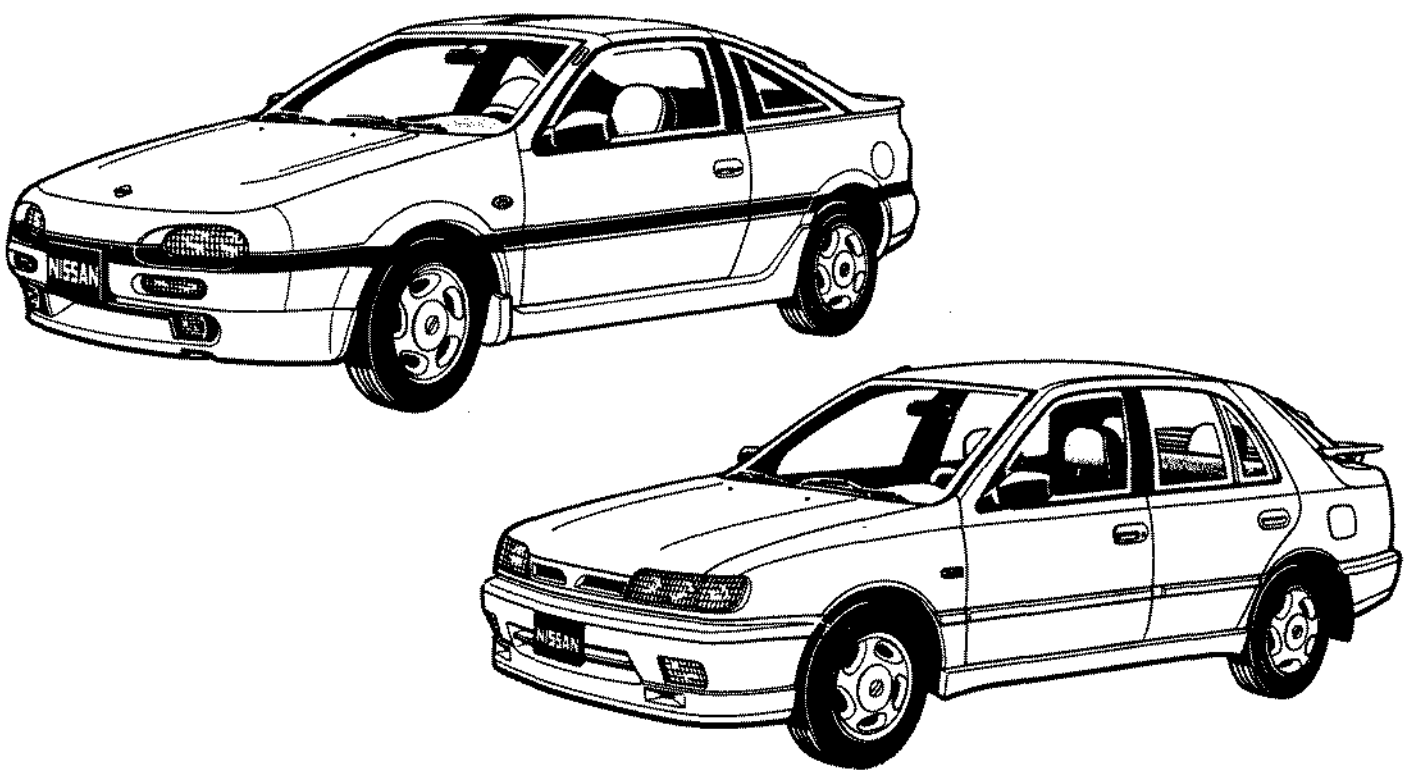
NISSAN

MODEL B13 AND N14 SERIES

Volume 1



SERVICE MANUAL

NISSAN

MODEL B13 AND N14 SERIES

Volume 1

QUICK REFERENCE INDEX

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GI (General Information) section is contained in Volume 1 and Volume 2.

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FOREWORD

This manual (Volume 1) contains maintenance and repair procedures for model B13 and N14 series engines.

For repair procedures for the following components, refer to Volume 2 (Pub. No. SM1E-2N4BG0).

1. Chassis
   - Clutch
   - Transaxle unit
   - Axle & suspension unit
   - Transfer unit
   - Propeller shaft & Differential carrier
   - Brake system
   - Steering system
2. Body
3. Heater & air conditioner unit
4. Electrical system

In order to assure your safety and the efficient functioning of the vehicle, this manual should be read thoroughly. It is especially important that the PRECAUTIONS in the GI section be completely understood before starting any repair task.

All information in this manual is based on the latest product information at the time of publication. The right is reserved to make changes in specifications and methods at any time without notice.

IMPORTANT SAFETY NOTICE

The proper performance of service is essential for both the safety of the technician 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 technician 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.

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Overseas Service Department
Tokyo, Japan

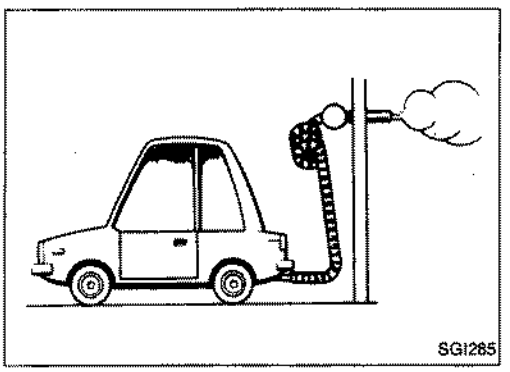
GENERAL INFORMATION

SECTION GI

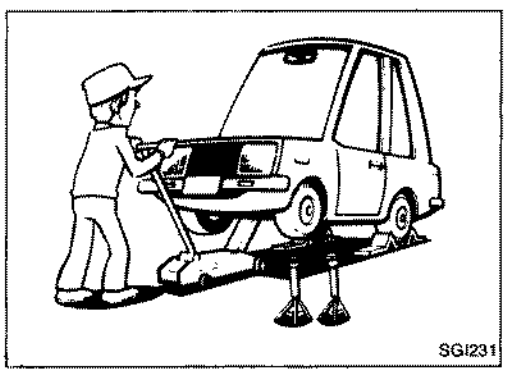
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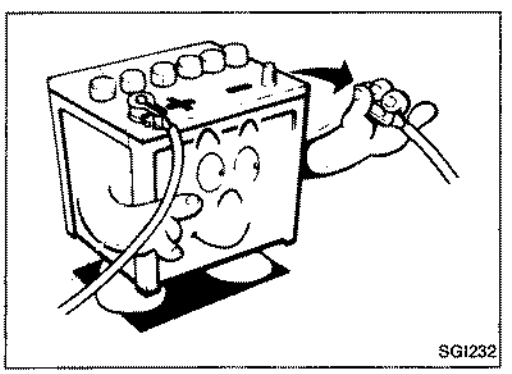
Observe the following precautions to ensure safe and proper servicing. These precautions are not described in each individual section.


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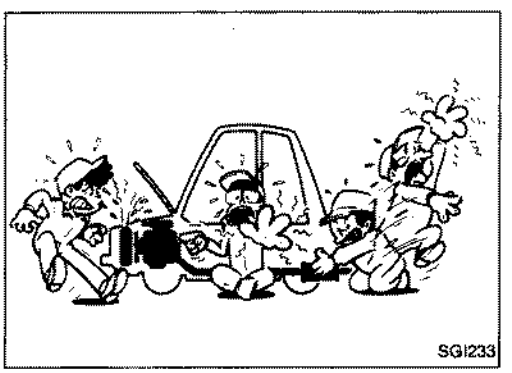
1. Do not operate the engine for an extended period of time without proper exhaust ventilation.
   Keep the work area well ventilated and free of any inflammable materials. Special care should be taken when handling any inflammable or poisonous materials, such as gasoline, refrigerant gas, etc. When 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

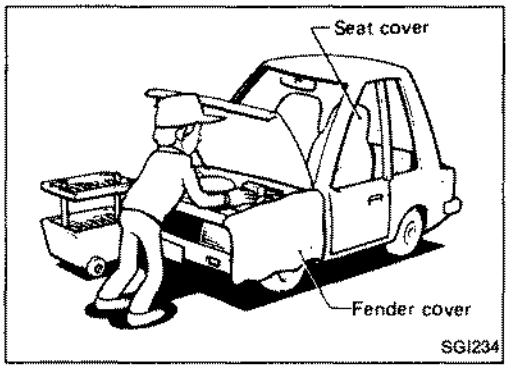
2. Before jacking up the vehicle, apply wheel chocks or other tire blocks to the wheels to prevent the vehicle from moving. After jacking up the vehicle, support the vehicle weight with safety stands at the points designated for proper lifting and towing before working on the vehicle.
   These operations should be done on a level surface.
3. 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.


SGI232

4. Before starting repairs which do not require battery power, always turn off the ignition switch, then disconnect the ground cable from the battery to prevent accidental short circuit.

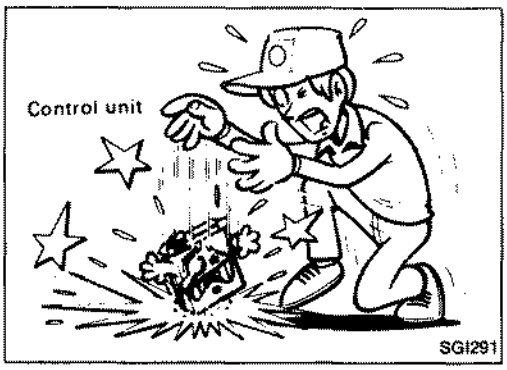

SGI233

5. To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe and muffler. Do not remove the radiator cap when the engine is hot.



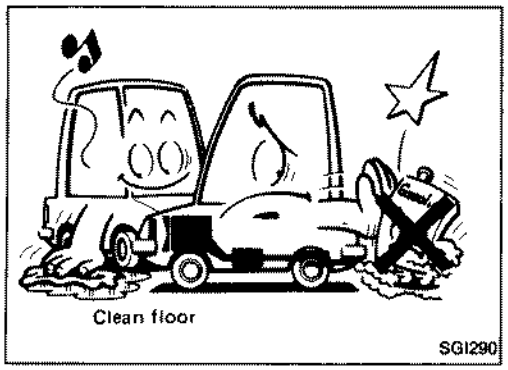
6. Before servicing the vehicle, protect fenders, upholstery and carpeting with appropriate covers.
   Take caution that keys, buckles or buttons on your person do not scratch the paint.

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



Precautions for E.F.I. or E.C.C.S. Engine

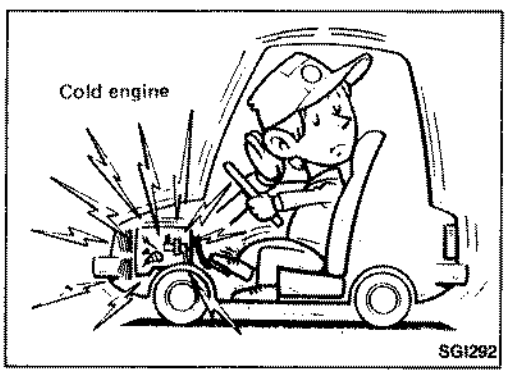
1. Before connecting or disconnecting E.F.I. or E.C.C.S. harness connector to or from any E.F.I. or E.C.C.S. control unit, be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal.
   Otherwise, there may be damage to control unit.
2. Before disconnecting pressurized fuel line from fuel pump to injectors, be sure to release fuel pressure to eliminate danger.
3. Be careful not to jar components such as control unit and air flow meter.



Precautions for Catalyst

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

1. Use unleaded gasoline only. Leaded gasoline will seriously damage the catalytic converter.
2. When checking for ignition spark or measuring engine compression, make tests quickly and only when necessary.
3. Do not run engine when the fuel tank level is low, otherwise the engine may misfire causing damage to the converter.
4. Do not place the vehicle on inflammable material. Keep inflammable material off the exhaust pipe.



Precautions for Turbocharger

The turbocharger turbine revolves at extremely high speeds and becomes very hot. Therefore, it is essential to maintain a clean supply of oil flowing through the turbocharger and to follow all required maintenance instructions and operating procedures.

For proper operation of the system, follow the procedure below.

1. Always use the recommended oil. Follow the instructions for proper time to change the oil and proper oil level.
2. Avoid accelerating engine to a high rpm immediately after starting.
3. If engine had been operating at high rpm for an extended period of time, let it idle for a few minutes prior to shutting it off.

Asbestos Safety Instructions (Based on United Kingdom and Republic of Ireland regulations)

This vehicle uses parts containing asbestos. Most are not hazardous but Brake and Clutch linings can be. Consult the manufacturer or his agent for further details. When working with these please observe the "Garage Workers' Asbestos Code" available through your Nissan Dealer, Local Authority or Health and Safety Executive. In particular, work in a well-ventilated place using, where possible, appropriate dust extraction equipment, and avoid creating dust. Dampen all asbestos/dust where possible prior to machining, cutting, cleaning, etc. Use only hand or low speed tools.

Dispose of all asbestos waste, wet rags, etc., in a closed container as directed by your local waste disposal authority.

Engine Oils

Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities must be provided.

HEALTH PROTECTION PRECAUTIONS

1. Avoid prolonged and repeated contact with oils, particularly used engine oils.
2. Wear protective clothing, including impervious gloves where practicable.
3. Do not put oily rags in pockets.
4. Avoid contaminating clothes, particularly underpants, with oil.
5. Heavily soiled clothing and oil-impregnated footwear should not be worn. Overalls must be cleaned regularly.
6. First Aid treatment should be obtained immediately for open cuts and wounds.
7. Use barrier creams, applying them before each work period, to help the removal of oil from the skin.
8. 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.
9. Do not use petrol, kerosine, diesel fuel, gas oil, thinners or solvents for cleaning skin.
10. If skin disorders develop, obtain medical advice without delay.
11. Where practicable, degrease components prior to handling.
12. 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.

(For the United Kingdom, see also HSE Cautionary Notice SHW 397 "Effects of Mineral Oil on the Skin".)

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 from country to country.

Precautions for Fuel

GASOLINE ENGINE:

For Europe

Catalytic converter equipped engines:
GA14DS engine models except for Switzerland ...
Unleaded gasoline of at least 91 octane (RON)
GA14DS engine models for Switzerland ...
Unleaded gasoline of at least 95 octane (RON)
Except GA14DS engine models ...
Unleaded gasoline of at least 95 octane (RON)

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

Except catalytic converter equipped engines:
For the United Kingdom and France only
GA14DS engine models ...
Unleaded gasoline of at least 91 octane (RON)
Except GA14DS engine models ...
Unleaded gasoline of at least 95 octane (RON)
Except the United Kingdom and France
GA14DS engine models ...
Unleaded or leaded gasoline of at least 91 octane (RON)
Except GA14DS engine models ...
Unleaded or leaded gasoline of at least 95 octane (RON)

Except Europe

Leaded gasoline of at least 88 octane (RON)

GA16DS engine models for Middle East ...
Leaded gasoline of at least 95 octane (RON)

DIESEL ENGINE*:

CD17 engine models ... Diesel fuel of at least 45 cetane
CD20 engine models ... 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:

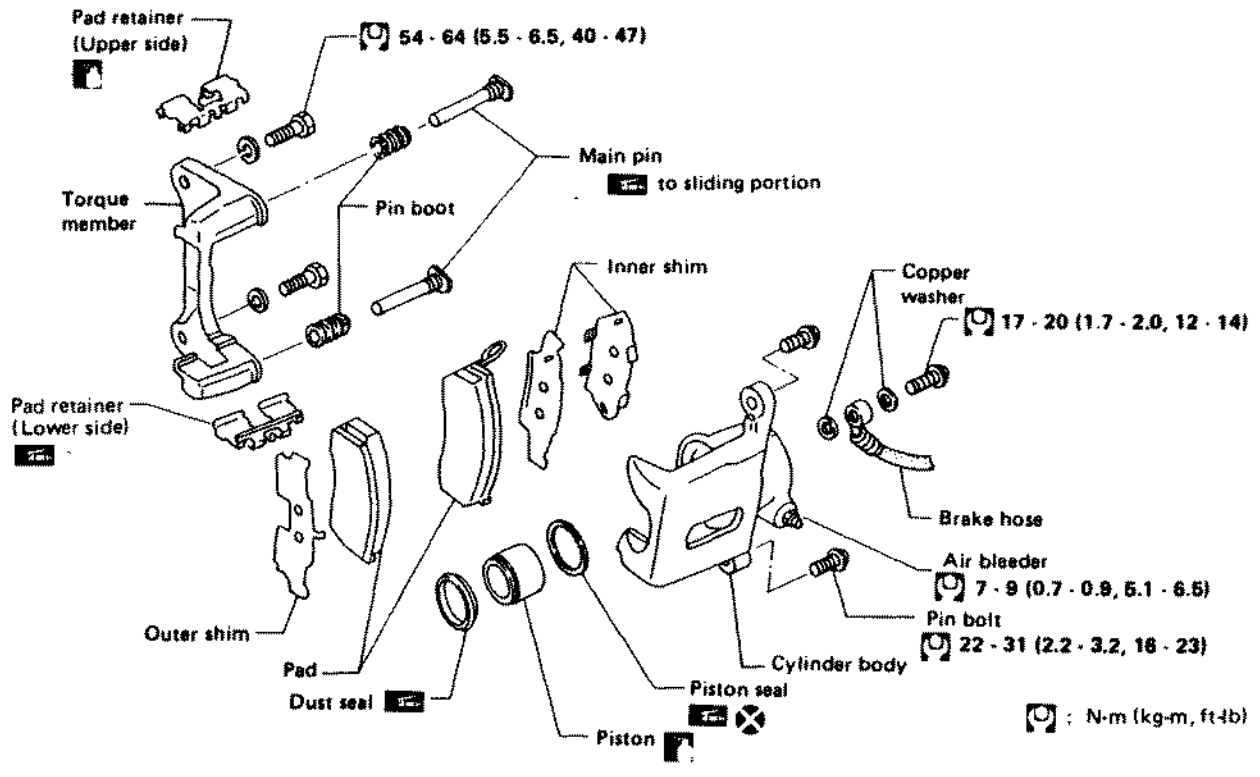
- **Do not use home heating oil, gasoline, or other alternate fuels in your diesel engine. The use of those can cause engine damage.**
- **Do not use summer fuel at temperature below –7°C (20°F). The cold temperatures will cause wax to form in the fuel. As a result, it may prevent the engine from running smoothly.**
- **Do not add gasoline or other alternate fuels to diesel fuel. Only under the following conditions may you use diesel fuel by mixing kerosene or regular gasoline (not premium gasoline) to prevent the fuel from thickening due to wax separation:**
  If the summer type diesel fuel is used at an ambient temperature below 0°C (32°F), add kerosene or regular gasoline but not more than 30% by volume. However, keep in mind that there may be less engine output performance due to the proportion of added fuel. The use of kerosene for motor vehicles is not permitted in some countries, e.g. U.K.

Precautions for Fuel (Cont'd)

Therefore, consult the relevant authorities before such mixtures are used.

1. **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.
2. **THE CONTENTS** are listed on the first page of each section.
3. **THE TITLE** is indicated on the upper portion of each page and shows the part or system.
4. **THE PAGE NUMBER** of each section consists of two letters which designate the particular section and a number (e.g. "BR-5").
5. **THE LARGE ILLUSTRATIONS** are exploded views (See below) and contain tightening torques, lubrication points 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"



6. **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.
7. The following **SYMBOLS AND ABBREVIATIONS** are used:

	:	Tightening torque
	:	Should be lubricated with grease. Unless otherwise indicated, use recommended multi-purpose grease.
	:	Should be lubricated with oil.
	:	Sealing point
	:	Checking point
	:	Always replace after every disassembly.
L.H., R.H.	:	Left-Hand, Right-Hand
FR, RR	:	Front, Rear

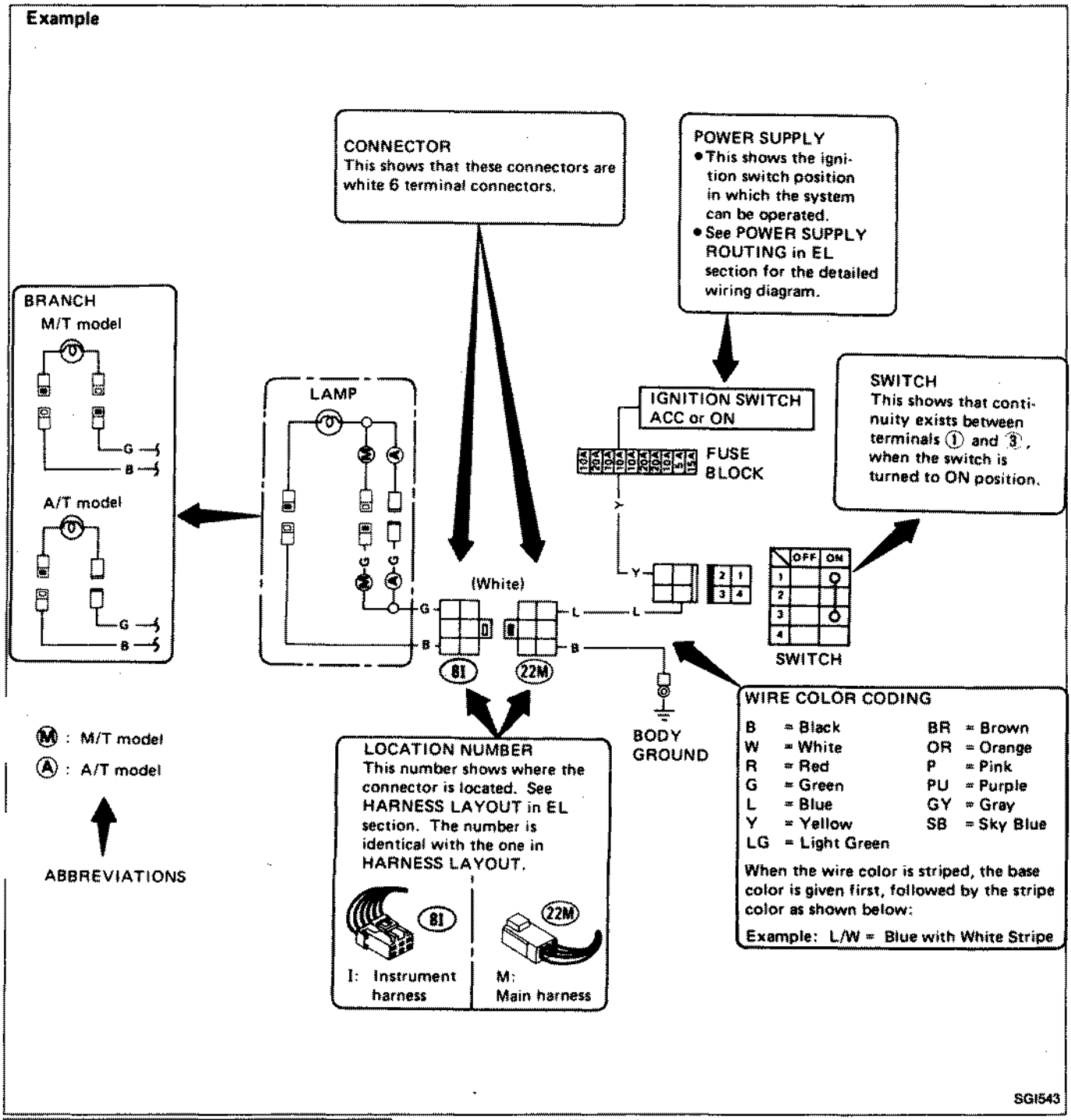
2WD	:	2-Wheel Drive
4WD	:	4-Wheel Drive
M/T	:	Manual Transaxle/Transmission
A/T	:	Automatic Transaxle/ Transmission
A/C	:	Air Conditioner
P/S	:	Power Steering
S.S.T.	:	Special Service Tools
S.D.S.	:	Service Data and Specifications
SAE	:	Society of Automotive Engineers, Inc.
G.C.C.	:	Gulf Cooperation Council
L.H.D.	:	Left-Hand Drive
R.H.D.	:	Right-Hand Drive

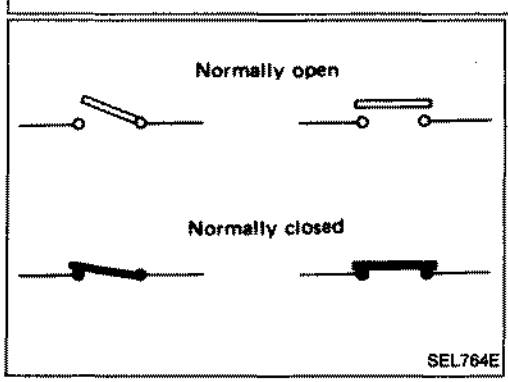
8. The **UNITS** given in this manual are primarily expressed as the SI UNIT (International System of Unit), and alternatively expressed in the metric system and in the yard/pound system.
   "Example"
   Tightening torque:
   59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)
9. **TROUBLE DIAGNOSES** are included in sections dealing with complicated components.
10. **SERVICE DATA AND SPECIFICATIONS** are contained at the end of each section for quick reference of data.
11. 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.

WIRING DIAGRAM

Symbols used in WIRING DIAGRAM are shown below:



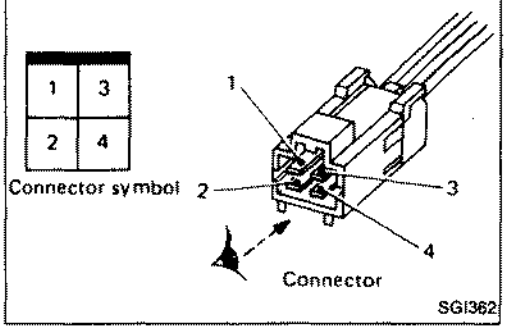


SWITCH POSITIONS

Wiring diagram switches are shown with the vehicle in the following condition.

- Ignition switch "OFF".
- Doors, hood and trunk lid/back door closed.
- Pedals are not depressed and parking brake is released.

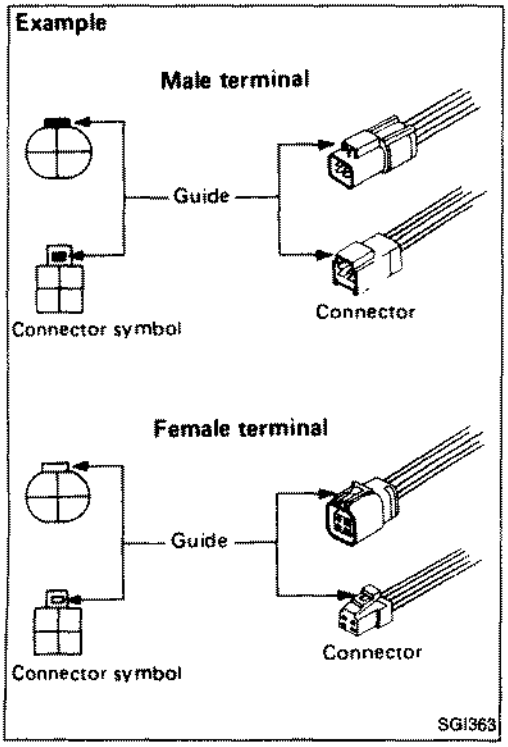
Example



CONNECTOR SYMBOLS

- All connector symbols in wiring diagrams are shown from the terminal side.

Example

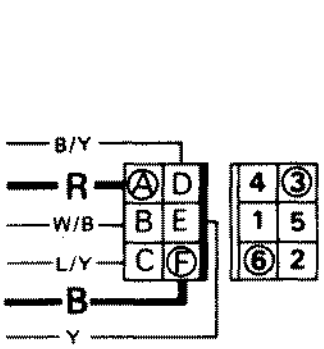


- Male and female terminals
  Connector guides for male terminals are shown in black and female terminals in white in wiring diagrams.

MULTIPLE SWITCH

The continuity of the multiple switch is identified in the switch chart in wiring diagrams.

Example



WIPER SWITCH

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

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

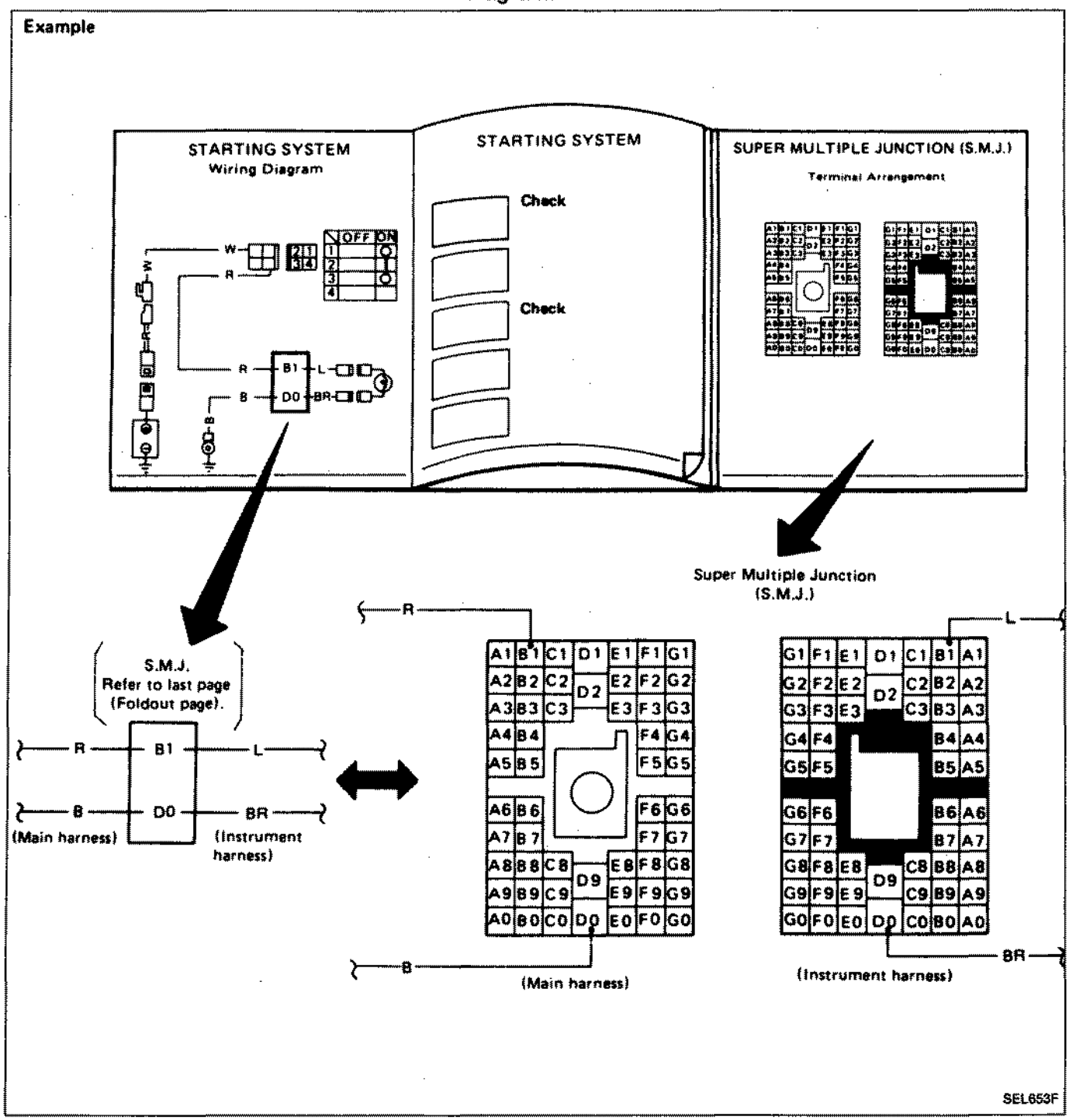
Example: Wiper switch in LO position
Continuity circuit: Red wire – Ⓐ terminal – ③ terminal – Wiper switch (● – ●: LO) – ⑥ terminal – Ⓕ terminal – Black wire

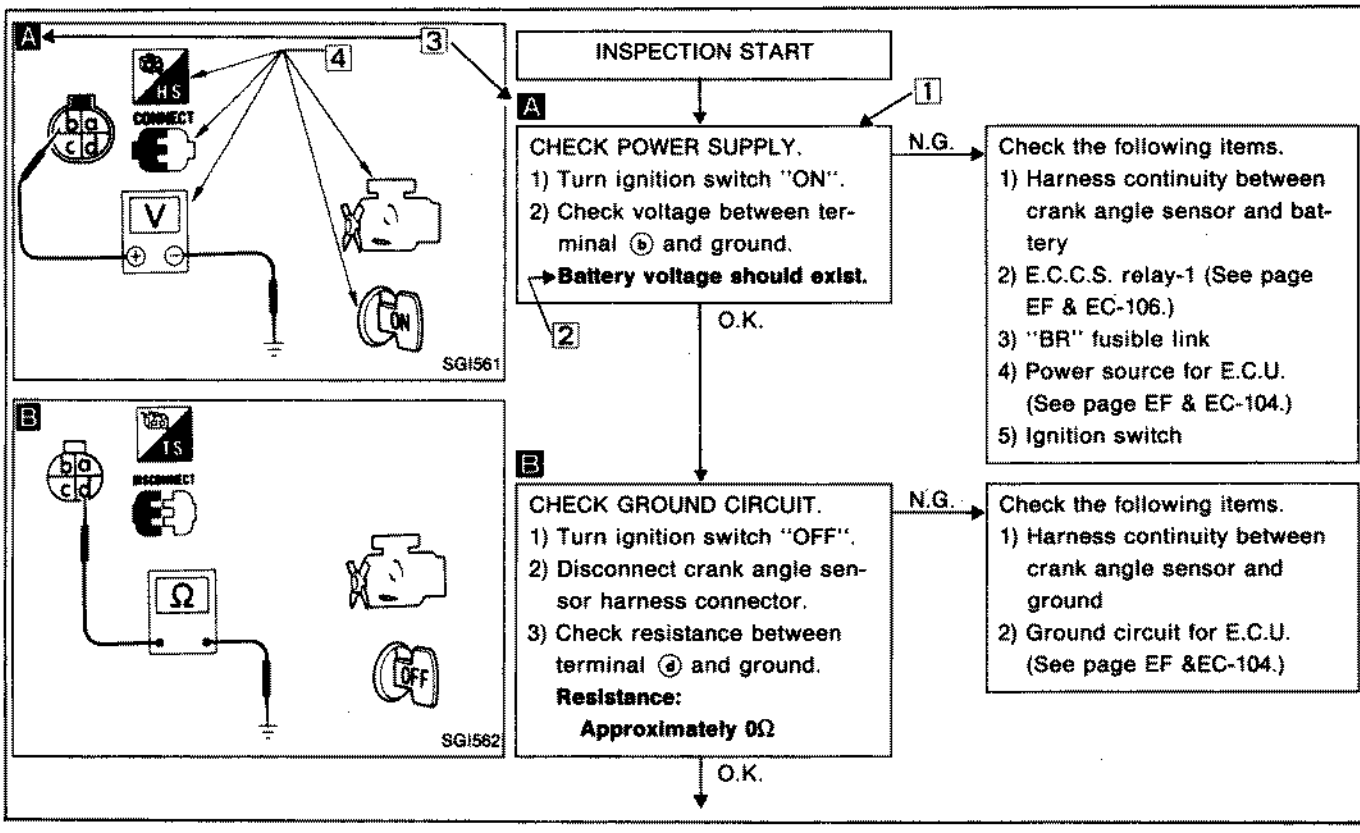
SGI365

SUPER MULTIPLE JUNCTION (S.M.J.)

- The "S.M.J." indicated in wiring diagrams is shown in a simplified form. The terminal arrangement should therefore be referred to in the foldout at the end of the Service Manual.
- The foldout should be spread to read the entire wiring diagram.

Example





NOTICE

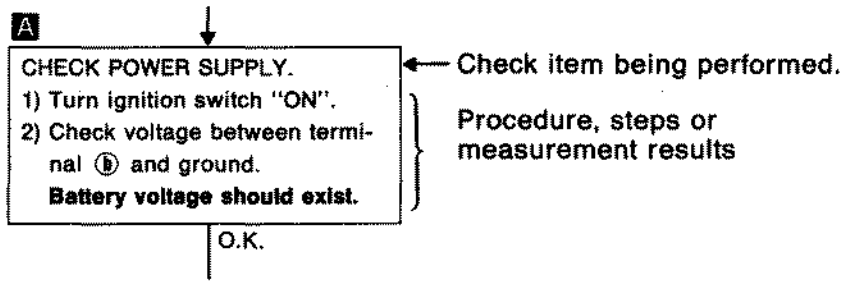
The flow chart indicates work procedures required to diagnose problems effectively. Observe the following instructions before diagnosing.

1) **Use the flow chart after locating probable causes of a problem following the "Preliminary Check" or the "Symptom Chart".**
2) **After repairs, recheck that the problem has been completely eliminated.**
3) **Refer to Component Parts Location and Harness Layout 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 perform circuit continuity between harness connectors more detail, such as in case of sub-harness is used, refer to Wiring Diagram and Harness Layout in EL section for identification of harness connectors.**
5) **When checking circuit continuity, ignition switch should be "OFF".**
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.**

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.



2 Measurement results

Required results are indicated in bold type in the corresponding block, as shown below:
These have the following meanings:

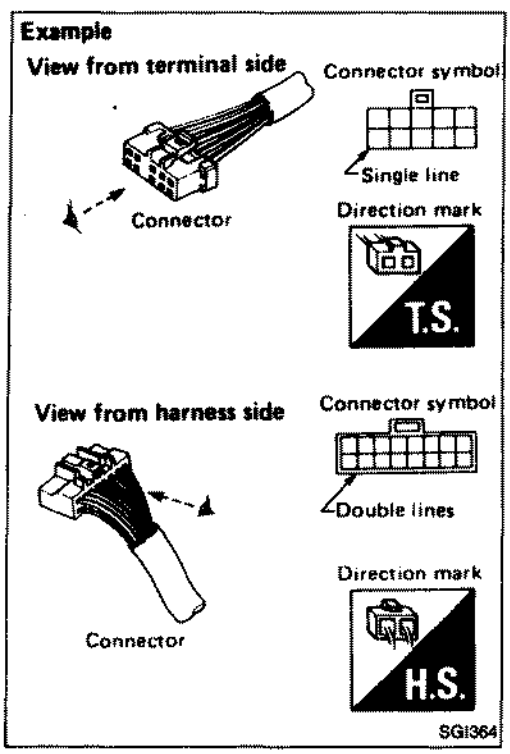
Battery voltage → 11 - 14V or approximately 12V
Voltage: Approximately 0V → Less than 1V

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 flowchart 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

A direction mark is shown to clarify the side of connector (terminal side or harness side).
Direction marks are mainly used in the illustrations indicating terminal inspection.



: **View from terminal side ... T.S.**

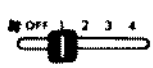
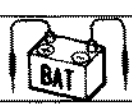
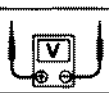
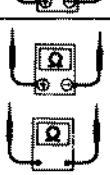
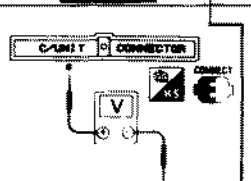
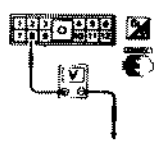
- **All connector symbols shown from the terminal side are enclosed by a single line.**



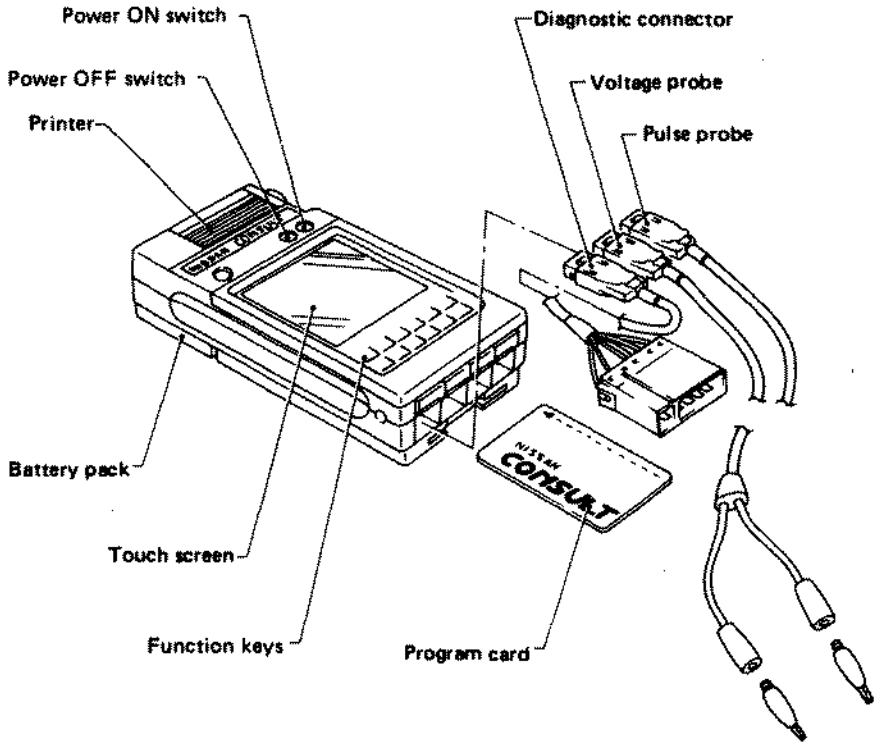
: **View from harness side ... H.S.**

- **All connector symbols shown from the harness side are enclosed by a double line.**

Key to symbols signifying measurements or procedures

Symbol	Symbol explanation	Symbol	Symbol explanation
	Check after disconnecting the connector to be measured.		Procedure with Consult
	Check after connecting the connector to be measured.		Procedure with CONSULT
	Insert key into ignition switch.		A/C switch is "OFF".
	Remove key from ignition switch.		A/C switch is "ON".
	Turn ignition switch to "OFF" position.		REC switch is "ON".
	Turn ignition switch to "ON" position.		REC switch is "OFF".
	Turn ignition switch to "START" position.		DEF switch is "ON".
	Turn ignition switch from "OFF" to "ACC" position.		VENT switch is "ON".
	Turn ignition switch from "ACC" to "OFF" position.		Fan switch is "ON". (At any position except for "OFF" position)
	Turn ignition switch from "OFF" to "ON" position.		Fan switch is "OFF".
	Turn ignition switch from "ON" to "OFF" position.		Apply battery voltage directly to components.
	Do not start engine, or check with engine stopped.		Drive vehicle.
	Start engine, or check with engine running.		Disconnect battery negative cable.
	Apply parking brake.		Depress brake pedal.
	Release parking brake.		Release brake pedal.
	Check after engine is warmed up sufficiently.		Depress accelerator pedal.
	Voltage should be measured with a voltmeter.		Release accelerator pedal.
	Circuit resistance should be measured with an ohmmeter.		Pin terminal check for S.M.J. type E.C.U. and A/T control unit connectors. **For details regarding the terminal arrangement, refer to the foldout page.** 
	Current should be measured with an ammeter.		

Outside View



SGI619

System Application

Diagnostic mode \ System	E.C.C.S. (GA16DE and SR20DE engines)
Work support	X
Self-diagnostic results	X
Data monitor	X
Active test	X
E.C.U. part number	X

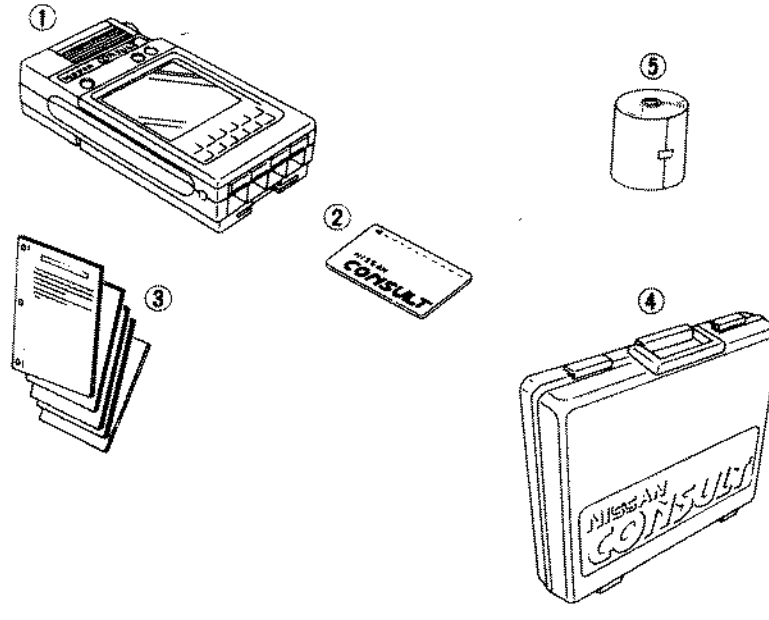
X: Applicable

Function

Diagnostic mode	Function
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.
Data monitor	Input/Output data in the control unit can be read.
Active test	Mode in which CONSULT drives some actuators apart from the control units and also shifts some parameters in a specified range.
E.C.U. part number	E.C.U. part number can be read.

Checking Equipment

When ordering this equipment, contact your NISSAN distributor.

Tool name	Description
NISSAN CONSULT kit ① CONSULT unit and accessories ② Program card ③ Operation manuals ④ Carrying case ⑤ Thermal paper (Rolls)	

Model Variation

MODEL B13 SERIES

Destination	Body	Grade	Engine / Transaxle	E10S	GA13DS	GA14DS		GA16DS		GA16DE		CD17
				RN4F30A	RS5F30A	RS5F30A	RL4F03A	RS5F31A	RL4F03A	RS5F31A	RL4F03A	RS5F30A
Except Europe and Middle East	R.H. drive	4-door Sedan	LE	—	BAJAR8F-SWA	BAVAR8F-SWA	BAVAR8A-SWA	BAYAR8F-SWA	—	—	—	BVAAR8F-NWA
			JX	BAJAR0T-SWA	BAJAR0F-SWA	BAVAR0F-SWA	BAVAR0A-SWA	—	—	—	—	—
			EX Saloon	BAJAR1T-SWA	BAJAR1F-SWA	BAVAR1F-SWA	BAVAR1A-SWA	BAYAR1F-SWA	BAYAR1A-SWA	—	—	—
			Super Saloon	—	BAJAR0F-SWA	BAVAR0F-SWA	BAVAR0A-SWA	BAYAR0F-SWA	BAYAR0A-SWA	BAYAR0F-EWA	BAYAR0A-EWA	—
	L.H. drive		LE	—	BAJAL8F-SWA	BAVAL8F-SWA	BAVAL8A-SWA	BAYAL8F-SWA	—	—	—	BVAAL8F-NWA
			JX	—	BAJAL0F-SWA	BAVAL0F-SWA	BAVAL0A-SWA	BAYAL0F-SWA	BAYAL0A-SWA	—	—	—
			Ex Saloon	—	BAJAL1F-SWA	BAVAL1F-SWA	BAVAL1A-SWA	BAYAL1F-SWA	BAYAL1A-SWA	—	—	—
			Super Saloon	—	—	—	—	BAYAL0F-SWA	BAYAL0A-SWA	BAYAL0F-EWA	BAYAL0A-EWA	—
	R.H. drive	Coupe	Type B	—	—	—	—	—	—	GAYAR1F-EWA	GAYAR1A-EWA	—
		T-bar roof		—	—	—	—	—	—	HAYAR1F-EWA	HAYAR1A-EWA	—
	L.H. drive	Coupe	Type B	—	—	—	—	—	—	GAYAL1F-EWA	GAYAL1A-EWA	—
		T-bar roof		—	—	—	—	—	—	HAYAL1F-EWA	HAYAL1A-EWA	—
Middle East	L.H. drive	4-door Sedan	LE	—	—	BAVAL8F-SKA	BAVAL8A-SKA	—	—	—	—	—
			JX	—	—	BAVAL0F-SKA	BAVAL0A-SKA	BAYAL0F-SKA	BAYAL0A-SKA	—	—	—
			EX Saloon	—	—	BAVAL1F-SKA	BAVAL1A-SKA	BAYAL1F-SKA	BAYAL1A-SKA	—	—	—
			Super Saloon	—	—	—	—	BAYAL0F-SKA	BAYAL0A-SKA	—	—	—
		Coupe	Type B	—	—	—	—	GAYAL1F-SKA	GAYAL1A-SKA	—	—	—
		T-bar roof	Type B	—	—	—	—	HAYAL1F-SKA	HAYAL1A-SKA	—	—	—

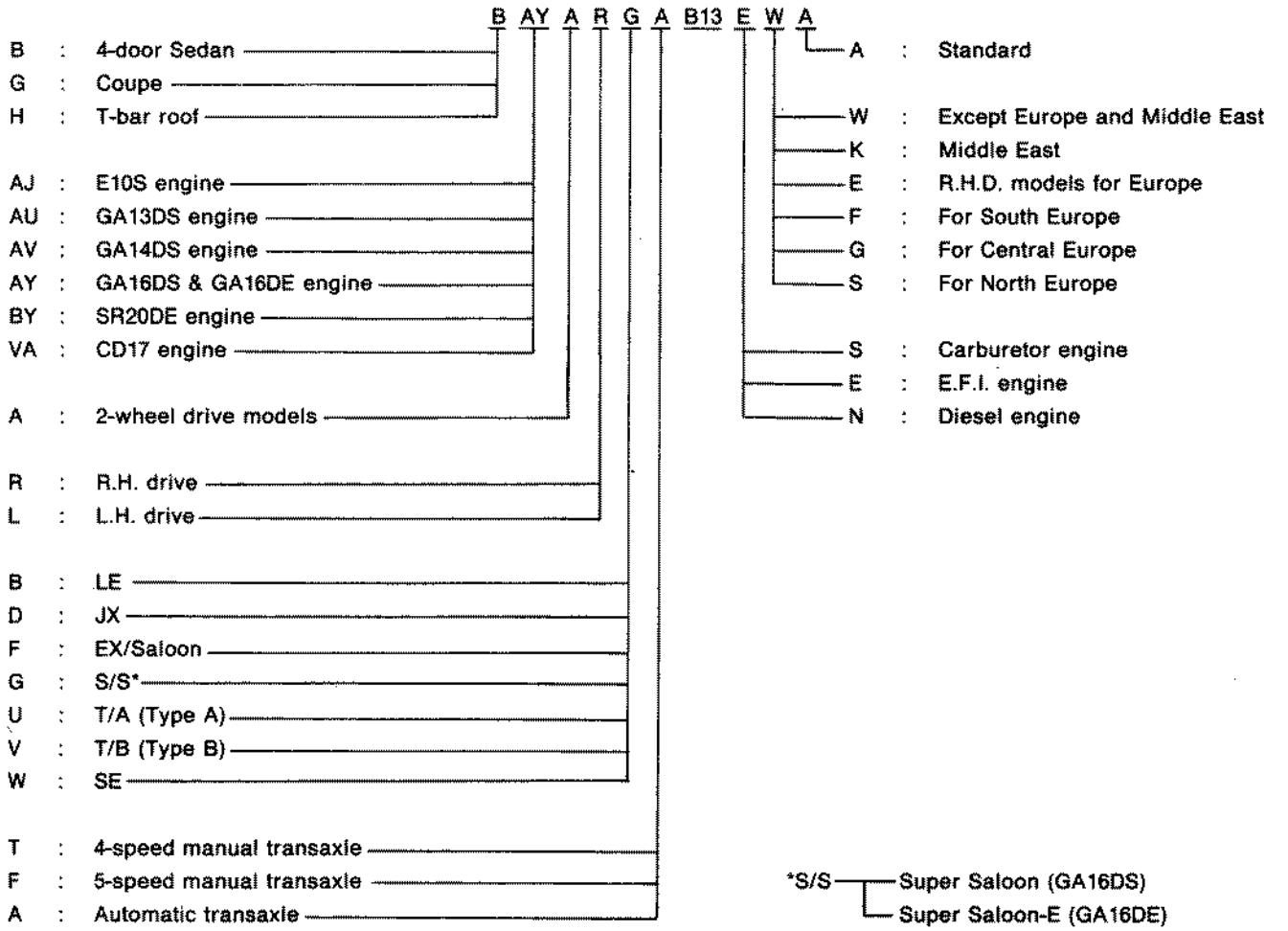
Model Variation (Cont'd)

MODEL B13 SERIES

Destination		Body	Grade	Engine: GA16DS / Transaxle: RS5F31A	Engine: GA16DS / Transaxle: RL4F03A	Engine: SR20DE / Transaxle: RS5F32A
Europe	R.H. drive models	Coupe	Type A	GAYARUF-SEA	GAYARUA-SEA	—
			SE	—	—	GBYARWF-EEA
		T-bar roof	Type A	HAYARUF-SEA	HAYARUA-SEA	—
			SE	—	—	HBYARWF-EEA
	For South Europe	Coupe	Type A	GAYALUF-SFA	GAYALUA-SFA	—
			SE	—	—	GBYALWF-EFA
		T-bar roof	Type A	HAYALUF-SFA	HAYALUA-SFA	—
			SE	—	—	HBYALWF-EFA
	For Central Europe	Coupe	Type A	GAYALUF-SGA	GAYALUA-SGA	—
			SE	—	—	GBYALWF-EGA
		T-bar roof	Type A	HAYALUF-SGA	HAYALUA-SGA	—
			SE	—	—	HBYALWF-EGA
	For North Europe	Coupe	Type A	GAYALUF-SSA	GAYALUA-SSA	—
			SE	—	—	GBYALWF-ESA
		T-bar roof	Type A	HAYALUF-SSA	HAYALUA-SSA	—
			SE	—	—	HBYALWF-ESA

Model Variation (Cont'd)

Prefix and suffix designations:



Model Variation (Cont'd)

MODEL N14 SERIES

Destination		Body	Grade	Engine	GA14DS		GA16DS		SR20DE	SR20DET	CD20
				Transaxle	5-speed M/T	4-speed A/T	5-speed M/T	4-speed A/T	5-speed M/T	5-speed M/T	5-speed M/T
					RS5F30A	RL4F03A	RS5F31A	RL4F03A	RS5F32A	RS5F50A	RS5F31A
Europe	R.H. drive models	Sedan	L		BAVARBF-SEA	BAVARBA-SEA	—	—	—	—	BVCARBF-NEA
			LX		BAVARDF-SEA	BAVARDA-SEA	BAYARDF-SEA	BAYARDA-SEA	—	—	BVCARDF-NEA
			SLX		—	—	BAYARFF-SEA	BAYARFA-SEA	—	—	—
		3-door Hatchback	L		EAVARBF-SEA	—	—	—	—	—	—
			LX		EAVARDF-SEA	—	—	—	—	—	—
			SLX		—	—	EAYARFF-SEA	EAYARFA-SEA	—	—	—
			GTI		—	—	—	—	EBYARUF-EEA	—	—
			GTI-R		—	—	—	—	—	EBYNRRF-TEA	—
		5-door Hatchback	L		FAVARBF-SEA	FAVARBA-SEA	—	—	—	—	FVCARBF-NEA
			LX		FAVARDF-SEA	—	FAYARDF-SEA	FAYARDA-SEA	—	—	FVCARDF-NEA
			SLX		—	—	FAYARFF-SEA	FAYARFA-SEA	—	—	—
			GTI		—	—	—	—	FBYARUF-EEA	—	—
	For South Europe	Sedan	LX		BAVALDF-SFA	BAVALDA-SFA	—	—	—	—	BVCALDF-NFA
			SLX		BAVALFF-SFA	BAVALFA-SFA	BAYALFF-SFA	BAYALFA-SFA	—	—	BVCALFF-NFA
			SLX 4WD		—	—	BAYNLFF-SFA	—	—	—	—
		3-door Hatchback	L		EAVALBF-SFA	—	—	—	—	—	—
			LX		EAVALDF-SFA	EAVALDA-SFA	—	—	—	—	EVCALDF-NFA
			SLX		EAVALFF-SFA	—	EAYALFF-SFA	EAYALFA-SFA	—	—	EVCALFF-NFA
			GTI		—	—	—	—	EBYALUF-EFA	—	—
			GTI-R		—	—	—	—	—	EBYNLRF-TFA	—
		5-door Hatchback	LX		FAVALDF-SFA	—	—	—	—	—	FVCALDF-NFA
			SLX		FAVALFF-SFA	FAVALFA-SFA	FAYALFF-SFA	FAYALFA-SFA	—	—	FVCALFF-NFA
			GTI		—	—	—	—	FBYALUF-EFA	—	—
	For Central Europe	Sedan	LX		BAVALDF-SGA	—	—	—	—	—	BVCALDF-NGA
			SLX		BAVALFF-SGA	—	BAYALFF-SGA	BAYALFA-SGA	—	—	BVCALFF-NGA
			SLX 4WD		—	—	BAYNLFF-SGA	—	—	—	—
		3-door Hatchback	L		EAVALBF-SGA	—	—	—	—	—	—
			LX		EAVALDF-SGA	EAVALDA-SGA	—	—	—	—	EVCALDF-NGA
			SLX		EAVALFF-SGA	—	EAYALFF-SGA	EAYALFA-SGA	—	—	EVCALFF-NGA
			GTI		—	—	—	—	EBYALUF-EGA	—	—
			GTI-R		—	—	—	—	—	EBYNLRF-TGA	—
		5-door Hatchback	LX		FAVALDF-SGA	—	FAYALDF-SGA	—	—	—	FVCALDF-NGA
			SLX		FAVALFF-SGA	—	FAYALFF-SGA	FAYALFA-SGA	—	—	FVCALFF-NGA
			GTI		—	—	—	—	FBYALUF-EGA	—	—
	For North Europe	Sedan	L		BAVALBF-SSA	—	—	—	—	—	—
			LX		BAVALDF-SSA	—	BAYALDF-SSA	—	—	—	BVCALDF-NSA
			SLX		—	—	BAYALFF-SSA	BAYALFA-SSA	—	—	—
			SLX 4WD		—	—	BAYNLFF-SSA	—	—	—	—
		3-door Hatchback	L		EAVALBF-SSA	—	—	—	—	—	—
			LX		EAVALDF-SSA	EAVALDA-SSA	EAYALDF-SSA	—	—	—	—
			SLX		—	—	EAYALFF-SSA	EAYALFA-SSA	—	—	—
			GTI		—	—	—	—	EBYALUF-ESA	—	—
			GTI-R		—	—	—	—	—	EBYNLRF-TSA	—
		5-door Hatchback	LX		FAVALDF-SSA	—	FAYALDF-SSA	—	—	—	—
			SLX		—	—	FAYALFF-SSA	—	—	—	—
			GTI		—	—	—	—	FBYALUF-ESA	—	—

Model Variation (Cont'd)

Destination		Body	Engine / Transaxle / Grade	GA14DS		GA16DE	
				5-speed M/T	4-speed A/T	5-speed M/T	4-speed A/T
				RS5F30A	RL4F03A	RS5F31A	RL4F03A
Except Europe	R.H. drive	5-door Hatchback	K1	FAVAREF-SHA	FAVAREA-SHA	—	—
			J1J	—	—	FAYARGF-EHA	FAYARGA-EHA

Prefix and suffix designations:

F A Y A R G A N14 E H A

- B : 4-door Sedan
- E : 3-door Hatchback
- F : 5-door Hatchback

- AV : GA14DS engine
- AY : GA16DS or GA16DE engine
- BY : SR20DE or SR20DET engine
- VC : CD20 engine

- A : 2-wheel drive models
- N : 4-wheel drive models

- R : R.H. drive
- L : L.H. drive

- B : L
- D : LX
- E : K1
- F : SLX
- G : J1J
- R : GTI-R
- U : GTI

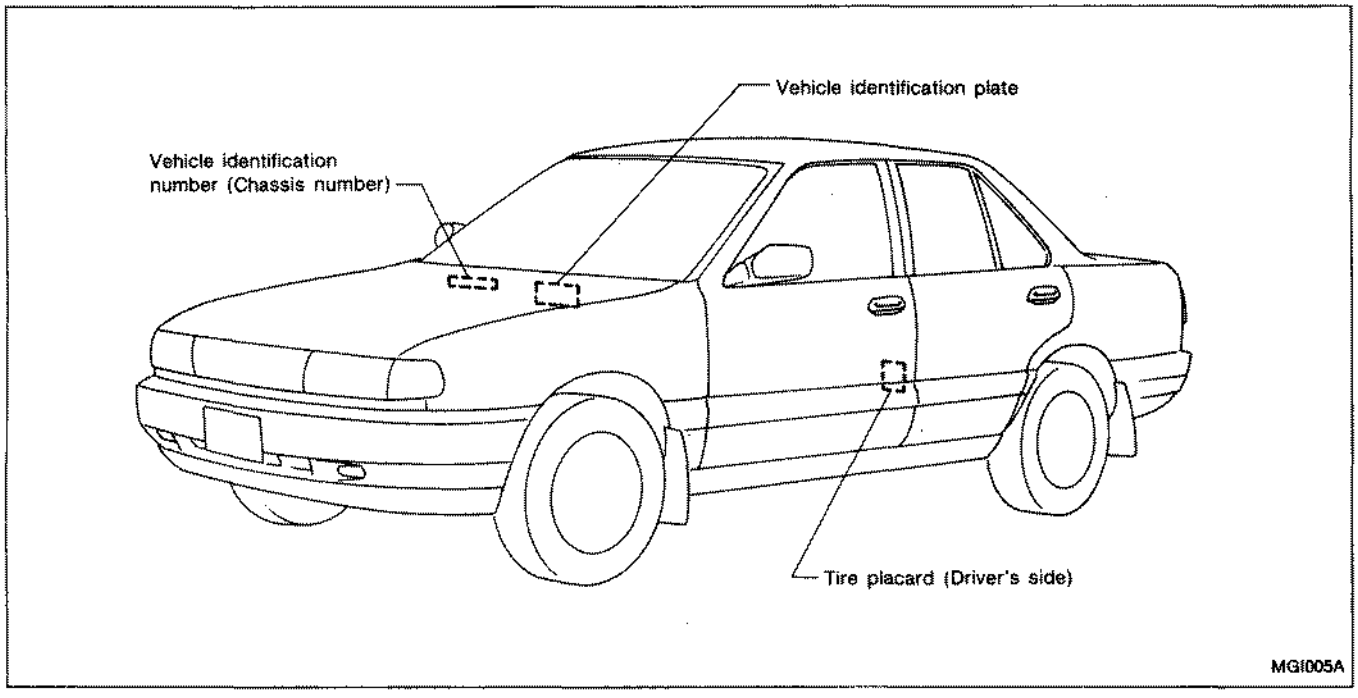
- F : 5-speed manual transaxle
- A : Automatic transaxle

- A : Standard

- H : Except for Europe
- E : R.H.D. models for Europe
- F : For South Europe
- G : For Central Europe
- S : For North Europe

- S : Carburetor engine
- E : E.F.I. engine
- N : Diesel engine
- T : Turbo engine

Identification Number



VEHICLE IDENTIFICATION NUMBER (Chassis number)

Prefix and suffix designations:

Model B13 series
(Except Europe)

B B A B13—XXXXXX

Body type
- B : Sedan
- G : Coupe
- H : T-bar roof

Engine type
- A : E10S engine
- B : GA13DS engine
- C : GA14DS engine
- E : GA16DS or GA16DE engine
- H : CD17 engine

A : 2-wheel drive models

Model

Vehicle serial number

Identification Number (Cont'd)

(For Europe)

JN1 G E A B13 U 0 XXXXXX

Manufacturer
JN1 : Nissan, Passenger vehicle

Body type
G : Coupe
H : T-bar roof

Engine type
E : GA16DE engine
G : SR20DE engine

A : 2-wheel drive models

Vehicle serial number

Stopgap (no meaning)

Destination
U : For Europe

Model

Model N14 series
(Except Europe)

F E A N14 — XXXXXX

Body type
F : 5-door Hatchback

Engine type
C : GA14DS engine
E : GA16DE engine

A : 2-wheel drive models

Vehicle serial number

Model

(For Europe)

JN1 E E A N14 U 0 XXXXXX

Manufacturer
JN1 : Nissan, Passenger vehicle

Body type
B : 4-door Sedan
E : 3-door Hatchback
F : 5-door Hatchback

Engine type
C : GA14DS engine
E : GA16DS engine
G : SR20DE or SR20DET engine
J : CD20 engine

A : 2-wheel drive models
N : 4-wheel drive models

Vehicle serial number

Stopgap (no meaning)

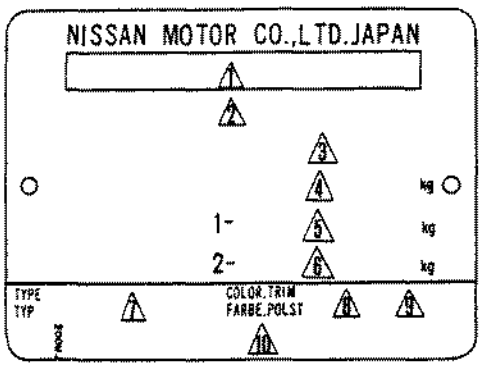
Destination
U : For Europe

Model

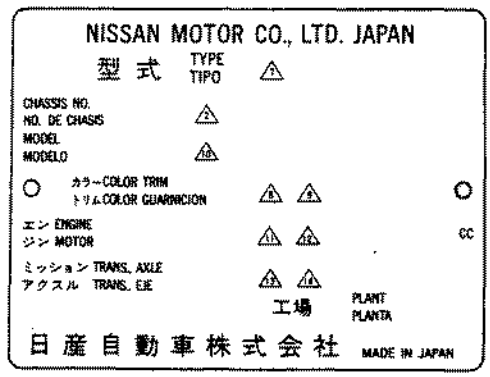
Identification Number (Cont'd)

IDENTIFICATION PLATE

Europe



Except Europe

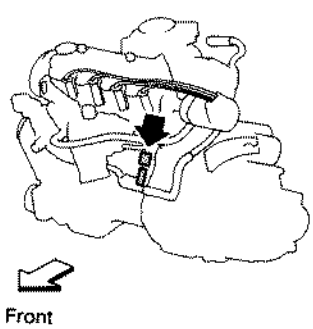


1 Type approval number
2 Vehicle identification number (Chassis number)
3 Gross vehicle weight
4 Gross combination weight
Gross vehicle weight
+ Gross trailing capacity (Weight)
5 Gross axle weight (Front)
6 Gross axle weight (Rear)
7 Type
8 Body color code
9 Trim color code
10 Model
11 Engine model
12 Engine displacement
13 Transaxle model
14 Axle model

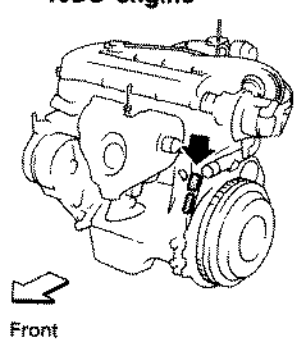
SGI704

ENGINE SERIAL NUMBER

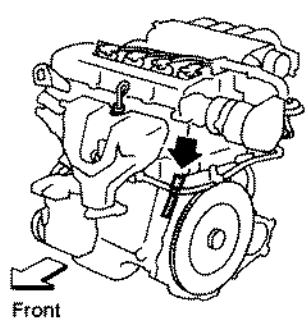
E10S engine



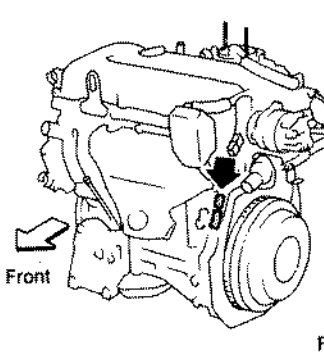
GA13DS, 14DS, 16DS engine



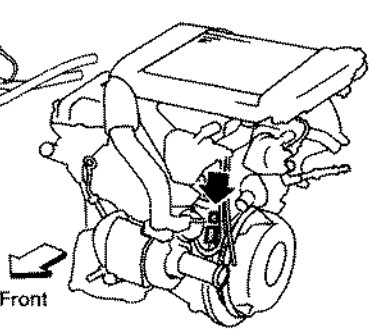
GA16DE engine



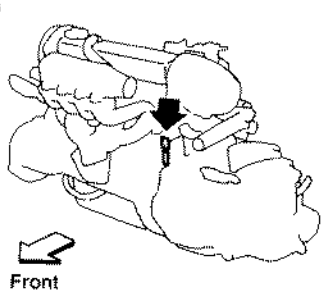
SR20DE engine



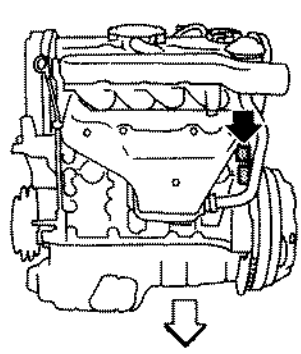
SR20DET engine



CD17 engine



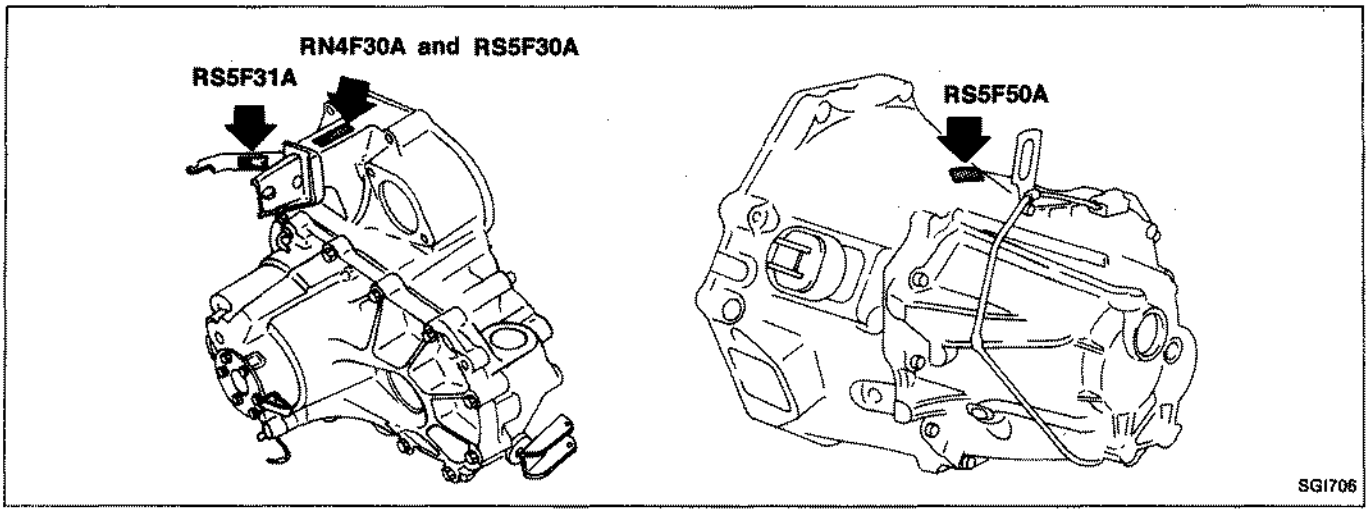
CD20 engine



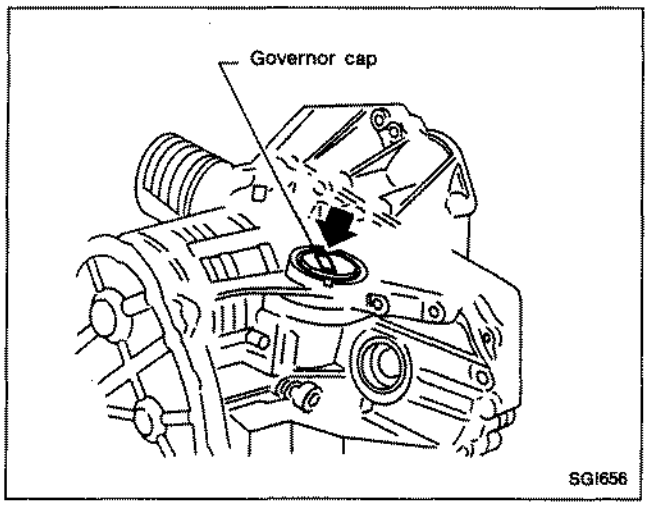
SGI705

Identification Number (Cont'd)

MANUAL TRANSAXLE NUMBER



AUTOMATIC TRANSAXLE NUMBER



Dimensions

MODEL B13 SERIES

Unit: mm (in)

	Sedan	Coupe
Overall length	4,210 (165.7)	4,140 (163.0) 4,135 (162.8)*4
Overall width	1,660 (65.4)*1 1,670 (65.7)	1,680 (66.1)
Overall height	1,375 (54.1)	1,310 (51.6) 1,315 (51.8)*2
Front tread	1,435 (56.5)*3 1,445 (56.9)	1,435 (56.5)*3 1,445 (56.9)
Rear tread	1,415 (55.7)*3 1,435 (56.5)	1,415 (55.7)*3 1,435 (56.5)
Wheelbase	2,430 (95.7)	2,430 (95.7)

*1: LE grade
*2: T-bar roof models
*3: 185/60R14 tire (Except Europe)/175/65R14 tire (For Europe)
*4: For Europe

MODEL N14 SERIES

Unit: mm (in)

	Sedan	3-door Hatchback	5-door Hatchback (For Europe)	5-door Hatchback (Except for Europe)
Overall length	4,230 (166.5)	3,975 (156.5)	4,145 (163.2)	4,145 (163.2)
Overall width	1,670 (65.7)	1,670 (65.7) 1,690 (66.5)*1	1,670 (65.7) 1,690 (66.5)*1	1,670 (65.7)
Overall height	1,395 (54.9) 1,410 (55.5)*2	1,395 (54.9) 1,410 (55.5)*2	1,395 (54.9)	1,385 (54.5)
Front tread	1,446 (56.9)*3 1,436 (56.5)*4	1,446 (56.9)*3 1,436 (56.5)*4	1,446 (56.9)*3 1,436 (56.5)*4	1,445 (56.9)
Rear tread	1,431 (56.3)*5 1,421 (55.9)*6	1,431 (56.3)*5 1,421 (55.9)*6	1,431 (56.3)*5 1,421 (55.9)*6	1,435 (56.5)
Wheelbase	2,430 (95.7)	2,430 (95.7)	2,430 (95.7)	2,430 (95.7)

*1: SR series engine models
*2: 4WD models
*3: Tire offset 40 mm (1.57 in)
*4: Tire offset 45 mm (1.77 in)
*5: 155SR13, 175/70R13 tire
*6: 175/65R14, 195/55R14 tire

Wheels and Tires

MODEL B13 SERIES

Except Europe

Wheels & tires \ Body			Coupe & T-bar roof model	Offset mm (in)	4-door sedan	Offset mm (in)
Wheel size	Steel	Standard	14 × 5-1/2JJ*8	45 (1.77)	13 × 5J	40 (1.57)
			13 × 5J*6	40 (1.57)		
		Option	—	—	14 x 5-1/2JJ*1	45 (1.77)
	Alu-minum	Option	13 × 5J*6	40 (1.57)	13 × 5J*7	40 (1.57)
			14 × 5-1/2JJ*8	45 (1.77)	14 × 5-1/2JJ*2	45 (1.77)
Tire size		Standard	185/60R14 82H*8 155/80R13 78S*6		155SR13*3 175/70R13 82S*4 6.15-13-4PR*5 155/80R13 78S*6	
		Option	175/70R13 82S*6		155SR13*5 175/70R13 82S*3,*6 185/60R14 82H*1 175/65R14 82H*1	

*1: GA16DS & GA16DE engine models
*2: Super saloon for GA16DS and GA16DE engine models
*3: Except E10S and GA16DE engine models
*4: GA16DE engine model
*5: E10S engine model
*6: For Middle East
*7: Except GA14DS engine for Middle East
*8: For General areas

For Europe

Wheels & tires \ Engine			GA16DS engine	Offset mm (in)	SR20DE engine	Offset mm (in)
Wheel size	Steel	Standard	14 × 5-1/2JJ	45 (1.77)	—	—
	Alu-minum	Standard	—	—	14 × 6JJ	40 (1.57)
		Option	14 × 5-1/2JJ	45 (1.77)	—	
	T-type	Standard	14 × 4T	40 (1.57)	15 × 4T	40 (1.57)
Tire size	Con-ven-tional	Standard	175/65R14 82H		195/55R14 82V	
	T-type	Standard	T115/70D14		T135/70D15	

Wheels and Tires (Cont'd)

MODEL N14 SERIES

Except Europe

Wheel & Tire \ Engine			GA14DS		GA16DE	
				Offset mm (in)		Offset mm (in)
Wheel size	Steel	Standard	13 x 5J	40 (1.57)	14 x 5-1/2JJ	45 (1.77)
	Aluminum	Option	—	—	14 x 5-1/2JJ	45 (1.77)
Tire size			175/70R13 82S		175/65R14 82H	

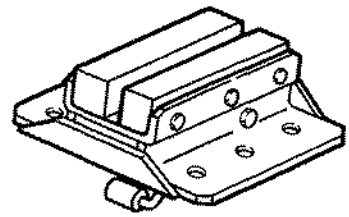
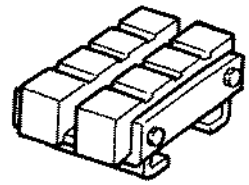
For Europe

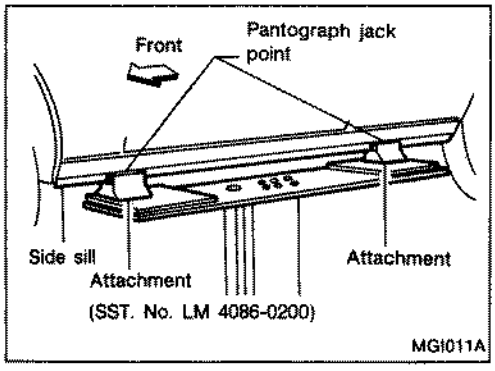
Wheel & Tire \ Engine			GA14DS		GA16DS		SR20DE		SR20DET		CD20	
				Offset mm (in)		Offset mm (in)		Offset mm (in)		Offset mm (in)		Offset mm (in)
Wheel size	Steel	Standard	13 × 5J	40 (1.57)	13 × 5J	40 (1.57)	—	—	—	—	13 × 5J	40 (1.57)
	Aluminum		—	—	—	—	14 × 6JJ	40 (1.57)	14 × 6JJ	40 (1.57)	—	—
	Steel	Option	—	—	14 × 5-1/2JJ *3	45 (1.77)	14 × 6JJ	40 (1.57)	14 × 6JJ	40 (1.57)	—	—
	Aluminum		13 × 5J *5	40 (1.57)	13 × 5J *5	40 (1.57)	—	—	—	—	13 × 5J *5	40 (1.57)
	T-type	Standard	—	—	—	—	—	—	15 × 4T	40 (1.57)	—	—
		Option	14 × 4T	40 (1.57)	14 × 4T*1 15 × 4T*2	40 (1.57) 40 (1.57)	15 × 4T	40 (1.57)	—	—	14 × 4T	40 (1.57)
Tire size	Conventional	Standard	155SR13		175/70R13 82H		195/55R14 82V		195/55R14 82V		175/70R13 82S	
		Option	175/70R13 82S*4		175/65R14 82H*3		—		—		—	
	T-type	Standard	—		—		—		T135/70D15		—	
		Option	T115/70D14		T115/70D14*1 T135/70D15*2		T135/70D15		—		T115/70D14	

*1: Except SLX 4WD
*2: SLX 4WD
*3: Except North Europe
*4: Except R.H.D. models for Europe
*5: Except Central Europe

Preparation

SPECIAL SERVICE TOOLS

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



Board-on Lift

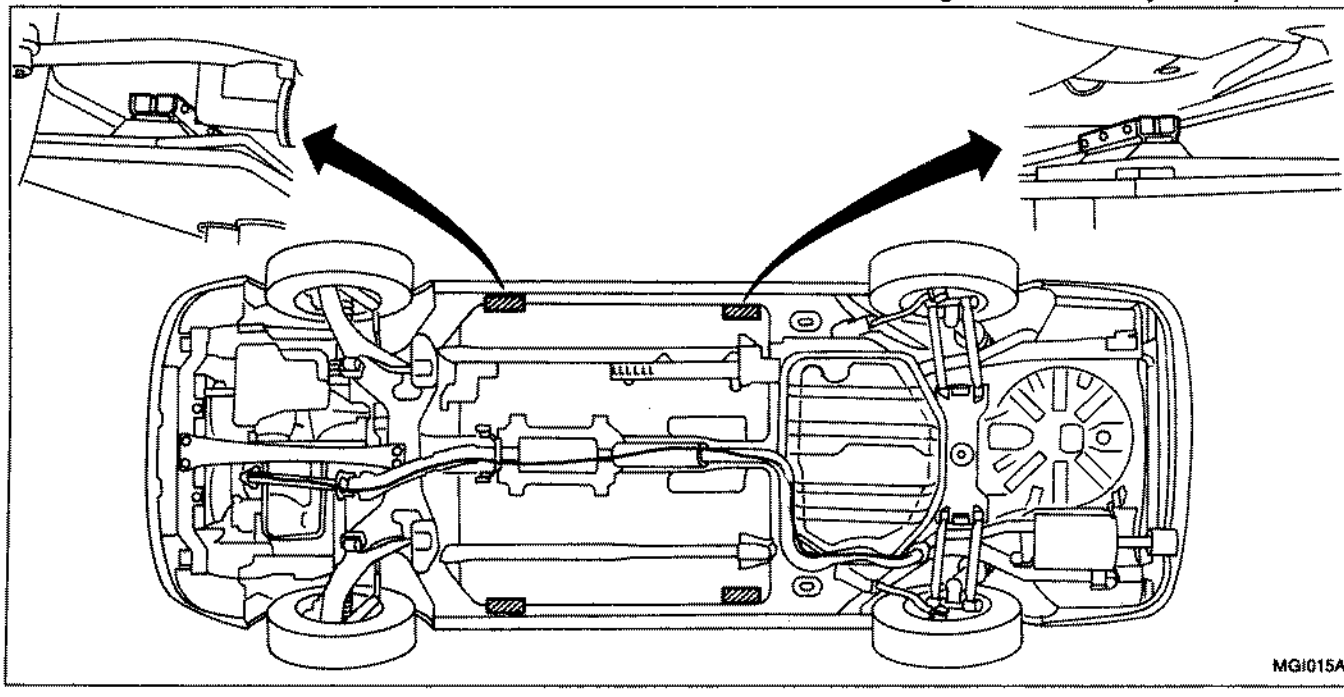
CAUTION:

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.**

Models with sill spoiler

Fix board-on lift attachments to inner side of sill when the side sill flange is covered by sill spoiler.

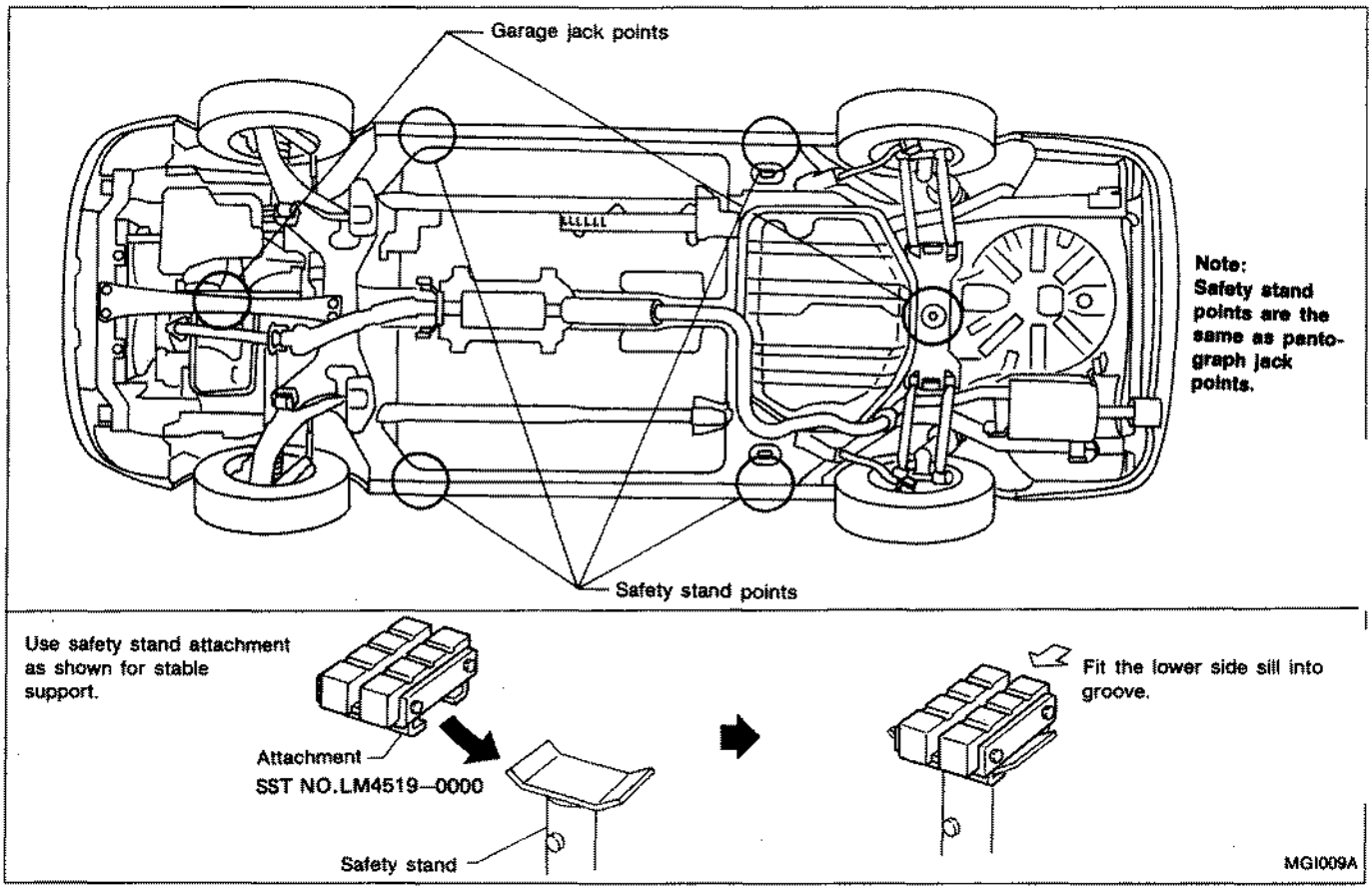


Garage Jack and Safety Stand

WARNING:

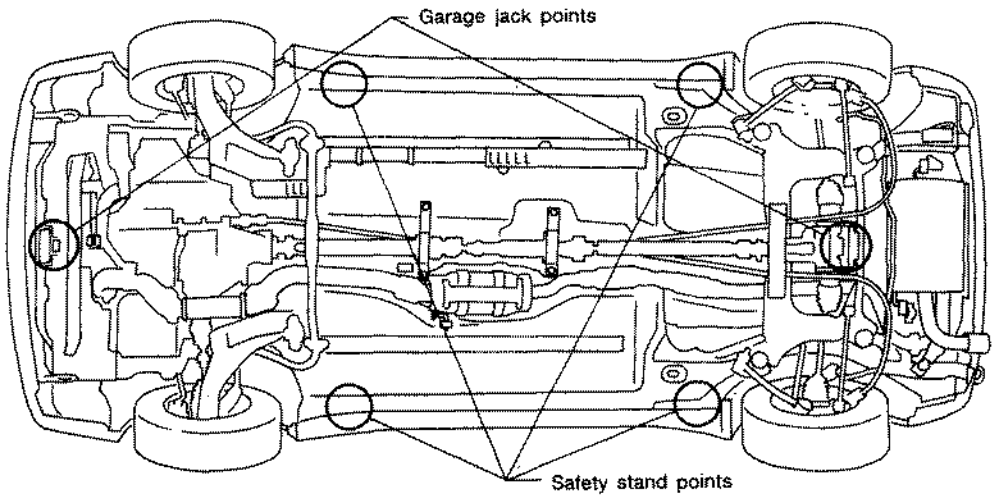
- **Never get under the vehicle while it is supported only by the jack. Always use safety stands when you have to get under the vehicle.**
- **Place wheel chocks at the front wheels when the rear wheels are raised and place wheel chocks at the rear wheels when the front wheels are raised.**

2-wheel drive models

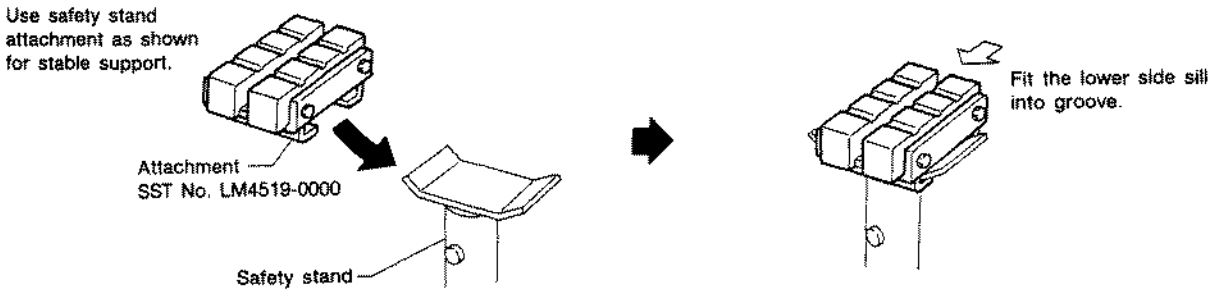


Garage Jack and Safety Stand (Cont'd)

4-wheel drive models



Note:
Safety stand points are the same as pantograph jack points.



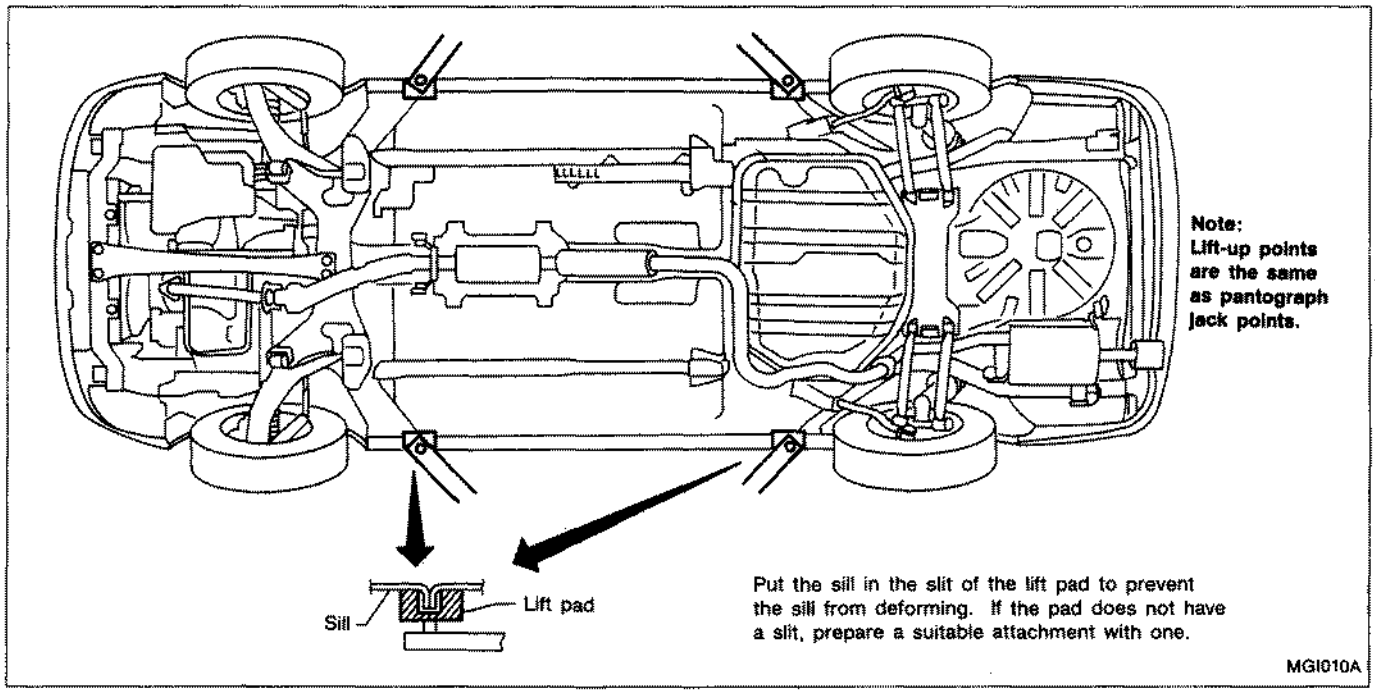
SGI707

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.

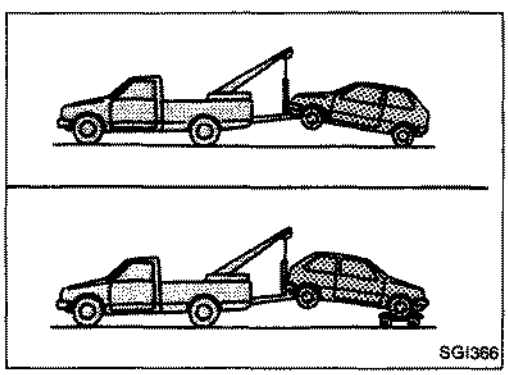
When setting the lift arm, do not allow the arm to contact the brake tubes and fuel lines.



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 a towing operation.**
- **When towing with the rear wheels on the ground, release the parking brake and move the gearshift lever to neutral ("N" position).**



2-WHEEL DRIVE MODELS

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

Tow Truck Towing (Cont'd)

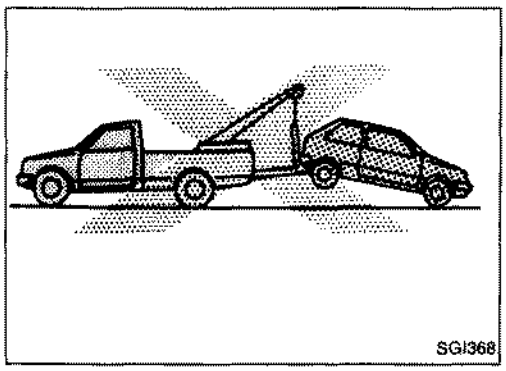
Towing an automatic transaxle model with four wheels on ground

Observe the following restricted towing speeds and distances.

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

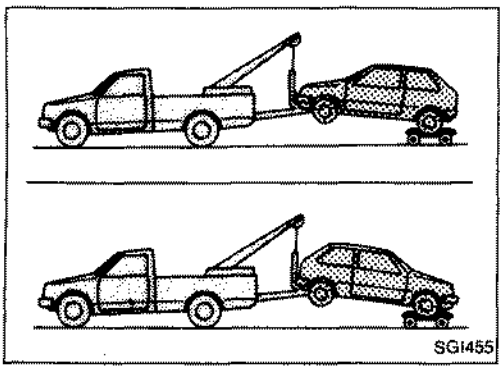
CAUTION:

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.


SGI368

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.


SGI455

4-WHEEL DRIVE MODELS

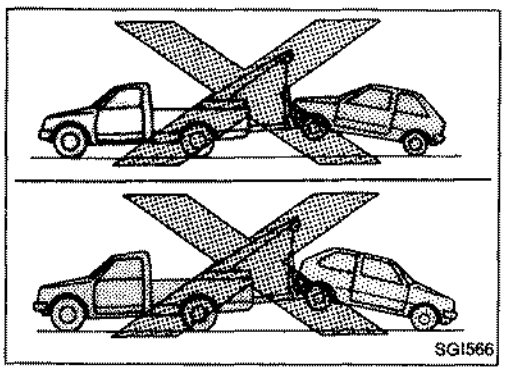
NISSAN recommends that the 4-wheel drive vehicle be towed with all wheels off the ground as follows:

1. Using a flat-bed truck.
2. Using a combination of a two truck and a dolly as illustrated.

Towing 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)

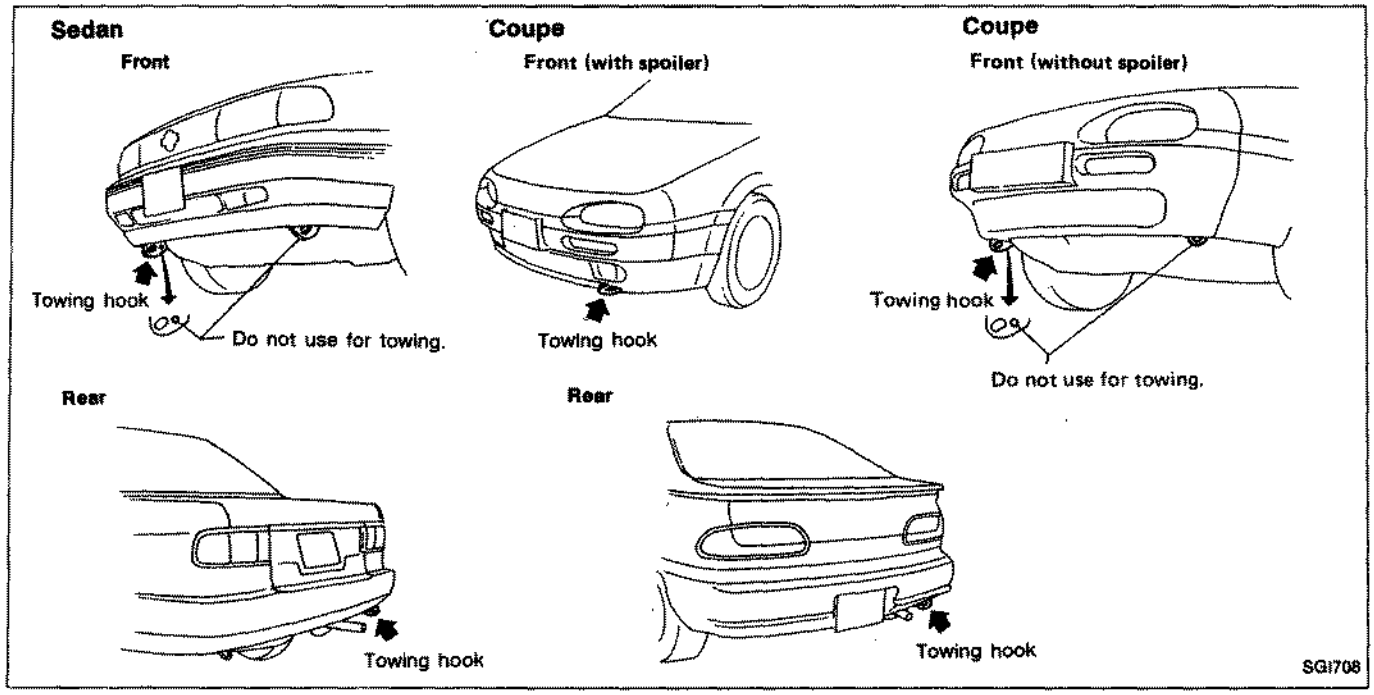

SGI566

Towing a 4-wheel drive model with front or rear wheels raised (With rear or front wheels on the ground)

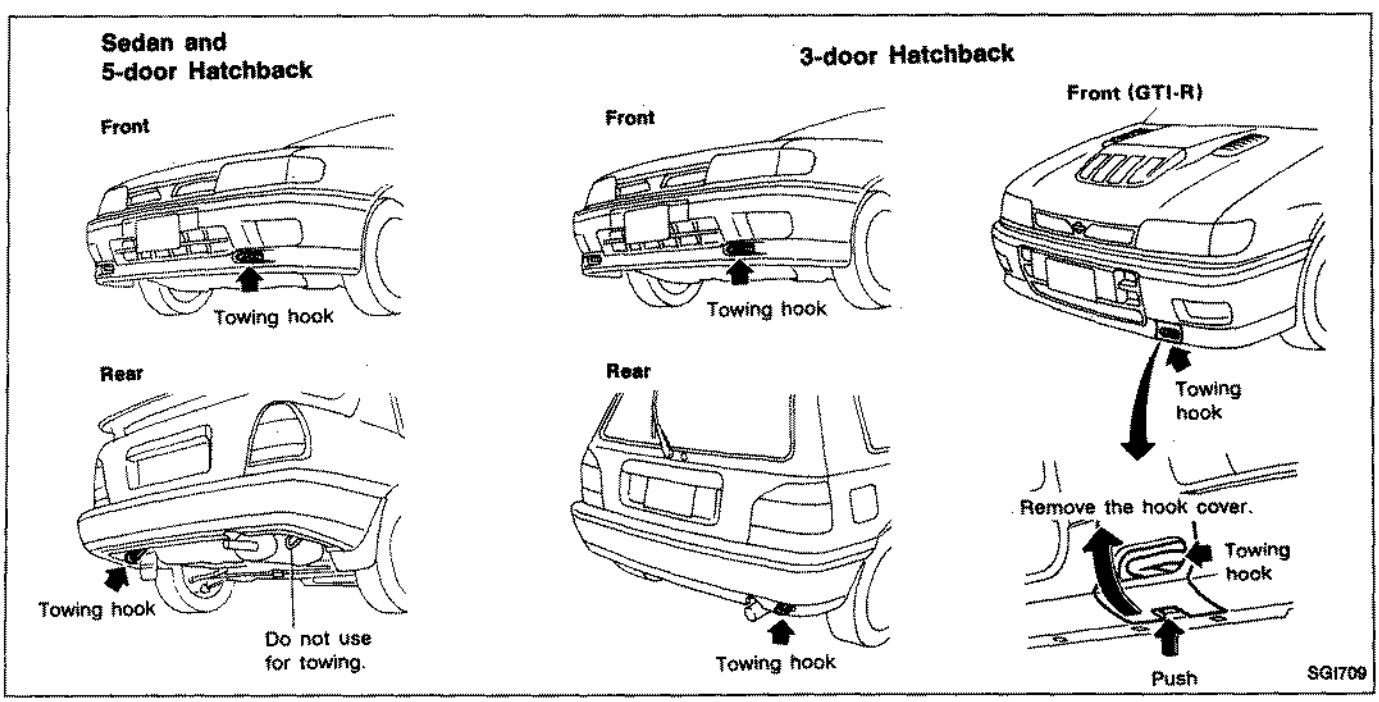
Never tow a 4-wheel drive model with front or rear wheels raised and rear or front wheels on the ground as this may cause serious and expensive damage to the transaxle. If it is necessary to tow the vehicle with the front or rear wheels raised, always use a towing dolly under the rear or front wheels.

Tow Truck Towing (Cont'd)

Model B13 series



Model N14 series



TOWING POINTS

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

CAUTION:

a. When doing on-the-car wheel balancing with a full-time 4WD vehicle, to prevent the wheels from rotating at different speeds or in different directions from each other (which could lead to damage to transaxle gear), always be sure to observe the following precautions:

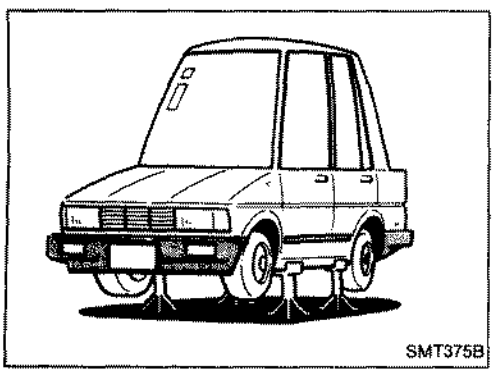
1) All four wheels should be jacked up, clearing the ground completely.

2) The wheels should be rotated with both the engine and the wheel balancer engaged.

3) The parking brake lever should be fully released.

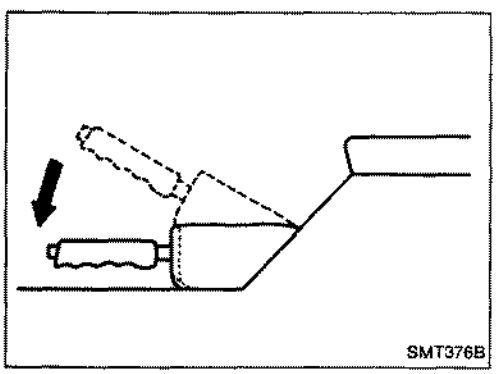
4) None of the brakes should be allowed to drag.

b. Avoid sudden acceleration, deceleration and braking.

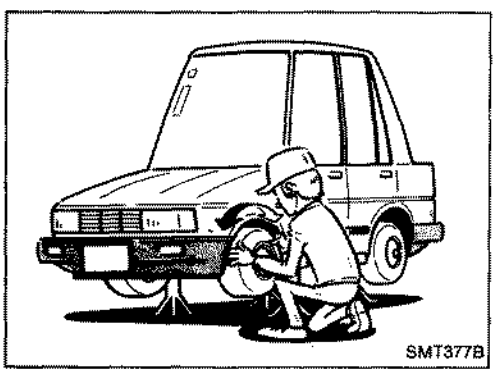

SMT375B

1. Jack up vehicle so that all four wheels can rotate.

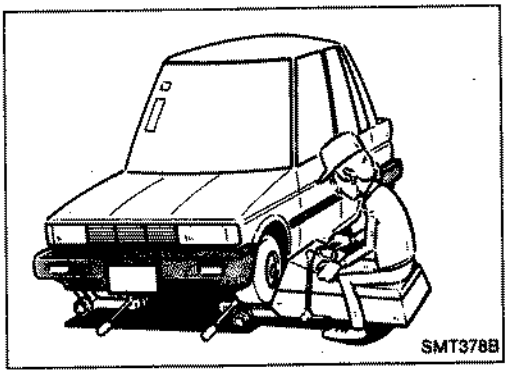
Make sure the vehicle is firmly supported on stands.


SMT376B

2. Release parking brake fully.


SMT377B

3. Make sure that brakes are not dragging on any of four wheels.


SMT378B

4. Place wheel to be balanced on wheel balancer.
   Follow the procedure specified by the wheel balancer manufacturer.

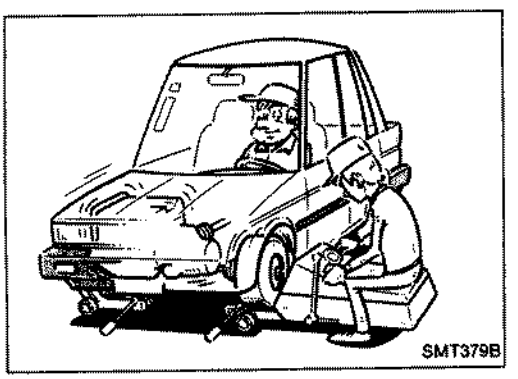
5. Start engine
6.

— M/T MODEL —

Put shift lever in 3rd or 4th gear and engage clutch slowly, then gradually increase speed to test speed.

— A/T MODEL —

Put shift lever into "D" position, then gradually increase speed to test speed.


SMT379B

7. Rotate wheels using both engine's driving force and wheel balancer driving force and check wheel balance.

Assure that the other wheels will rotate at the same time.

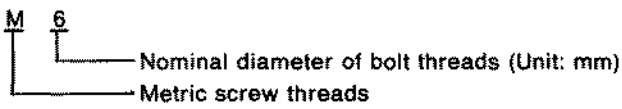
TIGHTENING TORQUE OF STANDARD BOLTS

Grade	Bolt size	Bolt diameter* mm	Pitch mm	Tightening torque (Without lubricant)					
				Hexagon head bolt			Hexagon flange bolt		
				N·m	kg-m	ft-lb	N·m	kg-m	ft-lb
4T	M6	6.0	1.0	5.1	0.52	3.8	6.1	0.62	4.5
	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	10	1.0	7
	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.

Grade	Mark
4T	4
7T	7
9T	9

*: Nominal diameter

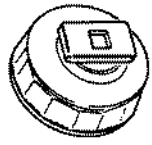
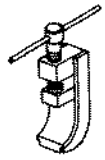
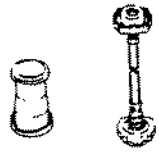


SECTION MA

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SPECIAL SERVICE TOOL

Tool number Tool name	Description	Engine application			
		GA	SR	E	CD
KV10115800 Oil filter cap wrench 65 mm (2.56 in) dia.	 SMA327C	—	X	—	—
KV10105900 Oil filter cap wrench		X	—	X	X
KV11102600 Lifter plate replacer		—	—	—	X
EG17650301 Radiator cap tester adapter		X	X	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 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 dusts, and fuel lines and connections for leaks
- ☐ Engine oil level and oil leaks
- ☐ Clutch and brake 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

ON INSIDE AND OUTSIDE

- ☐ Remove front spring/strut spacer (If applicable)
- ☐ Operation of all instruments, gauges, lights and accessories
- ☐ Operation of horn(s), wiper and washer
- ☐ Steering lock for operation
- ☐ Check air conditioner for gas 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, door panels for fit and alignment
- ☐ Latches, keys and locks for operation
- ☐ Weatherstrips for adhesion and fit
- ☐ Headlamp aiming
- ☐ Tighten wheel nuts (Inc. inner nuts if applicable)
- ☐ Tire pressure (Inc. spare tire)
- ☐ Check front wheels for toe-in
- ☐ Install clock/voltmeter/room lamp fuse (If applicable)
- ☒ Install deodorizing filter to air purifier (If applicable)
- ☒ Remove wiper blade protectors (If applicable)

UNDER BODY

- ☐ Manual transmission/transaxle, transfer and differential gear oil level
- ☐ Brake and fuel lines and oil/fluid reservoirs for leaks
- ☐ Tighten bolts and nuts of steering linkage and gear box, suspension, propeller shafts and drive shafts
- ☒ Tighten rear body bolts and nuts (Models with wooden bed only)

ROAD TEST

- ☐ Clutch operation
- ☐ Parking brake operation
- ☐ Service brake operation
- ☐ Automatic transmission/transaxle 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
- ☒ Engine idling and stop knob operation (Diesel only)

FINAL INSPECTION

- ☐ Install necessary parts (outside mirror, wheel covers, seat belts, mat, carpet or mud flaps)
- ☐ Inspect for interior and exterior metal and paint damage
- ☐ Check for spare tire, jack, tools (wheel chock), and literature
- ☐ Wash, clean interior and exterior

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

☒: Not applicable to this model.

General maintenance includes those items which should be checked during the normal day-to-day operation of the vehicle. They are essential if the vehicle is to continue operating properly. The owners can perform the checks and inspections themselves or they can have their NISSAN dealers do them.

Item	Reference pages
OUTSIDE THE VEHICLE The maintenance items listed here should be performed from time to time, unless otherwise specified.	
Tires Check the pressure with a gauge periodically 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 they do not wipe properly.	—
Doors and engine hood Check that all doors , the engine hood, the trunk lid and back door operate properly. Also ensure that all latches lock securely. Lubricate hinges, latches, rollers and links if necessary. Make sure that the secondary latch keeps the hood from opening when the primary latch is released. When driving in areas using road salt or other corrosive materials, check for lubrication frequently.	MA-66
Tire rotation Tires should be rotated every 10,000 km (6,000 miles).	MA-64
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 properly and installed securely. Also check headlight aim.	—
Warning lights and buzzers/chimes Make sure that all warning lights and buzzers/chimes are operating properly.	—
Steering wheel Check for change in the steering conditions, such as excessive free play, hard steering or strange noises. **Free play: Less than 35 mm (1.38 in)**	—
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-19, 30, 40, 53
Engine oil level Check the level after parking the vehicle on a level spot and turning off the engine.	MA-22, 33, 42, 55
Brake and clutch fluid levels Make sure that the brake and clutch fluid levels are between the "MAX" and "MIN" lines on the reservoir.	MA-58, 61
Battery Check the fluid level in each cell. It should be between the "MAX" and "MIN" lines.	—

PERIODIC MAINTENANCE (Except for Europe)

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.

MAINTENANCE OPERATION		MAINTENANCE INTERVAL [0016]									Reference page		
Perform either at number of kilometers (miles) or months, whichever comes first.	km x 1,000	1	10	20	30	40	50	60	70	80			
	(Miles x 1,000)	(0.6)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)			
	Months	—	6	12	18	24	30	36	42	48			
ENGINE AND EMISSION CONTROL MAINTENANCE	**Underhood and under vehicle**											GA	E	CD
Torque check manifolds & exhaust tube nuts & carburetor fixing nuts		X									MA	16	38	50
Adjust intake & exhaust valve clearance	GA series engines*1			X		X		X		X	EM	46	—	—
	Except above	X		X		X		X		X	MA	—	38	50
Check drive belts for cracks, fraying, wear & tension		X		X		X		X		X	MA	17	39	51
Change engine anti-freeze coolant (Ethylene glycol base)						X				X	MA	18	39	52
Change engine coolant (Soft water)			X	X	X	X	X	X	X	X	MA	18	39	52
Check cooling system				X		X		X		X	MA	19	41	53
Check fuel lines						X				X	MA	20	41	54
Clean & replace air cleaner filter (Dry paper type)	Clean★		X	X	X		X	X	X		MA	21	41	54
	Replace★					X				X	MA	21	41	54
Replace air cleaner filter (Viscous paper type)★						X				X	MA	21	41	54
GASOLINE ENGINE: Change engine oil (Use API SE, SF or SG oil.)★			X	X	X	X	X	X	X	X	MA	22	42	—
GASOLINE ENGINE: Change engine oil filter			X	X	X	X	X	X	X	X	MA	23	42	—
GASOLINE ENGINE: Check & adjust carburetor idle rpm & mixture ratio (Check mixture ratio only on models bound for areas affected by emission regulations.)		X	X	X	X	X	X	X	X	X	MA	*2	43	—
GASOLINE ENGINE: Replace fuel filter★						X				X	MA	20	47	—
GASOLINE ENGINE: Adjust ignition timing			X	X	X	X	X	X	X	X	MA	*2	43	—
GASOLINE ENGINE: Check & replace spark plugs	Check		X		X		X		X		MA	23	47	—
	Replace			X		X		X		X	MA	23	47	—
GASOLINE ENGINE: Check ignition wires						X				X	MA	24	48	—
GASOLINE ENGINE: Check positive crankcase ventilation (P.C.V.) system				X		X		X		X	MA	24	48	—
GASOLINE ENGINE: Replace P.C.V. filter★						X				X	MA	25	49	—
GASOLINE ENGINE: Check automatic temperature control air cleaner				X		X		X		X	MA	25	48	—
GASOLINE ENGINE: Check vacuum hoses & connections				X		X		X		X	MA	25	49	—
GASOLINE ENGINE: Check vapor lines (Hoses, connections, etc.) (Gulf standard models only)						X				X	MA	26	—	—
GASOLINE ENGINE: Replace timing belt (Except GA series engines)					Every 100,000 km (60,000 miles)						EM	—	161	—
DIESEL ENGINE: Check fuel filter, drain water & replace	Check & drain water		X	X	X		X	X	X		MA	—	—	54
	Replace★					X				X	MA	—	—	54
DIESEL ENGINE: Change engine oil (Use API CC or CD oil.)★					Every 5,000 km (3,000 miles) or 3 months						MA	—	—	55
DIESEL ENGINE: Change oil filter★			X	X	X	X	X	X	X	X	MA	—	—	55
DIESEL ENGINE: Check nozzles						See NOTE (1).					MA	—	—	56
DIESEL ENGINE: Check idling speed		X		X		X		X		X	MA	—	—	57
DIESEL ENGINE: Replace timing belts for camshaft and injection pump					Every 100,000 km (60,000 miles)						EM	—	—	203

NOTE: (1) If engine power decreases, black exhaust smoke is emitted or engine noise increases, check and, if necessary, adjust the fuel injection nozzle's starting pressure and the fuel spray pattern.

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

Check: Check. Correct or replace if necessary.

*1: In models for Hong Kong and Singapore, periodic maintenance is not required. However, if valve noise increases, check valve clearance.

*2: Refer to page EF & EC-160.

MAINTENANCE OPERATION		MAINTENANCE INTERVAL									Reference page
Perform either at number of kilometers (miles) or months, whichever comes first.	km x 1,000	1	10	20	30	40	50	60	70	80	
	(Miles x 1,000)	(0.6)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	
	Months	—	6	12	18	24	30	36	42	48	
CHASSIS AND BODY	**Underhood and under vehicle**										
Check brake & automatic transaxle fluid level & leaks★			X	X	X	X	X	X	X	X	MA-59, 61
Change brake fluid★						X				X	MA-62
Check brake booster vacuum hoses, connections & check valve						X				X	MA-62
Check power steering fluid & lines			X	X	X	X	X	X	X	X	MA-65
Check brake, clutch & exhaust systems for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.			X	X	X	X	X	X	X	X	MA-58, 62
Check oil level in manual transaxle★			X	X	X	X	X	X	X	X	MA-40
Check steering gear & linkage, axle & suspension parts, drive shafts for damaged, loose & missing parts & lubrication★		X		X		X		X		X	MA-65, FA-6, 9, RA-4
	Outside and inside										
Check wheel alignment. If necessary, rotate & balance wheels				X		X		X		X	MA-64 FA-7
Check brake pads, discs & other brake components for wear, deterioration & leaks★			X	X	X	X	X	X	X	X	MA-62
Check brake linings, drums & other brake components for wear, deterioration & leaks★				X		X		X		X	MA-63
Lubricate locks, hinges & hood latch★			X	X	X	X	X	X	X	X	MA-66
Check seat belts, buckles, retractors, anchors & adjuster				X		X		X		X	MA-66
Check foot brake, parking brake & clutch for free play, stroke & operation			X	X	X	X	X	X	X	X	BR-13, 48, CL-5

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

Check: Check. Correct or replace if necessary.

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 following items as shown in the table.

Severe driving conditions

A — Driving under dusty conditions
B — Driving repeatedly short distances
C — Towing a trailer or caravan
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

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page			
					GA	E	CD
A	Air cleaner filter						
	Dry paper type	Clean	More frequently	MA	21	41	54
	All types	Replace		MA	21	41	54
	P.C.V. filter	Replace		MA	25	49	—
A B C D	Engine oil						
	Gasoline engine	Replace	Every 5,000 km (3,000 miles) or 3 months	MA	22	42	—
	Diesel engine	Replace	More frequently	MA	—	—	55
A B C D	Engine oil filter	Replace	Every 5,000 km (3,000 miles) or 3 months	MA	23	42	55
A . . . E	Fuel filter	Replace	Every 20,000 km (12,000 miles) or 12 months	MA	20	47	54
. . . . . F . . .	Brake fluid	Replace		MA-62			
. . C . . . . H .	Automatic & manual transaxle oil	Replace	Every 40,000 km (24,000 miles) or 24 months	MA-59, 60			
. . . . . G H .	Steering gear & linkage, axle & suspension parts & drive shafts	Check	Every 10,000 km (6,000 miles) or 6 months	MA-65 FA-6, 9 RA-4			
A . C . . . G H I	Brake pads, discs & other brake components	Check	Every 5,000 km (3,000 miles) or 3 months	MA-62			
A . C . . . G H I	Brake linings, drums & other brake components	Check	Every 10,000 km (6,000 miles) or 6 months	MA-63			
. . . . . G . .	Lock, hinges & hood latch	Lubricate	Every 5,000 km (3,000 miles) or 3 months	MA-66			

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

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.

Engine Oil Service (Gasoline engine)

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								Reference page	
Perform at the specified time, but at the specified mileage, when driving more than 10,000 km (6,000 miles) a year.	Months	12	24	36	48	60	72	84	96	SR series	GA series
	km x 1,000	10	20	30	40	50	60	70	80		
	(Miles x 1,000)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)		
Underhood and under vehicle											
Change engine oil (Use API SF or SG only for non-turbo engines/API SG only for turbo engines)★		X	X	X	X	X	X	X	X	MA-33	MA-22
Change engine oil filter★	See NOTE (1).	X	X	X	X	X	X	X	X	MA-33	MA-23

NOTE: (1) Use Nissan PREMIUM type or equivalent for GA series engines.
(2) Maintenance items with "★" should be performed more frequently according to "Maintenance Under Severe Driving Conditions".

Engine Oil Service (Diesel engine)

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								Reference page
Perform at the specified time, but at the specified mileage, when driving more than 10,000 km (6,000 miles) in half a year.	Months	6	12	18	24	30	36	42	48	
	km x 1,000	10	20	30	40	50	60	70	80	
	(Miles x 1,000)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	
Underhood and under vehicle										
Change engine oil (Use API CD only)★		X	X	X	X	X	X	X	X	MA-54
Change engine oil filter★	See NOTE (1).	X	X	X	X	X	X	X	X	MA-55
Check drive belts for tension		X	(At the first oil change only)							MA-51

NOTE: (1) Use dual element type (Part No. 15208-40L00) for engines with E.G.R. system.
(2) Maintenance items with "★" should be performed more frequently according to "Maintenance Under Severe Driving Conditions".

Check: Check. Correct or replace if necessary.

Standard Service

MAINTENANCE OPERATION			MAINTENANCE INTERVAL				Reference page		
Perform the standard service on a yearly basis, but on a mileage basis when driving more than 20,000 km (12,000 miles) a year.	Months		12	24	36	48	SR series	GA series	CD series
	km x 1,000		20	40	60	80			
	(Miles x 1,000)		(12)	(24)	(36)	(48)			
ENGINE	**Underhood and under vehicle**								
Check drive belts for cracks, fraying, wear & tension			X*1	X	X*1	X	MA-28	MA-17	MA-51
Change engine anti-freeze coolant (Ethylene glycol base)				X		X	MA-29	MA-18	MA-52
Check cooling system			X	X	X	X	MA-30	MA-19	MA-53
Check fuel lines				X		X	MA-31	MA-20	MA-54
Replace air cleaner filter (Viscous paper type)★				X		X	MA-32	MA-21	MA-54
Check & adjust (carburetor idle rpm *4) & (mixture ratio *2)			X	X	X	X	EF & EC-389	EF & EC-153	—
Replace fuel filter★				X		X	MA-31	MA-20	—
GASOLINE ENGINE — Replace spark plugs	Non-turbo engines	See NOTE (1).	X*2	X	X*2	X	MA-34	MA-23	—
	Turbo engines (Use PLATINUM-TIPPED type)		Every 100,000 km (60,000 miles)				MA-35	—	—
GASOLINE ENGINE — Check ignition wires		See NOTE (2).	X	X	X	X	MA-35	MA-24	—
GASOLINE ENGINE — Check positive crankcase ventilation (P.C.V.) system*2			X	X	X	X	MA-36	MA-24	—
GASOLINE ENGINE — Replace P.C.V. filter ★				X		X	—	MA-25	—
GASOLINE ENGINE — Check automatic temperature control air cleaner			X*2	X	X*2	X	—	MA-25	—
GASOLINE ENGINE — Check vacuum hoses & connections *2			X	X	X	X	MA-36	MA-25	—
GASOLINE ENGINE — Check exhaust gas sensor (Except for Sweden)*3				X		X	MA-37	MA-27	—
GASOLINE ENGINE — Check vapor lines*3		See NOTE (2).		X		X	MA-36	MA-26	—
GASOLINE ENGINE — Adjust intake & exhaust valve clearance	*4	See NOTE (3).					—	EM-46	—
	Turbo engines		X	X	X	X	EM-124	—	—
DIESEL ENGINE — Replace fuel filter★					X		—	—	MA-54
DIESEL ENGINE — Check nozzle		See NOTE (4).					—	—	MA-56
DIESEL ENGINE — Check idling speed			X	X	X	X	—	—	MA-57
DIESEL ENGINE — Replace timing belts for camshaft and injection pump			Every 100,000 km (60,000 miles)				—	—	EM-161
CHASSIS AND BODY	**Underhood and under vehicle**								
Check brake, clutch & automatic transaxle fluid level & leaks★			X	X	X	X	MA-58, 59, 61		
Change brake fluid★				X		X	MA-62		
Check brake booster vacuum hoses, connections & check valve				X		X	MA-62		
Check power steering fluid & lines			X	X	X	X	MA-55		
Check brake & clutch system for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.			X	X	X	X	MA-58, 62		
Check oil level in manual transaxle★			X	X	X	X	MA-58		
Check oil level in transfer and differential gear (4WD)★				X		X	MA-60, 61		
Check steering gear & linkage, axle & suspension parts, (propeller shaft 4WD), drive shafts & exhaust system for damaged, loose & missing parts, lubrication & leaks★				X		X	MA-58, 65 FA-6, 9, RA-4		
	Outside and inside								
Check wheel alignment, if necessary, rotate & balance wheels			X	X	X	X	MA-64, FA-7		
Check brake pads, discs & other brake components for wear, deterioration & leaks★			X	X	X	X	MA-62		
Check brake linings, drums & other brake components for wear, deterioration & leaks★				X		X	MA-63		
Check seat belts, buckles, retractors, anchors & adjuster				X		X	MA-66		
Check foot brake, parking brake & clutch for free play, stroke & operation			X	X	X	X	BR-13, 48, CL-5		
Check body corrosion					Annually		MA-67		

NOTE: (1) For models for Sweden perform at mileage interval only.
(2) For models for Sweden perform at the first 80,000 km (48,000 miles), and then every 40,000 km (24,000 miles) or 24 months, whichever comes first.
(3) Periodic maintenance is not required. However, if valve noise increases, check valve clearances.
(4) If engine power decreases, black exhaust smoke is emitted or engine noise increases, check and, if necessary, adjust the fuel injection nozzle's starting pressure and the fuel spray pattern.
(5) Maintenance items with "★" should be performed more frequently according to "Maintenance Under Severe Driving Conditions".

Check: Check. Correct or replace if necessary.
*1: Except flat belt type *2: Non-catalyzer models only *3: Catalyzer models only *4: GA series engines only

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 following items as shown in the table.

SEVERE DRIVING CONDITIONS

A — Driving under dusty conditions
B — Driving repeatedly short distances
C — Towing a trailer or caravan
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

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page SR series	GA series	CD series
Engine oil service						
A B C D	Engine oil & oil filter					
	Gasoline engine	Replace	Every 6 months or 5,000 km (3,000 miles)	MA-33	MA-22, 23	—
	Diesel engine	Replace	Every 3 months or 5,000 km (3,000 miles)	—	—	MA-54, 55
Standard service						
A	Air cleaner filter & P.C.V. filter	Replace	Every 12 months or 20,000 km (12,000 miles)	MA-32	MA-21, 25	MA-54
A E	Fuel filter	Replace		MA-31	MA-20	MA-54
F	Brake fluid	Replace		MA-62		
G H	Steering gear & linkage, axle & suspension parts, (propeller shaft 4x4), drive shafts & exhaust system	Check		MA-65, FA-6, 9, RA-4		
A C G H I	Brake linings, drums & other brake components	Check		MA-63		
C H	Automatic & manual transaxle oil (transfer & differential gear oil 4x4)	Replace	Every 24 months or 40,000 km (24,000 miles)	MA-59, 60, 61		
A C G H I	Brake pads, discs & other brake components	Check	Every 6 months or 10,000 km (6,000 miles)	MA-62		

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

Maintenance for off-road driving (4x4 only)

Whenever you drive off-road through sand, mud or water, more frequent maintenance may be required of the following items:

- ▲ Brake pads and discs
- ▲ Brake lining and drums
- ▲ Brake lines and hoses
- ▲ Differential, transaxle and transfer oil
- ▲ Steering linkage
- ▲ Propeller shafts and drive shafts
- ▲ Air cleaner filter
- ▲ Clutch housing (Check water entry. Refer to page MA-65.)

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.

Engine Oil Service (Non-turbo gasoline engine)

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								Reference page	
Perform on a mileage basis, but on a semi-annual basis when driving less than 9,000 miles (15,000 km) in half a year.	Miles x 1,000	9	18	27	36	45	54	63	72	SR series	GA series
	(km x 1,000)	(15)	(30)	(45)	(60)	(75)	(90)	(105)	(120)		
	Months	6	12	18	24	30	36	42	48		
Under bonnet and under vehicle											
Change engine oil (Use API SF or SG only)★		X	X	X	X	X	X	X	X	MA-33	MA-22
Change engine oil filter★	See NOTE (1).	X	X	X	X	X	X	X	X	MA-33	MA-23

NOTE: (1) Use Nissan PREMIUM type or equivalent for GA series.
If Nissan oil filter other than PREMIUM type is used, oil filter and oil should be changed every 6,000 miles (10,000 km) or 6 months, whichever comes first.
(2) Maintenance items with "★" should be performed more frequently according to "Maintenance Under Severe Driving Conditions".

Engine Oil Service (Turbo gasoline engine)

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								Reference page
Perform on a mileage basis but on a yearly basis when driving less than 6,000 miles (10,000 km) a year.	Miles x 1,000	6	12	18	24	30	36	42	48	
	(km x 1,000)	(10)	(20)	(30)	(40)	(50)	(60)	(70)	(80)	
	Months	12	24	36	48	60	72	84	96	
Under bonnet and under vehicle										
Change engine oil (Use API SG oil only)★		X	X	X	X	X	X	X	X	MA-33
Change engine oil filter★		X	X	X	X	X	X	X	X	MA-33

NOTE: (1) Maintenance items with "★" should be performed more frequently according to "Maintenance under severe driving conditions".

Engine Oil Service (Diesel engine)

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								Reference page
Perform on a mileage basis but on a semi-annual basis when driving less than 6,000 miles (10,000 km) in half a year.	Miles x 1,000	6	12	18	24	30	36	42	48	
	(km x 1,000)	(10)	(20)	(30)	(40)	(50)	(60)	(70)	(80)	
	Months	6	12	18	24	30	36	42	48	
Under bonnet and under vehicle										
Change engine oil (Use API CD oil only)★		X	X	X	X	X	X	X	X	MA-54
Change engine oil filter★		X	X	X	X	X	X	X	X	MA-55
Check drive belts for tension		X	(At the first oil change only)							MA-51

NOTE: (1) Maintenance items with "★" should be performed more frequently according to "Maintenance Under Severe Driving Conditions".

Check: Check. Correct or replace if necessary.

Standard Service

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								Reference page		
Perform on a mileage basis, but on a semi-annual basis when driving less than 9,000 miles (15,000 km) in half a year.	Miles x 1,000	9	18	27	36	45	54	63	72	SR series	GA series	CD series
	(km x 1,000)	(15)	(30)	(45)	(60)	(75)	(90)	(105)	(120)			
	Months	6	12	18	24	30	36	42	48			
ENGINE MAINTENANCE (Except engine oil service) Under bonnet and under vehicle												
Change engine anti-freeze coolant (Ethylene glycol base)					X				X	MA-29	MA-16	MA-32
Check cooling system			X		X		X		X	MA-30	MA-19	MA-53
Check fuel lines					X				X	MA-31	MA-20	MA-54
PETROL ENGINE: Adjust intake & exhaust valve clearance	*1	See NOTE (1).								—	EM-46	—
	Turbo engines		X		X		X		X	EM-124	—	—
PETROL ENGINE: Check drive belts for cracks, fraying, wear & tension			X		X		X		X	MA-28	MA-17	—
PETROL ENGINE: Replace air cleaner filter (Viscous paper type)★					X				X	MA-32	MA-21	—
PETROL ENGINE: Check & adjust (carburetor idle rpm*1) & (mixture ratio*2)		X	X	X	X	X	X	X	X	EF & EC-389	EF & EC-153	—
PETROL ENGINE: Replace fuel filter★			X		X		X		X	MA-31	MA-20	—
PETROL ENGINE: Replace spark plugs	Non-turbo engines	X*2	X	X*2	X	X*2	X	X*2	X	MA-34	MA-23	—
	Turbo engines (Use PLATINUM-TIPPED type)	Every 60,000 miles (100,000 km)								MA-35	—	—
PETROL ENGINE: Check ignition wires					X				X	MA-35	MA-24	—
PETROL ENGINE: Check positive crankcase ventilation (P.C.V.) system*2			X		X		X		X	MA-36	MA-24	—
PETROL ENGINE: Replace P.C.V. filter★					X				X	—	MA-25	—
PETROL ENGINE: Check automatic temperature control air cleaner			X		X		X		X	—	MA-25	—
PETROL ENGINE: Check vacuum hoses & connections*2			X		X		X		X	MA-36	MA-25	—
PETROL ENGINE: Check exhaust gas sensor*3			X		X		X		X	MA-37	MA-27	—
PETROL ENGINE: Check vapor lines*3			X		X		X		X	MA-36	MA-26	—
DIESEL ENGINE: Replace timing belts for camshaft & injection pump		Every 60,000 miles (100,000 km)								—	—	EM-161
DIESEL ENGINE: Check drive belts for cracks, fraying, wear & tension		X	X	X	X	X	X	X	X	—	—	MA-51
DIESEL ENGINE: Replace air cleaner filter (Viscous paper type)★			X		X		X		X	—	—	MA-54
DIESEL ENGINE: Replace fuel filter					X				X	—	—	MA-54
DIESEL ENGINE: Check nozzles		See NOTE (2).								—	—	MA-56
DIESEL ENGINE: Check idling speed			X		X		X		X	—	—	MA-57
CHASSIS AND BODY MAINTENANCE Under bonnet and under vehicle												
Check brake, clutch, & automatic transaxle fluid level & leaks★		X	X	X	X	X	X	X	X	MA-58, 59, 61		
Change brake fluid			X		X		X		X	MA-62		
Check brake booster vacuum hoses, connections & check valve					X				X	MA-62		
Check power steering fluid & lines		X	X	X	X	X	X	X	X	MA-65		
Check brake & clutch system for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.		X	X	X	X	X	X	X	X	MA-58, 62		
Check oil level in manual transaxle★		X	X	X	X	X	X	X	X	MA-56		
Check oil level in transfer & differential gear (4WD) ★			X		X		X		X	MA-60, 61		
Check steering gear & linkage, axle & suspension parts (propeller shaft 4WD), drive shafts & exhaust system for damage, loose & missing parts, lubrication & leaks★			X		X		X		X	MA-58, 65 FA-6, 8, RA-4		
Outside and inside												
Check wheel alignment, if necessary, rotate & balance wheels			X		X		X		X	MA-64, FA-7		
Check brake pads, disc & other brake components for wear, deterioration & leaks★		X	X	X	X	X	X	X	X	MA-62		
Check brake linings, drums & other brake components for wear, deterioration & leaks★			X		X		X		X	MA-63		
Check seat belts, buckles, retractors, anchors & adjuster			X		X		X		X	MA-66		
Check foot brake, hand brake & clutch for free play, stroke & operation		X	X	X	X	X	X	X	X	BR-13, 48, CL-5		
Check body corrosion					Annually					MA-67		

NOTE: (1) Periodic maintenance is not required. However, if valve noise increases, check valve clearance.
(2) If engine power decreases, black exhaust smoke is emitted or engine noise increases, check and, if necessary, adjust the fuel injection nozzle's starting pressure and the fuel spray pattern.
(3) Maintenance items with "★" should be performed more frequently according to "Maintenance under severe driving conditions".

Check: Check, Correct or replace if necessary.
*1: GA series engines only *2: Non-catalyzer models only *3: Catalyzer models only

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 following items as shown in the table.

SEVERE DRIVING CONDITIONS

A — Driving under dusty conditions
B — Driving repeatedly short distances
C — Towing a trailer or caravan
D — Extensive idling
E — Driving in areas using salt or other corrosive materials
F — Driving on rough and/or muddy roads or in the desert
G — Driving with frequent use of braking or in mountainous areas

Driving condition	Maintenance item		Maintenance operation	Maintenance interval	Reference page SR series	GA series	CD series
Engine oil service							
A B C D . . .	Engine oil & oil filter						
	Petrol engine	Non-turbo engines	Replace	Every 4,500 miles (7,500 km) or 3 months	MA-33	MA-22, 23	—
		Turbo engines	Replace	Every 3,000 miles (5,000 km) or 6 months	MA-33	—	—
	Diesel engine		Replace	Every 3,000 miles (5,000 km) or 3 months	—	—	MA-54, 55
Standard service							
A	Air cleaner filter & P.C.V. filter		Replace	More frequently	MA-32	MA-21	MA-54
. . C . . F .	Automatic & manual transaxle oil (transfer & differential gear oil 4x4)		Replace	Every 36,000 miles (60,000 km) or 12 months	MA-59, 60, 61		
. . . . E F .	Steering gear & linkage, axle & suspension parts, (propeller shaft 4x4), drive shafts & exhaust system		Check	Every 9,000 miles (15,000 km) or 6 months	MA-65 FA-6, 9 RA-4		
A . C . E F G	Brake pads, discs & other brake components		Check	Every 4,500 miles (7,500 km) or 3 months	MA-62		
A . C . E F G	Brake linings, drums & other brake components		Check	Every 9,000 miles (15,000 km) or 6 months	MA-63		

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

Maintenance for off-road driving (4x4 only)

Whenever you drive off-road through sand, mud or water, more frequent maintenance may be required of the following items:

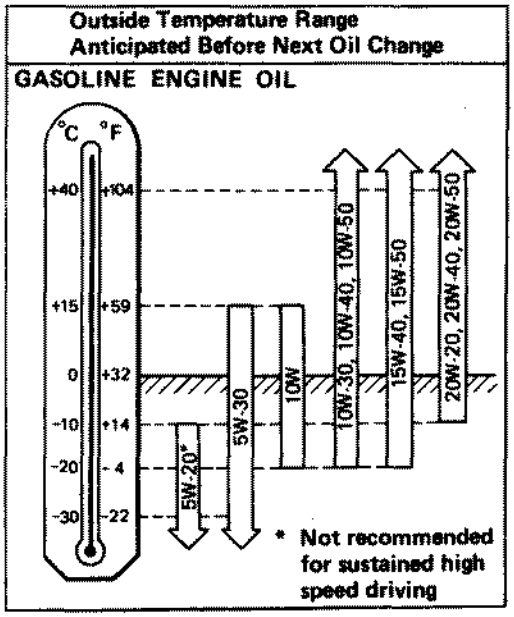
- ▲ Brake pads and discs
- ▲ Brake lining and drums
- ▲ Brake lines and hoses
- ▲ Differential, transaxle and transfer oil
- ▲ Steering linkage
- ▲ Propeller shafts and drive shafts
- ▲ Air cleaner filter
- ▲ Clutch housing (Check water entry. Refer to page MA-65.)

Lubricants and Fluids

		Capacity (Approximate)		Recommended lubricants and fluids
		Liter	Imp measure	
Engine oil (Refill)				
Gasoline				For Europe Non-turbo engines: API SF or SG*1 Turbo engines: API SG*1 Except for Europe API SE, SF or SG*1
With oil filter	GA & E series	3.2	2-7/8 qt	
	SR20DE	3.4	3 qt	
	SR20DET	3.7	3-1/4 qt	
Without oil filter	GA & E series	2.8	2-1/2 qt	
	SR20DE	3.2	2-7/8 qt	
	SR20DET	3.5	3-1/8 qt	
Diesel				
With oil filter	CD17	4.9	4-3/8 qt	CD17 engine: API CC or CD*1 CD20 engine: API CD*1
	CD20	5.4	4-3/4 qt	
Without oil filter	CD17	4.4	3-7/8 qt	
	CD20	4.9	4-3/8 qt	
Cooling system (With reservoir tank)				
Gasoline				
With heater	GA series	See MA-19.		
	E series	4.1	3-5/8 qt	
	SR series	6.6	5-7/8 qt	
Without heater	GA series	See MA-19.		Anti-freeze coolant (Ethylene glycol base) or soft water
	E series	3.8	3-3/8 qt	
Diesel				
With heater	CD17	6.5	5-3/4 qt	
	CD20	7.1	6-1/4 qt	
Without heater	CD17	6.2	5-1/2 qt	
	CD20	6.8	6 qt	
Manual transaxle gear oil				
RN4F30A		2.6	4-5/8 pt	
RS5F30A		2.8	4-7/8 pt	
RS5F31A		2.9	5-1/8 pt	API GL-4*1
RS5F32A		3.5 - 3.7	6-1/8 - 6-1/2 pt	
RS5F50A		4.2	7-3/8 pt	
Automatic transaxle fluid		7.0	6-1/8 qt	Type DEXRON™
Transfer gear oil 4WD	GA16DS engine models	1.1	1 qt	API GL-5*1
	SR20DET engine models	1.5	1-3/8 qt	
Differential gear oil 4WD		1.0	1-3/4 pt	API GL-5*1
Power steering fluid		—	—	Type DEXRON™
Brake & clutch fluid		—	—	DOT 3 (US FMVSS No. 116)
Multi-purpose grease		—	—	NLGI No. 2 (Lithium soap base)

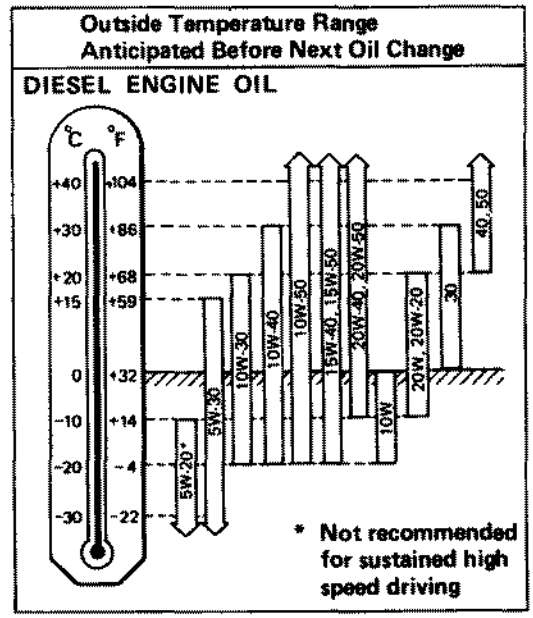
*1: For further details, see "Recommended SAE viscosity number".

SAE Viscosity Number



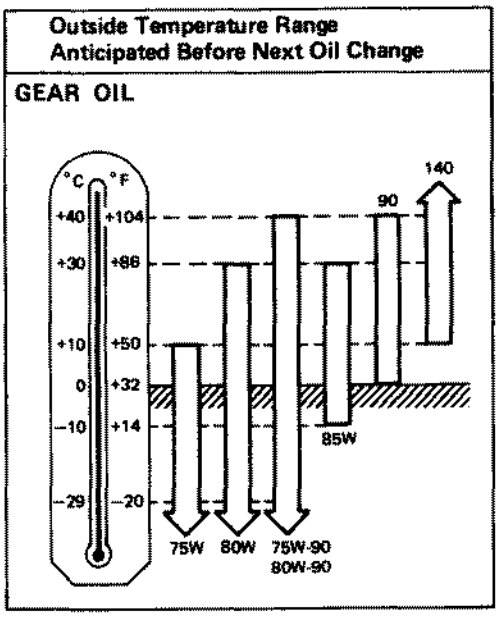
TI0005

- **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.
- **On turbo engines, 5W-20 is not recommended. 5W-30 should be used only under extremely cold conditions.**



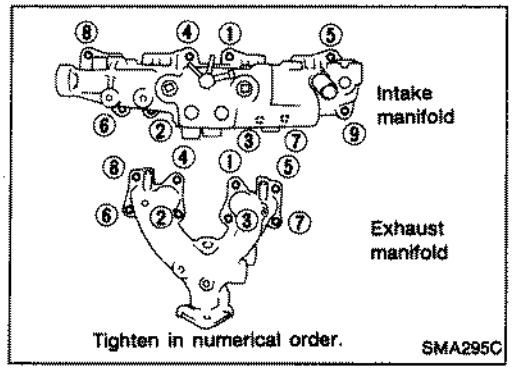
TI0006

- **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.



TI0003

- **80W-90 is preferable for differential gear (for North Europe), transaxle and transfer for ambient temperatures below 40°C (104°F).**
- **90 is preferable for differential gear (except for North Europe).**



Checking Tightening Torque

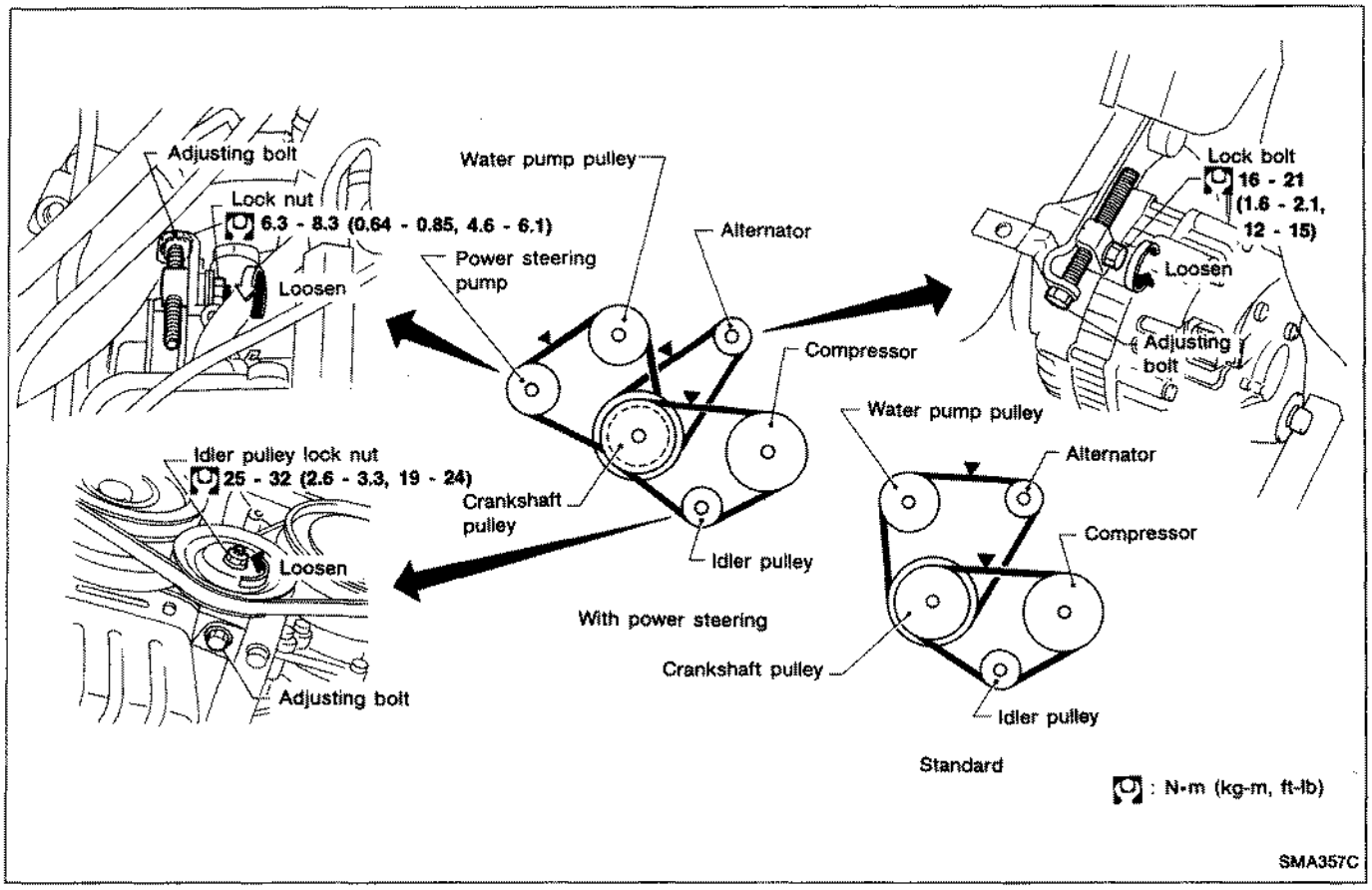
- Checking should be performed while engine is cold.

Manifold bolts and nuts:
: 16 - 21 N·m
(1.6 - 2.1 kg-m, 12 - 15 ft-lb)

Exhaust tube nuts:
: 28 - 33 N·m
(2.9 - 3.4 kg-m, 21 - 25 ft-lb)

Carburetor bolts:
: 16 - 21 N·m
(1.6 - 2.1 kg-m, 12 - 15 ft-lb)

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.

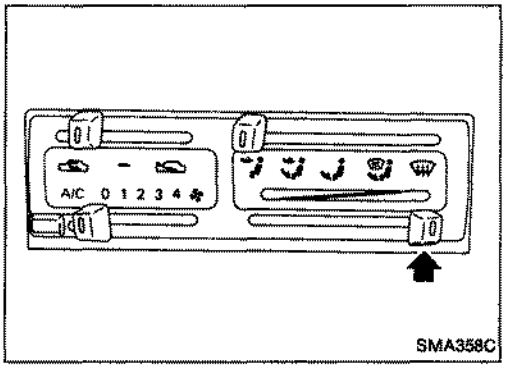
Adjust if belt deflections exceed the limit.

Belt deflection:

Unit: mm (in)

	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator			
With power steering	11 (0.43)	7 - 9 (0.28 - 0.35)	6 - 8 (0.24 - 0.31)
Without power steering	10 (0.39)		
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.

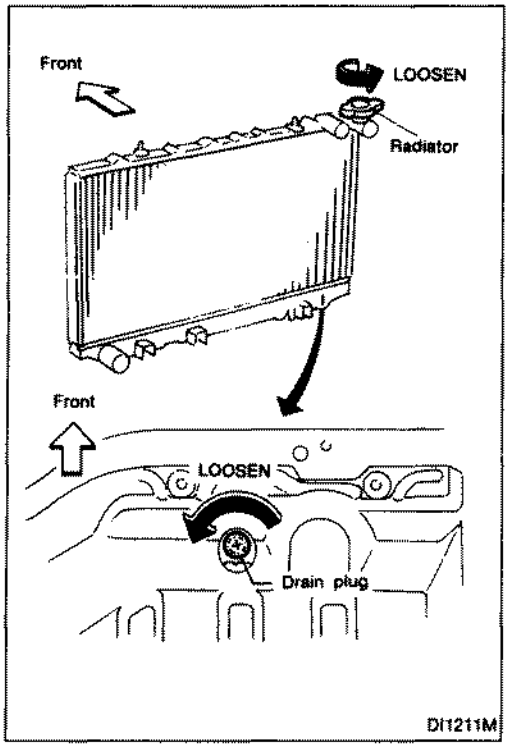


SMA358C

Changing Engine Coolant

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

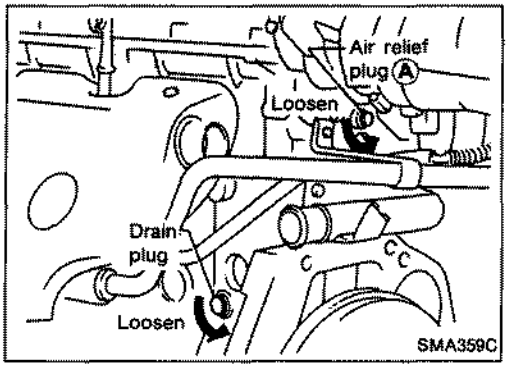
1. Move heater "TEMP" control lever all the way to "HOT".



DI1211M

2. Open radiator drain plug at the bottom of radiator and remove radiator cap.
3. Remove reservoir tank, drain coolant, then clean reservoir tank.
   Install it temporarily.

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



SMA359C

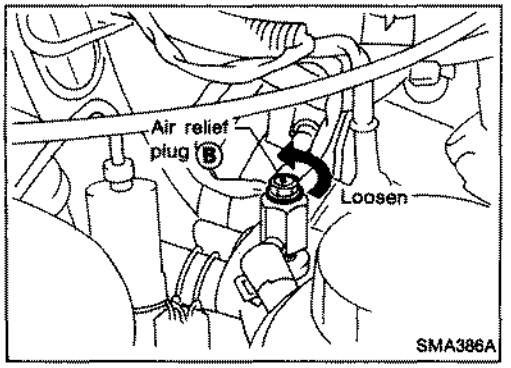
4. Remove cylinder block drain plug and air relief plugs Ⓐ and Ⓑ. (Air relief plug Ⓑ is only present on GA16DE.)
5. Close radiator drain plug.
6. Fill radiator with water until coolant spills from drain plug hole during refill, then reinstall drain plug securely.
7. Fill radiator with water again until coolant spills from the air relief hole during refill, then reinstall air relief plugs Ⓐ and Ⓑ. (Air relief plug Ⓑ is present on GA16DE.)
   Then fill radiator and reservoir tank with water.
   Air relief plug:
   (O): 7 - 8 N·m (0.7 - 0.8 kg-m, 5.1 - 5.8 ft-lb)
8. Reinstall 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.

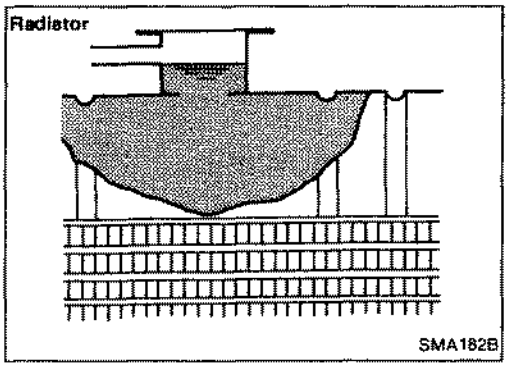
- **Apply sealant to the thread of drain plug.**
  (O): 34 - 44 N·m (3.5 - 4.5 kg-m, 25 - 33 ft-lb)

13. Reinstall reservoir tank.



SMA386A

Changing Engine Coolant (Cont'd)

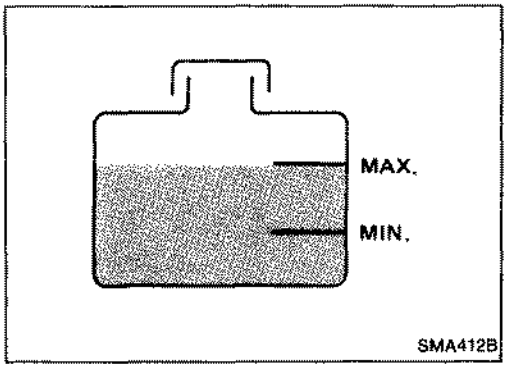


14. Fill radiator and reservoir tank with coolant up to specified level following step 6 through step 9.
    Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.

Coolant capacity (With reservoir tank):

Unit: ℓ (Imp qt)

	For 2WD model (except hot areas)	For 4WD model	For hot areas
M/T			
With heater	5.3 (4-5/8)	5.5 (4-7/8)	5.5 (4-7/8)
Without heater	5.0 (4-3/8)	5.2 (4-5/8)	5.2 (4-5/8)
A/T			
With heater	5.5 (4-7/8)	—	5.5 (4-7/8)
Without heater	5.2 (4-5/8)	—	5.2 (4-5/8)



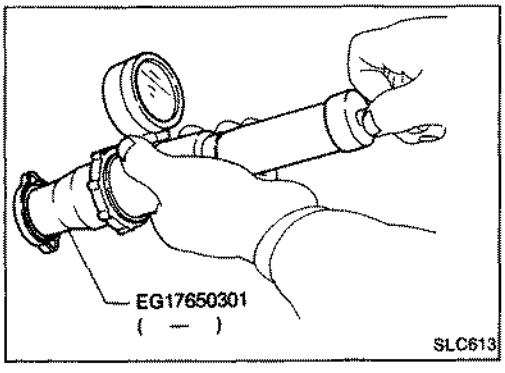
Reservoir tank capacity to "H" level is 0.7 ℓ (5/8 Imp qt).
Pour coolant through coolant filler neck slowly to allow air in system to escape.

15. If necessary, add coolant.

Checking Cooling System

CHECKING HOSES

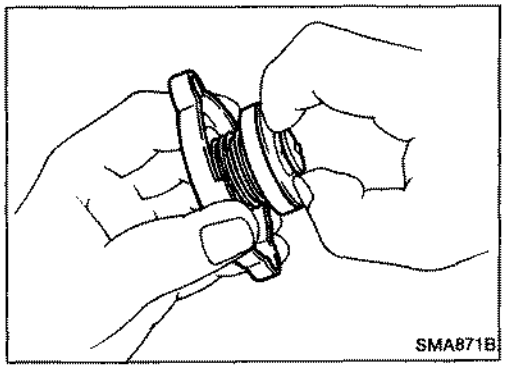
Check hoses for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.



CHECKING RADIATOR CAP

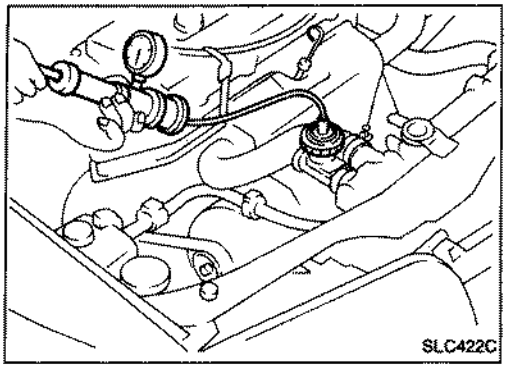
Apply pressure to radiator cap with cap tester to see if it is satisfactory.

Radiator cap relief pressure:
78 - 98 kPa
(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)



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

Checking Cooling System (Cont'd)



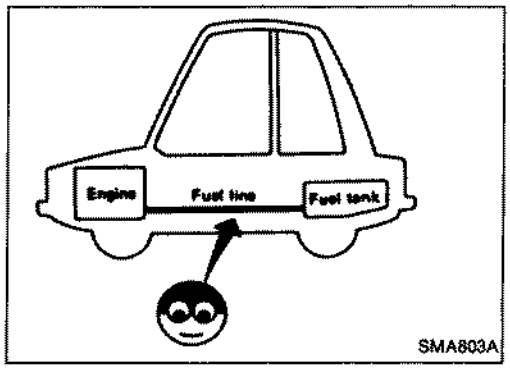
CHECKING COOLING SYSTEM FOR LEAKS

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

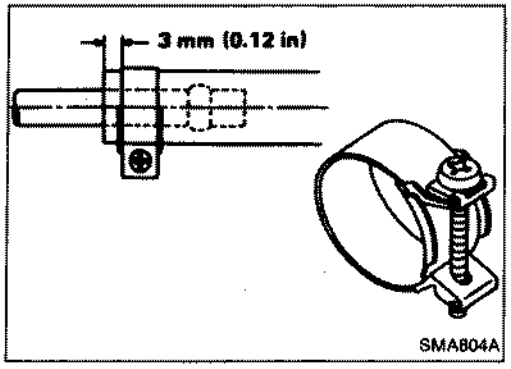
Testing pressure:
157 kPa (1.57 bar, 1.6 kg/cm^2, 23 psi)

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.

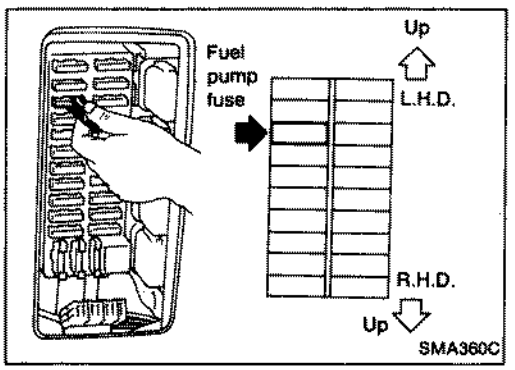


CAUTION:
Tighten high-pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end.
Tightening torque specifications are the same for all rubber hose clamps.
Ensure that screw does not contact adjacent parts.

Changing Fuel Filter

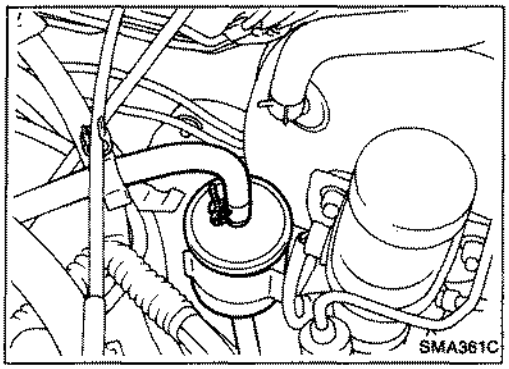
GA16DE MODELS

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



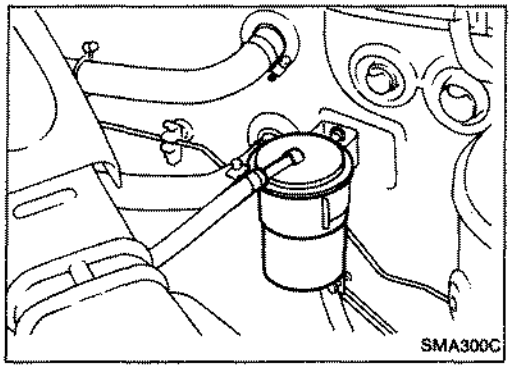
1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank engine two or three times to make sure that fuel pressure is released.
4. Turn ignition switch off and install fuse for fuel pump.

Changing Fuel Filter (Cont'd)



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.**



EXCEPT GA16DE MODELS

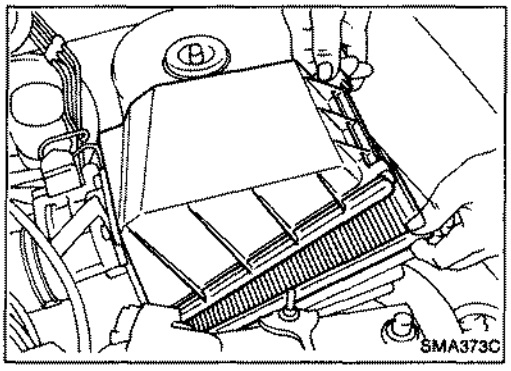
- **Be careful not to spill fuel over engine compartment. Place a shop towel to absorb fuel.**

Cleaning and Changing Air Cleaner Filter

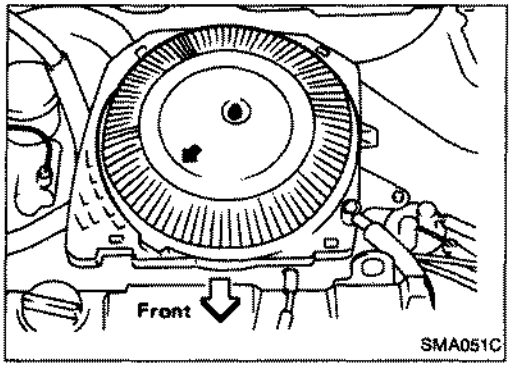
VISCOUS PAPER TYPE

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

GA16DE models



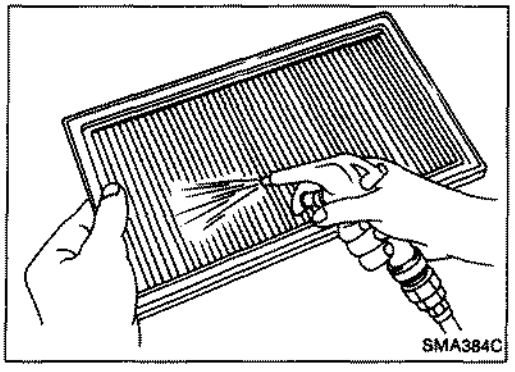
Except GA16DE models



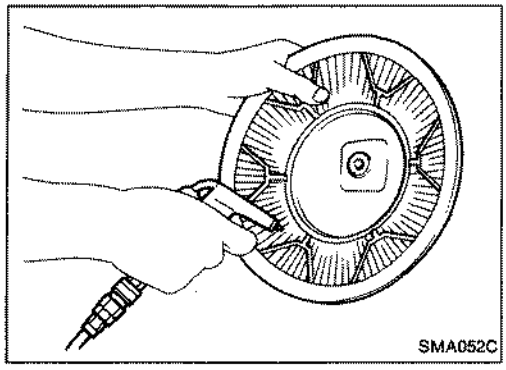
DRY PAPER TYPE

Clean or replace element more often under dusty driving conditions.

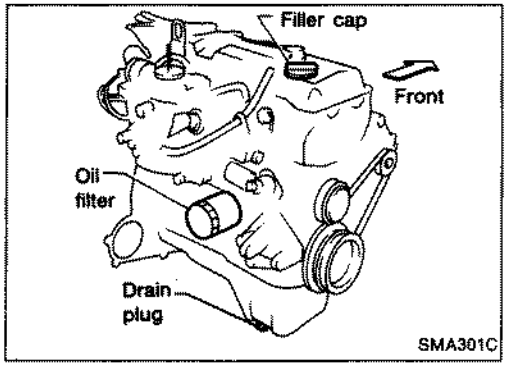
GA16DE models



Cleaning and Changing Air Cleaner Filter (Cont'd)


SMA052C

Except GA16DE models



SMA301C

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.

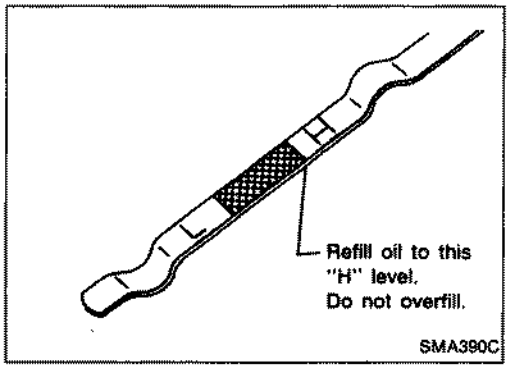
Refill oil capacity (Approximate):

Unit: ℓ (Imp qt)

With oil filter change	3.2 (2-7/8)
Without oil filter change	2.8 (2-1/2)

CAUTION:

- **Be sure to clean drain plug and install with new washer.**
  Drain plug:
  (O): 29 - 39 N·m
  (3.0 - 4.0 kg-m, 22 - 29 ft-lb)
- **Use recommended engine oil "API SE (Except Europe), SF or SG" with suitable viscosity.**
- **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.**



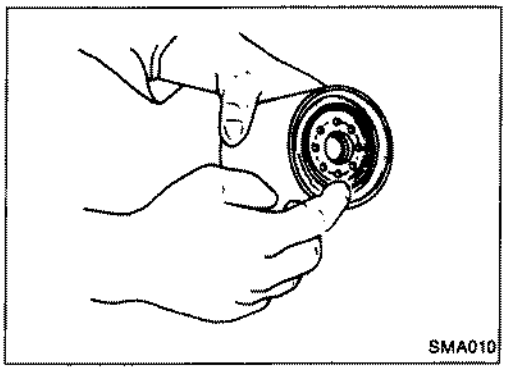
SMA390C

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.

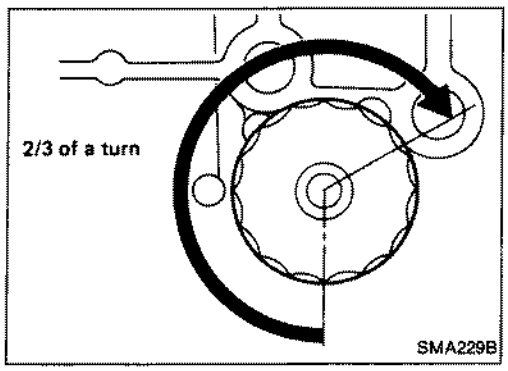
Changing Oil Filter

1. Remove oil filter with Tool.

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

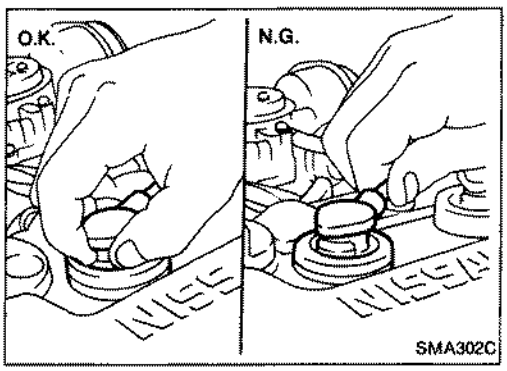


2. Before installing new oil filter, clean the oil filter mounting surface on cylinder block, and coat the rubber seal of oil filter with a little engine oil.



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

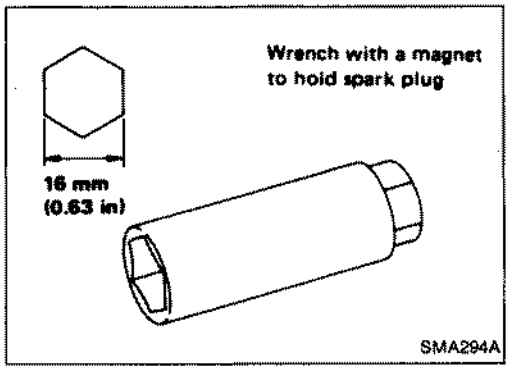
Refer to Changing Engine Oil.



Checking and Changing Spark Plugs

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

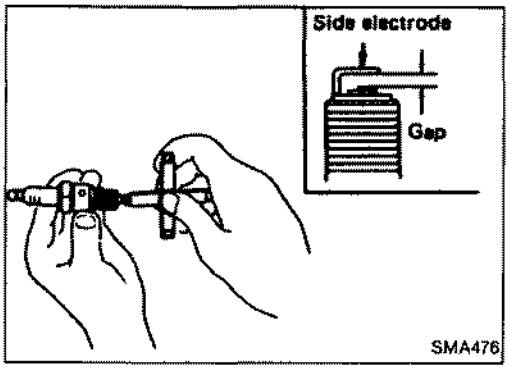
Checking and Changing Spark Plugs (Cont'd)



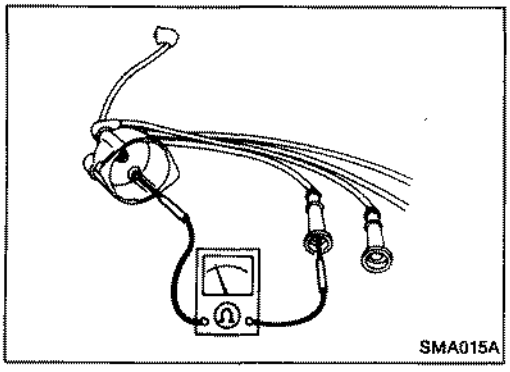
2. Remove spark plugs with spark plug wrench.
3. Clean plugs in sand blast cleaner.
4. Check insulator for cracks or chips, gasket for damage or deterioration and electrode for wear and burning. If they are excessively worn away, replace with new spark plugs.

Spark plug:

	GA16DS	GA13DS, GA14DS & GA16DE
Standard type	BKR6E	BKR5E
Hot type	BKR5E	—
Cold type	BKR7E	BKR6E, BKR7E



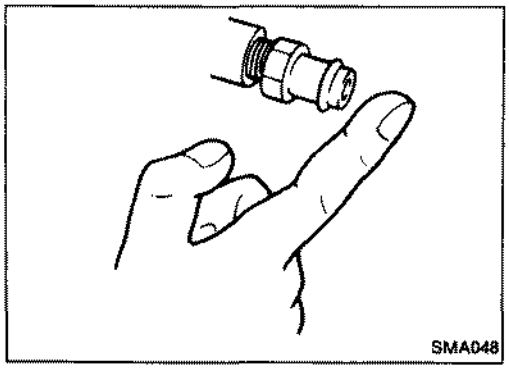
5. Check spark plug gap.
   Gap: 0.8 - 0.9 mm (0.031 - 0.035 in)
6. Install spark plugs. Reconnect ignition wires according to nos. indicated on them.
   Spark plug:
   [⚲]: 20 - 29 N·m
   (2.0 - 3.0 kg-m, 14 - 22 ft-lb)



Checking Ignition Wires

1. Inspect wires for cracks, damage, burned terminals and for improper fit.
2. Measure the resistance of wires and check for intermittent breaks.
   Resistance:
   9.6 - 22.4 kΩ/m (2.93 - 6.83 kΩ/ft)

If it exceeds the limit, replace the ignition wire with a new one.

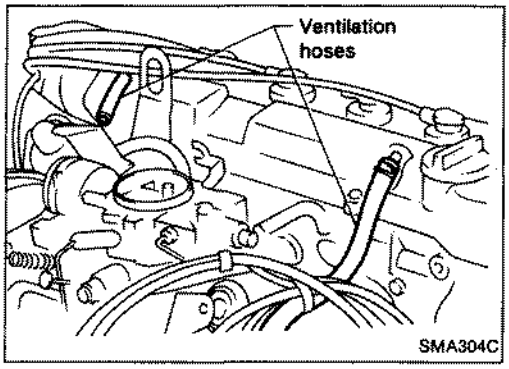


Checking Positive Crankcase Ventilation (P.C.V.) System

CHECKING P.C.V. VALVE

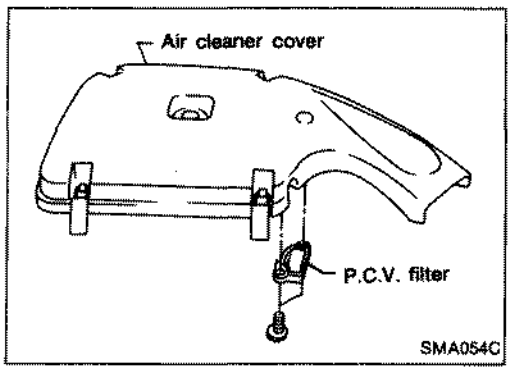
With engine running at idle, remove ventilation hose from P.C.V. valve; if valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.

Checking Positive Crankcase Ventilation (P.C.V.) System (Cont'd)



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.

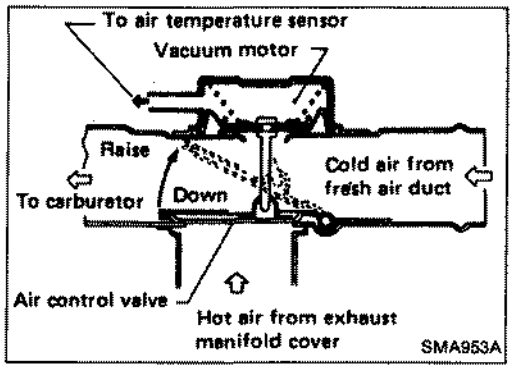


Changing Positive Crankcase Ventilation (P.C.V.) Filter

Remove air cleaner cover and replace P.C.V. filter.

Checking Vacuum Hoses and Connections

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



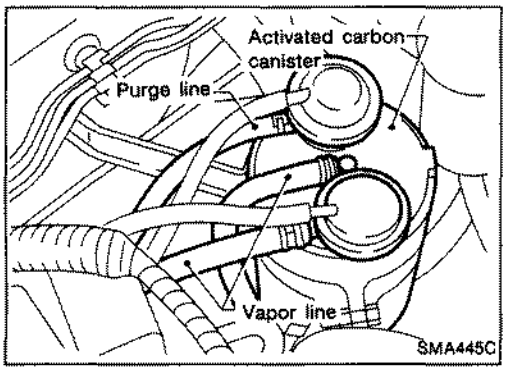
Checking Automatic Temperature Control (A.T.C.) Air Cleaner

1. Inspect vacuum hoses (Intake manifold to temperature sensor and vacuum motor) for secure connections.
2. Check each hose for cracks or distortion.
3. Check A.T.C. system for proper function.

- Make sure that air control valve moves when engine is raced under no-load.
- Make sure that air control valve partially rises as engine warms up.

Refer to AUTOMATIC TEMPERATURE CONTROL (A.T.C.) AIR CLEANER SYSTEM INSPECTION in EF & EC section.

Engine	Temperature	Air control valve position	Intake air temperature
Stopped	Any	Closed	—
At idle	Low	Open	Hot
	High	Closed	Cool

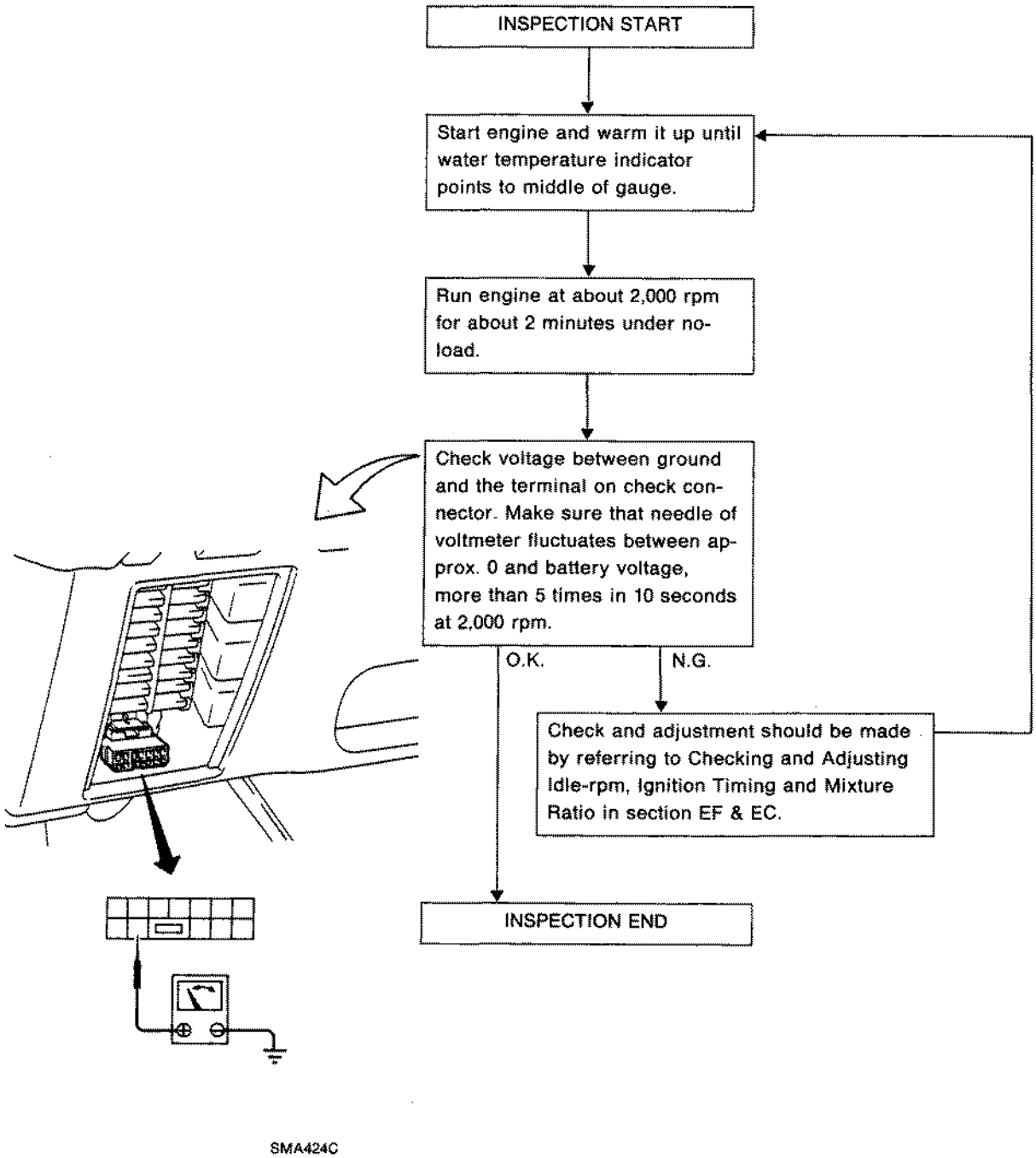


Checking Vapor Lines

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

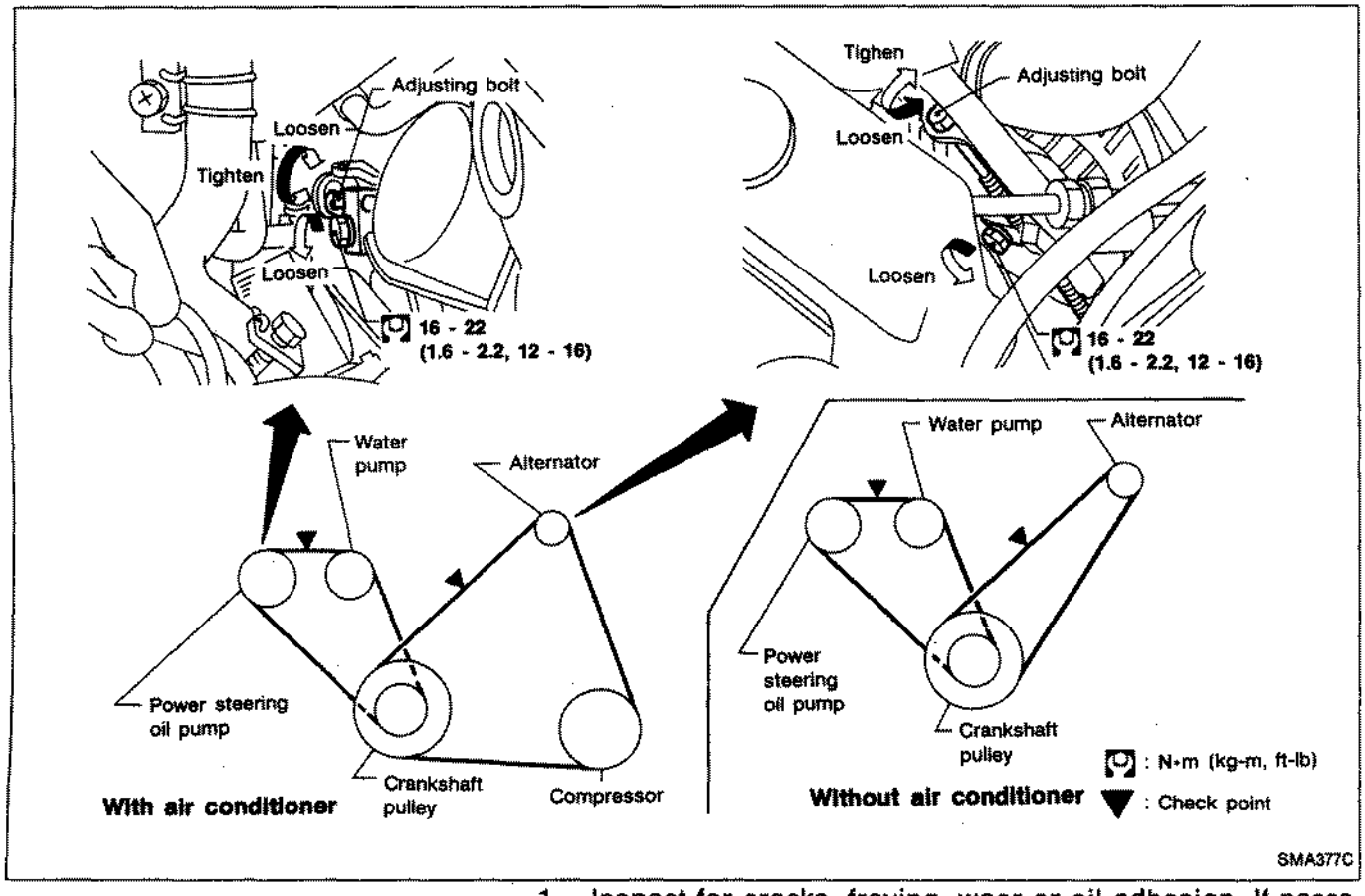
Refer to EVAPORATIVE EMISSION CONTROL SYSTEM INSPECTION in EF & EC section.

Checking Exhaust Gas Sensor



SMA424C

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.

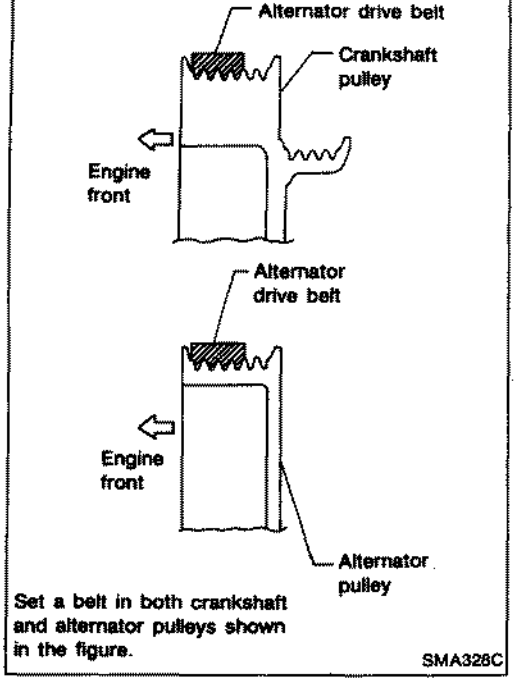
Belt deflection:

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)		

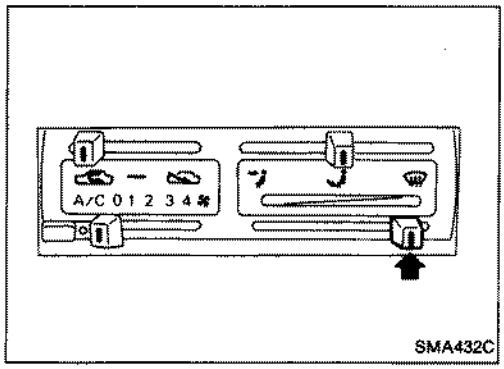
Inspect drive belt deflections when engine is cold.

Alternator drive belt fitting place (Models without air conditioner)



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

SMA328C



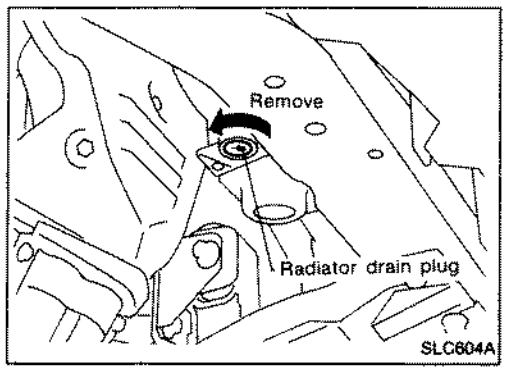
SMA432C

Changing Engine Coolant

WARNING:

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

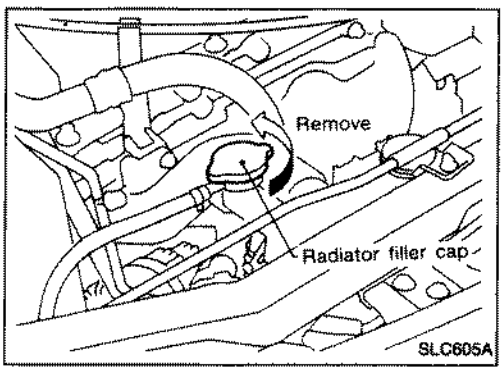
1. Move heater "TEMP" control lever all the way to "HOT".



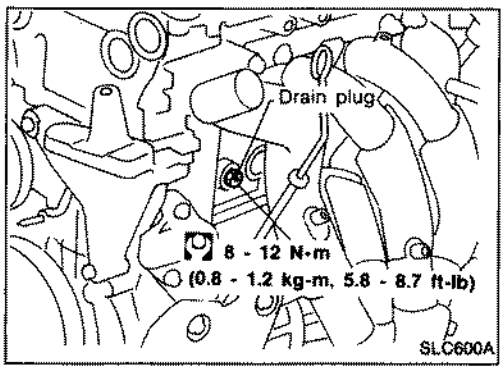
SLC604A

2. Remove radiator drain plug and radiator filler cap.
3. Remove reservoir tank, drain coolant, then clean reservoir tank.
   Install it temporarily.

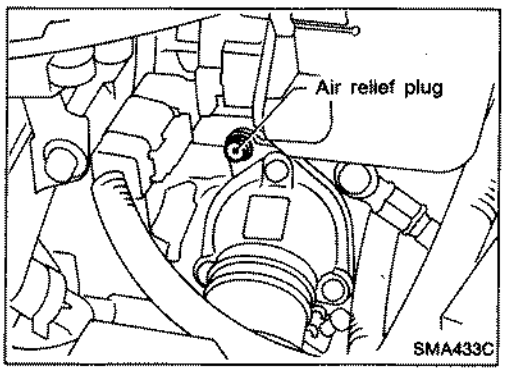
- **Be careful not to allow coolant to contact drive belts.**



SLC605A



SLC600A



SMA433C

4. Remove cylinder block drain plug, air relief plug and air bleeder cap.
5. Install radiator drain plug and tighten cylinder block drain plug securely.
6. Fill radiator and reservoir tank with water.
   Air relief plug is reinstalled once coolant spills from the air relief hole during refill.
   Then fill radiator and reservoir tank with water.
   Air relief plug:
   : 10 N·m (1.0 kg-m, 7 ft-lb)
7. Reinstall radiator cap and air bleeder cap.
8. Warm up engine until radiator fan operates, then race engine 2 or 3 times under no-load.

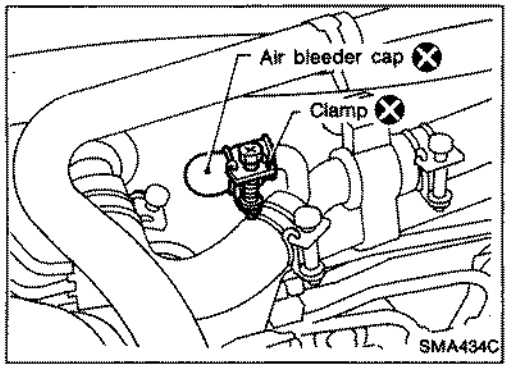
- **Make sure that air conditioner switch is "OFF".**

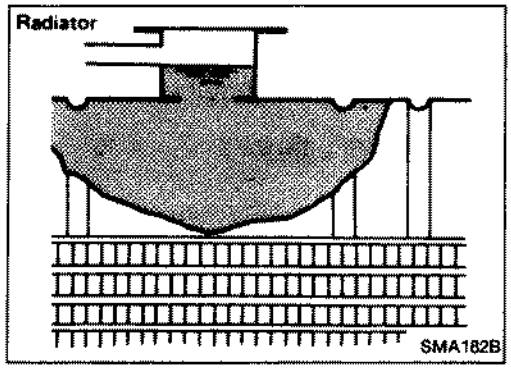
9. Stop engine and wait until it cools down.
10. Repeat step 2 through step 9 until clear water begins to drain from radiator.
11. Drain water.

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

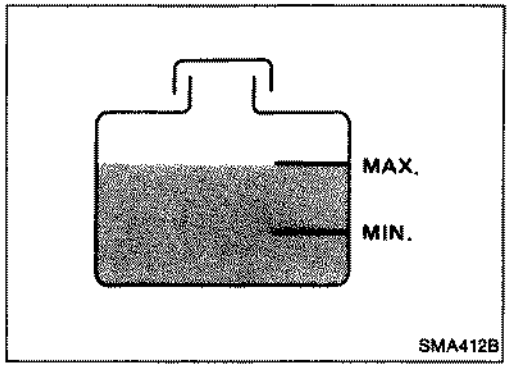
12. Reinstall reservoir tank.

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):
    6.6 ℓ (5-7/8 Imp qt)



[Reservoir tank capacity for "H" level is 0.7 ℓ (5/8 Imp qt).]

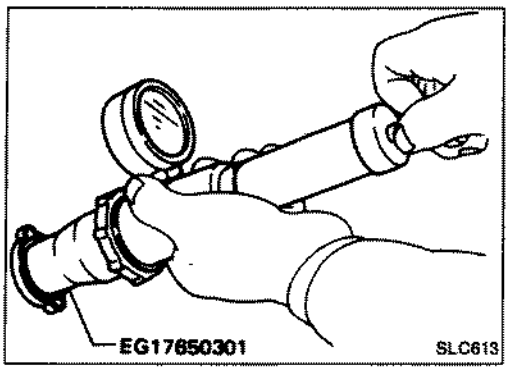
Pour coolant through coolant filler neck slowly to allow air in system to escape.

14. If necessary, add coolant.
15. 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

CHECKING HOSES

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

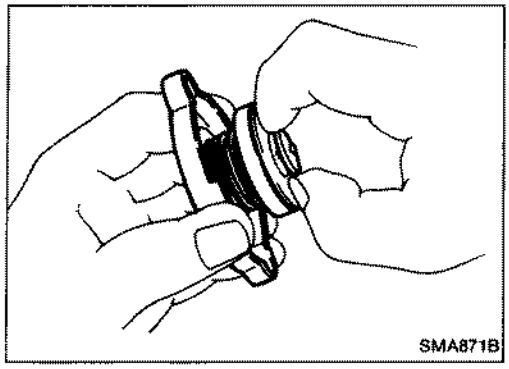


CHECKING RADIATOR CAP

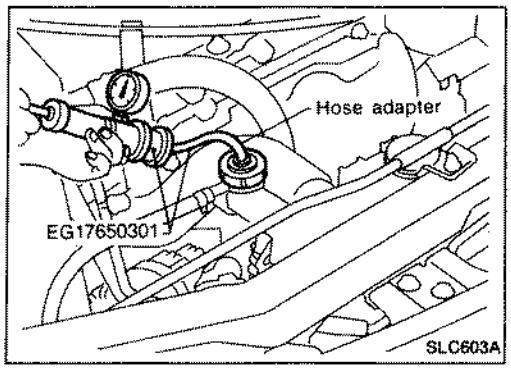
Apply pressure to radiator cap with cap tester to see if it is satisfactory.

Radiator cap relief pressure:
78 - 98 kPa
(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)

Checking Cooling System (Cont'd)



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

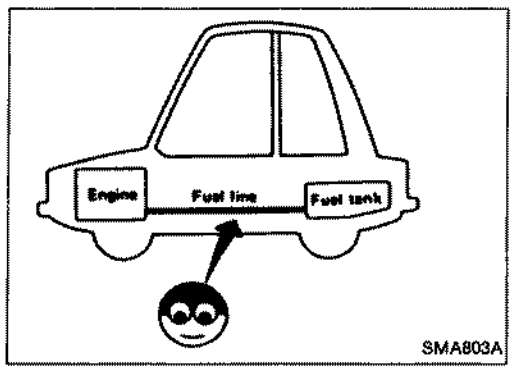


CHECKING COOLING SYSTEM FOR LEAKS

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

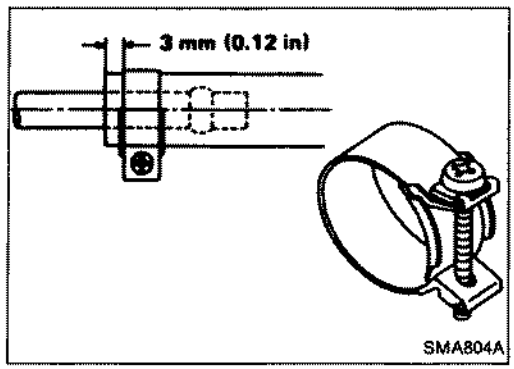
Testing pressure:
157 kPa (1.57 bar, 1.6 kg/cm², 23 psi)

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

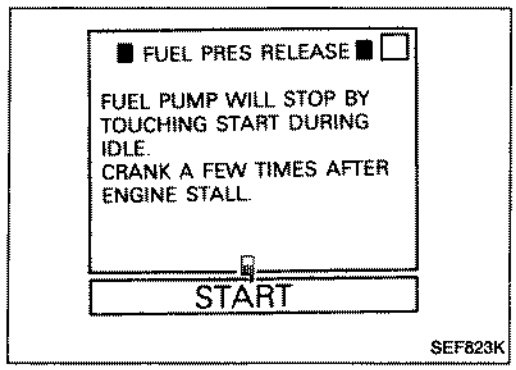


Checking Fuel Lines

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.

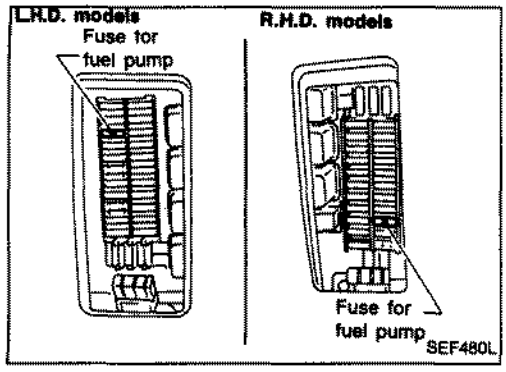


Changing Fuel Filter

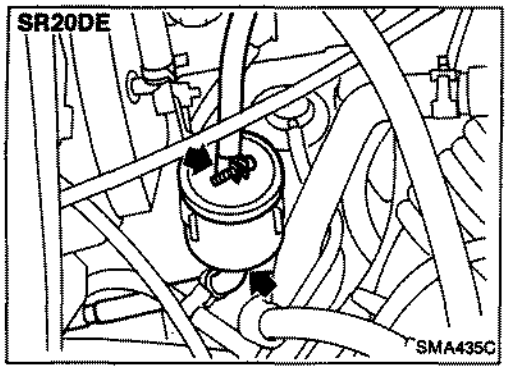
WARNING:
Before removing fuel filter, release fuel pressure from fuel line to eliminate danger.

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

Changing Fuel Filter (Cont'd)

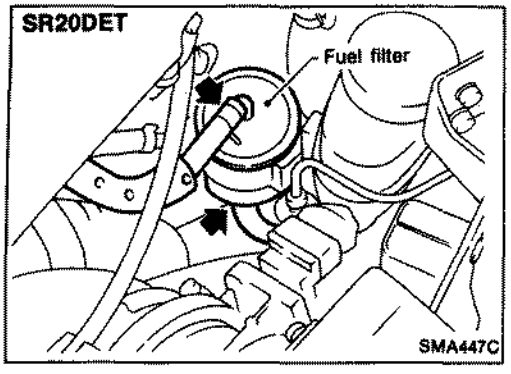


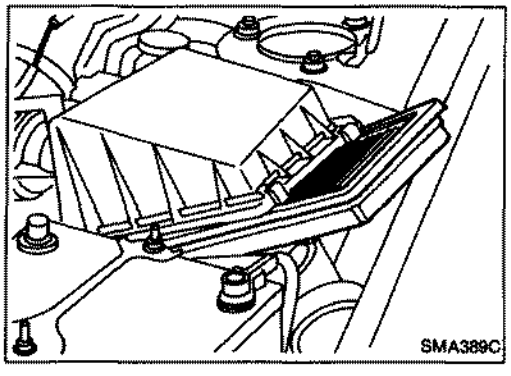
1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank engine two or three times to make sure that fuel pressure is released.
4. Turn ignition switch off and install fuse for fuel pump.



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.**
- **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".**

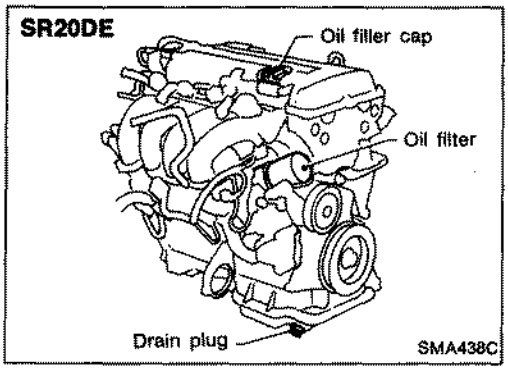


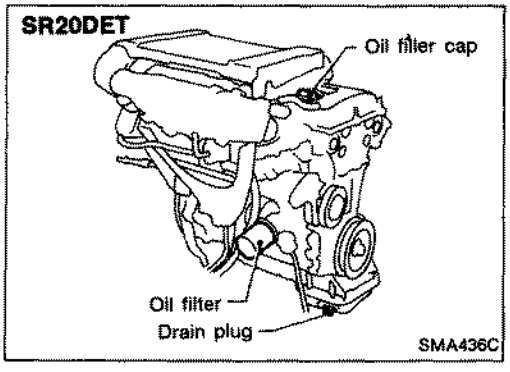


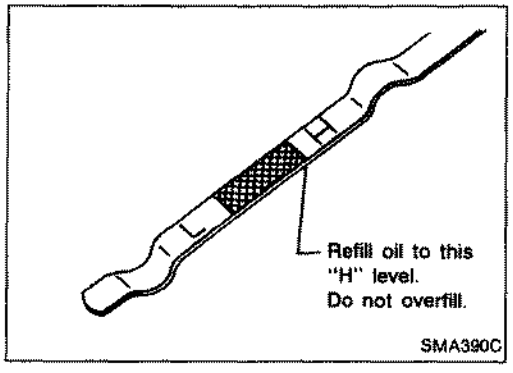
Changing Air Cleaner Filter

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.

Refill oil capacity (Approximate):

Unit: ℓ (Imp qt)

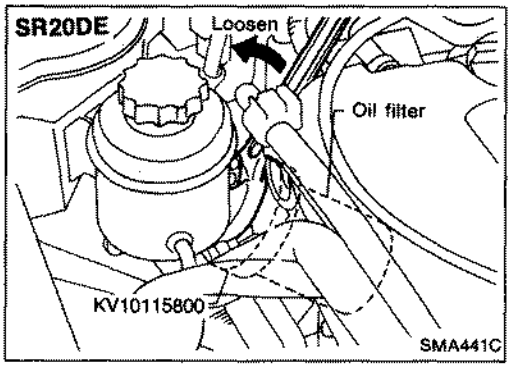
	SR20DE	SR20DET
With oil filter change	3.4 (3)	3.7 (3-1/4)
Without oil filter change	3.2 (2-7/8)	3.5 (3-1/8)

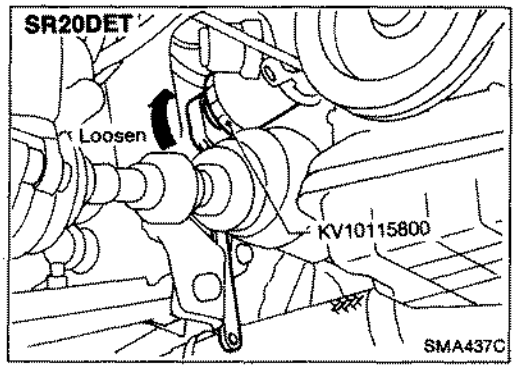
CAUTION:

- **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 grade).**

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

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.





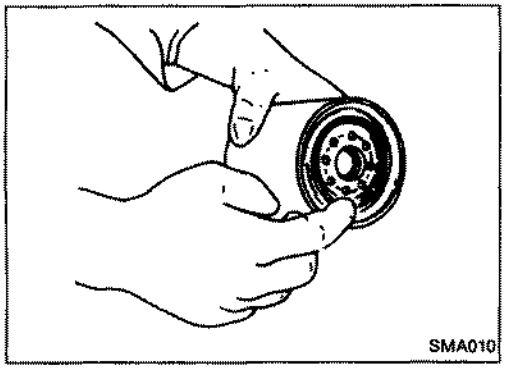
Changing Oil Filter

1. Remove oil filter with Tool.

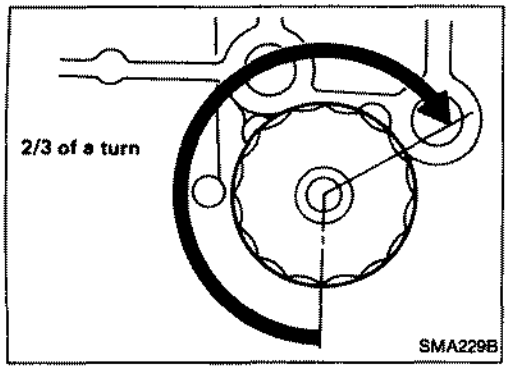
WARNING:

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

Changing Oil Filter (Cont'd)



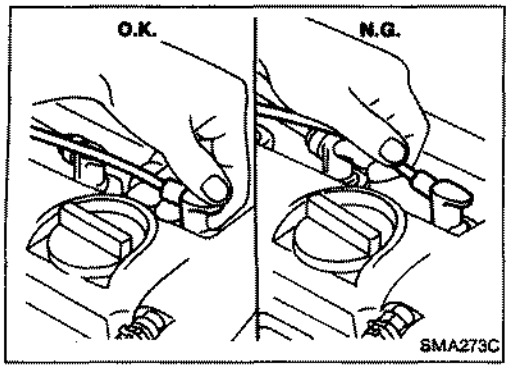
2. Before installing new oil filter, clean the oil filter mounting surface on cylinder block, and coat the rubber seal of oil filter with a little engine oil.



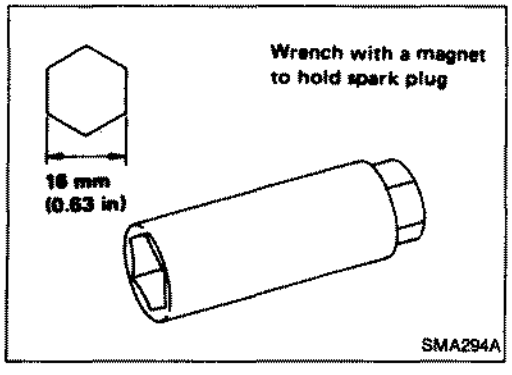
3. Screw in the oil filter until a slight resistance is felt, then tighten an additional 2/3 turn.
4. Add engine oil.

Refer to Changing Engine Oil.

Checking and Changing Spark Plugs (Conventional type for SR20DE engine)



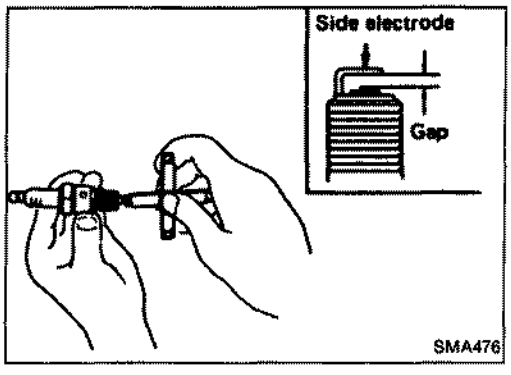
1. Disconnect ignition wires from spark plugs at boot. Do not pull on the wire.



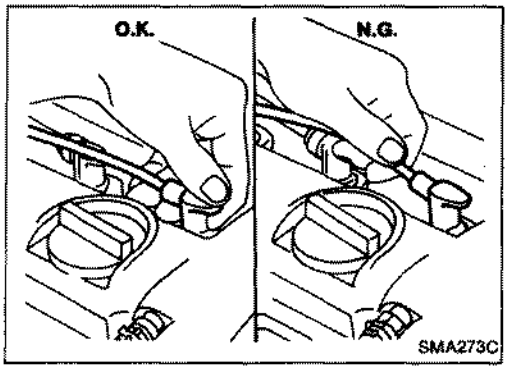
2. Remove spark plugs with spark plug wrench.

Spark plug:

Standard type	**BKR6EY**
Hot type	**BKR5EY**
Cold type	**BKR7EY**

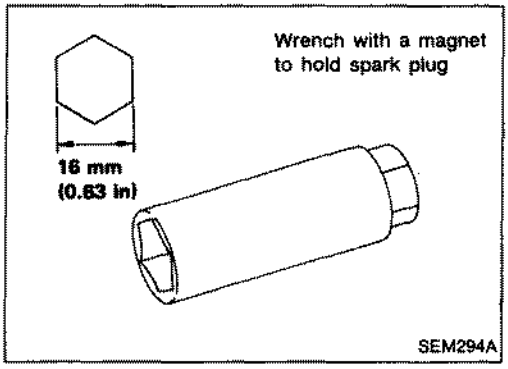


3. Check gap of each new spark plug.
   Gap: 0.8 - 0.9 mm (0.031 - 0.035 in)
4. Install spark plugs. Reconnect ignition wires according to nos. indicated on them.
   Spark plug:
   [O]: 20 - 29 N·m (2 - 3 kg-m, 14 - 22 ft-lb)



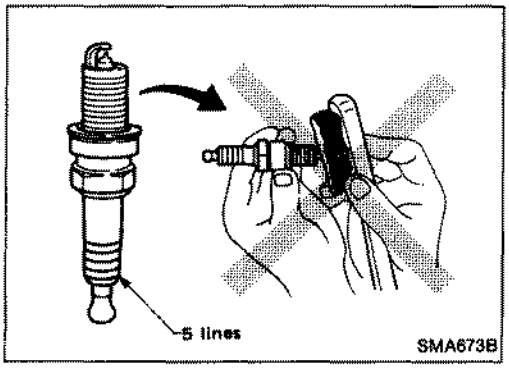
Changing Spark Plugs (Platinum-tipped type for SR20DET engine)

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



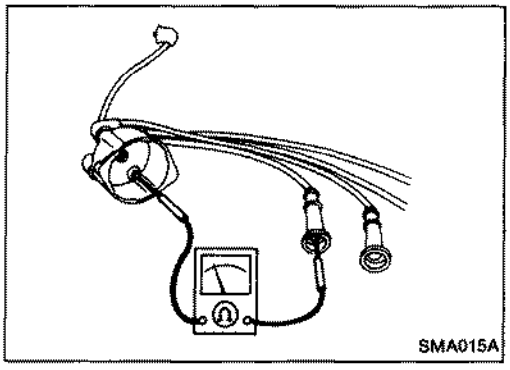
2. Remove spark plugs with spark plug wrench.
   Spark plug:

Standard type	**PFR7B-9**
Hot type	**PFR6B-9**
Cold type	**PFR8B-9**



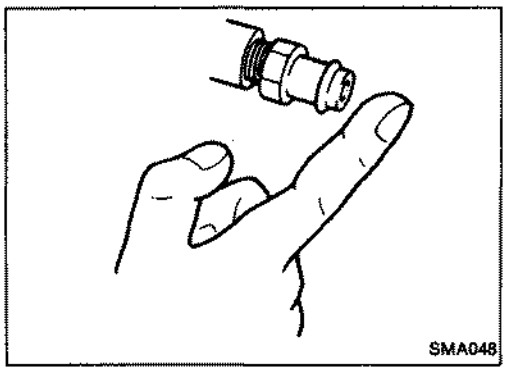
- **Checking and adjusting plug gap are not required between renewals.**
- **Do not use a wire brush for cleaning.**
- **If plug tip is covered with carbon, spark plug cleaner may be used.**
  Cleaner air pressure:
  Less than 588 kPa (5.9 bar, 6 kg/cm^2, 85 psi)
  Cleaning time:
  Less than 20 seconds

3. Install spark plugs. Reconnect ignition wires according to nos. indicated on them.
   Spark plug:
   : 20 - 29 N·m (2.0 - 3.0 kg-m, 14 - 22 ft-lb)



Checking Ignition Wires

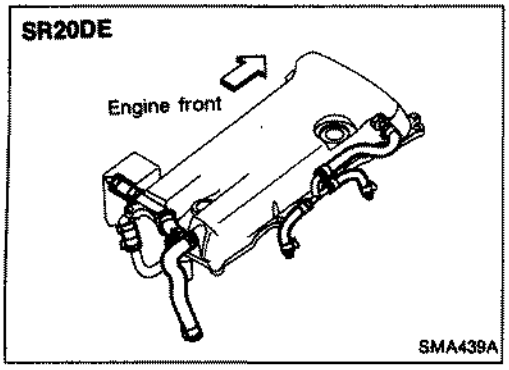
1. Inspect wires for cracks, damage, burned terminals and for improper fit.
2. Measure the resistance of wires and check for intermittent breaks.
   Resistance:
   13.6 - 18.4 kΩ/m (4.15 - 5.61 kΩ/ft)
   If the resistance exceeds the above specification, replace the ignition wire with a new one.



Checking Positive Crankcase Ventilation (P.C.V.) System

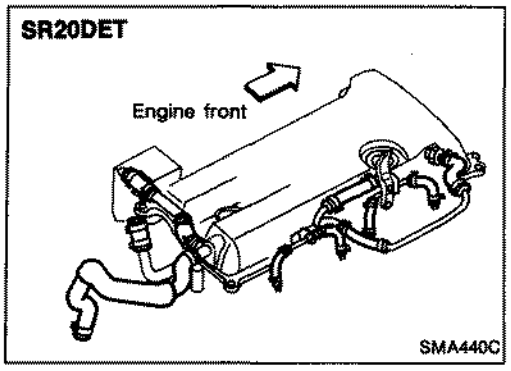
CHECKING P.C.V. VALVE

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



CHECKING VENTILATION HOSES

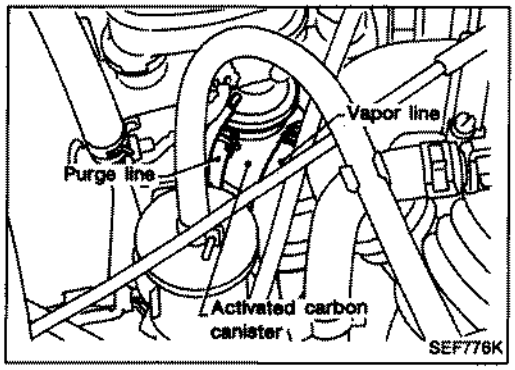
1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



Checking Vacuum Hoses and Connections

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

Refer to Vacuum Hose Drawing in ENGINE AND EMISSION CONTROL OVERALL SYSTEM in EF & EC section.



Checking Vapor Lines

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

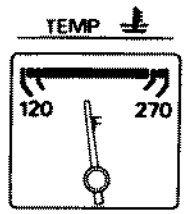
Refer to EVAPORATIVE EMISSION CONTROL SYSTEM INSPECTION in EF & EC section.

Checking Exhaust Gas Sensor

Checking procedure

INSPECTION START

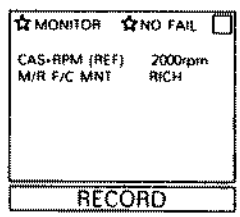
Start engine and warm it up until water temperature indicator points to the middle of gauge.



SEF246F

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.

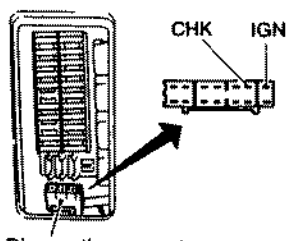
RICH → LEAN → RICH → LEAN → RICH .....
(1 time = RICH → LEAN → RICH; 2 times = LEAN → RICH)



SEF818K

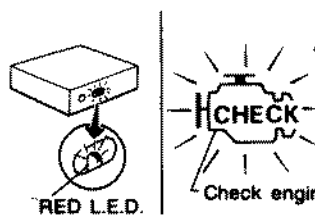
OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (Refer to section EF & EC.)
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 RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.



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

SEF265L



SEF621K

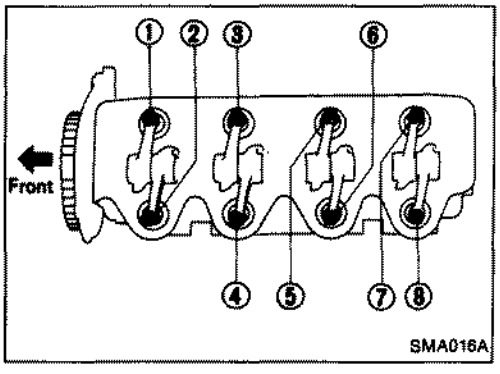
O.K. → INSPECTION END

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

RETIGHTENING MANIFOLD, CARBURETOR AND EXHAUST TUBE BOLTS AND NUTS

Retighten to prevent air and/or exhaust gas leakage.

Intake & exhaust manifold nut:
: 16 - 21 N·m
(1.6 - 2.1 kg-m, 12 - 15 ft-lb)
Carburetor bolt:
: 6 - 7 N·m
(0.6 - 0.7 kg-m, 4.3 - 5.1 ft-lb)
Exhaust tube nut:
: 28 - 33 N·m
(2.9 - 3.4 kg-m, 21 - 25 ft-lb)



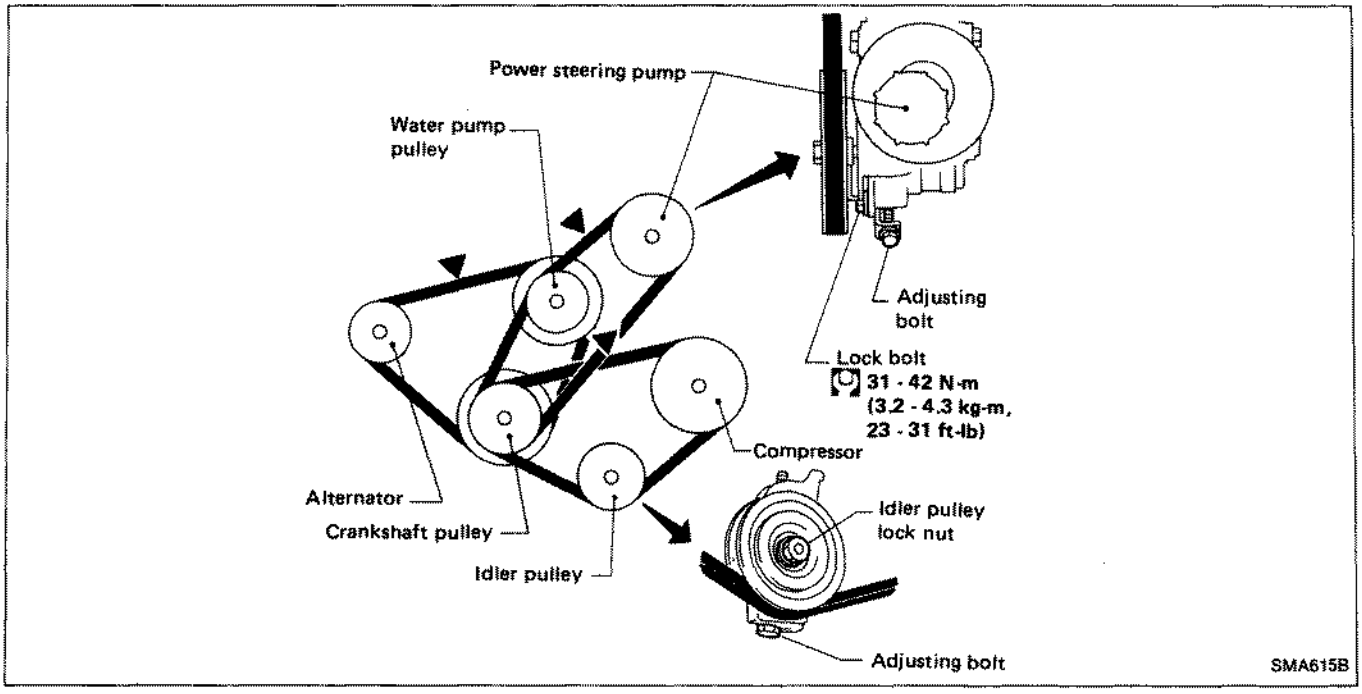
Adjusting Intake and Exhaust Valve Clearance

Adjustment must be made after engine has been warmed up sufficiently.

1. Set No. 1 cylinder at top dead center on its compression stroke, and adjust valve clearance ①, ②, ③ and ⑥.
2. Set No. 4 cylinder at top dead center on its compression stroke, and adjust valve clearance ④, ⑤, ⑦ and ⑧.

Valve clearance:
Intake and exhaust
0.28 mm (0.011 in)
Adjusting screw lock nut:
: 16 - 21 N·m
(1.6 - 2.1 kg-m, 12 - 15 ft-lb)

Drive Belt Inspection



1. Inspect for cracks, fraying, wear or oil adhesion. If necessary, replace with new one.

The belts should not touch the bottom of the pulley groove.

2. Inspect drive belt deflections by pushing on the belt midway between pulleys.

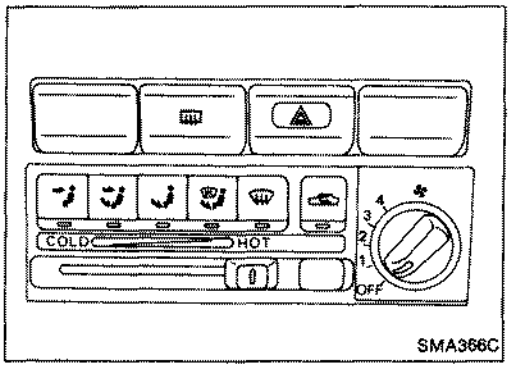
Adjust if belt deflections exceed the limit.

Belt deflection:

Unit: mm (in)

	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator	13.5 (0.531)	8.5 - 9.5 (0.335 - 0.374)	7.5 - 8.5 (0.295 - 0.335)
Air conditioner compressor	12.5 (0.492)	9 - 10 (0.35 - 0.39)	6 - 8 (0.24 - 0.31)
Power steering oil pump	10.5 (0.413)	7 - 9 (0.28 - 0.35)	6.5 - 8.5 (0.256 - 0.335)
Applied pushing force	98 N (10 kg, 22 lb)		

Inspect drive belt deflections when engine is cold. If engine is hot, wait 30 minutes or more and check deflections.



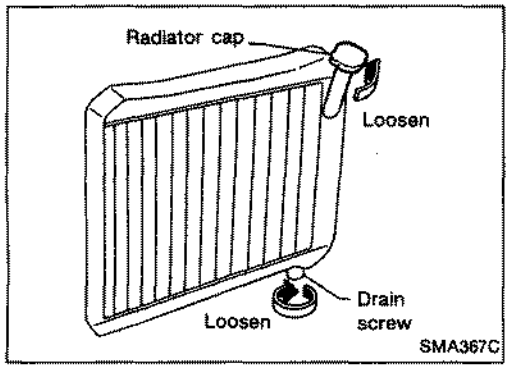
Changing Engine Coolant

WARNING:

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

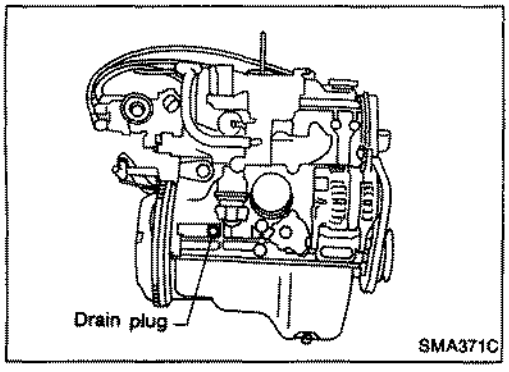
1. Move heater "TEMP" control lever all the way to "HOT" position.

Changing Engine Coolant (Cont'd)

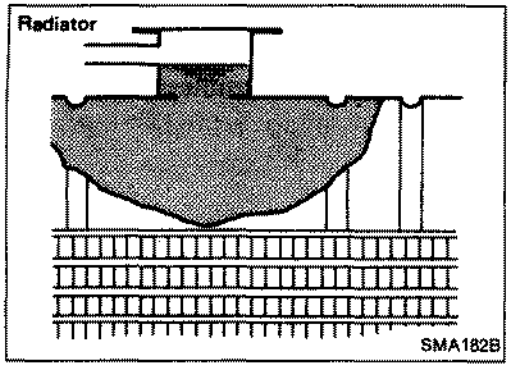


2. Drain engine coolant.
(1) Open drain screw at the bottom of radiator, and remove radiator cap.

Be careful not to allow coolant to contact drive belts.



(2) Remove drain plug on cylinder block.
3. Flush the cooling system.
(1) Close drain screw and drain plug.
(2) Fill radiator with water, then warm up engine.
(3) Stop engine and wait until it cools down.
(4) Drain water.
(5) Repeat step (1) through step (4) two or three times.



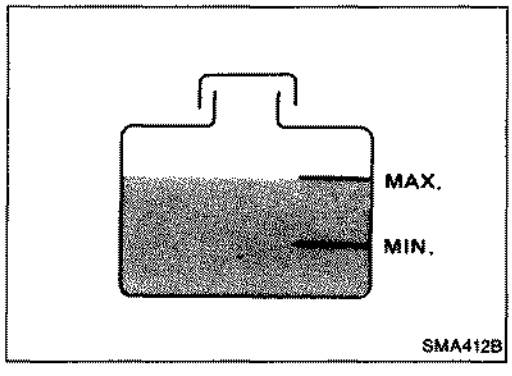
4. Fill radiator with coolant up to filler opening.
Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.

Coolant capacity (Without reservoir tank):

Coolant capacity ℓ (Imp qt)	
With heater	Without heater
4.1 (3-5/8)	3.8 (3-3/8)

Reservoir tank: 0.7ℓ (5/8 Imp qt)

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

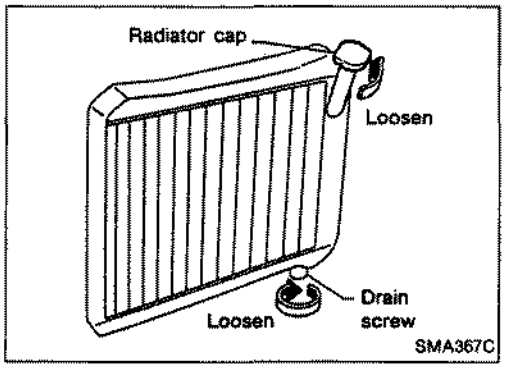


5. Fill reservoir tank with coolant up to "MAX" level.
6. Run engine at approximately 2,000 rpm for about one minute.
7. Stop engine and cool it down, then refill radiator and reservoir tank.

Checking Cooling System

CHECKING HOSES

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



CHECKING COOLING SYSTEM FOR LEAKS

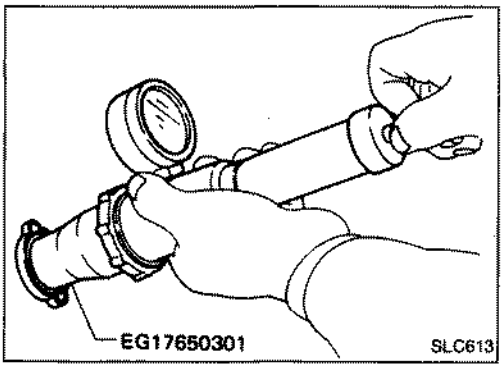
Apply pressure to the cooling system by means of a tester to check for leakage.

Testing pressure:

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

CAUTION:

Higher than the specified pressure may cause radiator damage.

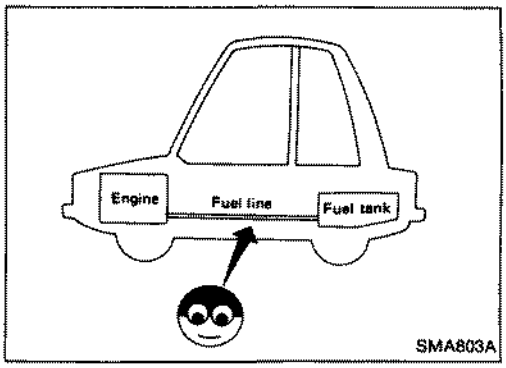


CHECKING RADIATOR CAP

Apply pressure to radiator cap by means of a cap tester to see if it is satisfactory.

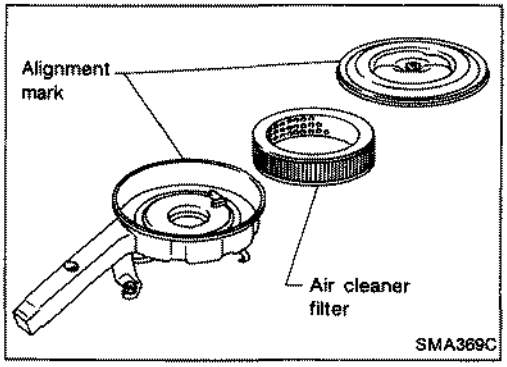
Radiator cap relief pressure:

78 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)



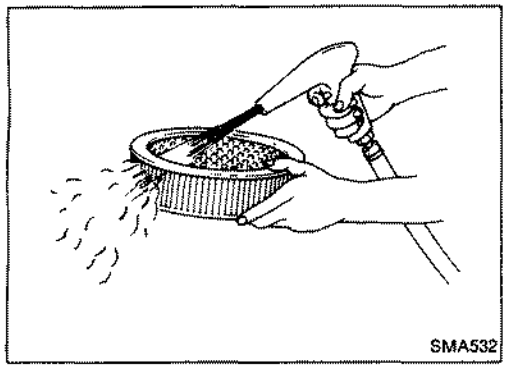
Checking Fuel Lines

Check fuel lines and tank for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



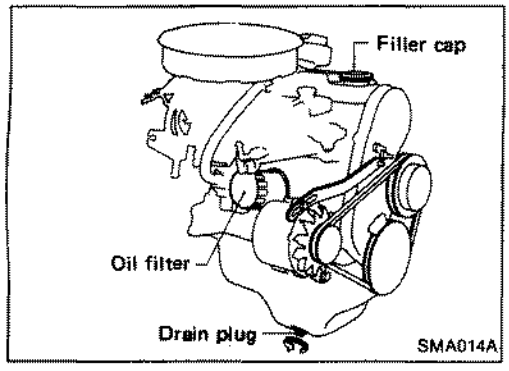
Replacing Air Cleaner Filter (Viscous paper type)

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


SMA532

Cleaning and Replacing Air Cleaner Filter (Dry paper type)

Clean or replace element more often under dusty driving conditions.



Changing Engine Oil

WARNING:

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

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

Oil capacity (Approximately):

With oil filter change 3.2ℓ (2-7/8 Imp qt)

Without oil filter change 2.8ℓ (2-1/2 Imp qt)

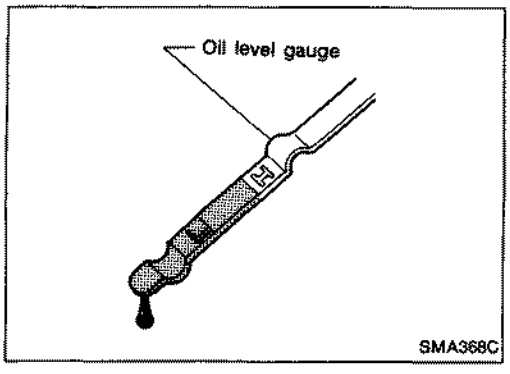
CAUTION:

- **Be sure to clean drain plug and install with new washer.**

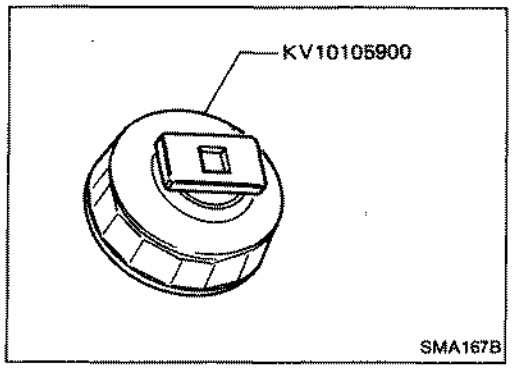
  Drain plug:

  : 29 - 39 N·m

  (3.0 - 4.0 kg-m, 22 - 29 ft-lb)
- **Use recommended engine oil "API SE, SF or SG" with suitable viscosity.**
- **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.**



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



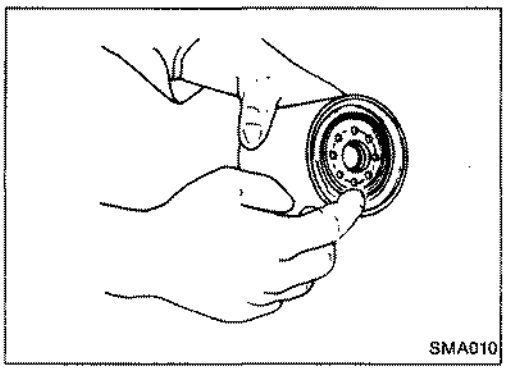
Changing Engine Oil Filter

1. Remove oil filter with Tool.

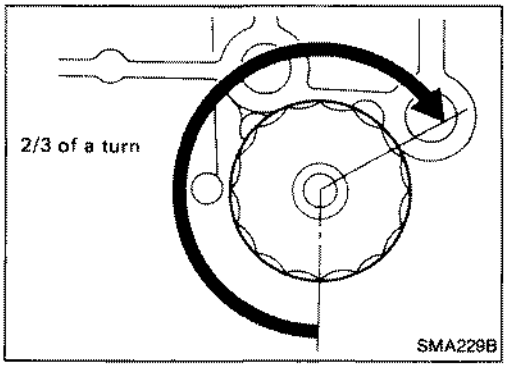
WARNING:

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

Changing Engine Oil Filter (Cont'd)



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



3. Screw oil filter on until a slight resistance is felt, then tighten by at least an additional 2/3 turn further.
4. Add engine oil.

Refer to Changing Engine Oil.

Checking and Adjusting Idle-rpm, Ignition Timing and Mixture Ratio

CAUTION:

Do not attempt to screw the idle adjusting screw down completely. Doing so could cause damage to tip, which in turn will tend to cause malfunctions.

Preparation

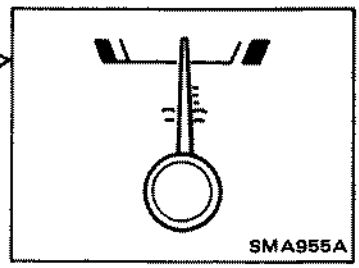
1. Set shift lever in "Neutral" position. Keep front wheels in a straight-ahead position on power steering equipped models. Engage parking brake and lock both front and rear wheels with wheel chocks.
2. Turn off air conditioner and headlamps.
3. Use "CO"-meter after it is fully warmed up, and insert "CO"-meter probe into tail pipe more than 0.4 m (1.3 ft).
4. Measure "CO"% with air cleaner installed.
5. During checking and adjusting, make sure that engine is at normal operating temperature.

Checking and Adjusting Idle-rpm, Ignition Timing and Mixture Ratio (Cont'd)

CHECKING AND ADJUSTING IDLE-RPM, IGNITION TIMING AND MIXTURE RATIO

START

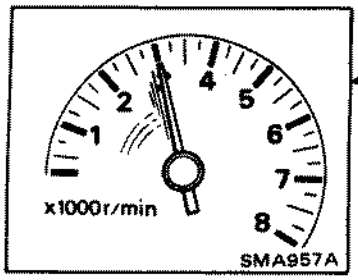
Start engine and warm it up until water temperature indicator reaches normal operating temperature.


SMA955A

Open engine hood.

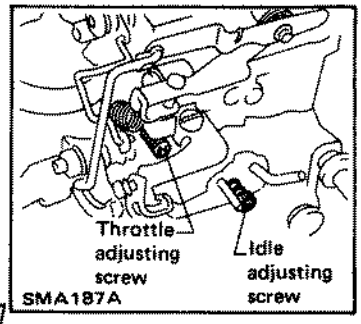
Run engine at idle speed for 2 minutes.

Disconnect distributor vacuum hose on intake manifold connector side and install blind cap to connector.



SMA957A

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



SMA187A

Check idle speed.

Idle speed:
Below 1,000 rpm

O.K.

N.G.

Adjust idle speed by turning throttle adjusting screw.

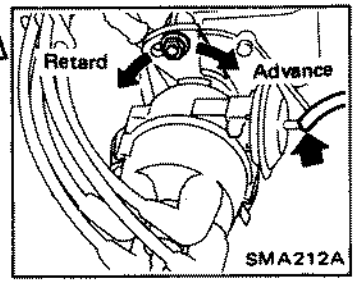
Check ignition timing at idle speed.

Ignition timing: B.T.D.C. degree
2±2

O.K.

N.G.

Adjust ignition timing by turning distributor.



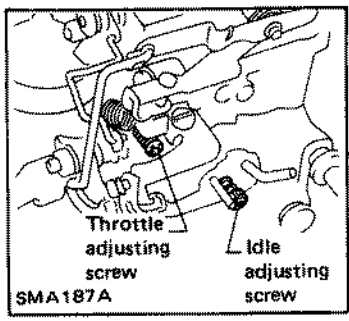
SMA212A

Connect distributor vacuum hose to intake manifold connector.

Ⓐ

Ⓑ

Checking and Adjusting Idle-rpm, Ignition Timing and Mixture Ratio (Cont'd)



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

Adjust idle speed by turning throttle adjusting screw.

Idle speed: rpm
900 ± 50

Confirm ignition timing at idle speed.

Ignition timing: B.T.D.C. degree
15 ± 5

O.K.

N.G.

Clean or replace vacuum hoses.

Check distributor and vacuum hoses.

Repair or replace distributor or vacuum controller.

Without "CO"-meter → Ⓒ

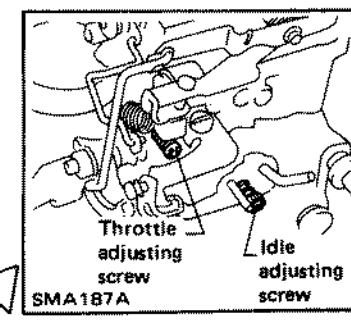
With "CO"-meter

Check "CO"% at idle speed.

Idle "CO": %
1.5 ± 0.5

O.K.

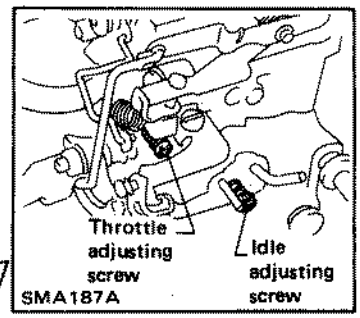
N.G.



Adjust idle "CO"% to 1.5 ± 0.5% by turning idle adjusting screw.

END

Checking and Adjusting Idle-rpm, Ignition Timing and Mixture Ratio (Cont'd)



CAUTION:
Do not attempt to screw the idle adjusting screw down completely. Doing so could cause damage to tip, which in turn will tend to cause malfunctions.

Turn out idle adjusting screw approximately three turns, starting from fully closed position.

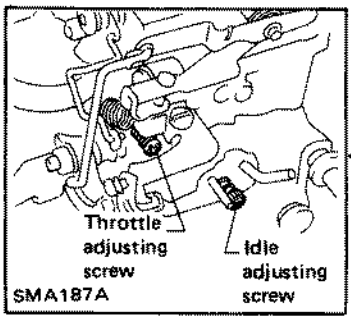
Adjust engine speed by turning throttle adjusting screw.

Engine speed: rpm
950 ± 50

Turn idle adjusting screw until engine runs smoothly at highest speed.

Engine speed does not rise.

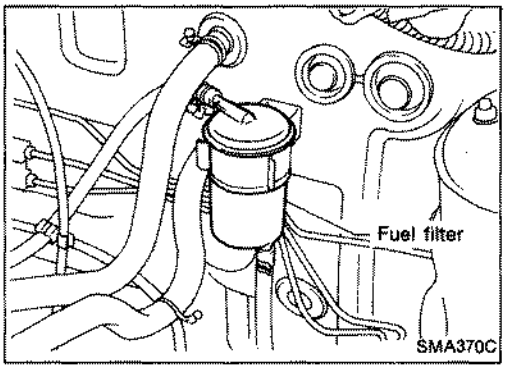
Engine speed rises.



Adjust engine speed by turning in idle adjusting screw.

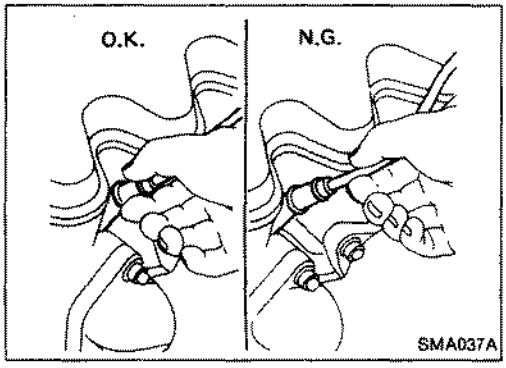
Idle speed: rpm
900 ± 50

END



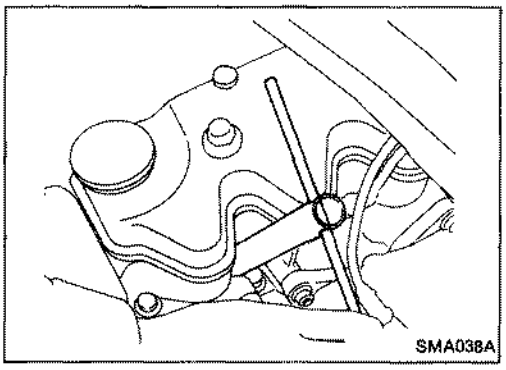
Replacing Fuel Filter

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



Checking and Replacing Spark Plugs

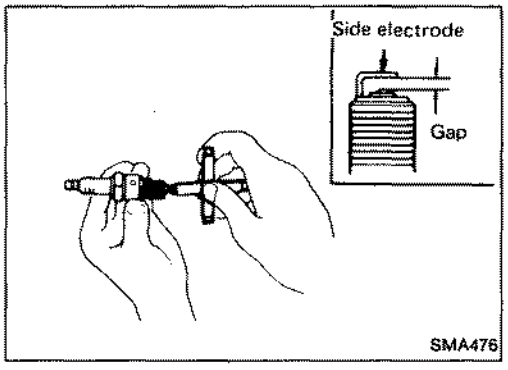
1. Remove air cleaner.
2. Disconnect ignition wires from spark plugs by pulling on boots. Do not pull on wires.



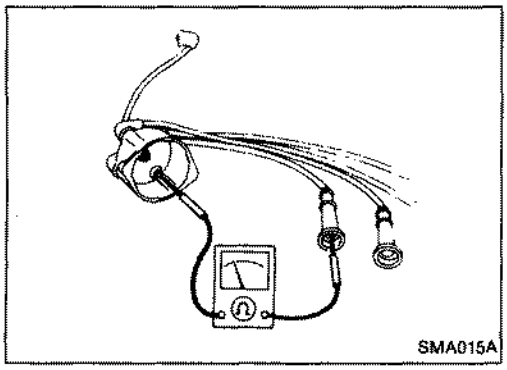
3. Remove spark plugs with spark plug wrench.

Spark plug:

Type	
Standard	BP5ES
Hot	BP4ES
Cold	BP6ES

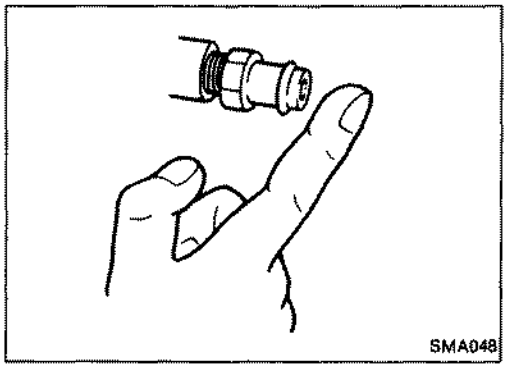


4. Check new spark plug gap.
   Gap: 0.8 - 0.9 mm (0.031 - 0.035 in)
5. Install spark plugs. Reconnect ignition wires according to Nos. indicated on them.
   Spark plug:
   : 20 - 29 N·m
   (2.0 - 3.0 kg-m, 14 - 22 ft-lb)


SMA015A

Checking Ignition Wire (High Tension Wire)

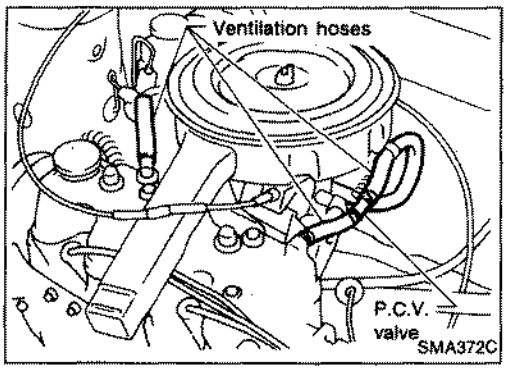
1. Inspect ignition wires for cracks, damage, burned terminals and proper fit.
2. Measure the resistance of ignition wires by shaking them and checking for intermittent breaks.
   Resistance: Less than 30 kΩ
   If N.G., replace with new ones.


SMA048

Checking Positive Crankcase Ventilation (P.C.V.) System

CHECKING P.C.V. VALVE

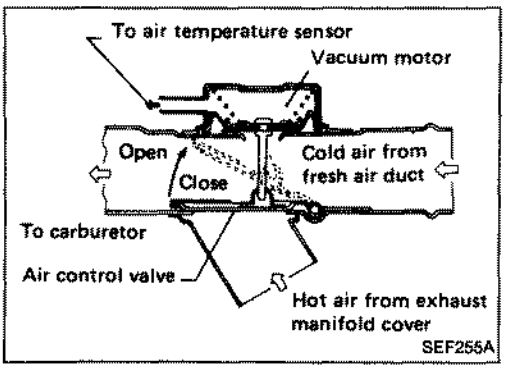
With engine running at idle, remove ventilation hose from P.C.V. valve; if valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.



SMA372C

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.



SEF255A

Checking Automatic Temperature Control (A.T.C.) Air Cleaner

1. Check that vacuum hoses (Intake manifold to temperature sensor and vacuum motor) are securely connected.
2. Inspect each hose for cracks or distortion.
3. Inspect A.T.C. system for proper function.

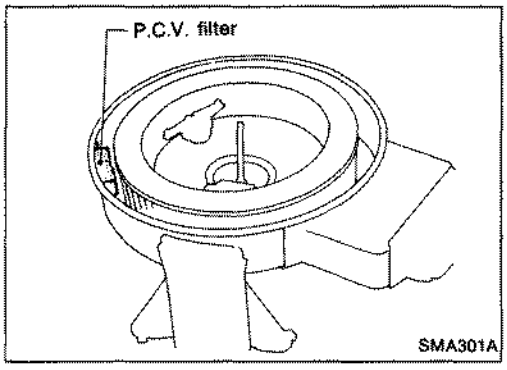
Engine	Temperature	Air control valve position	Intake air temperature
Stopped	Any	Closed	—
At idle	Low	Open	Hot
	High	Closed	Cool

4. Make sure that air control valve moves when engine is raced under no-load.
5. Make sure that air control valve gradually closes when engine warm-up advances.

Refer to section EF & EC.

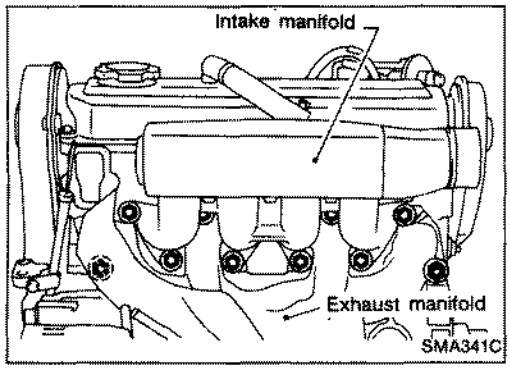
Checking Vacuum Fitting Hoses and Connections

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



Replacing P.C.V. filter

Remove air cleaner cover, and replace filter.

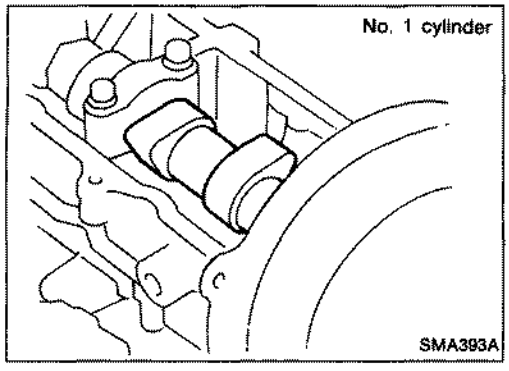


Manifold Nut Check

1. Remove exhaust manifold cover.
2. Tighten manifold bolts and nuts to the specified torque.
3. Install exhaust manifold cover.

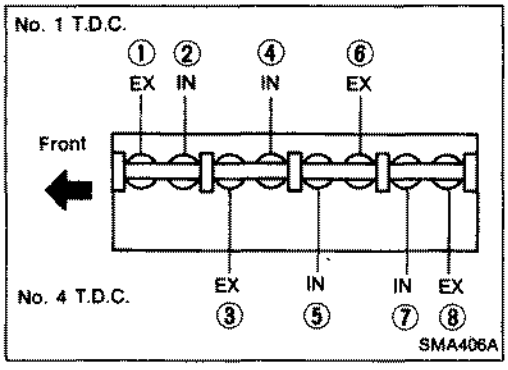
Valve Clearance Adjustment

Warm up engine to the normal operating temperature.



VALVE CLEARANCE CHECK

1. Set No. 1 cylinder to T.D.C. on its compression stroke.
2. Check valve clearances of cylinders No. ①, ②, ④ and ⑥.

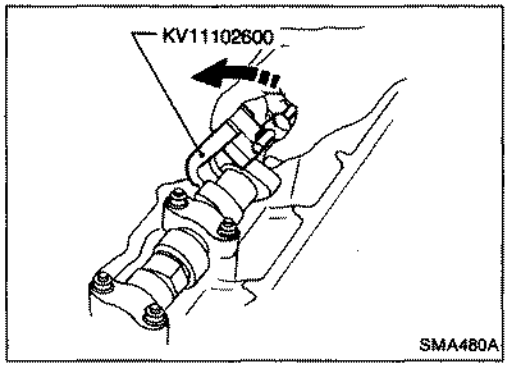


3. Set No. 4 cylinder to T.D.C. on its compression stroke.
4. Check valve clearances of cylinders No. ③, ⑤, ⑦ and ⑧.

Valve clearance (Hot):

Unit: mm (in)

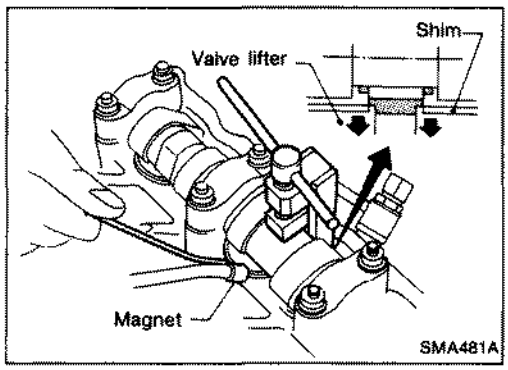
Intake	0.20 - 0.30 (0.008 - 0.012)
Exhaust	0.40 - 0.50 (0.016 - 0.020)



VALVE CLEARANCE ADJUSTMENT

1. Set the cylinder, whose valve clearance needs to be adjusted, to T.D.C.
2. Turn crankshaft an additional 90 degrees clockwise from T.D.C.
3. Set Tool or equivalent between cams on camshaft.

Valve Clearance Adjustment (Cont'd)

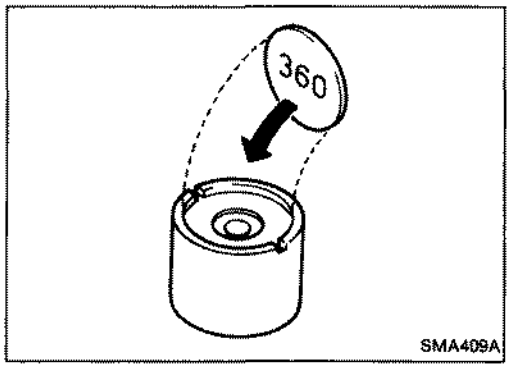


4. Install selected shim to valve lifter.

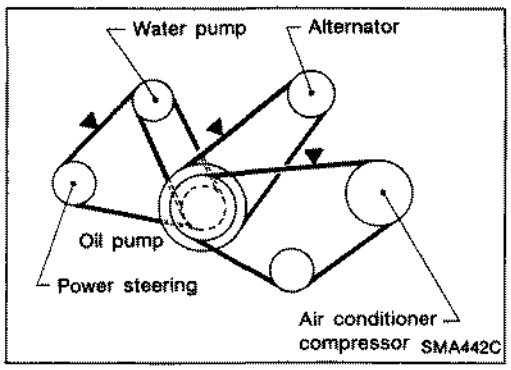
Example:

Unit: mm (in)

	Intake	Exhaust
Specified clearance	0.20 - 0.30 (0.008 - 0.012)	0.40 - 0.50 (0.016 - 0.020)
Measured clearance	0.32 (0.013)	0.36 (0.014)
Difference	0.02 - 0.12 (0.001 - 0.005) large	0.04 - 0.14 (0.002 - 0.006) small
Thickness of plate that was used	3.60 (0.142)	3.55 (0.140)
Thickness of plate to be used	3.65 or 3.70 (0.144 or 0.146)	3.45 or 3.50 (0.136 or 0.138)



Set shim with numbered side down.
Refer to S.D.S. for service shims.



Drive Belt Check

WARNING:

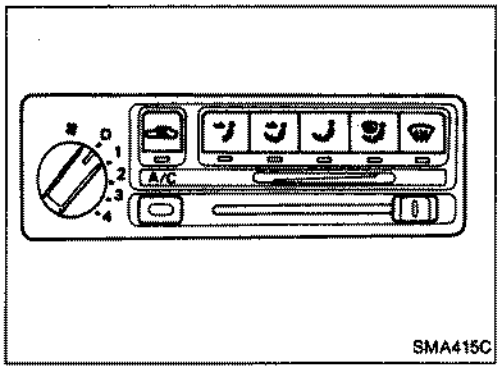
Inspect drive belt deflections when engine is cold. When engine is hot, check deflections at least 30 minutes after engine has been switched off.

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 (in)/98 N (10 kg, 22 lb)

	Alternator	A/C compressor	P/S oil pump		Water pump
			CD17	CD20	CD20 without P/S
New belt	8.5 - 10.5 (0.335 - 0.413)	9.5 - 11.5 (0.374 - 0.453)	8.5 - 10.5 (0.335 - 0.413)	4 - 6 (0.16 - 0.24)	6 (0.24)
Used belt	10.5 - 12.5 (0.413 - 0.492)	11.5 - 13.5 (0.453 - 0.531)	10.5 - 12.5 (0.413 - 0.492)	5 - 7 (0.20 - 0.28)	8 (0.31)
Limit	17 (0.67)	17 (0.67)	14 (0.55)	8 (0.31)	—

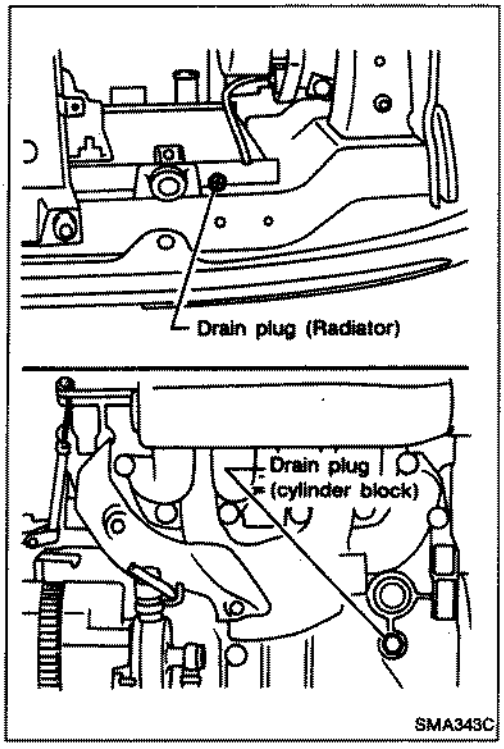


Engine Coolant Change

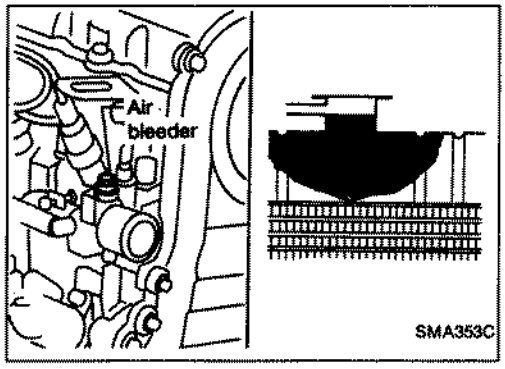
WARNING:

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

1. Set heater "TEMP" control lever to the max. "HOT" position.



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



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

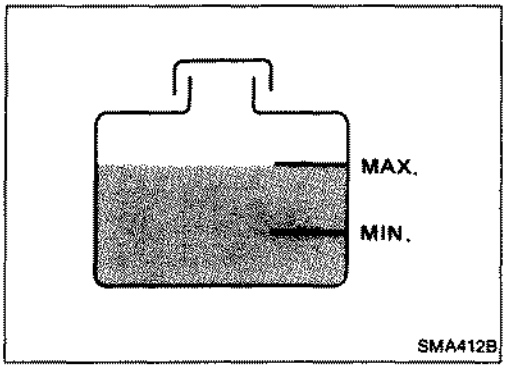
Pour coolant slowly to allow air in system to escape.

Coolant capacity:

Unit: ℓ (Imp qt)

	CD17	CD20
With heater	6.5 (5-3/4)	7.1 (6-1/4)
Without heater	6.2 (5-1/2)	6.8 (6)
Reservoir tank	0.7 (5/8)	

Engine Coolant Change (Cont'd)



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

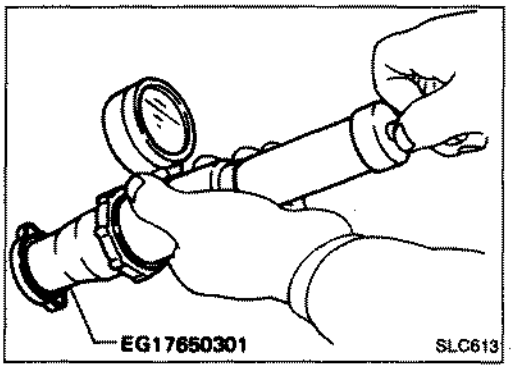
INFORMATION

For more detailed procedure of filling up radiator with coolant, refer to LC section.

Cooling System Check

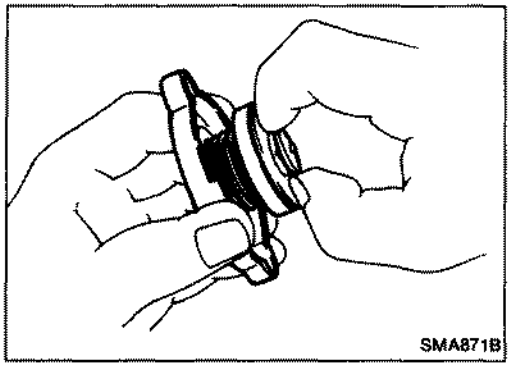
HOSE AND CLAMP CHECK

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

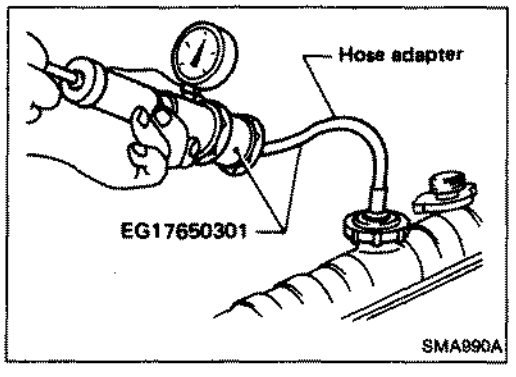


RADIATOR CAP CHECK

1. Check relief pressure with cap tester.
   Radiator cap relief pressure:
   CD17
   59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi)
   CD20
   88 - 127 kPa (0.88 - 1.27 bar, 0.9 - 1.3 kg/cm^2, 13 - 18 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.

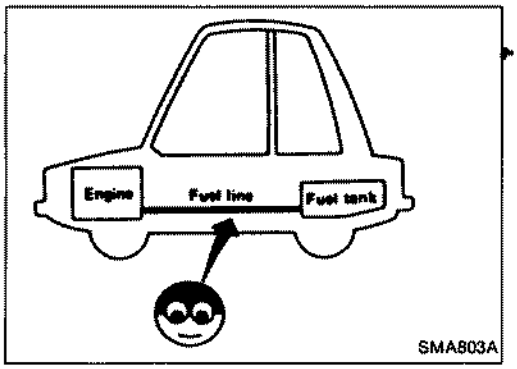


COOLING SYSTEM LEAK CHECK

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

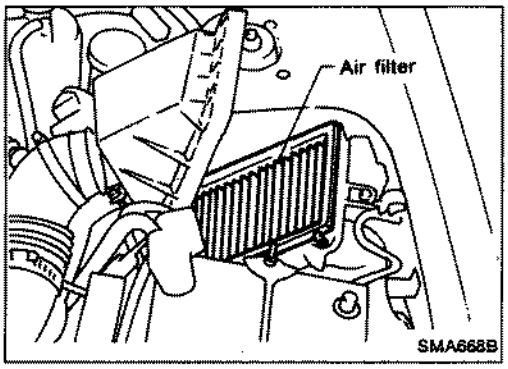
Testing pressure:
157 kPa (1.57 bar, 1.6 kg/cm^2, 23 psi)

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



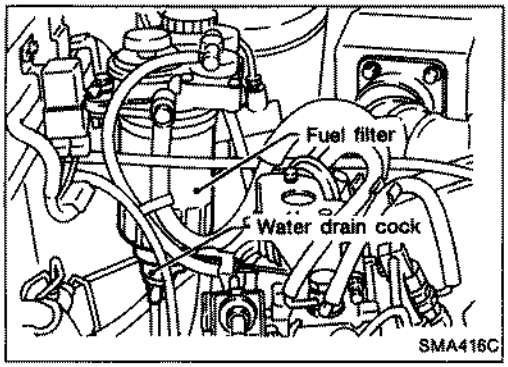
Fuel Line Check

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



Air Cleaner Filter Replacement

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



Water Draining, Fuel Filter Check and Replacement

WATER DRAINING

Open drain cock at the bottom of fuel filter.

FUEL FILTER CHECK

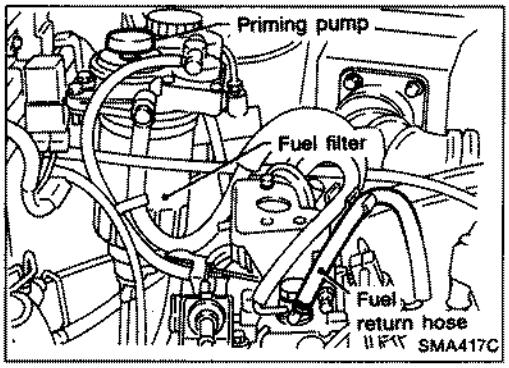
Check fuel filter for fuel leakage, damage and other abnormal signs.

FUEL FILTER REPLACEMENT

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

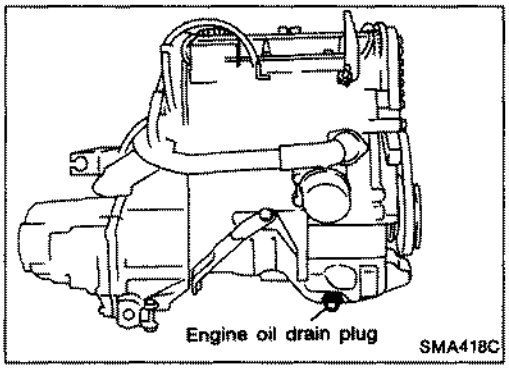
Hand-tighten fuel filter by about 2/3 turn after O-ring touches mounting surface. Follow the instructions on fuel filter.

2. Connect water sensor connector and bleed fuel system.



FUEL SYSTEM AIR BLEEDING

1. Disconnect fuel return hose at fuel injection pump.
2. Bleed air from fuel system with the priming pump until no bubbles come out of fuel return pipe of injection pump.
3. Securely connect fuel return hose.

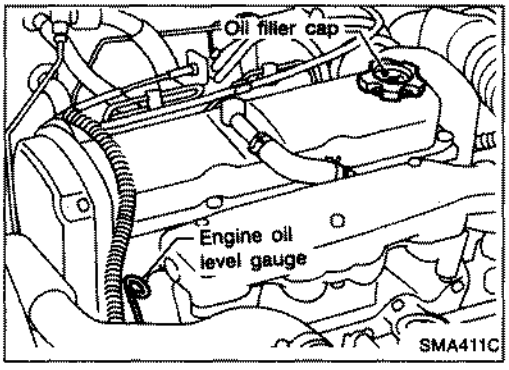


Engine Oil Change

WARNING:

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

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



3. Tighten oil drain plug.
4. Fill with engine oil.

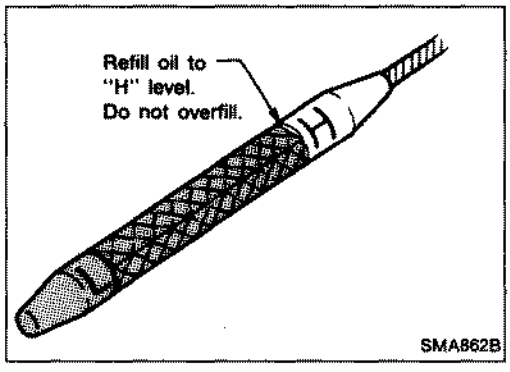
Oil refill capacity:

Unit: ℓ (Imp qt)

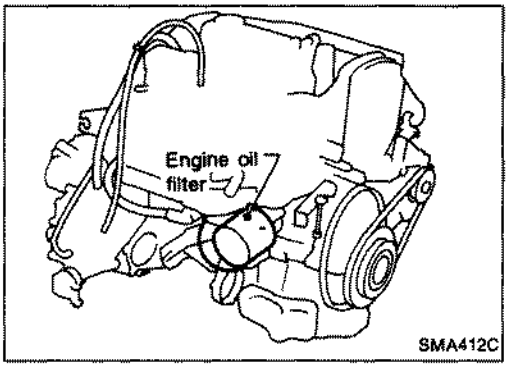
	CD17	CD20
Without oil filter	4.4 (3-7/8)	4.9 (4-3/8)
With oil filter	4.9 (4-3/8)	5.4 (4-3/4)

- **Use recommended engine oil "API CD" with suitable viscosity.**

5. Confirm oil level and warm up engine.



6. Recheck oil level and adjust it to "H" level if necessary.



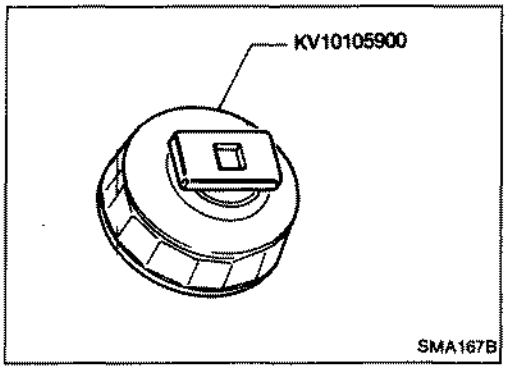
Engine Oil Filter Change

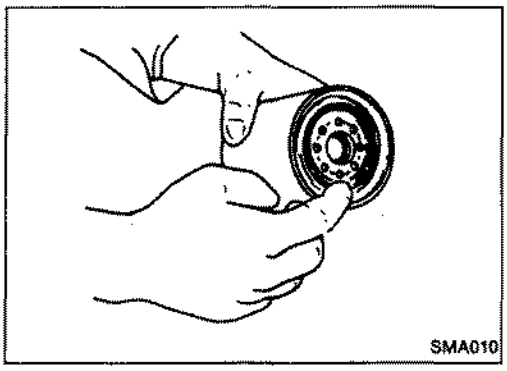
1. Remove oil filter with Tool.

WARNING:

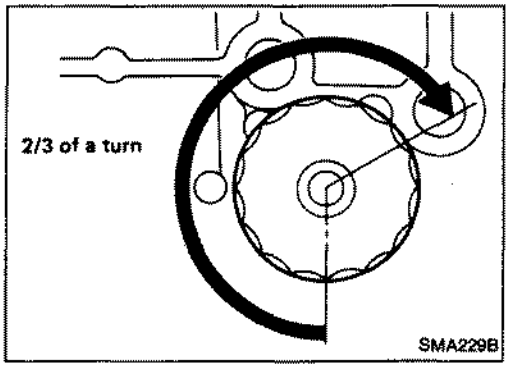
Be careful not to burn yourself, as engine and engine oil are hot.

Engine Oil Filter Change (Cont'd)



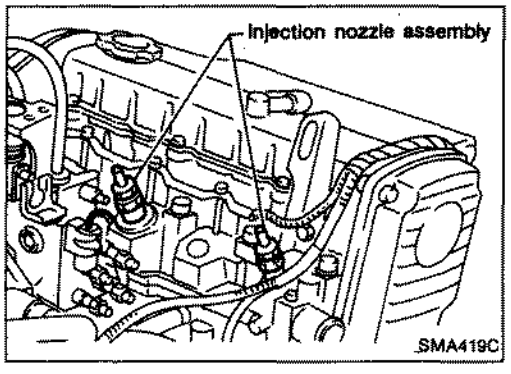


2. Before installing new oil filter, wipe clean oil filter mounting surface on cylinder block, and apply a little engine oil to rubber seal of oil filter.

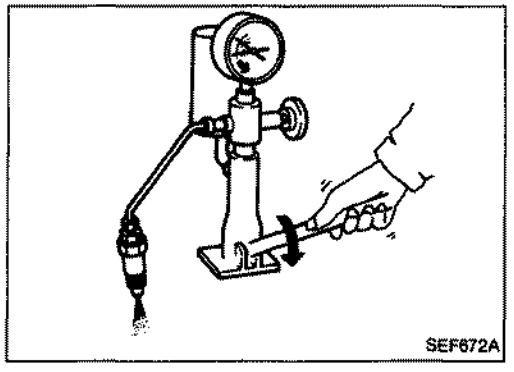


3. Screw oil filter on until a slight resistance is felt, then tighten an additional 2/3 turn or more (1/2 turn for CD20 models with E.G.R. system).
4. Warm up engine and check oil level.
5. Adjust oil level if necessary.

Injection Nozzle Check



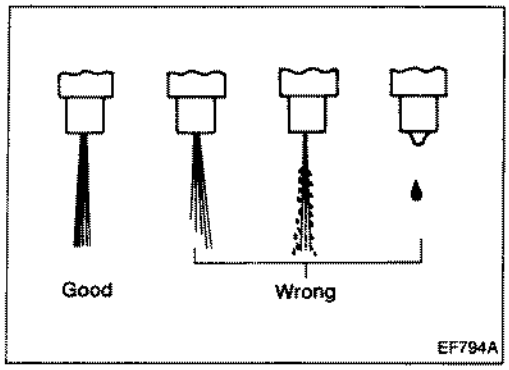
1. Remove injection delivery tubes and fuel spill tube.
2. Remove nozzle with a suitable tool [span 27 mm (1.06 in)].



3. Install injector to pressure tester.
4. 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)

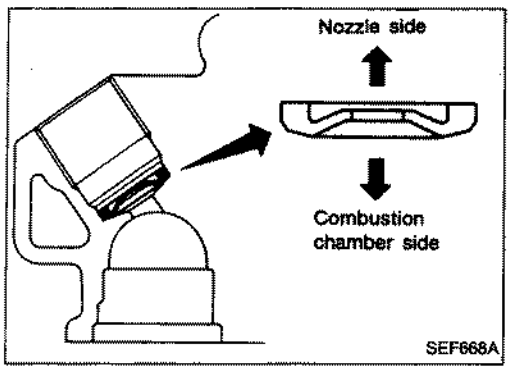
Injection Nozzle Check (Cont'd)



5. Check fuel spray pattern by pumping tester handle quickly (4 or 6 times per second).
6. If injection nozzle is not in normal condition, replace or correct.

Refer to EF & EC section for injection pressure adjustment.

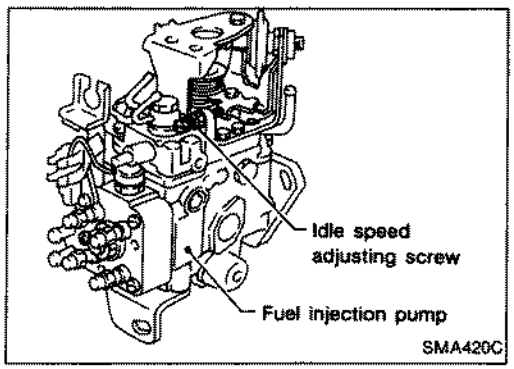
7. Install all injection nozzles and securely connect fuel spill tube and delivery tubes.
8. Bleed air from fuel system and check for fuel leakage with engine running.



Idle Speed Check

Inspection should be carried out with gears in "Neutral" and with air conditioner and other electrical loads off.

1. Warm up engine to normal operating temperature.
2. Attach a diesel tacho tester.
3. Race engine two or three times and check idle speed.



Idle Speed:

Unit: rpm

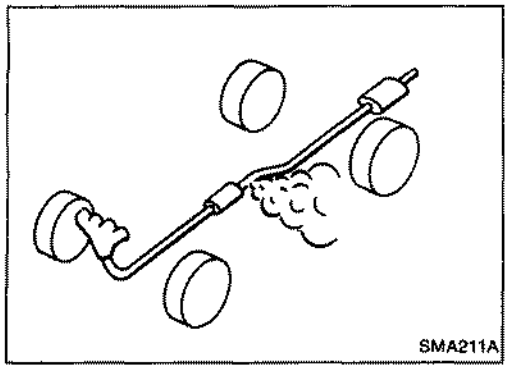
M/T
700^{+50}_{-0}

4. If it is out of specification, adjust idle speed with idle speed adjusting screw.

Securely lock the adjusting screw with lock nut.

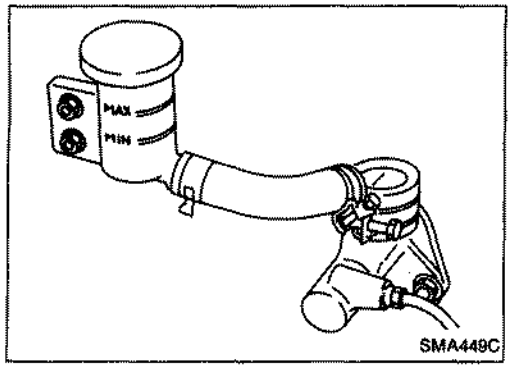
Timing Belt Replacement

Refer to EM section.


SMA211A

Checking Exhaust System

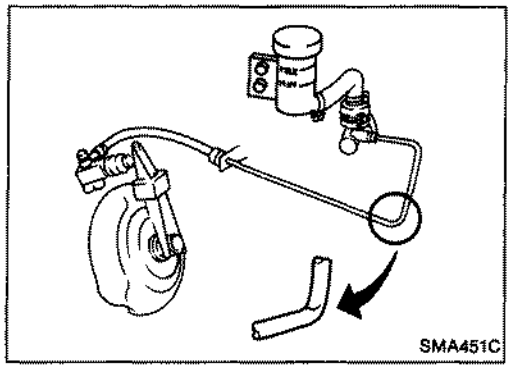
Check exhaust pipes, muffler and mounting for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.



SMA449C

Checking Clutch Fluid Level and Leaks

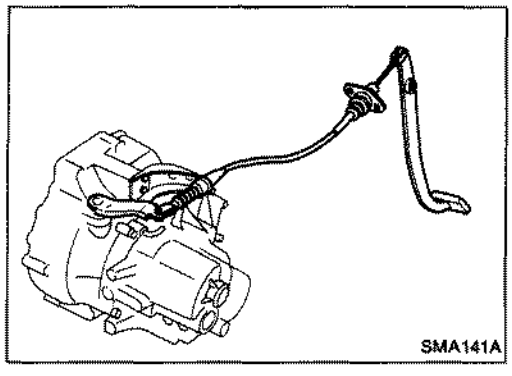
If fluid level is extremely low, check clutch system for leaks.


SMA451C

Checking Clutch System

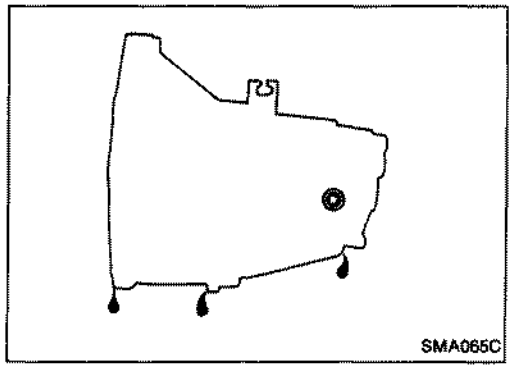
HYDRAULIC TYPE

Check fluid lines and operating cylinder for improper attachment, cracks, damage, loose connections, chafing and deterioration.


SMA141A

MECHANICAL TYPE

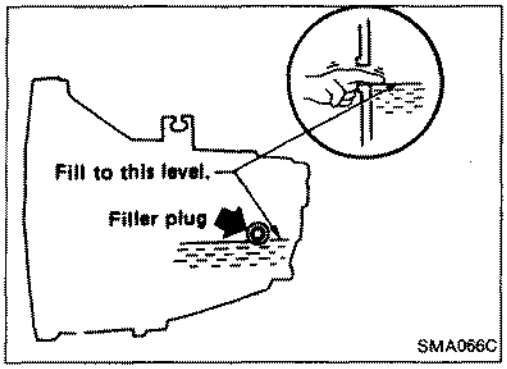
Check cable and links for improper attachment, chafing, wear and deterioration.


SMA065C

Checking M/T Oil

1. Check for oil leaks.

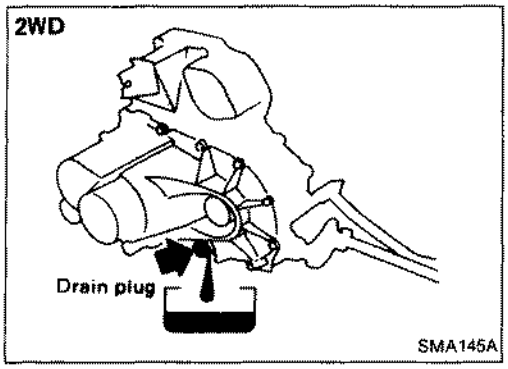
Checking M/T Oil (Cont'd)

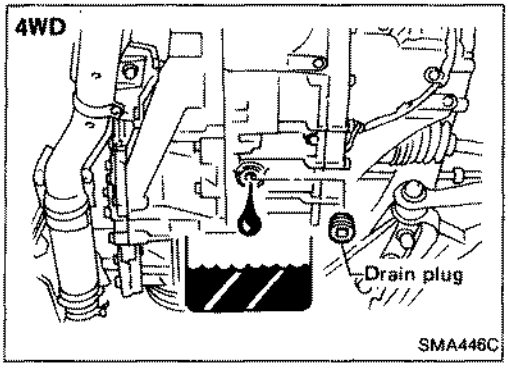


2. Check oil level.

Never start engine while checking oil level.

Changing M/T Oil



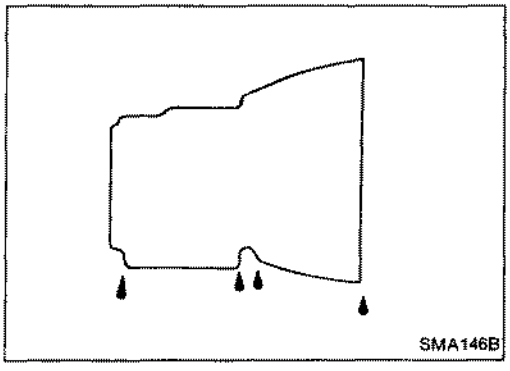


Oil capacity:

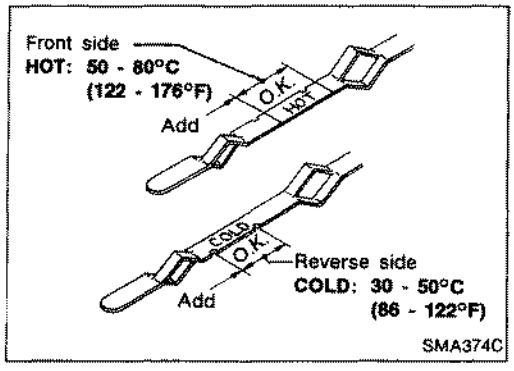
RN4F30A
2.6 liters (4-5/8 Imp pt)
RS5F30A
2.8 liters (4-7/8 Imp pt)
RS5F31A
2.9 liters (5-1/8 Imp pt)
RS5F32A
3.5 - 3.7 liters (6-1/8 - 6-1/2 Imp pt)
RS5F50A
4.2 liters (7-3/8 Imp pt)

- **Use recommended gear oil "API GL-4" with suitable viscosity.**

Checking A/T Fluid Level



1. Check for fluid leakage.

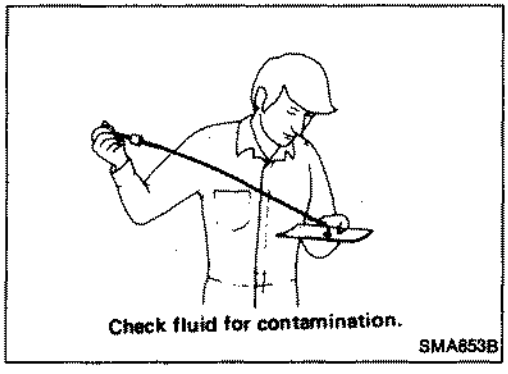


2. Check fluid level.
   Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) after vehicle has been driven approximately 5 minutes in urban areas after engine is warmed up. But it can be checked at fluid temperatures of 30 to 50°C (86 to 122°F) using "COLD" range on dipstick for reference after engine is warmed up and before driving. However, fluid level must be rechecked using "HOT" range.

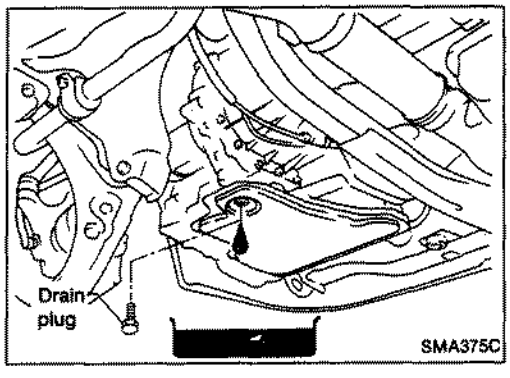
Checking A/T Fluid Level (Cont'd)

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.

Do not overfill.



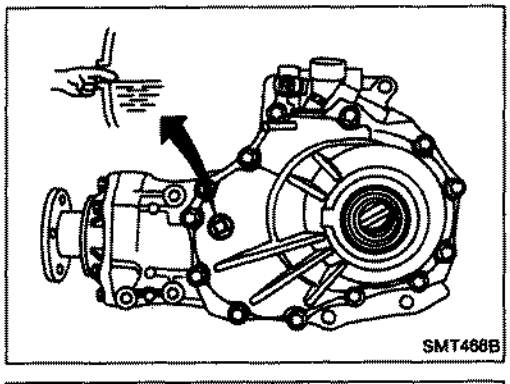
3. Check fluid condition.
   Check fluid for contamination. If fluid is very dark or smells burned, or contains frictional material (clutches, band, etc.), check operation of A/T.
   Refer to section AT for checking operation of A/T.



Changing A/T Fluid

Oil capacity (With torque converter):
7.0 liters (6-1/8 Imp qt)
Drain plug:
: 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

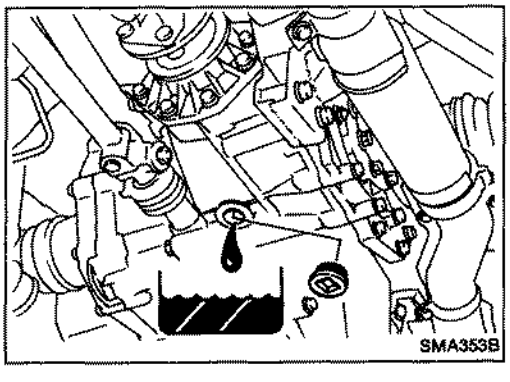
- **Use recommended A/T fluid "DEXRON™".**



Checking Transfer Oil Level

Never start engine while checking oil level.

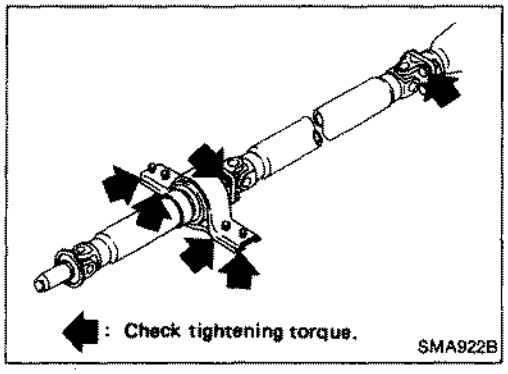
1. Check for oil leaks.
2. Check oil level.



Changing Transfer Oil

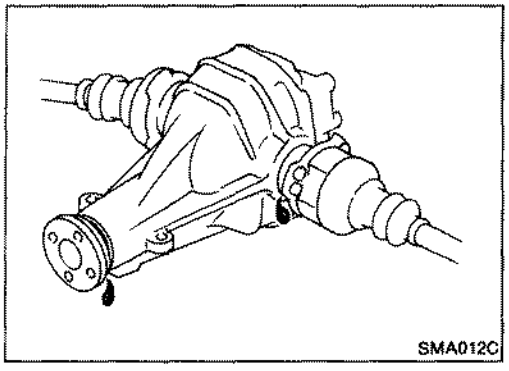
Oil capacity:
GA16DS engine models
1.1 liters (1 Imp qt)
SR20DET engine models
1.5 liters (1-3/8 Imp qt)

- **Use recommended gear oil "API GL-5" with suitable cosity.**



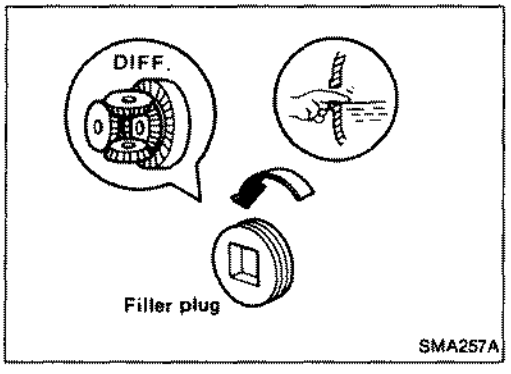
Checking Propeller Shaft

Check propeller shaft and center bearing for damage, looseness or grease leakage.
If greasing points are provided, supply grease as necessary.
Refer to section PD.

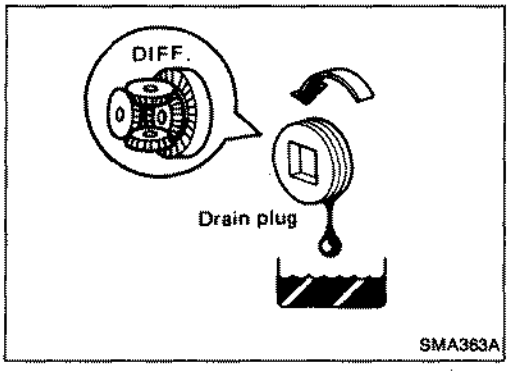


Checking Differential Gear Oil

1. Check differential carrier for oil leakage.



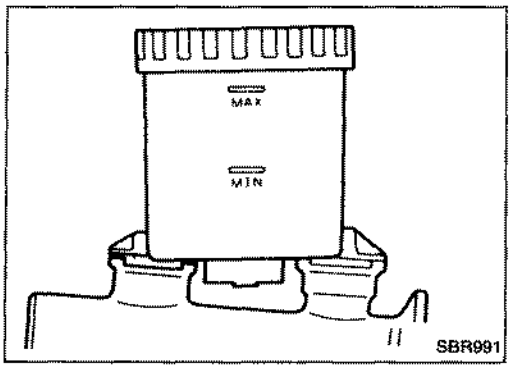
2. Check oil level.



Changing Differential Gear Oil

1. Drain oil and refill with new gear oil.
2. Check oil level.
   Oil capacity:
   1.0 liters (1-3/4 Imp pt)

- **Use recommended gear oil "API GL-5" with suitable viscosity.**

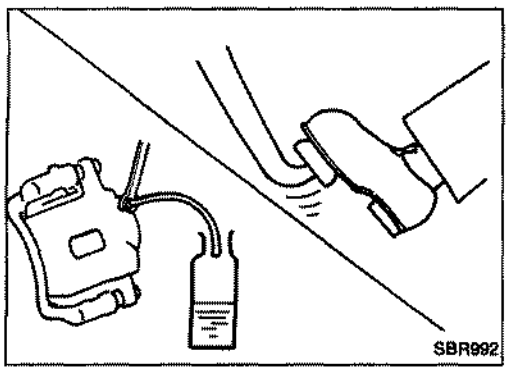


Checking Brake Fluid Level and Leaks

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

Checking Brake System

Check brake fluid lines and parking brake cables for improper attachment and for leaks, chafing, abrasions, deterioration, etc.



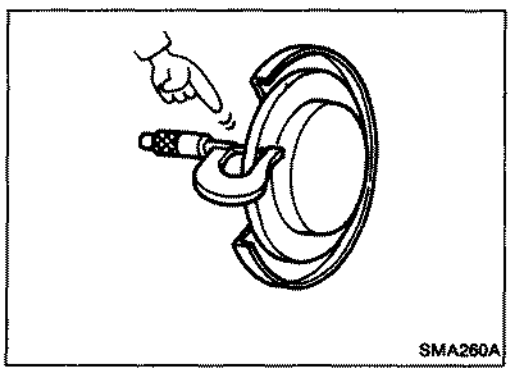
Changing Brake Fluid

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 3".**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**

Checking Brake Booster, Vacuum Hoses, Connections and Check Valve

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



Checking Disc Brake

Check condition of disc brake components.

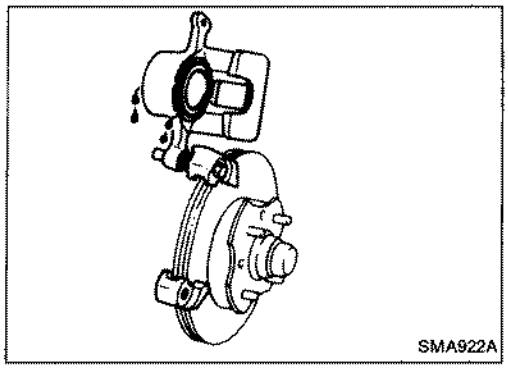
ROTOR

Check condition and thickness.

Unit: mm (in)

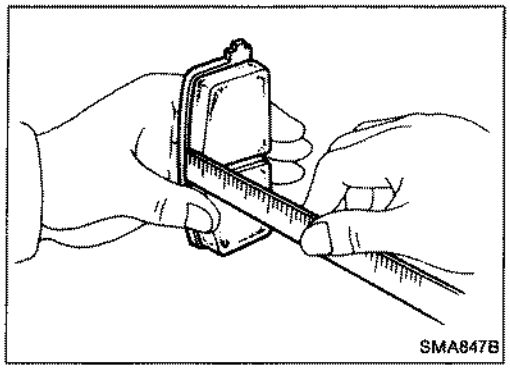
Brake model	CL18C	CL18VD	AD22VF	AD7HA	CL9HA
Standard thickness	12.0 (0.472)	18.0 (0.709)	26.0 (1.024)	7.0 (0.276)	9.0 (0.354)
Minimum thickness	10.0 (0.394)	16.0 (0.630)	24.0 (0.945)	6.0 (0.236)	8.0 (0.315)

Checking Disc Brake (Cont'd)


SMA922A

CALIPER

Check operation and for leakage.


SMA847B

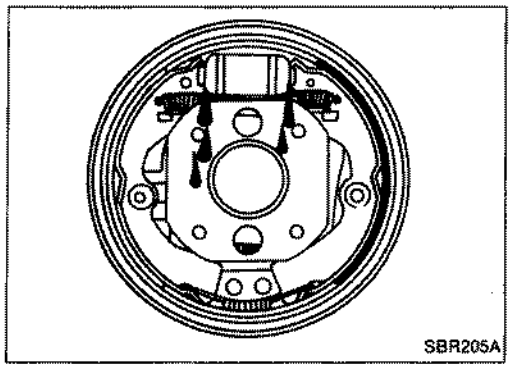
PAD

Check for wear or damage.

Standard thickness:
10.0 mm (0.394 in)
Minimum thickness:
2.0 mm (0.079 in)

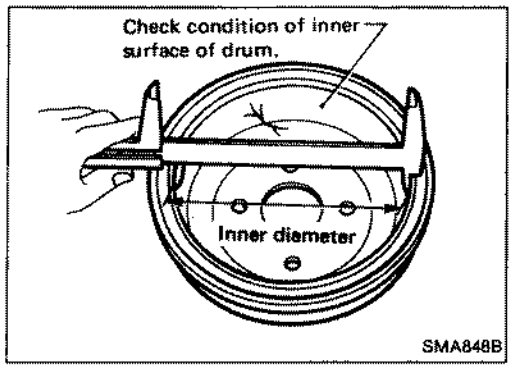
Checking Drum Brake

Check condition of drum brake components.


SBR205A

WHEEL CYLINDER

Check operation and for leakage.



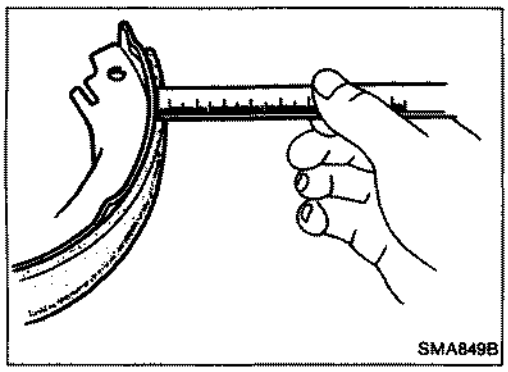
SMA848B

DRUM

Check condition of inner surface.

LT18C:
Standard diameter
180.0 mm (7.09 in)
Drum repair limit (inner diameter)
181.0 mm (7.13 in)
LT23B:
Standard diameter
228.6 mm (9 in)
Maximum diameter
230.0 mm (9.06 in)

Checking Drum Brake (Cont'd)



LINING

Check for wear or damage.

Standard thickness:

LT18C

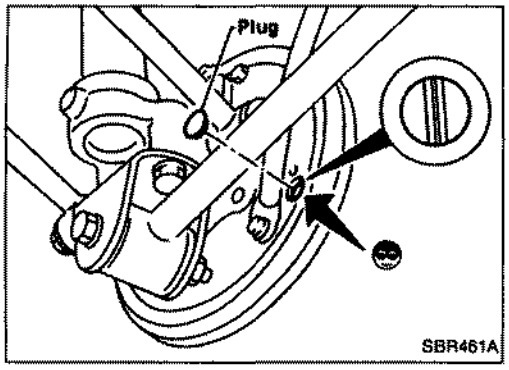
4.0 mm (0.157 in)

LT23B

4.5 mm (0.177 in)

Lining wear limit (Minimum thickness):

1.5 mm (0.059 in)



TEMPORARY METHOD FOR CHECKING LINING WEAR

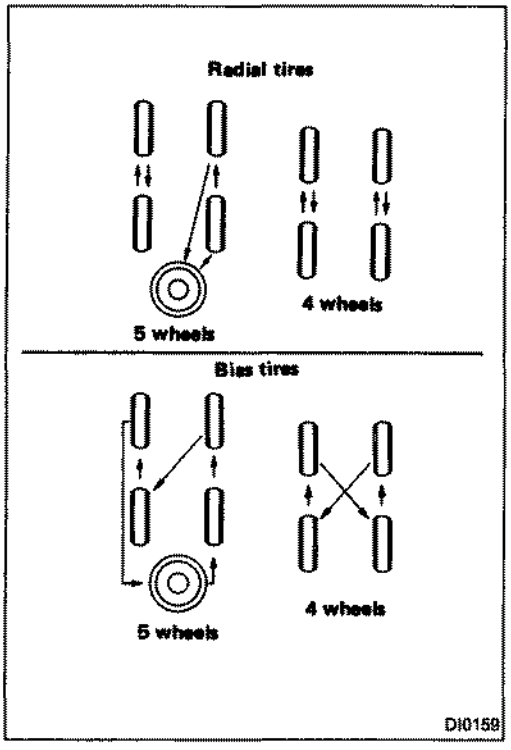
Remove inspection hole plug and check for lining wear.

Balancing Wheels

- Adjust wheel balance using road wheel center.

Wheel balance (Maximum allowable unbalance):

Refer to S.D.S.



Tire Rotation

Wheel nuts:

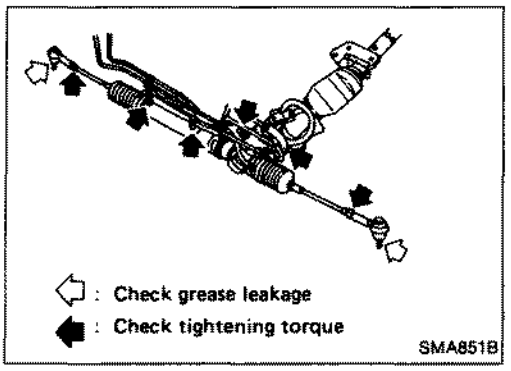
[O]: 98 - 118 N·m (10.0 - 12.0 kg-m, 72 - 87 ft-lb)

T-TYPE SPARE TIRE

- **Do not include the T-type spare tire when rotating the tires.**

Wheel nuts:

[O]: 98 - 118 N·m (10.0 - 12.0 kg-m, 72 - 87 ft-lb)



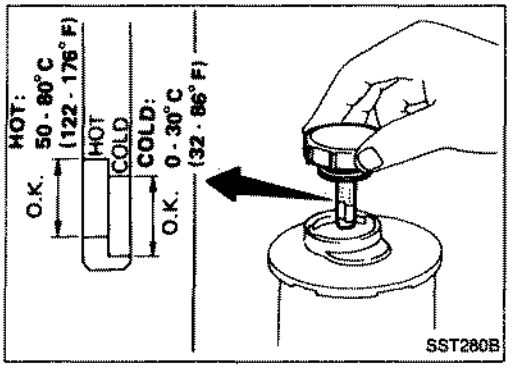
Checking Steering Gear and Linkage

STEERING GEAR

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

STEERING LINKAGE

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

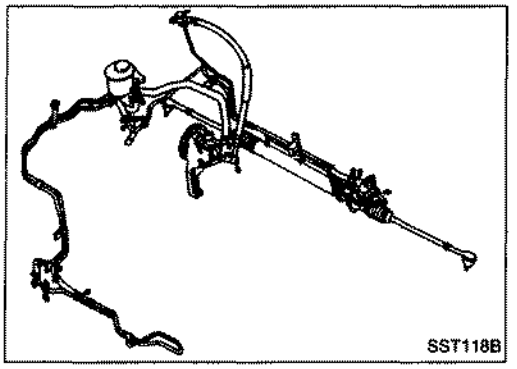


Checking Power Steering Fluid and Lines

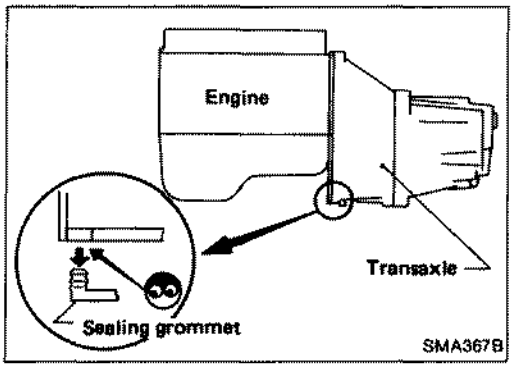
1. Check fluid level.
   Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) or using "COLD" range on dipstick at fluid temperatures of 0 to 30°C (32 to 86°F).

CAUTION:

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



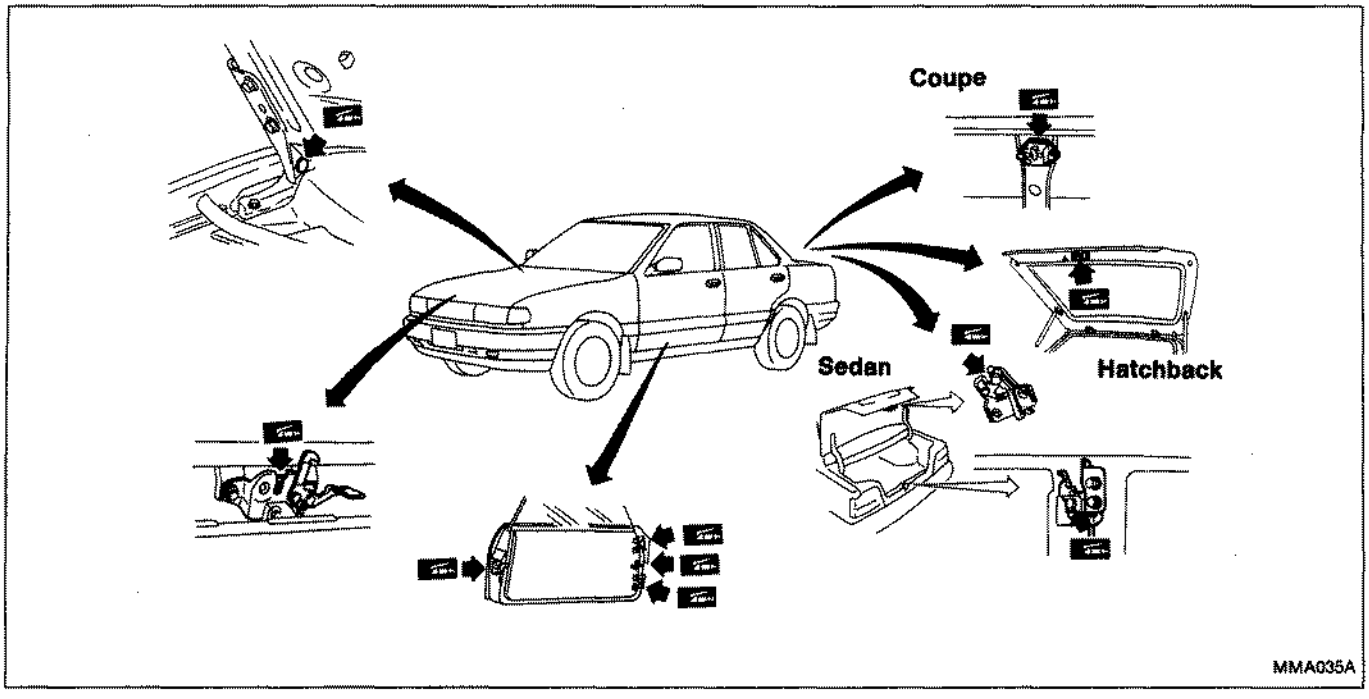
2. Check lines for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



Checking Water Entry

Check water entry in the clutch housing by removing the sealing grommet, whenever driving in deep water or mud.

Lubricating Locks, Hinges and Hood Latches

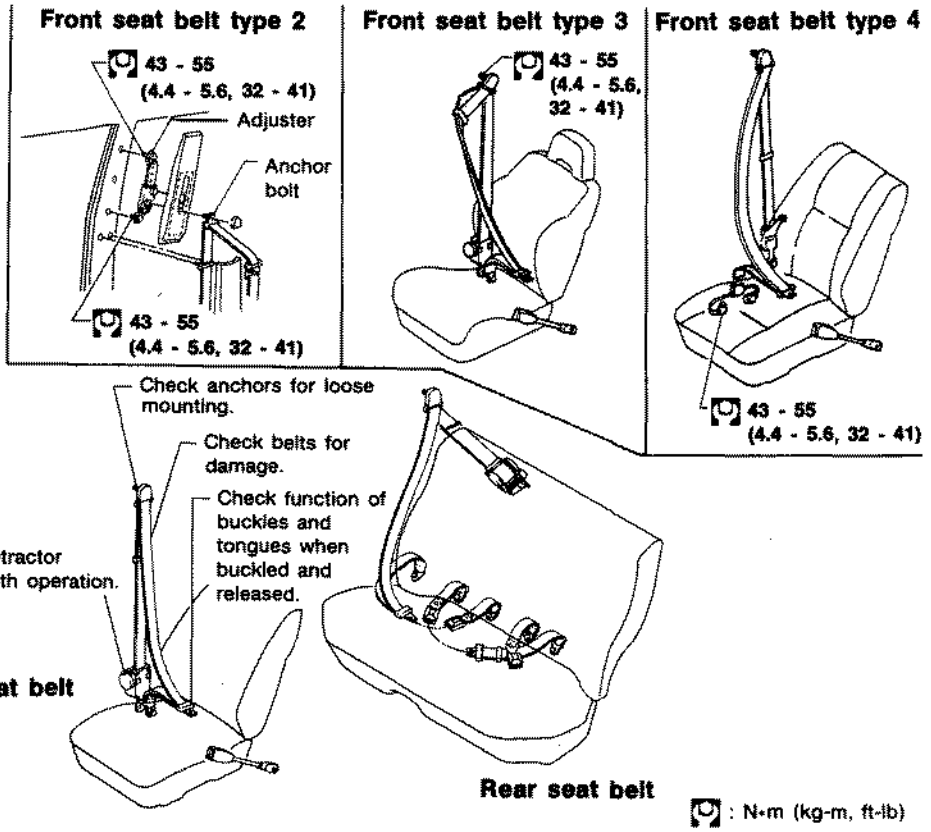


Checking Seat Belts, Buckles, Retractors, Anchors and Adjusters

CAUTION:

1. **If the vehicle is collided or overturned, replace the entire belt assembly, regardless of nature of accident.**
2. **If the condition of any component of a seat belt is questionable, do not have seat belt repaired, but replaced as a belt assembly.**
3. **If webbing is cut, frayed, or damaged, replace belt assembly.**
4. **Do not spill drinks, oil, etc. on inner lap belt buckle. Never oil tongue and buckle.**
5. **Use a NISSAN genuine seat belt assembly.**

Anchor bolt
43 - 55 (4.4 - 5.6, 32 - 41)



Checking Body Corrosion

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

Hemmed portion

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, sunroof opening, fender wheelarch flange, fuel filler lid flange, around holes in panel, etc.

Parts contact

Waist molding, windshield molding, 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)

	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator			
With power steering	11 (0.43)	7 - 9 (0.28 - 0.35)	6 - 8 (0.24 - 0.31)
Without power steering	10 (0.39)		
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)		

Oil capacity (Refill capacity)

Unit: ℓ (Imp qt)

With oil filter change	3.2 (2-7/8)
Without oil filter change	2.8 (2-1/2)

Coolant capacity (Refill capacity)

With reservoir tank

Unit: ℓ (Imp qt)

	With heater	Without heater
M/T	5.5 (4-7/8)	5.2 (4-5/8)
A/T	5.9 (5-1/4)	5.6 (4-7/8)
Reservoir tank	0.7 (5/8)	

Spark plug

	GA16DS	GA13DS, GA14DS & GA16DE -
Type		
Standard	BKR6E	BKR5E
Hot	BKR5E	—
Cold	BKR7E	BKR6E, BKR7E
Plug gap mm (in)	0.8 - 0.9 (0.031 - 0.035)	0.8 - 0.9 (0.031 - 0.035)

Engine Maintenance (Cont'd)

INSPECTION AND ADJUSTMENT

Drive 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)		

Oil capacity (Refill capacity)

Unit: ℓ (Imp qt)

	SR20DE	SR20DET
With oil filter change	3.4 (3)	3.7 (3-1/4)
Without oil filter change	3.2 (2-7/8)	3.5 (3-1/8)

Coolant capacity (Refill capacity)

Unit: ℓ (Imp qt)

With reservoir tank	6.6 (5-7/8)
Reservoir tank	0.7 (5/8)

Spark plug

	SR20DE (Conventional type)	SR20DET (Platinum-tipped type)
Type		
Standard	BKR6EY	PFR7B-9
Hot	BKR5EY	PFR6B-9
Cold	BKR7EY	PFR8B-9
Plug gap mm (in)	0.8 - 0.9 (0.031 - 0.035)	0.8 - 0.9 (0.031 - 0.035)

Ignition wire

Resistance	kΩ/m (kΩ/ft)	13.6 - 18.4 (4.15 - 5.61)

Engine Maintenance (Cont'd)

Valve clearance

Unit: mm (in)

	Hot
Intake	0.28 (0.011)
Exhaust	0.28 (0.011)

Drive belt deflection

	Used belt		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator mm (in)	13.5 (0.531)	8.5 - 9.5 (0.335 - 0.374)	7.5 - 8.5 (0.295 - 0.335)
Air conditioner mm (in)	12.5 (0.492)	9 - 10 (0.35 - 0.39)	6 - 8 (0.24 - 0.31)
Power steering mm (in)	10.5 (0.413)	7 - 9 (0.28 - 0.35)	6.5 - 8.5 (0.256 - 0.335)
Pushing force N (kg, lb)	98 (10, 22)		

Cooling system check

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

Cooling system leakage testing pressure	98 (0.98, 1.0, 14)
Radiator cap testing pressure	78 - 98 (0.78 - 0.98, 0.8 - 1.0, 11 - 14)

Spark plug

Type	
Standard	BP5ES
Hot	BP4ES
Cold	BP6ES
Plug gap mm (in)	0.8 - 0.9 (0.031 - 0.035)

Ignition timing & Idle speed

Ignition timing*1	2° ± 2° B.T.D.C.
Idle speed	
M/T	900 ± 50
A/T (in "N" position)	—

*1: Distributor vacuum hose disconnected and plugged

Mixture ratio

Idle CO%	1.5 ± 0.5

Engine Maintenance (Cont'd)

INSPECTION AND ADJUSTMENT

Valve clearance (Hot)

Unit: mm (in)

Intake	0.20 - 0.30 (0.008 - 0.012)
Exhaust	0.40 - 0.50 (0.016 - 0.020)

Service shims

Part number	Thickness mm (in)	Identification
13232-16A00	3.00 (0.1181)	300
13232-16A01	3.05 (0.1201)	305
13232-16A02	3.10 (0.1220)	310
13232-16A03	3.15 (0.1240)	315
13232-16A04	3.20 (0.1260)	320
13232-16A05	3.25 (0.1280)	325
13232-16A06	3.30 (0.1299)	330
13232-16A07	3.35 (0.1319)	335
13232-16A08	3.40 (0.1339)	340
13232-16A09	3.45 (0.1358)	345
13232-16A10	3.50 (0.1378)	350
13232-16A11	3.55 (0.1398)	355
13232-16A12	3.60 (0.1417)	360
13232-16A13	3.65 (0.1437)	365
13232-16A14	3.70 (0.1457)	370
13232-16A15	3.75 (0.1476)	375
13232-16A16	3.80 (0.1496)	380
13232-16A17	3.85 (0.1516)	385
13232-16A18	3.90 (0.1535)	390
13232-16A19	3.95 (0.1555)	395
13232-16A20	4.00 (0.1575)	400
13232-16A21	4.05 (0.1594)	405
13232-16A22	4.10 (0.1614)	410
13232-16A23	4.15 (0.1634)	415
13232-16A24	4.20 (0.1654)	420

Drive belt deflection [Applied pushing force:98 N (10 kg, 22 lb)]

Unit: mm (in)

	Alternator	A/C compressor	P/S oil pump		Water pump
			CD17	CD20	CD20 without P/S
New belt	8.5 - 10.5 (0.335 - 0.413)	9.5 - 11.5 (0.374 - 0.453)	8.5 - 10.5 (0.335 - 0.413)	4 - 6 (0.16 - 0.24)	6 (0.24)
Used belt	10.5 - 12.5 (0.413 - 0.492)	11.5 - 13.5 (0.453 - 0.531)	10.5 - 12.5 (0.413 - 0.492)	5 - 7 (0.20 - 0.28)	8 (0.31)
Limit	17 (0.67)	17 (0.67)	14 (0.55)	8 (0.31)	—

Coolant capacity (Refill capacity)

Unit: ℓ (Imp qt)

	CD17	CD20
With heater	6.5 (5-3/4)	7.1 (6-1/4)
Without heater	6.2 (5-1/2)	6.8 (6)
Reservoir tank	0.7 (5/8)	

Cooling system check

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

	CD17	CD20
Radiator cap relief pressure	88 (0.88, 0.9, 13)	118 (1.18, 1.2, 17)
Radiator testing pressure	157 (1.57, 1.6, 23)	

Engine oil capacity (Refill capacity)

Unit: ℓ (Imp qt)

	CD17	CD20
Without oil filter	4.4 (3-7/8)	4.9 (4-3/8)
With oil filter	4.9 (4-3/8)	5.4 (4-3/4)

Injection nozzle

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

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

Idle speed

Unit: rpm

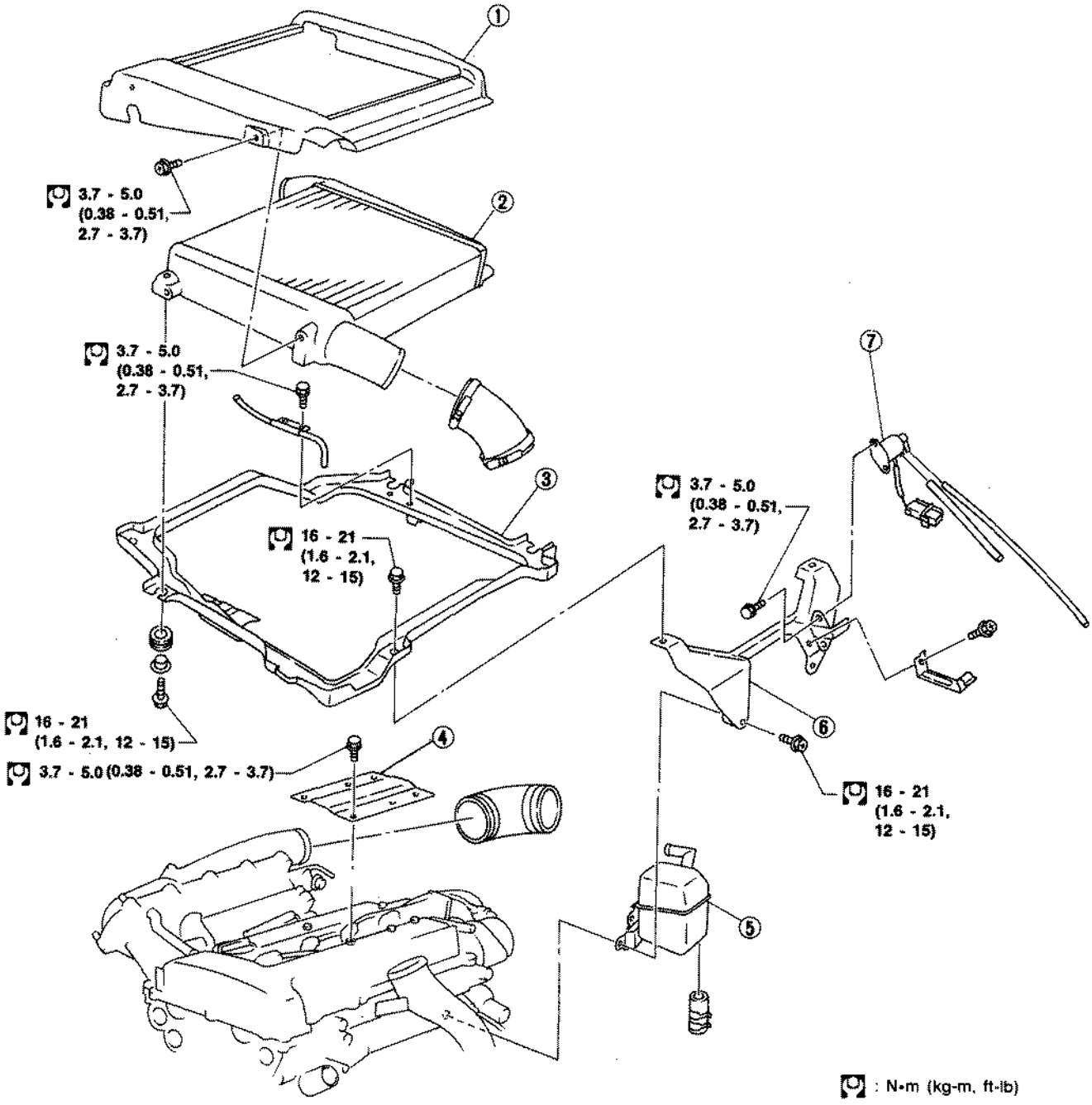
	Standard	—
M/T	700^{+50}_{-0}	800*

*: Air conditioner "ON"

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Manifold nuts & bolts	18 - 22	1.8 - 2.2	13 - 16
Rocker cover screw	1 - 3	0.1 - 0.3	0.7 - 2.2
Alternator, power steering mounting bolt	37 - 51	3.8 - 5.2	27 - 38
Alternator, power steering adjuster lock bolt	21 - 26	2.1 - 2.7	15 - 20
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

SR20DET



① Intercooler cover
② Intercooler
③ Intercooler support
④ Rocker cover ornament
⑤ Oil separator
⑥ Intercooler support bracket
⑦ Recirculation valve control solenoid valve

Chassis and Body Maintenance (Cont'd)

Model N14

Applied model	2WD			4WD	
	13-inch wheel		14-inch wheel	13-inch wheel	14-inch wheel
	Except CD engine	CD engine			
Camber degree	−1°00′ to 0°30′			−0°40′ to 0°50′	
Caster degree	0°40′ to 2°10′			0°30′ to 2°00′	
Kingpin inclination degree	13°15′ to 14°45′			12°15′ to 13°45′	
Total toe-in mm (in)	1 - 3 (0.04 - 0.12)				
degree	6′ - 18′				
Front wheel turning angle					
Full turn* degree					
Inside	39° - 43°	36° - 40°	33° - 37°	37° - 41°	34° - 38°
Outside	34°	32°	30°	31°	29°

*: On power steering models, wheel turning force (at circumference of steering wheel) is 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine at idle.

Rear axle and rear suspension (Unladen)*

Model B13

Applied model	Coupe	Sedan
Camber degree	−1°55′ to −0°25′	
Toe-in mm (in)	−1 to 3 (−0.04 to 0.12)	
Total toe-in degree	−6′ to 18′	

Model N14

Applied model	2WD	4WD
Camber degree	−1°40′ to −0°10′	−0°55′ to 0°35′
Toe-in mm (in)	−1 to 3 (−0.04 to 0.12)	
Total toe-in degree	−6′ to 18′	

*: Fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools and mats in designated positions.

Brake

Disc brake mm (in)	
Pad	
Standard thickness	10.0 (0.394)
Minimum thickness	2.0 (0.079)
Rotor	
Standard thickness	
CL18C	12.0 (0.472)
CL18VD	18.0 (0.709)
AD22VF	26.0 (1.024)
AD7HA	7.0 (0.276)
CL9HA	9.0 (0.354)
Minimum thickness	
CL18C	10.0 (0.394)
CL18VD	16.0 (0.630)
AD22VF	24.0 (0.945)
AD7HA	6.0 (0.236)
CL9HA	8.0 (0.315)
Drum brake	
Lining	
Standard thickness	
LT18C	4.0 (0.157)
LT23B	4.5 (0.177)
Wear limit	1.5 (0.059)
Drum	
Standard diameter	
LT18C	180.0 (7.09)
LT23B	228.6 (9)
Maximum diameter	
LT18C	181.0 (7.13)
LT23B	230.0 (9.06)

Wheel balance

Maximum allowable unbalance	Dynamic (At rim flange) g (oz)	10 (0.35) (one side)
	Static g (oz)	20 (0.71)

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)	196 - 275 (20 - 28, 145 - 203)	2WD: 186 - 255 (19 - 26, 137 - 188) 4WD: 196 - 275 (20 - 28, 145 - 203)

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			
Drain and filler plugs	25 - 34	2.5 - 3.5	18 - 25
Automatic transaxle			
Drain plug	29 - 39	3.0 - 4.0	22 - 29
Front axle and front suspension			
Tie-rod lock nut	37 - 46	3.8 - 4.7	27 - 34
Rear axle and rear suspension			
Toe adjusting pin	98 - 118	10 - 12	72 - 87
Brake system			
Air bleed valve	7 - 9	0.7 - 0.9	5.1 - 6.5
Brake lamp switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Brake booster input rod lock nut	16 - 22	1.6 - 2.2	12 - 16
Wheel and tire			
Wheel nut	98 - 118	10 - 12	72 - 87

ENGINE MECHANICAL

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SR

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CD

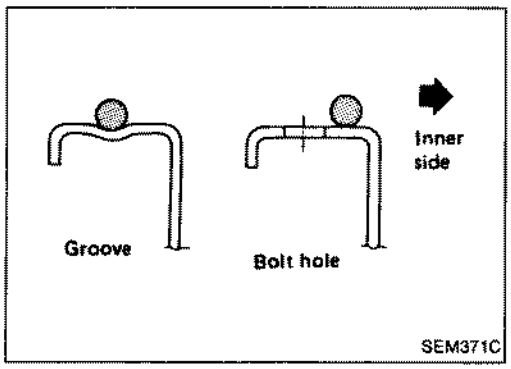
OUTER COMPONENT PARTS EM-195
COMPRESSION PRESSURE EM-198
OIL PAN EM-201
TIMING BELT EM-203
OIL SEAL REPLACEMENT EM-212
CYLINDER HEAD EM-215
ENGINE REMOVAL EM-232
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GA, SR, E and CD

SERVICE DATA AND SPECIFICATIONS (S.D.S.) EM-250

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 ... GA, SR, E, CD
  (2) Main bearing cap bolts ... SR
  (3) Connecting rod cap nuts. ... GA, SR



Liquid Gasket Application Procedure

a. Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surface.

b. Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
- **Be sure liquid gasket is specified width (for oil pan).**
  SR: 4.0 to 5.0 mm (0.157 to 0.197 in)
  GA, E, CD: 3.5 to 4.5 mm (0.138 to 0.177 in)
- **Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide (in areas except oil pan).**

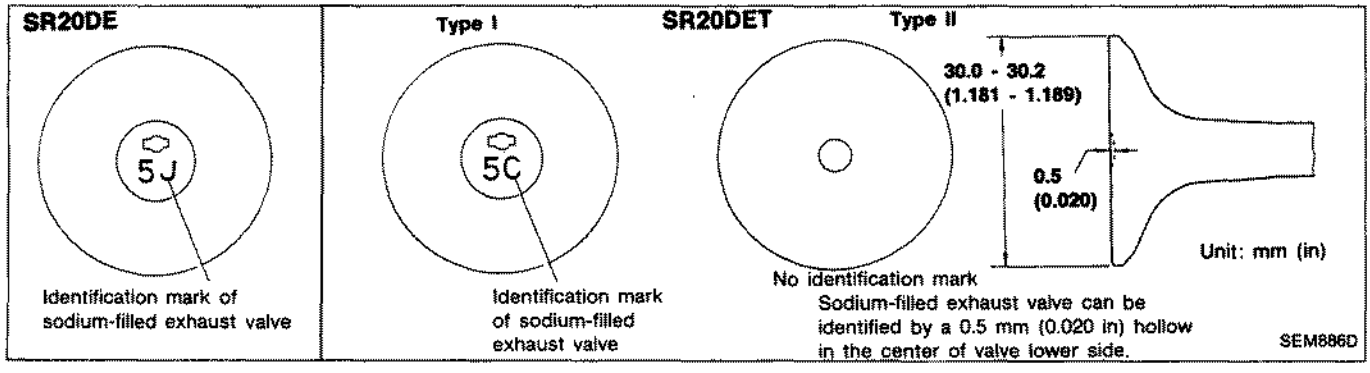
c. Apply liquid gasket to inner surface around hole perimeter area.
(Assembly should be done within 5 minutes after coating.)

d. Wait at least 30 minutes before refilling engine oil and engine coolant.

Special Cautions to Ensure the Safe Disposal of Sodium-filled Exhaust Valves (SR20DE & SR20DET engines)

The handling and disposal of sodium-filled exhaust valves requires special care and consideration. Under conditions such as breakage with subsequent exposure to water, the sodium metal which lines the inner portion of the exhaust valve will react violently, forming sodium hydroxide and releasing hydrogen gas which may result in an explosion or fire.

A sodium-filled exhaust valve is identified on the top of its stem as shown in illustration.

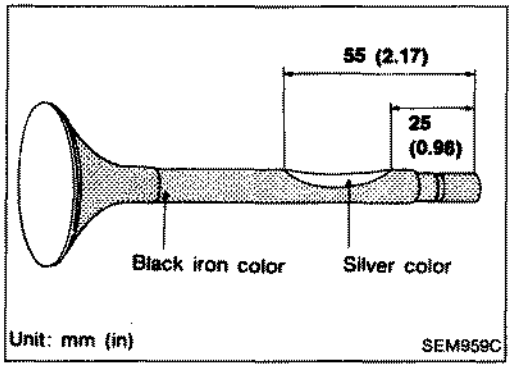


DEALER DISPOSAL INSTRUCTIONS

CAUTION:

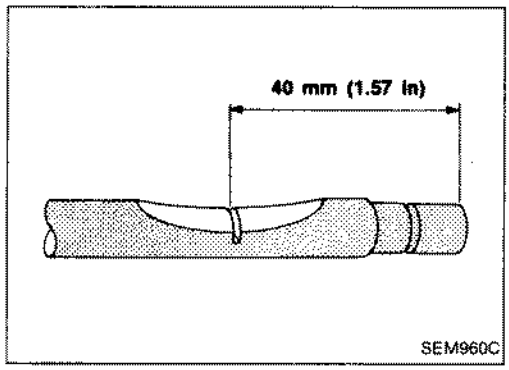
- **Use approved shatter-resistant eye protection when performing this procedure.**
- **Perform this and all subsequent disposal work procedures in an open room, away from flammable liquids. Keep a fire extinguisher, rated at least 10 ABC, in close proximity to the work area.**
- **Be sure to wear rubber gloves when performing the following operations.**

1. Clamp valve stem in a vice.

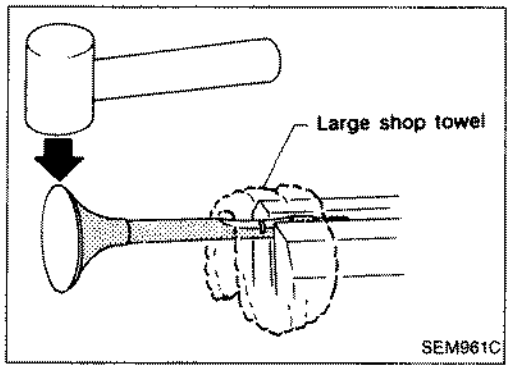


2. The valve has a specially-hardened surface. To cut through it, first remove a half-round section, approximately 30 mm (1.18 in) long. Use an air-powered grinder until the black iron color is removed and the silver-colored metal appears.

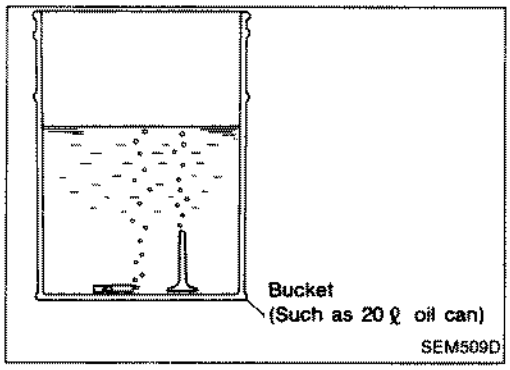
Special Cautions to Ensure the Safe Disposal of Sodium-filled Exhaust Valves (SR20DE & SR20DET engines) (Cont'd)



3. Use a hacksaw to cut through approximately half the diameter of the valve stem. Make the serration at a point 40 mm (1.57 in) from the end of the stem.



4. Cover the serrated end of the valve with a large shop towel. Strike the valve face end with a hammer, separating it into two pieces.



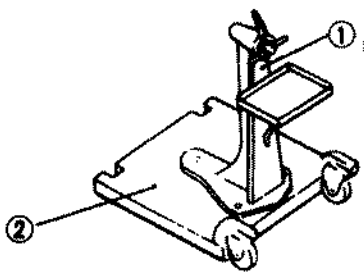
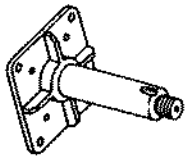
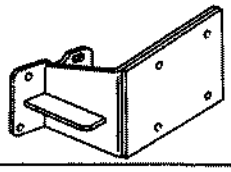
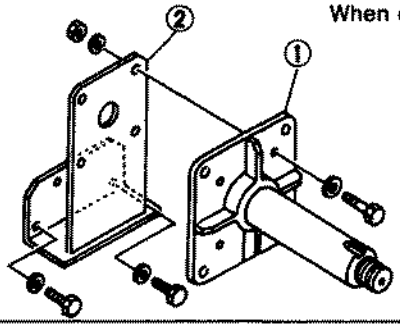
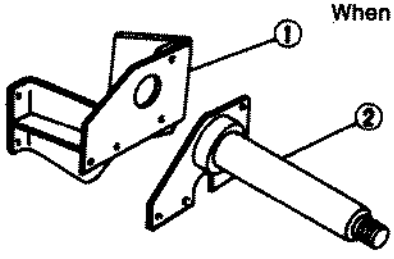
5. Fill a bucket (such as a 20 ℓ oil can) with at least 10 ℓ (2-1/4 Imp gal) of water. Carefully place the already-cut (serrated) valves into the water one-at-a-time using a set of large tweezers and quickly move away at least 2.7 m (9 ft). The valves should be placed in a standing position as shown in the illustration to allow complete reaction of the sodium with the water. The major portion of the resultant chemical reaction lasts 1 to 2 minutes. After the bubbling action has subsided, additional valves can be placed into the bucket allowing each subsequent chemical reaction to subside. However, no more than 8 valves should be placed in the same 10 ℓ (2-1/4 Imp gal) amount of water. The complete chemical reaction may take as long as 4 to 5 hours. Remove the valves using a set of large tweezers after the chemical reaction has stopped. Afterwards, the valves can be mixed with ordinary scrap metal.

CAUTION:

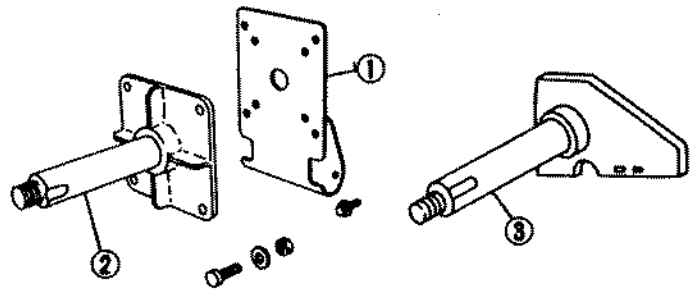
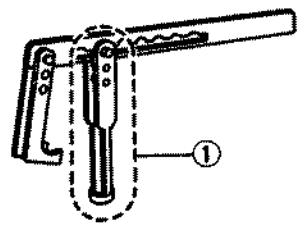
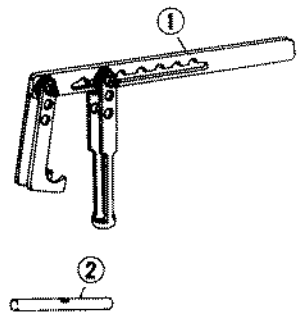
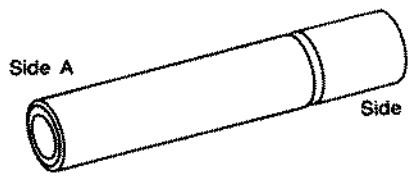
- **Make sure the resultant (high alkalinity) waste water does not contact your skin. If the waste water does contact you, wash the contacted area immediately with large quantities of water.**
- **Dealers should check their respective country and local regulations concerning any chemical treatment or waste water discharge permits which may be required to dispose of the resultant (high alkalinity) waste water.**

SPECIAL SERVICE TOOLS

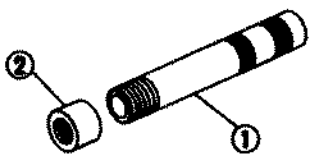
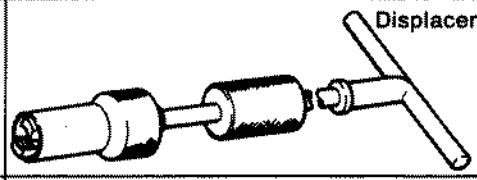
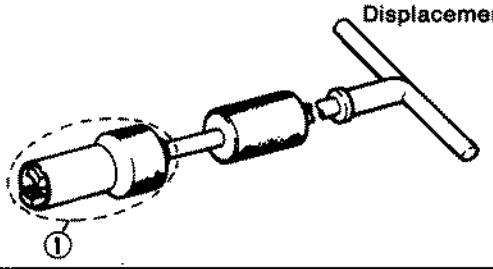
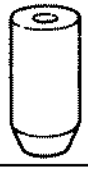
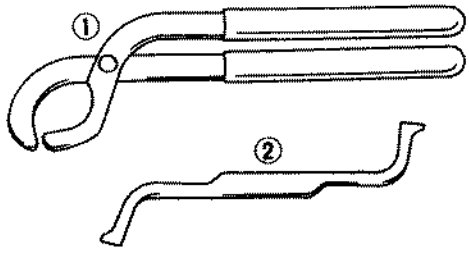
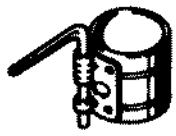
*: Special tool or commercial equivalent

Tool number Tool name	Description	Engine application			
		GA	SR	E	CD
ST0501S000 Engine stand assembly ① ST05011000 Engine stand ② ST05012000 Base	 Disassembling and assembling	X	X	X	X
KV10106500 Engine stand shaft		—	X	—	—
KV10115300 Engine sub-attachment		—	X	—	—
Engine attachment assembly ① KV10106500 Engine attachment ② KV10113300 Sub-attachment	 When overhauling engine	X	—	—	—
Engine attachment assembly* ① KV10107110 Engine attachment ② KV10102500 Sub-attachment	 When overhauling engine	—	—	X	—

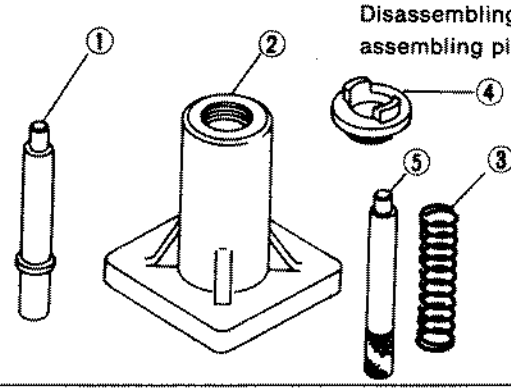
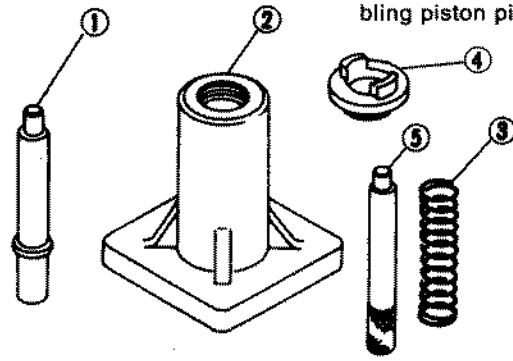
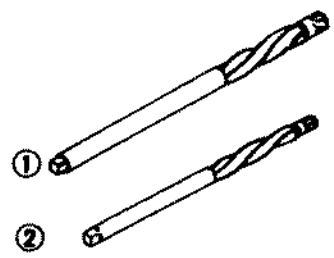
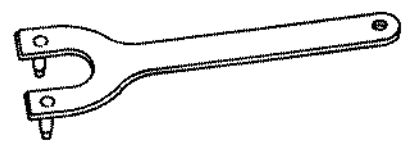
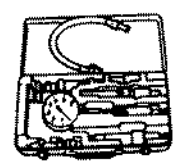
*: Special tool or commercial equivalent

Tool number Tool name	Description	Engine application			
		GA	SR	E	CD
① KV10108101* Engine attachment ② KV10106500* Engine stand shaft or ③ KV10102500* Engine stand shaft		—	—	—	X
ST10120000 Cylinder head bolt wrench	 Loosening and tightening cylinder head bolt	X	X	—	—
KV10116200 Valve spring compressor ① KV10115900 Attachment	 Disassembling valve mechanism	X	X	—	—
KV101092S0 Valve spring compressor ① KV10109210 Compressor ② KV10109220 Adapter	 Disassembling valve mechanism	—	X	X	X
KV10115600 Valve oil seal drift	Installing valve oil seal  Side A Side B Intake: Side A, Exhaust: Side B (SR) Intake: Side A, Exhaust: Side A (GA)	X	X	—	—

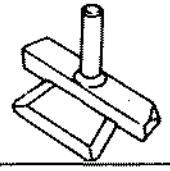
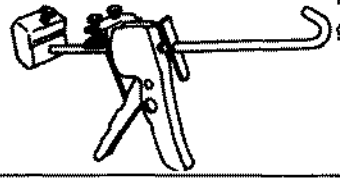
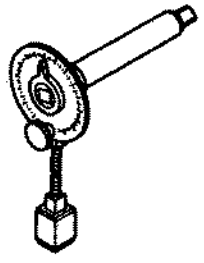
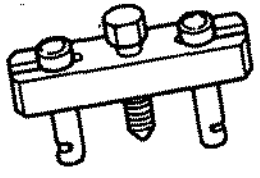
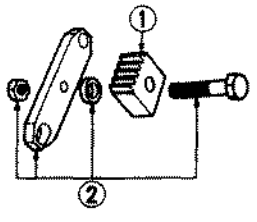
*: Special tool or commercial equivalent

Tool number Tool name	Description	Engine application			
		GA	SR	E	CD
① KV10107501 Valve lip seal drift* ② KV10109100 Valve oil seal drift attachment*	Installing valve lip seal 	—	—	X	—
KV10107900 Valve lip seal puller	Displacement valve lip seal 	—	X	X	X
KV10107902 Valve oil seal puller ① KV10116100 Holder (Holder design differs between KV10107900 and KV10107902.)	Displacement valve lip seal 	X	X	X	X
KV10115700 Dial gauge stand	Adjusting shims 	—	X	—	—
KV101151S0 Lifter stopper set ① KV10115110 Camshaft pliers ② KV10115120 Lifter stopper	Changing shims 	X	—	—	—
EM03470000 Piston ring compressor	Installing piston assembly into cylinder bore 	X	X	X	X

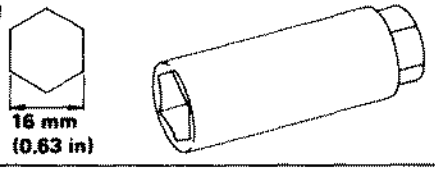
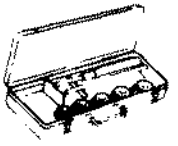
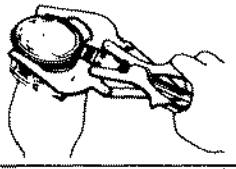
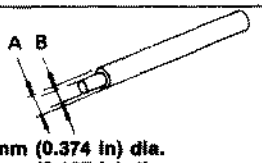
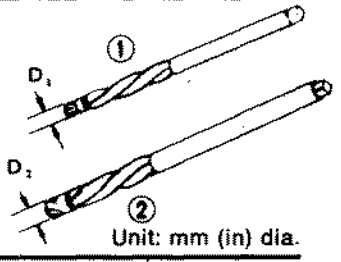
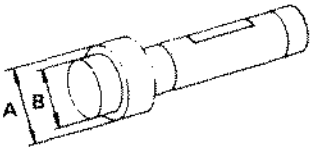
*: Special tool or commercial equivalent

Tool number Tool name	Description	Engine application			
		GA	SR	E	CD
KV10107400 Piston pin press stand ① KV10107310 Center shaft ② ST13040020 Stand ③ ST13040030 Spring ④ KV10107320 Cap ⑤ ST13040050 Drift	 Disassembling and assembling piston pin	X	X	—	—
KV101082S0 Piston pin press stand* ① KV10108210 Center shaft ② ST13040020 Stand ③ ST13040030 Spring ④ KV10108220 Cap ⑤ ST13040050 Drift	 Disassembling and assembling piston pin	—	—	X	—
① ST11081000 Reamer* ② KV10107700 Reamer*	 Reaming valve guide and hole [12.2 mm (0.480 in) dia.] [7 mm (0.28 in) dia.]	—	—	X	—
KV10109300* Pulley holder		—	—	—	X
ED19600000* Compression gauge set		—	—	—	X

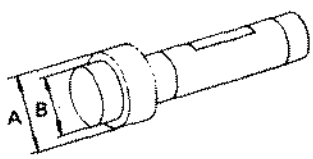
*: Special tool or commercial equivalent

Tool number Tool name	Description	Engine application			
		GA	SR	E	CD
KV11100300* Nozzle holder socket		—	—	—	X
KV10111100 Seal cutter	 Removing oil pan	X	X	X	X
WS39930000 Tube presser	 Pressing the tube of liquid gasket	X	X	X	X
KV10112100 Angle wrench	 Tightening bolts for bearing cap, cylinder head, etc.	X	X	X	X
KV11102900* Pulley puller		—	—	—	X
KV101056S0* Ring gear stopper ① KV10105630 Adapter ② KV10105610 Plate assembly		—	—	—	X

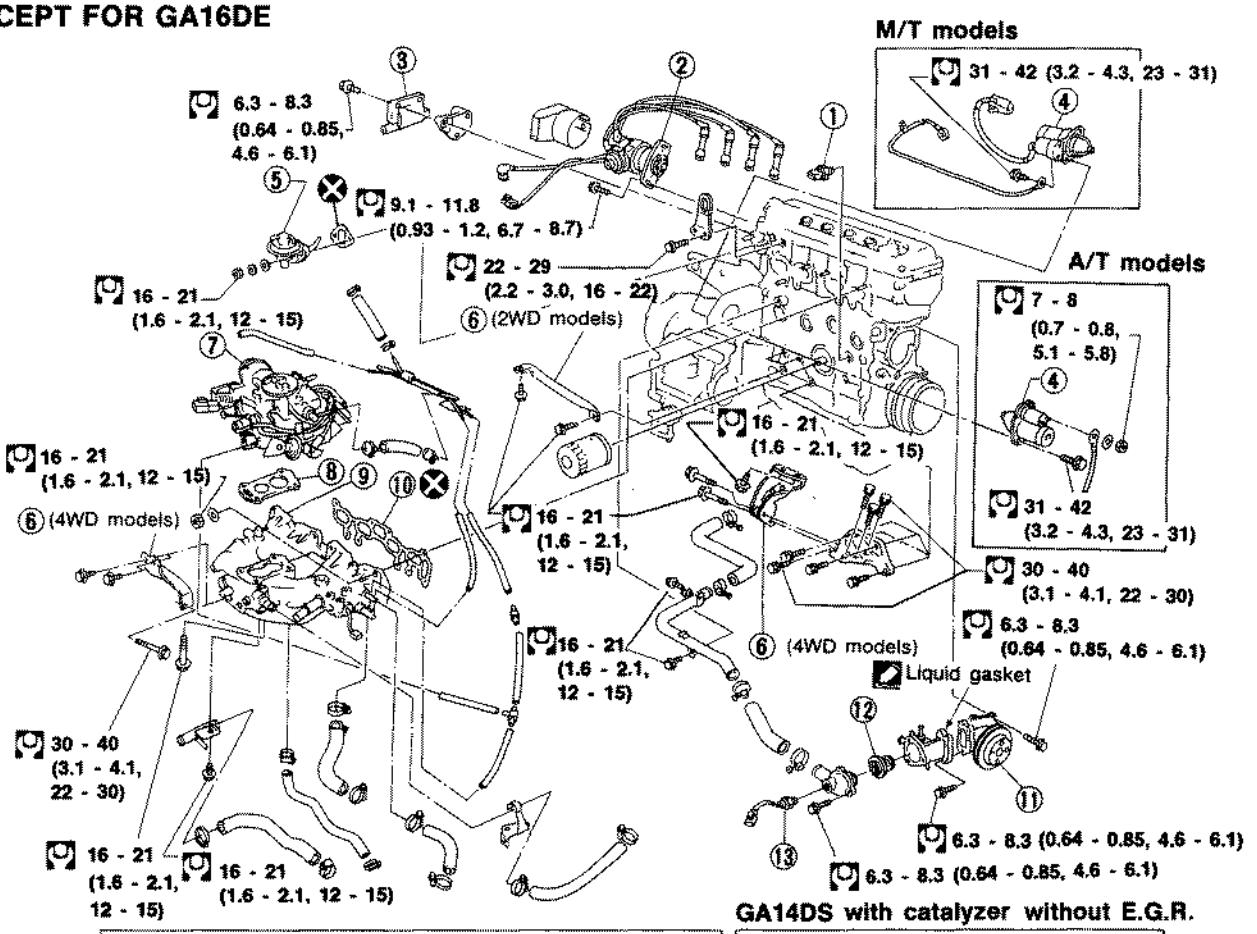
COMMERCIAL SERVICE TOOLS

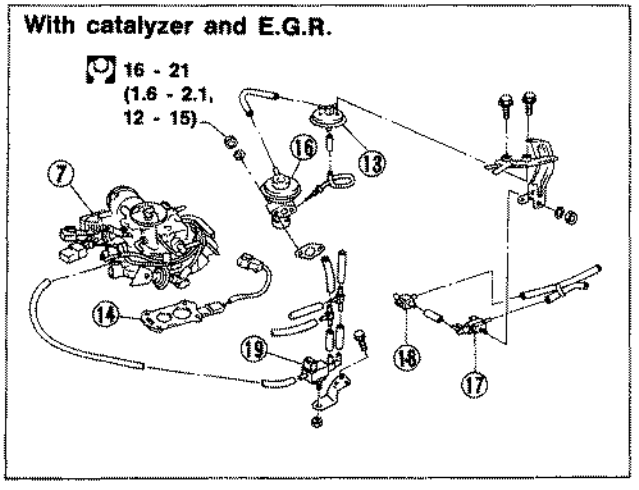
Tool name	Description	Engine application			
		GA	SR	E	CD
Spark plug wrench	Removing and installing spark plug 	X	X	—	—
Valve seat cutter set	Finishing valve seat dimensions 	X	X	X	X
Piston ring expander	Removing and installing piston ring 	X	X	X	X
Valve guide drift	Removing and installing valve guide  **SR Intake** A = 9.5 mm (0.374 in) dia. B = 5.0 mm (0.197 in) dia. **Exhaust** A = 10.5 mm (0.413 in) dia. B = 6.0 mm (0.236 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	Reaming valve guide ① or hole for oversize valve guide ②  Unit: mm (in) dia.	X	X	—	—
Front oil seal drift	Installing front oil seal  A = 75 mm (2.95 in) dia. B = 45 mm (1.77 in) dia.	X	X	—	—

		D_1	D_2
SR	Intake	6.0 (0.236)	10.175 (0.4006)
	Exhaust	7.0 (0.276)	11.175 (0.4400)
GA	Intake & Exhaust	5.5 (0.217)	9.685 (0.3813)

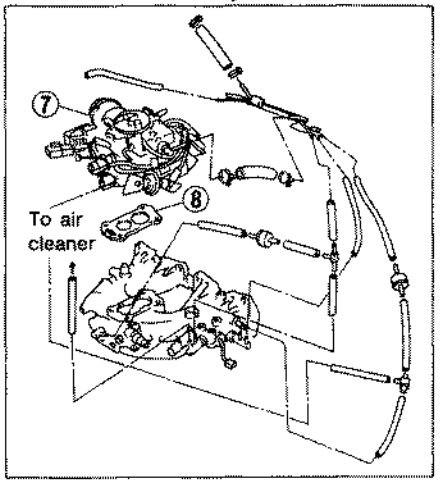
Tool name	Description	Engine application			
		GA	SR	E	CD
Rear oil seal drift	Installing rear oil seal  **A = 110 mm (4.33 in) dia.** **B = 80 mm (3.15 in) dia.**	X	X	—	—

EXCEPT FOR GA16DE





GA14DS with catalyzer without E.G.R.

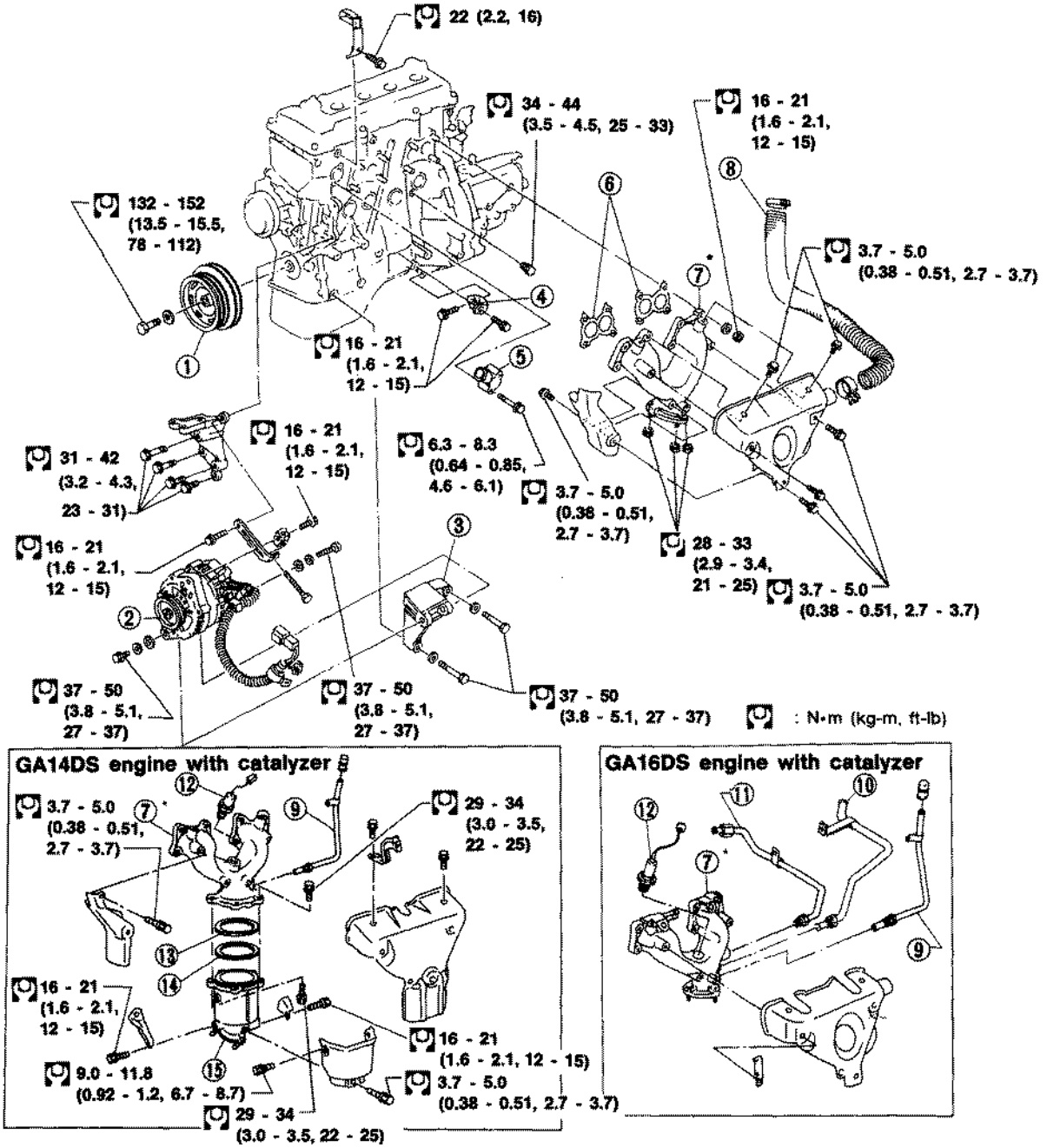


: N•m (kg-m, ft-lb)

SEM873D

① Oil pressure switch
② Distributor
③ Ignition coil
④ Starter motor
⑤ Fuel pump
⑥ Intake manifold support
⑦ Carburetor
⑧ Insulator
⑨ Intake manifold
⑩ Intake manifold gasket
⑪ Water pump
⑫ Thermostat
⑬ Thermoswitch
⑭ Mixture heater
⑮ B.P.T. valve
⑯ E.G.R. control valve
⑰ A.I.V. control solenoid valve
⑱ 3-way connector
⑲ E.G.R. & canister control solenoid valve

EXCEPT FOR GA16DE

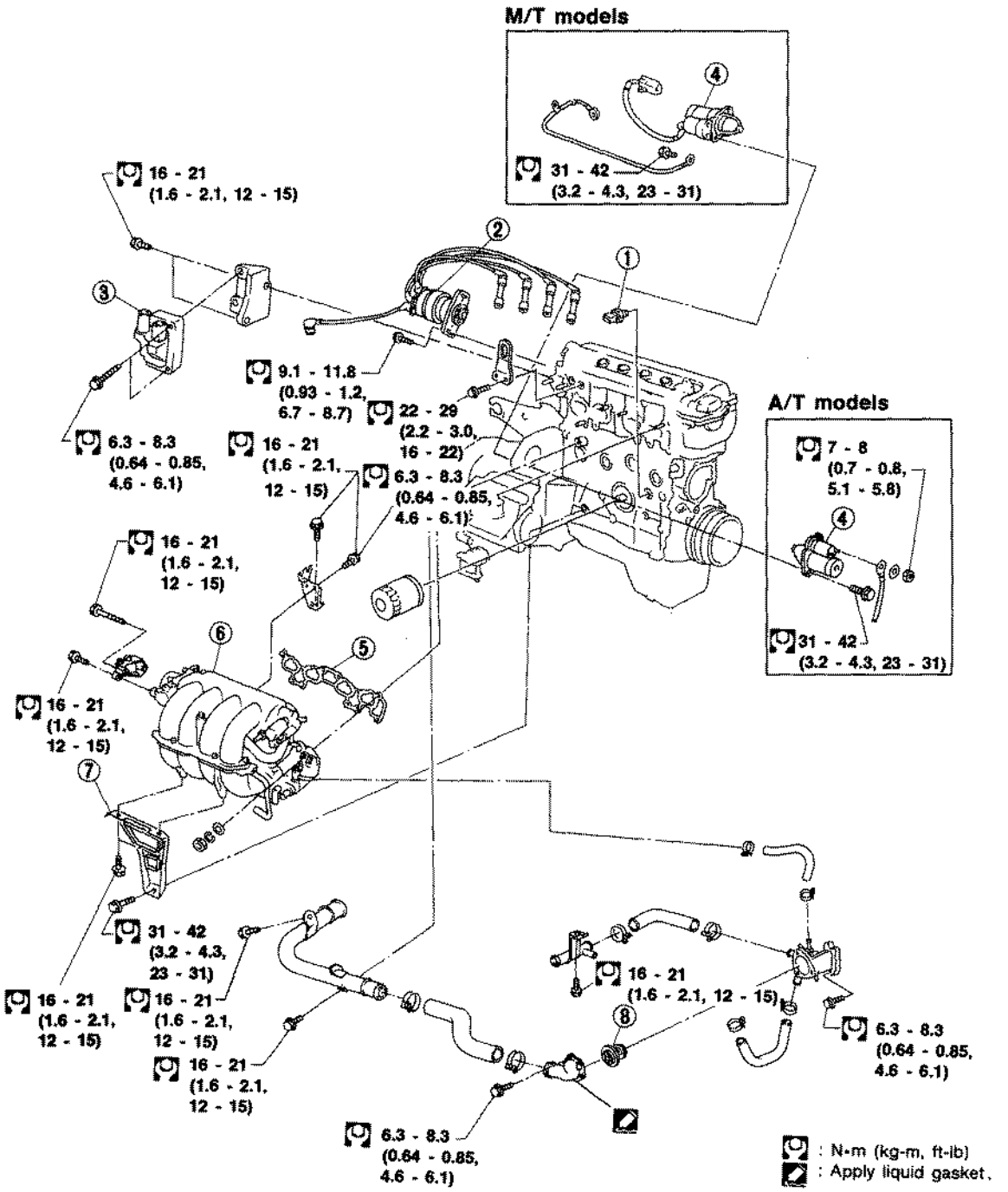


*: Refer to "Tightening order".

SEM874D

① Crankshaft pulley
② Alternator
③ Alternator bracket
④ Gusset
⑤ Water outlet
⑥ Exhaust manifold gasket
⑦ Exhaust manifold
⑧ Hot air duct
⑨ Test take-off
⑩ E.A.I. pipe
⑪ E.G.R. tube
⑫ Exhaust gas sensor
⑬ Gasket
⑭ O-ring
⑮ Catalyzer

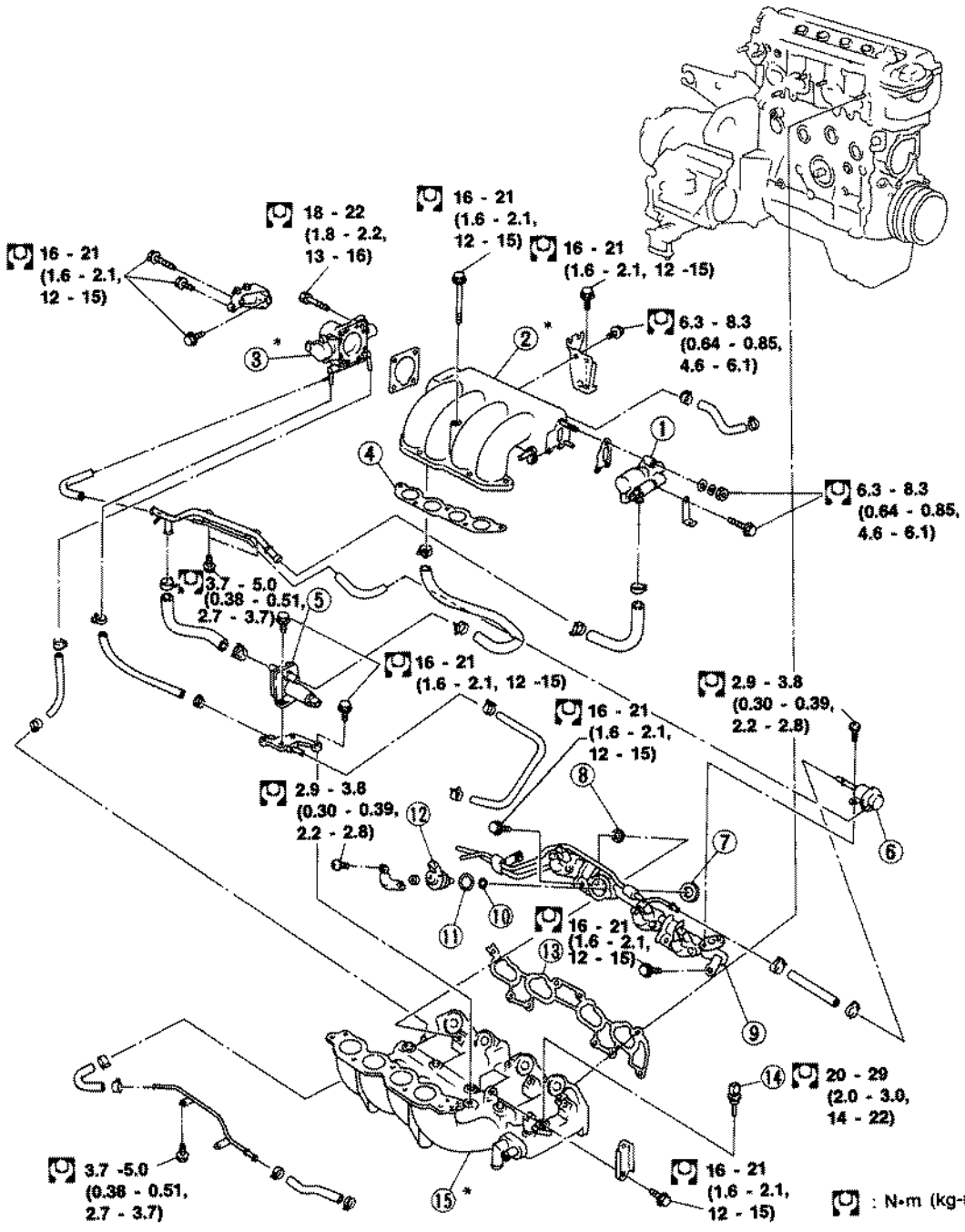
GA16DE



SEM872D

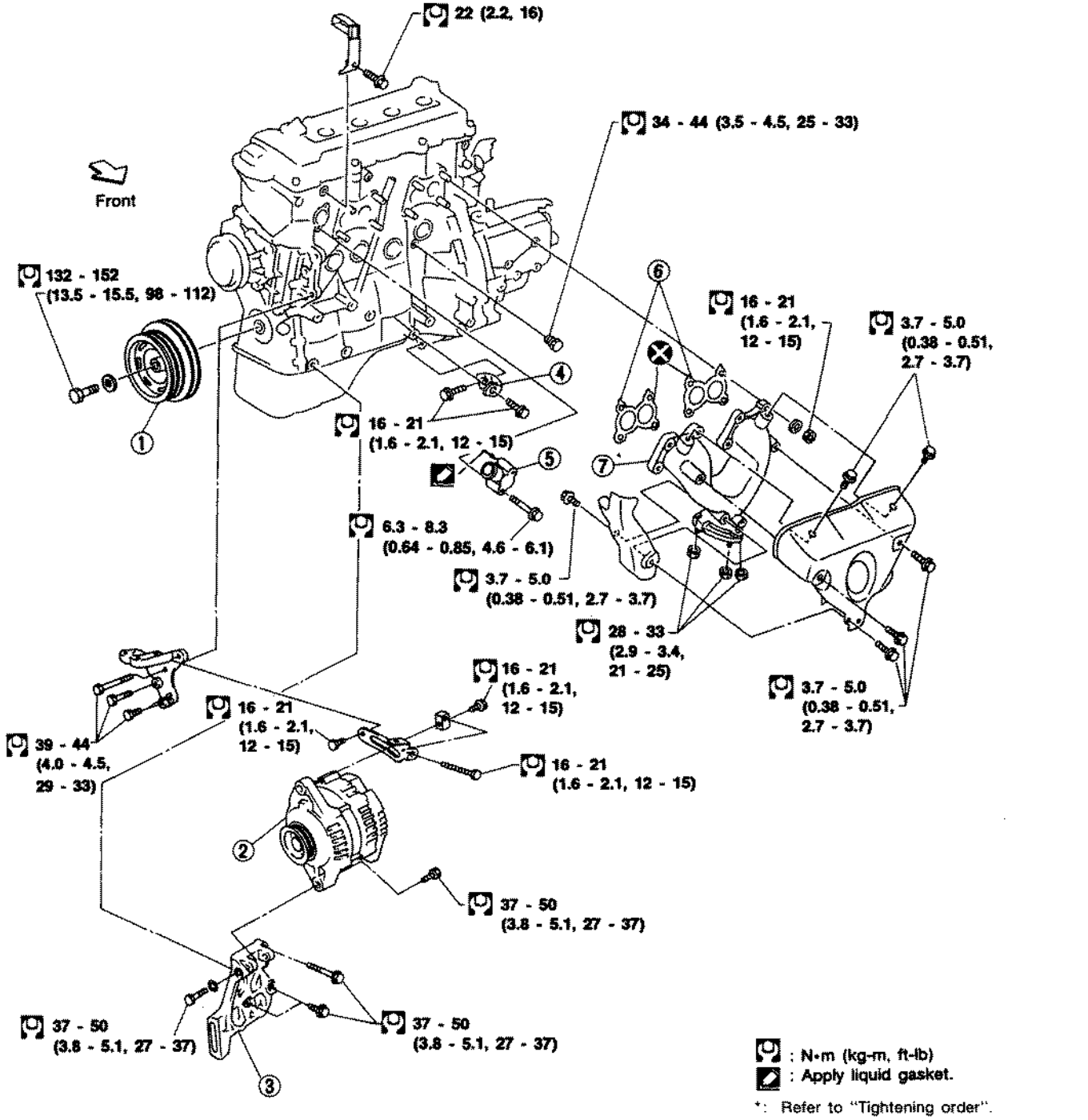
① Oil pressure switch
② Crank angle sensor built into distributor
③ Ignition coil
④ Starter motor
⑤ Intake manifold gasket
⑥ Intake manifold assembly
⑦ Intake manifold support
⑧ Thermostat

GA16DE



① Idle air adjusting unit
② Intake manifold collector
③ Throttle chamber
④ Collector gasket
⑤ Air regulator
⑥ Fuel pressure regulator
⑦ Insulator
⑧ Insulator
⑨ Fuel gallery assembly
⑩ O-ring
⑪ O-ring
⑫ Fuel injector
⑬ Intake manifold gasket
⑭ Engine temperature sensor
⑮ Intake manifold

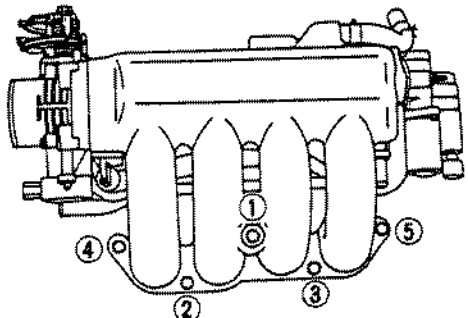
GA16DE



① Crankshaft pulley
② Alternator
③ Compressor bracket
④ Gusset
⑤ Water outlet
⑥ Exhaust manifold gasket
⑦ Exhaust manifold

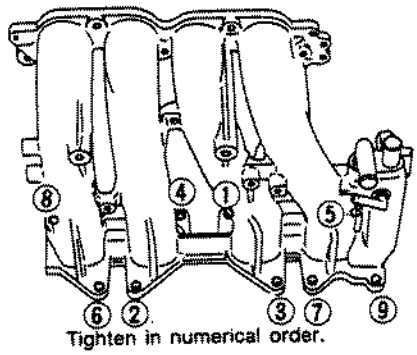
Tightening Order

***Intake manifold collector bolts tightening order**



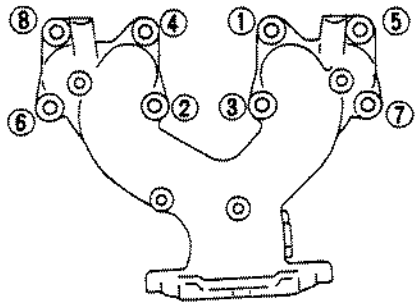
Tighten in numerical order.

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



Tighten in numerical order.

***Exhaust manifold nuts tightening order**

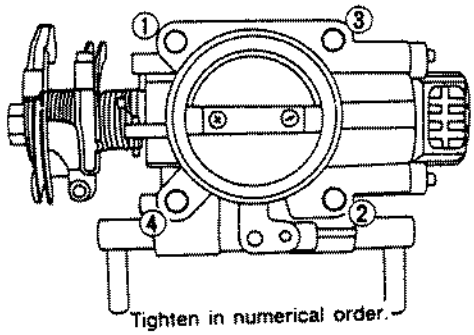


Tighten in numerical order.

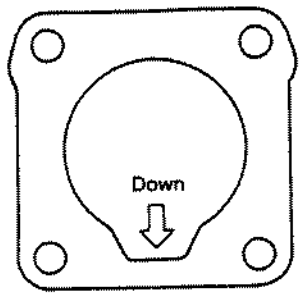
***Throttle chamber bolts tightening procedure**

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 N·m (1.8 to 2.2 kg-m, 13 to 16 ft-lb)**

● Make sure the direction of the gasket is as shown in figure.



Tighten in numerical order.

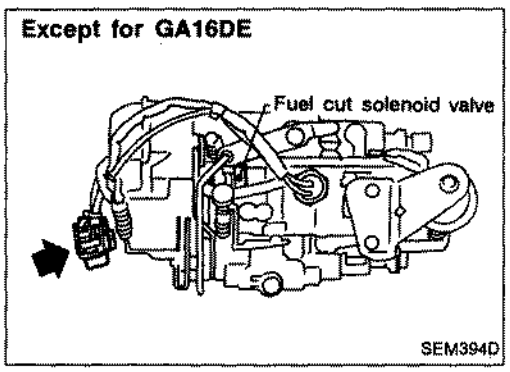


Gasket

SEM661D

Measurement of Compression Pressure

1. Warm up engine.
2. Turn ignition switch off.



3.

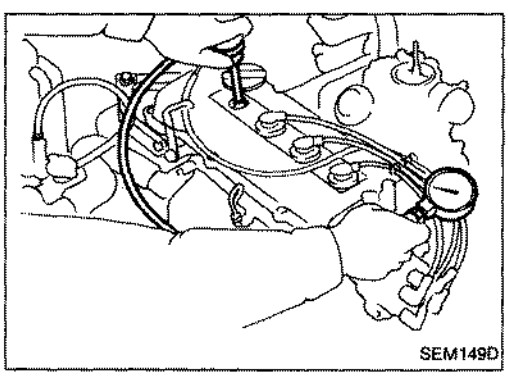
- **Except for GA16DE models**

Disconnect fuel cut solenoid valve connector.

- **GA16DE models**

Release fuel pressure.
Refer to "Releasing Fuel Pressure" in section EF & EC.

4. Remove all spark plugs.
5. Disconnect distributor center cable.



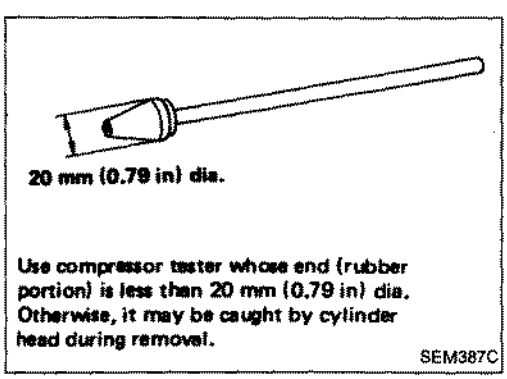
6. Attach a compression tester to No. 1 cylinder.
7. Depress accelerator pedal fully to keep throttle valve wide open.
8. Crank engine and record highest gauge indication.
9. Repeat the measurement on each cylinder as shown above.

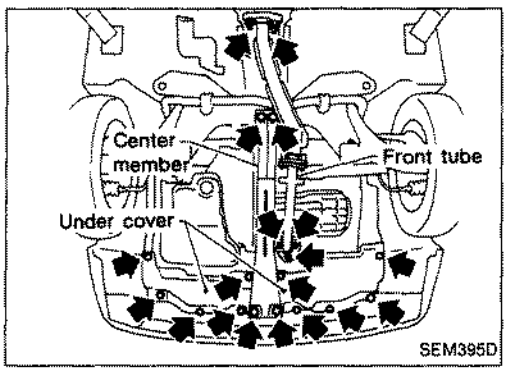
- **Always use a fully-charged battery to obtain specified engine revolution.**

Compression pressure:
kPa (bar, kg/cm^2, psi)/rpm
Standard
1,324 (13.24, 13.5, 192)/350
Minimum
1,128 (11.28, 11.5, 164)/350
Difference limit between cylinders
98 (0.98, 1.0, 14)/350

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

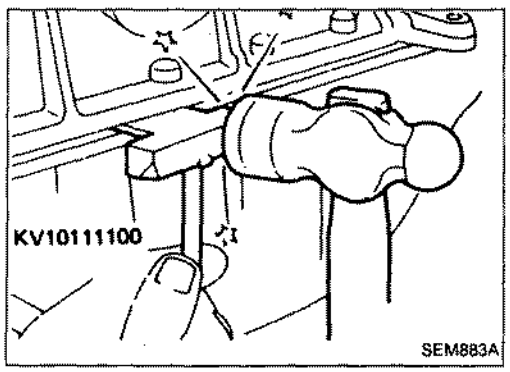
- **If adding oil helps compression, piston rings may be worn or damaged. If so, replace piston rings after checking piston.**
- **If pressure stays low, a valve may be sticking or seating improperly. Inspect and repair valve and valve seat. (Refer to S.D.S.) If valve or valve seat is damaged excessively, replace them.**
- **If compression in any two adjacent cylinders is low and if adding oil does not help compression, there is leakage past the gasket surface. If so, replace cylinder head gasket.**





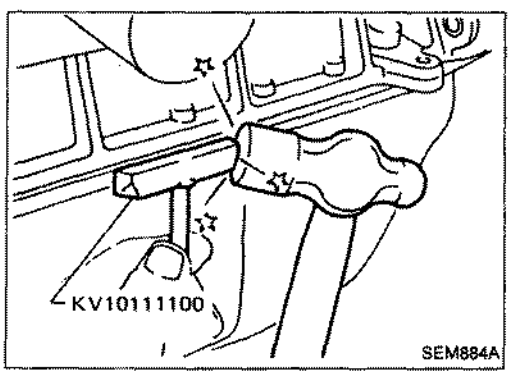
Removal

1. Remove undercovers.
2. Drain engine oil.
3. Remove center member.
4. Remove front exhaust tube.

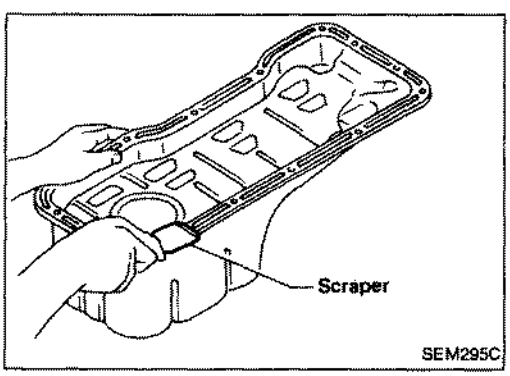


5. Remove oil pan.
(1) Insert Tool between cylinder block and oil pan.

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



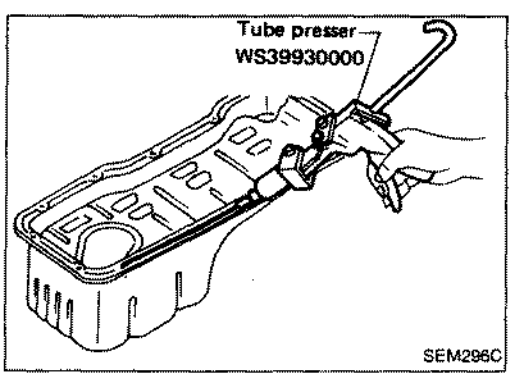
(2) Slide Tool by tapping its side with a hammer, and remove oil pan.



Installation

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

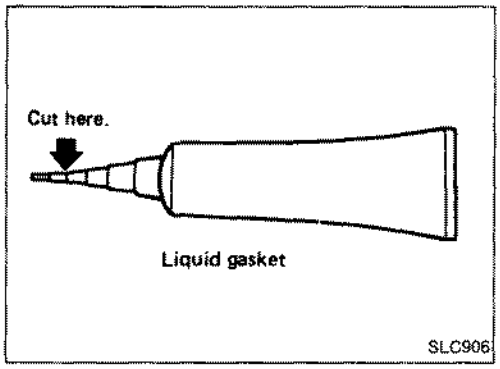
- Also remove traces of liquid gasket from mating surface of cylinder block.



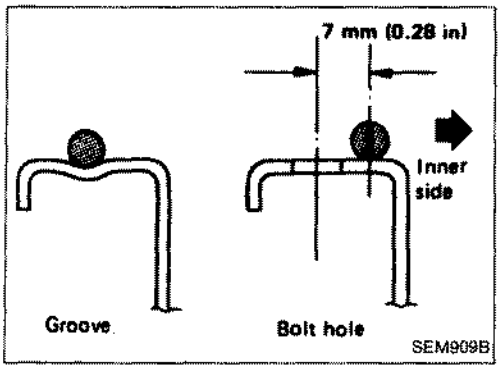
2. Apply a continuous bead of liquid gasket to mating surface of oil pan.

- **Use Genuine Liquid Gasket or equivalent.**

Installation (Cont'd)

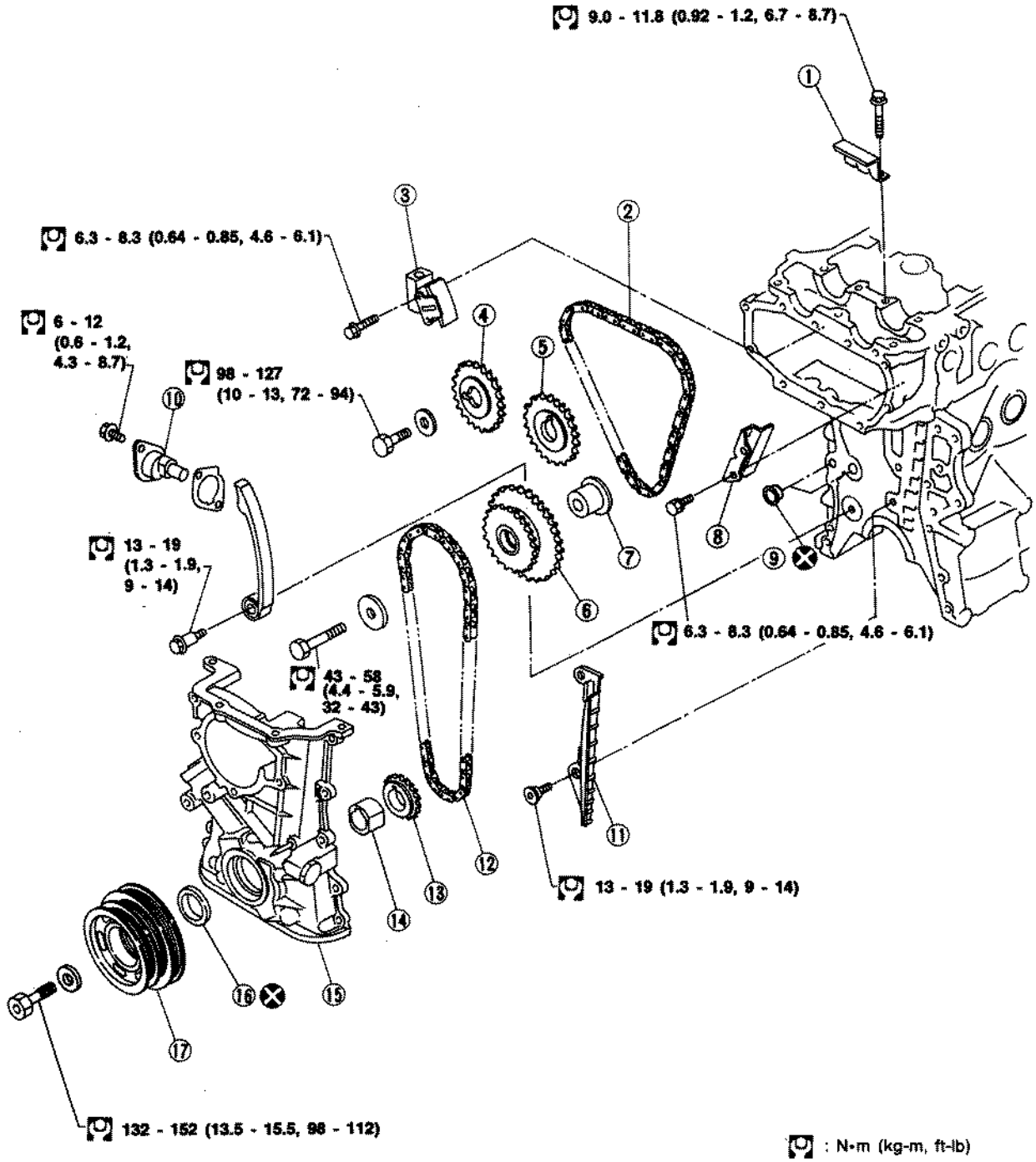


- Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide.



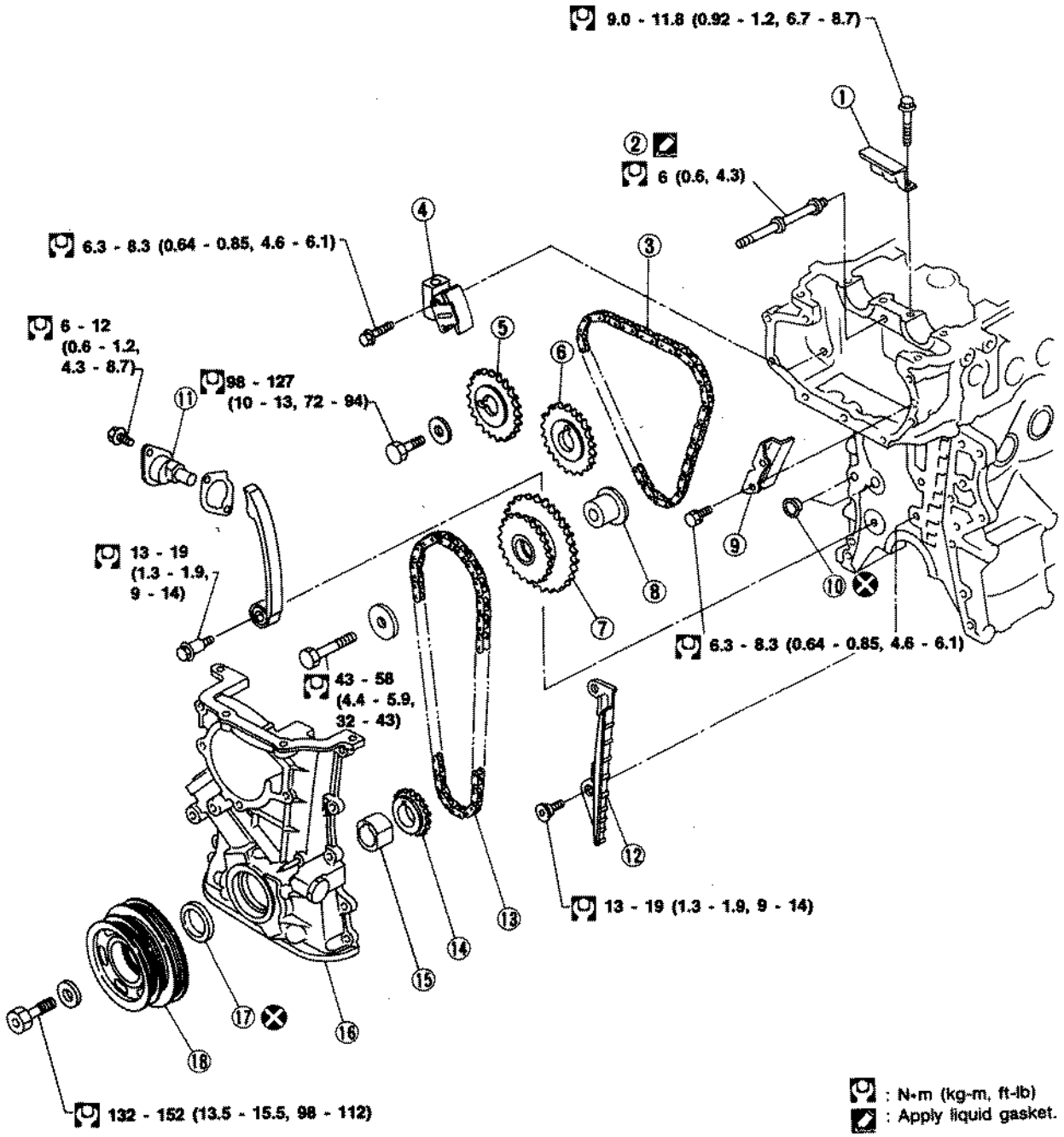
3. Apply liquid gasket to inner sealing surface as shown in figure.
- Attaching should be done within 5 minutes after coating.
4. Install oil pan.
- Wait at least 30 minutes before refilling engine oil.

EXCEPT FOR GA16DE



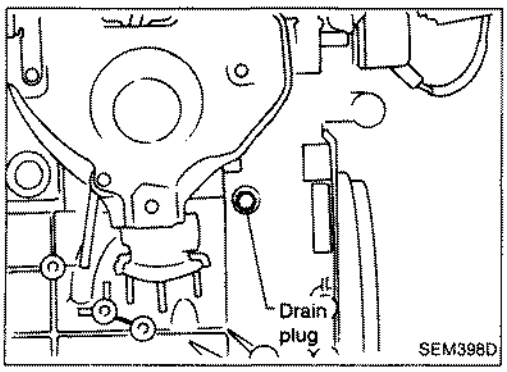
① Chain guide
② Upper timing chain
③ Chain tensioner
④ Camshaft sprocket (Intake)
⑤ Camshaft sprocket (Exhaust)
⑥ Idler sprocket
⑦ Idler shaft
⑧ Chain guide
⑨ O-ring
⑩ Chain tensioner
⑪ Chain guide
⑫ Lower timing chain
⑬ Crankshaft sprocket
⑭ Oil pump drive spacer
⑮ Front cover
⑯ Oil seal
⑰ Crankshaft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

GA16DE



SEM397D

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

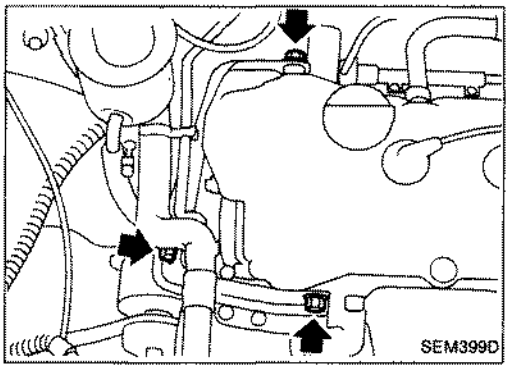


CAUTION:

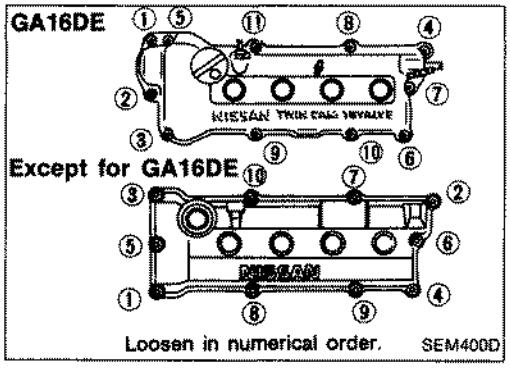
- **After removing timing chain, do not turn crankshaft and camshaft separately, or valves will strike piston heads.**

Removal

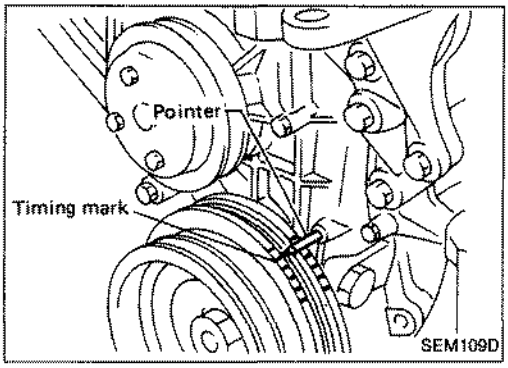
1. Drain engine coolant from radiator and cylinder block. Be careful not to spill coolant on drive belts.
2. Release fuel pressure (GA16DE). Refer to "Releasing Fuel Pressure" in section EF & EC.
3. Remove the following belts.
   - Power steering pump drive belt
   - Alternator drive belt
   - Air conditioner drive belt
4. Remove power steering pump bracket.
5. Remove air cleaner. (Except for GA16DE) Remove air duct to intake manifold collector. (GA16DE)
6. Remove front right-side wheel.
7. Remove front right-side splash cover.
8. Remove front undercovers.
9. Remove front exhaust tube.



10. Remove engine front mounting bracket.

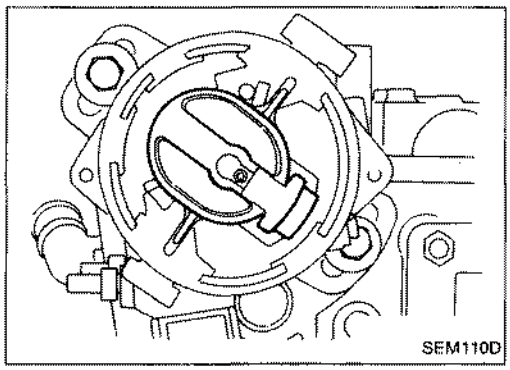


11. Remove rocker cover.
12. Remove distributor cap.
13. Remove all spark plugs.
14. Remove intake manifold support.



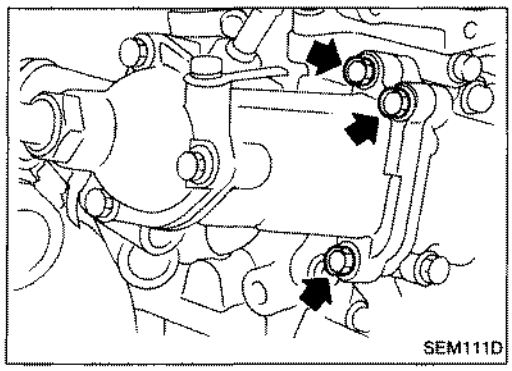
15. Set No. 1 piston at T.D.C. on its compression stroke.

Removal (Cont'd)

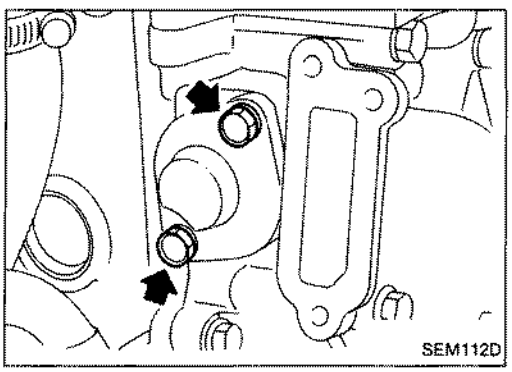


- Make sure No. 1 cylinder is at T.D.C. by looking at distributor rotor position.

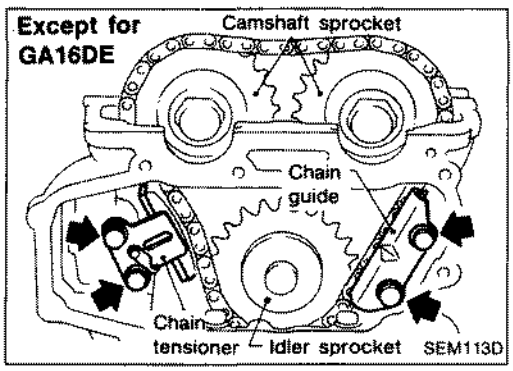
16. Remove distributor.
17. Remove cam sprocket cover and gusset.
18. Remove water pump pulley.



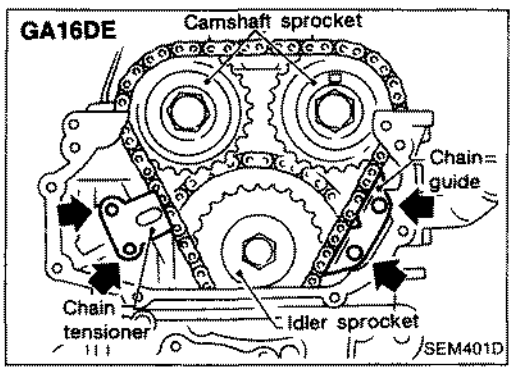
19. Remove thermostat housing.



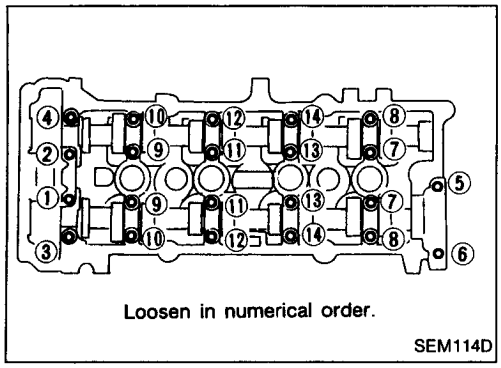
20. Remove chain tensioner.



21. Remove chain tensioner and chain guide.
22. Loosen idler sprocket bolt.
23. Remove camshaft sprocket bolts.
24. Remove camshaft sprockets.

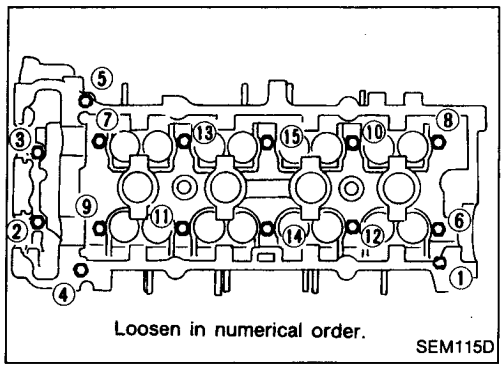


Removal (Cont'd)



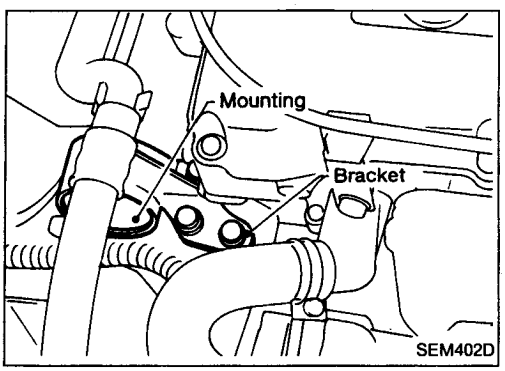
25. Remove camshaft brackets and camshafts.
- **These parts should be reassembled in their original positions.**
- **Bolts should be loosened in two or three steps.**

26. Remove idler sprocket bolt.

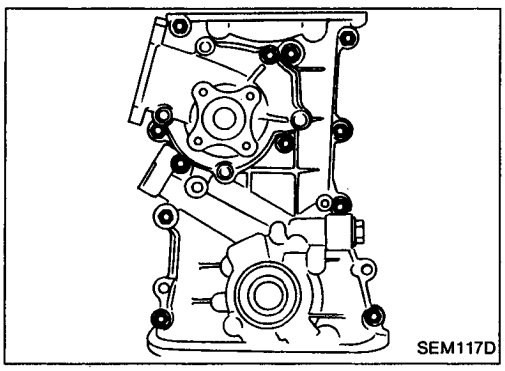


27. Remove cylinder head with manifolds.
- **Head warpage or cracking could result from removing in incorrect order.**
- **Cylinder head bolts should be loosened in two or three steps.**

28. Remove idler sprocket shaft from rear side.
29. Remove upper timing chain.
30. Remove center member.
31. Remove oil pan. Refer to "Removal" in "OIL PAN".
32. Remove oil strainer.
33. Remove crankshaft pulley.



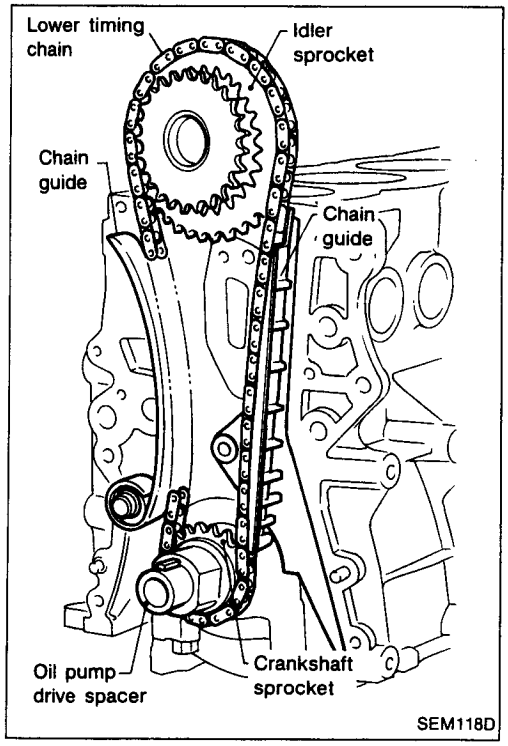
34. Support engine with a suitable jack.
35. Remove engine front mounting bracket.



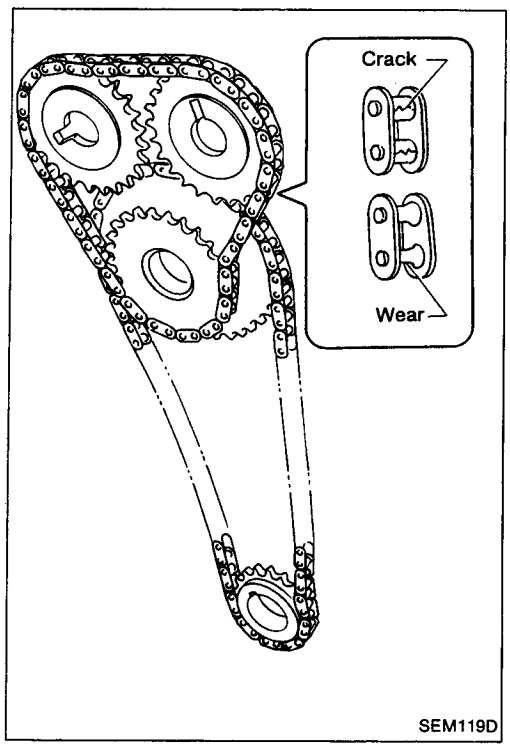
36. Remove front cover bolts and front cover as shown.

CAUTION:
One bolt is located on water pump.

Removal (Cont'd)

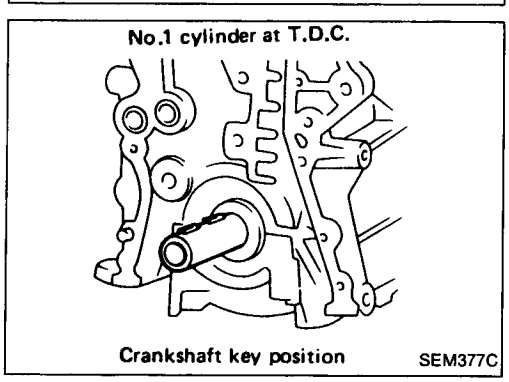


37. Remove idler sprocket.
38. Remove lower timing chain.
39. Remove oil pump drive spacer.
40. Remove chain guide.
41. Remove crankshaft sprocket.



Inspection

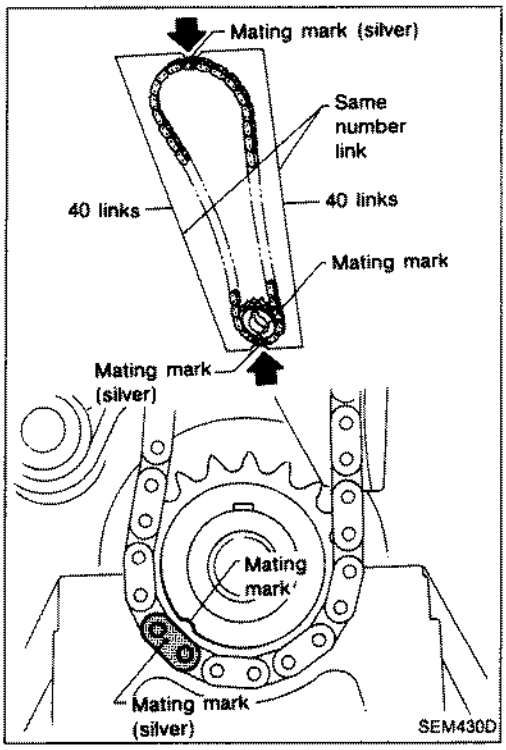
Check for cracks and excessive wear at roller links. Replace if necessary.



Installation

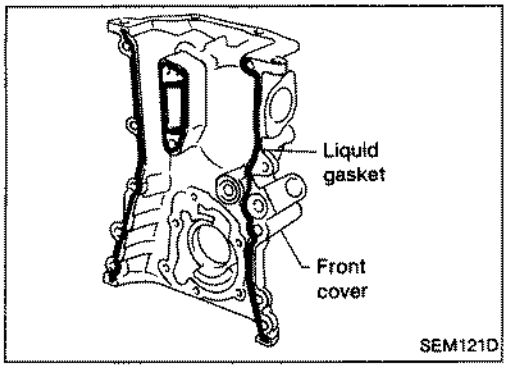
1. Confirm that No. 1 piston is set at T.D.C. on its compression stroke.

Installation (Cont'd)



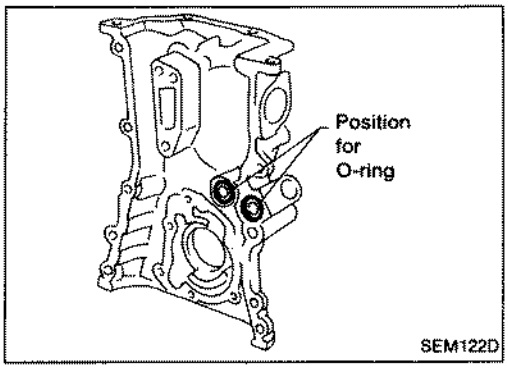
2. Install chain guide.
3. Install crankshaft sprocket and lower timing chain.

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



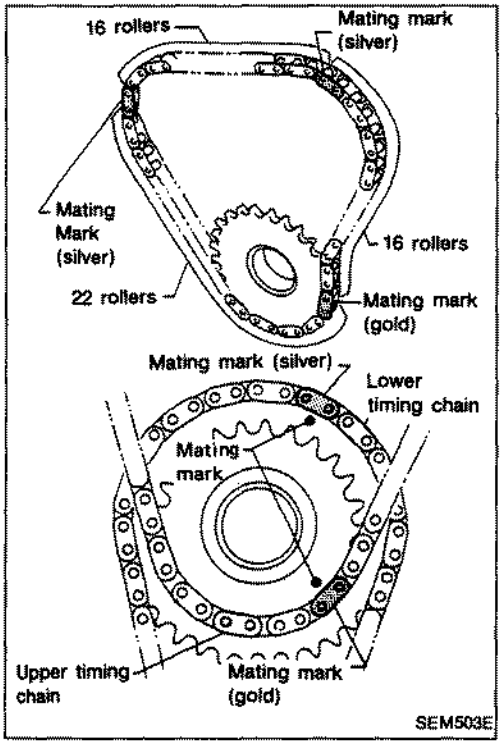
4. Apply liquid gasket to front cover.
5. Install front cover.

- **Check alignment of mating marks on chain and crankshaft sprocket.**
- **Align oil drive spacer with oil pump.**
- **Put chain to the side of chain guide so that chain does not make 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.**



6. Install engine front mounting.
7. Install oil strainer.
8. Install oil pan. Refer to "Installation" in "OIL PAN".
9. Install crankshaft pulley.
10. Install center member.

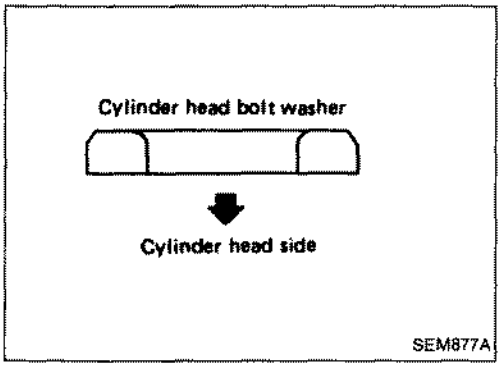
Installation (Cont'd)



11. Set idler sprocket by aligning the mating mark on the larger sprocket with the silver mating mark on the lower timing chain.
12. Install upper timing chain and set it by aligning the mating mark on the smaller sprocket with the silver mating marks on the upper timing chain.

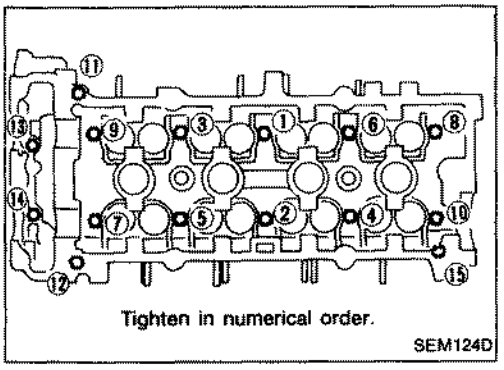
- **Make sure sprocket's mating mark faces engine front.**

13. Install idler sprocket shaft from the rear side.



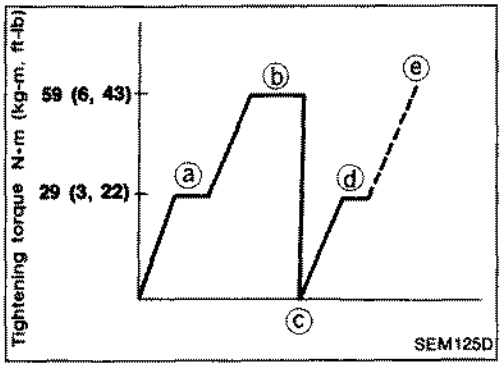
14. Install cylinder head with new gasket.

- **Be sure to install washers between bolts and cylinder head.**
- **Do not rotate crankshaft and camshaft separately, or valves will strike piston heads.**



- **Tightening procedure**

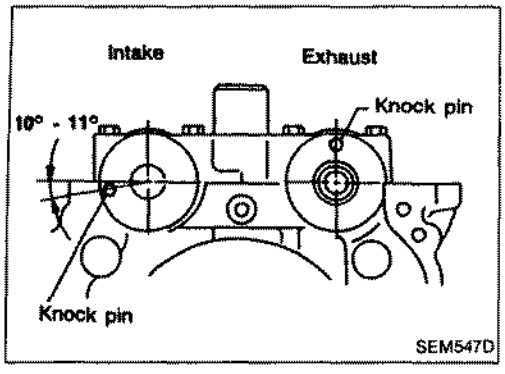
ⓐ **Tighten bolts to 29 N·m (3 kg-m, 22 ft-lb).**
ⓑ **Tighten bolts to 59 N·m (6 kg-m, 43 ft-lb).**
ⓒ **Loosen bolts completely.**
ⓓ **Tighten bolts to 29 N·m (3 kg-m, 22 ft-lb).**
ⓔ **Turn bolts 50 to 55 degrees clockwise or if angle wrench is not available, tighten bolts to 59 ± 5 N·m (6 ± 0.5 kg-m, 43.4 ± 3.6 ft-lb).**
ⓕ **Tighten bolts (⑪ - ⑮) to 6.3 to 8.3 N·m (0.64 to 0.85 kg-m, 4.6 to 6.1 ft-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 ± 5 (6 ± 0.5, 43.4 ± 3.6)
Bolts (⑪ - ⑮)	—	—	—	—	6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)

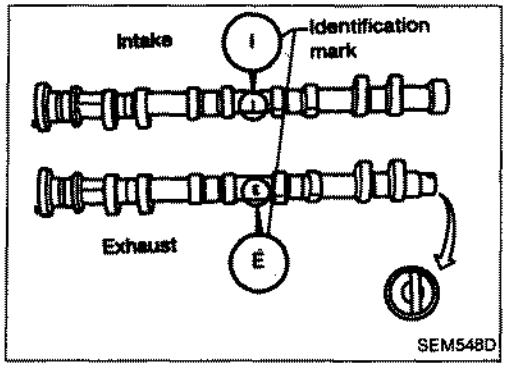
Installation (Cont'd)

15. Install idler sprocket bolt.

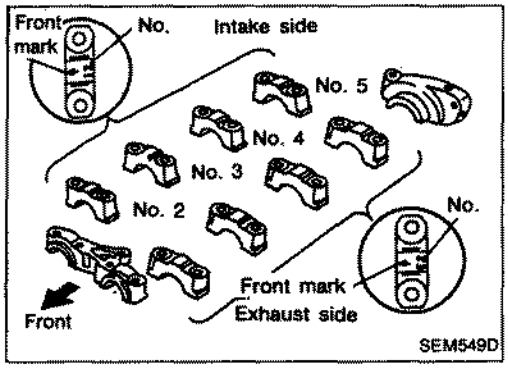


16. Install camshaft.

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

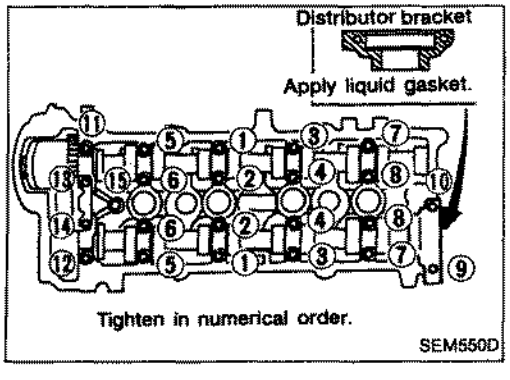


- **Identification marks are present on camshafts.**

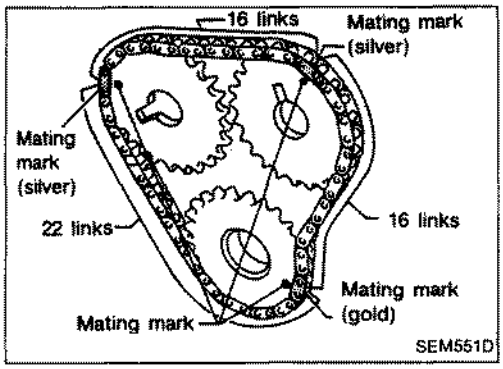


17. Install camshaft brackets and distributor bracket.

- **Make sure camshaft brackets are aligned as shown in figure.**
- **Apply liquid gasket to distributor bracket.**
- **Tighten camshaft bracket bolts gradually in two or three stages.**
- **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".
  Reference data valve clearance (Cold):
  Intake
  0.30 mm (0.012 in)
  Exhaust
  0.35 mm (0.014 in)

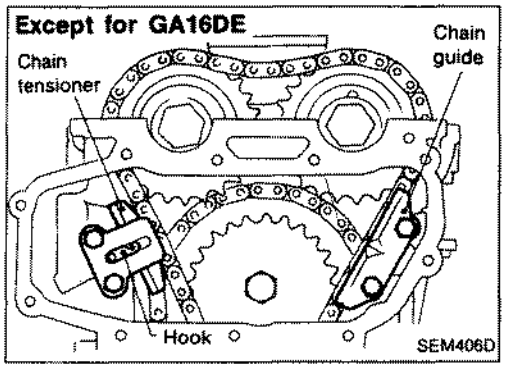


Installation (Cont'd)

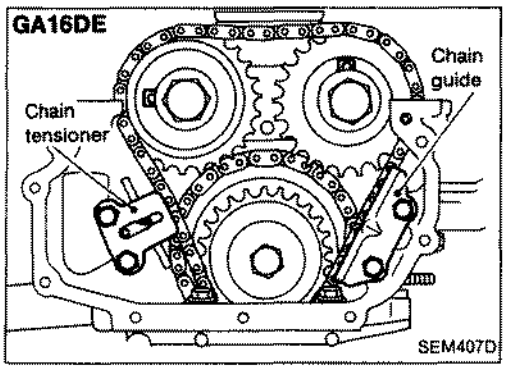


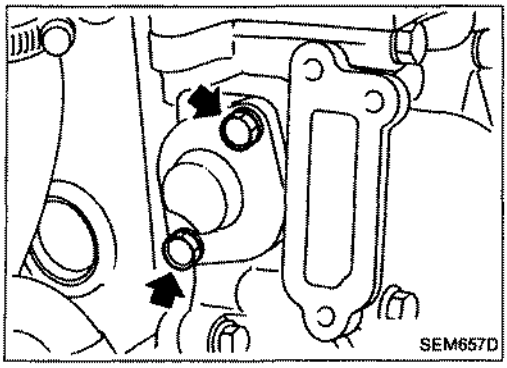
18. Assemble camshaft sprocket with chain.
- **Set timing chain by aligning mating marks with those of camshaft sprockets.**
- **Make sure sprocket's mating marks face engine front.**

19. Install camshaft sprocket bolts.



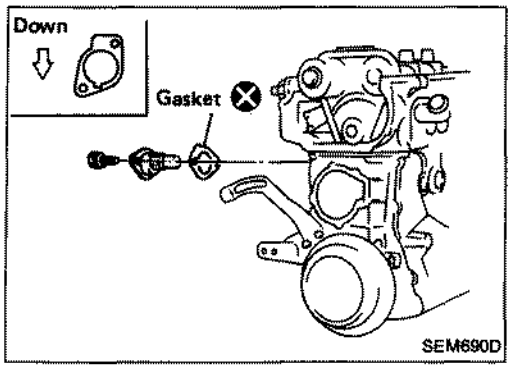
20. Install chain tensioner and chain guide.
- **Make sure that hook used to retain chain tensioner is released.**





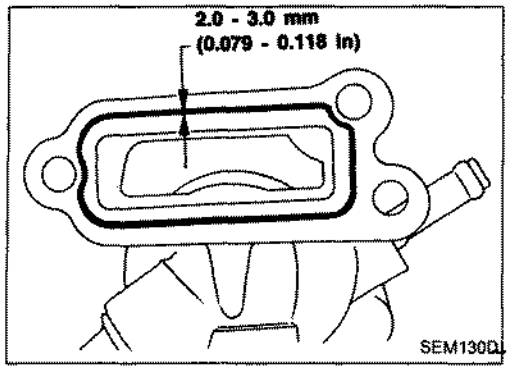
21. Install lower chain tensioner.

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

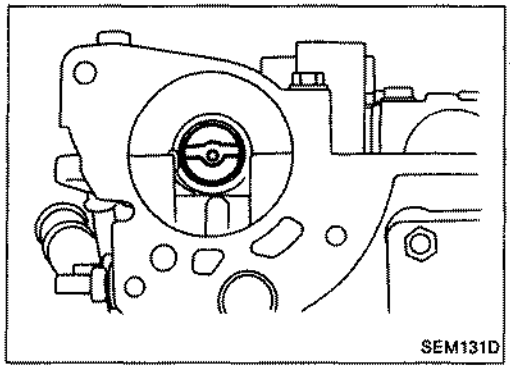


- **Make sure of the direction of the gasket before installing lower chain tensioner.**

Installation (Cont'd)



22. Apply liquid gasket to thermostat housing.
23. Install thermostat housing.
24. Install water pump pulley.

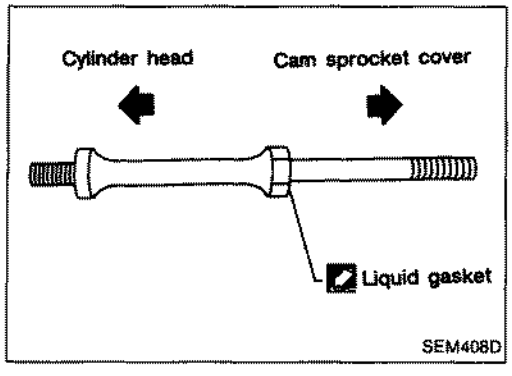


25. Install distributor.

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

Except for GA16DE

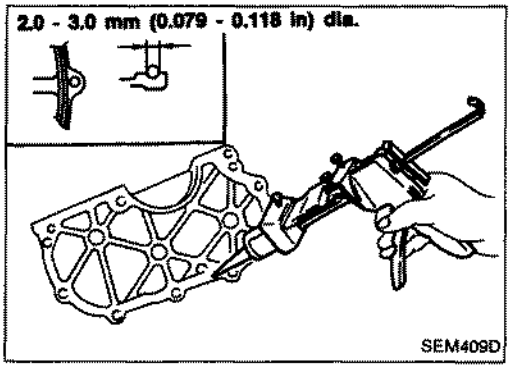
26. Install cam sprocket cover.



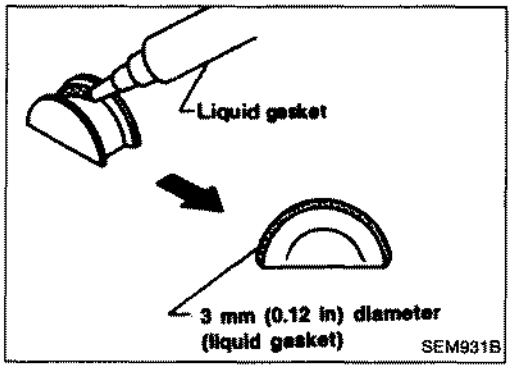
GA16DE

26. Install cam sprocket cover gusset and cam sprocket cover.

- Apply liquid gasket to cam sprocket cover gusset.



- Apply liquid gasket to cam sprocket cover.

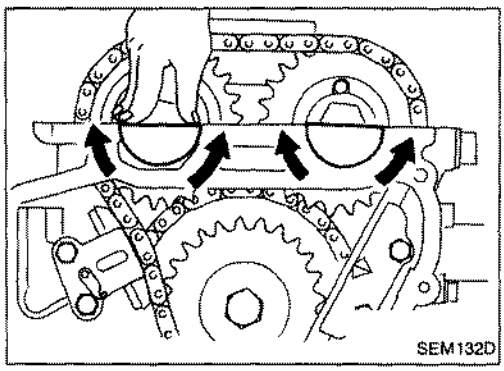


Except for GA16DE

27. Install rubber plugs as follows:
(1) Apply liquid gasket to rubber plugs.

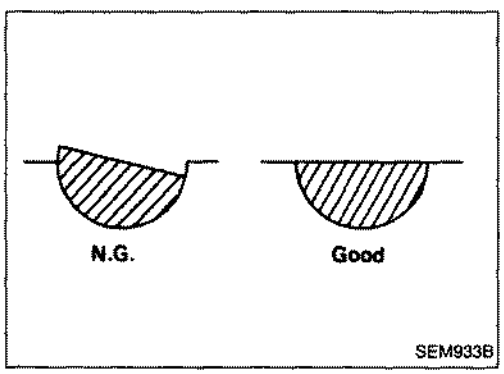
Rubber plugs should be installed within 5 minutes of applying liquid gasket.

Installation (Cont'd)



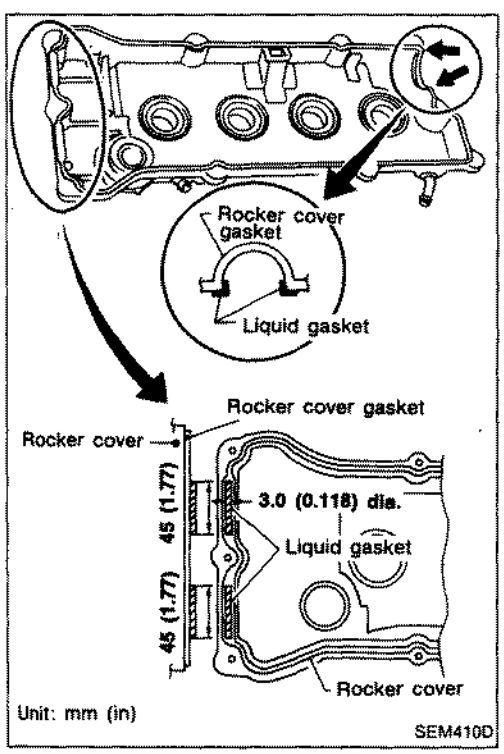
(2) Install rubber plugs, then move them with your fingers to uniformly spread the gasket on cylinder head surface.

- **Rubber plugs should be installed flush with the surface.**
- **Do not start engine for 30 minutes after installing rocker cover.**



Except for GA16DE

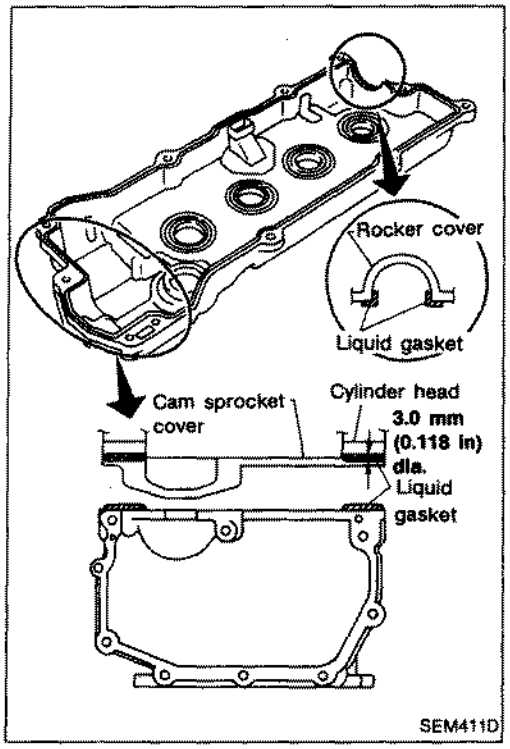
28. Apply liquid gasket to rocker cover.

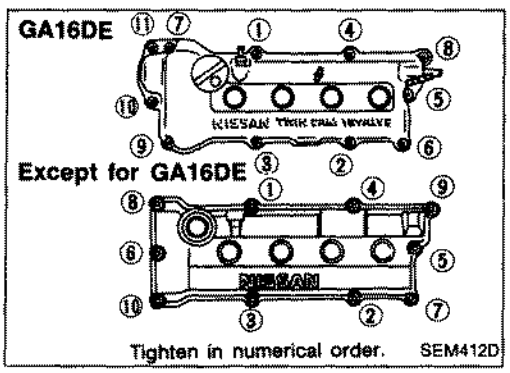


Installation (Cont'd)

GA16DE

28. Apply liquid gasket to rocker cover and cylinder head.



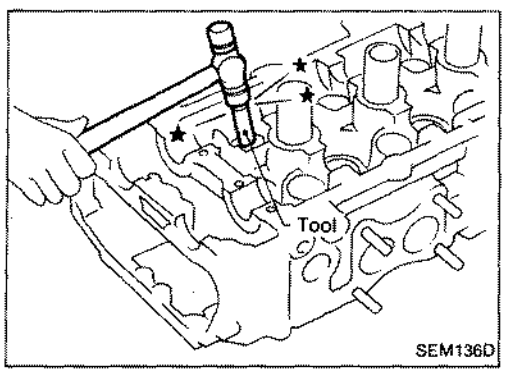


29. Install rocker cover.
30. Install all spark plugs.
31. Install engine front mounting bracket.
32. Install front exhaust tube.
33. Install front undercover.
34. Install front right splash cover.
35. Install front right wheel.
36. Install air cleaner.
37. Install power steering pump bracket.
38. Install the following belts.
- Alternator drive belt
- Power steering pump drive belt
- Air conditioner compressor drive belt

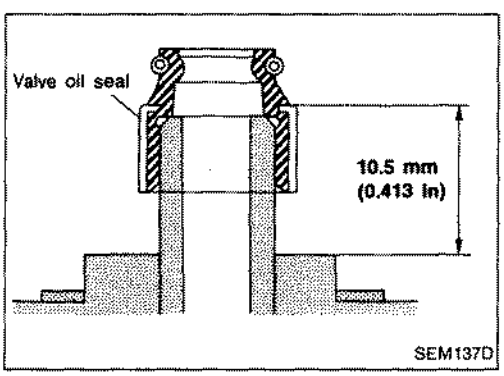
VALVE OIL SEAL

1. Remove rocker cover.
2. Remove camshaft.
3. Remove valve spring and valve oil seal with Tool or a suitable tool.

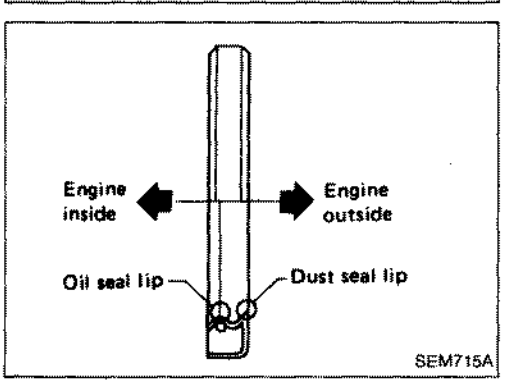
Piston concerned should be set at T.D.C. to prevent valve from falling.



4. Apply engine oil to new valve oil seal and install it with Tool.



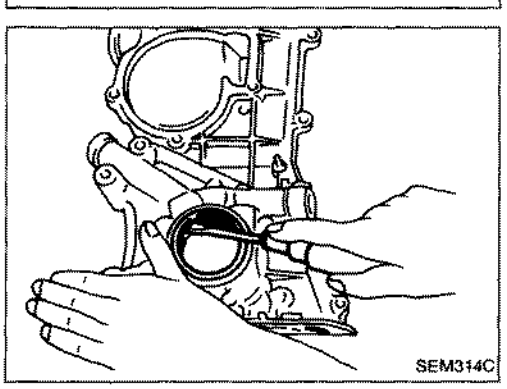
OIL SEAL INSTALLING DIRECTION

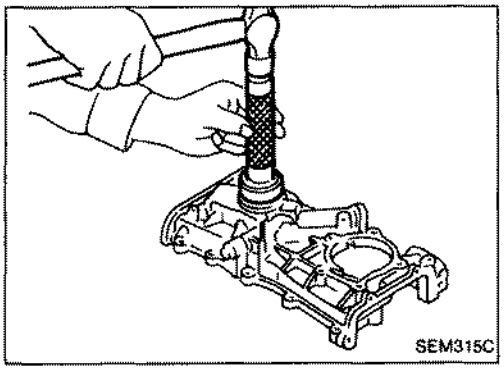


FRONT OIL SEAL

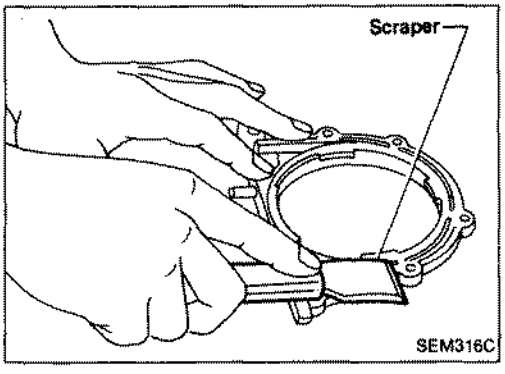
1. Remove front cover. Refer to "Removal" in "TIMING CHAIN".
2. Remove front oil seal from front cover.

Be careful not to damage oil seal retainer.




SEM315C

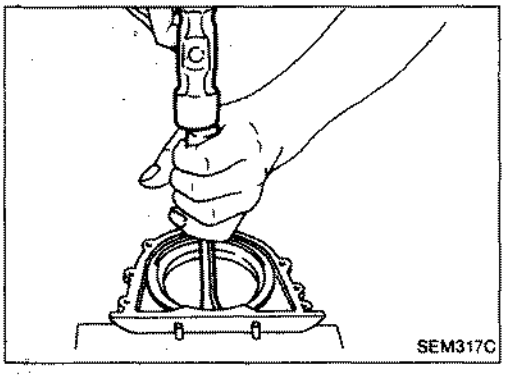
3. Apply engine oil to new oil seal and install it using a suitable tool.



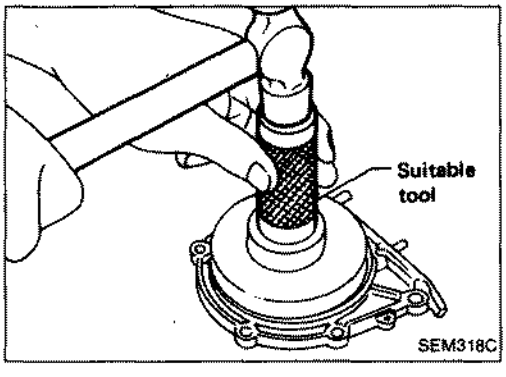
SEM316C

REAR OIL SEAL

1. Remove flywheel.
2. Remove rear oil seal retainer.
3. Remove traces of liquid gasket using scraper.

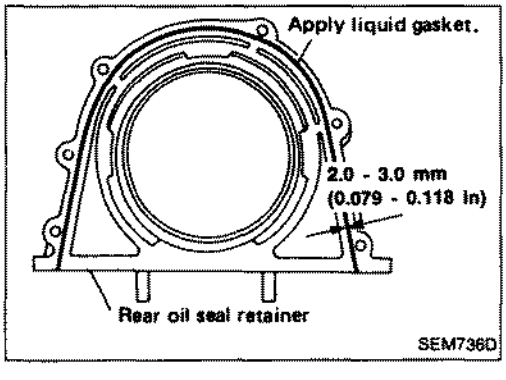

SEM317C

4. Remove seal from rear oil seal retainer.



SEM318C

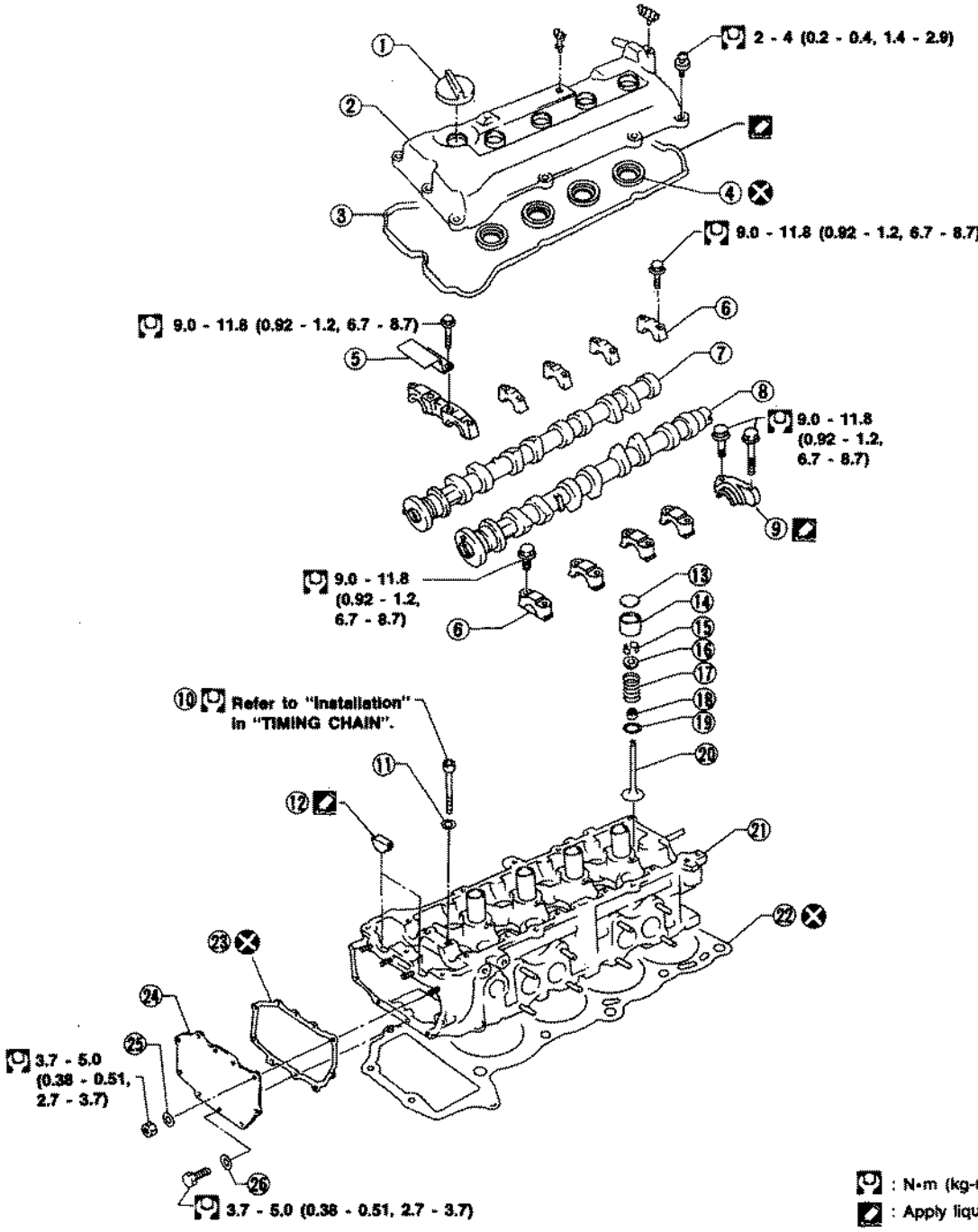
5. Apply engine oil to new oil seal and install it using a suitable tool.



SEM736D

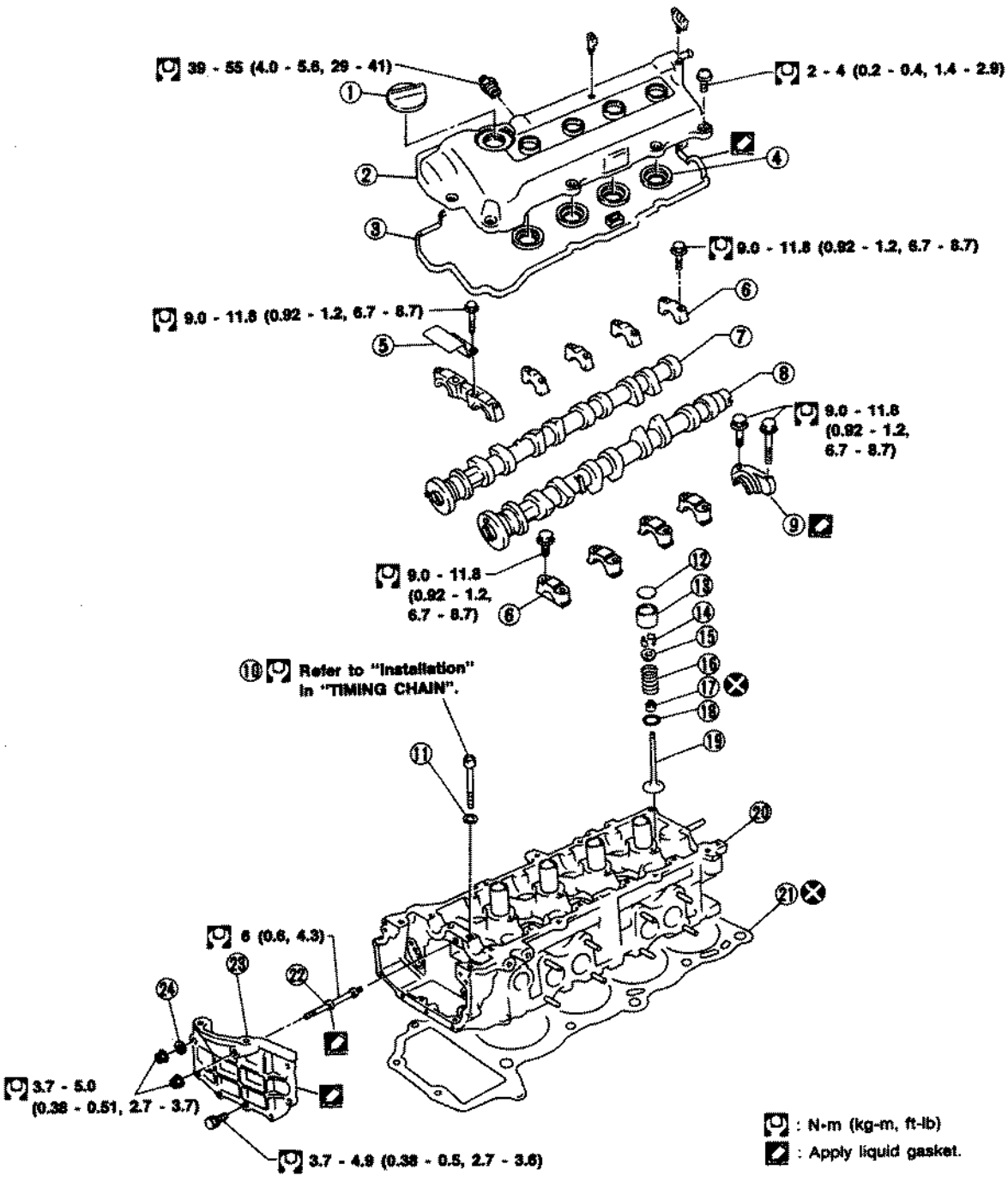
6. Apply liquid gasket to rear oil seal retainer.

Except for GA16DE



① Oil filler cap
② Rocker cover
③ Rocker cover gasket
④ Oil seal
⑤ Chain guide
⑥ Camshaft bracket
⑦ Intake camshaft
⑧ Exhaust camshaft
⑨ Distributor bracket
⑩ Cylinder head bolt
⑪ Washer
⑫ Rubber plug
⑬ Shim
⑭ Valve lifter
⑮ Valve cotter
⑯ Valve spring retainer
⑰ Valve spring
⑱ Valve oil seal
⑲ Spring seat
⑳ Valve
㉑ Cylinder head
㉒ Cylinder head gasket
㉓ Front cover gasket
㉔ Cam sprocket cover
㉕ Washer
㉖ Washer

GA16DE



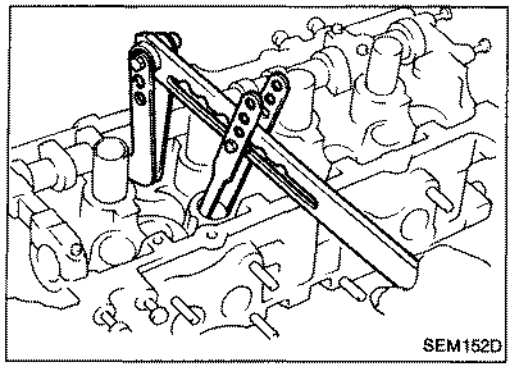
① Oil filler cap
② Rocker cover
③ Rocker cover gasket
④ Oil seal
⑤ Chain guide
⑥ Camshaft bracket
⑦ Intake camshaft
⑧ Exhaust camshaft
⑨ Distributor bracket
⑩ Cylinder head bolt
⑪ Washer
⑫ Shim
⑬ Valve lifter
⑭ Valve cotter
⑮ Valve spring retainer
⑯ Valve spring
⑰ Valve oil seal
⑱ Spring seat
⑲ Valve
⑳ Cylinder head
㉑ Cylinder head gasket
㉒ Cam sprocket cover gusset
㉓ Cam sprocket cover
㉔ Washer

CAUTION:

- **When installing sliding parts such as camshaft and oil seal, be sure to apply new engine oil on their sliding surfaces.**
- **When tightening cylinder head bolts, camshaft sprocket bolts and camshaft bracket bolts, apply new engine oil to thread portions and seat surfaces of bolts.**
- **Attach tags to valve lifters so as not to mix them up.**

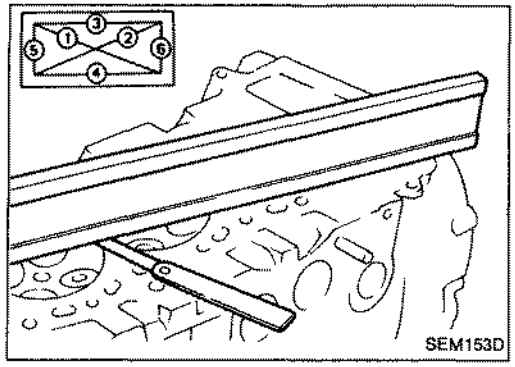
Removal

- This removal is the same procedure as those for timing chain. Refer to "Removal" in "TIMING CHAIN".


SEM152D

Disassembly

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



SEM153D

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 it or resurface it.

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.

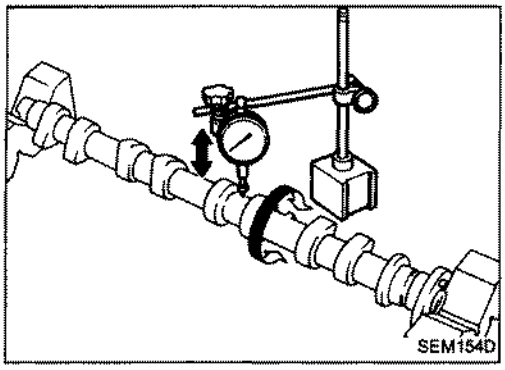
Nominal cylinder head height:

117.8 - 118.0 mm (4.638 - 4.646 in)

Inspection (Cont'd)

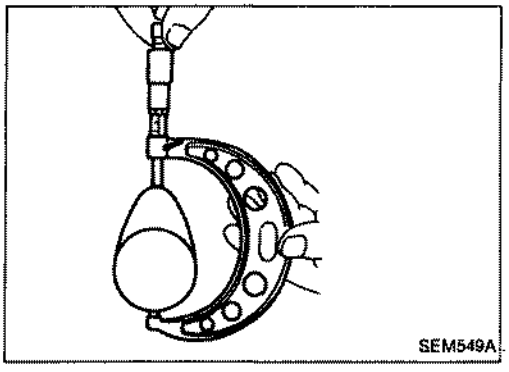
CAMSHAFT VISUAL CHECK

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.



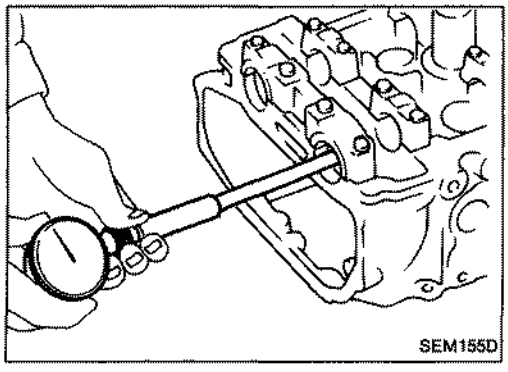
CAMSHAFT CAM HEIGHT

1. Measure camshaft cam height.

Unit: mm (in)

		GA14DS with catalyzer without E.G.R., except for GA16DE	GA14DS with catalyzer and E.G.R.	GA16DE
Standard cam height	Intake	39.880 - 40.070 (1.5701 - 1.5776)	39.380 - 39.570 (1.5504 - 1.5579)	40.600 - 40.790 (1.5984 - 1.6059)
	Exhaust	39.880 - 40.070 (1.5701 - 1.5776)	39.380 - 39.570 (1.5504 - 1.5579)	39.880 - 40.070 (1.5701 - 1.5776)
Cam wear limit		0.2 (0.008)		

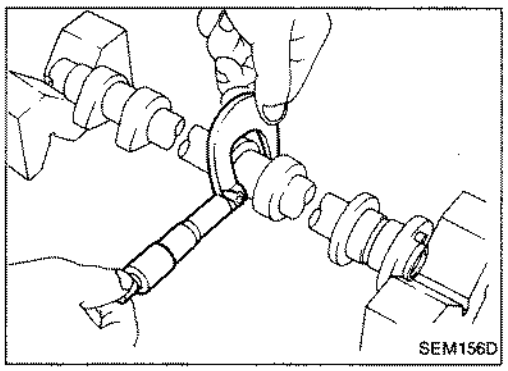
2. If wear is beyond the limit, replace camshaft.



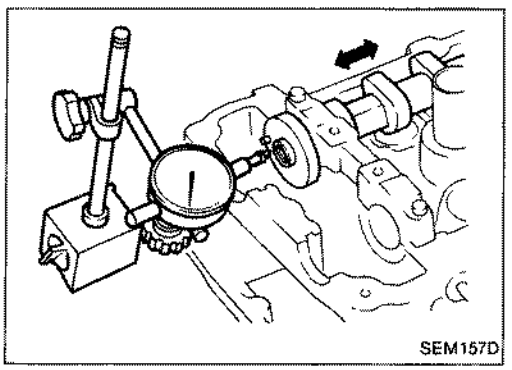
CAMSHAFT JOURNAL CLEARANCE

1. Install camshaft bracket and tighten bolts to the specified torque.
2. Measure inner diameter of camshaft bearing.
   Standard inner diameter:
   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)

Inspection (Cont'd)

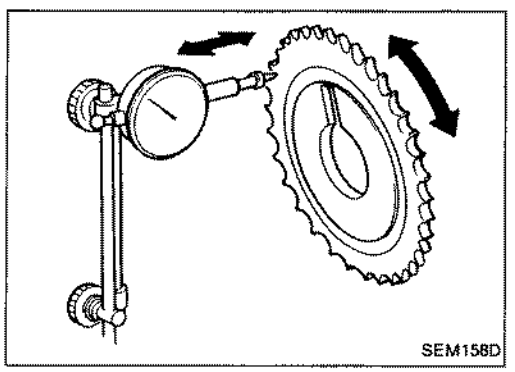

SEM156D

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)


SEM157D

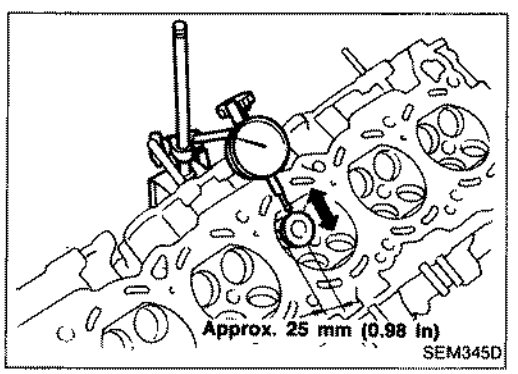
CAMSHAFT END PLAY

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)


SEM158D

CAMSHAFT SPROCKET RUNOUT

1. Install sprocket on camshaft.
2. Measure camshaft sprocket runout.
   Runout (Total indicator reading):
   Limit 0.15 mm (0.0059 in)
3. If it exceeds the limit, replace camshaft sprocket.

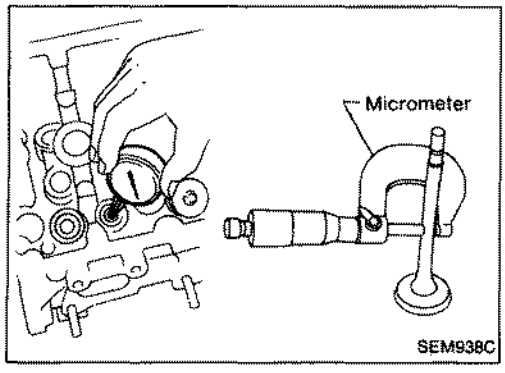


SEM345D

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)

Inspection (Cont'd)



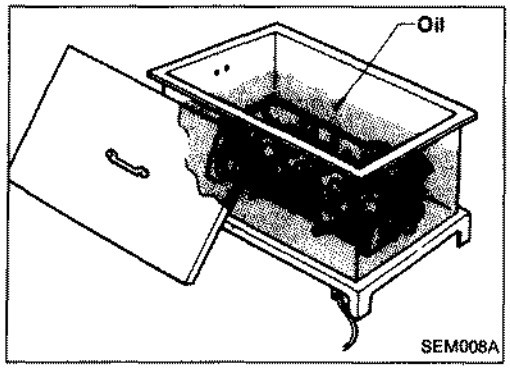
2. If it exceeds the limit, check valve to valve guide clearance.
a. Measure valve stem diameter and valve guide inner diameter.
b. Check that clearance is within specification.

Valve to valve guide clearance:

Unit: mm (in)

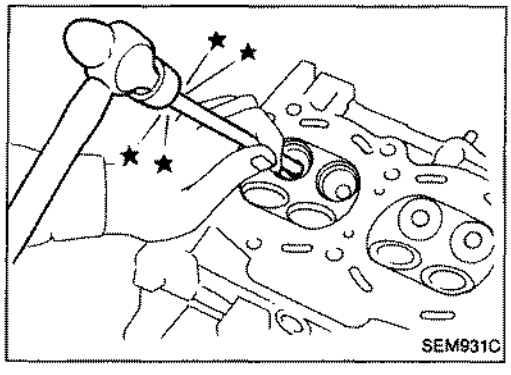
	Standard	Limit
Intake	0.020 - 0.050 (0.0008 - 0.0020)	0.1 (0.004)
Exhaust	0.040 - 0.070 (0.0016 - 0.0028)	0.1 (0.004)

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

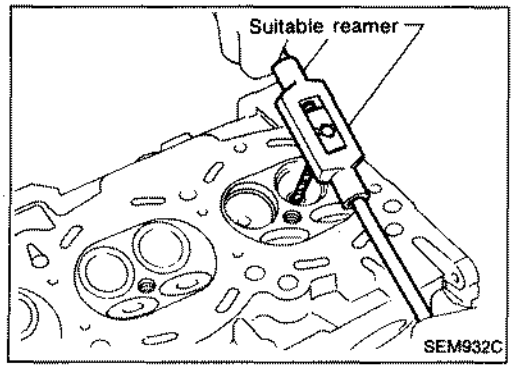


VALVE GUIDE REPLACEMENT

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

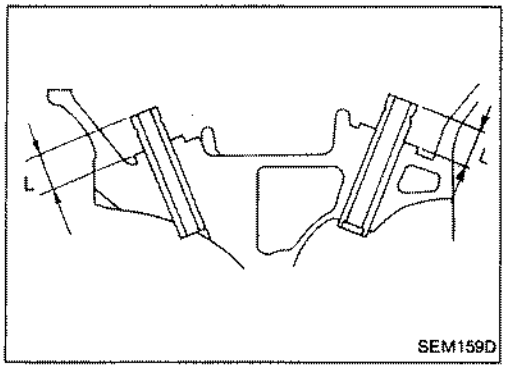


2. Drive out valve guide with a press [under a 20 kN (2 t, 2.2 US ton, 2.0 Imp ton) pressure] or hammer and suitable tool.

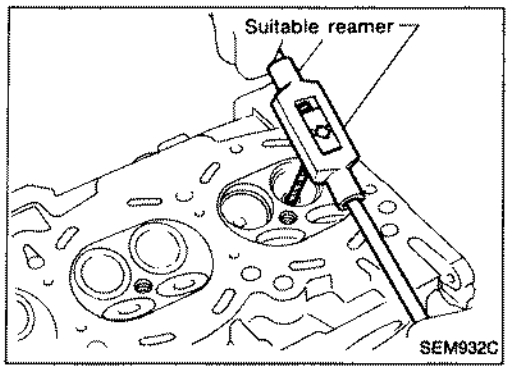


3. Ream cylinder head valve guide hole.
Valve guide hole diameter (for service parts):
Intake & Exhaust
9.685 - 9.696 mm (0.3813 - 0.3817 in)

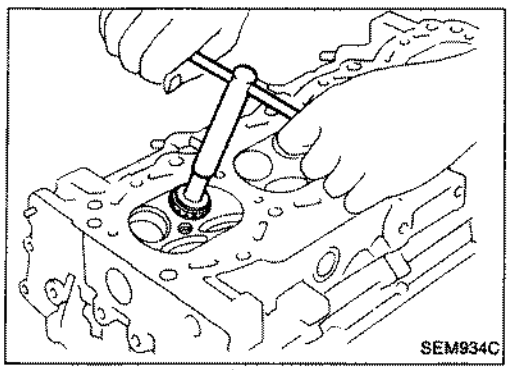
Inspection (Cont'd)



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)



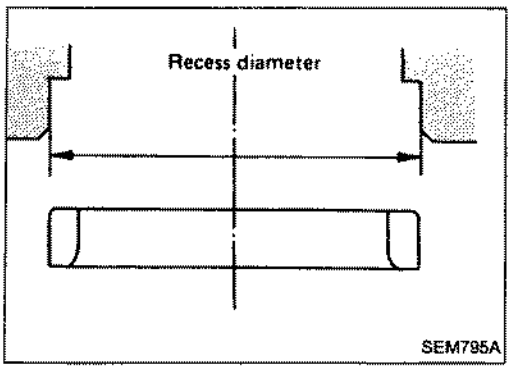
5. Ream valve guide.
   Finished size:
   Intake & Exhaust
   5.500 - 5.515 mm (0.2165 - 0.2171 in)



VALVE SEATS

Check valve seats for any evidence of pitting at valve contact surface, and 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.**
- **Cut with both hands to uniform the cutting surface.**



REPLACING VALVE SEAT FOR SERVICE PARTS

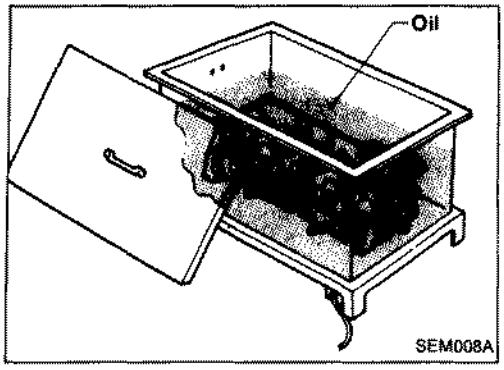
1. Bore out old seat until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the seat recess in cylinder head.
2. Ream cylinder head recess.
   Reaming bore for service valve seat
   Oversize [0.5 mm (0.020 in)]:

Unit: mm (in)

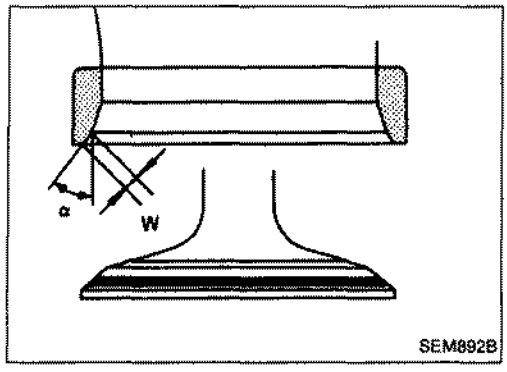
	GA13DS	GA14DS	GA16DS & GA16DE
Intake	28.000 - 28.016 (1.1024 - 1.1030)	30.500 - 30.516 (1.2008 - 1.2014)	31.500 - 31.516 (1.2402 - 1.2408)
Exhaust	23.000 - 23.016 (0.9055 - 0.9061)	25.500 - 25.516 (1.0039 - 1.0046)	25.500 - 25.516 (1.0039 - 1.0046)

Reaming should be done in circles concentric to the valve guide center so that valve seat will have the correct fit.

Inspection (Cont'd)

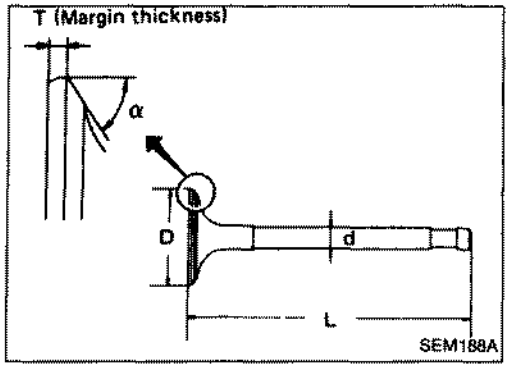


3. Heat cylinder head to 110 to 120°C (230 to 248°F).
4. Press fit valve seat until it seats on the bottom.



5. Cut or grind valve seat using suitable tool at the specified dimensions as shown in S.D.S.
6. After cutting, lap valve seat with abrasive compound.
7. Check valve seating condition.

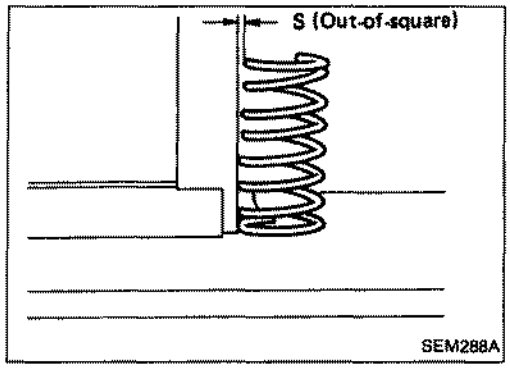
Seat face angle "α":
45°15' - 45°45' deg.
Contacting width "W":
Intake
1.34 - 1.63 mm (0.0528 - 0.0642 in)
Exhaust
1.70 - 2.12 mm (0.0669 - 0.0835 in)



VALVE DIMENSIONS

Check dimensions in each valve. For dimensions, refer to S.D.S. 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.



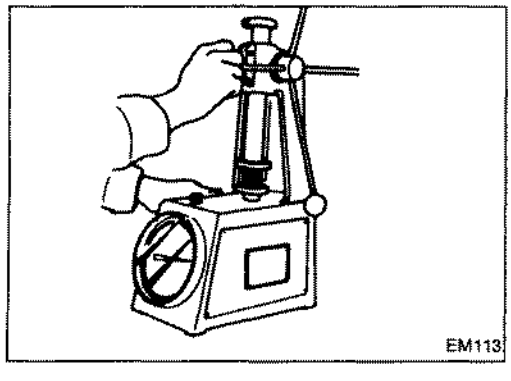
VALVE SPRING

Squareness

1. Measure "S" dimension.

Out-of-square:
Less than 1.80 mm (0.0709 in)

2. If it exceeds the limit, replace spring.



Pressure

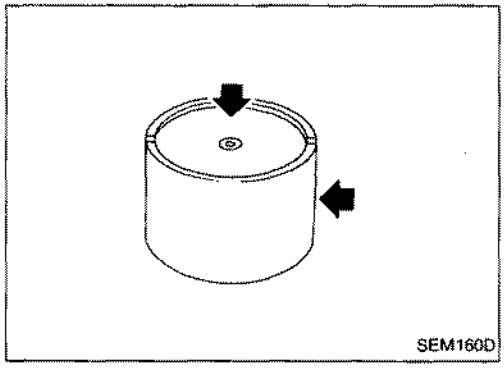
Check valve spring pressure.

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)

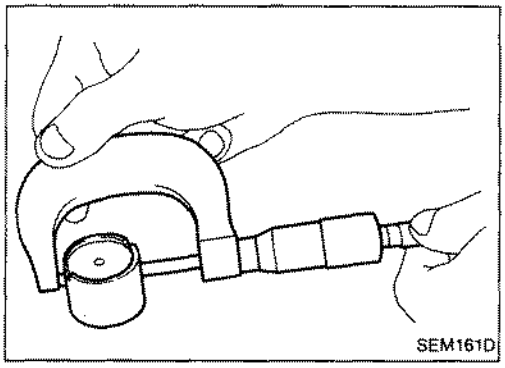
If it exceeds the limit, replace spring.

Inspection (Cont'd)

VALVE LIFTER

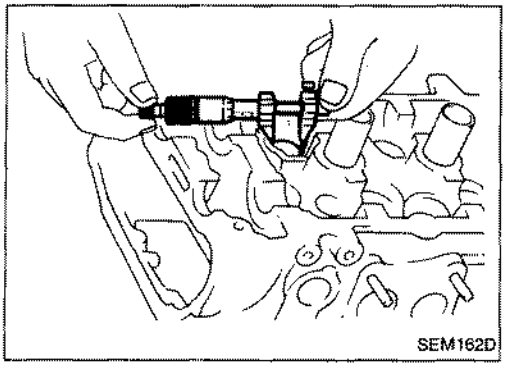

SEM160D

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

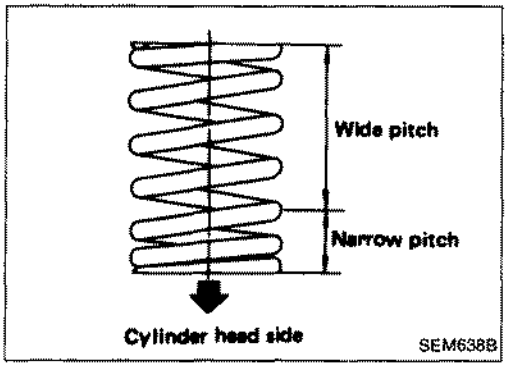

SEM161D

2. Check diameter of valve lifter and valve lifter guide bore.

Valve lifter diameter:
29.960 - 29.975 mm (1.1795 - 1.1801 in)


SEM162D

Lifter guide bore diameter:
30.000 - 30.021 mm (1.1811 - 1.1819 in)



SEM638B

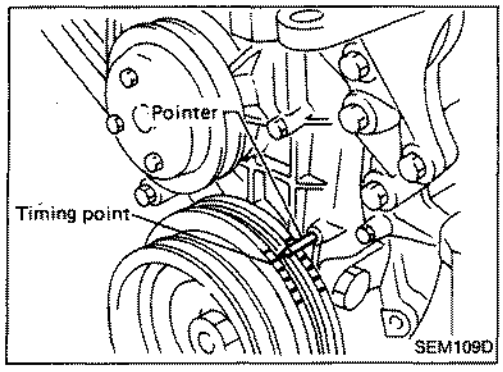
Assembly

1. Install valve component parts.

- **Always use new valve oil seal. Refer to OIL SEAL REPLACEMENT.**
- **Before installing valve oil seal, install valve spring seat.**
- **After installing valve component parts, use plastic hammer to lightly tap valve stem tip 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".

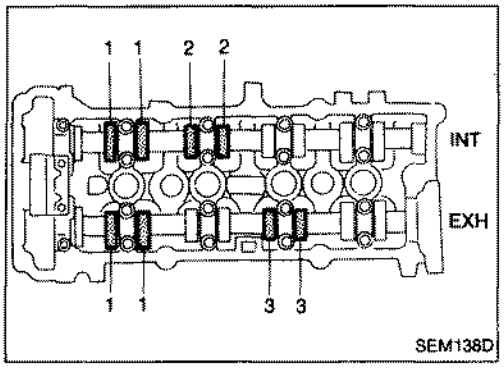


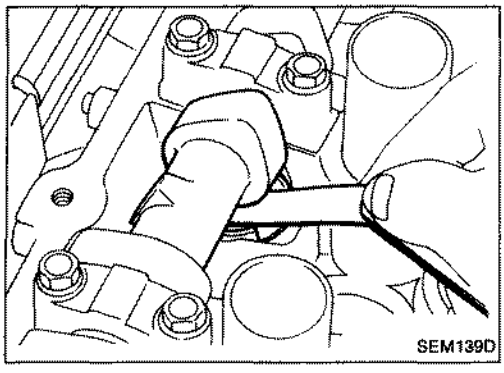
Checking

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 T.D.C. on its compression stroke.
- Align pointer with T.D.C. 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.

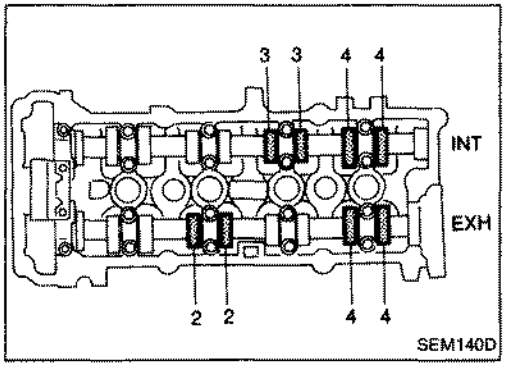
Valve clearance for checking (Hot):

Intake

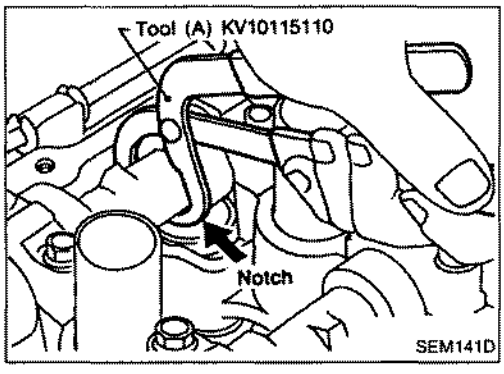
0.21 - 0.49 mm (0.008 - 0.019 in)

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.

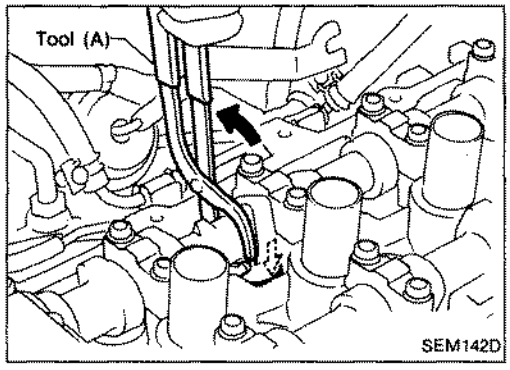
1. Turn crankshaft, to position cam lobe on camshaft of valve that must be adjusted upward.
2. Place Tool (A) around camshaft as shown in figure.

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

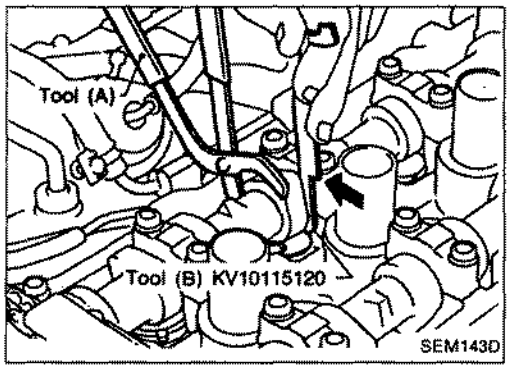
CAUTION:

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.

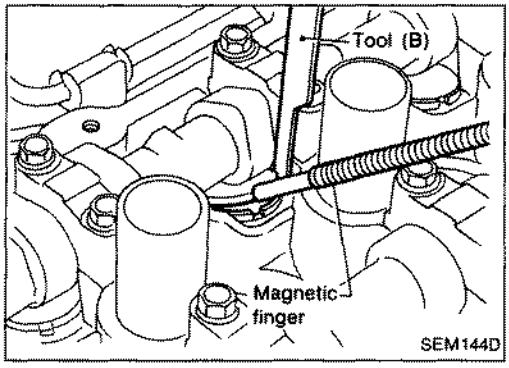


4. Place Tool (B) between camshaft and valve lifter to retain valve lifter.

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:

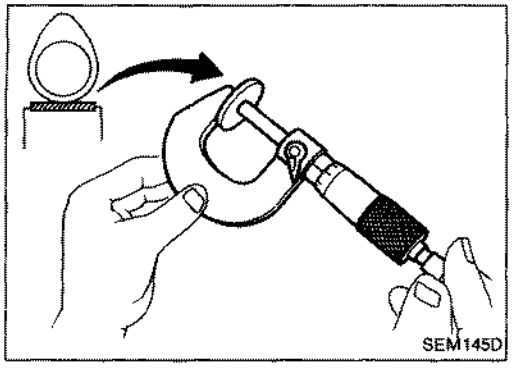
N = R + [M – 0.37 mm (0.0146 in)]

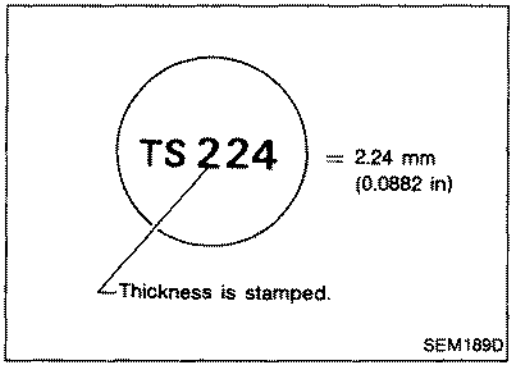
Exhaust:

N = R + [M – 0.40 mm (0.0157 in)]

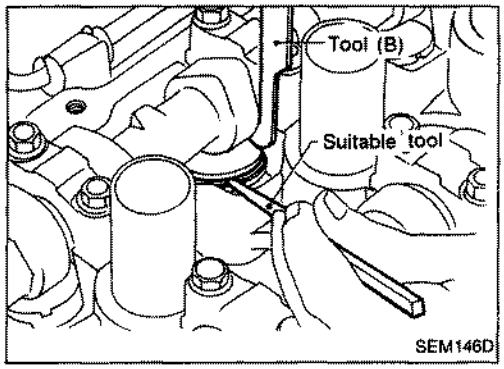
Shims are available in 50 sizes from 2.00 mm (0.0787 in) to 2.98 mm (0.1173 in), in steps of 0.02 mm (0.0008 in).

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

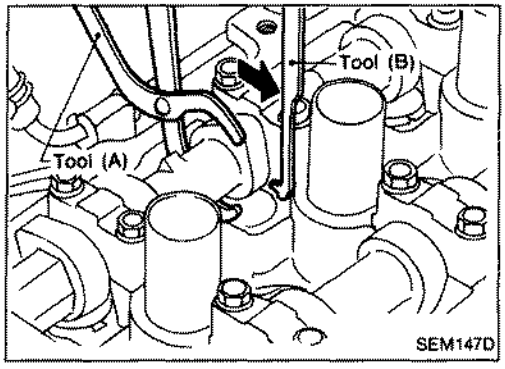




Adjusting (Cont'd)



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:

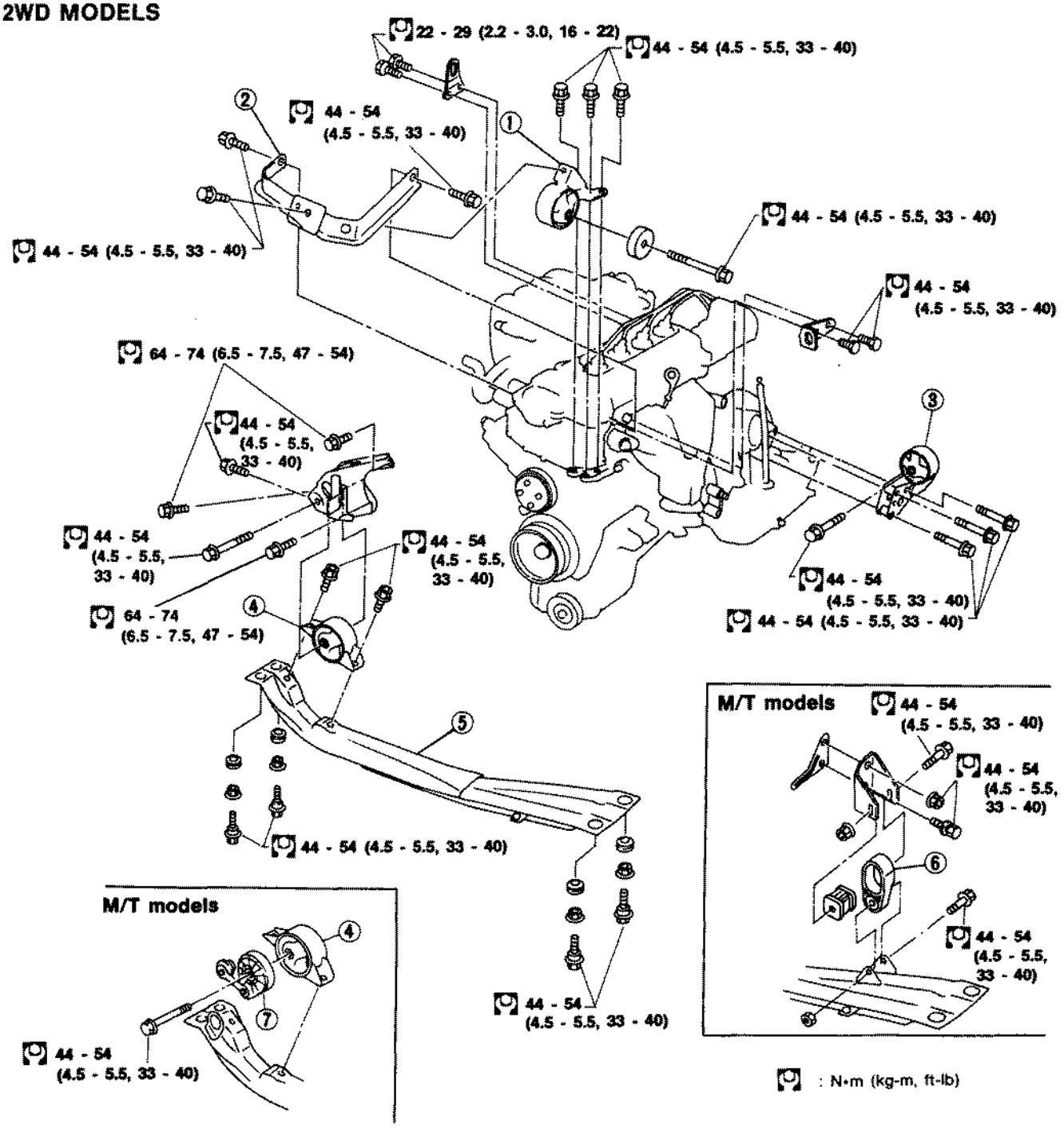
Unit: mm (in)

	For adjusting		For checking
	Hot	Cold*	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 clearance are adjusted to cold specifications, check that the clearances satisfy hot specifications and adjust again if necessary.

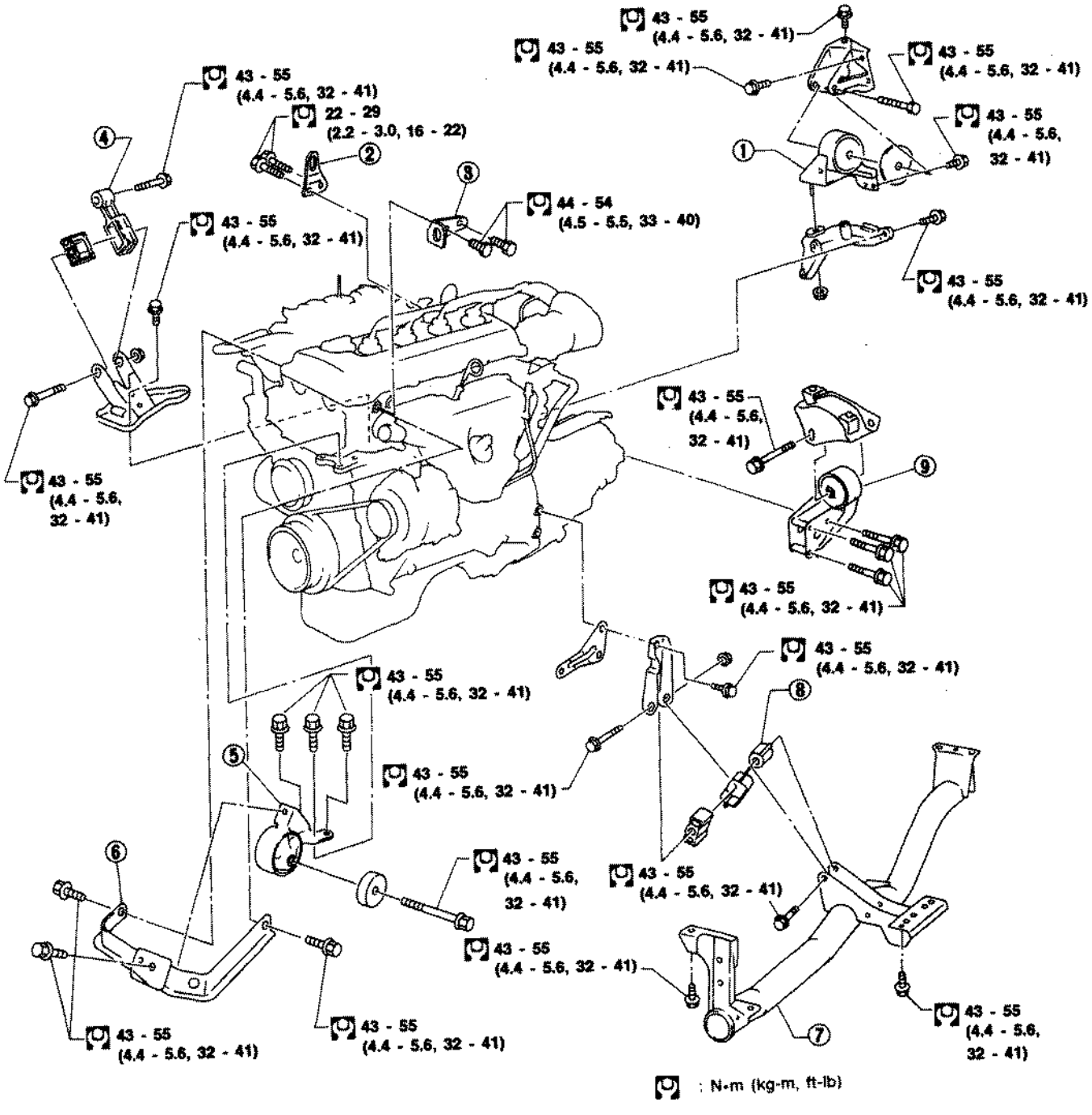
2WD MODELS



SEM422D

① Engine front mounting
② Engine front mounting bracket
③ Engine rear mounting bracket
④ Rear mounting
⑤ Center member
⑥ Buffer
⑦ Roll damper

4WD MODELS



① Rear mounting
② Rear engine slinger
③ Front engine slinger
④ Rear buffer
⑤ Front engine mounting
⑥ Front engine mounting bracket
⑦ Front member
⑧ Front buffer
⑨ Rear engine mounting

WARNING:

a. Situate vehicle on a flat and solid surface.
b. Place chocks at front and back of rear wheels.
c. 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.
d. For safety during subsequent steps, the tension of wires should be slackened against the engine.
e. Before disconnecting fuel hose, release fuel pressure from fuel line. (GA16DE)
Refer to "Releasing Fuel Pressure" in section EF & EC.
f. Be sure to hoist engine and transaxle in a safe manner.
g. For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.

CAUTION:

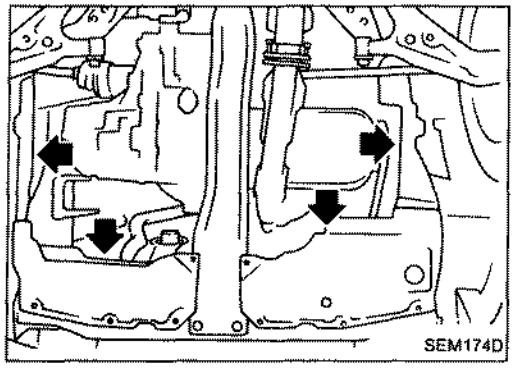
- **When lifting engine, be careful not to strike adjacent parts, especially accelerator wire casing, brake lines, and brake master cylinder.**
- **In hoisting the engine, always use engine slingers in a safe manner.**
- **In removing drive shaft, be careful not to damage grease seal of transaxle.**

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.
7. Remove the following parts:

- Right and left front tires



- Under covers
- Splash covers
- Brake caliper assembly
  : 72 - 97 N·m
  (7.3 - 9.9 kg-m, 53 - 72 ft-lb)

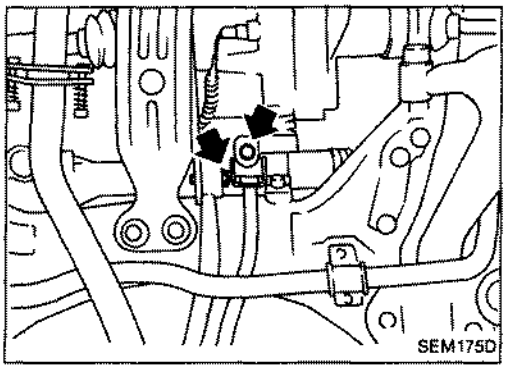
Brake hose does not need to be disconnected from brake caliper assembly.
Never depress brake pedal.

- Disconnect tie-rod ball joint (R.H. & L.H.).
  : 29 - 39 N·m
  (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

Removal (Cont'd)

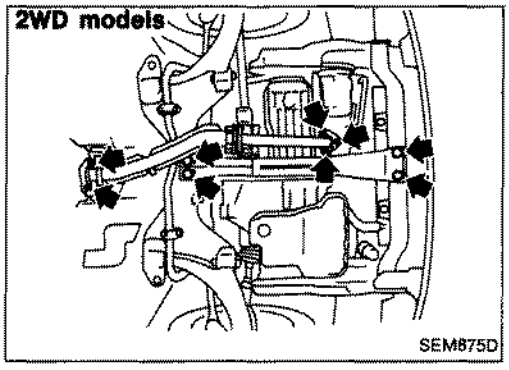
- R.H. & L.H. drive shaft

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

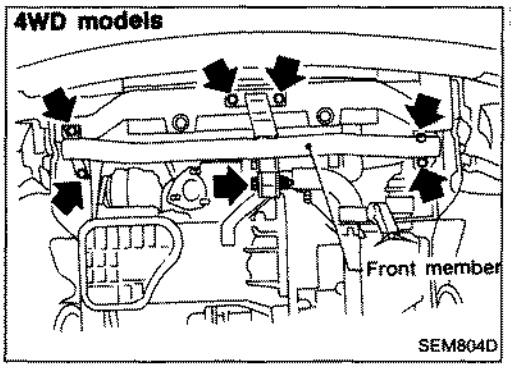


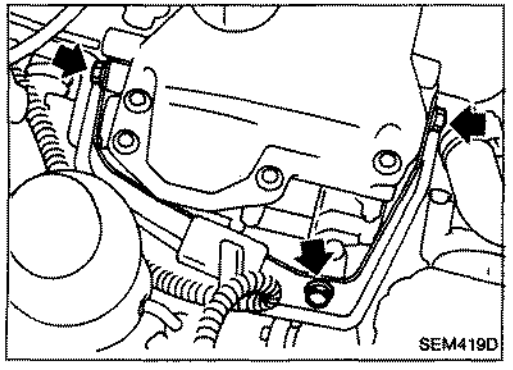
- Disconnect control rod and support rod from transaxle. (M/T models)

  Control rod:
  : 14 - 18 N·m (1.4 - 1.8 kg-m, 10 - 13 ft-lb)
  Support rod:
  : 36 - 49 N·m (3.7 - 5.0 kg-m, 27 - 36 ft-lb)
- Disconnect control cable from transaxle. (A/T models)



- Center member (2WD models)
- Front member (4WD models)
- Front exhaust tube
- Stabilizer
- Radiator fan
- Radiator
- Propeller shaft (4WD models)





- Front mounting bracket
- Power steering pump from engine

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

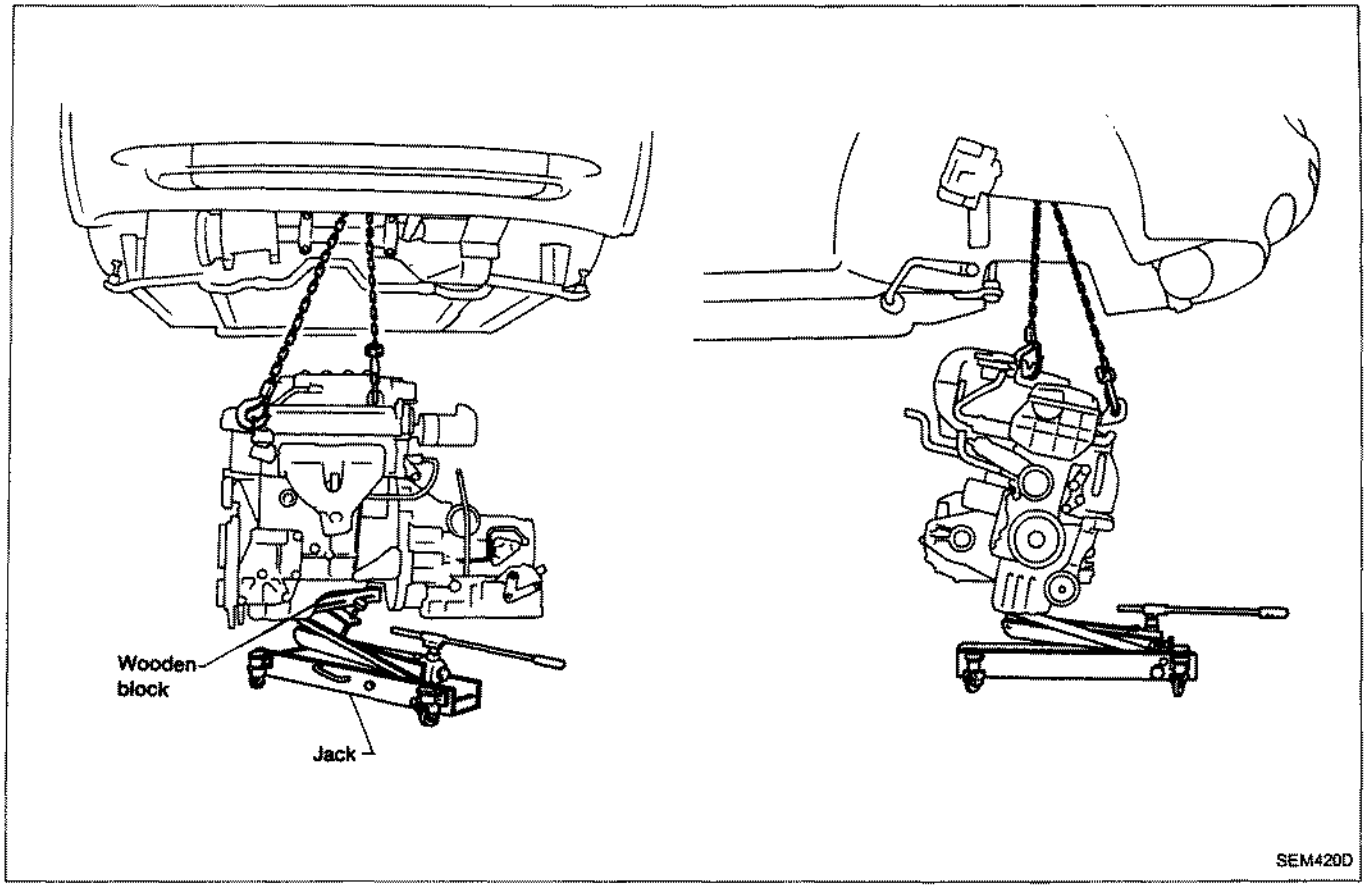
- Remove air duct and disconnect wires, harness, pipes, hoses and so on.

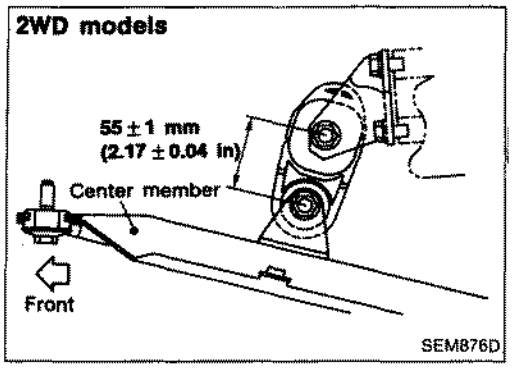
8. Lift up engine slightly and disconnect or remove all engine mountings.

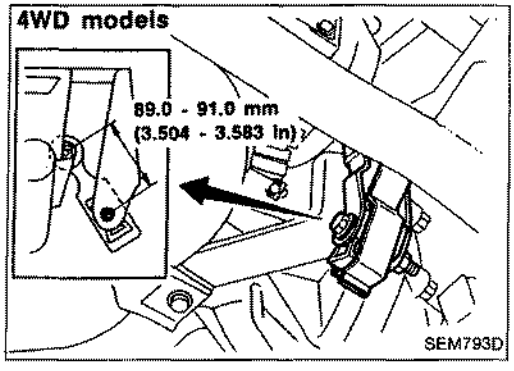
When lifting engine, be careful not to hit it against adjacent parts, especially against brake tubes and brake master cylinder.

Removal (Cont'd)

9. Remove engine with transaxle as shown. (2WD models)
   Remove engine with transaxle and transfer. (4WD models)



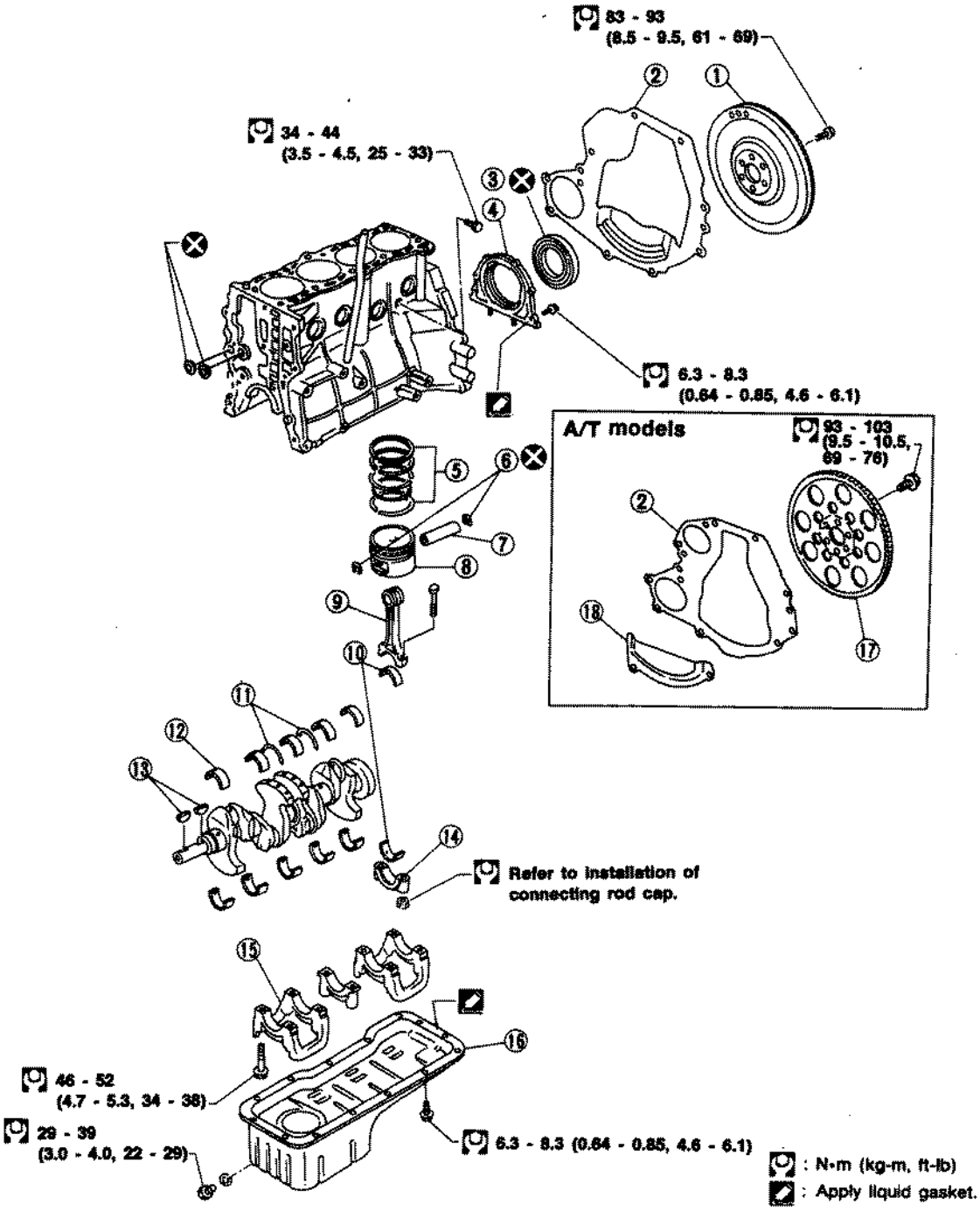




Installation

When installing the engine, adjust the height of buffer rod as shown. (For M/T)

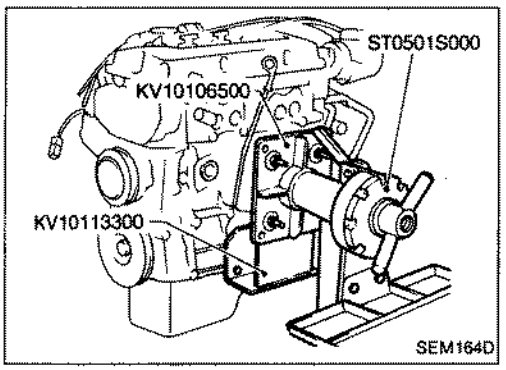
- Installation is the reverse order of removal.



① Flywheel
② Rear plate
③ Rear oil seal
④ Rear oil seal retainer
⑤ Piston ring
⑥ Snap ring
⑦ Piston pin
⑧ Piston
⑨ Connecting rod
⑩ Connecting bearing
⑪ Thrust bearing
⑫ Main bearing
⑬ Key
⑭ Connecting rod cap
⑮ Bearing beam cap
⑯ Oil pan
⑰ Drive plate
⑱ Dust cover

CAUTION:

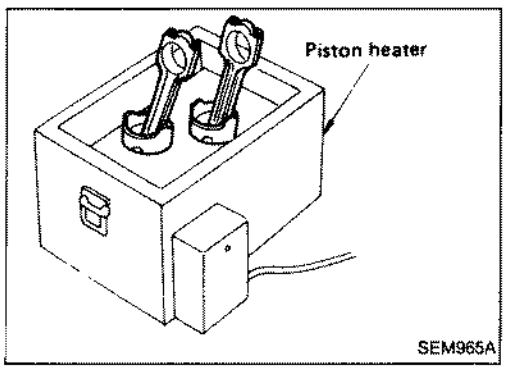
- **When installing sliding parts such as bearings and pistons, be sure to apply engine oil on the sliding surfaces.**
- **Place removed parts such as bearings and bearing caps in their proper order and direction.**
- **When tightening connecting rod bolts and main bearing cap bolts, apply engine oil to thread portion of bolts and seating surface of nuts.**



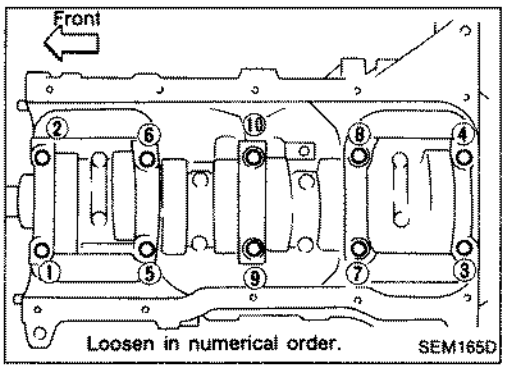
Disassembly

PISTON AND CRANKSHAFT

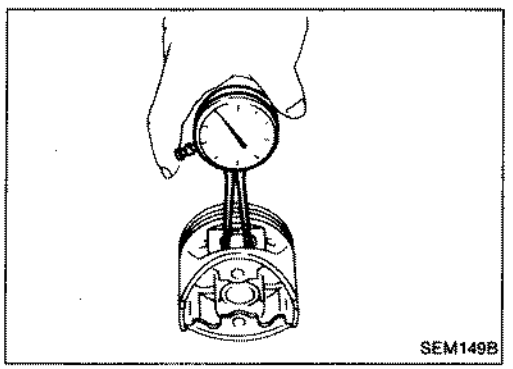
1. Place engine on a work stand.
2. Drain coolant and oil.
3. Remove timing chain.
   Refer to "Removal" in "TIMING CHAIN".



4. Remove pistons with connecting rod.
- 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. Remove bearing caps and crankshaft.
- **Before removing bearing caps, measure crankshaft end play.**
- **Bolts should be loosened in two or three steps.**

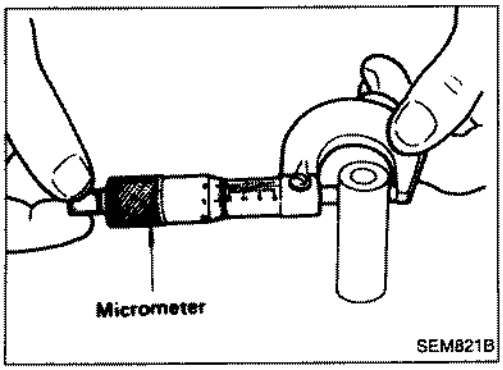


Inspection

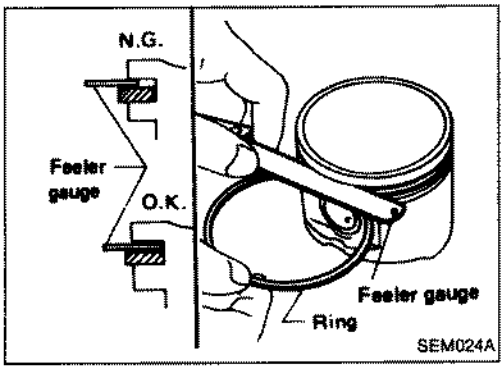
PISTON AND PISTON PIN CLEARANCE

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

Inspection (Cont'd)



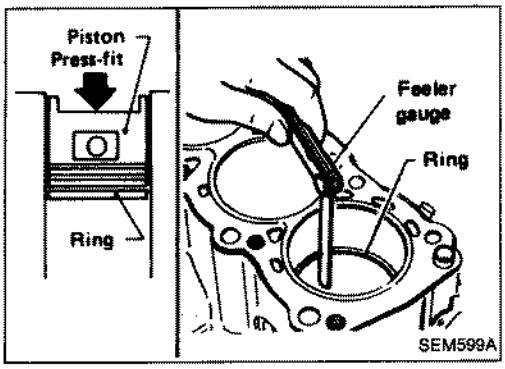
2. Measure outer diameter of piston pin "Dp".
   Standard diameter "Dp":
   18.989 - 19.001 mm (0.7476 - 0.7481 in)
3. Calculate piston pin clearance.
   dp – Dp = –0.004 to 0 mm (–0.0002 to 0 in)
   If it exceeds the above value, replace piston assembly with pin.



PISTON RING SIDE CLEARANCE

Side clearance:
Top ring
0.040 - 0.080 mm (0.0016 - 0.0031 in)
2nd ring
0.030 - 0.070 mm (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.

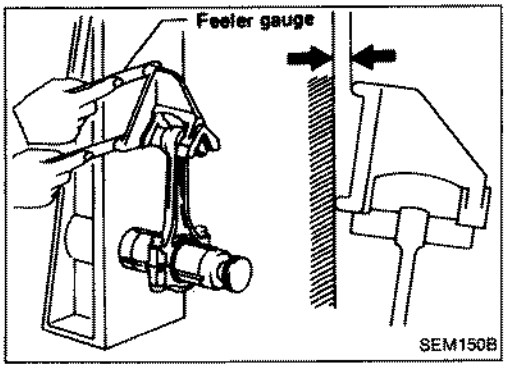


PISTON RING END GAP

End gap:
Top ring
0.20 - 0.35 mm (0.0079 - 0.0138 in)
2nd ring
0.37 - 0.52 mm (0.0146 - 0.0205 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, rebore cylinder and use oversized piston and piston rings.

Refer to S.D.S.



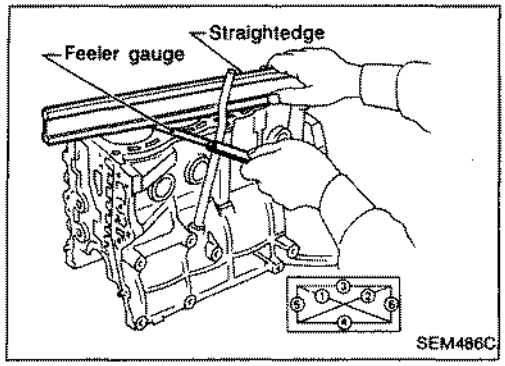
CONNECTING ROD BEND AND TORSION

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)

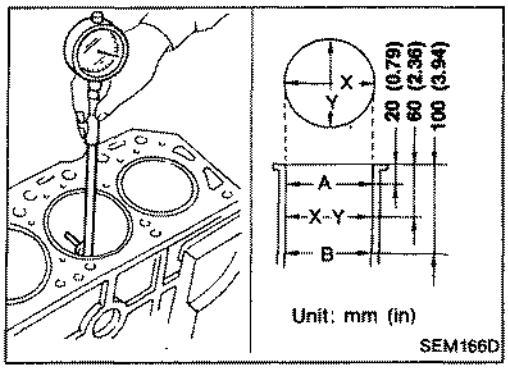
CYLINDER BLOCK DISTORTION AND WEAR



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.



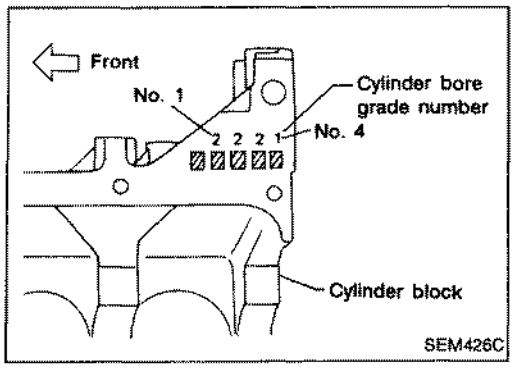
PISTON-TO-BORE CLEARANCE

1. Using a bore gauge, measure cylinder bore for wear, out-of-round and taper.
   Standard inner diameter:

Unit: mm (in)

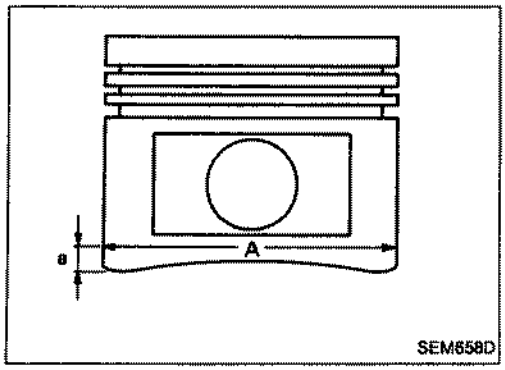
GA13DS	GA14DS	GA16DS & GA16DE
71.000 - 71.030 (2.7953 - 2.7965)	73.600 - 73.630 (2.8976 - 2.8988)	76.000 - 76.030 (2.9921 - 2.9933)

   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)
2. Check for scratches and seizure. If seizure is found, hone it.



- **If both cylinder block and piston are replaced with new ones, select piston of the same grade number punched on cylinder block lower surface.**

Inspection (Cont'd)



3. Measure piston skirt diameter.
   Piston diameter "A":
   Refer to S.D.S.
   Measuring point "a" (Distance from the bottom):
   9.5 mm (0.374 in)
4. Check that piston-to-bore clearance is within specification.
   Piston-to-bore clearance "B":
   0.015 - 0.035 mm (0.0006 - 0.0014 in)
5. Determine piston oversize according to amount of cylinder wear.

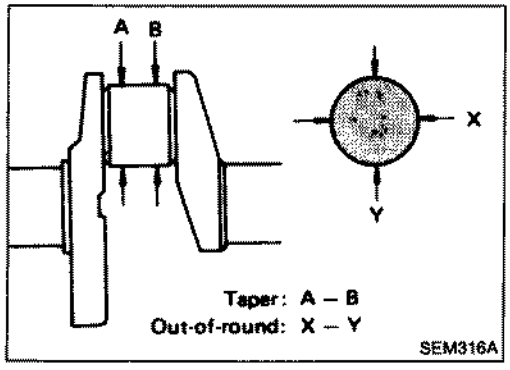
Oversize pistons are available for service. Refer to S.D.S.

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 to prevent distortion of cylinder bores 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.

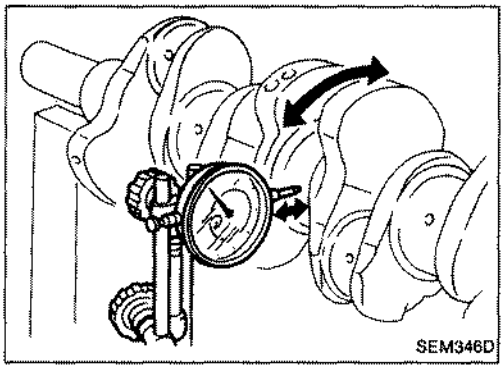
- **Measurement should be done after cylinder bore cools down.**



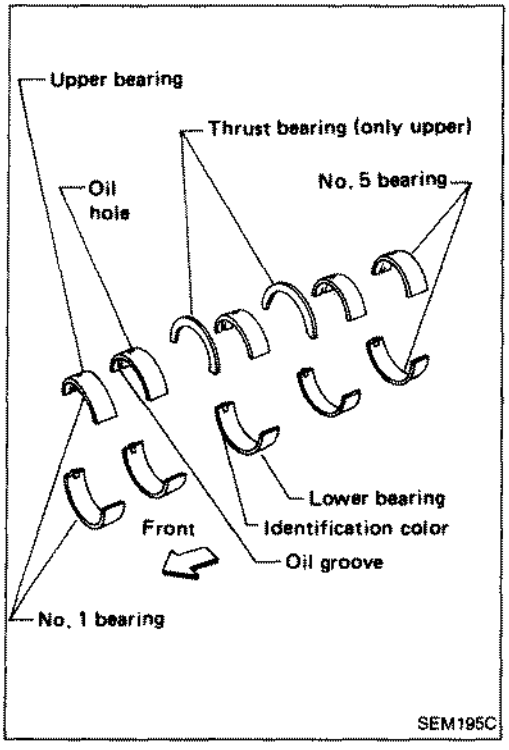
CRANKSHAFT

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):
   Less than 0.005 mm (0.0002 in)
   Taper (A – B):
   Less than 0.002 mm (0.0001 in)

Inspection (Cont'd)



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



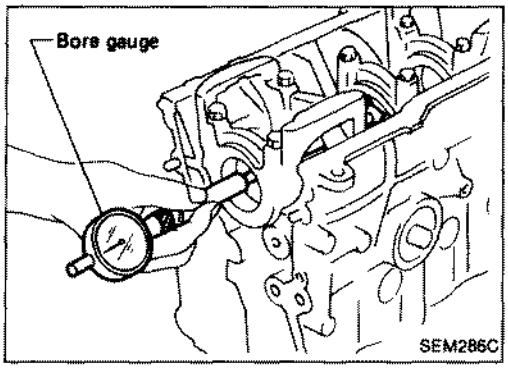
BEARING CLEARANCE

- Either of the following two methods may be used, however, method "A" gives more reliable results and is preferable.

Method A (Using bore gauge & micrometer)

Main bearing

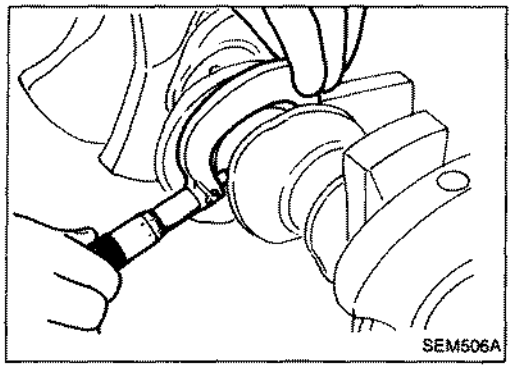
1. Set main bearings in their proper positions on cylinder block and main bearing cap.



2. Install main bearing cap to cylinder block.

Tighten all bolts in correct order in two or three stages.

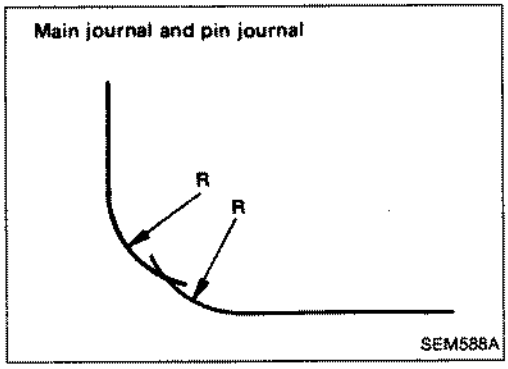
3. Measure inner diameter "A" of each main bearing.



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.

Inspection (Cont'd)

7. If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing.



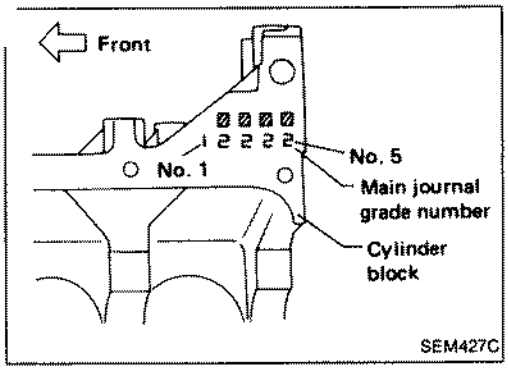
When grinding crank pin and crank journal:

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)

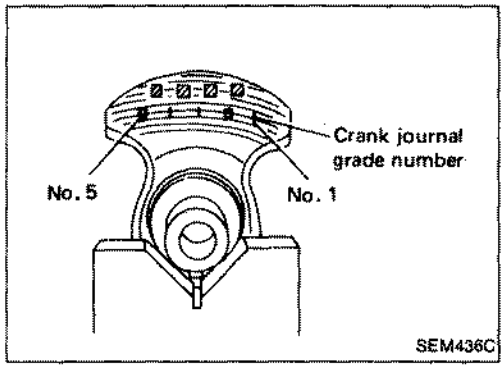
Refer to S.D.S. for standard bearing clearance and available spare parts.

8. If crankshaft, cylinder block or main bearing is reused again, measure main bearing clearance. If crankshaft, cylinder block and main bearings are replaced with new ones, it is necessary to 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)

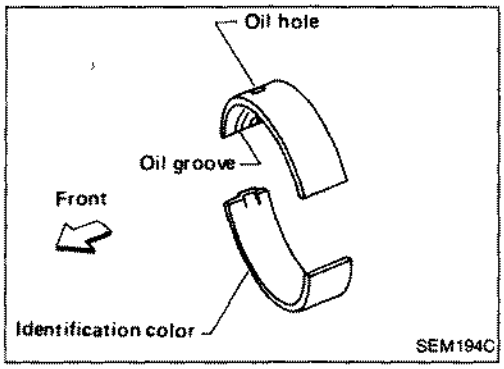


b. Grade number of each crankshaft main journal is punched on the respective crankshaft. These numbers are punched in either Arabic or Roman numerals.

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

Main bearing grade color:

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



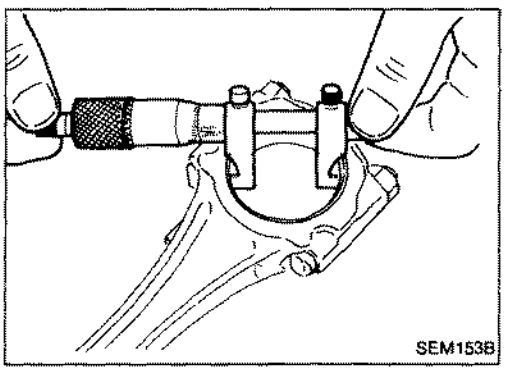
For example:
Main journal grade number: 1
Crankshaft journal grade number: 2
Main bearing grade number = 1 + 2 = Yellow

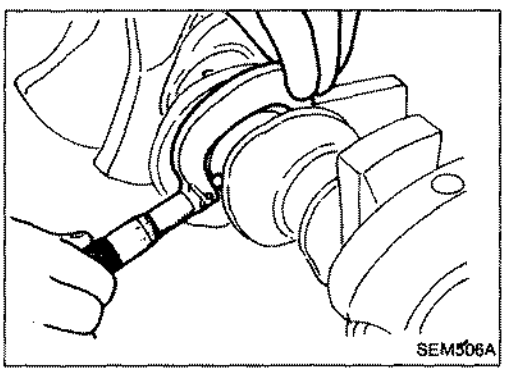
Connecting rod bearing (Big end)

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

Tighten bolts to the specified torque.

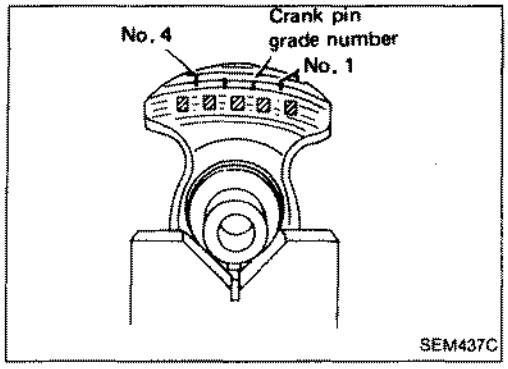
3. Measure inner diameter "C" of each bearing.





4. Measure outer diameter "Dp" of each crankshaft pin journal.
5. Calculate connecting rod bearing clearance.
   Connecting rod bearing clearance = C – Dp
   Standard:
   0.010 - 0.035 mm (0.0004 - 0.0014 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".

Inspection (Cont'd)

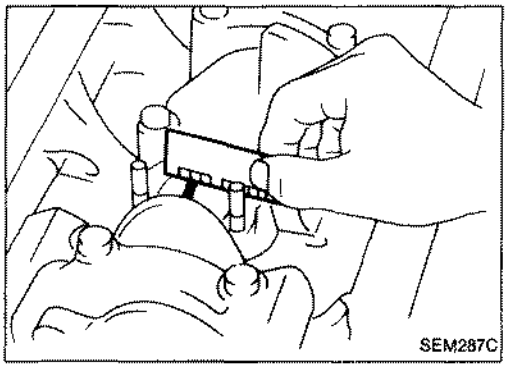


8. If bearing, crankshaft or connecting rod is replaced with a new one, select connecting rod bearing according to the following table.

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	—
1	Brown
2	Green



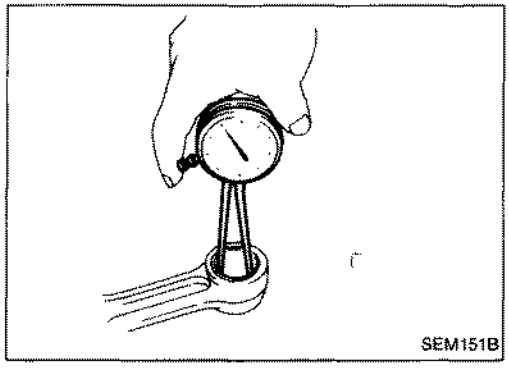
Method B (Using plastigage)

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.



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

Connecting rod bushing clearance = C – Dp

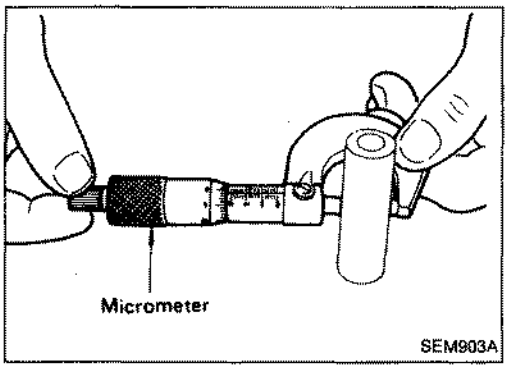
Standard:

0.005 - 0.017 mm (0.0002 - 0.0007 in)

Limit:

0.023 mm (0.0009 in)

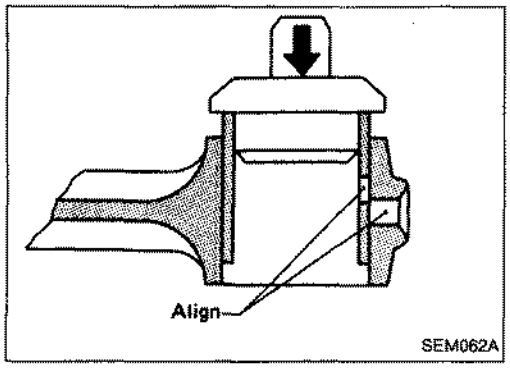
If it exceeds the limit, replace connecting rod assembly or connecting rod bushing and/or piston pin.



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.

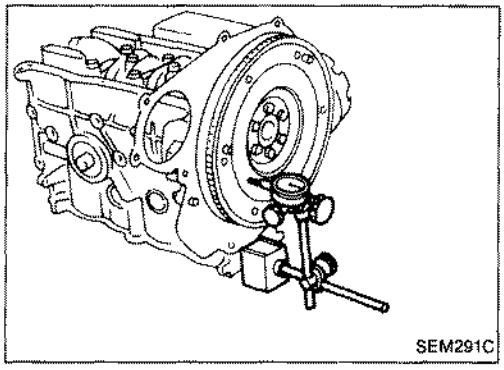


2. After driving in small end bushing, ream the bushing so that clearance between connecting rod busing and piston pin achieves specified value.

Clearance between connecting rod bushing and piston pin:

0.005 - 0.017 mm (0.0002 - 0.0007 in)

Inspection (Cont'd)


SEM291C

FLYWHEEL RUNOUT

Runout (Total indicator reading):

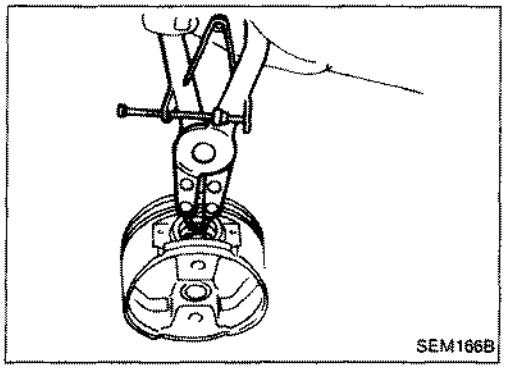
Flywheel

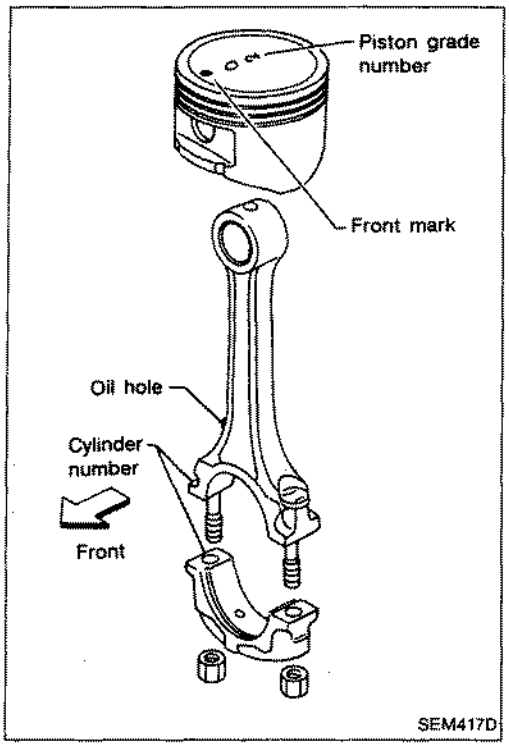
Less than 0.15 mm (0.0059 in)

Assembly

PISTON

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

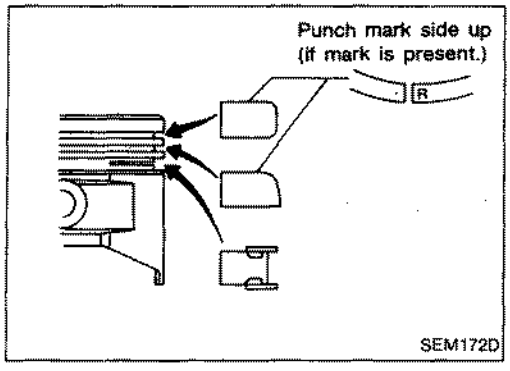

SEM166B



SEM417D

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.**



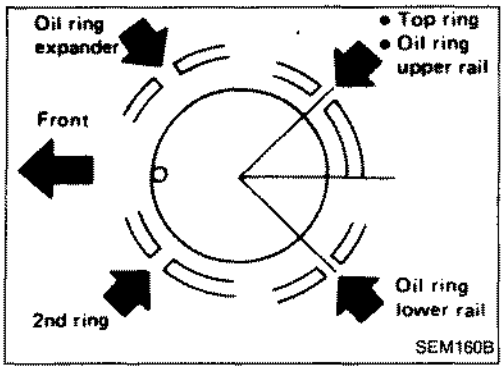
SEM172D

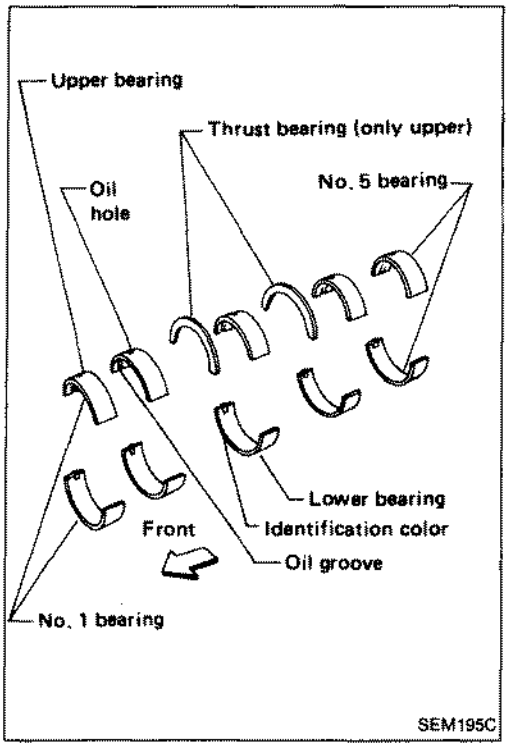
3. Set piston rings as shown.

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.**

Assembly (Cont'd)

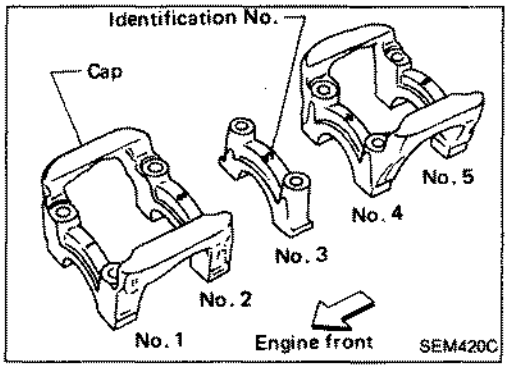


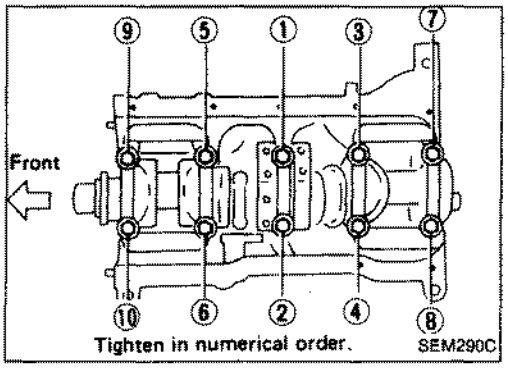


CRANKSHAFT

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".**

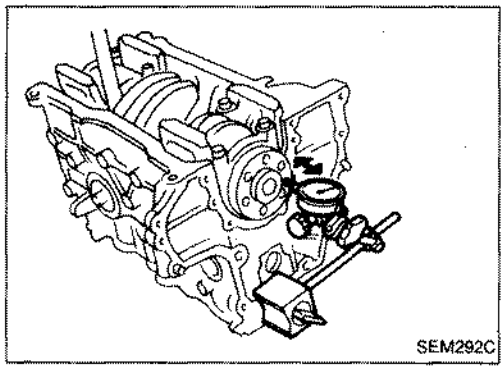




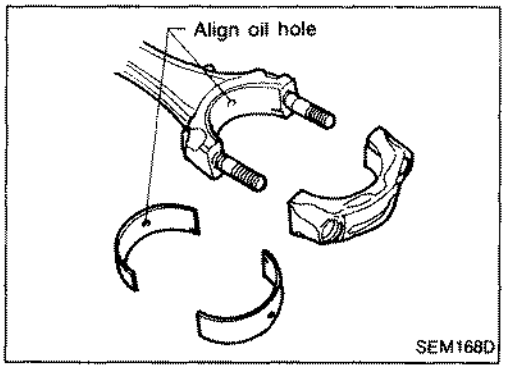
2. Install crankshaft and main bearing caps and tighten bolts to the specified torque.

- **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)

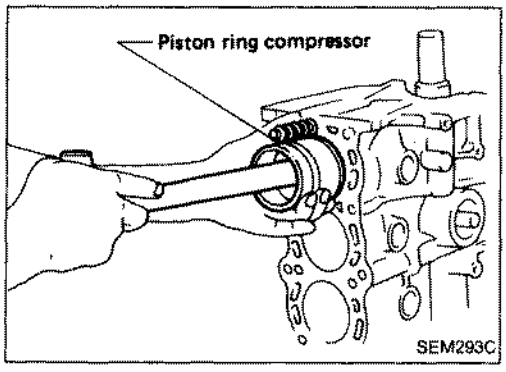

SEM292C

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.



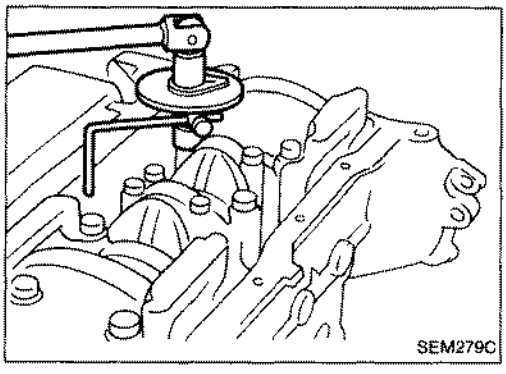
SEM168D

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.

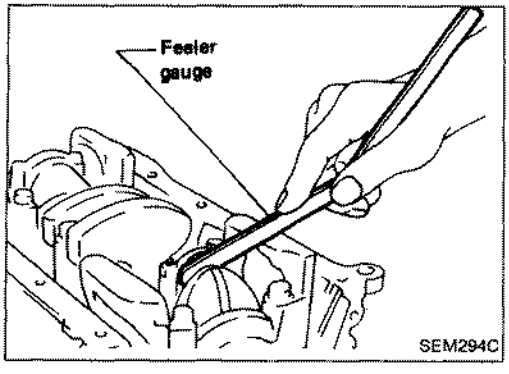


SEM293C

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.**


SEM279C

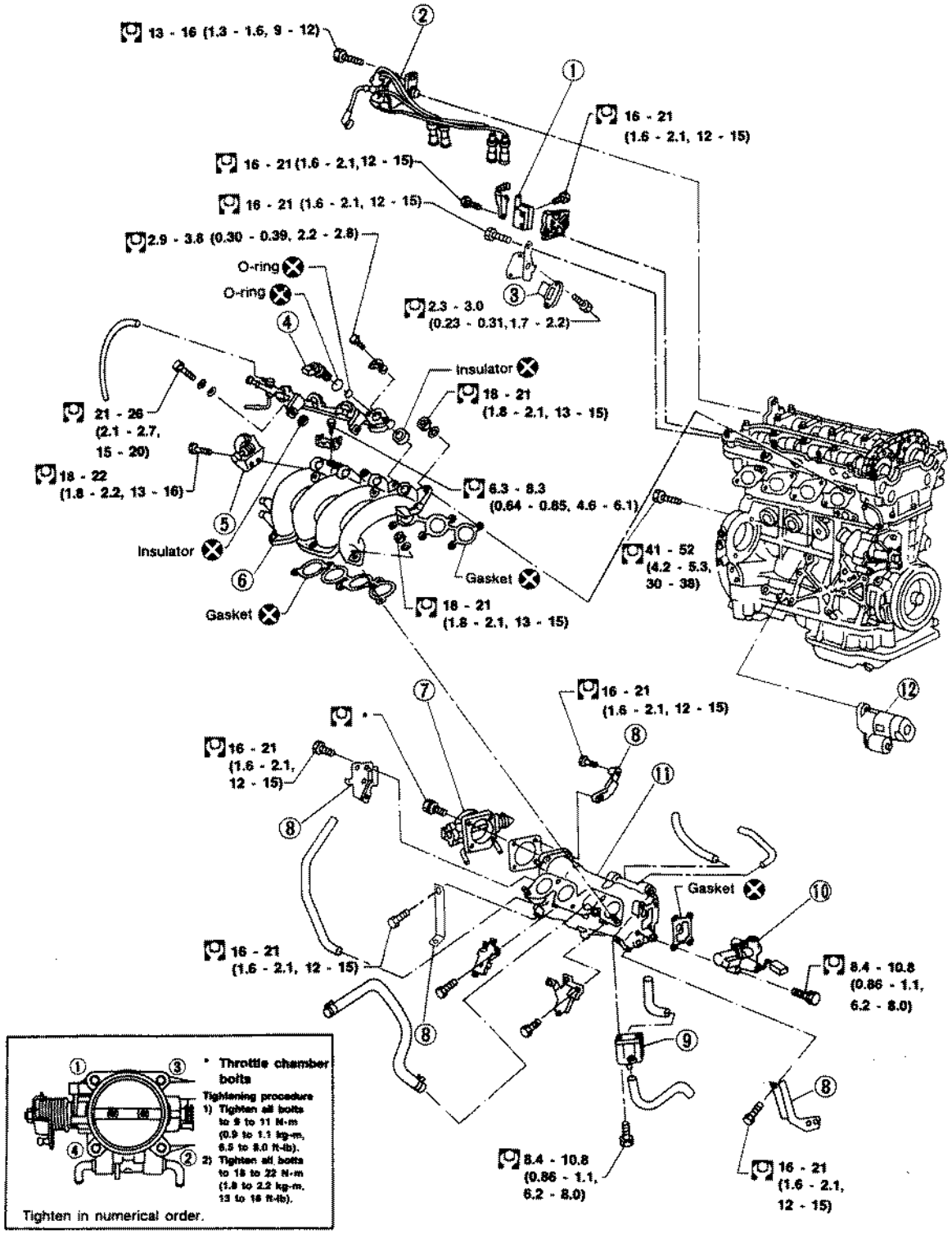
b. Install connecting rod caps.
Tighten connecting rod cap nuts to the specified torque.
: Connecting rod cap nuts
(1) Tighten to 14 to 16 N·m (1.4 to 1.6 kg-m, 10 to 12 ft-lb).
(2) Turn nuts to 35° to 40° degrees clockwise with an angle wrench. If an angle wrench is not available tighten nuts to 23 to 28 N·m (2.3 to 2.9 kg-m, 17 to 21 ft-lb).



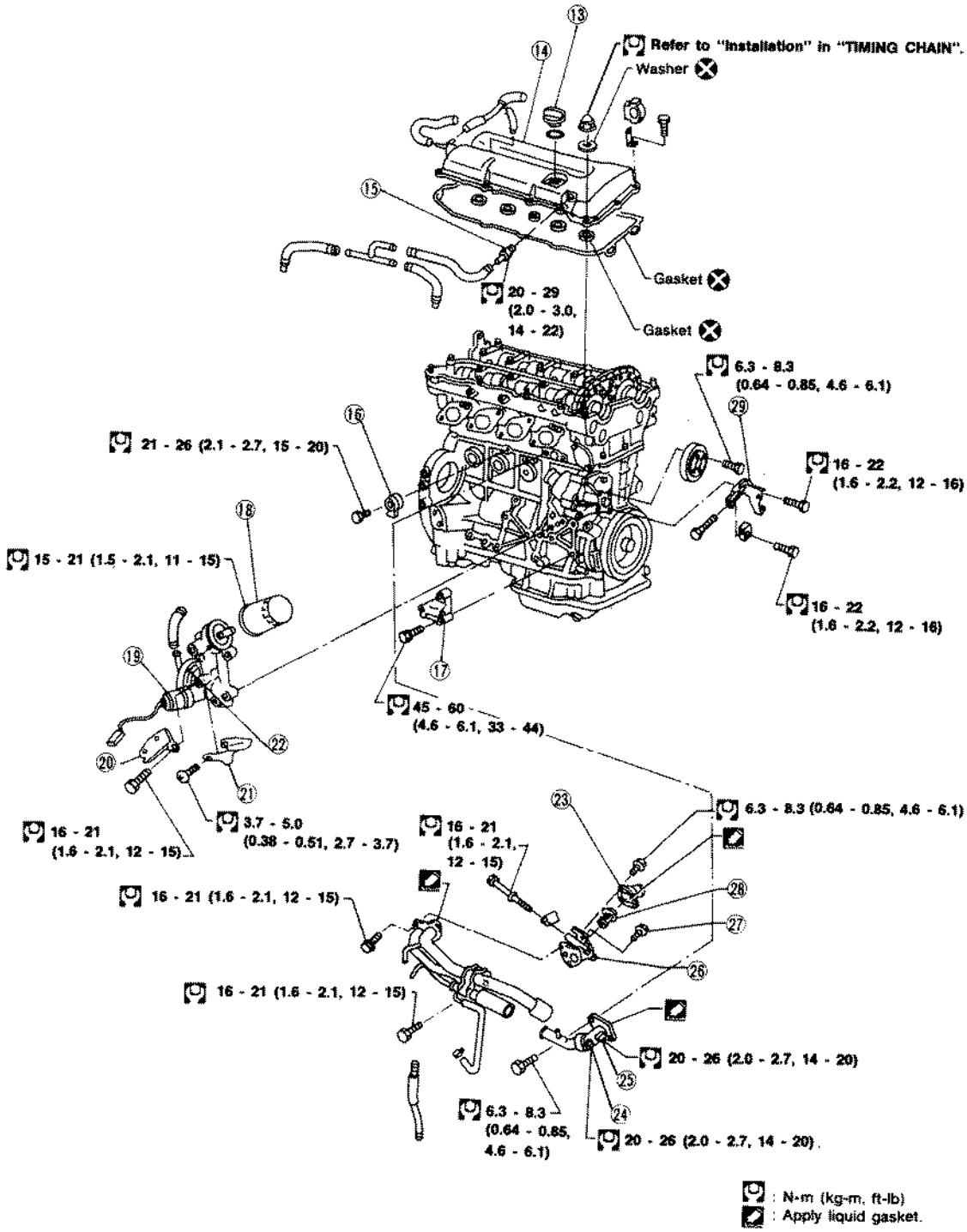
SEM294C

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.

SR20DE



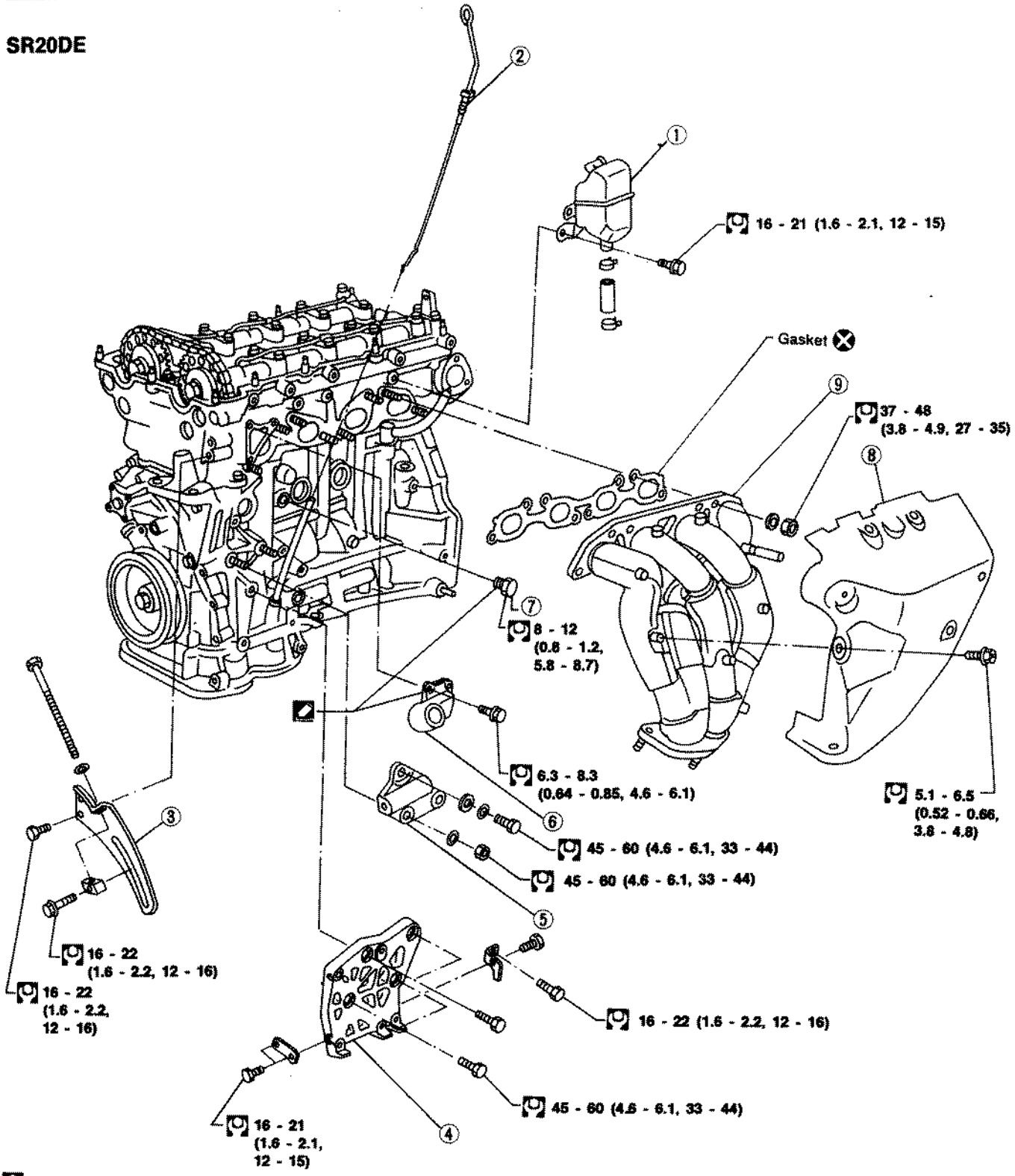
① Ignition coil
② Distributor
③ Power transistor
④ Injector
⑤ Accel-drum unit
⑥ Intake manifold
⑦ Throttle chamber
⑧ Intake manifold supports
⑨ Air regulator
⑩ A.A.C. valve
⑪ Intake manifold collector
⑫ Starter motor



SEM650D

⑬ Oil filter cap
⑭ Rocker cover
⑮ P.C.V. valve
⑯ Detonation sensor
⑰ Power steering oil pump bracket
⑱ Oil filter
⑲ Oil pressure switch
⑳ Intake manifold support
㉑ Oil catcher
㉒ Oil cooler
㉓ Water inlet
㉔ Thermal transmitter
㉕ Engine temperature sensor
㉖ Thermostat housing
㉗ Air relief plug
㉘ Thermostat
㉙ Power steering oil pump adjusting bar

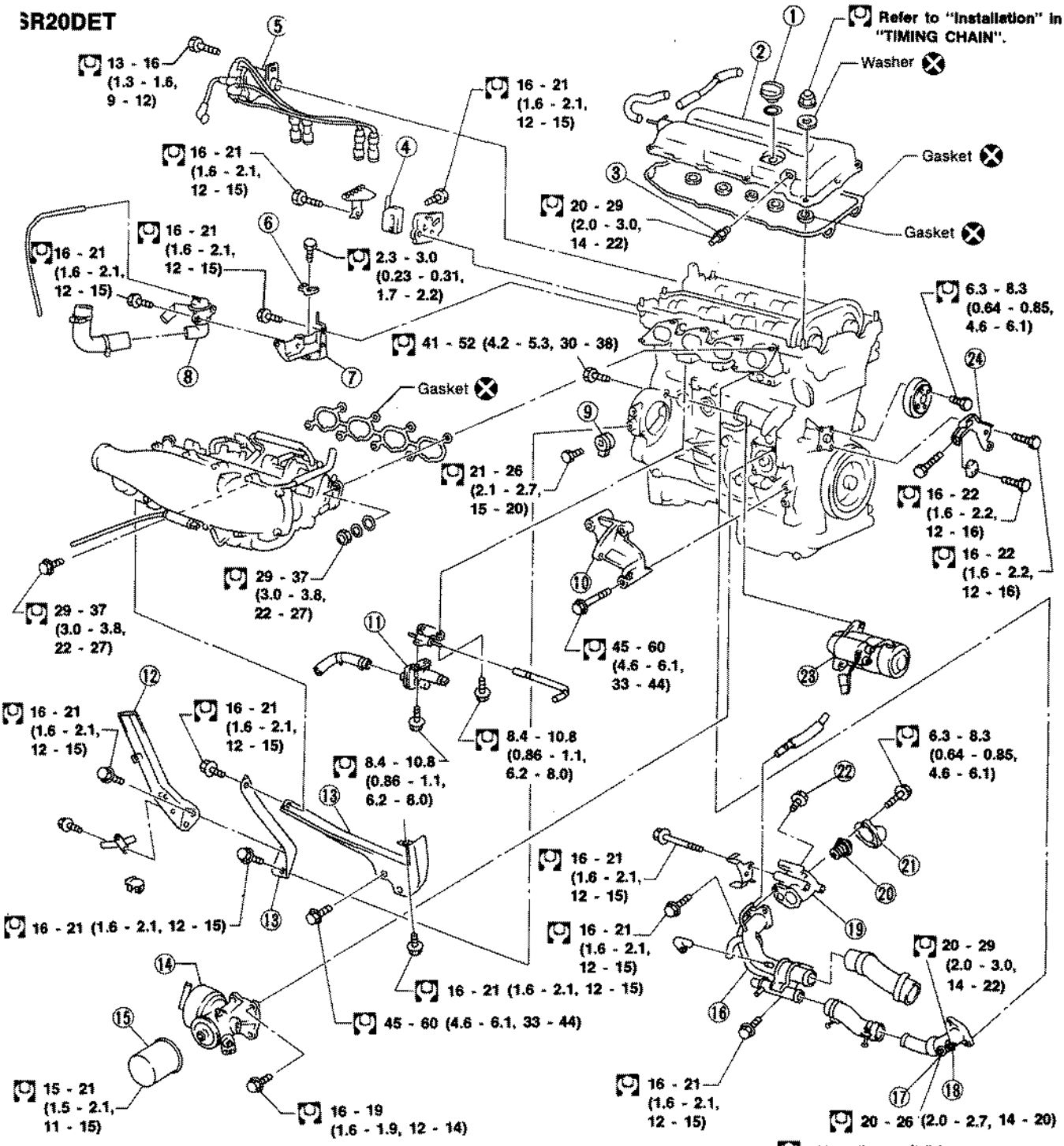
SR20DE



: N•m (kg-m, ft-lb)
: Apply liquid gasket.

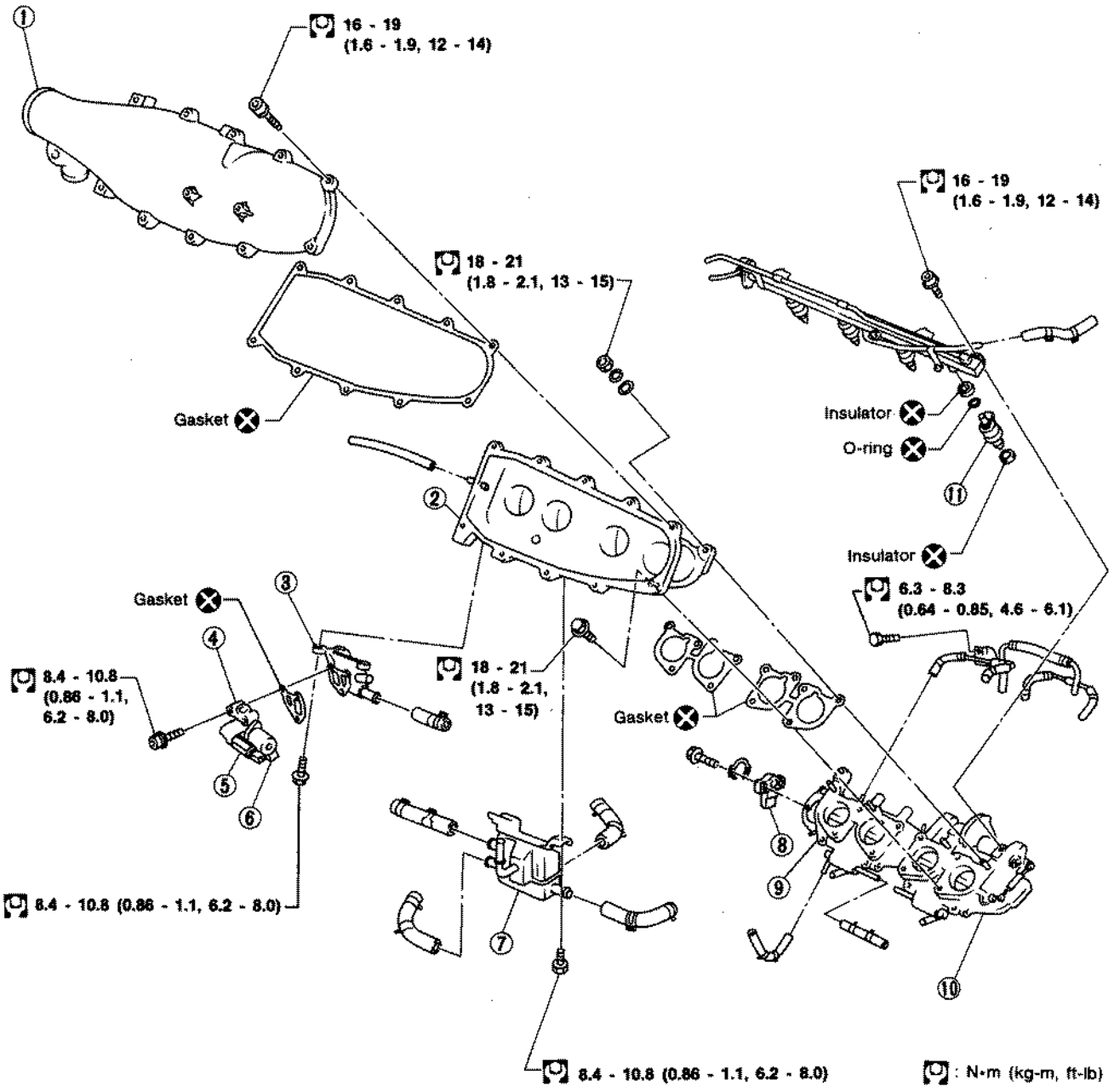
SEM851D

① Oil separator
② Oil level gauge
③ Alternator adjusting bar
④ Compressor bracket
⑤ Alternator bracket
⑥ Water outlet
⑦ Drain plug
⑧ Exhaust manifold cover
⑨ Exhaust manifold



① Oil filler cap
② Rocker cover
③ P.C.V. valve
④ Ignition coil
⑤ Distributor
⑥ Power transistor
⑦ Recirculation valve bracket
⑧ Recirculation valve
⑨ Detonation sensor
⑩ Power steering oil pump bracket
⑪ Air regulator
⑫ Intercooler support bracket
⑬ Intake manifold supports
⑭ Oil cooler
⑮ Oil filter
⑯ Water pipe
⑰ Thermal transmitter
⑱ Engine temperature sensor
⑲ Thermostat housing
⑳ Thermostat
㉑ Water inlet
㉒ Air relief plug
㉓ Starter motor
㉔ Power steering oil pump adjusting bar

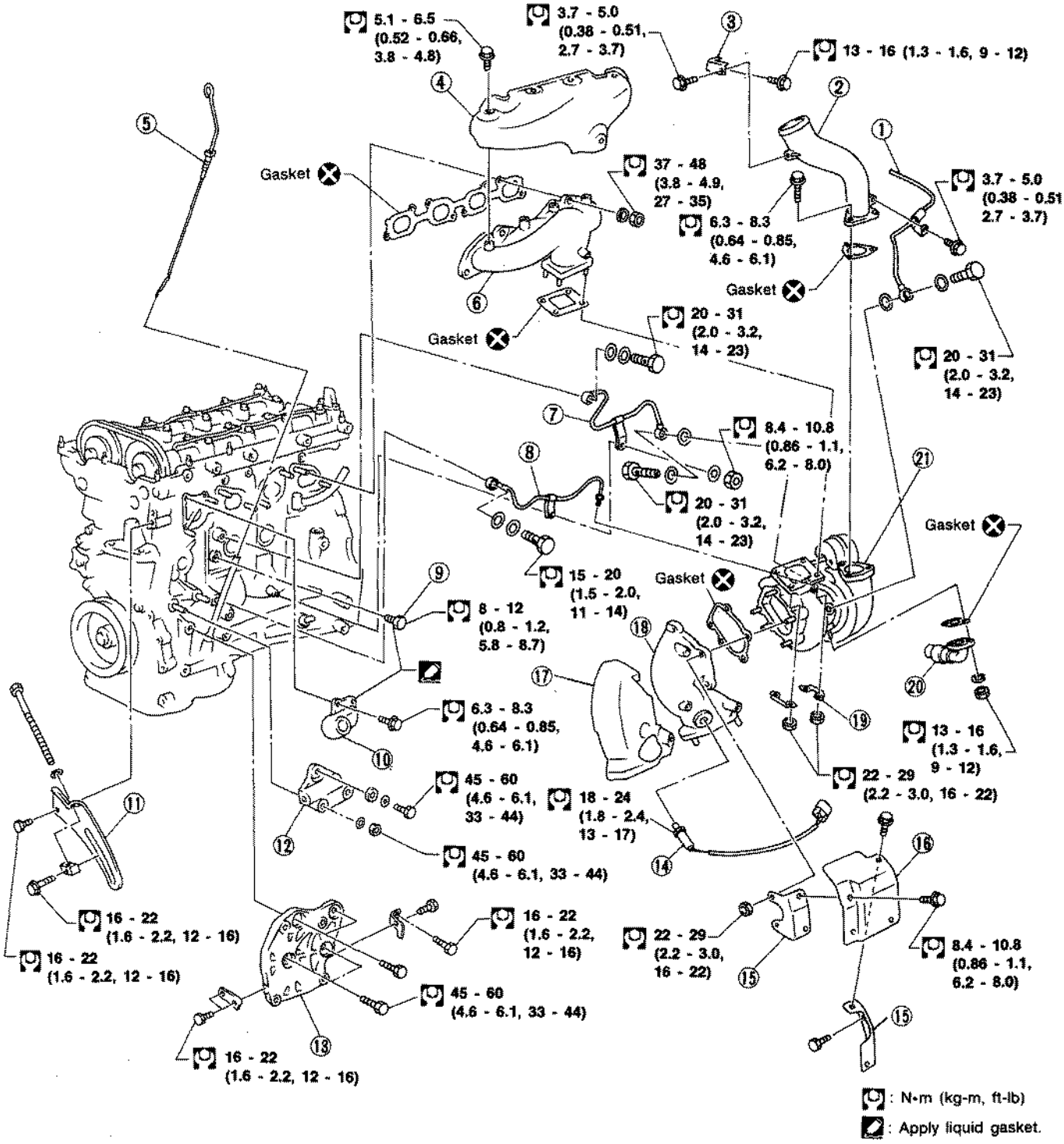
SR20DET



SEM760D

① Intake manifold collector
② Intake manifold
③ I.A.A. unit bracket
④ I.A.A. unit
⑤ F.I.C.D. solenoid valve
⑥ A.A.C. valve
⑦ Air chamber
⑧ Throttle sensor
⑨ Rear throttle chamber
⑩ Front throttle chamber
⑪ Injector

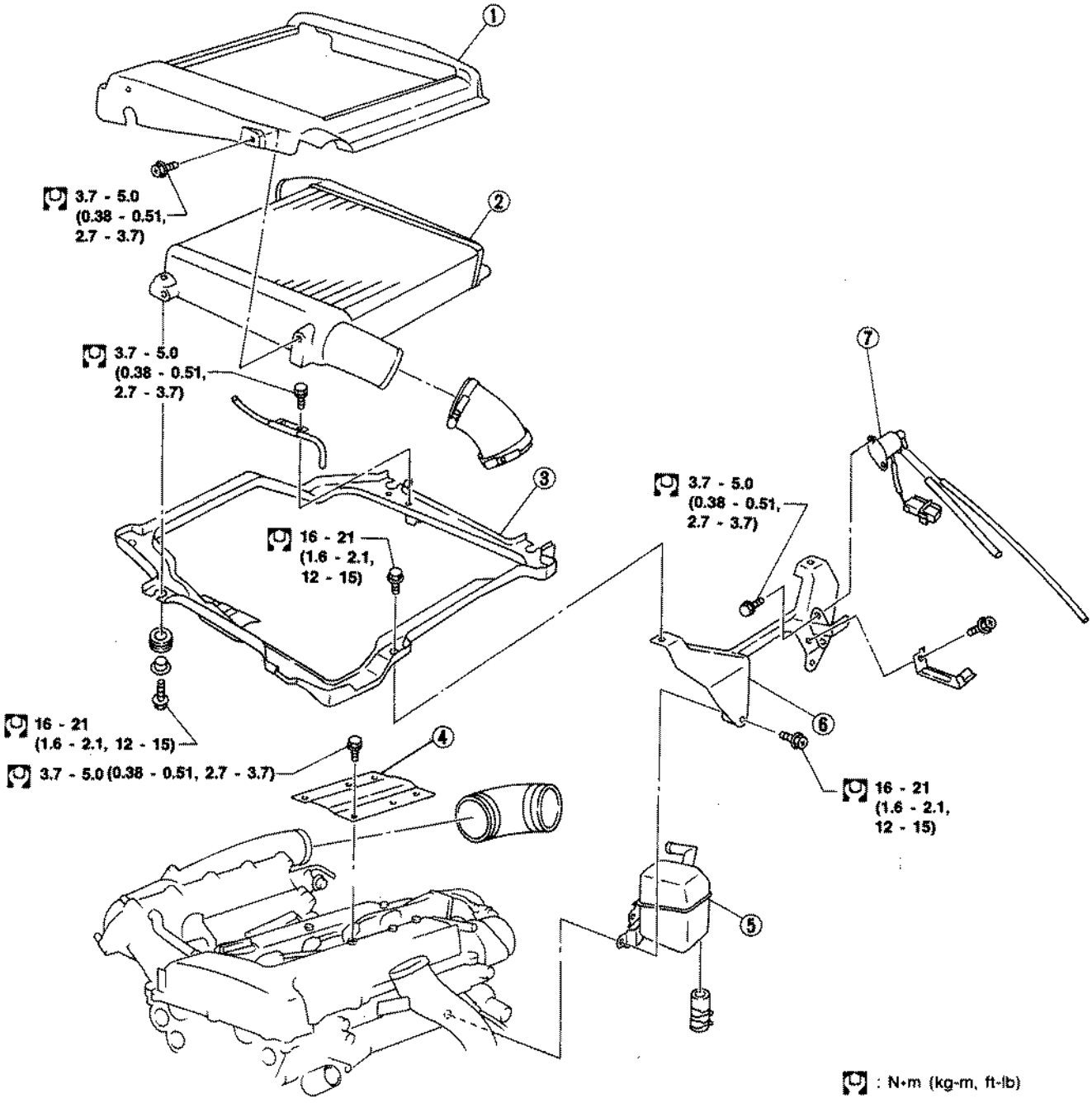
SR20DET



SEM761D

① Water return tube
② Air inlet tube
③ Air inlet tube bracket
④ Exhaust manifold cover
⑤ Oil level gauge
⑥ Exhaust manifold
⑦ Water inlet tube
⑧ Oil inlet tube
⑨ Drain plug
⑩ Water outlet
⑪ Alternator adjusting bar
⑫ Alternator bracket
⑬ Compressor bracket
⑭ Exhaust gas sensor
⑮ Heat insulator brackets
⑯ Heat insulator
⑰ Exhaust outlet cover
⑱ Exhaust outlet
⑲ Lock plate
⑳ Oil return tube
㉑ Turbocharger

SR20DET

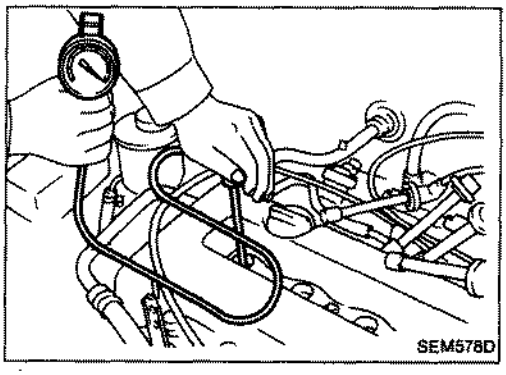


SEM762D

① Intercooler cover
② Intercooler
③ Intercooler support
④ Rocker cover ornament
⑤ Oil separator
⑥ Intercooler support bracket
⑦ Recirculation valve control solenoid valve

Measurement of Compression Pressure

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


SEM578D

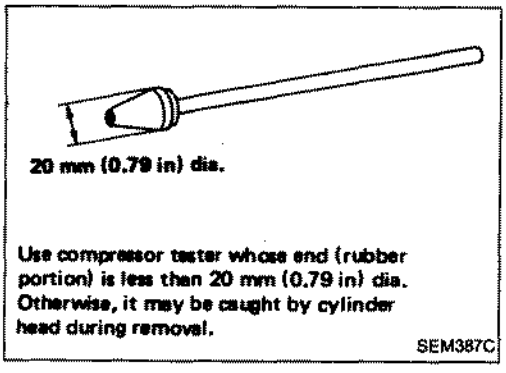
6. Attach a compression tester to No. 1 cylinder.
7. Depress accelerator pedal fully to keep throttle valve wide open.
8. Crank engine and record highest gauge indication.
9. Repeat the measurement on each cylinder as shown above.

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

Compression pressure:

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

	SR20DE	SR20DET
Standard	1,275 (12.75, 13.0, 185)	1,128 (11.28, 11.5, 164)
Minimum	1,079 (10.79, 11.0, 156)	932 (9.32, 9.5, 135)
Difference limit between cylinders	98 (0.98, 1.0, 14)	



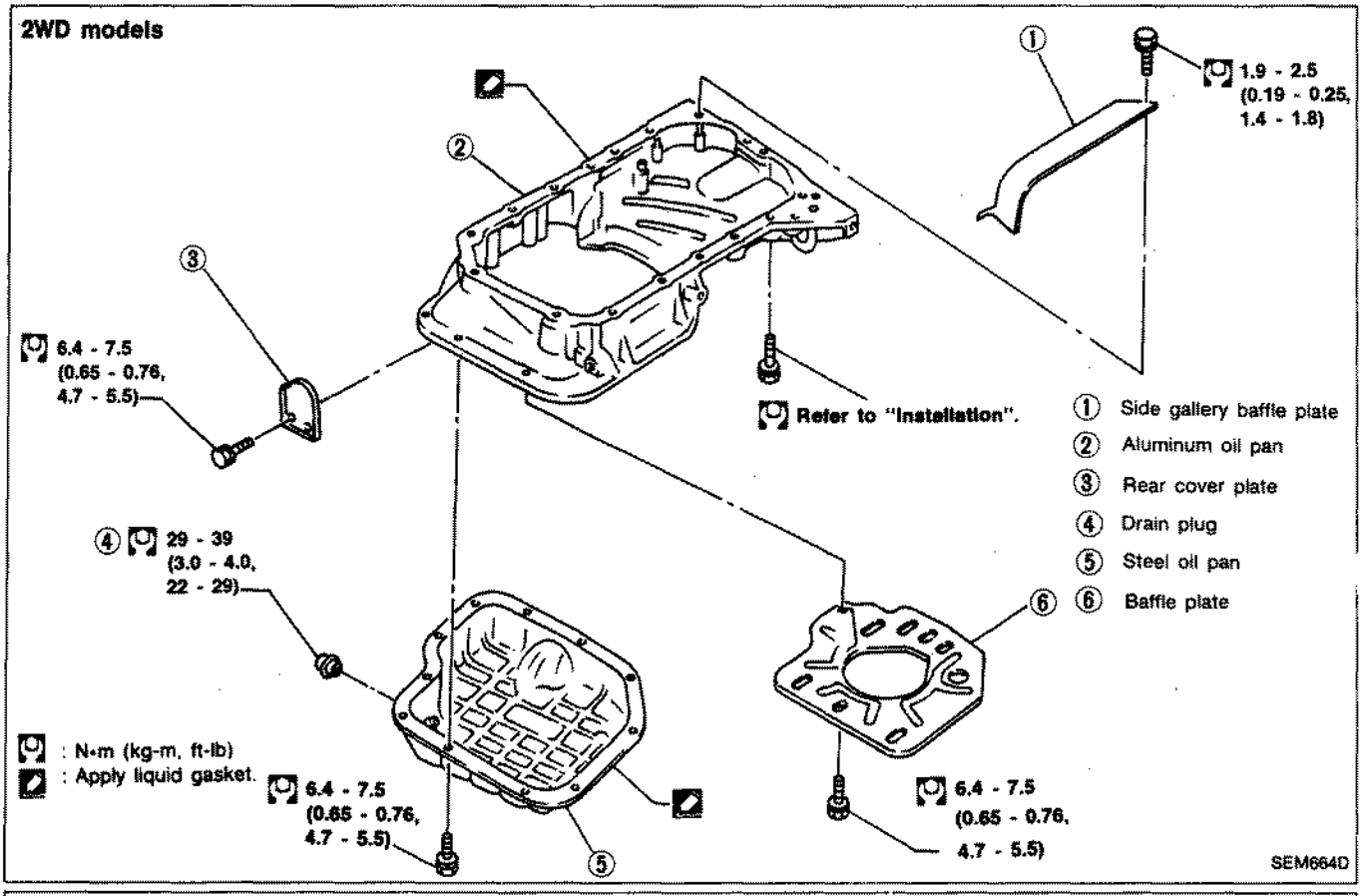
Use compressor tester whose end (rubber portion) is less than 20 mm (0.79 in) dia. Otherwise, it may be caught by cylinder head during removal.

SEM387C

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

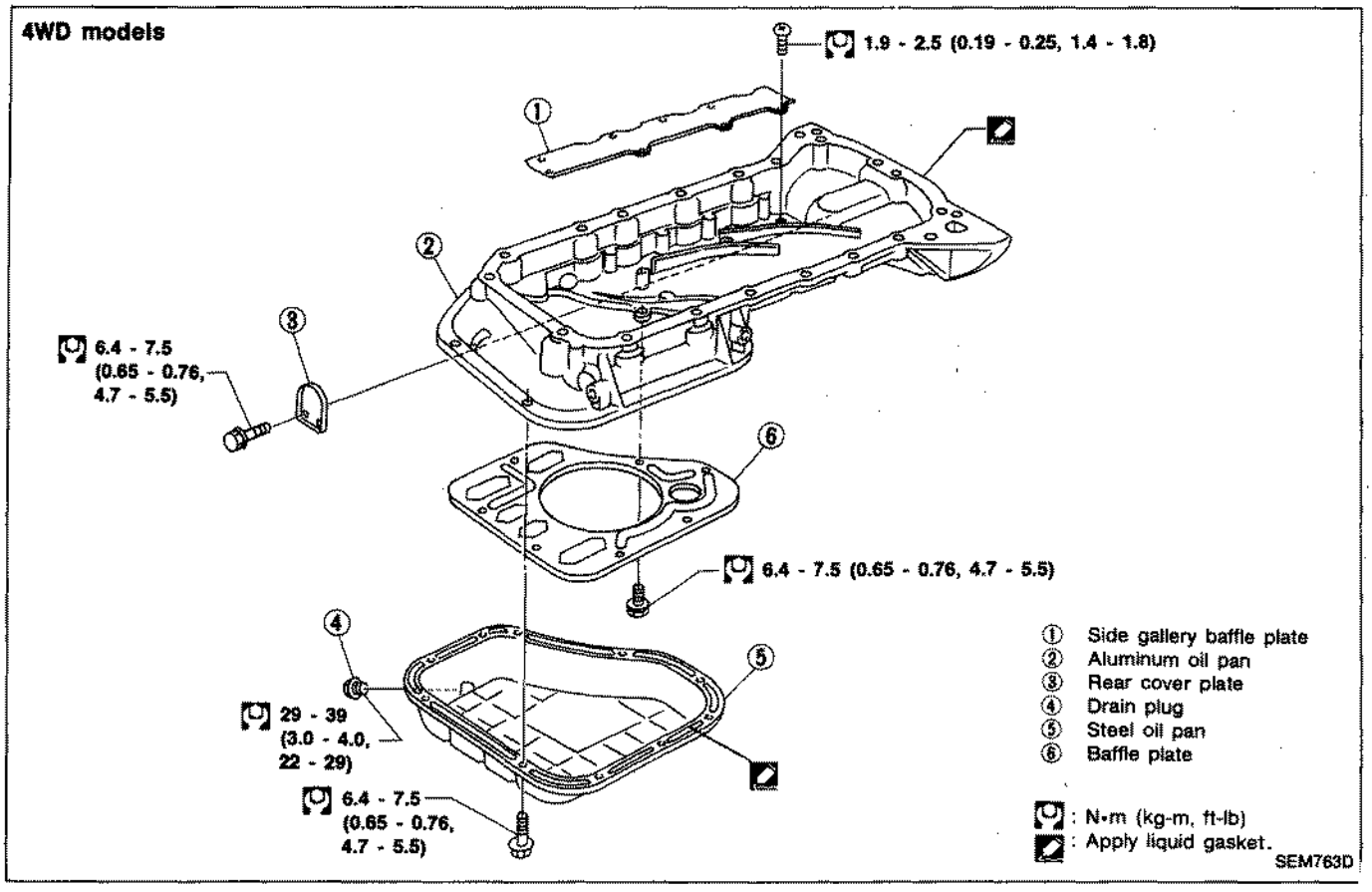
- **If adding oil helps compression, piston rings may be worn or damaged. If so, replace piston rings after checking piston.**
- **If pressure stays low, a valve may be sticking or seating improperly. Inspect and repair valve and valve seat. (Refer to S.D.S.) If valve or valve seat is damaged excessively, replace them.**
- **If compression in any two adjacent cylinders is low and if adding oil does not help compression, there is leakage past the gasket surface. If so, replace cylinder head gasket.**

2WD models



SEM664D

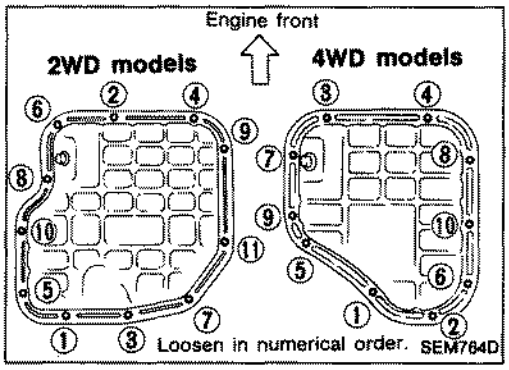
4WD models



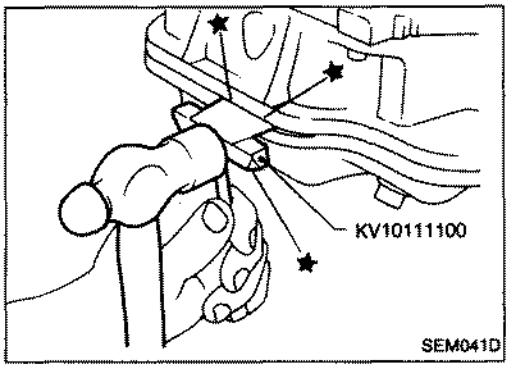
SEM763D

Removal

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

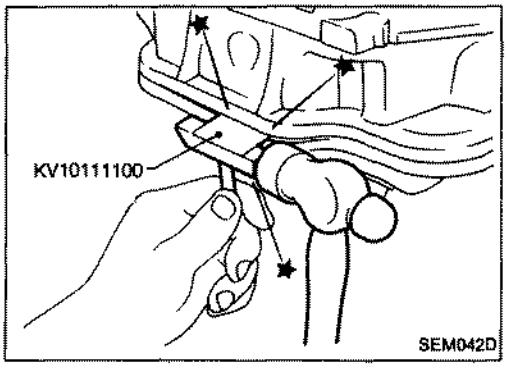


3. Remove steel oil pan bolts.

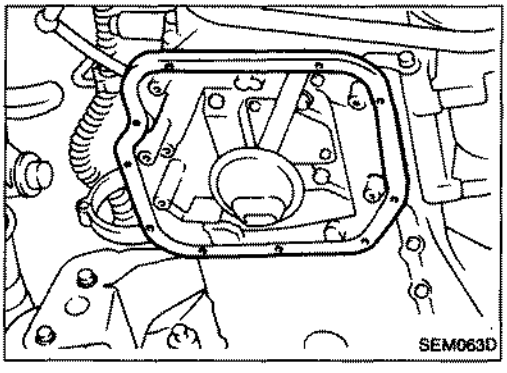


4. Remove steel oil pan.
(1) Insert Tool between aluminum oil pan and steel oil pan.

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

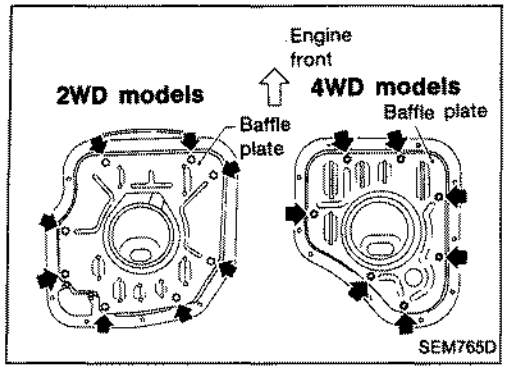


(2) Slide Tool by tapping on the side of the Tool with a hammer.

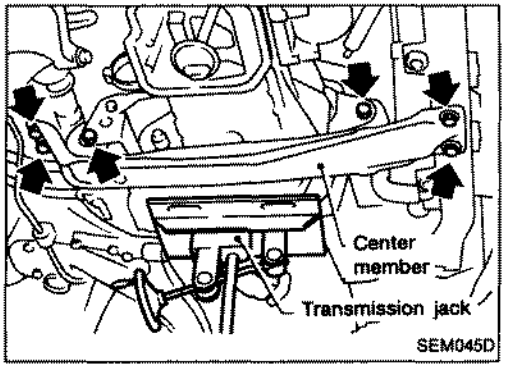


(3) Remove steel oil pan.

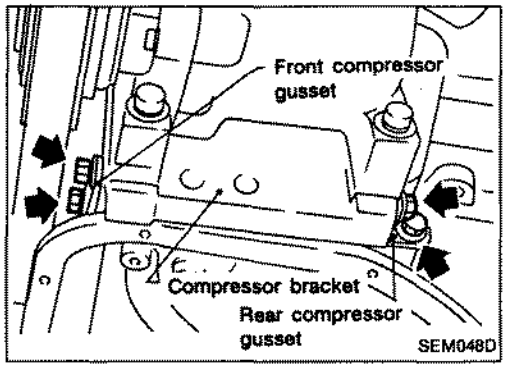
Removal (Cont'd)



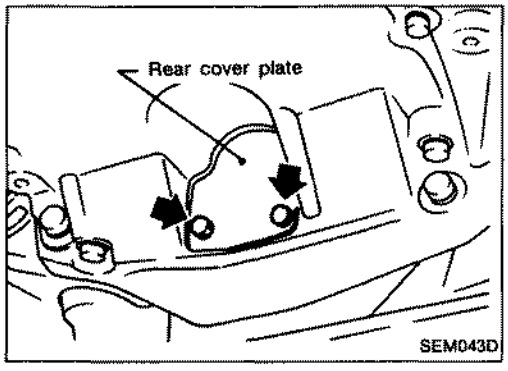
5. Remove baffle plate.



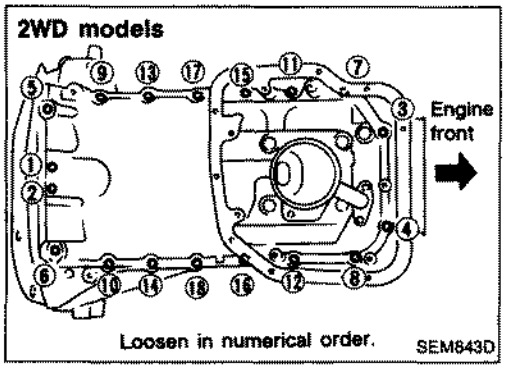
6. Remove front tube.
7. Set a suitable transmission jack under transaxle and hoist engine with engine slinger. (2WD only)
8. Remove center member. (2WD only)
9. Remove A/T shift control cable. (A/T only)



10. Remove compressor gussets.

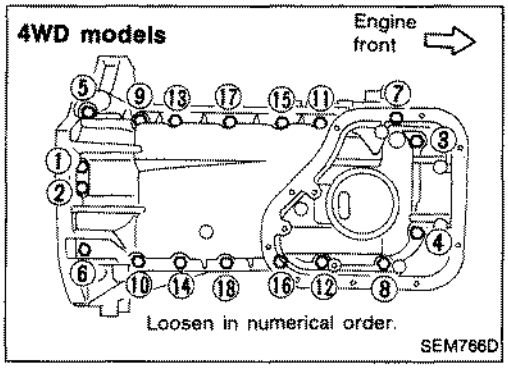


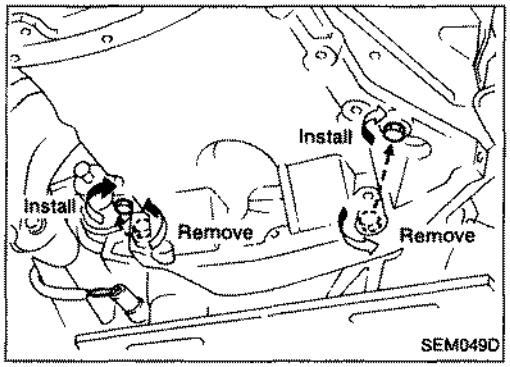
11. Remove rear cover plate.



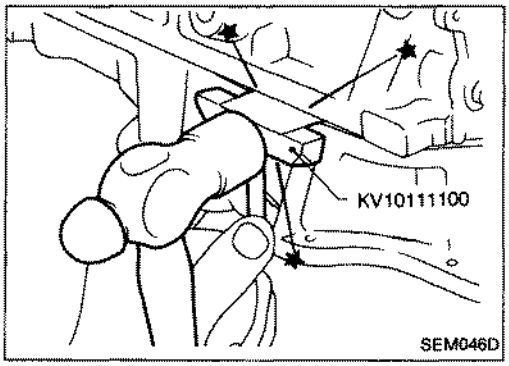
12. Remove aluminum oil pan bolts.

Removal (Cont'd)

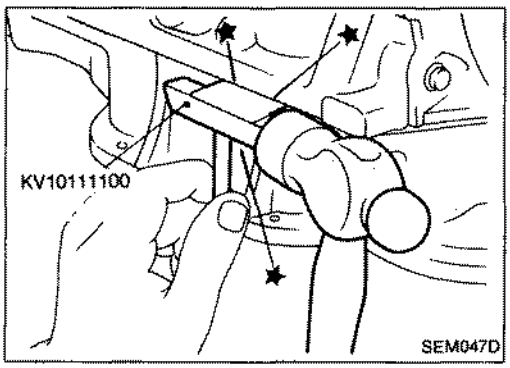




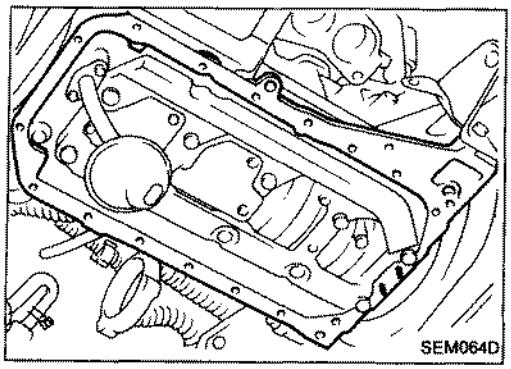
13. Remove the two engine to transaxle bolts and refit them into vacant holes as indicated. Tighten bolts to release aluminum oil pan from cylinder block.



14. Remove aluminum oil pan.
(1) 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 deformed.**

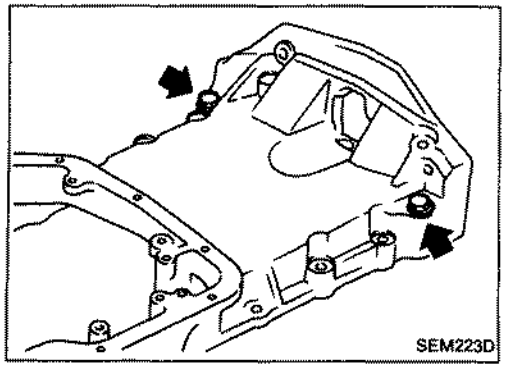


(2) Slide Tool by tapping on the side of the Tool with a hammer.



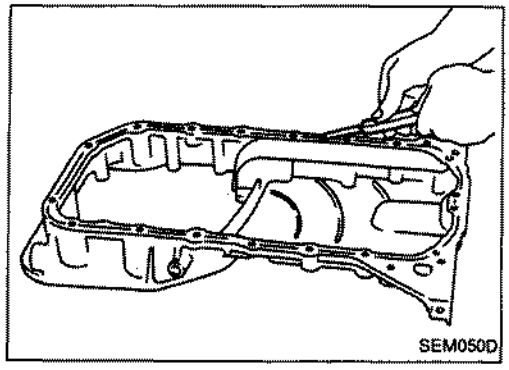
(3) Remove aluminum oil pan.

Removal (Cont'd)

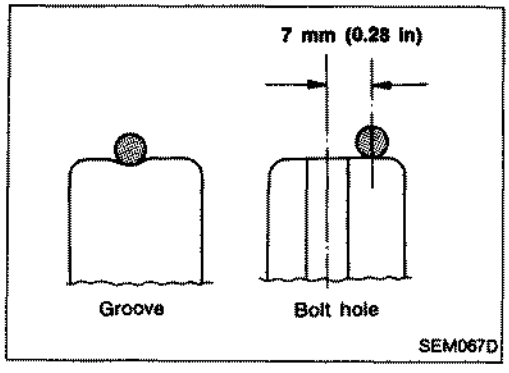


15. Remove the two engine to transaxle bolts previously installed in aluminum oil pan.

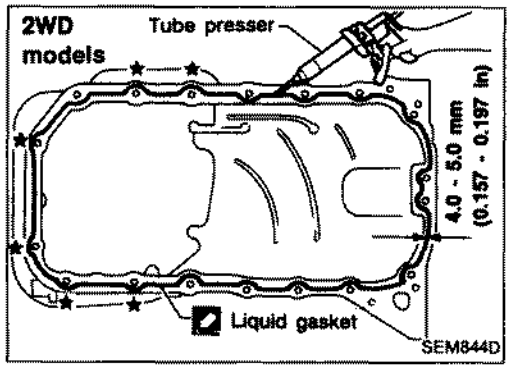
Installation



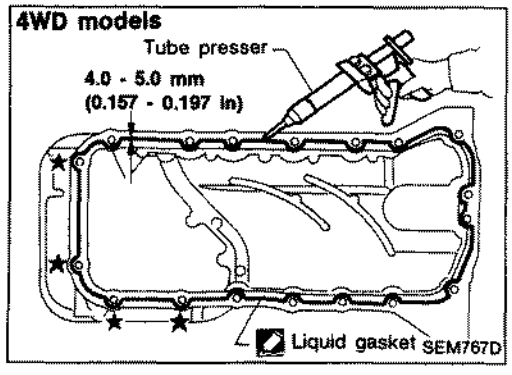
1. Install aluminum oil pan.
(1) Before installing aluminum oil pan, remove all traces of liquid gasket from mating surfaces using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block and front cover.



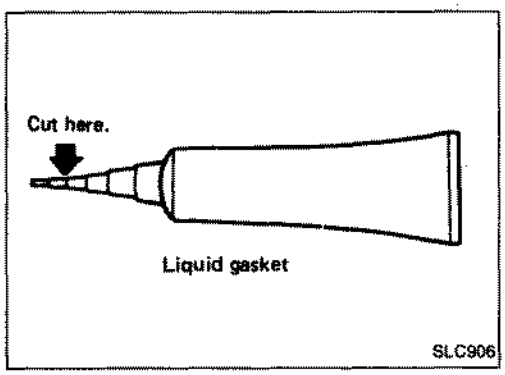
(2) Apply a continuous bead of liquid gasket to mating surface of aluminum oil pan.
- **Use Genuine Liquid Gasket or equivalent.**



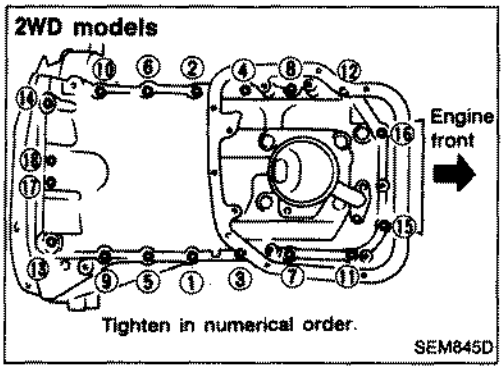
- **For areas marked with "★", apply liquid gasket to the outer side of the bolt hole.**



Installation (Cont'd)

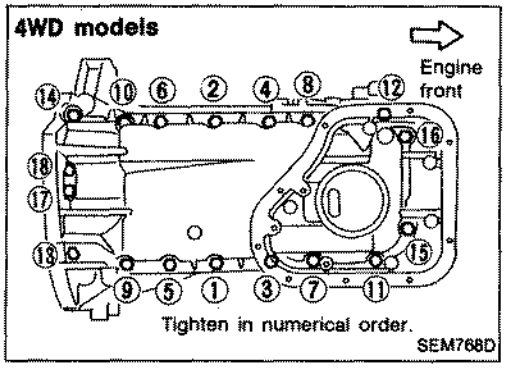


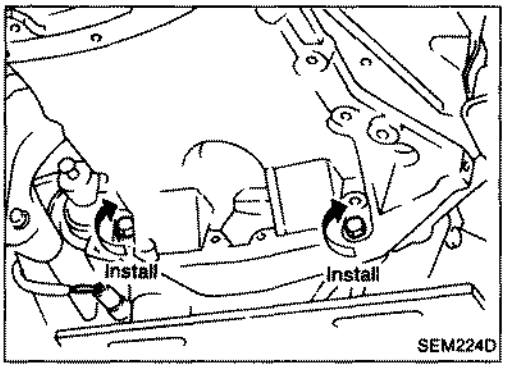
- **Be sure liquid gasket is 4.0 to 5.0 mm (0.157 to 0.197 in) wide.**
- **Attaching should be done within 5 minutes after coating.**



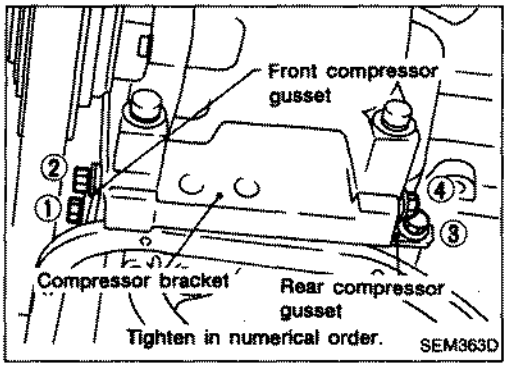
(3) Install aluminum oil pan.

- 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:**
    : 6.4 - 7.5 N·m (0.65 - 0.76 kg-m, 4.7 - 5.5 ft-lb)



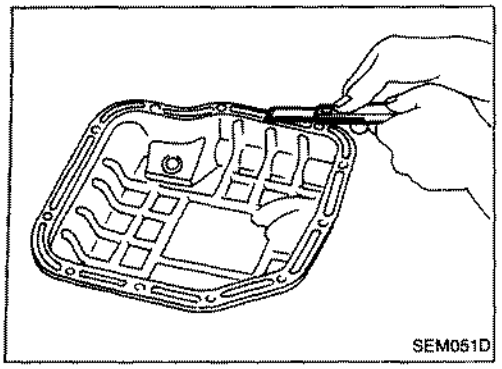


2. Install the two engine to transaxle bolts.
3. Install rear cover plate.

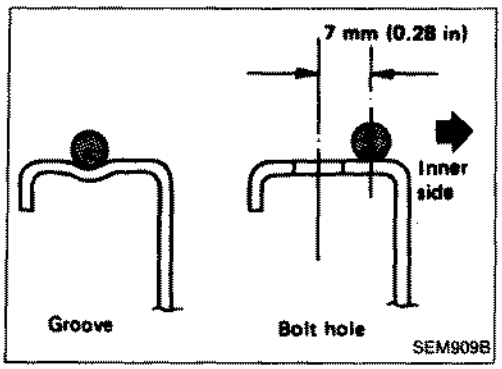


4. Install compressor gussets.
5. Install A/T shift control cable. (A/T only)
6. Install center member. (2WD only)
7. Install front tube.
8. Install baffle plate.

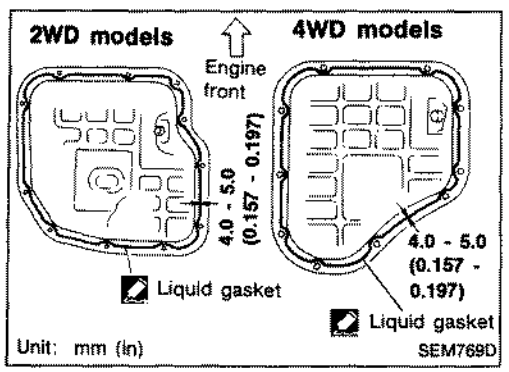
Installation (Cont'd)



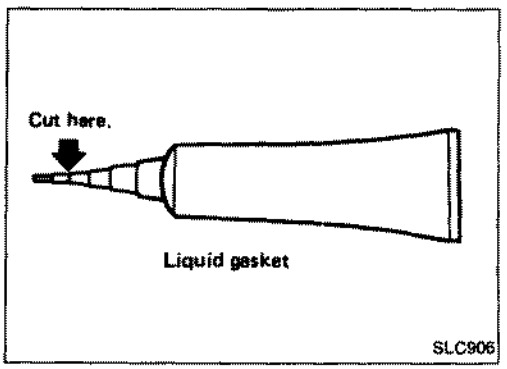
9. Install steel oil pan.
(1) Before installing steel oil pan, remove all traces of liquid gasket from mating surfaces using a scraper.
- Also remove traces of liquid gasket from mating surface of aluminum oil pan.

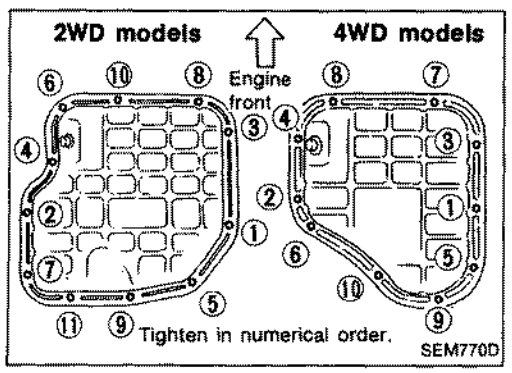


(2) Apply a continuous bead of liquid gasket to mating surface of steel oil pan.
- **Use Genuine Liquid Gasket or equivalent.**

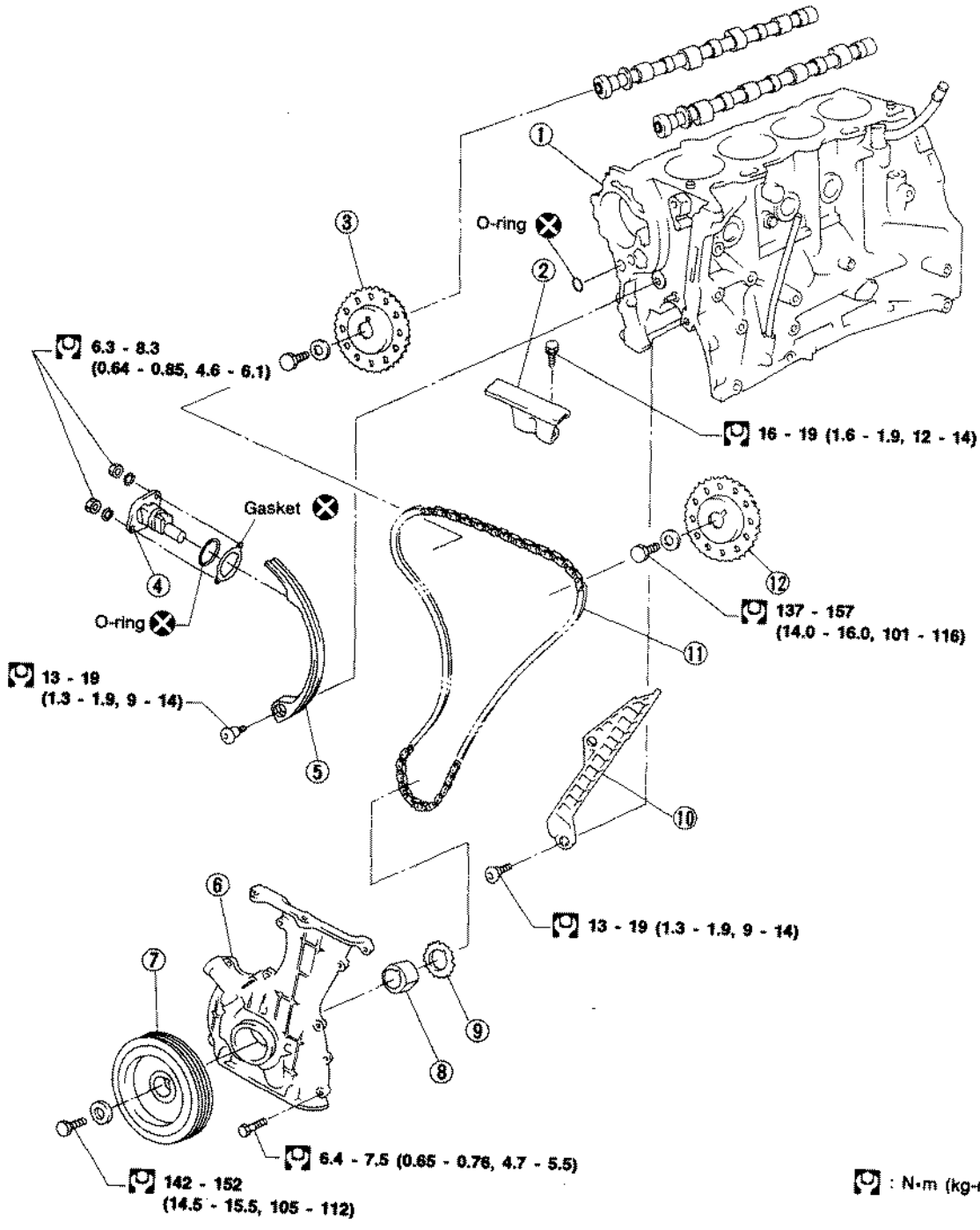


- **Be sure liquid gasket is 4.0 to 5.0 mm (0.157 to 0.197 in) wide.**
- **Attaching should be done within 5 minutes after coating.**





(3) Install steel oil pan.
- Install bolts in the reverse order of removal together with exhaust gas sensor harness bracket.
- Wait at least 30 minutes before refilling engine oil.



SEM699E

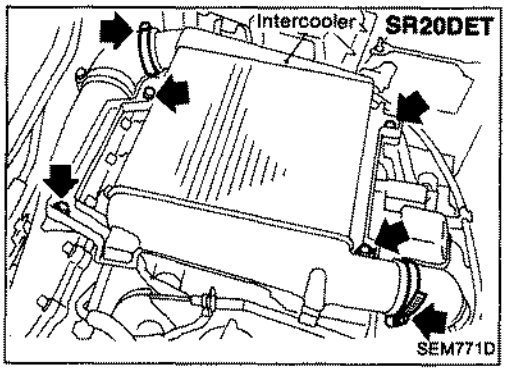
① Cylinder block
② Chain guide
③ R.H. camshaft sprocket
④ Chain tensioner
⑤ Chain guide
⑥ Front cover
⑦ Crank pulley
⑧ Oil pump spacer
⑨ Crankshaft sprocket
⑩ Chain guide
⑪ Timing chain
⑫ L.H. camshaft sprocket

CAUTION:

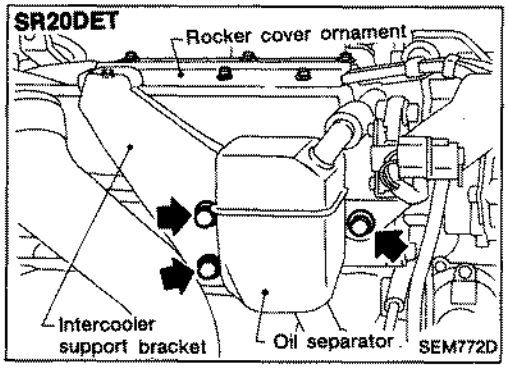
- **After removing timing chain, do not turn crankshaft and camshaft separately, or valves will strike piston heads.**
- **When installing sliding parts such as rocker arms, camshafts, chain tensioner and oil seal, be sure to apply new engine oil on their sliding surfaces.**
- **When tightening cylinder head bolts, camshaft sprocket bolts, crankshaft pulley bolt and camshaft bracket bolts, apply new engine oil to thread portions and seat surfaces of bolts.**

Removal

1. Release fuel pressure.
   Refer to "Releasing Fuel Pressure" in section EF & EC.
2. Remove engine under covers.
3. Remove front R.H. wheel and engine side cover.
4. Drain coolant by removing cylinder block drain plug and radiator drain cock.
5. Remove radiator.
6. Remove air duct to intake manifold.

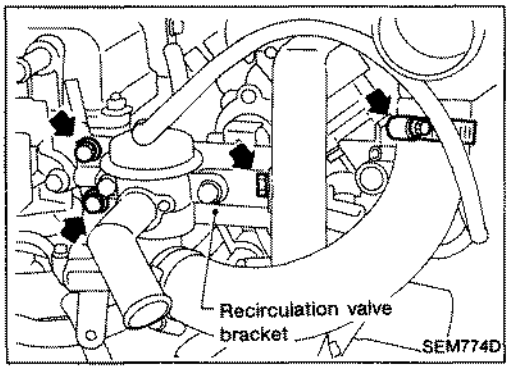


7. Remove intercooler cover and intercooler. (SR20DET only)

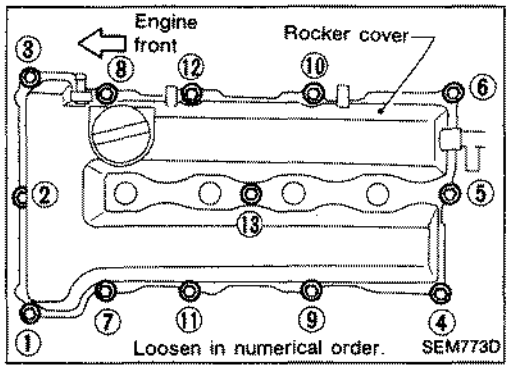


8. • SR20DE: Remove oil separator.
   • SR20DET: Remove oil separator, intercooler support bracket and rocker cover ornament.
9. Remove P.C.V. hoses from rocker cover.
10. Remove drive belts and water pump pulley.
11. Remove alternator.
12. Remove power steering oil pump.
13. Remove vacuum hoses, fuel hoses, wires, harness, connectors and so on.
14. Remove all spark plugs.

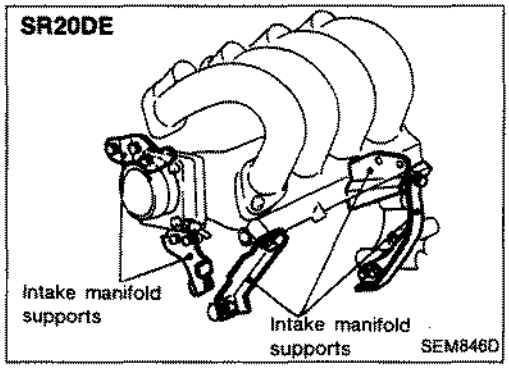
Removal (Cont'd)



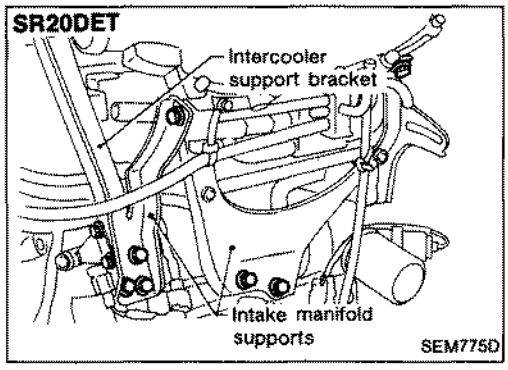
15. Remove recirculation valve bracket. (SR20DET only)

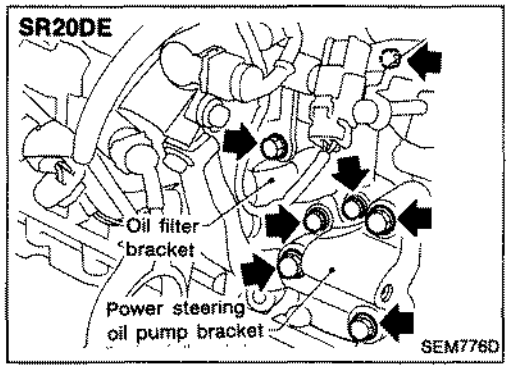


16. Remove rocker cover.



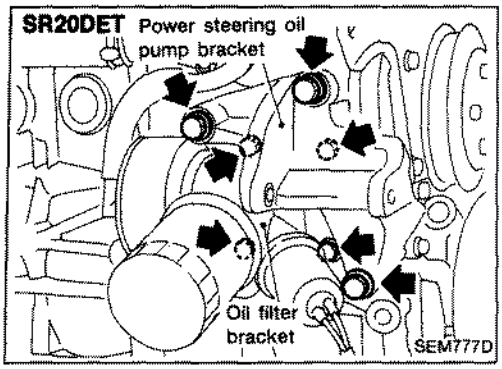
17. • SR20DE: Remove intake manifold supports.
    • SR20DET: Remove intake manifold supports and intercooler support bracket.

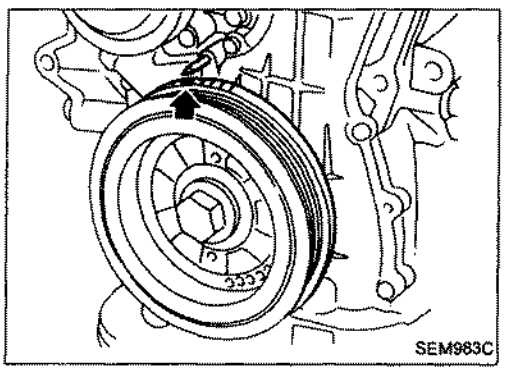




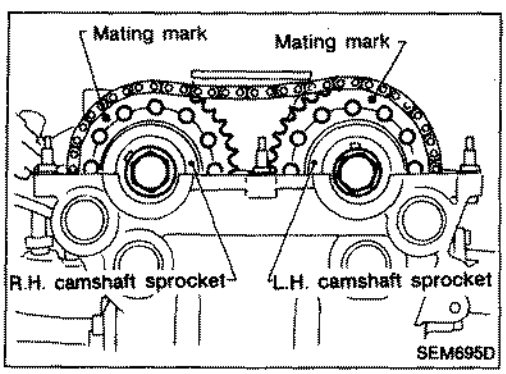
18. Remove oil filter bracket and power steering oil pump bracket.

Removal (Cont'd)

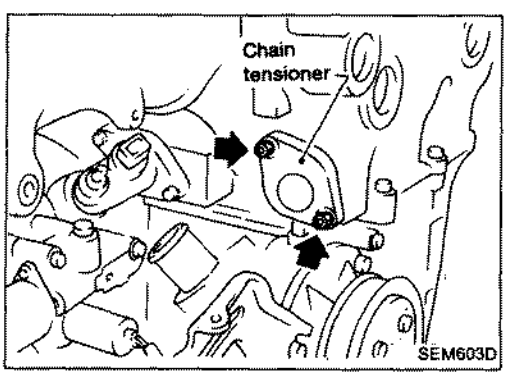




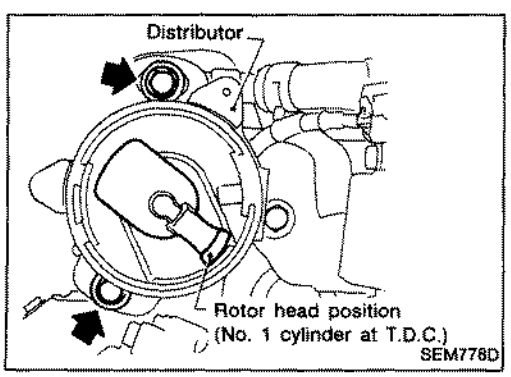
19. Set No. 1 piston at T.D.C. on the compression stroke by rotating crankshaft.



- **Rotate crankshaft until mating mark on camshaft sprocket is set at position indicated in figure at left.**



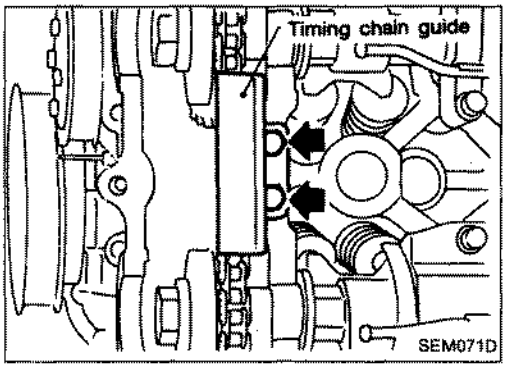
20. Remove chain tensioner.



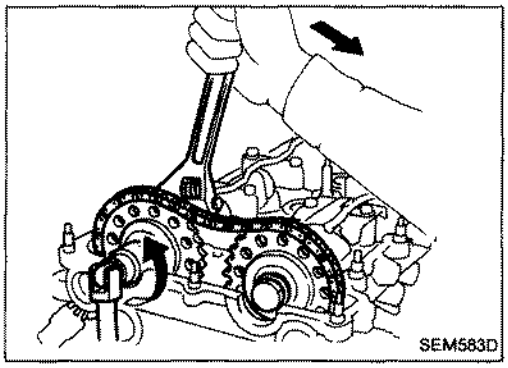
21. Remove distributor.

Do not turn rotor with distributor removed.

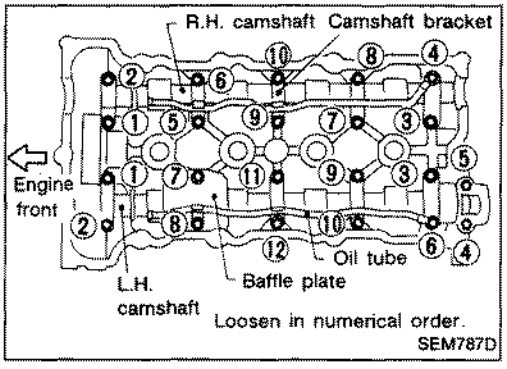
Removal (Cont'd)



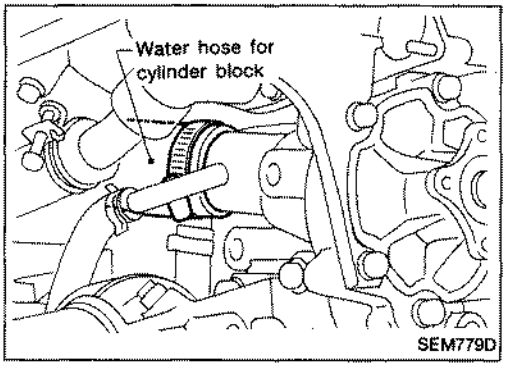
22. Remove timing chain guide.



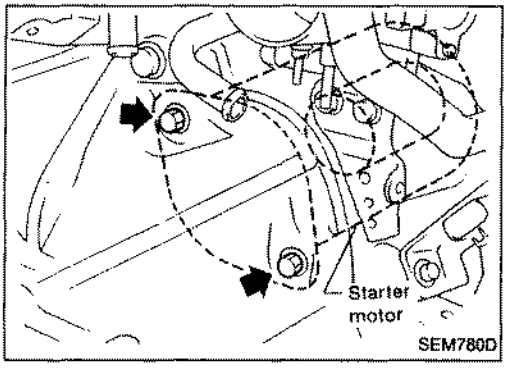
23. Remove camshaft sprockets.



24. Remove camshafts, camshaft brackets, oil tubes and baffle plate.

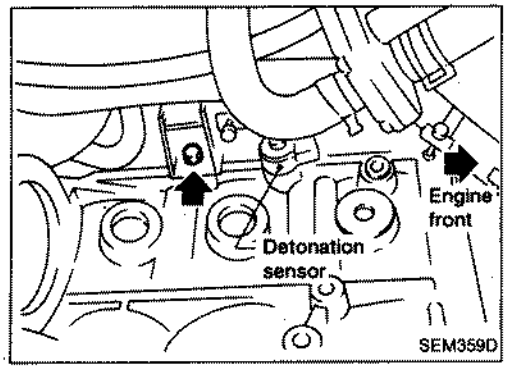


25. Remove the following water hoses.
- Water hose for cylinder block.
- Water hoses from heater.

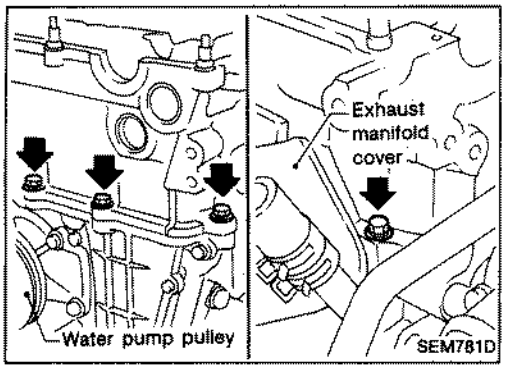


26. Remove starter motor.

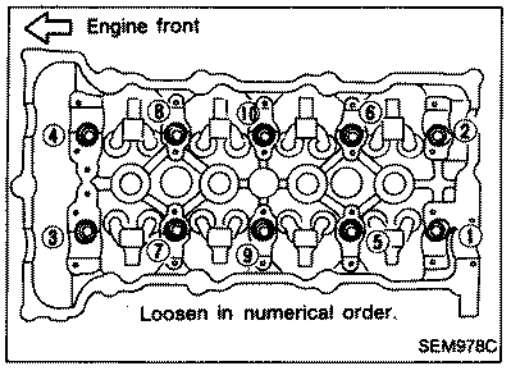
Removal (Cont'd)



27. Remove water pipe bolt.
28. Remove exhaust manifold with turbocharger. Refer to "Removal" in "TURBOCHARGER". (SR20DET only)



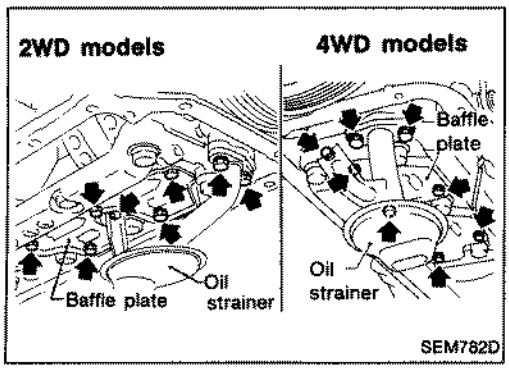
29. Remove cylinder head outside bolts.



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

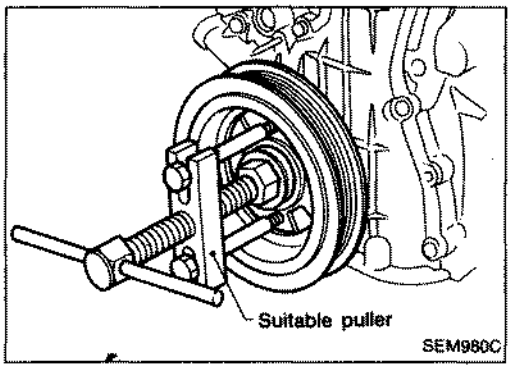
31. • SR20DE: Remove cylinder head with intake and exhaust manifolds.
    • SR20DET: Remove cylinder head with intake manifold.

32. Remove oil pans.
    Refer to "Removal" in "OIL PAN".

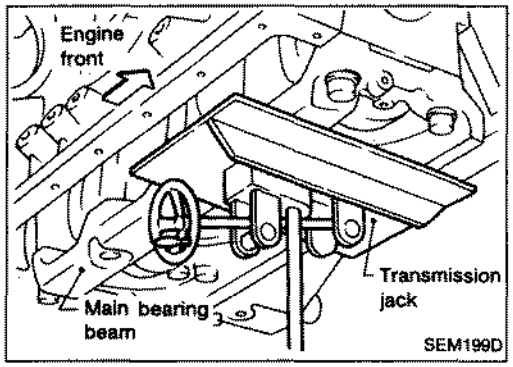


33. Remove oil strainer and baffle plate.

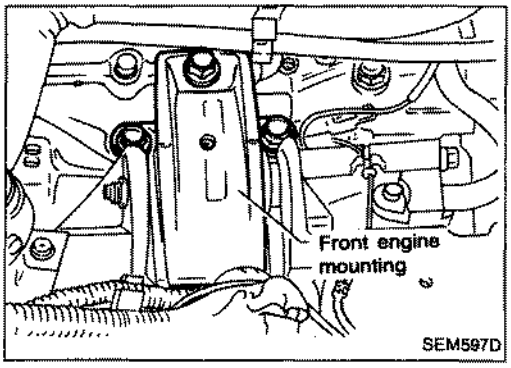
Removal (Cont'd)



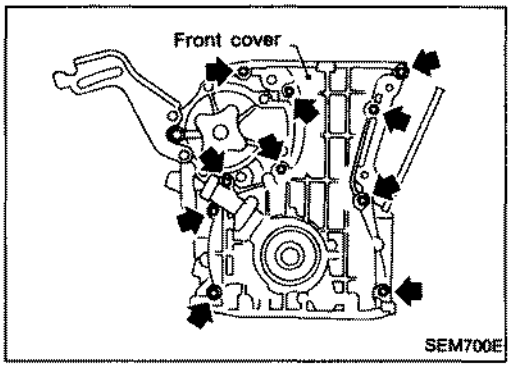
34. Remove crankshaft pulley.



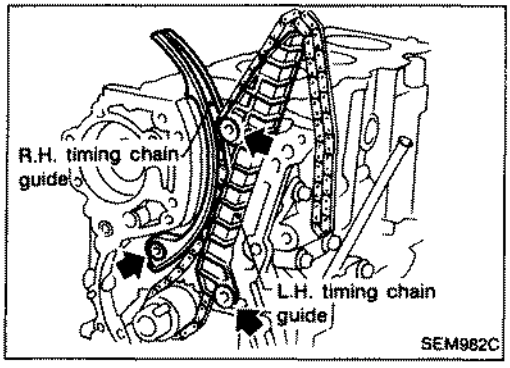
35. Set a suitable transmission jack under main bearing beam.



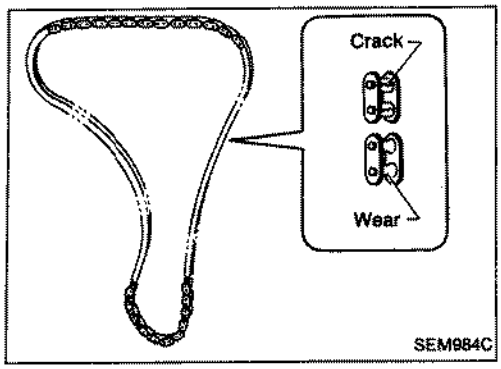
36. Remove front engine mounting.



37. Remove front cover.

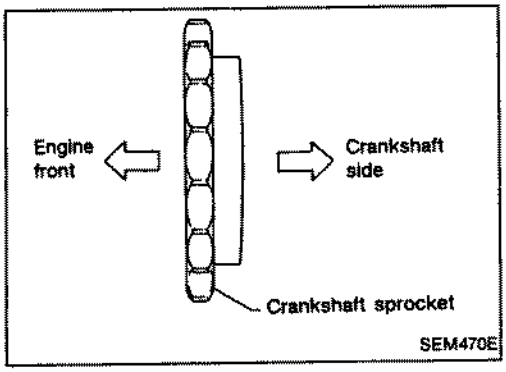


38. Remove timing chain guides and timing chain.



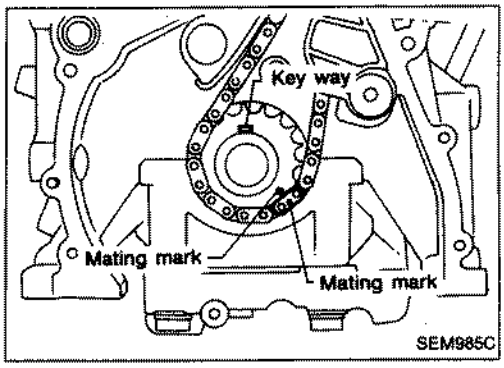
Inspection

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

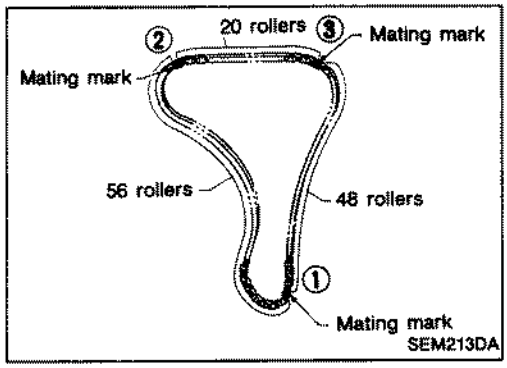


Installation

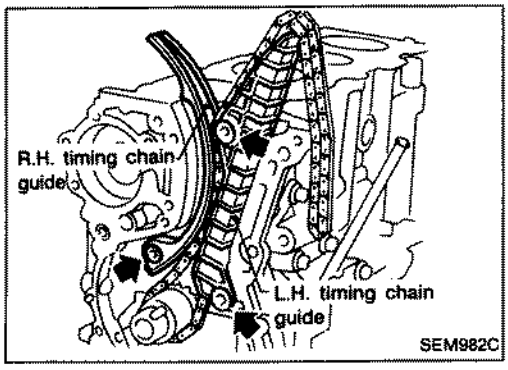
1. Install crankshaft sprocket on crankshaft.



2. Position crankshaft so that No. 1 piston is set at T.D.C. (Keyway at 12 o'clock-mating mark at 4 o'clock approx.) fit timing chain to crankshaft sprocket so that mating mark is in line with mating mark on crankshaft sprocket.

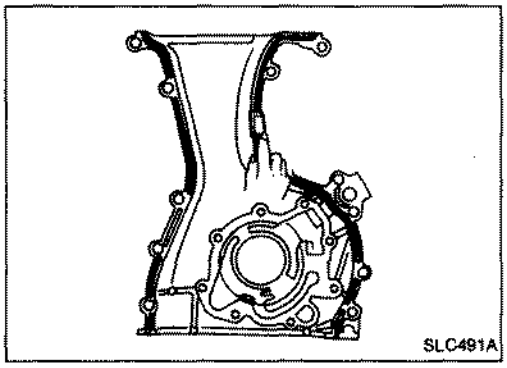


- Mating mark color on timing chain.
  ① : **Gold**
  ②, ③ : **Silver**

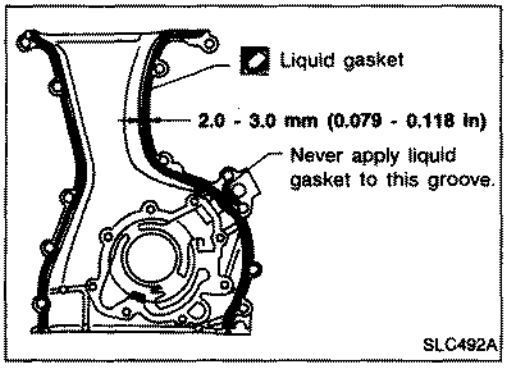


3. Install timing chain and timing chain guides.

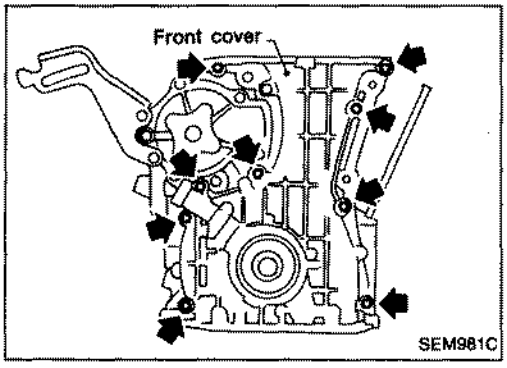
Installation (Cont'd)



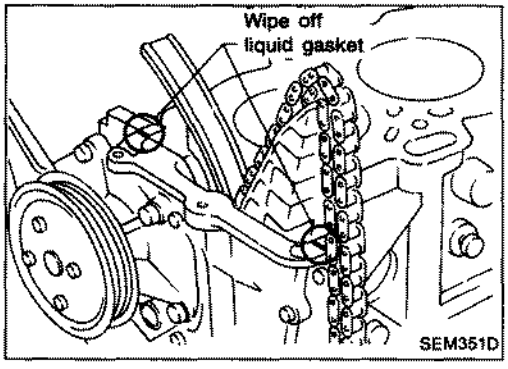
4. Before installing front cover, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.



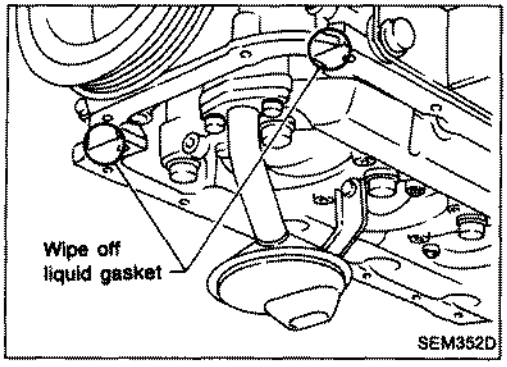
5. Apply a continuous bead of liquid gasket to mating surface of front cover.
- Use Genuine Liquid Gasket or equivalent.



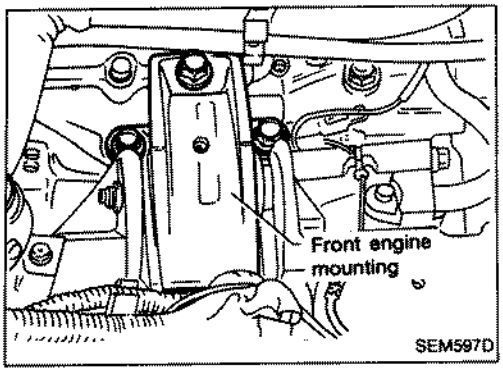
6. Install oil pump drive spacer and front cover.



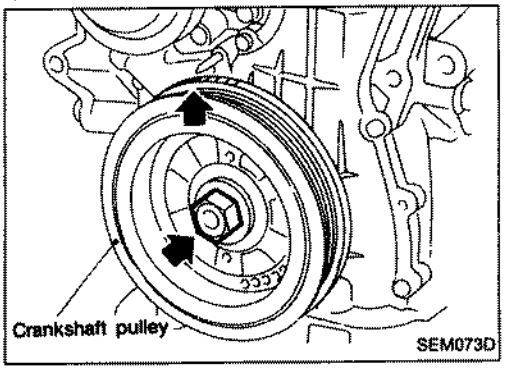
- Wipe off excessive liquid gasket.



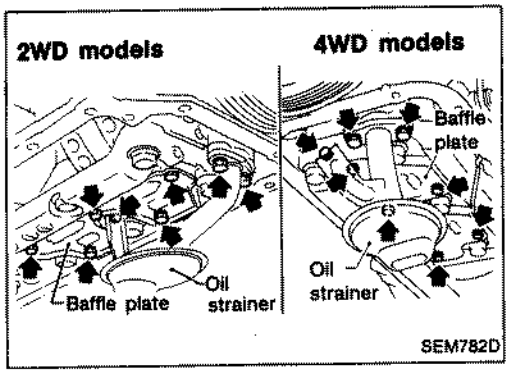
Installation (Cont'd)



7. Install front engine mounting.

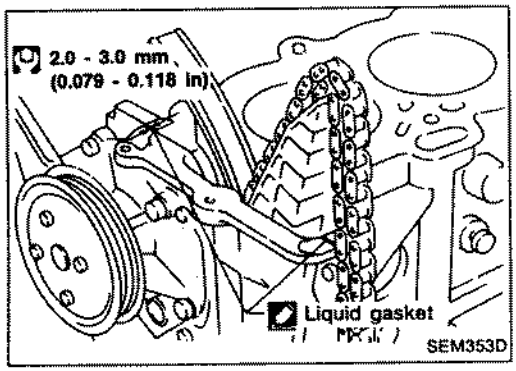


8. Install crankshaft pulley.
9. Set No. 1 piston at T.D.C. on its compression stroke.



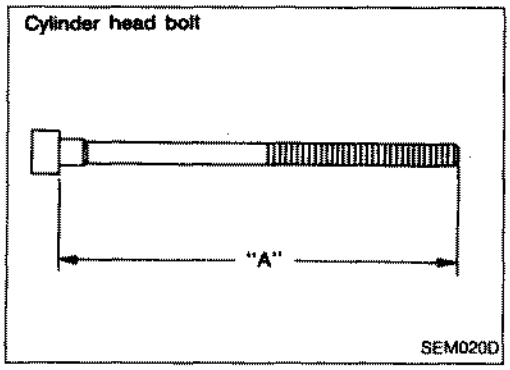
10. Install oil strainer and baffle plate.

11. Install oil pan.
    Refer to "Installation" in "OIL PAN".



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

Installation (Cont'd)

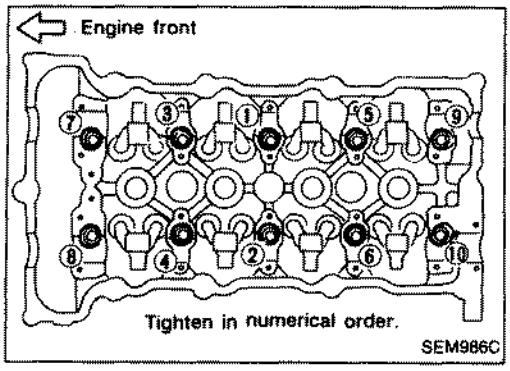


13. • SR20DE: Install cylinder head with intake and exhaust manifolds.
    • SR20DET: Install cylinder head with intake manifold.

CAUTION:

The cylinder head bolts of SR20DE can be reused providing dimension "A" is not exceeded.

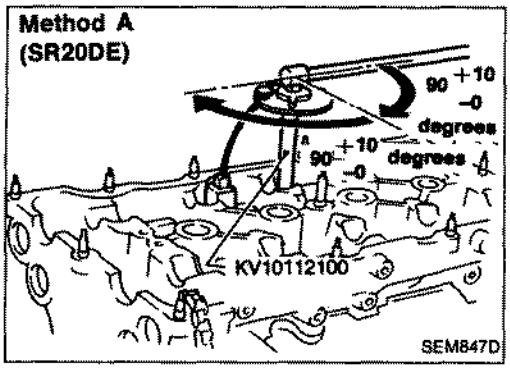
Dimension "A":
158.2 mm (6.23 in)



- **Tightening procedure:**

(SR20DE)

ⓐ **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 34 to 44 N·m (3.5 to 4.5 kg-m, 25 to 33 ft-lb).**

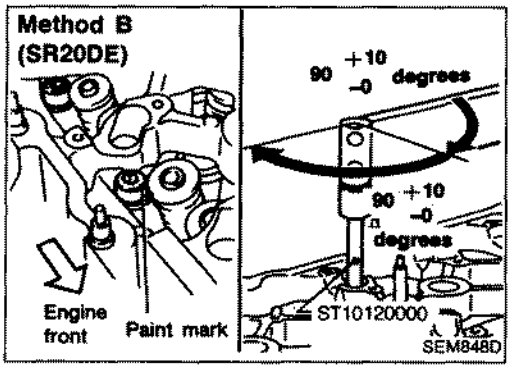


ⓔ **Method A: Turn all bolts 90 to 100 degrees clockwise with Tool or suitable angle wrench.**

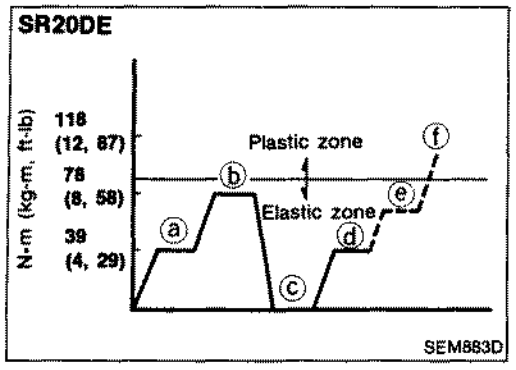
Method B: If angle wrench is not available, mark the side of each cylinder head bolt with a paint mark facing the front of the engine, then turn all bolts 90 to 100 degrees clockwise.

ⓕ **Turn all bolts 90 to 100 degrees clockwise.**
ⓖ **Ensure that paint mark on each bolt faces the rear of the engine. (Method B only)**

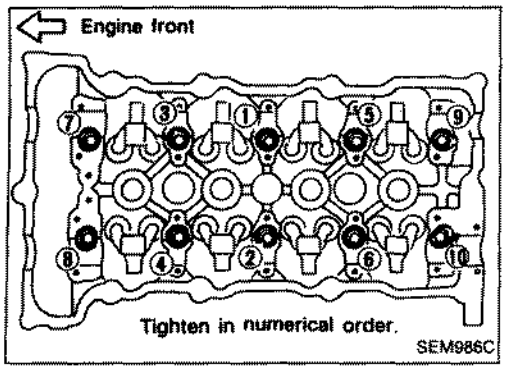
Do not turn any bolt 180 to 200 degrees clockwise all at once.



	Tightening torque N·m (kg-m, ft-lb)
ⓐ	39 (4.0, 29)
ⓑ	78 (8.0, 58)
ⓒ	0 (0, 0)
ⓓ	39 ± 5 (4.0 ± 0.5, 28.9 ± 3.6)
ⓔ	90 $^{+10}_{-0}$ degrees
ⓕ	90 $^{+10}_{-0}$ degrees

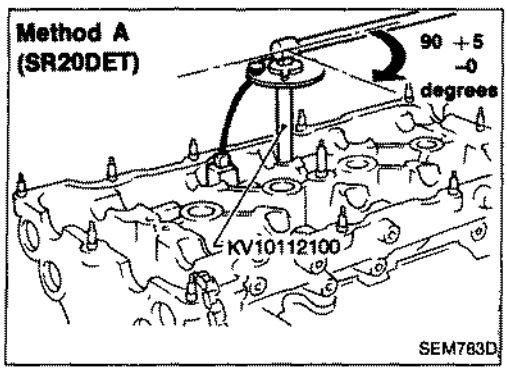


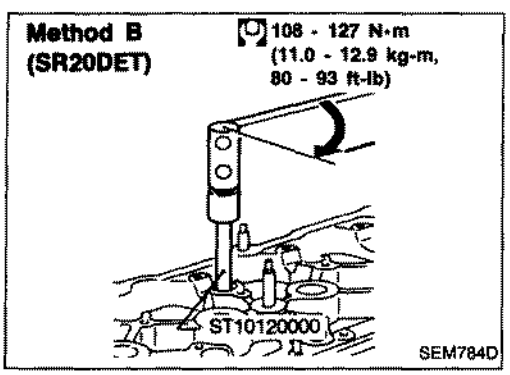
Installation (Cont'd)



(SR20DET)

- ⓐ **Tighten all bolts to 59 N·m (6.0 kg-m, 43 ft-lb).**
- ⓑ **Tighten all bolts to 108 to 118 N·m (11.0 to 12.0 kg-m, 80 to 87 ft-lb).**
- ⓒ **Loosen all bolts completely.**
- ⓓ **Tighten all bolts to 36 to 42 N·m (3.7 to 4.3 kg-m, 27 to 31 ft-lb).**

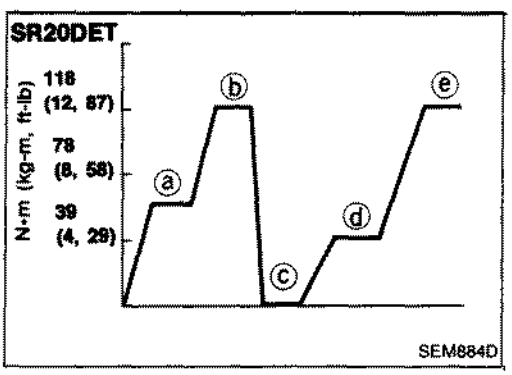


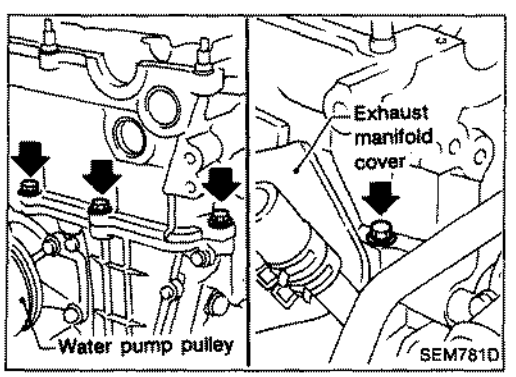


- ⓔ **Method A: Turn all bolts 90 to 95 degrees clockwise with Tool or suitable angle wrench.**

  Method B: If angle wrench is not available, tighten all bolts to 108 to 127 N·m (11.0 to 12.9 kg-m, 80 to 93 ft-lb).

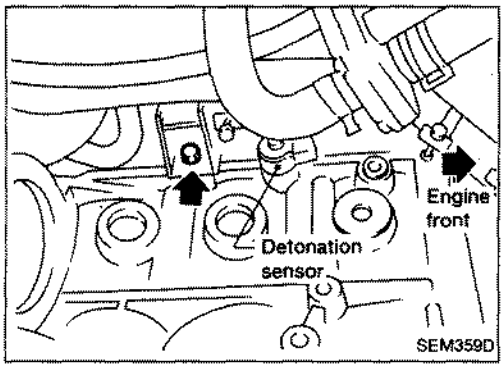
	Tightening torque N·m (kg-m, ft-lb)
ⓐ	59 (6.0, 43)
ⓑ	113 ± 5 (11.5 ± 0.5, 83.2 ± 3.6)
ⓒ	0 (0, 0)
ⓓ	39 ± 3 (4.0 ± 0.3, 28.9 ± 2.2)
ⓔ	90 $^{+5}_{-0}$ degrees or 117.2 ± 9.3 (11.95 ± 0.95, 86.4 ± 6.9)



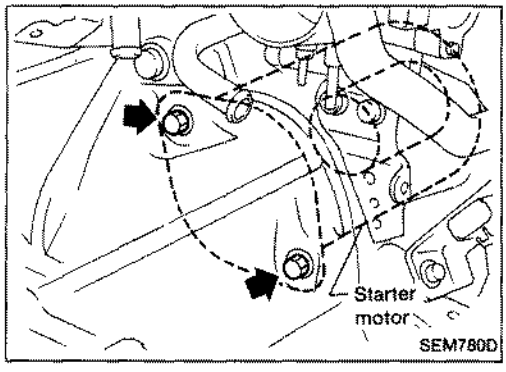


14. Install cylinder head outside bolts.
15. Install exhaust manifold with turbocharger. Refer to "Installation" in "TURBOCHARGER". (SR20DET only)

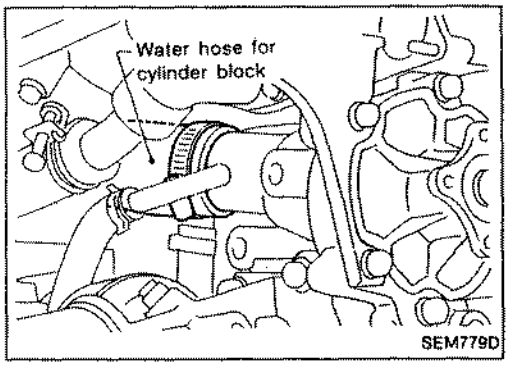
Installation (Cont'd)



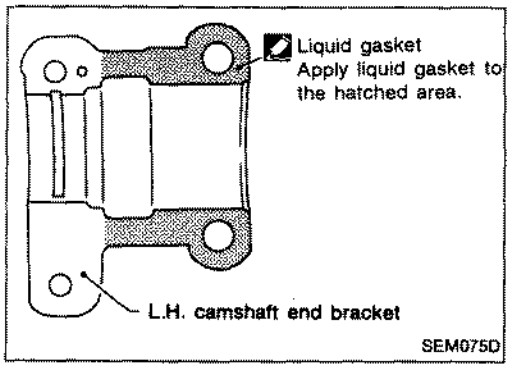
16. Install water pipe bolt.



17. Install starter motor.

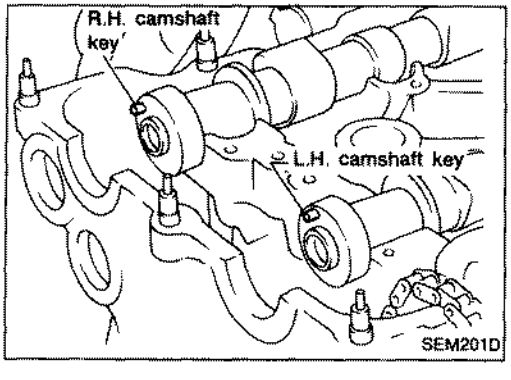


18. Install the following water hoses.
- Water hose for cylinder block.
- Water hoses for heater.



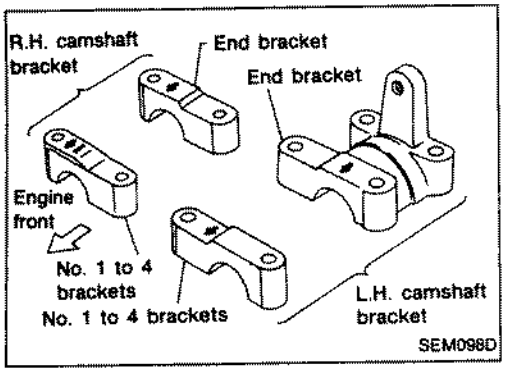
19. Before installing L.H. camshaft end bracket, remove all traces of liquid gasket from mating surface.
- Also remove traces of liquid gasket from mating surface of cylinder head.

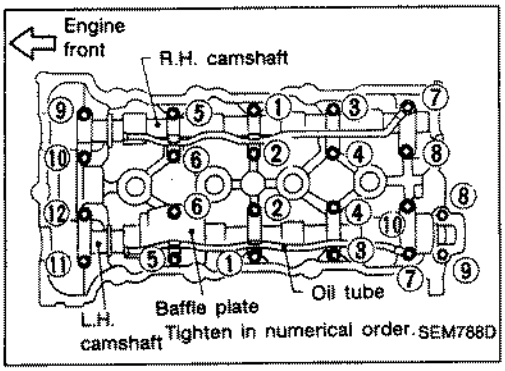
20. Apply a continuous bead of liquid gasket to mating surface of L.H. camshaft end bracket.
- Use Genuine Liquid Gasket or equivalent.



21. Install camshafts, camshaft brackets, oil tubes and baffle plate.
- Position camshaft.
  - L.H. camshaft key at about 12 o'clock
  - R.H. camshaft key at about 10 o'clock

Installation (Cont'd)





- **Tightening procedure**

STEP 1:

R.H. 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)

L.H. 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.

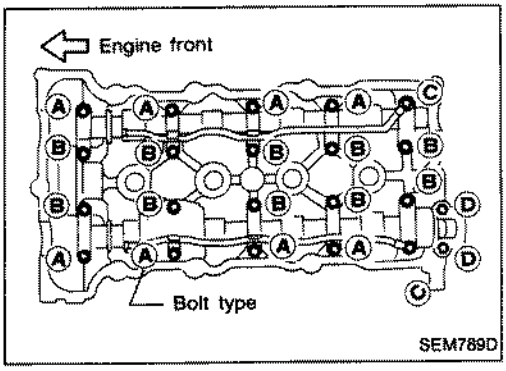
: 6 N·m (0.6 kg-m, 4.3 ft-lb)

STEP 3:

Tighten bolts in the specified order.

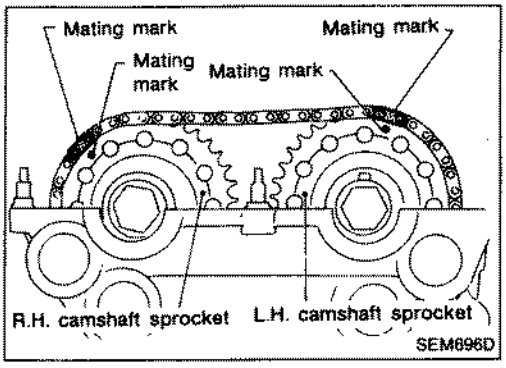
: 9.0 - 11.8 N·m (0.92 - 1.2 kg-m, 6.7 - 8.7 ft-lb) ... Bolt type Ⓐ Ⓑ Ⓒ

: 18 - 25 N·m (1.8 - 2.6 kg-m, 13 - 19 ft-lb) ... Bolt type Ⓓ



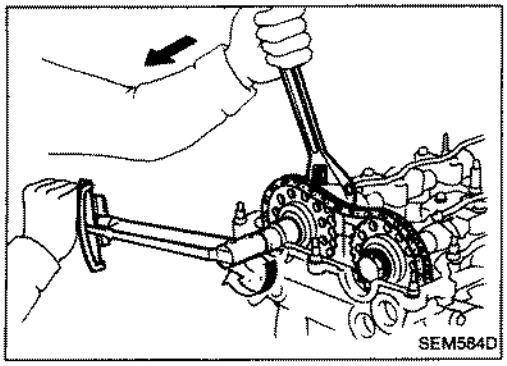
22. Install camshaft sprockets.

Line up mating marks on timing chain with mating marks on camshaft sprockets.

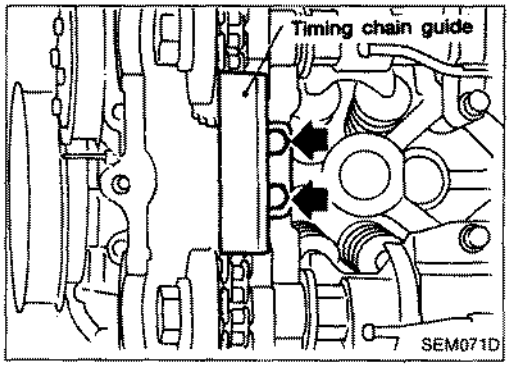


- Lock camshafts as shown in figure and tighten to specified torque.

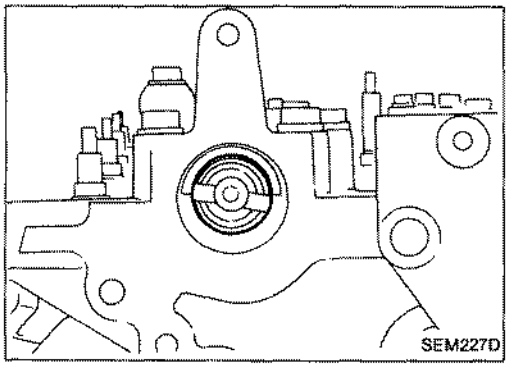
: 137 - 157 N·m (14.0 - 16.0 kg-m, 101 - 116 ft-lb)



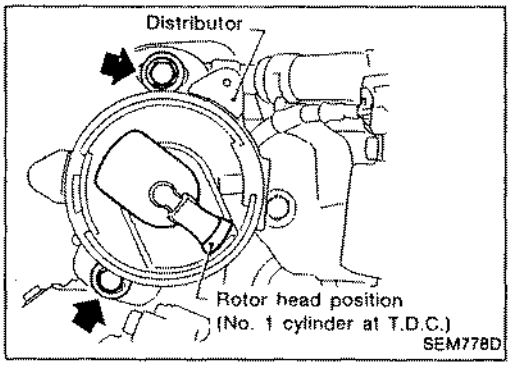
Installation (Cont'd)



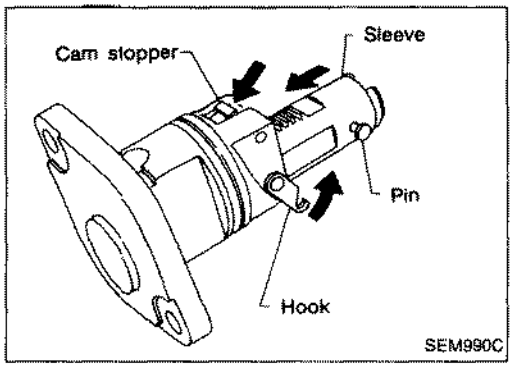
23. Install timing chain guide.



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

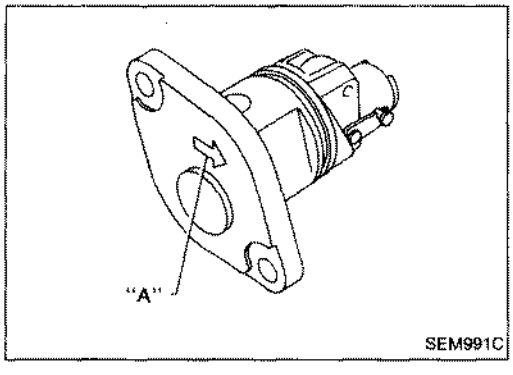


- **After installing, confirm that distributor rotor head is set as shown in figure.**

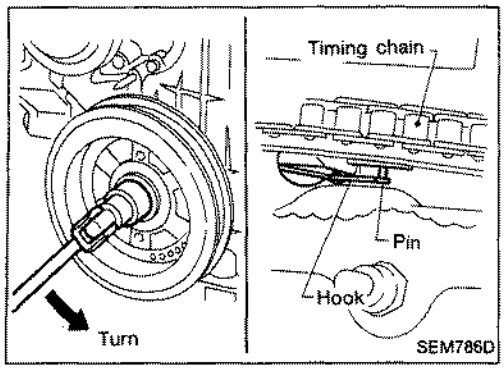


25. Install chain tensioner.

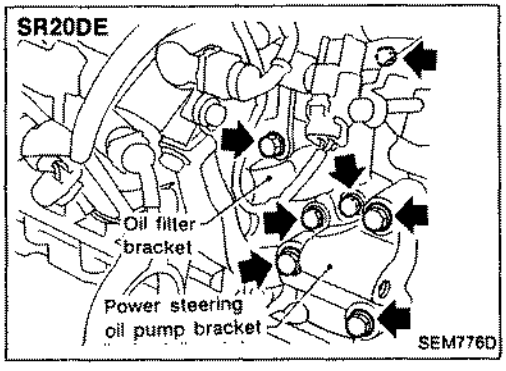
Press cam stopper down and "press-in" sleeve until hook can be engaged on pin. When tensioner is bolted in position the hook will release automatically. Ensure arrow "A" faces the front of the engine.



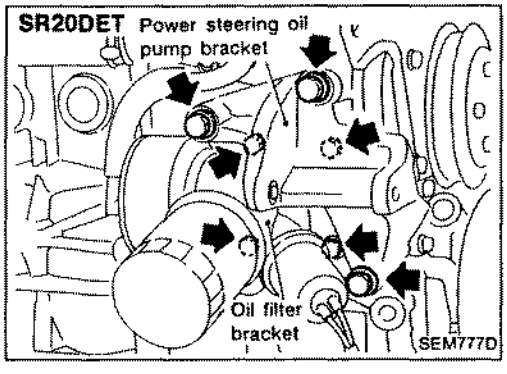
Installation (Cont'd)

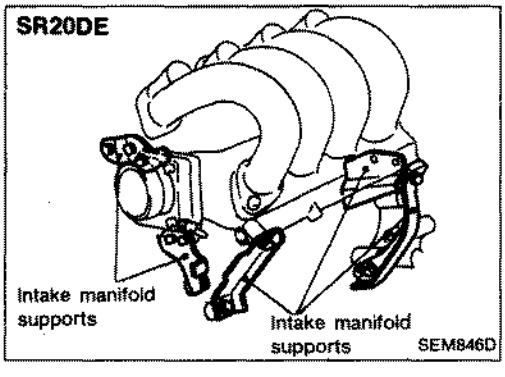


- **If hook does not release automatically, turn crankshaft counterclockwise until it does release.**

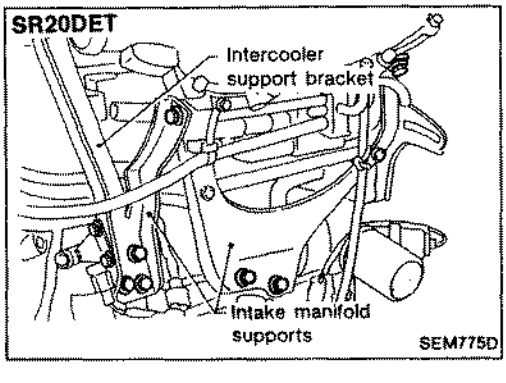


26. Install oil filter bracket and power steering oil pump bracket.

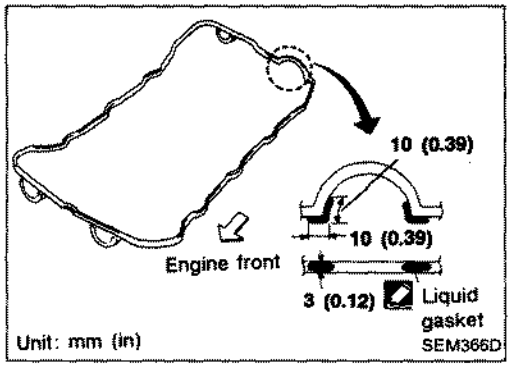




27. • SR20DE: Install intake manifold supports.
    • SR20DET: Install intake manifold supports and intercooler support bracket.

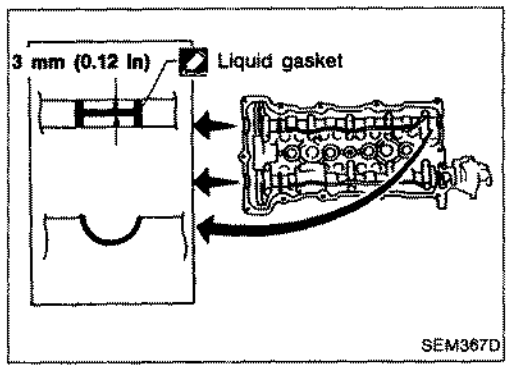


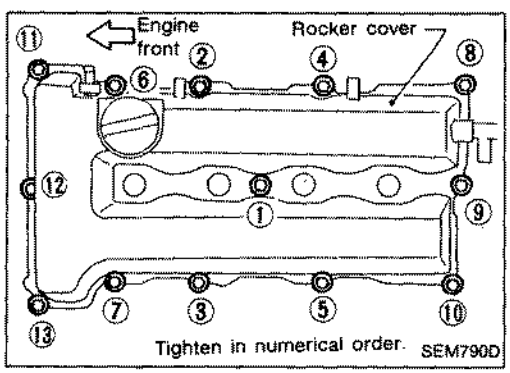
Installation (Cont'd)



28. Before installing rocker cover, remove all traces of liquid gasket from mating surface of rocker cover gasket to cylinder head.
29. Apply a continuous bead of liquid gasket to mating surface of rocker cover gasket and cylinder head.

- **Use Genuine Liquid Gasket or equivalent.**





30. Install rocker cover.

Rocker cover tightening procedure:

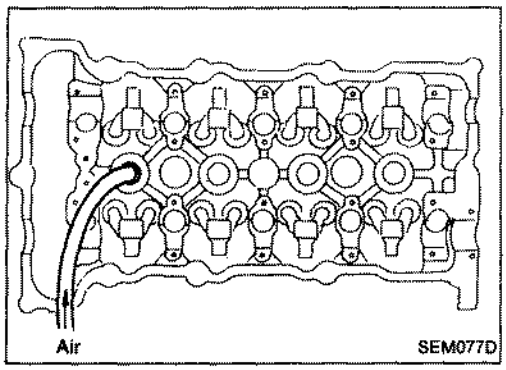
(1) Tighten nuts ① - ⑩ - ⑪ - ⑬ - ⑧ in that order to 4 N·m (0.4 kg-m, 2.9 ft-lb).

(2) Tighten nuts ① to ⑬ as indicated in figure to 8 to 10 N·m (0.8 to 1.0 kg-m, 5.8 to 7.2 ft-lb).

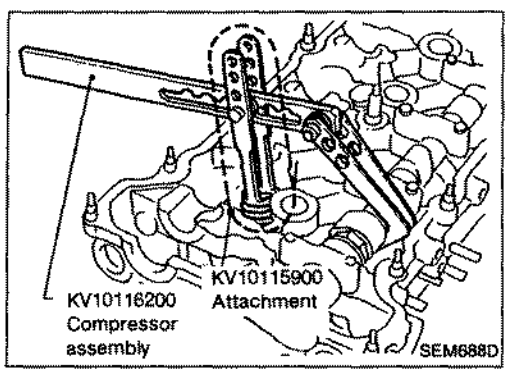
31. Install recirculation valve bracket. (SR20DET only)
32. Refit spark plugs and leads.
33. Install vacuum hoses, fuel hoses, wires, harness, connectors and so on.
34. Install power steering oil pump.
35. Install alternator.
36. Install water pump pulley and drive belts.
37. Install P.C.V. hoses to rocker cover.
38. • Install oil separator. (SR20DE)
    • Install oil separator, intercooler support bracket and rocker cover ornament. (SR20DET)
39. Install intercooler cover and intercooler. (SR20DET only)
40. Refit air duct to intake manifold.
41. Install radiator.
42. Refit hoses and refill with coolant.
    Refer to MA section.
43. Install engine side cover and front R.H. wheel.
44. Install engine under covers.

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".
4. Remove spark plugs.

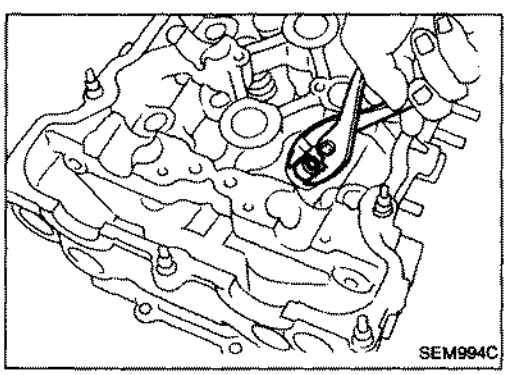


5. Install air hose adapter into spark plug hole and apply air pressure to hold valves in place. Apply a pressure of 490 kPa (4.9 bar, 5 kg/cm^2, 71 psi).
6. Remove rocker arm, rocker arm guide and shim.

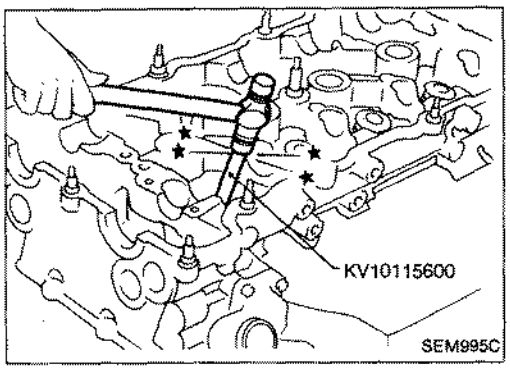


7. Remove valve spring with Tool.

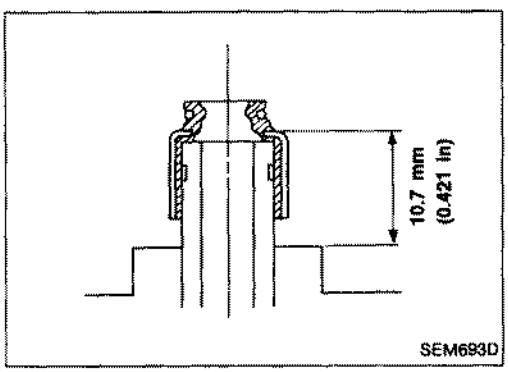
Piston concerned should be set at T.D.C. to prevent valve from falling.



8. Remove valve oil seal.

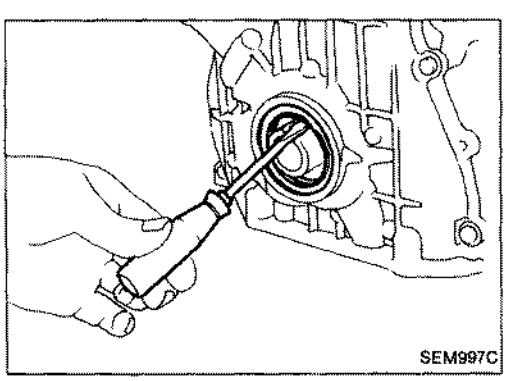


9. Apply engine oil to new valve oil seal and install it with Tool.



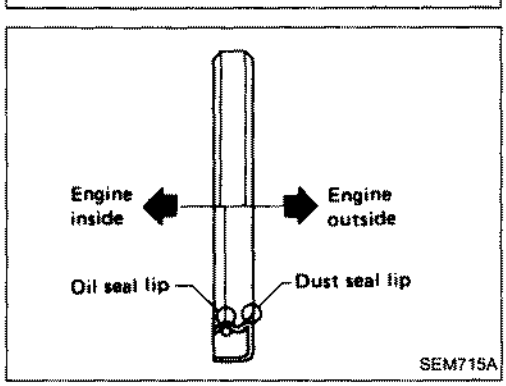
FRONT OIL SEAL

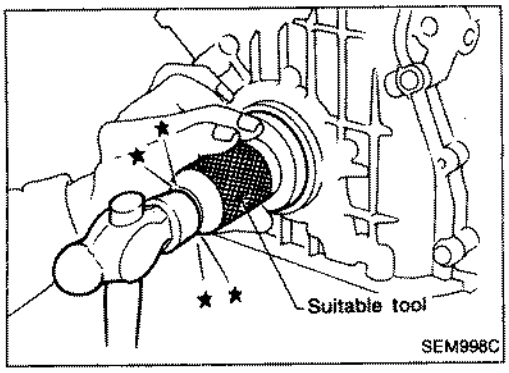
1. Remove the following parts:
- Engine under cover
- Front R.H. wheel and engine side cover
- Drive belts
- Crankshaft pulley



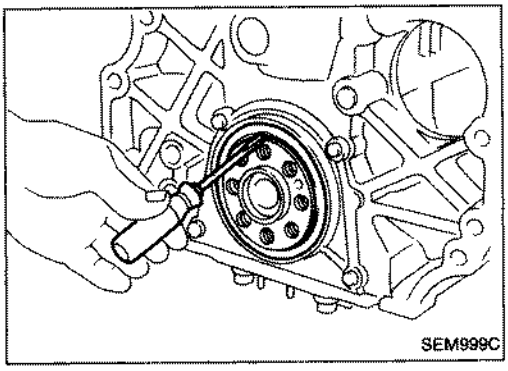
2. Remove front oil seal.

Be careful not to scratch front cover.





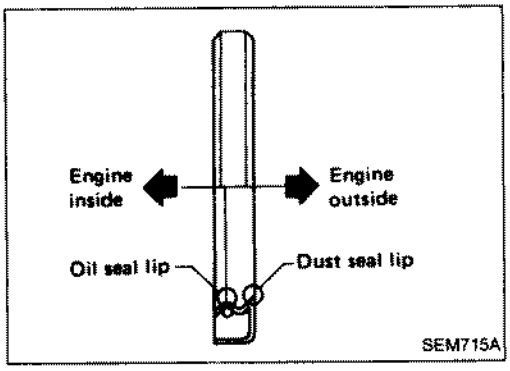
3. Apply engine oil to new oil seal and install it using a suitable tool.

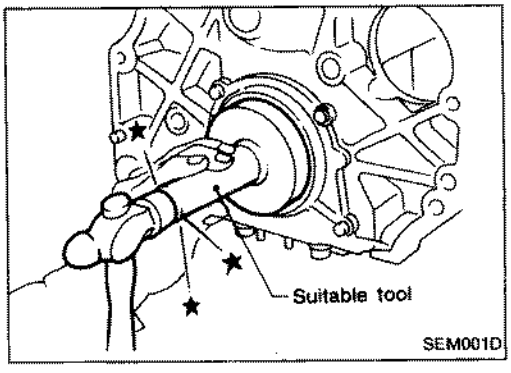


REAR OIL SEAL

1. Remove transaxle. (Refer to MT section.)
2. Remove flywheel.
3. Remove rear oil seal.

Be careful not to scratch rear oil seal retainer.

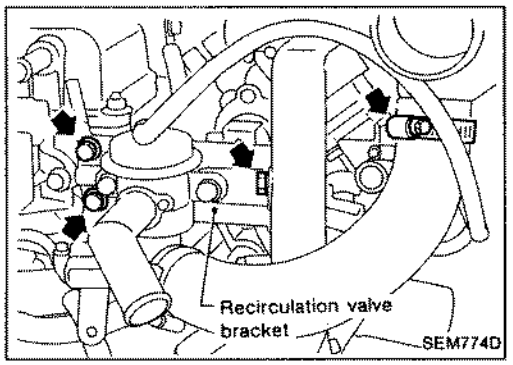




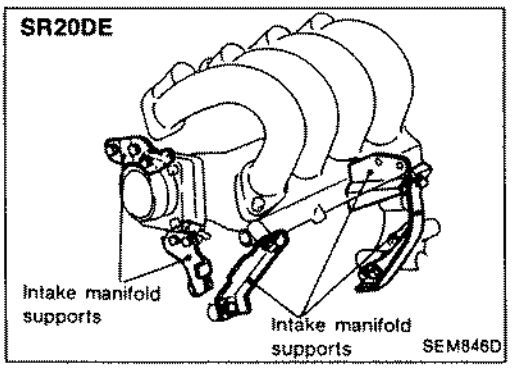
4. Apply engine oil to new oil seal and install it using a suitable tool.

Removal

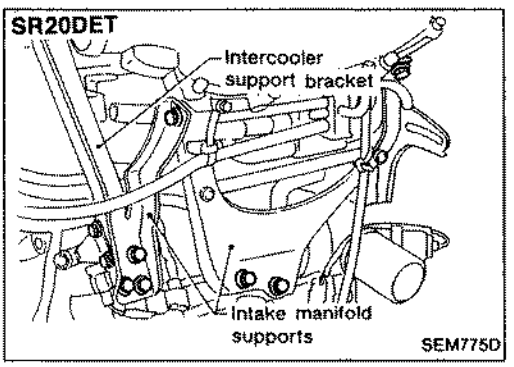
1. Release fuel pressure.
   Refer to "Releasing Fuel Pressure" in section EF & EC.
2. Drain coolant by removing cylinder block drain plug.
3. Remove air duct from intake manifold.
4. Remove intercooler cover and intercooler. (SR20DET only)
5. Remove P.C.V. hoses from rocker cover.
6. Remove vacuum hoses, fuel hoses, wires, harnesses, connectors, etc.

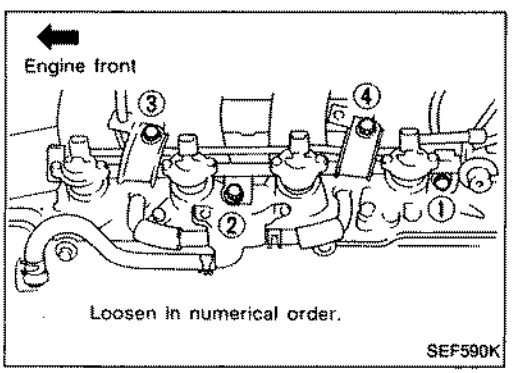


7. Remove recirculation valve bracket. (SR20DET only)



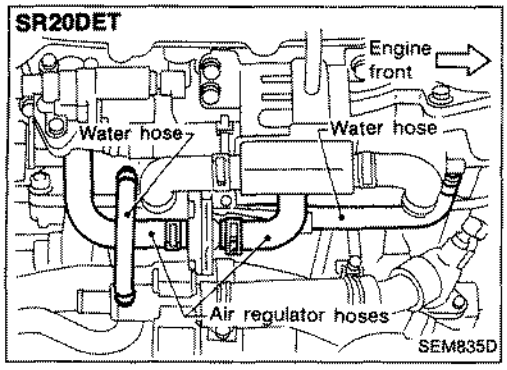
8. • SR20DE: Remove intake manifold supports.
   • SR20DET: Remove intake manifold supports and intercooler support bracket.



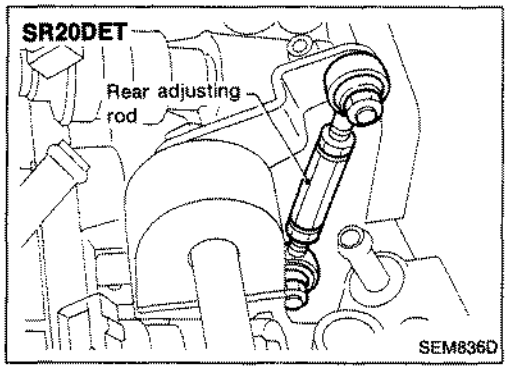


9. Remove fuel tube assembly. (SR20DE only)

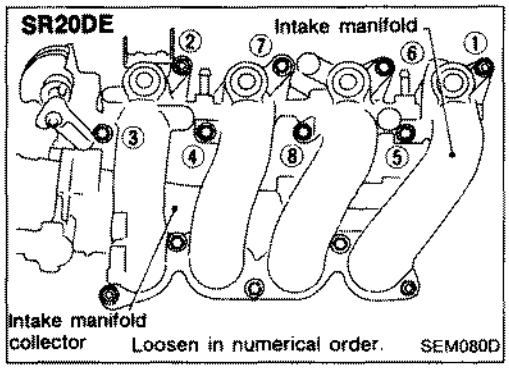
Removal (Cont'd)



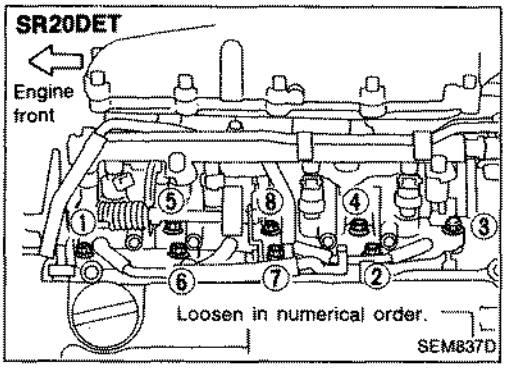
10. Remove the following hoses. (SR20DET only)
    - Air regulator hoses
    - Water hoses

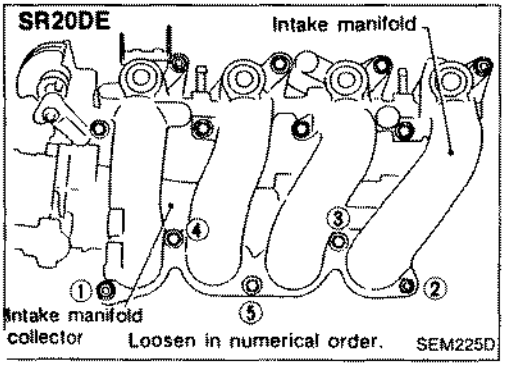


11. Remove rear adjusting rod. (SR20DET only)



12. Remove intake manifold.



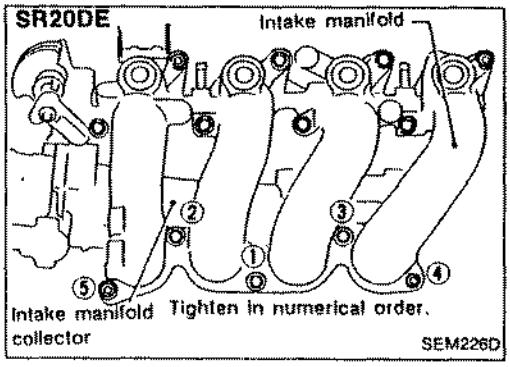


Disassembly and Assembly

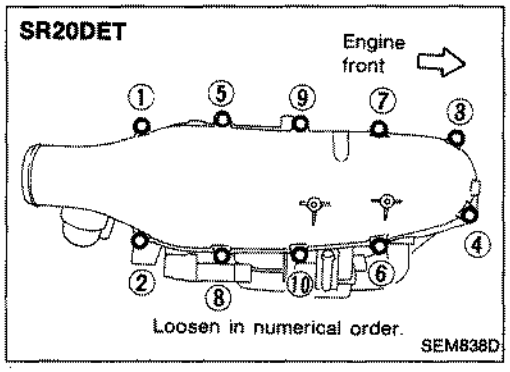
SR20DE

1. Remove intake manifold collector.

Disassembly and Assembly (Cont'd)

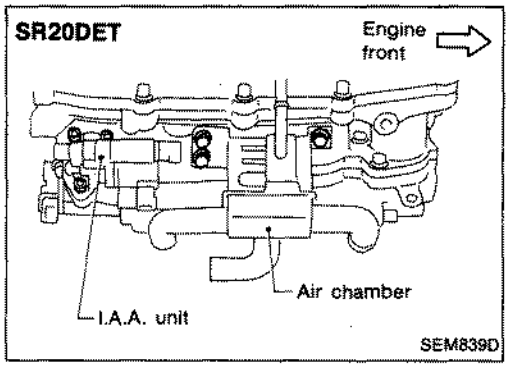


2. Install intake manifold collector.

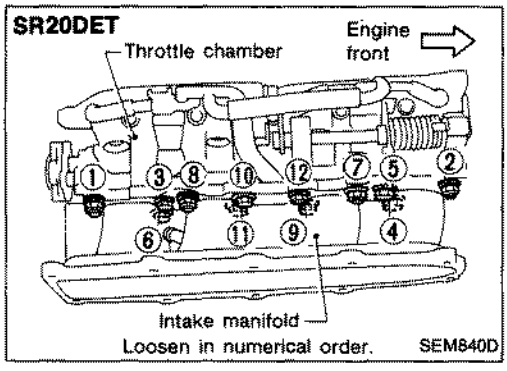


SR20DET

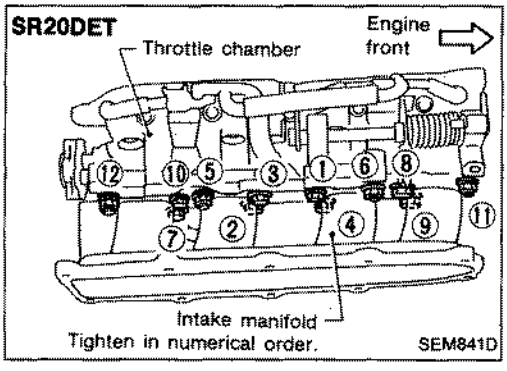
1. Remove intake manifold collector.



2. Remove air chamber and I.A.A. unit.
3. Remove injector tube assembly.
   Refer to "Injector Removal and Installation" in EF & EC section.

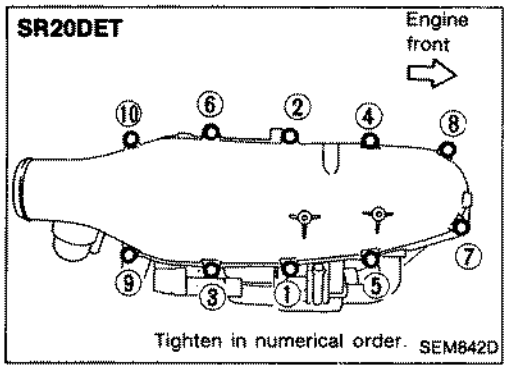


4. Remove intake manifold.

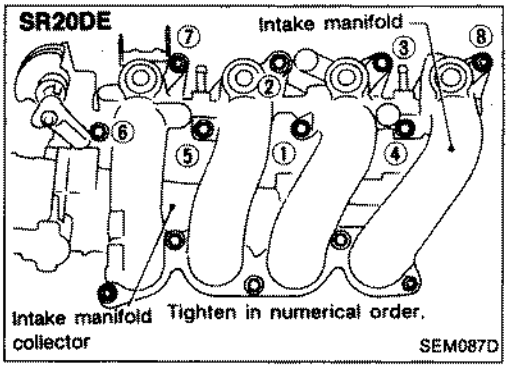


5. Install intake manifold.
6. Install injector tube assembly.
   Refer to "Injector Removal and Installation" in EF & EC section.
7. Install air chamber and I.A.A. unit.

Disassembly and Assembly (Cont'd)

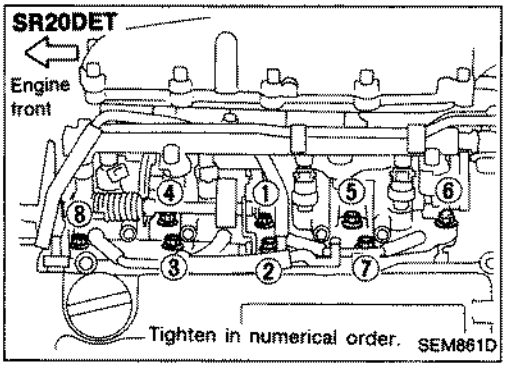


8. Install intake manifold collector.

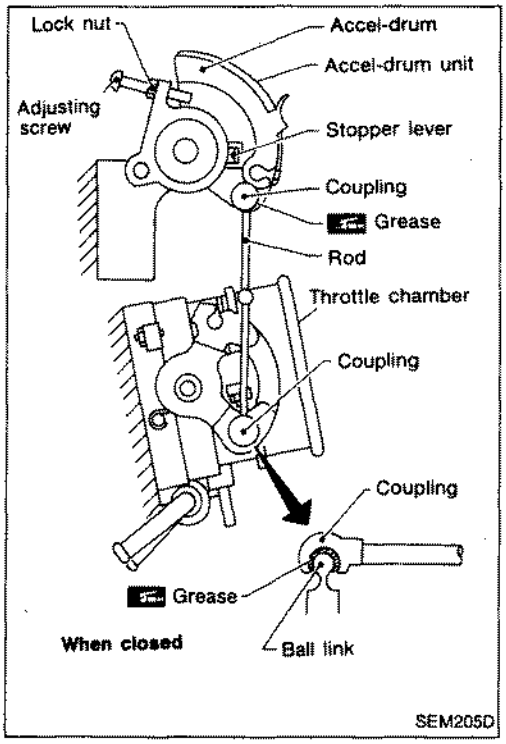


Installation

1. Install intake manifold.



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



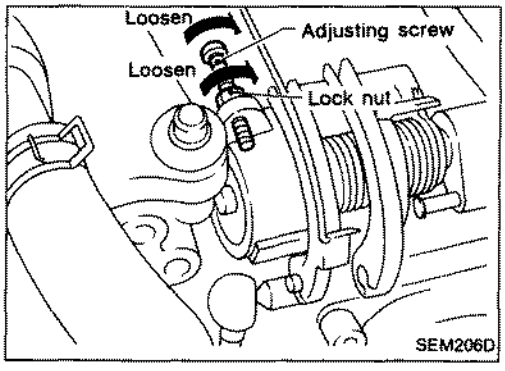
Adjust accel-drum unit whenever any of the following parts (new or old) are installed:

- **Accel-drum unit**
- **Throttle chamber**
- **Rod (Always replace with a new one after removal.)**

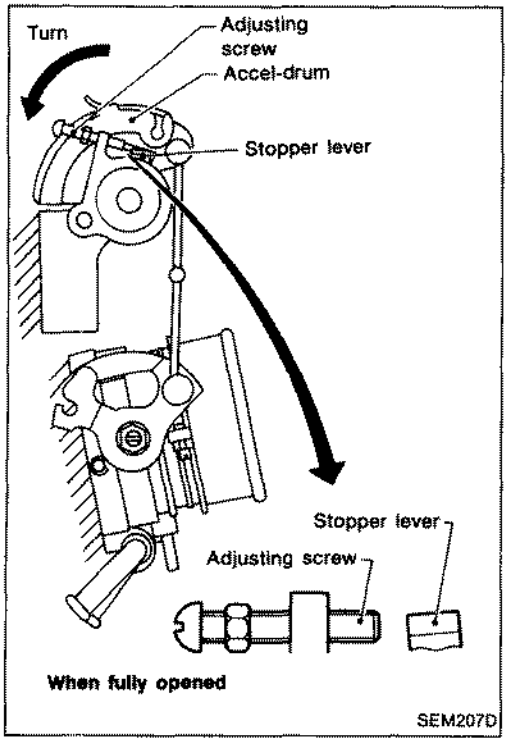
1. Install accel-drum unit and throttle chamber.
2. Apply grease all over the inside of the rod couplings.

Use genuine Nissan grease or equivalent.

3. Insert each one coupling to ball links of throttle chamber and accel-drum unit.

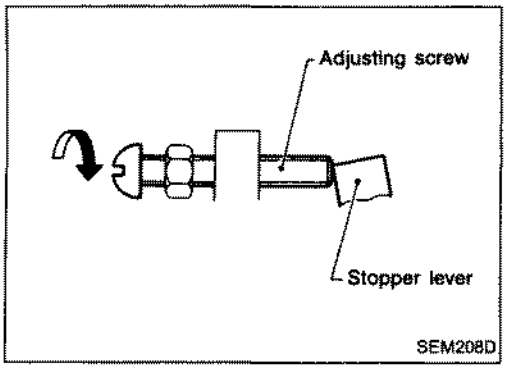


4. Loosen lock nut.
5. Loosen adjusting screw enough.

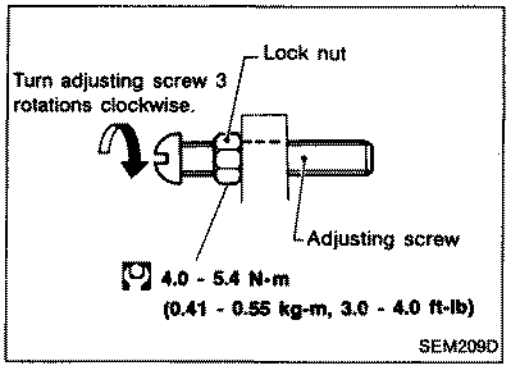


6. Manually turn accel-drum until throttle valve is fully open.

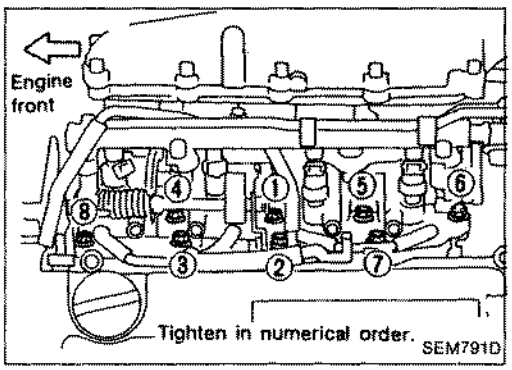
- Check that stopper lever is not touching adjusting screw. If it is, loosen adjusting screw to maintain clearance between the two.



7. Turn adjusting screw until it touches stopper lever.
8. Back off accel-drum.



9. Turn adjusting screw 3 rotations clockwise.
10. Tighten lock nut.



Installation

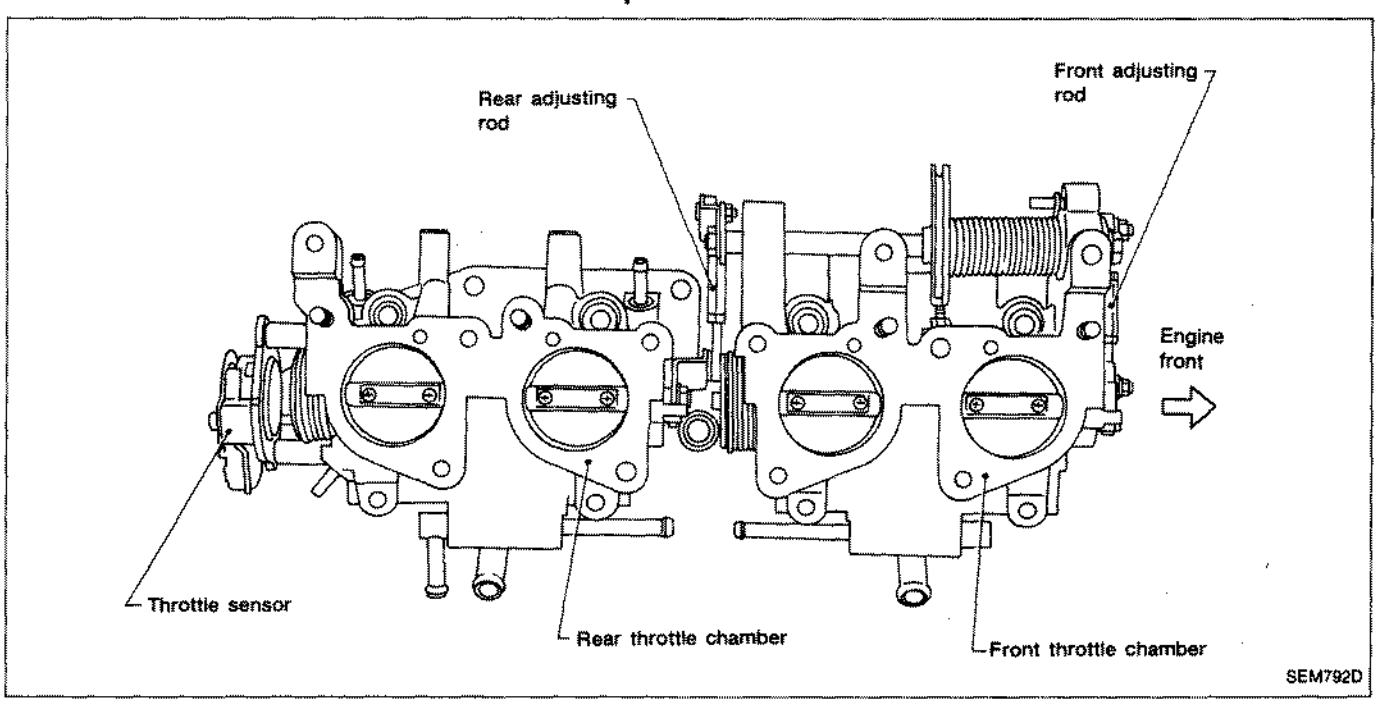
1. Install throttle chamber assembly.

Adjustment

Adjust throttle chambers whenever any of the following parts (new or old) are installed.

- **Throttle chambers.**
- **Adjusting rods.**

The above adjustment is made to equalize the four throttle valve positions.

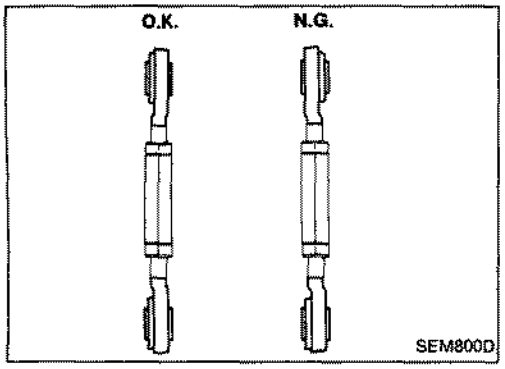


Throttle chamber adjustments

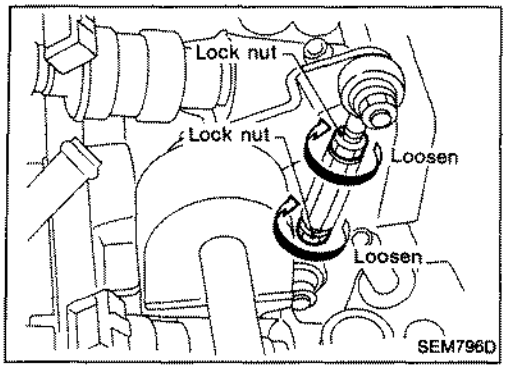
	Parts to be adjusted
When old throttle chamber assembly is reused.	Rear adjusting rod*
When throttle chamber assembly is replaced with a new one.	
When rear throttle chamber or rear adjusting rod is replace with a new one.	
When front adjusting rod is replaced with a new one.	Front adjusting rod
When front throttle chamber is replaced with a new one.	Front and rear adjusting rods

*: Front adjusting rod is adjusted at the factory and normally requires no adjustment in the field.

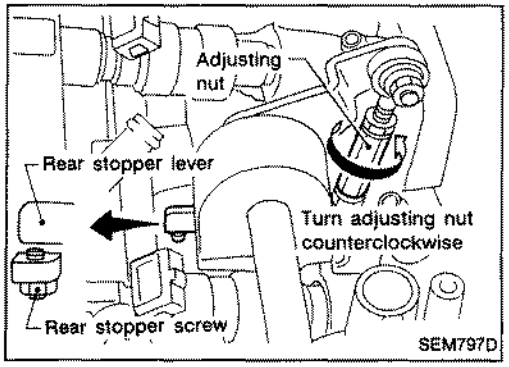
Adjustment (Cont'd)



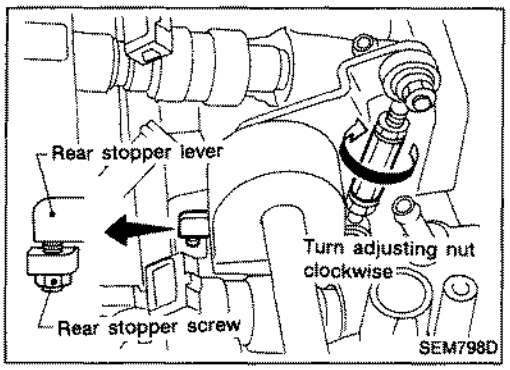
When installing rear adjusting rod, make sure it faces the correct direction, as shown in figure at left.



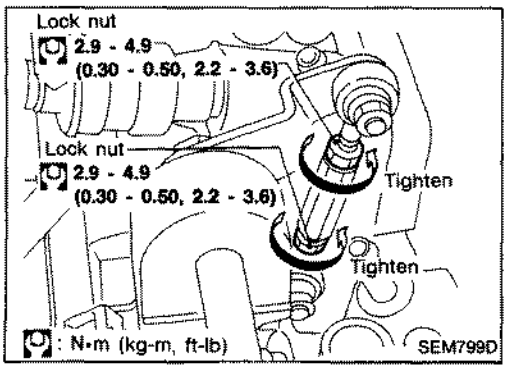
1. Loosen lock nuts.



2. Turn adjusting nut counterclockwise until rear stopper lever is slightly away from rear stopper screw.

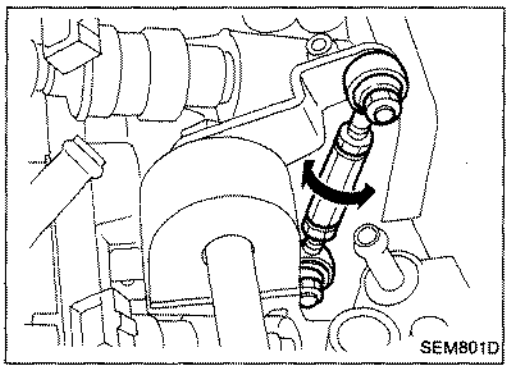


3. Turn adjusting nut clockwise until rear stopper lever contacts rear stopper screw or immediately before resistance is felt.



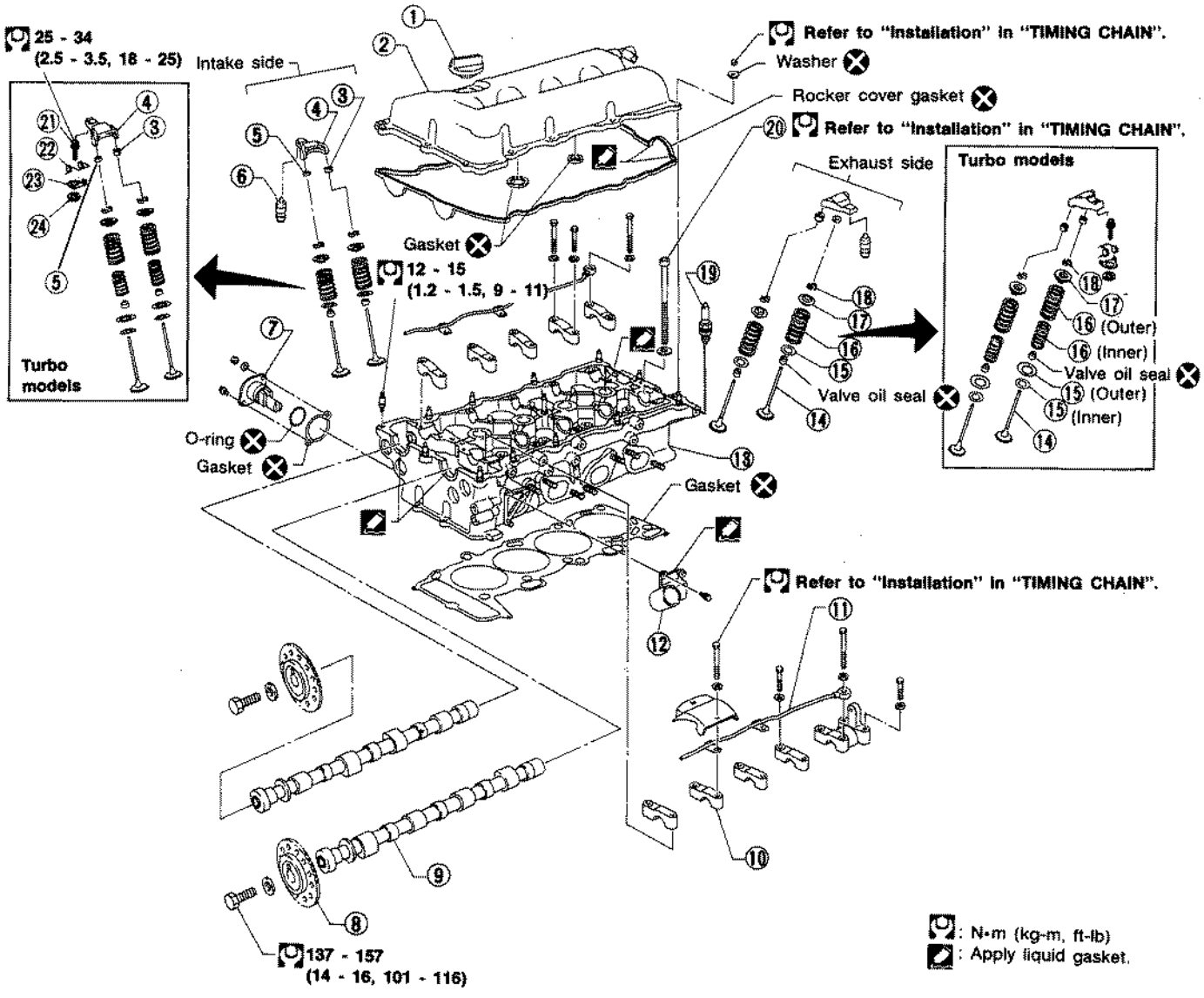
4. Prevent adjusting nut from turning and tighten lock nuts.

Adjustment (Cont'd)



5. Check front and rear adjusting rods for smooth and equal rotation. If not, readjust.

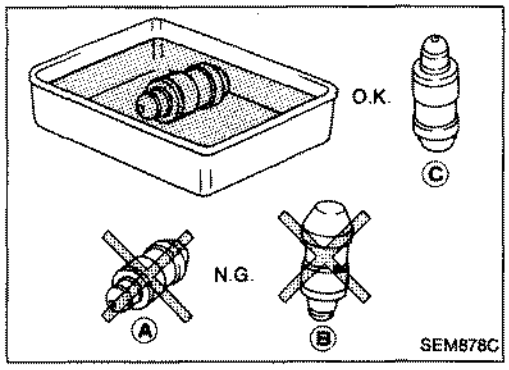
If front adjusting rod is to be adjusted, use the same adjustment procedure as that used for the rear adjusting rod.



SEM794D

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 Oil tube
⑫ Water outlet
⑬ Cylinder head
⑭ Valve
⑮ Valve spring seat
⑯ Valve spring
⑰ Valve spring retainer
⑱ Valve collet
⑲ Spark plug
⑳ Cylinder head bolt
㉑ Rocker pivot
㉒ Rocker arm spring
㉓ Rocker arm spring retainer
㉔ Washer

CAUTION:
- **When installing sliding parts such as rocker arms, camshaft and oil seal, be sure to apply new engine oil on their sliding surfaces.**
- **When tightening cylinder head bolts, camshaft sprocket bolts and camshaft bracket bolts, apply new engine oil to thread portions and seat surfaces of bolts.**

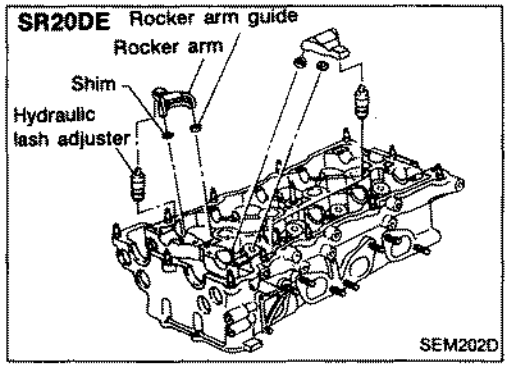


- **If a hydraulic lash adjuster is kept on its side, there is a risk of air entering it. After removal, always set hydraulic lash adjuster straight up, or when laying it on its side, have it soak in new engine oil.**
- **Do not disassemble hydraulic lash adjusters.**
- **Attach tags to lash adjusters so as not to mix them up.**

Removal

1. • SR20DE: Remove cylinder head with intake and exhaust manifolds.
   • SR20DET: Remove cylinder head with intake manifold.

This removal is the same procedure as that for timing chain. Refer to "Removal" in "TIMING CHAIN".

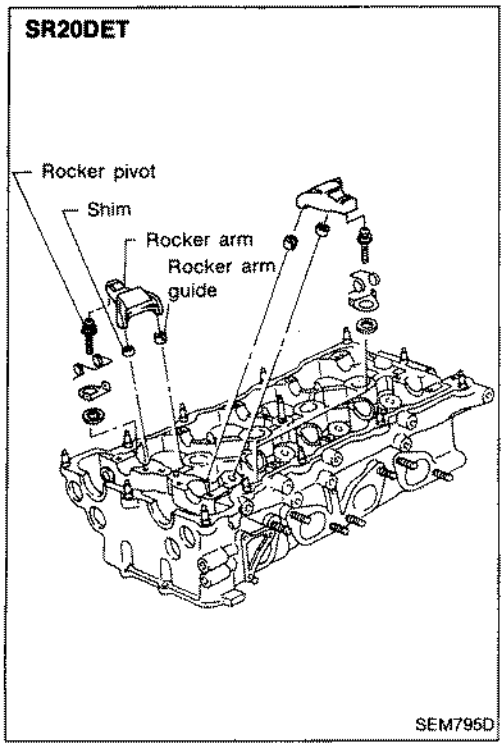


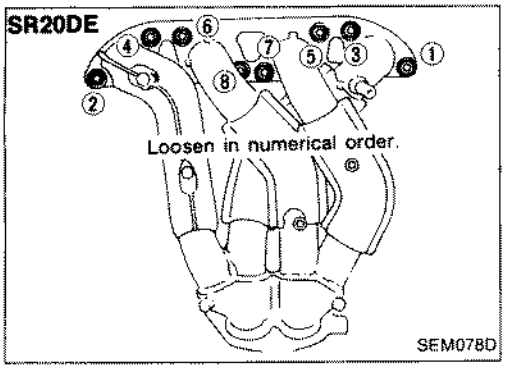
Disassembly

1. • SR20DE: Remove rocker arms, shims, rocker arm guides and hydraulic lash adjusters from cylinder head.
   • SR20DET: Remove rocker arms, shims, rocker arm guides and rocker pivots from cylinder head.

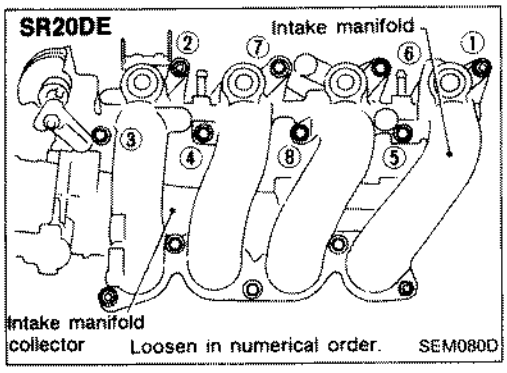
CAUTION:
Keep parts in order so that they can be installed in their original positions during assembly. (Install parts in their original positions.)

Disassembly (Cont'd)

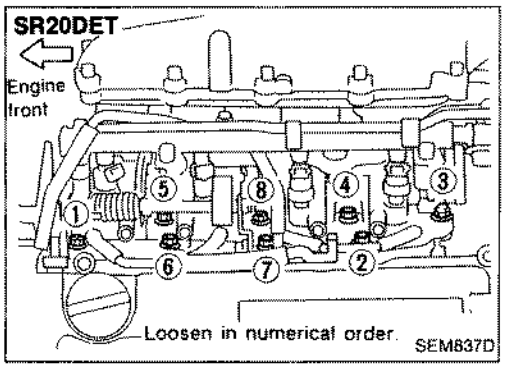




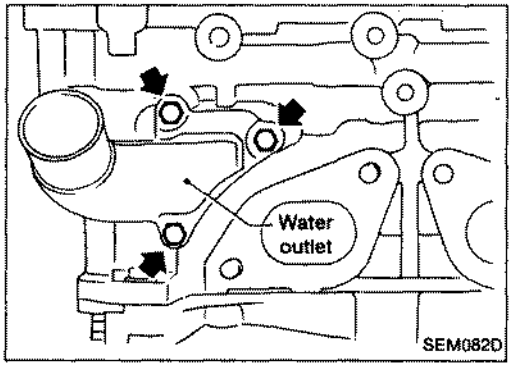
2. Remove exhaust manifold cover. (SR20DE only)
3. Remove exhaust manifold. (SR20DE only)



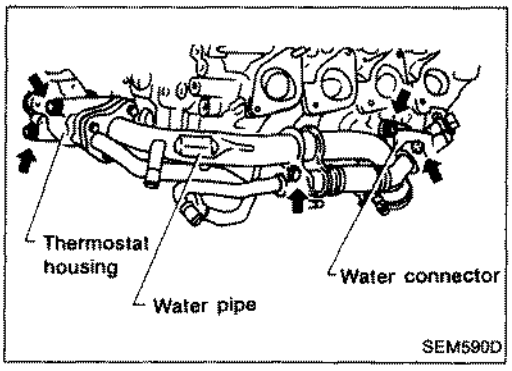
4. Remove intake manifold.



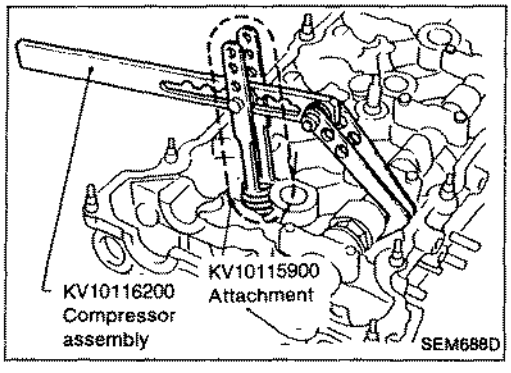
Disassembly (Cont'd)



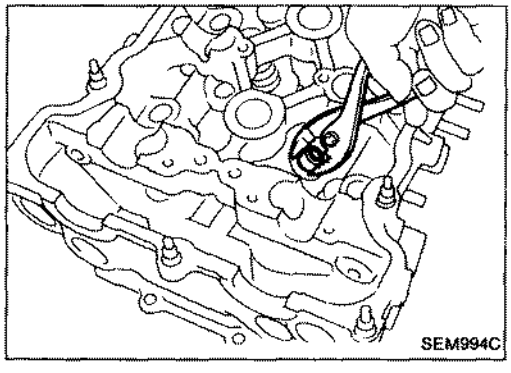
5. Remove water outlet.



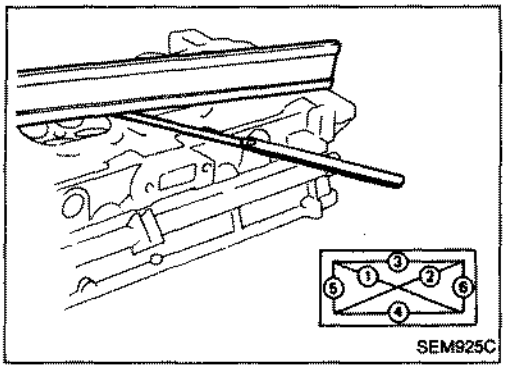
6. Remove water connector.
7. Remove thermostat housing with water pipe.



8. Remove valve components with Tool.



9. 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 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)

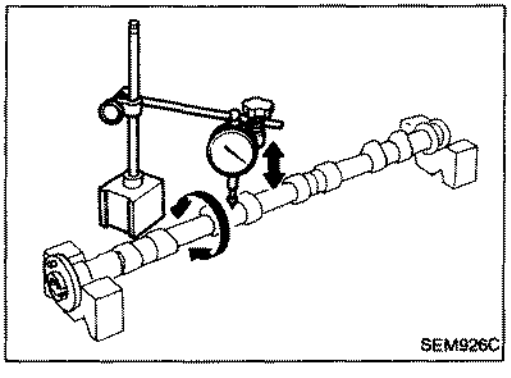
After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, cylinder head must be replaced.

Nominal cylinder head height:

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

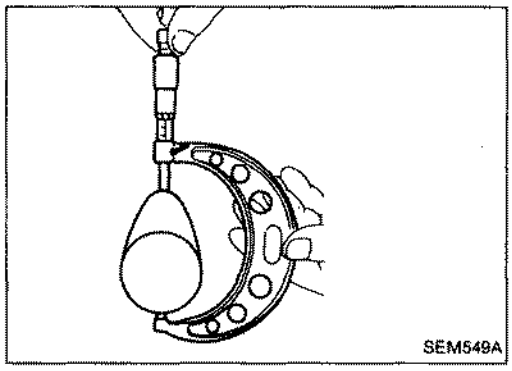
Less than 0.02 mm (0.0008 in)

Limit

0.1 mm (0.004 in)

2. If it exceeds the limit, replace camshaft.

Inspection (Cont'd)


SEM549A

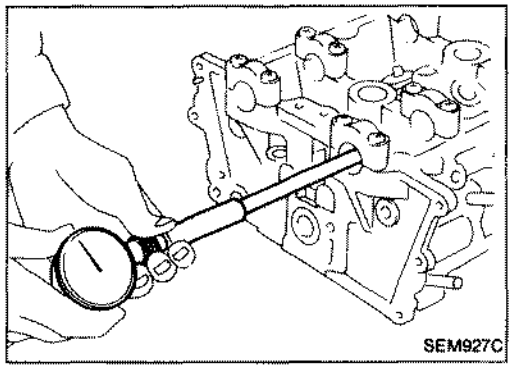
CAMSHAFT CAM HEIGHT

1. Measure camshaft cam height.

Unit: mm (in)

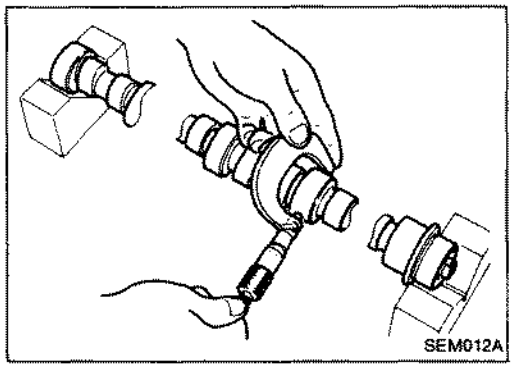
Engine	SR20DE	SR20DET
Standard cam height		
Intake	38.408 - 38.598 (1.5121 - 1.5196)	38.648 - 38.838 (1.5216 - 1.5291)
Exhaust	37.920 - 38.110 (1.4929 - 1.5004)	38.648 - 38.838 (1.5216 - 1.5291)
Cam wear limit		
Intake & Exhaust	0.20 (0.0079)	0.20 (0.0079)

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

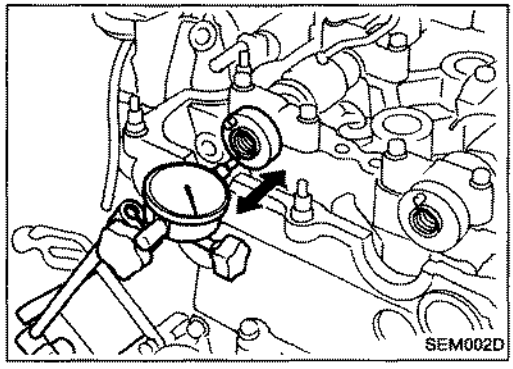

SEM927C

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)


SEM012A

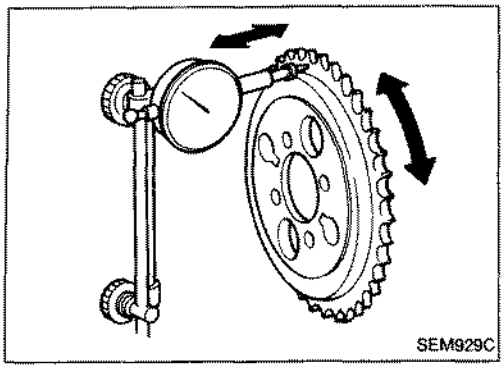
3. Measure outer diameter of camshaft journal.
   Standard outer diameter:
   27.935 - 27.955 mm (1.0998 - 1.1006 in)
4. If clearance exceeds the limit, replace camshaft and/or cylinder head.
   Camshaft journal clearance:
   Standard
   0.045 - 0.086 mm (0.0018 - 0.0034 in)
   Limit
   0.12 mm (0.0047 in)


SEM002D

CAMSHAFT END PLAY

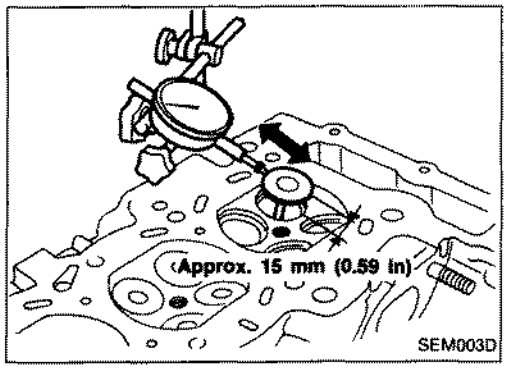
1. Install camshaft in cylinder head.
2. Measure camshaft end play.
   Camshaft end play:
   Standard
   0.055 - 0.139 mm (0.0022 - 0.0055 in)
   Limit
   0.20 mm (0.0079 in)

Inspection (Cont'd)



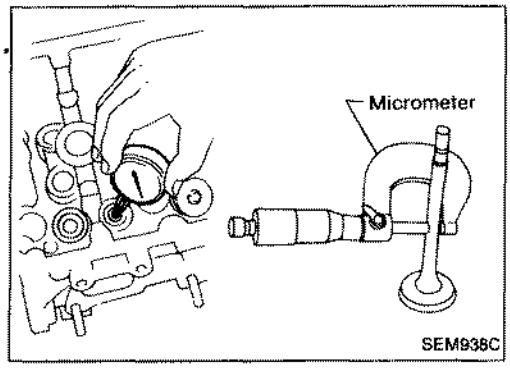
CAMSHAFT SPROCKET RUNOUT

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)



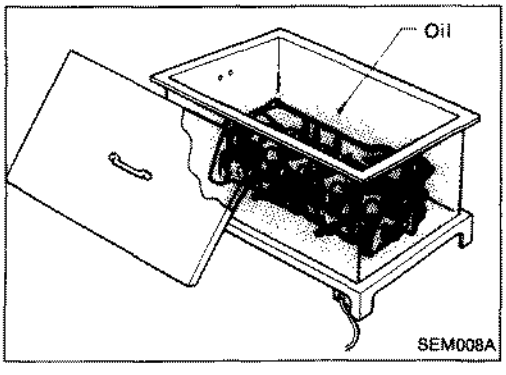
2. If it exceeds the limit, check valve to valve guide clearance.
a. Measure valve stem diameter and valve guide inner diameter.
b. Check that clearance is within specification.

Valve to valve guide clearance:

Unit: mm (in)

	Standard	Limit
Intake	0.020 - 0.053 (0.0008 - 0.0021)	0.1 (0.004)
Exhaust	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.004)

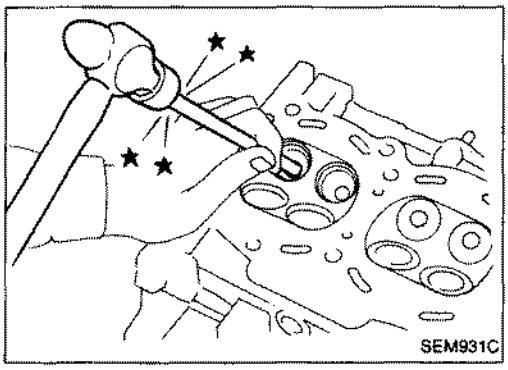
c. If it exceeds the limit, replace valve or valve guide.



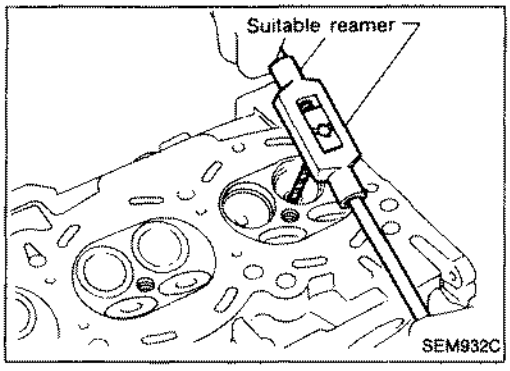
VALVE GUIDE REPLACEMENT

1. To remove valve guide, heat cylinder head to 110 to 130°C (230 to 266°F).

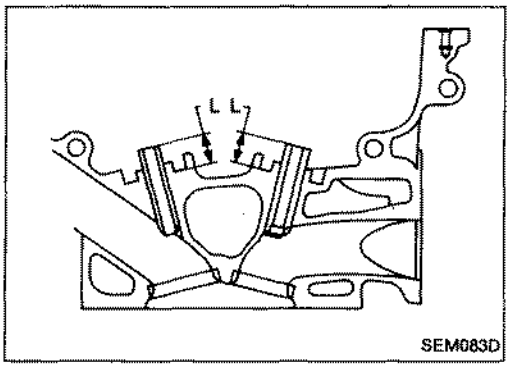
Inspection (Cont'd)



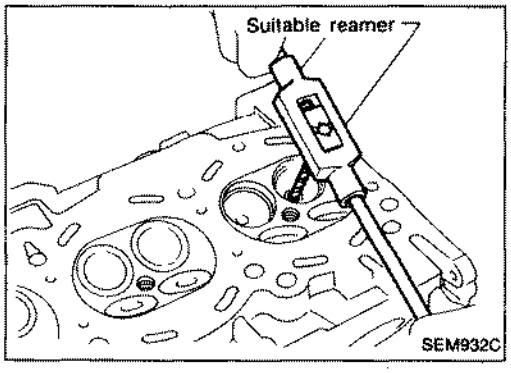
2. Press out valve guide or use a hammer and suitable tool.



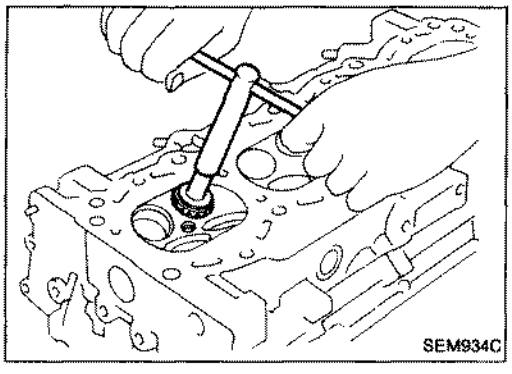
3. Ream cylinder head valve guide hole.
   Valve guide hole diameter
   (for service parts):
   Intake
   10.175 - 10.196 mm (0.4006 - 0.4014 in)
   Exhaust
   11.175 - 11.196 mm (0.4400 - 0.4408 in)



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
   7.000 - 7.018 mm (0.2756 - 0.2763 in)

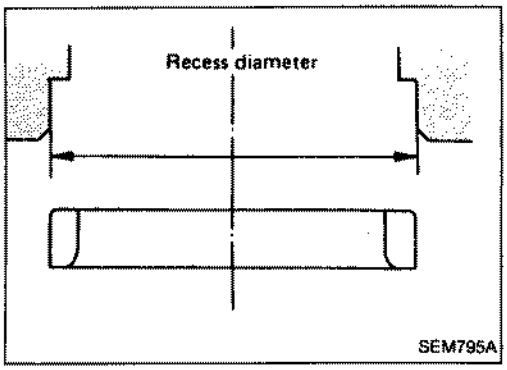


VALVE SEATS

Check valve seats for any evidence of pitting at valve contact surface, and 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.**
- **Cut with both hands to uniform the cutting surface.**

Inspection (Cont'd)

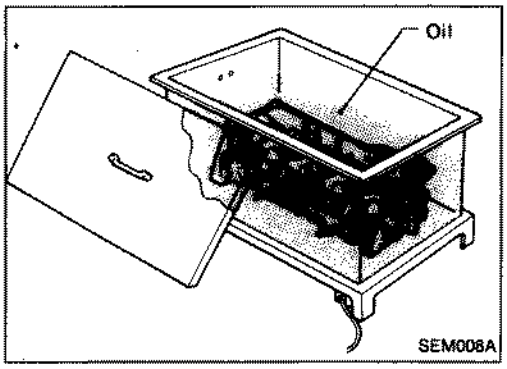


REPLACING VALVE SEAT FOR SERVICE PARTS

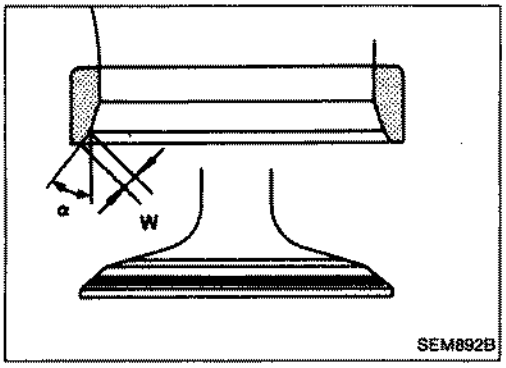
1. Bore out old seat until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the seat recess in cylinder head.
2. Ream cylinder head recess.

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)

Reaming should be done in circles concentric to the valve guide center so that valve seat will have the correct fit.

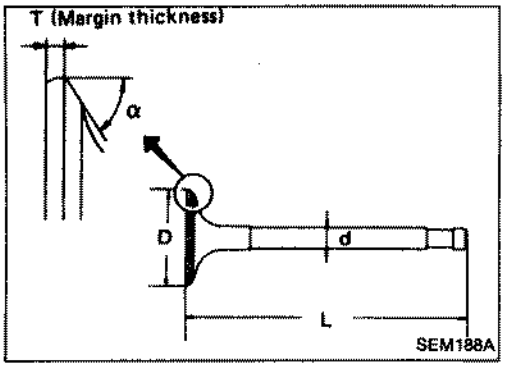


3. Heat cylinder head to 110 to 130°C (230 to 266°F).
4. Press fit valve seat until it seats on the bottom.



5. Cut or grind valve seat using a suitable tool at the specified dimensions as shown in S.D.S.
6. After cutting, lap valve seat with abrasive compound.
7. Check valve seating condition.

Seat face angle "α":
44°53' - 45°07' deg.
Contacting width "W":
Intake
1.4 - 1.7 mm (0.055 - 0.067 in)
Exhaust
1.7 - 2.0 mm (0.067 - 0.079 in)

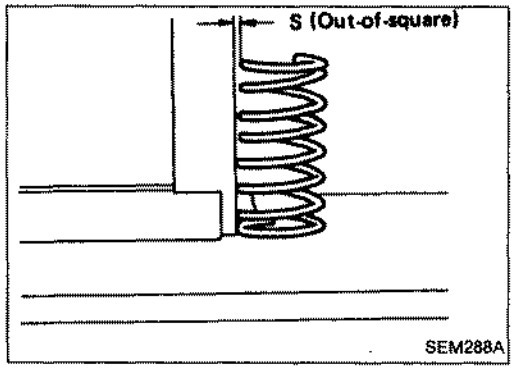


VALVE DIMENSIONS

Check dimensions in each valve. For dimensions, refer to S.D.S. 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

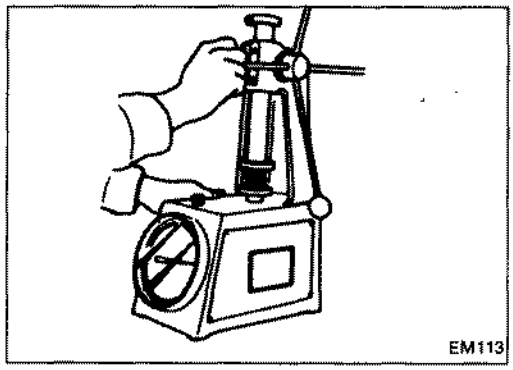
1. Measure "S" dimension.

Out-of-square:

Unit: mm (in)

SR20DE	SR20DET	
	Inner	Outer
Less than 2.2 (0.087)	Less than 1.8 (0.071)	Less than 2.1 (0.083)

2. If it exceeds the limit, replace spring.



Pressure

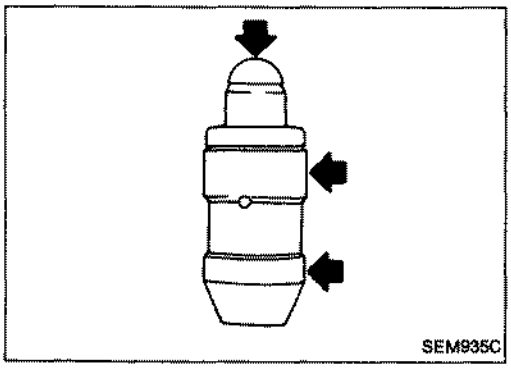
Check valve spring pressure.

Pressure:

N (kg, lb) at height mm (in)

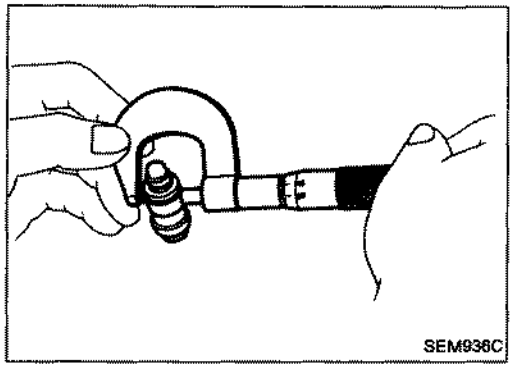
	SR20DE	SR20DET	
		Inner	Outer
Standard	569.00 - 641.57 (58.02 - 65.42, 127.93 - 144.25) at 30.0 (1.181)	154.95 - 174.76 (15.8 - 17.82, 34.84 - 39.29) at 20.6 (0.811)	451.51 - 504.18 (46.04 - 51.41, 101.52 - 113.36) at 27.9 (1.098)
Limit	More than 549.2 (56.0, 123.5) at 30.0 (1.181)	More than 147.1 (15.0, 33.1) at 20.6 (0.811)	More than 428.6 (43.7, 96.4) at 27.9 (1.098)

If it exceeds the limit, replace spring.



HYDRAULIC LASH ADJUSTER (SR20DE)

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

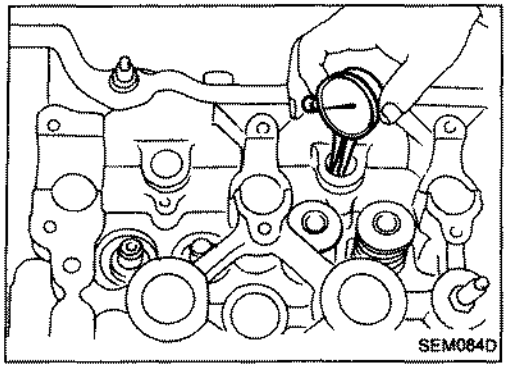


2. Check diameter of lash adjuster.

Outer diameter:

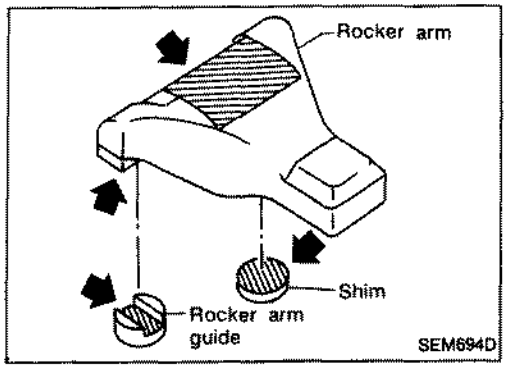
16.980 - 16.993 mm (0.6685 - 0.6690 in)

Inspection (Cont'd)


SEM084D

3. Check lash adjuster guide inner diameter.

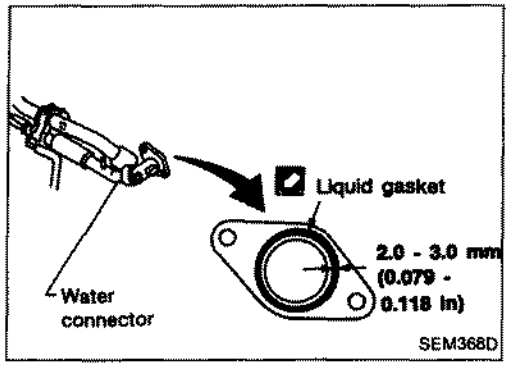
Inner diameter:
17.000 - 17.020 mm (0.6693 - 0.6701 in)
Standard clearance between lash adjuster and adjuster guide:
0.007 - 0.040 mm (0.0003 - 0.0016 in)



SEM694D

ROCKER ARM, SHIM AND ROCKER ARM GUIDE

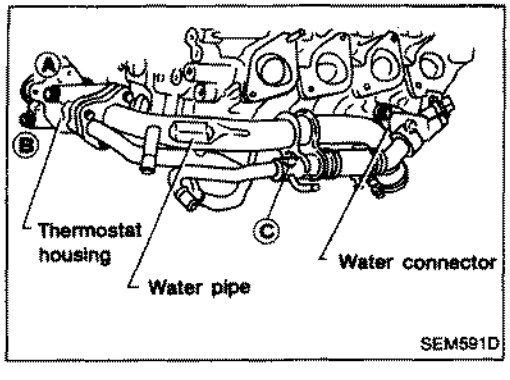
Check contact and sliding surfaces of rocker arms, shims and rocker arm guides for wear or scratches.



SEM368D

Assembly

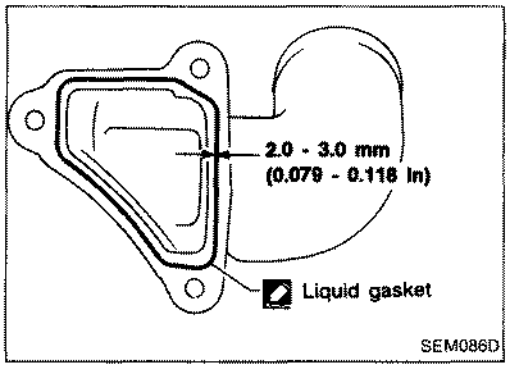
1. Install water connector.
(1) Before installing water connector, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder head.
(2) Apply a continuous bead of liquid gasket to mating surface of water connector.
- **Use Genuine Liquid Gasket or equivalent.**



SEM591D

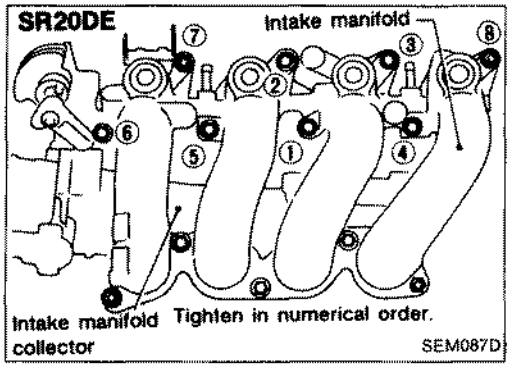
2. Install thermostat housing with water pipe.
- Tightening procedure:
(1) Tighten thermostat housing bolt Ⓐ to 2 - 5 N·m (0.2 - 0.5 kg-m, 1.4 - 3.6 ft-lb).
(2) Tighten water pipe bolt Ⓒ to 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb).
(3) Tighten thermostat housing bolt Ⓐ to 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb).
(4) Tighten thermostat housing bolt Ⓑ to 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb).
- **Perform steps (2) through (4) after installing cylinder head on cylinder block.**

Assembly (Cont'd)

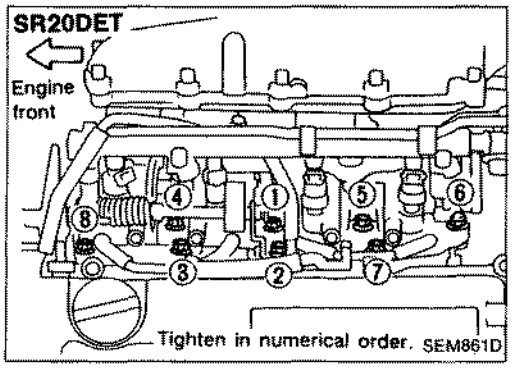


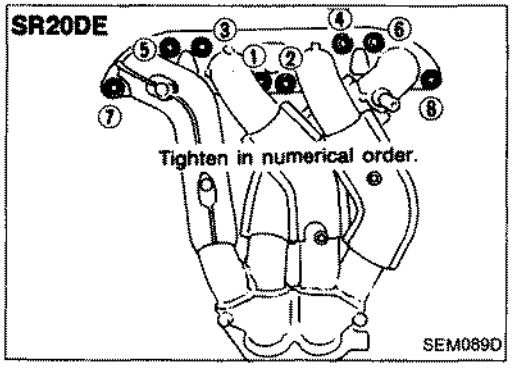
3. Install water outlet.
(1) Before installing water outlet, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder head.

(2) Apply a continuous bead of liquid gasket to mating surface of water outlet.
- **Use Genuine Liquid Gasket or equivalent.**

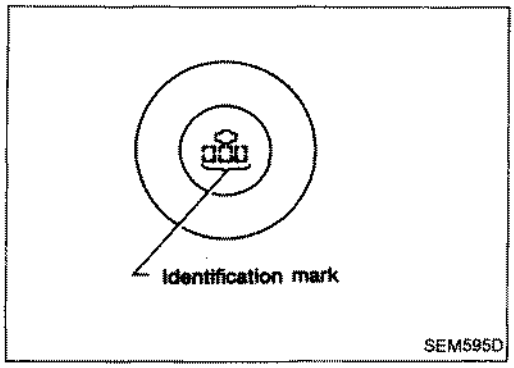


4. Install intake manifold.
Refer to "Installation" in "INTAKE MANIFOLD".





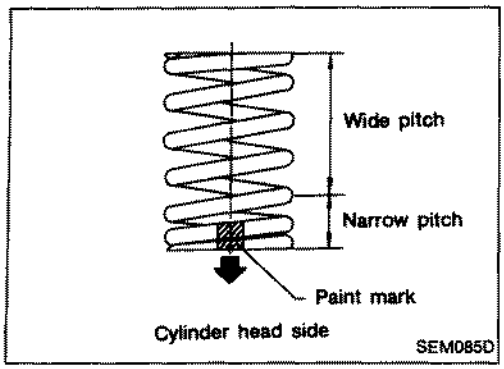
5. Install exhaust manifold. (SR20DE only)
6. Install exhaust manifold cover. (SR20DE only)



7. Install valve component parts.
- **Install valves, noting their identification marks as indicated in the table below.**

	Identification mark	
	SR20DE	SR20DET
Intake valve	53J	54C
Exhaust valve	5J	5C or no mark

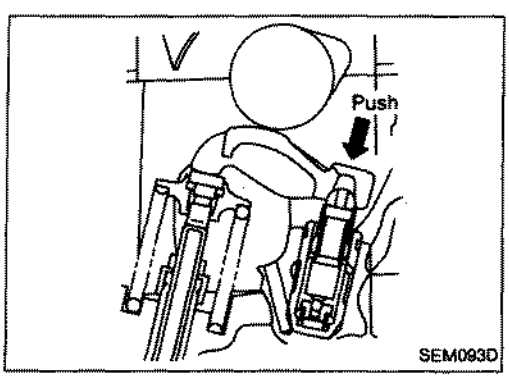
Assembly (Cont'd)



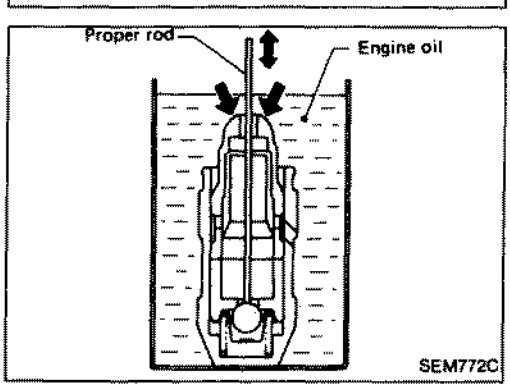
- **Always use new valve oil seal.**
  Refer to OIL SEAL REPLACEMENT.
- **Before installing valve oil seal, install valve spring seat.**
- **Install valve spring (uneven pitch type) with its narrow pitched side toward cylinder head side (paint mark).**

	SR20DE	SR20DET	
		Inner	Outer
Paint mark	Green	No color	Pink

- **After installing valve component parts, use plastic hammer to lightly tap valve stem tip to assure a proper fit.**

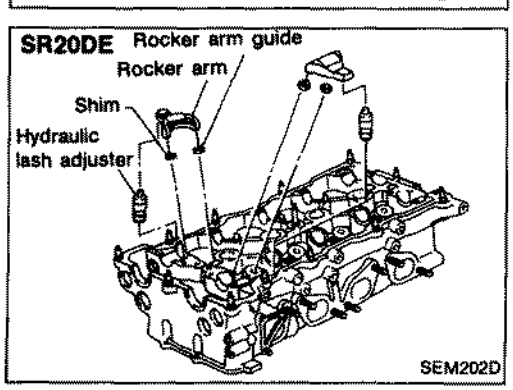


8. Check hydraulic lash adjusters. (SR20DE only)
(1) When rocker arm can be moved at least 1 mm (0.04 in) by pushing at hydraulic lash adjuster location, it indicates that there is air in the high pressure chamber.
Noise will be emitted from hydraulic lash adjuster if engine is started without bleeding air.



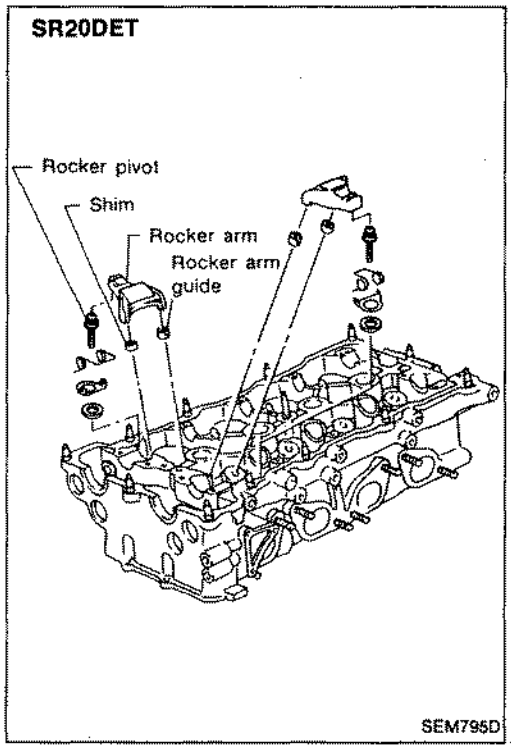
(2) Remove hydraulic lash adjuster and dip in a container filled with engine oil. While pushing plunger as shown in figure, lightly push check ball using a thin rod. Air is completely bled when plunger no longer moves.

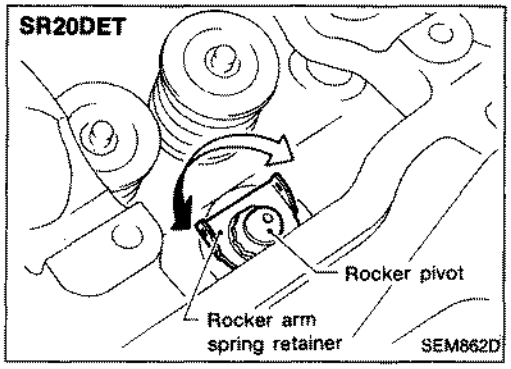
Air cannot be bled from this type of lash adjuster by running the engine.



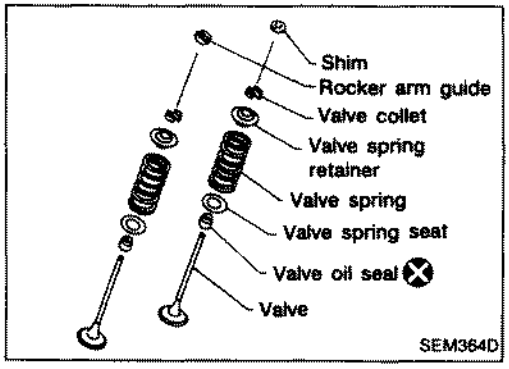
9. • SR20DE: Install rocker arms, shims, rocker arm guides and hydraulic lash adjusters.
   • SR20DET: Install rocker arms, rocker arm guides and rocker pivots.

CAUTION:
Install all parts in their original positions.





- **After installing rocker arm spring retainer, check that it moves smoothly right and left. (SR20DET only)**

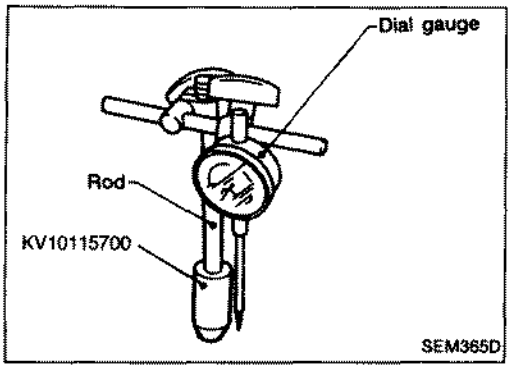


Valve Clearance Adjustment

SR20DE

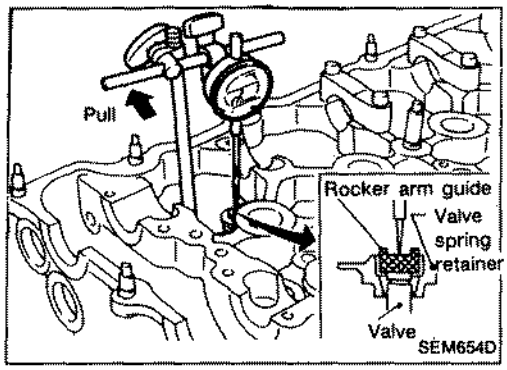
Select a suitable shim when replacing valve, cylinder head, shim, rocker arm guide and/or valve seat with new one(s), as follows:

1. Install valve component parts to cylinder head (Except shim).
- Always replace rocker arm guide with a new one.



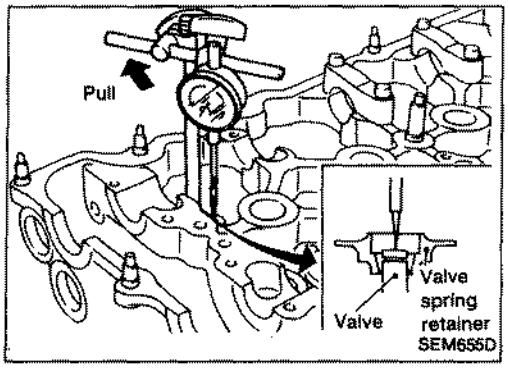
2. Remove hydraulic lash adjuster.
3. Install Tool* into hydraulic lash adjuster fixing hole.
   * Tool (KV10115700) is screwed into magnetic stand rod used with dial gauge.

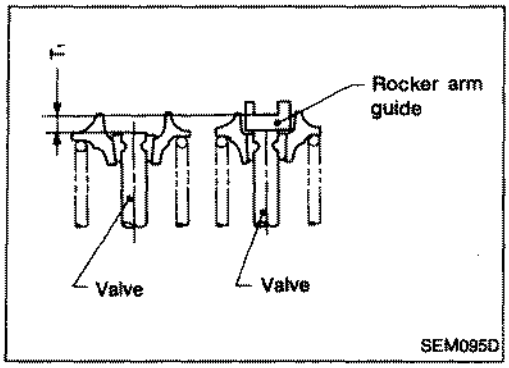
Valve Clearance Adjustment (Cont'd)

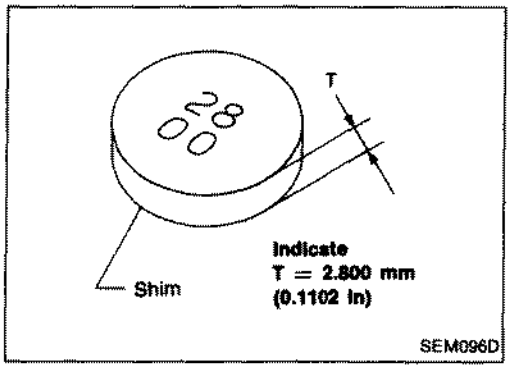


4. Measure difference in level (T_1) between sliding surface of rocker arm guide against rocker arm and valve stem end on shim side with valve, valve spring, collet, retainer and rocker arm guide installed to the head (Except shim),

When measuring, lightly pull dial indicator rod toward you to eliminate play in Tool (KV10115700).







5. Select a shim having a thickness (T) that makes –0.025 mm (–0.0010 in) ≦ [(T) – (T_1)] ≦ 0.025 mm (0.0010 in).

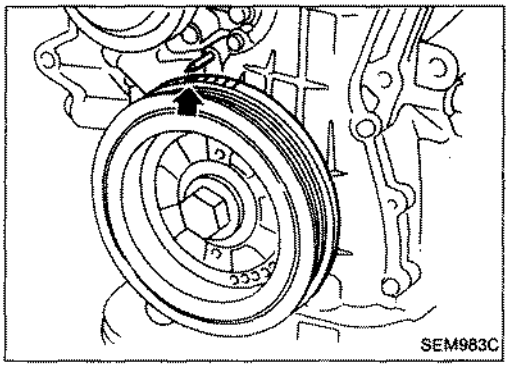
- Shims are available in 17 different thicknesses ranging from 2.800 mm (0.1102 in) to 3.200 mm (0.1260 in) in increments of 0.025 mm (0.0010 in).

SR20DET

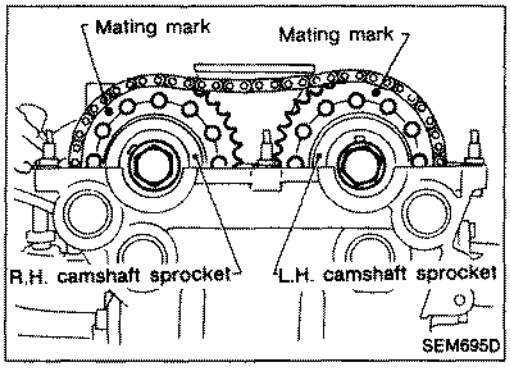
Check camshaft clearance while engine is warmed up sufficiently and not running.

1. Remove rocker cover.
2. Remove all spark plugs.

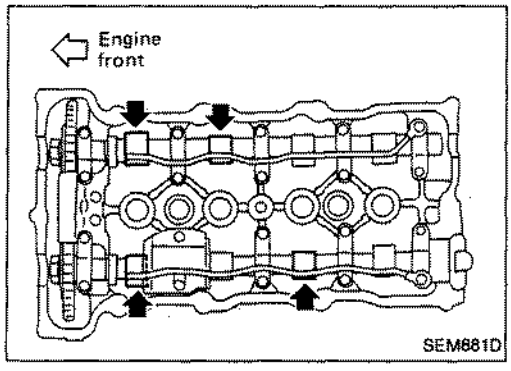
Valve Clearance Adjustment (Cont'd)



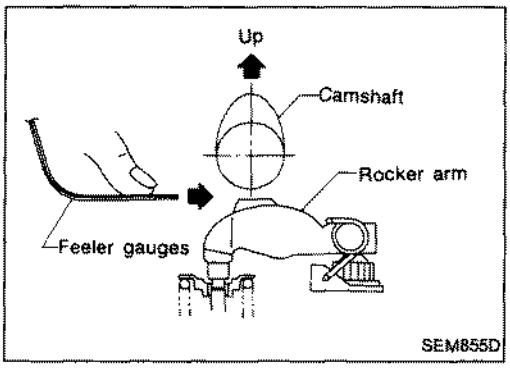
3. Set No. 1 piston at T.D.C. on the compression stroke by rotating crankshaft.



- **Rotate crankshaft until mating mark on camshaft sprocket is set at position indicated in figure at left.**

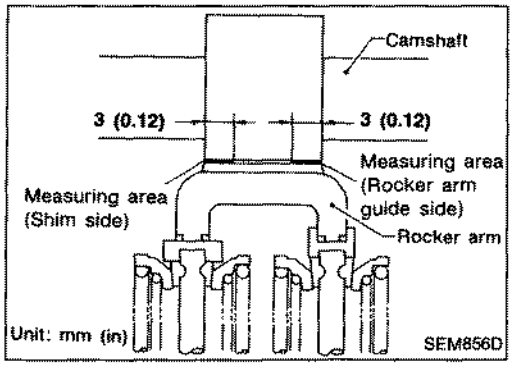


4. Check only those camshaft clearances shown in the figure.



1) Using *two feeler gauges (with one placed on the other), measure the camshaft-to-rocker arm clearance at two places (one on the shim side and one on the rocker arm guide side). Be sure to insert the gauges horizontally.

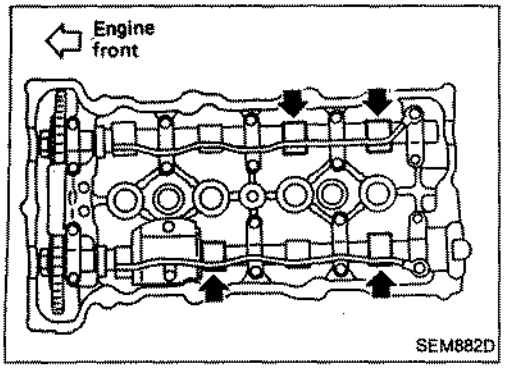
*: To minimize the measuring error.
- One feeler gauge increases the measurement error because the gauge is too stiff to bend.
- More than two gauges increases the gauge error twice as much, resulting in a considerable measurement error.



2) Record any valve clearance measurements which are out of specification.
They will be used later to determine the required replacement adjusting shim.

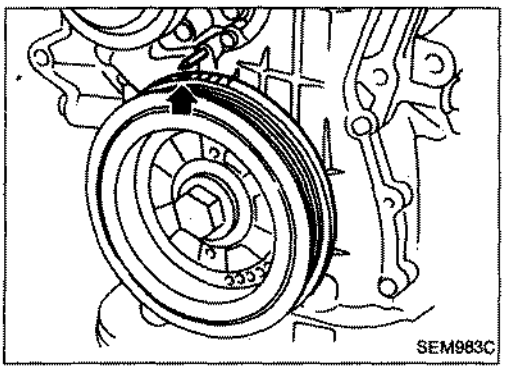
Camshaft clearance (Hot):
Intake & Exhaust
0.20 - 0.23 mm (0.0079 - 0.0091 in)

Valve Clearance Adjustment (Cont'd)

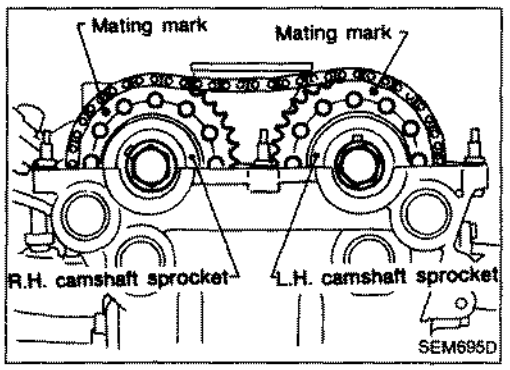


5. Turn crankshaft one revolution (360°) and align mark on crankshaft pulley with pointer.
6. Check those camshaft clearances shown in the figure.
   - Use the same procedure as mentioned in step 4.
7. If camshaft clearances are within specification, install any parts removed in reverse order of removal.

Select a suitable shim and a suitable rocker arm guide when camshaft clearances are out of specification or when replacing valve, cylinder head, shim, rocker arm guide and/or valve seat with new one(s), as follows:
Adjust valve clearance and camshaft clearance while engine is hot.

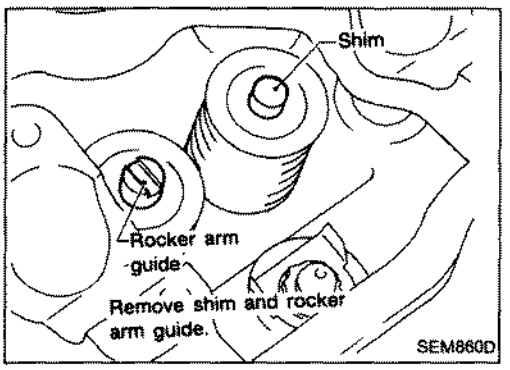


8. Set No. 1 piston at T.D.C. on the compression stroke by rotating crankshaft.



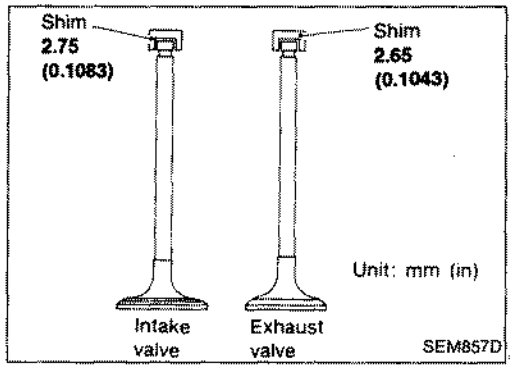
Rotate crankshaft until mating mark on camshaft sprocket is set at position indicated in figure at right.

9. Remove chain tensioner.
10. Remove distributor.
11. Remove camshaft sprockets.
12. Remove camshafts, oil tubes and rocker arms.



13. Remove the shim and rocker arm guide to adjust the corresponding camshaft.

Valve Clearance Adjustment (Cont'd)



14. Place new shims of the proper thickness (indicated below) in place of the shim and rocker arm guide that were removed in step 6 above.

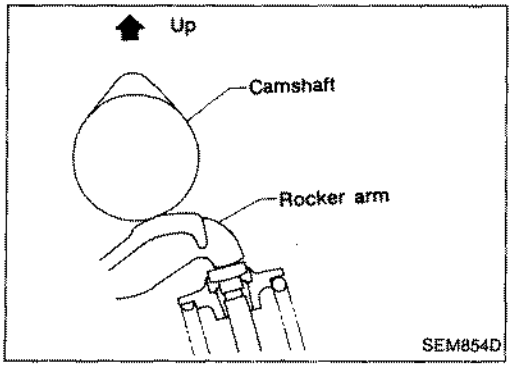
Shim thickness:

Intake 2.75 mm (0.1083 in)

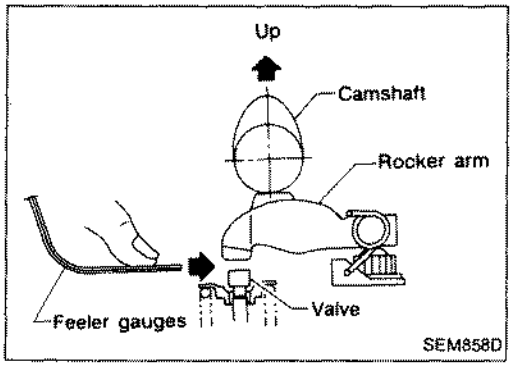
Exhaust 2.65 mm (0.1043 in)

Make sure the valve head and shims are clean and free from foreign matter.

15. Install rocker arms, oil tubes and camshafts.
16. Install camshaft sprockets.
17. Install distributor.
18. Install chain tensioner.



19. Rotate the crankshaft until the surface is set for the cylinder to be adjusted, as shown in figure.



20. Using two feeler gauges (one placed on the other), insert horizontally between the shim-to-rocker arm guide to measure the valve clearance.

Valve clearance:

Unit: mm (in)

	Hot	Cold* (reference data)
Intake & Exhaust	0.30 - 0.35 (0.012 - 0.014)	0.21 - 0.26 (0.008 - 0.010)

*: 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.**

Valve Clearance Adjustment (Cont'd)

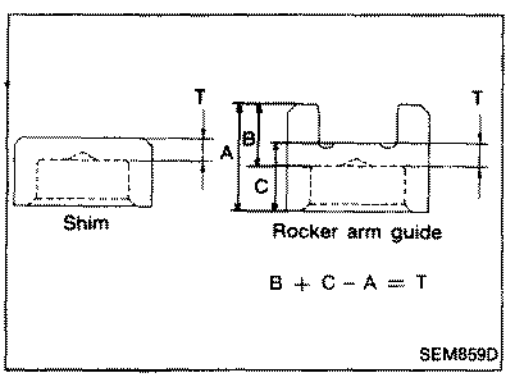
21. If valve clearance is not within specifications, select suitable shim(s) and rocker arm guide.

- **How to select a suitable shim and a suitable rocker arm guide**

  Example: When intake valve clearance (on the shim side) is 0.4 mm (0.016 in), determine the required shim thickness using the following equations:

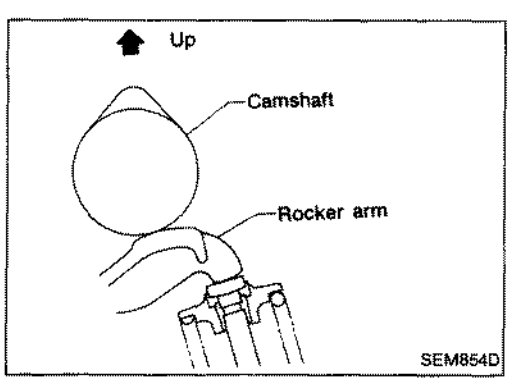
  0.40 mm (0.0157 in) − 0.30 mm (0.0118 in)
  └Minimum standard value
  = 0.10 mm (0.0039 in)
  2.55 mm (0.1043 in) + 0.10 mm (0.0039 in)
  └Actual shim thickness
  = 2.75 mm (0.1083 in)

  Select a total of 2.75 mm (0.1083 in) thick shim(s).



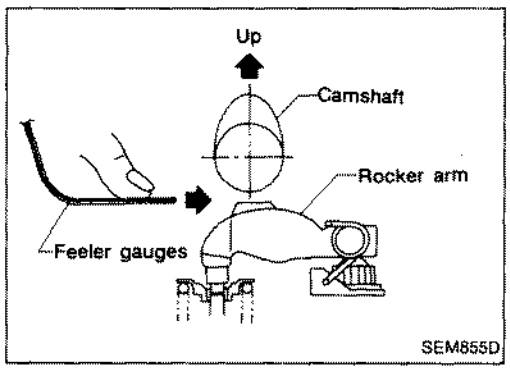
- **Using a dial gauge, measure thickness (T) of the selected shim(s) and the rocker arm guide on a flat surface to make sure it is within specifications.**
- Shims and rocker arm guides are available in 81 different thicknesses ranging from 1.50 mm (0.0591 in) to 3.50 mm (0.1378 in) in increments of 0.025 mm (0.0010 in).

22. Remove camshafts, oil tubes and rocker arms in the order of steps 1 through 5 above.
23. Remove the existing shim(s) and install the selected shim(s) and the rocker arm guide.



24. After installing the required parts as outlined in steps 8 through 11 above, rotate the crankshaft until the camshaft surface is positioned in relation to the cylinder to be checked, as shown in figure.

Valve Clearance Adjustment (Cont'd)



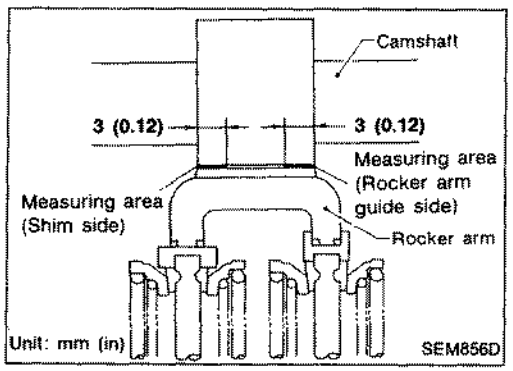
25. Using two feeler gauges (one placed on the other), insert horizontally between the camshaft and rocker arm to measure the clearance at two points (the front and rear of the rocker arm).

Camshaft clearance:

Unit: mm (in)

	Hot	Cold* (reference data)
Intake & Exhaust	0.20 - 0.23 (0.008 - 0.009)	0.14 - 0.17 (0.006 - 0.007)

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



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

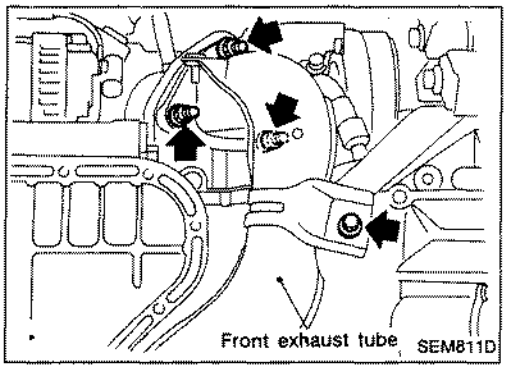
26. If the camshaft clearance is not within specifications, repeat steps 1 through 18 until correct clearance is obtained.

Installation

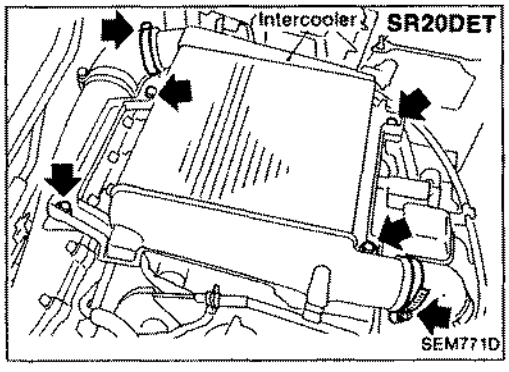
- This installation is the same procedure as that for timing chain. Refer to "Installation" in "TIMING CHAIN".

Removal

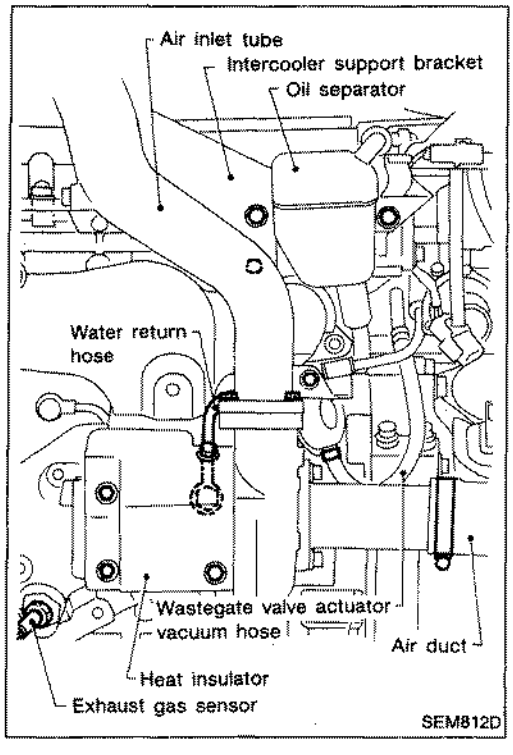
1. Drain coolant from radiator and cylinder block.
2. Remove engine under cover.



3. Remove front exhaust tube.

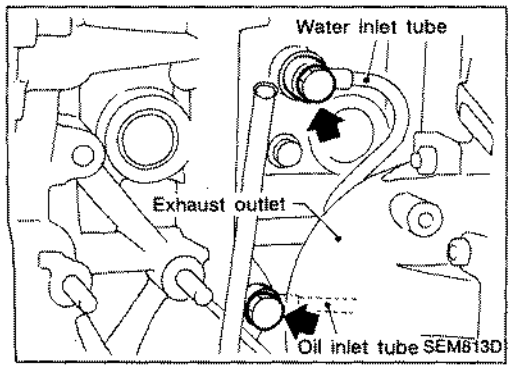


4. Remove intercooler cover and intercooler.
5. Remove radiator with fans.

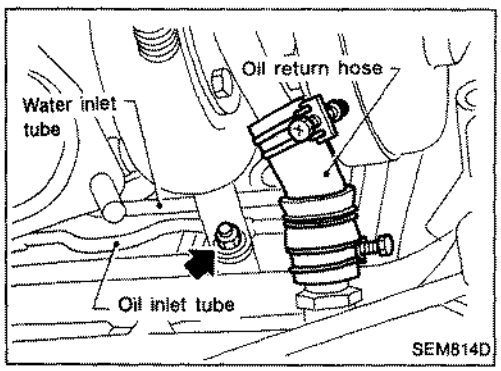


6. Remove heat insulator.
7. Remove water return tube.
8. Remove air inlet tube.
9. Remove oil separator and intercooler support bracket.
10. Remove wastegate valve actuator vacuum hose.
11. Remove air duct for turbocharger unit.
12. Remove exhaust gas sensor.

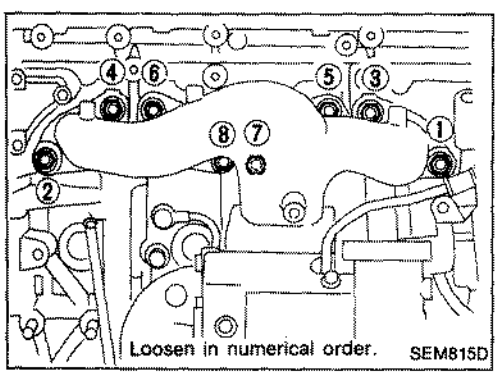
Removal (Cont'd)



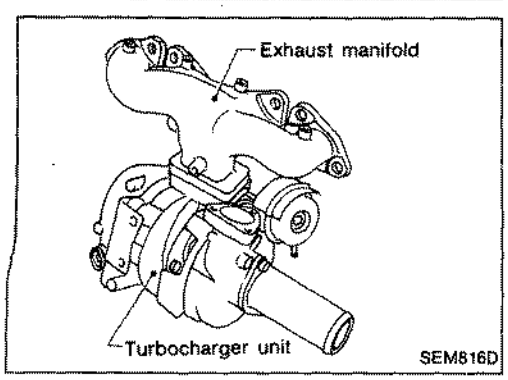
13. Remove exhaust outlet cover.
14. Remove water inlet tube and oil inlet tube.



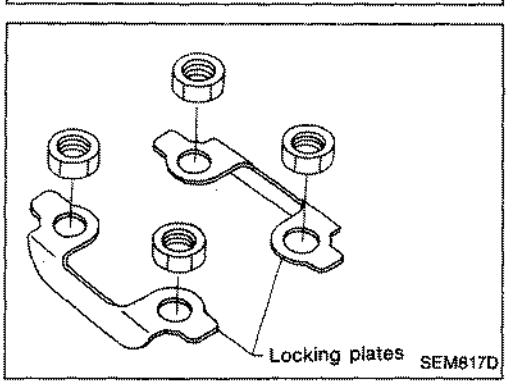
15. Remove oil return hose.
16. Remove nut fixing both water inlet tube and oil inlet tube.



17. Remove exhaust manifold cover.
18. Remove exhaust manifold fixing nuts.



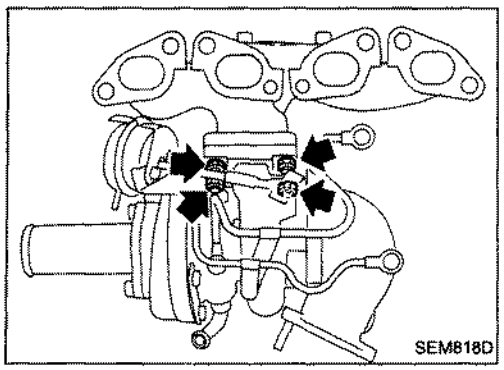
19. Remove exhaust manifold with turbocharger unit.



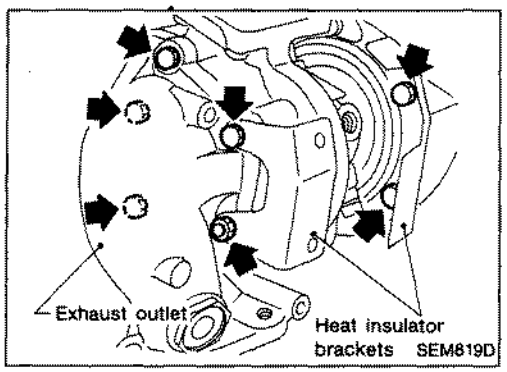
Disassembly

1. Unbend locking plates for turbocharger unit fastening nuts.

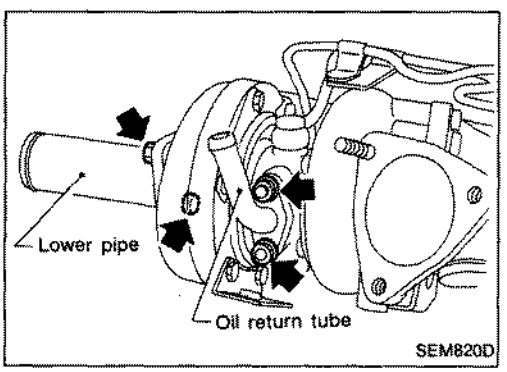
Disassembly (Cont'd)



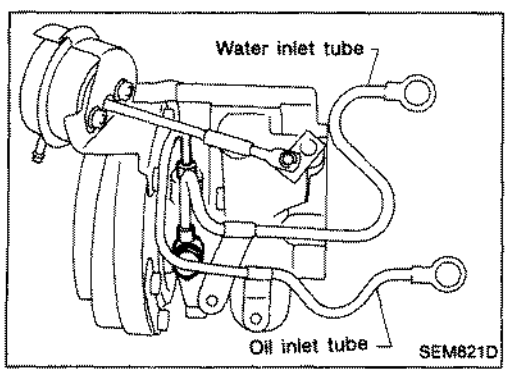
2. Remove exhaust manifold.



3.. Remove exhaust outlet and heat insulator brackets.



4. Remove oil return tube.
5. Remove lower pipe.

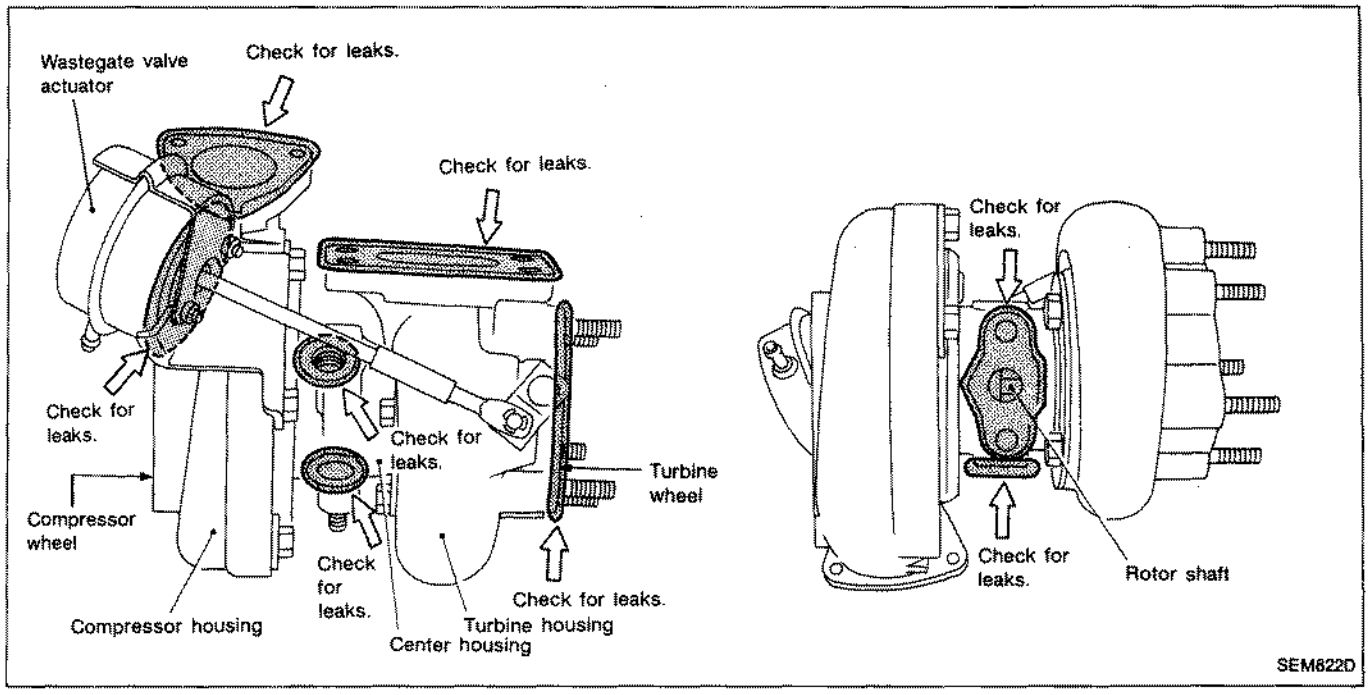


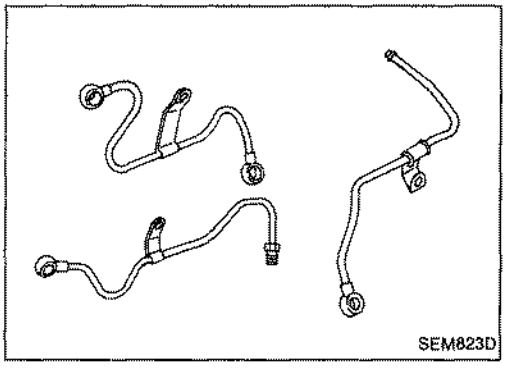
6. Remove oil inlet tube and water inlet tube.

Inspection

Perform the following checks. If N.G., replace turbocharger unit.

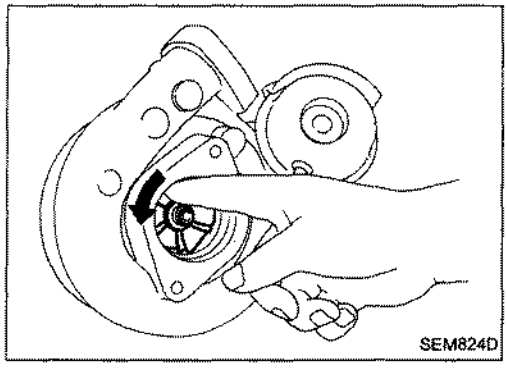
Inspection (Cont'd)





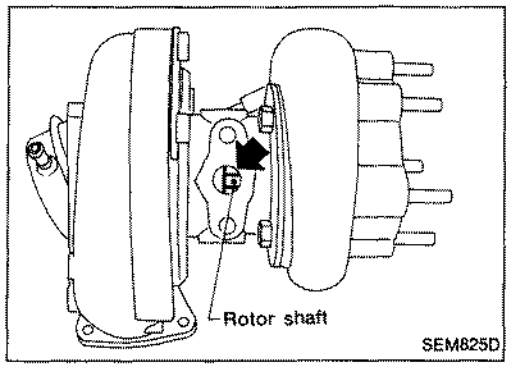
OIL AND WATER TUBES

Check tubes for clogging.



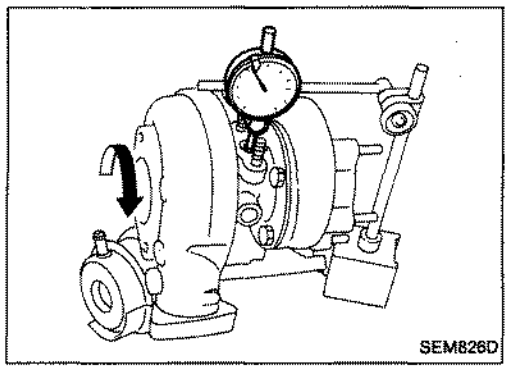
ROTOR SHAFT

1. Check rotor shaft for smooth rotation.

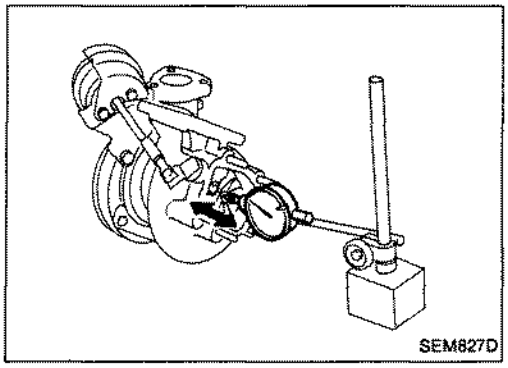


2. Check rotor shaft for carbon deposits.

Inspection (Cont'd)

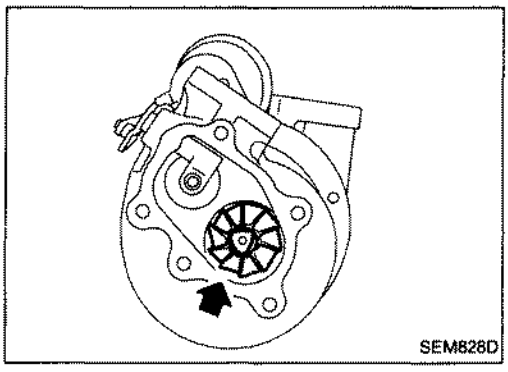

SEM826D

3. Measure rotor shaft runout.
   Runout (Total indicator reading):
   0.056 - 0.127 mm (0.0022 - 0.0050 in)


SEM827D

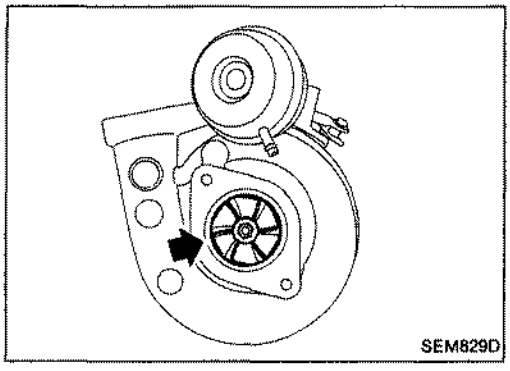
4. Measure rotor shaft end play.
   End play:
   0.013 - 0.097 mm (0.0005 - 0.0038 in)

- **Do not allow wheels to turn when axial play is being measured.**


SEM826D

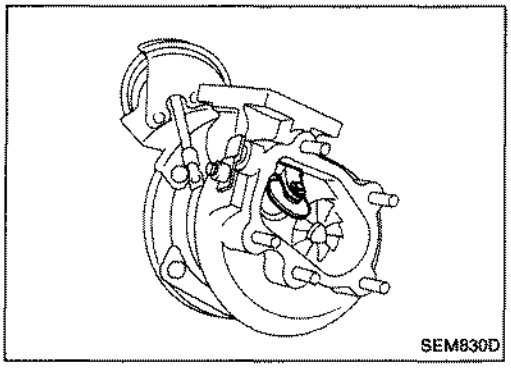
TURBINE WHEEL

Check turbine wheel for the following.
- Oil
- Carbon deposits
- Deformed fins
- Contact with turbine housing


SEM829D

COMPRESSOR WHEEL

Check compressor wheel for the following.
- Oil
- Deformed fins
- Contact with compressor housing

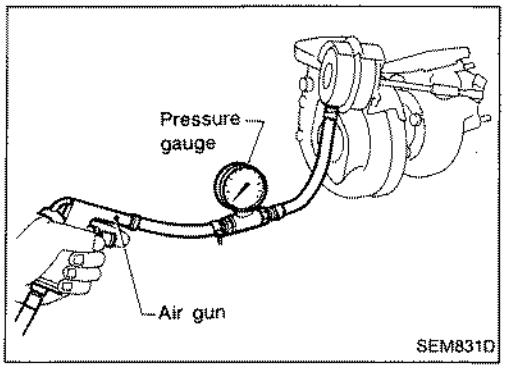

SEM830D

WASTEGATE VALVE

Remove rod pin and check wastegate valve for cracks, deformation and smooth movement. Check valve seat surface for smoothness.

Inspection (Cont'd)

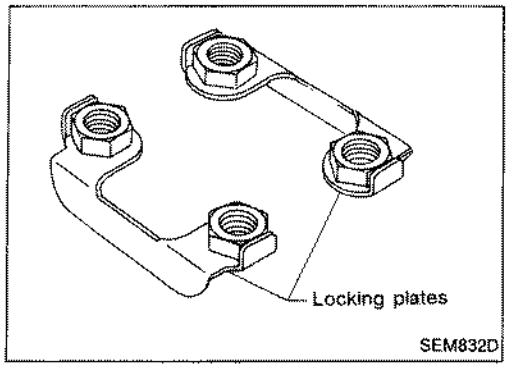
WASTEGATE VALVE ACTUATOR



Apply compressed air to wastegate valve actuator and check it for smooth movement.

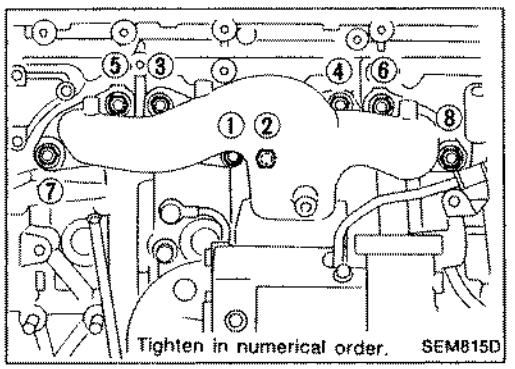
- **Do not applying compressed air to the actuator continuously.**
- **The air pressure should be in the range of 59 to 69 kPa (0.59 to 0.69 bar, 0.6 to 0.7 kg/cm^2, 9 to 10 psi).**

Assembly

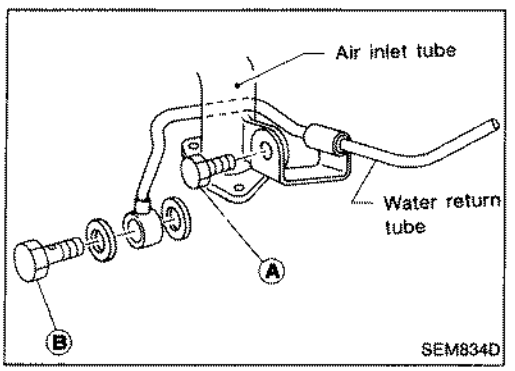


Assembly is the reverse order of disassembly. Bend locking plates along the side of turbocharger fastening nuts.

Installation



1. Install exhaust manifold fixing nuts.

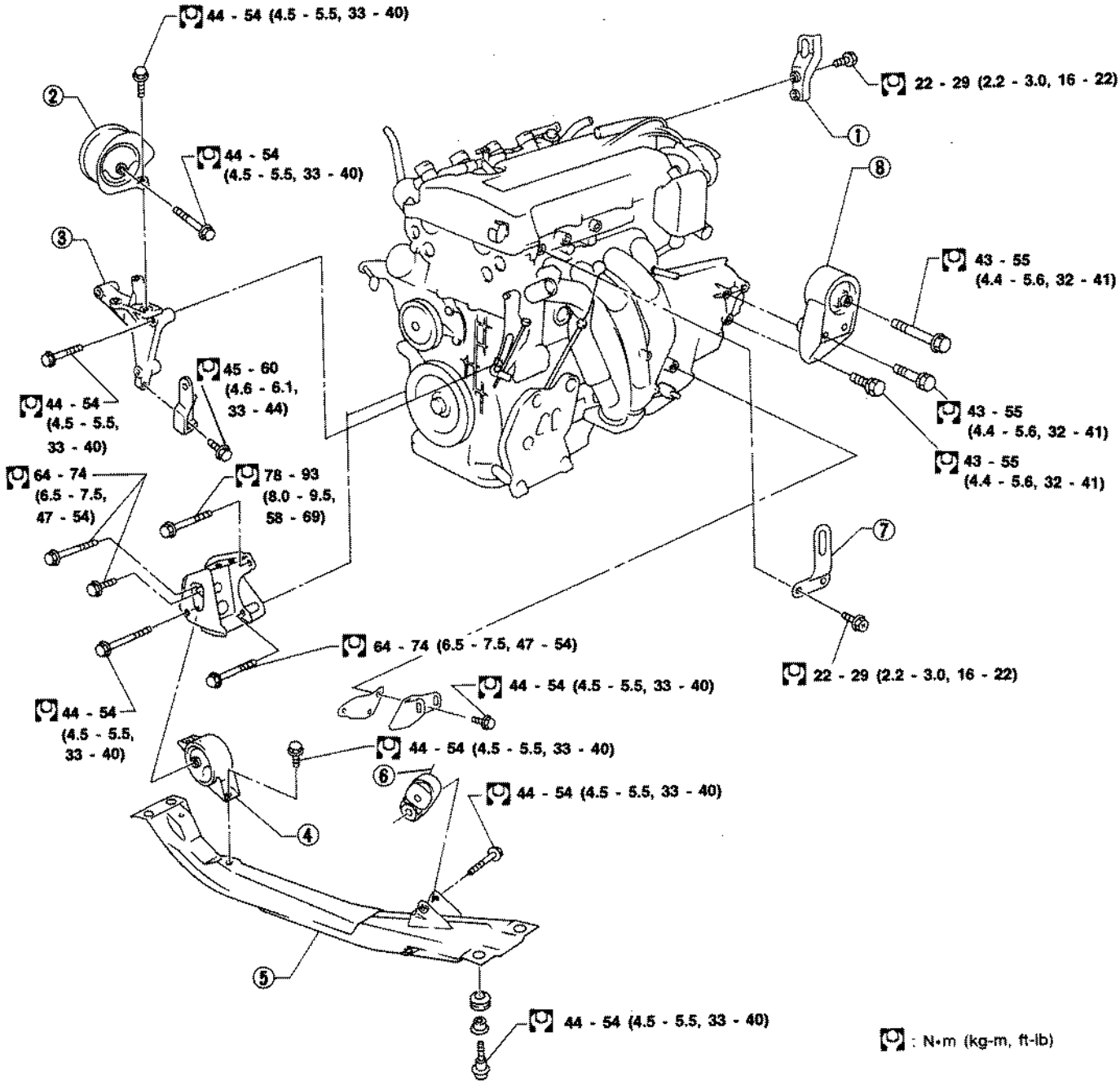


2. Installation is the reverse order of removal. When installing the water return tube, tighten in the following way.

Tightening procedure:

(1) Tighten bolt Ⓐ temporarily.
(2) Tighten bolt Ⓑ to 20 to 31 N·m (2.0 to 3.2 kg-m, 14 to 23 ft-lb).
(3) Tighten bolt Ⓐ to 3.7 to 5.0 N·m (0.38 to 0.51 kg-m, 2.7 to 3.7 ft-lb).

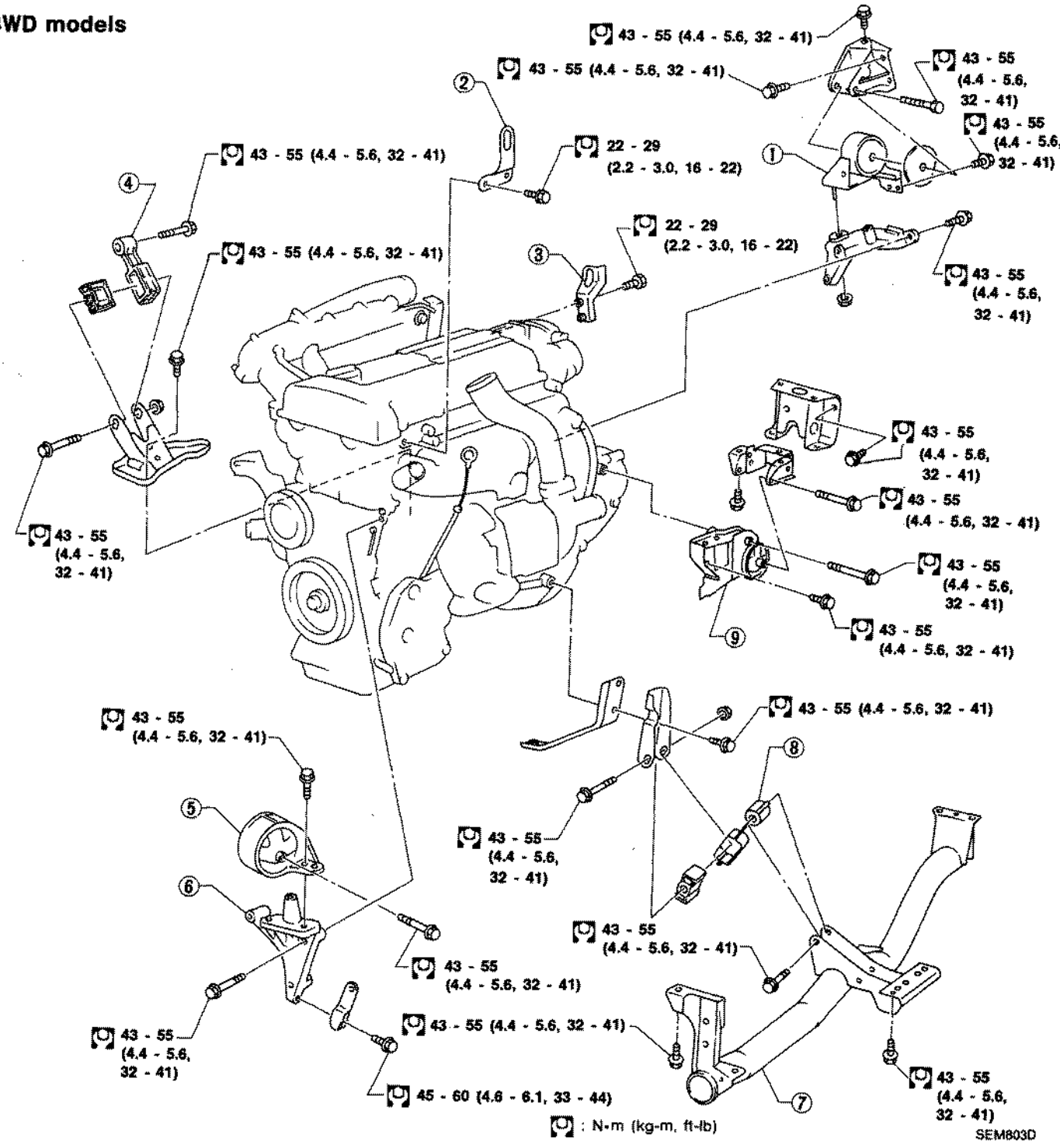
2WD models



SEM802D

① Rear engine slinger
② Front engine mounting (Fluid type)
③ Mounting bracket
④ Rear insulator
⑤ Center member
⑥ Buffer
⑦ Front engine slinger
⑧ Rear engine mounting

4WD models



① R.H. rear engine mounting
② Front engine slinger
③ Rear engine slinger
④ R.H. buffer
⑤ Front engine mounting (Fluid type)
⑥ Mounting bracket
⑦ Front member
⑧ L.H. buffer
⑨ L.H. rear engine mounting

WARNING:

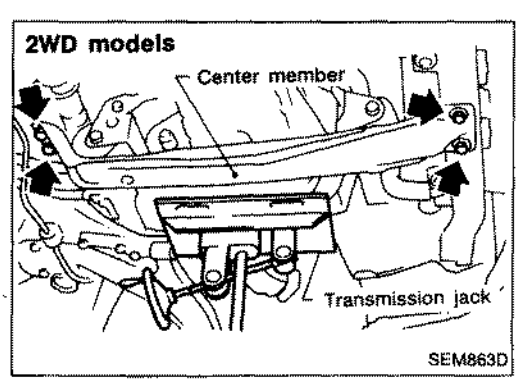
a. Situate vehicle on a flat and solid surface.
b. Place chocks at front and back of rear wheels.
c. Do not remove engine until exhaust system has completely cooled off.
Otherwise, you may burn yourself and/or fire may break out in fuel line.
d. For safety during subsequent steps, the tension of wires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

CAUTION:

- **When lifting engine, be careful not to strike adjacent parts, especially accelerator wire casing, brake lines, and brake master cylinder.**
- **In hoisting the engine, always use engine slingers in a safe manner.**

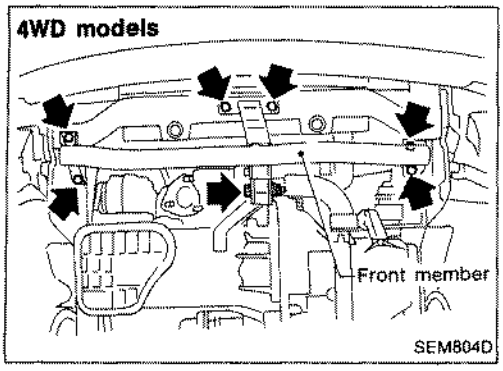
Removal

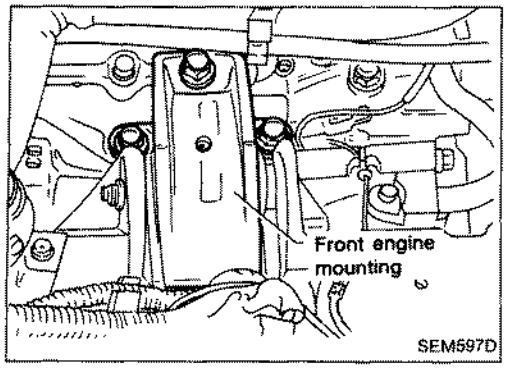
1. Remove engine under cover and hood.
2. Drain coolant from both cylinder block, and radiator.
3. Remove intercooler. (SR20DET only)
4. Remove vacuum hoses, fuel hoses, wires, harness and connectors and so on.
5. Remove exhaust tubes, ball joints and drive shafts.
6. Remove propeller shaft. (4WD models only)
7. Remove clutch operating cylinder. (4WD models only)
8. Remove radiator and fans.
9. Remove drive belts.
10. Remove alternator, compressor and power steering oil pump from engine.



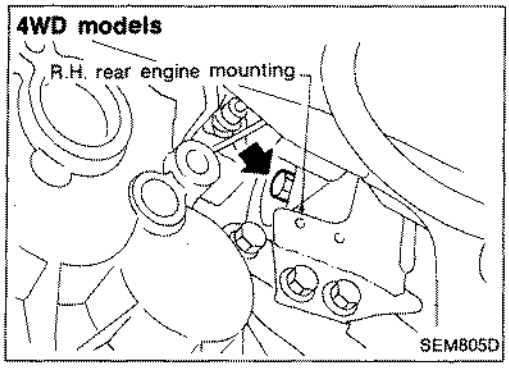
11. Set a suitable transmission jack under transaxle. Hoist engine with engine slinger.
12. • 2WD models: Remove center member.
    • 4WD models: Remove front member.
13. Remove R.H. buffer. (4WD models only)

Removal (Cont'd)

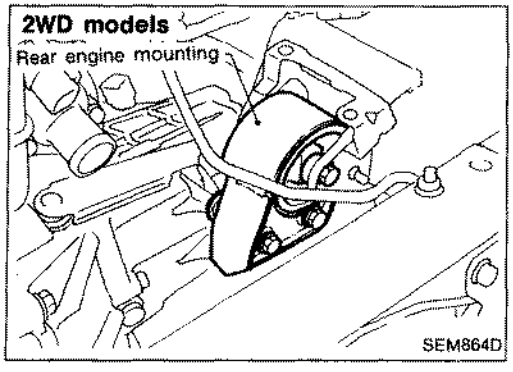




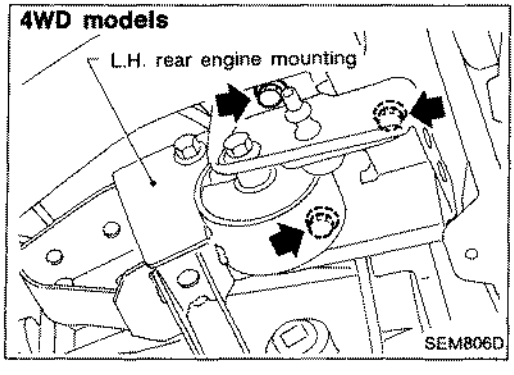
14. Remove front engine mounting.



15. Remove R.H. rear engine mounting. (4WD models only)

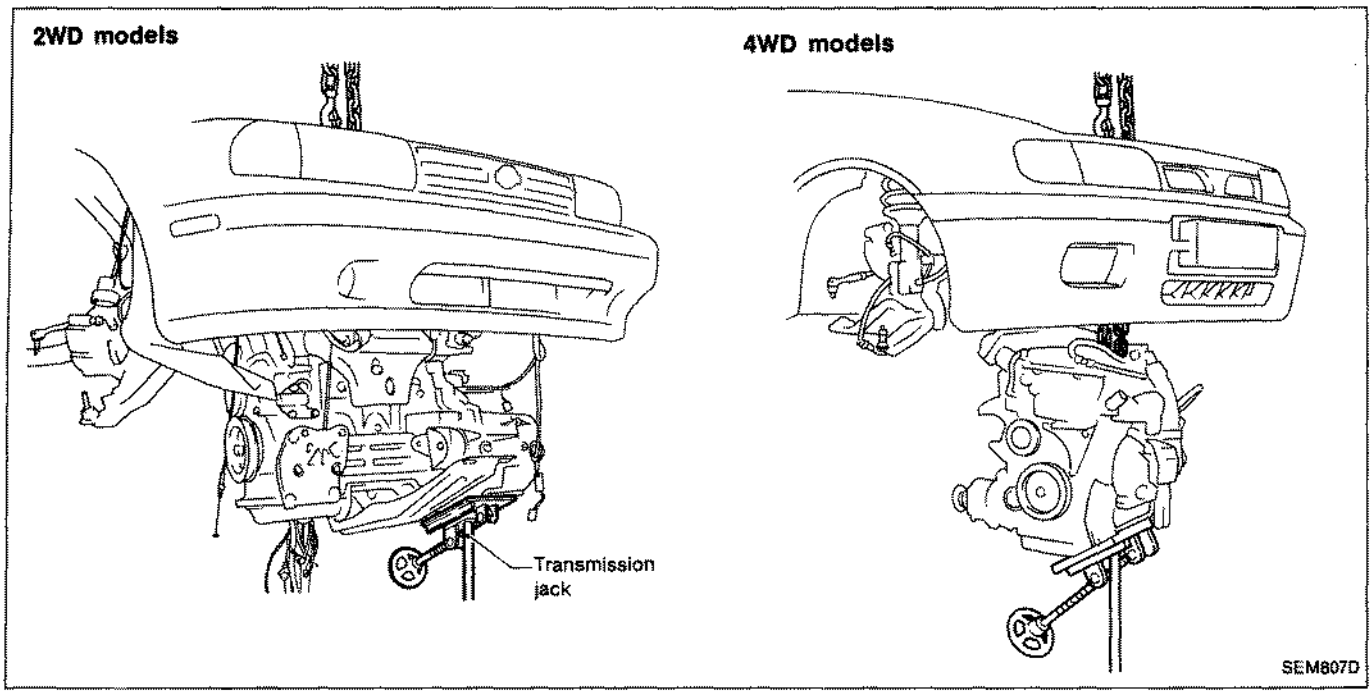


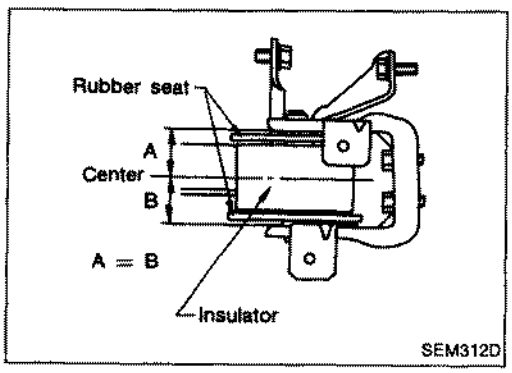
16. Remove rear engine mounting (engine left side) and then slowly lower transmission jack.



Removal (Cont'd)

17. • Remove engine with transaxle as shown. (2WD models)
    • Remove engine with transaxle and transfer as shown. (4WD models)



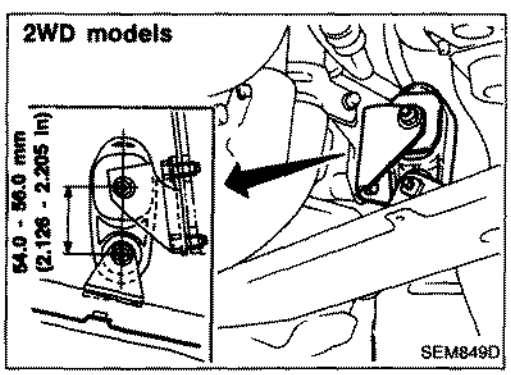


Installation

1. Install engine mounting bracket and fixing bolts.

Be sure that insulators are correctly positioned on the brackets.

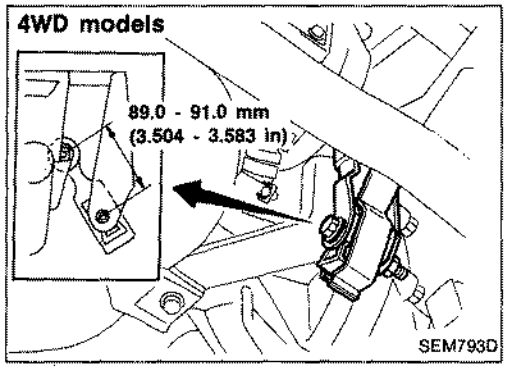
2. Carefully lower the engine onto engine mounting insulators.



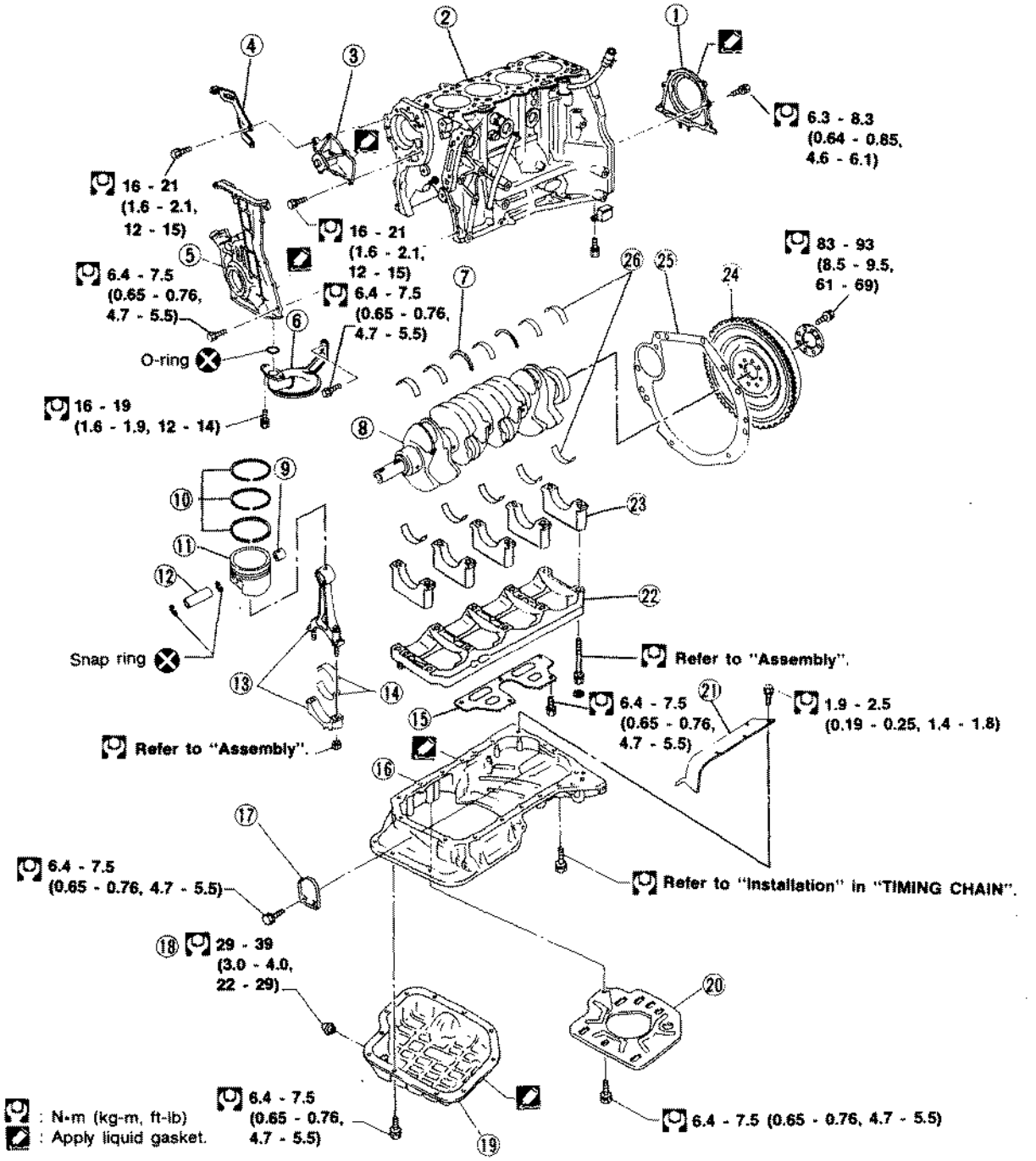
When installing the engine, adjust the height of the engine mounting as shown.

3. Installation is in the reverse order of removal.

Installation (Cont'd)



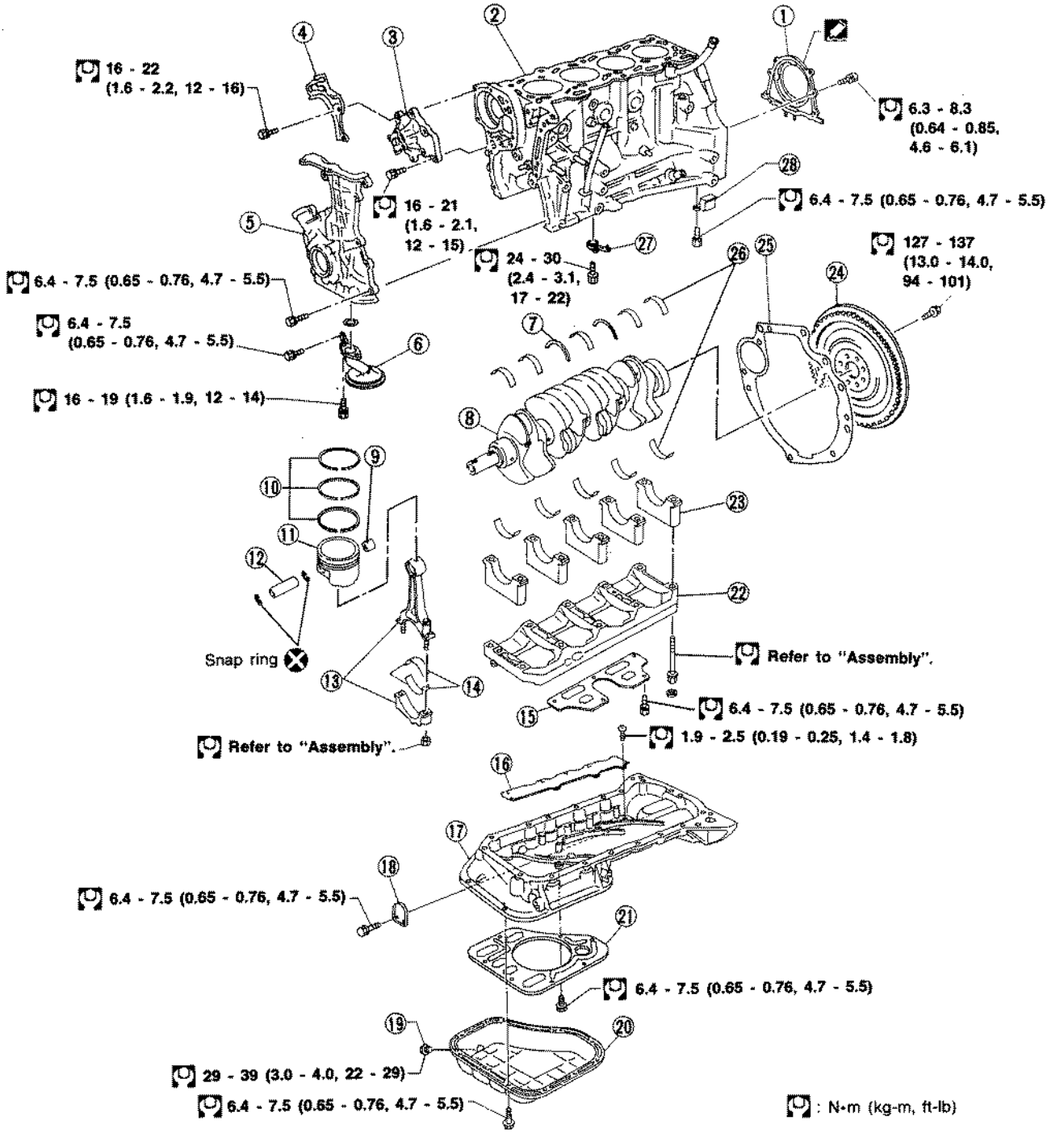
SR20DE



SEM602D

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 Baffle plate
⑯ Aluminum oil pan
⑰ Rear cover plate
⑱ Drain plug
⑲ Steel oil pan
⑳ Baffle plate
㉑ Side gallery baffle plate
㉒ Main bearing beam
㉓ Main bearing cap
㉔ Flywheel or drive plate
㉕ Rear plate
㉖ Main bearing

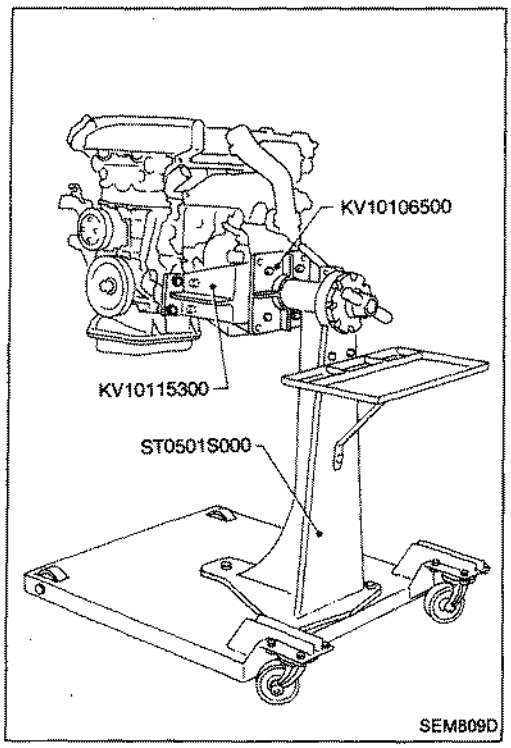
SR20DET



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 Crank shaft
⑨ Connecting rod bushing
⑩ Piston rings
⑪ Piston
⑫ Piston pin
⑬ Connecting rod
⑭ Connecting rod bearing
⑮ Baffle plate
⑯ Side gallery baffle plate
⑰ Aluminum oil pan
⑱ Rear cover plate
⑲ Drain plug
⑳ Steel oil pan
㉑ Baffle plate
㉒ Main bearing beam
㉓ Main bearing cap
㉔ Flywheel
㉕ Rear plate
㉖ Main bearing
㉗ Oil jet
㉘ Baffle plate

CAUTION:

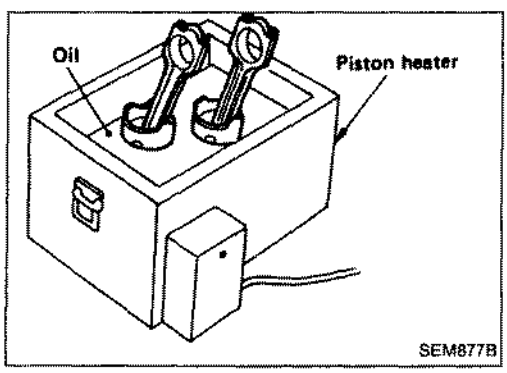
- **When installing sliding parts such as bearings and pistons, be sure to apply new engine oil on the sliding surfaces.**
- **Place removed parts such as bearings and bearing caps in their proper order and direction.**
- **When tightening connecting rod bolts and main bearing cap bolts, apply engine oil to thread portion of bolts and seating surface of nuts.**



Disassembly

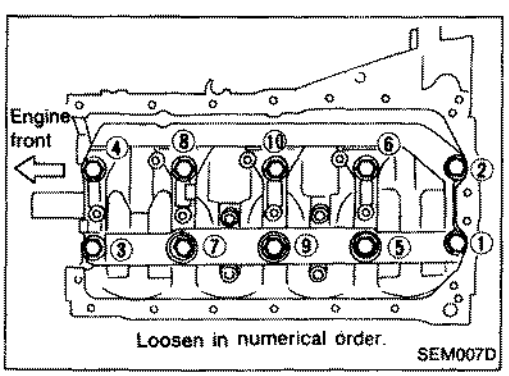
PISTON AND CRANKSHAFT

1. Remove engine.
   Refer to "ENGINE REMOVAL".
2. Remove compressor bracket then install engine on Tool.
3. Remove cylinder head.
   Refer to "Removal" in "TIMING CHAIN".
4. Remove oil pan.
   Refer to "Removal" in "OIL PAN".
5. Remove timing chain.
   Refer to "Removal" in "TIMING CHAIN".



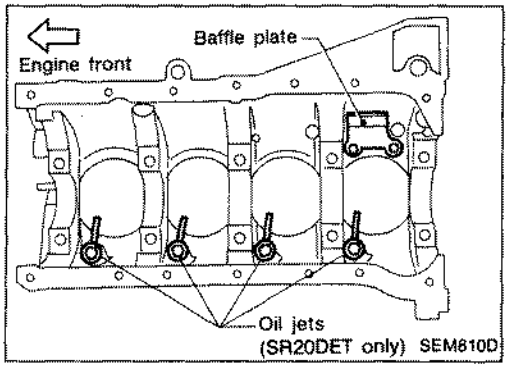
6. Remove pistons with connecting rod.
- When disassembling piston and connecting rod, remove snap ring first, then heat piston to 60 to 70°C (140 to 158°F) or use piston pin press stand at room temperature.

7. Remove rear oil seal retainer.



8. Remove bearing beam, bearing cap and crankshaft.
- **Before removing bearing cap, measure crankshaft end play.**
- **Bolts should be loosened in two or three steps.**

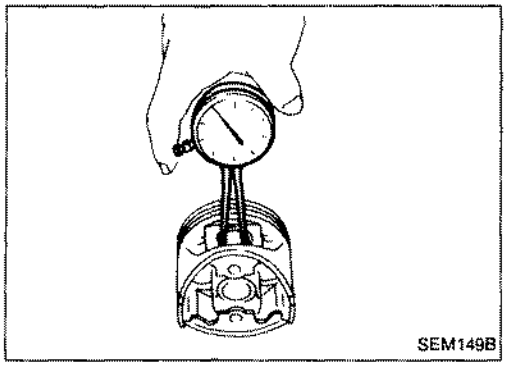
Disassembly (Cont'd)



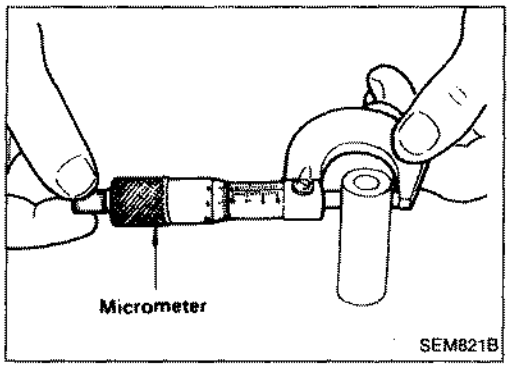
9. Remove baffle plate.
10. Remove oil jets. (SR20DET only)

Inspection

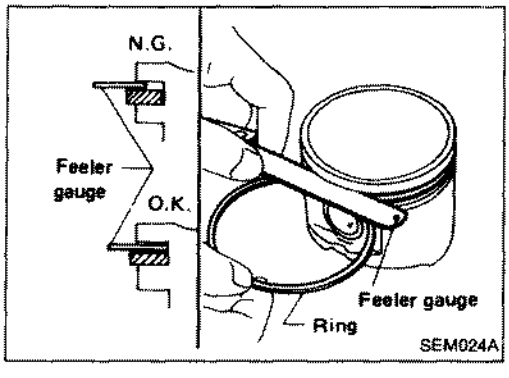
PISTON AND PISTON PIN CLEARANCE



1. Measure inner diameter of piston pin hole "dp".
   Standard diameter "dp":
   21.987 - 21.999 mm (0.8656 - 0.8661 in)



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 = –0.004 to 0 mm (–0.0002 to 0 in)
   If it exceeds the above value, replace piston assembly with pin.

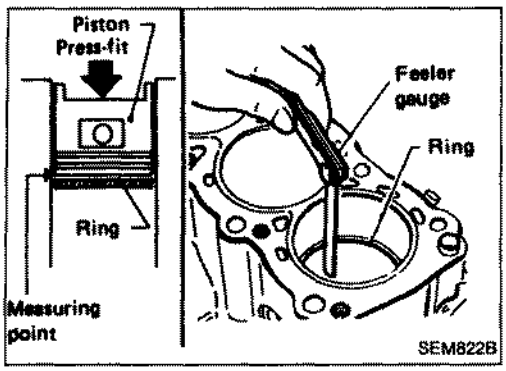


PISTON RING SIDE CLEARANCE

Side clearance:
Top ring
0.045 - 0.080 mm (0.0018 - 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.

Inspection (Cont'd)



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

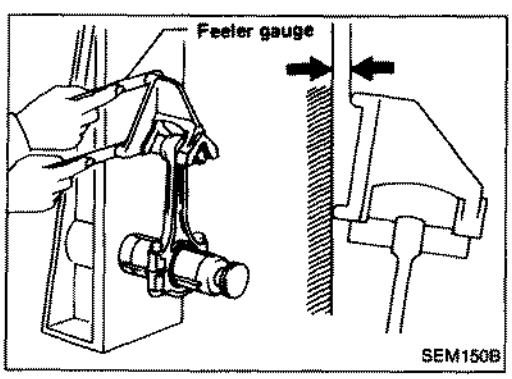
0.20 - 0.60 mm (0.0079 - 0.0236 in)

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, rebore cylinder and use oversized piston and piston rings.

Refer to S.D.S.



CONNECTING ROD BEND AND TORSION

Bend:

Limit 0.15 mm (0.0059 in)

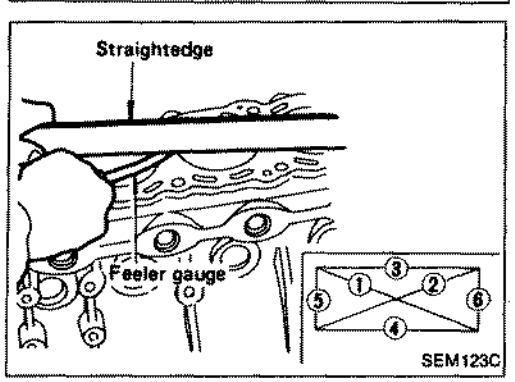
per 100 mm (3.94 in) length

Torsion:

Limit 0.30 mm (0.0118 in)

per 100 mm (3.94 in) length

If it exceeds the limit, replace connecting rod assembly.



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".

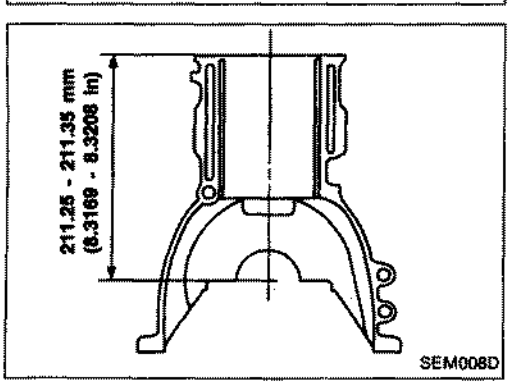
The maximum limit is as follows:

A + B = 0.2 mm (0.008 in)

Nominal cylinder block height from crankshaft center:

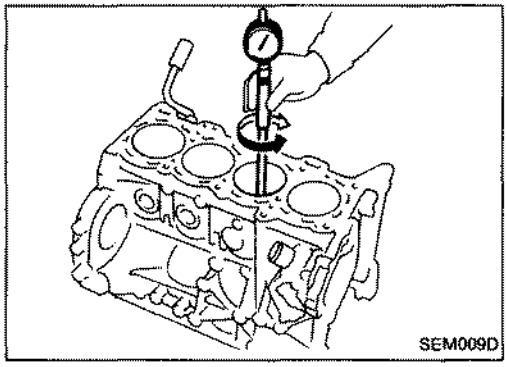
211.25 - 211.35 mm (8.3169 - 8.3208 in)

3. If necessary, replace cylinder block.

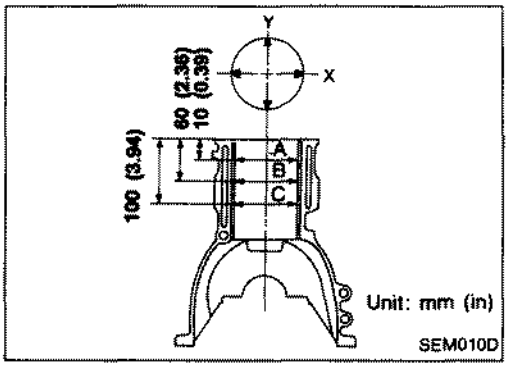


Inspection (Cont'd)

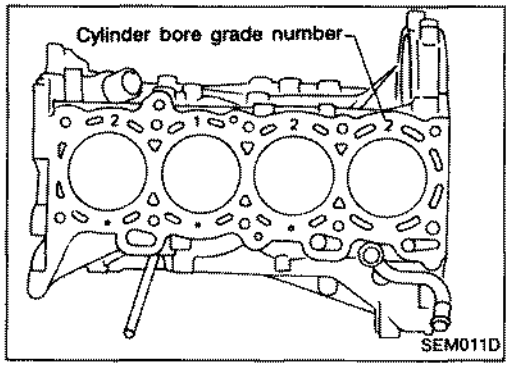
PISTON-TO-BORE CLEARANCE


SEM009D

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)
   Out-of-round limit:
   0.015 mm (0.0006 in)
   Taper limit:
   0.010 mm (0.0004 in)
   If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.
2. Check for scratches and seizure. If seizure is found, hone it.

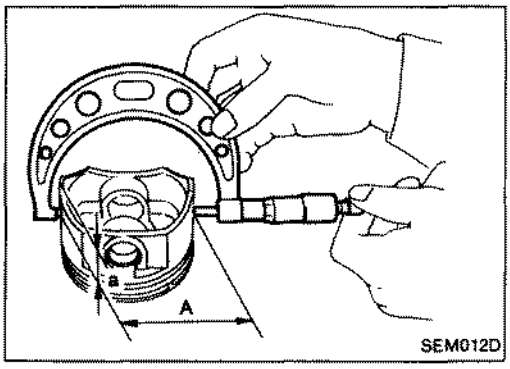


SEM010D



SEM011D

- **If both cylinder block and piston are replaced with new ones, select piston of the same grade number punched on cylinder block upper surface.**



SEM012D

3. Measure piston skirt diameter.
   Piston diameter "A":
   Refer to S.D.S.
   Measuring point "a" (Distance from the bottom):
   14.0 mm (0.551 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.

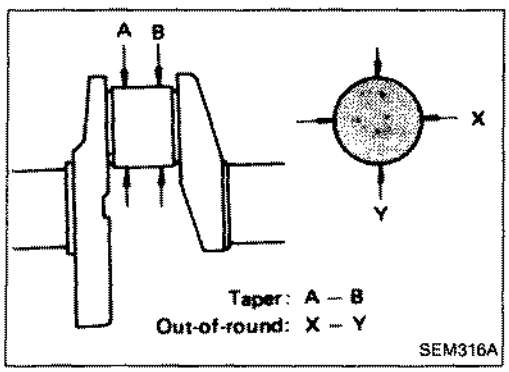
Oversize pistons are available for service. Refer to S.D.S.

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 to prevent distortion of cylinder bores in final assembly.

Inspection (Cont'd)

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.**

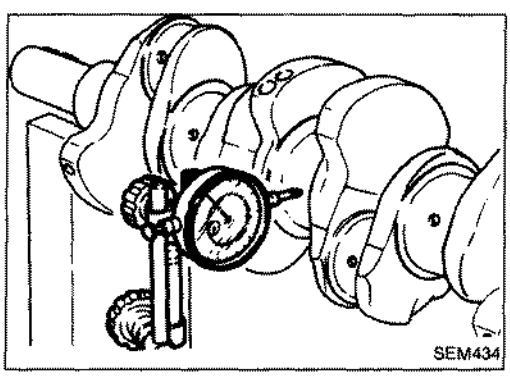


CRANKSHAFT

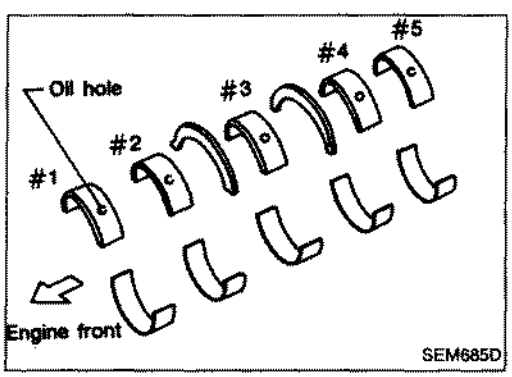
1. Check crankshaft main and pin journals for score, wear or cracks.
2. With a micrometer, measure journals for taper and out-of-round.

Unit: mm (in)

		SR20DE	SR20DET
Out-of-round (X—Y) and Taper (A—B)	Main journal	Less than 0.005 (0.0002)	
	Pin journal	Less than 0.005 (0.0002)	Less than 0.0025 (0.0001)



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



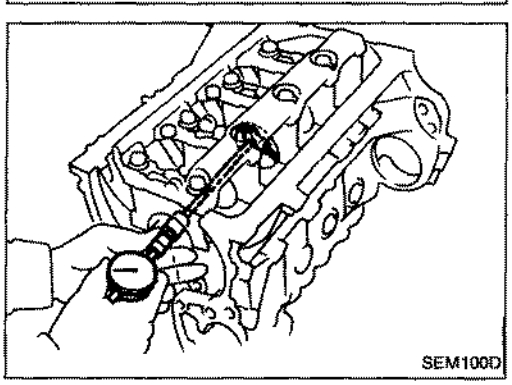
BEARING CLEARANCE

- Either of the following two methods may be used, however, method "A" gives more reliable results and is preferable.

Method A (Using bore gauge & micrometer)

Main bearing

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

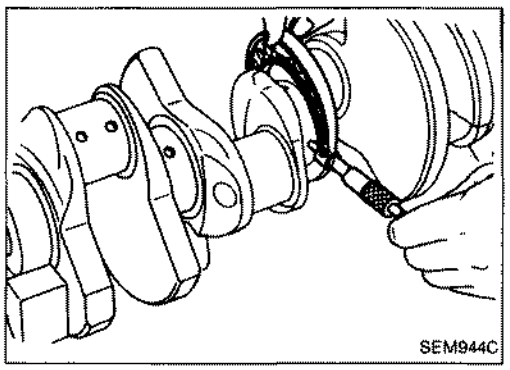


2. Install main bearing cap and main bearing beam to cylinder block.

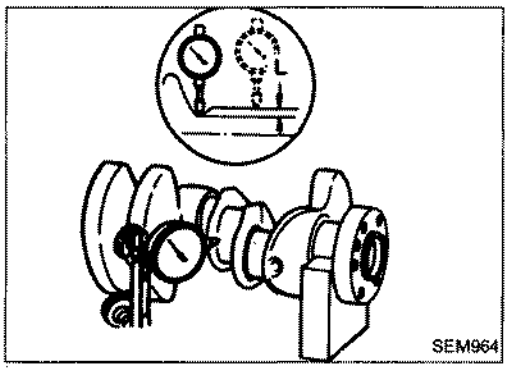
Tighten all bolts in correct order in two or three stages.

3. Measure inner diameter "A" of each main bearing.

Inspection (Cont'd)

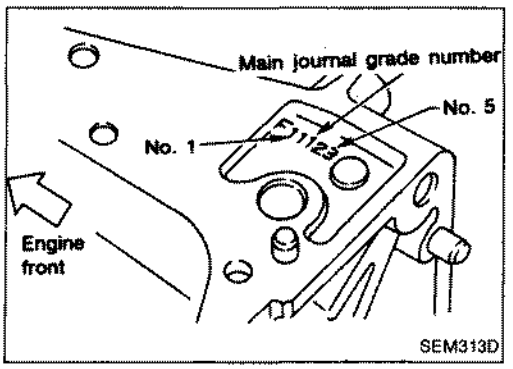

SEM944C

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.



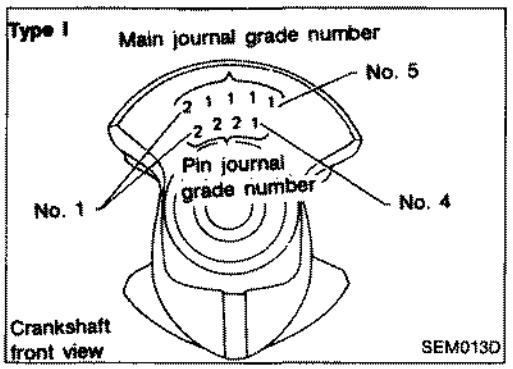
SEM964

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 S.D.S. for grinding crankshaft and available service parts.



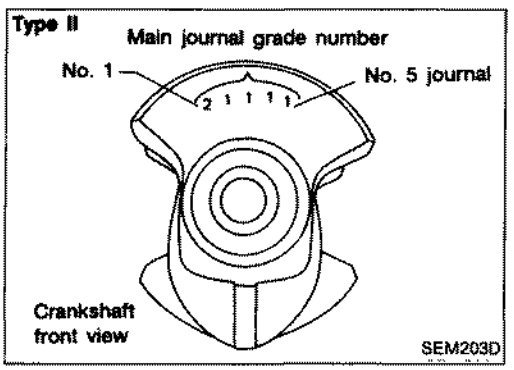
SEM313D

8. If crankshaft is reused, measure main bearing clearances and select thickness of main bearings.
   If crankshaft is replaced with a new one, it is necessary to 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.



SEM013D

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



SEM203D

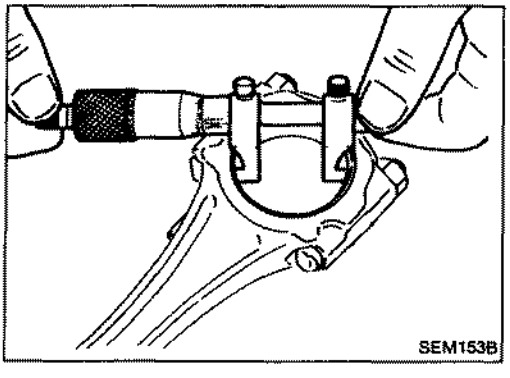
Inspection (Cont'd)

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

How to select main bearings (Identification mark and color)

Crankshaft journal grade number \ 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, No color)

For example:
Main journal grade number: 1
Crankshaft journal grade number: 2
Main bearing grade number = 1 + 2
= 3 (D, Yellow)

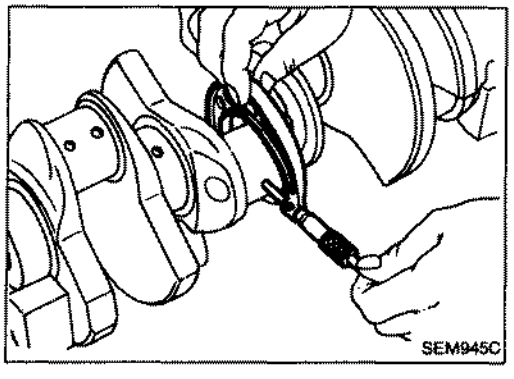

SEM153B

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.


SEM945C

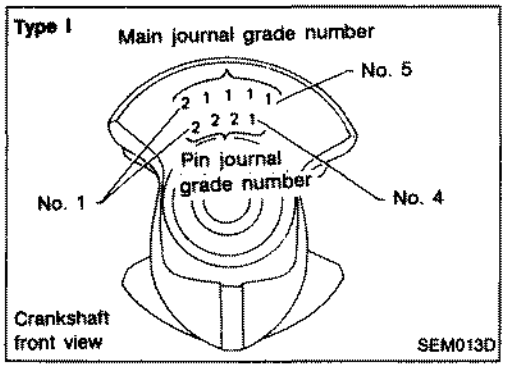
4. Measure outer diameter "Dp" of each crankshaft pin journal.
5. Calculate connecting rod bearing clearance.
   Connecting rod bearing clearance = C – Dp

Unit: mm (in)

	SR20DE	SR20DET
Standard	0.020 - 0.045 (0.0008 - 0.0018)	0.030 - 0.055 (0.0012 - 0.0022)
Limit	0.090 (0.0035)	

Inspection (Cont'd)

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".

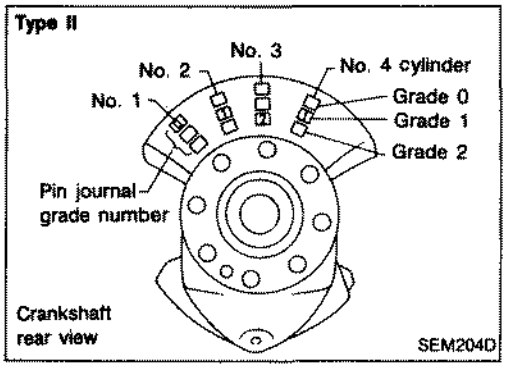


8. If crankshaft is replaced with a new one, select connecting rod bearing according to the following table.

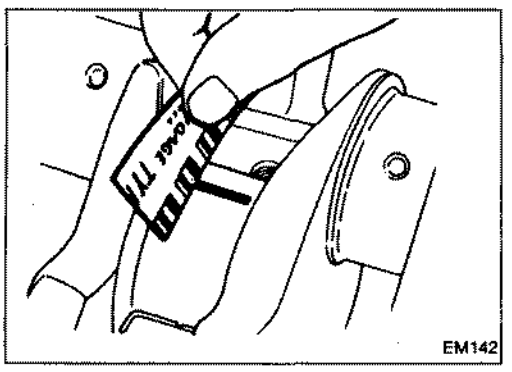
Connecting rod bearing grade number:

Grade numbers are punched in either Arabic or Roman numerals.

Crank pin grade number	Connecting rod bearing grade number
0	0
1	1
2	2



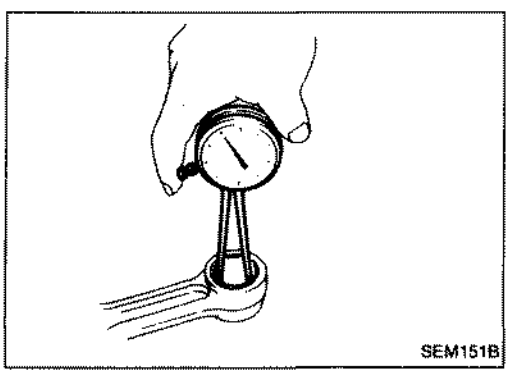
Identification color:
Grade 0; No color
Grade 1; Black
Grade 2; Brown



Method B (Using plastigage)

CAUTION:

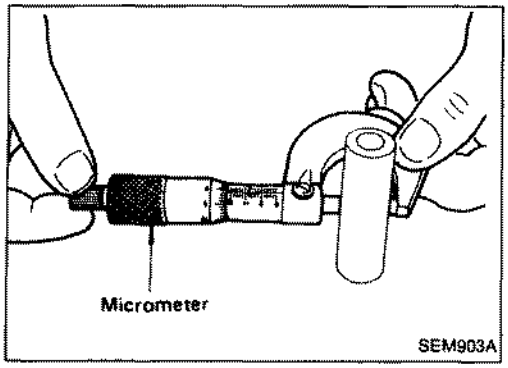
- **Do not turn crankshaft or connecting rod while plastigage is being inserted.**
- **When bearing clearance exceeds the specified limit, ensure that the proper bearing has been installed. Then if excessive bearing clearance exists, use a thicker main bearing or undersized bearing so that the specified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



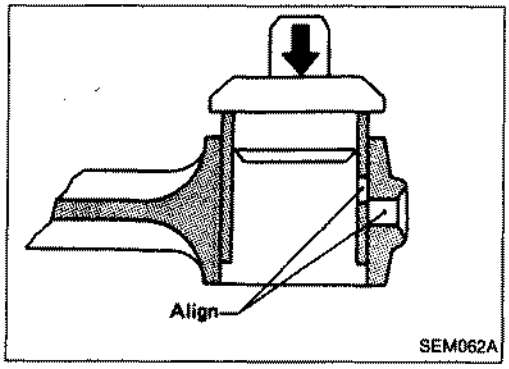
CONNECTING ROD BUSHING CLEARANCE (Small end)

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 set with pin.

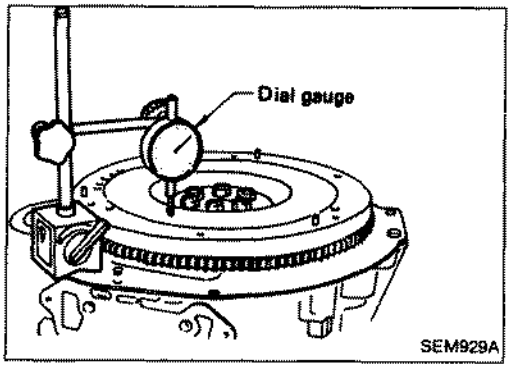


REPLACEMENT OF CONNECTING ROD BUSHING (Small end)

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

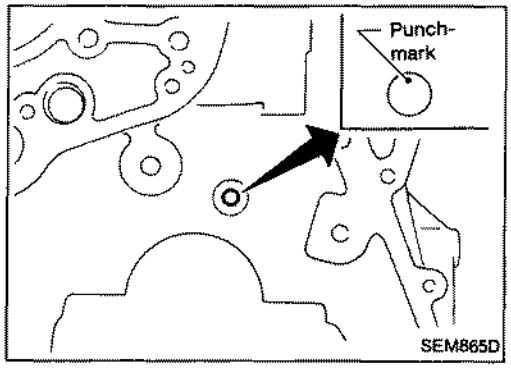
Be sure to align the oil holes.

2. After driving in small end bushing, ream the bushing so that 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)



FLYWHEEL RUNOUT

Runout (Total indicator reading):
Less than 0.10 mm (0.0039 in)

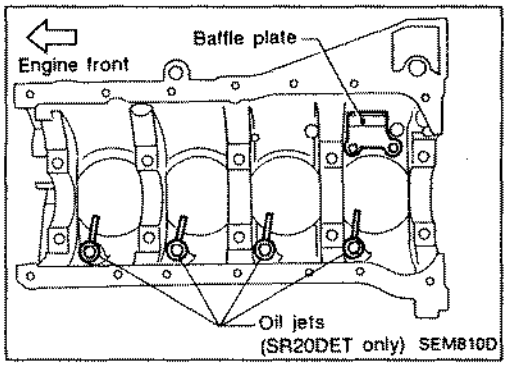


Assembly

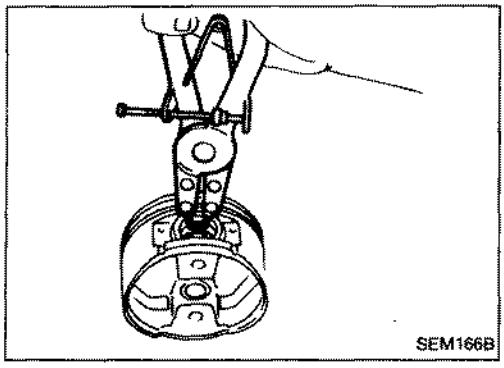
1. Install timing chain oil jet.

Drive oil jet into cylinder block with punchmark facing up.

Assembly (Cont'd)

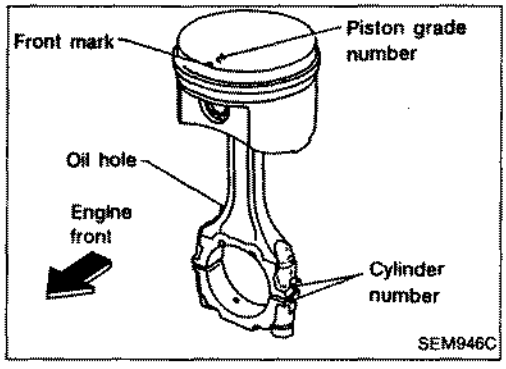


2. Install piston oil jets. (SR20DET only).
3. Install baffle plate.



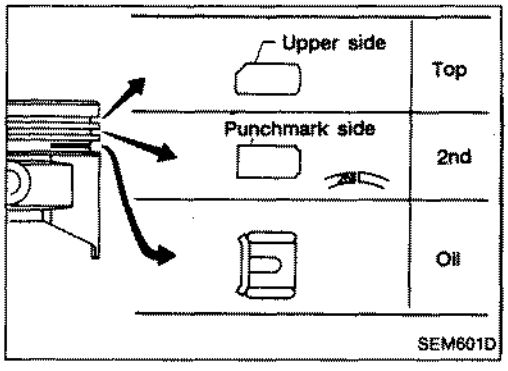
PISTON

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.

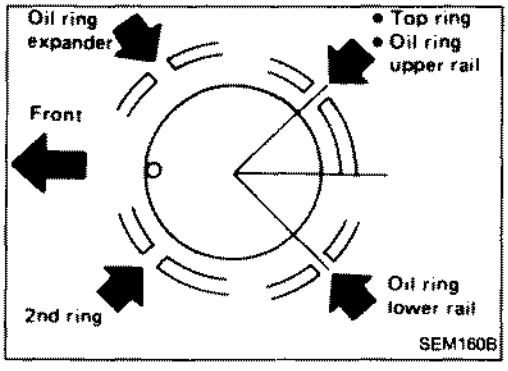
- **Align the direction of piston and connecting rod.**
- **Numbers stamped on connecting rod and cap correspond to each cylinder.**
- **After assembly, make sure connecting rod swings smoothly.**



3. Set piston rings as shown.

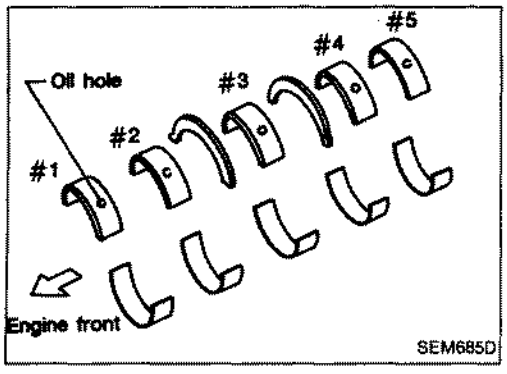
CAUTION:

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



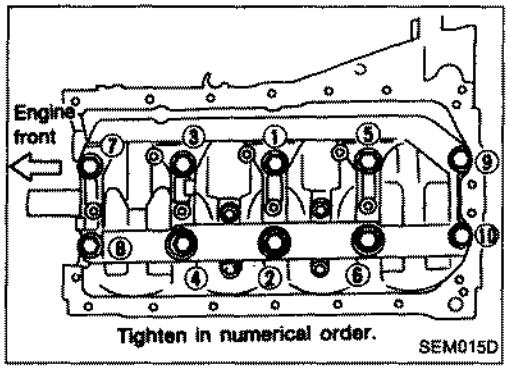
Assembly (Cont'd)

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.**



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

- **Prior to tightening bearing cap bolts, place bearing cap in its proper position by shifting crankshaft in the axial direction.**
- **Tightening procedure**

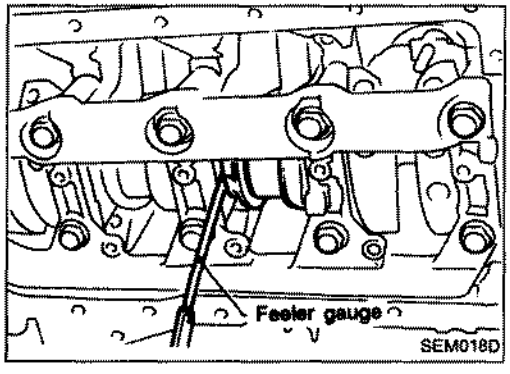
(SR20DE)

1) **Tighten bolts to 32 to 38 N·m (3.3 to 3.9 kg-m, 24 to 28 ft-lb).**
2) **Turn bolts 45 to 50 degrees clockwise or if angle wrench is not available, tighten bolts to 73 to 82 N·m (7.4 to 8.4 kg-m, 54 to 61 ft-lb).**

(SR20DET)

1) **Tighten bolts to 38 to 44 N·m (3.9 to 4.5 kg-m, 28 to 33 ft-lb).**
2) **Turn bolts 60 to 65 degrees clockwise or if angle wrench is not available, tighten bolts to 84 to 114 N·m (8.6 to 11.6 kg-m, 62 to 84 ft-lb).**

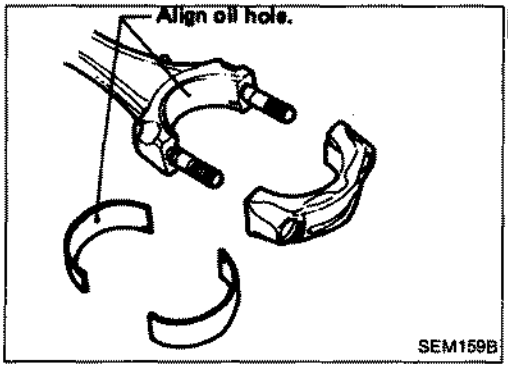
- **After securing bearing cap bolts, make sure crankshaft turns smoothly by hand.**



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)

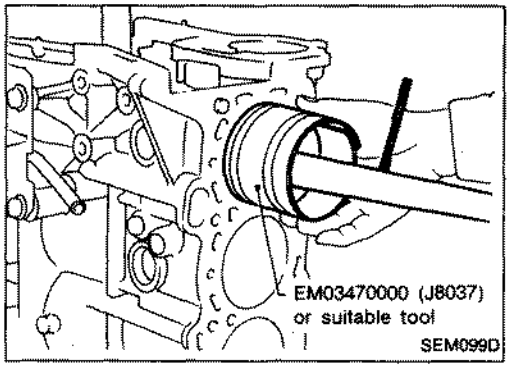
If beyond the limit, replace thrust bearings with new ones.



4. Install connecting rod bearings in connecting rods and connecting rod caps.

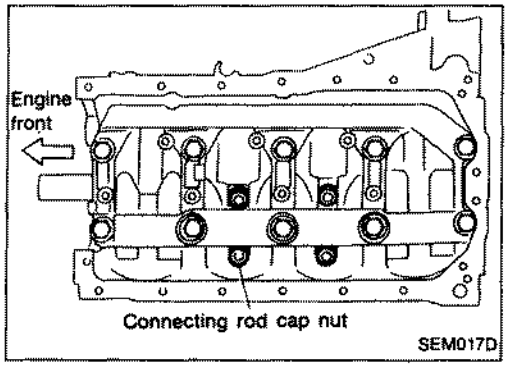
- **Confirm that correct bearings are used. Refer to "Inspection".**
- **Install bearings so that oil hole in connecting rod aligns with oil hole of bearing.**

Assembly (Cont'd)



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.**
- **Be careful not to hit oil jet with connecting rod. (SR20DET only)**



b. Install connecting rod caps.
Tighten connecting rod cap nuts to the specified torque.

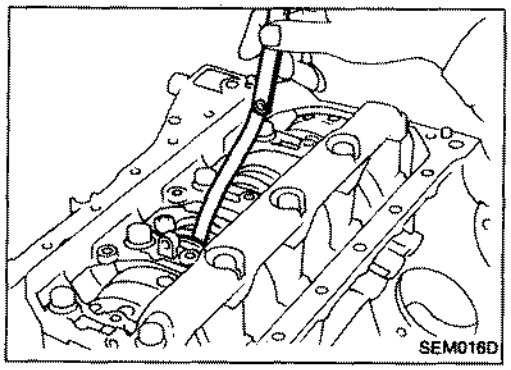
Tightening procedure:

(SR20DE)

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 or 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).**

(SR20DET)

1) **Tighten nuts to 19 to 21 N·m (1.9 to 2.1 kg-m, 14 to 15 ft-lb).**
2) **Turn nuts 60 to 65 degrees clockwise or if angle wrench is not available, tighten nuts to 46 to 52 N·m (4.7 to 5.3 kg-m, 34 to 38 ft-lb).**



6. Measure connecting rod side clearance.

Connecting rod side clearance:

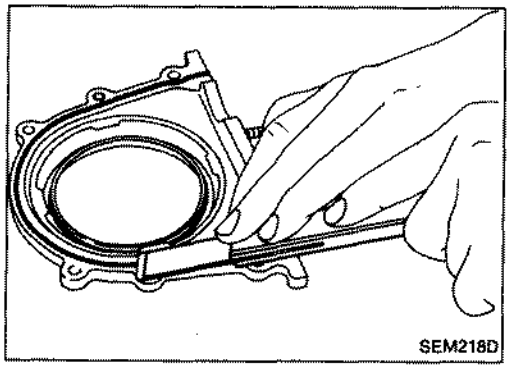
Standard

0.20 - 0.35 mm (0.0079 - 0.0138 in)

Limit

0.50 mm (0.0197 in)

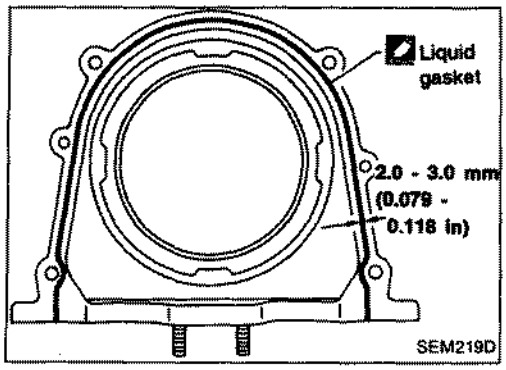
If beyond the limit, replace connecting rod and/or crankshaft.



7. Install rear oil seal retainer.
(1) Before installing rear oil seal retainer, remove all traces of liquid gasket from mating surface using a scraper.

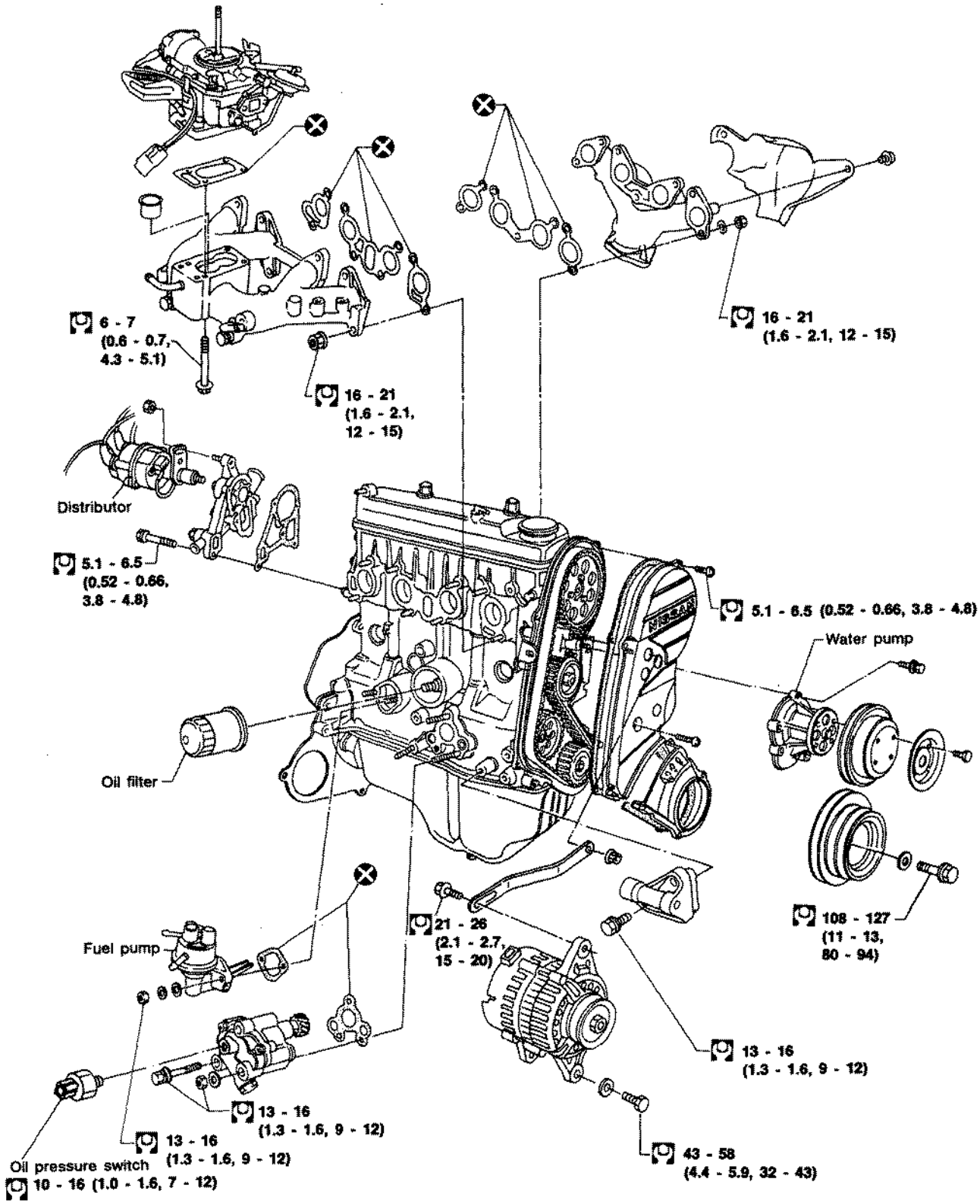
- Also remove traces of liquid gasket from mating surface of cylinder block.

Assembly (Cont'd)

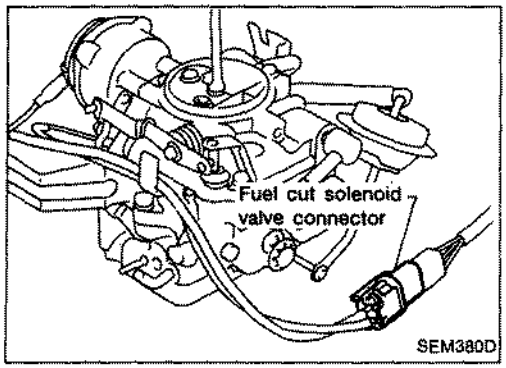


(2) Apply a continuous bead of liquid gasket to mating surface of rear oil seal retainer.

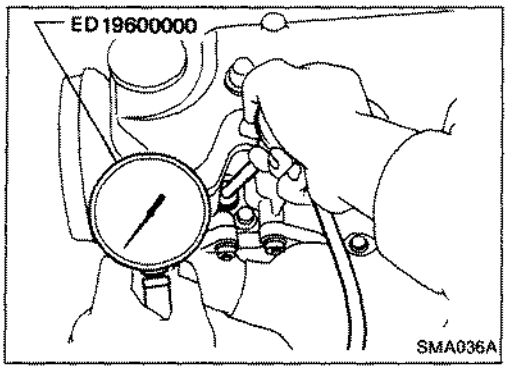
- Use Genuine Liquid Gasket or equivalent.


6 - 7 (0.6 - 0.7, 4.3 - 5.1)
16 - 21 (1.6 - 2.1, 12 - 15)
16 - 21 (1.6 - 2.1, 12 - 15)
Distributor
5.1 - 6.5 (0.52 - 0.66, 3.8 - 4.8)
5.1 - 6.5 (0.52 - 0.66, 3.8 - 4.8)
Water pump
Oil filter
108 - 127 (11 - 13, 80 - 94)
21 - 26 (2.1 - 2.7, 15 - 20)
Fuel pump
13 - 16 (1.3 - 1.6, 9 - 12)
13 - 16 (1.3 - 1.6, 9 - 12)
13 - 16 (1.3 - 1.6, 9 - 12)
Oil pressure switch
10 - 16 (1.0 - 1.6, 7 - 12)
43 - 58 (4.4 - 5.9, 32 - 43)
: N•m (kg-m, ft-lb)

SEM379D



1. Warm up engine.
2. Turn ignition switch off.
3. Disconnect fuel cut solenoid valve connector.
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 the 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: kPa (bar, kg/cm^2, psi)/350 rpm

Standard

1,245 (12.45, 12.7, 181)

Minimum

981 (9.81, 10.0, 142)

Difference limit between cylinders:

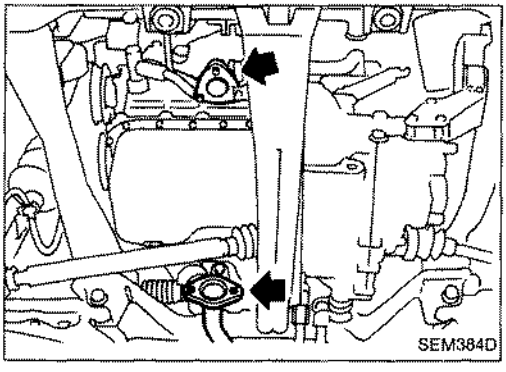
98 (0.98, 1.0, 14)

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

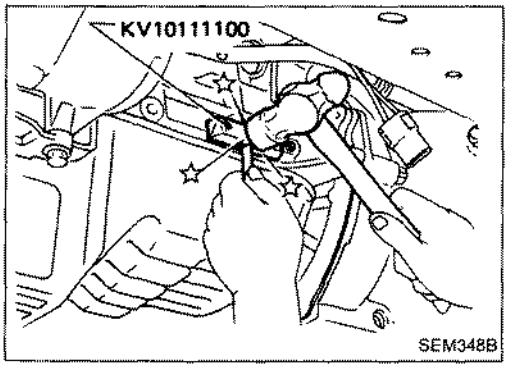
- **If adding oil helps compression, piston rings may be worn or damaged. If so, replace piston rings after checking piston.**
- **If pressure stays low, a valve may be sticking or seating improperly. Inspect and repair valve and valve seat. (Refer to S.D.S.) If valve or valve seat is damaged excessively, replace them.**
- **If compression in any two adjacent cylinders is low and if adding oil does not help compression, there is leakage past the gasket surface. If so, replace cylinder head gasket.**

Removal

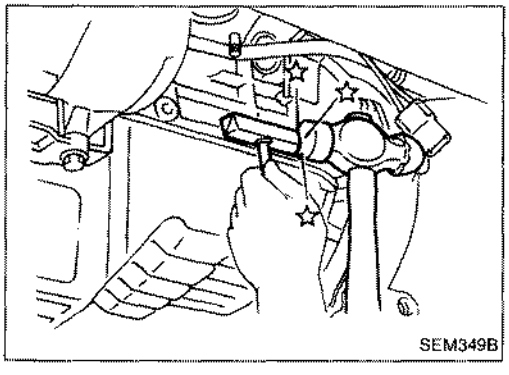
1. Drain engine oil.



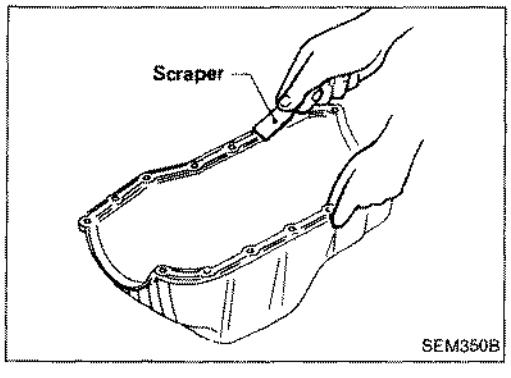
2. Remove front exhaust tube.
3. Remove engine gussets.



4. Remove oil pan.
(1) Insert Tool between cylinder block and oil pan.
- Do not insert Tool into oil pump or rear oil seal retainer portion, or aluminum mating face will be damaged.
- Do not insert screwdriver, or oil pan flange will be deformed.



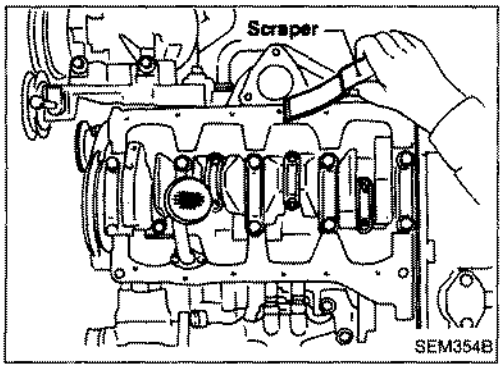
(2) Slide seal cutter by tapping it with a hammer, and remove oil pan.



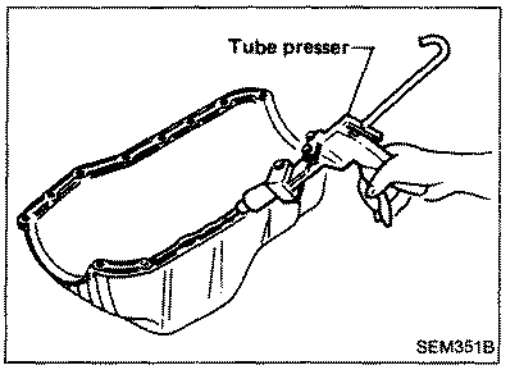
Installation

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

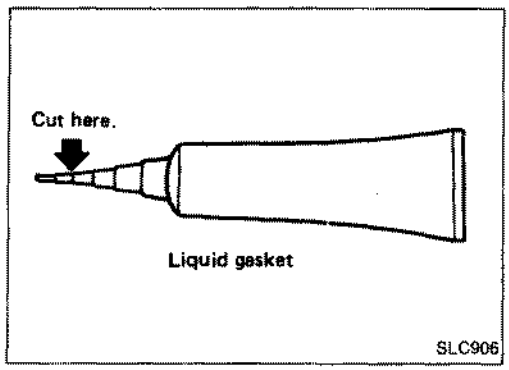
Installation (Cont'd)



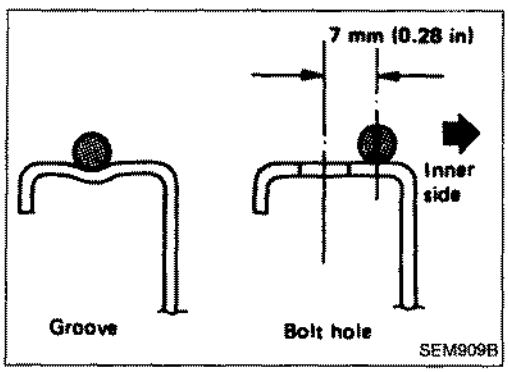
- Also remove traces of liquid gasket from mating surface of cylinder block.



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



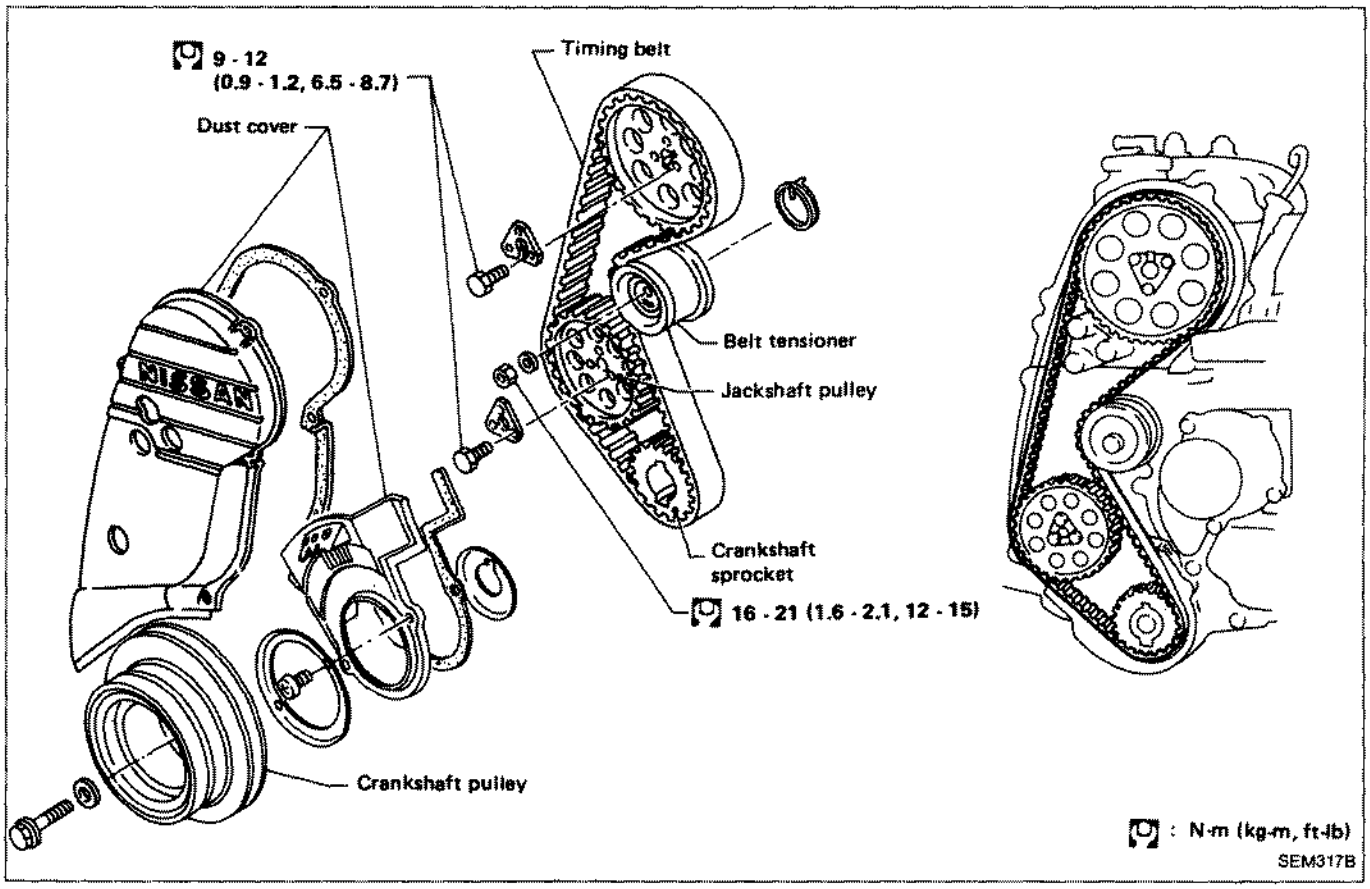
- **Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide.**

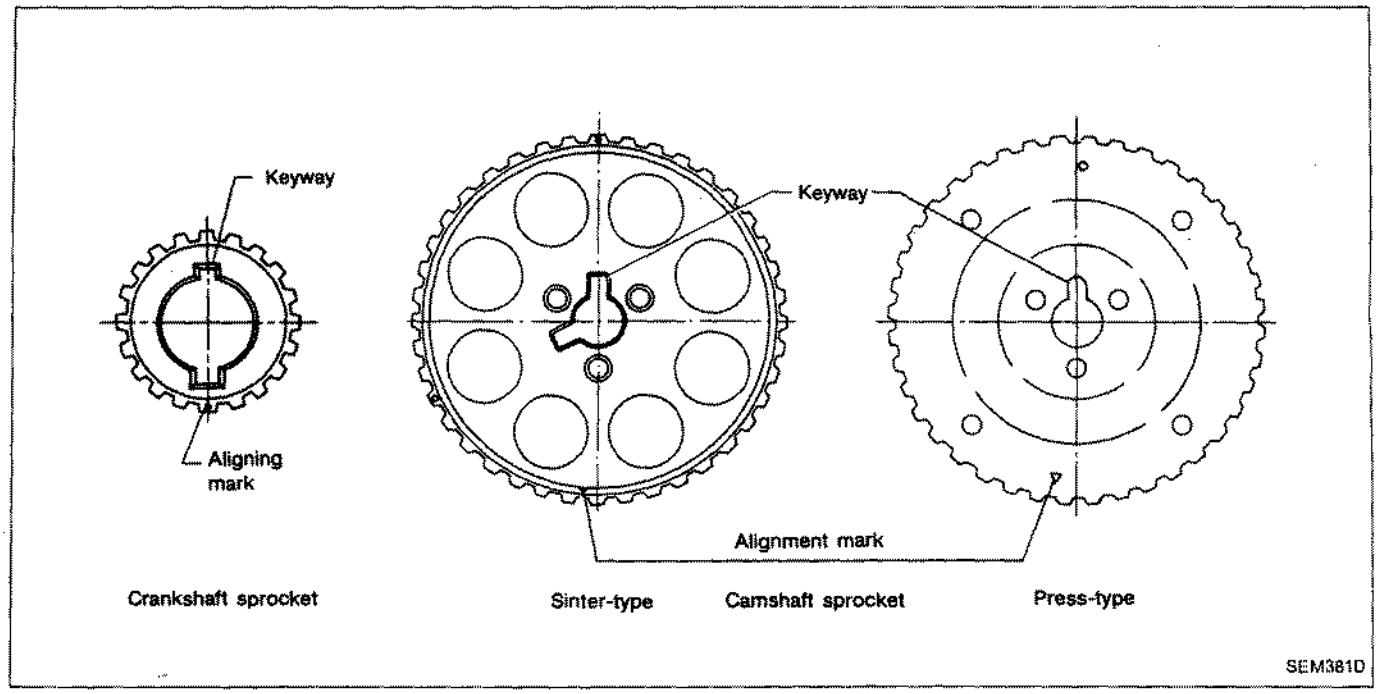


3. Apply liquid gasket to inner sealing surface instead of surface where there is no groove at bolt hole.
- **Attach oil pan to cylinder block within five minutes after coating.**
- **Wait at least 30 minutes before refilling engine oil and engine coolant.**

CAUTION:

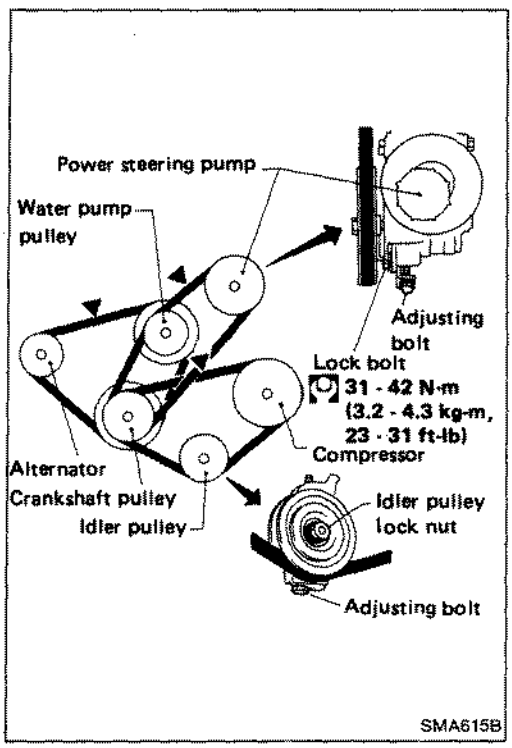
a. **Do not bend or twist timing belt.**
b. **After removing timing belt, do not rotate crankshaft and camshaft separately because valves will strike piston heads.**
c. **Make sure that timing belt, camshaft sprocket, crankshaft sprocket and belt tensioner are clean and free from oil and water.**
d. **Before installing timing belt, confirm that No. 1 cylinder is set at top dead center (T.D.C.) on compression stroke.**
e. **Align arrow in direction of timing belt rotation.**
f. **Adjust timing belt tension with all spark plugs removed.**





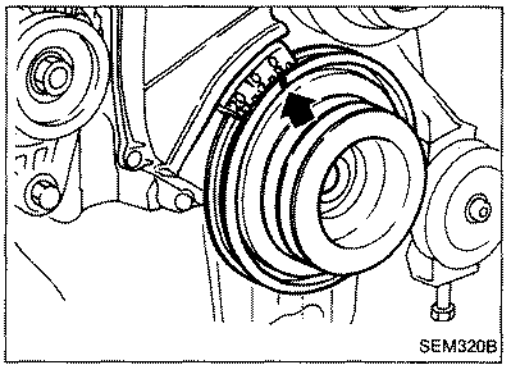
Removal

1. Remove front right side splash cover.

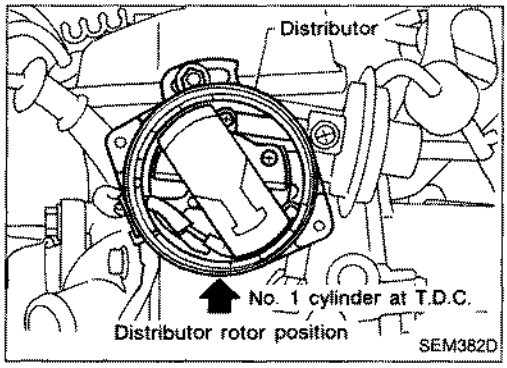


2. Remove the following belts.
- Power steering oil pump drive belt.
- Compressor drive belt
- Alternator drive belt

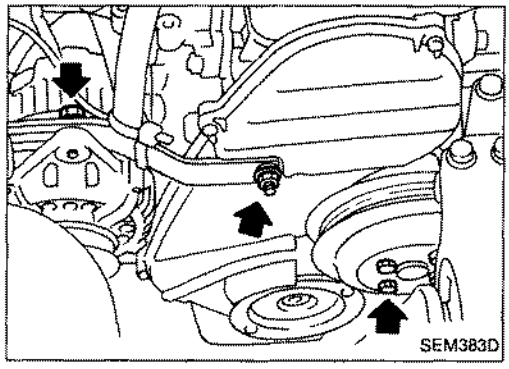
Removal (Cont'd)


SEM320B

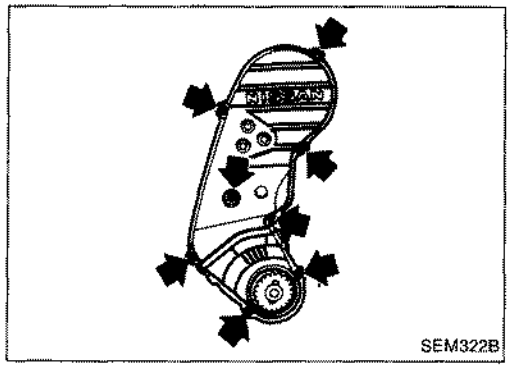
3. Set No. 1 cylinder at top dead center (T.D.C.) on its compression stroke.



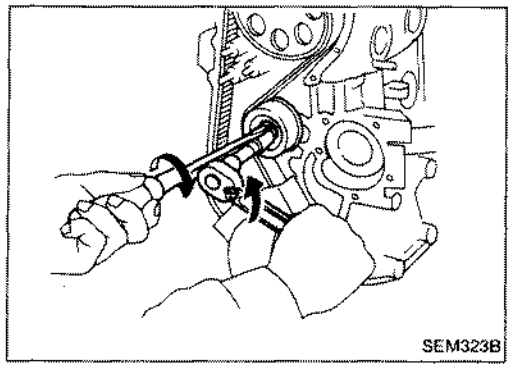
SEM382D


SEM383D

4. Remove the following parts.
- Alternator adjusting bar
- Water pump pulley
- Crankshaft pulley


SEM322B

5. Remove upper and lower dust covers. Use a torx wrench.


SEM323B

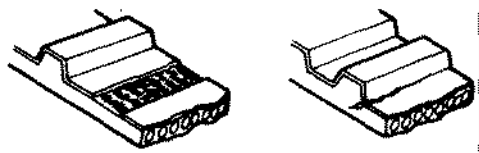
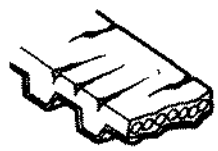
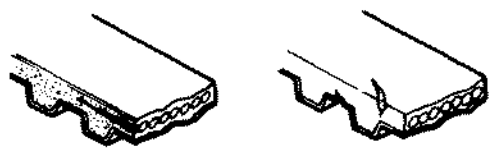
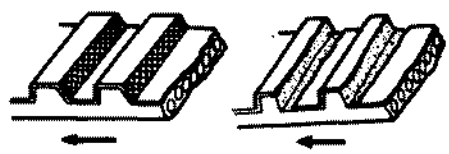
6. Loosen timing belt tension lock nut and rotate tension clockwise. Then tighten tensioner lock nut.

Mark rotating direction mark on timing belt.

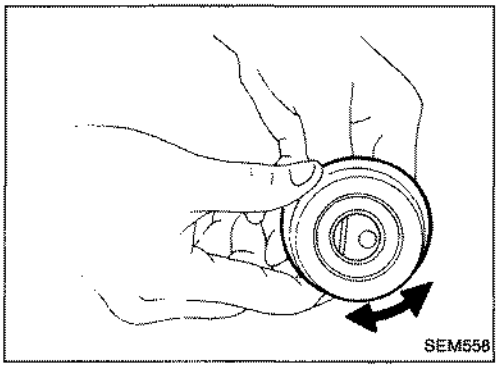
7. Remove timing belt.
8. Remove belt tensioner and return spring.

Inspection

Visually check the condition of the timing belt.
Replace if any abnormality is found.

Item to check	Problem	Cause
Tooth is broken/tooth root is cracked.	 SEM394A	• Camshaft jamming • Distributor jamming • Damaged camshaft/crankshaft oil seal
Back surface is cracked/worn.	 SEM395A	• Tensioner jamming • Overheated engine • Interference with belt cover
Side surface is worn.	 • Side surface of belt is worn to such an extent that there is no trace of cutoff performed during manufacturing process. • Belt corners are worn and round. • Wicks are frayed and coming out. SEM396A	• Improper installation of belt • Malfunctioning crank 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 • Distributor 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

Inspection (Cont'd)


SEM558

BELT TENSIONER AND RETURN SPRING

1. Visually check belt tensioner for stickiness, rust and any evidence of breaks.
2. Confirm that tensioner pulley can be rotated smoothly.
3. Visually check return spring for corrosion, distortion and any abnormal signs.

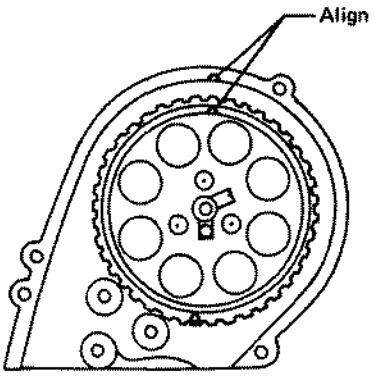
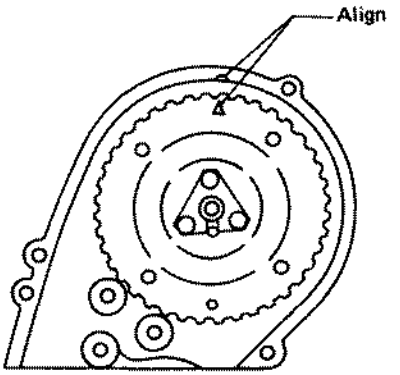
Installation

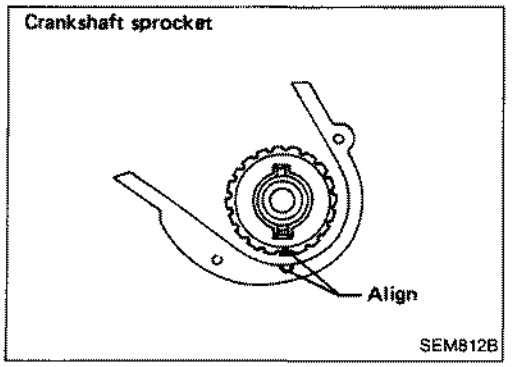
1. Confirm that No. 1 cylinder is set at T.D.C. on its compression stroke.

Ensure that marks on camshaft sprocket and upper front cover and marks on crankshaft sprocket and lower front cover are properly aligned.

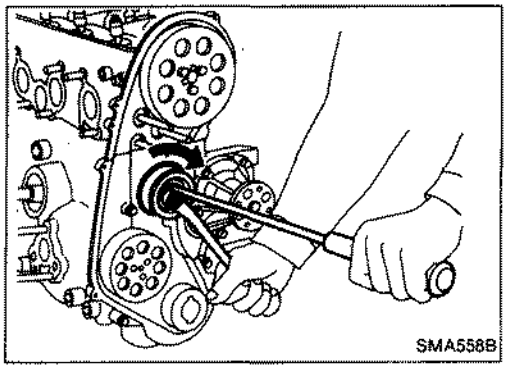
2. Temporarily install tensioner and return spring.

Camshaft sprocket adjusting mark

Sinter-type	Press-type
 SEM809B	 SEM810B



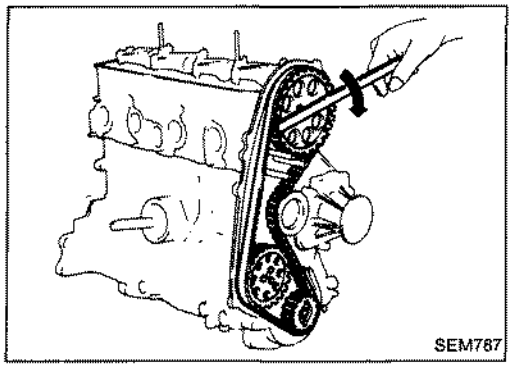
Installation (Cont'd)


SMA558B

3. Rotate tensioner clockwise about 70° to 80° and temporarily tighten lock nut.

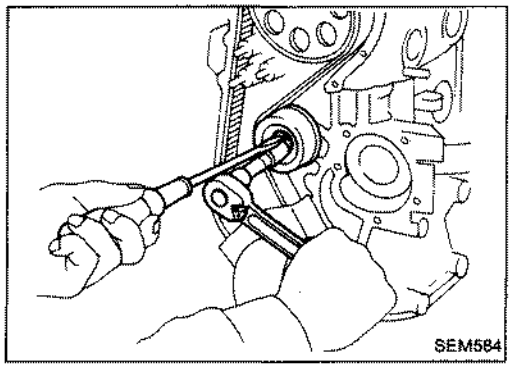
4. Set timing belt.
a. Ensure that timing belt and sprockets are clean and free of oil or water. Do not bend timing belt tightly.
b. Install timing belt with rotating direction mark facing engine rotating direction.
c. Ensure that timing belt is not loose around jackshaft and camshaft sprockets.

5. Loosen tensioner lock nut so that tensioner pushes on timing belt.

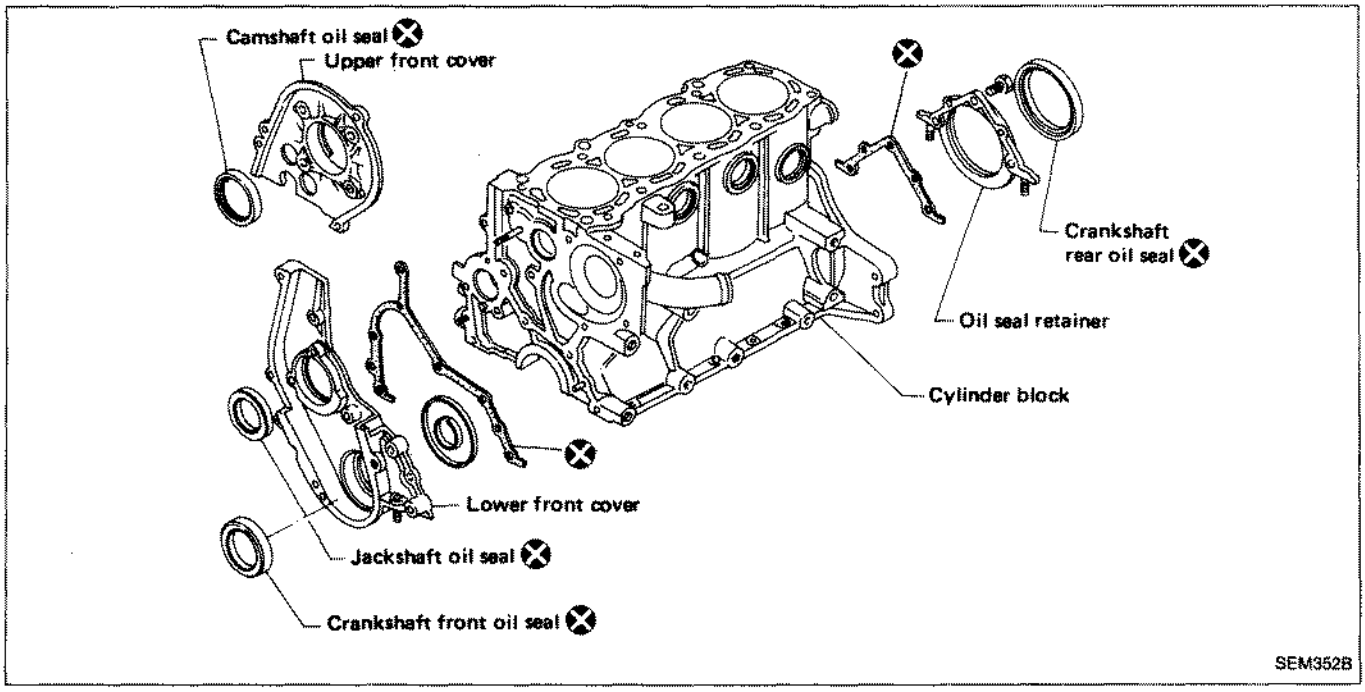

SEM787

6. Turn camshaft sprocket about 20° (2 cogs) clockwise.

Ensure that all spark plugs are removed.

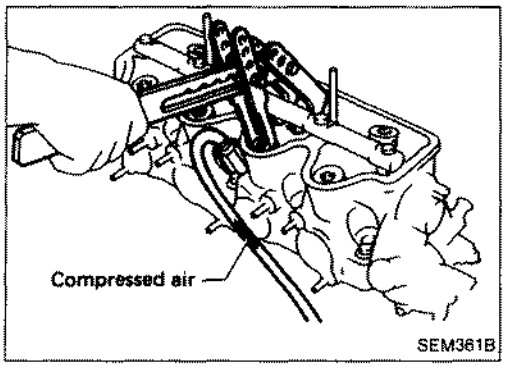

SEM584

7. Tighten nut while preventing tensioner from turning in "free" direction.
8. Install crank sprocket plate and upper and lower dust covers.



VALVE OIL SEAL

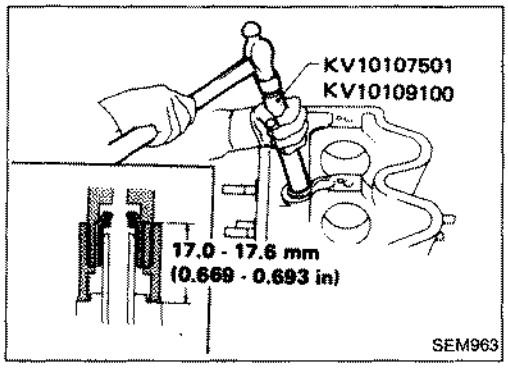
1. Remove rocker cover.
2. Remove rocker shaft assembly with rocker arm.
3. Remove all spark plugs.



4. Install air hose adapter into spark plug hole and apply air pressure to hold valves in place [Apply pressure of 490 kPa (4.9 bar, 5 kg/cm^2, 71 psi)].

When performing this operation, piston should be set at T.D.C.

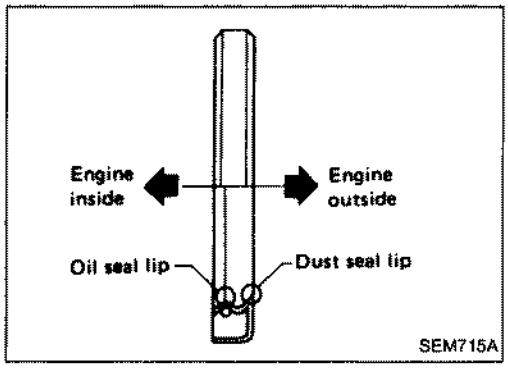
5. Remove valve spring with Tool, then remove valve oil seal.



6. Apply engine oil to valve oil seal lip and install it in place with Tool.

Before installing valve oil seal, be sure to install valve spring seat.

7. Install parts in the reverse order of removal.



OIL SEAL INSTALLING DIRECTION

CAMSHAFT OIL SEAL, CRANKSHAFT FRONT OIL SEAL AND JACKSHAFT OIL SEAL

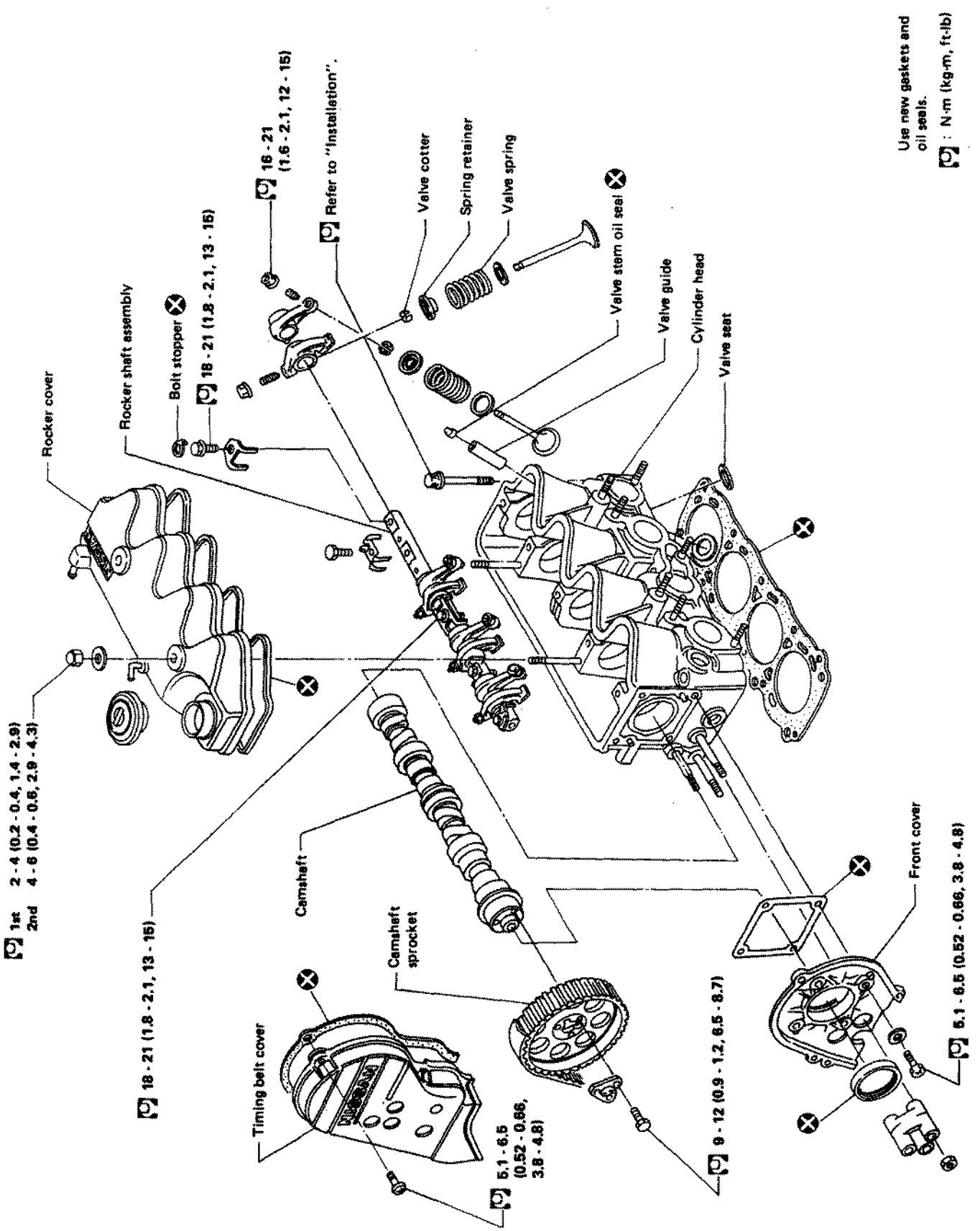
1. Remove timing belt and sprockets.
2. Remove oil seal.

Be careful not to damage surfaces of shafts.

3. Apply engine oil to oil seal lip and install seal in place.

CRANKSHAFT REAR OIL SEAL

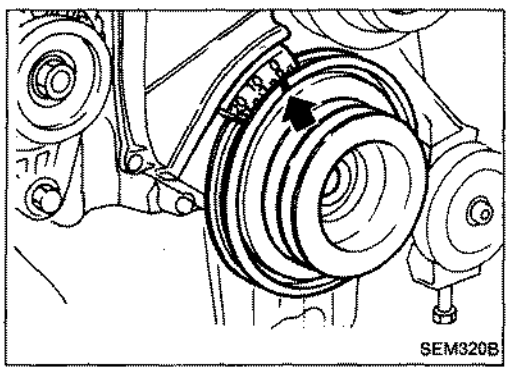
1. Remove transaxle. (Refer to MT section.)
2. Remove flywheel. Remove oil seal using a suitable tool. Be careful not to damage sealing surface of crankshaft.
3. Apply engine oil to oil seal lip and install it in place using suitable drift.
4. Install flywheel and transaxle. (Refer to MT section.)


Use new gaskets and oil seals.
: N·m (kg-m, ft-lb)
Rocker cover
Rocker shaft assembly
Bolt stopper
18 - 21 (1.8 - 2.1, 13 - 15)
16 - 21 (1.6 - 2.1, 12 - 15)
Refer to "installation".
Valve cotter
Spring retainer
Valve spring
Valve stem oil seal
Valve guide
Cylinder head
Valve seat
1st 2 - 4 (0.2 - 0.4, 1.4 - 2.9)
2nd 4 - 8 (0.4 - 0.8, 2.9 - 4.3)
18 - 21 (1.8 - 2.1, 13 - 15)
Camshaft
Camshaft sprocket
Timing belt cover
5.1 - 6.5 (0.52 - 0.66, 3.8 - 4.8)
9 - 12 (0.9 - 1.2, 6.5 - 8.7)
Front cover
5.1 - 6.5 (0.52 - 0.66, 3.8 - 4.8)

SEM358B

CAUTION:

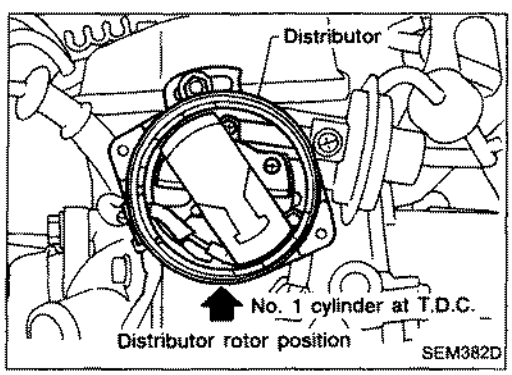
- **When installing sliding parts such as rocker arms, camshaft and oil seal, be sure to apply new engine oil on their sliding surfaces.**
- **When tightening cylinder head bolts and rocker shaft bolts, apply new engine oil to thread portions and seat surfaces of bolts.**


SEM320B

Removal

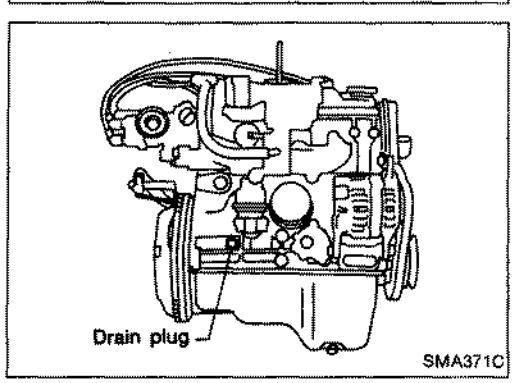
1. Set No. 1 cylinder at T.D.C. on its compression stroke and remove timing belt.

After removing timing belt, do not rotate crankshaft and camshaft separately, because valves will hit piston heads.



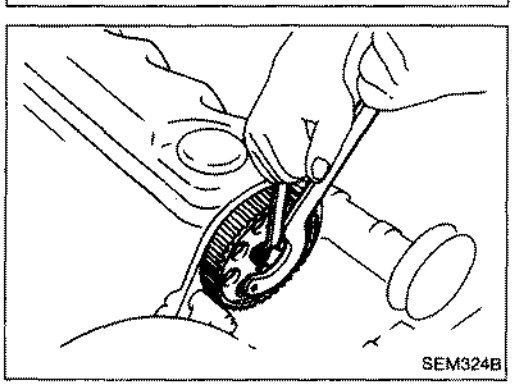
SEM382D

2. Drain engine coolant from radiator and cylinder block.

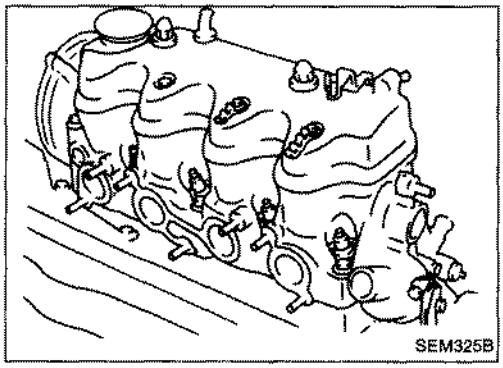


SMA371C

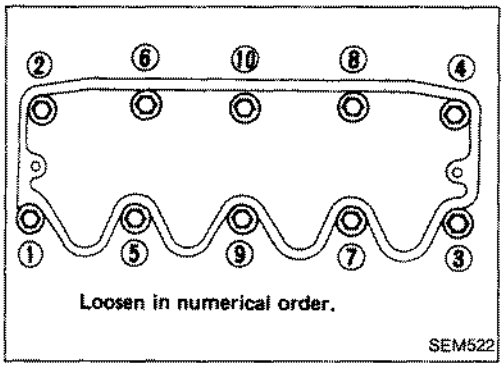
3. Remove camshaft sprocket and front cover.


SEM324B

Removal (Cont'd)


SEM325B

4. Remove the following parts.
- Exhaust manifold
- Air cleaner
- Intake manifold
- Rocker cover
- Distributor

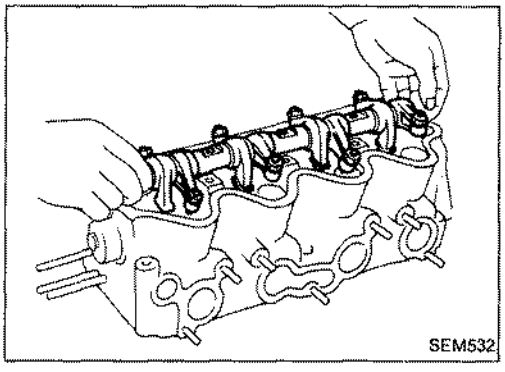


Loosen in numerical order.
SEM522

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

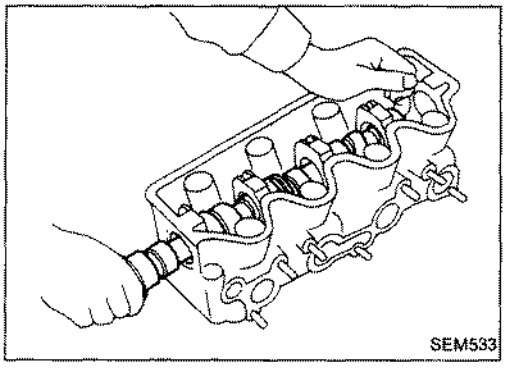
6. Remove intake manifold from cylinder head.

Disassembly

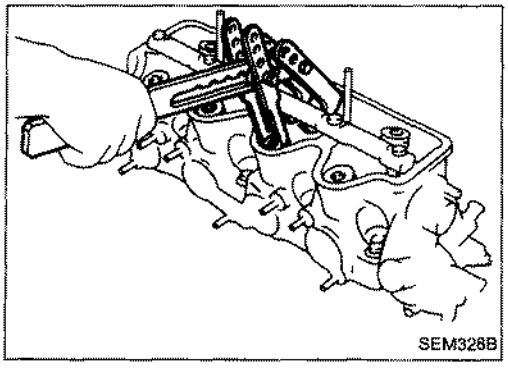

SEM532

1. Remove rocker shaft with rocker arms.

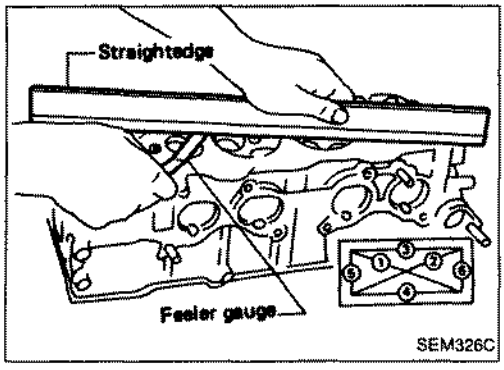
The bolts should be loosened in two or three stages.
Keep rocker shaft components in correct order.


SEM533

2. Remove camshaft from front side.


SEM328B

3. Remove valve component parts with Tool.



Inspection

CYLINDER HEAD DISTORTION

Cylinder head distortion:

Less than 0.1 mm (0.004 in)

If beyond the specified limit, replace it or resurface it.

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".

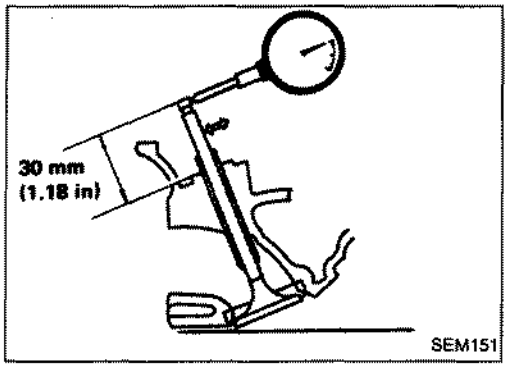
The maximum limit is as follows:

A + B = 0.2 mm (0.008 in)

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

Cylinder head height (Nominal):

120 ± 0.1 mm (4.724 ± 0.004 in)



VALVE GUIDE CLEARANCE

- **Valve guide clearance should be measured parallel with rocker arm. (Generally, a large amount of wear occurs in this direction.)**

Stem to guide clearance:

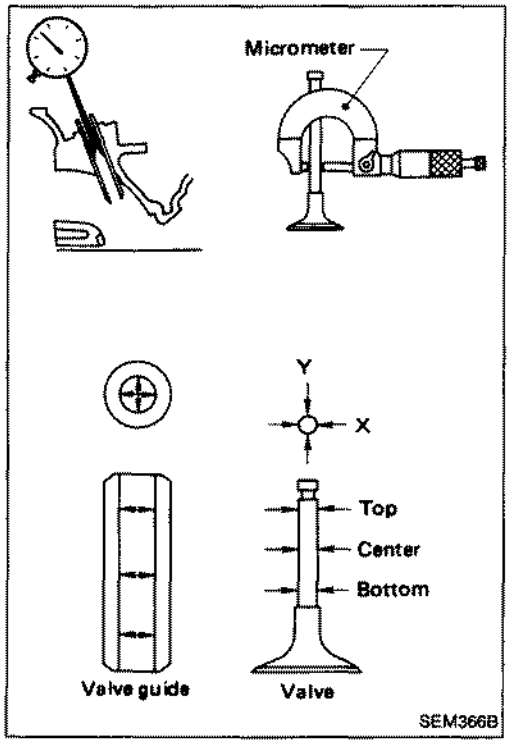
Maximum limit

0.10 mm (0.0039 in)

Maximum allowable deflection

(Dial indicator reading)

0.2 mm (0.008 in)

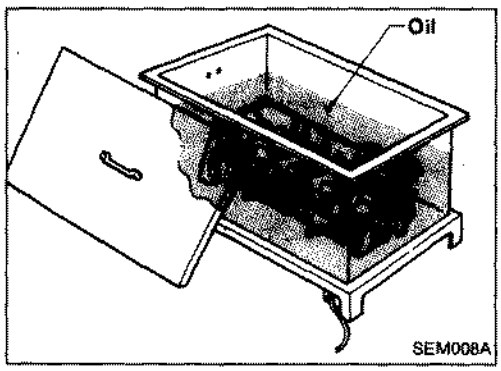


- **To determine the correct replacement part, measure valve stem diameter and valve guide bore.**

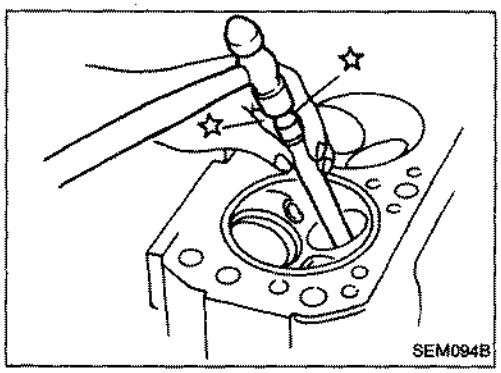
For dimensions, refer to S.D.S.

Inspection (Cont'd)

VALVE GUIDE REPLACEMENT

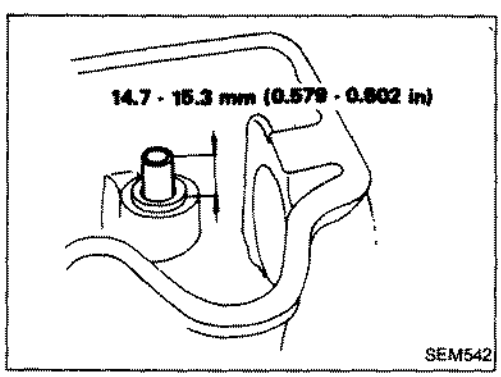


1. To remove valve guide, heat cylinder head to 150 to 160°C (302 to 320°F).

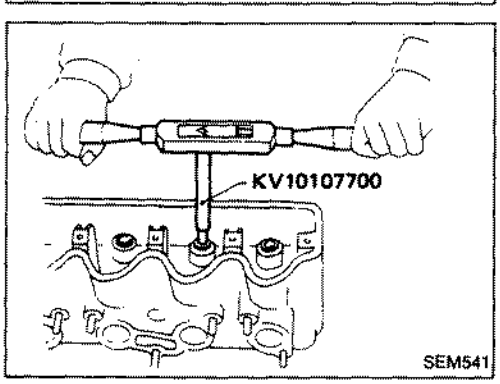


2. Drive out valve guide with hammer and suitable tool.

3. Ream cylinder head valve guide hole. (at room temperature)
   Valve guide hole inner diameter
   (For service parts):
   12.200 - 12.211 mm (0.4803 - 0.4807 in)

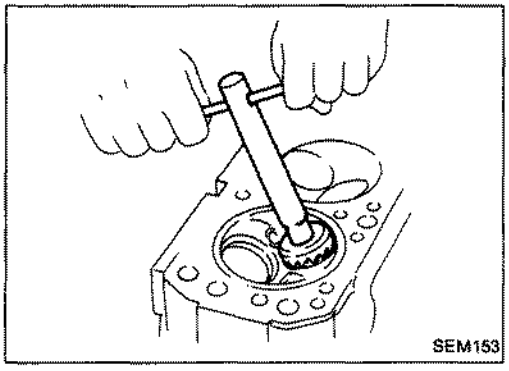


4. Heat cylinder head to 150 to 160°C (302 to 320°F) and press service valve guide onto cylinder head.



5. Ream valve guide. (at room temperature)
   Finished size (Inner diameter):
   7.005 - 7.020 mm (0.2758 - 0.2764 in)

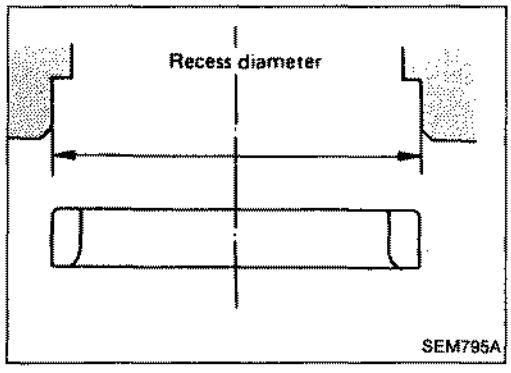
Inspection (Cont'd)


SEM153

VALVE SEATS

Check valve for any evidence of pitting at valve contact surface, and reseat or replace if worn out excessively.

- **When repairing valve seats, check valve and valve guide for wear beforehand. If worn, replace them. Then correct valve seat.**
- **The cutting should be done with both hands for uniform cutting.**



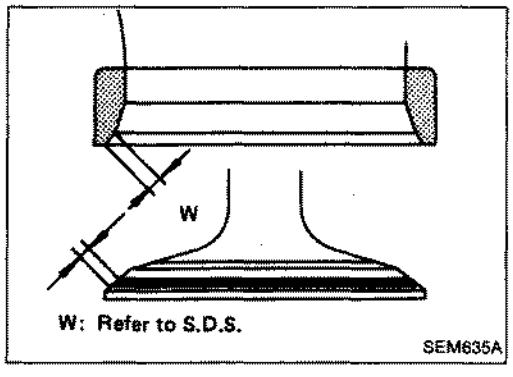
SEM795A

REPLACING VALVE SEAT FOR SERVICE PARTS

1. Bore out old seat until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the seat recess in cylinder head.
2. Ream cylinder head recess.
   Reaming bore for service valve seat
   [Oversize 0.5 mm (0.020 in)]:
   Intake
   37.500 - 37.516 mm (1.4764 - 1.4770 in)
   Exhaust
   31.500 - 31.511 mm (1.2402 - 1.2406 in)

Reaming should be done to the concentric circles to valve guide center so that valve seat will have the correct fit.

3. Heat cylinder head to a temperature of 150 to 160°C (302 to 320°F).
4. Press fit insert until it seats on the bottom.



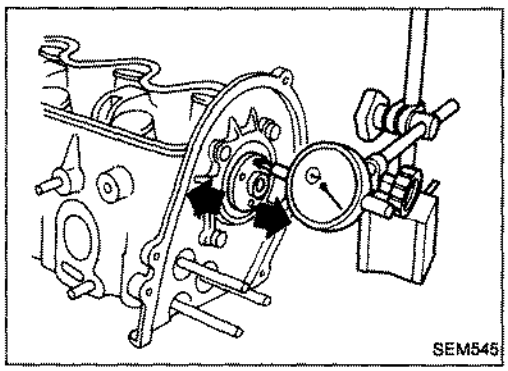
W: Refer to S.D.S.
SEM635A

5. Cut or grind valve seat using suitable tool at the specified dimensions as shown in S.D.S.
6. After cutting, lap valve seat with a lapping compound.
7. Check contact condition of valve seat.

CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.

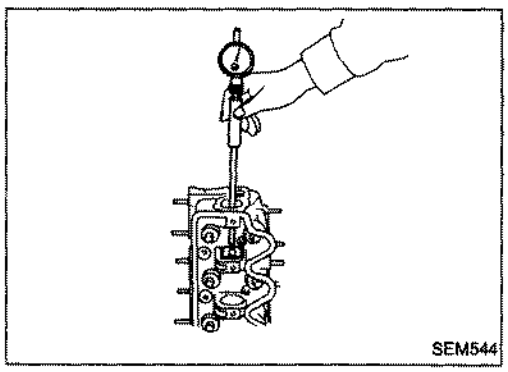
Inspection (Cont'd)


SEM545

CAMSHAFT END PLAY

1. Install camshaft and front cover in cylinder head.
2. Measure camshaft end play.

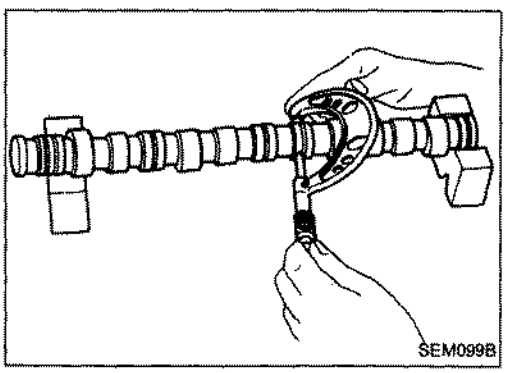
Camshaft end play:
Limit 0.4 mm (0.016 in)


SEM544

CAMSHAFT JOURNAL CLEARANCE

1. Measure the inside diameter of camshaft bearing.

Standard inner diameter:
42.000 - 42.025 mm (1.6535 - 1.6545 in)

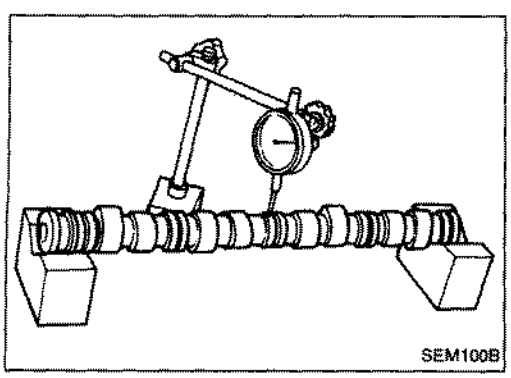

SEM099B

2. Measure the outside diameter of camshaft journal.

Standard outer diameter:
No. 1, 3, 5
41.949 - 41.965 mm (1.6515 - 1.6522 in)
No. 2, 4
41.906 - 41.922 mm (1.6498 - 1.6505 in)

If the clearance is greater than the maximum, replace camshaft and/or cylinder head.

Maximum clearance:
No. 1, 3, 5
0.15 mm (0.0059 in)
No. 4, 6
0.20 mm (0.0079 in)

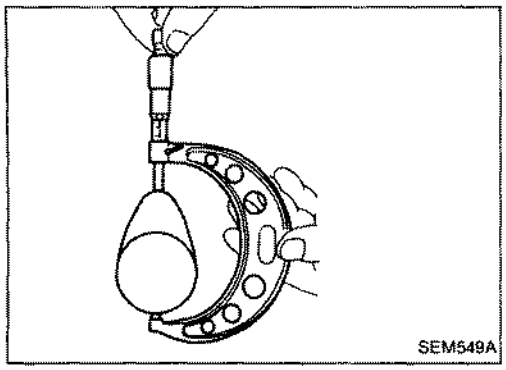

SEM100B

CAMSHAFT RUNOUT

Runout [T.I.R. (Total Indicator Reading)]
Limit 0.1 mm (0.004 in)
at the center journal

If beyond the limit, replace.

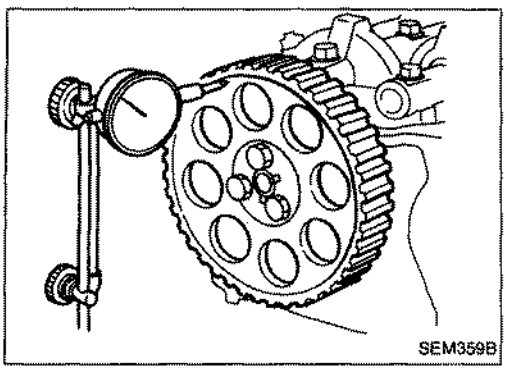
Inspection (Cont'd)


SEM549A

CAMSHAFT CAM HEIGHT

Standard cam height:
Intake
35.71 - 35.96 mm (1.4059 - 1.4157 in)
Exhaust
35.43 - 35.68 mm (1.3949 - 1.4047 in)
Cam wear:
Limit 0.20 mm (0.0079 in)

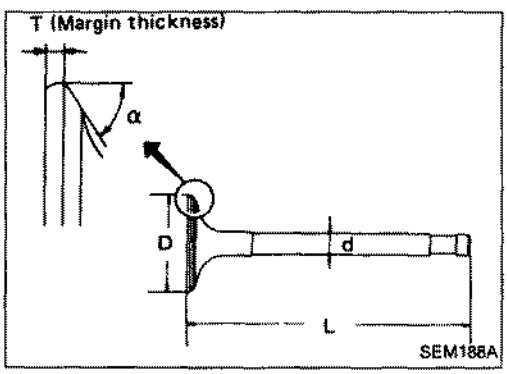
If wear is beyond the limit, replace.


SEM359B

CAMSHAFT SPROCKET RUNOUT

Install sprocket on camshaft and check for runout.

If runout exceeds the specified limit, replace camshaft sprocket.
Runout (Total indicator reading):
Limit 0.1 mm (0.004 in)



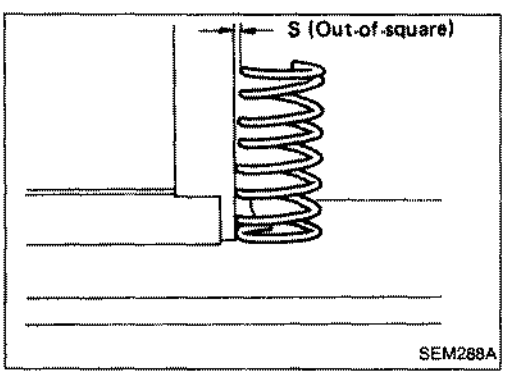
SEM188A

VALVE DIMENSIONS

Check dimensions in each valve. For dimensions, refer to S.D.S.

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

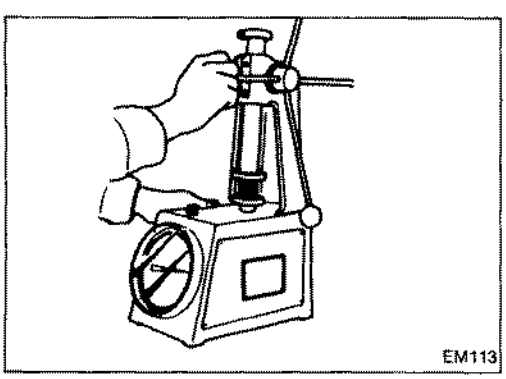
Grinding allowance for valve stem tip is 0.2 mm (0.008 in) or less.



SEM288A

VALVE SPRING SQUARENESS

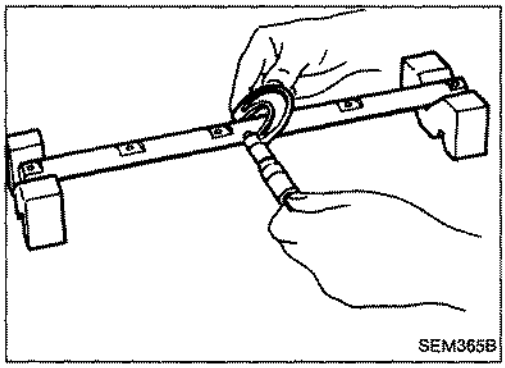
Out-of-square:
Less than 2.0 mm (0.079 in)


EM113

VALVE SPRING PRESSURE LOAD

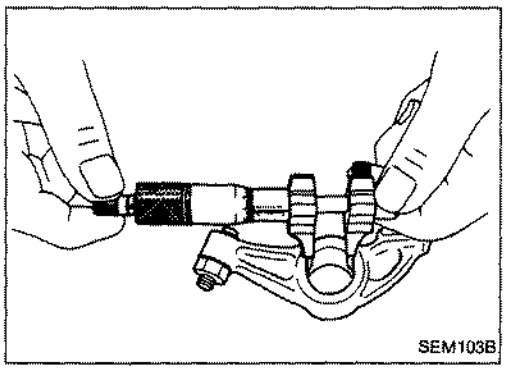
Refer to S.D.S.

Inspection (Cont'd)

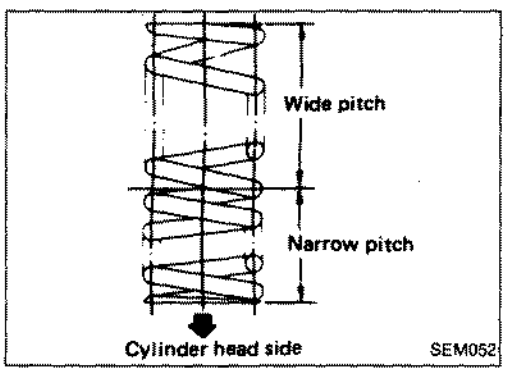

SEM365B

ROCKER SHAFT AND ROCKER ARM

1. Check rocker shaft and rocker arms for scratches, seizure and wear.
2. Check outer diameter of rocker shaft.
   Diameter:
   19.979 - 20.000 mm (0.7866 - 0.7874 in)


SEM103B

3. Check inner diameter of rocker arm.
   Diameter:
   20.007 - 20.028 mm (0.7877 - 0.7885 in)
   Rocker arm to shaft clearance:
   0.007 - 0.049 mm (0.0003 - 0.0019 in)



SEM052

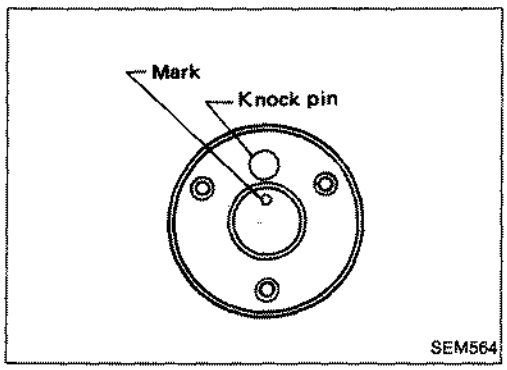
Assembly

1. Install valve component parts.

- **Always use new valve oil seal. (Refer to OIL SEAL REPLACEMENT.)**
- **Before installing valve oil seal, install valve spring seat.**
- **Install uneven pitch type spring with its narrow pitch side toward cylinder head side.**
- **After installing valve component parts, use plastic hammer to lightly tap valve stem tip to assure a proper fit.**

2. Install camshaft and upper front cover in cylinder head with new camshaft oil seal.

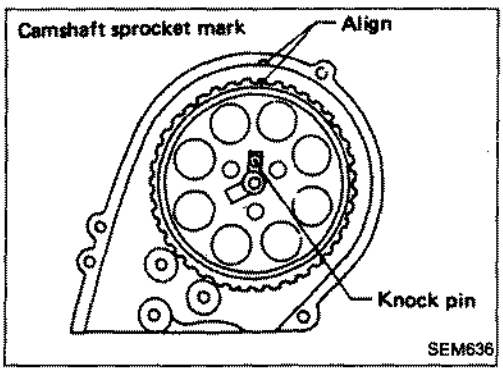
- **Refer to OIL SEAL REPLACEMENT.**



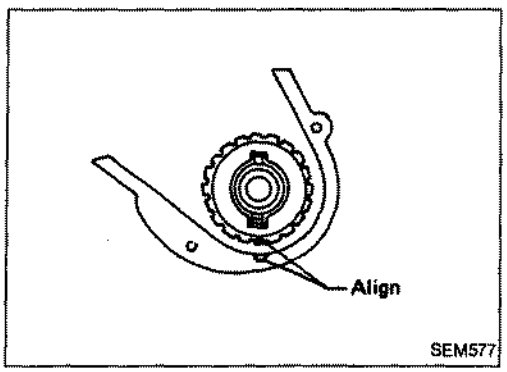
SEM564

- **After installing camshaft, set knock pin upper side.**

Assembly (Cont'd)



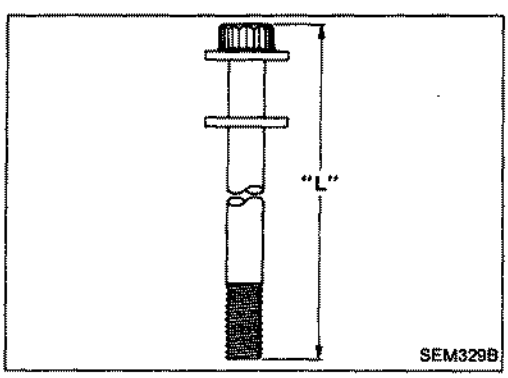
3. Install camshaft sprocket.
- **Align camshaft sprocket mark with upper front cover mark.**



4. Align crankshaft sprocket mark with lower front cover mark.
5. Install intake manifold to cylinder head.

Installation

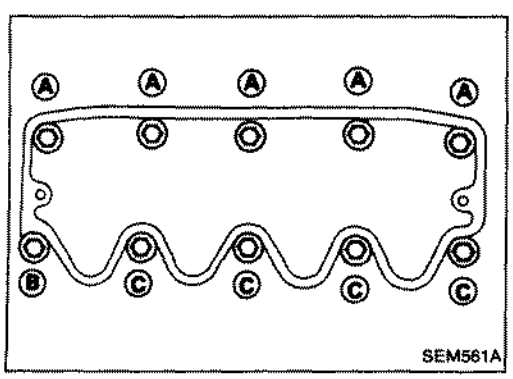
1. Install cylinder head with new gasket.
- **Be sure to install washers between cylinder head and bolts.**



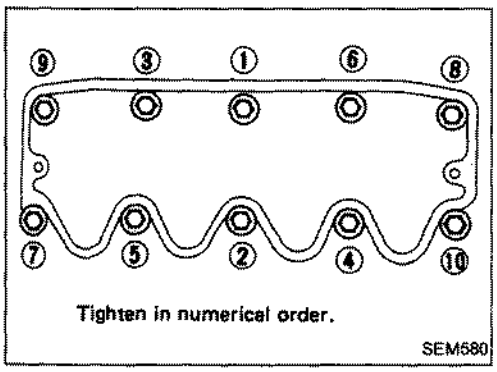
- **There are three kinds of cylinder head bolts with different lengths.**

  Bolt length "L":

  Ⓐ: 95 mm (3.74 in)
  Ⓑ: 110 mm (4.33 in)
  Ⓒ: 80 mm (3.15 in)

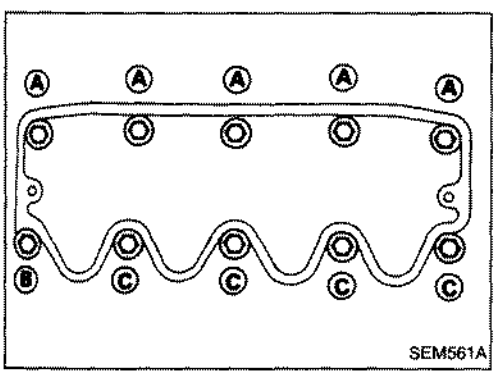


Installation (Cont'd)



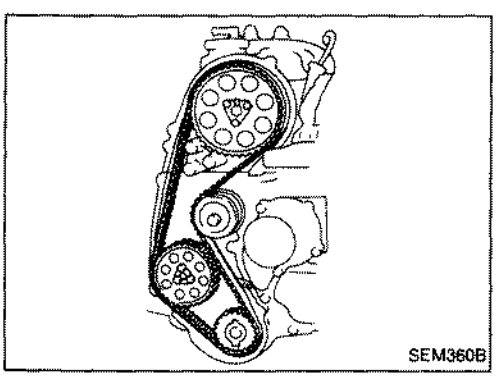
2. Apply oil to the thread portion and seat surface of cylinder head bolts and tighten cylinder head bolts with washers.

- **Tightening procedure**
  - **1st** **Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb)**
  - **2nd** **Tighten all bolts to 69 N·m (7.0 kg-m, 51 ft-lb)**
  - **3rd** **Loosen all bolts completely**
  - **4th** **Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb)**
  - **5th** **Turn each bolt clockwise the specified number of degrees. If an angle wrench is not available, tighten all bolts to 69 to 74 N·m (7.0 to 7.5 kg-m, 51 to 54 ft-lb).**

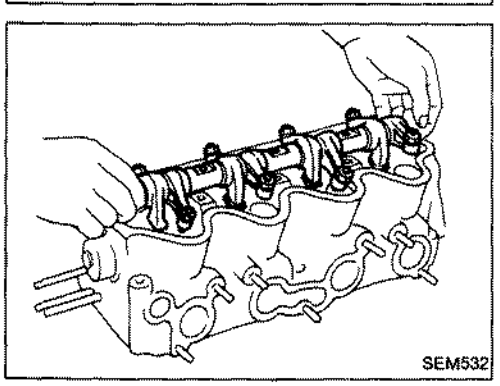


Specified number of degrees.

- **Ⓐ 45 - 50**
- **Ⓑ 55 - 60**
- **Ⓒ 40 - 45**

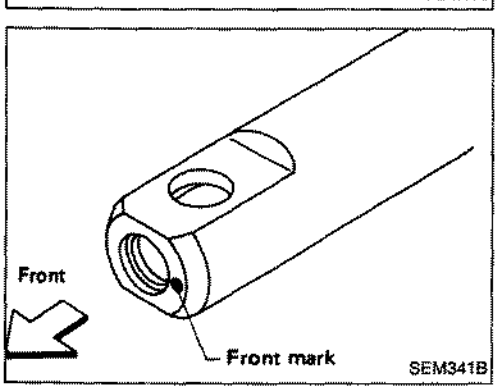


3. Install timing belt and adjust belt tension.
   Refer to "TIMING BELT".



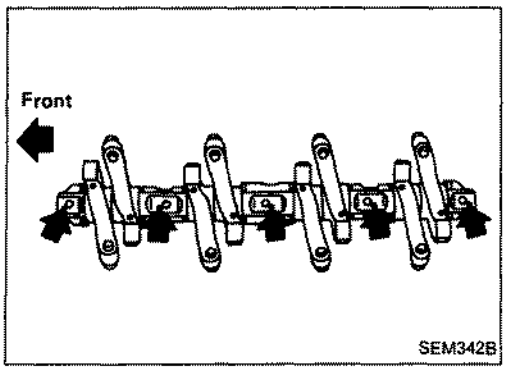
4. Install rocker shaft with rocker arms.

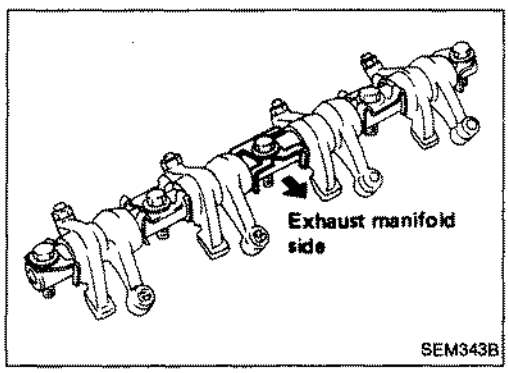
- **Apply engine oil to rocker shaft and interior of rocker arm.**



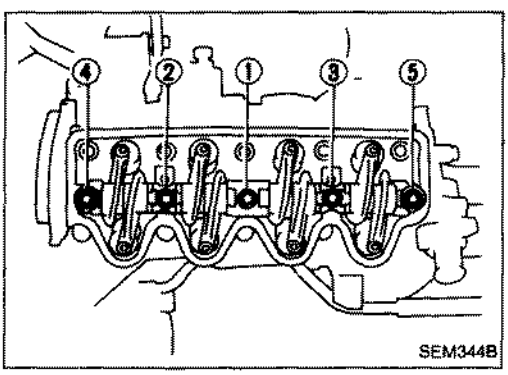
- **Ensure that punched mark on rocker shaft faces toward front side and oil holes in rocker shaft face downward.**

Installation (Cont'd)

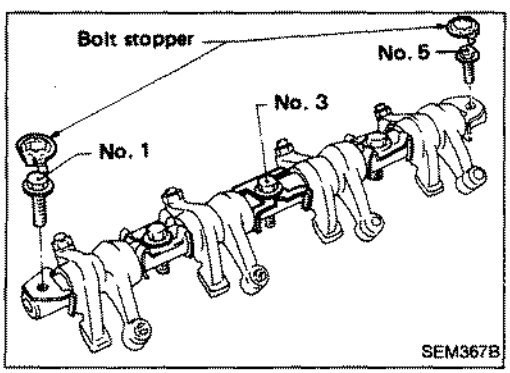




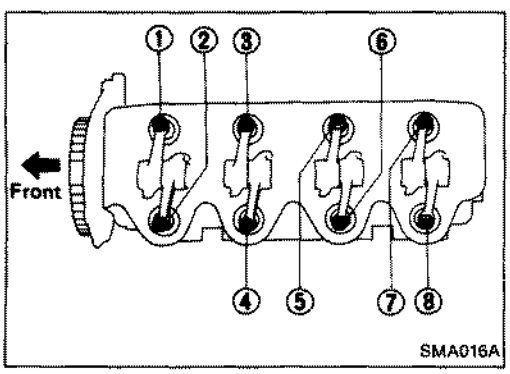
- **Ensure that cutout in center retainer of rocker shaft faces toward exhaust manifold side.**



5. Tighten rocker shaft bolts.
- **Make sure that valve clearance adjusting screws are fully loosened.**
- **Tighten bolts gradually, in two or three stages, outward from center position.**

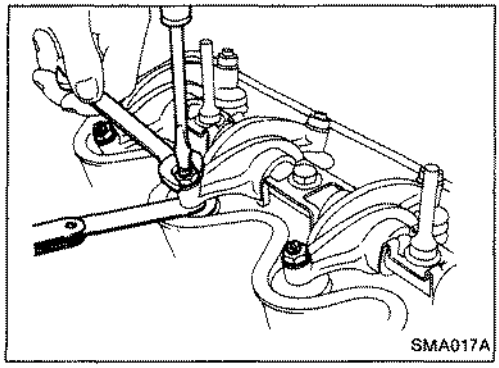


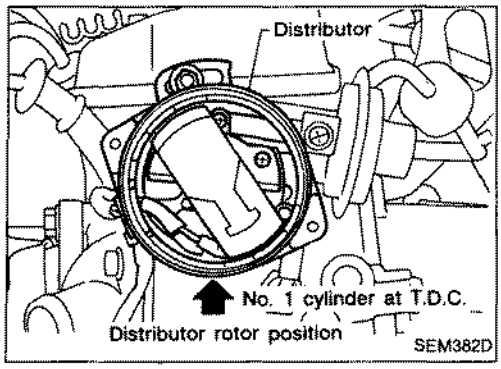
6. Install new bolt stopper on No. 1 and 5 bolts.



7. Adjust valve clearance.
(1) Set No. 1 cylinder in top dead center on its compression stroke, and adjust valve clearance ①, ②, ③ and ⑥.
(2) Set No. 4 cylinder in top dead center on its compression stroke, and adjust valve clearance ④, ⑤, ⑦ and ⑧.

Installation (Cont'd)


SMA017A



SEM382D

Valve clearance:

Unit: mm (in)

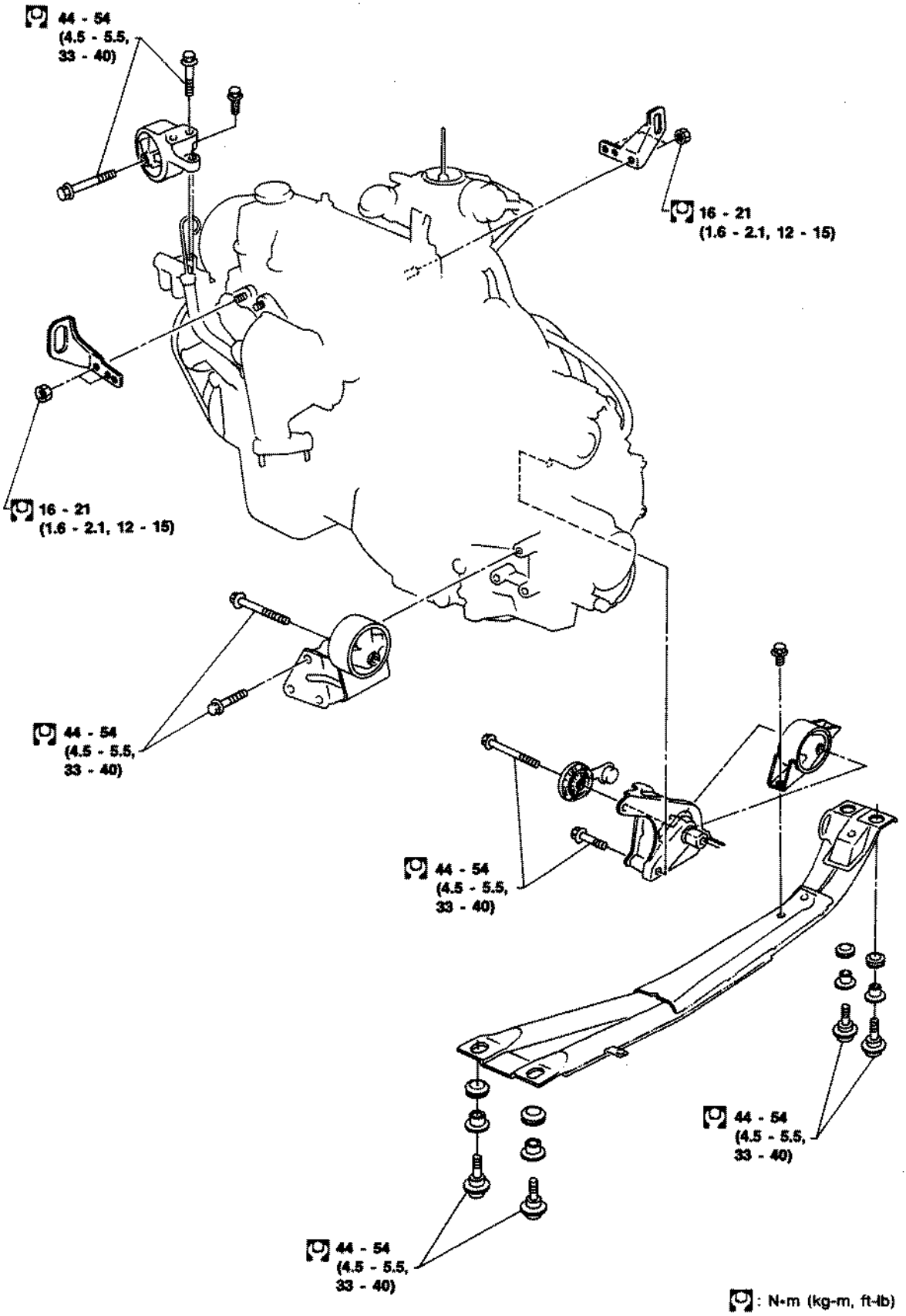
	COLD*	HOT
Intake & Exhaust	0.22 (0.009)	0.28 (0.011)

*: At temperature 20°C (68°F)

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

8. Install exhaust manifold.
9. Install distributor.
   Confirm the rotor position with the No. 1 cylinder at the T.D.C. compression stroke, and then set the distributor.
10. Install the following parts.

- Rocker cover and dust covers
- Water pump pulley
- Crankshaft pulley and drive belts


44 - 54
(4.5 - 5.5,
33 - 40)
16 - 21
(1.6 - 2.1, 12 - 15)
16 - 21
(1.6 - 2.1, 12 - 15)
44 - 54
(4.5 - 5.5,
33 - 40)
44 - 54
(4.5 - 5.5,
33 - 40)
44 - 54
(4.5 - 5.5,
33 - 40)
44 - 54
(4.5 - 5.5,
33 - 40)
: N•m (kg-m, ft-lb)

SEM385D

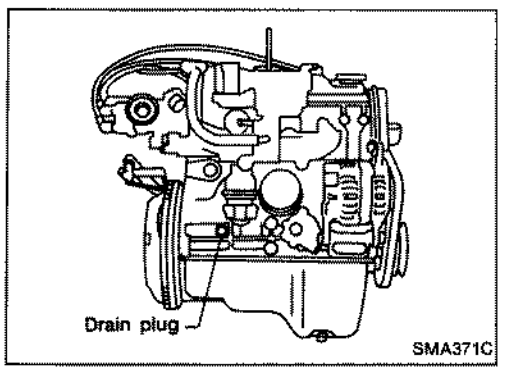
WARNING:

a. **Situate vehicle on a flat and solid surface.**
b. **Place chocks at front and back of rear wheels.**
c. **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.
d. **For safety during subsequent steps, the tension of wires should be slackened against the engine.**
e. **Before removing front axle from transaxle, place safety stands under designated front supporting points. Refer to GI section for lifting points and towing.**
f. **Be sure to hoist engine and transaxle in a safe manner.**
g. **For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.**

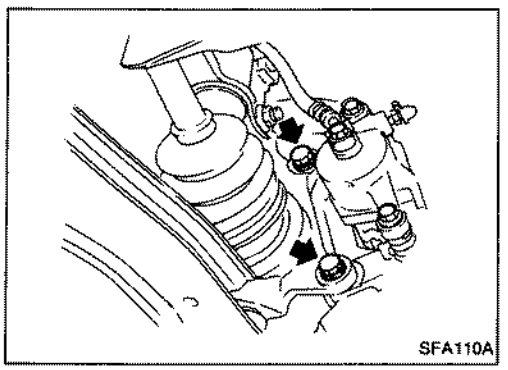
CAUTION:

- **When lifting engine, be careful not to strike adjacent parts, especially accelerator wire casing, brake lines, and brake master cylinder.**
- **In hoisting the engine, always use engine slingers in a safe manner.**
- **In removing drive shaft, be careful not to damage grease seal of transaxle.**

1. Remove engine under cover and hood.

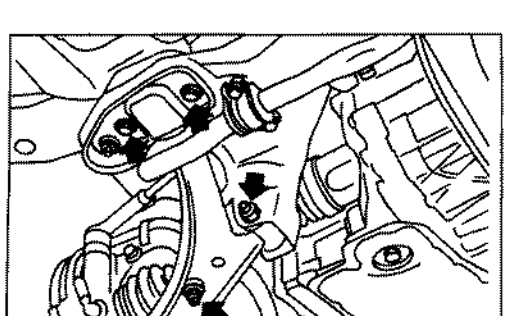


2. Drain engine coolant from radiator and cylinder block.
3. Remove drive belts for cooling fan, air compressor and power steering pump.
4. Disconnect adjacent wires, harness, pipes and hoses.
5. Remove front tires and splash covers.

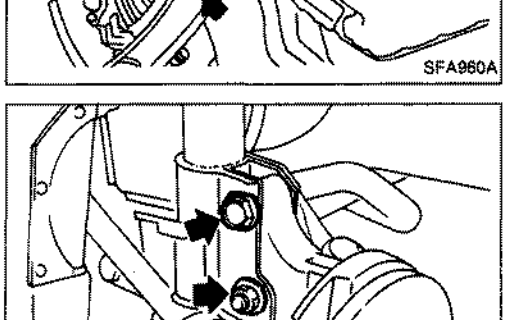


6. Remove brake caliper assembly and rotor.

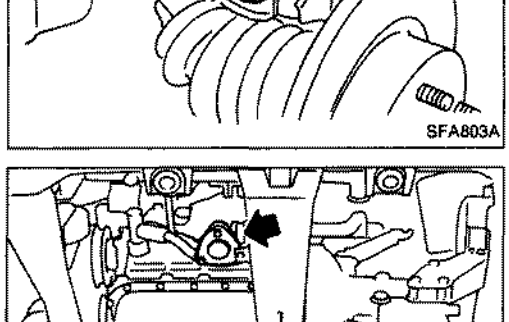
- **Brake hose does not need to be disconnected from brake caliper assembly.**
- **Never depress brake pedal.**



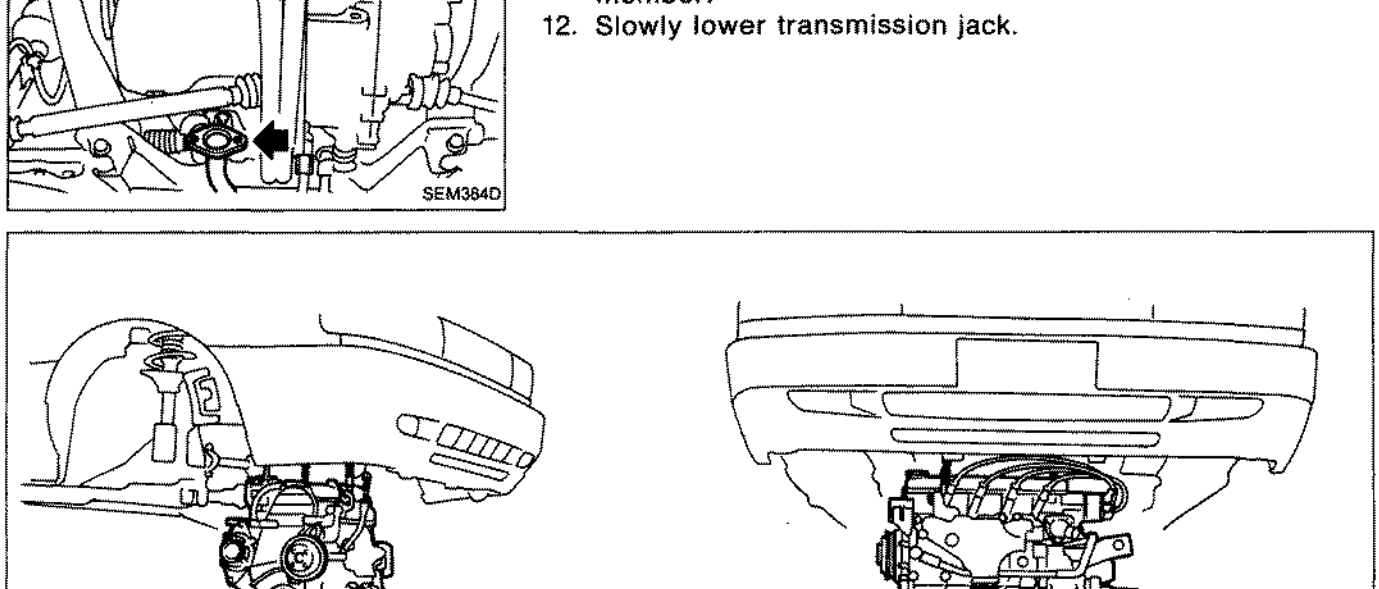
7. Disconnect transverse link (RH & LH) and tie-rod ball joint (RH & LH).



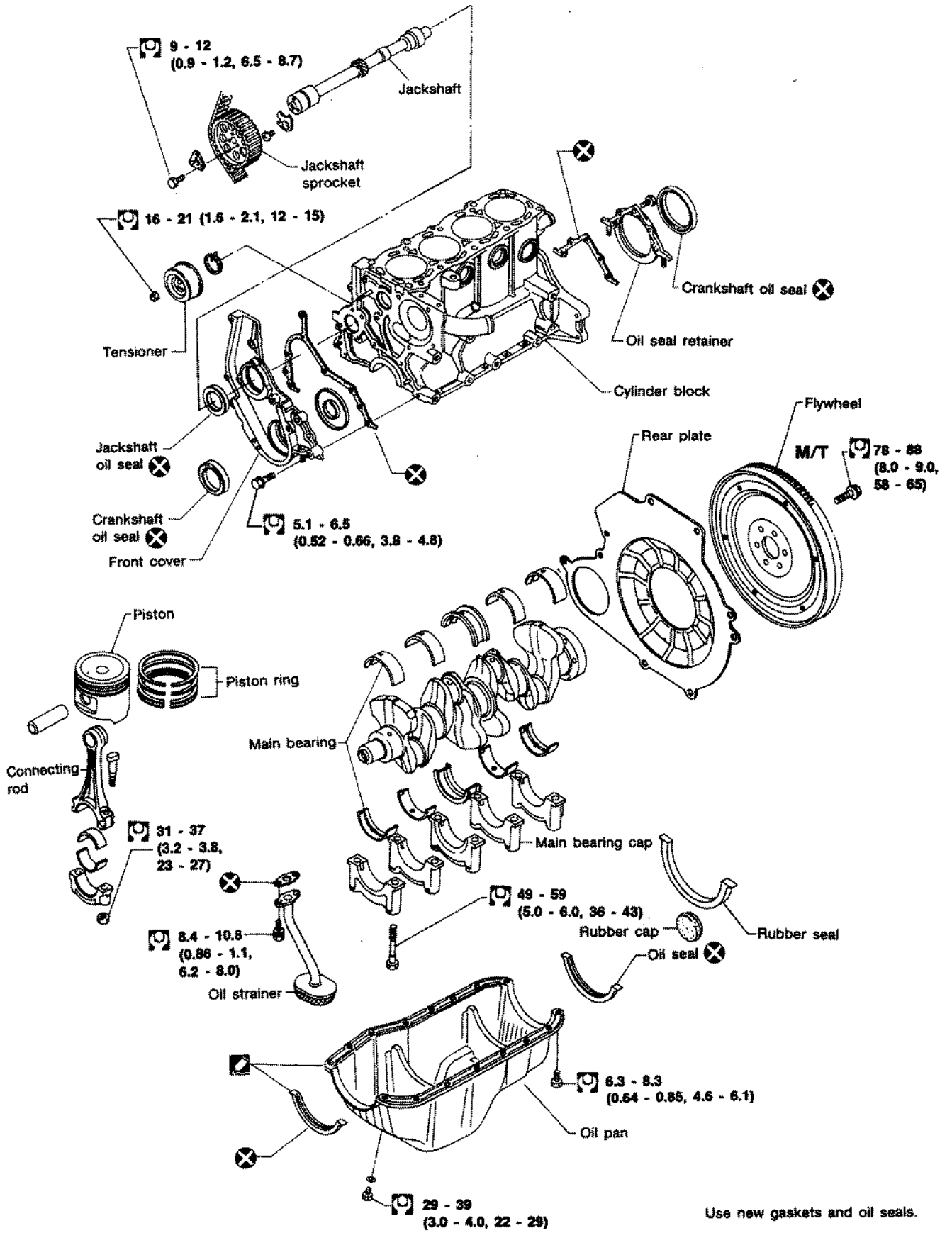
8. Remove knuckle to strut bolts (RH & LH).



9. Remove front exhaust tube.
10. Set a suitable transmission jack under transaxle and engine. Hoist engine with engine slinger.
11. Remove front and right engine mounting bolts and center member.
12. Slowly lower transmission jack.



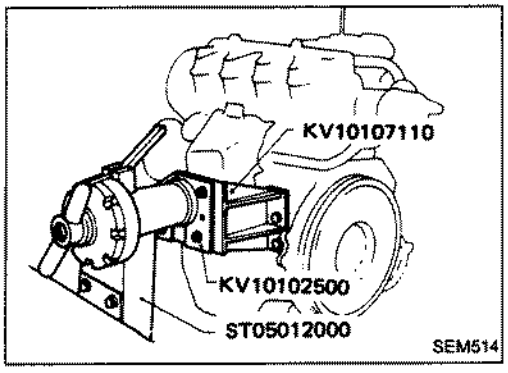
13. Remove engine with transaxle as shown.


9 - 12 (0.9 - 1.2, 6.5 - 8.7)
Jackshaft
Jackshaft sprocket
16 - 21 (1.6 - 2.1, 12 - 15)
Tensioner
Crankshaft oil seal
Oil seal retainer
Cylinder block
Jackshaft oil seal
Crankshaft oil seal
Front cover
5.1 - 6.5 (0.52 - 0.66, 3.8 - 4.8)
Flywheel
Rear plate
M/T
78 - 88 (8.0 - 9.0, 58 - 65)
Piston
Piston ring
Connecting rod
Main bearing
31 - 37 (3.2 - 3.8, 23 - 27)
Main bearing cap
49 - 59 (5.0 - 6.0, 36 - 43)
Rubber cap
Rubber seal
Oil seal
8.4 - 10.8 (0.86 - 1.1, 6.2 - 8.0)
Oil strainer
6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
Oil pan
29 - 39 (3.0 - 4.0, 22 - 29)
Use new gaskets and oil seals.
: N·m (kg-m, ft-lb)

SEM387D

CAUTION:

- **When installing sliding parts such as bearings and pistons, be sure to apply engine oil on the sliding surfaces.**
- **Place removed parts such as bearings and bearing caps in their proper order and direction.**
- **When tightening connecting rod bolts and main bearing cap bolts, apply engine oil to thread portion of bolts and seating surface of nuts.**

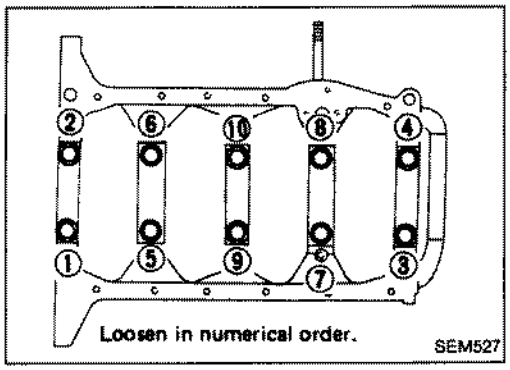


Disassembly

PISTON AND CRANKSHAFT

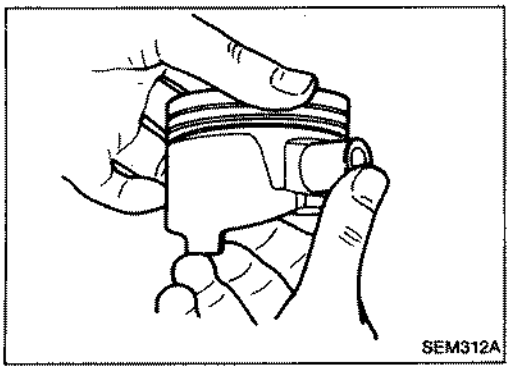
1. Place engine on work stand with Tool.

2. Remove cylinder head and timing belt.
3. Drain engine oil.
4. Remove water pump.
5. Remove oil pan and oil strainer.
6. Remove pistons.



7. Remove bearing caps and crankshaft.

Place the bearings and caps in their proper order.



Inspection

PISTON AND PISTON PIN CLEARANCE

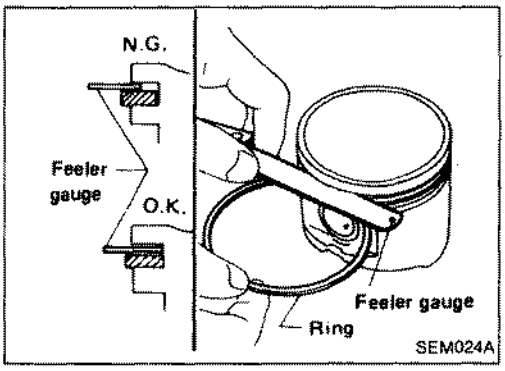
- Confirm the fitting of piston pin into piston pin hole to such an extent that it can be pressed smoothly by finger at room temperature.

  Piston pin to piston clearance:

  0.006 - 0.010 mm (0.0002 - 0.0004 in)

Apply engine oil to piston pin.

Inspection (Cont'd)



PISTON RING SIDE CLEARANCE

Side clearance:

Top ring

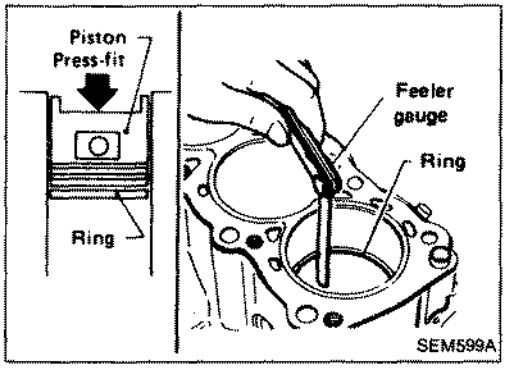
0.040 - 0.073 mm (0.0016 - 0.0029 in)

2nd ring

0.030 - 0.063 mm (0.0012 - 0.0025 in)

Max. limit of side clearance (Top and 2nd rings)

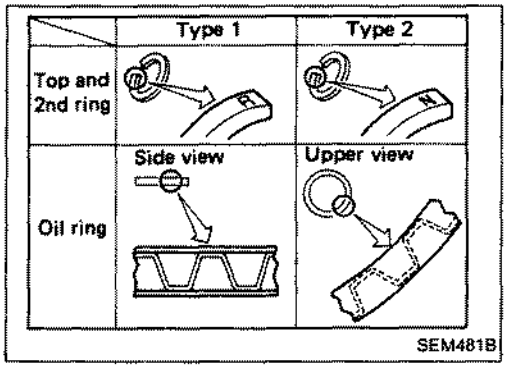
0.2 mm (0.008 in)



PISTON RING GAP

Unit: mm (in)

Ring	Type 1	Type 2	Max. limit
Top	0.14 - 0.26 (0.0055 - 0.0102)	0.20 - 0.30 (0.0079 - 0.0118)	1.0 (0.039)
2nd	0.28 - 0.37 (0.0110 - 0.0146)	0.15 - 0.25 (0.0059 - 0.0098)	
Oil	0.20 - 0.60 (0.0079 - 0.0236)		



BEARING CLEARANCE

Main bearing clearance:

No. 1, No. 3 and No. 5 bearings

0.031 - 0.056 mm (0.0012 - 0.0022 in)

No. 2 and No. 4 bearings

0.031 - 0.092 mm (0.0012 - 0.0036 in)

Limit 0.10 mm (0.0039 in)

Connecting rod bearing clearance:

0.010 - 0.044 mm (0.0004 - 0.0017 in)

Limit 0.10 mm (0.0039 in)

- Either of the following two methods may be used, however, method "A" gives more reliable results and is preferable.

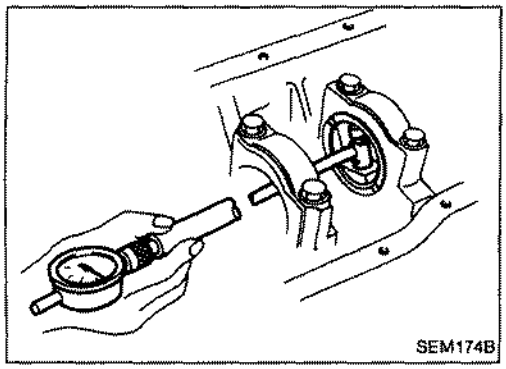
Method A (Using bore gauge & micrometer)

Main bearing

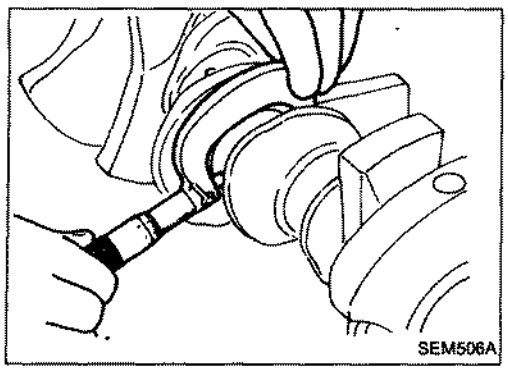
1. Install main bearings to cylinder block and main bearing caps.
2. Install main bearing caps to cylinder block.

Tighten all bolts in correct order and in two or three stages.

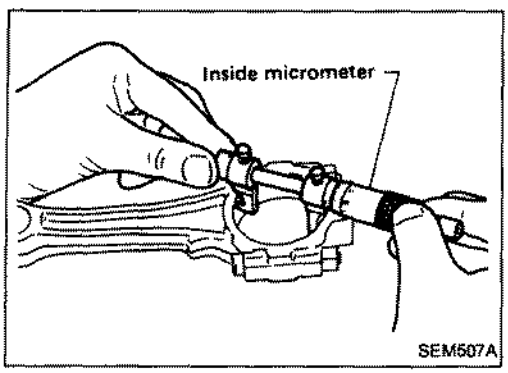
Inspection (Cont'd)



3. Measure inside diameter "A" of main bearing.



4. Measure outside diameter "Dm" of main journal in crankshaft.
5. Calculate main bearing clearance.
   Main bearing clearance = A – Dm

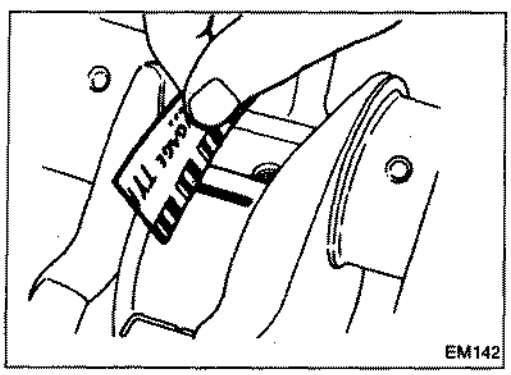


Connecting rod bearing

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

Apply oil to the thread portion of bolts and seating surface of nuts.

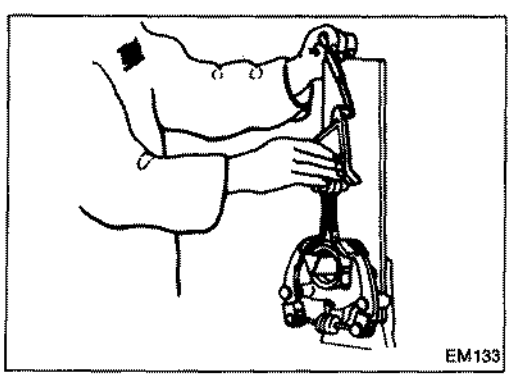
3. Measure inside diameter "C" of bearing.
4. Measure outside diameter "Dp" of pin journal in crankshaft.
5. Calculate connecting rod bearing clearance.
   Connecting rod bearing clearance = C – Dp



Method B (Using plastigage)

CAUTION:

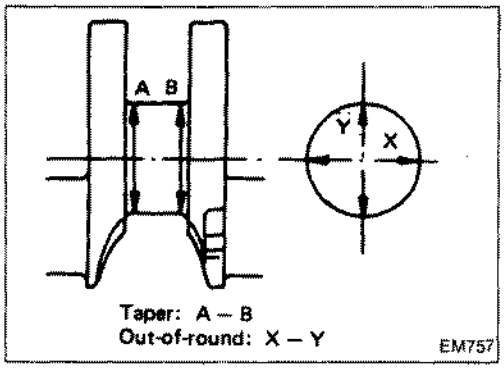
- **Do not turn crankshaft or connecting rod while plastigage is being inserted.**
- **When bearing clearance exceeds the specified limit, ensure that the proper bearing has been installed. Then if excessive bearing clearance exists, use a thicker main bearing or undersized bearing so that the specified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



CONNECTING ROD BEND AND TORSION

Bend and torsion:
Limit 0.05 mm (0.0020 in)
per 100 mm (3.94 in) length

Inspection (Cont'd)

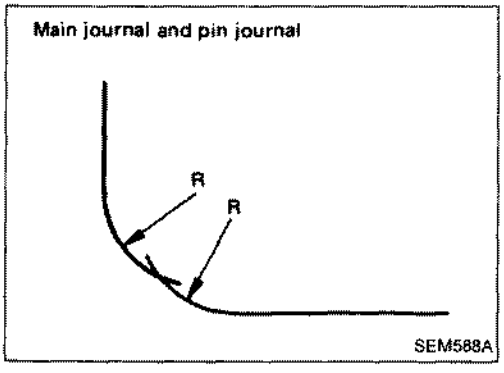


Taper: A – B
Out-of-round: X – Y
EM757

CRANKSHAFT

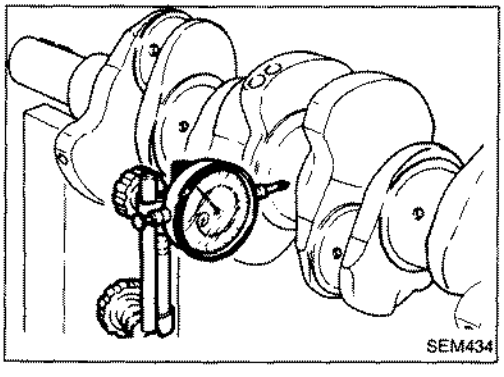
1. Check crankshaft journals for score, bias, wear or cracks. If faults are minor, correct with fine crocus cloth.
2. Check journals with a micrometer for taper and out-of-round.

Out-of-round (X – Y):
Less than 0.01 mm (0.0004 in)
Taper (A – B):
Less than 0.01 mm (0.0004 in)
Limit: 0.03 mm (0.0012 in)



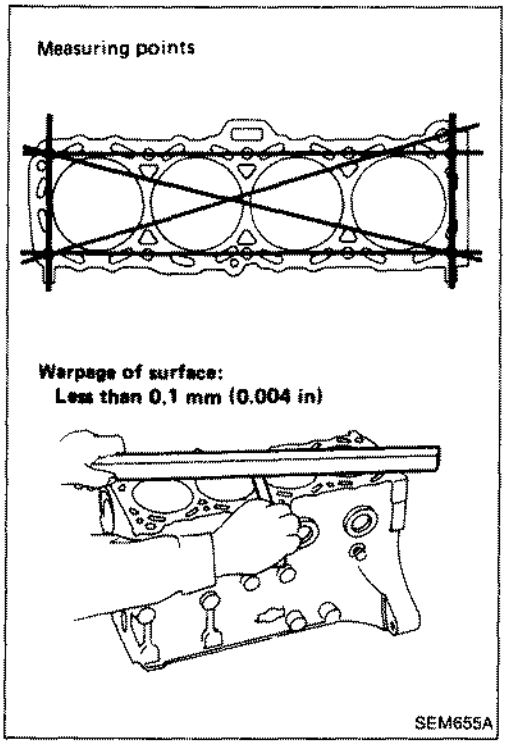
SEM588A

When regrinding crank pin and crank journal, fillets should be finished as shown.
R: 2.3 - 2.7 mm (0.091 - 0.106 in)


SEM434

3. Check crankshaft runout.

Runout [T.I.R. (Total Indicator Reading)]:
Less than 0.04 mm (0.0016 in)
Limit 0.08 mm (0.0031 in)



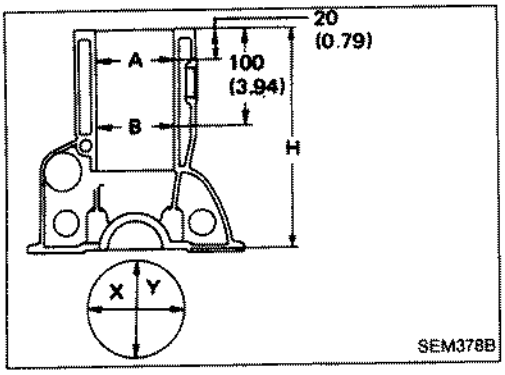
SEM655A

CYLINDER BLOCK DISTORTION AND WEAR

1. If beyond the specified limit, resurface it.

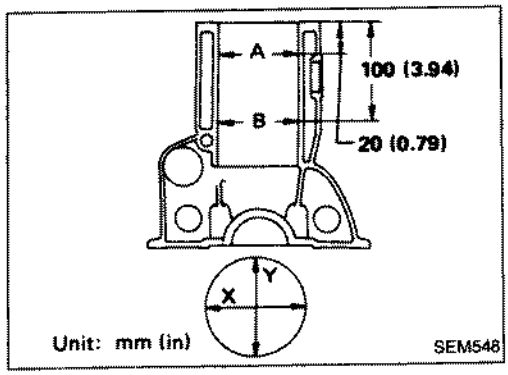
Resurfacing limit:
The resurfacing limit of cylinder block is determined by the cylinder head resurfacing in an engine.
Amount of cylinder head resurfacing is "A".
Amount of cylinder block resurfacing is "B".
The maximum limit is as follows:
A + B = 0.2 mm (0.008 in)

Inspection (Cont'd)



Nominal cylinder block height from crankshaft center "H":

189.00 ± 0.05 mm (7.4409 ± 0.0020 in)



2. Using a bore gauge, measure cylinder bore for wear, out-of-round or taper.

   Standard inner diameter:

   73.00 - 73.05 mm (2.8740 - 2.8760 in)

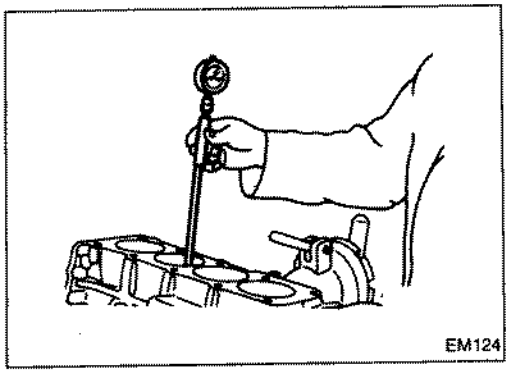
   Out-of-round (X – Y):

   Limit 0.02 mm (0.0008 in)

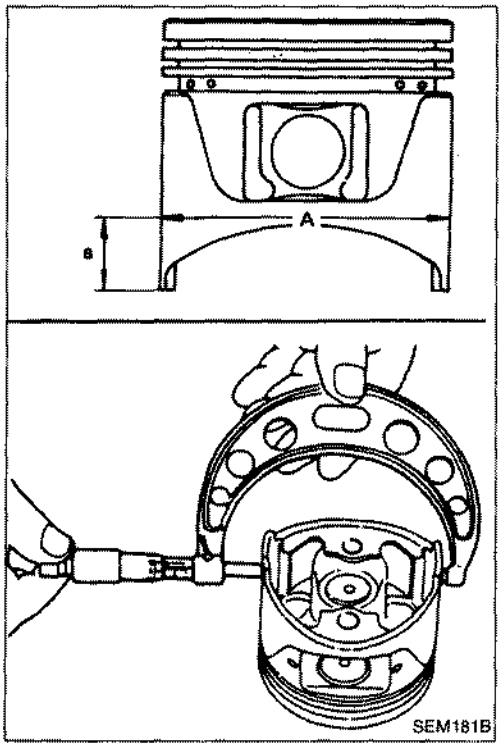
   Taper (A – B):

   Limit 0.015 mm (0.0006 in)

3. Check for scratches or seizure. If seizure is found, hone it.



Inspection (Cont'd)



CYLINDER BORING

When any cylinder needs boring, all other cylinders must also be bored.

1. Determine piston oversize according to amount of cylinder wear.

Oversize pistons are available for service.

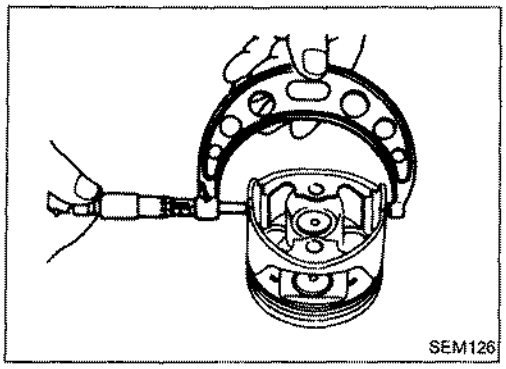
Refer to S.D.S.

2. The size to which cylinders must be honed is determined by adding piston-to-cylinder clearance to the piston skirt diameter "A".
   Dimension "a":
   10.6 mm (0.417 in)
   Rebored size calculation:
   D = A + B – C = A + [0.003 to 0.023 mm (0.0001 to 0.0009 in)]
   where,
   D: Bored diameter
   A: Skirt diameter as measured
   B: Piston-to-wall clearance
   C: Honing allowance 0.02 mm (0.0008 in)
3. Install main bearing caps in place, and tighten to the specified torque to prevent distortion of the cylinder bores in final assembly.
4. Cut cylinder bores.

- **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.**

5. Hone the cylinders to the required size referring to S.D.S.
6. Measure the finished cylinder bore for out-of-round and taper.

- **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.**
- **Bore the cylinders in the order of 2-4-1-3 to prevent heat strain due to cutting.**

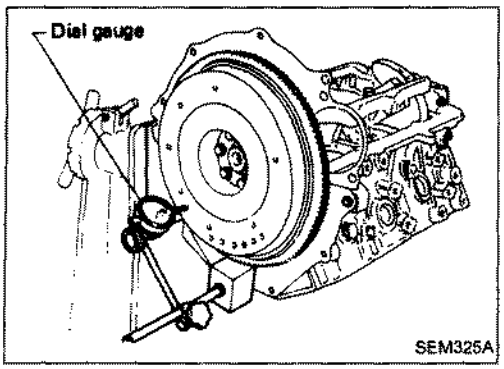


PISTON TO CYLINDER WALL CLEARANCE

Using micrometer

1. Measure piston skirt diameter "A" and cylinder bore diameter.
   Piston diameter "A":
   Refer to S.D.S.
2. Check that piston clearance is within the specification.
   Piston clearance:
   0.023 - 0.043 mm (0.0009 - 0.0017 in)

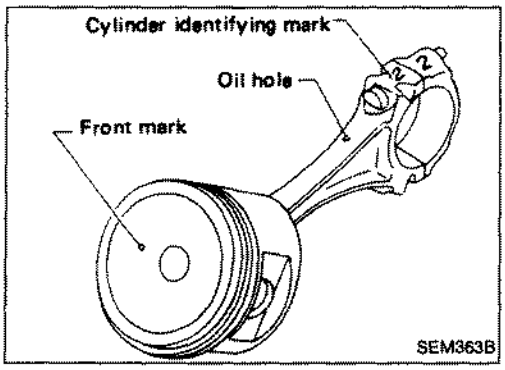
Inspection (Cont'd)



FLYWHEEL RUNOUT

Runout (Total indicator reading):
Less than 0.15 mm (0.0059 in)

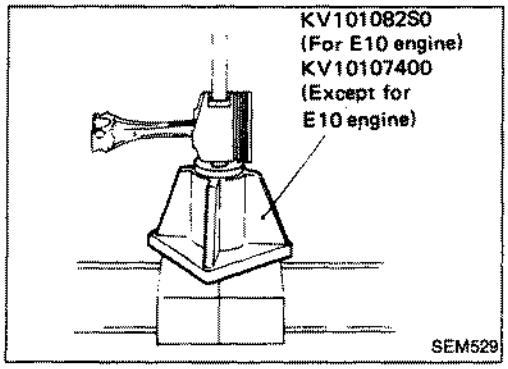
Assembly



PISTON

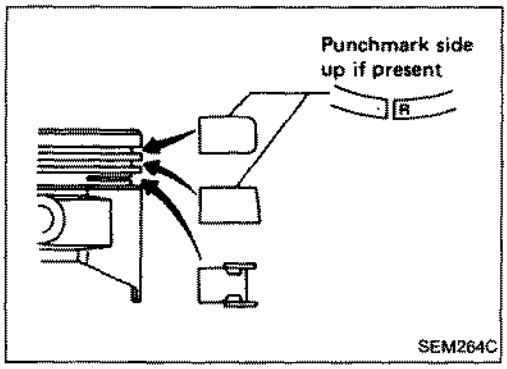
a. **Numbers are stamped on the connecting rod and cap corresponding to each cylinder. Care should be taken to avoid a wrong combination including bearing.**

b. **Arrange so that the front mark on piston head faces to the front of engine.**



c. **When pressing piston pin in connecting rod, apply engine oil to pin and small end of connecting rod.**

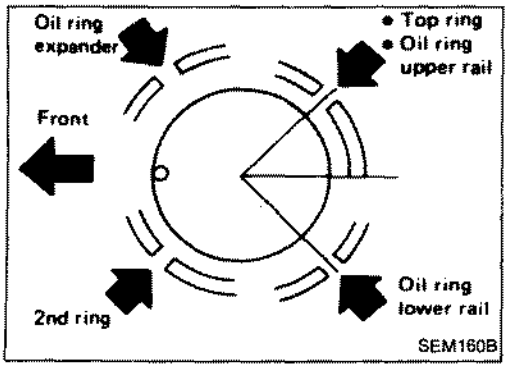
d. **After assembling, ascertain that piston swings smoothly.**



e. **Set piston rings as shown.**

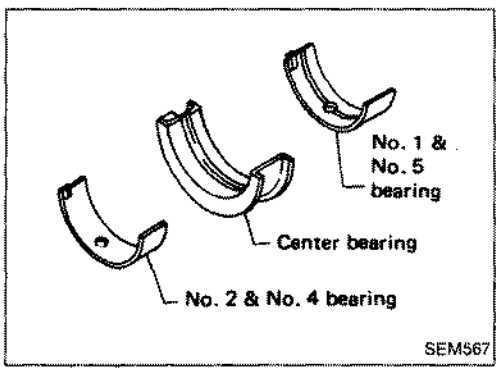
CAUTION:

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



Assembly (Cont'd)

CRANKSHAFT



SEM567

1. Set main bearings in the proper position on cylinder block.

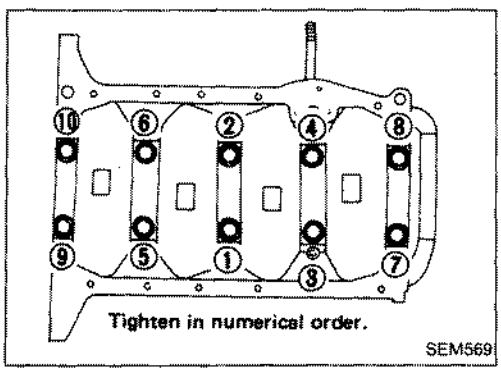
If either crankshaft, cylinder block or main bearing is reused again, it is necessary to measure main bearing clearance.

a. Only center bearing (No. 3) is a flanged type.

b. All inter-bearings (No. 2 and No. 4) are the same type.

c. Front bearing (No. 1) is also the same type as rear bearing (No. 5).

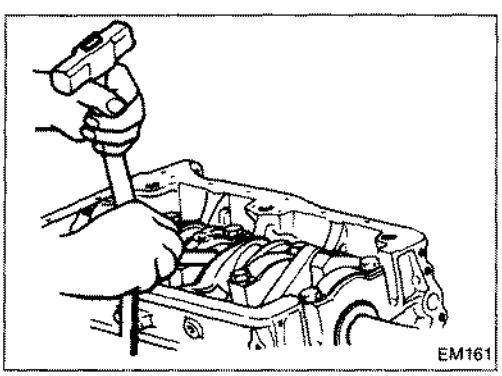
d. Upper and lower bearings are not interchangeable. Upper ones have oil groove.



SEM569

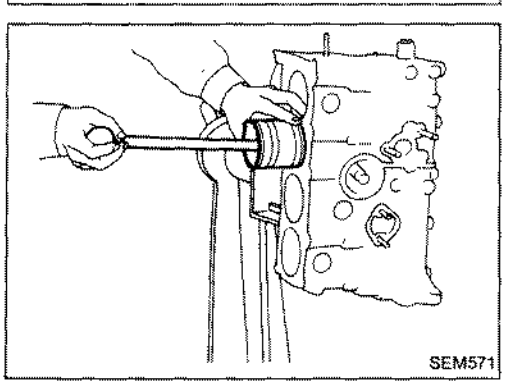
2. Apply engine oil to main bearing surfaces on both sides of cylinder block and cap.
3. Install crankshaft and main bearing caps and tighten bolts to the specified torque.

- **Tighten in two or three stages.**
- **After securing bearing cap bolts, ascertain that crankshaft turns smoothly by hand.**


EM161

4. Make sure that there exists proper end play of crankshaft at center bearing.

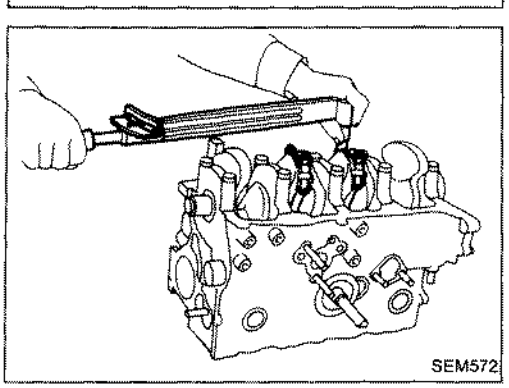
Crankshaft free end play:
Standard
0.05 - 0.165 mm (0.0020 - 0.0065 in)
Limit
0.30 mm (0.0118 in)


SEM571

5. Install pistons with connecting rods.

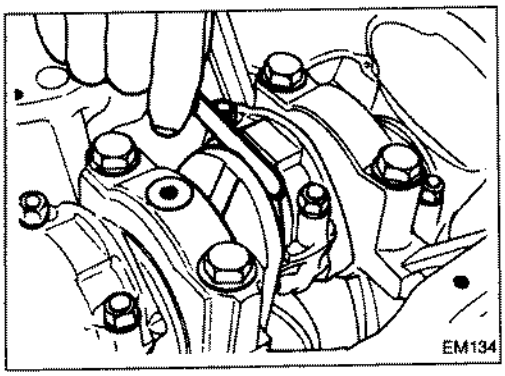
(1) Install them into corresponding cylinder using Tool.

- **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.**


SEM572

(2) Install connecting rod bearing caps.

Assembly (Cont'd)



6. Measure connecting rod side clearance.

Connecting rod side clearance:

Standard

0.1 - 0.37 mm (0.0039 - 0.0146 in)

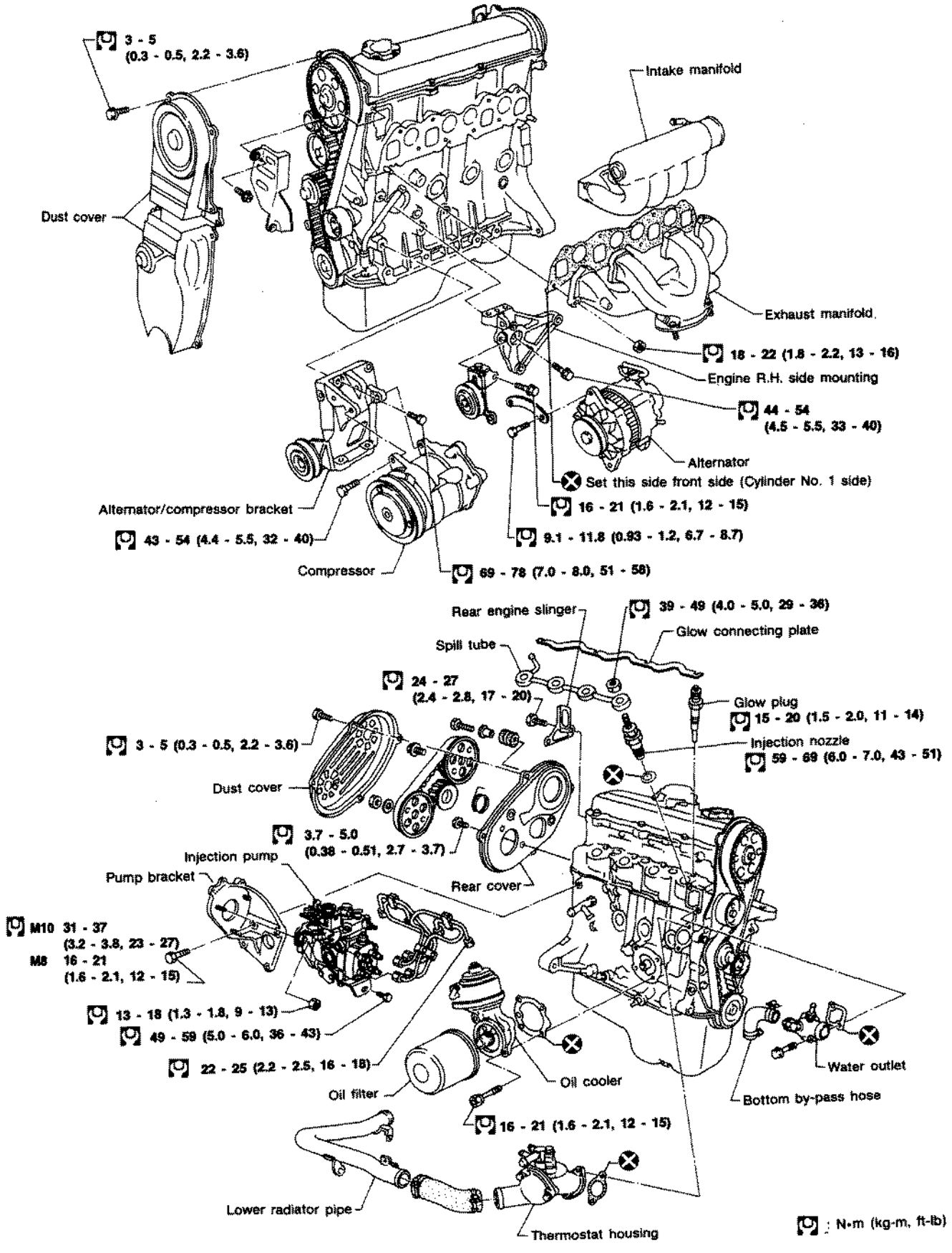
Limit

0.50 mm (0.0197 in)

If beyond the limit, replace connecting rod and/or crankshaft.

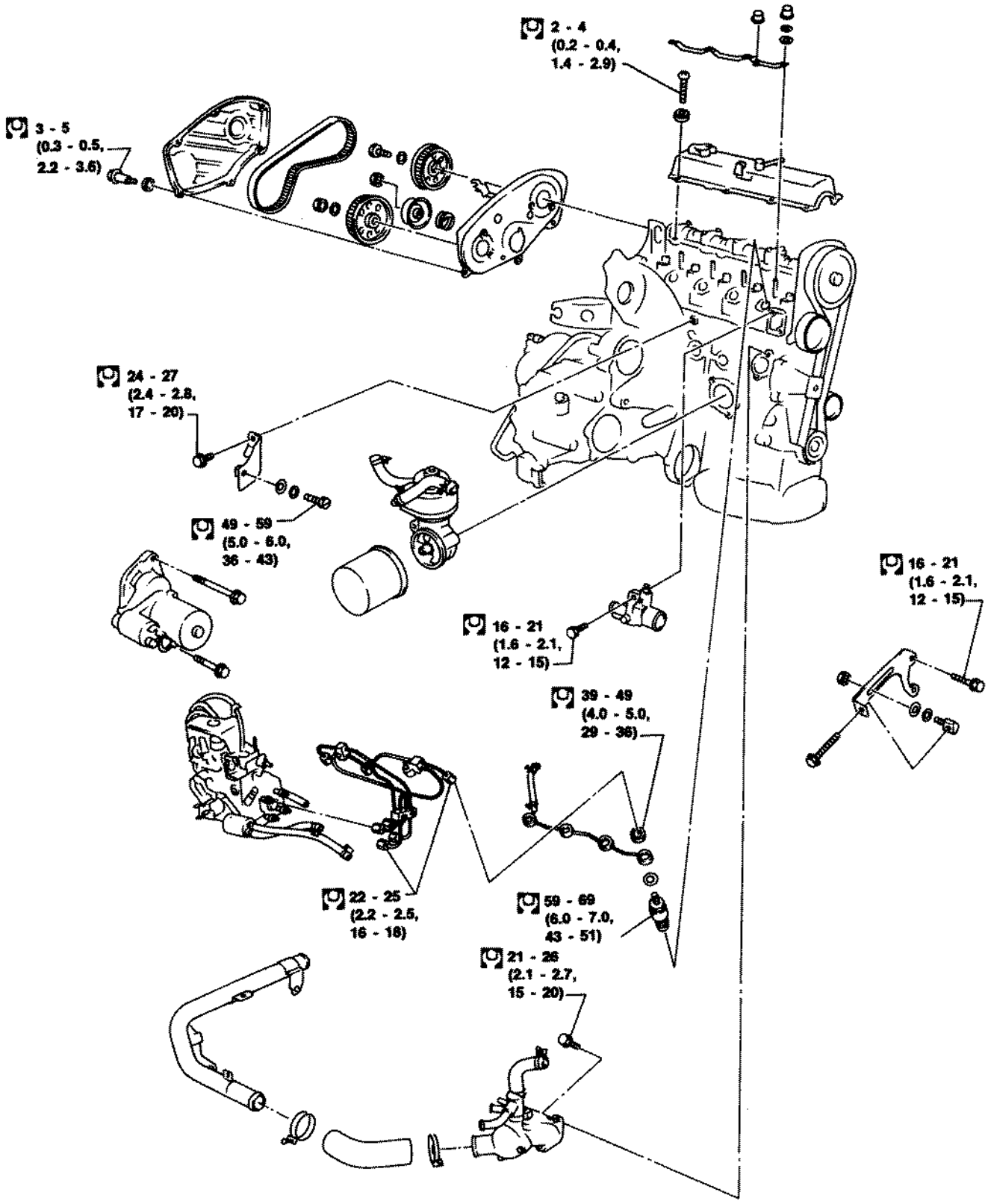
7. Install oil pan.

CD17



SEM708A

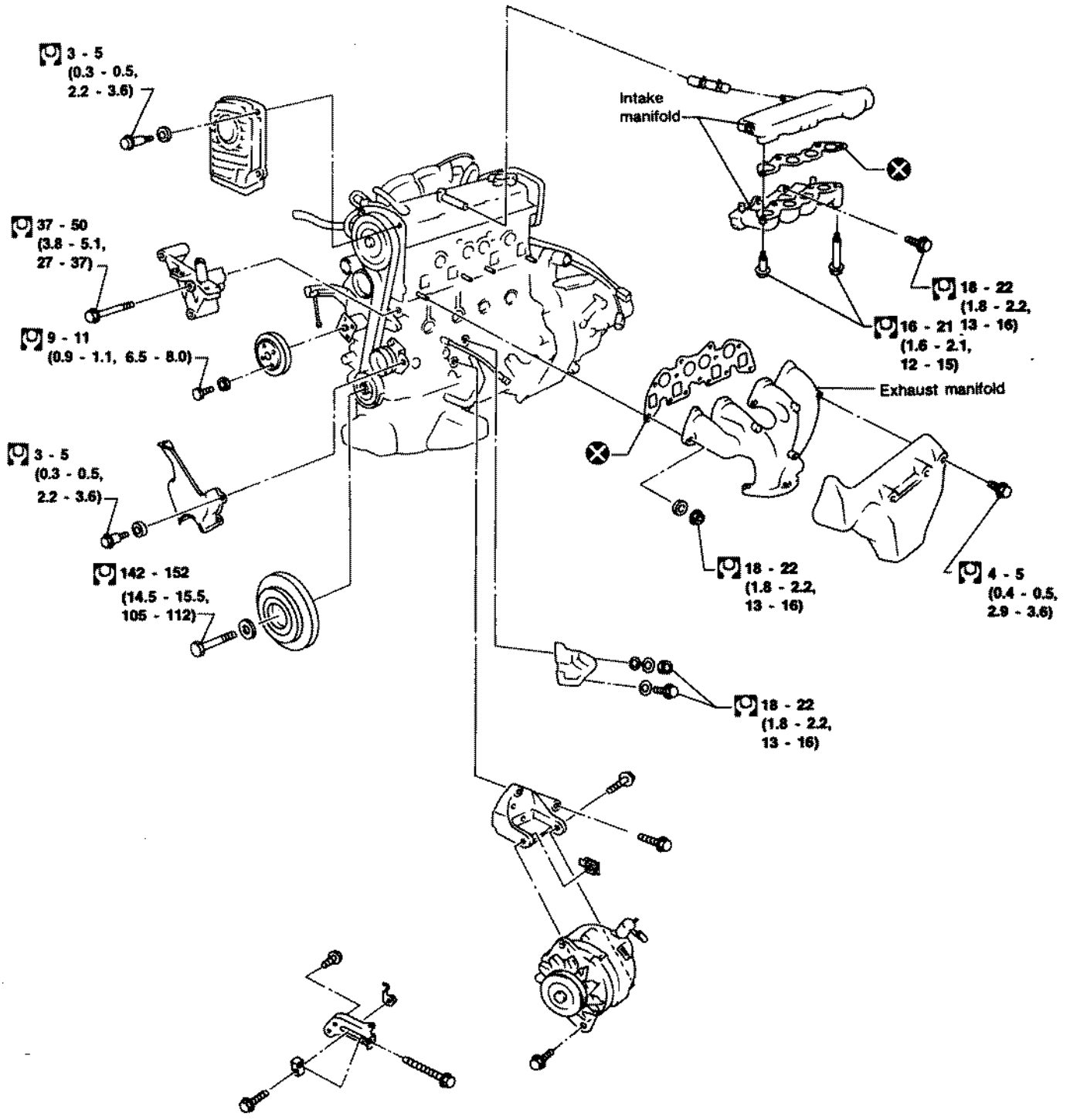
CD20 — Right side



: N·m (kg-m, ft-lb)

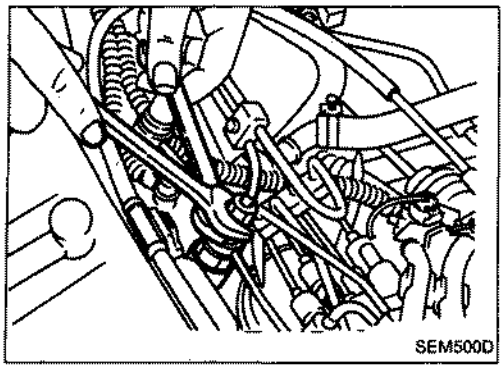
SEM571D

CD20 — Left side



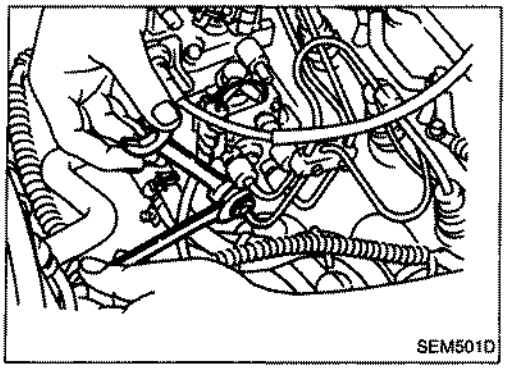
: N·m (kg-m, ft-lb)

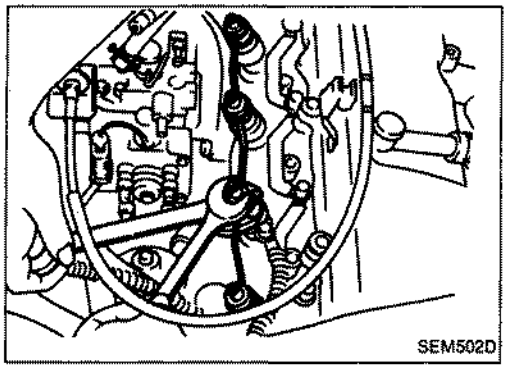
SEM572D


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.

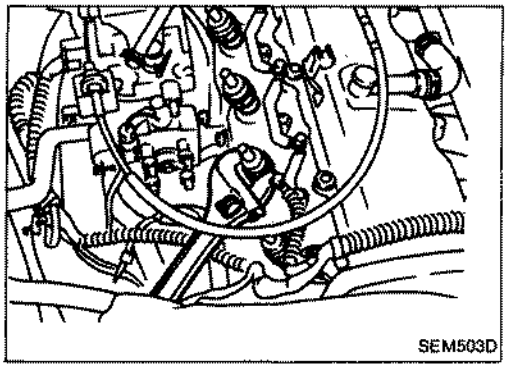
- **Use two wrenches to prevent delivery holder on pump side from loosening.**


SEM501D

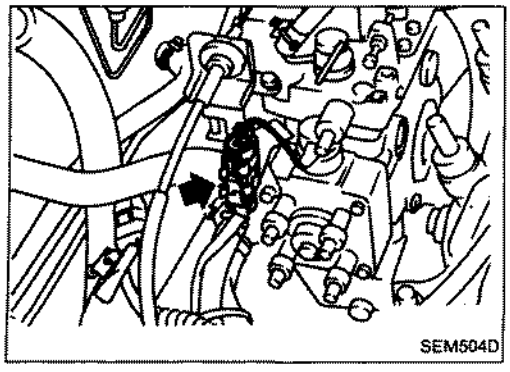

SEM502D

3. Remove spill-tube assembly.

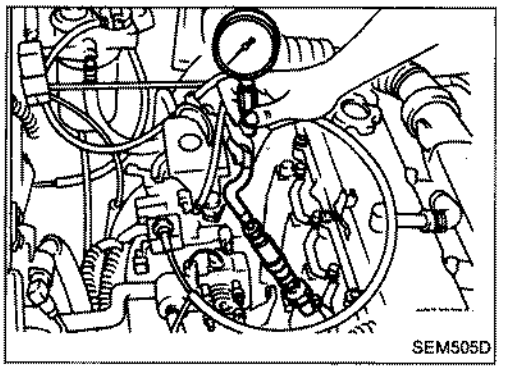
- **To prevent spill tube from breaking, remove it by gripping nozzle holder.**


SEM503D

4. Remove all injection nozzles using a suitable tool.

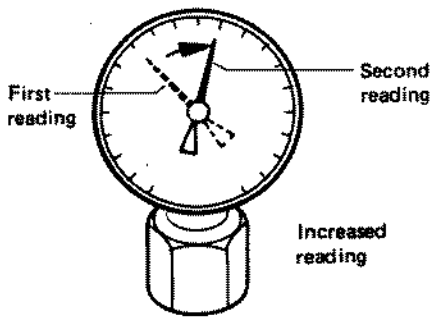
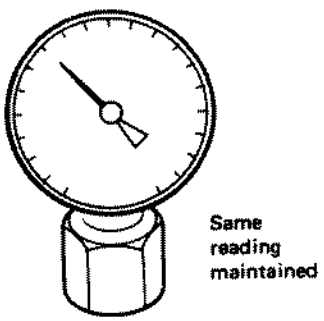

SEM504D

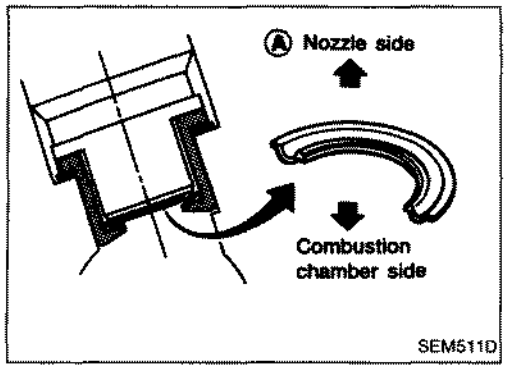
5. Disconnect fuel-cut solenoid valve connector.


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
   2,942 - 3,236 (29.4 - 32.4, 30 - 33, 427 - 469)
   Limit
   2,452 (24.52, 25.0, 356)
   Limit of difference between cylinders
   490 (4.90, 5.0, 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.



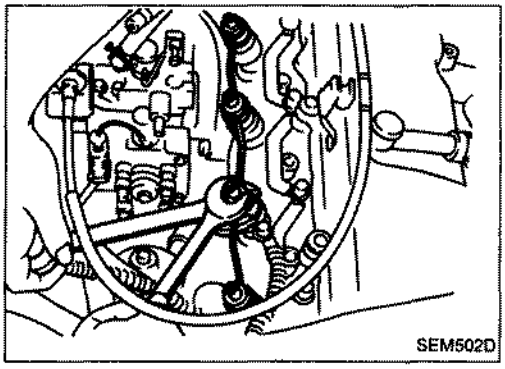
9. Replace nozzle gaskets and re-install injection nozzles.

New nozzle gaskets must be installed in the direction shown.

Nozzle to cylinder head:

[O]: 59 - 69 N·m

(6 - 7 kg-m, 43 - 51 ft-lb)

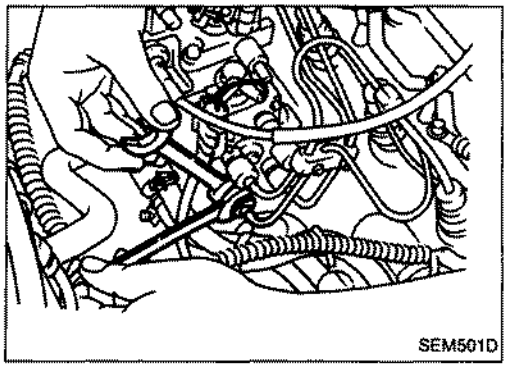


10. Install spill tube by holding nozzle holder.

Spill tube nut:

[O]: 39 - 49 N·m

(4 - 5 kg-m, 29 - 36 ft-lb)

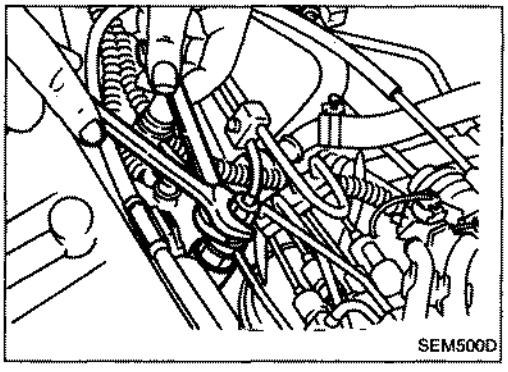


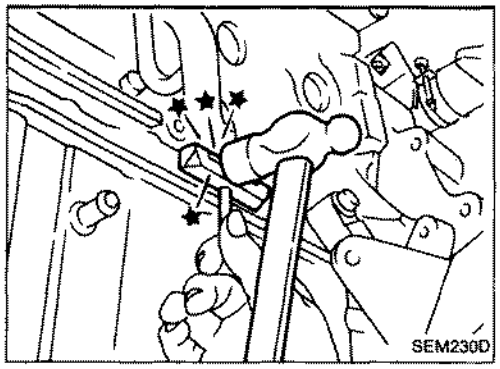
11. Install injection tubes using two wrenches as shown.

Injection tubes:

[O]: 22 - 25 N·m

(2.2 - 2.5 kg-m, 16 - 18 ft-lb)



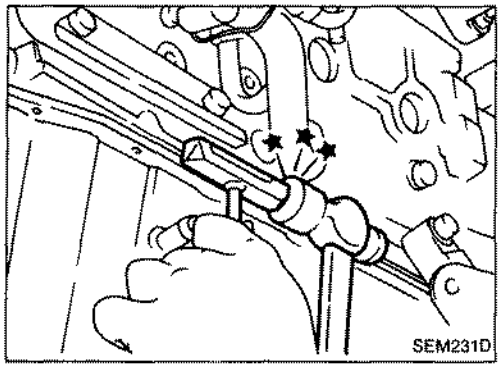


Removal

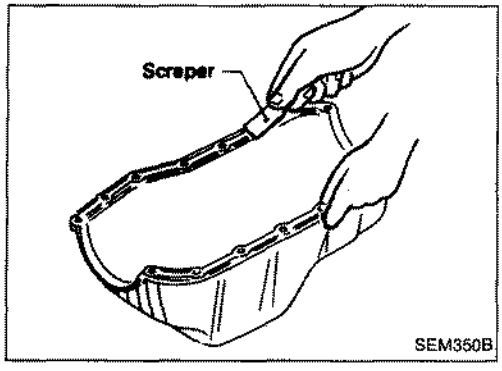
1. Drain oil.
2. Remove oil pan using tool as illustrated.

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.**

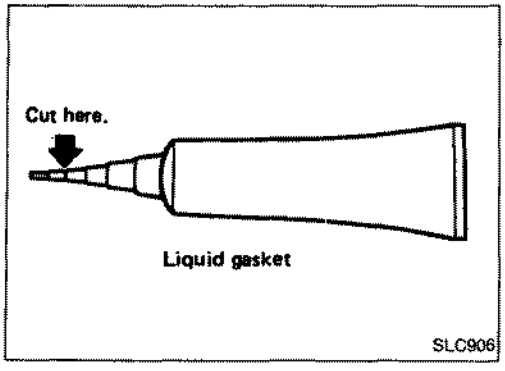


2) Slide Tool by tapping it with a hammer, and remove oil pan.



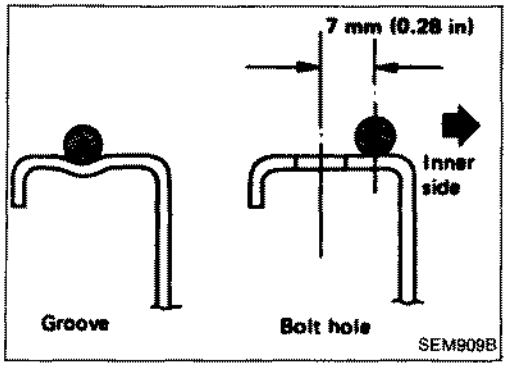
Installation

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.



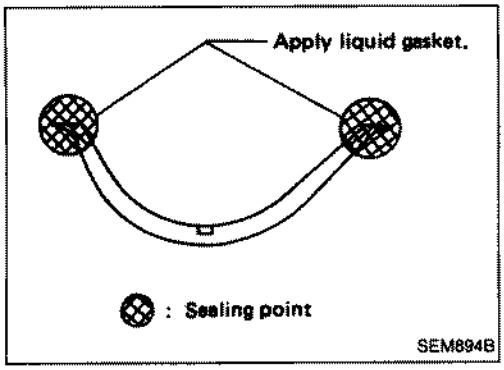
- Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide.

Use Genuine Liquid Gasket or equivalent.

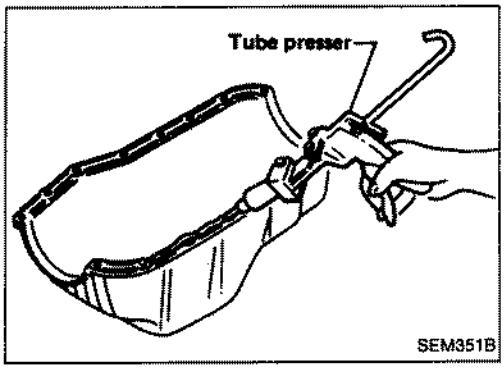


2. Apply liquid gasket to inner sealing surface as shown at left.

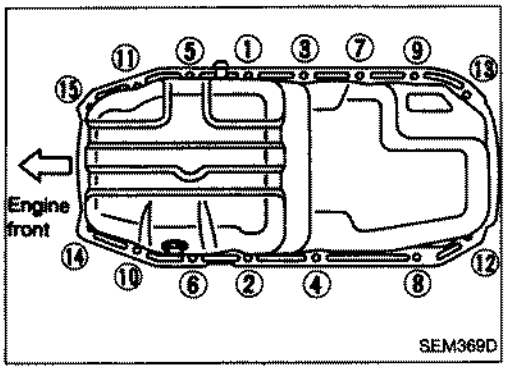
Installation (Cont'd)



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:

: CD17 5 - 7 N·m (0.5 - 0.7 kg-m, 3.6 - 5.1 ft-lb)
CD20 7 - 8 N·m (0.7 - 0.8 kg-m, 5.1 - 5.8 ft-lb)

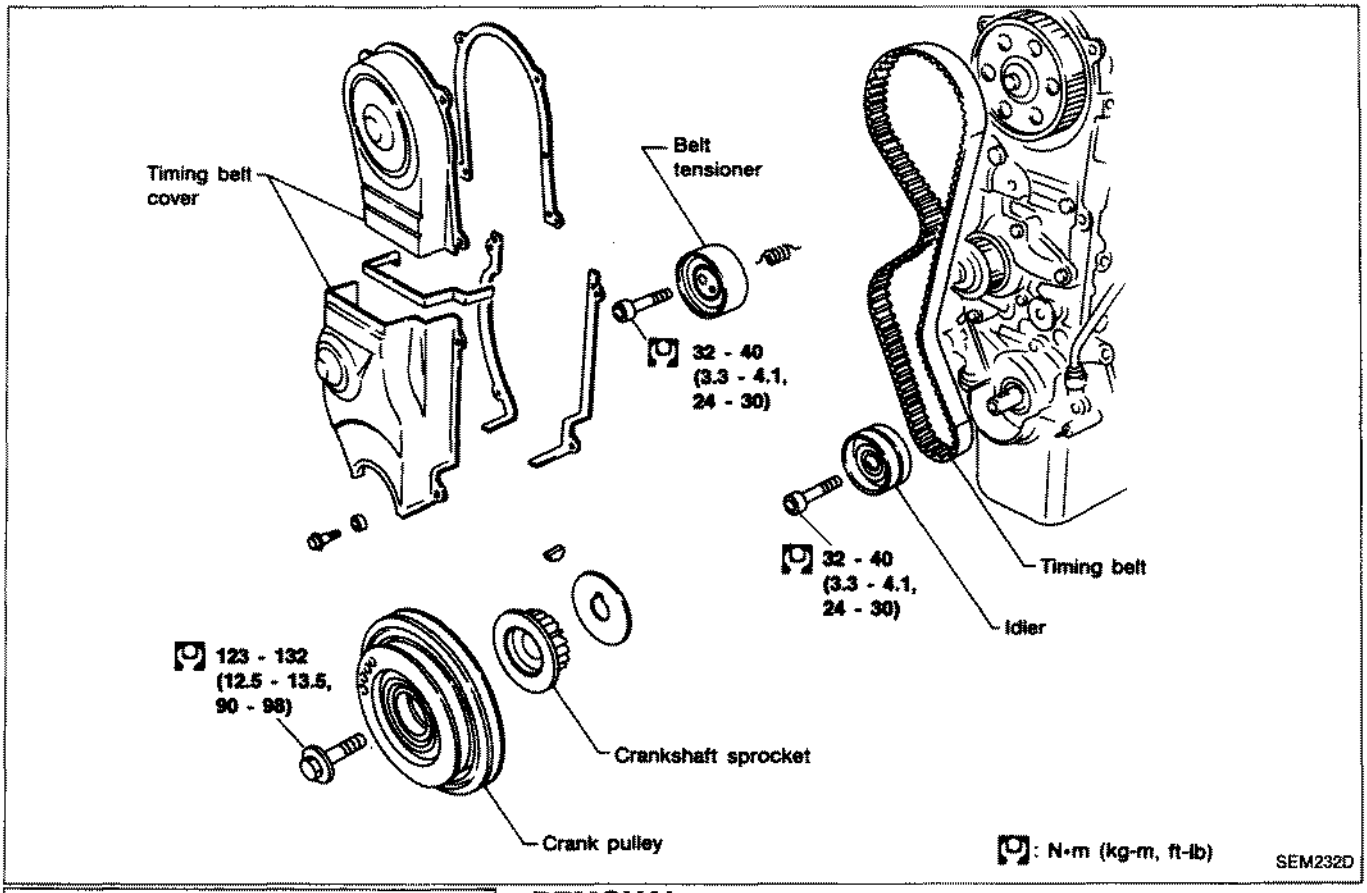
Camshaft Timing Belt — CD17

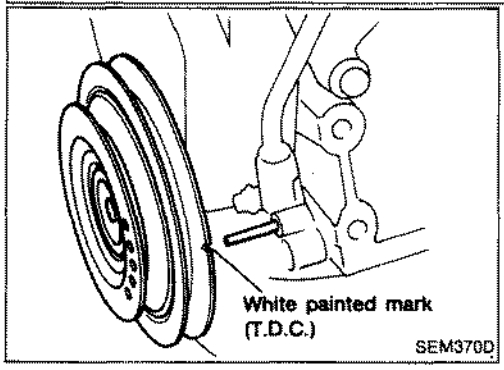
CAUTION:

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.

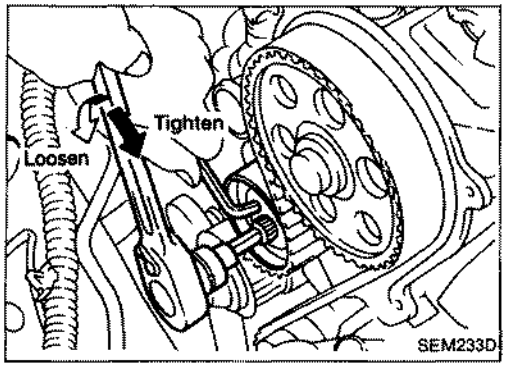
c. Ensure that timing belt, camshaft sprocket, crankshaft sprocket and belt tensioner are clean and free from oil and water.





REMOVAL

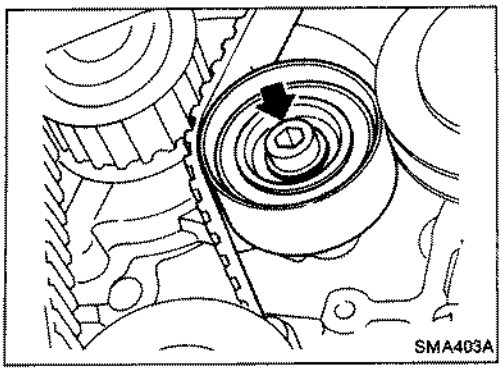
1. Set No. 1 cylinder at T.D.C. on its compression stroke.



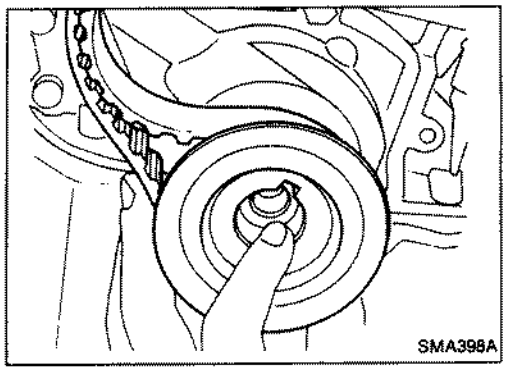
2. Remove timing belt.

(1) Loosen tensioner pulley bolt, turn tensioner pulley counterclockwise then tighten bolt.

Camshaft Timing Belt — CD17 (Cont'd)



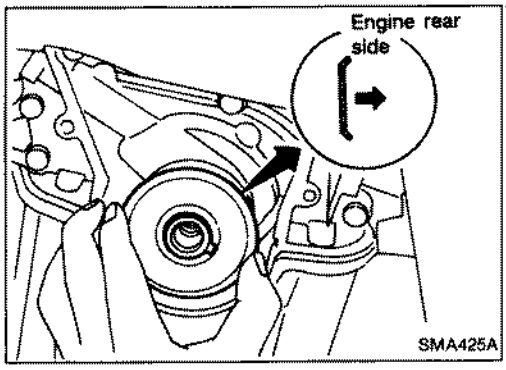
(2) Remove idler pulley.



(3) Remove timing belt with crankshaft sprocket.

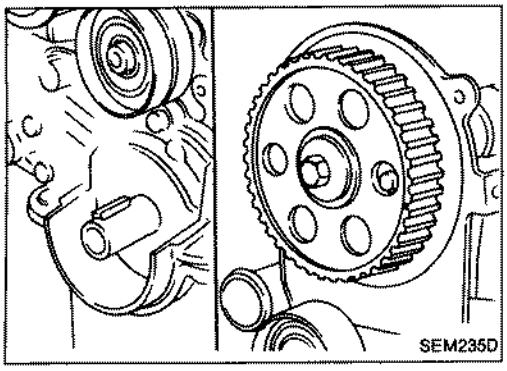
INSPECTION

Refer to page EM-208. (CD20 engine)



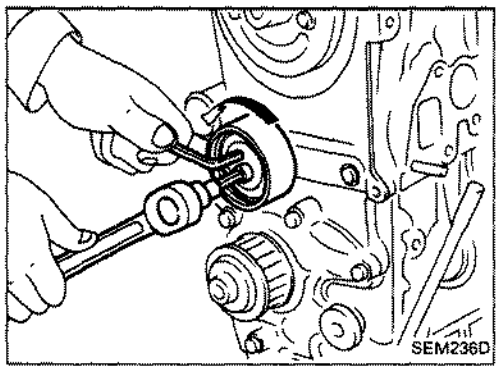
INSTALLATION

1. Install sprocket plate in correct direction.



2. Confirm that No. 1 piston is set at T.D.C. on its compression stroke.

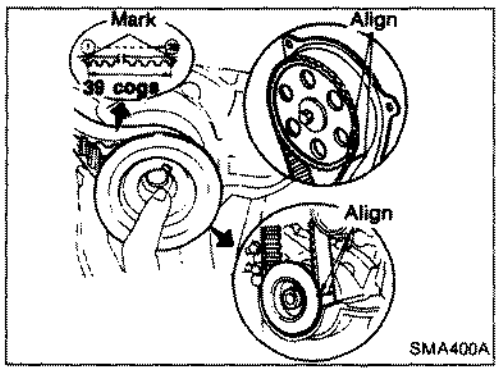
Camshaft Timing Belt — CD17 (Cont'd)



3. Install tensioner and return spring.

Temporarily tighten bolts so that tensioner is set at the fully outside position.

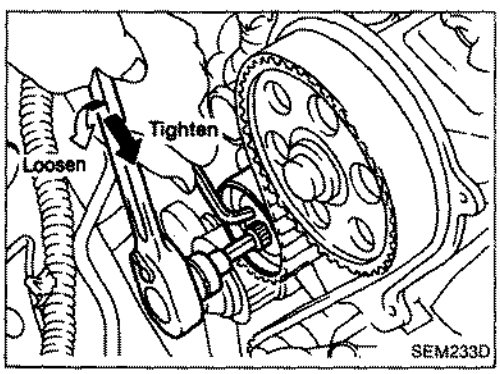
4. Install idler and tighten bolt to the specified torque.
5. Check tensioner and idler for smooth turning.



6. Install timing belt with crankshaft sprocket.

a. Align white lines on timing belt with punchmarks on camshaft sprocket and crankshaft sprocket.

b. Point arrow on timing belt toward belt cover.



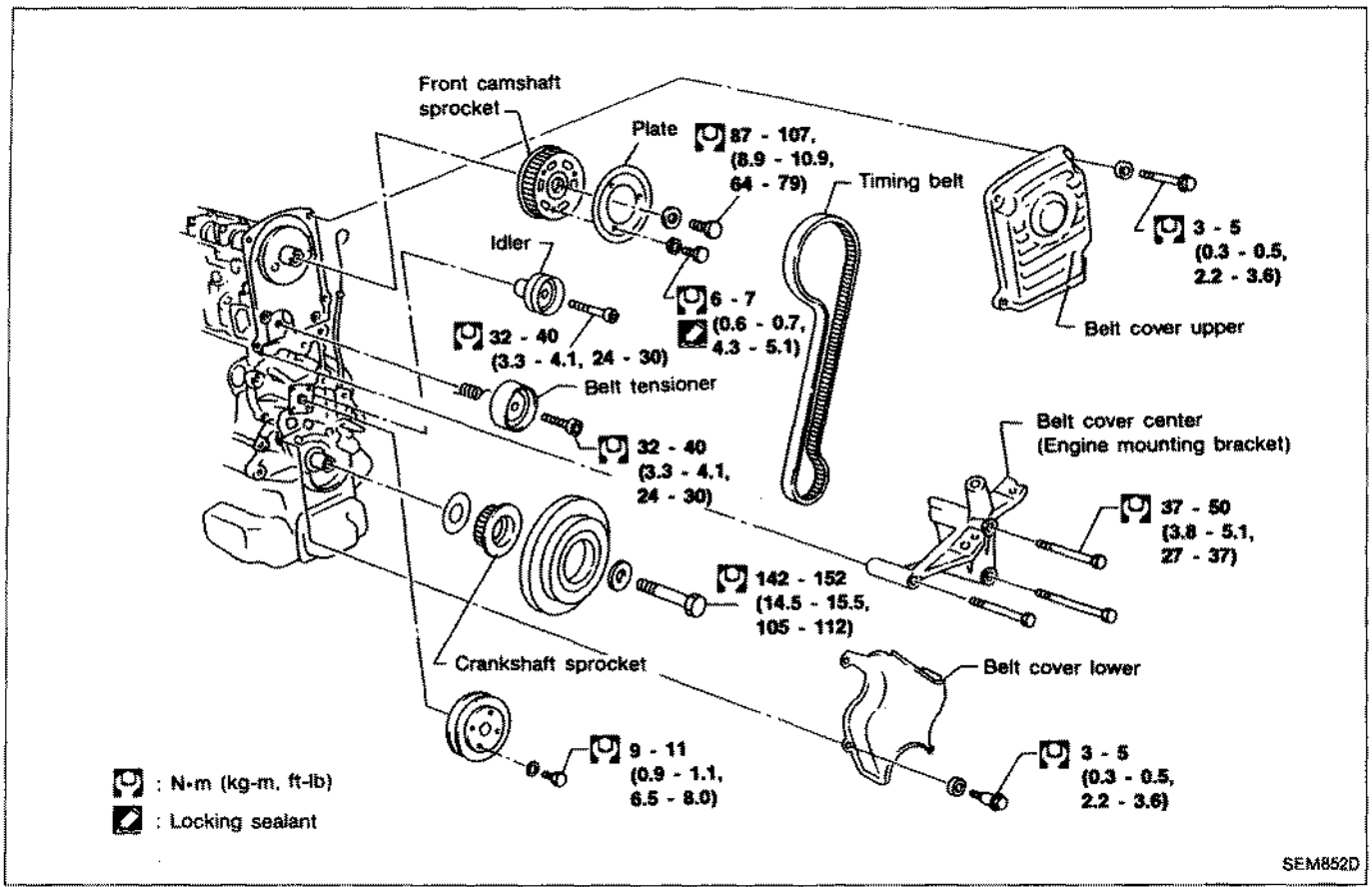
7. Adjust timing belt tension.

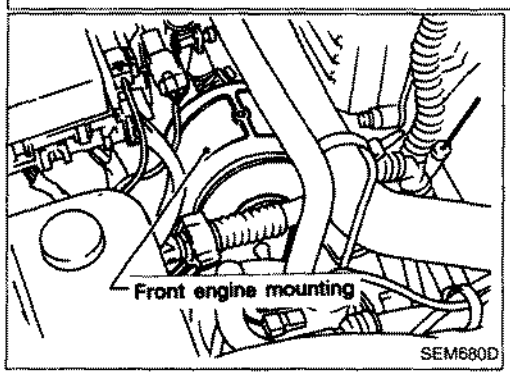
1) Loosen tensioner lock bolt to apply tension to timing belt.
2) Rotate crankshaft clockwise two turns to apply the specified tension to timing belt.
3) Tighten tensioner lock bolt while holding tensioner pulley with hexagon wrench.

Camshaft Timing Belt — CD20

CAUTION:

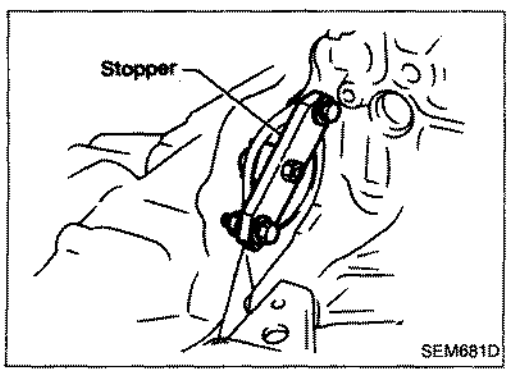
a. **Do not bend or twist timing belt.**
b. **After removing timing belt, do not turn crankshaft and camshaft separately because valves will strike piston heads.**
c. **Ensure that timing belt, camshaft sprocket, crankshaft sprocket and belt tensioner are clean and free from oil and water.**





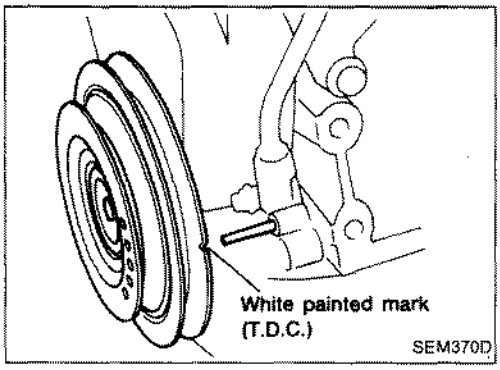
REMOVAL

- Remove engine front mounting bracket.
  When removing, support front portion of engine with transmission jack or hoist.

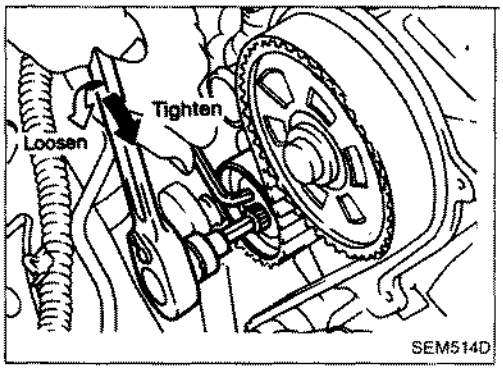


- Remove starter motor, and install ring gear stopper using mounting bolt holes.
- Remove crank pulley bolt.
- Remove crank pulley using puller.
  Be sure to securely attach puller jaws. Attach jaws only to the rear side of pulley.

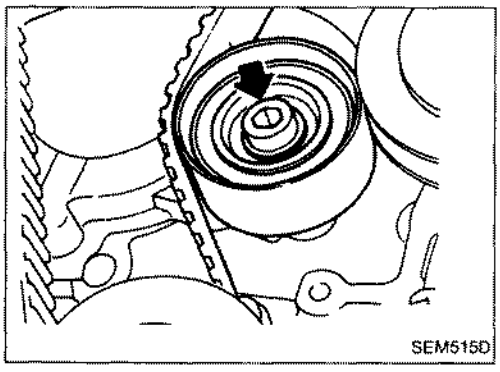
Camshaft Timing Belt — CD20 (Cont'd)



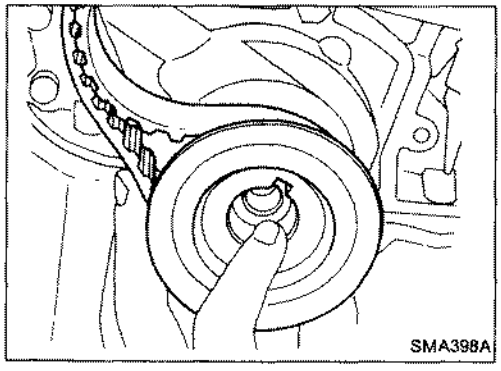
1. Set No. 1 cylinder at T.D.C. on its compression stroke.



2. Remove timing belt.
(1) Loosen tensioner pulley bolt, turn tensioner pulley counterclockwise then tighten bolt.
(2) Remove camshaft sprocket plate.



(3) Remove idler pulley.



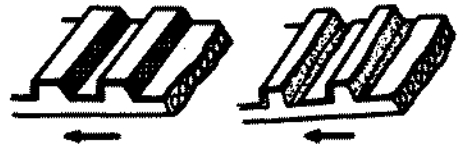
(4) Remove timing belt with crankshaft sprocket.

Camshaft Timing Belt — CD20 (Cont'd)

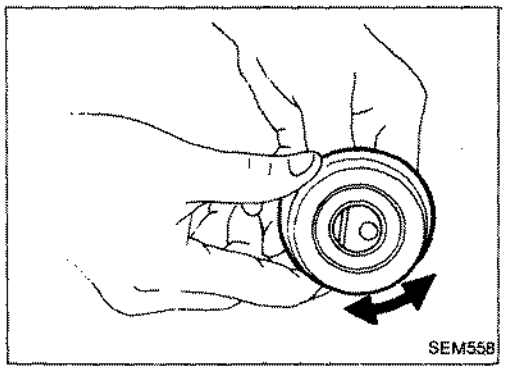
INSPECTION

Timing belt

Visually check the condition of timing belt.
Replace if any abnormality is found.

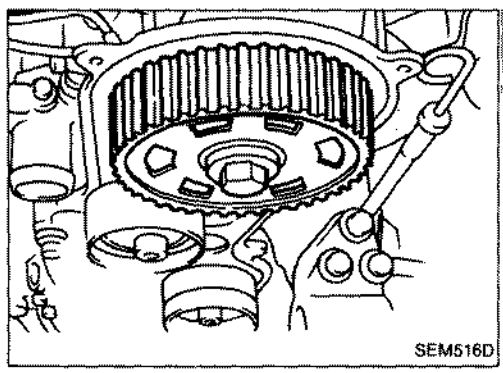
Item to check	Problem	Cause
Tooth is broken/tooth root is cracked.	 SEM394A	• Camshaft jamming • Distributor jamming • Damaged camshaft/crankshaft oil seal
Back surface is cracked/worn.	 SEM395A	• Tensioner jamming • Overheated engine • Interference with belt cover
Side surface is worn.	 • Belt corners 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 • Distributor 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 — CD20 (Cont'd)


SEM558

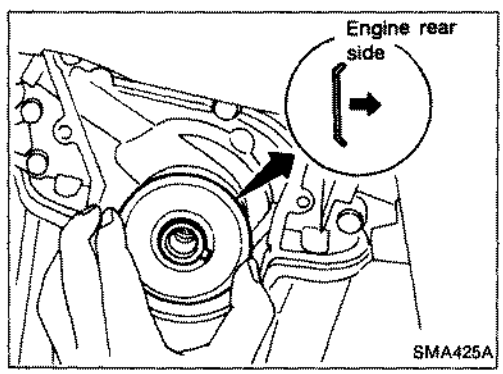
Belt tensioner, tensioner spring and idler

1. Check belt tensioner and idler for smooth turning.
2. Check condition of tensioner spring.


SEM516D

Crankshaft sprocket and front camshaft sprocket

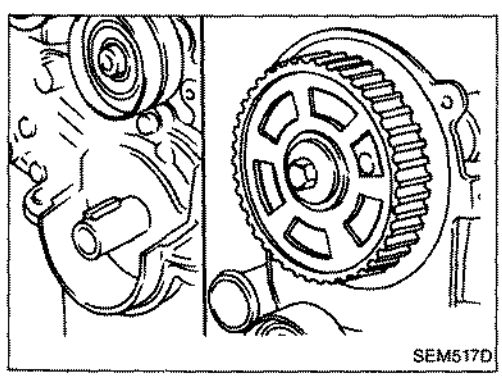
Check teeth for abnormal signs.



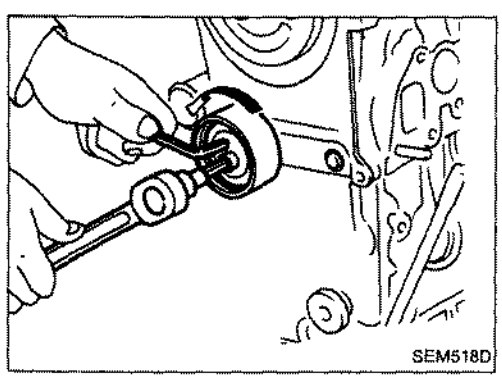
SMA425A

INSTALLATION

1. Install crankshaft sprocket plate in correct direction.


SEM517D

2. Confirm that No. 1 piston is set at T.D.C. on its compression stroke.

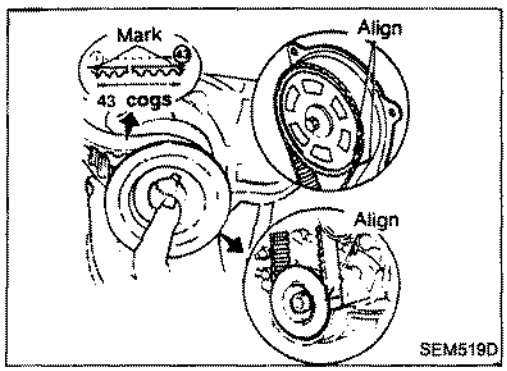

SEM518D

3. Install tensioner and return spring.

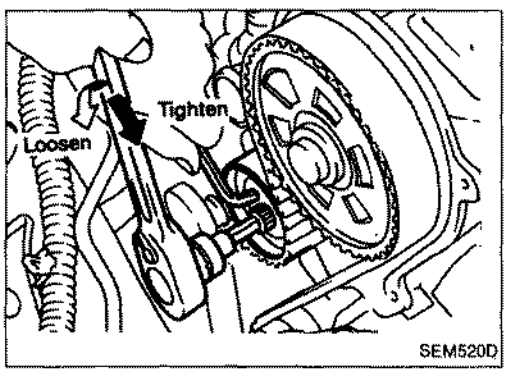
Temporarily tighten bolts so that tensioner is set at the fully outside position.

4. Install idler and tighten bolt to the specified torque.

Camshaft Timing Belt — CD20 (Cont'd)



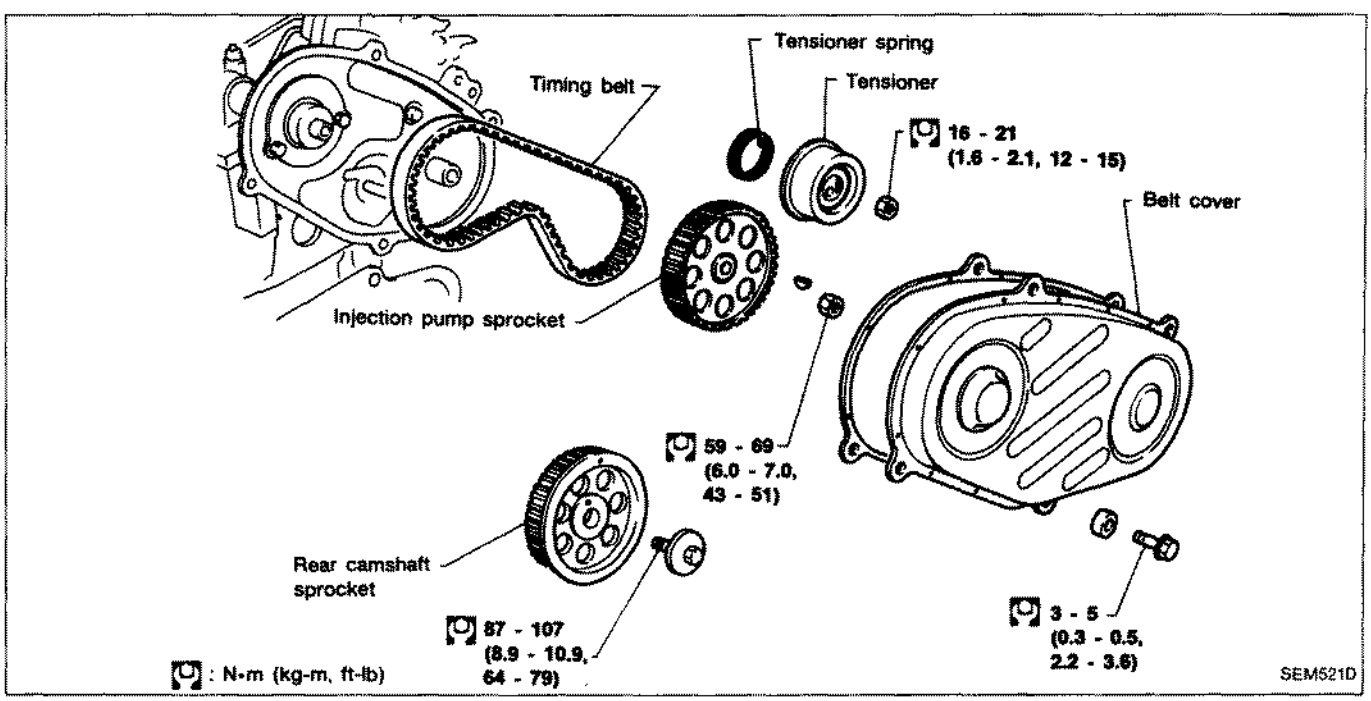
5. Install timing belt with crankshaft sprocket.
   a. Align white lines on timing belt with punchmarks on camshaft sprocket and crankshaft sprocket.
   b. Point arrow on timing belt toward belt cover.
6. Install camshaft sprocket plate and secure screws with locktite.

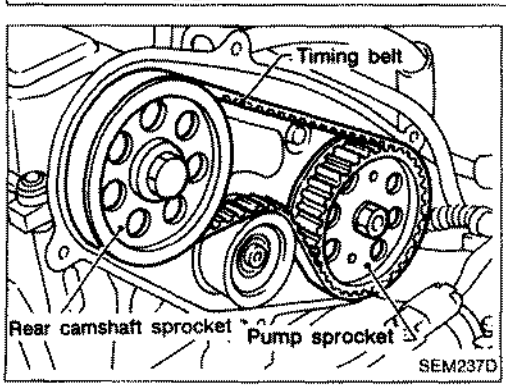


7. Adjust timing belt tension.
   1) Loosen tensioner lock bolt to apply tension to timing belt.
   2) Rotate crankshaft clockwise two turns to apply the specified tension to timing belt.
   3) Tighten tensioner lock bolt while holding tensioner pulley with hexagon wrench.

   Belt tension:
   147.1 ± 24.5 N (15 ± 2.5 kg, 33.1 ± 5.5 lb)

Injection Pump Timing Belt

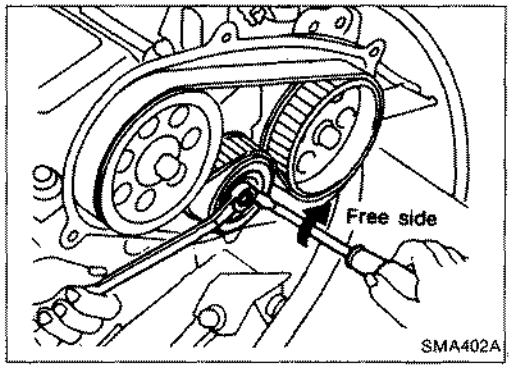




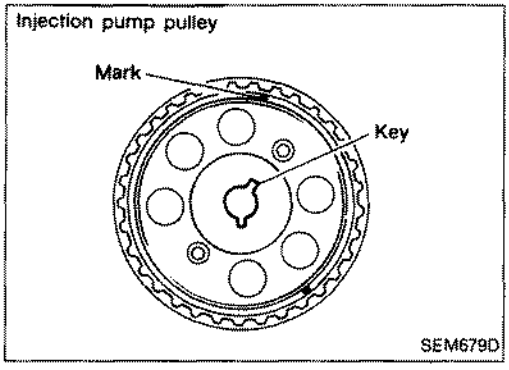
REMOVAL

1. Set No. 1 cylinder at T.D.C. (white paint mark) on its compression stroke.
2. Remove air duct with resonator and timing belt cover.

Injection Pump Timing Belt (Cont'd)



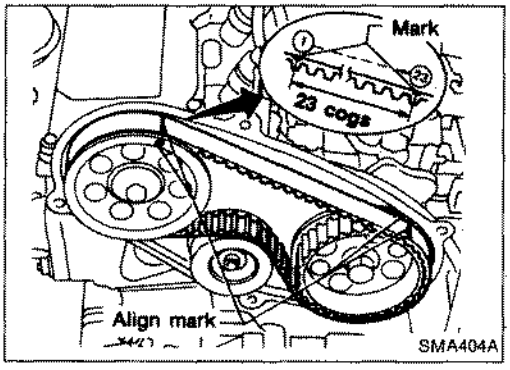
3. Remove timing belt.
1) Loosen tensioner lock nut and turn tensioner clockwise to free belt from tension. Then temporarily tighten tensioner nut.
2) Remove timing belt.



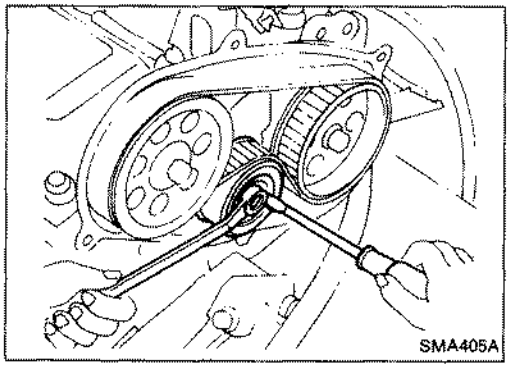
INSTALLATION

1. Confirm that No. 1 piston is set at T.D.C. on its compression stroke.
- If injection pump pulley was removed, confirm that it is re-installed as illustrated.

Identification of alignment:
CD17 No mark
CD20 Use mark "A"



2. Set timing belt.
a. Align white lines on timing belt with punchmarks on camshaft sprocket and injection pump sprocket.
b. Point arrow on timing belt toward belt cover.



3. Adjust belt tension.
1) Loosen tensioner lock nut to apply tension to timing belt.
2) Rotate crankshaft clockwise two turns.

Do not turn crankshaft by camshaft sprockets.

3) Tighten tensioner lock nut while holding tensioner with a screwdriver.

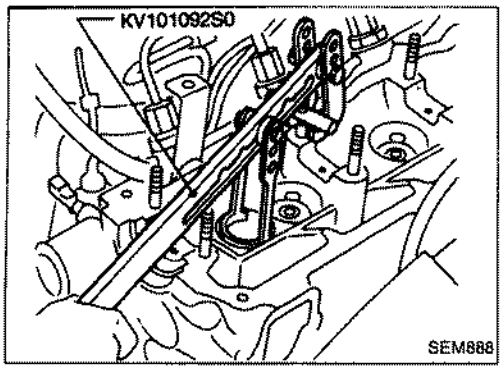
Belt tension:
CD17 255 ± 49 N (26 ± 5 kg, 57 ± 11 lb)
CD20 147 ± 49 N (15 ± 5 kg, 33 ± 11 lb)

INSPECTION

Refer to page EM-208.

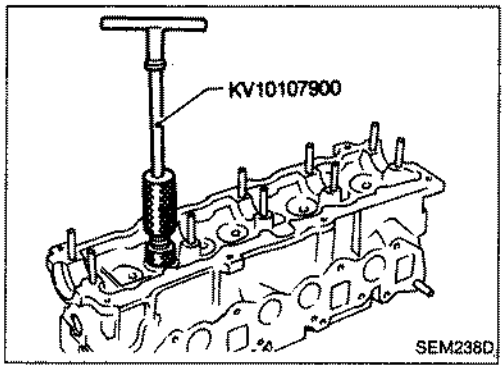
INJECTION TIMING ADJUSTMENT

Refer to EF & EC section.



VALVE OIL SEAL

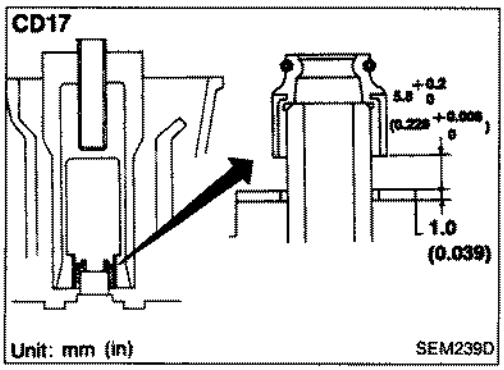
1. Remove both timing belts.
2. Remove camshaft sprockets and back covers.
3. Remove camshaft brackets by loosening bracket nuts from center to outside in two or three stages.
4. Remove camshaft oil seals and camshaft.

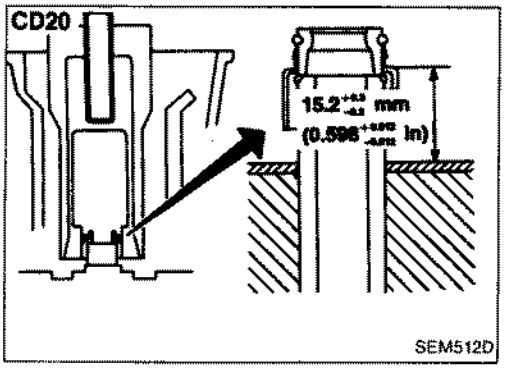


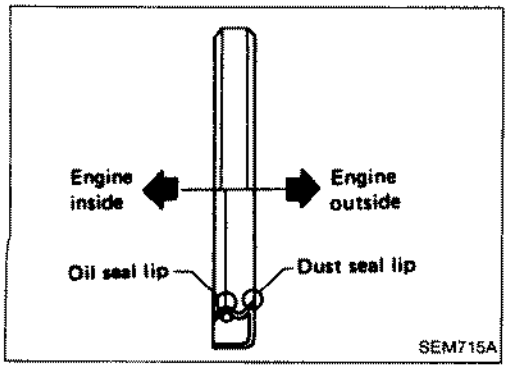
5. Remove valve lifters and mark order No. on each lifter.
6. Replace valve oil seal according to the following procedure.

When replacing valve oil seal, set the corresponding piston at T.D.C. Failure to do so causes the valve to drop into the cylinder.

1) Set No. 1 cylinder at T.D.C.
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 T.D.C.
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.

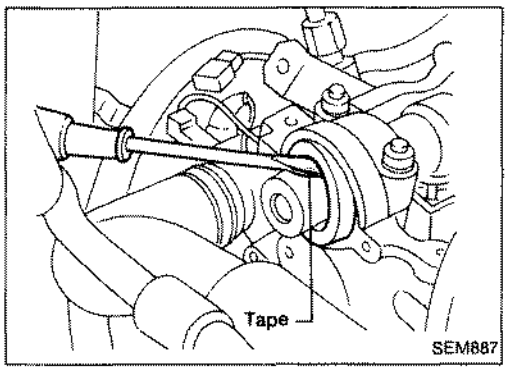






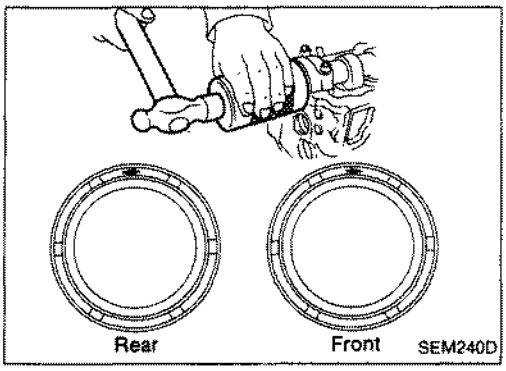
CAMSHAFT AND CRANKSHAFT OIL SEAL INSTALLING DIRECTION AND MANNER

- **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.**



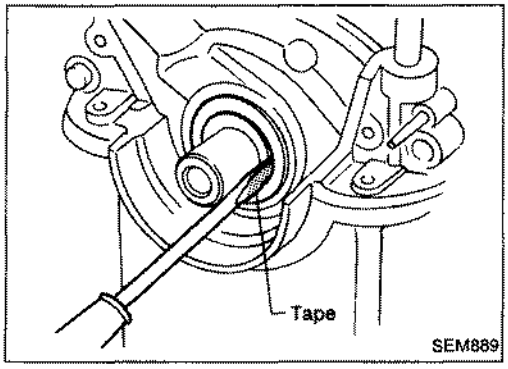
CAMSHAFT OIL SEALS

1. Remove timing belts, sprockets and back covers.
2. Pull out oil seal with a suitable tool.



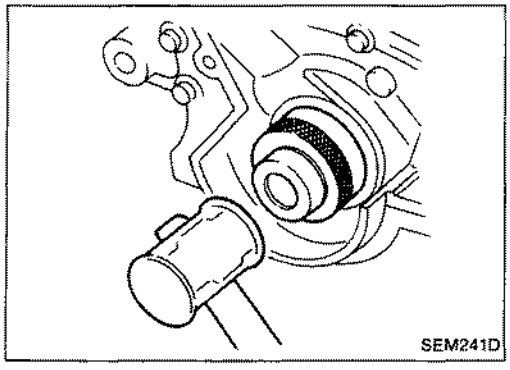
3. Install new oil seals with a suitable tool.

Confirm turning direction of both oil seals and camshaft.

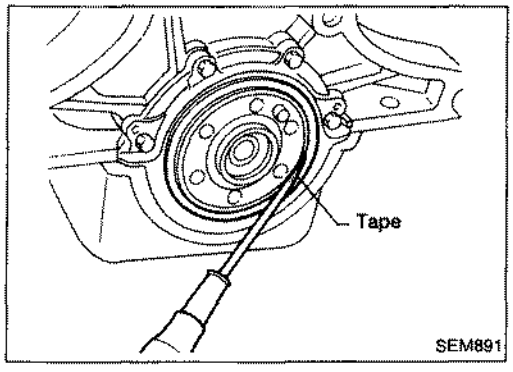


CRANKSHAFT FRONT OIL SEAL

1. Remove valve timing belt and crankshaft sprocket.
2. Remove oil seal with a suitable tool.

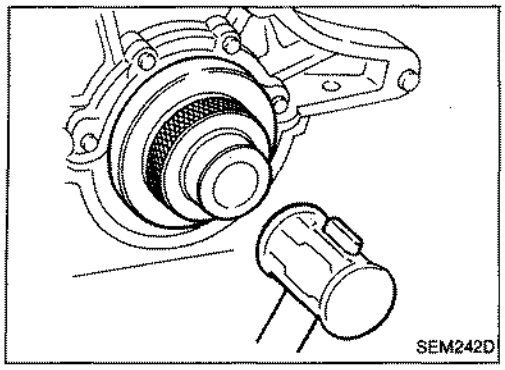


3. Apply engine oil to new oil seal and install oil seal using a suitable tool.



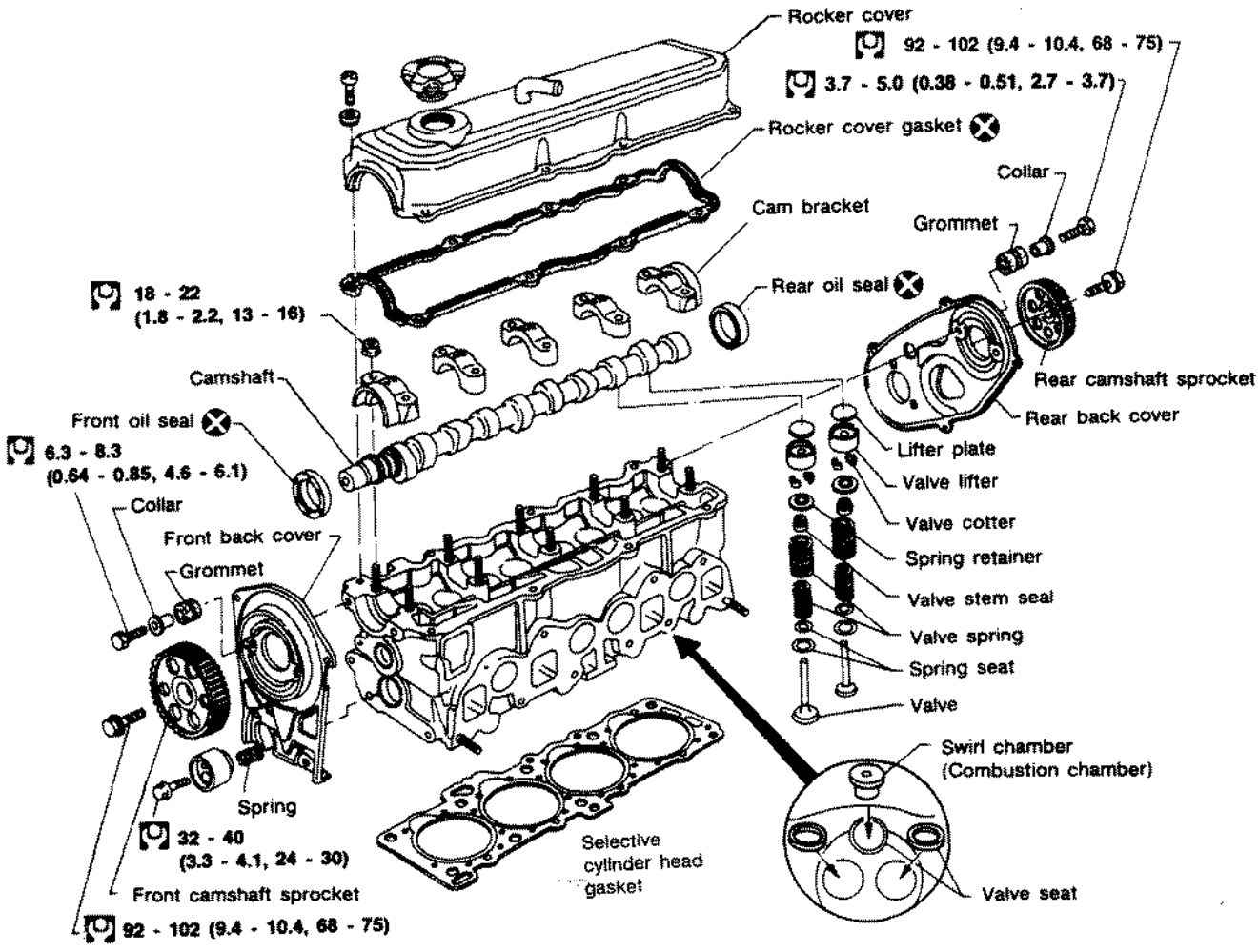
CRANKSHAFT REAR OIL SEAL

1. Remove transaxle assembly. (Refer to MT/AT section.)
2. Remove flywheel (drive plate).
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.

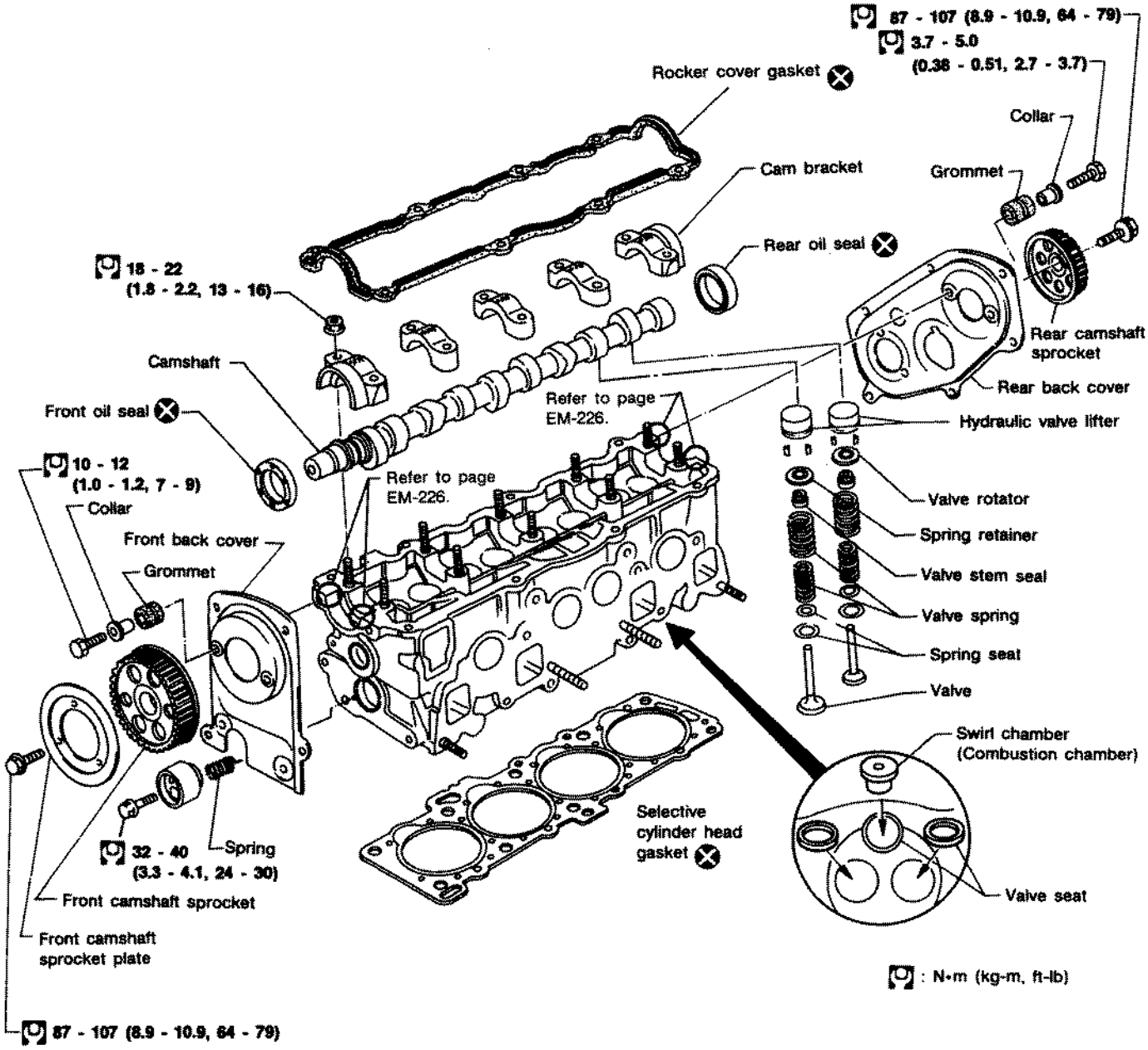
CD17



: N·m (kg-m, ft-lb)

SEM709A

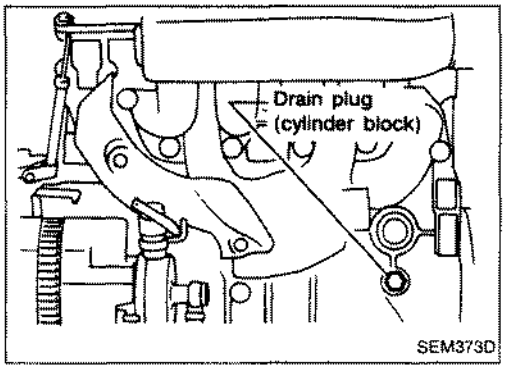
CD20



SEM524D

For hydraulic valve lifter

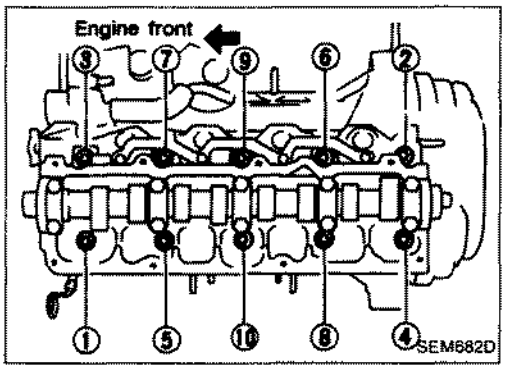
- Before starting engine, make sure that valve does not hit piston when rotating crankshaft by hand.
- When bleeding air out from hydraulic valve lifter, run engine at more than 2,400 rpm for 20 minutes or more.



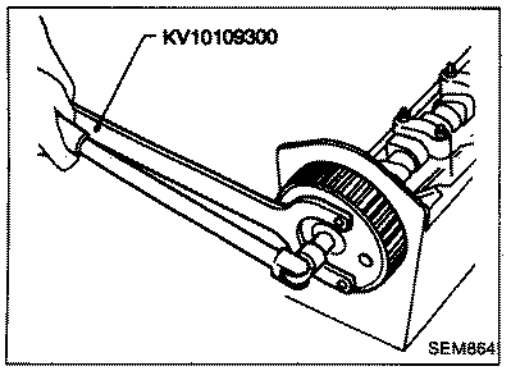
1. Drain coolant and disconnect front exhaust pipe from manifold.
2. Remove water hoses, air duct and intake manifold.
3. Remove heat shield and exhaust manifold.
4. Remove rocker cover and injection tubes.

5. Remove both timing belts.
   Set No. 1 cylinder at T.D.C. on its compression stroke. Refer to "Replacing Timing Belt".

After timing belts have been removed, do not rotate crankshaft and/or camshaft separately as valves will hit piston heads.



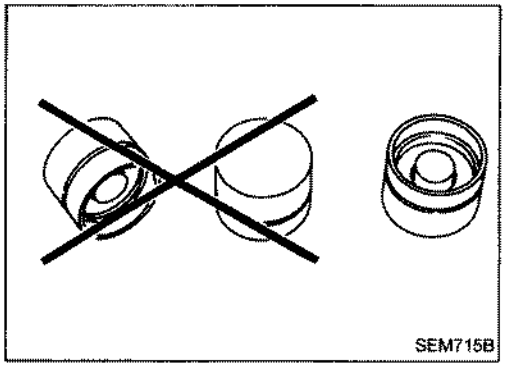
6. Remove cylinder head.



1. Remove front camshaft sprocket plate, front and rear sprockets using suitable tools and front back cover.

2. Remove camshaft brackets in order from outside to inside.
- Loosen camshaft bracket nuts in two or three stages.

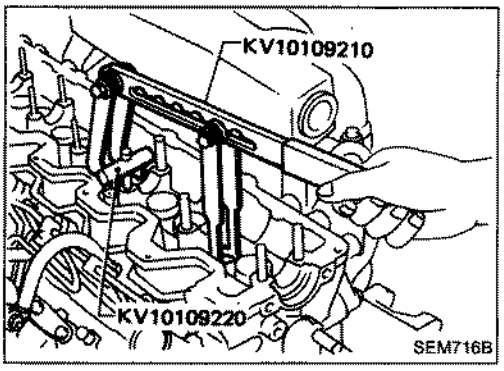
3. Remove camshaft and oil seals.



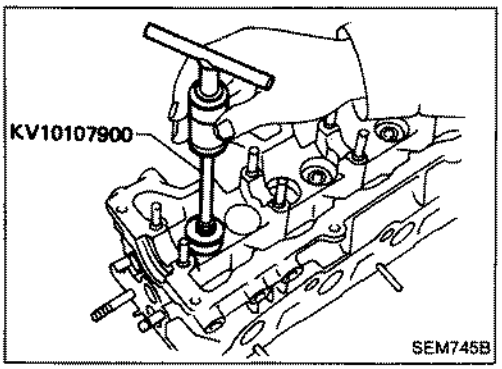
4. Remove valve lifters.

For hydraulic valve lifter — CD20

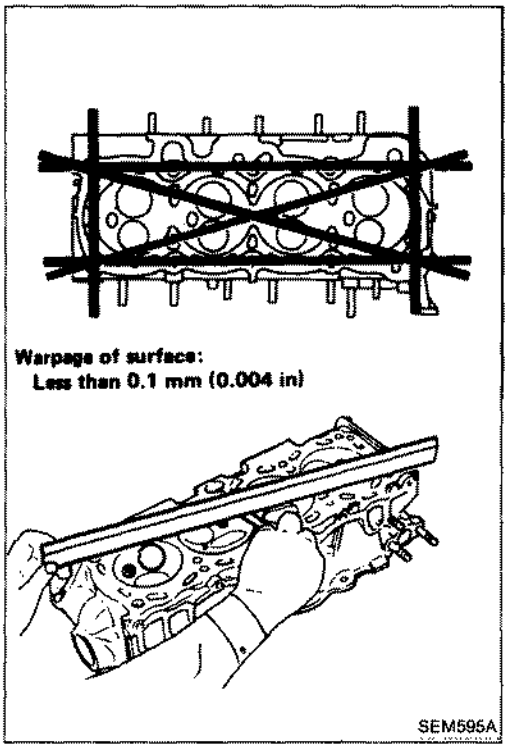
- **Do not set hydraulic valve lifters as illustrated as air will enter valve lifter causing malfunction.**
- **Do not disassemble hydraulic valve lifters.**
- **Attach tags to valve lifters to prevent mixing them up.**
- **Valve lifters must be put in engine oil after removal.**



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.



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)

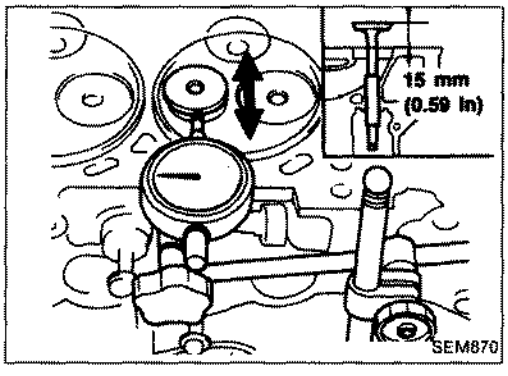
If beyond the specified limit, replace or resurface cylinder head.

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.

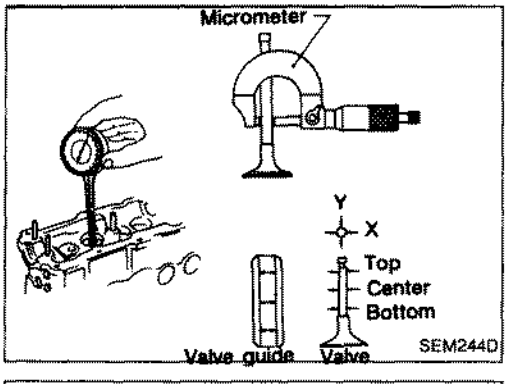
Nominal height of cylinder head:
CD17 116.6 - 117.0 mm (4.591 - 4.606 in)



VALVE GUIDE CLEARANCE

1. Measure deflection across the cylinder head as illustrated.

Valve deflection limit (dial gauge reading):
0.1 mm (0.004 in)

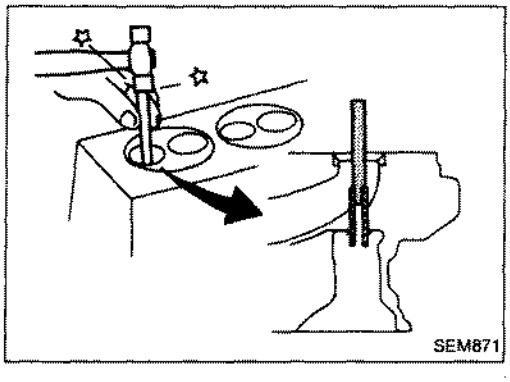


2. If exceeding the limit, check valve-to-guide clearance.

a) Measure valve stem diameter and valve guide inner diameter as illustrated.
b) Check that clearance is within the specification.

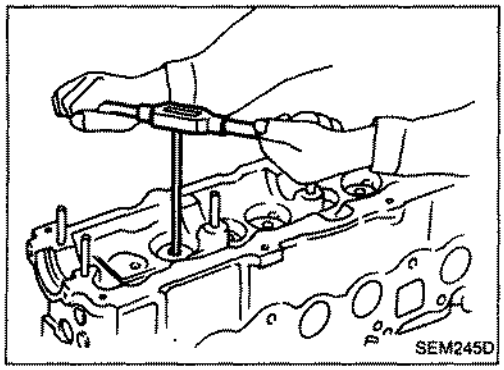
Valve stem to valve guide clearance limit:
0.1 mm (0.004 in)

c) If exceeding the limit, replace valve or valve guide.

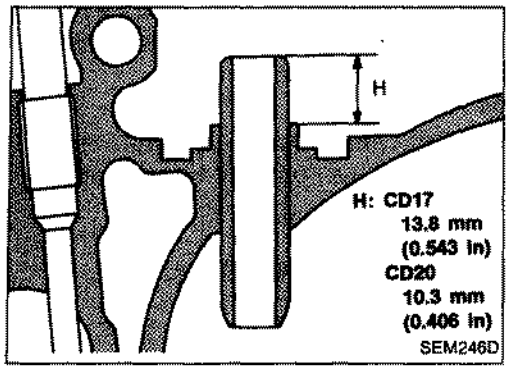


VALVE GUIDE REPLACEMENT

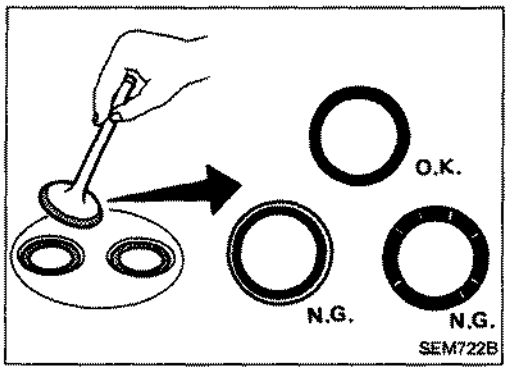
1. Heat cylinder head in oil to 150 to 160°C (300 to 320°F).
2. Drive out valve guide using a press or hammer and a suitable tool.



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)

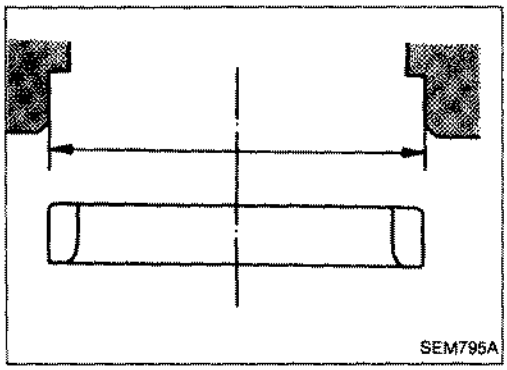


VALVE SEATS

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 any evidence of pitting on valve contact surface, and reseat or replace if worn out excessively.
   Correct valve seat surface.

When repairing valve seat, check valve and valve guide for wear beforehand. If worn, replace them. Then correct valve seat.


SEM795A

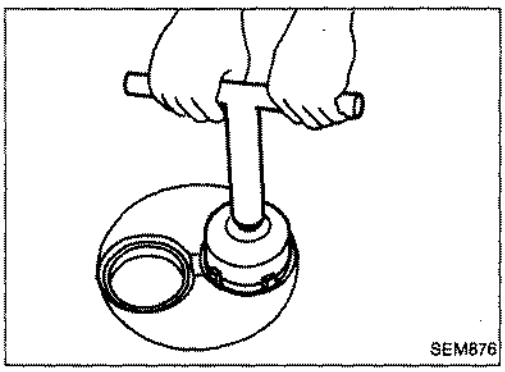
VALVE SEAT REPLACEMENT

1. Bore out old seat until it collapses.
   The machine depth stop should be set so that boring cannot continue beyond the bottom face of the seat recess in cylinder head.
2. Ream the cylinder head recess.
   Reaming bore for service valve seat
   [Oversize 0.5 mm (0.020 in)]:
   CD17
   Intake 38.44 ± 0.01 mm (1.5134 ± 0.0004 in)
   Exhaust 34.46 ± 0.01 mm (1.3567 ± 0.0004 in)
   CD20
   Intake 40.943 ± 0.011 mm (1.6119 ± 0.0004 in)
   Exhaust 34.943 ± 0.011 mm (1.3757 ± 0.0004 in)

Reaming should be done to the concentric circles around the valve guide center so that valve seat will have the correct fit.

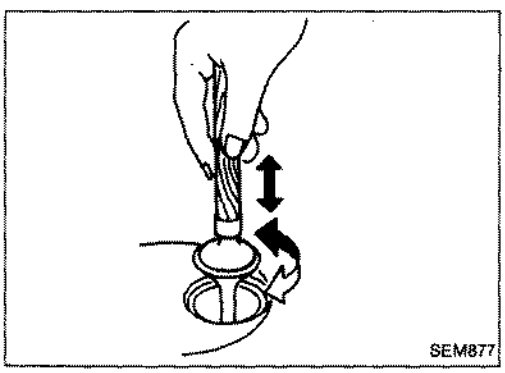
3. Heat cylinder head to a temperature of 150 to 160°C (302 to 320°F) and press fit seat until it seats on the bottom.
4. Install valve seats.

When replacing valve seat, valve should be replaced as well.

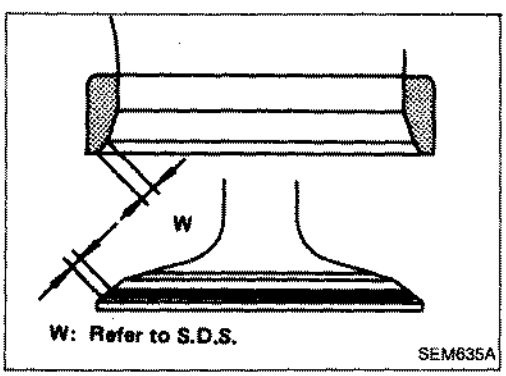

SEM876

5. Cut or grind valve seat using a suitable tool at the specified dimensions as shown in S.D.S.

The cutting should be done with both hands to obtain a uniform and concentric finish.

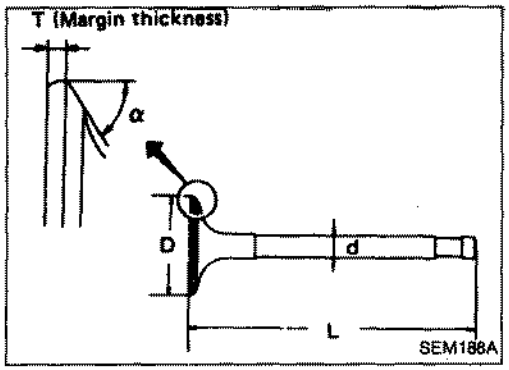

SEM877

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.



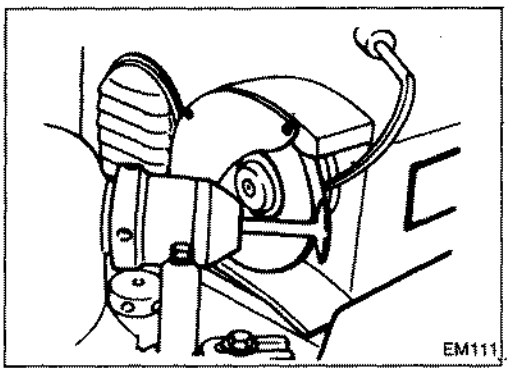
W: Refer to S.D.S.
SEM635A

7. Check valve seating condition.



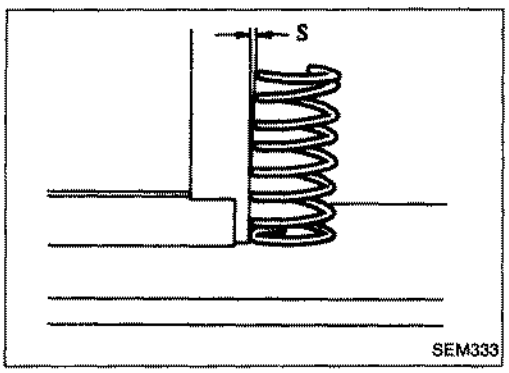
VALVE DIMENSIONS

1. Check dimensions of each valve. For dimensions, refer to S.D.S.
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.

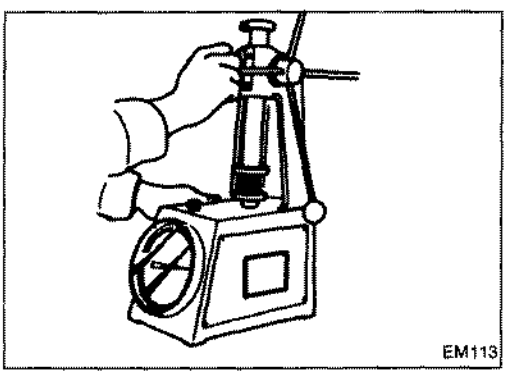
When valve head has been worn down to 0.5 mm (0.020 in) in margin thickness, replace the valve.
Grinding allowance for valve stem tip is 0.5 mm (0.020 in) or less.



VALVE SPRING SQUARENESS

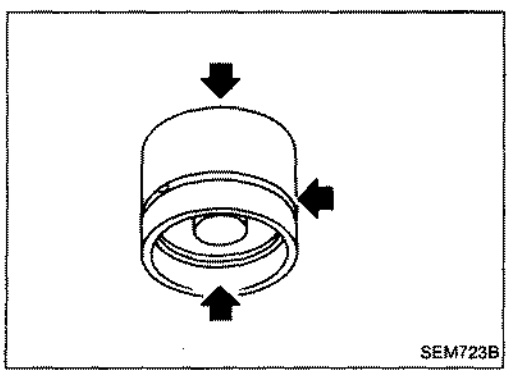
Check valve spring for squareness using a steel square and flat surface plate.
If spring is out of square "S" more than specified limit, replace with new one.

Out-of-square:
Outer
Less than 2.1 mm (0.083 in)
Inner
Less than 1.9 mm (0.075 in)



VALVE SPRING PRESSURE LOAD

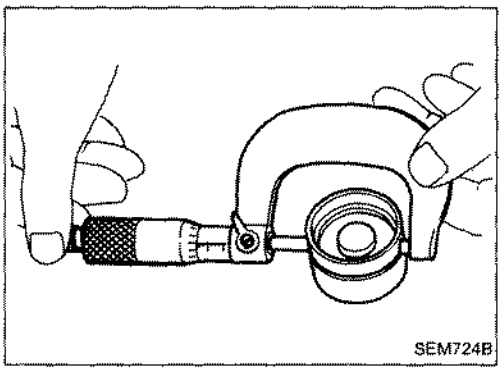
Measure the free length and the tension of each spring. If the measured value exceeds the specified limit, replace spring. Refer to S.D.S.



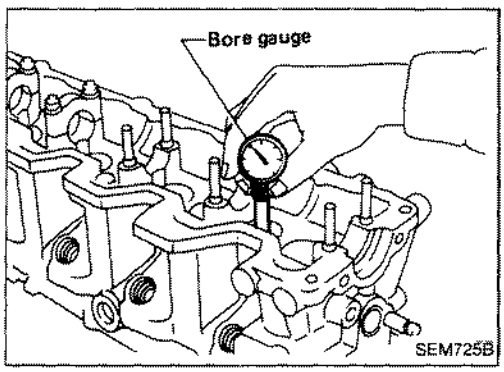
VALVE LIFTER

CD17: Valve lifter
CD20: Hydraulic valve lifter

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


SEM724B

2. Check diameter of valve lifters.
   Outer diameter:
   34.959 - 34.975 mm (1.3763 - 1.3770 in)



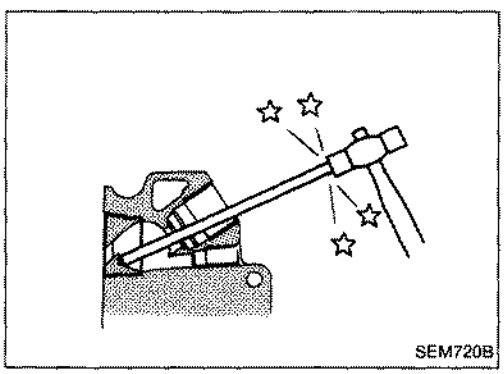
SEM725B

3. Check valve lifter guide bore.
   CD17
   Bore diameter
   34.988 - 35.013 mm (1.3775 - 1.3785 in)
   Standard clearance
   0.013 - 0.054 mm (0.0005 - 0.0021 in)
   CD20
   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

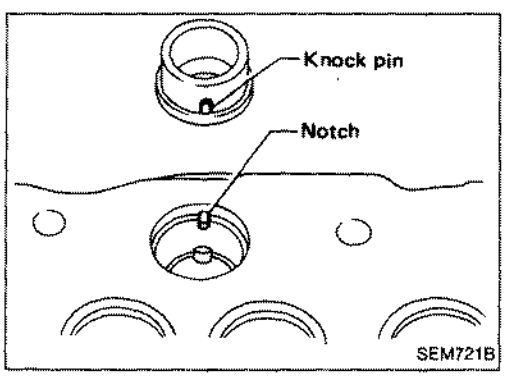
Usually combustion chambers should not be removed. However, if they show cracks or extensive damage, they should be replaced.

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.


SEM720B

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.



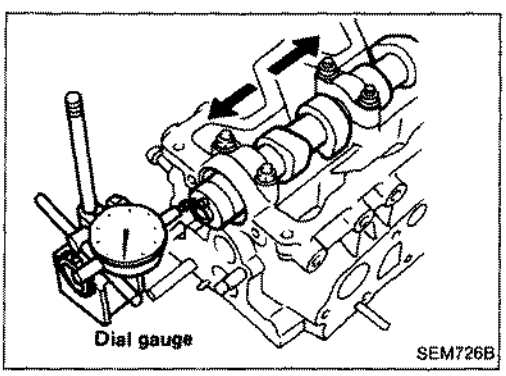
SEM721B

CAMSHAFT VISUAL CHECK

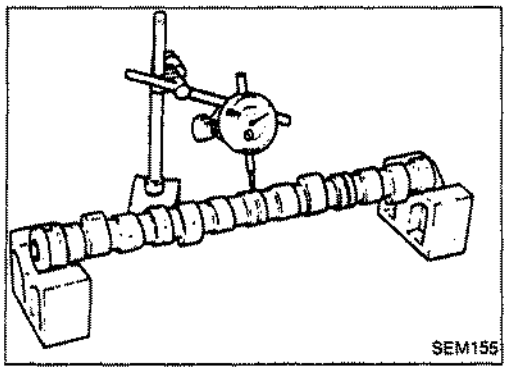
Check camshaft for scratches, seizure and wear.

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
   CD17 0.06 - 0.17 mm (0.0024 - 0.0067 in)
   CD20 0.115 - 0.188 mm (0.0045 - 0.0074 in)

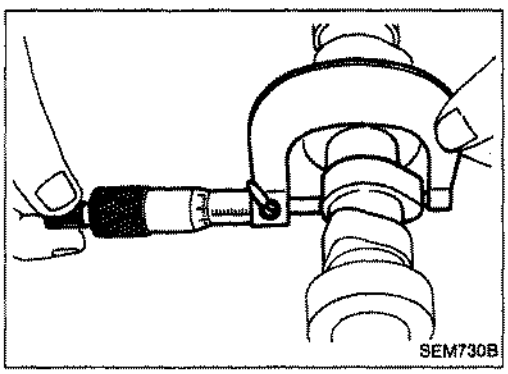


SEM726B


SEM155

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.


SEM730B

CAMSHAFT CAM HEIGHT

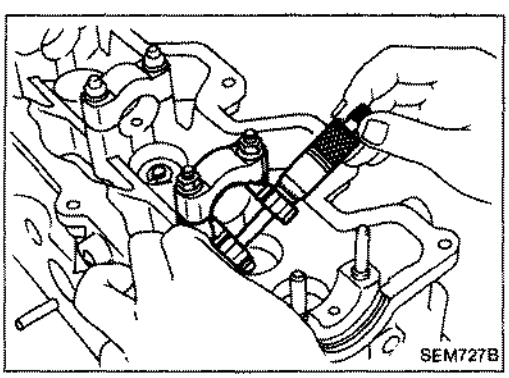
1. Measure camshaft cam height.

Cam height: Standard

Unit: mm (in)

	CD17	CD20
Intake	44.45 - 44.50 (1.7500 - 1.7520)	49.20 - 49.30 (1.9370 - 1.9409)
Exhaust	45.45 - 45.50 (1.7894 - 1.7913)	49.15 - 49.25 (1.9350 - 1.9390)

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

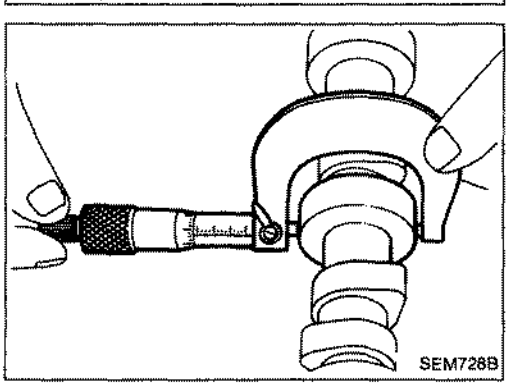

SEM727B

CAMSHAFT JOURNAL CLEARANCE

Using micrometer

1. Measure the inner diameter of camshaft bearings.
   Standard inner diameter:
   30.000 - 30.021 mm (1.1811 - 1.1819 in)

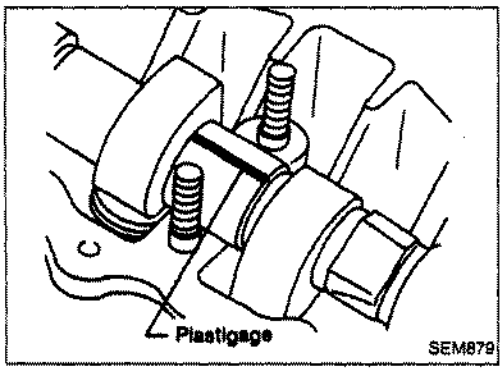
Tighten bracket bolts to the specified torque.


SEM728B

2. Measure the outer diameter of camshaft journals.
   Standard outer diameter:
   29.935 - 29.955 mm (1.1785 - 1.1793 in)

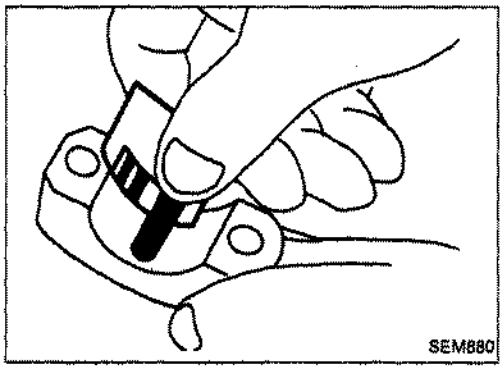
If clearance exceeds the limit, replace camshaft and/or cylinder head.

Standard clearance:
0.045 - 0.086 mm (0.0018 - 0.0034 in)
Limit: 0.1 mm (0.004 in)



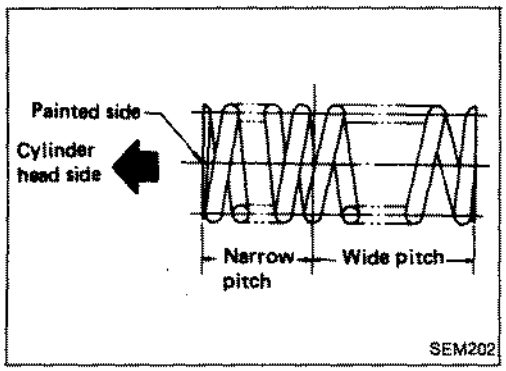
Using plastigage

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)



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.

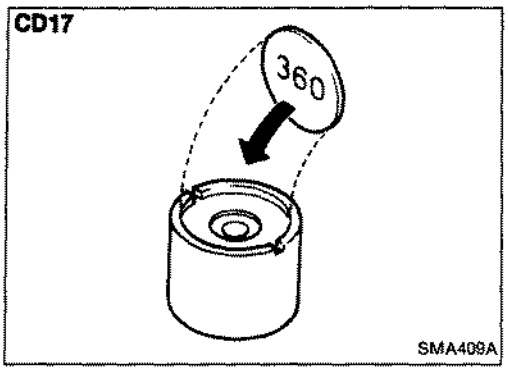
- Which parts to be replaced should be decided upon after measuring the diameters of the parts concerned.



1. Install valve component parts.

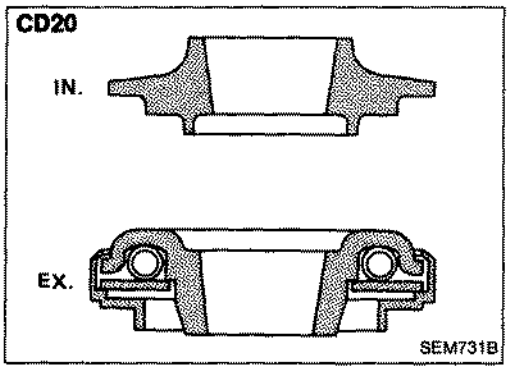
Install valve spring with its narrow pitch side toward cylinder head side.

- **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.**



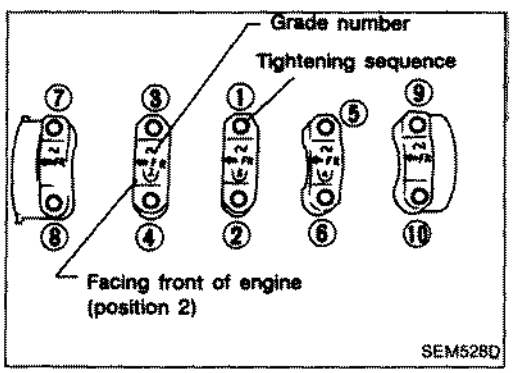
For CD17

- **Install valve lifter plate.**
- **Adjust valve clearance.**



For CD20

- **Install valve spring retainers on the intake side and valve rotators on the exhaust side.**
- **Valve rotators cannot be disassembled.**

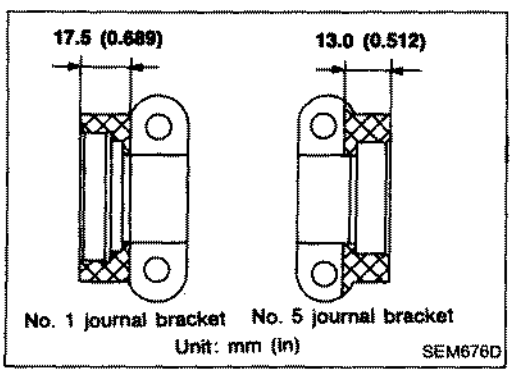


2. Install camshaft and brackets and tighten bracket nuts to the specified torque in two or three stages.

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.

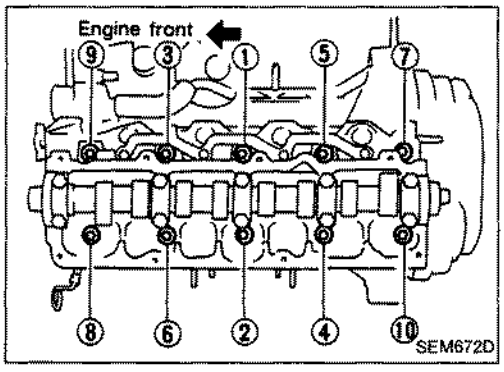


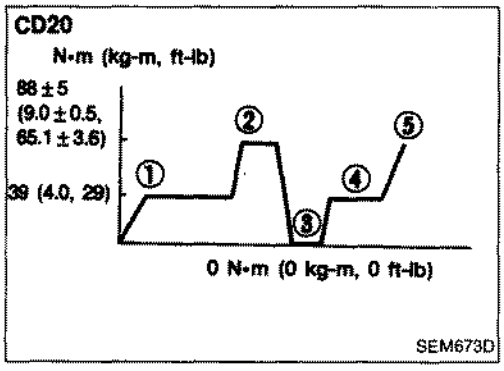
1. Install cylinder head gasket.

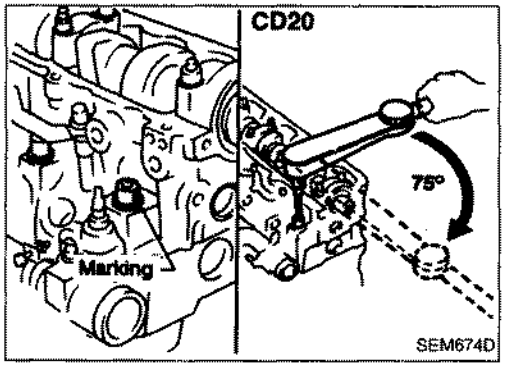
a. When replacing only cylinder head gasket, install same grade gasket as the one formerly used.

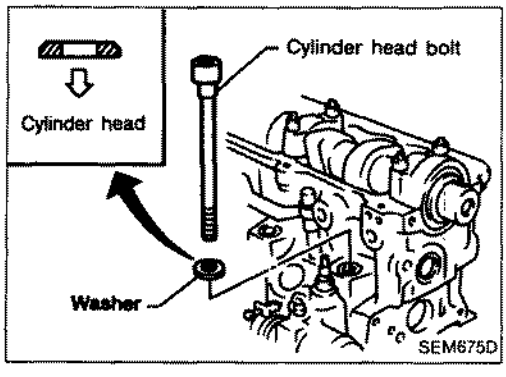
b. When replacing or repairing cylinder block, piston, connecting rod and crankshaft, select gasket referring to "Selecting cylinder head gasket".

2. Install cylinder head and tighten cylinder head bolts according to the following sequence.









Tightening procedure

1. Apply engine oil to threads and underhead seating face of each bolt.

For CD20

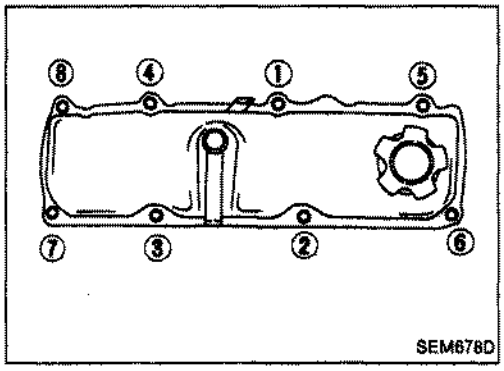
2. Tighten bolts progressively in the following steps.
   - ① 39 N·m (4.0 kg-m, 29 ft-lb)
   - ② 88 ± 5 N·m (9.0 ± 0.5 kg-m, 65.1 ± 3.6 ft-lb)
   - ③ Return to 0 N·m (0 kg-m, 0 ft-lb)
   - ④ 39 N·m (4.0 kg-m, 29 ft-lb)
   - ⑤ Tighten to 75 $^{+5^\circ}_{-0^\circ}$

   If it is difficult to check tightening angle of bolt, tighten to 83 to 93 N·m (8.5 to 9.5 kg-m, 61 to 69 ft-lb).

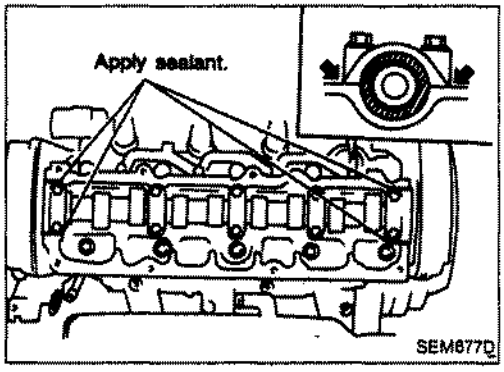
For CD17

2. Tighten bolts progressively in the following steps.
   - ① 39 N·m (4.0 kg-m, 29 ft-lb)
   - ② 103 ± 5 N·m (10.5 ± 0.5 kg-m, 76 ± 3.6 ft-lb)
   - ③ Return to 0 N·m (0 kg-m, 0 ft-lb)
   - ④ 39 N·m (4.0 kg-m, 29 ft-lb)
   - ⑤ Tighten to 82 $^{+5^\circ}_{-0^\circ}$

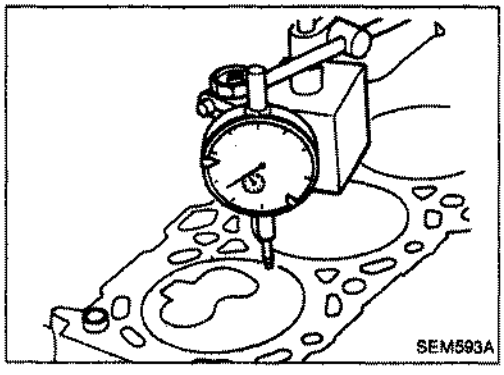
   If it is difficult to check tightening angle of bolt, tighten to 98 to 108 N·m (10.0 to 11.0 kg-m, 72 to 80 ft-lb).



3. Install rocker cover.
- Install rocker cover in the sequence shown at left.

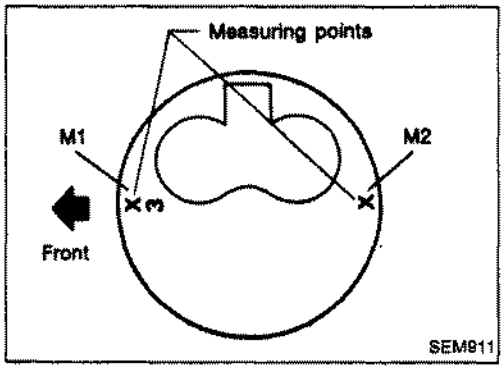


- Apply sealing compound (THREE-BOND No. 10 or equivalent) to both ends of brackets No. 1 and No. 5.

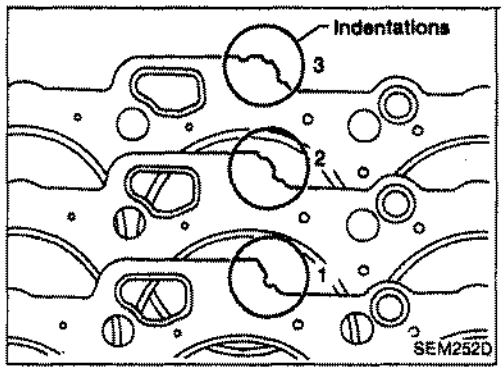


Selecting cylinder head gasket — CD17

1. Set dial gauge and needle on cylinder block surface.
2. Adjust scale to zero.
3. Move dial gauge assembly until needle is set on the measuring point of piston.
4. Read scale.
5. Reset dial gauge on cylinder block and confirm that scale indicates zero again.



- Be sure to measure the projection at two points for each cylinder as shown.
- Set each piston at its T.D.C.



6. Determine gasket grade.
(1) Calculate average value of projections for all pistons.
(2) Determine gasket thickness, referring to the chart.

Unit: mm (in)

Grade	Average values for piston projections	Gasket thickness	Number of indentations
A	Less than 0.52 (0.0205)	1.15 (0.0453)	1
B	0.52 - 0.57 (0.0205 - 0.0224)	1.20 (0.0472)	2
C	More than 0.57 (0.0224)	1.25 (0.0492)	3

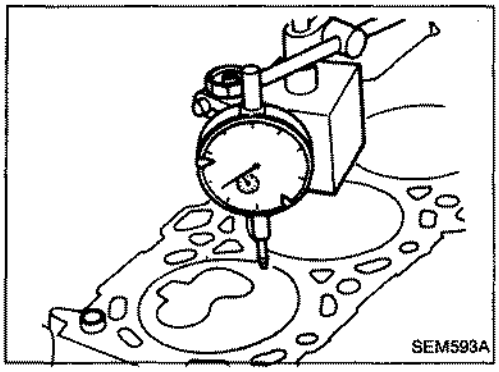
(3) If any one of the average values of each piston exceeds the average value (Max.) for piston projections by more than 0.05 mm (0.0020 in), select a one grade thicker gasket than that determined in step (2).

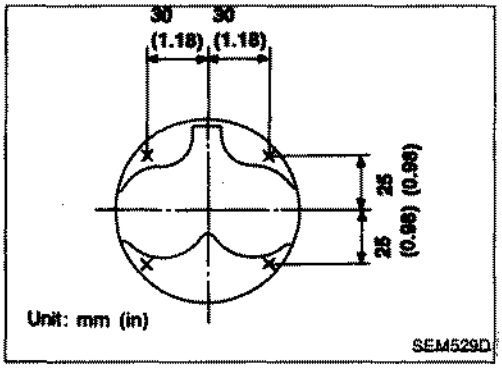
Example

Unit: mm (in)

Step	Item \ Cylinder No.	1		2		3		4		Remarks
1.	Measured value	M1	M2	M1	M2	M1	M2	M1	M2	
		0.53 (0.0209)	0.56 (0.0220)	0.59 (0.0232)	0.55 (0.0217)	0.53 (0.0209)	0.58 (0.0228)	0.58 (0.0228)	0.51 (0.0201)	
2.	Average value of each piston	0.545 (0.0215)		0.57 (0.0224)		0.555 (0.0219)		0.545 (0.0215)		
3.	Average value of all pistons	0.55375 (0.02180)								
4.	Rounded value	0.55 (0.0217)								
5.	Determined gasket thickness (Temporary)	1.20 (0.0472) (Grade B)								
6.	X: Maximum piston projection of selected gasket ... 0.57 (0.0224) + 0.05 (0.0020) = 0.62 (0.0244) Y: Maximum of the average value of each piston = 0.57 (0.0224) Result: Y < X									*1
7.	Determined gasket thickness (Final)	1.20 (0.0472) (Grade B)								

*1: If Y > X [for example Y = 0.63 mm (0.0248 in)], use thicker gasket grade C.


SEM593A



SEM529D

Selecting cylinder head gasket — CD20

When replacing only cylinder head gasket, install the same grade 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) Read and write down 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

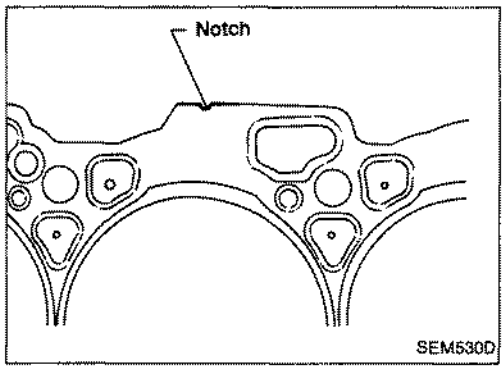
Calculate the average value of measurements for all pistons from the values obtained from step 2.

Step 4

Round of 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)

Grade	Average value of piston projections mm (in)	Gasket thickness mm (in)	Number of notches
A	Less than 0.505 (0.0199)	$1.15^{+0.05}_{-0.05}$ ($0.0453^{+0.0020}_{-0.0020}$)	1
B	0.505 - 0.555 (0.0199 - 0.0219)	$1.20^{+0.05}_{-0.05}$ ($0.0472^{+0.0020}_{-0.0020}$)	2
C	Over 0.555 (0.0219)	$1.25^{+0.05}_{-0.05}$ ($0.0492^{+0.0020}_{-0.0020}$)	3

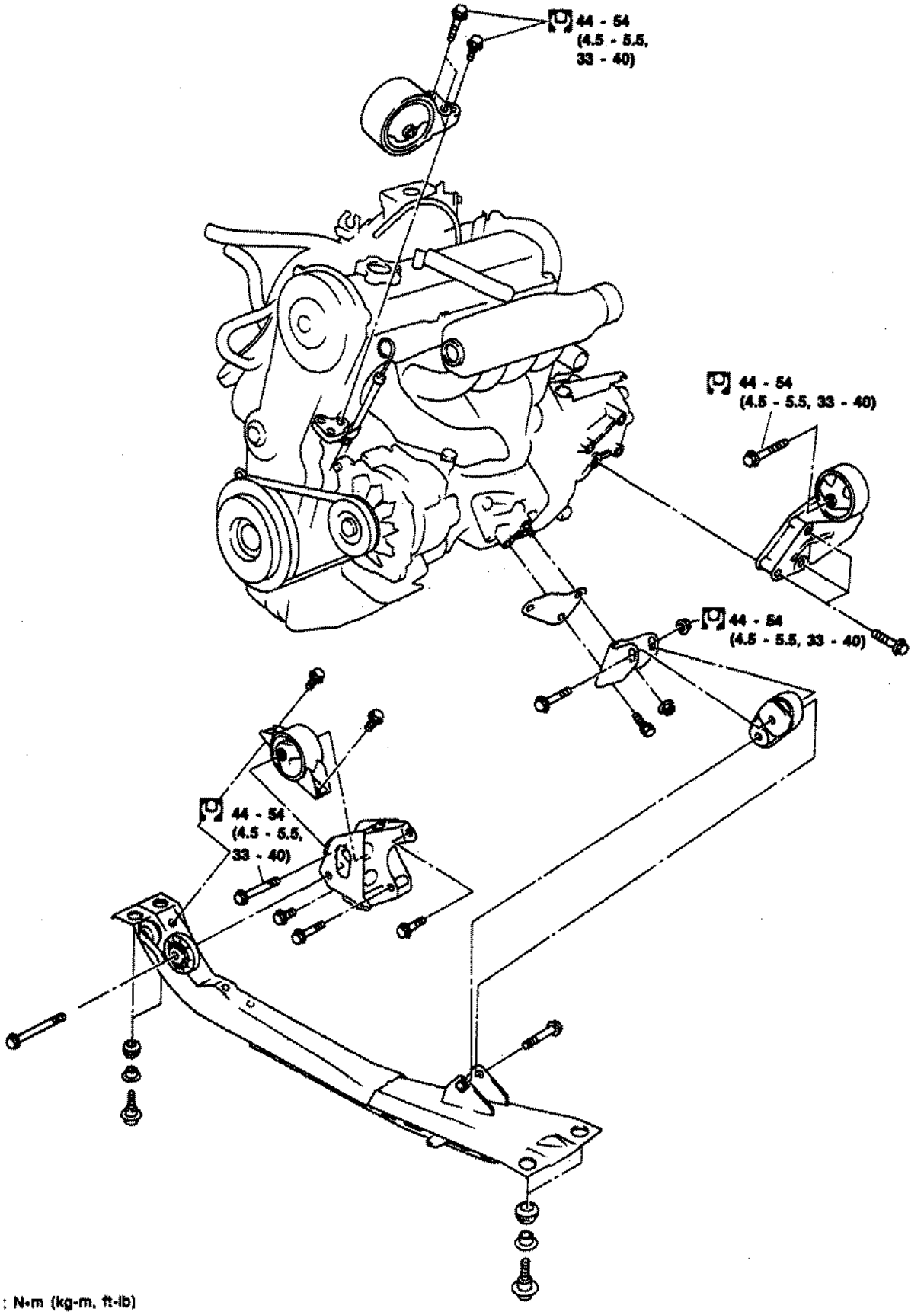
Step 6
Check if the average value of each projection obtained from step 2 is larger than the max. value of the standard projection (of selected gasket) incremented by 0.05 mm (0.0020 in).
If so, use gasket that is 1 grade thicker. If not so, use gasket as selected in step 4.

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)				0.57 (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 B)															
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 B)*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 forth 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 C gasket must be used.**



: N•m (kg-m, ft-lb)

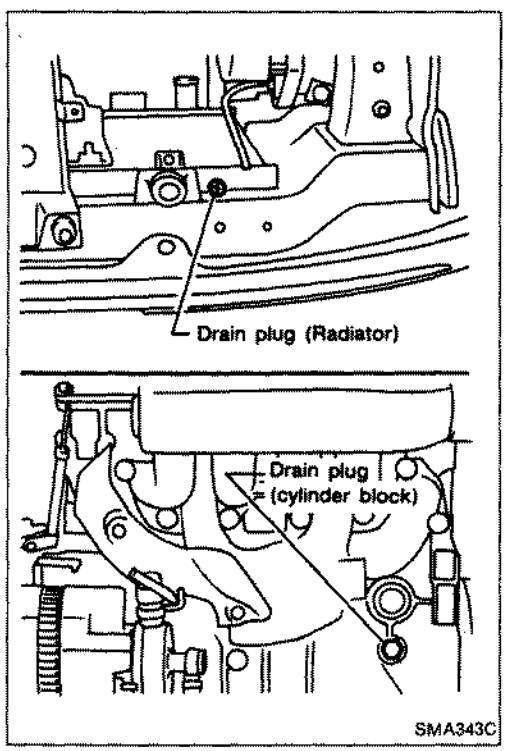
SEM248D

WARNING:

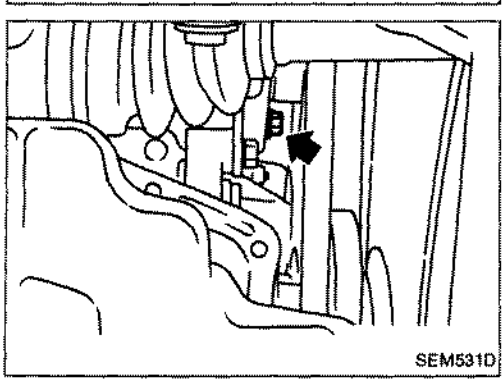
- **Situate vehicle on a flat and solid surface.**
- **Place chocks at front and back of rear wheels.**
- **Do not remove engine until exhaust system has completely cooled off. Otherwise, you may burn yourself and/or fire may break out in the fuel line.**
- **For safety during subsequent steps, the tension 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.**

CAUTION:

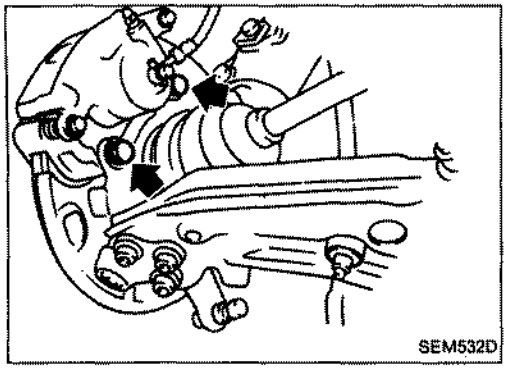
- **When lifting engine, be careful not to strike adjacent parts, especially accelerator wire casing, brake lines, and brake master cylinder.**
- **In hoisting the engine, always use engine slingers in a safe manner.**
- **In removing drive shaft, be careful not to damage transaxle oil seal.**



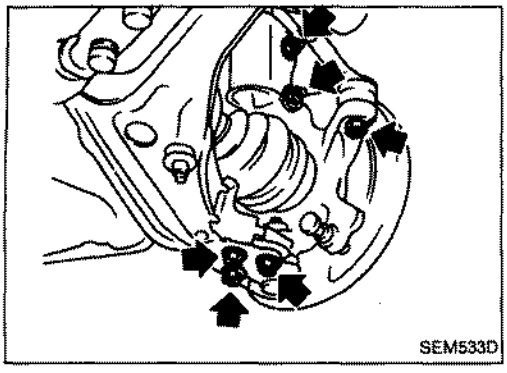
SMA343C


SEM531D

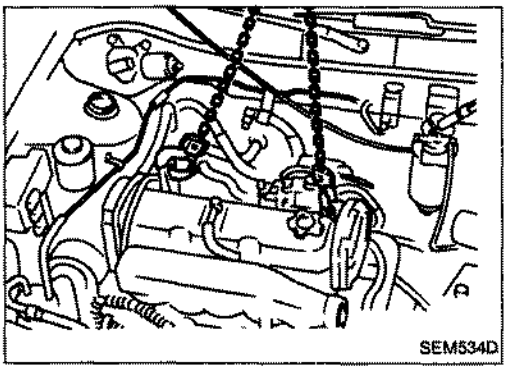
1. Remove engine undercovers and splash covers.
2. Remove front exhaust tube.
3. Drain coolant and disconnect lower water hose from radiator.
4. Drain transaxle oil.
5. Disconnect electrical wiring from radiator.
6. Remove power steering mounting bolt.
7. Drain coolant from cylinder head.
8. Disconnect water hoses and electrical wiring from radiator and remove radiator.
9. Disconnect fuel tubes and vacuum tubes.
10. Release power steering belt adjusting nut and remove power steering pump from engine.
    Bind pump properly to the vehicle.
11. Disconnect or remove electrical wiring where necessary.
12. Release clutch lever cable and accelerator cable.
13. Release tachometer cable from transaxle housing.
14. Remove front wheels.


SEM532D

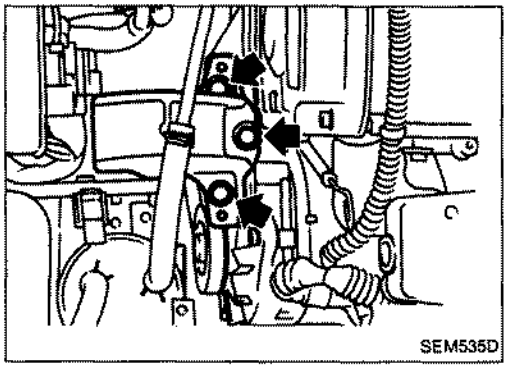
15. Remove brake caliper mounting bolts and bind caliper properly to vehicle (coil spring) L.H. & R.H.


SEM533D

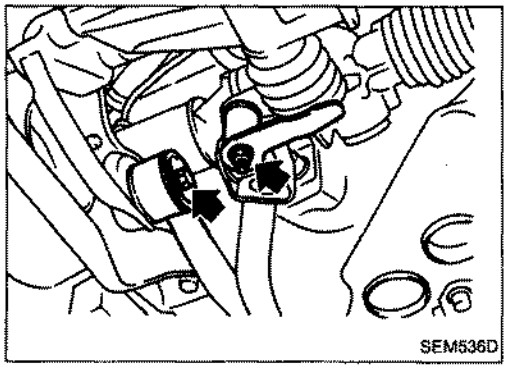
16. Remove lower ball joint nuts and release the upper hub mounting bolts.
17. Release steering arm ball joint using a suitable tool. Remove drive shafts from transaxle.
1) RH: Split drive shaft center thrust bearing.
2) RH & LH: Remove hub mounting bolts and remove drive shaft carefully from transaxle.


SEM534D

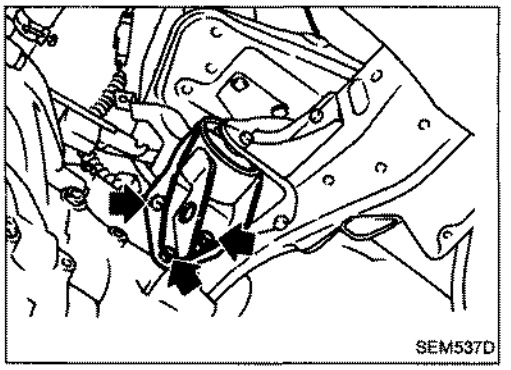
18. Mount suitable slingers to cylinder head. Fit hoist with studge and hoist engine to release force on engine mountings.


SEM535D

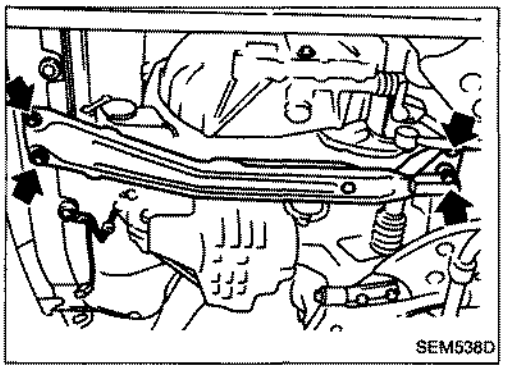
19. Remove upper mounting (Right side).


SEM536D

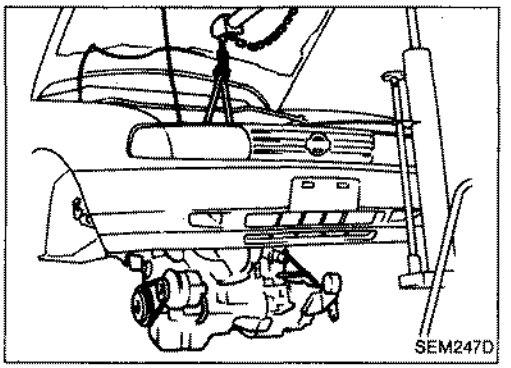
20. Release transaxle shift linkages.



21. Release lower left engine mounting.

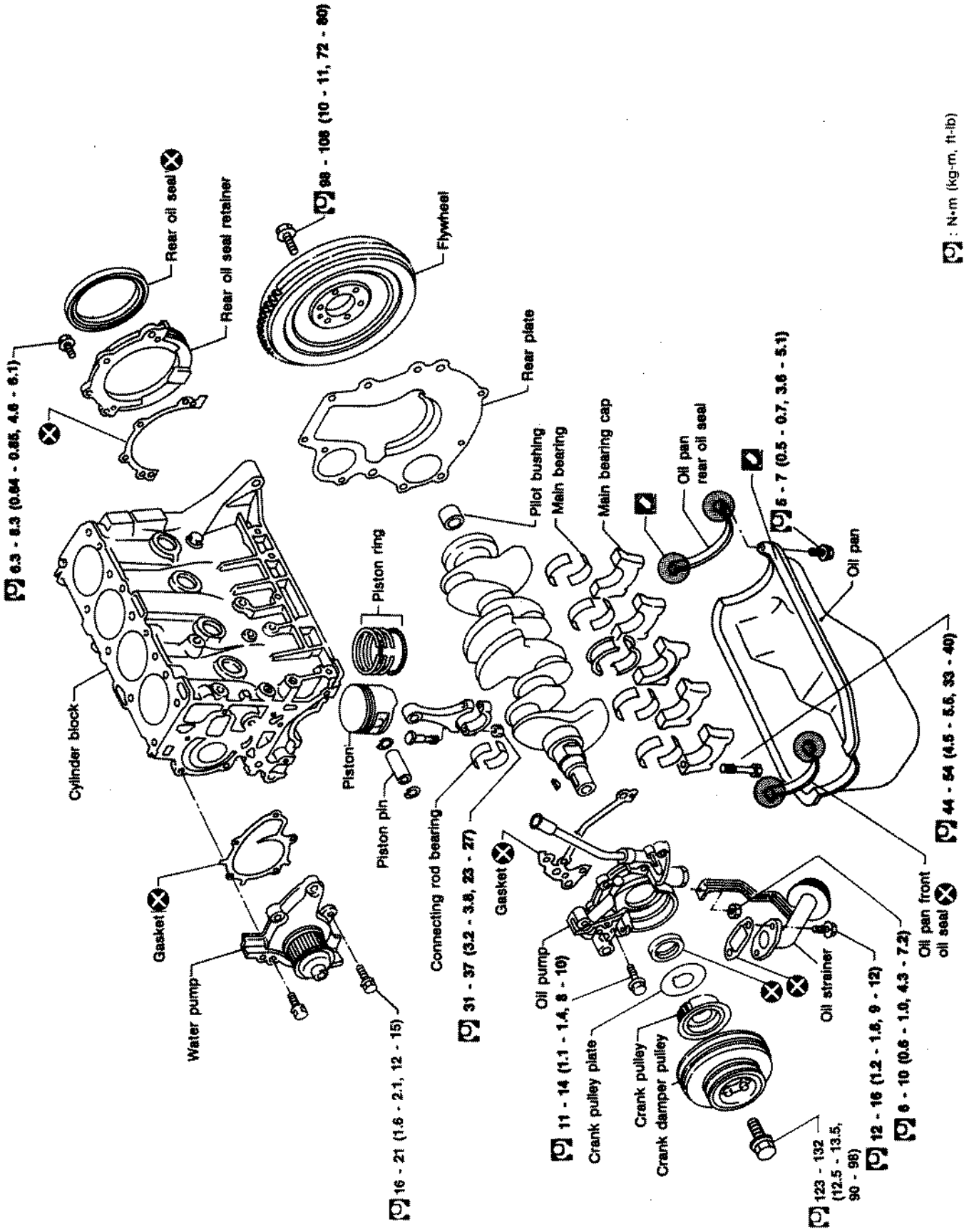


22. Remove center member from chassis.



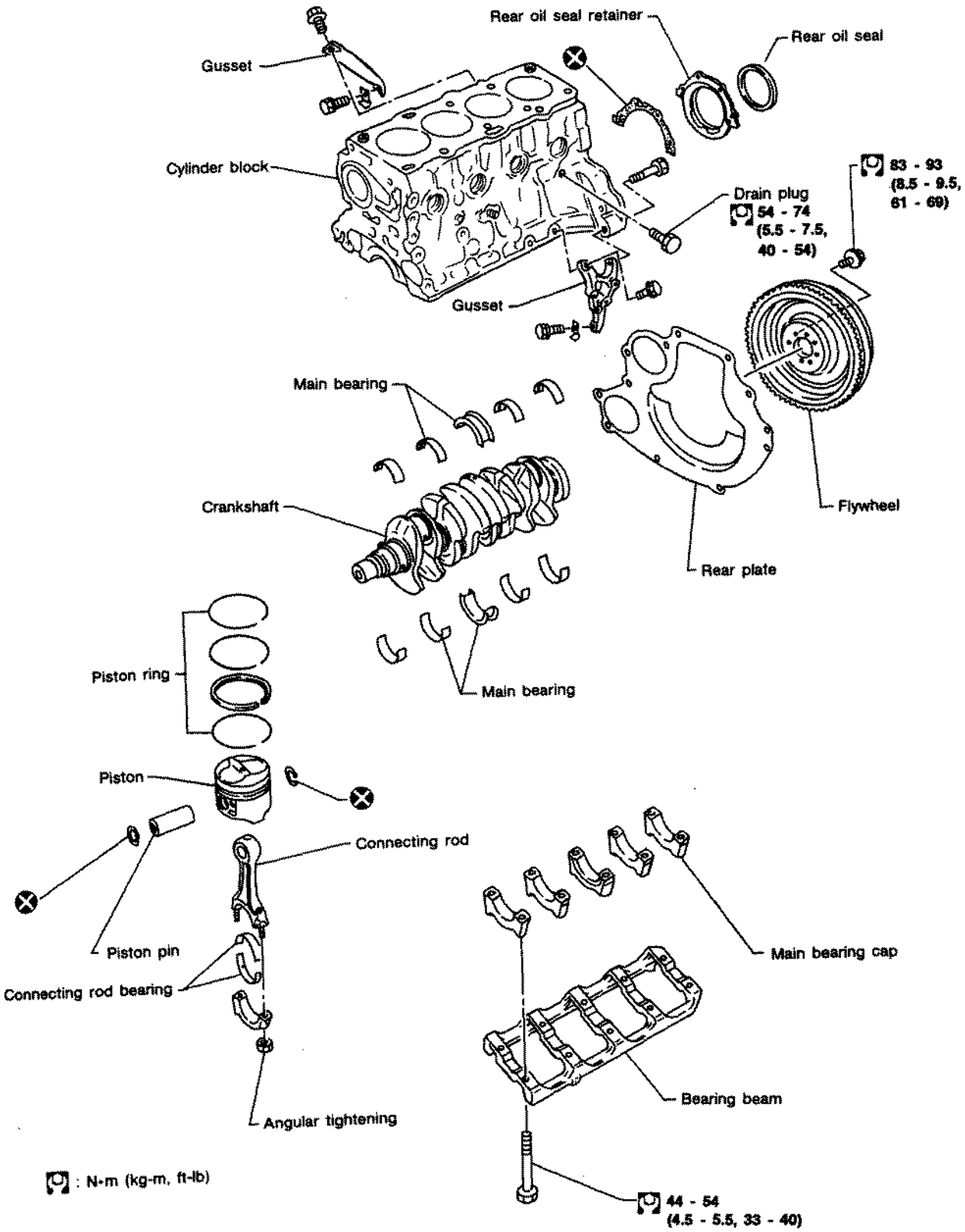
23. Remove engine with transaxle as shown.

CD17

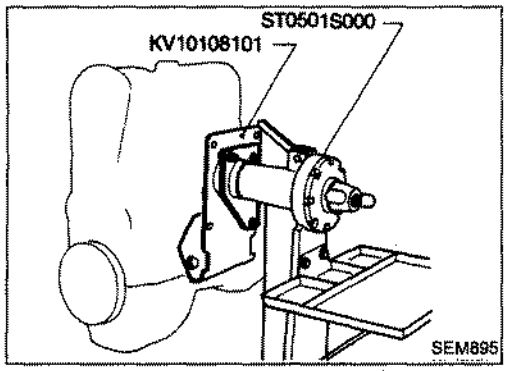


SEM853D

CD20



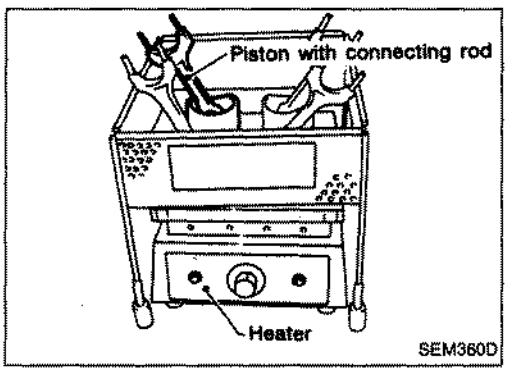
SEM708D



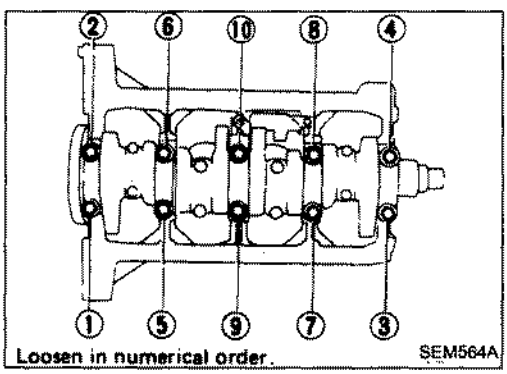
Disassembly

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.

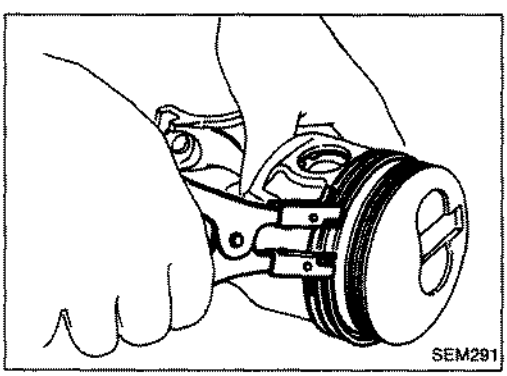


When disassembling piston and connecting rod, heat piston to 60 to 70°C (140 to 158°F) or use piston pin press stand at room temperature.



8. Remove 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.

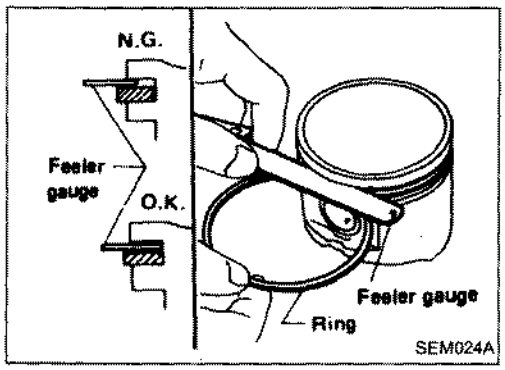
Inspection

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:
CD17 23.994 - 24.000 mm (0.9446 - 0.9449 in)
CD20 24.994 - 25.000 mm (0.9840 - 0.9843 in)
Pin hole diameter:
CD17 23.991 - 23.999 mm (0.9445 - 0.9448 in)
CD20 24.991 - 24.999 mm (0.9839 - 0.9842 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:

CD17

Unit: mm (in)

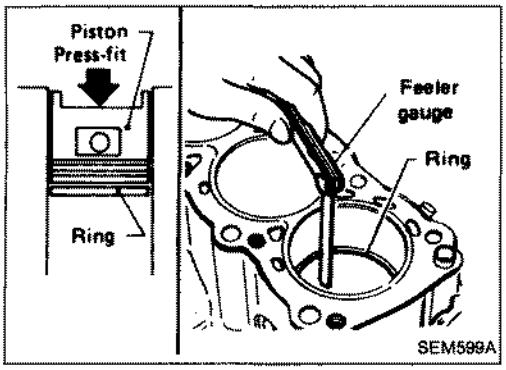
	Standard	Limit
Top ring	0.020 - 0.060 (0.0008 - 0.0024)	0.20 (0.0079)
2nd ring	0.040 - 0.080 (0.0016 - 0.0031)	0.15 (0.0059)
Oil ring	0.030 - 0.070 (0.0012 - 0.0028)	0.10 (0.0039)

CD20

Unit: mm (in)

	Standard	Limit
Top ring	0.060 - 0.095 (0.0024 - 0.0037)	0.10 (0.0039)
2nd ring	0.040 - 0.075 (0.0016 - 0.0030)	0.10 (0.0039)
Oil ring	0.030 - 0.070 (0.0012 - 0.0028)	0.10 (0.0039)

Inspection (Cont'd)



PISTON RING GAP

Ring gap:

CD17

Unit: mm (in)

	Standard	Limit
Top ring	0.20 - 0.35 (0.0079 - 0.0138)	1.0 (0.039)
2nd ring	0.20 - 0.35 (0.0079 - 0.0138)	0.7 (0.028)
Oil ring	0.30 - 0.45 (0.0118 - 0.0177)	0.6 (0.024)

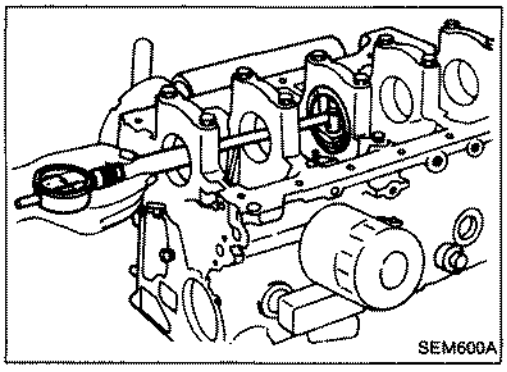
CD20

Unit: mm (in)

	Standard	Limit
Top ring	0.12 - 0.30 (0.0047 - 0.0118)	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 still exceeds the limit even with a new ring, rebore the cylinder and use oversize piston/piston ring assembly.

Refer to S.D.S.



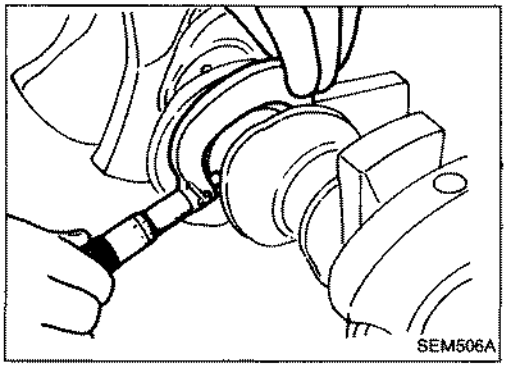
MAIN BEARING CLEARANCE

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.

: 44 - 54 N·m (4.5 - 5.5 kg-m, 33 - 40 ft-lb)

3. Measure inside diameter "A" of main journal.



4. Measure outside diameter "Dm" of main journal of crankshaft.

   Journal diameter:

   Refer to S.D.S.

5. Calculate main bearing clearance.

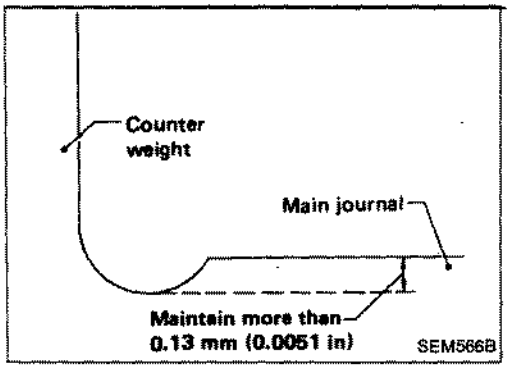
   Main bearing clearance = A – Dm

   Standard:

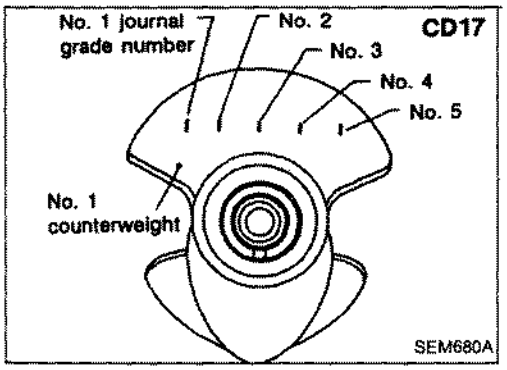
   0.039 - 0.065 mm (0.0015 - 0.0026 in)

- If it exceeds the limit, replace the bearing.

Inspection (Cont'd)

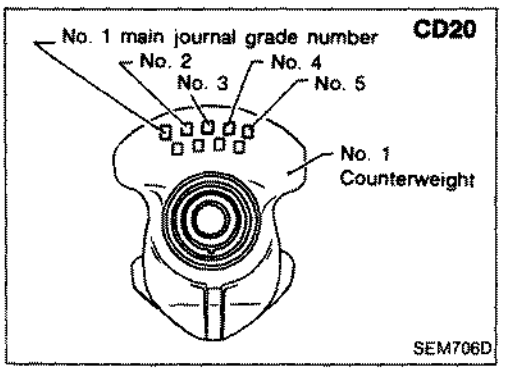


- If crankshaft main journal is worn or shows any abnormality, regrind crank journal and use undersized bearings to maintain the specified oil clearance.
- **Refer to S.D.S. for regrinding crankshaft journal diameter and available service parts.**
- **When regrinding crankshaft journal, do not grind fillet-roll.**



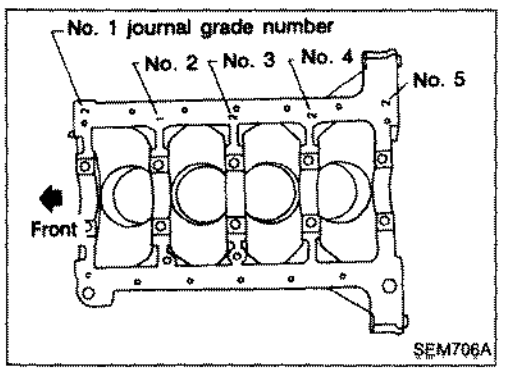
- If either bearing, crankshaft or cylinder block is replaced with a new one, select main bearing according to the following table. These numbers are punched in either Arabic or Roman numerals.

Crankshaft main journal grade number	Main bearing housing grade number: 0	1	2
	Main bearing grade number		
0	0	1	2
1	1	2	3
2	2	3	4



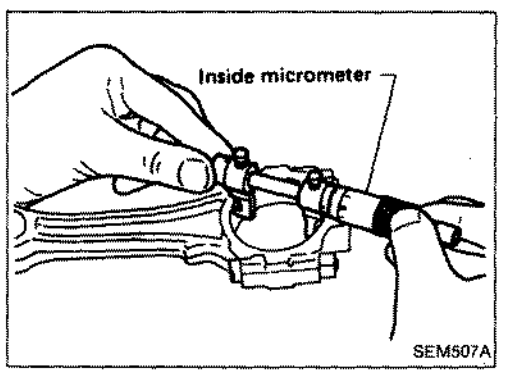
Identification color:

	CD17	CD20
Grade 0	Black	Yellow
Grade 1	Brown	Green
Grade 2	Green	Brown
Grade 3	Yellow	Black
Grade 4	Blue	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 S.D.S.



CONNECTING ROD BEARING CLEARANCE (Big end)

CD17: Non-selective connecting rod bearing
CD20: Selective connecting rod bearing

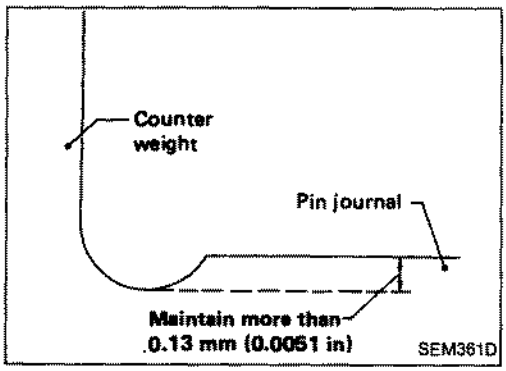
1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap with bearing to connecting rod.

Apply oil to the thread portion of bolts and seating surface of nuts.

: CD17 31 - 37 N·m (3.2 - 3.8 kg-m, 23 - 27 ft-lb)
CD20 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.

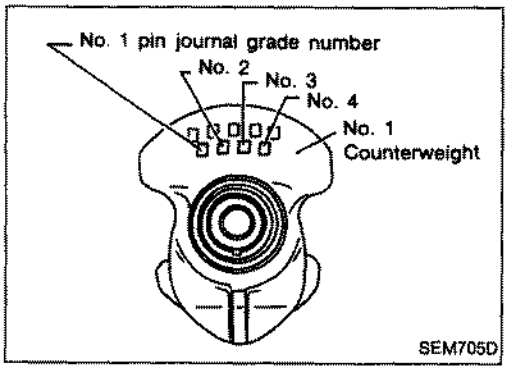
Connecting rod bearing clearance = C – Dp

Standard:

CD17 0.024 - 0.066 mm (0.0009 - 0.0026 in)

CD20 0.031 - 0.061 mm (0.0012 - 0.0024 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 S.D.S. for regrinding diameter of crankshaft pin and available service parts.**
- **When regrinding crankshaft pin, do not grind fillet-roll.**



For CD20 (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.

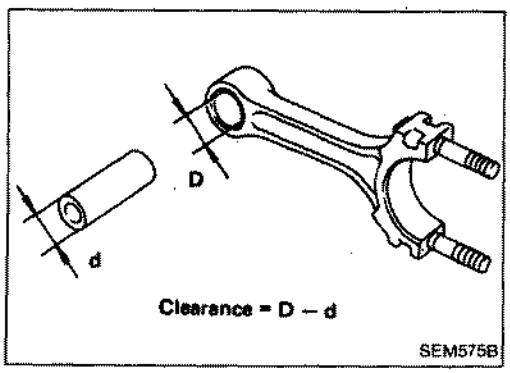
	Crankshaft pin journal grade number		
	0	1	2
Connecting rod baring grade number	0	1	2

Identification color

Grade 0: Black

Grade1: Yellow

Grade2: Blue



CONNECTING ROD AND PISTON PIN CLEARANCE (Small end)

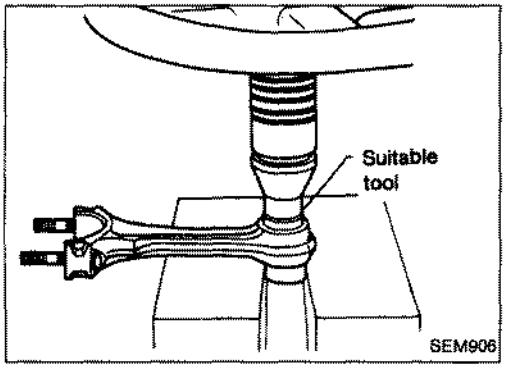
Clearance (D – d):

0.025 - 0.044 mm (0.0010 - 0.0017 in)

- If clearance exceeds the specifications, replace the bearing.

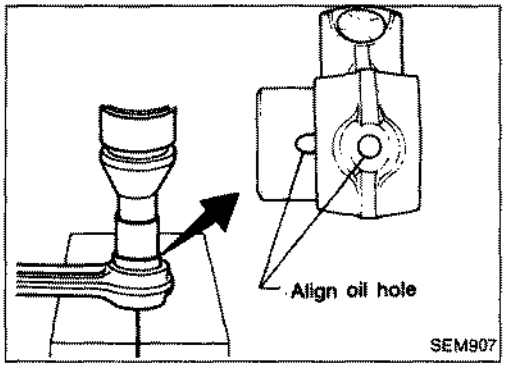
Inspection (Cont'd)

Bearing replacement



1. Remove bearing with a suitable tool.

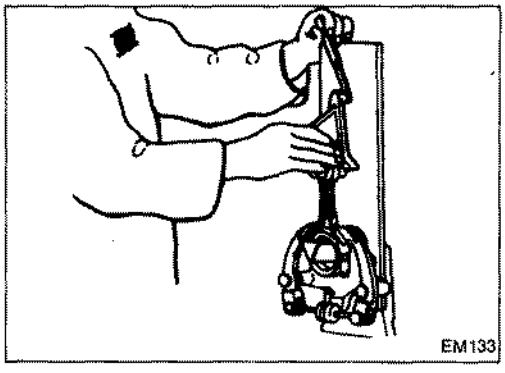
Do not scratch inner surface of connecting rod.



2. Install new bearing with oil holes aligned correctly.
3. Ream bore using a suitable tool.

Ream bore:

CD17 24.025 - 24.038 mm (0.9459 - 0.9464 in)
CD20 25.025 - 25.038 mm (0.9852 - 0.9857 in)



CONNECTING ROD BEND AND TORSION

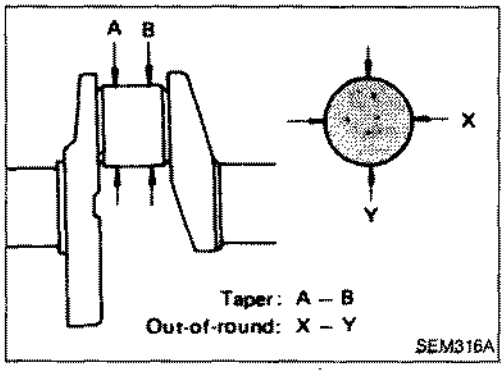
Bend and torsion [per 100 mm (3.94 in) length]:

CD17

Bend Less than 0.15 mm (0.0059 in)
Torsion Less than 0.30 mm (0.0118 in)

CD20

Bend Less than 0.025 mm (0.0010 in)
Torsion Less than 0.025 mm (0.0010 in)



CRANKSHAFT

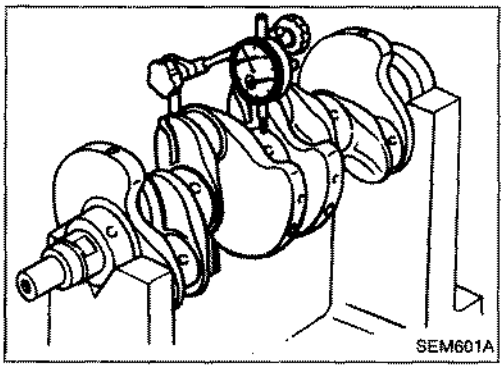
1. Check crankshaft journals and pins for score, bias, wear or cracks. If faults are minor, correct with fine crocus cloth.
2. Check journals and pins with a micrometer for taper and out-of-round.

Out-of-round (X – Y):

Less than 0.005 mm (0.0002 in)

Taper (A – B):

Less than 0.005 mm (0.0002 in)

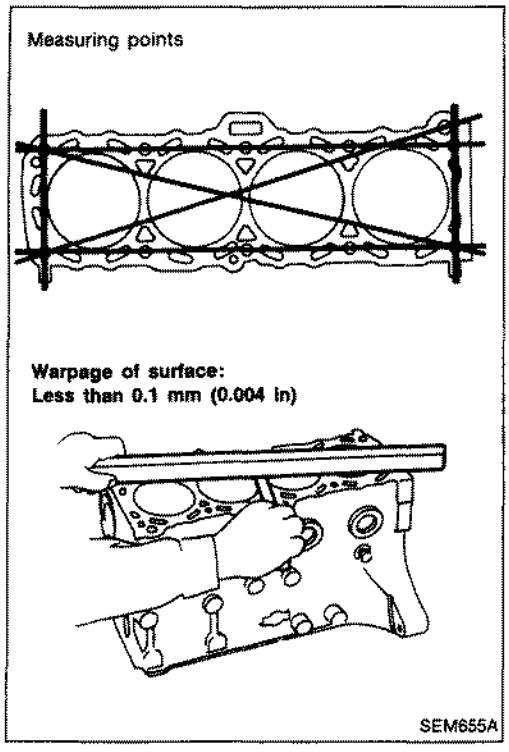


3. Check crankshaft runout.

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.

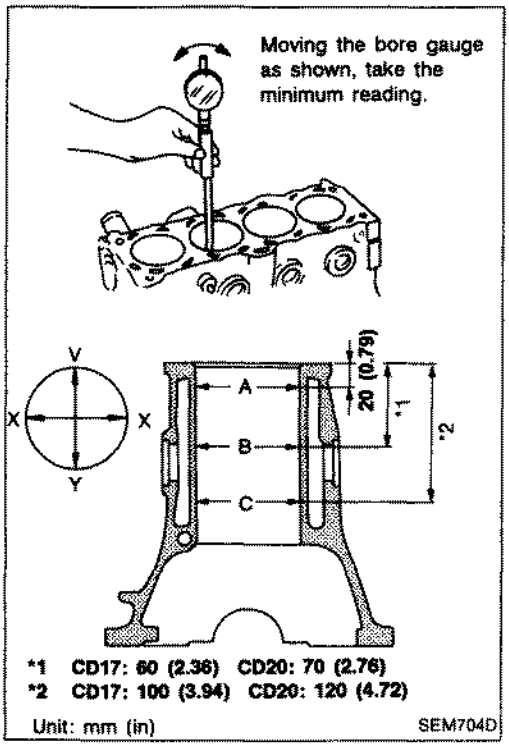
Amount of cylinder head resurfacing is "A".

Amount of cylinder block resurfacing is "B".

The maximum limit is as follows:

A + B = 0.1 mm (0.004 in)

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:

CD17 80.000 - 80.050 mm (3.1496 - 3.1516 in)

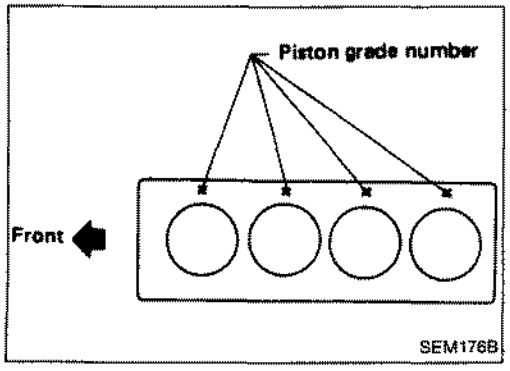
CD20 84.500 - 84.550 mm (3.3268 - 3.3287 in)

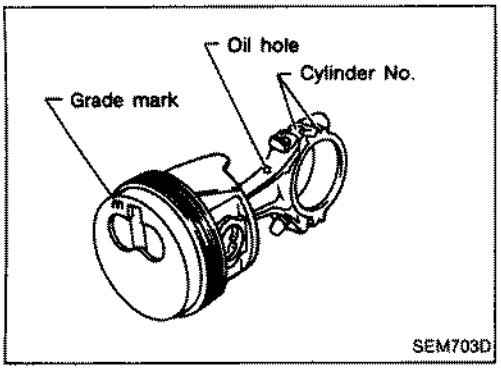
Unit: mm (in)

	CD17	CD20
Bore wear limit	0.1 (0.004)	0.2 (0.008)
Out-of-round standard	0.04 (0.0016)	0.015 (0.0006)
Taper (A – B) standard	0.04 (0.0016)	0.010 (0.0004)

If it exceeds the limit, rebore all four cylinders. Replace cylinder block if necessary.

If either cylinder block or piston is replaced with a new one, select the same piston as piston grade number punched on cylinder block upper surfaces.

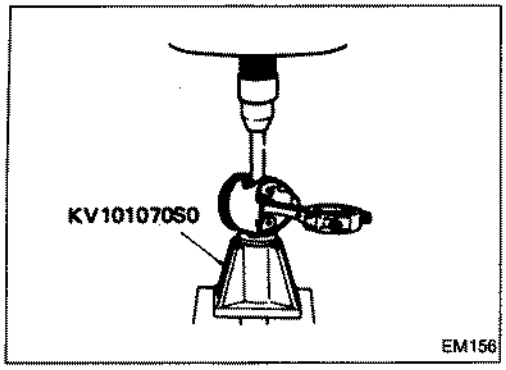




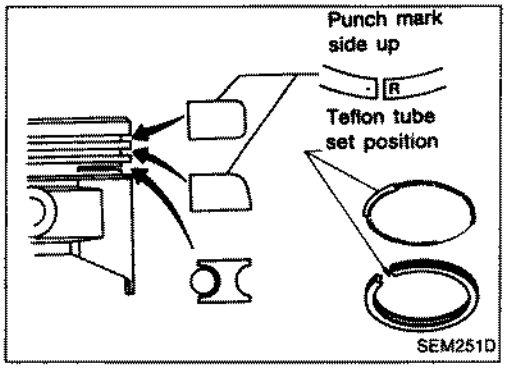
Assembly

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.**



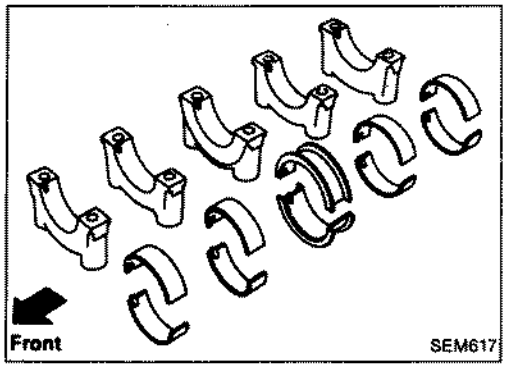
- **Install new snap ring on one side of piston pin hole.**
- **When assembling piston and connecting rod with piston pin, heat piston to between 60 and 80°C (140 and 176°F) and install piston pin with a suitable tool.**
- **Install new snap ring.**
- **After assembling, ascertain that piston swings smoothly.**



- Install piston rings with a suitable tool.

CD20 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

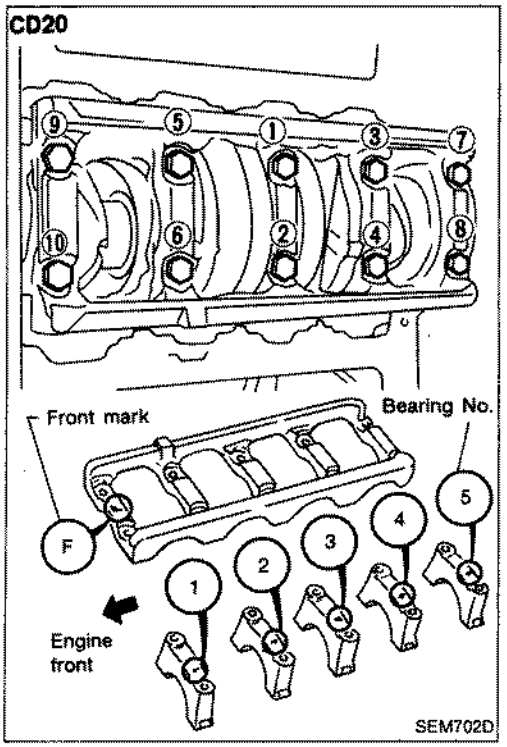


CRANKSHAFT

1. Set main bearings in the proper position on cylinder block and main bearing caps.

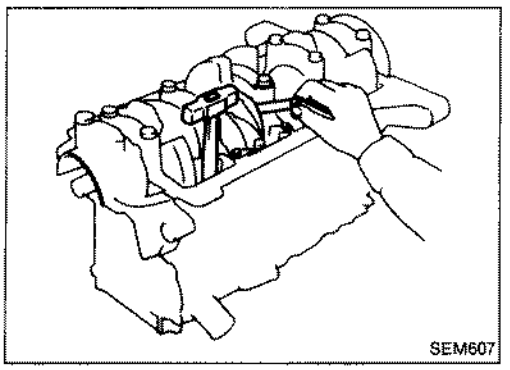
- **If either crankshaft, cylinder block or main bearing is reused again, it is necessary to measure main bearing clearance.**
- **Upper bearings (cylinder block side) have oil groove.**

Assembly (Cont'd)

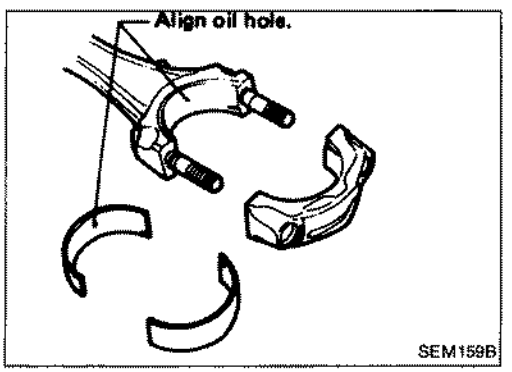


2. Apply engine oil to main bearing surfaces on crankshaft journal side.
3. Install crankshaft and main bearing caps and main bearing beam (CD20).
   Main bearing cap bolt:
   : 44 - 54 N·m (4.5 - 5.5 kg-m, 33 - 40 ft-lb)
4. Tighten main bearing cap bolts.

- **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.**



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)



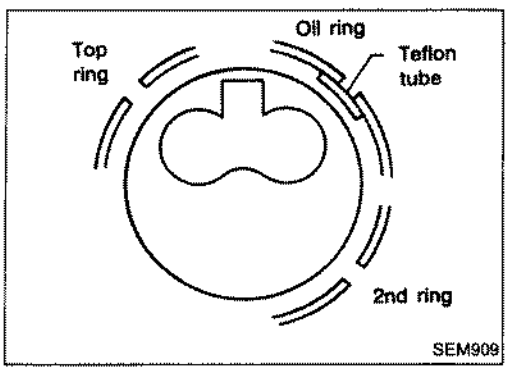
PISTON WITH CONNECTING ROD

1. Install connecting rod bearings in the connecting rods and connecting rod caps.

- Confirm that correct size of bearings is used.

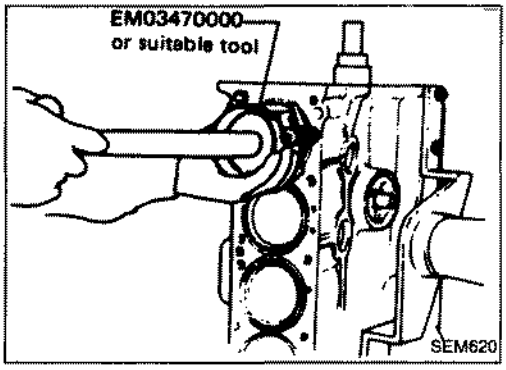
Refer to "Inspection".

- 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.

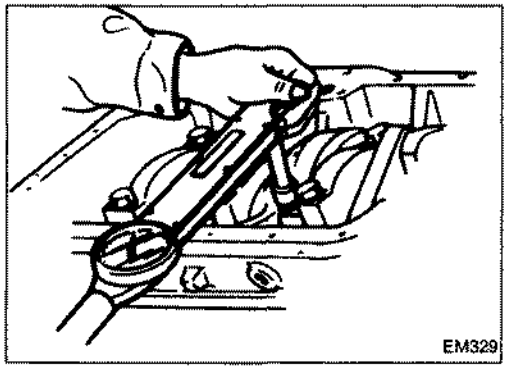


- Set piston rings as shown.

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 a little engine oil to the thread of connecting rod bearing nut.

For CD17

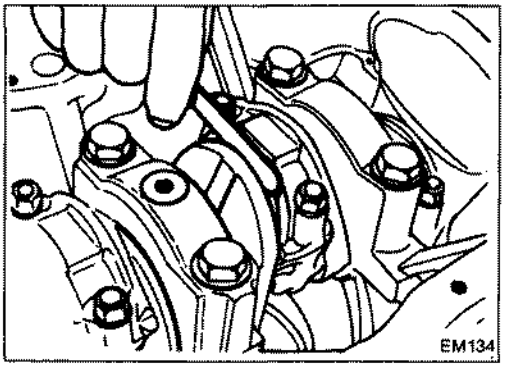
: 31 - 37 N·m (3.2 - 3.8 kg-m, 23 - 27 ft-lb)

For CD20

(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, 10.8 ± 0.7 ft-lb) plus 60 $^{+5^\circ}_{-0^\circ}$ or 27 - 45 N·m (3.8 - 4.6 kg-m, 27 - 33 ft-lb)

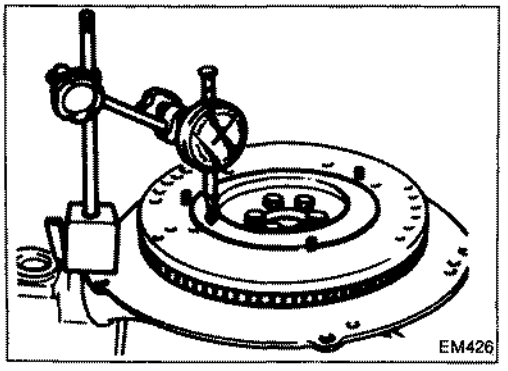


4. Measure connecting rod side clearance.

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)

Assembly (Cont'd)

CYLINDER HEAD GASKET

- Refer to "Selecting cylinder head gasket".
- When replacing or repairing cylinder block, piston, connecting rod and crankshaft, select gasket.

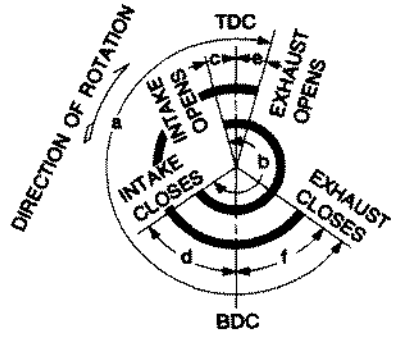
General Specifications

GENERAL SPECIFICATIONS

Engine	GA13DS	GA14DS	GA16DS & GA16DE
Classification	Gasoline		
Cylinder arrangement	4, in-line		
Displacement cm^3 (cu in)	1,295 (79.02)	1,392 (84.94)	1,597 (97.45)
Bore × stroke mm (in)	71.0 x 81.8 (2.795 x 3.220)	73.6 x 81.8 (2.898 x 3.220)	76.0 × 88.0 (2.992 × 3.465)
Valve arrangement	D.O.H.C.		
Firing order	1-3-4-2		
Number of piston rings			
Compression	2		
Oil	1		
Number of main bearings	5		
Compression ratio	9.5	9.5	9.5, 9.8*

Valve timing

* For Europe and Gulf standard



EM120

Unit: degree

	a	b	c	d	e	f
GA13DS, GA16DS, and GA14DS without E.G.R.	222°	222°	0°	42°	0°	42°
GA14DS with E.G.R.	214°	214°	2°	32°	–12°	46°
GA16DE	222°	236°	–2°	58°	0°	42°

Inspection and Adjustment

ENGINE COMPRESSION PRESSURE

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

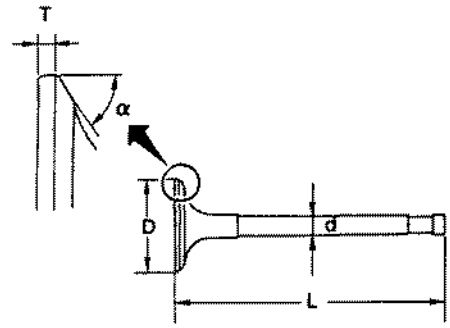
CYLINDER HEAD

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

		GA13DS	GA14DS	GA16DS GA16DE
Valve head diameter "D"	Intake	26.4 - 26.6 (1.039 - 1.047)	28.9 - 29.1 (1.138 - 1.146)	29.9 - 30.1 (1.177 - 1.185)
	Exhaust	21.4 - 21.6 (0.843 - 0.850)	23.9 - 24.1 (0.941 - 0.949)	23.9 - 24.1 (0.941 - 0.949)
Valve length "L"	Intake	92.00 - 92.5 (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		0.9 - 1.1 (0.035 - 0.043)		
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)

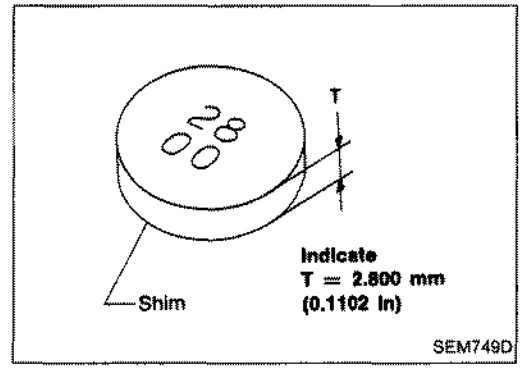
*: At a temperature of approximately 20°C (68°F)

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)	2.32
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)		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)		0.2 (0.008)	

Valve spring

Free height	mm (in)	41.19 (1.6217)
Pressure N (kg, lb) at height mm (in)	Standard	344.42 (35.12, 77.44) at 25.26 (0.9945)
	Limit	323.73 (33.01, 72.79) at 25.26 (0.9945)
Out-of-square	mm (in)	Less than 1.80 (0.0709)

Valve lifter

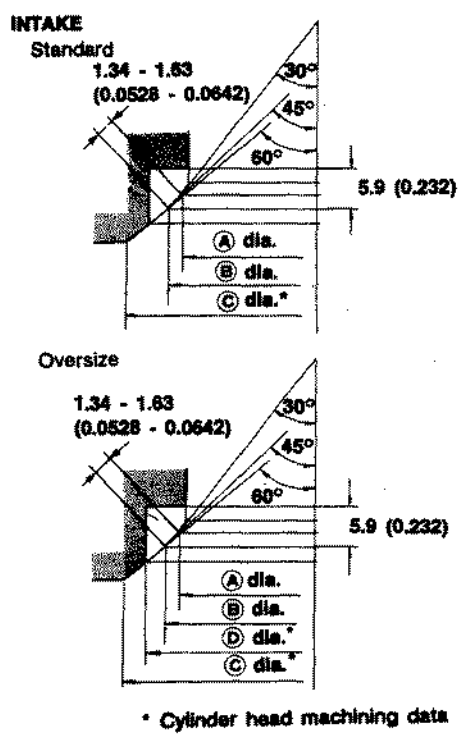
Unit: mm (in)

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)

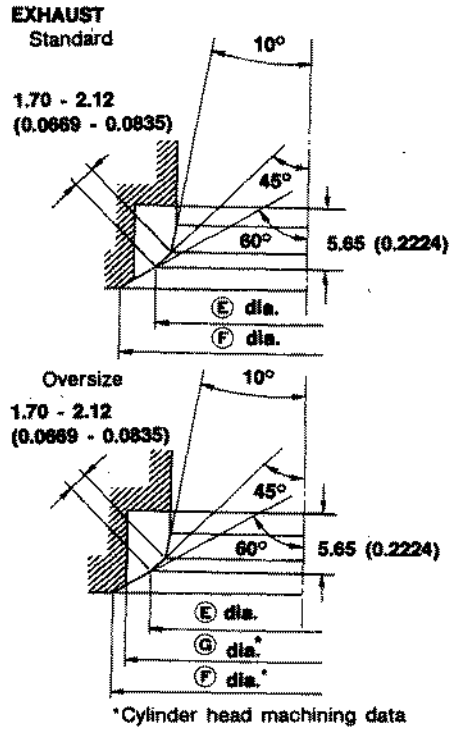
Inspection and Adjustment (Cont'd)

Valve seat

Unit: mm (in)



SEM573D



SEM574D

Dia.	GA13DS	GA14DS	GA16DS & GA16DE
Ⓐ	23.9 - 24.1 (0.941 - 0.949)	26.4 - 26.6 (1.039 - 1.047)	27.4 - 27.6 (1.079 - 1.087)
Ⓑ	26.0 - 26.2 (1.024 - 1.031)	28.5 - 28.7 (1.122 - 1.130)	29.5 - 29.7 (1.161 - 1.169)
Ⓒ	27.7 - 27.9 (1.091 - 1.098)	30.2 - 30.4 (1.189 - 1.197)	31.9 - 32.1 (1.256 - 1.264)
Ⓓ	28.000 - 28.016 (1.1024 - 1.1030)	30.500 - 30.516 (1.2008 - 1.2014)	31.500 - 31.516 (1.2402 - 1.2408)
Ⓔ	21.0 - 21.2 (0.827 - 0.835)	23.5 - 23.7 (0.925 - 0.933)	23.5 - 23.7 (0.925 - 0.933)
Ⓕ	22.7 - 22.9 (0.894 - 0.902)	25.2 - 25.4 (0.992 - 1.000)	25.2 - 25.4 (0.992 - 1.000)
Ⓖ	23.000 - 23.016 (0.9055 - 0.9061)	25.500 - 25.516 (1.0039 - 1.0046)	25.500 - 25.516 (1.0039 - 1.0046)

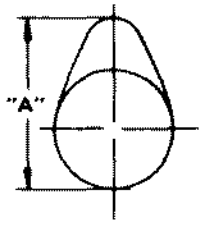
Inspection and Adjustment (Cont'd)

CAMSHAFT AND CAMSHAFT BEARING

Camshaft

Unit: mm (in)

Engine model		GA13DS, GA16DS, and GA14DS with E.G.R.	GA16DE	GA14DS with E.G.R.
Cam height "A"	Intake	39.880 - 40.070 (1.5701 - 1.5776)	40.600 - 40.790 (1.5984 - 1.6059)	39.380 - 39.570 (1.5504 - 1.5579)
	Exhaust	39.880 - 40.070 (1.5701 - 1.5776)	39.880 - 40.070 (1.5701 - 1.5776)	39.380 - 39.570 (1.5504 - 1.5579)
Cam wear limit		0.20 (0.0079)		



EM671

Camshaft bearing

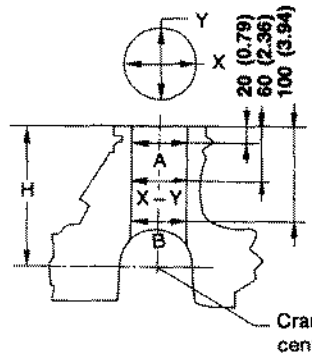
Unit: mm (in)

		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 [T.I.R.*]		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

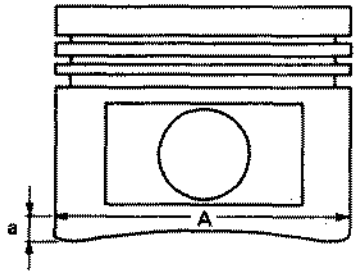
	GA13DS	GA14DS	GA16DS GA16DE	Limit
	Standard			
Surface flatness	Less than 0.03 (0.0012)			0.1 (0.004)
Height "H" (nominal)	213.95 - 214.05 (8.4232 - 8.4271)			—
Standard Inner diameter Grade No. 1	71.000 - 71.010 (2.7953 - 2.7957)	73.600 - 73.610 (2.7986 - 2.8980)	76.000 - 76.010 (2.9921 - 2.9925)	0.2 (0.008)
Grade No. 2	71.010 - 71.020 (2.7957 - 2.7961)	73.610 - 73.620 (2.8980 - 2.8984)	76.010 - 76.020 (2.9925 - 2.9929)	
Grade No. 3	71.020 - 71.030 (2.7961 - 2.7965)	73.620 - 73.630 (2.8984 - 2.8988)	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)

Inspection and Adjustment (Cont'd)

PISTON, PISTON RING AND PISTON PIN

Piston

Unit: mm (in)



SEM658D

	GA13DS	GA14DS	GA16DS GA16DE
Piston skirt diameter "A"			
Standard			
Grade No. 1	70.975 - 70.985 (2.7943 - 2.7947)	73.575 - 73.585 (2.8966 - 2.8970)	75.975 - 75.985 (2.9911 - 2.9915)
Grade No. 2	70.985 - 70.995 (2.7947 - 2.7951)	73.585 - 73.595 (2.8970 - 2.8974)	75.985 - 75.995 (2.9915 - 2.9919)
Grade No. 3	70.995 - 71.005 (2.7951 - 2.7955)	73.595 - 73.605 (2.8974 - 2.8978)	75.995 - 76.005 (2.9919 - 2.9923)
0.5 (0.020) oversize (service)	71.475 - 71.505 (2.8140 - 2.8152)	74.075 - 74.105 (2.9163 - 2.9175)	76.475 - 76.505 (3.0108 - 3.0120)
1.0 (0.039) oversize (service)	71.975 - 72.005 (2.8337 - 2.8348)	74.575 - 74.605 (2.9360 - 2.9372)	76.975 - 77.005 (3.0305 - 3.0317)
"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	0.040 - 0.080 (0.0016 - 0.0031)	0.2 (0.008)
	2nd	0.030 - 0.070 (0.0012 - 0.0028)	
End gap	Top	0.20 - 0.35 (0.0079 - 0.0138)	1.0 (0.039)
	2nd	0.37 - 0.52 (0.0146 - 0.0205)	
	Oil	0.20 - 0.60 (0.0079 - 0.0236)	

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

Inspection and Adjustment (Cont'd)

CRANKSHAFT

Unit: mm (in)

	GA13DS	GA14DS	GA16DS 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"	40.85 - 40.95 (1.6083 - 1.6122)	40.85 - 40.95 (1.6083 - 1.6122)	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 [T.I.R.*]			
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)	1.957 - 1.965 (0.0770 - 0.0774)
0.50 (0.0197)	2.082 - 2.090 (0.0820 - 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)	—
	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)	1.542 - 1.546 (0.0607 - 0.0609)	8
	0.12 (0.0047)	1.562 - 1.566 (0.0615 - 0.0617)	12
	0.25 (0.0098)	1.627 - 1.631 (0.0641 - 0.0642)	25

Bearing clearance

Unit: mm (in)

Main bearing clearance	
Standard	0.018 - 0.042 (0.0007 - 0.0017)
Limit	0.1 (0.004)
Connecting rod bearing clearance	
Standard	0.010 - 0.035 (0.0004 - 0.0014)
Limit All	0.1 (0.004)

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Flywheel Runout [T.I.R.*]	Less than 0.15 (0.0059)

*: 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		D.O.H.C.
Firing order		1-3-4-2
Number of piston rings		
Compression		2
Oil		1
Number of main bearings		5
Compression ratio		
SR20DE		10.0
SR20DET		8.3

COMPRESSION PRESSURE

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

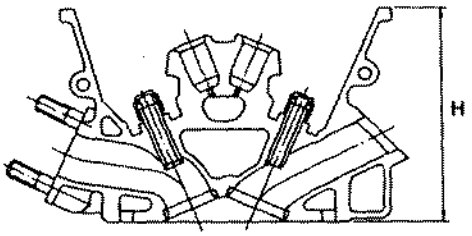
	SR20DE	SR20DET
Standard	1,275 (12.75, 13.0, 185)	1,128 (11.28, 11.5, 164)
Minimum	1,079 (10.79, 11.0, 156)	932 (9.32, 9.5, 135)
Differential limit between cylinders	98 (0.98, 1.0, 14)	

Inspection and Adjustment

CYLINDER HEAD

Unit: mm (in)

	Standard	Limit
Head surface distortion	Less than 0.03 (0.0012)	0.1 (0.004)

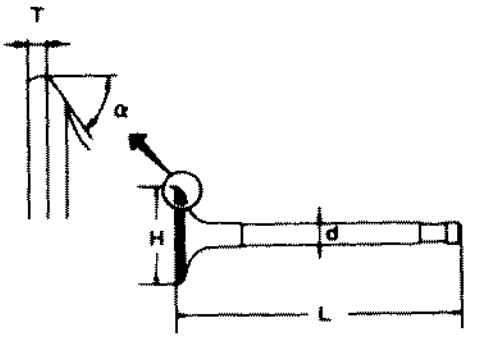


Nominal cylinder head height:
H = 136.9 - 137.1 (5.390 - 5.398)

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	
SR20DE	101.19 - 101.61 (3.9839 - 4.0004)
SR20DET	101.845 - 102.355 (4.0096 - 4.0297)
Exhaust	
SR20DE	102.11 - 102.53 (4.0201 - 4.0366)
SR20DET	102.765 - 103.275 (4.0459 - 4.0659)
Valve stem diameter "d"	
Intake	5.965 - 5.980 (0.2348 - 0.2354)
Exhaust	6.945 - 6.960 (0.2734 - 0.2740)
Valve seat angle "α"	
Intake	45°15' - 45°45'
Exhaust	
Valve margin "T"	
Intake	
SR20DE	1.1 (0.043)
SR20DET	1.3 (0.051)
Exhaust	
SR20DE	1.3 (0.051)
SR20DET	1.5 (0.059)
Valve margin "T" limit	More than 0.5 (0.020)
Valve stem end surface grinding limit	Less than 0.2 (0.008)

Inspection and Adjustment (Cont'd)

Valve spring

	SR20DE	SR20DET	
		Inner	Outer
Free height mm (in)	49.36 (1.9433)	40.49 (1.5941)	47.74 (1.8795)
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)	154.95 - 174.76 (15.8 - 17.82, 34.84 - 39.29) at 20.6 (0.811)	451.51 - 504.18 (46.04 - 51.41, 101.52 - 113.36) at 27.9 (1.098)
Limit	549.2 (56.0, 123.5) at 30.0 (1.181)	147.1 (15.0, 33.1) at 20.6 (0.811)	428.6 (43.7, 96.4) at 27.9 (1.098)
Out-of-square mm (in)	Less than 2.2 (0.087)	Less than 1.8 (0.071)	Less than 2.1 (0.083)

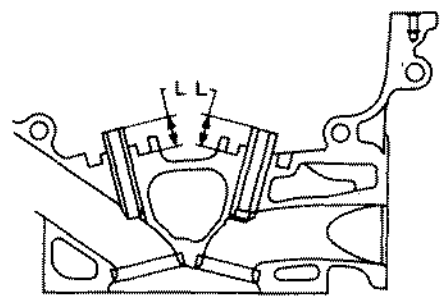
Hydraulic lash adjuster (H.L.A.)

Unit: mm (in)

H.L.A. outer diameter	16.980 - 16.993 (0.6685 - 0.6690)
H.L.A. guide inner diameter	17.000 - 17.020 (0.6693 - 0.6701)
Clearance between H.L.A. and H.L.A. guide	0.007 - 0.040 (0.0003 - 0.0016)

Valve guide

Unit: mm (in)



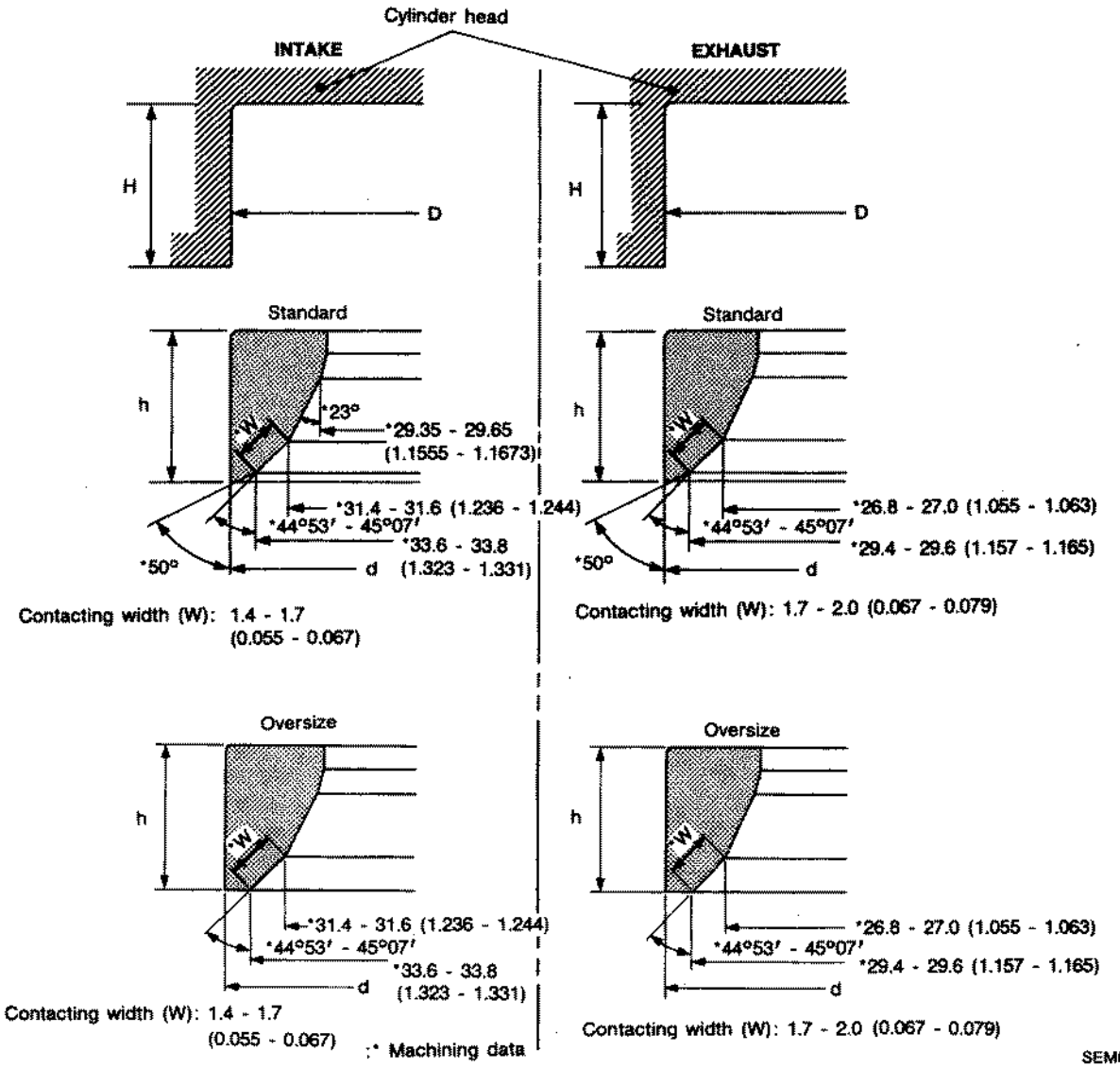
SEM083D

		Standard	Service
Valve guide Outer diameter	Intake	10.023 - 10.034 (0.3946 - 0.3950)	10.223 - 10.234 (0.4025 - 0.4029)
	Exhaust	11.023 - 11.034 (0.4340 - 0.4344)	11.223 - 11.234 (0.4418 - 0.4423)
Valve guide inner diameter (Finished size)	Intake	6.000 - 6.018 (0.2362 - 0.2369)	
	Exhaust	7.000 - 7.018 (0.2756 - 0.2763)	
Cylinder head valve guide hole diameter	Intake	9.975 - 9.996 (0.3927 - 0.3935)	10.175 - 10.196 (0.4006 - 0.4014)
	Exhaust	10.975 - 10.996 (0.4321 - 0.4329)	11.175 - 11.196 (0.4400 - 0.4408)
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)	0.1 (0.004)
	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

Unit: mm (in)



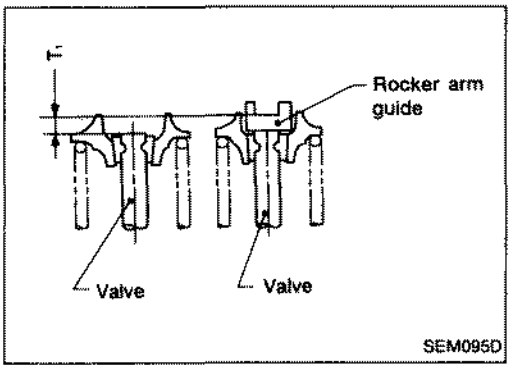
		Standard	Service
Cylinder head seat recess diameter (D)	In.	35.000 - 35.016 (1.3780 - 1.3786)	35.500 - 35.516 (1.3976 - 1.3983)
	Ex.	31.000 - 31.016 (1.2205 - 1.2211)	31.500 - 31.516 (1.2402 - 1.2408)
Valve seat interference fit	In.	0.064 - 0.096 (0.0025 - 0.0038)	
	Ex.	0.064 - 0.096 (0.0025 - 0.0038)	
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)	5.4 - 5.5 (0.213 - 0.217)

Inspection and Adjustment (Cont'd)

Valve clearance adjustment (For SR20DE)

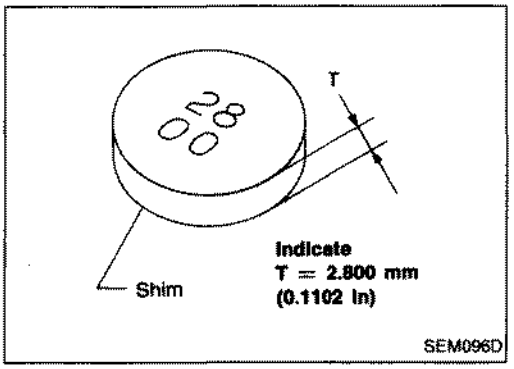
Unit: mm (in)

Valve clearance	
Intake	0 (0)
Exhaust	0 (0)
Valve clearance	
Adjustment valve limit $(T) - (T_1) =$	$-0.025\ (-0.0010) \leqq$ $[(T) - (T_1)] \leqq 0.025\ (0.0010)$



Available shims (For SR20DE)

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



Inspection and Adjustment (Cont'd)

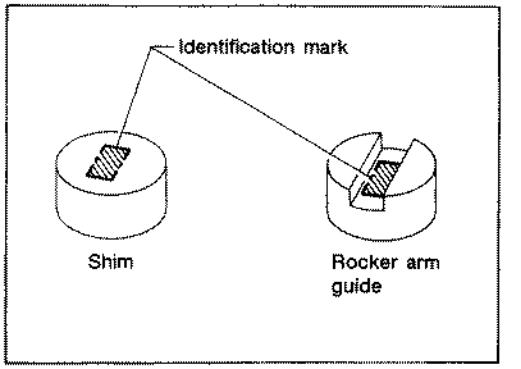
Valve clearance adjustment (For SR20DET)

Unit: mm (in)

	Hot	Cold*
Valve clearance		
Intake & Exhaust	0.30 - 0.35 (0.012 - 0.014)	0.21 - 0.26 (0.008 - 0.010)
Camshaft clearance		
Intake & Exhaust	0.20 - 0.23 (0.008 - 0.009)	0.14 - 0.17 (0.006 - 0.007)

*: 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.



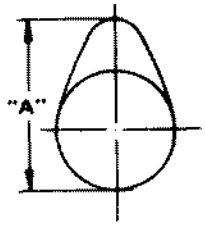
Available shims and rocker arm guides (For SR20DET)

Thickness mm (in)	Identification mark	Thickness mm (in)	Identification mark	Thickness mm (in)	Identification mark
1.50 (0.0591)	1	2.175 (0.0856)	28	2.85 (0.1122)	55
1.525 (0.0600)	2	2.20 (0.0866)	29	2.875 (0.1132)	56
1.55 (0.0610)	3	2.225 (0.0876)	30	2.90 (0.1142)	57
1.575 (0.0620)	4	2.25 (0.0886)	31	2.925 (0.1152)	58
1.60 (0.0630)	5	2.275 (0.0896)	32	2.95 (0.1161)	59
1.625 (0.0640)	6	2.30 (0.0906)	33	2.975 (0.1171)	60
1.65 (0.0650)	7	2.325 (0.0915)	34	3.00 (0.1181)	61
1.675 (0.0659)	8	2.35 (0.0925)	35	3.025 (0.1191)	62
1.70 (0.0669)	9	2.375 (0.0935)	36	3.05 (0.1201)	63
1.725 (0.0679)	10	2.40 (0.0945)	37	3.075 (0.1211)	64
1.75 (0.0689)	11	2.425 (0.0955)	38	3.10 (0.1220)	65
1.775 (0.0699)	12	2.45 (0.0965)	39	3.125 (0.1230)	66
1.80 (0.0709)	13	2.475 (0.0974)	40	3.150 (0.1240)	67
1.825 (0.0719)	14	2.50 (0.0984)	41	3.175 (0.1250)	68
1.85 (0.0728)	15	2.525 (0.0994)	42	3.20 (0.1260)	69
1.875 (0.0738)	16	2.55 (0.1004)	43	3.225 (0.1270)	70
1.90 (0.0748)	17	2.575 (0.1014)	44	3.25 (0.1280)	71
1.925 (0.0758)	18	2.60 (0.1024)	45	3.275 (0.1289)	72
1.95 (0.0768)	19	2.625 (0.1033)	46	3.30 (0.1299)	73
1.975 (0.0778)	20	2.65 (0.1043)	47	3.325 (0.1309)	74
2.00 (0.0787)	21	2.675 (0.1053)	48	3.35 (0.1319)	75
2.025 (0.0797)	22	2.70 (0.1063)	49	3.375 (0.1329)	76
2.05 (0.0807)	23	2.725 (0.1073)	50	3.40 (0.1339)	77
2.075 (0.0817)	24	2.75 (0.1083)	51	3.425 (0.1348)	78
2.10 (0.0827)	25	2.775 (0.1093)	52	3.45 (0.1358)	79
2.125 (0.0837)	26	2.80 (0.1102)	53	3.475 (0.1368)	80
2.15 (0.0846)	27	2.825 (0.1112)	54	3.50 (0.1378)	81

CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

	Standard	Limit
Camshaft journal to bearing clearance	0.045 - 0.086 (0.0018 - 0.0034)	0.12 (0.0047)
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 [T.I.R.*]	Less than 0.02 (0.0008)	0.1 (0.004)
Camshaft sprocket runout [T.I.R.*]	Less than 0.25 (0.0098)	—
Camshaft end play	0.055 - 0.139 (0.0022 - 0.0055)	0.20 (0.0079)

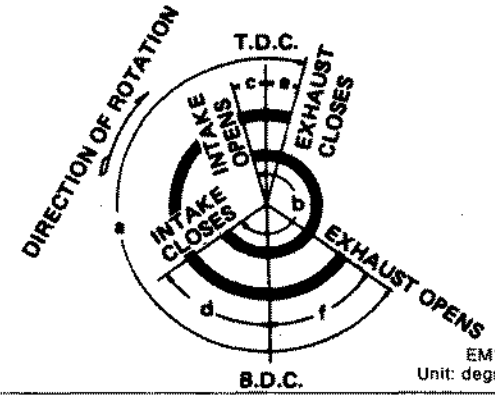


EM671

Cam height "A"	
Intake	
SR20DE	38.408 - 38.598 (1.5121 - 1.5196)
SR20DET	38.648 - 38.838 (1.5216 - 1.5291)
Exhaust	
SR20DE	37.920 - 38.110 (1.4929 - 1.5004)
SR20DET	38.648 - 38.838 (1.5216 - 1.5291)
Wear limit of cam height	0.2 (0.008)
Valve lift	
Intake	
SR20DE & SR20DET	10.0 (0.394)
Exhaust	
SR20DE	9.2 (0.362)
SR20DET	10.0 (0.394)

*Total indicator reading

Valve timing



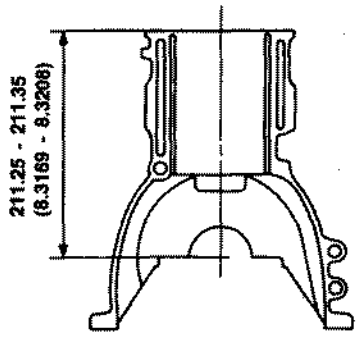
EM120
Unit: degree

	a	b	c	d	e	f
SR20DE	240°	248°	9°	59°	9°	51°
SR20DET	248°	248°	14°	54°	8°	60°

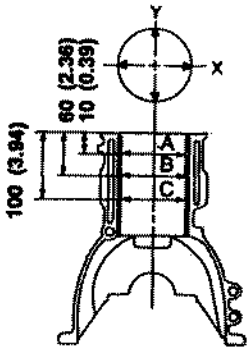
Inspection and Adjustment (Cont'd)

CYLINDER BLOCK

Unit: mm (in)



SEM008D



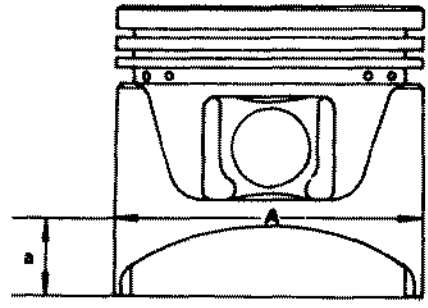
SEM686D

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	14.0 (0.551)
Piston clearance to cylinder block	0.010 - 0.030 (0.0004 - 0.0012)
Piston pin hole diameter	21.987 - 21.999 (0.8656 - 0.8661)

Inspection and Adjustment (Cont'd)

Piston ring

Unit: mm (in)

Side clearance	
Top	
Standard	0.045 - 0.080 (0.0018 - 0.0031)
Limit	0.2 (0.008)
2nd	
Standard	0.030 - 0.065 (0.0012 - 0.0026)
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 - 0.004 (0 - 0.0002)
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)

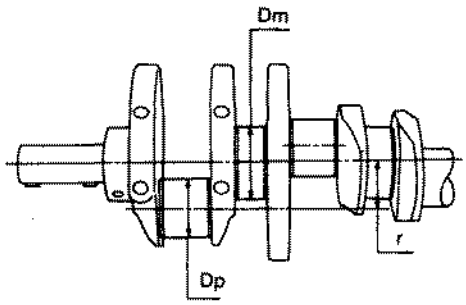
*After installing in connecting rod

Inspection and Adjustment (Cont'd)

CRANKSHAFT

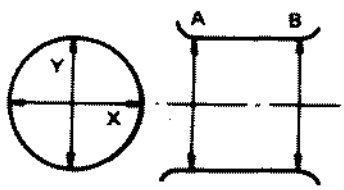
Unit: mm (in)

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	
SR20DE (Main & pin journal)	Less than 0.005 (0.0002)
SR20DET (Main journal)	Less than 0.005 (0.0002)
SR20DET (Pin journal)	Less than 0.0025 (0.0001)
Taper (A – B)	
Standard	
SR20DE (Main & pin journal)	Less than 0.005 (0.0002)
SR20DET (Main journal)	Less than 0.005 (0.0002)
SR20DET (Pin journal)	Less than 0.0025 (0.0001)
Runout [T.I.R.]	
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)



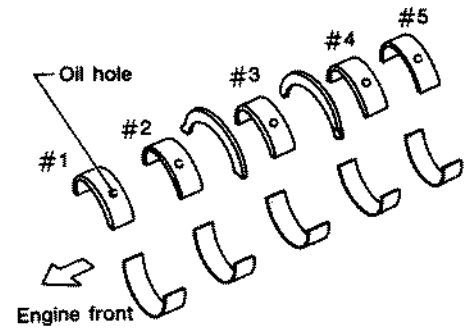
SEM954C

Out-of-round X — Y
Taper A — B



EM715

AVAILABLE MAIN BEARING



SEM685D

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)		No color (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.

Inspection and Adjustment (Cont'd)

AVAILABLE CONNECTING ROD BEARING

Connecting rod bearing

Standard size

Unit: mm (in)

Grade number	Thickness "T"		Width "W"	Identification color (mark)
	SR20DE	SR20DET		
0	1.500 - 1.503 (0.0591 - 0.0592)	1.495 - 1.498 (0.0589 - 0.0590)	16.9 - 17.1 (0.665 - 0.673)	No color (A)
1	1.503 - 1.506 (0.0592 - 0.0593)	1.498 - 1.501 (0.0590 - 0.0591)		Black (B)
2	1.506 - 1.509 (0.0593 - 0.0594)	1.501 - 1.504 (0.0591 - 0.0592)		Brown (C)

Undersize

Unit: mm (in)

Undersize	Thickness "T"		Crank pin journal diameter "Dp"
	SR20DE	SR20DET	
0.08 (0.0031)	1.541 - 1.549 (0.0607 - 0.0610)	1.536 - 1.544 (0.0605 - 0.0608)	Grind so that bearing clearance is the specified value.
0.12 (0.0047)	1.561 - 1.569 (0.0615 - 0.0618)	1.556 - 1.564 (0.0613 - 0.0616)	
0.25 (0.0098)	1.626 - 1.634 (0.0640 - 0.0643)	1.621 - 1.629 (0.0638 - 0.0641)	

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	
SR20DE	0.020 - 0.045 (0.0008 - 0.0018)
SR20DET	0.030 - 0.055 (0.0012 - 0.0022)
Limit	0.09 (0.0035)

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Camshaft sprocket runout limit [T.I.R.]	0.25 (0.0098)
Flywheel runout limit [T.I.R.]	0.1 (0.004)

General Specifications

Cylinder arrangement		4, in-line
Displacement	cm^3 (cu in)	988 (60.29)
Bore and stroke	mm (in)	73 x 59 (2.87 x 2.32)
Valve arrangement		S.O.H.C.
Firing order		1-3-4-2
Number of piston rings	Compression	2
	Oil	1
Number of main bearings		5
Compression ratio		9.0

Inspection and Adjustment

ENGINE COMPRESSION PRESSURE

Unit: kPa (bar, kg/cm^2, psi)/350 rpm

Standard	1,245 (12.45, 12.7, 181)
Minimum	981 (9.81, 10.0, 142)
Difference limit between cylinders	98 (0.98, 1.0, 14)

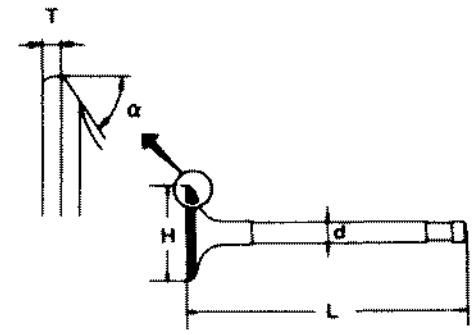
CYLINDER HEAD

Unit: mm (in)

	Standard	Limit
Head surface flatness	Less than 0.03 (0.0012)	0.1 (0.004)
Height	119.9 - 120.1 (4.720 - 4.728)	—

VALVE

Unit: mm (in)



SEM188

Valve head diameter "D"	Intake	35 (1.38)
	Exhaust	29 (1.14)
Valve length "L"	Intake	118.98 - 119.28 (4.6842 - 4.6961)
	Exhaust	118.28 - 118.88 (4.6567 - 4.6803)
Valve stem diameter "d"	Intake	6.970 - 6.985 (0.2744 - 0.2750)
	Exhaust	6.945 - 6.960 (0.2734 - 0.2740)
Valve seat angle "α"	Intake	45°15' - 45°45'
	Exhaust	
Valve margin "T" Limit		0.5 (0.020)
Valve stem end surface grinding limit		0.2 (0.008)
Valve clearance (Hot) [*1Cold]	Intake	0.28 (0.011) [*0.22 (0.009)]
	Exhaust	0.28 (0.011) [*0.22 (0.009)]

*: Used as approximate values during engine assembly, clearances should ultimately be adjusted to the above hot values.

Inspection and Adjustment (Cont'd)

Valve spring

Free height	mm (in)	46.70 (1.8386)
Pressure N (kg, lb) at height mm (in)		
Standard		568.8 (58.0, 127.9) at 30.2 (1.189)
Limit		521.7 (53.2, 117.3) at 30.2 (1.189)
Out-of-square "S"	mm (in)	2.0 (0.079)

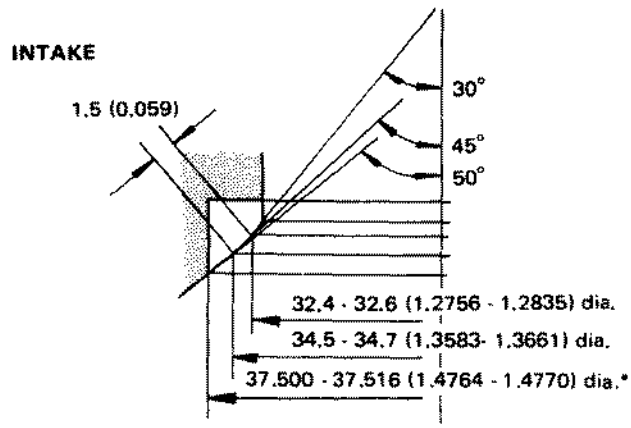
Valve guide

Unit: mm (in)

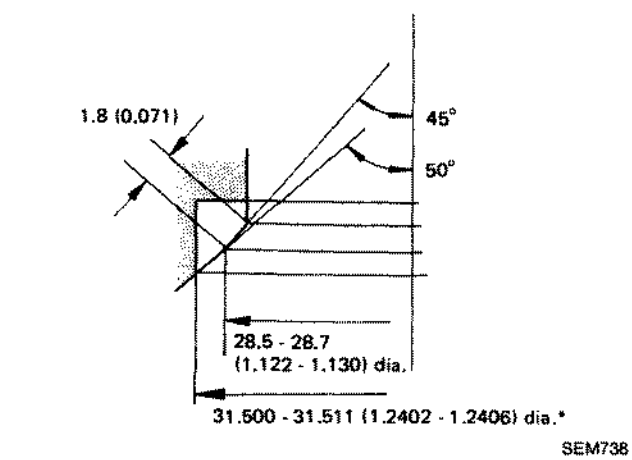
		Standard	Service
Valve guide Outer diameter		12.033 - 12.044 (0.4737 - 0.4742)	12.256 - 12.274 (0.4825 - 0.4832)
Inner diameter [Finished size]		7.005 - 7.020 (0.2758 - 0.2764)	
Cylinder head valve guide hole diameter		11.970 - 11.988 (0.4713 - 0.4720)	12.200 - 12.211 (0.4803 - 0.4807)
Interference fit of valve guide		0.045 - 0.074 (0.0018 - 0.0029)	
		Standard	Max. tolerance
Stem to guide clearance	Intake	0.02 - 0.05 (0.0008 - 0.0020)	0.10 (0.0039)
	Exhaust	0.045 - 0.075 (0.0018 - 0.0030)	
Valve deflection limit (Dial indicator reading)		0.2 (0.008)	

Valve seat

Unit: mm (in)



SEM737



SEM738

* Cylinder head machining data for 0.5 (0.020) oversize

Rocker shaft and rocker arm

Unit: mm (in)

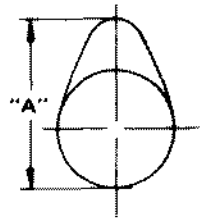
Rocker shaft	
Outer diameter	19.979 - 20.000 (0.7866 - 0.7874)
Rocker arm	
Inner diameter	20.007 - 20.028 (0.7877 - 0.7885)
Clearance between rocker arm and rocker shaft	0.007 - 0.049 (0.0003 - 0.0019)

Inspection and Adjustment (Cont'd)

CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

		Standard	Max. tolerance
Camshaft journal to bearing clearance	No. 1, 3, 5	0.035 - 0.076 (0.0014 - 0.0030)	0.15 (0.0059)
	No. 2, 4	0.078 - 0.119 (0.0031 - 0.0047)	0.20 (0.0079)
Inner diameter of camshaft bearing		42.000 - 42.025 (1.6535 - 1.6545)	—
Outer diameter of camshaft journal	No. 1, 3, 5	41.949 - 41.965 (1.6515 - 1.6522)	—
	No. 2, 4	41.906 - 41.922 (1.6498 - 1.6505)	
Camshaft bend [T.I.R.*]		Less than 0.02 (0.0008)	0.1 (0.004)
Camshaft end play		0.15 - 0.29 (0.0059 - 0.0114)	0.4 (0.016)

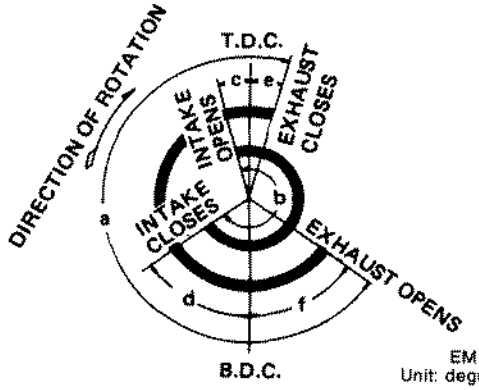


EM671

Cam height "A"	Intake	35.71 - 35.96 (1.4059 - 1.4157)
	Exhaust	35.43 - 35.68 (1.3949 - 1.4047)
Wear limit of cam height		0.2 (0.008)

*Total indicator reading

Valve timing



EM120
Unit: degree

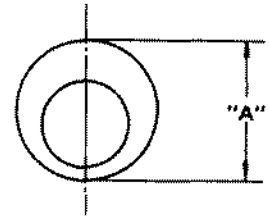
a	b	c	d	e	f
237°	236°	17°	39°	0°	57°

JACKSHAFT AND JACKSHAFT BUSHING

Unit: mm (in)

		Standard	Max. tolerance
Jackshaft journal to bushing clearance	FR	0.020 - 0.098 (0.0008 - 0.0039)	0.20 (0.0079)
	RR	0.020 - 0.098 (0.0008 - 0.0039)	
Inner diameter of jackshaft bushing	FR	32.020 - 32.085 (1.2606 - 1.2632)	
	RR	28.620 - 28.685 (1.1268 - 1.1293)	
Outer diameter of jackshaft journal	FR	31.987 - 32.000 (1.2593 - 1.2598)	
	RR	28.587 - 28.600 (1.1255 - 1.1260)	
Jackshaft end play		0.045 - 0.105 (0.0018 - 0.0041)	—

Fuel pump cam

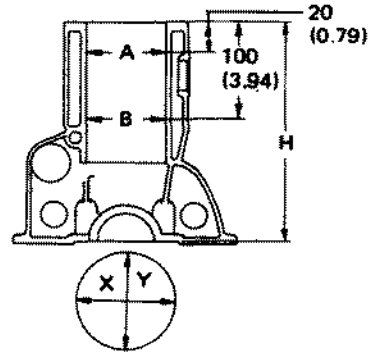


SEM734

Cam height "A"	27.7 - 27.8 (1.091 - 1.094)	—

CYLINDER BLOCK

Unit: mm (in)



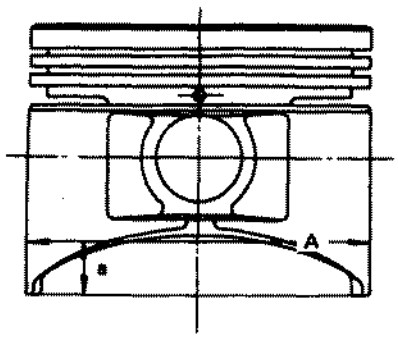
SEM378B

Surface flatness	Standard	Less than 0.05 (0.0020)
	Limit	0.10 (0.0039)
Height "H"		188.95 - 189.05 (7.4390 - 7.4429)
Cylinder bore	Inner diameter	73.00 - 73.05 (2.8740 - 2.8760)
	Out-of-round (X – Y)	Less than 0.02 (0.0008)
	Taper (A – B)	Less than 0.015 (0.0006)
Difference in inner diameter between cylinders		Less than 0.05 (0.0020)

PISTON RING AND PISTON PIN

Piston

Unit: mm (in)



SEM646

Piston skirt diameter "A"	Standard		72.967 - 73.017 (2.8727 - 2.8747)
	Oversize for service	0.25 (0.0098)	73.217 - 73.287 (2.8826 - 2.8853)
		0.5 (0.020)	73.467 - 73.517 (2.8924 - 2.8944)
"a" dimension			10.6 (0.417)
Piston pin hole diameter			17.452 - 17.459 (0.6871 - 0.6874)
Piston clearance to cylinder block			0.023 - 0.043 (0.0009 - 0.0017)

Piston ring

Unit: mm (in)

		Standard	Limit
Side clearance	Top	0.040 - 0.073 (0.0016 - 0.0029)	0.2 (0.008)
	2nd	0.030 - 0.063 (0.0012 - 0.0025)	
Ring gap	Top	Type 1: 0.14 - 0.26 (0.0055 - 0.0102) Type 2: 0.20 - 0.30 (0.0079 - 0.0118)	1.0 (0.039)
	2nd	Type 1: 0.28 - 0.37 (0.0110 - 0.0146) Type 2: 0.15 - 0.25 (0.0059 - 0.0098)	
	Oil (rail ring)	0.20 - 0.60 (0.0079 - 0.0236)	

Type 1, Type 2: Refer to page EM-90.

Piston pin

Unit: mm (in)

Piston pin outer diameter	17.445 - 17.450 (0.6868 - 0.6870)
Piston pin to piston clearance	0.006 - 0.010 (0.0002 - 0.0004)
Interference fit of piston pin to connecting rod	0.017 - 0.038 (0.0007 - 0.0015)

CONNECTING ROD

Unit: mm (in)

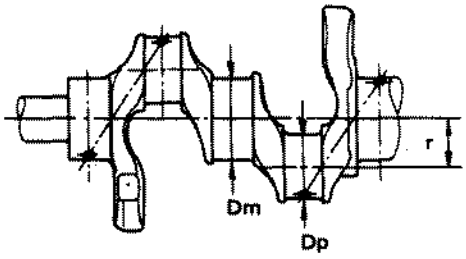
Center distance		131.5 (5.1772)
Bend, torsion [per 100 (3.94)]	Limit	0.05 (0.0020)
Piston pin bore dia.		17.412 - 17.428 (0.6855 - 0.6861)
Big end play	Standard	0.1 - 0.37 (0.0039 - 0.0146)
	Limit	0.5 (0.020)

Inspection and Adjustment (Cont'd)

CRANKSHAFT

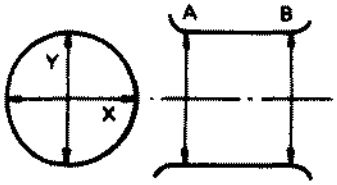
Unit: mm (in)

Main journal dia. "Dm"		49.940 - 49.964 (1.9661 - 1.9671)
Pin journal dia. "Dp"		39.961 - 39.974 (1.5733 - 1.5738)
Center distance "r"		29.5 (1.1614)
Out-of-round (X – Y) and taper (A – B)	Standard	Less than 0.01 (0.0004)
	Limit	0.03 (0.0012)
Bend [T.I.R.*]	Standard	Less than 0.04 (0.0016)
	Limit	0.08 (0.0031)
Free end play	Standard	0.05 - 0.165 (0.0020 - 0.0065)
	Limit	0.30 (0.0118)



SEM645

Out-of-round X – Y
Taper A – B



EM715

*: Total indicator reading

BEARING

Bearing clearance

Unit: mm (in)

	Standard	Limit
Main bearing clearance		
No. 1, 3, 5	0.031 - 0.056 (0.0012 - 0.0022)	0.10 (0.0039)
No. 2, 4	0.031 - 0.092 (0.0012 - 0.0036)	
Connecting rod bearing clearance	0.018 - 0.052 (0.0007 - 0.0020)	0.12 (0.0047)

Main bearing size

Unit: mm (in)

		Thickness
Standard		1.820 - 1.840 (0.0717 - 0.0724)
Undersize	0.25 (0.0098)	1.943 - 1.949 (0.0765 - 0.0767)

Connecting rod bearing size

Unit: mm (in)

		Thickness
Standard		1.499 - 1.508 (0.0590 - 0.0594)
Undersize	0.25 (0.0098)	1.615 - 1.623 (0.0636 - 0.0639)

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Camshaft pulley Runout [T.I.R.*]	Less than 0.1 (0.004)
Flywheel Runout [T.I.R.*]	Less than 0.15 (0.0059)

*: Total indicator reading

Inspection and Adjustment — CD17

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

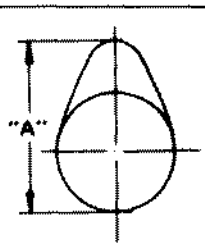
Unit: mm (in)

Head surface flatness	
Standard	Less than 0.05 (0.0020)
Limit	0.1 (0.004)
Nominal cylinder head height	116.6 - 117.0 (4.591 - 4.606)

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	0.06 - 0.17 (0.0024 - 0.0067)	0.17 (0.0067)

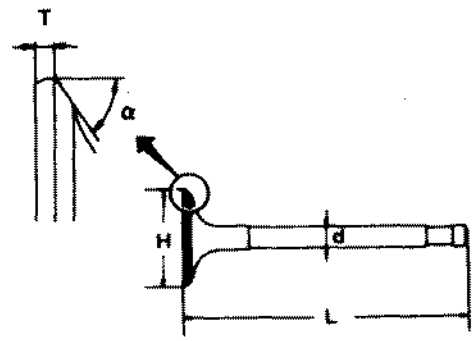


EM671

Cam height "A"	
Intake	44.45 - 44.50 (1.7500 - 1.7520)
Exhaust	45.45 - 45.50 (1.7894 - 1.7913)
Wear limit of cam height	
Intake	44.300 (1.7441)
Exhaust	45.300 (1.7835)

VALVE

Unit: mm (in)



SEM188

Valve head diameter "D"	
Intake	36.00 (1.4173)
Exhaust	31.00 (1.2205)
Valve length "L"	
Intake & Exhaust	100.55 - 100.85 (3.9587 - 3.9705)
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)
Valve seat contact width	
Intake	1.7 (0.067)
Exhaust	1.8 (0.071)

Valve spring

Free height mm (in)		
Outer	46.40 (1.8268)	
Inner	43.20 (1.7008)	
	Standard	Limit
Assembled height mm/N (mm/kg, in/lb)		
Outer	39.5/150.0 (39.5/15.3, 1.555/33.7)	39.5/125.5 (39.5/12.8, 1.555/28.2)
Inner	36.0/85.3 (36.0/8.7, 1.417/19.2)	36.0/71.6 (36.0/7.3, 1.417/16.1)
Out-of-square "S" mm (in)		
Outer	2.1 (0.083)	
Inner	1.9 (0.075)	

Valve guide

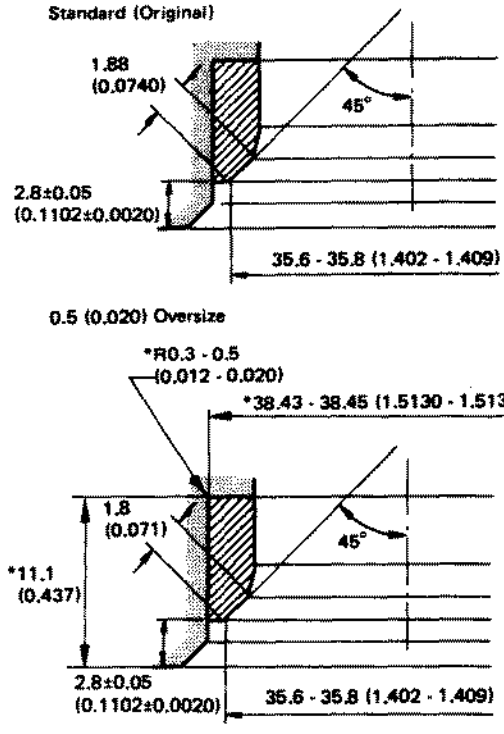
Unit: mm (in)

	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	10.975 - 10.996 (0.4321 - 0.4329)	11.185 - 11.196 (0.4404 - 0.4408)
Interference fit of valve guide	0.027 - 0.059 (0.0011 - 0.0023)	
	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

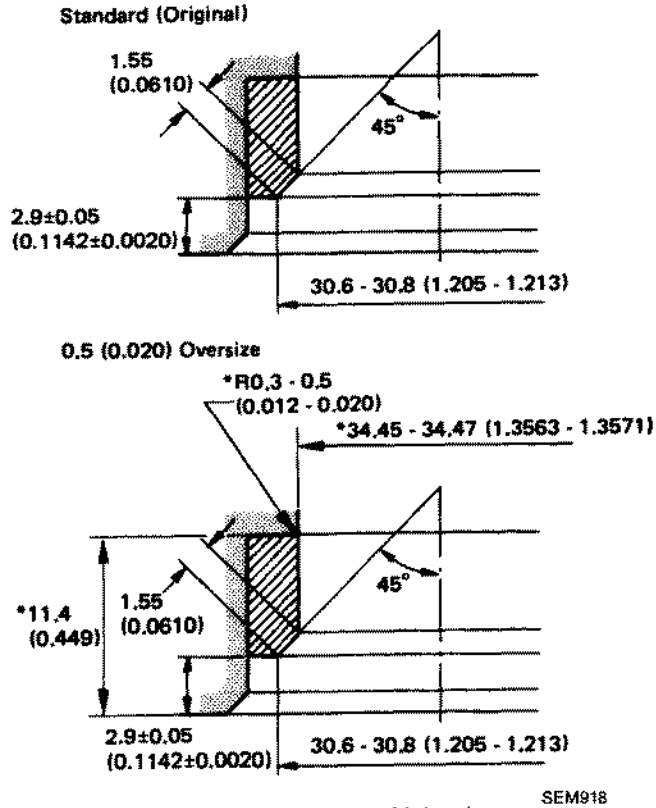
Unit: mm (in)

Intake



SEM917

Exhaust



SEM918

Inspection and Adjustment — CD17 (Cont'd)

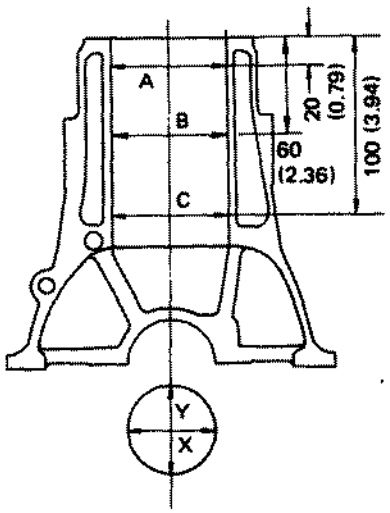
VALVE LIFTER

Unit: mm (in)

Valve lifter outer diameter	
Standard	34.959 - 34.975 (1.3763 - 1.3770)
Cylinder head valve lifter hole diameter	34.988 - 35.013 (1.3775 - 1.3785)
Clearance	
Standard	0.013 - 0.054 (0.0005 - 0.0021)
Limit	0.1 (0.004)

CYLINDER BLOCK

Unit: mm (in)



SEM902

		Standard	Limit
Surface flatness		Less than 0.05 (0.0020)	0.10 (0.0039)
Cylinder bore	Inner diameter	Grade No. 1 80.000 - 80.010 (3.1496 - 3.1500) Grade No. 2 80.010 - 80.020 (3.1500 - 3.1504) Grade No. 3 80.020 - 80.030 (3.1504 - 3.1508) Grade No. 4 80.030 - 80.040 (3.1508 - 3.1512) Grade No. 5 80.040 - 80.050 (3.1512 - 3.1516)	—
	Out-of-round (X – Y)	Less than 0.02 (0.0008)	0.04 (0.0016)
	Taper (A – B)	Less than 0.02 (0.0008)	0.04 (0.0016)
Difference in inner diameter between cylinders		Less than 0.05 (0.0020)	0.2 (0.008)
Piston to cylinder clearance		0.05 - 0.07 (0.0020 - 0.0028)	—
Feeler gauge extracting force [with gauge thickness 0.06 mm (0.0024 in)] N (kg, lb)		7.8 - 14.7 (0.8 - 1.5, 1.8 - 3.3)	—
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	79.94 - 79.95 (3.1472 - 3.1476)
		Grade No. 2	79.95 - 79.96 (3.1476 - 3.1480)
		Grade No. 3	79.96 - 79.97 (3.1480 - 3.1484)
		Grade No. 4	79.97 - 79.98 (3.1484 - 3.1488)
		Grade No. 5	79.98 - 79.99 (3.1488 - 3.1492)
	Oversize	Standard	79.96 - 80.01 (3.1480 - 3.1500)
		0.5 (0.020)	80.44 - 80.49 (3.1669 - 3.1689)
		1.0 (0.039)	80.94 - 80.99 (3.1866 - 3.1886)
Measure position (From Top)			60 (2.36)
Piston pin hole diameter			23.991 - 23.999 (0.9445 - 0.9448)

Piston ring

Unit: mm (in)

Side clearance	
Top	
Standard	0.020 - 0.060 (0.0008 - 0.0024)
Limit	0.20 (0.0079)
2nd	
Standard	0.040 - 0.080 (0.0016 - 0.0031)
Limit	0.15 (0.0059)
Oil	
Standard	0.030 - 0.070 (0.0012 - 0.0028)
Limit	0.10 (0.0039)
Ring gap	
Top	
Standard	0.20 - 0.35 (0.0079 - 0.0138)
Limit	1.0 (0.039)
2nd	
Standard	0.20 - 0.35 (0.0079 - 0.0138)
Limit	0.7 (0.028)
Oil	
Standard	0.30 - 0.45 (0.0118 - 0.0177)
Limit	0.6 (0.024)

Piston pin

Unit: mm (in)

Piston pin outer diameter	23.994 - 24.000 (0.9446 - 0.9449)
Interference fit of piston pin to piston	0 - 0.004 (0 - 0.0002)
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 0.15 (0.0059)
Torsion	
Standard	Less than 0.30 (0.0118)
Piston pin bore dia.	24.025 - 24.038 (0.9459 - 0.9464)
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.	44.961 - 44.974 (1.7701 - 1.7706)
Out-of-round (X – Y) and taper (A – B)	
Standard	Less than 0.005 (0.0002)
Limit	0.03 (0.0012)
Runout	
Standard	Less than 0.05 (0.0020)
Limit	0.03 (0.0012)
Free end play	
Standard	0.05 - 0.18 (0.0020 - 0.0071)
Limit	0.3 (0.012)

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)		Black
1	1.820 - 1.824 (0.0717 - 0.0718)		Brown
2	1.824 - 1.828 (0.0718 - 0.0720)	22 (0.87)	Green
3	1.828 - 1.832 (0.0720 - 0.0721)		Yellow
4	1.832 - 1.836 (0.0721 - 0.0723)		Blue

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)		Black
1	1.820 - 1.824 (0.0717 - 0.0718)		Brown
2	1.824 - 1.828 (0.0718 - 0.0720)	24 (0.94)	Green
3	1.828 - 1.832 (0.0720 - 0.0721)		Yellow
4	1.832 - 1.836 (0.0721 - 0.0723)		Blue

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)

Connecting rod bearing undersize

Unit: mm (in)

	Crank pin diameter
STD	44.961 - 44.974 (1.7701 - 1.7706)
0.08 (0.0031) undersize	44.881 - 44.894 (1.7670 - 1.7675)
0.12 (0.0047) undersize	44.841 - 44.854 (1.7654 - 1.7659)
0.25 (0.0098) undersize	44.711 - 44.724 (1.7603 - 1.7608)

Bearing clearance

Unit: mm (in)

Main bearing clearance	
Standard	0.039 - 0.065 (0.0015 - 0.0026)
Limit	0.12 (0.0047)
Connecting rod bearing clearance	
Standard	0.024 - 0.066 (0.0009 - 0.0026)
Limit	0.12 (0.0047)

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Camshaft sprocket	
Runout [T.I.R.*]	Less than 0.1 (0.004)
Flywheel	
Runout [T.I.R.*]	Less than 0.15 (0.0059)

*: Total indicator reading

Inspection and Adjustment — CD20

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

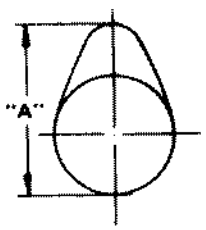
Unit: mm (in)

Head surface flatness	
Standard	Less than 0.05 (0.0020)
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)	—

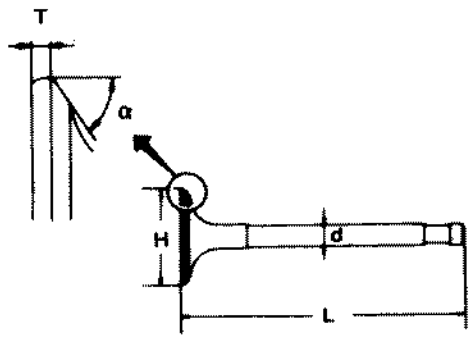


EM671

Cam height "A"	
Intake	49.20 - 49.30 (1.9370 - 1.9409)
Exhaust	49.15 - 49.25 (1.9350 - 1.9390)

VALVE

Unit: mm (in)



SEM188

Valve head diameter "D"	
Intake	39.0 - 39.2 (1.535 - 1.543)
Exhaust	32.0 - 32.2 (1.260 - 1.268)
Valve length "L"	
Intake	100.53 - 100.97 (3.9579 - 3.9752)
Exhaust	100.38 - 100.82 (3.9520 - 3.9693)
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 — CD20 (Cont'd)

Valve spring

Free height mm (in)	
Outer	43.2 (1.701)
Inner	38.2 (1.504)
	Standard
Assembled height mm/N (mm/kg, in/lb)	
Outer	36.1/164.8 (36.1/16.8, 1.421/37.0)
Inner	32.6/78.5 (32.6/8.0, 1.283/17.6)
Out-of-square "S" mm (in)	
Outer	2.1 (0.083)
Inner	1.9 (0.075)

Valve guide

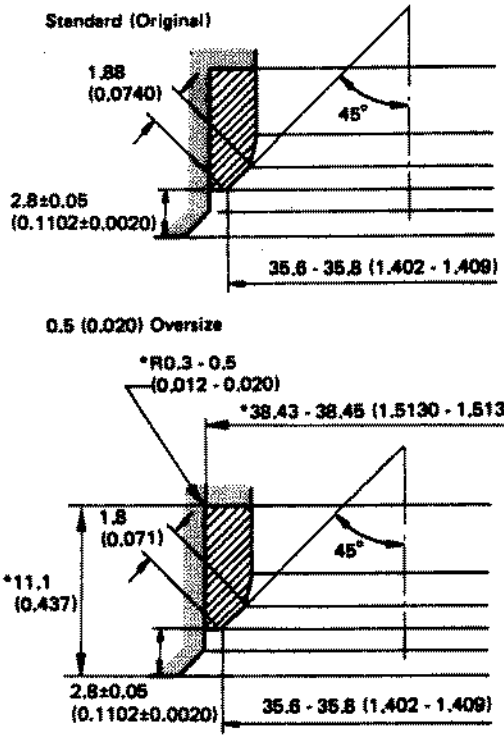
Unit: mm (in)

	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	10.975 - 10.996 (0.4321 - 0.4329)	11.185 - 11.196 (0.4404 - 0.4408)
Interference fit of valve guide	0.027 - 0.059 (0.0011 - 0.0023)	
	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

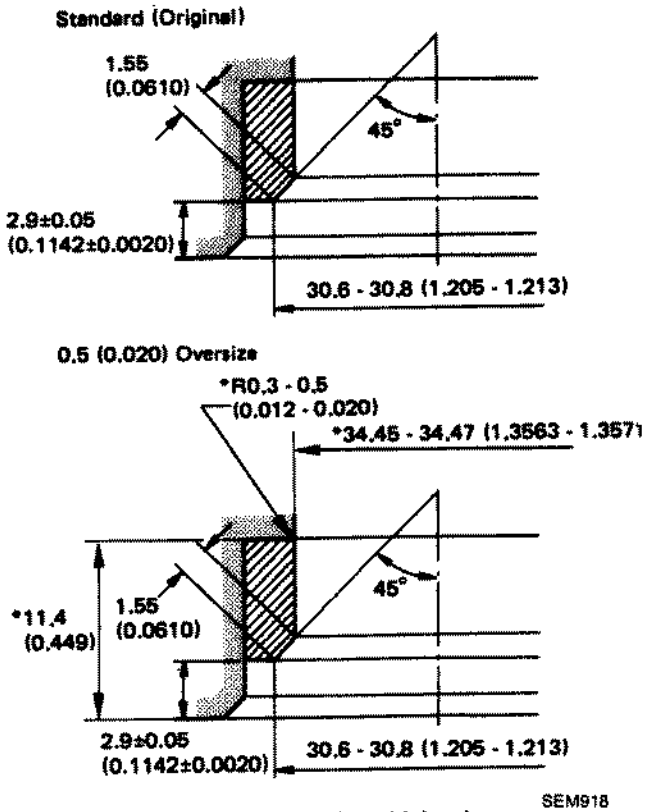
Unit: mm (in)

Intake



SEM917

Exhaust



SEM918

Inspection and Adjustment — CD20 (Cont'd)

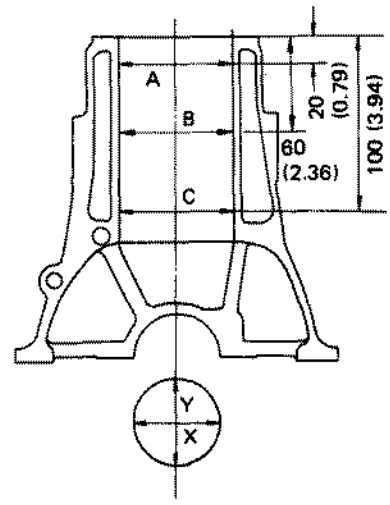
VALVE LIFTER

Unit: mm (in)

Valve lifter outer diameter	
Standard	34.959 - 34.975 (1.3763 - 1.3770)
Cylinder head valve lifter hole diameter	34.988 - 35.018 (1.3775 - 1.3787)
Clearance	
Standard	0.023 - 0.059 (0.0009 - 0.0023)
Limit	0.1 (0.004)

CYLINDER BLOCK

Unit: mm (in)



SEM902

		Standard	Limit
Surface flatness		Less than 0.05 (0.0020)	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 (3.3276 - 3.3279) 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)	—
	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		0.025 - 0.045 (0.0010 - 0.0018)	—
Feeler gauge extracting force [with gauge thickness 0.06 mm (0.0024 in)] N (kg, lb)		7.8 - 14.7 (0.8 - 1.5, 1.8 - 3.3)	—
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)	—

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)		Yellow
1	1.820 - 1.824 (0.0717 - 0.0718)		Green
2	1.824 - 1.828 (0.0718 - 0.0720)	20.0 (0.787) 17.8 (0.701)*	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)		Yellow
1	1.820 - 1.824 (0.0717 - 0.0718)		Green
2	1.824 - 1.828 (0.0718 - 0.0720)	27.95 (1.1004) 20.8 (0.819)*	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 - 0.061 (0.0012 - 0.0024)

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

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Flywheel	
Runout [T.I.R.*]	Less than 0.15 (0.0059)

*: Total indicator reading

Inspection and Adjustment — CD20 (Cont'd)

PISTON, PISTON RING AND PISTON PIN

Piston

Unit: mm (in)

Piston skirt diameter	Standard	Grade No. 1	84.465 - 84.475 (3.3254 - 3.3258)
		Grade No. 2	84.475 - 84.485 (3.3258 - 3.3262)
		Grade No. 3	84.485 - 84.495 (3.3262 - 3.3266)
		Grade No. 4	84.495 - 84.505 (3.3266 - 3.3270)
		Grade No. 5	84.505 - 84.515 (3.3270 - 3.3274)
	Oversize	0.25 (0.0098)	84.715 - 84.765 (3.3352 - 3.3372)
		0.5 (0.020)	84.965 - 85.015 (3.3451 - 3.3470)
Measure position (From Top)			62 (2.44)
Piston pin hole diameter			24.991 - 24.999 (0.9839 - 0.9842)

Piston ring

Unit: mm (in)

Side clearance		
Top		
Standard		0.060 - 0.095 (0.0024 - 0.0037)
Limit		0.10 (0.0039)
2nd		
Standard		0.040 - 0.075 (0.0016 - 0.0030)
Limit		0.10 (0.0039)
Oil		
Standard		0.030 - 0.070 (0.0012 - 0.0028)
Ring gap		
Top		
Standard		
Bore grade 1, 2, 3		0.20 - 0.30 (0.0079 - 0.0118)
Bore grade 4, 5		0.12 - 0.22 (0.0047 - 0.0087)
2nd		
Standard		0.38 - 0.53 (0.0150 - 0.0209)
Oil		
Standard		0.30 - 0.55 (0.0118 - 0.0217)

Piston pin

Unit: mm (in)

Piston pin outer diameter	24.994 - 25.000 (0.9840 - 0.9843)
Interference fit of piston pin to piston	0 - 0.004 (0 - 0.0002)
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.	25.025 - 25.038 (0.9852 - 0.9857)
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)

Tightening Torque

ENGINE OUTER PARTS

Unit		N·m	kg-m	ft-lb
Adjusting bar to engine mounting	CD17	16 - 21	1.6 - 2.1	12 - 15
	CD20	21 - 26	2.1 - 2.7	15 - 20
Alternator to bracket		37 - 51	3.8 - 5.2	27 - 38
Front dust cover		3 - 5	0.3 - 0.5	2.2 - 3.6
Idler pulley nut (For air conditioner)		19 - 25	1.9 - 2.6	14 - 19
Injection pump rear bracket (to cylinder block)		24 - 27	2.4 - 2.8	17 - 20
Injection pump rear bracket		49 - 59	5.0 - 6.0	36 - 43
Injection pump to rear bracket		24 - 27	2.4 - 2.8	17 - 20
Injection pump sprocket nut		59 - 69	6.0 - 7.0	43 - 51

ENGINE BODY PARTS

Unit		N·m	kg-m	ft-lb
Oil pan drain plug		29 - 39	3.0 - 4.0	22 - 29
Rocker cover	CD17	1 - 3	0.1 - 0.3	0.7 - 2.2
	CD20	2 - 4	0.2 - 0.4	1.4 - 2.9
Water pump to cylinder block		16 - 21	1.6 - 2.1	12 - 15
Water drain plug		54 - 74	5.5 - 7.5	40 - 54

ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

CONTENTS

PRECAUTION ..... LC- 2
PREPARATION ..... LC- 3

GA, SR, CD

ENGINE COOLING SYSTEM ..... LC- 4

GA, SR, E, CD

ENGINE COOLING SYSTEM ..... LC- 6

GA

ENGINE LUBRICATION SYSTEM LC-10
ENGINE COOLING SYSTEM LC-14
RADIATOR FAN MOTOR ELECTRICAL CIRCUIT LC-21

SR

ENGINE LUBRICATION SYSTEM LC-29
ENGINE COOLING SYSTEM LC-36

E

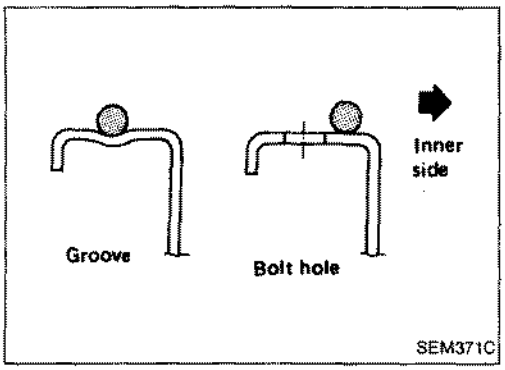
ENGINE LUBRICATION SYSTEM LC-42
ENGINE COOLING SYSTEM LC-46
RADIATOR FAN MOTOR ELECTRICAL CIRCUIT LC-50

CD

ENGINE LUBRICATION SYSTEM LC-53
ENGINE COOLING SYSTEM LC-59
RADIATOR FAN MOTOR ELECTRICAL CIRCUIT LC-65

GA, SR, E, CD

SERVICE DATA AND SPECIFICATIONS (S.D.S.) LC-66

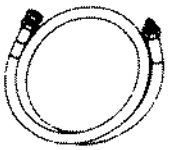
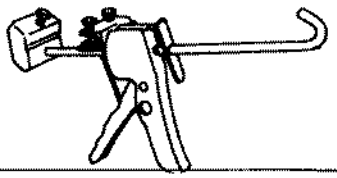
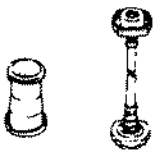


LIQUID GASKET APPLICATION PROCEDURE

a. Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surface.
b. Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
   - Be sure liquid gasket is specified width (for oil pan).
     SR: 4.0 to 5.0 mm (0.157 to 0.197 in)
     GA, E, CD: 3.5 to 4.5 mm (0.138 to 0.177 in)
   - 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 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.

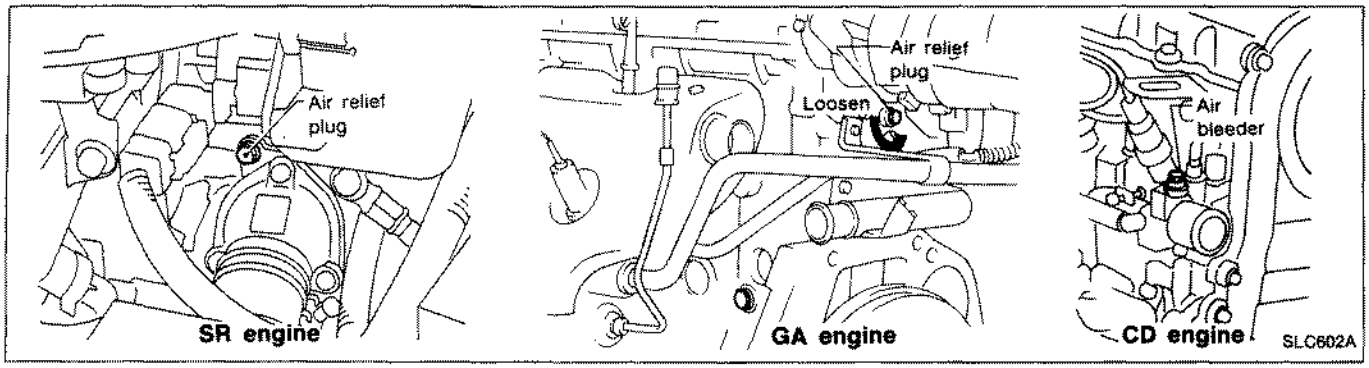
SPECIAL SERVICE TOOLS

*: Special tool or commercial equivalent

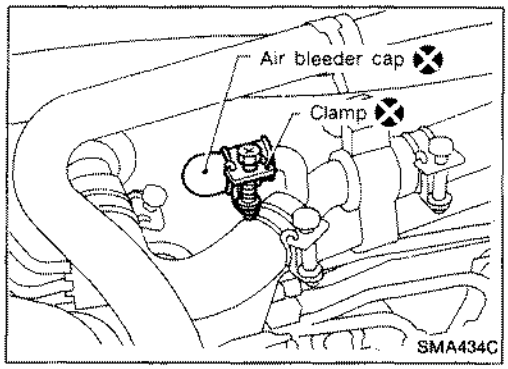
Tool number Tool name	Description		Engine application			
			GA	SR	E	CD
ST25051001* Oil pressure gauge			X	X	X	X
ST25052000* Hose		Adapting oil pressure gauge to cylinder block	X	X	X	X
WS39930000 Tube presser		Pressing the tube of liquid gasket	X	X	X	X
EG17650301 Radiator cap tester adapter		Adapting radiator cap tester to radiator filler neck	X	X	X	X
KV99103510 Radiator plate pliers A		Installing radiator upper and lower tanks	X	X	X	X
KV99103520 Radiator plate pliers B		Removing radiator upper and lower tanks	X	X	X	X

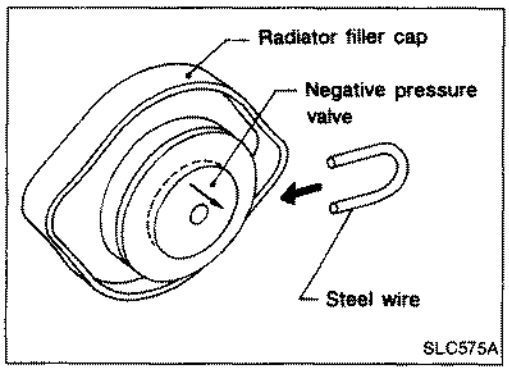
Refilling Engine Coolant

1. Set heater temperature control lever to Maximum Hot position.
2. Remove radiator filler cap, air relief plug and air bleeder cap.



3. Fill radiator with coolant and fill reservoir tank to Max line with coolant.
- Air relief plug is reinstalled once coolant spills from the air relief hole during refill.
  Then fill radiator and reservoir tank with coolant.
4. Reinstall air bleeder cap.



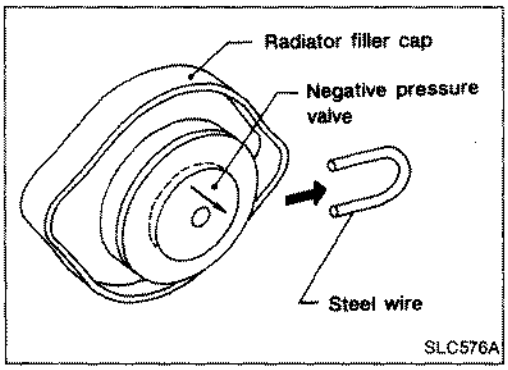


5. Install a temporary radiator filler cap which allows air and coolant in cooling system to be directed into reservoir tank regardless of pressure.
- Install a suitable steel wire between negative pressure valve and its seat as shown in the picture.
6. Warm up engine to normal operating temperature.
7. Run engine at 2,500 rpm for 10 seconds and return to idle speed.
- Repeat 2 or 3 times

Watch coolant temperature gauge so as not to overheat the engine.

8. Stop engine and cool it down.
- Cool down using a fan to reduce the time.
9. Remove the temporary radiator filler cap and check coolant level.
- If necessary, refill radiator up to filler neck with coolant.
10. Refill reservoir tank to Max line with coolant.
11. Repeat step 7 through step 10 two or more times.

Refilling Engine Coolant (Cont'd)

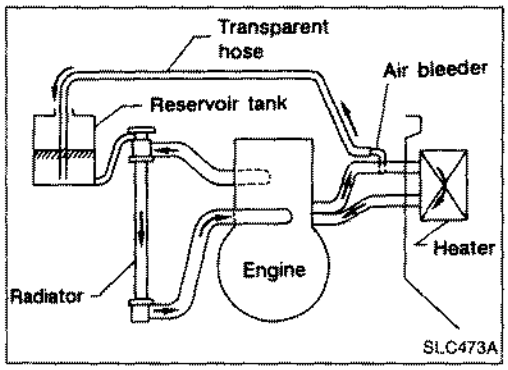


12. Install a proper radiator filler cap. (Original radiator filler cap)
13. Warm up engine, and check for sound of coolant flow while running engine from idle up to 4,000 rpm with heater temperature control lever set at several positions between COOL and HOT.

- Sound may be noticeable at heater water cock.

14. GA and CD engines:
    If sound is heard, bleed air from cooling system by repeating steps 5 through 10 until coolant level no longer drops.
    SR engine:
    If sound is heard, bleed air from cooling system according to the following steps.

1) Cool engine down and remove air bleeder cap on heater inlet hose.



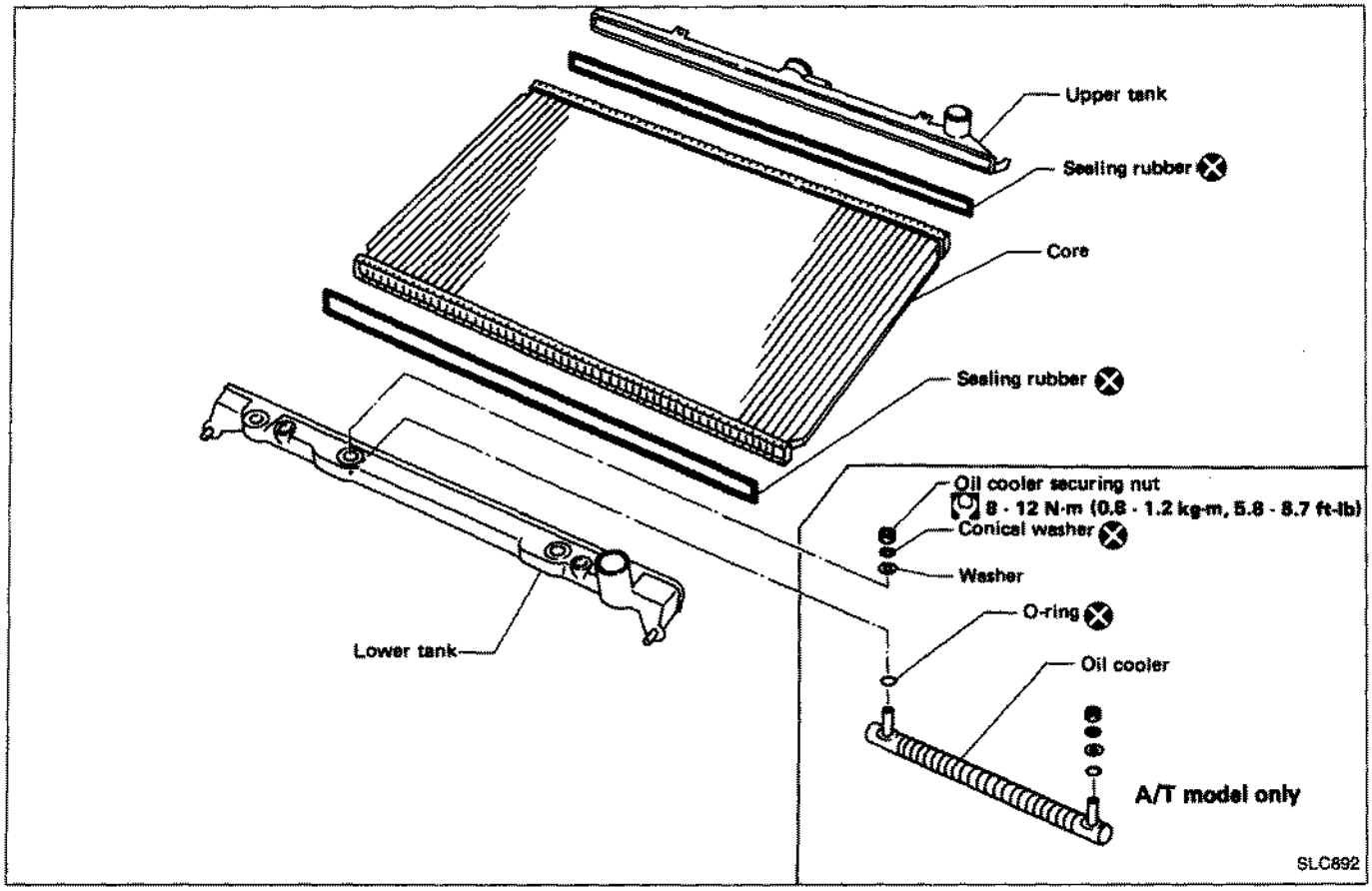
2) Attach a suitable transparent hose at air bleeder pipe and put the opposite end of the hose into coolant of reservoir tank.
3) Install the temporary radiator cap and check for proper connection of all coolant related hoses.
4) Start engine and check for bubbles in reservoir tank.
5) Set heater temperature control lever to max "COOL" position in order to bypass coolant through the transparent hose.
6) Run engine up to 2,300 rpm until bubbles disappear in the transparent hose.

Do not run engine over 2,300 rpm because engine may be damaged due to reduced coolant flow.

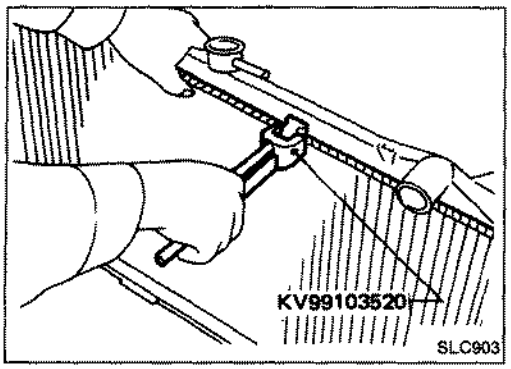
7) After removing bubbles, set heater temperature control lever to max "HOT" position and check for sound of coolant flow.
8) If sound is heard, repeat step 5) through step 7).

15. Stop engine and cool it down.
16. Install a proper radiator cap. (Original radiator cap)
17. Remove the transparent hose and install air bleeder cap.
18. Check any removed parts for secure reinstallation.

Radiator (Aluminum type)

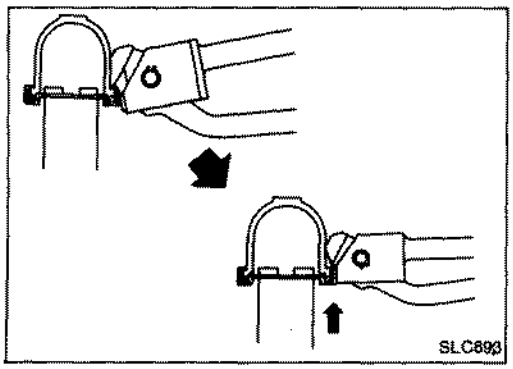


Aluminum radiator can be disassembled by using special procedures and special service tools.



DISASSEMBLY

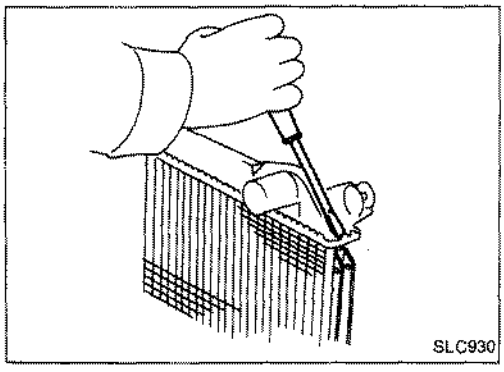
1. Remove tank with Tool.



- Grip the crimped edge and bend it upwards so that Tool slips off.

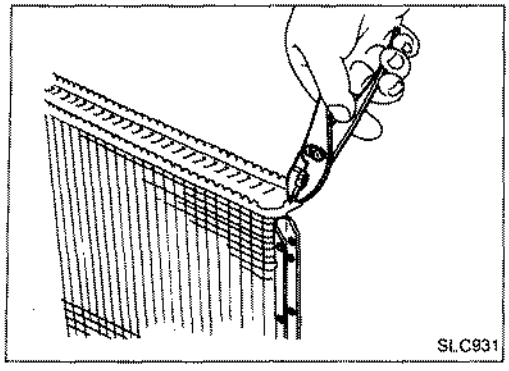
Do not bend excessively.

Radiator (Aluminum type) (Cont'd)

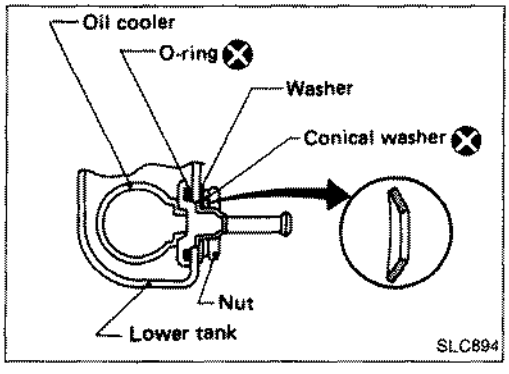


- In areas where Tool cannot be used, use a screwdriver to bend the edge up.

Be careful not to damage tank.



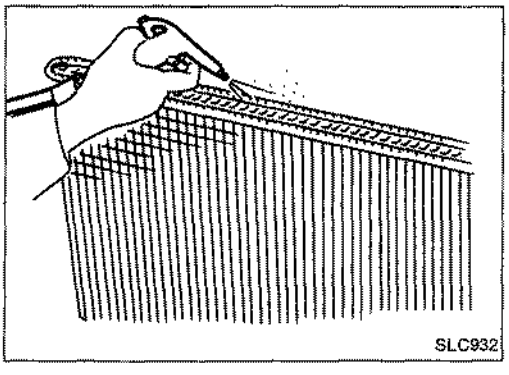
2. Make sure the edge stands straight up.
3. Remove oil cooler from tank. (A/T models only)



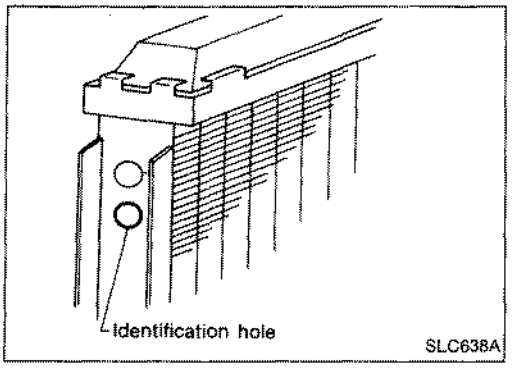
ASSEMBLY

1. Install oil cooler. (A/T models only)

Pay attention to direction of conical washer.



2. Clean contact portion of tank.

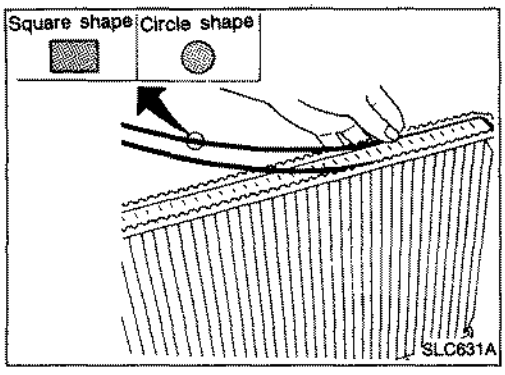


3. Install sealing rubber.

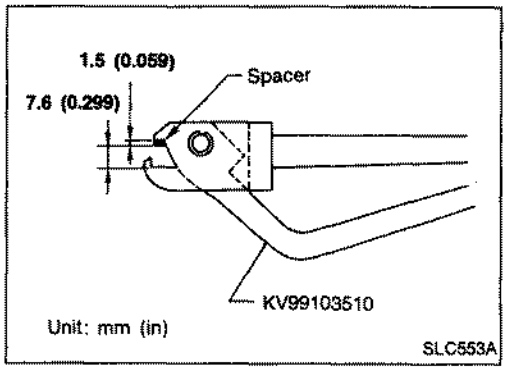
When installing sealing rubber, select the correct one according to the table below.

Identification hole	Applicable sealing rubber
Yes (on the side of radiator core)	Square shaped sealing rubber
No	Circle shaped sealing rubber

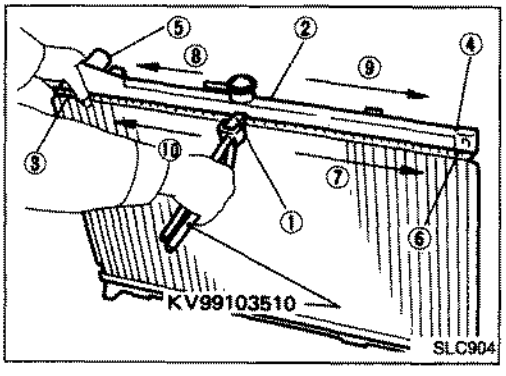
Radiator (Aluminum type) (Cont'd)



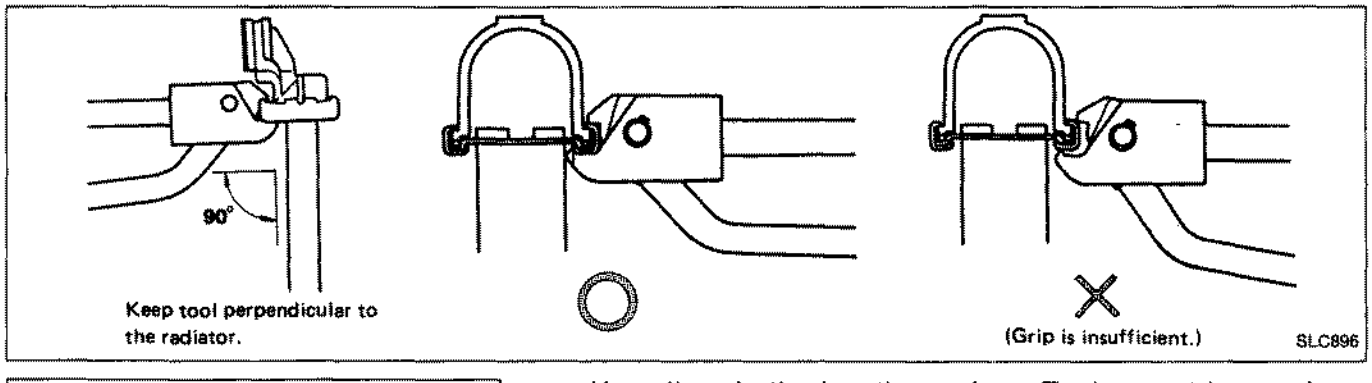
Push it in with fingers.
Be careful not to twist sealing rubber.

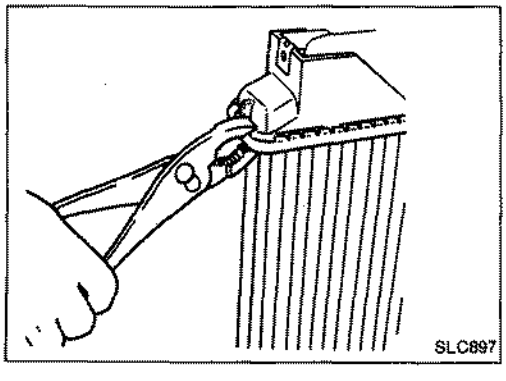


4. Attach a 1.5 mm (0.059 in) thick spacer to the tip of Tool. (Square shaped sealing rubber only)



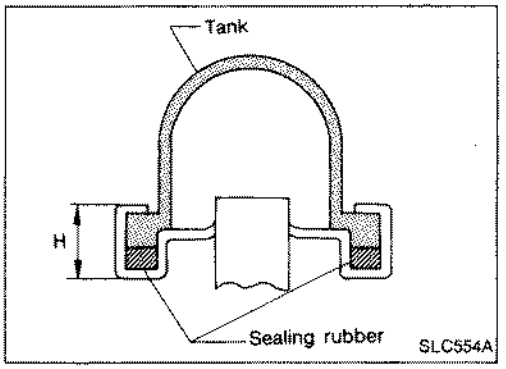
5. Caulk tank in specified sequence with Tool.





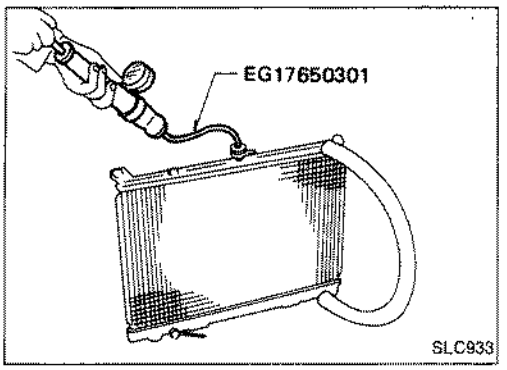
- Use pliers in the locations where Tool cannot be used.

Radiator (Aluminum type) (Cont'd)



6. Make sure that the rim is completely crimped down.
   Standard height "H":
   Square shaped sealing rubber
   8.0 - 8.4 mm (0.315 - 0.331 in)
   Circle shaped sealing rubber
   9.5 - 9.9 mm (0.374 - 0.390 in)
7. Confirm that there is no leakage.

Refer to Inspection.



INSPECTION

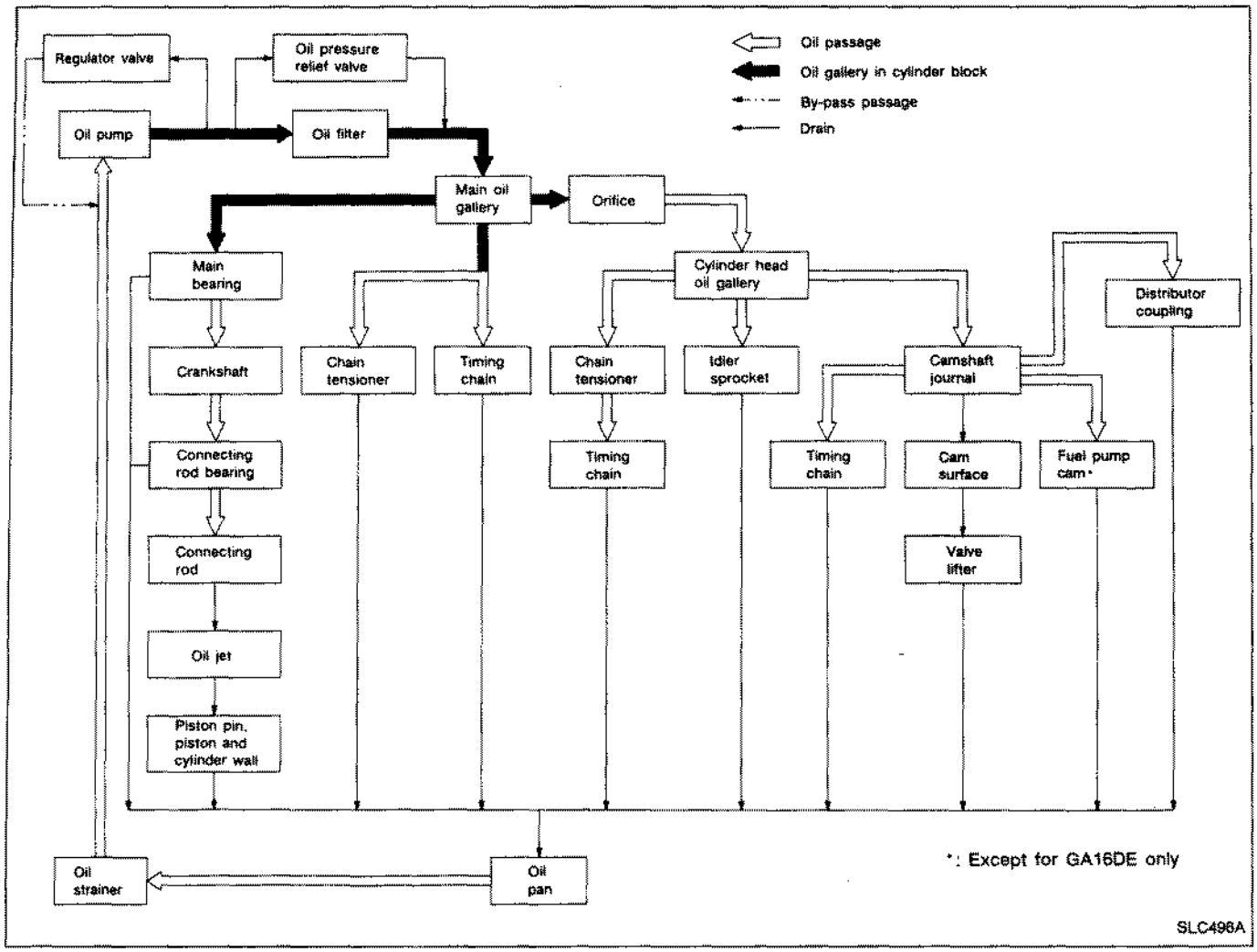
Apply pressure with Tool.

Specified pressure value:
157 kPa (1.57 bar, 1.6 kg/cm^2, 23 psi)

WARNING:

To prevent the risk of the hose coming undone while under pressure, securely fasten it down with a hose clamp.
Attach a hose to the oil cooler as well. (A/T models only)

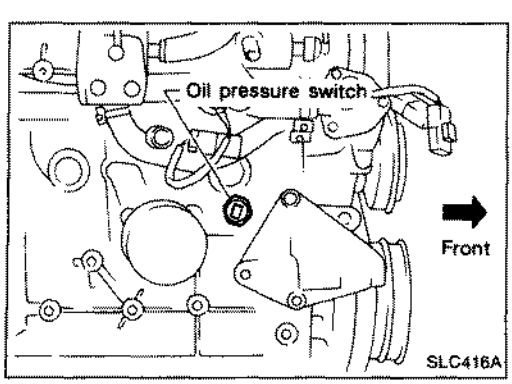
Lubrication Circuit



Oil Pressure Check

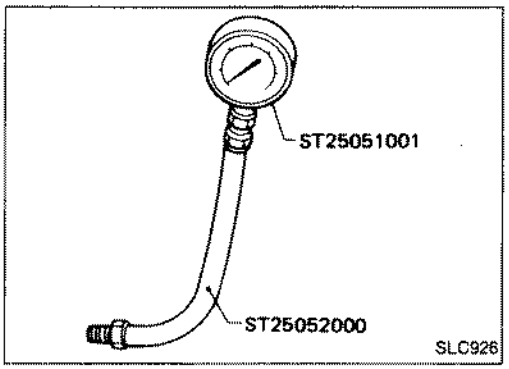
WARNING:

- **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.

Oil Pressure Check (Cont'd)



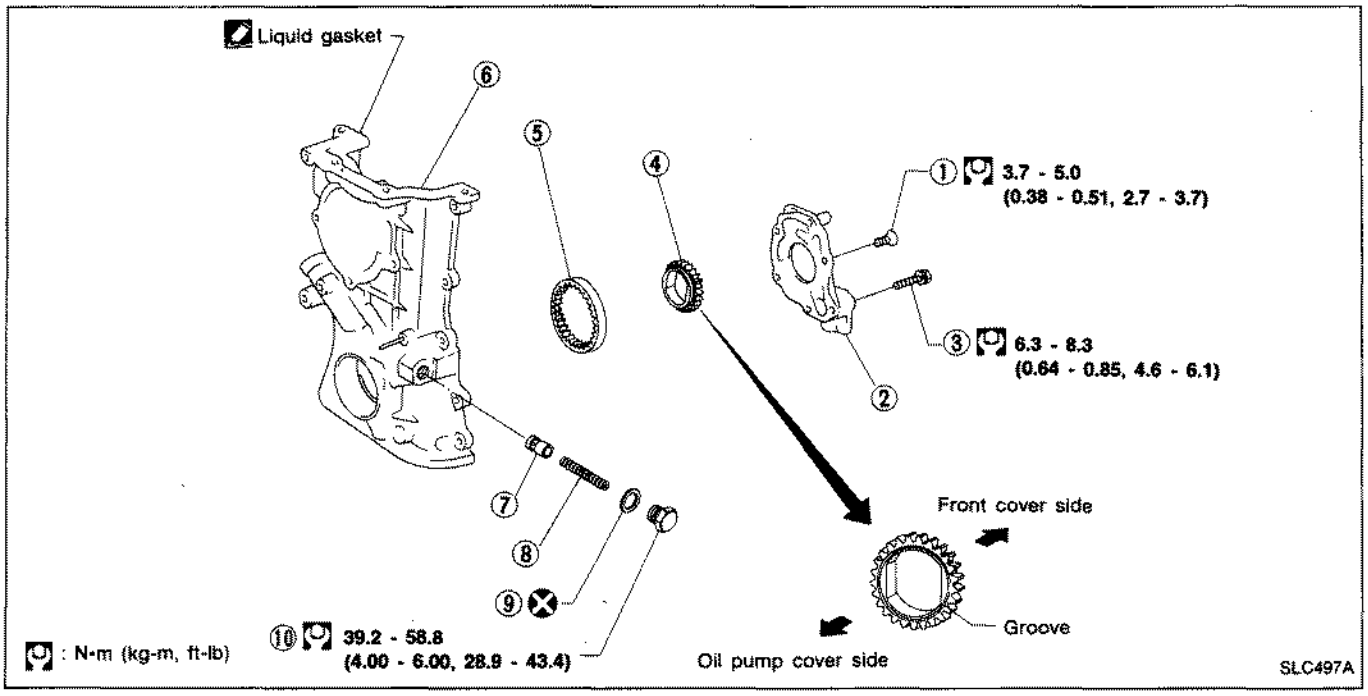
Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)
Idle speed	49 - 186 (0.49 - 1.86, 0.5 - 1.9, 7 - 27)
3,000	343 - 441 (3.43 - 4.41, 3.5 - 4.5, 50 - 64)

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.

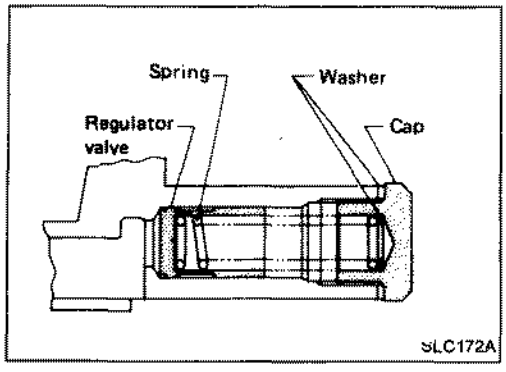
If difference is extreme, check oil passage and oil pump for oil leaks.

6. Install oil pressure switch with sealant.

Oil Pump



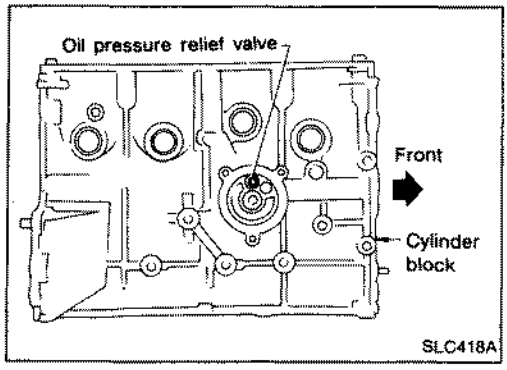
① Screw
② Oil pump cover
③ Bolt
④ Inner gear
⑤ Outer gear
⑥ Front cover
⑦ Regulator valve
⑧ Spring
⑨ Washer
⑩ Plug



REGULATOR VALVE INSPECTION

1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Apply regulator valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

If damaged, replace regulator valve set or oil pump assembly.



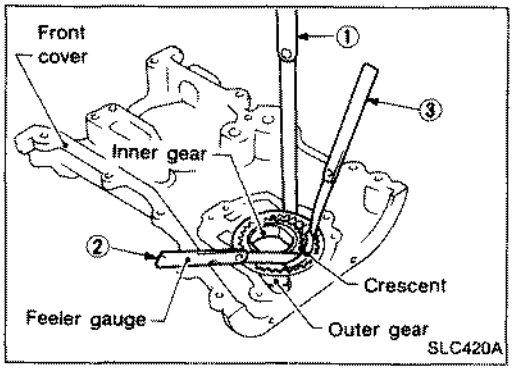
OIL PRESSURE RELIEF VALVE INSPECTION

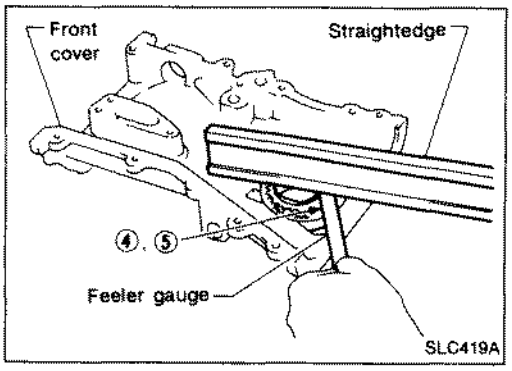
Inspect oil pressure relief valve for movement, cracks and breaks by pushing the ball. If replacement is necessary, remove valve by prying it out with suitable tool.
Install a new valve in place by tapping it.

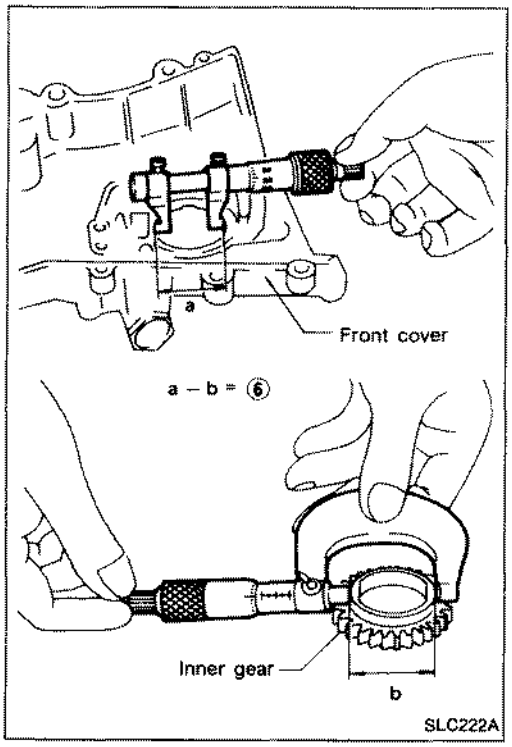
Oil Pump (Cont'd)

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.**







OIL PUMP INSPECTION

Using a feeler gauge, check the following clearance.

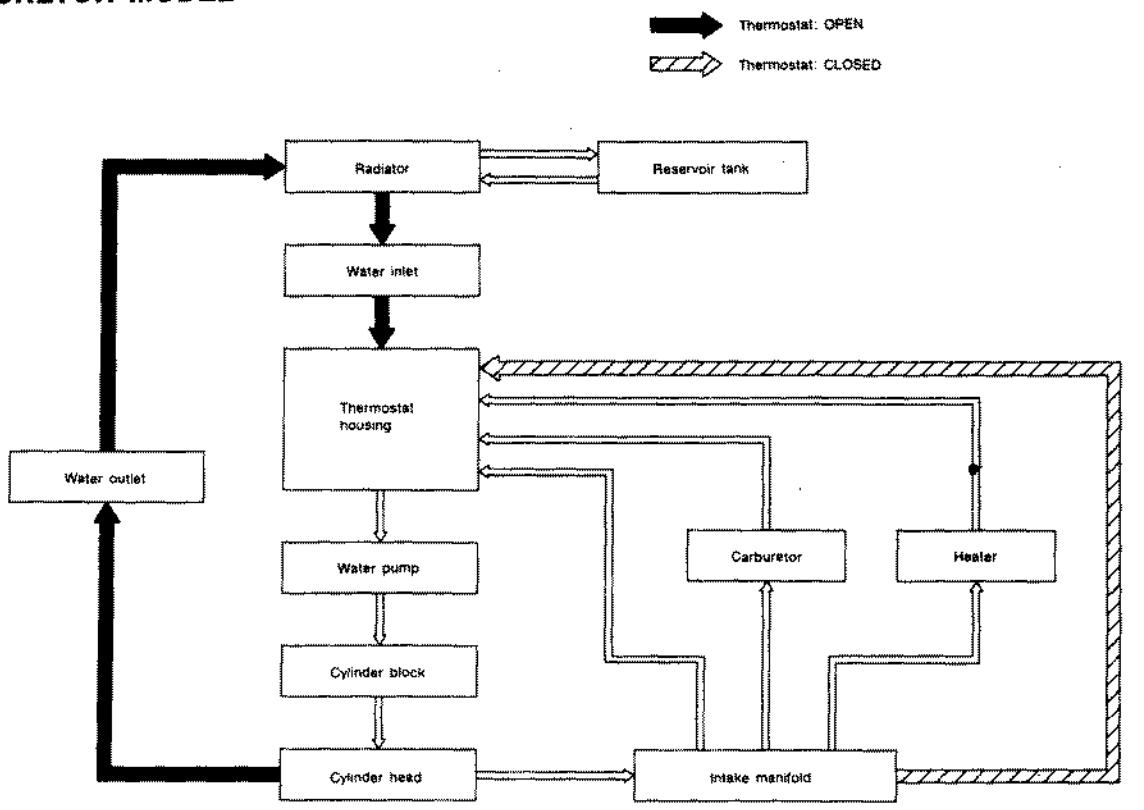
Unit: mm (in)

Body to outer gear clearance ①	0.110 - 0.200 (0.0043 - 0.0079)
Inner gear to crescent clearance ②	0.217 - 0.327 (0.0085 - 0.0129)
Outer gear to crescent clearance ③	0.21 - 0.32 (0.0083 - 0.0126)
Body to inner gear clearance ④	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear clearance ⑤	0.05 - 0.11 (0.0020 - 0.0043)
Inner gear to brazed portion of housing clearance ⑥	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, ⑥) exceed the limit, replace front cover assembly.**

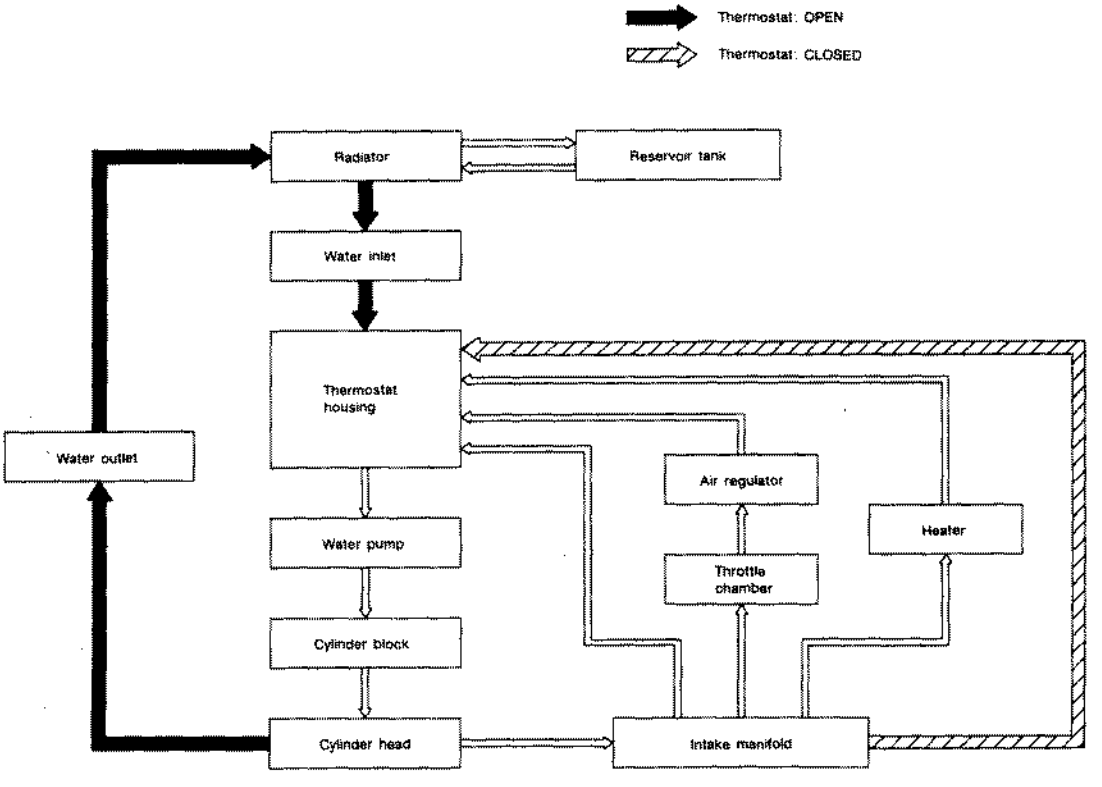
Cooling Circuit

CARBURETOR MODEL



SLC421A

EXCEPT CARBURETOR MODEL



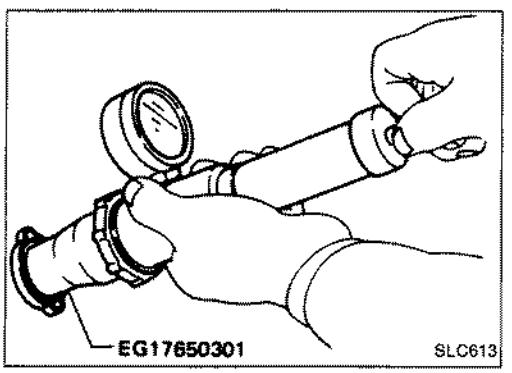
SLC498C

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

CHECKING COOLING SYSTEM HOSES

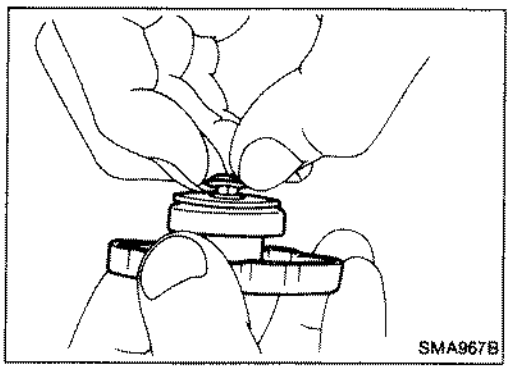
Check hoses for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



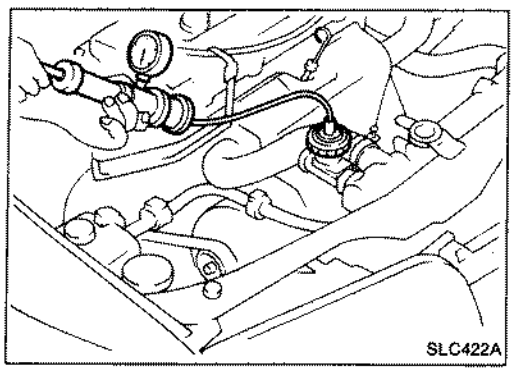
CHECKING RADIATOR CAP

To check radiator cap, apply pressure to cap with a tester.

Radiator cap relief pressure:
78 - 98 kPa
(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)



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



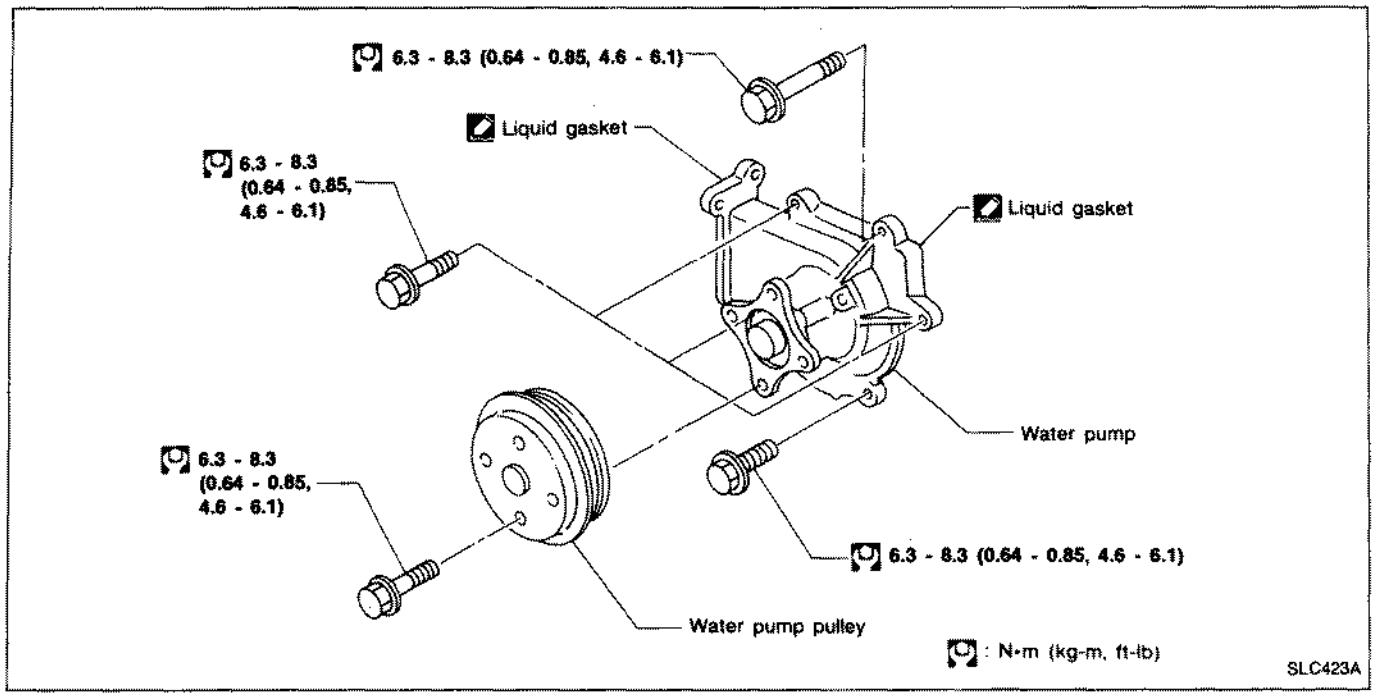
CHECKING COOLING SYSTEM FOR LEAKS

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)

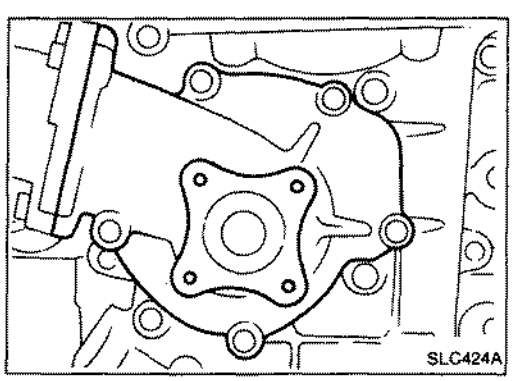
CAUTION:
Higher than the specified pressure may cause radiator damage.

Water Pump



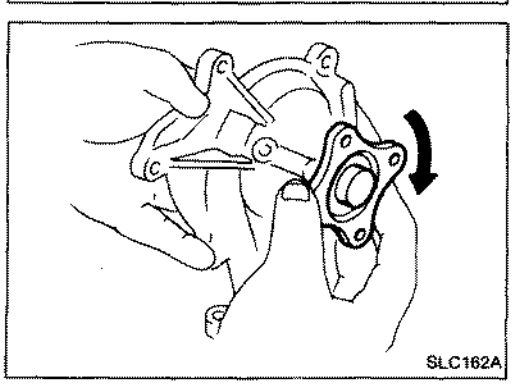
CAUTION:

- **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

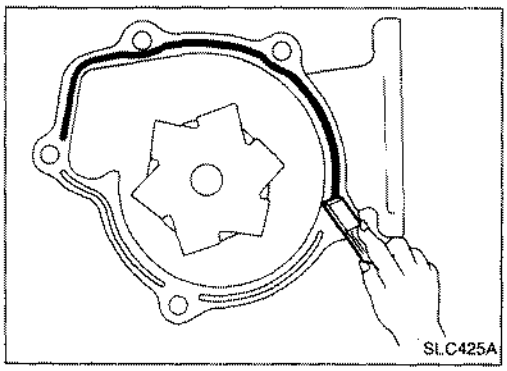
1. Drain coolant from radiator and cylinder block.
2. Remove drive belts for compressor, power steering pump and alternator.
3. Remove water pump pulley.
4. Remove water pump.



INSPECTION

1. Check for badly rusted or corroded body assembly and vane.
2. Check for rough operation due to excessive end play.

Water Pump (Cont'd)

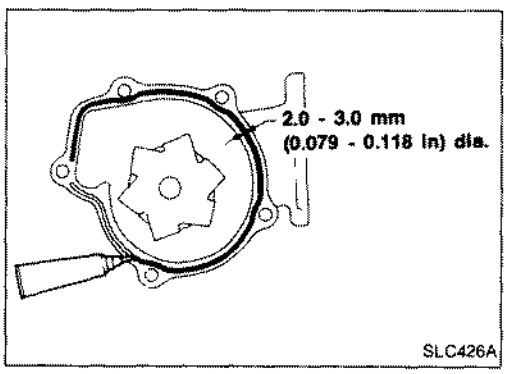


INSTALLATION

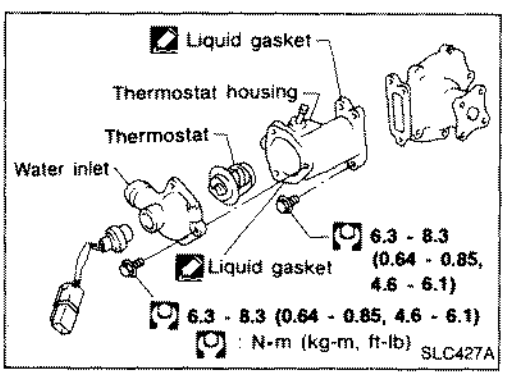
- Before installing water pump, remove liquid gasket from mating surface of water pump using a scraper.

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.



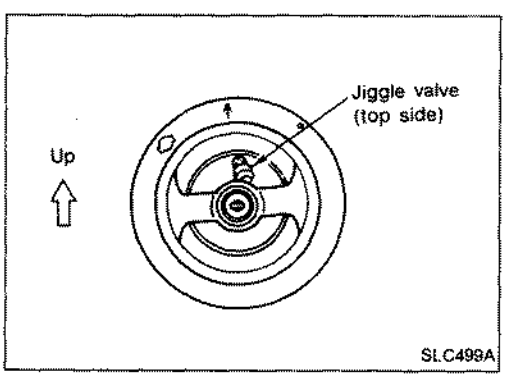
- Apply liquid gasket to mating surface of pump housing as shown.

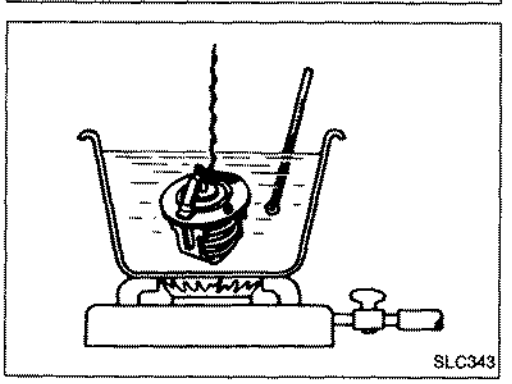


Thermostat

INSPECTION

1. Check for valve seating condition at ordinary temperatures. It should seat tightly.





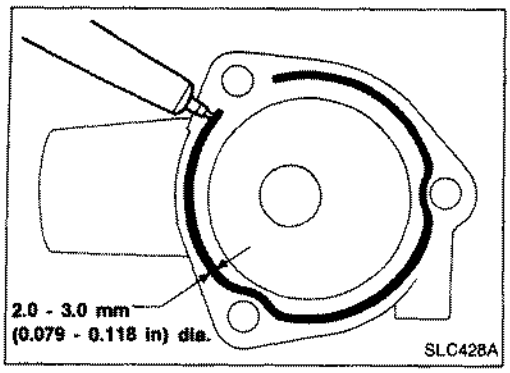
2. Check valve opening temperature and maximum valve lift.

Valve opening temperature	°C (°F)	76.5 (170)
Max. valve lift	mm/°C (in/°F)	8/90 (0.31/194)

3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

- **After installation, run engine for a few minutes, and check for leaks.**

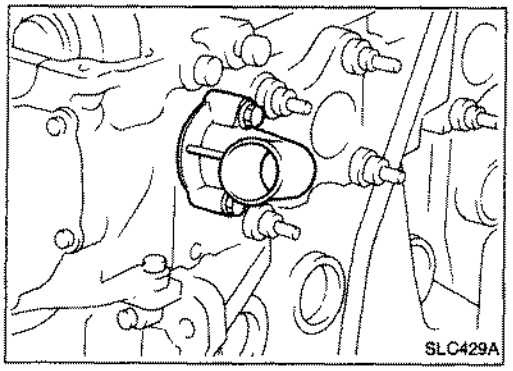
Thermostat (Cont'd)



INSTALLATION

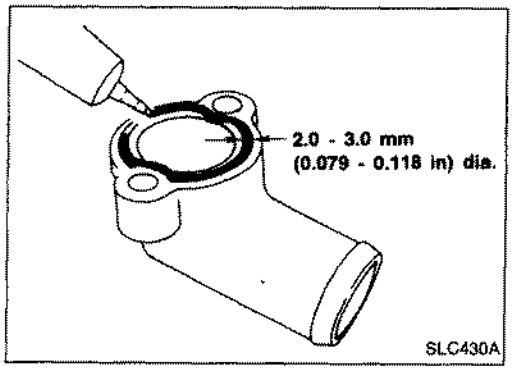
When installing water inlet apply liquid gasket as shown.

Water Outlet



INSPECTION

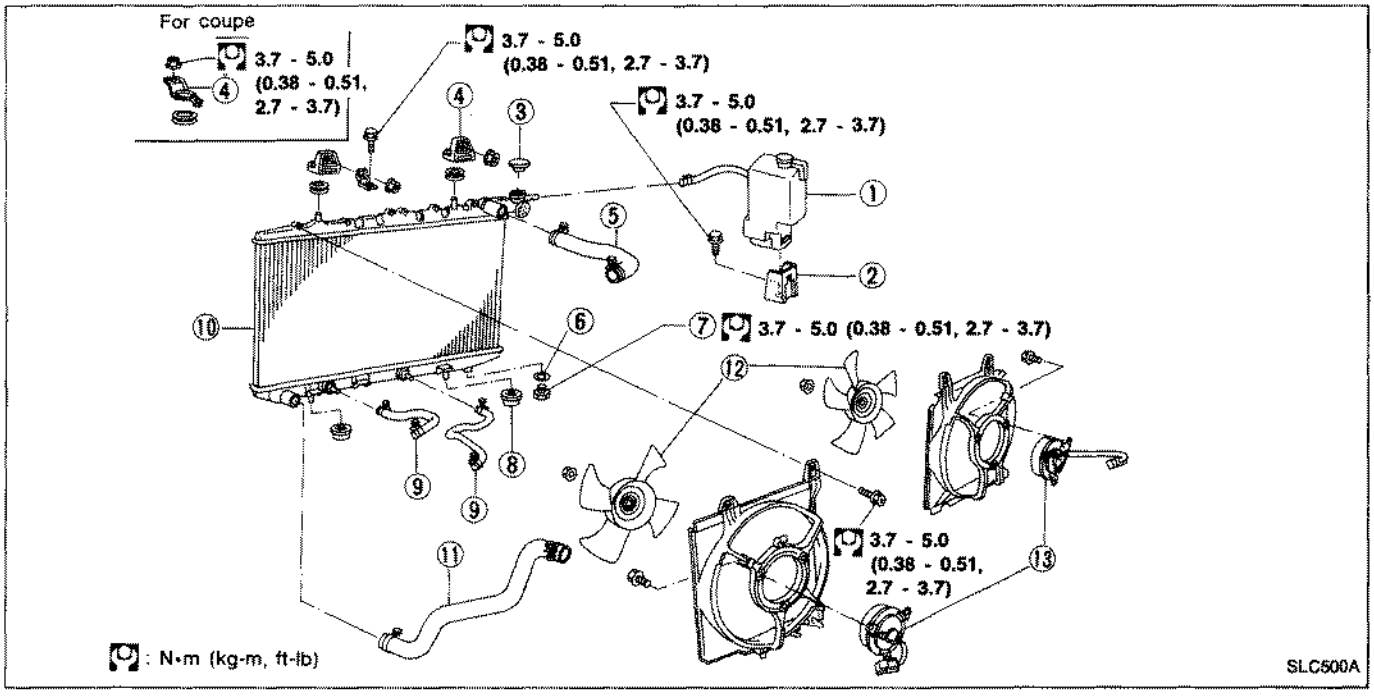
Visually inspect for water leaks. If there is leakage, apply liquid gasket.



INSTALLATION

When installing water outlet, apply liquid gasket as shown.

Radiator

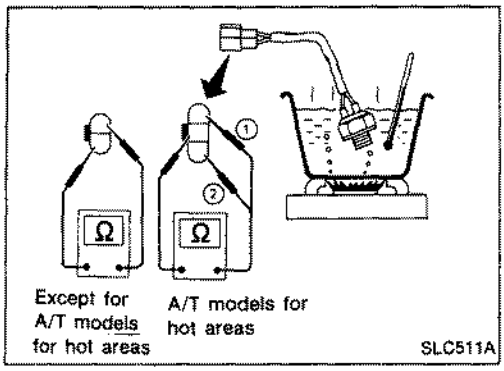


① Reservoir tank
② Reservoir tank bracket
③ Radiator cap
④ Mounting bracket
⑤ Upper hose
⑥ Washer
⑦ Drain plug
⑧ Mounting rubber
⑨ Oil cooler hose (A/T models)
⑩ Radiator
⑪ Lower hose
⑫ Fan
⑬ Fan motor

CAUTION:
When filling radiator with coolant, refer to MA section.

Electrical Cooling Fan

For schematic and wiring diagram of electrical cooling fan, refer to pages LC-21, 22 and 23.



Thermoswitch (GA13DS, GA14DS & GA16DS)

INSPECTION

1. Drain about one liter of coolant.
2. Remove thermoswitch.
3. Check thermoswitch for proper operation.

Operating temperature:

Except for A/T models for hot areas

OFF → ON 82 - 88°C (180 - 190°F)

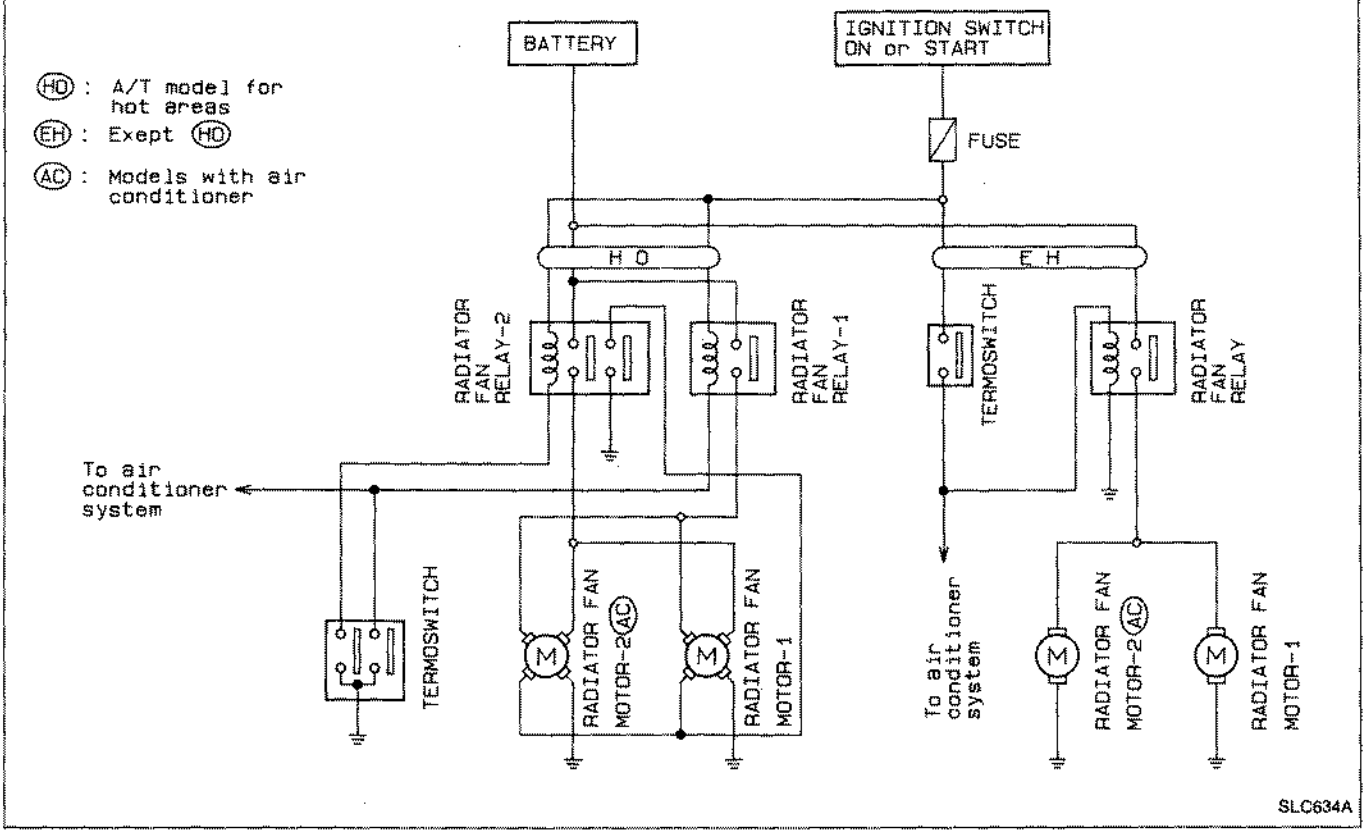
A/T models for hot areas

OFF → ON ① 82 - 88°C (180 - 190°F)

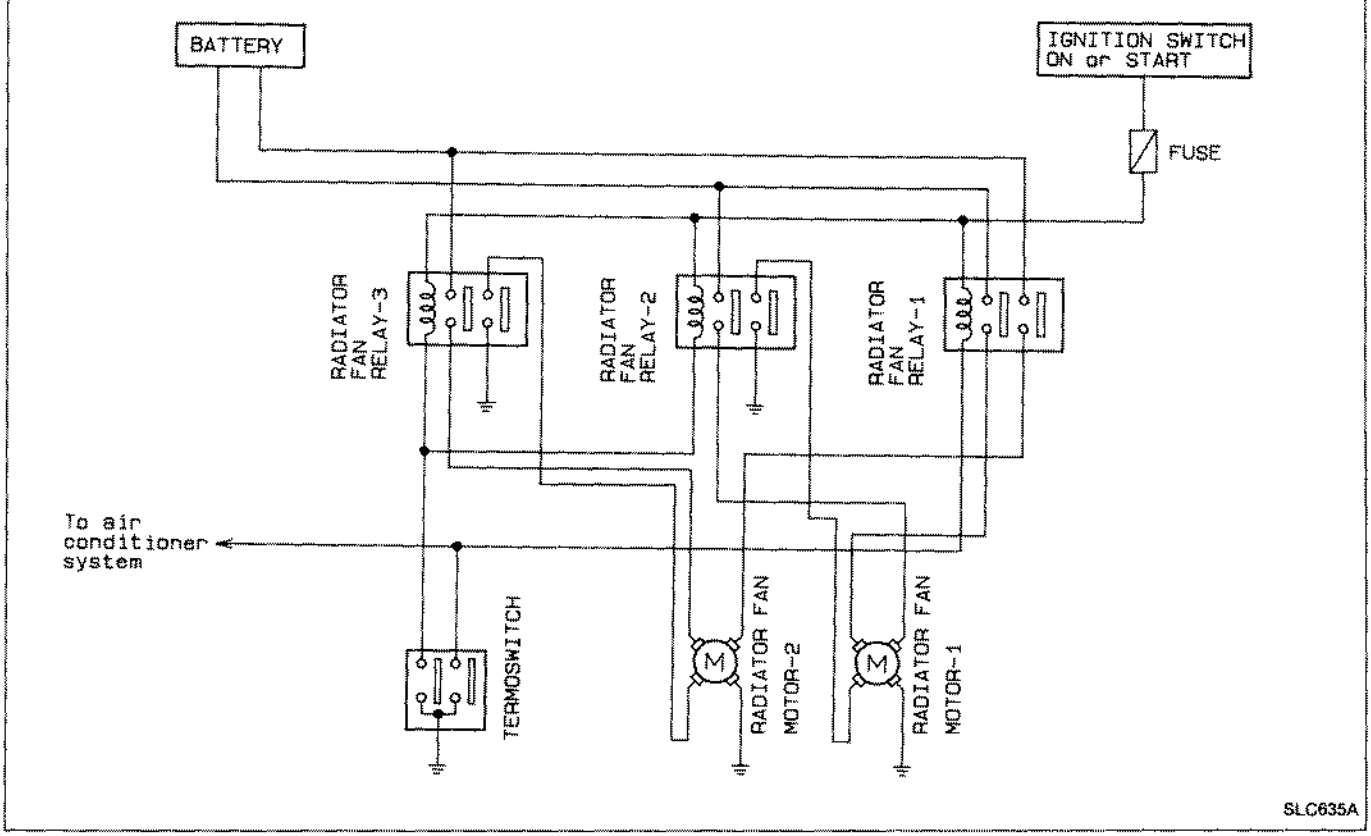
② 102 - 108°C (216 - 226°F)

Schematic

Except A/T model for Middle East

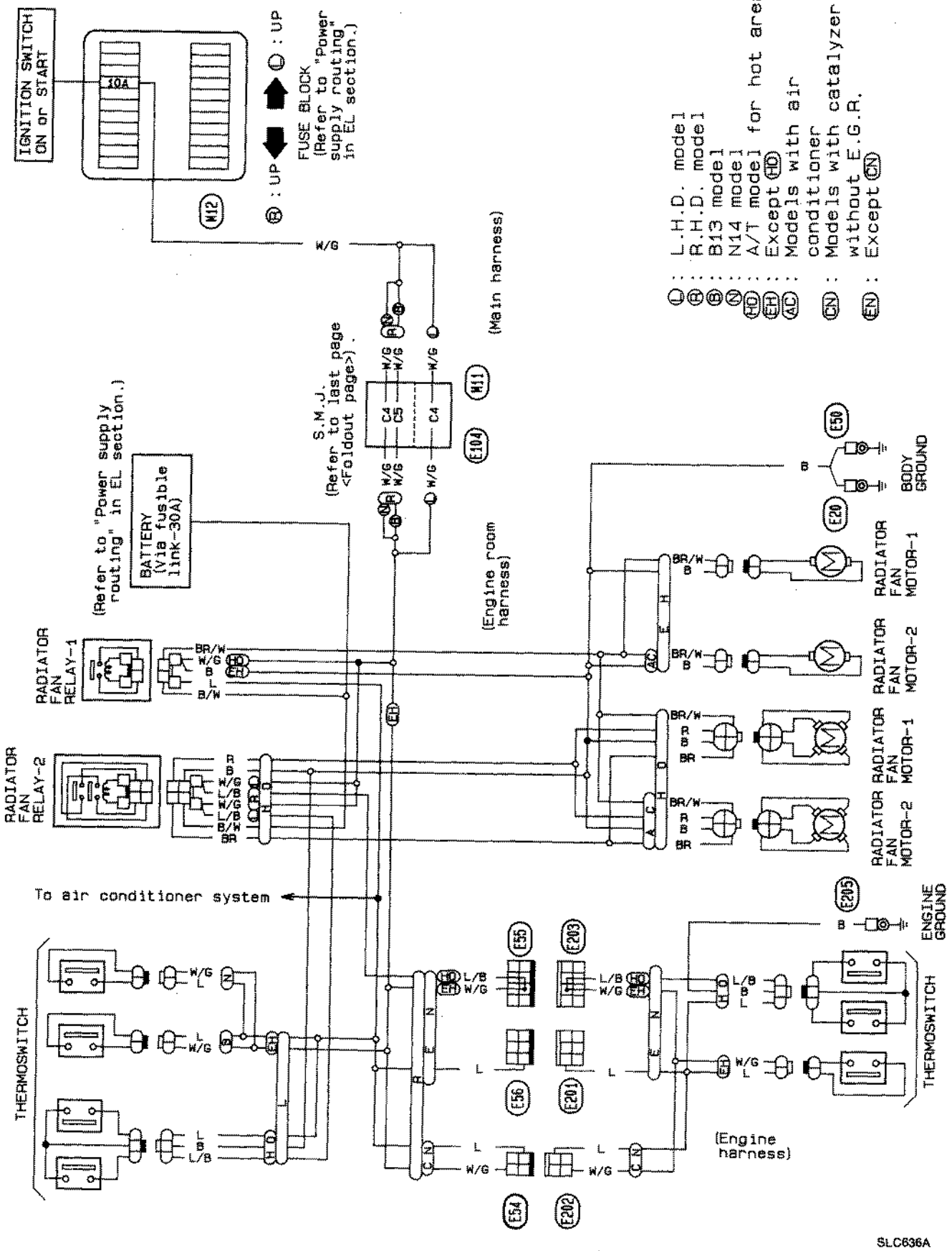


A/T model for Middle East



Wiring Diagram

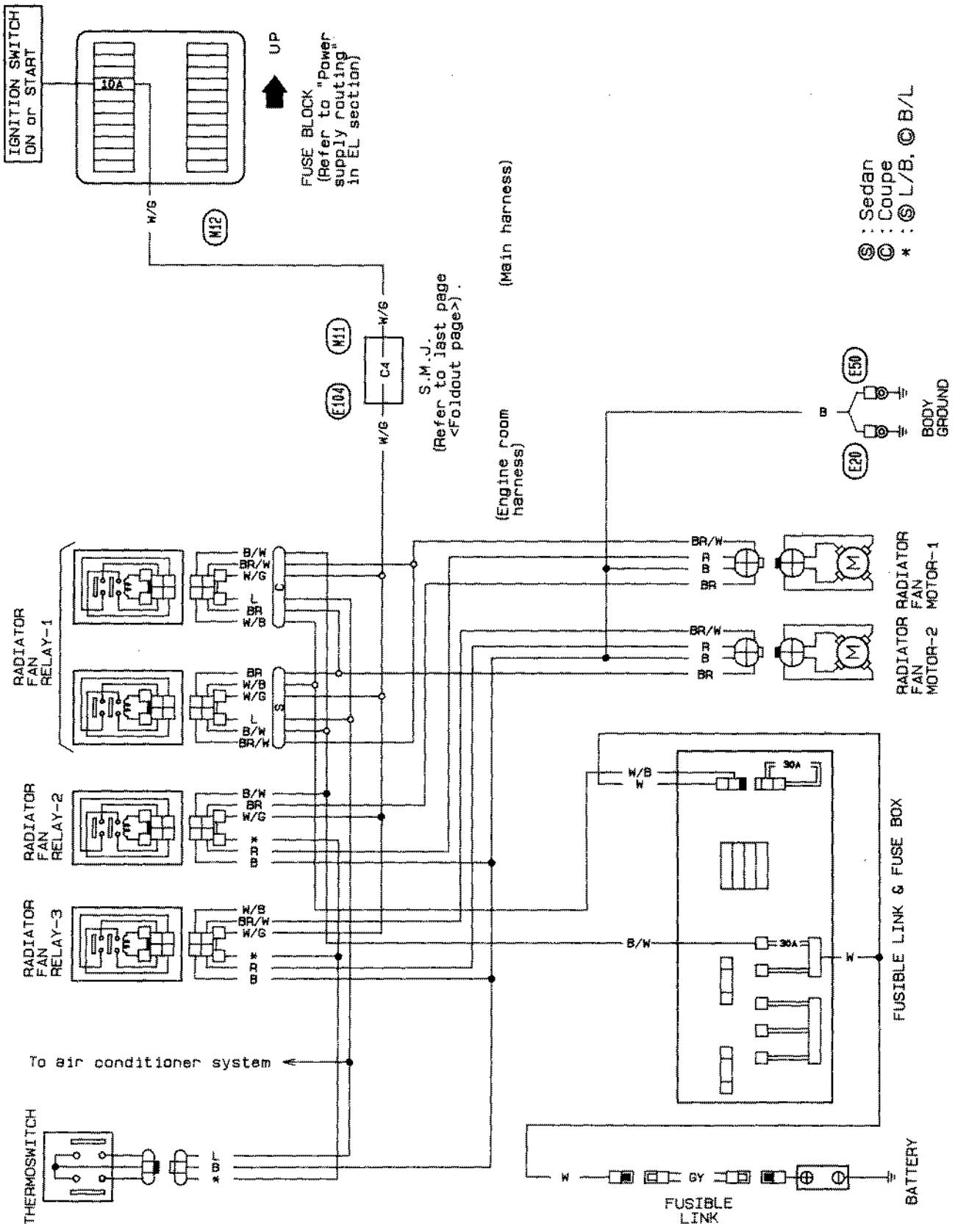
Except A/T model for Middle East



SLC636A

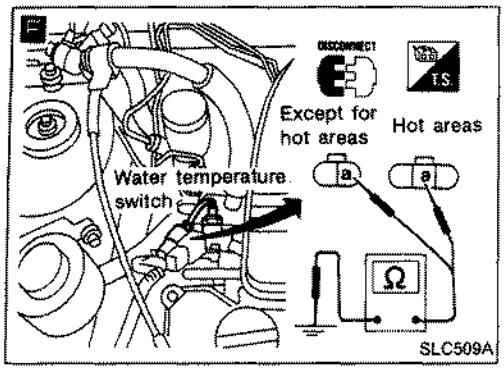
Wiring Diagram (Cont'd)

A/T model for Middle East



SLC637A

Trouble Diagnoses — Radiator Fan Motor (Cont'd)

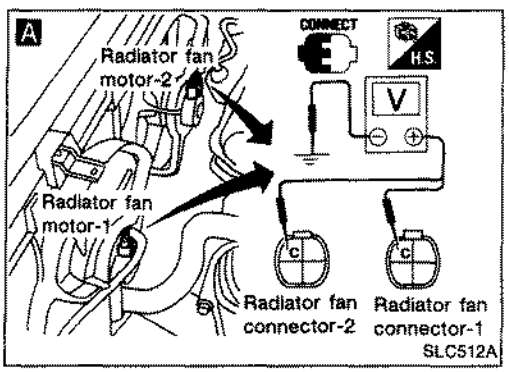


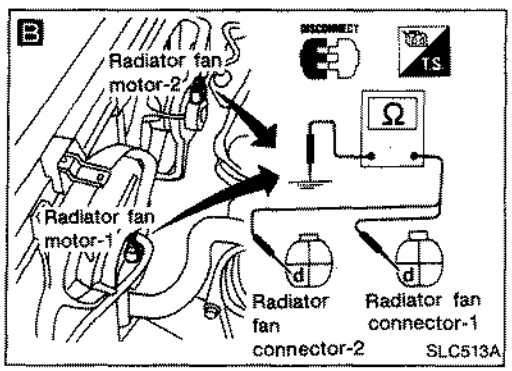
F

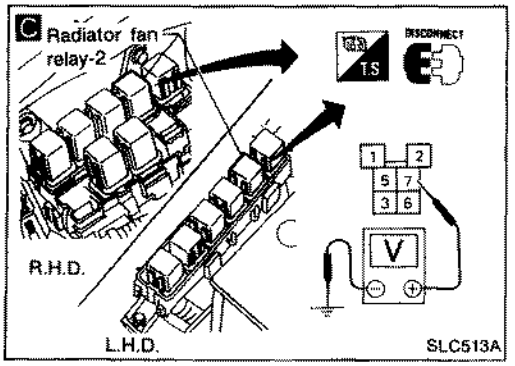
(A)

1) Turn ignition switch "OFF".
2) Check harness continuity between terminal (a) and ground.
Continuity should exist.
If N.G., repair harness.

Replace water temperature switch with a new one.







SYMPTOM:
Even though the engine is extremely hot [engine temperature is above 105°C (221°F)], the radiator fan motor does not rotate at a higher speed. (Only for A/T models for hot areas)

This check should be performed after the engine is warmed up sufficiently.

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between (c) and ground.
Battery voltage should exist.

N.G. →
1) Turn ignition switch "OFF".
2) Disconnect radiator fan relay.
C 3) Check voltage between terminal (7) and ground.
Battery voltage should exist.
If N.G., check harness continuity between battery ⊕ terminal and terminal (7).

O.K. ↓

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect radiator fan motor harness connector.
3) Check harness continuity between (d) and ground.
Continuity should exist.
If N.G., repair harness.

O.K. ↓

Replace radiator fan motor with a new one.

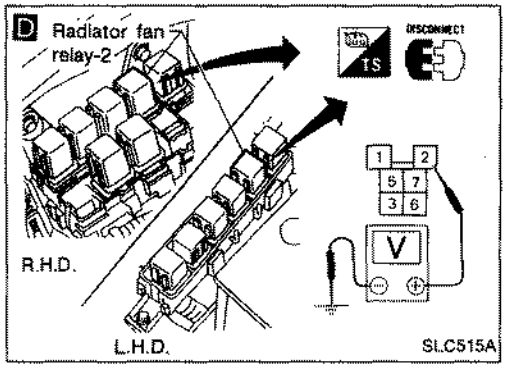
O.K. ↓

1) Check radiator fan relay. If N.G., replace with a new one.
2) Check harness continuity between radiator fan relay terminal (6) and radiator fan motor harness connector terminal (c).
If N.G., repair harness.

O.K. ↓

(A)

Trouble Diagnoses — Radiator Fan Motor (Cont'd)

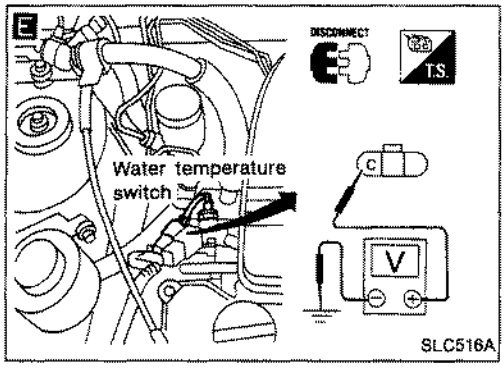


D

Ⓐ

1) Turn ignition switch "ON".
2) Check voltage between terminal ② and ground.
Battery voltage should exist.
If N.G., check the following parts:
- Harness continuity between terminal ② and fuse
- Fuse

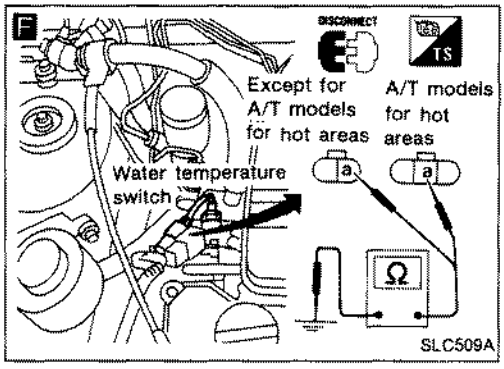
O.K.



1) Connect radiator fan relay.
2) Disconnect water temperature switch harness connector.

E 3) Check voltage between terminal ⓒ and ground.
Battery voltage should exist.
If N.G., check harness between terminal ⓒ and radiator fan relay terminal ①.

O.K.

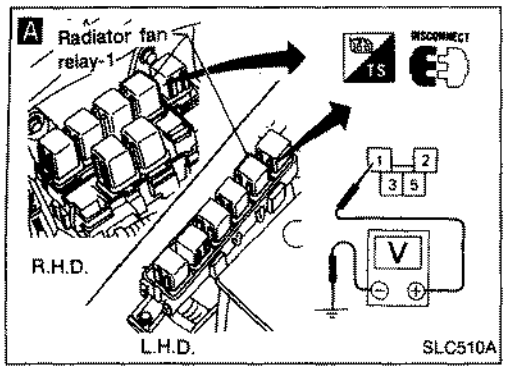


F

1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓐ and ground.
Continuity should exist.
If N.G., repair harness.

Replace water temperature switch with a new one.

Trouble Diagnoses — Radiator Fan Motor (Cont'd)



SYMPTOM:
Even though the engine is cold, the radiator fan motor is rotating.

1) Turn ignition switch "ON".
2) Disconnect water temperature switch.
Radiator fan motor should stop.

N.G. →

1) Disconnect radiator relay.
Radiator fan motor should stop.

N.G. → Ⓑ

O.K. ↓

Replace water temperature switch with a new one.

O.K. ↓

Replace radiator fan relay with a new one.

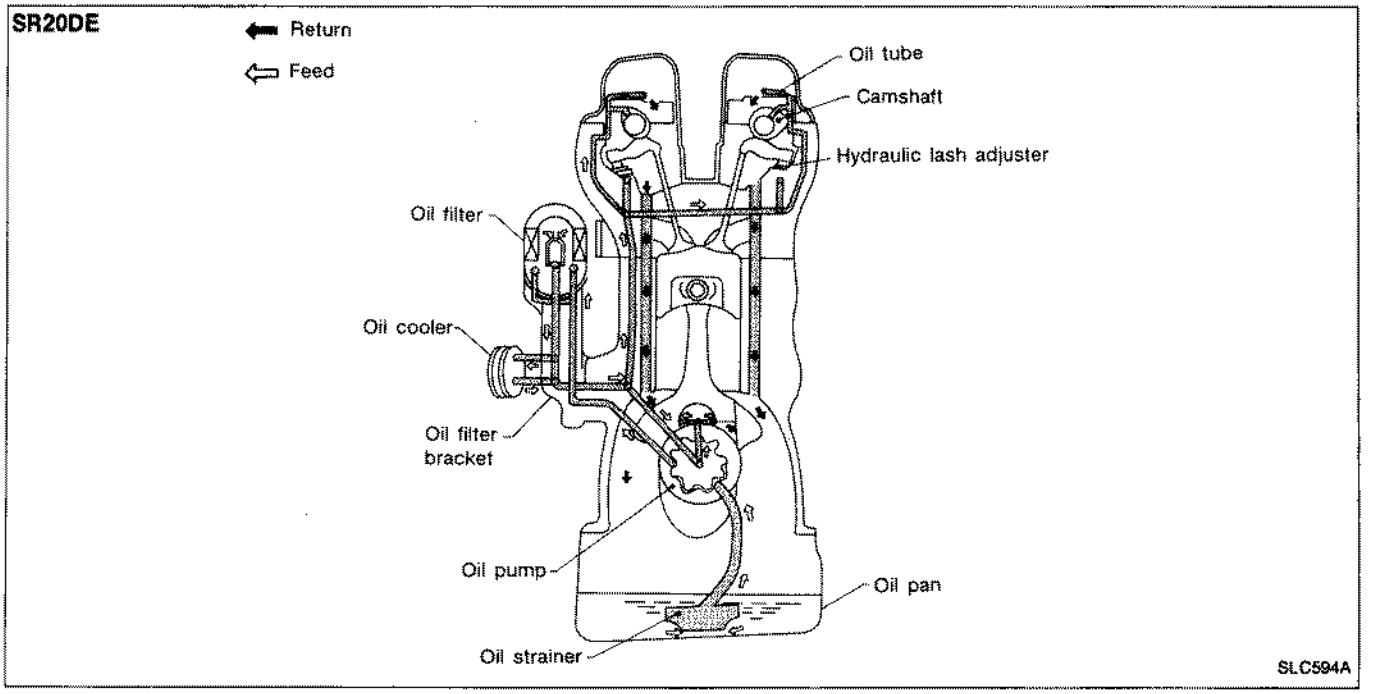
Ⓑ →

A

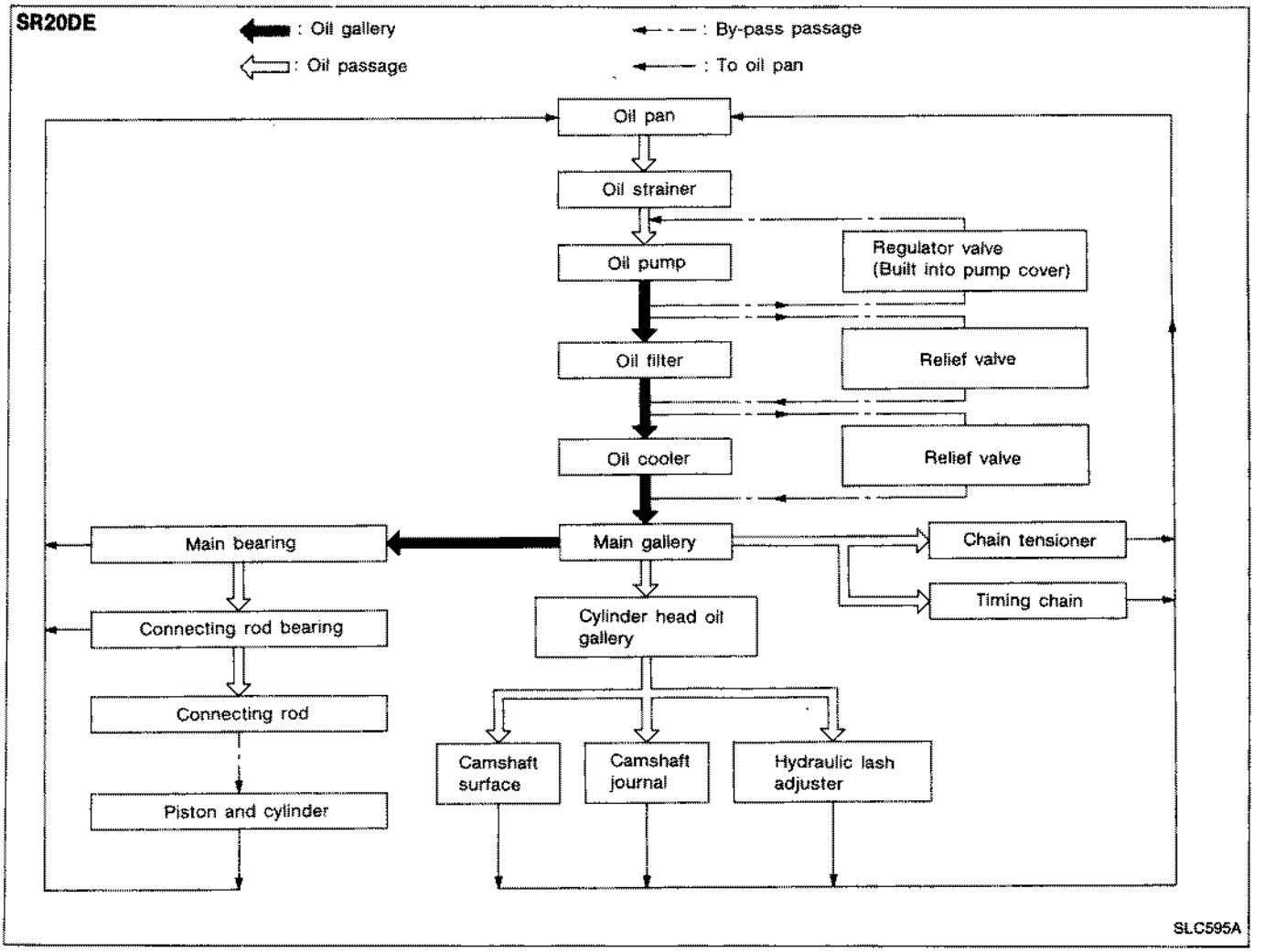
1) Check voltage between terminal ⑤ and ground.
No voltage should exist.
If N.G., check harness between terminal ⑤ and radiator fan motor harness connector terminal ⓑ for shorting.

Lubrication Circuit

SR20DE

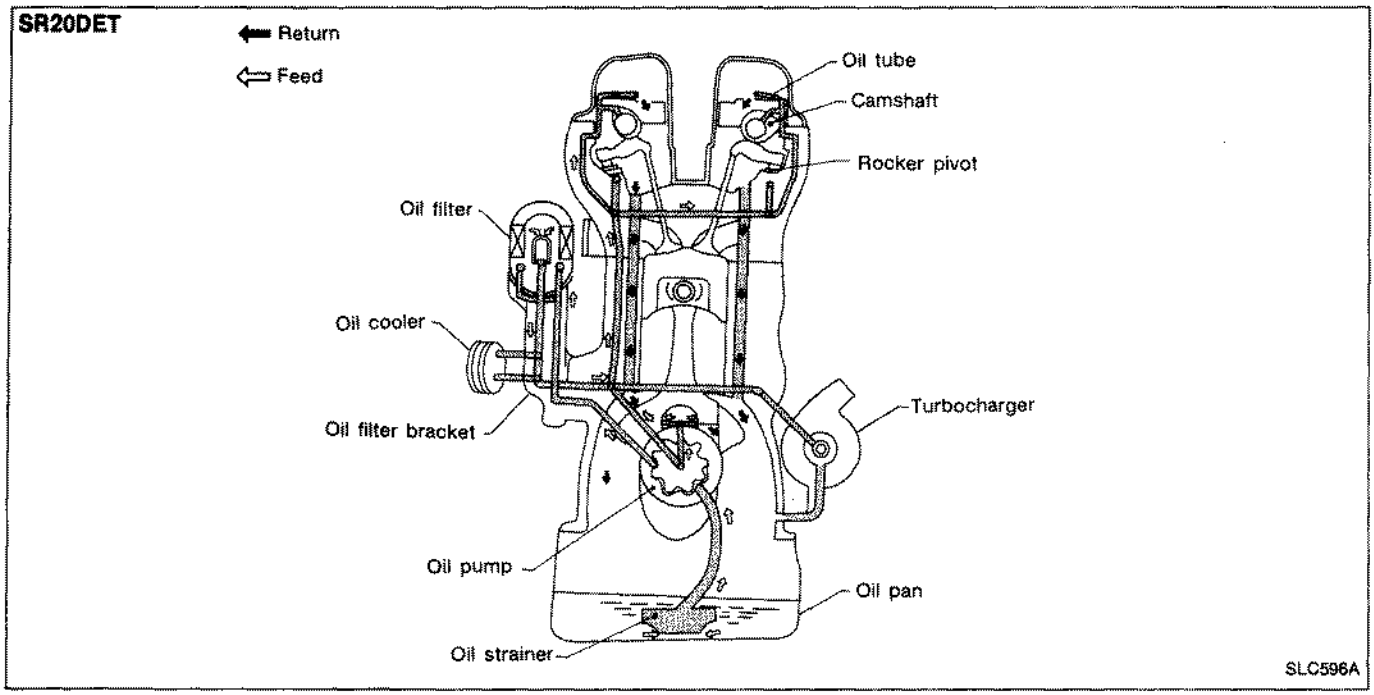


SR20DE

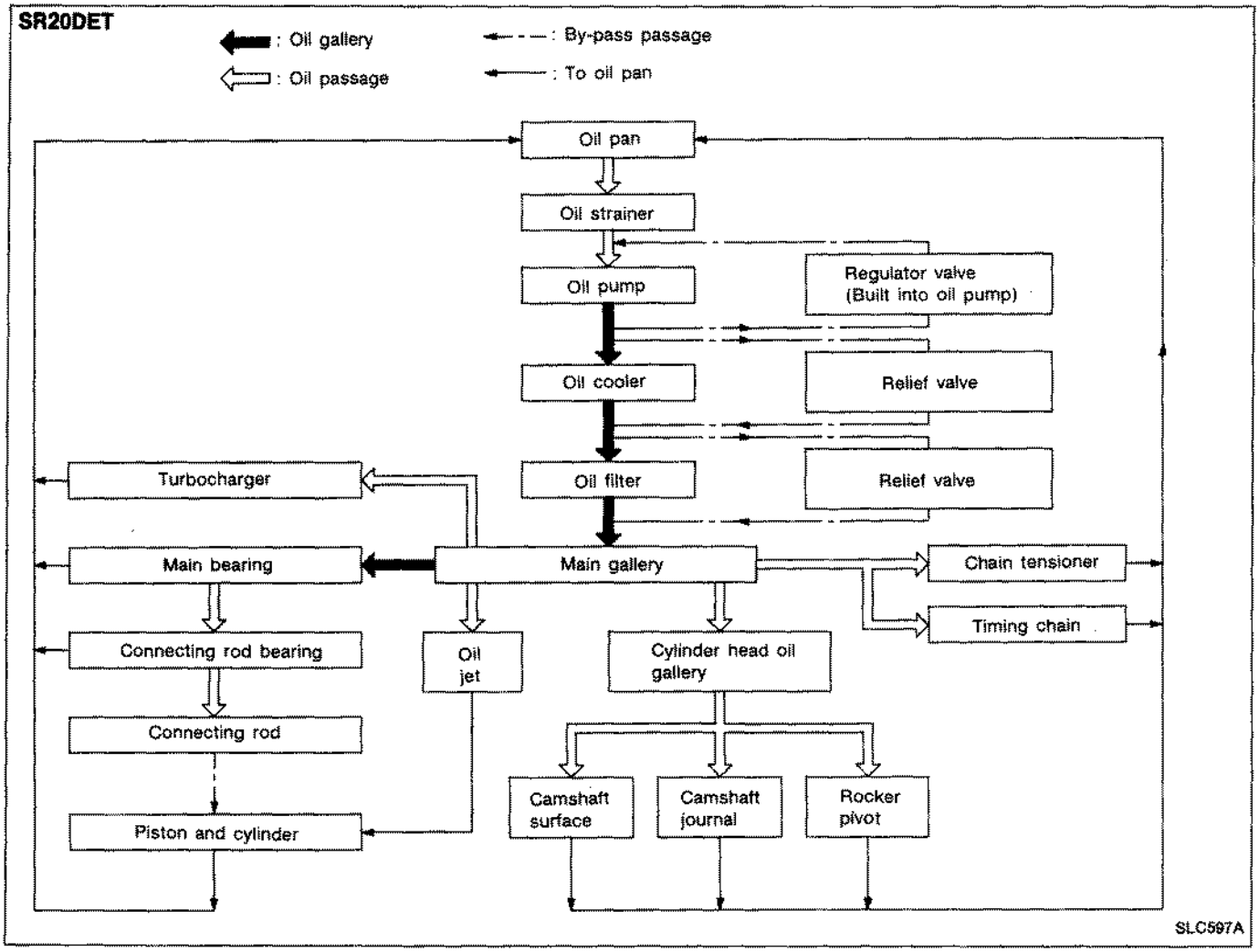


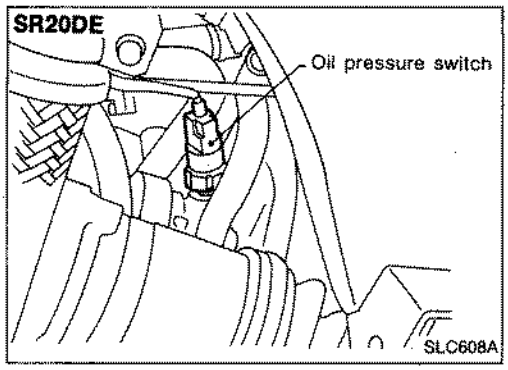
Lubrication Circuit (Cont'd)

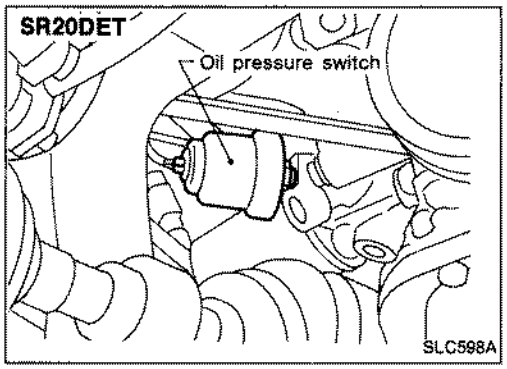
SR20DET

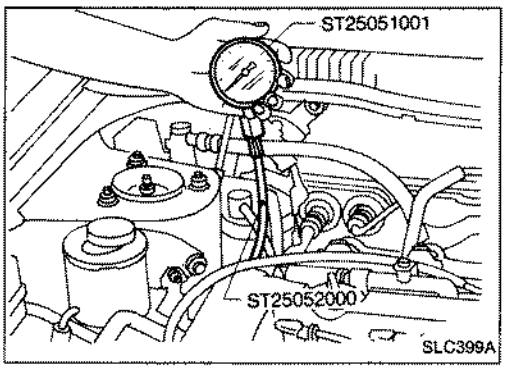


SR20DET









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	SR20DE: More than 98 (0.98, 1.0, 14) SR20DET: More than 98 (0.98, 1.0, 14)
3,200	SR20DE: 324 - 422 (3.24 - 4.22, 3.3 - 4.3, 47 - 61) SR20DET: 343 - 441 (3.43 - 4.41, 3.5 - 4.5, 50 - 64)

If difference is extreme, check oil passage and oil pump for oil leaks.

6. Install oil pressure switch with sealant.

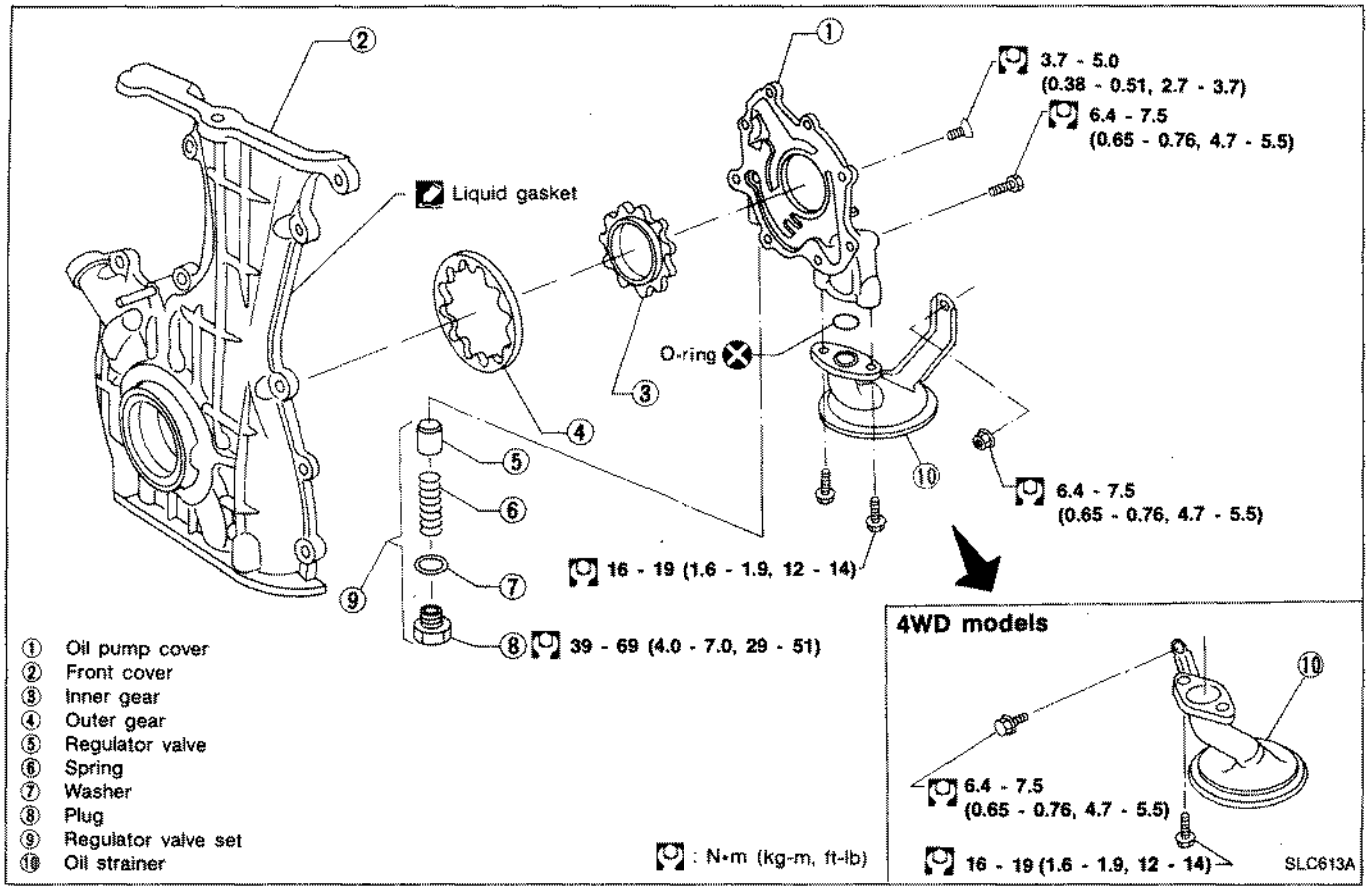
Oil Pump

REMOVAL

1. Remove drive belts.
2. Remove cylinder head. (Refer to EM section.)
3. Remove oil pans. (Refer to EM section.)
4. Remove oil strainer and baffle plate.
5. Remove front cover assembly.

Oil Pump (Cont'd)

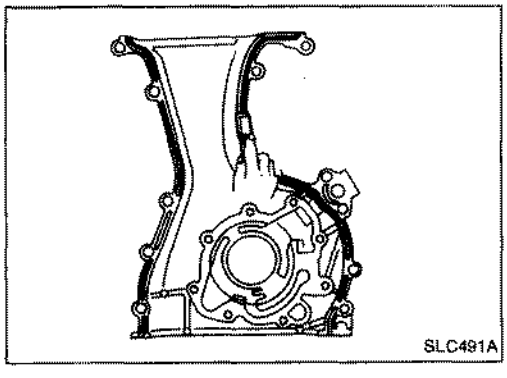
DISASSEMBLY AND ASSEMBLY



① Oil pump cover
② Front cover
③ Inner gear
④ Outer gear
⑤ Regulator valve
⑥ Spring
⑦ Washer
⑧ Plug
⑨ Regulator valve set
⑩ Oil strainer

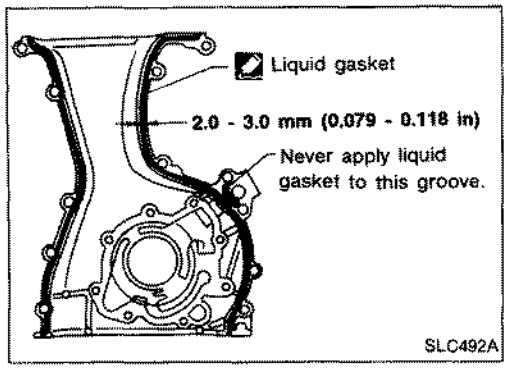
: N·m (kg-m, ft-lb)

- **Always replace oil seal and O-ring with new ones.**
- **When installing oil pump, apply engine oil to inner and outer gear.**
- **Be sure that O-rings are properly fitted.**



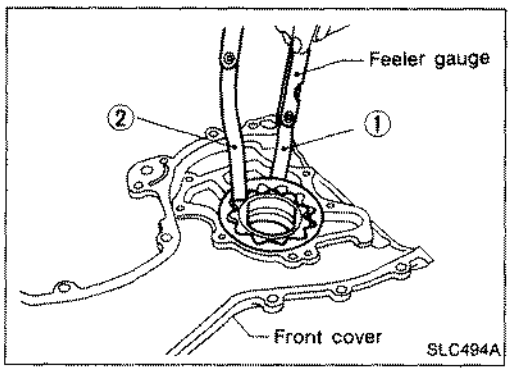
INSTALLATION

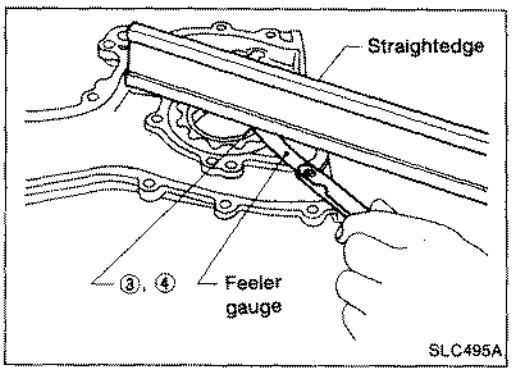
- Before installing front cover assembly, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.

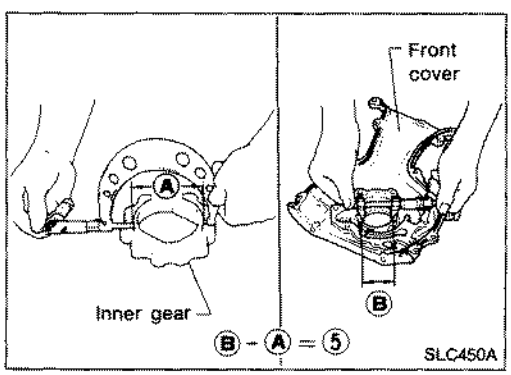


1. Apply a continuous bead of liquid gasket to mating surface of front cover assembly.
   - Use Genuine Liquid Gasket or equivalent.
2. Installation is in reverse order of removal.

Oil Pump (Cont'd)







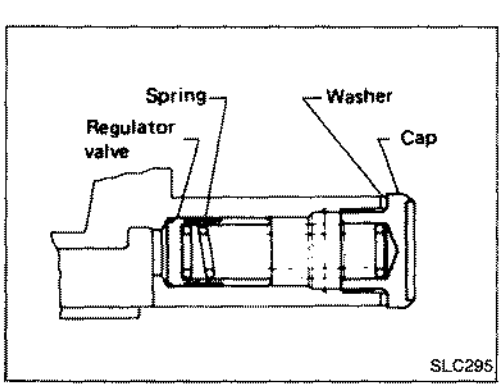
INSPECTION

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)
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 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.**

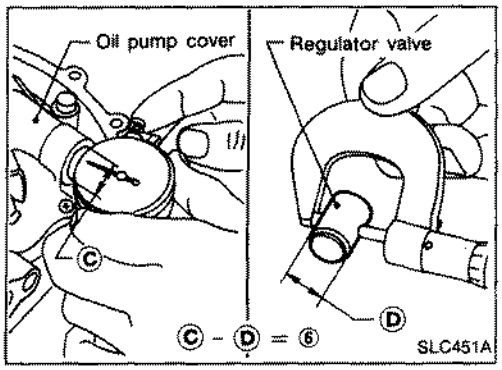


REGULATOR VALVE INSPECTION

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 and check that it falls smoothly into the valve hole by its own weight.

If damaged, replace regulator valve set or front cover assembly.

Oil Pump (Cont'd)

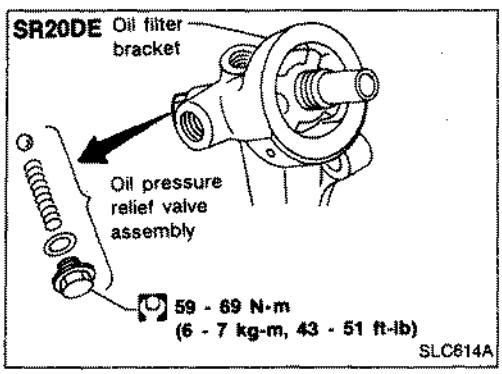


4. Check regulator valve to oil pump cover clearance.

Clearance:

⑥ : 0.040 - 0.097 mm (0.0016 - 0.0038 in)

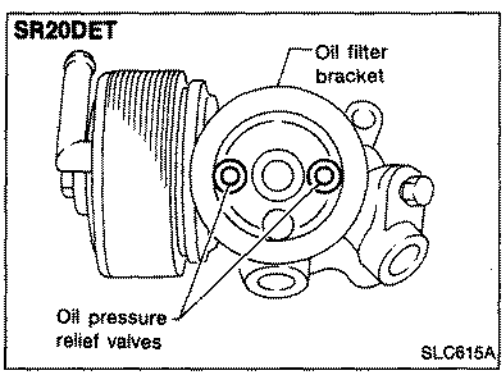
If it exceeds the limit, replace oil pump cover.



OIL PRESSURE RELIEF VALVE INSPECTION

(SR20DE)

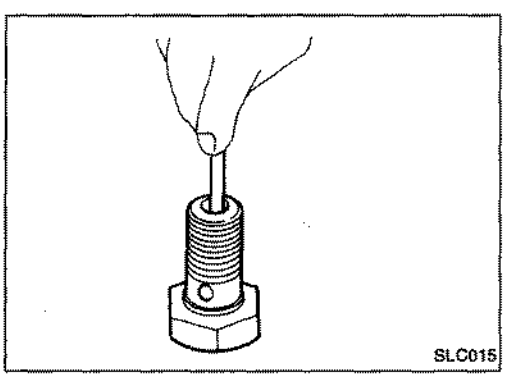
Inspect oil pressure relief valve for movement, cracks and breaks. If damaged, replace oil filter bracket assembly.



(SR20DET)

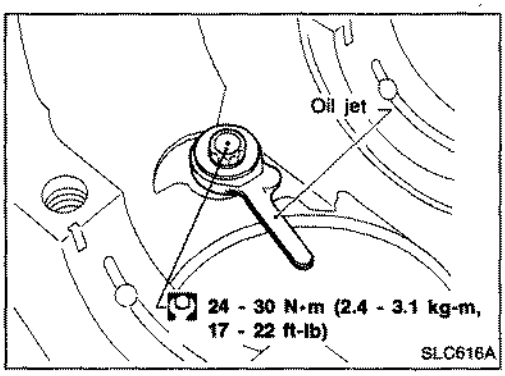
Inspect oil pressure relief valves for movement, cracks and breaks by pushing the ball, If replacement is necessary, remove valve by prying it out with a suitable tool. Install a new valve in place by tapping it.

Oil Jet (For piston)



INSPECTION

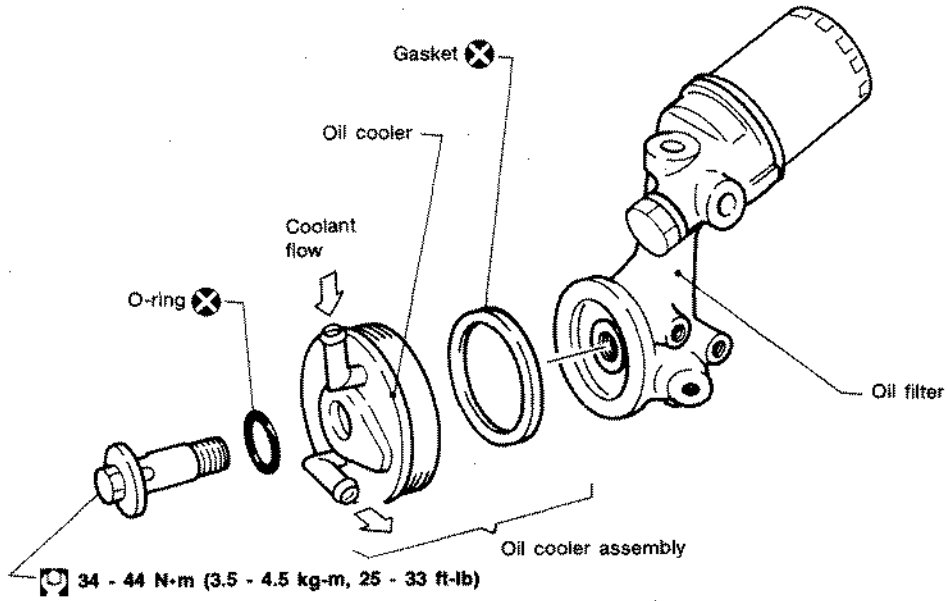
1. Blow through outlet of oil jet and make sure that air comes out of inlet.
2. Push cut-off valve of oil jet bolt with a clean resin or brass rod and make sure that cut-off valve moves smoothly with proper repulsion.



When installing oil jet, align oil jet's boss with hole on cylinder block.

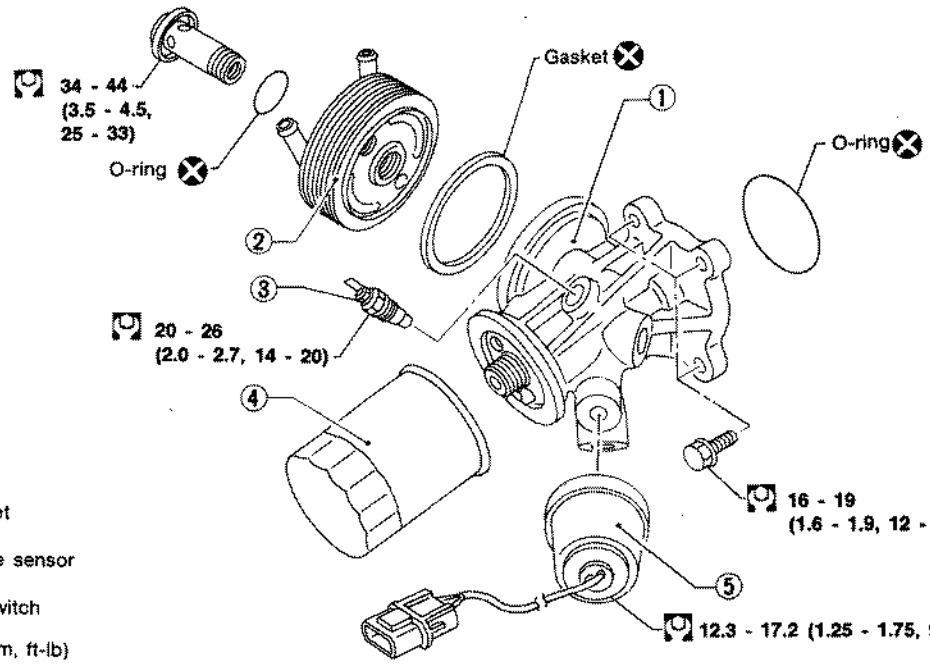
Oil Cooler

SR20DE



SLC632A

SR20DET



SLC612A

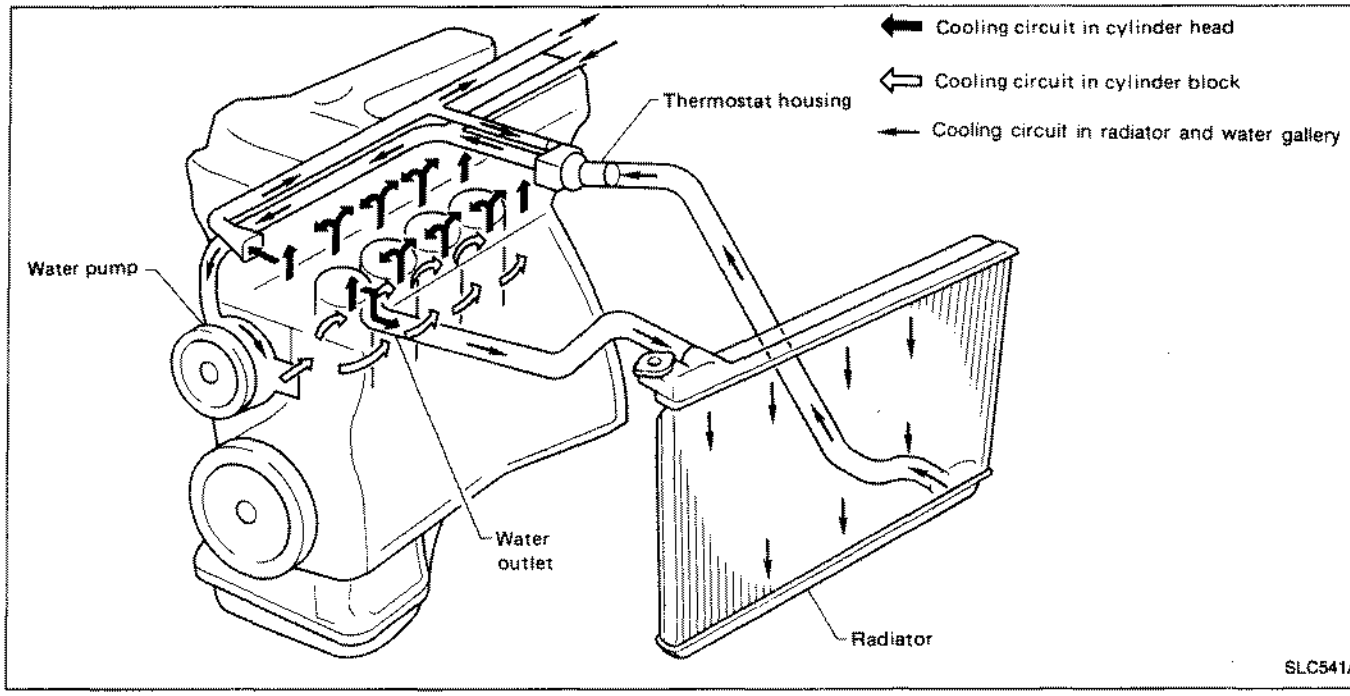
REMOVAL AND INSTALLATION

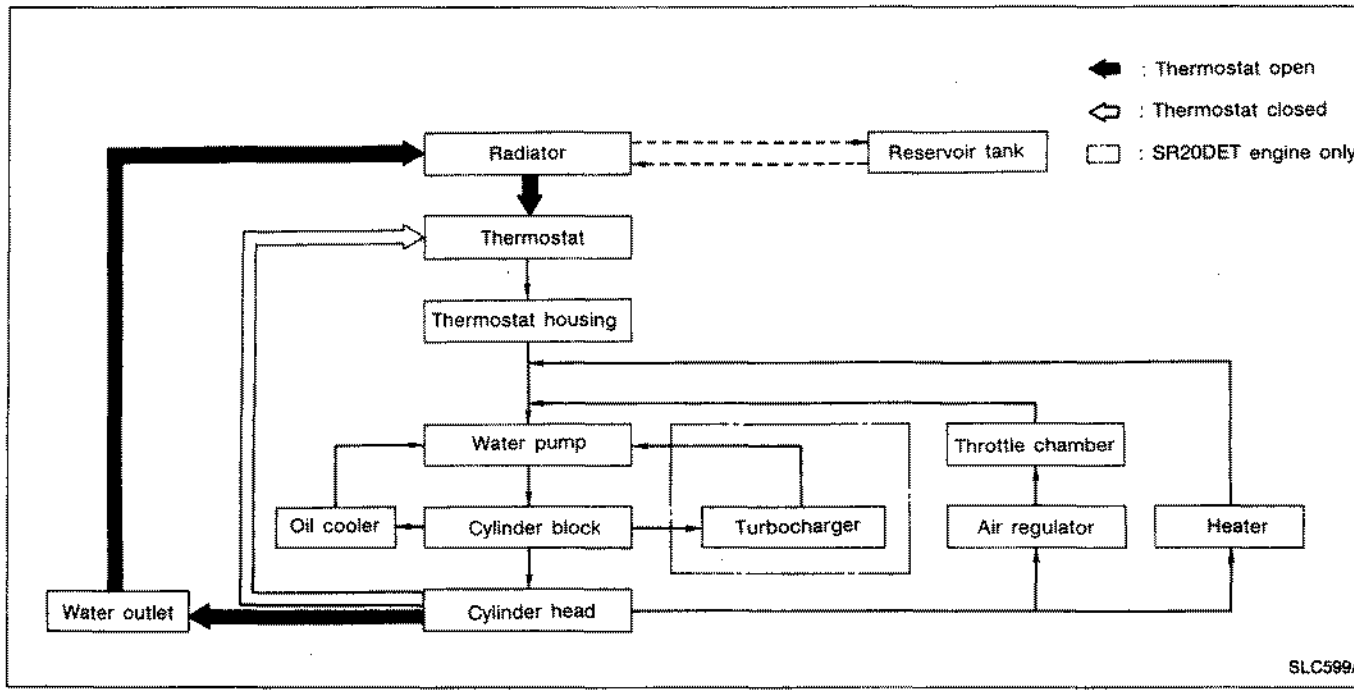
1. Drain engine oil and coolant.
2. Remove oil cooler.
3. Installation is in reverse order of removal.

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:

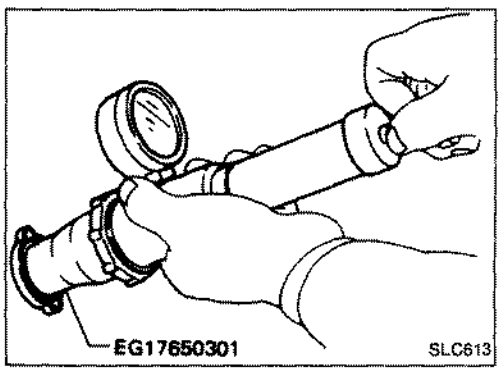
Never remove the radiator cap when the engine is hot; serious burns could be caused by high pressure fluid escaping from the radiator.

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

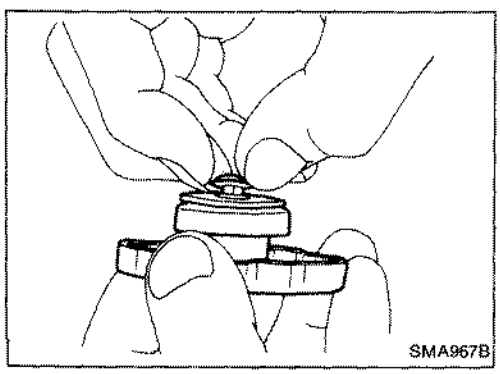
Check water hoses for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



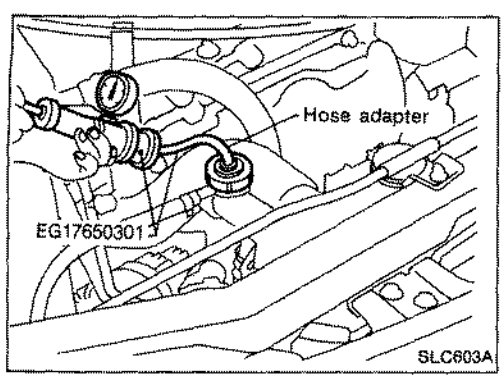
CHECKING RADIATOR CAP

To check radiator cap, apply pressure to cap with a tester.

Radiator cap relief pressure:
78 - 98 kPa
(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)



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

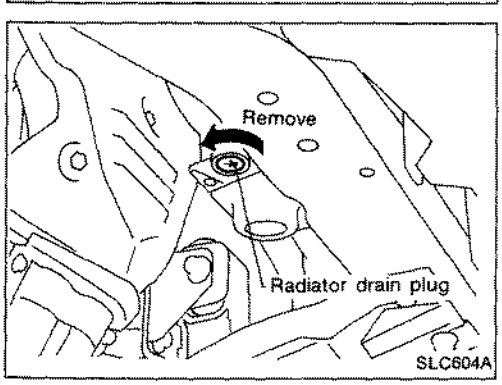


CHECKING COOLING SYSTEM FOR LEAKS

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.

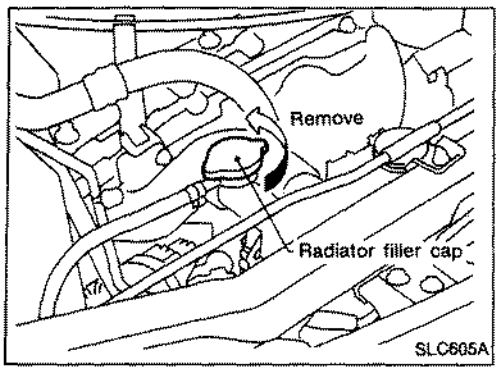


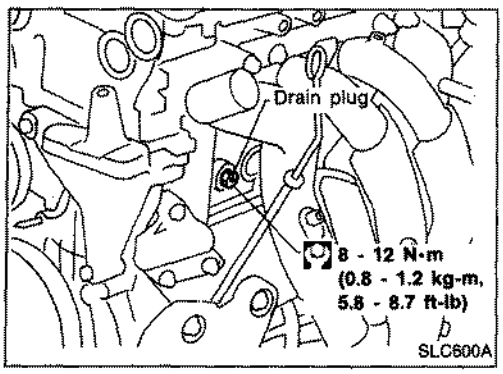
Water Pump

REMOVAL

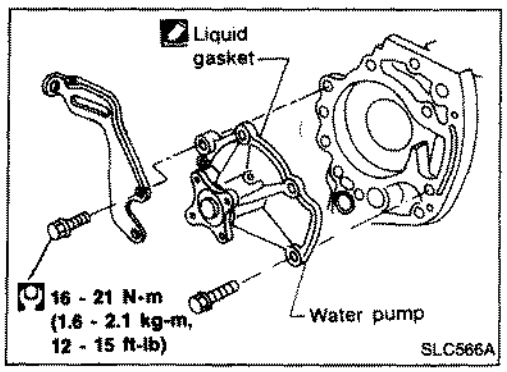
1. Drain coolant from radiator.

Water Pump (Cont'd)





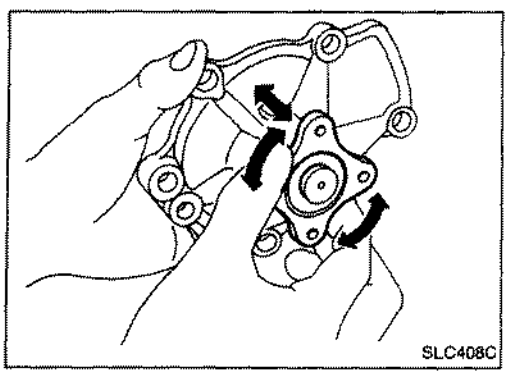
2. Remove cylinder block drain plug located at left front of cylinder block and drain coolant.



3. Remove drive belts.
4. Remove water pump pulley.
5. Remove water pump.

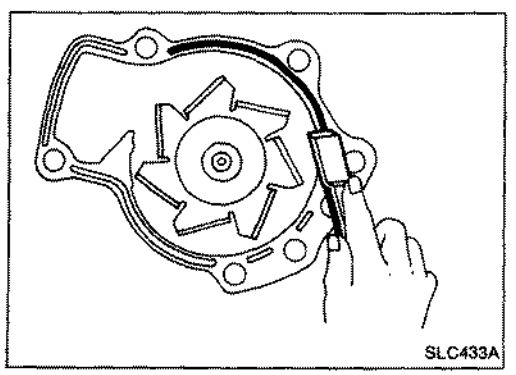
CAUTION:

- **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

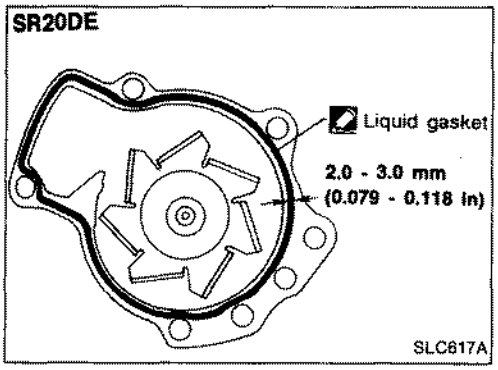
1. Check for badly rusted or corroded body assembly.
2. Check for rough operation due to excessive end play.

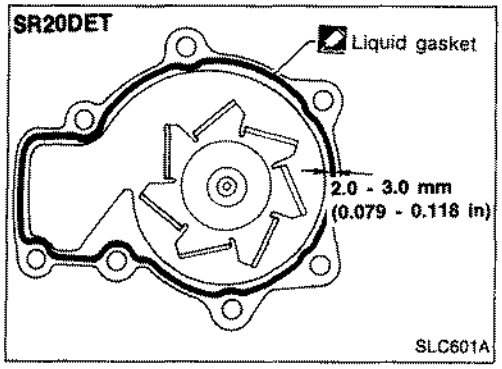


INSTALLATION

1. Before installing water pump, 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 .

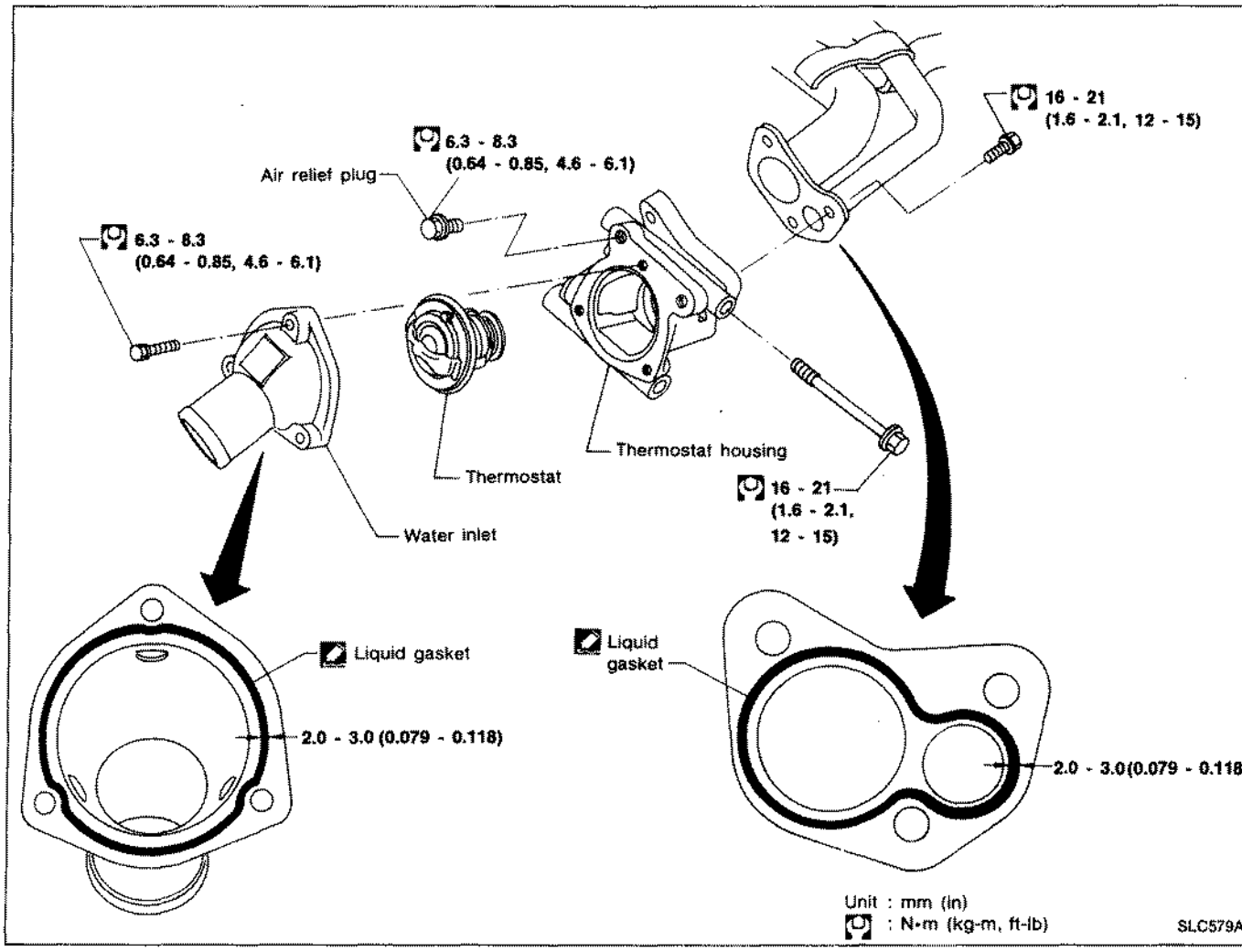
Water Pump (Cont'd)





2. Apply a continuous bead of liquid gasket to mating surface of water pump.
- Use Genuine Liquid Gasket or equivalent.

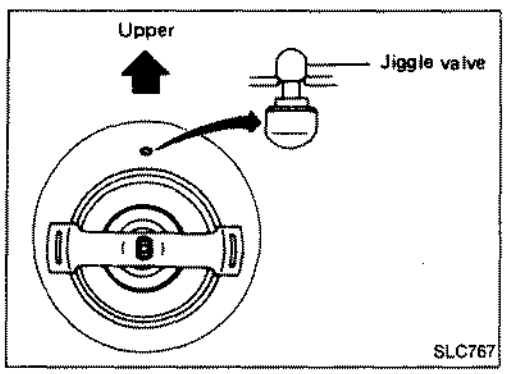
Thermostat



Thermostat (Cont'd)

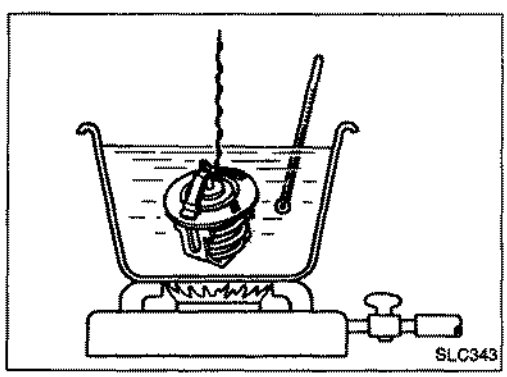
REMOVAL AND INSTALLATION

1. Drain engine coolant.
2. Remove lower radiator hose.
3. Remove water inlet, then take out thermostat.



4. 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.**

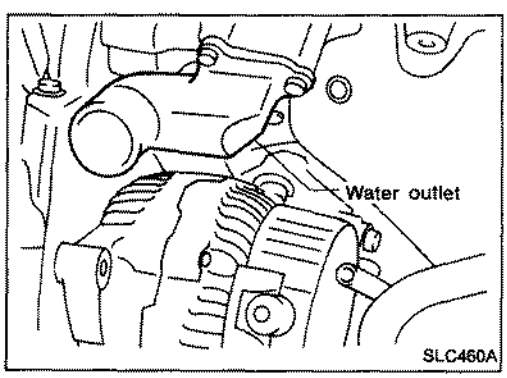


INSPECTION

1. Check for valve seating condition at ordinary temperatures. It should seat tightly.
2. Check valve opening temperature and maximum valve lift.

Valve opening temperature	°C (°F)	76.5 (170)
Max. valve lift	mm/°C (in/°F)	8/90 (0.31/194)

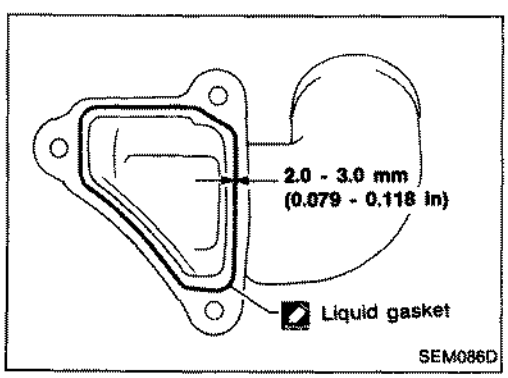
3. Then check if valve closes at 5°C (9°F) below valve opening temperature.



Water outlet

INSPECTION

Visually inspect for water leaks. If there is leakage, apply liquid gasket.

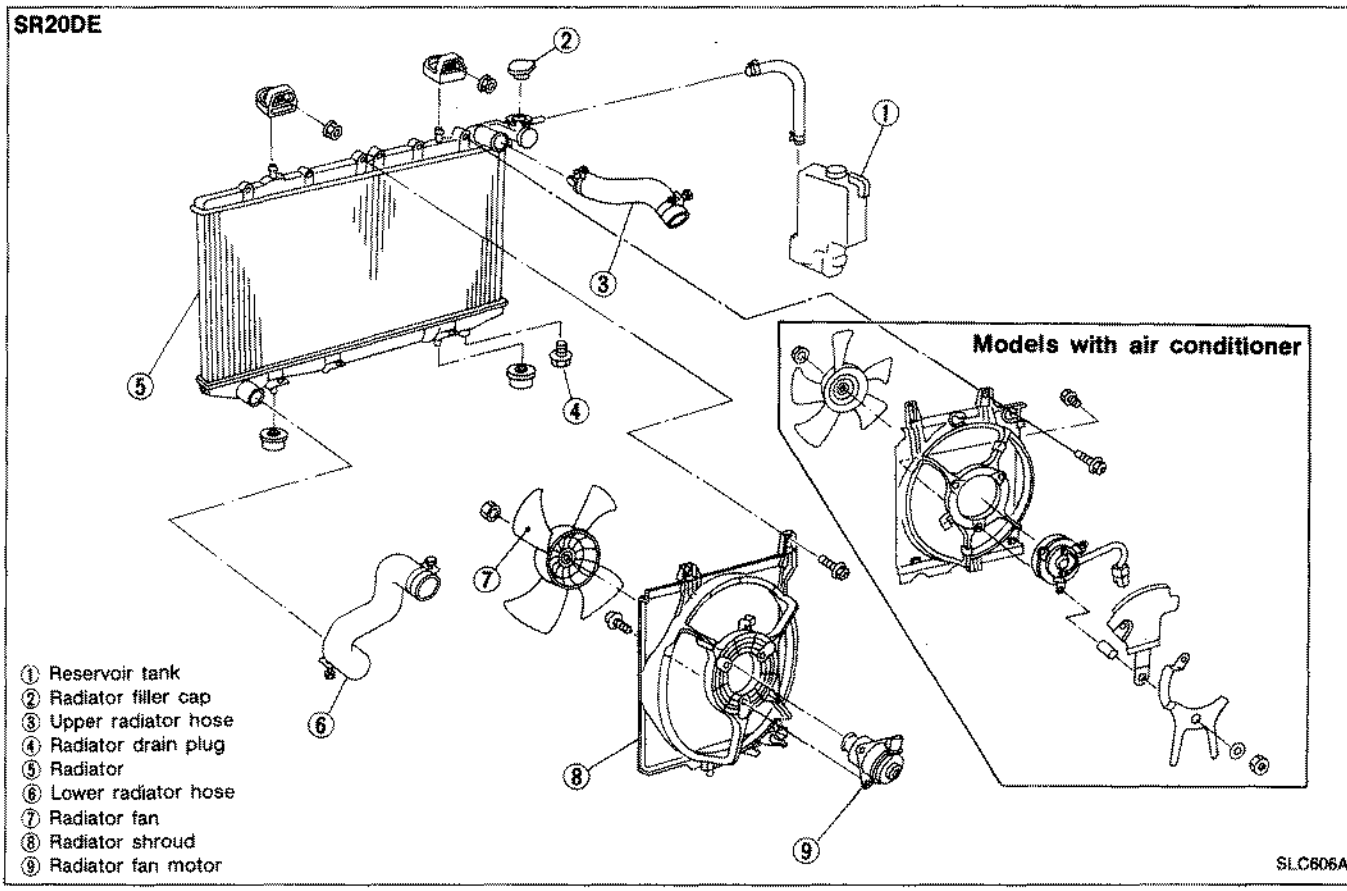


INSTALLATION

1. Before installing water outlet, 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 (Aluminum type)

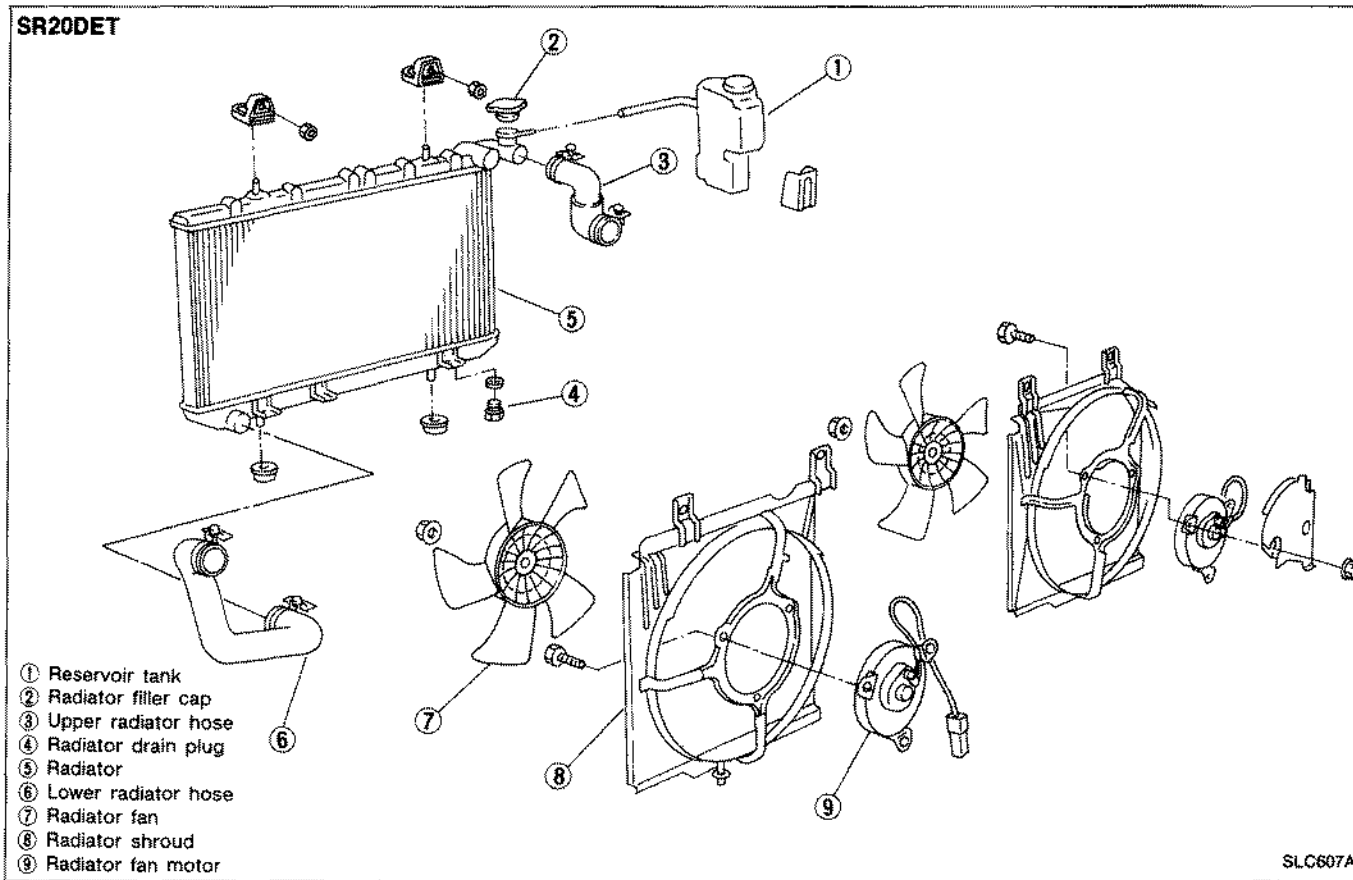
SR20DE



① Reservoir tank
② Radiator filler cap
③ Upper radiator hose
④ Radiator drain plug
⑤ Radiator
⑥ Lower radiator hose
⑦ Radiator fan
⑧ Radiator shroud
⑨ Radiator fan motor

SLC606A

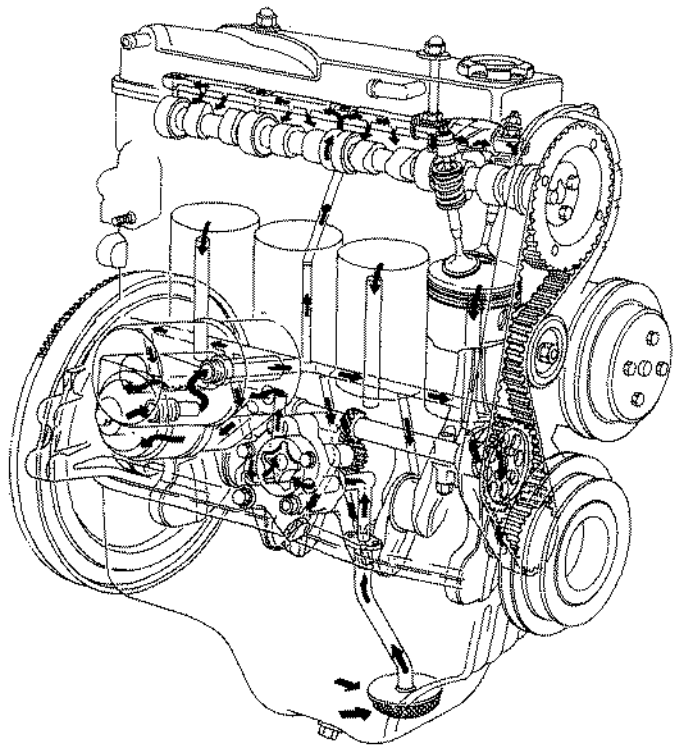
SR20DET

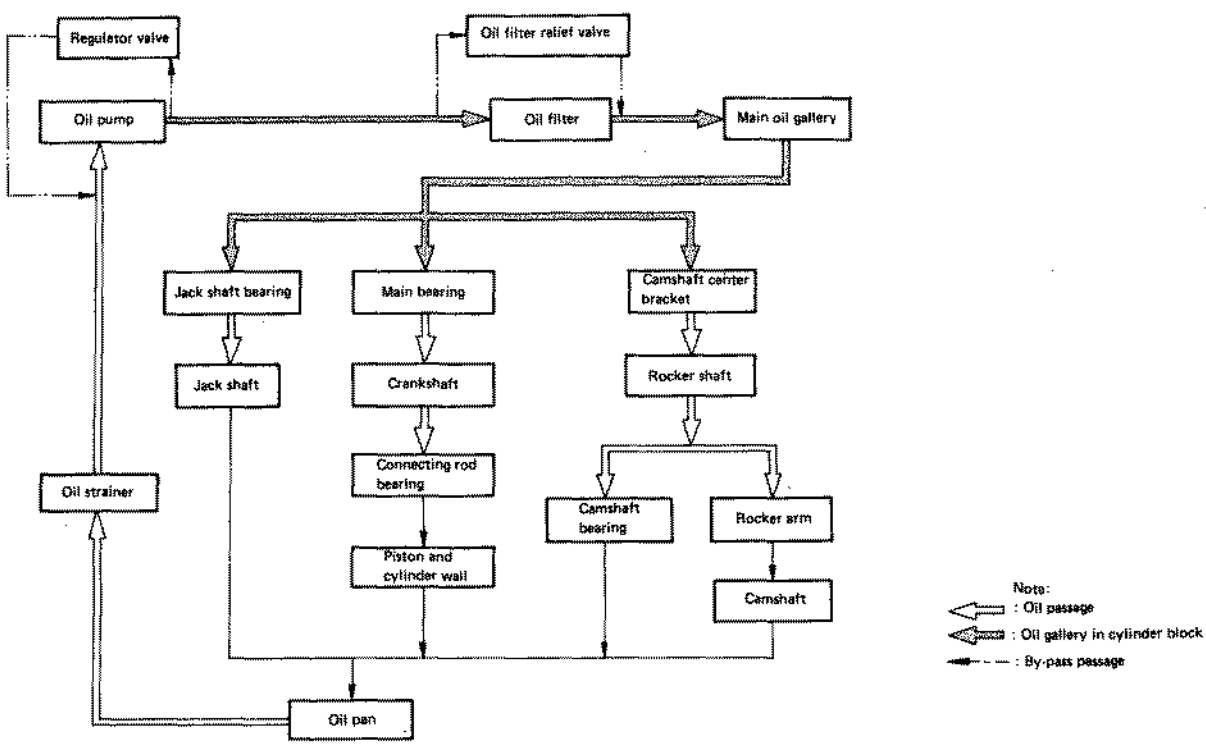


① Reservoir tank
② Radiator filler cap
③ Upper radiator hose
④ Radiator drain plug
⑤ Radiator
⑥ Lower radiator hose
⑦ Radiator fan
⑧ Radiator shroud
⑨ Radiator fan motor

SLC607A

Lubrication Circuit



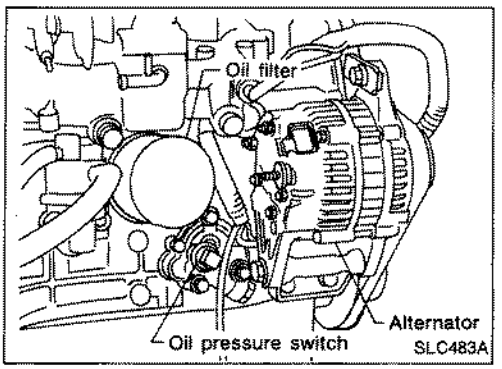


SLC486A

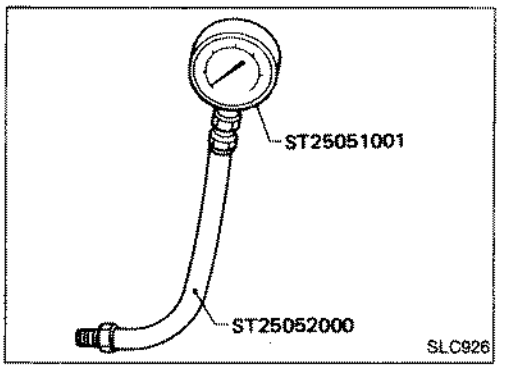
Oil Pressure Check

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. Warm up engine.
2. Stop engine and remove oil pressure switch.

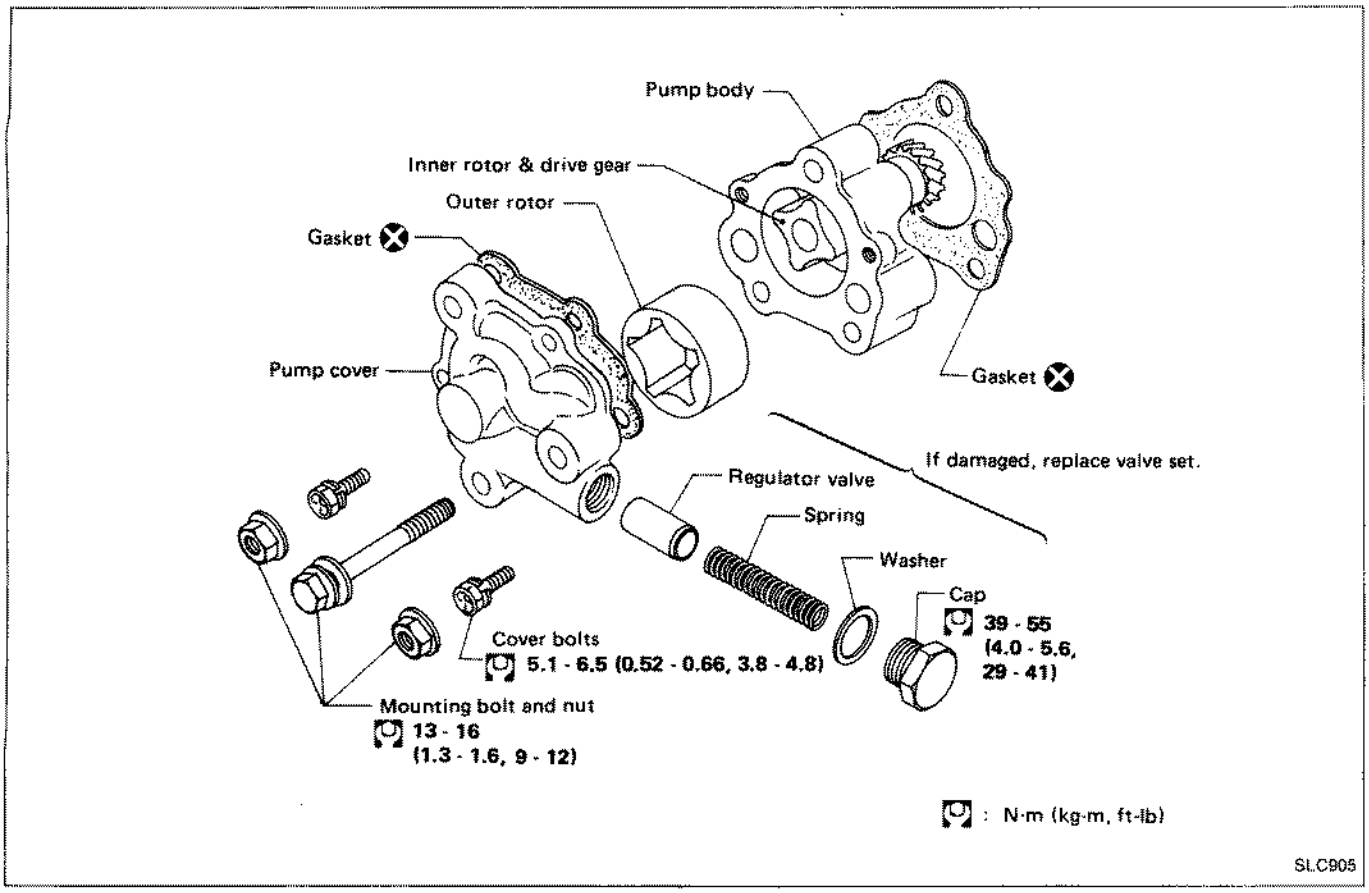


3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.

Engine rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)
Idle speed	More than 59 (0.59, 0.6, 9)
3,000	363 - 520 (3.63 - 5.20, 3.7 - 5.3, 53 - 75)

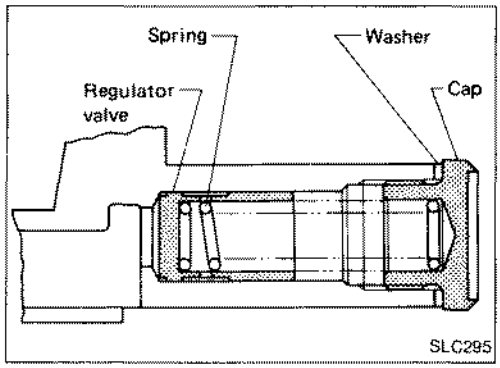
6. Install oil pressure switch.
   Oil pressure switch:
   : 10 - 16 N·m
   (1.0 - 1.6 kg-m, 7 - 12 ft-lb)

Oil Pump



- **Do not disassemble inner rotor and drive gear.**
- **Always replace gaskets with new ones.**
- **When installing oil pump, apply engine oil to inner and outer rotors.**
- **After installation, run engine for a few minutes, and check for leaks.**

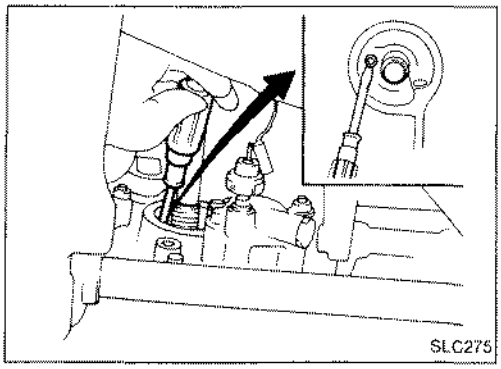
Oil Pump (Cont'd)



REGULATOR VALVE INSPECTION

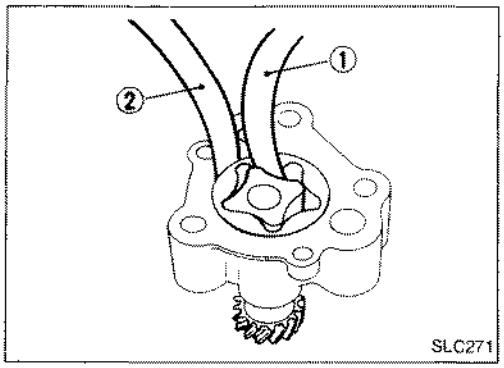
1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Coat regulator valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

If damaged, replace regulator valve set or oil pump 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 a screwdriver.
Install a new valve in place by tapping it.



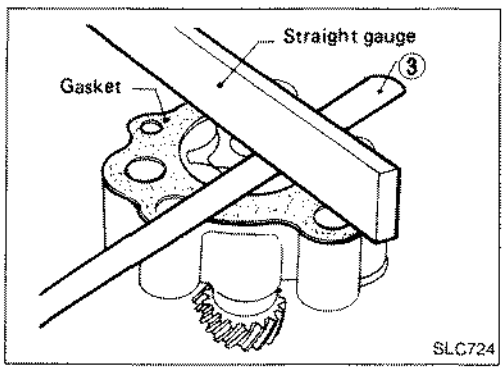
OIL PUMP INSPECTION

Using a feeler gauge, check the following clearance.

Unit: mm (in)

Rotor tip clearance ①	Less than 0.12 (0.0047)
Outer rotor to body clearance ②	0.15 - 0.21 (0.0059 - 0.0083)
Side clearance (with gasket) ③	0.05 - 0.12 (0.0020 - 0.0047)

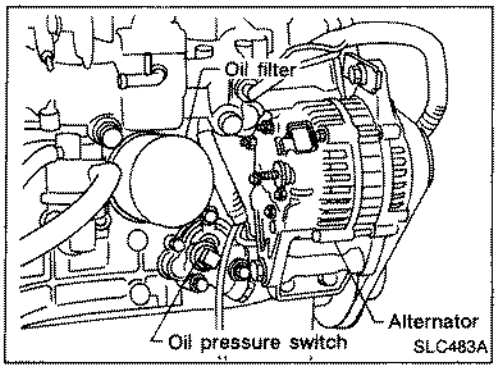
If it exceeds the limit, replace gear set or entire oil pump assembly.



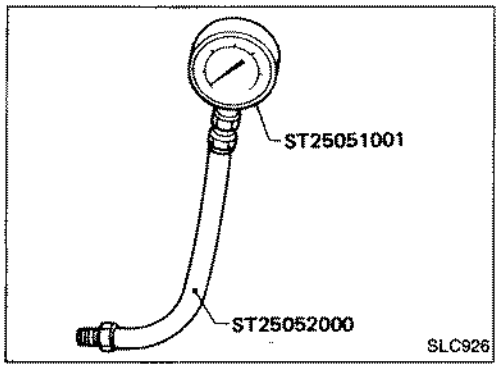
Oil Pressure Check

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. Warm up engine.
2. Stop engine and remove oil pressure switch.

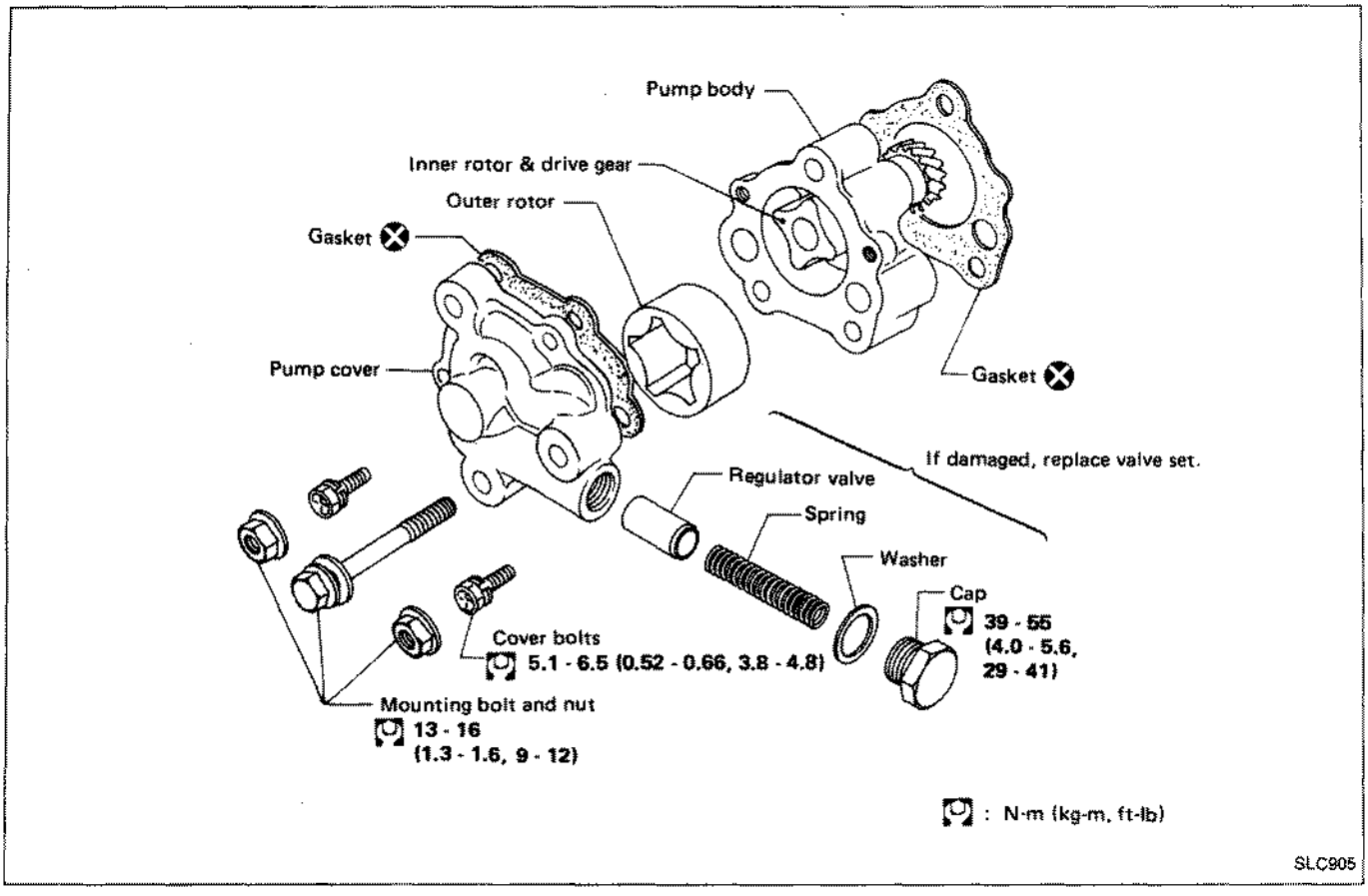


3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.

Engine rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)
Idle speed	More than 59 (0.59, 0.6, 9)
3,000	363 - 520 (3.63 - 5.20, 3.7 - 5.3, 53 - 75)

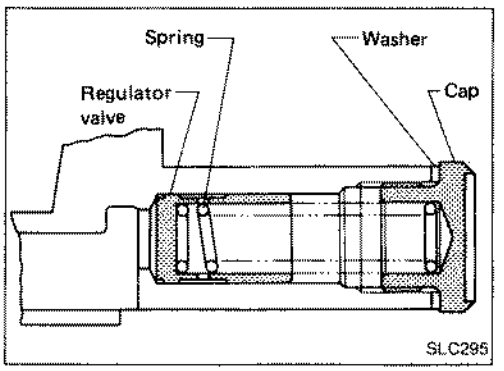
6. Install oil pressure switch.
   Oil pressure switch:
   : 10 - 16 N·m
   (1.0 - 1.6 kg-m, 7 - 12 ft-lb)

Oil Pump



- **Do not disassemble inner rotor and drive gear.**
- **Always replace gaskets with new ones.**
- **When installing oil pump, apply engine oil to inner and outer rotors.**
- **After installation, run engine for a few minutes, and check for leaks.**

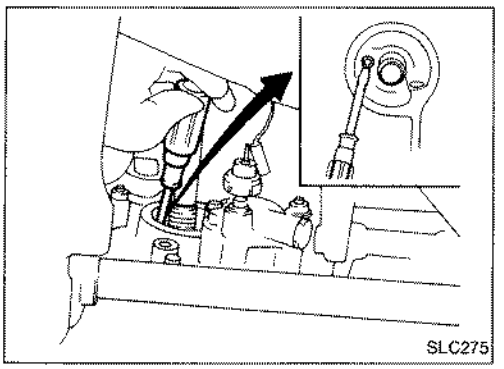
Oil Pump (Cont'd)



REGULATOR VALVE INSPECTION

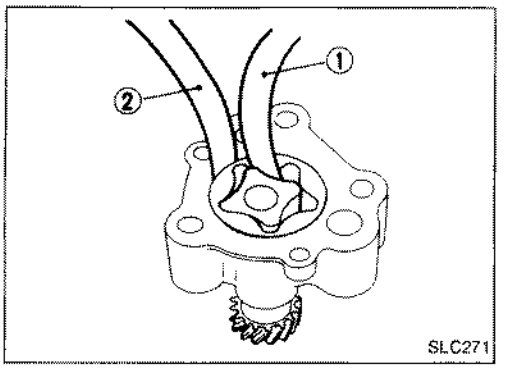
1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Coat regulator valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

If damaged, replace regulator valve set or oil pump 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 a screwdriver.
Install a new valve in place by tapping it.



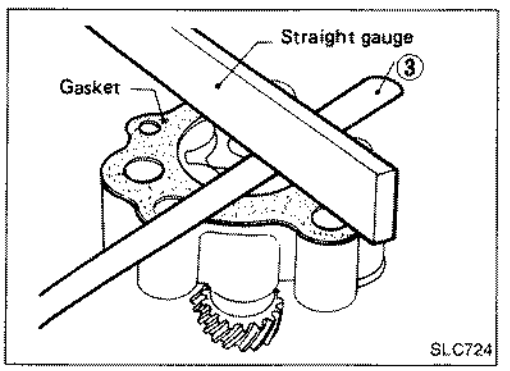
OIL PUMP INSPECTION

Using a feeler gauge, check the following clearance.

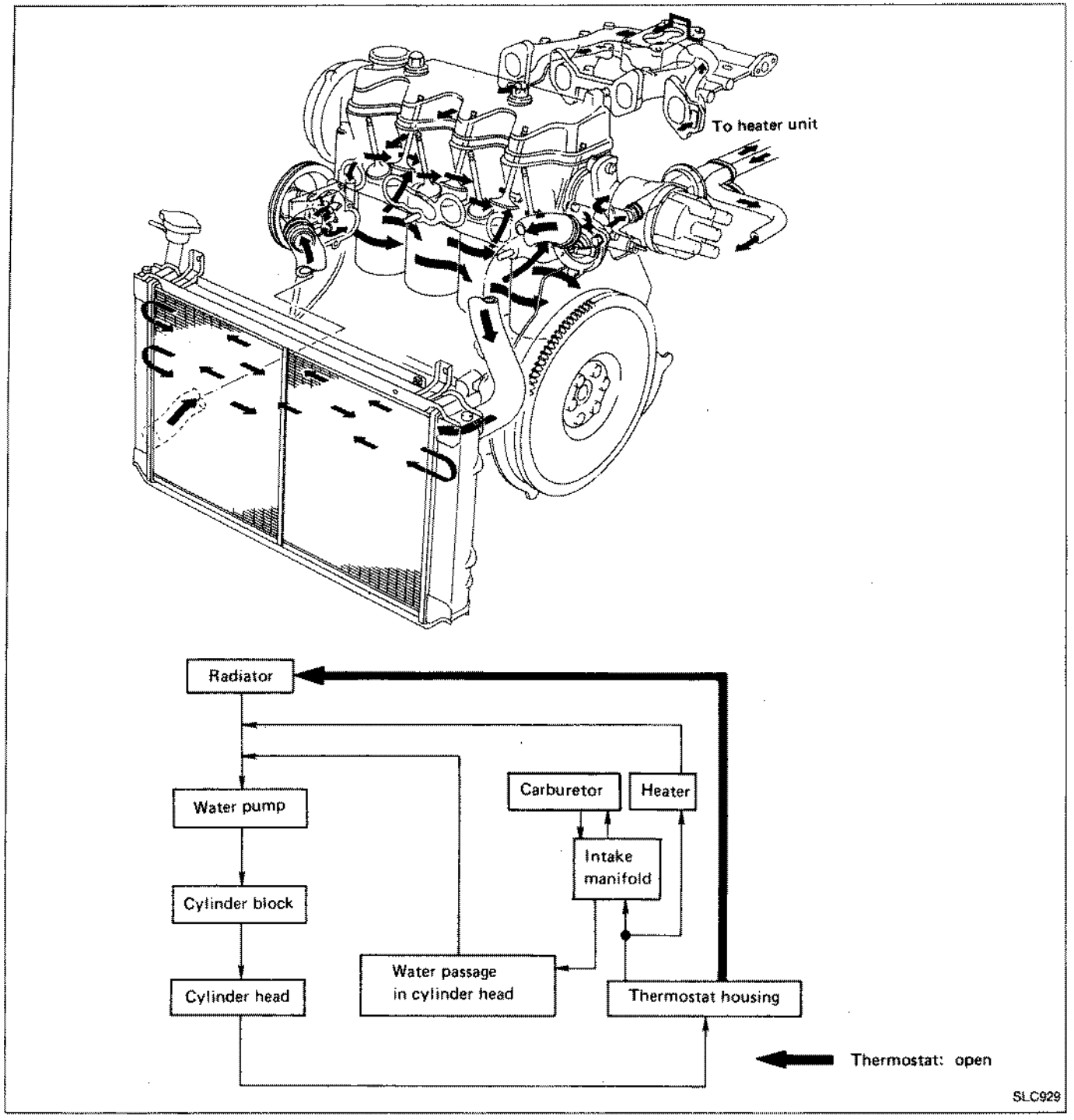
Unit: mm (in)

Rotor tip clearance ①	Less than 0.12 (0.0047)
Outer rotor to body clearance ②	0.15 - 0.21 (0.0059 - 0.0083)
Side clearance (with gasket) ③	0.05 - 0.12 (0.0020 - 0.0047)

If it exceeds the limit, replace gear set or entire oil pump assembly.



Cooling Circuit

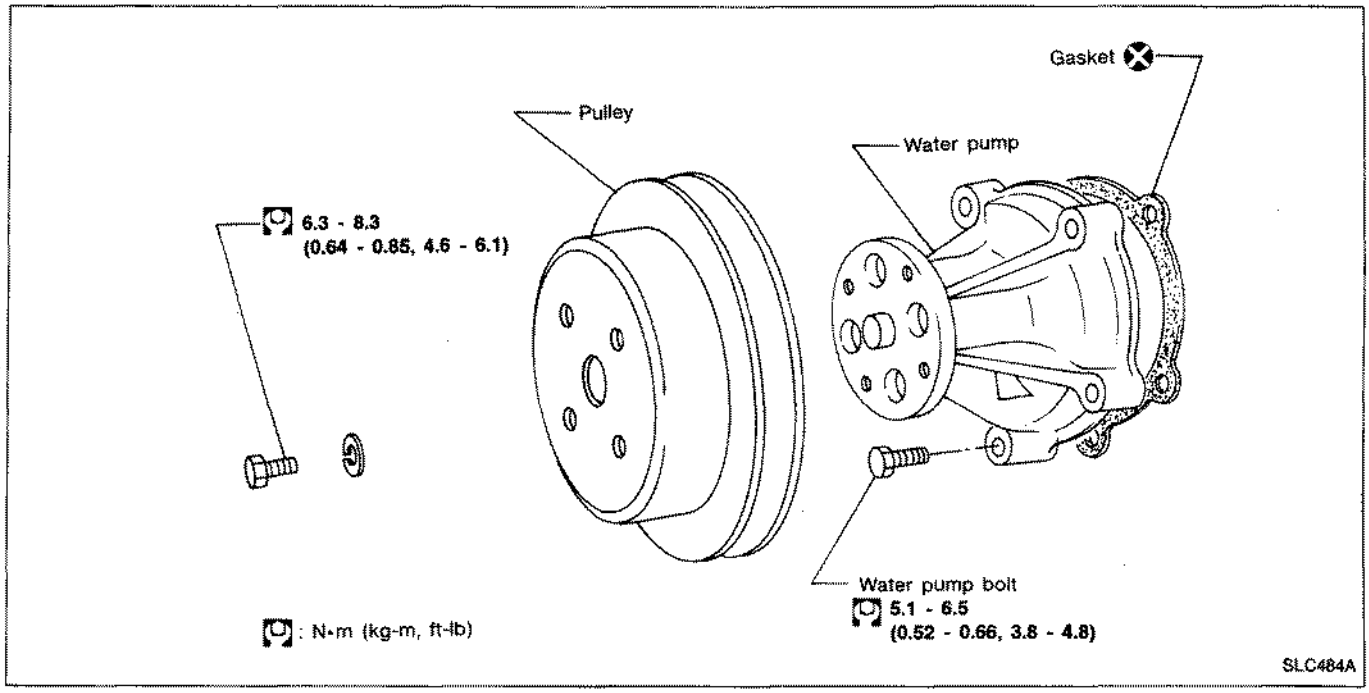


WARNING:
To avoid serious personal injury, never remove radiator cap quickly when engine is hot. Sudden release of cooling system pressure is very dangerous.
If it is necessary to remove radiator cap when radiator is hot, wrap cap with a cloth and turn cap slowly counterclockwise to the first stop. After all pressure in the cooling system is released, turn cap passing the stop and remove it.

Cooling System Inspection

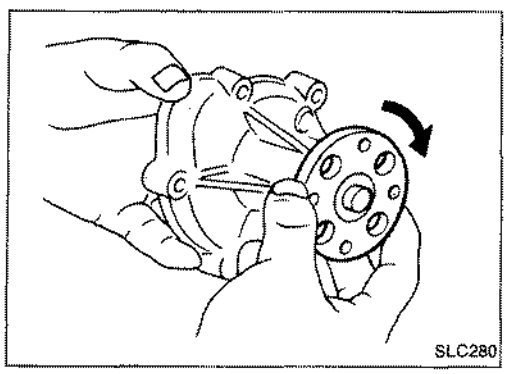
Refer to MA section.

Water Pump



CAUTION:

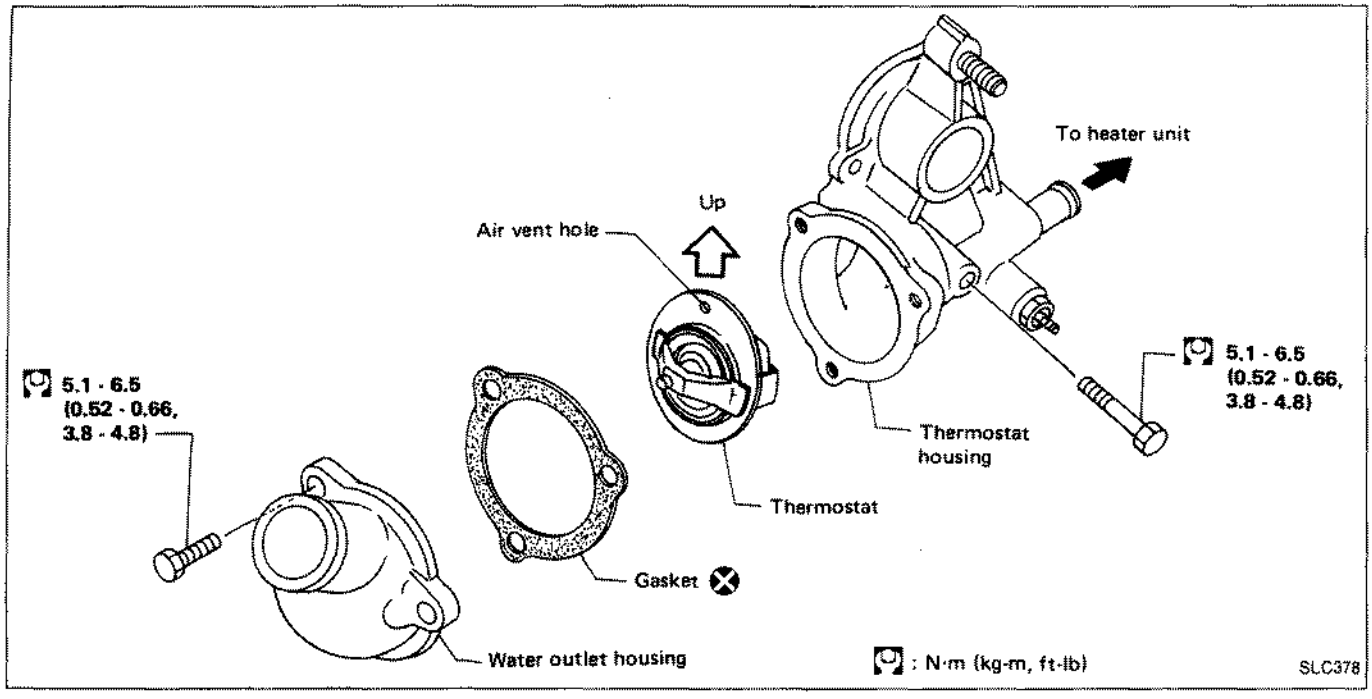
- **When removing water pump assembly, be careful not to get coolant on timing belt.**
- **Water pump cannot be disassembled and should be replaced as a unit.**
- **To avoid deforming timing cover, make sure there is adequate clearance between cover and hose clamp.**
- **After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester.**



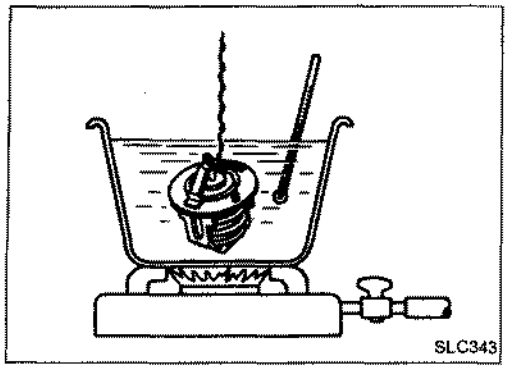
INSPECTION

1. Check for badly rusted or corroded body assembly and vane.
2. Check for rough operation due to excessive end play.

Thermostat



- **After installation, run engine for a few minutes, and check for leaks.**
- **Be careful not to spill coolant over engine compartment. Place a rag to absorb coolant.**



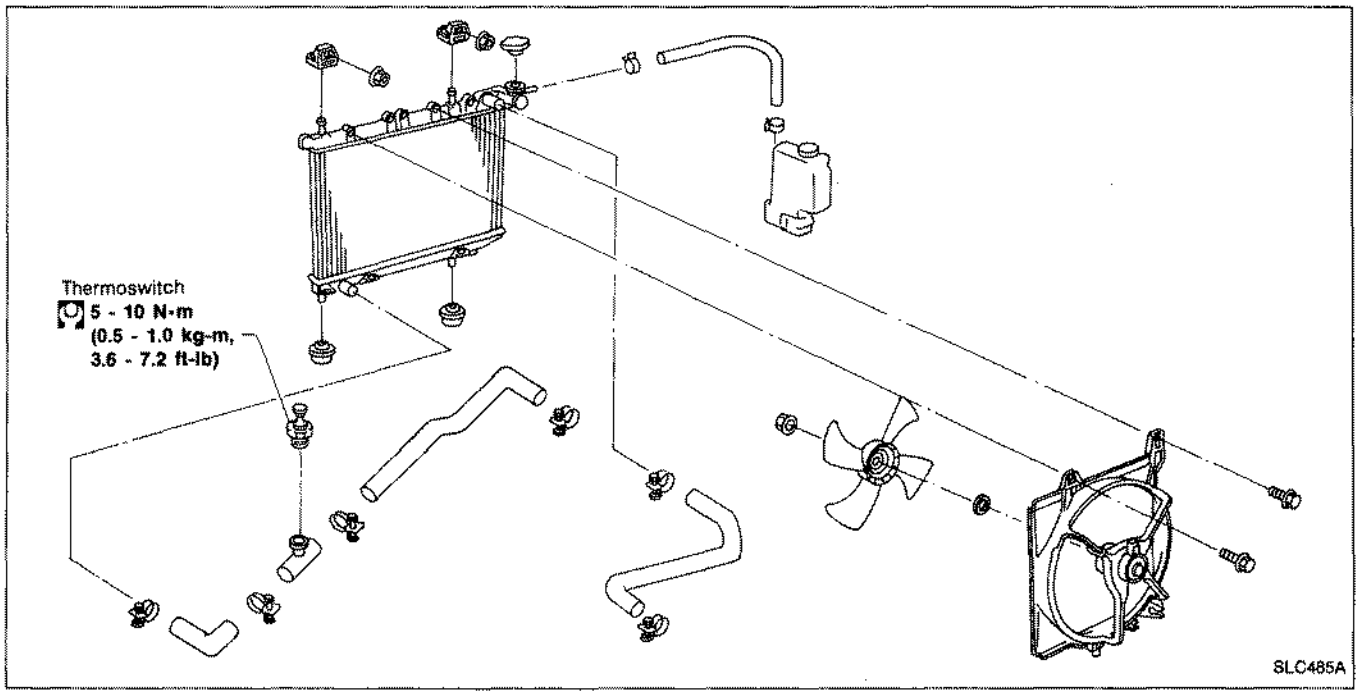
INSPECTION

1. Check valve seating condition at ordinary temperatures. It should seat tightly.
2. Check valve opening temperature and maximum valve lift.

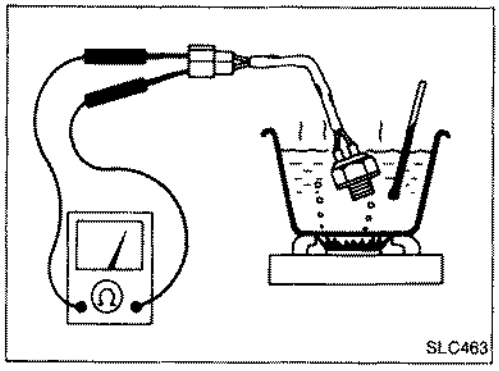
	Frigid type	Standard type	Tropical type
Valve opening temperature °C (°F)	88 (190)	82 (180)	76.5 (170)
Max. valve lift mm/°C (in/°F)	8/100 (0.31/212)	8/95 (0.31/203)	8/90 (0.31/194)

3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

Radiator



CAUTION:
When filling radiator with coolant, refer to MA section.

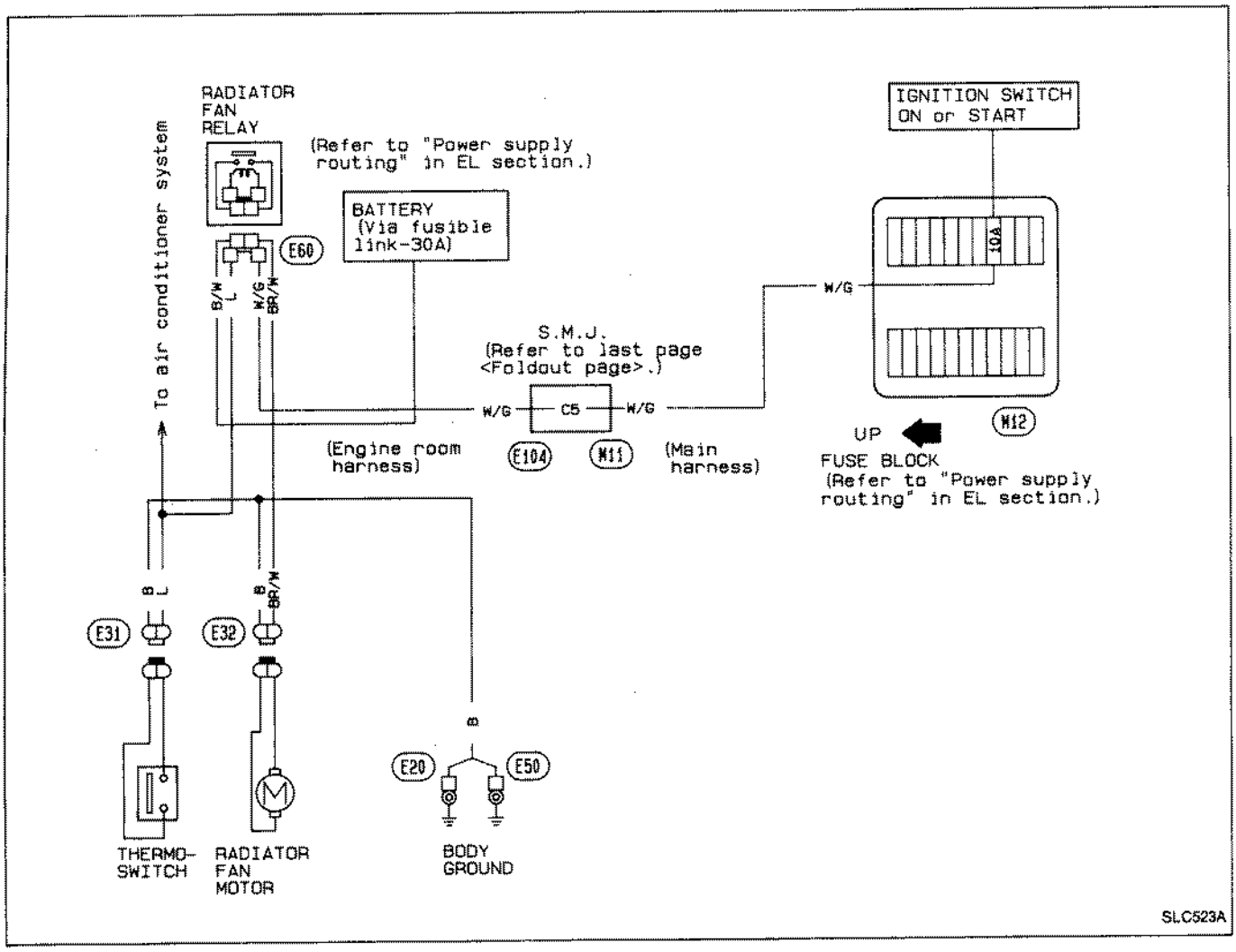


Thermoswitch

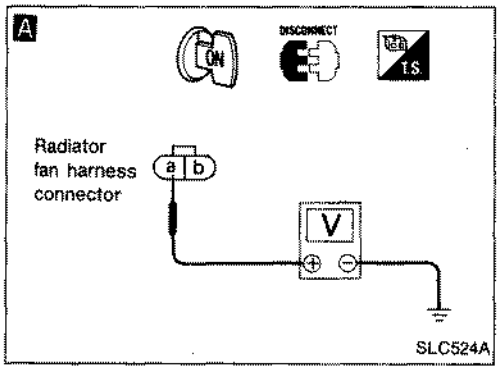
INSPECTION

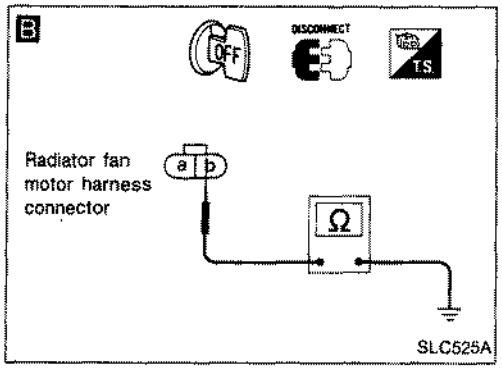
1. Drain about one liter of coolant.
2. Remove thermoswitch.
3. Check thermoswitch for proper operation.
   Operating temperature:
   OFF → ON 87 - 93°C (189 - 199°F)

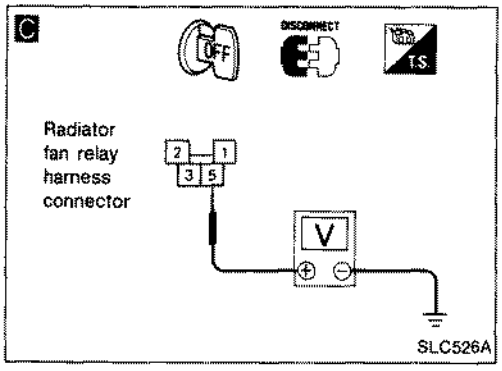
Trouble Diagnoses — Radiator Fan Motor

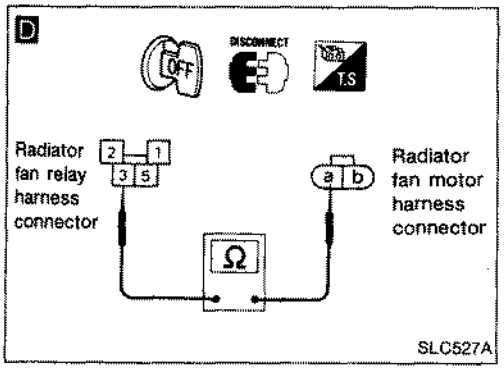


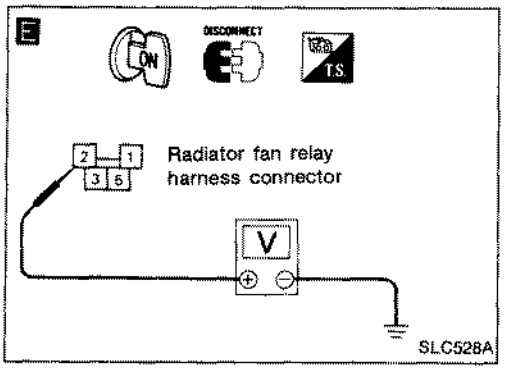
Trouble Diagnoses — Radiator Fan Motor (Cont'd)











SYMPTOM:
Even though the engine coolant is hot, the radiator fan motor does not rotate.

This check should be performed after engine is warmed up sufficiently.

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Disconnect radiator fan harness connector.
3) Check voltage between ⓐ and ground.
Battery voltage should exist.

N.G. →
1) Turn ignition switch "OFF".
2) Disconnect radiator fan relay.
C 3) Check voltage between terminal ⑤ and ground.
Battery voltage should exist.
If N.G., check harness continuity between battery ⊕ pole and terminal ⑤.
D 4) Check harness continuity between radiator fan relay terminal ③ and radiator fan motor harness connector terminal ⓐ.
Continuity should exist.
If N.G., repair harness.

O.K. ↓

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect radiator fan motor harness connector.
3) Check harness continuity between ⓑ and ground.
Continuity should exist.
If N.G., repair harness.

O.K. ↓

Replace radiator fan motor with a new one.

E

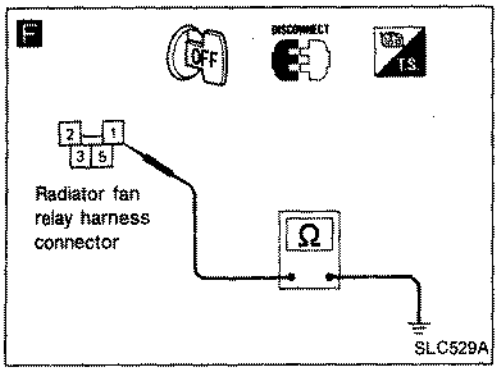
O.K. ↓

1) Turn ignition switch "ON".
2) Check voltage between terminal ② and ground.
Battery voltage should exist.
If N.G., check following parts:
- Harness continuity between fuse and terminal ②
- Fuse

O.K. ↓

Ⓐ

Trouble Diagnoses — Radiator Fan Motor (Cont'd)



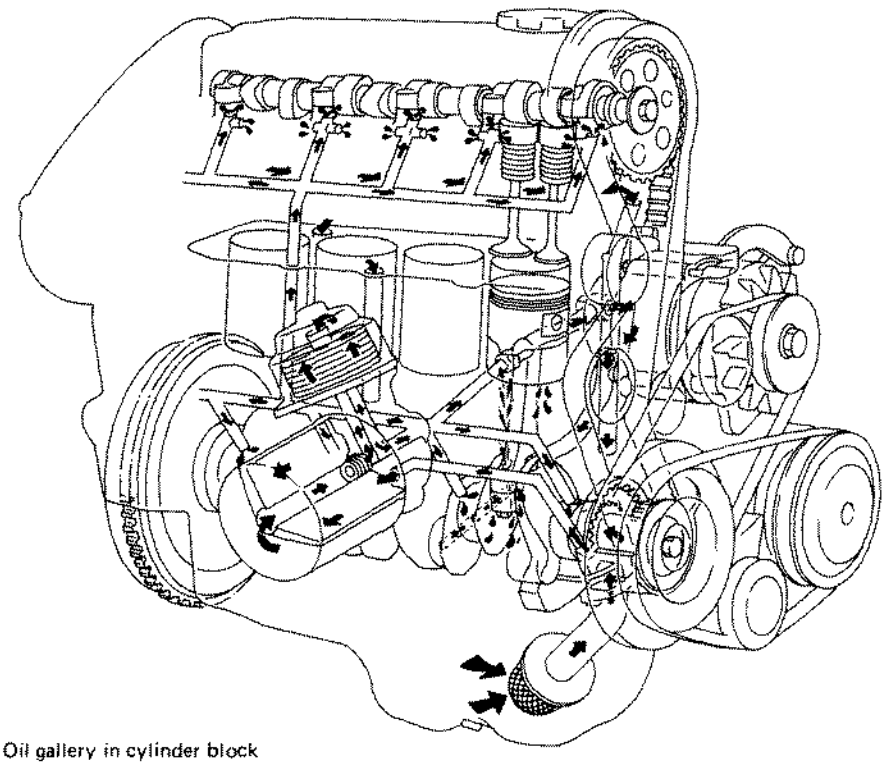
F (A)

1) Turn ignition switch "OFF".
2) Check continuity between terminal ① and ground.
Continuity should exist.
If N.G., check the following parts:
- Thermoswitch
- Harness continuity between ① and thermoswitch terminal
- Harness continuity between thermoswitch terminal and body ground

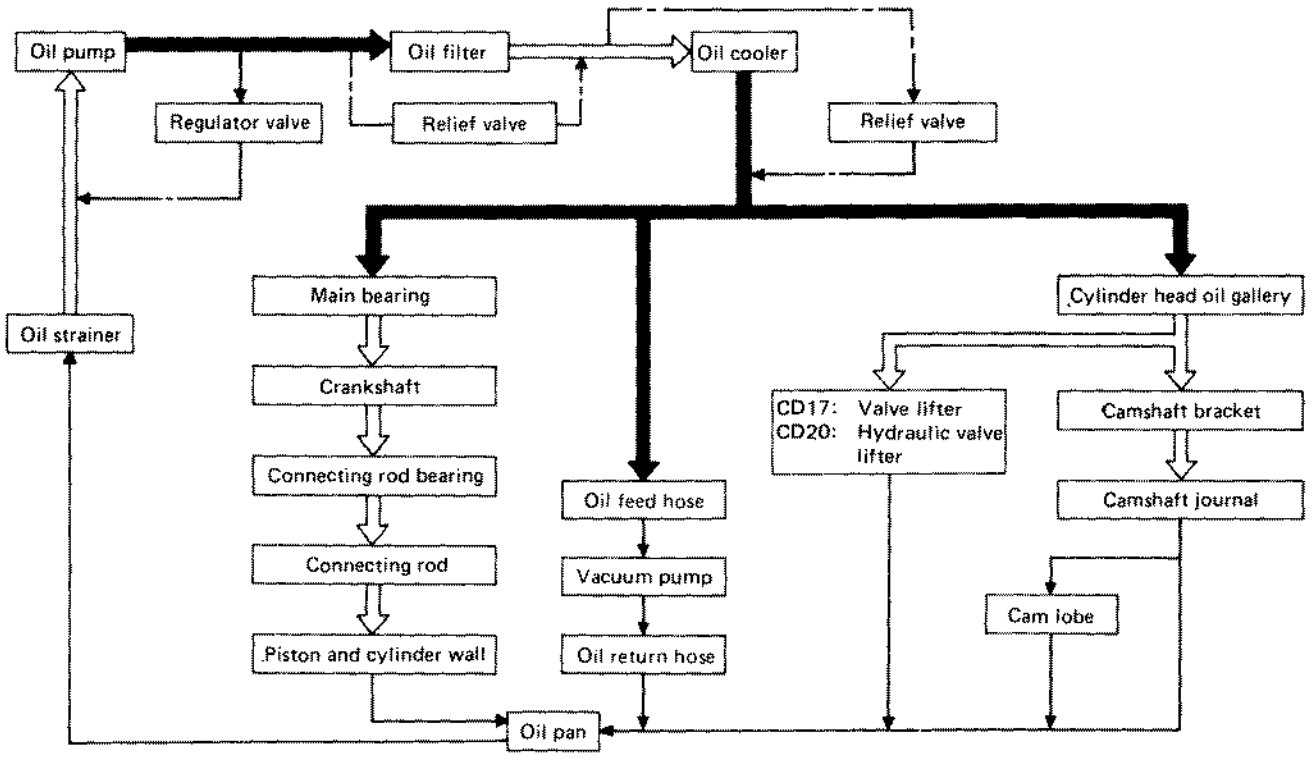
O.K.

Check radiator fan relay. If N.G., replace with a new one.

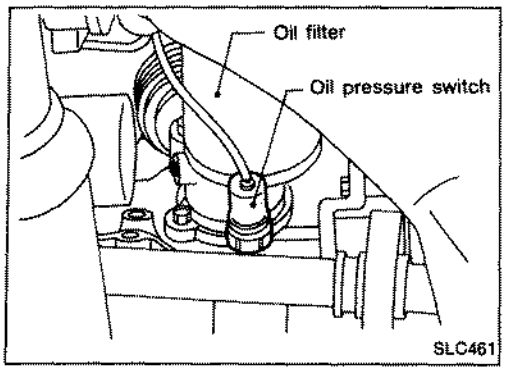
Lubrication Circuit



Note: : Oil gallery in cylinder block
: Oil passage
: By-pass passage



SLC609A

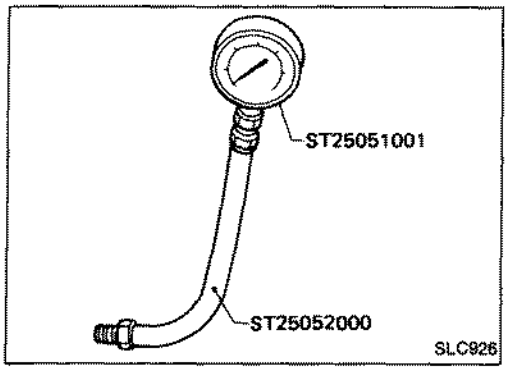


Oil Pressure Check

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.

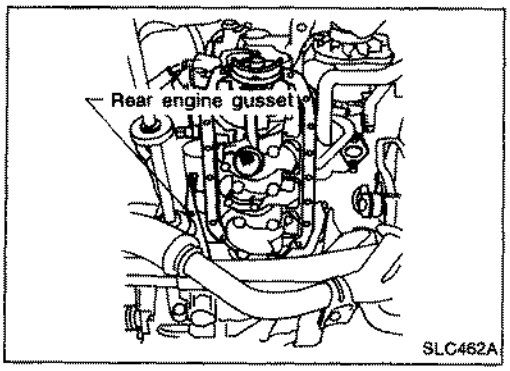


3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.

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.

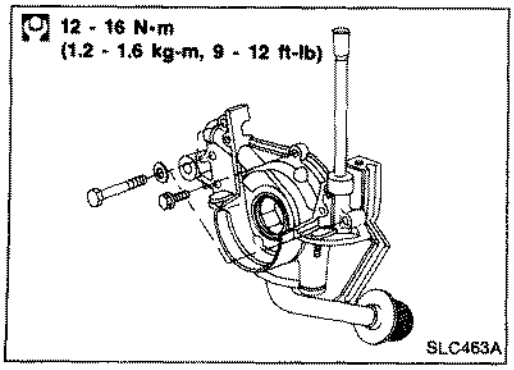
6. Install oil pressure switch with sealant.



Oil Pump

REMOVAL AND INSTALLATION

1. Drain engine coolant and engine oil.
2. Remove upper radiator hose, drive belts, crank pulley, timing belt covers, front engine mounting (CD20) bracket and timing belt.
3. Remove exhaust front tube, timing belt pulley and rear engine gusset (bar type), then remove oil pan.



4. Remove oil pump assembly with oil strainer.
5. Reinstall any part removed. Refill engine oil and engine coolant.

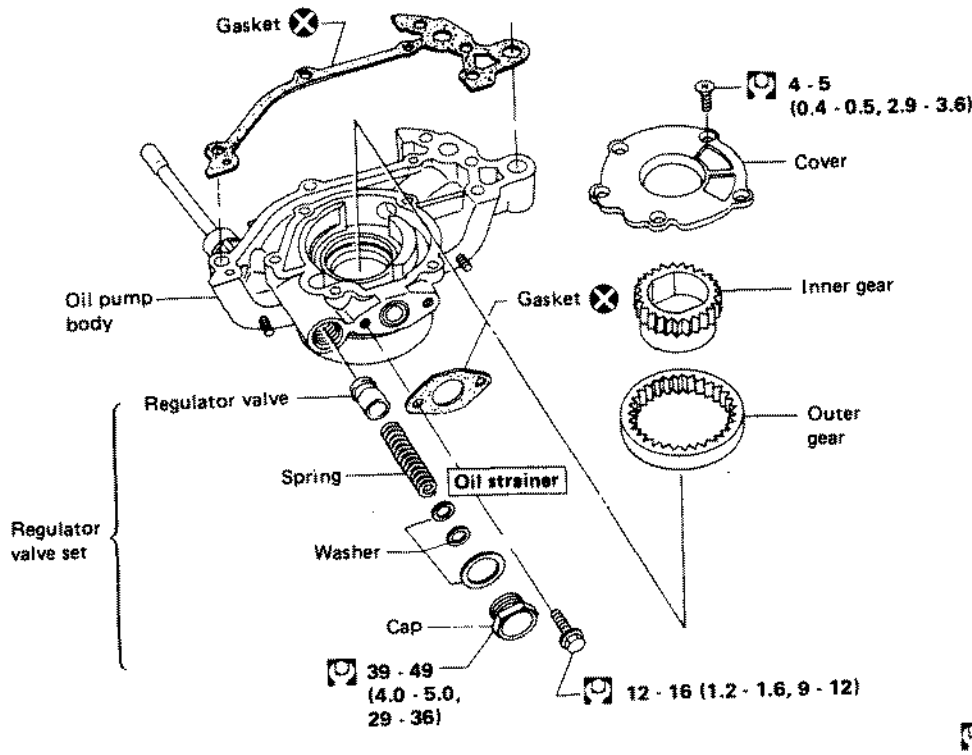
- Install new oil pump gasket. (CD17)
- Apply liquid gasket to oil pump. (CD20)
- Apply liquid gasket to oil pan.
- Apply liquid gasket to both ends of oil pan oil seals.
- Install oil pan, fitting oil seals in the correct position.

Oil Pump (Cont'd)

DISASSEMBLY AND ASSEMBLY

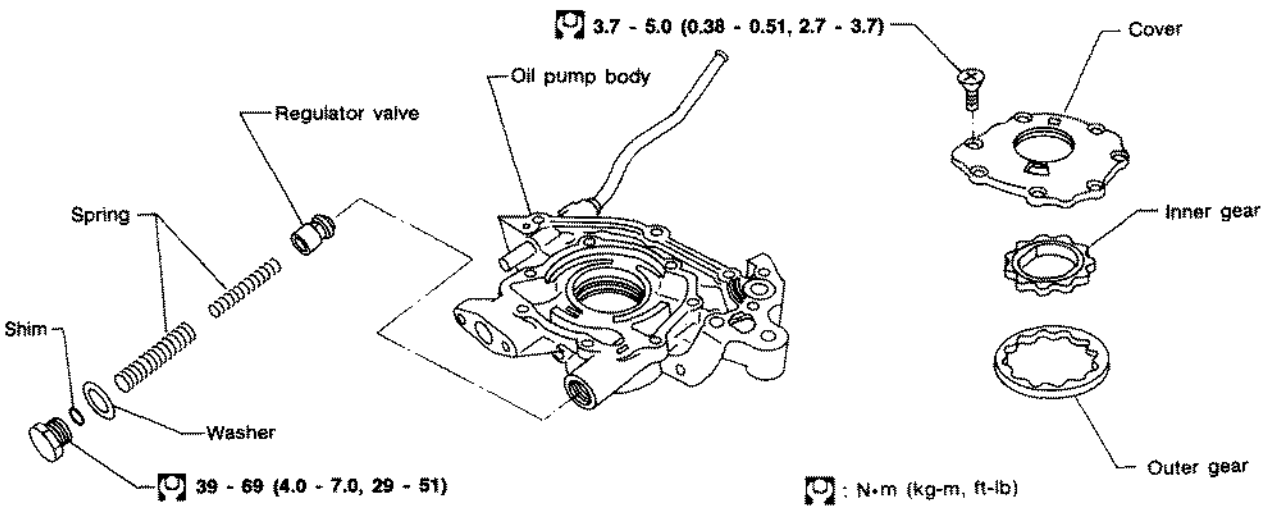
When installing oil pump, apply engine oil to inner and outer gears.

CD17



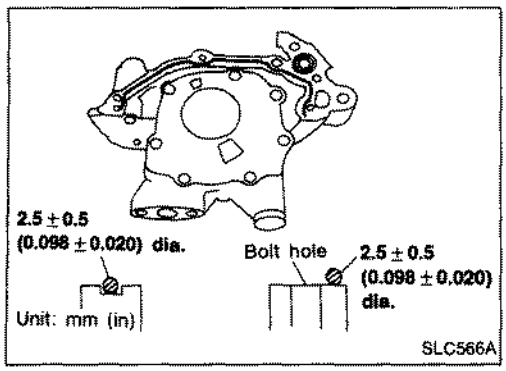
SLC911

CD20

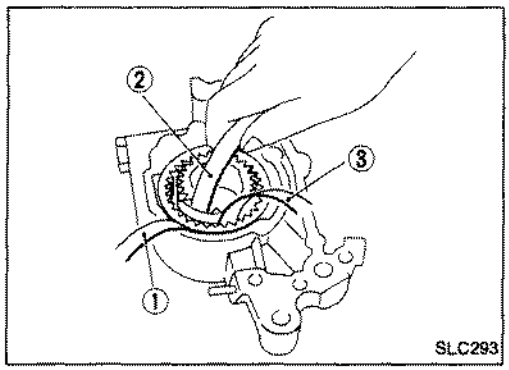


SLC559A

Oil Pump (Cont'd)



- Apply liquid gasket when installing oil pump onto engine.

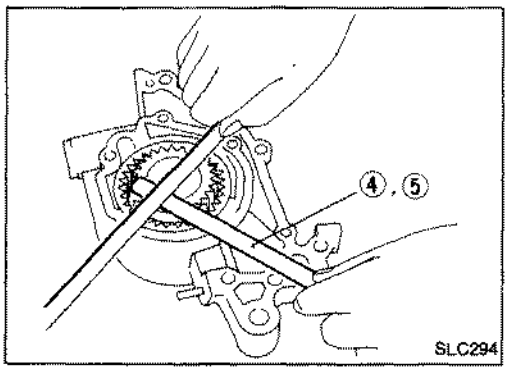


INSPECTION — CD17

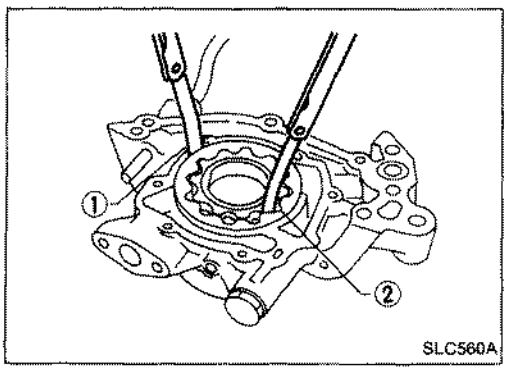
Using a feeler gauge, check the following clearances.

Unit: mm (in)

Body to outer gear clearance ①	0.11 - 0.20 (0.0043 - 0.0079)
Inner gear to crescent clearance ②	0.12 - 0.23 (0.0047 - 0.0091)
Outer gear to crescent clearance ③	0.21 - 0.32 (0.0083 - 0.0126)
Housing to inner gear clearance ④	0.05 - 0.09 (0.0020 - 0.0035)
Housing to outer gear clearance ⑤	0.05 - 0.11 (0.0020 - 0.0043)



If it exceeds the limit, replace gear set or entire oil pump assembly.

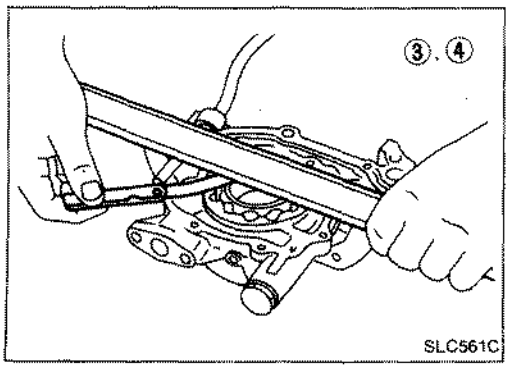


INSPECTION — CD20

Using a feeler gauge, check the following clearances.

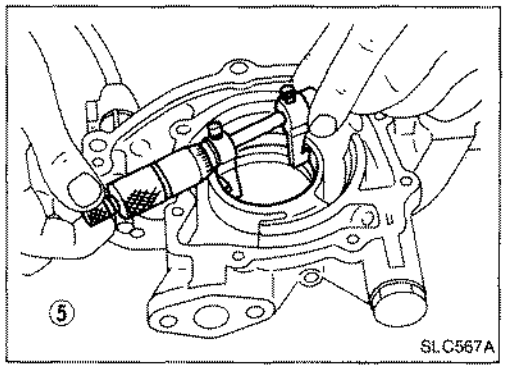
Unit: mm (in)

Body to outer gear clearance ①	0.12 - 0.20 (0.0047 - 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	0.05 - 0.09 (0.0020 - 0.0035)

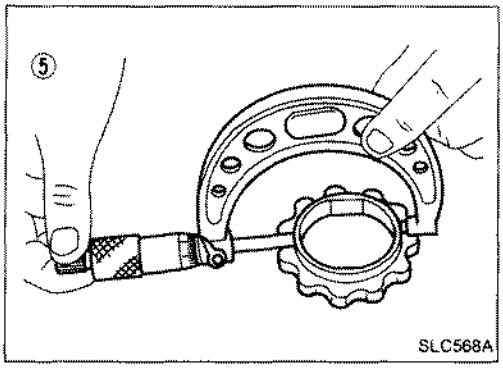


If it exceeds the limit, replace gear set or entire oil pump assembly.

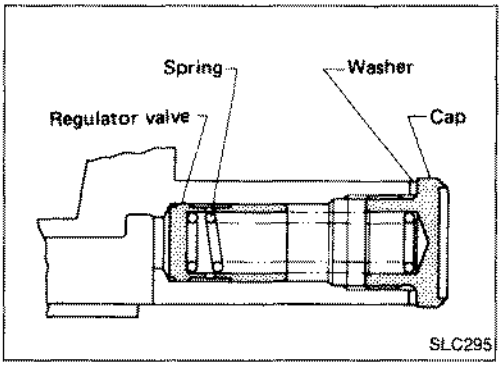
Oil Pump (Cont'd)



SLC567A



SLC568A

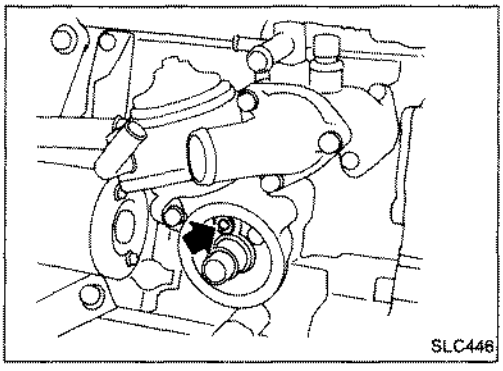


SLC295

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 and check that it falls smoothly into the valve hole by its own weight.

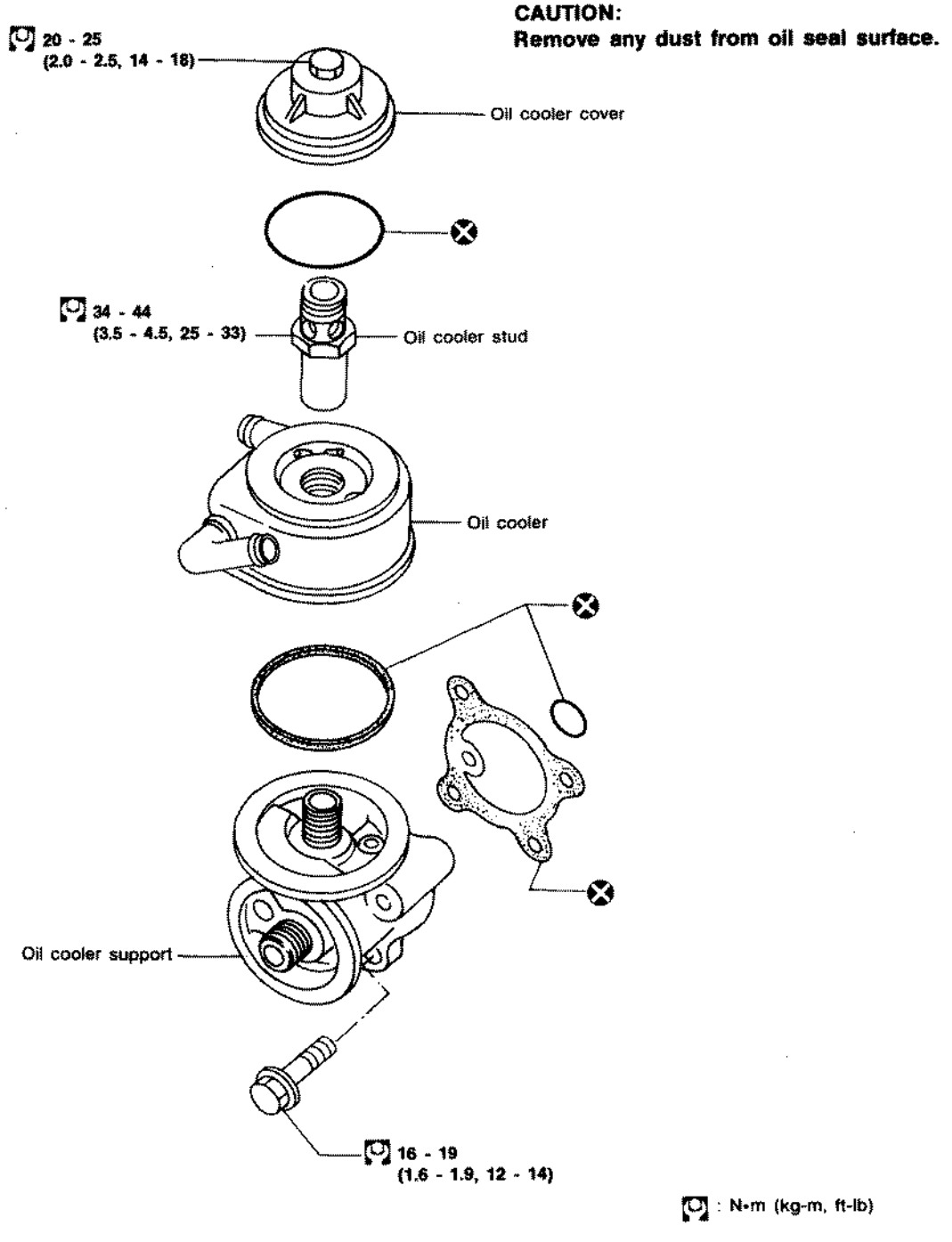
If damaged, replace regulator valve set or oil pump assembly.

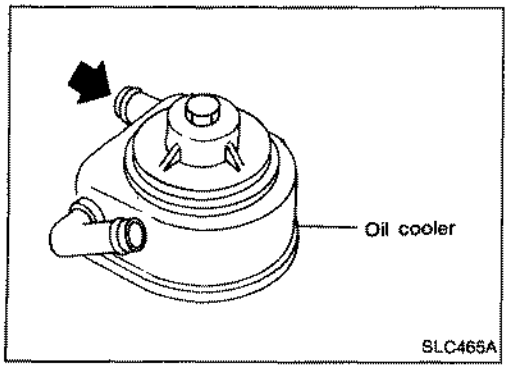

SLC446

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 a suitable tool. Install a new valve in place by tapping it.

Oil Cooler

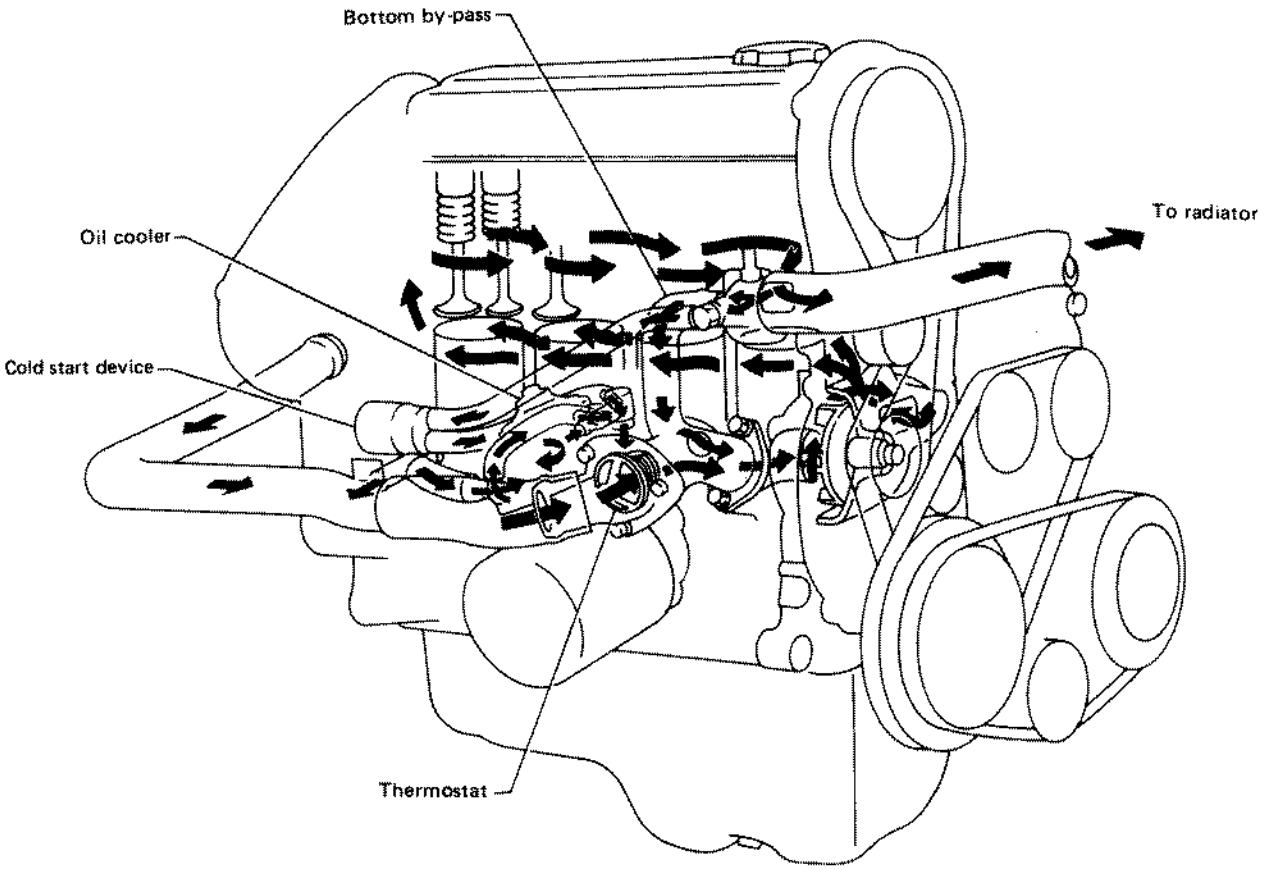


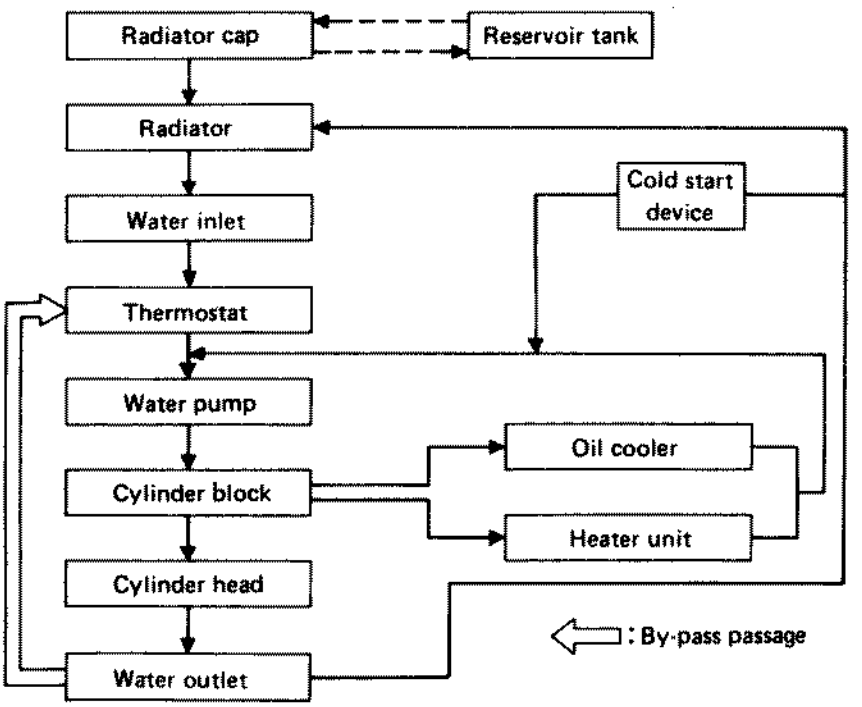


INSPECTION

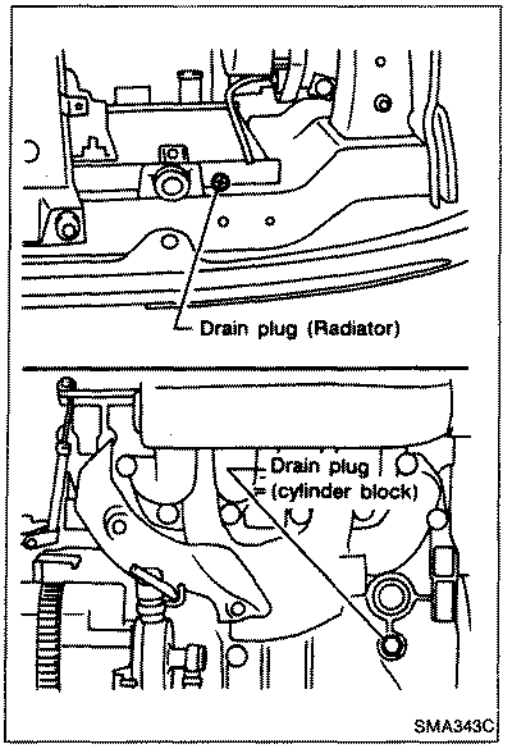
1. Check oil cooler element and housing for cracks.
2. Check coolant inlet of oil cooler for clogging by blowing through it.
   Replace it if necessary.

Cooling Circuit





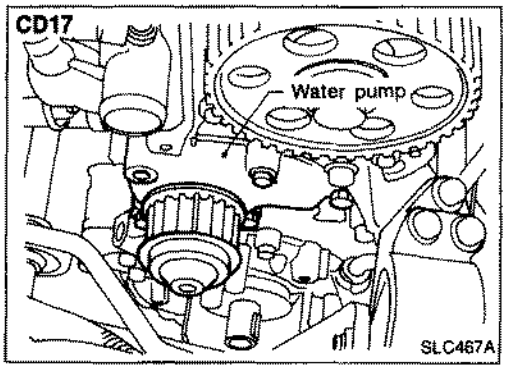
SLC407



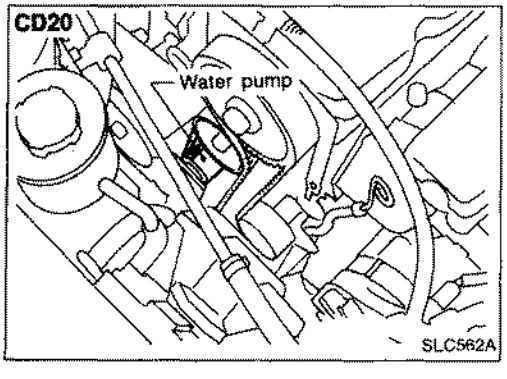
Water Pump

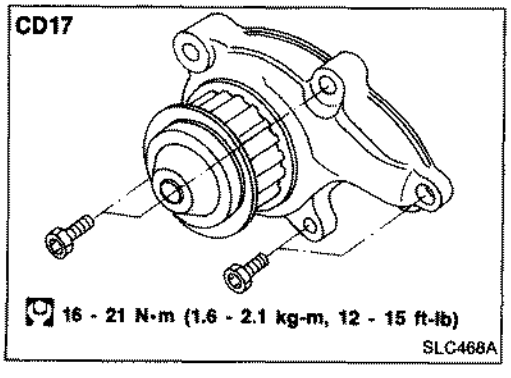
REMOVAL AND INSTALLATION

1. Drain engine coolant from radiator and cylinder block.
2. Remove upper radiator hose, timing belt covers, front engine mounting bracket and timing belt.
3. Remove timing belt tensioner and idler and timing belt lower back cover.



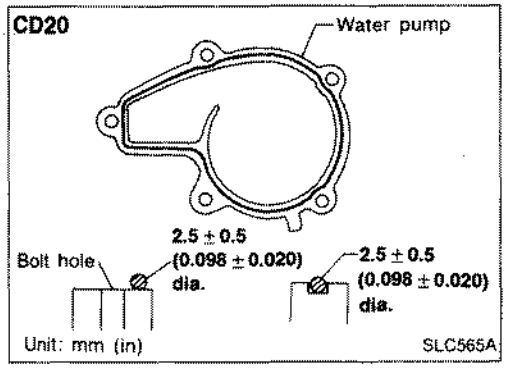
4. Remove water pump.

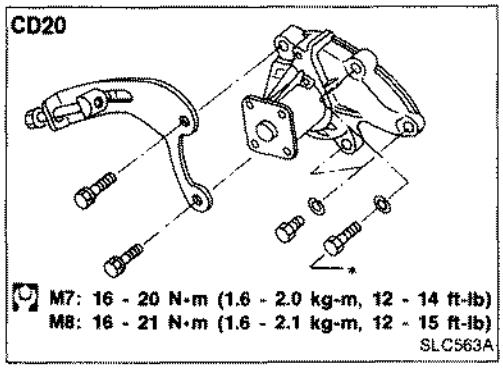




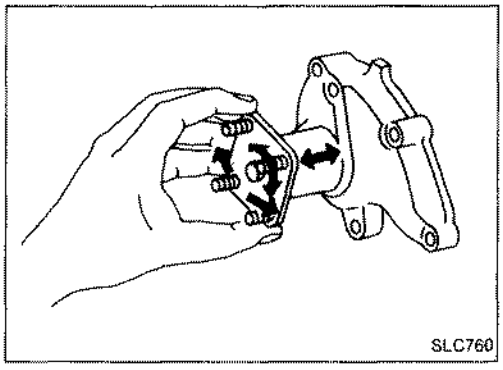
5. Install water pump with a new gasket. (CD17)
   Install water pump with liquid gasket. (CD20)

Water Pump (Cont'd)





*: Apply liquid sealant to the thread.

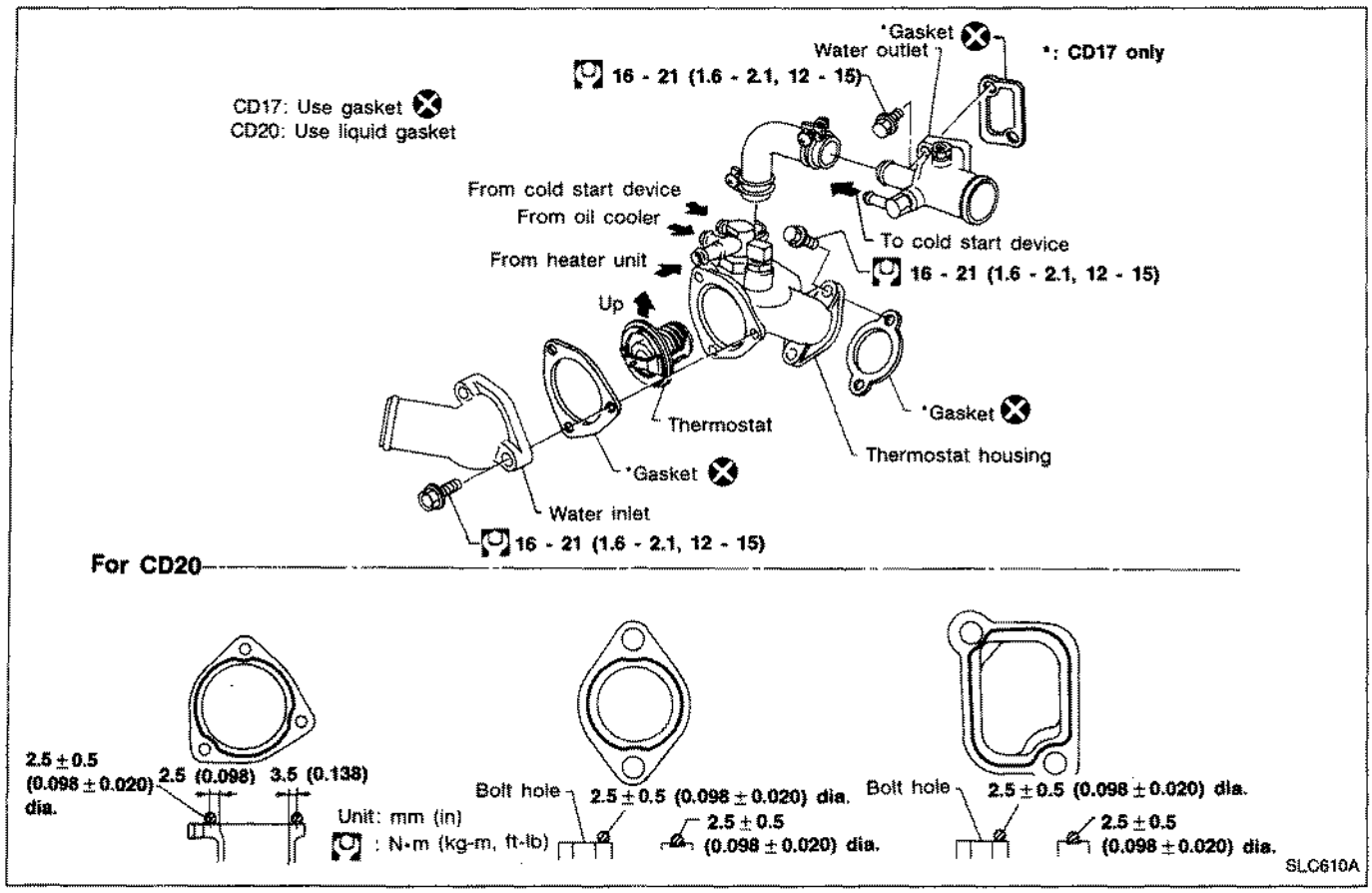


INSPECTION

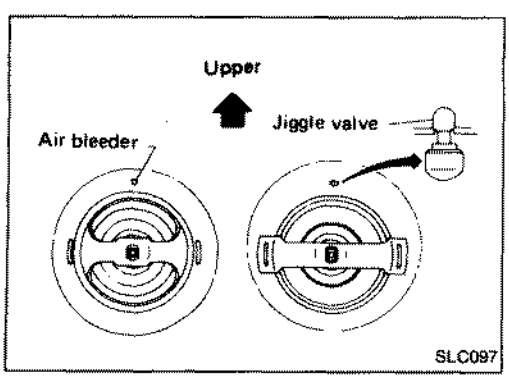
1. Check for badly rusted or corroded body assembly and vane.
2. Check for rough operation due to excessive end play.

Thermostat

REMOVAL AND INSTALLATION

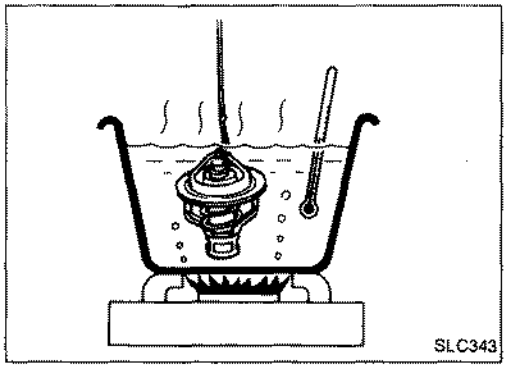


- Use new gasket. (CD17)
- Apply liquid gasket to water outlet, thermostat housing and water inlet. (CD20)



- Install thermostat with jiggle valve uppermost.
- **After installation, run engine for a few minutes, and check for leaks.**

Thermostat (Cont'd)



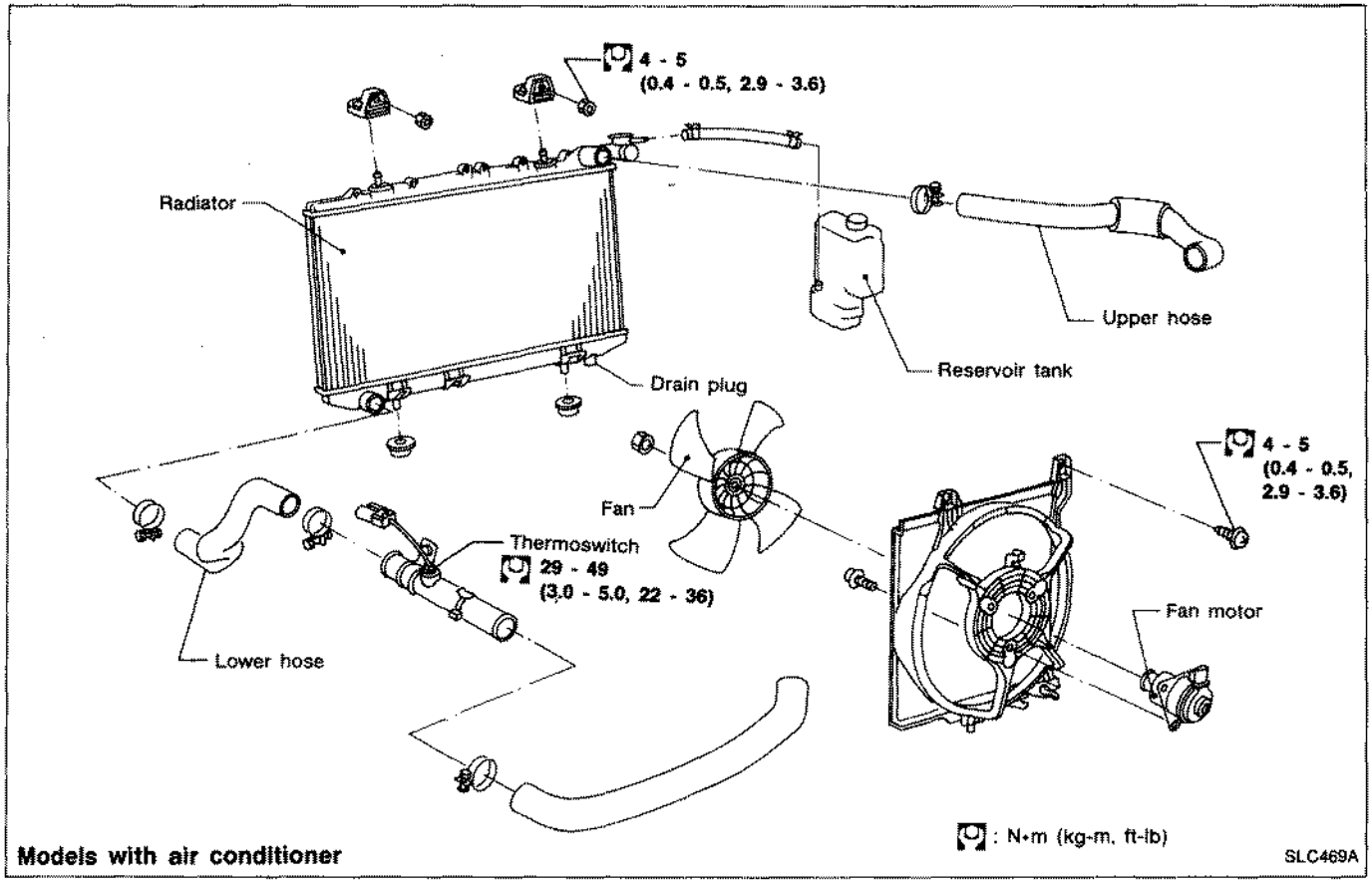
INSPECTION

1. Check for valve seating condition at ordinary temperatures. It should seat tightly.
2. Check valve opening temperature and maximum valve lift.

	CD17	CD20
Valve opening temperature °C (°F)	82 (180)	88 (190)
Max. valve lift mm/°C (in/°F)	8/95 (0.31/203)	8/100 (0.31/212)

3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

Radiator

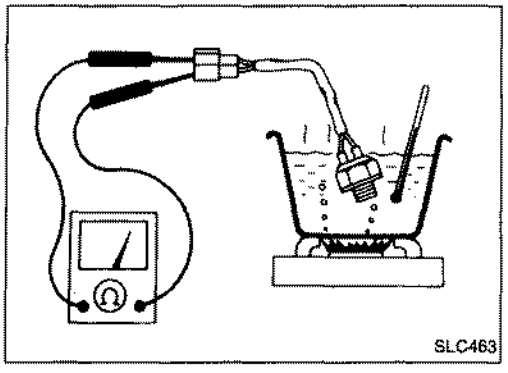


Models with air conditioner

Radiator Fan Motor

OPERATION

Water temperature °C (°F)	Fan motor operation	
	A/C OFF	A/C ON
Below 90 (194)	OFF	ON
Above 90 (194)	ON	



THERMOSWITCH INSPECTION

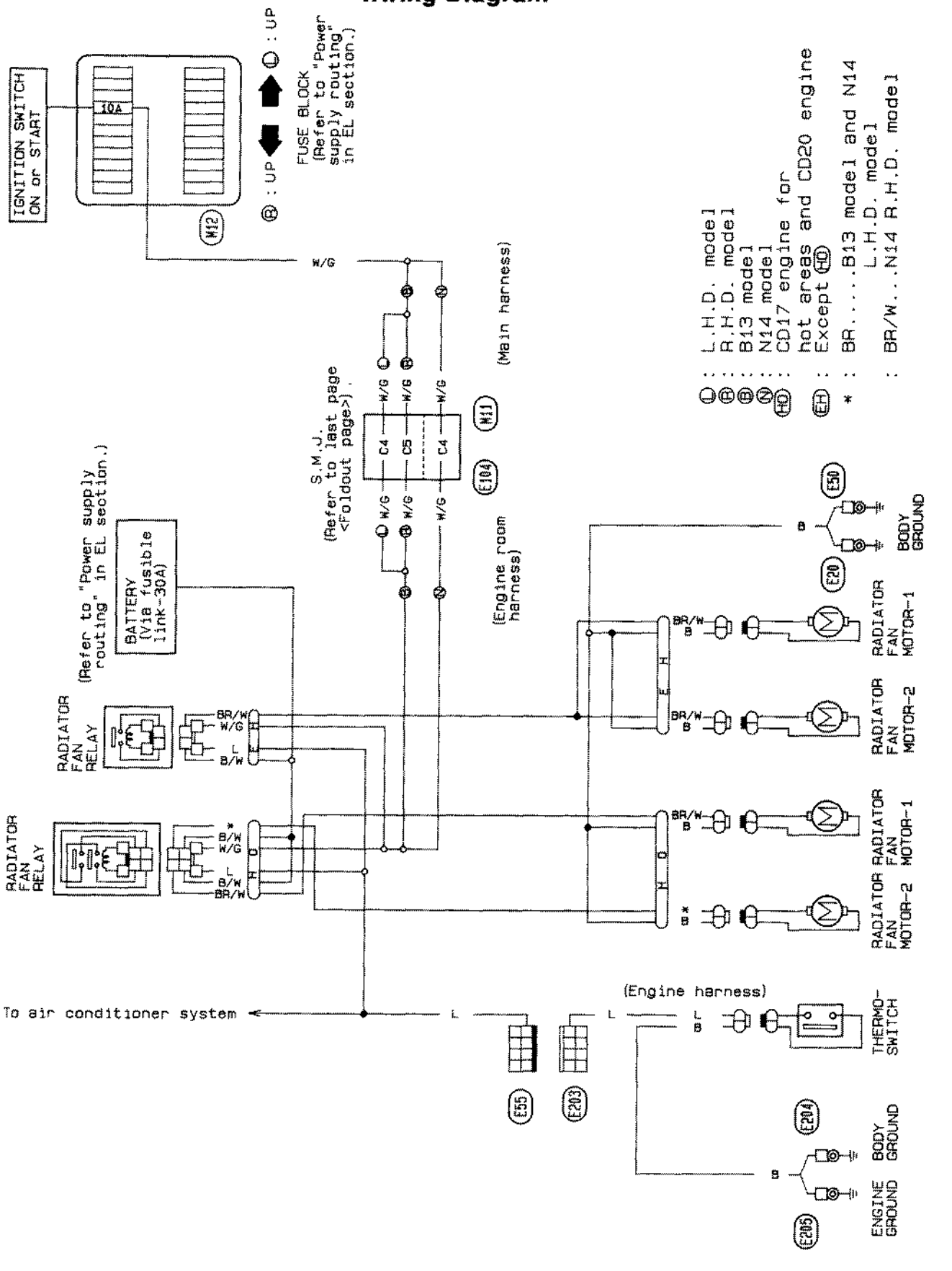
Check thermoswitch for proper operation.

Operating temperature:

OFF → ON 90°C (194°F)

ON → OFF 83°C (181°F)

Wiring Diagram



SLC633A

Engine Lubrication System

Oil pressure check

Engine rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)
Idle speed	49 - 186 (0.49 - 1.86, 0.5 - 1.9, 7 - 27)
3,000	343 - 441 (3.43 - 4.41, 3.5 - 4.5, 50 - 64)

Oil pump

Unit: mm (in)

Body to outer gear clearance ①	0.110 - 0.200 (0.0043 - 0.0079)
Inner gear to crescent clearance ②	0.217 - 0.327 (0.0085 - 0.0129)
Outer gear to crescent clearance ③	0.21 - 0.32 (0.0083 - 0.0126)
Body to inner gear clearance ④	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear clearance ⑤	0.05 - 0.11 (0.0020 - 0.0043)
Inner gear to brazed portion of housing clearance ⑥	0.045 - 0.091 (0.0018 - 0.0036)

Engine Cooling System

Thermostat

		Standard
Valve opening temperature	°C (°F)	76.5 (170)
Maximum valve lift	mm/°C (in/°F)	8/90 (0.31/194)

Thermoswitch (Electrical cooling fan)

	Except for A/T models for hot areas	A/T models for hot areas
Operating temperature (OFF → ON) °C (°F)	82 - 88 (180 - 190)	Low: 82 - 88 (180 - 190) High: 102 - 108 (216 - 226)

Engine Lubrication System

Oil pressure check

Engine rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)
Idle speed	SR20DE: More than 98 (0.98, 1.0, 14) SR20DET: More than 98 (0.98, 1.0, 14)
3,200	SR20DE: 324 - 422 (3.24 - 4.22, 3.3 - 4.3, 47 - 61) SR20DET: 343 - 441 (3.43 - 4.41, 3.5 - 4.5, 50 - 64)

Oil pump inspection

Unit: mm (in)

Body to outer gear clearance	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	0.05 - 0.11 (0.0020 - 0.0043)
Inner gear to brazed portion of housing clearance	0.045 - 0.091 (0.0018 - 0.0036)

Regulator valve inspection

Unit: mm (in)

Regulator valve to oil pump cover clearance	0.040 - 0.097 (0.0016 - 0.0038)

Engine Cooling System

Thermostat

Valve opening temperature °C (°F)	76.5 (170)
Max. valve lift mm/°C (in/°F)	8/90 (0.31/194)

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)
3,000	363 - 520 (3.63 - 5.20, 3.7 - 5.3, 53 - 75)

Oil pump

Unit: mm (in)

Rotor tip clearance	Less than 0.12 (0.0047)
Outer rotor to body clearance	0.15 - 0.21 (0.0059 - 0.0083)
Side clearance (with gasket)	0.05 - 0.12 (0.0020 - 0.0047)

Engine Cooling System

Thermostat

	Frigid type	Standard type	Tropical type
Valve opening temperature °C (°F)	88 (190)	82 (180)	76.5 (170)
Max. valve lift mm/°C (in/°F)	8/100 (0.31/212)	8/95 (0.31/203)	8/90 (0.31/194)

Thermoswitch (Electrical cooling fan)

Operating temperature (OFF → ON) °C (°F)	87 - 93 (189 - 199)

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)
2,000	294 (2.9, 3, 43)

Oil pump inspection — CD17

Unit: mm (in)

Body to outer gear clearance	0.11 - 0.20 (0.0043 - 0.0079)
Inner gear to crescent clearance	0.12 - 0.23 (0.0047 - 0.0091)
Outer gear to crescent clearance	0.21 - 0.32 (0.0083 - 0.0126)
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)

Oil pump inspection — CD20

Unit: mm (in)

Body to outer gear clearance	0.12 - 0.20 (0.0047 - 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	0.05 - 0.09 (0.0020 - 0.0035)

Engine Cooling System

Thermostat

	CD17	CD20
Valve opening temperature °C (°F)	82 (180)	88 (190)
Max. valve lift mm/°C (in/°F)	8/95 (0.31/203)	8/100 (0.31/212)

Thermoswitch

Operating temperature	
OFF → ON	90°C (194°F)
ON → OFF	83°C (181°F)

Radiator

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

Leakage test pressure	157 (1.57, 1.6, 23)

Tightening Torque

Unit		N·m	kg-m	ft-lb
Oil pressure switch		10 - 16	1.0 - 1.6	7 - 12
Oil pan drain plug		29 - 39	3.0 - 4.0	22 - 29
Oil pan	CD20	7 - 8	0.7 - 0.8	5.1 - 5.8
	CD17	5 - 7	0.5 - 0.7	3.6 - 5.1
Oil pump mounting bolt		12 - 16	1.2 - 1.6	9 - 12
Oil strainer bolt		16 - 19	1.6 - 1.9	12 - 14
Oil strainer bracket bolt		7	0.7	5.1
Thermoswitch		29 - 49	3.0 - 5.0	22 - 36
Cylinder block drain plug		54 - 74	5.5 - 7.5	40 - 54

ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

CONTENTS

PREPARATION ..... EF & EC- 3

GA13DS, GA14DS & GA16DS

ENGINE AND EMISSION CONTROL PARTS LOCATION ..... EF & EC- 7
ENGINE CONTROL DIAGRAM ..... EF & EC- 12
ENGINE AND EMISSION CONTROL SYSTEM CHART ..... EF & EC- 15
ENGINE AND EMISSION CONTROL CIRCUIT DIAGRAM ..... EF & EC- 17
E.C.C. DESCRIPTION ..... EF & EC- 30
E.C.C. TROUBLE DIAGNOSES ..... EF & EC- 44
CARBURETOR ..... EF & EC-150
MECHANICAL FUEL PUMP ..... EF & EC-176
ELECTRIC FUEL PUMP CONTROL SYSTEM ..... EF & EC-177
IGNITION CONTROL SYSTEM ..... EF & EC-183
IGNITION CONTROL SYSTEM — Distributor ..... EF & EC-187
AUTOMATIC TEMPERATURE CONTROL (A.T.C.) AIR CLEANER SYSTEM ..... EF & EC-191
IDLE COMPENSATOR ..... EF & EC-194
EVAPORATIVE EMISSION CONTROL SYSTEM ..... EF & EC-195
CRANKCASE EMISSION CONTROL SYSTEM ..... EF & EC-198

GA16DE

PRECAUTIONS ..... EF & EC-199
ENGINE AND EMISSION CONTROL OVERALL SYSTEM ..... EF & EC-200
ENGINE AND EMISSION CONTROL PARTS DESCRIPTION ..... EF & EC-210
ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION ..... EF & EC-214
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION ..... EF & EC-224
TROUBLE DIAGNOSES ..... EF & EC-232
FUEL INJECTION CONTROL SYSTEM INSPECTION ..... EF & EC-353
CRANKCASE EMISSION CONTROL SYSTEM ..... EF & EC-356

SR

PRECAUTIONS ..... EF & EC-358
ENGINE AND EMISSION CONTROL OVERALL SYSTEM ..... EF & EC-359
ENGINE AND EMISSION CONTROL PARTS DESCRIPTION ..... EF & EC-371
ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION ..... EF & EC-378
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION ..... EF & EC-389

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TROUBLE DIAGNOSES ..... EF & EC-404
FUEL INJECTION CONTROL SYSTEM INSPECTION ..... EF & EC-638
EVAPORATIVE EMISSION CONTROL SYSTEM ..... EF & EC-641
CRANKCASE EMISSION CONTROL SYSTEM ..... EF & EC-643

Note: Refer to Foldout page for "E.C.C.S. WIRING DIAGRAM".

E

GENERAL DESCRIPTION ..... EF & EC-645
ENGINE ELECTRICAL SYSTEM ..... EF & EC-646
CARBURETOR ..... EF & EC-647
CARBURETOR — Inspection and Adjustment ..... EF & EC-650
FUEL PUMP ..... EF & EC-654
IGNITION CONTROL SYSTEM ..... EF & EC-655
IGNITION CONTROL SYSTEM — Distributor ..... EF & EC-659
AUTOMATIC TEMPERATURE CONTROL (A.T.C.) SYSTEM ..... EF & EC-662
IDLE COMPENSATOR ..... EF & EC-664
CRANKCASE EMISSION CONTROL SYSTEM ..... EF & EC-665

CD

INJECTION SYSTEM ..... EF & EC-666
VE-TYPE INJECTION PUMP ..... EF & EC-667
INJECTION NOZZLE ..... EF & EC-699
FUEL SYSTEM CHECK ..... EF & EC-704
CRANKCASE VENTILATION SYSTEM ..... EF & EC-705
QUICK-GLOW SYSTEM ..... EF & EC-707
E.G.R. SYSTEM ..... EF & EC-717

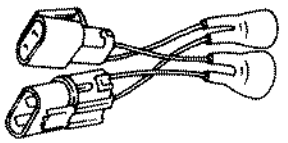
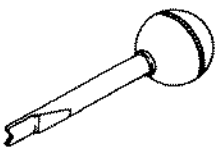
GA, SR, E, CD

SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... EF & EC-723

For assistance with 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".

SPECIAL SERVICE TOOLS

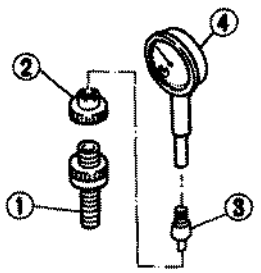
Tool number Tool name	Description	Engine application		
		GA13DS, GA14DS & GA16DS	GA16DE	SR
EG11160000 Adapter harness	 Measuring engine speed	—	X	X
KV10108300 Idle adjusting screwdriver		X *	—	—

* Only for models for Hong Kong and Singapore

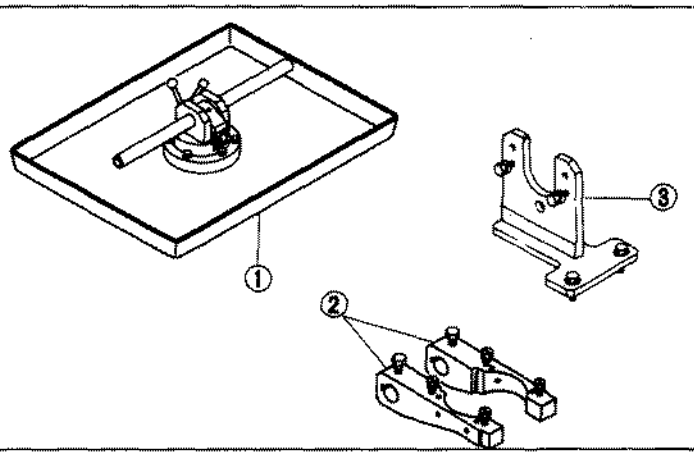
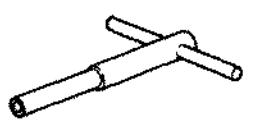
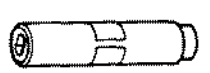
SPECIAL SERVICE TOOLS

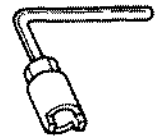
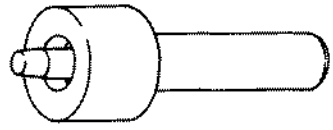
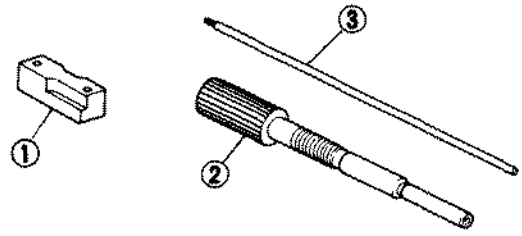
For VE-type injection pump

Adjusting device on vehicle

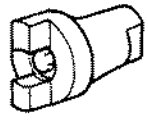
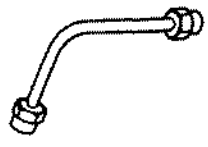
Tool number Tool name	Description	
KV11229352 Measuring device ① KV11229350 Holder ② KV11229360 Nut ③ KV11229370 Pin ④ KV11254410 Dial gauge		Measuring set length of plunger spring

Disassembling and assembling tools

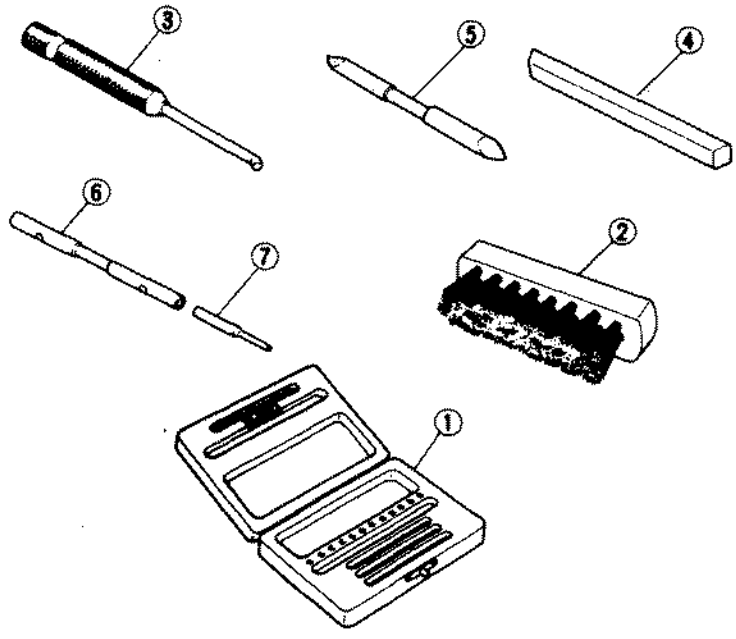
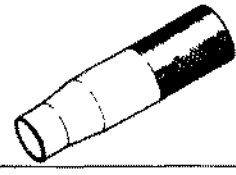
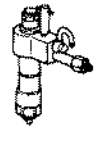
① KV11244852 Universal vise ② KV11244872 Bracket ③ KV11244792 Bracket	
KV11229072 Insert device	
KV11214110 Socket wrench for delivery valve	
KV11214270 Socket wrench for governor pivot bolt	
KV11214260 Socket wrench for regulating valve	
KV11214250 Socket wrench for distributor head plug	

Tool number Tool name	Description
KV11215262 Governor shaft adjusting device	
KV11229542 Feed pump holder	
KV11229852 "MS" measuring device set ① KV11229110 Block gauge ② KV11229820 Dummy shaft ③ KV11229830 Rod	
KV11229042 "K" & "KF" measuring device	

Adjusting device on pump tester

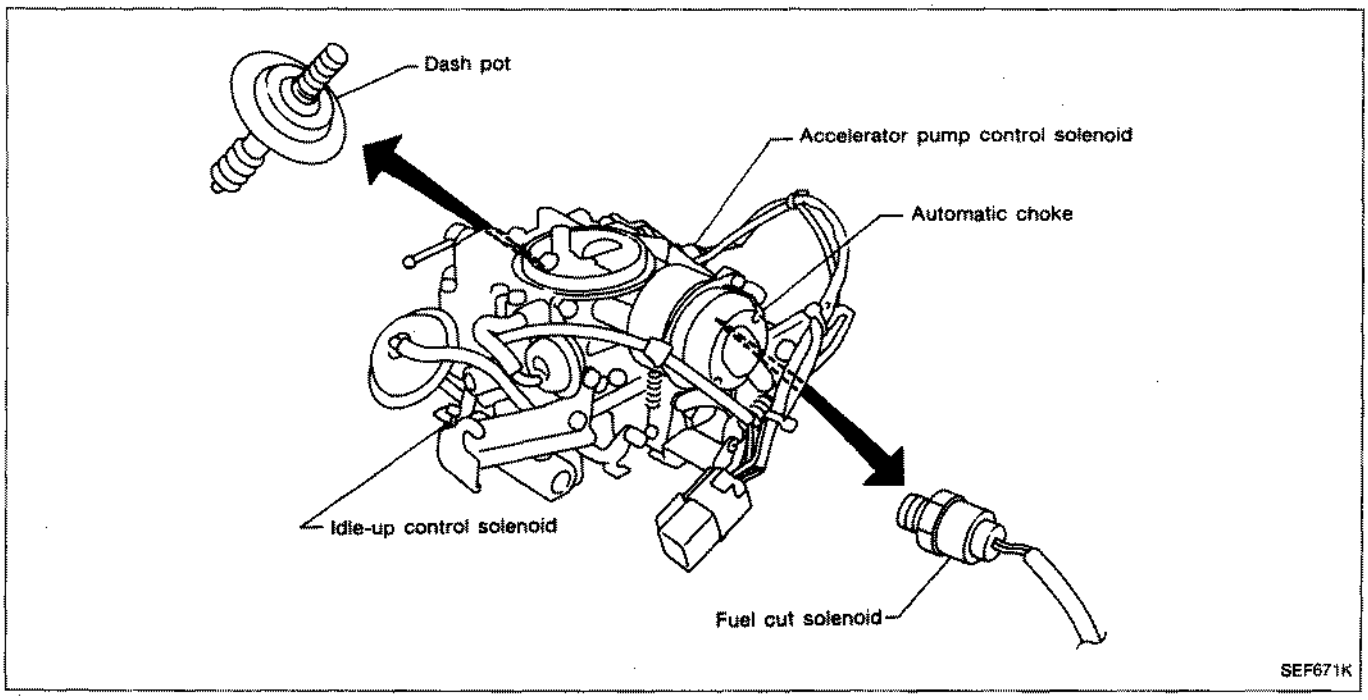
KV11281036 Fixing stand	
KV11242442 Coupling	
KV11282815 Measuring device (for high-pressure side) KV11282819 Measuring device (for low-pressure side)	Measuring timer advance angle 
KV11205032 Injection pipe	 840 mm (33.07 in)

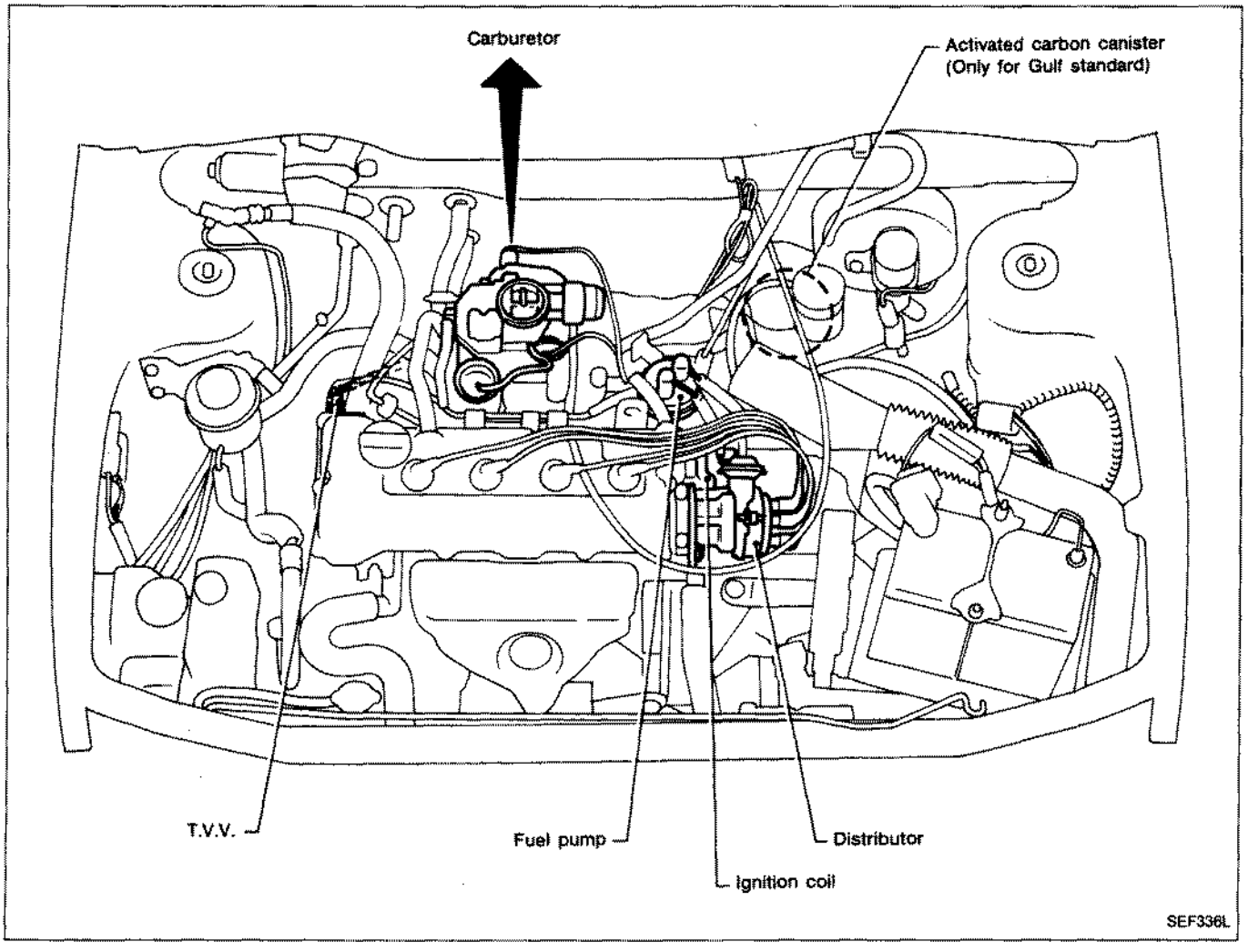
For injection nozzle

Tool number Tool name	Description
KV11289004 Nozzle cleaning kit ① KV11290012 Box ② KV11290110 Brush ③ KV11290122 Nozzle oil sump scraper ④ KV11290140 Nozzle needle tip cleaner ⑤ KV11290150 Nozzle seat scraper ⑥ KV11290210 Nozzle holder ⑦ KV11290220 Nozzle hole cleaning needle	
KV11292010 Nozzle centering device	
KV11100300 Nozzle holder socket	
KV11229462 Extractor	Disassembling of regulating valve 
KV11229522 Insert device	Assembling of regulating valve 
KV11257802 Nozzle holder (Bosch type EF8511-9A)	
KV11257800 Nozzle (Bosch type DN12SD12T)	

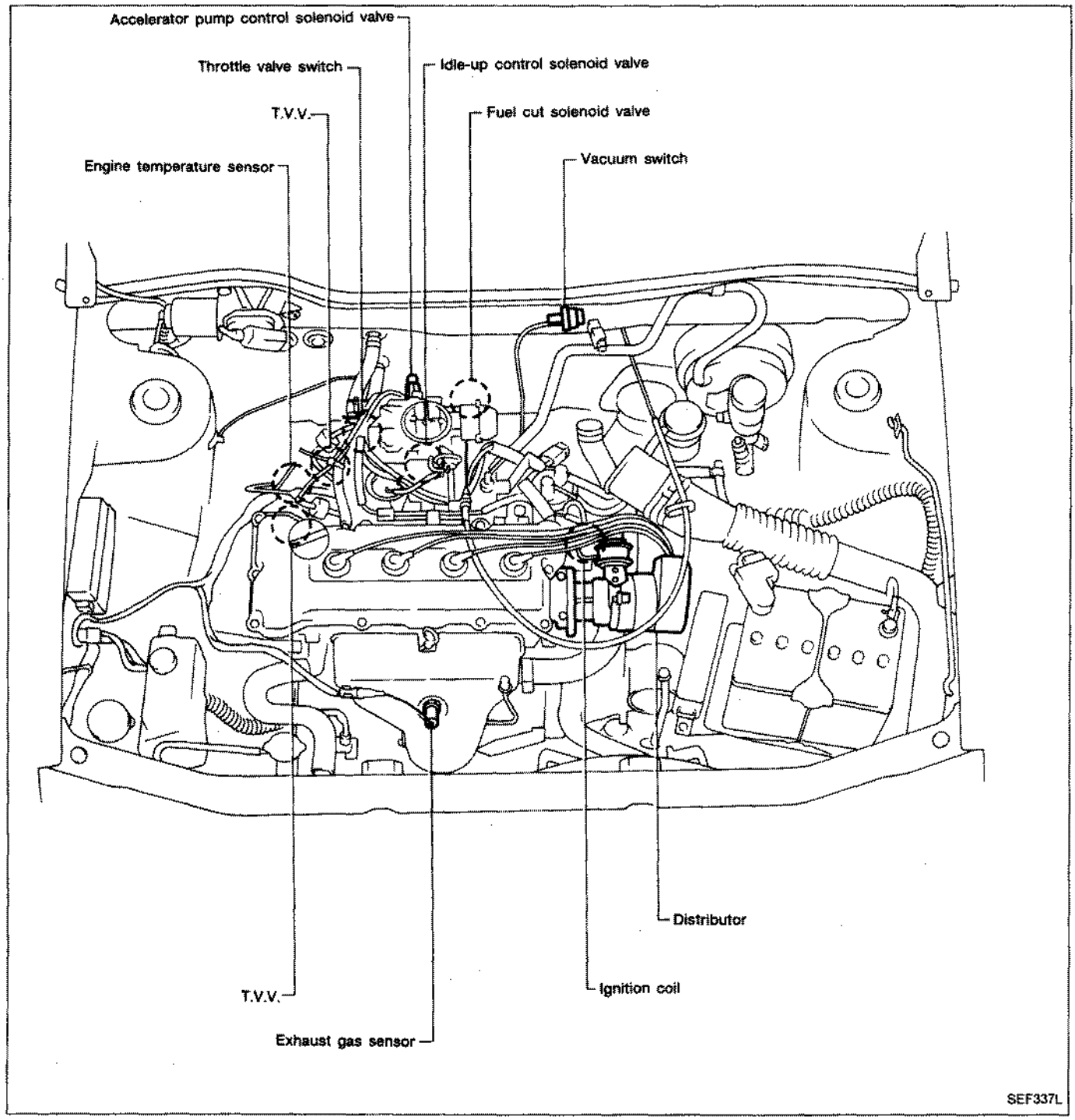
Component Parts Location

Models Without Catalyzer

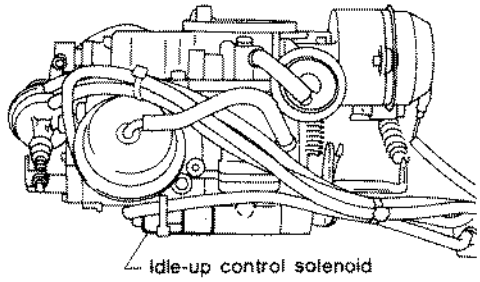




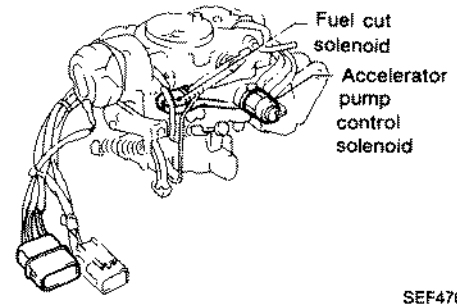
GA14DS With Catalyzer Without E.G.R.



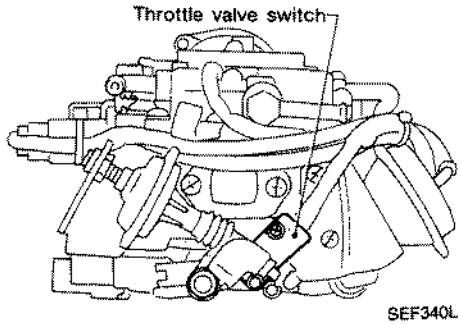
GA14DS With Catalyzer Without E.G.R. (Cont'd)



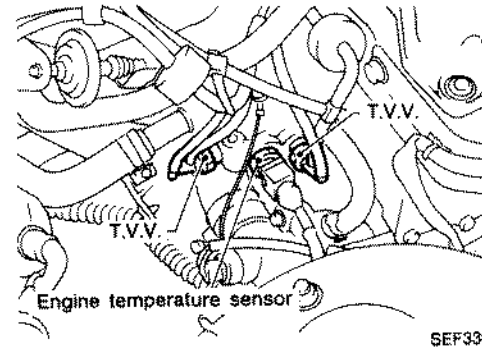
SEF292K



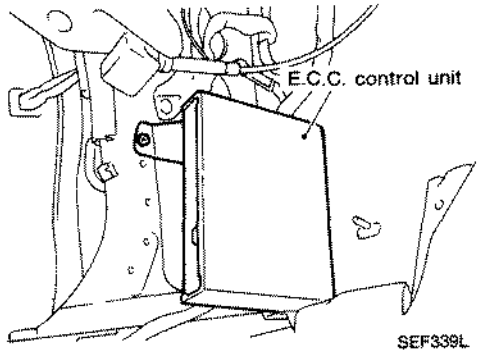
SEF476K



SEF340L

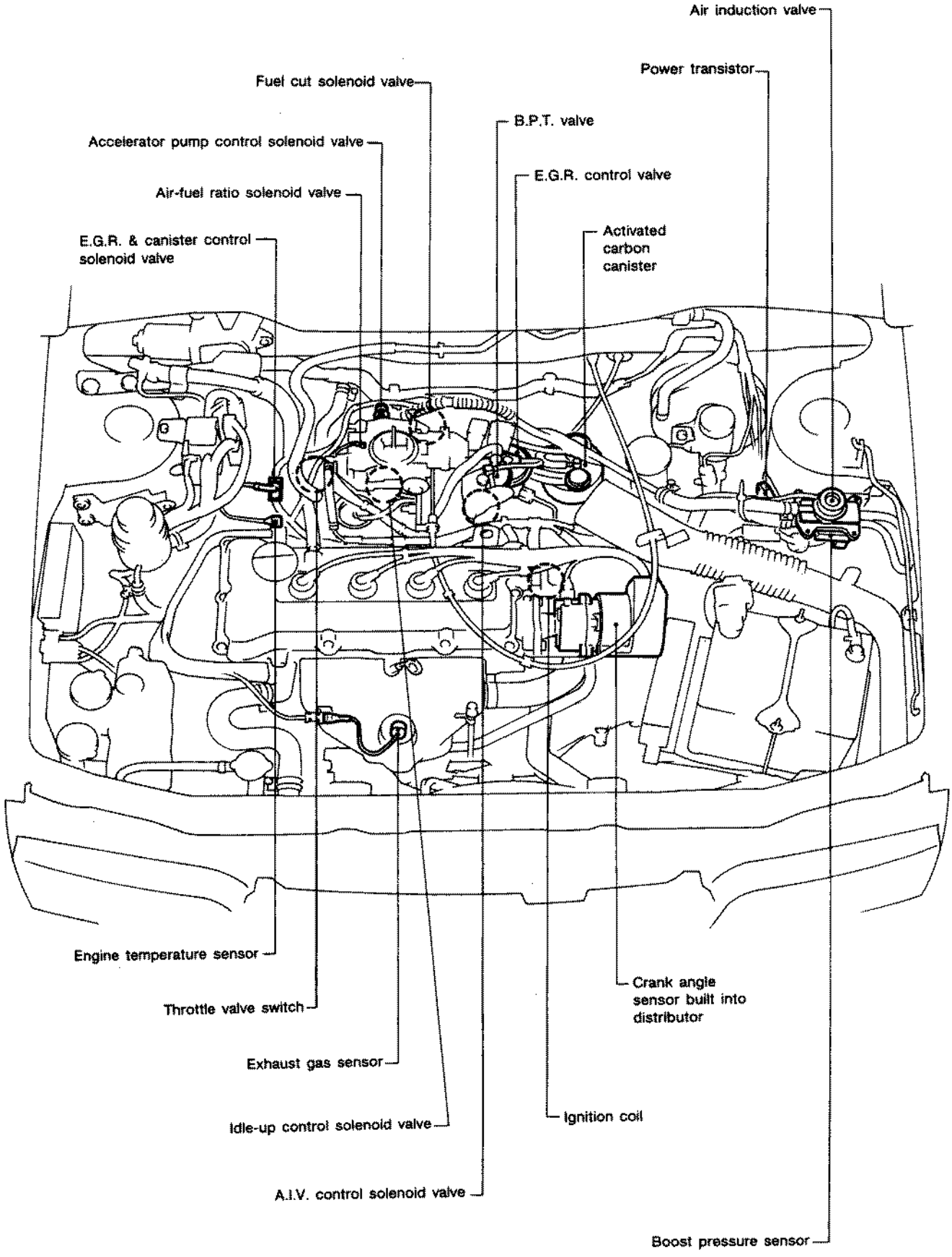


SEF338L



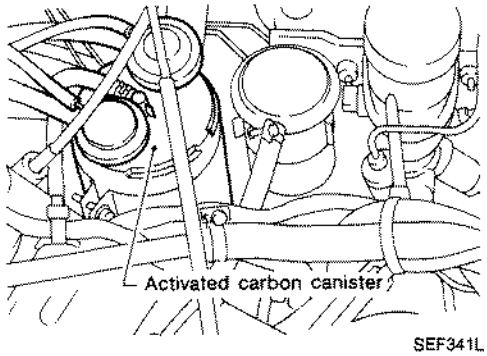
SEF339L

Models With Catalyzer and E.G.R.

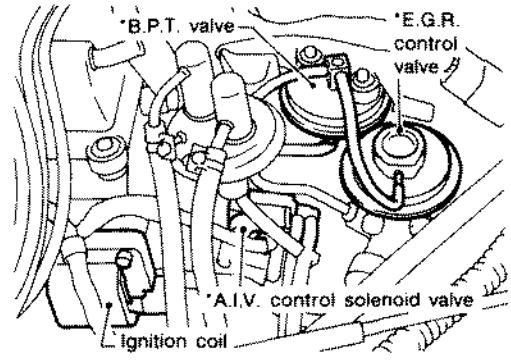


SEF356L

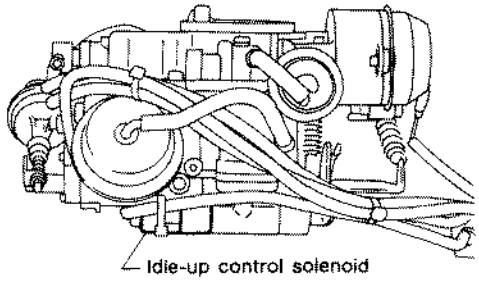
Models With Catalyzer and E.G.R. (Cont'd)



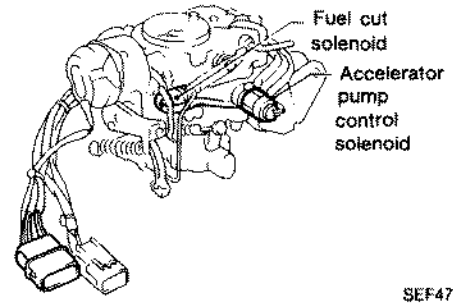
SEF341L



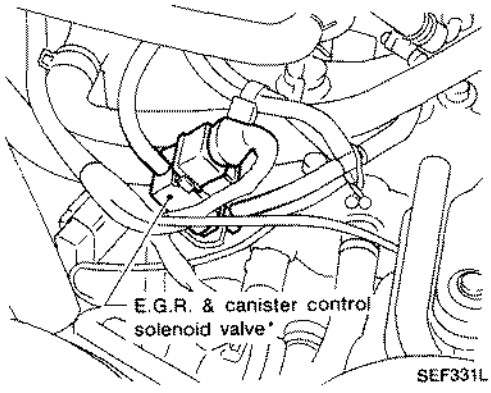
SEF813L



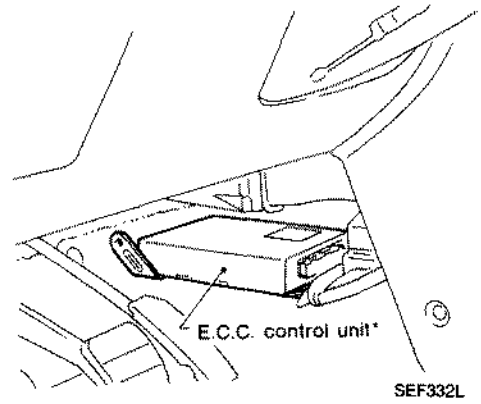
SEF292K



SEF476K



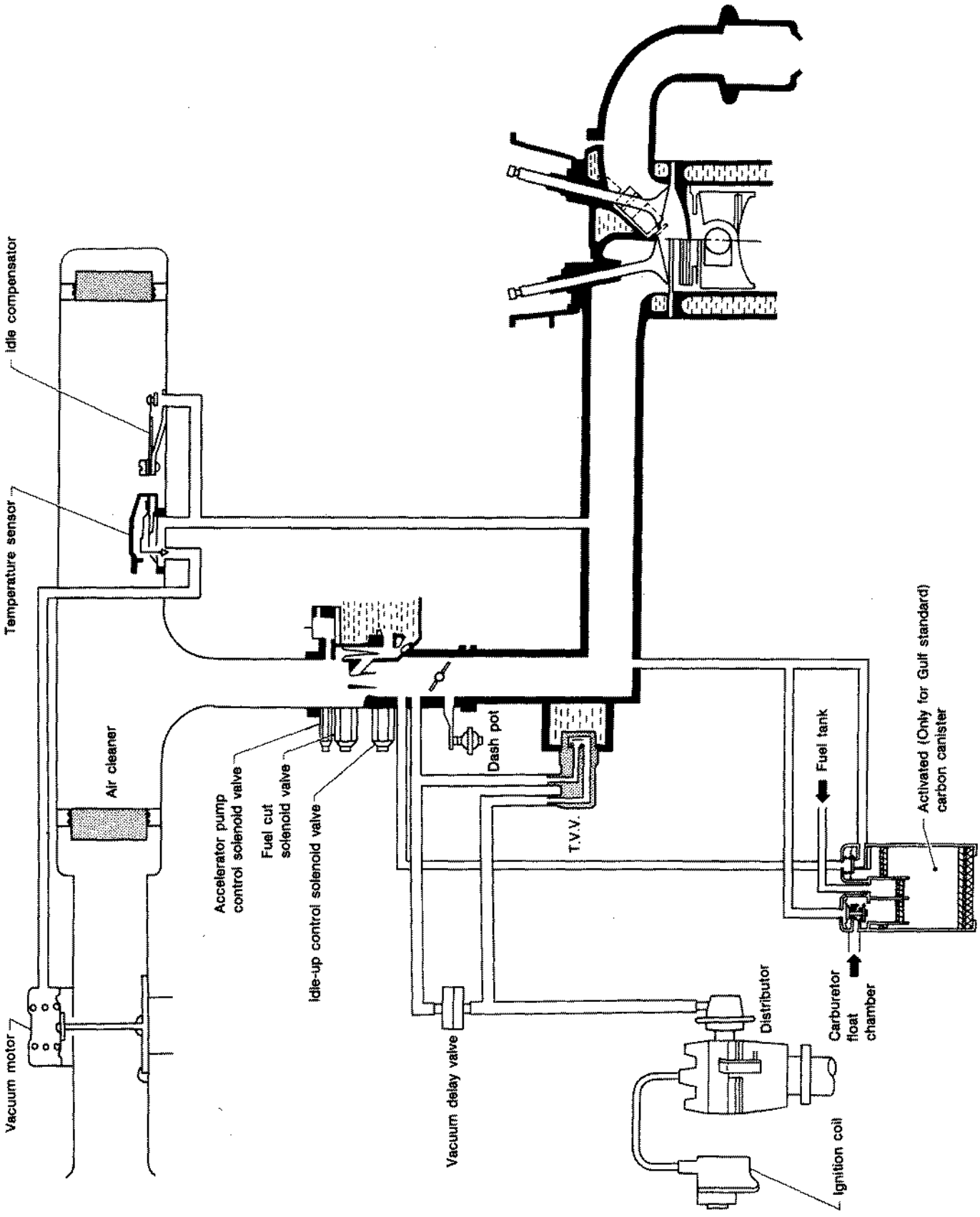
SEF331L



SEF332L

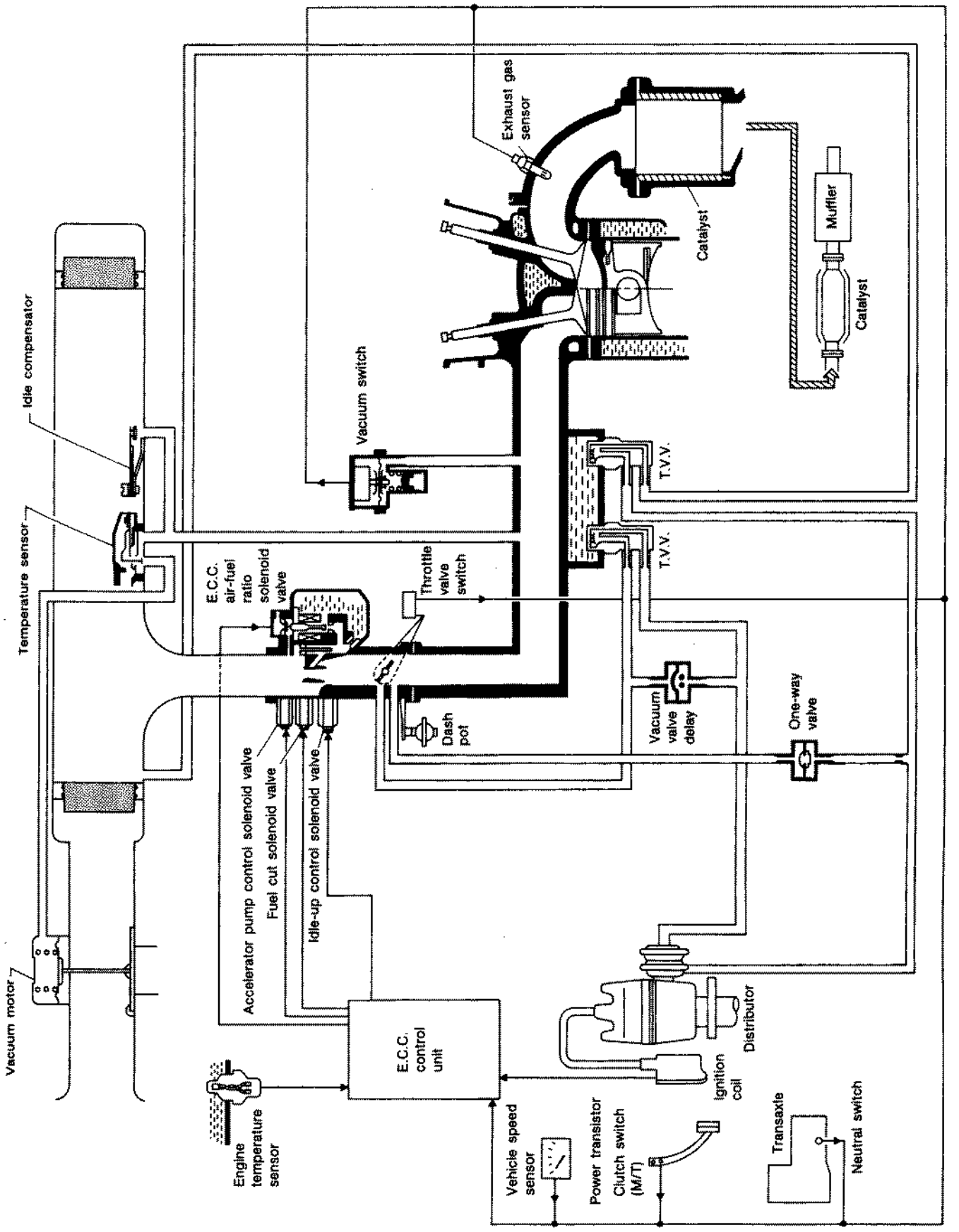
*For models with catalyzer only

Models Without Catalyzer



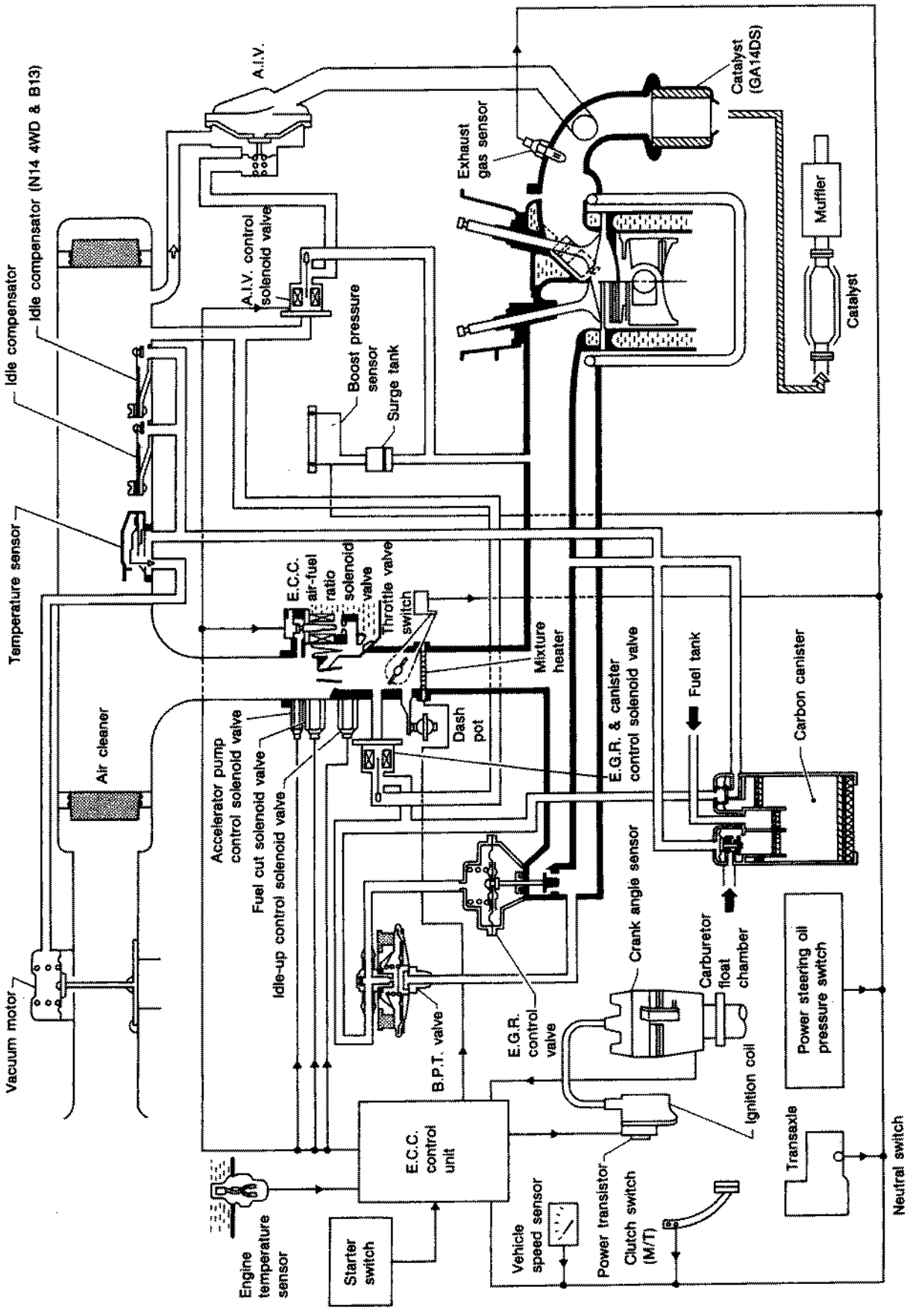
SEF335L

GA14DS With Catalyzer Without E.G.R.



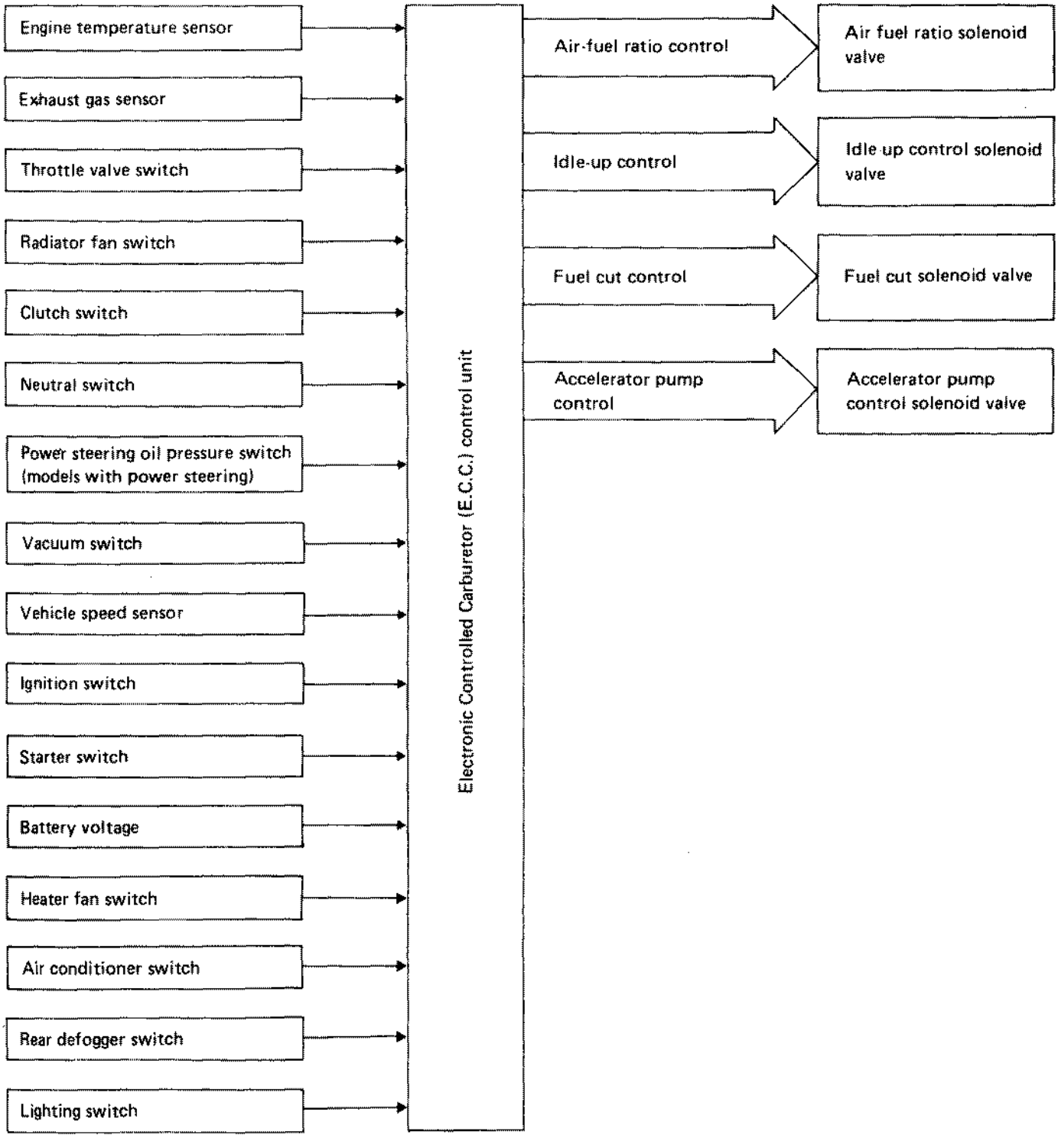
SEF334L

Models With Catalyzer and E.G.R.

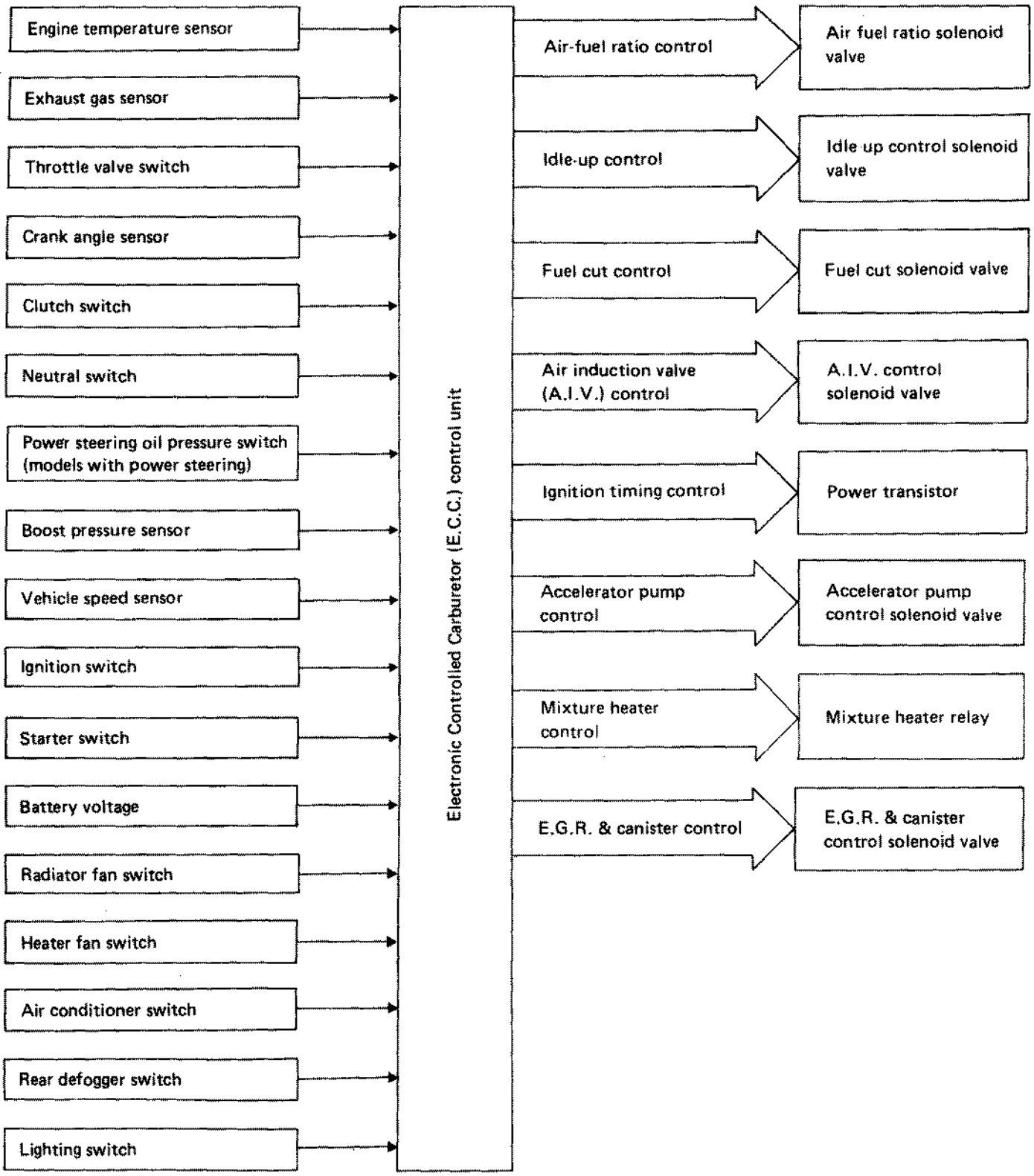


SEF333L

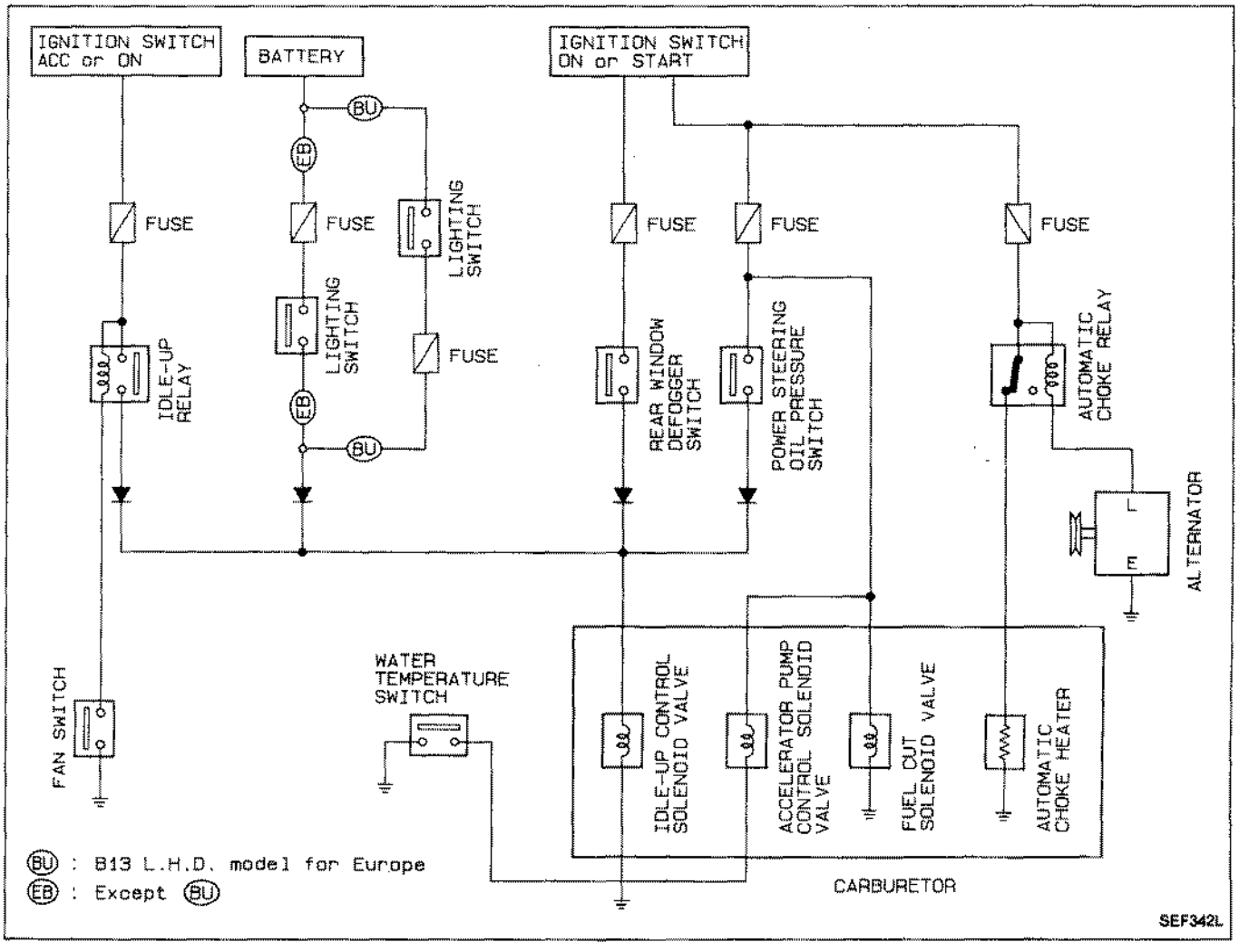
GA14DS WITH CATALYZER WITHOUT E.G.R.



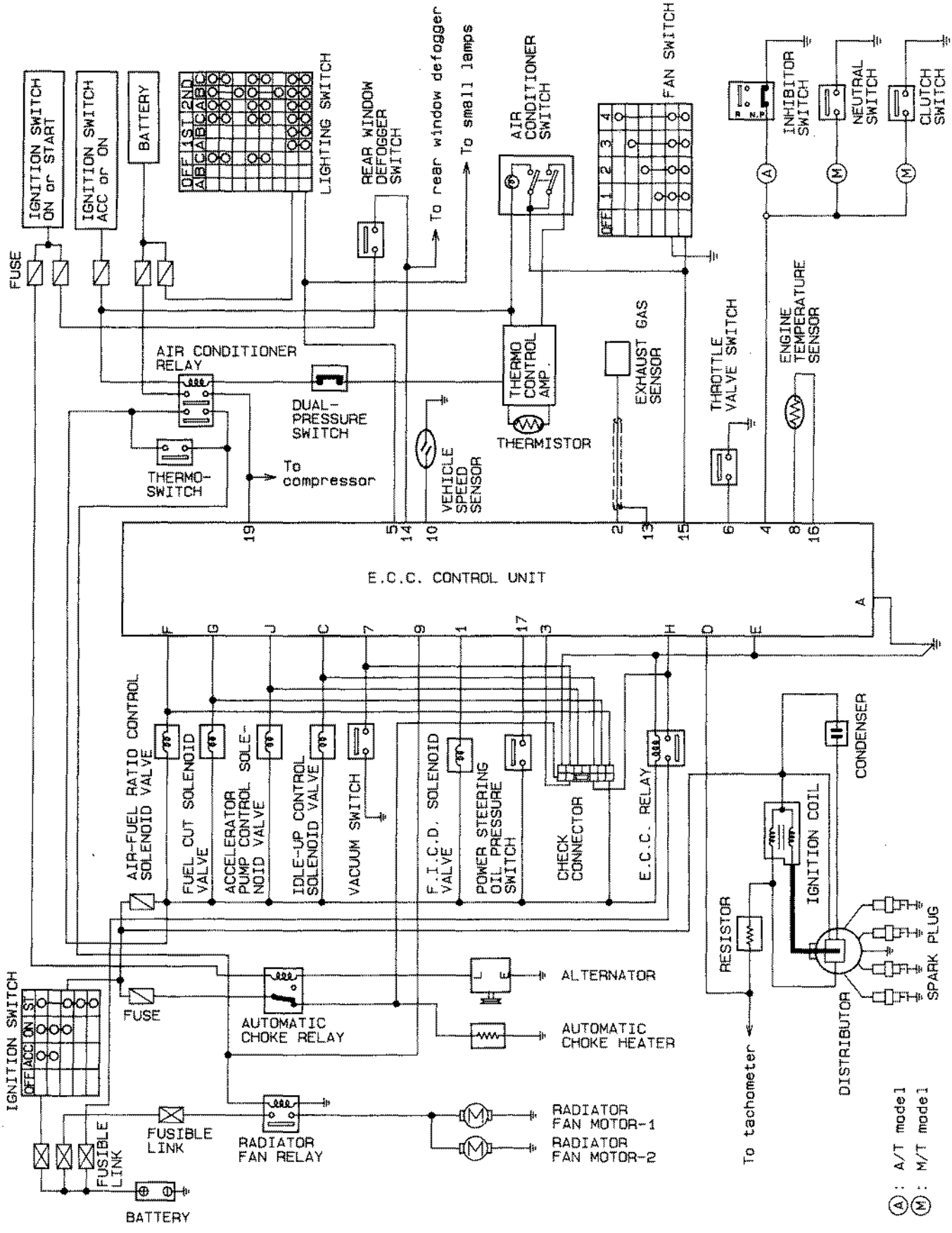
MODELS WITH CATALYZER AND E.G.R.



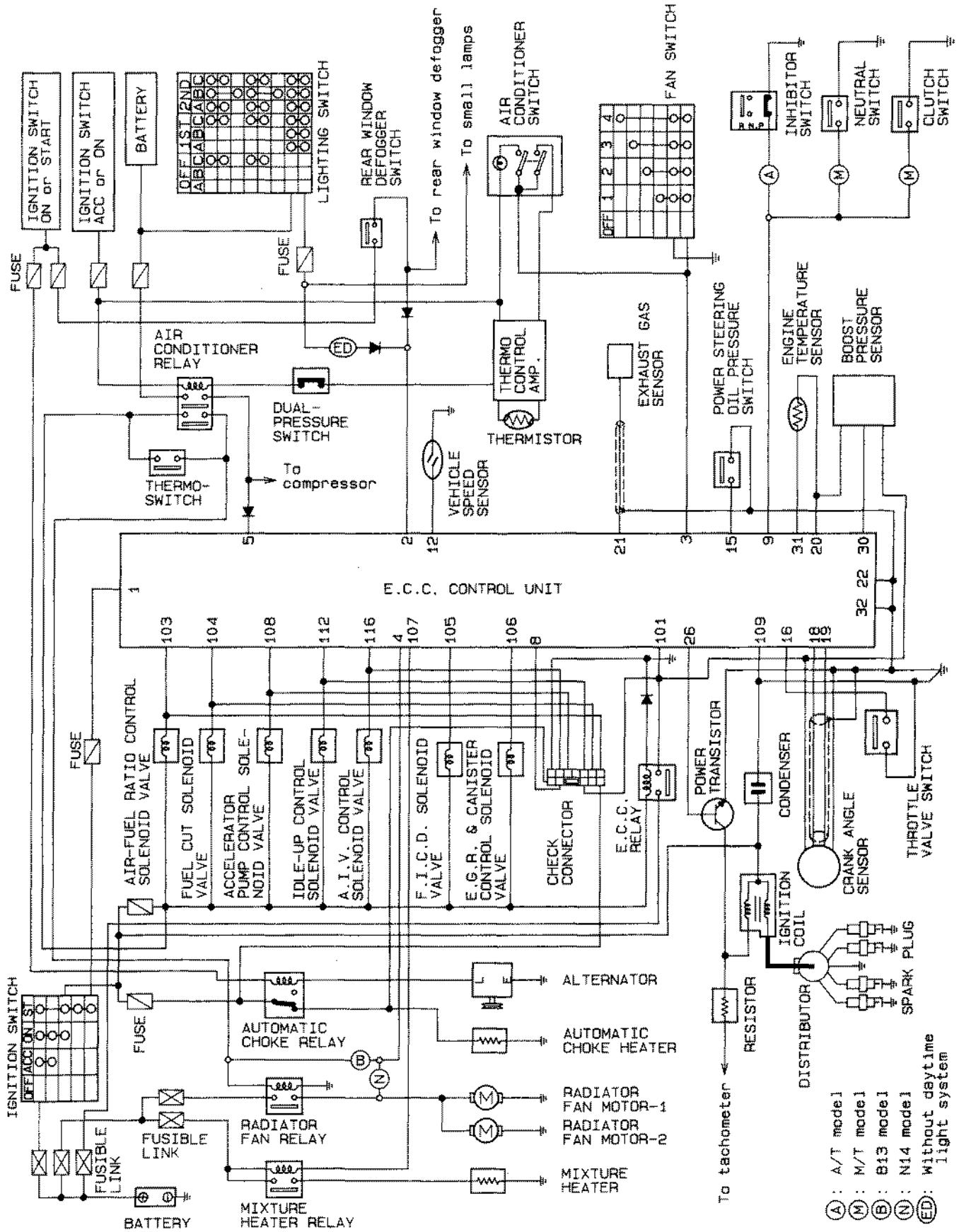
MODELS WITHOUT CATALYZER



GA14DS WITH CATALYZER WITHOUT E.G.R.

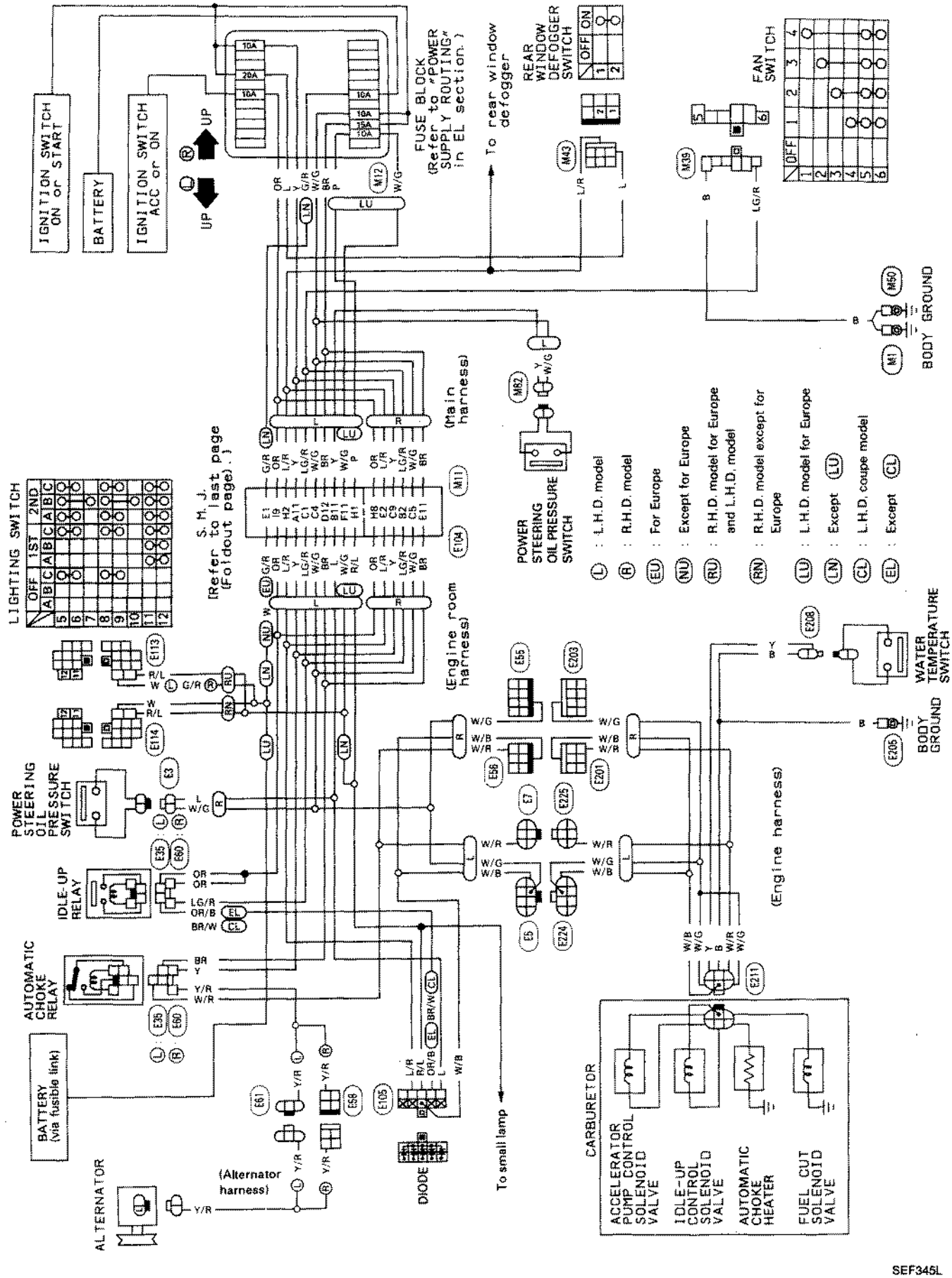


SEF343L


IGNITION SWITCH ON or START
IGNITION SWITCH ACC or ON
BATTERY
OFF 1ST 2ND
LIGHTING SWITCH
REAR WINDOW DEFOGGER SWITCH
To rear window defogger
To small lamps
AIR CONDITIONER SWITCH
FAN SWITCH
INHIBITOR SWITCH
NEUTRAL SWITCH
CLUTCH SWITCH
FUSE
AIR CONDITIONER RELAY
DUAL-PRESSURE SWITCH
THERMO-SWITCH
To compressor
THERMO CONTROL AMP.
THERMISTOR
VEHICLE SPEED SENSOR
EXHAUST GAS SENSOR
POWER STEERING OIL PRESSURE SWITCH
ENGINE TEMPERATURE SENSOR
BOOST PRESSURE SENSOR
E.C.C. CONTROL UNIT
AIR-FUEL RATIO CONTROL SOLENOID VALVE
FUEL CUT SOLENOID VALVE
ACCELERATOR PUMP CONTROL SOLENOID VALVE
IDLE-UP CONTROL SOLENOID VALVE
A.I.V. CONTROL SOLENOID VALVE
F.I.C.D. SOLENOID VALVE
E.G.R. & CANISTER CONTROL SOLENOID VALVE
CHECK CONNECTOR
E.C.C. RELAY
POWER TRANSISTOR
CONDENSER
CRANK ANGLE SENSOR
THROTTLE VALVE SWITCH
IGNITION COIL
DISTRIBUTOR
SPARK PLUG
RESISTOR
To tachometer
IGNITION SWITCH
OFF ACC ON ST
AUTOMATIC CHOKE RELAY
ALTERNATOR
AUTOMATIC CHOKE HEATER
RADIATOR FAN RELAY
RADIATOR FAN MOTOR-1
RADIATOR FAN MOTOR-2
FUSIBLE LINK
MIXTURE HEATER
MIXTURE HEATER RELAY
BATTERY
A : A/T model
M : M/T model
B : B13 model
N : N14 model
ED : Without daytime light system

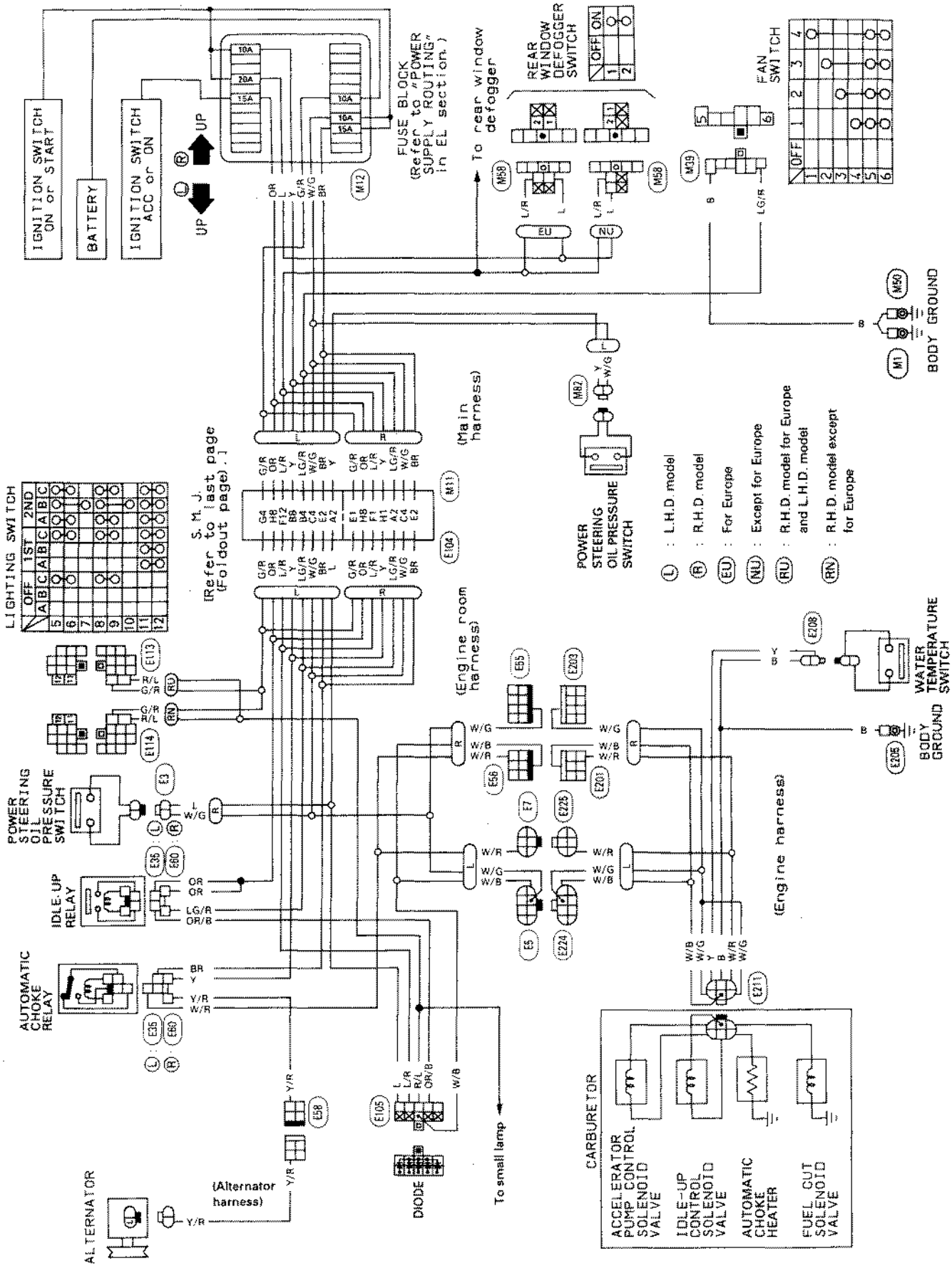
SEF344L

B13 MODELS WITHOUT CATALYZER



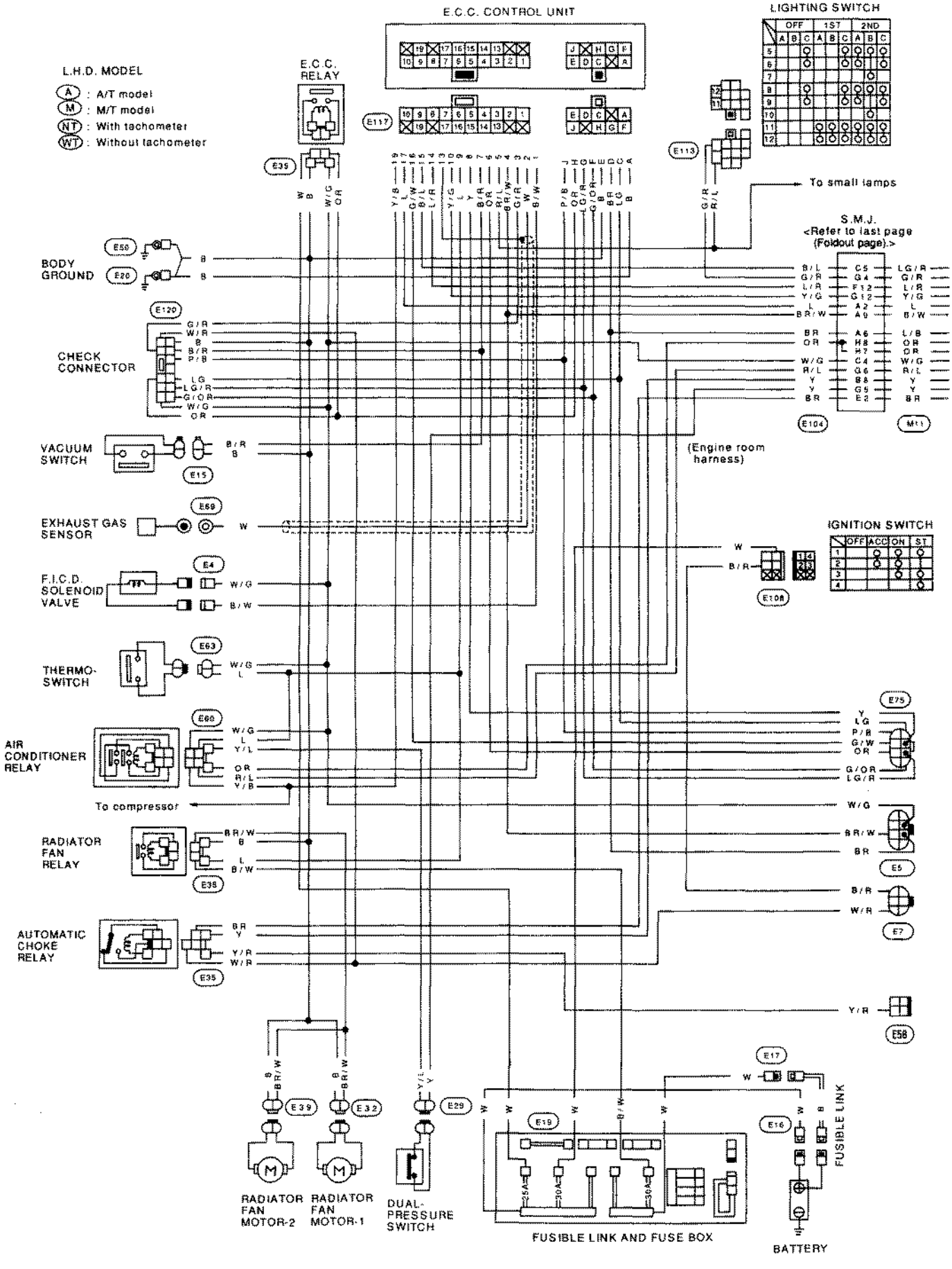
SEF345L

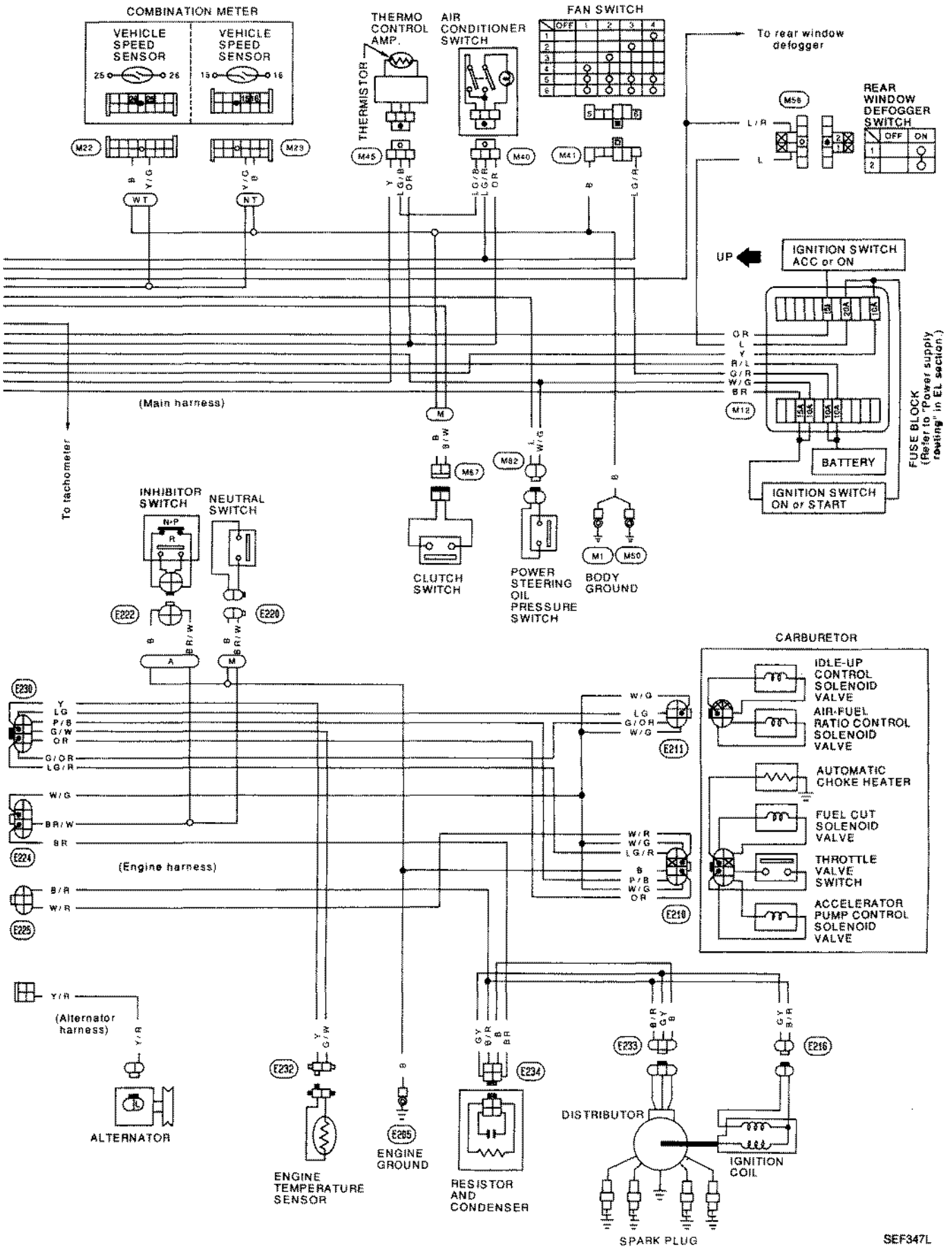
N14 MODELS WITHOUT CATALYZER



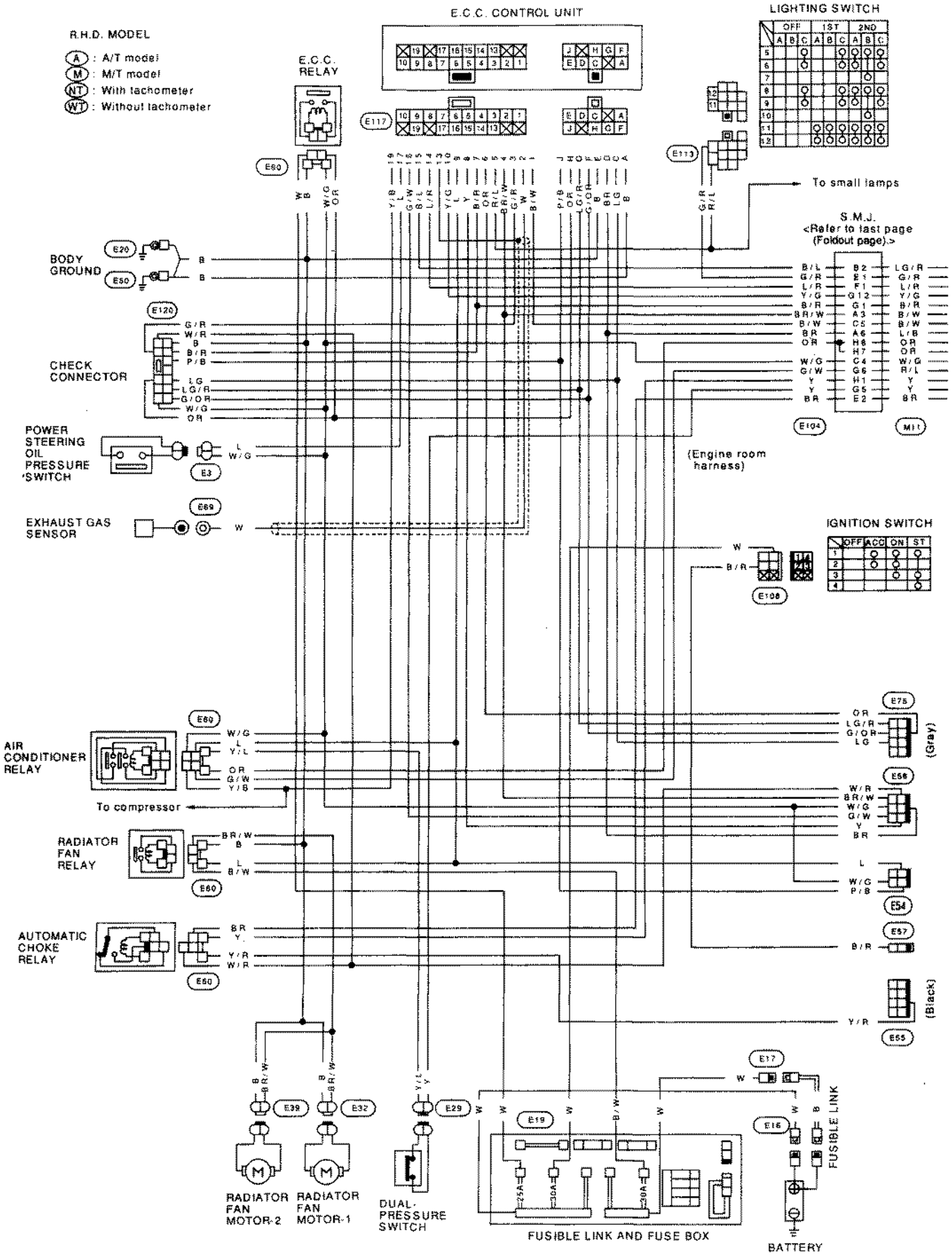
SEF346L

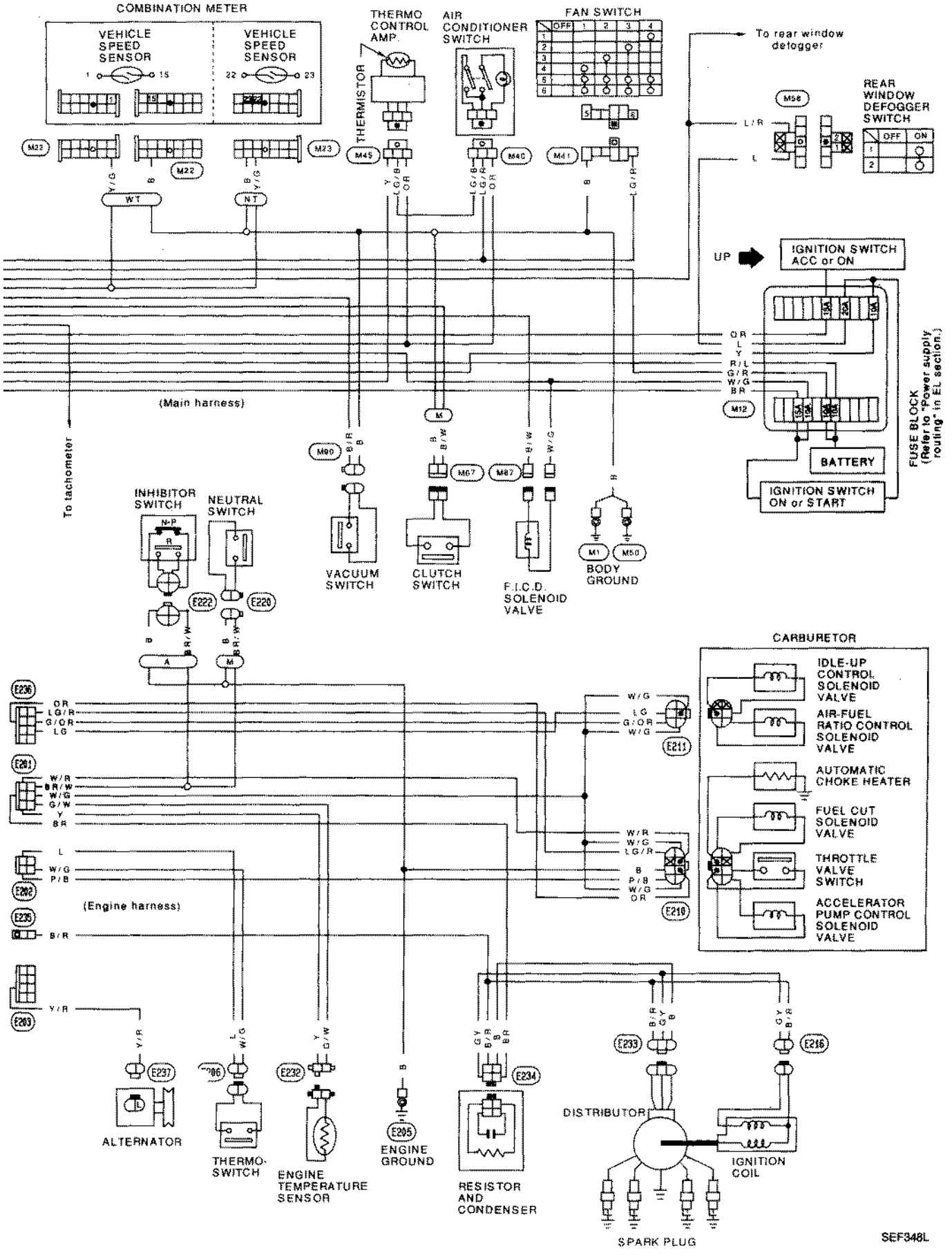
N14 L.H.D. MODELS (GA14DS with catalyzer without E.G.R.)



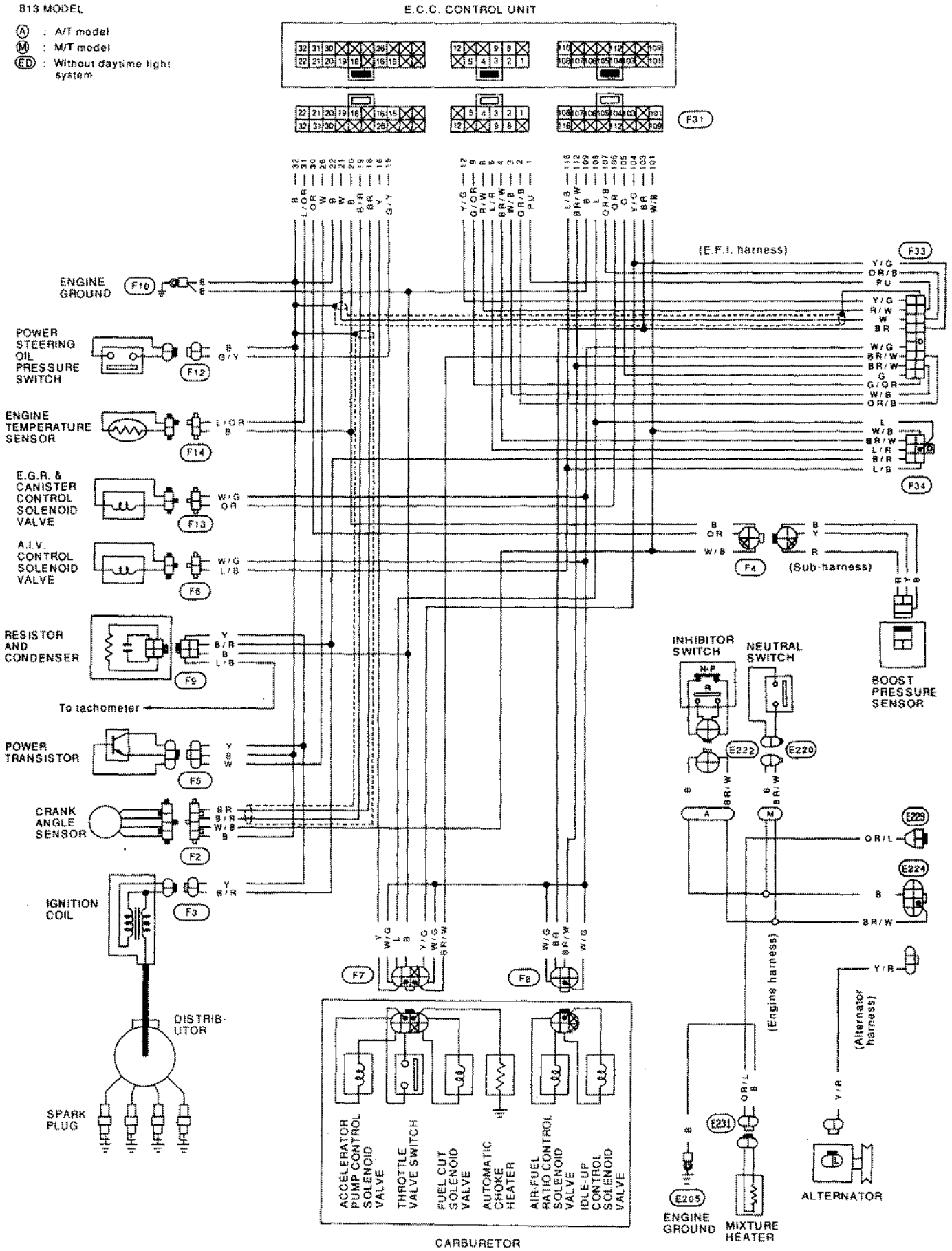

COMBINATION METER
VEHICLE SPEED SENSOR
VEHICLE SPEED SENSOR
THERMO CONTROL AMP.
THERMISTOR
AIR CONDITIONER SWITCH
FAN SWITCH
To rear window defogger
REAR WINDOW DEFOGGER SWITCH
OFF
ON
IGNITION SWITCH ACC or ON
UP
FUSE BLOCK (Refer to "Power supply routing" in EL section.)
BATTERY
IGNITION SWITCH ON or START
(Main harness)
To tachometer
INHIBITOR SWITCH
NEUTRAL SWITCH
CLUTCH SWITCH
POWER STEERING OIL PRESSURE SWITCH
BODY GROUND
CARBURETOR
IDLE-UP CONTROL SOLENOID VALVE
AIR-FUEL RATIO CONTROL SOLENOID VALVE
AUTOMATIC CHOKE HEATER
FUEL CUT SOLENOID VALVE
THROTTLE VALVE SWITCH
ACCELERATOR PUMP CONTROL SOLENOID VALVE
(Engine harness)
(Alternator harness)
ALTERNATOR
ENGINE TEMPERATURE SENSOR
ENGINE GROUND
RESISTOR AND CONDENSER
DISTRIBUTOR
IGNITION COIL
SPARK PLUG
SEF347L

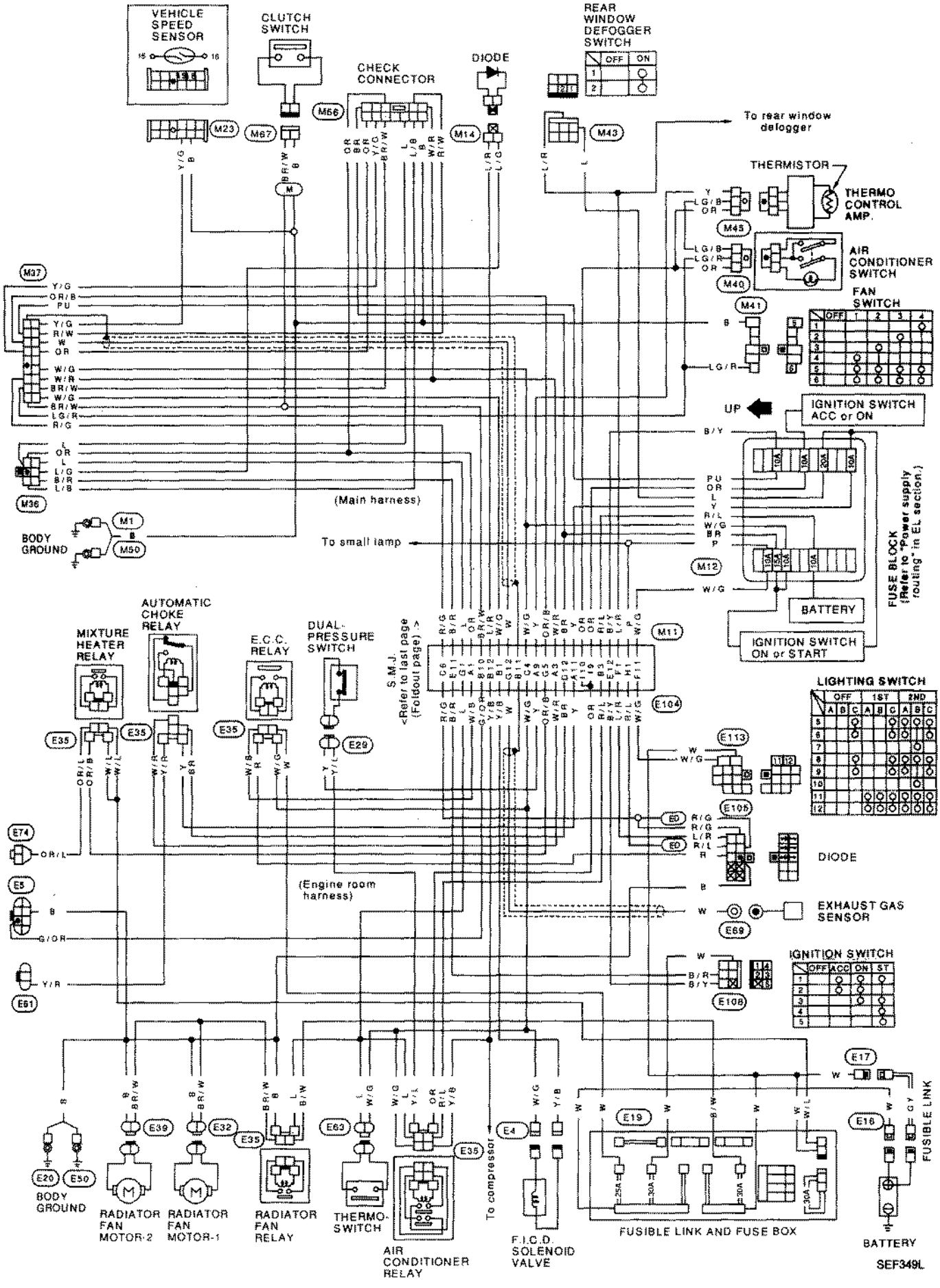
N14 R.H.D. MODELS (GA14DS with catalyzer without E.G.R.)



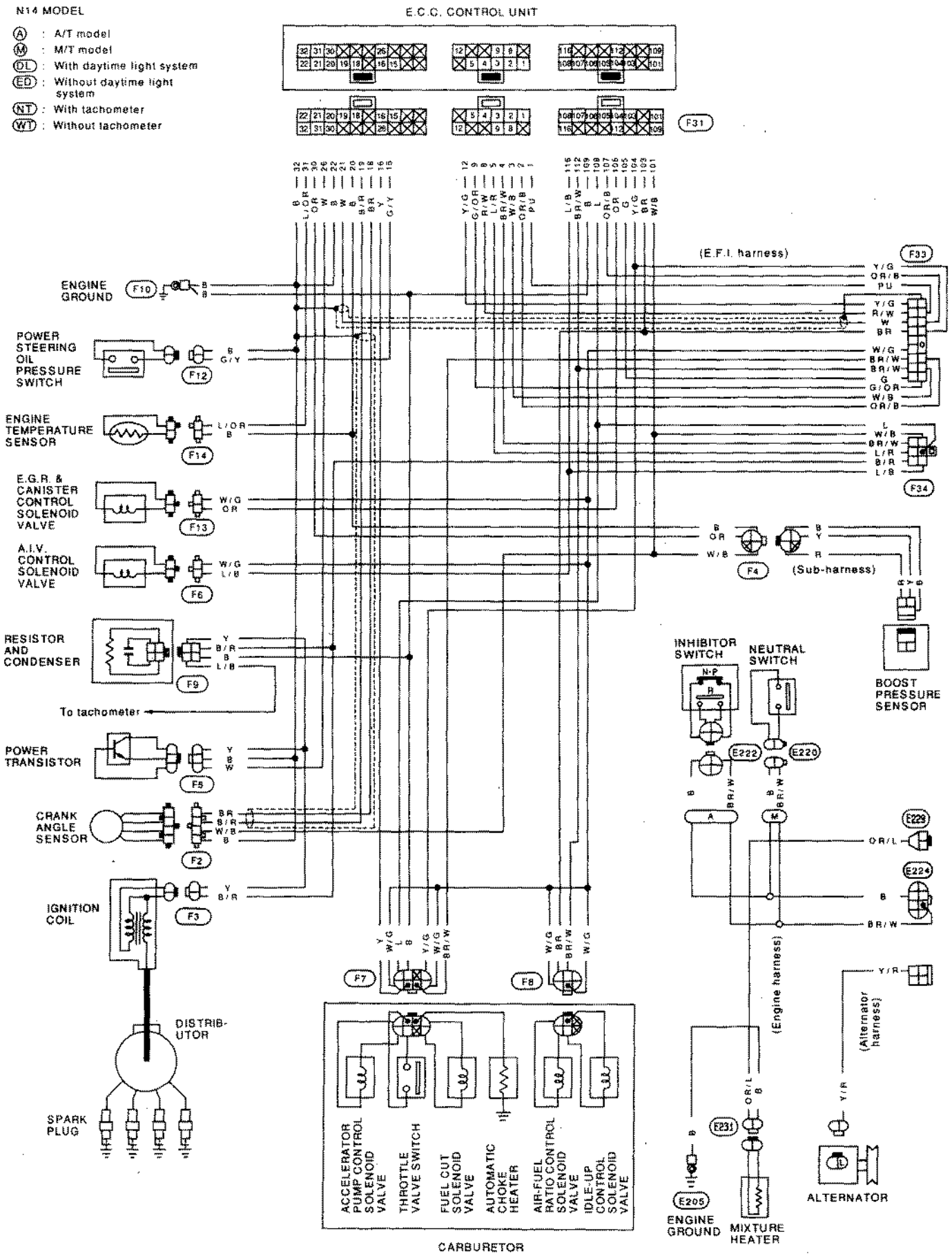

COMBINATION METER
VEHICLE SPEED SENSOR
VEHICLE SPEED SENSOR
THERMO CONTROL AMP.
THERMISTOR
AIR CONDITIONER SWITCH
FAN SWITCH
To rear window defogger
REAR WINDOW DEFOGGER SWITCH
OFF
ON
UP
IGNITION SWITCH ACC or ON
IGNITION SWITCH ON or START
BATTERY
FUSE BLOCK (Refer to "Power supply routing" in EL section.)
(Main harness)
To tachometer
INHIBITOR SWITCH
NEUTRAL SWITCH
VACUUM SWITCH
CLUTCH SWITCH
F.I.C.D. SOLENOID VALVE
BODY GROUND
CARBURETOR
IDLE-UP CONTROL SOLENOID VALVE
AIR-FUEL RATIO CONTROL SOLENOID VALVE
AUTOMATIC CHOKE HEATER
FUEL CUT SOLENOID VALVE
THROTTLE VALVE SWITCH
ACCELERATOR PUMP CONTROL SOLENOID VALVE
(Engine harness)
ALTERNATOR
THERMO-SWITCH
ENGINE TEMPERATURE SENSOR
ENGINE GROUND
RESISTOR AND CONDENSER
DISTRIBUTOR
IGNITION COIL
SPARK PLUG
SEF348L

B13 MODELS WITH CATALYZER AND E.G.R.



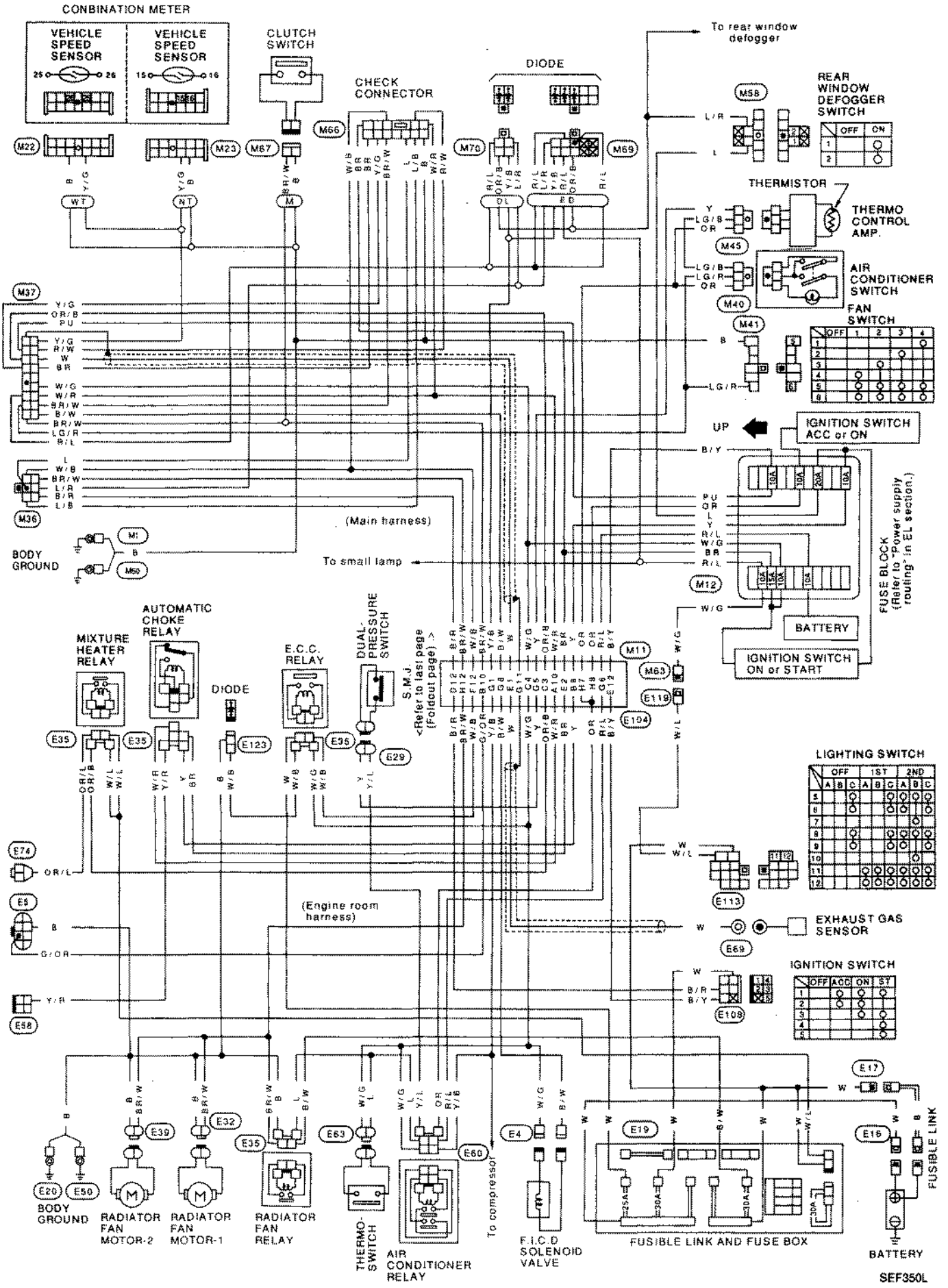

VEHICLE SPEED SENSOR
CLUTCH SWITCH
CHECK CONNECTOR
DIODE
REAR WINDOW DEFOGGER SWITCH
To rear window defogger
THERMISTOR
THERMO CONTROL AMP.
AIR CONDITIONER SWITCH
FAN SWITCH
IGNITION SWITCH ACC or ON
BATTERY
IGNITION SWITCH ON or START
FUSE BLOCK (Refer to "Power supply routing" in EL section.)
(Main harness)
To small lamp
BODY GROUND
AUTOMATIC CHOKE RELAY
MIXTURE HEATER RELAY
E.C.C. RELAY
DUAL-PRESSURE SWITCH
S.M.J. <Refer to last page (Foldout page).>
LIGHTING SWITCH
(Engine room harness)
EXHAUST GAS SENSOR
IGNITION SWITCH
RADIATOR FAN MOTOR-2
RADIATOR FAN MOTOR-1
RADIATOR FAN RELAY
THERMO-SWITCH
AIR CONDITIONER RELAY
To compressor
F.I.C.D. SOLENOID VALVE
FUSIBLE LINK AND FUSE BOX
FUSIBLE LINK
SEF349L

N14 MODELS WITH CATALYZER AND E.G.R.



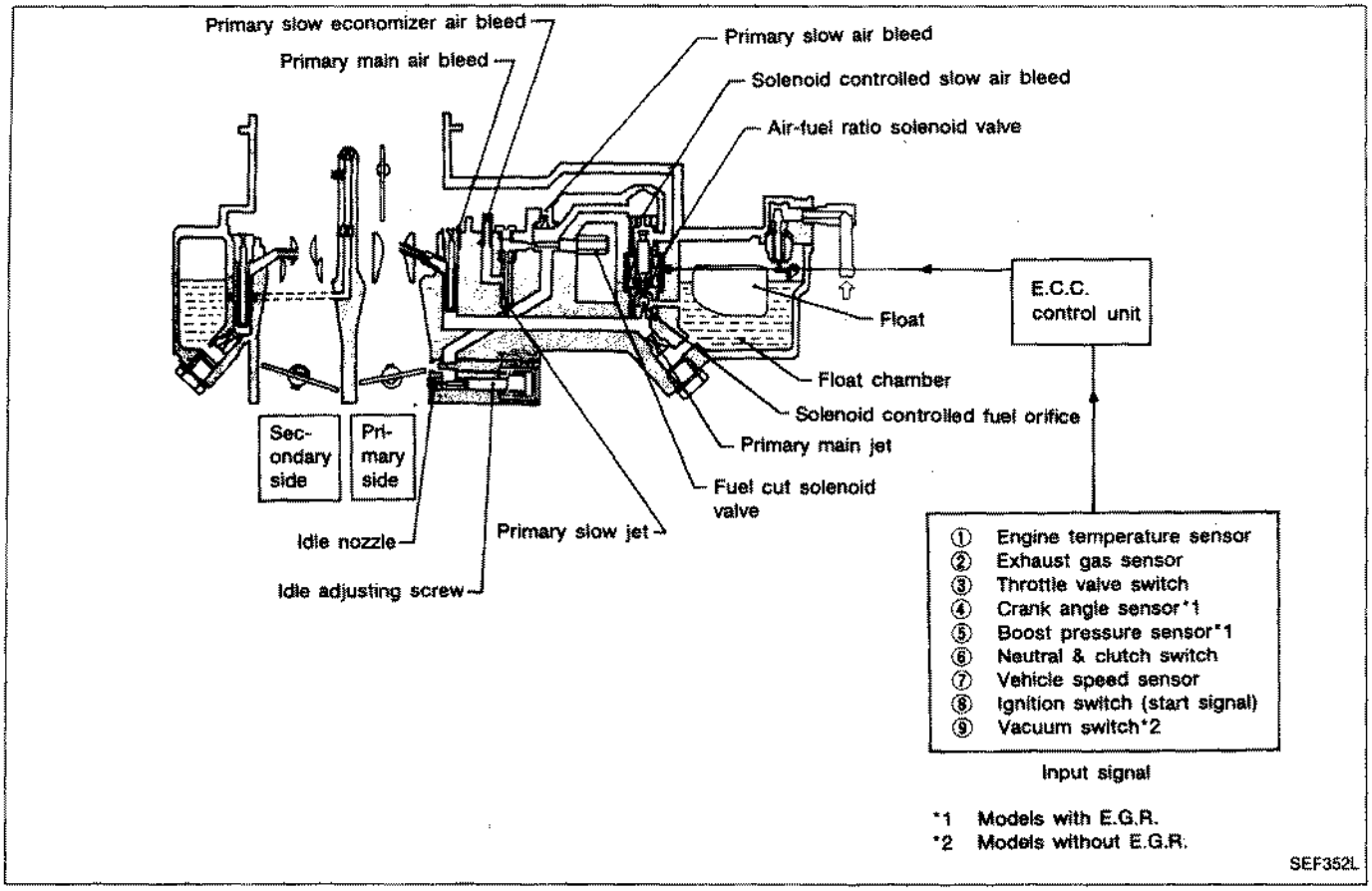
ENGINE AND EMISSION CONTROL CIRCUIT DIAGRAM

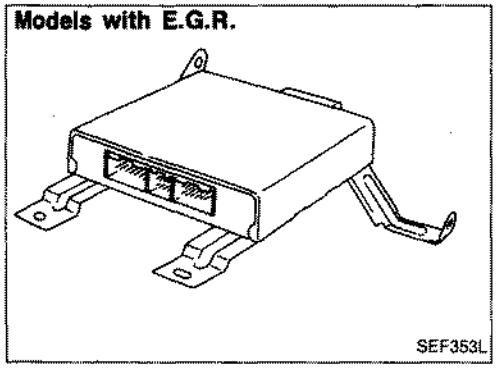
GA13DS, GA14DS & GA16DS

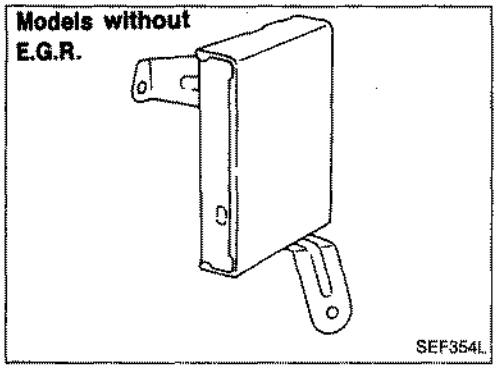


General Description

The carburetor is equipped with an air-fuel ratio control on-off valve instead of a power valve. This on-off valve opens or closes the compensating air bleed and main jet to compensate for rich/lean air-fuel ratio, depending on varying conditions, such as acceleration, deceleration, low coolant temperature, low voltage, etc. These varying conditions are detected by various sensors which transmit corresponding signals to provide air-fuel ratio compensation.







Components

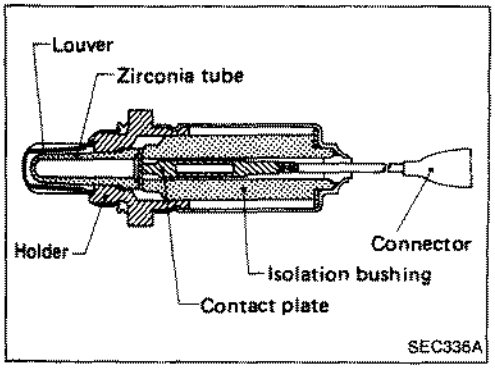
E.C.C. CONTROL UNIT (E.C.U.)

The E.C.C. control unit consists of a micro-computer, connectors for signal input and output and power supply. The control unit controls the feedback pulse width and fuel shut-off operation, etc.

WARNING:

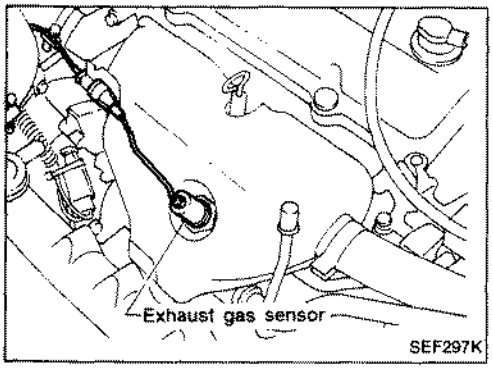
- **When installing CB ham radio equipment or a vehicle phone, be sure to observe the following as it may adversely affect electronic control systems depending on its installation location.**

1) **Keep the antenna as far as possible away from the electronic control units.**
2) **Also keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls. Do not let them run parallel for a long distance.**
3) **Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.**

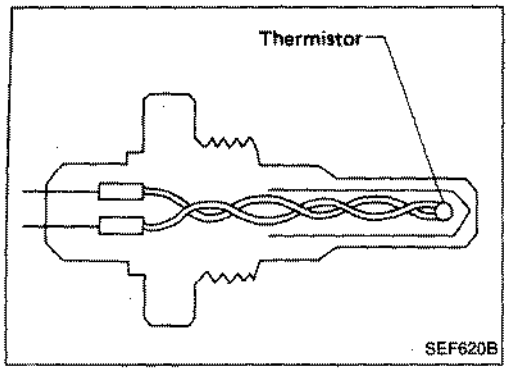


EXHAUST GAS SENSOR

The exhaust gas sensor, which is built into the exhaust manifold, monitors the density of oxygen in the exhaust gas. It consists of a closed-end tube made of ceramic zirconia and other components. Porous platinum electrodes cover the tubes inner and outer surfaces. The closed-end of the tube is exposed to the exhaust gas in the exhaust manifold The tubes outer surface contacts the exhaust gas while the inner surface contacts the air.

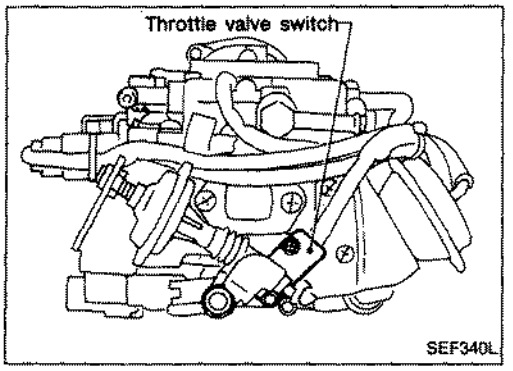


Components (Cont'd)



ENGINE TEMPERATURE SENSOR

The engine temperature sensor, built into the water jacket of the intake manifold, monitors change in water temperature and transmits a signal to the E.C.U.
The temperature sensing unit employs a thermistor which is very sensitive in the low temperature range.
The electrical resistance of the thermistor decreases in response to the temperature rise.



THROTTLE VALVE SWITCH

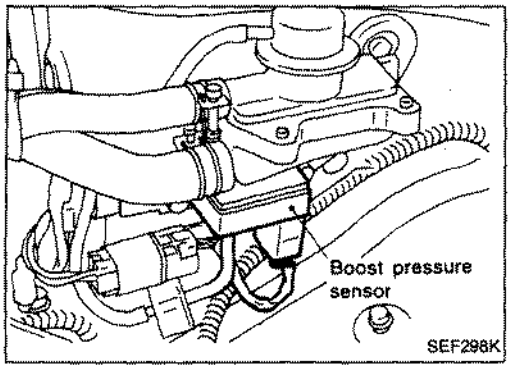
The throttle valve switch is attached to the carburetor and actuates in response to accelerator pedal movement.
This switch has the idle contact.
The idle contact opens when the throttle valve is positioned at idle and closes when it is at any other position.

NEUTRAL SWITCH

The neutral switch detects the transmission gear selector's position and transmits an electric signal to the control unit.

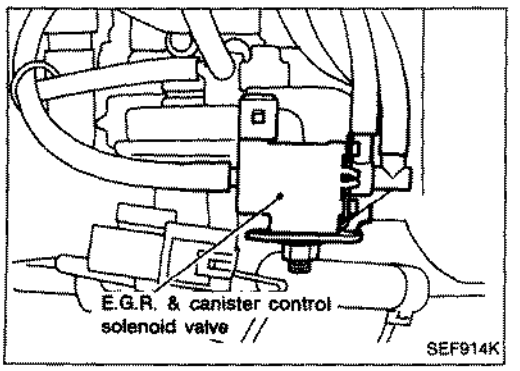
CLUTCH SWITCH

The clutch switch detects the clutch position (depressed or released) and transmits an electric signal to the control unit.



BOOST PRESSURE SENSOR (Models with E.G.R.)

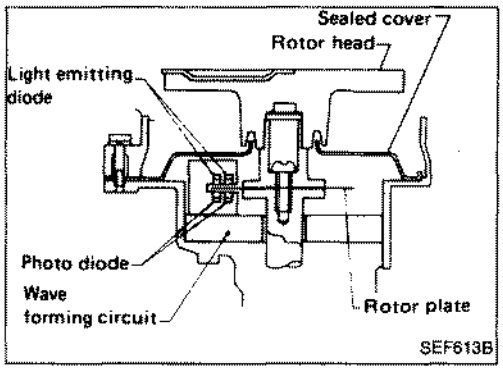
Boost pressure sensor detects the low intake manifold vacuum and transmits an electrical signal to the control unit.



E.G.R. & CANISTER CONTROL SOLENOID VALVE (Models with E.G.R.)

The E.G.R. and canister systems are controlled only by the E.C.U. At both low- and high-speed revolutions of engine, the solenoid valve turns on and accordingly the E.G.R. control valve and canister cut the exhaust gas and fuel vapor leading to the intake manifold.

Components (Cont'd)

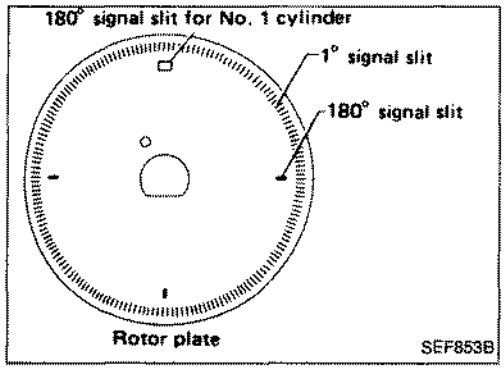


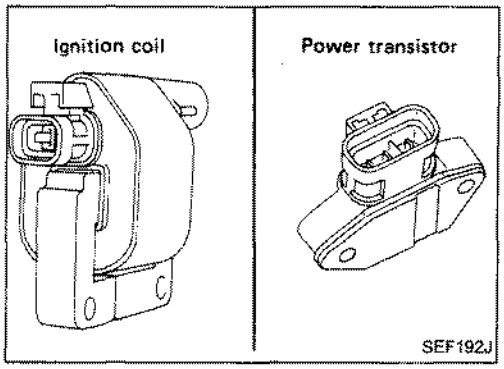
CRANK ANGLE SENSOR (Models with E.G.R.)

The crank angle sensor is a basic component of the entire E.C.U. It monitors engine speed and piston position, and sends to the E.C.U. signals on which the controls of ignition timing and other functions are based.

The crank angle sensor has a rotor plate and a wave forming circuit. The rotor plate has 360 slits for 1° signal (engine speed signal) and 4 slits for 180° signal (crank angle signal). Light Emitting Diodes (L.E.D.) and Photo Diodes are built in the wave forming circuit.

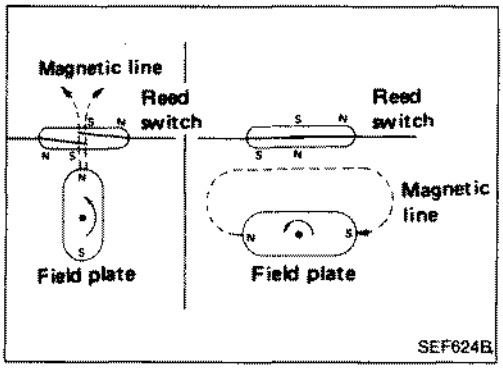
When the rotor plate passes the space between the L.E.D. and the Photo Diode, the slits of the rotor plate continually cut the light which is sent to the photo diode from the L.E.D. This causes generating rough-shaped pulses. They are then converted into on-off pulses by the wave forming circuit, which are sent to the E.C.U.





POWER TRANSISTOR & IGNITION COIL (Models with E.G.R.)

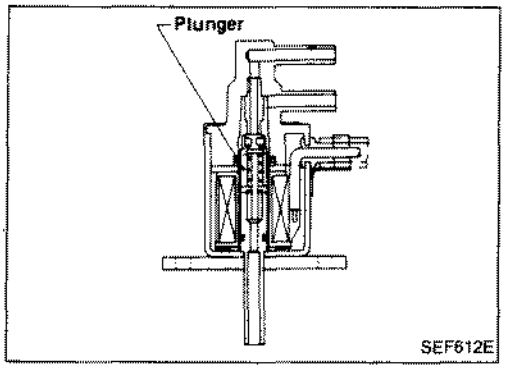
The ignition signal from the E.C.U. is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit. The ignition coil is a small, molded type.



VEHICLE SPEED SENSOR

The vehicle speed sensor provides a vehicle speed signal to the E.C.U.

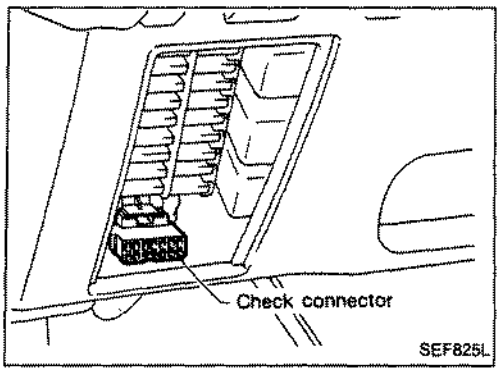
The speed sensor consists of a reed switch, which is installed in the speed meter unit and transforms vehicle speed into a pulse signal.



A.I.V. CONTROL SOLENOID VALVE (Models with E.G.R.)

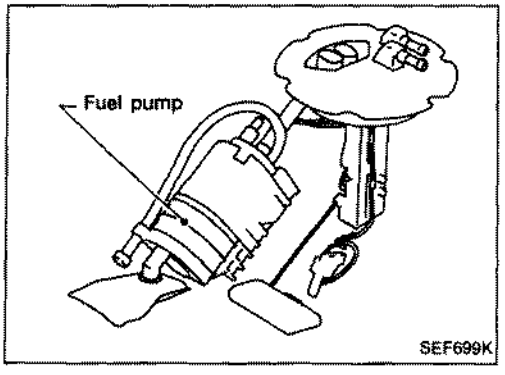
This three-port solenoid valve controls the "cold" A.I.V. vacuum line, based on signals supplied by the E.C.U. The second A.I.V. line, called the "hot" line is not controlled by the E.C.U. Refer to A.I.V. description for further details.

Components (Cont'd)



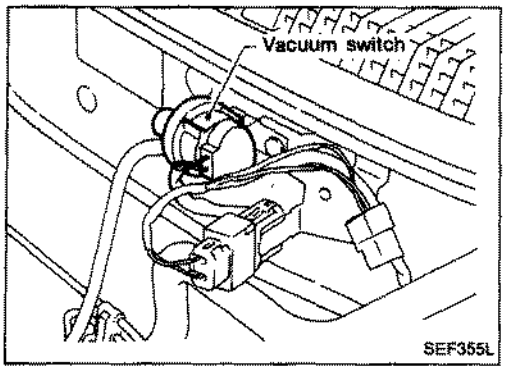
CHECK CONNECTOR FOR EXHAUST GAS SENSOR

The check connector for exhaust gas sensor is below fuse box.



FUEL PUMP (N14 4WD models)

A turbine type design fuel pump is used and is situated in the fuel tank.

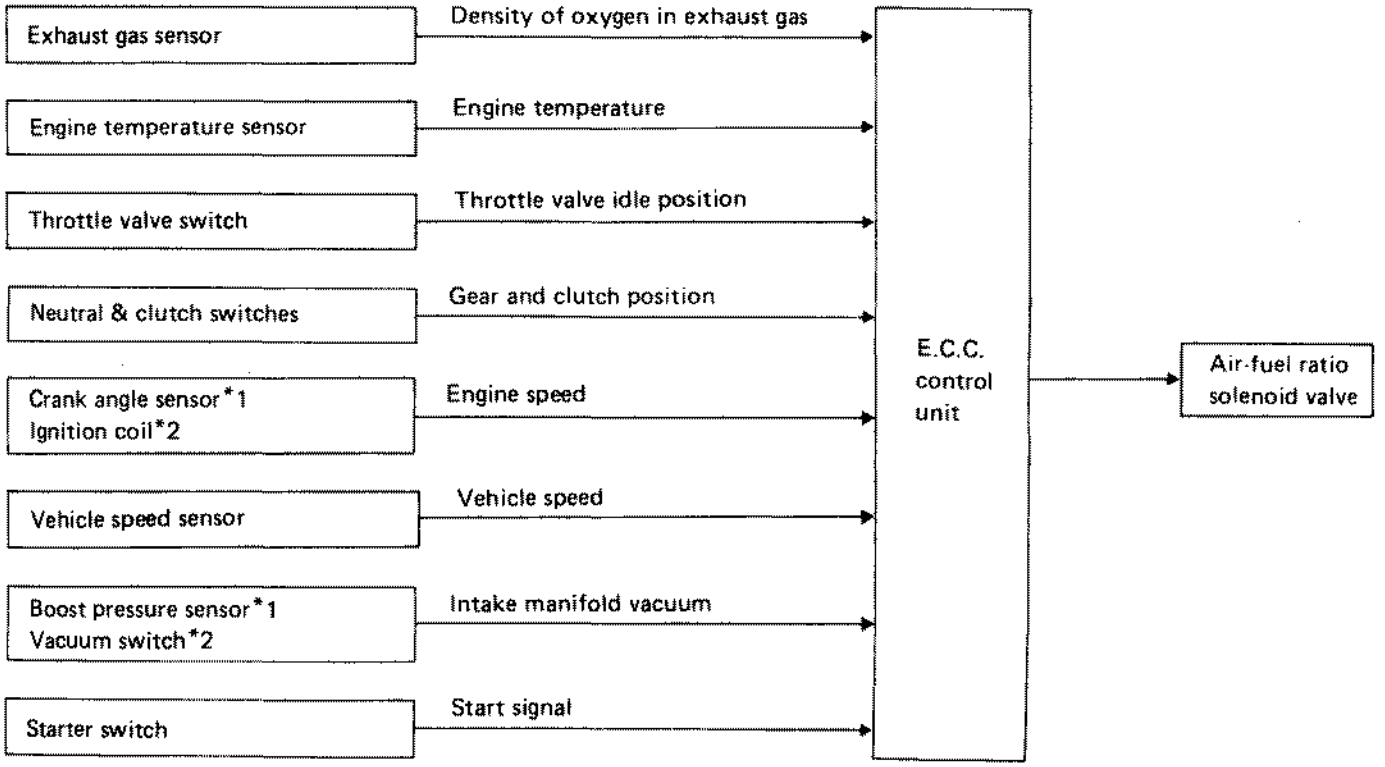


VACUUM SWITCH (Models without E.G.R.)

Vacuum switch detects low intake manifold vacuum and transmits an electrical signal to the control unit.

Air-fuel Ratio Control

There are two ways to control the air-fuel ratio. These are open loop control and closed loop control, which are switched back and forth by the signal of water temperature, engine rpm, exhaust gas sensor signal, manifold vacuum and so on.



*1 Model with E.G.R. only
*2 Models without E.G.R. only

OPEN-LOOP CONTROL

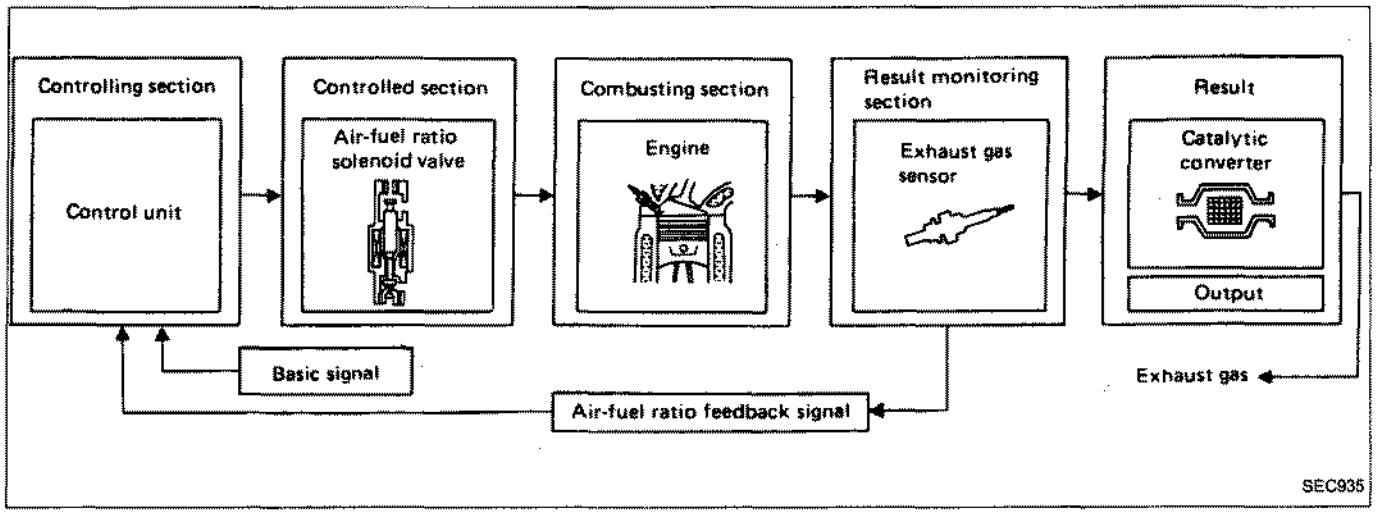
For improved driveability, air fuel ratio solenoid is controlled by open-loop control under the following conditions.
With open-loop control, the air-fuel ratio is determined by the E.C.C. control unit, corresponding to the condition as shown below:

a	When starting engine
b	When engine is cold
c	During deceleration (Fuel cut system is in operation.)
d	When driving at high speeds
e	At full throttle
f	When exhaust gas sensor in not activated
g	When engine is idling

Air-fuel Ratio Control (Cont'd)

CLOSED-LOOP CONTROL
(Air-fuel ratio feedback control)

This system is designed to control the air-fuel ratio precisely to the stoichiometric point so that the three-way catalyst can minimize CO, HC and NOx emissions simultaneously. The system uses the exhaust gas sensor located in the exhaust manifold to give an indication of whether the air-fuel ratio is richer or leaner than the stoichiometric point. The sensor transmits a nonlinear voltage to the E.C.U. The control unit adjusts the feedback pulse width according to the sensor voltage so the mixture ratio will be within the narrow window of the three-way catalyst. During engine warm-up period, however, this system remains open until the sensor reaches the operating temperature.

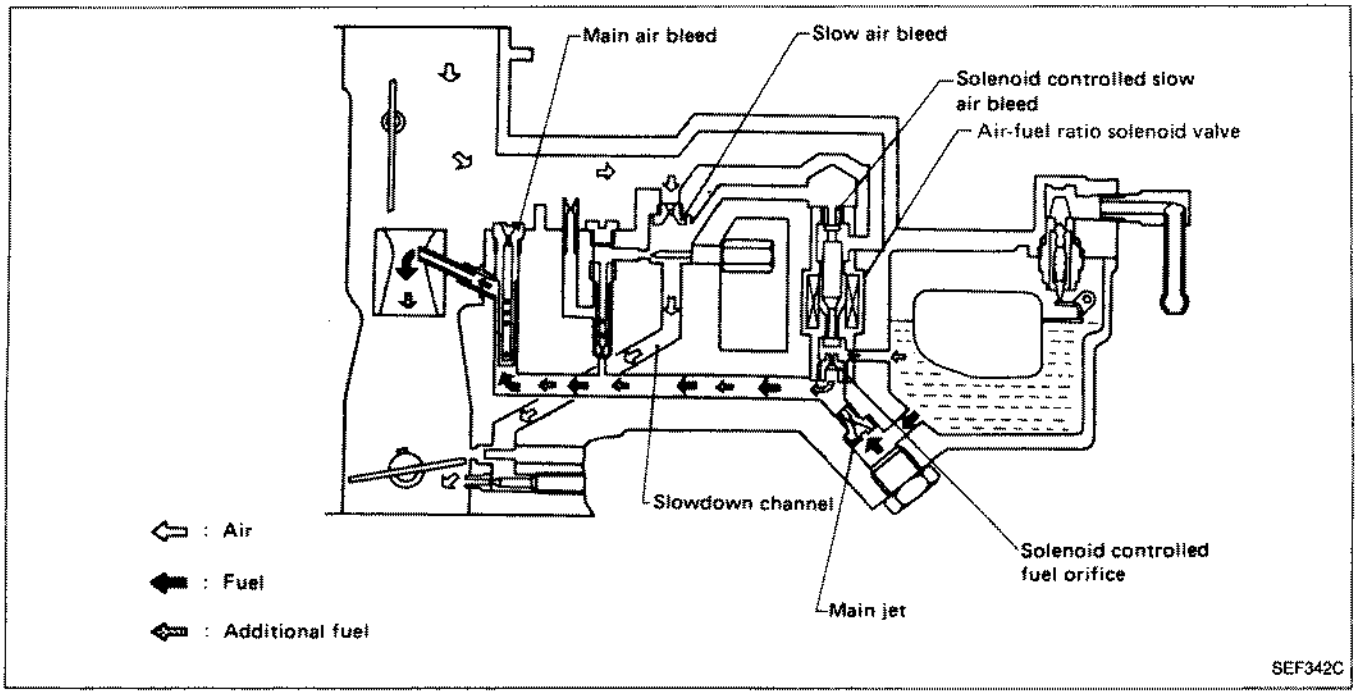


Air-fuel Ratio Control (Cont'd)

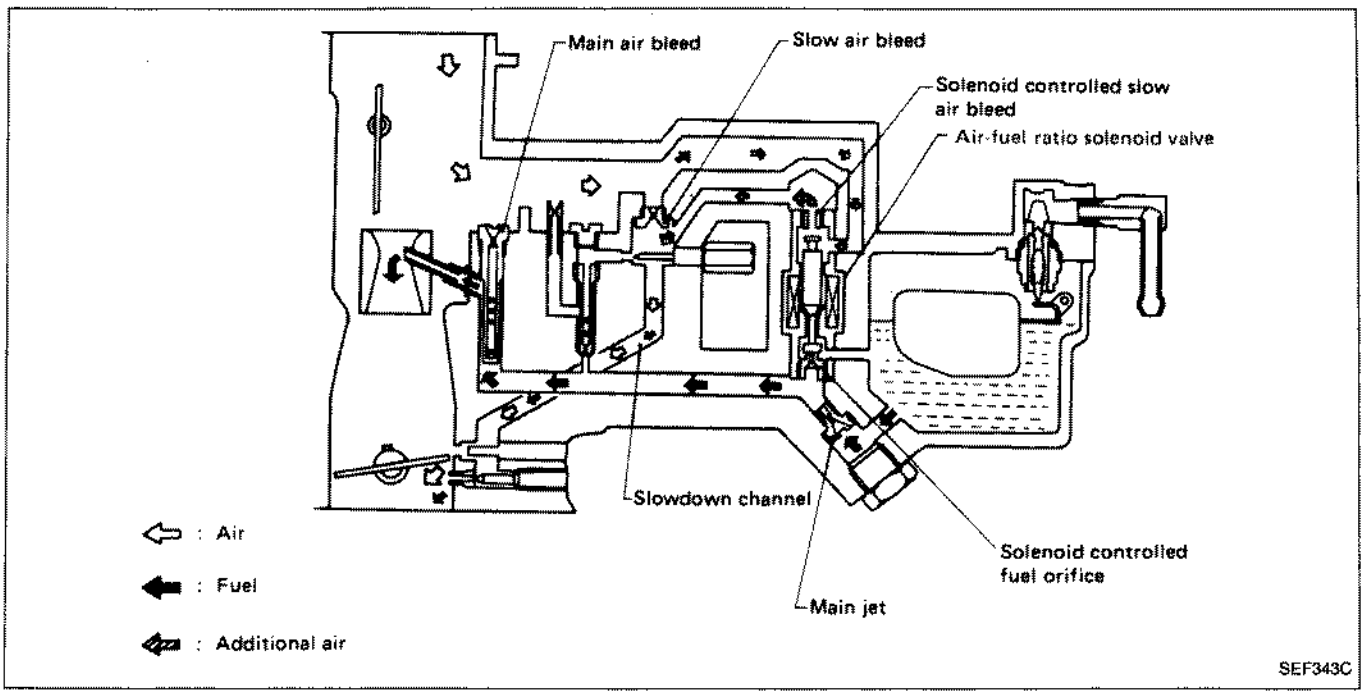
AIR-FUEL RATIO CONTROL SOLENOID VALVE

This solenoid valve is opened or closed repeatedly every 65 msec.
Under closed-loop control, the percentage of opening time and closing time is feedback controlled in E.C.U. by the signal from exhaust gas sensor.
Under the open-loop control, the percentage of opening time and closing time is kept at the specified level according to condition of engine.

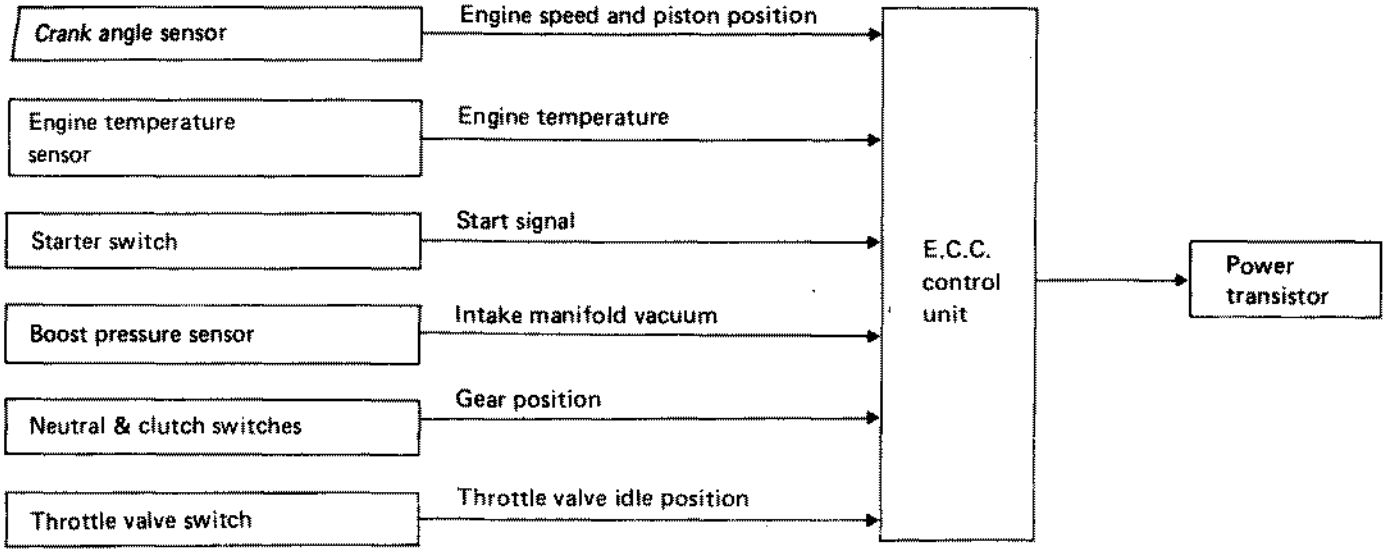
Air-fuel ratio solenoid valve: ON



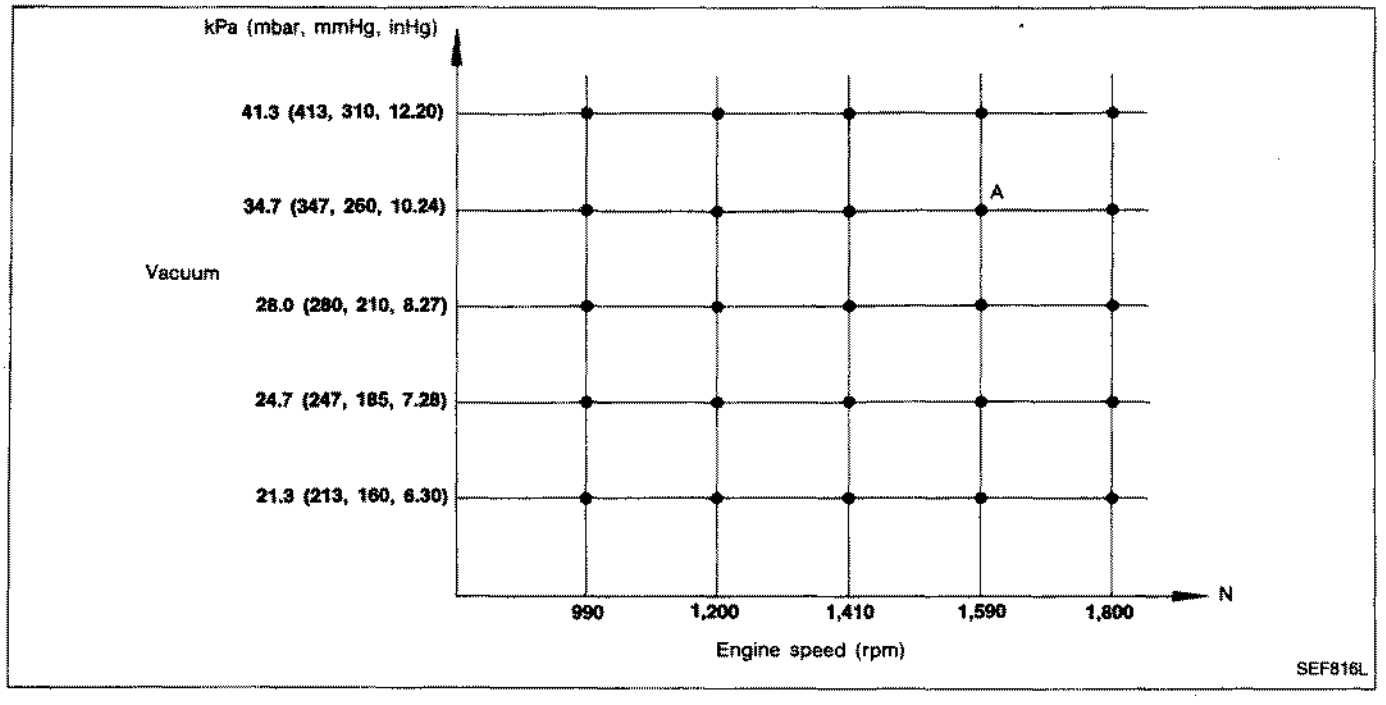
Air-fuel ratio solenoid valve: OFF

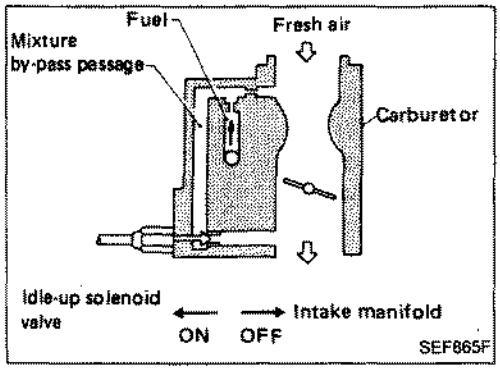


Ignition Timing Control (Models with E.G.R.)



The ignition timing is controlled by the E.C.U. in order to maintain the best air-fuel ratio in response to every running condition of the engine. The ignition timing data is stored in the ROM located in the E.C.U., in the form of the map shown below.
The E.C.U. detects information such as the intake manifold vacuum and crank angle sensor signal which varies every moment. Then responding to this information, ignition signals are transmitted to the power transistor.
In addition to this, at starting, the ignition timing is revised by the E.C.U. according to the other data stored in the ROM.



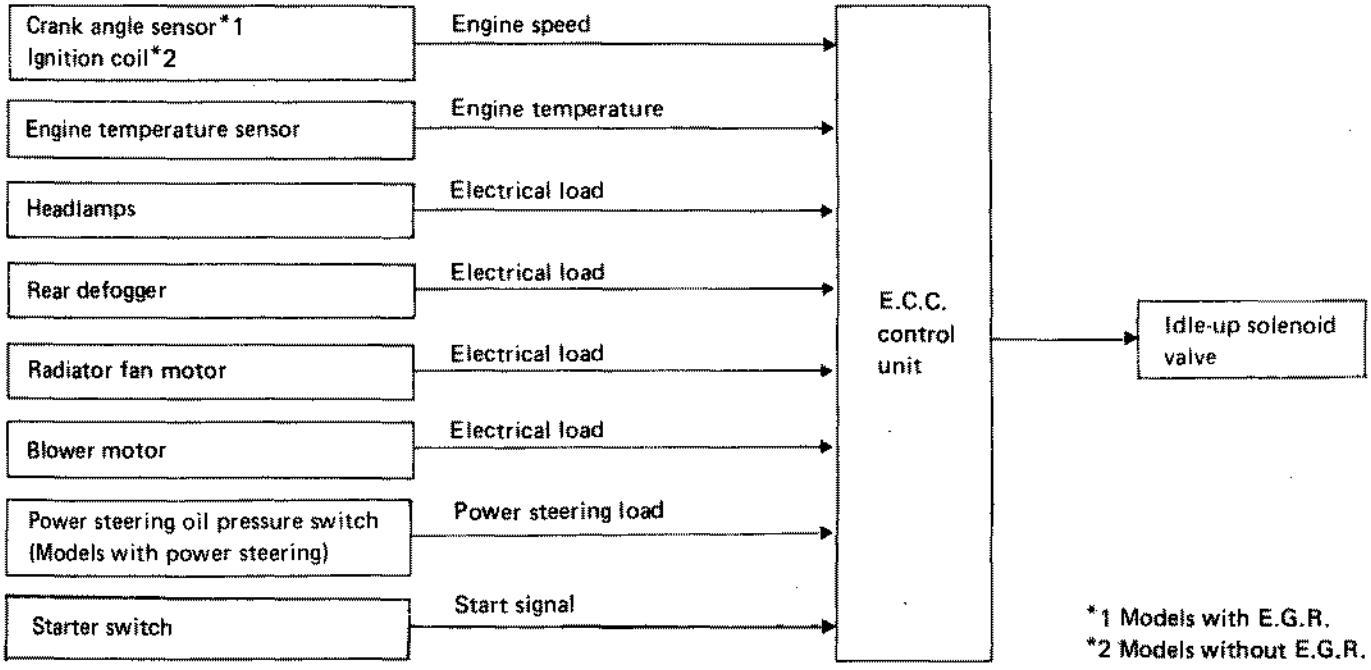


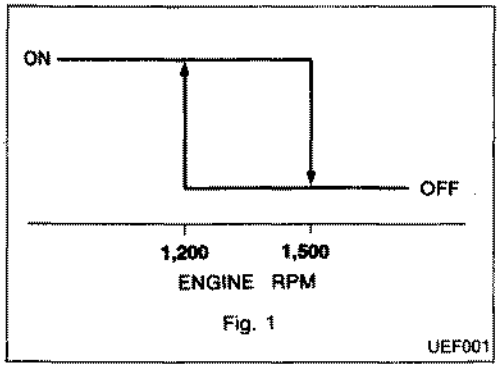
Idle-up Control

This system prevents poor battery charging and erratic idling when the following units are operating:

- Headlamps
- Rear defogger
- Radiator fan motor
- Blower motor
- Power steering pump

In this system, the proper fuel is added to keep a constant idle speed when solenoid valve attached to carburetor are in the "ON" position.





OPERATION

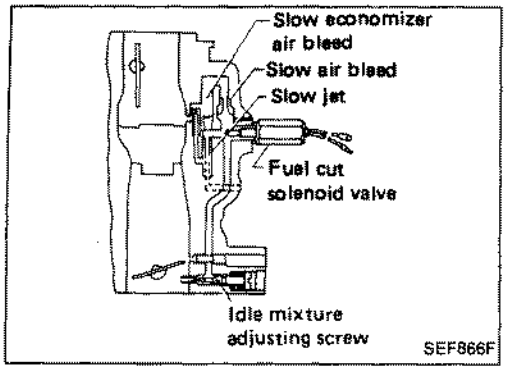
① Water temperature: Between −10°C (14°F) and 75°C (167°F)
Engine rpm: As shown in Fig. 1

② Water temperature: Above 30°C (86°F)
At least one switch ON:
- Headlamps
- Rear defogger
- Radiator fan motor
- Blower motor
- Power steering oil pressure switch (Models with power steering only)

Engine rpm: As shown in Fig. 1

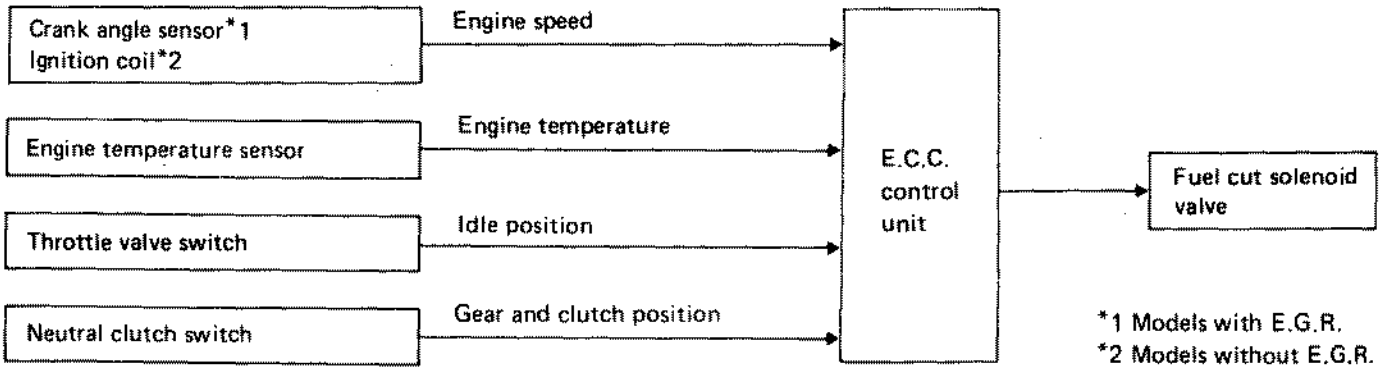
③ Water temperature: Above 60°C (140°F)
Starter switch: ON → OFF
During 15 seconds*1, 10 seconds*2
Engine rpm: As shown in Fig. 1

*1 Models with E.G.R.
*2 Models without E.G.R.



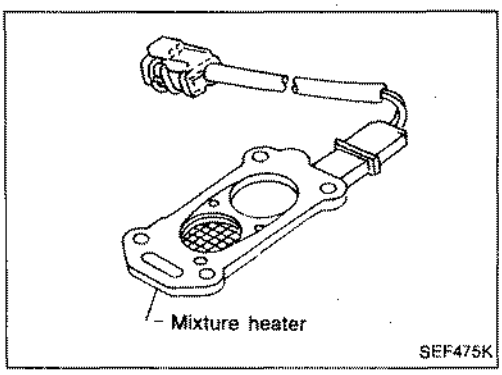
Fuel Cut Control

The fuel cut solenoid valve is attached to the carburetor with its needle valve facing the fuel passage of the primary slow system. When current flows through the fuel cut solenoid valve, the needle valve retracts, allowing the fuel to flow through the primary slow system. When current does not flow through this system, the fuel will be shut off.



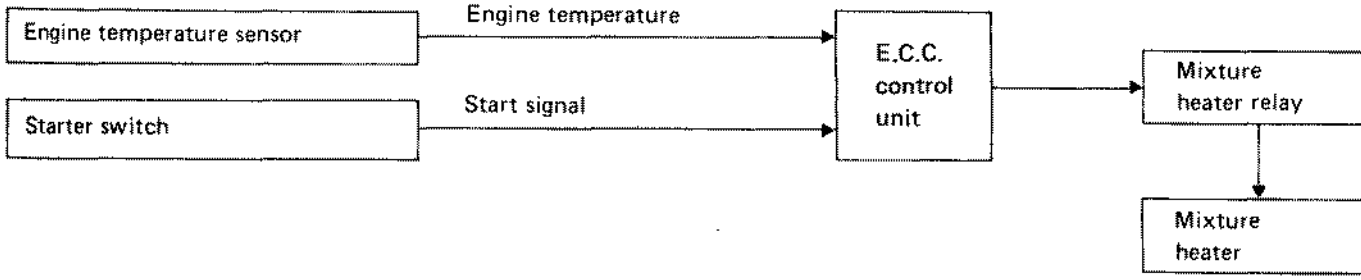
OPERATION

Conditions	Fuel cut system operation
Engine rpm: 4,200 or more (M/T), 3,690 (A/T) Water temperature: 63°C (145°F) or more Throttle valve switch: OFF Neutral and clutch switch: OFF	ON
Except above	OFF



Mixture Heater Control (Models with E.G.R.)

The mixture heater is located between the carburetor and the intake manifold. It is designed to atomize fuel during cold engine starts. It is controlled by the E.C.U.

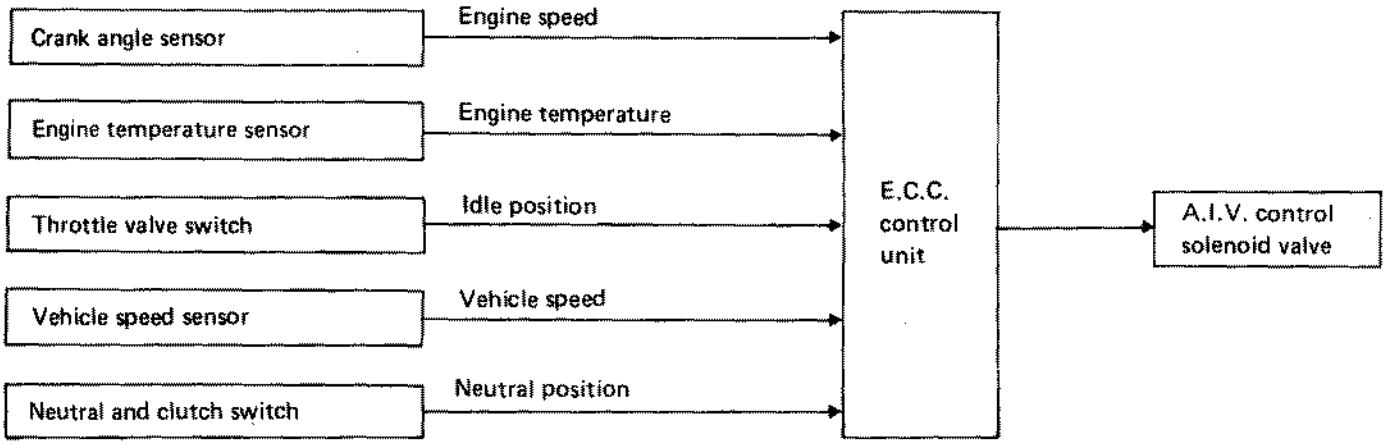


OPERATION

Condition	Mixture heater operation
Water temperature After starting engine: 75°C (167°F) or more	ON
Except above	OFF

A.I.V. Control (Models with E.G.R.)

The Air Induction Valve (A.I.V.) is utilized to reduce HC and CO emissions by supplying filtered air through the A.I.V. into the exhaust tube.
This valve induces secondary air into the exhaust tube by the inherent exhaust pressure pulsations.
The valve is designed for one-way flow operation, and consists of a one-way lead valve and stopper.
While exhaust pressure is below atmospheric pressure, the valves are open and induce air into the exhaust tube.
While exhaust pressure is above atmospheric pressure, the valves are closed and air is not induced into the exhaust tube.

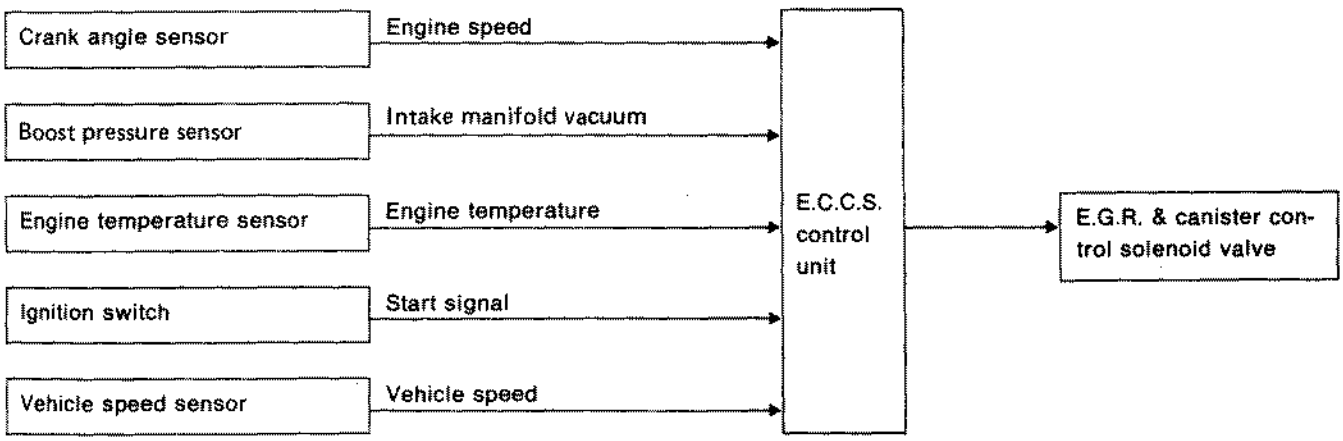


OPERATION

Conditions	A.I.V. control system
① During warm up Idle or deceleration	ON
② After warming up Neutral and clutch switch: ON Throttle valve switch: OFF Vehicle speed: 4 km/h (2 MPH) or less	
Except above	OFF

E.G.R. (Exhaust Gas Recirculation) & Canister Control (Models with E.G.R.)

INPUT/OUTPUT SIGNAL LINE



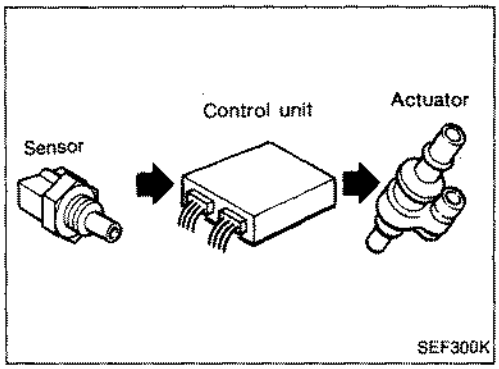
SYSTEM DESCRIPTION

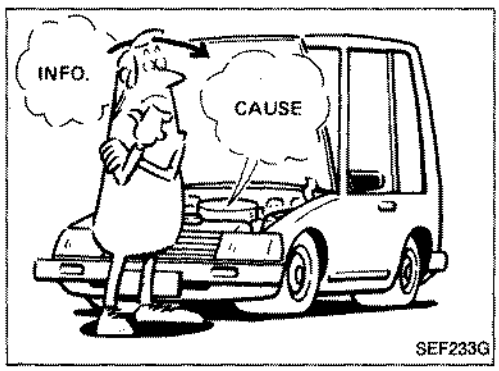
In addition, a system is provided which precisely cuts and controls port vacuum applied to the E.G.R. control valve and canister to suit engine operating conditions. This cut-and-control operation is accomplished through the E.C.U. When the E.C.U. detects any of the following conditions, current flows through the solenoid valve in the E.G.R. and canister control vacuum line.

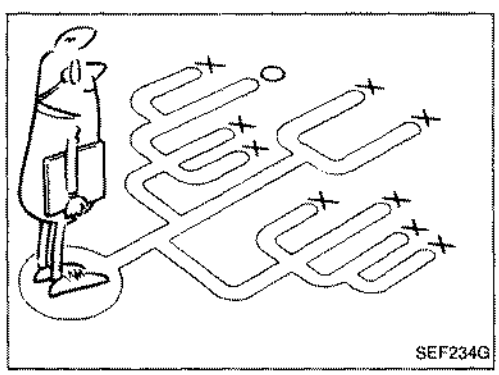
This causes the port vacuum to be discharged into the atmosphere so that the E.G.R. control valve and canister remain closed.

1) During warm-up
2) Engine starting
3) High-speed engine operation
4) Engine idling
5) Excessively high engine temperature

How to Perform Trouble Diagnoses for Quick and Accurate Repair ..... EF & EC- 45
Basic Inspection ..... EF & EC- 48
Diagnostic Procedure ..... EF & EC- 48
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Diagnostic Procedure 3 — EXHAUST GAS SENSOR ..... EF & EC- 56
Diagnostic Procedure 4 — THROTTLE VALVE SWITCH ..... EF & EC- 60
Diagnostic Procedure 5 — VEHICLE SPEED SENSOR ..... EF & EC- 62
Diagnostic Procedure 6 — AIR-FUEL RATIO CONTROL SOLENOID VALVE ..... EF & EC- 64
Diagnostic Procedure 7 — FUEL CUT SOLENOID VALVE ..... EF & EC- 68
Diagnostic Procedure 8 — ACCELERATOR PUMP CONTROL SOLENOID VALVE ..... EF & EC- 70
Diagnostic Procedure 9 — IDLE-UP CONTROL SOLENOID VALVE ..... EF & EC- 72
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Diagnostic Procedure 12 — POWER STEERING OIL PRESSURE SWITCH ..... EF & EC- 80
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Diagnostic Procedure 2 — CRANK ANGLE SENSOR ..... EF & EC- 90
Diagnostic Procedure 3 — BOOST PRESSURE SENSOR ..... EF & EC- 92
Diagnostic Procedure 4 — ENGINE TEMPERATURE SENSOR ..... EF & EC- 94
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Diagnostic Procedure 6 — IGNITION SIGNAL ..... EF & EC- 98
Diagnostic Procedure 7 — THROTTLE VALVE SWITCH ..... EF & EC-100
Diagnostic Procedure 8 — VEHICLE SPEED SENSOR ..... EF & EC-102
Diagnostic Procedure 9 — START SIGNAL ..... EF & EC-104
Diagnostic Procedure 10 — E.G.R. & CANISTER CONTROL SOLENOID VALVE ..... EF & EC-106
Diagnostic Procedure 11 — AIR-FUEL RATIO CONTROL SOLENOID VALVE ..... EF & EC-110
Diagnostic Procedure 12 — FUEL CUT SOLENOID VALVE ..... EF & EC-112
Diagnostic Procedure 13 — ACCELERATOR PUMP CONTROL SOLENOID VALVE ..... EF & EC-114
Diagnostic Procedure 14 — IDLE-UP CONTROL SOLENOID VALVE ..... EF & EC-116
Diagnostic Procedure 15 — A.I.V. CONTROL SOLENOID VALVE ..... EF & EC-118
Diagnostic Procedure 16 — F.I.C.D. CONTROL SOLENOID VALVE ..... EF & EC-122
Diagnostic Procedure 17 — MIXTURE HEATER CONTROL ..... EF & EC-126
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Diagnostic Procedure 19 — INHIBITOR/NEUTRAL/CLUTCH SWITCH ..... EF & EC-132
Electrical Components Inspection ..... EF & EC-136







How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

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

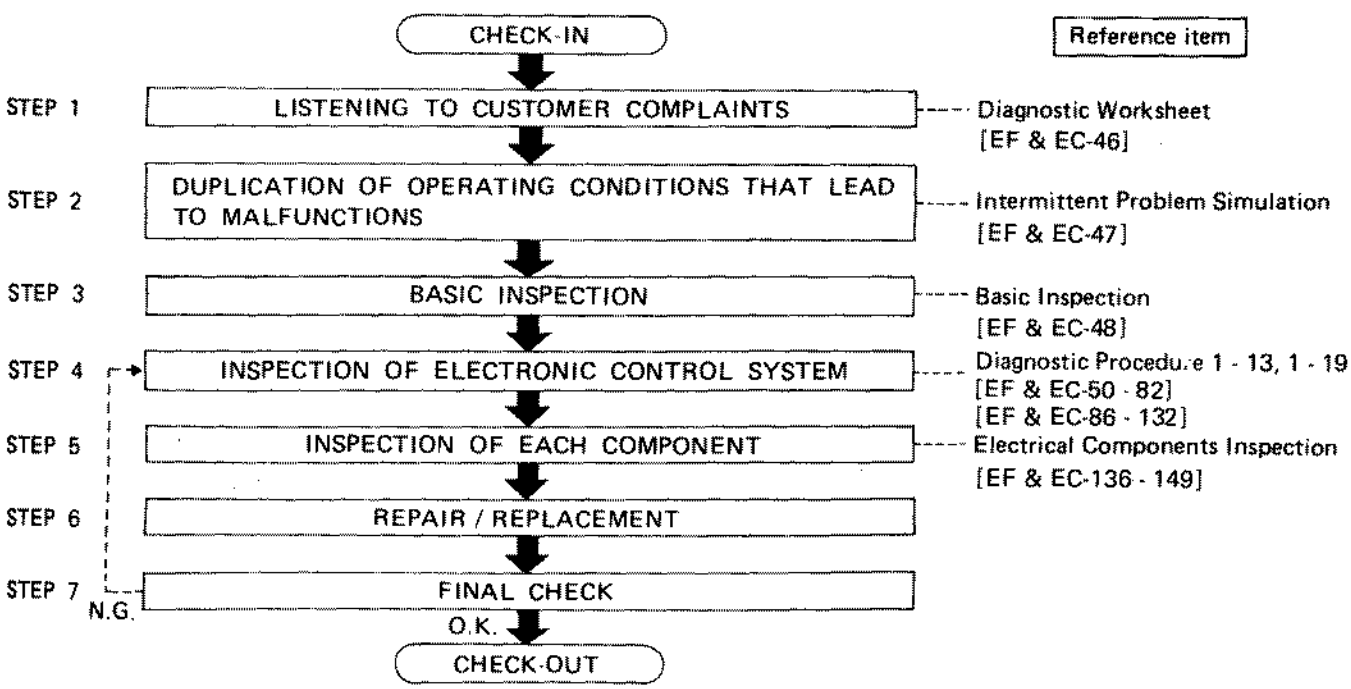
It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or faulty wiring. In this case, careful checking of suspicious circuits may help prevent the replacement of good parts.

A visual check only may not find the cause of the problems. A road test with a circuit tester connected to a suspected circuit should be performed.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a driveability complaint. The customer is a very good supplier 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 driveability problems on an electronically controlled engine vehicle.

WORK FLOW



How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

KEY POINTS

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

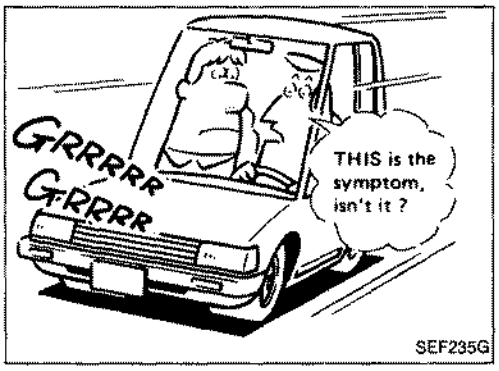
DIAGNOSTIC WORKSHEET

There are many kinds of operating conditions that lead to malfunctions on engine components.
A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, feelings for a problem depend on each customer. It is important to fully understand the symptoms or under what conditions a customer complains.
Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for trouble-shooting.

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 [ ]	
Symptoms — ☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
Symptoms — ☐ Driveability	☐ Stumble ☐ Surge ☐ Detonation ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
Symptoms — ☐ 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	
Check engine light	☐ Turned on ☐ Not turned on	

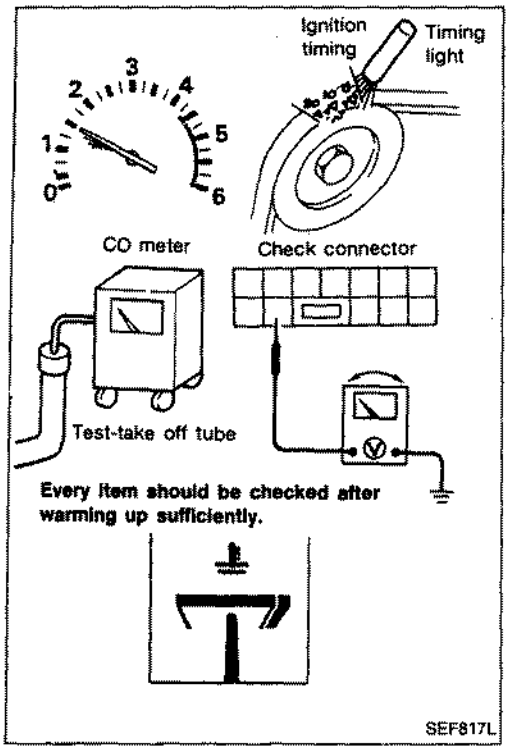
How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)



INTERMITTENT PROBLEM SIMULATION

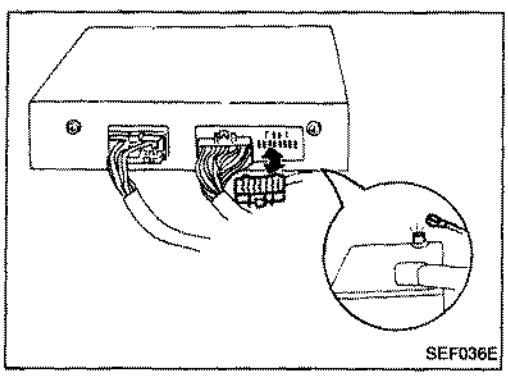
In order to duplicate an intermittent problem, it is effective to create similar conditions for component parts, under which the problem might occur.
Perform the activity listed under Service procedure and note the result.

	Variable factor	Influential part	Target condition	Service procedure
1	Air-fuel ratio	Air-fuel ratio solenoid	Made lean	Supply it with battery voltage.
			Made rich	Disconnect carburetor harness connector (F8).
2	Ignition timing	Distributor	Advanced	Rotate distributor counterclockwise.
			Retarded	Rotate distributor clockwise.
3	Air-fuel ratio feedback control	Exhaust gas sensor	Suspended	Disconnect exhaust gas sensor harness connector.
		Control unit	Operation check	Refer to "Checking Exhaust Gas Sensor" in MA section.
4	Idle speed	Carburetor	Raised	Turn throttle adjusting screw clockwise.
			Lowered	Turn throttle adjusting screw counterclockwise.
5	Electric connection (Electric continuity)	Harness connectors and wires	Poor electric connection or faulty wiring	Tap or wiggle.
				Race engine rapidly. See if the torque reaction of the engine unit causes electric breaks.
6	Temperature	Control unit	Cooled	Cool with an icing spray or similar device.
			Warmed	Heat with a hair drier. **[WARNING: Do not overheat the unit.]**
7	Moisture	Electric parts	Damp	Wet. **[WARNING: Do not directly pour water on components. Use a mist sprayer.]**
8	Electric loads	Load switches	Loaded	Turn on headlamps, air conditioner, rear defogger, etc.
9	Throttle valve switch condition	Control unit	ON-OFF switching	Push throttle valve switch.
10	Ignition spark	Timing light	Spark power check	Try to flash timing light for each cylinder.



Basic Inspection

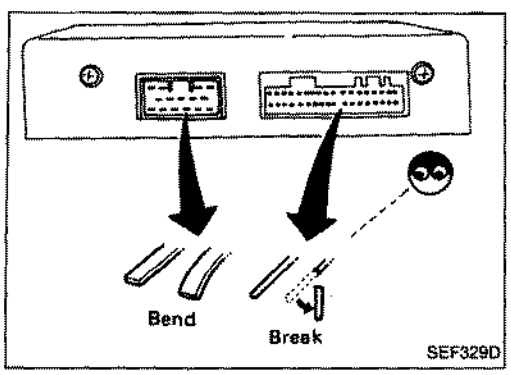
1) Idle speed
   750 ± 50 rpm
2) Ignition timing
   10° ± 2° B.T.D.C.
3) Idle CO
   1.0 ± 0.5% (test-take off tube)
   - **A.I.V. control solenoid valve harness connector disconnected (No A.I.V. controlled condition).**
   - **Exhaust gas sensor harness connector disconnected.**
4) Air-fuel ratio at approximately 2,000 rpm of engine speed.
   Number of fluctuations of voltage meter
   5 times or more/10 seconds (Refer to section MA.)
5) Engine speed of idle switch OFF → ON
   1,200 rpm



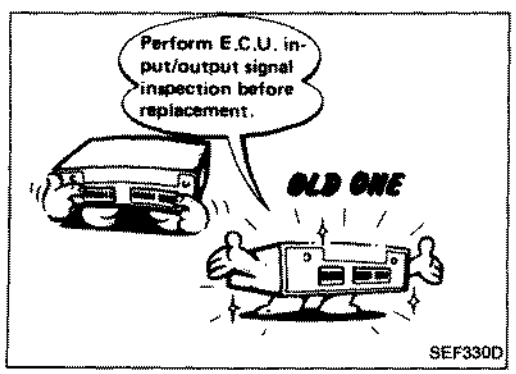
Diagnostic Procedure

CAUTION:

1. **Before connecting or disconnecting E.C.U. harness connector to or from any E.C.U., be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal in order not to damage E.C.U. as battery voltage is applied to E.C.U. even if ignition switch is turned off. Otherwise, there may be damage to the E.C.C. control unit.**

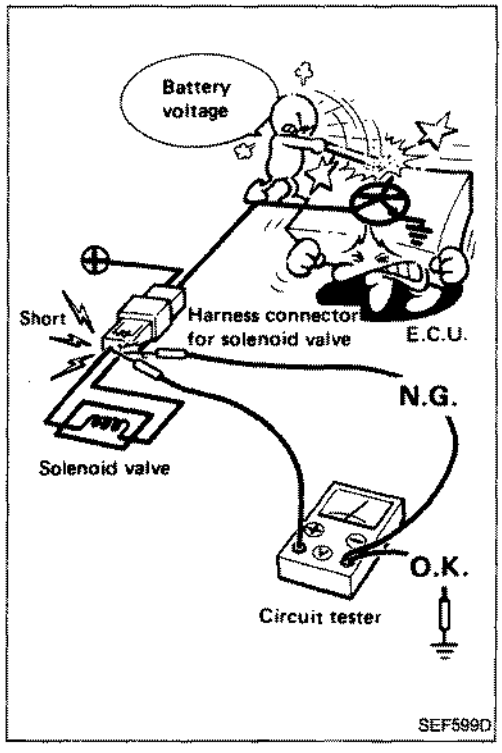


2. **When connecting pin connectors into E.C.U. or disconnecting them from E.C.U., take care not to damage pin terminal of E.C.U. (Bend or break).**
3. **Make sure that there are not any bends or breaks on E.C.U. pin terminal, when connecting pin connectors into E.C.U..**



4. **Before replacing E.C.U., perform E.C.U. input/output signal inspection and make sure whether E.C.U. functions properly or not. (See page EF & EC-136.)**
5. **After performing this "Diagnostic Procedure", perform driving test.**

Diagnostic Procedure (Cont'd)



6. When measuring supply voltage of E.C.U. controlled components with a circuit tester, separate one tester probe from the other.
   If the two tester probes accidentally make contact with each other during measurement, the circuit will be shorted, resulting in damage to the power transistor of the control unit.

7. When measuring voltage or resistance at connector with tester probes, there are two methods of measurement; one is done from terminal side and the other from harness side. Before measuring, confirm symbol mark again.

   H.S. : Inspection should be done from harness side.

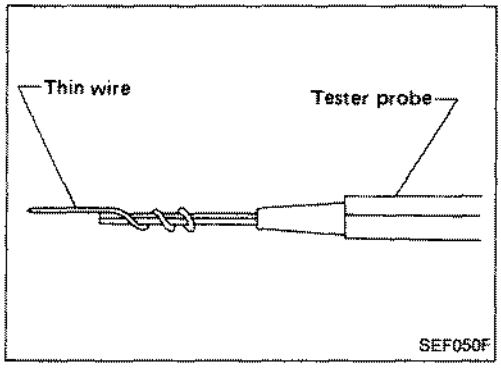
   T.S. : Inspection should be done from terminal side.

   Refer to GI section.

8. As for continuity check of joint connector, refer to EL section.
9. Key to symbols

   DISCONNECT : Check after disconnecting the connector to be measured.

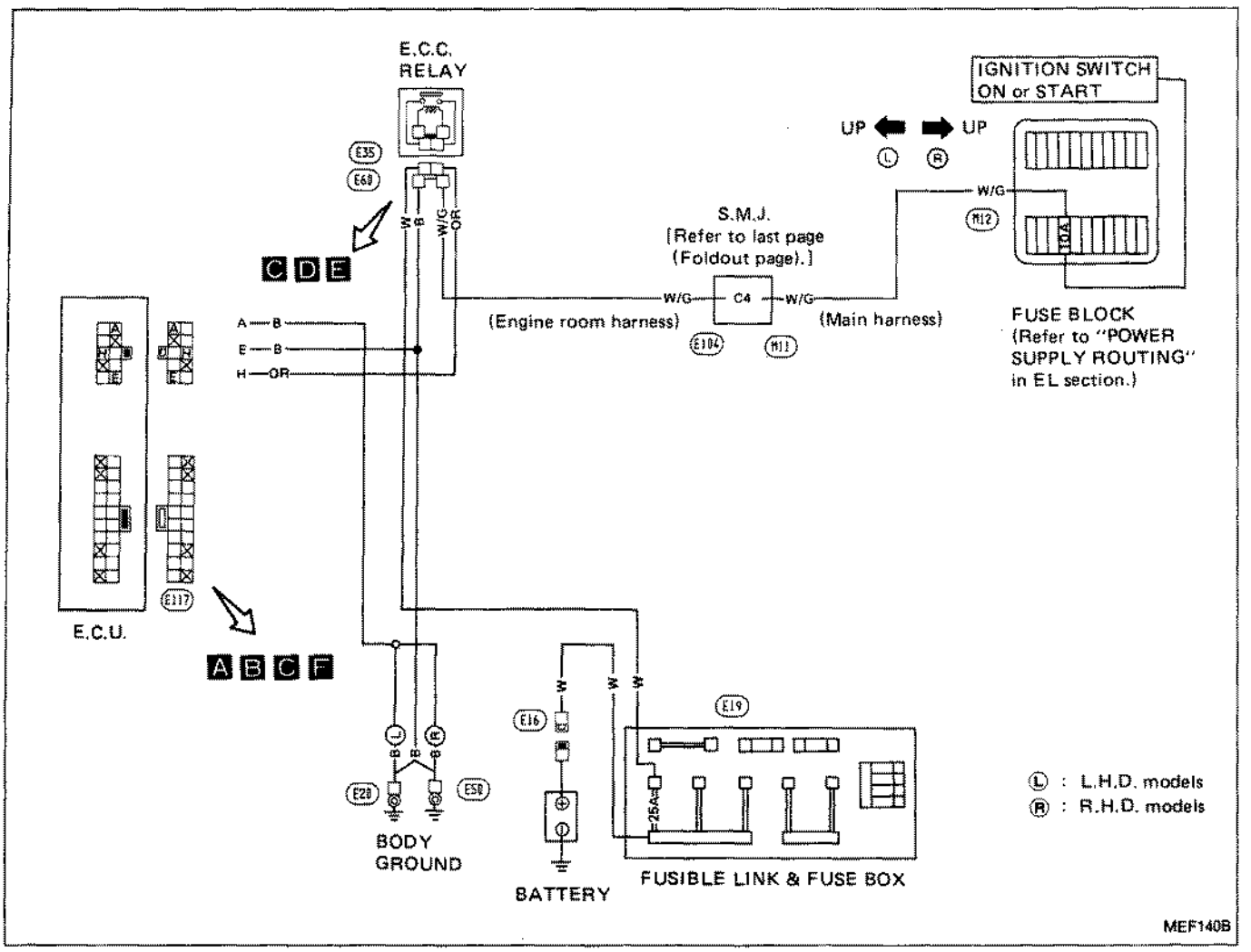
   CONNECT : Check after connecting the connector to be measured.



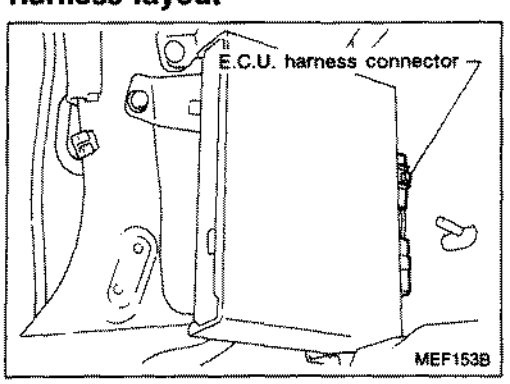
10. Improve tester probe as shown to perform test easily.
11. For the first trouble-shooting procedure, perform POWER SOURCE & GROUND CIRCUIT FOR E.C.C. control unit check.

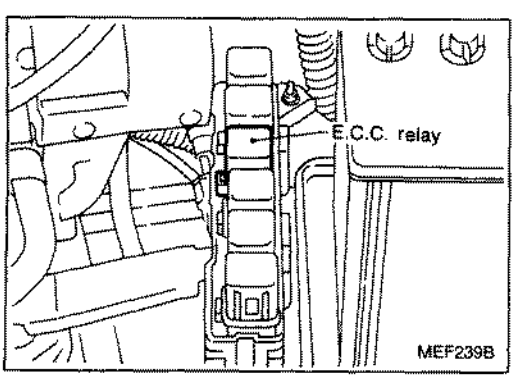
Diagnostic Procedure 1

MAIN POWER SUPPLY AND GROUND CIRCUIT (Not self-diagnostic item)



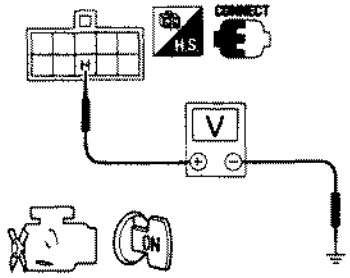
Harness layout





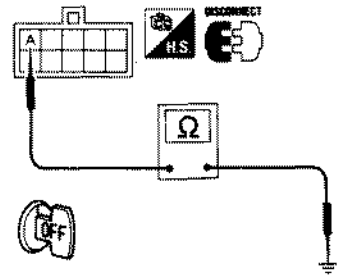
Diagnostic Procedure 1 (Cont'd)

A



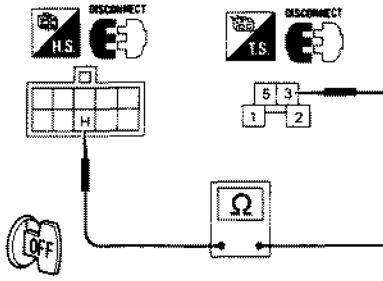
MEF161B

B



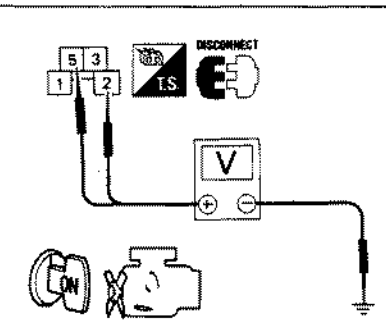
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C



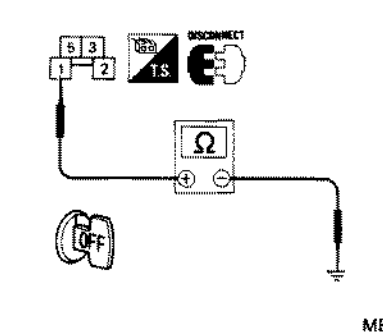
MEF163B

D



MEF164B

E



MEF165B

INSPECTION START

A CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminal Ⓗ and ground.
Voltage: Battery voltage

O.K. → **B**

B CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal Ⓐ and body ground.
Continuity should exist.

If N.G., repair harness or connectors.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

N.G.

C CHECK HARNESS CONTINUITY BETWEEN E.C.C. RELAY AND E.C.U.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Disconnect E.C.C. relay.
4) Check harness continuity between E.C.U. terminal Ⓗ and terminal ③.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

D CHECK VOLTAGE BETWEEN E.C.C. RELAY AND GROUND.
1) Turn ignition switch "ON".
2) Check voltage between terminals ②, ⑤ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M31), (E104)
- 25A fusible link
- 10A fuse
- Harness continuity between E.C.C. relay and battery
- Harness continuity between E.C.C. relay and fuse

If N.G., repair harness or connectors.

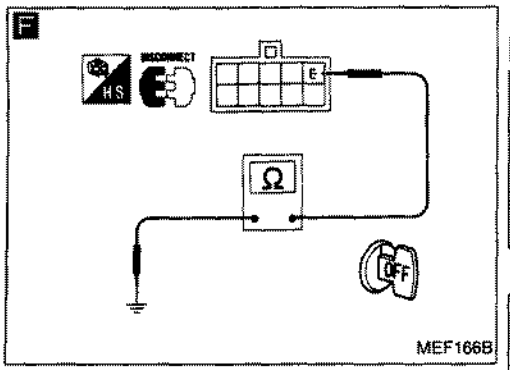
O.K.

E CHECK HARNESS CONTINUITY BETWEEN E.C.C. RELAY AND GROUND.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ① and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.
Ⓐ

Diagnostic Procedure 1 (Cont'd)



Ⓐ

CHECK GROUND CIRCUIT.
1) Check harness continuity between E.C.U. terminal Ⓔ and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(E.C.C. relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-147.)

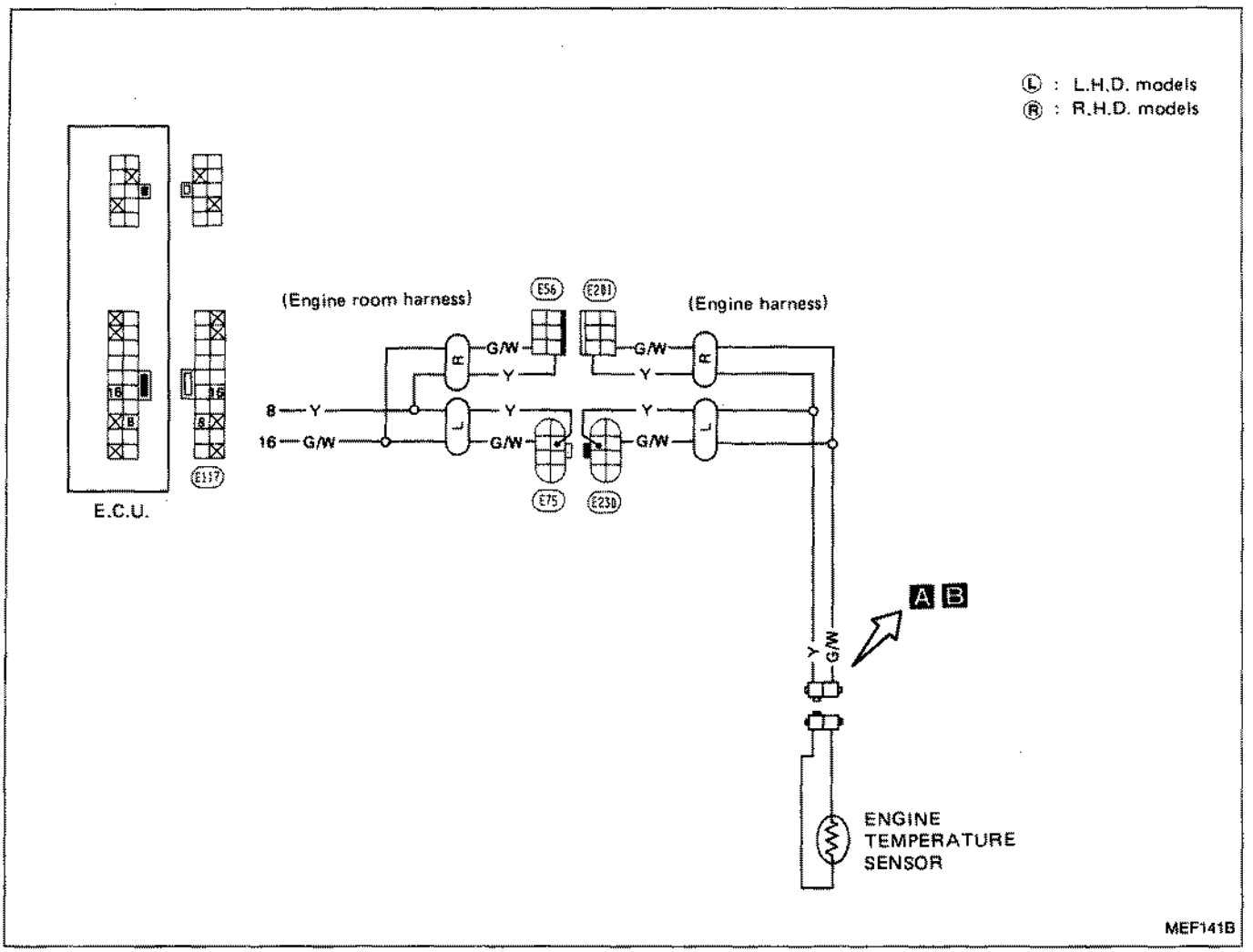
N.G. → Replace E.C.C. relay.

O.K. ↓

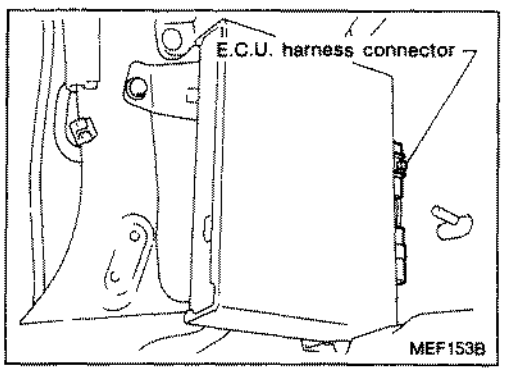
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

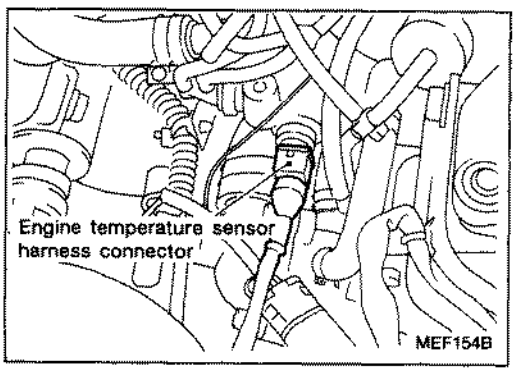
Diagnostic Procedure 2

ENGINE TEMPERATURE SENSOR (Not self-diagnostic item)

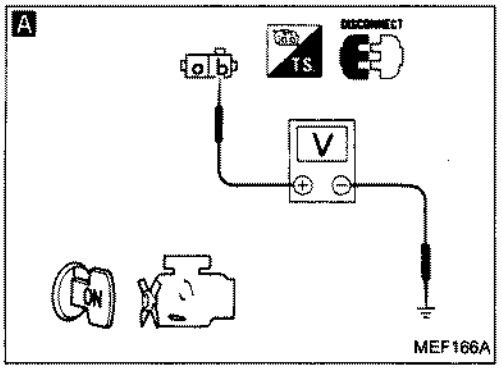


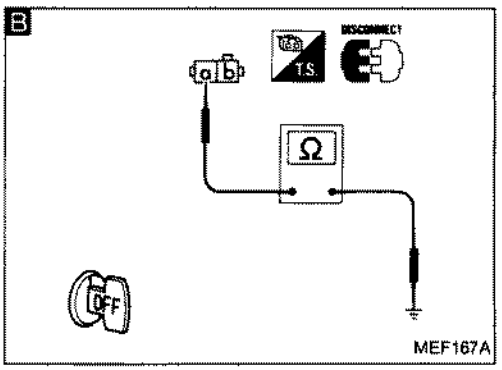
Harness layout





Diagnostic Procedure 2 (Cont'd)





INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect engine temperature sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Approximately 5V

N.G. → Check the following.
- Harness connectors (E75), (E230) (L.H.D. models)
- Harness connectors (E56), (E201) (R.H.D. models)
- Harness continuity between E.C.U. and engine temperature sensor

If N.G., repair harness or connectors.

O.K. ↓

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓐ and body ground.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (E75), (E238) (L.H.D. models)
- Harness connectors (E56), (E201) (R.H.D. models)
- Harness continuity between E.C.U. and engine temperature sensor

If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(Engine temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-143.)

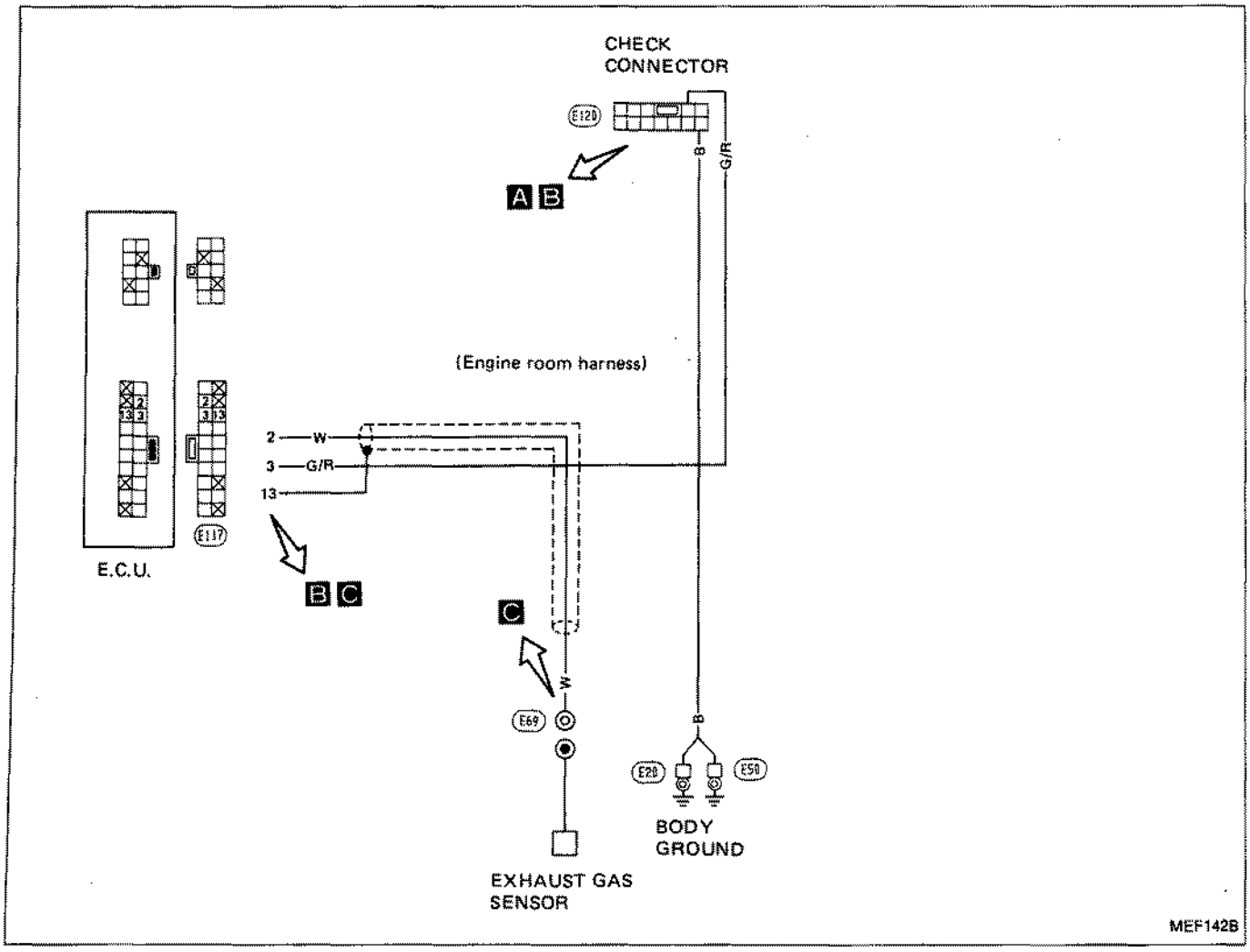
N.G. → Replace engine temperature sensor.

O.K. ↓

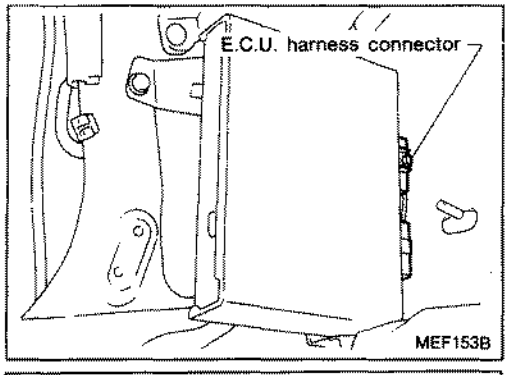
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

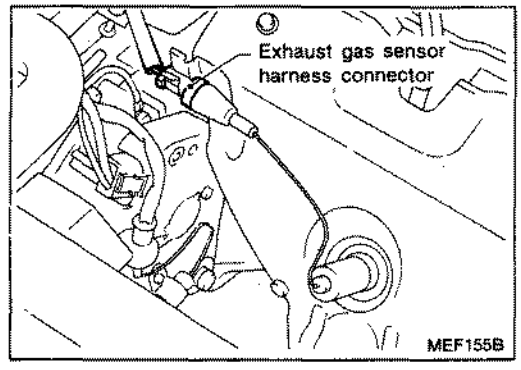
Diagnostic Procedure 3

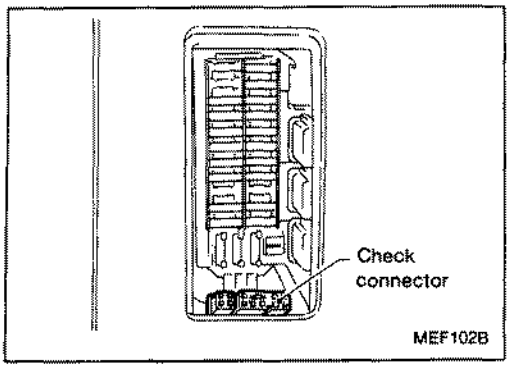
EXHAUST GAS SENSOR (Not self-diagnostic item)



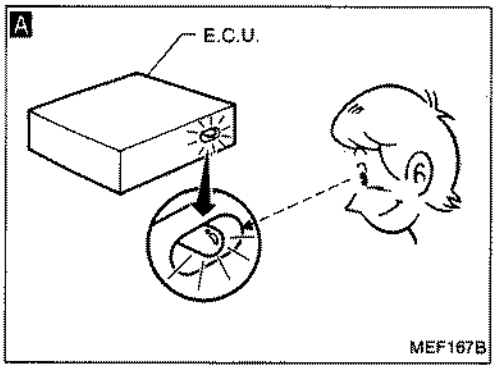
Harness layout

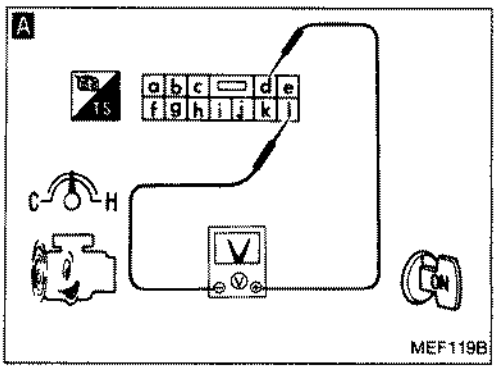


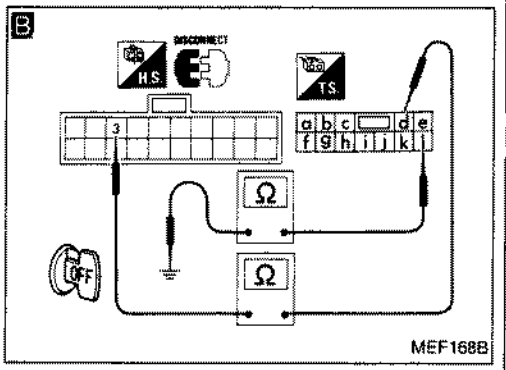


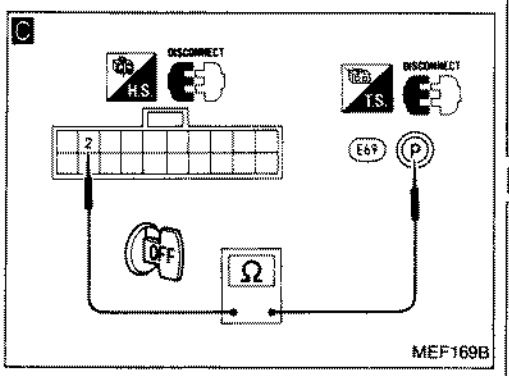


Diagnostic Procedure 3 (Cont'd)









INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Run engine at about 2,500 rpm for about 5 minutes under no-load.
3) Keep engine speed at 2,000 rpm under no-load, make sure that green L.E.D. on E.C.U. goes on and off periodically more than 5 times during 10 seconds.

O.K. → INSPECTION END

OR

3) Keep engine speed at 2,000 rpm under no-load, check voltage between terminal ⓓ and terminal ① on check connector.
Needle of voltmeter should fluctuate between approximately 0V and battery voltage more than 5 times during 10 seconds.

N.G.

B

CHECK HARNESS CONTINUITY BETWEEN E.C.U. AND CHECK CONNECTOR.
1) Stop engine.
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal ③ and terminal ⓓ, terminal ① and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

C

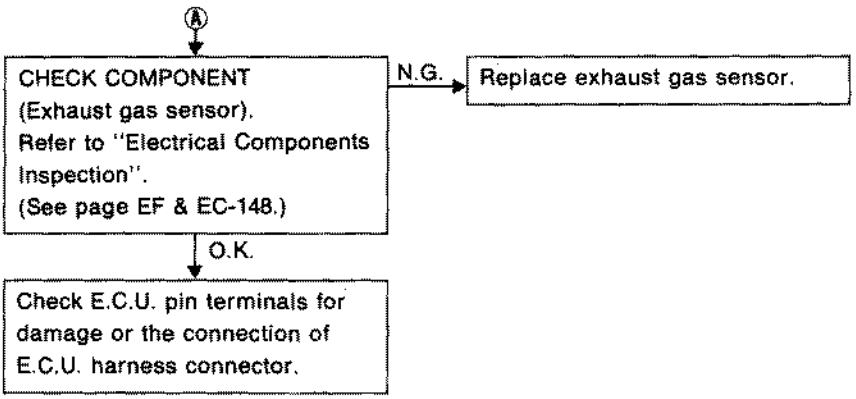
CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect exhaust gas sensor harness connector.
2) Check harness continuity between E.C.U. terminal ② and terminal ⓟ (Harness side connector (E69)).
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

Ⓐ

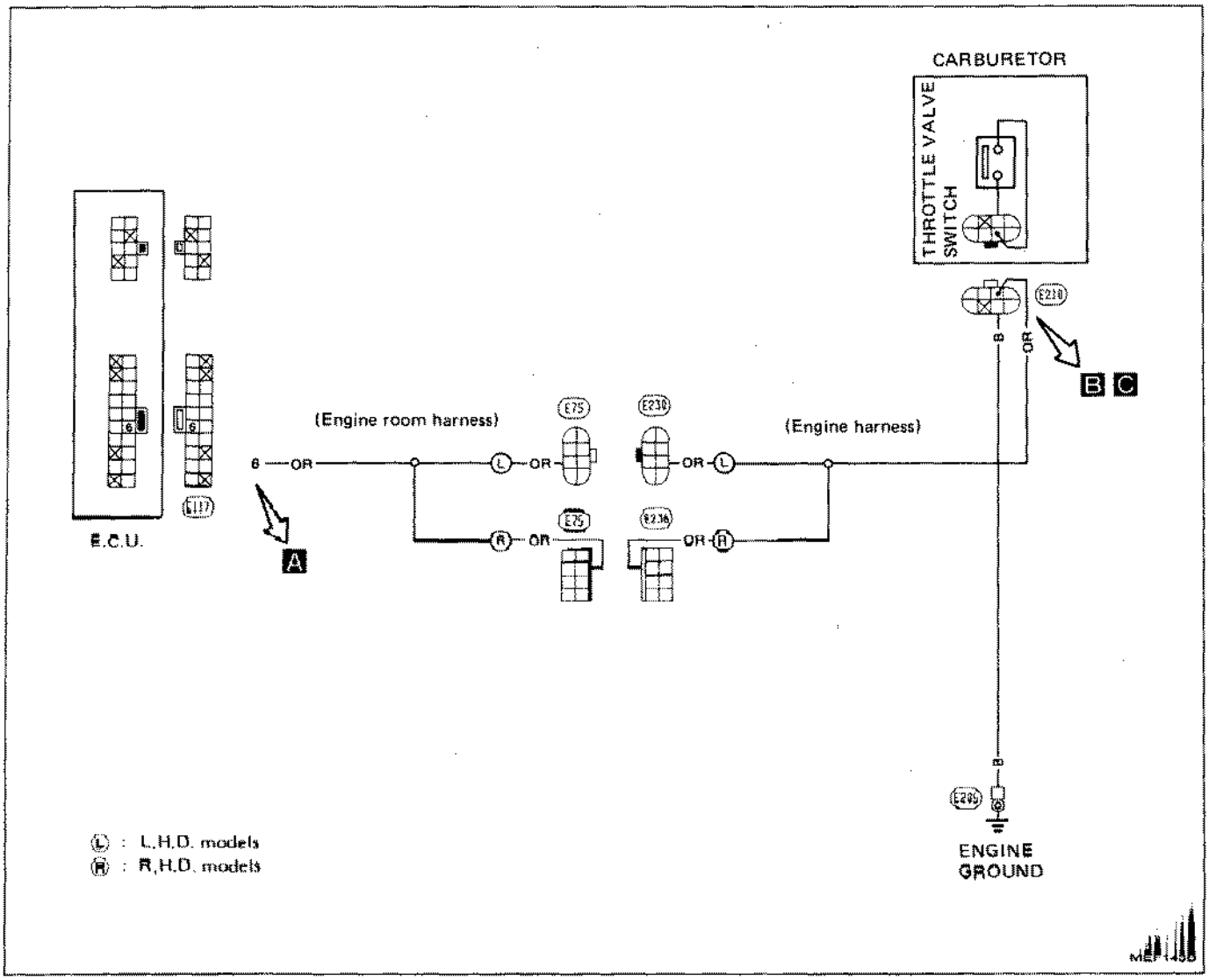
Diagnostic Procedure 3 (Cont'd)



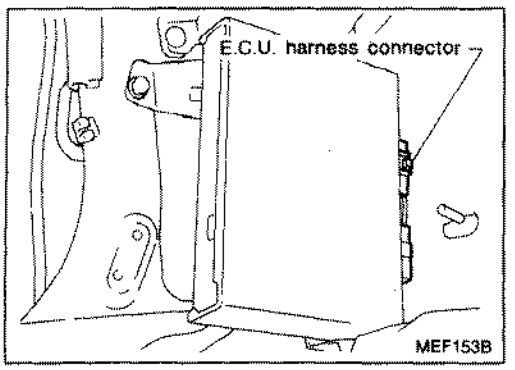
NOTE

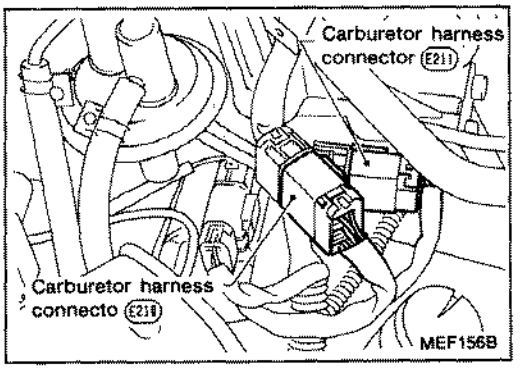
Diagnostic Procedure 4

THROTTLE VALVE SWITCH (Not self-diagnostic item)

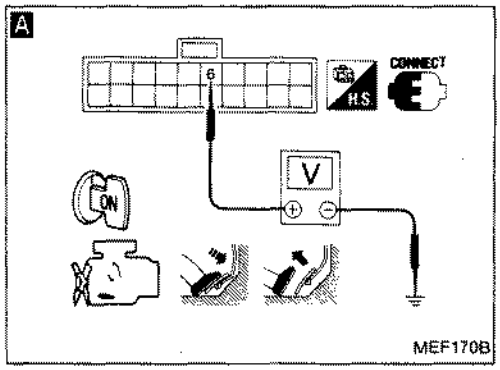


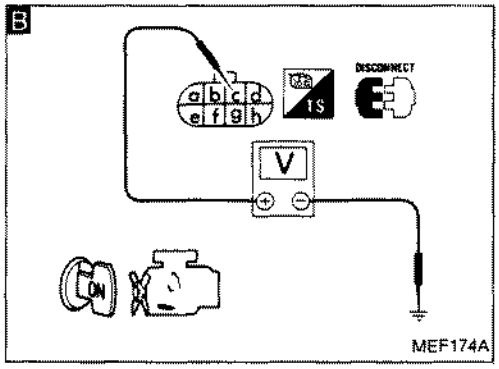
Harness layout

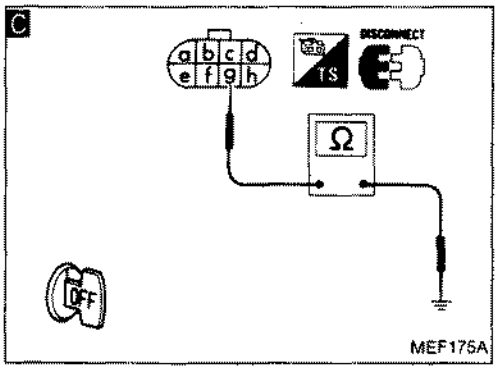




Diagnostic Procedure 4 (Cont'd)







INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminal ⑥ and ground.
Voltage:
Accelerator pedal is released
Approximately 0V
Accelerator pedal is depressed
Approximately 8V

O.K. → INSPECTION END

N.G. ↓

B

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect carburetor harness connector (E218).
3) Turn ignition switch "ON".
4) Check voltage between terminal ⑧ and ground.
Voltage: Approximately 8V

N.G. → Check the following.
- Harness connectors (E75), (E238) (L.H.D. models)
- Harness connectors (E75), (E236) (R.H.D. models)
- Harness continuity between E.C.U. and carburetor

If N.G., repair harness or connectors.

O.K. ↓

C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⑨ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(Throttle valve switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-145.)

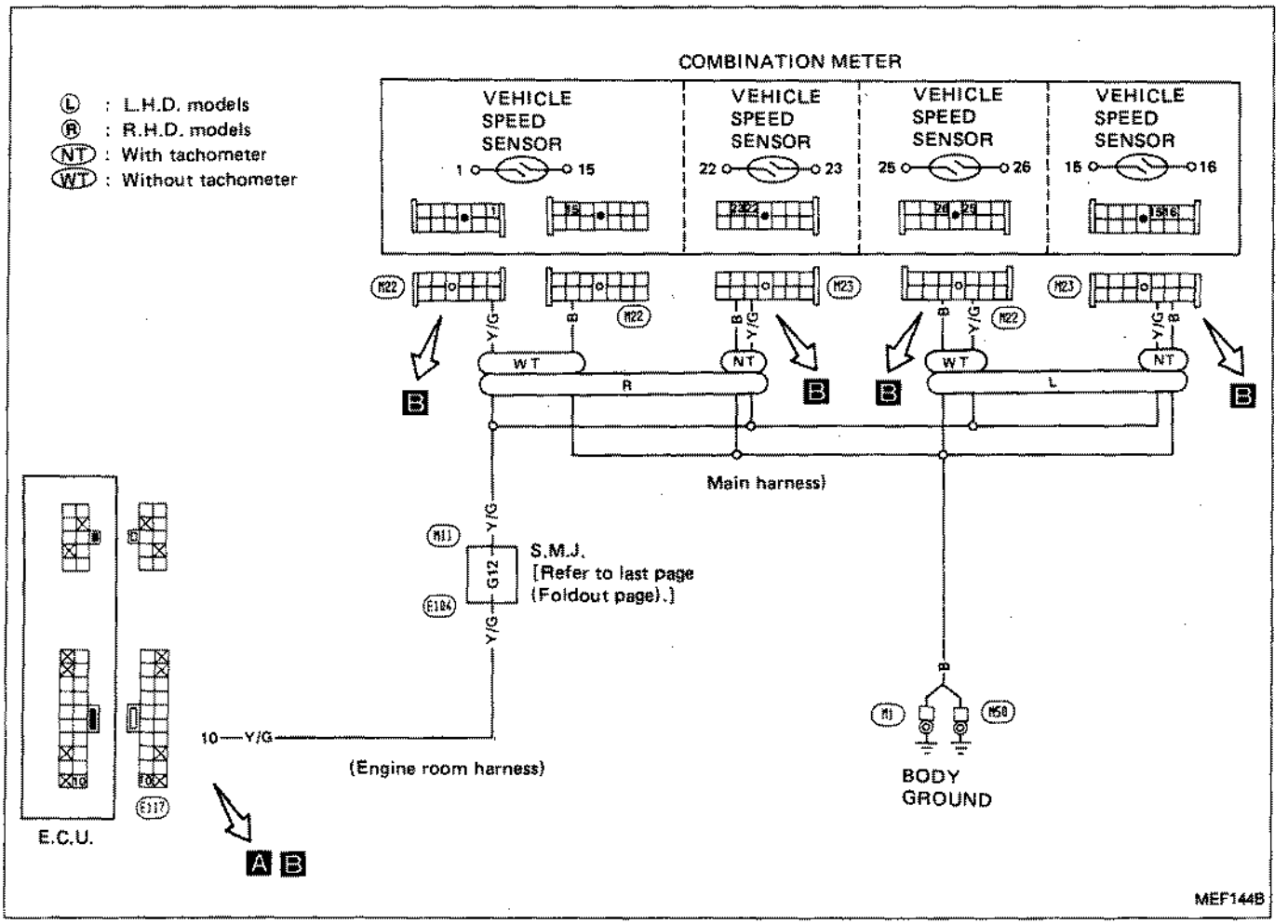
N.G. → Replace throttle valve switch.

O.K. ↓

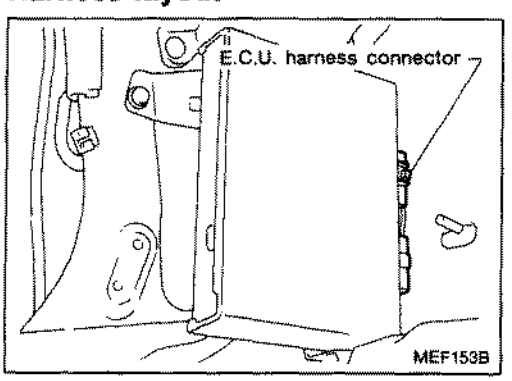
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 5

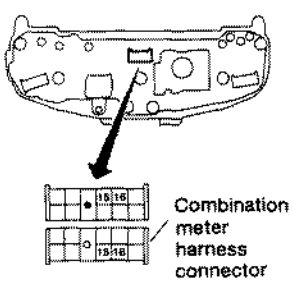
VEHICLE SPEED SENSOR (Not self-diagnostic item)



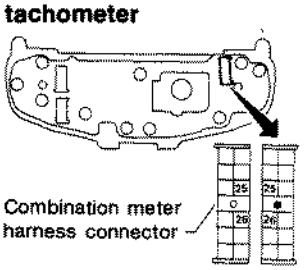
Harness layout



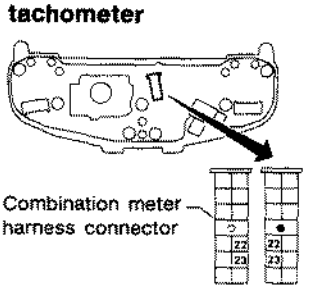
L.H.D. models with tachometer



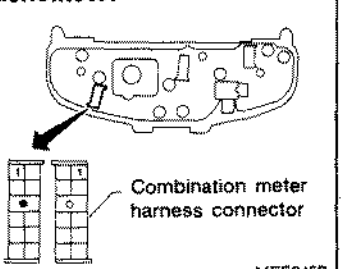
L.H.D. models without tachometer



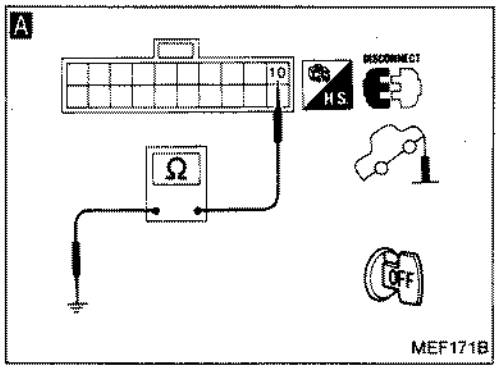
R.H.D. models with tachometer

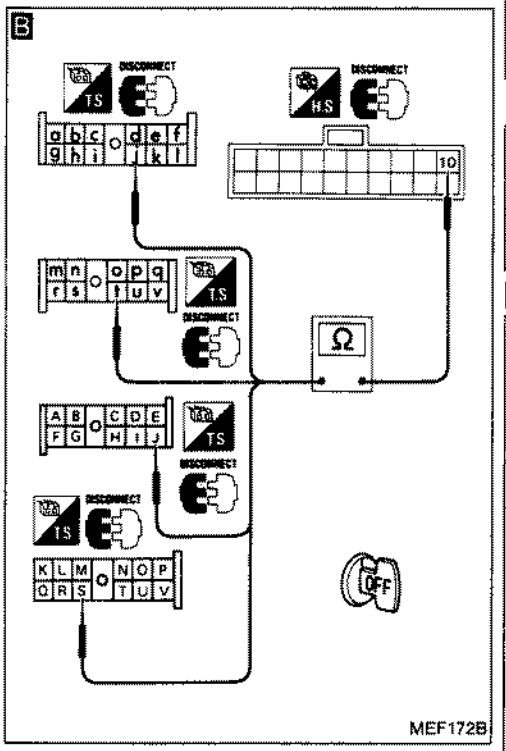


R.H.D. models without tachometer



Diagnostic Procedure 5 (Cont'd)





INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Jack up front wheels.
2) Disconnect E.C.U. harness connector.
3) Rotate front wheel by hand.
4) Check harness continuity between E.C.U. terminal ⑩ and body ground.
Continuity should come and go.

O.K. → INSPECTION END

N.G.

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

N.G. → Check vehicle speed sensor and circuit.
(Refer to EL section.)

O.K.

B

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect combination meter harness connector.
3) Check harness continuity between E.C.U. terminal ⑩ and terminal ⓘ (L.H.D. models without tachometer), terminal ① (L.H.D. models with tachometer), terminal ⓙ (R.H.D. models without tachometer), terminal ⑤ (R.H.D. models with tachometer).
Continuity should exist.

N.G. → Check the following.
- Harness connectors (M11), (E104)
- Harness continuity between E.C.U. and combination meter

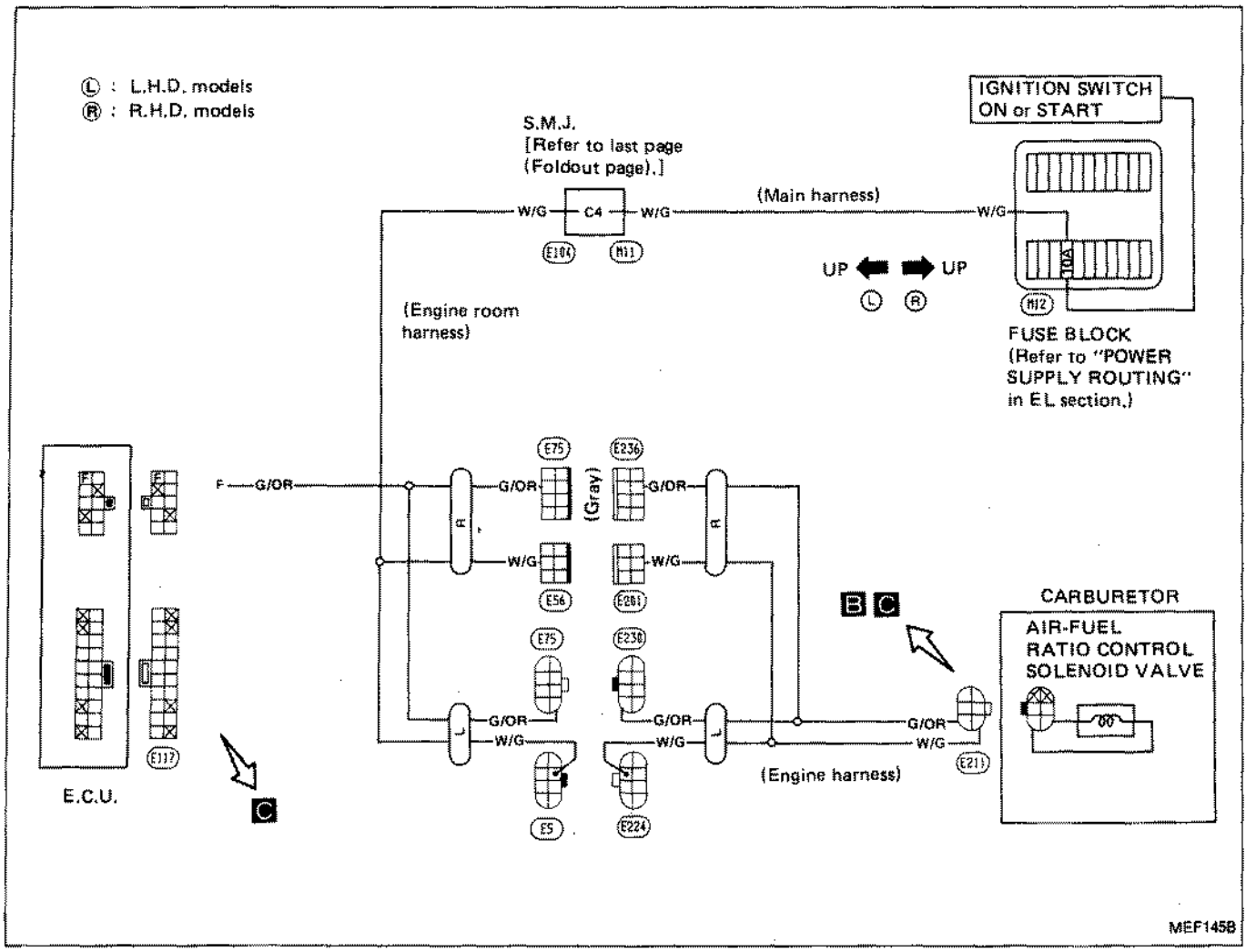
If N.G., repair harness or connectors.

O.K.

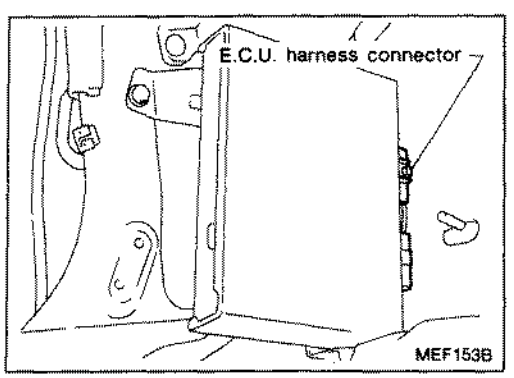
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

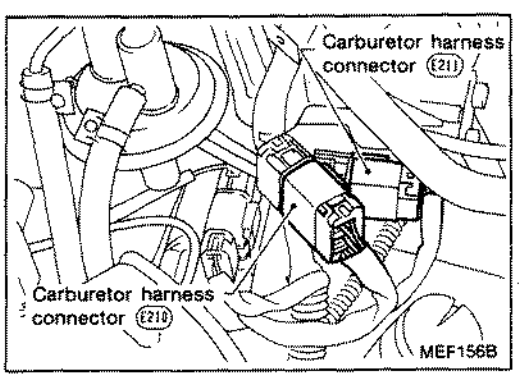
Diagnostic Procedure 6

AIR-FUEL RATIO CONTROL SOLENOID VALVE (Not self-diagnostic item)



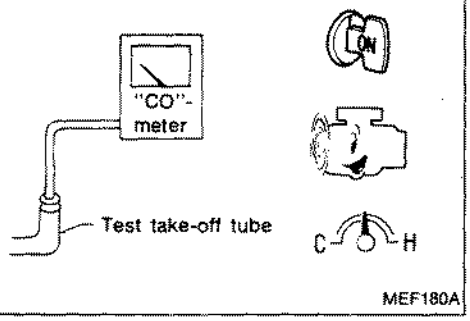
Harness layout



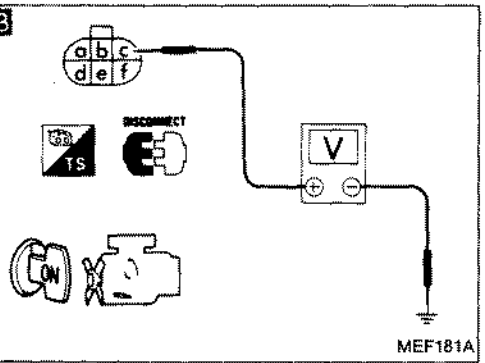


Diagnostic Procedure 6 (Cont'd)

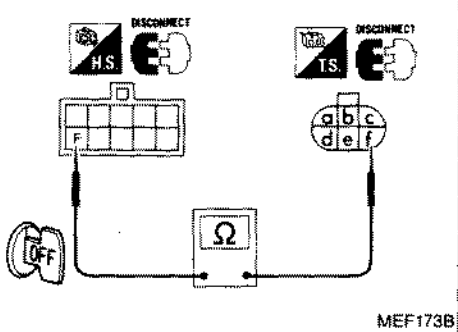
A



B



C



INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Inspect and adjust idle speed and mixture ratio. (Refer to page EF & EC-156.)
2) Stop engine.
3) Disconnect exhaust gas sensor harness connector and A.I.V. control solenoid valve harness connector.
4) Set "CO"-meter on test take-off tube.
5) Start engine and run it at idle.
6) Check idle "CO"%.
Idle "CO"%: 0.5 - 1.5%
$= \alpha\%$
If N.G., adjust idle "CO"%. (Refer to page EF & EC-156.)
7) Disconnect carburetor harness connector (E211).
8) Recheck idle "CO"%.
Idle "CO"%: more than $\alpha\%$

O.K. → INSPECTION END

N.G. ↓

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Turn ignition switch "ON".
3) Check voltage between terminal (E) and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M11), (E184)
- Harness connectors (E5), (E224) (L.H.D. models)
- Harness connectors (E56), (E201) (R.H.D. models)
- 10A fuse
- Harness continuity between carburetor and fuse

If N.G., repair harness or connectors.

O.K. ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (F) and terminal (f).
Continuity should exist.

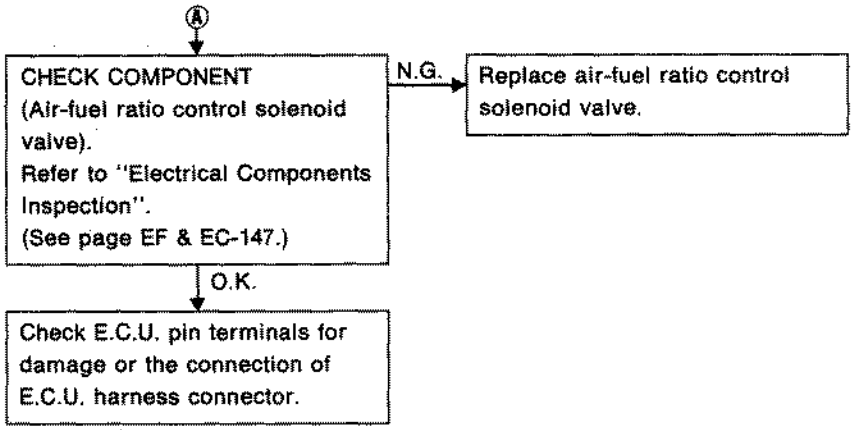
N.G. → Check the following.
- Harness connectors (E75), (E236) (L.H.D. models)
- Harness connectors (E75), (E236) (R.H.D. models)
- Harness continuity between E.C.U. and carburetor

If N.G., repair harness or connectors.

O.K. ↓

(A)

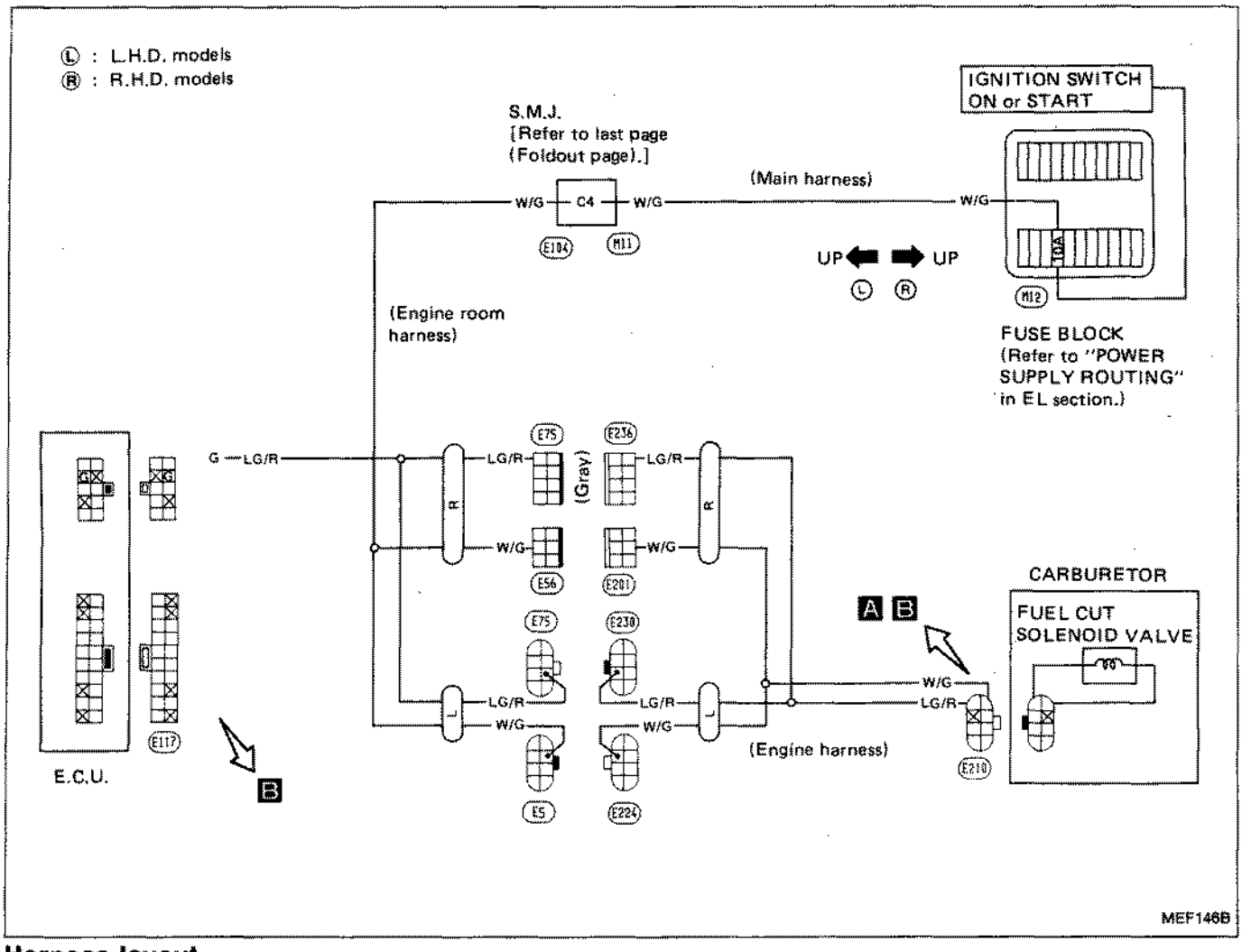
Diagnostic Procedure 6 (Cont'd)



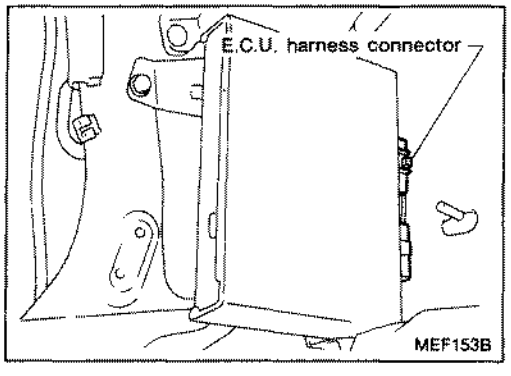
NOTE

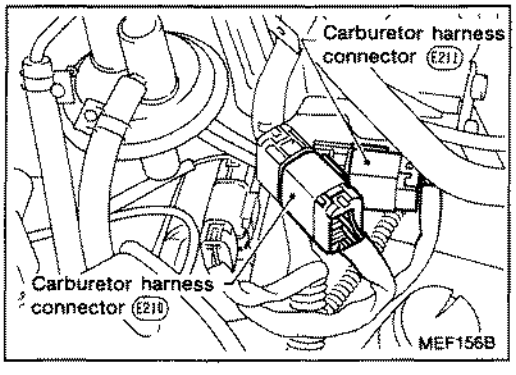
Diagnostic Procedure 7

FUEL CUT SOLENOID VALVE (Not self-diagnostic item)



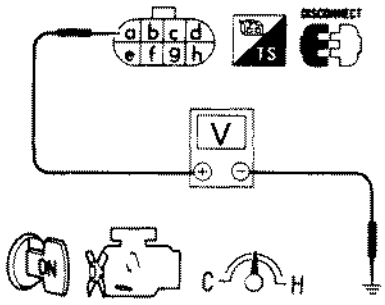
Harness layout





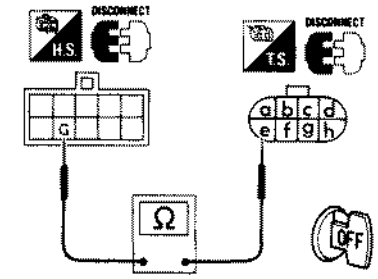
Diagnostic Procedure 7 (Cont'd)

A



MEF183A

B



MEF174B

INSPECTION START

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Stop engine.
3) Turn ignition switch "ON".
4) Listen to fuel cut solenoid valve operating sound.
Clicking noise should be heard.

O.K. → INSPECTION END

N.G. ↓

A

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect carburetor harness connector (E218).
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓖ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M11), (E184)
- Harness connectors (E5), (E224) (L.H.D. models)
- Harness connectors (E56), (E201) (R.H.D. models)
- 10A fuse
- Harness continuity between carburetor and fuse

If N.G., repair harness, fuse or connectors.

O.K. ↓

B

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal ⑥ and terminal ⑧.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (E75), (E238) (L.H.D. models)
- Harness connectors (E75), (E234) (R.H.D. models)
- Harness continuity between E.C.U. and carburetor

If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(Fuel cut solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-145.)

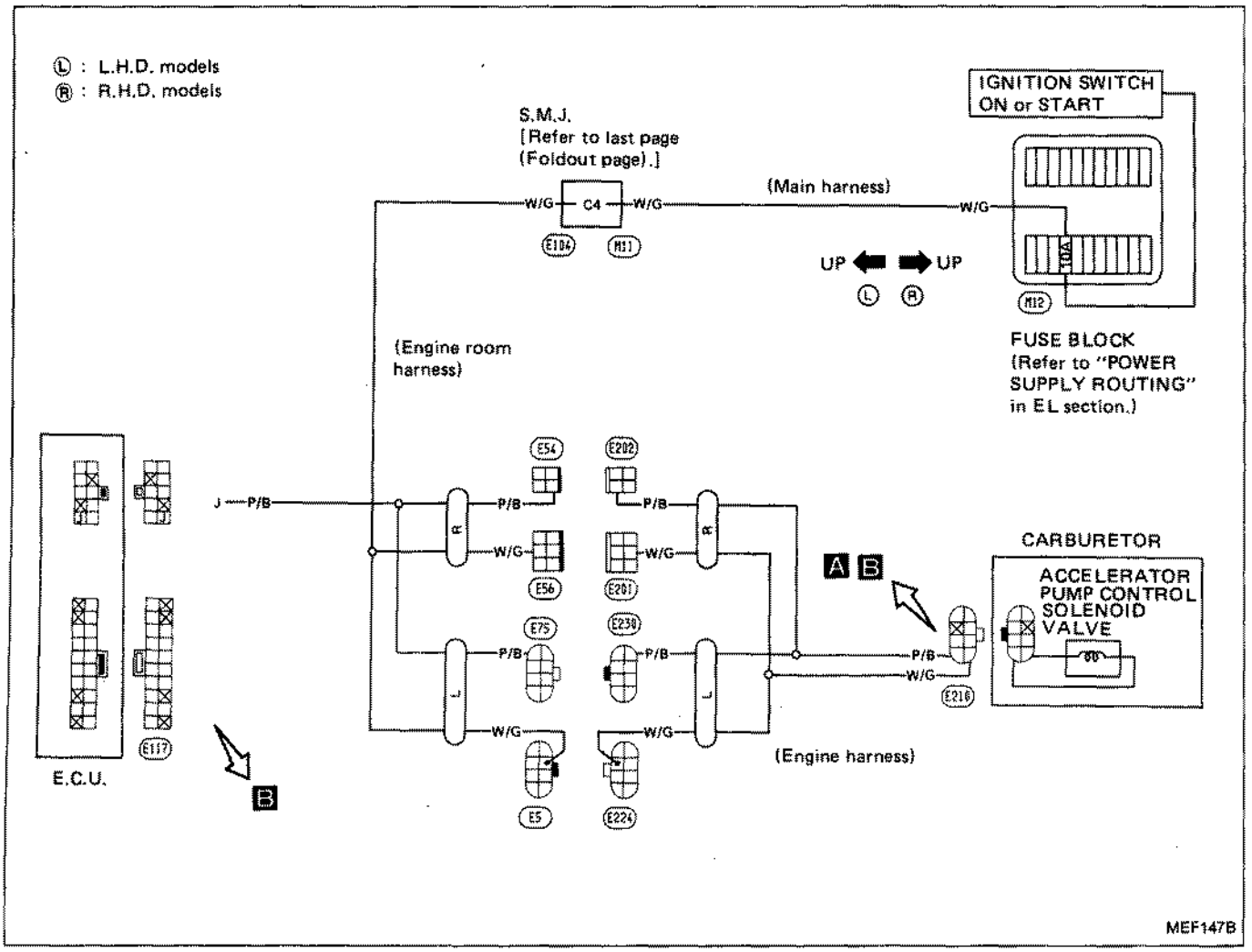
N.G. → Replace fuel cut solenoid valve.

O.K. ↓

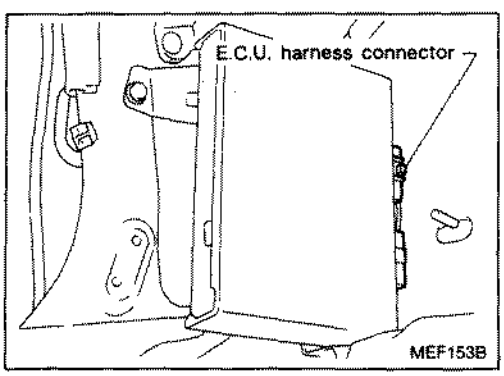
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

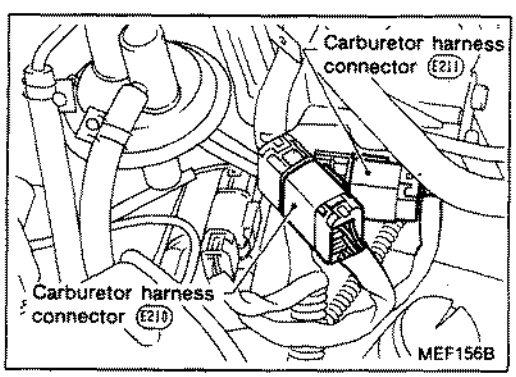
Diagnostic Procedure 8

ACCELERATOR PUMP CONTROL SOLENOID VALVE (Not self-diagnostic item)

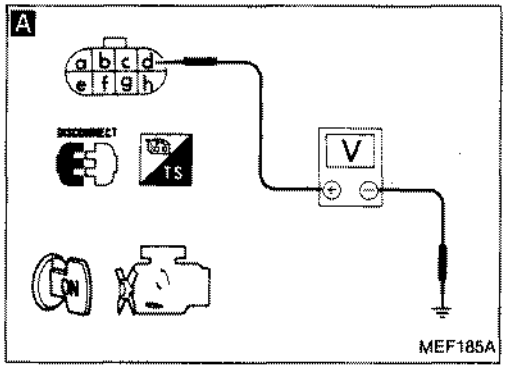


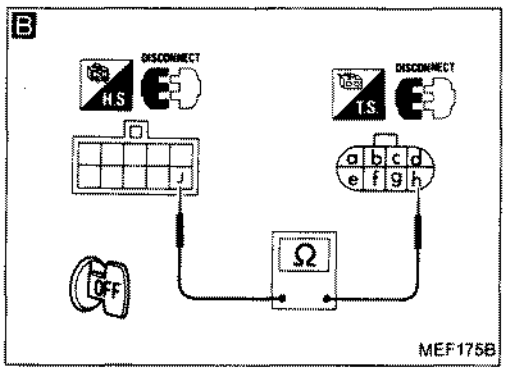
Harness layout





Diagnostic Procedure 8 (Cont'd)





INSPECTION START

CHECK OVERALL FUNCTION.
1) Make sure that engine is cold.
[Engine temperature is below 75°C (167°F) (M/T models), 65°C (149°F) (A/T models).]
2) Turn ignition switch "ON".
3) Listen to accelerator pump control solenoid valve operating sound.
Clicking noise should be heard.

O.K. → INSPECTION END

N.G.

A

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect carburetor harness connector (E218).
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓓ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M11), (E104)
- Harness connectors (E5), (E224) (L.H.D. models)
- Harness connectors (E56), (E281) (R.H.D. models)
- 10A fuse
- Harness continuity between carburetor and fuse

If N.G., repair harness or connectors.

O.K.

B

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal ⓙ and terminal ⓗ.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (E75), (E238) (L.H.D. models)
- Harness connectors (E54), (E282) (R.H.D. models)
- Harness continuity between E.C.U. and carburetor

If N.G., repair harness or connectors.

O.K.

CHECK COMPONENT
(Accelerator pump control solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-146.)

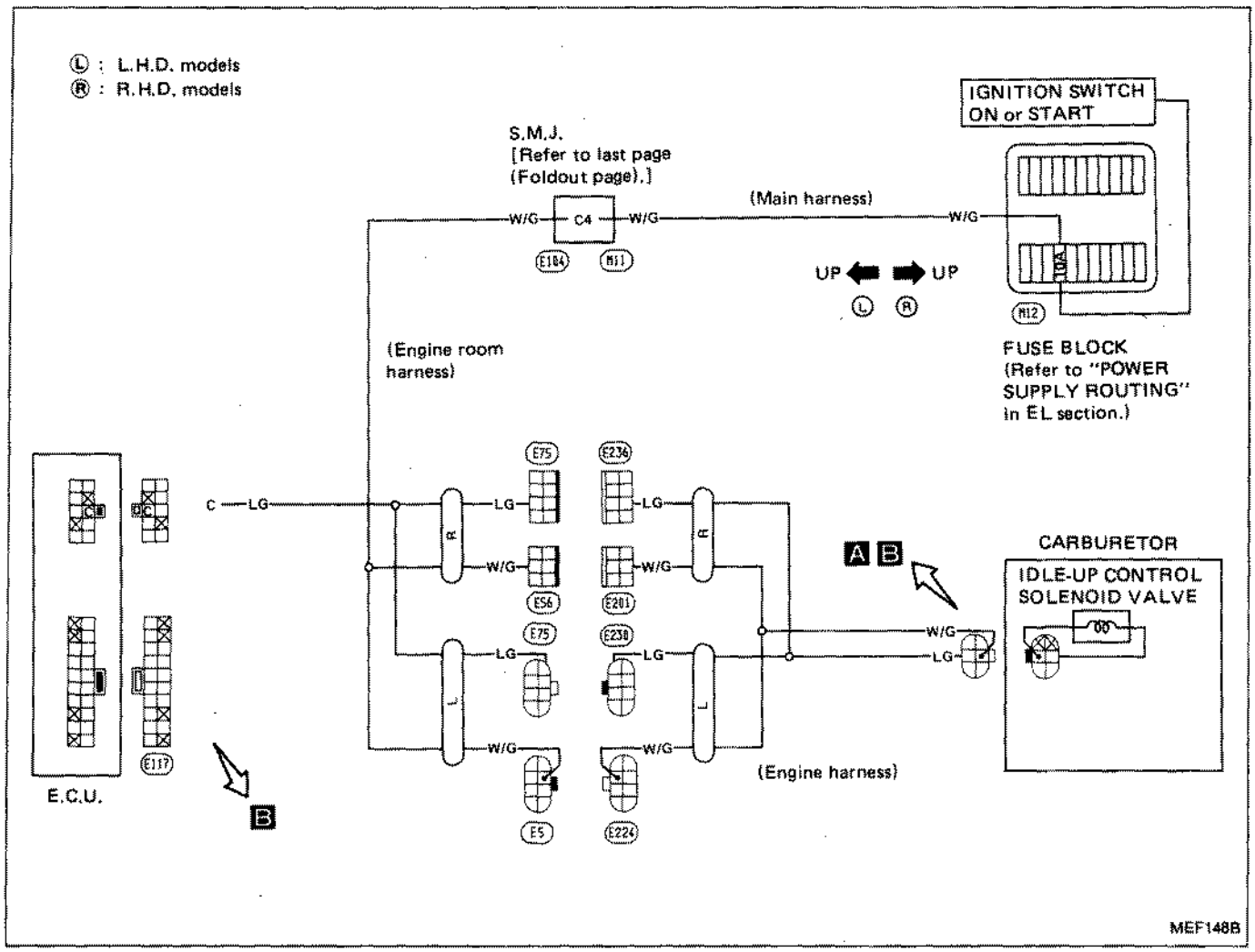
N.G. → Replace accelerator pump control solenoid valve.

O.K.

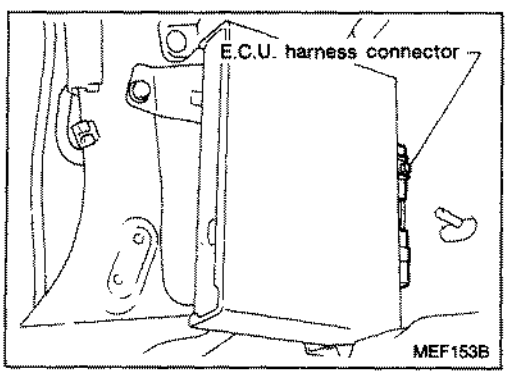
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

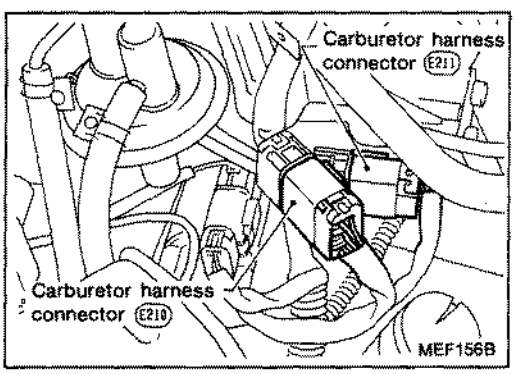
Diagnostic Procedure 9

IDLE-UP CONTROL SOLENOID VALVE (Not self-diagnostic item)



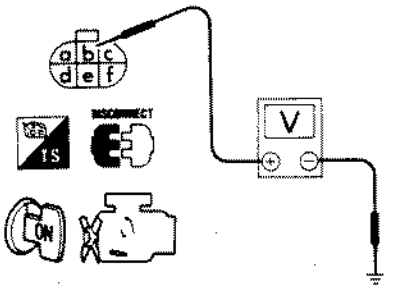
Harness layout





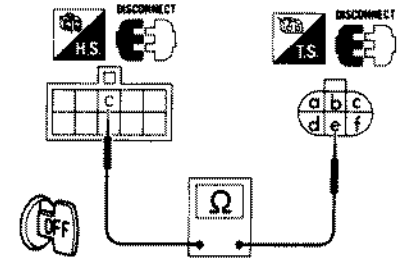
Diagnostic Procedure 9 (Cont'd)

A



MEF187A

B



MEF176B

INSPECTION START

CHECK OVERALL FUNCTION.
1) Make sure that engine is cold.
[Engine temperature is below 65°C (149°F).]
2) Turn ignition switch "ON".
3) Listen to idle-up control solenoid valve operating sound.
Clicking noise should be heard.

O.K. → INSPECTION END

N.G. ↓

A

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect carburetor harness connector (E211).
3) Turn ignition switch "ON".
4) Check voltage between terminal (b) and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M11), (E184)
- Harness connectors (E5), (E224) (L.H.D. models)
- Harness connectors (E56), (E201) (R.H.D. models)
- 10A fuse
- Harness continuity between carburetor and fuse

If N.G., repair harness, fuse or connectors.

O.K. ↓

B

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (c) and terminal (e).
Continuity should exist.

N.G. → Check the following.
- Harness connectors (E75), (E238) (L.H.D. models)
- Harness connectors (E75), (E236) (R.H.D. models)
- Harness continuity between E.C.U. and carburetor

If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT (Idle-up control solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-145.)

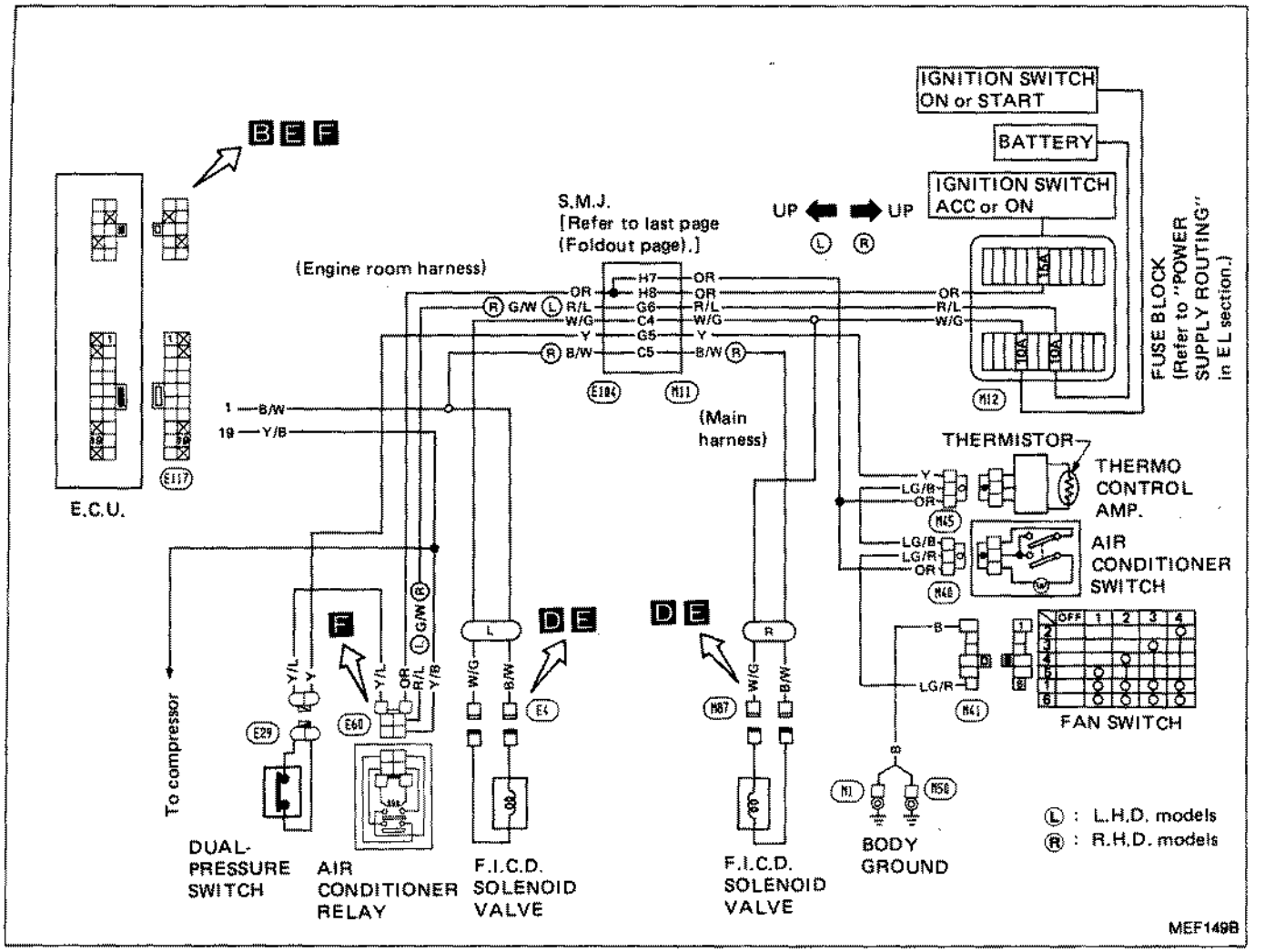
N.G. → Replace idle-up control solenoid valve.

O.K. ↓

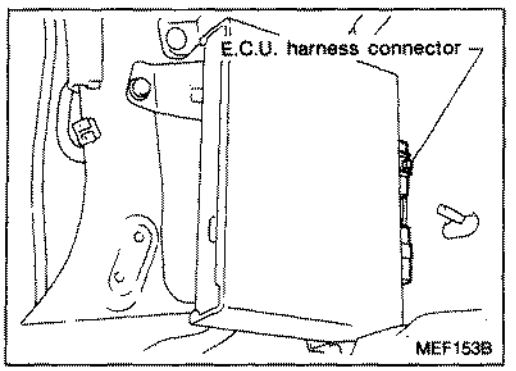
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

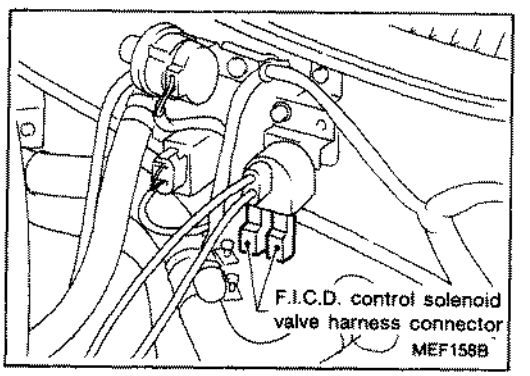
Diagnostic Procedure 10

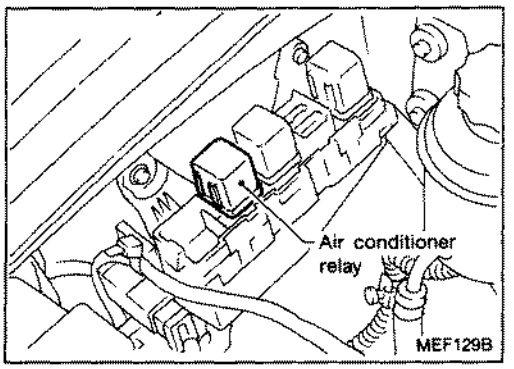
F.I.C.D. CONTROL SOLENOID VALVE (Not self-diagnostic item)



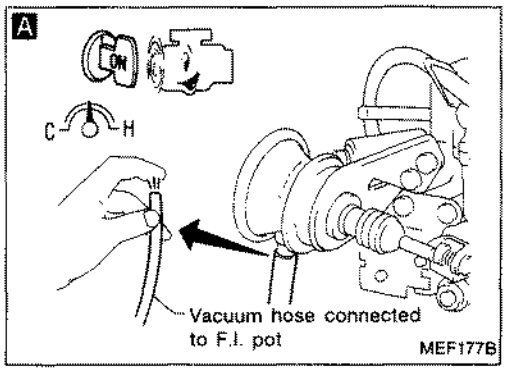
Harness layout

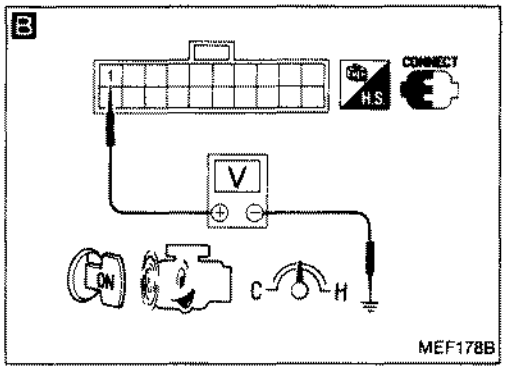


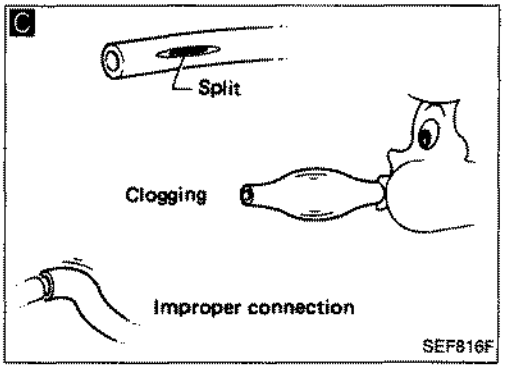


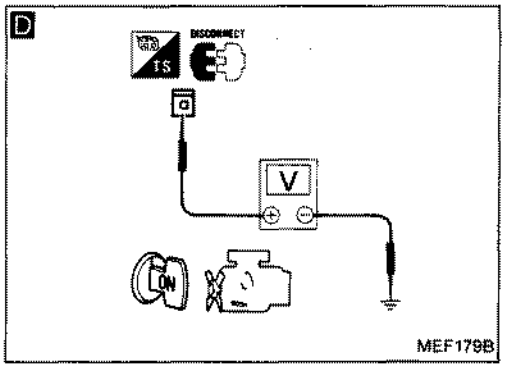


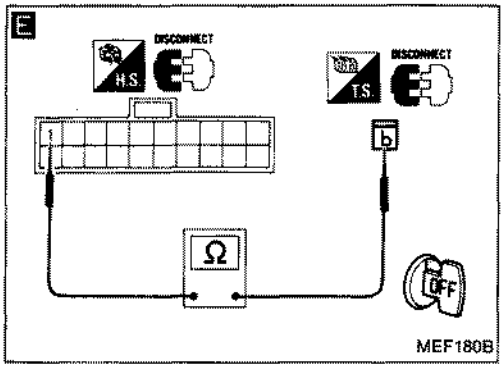
Diagnostic Procedure 10 (Cont'd)











INSPECTION START

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check idle speed.
M/T: 750 ± 50 rpm
A/T: 850 ± 50 rpm
If N.G., adjust idle speed.
3) Turn both air conditioner switch and blower fan switch "ON", then recheck idle speed.
M/T: 850 ± 50 rpm
A/T: 850 ± 50 rpm

O.K. → INSPECTION END

N.G.

Check if air conditioner compressor functions normally.

N.G. → Refer to HA section.

O.K.

A

CHECK VACUUM SOURCE TO F.I. POT.
1) Disconnect vacuum hose to F.I. pot.
2) Make sure that vacuum exists under the following condition.
Air conditioner switch "OFF":
Vacuum should not exist.
Air conditioner switch "ON":
Vacuum should exist.

O.K. → CHECK COMPONENT (F.I. pot).
Refer to "Electrical Components Inspection".
(See page EF & EC-149.)

N.G. → Replace F.I. pot.

N.G.

B

CHECK CONTROL FUNCTION.
1) Check voltage between E.C.U. terminal ① and ground under the following condition.
Voltage:
Air conditioner switch "OFF"
Battery voltage
Air conditioner switch "ON"
Approximately 0V

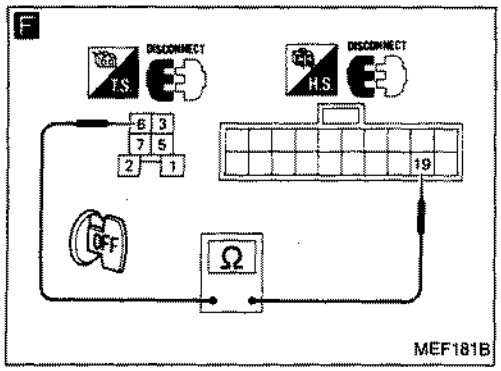
O.K. → C
Check vacuum hose for clogging, cracks and proper connection.

N.G.

Ⓐ

Diagnostic Procedure 10 (Cont'd)

F



D

Ⓐ

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect F.I.C.D. control solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓖ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M11), (E104) (L.H.D. models)
- 10A fuse
- Harness continuity between F.I.C.D. control solenoid valve and fuse

If N.G., repair harness, or connectors.

O.K. ↓

E

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal ① and terminal ⓑ.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (M11), (E104) (R.H.D. models)
- Harness continuity between E.C.U. and F.I.C.D. control solenoid valve

If N.G., repair harness or connectors.

O.K. ↓

F

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect air conditioner relay.
2) Check harness continuity between E.C.U. terminal ⑲ and terminal ⑥.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT (F.I.C.D. control solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-149.)

N.G. → Replace F.I.C.D. control solenoid valve.

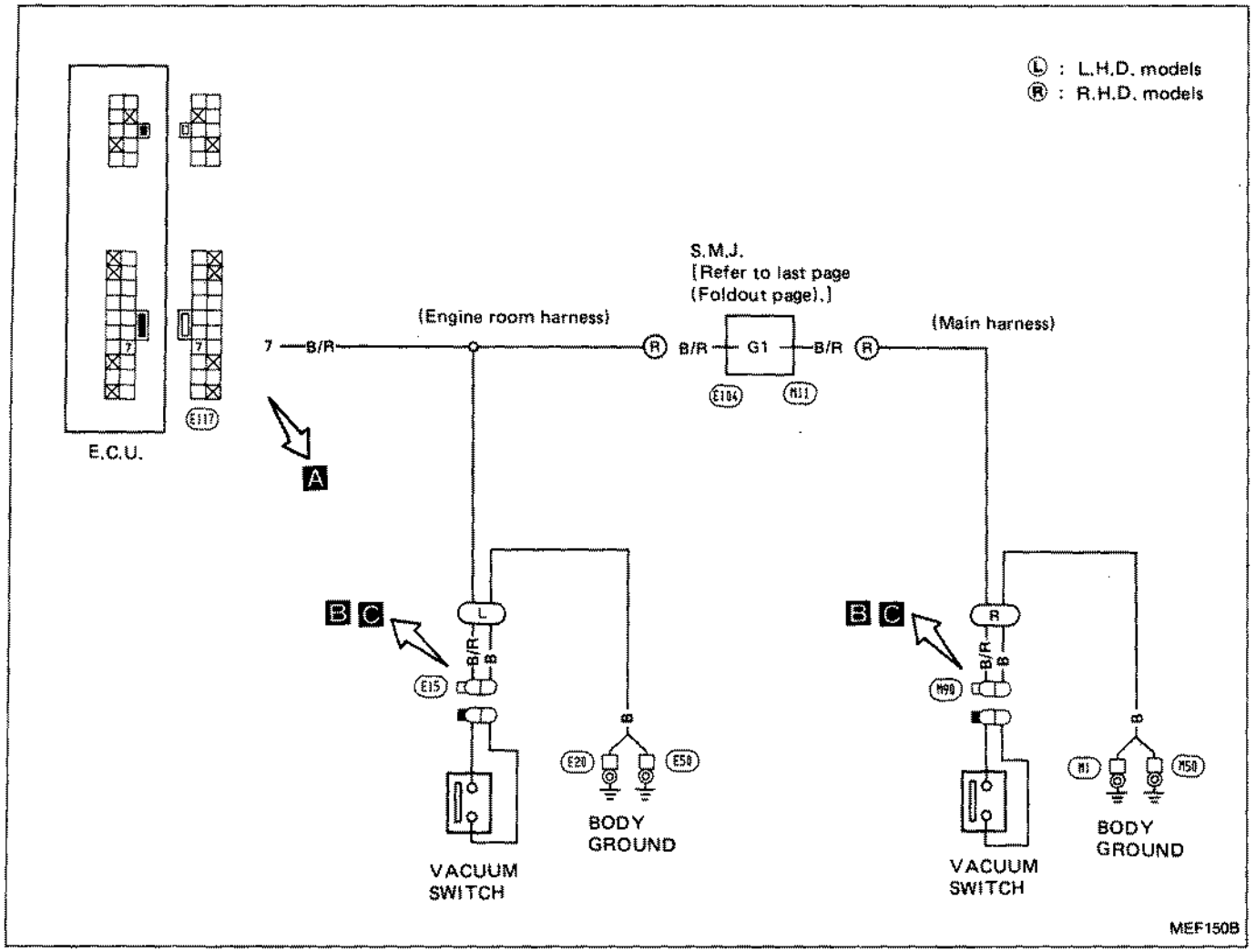
O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

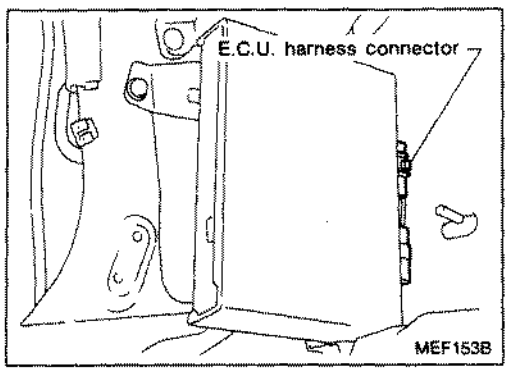
NOTE

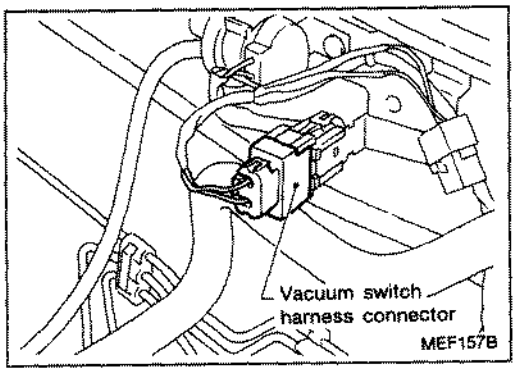
Diagnostic Procedure 11

VACUUM SWITCH (Not self-diagnostic item)



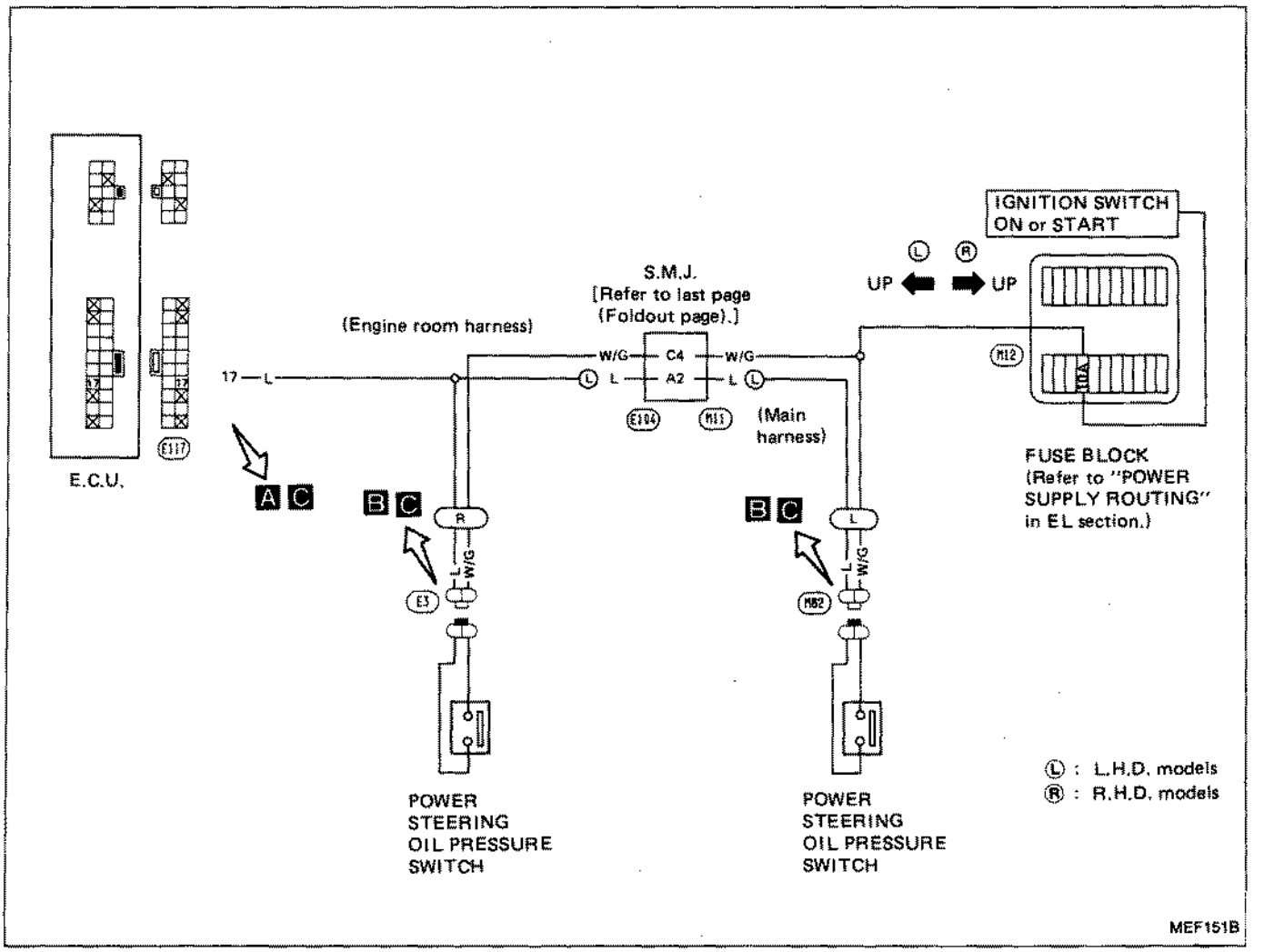
Harness layout



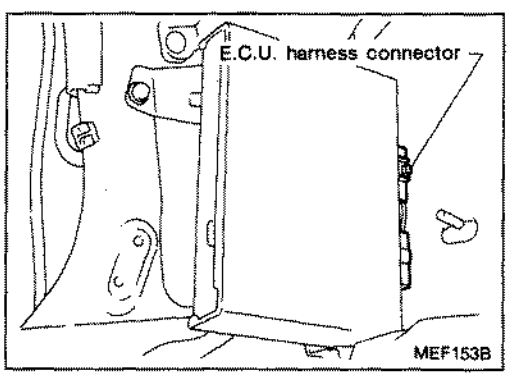


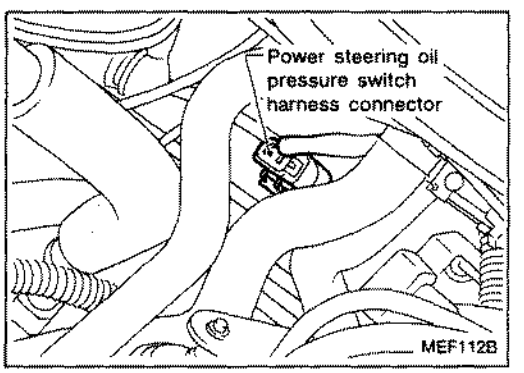
Diagnostic Procedure 12

POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)

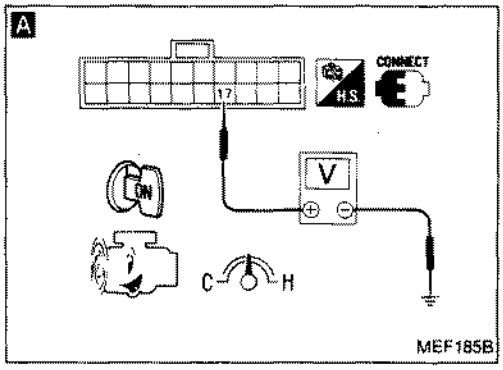


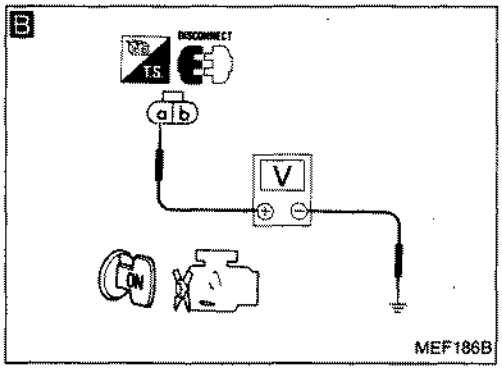
Harness layout

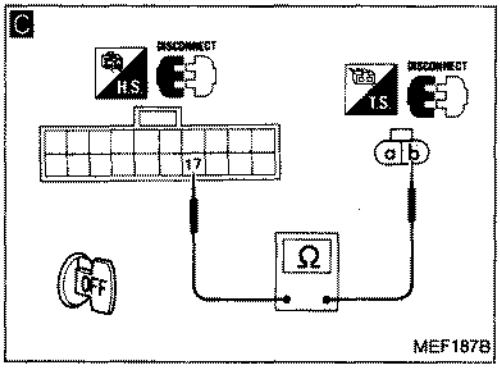




Diagnostic Procedure 12 (Cont'd)







INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check voltage between E.C.U. terminal ⑰ and ground under the following conditions.
Voltage:
When steering wheel is turned quickly
Battery voltage
Except above
Approximately 0V

O.K. → INSPECTION END

N.G. ↓

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect power steering oil pressure switch harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M11), (E104) (R.H.D. models)
- 10A fuse
- Harness continuity between power steering oil pressure switch and fuse

If N.G., repair harness or connectors.

O.K. ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal ⑰ and terminal ⓑ.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (M11), (E104) (L.H.D. models)
- Harness continuity between E.C.U. and power steering oil pressure switch

If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(Power steering oil pressure switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-146.)

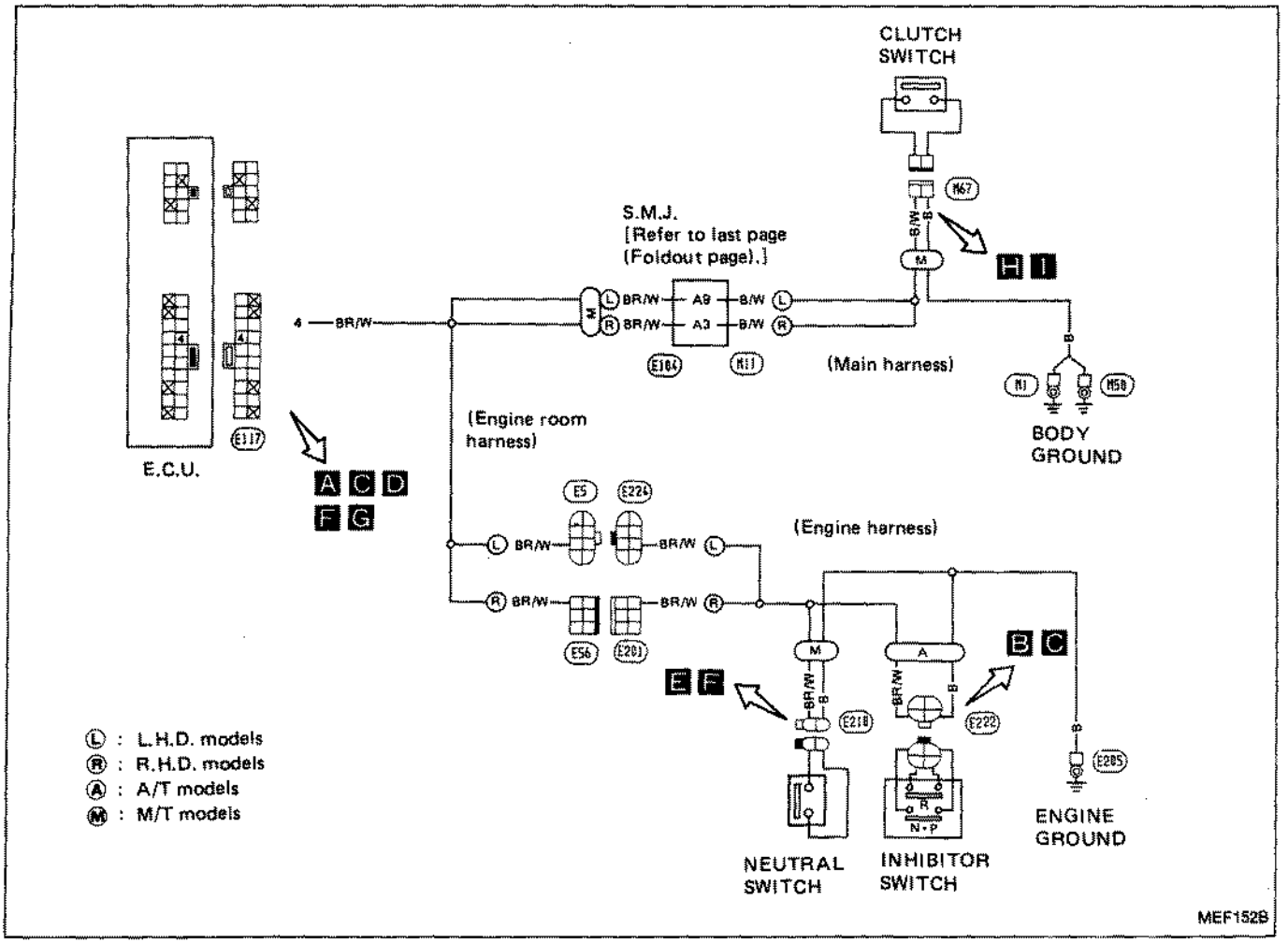
N.G. → Replace power steering oil pressure switch.

O.K. ↓

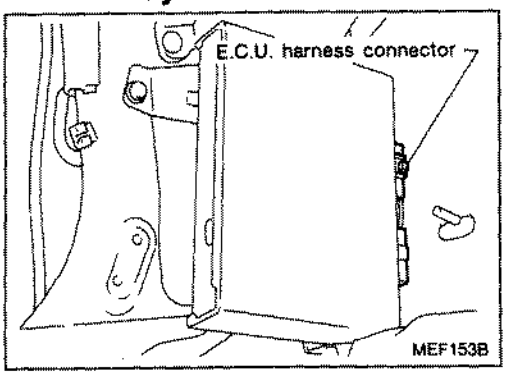
Check E.C.U. pin terminals for damage or the connection of the E.C.U. harness connector.

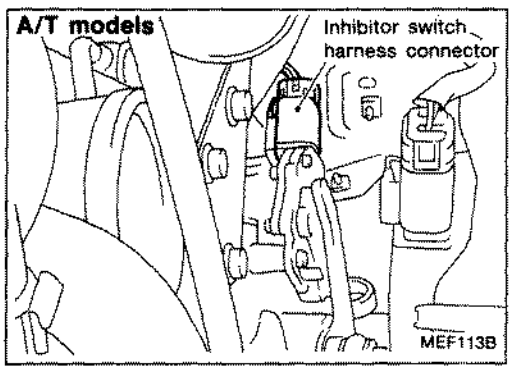
Diagnostic Procedure 13

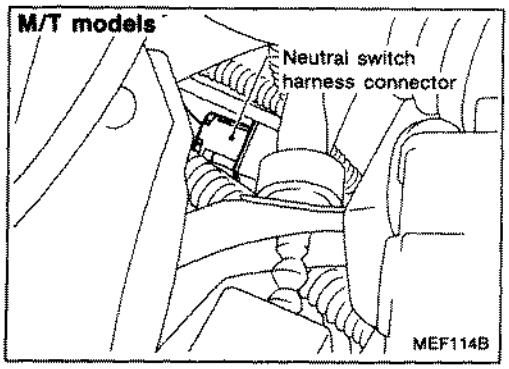
INHIBITOR/NEUTRAL/CLUTCH SWITCH (Not self-diagnostic item)

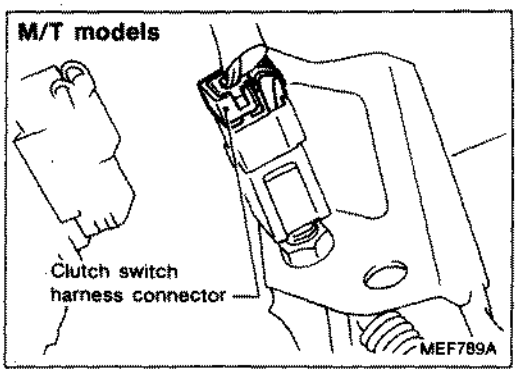


Harness layout



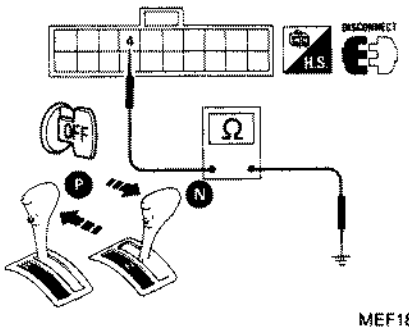






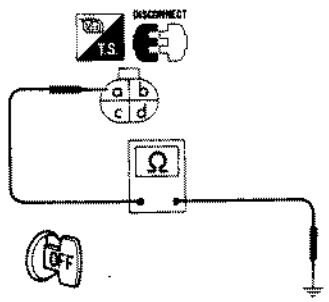
Diagnostic Procedure 13 (Cont'd)

A



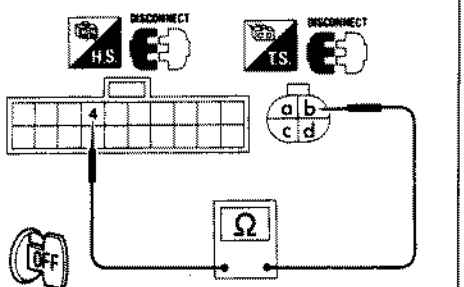
MEF188B

B



MEF189B

C



MEF190B

Inhibitor switch

INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Shift selector lever to "P" position.
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal ④ and engine ground.
Continuity should exist.
4) Shift selector lever to "N" position.
5) Check harness continuity between E.C.U. terminal ④ and engine ground.
Continuity should exist.

O.K. → INSPECTION END

N.G. ↓

B

CHECK GROUND CIRCUIT.
1) Disconnect inhibitor switch harness connector.
2) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1) Check harness continuity between E.C.U. terminal ④ and terminal ⓑ.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (E5), (E224) (L.H.D. models)
- Harness connectors (E56), (E201) (R.H.D. models)
- Harness continuity between E.C.U. and inhibitor switch

If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT (Inhibitor switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-143.)

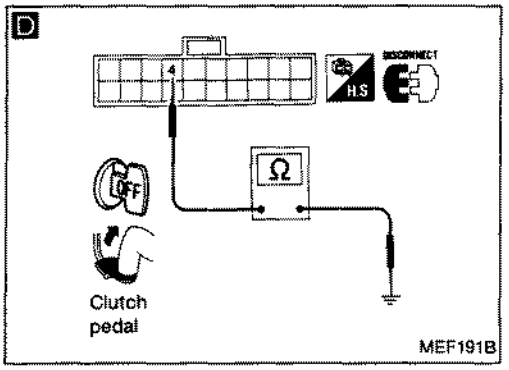
N.G. → Replace inhibitor switch.

O.K. ↓

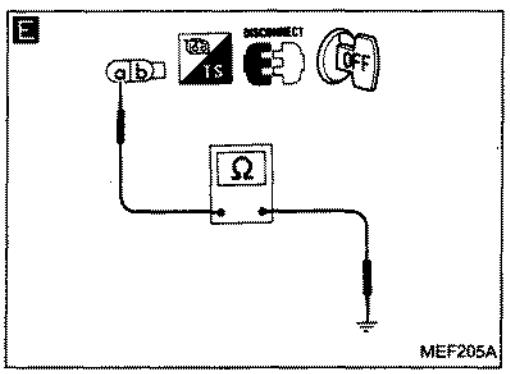
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 13 (Cont'd)

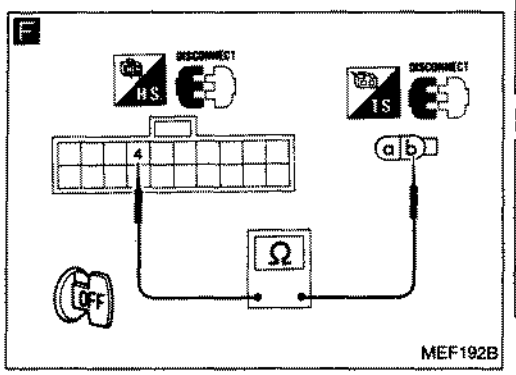
D



E



F



Neutral switch

INSPECTION START

D

CHECK OVERALL FUNCTION.
1) Set shift lever to the neutral position.
2) Make sure that clutch pedal is fully released.
3) Disconnect E.C.U. harness connector.
4) Check harness continuity between E.C.U. terminal ④ and body ground.
Continuity should exist.

O.K. → INSPECTION END

N.G.

E

CHECK GROUND CIRCUIT.
1) Disconnect neutral switch harness connector.
2) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

F

CHECK INPUT SIGNAL CIRCUIT.
1) Check harness continuity between E.C.U. terminal ④ and terminal ⓑ.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (E5), (E224) (L.H.D. models)
- Harness connectors (E54), (E201) (R.H.D. models)
- Harness continuity between E.C.U. and neutral switch

If N.G., repair harness or connectors.

O.K.

CHECK COMPONENT (Neutral switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-147.)

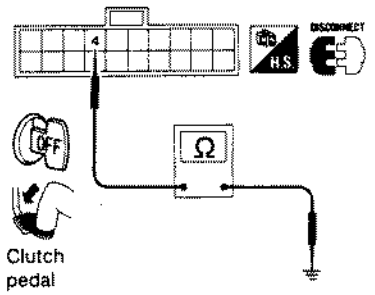
N.G. → Replace neutral switch.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

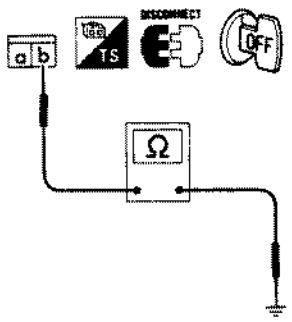
Diagnostic Procedure 13 (Cont'd)

G



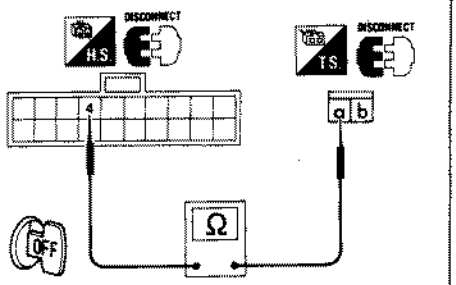
MEF193B

H



MEF208A

I



MEF194B

Clutch switch

INSPECTION START

G

CHECK OVERALL FUNCTION.
1) Set shift lever to any position except the neutral position.
2) Disconnect E.C.U. harness connector.
3) Depress clutch pedal.
4) Check harness continuity between E.C.U. terminal ④ and body ground.
Continuity should exist.

O.K. → INSPECTION END

N.G.

H

CHECK GROUND CIRCUIT.
1) Disconnect clutch switch harness connector.
2) Check harness continuity between terminal ⑤ and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

I

CHECK INPUT SIGNAL CIRCUIT.
1) Check harness continuity between E.C.U. terminal ④ and terminal ⓐ.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (M11), (E104)
- Harness continuity between E.C.U. and clutch switch

If N.G., repair harness or connectors.

O.K.

CHECK COMPONENT
(Clutch switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-147.)

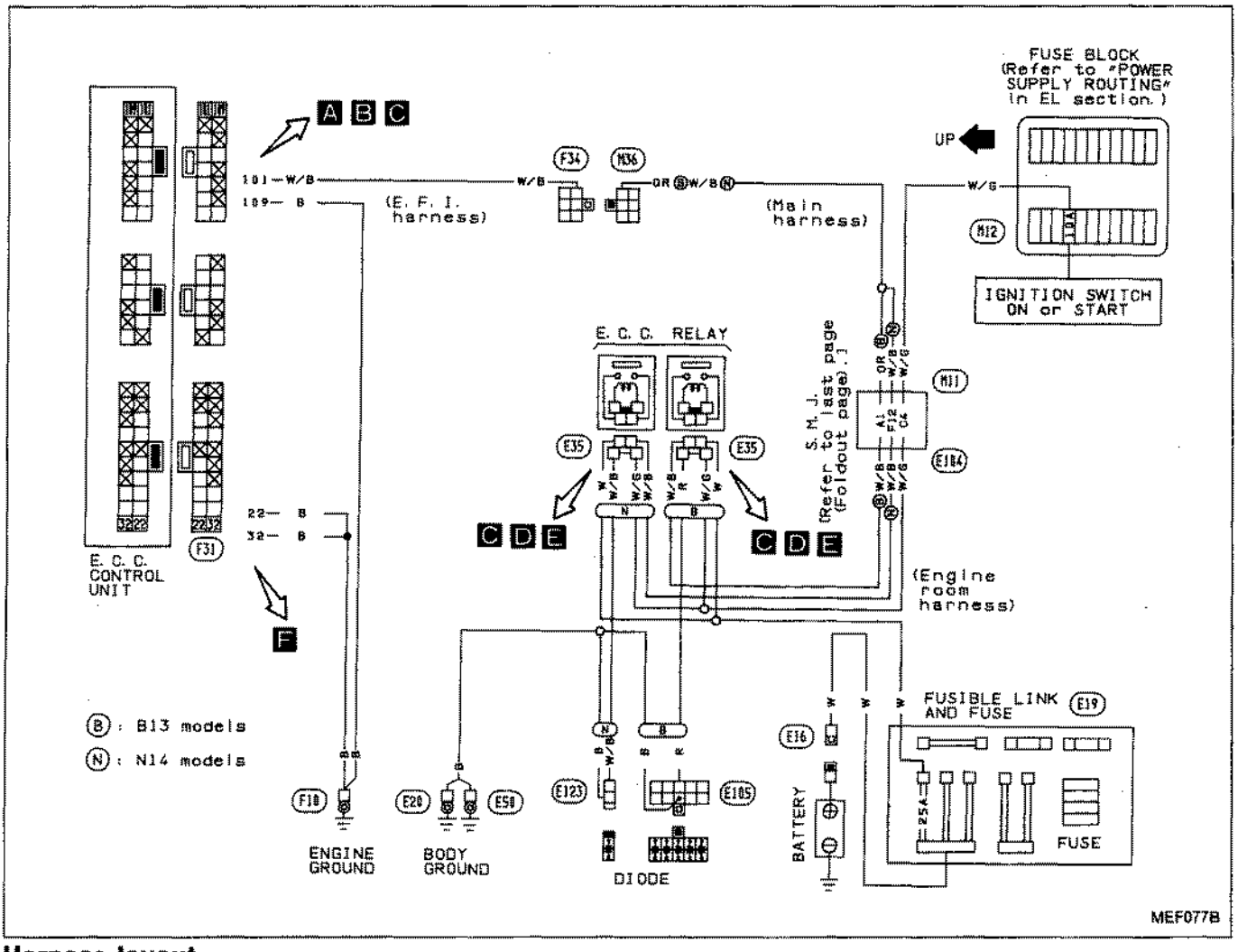
N.G. → Replace clutch switch.

O.K.

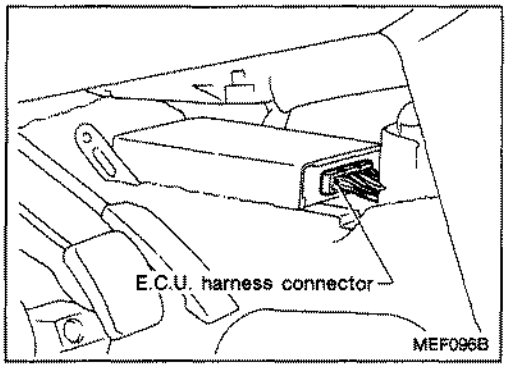
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

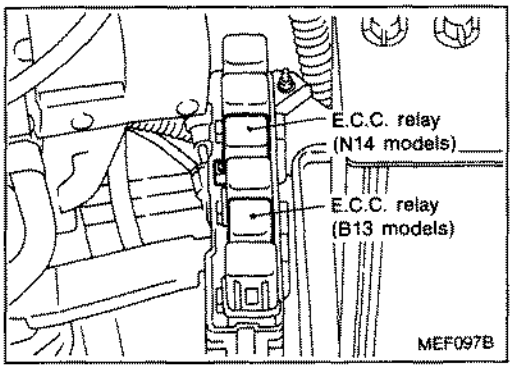
Diagnostic Procedure 1

MAIN POWER SUPPLY AND GROUND CIRCUIT (Not self-diagnostic item)



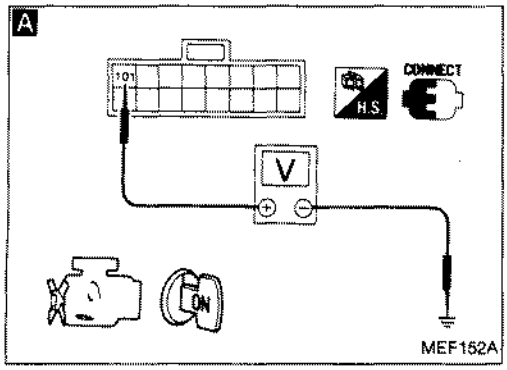
Harness layout





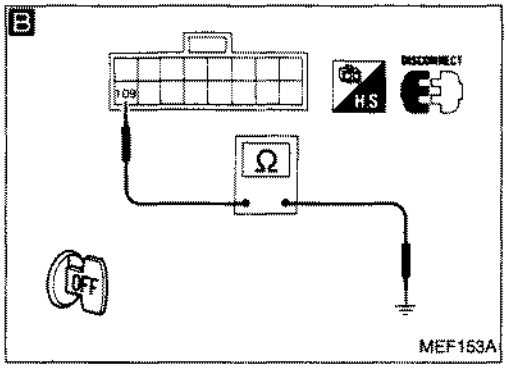
Diagnostic Procedure 1 (Cont'd)

A



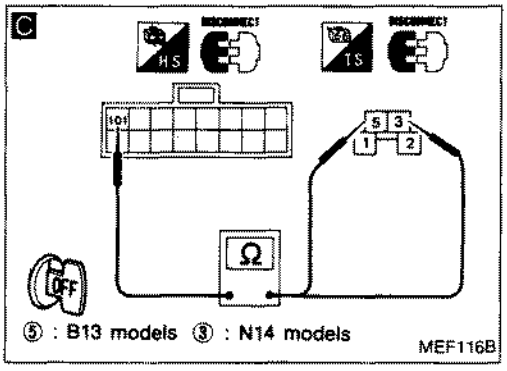
MEF152A

B



MEF153A

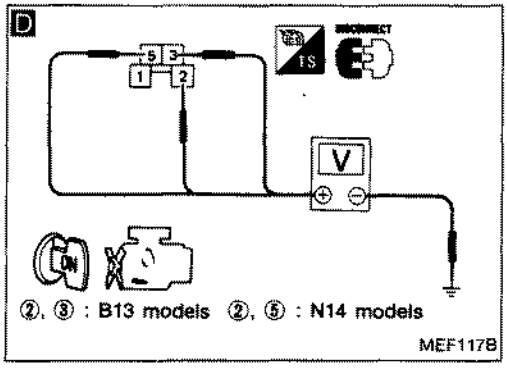
C



⑤ : B13 models ③ : N14 models

MEF116B

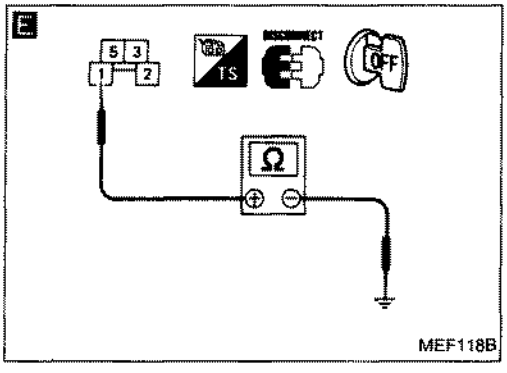
D



②, ③ : B13 models ②, ⑤ : N14 models

MEF117B

E



MEF118B

INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminal (101) and ground.
Voltage: Battery voltage

O.K. → **B**

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (109) and engine ground.
Continuity should exist.
If N.G., repair harness or connectors.

O.K. →
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

N.G. →

C

CHECK HARNESS CONTINUITY BETWEEN E.C.C. RELAY AND E.C.U.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Disconnect E.C.C. relay.
4) Check harness continuity between E.C.U. terminal (101) and terminal ⑤ (B13 models), terminal ③ (N14 models).
Continuity should exist.

N.G. →
Check the following.
- Harness connectors (F34), (K36)
- Harness connectors (M11), (E104)
- Harness continuity between E.C.U. and E.C.C. relay

If N.G., repair harness or connectors.

O.K. →

D

CHECK VOLTAGE BETWEEN E.C.C. RELAY AND GROUND.
1) Turn ignition switch "ON".
2) Check voltage between terminals ②, ③ (B13 models), terminals ②, ⑤ (N14 models) and ground.
Voltage: Battery voltage

N.G. →
Check the following.
- Harness connectors (M11), (E104)
- 25A fusible link
- 10A fuse
- Harness continuity between E.C.C. relay and battery
- Harness continuity between E.C.C. relay and fuse

If N.G., repair harness or connectors.

O.K. →

E

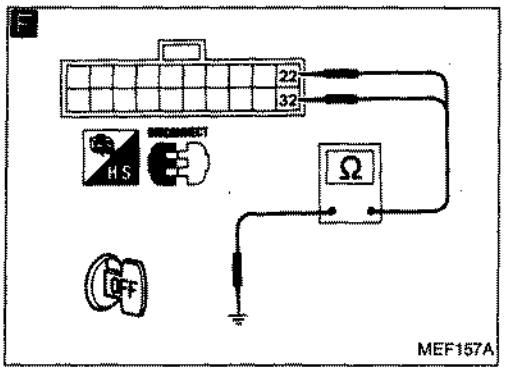
CHECK HARNESS CONTINUITY BETWEEN E.C.C. RELAY AND GROUND.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ① and body ground.
Continuity should exist.

N.G. →
Check the following.
- Diode (E105) (B13 models)
- Diode (E123) (N14 models)
- Harness continuity between diode and E.C.C. relay
- Harness continuity between diode and body ground

If N.G., repair harness or connectors.

O.K. → Ⓐ

Diagnostic Procedure 1 (Cont'd)



Ⓐ

CHECK GROUND CIRCUIT.
1) Check harness continuity between E.C.U. terminals ㉒, ㉜ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT
(E.C.C. relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-147.)

N.G. → Replace E.C.C. relay.

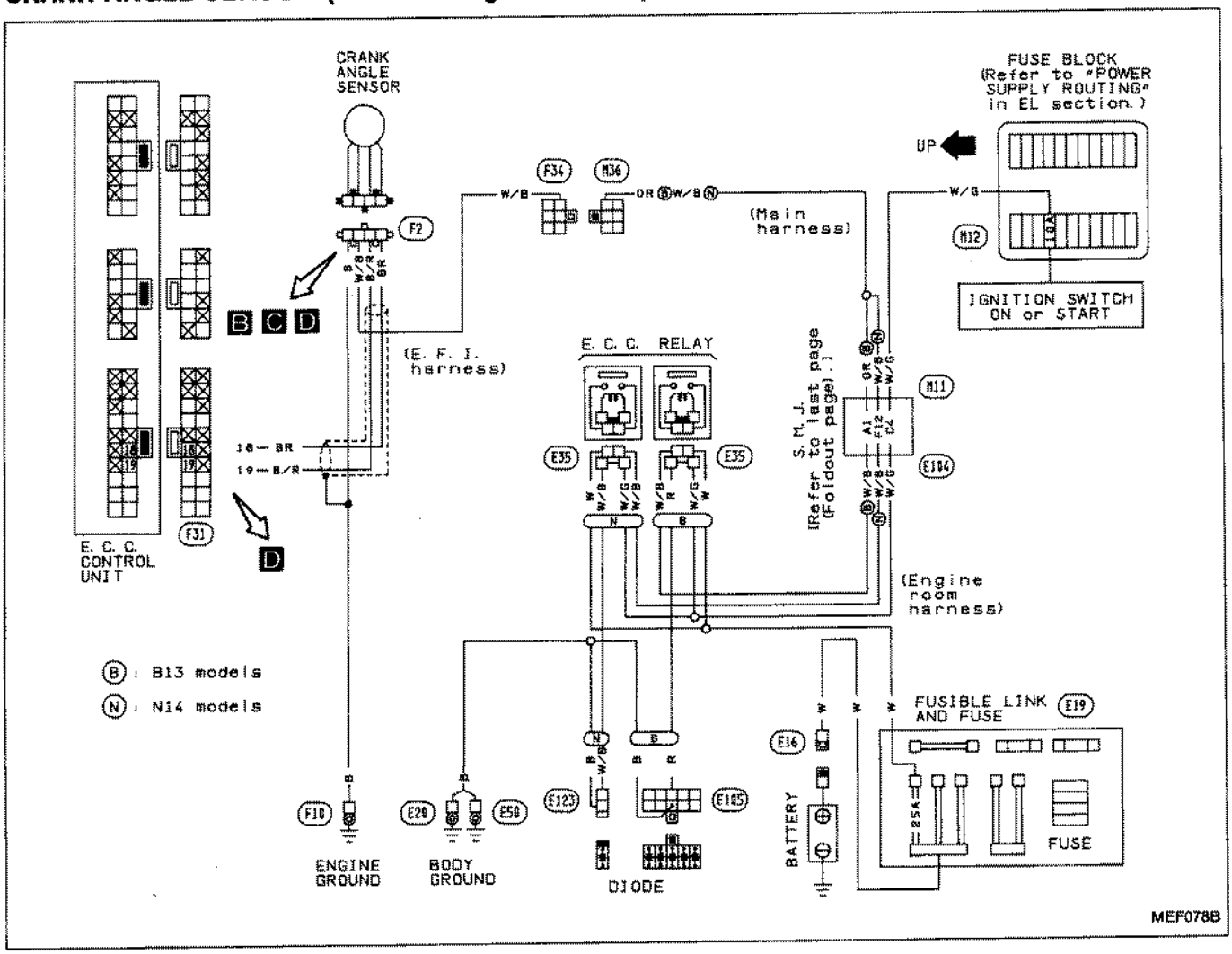
O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

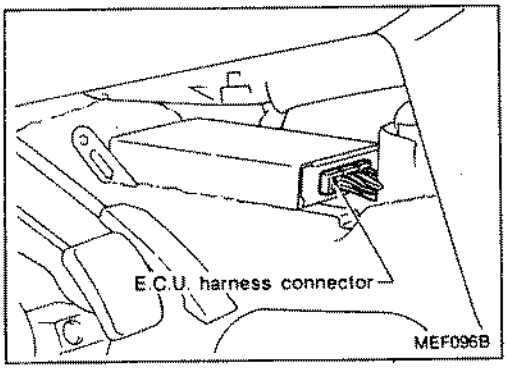
NOTE

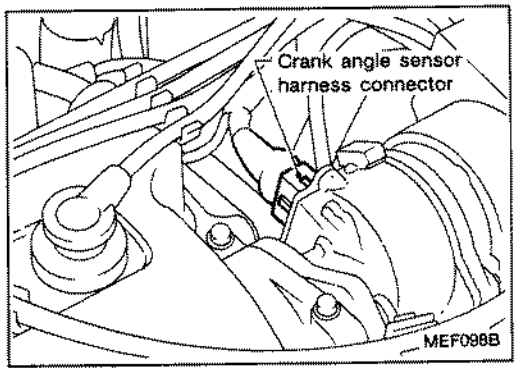
Diagnostic Procedure 2

CRANK ANGLE SENSOR (Not self-diagnostic item)



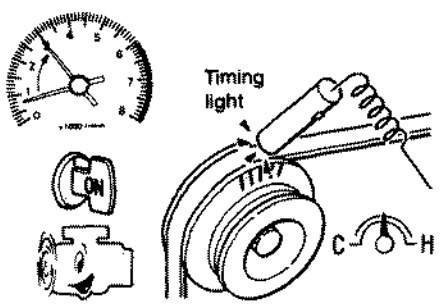
Harness layout





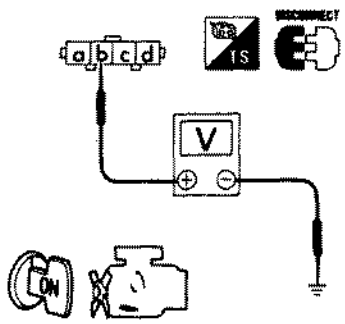
Diagnostic Procedure 2 (Cont'd)

A



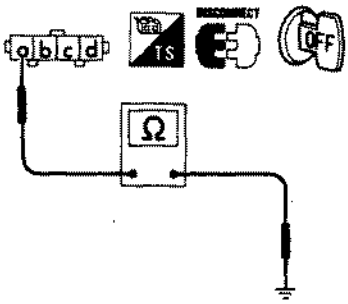
MEF158A

B



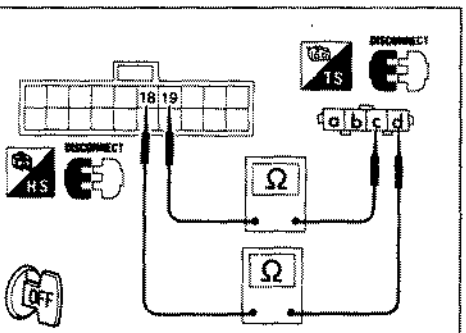
MEF159A

C



MEF160A

D



MEF161A

INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Set timing light on high tension cable.
3) Check ignition timing while racing engine from idle speed to about 3,000 rpm under no-load.
Ignition timing should advance.

O.K. → INSPECTION END

N.G.

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect crank angle sensor harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F34), (M36)
- Harness connectors (M11), (E104)
- Harness continuity between crank angle sensor and E.C.C. relay

If N.G., repair harness or connectors.

O.K.

C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

D

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between terminal ⓒ and E.C.U. terminal ⑱ (1° signal), terminal ⓓ and E.C.U. terminal ⑲ (180° signal).
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT
(Crank angle sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-143.)

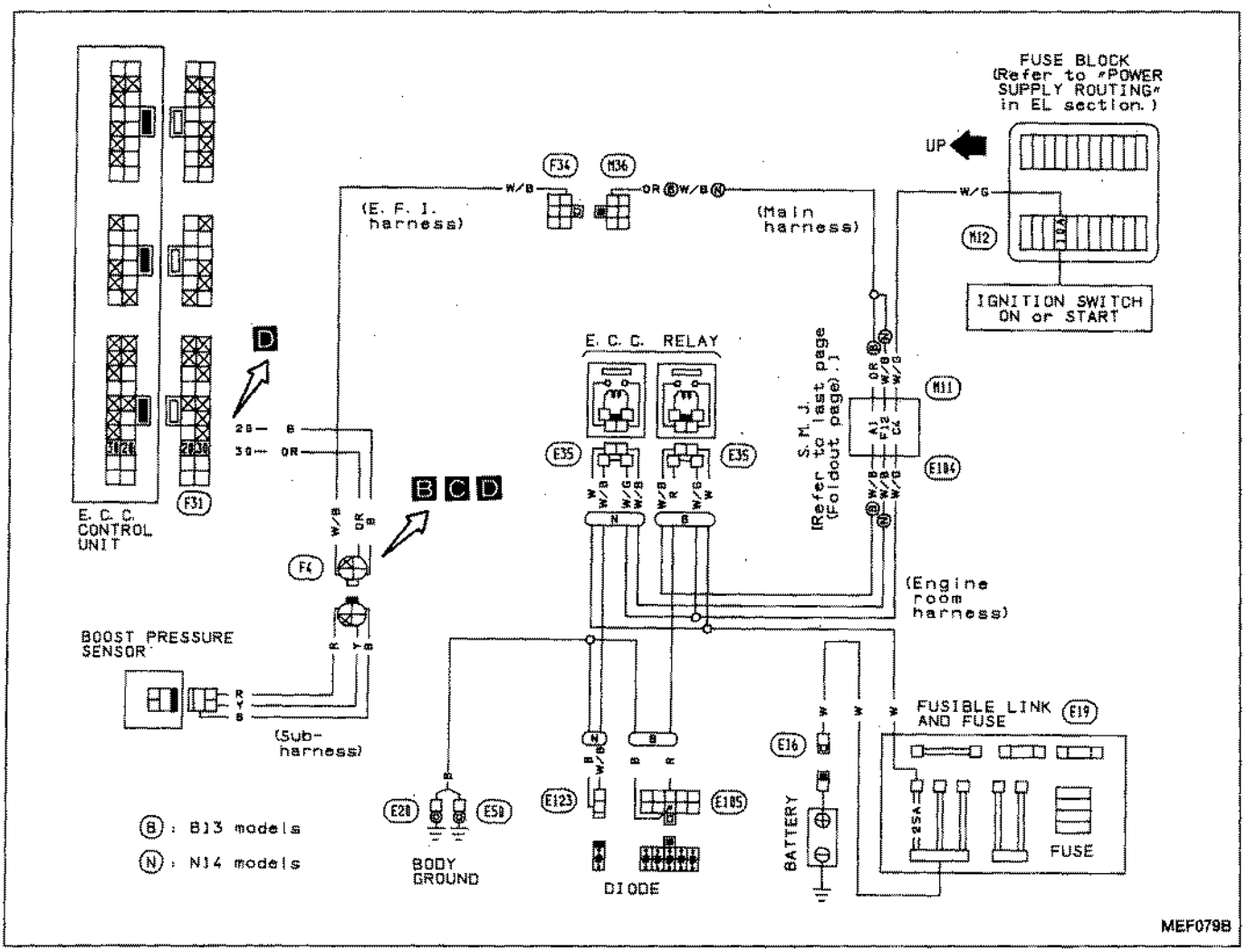
N.G. → Replace crank angle sensor.

O.K.

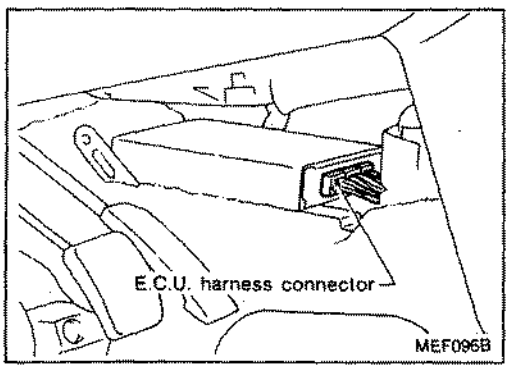
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

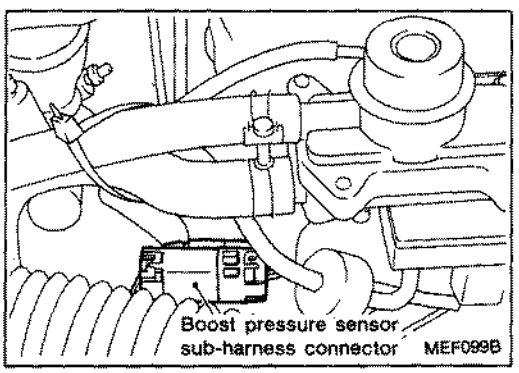
Diagnostic Procedure 3

BOOST PRESSURE SENSOR (Not self-diagnostic item)

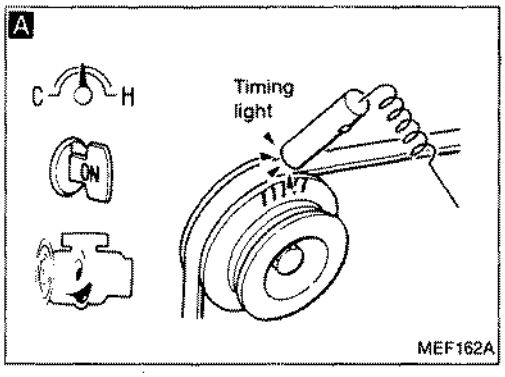


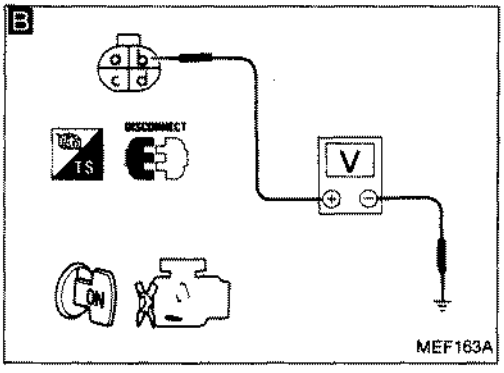
Harness layout

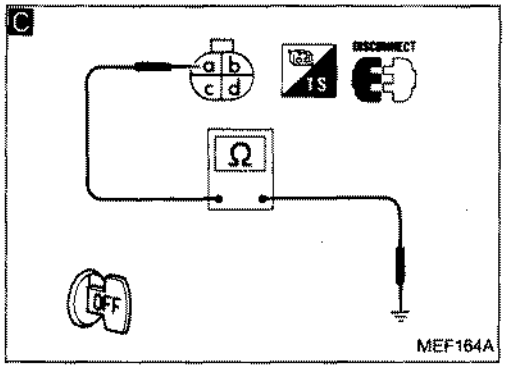


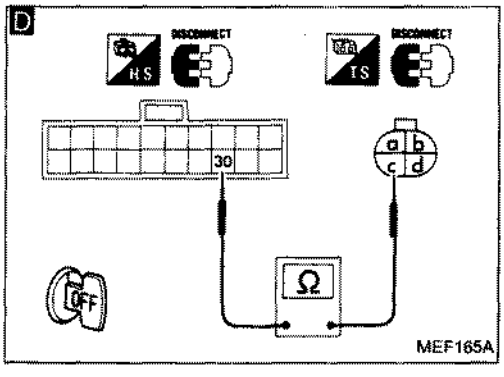


Diagnostic Procedure 3 (Cont'd)









INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Set timing light on high tension cable.
3) Check ignition timing at idle under no-load.
4) Disconnect vacuum hose connected to boost pressure sensor and plug vacuum hose. Recheck ignition timing.
Ignition timing should retard.

O.K. → INSPECTION END

N.G.

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect boost pressure sensor sub-harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F34), (M36)
- Harness connectors (M11), (E104)
- Harness continuity between boost pressure sensor sub-harness connector and E.C.C. relay

If N.G., repair harness or connectors.

O.K.

C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓓ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

D

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ㉚ and terminal ⓒ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT (Boost pressure sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-144.)

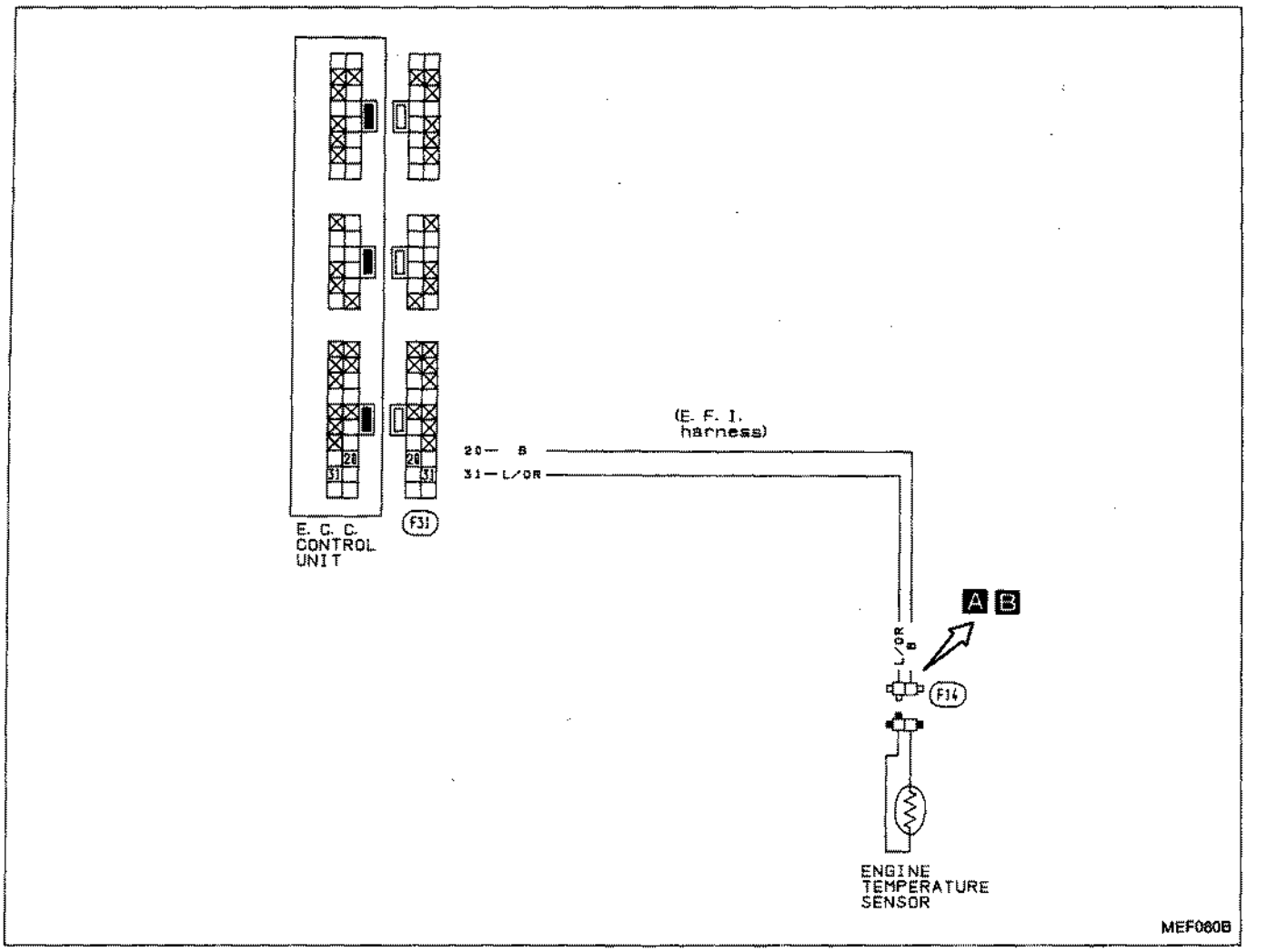
N.G. → Replace boost pressure sensor.

O.K.

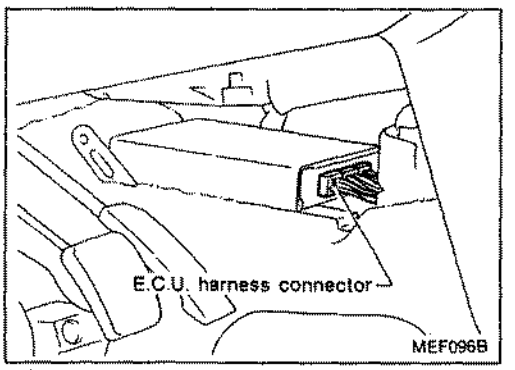
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

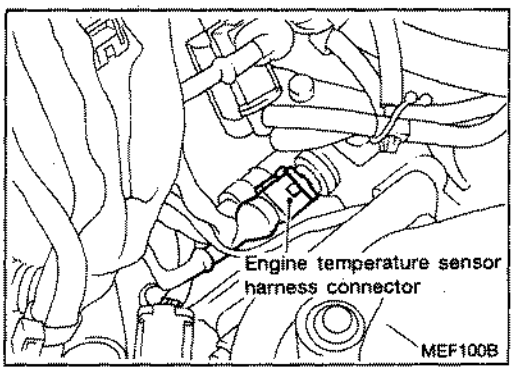
Diagnostic Procedure 4

ENGINE TEMPERATURE SENSOR (Not self-diagnostic item)

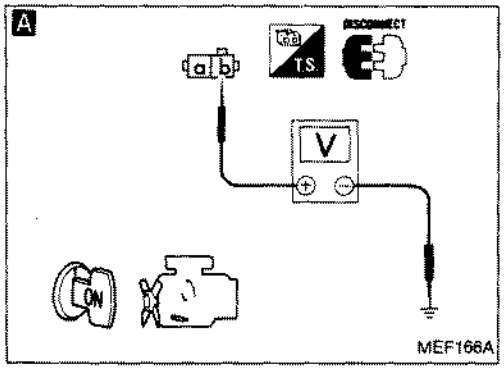


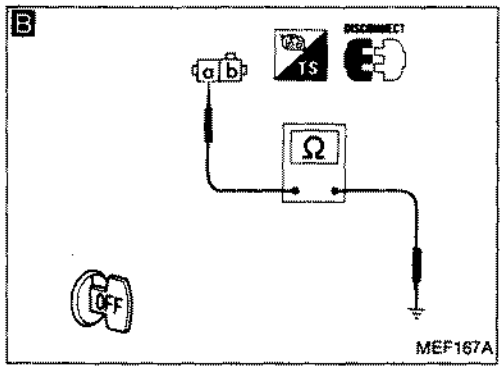
Harness layout





Diagnostic Procedure 4 (Cont'd)





INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect engine temperature sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Approximately 5V

N.G. → Repair harness or connectors.

O.K.

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓖ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT
(Engine temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-143.)

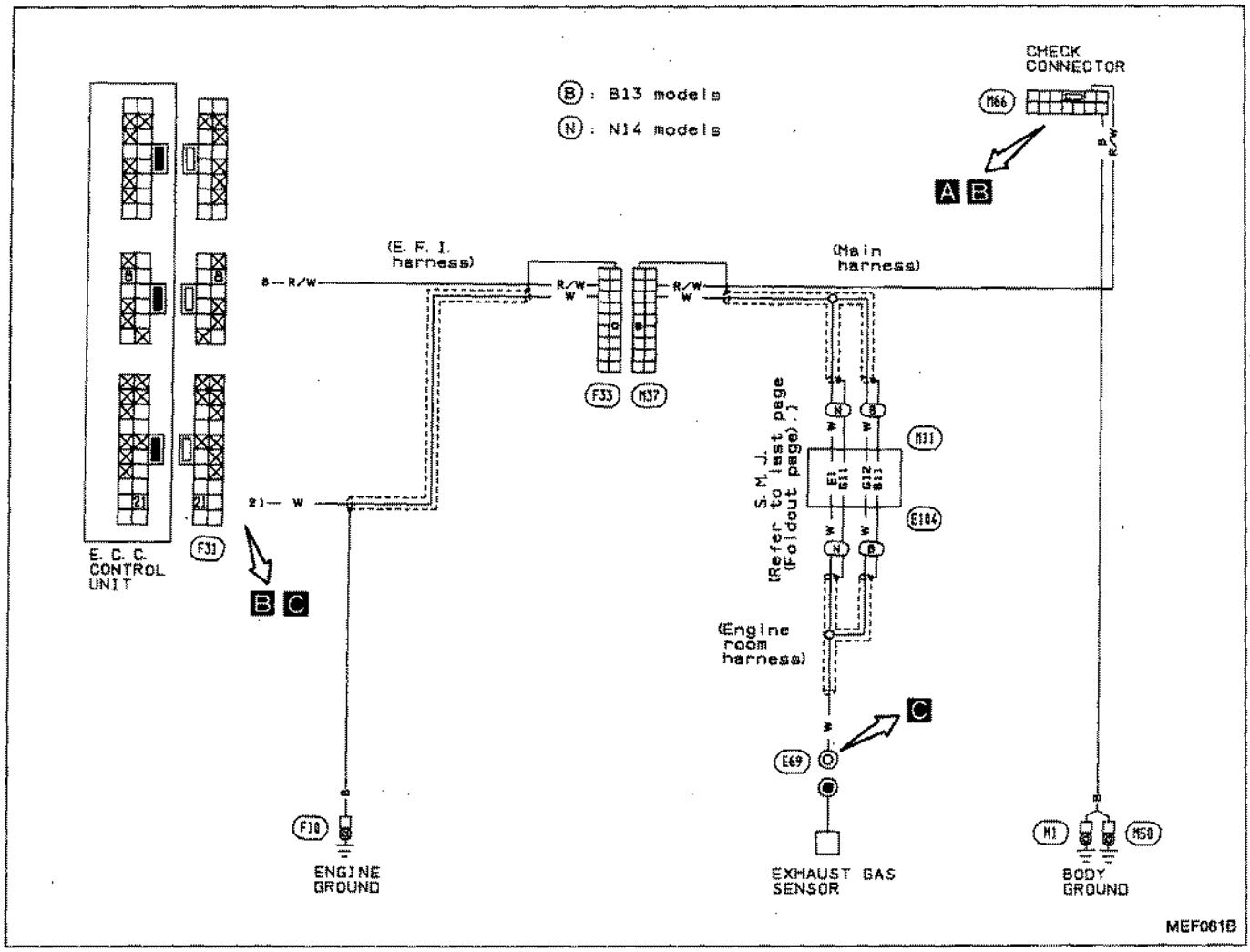
N.G. → Replace engine temperature sensor.

O.K.

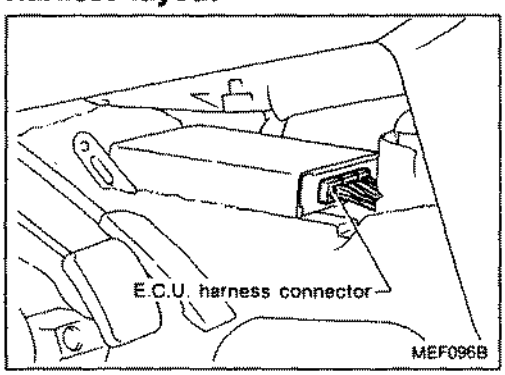
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

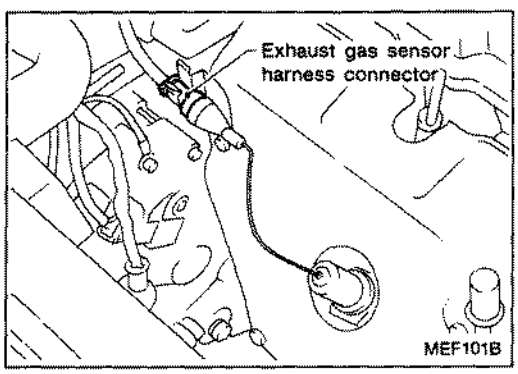
Diagnostic Procedure 5

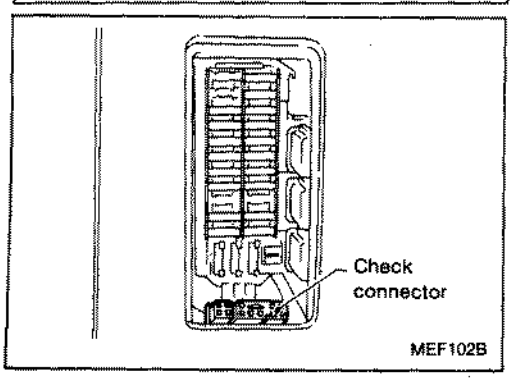
EXHAUST GAS SENSOR (Not self-diagnostic item)



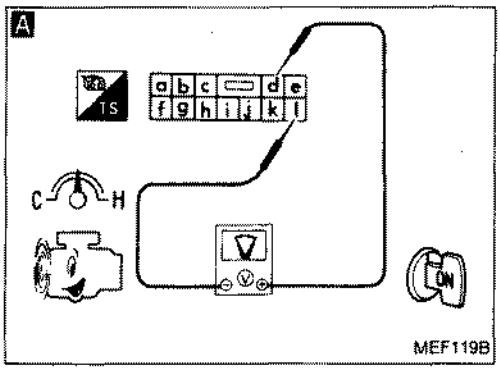
Harness layout

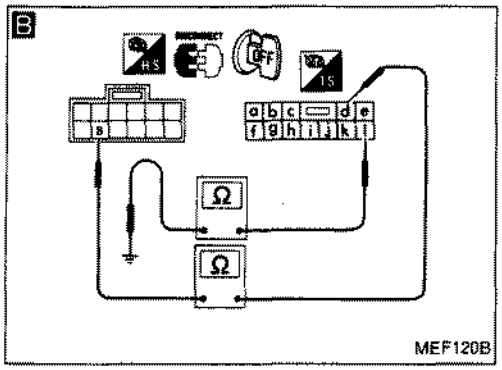


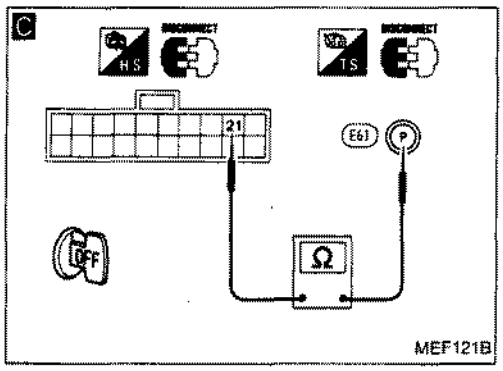




Diagnostic Procedure 5 (Cont'd)







INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Run engine at about 2,500 rpm for about 5 minutes under no- load.
3) Keep engine speed at 2,000 rpm under no-load, check voltage between terminal ⓓ and terminal Ⓘ on check connector.
Needle of voltmeter should fluctuate between approximately 0V and battery voltage more than 5 times during 10 seconds.

O.K. → INSPECTION END

N.G.

B

CHECK HARNESS CONTINUITY BETWEEN E.C.U. AND CHECK CONNECTOR.
1) Stop engine.
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal ⑧ and terminal ⓓ , terminal Ⓘ and body ground.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F33) , (M37)
- Check connector
- Harness continuity between E.C.U. and check connector
- Harness continuity between check connector and body ground

If N.G., repair harness or connectors.

O.K.

C

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect exhaust gas sensor harness connector.
2) Check harness continuity between E.C.U. terminal ㉑ and terminal Ⓟ (Harness side connector (E61)).
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F33) , (M37)
- Harness connectors (M11) , (E104)
- Harness continuity between E.C.U. and exhaust gas sensor

If N.G., repair harness or connectors.

O.K.

CHECK COMPONENT (Exhaust gas sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-148.)

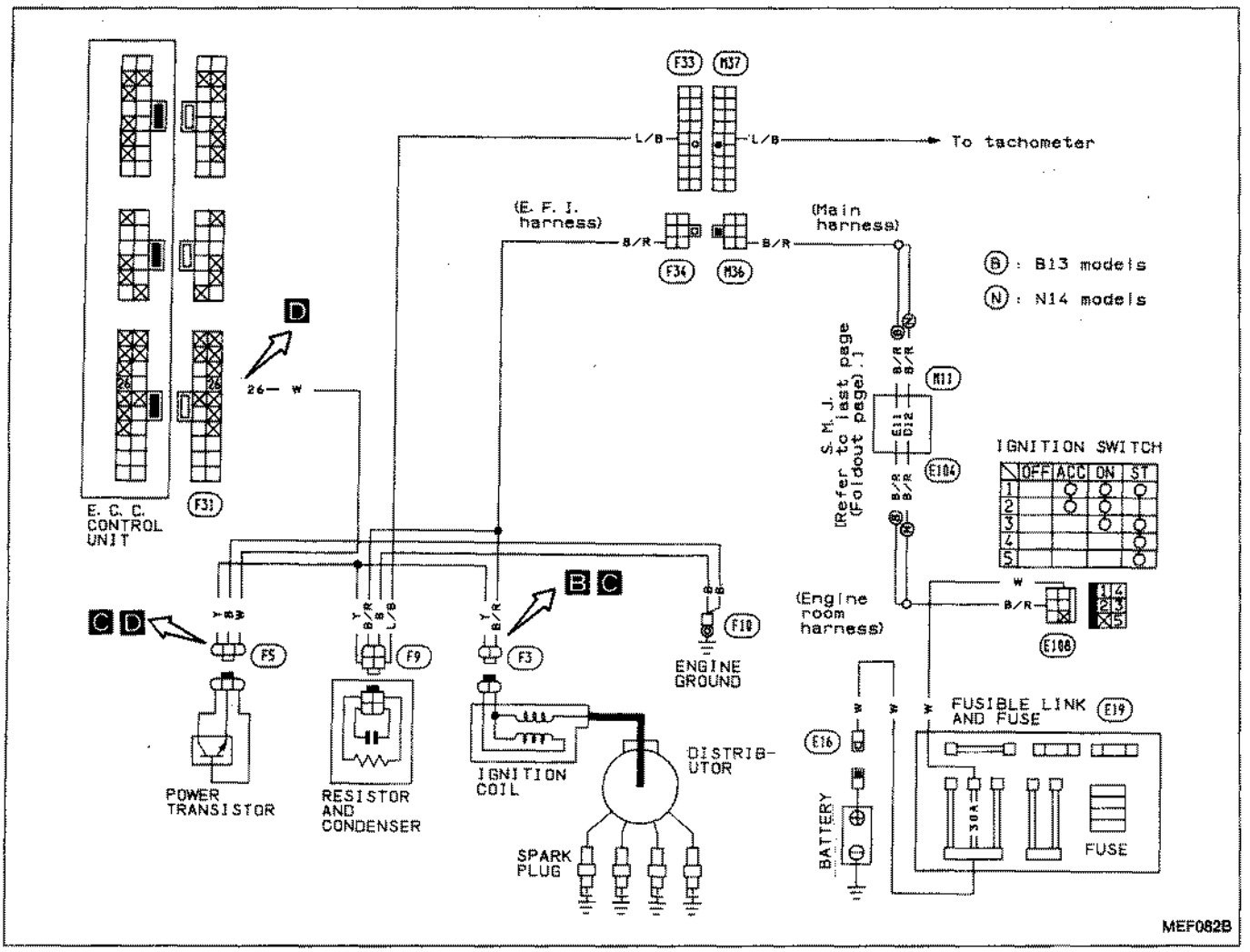
N.G. → Replace exhaust gas sensor.

O.K.

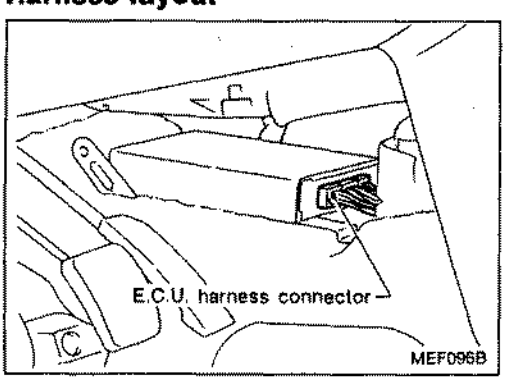
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

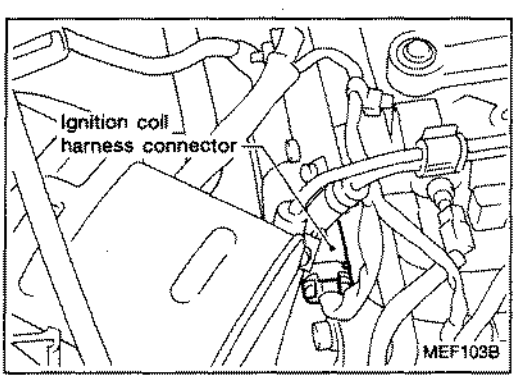
Diagnostic Procedure 6

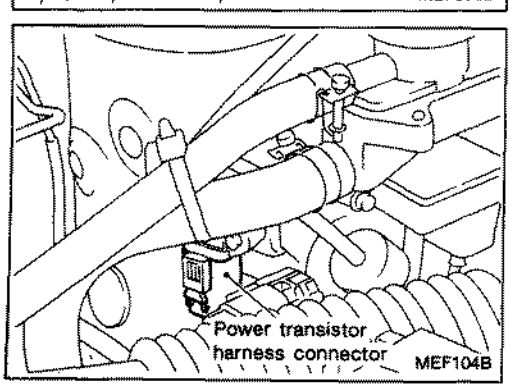
IGNITION SIGNAL (Not self-diagnostic item)



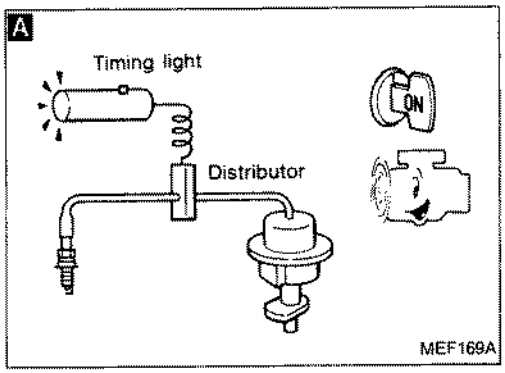
Harness layout







Diagnostic Procedure 6 (Cont'd)



INSPECTION START

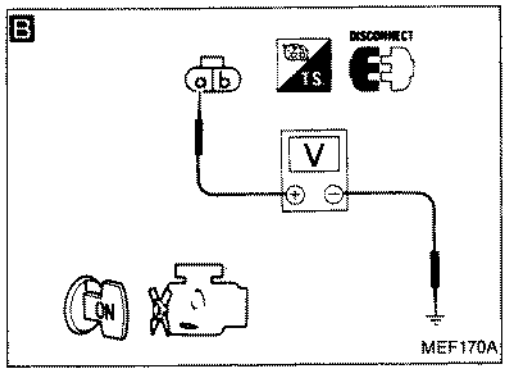
A

CHECK CONTROL FUNCTION.
1) Start engine.
2) Set timing light on high tension cables No. 1, No. 2, No. 3 and No. 4.
3) Check timing light flashes.

O.K. → CHECK COMPONENT (Spark plug).
Refer to "Checking Spark Plugs" in MA section.
If N.G., replace spark plug.

O.K. → INSPECTION END

N.G.



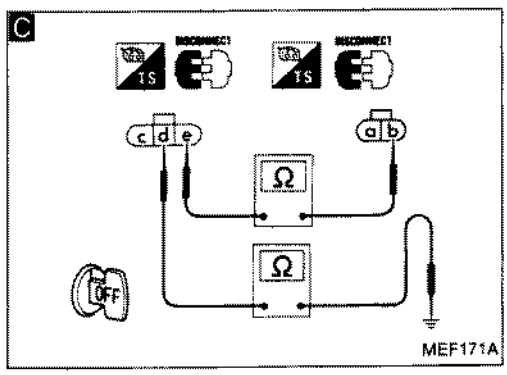
B

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect ignition coil harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors F34, M36
- Harness connectors M11, E104
- Harness continuity between ignition coil and ignition switch

If N.G., repair harness or connectors.

O.K.

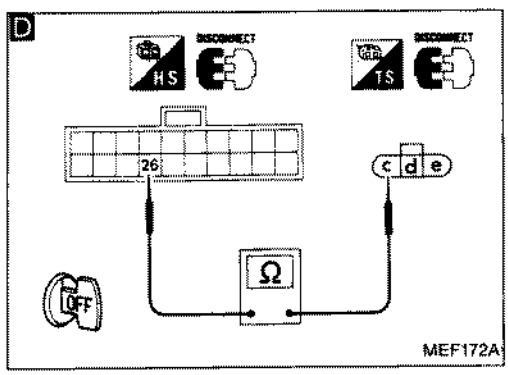


C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect power transistor harness connector.
3) Check harness continuity between terminal ⓑ and terminal ⓔ, terminal ⓓ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.



D

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ㉖ and terminal ⓔ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENTS (Ignition coil, power transistor and high tension cable).
Refer to "Electrical Components Inspection". (See pages EF & EC-143, 144 and "Checking Ignition Wires" in MA section.)

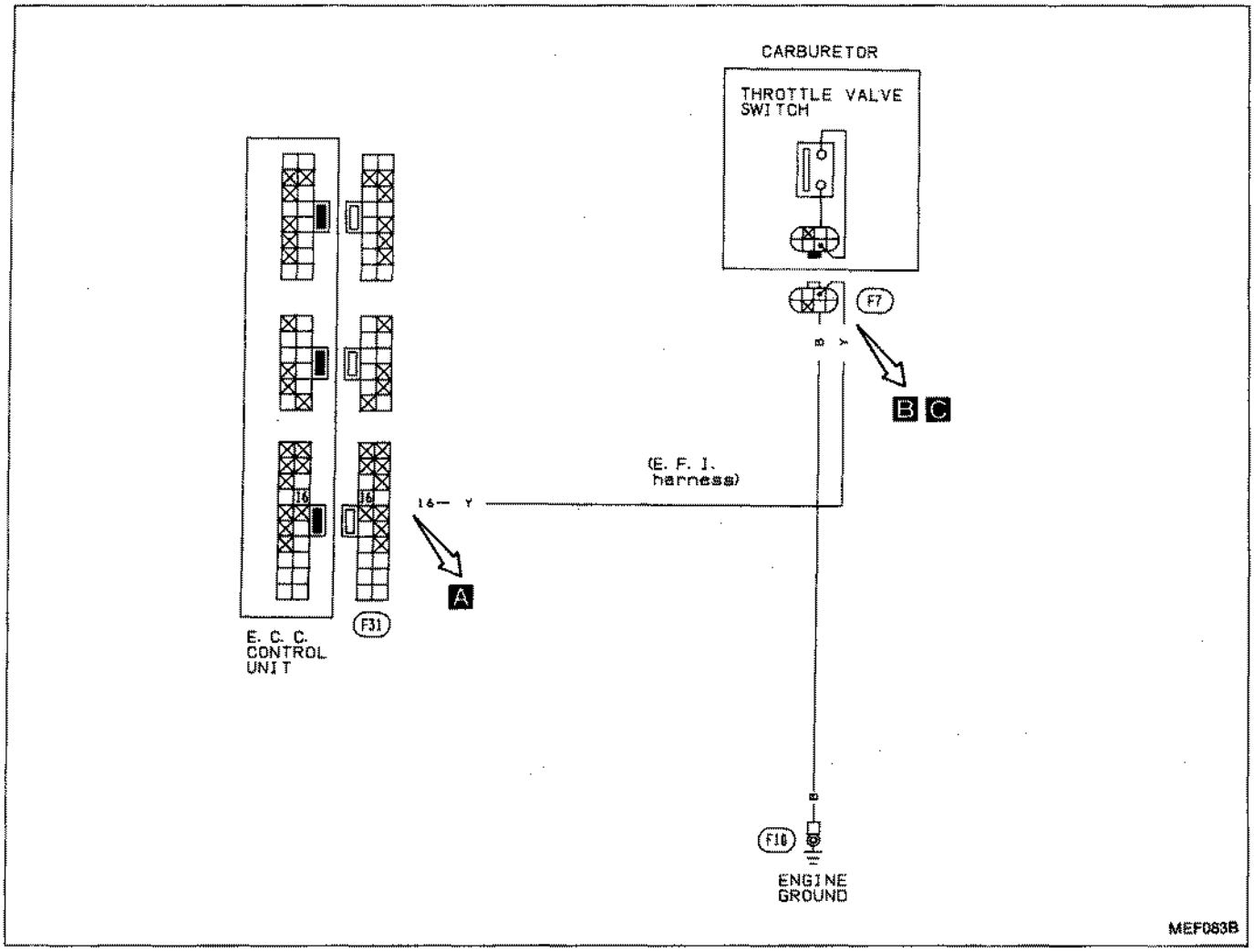
N.G. → Replace malfunctioning component(s).

O.K.

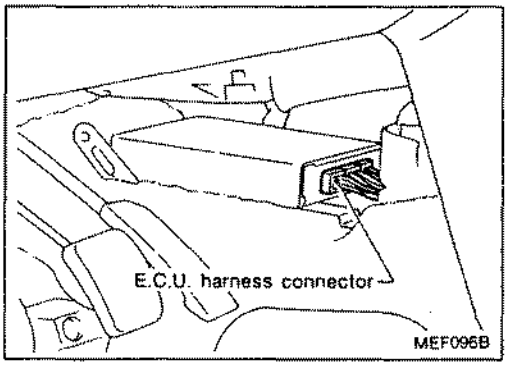
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

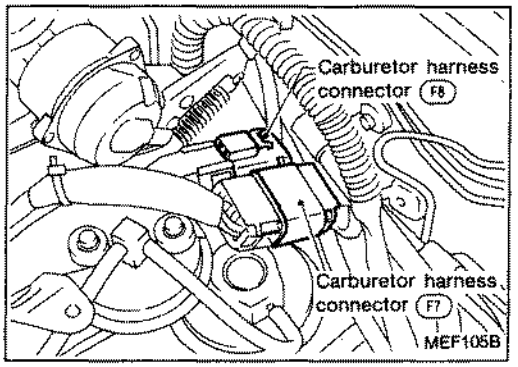
Diagnostic Procedure 7

THROTTLE VALVE SWITCH (Not self-diagnostic item)

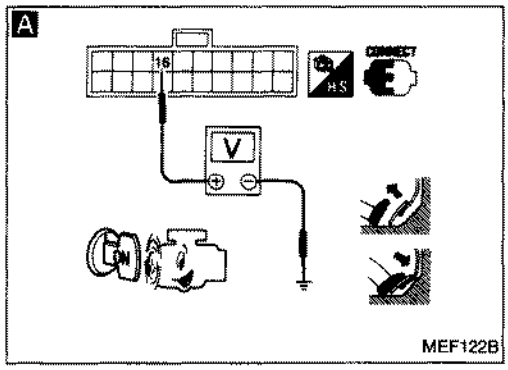


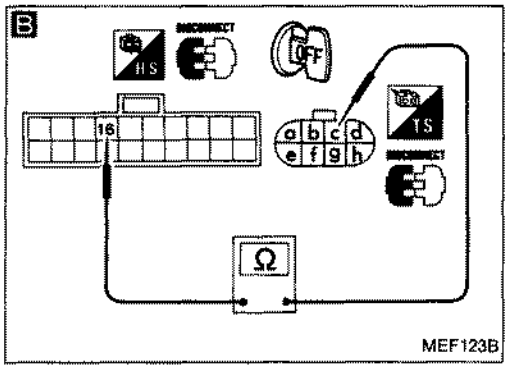
Harness layout

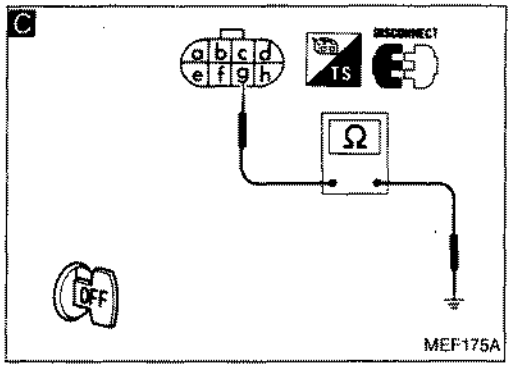




Diagnostic Procedure 7 (Cont'd)







INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and run it at idle.
2) Check voltage between E.C.U. terminal ⑯ and ground.
Voltage:
Accelerator pedal is depressed
Battery voltage
Accelerator pedal is released
Approximately 0V

O.K. → INSPECTION END

N.G.

B

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector and carburetor harness connector (F7).
3) Check harness continuity between E.C.U. terminal ⑯ and terminal ⑥.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

C

CHECK GROUND CIRCUIT.
1) Check harness continuity between terminal ⑧ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT
(Throttle valve switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-145.)

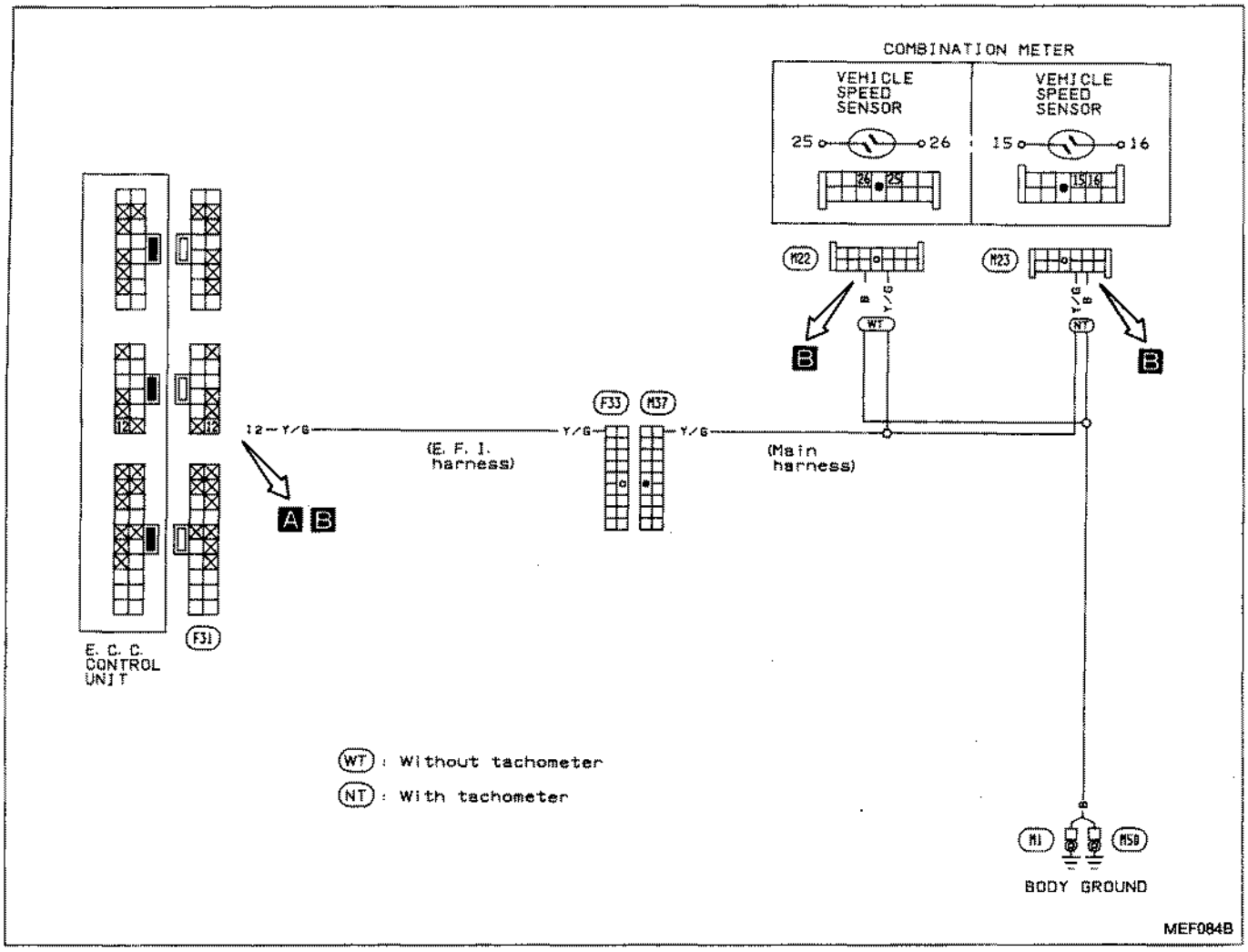
N.G. → Replace throttle valve switch.

O.K.

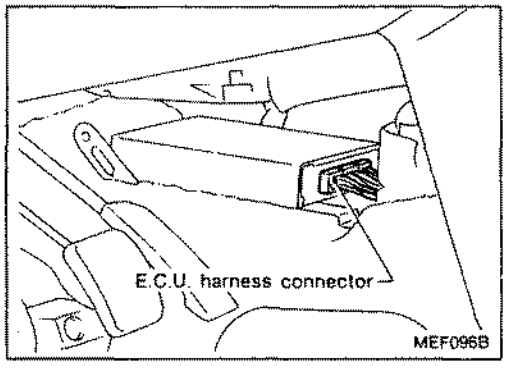
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 8

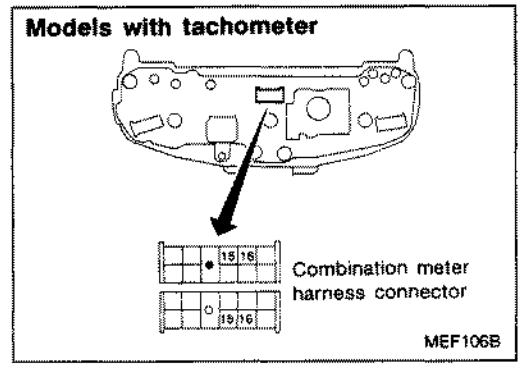
VEHICLE SPEED SENSOR (Not self-diagnostic item)



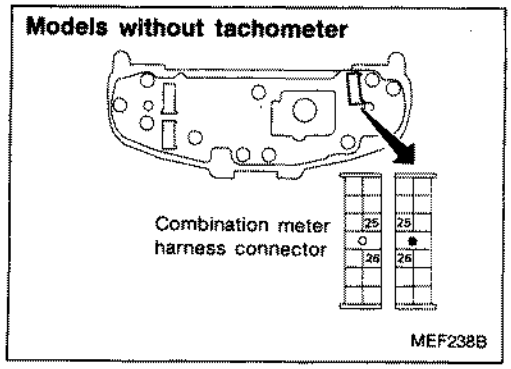
Harness layout



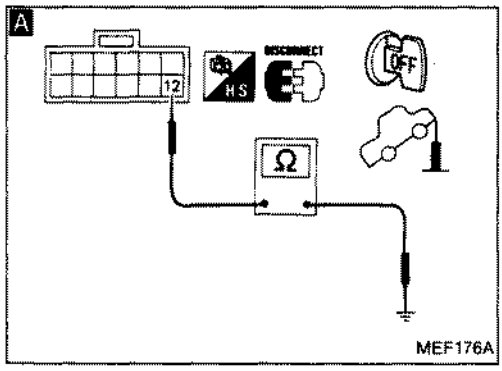
Models with tachometer

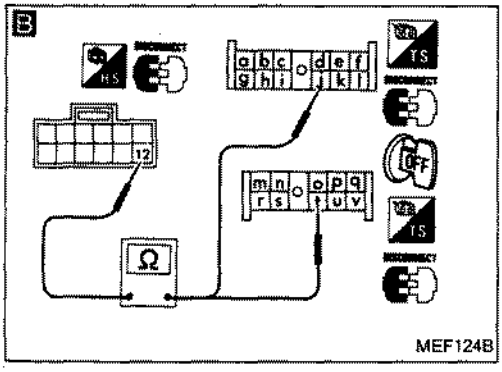


Models without tachometer



Diagnostic Procedure 8 (Cont'd)





INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Jack up front wheels.
2) Disconnect E.C.U. harness connector.
3) Rotate front wheel by hand.
4) Check harness continuity between E.C.U. terminal ⑫ and body ground.
Continuity should come and go.

O.K. → INSPECTION END

N.G.

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

N.G. → Check vehicle speed sensor and circuit.
(Refer to EL section.)

O.K.

B

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect combination meter harness connector.
3) Check harness continuity between E.C.U. terminal ⑫ and terminal ⓙ (Models without tachometer), terminal ① (Models with tachometer).
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F33), (M57)
- Harness continuity between E.C.U. and combination meter

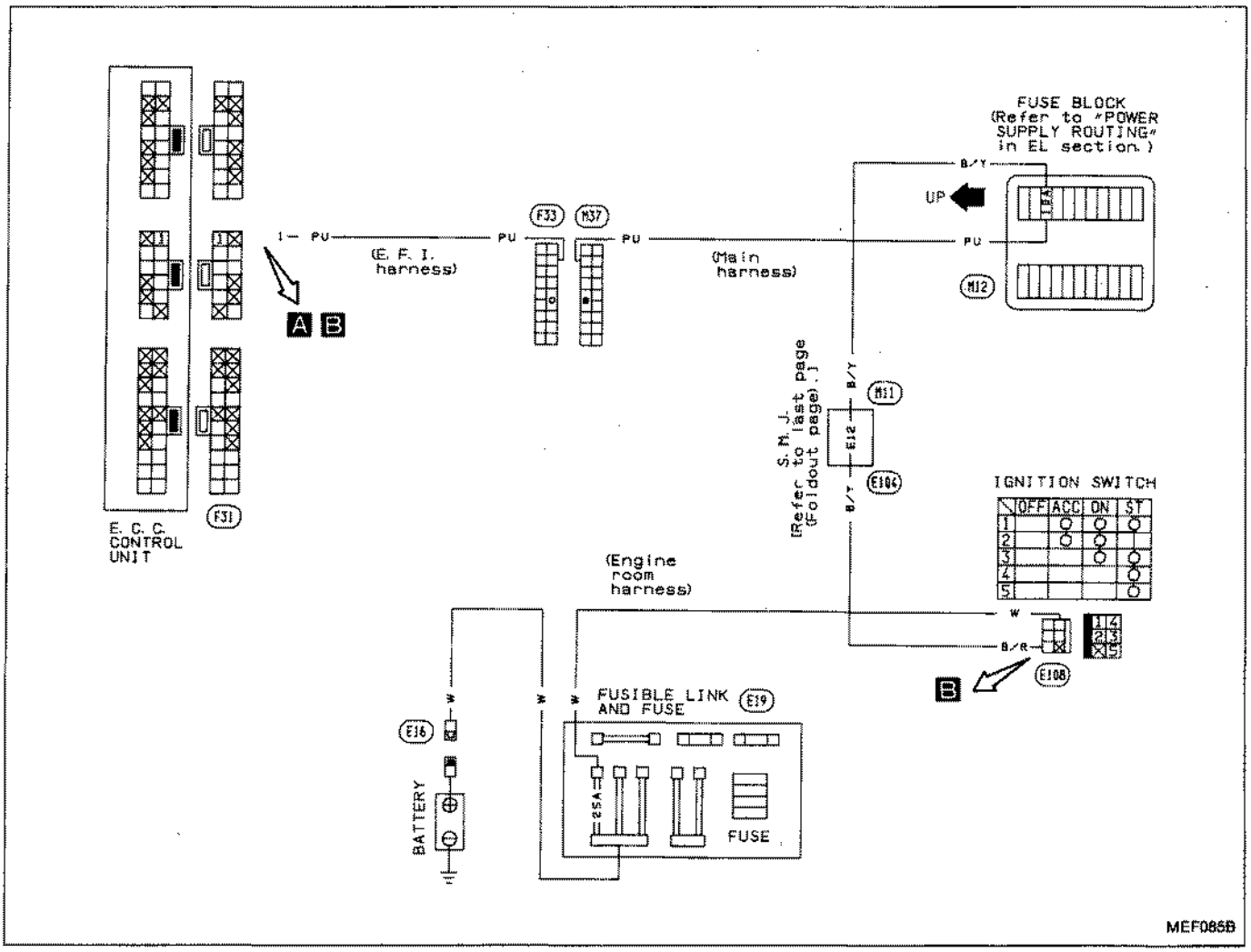
If N.G., repair harness or connectors.

O.K.

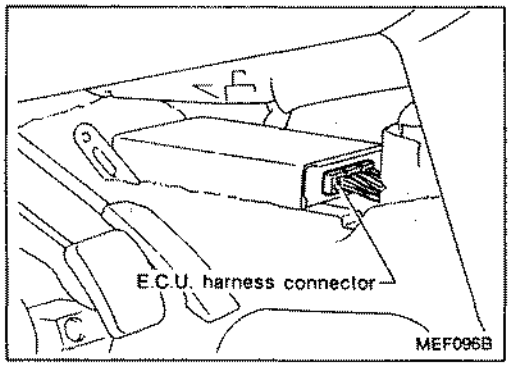
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 9

START SIGNAL (Not self-diagnostic item)

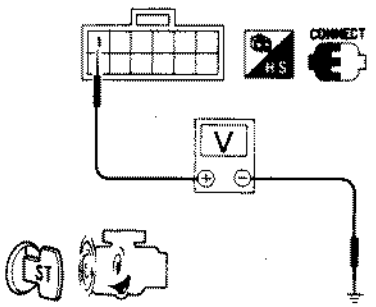


Harness layout



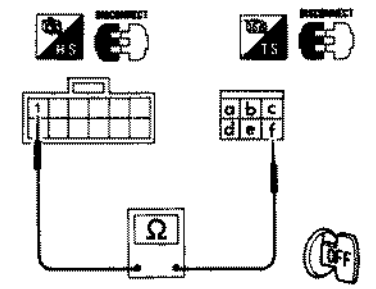
Diagnostic Procedure 9 (Cont'd)

A



MEF178A

B



MEF125B

INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Turn ignition switch to "START".
2) Check voltage between E.C.U. terminal ① and ground.
Voltage:
Ignition switch "START"
Battery voltage
Except above
Approximately 0V

O.K. → INSPECTION END

N.G.

B

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector and ignition switch harness connector.
3) Check harness continuity between E.C.U. terminal ① and terminal ⓕ.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F33), (M37)
- Harness connectors (M11), (E104)
- 10A fuse
- Harness continuity between E.C.U. and ignition switch

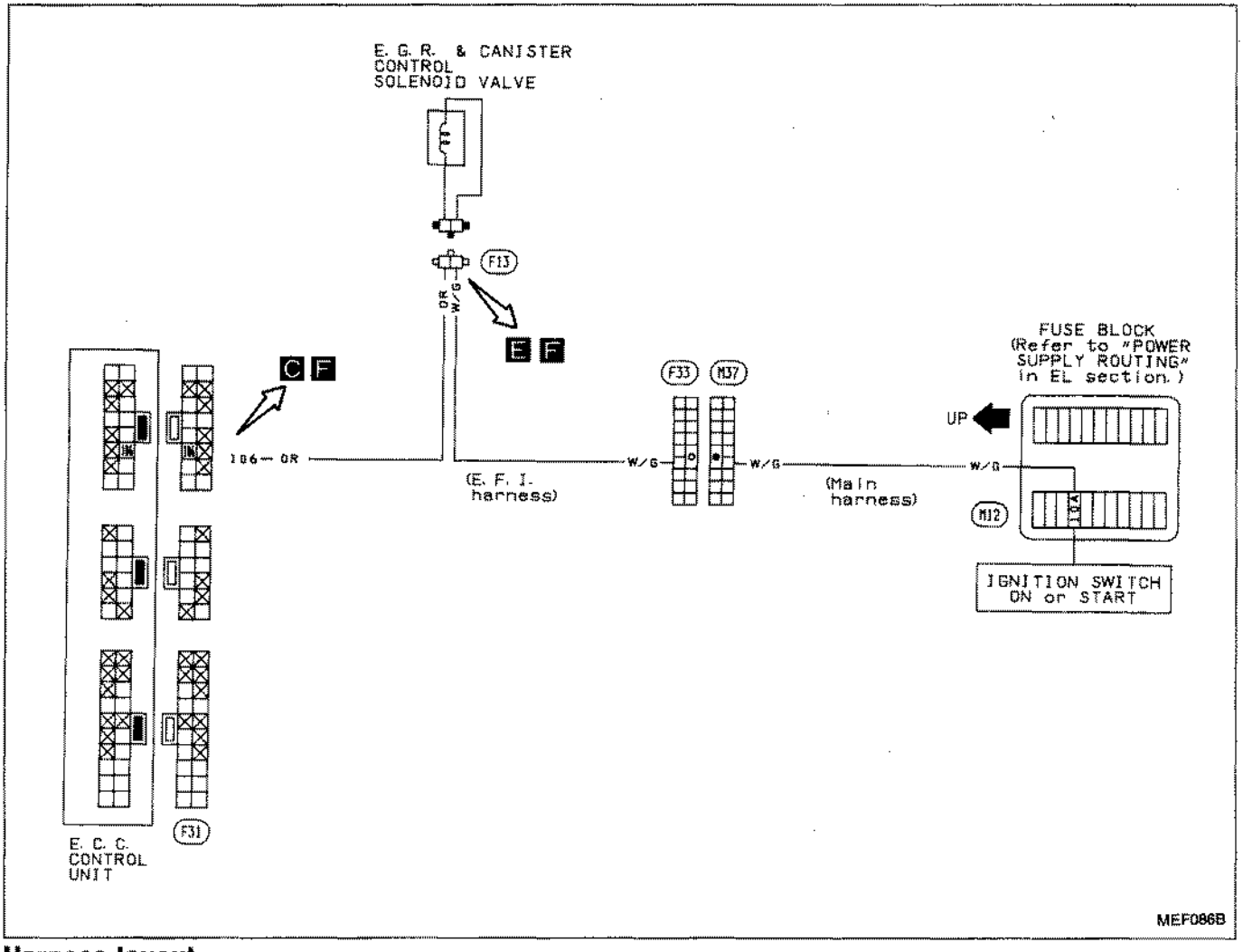
If N.G., repair harness or connectors.

O.K.

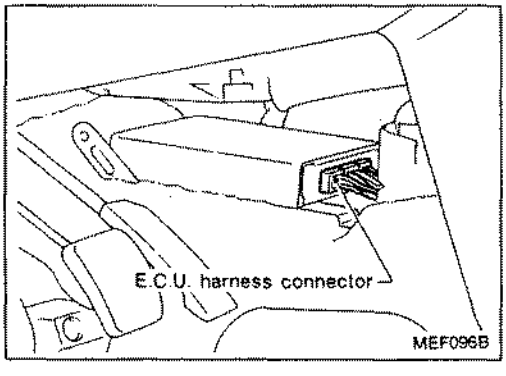
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

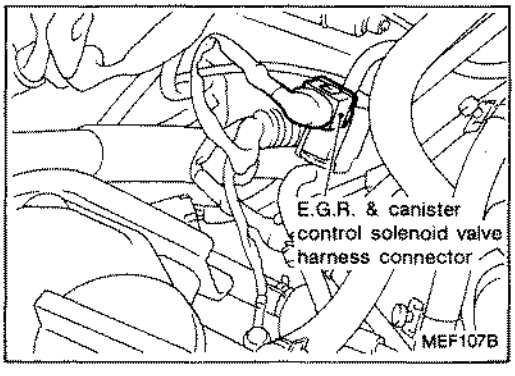
Diagnostic Procedure 10

E.G.R. & CANISTER CONTROL SOLENOID VALVE (Not self-diagnostic item)



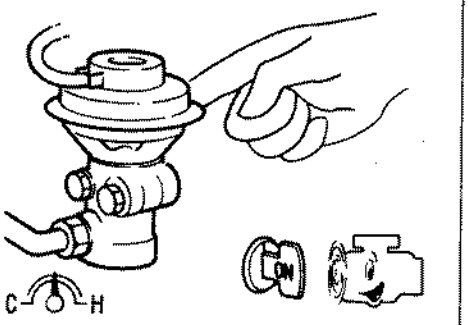
Harness layout





Diagnostic Procedure 10 (Cont'd)

A



SEF939I

INSPECTION START

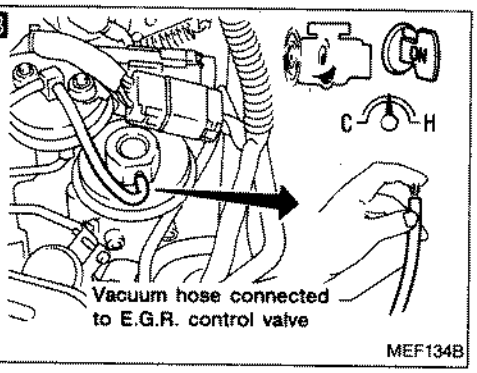
A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Stop engine and jack up drive wheels.
3) Disconnect boost pressure sensor harness connector.
4) Restart engine.
5) Shift selector lever to "1" position, and keep engine speed at about 3,000 rpm.
Make sure that E.G.R. control valve spring moves up and down. (Use your finger.)

O.K. → INSPECTION END

N.G.

B



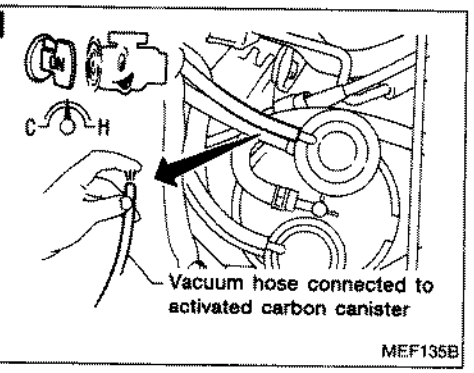
MEF134B

CHECK VACUUM SOURCE TO E.G.R. CONTROL VALVE AND ACTIVATED CARBON CANISTER.
1) Disconnect vacuum hose to E.G.R. control valve and activated carbon canister.
2) Make sure that vacuum exists under the following condition.
At idle (in "N" position):
Vacuum should not exist.
Engine speed is about 3,000 rpm (in "1" position):
Vacuum should exist.

O.K. → CHECK COMPONENTS
(E.G.R. control valve, B.P.T. valve and activated carbon canister).
Refer to "Electrical Components Inspection".
(See pages EF & EC-149, 196.)

N.G. → Replace malfunctioning component(s).

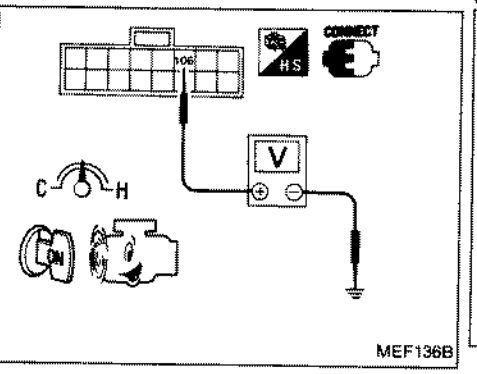
B



MEF135B

N.G.

C



MEF136B

CHECK CONTROL FUNCTION.
1) Check voltage between E.C.U. terminal (106) and ground under the following condition.
Voltage:
At idle (In "N" position)
Approximately 0.8V
Engine speed is about 3,000 rpm (In "1" position)
Battery voltage

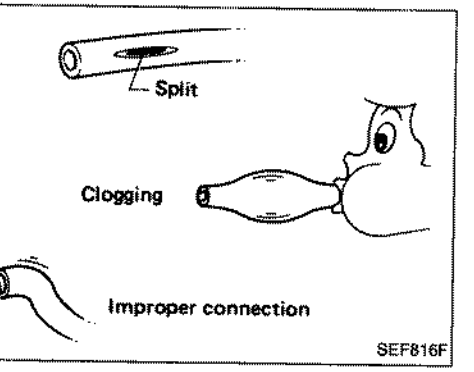
O.K. → D

D

Check vacuum hose for clogging cracks and proper connection.

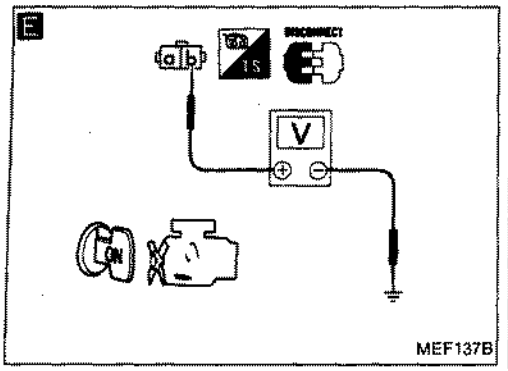
N.G. → (A)

D



SEF816F

Diagnostic Procedure 10 (Cont'd)



Ⓐ

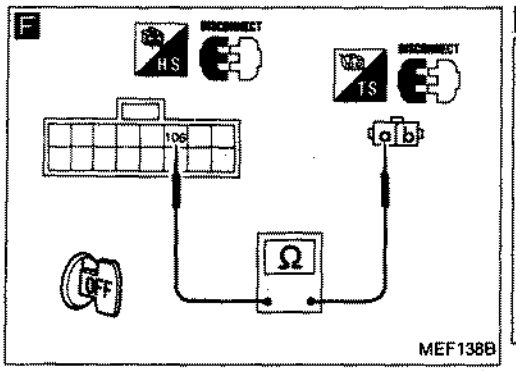
E

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect E.G.R. & canister control solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F33), (H37)
- 10A fuse
- Harness continuity between E.G.R. & canister control solenoid valve and fuse

If N.G., repair harness or connectors.

O.K. ↓



F

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (106) and terminal ⓐ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(E.G.R. & canister control solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-145.)

N.G. → Replace E.G.R. & canister control solenoid valve.

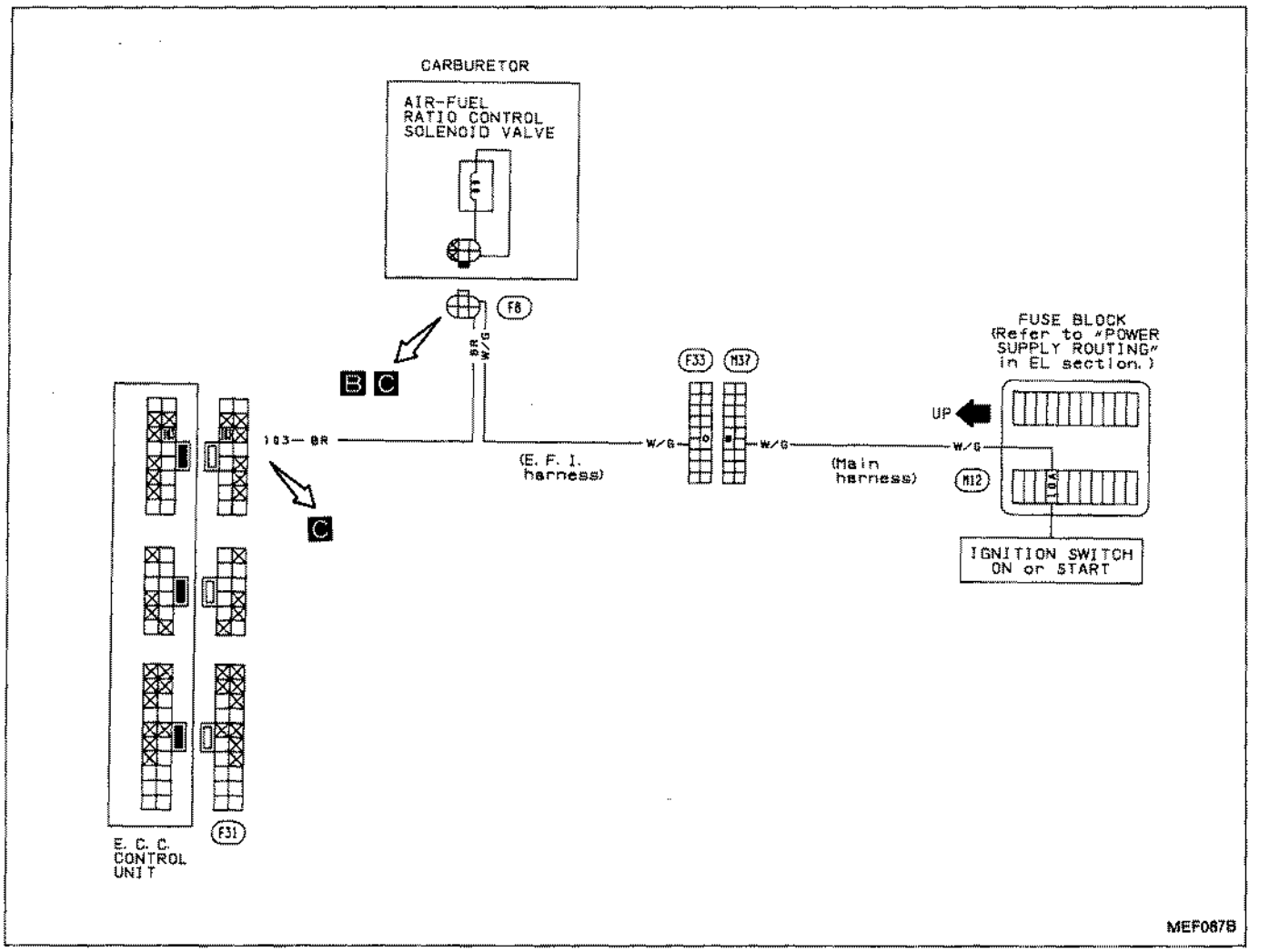
O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

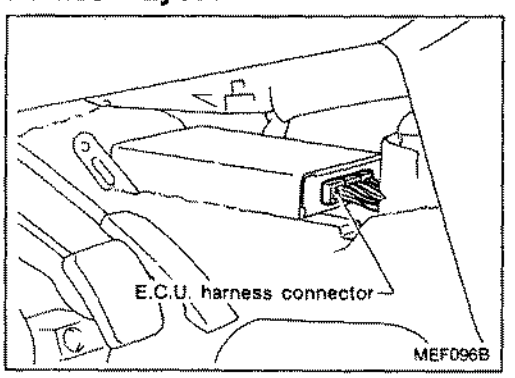
NOTE

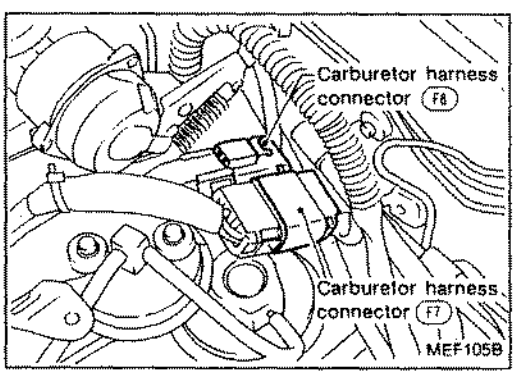
Diagnostic Procedure 11

AIR-FUEL RATIO CONTROL SOLENOID VALVE (Not self-diagnostic item)



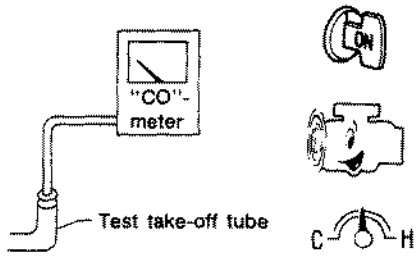
Harness layout





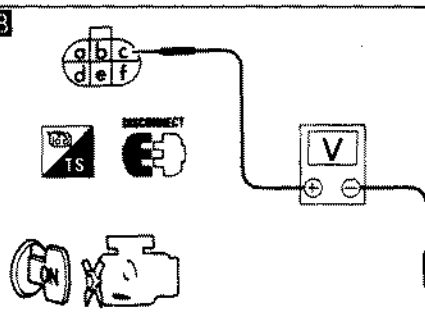
Diagnostic Procedure 11 (Cont'd)

A



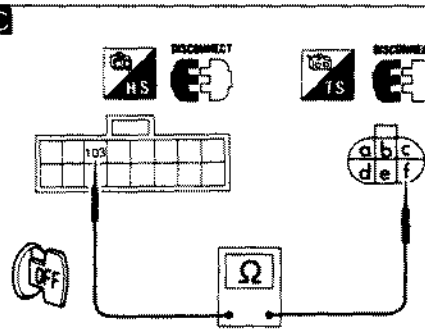
MEF180A

B



MEF181A

C



MEF182A

INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Inspect and adjust idle speed and mixture ratio. (Refer to page EF & EC-153.)
2) Stop engine.
3) Disconnect exhaust gas sensor harness connector and A.I.V. control solenoid valve harness connector.
4) Set "CO"-meter on test take-off tube.
5) Start engine and run it at idle.
6) Check idle "CO"%.
Idle "CO"%: 0.5 - 1.5% = α%
If N.G., adjust idle "CO"%. (Refer to page EF & EC-153.)
7) Disconnect carburetor harness connector (F8).
8) Recheck idle "CO"%.
Idle "CO"%: more than α%

O.K. → INSPECTION END

N.G.

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓒ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F33), (K17)
- 10A fuse
- Harness continuity between carburetor and fuse

If N.G., repair harness or connectors.

O.K.

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (103) and terminal ⓕ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT
(Air-fuel ratio control solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-147.)

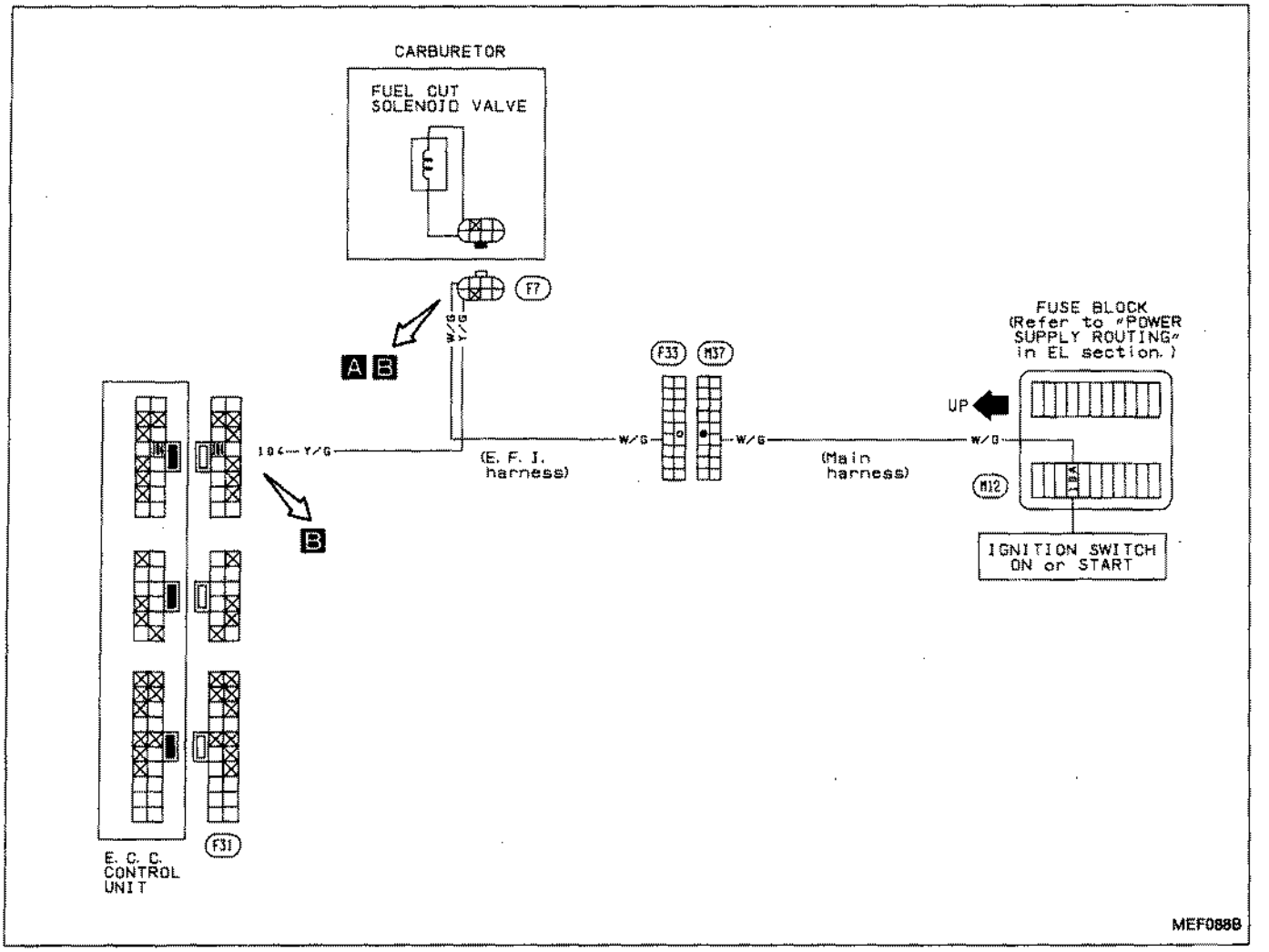
N.G. → Replace air-fuel ratio control solenoid valve.

O.K.

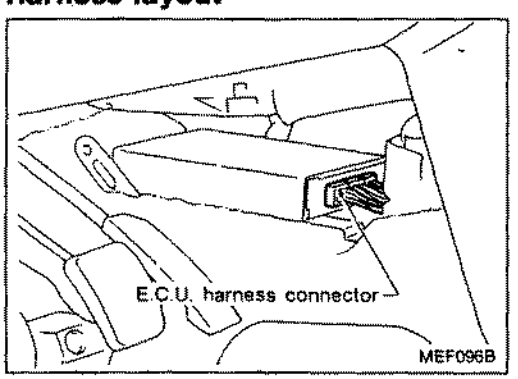
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

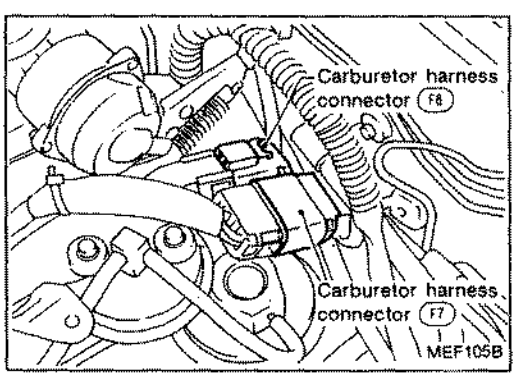
Diagnostic Procedure 12

FUEL CUT SOLENOID VALVE (Not self-diagnostic item)

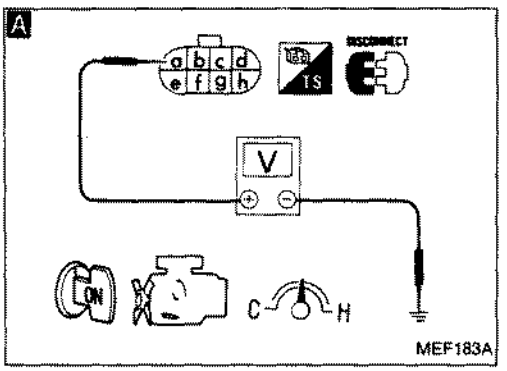


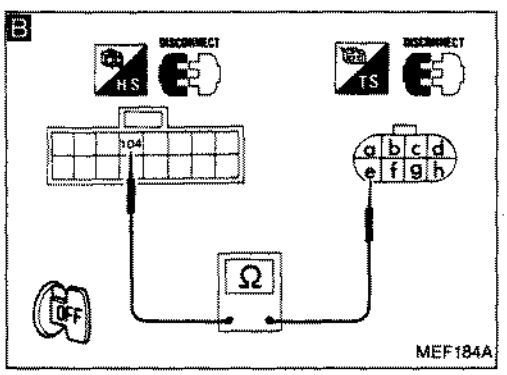
Harness layout





Diagnostic Procedure 12 (Cont'd)





INSPECTION START

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Stop engine.
3) Turn ignition switch "ON".
4) Listen to fuel cut solenoid valve operating sound.
Clicking noise should be heard.

O.K. → INSPECTION END

N.G. ↓

A

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect carburetor harness connector (F7).
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓖ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F35), (R37)
- 10A fuse
- Harness continuity between carburetor and fuse

If N.G., repair harness, fuse or connectors.

O.K. ↓

B

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (104) and terminal ⓔ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(Fuel cut solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-145.)

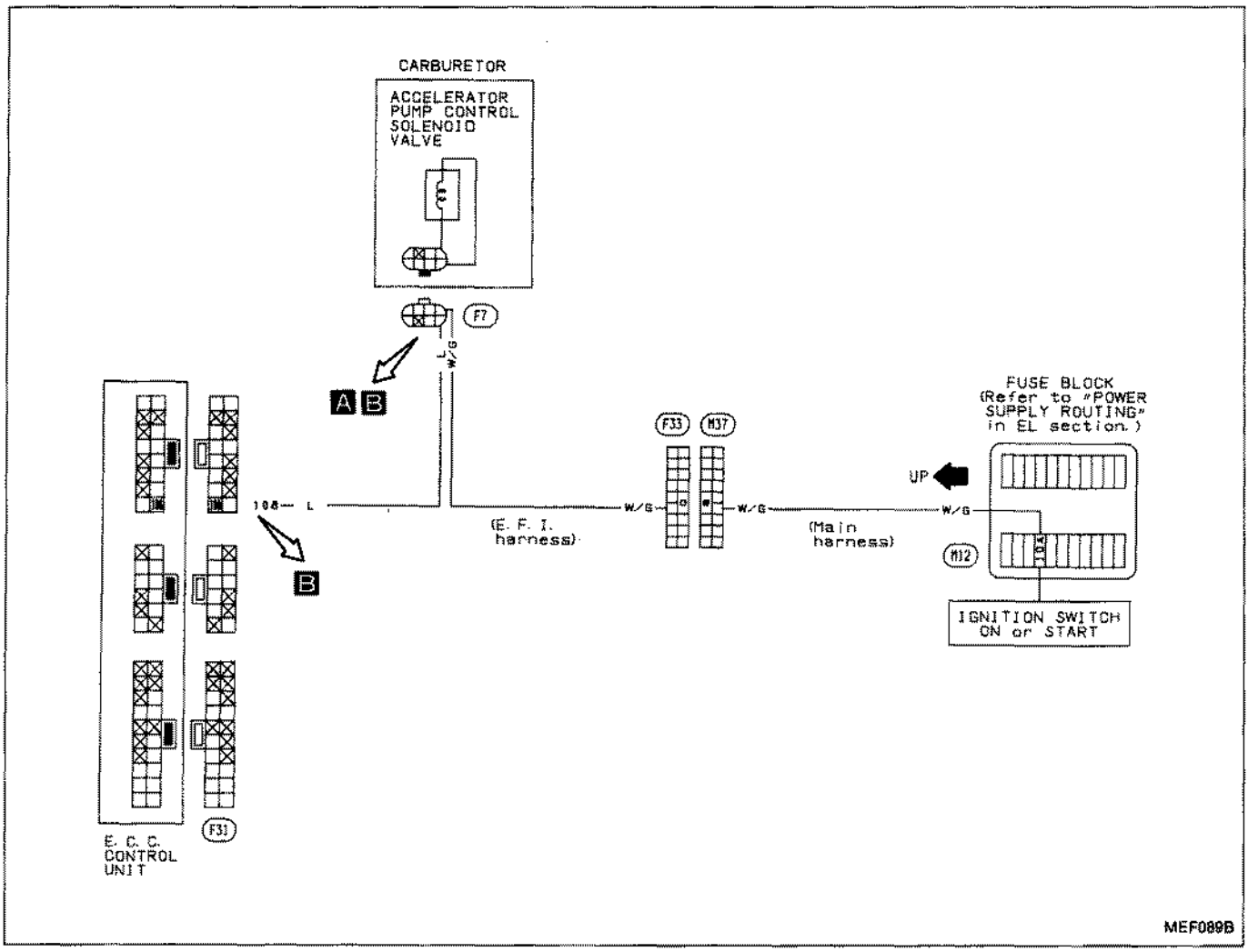
N.G. → Replace fuel cut solenoid valve.

O.K. ↓

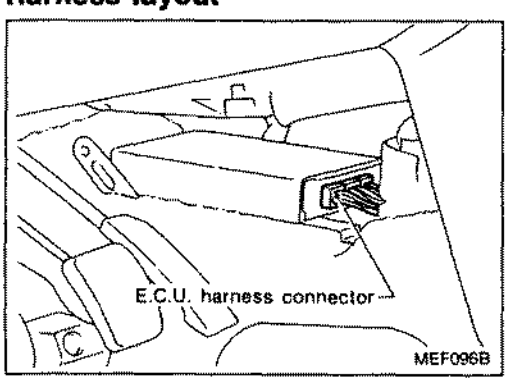
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

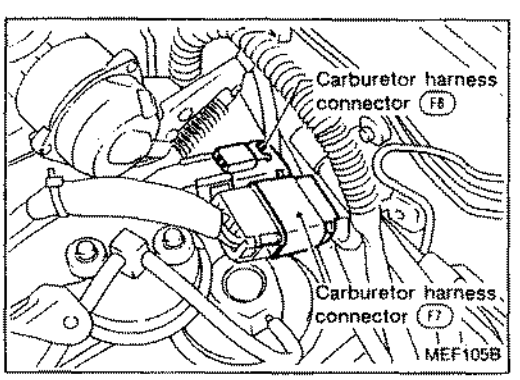
Diagnostic Procedure 13

ACCELERATOR PUMP CONTROL SOLENOID VALVE (Not self-diagnostic item)

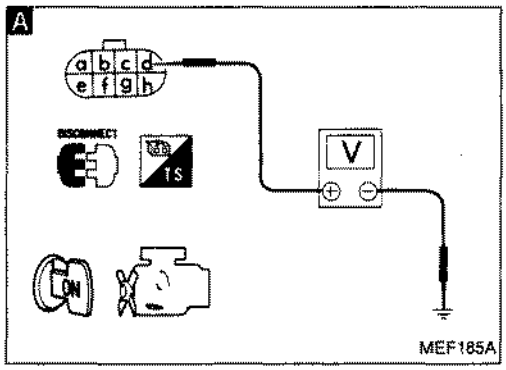


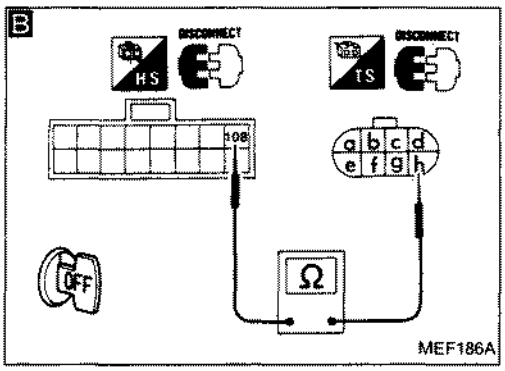
Harness layout





Diagnostic Procedure 13 (Cont'd)





INSPECTION START

CHECK OVERALL FUNCTION.
1) Make sure that engine is cold.
[Engine temperature is below 75°C (167°F) (2WD M/T models for Germany), 60°C (140°F) (Except 2WD M/T models for Germany).]
2) Turn ignition switch "ON".
3) Listen to accelerator pump control solenoid valve operating sound.
Clicking noise should be heard.

O.K. → INSPECTION END

N.G.

A

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect carburetor harness connector (F7).
3) Turn ignition switch "ON".
4) Check voltage between terminal (d) and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F33), (I37)
- 10A fuse
- Harness continuity between carburetor and fuse

If N.G., repair harness or connectors.

O.K.

B

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (108) and terminal (h).
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT
(Accelerator pump control solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-146.)

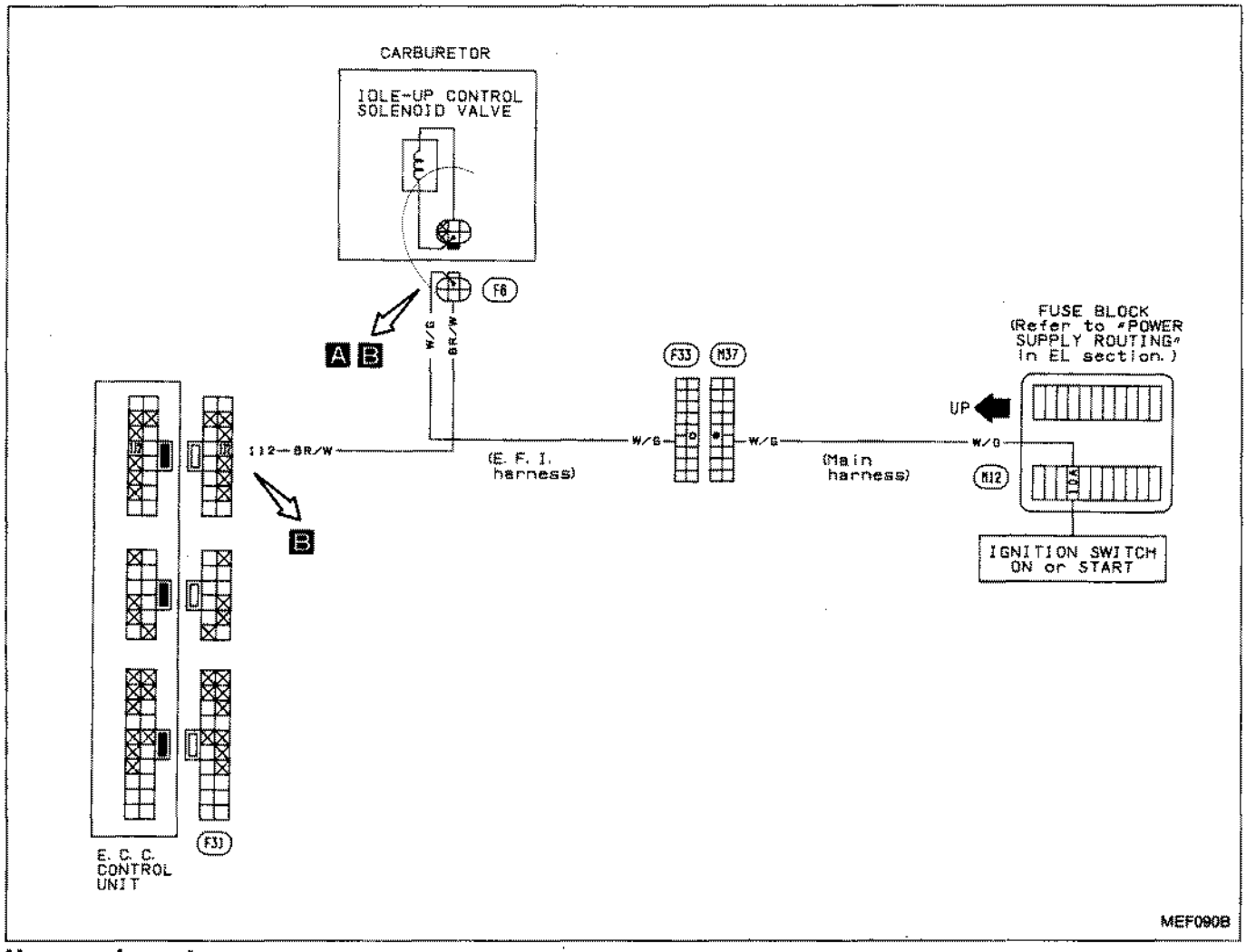
N.G. → Replace accelerator pump control solenoid valve.

O.K.

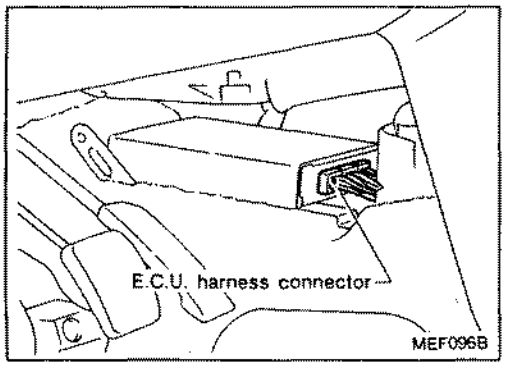
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

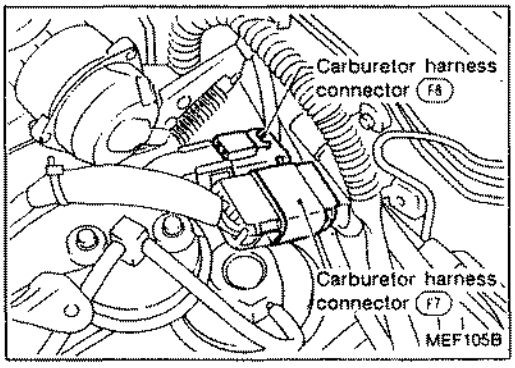
Diagnostic Procedure 14

IDLE-UP CONTROL SOLENOID VALVE (Not self-diagnostic item)



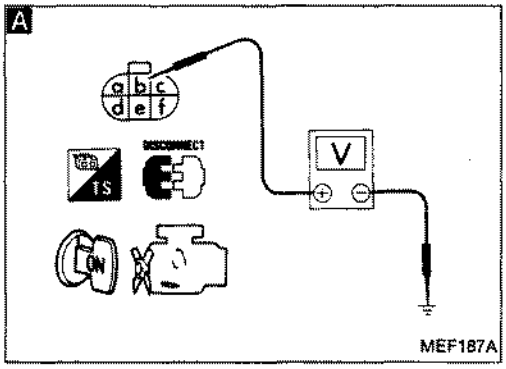
Harness layout





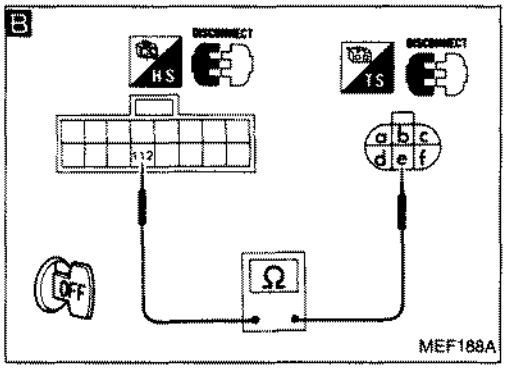
Diagnostic Procedure 14 (Cont'd)

A



MEF187A

B



MEF188A

INSPECTION START

CHECK OVERALL FUNCTION.
1) Make sure that engine is cold.
[Engine temperature is below 75°C (167°F).]
2) Turn ignition switch "ON".
3) Listen to idle-up control solenoid valve operating sound.
Clicking noise should be heard.

O.K. → INSPECTION END

N.G. ↓

A

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect carburetor harness connector (F8).
3) Turn ignition switch "ON".
4) Check voltage between terminal (b) and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F33), (R37)
- 10A fuse
- Harness continuity between carburetor and fuse

If N.G., repair harness, fuse or connectors.

O.K. ↓

B

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (12) and terminal (8).
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(Idle-up control solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-145.)

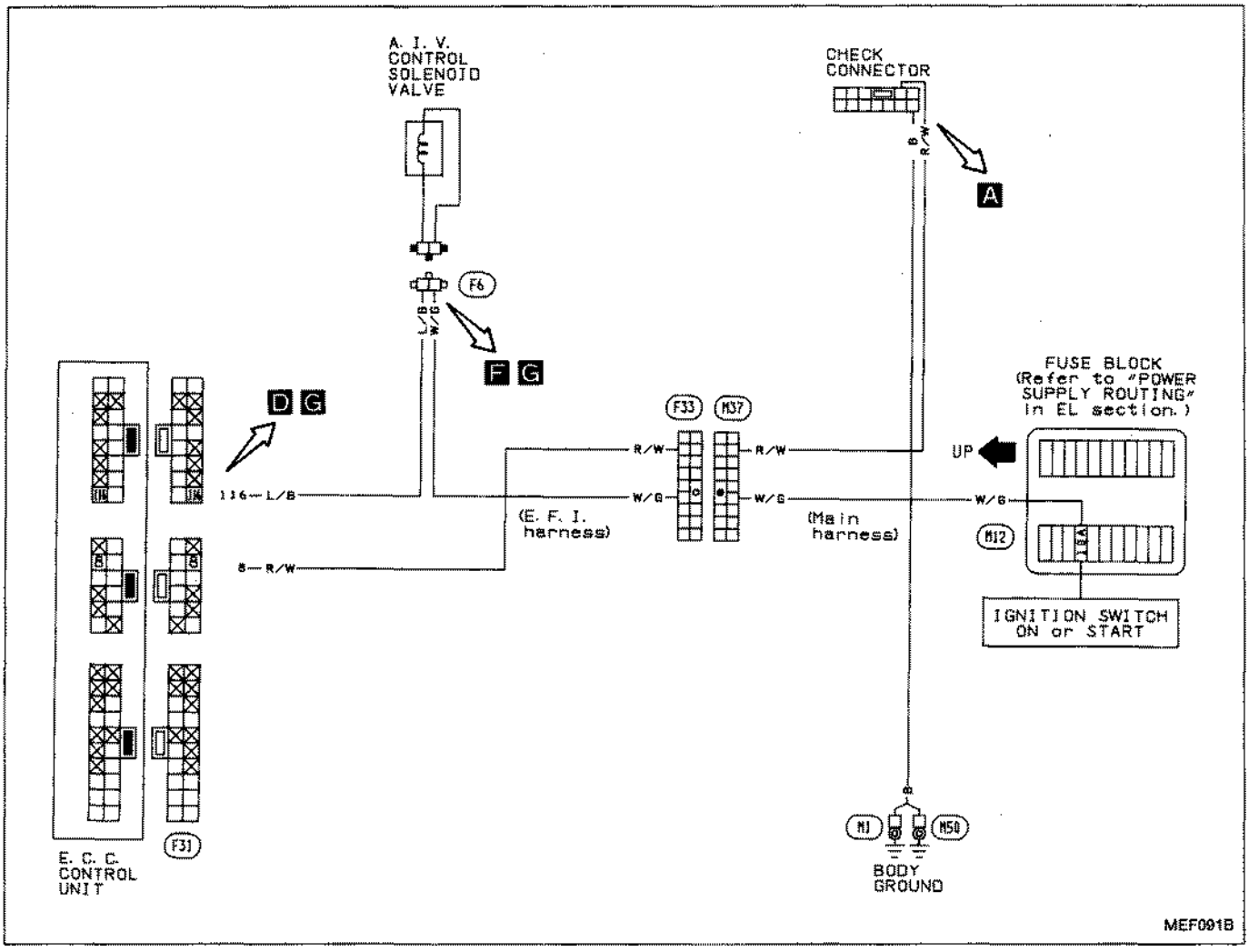
N.G. → Replace idle-up control solenoid valve.

O.K. ↓

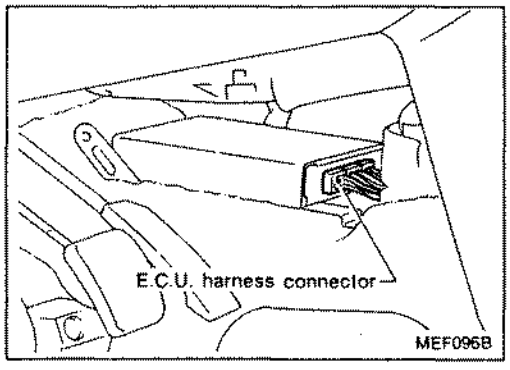
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

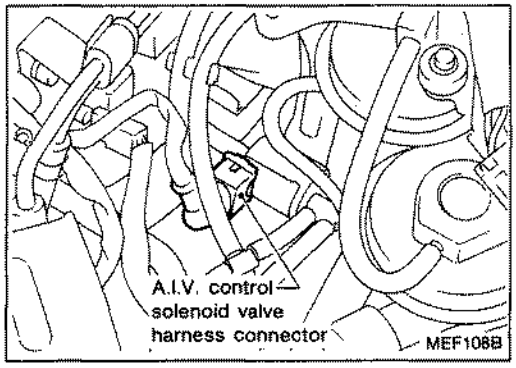
Diagnostic Procedure 15

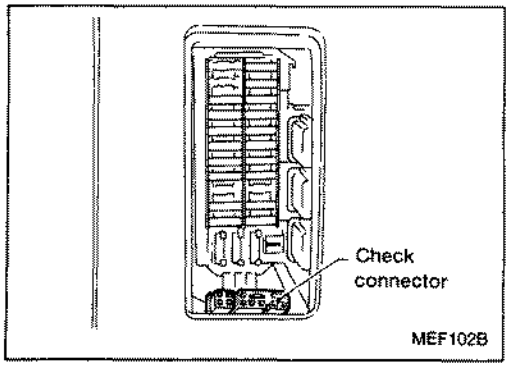
A.I.V. CONTROL SOLENOID VALVE (Not self-diagnostic item)



Harness layout

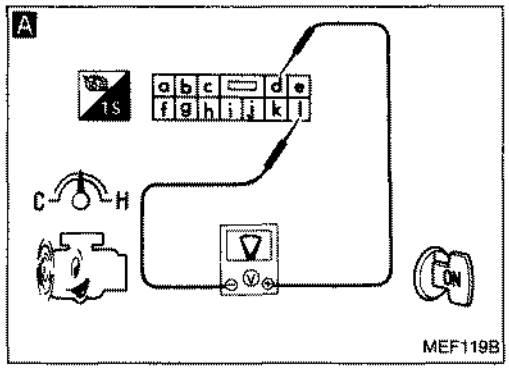






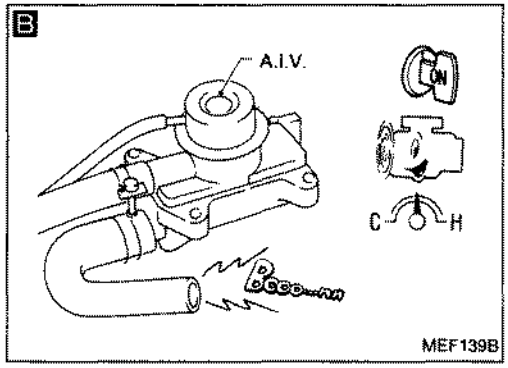
Diagnostic Procedure 15 (Cont'd)

A



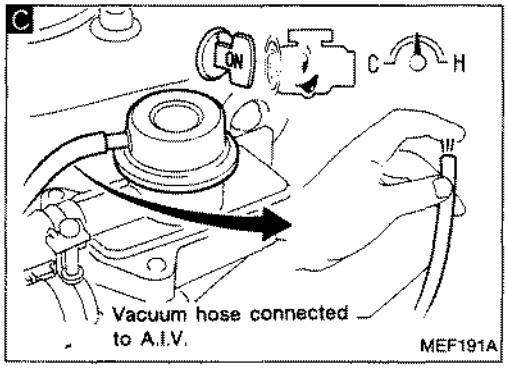
MEF119B

B



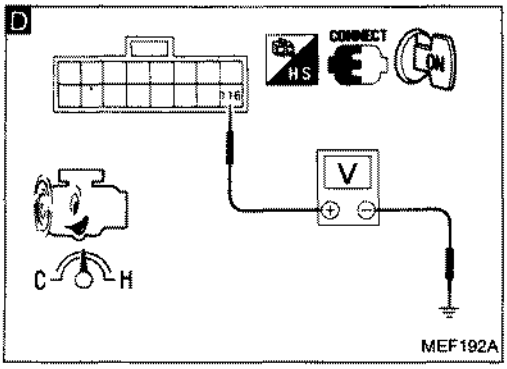
MEF139B

C



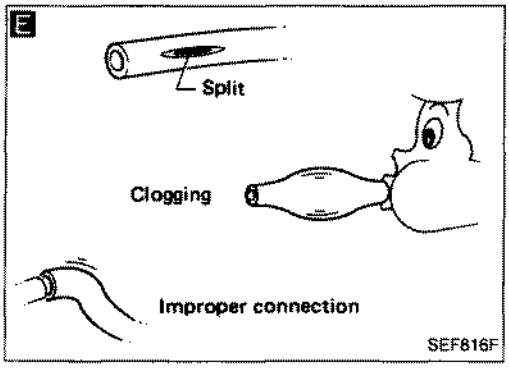
MEF191A

D



MEF192A

E



SEF816F

INSPECTION START

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Run engine at about 2,500 rpm for about 5 minutes under no-load.

A 3) Keep engine speed at 2,000 rpm under no-load, check voltage between terminal ⑱ and terminal ① on check connector. Make sure that needle of voltmeter fluctuates between approximately 0V and battery voltage more than 5 times during 10 seconds.
If N.G., go to Diagnostic Procedure 5.

4) Release accelerator pedal fully, and run engine at idle.

B 5) Listen to A.I.V. operating sound.
At idle:
A.I.V. should operate.
Except at idle:
A.I.V. should not operate.

O.K. → INSPECTION END

C N.G.

CHECK VACUUM SOURCE TO A.I.V.
1) Disconnect vacuum hose to A.I.V.
2) Make sure that vacuum exists under the following conditions.
At idle:
Vacuum should exist.
Except at idle:
Vacuum should not exist.

N.G. → CHECK COMPONENT (A.I.V.).
Refer to "Electrical Components Inspection".
(See page EF & EC-148.)

D O.K.

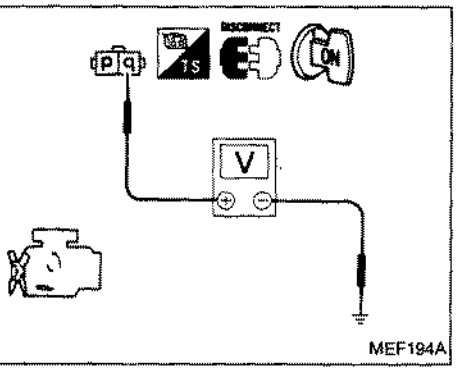
CHECK CONTROL FUNCTION.
1) Check voltage between E.C.U. terminal ⑯ and ground.
Voltage:
At idle
Approximately 0.8V
Except at idle
Battery voltage

N.G. → E
CHECK VACUUM HOSE.
Check vacuum hose for clogging, cracks and proper connection.

O.K.
Ⓐ

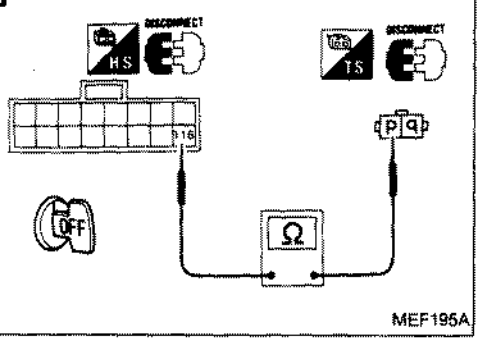
Diagnostic Procedure 15 (Cont'd)

F



MEF194A

G



MEF195A

Ⓐ

F

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect A.I.V. control solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal Ⓠ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F33), (M57)
- 10A fuse
- Harness continuity between A.I.V. control solenoid valve and fuse

If N.G., repair harness, fuse or connectors.

O.K. ↓

G

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (16) and terminal Ⓟ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(A.I.V. control solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-145.)

N.G. → Replace A.I.V. control solenoid valve.

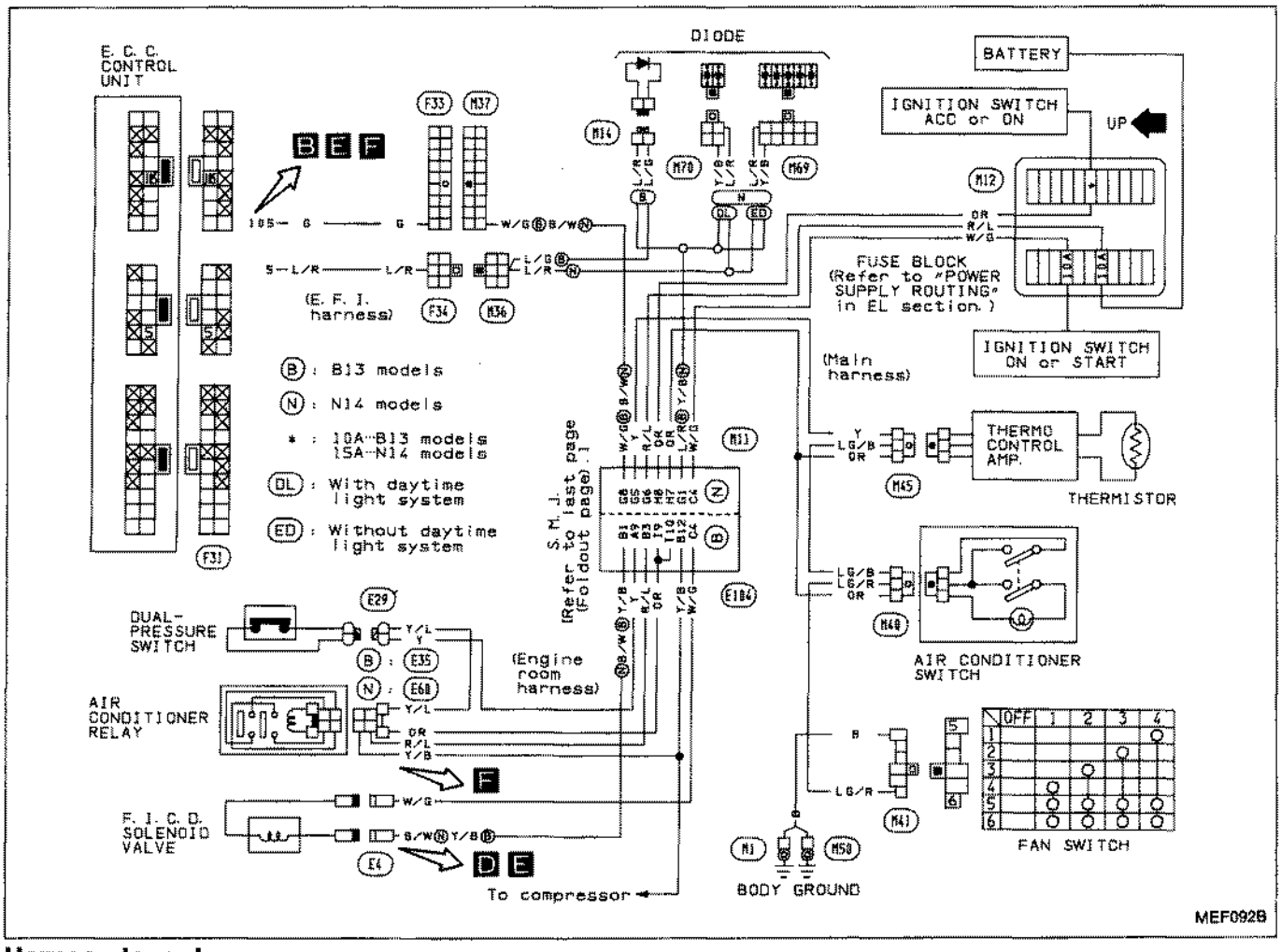
O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

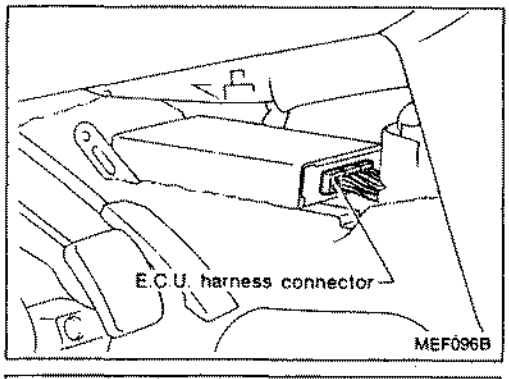
NOTE

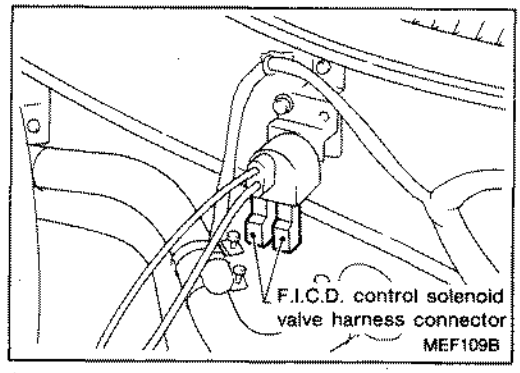
Diagnostic Procedure 16

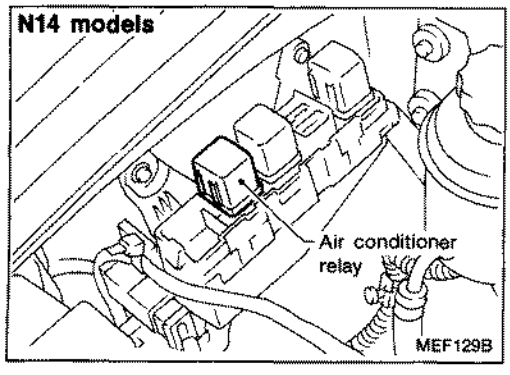
F.I.C.D. CONTROL SOLENOID VALVE (Not self-diagnostic item)

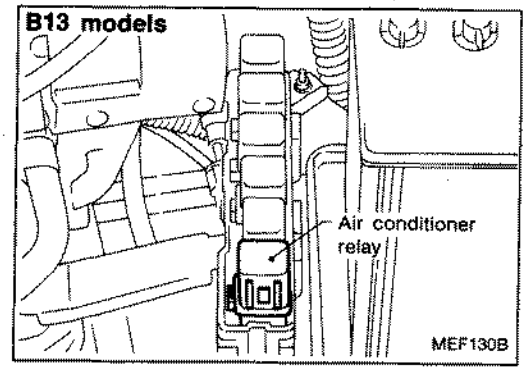


Harness layout

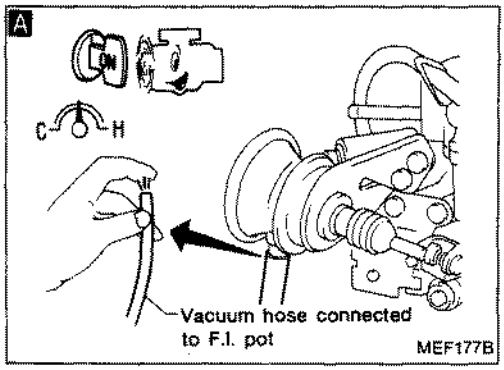


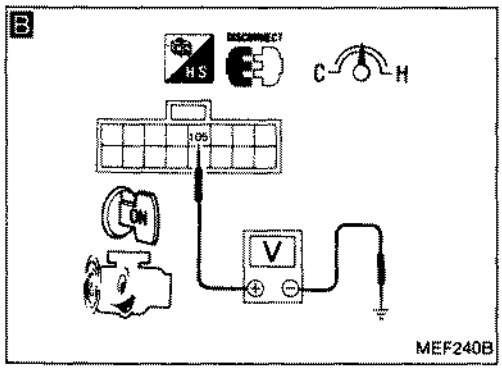


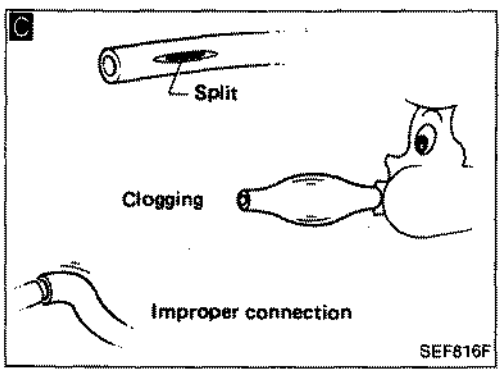


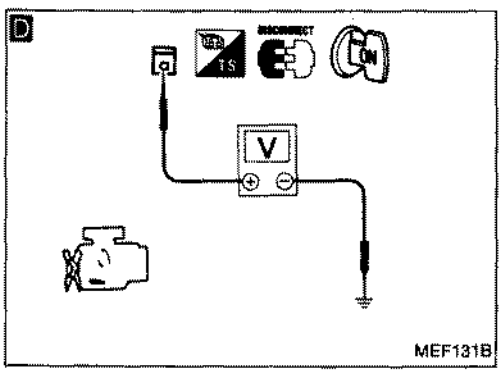


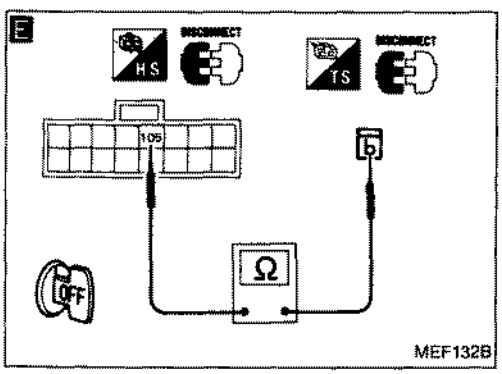
Diagnostic Procedure 16 (Cont'd)











INSPECTION START

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check idle speed.
M/T: 750 ± 50 rpm
A/T: 850 ± 50 rpm
If N.G., adjust idle speed.
3) Turn both air conditioner switch and blower fan switch "ON", then recheck idle speed.
M/T: 850 ± 50 rpm
A/T: 850 ± 50 rpm

O.K. → INSPECTION END

N.G.

Check if air conditioner compressor functions normally.

N.G. → Refer to HA section.

O.K.

A

CHECK VACUUM SOURCE TO F.I. POT
1) Disconnect vacuum hose to F.I. pot.
2) Make sure that vacuum exists under the following condition.
At conditioner switch "OFF":
Vacuum should not exist.
Air conditioner switch "ON":
Vacuum should exist.

O.K. → CHECK COMPONENTS (F.I. pot).
Refer to "Electrical Components Inspection".
(See page EF & EC-149.)

N.G. → Replace F.I. pot.

N.G.

B

CHECK CONTROL FUNCTION.
1) Check voltage between E.C.U. terminal (105) and ground under the following condition.
Voltage:
At conditioner switch "OFF".
Battery voltage
Air conditioner switch "ON"
Approximately 0V

O.K. → C
Check vacuum hose for clogging cracks and proper connection.

N.G.

D

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect F.I.C.D. control solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

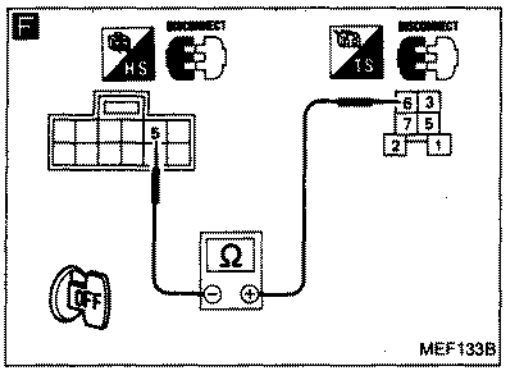
N.G. → Check the following.
- Harness connectors (M11), (E104)
- 10A fuse
- Harness continuity between F.I.C.D. control solenoid valve and fuse

If N.G., repair harness or connectors.

O.K.

Ⓐ

Diagnostic Procedure 16 (Cont'd)



Ⓐ

E

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (105) and terminal (b).
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F33), (M37)
- Harness connectors (M11), (E184)
- Harness continuity between E.C.U. and F.I.C.D. control solenoid valve

If N.G., repair harness or connectors.

O.K. ↓

F

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect air conditioner relay.
2) Check harness continuity between E.C.U. terminal (5) and terminal (6).
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F34), (M36)
- Harness connectors (M11), (E184)
- Diode (M70) (N14 models with daytime light system)
- Diode (M69) (N14 models without daytime light system)
- Diode M14 (B13 models)
- Harness continuity between E.C.U. and air conditioner relay

If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(F.I.C.D. control solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-149.)

N.G. → Replace F.I.C.D. control solenoid valve.

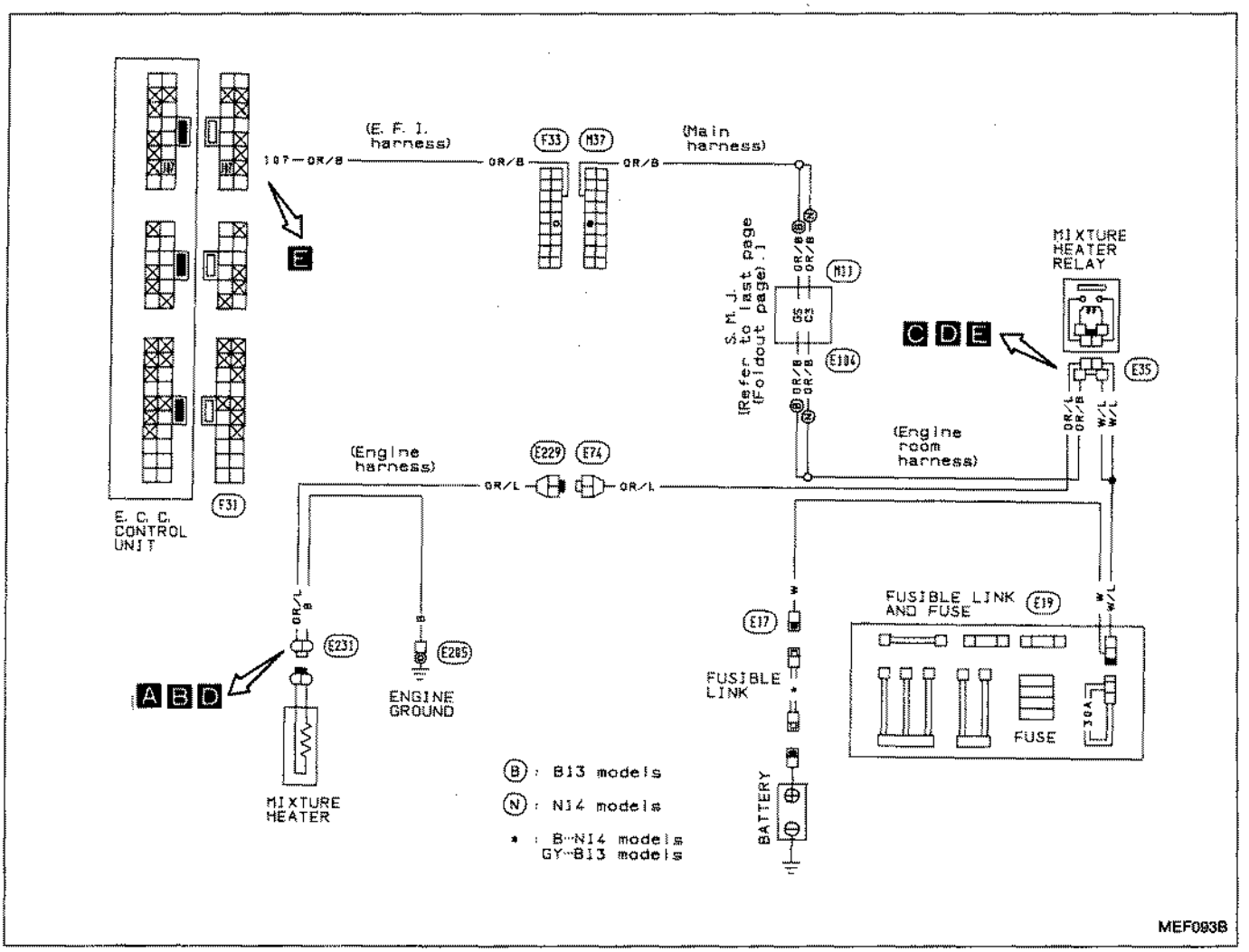
O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

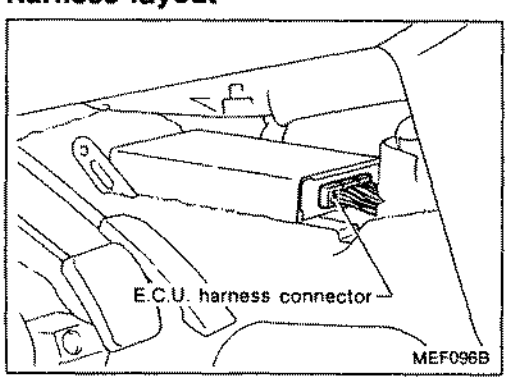
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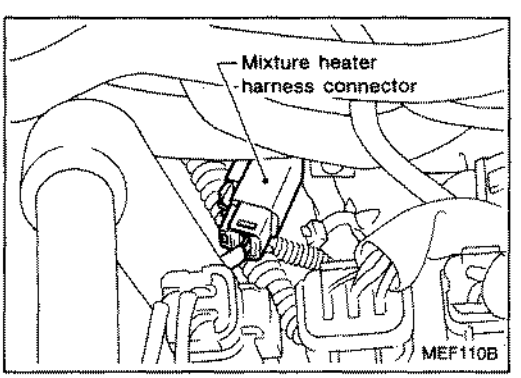
Diagnostic Procedure 17

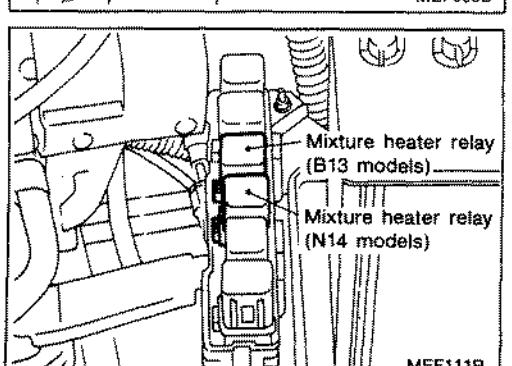
MIXTURE HEATER CONTROL (Not self-diagnostic item)



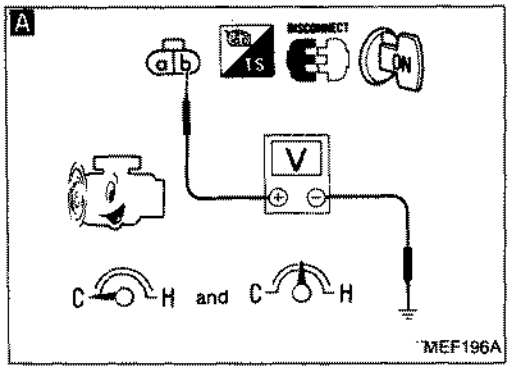
Harness layout

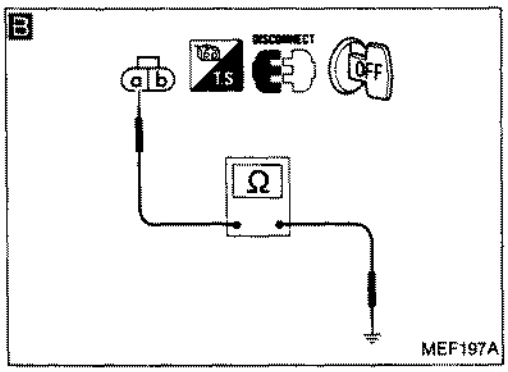


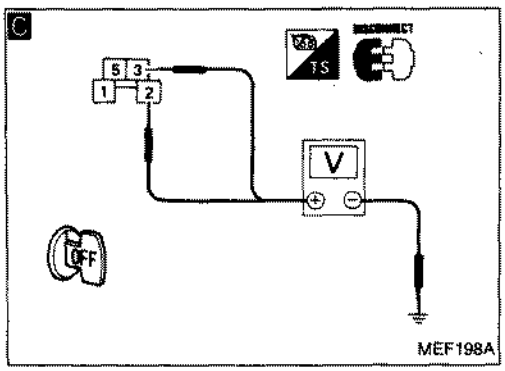


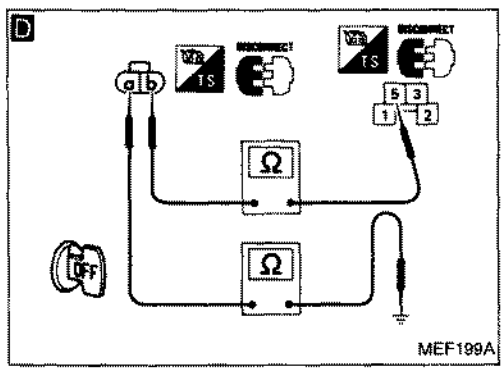


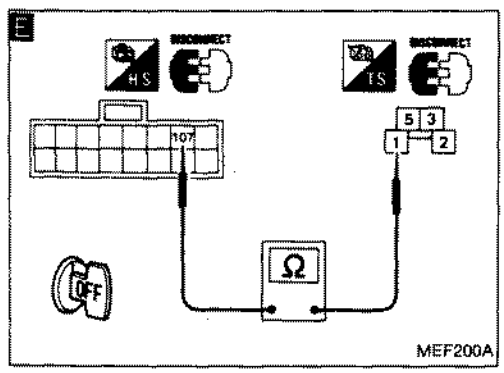
Diagnostic Procedure 17 (Cont'd)











INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Make sure that engine is cold.
[Engine temperature is below 75°C (167°F).]
2) Disconnect mixture heater harness connector.
3) Start engine.
4) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage
5) After engine is warmed up sufficiently, recheck voltage between terminal ⓑ and ground.
Voltage: Approximately 0V

O.K. → **B**

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Check harness continuity between terminal ⓖ and engine ground.
Continuity should exist.
If N.G., repair harness or connectors.

O.K.

CHECK COMPONENT (Mixture heater).
Refer to "Electrical Components Inspection".
(See page EF & EC-146.)
If N.G., replace mixture heater.

O.K.

INSPECTION END

N.G.

C

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect mixture heater relay.
3) Check voltage between terminals ② , ③ and ground.
Voltage: Battery voltage

N.G.

Check the following.
- 30A fusible link
- "GY" fusible link
- Harness continuity between mixture heater relay and battery

If N.G., repair harness, fusible link or connectors.

O.K.

D

CHECK GROUND CIRCUIT.
1) Check harness continuity between terminal ⑤ and terminal ⓑ, terminal ⓖ and engine ground.
Continuity should exist.

N.G.

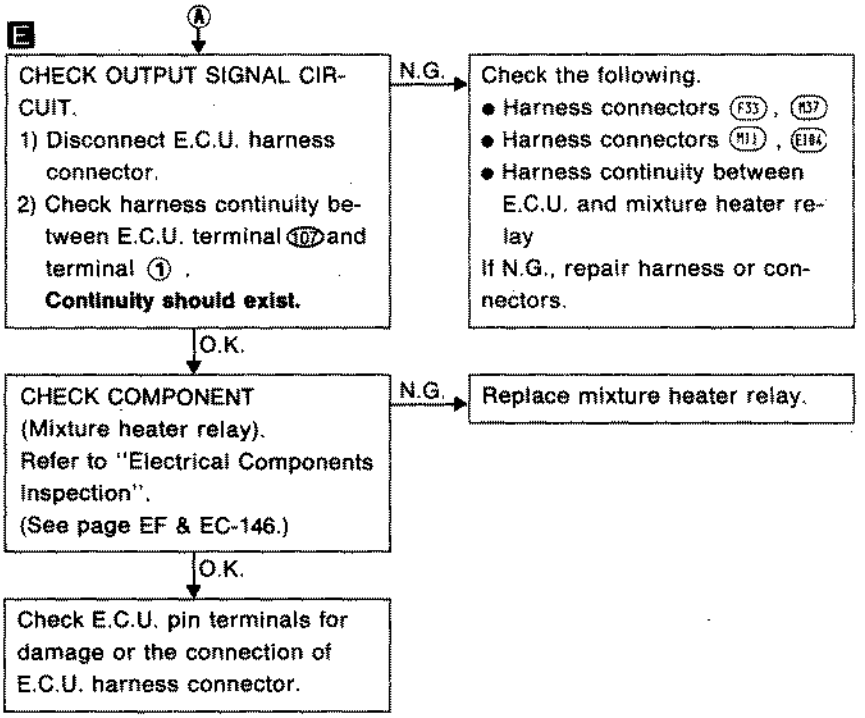
Check the following.
- Harness connectors E74 , E279
- Harness continuity between mixture heater and mixture heater relay
- Harness continuity between mixture heater and engine ground

If N.G., repair harness or connectors.

O.K.

Ⓐ

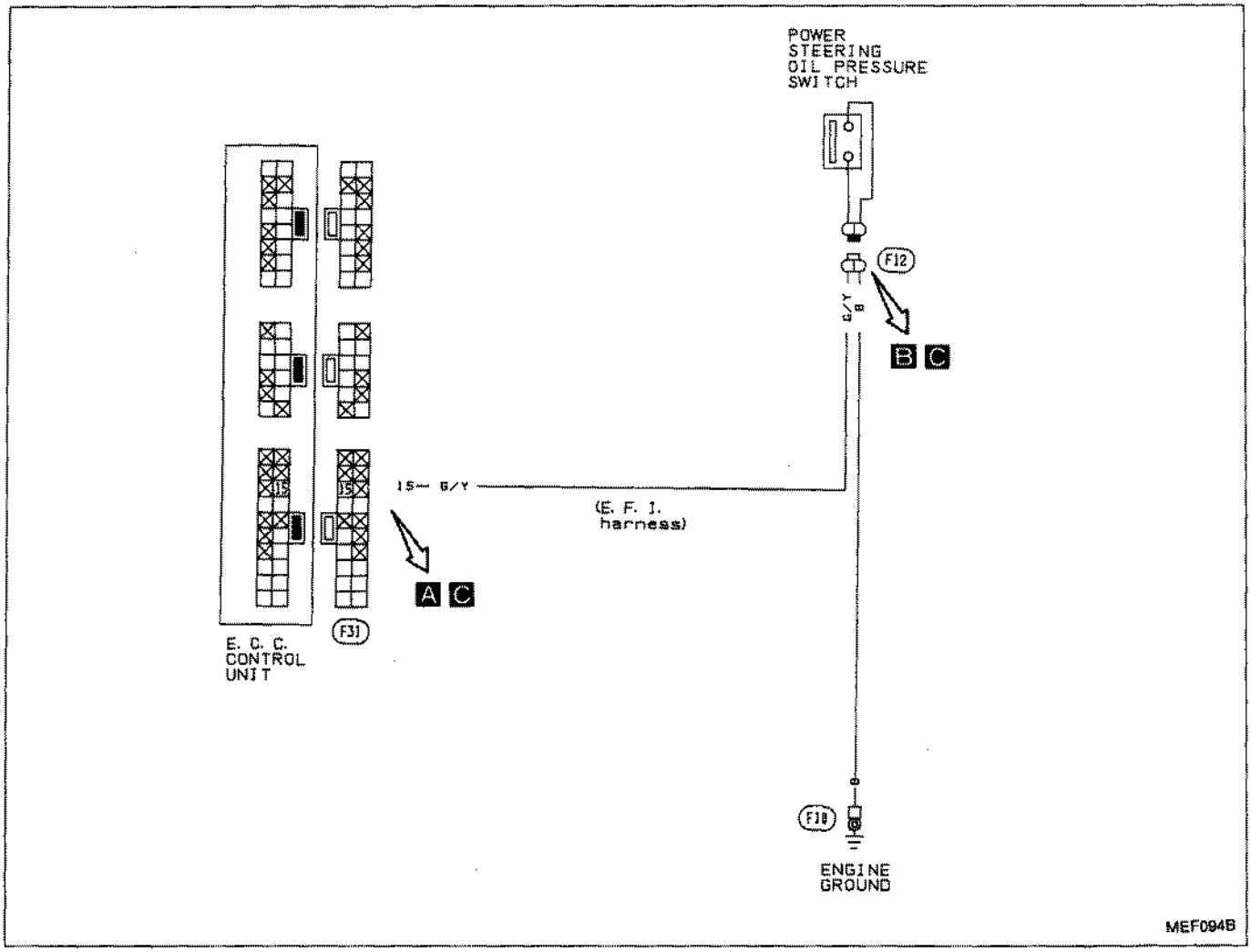
Diagnostic Procedure 17 (Cont'd)



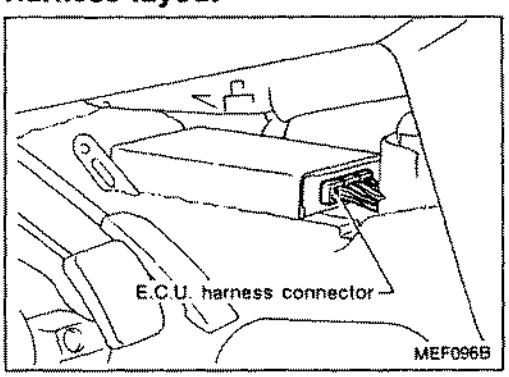
NOTE

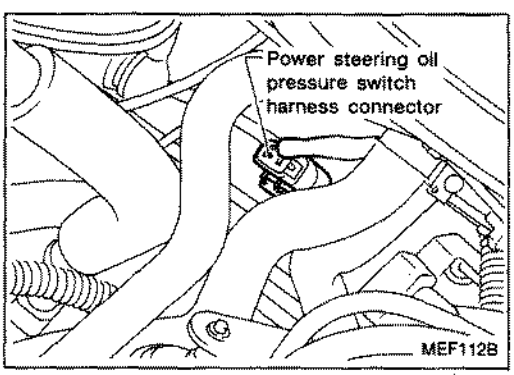
Diagnostic Procedure 18

POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)

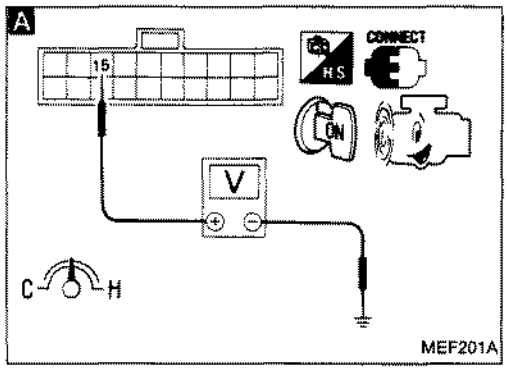


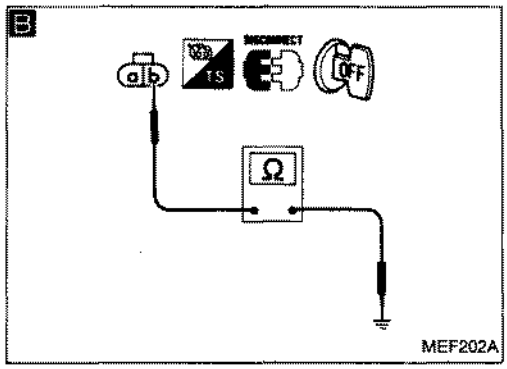
Harness layout

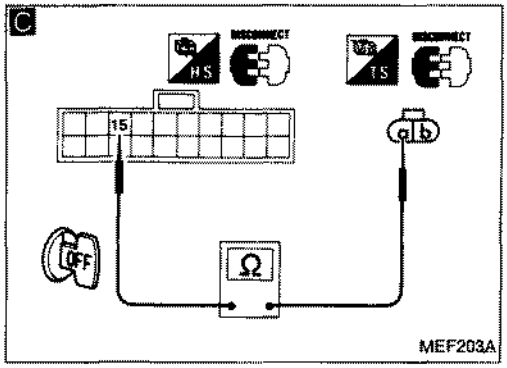




Diagnostic Procedure 18 (Cont'd)







INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check voltage between E.C.U. terminal ⑮ and ground under the following conditions.

Voltage:
When steering wheel is turned quickly.
Approximately 0V
Except above
Approximately 11V

O.K. → INSPECTION END

N.G. ↓

B

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect power steering oil pressure switch harness connector.
3) Check harness continuity between terminal ⓑ and engine ground.

Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ⑮ and terminal ⓐ.

Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(Power steering oil pressure switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-146.)

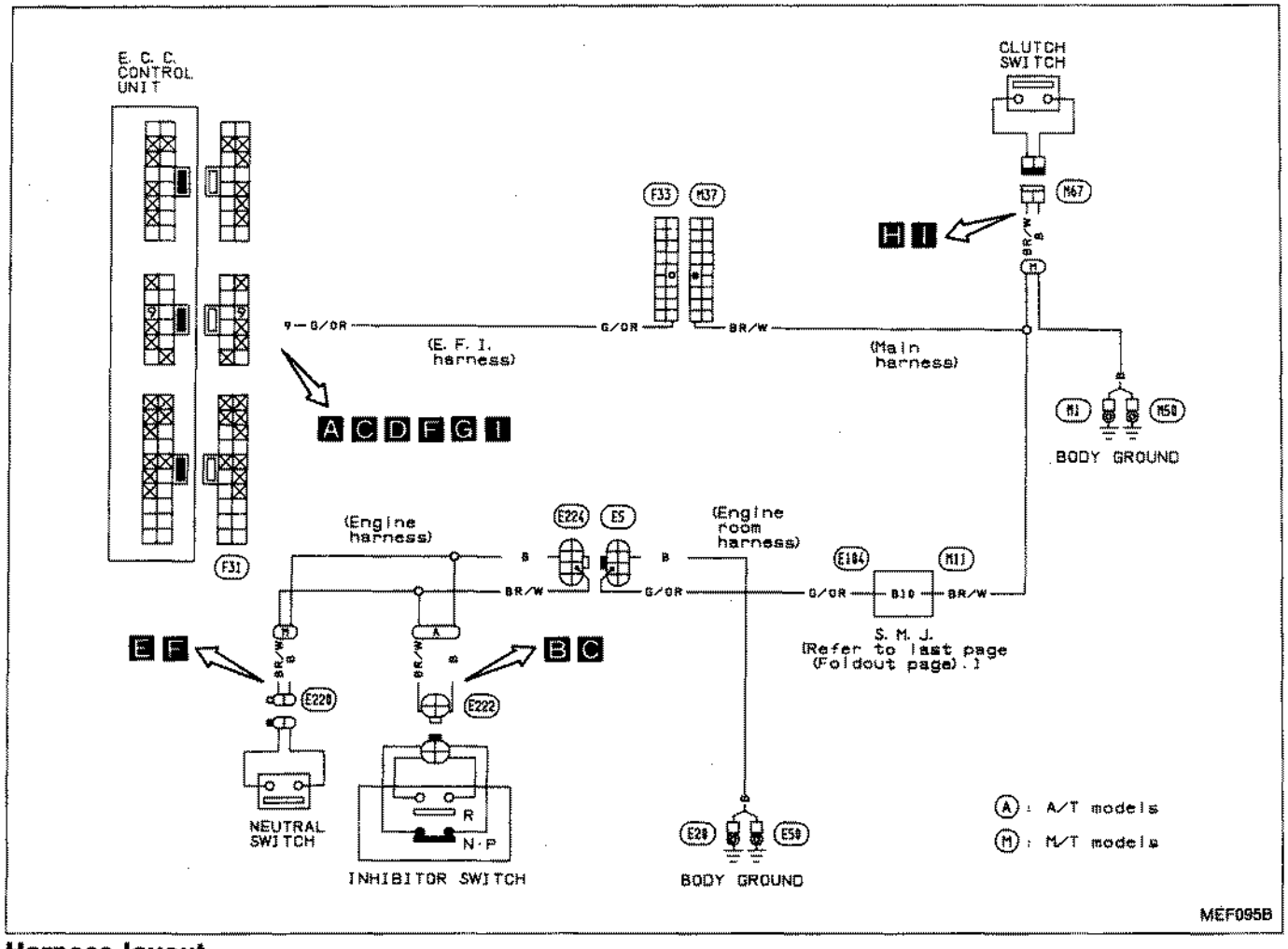
N.G. → Replace power steering oil pressure switch.

O.K. ↓

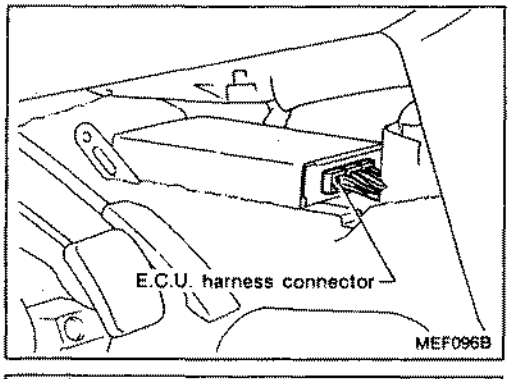
Check E.C.U. pin terminals for damage or the connection of the E.C.U. harness connector.

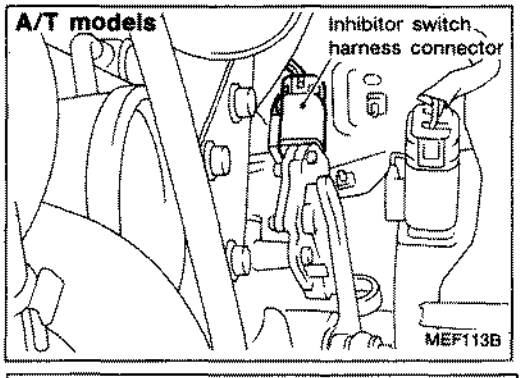
Diagnostic Procedure 19

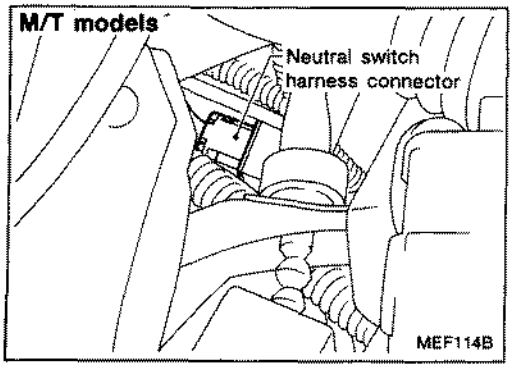
INHIBITOR/NEUTRAL/CLUTCH SWITCH (Not self-diagnostic item)

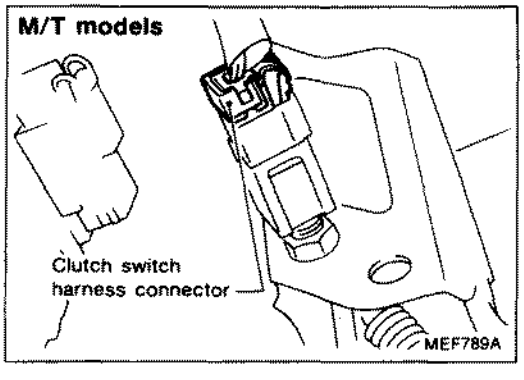


Harness layout

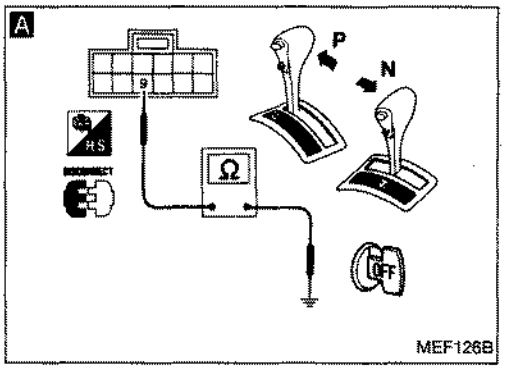


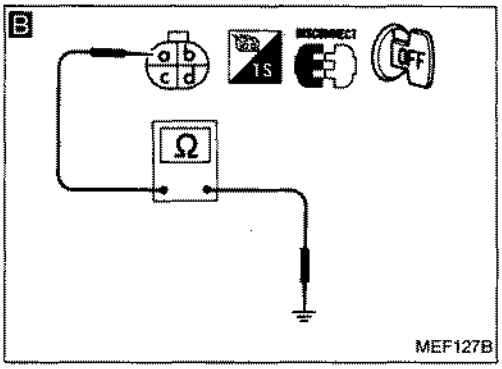


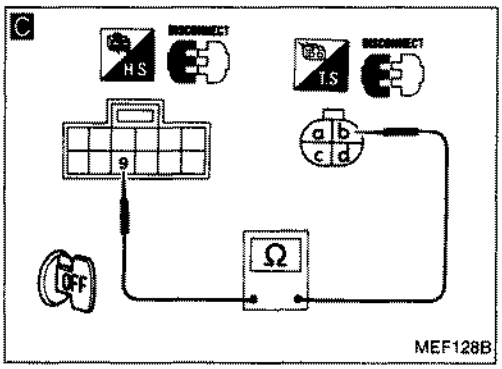




Diagnostic Procedure 19 (Cont'd)







Inhibitor switch

INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Shift selector lever to "P" position.
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal ⑨ and body ground.
Continuity should exist.
4) Shift selector lever to "N" position.
5) Check harness continuity between E.C.U. terminal ⑨ and body ground.
Continuity should exist.

O.K. → INSPECTION END

N.G.

B

CHECK GROUND CIRCUIT.
1) Disconnect inhibitor switch harness connector.
2) Check harness continuity between terminal ⓐ and body ground.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (E224), (E5)
- Harness continuity between inhibitor switch and body ground

If N.G., repair harness or connectors.

O.K.

C

CHECK INPUT SIGNAL CIRCUIT.
1) Check harness continuity between E.C.U. terminal ⑨ and terminal ⓑ.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F33), (M37)
- Harness connectors (M11), (E104)
- Harness connectors (E5), (E224)
- Harness continuity between E.C.U. and inhibitor switch

If N.G., repair harness or connectors.

O.K.

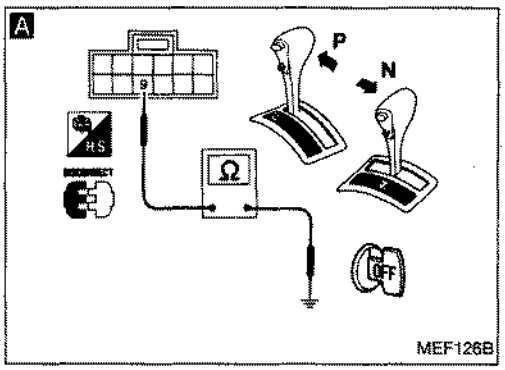
CHECK COMPONENT (Inhibitor switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-143.)

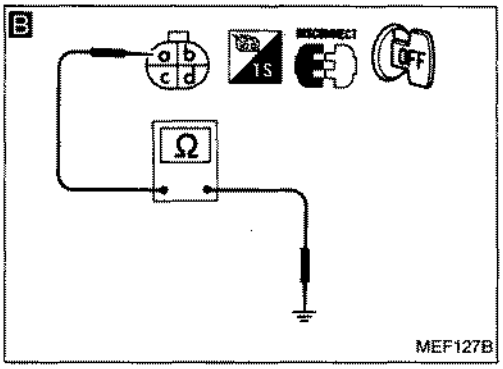
N.G. → Replace inhibitor switch.

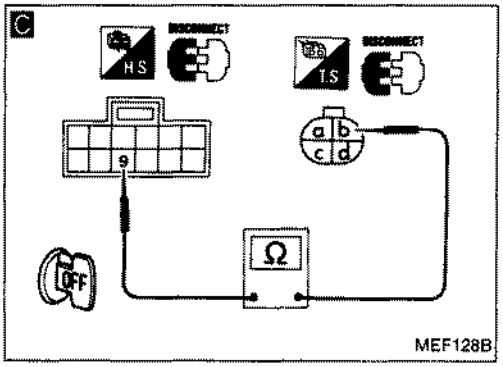
O.K.

Check E.C.U. pin terminals for damage or connection of E.C.U. harness connector.

Diagnostic Procedure 19 (Cont'd)







Inhibitor switch

INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Shift selector lever to "P" position.
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal ⑨ and body ground.
Continuity should exist.
4) Shift selector lever to "N" position.
5) Check harness continuity between E.C.U. terminal ⑨ and body ground.
Continuity should exist.

O.K. → INSPECTION END

N.G. ↓

B

CHECK GROUND CIRCUIT.
1) Disconnect inhibitor switch harness connector.
2) Check harness continuity between terminal ⓓ and body ground.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (E224), (E5)
- Harness continuity between inhibitor switch and body ground

If N.G., repair harness or connectors.

O.K. ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1) Check harness continuity between E.C.U. terminal ⑨ and terminal ⓑ.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F33), (K57)
- Harness connectors (M11), (E184)
- Harness connectors (E5), (E224)
- Harness continuity between E.C.U. and inhibitor switch

If N.G., repair harness or connectors.

O.K. ↓

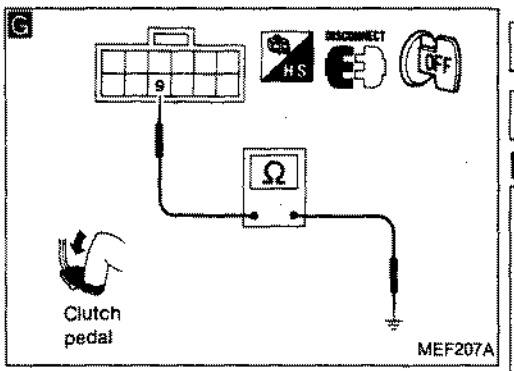
CHECK COMPONENT
(Inhibitor switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-143.)

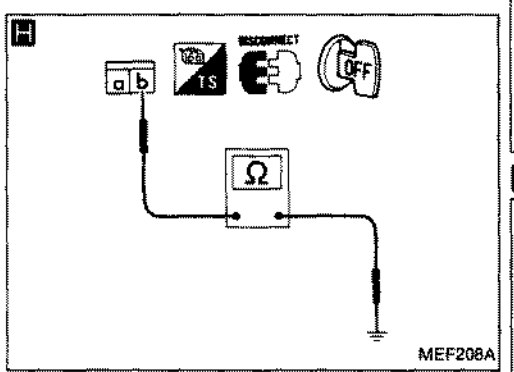
N.G. → Replace inhibitor switch.

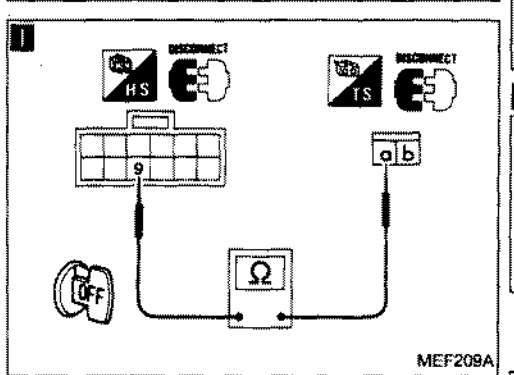
O.K. ↓

Check E.C.U. pin terminals for damage or connection of E.C.U. harness connector.

Diagnostic Procedure 19 (Cont'd)







Clutch switch

INSPECTION START

G

CHECK OVERALL FUNCTION.
1) Set shift lever to any position except the neutral position.
2) Disconnect E.C.U. harness connector.
3) Depress clutch pedal.
4) Check harness continuity between E.C.U. terminal ⑨ and body ground.
Continuity should exist.

O.K. → INSPECTION END

N.G.

H

CHECK GROUND CIRCUIT.
1) Disconnect clutch switch harness connector.
2) Check harness continuity between terminal ⓑ and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

I

CHECK INPUT SIGNAL CIRCUIT.
1) Check harness continuity between E.C.U. terminal ⑨ and terminal ⓐ.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F53), (R57)
- Harness continuity between E.C.U. and clutch switch

If N.G., repair harness or connectors.

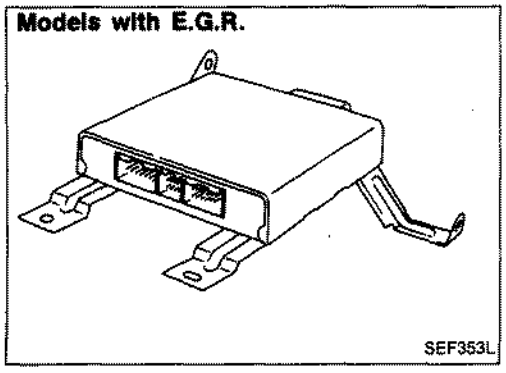
O.K.

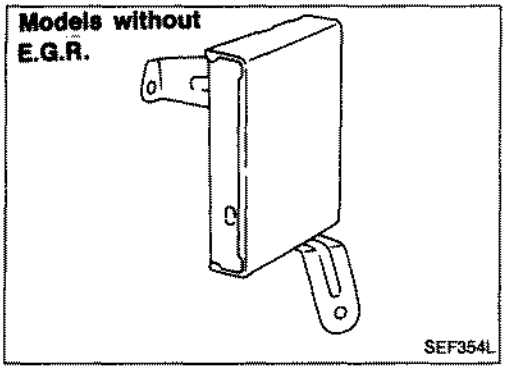
CHECK COMPONENT (Clutch switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-147.)

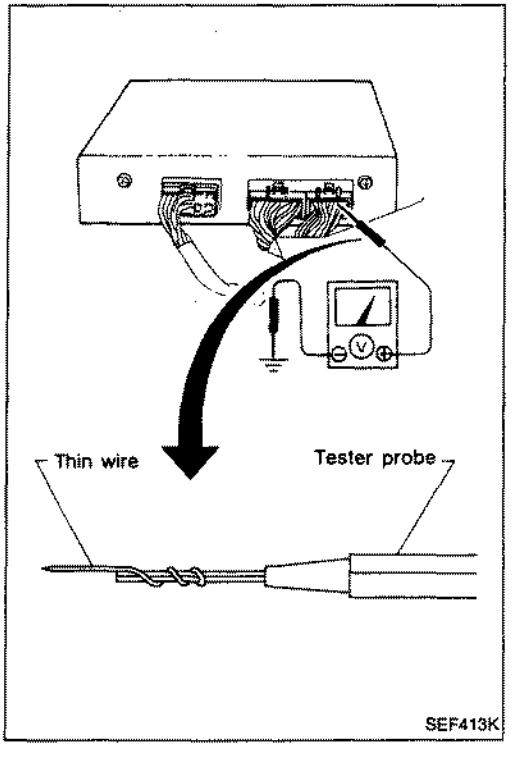
N.G. → Replace clutch switch.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.







Electrical Components Inspection

E.C.C. CONTROL UNIT INPUT/OUTPUT SIGNAL INSPECTION

1. Models with E.G.R.:
   E.C.C. control unit is located behind center console. For this inspection, remove center console under cover.

   Models without E.G.R.:
   E.C.C. control unit is located at dash side. For this inspection, remove dash side finisher.

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

Electrical Components Inspection (Cont'd)

E.C.U. INSPECTION TABLE — Models without E.G.R.

*Data are reference values.

1	F.I.C.D. control solenoid valve	Engine is running. -Idle speed -Air conditioner switch "ON"	Approximately 0V
		Engine is running. -Idle speed -Air conditioner switch "OFF"	BATTERY VOLTAGE (11 - 14V)
2	Exhaust gas sensor	Engine is running. -After warming up sufficiently	0 - Approximately 1.0V
4	Inhibitor/Neutral/Clutch switch	Ignition switch "ON" -Selector lever is in "N" or "P" position. -Shift lever is in neutral position. -Clutch pedal is depressed.	Approximately 0V
		Ignition switch "ON" -Except the above condition.	Approximately 8V
5	Headlamp switch	Ignition switch "ON" -Lighting switch "ON"	BATTERY VOLTAGE (11 - 14V)
		Ignition switch "ON" -Lighting switch "OFF"	Approximately 0V
6	Throttle valve switch	Ignition switch "ON" -Accelerator pedal is depressed.	Approximately 8V
		Ignition switch "ON" -Accelerator pedal is fully released.	Approximately 0V
7	Vacuum switch	Engine is running. -Idle speed	Approximately 8V
		Engine is running. -Accelerator pedal is quickly depressed.	Approximately 0V
8	Engine temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with engine temperature.
9	Radiator fan relay	Engine is running. -Radiator fan motor is operating.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. -Radiator fan motor is not operating.	Approximately 0V

Electrical Components Inspection (Cont'd)

*Data are reference values.

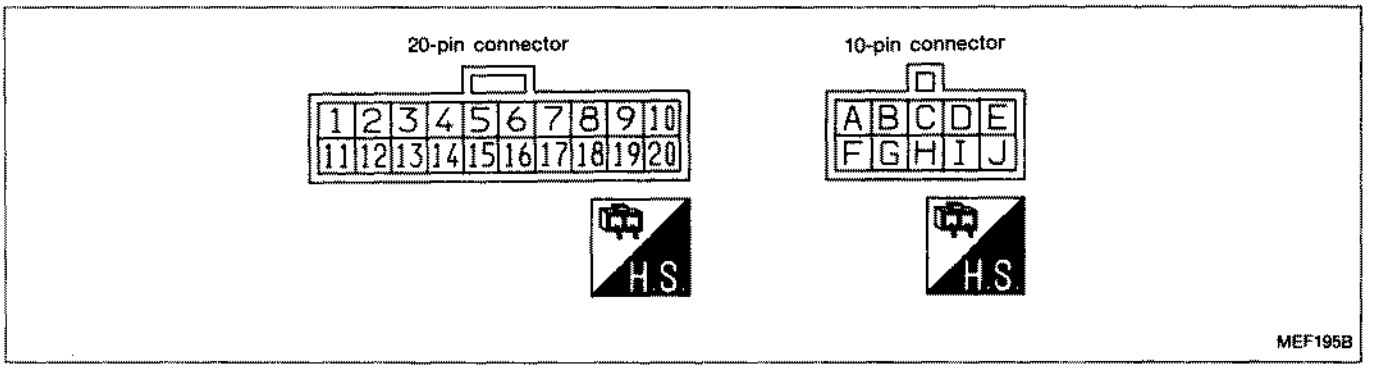
14	Rear window defogger switch	Ignition switch "ON" └Rear window defogger switch "ON"	BATTERY VOLTAGE (11 - 14V)
		Ignition switch "ON" └Rear window defogger switch "OFF"	Approximately 0V
15	Fan switch	Ignition switch "ON" └Fan switch "ON"	Approximately 0V
		Ignition switch "ON" └Fan switch "OFF"	BATTERY VOLTAGE (11 - 14V)
17	Power steering oil pressure switch	Ignition switch "ON" └Steering wheel is being turned.	BATTERY VOLTAGE (11 - 14V)
		Ignition switch "ON" └Except the above condition.	Approximately 0V
19	Air conditioner switch	Engine is running. └Both air conditioner switch and fan switch "ON"	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └Air conditioner switch "OFF"	Approximately 0V
C	Idle-up control solenoid valve	Engine is running. ├After warming up └Idle speed	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └Idle speed ├Lighting switch "ON" ├Rear window defogger switch "ON" ├Fan switch "ON" ├Air conditioner switch "ON" ├Power steering switch "ON" ├Radiator fan motor is operating. └Engine temperature is below 65°C (149°F).	Approximately 0.8V
F	Air-fuel ratio control solenoid valve	Engine is running.	Approximately 0 - 8V
G	Fuel cut solenoid valve	Engine is running. ├After warming up └Idle speed	Approximately 0V
		Engine is running. ├After warming up └Engine speed is decelerated from 5,000 rpm to idle.	BATTERY VOLTAGE (11 - 14V)
H	Power source	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

Electrical Components Inspection (Cont'd)

*Data are reference values.

J	Accelerator pump control solenoid valve	Engine is running. └Engine is cold and at idle.	Approximately 0.8V
		Engine is running. └Except the above condition.	BATTERY VOLTAGE (11 - 14V)

E.C.U. HARNESS CONNECTOR TERMINAL LAYOUT



Electrical Components Inspection (Cont'd)

E.C.U. INSPECTION TABLE — Models with E.G.R.

*Data are reference values.

1	Start signal	Ignition switch "ON"	Approximately 0V
		Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
2	Rear window defogger switch Headlamp switch (Models with daytime light system)	Ignition switch "ON" - Rear window defogger switch "ON" - Headlamp switch "ON"	BATTERY VOLTAGE (11 - 14V)
		Ignition switch "ON" - Except the above condition.	Approximately 0V
3	Fan switch	Ignition switch "ON" - Fan switch "ON"	Approximately 0V
		Ignition switch "ON" - Fan switch "OFF"	BATTERY VOLTAGE (11 - 14V)
4	Radiator fan relay	Ignition switch "ON" - Radiator fan motor is operating.	BATTERY VOLTAGE (11 - 14V)
		Ignition switch "ON" - Radiator fan motor is not operating.	Approximately 0V
5	Air conditioner switch	Engine is running. - Both air conditioner switch and blower fan switch "ON"	BATTERY VOLTAGE (11 - 14V)
		Engine is running. - Air conditioner switch "OFF"	Approximately 0V
9	Inhibitor/Neutral/clutch switch	Ignition switch "ON" - Selector lever is in "N" or "P" position. - Shift lever is in neutral position. - Clutch pedal is depressed.	Approximately 0V
		Ignition switch "ON" - Except the above condition.	Approximately 5V
15	Power steering oil pressure switch	Ignition switch "ON" - Steering wheel is being turned.	Approximately 0V
		Ignition switch "ON" - Except the above condition.	Approximately 11V
16	Throttle valve switch (Idle position)	Engine is running. - Accelerator pedal is depressed.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. - Accelerator pedal is fully released.	Approximately 0V

Electrical Components Inspection (Cont'd)

*Data are reference values.

18	Crank angle sensor (Reference signal)	Engine is running. └**Do not run engine at high speed under no-load.**	0.2 - 0.5V Output voltage varies slightly with engine speed.
19	Crank angle sensor (Position signal)	Engine is running. └**Do not run engine at high speed under no-load.**	2.5 - 2.7V Output voltage varies slightly with engine speed.
21	Exhaust gas sensor	Engine is running. └After warming up sufficiently.	0 - Approximately 1.0V
26	Ignition signal	Engine is running. └Idle speed	0.3 - 0.5V
		Engine is running. └Engine speed is 2,000 rpm	0.9 - 1.1V
30	Boost pressure sensor	Engine is running.	0 - 4V
31	Engine temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with engine temperature.
101	Power source	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
103	Air-fuel ratio control solenoid valve	Engine is running.	Approximately 0 - 10V
104	Fuel cut solenoid valve	Engine is running. (Warmed-up) └Idle speed	Approximately 0V
		Engine is running. (Warmed-up) └Engine speed is decelerated from 3,000 rpm to idle.	BATTERY VOLTAGE (11 - 14V)
105	F.I.C.D. control solenoid valve	Engine is running. ├Idle speed └Air conditioner switch "ON"	Approximately 0.8V
		Engine is running. ├Idle speed └Air conditioner switch "OFF"	BATTERY VOLTAGE (11 - 14V)
106	E.G.R. & canister control solenoid valve	Engine is running. └Idle speed	Approximately 0.8V
		Engine is running. └E.G.R. system is operating.	BATTERY VOLTAGE (11 - 14V)

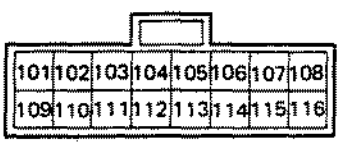
Electrical Components Inspection (Cont'd)

*Data are reference values.

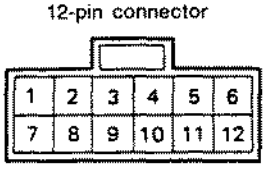
107	Mixture heater relay	Engine is running. └Engine is cold and at idle.	Approximately 0.8V
		Engine is running. └Except the above condition.	BATTERY VOLTAGE (11 - 14V)
108	Accelerator pump control solenoid valve	Engine is running. └Engine is cold and at idle.	Approximately 0.8V
		Engine is running. └Except the above condition.	BATTERY VOLTAGE (11 - 14V)
112	Idle-up control solenoid valve	Engine is running. ├After warming up └Idle speed	BATTERY VOLTAGE (11 - 14V)
		Engine is running. ├After warming up └Idle speed ├Headlamp is in high position. ├Radiator fan motor is operating. ├Rear defogger is "ON". ├Fan switch is "ON". └Power steering switch is "ON".	Approximately 0.8V
116	A.I.V. control solenoid valve	Engine is running. └During warm up	Approximately 0.8V
		Engine is running. └After warming up	BATTERY VOLTAGE (11 - 14V)

E.C.U. HARNESS CONNECTOR TERMINAL LAYOUT

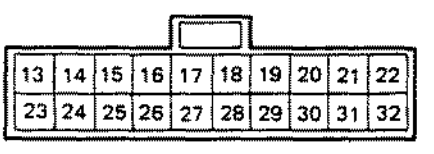
16-pin connector



12-pin connector



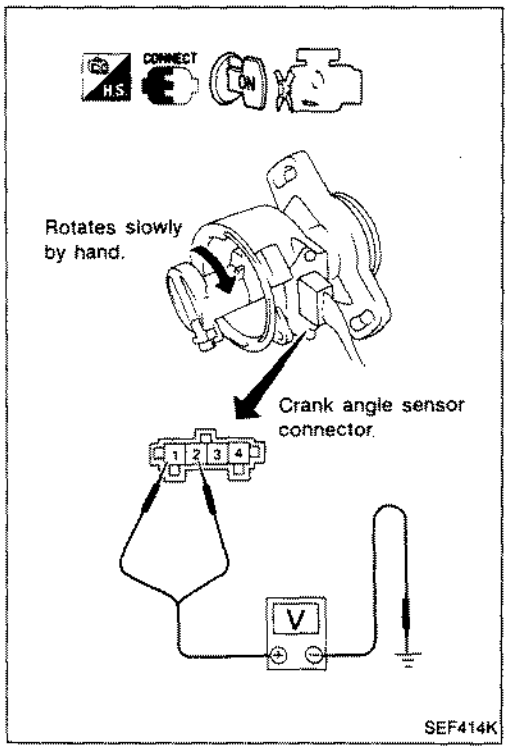
20-pin connector





MEF763A

Electrical Components Inspection (Cont'd)

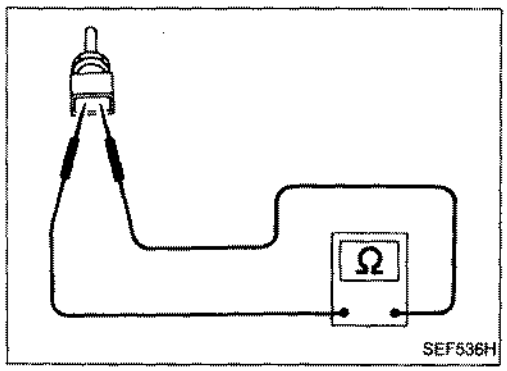


CRANK ANGLE SENSOR

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch "ON".
4. Rotate distributor shaft slowly by hand and check voltage between terminals ③, ④ and ground.

Terminal	Voltage
① (180° signal)	Tester's pointer fluctuates between 5V and 0V.
② (1° signal)	

If N.G., replace distributor assembly with crank angle sensor.

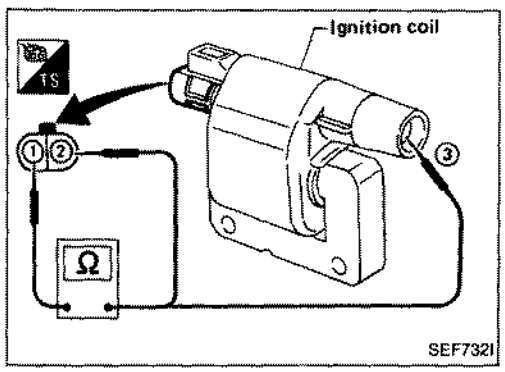


ENGINE TEMPERATURE SENSOR

1. Disconnect engine temperature sensor harness connector.
2. Check resistance as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
80 (176)	0.30 - 0.33

If N.G., replace engine temperature sensor.

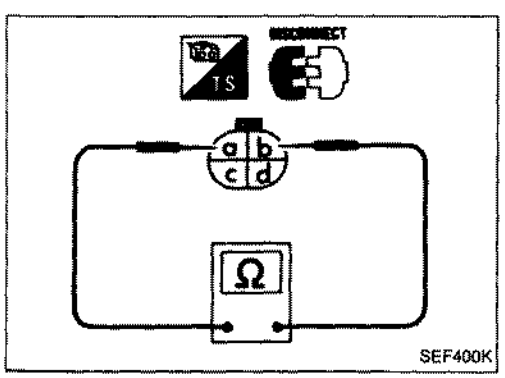


IGNITION COIL

1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.

Terminal	Resistance
① - ②	Approximately 0.9Ω
① - ③	Approximately 9.5 kΩ

If N.G., replace ignition coil.



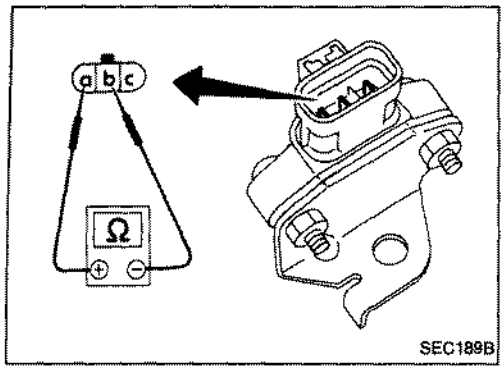
INHIBITOR SWITCH

Check continuity between terminals ⓒ and ⓑ.

Conditions	Continuity
Shift to "P" position	Yes
Shift to "N" position	Yes
Shift to position other than "P" and "N"	No

If N.G., replace inhibitor switch.

Electrical Components Inspection (Cont'd)



POWER TRANSISTOR

1. Disconnect power transistor harness connector.
2. Check power transistor continuity between terminals as shown in the illustration.

⊕ side: ⓐ
⊖ side: ⓑ
Resistance: ∞ Ω
N.G.
↓ O.K.

⊕ side: ⓐ
⊖ side: ⓒ
Resistance: ∞ Ω
N.G.
↓ O.K.

⊕ side: ⓑ
⊖ side: ⓐ
Resistance: Not ∞ or 0Ω
N.G.
↓ O.K.

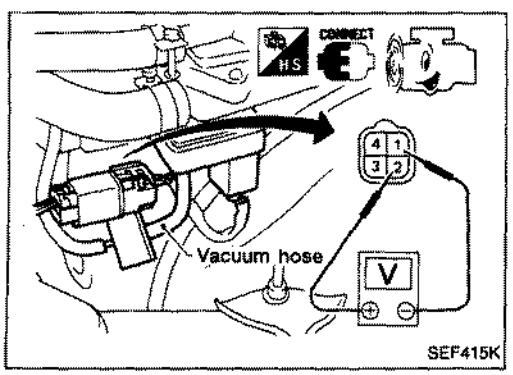
⊕ side: ⓑ
⊖ side: ⓒ
Resistance: Not ∞ or 0Ω
N.G.
↓ O.K.

⊕ side: ⓒ
⊖ side: ⓐ
Resistance: Not ∞ or 0Ω
N.G.
↓ O.K.

⊕ side: ⓒ
⊖ side: ⓑ
Resistance: Not ∞ or 0Ω
N.G.
↓ O.K.

INSPECTION END

→ Replace power transistor unit.



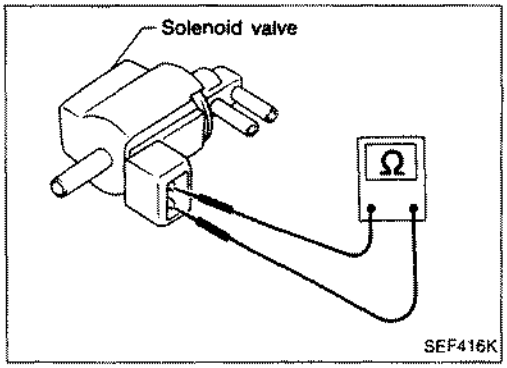
BOOST PRESSURE SENSOR

1. Turn ignition switch "ON".
2. Start engine.
3. Check voltage between ① and ②.

Condition	Voltage
Vacuum hose connected	Approximately 1.0V
Vacuum hose disconnected	Approximately 4.0V

If N.G., replace boost pressure sensor.

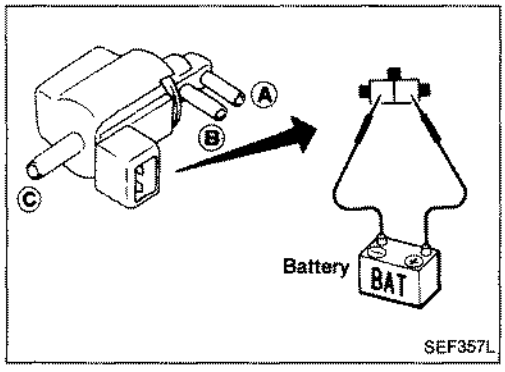
Electrical Components Inspection (Cont'd)



AIR INDUCTION CONTROL SOLENOID VALVE AND E.G.R. & CANISTER CONTROL SOLENOID VALVE

1. Check it for electric continuity.

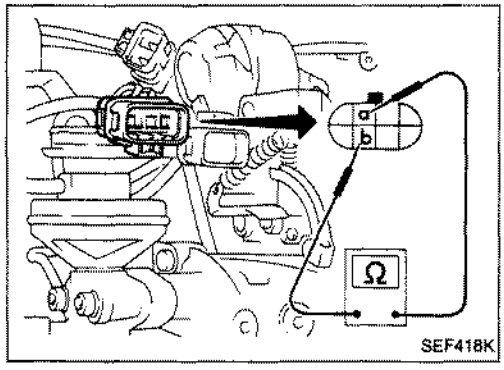
Continuity should exist.



2. Check the solenoid valve for normal operation. Supply it with battery voltage, and check whether there is continuity between ports Ⓐ, Ⓑ and Ⓒ as shown below.

Item \ Solenoid valve	OFF	ON
Continuity	Ⓑ-Ⓒ	Ⓐ-Ⓑ

If N.G., replace air induction control solenoid valve.

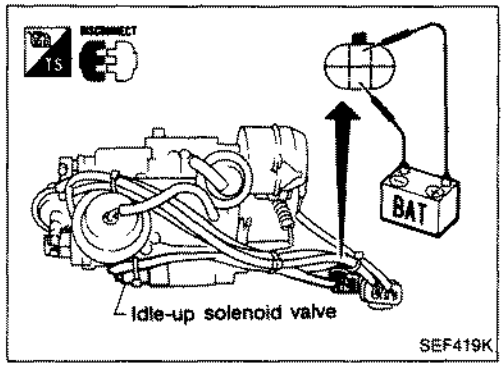


THROTTLE VALVE SWITCH

1. Disconnect throttle valve switch connector.
2. Check continuity between terminals ⓐ and ⓑ.

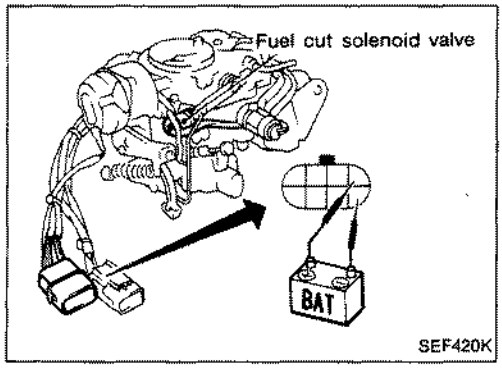
Accelerator pedal condition	Continuity
Released	No
Depressed	Yes

If N.G., replace throttle valve switch.



IDLE-UP CONTROL SOLENOID VALVE

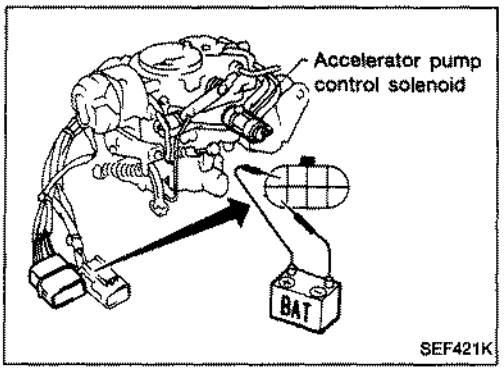
1. Disconnect solenoid harness connector.
2. Connect solenoid harness connector to battery.
3. Check "click" sound is heard from solenoid when battery is connected and disconnected.
   If N.G., replace idle-up solenoid.



FUEL CUT SOLENOID VALVE

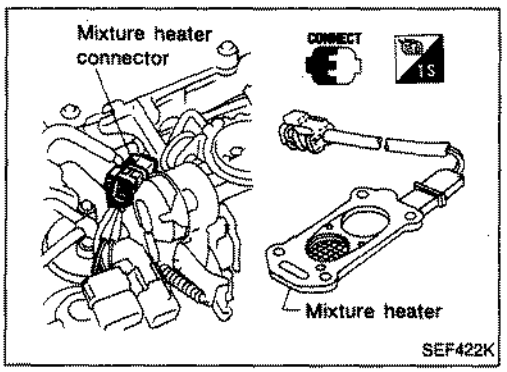
1. Disconnect solenoid harness connector.
2. Connect solenoid harness connector to battery.
3. Check "click" sound is heard from solenoid when battery is connected and disconnected.
   If N.G., replace fuel cut solenoid.

Electrical Components Inspection (Cont'd)



ACCELERATOR PUMP CONTROL SOLENOID VALVE

1. Disconnect solenoid harness connector.
2. Connect solenoid harness connector to battery.
3. Check "click" sound is heard from solenoid when battery is connected and disconnected.
   If N.G., replace accelerator pump control solenoid.

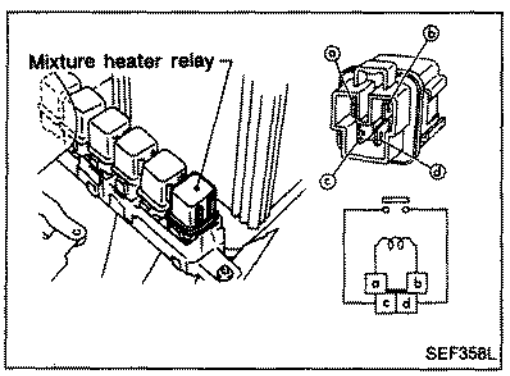


MIXTURE HEATER

1. Disconnect mixture heater harness connector.
2. Check resistance between terminals ⓐ and ⓑ.

Continuity should exist.

If N.G., replace mixture heater.

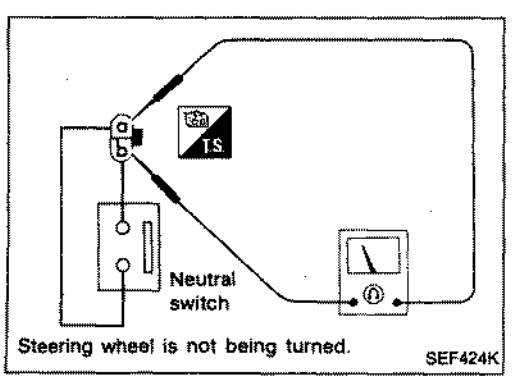


MIXTURE HEATER RELAY

1. Disconnect mixture heater relay.
2. Check continuity between terminals ⓒ and ⓓ as shown below.

Condition	Continuity between terminals ⓒ and ⓓ
12V direct current supplied between terminals ⓐ and ⓑ	Yes
No supply	No

If N.G., replace mixture heater relay.



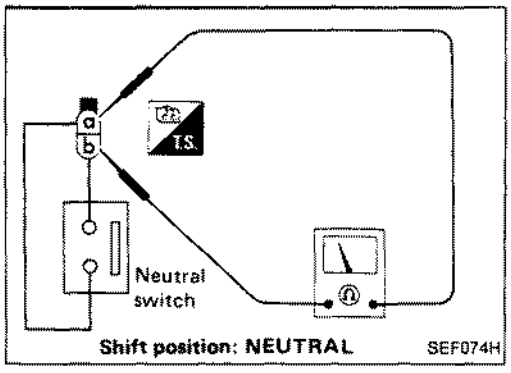
POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector.
2. Check continuity between terminals.

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

If N.G., replace power steering oil pressure switch.

Electrical Components Inspection (Cont'd)

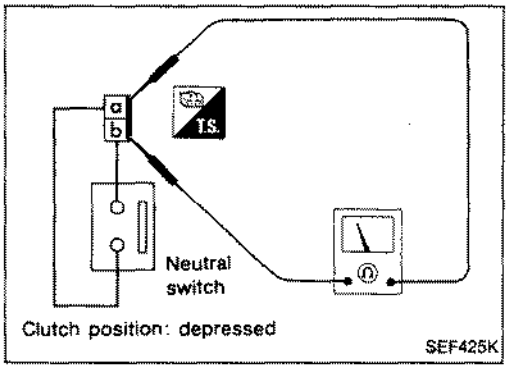


NEUTRAL SWITCH

1. Disconnect neutral switch harness connector.
2. Check continuity between terminals.

Condition	Continuity between terminals ⓐ and ⓑ
Shift to "Neutral"	Yes
Shift to other positions	No

If N.G., replace neutral switch.

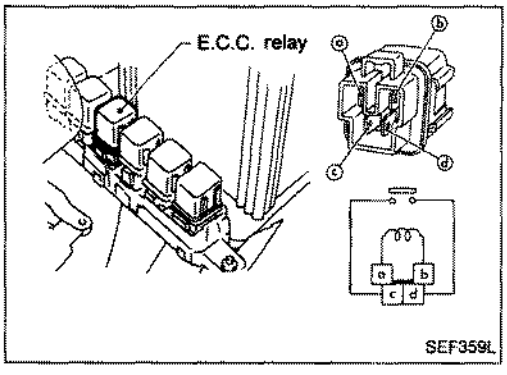


CLUTCH SWITCH

1. Disconnect clutch switch harness connector.
2. Check continuity between terminals.

Clutch position	Continuity between terminals ⓒ and ⓓ
Released	Yes
Depressed	No

If N.G., replace clutch switch.

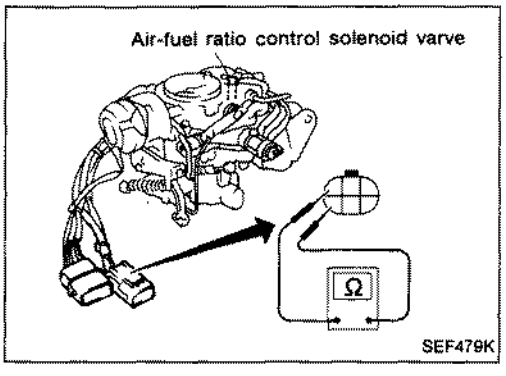


E.C.C. RELAY

1. Disconnect E.C.C. relay.
2. Check continuity between terminals ⓒ and ⓓ as shown below.

Condition	Continuity between terminals ⓒ and ⓓ
12V direct current supplied between terminals ⓐ and ⓑ	Yes
No supply	No

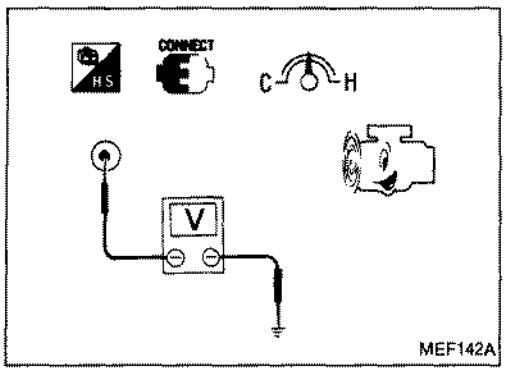
If N.G., replace E.C.C. relay.



AIR-FUEL RATIO CONTROL SOLENOID VALVE

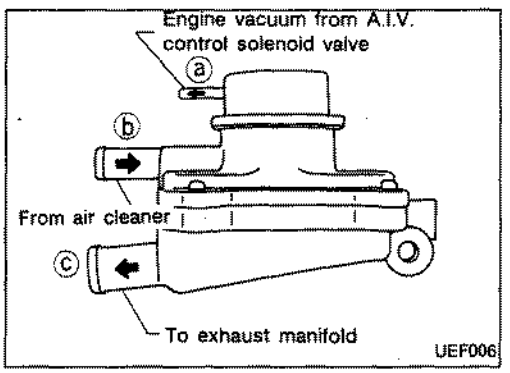
1. Disconnect solenoid harness connector.
2. Check continuity between terminals.
   If N.G., replace air-fuel ratio control solenoid valve.

Electrical Components Inspection (Cont'd)



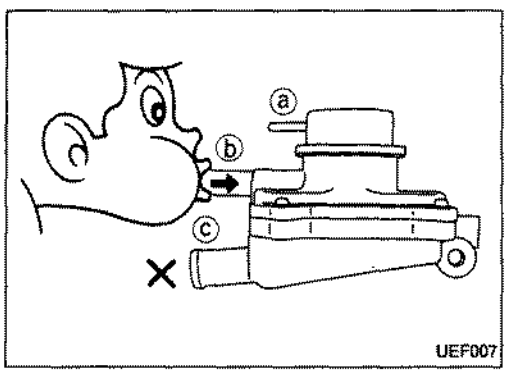
EXHAUST GAS SENSOR

1. Start engine and warm it up until water temperature indicator points to middle of gauge.
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. Check voltage between terminal ⓖ and ground. Make sure that needle of voltmeter fluctuates between approx. 0 and 1V, more than 5 times in 10 seconds at 2,000 rpm.
   If N.G., replace exhaust gas sensor.

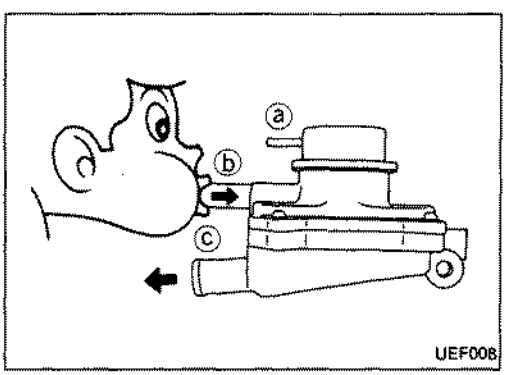


AIR INDUCTION VALVE (A.I.V.)

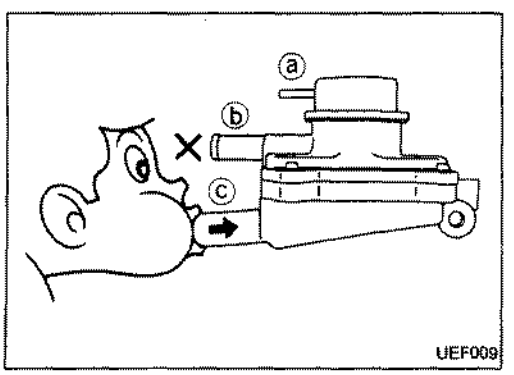
1. Disconnect vacuum hoses.
2. Check air flow between ⓑ and ⓒ in the following situations:



a. No vacuum at ⓐ.
   No air flow exists at ⓒ.

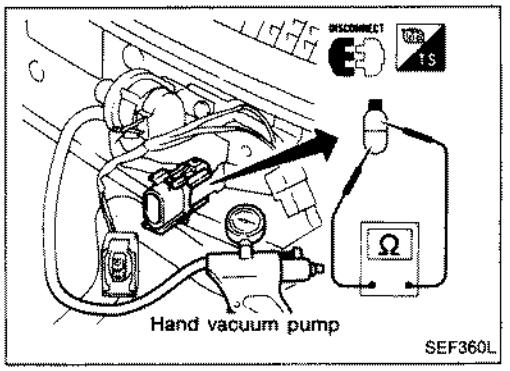


b. Vacuum at ⓐ.
   Air flow exists at ⓒ.



c. No air flow at ⓑ.
   With or without vacuum at ⓐ.

Electrical Components Inspection (Cont'd)

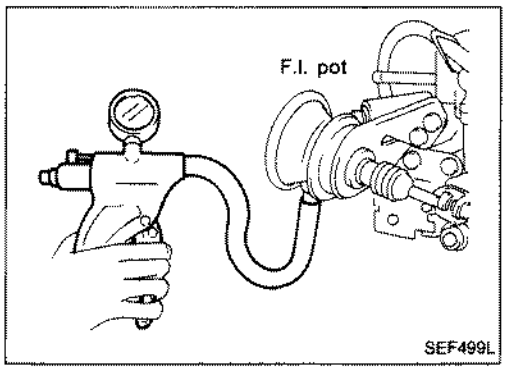


VACUUM SWITCH

1. Disconnect vacuum switch connector.
2. Check continuity between terminals.
3. Apply vacuum to vacuum switch port with a hand vacuum pump.

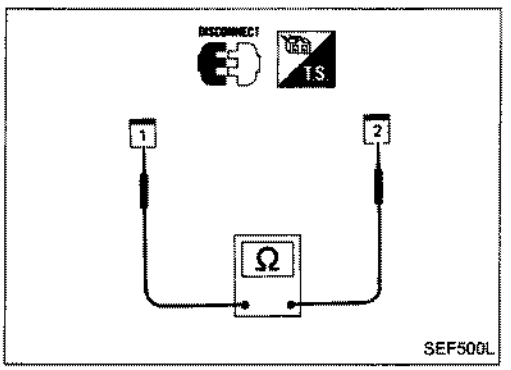
Applied vacuum –kPa (–bar, –mmHg, –inHg)	Continuity
Above 20.0 (200, 150, 5.91)	Yes
Below 20.0 (200, 150, 5.91)	No

If N.G. replace vacuum switch.



F.I. POT

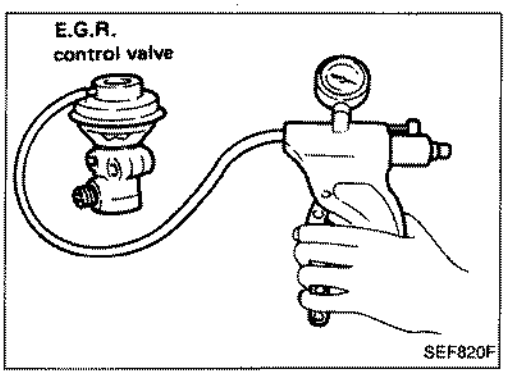
Apply vacuum to F.I. pot with a handy vacuum pump.
Rod of F.I. pot should pull out.



F.I.C.D. SOLENOID VALVE

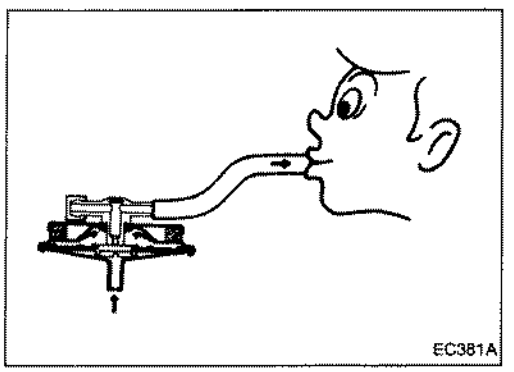
1. Disconnect F.I.C.D. harness connector.
2. Check continuity between terminals.

If N.G., replace F.I.C.D. solenoid valve.



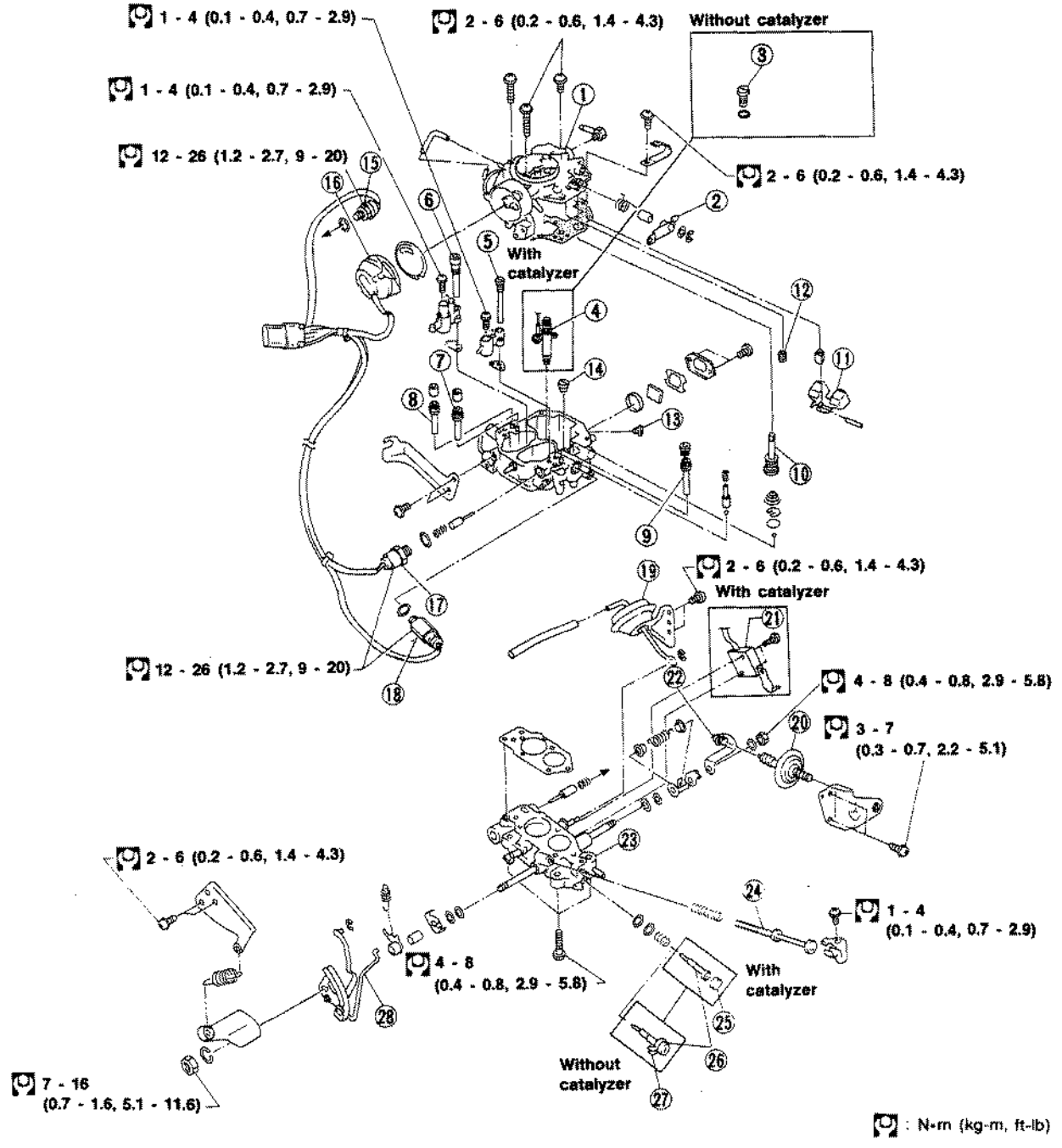
E.G.R. CONTROL VALVE

Apply vacuum to E.G.R. vacuum port with a hand vacuum pump.
E.G.R. control valve spring should lift.



B.P.T. VALVE

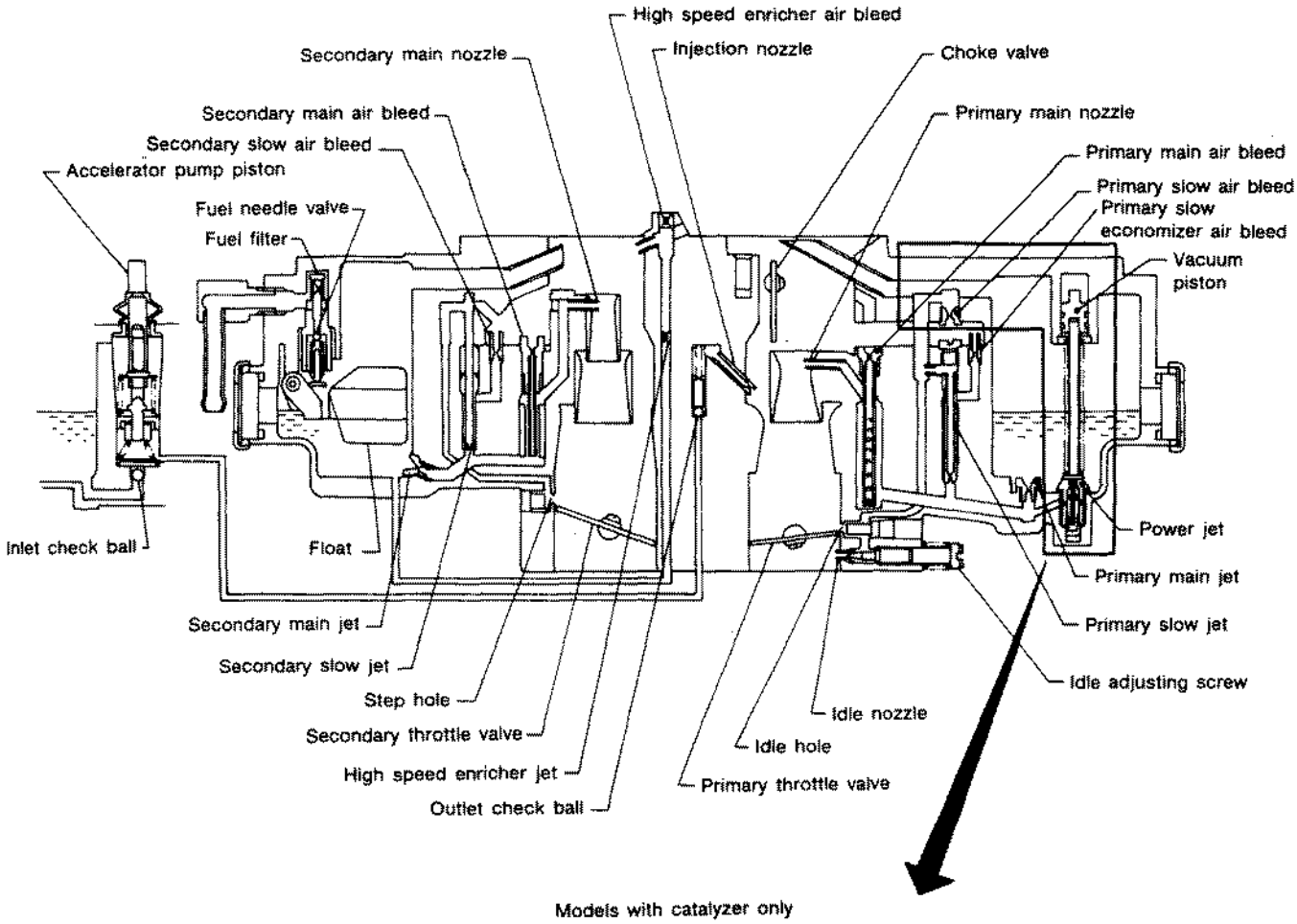
Plug one of two ports of B.P.T. valve.
Apply a pressure above 0.490 kPa (4.90 mbar, 50 mmH_2O, 1.97 in H_2O) to check for leakage. If a leak is noted, replace valve.



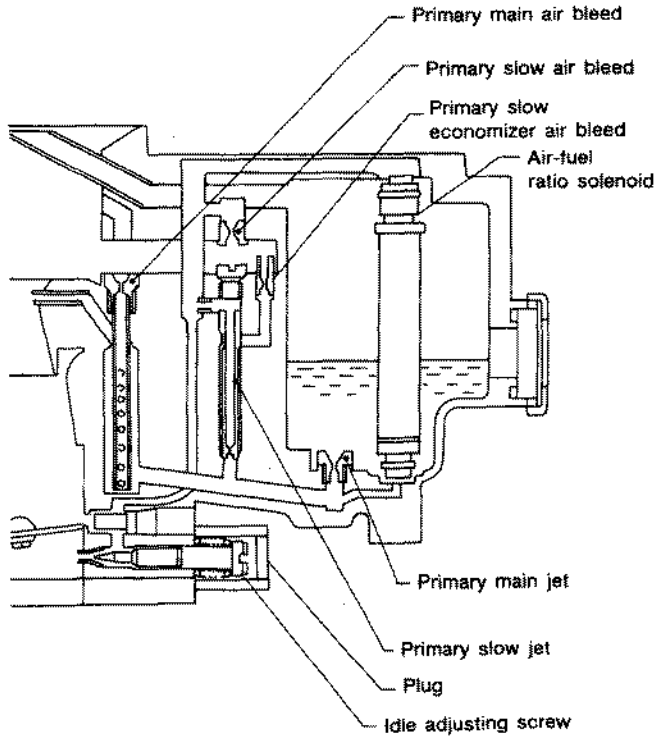
SEF820L

① Choke chamber
② Accelerator pump lever
③ Power jet
④ Air-fuel ratio control valve
⑤ Primary main air bleed
⑥ Secondary main air bleed
⑦ Secondary slow jet
⑧ Idle-up jet
⑨ Primary slow jet
⑩ Accelerator pump piston
⑪ Float
⑫ Primary slow air bleed
⑬ Secondary main jet
⑭ Primary main jet
⑮ Idle-up control solenoid
⑯ Auto-choke heater
⑰ Fuel cut solenoid
⑱ Accelerator pump control solenoid
⑲ Diaphragm for secondary system
⑳ Dash pot
㉑ Throttle valve switch
㉒ Dash pot adjusting screw
㉓ Throttle chamber
㉔ Throttle adjusting screw
㉕ Seal plug
㉖ Idle adjusting screw
㉗ Limiter cap
㉘ Accelerator pump connecting rod

Construction



Models with catalyzer only



SEF428K

Major Service Operation

The perfectly adjusted carburetor delivers the proper fuel and air ratios at all speeds for the particular engine for which it was designed.
The carburetor should be maintained in its original condition and will continue to deliver the proper ratios.
To maintain accurate carbureting through passages and discharge holes, extreme care must be taken in cleaning.
Use only carburetor solvent and compressed air to clean all passages and discharge holes. Never use wire or other pointed instrument to clean or carburetor calibration will be affected.

REMOVAL

Remove carburetor from engine, taking sufficient care to the following:

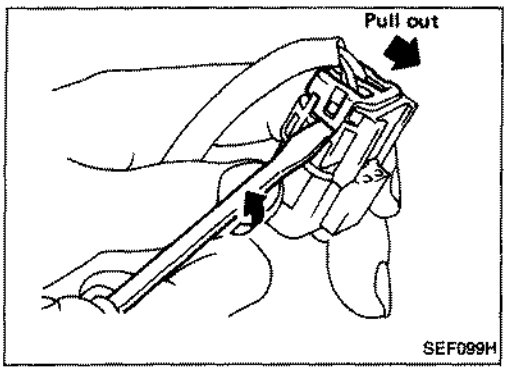
PRECAUTIONS:

a. **When disconnecting fuel lines, do not spill fuel from fuel pipe.**
b. **When removing carburetor, do not drop any nut or bolt into intake manifold.**
c. **Be careful not to bend or scratch any part.**

CLEANING AND INSPECTION

Dirt, gum, water or carbon contamination in or on exterior moving parts of a carburetor often results in unsatisfactory performance. For this reason, efficient carbureting depends upon careful cleaning and inspection while servicing.
Before assembling and installing the carburetor, blow all passages and castings with compressed air and blow off all parts until dry.

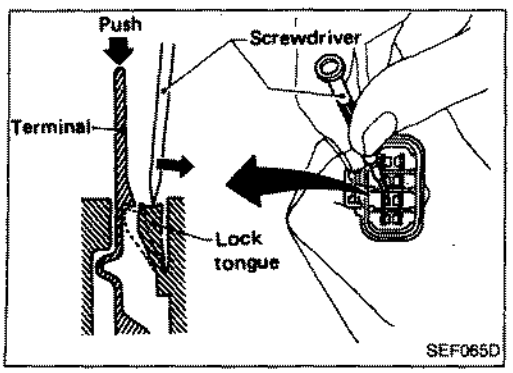
Do not pass drills or wires through calibrated jets or passages as this may enlarge orifice and seriously affect carburetor calibration.



Disassembling Carburetor Harness Connector

When replacing fuel cut solenoid, throttle valve switch, automatic choke heater (choke chamber assembly) idle-up solenoid, accelerator pump control solenoid or air-fuel ratio solenoid, it will be necessary to disassemble carburetor harness connector.

1. Remove rear clip.



2. With a small screwdriver, tilt lock tongue and, at the same time, push out terminal.

CAUTION:

- **When extracting terminal, do not pull wire harness. Always push the top of terminal.**
- **Take care not to damage seal boot at the bottom of terminal.**
- **Do not let oil or gasoline adhere to seal boot.**

Idle Speed and Mixture Ratio (Models with catalyzer and E.G.R.)

CAUTION:

a. Idle mixture ratio is adjusted at factory and requires no further adjustment. If it becomes necessary to adjust it, proceed with the following steps.
b. Do not attempt to screw the idle adjusting screw down completely. Doing so could cause damage to tip, which in turn will tend to cause malfunctions.
c. After adjusting idle speed and mixture ratio, be sure to check items below, and if necessary, adjust them.
   (1) Fast idle adjustment
   (2) Dash pot touch speed
   (3) Throttle valve switch operating speed

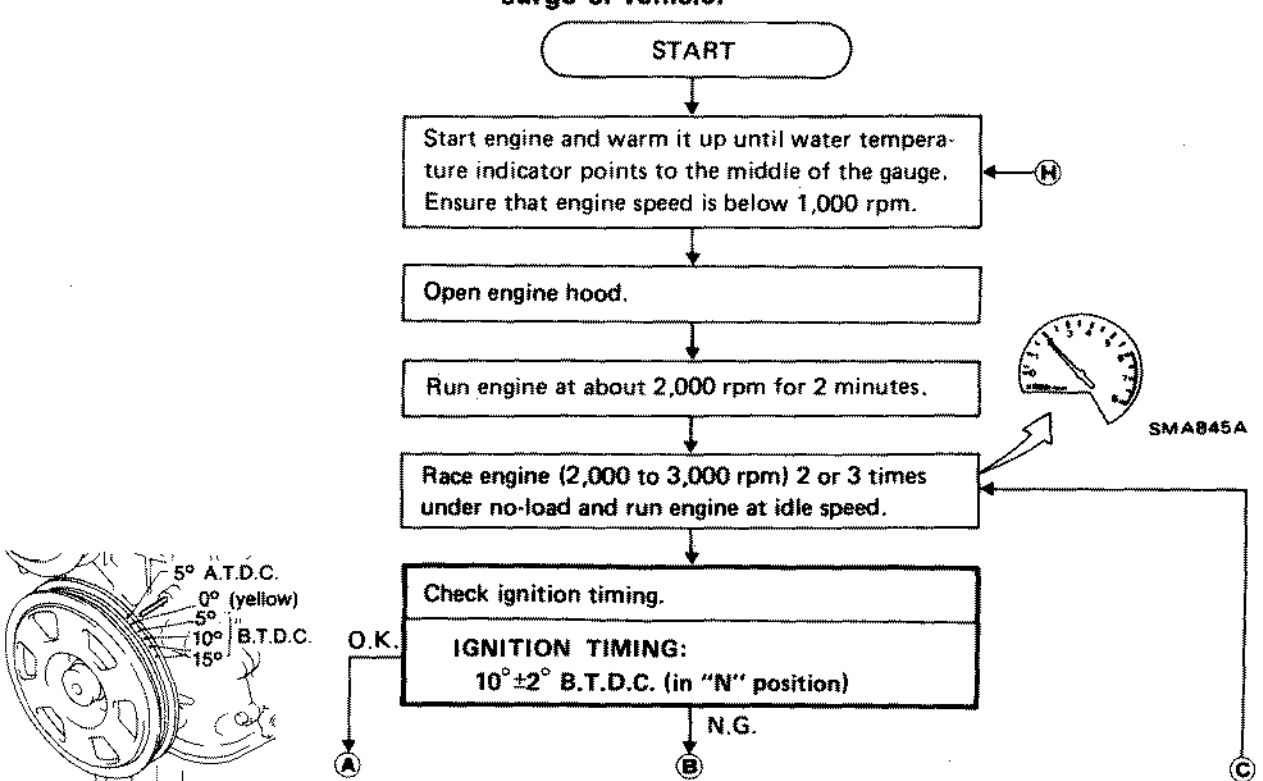
PREPARATION

1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.U. harness connector
- Vacuum hoses
- Air intake system
  (Oil filler cap, oil level gauge, etc.)
- Engine compression
- E.G.R. control valve operation
- Throttle valve

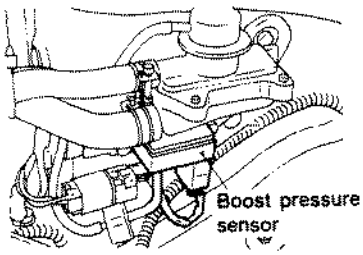
2. Turn off headlamps, heater blower and rear defogger.
3. Keep front wheels pointed straight ahead.
4. Make the check after the radiator fan has stopped.

WARNING:

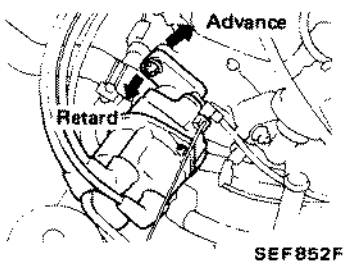
Depress brake pedal while racing the engine to prevent forward surge of vehicle.



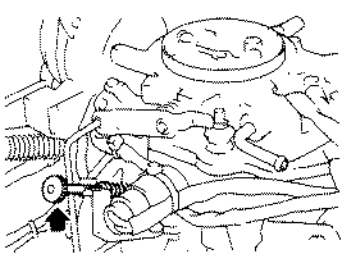
Idle Speed and Mixture Ratio (Models with catalyzer and E.G.R.) (Cont'd)

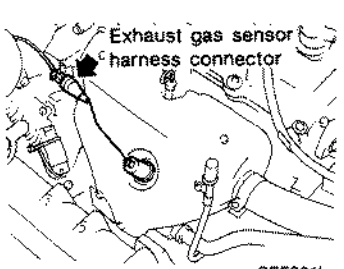


SEF298K

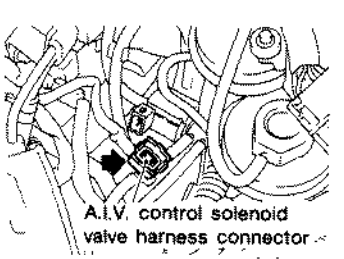


SEF852F

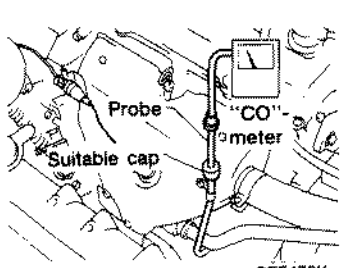

SEF468K



SEF361L



SEF362L



SEF470K

Disconnect boost pressure sensor vacuum hose and install blind plug to hose.

Loosen distributor securing bolt, and adjust ignition timing by turning distributor, until ignition timing is 2° B.T.D.C.
2° B.T.D.C. (GA16DS)
0° B.T.D.C. (GA14DS) (in "N" position)

Connect boost pressure sensor vacuum hose.

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


SMA845A

Check idle speed.

IDLE SPEED:
M/T: 750±50 rpm
A/T: 850±50 rpm (in "N" position)

O.K.

N.G.

Adjust idle speed by turning throttle adjusting screw.

O.K.

N.G.

Correct or replace carburetor. → (H)

Turn off engine and disconnect exhaust gas sensor harness connector and A.I.V. control solenoid valve harness connector. ← (G)

Remove test-take off plug and insert "CO" meter probe into test-take off tube sealing with a suitable cap.

Start engine.


SMA845A

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

Check idle "CO"% (at test-take off)

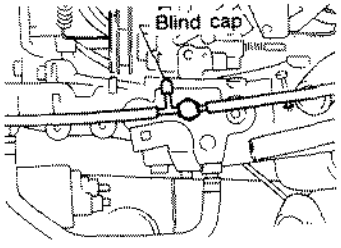
IDLE "CO"%:
1.0±0.5%

N.G. → (E)

O.K. → (D)

(A) (B) (C) (F)

Idle Speed and Mixture Ratio (Models with catalyzer and E.G.R.) (Cont'd)



SEF363L


SMA845A

Idle Speed and Mixture Ratio (Models with catalyzer without E.G.R.)

CAUTION:

a. Idle mixture ratio is adjusted at factory and requires no further adjustment. If it becomes necessary to adjust it, proceed with the following steps.
b. Do not attempt to screw the idle adjusting screw down completely. Doing so could cause damage to tip, which in turn will tend to cause malfunctions.
c. After adjusting idle speed and mixture ratio, be sure to check items below, and if necessary, adjust them.
   (1) Fast idle adjustment
   (2) Dash pot touch speed
   (3) Throttle valve switch operating speed

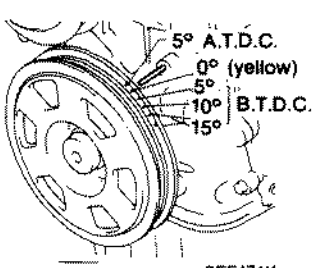
PREPARATION

1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.U. harness connector
- Vacuum hoses
- Air intake system
  (Oil filler cap, oil level gauge, etc.)
- Engine compression
- E.G.R. control valve operation
- Throttle valve

2. Turn off headlamps, heater blower and rear defogger.
3. Keep front wheels pointed straight ahead.
4. Make the check after the radiator fan has stopped.

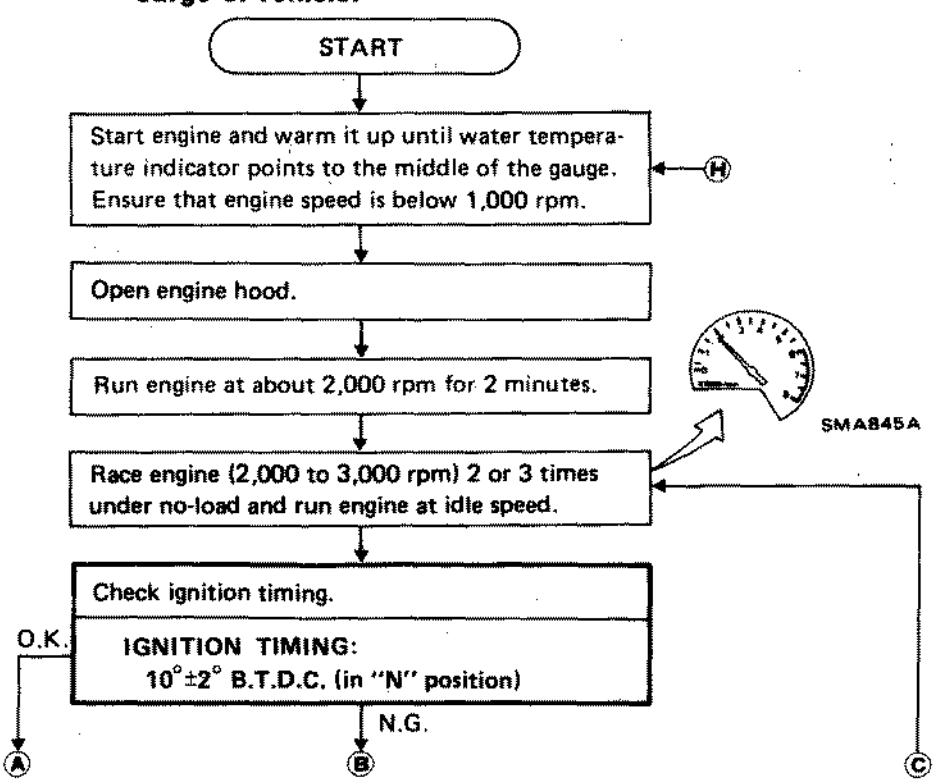
WARNING:

Depress brake pedal while racing the engine to prevent forward surge of vehicle.

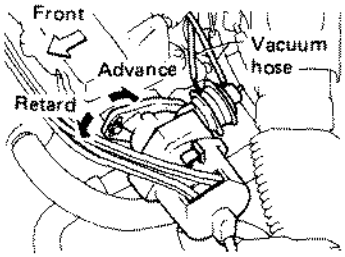


SEF471K

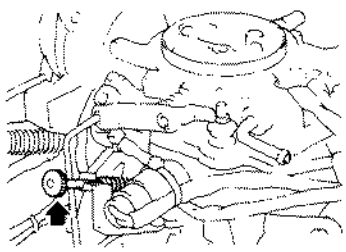
SMA845A

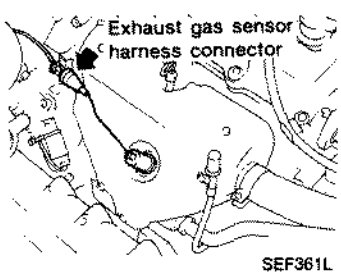


Idle Speed and Mixture Ratio (Models with catalyzer without E.G.R.) (Cont'd)

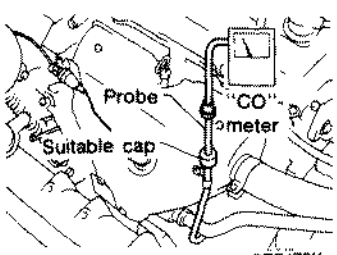


SMA060C


SEF468K



SEF361L



SEF470K

Ⓐ Ⓑ Ⓒ

Disconnect distributor vacuum hose on carburetor connector side and install blind plug to hose.

Loosen distributor securing bolt, and adjust ignition timing by turning distributor, until ignition timing is 0° B.T.D.C. (in "N" position)

Connect distributor vacuum hose to carburetor connector.

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


SMA845A

Check idle speed.

IDLE SPEED:
M/T: 750±50 rpm
A/T: 850±50 rpm (in "N" position)

O.K.

N.G.

Adjust idle speed by turning throttle adjusting screw.

O.K.

N.G.

Correct or replace carburetor. → Ⓗ

Turn off engine and disconnect exhaust gas sensor harness connector. ← Ⓖ

Remove test-take off plug and insert "CO" meter probe into test-take off tube sealing with a suitable cap.

Start engine.


SMA845A

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

Check idle "CO"% (at test-take off)

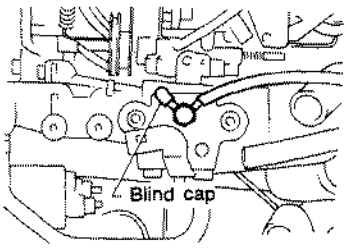
IDLE "CO"%:
1.0±0.5%

N.G. → Ⓔ

O.K. → Ⓓ

Ⓕ

Idle Speed and Mixture Ratio (Models with catalyzer without E.G.R.) (Cont'd)



SEF365L


SMA845A

Ⓓ

YES

Does engine run smoothly?

NO

Check the following.
- Vacuum hoses for proper connections
- Air leaks at carburetor mounting and intake manifold

O.K.

N.G.

Correct or replace malfunctioning parts.

Adjust idle mixture ratio by turning idle adjusting screw until idle "CO" 1.0±0.5% is obtained at test-take off tube and install idle mixture seal plug. (Refer to Idle Mixture Adjusting Procedure.)

O.K.

N.G.

Correct or replace carburetor.

Disconnect idle compensator vacuum hose from vacuum connector on intake manifold and install suitable blind cap to vacuum connector.
Check idle CO %
(at test-take off)

IDLE "CO" %
0.5 - 2.0 %

N.G.

O.K.

Reconnect idle compensator vacuum hose to vacuum connector.

Ⓘ

Turn off engine and connect exhaust gas sensor harness connector. Also reconnect idle compensator vacuum hose to vacuum connector.

Disconnect "CO"-meter probe and install cap on test-take off rube.

Start engine.

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

Check idle speed.

IDLE SPEED:
M/T: 750±50 rpm
A/T: 850±50 rpm (in "N" position)

O.K.

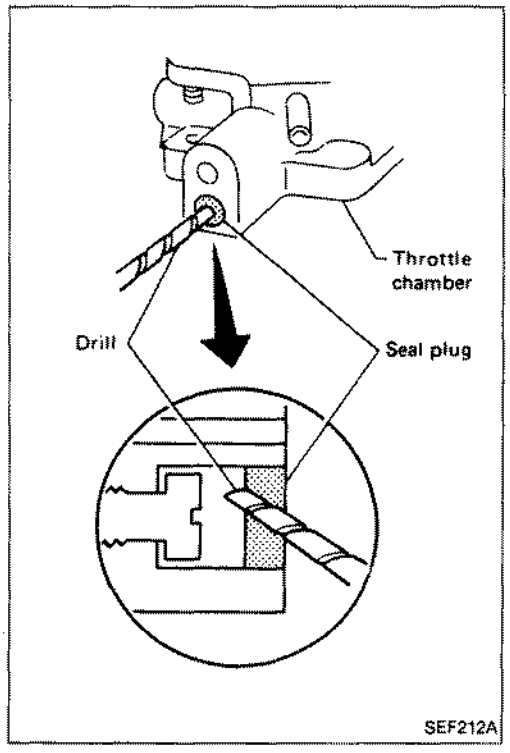
END

N.G.

Adjust idle speed by turning throttle adjusting screw.

IDLE SPEED:
M/T: 750±50 rpm
A/T: 850±50 rpm (in "N" position)

Ⓖ (on previous page)



Idle Mixture Adjusting Procedure (Models with catalyzer)

CAUTION:

a. Removal of idle adjusting screw seal plug should be performed only when idle mixture adjustment or carburetor overhaul is necessary.

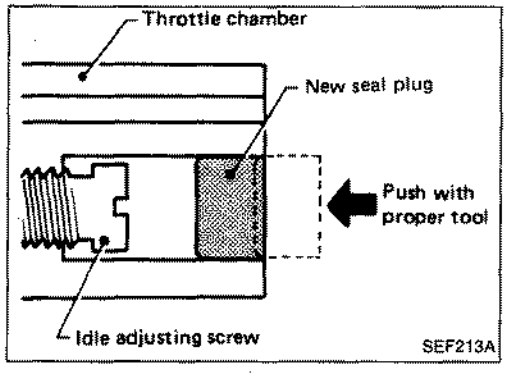
b. When installing carburetor, be sure to tighten nuts to specified torque.

1. Remove carburetor from engine.
2. Carefully drill idle adjusting screw seal plug and remove it from plug hole with suitable tool.

a. Be careful to prevent metal chips from entering carburetor, and be sure that sliding surface of link and shaft are not scratched.

b. When drilling seal plug, be careful not to damage head of idle adjusting screw.

3. After performing step 2, mount carburetor on engine.
4. Start engine, adjust idle RPM and adjust idle "CO"% by turning idle adjusting screw.
5. If proper idle "CO"% is not obtained by adjustment, turn off engine and overhaul carburetor or replace it with a new one. Then adjust idle "CO"% by turning idle adjusting screw.



6. After adjusting carburetor idle-rpm and mixture ratio, turn off engine and install new seal plug on carburetor.

7. Finally, check idle "CO"% again. If idle "CO"% is abnormal, readjust it by starting from step 4.

Checking and Adjusting Idle-rpm, Ignition Timing and Mixture Ratio (Models without catalyzer)

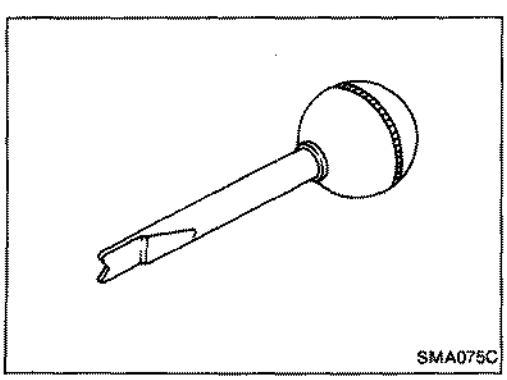
CAUTION

a. Idle mixture ratio is adjusted at factory and requires no further adjustment. If it becomes necessary to adjust it, proceed with the following steps.
b. Do not attempt to screw the idle adjusting screw down completely. Doing so could cause damage to tip, which in turn will tend to cause malfunctions.
c. After adjusting idle speed and mixture ratio, be sure to check items below, and if necessary, adjust them.
   (1) Fast idle adjustment
   (2) Dash pot touch speed

PREPARATION

1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.U. harness connector
- Vacuum hoses
- Air intake system
  (Oil filler cap, oil level gauge, etc.)
- Engine compression
- Throttle valve

2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
3. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
4. Turn off headlamps, heater blower, rear defogger.
5. Keep front wheels pointed straight ahead.
6. Make the check after the radiator fan has stopped.


SMA075C

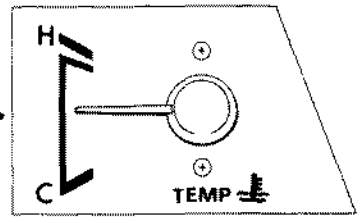
7. Use idle adjusting screwdriver when adjusting idle adjusting screw.

WARNING:
Depress brake pedal while racing the engine to prevent forward surge of vehicle.

Checking and Adjusting Idle-rpm, Ignition Timing and Mixture Ratio (Models without catalyzer) (Cont'd)

START

Start engine and warm it up until water temperature indicator points to normal operating temperature.

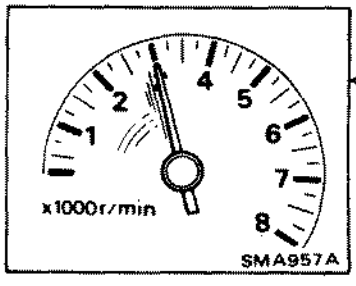


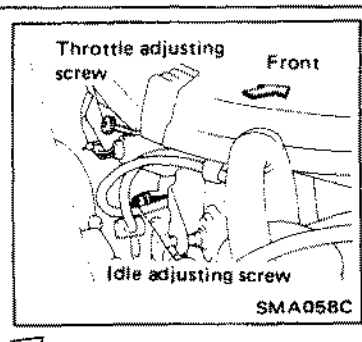
Open engine hood.

Run engine at idle speed for 2 minutes.

Disconnect distributor vacuum hose on carburetor connector side and install blind cap to connector.

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





Check idle speed.

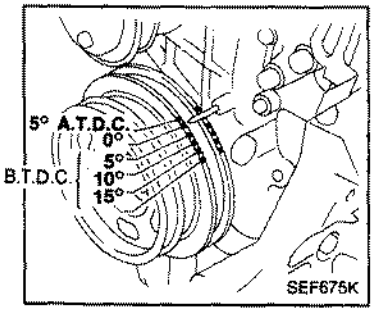
Idle speed:
Below 1,000 rpm

O.K. N.G.

Adjust idle speed by turning throttle adjusting screw.

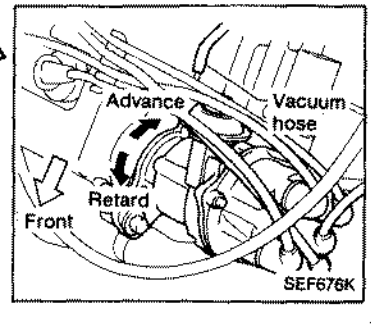
Check ignition timing at idle speed.

Ignition timing: degree B.T.D.C. (in "N" position)
GA13DS –2 ± 2
GA14DS 0 ± 2
GA16DS –3 ± 2, 2 ± 2*
***For Europe, Hong Kong, Singapore and Middle East**



O.K. N.G.

Adjust ignition timing by turning distributor.



Connect distributor vacuum hose to carburetor connector.

Ⓐ

Ⓑ

Checking and Adjusting Idle-rpm, Ignition Timing and Mixture Ratio (Models without catalyzer) (Cont'd)

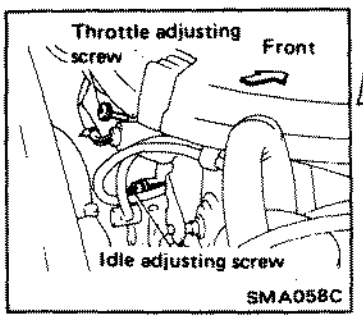
Ⓐ

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

Adjust idle speed by turning throttle adjusting screw.

Idle speed: rpm (in "N" position)

GA13DS	**M/T**	**750 ± 50**
GA14DS	**M/T**	**750 ± 50**
	A/T	**850 ± 50**
GA16DS	**M/T**	**750 ± 50**
	A/T	**850 ± 50**



Confirm ignition timing at idle speed.

Ignition timing: degree B.T.D.C. (In "N" position)
GA13DS 9 ± 5
GA14DS 10 ± 5
GA16DS 12 ± 5, 10 ± 5*
***For Europe, Hong Kong, Singapore and Middle East**

O.K. / N.G.

N.G. → Check distributor and vacuum hoses.

Check distributor and vacuum hoses. → Repair or replace distributor or vacuum controller.

Repair or replace distributor or vacuum controller. → Clean or replace vacuum hoses.

Clean or replace vacuum hoses. → Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load, and then run engine at idle speed.

O.K. → Without "CO"-meter → Ⓒ

O.K. → With "CO"-meter

With "CO"-meter → Check "CO"% at idle speed.

Idle "CO": %
1.5 ± 0.5

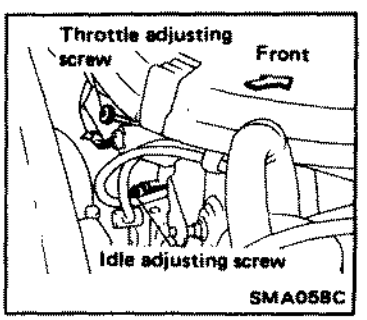
O.K. → Disconnect idle compensator vacuum hose from vacuum connector on intake manifold and install suitable blind cap to vacuum connector. Check idle "CO"%.

Idle "CO" %
1.0 - 2.5%

O.K. → Reconnect idle compensator vacuum hose to vacuum connector.

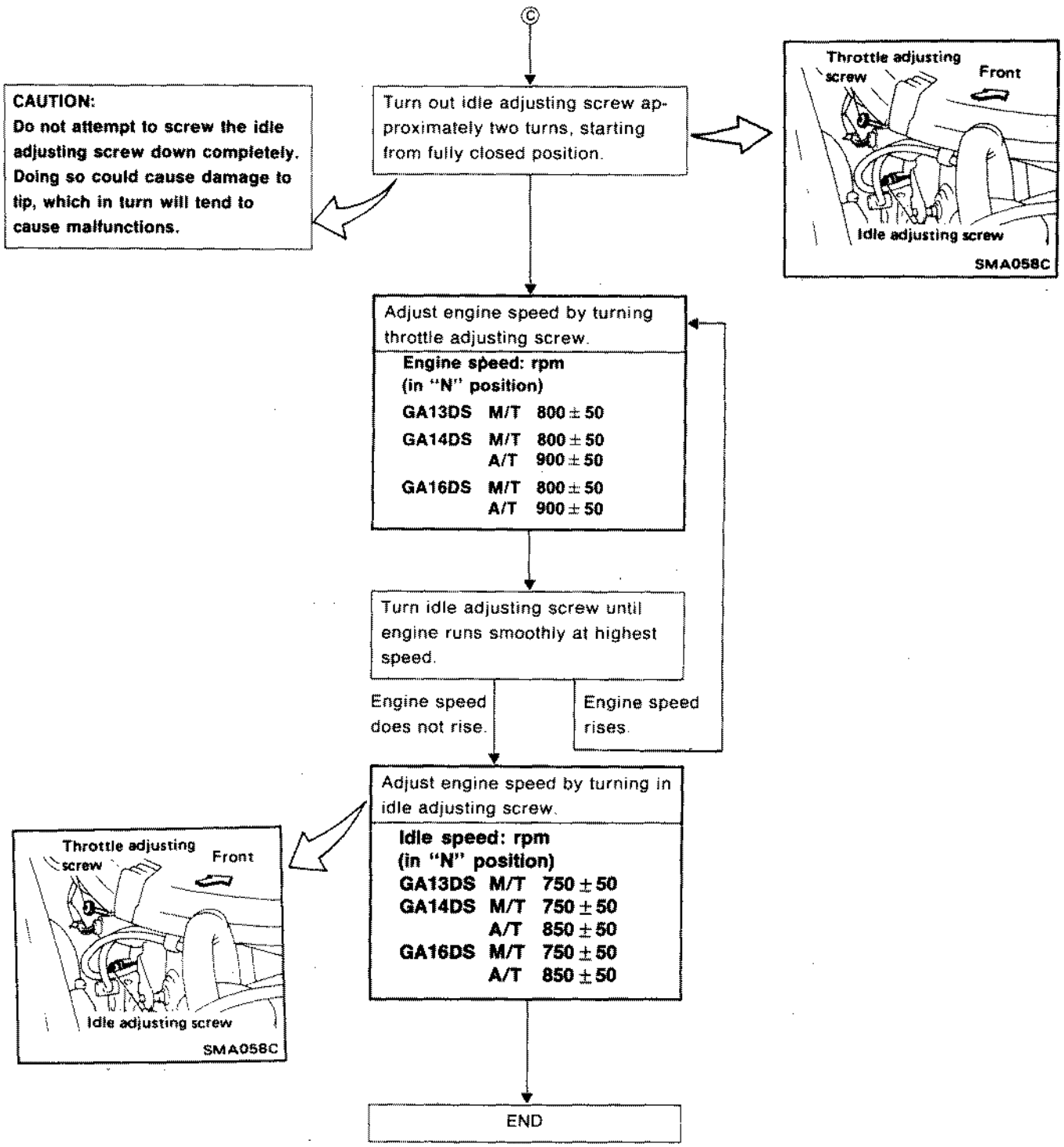
Reconnect idle compensator vacuum hose to vacuum connector. → END

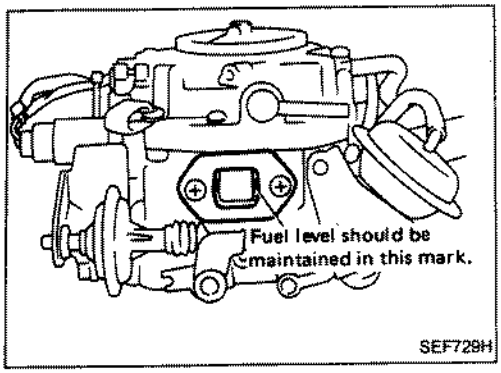
N.G. → Adjust idle "CO"% to 1.5 ± 0.5% by turning idle adjusting screw.



Adjust idle "CO"% to 1.5 ± 0.5% by turning idle adjusting screw. → Ⓑ

Checking and Adjusting Idle-rpm, Ignition Timing and Mixture Ratio (Models without catalyzer) (Cont'd)

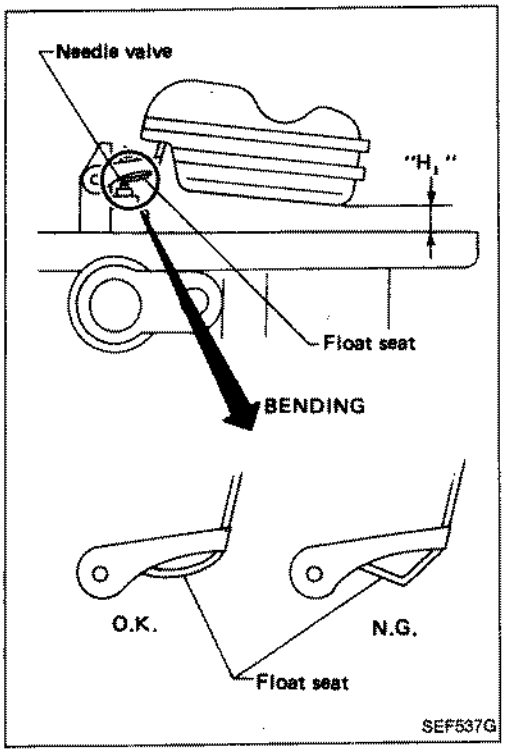




Fuel Level

INSPECTION

Place vehicle on a level surface. With engine idling, check fuel level.



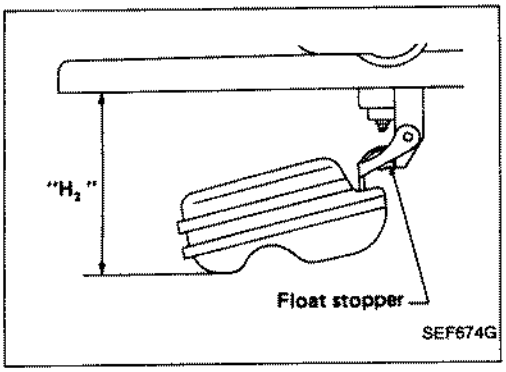
ADJUSTMENT

1. Remove carburetor from engine.
2. Remove choke chamber from carburetor.
3. Turn choke chamber upside down, and fix it horizontally.
4. Raise float fully, then lower it slowly until float seat contacts needle valve, and in this position, check height "H_1".

   Height "H_1":

   9.5 - 10.5 mm (0.374 - 0.413 in)

If out of specification, adjust by bending float seat. Make sure needle valve slides smoothly on float seat.



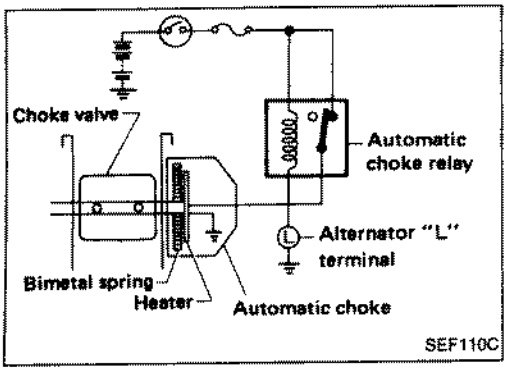
5. Lower float slowly until float stopper contacts carburetor, and in this position, check height "H_2".

   Height "H_2":

   43.0 - 44.0 mm (1.693 - 1.732 in)

If out of specification, adjust by bending float stopper.

6. Install choke chamber and then place carburetor on engine.
7. Perform "FUEL LEVEL INSPECTION".

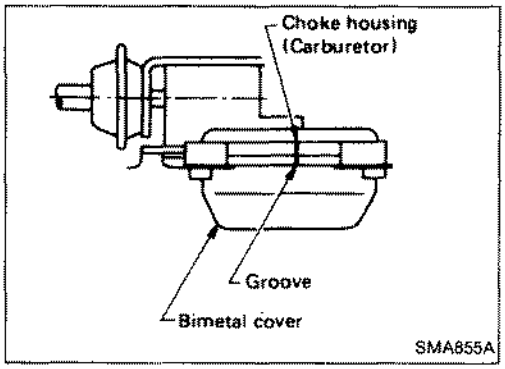


Automatic Choke

MECHANICAL CHECK

1. Before starting engine, fully open throttle valve and ensure that choke valve closes properly.
2. Push choke valve with your finger to check for smooth movement.

Automatic Choke (Cont'd)

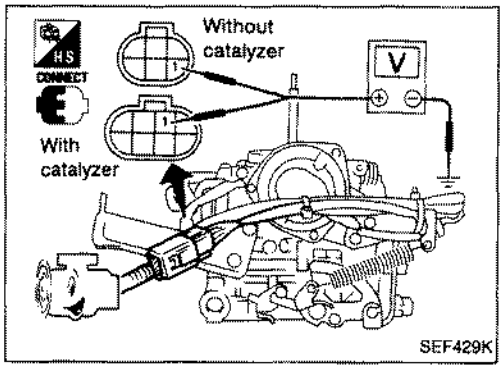


3. Make sure bimetal cover index mark is aligned with center of choke housing index mark.
4. Check wiring connection, and start engine.
5. After warming up engine, ensure that choke valve is fully open.
   If not, check automatic choke circuit and heater.

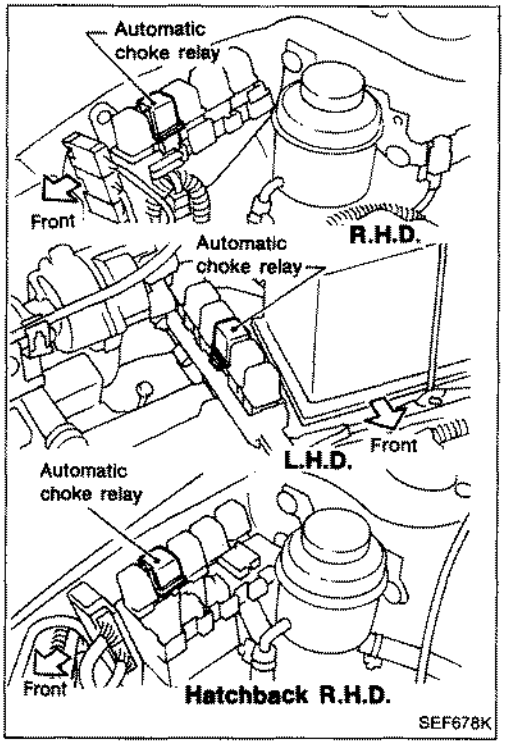
ENTIRE SYSTEM

Do not attach test leads of a circuit tester to those other than designated.

1. Start engine.



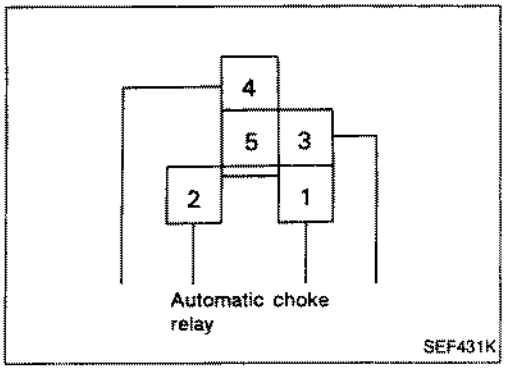
2. Check voltage between terminal ① and ground, with engine running.
   Voltage: Approximately 9 - 12V
   If no voltage appears, check the following items.
   - Automatic choke relay
   - Automatic choke circuit
   - Fuse



AUTOMATIC CHOKE RELAY

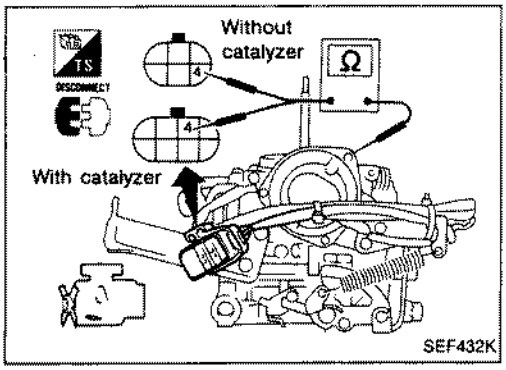
Check relay for proper operation.

Automatic Choke (Cont'd)



AUTOMATIC CHOKE CIRCUIT

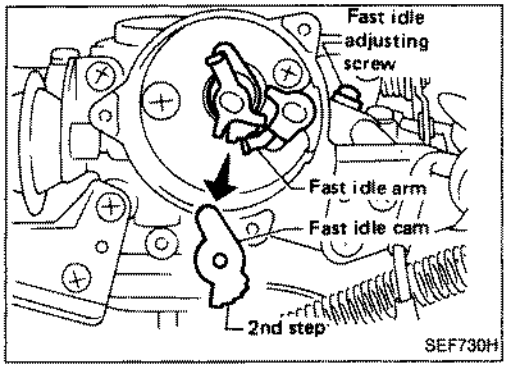
1. Disconnect automatic choke relay and then connect a suitable jumper wire between terminals ① and ④.
2. Check resistance between connector terminal ② and fuse.
   Resistance: Approximately 0Ω
   If N.G., check or repair the harness.



AUTOMATIC CHOKE HEATER

1. Disconnect carburetor harness connector.
2. Check for continuity between choke heater connector terminal ④ and choke housing.

Continuity should exist.



Fast Idle (Automatic choke model)

1. Warm up engine. Set fast idle arm on 2nd step of fast idle cam.
2. Check fast idle speed.

Fast idle speed (at 2nd cam step):

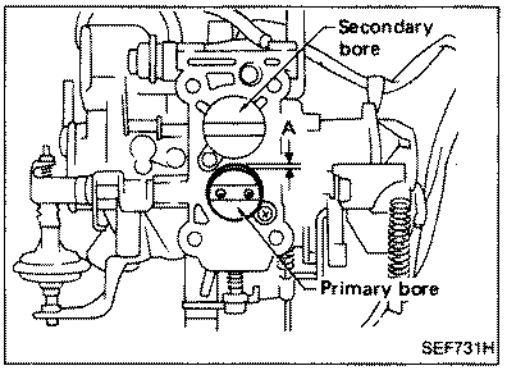
Unit: rpm

	M/T	A/T
GA13DS and GA14DS	2,400 ± 200, 2,200 ± 200*	2,700 ± 200, 2,500 ± 200*
GA16DS	2,100 ± 200	2,400 ± 200

* Models with catalyzer

Make sure that engine is completely adjusted (idle rpm, ignition timing, etc.) before checking or adjusting fast idle speed.

Fast Idle (Automatic choke model) (Cont'd)



3. If out of specification, remove carburetor and make fast idle adjustments as follows:

1) Place fast idle arm on 2nd step of fast idle cam, in the same manner as in step 1. above.
2) Adjust clearance "A" between primary throttle valve and inner carburetor wall by turning fast idle adjusting screw.

Clearance "A":

GA13DS & GA14DS

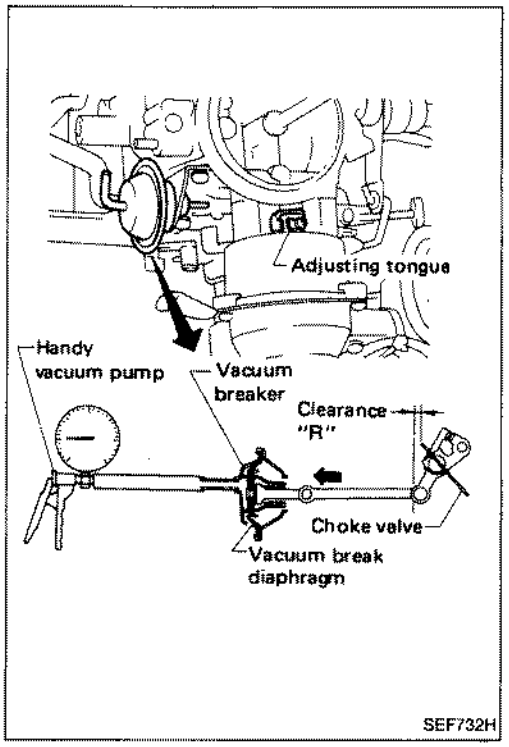
M/T 0.62 ± 0.07 mm (0.0244 ± 0.0028 in),
0.59 ± 0.07 mm (0.0232 ± 0.0028 in)*
A/T 0.79 ± 0.07 mm (0.0311 ± 0.0028 in),
0.75 ± 0.07 mm (0.0295 ± 0.0028 in)*
*** For models with catalyzer**

GA16DS

M/T 0.59 ± 0.07 mm (0.0232 ± 0.0028 in)
A/T 0.75 ± 0.07 mm (0.0295 ± 0.0028 in)

4. After adjusting clearance "A", install carburetor on engine and check engine speed.

Following installation, do not attempt further adjustment of clearance "A" even if fast idle speed is incorrect.

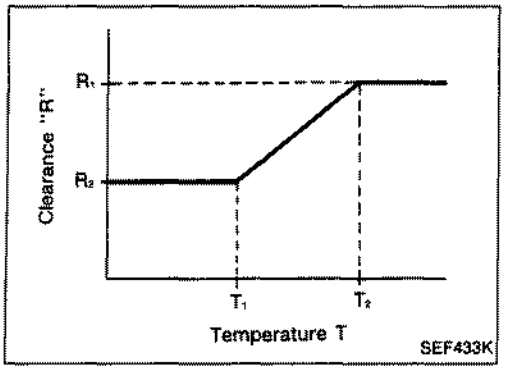


Vacuum Break

1. When engine is cold, close choke valve completely.
2. Apply vacuum to vacuum break diaphragm with a handy vacuum pump.

Approximately –53.3 kPa
(–533 mbar, –400 mmHg, –15.75 inHg)

Vacuum Break (Cont'd)

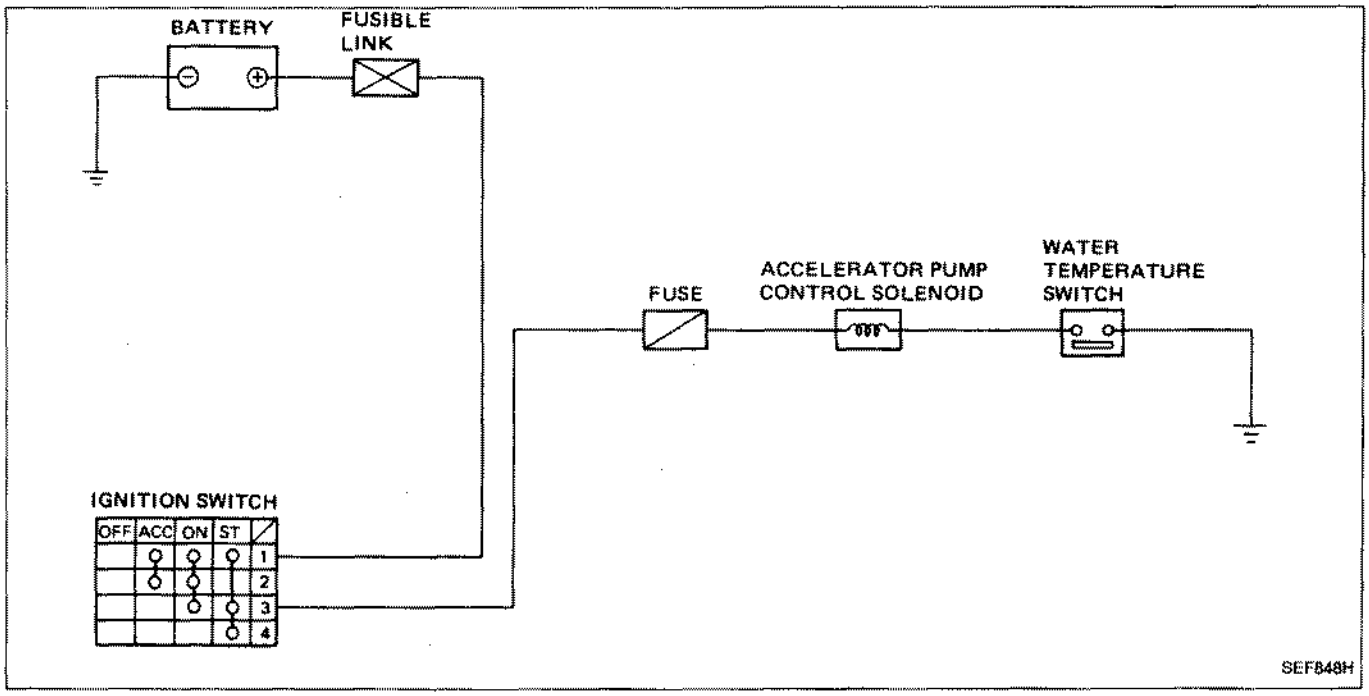


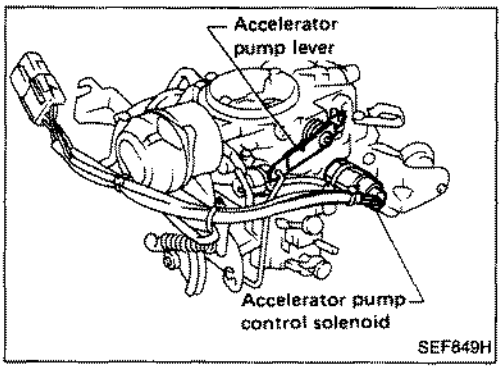
Temperature T °C (°F)	Models with catalyzer and E.G.R.	Models without catalyzer, Models with catalyzer without E.G.R.
T_1	0 ± 4 (32 ± 7.2)	14 ± 4 (57 ± 7.2)
T_2	20 ± 4 (68 ± 7.2)	31 ± 4 (88 ± 7.2)

Temperature T	Clearance R mm (in)	
	Models with catalyzer	Models without catalyzer
Below T_1	1.44 ± 0.13 (0.0567 ± 0.0051)	1.22 ± 0.14 (0.0480 ± 0.0055)
Above T_2	2.42 ± 0.32 (0.0953 ± 0.0126)	2.15 ± 0.32 (0.0846 ± 0.0126)

3. In this condition, check clearance "R" between choke valve and carburetor body.
4. If out of specification, adjust "R" by bending tongue.

Automatic Temperature Control Accelerator Pump (Models without catalyzer)



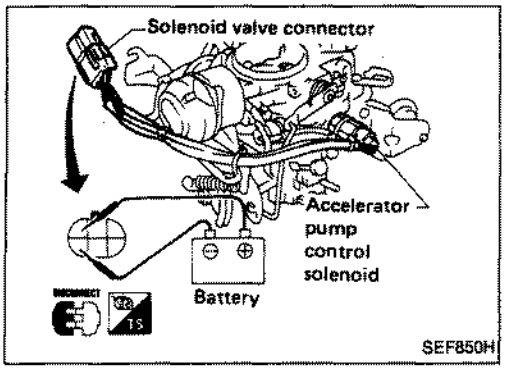


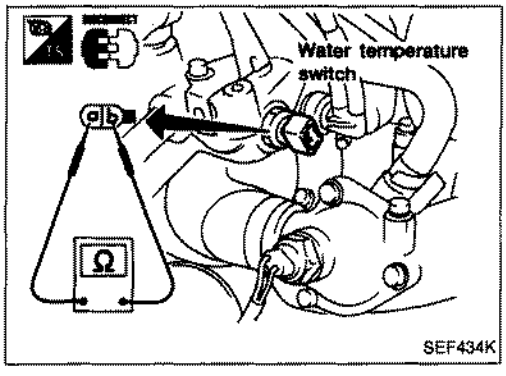
Operate accelerator pump by opening throttle lever with engine stopped. Check if pump nozzle located at primary port injects fuel smoothly without delay.
If N.G., check accelerator pump piston or linkage. Amount of fuel injected is controlled by the water temperature.

OPERATION

Ignition switch position	Water temperature switch °C (°F)	Accelerator pump control solenoid	Amount of fuel injected
"ON" or "START"	ON Below 70 (158)	ON	High
	OFF Above 70 (158)	OFF	Normal
"OFF"	—		

Automatic Temperature Control Accelerator Pump (Models without catalyzer)





INSPECTION (Cont'd)

Accelerator pump control solenoid valve

1. Connect solenoid valve connector to battery.
2. Check "click" sound from solenoid valve when battery is connected and disconnected.
3. If no sound is heard from solenoid valve, replace with a new one.

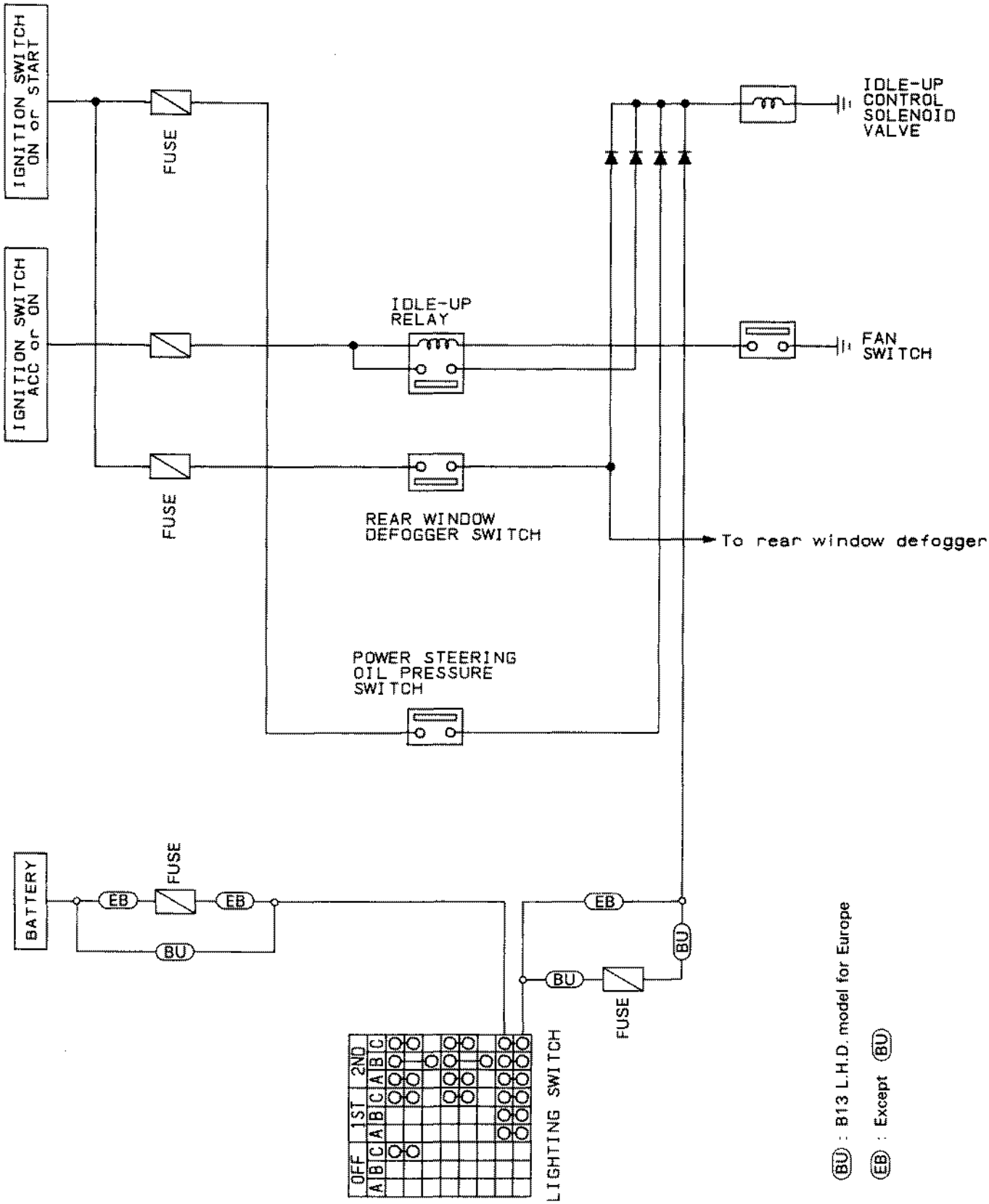
1) Disconnect harness from harness connector.
2) Remove solenoid valve from carburetor.
3) Install new solenoid valve. After replacement, check that solenoid valve is in good condition.

Water temperature switch

Water temperature °C (°F)	Continuity between terminals ⓐ and ⓑ
Below 70 (158)	Yes
Above 70 (158)	No

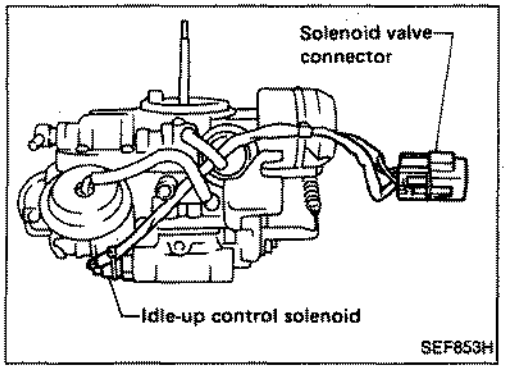
If N.G., replace with a new one.

Idle-up Control (Models without catalyzer)



SEF375L

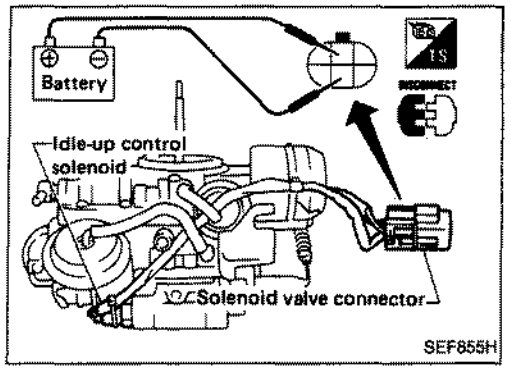
Idle-up Control (Models without catalyzer) (Cont'd)



This system prevents poor battery charging and erratic idling when the following load switches are operating.

- Headlamps
- Rear defogger
- Blower motor
- Power steering switch

In this system, the proper fuel is added when solenoid valve attached to carburetor is in the "ON" position.

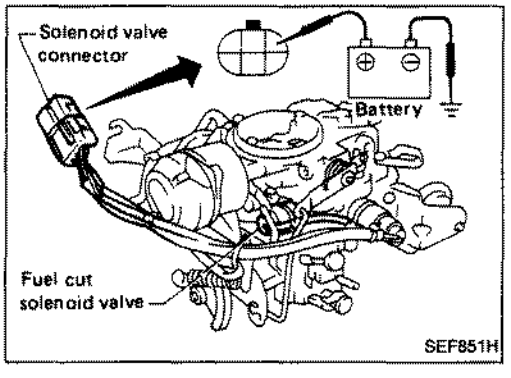


INSPECTION

Idle-up control solenoid valve

1. Connect solenoid valve connector to battery.
2. Check "click" sound from solenoid valve when battery is connected and disconnected.
3. If no sound is heard from solenoid valve, replace with a new one.

1) Disconnect harness from harness connector.
2) Remove solenoid valve from carburetor.
3) Install new solenoid valve. After replacement, check that solenoid valve is in good condition.



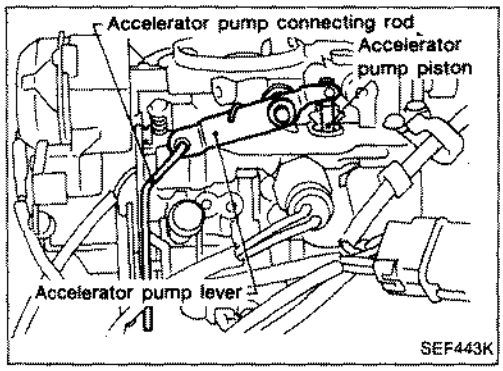
Fuel Cut Solenoid Valve (Models without catalyzer)

1. Connect solenoid valve connector to battery.
2. Check "click" sound from solenoid valve when battery is connected and disconnected.

3. If no sound is heard from fuel cut solenoid valve, replace with a new one.

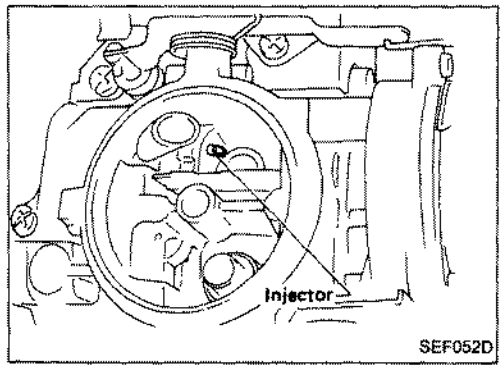
1) Disconnect harness from harness connector.
2) Remove fuel cut solenoid valve from carburetor.
3) Install new fuel cut solenoid valve.

After replacement, start engine and check that fuel cut solenoid is in good condition.

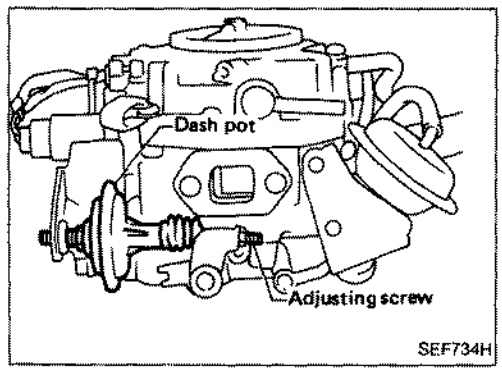


Accelerator Pump

1. After stopping the engine, make a visual check of the accelerator pump connecting rod and lever.
- If they are bent or twisted, replace them.



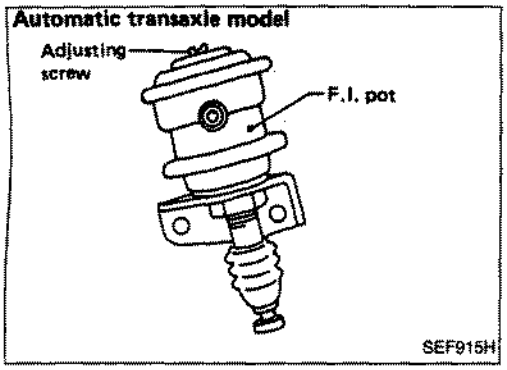
2. Turn the throttle lever and make sure that fuel is smoothly injected from the injector located in the primary port.
- If the accelerator pump is not functioning properly, check the pump piston.
  Replace it if necessary.



Dash Pot or F.I. (Fast Idle) Pot

1. Engine idle speed and mixture must be set properly and engine warmed up sufficiently.
2. Turn throttle valve by hand, and read engine speed when dash pot or F.I. pot just touches stopper lever.
   Dash pot or F.I. pot touch speed:
   GA13DS & GA14DS
   2,540 ± 200 rpm, 2,500 ± 200 rpm*
   ***For models with catalyzer**
   GA16DS
   2,500 ± 200 rpm
3. If out of specifications, adjust it by turning adjusting screw.
4. After adjusting, make sure that engine speed drops smoothly from 2,000 to 1,000 rpm in approximately three seconds.

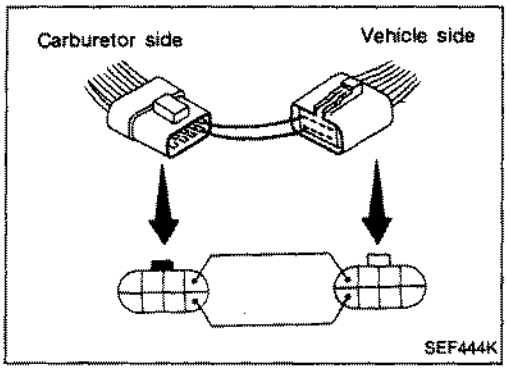
Dash Pot or F.I. (Fast Idle) Pot (Cont'd)



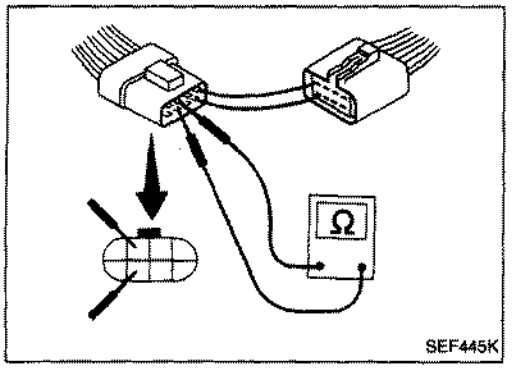
F.I. ACTUATOR

1. Warm up engine sufficiently.
2. Check idle speed and mixture ratio.
   Idle speed: rpm (in "N" position)
   M/T 750 ± 50
   A/T 850 ± 50
   Idle "CO":
   1.5 ± 0.5% (Models without catalyzer)
   1.0 ± 0.5%* (Models with catalyzer)
   *** Disconnect exhaust gas sensor harness connector and A.I.V. control solenoid valve harness connector.**
3. Turn air conditioner switch "ON", and check idle speed.
   Idle speed: rpm (in "N" position)
   M/T 850 ± 50
   A/T 850 ± 50
4. If out of specification, adjust idle speed by turning adjusting screw.

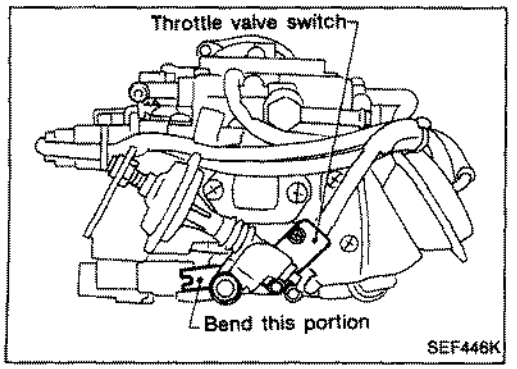
Throttle Valve Switch (Models with catalyzer)



1. Turn off engine and disconnect harness connector on carburetor.
2. Connect proper wires between the fuel cut solenoid valve harness terminals.

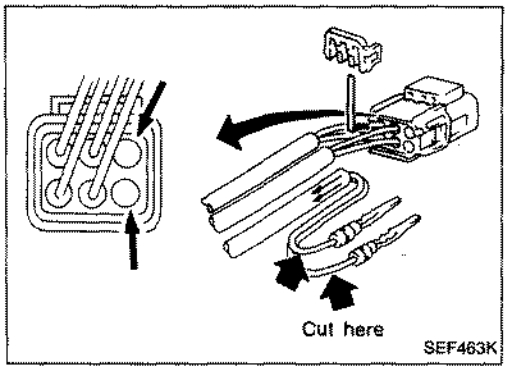


3. Verify that continuity does not exist between the throttle valve switch harness terminals.
4. Start engine and increase engine speed to about 2,000 rpm.
5. At this time, verify that continuity exists between the throttle valve harness terminals.



6. Then, decrease engine speed gradually to below.
   Engine speed:
   1,200 rpm

At that point, the circuit should break and cause the ohmmeter to indicate an open circuit.
If incorrect, adjust by bending plate until the ohmmeter indicates an open circuit.



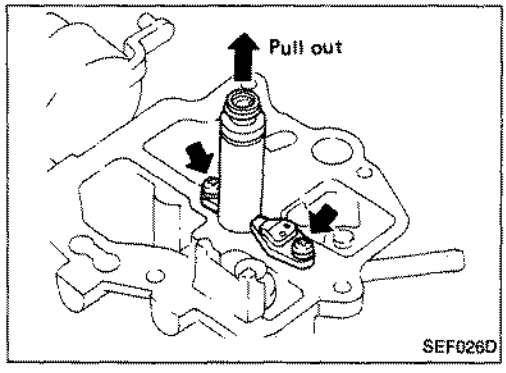
Replacing Air-fuel Ratio Solenoid Valve (Models with catalyzer)

1. Remove carburetor from engine.

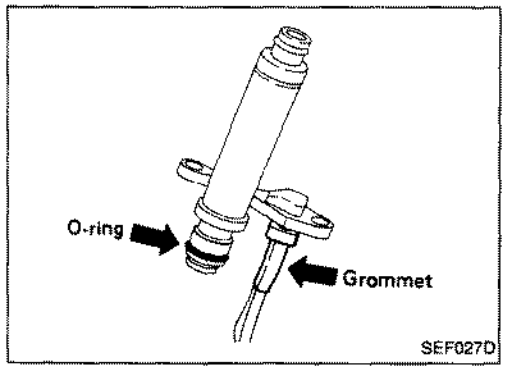
CAUTION:

Before removing carburetor, drain about one liter (7/8 Imp qt) of engine coolant.

2. Disconnect harness from harness connector and cut at the terminals.

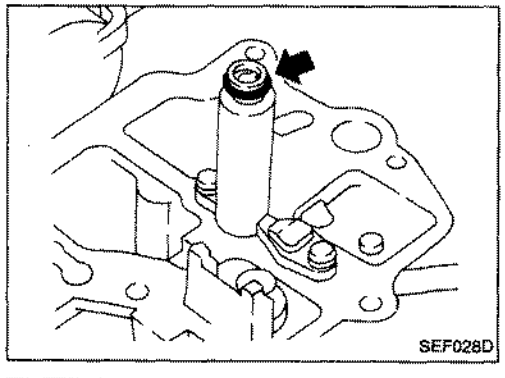


3. Remove choke chamber assembly from carburetor.
4. Remove air-fuel ratio solenoid from choke chamber.

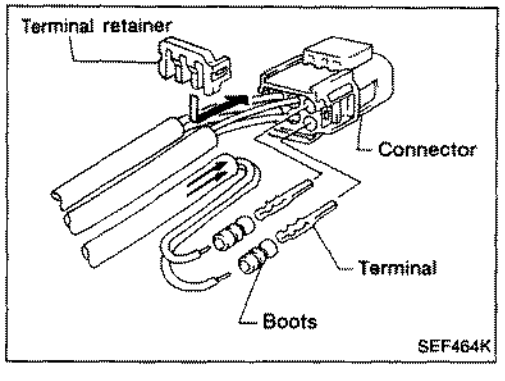


5. Install new air-fuel ratio solenoid valve to choke chamber.
- Apply silicon grease to O-ring.
- Always use new grommet.
- Take care not to damage O-ring when installing.
- If mounting bolts are damaged, replace with new ones.

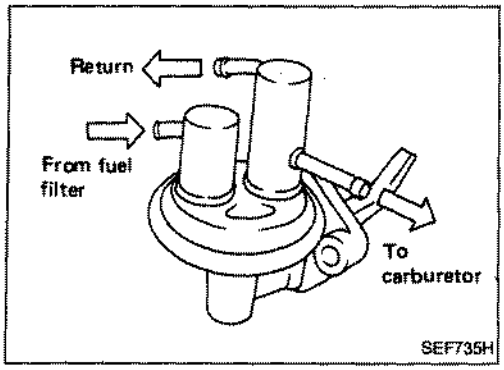
: 1.5 - 3.9 N·m (0.15 - 0.40 kg-m, 1.1 - 2.9 ft-lb)



6. Install choke chamber assembly.
- Apply silicon grease to O-ring.
- Take care not to damage O-ring.
- Always use new choke chamber gasket.

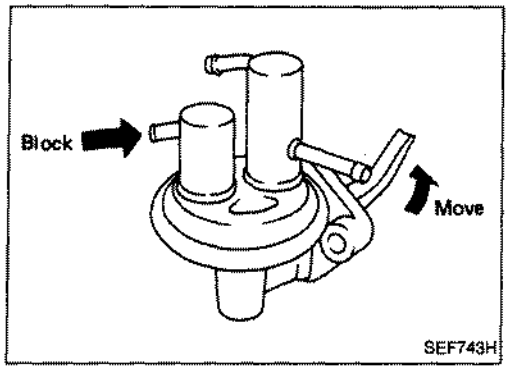


7. Fix new boots and terminal ends to harness with terminal pliers, and then place terminals in connector.



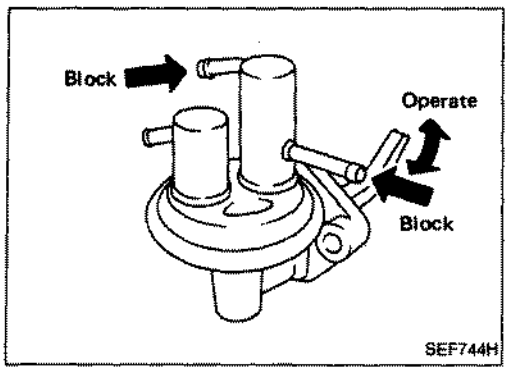
Fuel Pump

The fuel pump is a mechanical type and is mounted on the cylinder head. The end of the pump lever rests on the camshaft. When the camshaft rotates, the lever moves in a reciprocating motion to deliver fuel from the fuel tank to the carburetor.



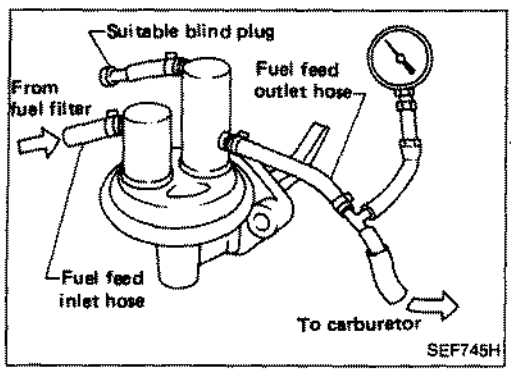
Operation

1. Flush pump by immersing it in a fuel bath and operating rocker arm several times.
2. Drain fuel from fuel pump. Then block off the inlet port and check that pump arm does not move.
3. Remove your finger from the inlet port and listen for a suction sound which will confirm that sufficient suction was produced.



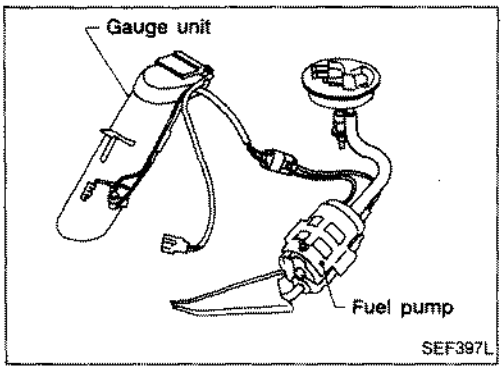
4. Block off outlet port and return port. Once again operate rocker arm. After air pressure has been built up, confirm that pressure remains for two or three seconds after.
5. Put a finger over outlet port and again build up pressure in pump. Then submerse pump in a fuel bath and check for air leaks.

WARNING:
Before starting to work on any part of fuel system, disconnect ground cable from battery. When disconnecting fuel hoses, use a container to catch fuel remaining in hoses.



Fuel Pressure

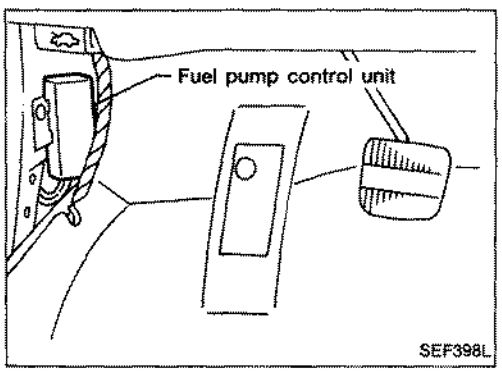
1. Disconnect fuel return hose and plug with a suitable blind plug.
2. Disconnect fuel feed outlet hose and connect fuel pressure gauge between fuel pump and carburetor.
3. Check fuel pressure with engine running at various speeds.
   Fuel pressure:
   20.6 - 34.3 kPa
   (0.206 - 0.343 bar, 0.21 - 0.35 kg/cm^2, 3.0 - 5.0 psi)
   If out of specification, check for fuel filter clogging or improper fuel pump operation.



Component Parts Description

ELECTRIC FUEL PUMP

The fuel pump, which is located in the fuel tank, is a turbine type pump.

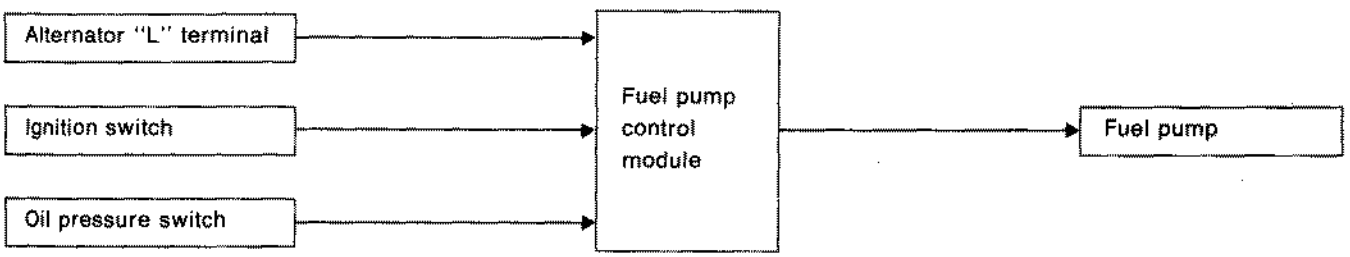


FUEL PUMP CONTROL UNIT

The fuel pump control unit is located at dash side.
Electric fuel pump is controlled by fuel pump control unit. This unit drives electric fuel pump in response to the signals from alternator "L" terminal, ignition switch and oil pressure switch.

System Description

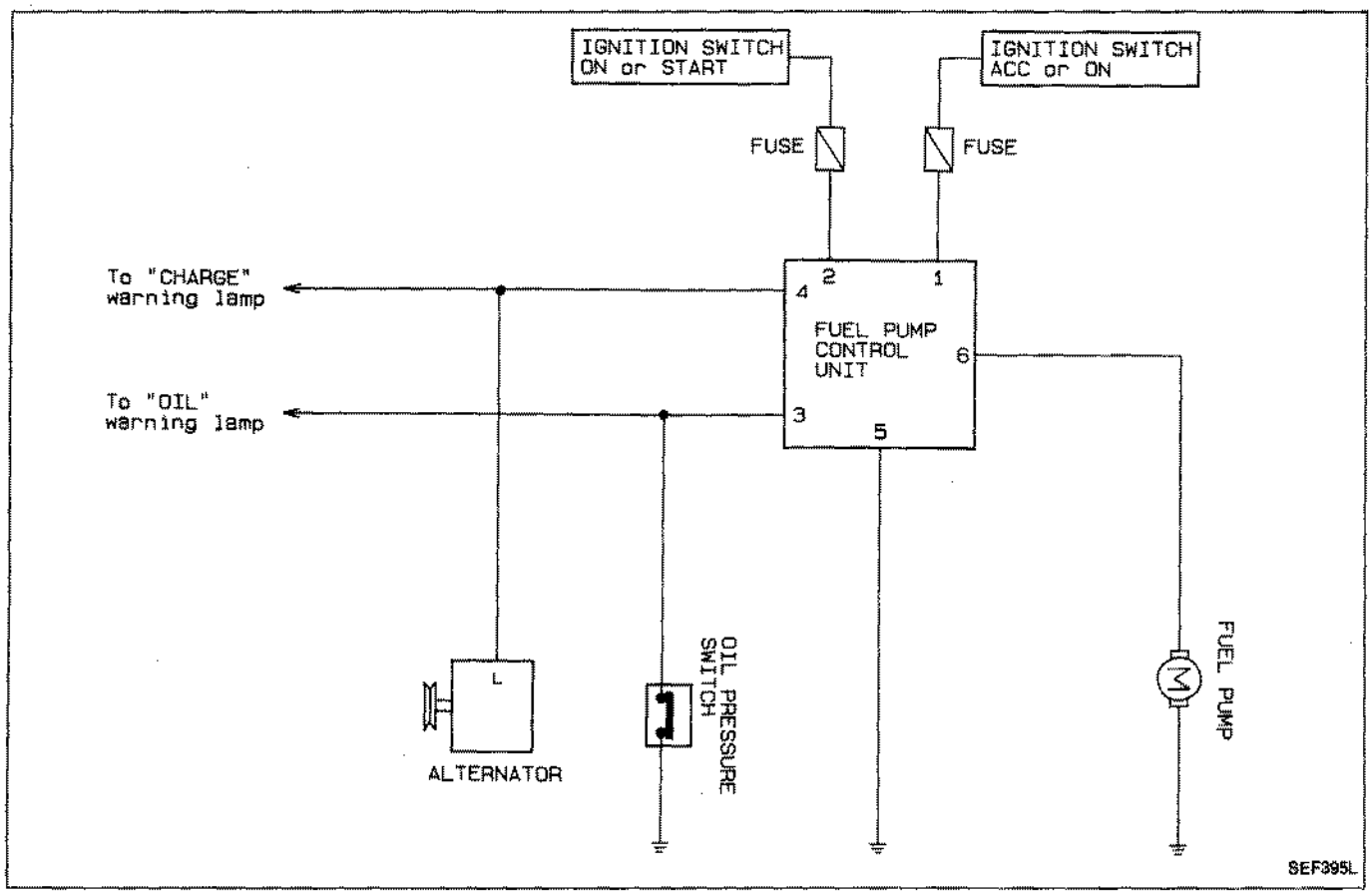
The electric fuel pump is controlled by the fuel pump control unit. This unit drives the electric fuel pump in response to signals from the alternator "L" terminal, ignition switch and oil pressure switch.



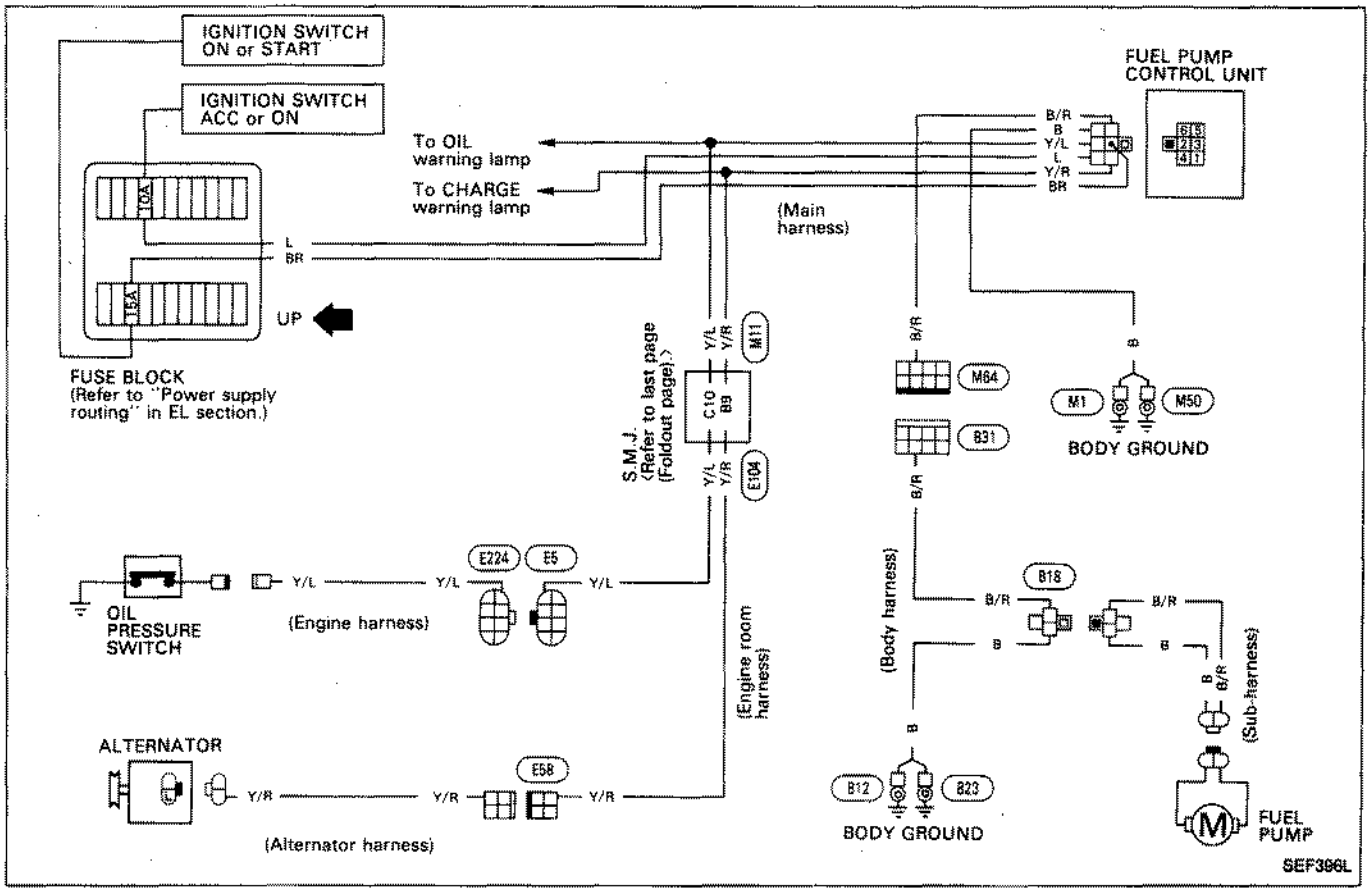
Operation

Ignition switch position	Engine	Alternator	Oil pressure	Fuel pump
OFF	Stopped	Not generating	No pressure	Not operating
ACC				
ON				
START	Cranking	Generating	Low pressure	Operating
		Not generating	Normal	
ON	Running	Generating		
		Failure		
		Generating	Failure	

Schematic



Wiring Diagram



Inspection

ELECTRIC CHECK

1. Crank or start engine.
2. Check voltage between terminal ③ and ground.
   Voltage: Battery voltage should exist.
   If N.G., check the following:
   1) Input signal to control unit
   2) Electric fuel pump control unit
   3) Circuit continuity

INPUT SIGNAL CHECK

Check input signals in each terminal of fuel pump control unit, following the table shown below.
If N.G., check harness continuity between fuel pump control unit and each component, or check each component individually. If O.K., perform fuel pump control unit check.

Check terminals			Condition	Circuit tester	
	+	−		Range	Reading
Ground	⑥	Body earth	—	Ω	0Ω
Battery (ON or START)	②		Ignition switch "ON"	V	Battery voltage
			Ignition switch "START"*		
Battery (ACC or ON)	④		Ignition switch "ON"		
			Ignition switch "START"*		0V
Alternator "L" terminal	①		Engine running		Battery voltage
			Engine stopped		0V
Oil pressure switch	⑤		Engine running		Battery voltage
			Engine stopped		0V

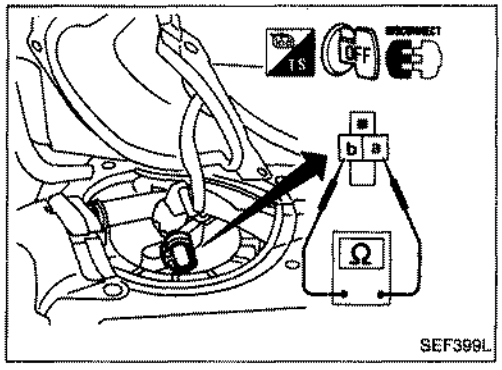
*: Disconnect starter motor "S" terminal before turning ignition switch to "START".

Inspection (Cont'd)

FUEL PUMP CONTROL UNIT CHECK

- **First, disconnect starter motor "S" terminal.**
- **This check should be performed without starting engine. Check fuel pump control unit, following the table shown below.**

Step	Condition			Output voltage of terminal ③
	Alternator "L" terminal	Oil pressure switch terminal	Ignition switch	
1	Connected	Connected	OFF	0V
2			ACC	
3			ON	
4			START	Battery voltage
5	Disconnected		ON	
6			START	
7		Disconnected	ON	
8			START	
9	Connected		ON	
10			START	



FUEL PUMP COMPONENT CHECK

1) Make sure that ignition switch is "OFF".
2) Disconnect fuel pump harness connector.
3) Check continuity between terminals ⓐ and ⓑ.

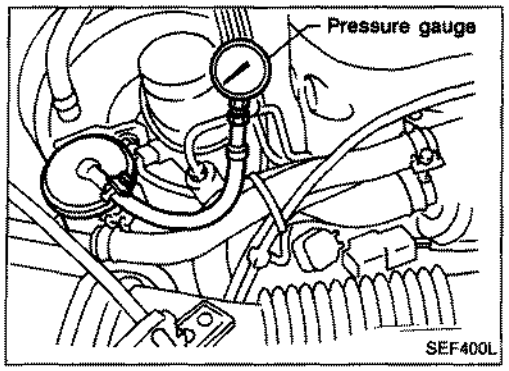
Continuity should exist.

FUEL PRESSURE CHECK

WARNING:

a. Keep flammables away during the test.
b. For safety, the test must be completed in as short a time as possible.

Inspection (Cont'd)



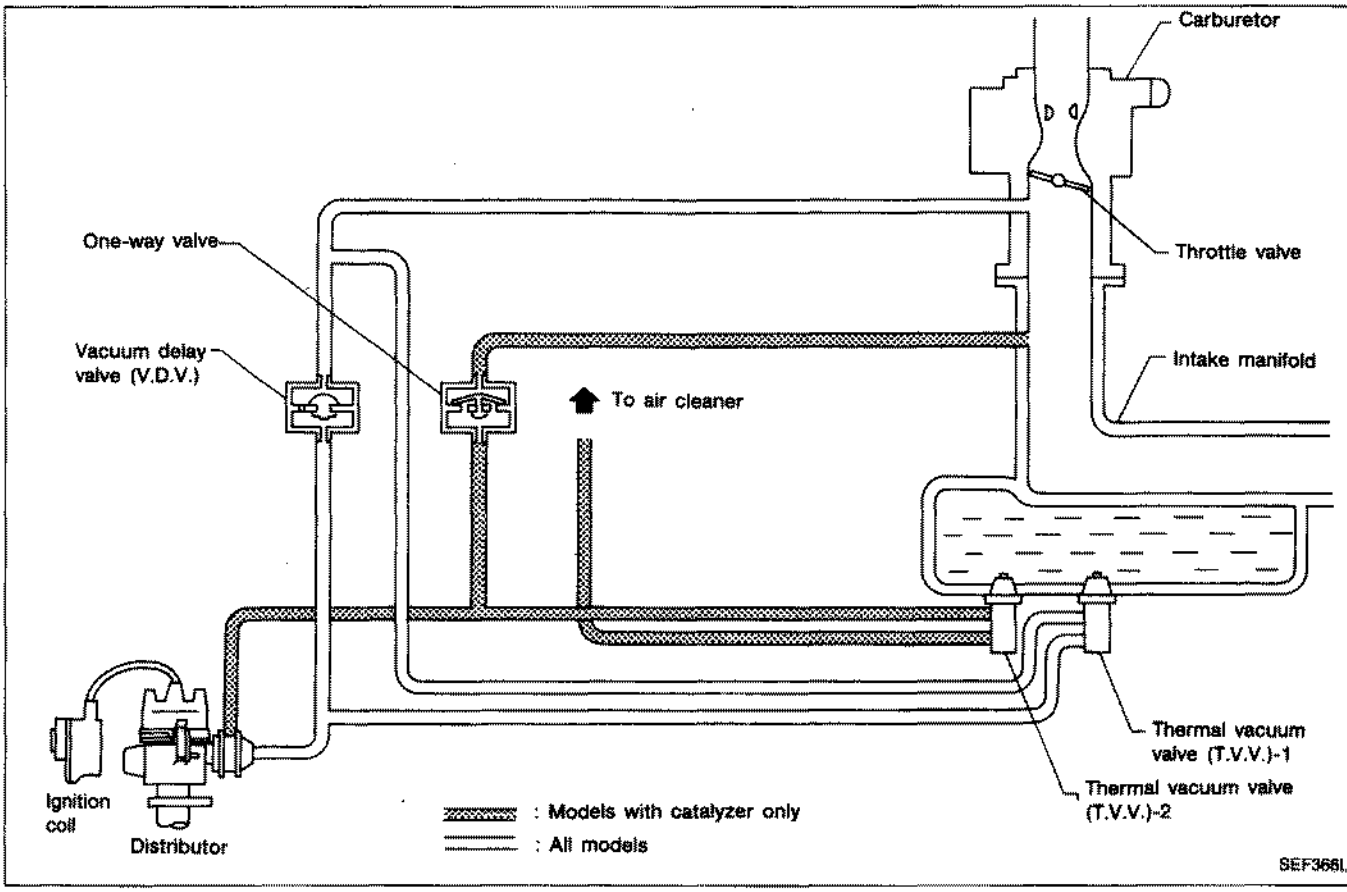
1. Connect a suitable fuel pressure gauge.
2. Check fuel pressure.

Fuel pressure (Approximately):

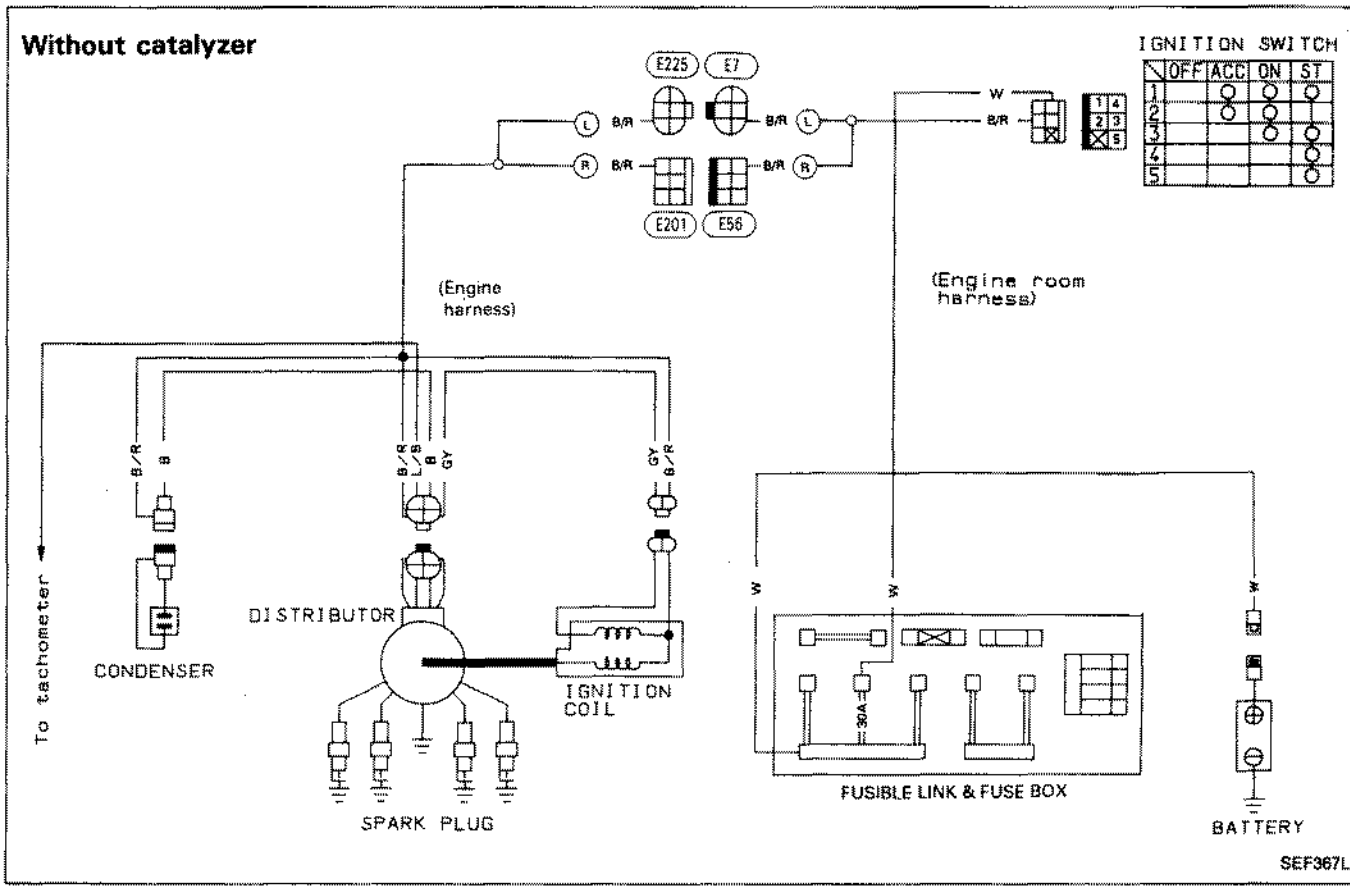
14.7 kPa

(0.147 bar, 0.15 kg/cm^2, 2.1 psi)

If fuel pressure or fuel quantity is extremely low, check if fuel filter is clogged.



Wiring Diagram



System Description

Ignition timing is controlled by two systems built into the distributor to meet varying conditions during engine operation:

1) Governor advance system
   Advances ignition timing in response to engine speed.
2) Vacuum advance system
   Advances ignition timing by compensating for combustion speed delay when intake vacuum is high.

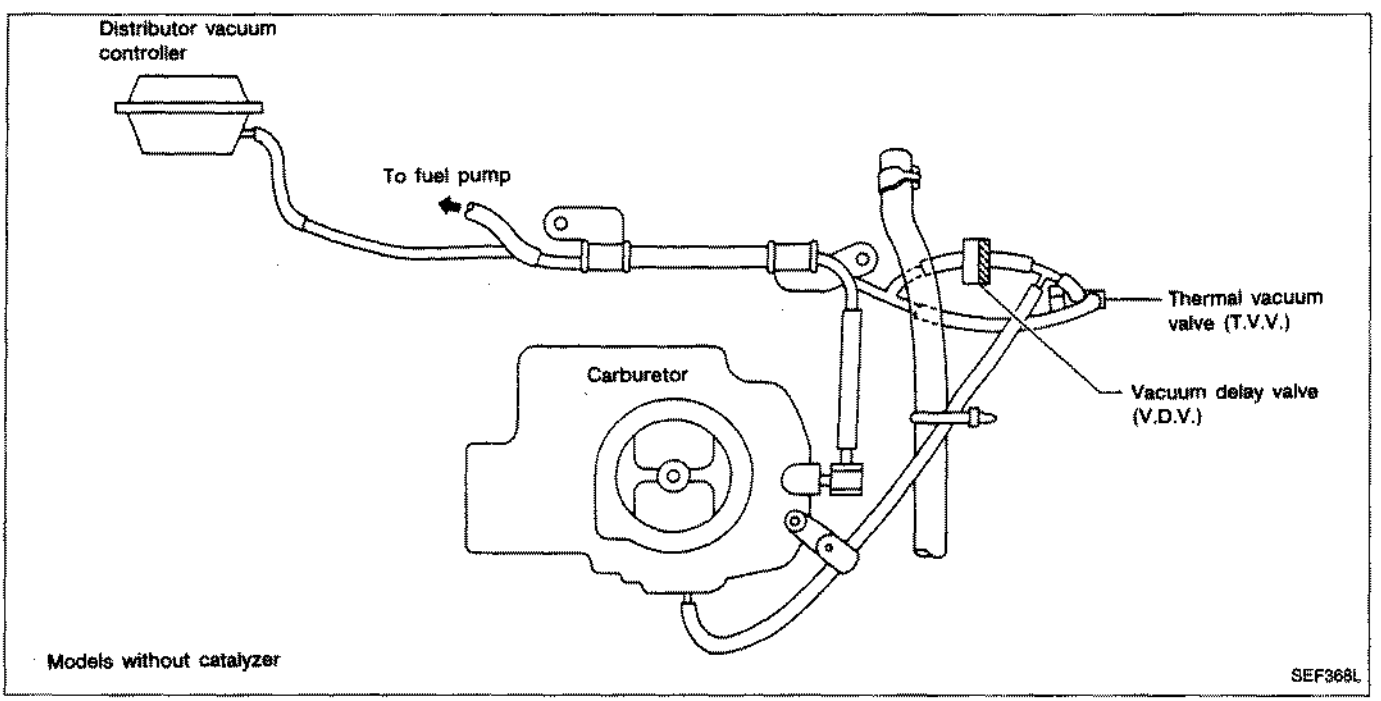
The thermal vacuum valve is located in the distributor vacuum line. It prevents vacuum advance during engine warm-up and improves operating performance.

OPERATION

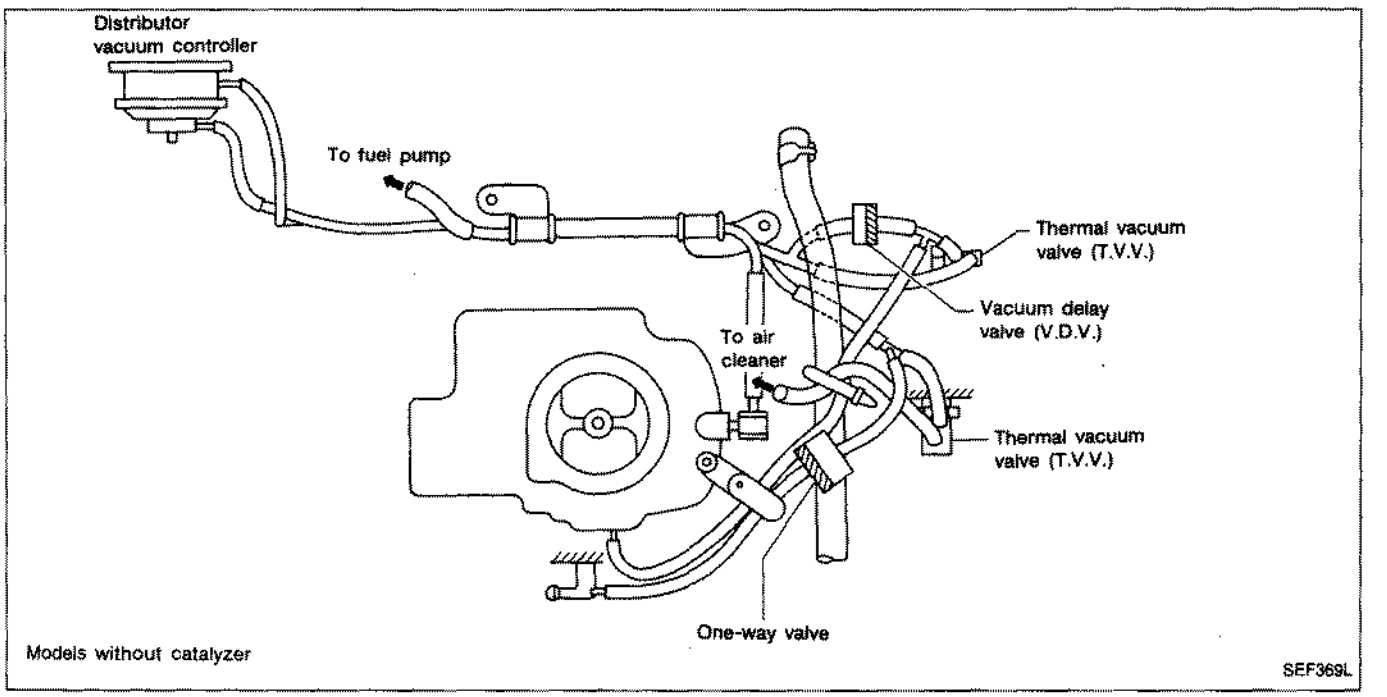
Water temperature °C (°F)	T.V.V.-1	T.V.V.-2 Models with catalyzer only	Vacuum advance	
			Models with catalyzer	Models without catalyzer
Below 20 (68)	Close	Close	Fully advanced*	Normal*
Between 20 (68) and 50 (122)	Close	Open	Normal*	
Above 50 (122)	Open	Open	Normal	Normal

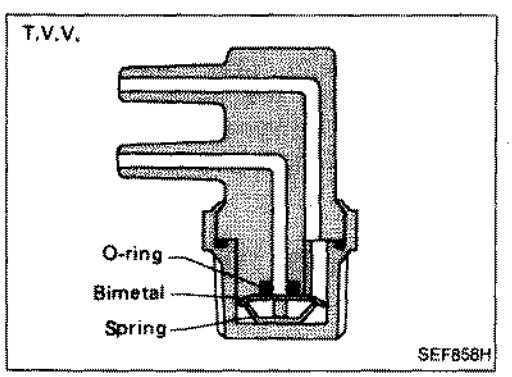
* Ignition timing is prevented from retarding suddenly by V.D.V. when depressing accelerator pedal.

Component Parts Description



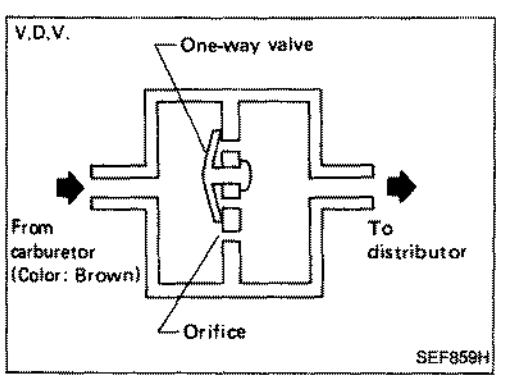
Component Parts Description (Cont'd)





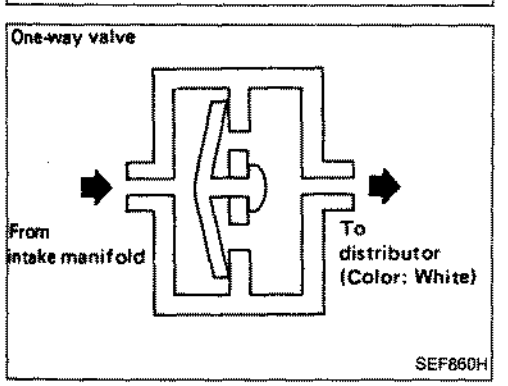
THERMAL VACUUM VALVE (T.V.V.)

This thermal vacuum valve is mounted on the front side of the intake manifold. It detects engine coolant temperature by means of a built-in bimetal, and opens or closes the vacuum passage in the thermal vacuum valve.



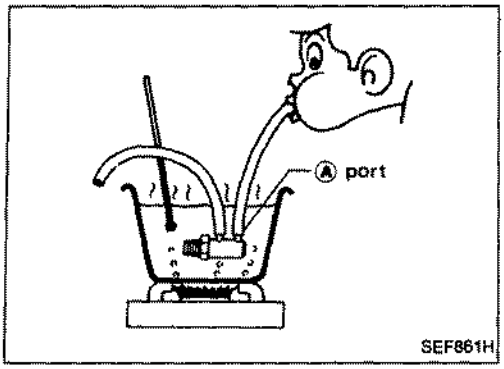
VACUUM DELAY VALVE (V.D.V.)

The vacuum delay valve is installed in the vacuum control line to the distributor. This valve prevents ignition timing from retarding suddenly when the throttle valve is opened rapidly.



ONE-WAY VALVE

The one-way valve is installed in the vacuum control line to the distributor. This valve restricts air flow to one way.

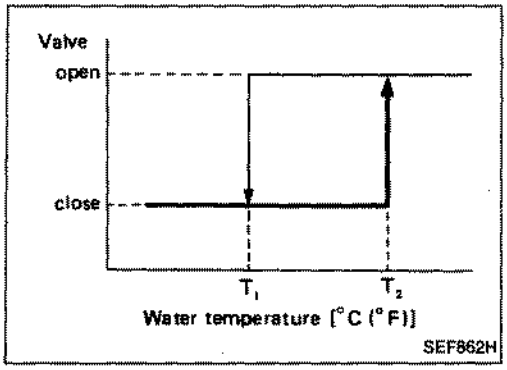


Component Parts Inspection

THERMAL VACUUM VALVE (T.V.V.)

Remove T.V.V. from engine.
Blow air from Ⓐ port and check to be sure that T.V.V. opens or closes in response to its temperature.

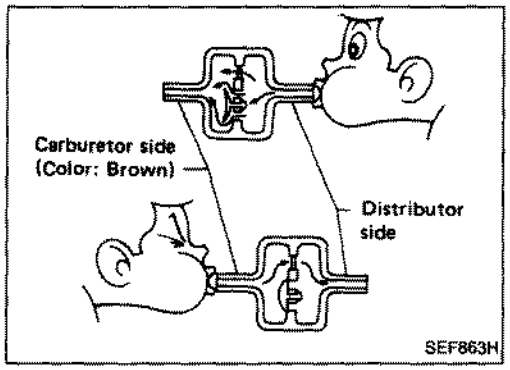
CAUTION:
Do not allow water to get inside the T.V.V.



Operation of T.V.V.

Unit: °C (°F)

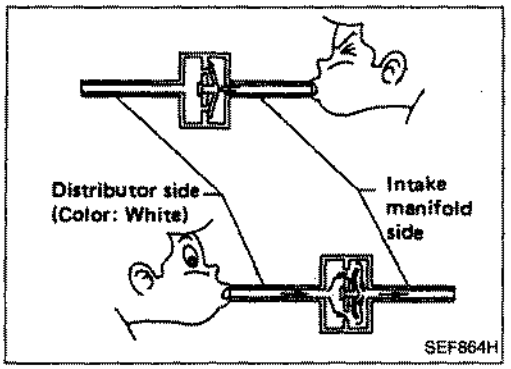
	T.V.V.-1	T.V.V.-2
T_1	30 (86) or more	5 (41) or more
T_2	40 (104)	20 (68)



VACUUM DELAY VALVE

1. Blow air from the port of the distributor side. The valve is in good condition if the air flows through the valve.
2. Try again from the opposite side of the valve. The valve is in good condition if the air flow resistance is greater than in step 1 above.

CAUTION:
Be careful to avoid entry of oil or dirt into valve.

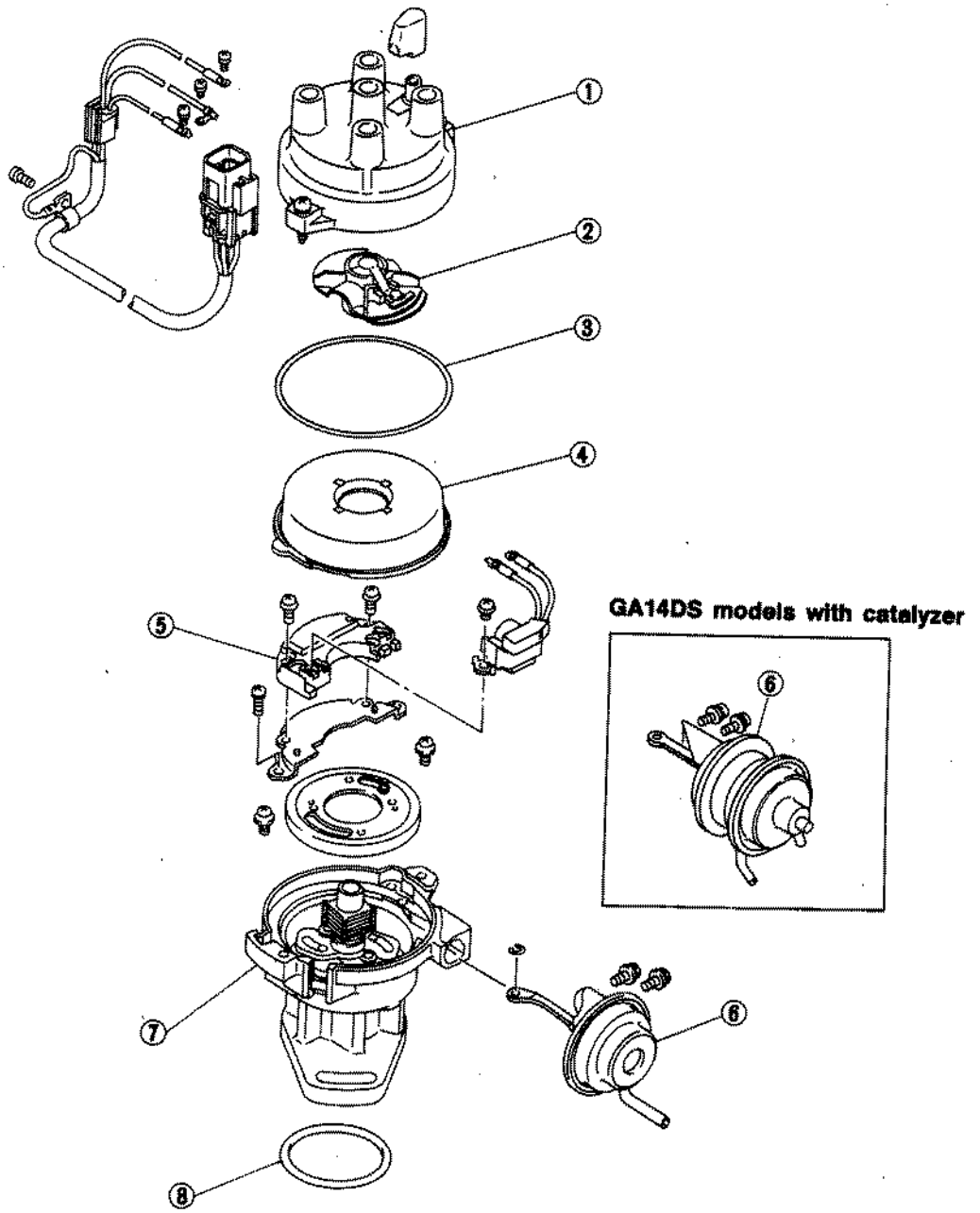


ONE-WAY VALVE

1. Blow air from the port of the intake manifold side. The one-way valve is in good condition if the air does not flow through the valve.
2. Try again from the opposite side of (White-faced side) of the valve. The valve is in good condition if the air flow resistance is greater.

CAUTION:
Be careful to avoid entry of oil or dirt into valve.

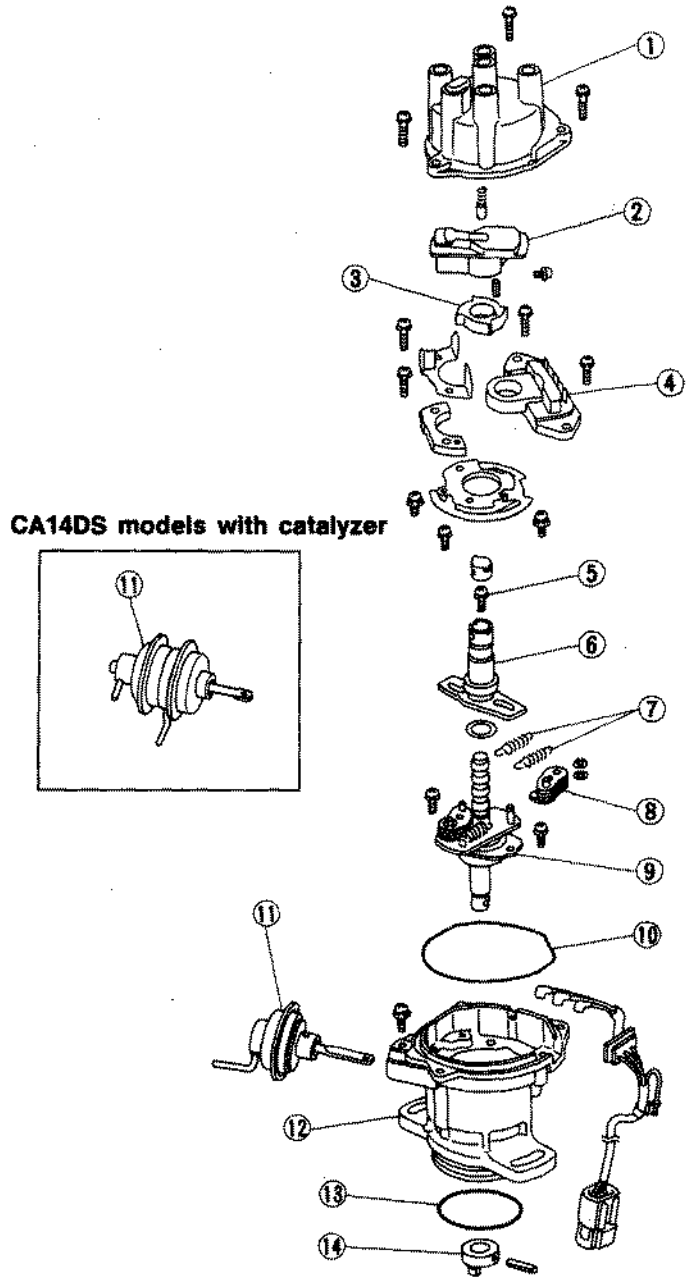
MITSUBISHI make



① Cap
② Rotor
③ Rubber ring
④ Cover
⑤ IC ignition unit
⑥ Vacuum controller
⑦ Housing assembly
⑧ O-ring

SEF370L

HITACHI make



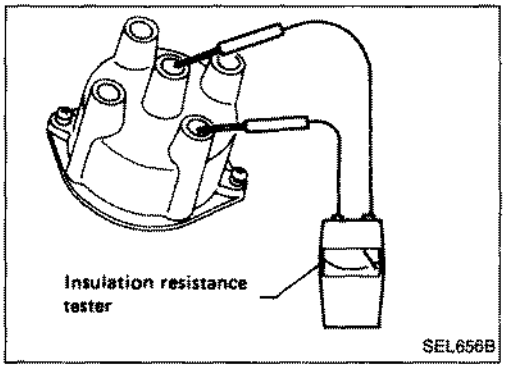
SEF371L

① Cap
② Rotor head
③ Reluctor
④ IC ignition unit
⑤ Rotor shaft setting screw
⑥ Rotor shaft
⑦ Governor spring
⑧ Governor weight
⑨ Shaft assembly
⑩ Rubber ring
⑪ Vacuum controller
⑫ Housing
⑬ O-ring
⑭ Coupling

Disassembly

Carefully observe the following instructions during disassembly.

- **Put a matchmark across cam and shaft so that original combination can be restored at assembly.**
- **Inscribe a matchmark across spring and mating parts so that spring can be replaced in its original position during assembly.**
  Be careful not to stretch or deform governor spring.

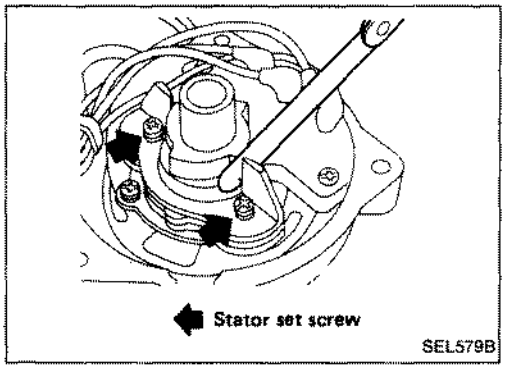


Distributor Component Check

CAP AND ROTOR HEAD

1. Check cap and rotor head for dust, carbon deposits and cracks.
2. Measure insulation resistance between electrodes on ignition coil and spark plug sides on cap.
   Insulation resistance:
   More than 50 MΩ

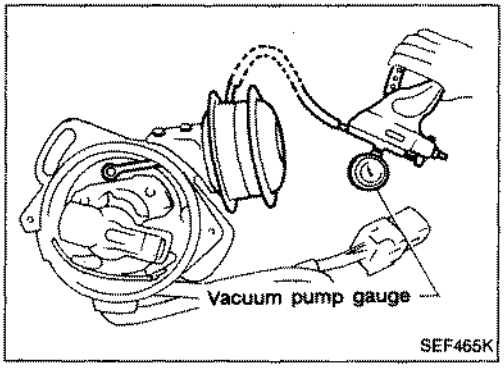
- Less than specified value ... Replace.



CHECKING AIR GAP

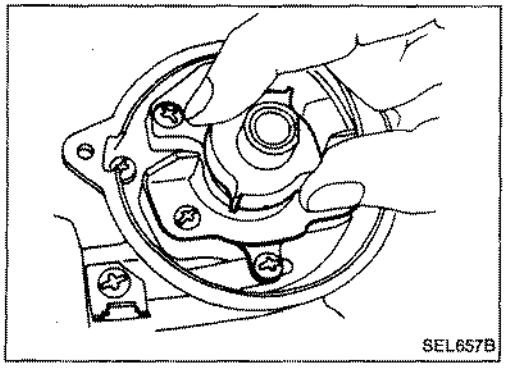
Check air gap between reluctor and stator.

Air gap:
0.3 - 0.5 mm (0.012 - 0.020 in)



VACUUM ADVANCE

1. Connect vacuum pump gauge to vacuum controller and gradually draw a vacuum while watching breaker plate movement. Check for smooth operation with no evidence of binding.
2. Turn breaker plate right and left to check for freedom of movement.



GOVERNOR ADVANCE

Turn head of cam assembly counterclockwise, release it, then check that it returns smoothly to the original position.

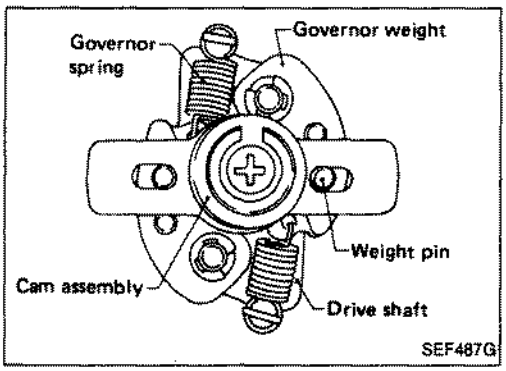
Assembly

Carefully observe the following instructions.

GREASE POINT

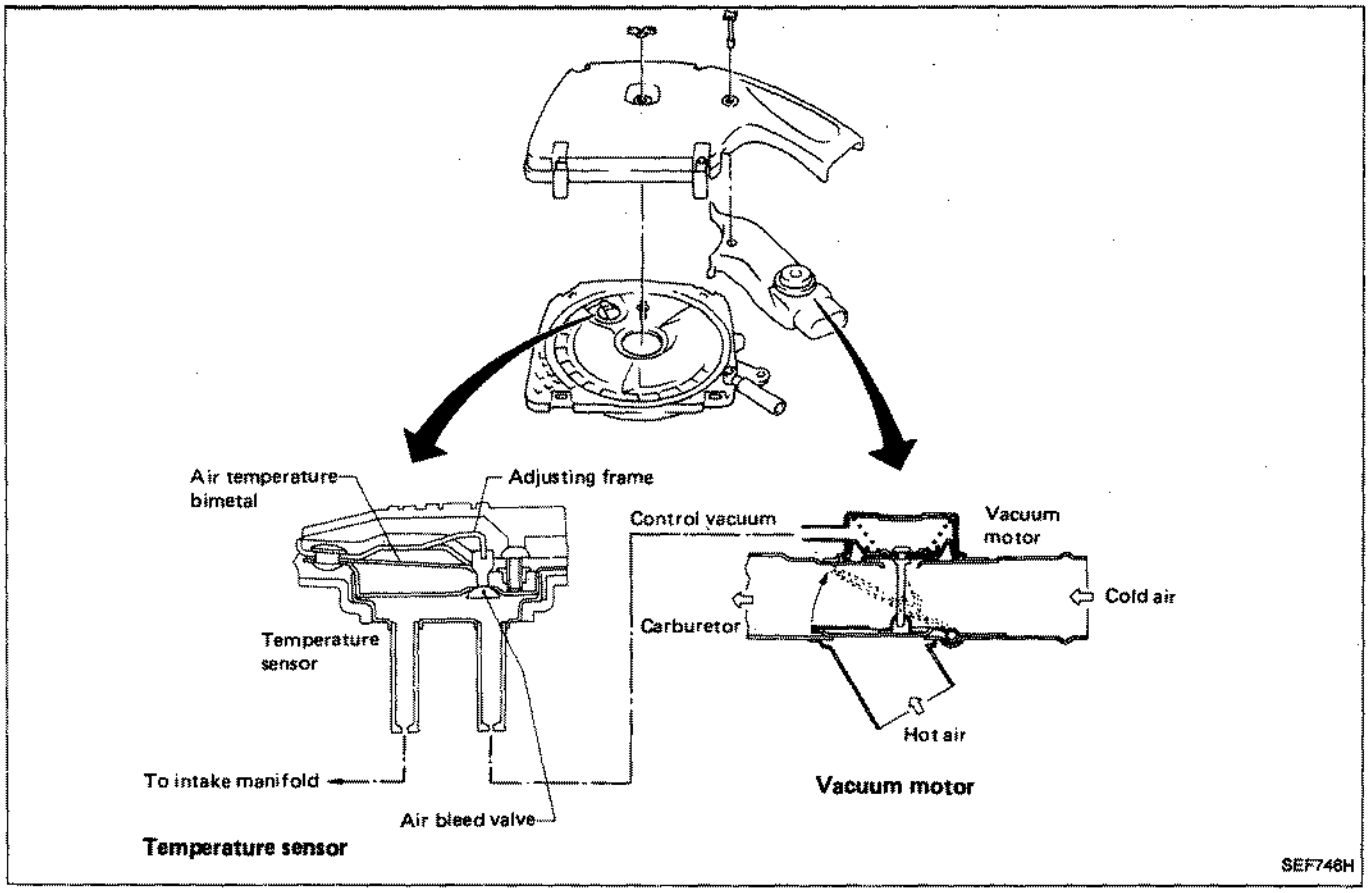
Apply high-temperature grease to:

- Governor spring
- Frictional surface of governor weight
- Frictional surface of breaker plate
- Vacuum control shaft
- Cam and cam head



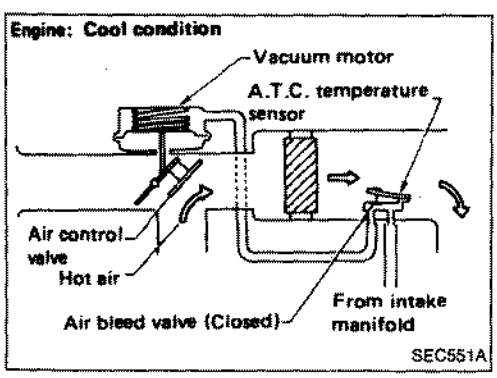
INSTALLATION OF GOVERNOR

Install governor springs, governor weights and cam assembly to drive shaft as shown in figure.



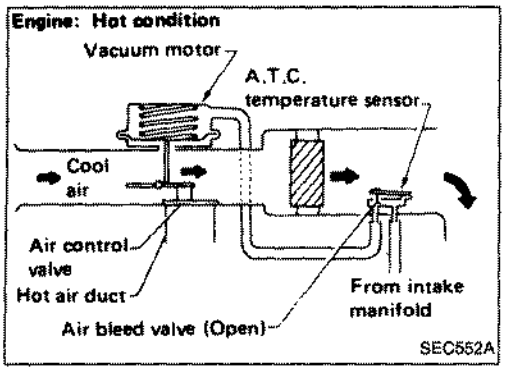
System Description

The automatic temperature control system maintains the temperature of air entering the carburetor. In addition, the automatic temperature control system improves the warm-up characteristics of the engine and prevents the fuel from icing.
The automatic temperature control system is controlled by the inlet air temperature and the load condition of the engine. The inlet air temperature is detected by the sensor, installed in the air cleaner box, and the vacuum motor is actuated by the intake manifold vacuum.



When the engine is not warmed up sufficiently, since the A.T.C. temperature sensor passes the intake manifold vacuum to the vacuum motor, the motor actuates and hot air is introduced into the air cleaner. In this step, the higher the intake manifold vacuum is, the wider the air control valve opens.

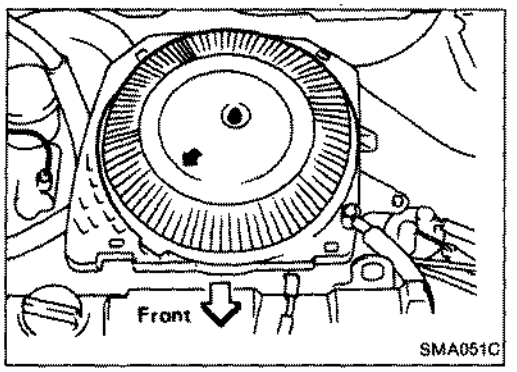
System Description (Cont'd)



When the engine is warmed up, the A.T.C. temperature sensor releases to the atmosphere the intake manifold vacuum leading to the vacuum motor. Therefore, the vacuum motor deactivates. In this step, the air control valve shuts off hot air, allowing normal temperature air to flow to the air cleaner.

Operation

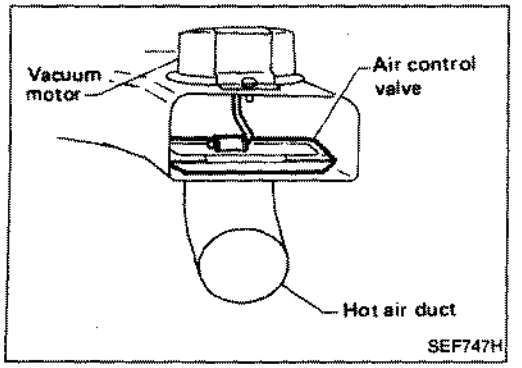
Temperature sensor		Vacuum motor		Inlet air
Ambient temperature around sensor °C (°F)	Operation	Intake manifold vacuum –kPa (–mbar, –mmHg, –inHg)	Operation	
Below 38 (100)	Closed	Above 16.7 (167, 125, 4.92)	Raised	Hot
		4.7 - 16.7 (47 - 167, 35 - 125, 1.38 - 4.92)	Partially raised	Cold + Hot
		Below 4.7 (47, 35, 1.38)	Down	Cold
Above 48 (118)	Open	Any value	Down	



Inspection

AIR CLEANER FILTER (Viscous paper type)

Viscous paper type air cleaner filter does not need cleaning between renewals. The filter should never be brushed or blasted because both cause clogging and enrich the mixture ratio.



AUTOMATIC TEMPERATURE CONTROL SYSTEM

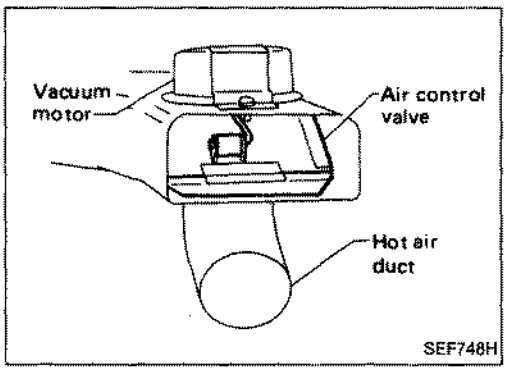
- Engine stall or hesitation
- Increase in fuel consumption
- Lack of power

If these phenomena occur, check A.T.C. system before inspecting carburetor.

1. Check hoses for cracks, distortion and improper position.
2. Check A.T.C. system for proper function while engine is cool. Check air control valve position.

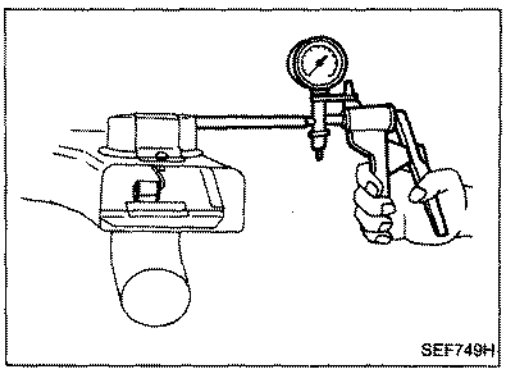
Air control valve is correct if it is in the lower position.

Inspection (Cont'd)



3. Start engine and immediately check the air control valve position. If it rises, it is correct.
4. Make sure that air control valve moves up and down when engine speed is quickly increased and decreased.
5. Make sure that air control valve partially rises when engine warm-up advances.

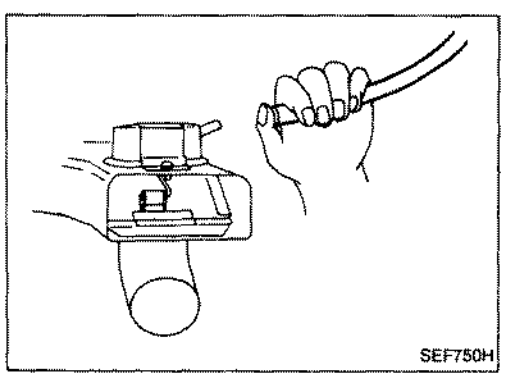
If the above test reveals any malfunction in the operation of the air control valve, carry out the following test:



Vacuum motor

Disconnect the inlet vacuum hose of vacuum motor, and connect another hose to the inlet to apply vacuum to vacuum motor. Then, confirm that air control valve moves.

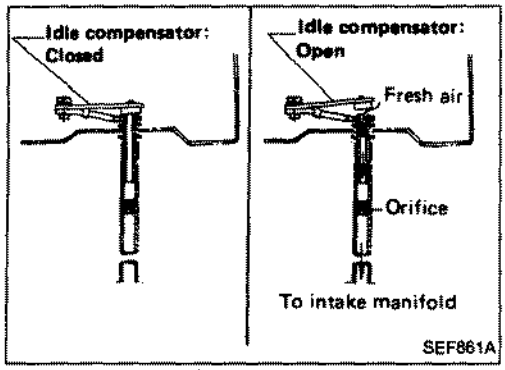
Air control valve operating vacuum:
–kPa (–mbar, –mmHg, –inHg)
Opening starts
6.7 ± 2.0 (67 ± 20, 50 ± 15, 1.97 ± 0.59)
Full opening
13.3 ± 3.3 (133 ± 33, 100 ± 25, 3.94 ± 0.98)

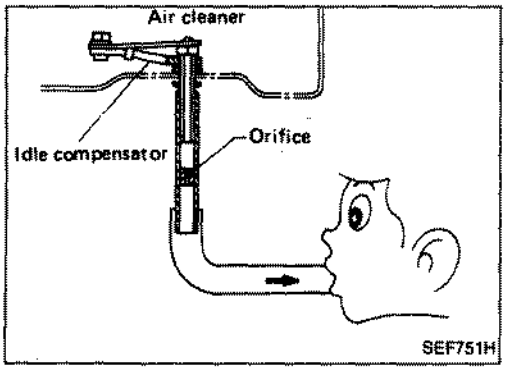


Temperature sensor

While engine is cool and idling, disconnect inlet vacuum hose of vacuum motor and make sure that intake manifold vacuum is present at the end of vacuum hose. If vacuum is weak or is nonexistent, check vacuum hose for leakage.

Replace temperature sensor if vacuum hoses are in good condition. After engine warms up, make sure no vacuum exists. If necessary, replace temperature sensor.





Idle Compensator

The idle compensator is basically a thermostatic valve which introduces air directly from the air cleaner to the intake manifold to compensate for abnormal enrichment of mixture in high idle temperatures and to stabilize the engine. The idle compensator is installed on the air cleaner.
N14 4WD for Europe, B13 GA16DS for Europe and Gulf standard models have idle compensators No. 1 and No. 2. The others have only idle compensator No. 1.

Inspection

1. Remove air cleaner.
2. Suck on hose to make sure neither idle compensator opens.

Idle compensator opening temperature

Idle compensator No. 1

Intake air temperature °C (°F)	Bimetal function
Below 55 (131)	Fully closed
55 - 65 (131 - 149)	Closed or open
Above 65 (149)	Fully open

Idle compensator No. 2

Intake air temperature °C (°F)	Bimetal function
Below 65 (149)	Fully closed
65 - 75 (149 - 167)	Closed or open
Above 75 (167)	Fully open

3. Direct warm air to idle compensator with a heat gun. And measure operating temperature of idle compensator.

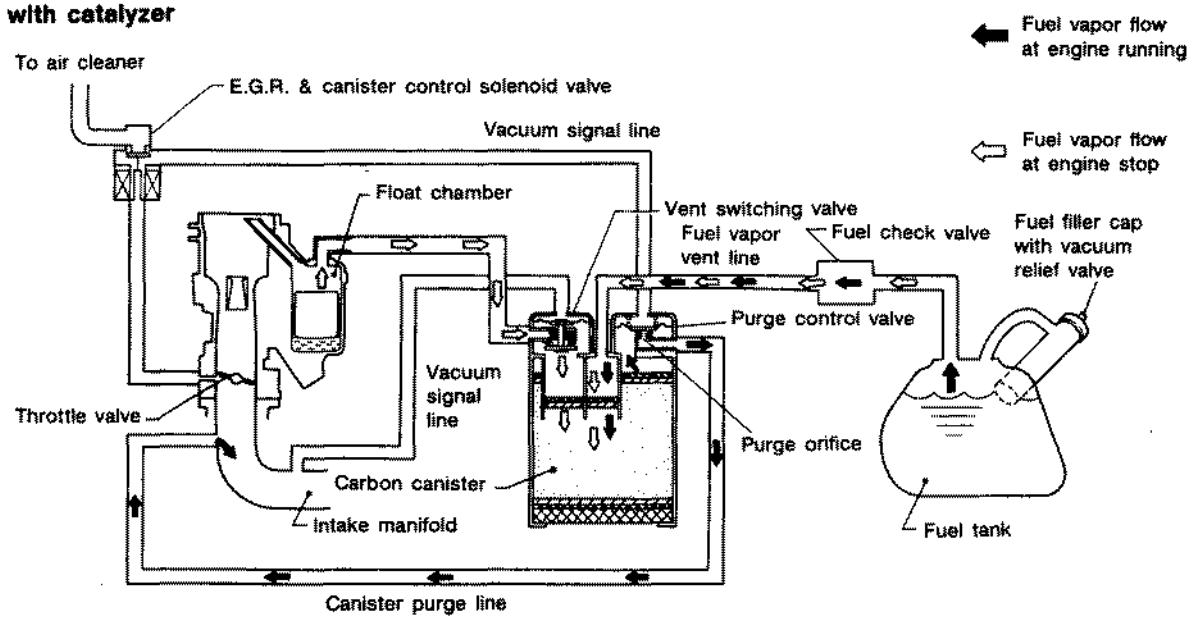
- **Place thermometer as close as possible to idle compensator sensor.**

4. Idle compensator is in good condition if airflow opens idle compensator when it reaches operating temperature.

- **Take care not to bend or damage bimetals of idle compensator.**

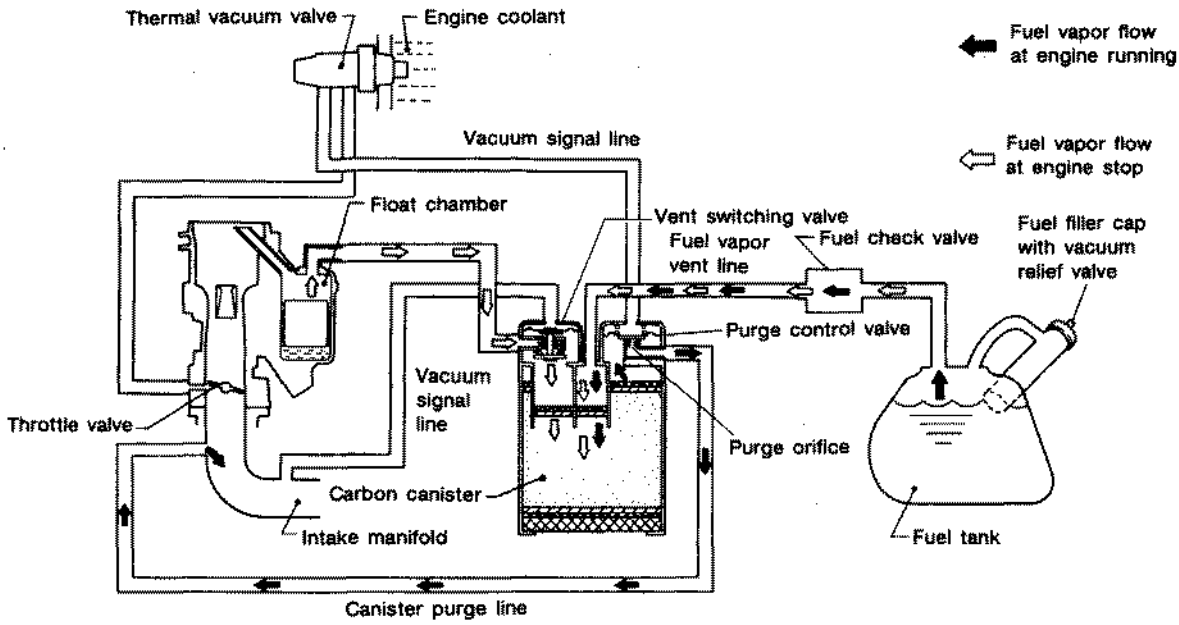
Description

Models with catalyzer



SEF486L

Models for Gulf standard



SEF487L

The evaporative emission control 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 carbon canister.

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

The canister retains the fuel vapor until the canister is purged by the air drawn through the bottom of the canister to the intake manifold when the engine is running. When the engine runs at idle, the purge control valve is closed.

Only a small amount of stored vapor flows into the intake manifold through the constant purge orifice. As the engine speed increases, and the throttle vacuum rises higher, the

Description (Cont'd)

purge control valve opens and the vapor is sucked into the intake manifold through both the main purge orifice and the constant purge orifice.

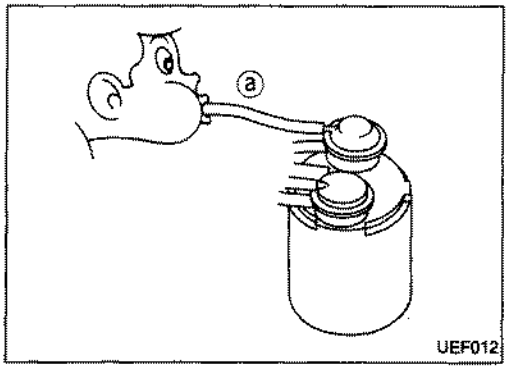
Inspection

FUEL TANK AND VAPOR VENT LINE

Refer to MA section for inspection of fuel tank and vapor vent line.

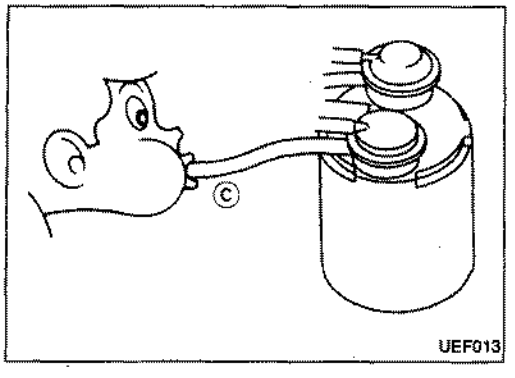
THERMAL VACUUM VALVE

The thermal vacuum valve is used with the ignition control system. Refer to page EF & EC-185.

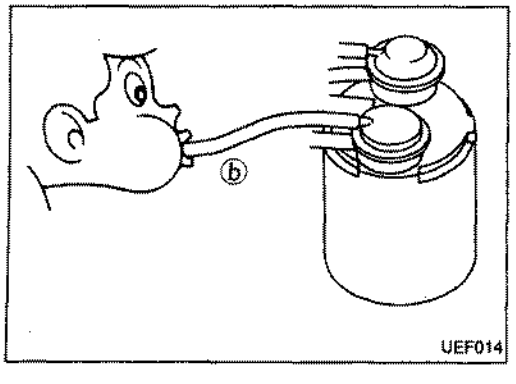


CARBON CANISTER PURGE CONTROL VALVE

1. Disconnect rubber hose in the line between T-connector and carbon canister, at T-connector (hose ⓐ).
2. With engine running, suck air from the opening of the rubber hose ⓐ, and make sure that there is no leak. Also, when sucking, engine rpm should increase.
   If N.G., replace canister.

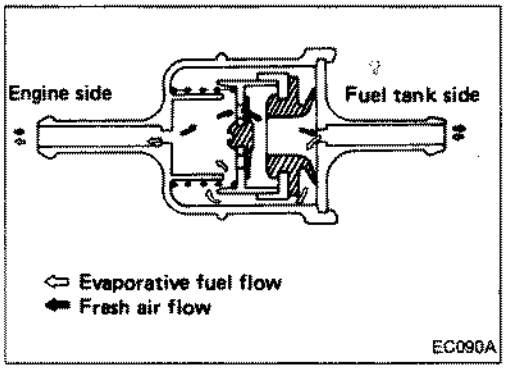


3. Disconnect rubber hose ⓒ, leading to carburetor float chamber.
4. With engine running blow air through rubber hose ⓒ, and make sure that there is no leak.
5. With engine off make sure there is a leak.
   If N.G., replace canister.



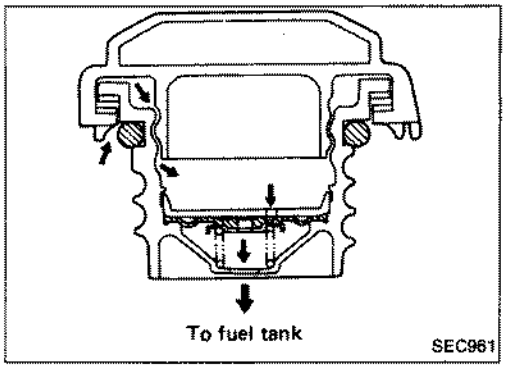
6. Disconnect rubber hose ⓑ, leading to intake manifold.
7. Blow or suck air to or from the opening of rubber hose ⓑ, and make sure that there is no leak.
   If N.G., replace canister.

Inspection (Cont'd)



FUEL CHECK VALVE

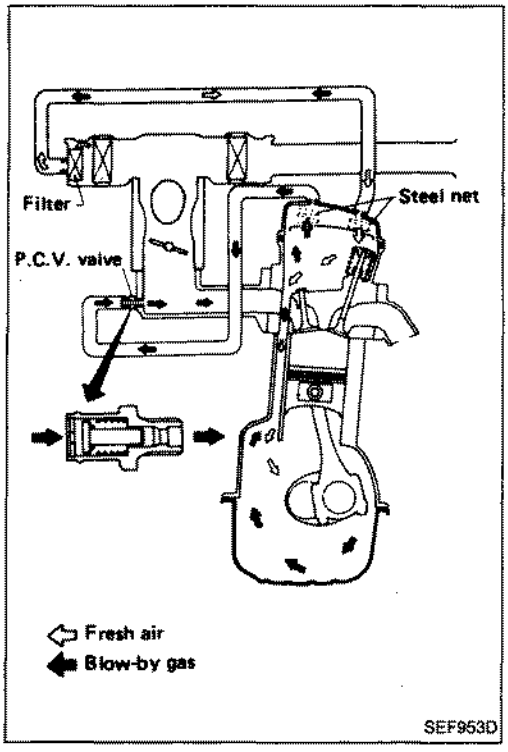
1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt at the mouth and a portion of air flow be directed toward the engine.
2. Blow air through connector on engine side.
   Air flow should be smoothly directed toward fuel tank.
3. If fuel check valve is suspected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



FUEL TANK VACUUM RELIEF VALVE

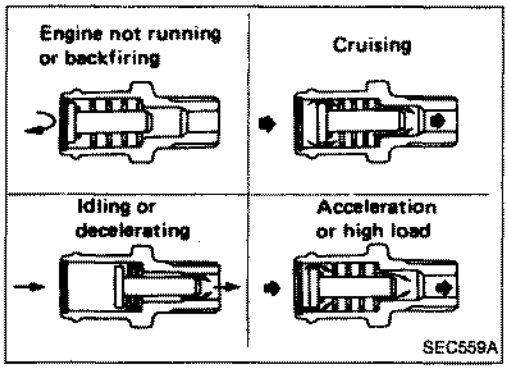
Remove fuel filler cap and make sure it functions properly.

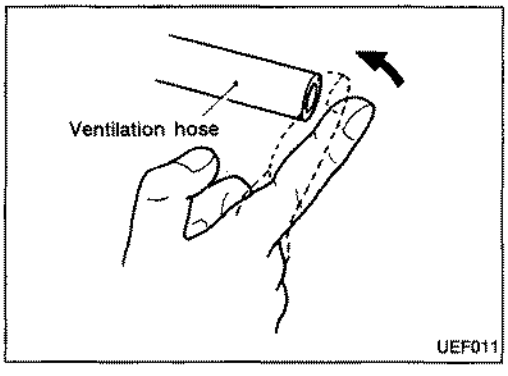
1. Wipe clean valve housing and place it in your mouth.
2. Suck air. A slight resistance accompanied by valve indicates that valve is in good mechanical condition. Note also that, by further sucking air, the resistance should disappear with valve clicks.
3. If valve is clogged, or if no resistance is felt, replace cap as an assembled unit.



Description

This system returns blow-by gas to both the intake manifold and air cleaner.
The positive crankcase ventilation (P.C.V.) 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 P.C.V. valve.
Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.
The ventilating air is then drawn from the air cleaner, through the hose connecting air cleaner to rocker cover, into the crankcase.
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.
On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air cleaner under all conditions.

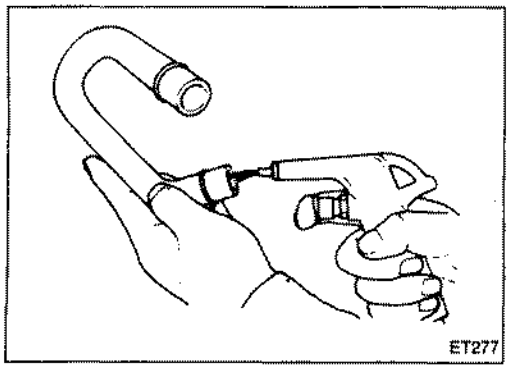




Inspection

P.C.V. VALVE

With engine running at idle, remove ventilation hose from rocker cover; if P.C.V. valve is working properly a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over hose inlet.
If N.G., check ventilation hose first.
If hose is O.K., replace P.C.V. valve.



VENTILATION HOSE

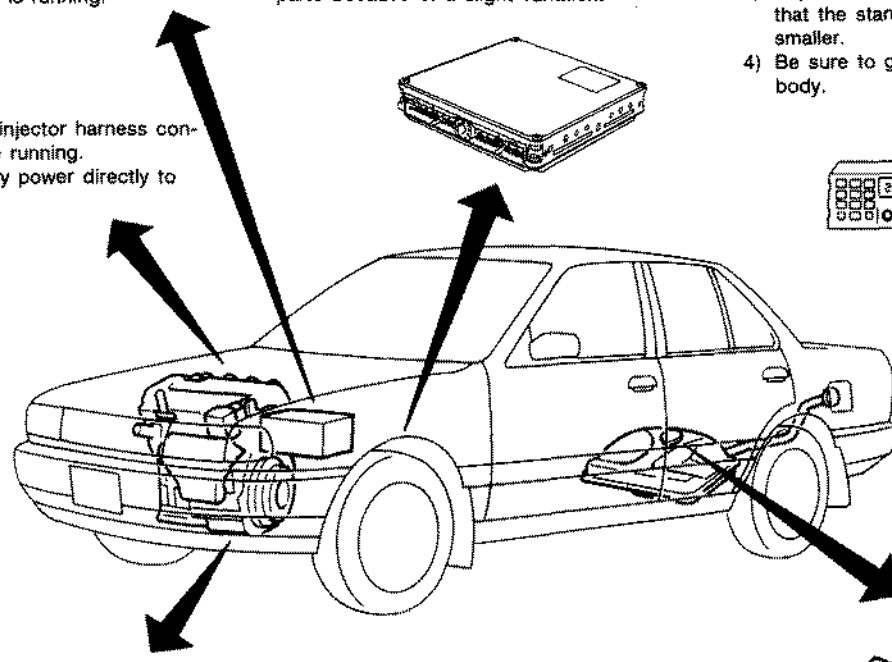
1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

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

INJECTOR
- Do not disconnect injector harness connectors with engine running.
- Do not apply battery power directly to injectors.

E.C.C.S. PARTS HANDLING
- Handle air flow meter carefully to avoid damage.
- Do not disassemble air flow meter.
- Do not clean air flow meter with any type of detergent.
- Do not disassemble auxiliary air control valve.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the crank angle sensor.

E.C.U.
- Do not disassemble E.C.C.S. control unit (E.C.U.).
- Do not turn diagnosis mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ROM value. The E.C.C.S. 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.

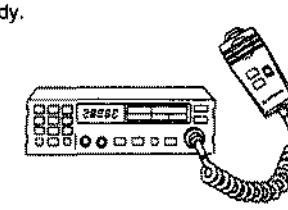


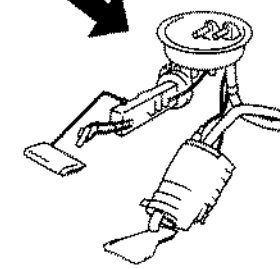


WHEN STARTING
- Do not depress accelelator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shut-down.

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



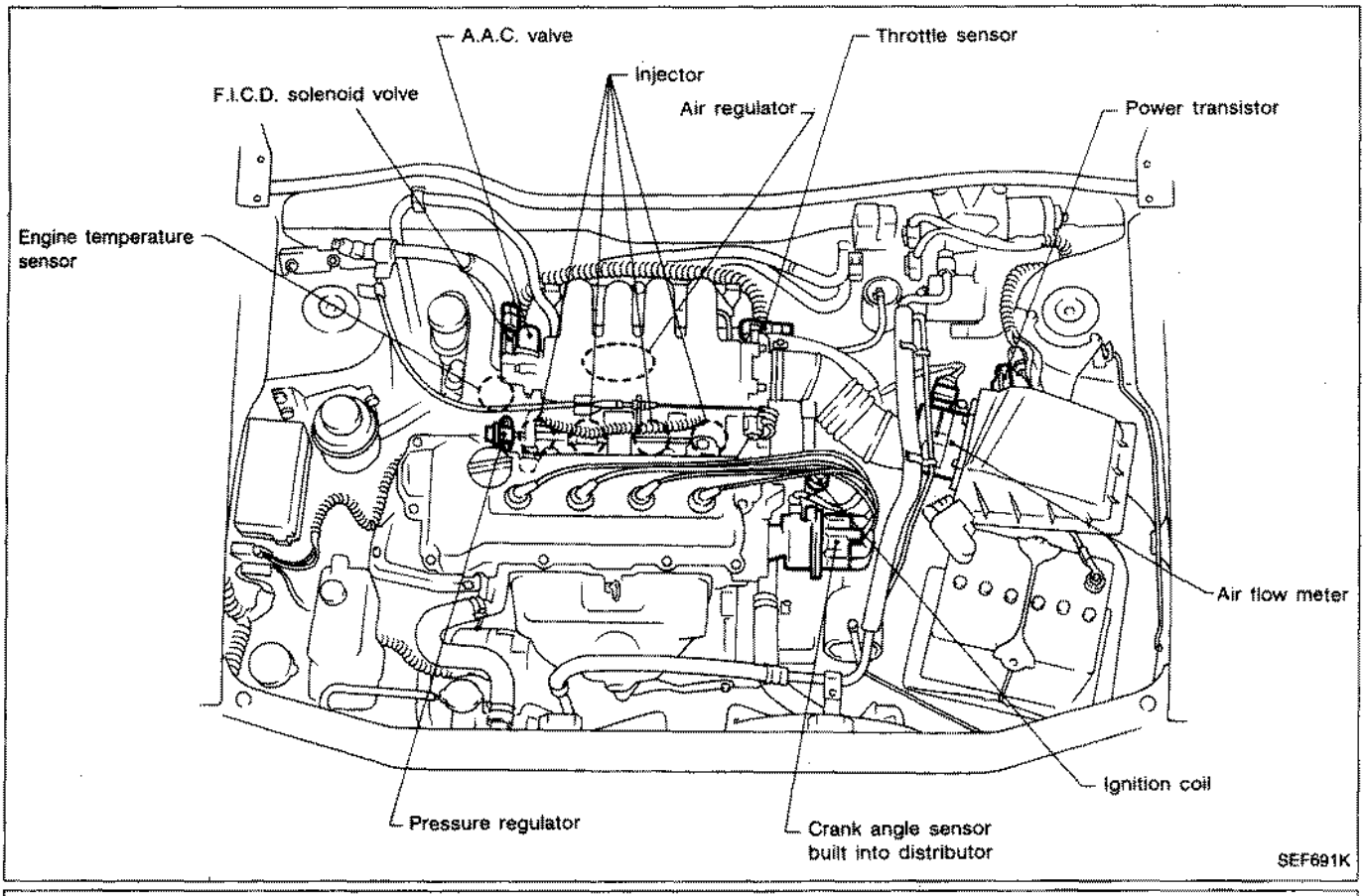


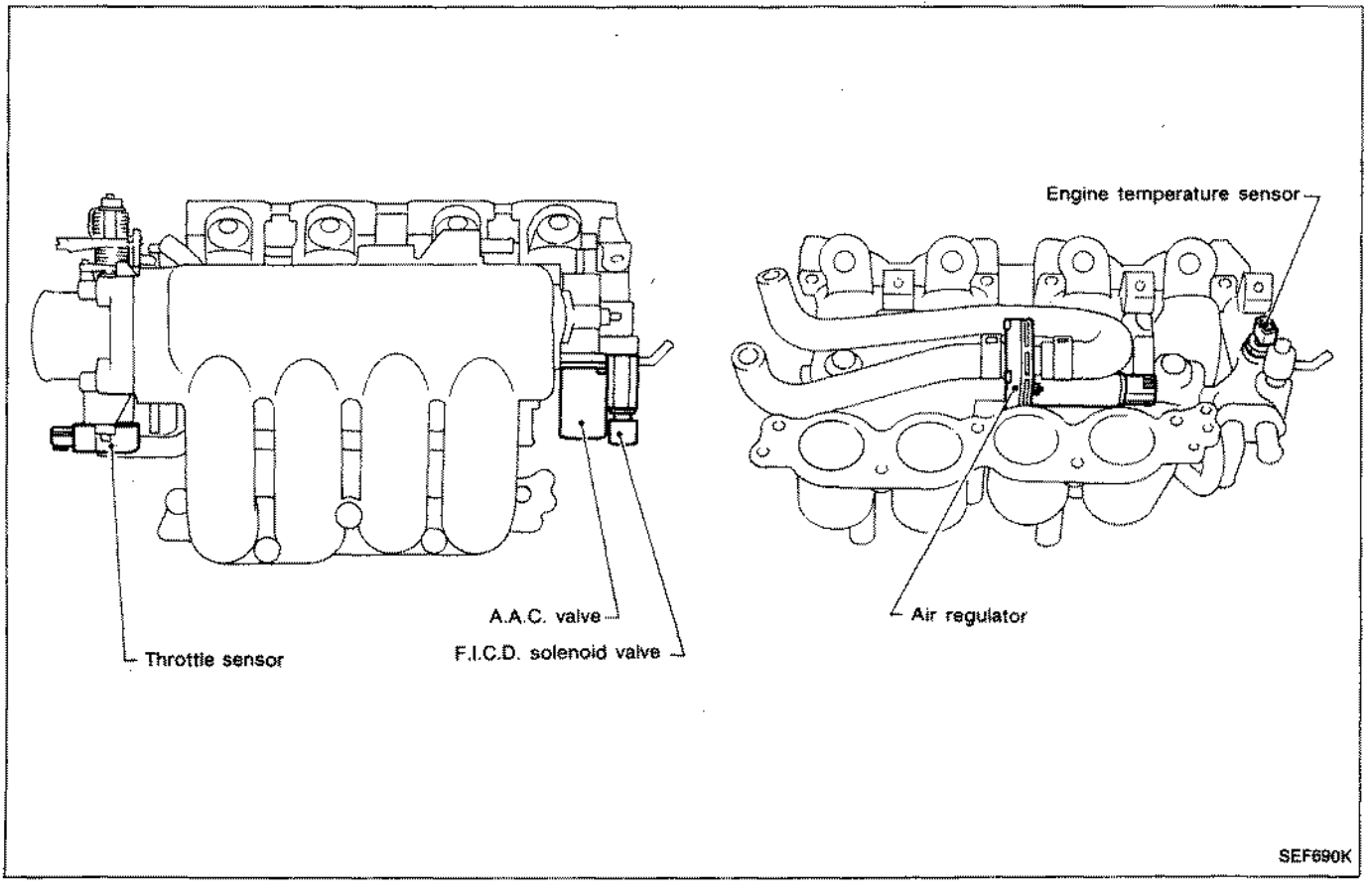
FUEL PUMP
- Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.

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

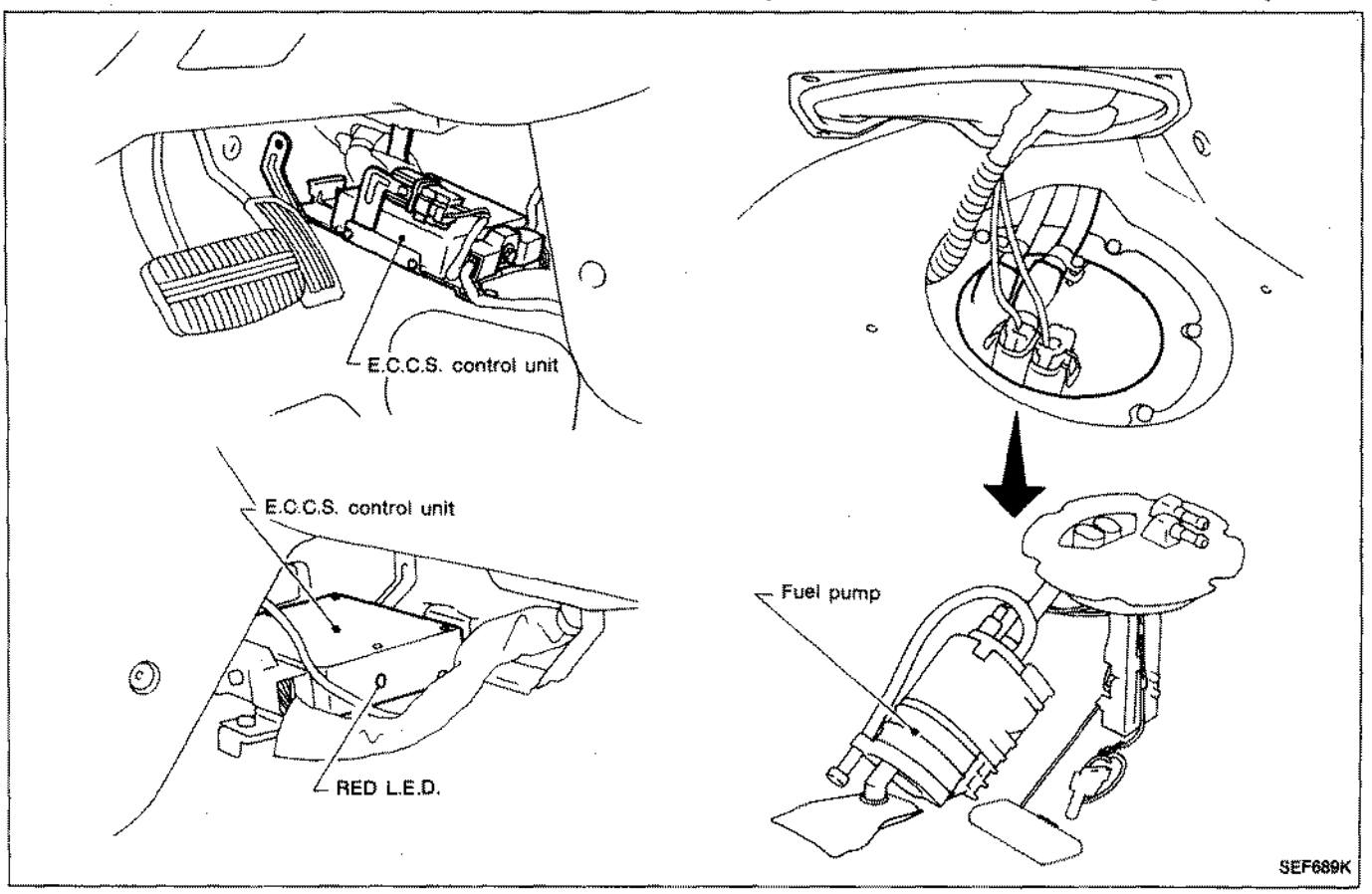
SEF688K

E.C.C.S. Component Parts Location

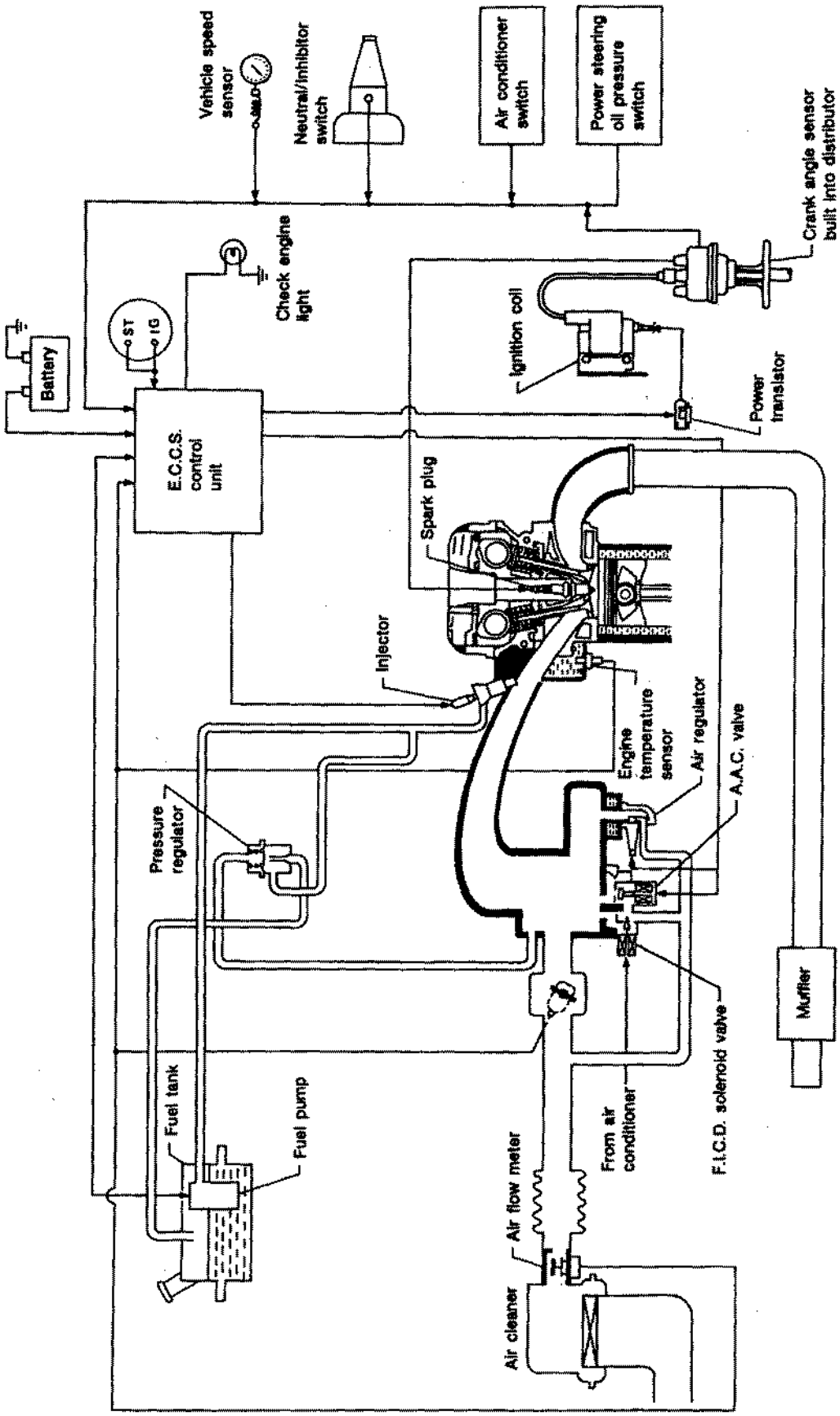




E.C.C.S. Component Parts Location (Cont'd)

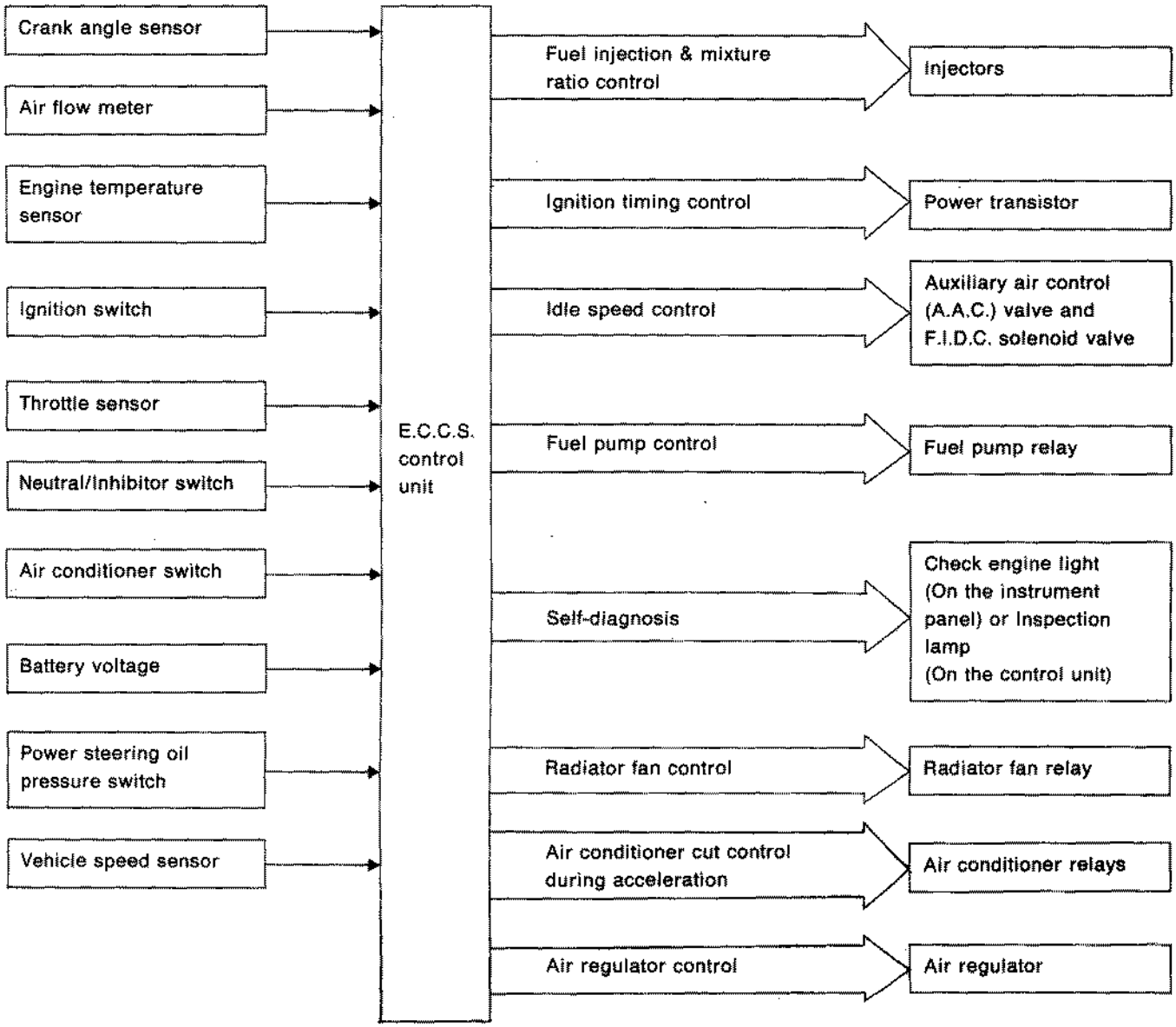


System Diagram

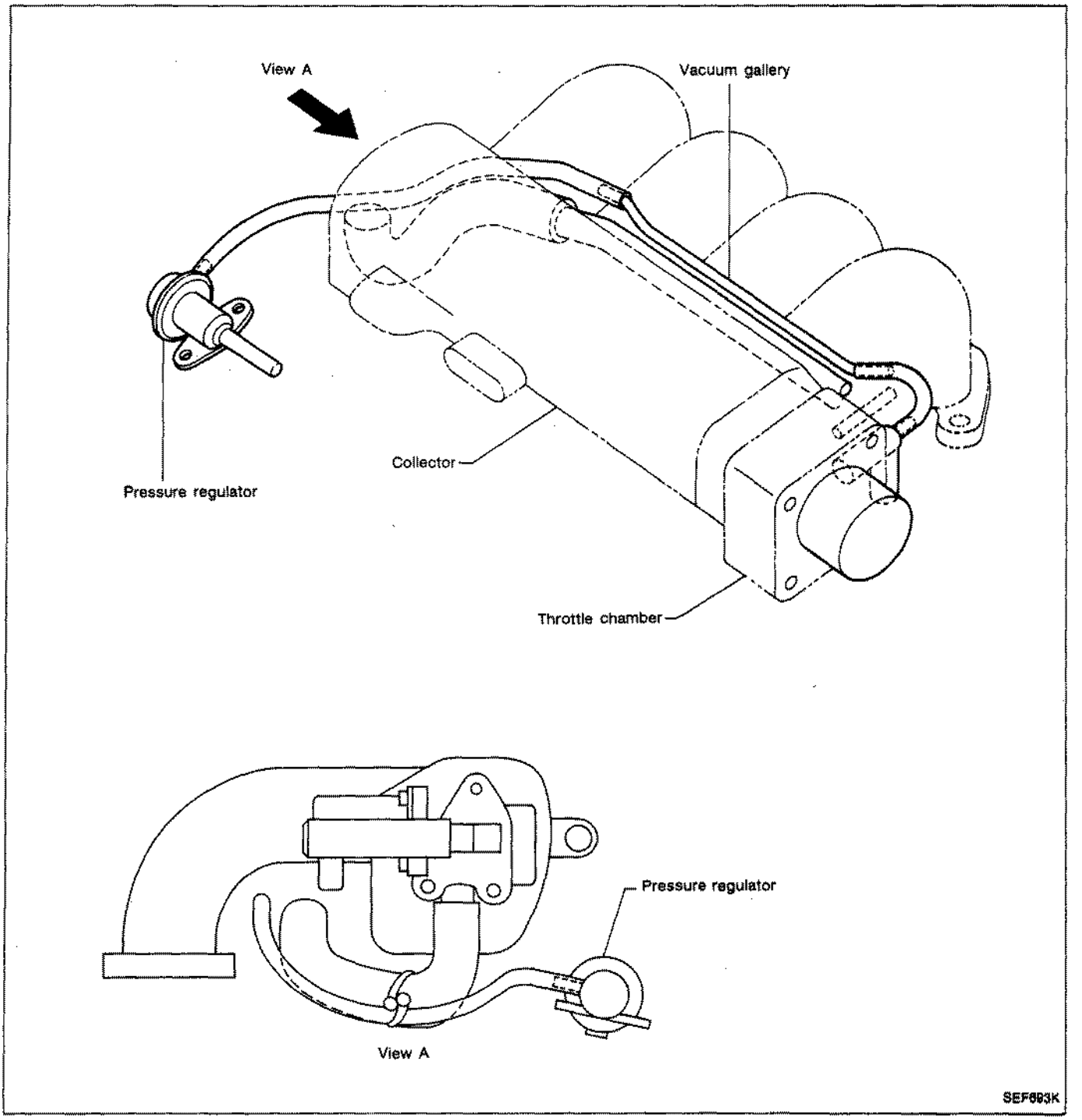


SEF351L

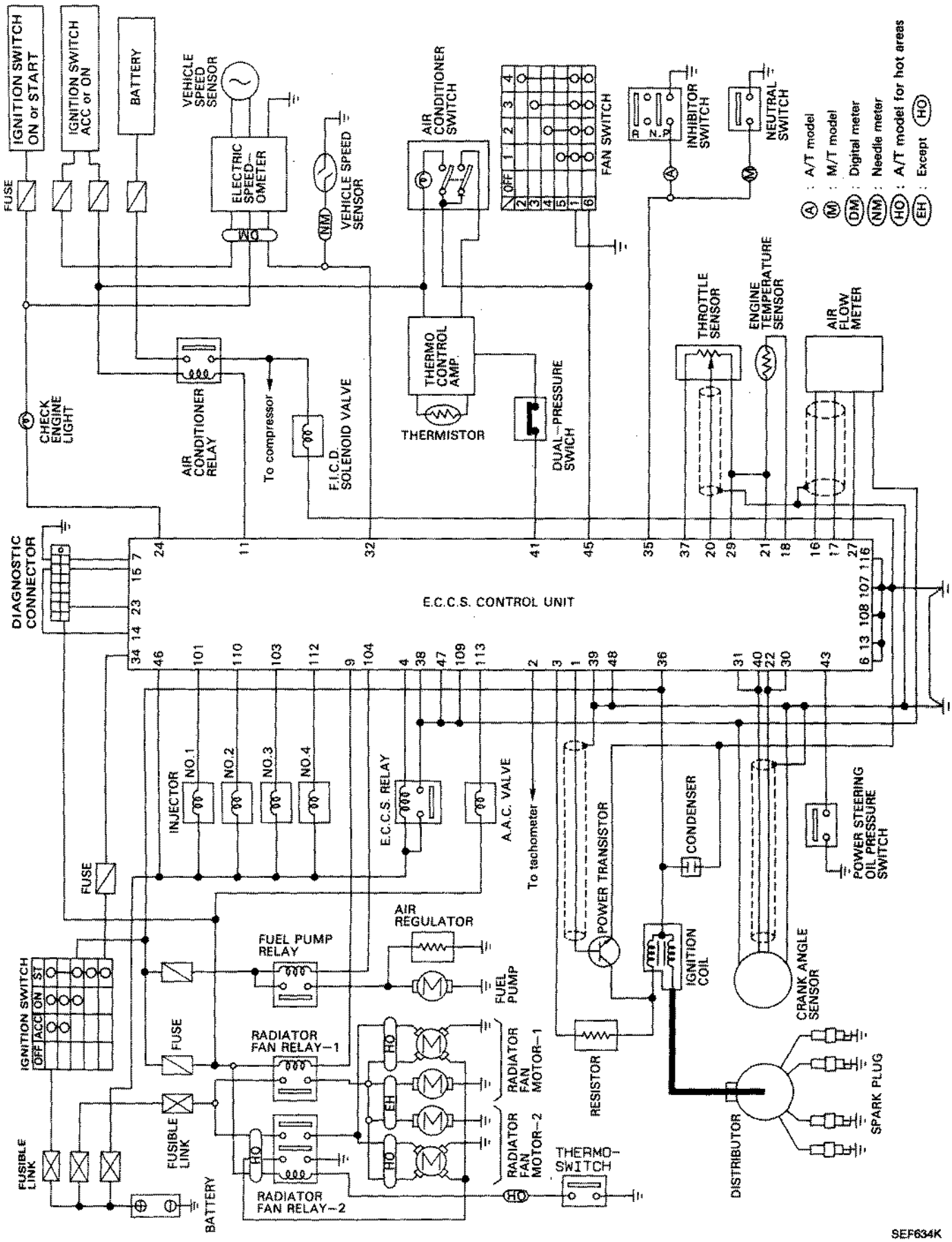
System Chart



Vacuum Hose Drawing

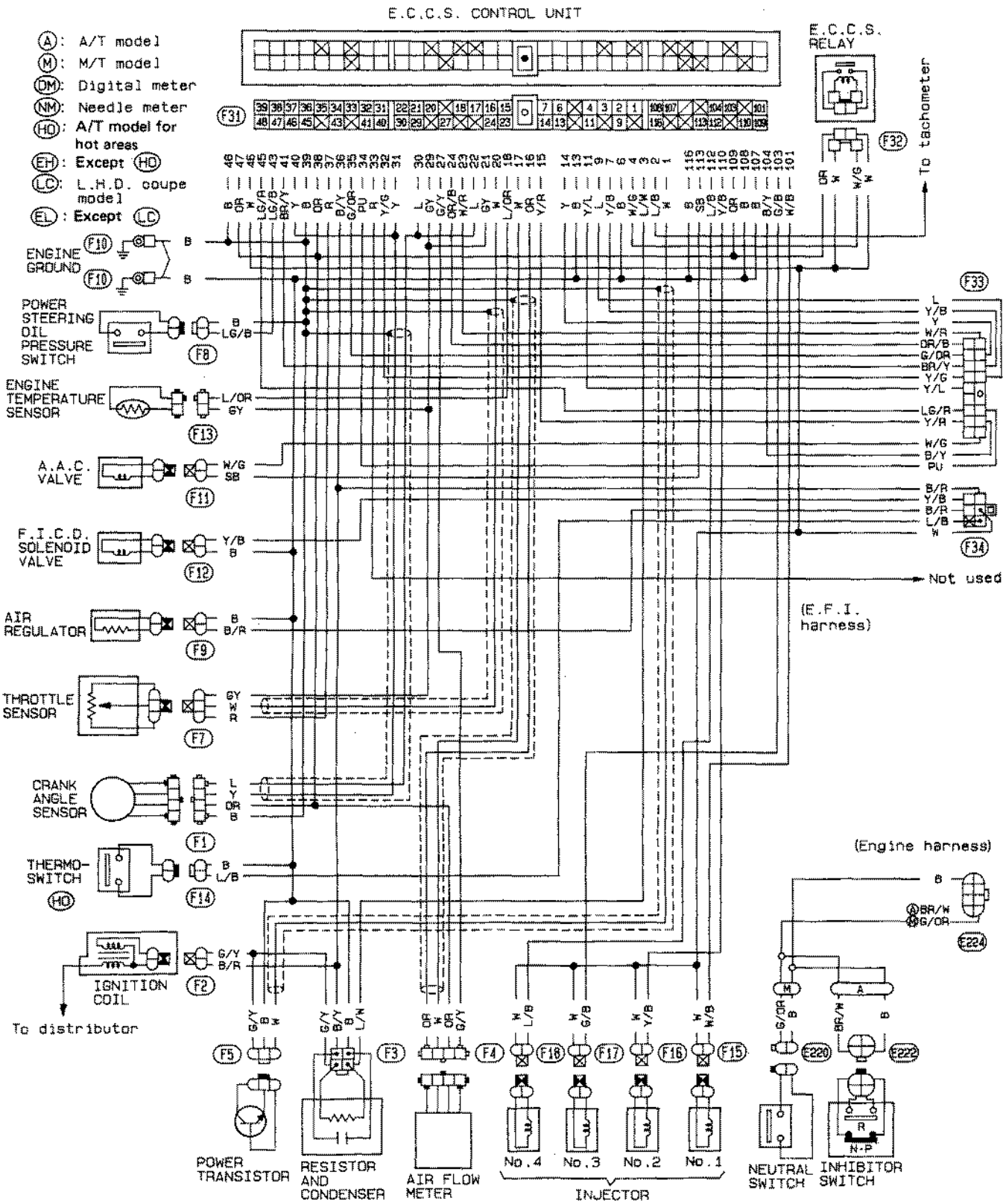


Circuit Diagram

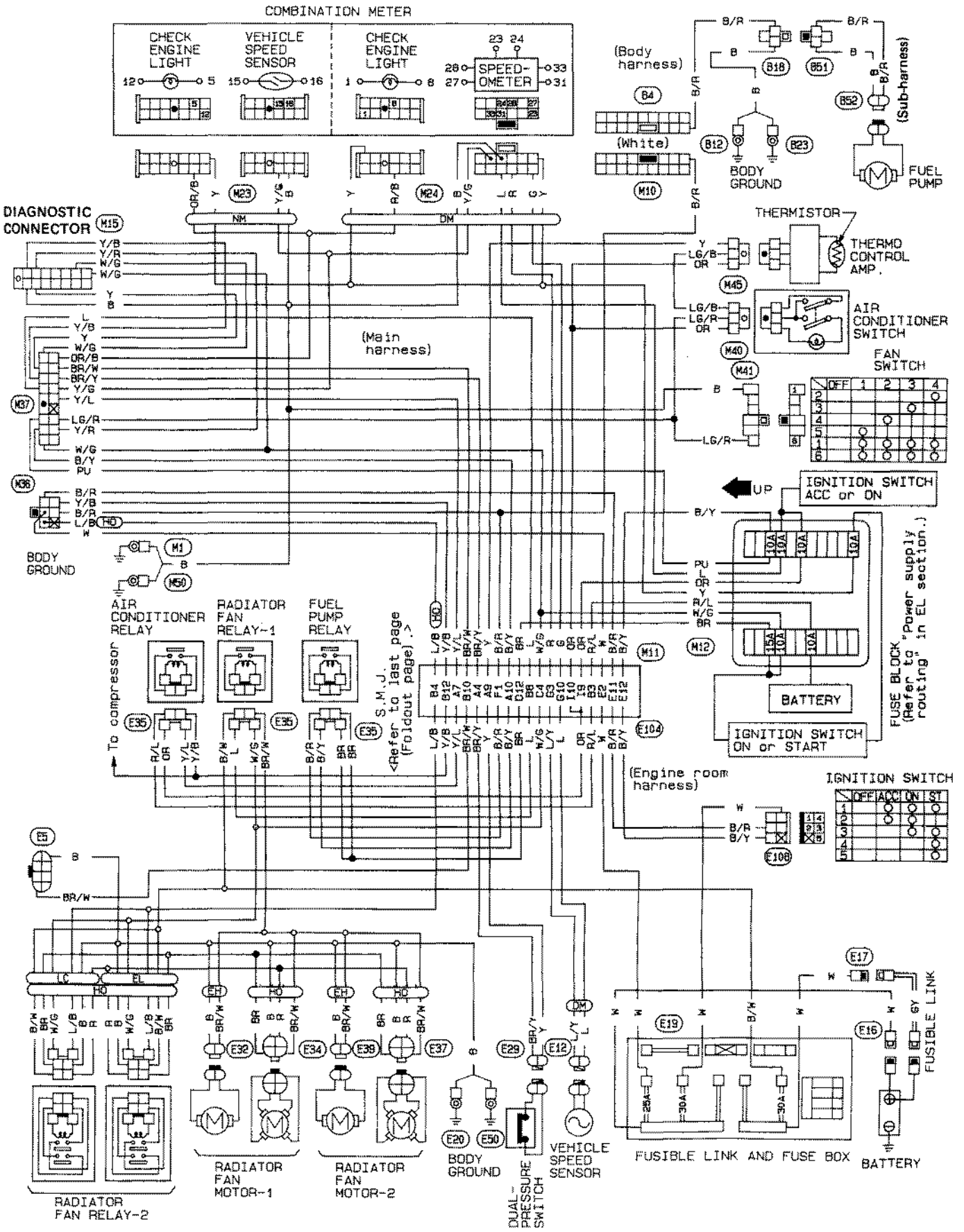


Wiring Diagram

L.H.D. MODELS



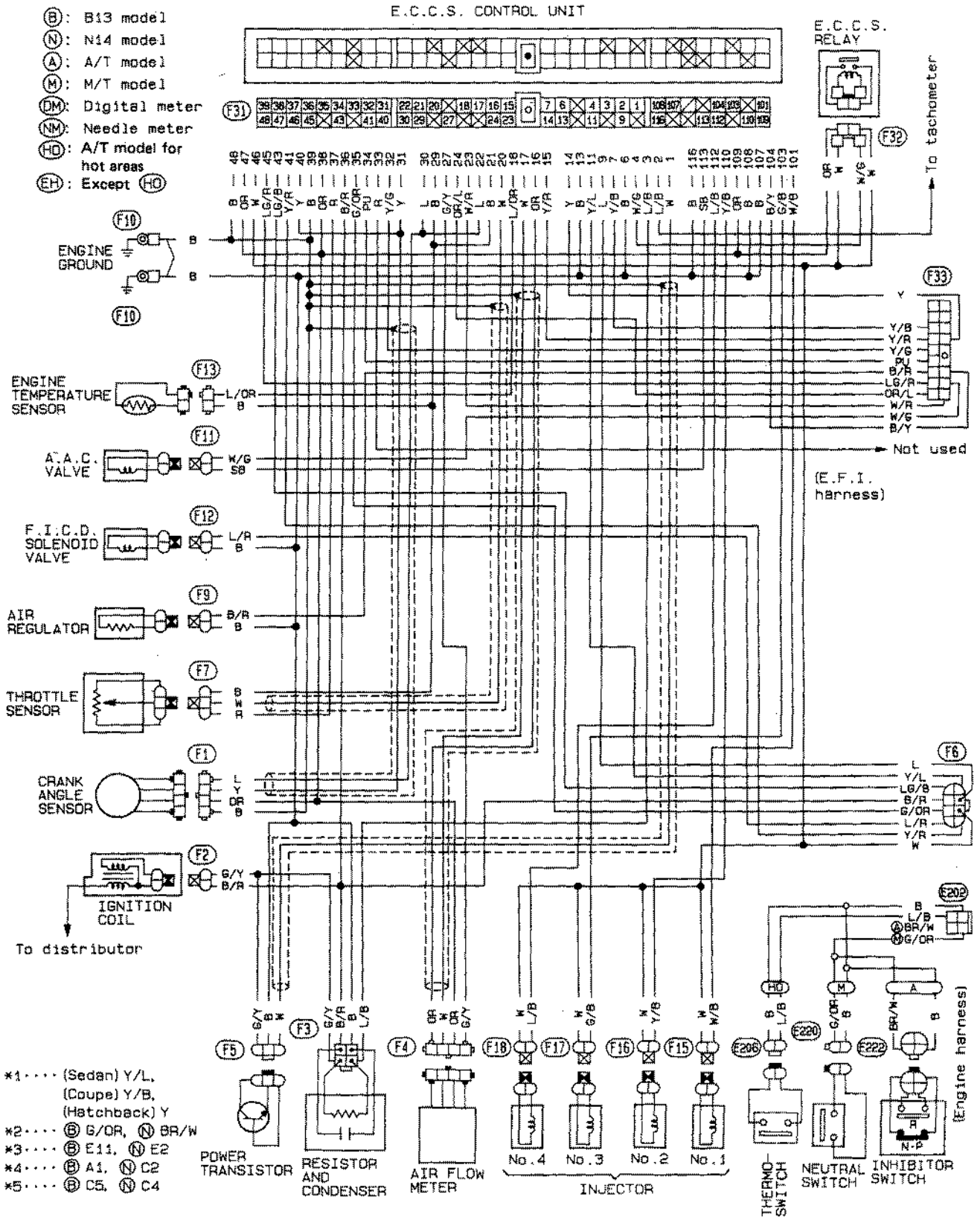
Wiring Diagram (Cont'd)



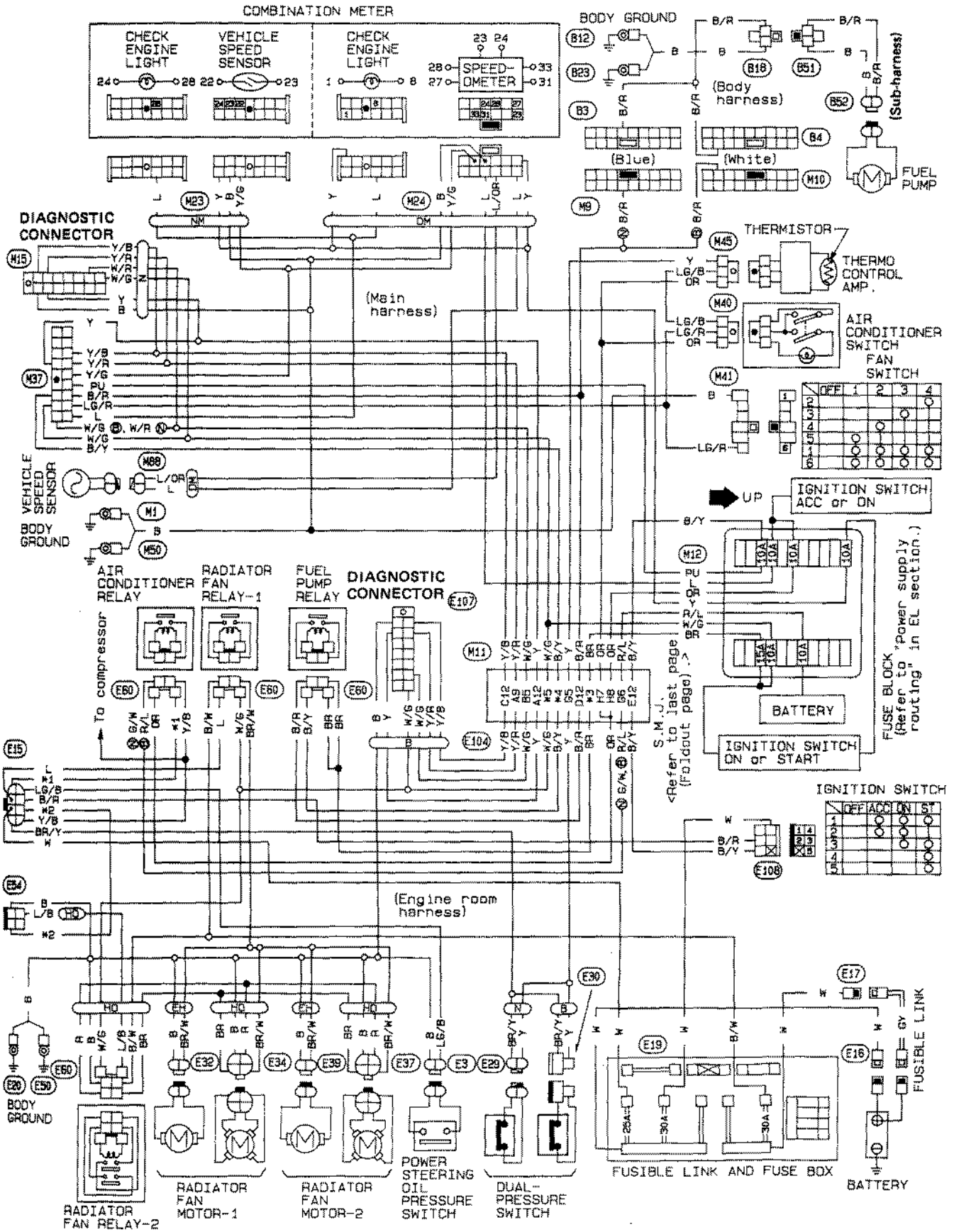
SEF635K

Wiring Diagram (Cont'd)

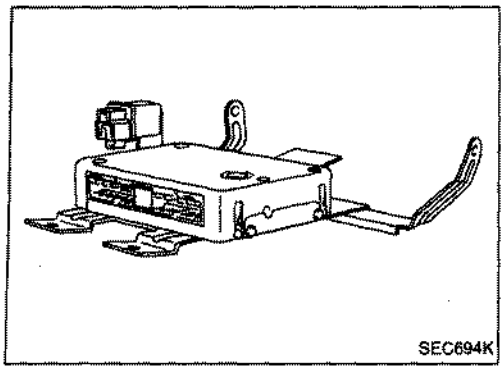
R.H.D. MODELS



Wiring Diagram (Cont'd)

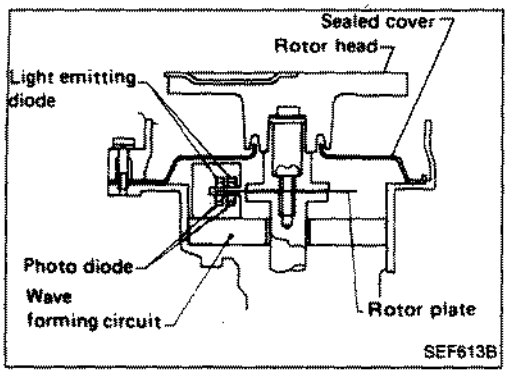


SEF636K


SEC694K

E.C.C.S. Control Unit (E.C.U.)

The E.C.U. consists of a microcomputer, inspection lamp, a diagnostic mode selector, and connectors for signal input and output and for power supply. The unit controls the engine.

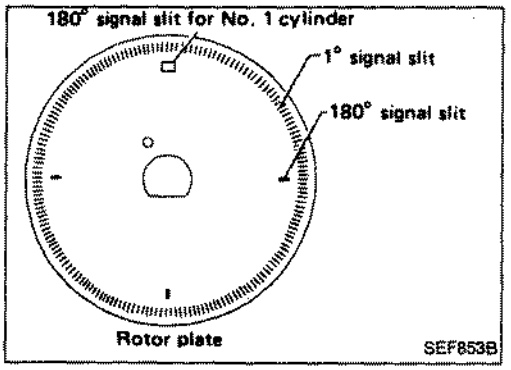


SEF613B

Crank Angle Sensor

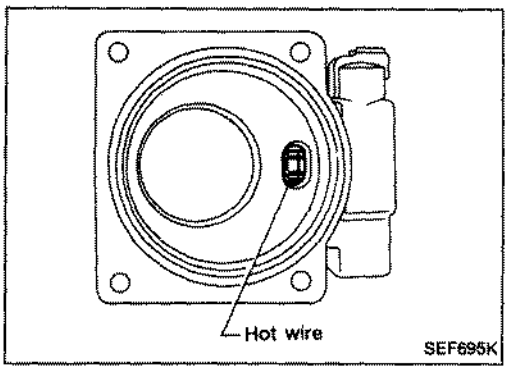
The crank angle sensor is a basic component of the entire E.C.C.S. It monitors engine speed and piston position, and sends signals to the E.C.U. to control fuel injection, ignition timing and other functions.

The crank angle sensor has a rotor plate and a wave-forming circuit. The rotor plate has 360 slits for 1° signal and 4 slits for 180° signal. Light Emitting Diodes (L.E.D.) and photo diodes are built in the wave-forming circuit.



SEF853B

When the rotor plate passes between the L.E.D. and the photo diode, the slits in the rotor plate continually cut the light being transmitted to the photo diode from the L.E.D. This generates rough-shaped pulses which are converted into on-off pulses by the wave-forming circuit, which are sent to the E.C.U.



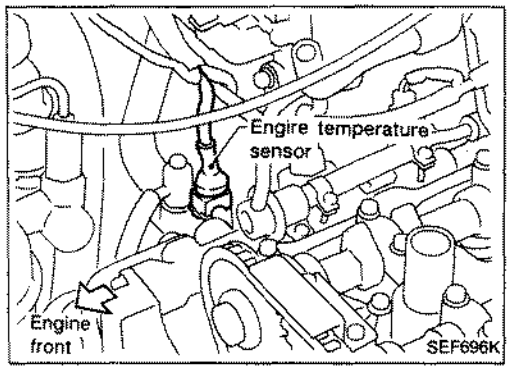
SEF695K

Air Flow Meter

The air flow meter measures the intake air flow rate by taking a part of the entire flow. Measurements are made in such a manner that the E.C.U. receives electrical output signals varied by the amount of heat emitting 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 taken away by the air. The amount of heat depends on the air flow. On the other hand, the temperature of the hot wire is automatically controlled to a certain number of degrees.

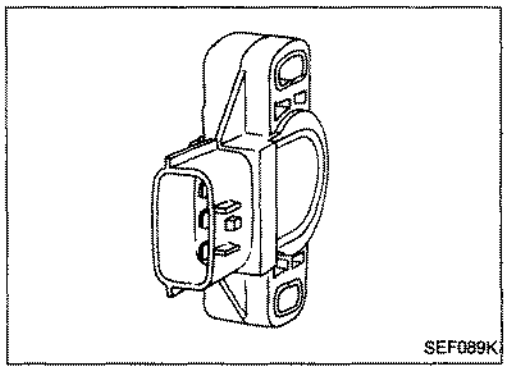
Therefore, it is necessary to supply the hot wire with more electric current in order to maintain the temperature of the hot wire. The E.C.U. knows the air flow by means of the electric change.



Engine Temperature Sensor

The engine temperature sensor, located on the intake manifold, detects engine coolant temperature and transmits a signal to the E.C.U.

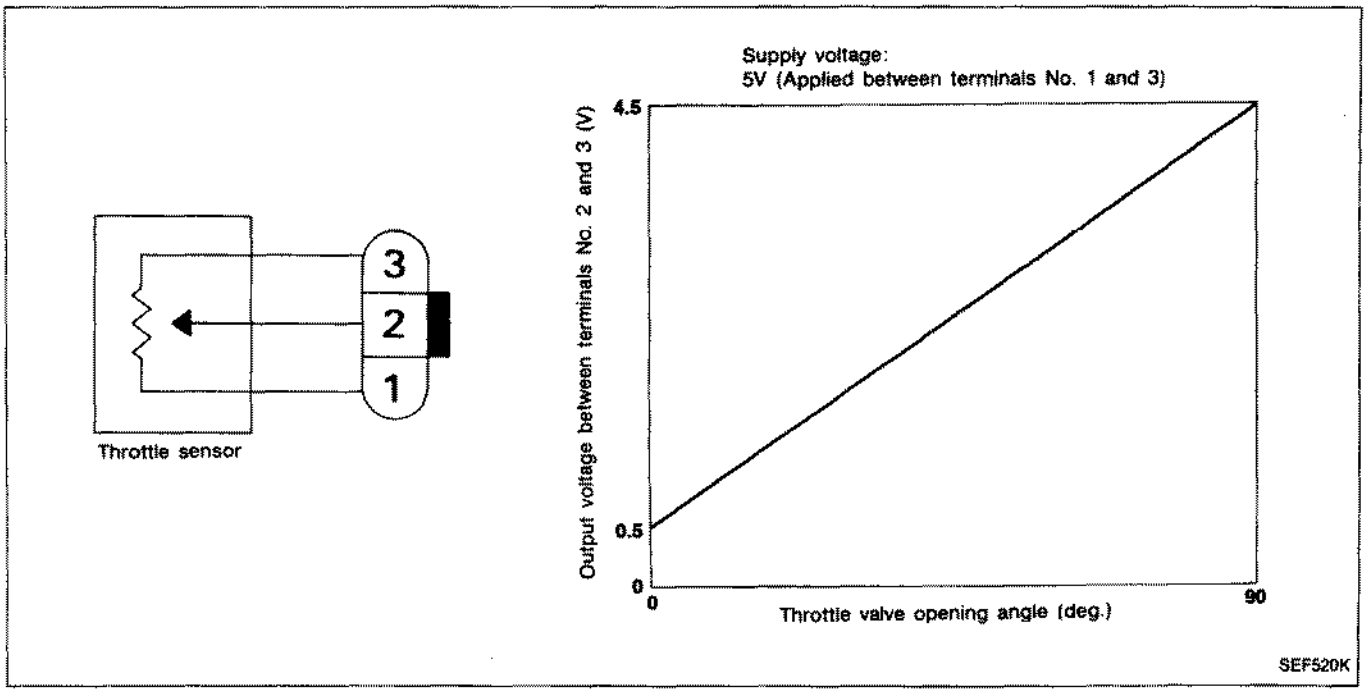
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

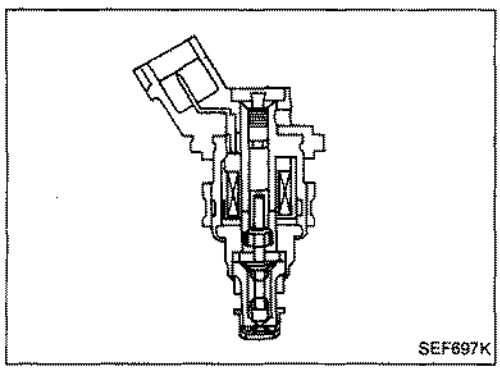


Throttle Sensor & Soft Idle Switch

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

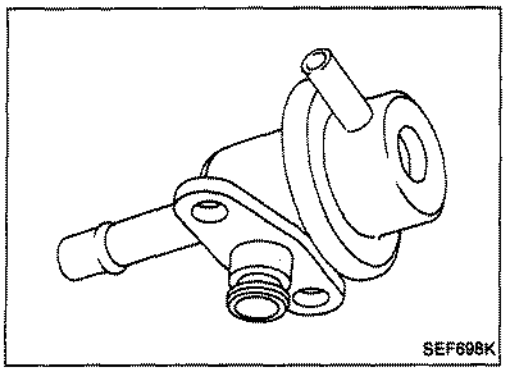
Idle position of the throttle valve is determined by the E.C.U. receiving the signal from the throttle sensor. This system is called "soft idle switch". This one controls engine operation such as fuel cut.





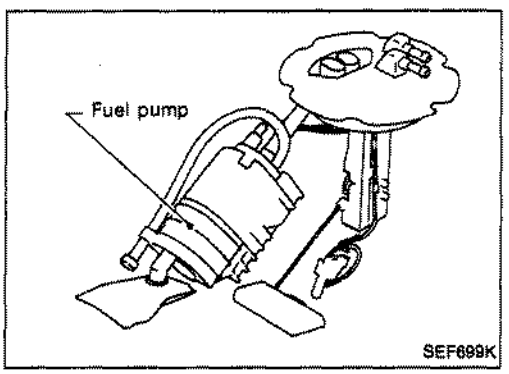
Fuel Injector

The fuel injector is a small, elaborate solenoid valve. As the E.C.U. sends injection signals to the injector, the coil in the injector pulls the needle valve back and fuel is released into the intake manifold through the nozzle. The injected fuel is controlled by the E.C.U. in terms of injection pulse duration.


SEF698K

Pressure Regulator

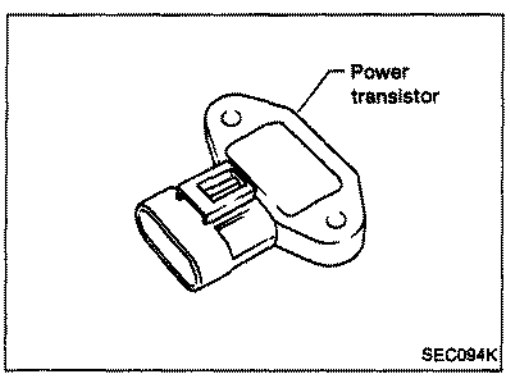
The pressure regulator maintains the fuel pressure at 299.1 kPa (2.991 bar, 3.05 kg/cm^2, 43.4 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pressure at the above value.



SEF699K

Fuel Pump

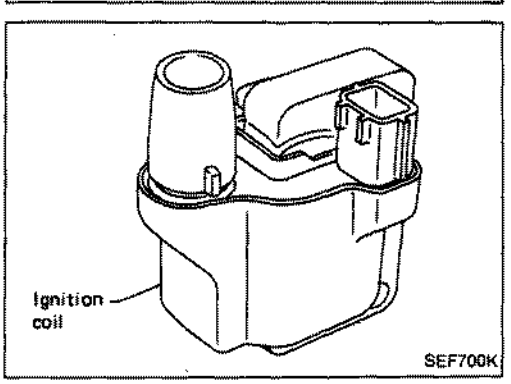
A turbine type design fuel pump is used and is situated in the fuel tank.



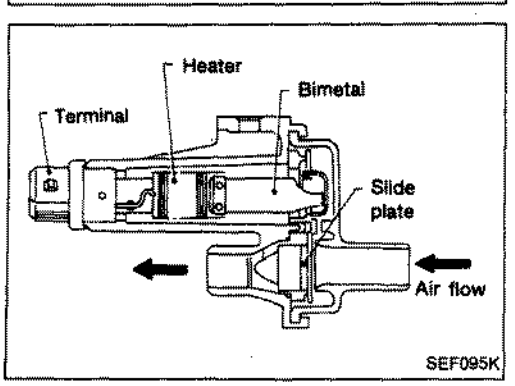
SEC094K

Power Transistor & Ignition Coil

The ignition signal from the E.C.U. is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit. The ignition coil is a small, semi-molded type.



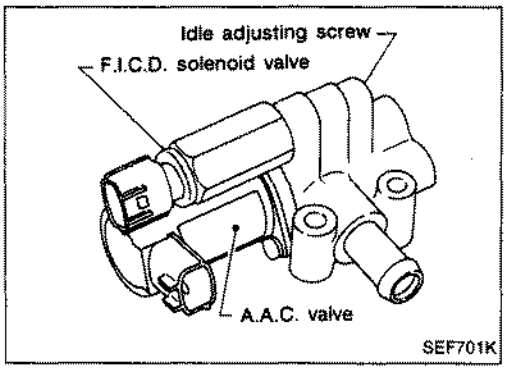
SEF700K



SEF095K

Air Regulator

The air regulator provides an air by-pass when the engine is cold for a fast idle during warm-up.
A bimetal, heater and rotary shutter are built into the air regulator. When the bimetal temperature is low, the air by-pass port opens. As the engine starts and electric current flows through a heater, the bimetal begins to turn the shutter to close the by-pass port. The air passage remains closed until the engine stops and the bimetal temperature drops.

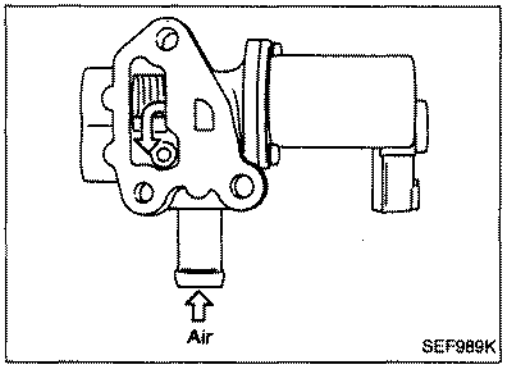


Idle Air Adjusting (I.A.A.) Unit

The I.A.A. unit is made up of the A.A.C. valve, F.I.C.D. solenoid valve and idle adjusting screw. It receives the signal from the E.C.U. and controls the idle speed at the preset value.

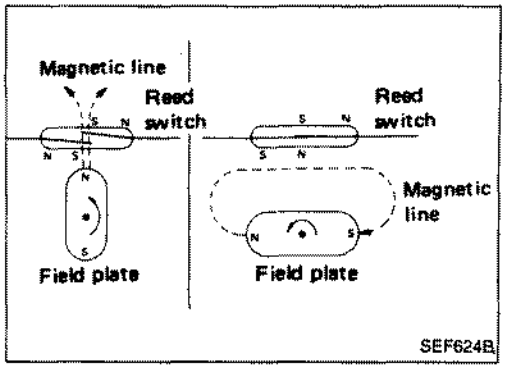
Fast Idle Control Device (F.I.C.D.) Solenoid Valve

The F.I.C.D. solenoid valve provides additional air when the air conditioner switch is turned on.



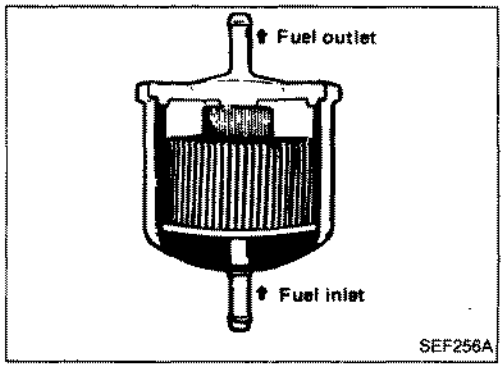
Auxiliary Air Control (A.A.C.) Valve

The E.C.U. actuates the A.A.C. valve by an ON/OFF pulse. The longer that ON duty is left on, the larger the amount of air that will flow through the A.A.C. valve.



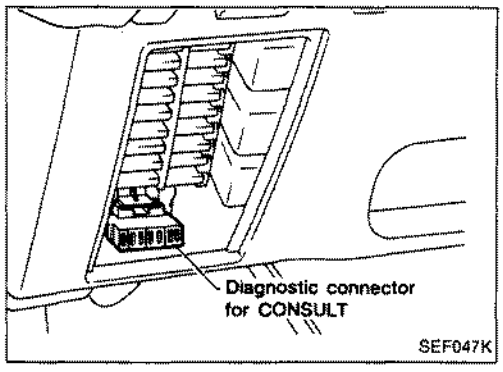
Vehicle Speed Sensor

The vehicle speed sensor provides a vehicle speed signal to the E.C.U.
The speed sensor consists of a reed switch, which is installed in the speedometer unit and transforms vehicle speed into a pulse signal.



Fuel Filter

The specially designed fuel filter has a metal case in order to withstand high fuel pressure.

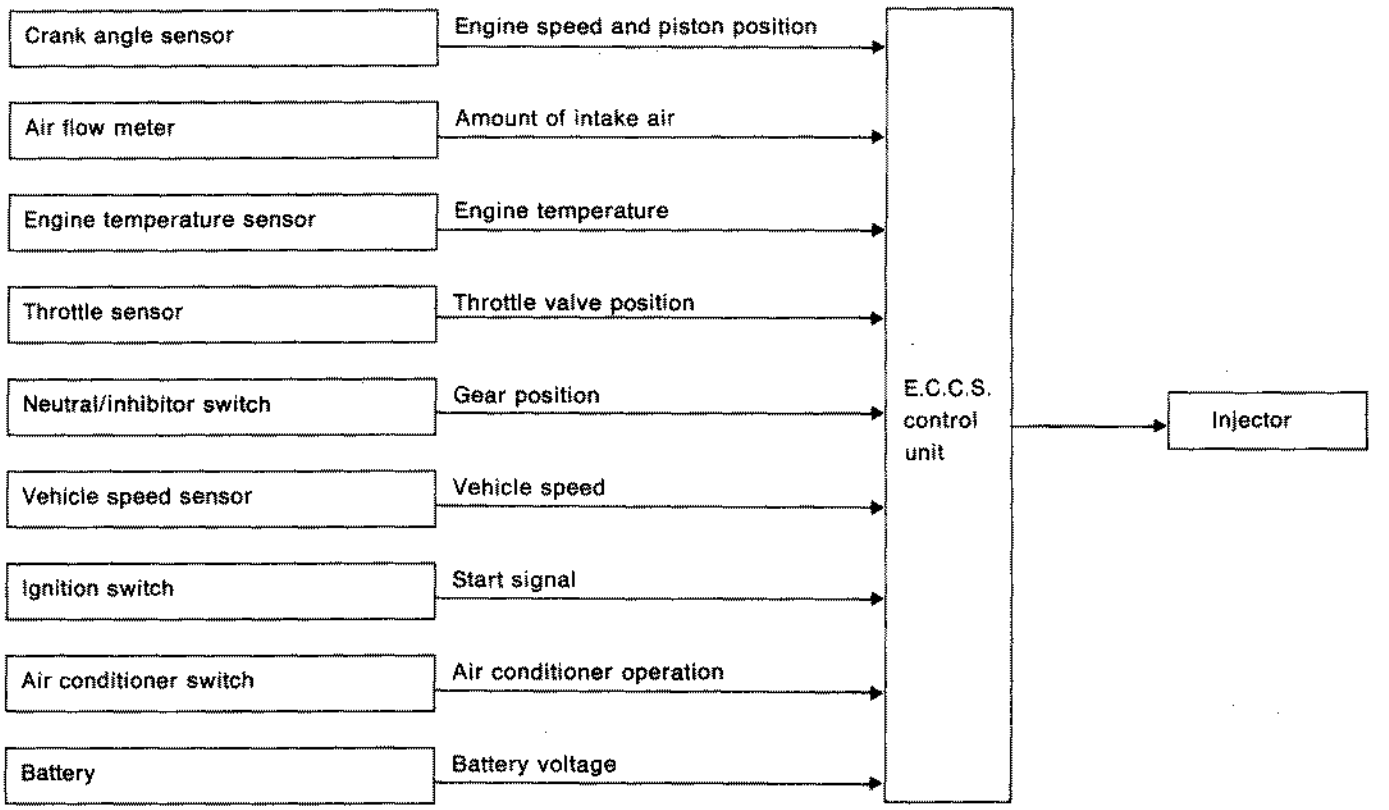


Diagnostic Connector for CONSULT

The diagnostic connector for CONSULT is located behind the fuse box cover.

Fuel Injection Control

INPUT/OUTPUT SIGNAL LINE



BASIC FUEL INJECTION CONTROL

The amount of fuel injected from the fuel injector, or the length of time the valve remains open, is determined by the E.C.U. The basic amount of fuel injected is a program value mapped in the E.C.U. ROM memory. In other words, the program value is preset by engine operating conditions determined by input signals (for engine rpm and air intake) from both the crank angle sensor and the air flow meter.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injection is compensated for to improve engine performance under various operating conditions as listed below.

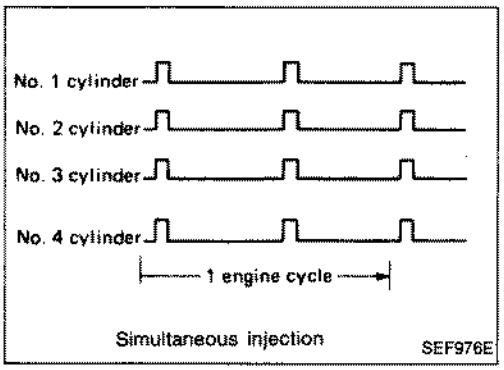
<Fuel increase>

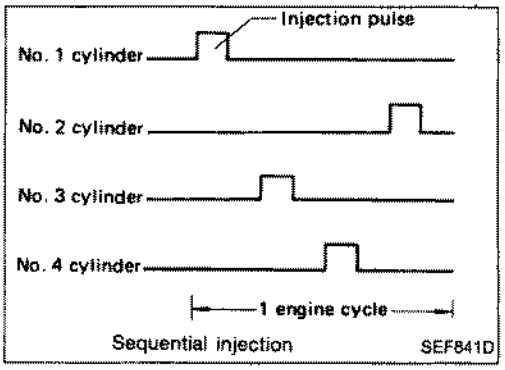
1) During warm-up
2) When starting the engine
3) During acceleration
4) Hot-engine operation
5) When selector lever is changed from "N" to "D" (A/T models only)

<Fuel decrease>

1) During deceleration

Fuel Injection Control (Cont'd)





FUEL INJECTION TIMING

Two types of fuel injection systems are used — simultaneous injection and sequential injection. In the former, fuel is injected into all four cylinders simultaneously twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the E.C.U. to the four injectors two times for each engine cycle.

In the sequential injection system, fuel is injected into each cylinder during each engine cycle according to the firing order. When the engine is being started and/or if the fail-safe system (C.P.U. of E.C.U.) is operating, simultaneous fuel injection is used.

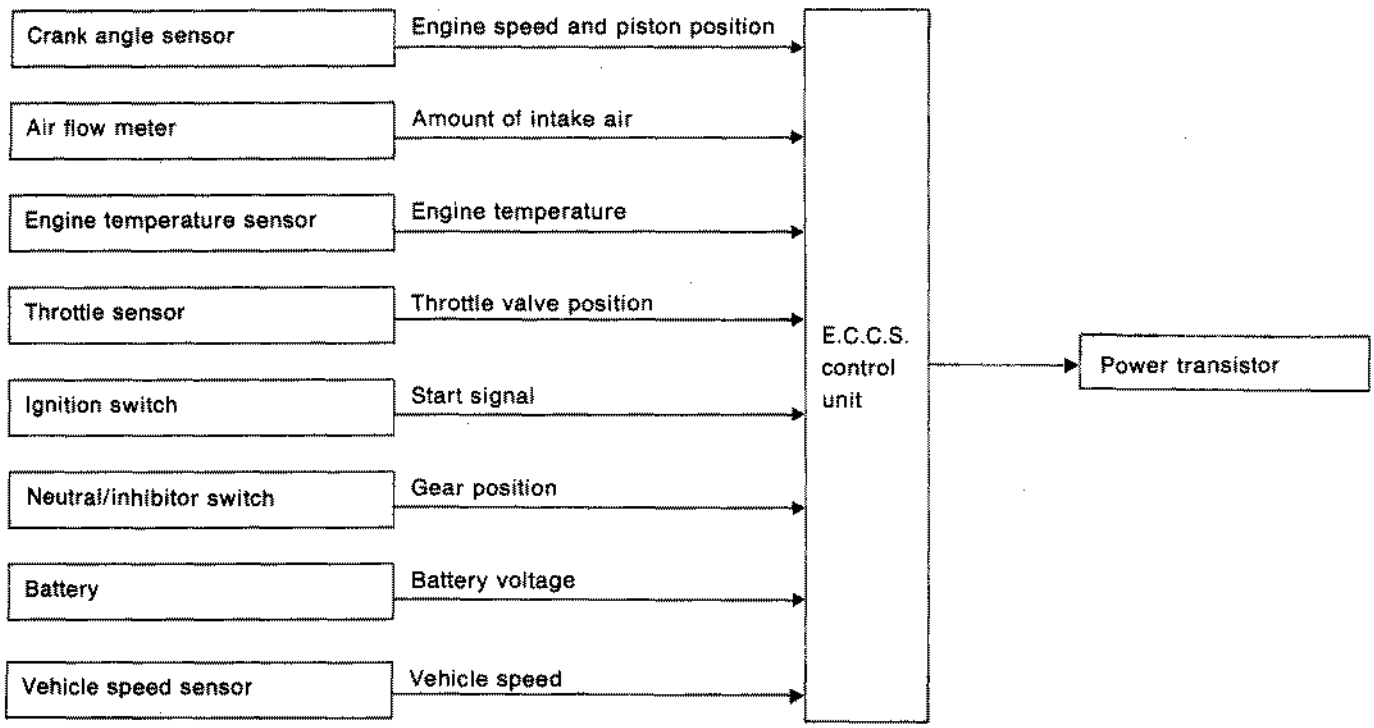
When the engine is running sequential fuel injection is used.

FUEL SHUT-OFF

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

Ignition Timing Control

INPUT/OUTPUT SIGNAL LINE



Ignition Timing Control (Cont'd)

SYSTEM DESCRIPTION

The ignition timing is controlled by the E.C.U. in order to maintain the best air-fuel ratio in response to every running condition of the engine. The ignition timing data is stored in the ROM located in the E.C.U., in the form of the map shown below.

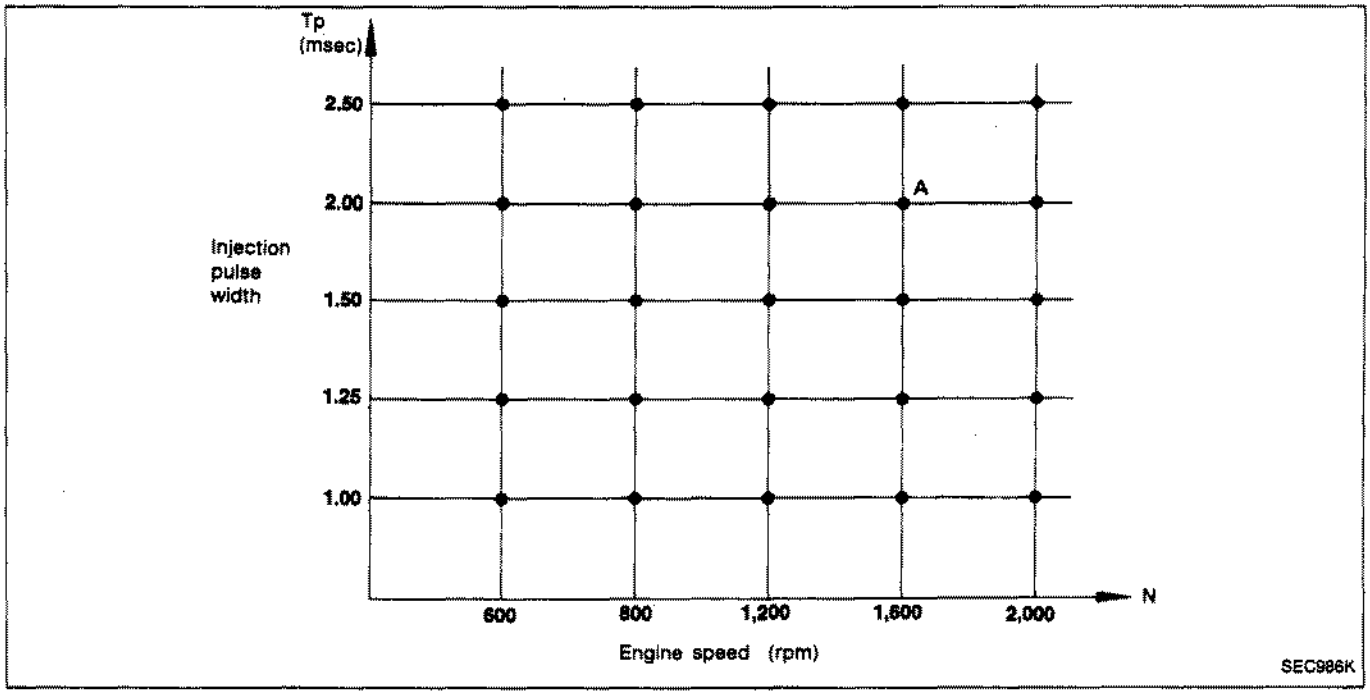
The E.C.U. detects information such as the injection pulse width and crank angle sensor signal which varies every moment. Then responding to this information, ignition signals are transmitted to the power transistor.

e.g. N: 1,800 rpm, Tp: 1.50 msec
A °B.T.D.C.

In addition to this,

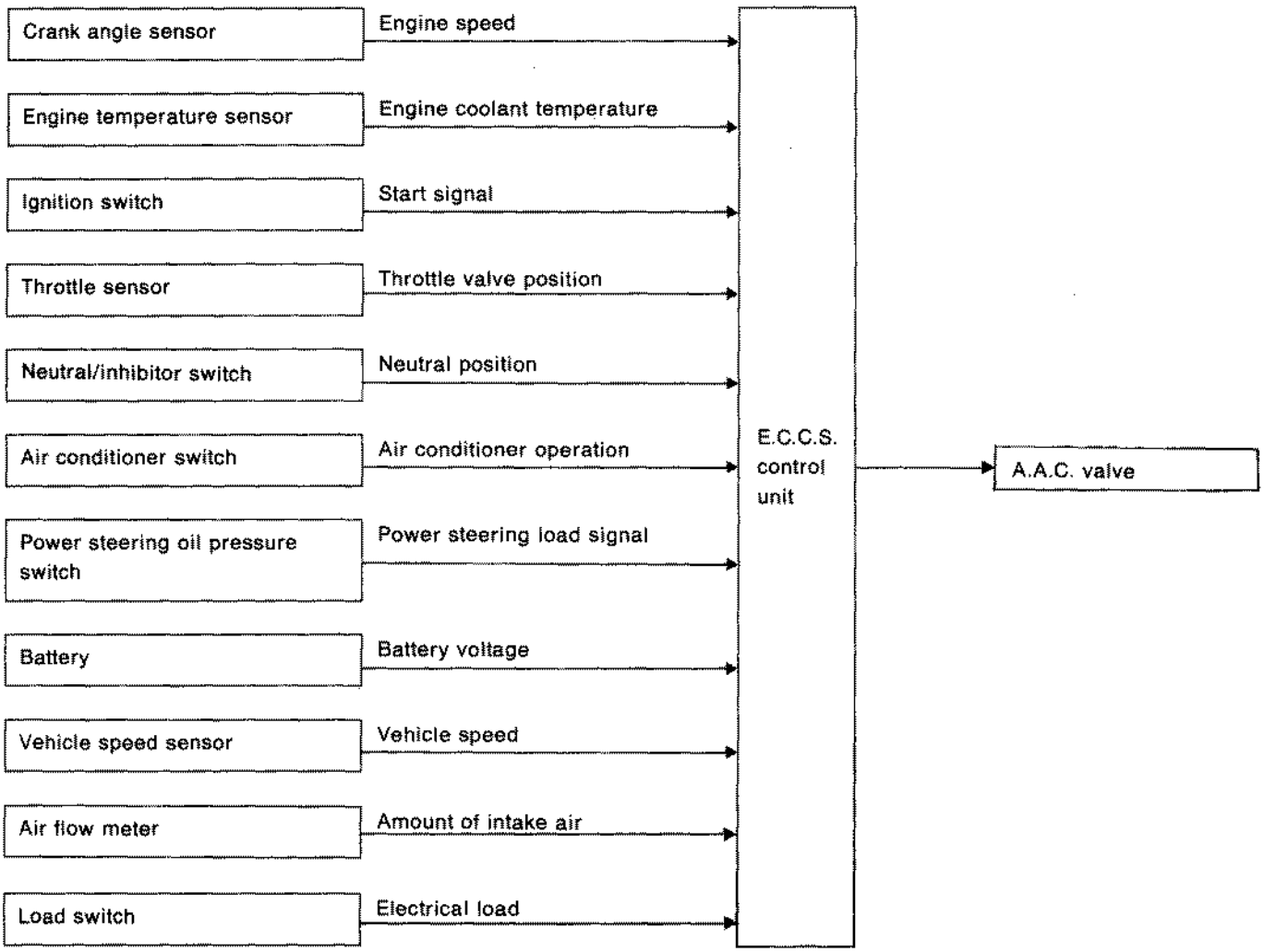
1) At starting
2) During warm-up
3) At idle
4) At low battery voltage
5) At acceleration
6) Hot-engine operation

the ignition timing is revised by the E.C.U. according to the other data stored in the ROM.



Idle Speed Control

INPUT/OUTPUT SIGNAL LINE

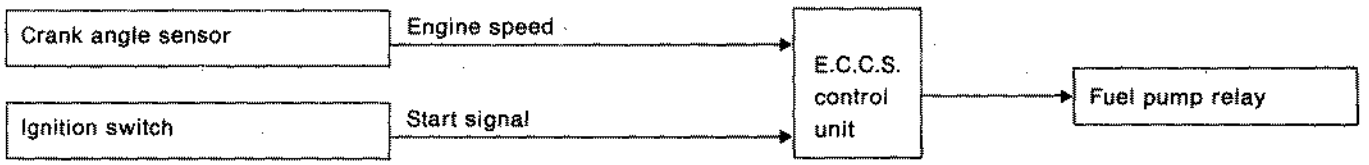


SYSTEM DESCRIPTION

This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via A.A.C. valve. The A.A.C. valve repeats ON/OFF operation according to the signal sent from the E.C.U. The crank angle sensor detects the actual engine speed and sends a signal to the E.C.U. The E.C.U. then controls the ON/OFF time of the A.A.C. valve so that engine speed coincides with the target value memorized in ROM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ROM is determined by taking into consideration various engine conditions, such as warming up and during deceleration, fuel consumption, and engine load (air conditioner, electrical load).

Fuel Pump Control

INPUT/OUTPUT SIGNAL LINE



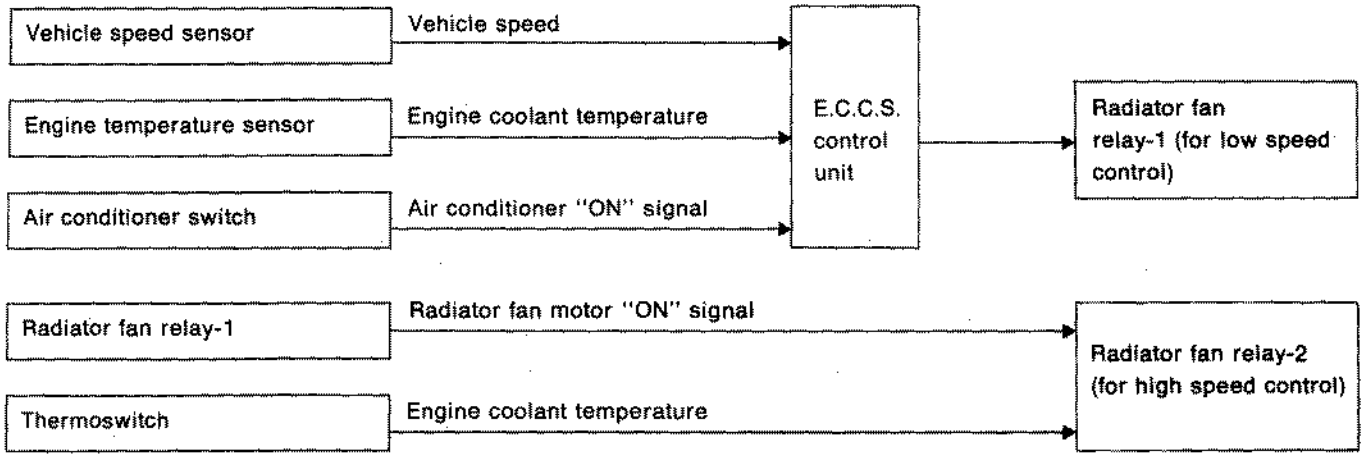
SYSTEM DESCRIPTION

The E.C.U. activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the E.C.U. receives a 180° signal from the crank angle 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 E.C.U. stops pump operation and prevents battery discharging, thereby improving safety. The E.C.U. does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

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

Radiator Fan Control

INPUT/OUTPUT SIGNAL LINE



The E.C.U. controls the radiator fan corresponding to the vehicle speed, engine temperature, and air conditioner ON signal. The control system for models for hot areas has 2-step controls [Low/High speed].

OPERATION

Air conditioner switch is "OFF"

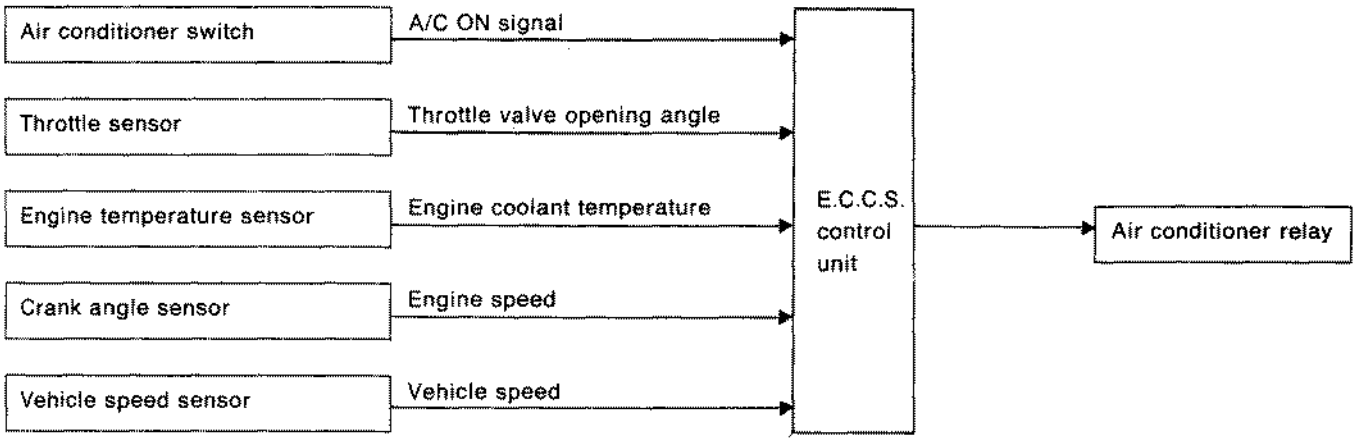
Engine coolant temperature °C (°F)	Radiator fans	Remarks
90 (194) or less	OFF	—
Between 91 (196) and 94 (201)	Low speed	Vehicle speed is 19 km/h (12 MPH) or less
	OFF	Vehicle speed is 20 km/h (12 MPH) or more
Between 95 (203) and 99 (210)	Low speed	—
100 (212) or more	Low speed	Except for the below models
	High speed	A/T models for hot areas, A/T models with front spoiler and M/T models with front spoiler for hot areas

Air conditioner switch is "ON"

Engine coolant temperature °C (°F)	Radiator fans	Remarks
94 (201) or less	OFF	Vehicle speed is 80 km/h (50 MPH) or more
	Low speed	Vehicle speed is 79 km/h (49 MPH) or less
Between 95 (203) and 99 (210)	Low speed	—
100 (212) or more	Low speed	Except for the below models
	High speed	A/T models for hot areas, A/T models with front spoiler and M/T models with front spoiler for hot areas

Air Conditioner Cut Control During Acceleration

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

When the accelerator pedal is fully depressed or engine temperature is extremely high, the air conditioner is turned off for a few seconds.
This system improves acceleration when the air conditioner is used.

Air Regulator Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

The air regulator is controlled by the E.C.U. at the same time as fuel pump ON-OFF control.

Condition	Air regulator operation
Ignition switch is turned to ON	Operates for 5 seconds
While engine is running and cranking	Operates
When engine is stopped	OFF in 1 second
Except as shown above	OFF

Fail-safe System

C.P.U. MALFUNCTION OF E.C.U.

Outline

The fail-safe system makes engine starting possible if there is something malfunctioning in the E.C.U.'s C.P.U. circuit. In former models, engine starting was difficult under the conditions mentioned above. But with the provisions provided in this fail-safe system, it is possible to start the engine.

Fail-safe system activating condition when E.C.U. is malfunctioning

The computing function of the E.C.U. was judged to be malfunctioning.
When the fail-safe system activates, i.e. if the E.C.U. detects a malfunction condition in the C.P.U. of E.C.U., the CHECK ENGINE LIGHT on the instrument panel lights to warn the driver.

Engine control, with fail-safe system, operates when E.C.U. is malfunctioning

When the fail-safe system is operating, fuel injection, ignition timing, fuel pump operation, A.A.C. valve operation and radiator fan operation are controlled under certain limitations.

Operation

	Operation
Fuel injection	Simultaneous injection
Ignition timing	Ignition timing is fixed at the preset valve.
Fuel pump	Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls.
A.A.C. valve	Full open
Radiator fans	Radiator fan relay "ON"

Cancellation of fail-safe system when E.C.U. is malfunctioning

Activation of the fail-safe system is canceled each time the ignition switch is turned OFF. The system is reactivated if all of the above-mentioned activating conditions are satisfied after turning the ignition switch from OFF to ON.

Fail-safe System (Cont'd)

AIR FLOW METER MALFUNCTION

If the air flow meter output voltage is above or below the specified value, the E.C.U. senses an air flow meter malfunction. In case of a malfunction, the throttle sensor substitutes for the air flow meter.

Though air flow meter is malfunctioning, it is possible to drive the vehicle and start the engine. But engine speed will not rise more than 2,400 rpm in order to inform the driver of fail-safe system operation while driving.

Operation

Engine condition	Starter switch	Fail-safe system	Fail-safe functioning
Stopped	ANY	Does not operate	—
Cranking	ON	Operates	Engine will be started by a pre-determined injection pulse on E.C.U.
Running	OFF		Engine speed will not rise above 2,400 rpm

ENGINE TEMPERATURE SENSOR MALFUNCTION

When engine temperature sensor output voltage is below or above the specified value, water temperature is fixed at the preset value as follows:

Operation

Condition	Engine temperature decided
Just as ignition switch is turned ON or Start	40°C (104°F)
More than 4 minutes after ignition ON or Start	80°C (176°F)
Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)

THROTTLE SENSOR MALFUNCTION

Description

When the output signal of throttle sensor is abnormal the E.C.U. judges it as a malfunctioning of throttle sensor.

The E.C.U. does not use the throttle sensor signal, but judges the idle position by the amount of fuel injected and the engine rpm.

Operation

	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration

PREPARATION

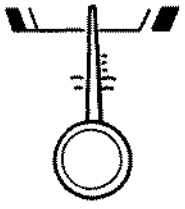
1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.U. harness connector
- Vacuum hoses
- Air intake system
  (Oil filler cap, oil level gauge, etc.)
- Fuel pressure
- Engine compression
- Throttle valve

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

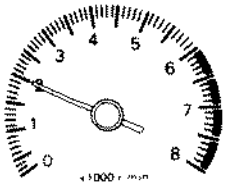
CHECKING AND ADJUSTING IDLE RPM AND IGNITION TIMING

START

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



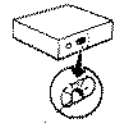
Start engine and warm it up until water temperature indicator points to the middle of gauge.
Ensure engine stays below 1,000 rpm.



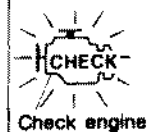
SEF247F

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

Perform E.C.C.S. self-diagnosis (Mode II).



RED L.E.D.



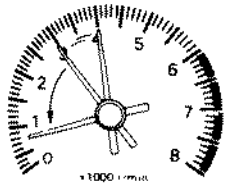
Check engine light

SEF621K

O.K.

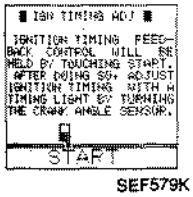
N.G.

Repair or replace components as necessary.



SEF248F

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.

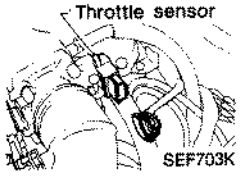


SEF579K

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

OR

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



SEF703K

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

Check ignition timing with a timing light.

10° ± 2° B.T.D.C. (in "N" position)

O.K.

N.G.

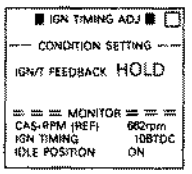
Ⓐ

①

Ⓐ

Ⓘ

Adjust ignition timing to the specified value by turning distributor after loosing bolts which secure distributor.
10° B.T.D.C. (In "N" position)



SEF704K

Check idle speed.

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

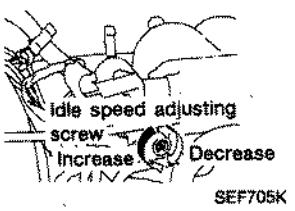
OR

- Check idle speed.

M/T: 675 ± 50 rpm
A/T: 725 ± 50 rpm (in "N" position)

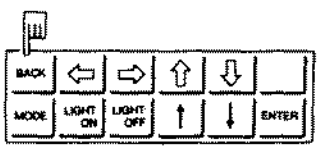
O.K. | N.G.

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



SEF705K

Adjust idle speed by turning idle speed adjusting screw.
M/T: 675 rpm
A/T: 725 rpm (in "N" position)



SEF913J

1) Touch "BACK".

OR

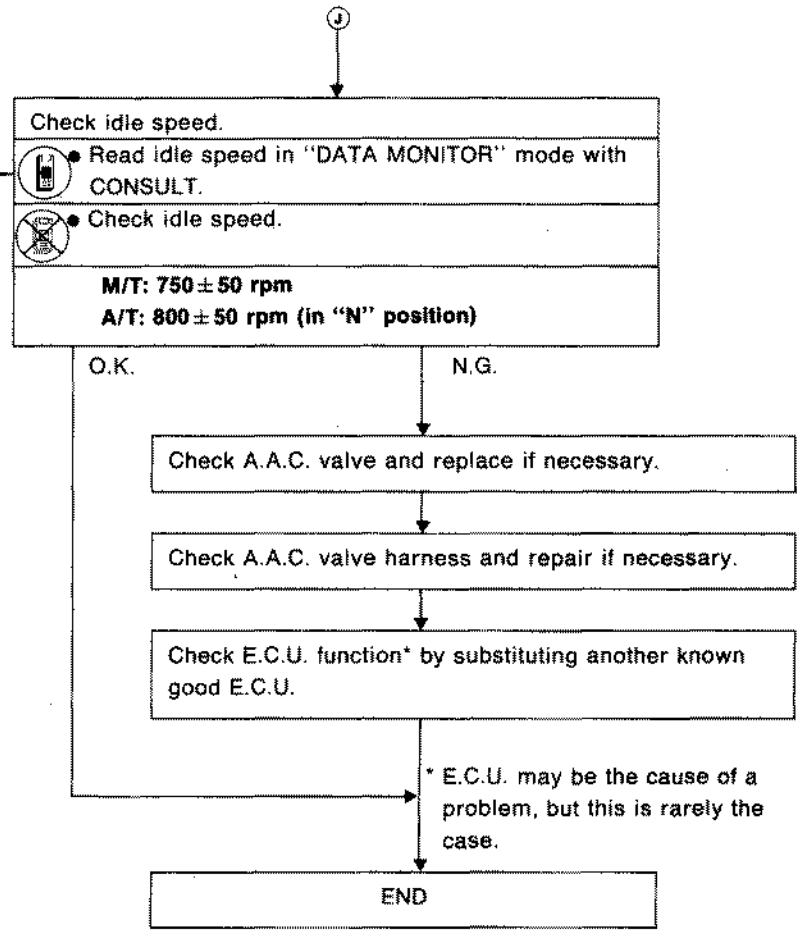
1) Turn off engine and connect throttle sensor harness connector.
2) Start engine

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

Ⓙ


MONITOR
CAS-RPM/REF
RECORD

SEF135K


J
Check idle speed.
Read idle speed in "DATA MONITOR" mode with CONSULT.
Check idle speed.
M/T: 750±50 rpm
A/T: 800±50 rpm (in "N" position)
O.K.
N.G.
Check A.A.C. valve and replace if necessary.
Check A.A.C. valve harness and repair if necessary.
Check E.C.U. function* by substituting another known good E.C.U.
* E.C.U. may be the cause of a problem, but this is rarely the case.
END

MIXTURE RATIO INSPECTION

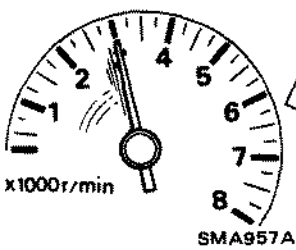
With "CO"-meter

INSPECTION START

Check and adjust idle speed and ignition timing.
(Refer to EF & EC-66.)

Idle speed: M/T 750 ± 50 rpm
A/T 800 ± 50 rpm (in "N" position)
Ignition timing: 10° ± 2° B.T.D.C.

O.K.



SMA957A

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

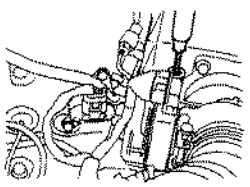
Check "CO" with "CO"-meter.

Idle "CO"%: 1.5 ± 0.5

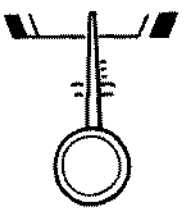
O.K. → (B)

N.G.

Turn off engine and remove air flow meter from vehicle.

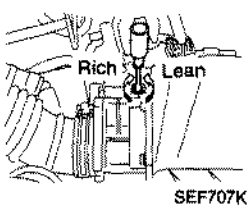

SEF706K

Drill a hole in seal plug which seals variable resistor of air flow meter and remove seal plug.


SMA955A

Install air flow meter on vehicle. Start engine and warm it up until water temperature indicator reads normal operating temperature.

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

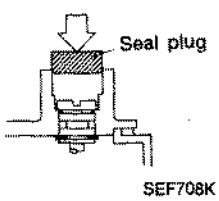


SEF707K

Adjust "CO"% by turning variable resistor on air flow meter.

Idle "CO"%: 1.5 ± 0.5

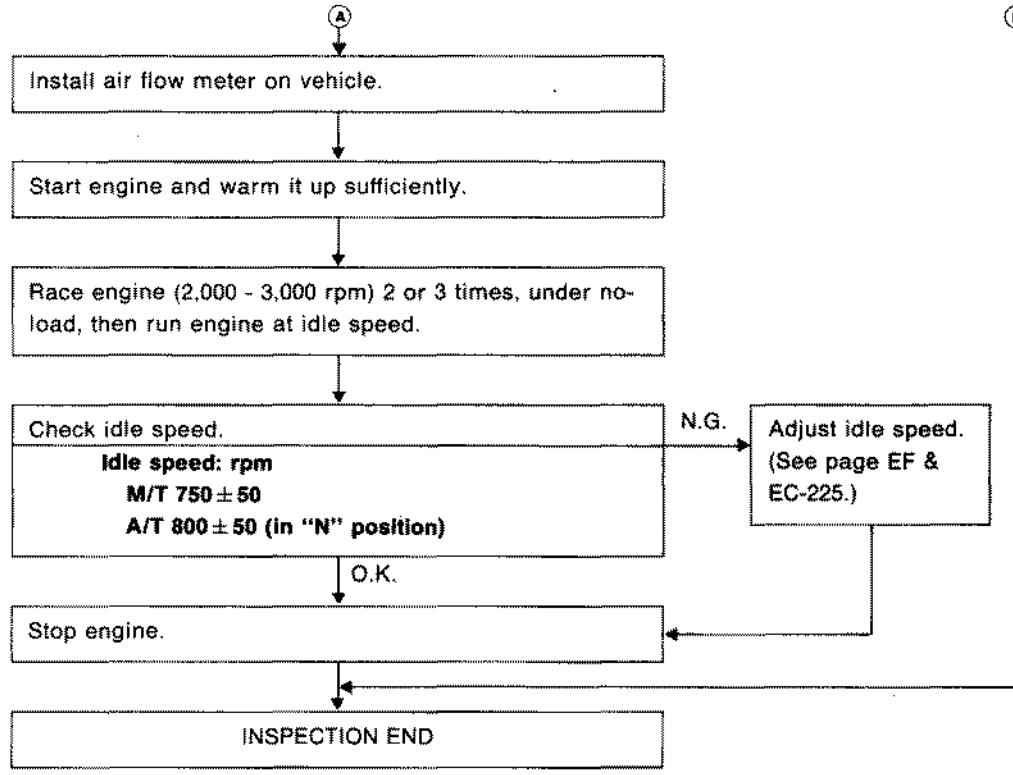
Turn off engine and remove air flow meter from vehicle.



SEF708K

Insert new seal plug into variable resistor hole. Tap seal plug with a suitable bar, thereby installing seal plug on air flow meter.

(A)

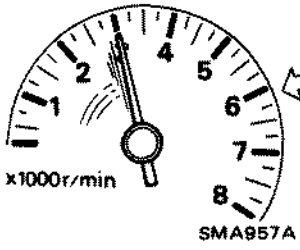

A
B
Install air flow meter on vehicle.
Start engine and warm it up sufficiently.
Race engine (2,000 - 3,000 rpm) 2 or 3 times, under no-load, then run engine at idle speed.
Check idle speed.
Idle speed: rpm
M/T 750 ± 50
A/T 800 ± 50 (in "N" position)
N.G.
Adjust idle speed. (See page EF & EC-225.)
O.K.
Stop engine.
INSPECTION END

Without "CO"-meter

INSPECTION START

Check and adjust idle speed and ignition timing.
(Refer to EF & EC-66.)

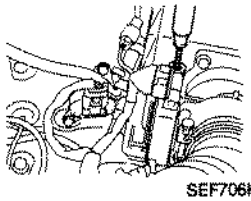
Idle speed: M/T 750 ± 50 rpm
A/T 800 ± 50 rpm (in "N" position)
Ignition timing: 10° ± 2° B.T.D.C.



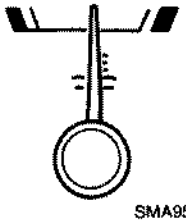
SMA957A

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

Turn off engine and remove air flow meter from vehicle.

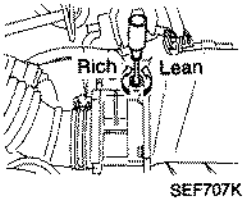

SEF706K

Drill a hole in seal plug which seals variable resistor of air flow meter and remove seal plug.


SMA955A

Install air flow meter on vehicle. Start engine and warm it up until water temperature indicator reads normal operating temperature.

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

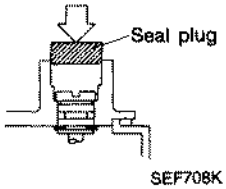


SEF707K

Adjust mixture ratio with engine speed set at maximum by turning variable resistor.

Turn variable resistor of air flow meter one full turn counterclockwise.

Turn off engine and remove air flow meter from vehicle.

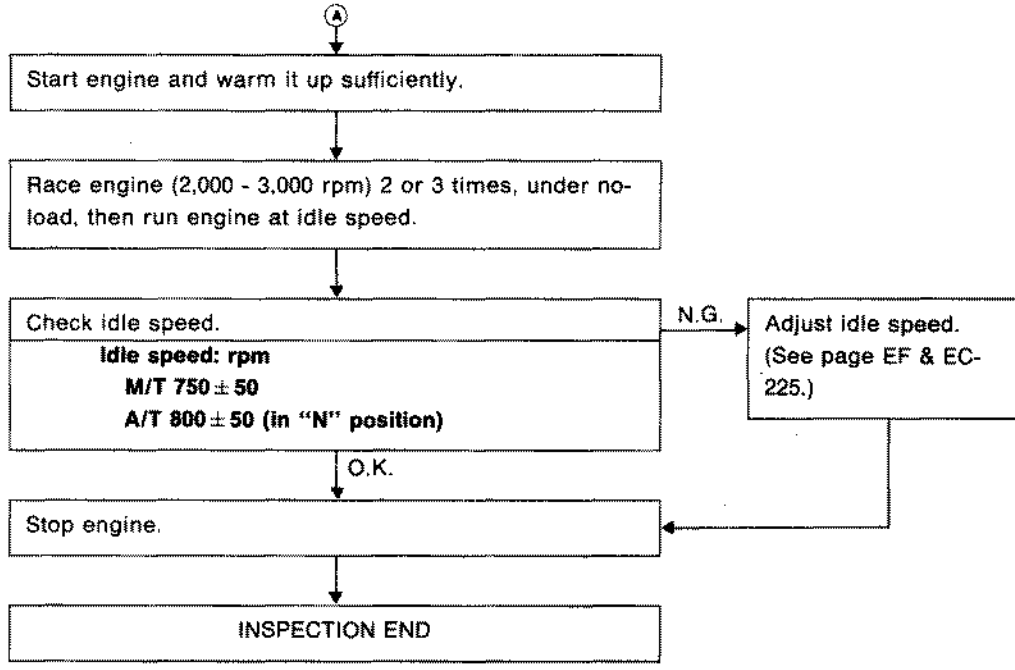


SEF708K

Insert new seal plug into variable resistor hole. Tap seal plug with a suitable bar, thereby installing seal plug on air flow meter.

Install air flow meter on vehicle.

Ⓐ

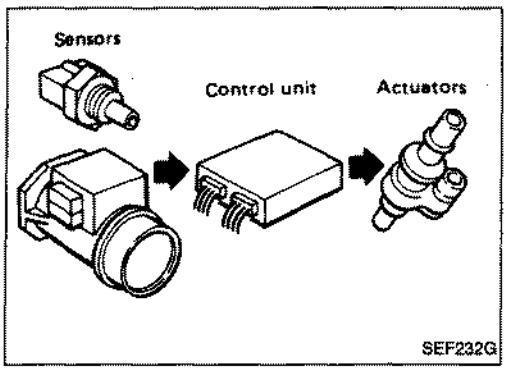

Ⓐ
Start engine and warm it up sufficiently.
Race engine (2,000 - 3,000 rpm) 2 or 3 times, under no-load, then run engine at idle speed.
Check idle speed.
Idle speed: rpm
M/T 750 ± 50
A/T 800 ± 50 (in "N" position)
N.G.
Adjust idle speed. (See page EF & EC-225.)
O.K.
Stop engine.
INSPECTION END

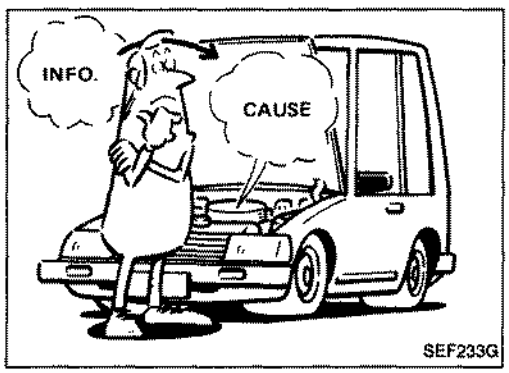
Contents

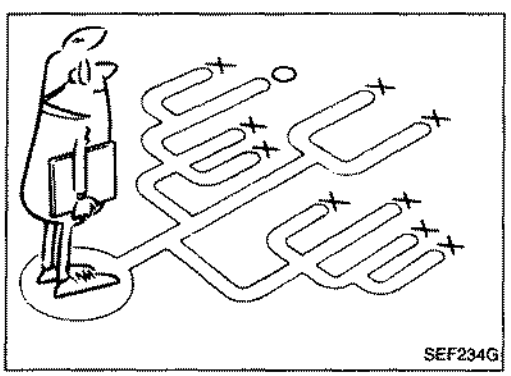
How to Perform Trouble Diagnoses for Quick and Accurate Repair ..... EF & EC-234
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Basic Inspection ..... EF & EC-251
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Diagnostic Procedure 2 — Hunting ..... EF & EC-255
Diagnostic Procedure 3 — Unstable Idle ..... EF & EC-256
Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold ..... EF & EC-259
Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot ..... EF & EC-261
Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions ..... EF & EC-263
Diagnostic Procedure 7 — Hesitation when the Engine is Hot ..... EF & EC-265
Diagnostic Procedure 8 — Hesitation when the Engine is Cold ..... EF & EC-265
Diagnostic Procedure 9 — Hesitation under Normal Conditions ..... EF & EC-266
Diagnostic Procedure 10 — Engine Stalls when turning ..... EF & EC-267
Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot ..... EF & EC-269
Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold ..... EF & EC-271
Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily ..... EF & EC-273
Diagnostic Procedure 14 — Engine Stalls after Decelerating ..... EF & EC-275
Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed ..... EF & EC-278
Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy ..... EF & EC-280
Diagnostic Procedure 17 — Lack of Power and Stumble ..... EF & EC-282
Diagnostic Procedure 18 — Detonation ..... EF & EC-282
Diagnostic Procedure 19 — Surge ..... EF & EC-283
Diagnostic Procedure 20 — Backfire through the Intake ..... EF & EC-284
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POWER STEERING OIL PRESSURE SWITCH ..... EF & EC-336
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Electrical Components Inspection ..... EF & EC-343







How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

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

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

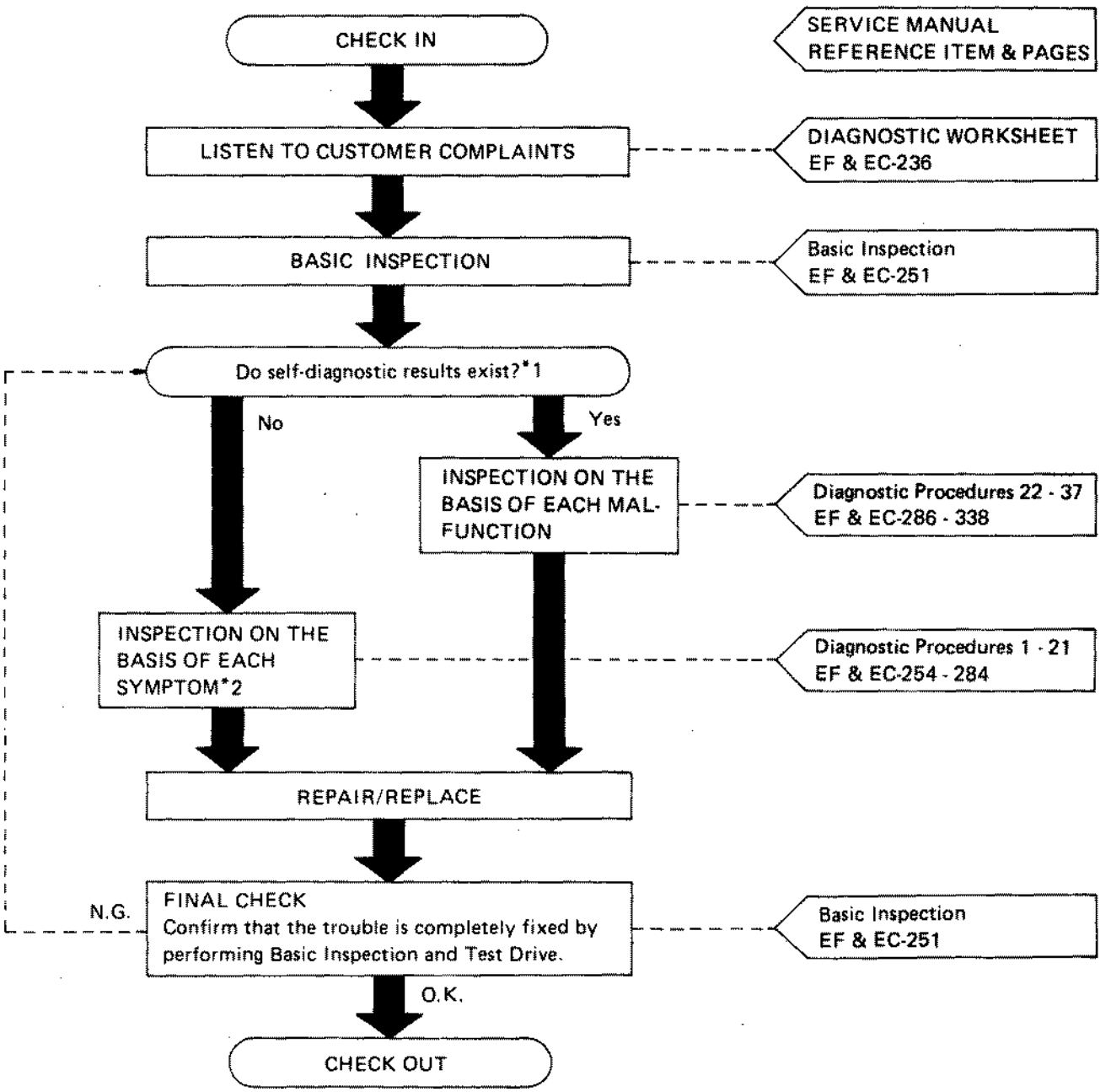
A visual check only may not find the cause of the problems, so a road test with a circuit tester connected to a suspected circuit should be performed.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a driveability complaint. The customer is a very good supplier of information on such problems, especially intermittent ones. Through interaction 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 driveability problems on an electronically controlled engine vehicle.

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

WORK FLOW



***1: If the self-diagnosis cannot be performed, check main power supply and ground circuit. (See Diagnostic Procedure 22.)**

***2: If the trouble is not duplicated, see INTERMITTENT PROBLEM SIMULATION (EF & EC-237).**

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

KEY POINTS

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

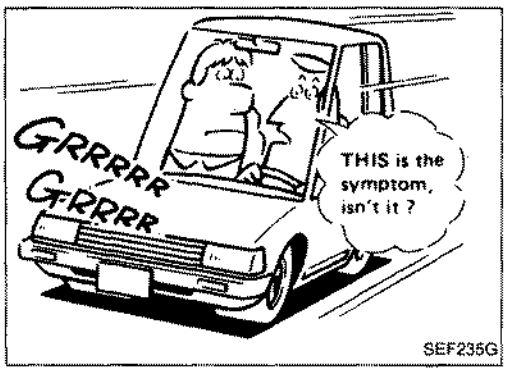
DIAGNOSTIC WORKSHEET

There are many kinds of operating conditions that lead to malfunctions on engine components.
A good grasp of such conditions can make trouble-shooting faster and more accurate.
In general, feelings for a problem depend on each customer. It is important to fully understand the symptoms or under what conditions a customer complains.
Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for trouble-shooting.

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 [ ]	
Symptoms — ☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
Symptoms — ☐ Driveability	☐ Stumble ☐ Surge ☐ Detonation ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
Symptoms — ☐ 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	
Check engine light	☐ Turned on ☐ Not turned on	

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

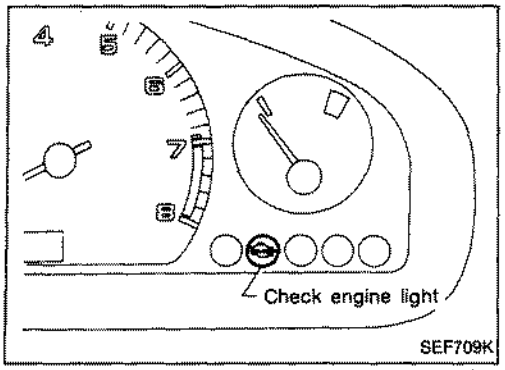


INTERMITTENT PROBLEM SIMULATION

In order to duplicate an intermittent problem, it is effective to create similar conditions for component parts, under which the problem might occur.
Perform the activity listed under Service procedure and note the result.

	Variable factor	Influential part	Target condition	Service procedure
1	Mixture ratio	Pressure regulator	Made lean	Remove vacuum hose and apply vacuum.
			Made rich	Remove vacuum hose and apply pressure.
2	Ignition timing	Crank angle sensor	Advanced	Rotate distributor clockwise.
			Retarded	Rotate distributor counterclockwise.
3	Idle speed	A.A.C. valve	Raised	Turn idle adjusting screw counterclockwise.
			Lowered	Turn idle adjusting screw clockwise.
4	Electrical connection (Electric continuity)	Harness connectors and wires	Poor electrical connection or improper wiring	Tap or wiggle.
				Race engine rapidly. See if the torque reaction of the engine unit causes electric breaks.
5	Temperature	Control unit	Cooled	Cool with an icing spray or similar device.
			Warmed	Heat with a hair drier. **[WARNING: Do not overheat the unit.]**
6	Moisture	Electric parts	Damp	Wet. **[WARNING: Do not directly pour water on components. Use a mist sprayer.]**
7	Electric loads	Load switches	Loaded	Turn on headlamps, air conditioner, rear defogger, etc.
8	Idle switch condition	Control unit	ON-OFF switching	Rotate throttle sensor body.
9	Ignition spark	Timing light	Spark power check	Try to flash timing light for each cylinder.

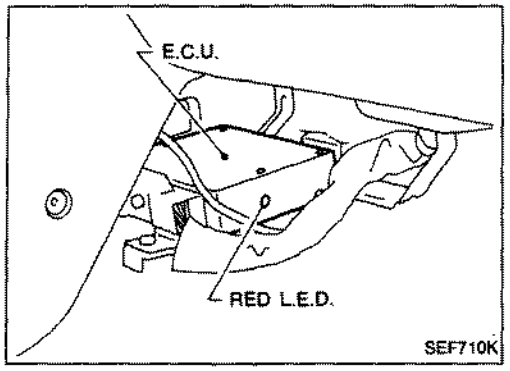
*: Models with catalyzer only



Self-diagnosis

CHECK ENGINE LIGHT

A check engine light has been adopted on all models. This light blinks simultaneously with the RED L.E.D. on the E.C.U.



E.C.U. L.E.D.

The E.C.U. has only one RED L.E.D.

SELF-DIAGNOSTIC FUNCTION

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

Self-diagnosis (Cont'd)

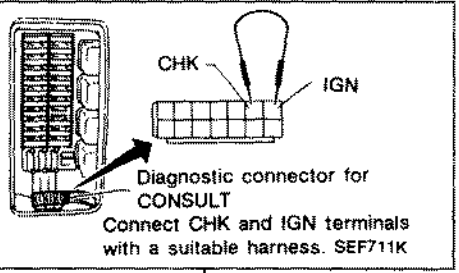
HOW TO SWITCH MODES

Turn ignition switch "ON". (Do not start engine.)

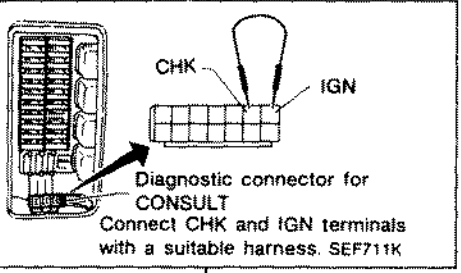
Mode I — BULB CHECK

Start engine.

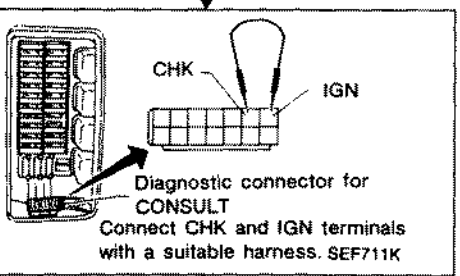
Mode I — MALFUNCTION WARNING



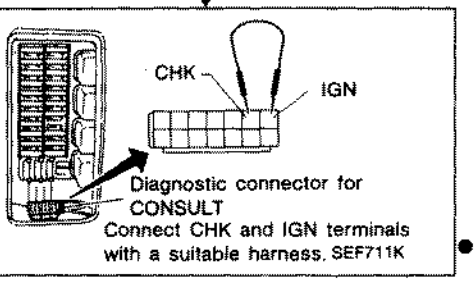
Wait at least 2 seconds.



Mode II — SELF-DIAGNOSTIC RESULTS



Wait at least 2 seconds.



- **Switching the modes is not possible when the engine is running.**
- **When the ignition switch is turned off during diagnosis in each mode, and then turned back on again after power to the E.C.U. has dropped off completely, the diagnosis will automatically return to Mode I.**

Self-diagnosis — Mode I

MODE I — BULB CHECK

In this mode, the RED L.E.D. in the E.C.U. and the CHECK ENGINE LIGHT in the instrument panel stay "ON".
If either remain "OFF", check the bulb in the CHECK ENGINE LIGHT or the RED L.E.D.

MODE I — MALFUNCTION WARNING

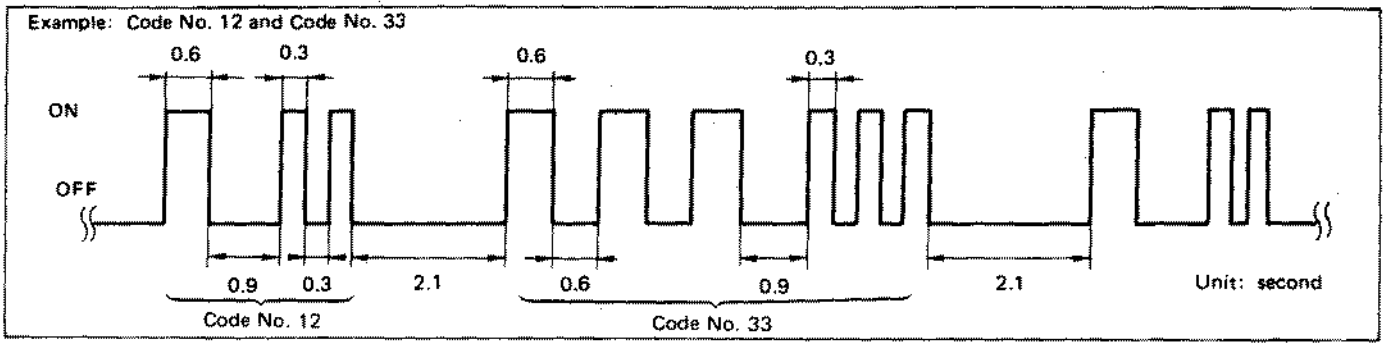
CHECK ENGINE LIGHT and RED L.E.D.	Condition
ON	When the E.C.U.'s C.P.U. is malfunctioning.
OFF	O.K.

- **The RED L.E.D. and the CHECK ENGINE LIGHT will turn off when normal condition is detected.**

Self-diagnosis — Mode II (Self-diagnostic results)

DESCRIPTION

In this mode, a malfunction code is indicated by the number of flashes from the RED L.E.D. or the CHECK ENGINE LIGHT as shown below:



Long (0.6 second) blinking indicates the number of ten digits and short (0.3 second) blinking indicates the number of single digits.
For example, the red L.E.D. flashes once for 0.6 seconds and then it flashes twice for 0.3 seconds. This indicates the number "12" and refers to a malfunction in the air flow meter. In this way, all the problems are classified by their code numbers.
The diagnostic results will remain in E.C.U. memory.

Display code table

Code No.	Detected items
11*	Crank angle sensor circuit
12	Air flow meter circuit
13	Engine temperature sensor circuit
14	Vehicle speed sensor circuit
21*	Ignition signal circuit
43	Throttle sensor circuit
55	No malfunction in the above circuits

*: Check items causing a malfunction of crank angle sensor circuit first, if both code No. 11 and 21 are displayed at the same time.

Self-diagnosis — Mode II (Self-diagnostic results) (Cont'd)

Code No.	Detected items	Malfunction is detected when ...	Check item (remedy)
*11	Crank angle sensor circuit	• Either 1° or 180° signal is not entered for the first few seconds during engine cranking. • Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm.	• Harness and connector (If harness and connector are normal, replace crank angle sensor.)
12	Air flow meter circuit	• The air flow meter circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector (If harness and connector are normal, replace air flow meter.)
13	Engine temperature sensor circuit	• The engine temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Engine temperature sensor
14	Vehicle speed sensor circuit	• The vehicle speed sensor circuit is open or shorted.	• Harness and connector • Vehicle speed sensor (reed switch)
*21	Ignition signal circuit	• The ignition signal in the primary circuit is not entered during engine cranking or running.	• Harness and connector • Power transistor unit
43	Throttle sensor circuit	• The throttle sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Throttle sensor

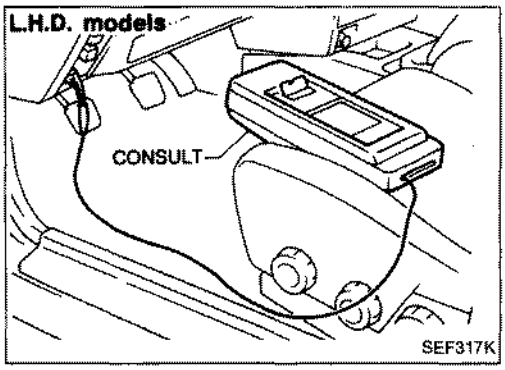
*: Check items causing a malfunction of crank angle sensor circuit first, if both code No. 11 and 21 come out at the same time.

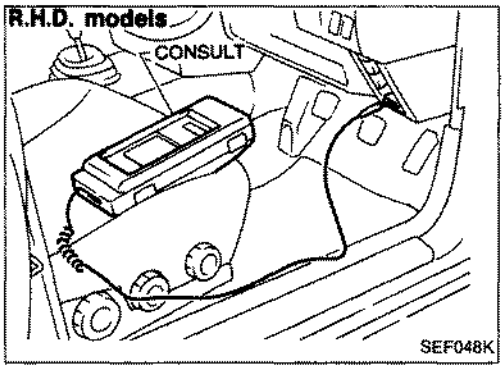
HOW TO ERASE SELF-DIAGNOSTIC RESULTS

The malfunction code is erased from the backup memory on the E.C.U. when the diagnostic mode is changed from Mode II to Mode I. (Refer to "HOW TO SWITCH MODES".)

- **When the battery terminal is disconnected, the malfunction code will be lost from the backup memory within 24 hours.**
- **Before starting self-diagnosis, do not erase the stored memory before beginning self-diagnosis.**

NOTE

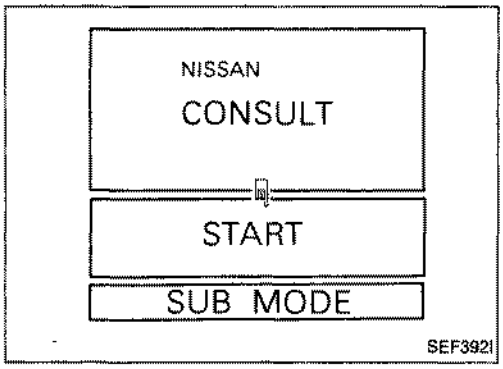




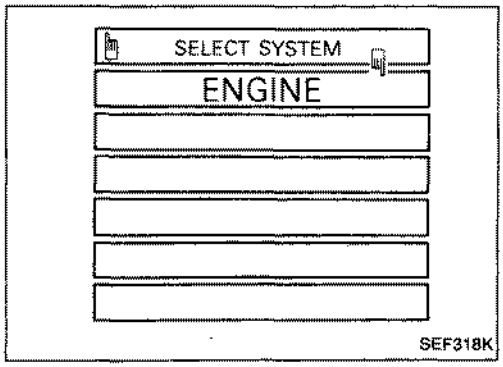
Consult

CONSULT INSPECTION PROCEDURE

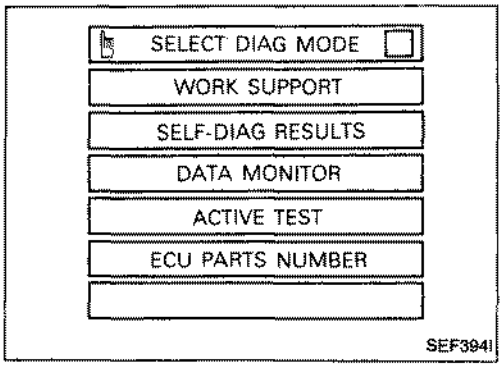
1. Turn off ignition switch.
2. Connect "CONSULT" to diagnostic connector.
   (Diagnostic connector is located behind the fuse box cover.)



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



5. Touch "ENGINE".



6. Perform each diagnostic mode according to the inspection sheet as follows:

For further information, see the CONSULT Operation Manual.

Consult (Cont'd)

E.C.C.S. COMPONENT PARTS APPLICATION

E.C.C.S. COMPONENT PARTS \ MODE		WORK SUPPORT	SELF-DIAGNOSTIC RESULTS	DATA MONITOR	ACTIVE TEST
INPUT	Crank angle sensor		X	X	
	Air flow meter		X	X	
	Engine temperature sensor		X	X	X
	Vehicle speed sensor		X	X	
	Throttle sensor	X	X	X	
	Ignition switch (start signal)			X	
	Air conditioner switch			X	
	Neutral switch			X	
	Power steering oil pressure switch			X	
	Load switch			X	
	Battery			X	
OUTPUT	Injectors			X	X
	Power transistor (ignition signal)	X (Ignition timing)	X	X (Ignition timing)	X
	A.A.C. valve	X		X	X
	Air conditioner relay			X	
	Fuel pump relay	X		X	X
	Radiator fan			X	X

X: Applicable

FUNCTION

Diagnostic mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT unit.
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.
Data monitor	Input/Output data in the control unit can be read.
Active test	Mode in which CONSULT drives some actuators apart from the control units and also shifts some parameters in a specified range.
E.C.U. part numbers	E.C.U. part numbers can be read.

Consult (Cont'd)

WORK SUPPORT MODE

WORK ITEM	CONDITION	USAGE
THROTTLE SENSOR ADJUSTMENT	CHECK THE THROTTLE 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 sensor initial position.
IGNITION TIMING ADJUSTMENT	• IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING "START". AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CRANK ANGLE SENSOR.	When adjusting initial ignition timing.
AAC VALVE ADJUSTMENT	SET ENGINE RPM 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 RESULTS MODE

DIAGNOSTIC ITEM	DIAGNOSTIC ITEM IS DETECTED WHEN ...	CHECK ITEM (REMEDY)
CRANK ANGLE SENSOR*	• Either 1° or 180° signal is not entered for the first few seconds during engine cranking. • Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm.	• Harness and connector (If harness and connector are normal, replace crank angle sensor.)
AIR FLOW METER	• The air flow meter circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector (If harness and connector are normal, replace air flow meter.)
ENGINE TEMP SENSOR	• The engine temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Engine temperature sensor
VEHICLE SPEED SENSOR	• The vehicle speed sensor circuit is open or shorted.	• Harness and connector • Vehicle speed sensor
IGN SIGNAL-PRIMARY*	• The ignition signal in primary circuit is not entered during engine cranking or running.	• Harness and connector • Power transistor unit
THROTTLE SENSOR	The throttle sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Throttle sensor

*: Check items causing a malfunction of crank angle sensor circuit first, if both "CRANK ANGLE SENSOR" and "IGN SIGNAL-PRIMARY" come out at the same time.

Consult (Cont'd)

DATA MONITOR MODE

Remarks:

- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the E.C.U. at the connector.
  * Specification data may not be directly related to their components signals/values/operations.
  i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the E.C.U. according to the signals input from the crank angle sensor and other ignition timing related sensors.

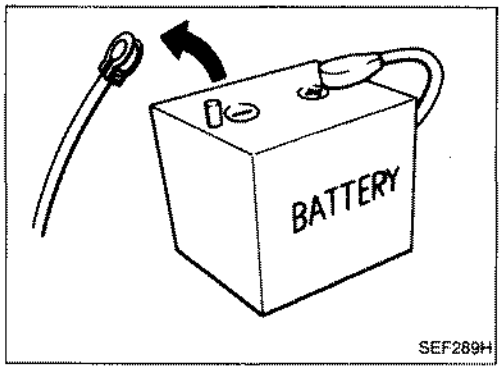
MONITOR ITEM	CONDITION		SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
CAS, RPM (REF)	• Tachometer: Connect • Run engine and compare tachometer indication with the CONSULT value.		Almost the same speed as the CONSULT value.	• Harness and connector • Crank angle sensor
AIR FLOW MTR	• Engine: After warming up, idle the engine • A/C switch "OFF" • Shift lever "N"	Idle	0.7 - 1.1V	• Harness and connector • Air flow meter
		2,000 rpm	1.1 - 1.5V	
ENG TEMP SEN	• Engine: After warming up		More than 70°C (158°F)	• Harness and connector • Engine temperature sensor
CAR SPEED SEN	• Turn drive wheels and compare speedometer indication with the CONSULT value		Almost the same speed as the CONSULT value	• Harness and connector • Vehicle speed sensor
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14V	• Battery • E.C.U. power supply circuit
THROTTLE SEN	• Ignition switch: ON (Engine stopped)	Throttle valve fully closed	Approx. 0.5V	• Harness and connector • Throttle sensor • Throttle sensor adjustment
		Throttle valve fully opened	Approx. 5.0V	
START SIGNAL	• Ignition switch: ON → START		OFF → ON	• Harness and connector • Starter switch
IDLE POSITION	• Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON	• Harness and connector • Throttle sensor • Throttle sensor adjustment
		Throttle valve: Slightly open	OFF	
AIR COND SIG	• Engine: After warming up, idle the engine	A/C switch "OFF"	OFF	• Harness and connector • Air conditioner switch
		A/C switch "ON"	ON	
NEUTRAL SW	• Ignition switch: ON	Shift lever "P" or "N"	ON	• Harness and connector • Neutral switch
		Except above	OFF	
PW/ST SIGNAL	• Engine: After warming up, idle the engine	Steering wheel in neutral (forward direction)	OFF	• Harness and connector • Power steering oil pressure switch
		The steering wheel is turned	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	• Harness and connector • Fuel pump relay
	Except as shown above		OFF	
RADIATOR FAN	• Engine: After warming up, idle the engine. • A/C switch "OFF"	Engine temperature is below 90°C (194°F)	OFF	• Harness and connector • Radiator fan relay • Radiator fan
		Engine temperature is above 91°C (196°F)	ON	

Consult (Cont'd)

MONITOR ITEM	CONDITION		SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
INJ PULSE	• Engine: After warming up • A/C switch "OFF" • Shift lever "N" • No-load	Idle	2.5 - 3.3 msec.	• Harness and connector • Injector • Air flow meter • Intake air system
		2,000 rpm	2.5 - 3.3 msec.	
IGN TIMING	ditto	Idle	10° B.T.D.C.	• Harness and connector • Crank angle sensor
		2,000 rpm	More than 20° B.T.D.C.	
AAC VALVE	ditto	Idle	20 - 40%	• Harness and connector • A.A.C. valve
		2,000 rpm	—	
AIR COND RLY	• Air conditioner switch OFF → ON		OFF → ON	• Harness and connector • Air conditioner switch • Air conditioner relay

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
FUEL INJECTION TEST	• 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 • Exhaust gas sensor
AAC/V OPENING TEST	• Engine: After warming up, idle the engine. • Change the AAC valve opening percent using CONSULT.	Engine speed changes according to the opening percent.	• Harness and connector • AAC valve
ENGINE TEMP TEST	• Engine: Return to the original trouble condition • Change the engine coolant temperature using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connector • Engine temperature sensor • Fuel injectors
IGN TIMING TEST	• 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 TEST	• 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
RADIATOR FAN TEST	• Ignition switch: ON • Turn the radiator fan "ON" and "OFF" using CONSULT.	Radiator fan moves and stops.	• Harness and connector • Radiator fan motor
FUEL PUMP RLY TEST	• 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

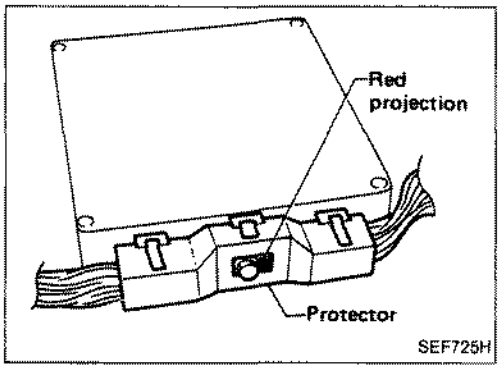


SEF289H

Diagnostic Procedure

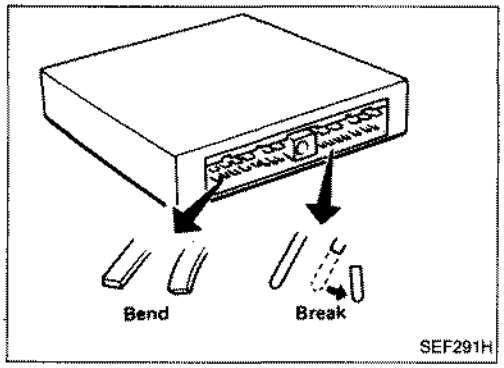
CAUTION:

1. **Before connecting or disconnecting the E.C.U. harness connector to or from any E.C.U., be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal in order not to damage E.C.U. as battery voltage is applied to E.C.U. even if ignition switch is turned off. Failure to do so may damage the E.C.U.**



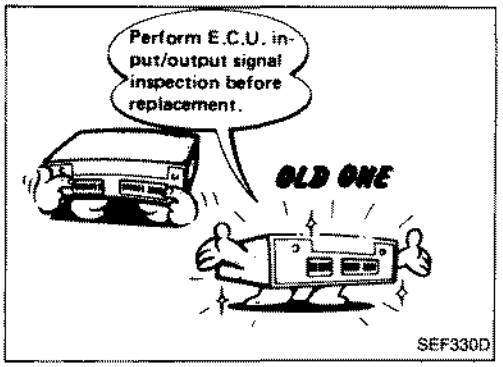
SEF725H

2. **When connecting E.C.U. harness connector, tighten securing bolt until red projection is in line with connector face.**



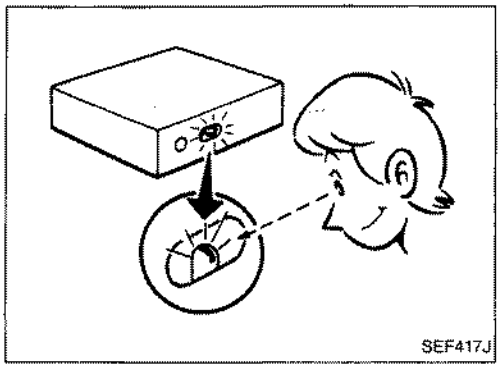
SEF291H

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



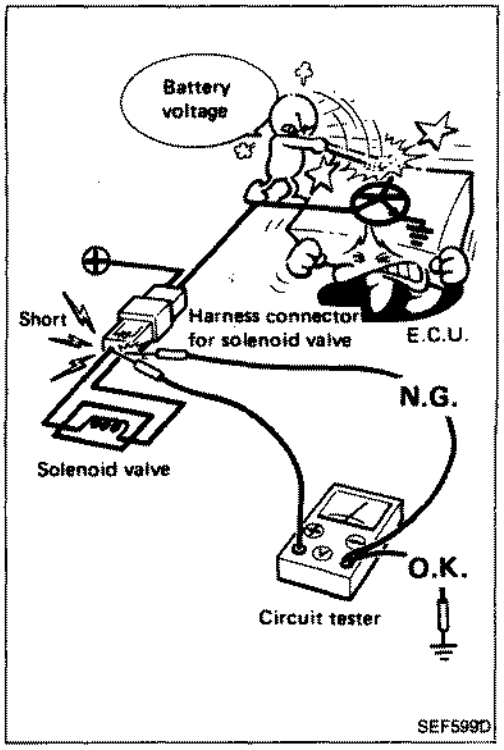
SEF330D

5. **Before replacing E.C.U., perform E.C.U. input/output signal inspection and make sure whether E.C.U. functions properly or not. (See page EF & EC-343.)**


SEF417J

6. **After performing this "Diagnostic Procedure", perform E.C.C.S. self-diagnosis and driving test.**

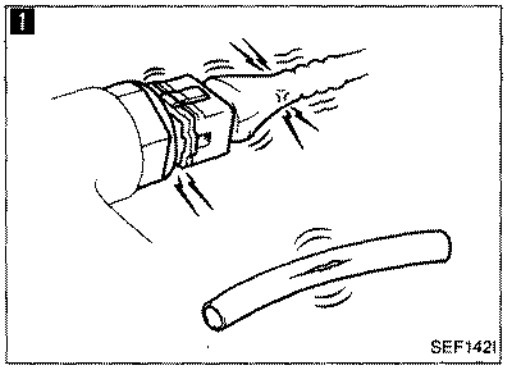
Diagnostic Procedure (Cont'd)



7. **When measuring E.C.U. controlled components supply voltage with a circuit tester, separate one tester probe from the other.**
   If the two tester probes accidentally make contact with each other during measurement, the circuit will be shorted, resulting in damage to the control unit power transistor.

Basic Inspection

1


SEF142I

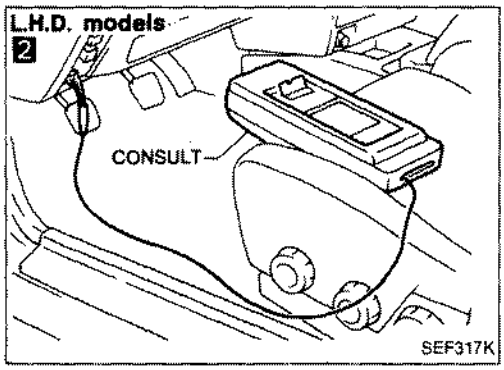
BEFORE STARTING

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 proper connections
- Vacuum hoses for splits, kinks, and proper connections
- Wiring for proper connections, pinches, and cuts

2

L.H.D. models

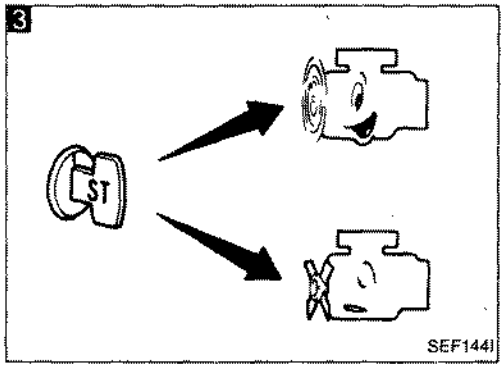


SEF317K

CONNECT CONSULT TO THE VEHICLE

Connect "CONSULT" to the diagnostic connector and select "ENGINE" from the menu. (Refer to page EF & EC-243.)

3



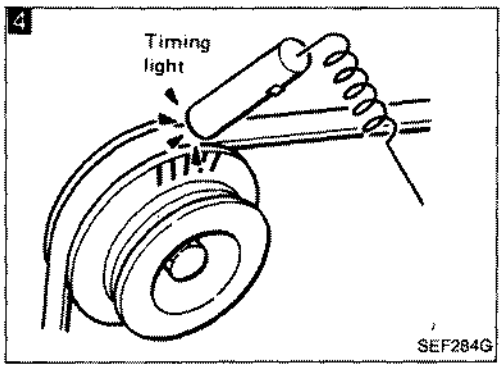
SEF144I

DOES ENGINE START?

No → Go to 6 .

Yes

4



SEF284G

CHECK IGNITION TIMING.

Warm up engine sufficiently and check ignition timing at idle using timing light. (Refer to page EF & EC-225.)

Ignition timing:

10° ± 2° B.T.D.C.

N.G. → Adjust ignition timing by turning crank angle sensor.

O.K.

(Go to Ⓐ on next page.)

Basic Inspection (Cont'd)

5

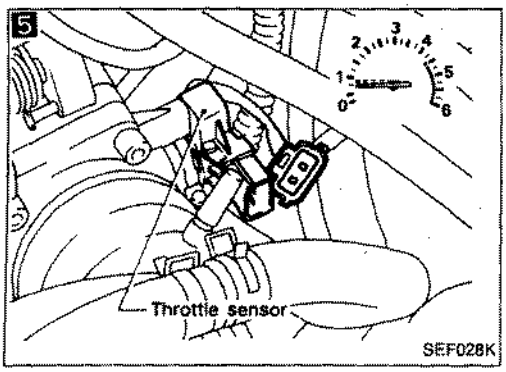
■ IGN TIMING ADJ ■

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

START

SEF579K

5



SEF028K

6

■ THROTTLE SEN ADJ ■

✱✱✱✱ ADJ MONITOR ✱✱✱✱

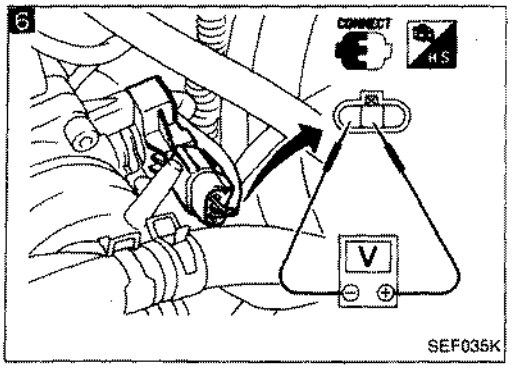
THROTTLE SEN 0.50V

MONITOR

CAS•RPM (REF) 0rpm
IDLE POSITION ON

SEF581K

6



SEF035K

Ⓐ

5

CHECK IDLE ADJ. SCREW INITIAL SET RPM.

1. Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. When touching "START", does engine rpm fall to 675 ± 50 rpm (M/T), 725 ± 50 rpm (A/T) (in "N" position)?

No → Adjust engine rpm by turning idle adjusting screw.

OR

When disconnecting throttle sensor harness connector, does engine rpm fall to 675 ± 50 rpm (M/T), 725 ± 50 rpm (A/T) (in "N" position)?

Yes ↓

6

CHECK THROTTLE SENSOR IDLE POSITION.

1. Perform "THROTTLE SEN. ADJ" in "WORK SUPPORT" mode.
2. Check that output voltage of throttle sensor is 0.45 to 0.55V. (Throttle valve fully closes.) and "IDLE POSITION" stays "ON".

N.G. →
1. Adjust output voltage by rotating throttle sensor body.
2. Disconnect throttle sensor harness connector for a few seconds and then reconnect it.
3. Confirm that "IDLE POSITION" stays "ON".

OR

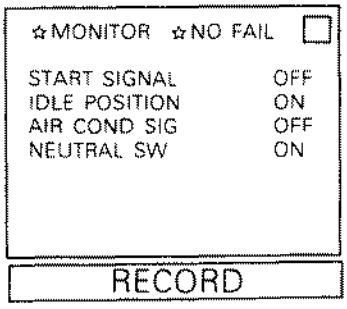
Measure output voltage of throttle sensor using voltmeter, and check that it is 0.45 to 0.55V. (Throttle valve fully closed.)

O.K. ↓

(Go to Ⓑ on next page.)

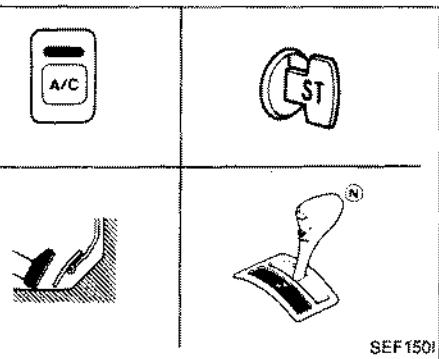
Basic Inspection (Cont'd)

7



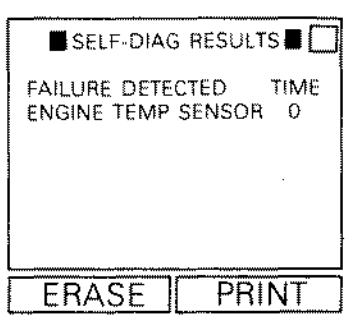
SEF384J

7



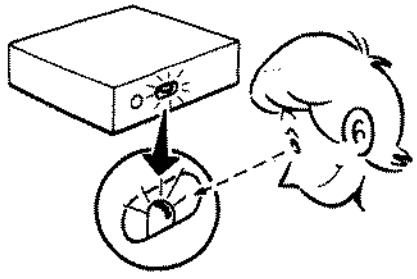
SEF150I

8



SEF151I

8



SEF417J

Ⓑ

7

CHECK SWITCH INPUT SIGNAL.

Select the following switches in "DATA MONITOR" mode,
a) Start signal,
b) Idle position,
c) Air conditioner signal,
d) Neutral (Parking) switch,
and check the switches' ON-OFF operation.

N.G. → Repair or replace the malfunctioning switch or its circuit.

OR

Remove E.C.U. from behind audio system panel and check the above switches' ON-OFF operation using voltmeter at each E.C.U. terminal.

Switch	Condition	Voltage (V)
Start signal	IGN → IGN ON → START	0 → Battery voltage
Idle position	—	—
A/C signal	A/C OFF → A/C ON (Engine running)	Battery voltage → 0 - 0.3
Neutral (Parking) switch	Shift lever is Neutral position → Except Neutral position	0 → Battery voltage

O.K.

8

READ SELF-DIAGNOSTIC RESULTS.

1. Perform "SELF-DIAG RESULTS" mode.
2. Read out self-diagnostic results.
3. Is a failure detected?

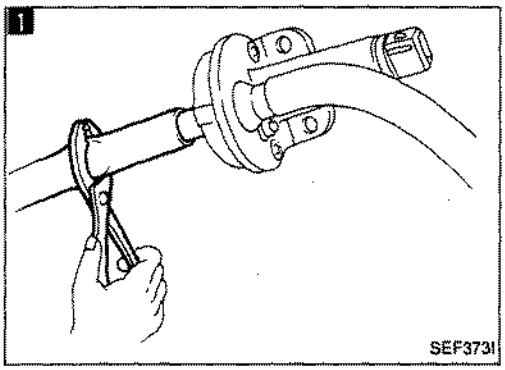
Yes → Go to the relevant inspection procedure.

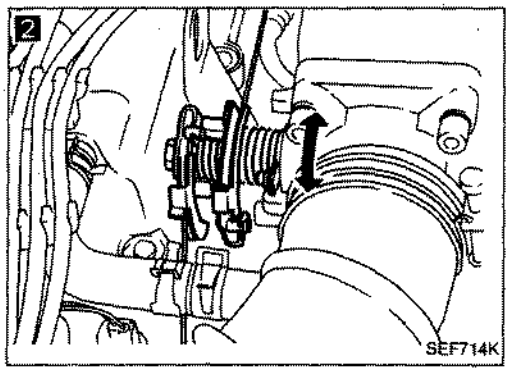
OR

1. Set "Self-diagnostic results mode" in Mode II. (Refer to page EF & EC-240.)
2. Count the number of RED L.E.D. flashes and read out the codes.
3. Are the codes shown?

No

INSPECTION END





Diagnostic Procedure 1 — High Idling after Warm-up

1

CHECK AIR REGULATOR.
When pinching the air regulator hose, does the engine speed drop?

Yes → Check air regulator and circuit. (See page EF & EC-322.)

No

2

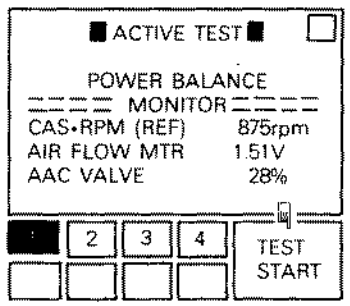
CHECK THROTTLE LINKAGE.
1. Check that throttle linkage moves smoothly.
2. Confirm that throttle valve both fully opens and fully closes.

N.G. → Repair throttle linkage or sticking of throttle valve.

O.K.

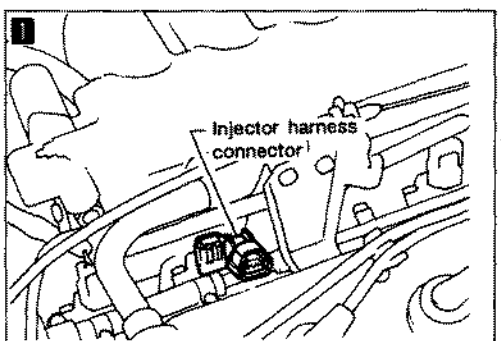
INSPECTION END

1



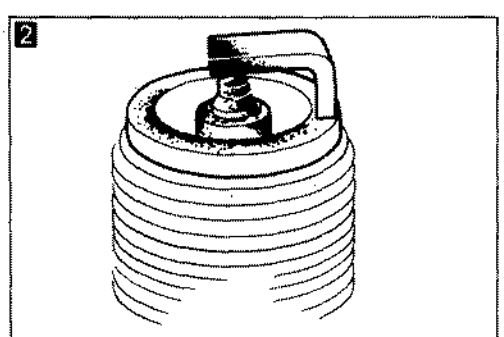
SEF325K

1



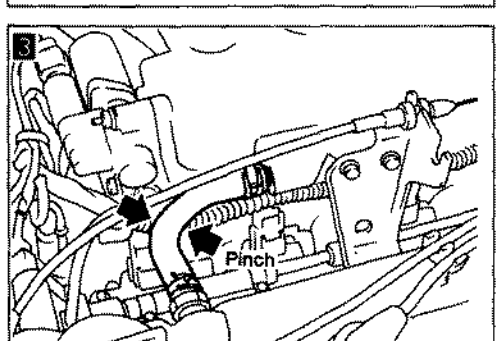
SEF715K

2



SEF156I

3



SEF716K

Diagnostic Procedure 2 — Hunting

1

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 3.

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes

2

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K.

3

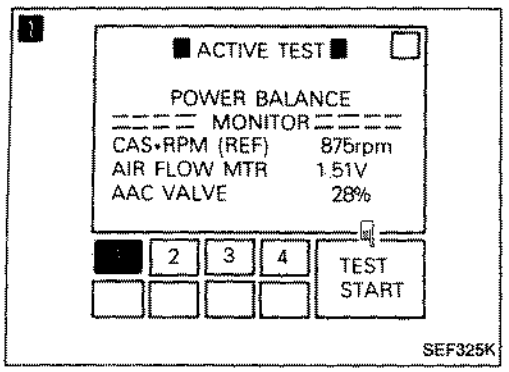
CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

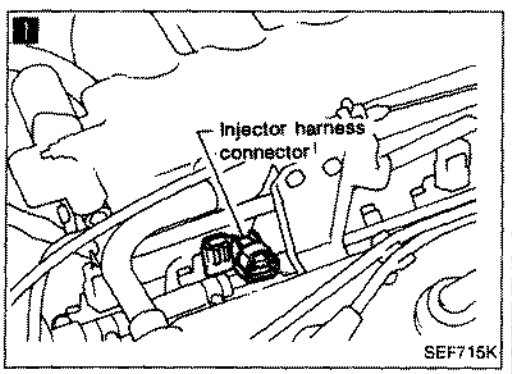
Yes → Discover air leak location and repair.

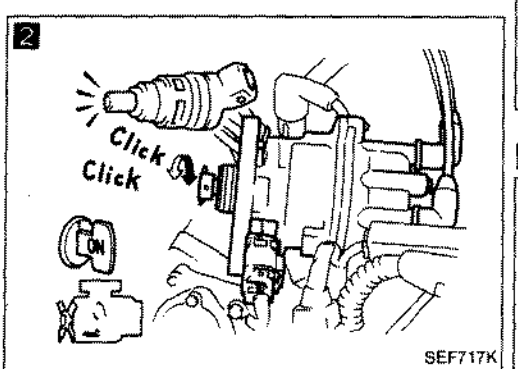
No

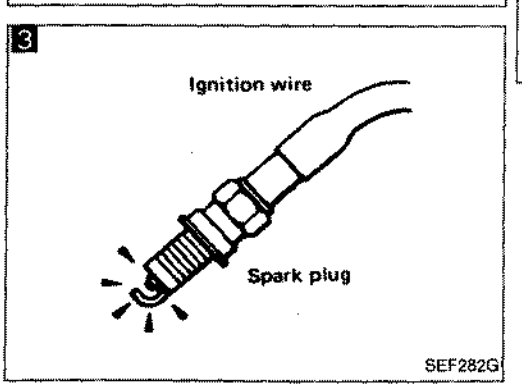
INSPECTION END

Diagnostic Procedure 3 — Unstable Idle









1

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 6.

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes ↓

2

CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

3

CHECK IGNITION SPARK.

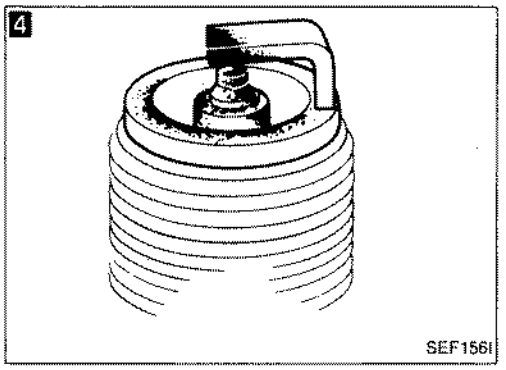
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

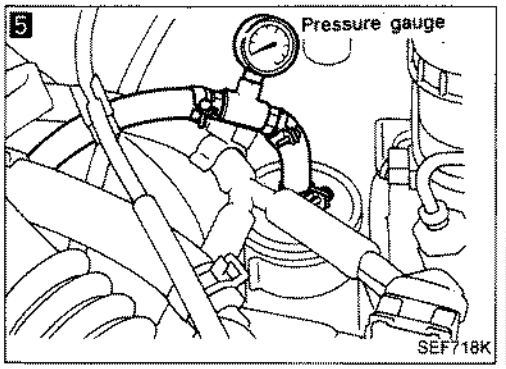
N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-304.)

O.K. ↓

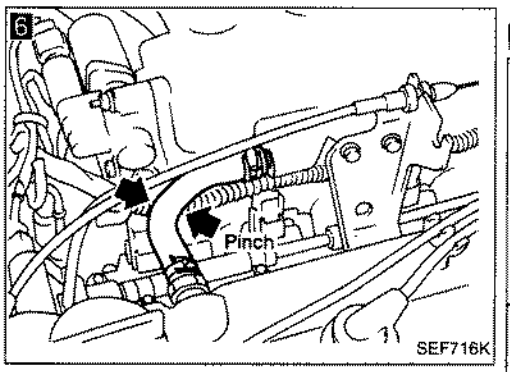
(Go to Ⓐ on next page.)

Diagnostic Procedure 3 — Unstable Idle (Cont'd)

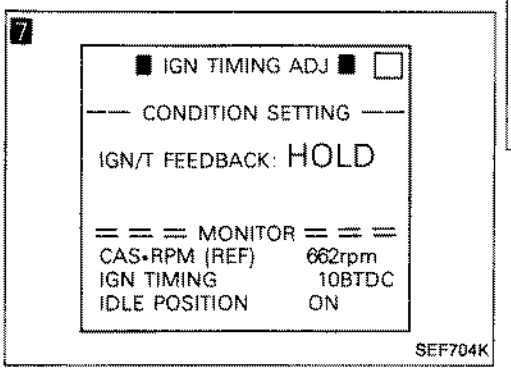

SEF156I



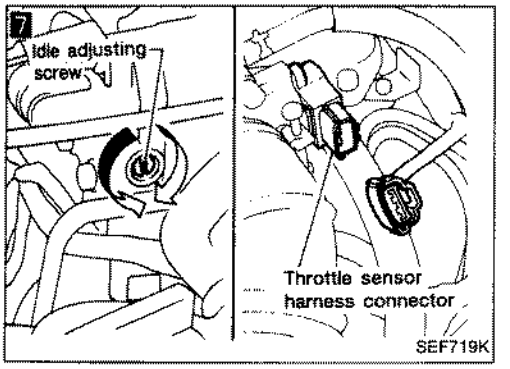
SEF718K



SEF716K



SEF704K



SEF719K

Ⓐ

4 **CHECK SPARK PLUGS.**
Remove the spark plugs and check for fouling, etc.
N.G. → Repair or replace spark plug(s).
O.K.

5 **CHECK FUEL PRESSURE.**
1. Release fuel pressure to zero. (Refer to page EF & EC-353.)
2. Install fuel pressure gauge and check fuel pressure.
   At idle:
   Approx. 245 kPa
   (2.45 bar, 2.5 kg/cm², 36 psi)

N.G. → Check fuel pump and circuit.
O.K.

6 **CHECK FOR INTAKE AIR LEAK.**
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?
Yes → Discover air leak location and repair.
No

7 **CHECK IDLE ADJ. SCREW CLOGGING.**
1. Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. Can you set engine rpm at 800 ± 50 rpm (in "N" position) by turning idle adjusting screw?

OR

1. Disconnect throttle sensor harness connector.
2. Can you set engine rpm at 800 ± 50 rpm (in "N" position) by turning idle adjusting screw?

No → Check for IAS clogging or throttle valve clogging.
Yes

(Go to Ⓑ on next page.)

Diagnostic Procedure 3 — Unstable Idle (Cont'd)

8

COMPRESSION PRESSURE



SEF309G

Ⓑ

8

CHECK COMPRESSION PRESSURE.

- Check compression pressure.

Standard:

kPa (bar, kg/cm², psi)/350 rpm

1,324 (13.24, 13.5, 192)

Minimum:

kPa (bar, kg/cm², psi)/350 rpm

1,128 (11.28, 11.5, 164)

Difference between each cylinder:

kPa (bar, kg/cm², psi)/350 rpm

98 (0.98, 1.0, 14)

N.G. → Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

O.K. ↓

9

CHECK E.C.U. HARNESS CONNECTOR.

Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K. ↓

10

TRY A KNOWN GOOD E.C.U.*

↓

INSPECTION END

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

Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold

1

CHECK BATTERY AND STARTER.
Check battery and starter condition.
(Refer to EL section.)

N.G. → Repair or replace.

O.K. ↓

2

CHECK FUEL PRESSURE.
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-318.)

Yes ↓

3

CHECK AIR REGULATOR AND A.A.C. VALVE.
When pressing accelerator pedal fully, can you start the engine.

Yes → Check A.A.C. valve, air regulator and circuits. (See pages EF & EC-322.)

No ↓

4

CHECK INJECTOR.
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

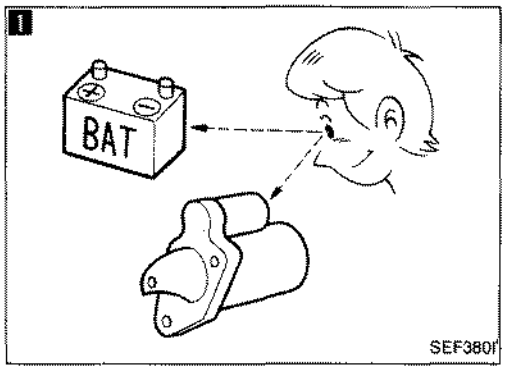
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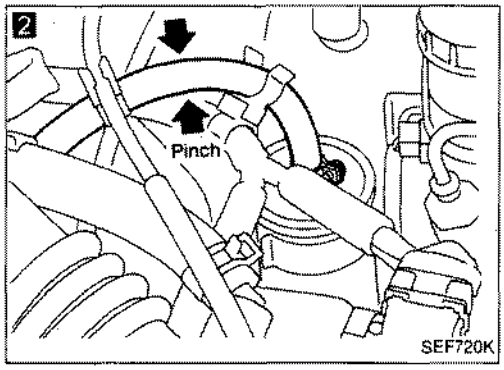
CHECK IGNITION SPARK.
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

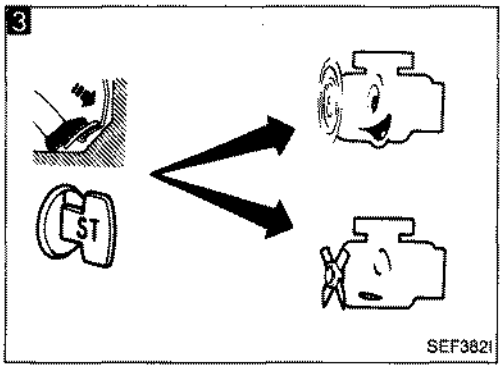
N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-304.)

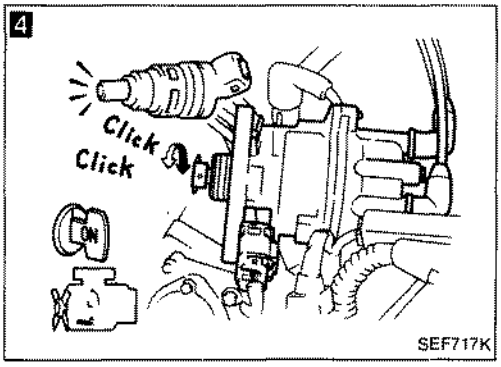
O.K. ↓

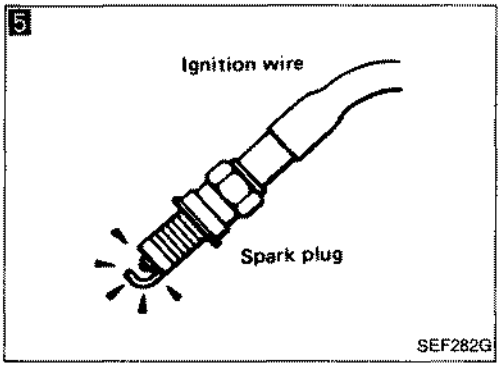
(Go to Ⓐ on next page.)





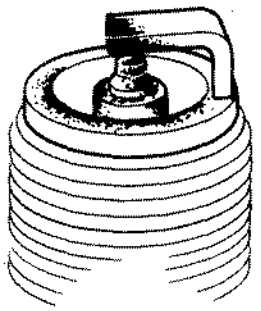






Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold (Cont'd)

6



SEF156I

Ⓐ

6

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K.

7

CHECK E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K.

8

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-286.

N.G. → Repair or replace.

O.K.

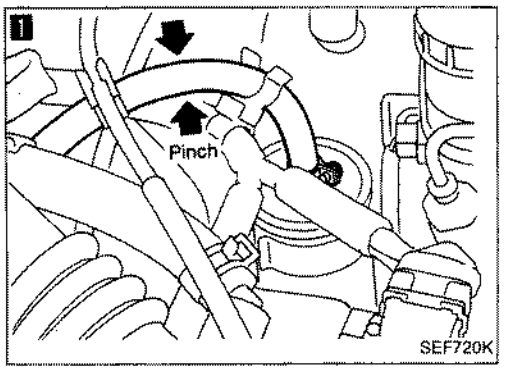
9

TRY A KNOWN GOOD E.C.U.*

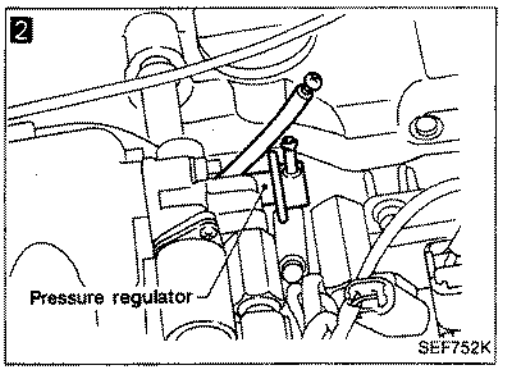
INSPECTION END

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

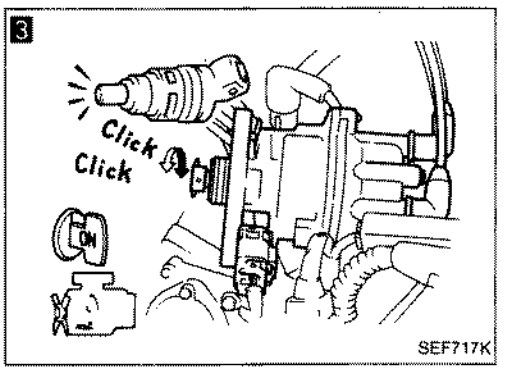
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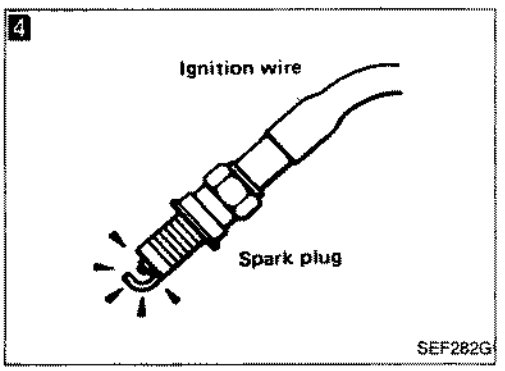
2



3



4



Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot

1

CHECK FUEL PRESSURE.
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-318.)

Yes ↓

2

CHECK FUEL VAPOR.
1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Can you start engine?

Yes → Check fuel properties.

No ↓

3

CHECK INJECTOR.
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

4

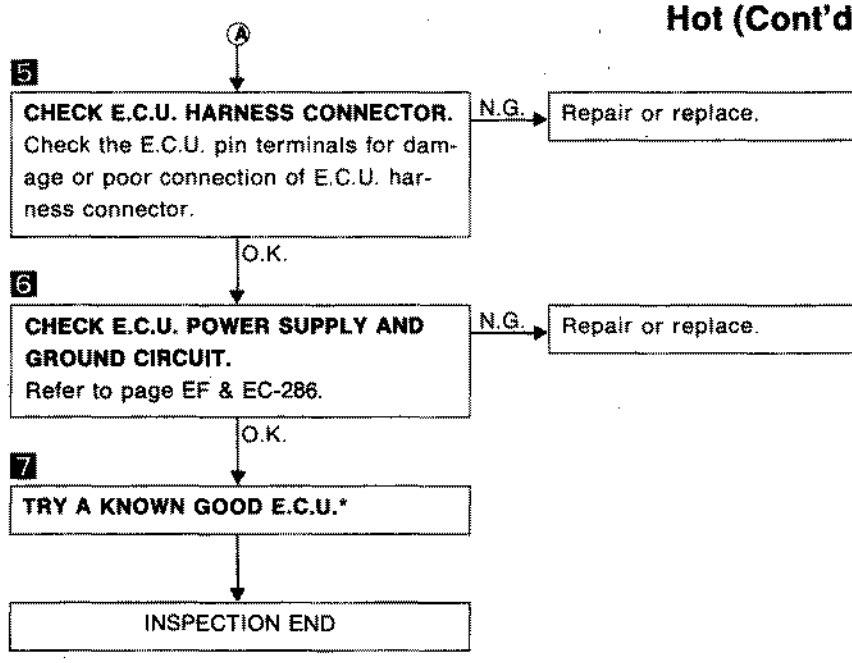
CHECK IGNITION SPARK.
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-304.)

O.K. ↓

(Go to Ⓐ on next page.)

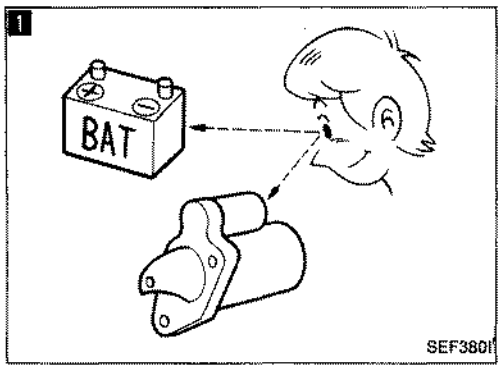
Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot (Cont'd)



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

Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions

1



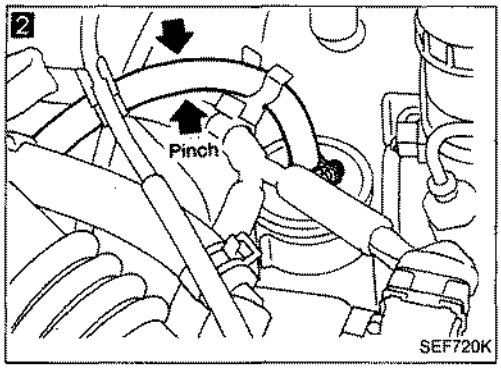
SEF380I

CHECK BATTERY AND STARTER.
Check battery and starter operation.
(Refer to EL section.)

N.G. → Repair or replace.

O.K. ↓

2



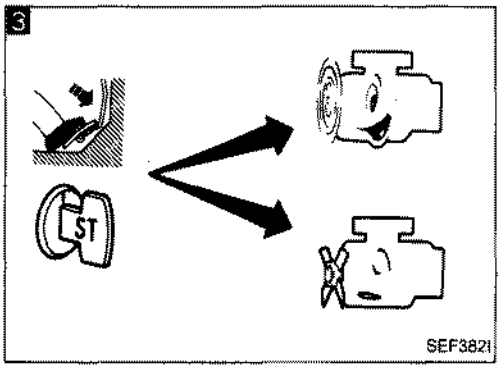
SEF720K

CHECK FUEL PRESSURE.
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-318.)

Yes ↓

3



SEF382I

CHECK INJECTOR FOR LEAKAGE.
When pressing accelerator pedal fully, can you start the engine.

Yes → Check injector(s) for leakage.

No ↓

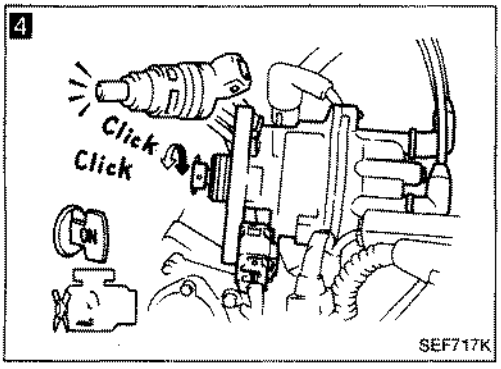
4

CHECK INJECTOR.
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injectors and circuits.

Yes ↓

5



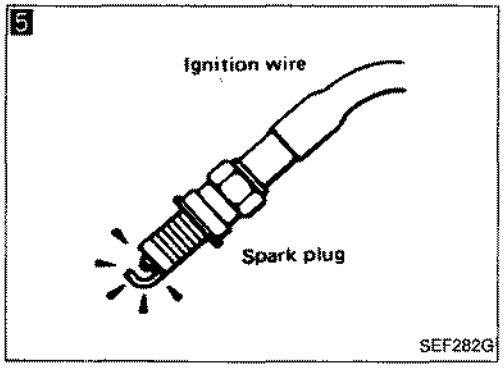
SEF717K

CHECK IGNITION SPARK.
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-304.)

O.K. ↓

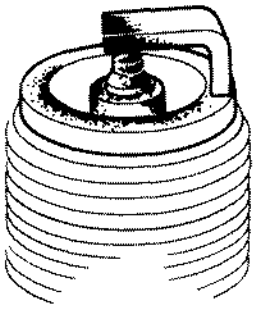
(Go to Ⓐ on next page.)



SEF282G

Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions (Cont'd)

6



SEF156I

Ⓐ

6

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K.

7

CHECK E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K.

8

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-286.

N.G. → Repair or replace.

O.K.

9

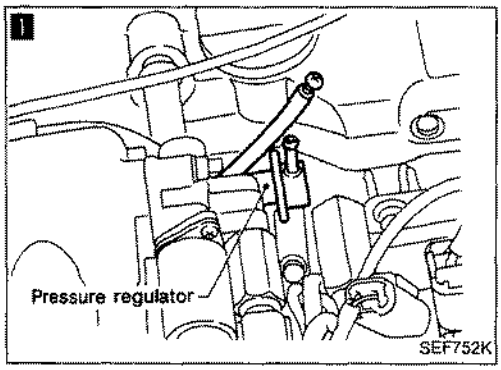
TRY A KNOWN GOOD E.C.U.*

Trouble is fixed. → Replace E.C.U.

Trouble is not fixed.

INSPECTION END

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



Diagnostic Procedure 7 — Hesitation when the Engine is Hot

1

CHECK FUEL VAPOR.
1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

Yes → Check fuel properties.

No ↓

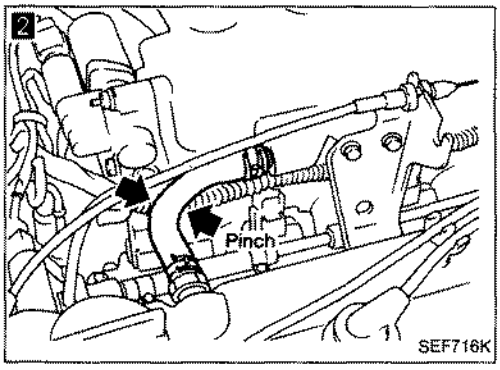
2

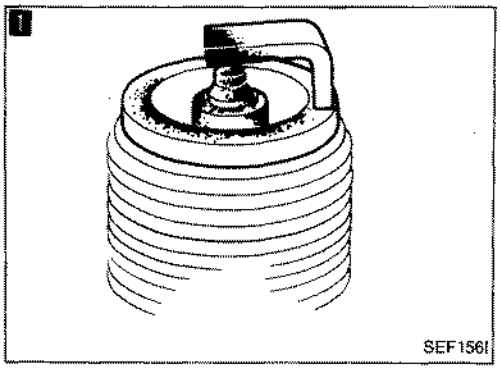
CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

INSPECTION END





Diagnostic Procedure 8 — Hesitation when the Engine is Cold

1

CHECK SPARK PLUGS.
Remove spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K. ↓

2

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

3

TRY A KNOWN GOOD AIR FLOW METER.

Trouble is fixed. → Replace air flow meter.

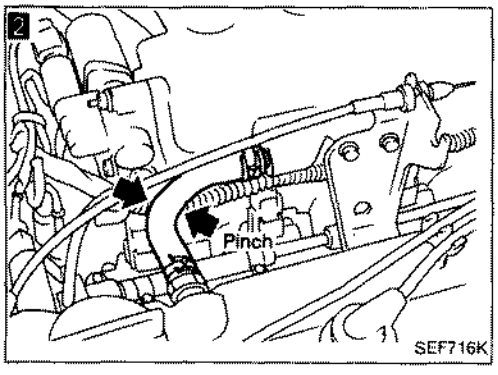
Trouble is not fixed. ↓

4

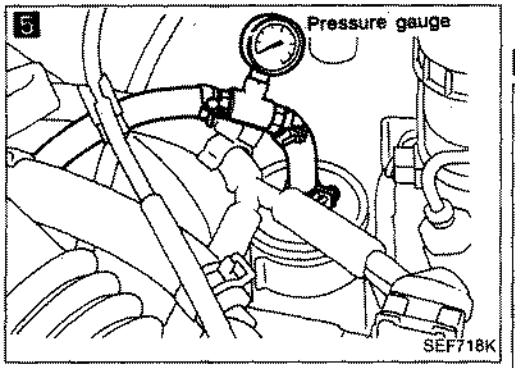
CHECK FOR INTAKE VALVE DEPOSITS.
If there are deposits on intake valves, remove them.

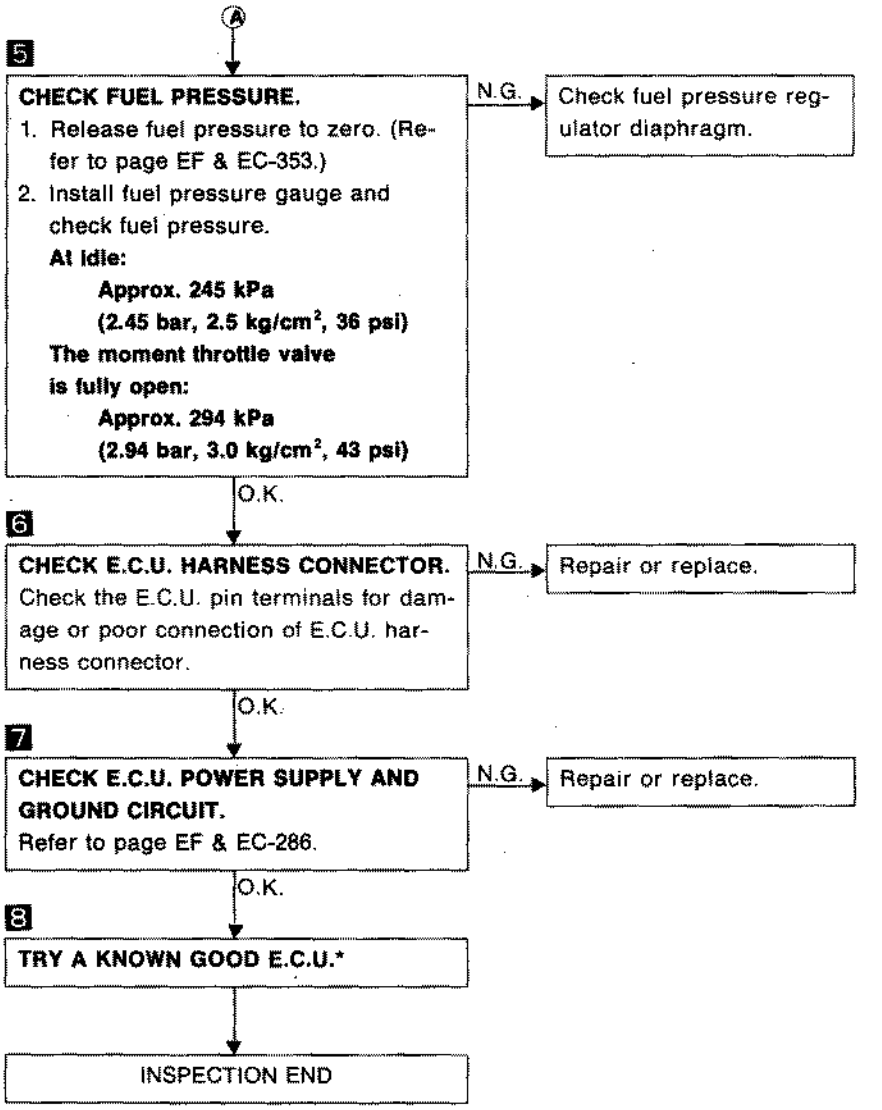
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INSPECTION END



Diagnostic Procedure 10 — Engine Stalls when Turning (Cont'd)

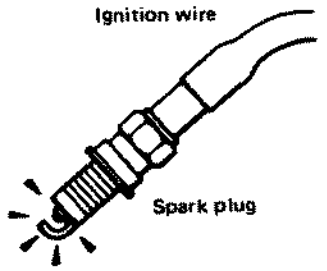




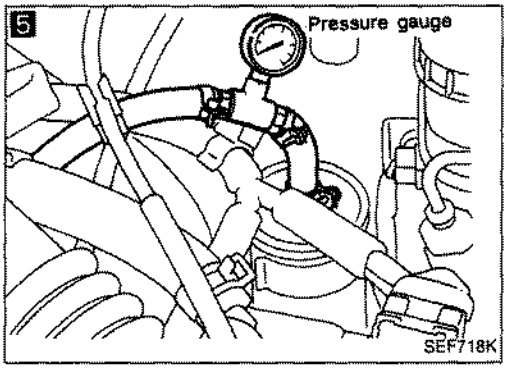
*: E.C.U. may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot (Cont'd)

4



5



Ⓐ

4 **CHECK IGNITION SPARK.**

1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-304.)

O.K. ↓

5 **CHECK FUEL PRESSURE.**

1. Release fuel pressure to zero. (Refer to page EF & EC-353.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm^2, 36 psi)
The moment throttle valve is fully open:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm^2, 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

6 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K. ↓

7 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-286.

N.G. → Repair or replace.

O.K. ↓

8 **TRY A KNOWN GOOD E.C.U.***

Trouble is fixed. → Replace E.C.U.

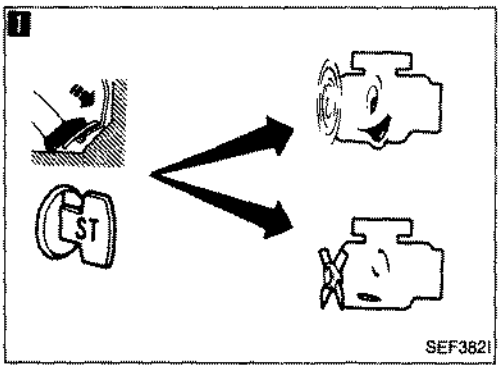
Trouble is not fixed. ↓

INSPECTION END

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

Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold

1



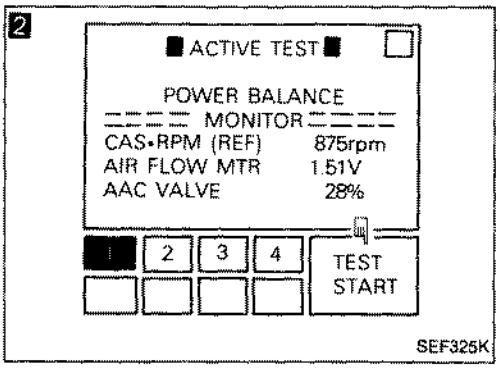
SEF382I

CHECK AIR REGULATOR AND A.A.C. VALVE.
When the engine is cold, can you start the engine when pressing accelerator pedal fully?

N.G. → Check A.A.C. valve, air regulator and circuits. (See pages EF & EC-324.)

O.K. ↓

2



SEF325K

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

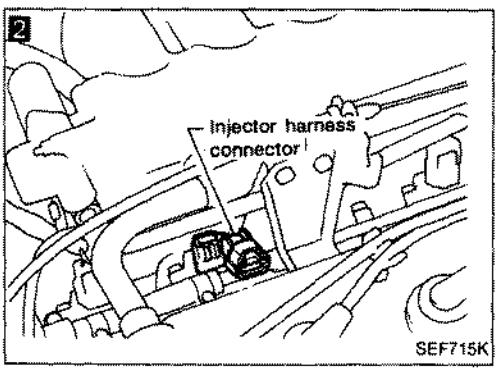
No → Go to 6.

— OR —

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes ↓

2



SEF715K

3

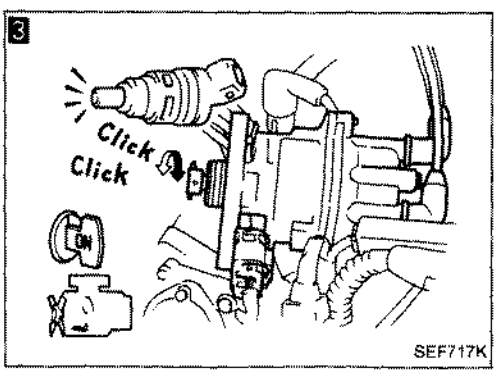
CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

N.G. → Check injector(s) and circuit(s).

O.K. ↓

3



SEF717K

4

CHECK IGNITION SPARK.

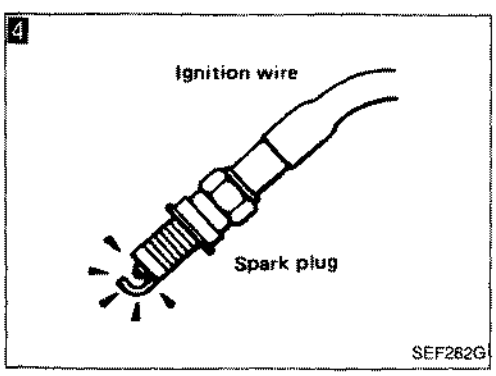
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-304.)

O.K. ↓

(Go to Ⓐ on next page.)

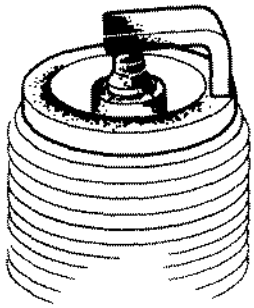
4



SEF262G

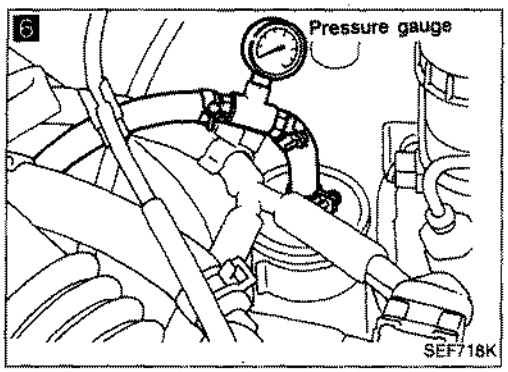
Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold (Cont'd

5



SEF156I

6



SEF718K

Ⓐ

5

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K.

6

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-353.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)
The moment throttle valve is fully open:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K.

7

CHECK E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K.

8

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-286.

N.G. → Repair or replace.

O.K.

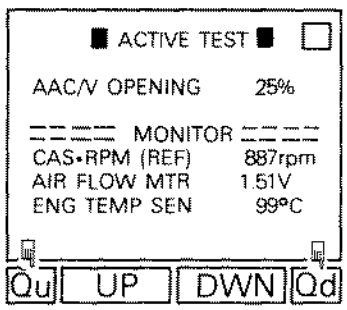
9

TRY A KNOWN GOOD E.C.U.*

INSPECTION END

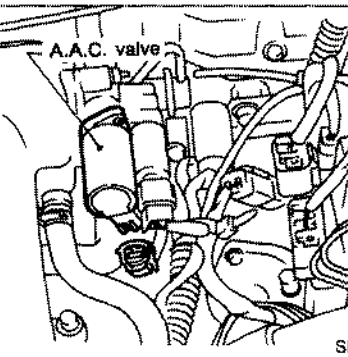
*: E.C.U. may be the cause of a problem, but this is rarely the case.

1



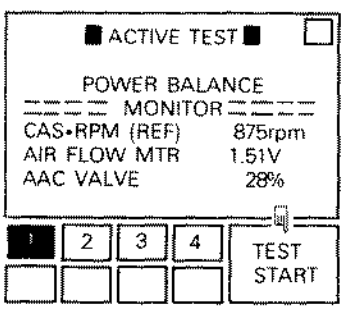
SEF328K

1



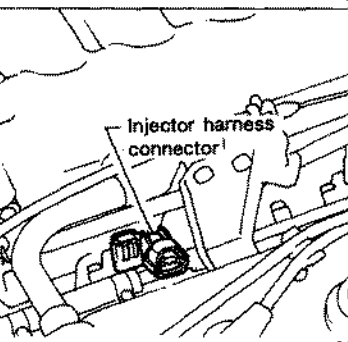
SEF753K

2



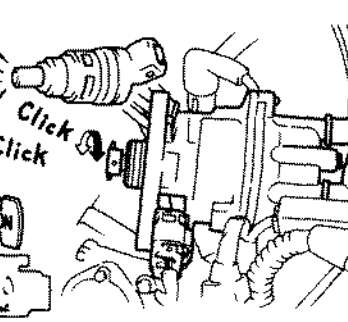
SEF325K

2



SEF715K

3



SEF717K

Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily

1

CHECK A.A.C. VALVE.

1. Select "A.A.C. VALVE OPENING" in "ACTIVE TEST" mode.
2. When touching "Qu" and "Qd", does the engine speed change according to the percent of A.A.C. valve opening?

No → Check A.A.C. valve and circuit. (See page EF & EC-324.)

OR

When disconnecting A.A.C. valve harness connector, does the engine speed drop?

Yes ↓

2

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to **5**.

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes ↓

3

CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

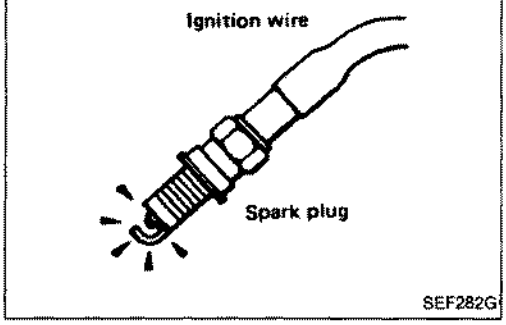
No → Check injector(s) and their circuit(s).

Yes ↓

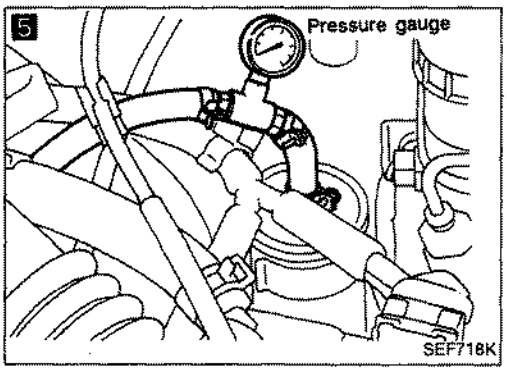
(Go to Ⓐ on next page.)

Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily (Cont'd)

4



5



Ⓐ

4

CHECK IGNITION SPARK.
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against an earth point with engine cranking.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-304.)

O.K. ↓

5

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-353.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)
The moment throttle valve is fully open:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

6

CHECK E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K. ↓

7

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-286.

N.G. → Repair or replace.

O.K. ↓

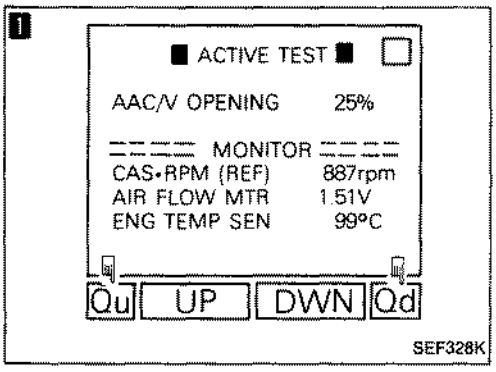
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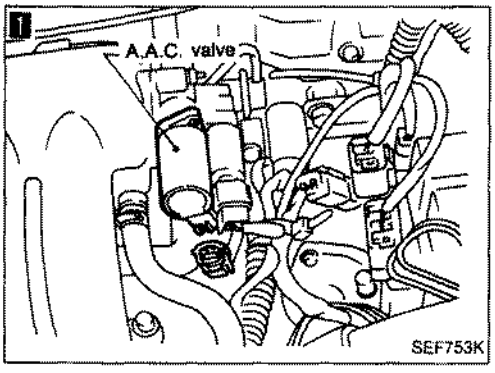
TRY A KNOWN GOOD E.C.U.*

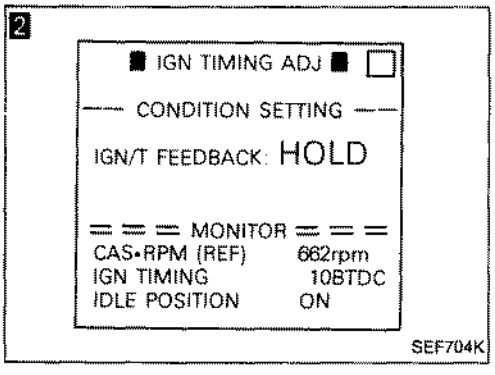
↓

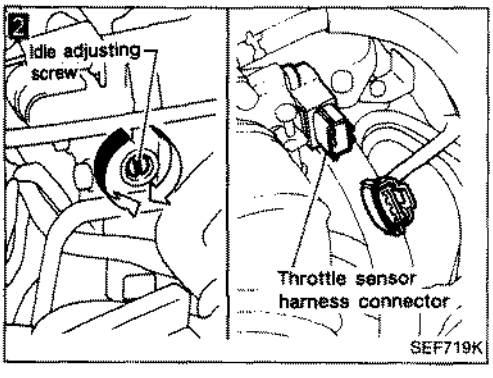
INSPECTION END

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









Diagnostic Procedure 14 — Engine Stalls after Decelerating

1

CHECK A.A.C. VALVE.

1. Select "A.A.C. VALVE OPENING" in "ACTIVE TEST" mode.
2. When touching "Qu" and "Qd", does the engine speed change according to the percent of A.A.C. valve opening?

No → Check A.A.C. valve and circuit. (See page EF & EC-324.)

OR

When disconnecting A.A.C. valve harness connector, does the engine speed drop?

Yes

2

CHECK IDLE ADJ. SCREW CLOGGING.

1. Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. Can you set engine rpm at 675±50 rpm (M/T), 725±50 rpm (A/T) (in "N" position) by turning idle adjusting screw?

No → Check for IAS clogging or throttle chamber clogging.

OR

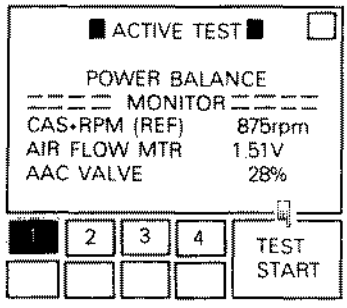
1. Disconnect throttle sensor harness connector.
2. Can you set engine rpm at 675±50 rpm (M/T), 725±50 rpm (A/T) (in "N" position) by turning idle adjusting screw?

Yes

(Go to Ⓐ on next page.)

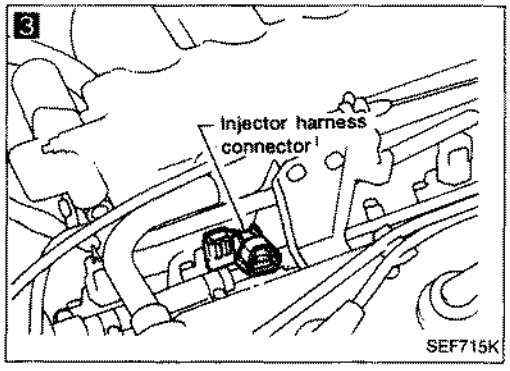
Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

3



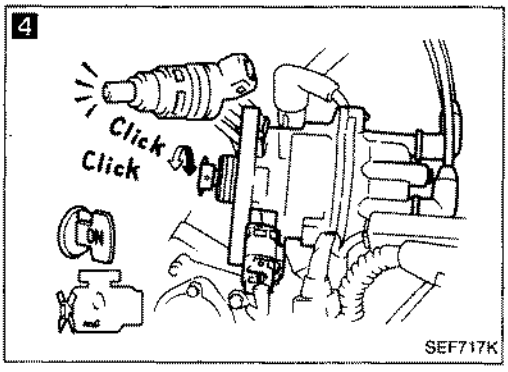
SEF325K

3



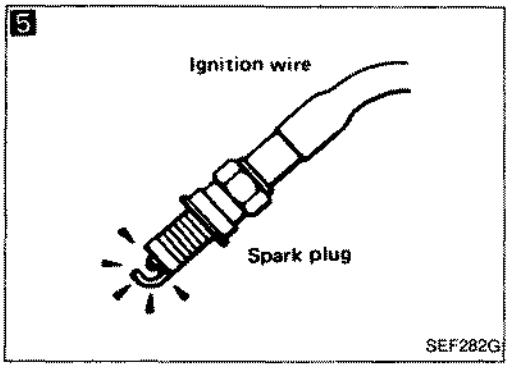
SEF715K

4



SEF717K

5



SEF282G

Ⓐ

3 **PERFORM POWER BALANCE TEST.**

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

— OR —

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to **6**.

Yes ↓

4 **CHECK INJECTOR.**

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

5 **CHECK IGNITION SPARK.**

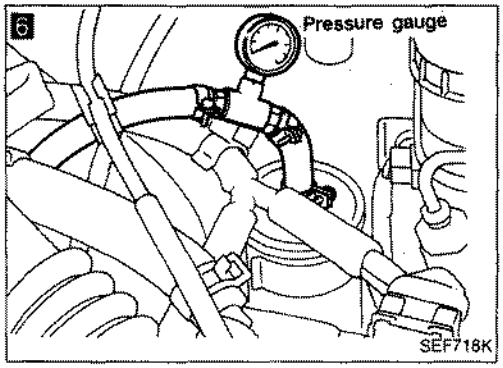
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

No → Check ignition coil, power transistor unit and circuits. (See page EF & EC-304.)

Yes ↓

(Go to Ⓑ on next page.)

Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)



Ⓑ

6

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero. (Refer to page EF & EC-353.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)

The moment throttle valve is fully open:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K.

7

CHECK E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K.

8

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-286.

N.G. → Repair or replace.

O.K.

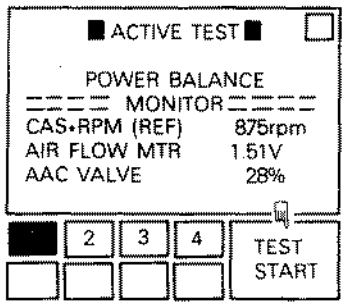
9

TRY A KNOWN GOOD E.C.U.*

INSPECTION END

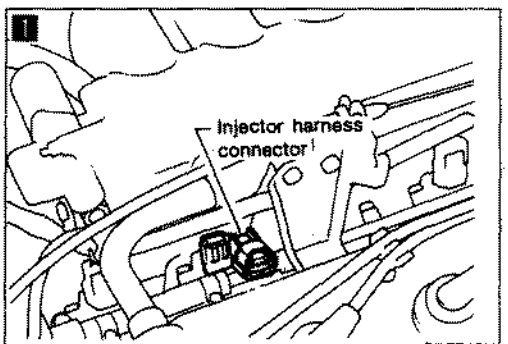
*: E.C.U. may be the cause of a problem, but this is rarely the case.

1



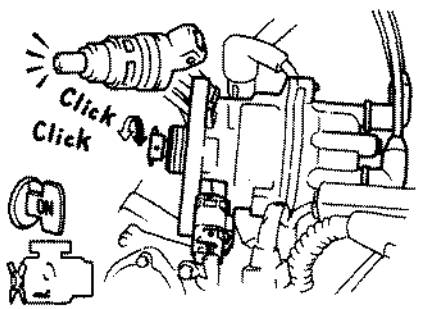
SEF325K

1



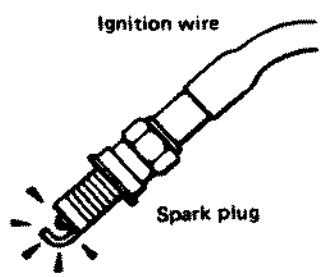
SEF715K

2



SEF717K

3



SEF282G

Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed

1

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 4.

— OR —

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes ↓

2

CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

3

CHECK IGNITION SPARK.

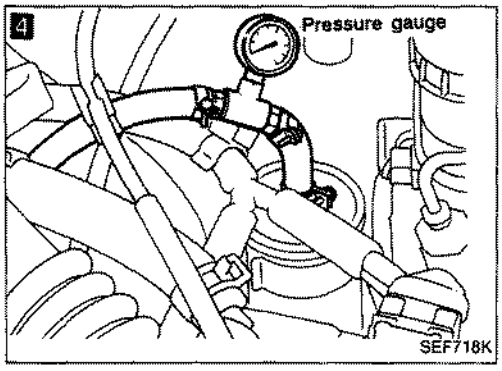
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

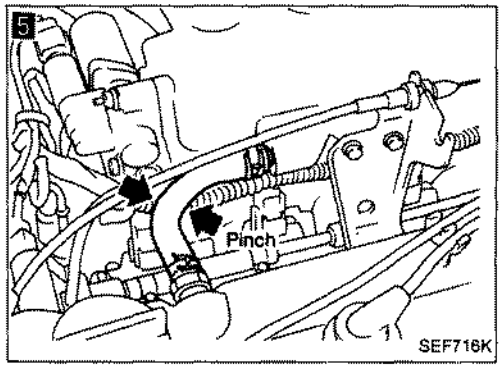
No → Check ignition coil, power transistor unit and circuits. (See page EF & EC-304.)

Yes ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed (Cont'd)





Ⓐ

4

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-353.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)
The moment throttle valve is fully open:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pump, circuit and fuel pressure regulator.

O.K.

5

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No

6

CHECK E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K.

7

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-286.

Yes → Repair or replace.

No

8

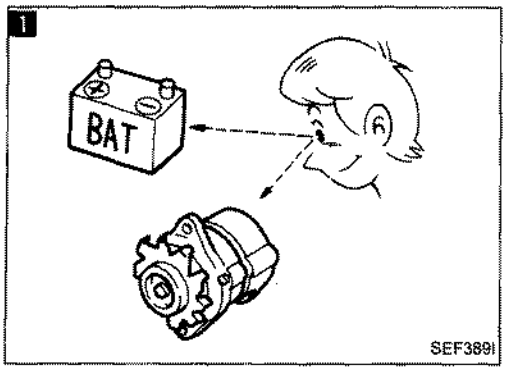
TRY A KNOWN GOOD E.C.U.*

INSPECTION END

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

Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy

1



SEF389I

CHECK BATTERY AND ALTERNATOR.
Check battery and alternator condition. (Refer to EL section.)

N.G. → Repair or replace.

O.K. ↓

2

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

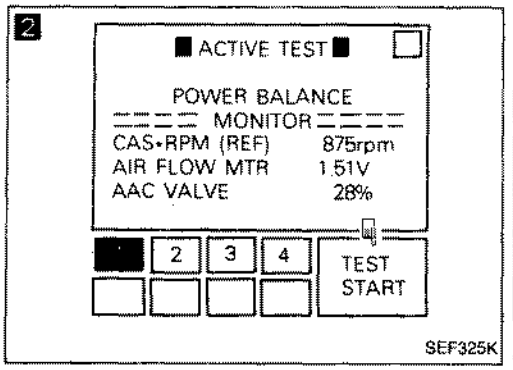
No → Go to 5.

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes ↓

2



SEF325K

3

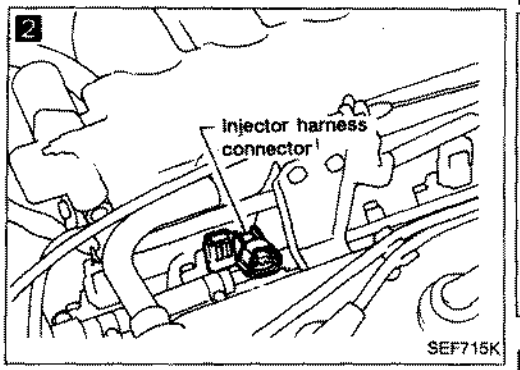
CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

2



SEF715K

4

CHECK IGNITION SPARK.

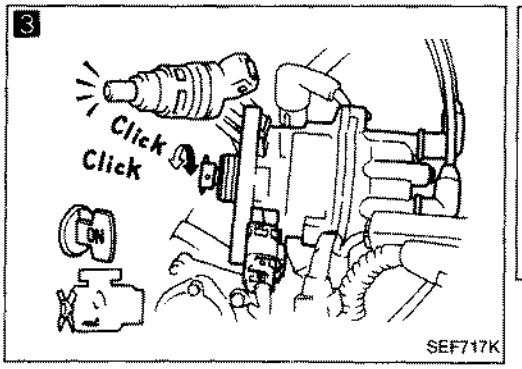
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-304.)

O.K. ↓

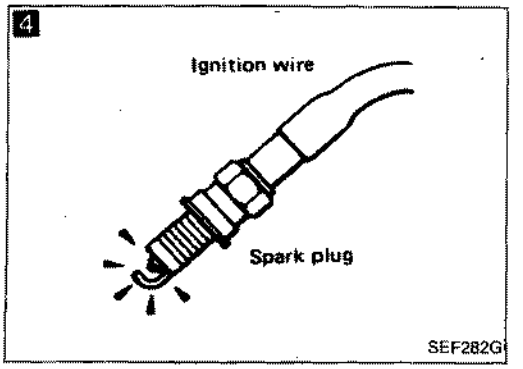
(Go to Ⓐ on next page.)

3



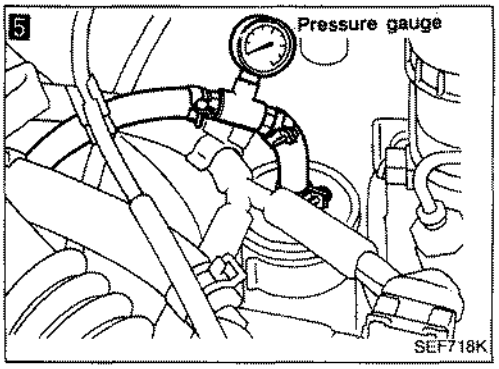
SEF717K

4



SEF282G

Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy (Cont'd)



Ⓐ

5

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-353.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)
The moment throttle valve is fully open:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

6

CHECK E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K. ↓

7

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-286.

N.G. → Repair or replace.

O.K. ↓

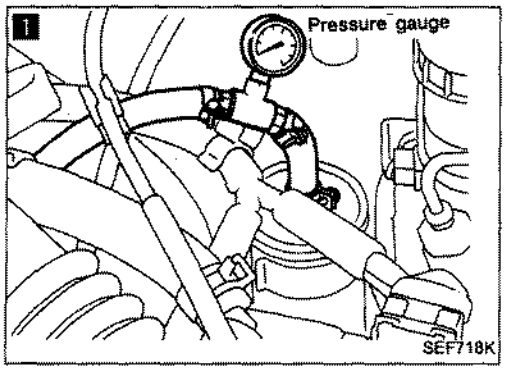
8

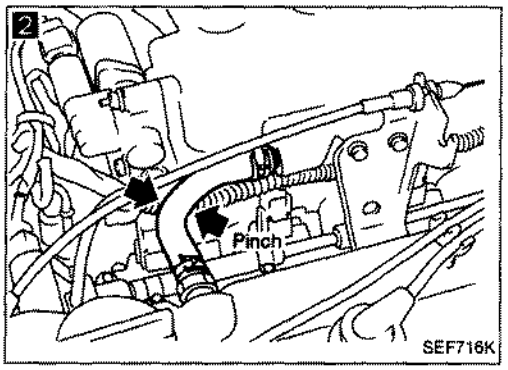
TRY A KNOWN GOOD E.C.U.*

↓

INSPECTION END

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





Diagnostic Procedure 17 — Lack of Power and Stumble

1

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-353.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)
The moment throttle valve is fully open:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

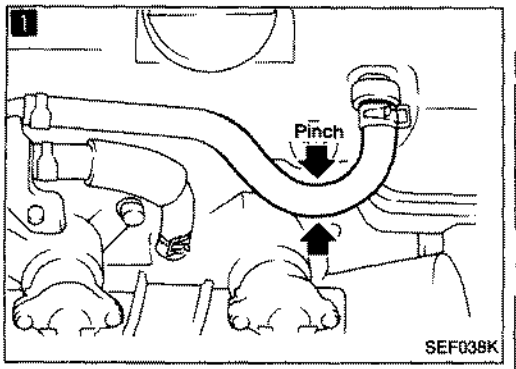
2

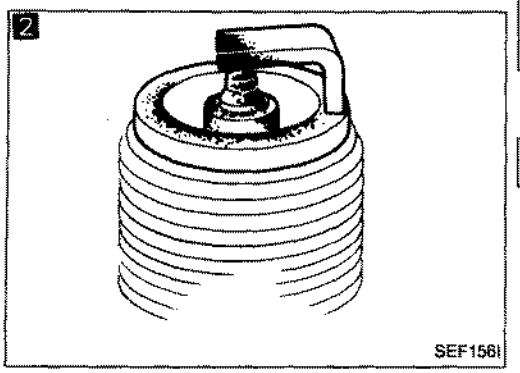
CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

INSPECTION END





Diagnostic Procedure 18 — Detonation

1

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine rpm rise?

Yes → Discover air leak location and repair.

No ↓

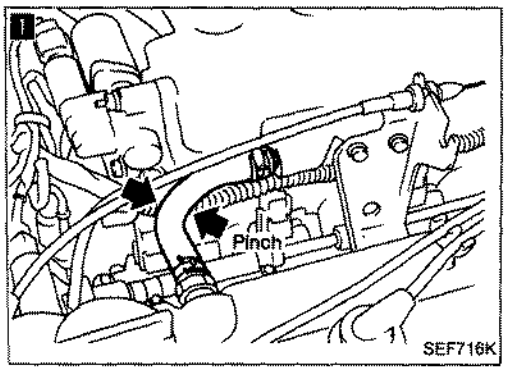
2

CHECK FOR OIL LEAK TO COMBUSTION CHAMBER.
Remove spark plugs and check for fouling with oil.

Yes → Check pistons, piston rings, valves, valve seats, valve oil seal, engine oil level, etc.

No ↓

INSPECTION END



Diagnostic Procedure 19 — Surge

1

CHECK INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

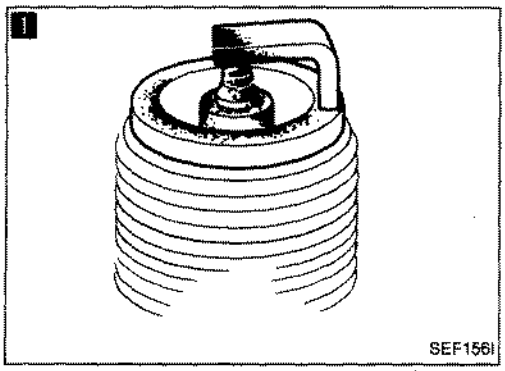
2

TRY A KNOWN GOOD E.C.U.*

↓

INSPECTION END

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



Diagnostic Procedure 20 — Backfire through the Intake

1

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K. ↓

2

CHECK INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

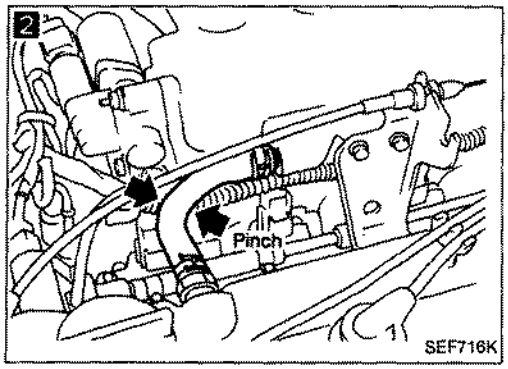
No ↓

3

CHECK FOR INTAKE VALVE DEPOSITS.
If there are deposits on intake valves, remove them.

↓

INSPECTION END



Diagnostic Procedure 21 — Backfire through the Exhaust

1

CHECK ENGINE TEMPERATURE SENSOR.
Check engine temperature sensor and its circuit. (See page EF & EC-298.)

N.G. → Replace or repair.

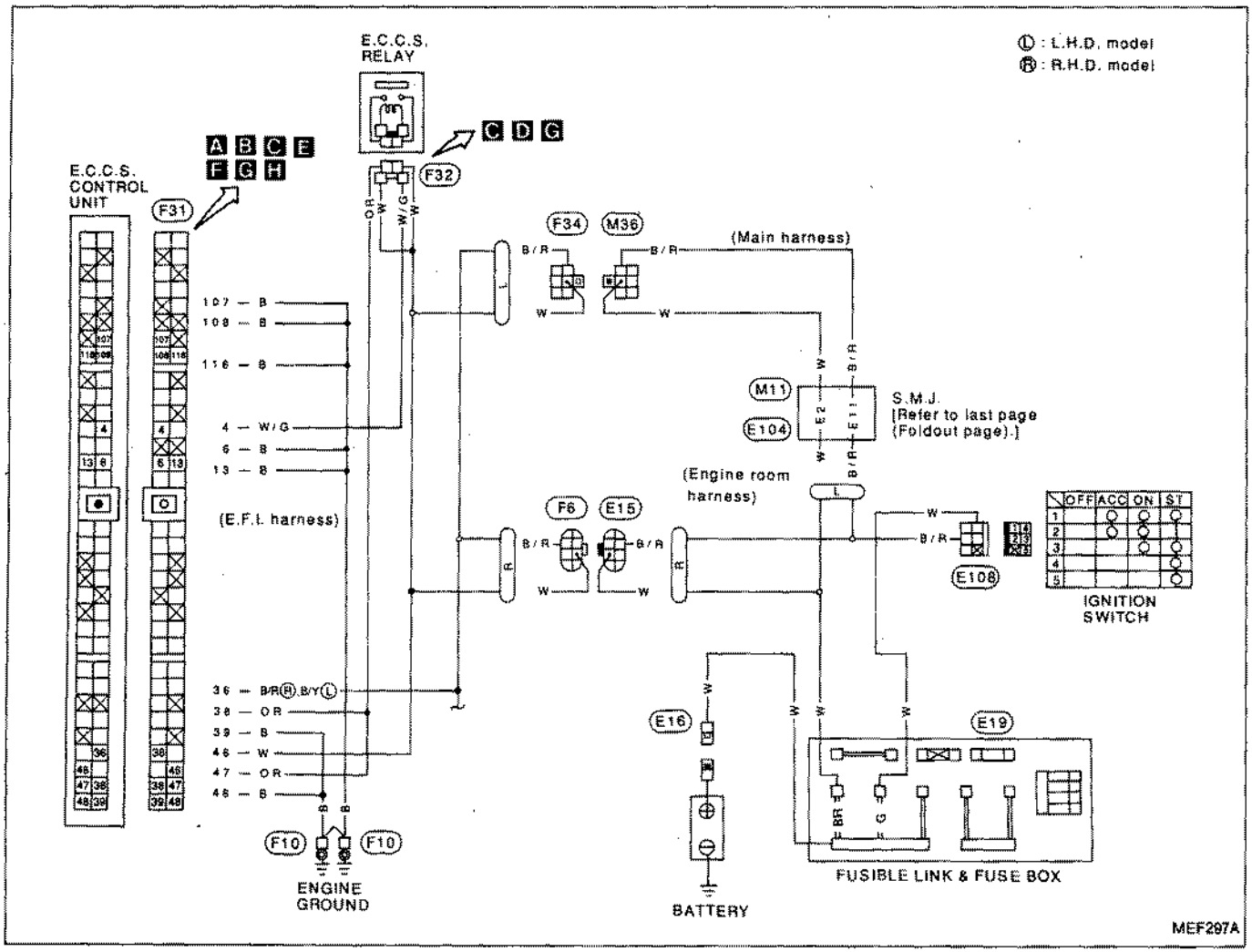
O.K. ↓

INSPECTION END

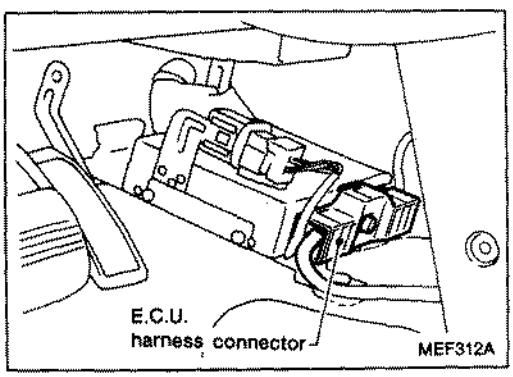
NOTE

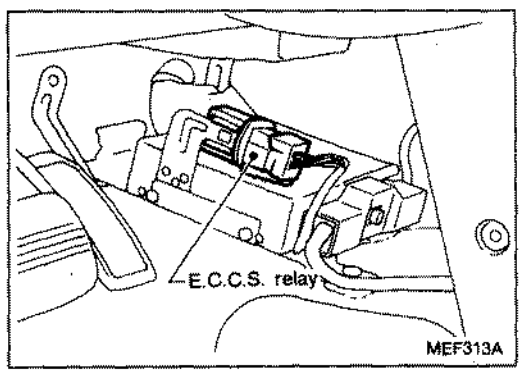
Diagnostic Procedure 22

MAIN POWER SUPPLY AND GROUND CIRCUIT (Not self-diagnostic item)



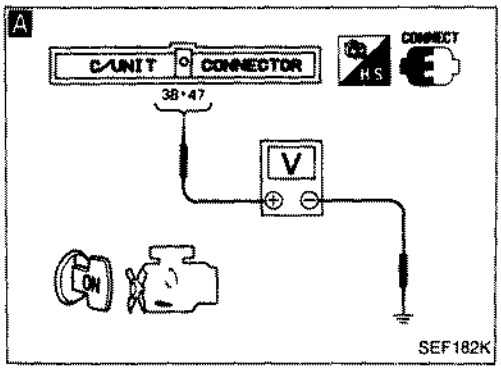
Harness layout





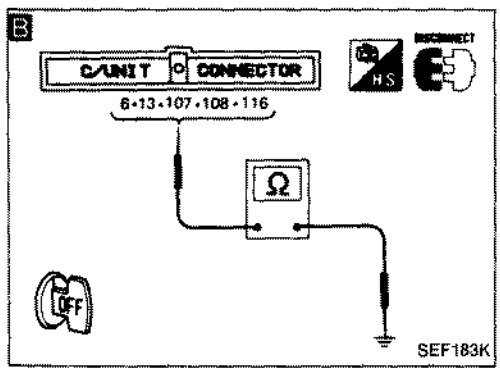
Diagnostic Procedure 22 (Cont'd)

A



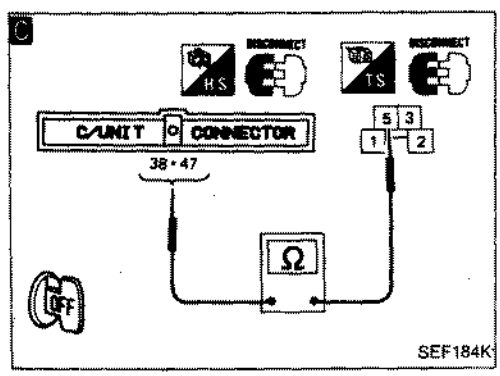
SEF182K

B



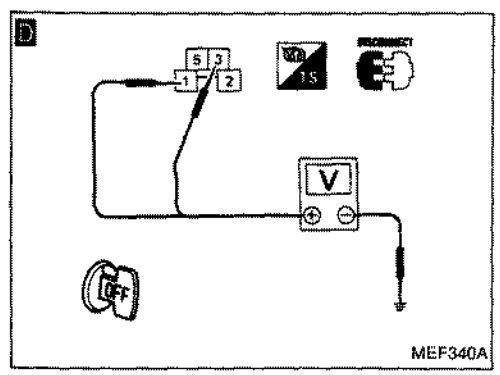
SEF183K

C



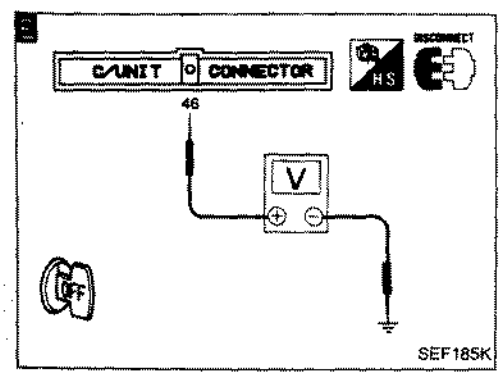
SEF184K

D



MEF340A

E



SEF185K

INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminals (38), (47) and ground.
Voltage: Battery voltage

O.K. → B

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminals (6), (13), (107), (108), (116) and engine ground.
Continuity should exist.
If N.G., repair harness or connectors.

O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

N.G. ↓

C

CHECK HARNESS CONTINUITY BETWEEN E.C.C.S. RELAY AND E.C.U.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Disconnect E.C.C.S. relay.
4) Check harness continuity between E.C.U. terminals (38), (47) and terminal (5).
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

D

CHECK VOLTAGE BETWEEN E.C.C.S. RELAY AND GROUND.
1) Check voltage between terminals (1), (3) and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M11), (E104) (L.H.D. models)
- Harness connectors (F34), (M36) (L.H.D. models)
- Harness connectors (F6), (E15) (R.H.D. models)
- "BR" fusible link
- Harness continuity between E.C.C.S. relay and battery

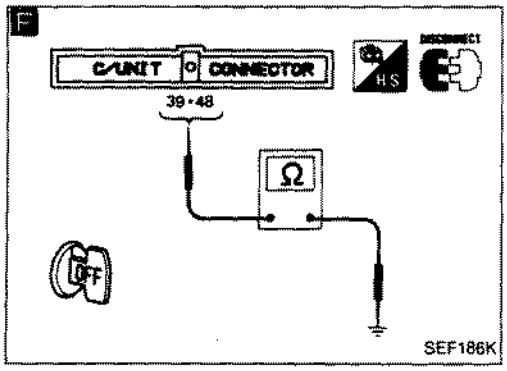
If N.G., repair harness or connectors.

O.K. ↓

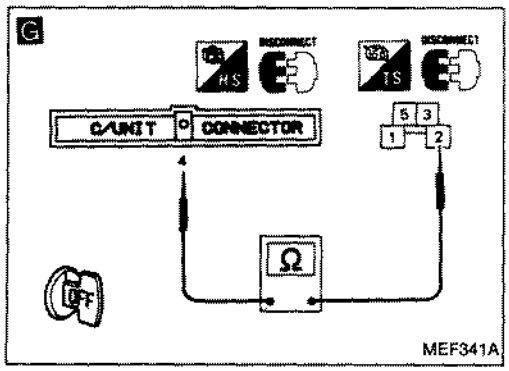
(A)

Diagnostic Procedure 22 (Cont'd)

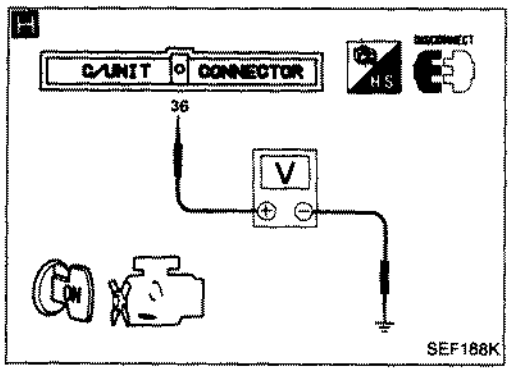
F



G



H



E

(A)

CHECK VOLTAGE BETWEEN E.C.U. AND GROUND.
1) Check voltage between E.C.U. terminal (46) and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F34), (M36) (L.H.D. models)
- Harness connectors (M11), (E104) (L.H.D. models)
- Harness connectors (F6), (E15) (R.H.D. models)
- "BR" fusible link
- Harness continuity between E.C.U. and battery

If N.G., repair harness or connectors.

O.K. ↓

F

CHECK GROUND CIRCUIT.
1) Check harness continuity between E.C.U. terminals (39), (48) and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

G

CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between E.C.U. terminal (4) and terminal (2).
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

H

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminal (36) and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F34), (M36) (L.H.D. models)
- Harness connectors (M11), (E104) (L.H.D. models)
- Harness connectors (F6), (E15) (R.H.D. models)
- Harness continuity between E.C.U. and ignition switch

If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT (E.C.C.S. relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-351.)

N.G. → Replace E.C.C.S. relay.

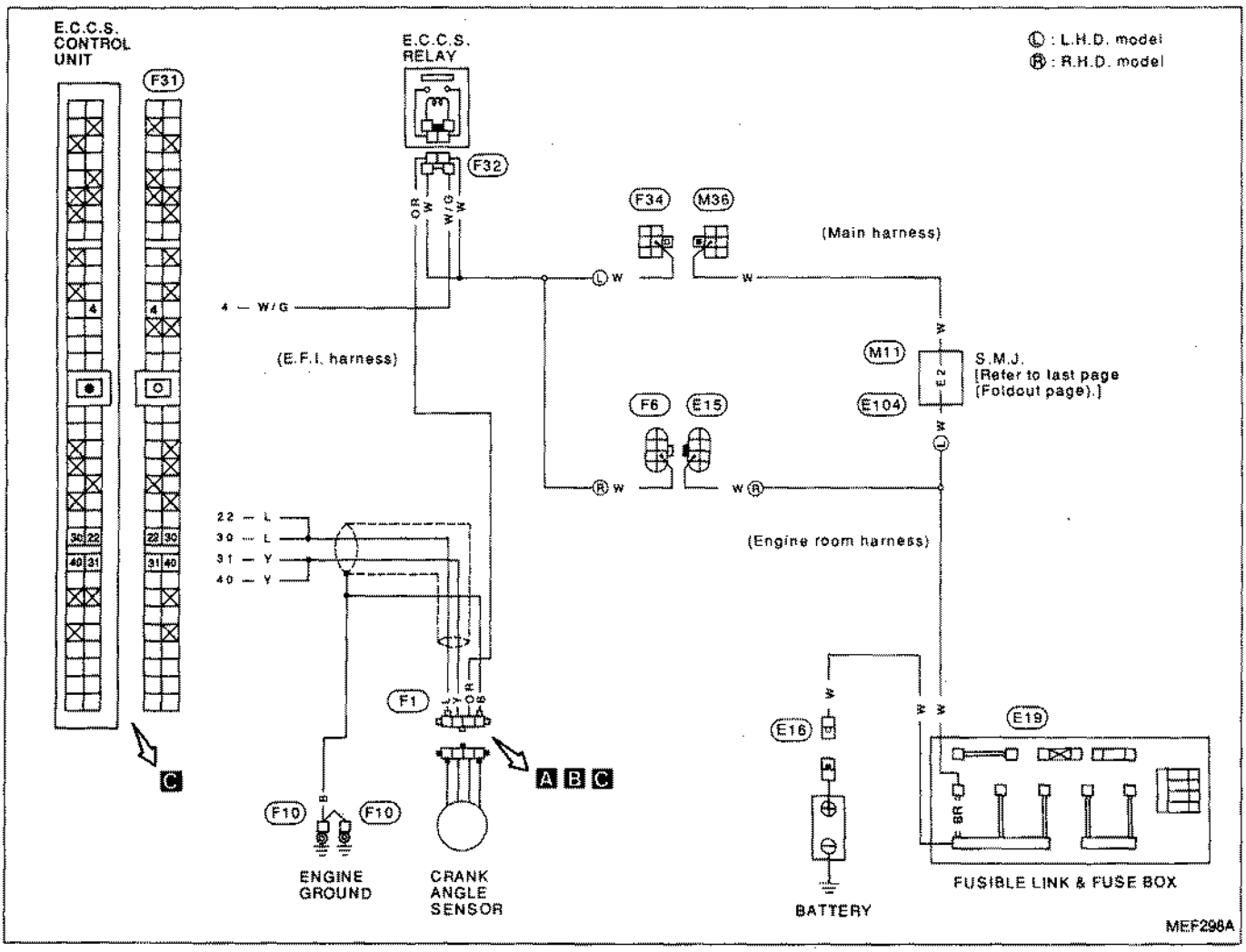
O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

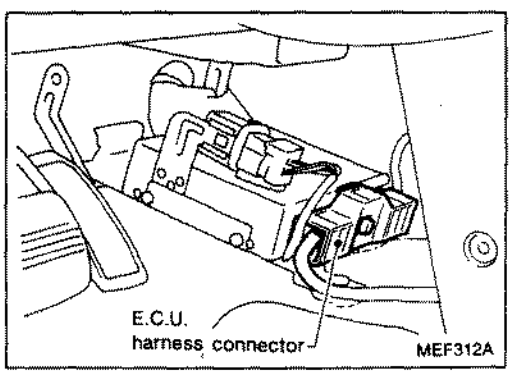
NOTE

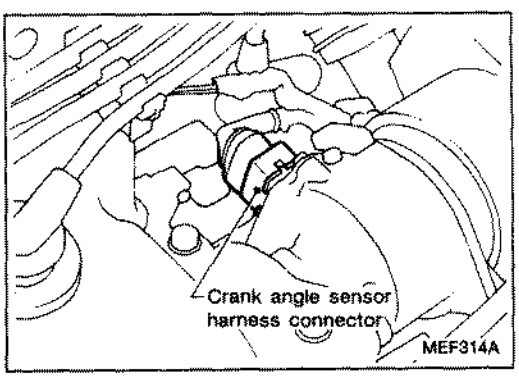
Diagnostic Procedure 23

CRANK ANGLE SENSOR (Code No. 11)



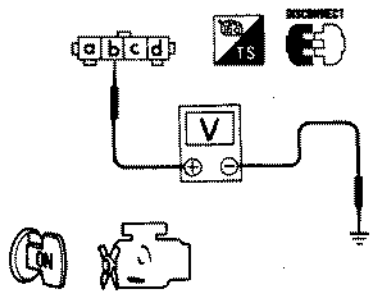
Harness layout





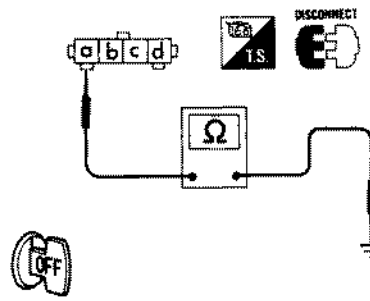
Diagnostic Procedure 23 (Cont'd)

A



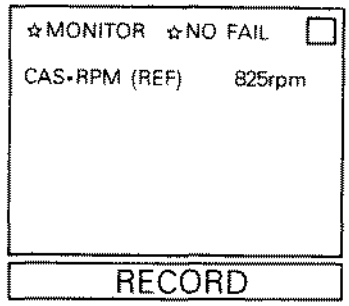
MEF342A

B



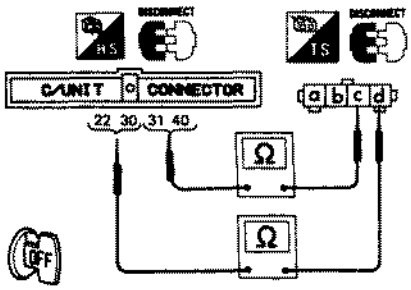
MEF343A

C



SEF135K

C



MEF344A

INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect crank angle sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

N.G. → Repair harness or connectors.

O.K.

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

C

CHECK INPUT SIGNAL CIRCUIT.
1) Reconnect crank angle sensor harness connector.
2) Start engine.
3) Read crank angle sensor signals in "DATA MONITOR" mode with CONSULT.
rpm: M/T: 750 ± 50
A/T: 800 ± 50

N.G. → Repair harness or connectors.

OR

1) Disconnect E.C.U. harness connector.
2) Check harness continuity between terminal ⓒ and E.C.U. terminals ㉛, ㊵ (1° signal), terminal ⓓ and E.C.U. terminals ㉒, ㉚ (180° signal).
Continuity should exist.

O.K.

CHECK COMPONENT (Crank angle sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-347.)

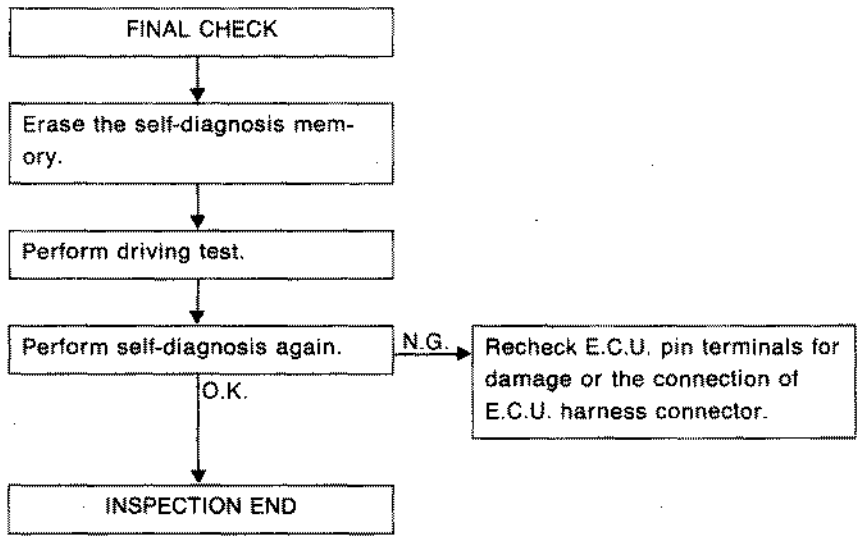
N.G. → Replace crank angle sensor.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 23 (Cont'd)

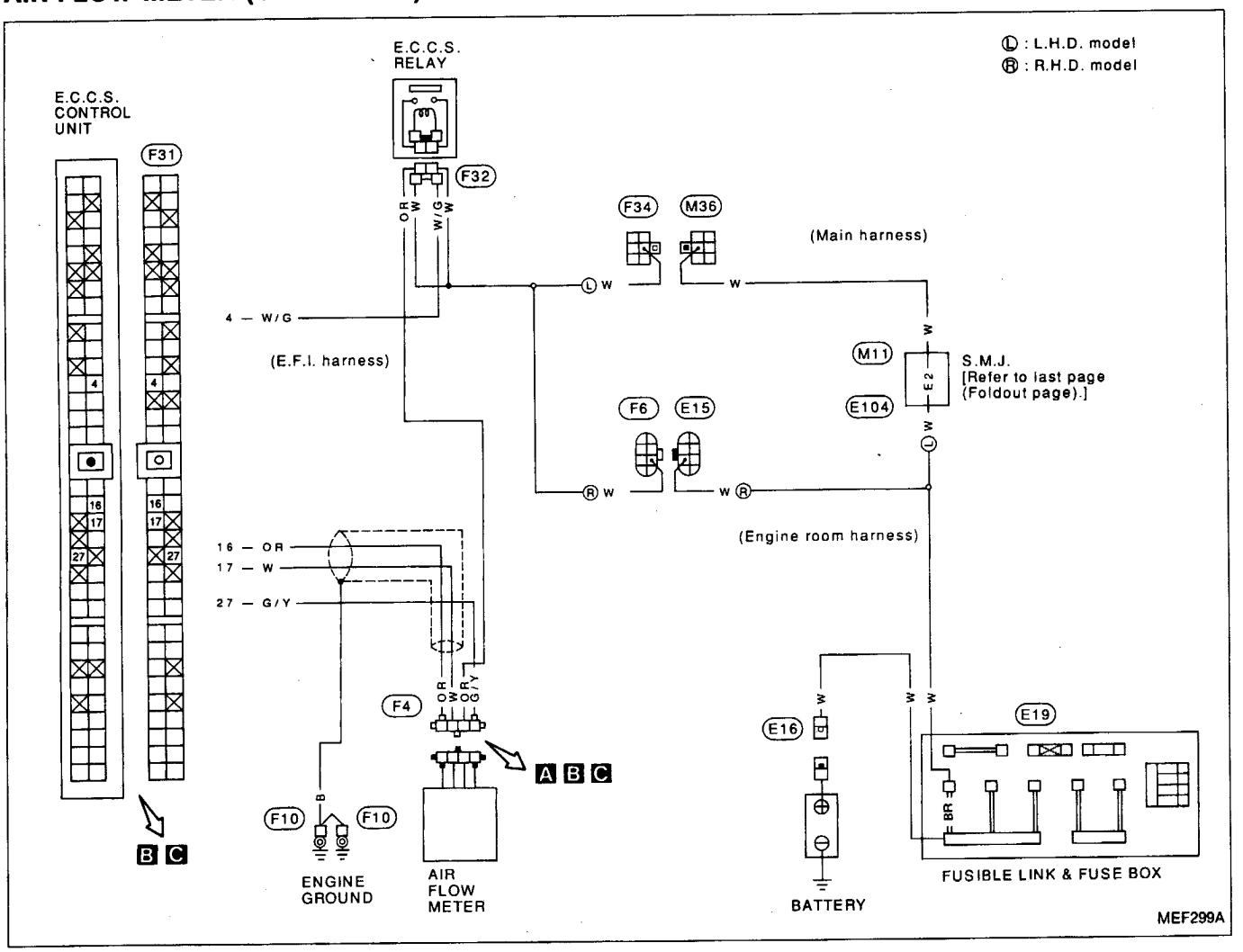
Perform FINAL CHECK by the following procedure after repair is completed.



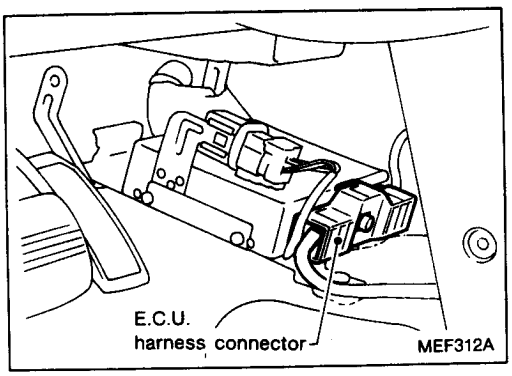
NOTE

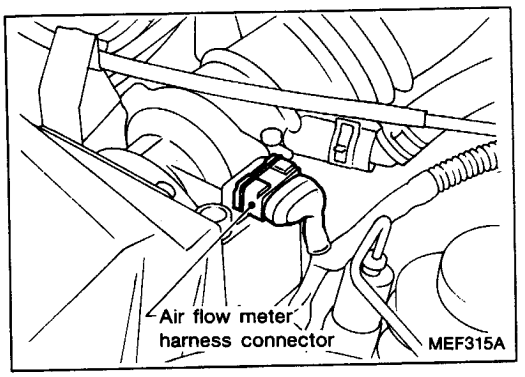
Diagnostic Procedure 24

AIR FLOW METER (Code No. 12)



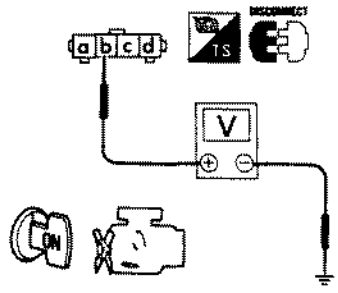
Harness layout





Diagnostic Procedure 24 (Cont'd)

A



MEF345A

INSPECTION START

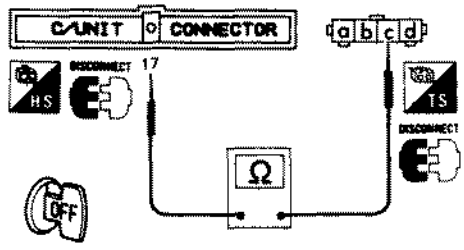
A

CHECK POWER SUPPLY.
1) Disconnect air flow meter harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

N.G. → Repair harness or connectors.

O.K. ↓

B



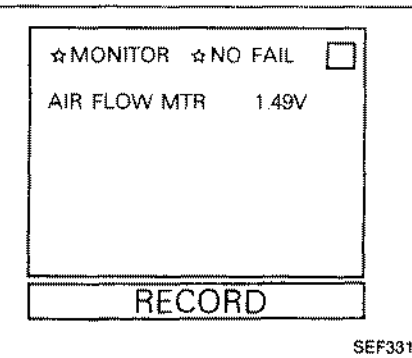
MEF346A

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between terminal ⓒ and E.C.U. terminal ⑰.
Continuity should exist.

N.G. → Repair harness or connectors.

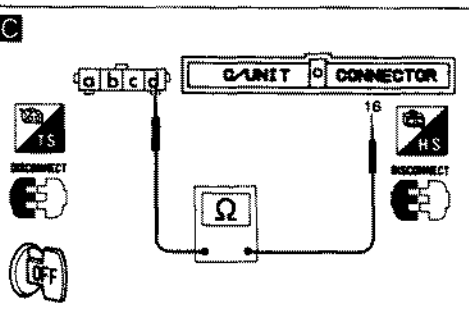
O.K. ↓

C



SEF331K

C



MEF347A

CHECK INPUT SIGNAL CIRCUIT.

1) Reconnect air flow meter harness connector and E.C.U. harness connector.
2) Start engine and warm it up sufficiently.
3) Read air flow meter signal in "DATA MONITOR" mode with CONSULT.
Voltage: 0.8 - 1.5V
(At idle)

N.G. → Repair harness or connectors.

— OR —

1) Check harness continuity between terminal ⓓ and E.C.U. terminal ⑯.
Continuity should exist.

O.K. ↓

CHECK COMPONENT
(Air flow meter).
Refer to "Electrical Components Inspection".
(See page EF & EC-347.)

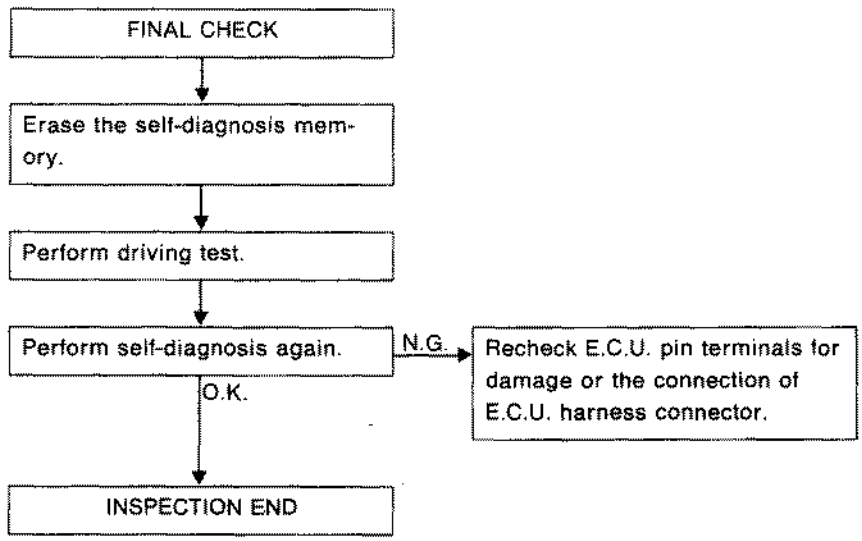
N.G. → Replace air flow meter.

O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 24 (Cont'd)

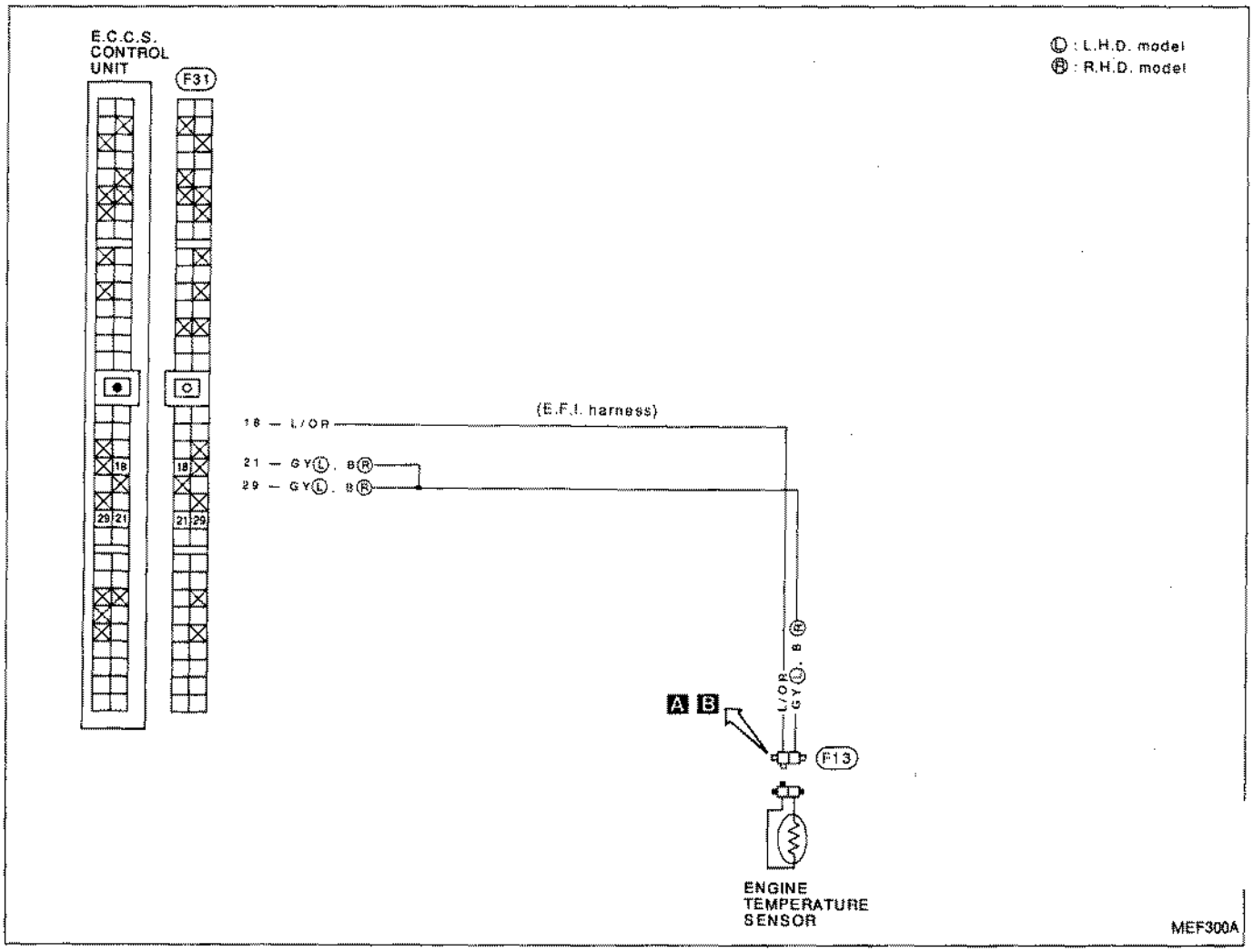
Perform FINAL CHECK by the following procedure after repair is completed.



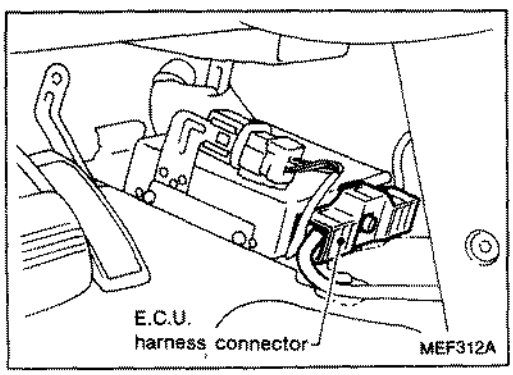
NOTE

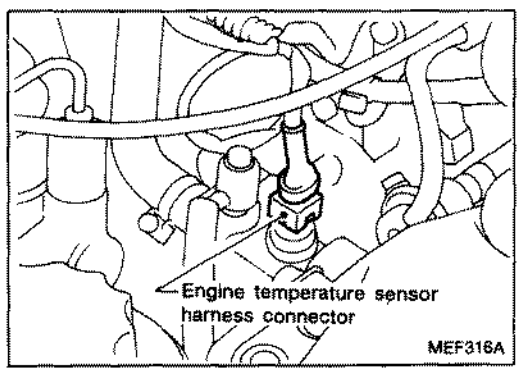
Diagnostic Procedure 25

ENGINE TEMPERATURE SENSOR (Code No. 13)

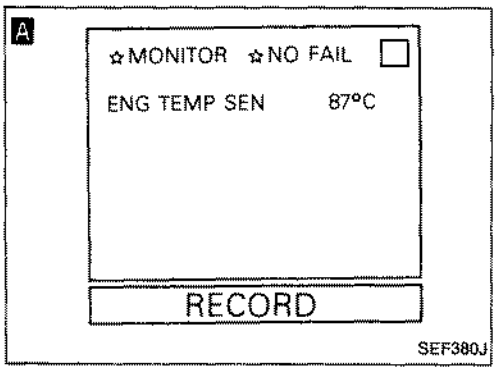


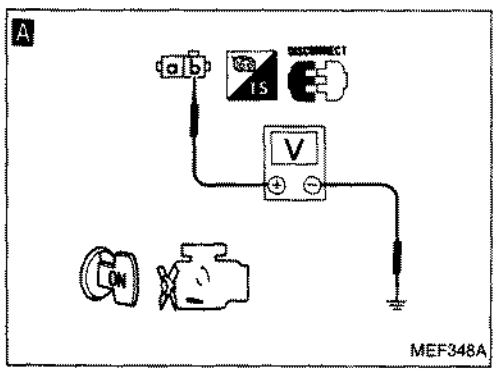
Harness layout

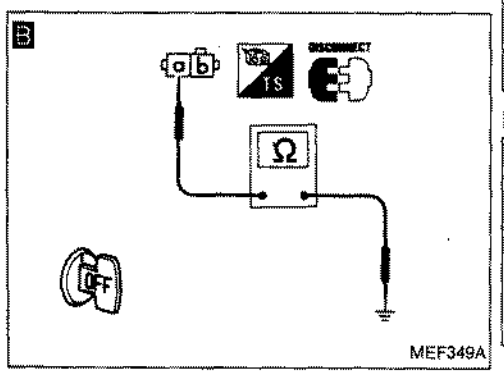




Diagnostic Procedure 25 (Cont'd)







INSPECTION START

A

CHECK POWER SUPPLY.

1) Start engine.
2) Read engine temperature sensor signal in "DATA MONITOR" mode with CONSULT.
Engine temperature should gradually rise and reach more than 70°C (158°F) after engine warm-up.

N.G. → Repair harness or connectors.

OR

1) Disconnect engine temperature sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Approximately 5V

O.K.

B

CHECK GROUND CIRCUIT.

1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT (Engine temperature sensor). Refer to "Electrical Components Inspection". (See page EF & EC-348.)

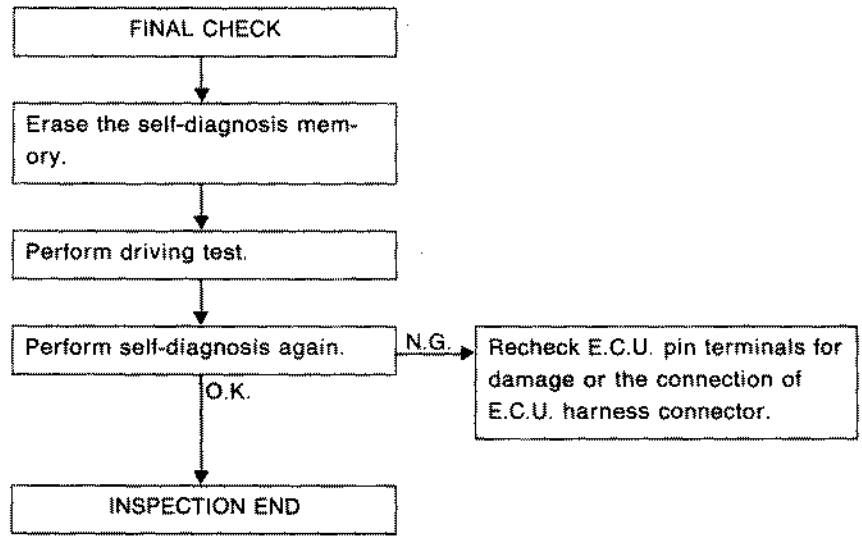
N.G. → Replace engine temperature sensor.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 25 (Cont'd)

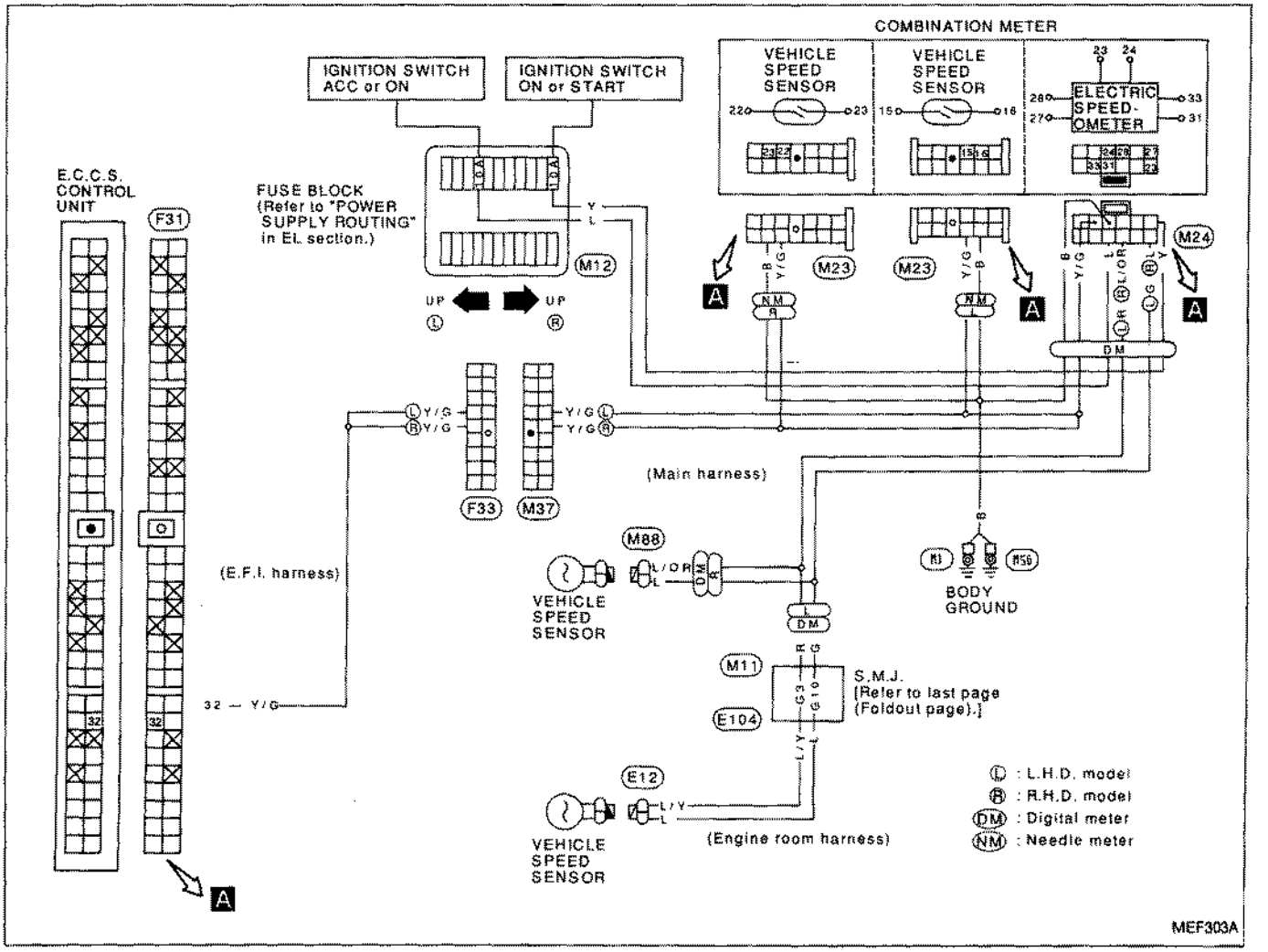
Perform FINAL CHECK by the following procedure after repair is completed.



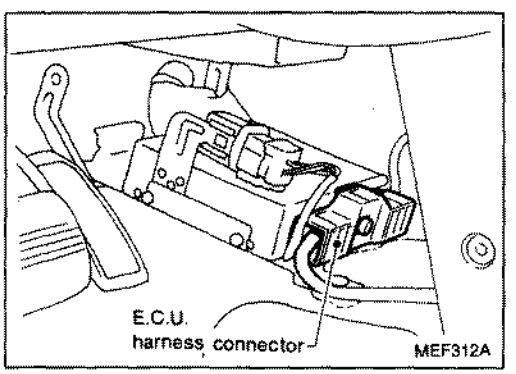
NOTE

Diagnostic Procedure 26

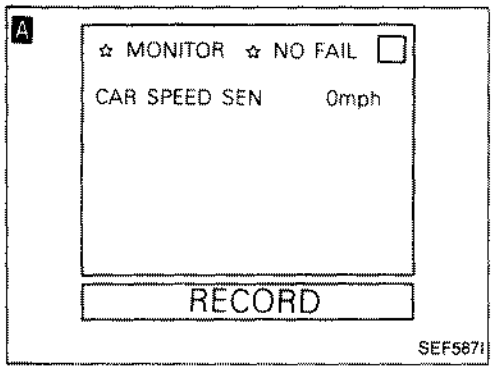
VEHICLE SPEED SENSOR (Code No. 14)

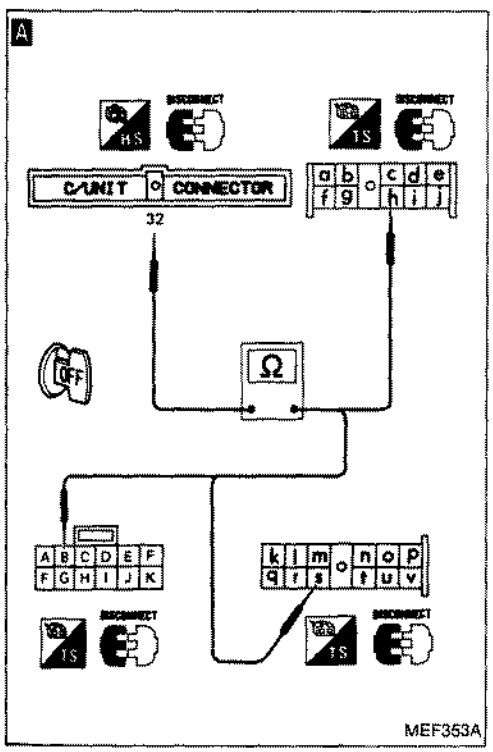


Harness layout



Diagnostic Procedure 26 (Cont'd)





INSPECTION START

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

N.G. → Check vehicle speed sensor and circuit.
(Refer to EL section.)

O.K.

A

CHECK INPUT SIGNAL CIRCUIT.

1) Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT. **CONSULT value should be the same as the speedometer indication.**

N.G. → Check the following.
- Harness connectors (F33), (M37)
- Harness continuity between E.C.U. and combination meter

If N.G., repair harness or connectors.

OR

1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector and combination meter harness connector.
3) Check harness continuity between E.C.U. terminal (32) and terminal (h) (L.H.D. models with needle meter), (s) (R.H.D. models with needle meter), (B) (Digital meter model). **Continuity should exist.**

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

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

FINAL CHECK

Start engine.

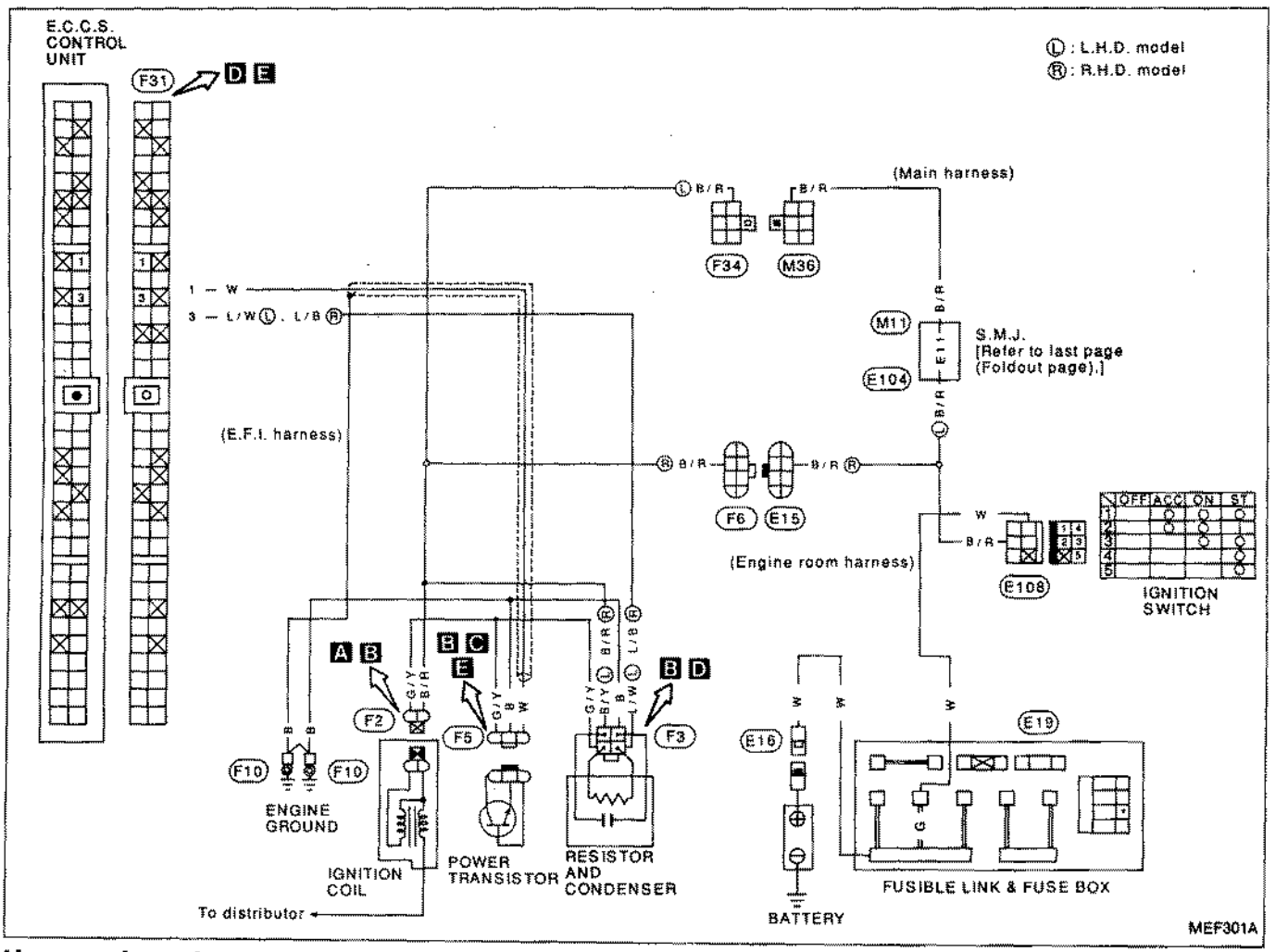
Perform self-diagnosis (Mode II). N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K.

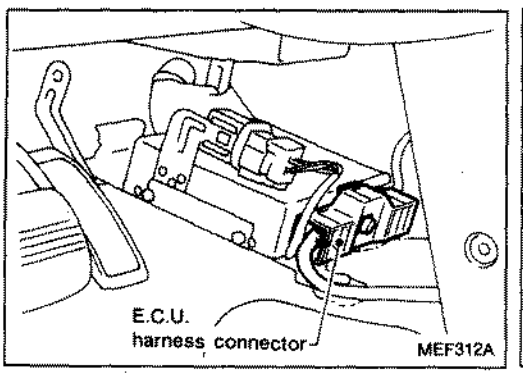
INSPECTION END

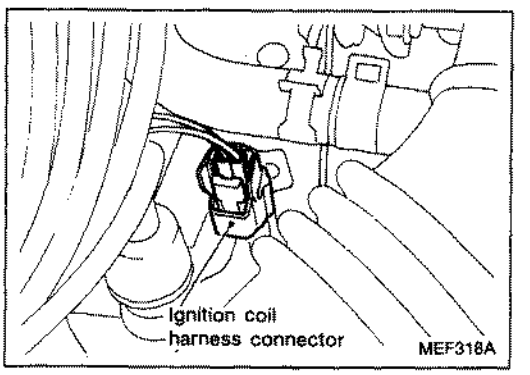
Diagnostic Procedure 27

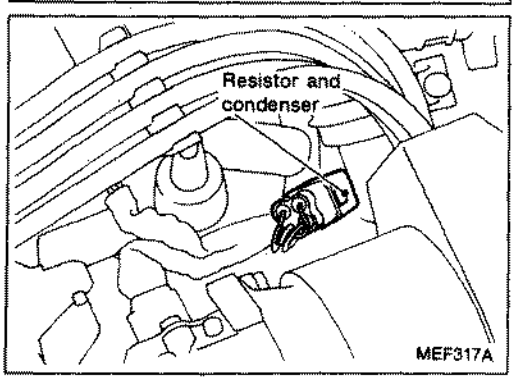
IGNITION SIGNAL (Code No. 21)

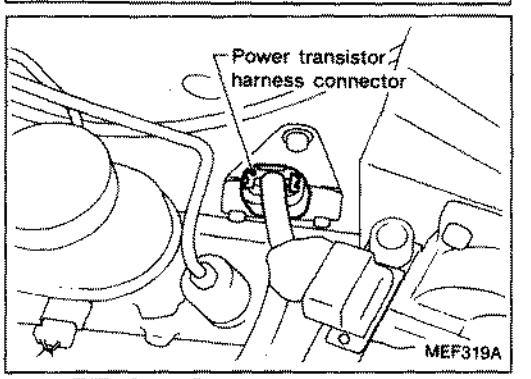


Harness layout

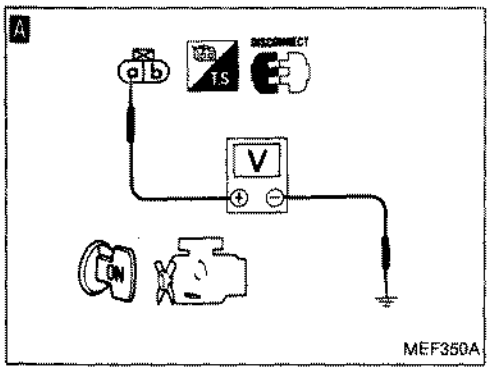


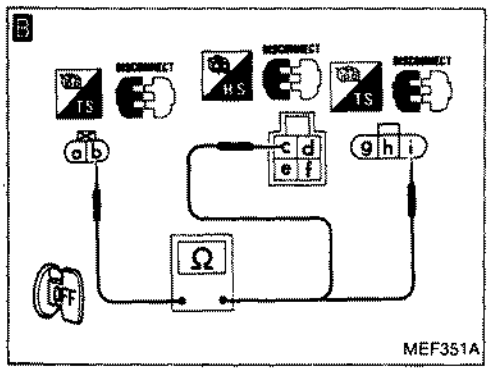


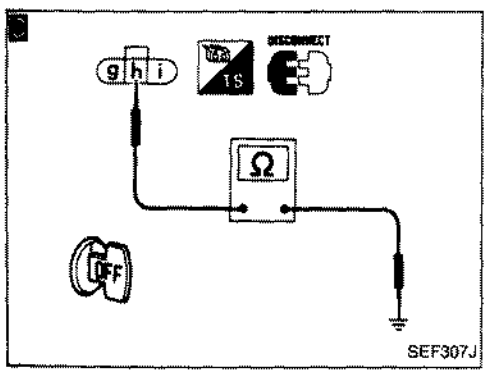


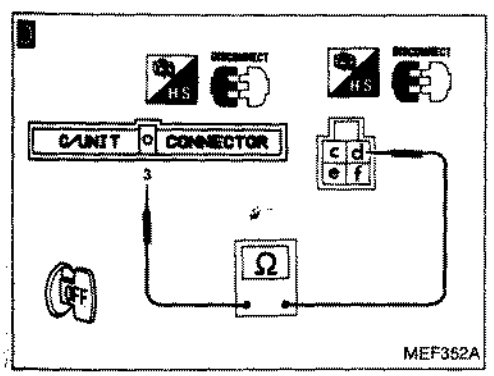


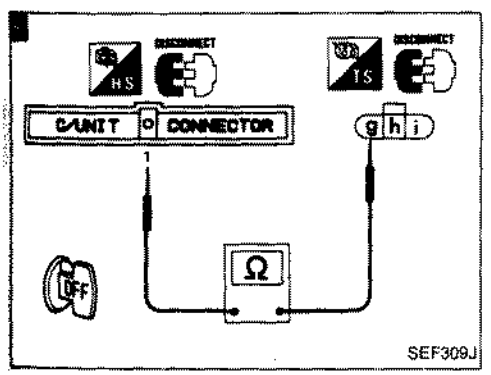
Diagnostic Procedure 27 (Cont'd)











INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect ignition coil harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F34), (M36) (L.H.D. models)
- Harness connectors (M11), (E104) (L.H.D. models)
- Harness connectors (F6), (E15) (R.H.D. models)
- Harness continuity between ignition coil and ignition switch

If N.G., repair harness or connectors.

O.K.

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect resistor and condenser harness connector.
3) Disconnect power transistor harness connector.

B 4) Check harness continuity between terminal ⓑ and terminal ⓒ, ⓘ.
Continuity should exist.

C 5) Check harness continuity between terminal ⓗ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

D

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between terminal ⓓ and E.C.U. terminal ③.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

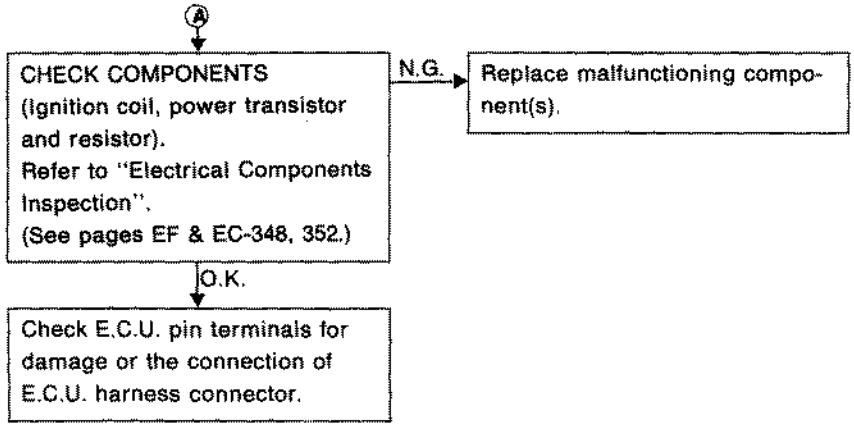
E

CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between terminal ⓖ and E.C.U. terminal ①.
Continuity should exist.

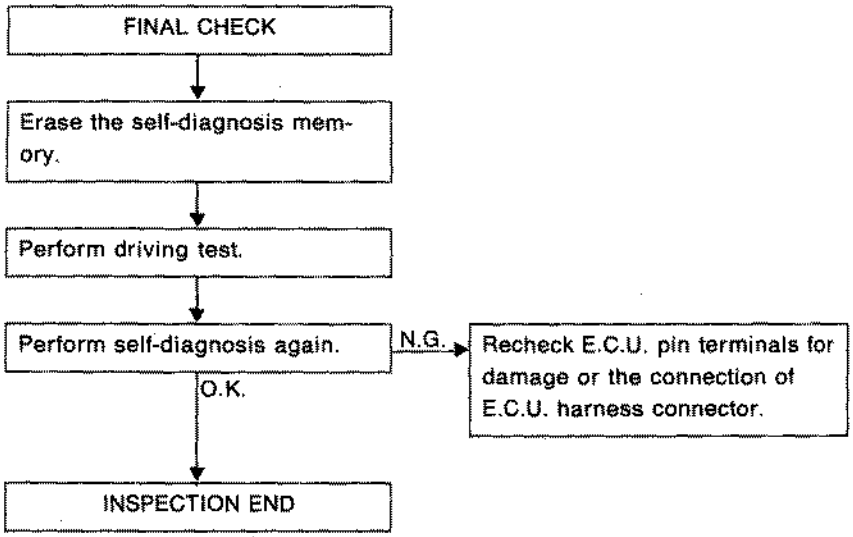
N.G. → Repair harness or connectors.

O.K. → Ⓐ

Diagnostic Procedure 27 (Cont'd)



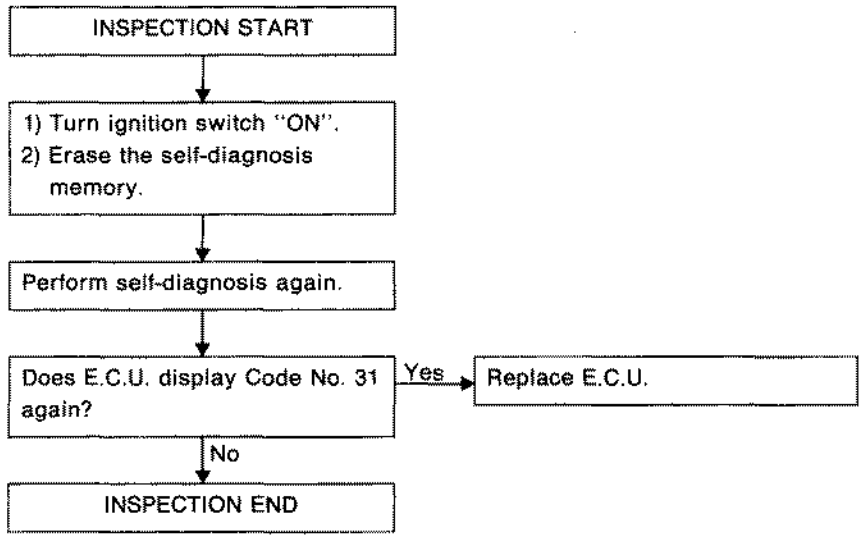
Perform FINAL CHECK by the following procedure after repair is completed.



NOTE

Diagnostic Procedure 28

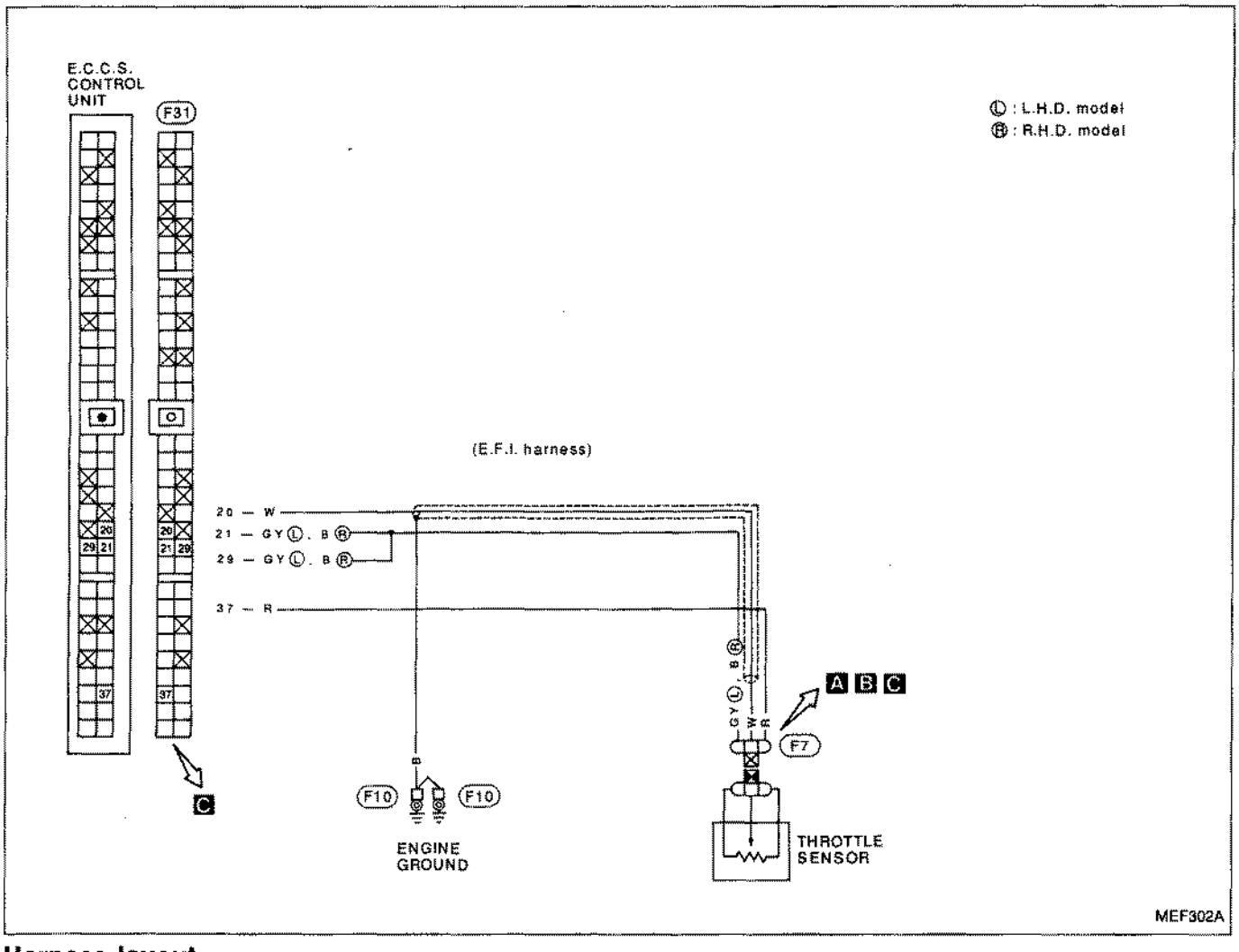
E.C.C.S. CONTROL UNIT (Code No. 31)



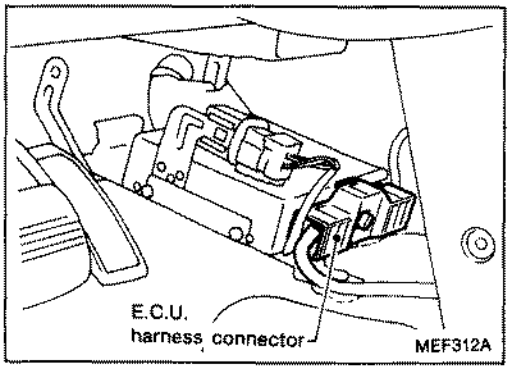
NOTE

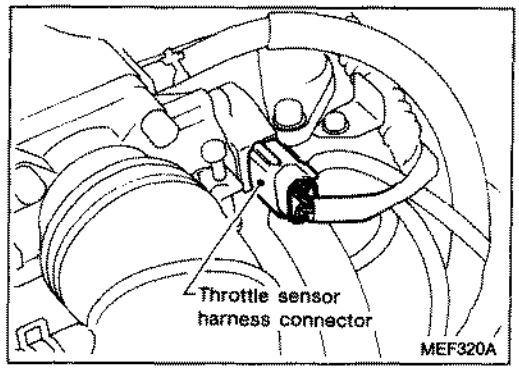
Diagnostic Procedure 29

THROTTLE SENSOR (Code No. 43)

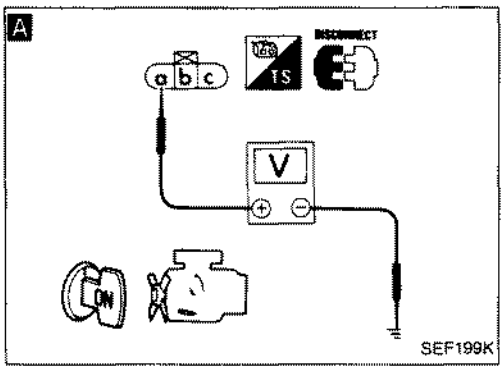


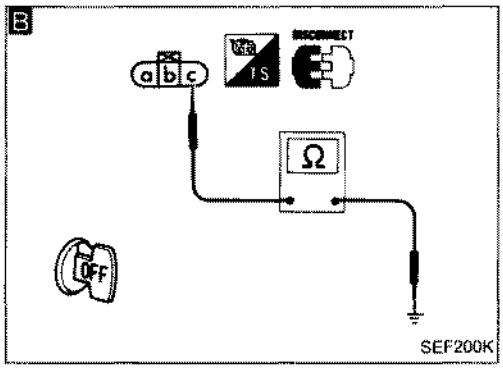
Harness layout

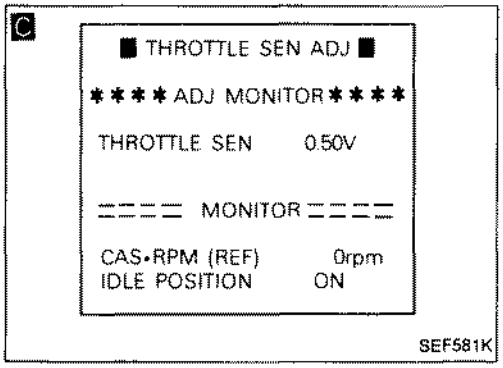


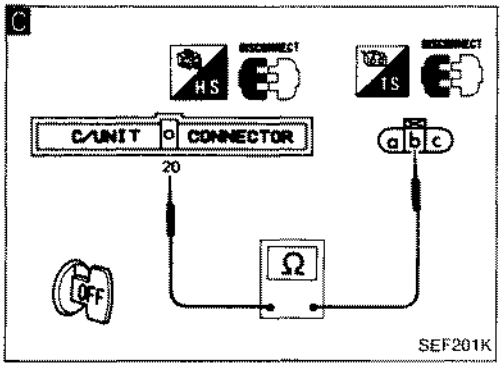


Diagnostic Procedure 29 (Cont'd)









INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect throttle sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓒ and ground.
Voltage: Approximately 5V

N.G. → Repair harness or connectors.

O.K. ↓

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓒ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1) Reconnect throttle sensor harness connector.
2) Turn ignition switch "ON".
3) Read throttle sensor output voltage in "WORK SUPPORT" mode with CONSULT.
Throttle valve fully closed:
0.45 - 0.55V
Throttle valve fully open:
Approx. 5.0V

N.G. → Repair harness or connectors.

— OR —

1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ⑳ and terminal ⓑ.
Continuity should exist.

O.K. ↓

CHECK COMPONENT (Throttle sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-349.)

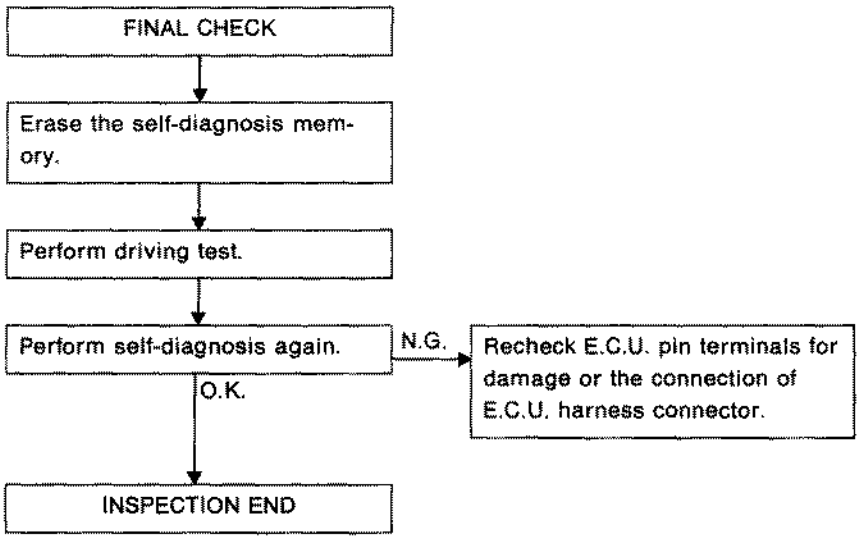
N.G. → Replace throttle sensor.

O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 29 (Cont'd)

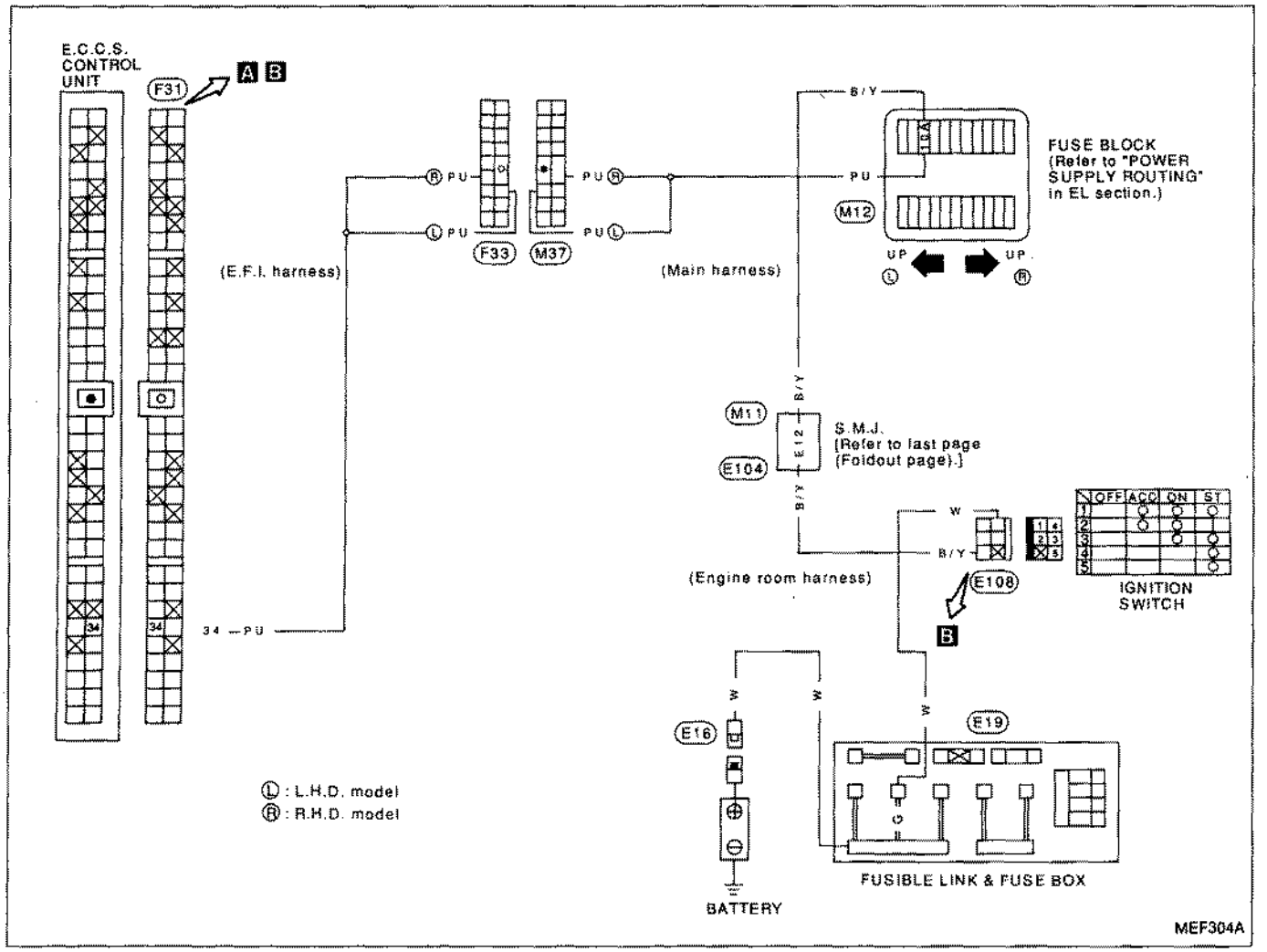
Perform FINAL CHECK by the following procedure after repair is completed.



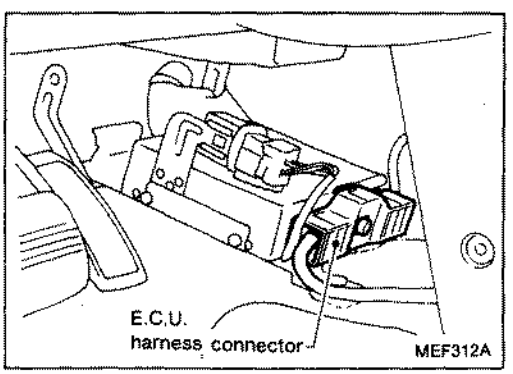
NOTE

Diagnostic Procedure 30

START SIGNAL (Not self-diagnostic item)

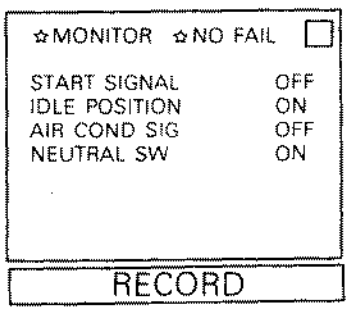


Harness layout



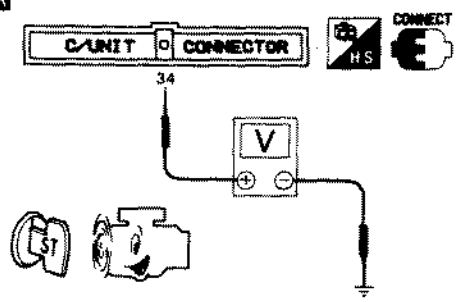
Diagnostic Procedure 30 (Cont'd)

A



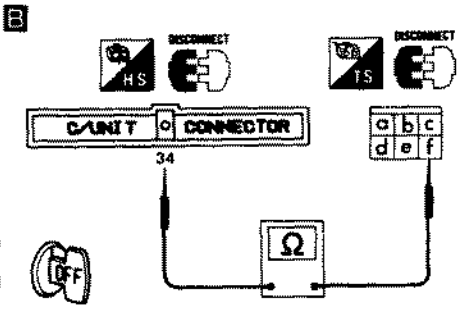
SEF384J

A



SEF202K

B



MEF354A

INSPECTION START

A

CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON".
2) Check start signal in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

O.K. → INSPECTION END

OR

1) Turn ignition switch to "START".
2) Check voltage between E.C.U. terminal ㉞ and ground.

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

N.G.

B

CHECK INPUT SIGNAL CIRCUIT.

1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector and ignition switch harness connector.
3) Check harness continuity between E.C.U. terminal ㉞ and terminal ⓕ.

Continuity should exist.

N.G. → Check the following.
- Harness connectors (F33), (M37)
- Harness connectors (M11), (E104)
- 10A fuse
- Harness continuity between E.C.U. and ignition switch

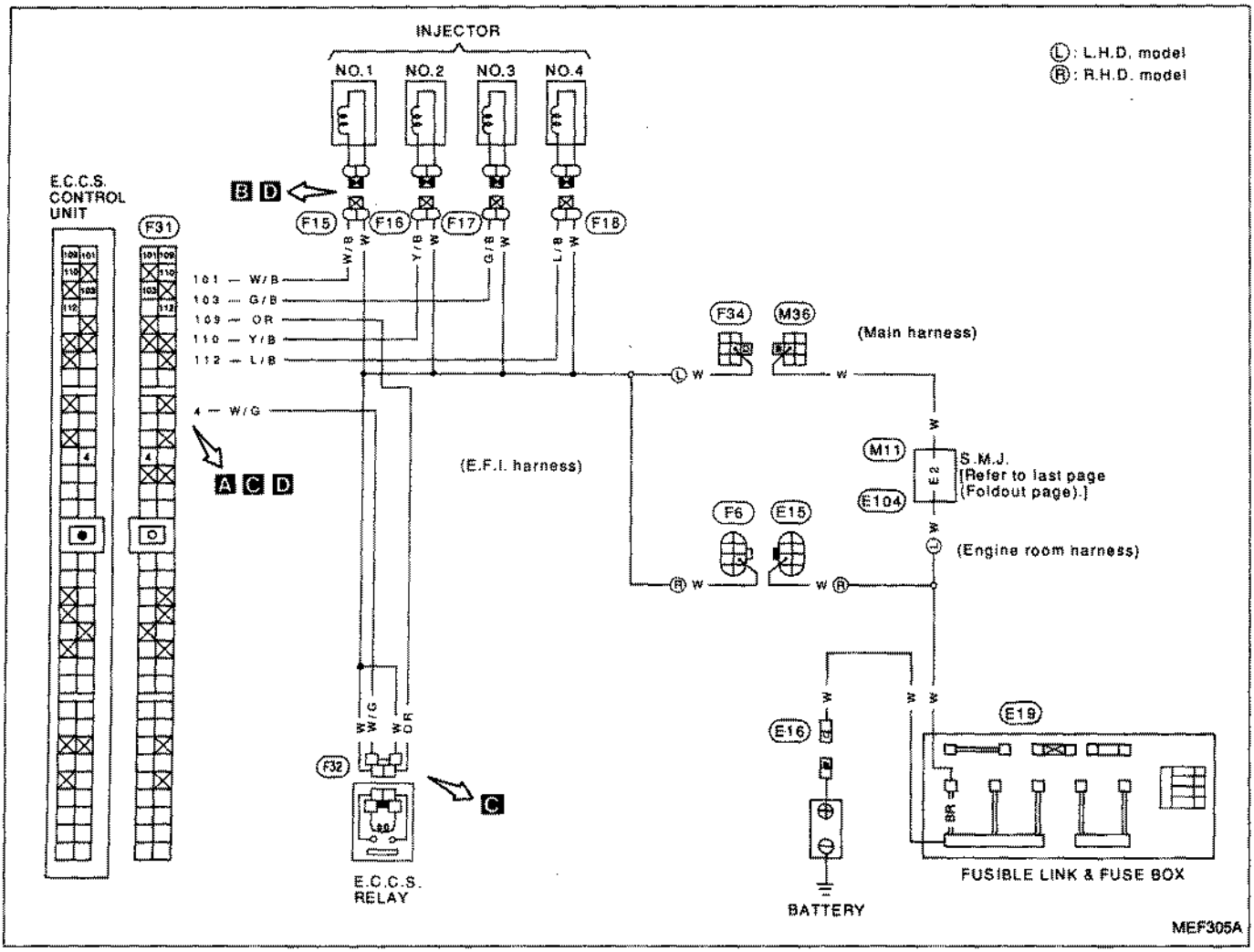
If N.G., repair harness or connectors.

O.K.

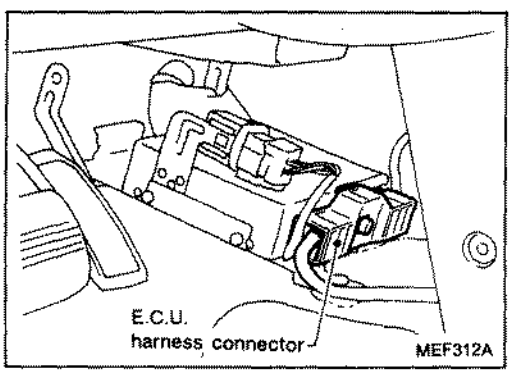
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

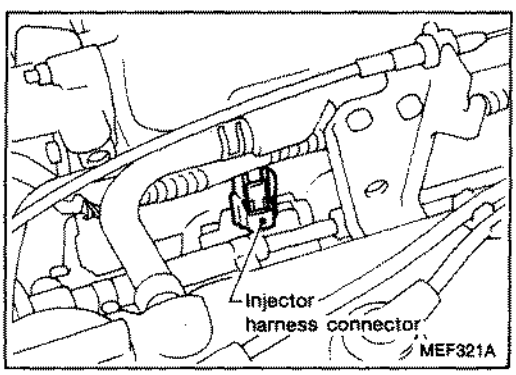
Diagnostic Procedure 31

INJECTOR (Not self-diagnostic item)



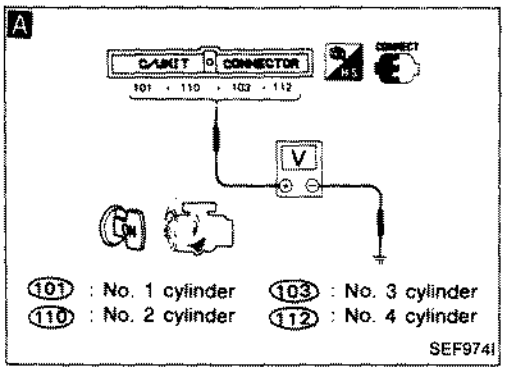
Harness layout



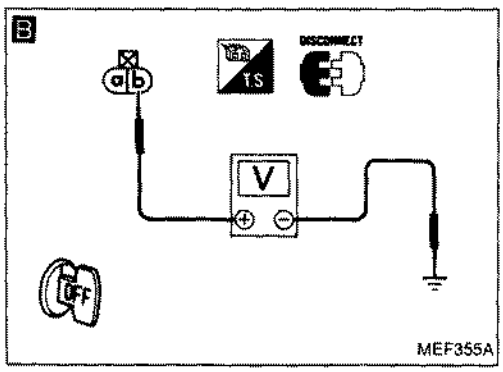


Diagnostic Procedure 31 (Cont'd)

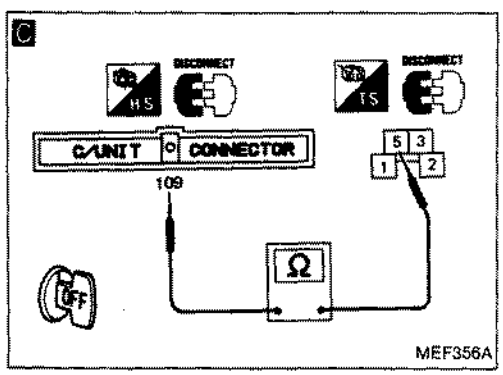
A



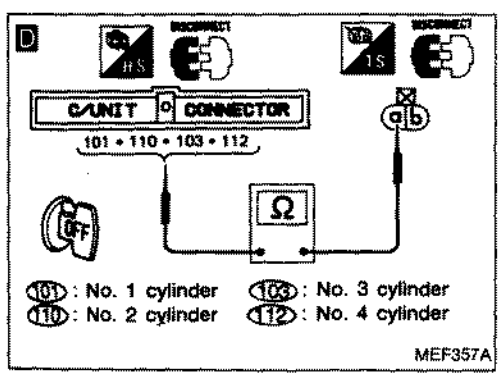
B



C



D



INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Start engine.
2) Check voltage between E.C.U. terminals 101, 110, 103, 112 and ground.
Voltage: Battery voltage

O.K. → INSPECTION END

N.G.

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect injector harness connector and E.C.U. harness connector.

B 3) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

C 4) Disconnect E.C.C.S. relay.
5) Check harness continuity between E.C.U. terminal 109 and terminal ⑤.
Continuity should exist.

N.G. → Check the following.
- Harness connectors F34, M36 (L.H.D. models)
- Harness connectors M11, E186 (L.H.D. models)
- Harness connectors F6, E15 (R.H.D. models)
- "BR" fusible link
- Harness continuity between battery and injector
- Harness continuity between E.C.U. and E.C.C.S. relay

If N.G., repair harness or connectors.

O.K.

D

CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between terminal ⓐ and E.C.U. terminals 101, 110, 103, 112.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT (Injector).
Refer to "Electrical Components Inspection".
(See page EF & EC-351.)

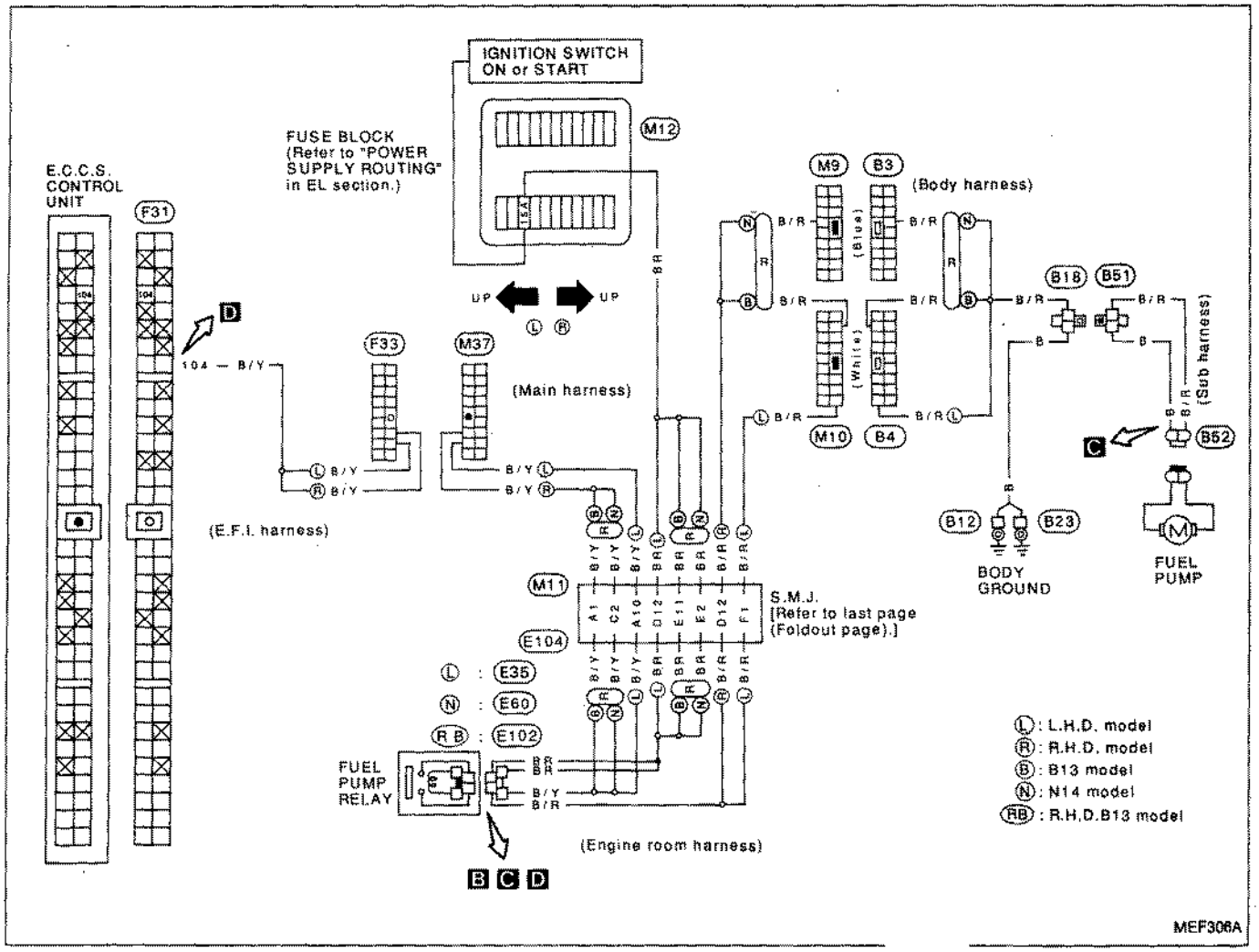
N.G. → Replace injector.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

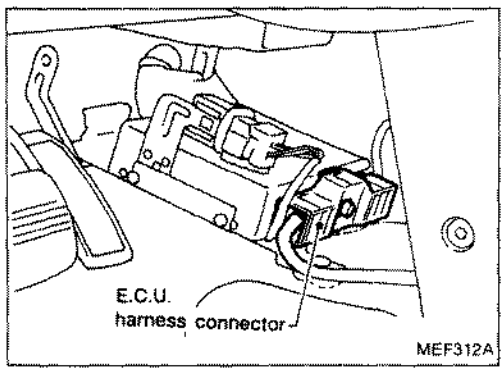
Diagnostic Procedure 32

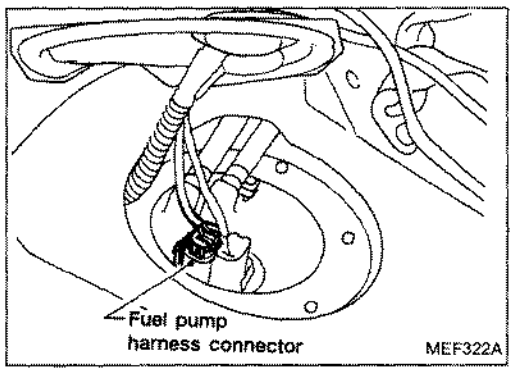
FUEL PUMP (Not self-diagnostic item)

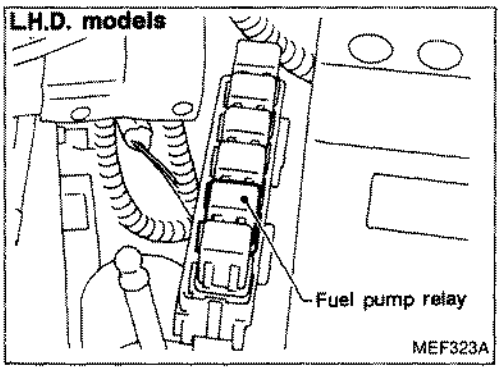


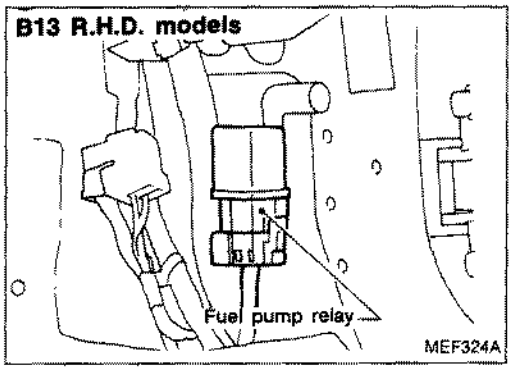
Diagnostic Procedure 32 (Cont'd)

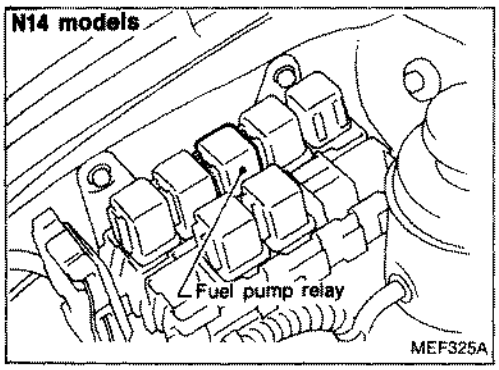
Harness layout





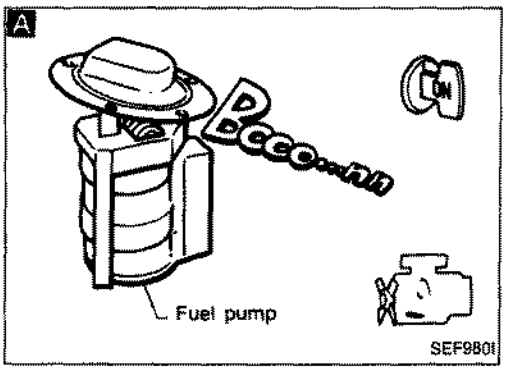




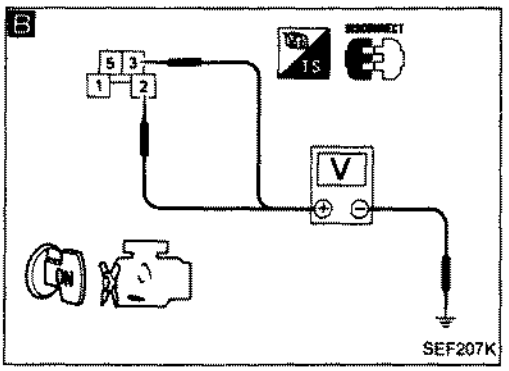


Diagnostic Procedure 32 (Cont'd)

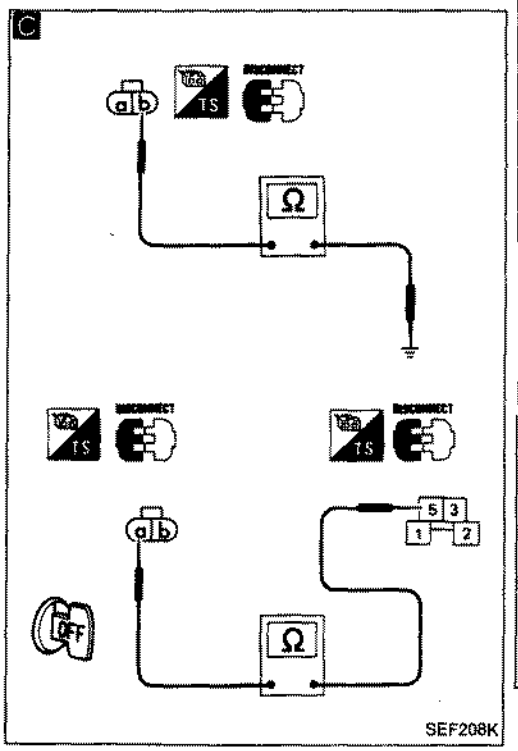
A



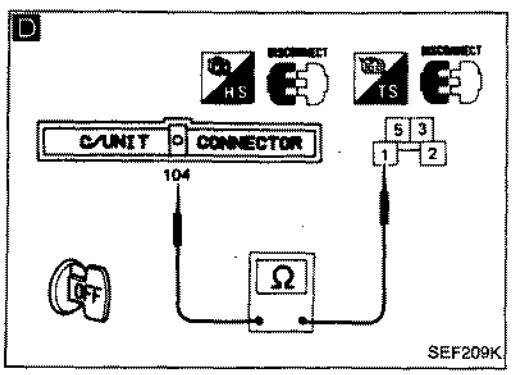
B



C



D



INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Turn ignition switch "ON".
2) Listen to fuel pump operating sound.
Fuel pump should operate for 5 seconds after ignition switch is turned "ON".

O.K. → INSPECTION END

N.G.

B

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect fuel pump relay.
3) Turn ignition switch "ON".
4) Check voltage between terminals ②, ③ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M11), (E104)
- 15A fuse
- Harness continuity between fuse and fuel pump relay

If N.G., repair harness or connectors.

O.K.

C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect fuel pump harness connector.
3) Check harness continuity between terminal ⓑ and body ground, terminal ⓐ and terminal ⑤.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (M11), (E104)
- Harness connectors (M18), (B4) (Model B13).
- Harness connectors (M9), (B3) (Model N14).
- Harness connectors (B18), (B51)
- Harness continuity between fuel pump and body ground
- Harness continuity between fuel pump and fuel pump relay

If N.G., repair harness or connectors.

O.K.

D

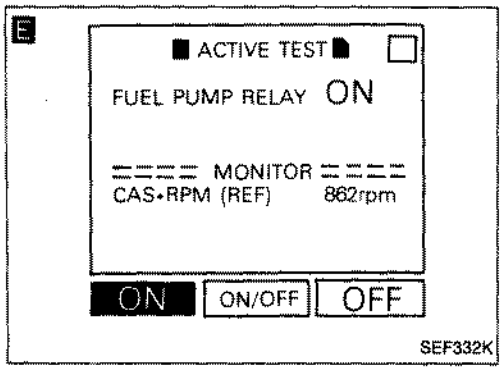
CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal (104) and terminal ①.
Continuity should exist.

N.G. → Check the following:
- Harness connectors (F33), (M37)
- Harness connectors (M11), (E104)
- Harness continuity between E.C.U. and fuel pump relay

If N.G., repair harness or connectors.

O.K. → Ⓐ

Diagnostic Procedure 32 (Cont'd)



E

Ⓐ

CHECK COMPONENT
(Fuel pump relay).

1) Reconnect fuel pump relay, fuel pump harness connector and E.C.U. harness connector.
2) Ignition switch "ON".
3) Turn fuel pump relay "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

N.G. → Replace fuel pump relay.

OR

Refer to "Electrical Components Inspection". (See page EF & EC-351.)

O.K. ↓

CHECK COMPONENT
(Fuel pump).
Refer to "Electrical Components Inspection".
(See page EF & EC-349.)

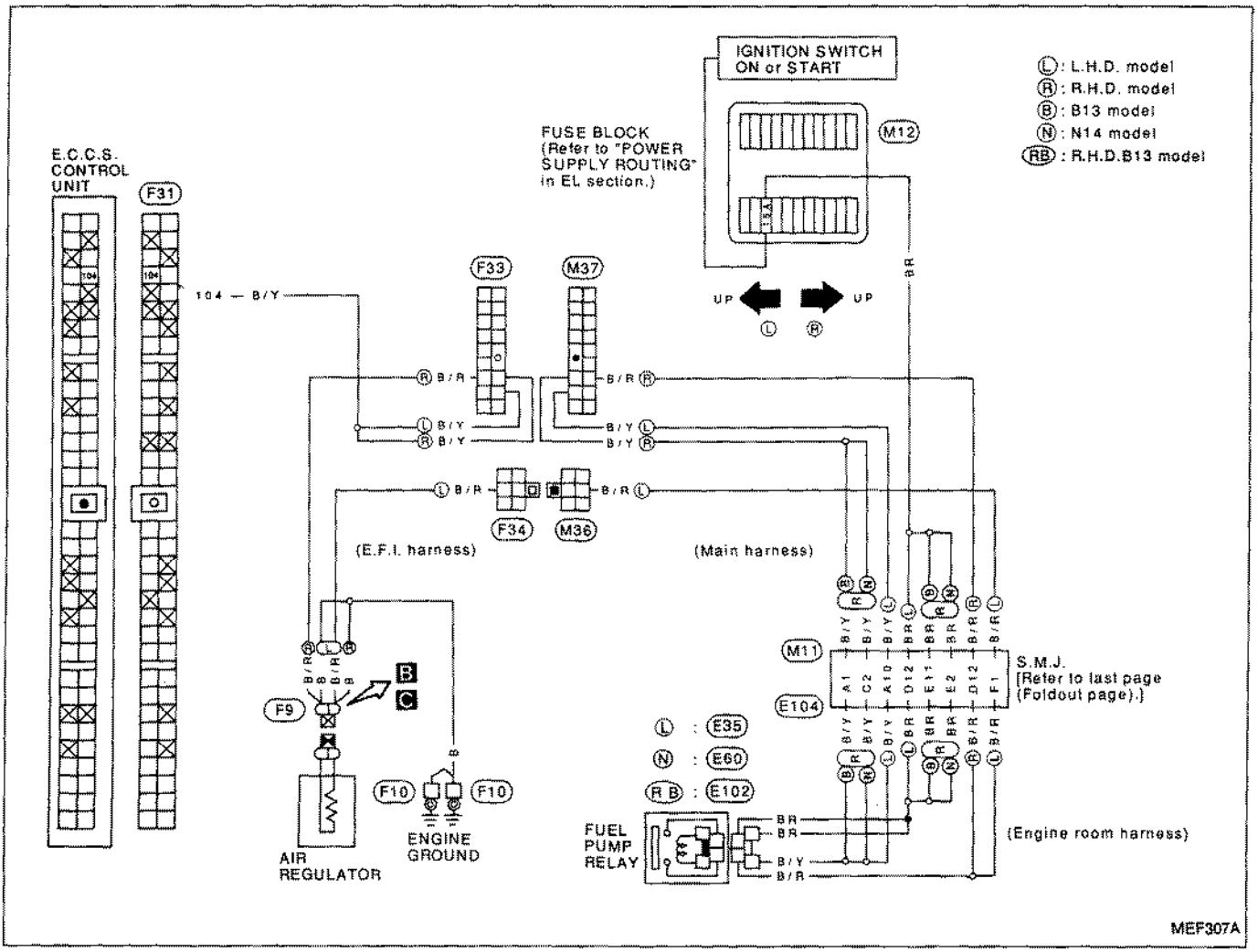
N.G. → Replace fuel pump.

O.K. ↓

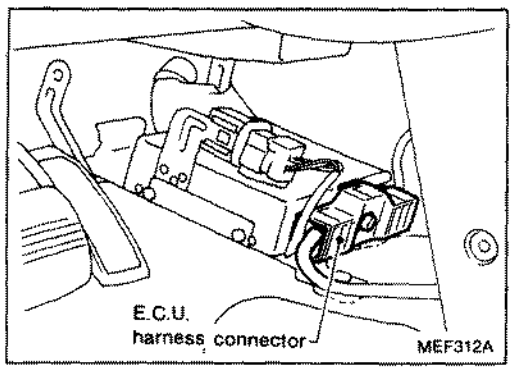
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

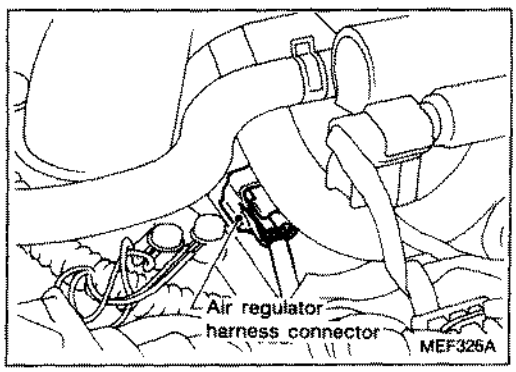
Diagnostic Procedure 33

AIR REGULATOR (Not self-diagnostic item)



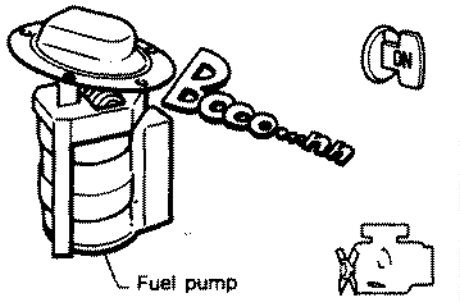
Harness layout



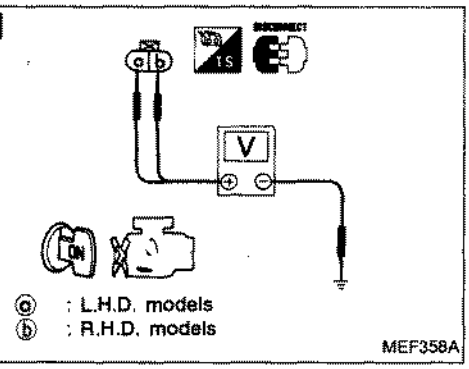


Diagnostic Procedure 33 (Cont'd)

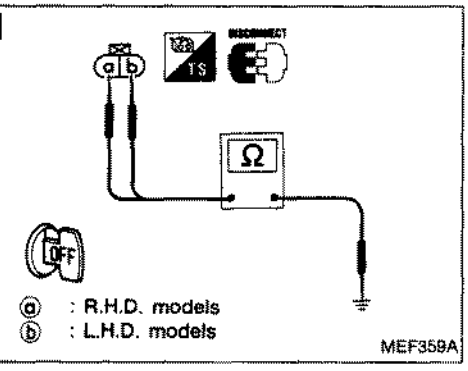
A



B



C



INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Turn ignition switch "ON".
2) Listen to fuel pump operating sound.
Fuel pump should operate for 5 seconds after ignition switch is turned "ON".

N.G. → Check fuel pump control circuit. (See page EF & EC-318.)

O.K.

B

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect air regulator harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ and ground (L.H.D. models), terminal ⓑ and ground (R.H.D. models).
Battery voltage should exist for 5 seconds after ignition switch is turned "ON".

N.G. → Check the following.
- Harness connectors (F34), (M36) (L.H.D. models)
- Harness connectors (F33), (M37) (R.H.D. models)
- Harness connectors (M31), (E104)
- Harness continuity between air regulator and fuel pump relay

If N.G., repair harness or connectors.

O.K.

C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓑ and body ground (L.H.D. models), terminal ⓐ and ground (R.H.D. models).
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT (Air regulator).
Refer to "Electrical Components Inspection".
(See page EF & EC-350.)

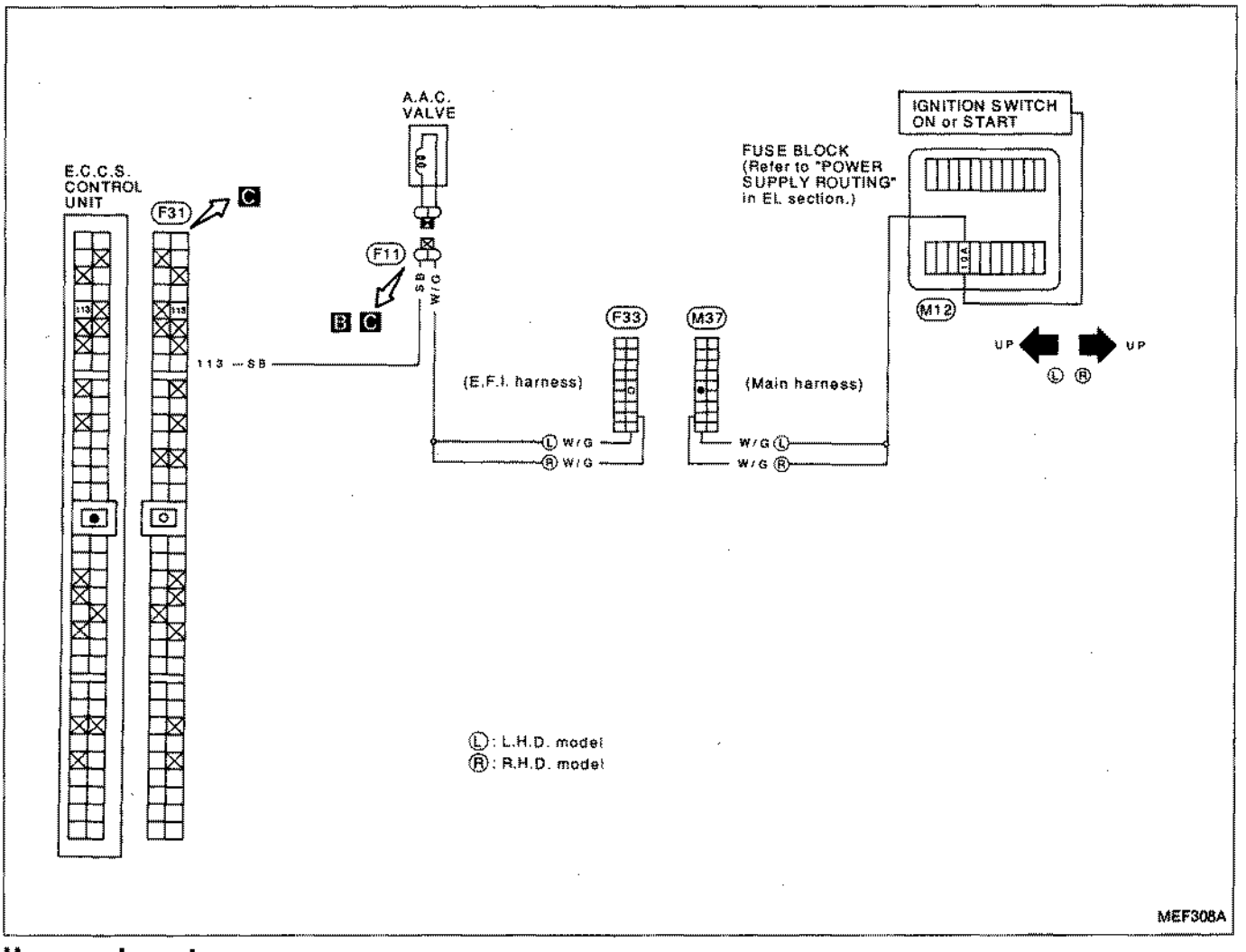
N.G. → Replace air regulator.

O.K.

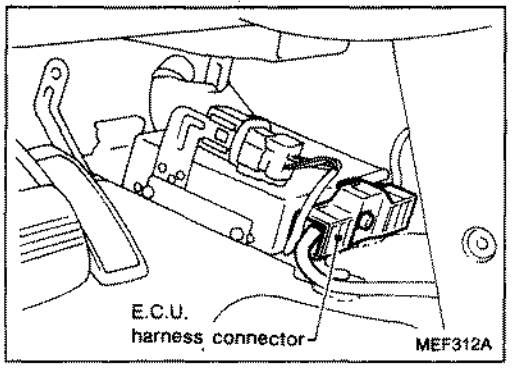
INSPECTION END

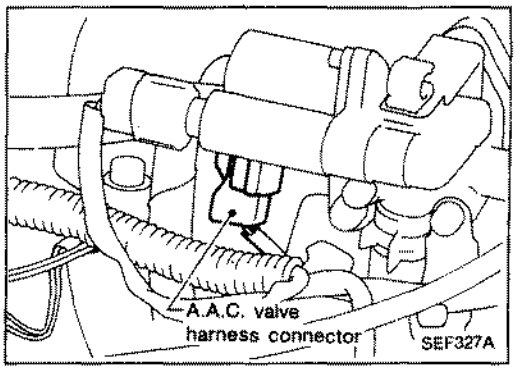
Diagnostic Procedure 34

A.A.C. VALVE (Not self-diagnostic item)



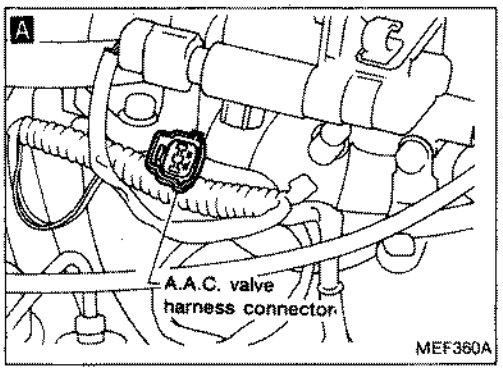
Harness layout



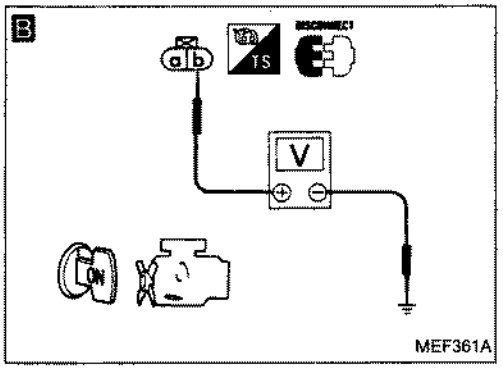


Diagnostic Procedure 34 (Cont'd)

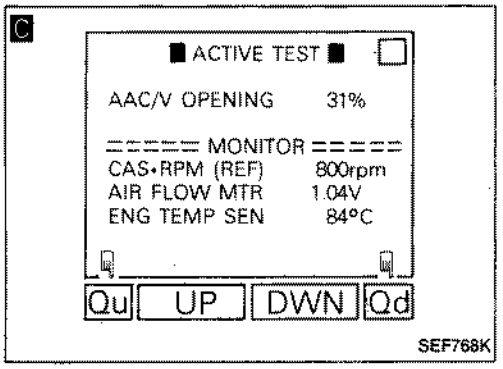
A



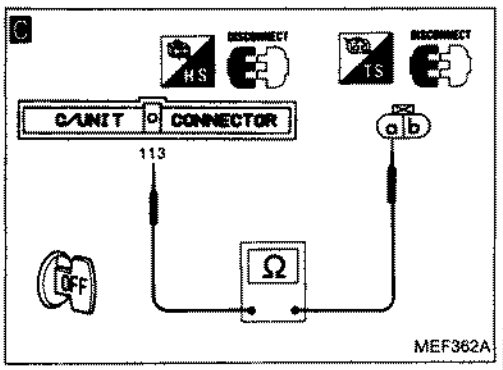
B



C



C



INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check idle speed.
750 ± 50 rpm (M/T)
800 ± 50 rpm (A/T) (in "N" position)
3) Disconnect A.A.C. valve harness connector.
4) Make sure that idle speed drops.

Drops → INSPECTION END

Does not drop

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F33), (B37)
- 10A fuse
- Harness continuity between A.A.C. valve and fuse

If N.G., repair harness or connectors.

O.K.

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Reconnect A.A.C. valve harness connector.
2) Perform "AAC VALVE OPENING TEST" in "ACTIVE TEST" mode with CONSULT.

N.G. → Repair harness or connectors.

OR

1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (113) and terminal ⓐ.
Continuity should exist.

O.K.

CHECK COMPONENT (A.A.C. valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-350.)

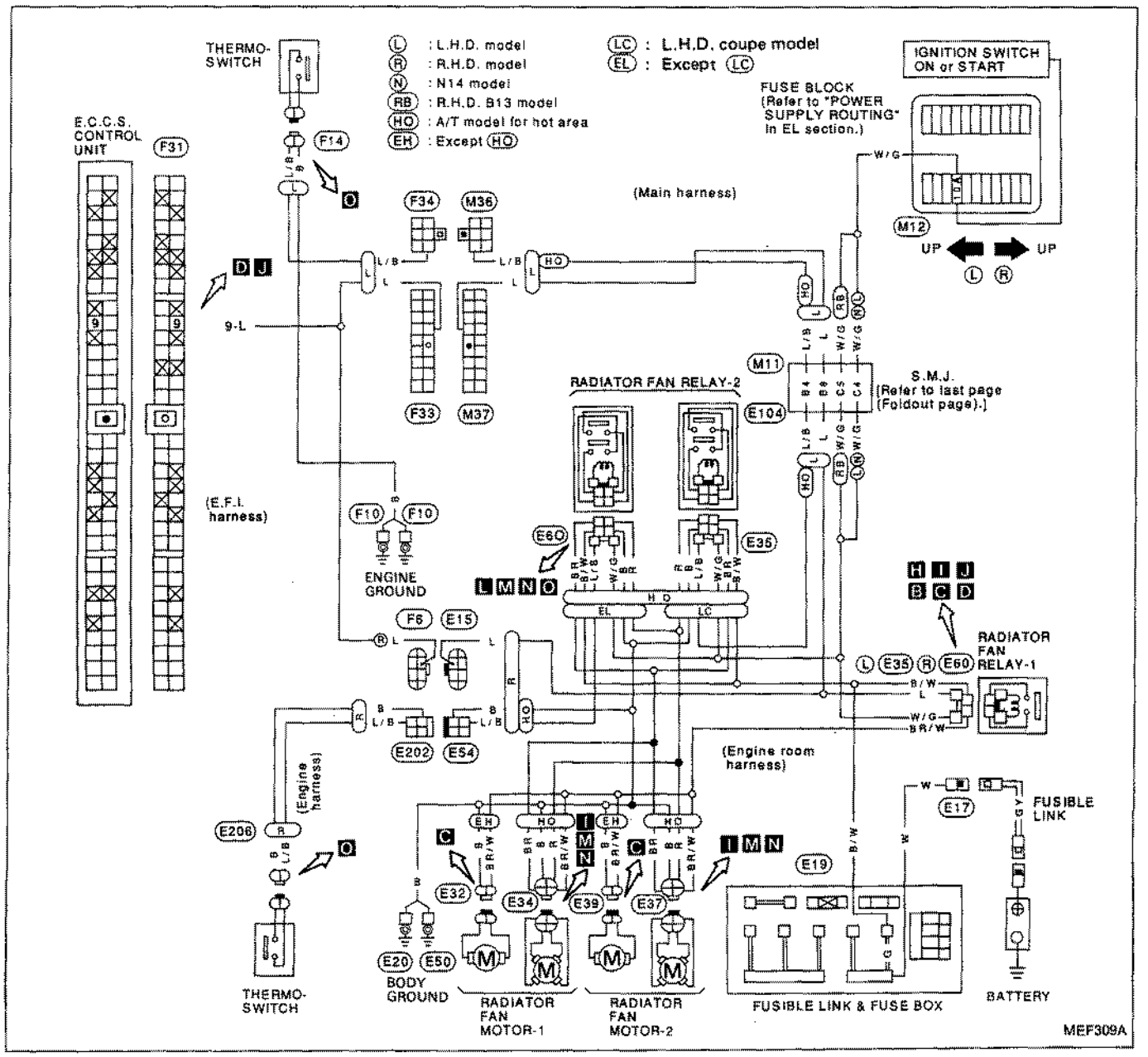
N.G. → Replace A.A.C. valve.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

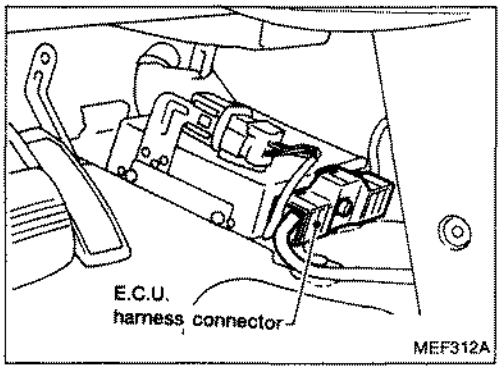
Diagnostic Procedure 35

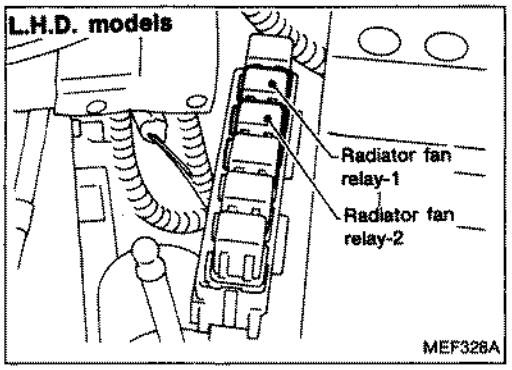
RADIATOR FAN CONTROL (Not self-diagnostic item)

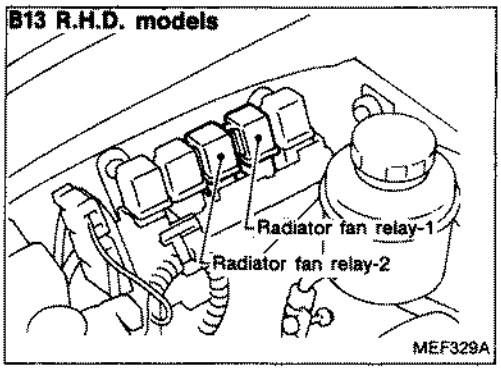


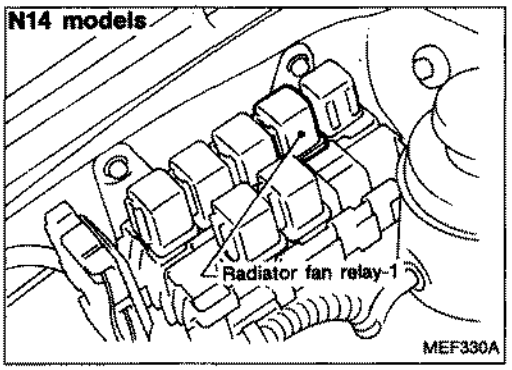
Diagnostic Procedure 35 (Cont'd)

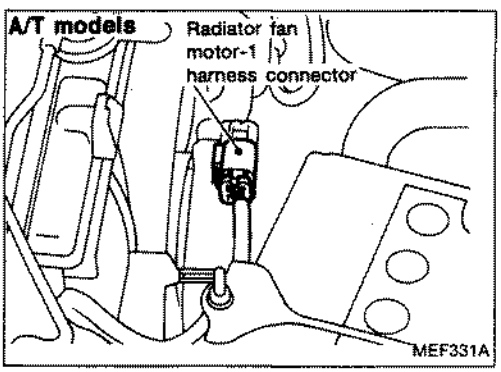
Harness layout

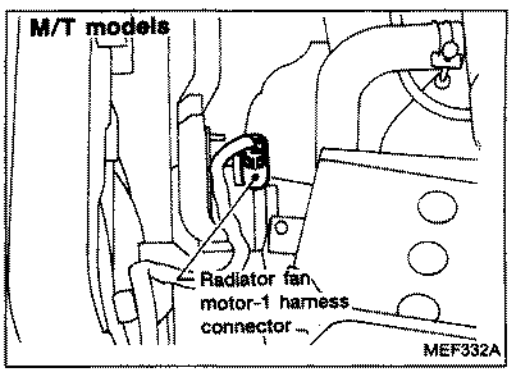


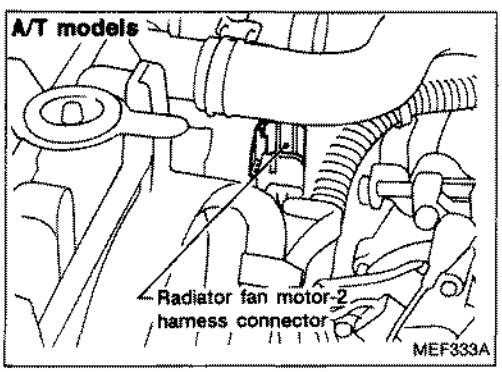


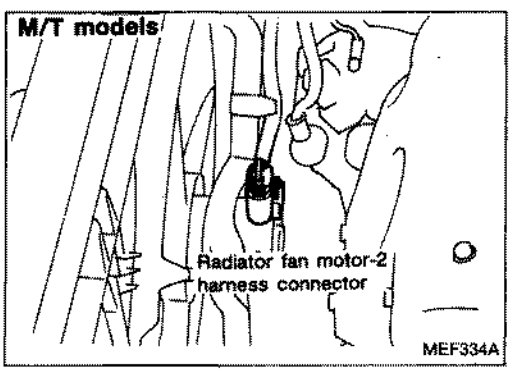


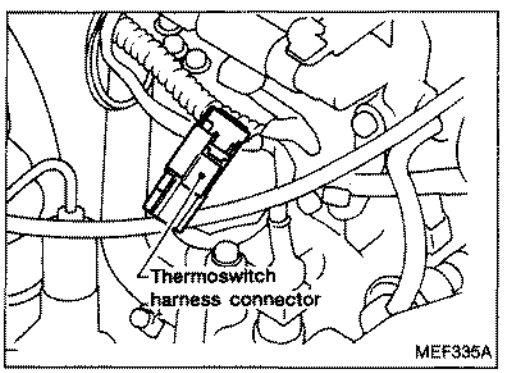






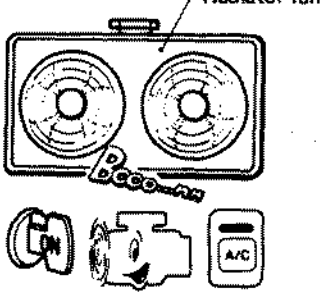




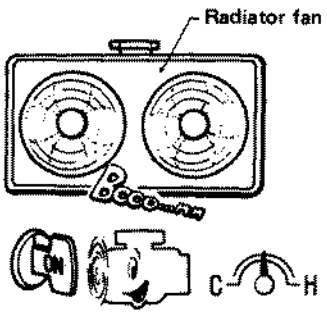


Diagnostic Procedure 35 (Cont'd)

A With air conditioner

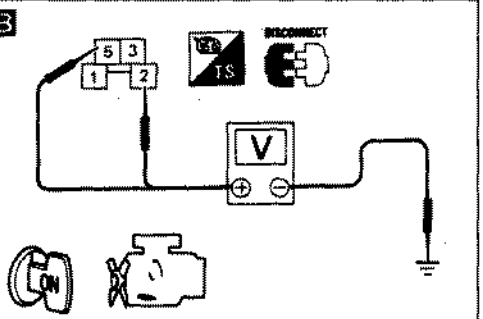


Without air conditioner



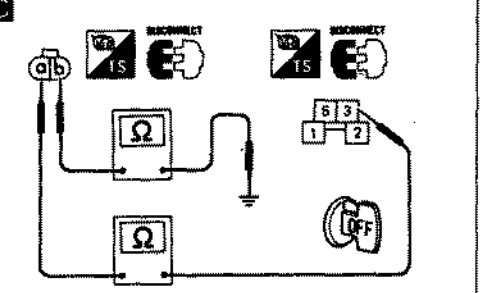
SEF997I

B



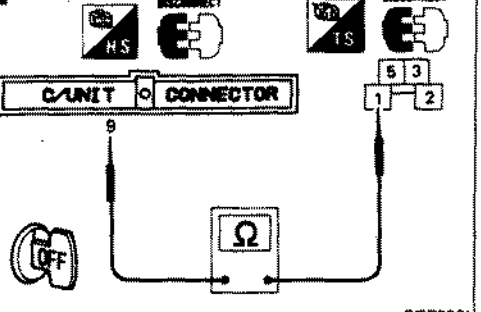
MEF365A

C



MEF366A

D



SEF999I

Except A/T models for hot areas

INSPECTION START

A

CHECK RADIATOR FAN OPERATION.

With air conditioner

1) Start engine.
2) Set temperature lever at full cold position.
3) Turn air conditioner switch "ON".
4) Turn blower fan switch "ON".
5) Run engine at idle for a few minutes with air conditioner operating.
6) Make sure that radiator 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 radiator fan begins to operate during warm-up.

O.K. → INSPECTION END

N.G. ↓

B

CHECK POWER SUPPLY.

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

N.G. → Check the following.

- Harness connectors (M1), (E105)
- "GY" fusible link
- "G" fusible link
- 10A fuse
- Harness continuity between fuse and radiator fan relay-1
- Harness continuity between battery and radiator fan relay-1

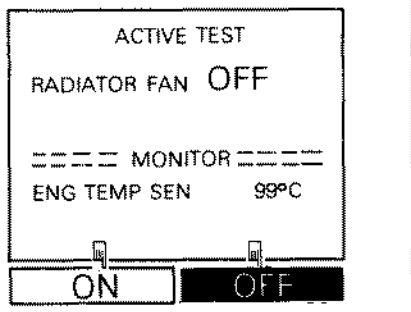
If N.G., repair harness or connectors.

O.K. ↓

Ⓐ

Diagnostic Procedure 35 (Cont'd)

E



Ⓐ

C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect radiator fan motor-1 harness connector and radiator fan motor-2 harness connector.
3) Check harness continuity between terminal ⓒ and terminal ③, terminal ⓑ and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

D

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ⑨ and terminal ①.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F33), (M37) (L.H.D. models)
- Harness connectors (M31), (E194) (L.H.D. models)
- Harness connectors (F6), (E15) (R.H.D. models)
- Harness continuity between E.C.U. and radiator fan relay-1

If N.G., repair harness or connectors.

O.K. ↓

E

CHECK COMPONENT
(Radiator fan relay-1).
Refer to "Electrical Components Inspection".
(See page EF & EC-351.)

N.G. → Replace radiator fan relay.

O.K. ↓

CHECK COMPONENTS
(Radiator fan motors).

1) Reconnect radiator fan relay, radiator fan motor harness connectors and E.C.U. harness connector.
2) Start engine.
3) Perform "RADIATOR FAN TEST" in "ACTIVE TEST" mode with CONSULT.

N.G. → Replace radiator fan motors.

OR

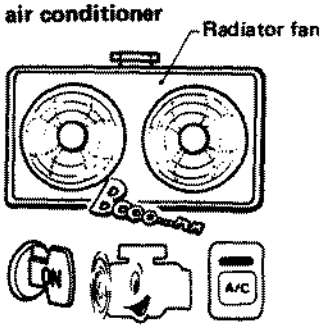
Refer to "Electrical Components Inspection".
(See page EF & EC-351.)

O.K. ↓

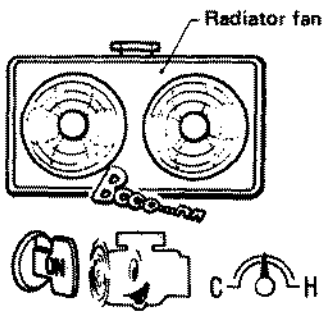
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 35 (Cont'd)

F With air conditioner

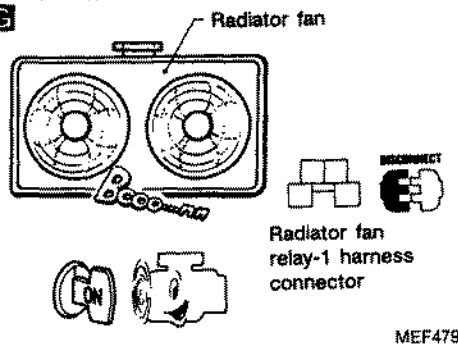


Without air conditioner



SEF997I

G



MEF479A

A/T models for hot areas

INSPECTION START

F

CHECK RADIATOR FAN LOW SPEED OPERATION.

With air conditioner

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

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 radiator fan begins to operate at low speed during warm-up.

N.G. → Check radiator fan low speed control circuit. (Go to PROCEDURE A .)

O.K.

G

CHECK RADIATOR FAN HIGH SPEED OPERATION.

1) Turn air conditioner switch "OFF".
2) Turn blower fan switch "OFF".
   (Step 1) and 2) are only performed for model with air conditioner.)
3) Stop engine.
4) Disconnect radiator fan relay-1.
5) Restart engine and warm it up until engine is extremely hot [Engine temperature is above 105°C (221°F)].
   Make sure that radiator fan operates at high speed.

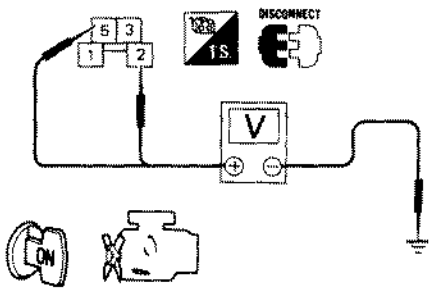
N.G. → Check radiator fan high speed control circuit. (Go to PROCEDURE B .)

O.K.

INSPECTION END

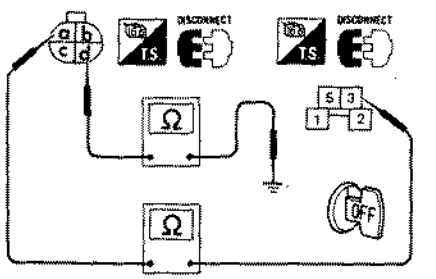
Diagnostic Procedure 35 (Cont'd)

H



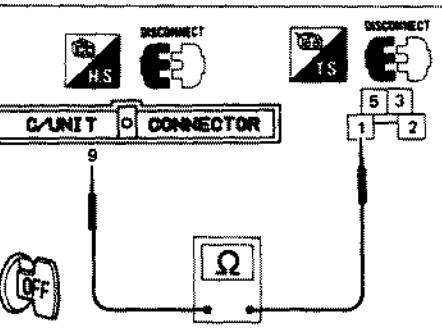
SEF365K

I



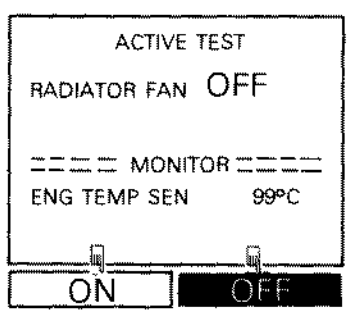
MEF480A

J



SEF999I

K



SEF333K

PROCEDURE A

INSPECTION START

H

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect radiator fan relay-1.
3) Turn ignition switch "ON".
4) Check voltage between terminals ②, ⑤ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M11), (E104)
- 10A fuse
- "G" fusible link
- "GY" fusible link
- Harness continuity between radiator fan relay-1 and fuse
- Harness continuity between radiator fan relay-1 and battery

If N.G., repair harness or connectors.

O.K.

I

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect radiator fan motor-1 harnes connector and radiator fan motor-2 harness connector.
3) Check harness continuity between terminals ③ and terminal ⓐ, terminal ⓓ and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

J

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ⑨ and terminal ①.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F33), (M37) (L.H.D. models)
- Harness connectors (M11), (E104) (L.H.D. models)
- Harness connectors (F6), (E15) (R.H.D. models)
- Harness continuity between radiator fan relay-1 and E.C.U.

If N.G., repair harness or connectors.

O.K.

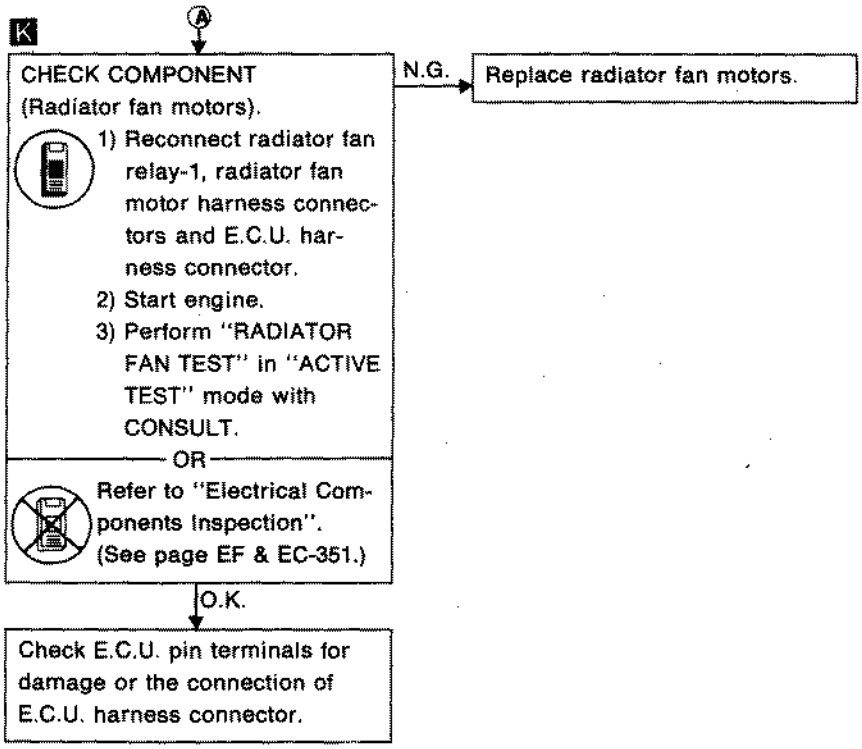
CHECK COMPONENT
(Radiator fan relay-1).
Refer to "Electrical Components Inspection".
(See page EF & EC-351.)

N.G. → Replace radiator fan relay.

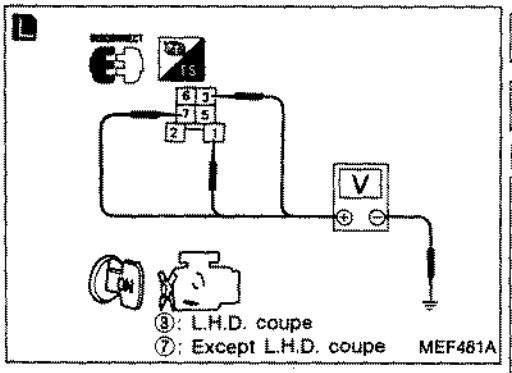
O.K.

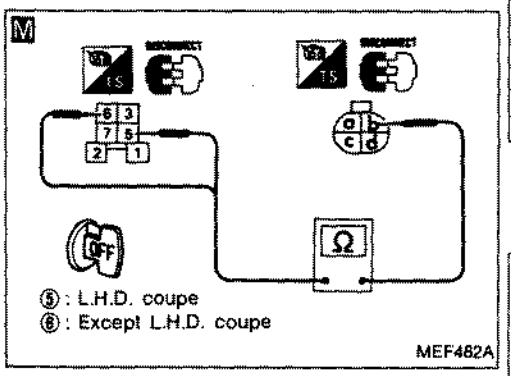
Ⓐ

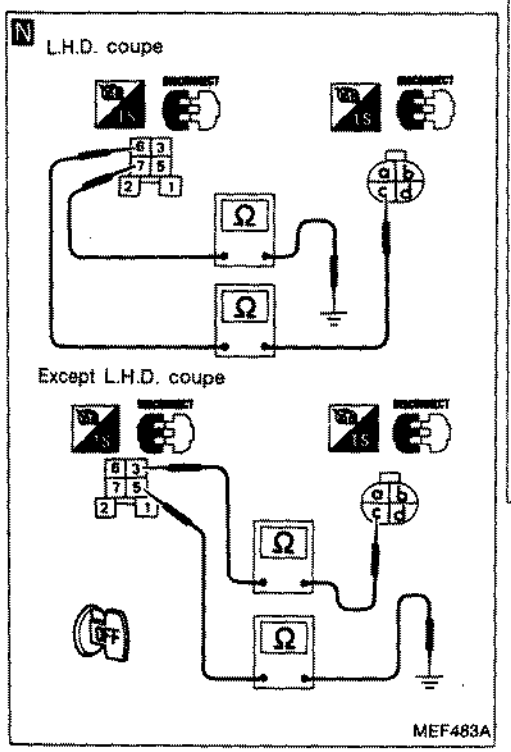
Diagnostic Procedure 35 (Cont'd)

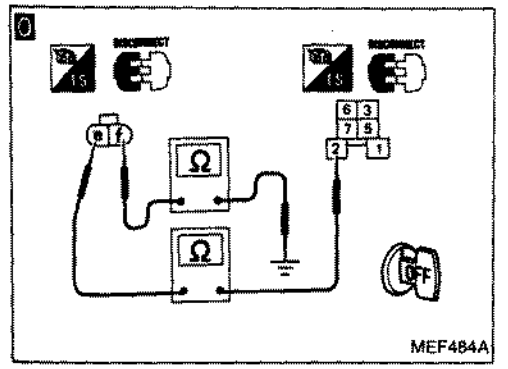


Diagnostic Procedure 35 (Cont'd)









PROCEDURE B

INSPECTION START

L

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect radiator fan relay- 2.
3) Turn ignition switch "ON".
4) Check voltage between terminals ①, ③ (L.H.D. coupe), ⑦ (Except L.H.D. coupe) and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M11), (E104)
- 10A fuse
- "G" fusible link
- "GY" fusible link
- Harness continuity between radiator fan relay-2 and fuse
- Harness continuity between radiator fan relay-2 and battery

If N.G., repair harness or connectors.

O.K. ↓

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

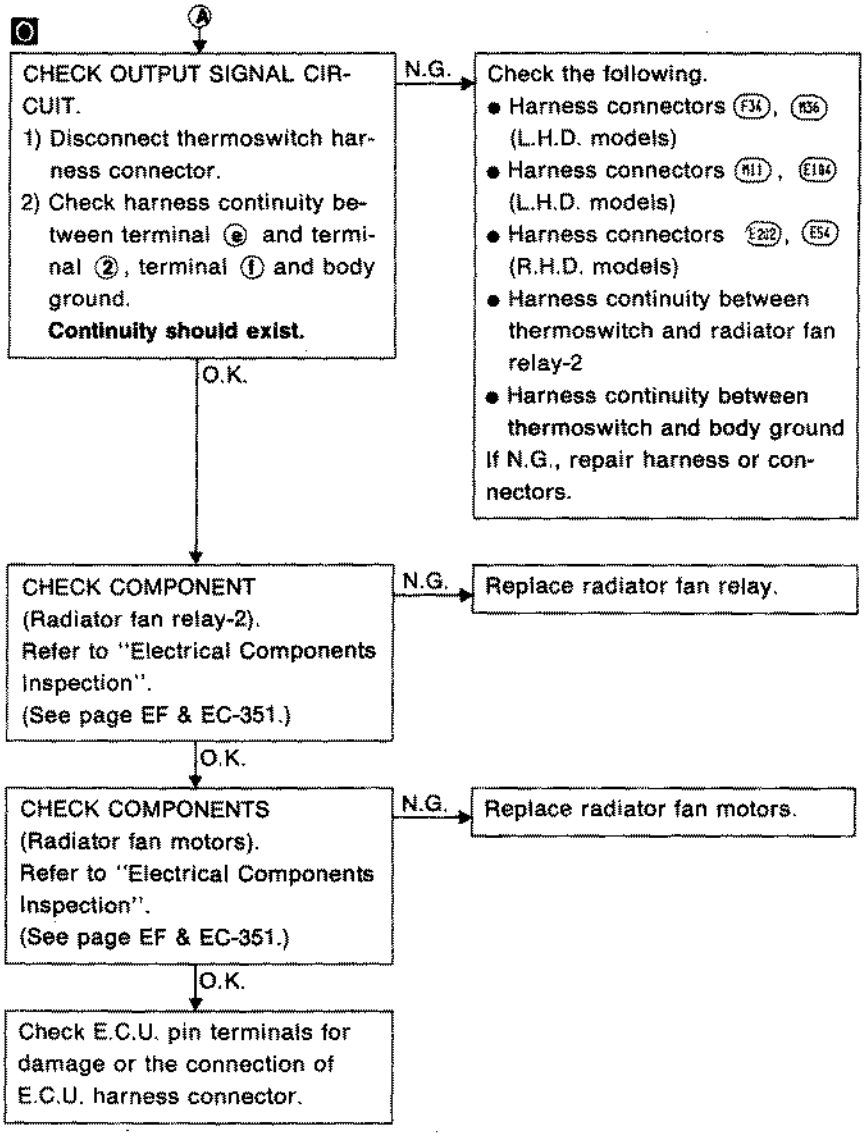
M 3) Check harness continuity between terminal ⓑ and terminal ⑤ (L.H.D. coupe), ⑥ (Except L.H.D. coupe).
Continuity should exist.

N 4) Check harness continuity between terminal ⓒ and terminal ⑥ (L.H.D. coupe), ③ (Except L.H.D. coupe), terminal ⑦ (L.H.D. coupe), ⑤ (Except L.H.D. coupe) and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓ Ⓐ

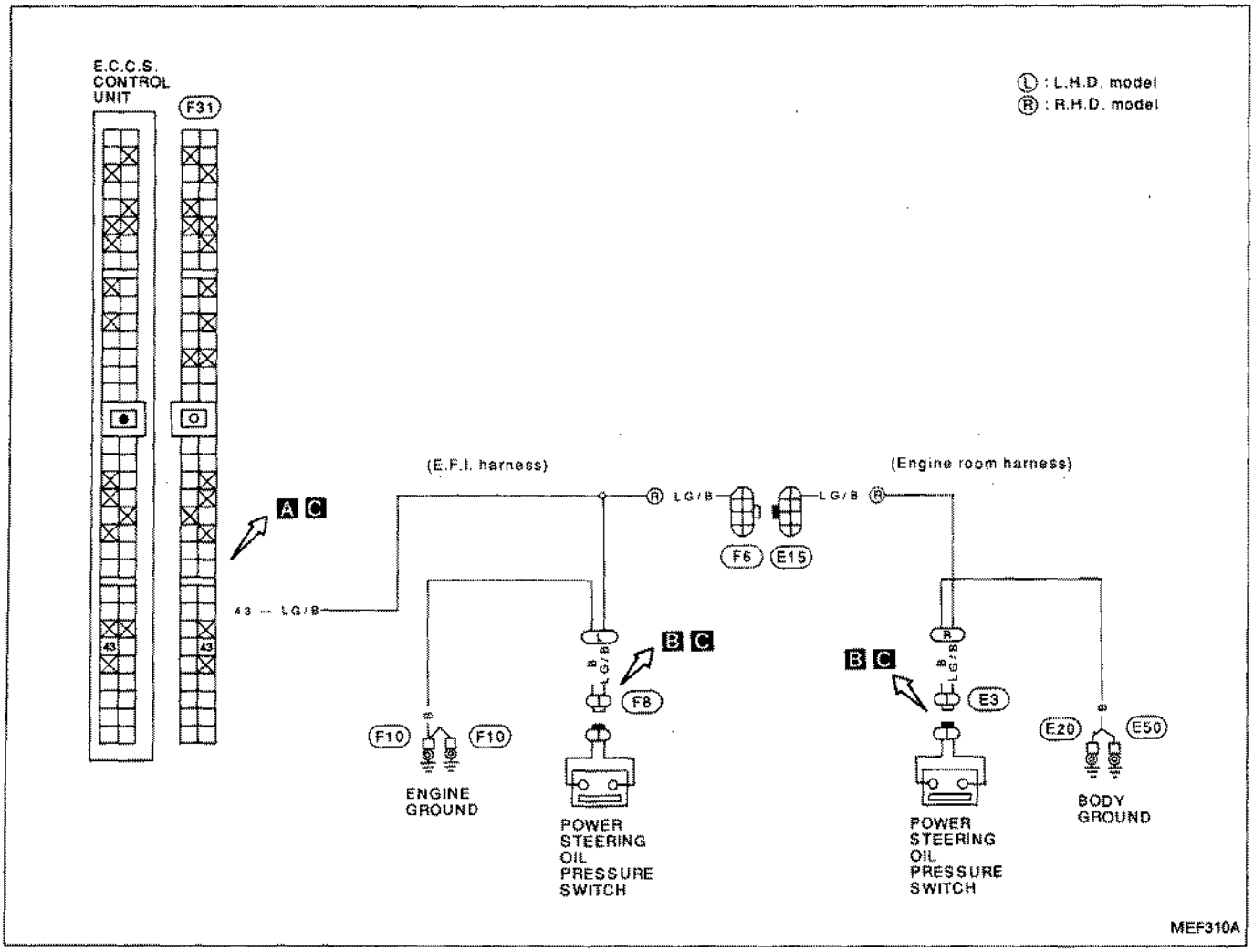
Diagnostic Procedure 35 (Cont'd)



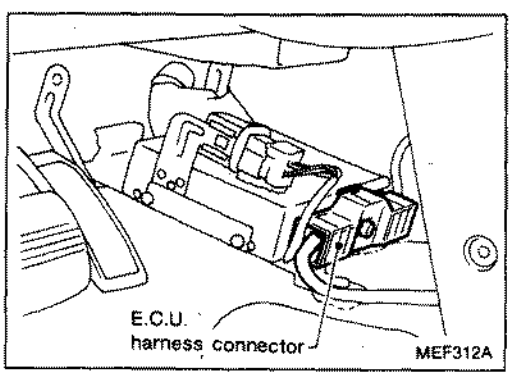
NOTE

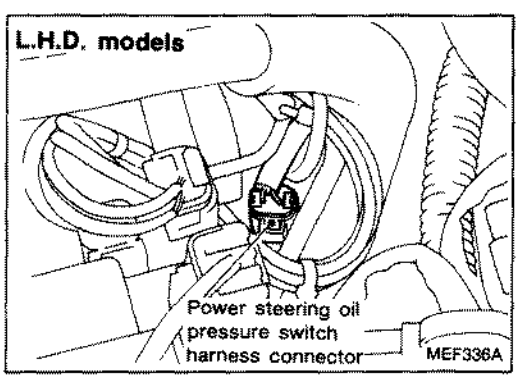
Diagnostic Procedure 36

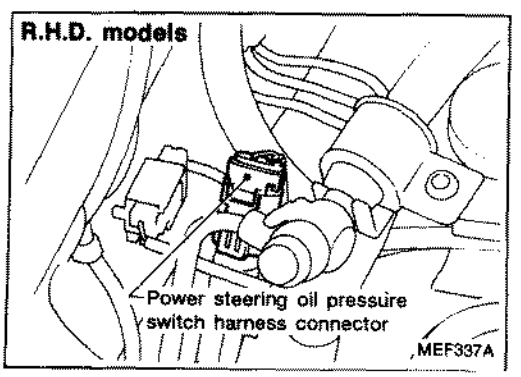
POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)



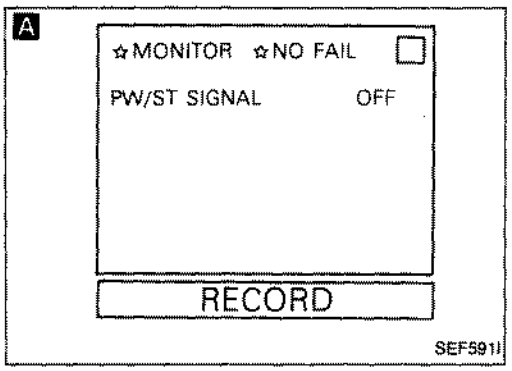
Harness layout

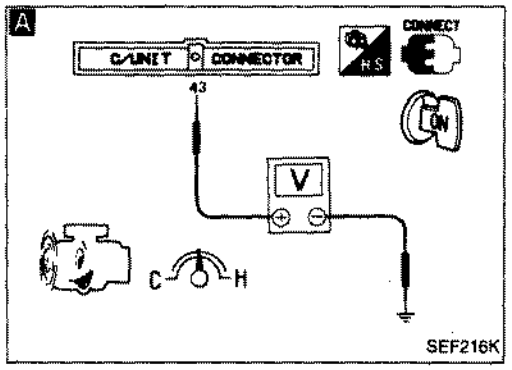


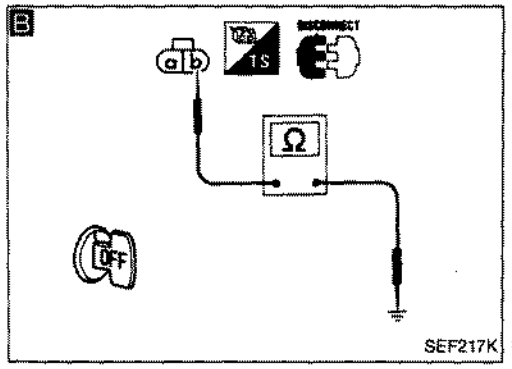


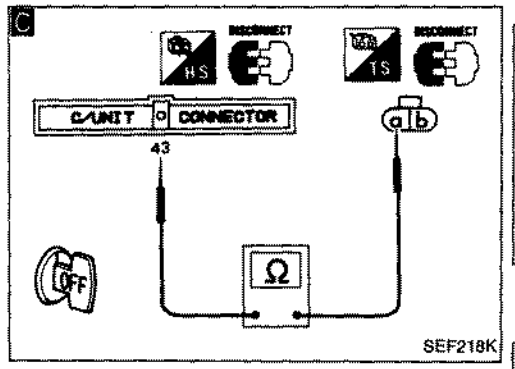


Diagnostic Procedure 36 (Cont'd)









INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check power steering oil pressure switch signal in "DATA MONITOR" mode with CONSULT.
Steering is neutral: OFF
Steering is turned: ON

OR

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

O.K. → INSPECTION END

N.G.

B

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect power steering oil pressure switch harness connector.
3) Check harness continuity between terminal ⓑ and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

C

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ㊸ and terminal ⓐ.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F6), (E15) (R.H.D. models)
- Harness continuity between E.C.U. and power steering oil pressure switch

If N.G., repair harness or connectors.

O.K.

CHECK COMPONENT
(Power steering oil pressure switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-352.)

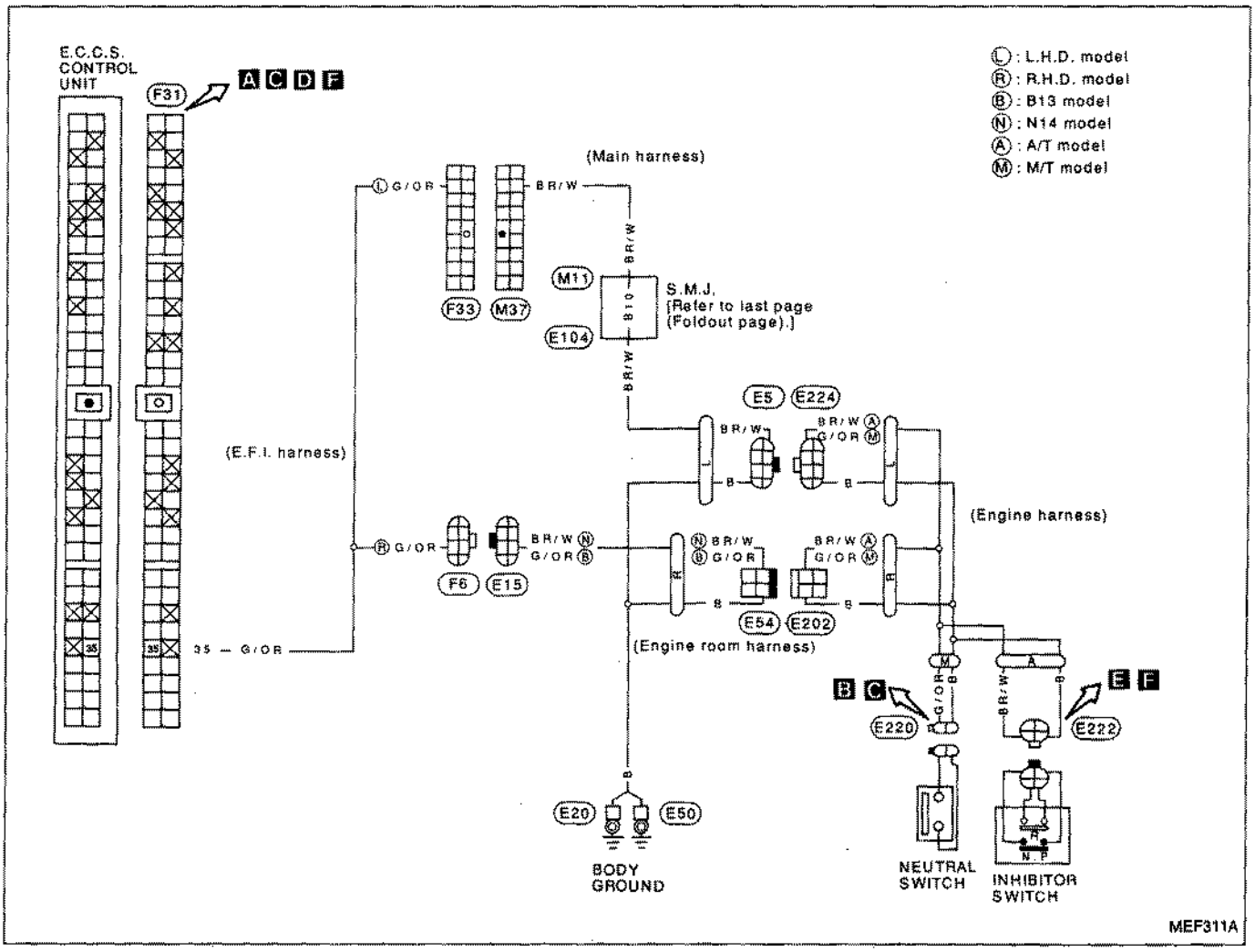
N.G. → Replace power steering oil pressure switch.

O.K.

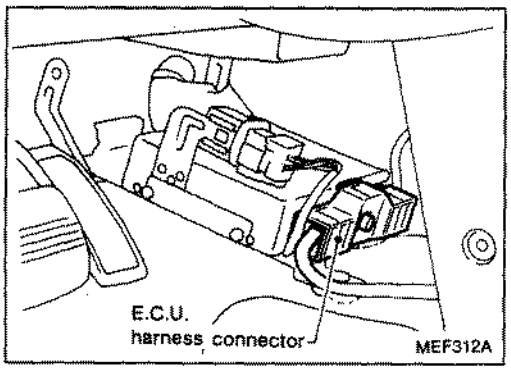
Check E.C.U. pin terminals for damage or the connection of the E.C.U. harness connector.

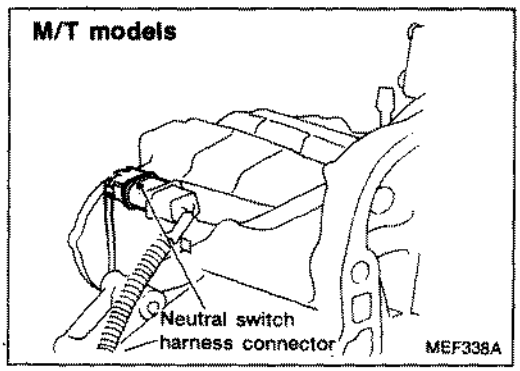
Diagnostic Procedure 37

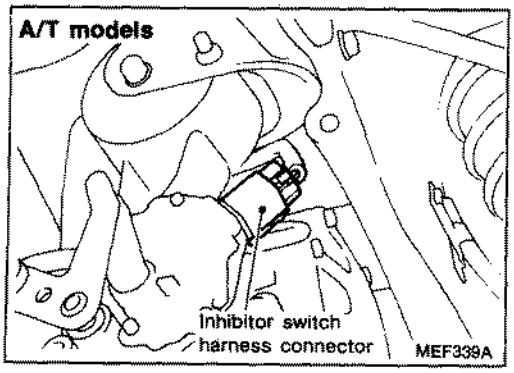
NEUTRAL/INHIBITOR SWITCH (Not self-diagnostic item)



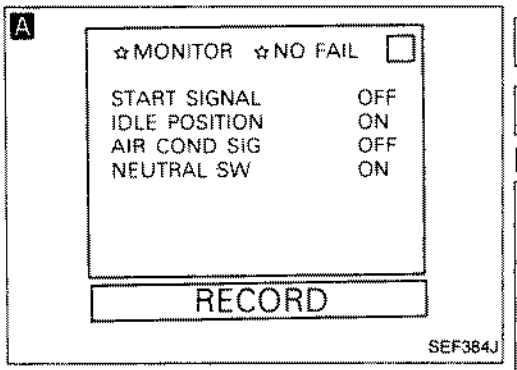
Harness layout

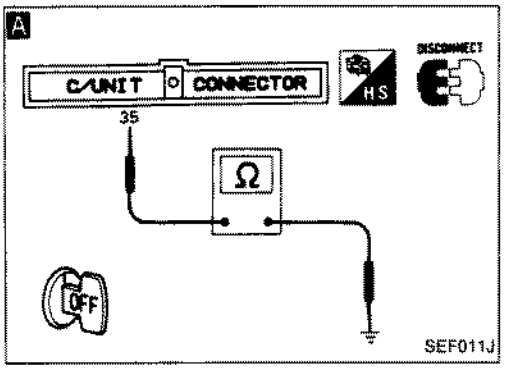


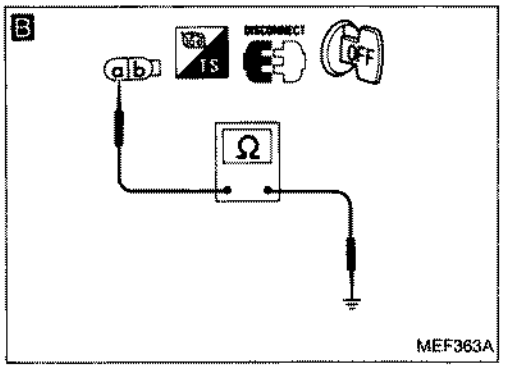


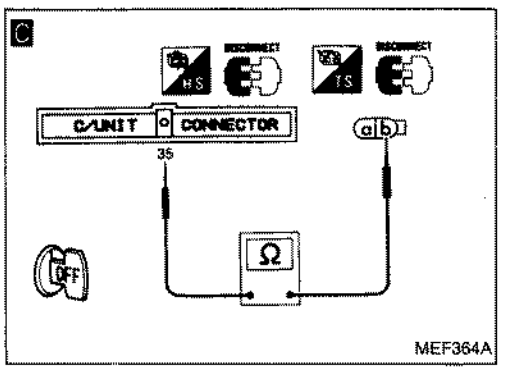


Diagnostic Procedure 37 (Cont'd)









Neutral switch

INSPECTION START

A

CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON".
2) Check neutral switch signal in "DATA MONITOR" mode with CONSULT.

Neutral position: ON
Except above: OFF

O.K. → INSPECTION END

OR

1) Set shift lever to the neutral position.
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (35) and body ground.

Continuity should exist.

N.G.

Turn ignition switch "OFF".

B

CHECK GROUND CIRCUIT.

1) Disconnect neutral switch harness connector.
2) Check harness continuity between terminal ⓐ and body ground.

Continuity should exist.

N.G. → Check the following.
- Harness connectors (E5), (E224) (L.H.D. models)
- Harness connectors (E54), (E282) (R.H.D. models)
- Harness continuity between neutral switch and body ground

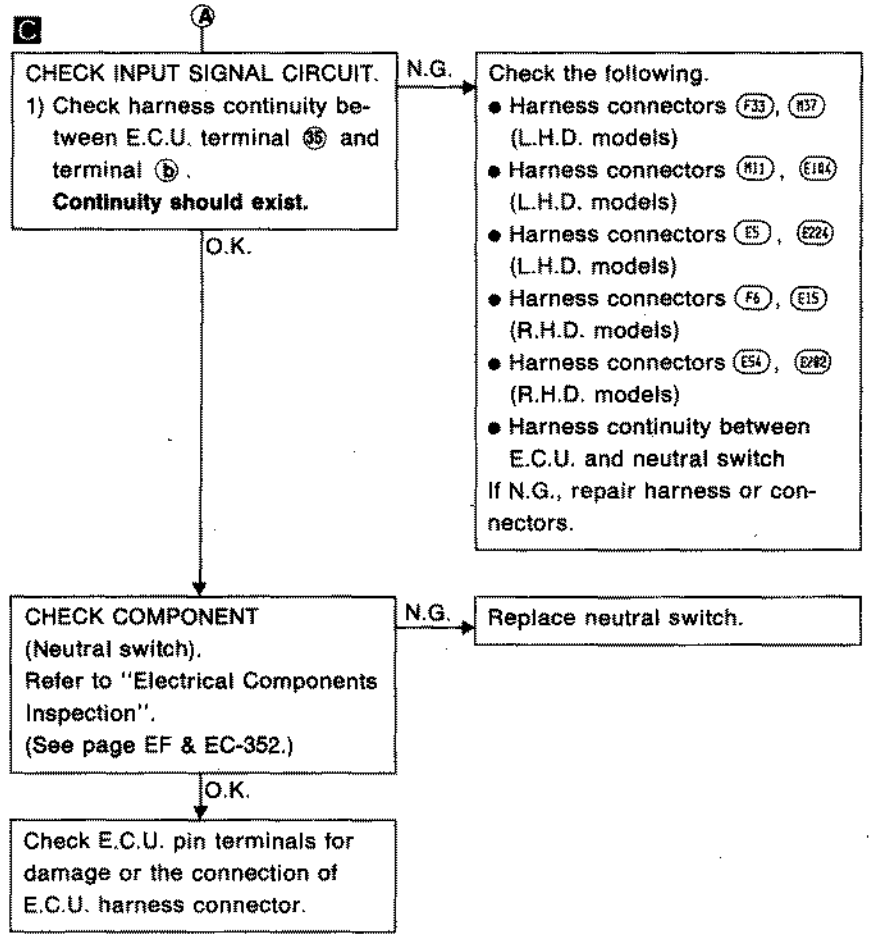
If N.G., repair harness or connectors.

O.K.

Disconnect E.C.U. harness connector.

Ⓐ

Diagnostic Procedure 37 (Cont'd)



Diagnostic Procedure 37 (Cont'd)

D

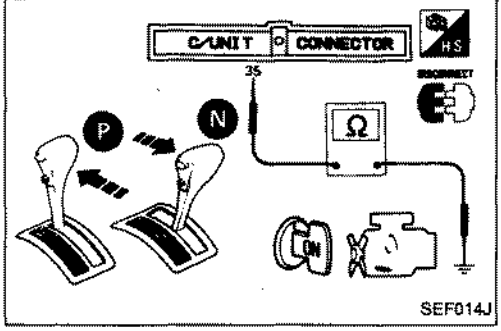
☆MONITOR ☆NO FAIL

START SIGNAL	OFF
IDLE POSITION	ON
AIR COND SIG	OFF
NEUTRAL SW	ON

RECORD

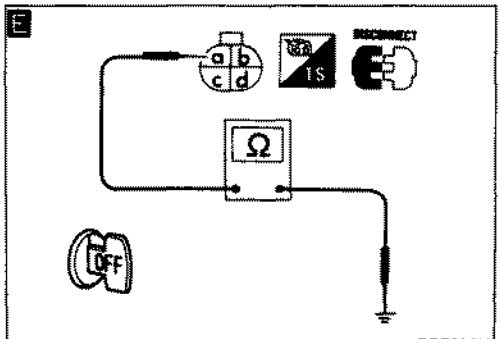
SEF384J

D



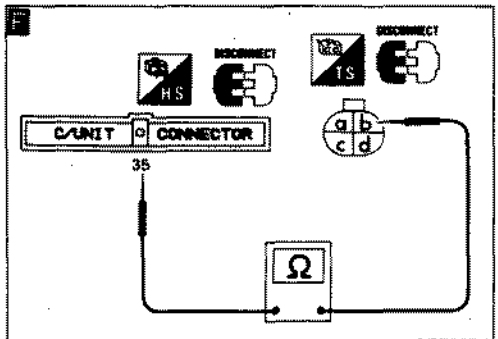
SEF014J

E



SEF286K

F



SEF287K

Inhibitor switch

INSPECTION START

D

CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON".
2) Check neutral switch signal in "DATA MONITOR" mode with CONSULT.
   "N" or "P": ON
   Except above: OFF

O.K. → INSPECTION END

OR

1) Shift selector lever to "P" range.
2) Disconnect E.C.U. harness connector.
3) Turn ignition switch "ON".
4) Check harness continuity between E.C.U. terminal ㉟ and body ground.
   Continuity should exist.
5) Shift selector lever to "N" range.
6) Check harness continuity between E.C.U. terminal ㊱ and body ground.
   Continuity should exist.

N.G.

E

CHECK GROUND CIRCUIT.

1) Turn ignition switch "OFF".
2) Disconnect inhibitor switch harness connector.
3) Check harness continuity between terminal ⓓ and body ground.
   Continuity should exist.

N.G. → Check the following.
- Harness connectors (E5), (E224) (L.H.D. models)
- Harness connectors (E54), (E282) (R.H.D. models)
- Harness continuity between inhibitor switch and body ground

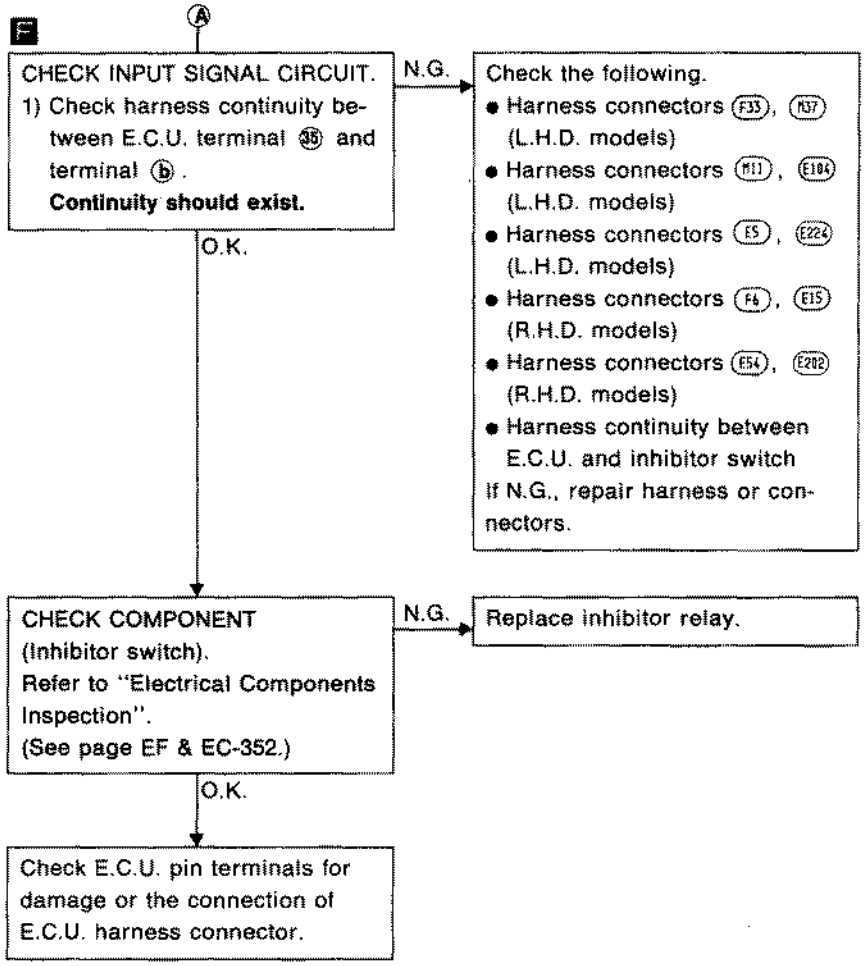
If N.G., repair harness or connectors.

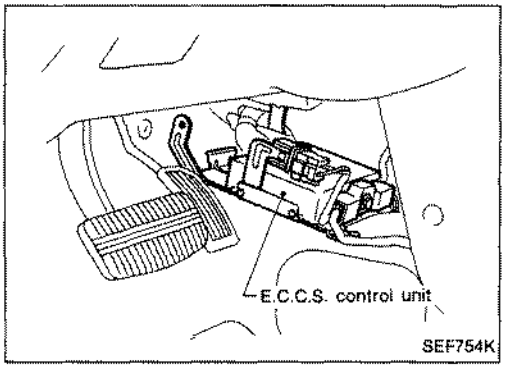
O.K.

Disconnect E.C.U. harness connector.

Ⓐ

Diagnostic Procedure 37 (Cont'd)

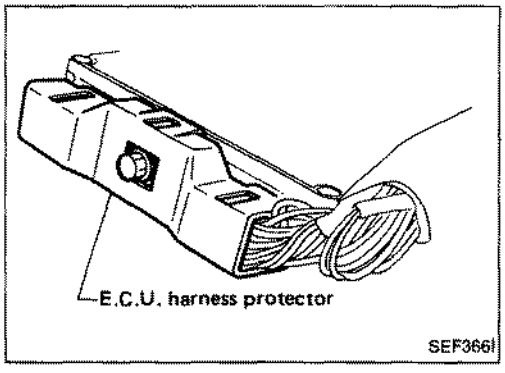




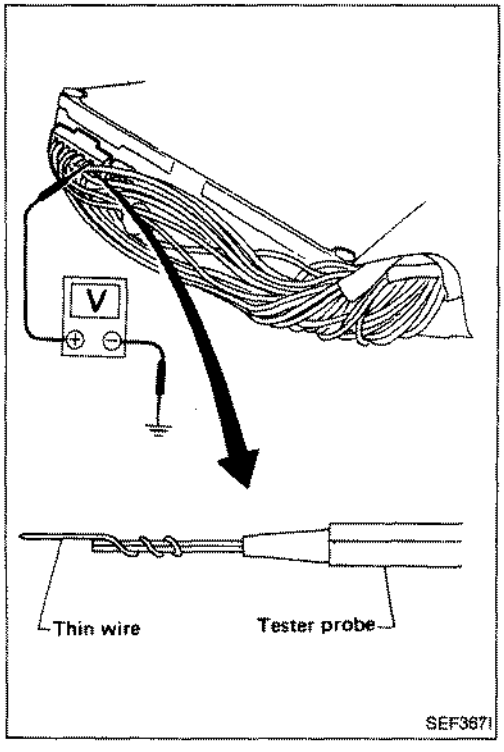
Electrical Components Inspection

E.C.U. INPUT/OUTPUT SIGNAL INSPECTION

1. E.C.U. is located behind the center console panel. For this inspection, remove the center console under cover.



2. Remove E.C.U. harness protector.



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

Electrical Components Inspection (Cont'd)

E.C.U. inspection table

*Date are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
1	Ignition signal	Engine is running. └ Idle speed	0.3 - 0.5V
		Engine is running. └Engine speed is 2,000 rpm	Approximately 0.9V
3	Ignition check	Engine is running. └Idle speed	Approximately 13V
4	E.C.C.S. relay (Self-shutoff)	Engine is running. Ignition switch "OFF" └For approximately 5 seconds after turning ignition switch "OFF"	0 - 1V
		Ignition switch "OFF" └Approximately 5 seconds after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
9	Radiator fan relay	Engine is running. └Radiator fan is not operating.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └Radiator fan is operating.	Approximately 0V
11	Air conditioner relay	Engine is running. └Both A/C switch and blower switch are "ON".	Approximately 0V
		Engine is running └A/C switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
16	Air flow meter	Engine is running.	0.7 - 3.0V Output voltage varies with engine revolution.
18	Engine temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with engine water temperature.
20	Throttle sensor	Ignition switch "ON"	0.5 - Approximately 5V Output voltage varies with the throttle valve opening angle.
22 30	Crank angle sensor (Reference signal)	Engine is running. └**Do not run engine at high speed under no-load.**	0.2 - 1.3V

Electrical Components Inspection (Cont'd)

*Date are reference values.

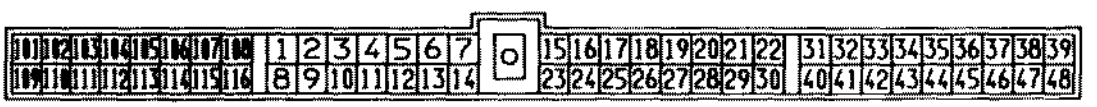
TER-MINAL NO.	ITEM	CONDITION	*DATA
31 40	Crank angle sensor (Position signal)	Engine is running. └**Do not run engine at high speed under no-load.**	2.0 - 3.0V
34	Start signal	Ignition switch "ON"	Approximately 0V
		Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
35	Neutral switch	Ignition switch "ON" └Neutral	0V
		Ignition switch "ON" └Except the above gear position	Approximately 5V
36	Ignition switch	Ignition switch "OFF"	0V
		Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
37	Throttle sensor power supply	Ignition switch "ON"	Approximately 5V
38 47	Power supply for E.C.U.	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
41	Air conditioner switch	Engine is running. └Both air conditioner switch and blower switch are "ON".	Approximately 0V
		Engine is running. └Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
43	Power steering oil pressure switch	Engine is running. └Steering wheel is being turned.	0V
		Engine is running. └Steering wheel is not being turned.	Approximately 5V
45	Fan switch	Engine is running. └Fan switch is "ON".	Approximately 0V
		Engine is running. └Fan switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
46	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)

Electrical Components Inspection (Cont'd)

*Date are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
101	Injector No. 1	Engine is running	BATTERY VOLTAGE (11 - 14V)
103	Injector No. 3		
110	Injector No. 2		
112	Injector No. 4		
104	Fuel pump relay	Ignition switch "ON" └For 5 seconds after turning ignition switch "ON" Engine is running.	Approximately 0V
		Ignition switch "ON" └5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
113	A.A.C. valve	Engine is running. └Idle speed	9 - 14V
		Engine is running. -Steering wheel is being turned. -Air conditioner is operating. -Rear defogger is "ON". └Headlamp are in high position.	5 - 9V

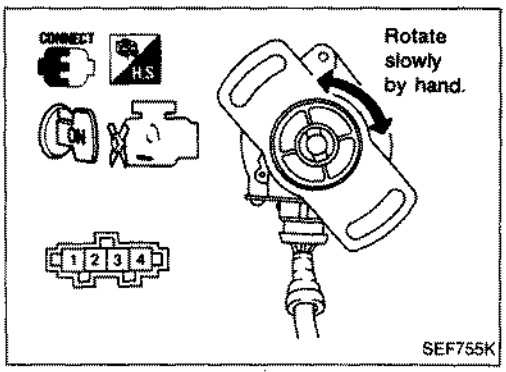
E.C.U. HARNESS CONNECTOR TERMINAL LAYOUT





SEF419H

Electrical Components Inspection (Cont'd)

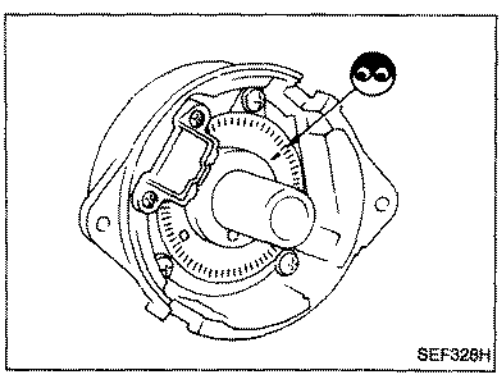


CRANK ANGLE SENSOR

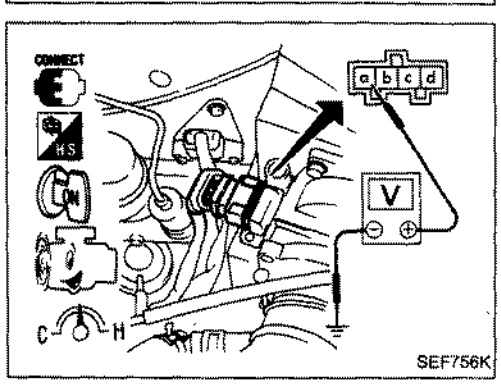
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch "ON".
4. Rotate distributor shaft slowly by hand and check voltage between terminals ②, ① and ground.

Terminal	Voltage
① (180° signal)	Tester's pointer fluctuates between 5V and 0V.
② (1° signal)	

If N.G., replace distributor assembly with crank angle sensor.



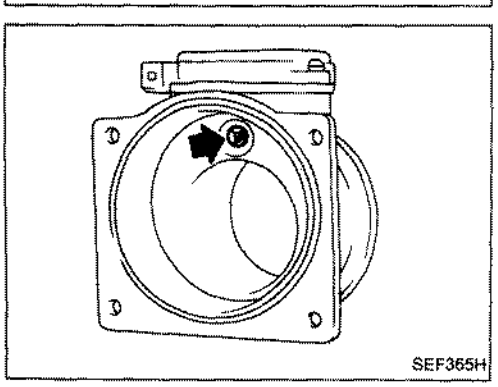
5. Visually check signal plate for damage or dust.



AIR FLOW METER

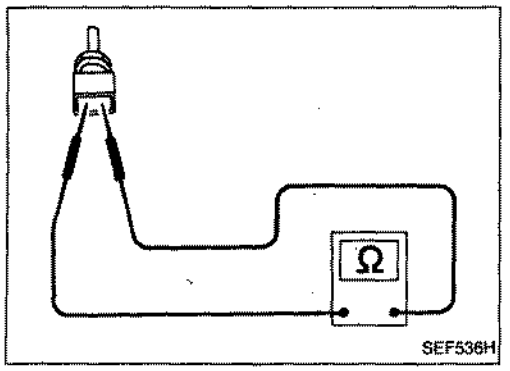
1. Peel air flow meter harness connector rubber as shown in the figure if the harness connector is connected.
2. Turn ignition switch "ON".
3. Start engine and warm it up sufficiently.
4. Check voltage between terminal ⓖ and ground.

Conditions	Voltage V
Ignition switch "ON" (Engine stopped.)	Less than 1.0
Idle (Engine is warm-up sufficiently.)	0.7 - 1.1



5. If N.G., remove air flow meter from air duct. Check hot wire for damage or dust.

Electrical Components Inspection (Cont'd)

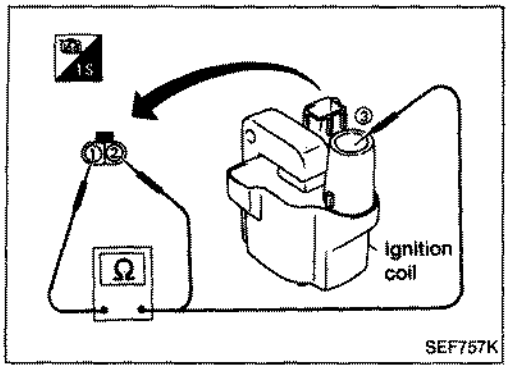


ENGINE TEMPERATURE SENSOR

1. Disconnect engine temperature sensor harness connector.
2. Check resistance as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
90 (194)	0.24 - 0.26
110 (230)	0.14 - 0.15

If N.G., replace engine temperature sensor.

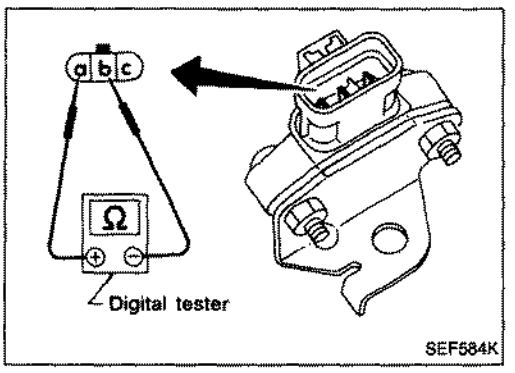


IGNITION COIL

1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.

Terminal	Resistance
① - ②	Approximately 0.9 Ω
① - ③	Approximately 13.0 kΩ

If N.G., replace ignition coil.



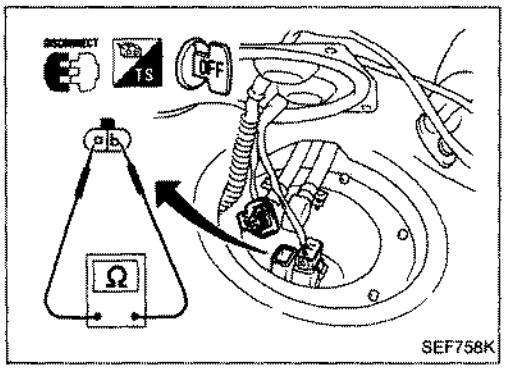
POWER TRANSISTOR

1. Disconnect power transistor harness connector.
2. Check power transistor continuity between terminals with a digital tester as shown in the figure.

⊖terminal side / ⊕terminal side	Terminal ⓐ		Terminal ⓑ		Terminal ⓒ	
	Resistance Ω	Result	Resistance Ω	Result	Resistance Ω	Result
Terminal ⓐ	—	—	∞	O.K.	∞	O.K.
	—	—	Not ∞ or 0	N.G.	Not ∞ or 0	N.G.
	—	—	0	N.G.	0	N.G.
Terminal ⓑ	∞	N.G.	—	—	∞	N.G.
	Not ∞ or 0	O.K.	—	—	Not ∞ or 0	O.K.
	0	N.G.	—	—	0	N.G.
Terminal ⓒ	∞	N.G.	∞	N.G.	—	—
	Not ∞ or 0	O.K.	Not ∞ or 0	O.K.	—	—
	0	N.G.	0	N.G.	—	—

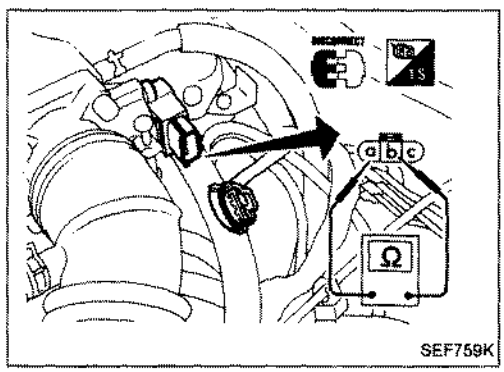
If N.G., replace power transistor.

Electrical Components Inspection (Cont'd)



FUEL PUMP

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ⓐ and ⓑ.
   Resistance: Approximately 0.7Ω
   If N.G., replace fuel pump.



THROTTLE SENSOR

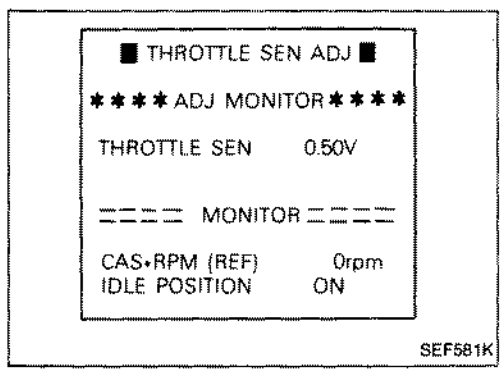
1. Disconnect throttle sensor harness connector.
2. Make sure that resistance between terminals ⓐ and ⓑ changes when opening throttle valve manually.

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 0.5
Partially released	0.5 - 4
Completely depressed	Approximately 4

If N.G., replace throttle sensor.

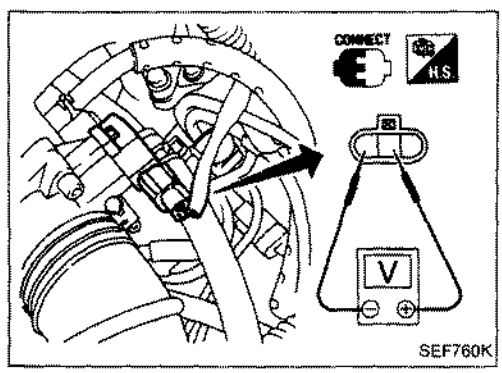
Adjustment

If throttle sensor is replaced or removed, it is necessary to install in proper position, by following the procedure as shown below:



1. Install throttle sensor body in throttle chamber. Do not tighten bolts. Leave bolts loose.
2. Connect throttle sensor and idle switch harness connector.
3. Start engine and warm it up sufficiently.
4. Perform "THROTTLE SEN ADJ" in "WORK SUPPORT" mode.

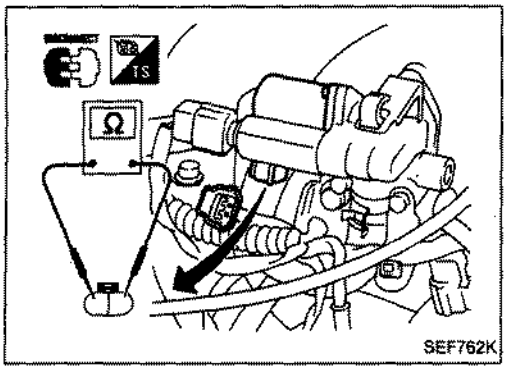
   Measure output voltage of throttle sensor using voltmeter.



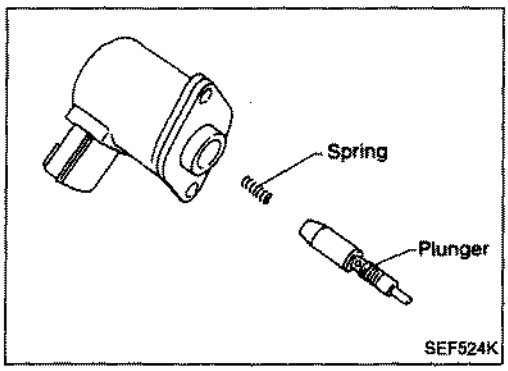
5. Adjust by rotating throttle sensor body so that output voltage is 0.45 to 0.55V.
6. Tighten mounting bolts.
7. Disconnect throttle sensor harness connector for a few seconds and then reconnect it.

Electrical Components Inspection (Cont'd)

A.A.C. VALVE

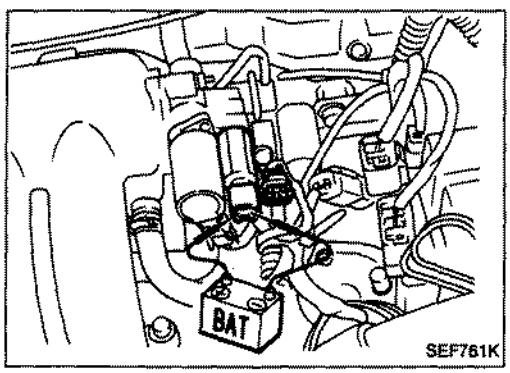


- Check A.A.C. valve resistance.
  Resistance:
  Approximately 10Ω

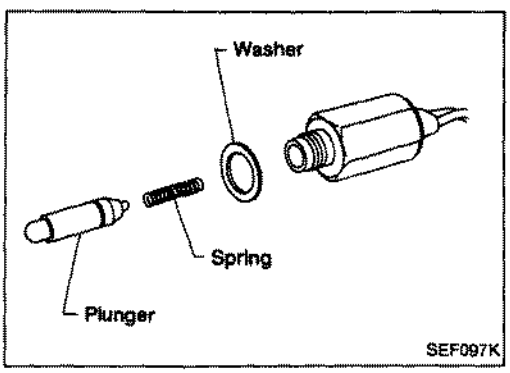


- Check plunger for seizing or sticking.
- Check for broken spring.

F.I.C.D. SOLENOID VALVE

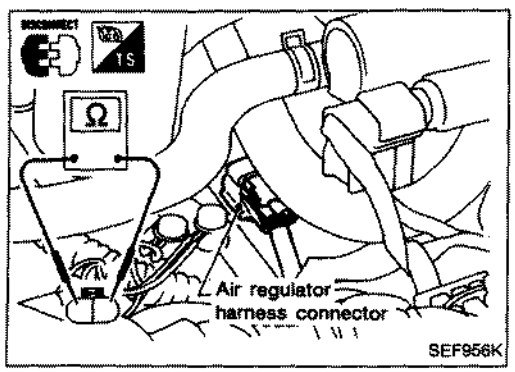


- Check for clicking sound when applying 12V direct current to terminals.



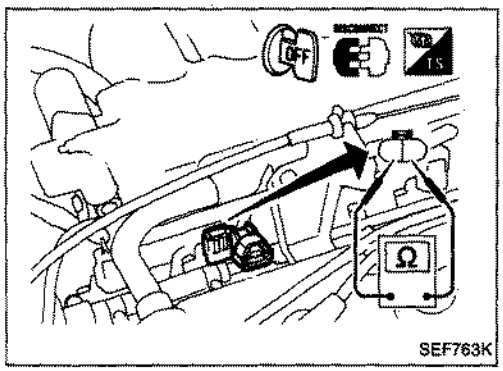
- Check plunger for seizing or sticking.
- Check for broken spring.

AIR REGULATOR



- Check air regulator resistance.
  Resistance:
  Approximately 70 - 80Ω
- Check air regulator for clogging.

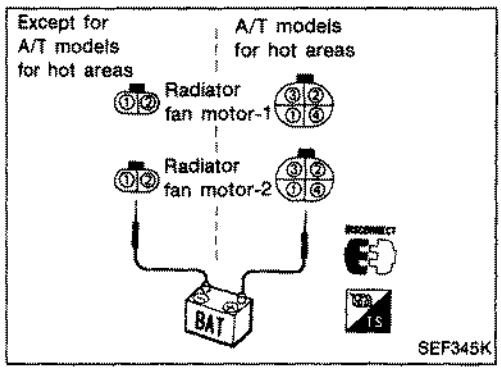
Electrical Components Inspection (Cont'd)



INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.
   Resistance: Approximately 10Ω

If N.G., replace injector.

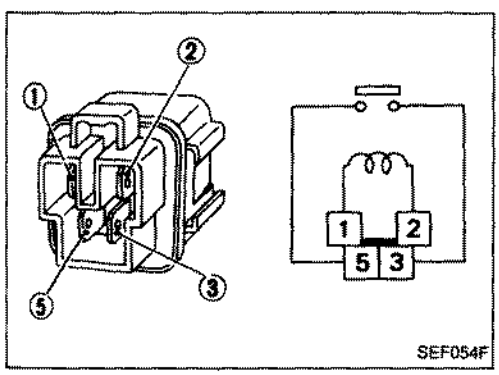


RADIATOR FAN MOTOR

Disconnect radiator fan motor harness connectors and supply radiator fan motor terminals with battery voltage.

Supply battery voltage		Radiator fan operation	Remarks
⊕	⊖		
②	①	Low speed	A/T models for hot areas
②	①	Low speed	Except for above
② ③	① ④	High speed	

If N.G., replace radiator fan motor.

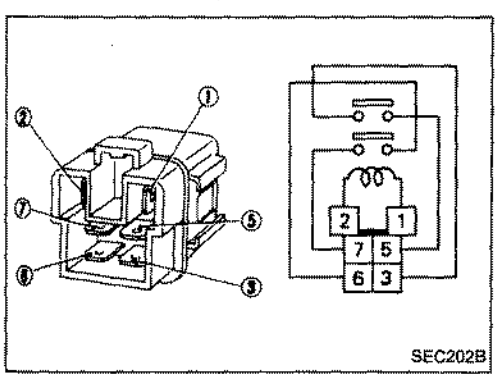


E.C.C.S. RELAY, RADIATOR FAN RELAY-1 AND FUEL PUMP RELAY

Check continuity between terminals ③ and ⑤.

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

If N.G., replace relay.



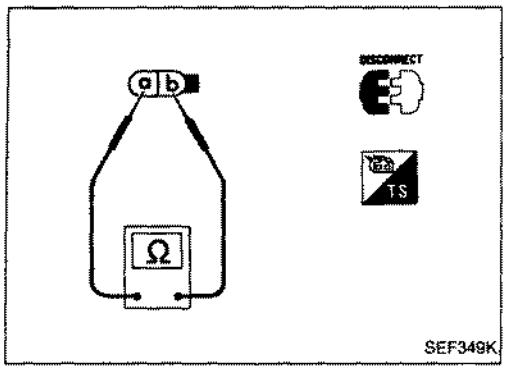
RADIATOR FAN RELAY-2

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

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

If N.G., replace relay.

Electrical Components Inspection (Cont'd)

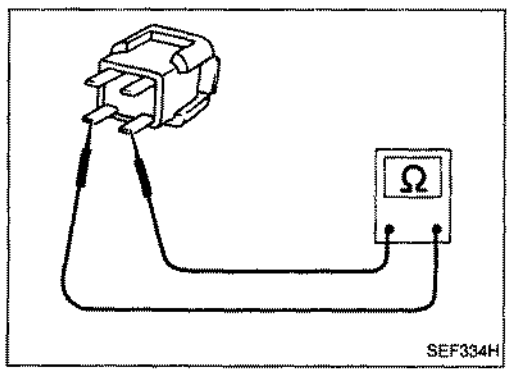


NEUTRAL SWITCH

Check continuity between terminals ⓐ and ⓑ.

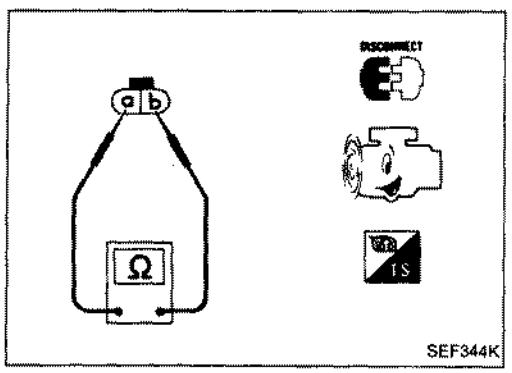
Conditions	Continuity
Shift to Neutral	Yes
Shift to other position	No

If N.G., replace relay.



RESISTOR

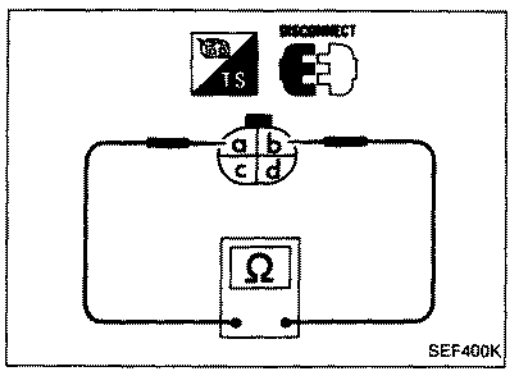
1. Disconnect resistor harness connector.
2. Check resistance between terminals ⓐ and ⓑ.
   Resistance: Approximately 2.2kΩ
   If N.G., replace resistor.



POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector.
2. Start engine.
3. Check continuity between terminals ⓐ and ⓑ.

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

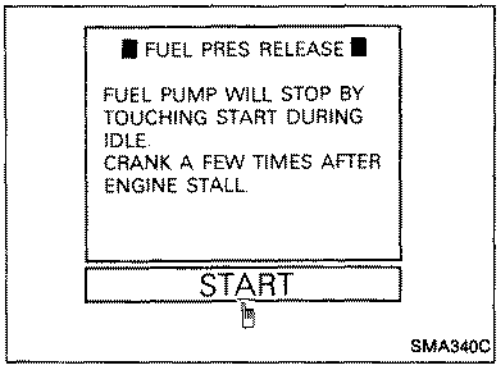


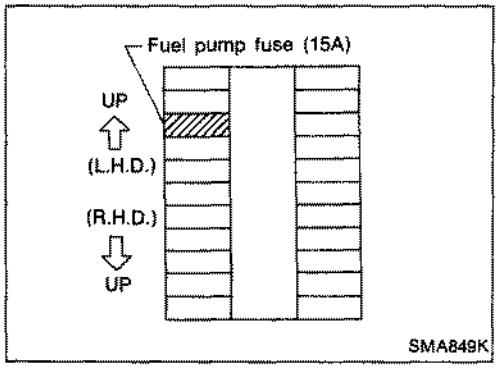
INHIBITOR SWITCH

Check continuity between terminals ⓐ and ⓑ.

Conditions	Continuity
Shift to "P" position	Yes
Shift to "N" position	Yes
Shift to position other than "P" and "N"	No

If N.G., replace inhibitor switch.





Releasing Fuel Pressure

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

1. Turn ignition switch "ON".
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 off.

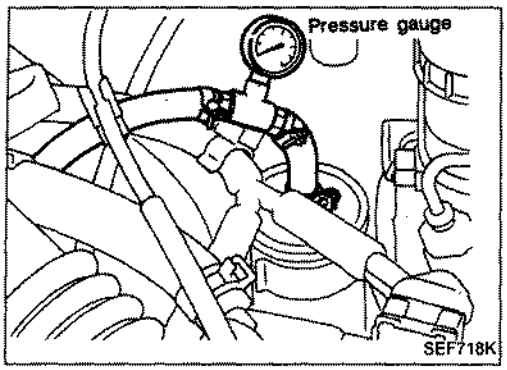
1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and reconnect fuel pump relay.

Fuel Pressure Check

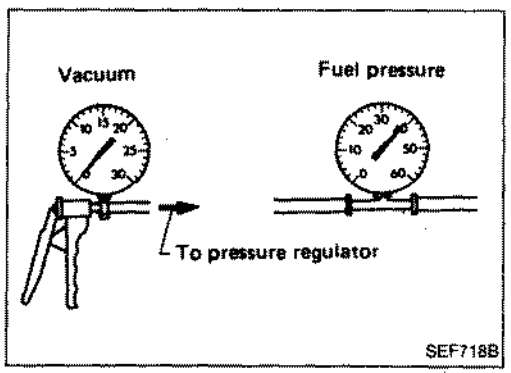
a. When reconnecting fuel line, always use new clamps.
b. Make sure that clamp screw does not contact adjacent parts.
c. Use a torque driver to tighten clamps.
d. Use Pressure Gauge to check fuel pressure.
e. Do not perform fuel pressure check while fuel pressure regulator control system is operating; otherwise, fuel pressure gauge might indicate incorrect 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.

Fuel Pressure Check (Cont'd)



5. Read the indication of fuel pressure gauge.
   At idling:
   When fuel pressure regulator valve vacuum hose is connected.
   Approximately 245 kPa (2.45 bar, 2.5 kg/cm^2, 36 psi)
   When fuel pressure regulator valve vacuum hose is disconnected.
   Approximately 294 kPa (2.94 bar, 3.0 kg/cm^2, 43 psi)
6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
7. Plug intake manifold with a rubber cap.
8. Connect variable vacuum source to fuel pressure regulator.

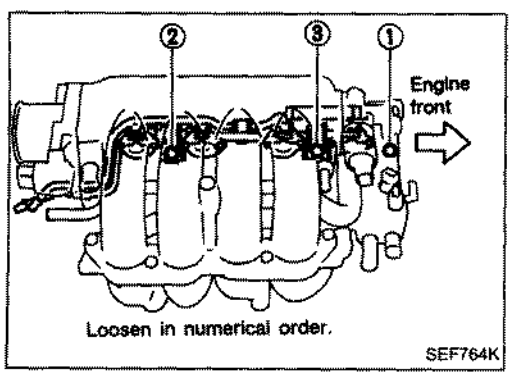


9. Start engine and read indication of fuel pressure gauge as vacuum is changed.

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

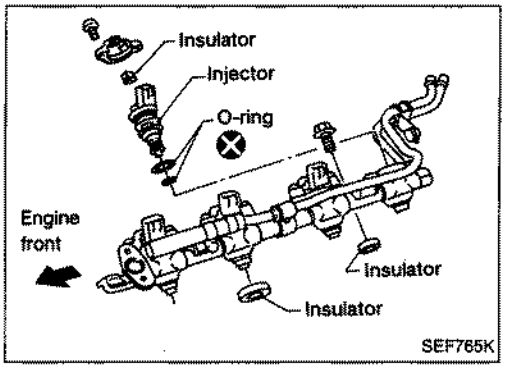
Injector Removal and Installation

1. Release fuel pressure to zero.
2. Disconnect injector harness connectors.
3. Disconnect vacuum hose from pressure regulator.
4. Disconnect fuel hoses from fuel tube assembly.



5. Remove injectors with fuel tube assembly.

Injector Removal and Installation (Cont'd)

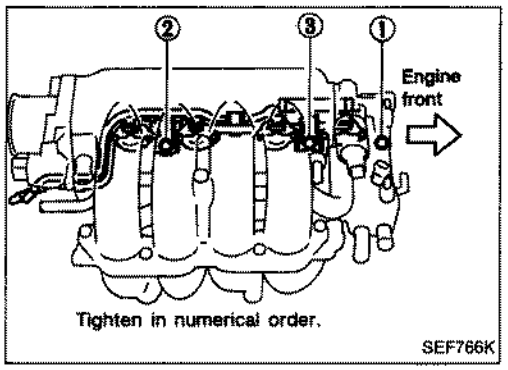


6. Push out any malfunctioning injector from fuel tube assembly.

Do not extract injector by pinching connector.

7. Replace or clean injector as necessary.
8. Install injector to fuel tube assembly.

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



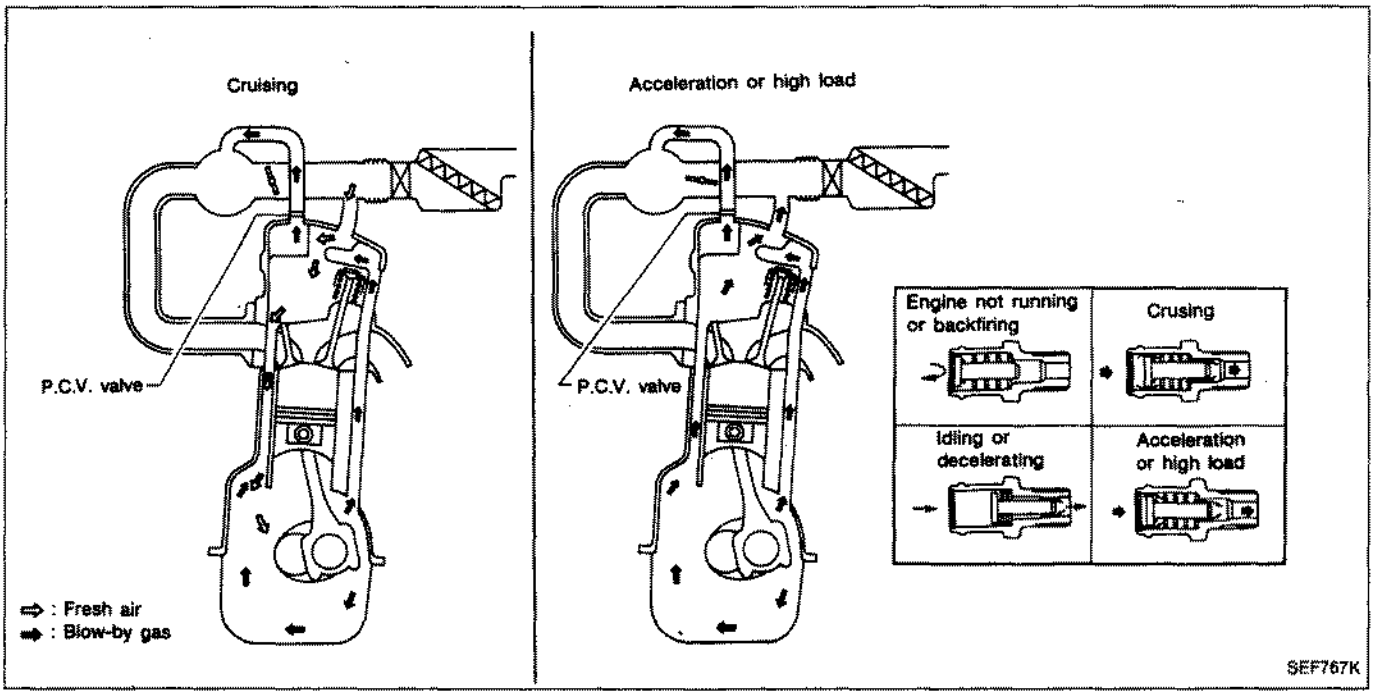
9. Install injectors with fuel tube assembly to intake manifold. Tighten fuel tube bolts to the specified torque.
   Tightening procedure:
   1) **Tighten all bolts to 9.3 to 10.8 N·m (0.95 to 1.1 kg-m, 6.9 to 8.0 ft-lb).**
   2) **Tighten all bolts to 16 to 21 N·m (1.6 to 2.1 kg-m, 12 - 15 ft-lb).**
10. Install fuel tubes to fuel tube assembly.

Lubricate fuel tubes with a smear of silicone oil.

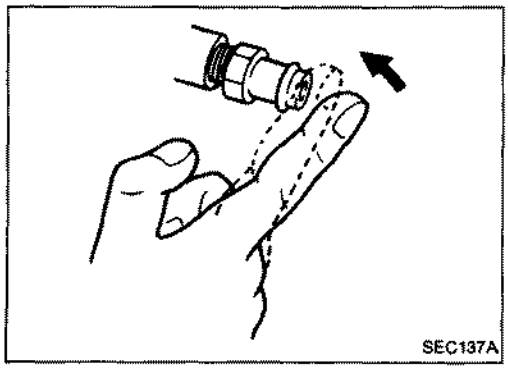
11. Reinstall any parts removed in reverse order of removal.

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

Description



This system returns blow-by gas to both the intake manifold and air inlet tubes.
The positive crankcase ventilation (P.C.V.) 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 P.C.V. 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 inlet tubes, through the hose connecting air inlet tubes to rocker cover, into the crankcase.
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.
On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air inlet tubes under all conditions.

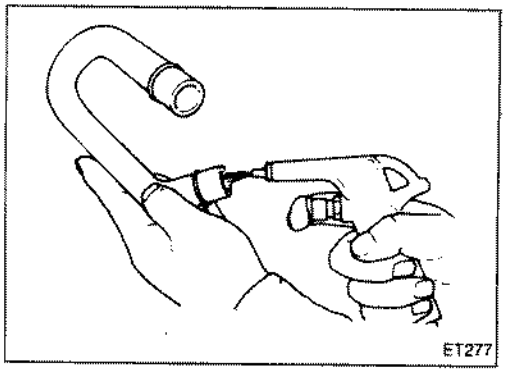


Inspection

P.C.V. (Positive Crankcase Ventilation)

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

Inspection (Cont'd)



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.

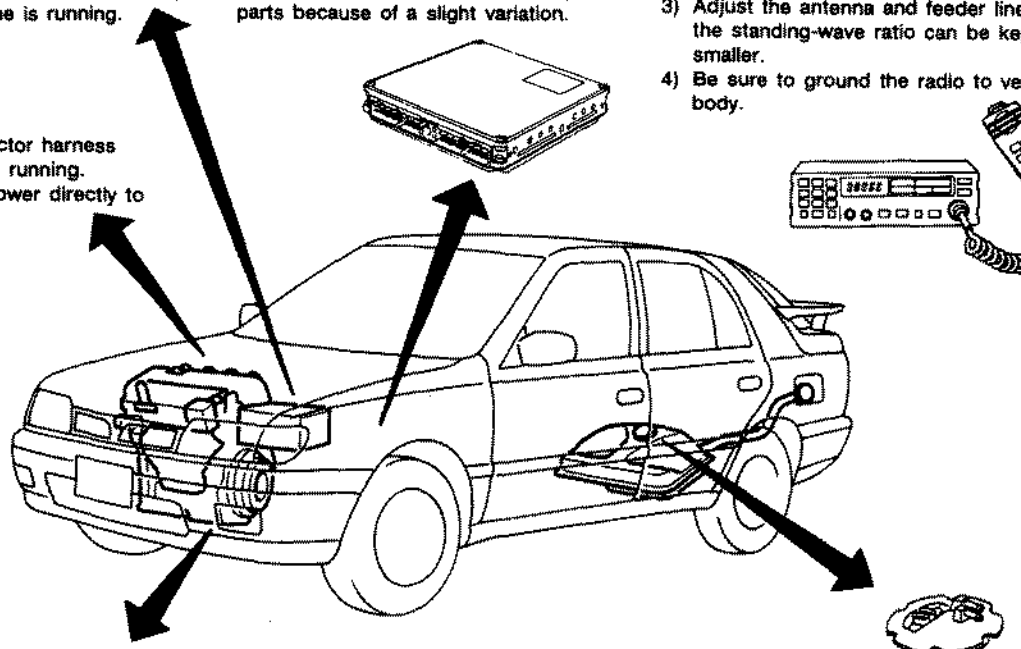
Engine Fuel & Emission Control System

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

INJECTOR
- Do not disconnect injector harness connectors with engine running.
- Do not apply battery power directly to injectors.

E.C.C.S. PARTS HANDLING
- Handle air flow meter carefully to avoid damage.
- Do not disassemble air flow meter.
- Do not clean air flow meter with any type of detergent.
- Do not disassemble auxiliary air control valve.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the crank angle sensor.

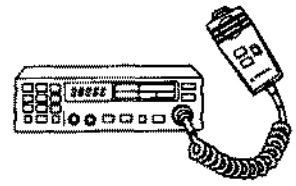
E.C.U.
- Do not disassemble E.C.C.S. control unit (E.C.U.).
- Do not turn diagnosis mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ROM value. The E.C.C.S. will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.



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

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

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



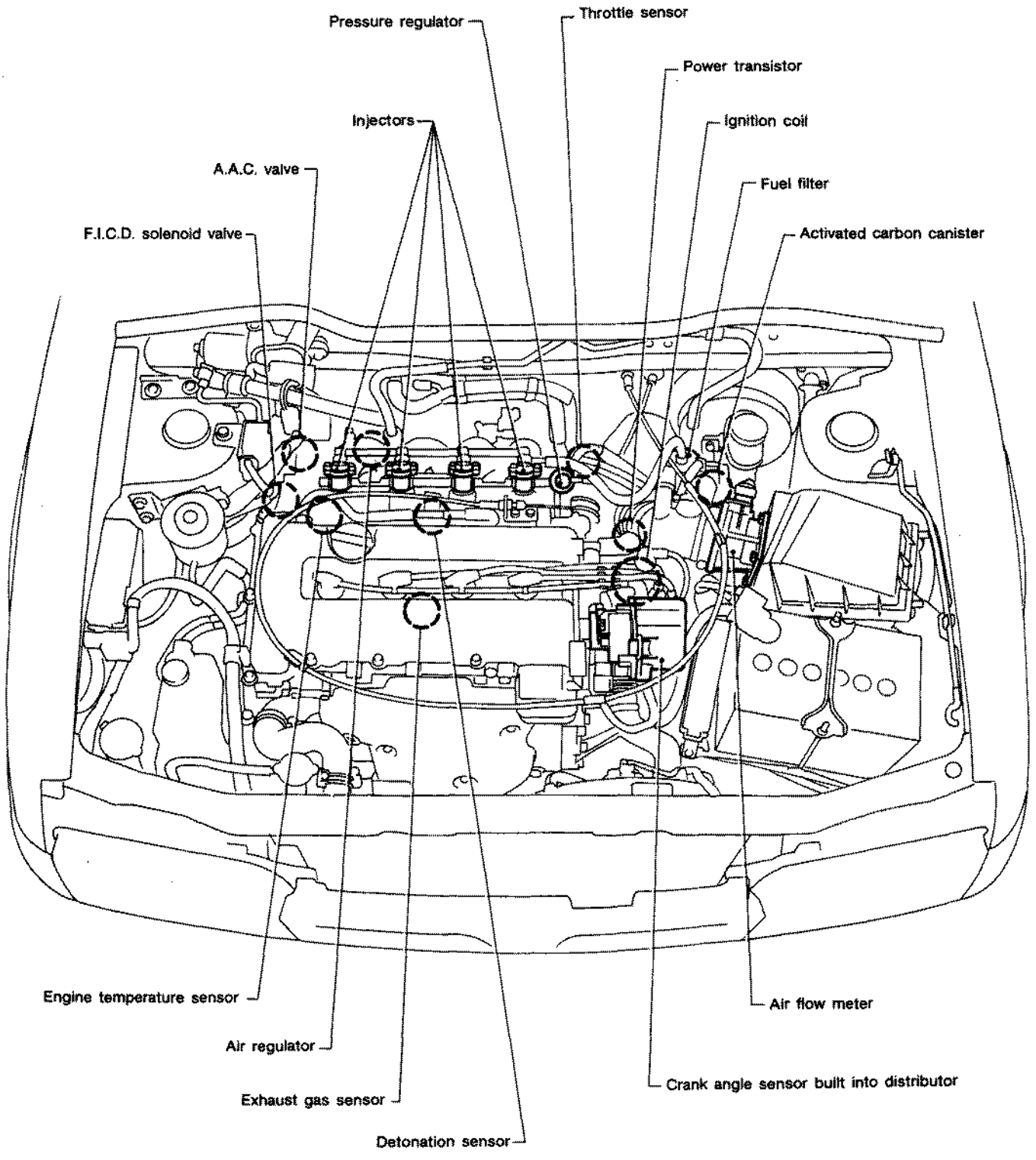
FUEL PUMP
- Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.

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

SEF315L

E.C.C.S. Component Parts Location

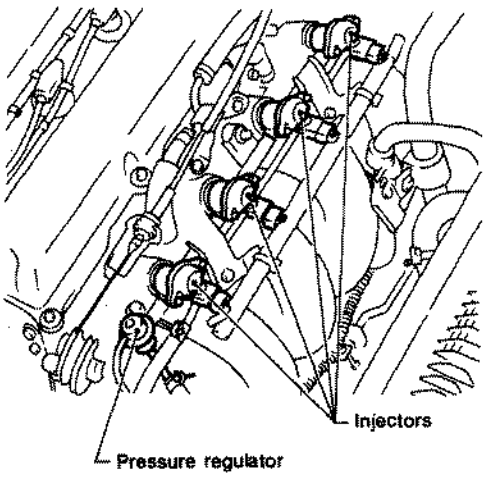
SR20DE

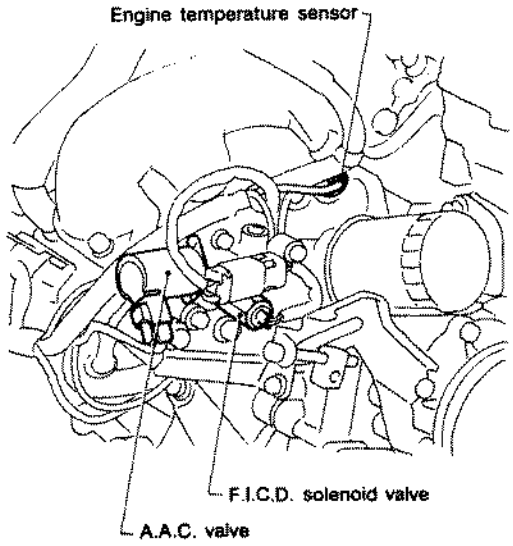


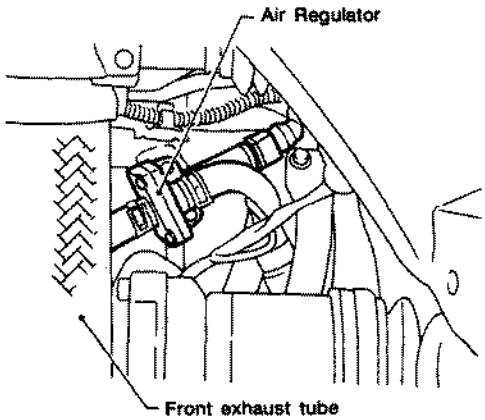
SEF270L

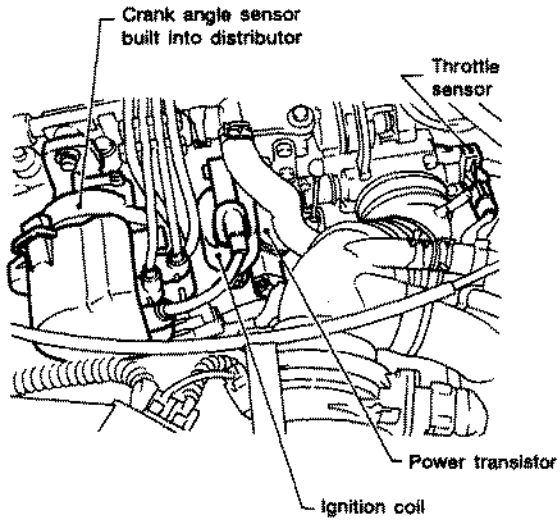
E.C.C.S. Component Parts Location (Cont'd)

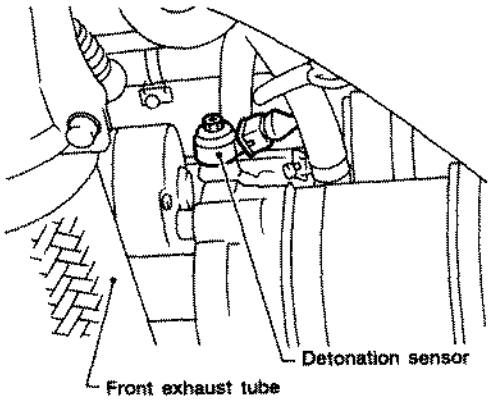
SR20DE

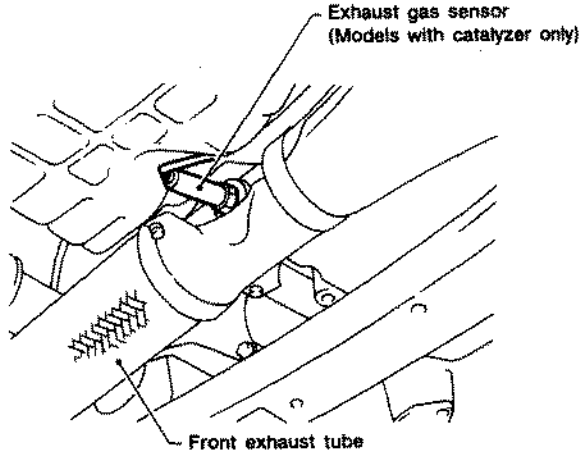








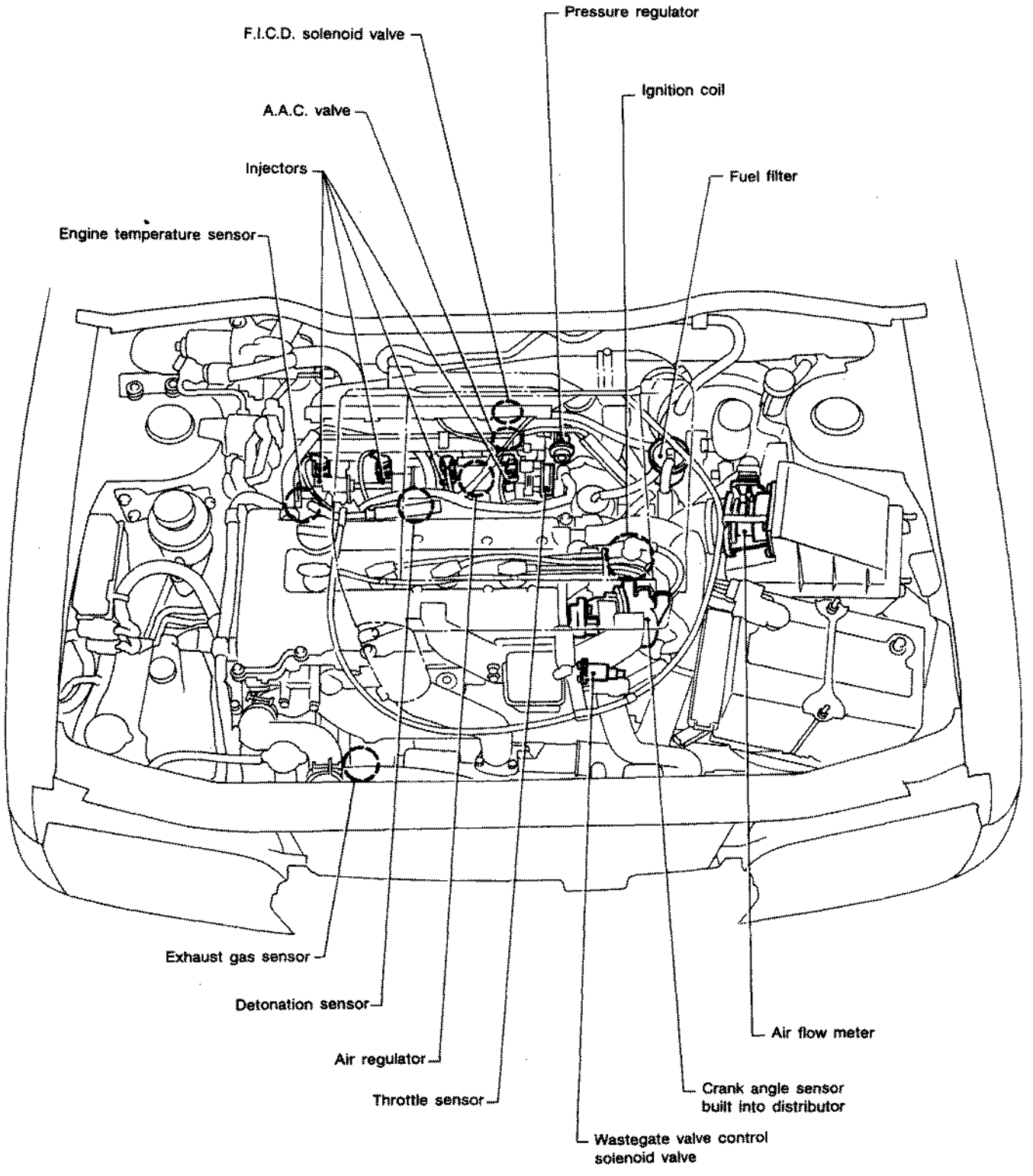




SEF271L

E.C.C.S. Component Parts Location (Cont'd)

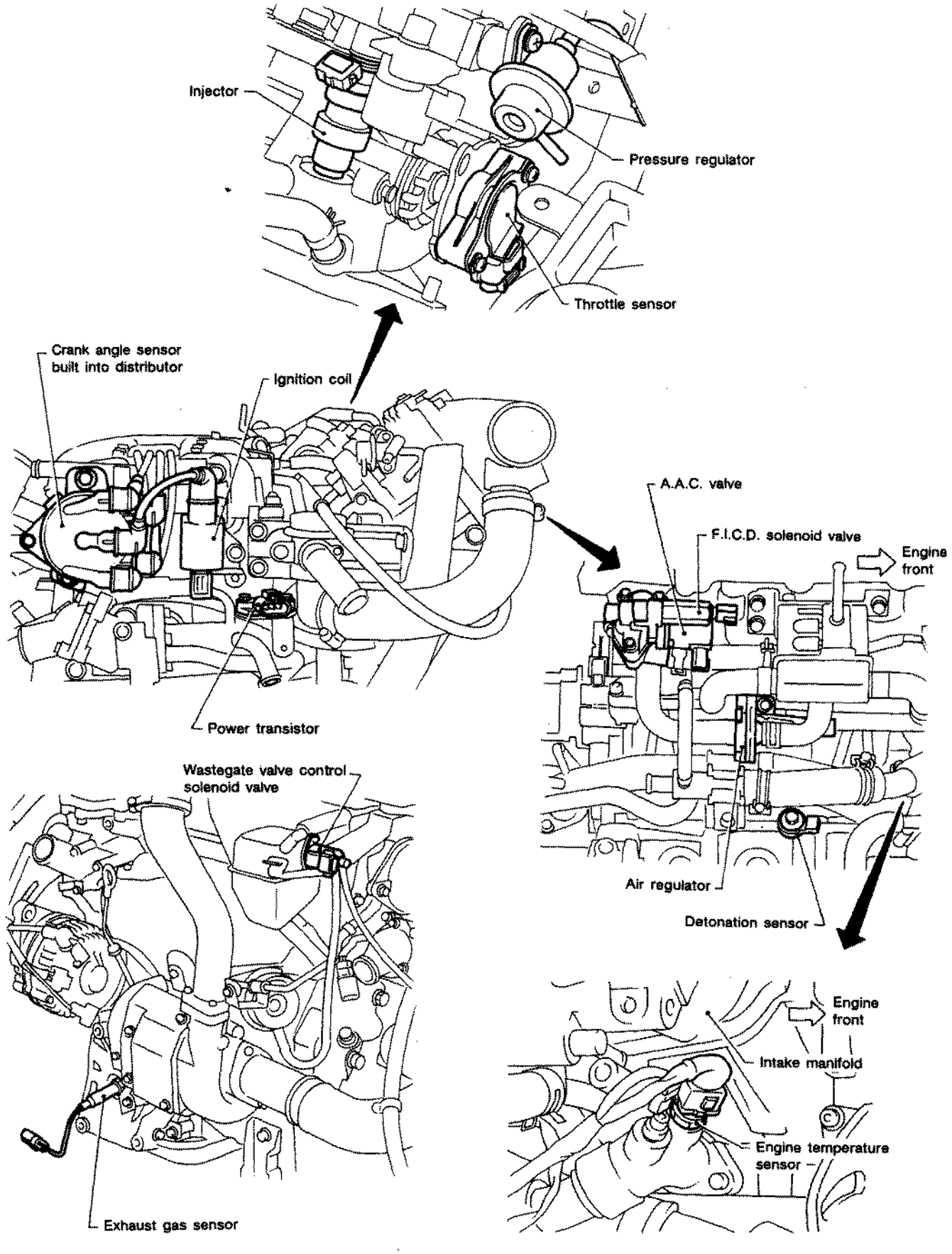
SR20DET



SEF258L

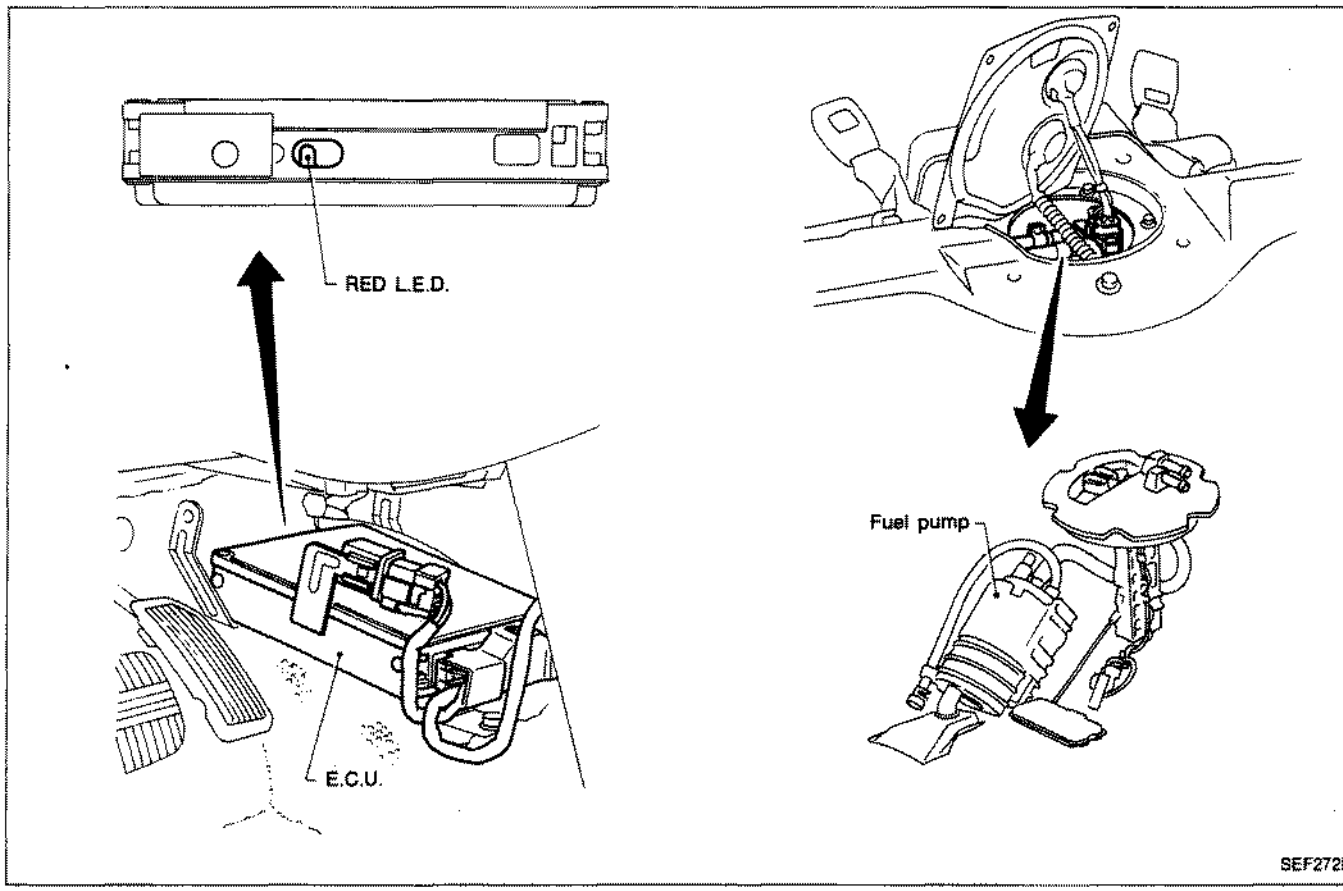
E.C.C.S. Component Parts Location (Cont'd)

SR20DET



SEF259L

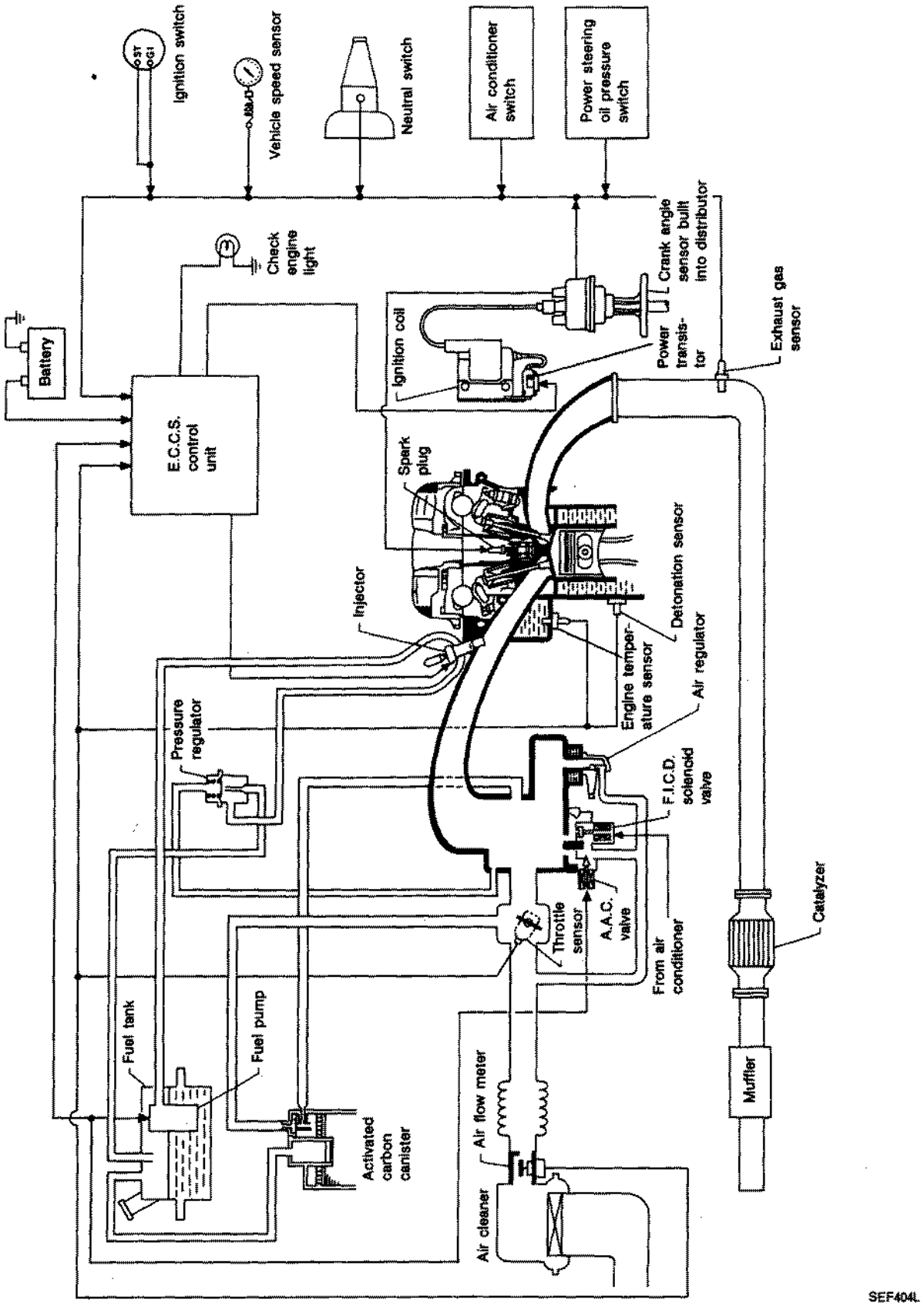
E.C.C.S. Component Parts Location (Cont'd)



System Diagram

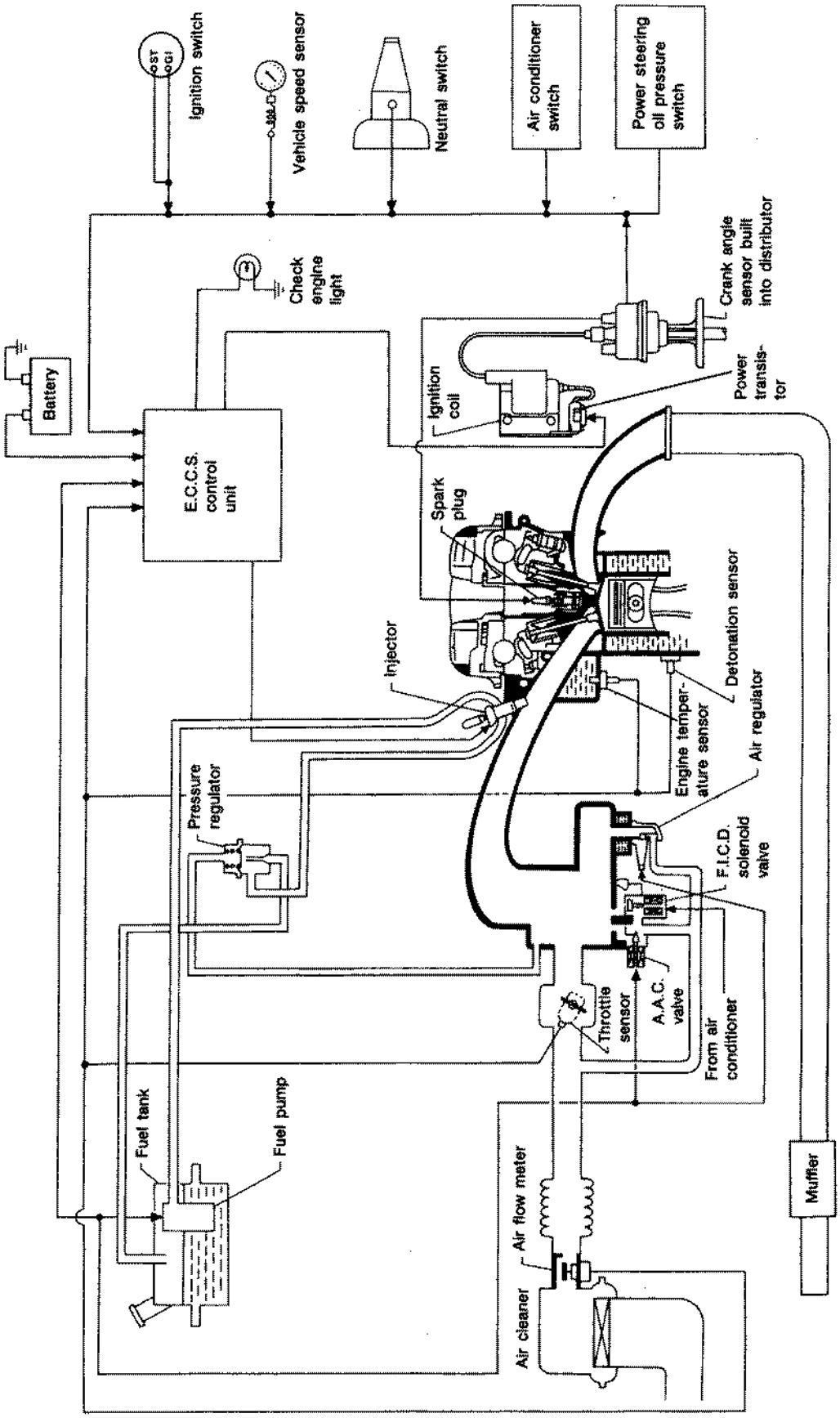
SR20DE

Models with catalyzer



System Diagram (Cont'd)

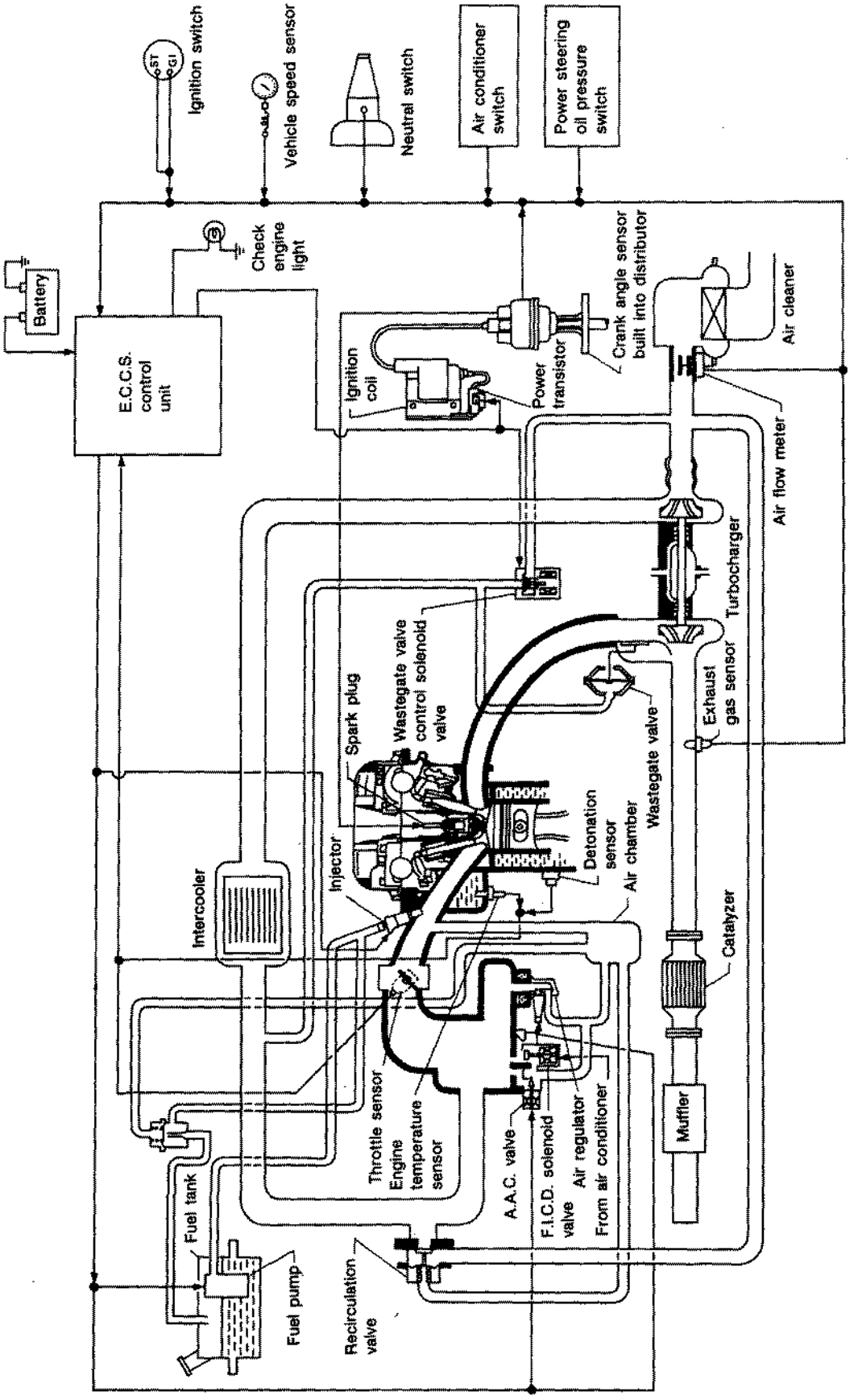
Models without catalyzer



SEF405L

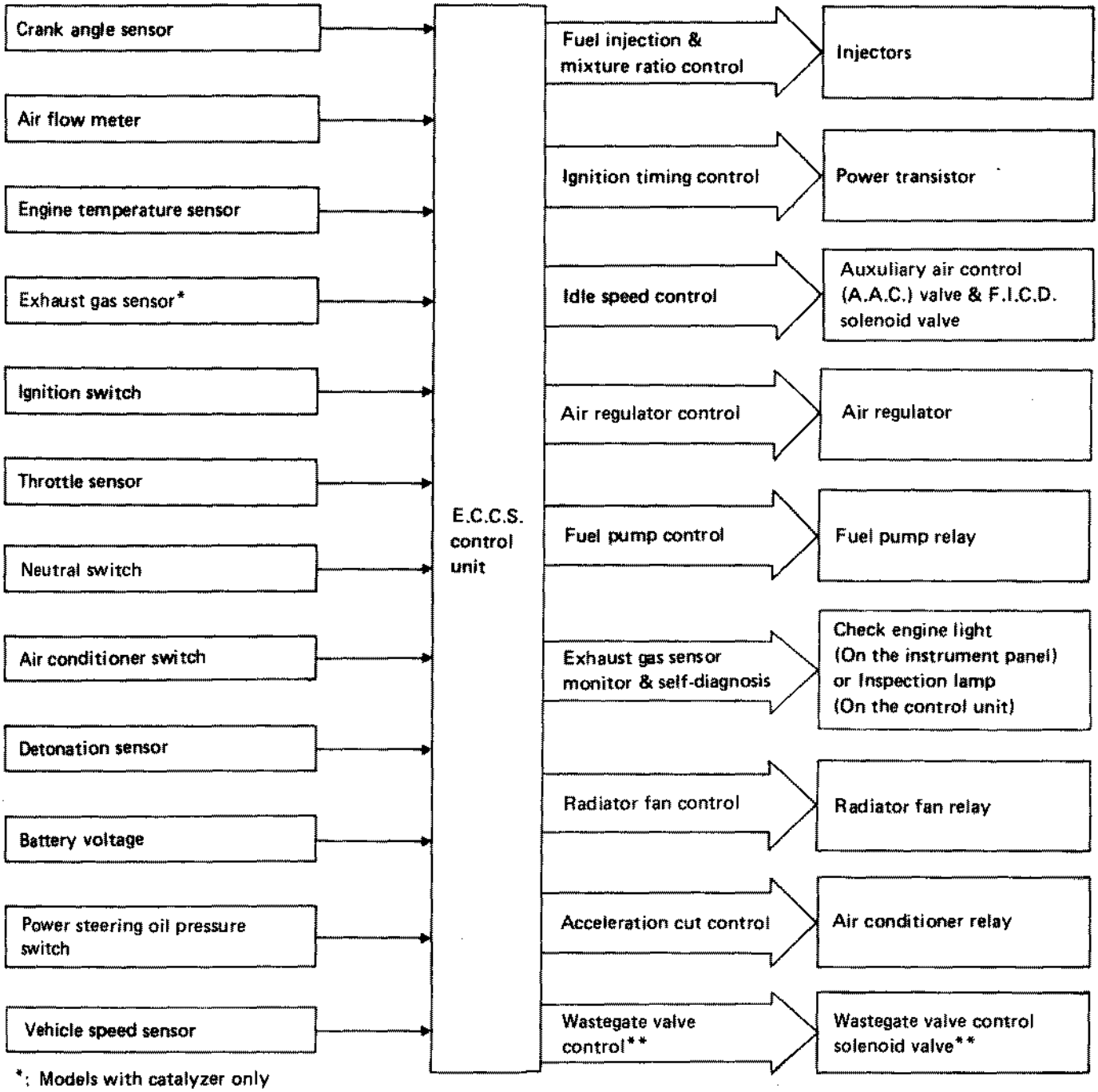
System Diagram (Cont'd)

SR20DET



SEF288L

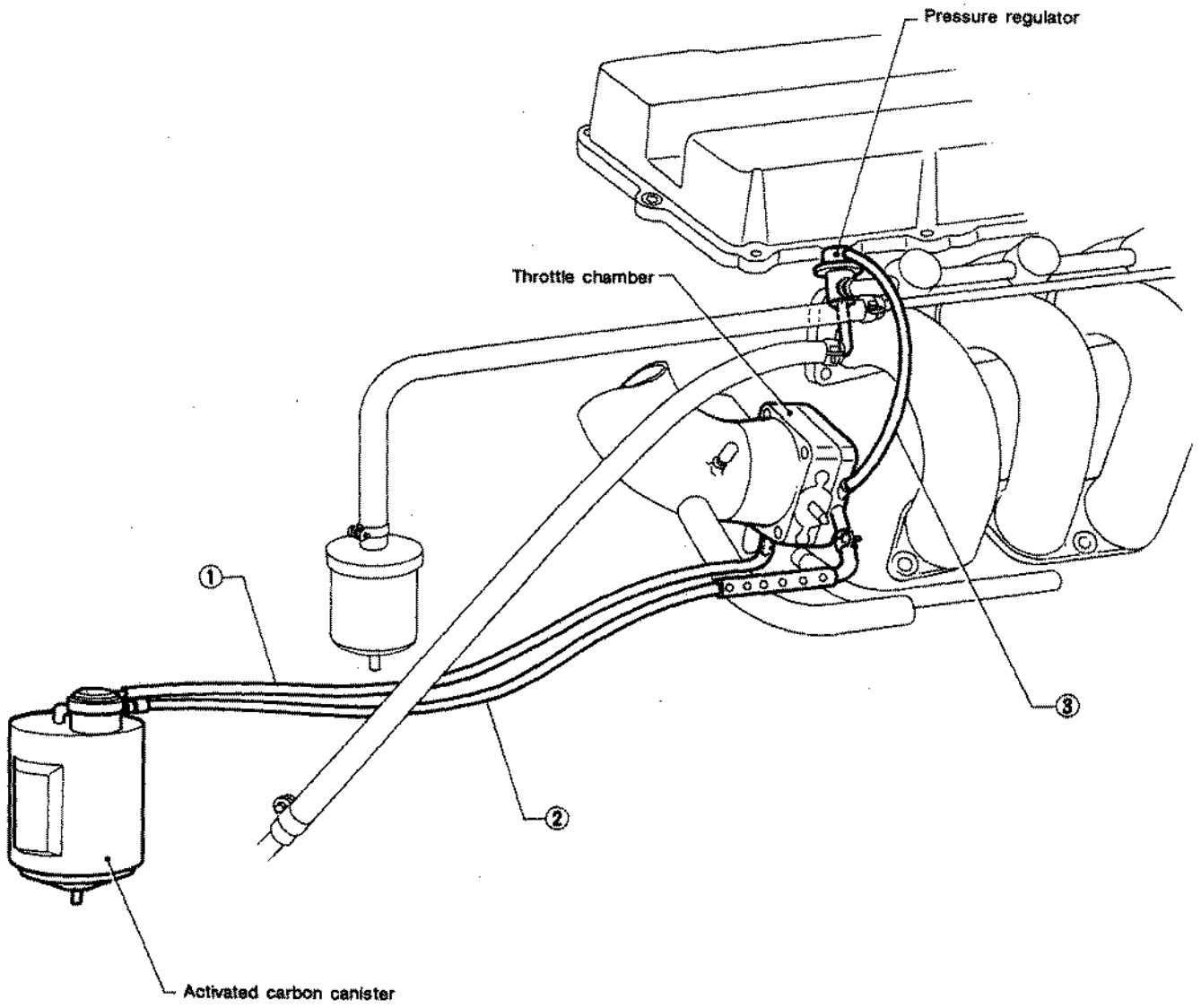
System Chart



*: Models with catalyzer only
**: Models with turbocharger only

Vacuum Hose Drawing

SR20DE



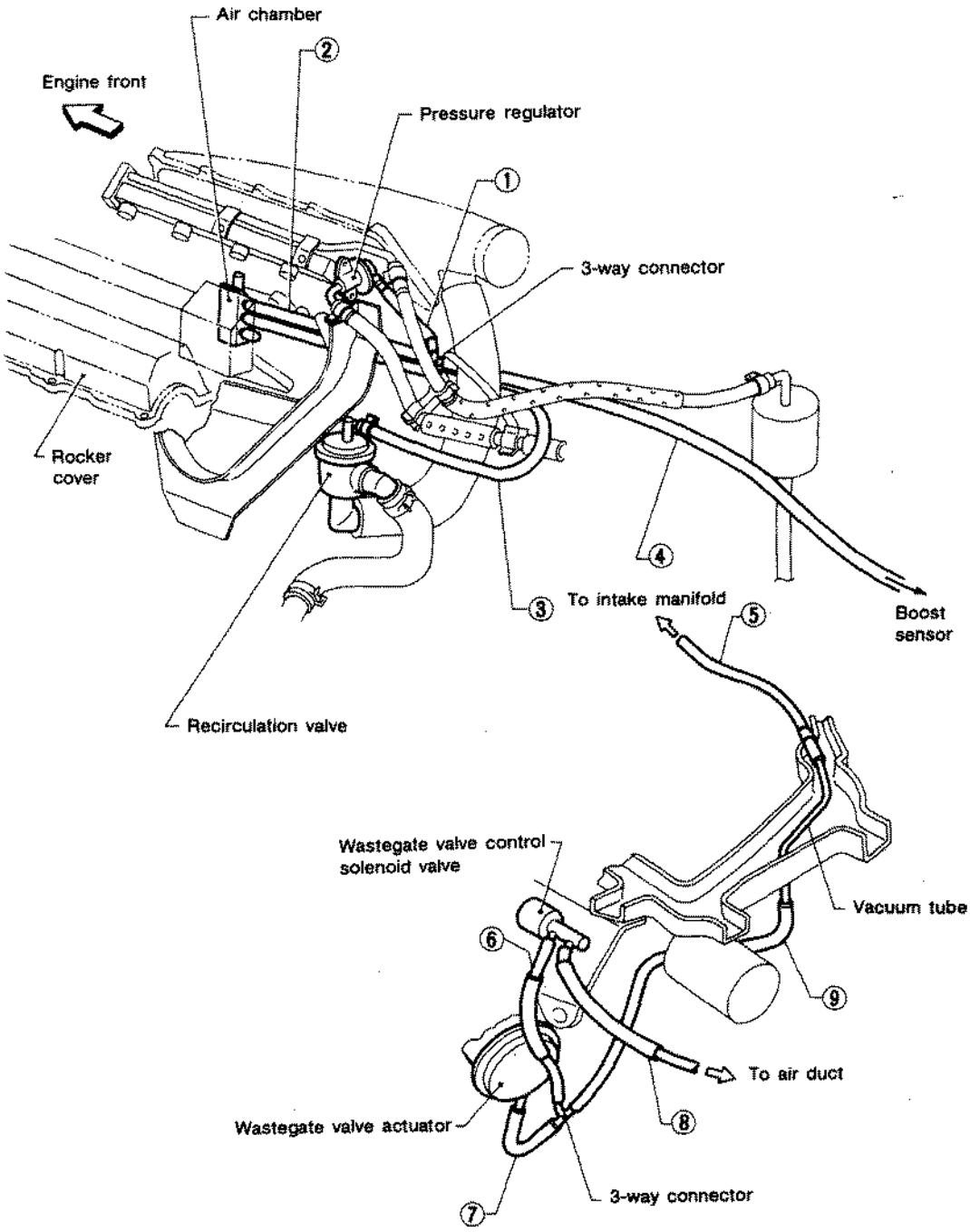
	Models with catalyzer	Models without catalyzer
① Activated carbon canister (vacuum port) to throttle chamber	X	–
② Activated carbon canister (purge port) to intake manifold	X	–
③ Pressure regulator to intake manifold collector	X	X

X: Applicable

SEF260L

Vacuum Hose Drawing (Cont'd)

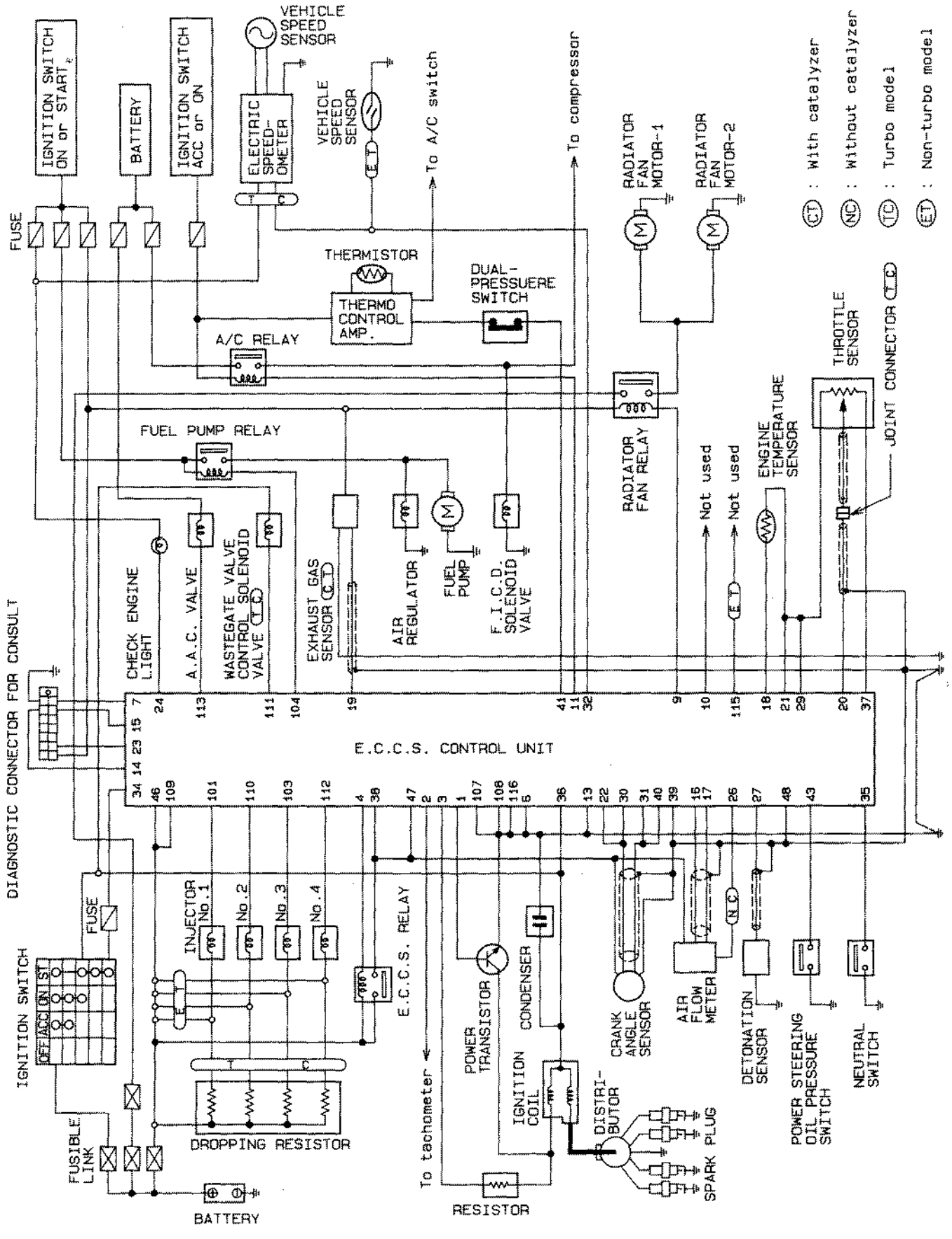
SR20DET



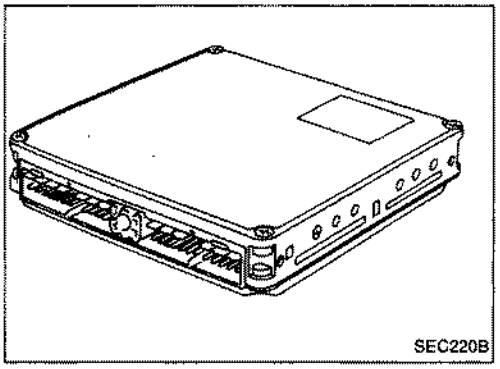
SEF261L

① Pressure regulator to 3-way connector
② Air chamber to 3-way connector
③ Air chamber to recirculation valve
④ 3-way connector to boost sensor
⑤ Intake manifold to vacuum tube
⑥ Wastegate valve control solenoid valve to 3-way connector
⑦ Wastegate valve actuator to 3-way connector
⑧ Wastegate valve control solenoid valve to air duct
⑨ Vacuum tube to 3-way connector

Circuit Diagram

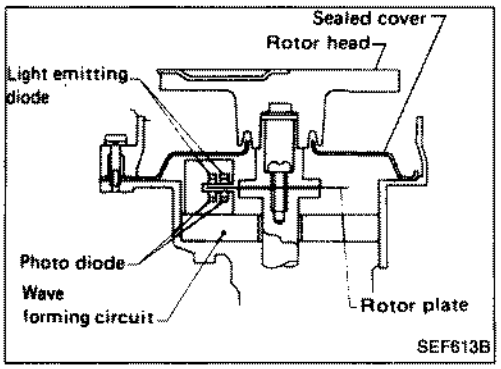


SEF430L


SEC220B

E.C.C.S. Control Unit (E.C.U.)

The E.C.U. consists of a microcomputer, inspection lamp, a diagnostic mode selector, and connectors for signal input and output and for power supply. The unit controls the engine.

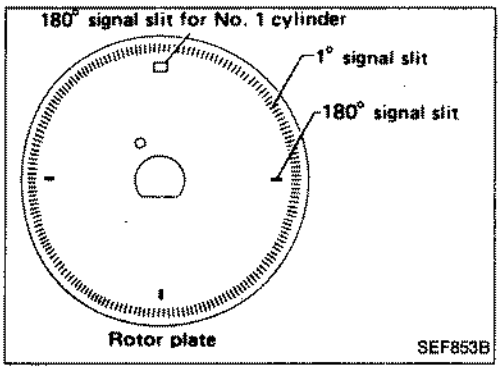


SEF613B

Crank Angle Sensor

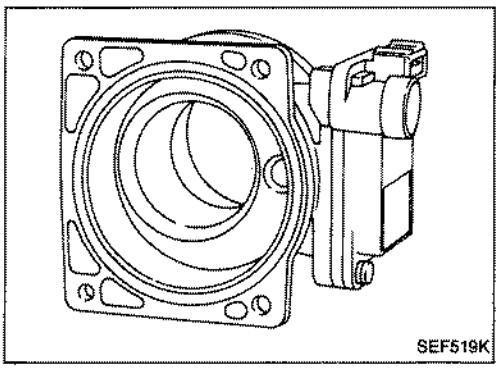
The crank angle sensor is a basic component of the entire E.C.C.S. It monitors engine speed and piston position, and sends signals to the E.C.U. to control fuel injection, ignition timing and other functions.

The crank angle sensor has a rotor plate and a wave-forming circuit. The rotor plate has 360 slits for 1° signal and 4 slits for 180° signal. Light Emitting Diodes (L.E.D.) and photo diodes are built in the wave-forming circuit.



SEF853B

When the rotor plate passes between the L.E.D. and the photo diode, the slits in the rotor plate continually cut the light being transmitted to the photo diode from the L.E.D. This generates rough-shaped pulses which are converted into on-off pulses by the wave-forming circuit, which are sent to the E.C.U.

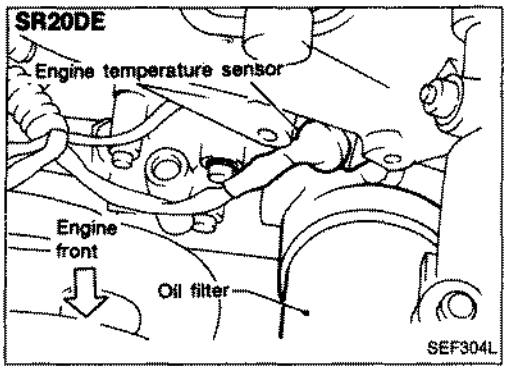

SEF519K

Air Flow Meter

The air flow meter measures the intake air flow rate by taking a part of the entire flow. Measurements are made in such a manner that the E.C.U. receives electrical output signals varied by the amount of heat emitting from the hot wire placed in the stream of the intake air.

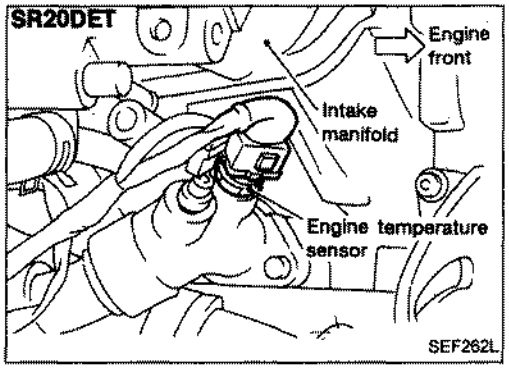
When intake air flows into the intake manifold through a route around the hot wire, some of the heat generated from the hot wire is taken away by the air. The amount of heat lost depends on the air flow velocity. However, the temperature of the hot wire is automatically controlled within a certain number of degrees.

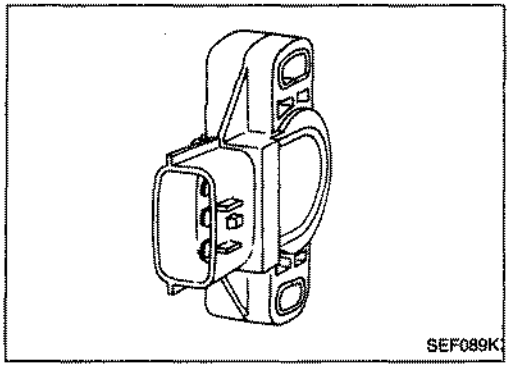
Therefore, it is necessary to supply the hot wire with more electric current in order to maintain the temperature of the hot wire. The E.C.U. then knows the air flow velocity by means of the electric change.



Engine Temperature Sensor

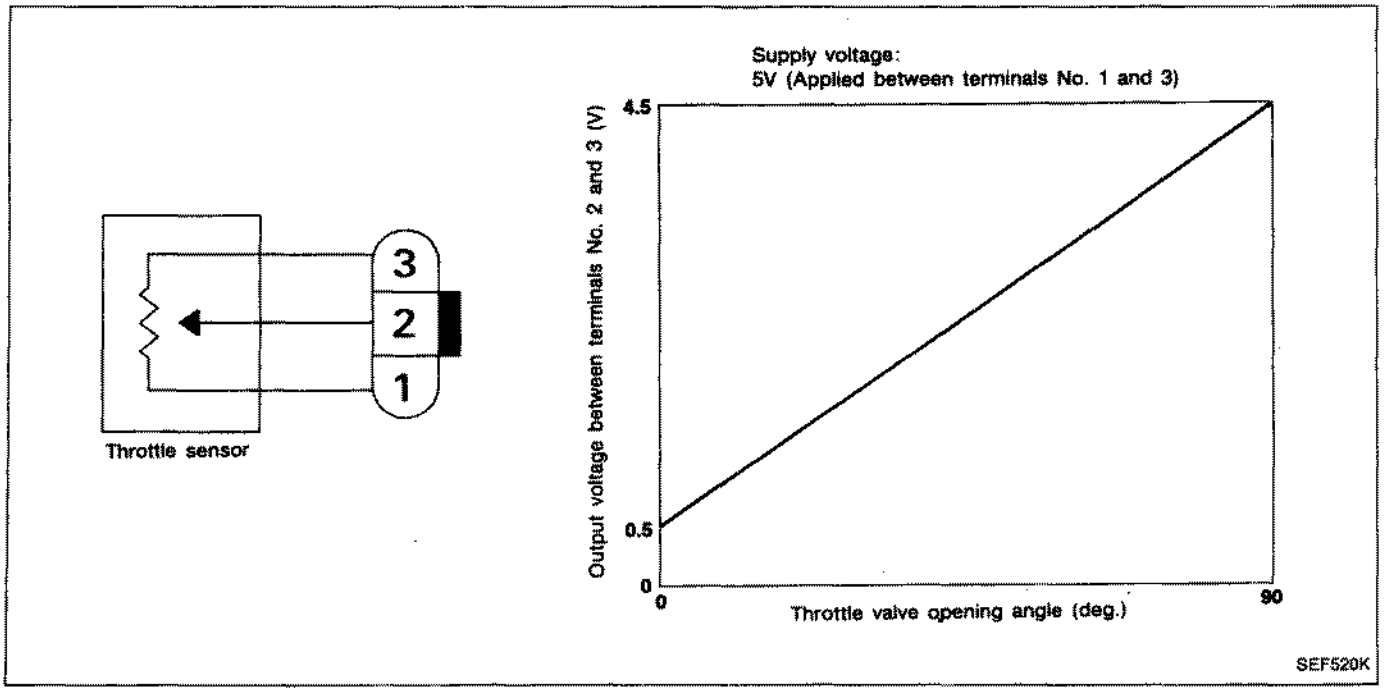
The engine temperature sensor, located behind the oil filter, detects engine coolant temperature and transmits a signal to the E.C.U.
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



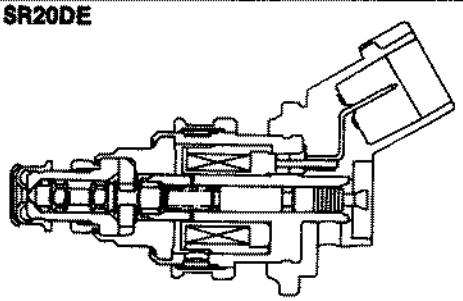


Throttle Sensor & Soft Idle Switch

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



SR20DE

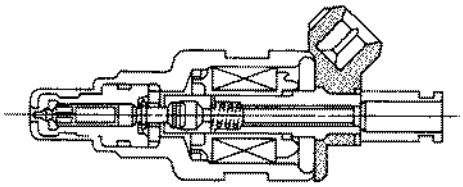


SEF406L

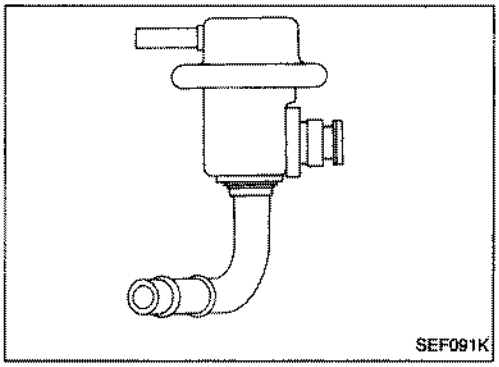
Fuel Injector

The fuel injector is a small, elaborate solenoid valve. As the E.C.U. sends injection signals to the injector, the coil in the injector pulls the needle valve back and fuel is released into the intake manifold through the nozzle. The injected fuel is controlled by the E.C.U. in terms of injection pulse duration.

SR20DET



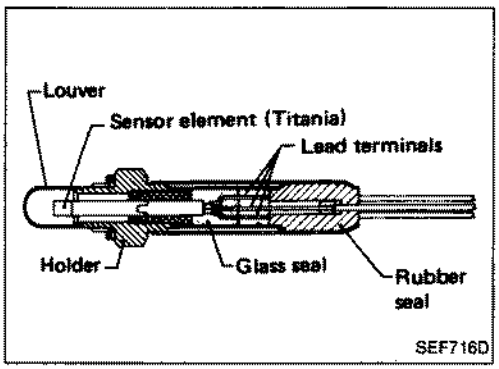
SEF364L



SEF091K

Pressure Regulator

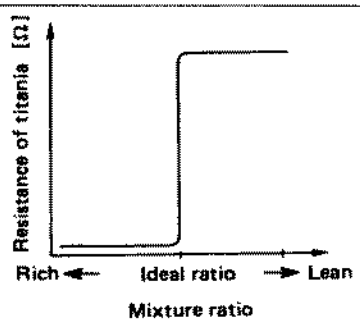
The pressure regulator maintains the fuel pressure at 299.1 kPa (2.991 bar, 3.05 kg/cm^2, 43.4 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pressure at the above value.

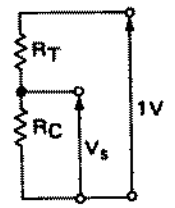


SEF716D

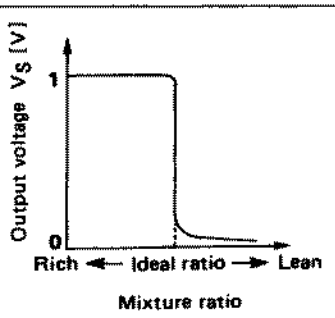
Exhaust Gas Sensor (Models with catalyzer only)

The exhaust gas sensor, located in the exhaust tube, monitors the oxygen level in the exhaust gas.
This sensor is made of ceramic titania, the electric resistance of which drastically changes at the ideal air-fuel ratio.
The E.C.U. supplies the sensor with approximately 1V and then measures the output voltage depending on its resistance. In order to activate the sensor element, it is equipped with a heater.



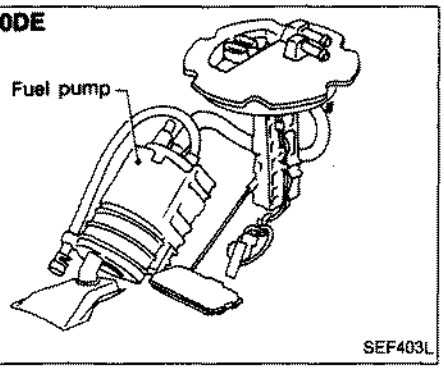


R_T: Resistance of titania
R_C: Comparative resistance (equipped in the E.C.U.)



SEF285D

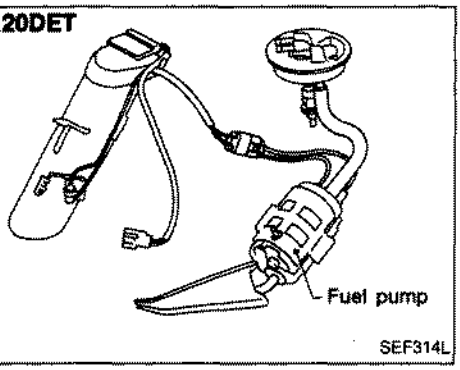
SR20DE

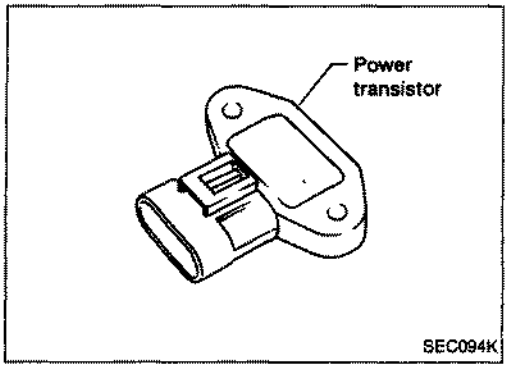


Fuel Pump

A turbine type design fuel pump is used and is situated in the fuel tank.

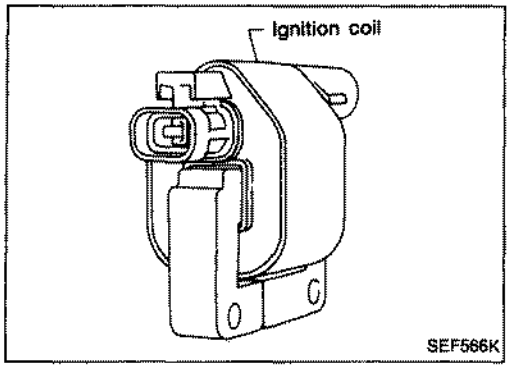
SR20DET

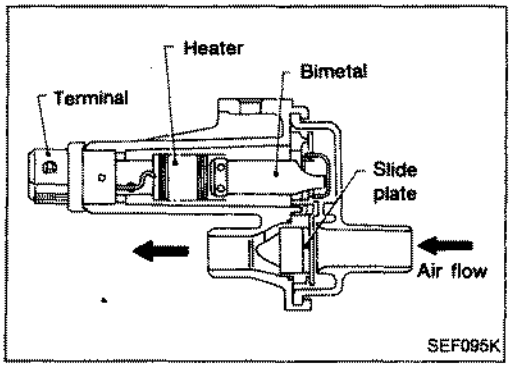




Power Transistor & Ignition Coil

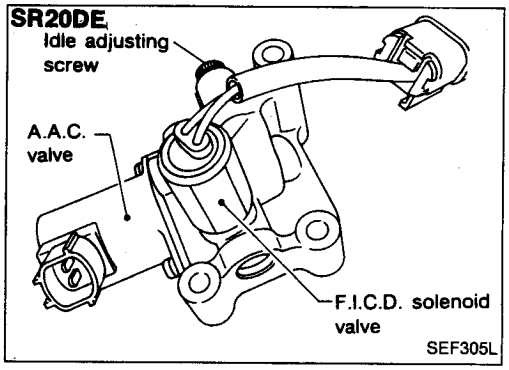
The ignition signal from the E.C.U. is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit. The ignition coil is a small, molded type.





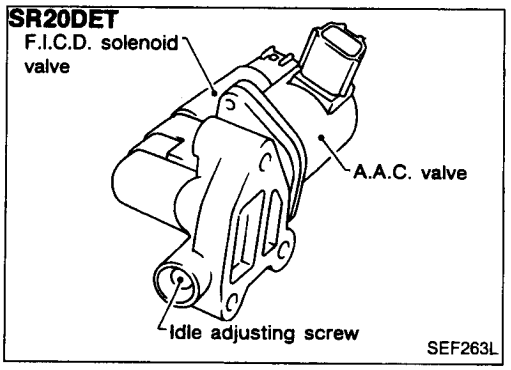
Air Regulator

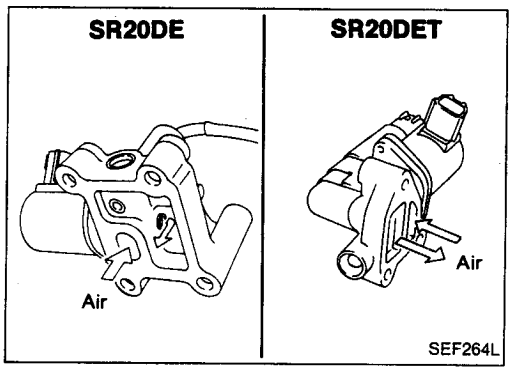
The air regulator provides an air by-pass when the engine is cold for a fast idle during warm-up.
A bimetal, heater and rotary shutter are built into the air regulator. When the bimetal temperature is low, the air by-pass port opens. As the engine starts and electric current flows through a heater, the bimetal begins to turn the shutter to close the by-pass port. The air passage remains closed until the engine stops and the bimetal temperature drops.



Idle Air Adjusting (I.A.A.) Unit

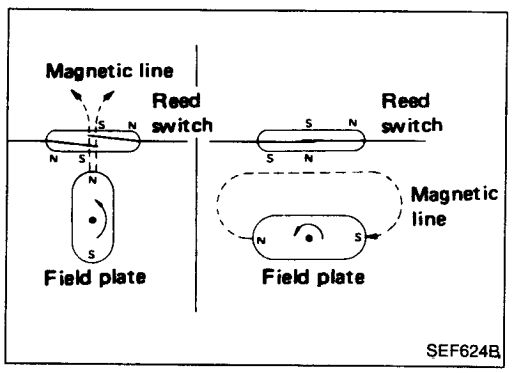
The I.A.A. unit is made up of the A.A.C. valve, F.I.C.D. solenoid valve and idle adjusting screw. It receives the signal from the E.C.U. and controls the idle speed at the preset value.





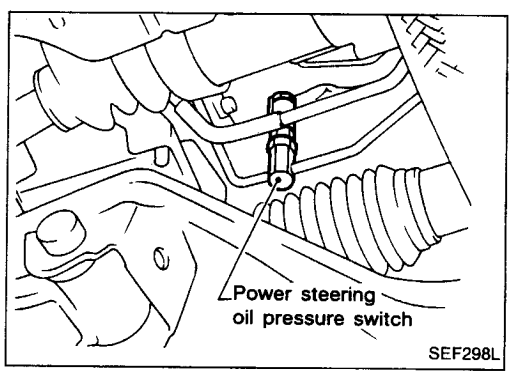
Auxiliary Air Control (A.A.C.) Valve

The E.C.U. actuates the A.A.C. valve by an ON/OFF pulse. The longer that ON duty is left on, the larger the amount of air that will flow through the A.A.C. valve.



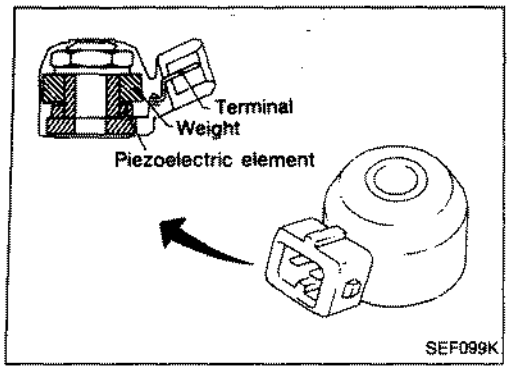
Vehicle Speed Sensor

The vehicle speed sensor provides a vehicle speed signal to the E.C.U.
The speed sensor consists of a reed switch, which is installed in the speedometer unit and transforms vehicle speed into a pulse signal.



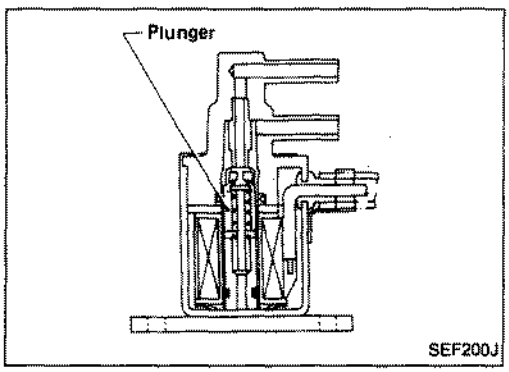
Power Steering Oil Pressure Switch

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects the power steering load, sending the load signal to the E.C.U. The E.C.U. then sends the idle-up signal to the A.A.C. valve.



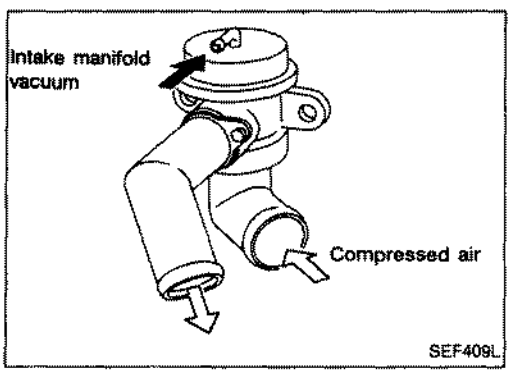
Detonation Sensor

The detonation sensor is attached to the cylinder block and senses engine knocking conditions.
A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. This vibrational pressure is then converted into a voltage signal which is delivered as output.



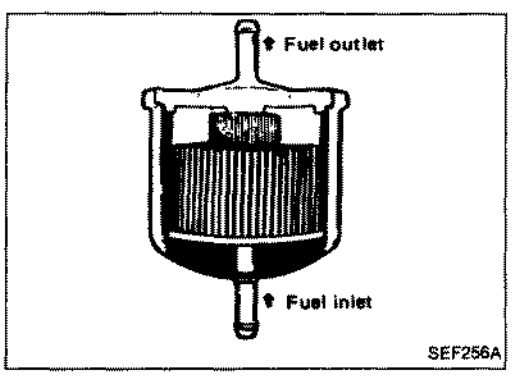
Wastegate Valve Control Solenoid Valve (SR20DET only)

The solenoid valve responds to the ON/OFF signal from the E.C.U. When it is ON, a vacuum signal from the suction pipe or compressor outlet is fed into the wastegate valve actuator. The actuator is hard to open at this time. When the control unit sends an OFF signal, the coil pulls the plunger upward and cuts the route to the suction pipe.



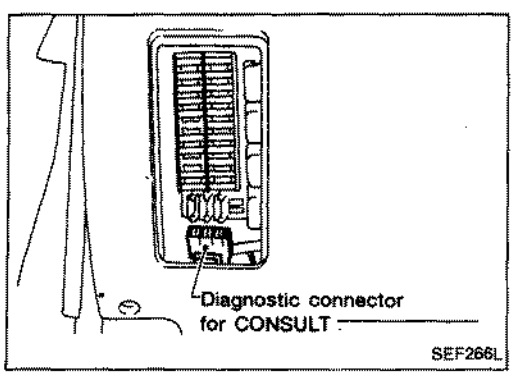
Recirculation Valve (SR20DET only)

The recirculation valve reduces the noise occurring in the compressor of the turbocharger during deceleration. This valve recirculates air compressed downstream of the intercooler to upstream of the compressor using the intake manifold vacuum that occurs when the throttle chamber is suddenly closed.
The recirculation valve also must not be disassembled or adjusted.



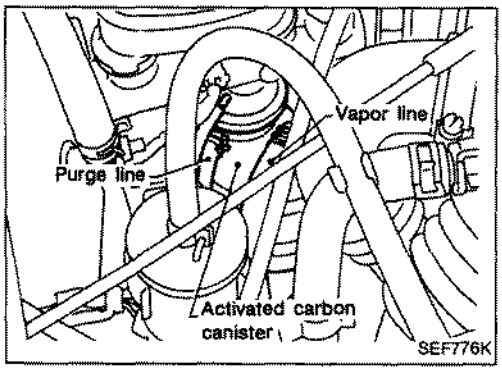
Fuel Filter

The specially designed fuel filter has a metal case in order to withstand high fuel pressure.



Diagnostic Connector for CONSULT

The diagnostic connector for CONSULT is located behind the fuse box cover.

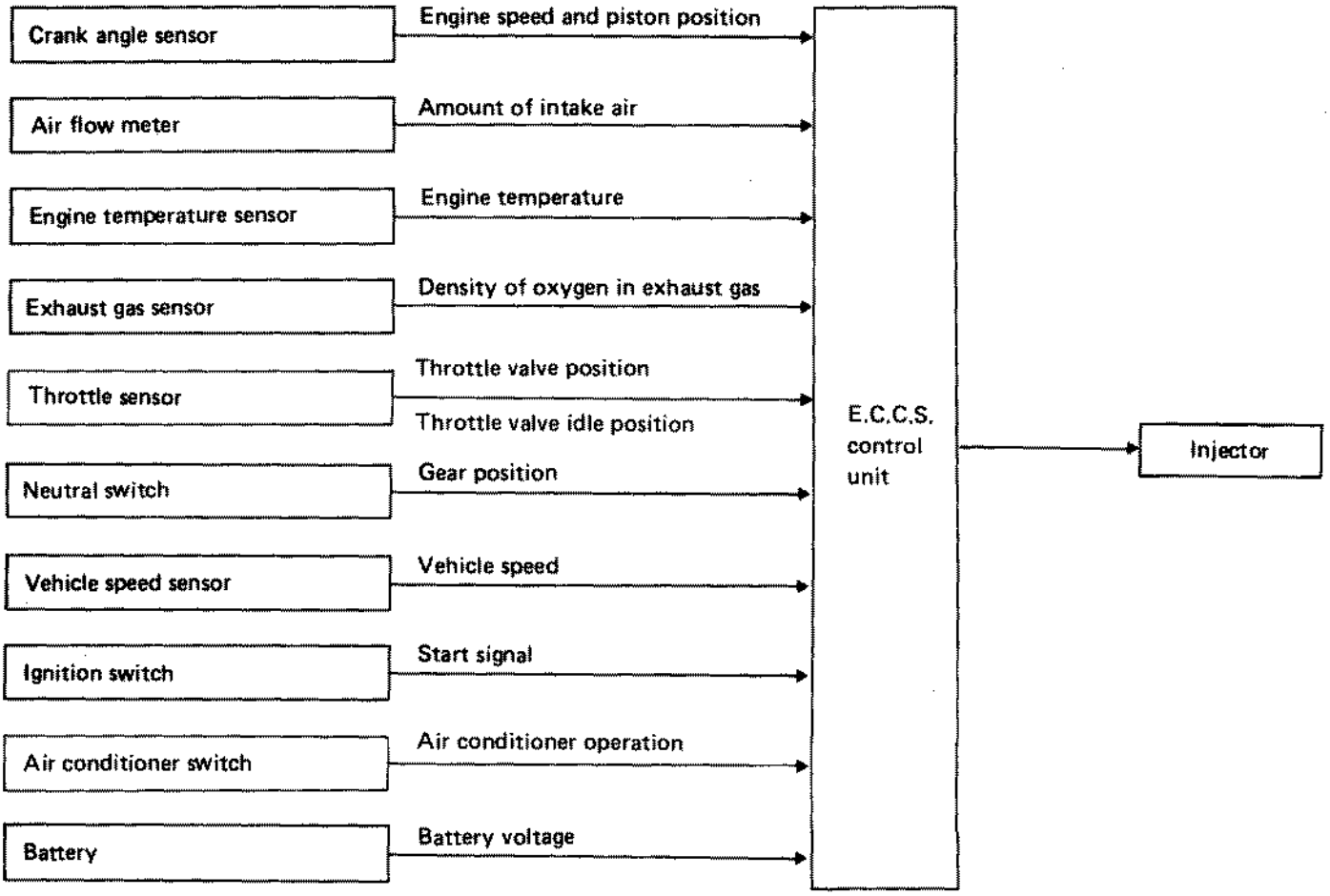


Activated Carbon Canister (SR20DE engine models with catalyzer only)

The carbon canister is filled with active charcoal to absorb evaporative gases produced in the fuel tank. These absorbed gases are then delivered to the intake manifold by manifold vacuum for combustion purposes.

Fuel Injection Control

INPUT/OUTPUT SIGNAL LINE



BASIC FUEL INJECTION CONTROL

The amount of fuel injected from the fuel injector, or the length of time the valve remains open, is determined by the E.C.U. The basic amount of fuel injected is a program value mapped in the E.C.U. ROM memory. In other words, the program value is preset by engine operating conditions determined by input signals (for engine rpm and air intake) from both the crank angle sensor and the air flow meter.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injection is compensated for to improve engine performance under various operating conditions as listed below.

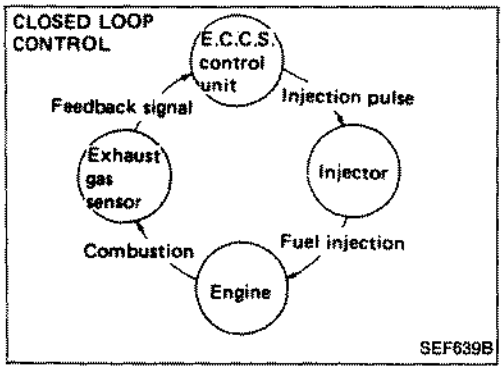
<Fuel increase>

1) During warm-up
2) When starting the engine
3) During acceleration

<Fuel decrease>

1) During deceleration

Fuel Injection Control (Cont'd)



MIXTURE RATIO FEEDBACK CONTROL

Mixture ratio feedback system is designed to precisely control the mixture ratio to the stoichiometric point so that the three-way catalyst can reduce CO, HC and NOx emissions. This system uses an exhaust gas sensor in the exhaust manifold to check the air-fuel ratio. The control unit adjusts the injection pulse width according to the sensor voltage so the mixture ratio will be within the range of the stoichiometric air-fuel ratio.

This stage refers to the closed-loop control condition. The open-loop control condition refers to that under which the E.C.U. detects any of the following conditions and feedback control stops in order to maintain stabilized fuel combustion.

1) Deceleration
2) High-load operation
3) Engine idling
4) Malfunction of exhaust gas sensor or its circuit
5) Insufficient activation of exhaust gas sensor at low engine temperature
6) Engine starting
7) When all of the following conditions are met:

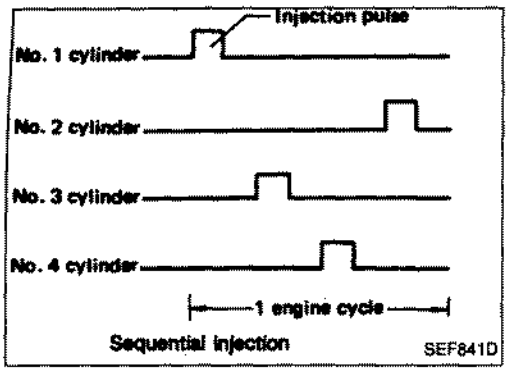
- Ignition switch "ON"
- Soft idle switch "ON"
- Neutral switch "OFF"
- Engine running at idle speed
- Vehicle running at slow speed

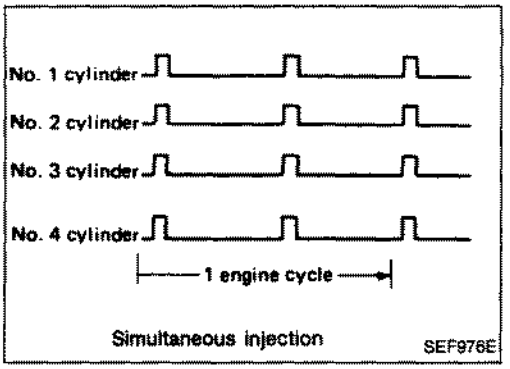
MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the exhaust gas sensor. This feedback signal is then sent to the E.C.U. to control the amount of fuel injection to provide a basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. This is due to manufacturing errors (e.g., air flow meter hot wire) and changes during operation (injector clogging, etc.) of E.C.C.S. parts which directly affect the mixture ratio.

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

Fuel Injection Control (Cont'd)





FUEL INJECTION TIMING

Two types of fuel injection systems are used — simultaneous injection and sequential injection. In the former, fuel is injected into all four cylinders simultaneously twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the E.C.U. to the four injectors two times for each engine cycle.

In the sequential injection system, fuel is injected into each cylinder during each engine cycle according to the firing order. When the engine is being started and/or if the fail-safe system (C.P.U. of E.C.U.) is operating, simultaneous fuel injection is used.

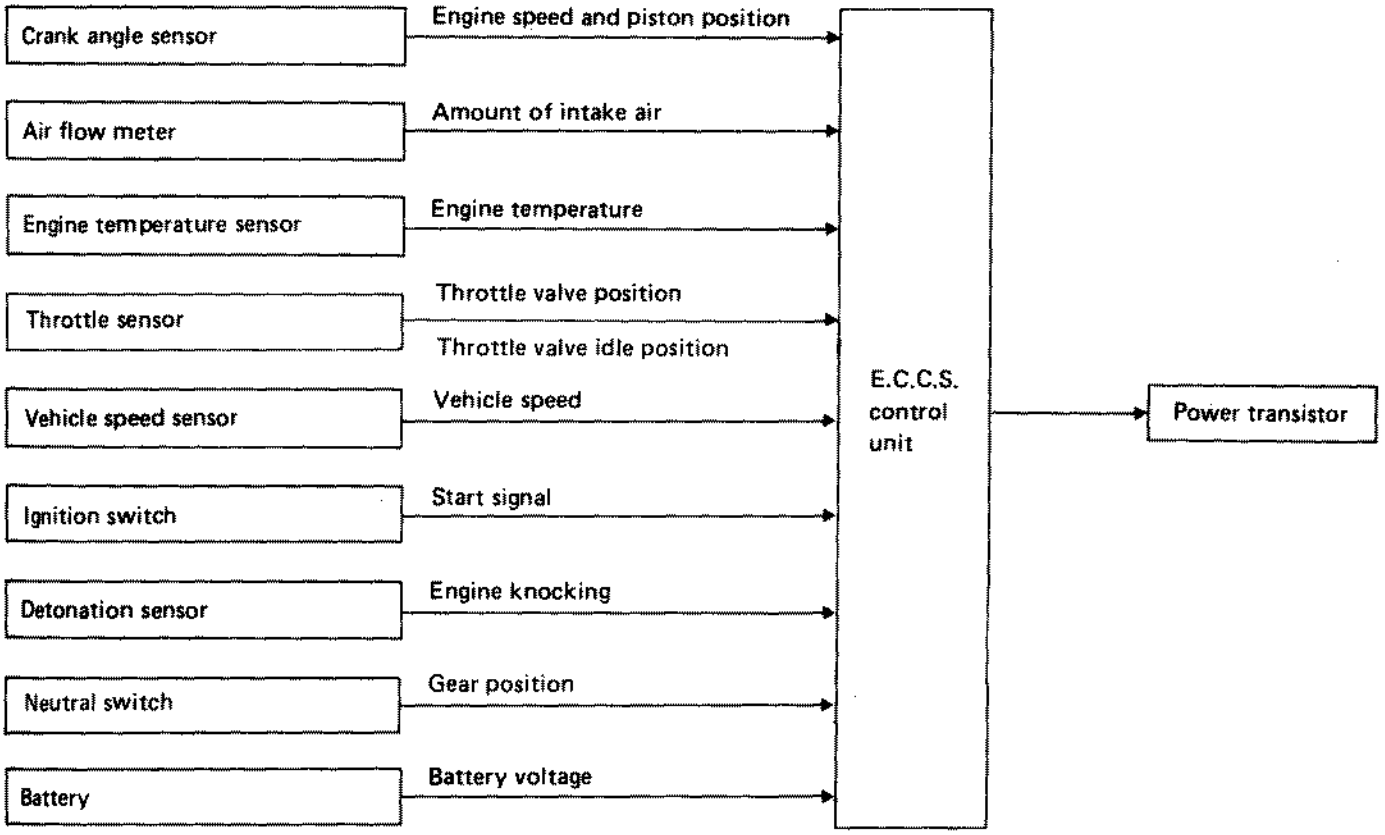
When the engine is running sequential fuel injection is used.

FUEL SHUT-OFF

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

Ignition Timing Control

INPUT/OUTPUT SIGNAL LINE



Ignition Timing Control (Cont'd)

SYSTEM DESCRIPTION

The ignition timing is controlled by the E.C.U. in order to maintain the best air-fuel ratio in response to every running condition of the engine. The ignition timing data is stored in the ROM located in the E.C.U., in the form of the map shown below.

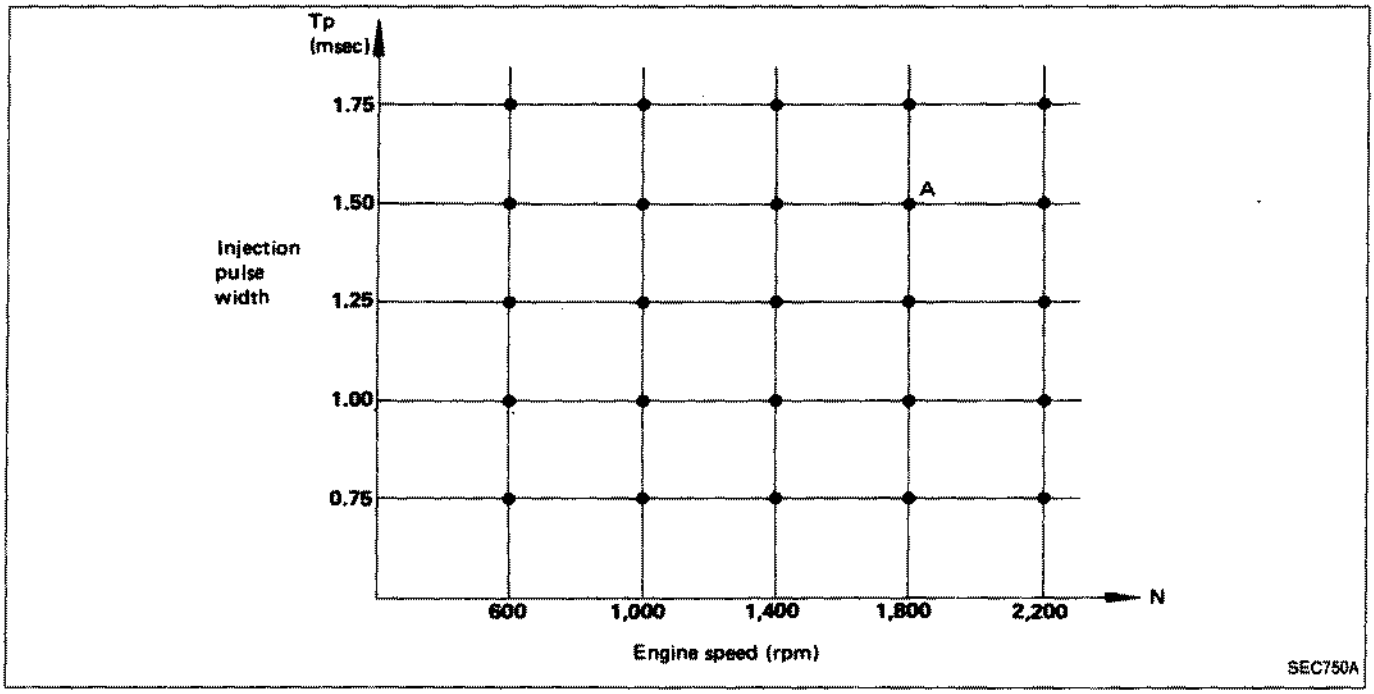
The E.C.U. detects information such as the injection pulse width and crank angle sensor signal which varies every moment. Then responding to this information, ignition signals are transmitted to the power transistor.

e.g. N: 1,800 rpm, Tp: 1.50 msec
A °B.T.D.C.

In addition to this,

1) At starting
2) During warm-up
3) At idle
4) At acceleration

the ignition timing is revised by the E.C.U. according to the other data stored in the ROM.

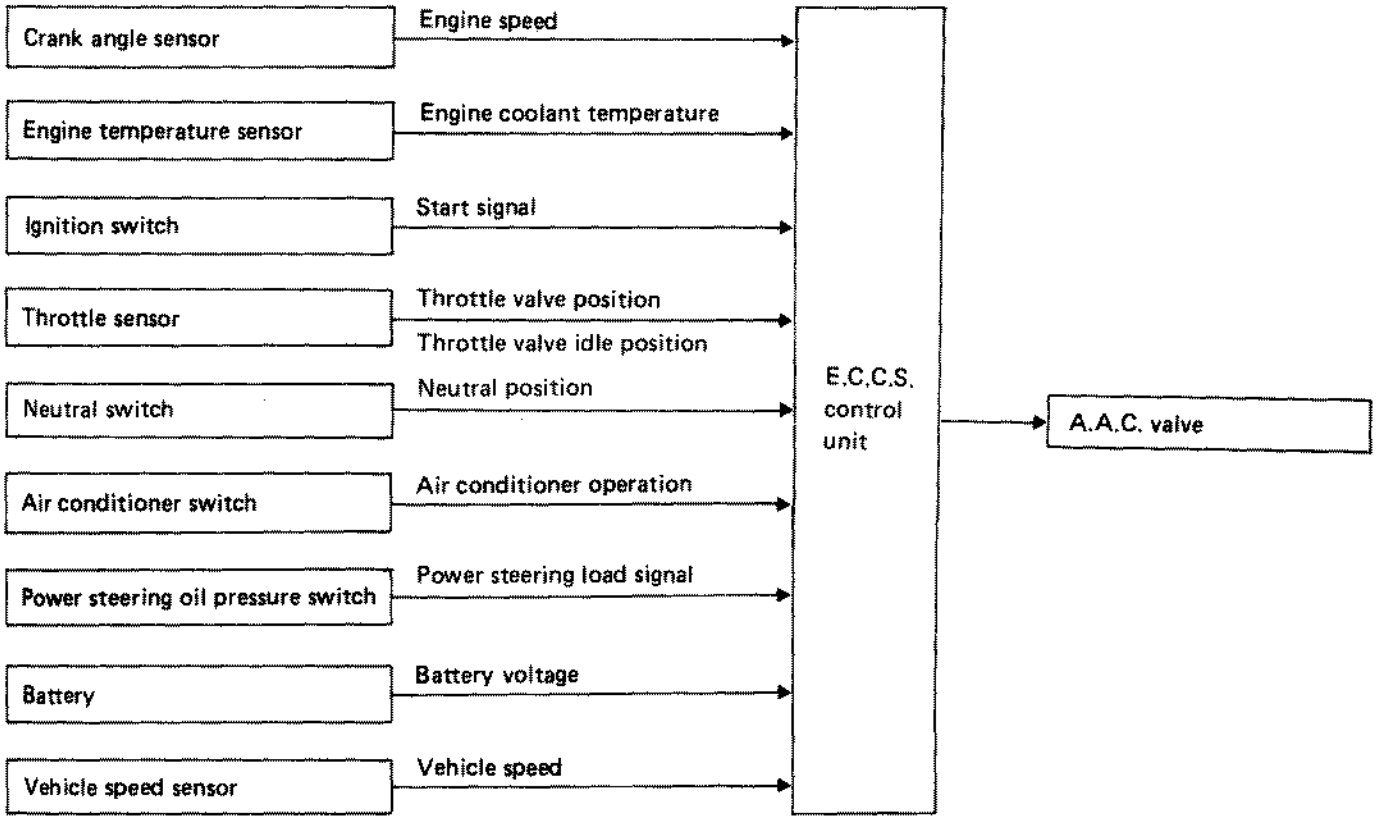


The retard system actuated by the detonation sensor is designed only for emergencies. The basic ignition timing is pre-programmed within the anti-knocking zone, even if recommended fuel is used under dry conditions. Consequently, the retard system does not operate under normal driving conditions.

However, if engine knocking occurs, the detonation sensor monitors the condition and the signal is transmitted to the E.C.C.S. control unit. After receiving it, the control unit retards the ignition timing to avoid the knocking condition.

Idle Speed Control

INPUT/OUTPUT SIGNAL LINE

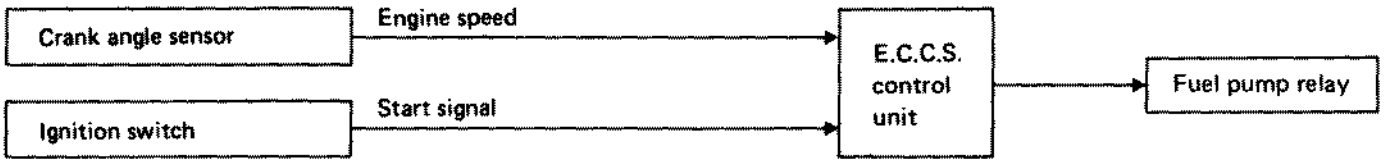


SYSTEM DESCRIPTION

This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via A.A.C. valve. The A.A.C. valve repeats ON/OFF operation according to the signal sent from the E.C.U. The crank angle sensor detects the actual engine speed and sends a signal to the E.C.U. The E.C.U. then controls the ON/OFF time of the A.A.C. valve so that engine speed coincides with the target value memorized in ROM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ROM is determined by taking into consideration various engine conditions, such as warming up and during deceleration, fuel consumption, and engine load (air conditioner, electrical load).

Fuel Pump Control

INPUT/OUTPUT SIGNAL LINE



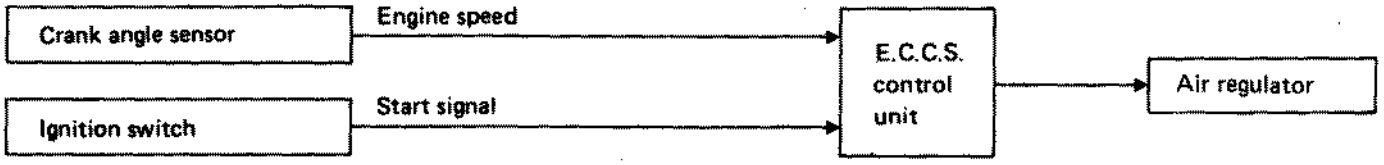
SYSTEM DESCRIPTION

The E.C.U. activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the E.C.U. receives a 180° signal from the crank angle 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 E.C.U. stops pump operation and prevents battery discharging, thereby improving safety. The E.C.U. 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.	SR20DE: Operates for 5 seconds SR20DET: Operates for 1 second
Engine running and cranking	Operates
When engine is stopped	Stops in 1 second
Except as shown above	Stops

Air Regulator Control

INPUT/OUTPUT SIGNAL LINE



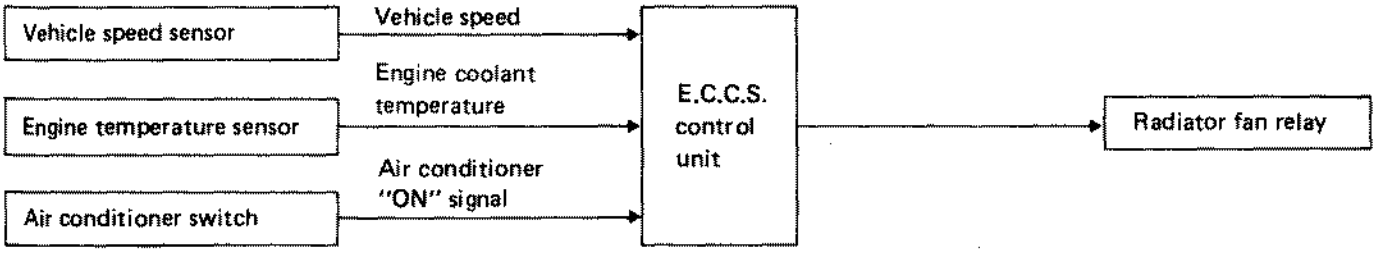
SYSTEM DESCRIPTION

The air regulator is controlled by the E.C.U. at the same time as fuel pump ON-OFF control.

Condition	Air regulator operation
Ignition switch is turned ON	SR20DE: Operates for 5 seconds SR20DET: Operates for 1 second
While engine is running and cranking	Operates
When engine is stopped	OFF in 1 second
Except as shown above	OFF

Radiator Fan Control

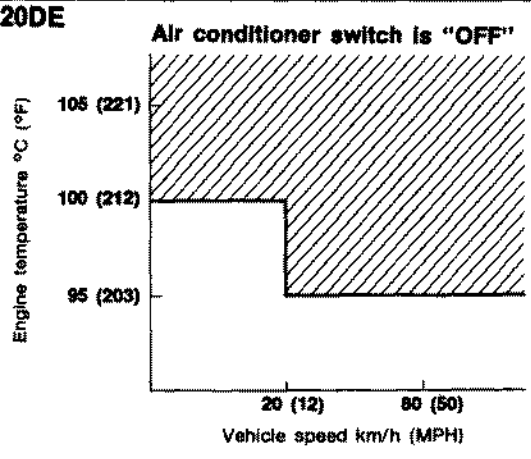
INPUT/OUTPUT SIGNAL LINE

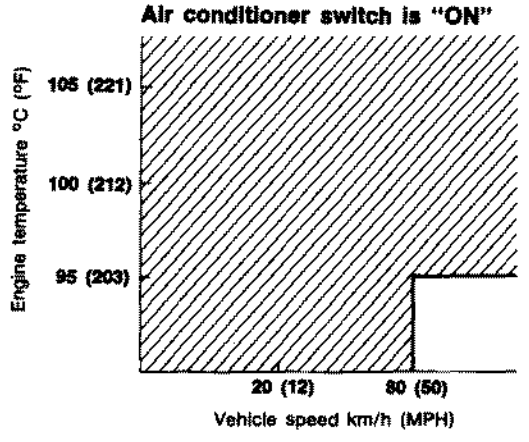


The E.C.U. controls the radiator fan corresponding to the vehicle speed, engine temperature, and air conditioner ON signal. The control system has 2-step control [ON/OFF].

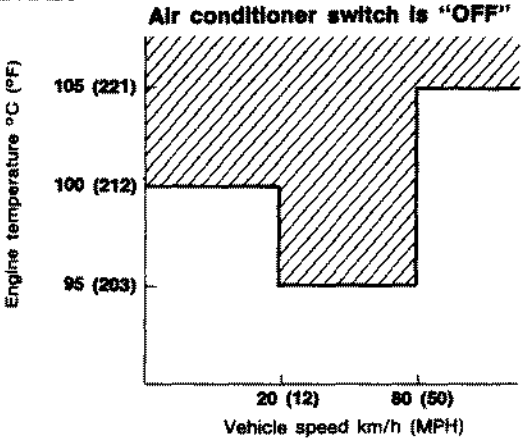
OPERATION

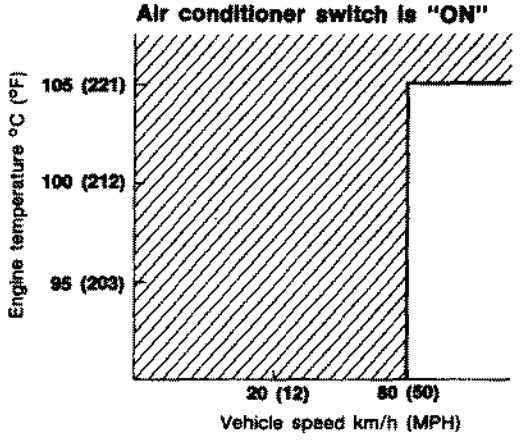
SR20DE





SR20DET





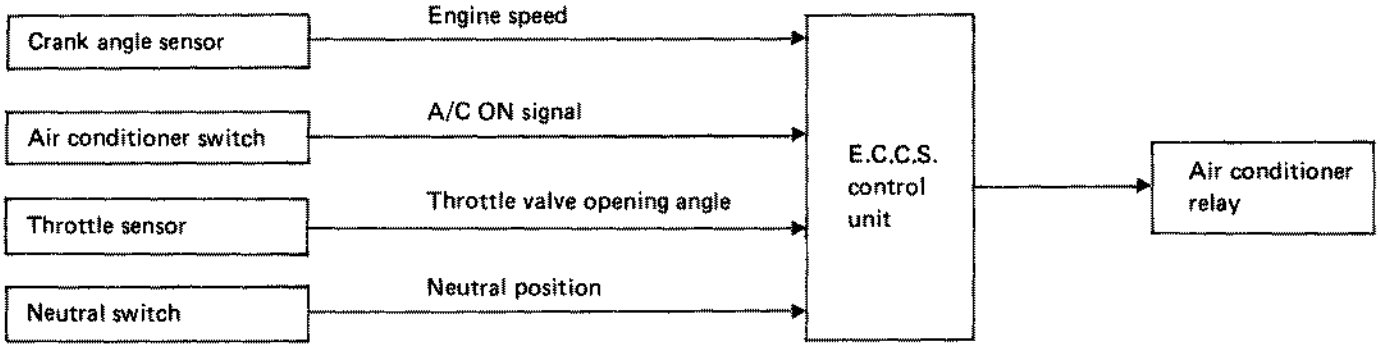
: Radiator fans operate.

: Radiator fans do not operate.

SEF267L

Acceleration Cut Control

INPUT/OUTPUT SIGNAL LINE



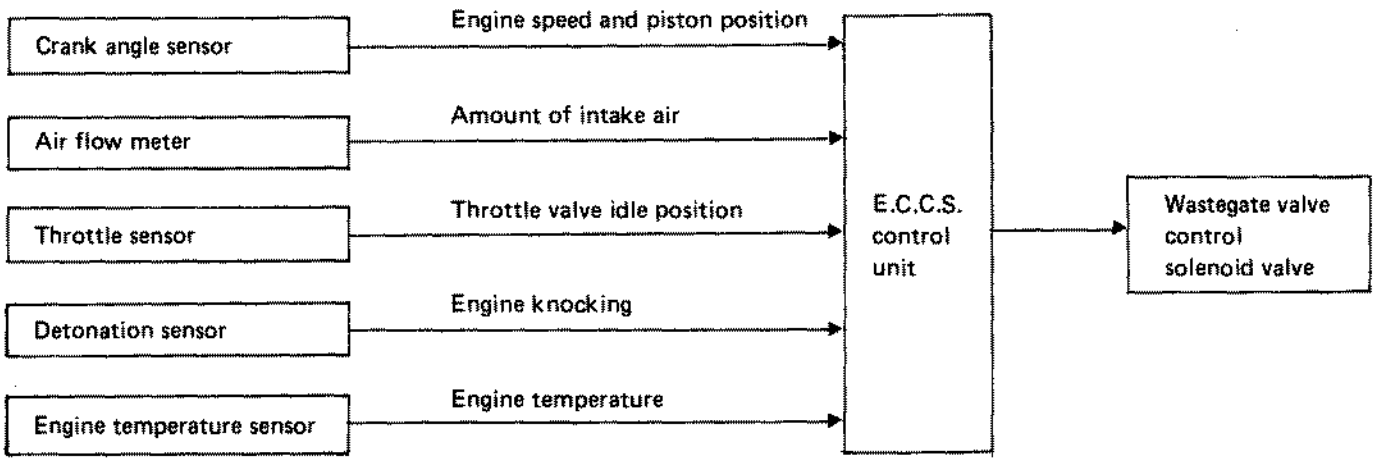
SYSTEM DESCRIPTION

When the accelerator pedal is fully depressed, the air conditioner is turned off for a few seconds.

This system improves acceleration when the air conditioner is used.

Wastegate Valve Control (SR20DET only)

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

The wastegate valve control solenoid valve changes the source vacuum which activates the actuator. This results in a suitable turbo-pressure.

When detonation signs are detected, which means a low octane fuel is being used, the solenoid valve turns OFF, and turbocharger pressure becomes low.

OPERATION

Engine conditions	Wastegate valve control solenoid valve	Vacuum to wastegate valve actuator	Turbocharger pressure
• Engine stopped. • C.P.U. of E.C.U. is malfunctioning. • Detonation sensor is malfunctioning. • Throttle valve is in idle position. • Judged fuel quality: low octane (Detecting sign of detonation)	OFF (When any of the conditions at left are present.)	Leads to wastegate valve actuator.	Low
Except the above	ON	Leads to suction pipe & wastegate valve actuator.	High

Fail-safe System

C.P.U. MALFUNCTION OF E.C.U.

Outline

The fail-safe system makes engine starting possible if there is something malfunctioning in the E.C.U.'s C.P.U. circuit. In former models, engine starting was difficult under the conditions mentioned above. But with the provisions provided in this fail-safe system, it is possible to start the engine.

Fail-safe system activating condition when E.C.U. is malfunctioning

The computing function of the E.C.U. was judged to be malfunctioning.
When the fail-safe system activates, i.e. if the E.C.U. detects a malfunction condition in the C.P.U. of E.C.U., the CHECK ENGINE LIGHT on the instrument panel lights to warn the driver.

Engine control, with fail-safe system, operates when E.C.U. is malfunctioning

When the fail-safe system is operating, fuel injection, ignition timing, fuel pump operation, A.A.C. valve operation and radiator fan operation are controlled under certain limitations.

Operation

	Operation
Fuel injection	Simultaneous injection
Ignition timing	Ignition timing is fixed at the preset valve.
Fuel pump	Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls.
A.A.C. valve	Full open
Radiator fans	Radiator fan relay "ON"

Cancellation of fail-safe system when E.C.U. is malfunctioning

Activation of the fail-safe system is canceled each time the ignition switch is turned OFF. The system is reactivated if all of the above-mentioned activating conditions are satisfied after turning the ignition switch from OFF to ON.

AIR FLOW METER MALFUNCTION

If the air flow meter output voltage is above or below the specified value, the E.C.U. senses an air flow meter malfunction. In case of a malfunction, the throttle sensor substitutes for the air flow meter.
Though air flow meter is malfunctioning, it is possible to drive the vehicle and start the engine. But engine speed will not rise more than 2,400 rpm in order to inform the driver of fail-safe system operation while driving.

Operation

Engine condition	Starter switch	Fail-safe system	Fail-safe functioning
Stopped	ANY	Does not operate	—
Cranking	ON	Operates	Engine will be started by a pre-determined injection pulse on E.C.U.
Running	OFF		Engine speed will not rise above 2,400 rpm

Fail-safe System (Cont'd)

ENGINE TEMPERATURE SENSOR MALFUNCTION

When engine temperature sensor output voltage is below or above the specified value, water temperature is fixed at the preset value as follows:

Operation

Condition	Engine temperature decided
Just as ignition switch is turned ON or Start	20°C (68°F)
More than 6 minutes after ignition ON or Start	80°C (176°F)
Except as shown above	20 - 80°C (68 - 176°F) (Depends on the time)

DETONATION SENSOR MALFUNCTION

When the output signal of the detonation sensor is abnormal, the E.C.U. judges it to be malfunctioning. When detonation sensor is malfunctioning, ignition timing will retard according to operating conditions.

THROTTLE SENSOR MALFUNCTION

Description

When the output signal of throttle sensor is abnormal the E.C.U. judges it as a malfunctioning of throttle sensor.
The E.C.U. does not use the throttle sensor signal, but judges the idle position by the amount of fuel injected and the engine rpm.

Operation

	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration

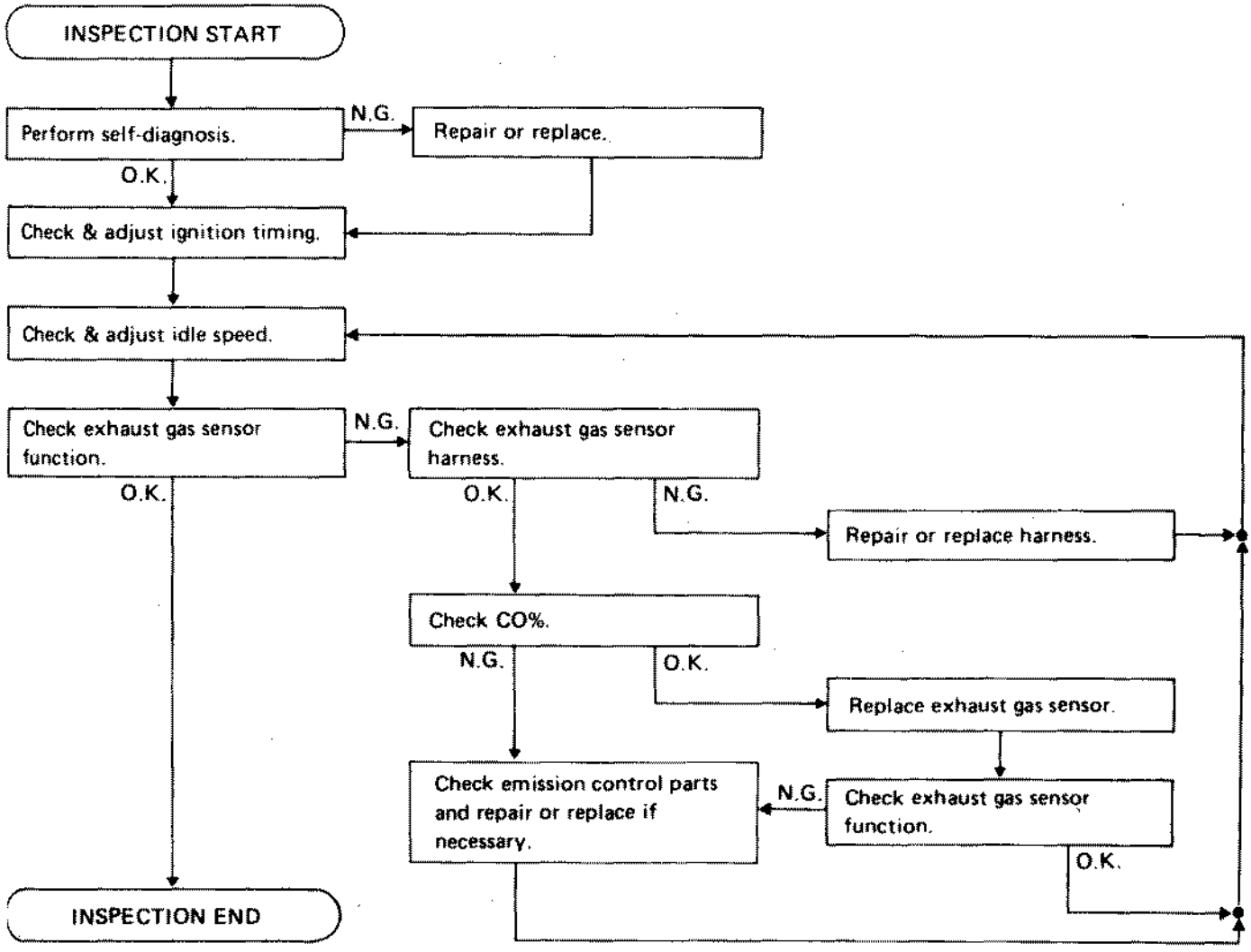
PREPARATION

1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.U. harness connector
- Vacuum hoses
- Air intake system
  (Oil filler cap, oil level gauge, etc.)
- Fuel pressure
- Engine compression
- Throttle valve

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

FOR MODELS WITH CATALYZER

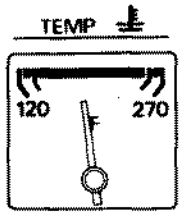
Overall inspection sequence



Idle check and procedure

START

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



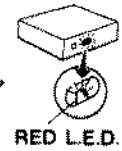
SEF246F

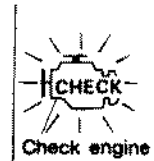
Start engine and warm it up until water temperature indicator points to the middle of gauge.
Ensure engine stays below 1,000 rpm.


SEF247F

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

Perform E.C.C.S. self-diagnosis (mode II).

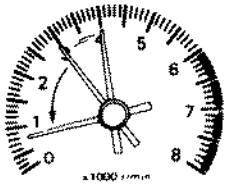

RED L.E.D.



Check engine light
SEF621K

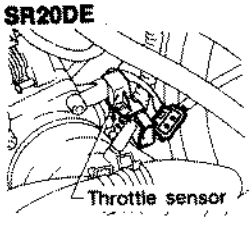
O.K. / N.G.

Repair or replace components as necessary.


SEF248F

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.

SR20DE

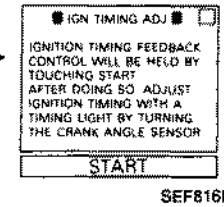


SEF306L

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

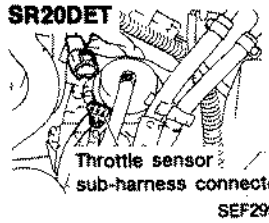
OR

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



SEF816K

SR20DET



SEF299L

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

Check ignition timing with a timing light.

SR20DE: 15°±2° B.T.D.C.
SR20DET: 20°±2° B.T.D.C.

O.K. → Ⓐ
N.G. → ①

Ⓐ

Ⓘ

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

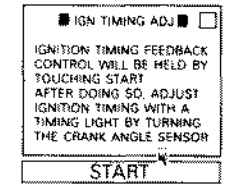
SR20DE: 15° B.T.D.C.
SR20DET: 20° B.T.D.C.

Ⓔ

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

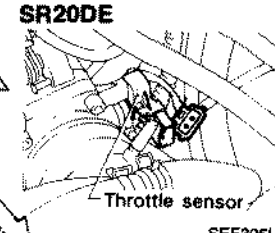
OR

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



SEF316L

SR20DE



SEF306L

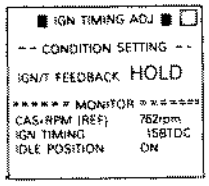
Check idle speed.

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

OR

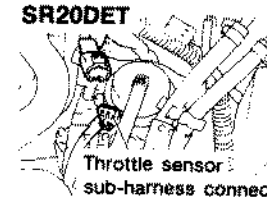
- Check idle speed.

SR20DE: 800±50 rpm
SR20DET: 850±50 rpm



SEF786K

SR20DET

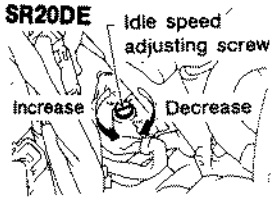


SEF299L

O.K.

N.G.

SR20DE



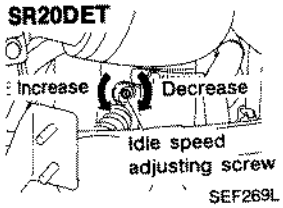
SEF268L

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.

SR20DE: 800 rpm
SR20DET: 850 rpm

SR20DET

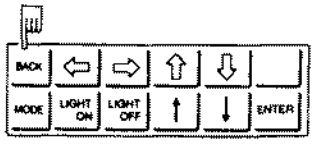


SEF269L

1) Touch "BACK".

OR

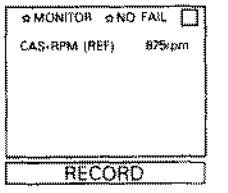
1) Turn off engine and connect throttle sensor harness connector.
2) Start engine.



SEF913J

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

Ⓙ



SEF317L

Ⓙ

Check idle speed.

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

SR20DE: 850±50 rpm

SR20DET: 925^{+25}_{-75} rpm

O.K.

N.G.

Check A.A.C. valve and replace if necessary.

Check A.A.C. valve harness and repair if necessary.

Check E.C.U. function* by substituting another known good E.C.U.

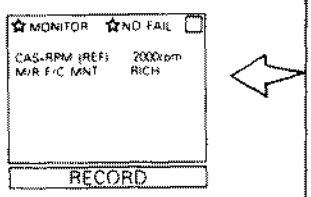
* E.C.U. may be the cause of a problem, but this is rarely the case.

Ⓑ

Ⓑ

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 .....

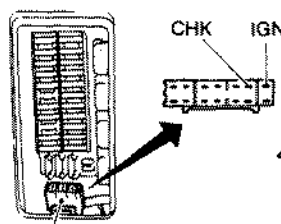


SEF818K

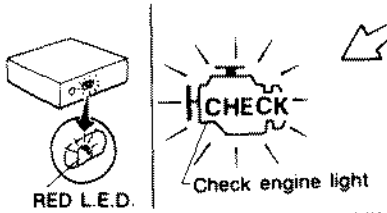
OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic mode II.
(See page EF & EC-412.)
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 RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

N.G. → Ⓒ

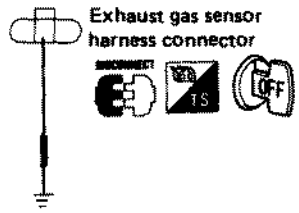


Diagnostic connector for CONSULT
(Connect CHK and IGN terminals with a suitable harness.)
SEF265L



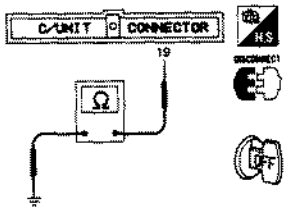
SEF621K

END



As for the location of exhaust gas sensor harness connector, refer to pages EF & EC-486, 582.

SEC240B



SEF587K

Check exhaust gas sensor harness:
1) Turn off engine and disconnect battery ground cable.
2) Disconnect E.C.U. S.M.J. harness connector from E.C.U.
3) Disconnect exhaust gas sensor harness connector and connect main harness side terminal for exhaust gas sensor to ground with a jumper wire.
4) Check for continuity between terminal No. 19 of E.C.U. S.M.J. harness connector and body ground.

Continuity exists . . . . . O.K.
Continuity does not exist . . . . . N.G.

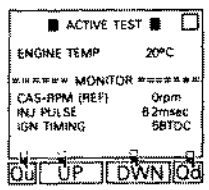
O.K.

N.G.

Repair or replace harness.

Connect E.C.U. S.M.J. harness connector to control unit.

Connect battery ground cable.

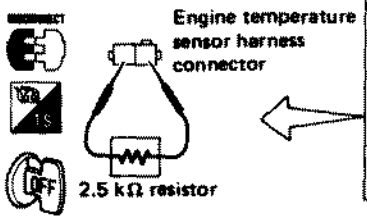


SEF788K

1) Select "ENG TEMPERATURE" in "ACTIVE TEST" mode.
2) Set "ENGINE TEMP" to 20°C (68°F) by touching "Qu" and "Qd" and "UP", "DOWN".

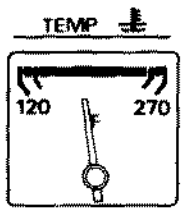
OR

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

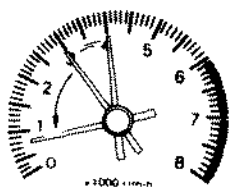


SEC242B

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



SEF246F


SEF248F

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

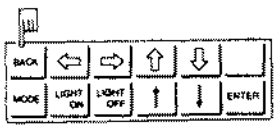
Check "CO" %.

Idle CO: Less than 10%

After checking CO%,

1) Touch "BACK".

O.K.


SEF913J

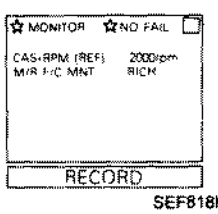
1) Disconnect the resistor from terminals of engine temperature sensor harness connector.
2) Connect engine temperature sensor harness connector to engine temperature sensor.

N.G.

Replace exhaust gas sensor.

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.

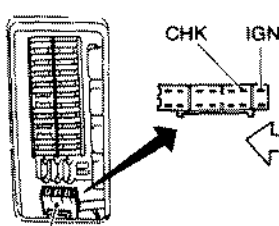
RICH → LEAN → RICH →
1 time 2 times
LEAN → RICH .....



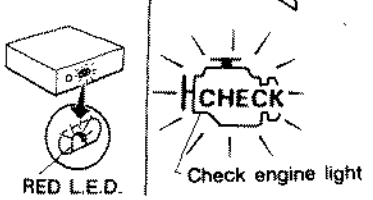
SEF818K

OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic mode II. (See page EF & EC-412.)
2. Maintaining engine at 2,000 rpm under no-load, check to make sure that the RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

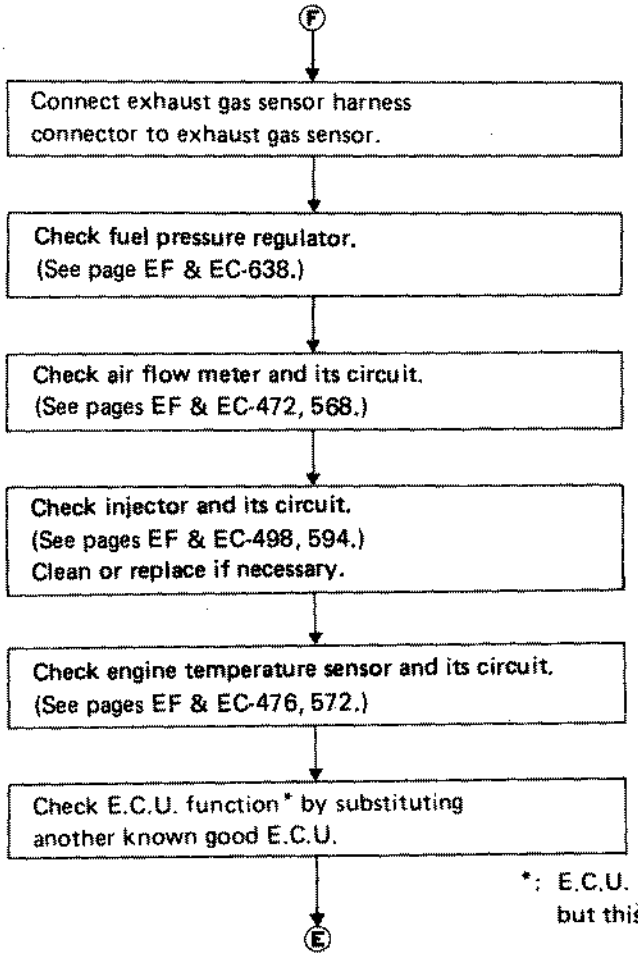


Diagnostic connector for CONSULT
(Connect CHK and IGN terminals with a suitable harness.)
SEF265L



RED L.E.D.
Check engine light
SEF621K

Ⓕ Ⓔ



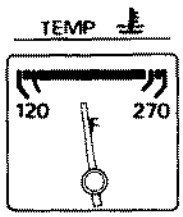
*: E.C.U. may be the cause of a problem, but this is rarely the case.

FOR MODELS WITHOUT CATALYZER (SR20DE only)

Checking and adjusting idle rpm and ignition timing

START

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



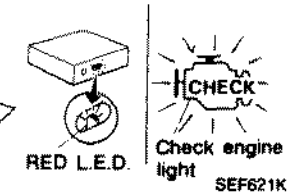
SEF246F

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


SEF247F

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

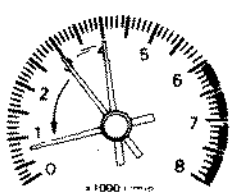
Perform E.C.C.S. self-diagnosis (mode II).



SEF621K

O.K. / N.G.

Repair or replace components as necessary.


SEF248F

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.

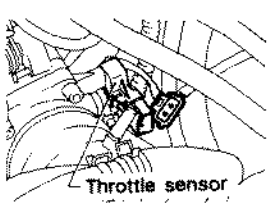


SEF316L

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

OR

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



SEF317L

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

Check ignition timing with a timing light.

$15^\circ \pm 2^\circ$ B.T.D.C.

O.K. → Ⓐ

N.G. → Ⓘ

Ⓐ Ⓘ

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

15° B.T.D.C.

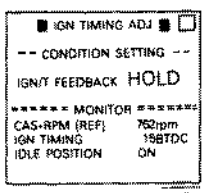
Check idle speed.

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

OR

- Check idle speed.

800±50 rpm



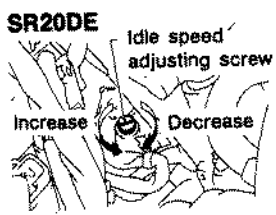
SEF786K

O.K. N.G.

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.

800 rpm

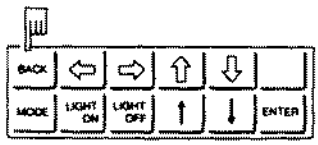


SEF268L

1) Touch "BACK".

OR

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



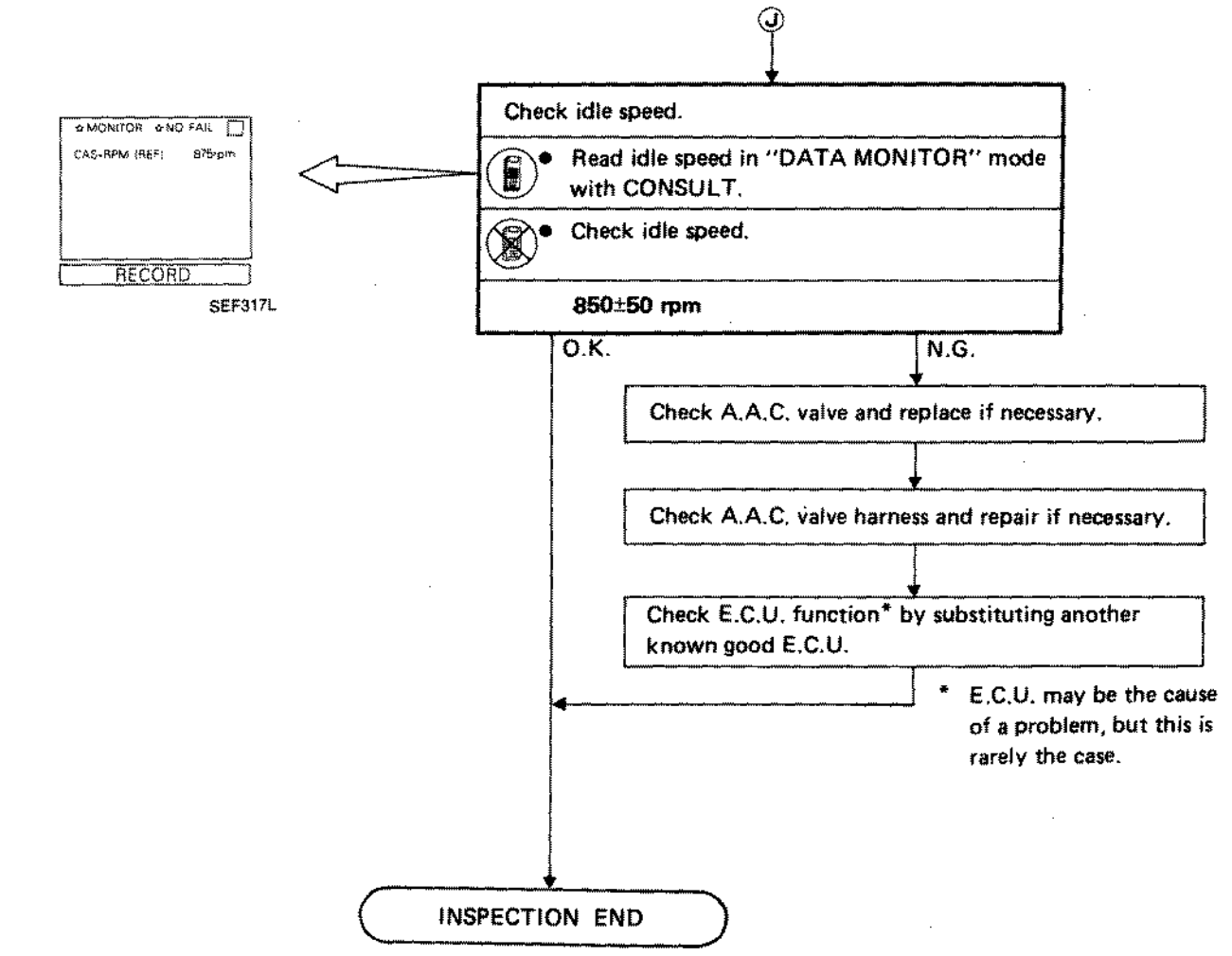
SEF913J

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

Ⓙ

☆MONITOR ☆NO FAIL
CAS-RPM (REF) 875rpm
RECORD

SEF317L


J
Check idle speed.
Read idle speed in "DATA MONITOR" mode with CONSULT.
Check idle speed.
850±50 rpm
O.K.
N.G.
Check A.A.C. valve and replace if necessary.
Check A.A.C. valve harness and repair if necessary.
Check E.C.U. function* by substituting another known good E.C.U.
* E.C.U. may be the cause of a problem, but this is rarely the case.
INSPECTION END

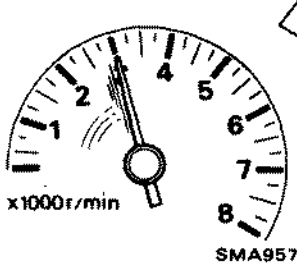
Checking and adjusting mixture ratio [With "CO"-meter]

INSPECTION START

Check and adjust idle speed and ignition timing. (Refer to EF & EC-397.)

Idle speed: 850±50 rpm
Ignition timing: 15°±2° B.T.D.C.

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



SMA957A

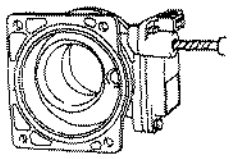
Check "CO" with "CO"-meter.

Idle "CO" %
Below 2.0

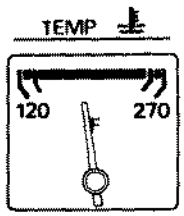
O.K.

N.G.

Turn off engine and remove air flow meter from vehicle.


SEF567K

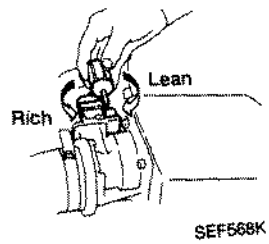
Drill a hole in seal plug which seals variable resistor of air flow meter and remove seal plug.



SEF246F

Install air flow meter on vehicle. Start engine and warm it up until water temperature indicator reads normal operating temperature.

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

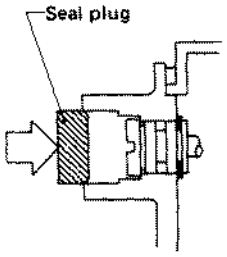


SEF568K

Adjust "CO"% by turning variable resistor on air flow meter.

Idle "CO" %
0.5±0.5

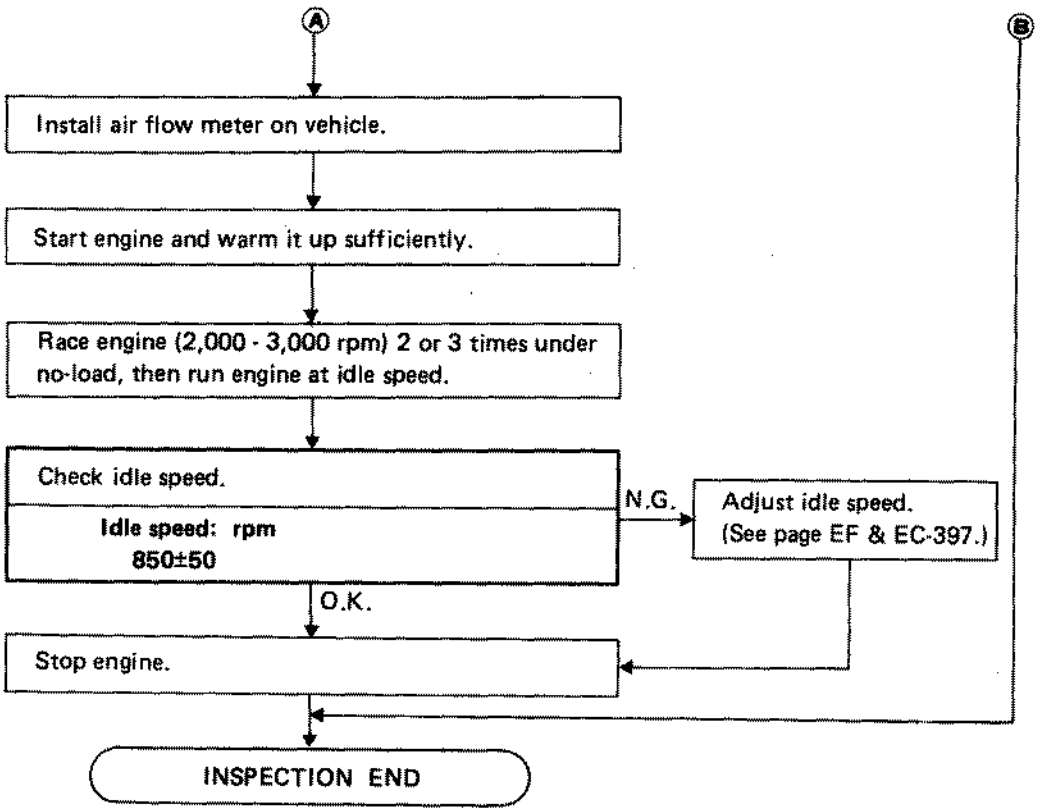
Turn off engine and remove air flow meter from vehicle.



SEF713B

Insert new seal plug into variable resistor hole. Tap seal plug with a suitable bar, thereby installing seal plug on air flow meter.

Ⓐ

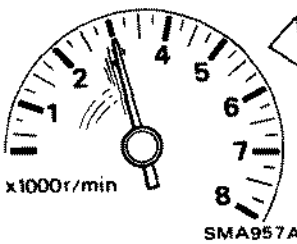

A
B
Install air flow meter on vehicle.
Start engine and warm it up sufficiently.
Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load, then run engine at idle speed.
Check idle speed.
Idle speed: rpm
850±50
N.G.
Adjust idle speed.
(See page EF & EC-397.)
O.K.
Stop engine.
INSPECTION END

[Without "CO"-meter]

INSPECTION START

Check and adjust idle speed and ignition timing.
(Refer to EF & EC-397.)

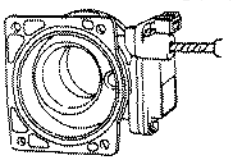
Idle speed: 850±50 rpm
Ignition timing: 15°±2° B.T.D.C.



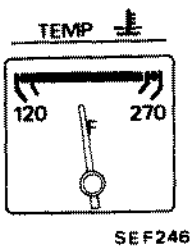
SMA957A

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

Turn off engine and remove air flow meter from vehicle.


SEF567K

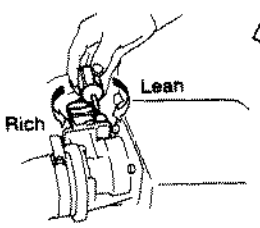
Drill a hole in seal plug which seals variable resistor of air flow meter and remove seal plug.



SEF246F

Install air flow meter on vehicle. Start engine and warm it up until water temperature indicator reads normal operating temperature.

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

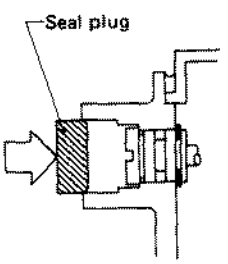


SEF568K

Adjust mixture ratio with engine speed set at maximum by turning variable resistor.

Turn variable resistor of air flow meter one full turn counterclockwise.

Turn off engine and remove air flow meter from vehicle.

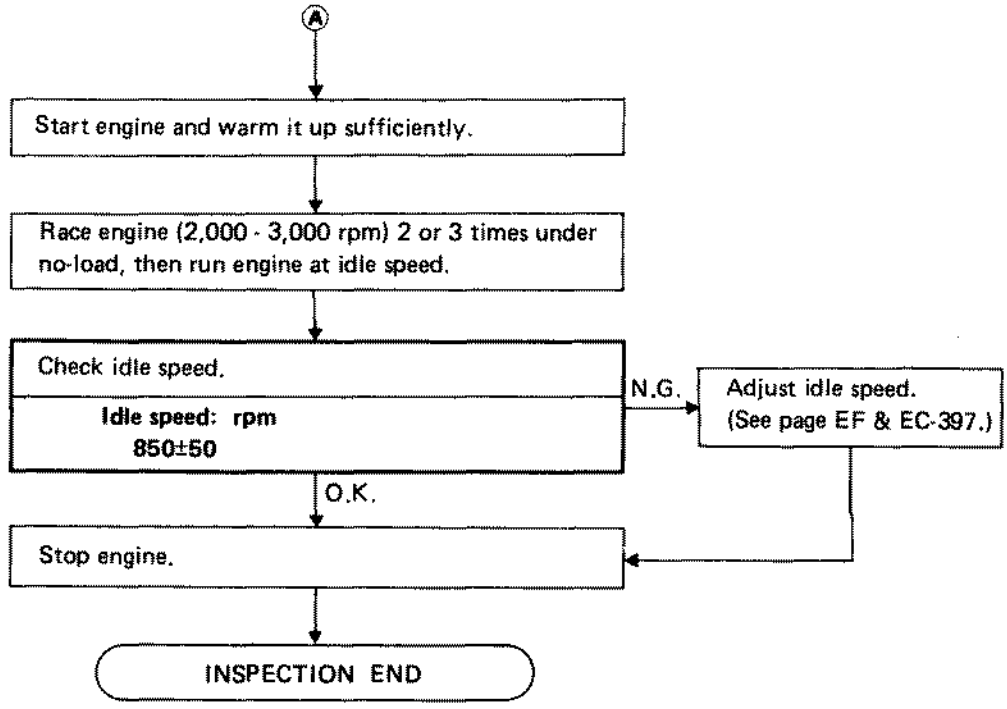


SEF713B

Insert new seal plug into variable resistor hole.
Tap seal plug with a suitable bar, thereby installing seal plug on air flow meter.

Install air flow meter on vehicle.

Ⓐ


Ⓐ
Start engine and warm it up sufficiently.
Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load, then run engine at idle speed.
Check idle speed.
Idle speed: rpm
850±50
N.G.
Adjust idle speed.
(See page EF & EC-397.)
O.K.
Stop engine.
INSPECTION END

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SR20DE

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SR20DET

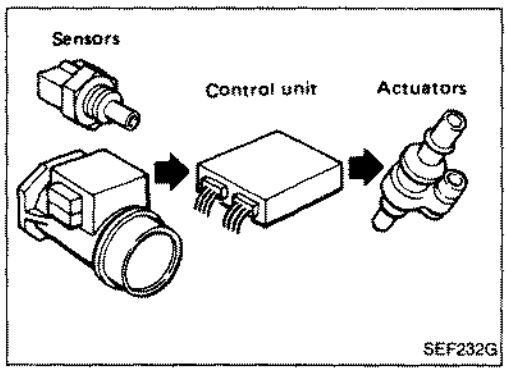
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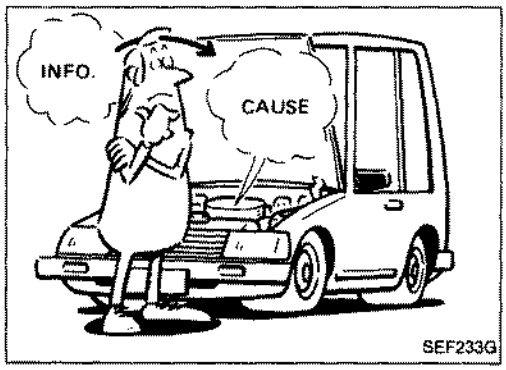
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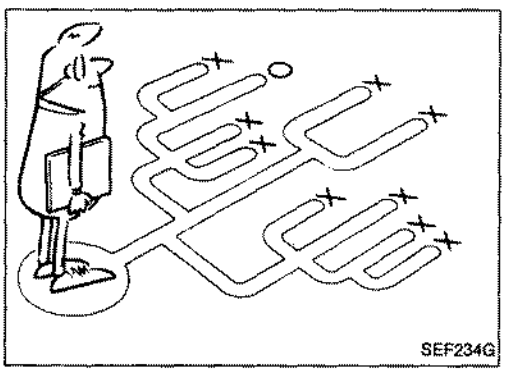
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SR

Electrical Components Inspection ..... EF & EC-621







How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

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

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

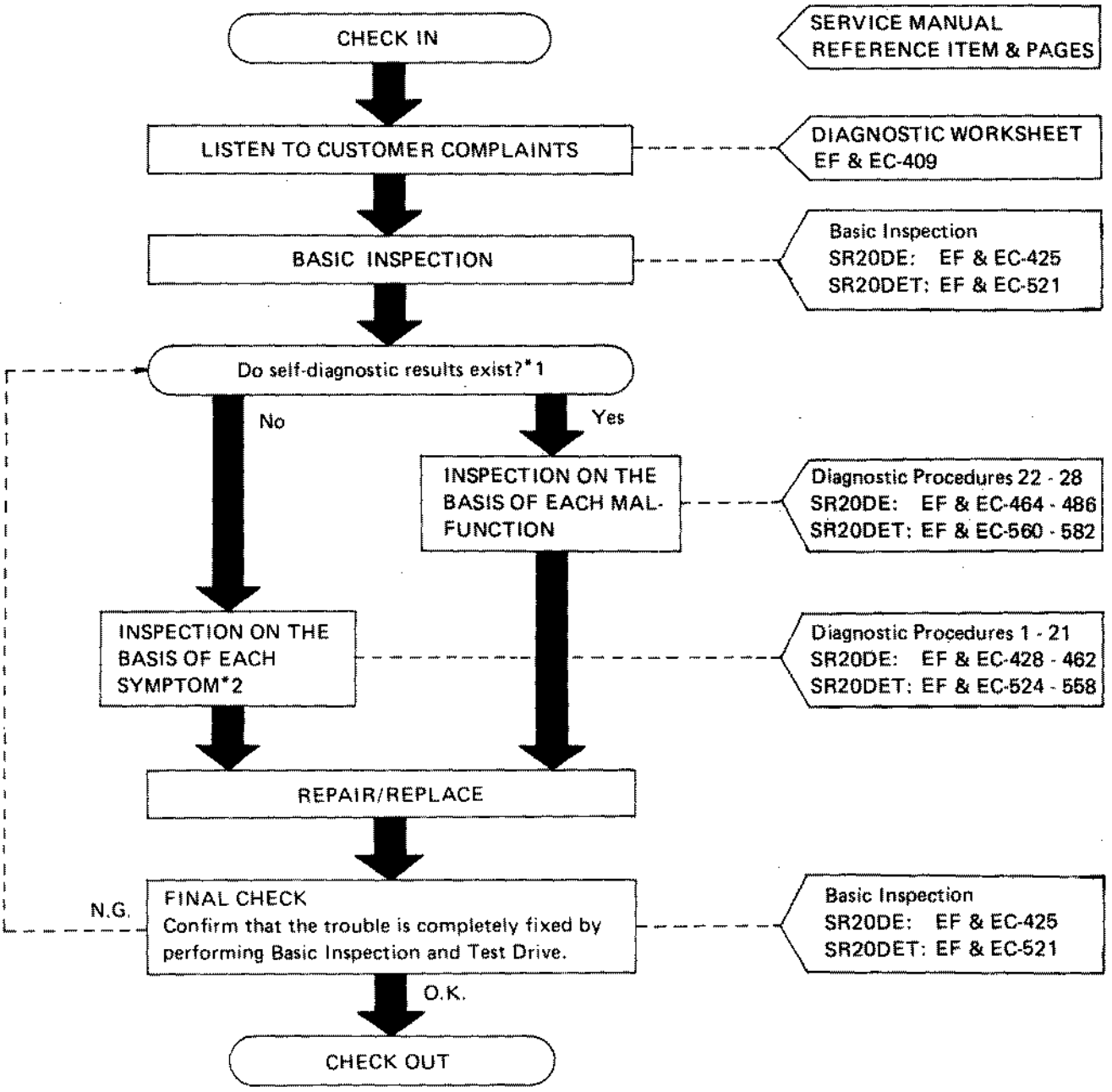
A visual check only may not find the cause of the problems, so a road test with a circuit tester connected to a suspected circuit should be performed.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a driveability complaint. The customer is a very good supplier of information on such problems, especially intermittent ones. Through interaction 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 driveability problems on an electronically controlled engine vehicle.

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

WORK FLOW



*1: If the self-diagnosis cannot be performed, check main power supply and ground circuit. (See Diagnostic Procedure 22.)
*2: If the trouble is not duplicated, see INTERMITTENT PROBLEM SIMULATION (EF & EC-410).

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

KEY POINTS

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

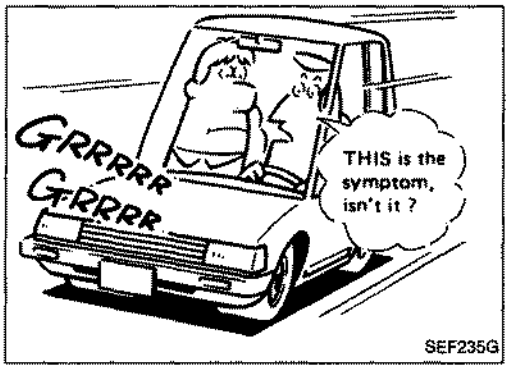
DIAGNOSTIC WORKSHEET

There are many kinds of operating conditions that lead to malfunctions on engine components.
A good grasp of such conditions can make trouble-shooting faster and more accurate.
In general, feelings for a problem depend on each customer. It is important to fully understand the symptoms or under what conditions a customer complains.
Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for trouble-shooting.

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 ☐ Detonation ☐ 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	
Check engine light		☐ Turned on ☐ Not turned on	

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

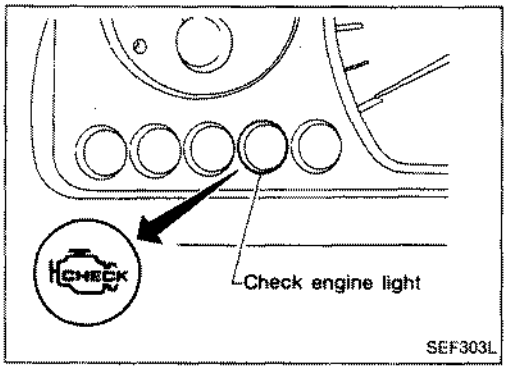


INTERMITTENT PROBLEM SIMULATION

In order to duplicate an intermittent problem, it is effective to create similar conditions for component parts, under which the problem might occur.
Perform the activity listed under Service procedure and note the result.

	Variable factor	Influential part	Target condition	Service procedure
1	Mixture ratio	Pressure regulator	Made lean	Remove vacuum hose and apply vacuum.
			Made rich	Remove vacuum hose and apply pressure.
2	Ignition timing	Crank angle sensor	Advanced	Rotate distributor clockwise.
			Retarded	Rotate distributor counterclockwise.
3*	Mixture ratio feedback control	Exhaust gas sensor	Suspended	Disconnect exhaust gas sensor harness connector.
		Control unit	Operation check	Perform self-diagnosis (Mode II) at 2,000 rpm.
4	Idle speed	A.A.C. valve	Raised	Turn idle adjusting screw counterclockwise.
			Lowered	Turn idle adjusting screw clockwise.
5	Electrical connection (Electric continuity)	Harness connectors and wires	Poor electrical connection or improper wiring	Tap or wiggle.
				Race engine rapidly. See if the torque reaction of the engine unit causes electric breaks.
6	Temperature	Control unit	Cooled	Cool with an icing spray or similar device.
			Warmed	Heat with a hair drier. **[WARNING: Do not overheat the unit.]**
7	Moisture	Electric parts	Damp	Wet. **[WARNING: Do not directly pour water on components. Use a mist sprayer.]**
8	Electric loads	Load switches	Loaded	Turn on headlamps, air conditioner, rear defogger, etc.
9	Idle switch condition	Control unit	ON-OFF switching	Rotate throttle sensor body.
10	Ignition spark	Timing light	Spark power check	Try to flash timing light for each cylinder using ignition coil adapter (S.S.T.).

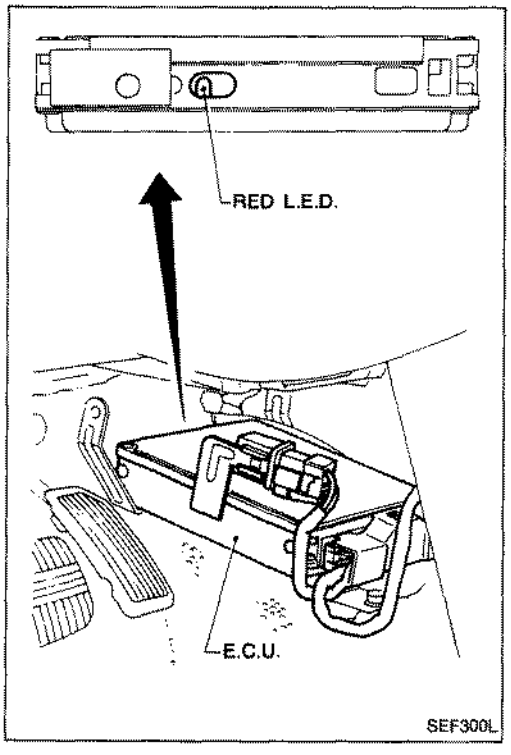
*: Models with catalyzer only



Self-diagnosis

CHECK ENGINE LIGHT

A check engine light has been adopted on all models. This light blinks simultaneously with the RED L.E.D. on the E.C.U.



E.C.U. L.E.D.

The E.C.U. has only one RED L.E.D.

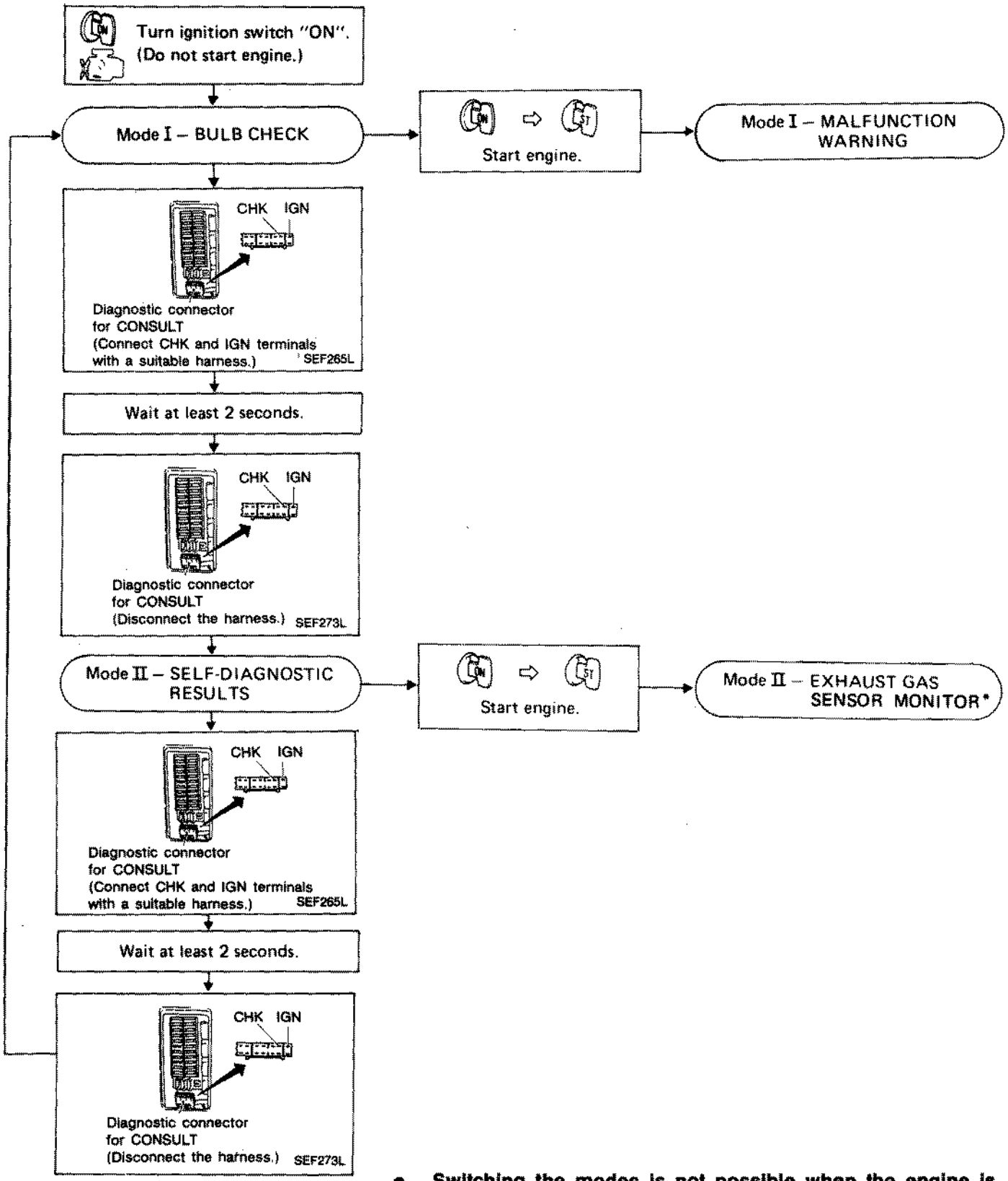
SELF-DIAGNOSTIC FUNCTION

Condition	Mode	Mode I	Mode II
Ignition switch in "ON" position	Engine stopped	BULB CHECK	SELF-DIAGNOSTIC RESULTS
	Engine running	MALFUNCTION WARNING	EXHAUST GAS SENSOR MONITOR*

*: Models with catalyzer only

Self-diagnosis (Cont'd)

HOW TO SWITCH MODES



*: Models with catalyzer only

- **Switching the modes is not possible when the engine is running.**
- **When the ignition switch is turned off during diagnosis in each mode, and then turned back on again after power to the E.C.U. has dropped off completely, the diagnosis will automatically return to Mode I.**

Self-diagnosis — Mode I

MODE I — BULB CHECK

In this mode, the RED L.E.D. in the E.C.U. and the CHECK ENGINE LIGHT in the instrument panel stay "ON".
If either remain "OFF", check the bulb in the CHECK ENGINE LIGHT or the RED L.E.D.

MODE I — MALFUNCTION WARNING

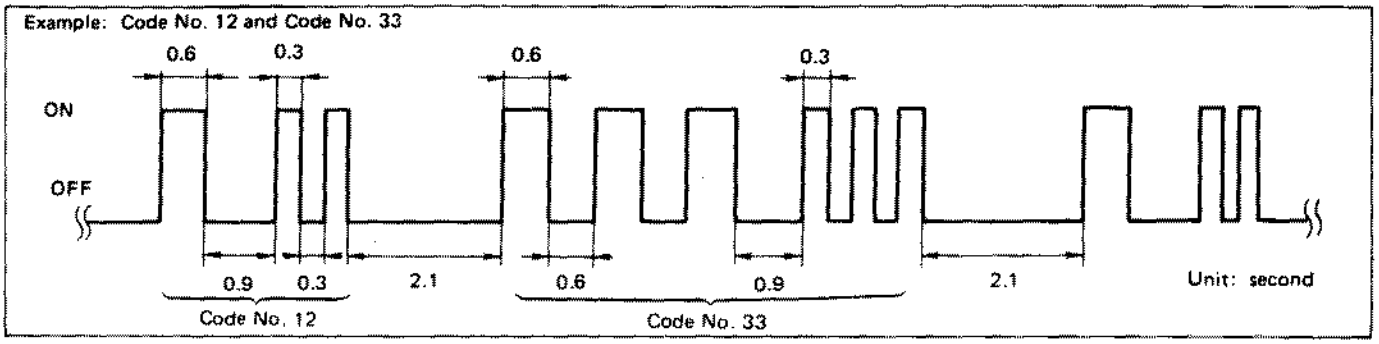
CHECK ENGINE LIGHT and RED L.E.D.	Condition
ON	When the E.C.U.'s C.P.U. is malfunctioning.
OFF	O.K.

- **The RED L.E.D. and the CHECK ENGINE LIGHT will turn off when normal condition is detected.**

Self-diagnosis — Mode II (Self-diagnostic results)

DESCRIPTION

In this mode, a malfunction code is indicated by the number of flashes from the RED L.E.D. or the CHECK ENGINE LIGHT as shown below:



Long (0.6 second) blinking indicates the number of ten digits and short (0.3 second) blinking indicates the number of single digits.
For example, the red L.E.D. flashes once for 0.6 seconds and then it flashes twice for 0.3 seconds. This indicates the number "12" and refers to a malfunction in the air flow meter. In this way, all the problems are classified by their code numbers.
The diagnostic results will remain in E.C.U. memory.

Display code table

Code No.	Detected items
11*	Crank angle sensor circuit
12	Air flow meter circuit
13	Engine temperature sensor circuit
21*	Ignition signal circuit
34	Detonation sensor circuit
43	Throttle sensor circuit
55	No malfunction in the above circuits

*: Check items causing a malfunction of crank angle sensor circuit first, if both code No. 11 and 21 are displayed at the same time.

NOTE

Self-diagnosis — Mode II (Exhaust gas sensor monitor — Models with catalyzer only)

DESCRIPTION

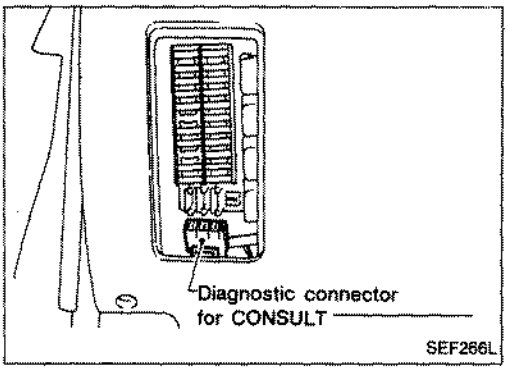
In this mode, the CHECK ENGINE LIGHT and RED L.E.D. display the condition of the fuel mixture (lean or rich) which is monitored by the exhaust gas sensor.

CHECK ENGINE LIGHT and RED L.E.D.	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition
ON	Lean	Closed loop control
OFF	Rich	
*Remains ON or OFF	Any condition	Open loop control

*: Maintains conditions just before switching to open loop.

HOW TO CHECK EXHAUST GAS SENSOR

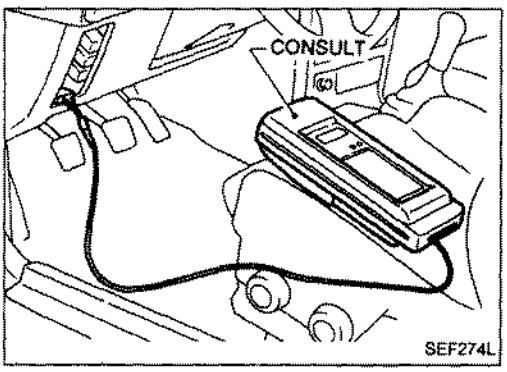
1. Set Mode II. (Refer to "HOW TO SWITCH MODES".)
2. Start engine and warm it up until engine coolant temperature indicator points to the middle of the gauge.
3. Run engine at about 2,000 rpm for about 2 minutes under no-load conditions.
4. Make sure RED L.E.D. or CHECK ENGINE LIGHT goes ON and OFF more than 5 times every 10 seconds; measured at 2,000 rpm under no-load.

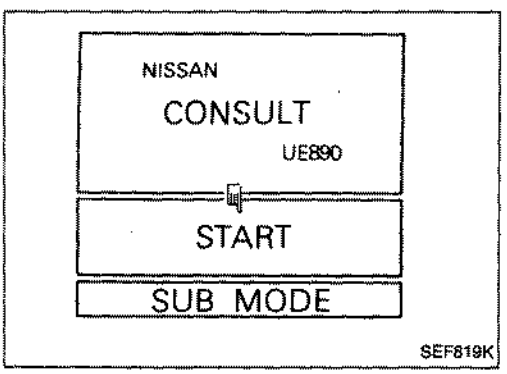


Consult

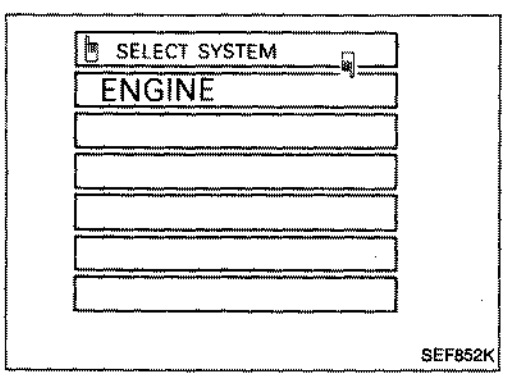
CONSULT INSPECTION PROCEDURE

1. Turn off ignition switch.
2. Connect "CONSULT" to diagnostic connector.
   (Diagnostic connector is located behind the fuse box cover.)

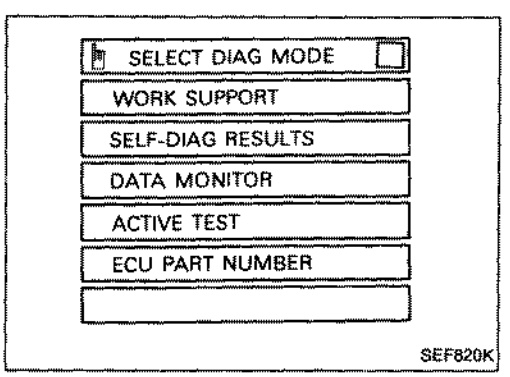




3. Turn on ignition switch.
4. Touch "START".



5. Touch "ENGINE".



6. Perform each diagnostic mode according to the inspection sheet as follows:

For further information, see the CONSULT Operation Manual.

Consult (Cont'd)

E.C.C.S. COMPONENT PARTS APPLICATION

E.C.C.S. COMPONENT PARTS \ MODE		WORK SUPPORT	SELF- DIAGNOSTIC RESULTS	DATA MONITOR	ACTIVE TEST
INPUT	Crank angle sensor		X	X	
	Air flow meter		X	X	
	Engine temperature sensor		X	X	X
	Exhaust gas sensor*			X*	
	Vehicle speed sensor			X	
	Throttle sensor	X	X	X	
	Detonation sensor		X		
	Ignition switch (start signal)			X	
	Air conditioner switch			X	
	Neutral switch			X	
	Power steering oil pressure switch			X	
	Battery			X	
OUTPUT	Injectors			X	X
	Power transistor (ignition signal)	X (Ignition timing)	X	X (Ignition timing)	X
	A.A.C. valve	X		X	X
	Air conditioner relay			X	
	Fuel pump relay	X		X	X
	Radiator fan			X	X
	Wastegate valve control solenoid valve**			X**	

X: Applicable
*: Models with catalyzer only
**: For SR20DET engine only

FUNCTION

Diagnostic mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT unit.
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.
Data monitor	Input/Output data in the control unit can be read.
Active test	Mode in which CONSULT drives some actuators apart from the control units and also shifts some parameters in a specified range.
E.C.U. part numbers	E.C.U. part numbers can be read.

Consult (Cont'd)

WORK SUPPORT MODE

WORK ITEM	CONDITION	USAGE
THROTTLE SENSOR ADJUSTMENT	CHECK THE THROTTLE 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 sensor initial position.
IGNITION TIMING ADJUSTMENT	• IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING "START". AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CRANK ANGLE SENSOR.	When adjusting initial ignition timing.
AAC VALVE ADJUSTMENT	SET ENGINE RPM 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.

SELF-DIAGNOSTIC RESULTS MODE

DIAGNOSTIC ITEM	DIAGNOSTIC ITEM IS DETECTED WHEN ...	CHECK ITEM (REMEDY)
CRANK ANGLE SENSOR*	• Either 1° or 180° signal is not entered for the first few seconds during engine cranking. • Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm.	• Harness and connector (If harness and connector are normal, replace crank angle sensor.)
AIR FLOW METER	• The air flow meter circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector (If harness and connector are normal, replace air flow meter.)
ENGINE TEMP SENSOR	• The engine temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Engine temperature sensor
IGN SIGNAL-PRIMARY*	• The ignition signal in primary circuit is not entered during engine cranking or running.	• Harness and connector • Power transistor unit
DETONATION SENSOR	• The detonation circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Detonation sensor
THROTTLE SENSOR	The throttle sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Throttle sensor

*: Check items causing a malfunction of crank angle sensor circuit first, if both "CRANK ANGLE SENSOR" and "IGN SIGNAL-PRIMARY" come out at the same time.

Consult (Cont'd)

DATA MONITOR MODE

Remarks:

- The monitor item marked "*" is applicable to models with turbocharger only.
- The monitor item marked "**" is applicable to vehicles with catalyzer only.
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the E.C.U. at the connector.
  * Specification data may not be directly related to their components signals/values/operations.
  i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the E.C.U. according to the signals input from the crank angle sensor and other ignition timing related sensors.

MONITOR ITEM	CONDITION		SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
CAS, RPM (REF)	• Tachometer: Connect • Run engine and compare tachometer indication with the CONSULT value.		Almost the same speed as the CONSULT value.	• Harness and connector • Crank angle sensor
AIR FLOW MTR	• Engine: After warming up, idle the engine • A/C switch "OFF" • Shift lever "N"	Idle	SR20DE: 1.3 - 1.8V SR20DET: 1.0 - 1.5V	• Harness and connector • Air flow meter
		2,000 rpm	SR20DE: 1.6 - 2.1V SR20DET: 1.3 - 1.8V	
ENG TEMP SEN	• Engine: After warming up		More than 70°C (158°F)	• Harness and connector • Engine temperature sensor
EXH GAS SEN**	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0V	• Harness and connector • Exhaust gas sensor • Intake air leaks • Injectors
M/R F/C MNT**			LEAN ↔ RICH Changes more than 5 times during 10 seconds.	
CAR SPEED SEN	• Turn drive wheels and compare speedometer indication with the CONSULT value		Almost the same speed as the CONSULT value	• Harness and connector • Vehicle speed sensor
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14V	• Battery • E.C.U. power supply circuit
THROTTLE SEN	• Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.45 - 0.55V	• Harness and connector • Throttle sensor • Throttle sensor adjustment
		Throttle valve fully opened	Approx. 4.0V	
START SIGNAL	• Ignition switch: ON → START		OFF → ON	• Harness and connector • Starter switch
IDLE POSITION	• Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON	• Harness and connector • Throttle sensor • Throttle sensor adjustment
		Throttle valve: Slightly open	OFF	
AIR COND SIG	• Engine: After warming up, idle the engine	A/C switch "OFF"	OFF	• Harness and connector • Air conditioner switch
		A/C switch "ON"	ON	
NEUTRAL SW	• Ignition switch: ON	Shift lever "P" or "N"	ON	• Harness and connector • Neutral switch
		Except above	OFF	
PW/ST SIGNAL	• Engine: After warming up, idle the engine	Steering wheel in neutral (forward direction)	OFF	• Harness and connector • Power steering oil pressure switch
		The steering wheel is turned	ON	
FUEL PUMP RLY	• Ignition switch is turned to ON (SR20DE: Operates for 5 seconds, SR20DET: Operates for 1 second) • Engine running and cranking • When engine is stopped (stops in 1.0 seconds)		ON	• Harness and connector • Fuel pump relay
	Except as shown above		OFF	

Consult (Cont'd)

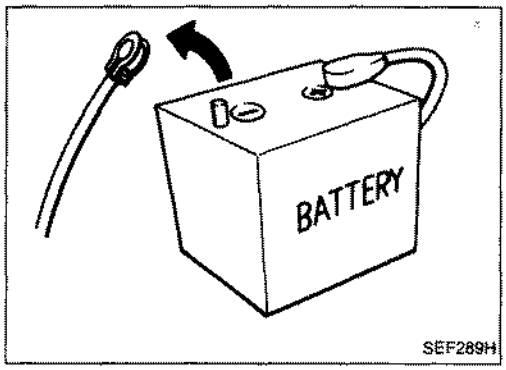
MONITOR ITEM	CONDITION		SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
RADIATOR FAN	• Engine: After warming up, idle the engine. • A/C switch "OFF"	Engine temperature is 99°C (210°F) or less	OFF	• Harness and connector • Radiator fan relay • Radiator fan
		Engine temperature is 100°C (212°F) or more	ON	
INJ PULSE	• Engine: After warming up • A/C switch "OFF" • Shift lever "N" • No-load	Idle	SR20DE: 2.4 - 3.2 msec. SR20DET: 1.7 - 2.5 msec.	• Harness and connector • Injector • Air flow meter • Intake air system
		2,000 rpm	SR20DE: 1.9 - 2.8 msec. SR20DET: 1.5 - 2.3 msec.	
IGN TIMING	ditto	Idle	SR20DE: 15° B.T.D.C. SR20DET: 20° B.T.D.C.	• Harness and connector • Crank angle sensor
		2,000 rpm	SR20DE: More than 25° B.T.D.C. SR20DET: More than 30° B.T.D.C.	
AAC VALVE	ditto	Idle	20 - 40%	• Harness and connector • A.A.C. valve
		2,000 rpm	—	
A/F ALPHA	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	75 - 125%	• Harness and connector • Injector • Air flow meter • Exhaust gas sensor • Canister purge line • Intake air system
AIR COND RLY	• Air conditioner switch OFF → ON		OFF → ON	• Harness and connector • Air conditioner switch • Air conditioner relay
W/G CONT S/V*	• Use unleaded premium fuel. • Shift lever "N"	Idle	OFF	• Harness and connector • Wastegate valve control solenoid valve
		Race engine up to 2,000 rpm.	ON	

Consult (Cont'd)

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
FUEL INJECTION TEST	• 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 • Exhaust gas sensor
AAC/V OPENING TEST	• Engine: After warming up, idle the engine. • Change the AAC valve opening percent using CONSULT.	Engine speed changes according to the opening percent.	• Harness and connector • AAC valve
ENGINE TEMP TEST	• Engine: Return to the original trouble condition • Change the engine coolant temperature using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connector • Engine temperature sensor • Fuel injectors
IGN TIMING TEST	• 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 TEST	• 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
RADIATOR FAN TEST	• Ignition switch: ON • Turn the radiator fan "ON" and "OFF" using CONSULT.	Radiator fan moves and stops.	• Harness and connector • Radiator fan motor
FUEL PUMP RLY TEST	• Ignition switch: ON (Engine stopped) • Turn the fuel pump relay "ON" and "OFF" using CONSULT and listen to operating sound.	Fuel pump relay makes the operating sound.	• Harness and connector • Fuel pump relay
SELF-LEARN CONT TEST*	• In this test, the coefficient of self-learning control mixture ratio returns to the original coefficient by touching "CLEAR" on the screen.		

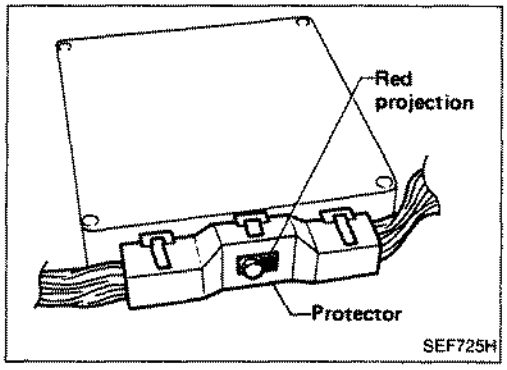
Remarks: The monitor item marked "*" is applicable to vehicles with catalyzer only.



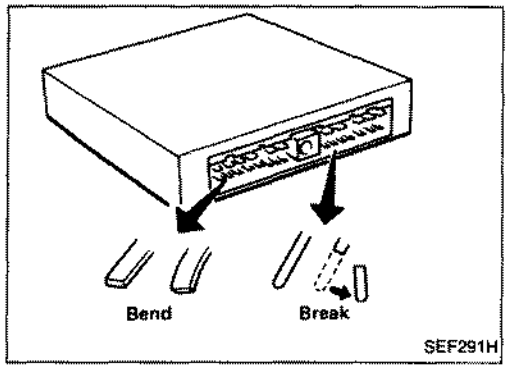
Diagnostic Procedure

CAUTION:

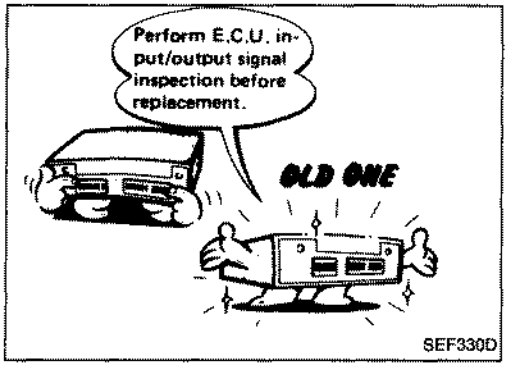
1. **Before connecting or disconnecting the E.C.U. harness connector to or from any E.C.U., be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal in order not to damage E.C.U. as battery voltage is applied to E.C.U. even if ignition switch is turned off. Failure to do so may damage the E.C.U.**



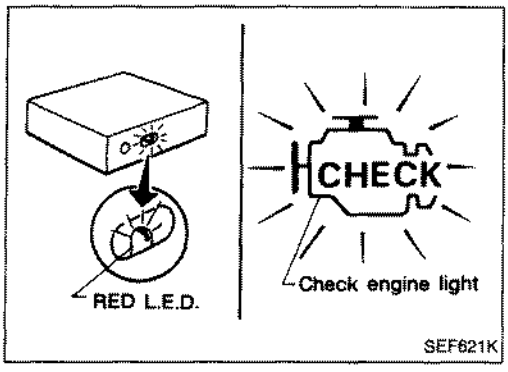
2. **When connecting E.C.U. harness connector, tighten securing bolt until red projection is in line with connector face.**



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

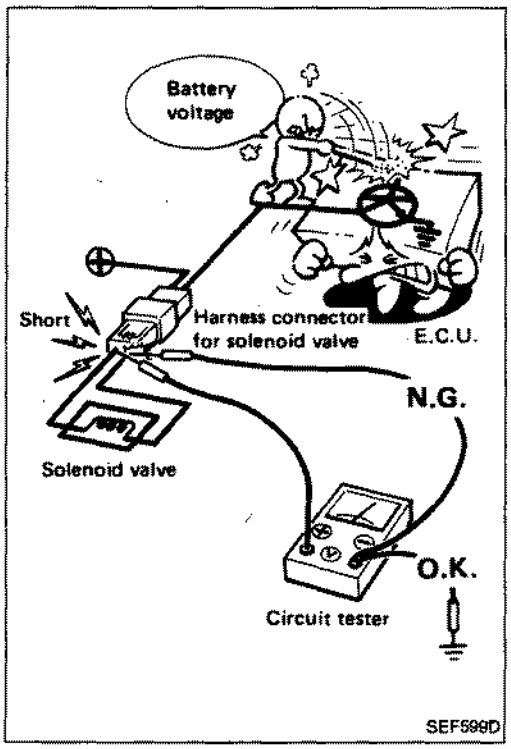


5. **Before replacing E.C.U., perform E.C.U. input/output signal inspection and make sure whether E.C.U. functions properly or not. (See page EF & EC-621.)**



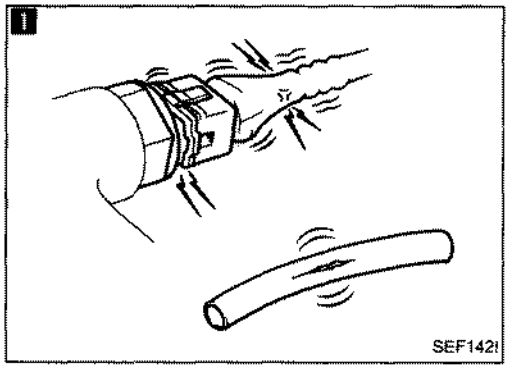
6. **After performing this "Diagnostic Procedure", perform E.C.C.S. self-diagnosis and driving test.**

Diagnostic Procedure (Cont'd)



7. **When measuring E.C.U. controlled components supply voltage with a circuit tester, separate one tester probe from the other.**
   If the two tester probes accidentally make contact with each other during measurement, the circuit will be shorted, resulting in damage to the control unit power transistor.

Basic Inspection

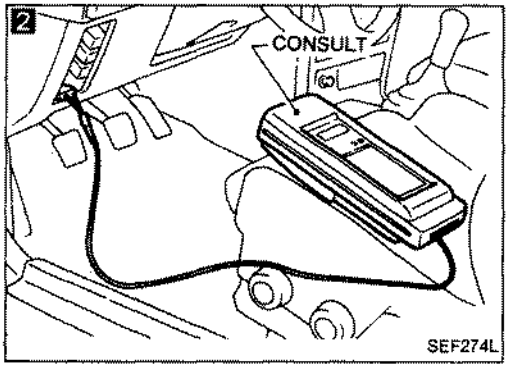


1

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:

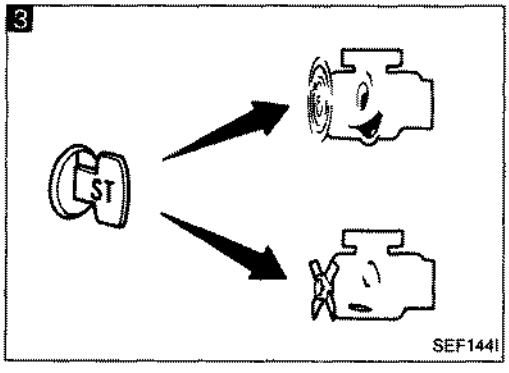
- Harness connectors for proper connections
- Vacuum hoses for splits, kinks, and proper connections
- Wiring for proper connections, pinches, and cuts



2

CONNECT CONSULT TO THE VEHICLE

Connect "CONSULT" to the diagnostic connector and select "ENGINE" from the menu. (Refer to page EF & EC-417.)



3

DOES ENGINE START? — No → Go to **6**.

Yes

4

CHECK IGNITION TIMING.

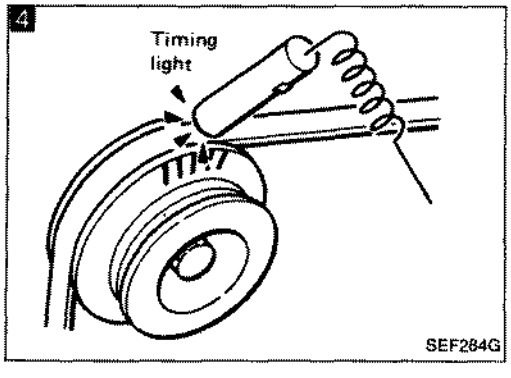
Warm up engine sufficiently and check ignition timing at idle using timing light. (Refer to page EF & EC-389.)

Ignition timing:

15° ± 2° B.T.D.C.

N.G. → Adjust ignition timing by turning crank angle sensor.

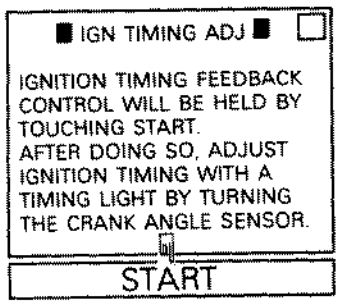
O.K.



(Go to Ⓐ on next page.)

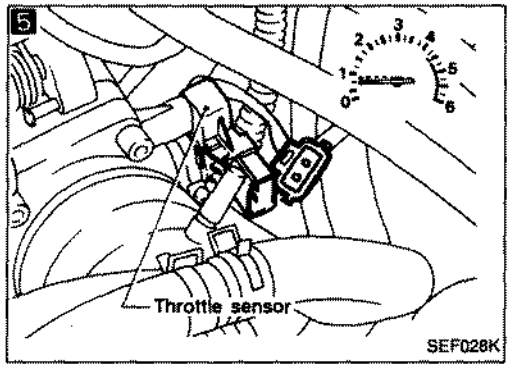
Basic Inspection (Cont'd)

5



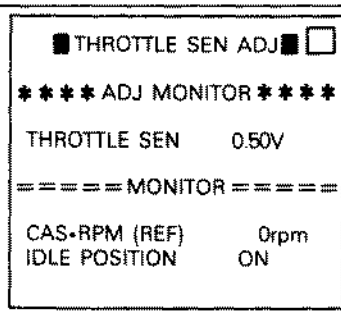
SEF816K

5



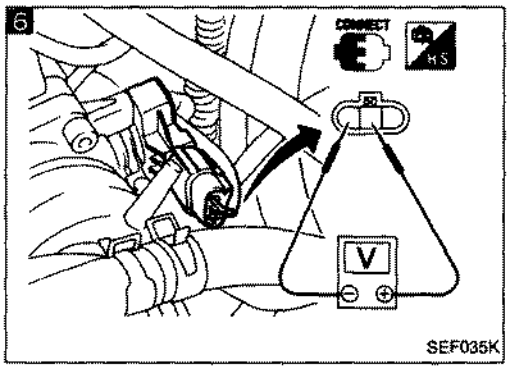
SEF028K

6



SEF275L

6



SEF035K

Ⓐ

5 **CHECK IDLE ADJ. SCREW INITIAL SET RPM.**

1. Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. When touching "START", does engine rpm fall to 800±50 rpm (in "N" position)?

No → Adjust engine rpm by turning idle adjusting screw.

OR

When disconnecting throttle sensor harness connector, does engine rpm fall to 800±50 rpm (in "N" position)?

Yes

6 **CHECK THROTTLE SENSOR IDLE POSITION.**

1. Perform "THROTTLE SEN. ADJ" in "WORK SUPPORT" mode.
2. Check that output voltage of throttle sensor is 0.45 to 0.55V. (Throttle valve fully closes.) and "IDLE POSITION" stays "ON".

N.G. →
1. Adjust output voltage by rotating throttle sensor body.
2. Disconnect throttle sensor harness connector for a few seconds and then reconnect it.
3. Confirm that "IDLE POSITION" stays "ON".

OR

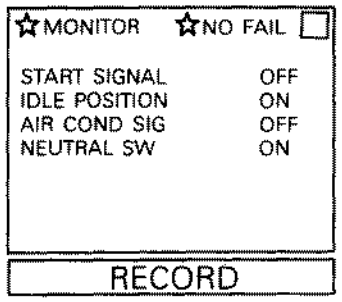
Measure output voltage of throttle sensor using voltmeter, and check that it is 0.45 to 0.55V. (Throttle valve fully closed.)

O.K.

(Go to Ⓑ on next page.)

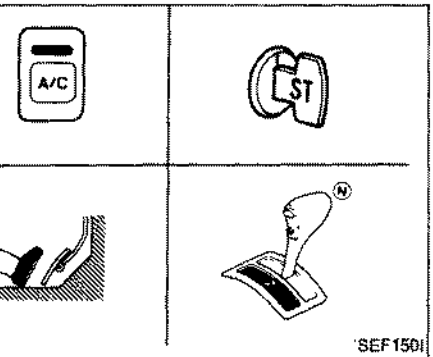
Basic Inspection (Cont'd)

7



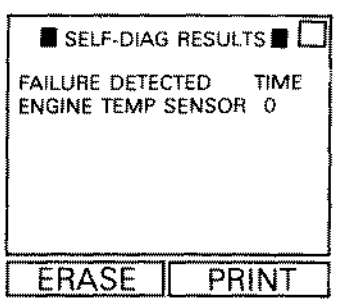
SEF821K

7



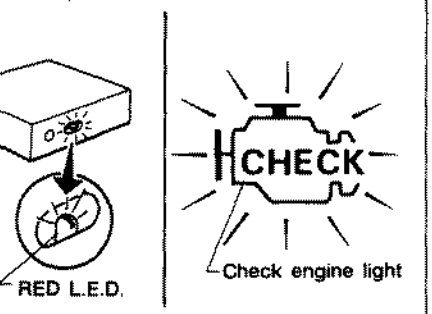
SEF150I

8



SEF822K

8



SEF621K

Ⓑ

7

CHECK SWITCH INPUT SIGNAL.

Select the following switches in "DATA MONITOR" mode.

a) Start signal,
b) Idle position,
c) Air conditioner signal,
d) Neutral (Parking) switch,

and check the switches' ON-OFF operation.

N.G. → Repair or replace the malfunctioning switch or its circuit.

OR

Remove E.C.U. from behind audio system panel and check the above switches' ON-OFF operation using voltmeter at each E.C.U. terminal.

Switch	Condition	Voltage (V)
Start signal	IGN ON → IGN START	0 → Battery voltage
Idle position	Accelerator pedal released → Accelerator pedal fully depressed	0.45 - 0.55 → Approx. 4.0
A/C signal	A/C OFF → A/C ON (Engine running)	Battery voltage → Approx. 0
Neutral (Parking) switch	Shift lever is Neutral position → Except Neutral position	0 → Approx. 6.0

O.K.

8

READ SELF-DIAGNOSTIC RESULTS.

1. Perform "SELF-DIAG RESULTS" mode.
2. Read out self-diagnostic results.
3. Is a failure detected?

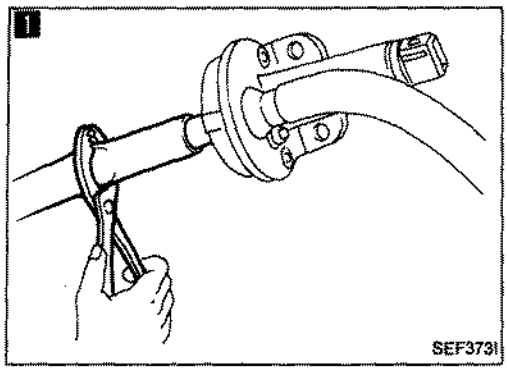
Yes → Go to the relevant inspection procedure.

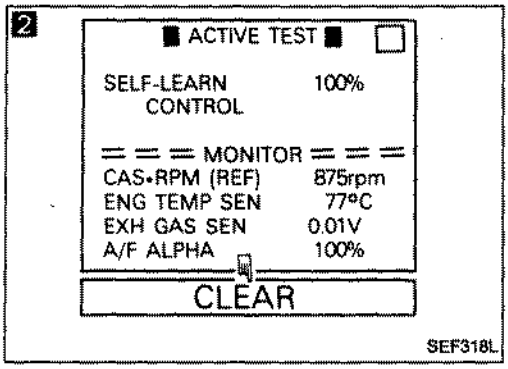
OR

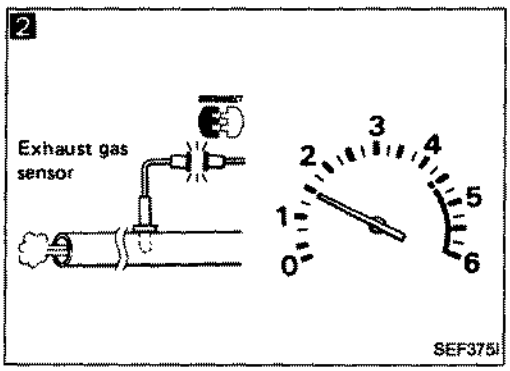
1. Set "Self-diagnostic results mode" in Mode II. (Refer to page EF & EC-412.)
2. Count the number of RED L.E.D. or check engine light flashes and read out the codes.
3. Does the code shown correspond to any malfunction?

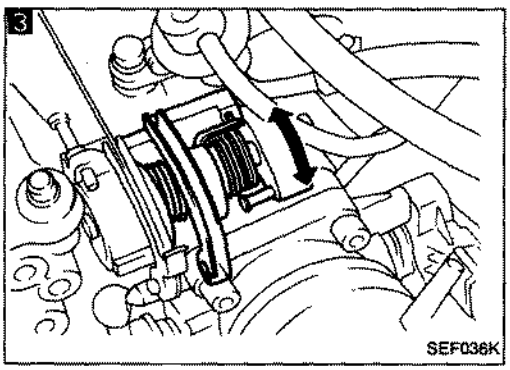
No

INSPECTION END









Diagnostic Procedure 1 — High Idling after Warm-up

1

CHECK AIR REGULATOR.
When pinching the air regulator hose, does the engine speed drop?

Yes → Check air regulator and circuit. (See page EF & EC-504.)

No ↓

2

CHECK INTAKE AIR LEAK.
(MODELS WITH CATALYZER ONLY)

1. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode.
2. Clear the self-learning control coefficient by touching "CLEAR".
3. Does the engine speed drop?

Yes → Discover air leak location and repair.

OR

1. Disconnect exhaust gas sensor harness connector.
2. After racing engine at 2,000 rpm under no-load for about 30 seconds, does the engine speed drop?

No ↓

3

CHECK THROTTLE LINKAGE.
1. Check that throttle linkage moves smoothly.
2. Confirm that throttle valve both fully opens and fully closes.

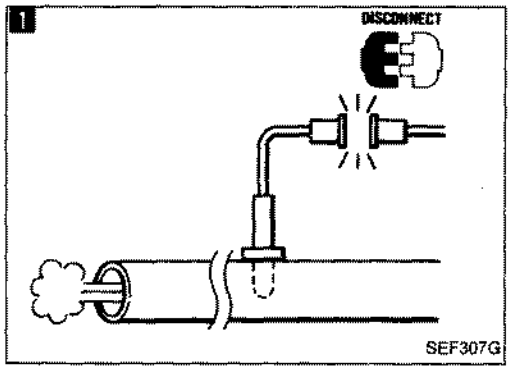
N.G. → Repair throttle linkage or sticking of throttle valve.

O.K. ↓

INSPECTION END

Diagnostic Procedure 2 — Hunting

1

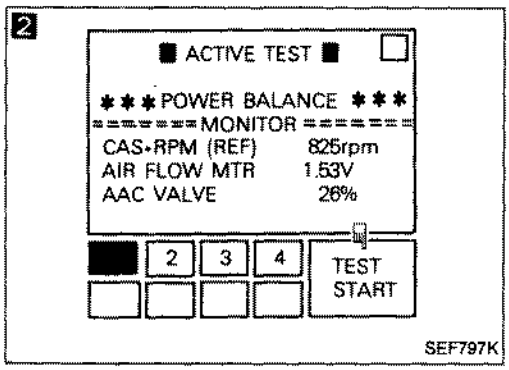


CHECK EXHAUST GAS SENSOR. (MODELS WITH CATALYZER ONLY)
When disconnecting exhaust gas sensor harness connector, is the hunting fixed?

Yes → Check exhaust gas sensor. (See page EF & EC-494.)

No ↓

2



PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

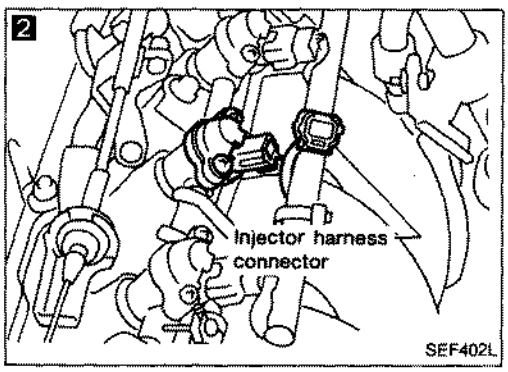
OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 4.

Yes ↓

2



3

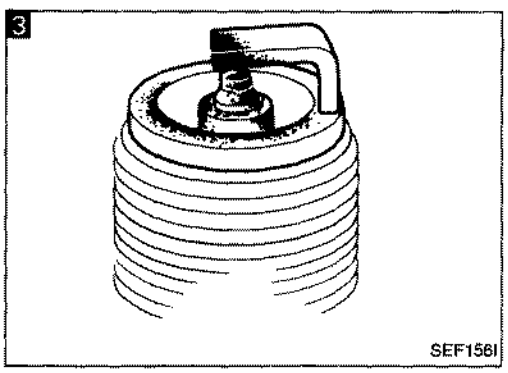
CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

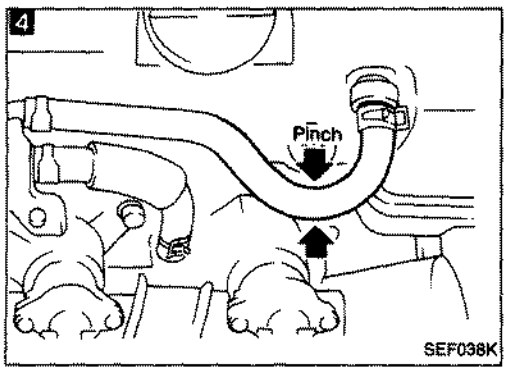
O.K. ↓

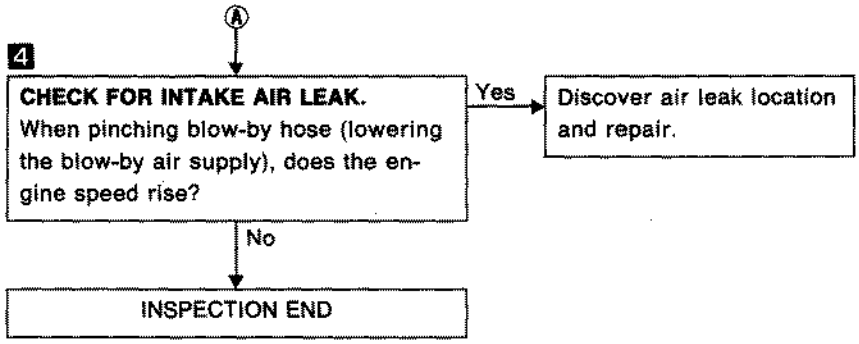
(Go to Ⓐ on next page.)

3



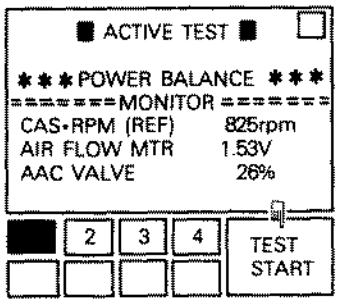
Diagnostic Procedure 2 — Hunting (Cont'd)





Diagnostic Procedure 3 — Unstable Idle

1



SEF797K

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 6.

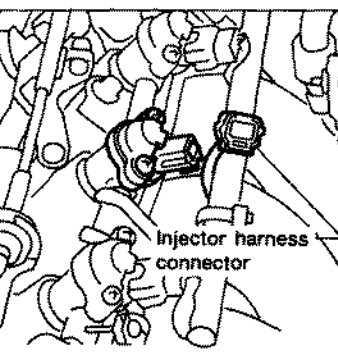
OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes ↓

2

1



SEF402L

CHECK INJECTOR.

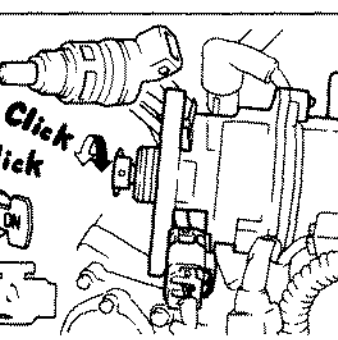
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

3

2



SEF326K

CHECK IGNITION SPARK.

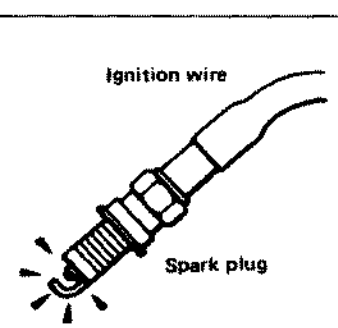
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor and their circuits. (See page EF & EC-480.)

O.K. ↓

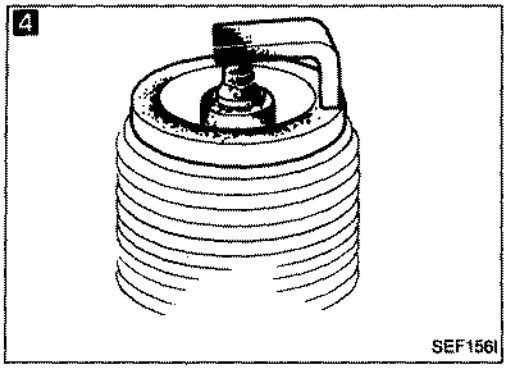
(Go to Ⓐ on next page.)

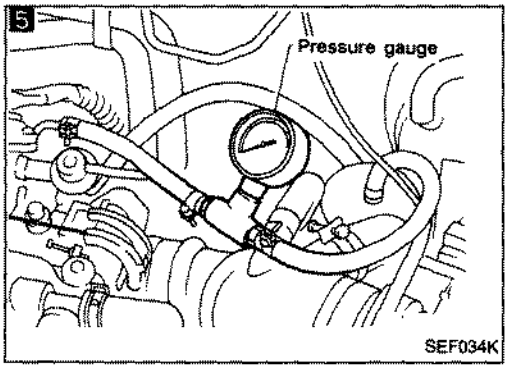
3



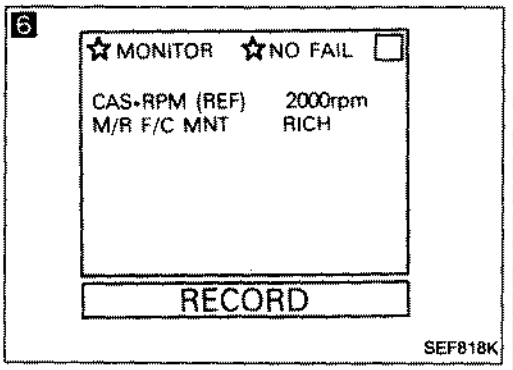
SEF282G

Diagnostic Procedure 3 — Unstable Idle (Cont'd)

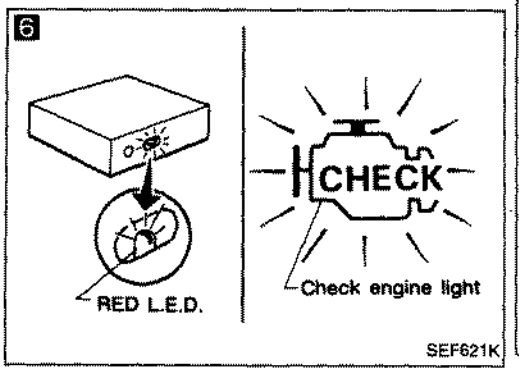

SEF156I



SEF034K



SEF818K



SEF621K

Ⓐ

4 **CHECK SPARK PLUGS.**
Remove the spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K.

5 **CHECK FUEL PRESSURE.**
1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.
   At idle:
   Approx. 245 kPa
   (2.45 bar, 2.5 kg/cm², 36 psi)

N.G. → Check fuel pump and circuit.

O.K.

6 **CHECK EXHAUST GAS SENSOR. (MODELS WITH CATALYZER ONLY)**

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

N.G. → Replace exhaust gas sensor.

OR

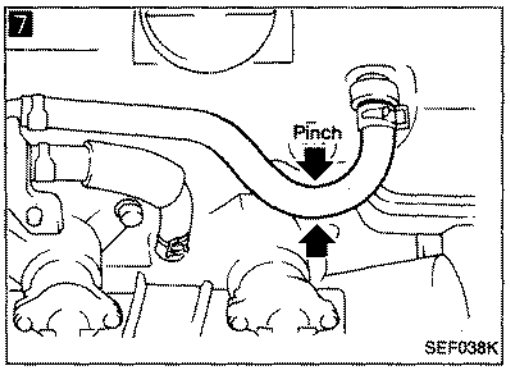
1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode Ⅱ. (See page EF & EC-412.)
2. Maintaining engine at 2,000 rpm under no-load, check to make sure that the RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

O.K.

(Go to Ⓑ on next page.)

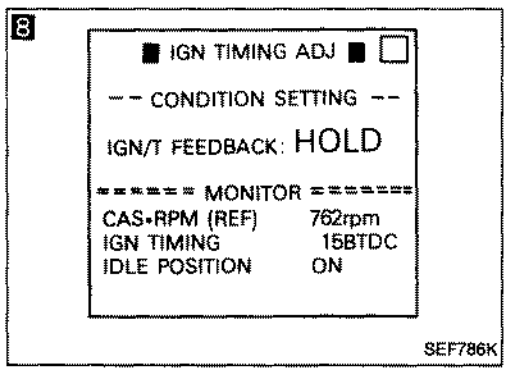
Diagnostic Procedure 3 — Unstable Idle (Cont'd)

7



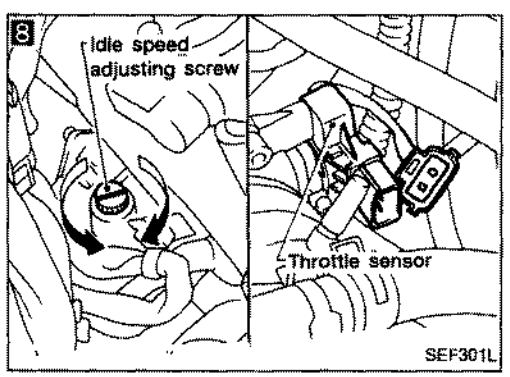
SEF038K

8



SEF786K

8



SEF301L

9

COMPRESSION PRESSURE

SEF309G

(8)

7 **CHECK FOR INTAKE AIR LEAK.**
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No

8 **CHECK IDLE ADJ. SCREW CLOGGING.**
1. Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. Can you set engine rpm at 800 ± 50 rpm (in "N" position) by turning idle adjusting screw?

OR

1. Disconnect throttle sensor harness connector.
2. Can you set engine rpm at 800 ± 50 rpm (in "N" position) by turning idle adjusting screw?

No → Check for I.A.S. clogging or throttle valve clogging.

Yes

9 **CHECK COMPRESSION PRESSURE.**
- Check compression pressure.

Standard:
kPa (bar, kg/cm², psi)/300 rpm
1,275 (12.75, 13.0, 185)
Minimum:
kPa (bar, kg/cm², psi)/300 rpm
1,079 (10.79, 11.0, 156)
Difference between each cylinder:
kPa (bar, kg/cm², psi)/300 rpm
98 (0.98, 1.0, 14)

N.G. → Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

O.K.

10 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

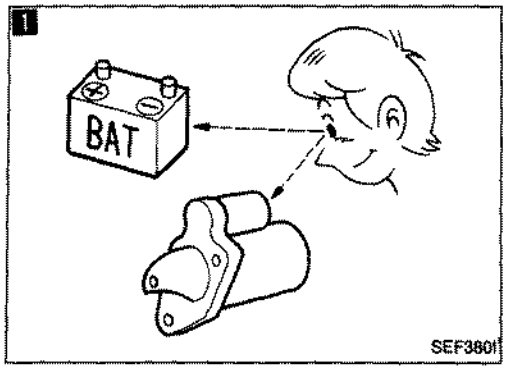
O.K.

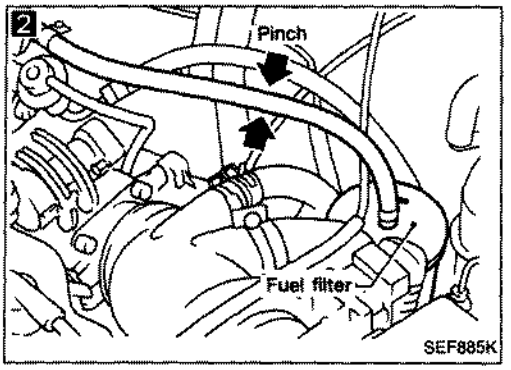
11 **TRY A KNOWN GOOD E.C.U.***

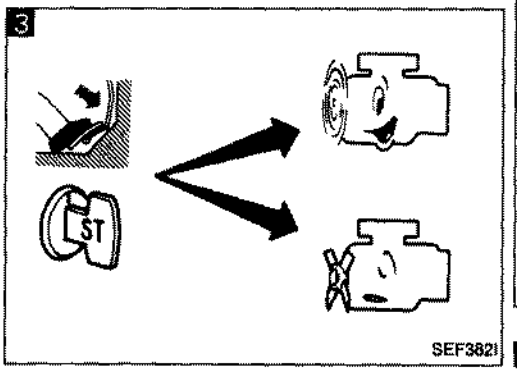
INSPECTION END

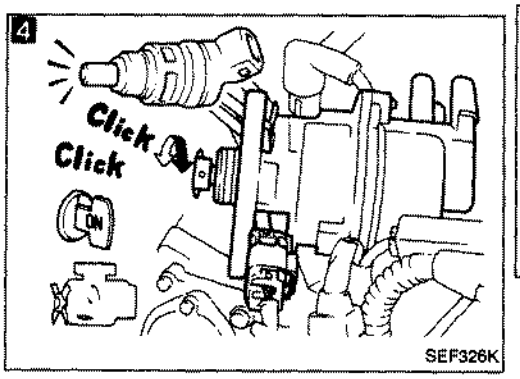
*: E.C.U. may be the cause of a problem, but this is rarely the case.

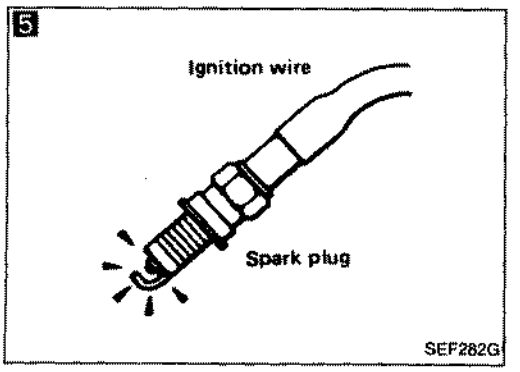
Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold











1

CHECK BATTERY AND STARTER.
Check battery and starter condition.
(Refer to EL section.)

N.G. → Repair or replace.

O.K. ↓

2

CHECK FUEL PRESSURE.
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-500.)

Yes ↓

3

CHECK AIR REGULATOR AND A.A.C. VALVE.
When pressing accelerator pedal fully, can you start the engine.

Yes → Check A.A.C. valve, air regulator and circuits. (See pages EF & EC-504, 506.)

No ↓

4

CHECK INJECTOR.
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

5

CHECK IGNITION SPARK.
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

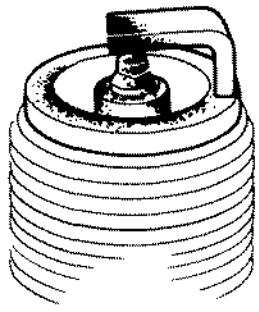
N.G. → Check ignition coil, power transistor and their circuits. (See page EF & EC-480.)

O.K. ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold (Cont'd)

6



SEF156I

Ⓐ

6 **CHECK SPARK PLUGS.**
Remove the spark plugs and check for fouling, etc.
N.G. → Repair or replace spark plug(s).
O.K. ↓

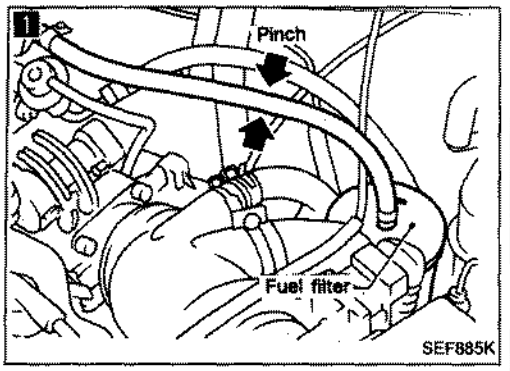
7 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.
N.G. → Repair or replace.
O.K. ↓

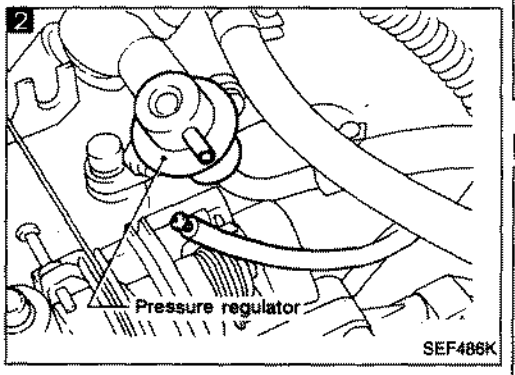
8 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-464.
N.G. → Repair or replace.
O.K. ↓

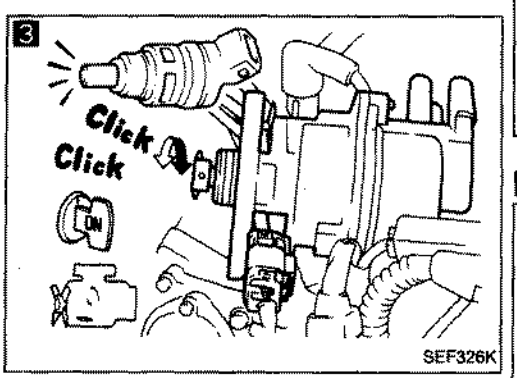
9 **TRY A KNOWN GOOD E.C.U.***
Trouble is fixed. → Replace E.C.U.
Trouble is not fixed. ↓

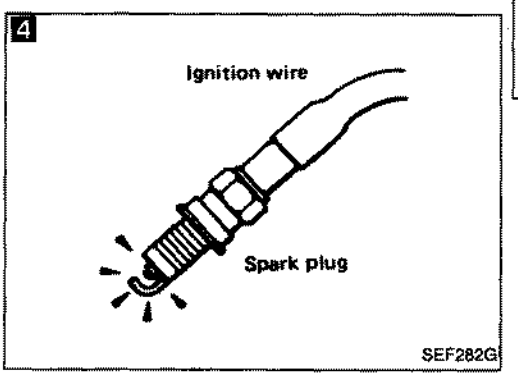
INSPECTION END

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









Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot

1

CHECK FUEL PRESSURE.
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-500.)

Yes ↓

2

CHECK FUEL VAPOR.
1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Can you start engine?

Yes → Check fuel properties.

No ↓

3

CHECK INJECTOR.
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

4

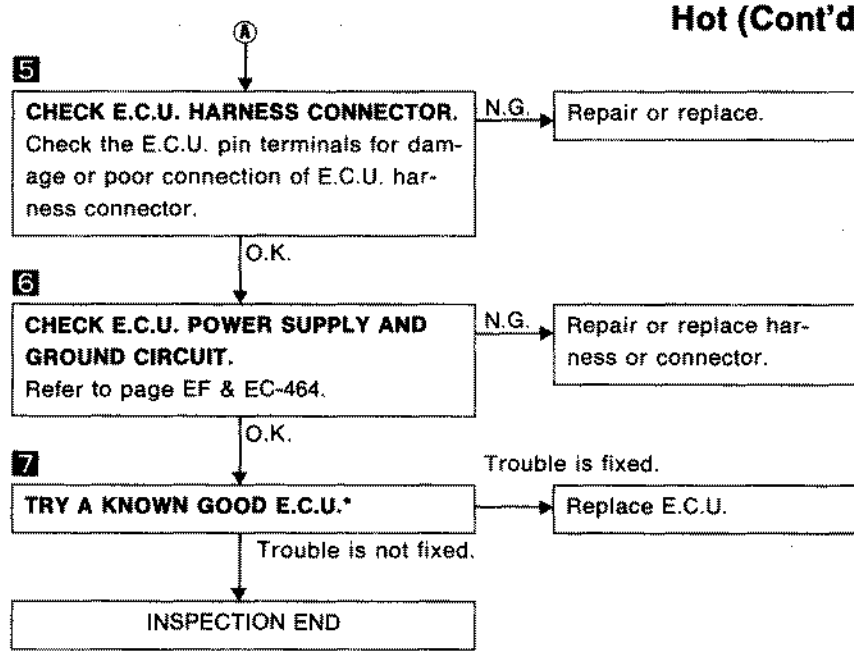
CHECK IGNITION SPARK.
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor and circuits. (See page EF & EC-480.)

O.K. ↓

(Go to Ⓐ on next page.)

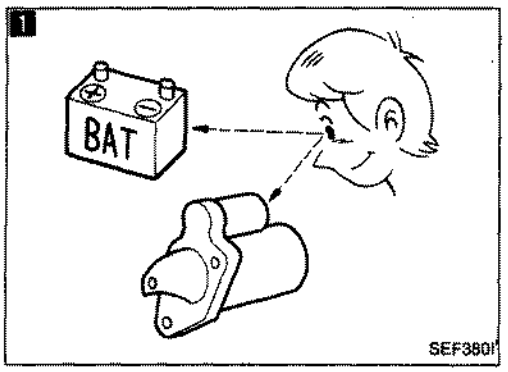
Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot (Cont'd)



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

Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions

1



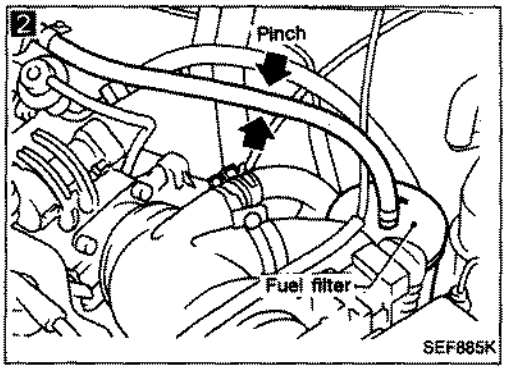
SEF380I

CHECK BATTERY AND STARTER.
Check battery and starter operation.
(Refer to EL section.)

N.G. → Repair or replace.

O.K. ↓

2



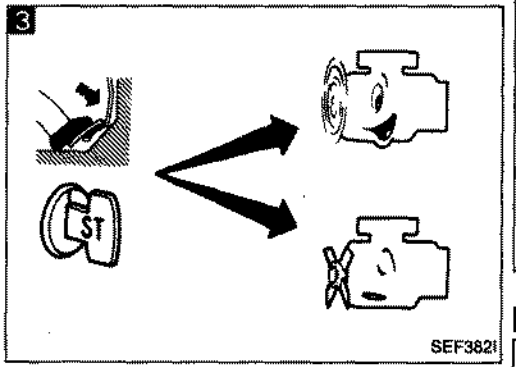
SEF885K

CHECK FUEL PRESSURE.
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-500.)

Yes ↓

3



SEF382I

CHECK INJECTOR FOR LEAKAGE.
When pressing accelerator pedal fully, can you start the engine.

Yes → Check injector(s) for leakage.

No ↓

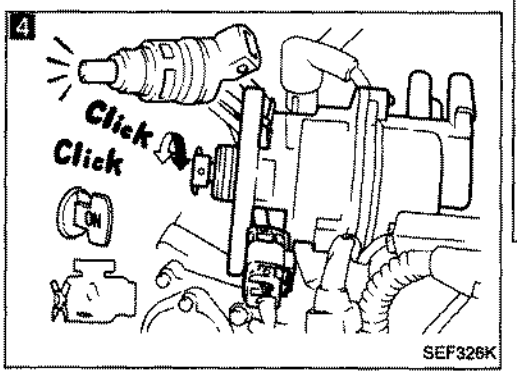
4

CHECK INJECTOR.
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injectors and circuits.

Yes ↓

5



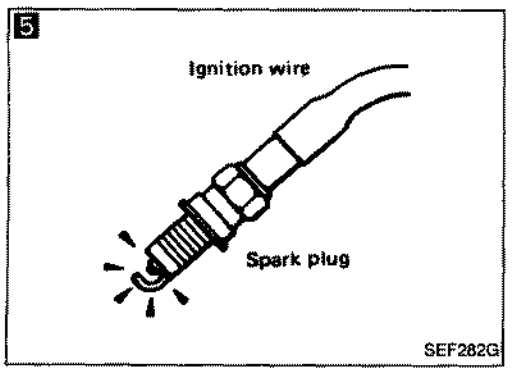
SEF326K

CHECK IGNITION SPARK.
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor and circuits. (See page EF & EC-480.)

O.K. ↓

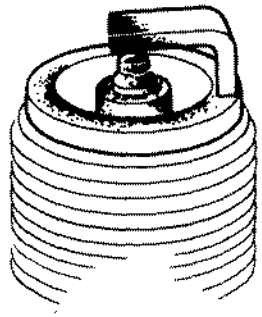
(Go to Ⓐ on next page.)



SEF282G

Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions (Cont'd)

6



SEF156I

Ⓐ

6 **CHECK SPARK PLUGS.**
Remove the spark plugs and check for fouling, etc.
N.G. → Repair or replace spark plug(s).
O.K. ↓

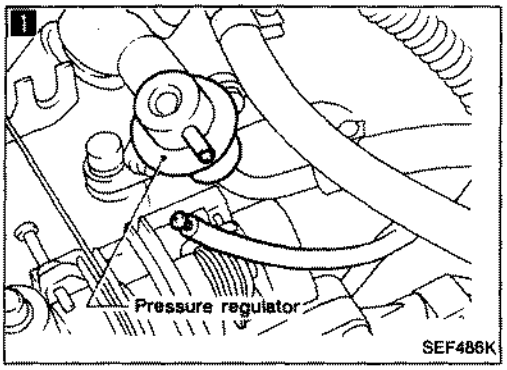
7 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.
N.G. → Repair or replace.
O.K. ↓

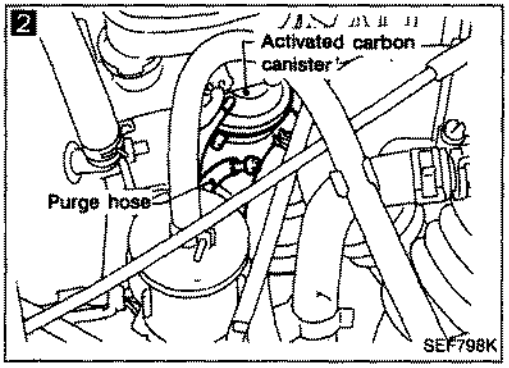
8 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-464.
N.G. → Repair or replace.
O.K. ↓

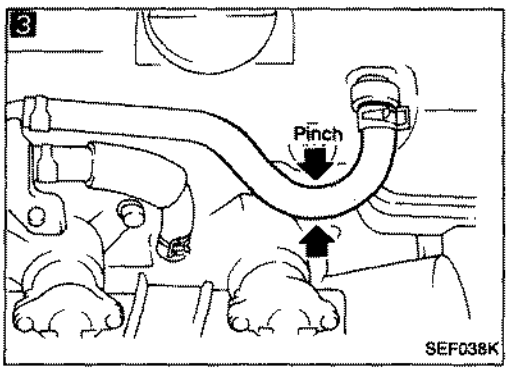
9 **TRY A KNOWN GOOD E.C.U.***
Trouble is fixed. → Replace E.C.U.
Trouble is not fixed. ↓

INSPECTION END

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







Diagnostic Procedure 7 — Hesitation when the Engine is Hot

1

CHECK FUEL VAPOR.
1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Test drive.
3. Does the hesitation disappear?

Yes → Check fuel properties.

No ↓

2

CHECK CANISTER PURGE. (MODELS WITH CATALYZER ONLY)
1. Disconnect canister purge line hose and plug hose.
2. Test drive.
3. Does the hesitation disappear?

Yes → Check purge and vacuum line.

No ↓

3

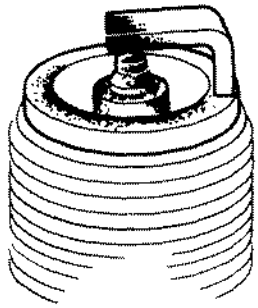
CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

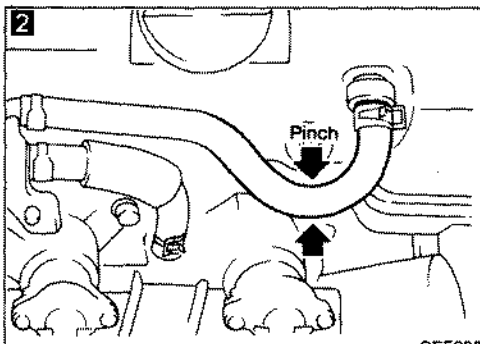
INSPECTION END

1



SEF156I

2



SEF038K

Diagnostic Procedure 8 — Hesitation when the Engine is Cold

1

CHECK SPARK PLUGS.
Remove spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K. ↓

2

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

3

TRY A KNOWN GOOD AIR FLOW METER.

Trouble is fixed. → Replace air flow meter.

Trouble is not fixed. ↓

4

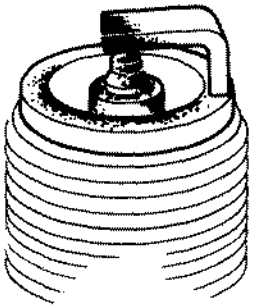
CHECK FOR INTAKE VALVE DEPOSITS.
If there are deposits on intake valves, remove them.

↓

INSPECTION END

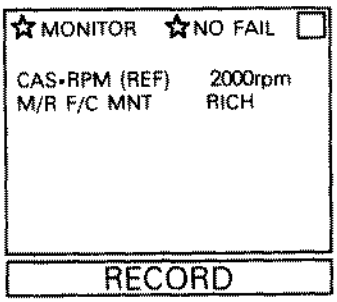
Diagnostic Procedure 9 — Hesitation under Normal Conditions

1



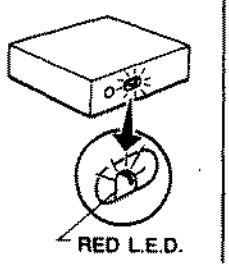
SEF156I

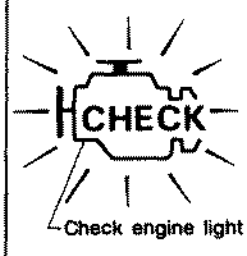
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SEF818K

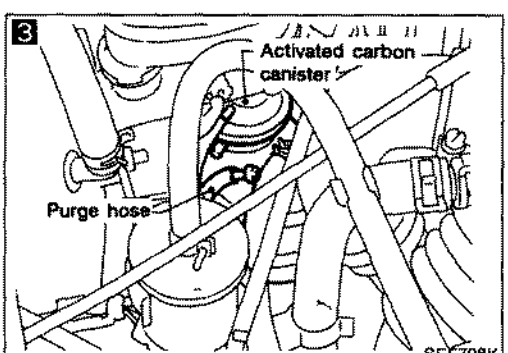
3





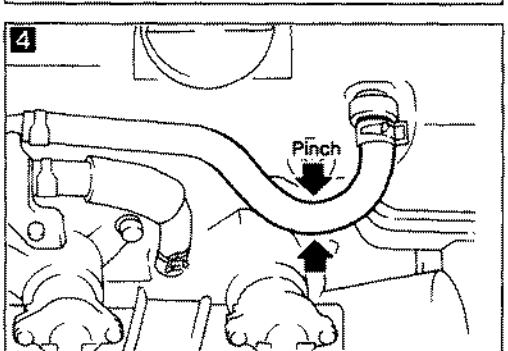
SEF621K

3



SEF798K

4



SEF038K

1

CHECK SPARK PLUGS.
Remove spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K.

2

CHECK EXHAUST GAS SENSOR. (MODELS WITH CATALYZER ONLY)

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

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

N.G. → Replace exhaust gas sensor.

OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-412.)
2. Maintaining engine at 2,000 rpm under no-load, check that the RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

O.K.

3

CHECK CANISTER PURGE. (MODELS WITH CATALYZER ONLY)

1. Disconnect canister purge line hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

Yes → Check purge and vacuum line.

No

4

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

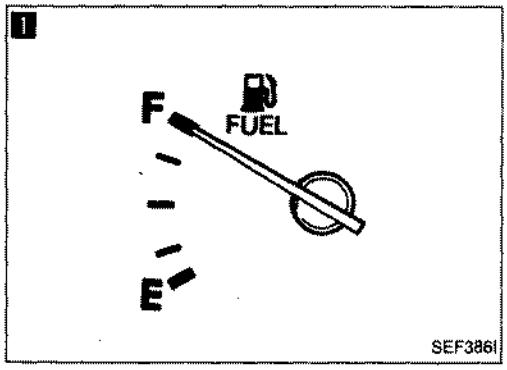
Yes → Discover air leak location and repair.

No

INSPECTION END

Diagnostic Procedure 10 — Engine Stalls when Turning

1



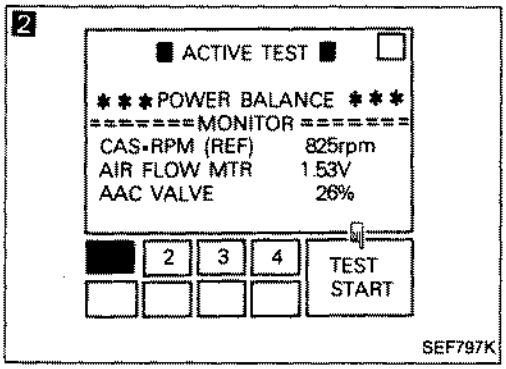
SEF386I

CHECK FUEL LEVEL.
Check to see that there is enough fuel in tank.

N.G. → Fill fuel tank with fuel.

O.K.

2



SEF797K

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

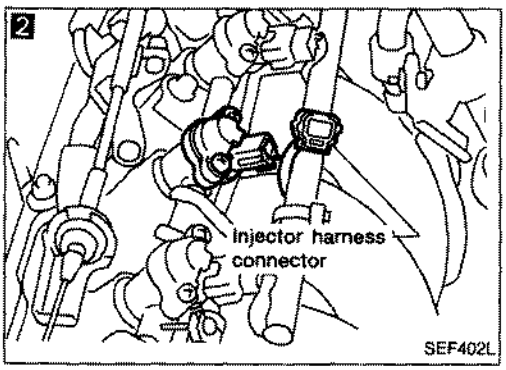
OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 5.

Yes

2



SEF402L

3

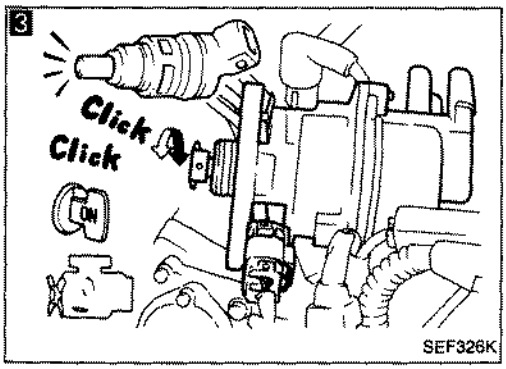
CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes

3



SEF326K

4

CHECK IGNITION SPARK.

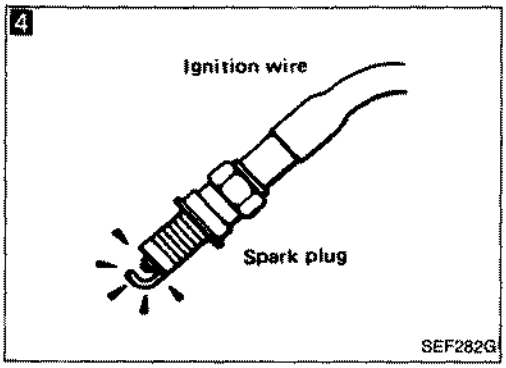
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor and circuits. (See page EF & EC-480.)

O.K.

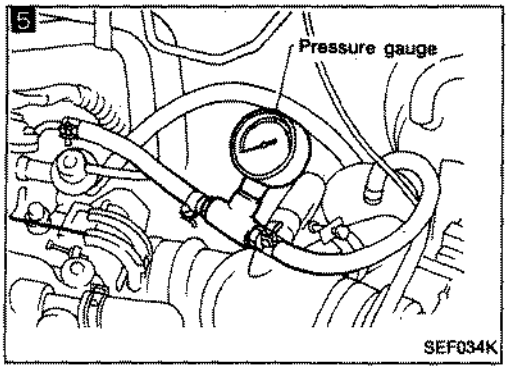
(Go to Ⓐ on next page.)

4



SEF282G

Diagnostic Procedure 10 — Engine Stalls when Turning (Cont'd)



Ⓐ

5

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)

A few seconds after ignition switch is turned from OFF to ON:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K.

6

CHECK E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K.

7

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-464.

N.G. → Repair or replace.

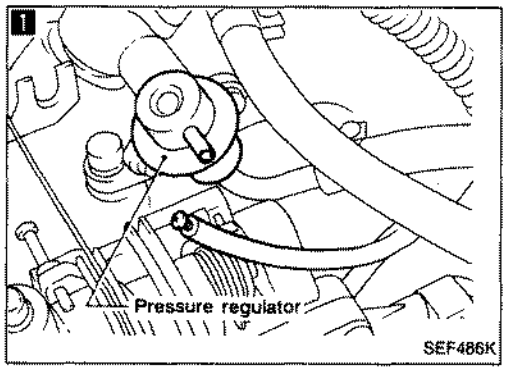
O.K.

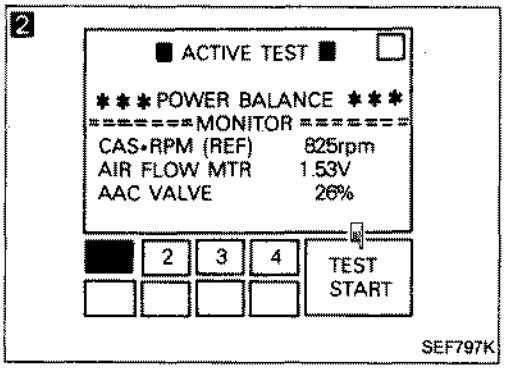
8

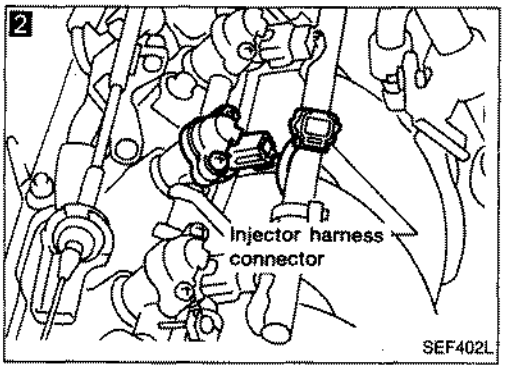
TRY A KNOWN GOOD E.C.U.*

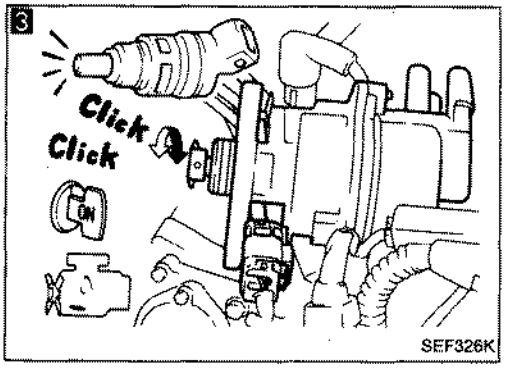
INSPECTION END

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









Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot

1

CHECK FUEL VAPOR.
1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Perform cruise test.
3. Does the engine stall disappear?

Yes → Check fuel properties.

No ↓

2

PERFORM POWER BALANCE TEST.
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 5.

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes ↓

3

CHECK INJECTOR.
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

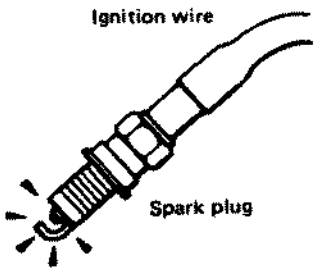
No → Check injector(s) and circuit(s).

Yes ↓

(Go to Ⓐ on next page.)

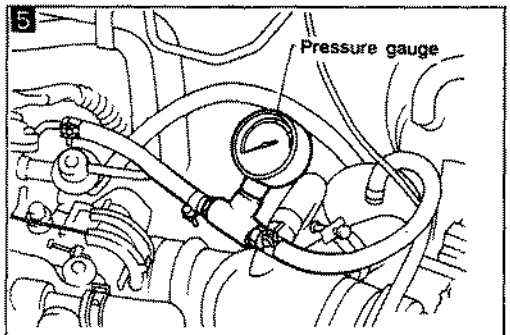
Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot (Cont'd)

4



SEF282G

5



SEF034K

Ⓐ

4 **CHECK IGNITION SPARK.**

1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor and their circuits. (See page EF & EC-480.)

O.K. ↓

5 **CHECK FUEL PRESSURE.**

1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:

Approx. 245 kPa
(2.45 bar, 2.5 kg/cm^2, 36 psi)

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

Approx. 294 kPa
(2.94 bar, 3.0 kg/cm^2, 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

6 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K. ↓

7 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-464.

N.G. → Repair or replace.

O.K. ↓

8 **TRY A KNOWN GOOD E.C.U.***

Trouble is fixed. → Replace E.C.U.

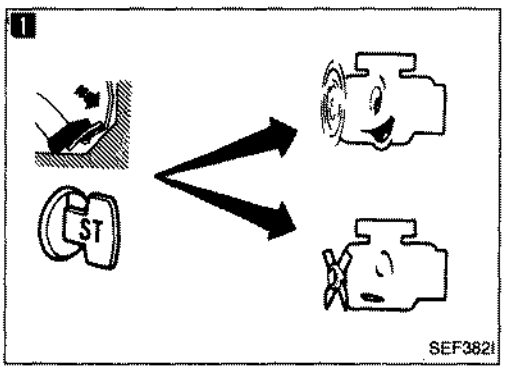
Trouble is not fixed. ↓

INSPECTION END

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

Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold

1



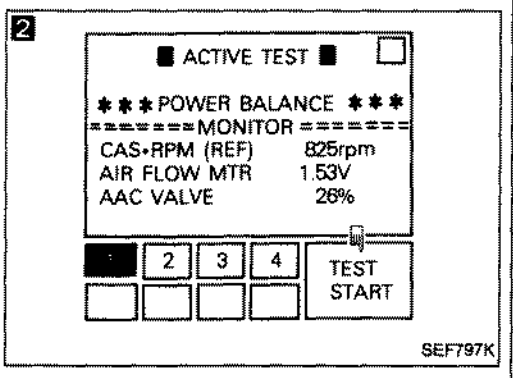
SEF382I

CHECK AIR REGULATOR AND A.A.C. VALVE.
When the engine is cold, can you start the engine when pressing accelerator pedal fully?

N.G. → Check A.A.C. valve, air regulator and circuits. (See pages EF & EC-504, 506.)

O.K. ↓

2



SEF797K

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

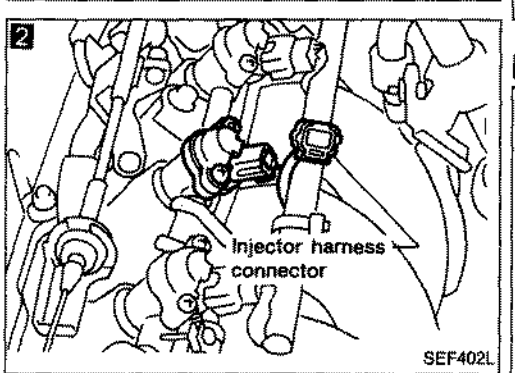
OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 6.

Yes ↓

2



SEF402L

3

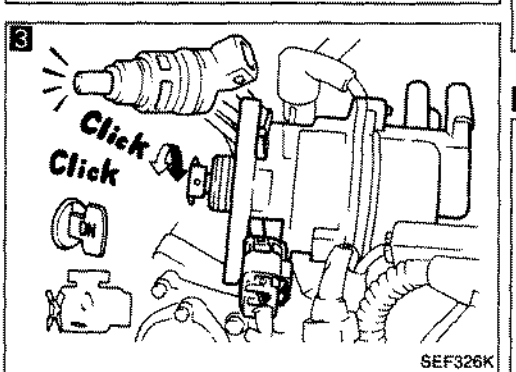
CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

N.G. → Check injector(s) and circuit(s).

O.K. ↓

3



SEF326K

4

CHECK IGNITION SPARK.

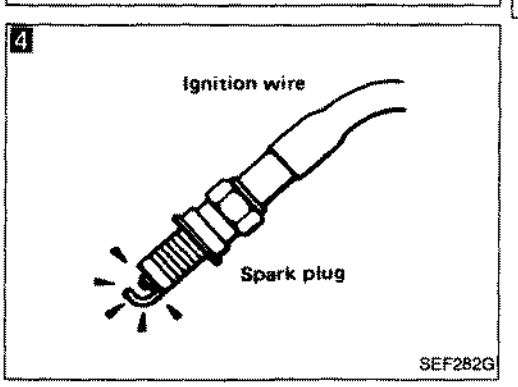
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor and circuits. (See page EF & EC-480.)

O.K. ↓

(Go to Ⓐ on next page.)

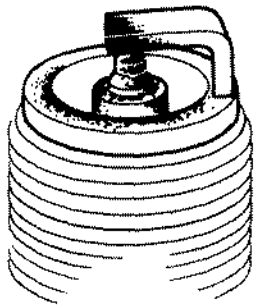
4



SEF282G

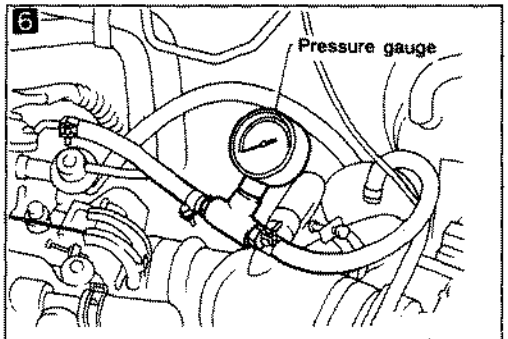
Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold (Cont'd)

5



SEF156I

6



SEF034K

Ⓐ

5 **CHECK SPARK PLUGS.**
Remove the spark plugs and check for fouling, etc.
N.G. → Repair or replace spark plug(s).
O.K. ↓

6 **CHECK FUEL PRESSURE.**
1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)
A few seconds after ignition switch is turned from OFF to ON:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.
O.K. ↓

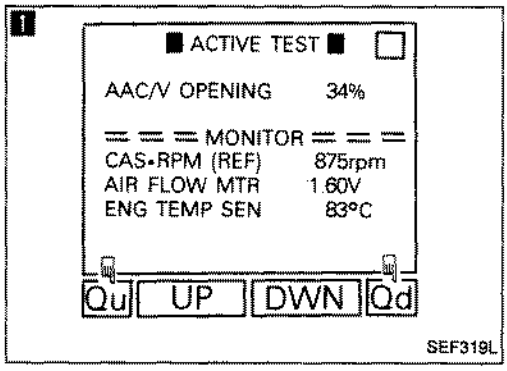
7 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.
N.G. → Repair or replace.
O.K. ↓

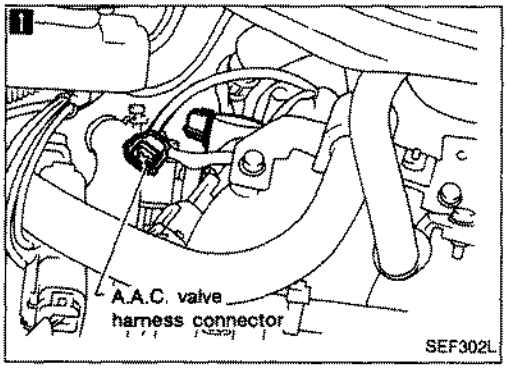
8 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-464.
N.G. → Repair or replace.
O.K. ↓

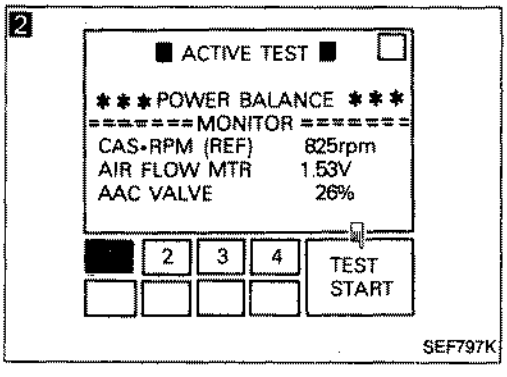
9 **TRY A KNOWN GOOD E.C.U.***
Trouble is fixed. → Replace E.C.U.
Trouble is not fixed. ↓

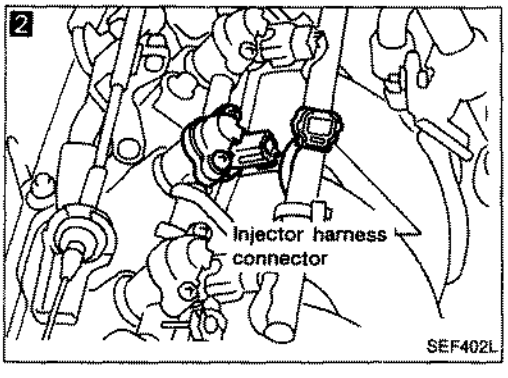
INSPECTION END

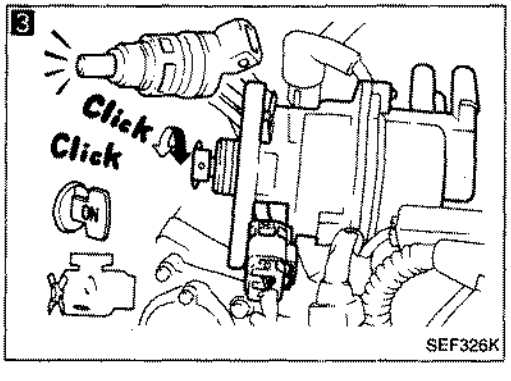
*: E.C.U. may be the cause of a problem, but this is rarely the case.











Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily

1

CHECK A.A.C. VALVE.

1. Select "A.A.C. VALVE OPENING" in "ACTIVE TEST" mode.
2. When touching "Qu" and "Qd", does the engine speed change according to the percent of A.A.C. valve opening?

OR

When disconnecting A.A.C. valve harness connector, does the engine speed drop?

No → Check A.A.C. valve and circuit. (See page EF & EC-506.)

Yes

2

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to **5**.

Yes

3

CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

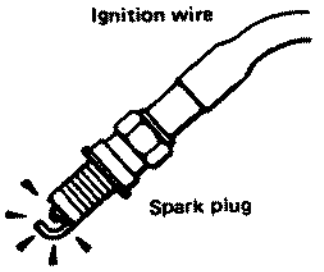
No → Check injector(s) and their circuit(s).

Yes

(Go to Ⓐ on next page.)

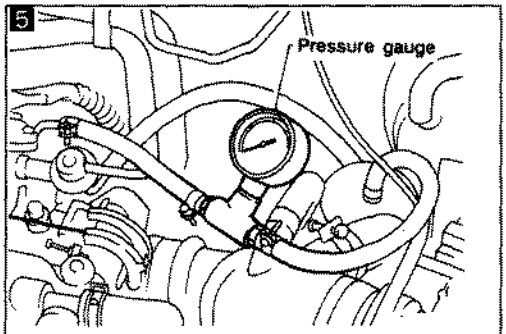
Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily (Cont'd)

4



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5



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Ⓐ

4

CHECK IGNITION SPARK.
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against an earth point with engine cranking.
4. Check for spark.

N.G. → Check ignition coil, power transistor and their circuits. (See page EF & EC-480.)

O.K.

5

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)
A few seconds after ignition switch is turned from OFF to ON:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K.

6

CHECK E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K.

7

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-464.

N.G. → Repair or replace.

O.K.

8

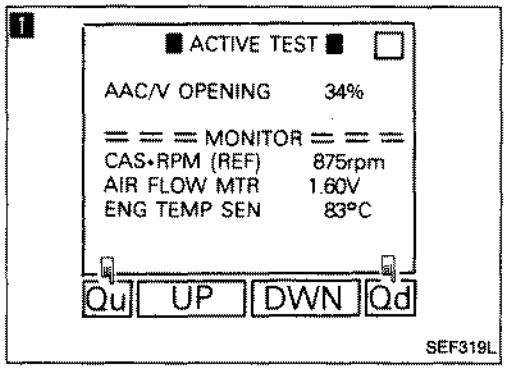
TRY A KNOWN GOOD E.C.U.*

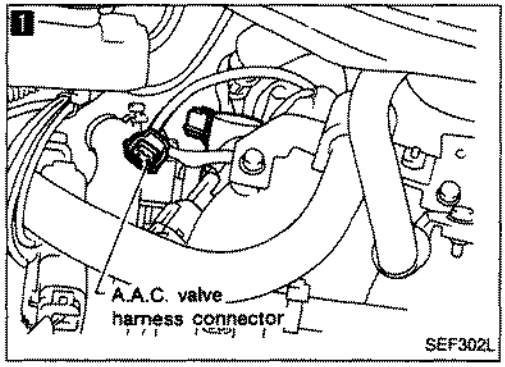
Trouble is not fixed. → Replace E.C.U.

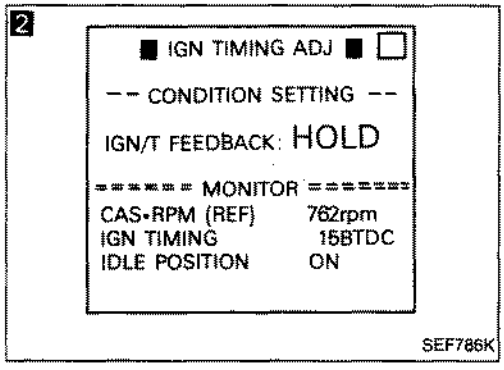
Trouble is fixed

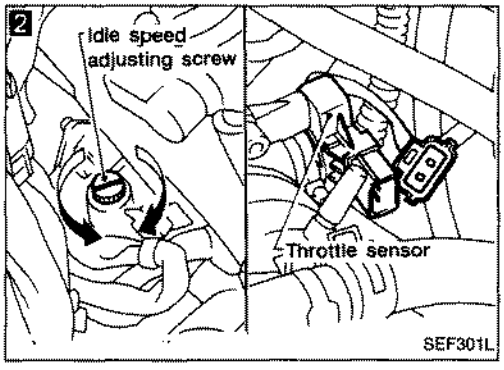
INSPECTION END

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









Diagnostic Procedure 14 — Engine Stalls after Decelerating

1

CHECK A.A.C. VALVE.

1. Select "A.A.C. VALVE OPENING" in "ACTIVE TEST" mode.
2. When touching "Qu" and "Qd", does the engine speed change according to the percent of A.A.C. valve opening?

No → Check A.A.C. valve and circuit. (See page EF & EC-506.)

OR

When disconnecting A.A.C. valve harness connector, does the engine speed drop?

Yes ↓

2

CHECK IDLE ADJ. SCREW CLOGGING.

1. Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. Can you set engine rpm at 800±50 rpm (in "N" position) by turning idle adjusting screw?

No → Check for I.A.S. clogging or throttle chamber clogging.

OR

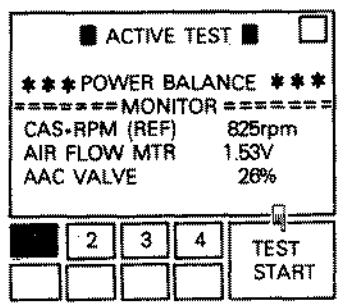
1. Disconnect throttle sensor harness connector.
2. Can you set engine rpm at 800±50 rpm (in "N" position) by turning idle adjusting screw?

Yes ↓

(Go to Ⓐ on next page.)

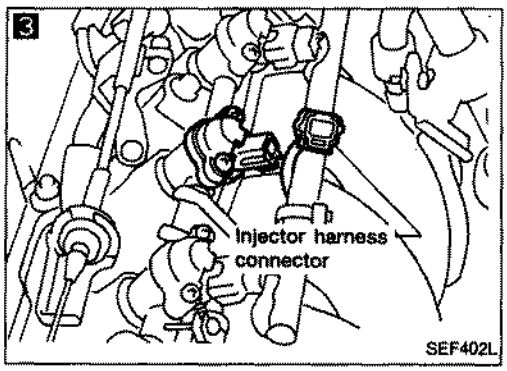
Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

3



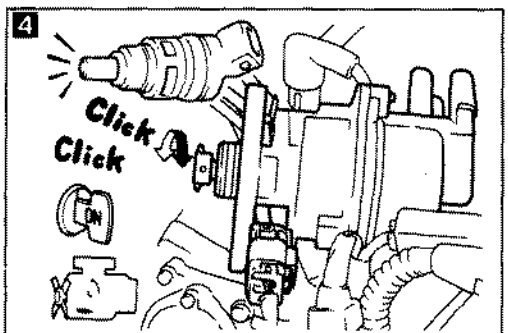
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3



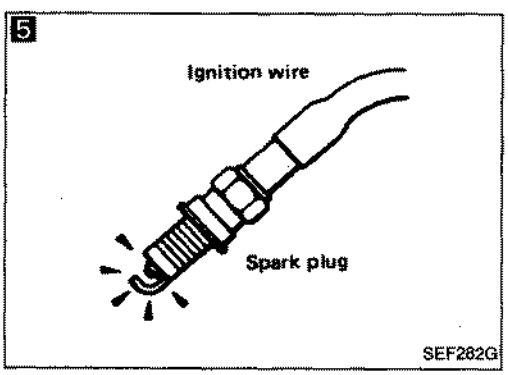
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5



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Ⓐ

3 **PERFORM POWER BALANCE TEST.**

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 6.

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes ↓

4 **CHECK INJECTOR.**

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

5 **CHECK IGNITION SPARK.**

1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

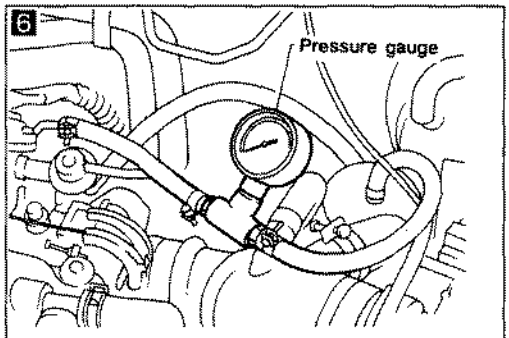
No → Check ignition coil, power transistor and circuits. (See page EF & EC-480.)

Yes ↓

(Go to Ⓑ on next page.)

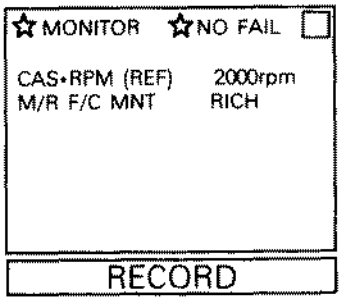
Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

6



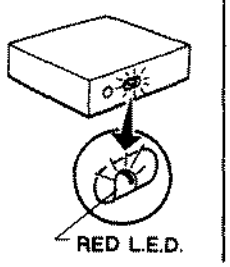
SEF034K

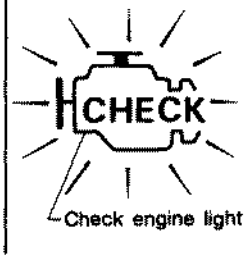
7



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7





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Ⓑ

6

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:

Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)

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

Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K.

7

CHECK EXHAUST GAS SENSOR. (MODELS WITH CATALYZER ONLY)

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

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

N.G. → Replace exhaust gas sensor.

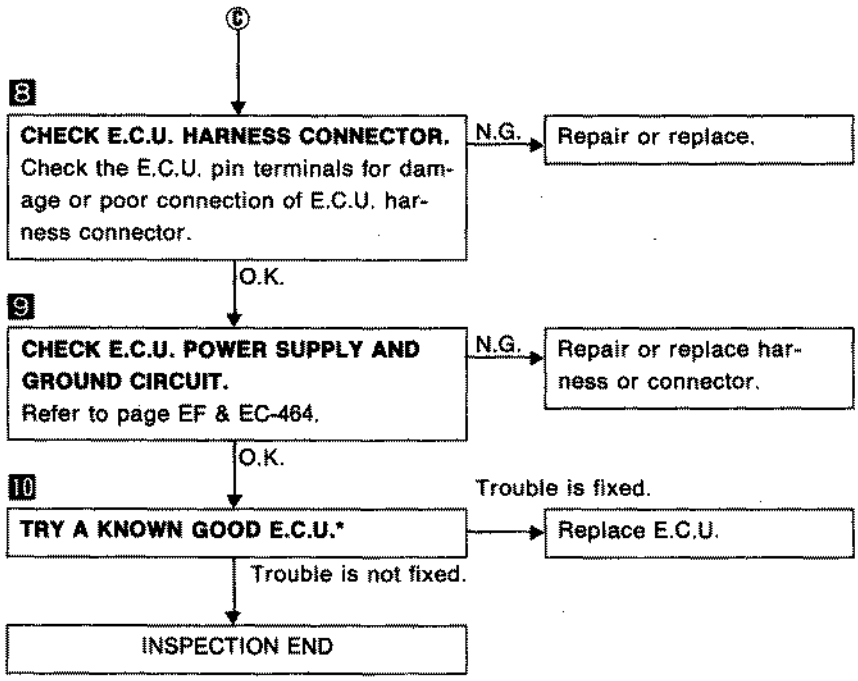
OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode Ⅱ. (See page EF & EC-412.)
2. Maintaining engine at 2,000 rpm under no load, check that the RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

O.K.

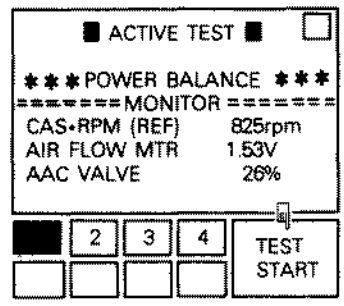
(Go to Ⓒ on next page.)

Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)



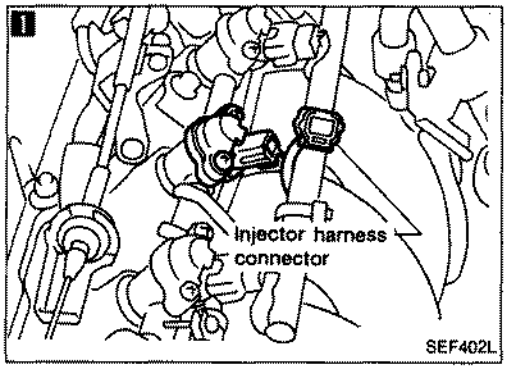
*: E.C.U. may be the cause of a problem, but this is rarely the case.

1



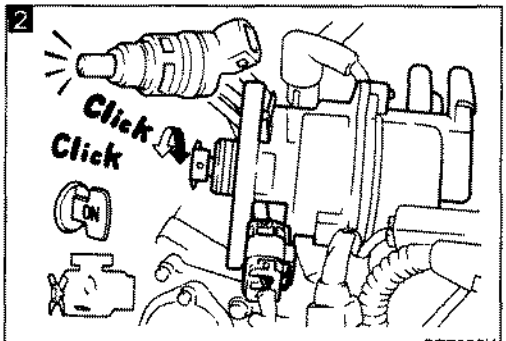
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1



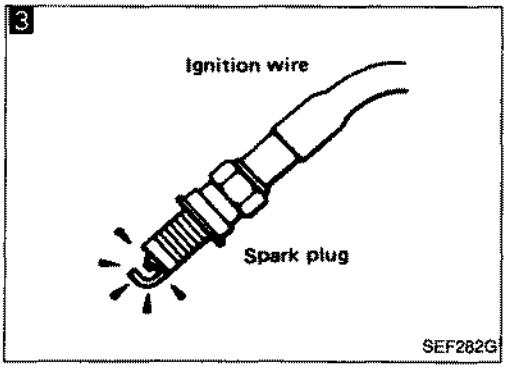
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2



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3



SEF282G

Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed

1

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to **4**.

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes ↓

2

CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

3

CHECK IGNITION SPARK.

1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

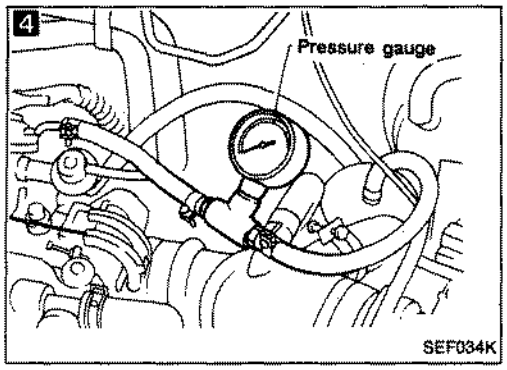
No → Check ignition coil, power transistor and circuits. (See page EF & EC-480.)

Yes ↓

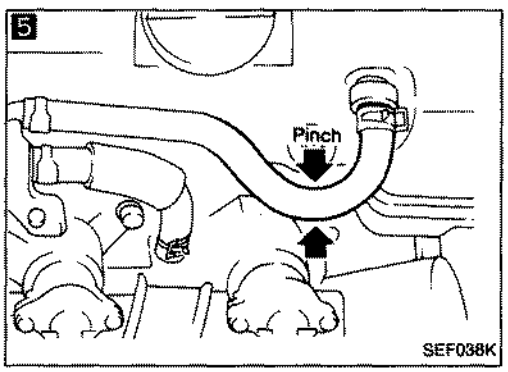
(Go to Ⓐ on next page.)

Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed (Cont'd)

4



5



Ⓐ

4 **CHECK FUEL PRESSURE.**
1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)
A few seconds after ignition switch is turned from OFF to ON:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pump, circuit and fuel pressure regulator.

O.K. ↓

5 **CHECK FOR INTAKE AIR LEAK.**
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

6 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K. ↓

7 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-464.

Yes → Repair or replace.

No ↓

8 **TRY A KNOWN GOOD E.C.U.***

Trouble is fixed. → Replace E.C.U.

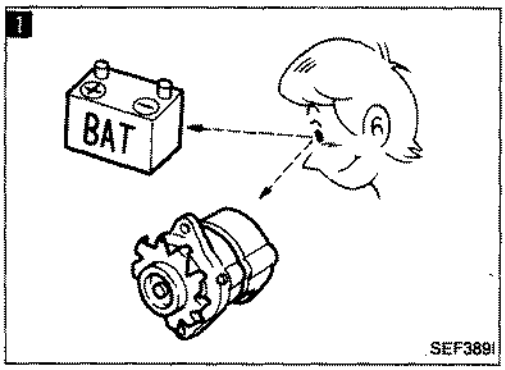
Trouble is not fixed. ↓

INSPECTION END

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

Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy

1



SEF389I

CHECK BATTERY AND ALTERNATOR.
Check battery and alternator condition.
(Refer to EL section.)

N.G. → Repair or replace.

O.K. ↓

2

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

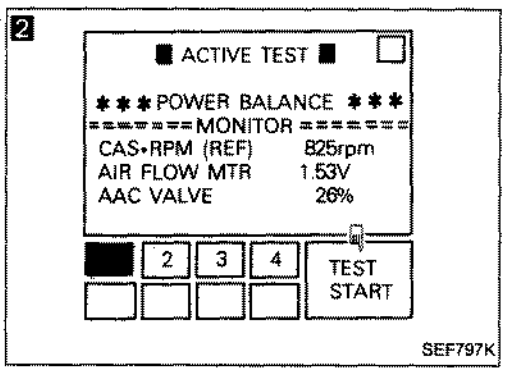
No → Go to 5.

— OR —

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes ↓

2



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3

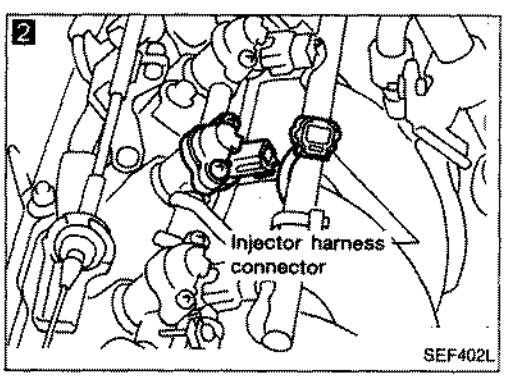
CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

2



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4

CHECK IGNITION SPARK.

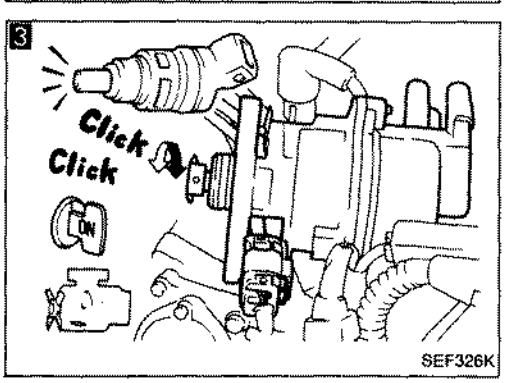
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor and circuits. (See page EF & EC-480.)

O.K. ↓

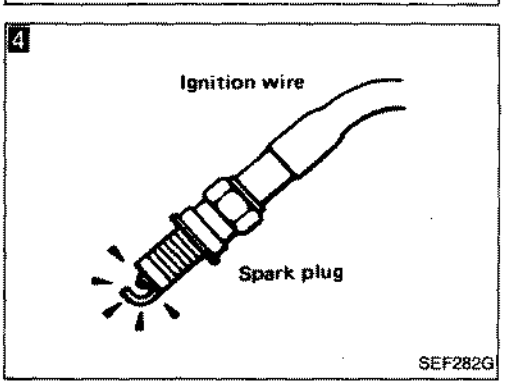
(Go to Ⓐ on next page.)

3



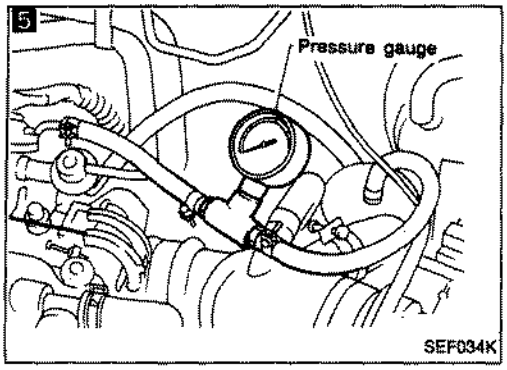
SEF326K

4



SEF282G

Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy (Cont'd)



Ⓐ

5 **CHECK FUEL PRESSURE.**
1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)
A few seconds after ignition switch is turned from OFF to ON:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K.

6 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K.

7 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-464.

N.G. → Repair or replace harness or connector.

O.K.

8 **TRY A KNOWN GOOD E.C.U.***

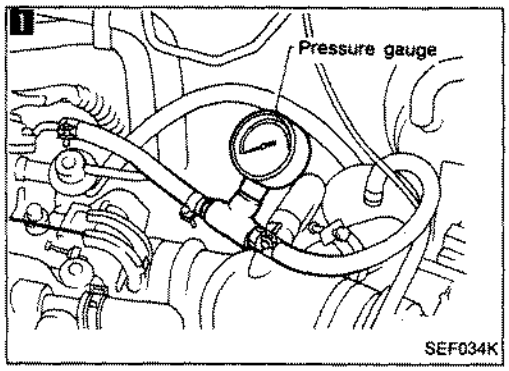
Trouble is fixed. → Replace E.C.U.

Trouble is not fixed.

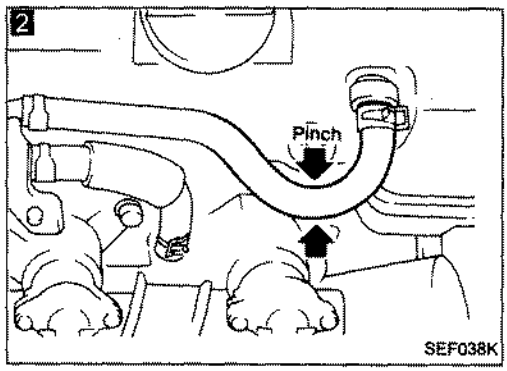
INSPECTION END

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

1



2



Diagnostic Procedure 17 — Lack of Power and Stumble

1

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:

Approx. 245 kPa

(2.45 bar, 2.5 kg/cm², 36 psi)

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

Approx. 294 kPa

(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

2

CHECK FOR INTAKE AIR LEAK.

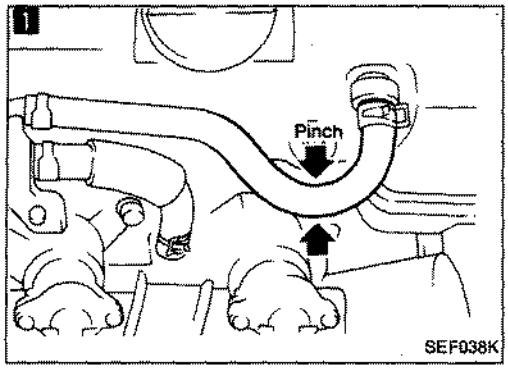
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

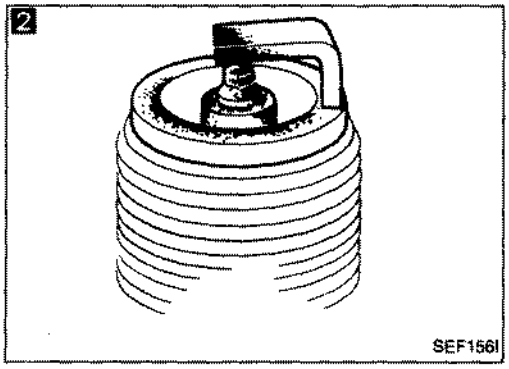
No ↓

INSPECTION END

1



2



Diagnostic Procedure 18 — Detonation

1

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine rpm rise?

Yes → Discover air leak location and repair.

No ↓

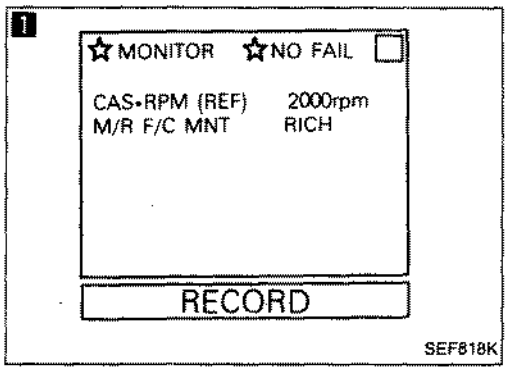
2

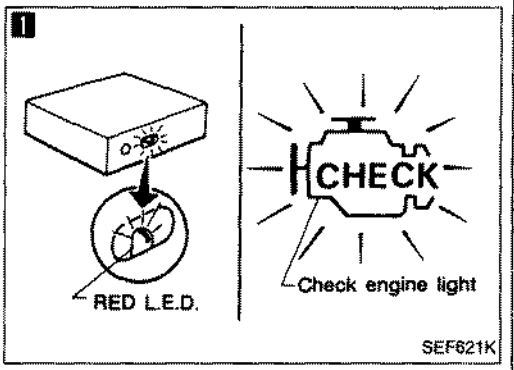
CHECK FOR OIL LEAK TO COMBUSTION CHAMBER.
Remove spark plugs and check for fouling with oil.

Yes → Check pistons, piston rings, valves, valve seats, valve oil seal, engine oil level, etc.

No ↓

INSPECTION END





Diagnostic Procedure 19 — Surge

CHECK EXHAUST GAS SENSOR. (MODELS WITH CATALYZER ONLY)

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

RICH→LEAN→RICH→ LEAN→RICH.....
(1 time, 2 times)

N.G. → Replace exhaust gas sensor.

OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-412.)
2. Maintaining engine at 2,000 rpm under no load, check that the RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

O.K. ↓

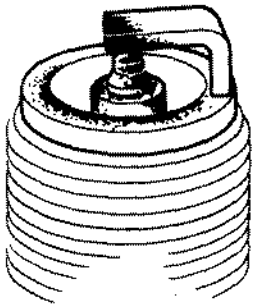
TRY A KNOWN GOOD E.C.U.* → Trouble is fixed. → Replace E.C.U.

Trouble is not fixed. ↓

INSPECTION END

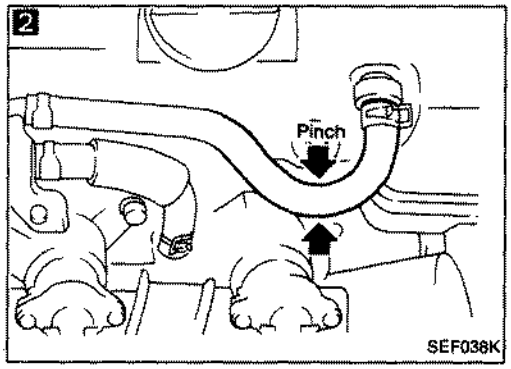
*: E.C.U. may be the cause of a problem, but this is rarely the case.

1



SEF156I

2



SEF038K

Diagnostic Procedure 20 — Backfire through the Intake

1

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K.

2

CHECK INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No

3

CHECK FOR INTAKE VALVE DEPOSITS.
If there are deposits on intake valves, remove them.

INSPECTION END

Diagnostic Procedure 21 — Backfire through the Exhaust

1

CHECK ENGINE TEMPERATURE SENSOR.
Check engine temperature sensor and its circuit. (See page EF & EC-476.)

N.G. → Replace or repair.

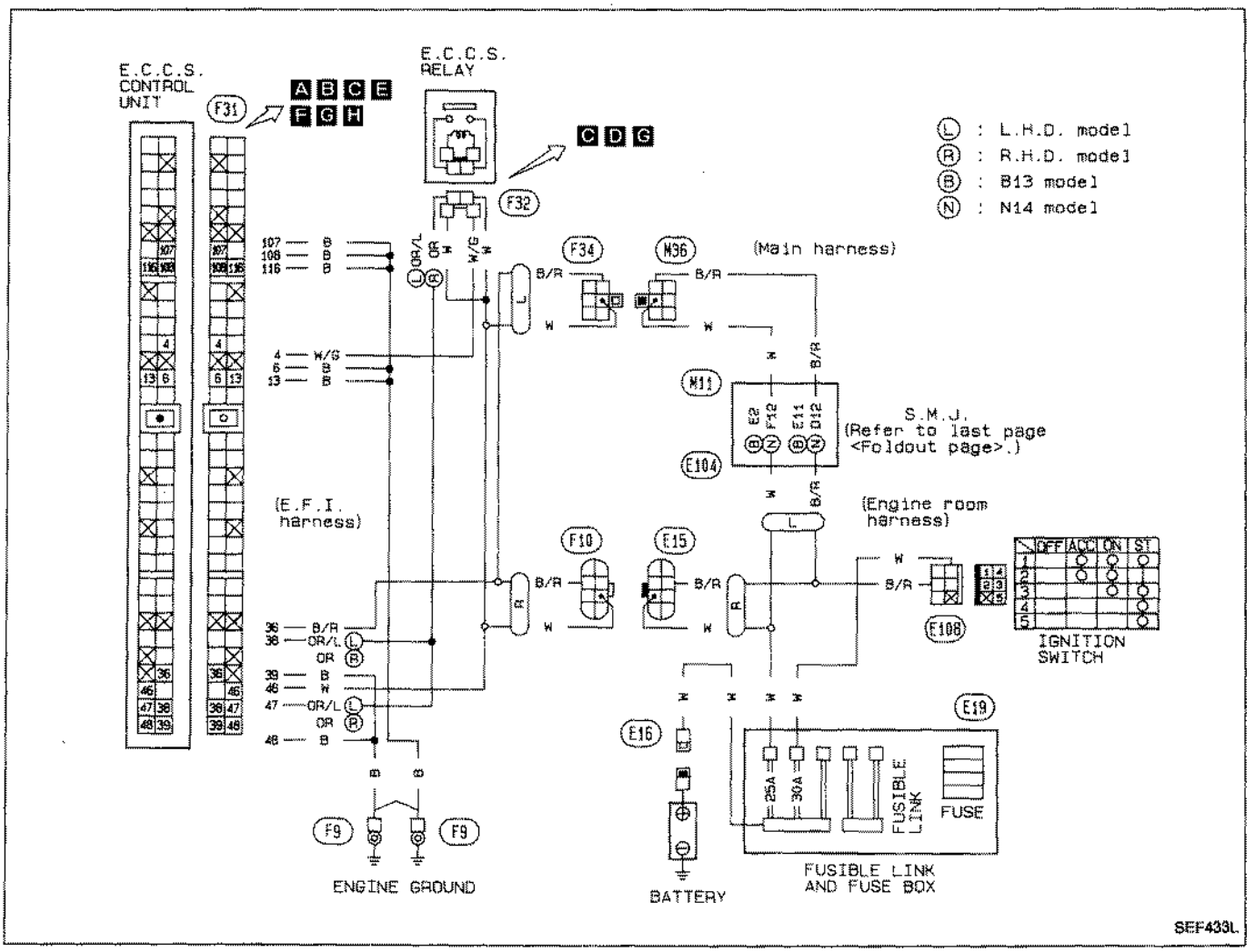
O.K.

INSPECTION END

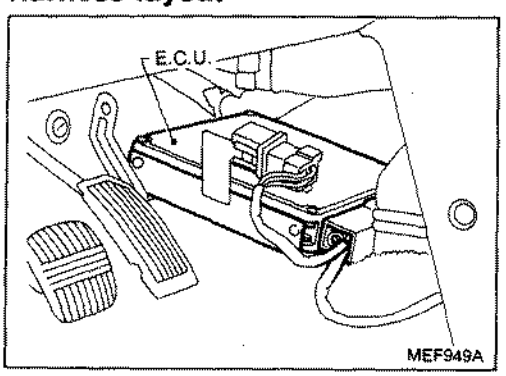
NOTE

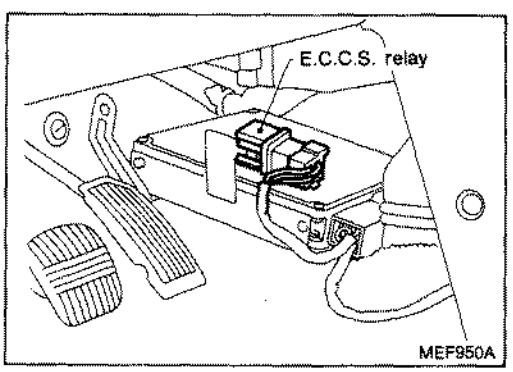
Diagnostic Procedure 22

MAIN POWER SUPPLY AND GROUND CIRCUIT (Not self-diagnostic item)



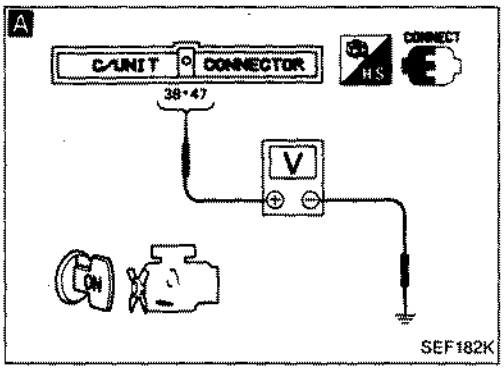
Harness layout





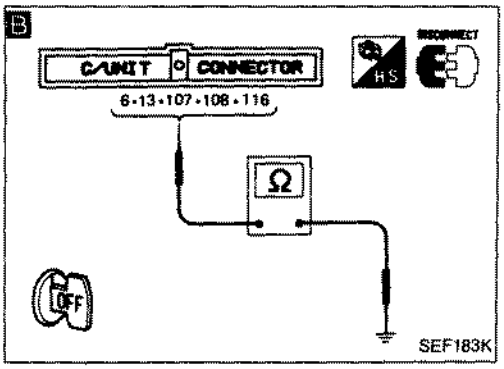
Diagnostic Procedure 22 (Cont'd)

A



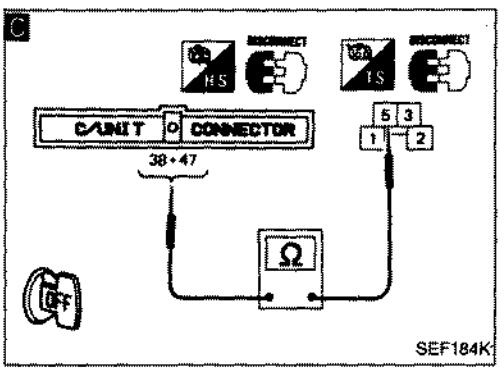
SEF182K

B



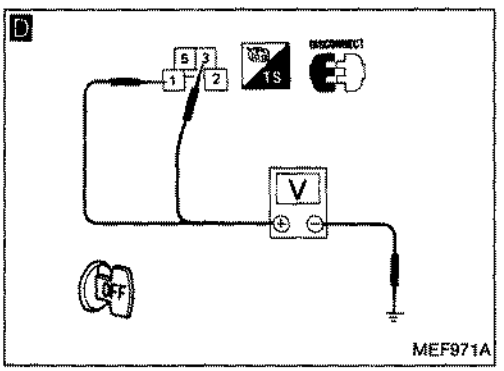
SEF183K

C



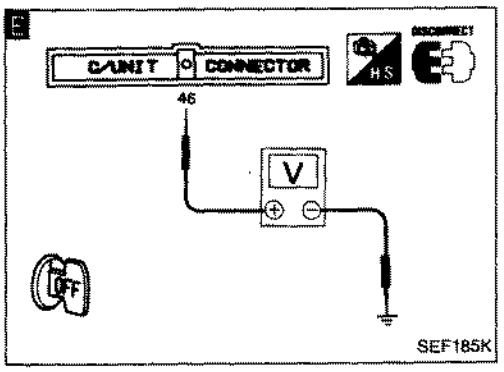
SEF184K

D



MEF971A

E



SEF185K

INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminals (38), (47) and ground.
Voltage: Battery voltage

O.K. → **B**

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminals (6), (13), (107), (108), (116) and engine ground.
Continuity should exist.
If N.G., repair harness or connectors.

O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

N.G. ↓

C

CHECK HARNESS CONTINUITY BETWEEN E.C.C.S. RELAY AND E.C.U.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Disconnect E.C.C.S. relay.
4) Check harness continuity between E.C.U. terminals (38), (47) and terminal (5).
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

D

CHECK VOLTAGE BETWEEN E.C.C.S. RELAY AND GROUND.
1) Check voltage between terminals (1), (3) and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F34), (R36) (L.H.D. models)
- Harness connectors (H11), (E104) (L.H.D. models)
- Harness connectors (F10), (E15) (R.H.D. models)
- "25A" fusible link
- Harness continuity between E.C.C.S. relay and battery

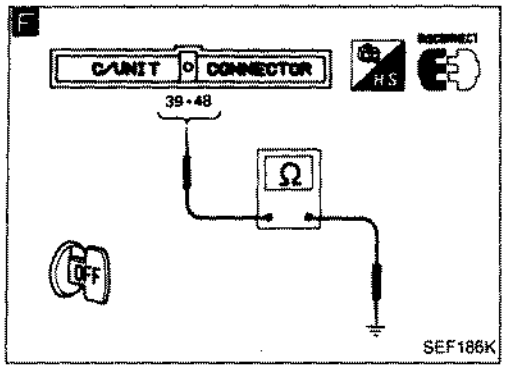
If N.G., repair harness or connectors.

O.K. ↓

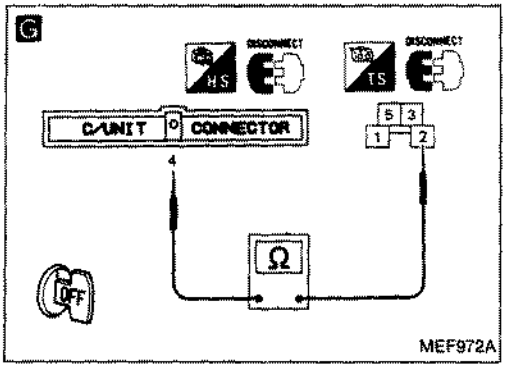
(A)

Diagnostic Procedure 22 (Cont'd)

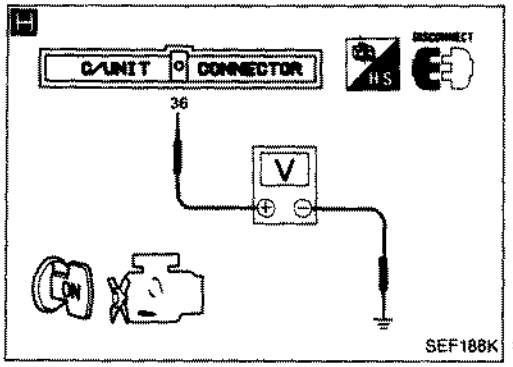
F



G



H



Ⓐ

E CHECK VOLTAGE BETWEEN E.C.U. AND GROUND.
1) Check voltage between E.C.U. terminal ㊻ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F34), (M36) (L.H.D. models)
- Harness connectors (M11), (E104) (L.H.D. models)
- Harness connectors (F10), (E15) (R.H.D. models)
- 25A fusible link
- Harness continuity between E.C.U. and battery

If N.G., repair harness or connectors.

O.K. ↓

F CHECK GROUND CIRCUIT.
1) Check harness continuity between E.C.U. terminals ㊴, ㊽ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

G CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between E.C.U. terminal ④ and terminal ②.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

H CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminal ㊱ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F34), (M36) (L.H.D. models)
- Harness connectors (M11), (E104) (L.H.D. models)
- Harness connectors (F10), (E15) (R.H.D. models)
- Harness continuity between E.C.U. and ignition switch

If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT (E.C.C.S. relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-635.)

N.G. → Replace E.C.C.S. relay.

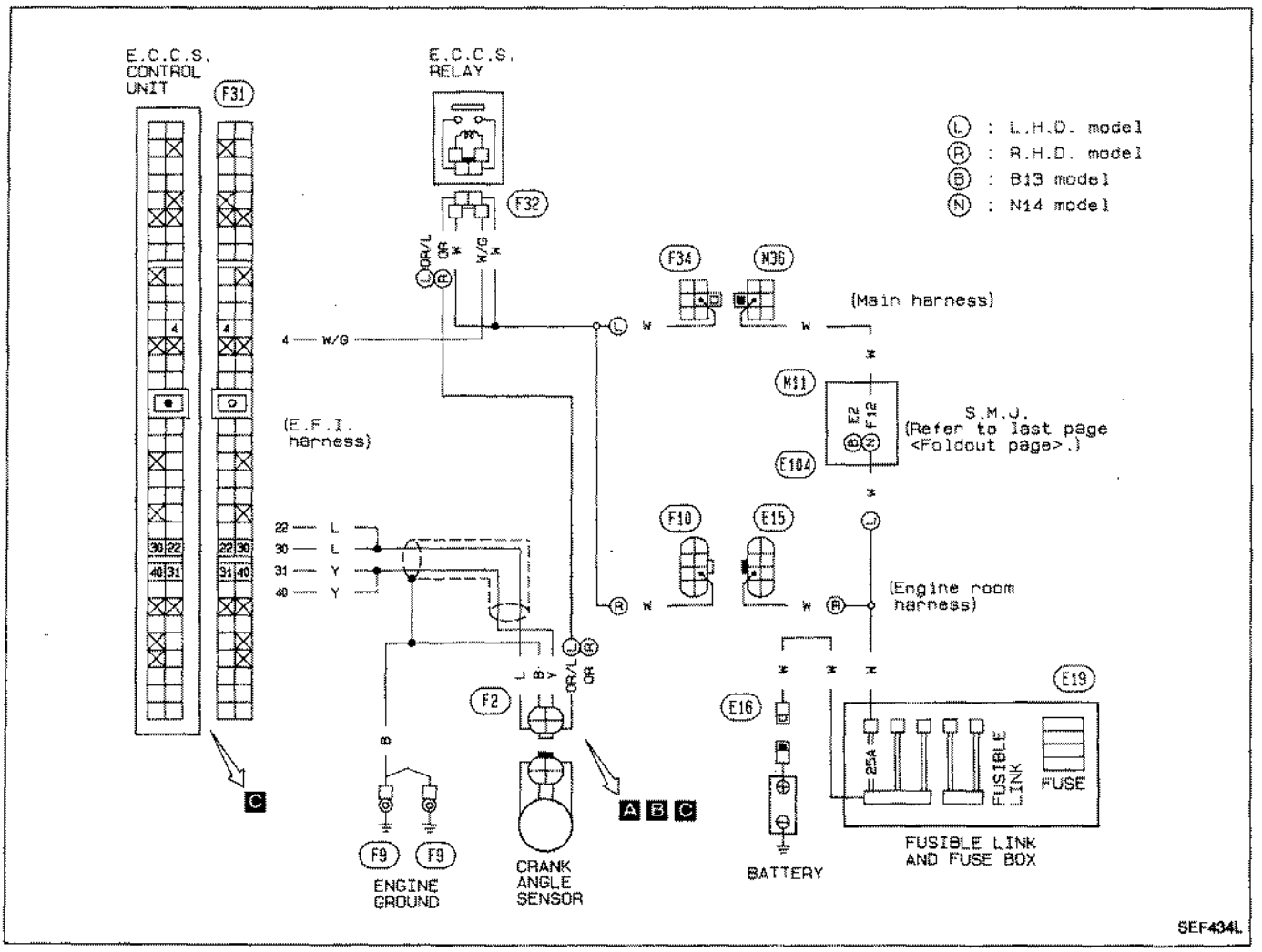
O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

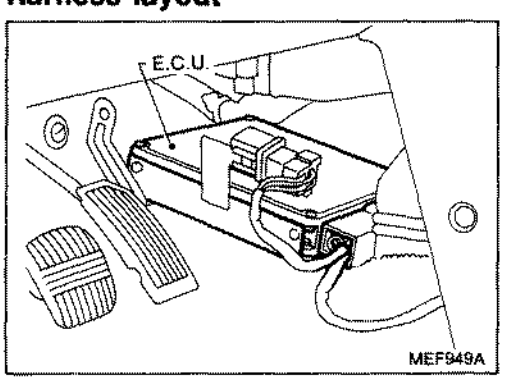
NOTE

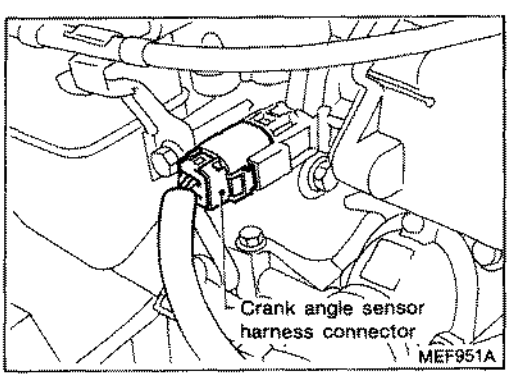
Diagnostic Procedure 23

CRANK ANGLE SENSOR (Code No. 11)



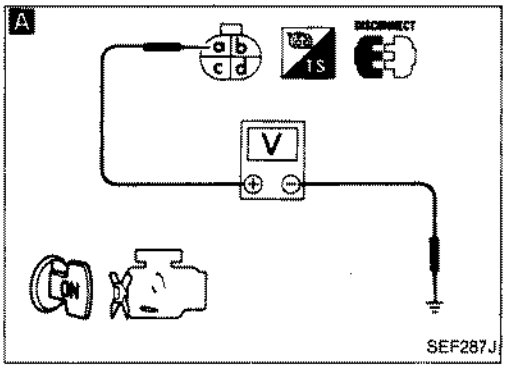
Harness layout



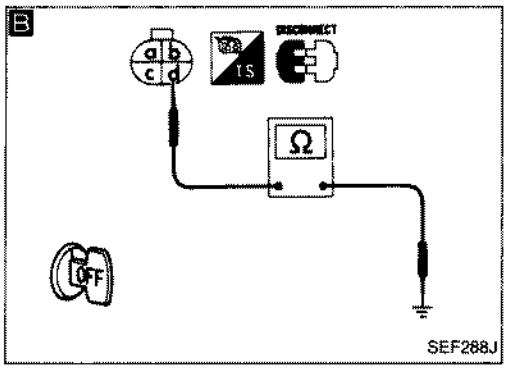


Diagnostic Procedure 23 (Cont'd)

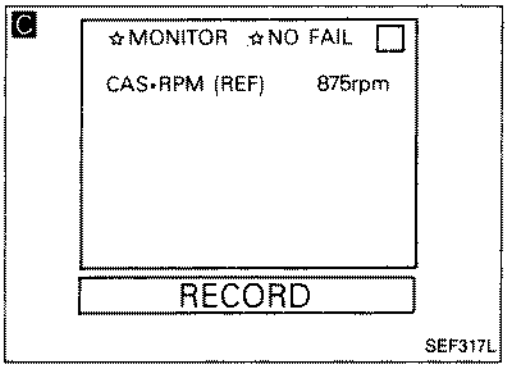
A



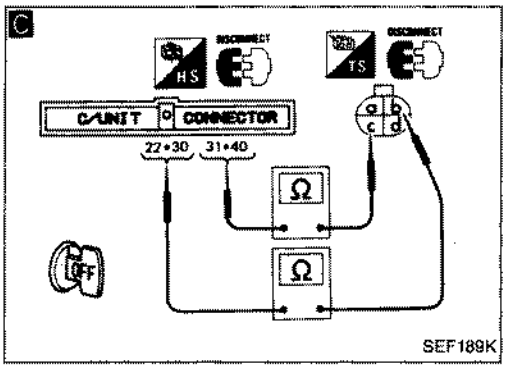
B



C



C



INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect crank angle sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness continuity between crank angle sensor and E.C.C.S. relay

If N.G., repair harness or connectors.

O.K.

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓓ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

C

CHECK INPUT SIGNAL CIRCUIT.

1) Reconnect crank angle sensor harness connector.
2) Start engine.
3) Read crank angle sensor signals in "DATA MONITOR" mode with CONSULT.
rpm: 850 ± 50

OR

1) Disconnect E.C.U. harness connector.
2) Check harness continuity between terminal ⓒ and E.C.U. terminals ㉛, ㊵ (1° signal), terminal ⓑ and E.C.U. terminals ㉒, ㉚ (180° signal).
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT (Crank angle sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-629.)

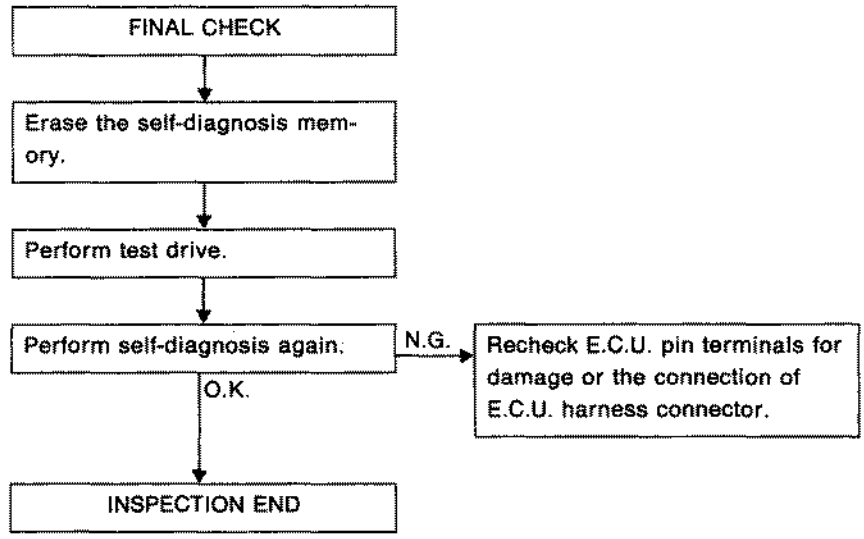
N.G. → Replace crank angle sensor.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 23 (Cont'd)

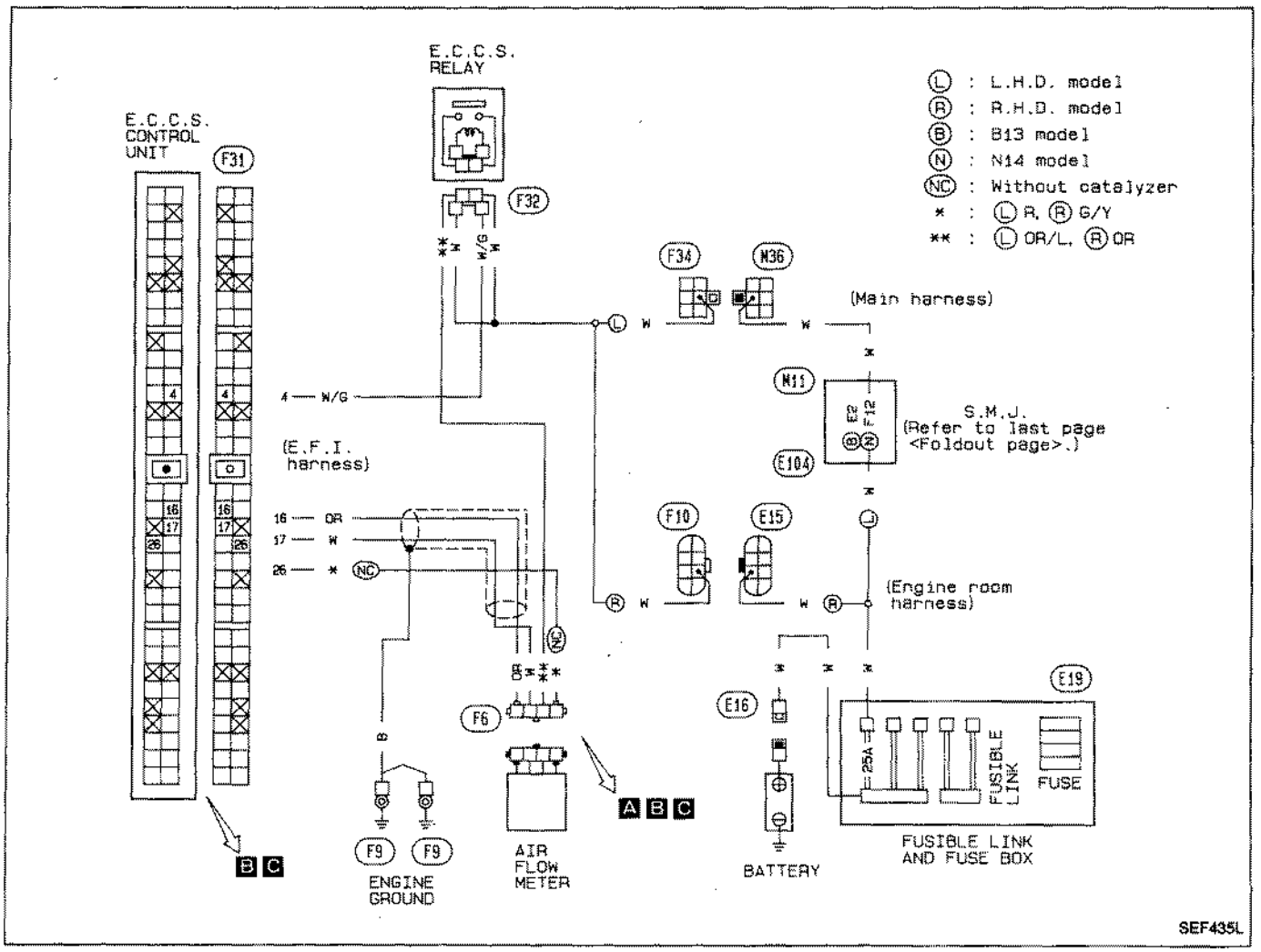
Perform FINAL CHECK by the following procedure after repair is completed.



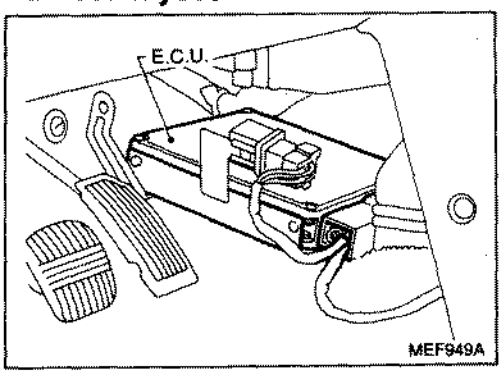
NOTE

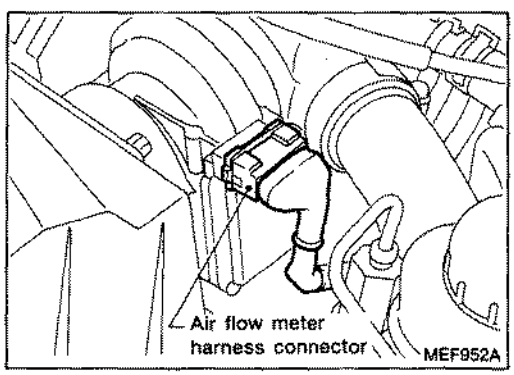
Diagnostic Procedure 24

AIR FLOW METER (Code No. 12)



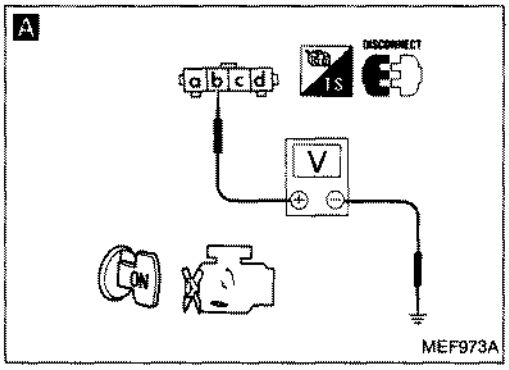
Harness layout





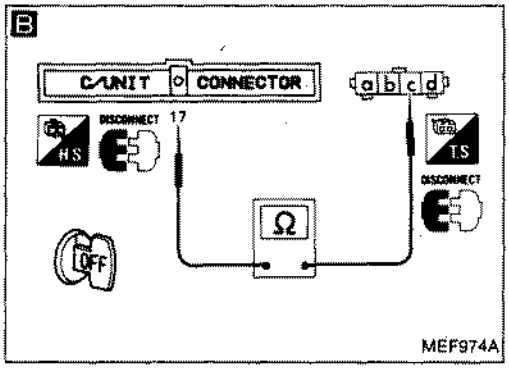
Diagnostic Procedure 24 (Cont'd)

A



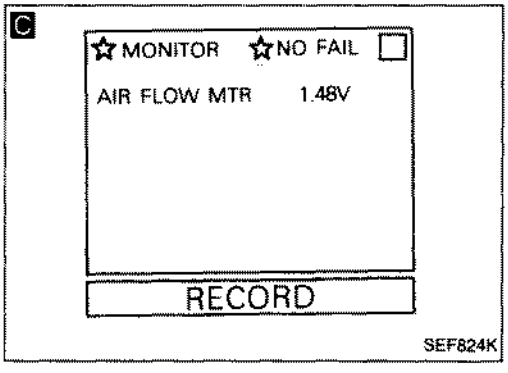
MEF973A

B



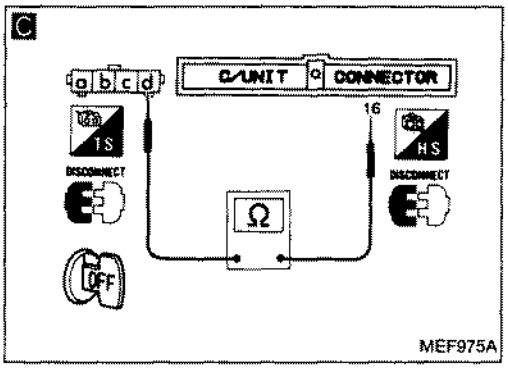
MEF974A

C



SEF824K

C



MEF975A

INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect air flow meter harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness continuity between air flow meter and E.C.C.S. relay

If N.G., repair harness or connectors.

O.K. ↓

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between terminal ⓒ and E.C.U. terminal ⑰.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

C

CHECK INPUT SIGNAL CIRCUIT.

1) Reconnect air flow meter harness connector and E.C.U. harness connector.
2) Start engine and warm it up sufficiently.
3) Read air flow meter signal in "DATA MONITOR" mode with CONSULT.
Voltage: 1.3 - 1.8V
(At idle)

OR

1) Check harness continuity between terminal ⓓ and E.C.U. terminal ⑯.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(Air flow meter).
Refer to "Electrical Components Inspection".
(See page EF & EC-629.)

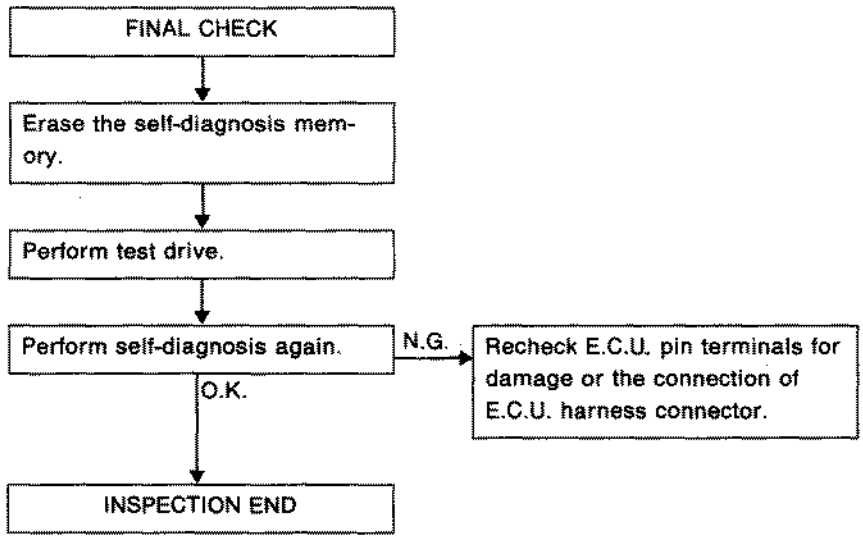
N.G. → Replace air flow meter.

O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 24 (Cont'd)

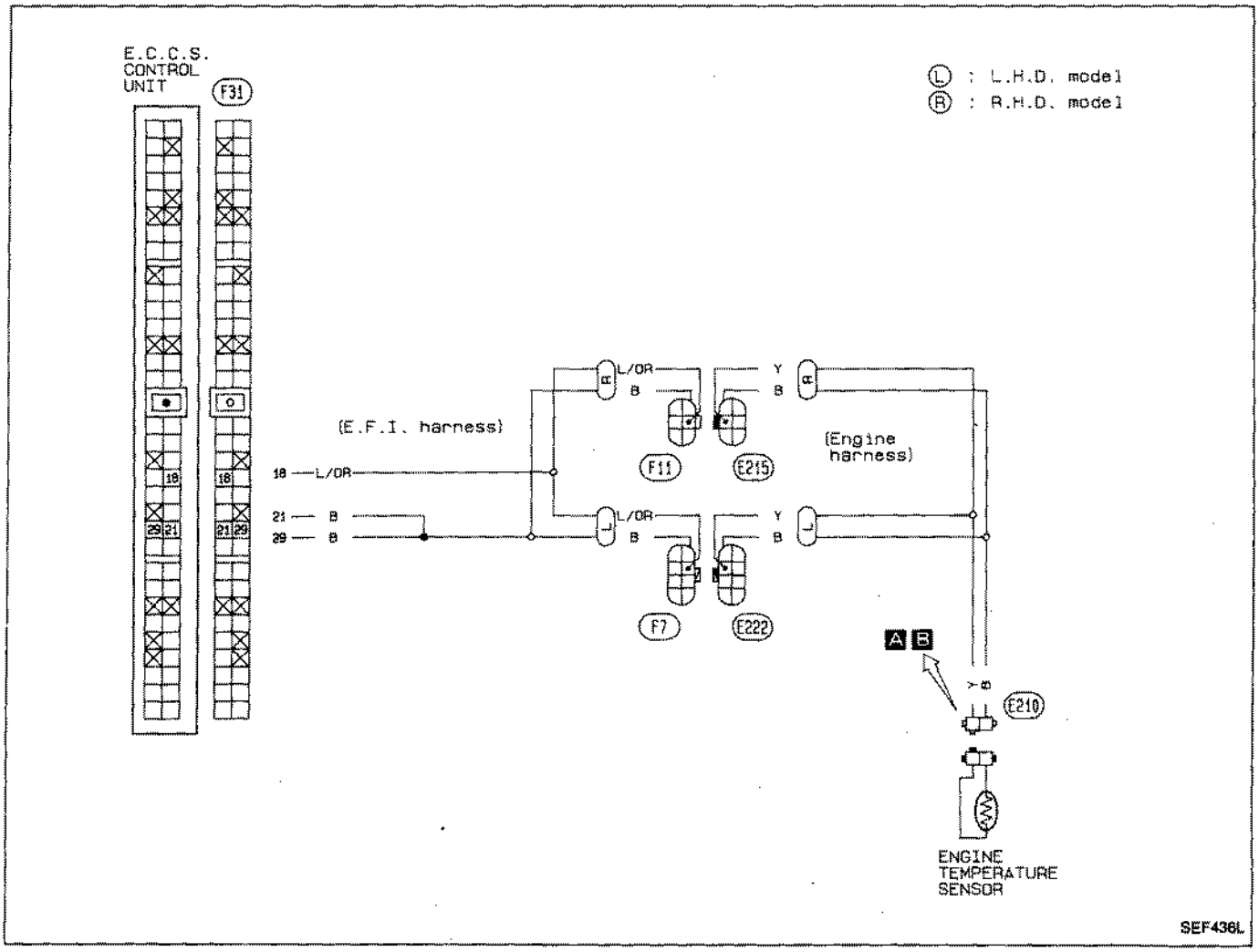
Perform FINAL CHECK by the following procedure after repair is completed.



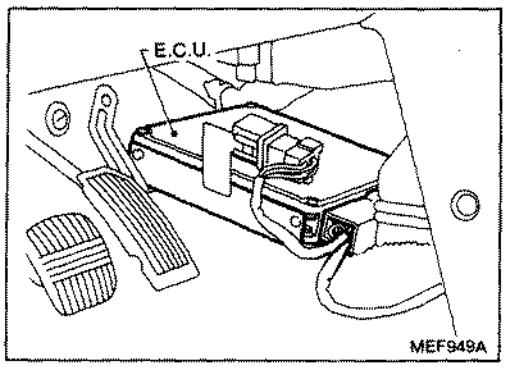
NOTE

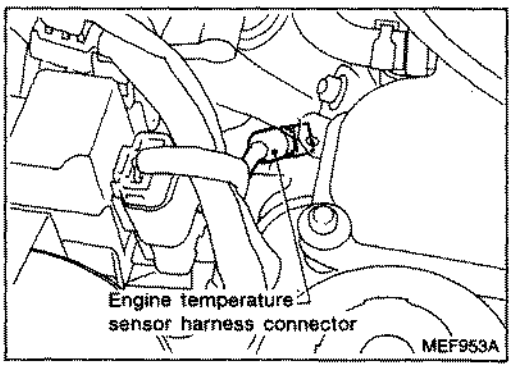
Diagnostic Procedure 25

ENGINE TEMPERATURE SENSOR (Code No. 13)

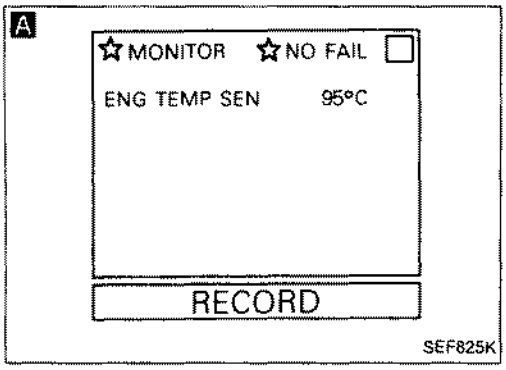


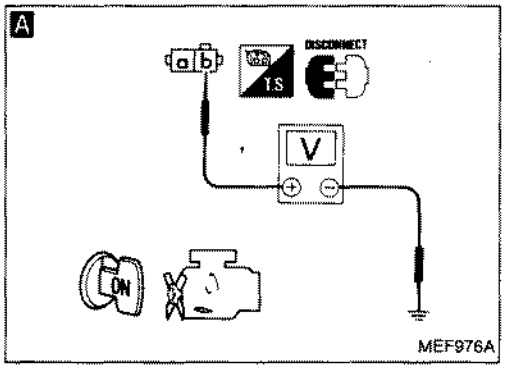
Harness layout

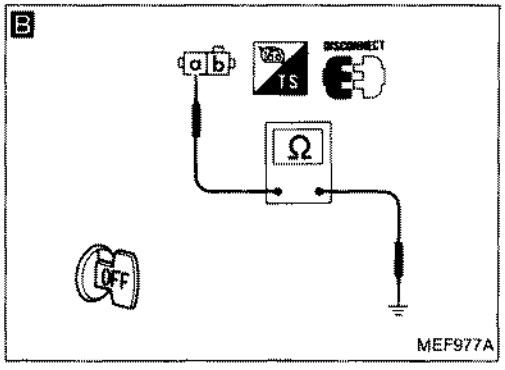




Diagnostic Procedure 25 (Cont'd)







INSPECTION START

A

CHECK POWER SUPPLY.

1) Start engine and warm it up sufficiently.
2) Select engine temperature sensor signal in "DATA MONITOR" mode with CONSULT.
3) Stop engine
4) When restarting engine make sure that CONSULT indicates "ENG.TEMP SEN" is 50°C (122°F) or more.

OR

1) Disconnect engine temperature sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Approximately 5V

N.G. → Check the following.
- Harness connectors (F7), (E222) (L.H.D. models)
- Harness connectors (F11), (E215) (R.H.D. models)
- Harness continuity between E.C.U. and engine temperature sensor.

If N.G., repair harness or connectors.

O.K. ↓

B

CHECK GROUND CIRCUIT.

1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F7), (E222) (L.H.D. models)
- Harness connectors (F11), (E215) (R.H.D. models)
- Harness continuity between E.C.U. and engine temperature sensor.

If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT (Engine temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC- 630.)

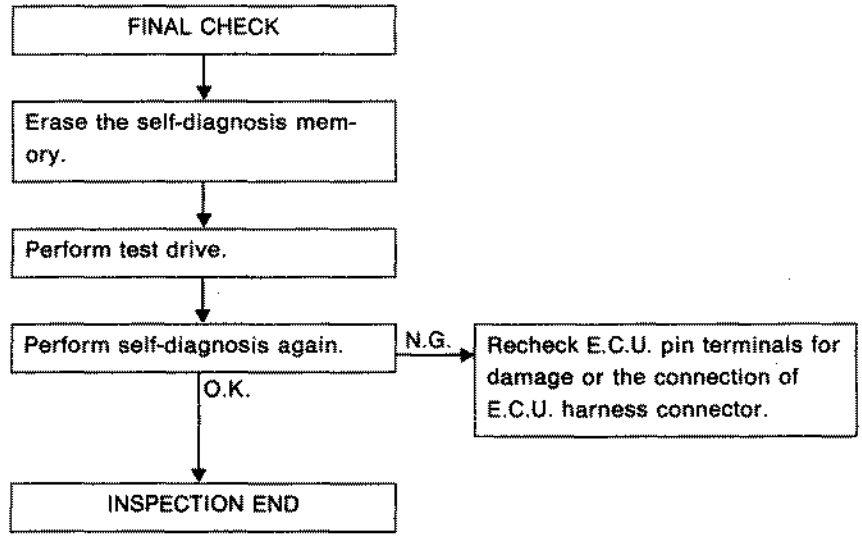
N.G. → Replace engine temperature sensor.

O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 25 (Cont'd)

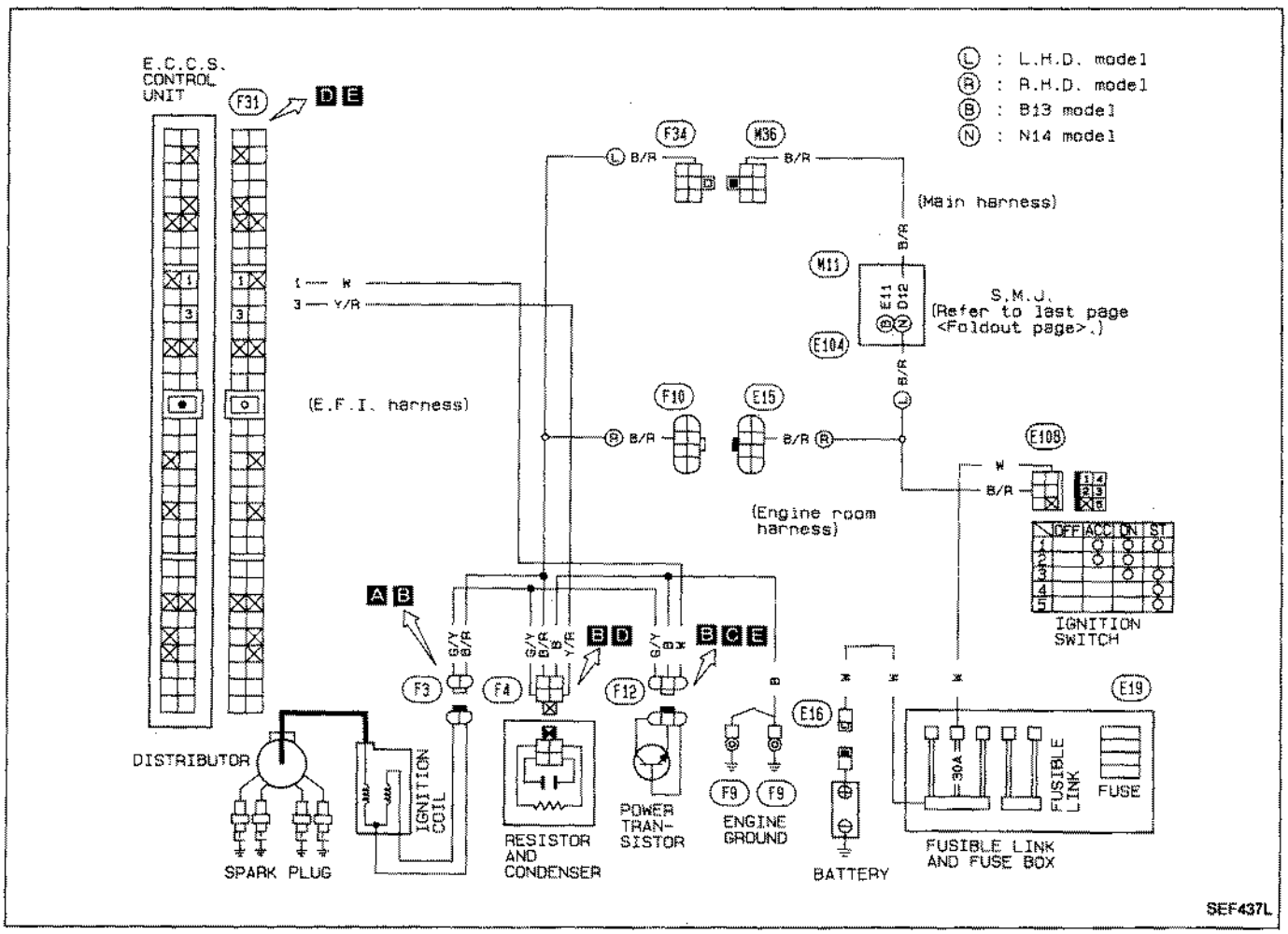
Perform FINAL CHECK by the following procedure after repair is completed.



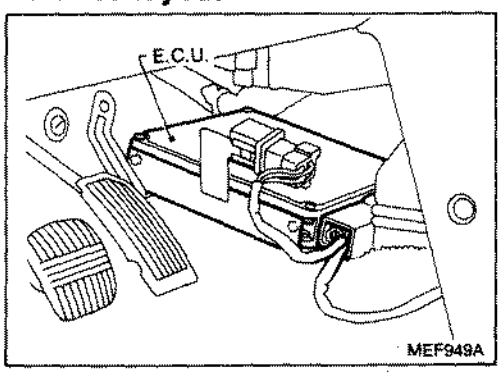
NOTE

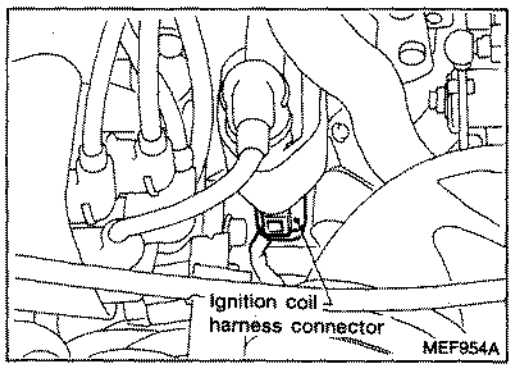
Diagnostic Procedure 26

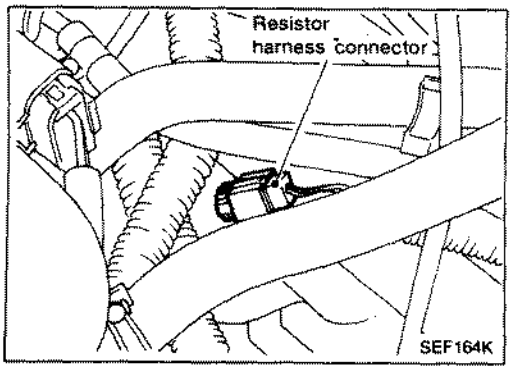
IGNITION SIGNAL (Code No. 21)

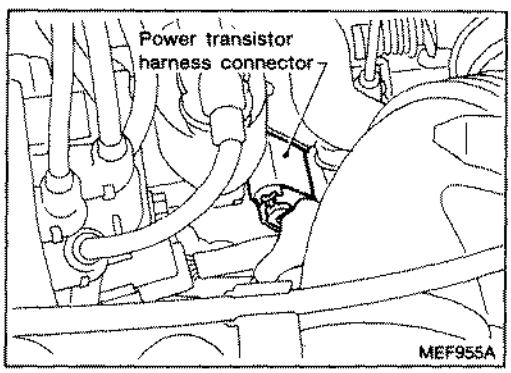


Harness layout

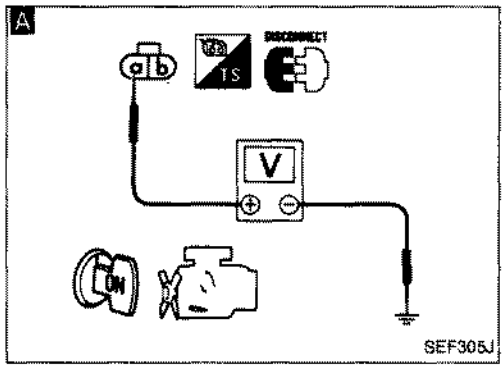


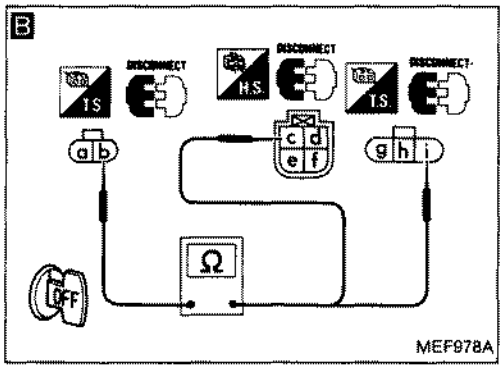


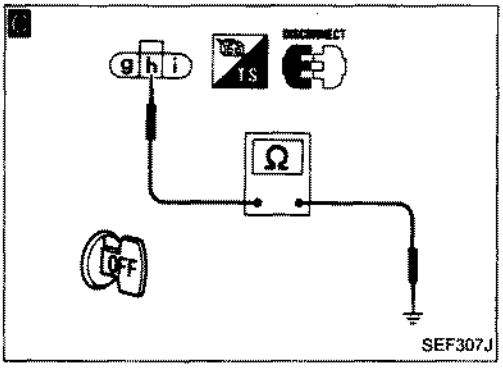


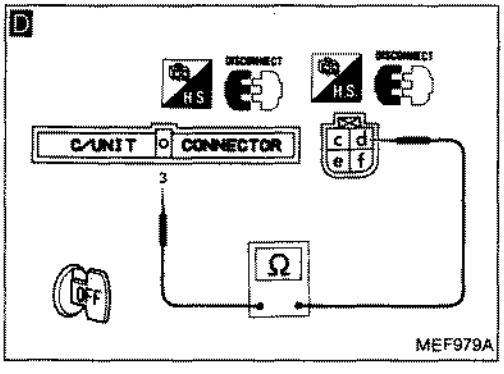


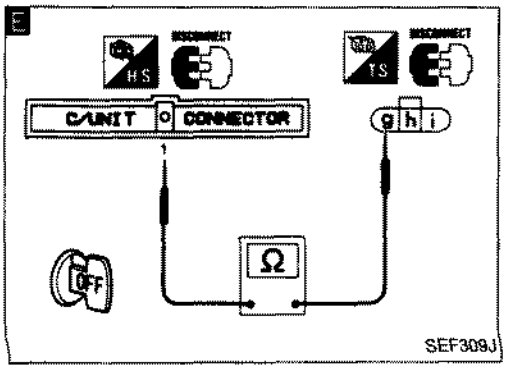
Diagnostic Procedure 26 (Cont'd)











INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect ignition coil harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓖ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F34), (M36) (L.H.D. models)
- Harness connectors (M11), (E184) (L.H.D. models)
- Harness connectors (F10), (E15) (R.H.D. models)
- Harness continuity between ignition coil and ignition switch

If N.G., repair harness or connectors.

O.K. ↓

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect resistor harness connector.
3) Disconnect power transistor harness connector.

B 4) Check harness continuity between terminal ⓑ and terminals ⓒ, ⓘ.
Continuity should exist.

C 5) Check harness continuity between terminal ⓗ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

D

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between terminal ⓓ and E.C.U. terminal ③.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

E

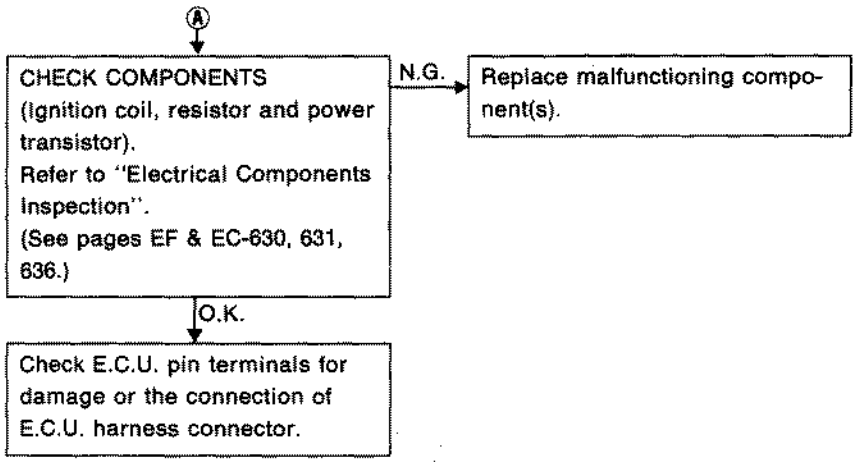
CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between terminal ⓖ and E.C.U. terminal ①.
Continuity should exist.

N.G. → Repair harness or connectors.

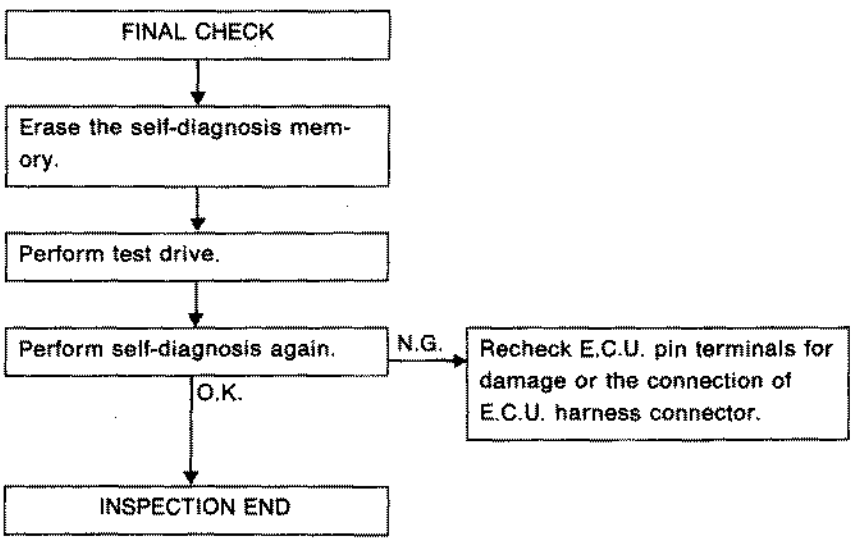
O.K. ↓

Ⓐ

Diagnostic Procedure 26 (Cont'd)



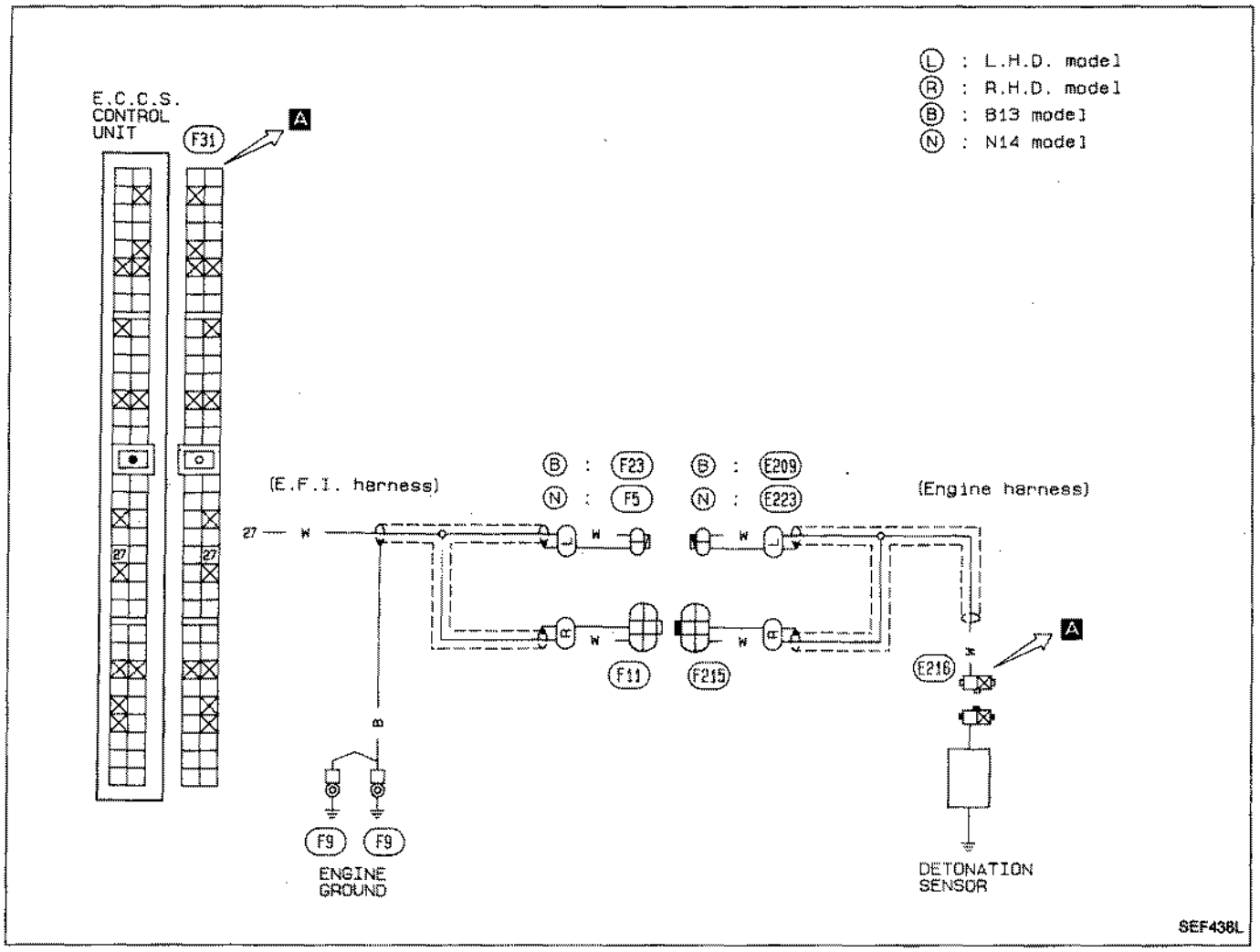
Perform FINAL CHECK by the following procedure after repair is completed.



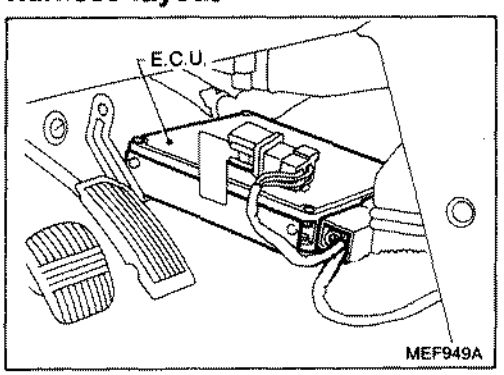
NOTE

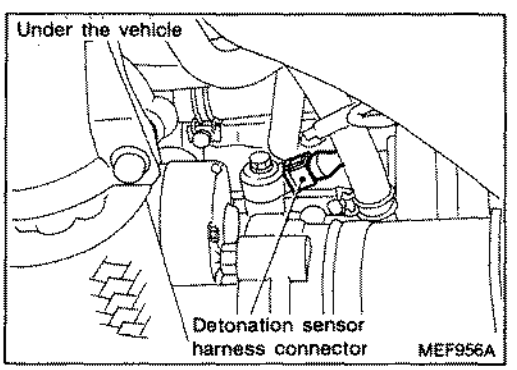
Diagnostic Procedure 27

DETONATION SENSOR (Code No. 34)

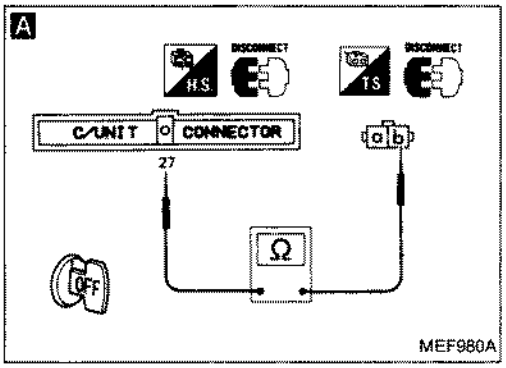


Harness layout





Diagnostic Procedure 27 (Cont'd)



INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector and detonation sensor harness connector.
2) Check harness continuity between terminal (b) and E.C.U. terminal (27).
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F23), (E289) (B13 L.H.D. models)
- Harness connectors (F5), (E223) (N14 L.H.D. models)
- Harness connectors (F11), (E215) (R.H.D. models)
- Harness continuity between E.C.U. and detonation sensor

If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT (Detonation sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-634.)

N.G. → Replace detonation sensor.

O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

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

FINAL CHECK ↓

Erase the self-diagnosis memory. ↓

Perform test drive. ↓

Perform self-diagnosis again.

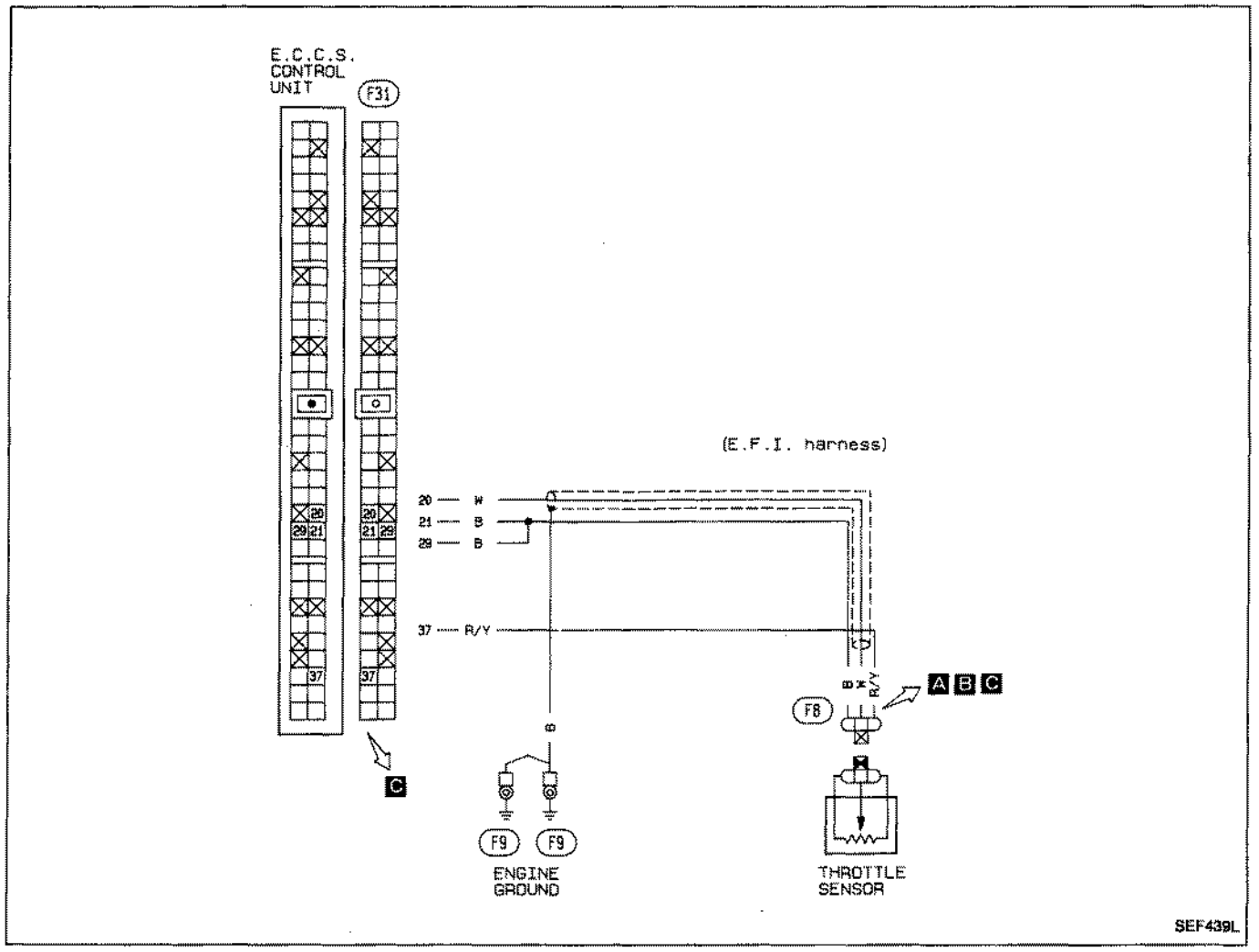
N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K. ↓

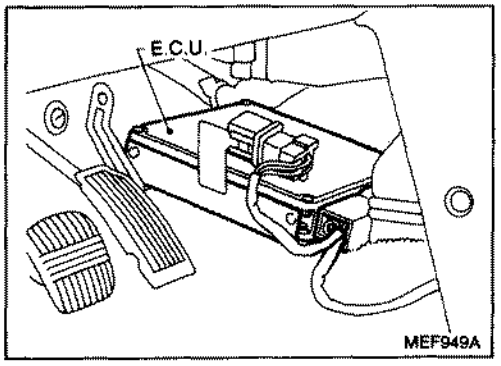
INSPECTION END

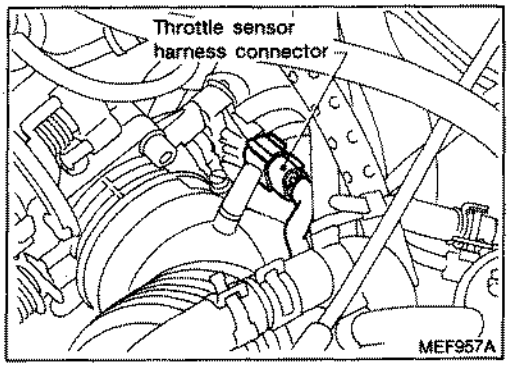
Diagnostic Procedure 28

THROTTLE SENSOR (Code No. 43)



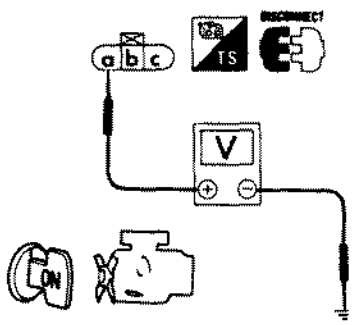
Harness layout





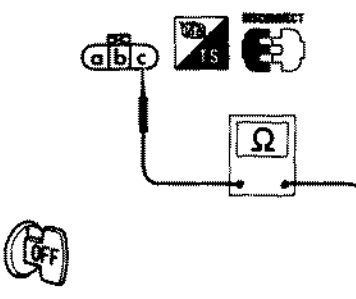
Diagnostic Procedure 28 (Cont'd)

A



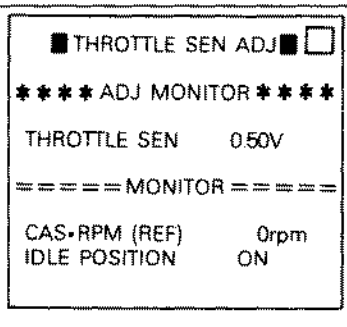
SEF199K

B



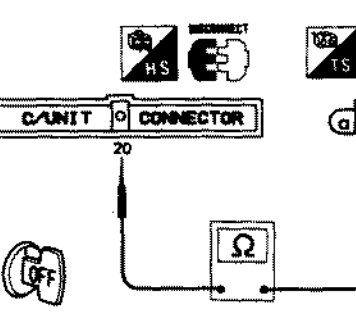
SEF200K

C



SEF275L

C



SEF201K

INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect throttle sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Approximately 5V

N.G. → Repair harness or connectors.

O.K.

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓒ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

C

CHECK INPUT SIGNAL CIRCUIT.
1) Reconnect throttle sensor harness connector.
2) Turn ignition switch "ON".
3) Read throttle sensor output voltage in "WORK SUPPORT" mode with CONSULT.
Throttle valve fully closed:
0.45 - 0.55V
Throttle valve fully open:
Approx. 4.0V

N.G. → Repair harness or connectors.

— OR —

1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ⑳ and terminal ⓑ.
Continuity should exist.

O.K.

CHECK COMPONENT (Throttle sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-632.)

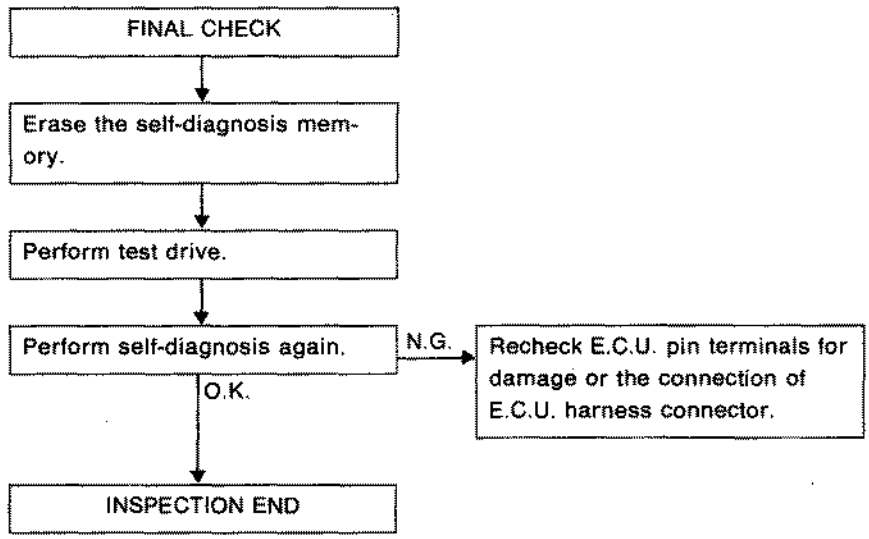
N.G. → Replace throttle sensor.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 28 (Cont'd)

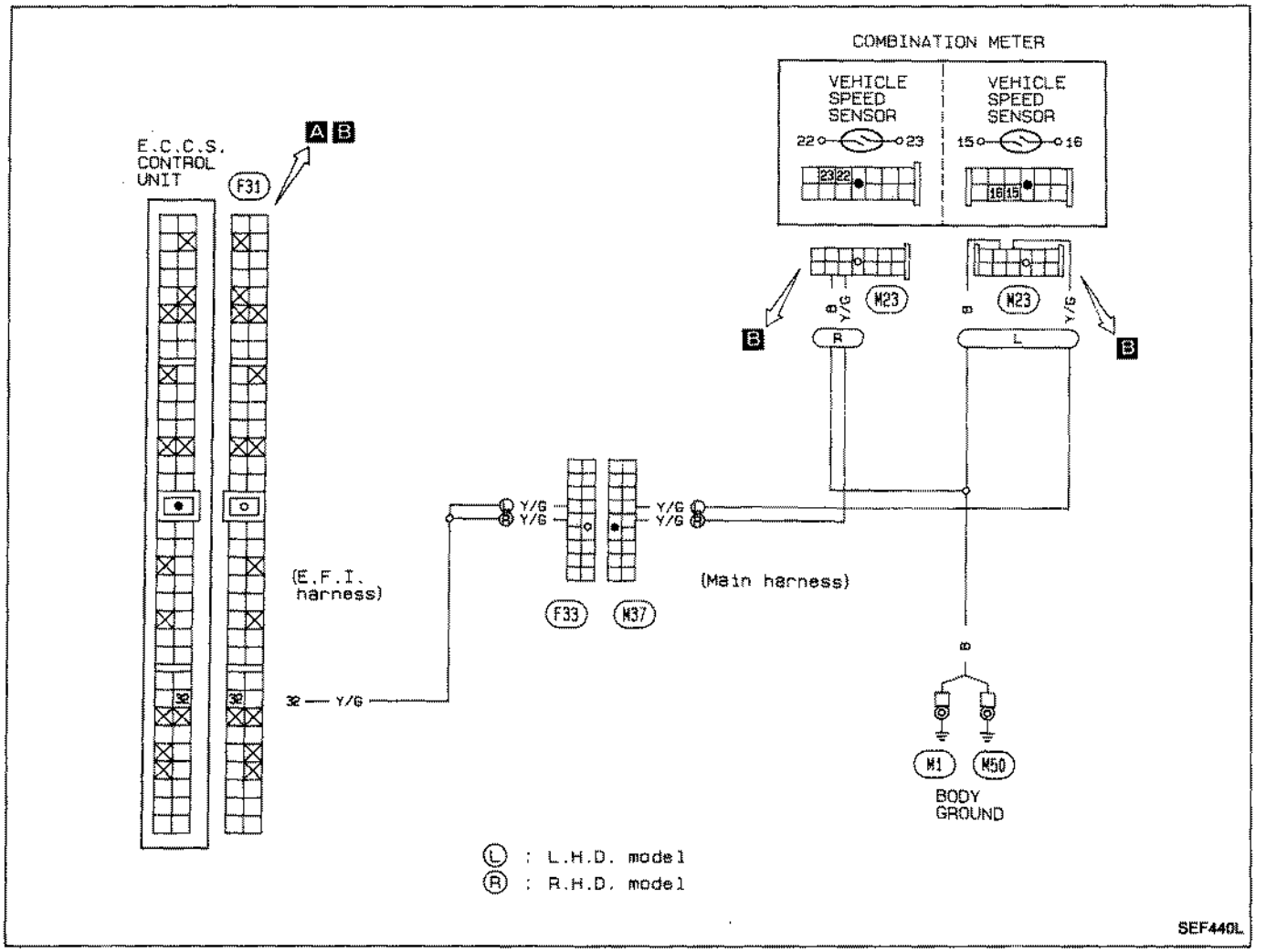
Perform FINAL CHECK by the following procedure after repair is completed.



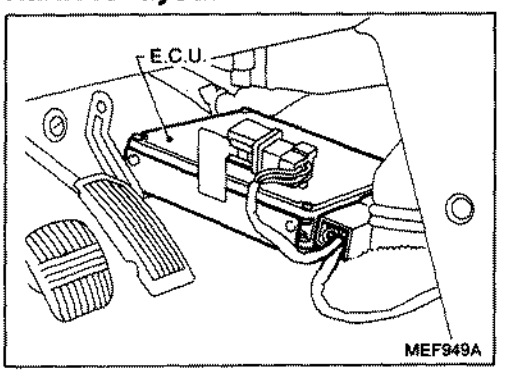
NOTE

Diagnostic Procedure 29

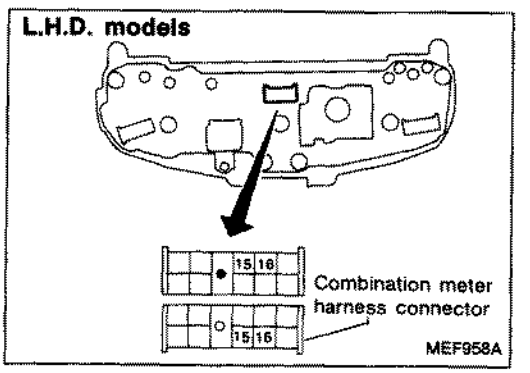
VEHICLE SPEED SENSOR (Not self-diagnostic item)



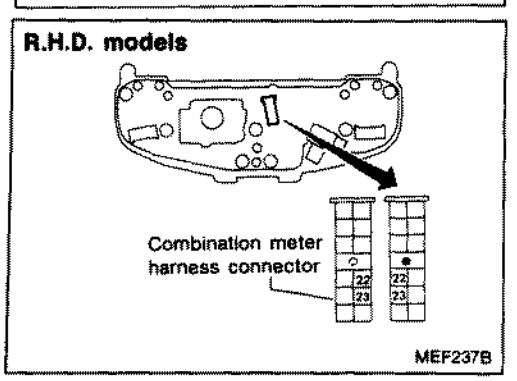
Harness layout



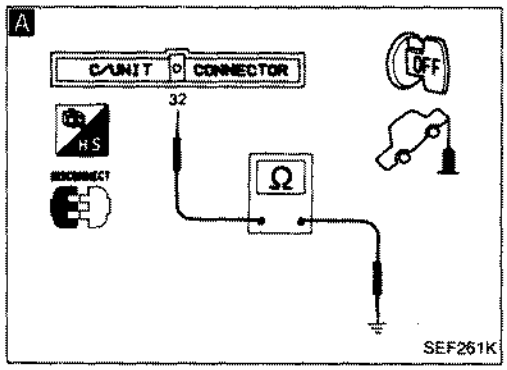
L.H.D. models

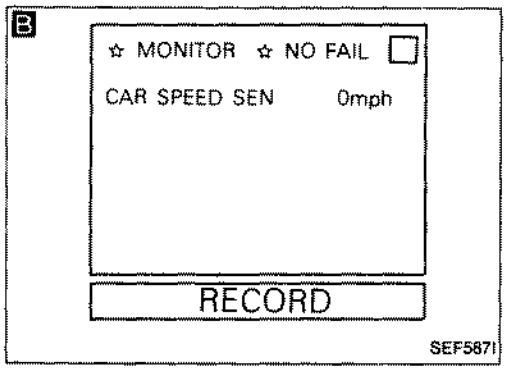


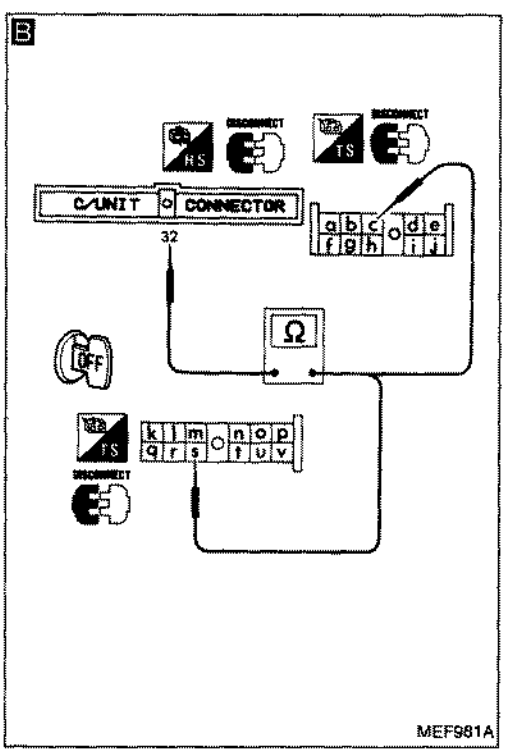
R.H.D. models



Diagnostic Procedure 29 (Cont'd)







INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Jack up front wheels.
2) Disconnect E.C.U. harness connector.
3) Rotate front wheel by hand.
4) Check harness continuity between E.C.U. terminal (32) and body ground.
Continuity should come and go.

O.K. → INSPECTION END

N.G.

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

N.G. → Check vehicle speed sensor and circuit.
(Refer to EL section.)

O.K.

B

CHECK INPUT SIGNAL CIRCUIT.
1) Reconnect E.C.U. harness connector.
2) Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT.
CONSULT value should be the same as the speedometer indication.

N.G. → Check the following.
- Harness connectors (F33), (M37)
- Harness continuity between E.C.U. and combination meter

If N.G., repair harness or connectors.

OR

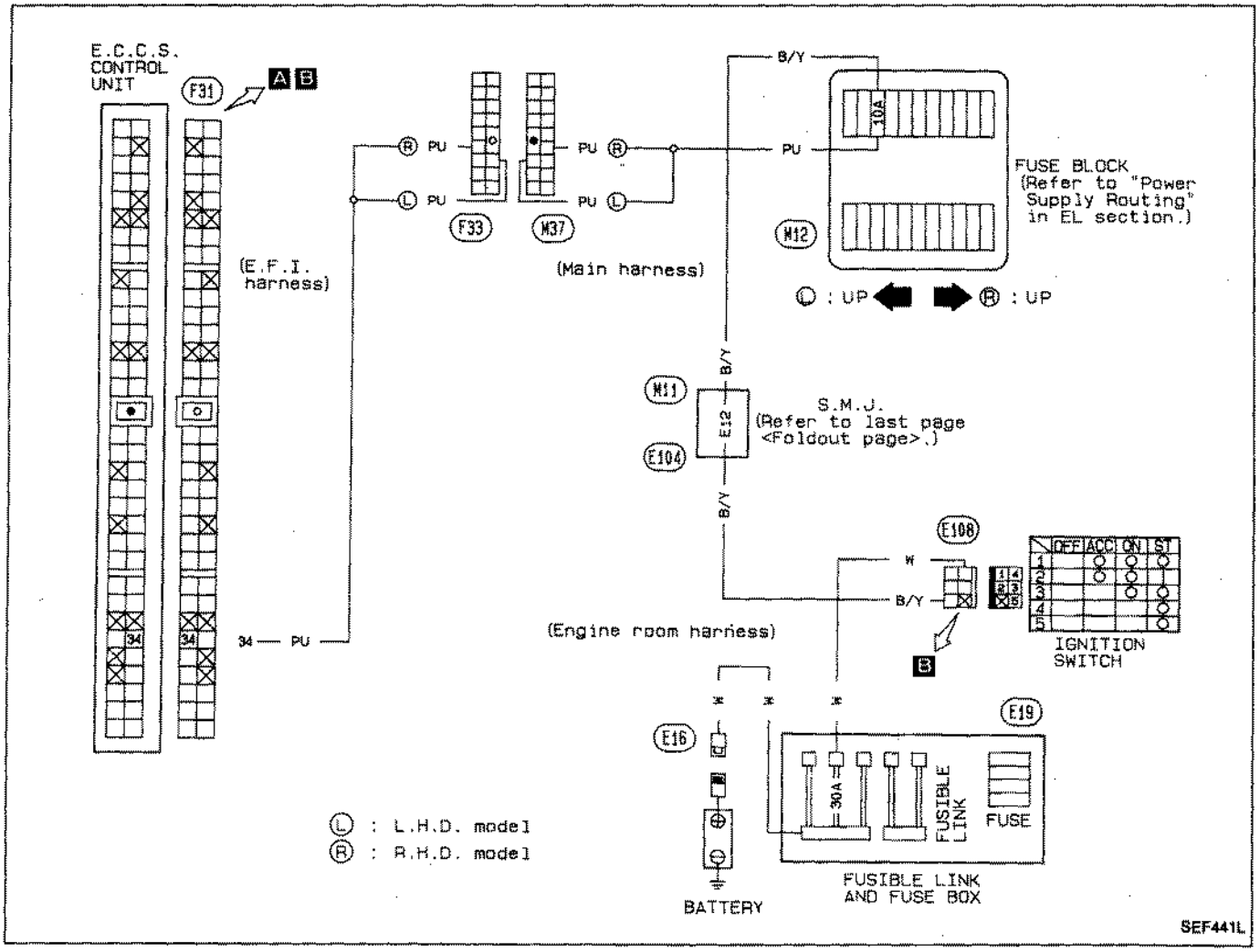
1) Turn ignition switch "OFF".
2) Disconnect combination meter harness connector.
3) Check harness continuity between E.C.U. terminal (32) and terminal (E) (L.H.D. models), terminal (S) (R.H.D. models).
Continuity should exist.

O.K.

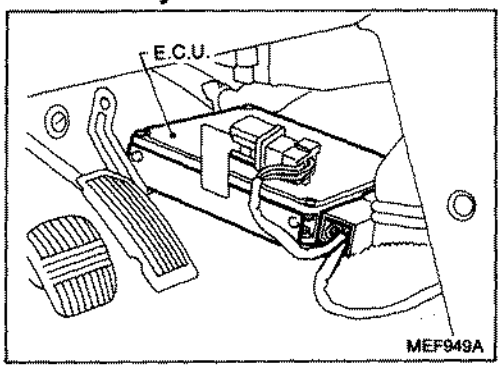
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 30

START SIGNAL (Not self-diagnostic item)

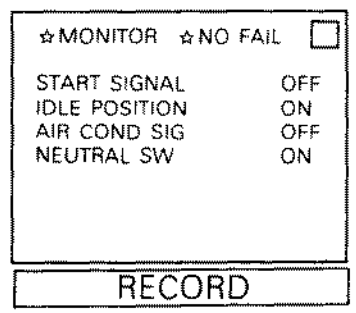


Harness layout



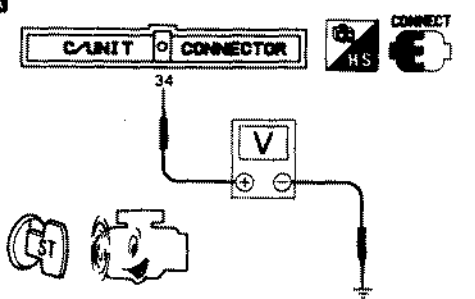
Diagnostic Procedure 30 (Cont'd)

A



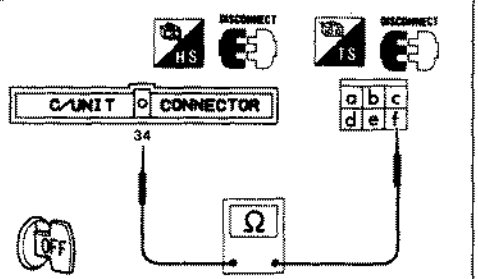
SEF384J

A



SEF202K

B



MEF982A

INSPECTION START

A

CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON".
2) Check start signal in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

OR

1) Turn ignition switch to "START".
2) Check voltage between E.C.U. terminal ㉞ and ground.

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

O.K. → INSPECTION END

N.G.

B

CHECK INPUT SIGNAL CIRCUIT.

1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector and ignition switch harness connector.
3) Check harness continuity between E.C.U. terminal ㉞ and terminal ⓕ.

Continuity should exist.

N.G. → Check the following.
- Harness connectors (F33), (M37)
- Harness connectors (M11), (E164)
- 10A fuse
- Harness continuity between E.C.U. and ignition switch

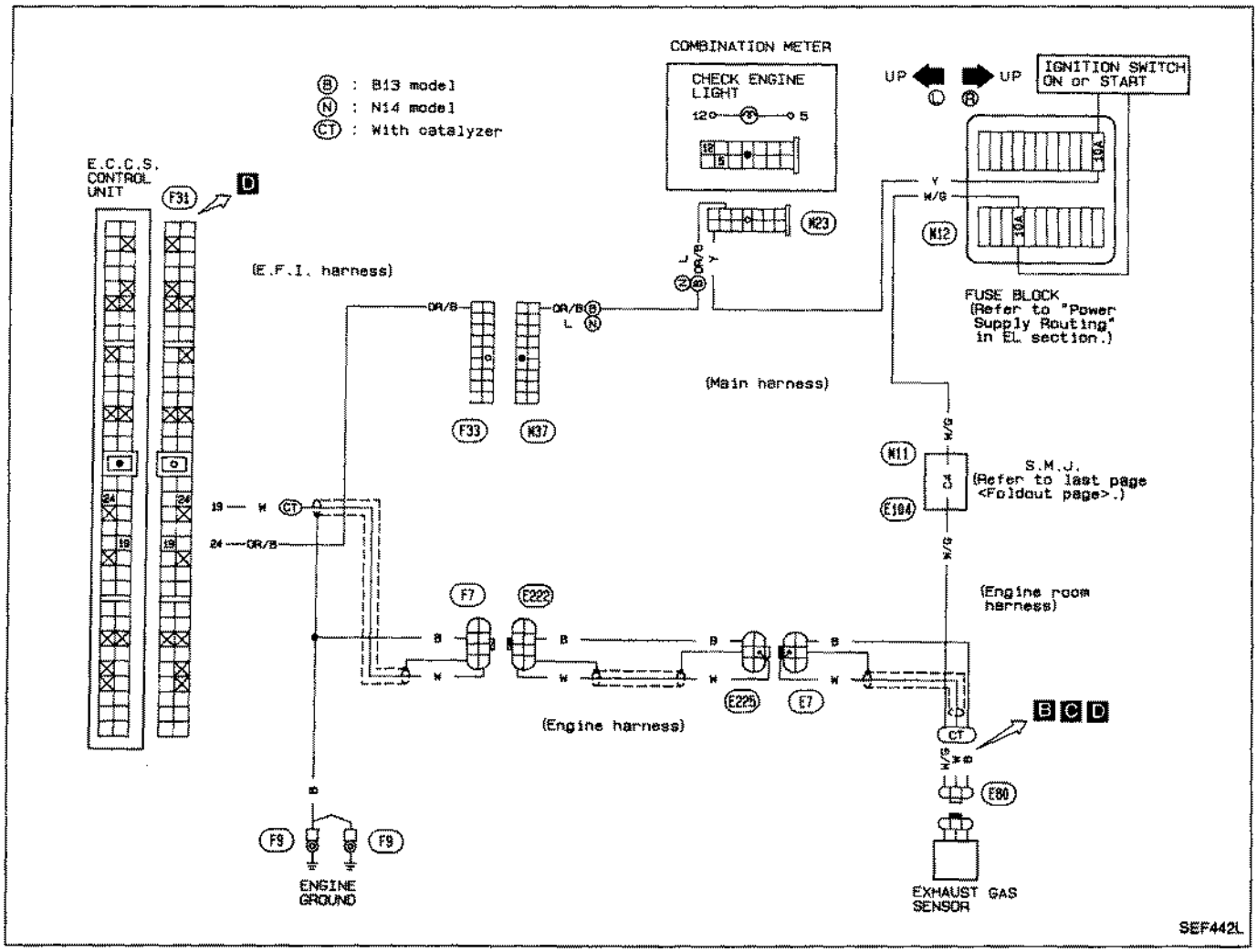
If N.G., repair harness or connectors.

O.K.

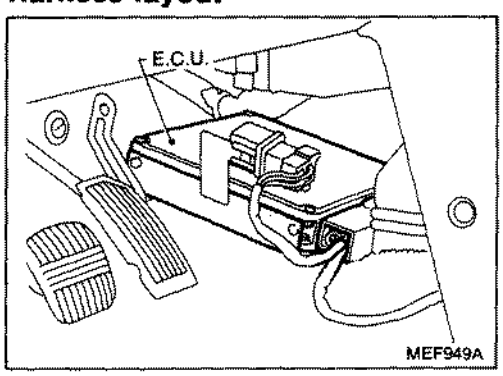
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

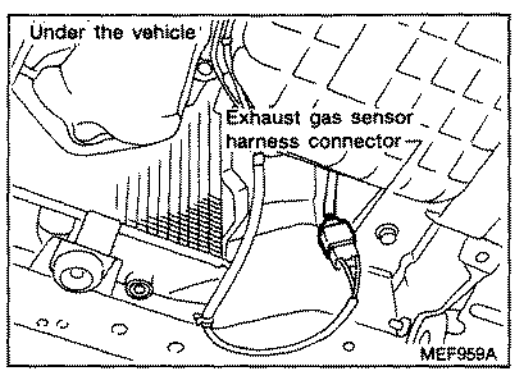
Diagnostic Procedure 31

EXHAUST GAS SENSOR (Not self-diagnostic item)

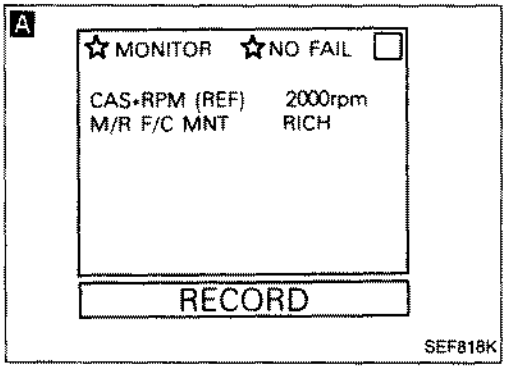


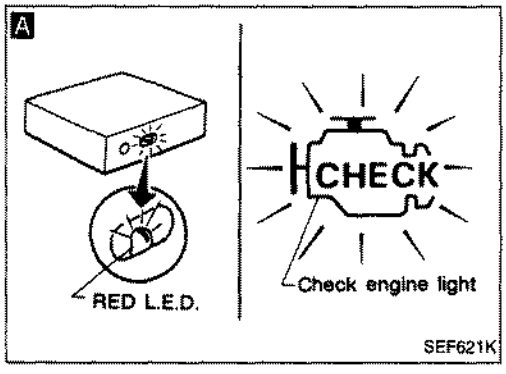
Harness layout

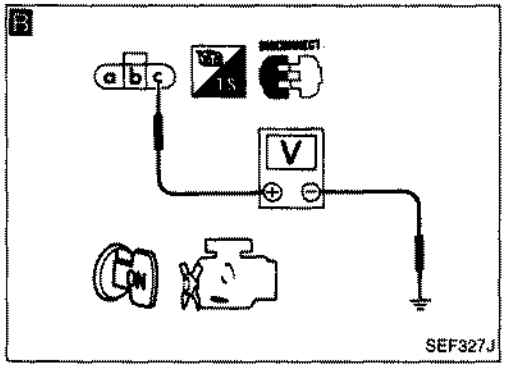


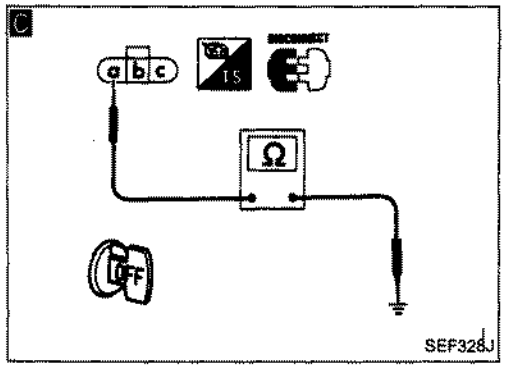


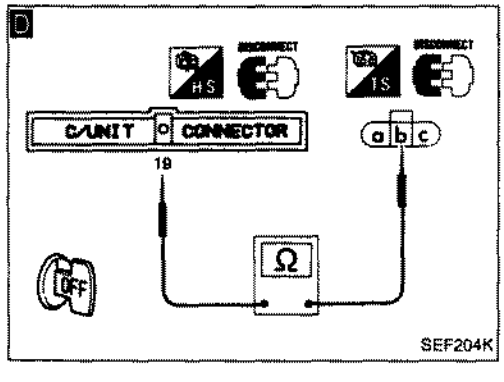
Diagnostic Procedure 31 (Cont'd)











INSPECTION START

A

CHECK EXHAUST GAS SENSOR CIRCUIT.

1) Start engine and warm it up sufficiently.
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.

O.K. → INSPECTION END

OR

1) Start engine and warm it up sufficiently.
2) Run engine at about 2,000 rpm for about 2 minutes under no-load.
3) Set E.C.U. diagnosis mode to Mode II.
4) Keep engine speed at 2,000 rpm and make sure that the RED L.E.D. on E.C.U. or the check engine light on the instrument panel goes on and off more than 5 times during 10 seconds.

N.G.

B

CHECK POWER SUPPLY.

1) Stop engine.
2) Disconnect exhaust gas sensor harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓒ and ground.

Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M1), (E104)
- 10A fuse
- Harness continuity between exhaust gas sensor and fuse

If N.G., repair harness or connectors.

O.K.

C

CHECK GROUND CIRCUIT.

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

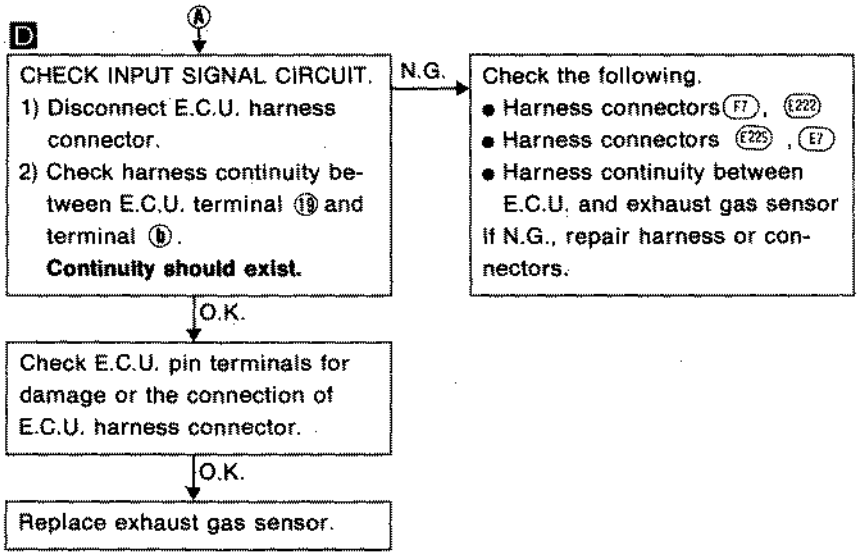
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F7), (E222)
- Harness connectors (E225), (E7)
- Harness continuity between exhaust gas sensor and engine ground

If N.G., repair harness or connectors.

O.K. → Ⓐ

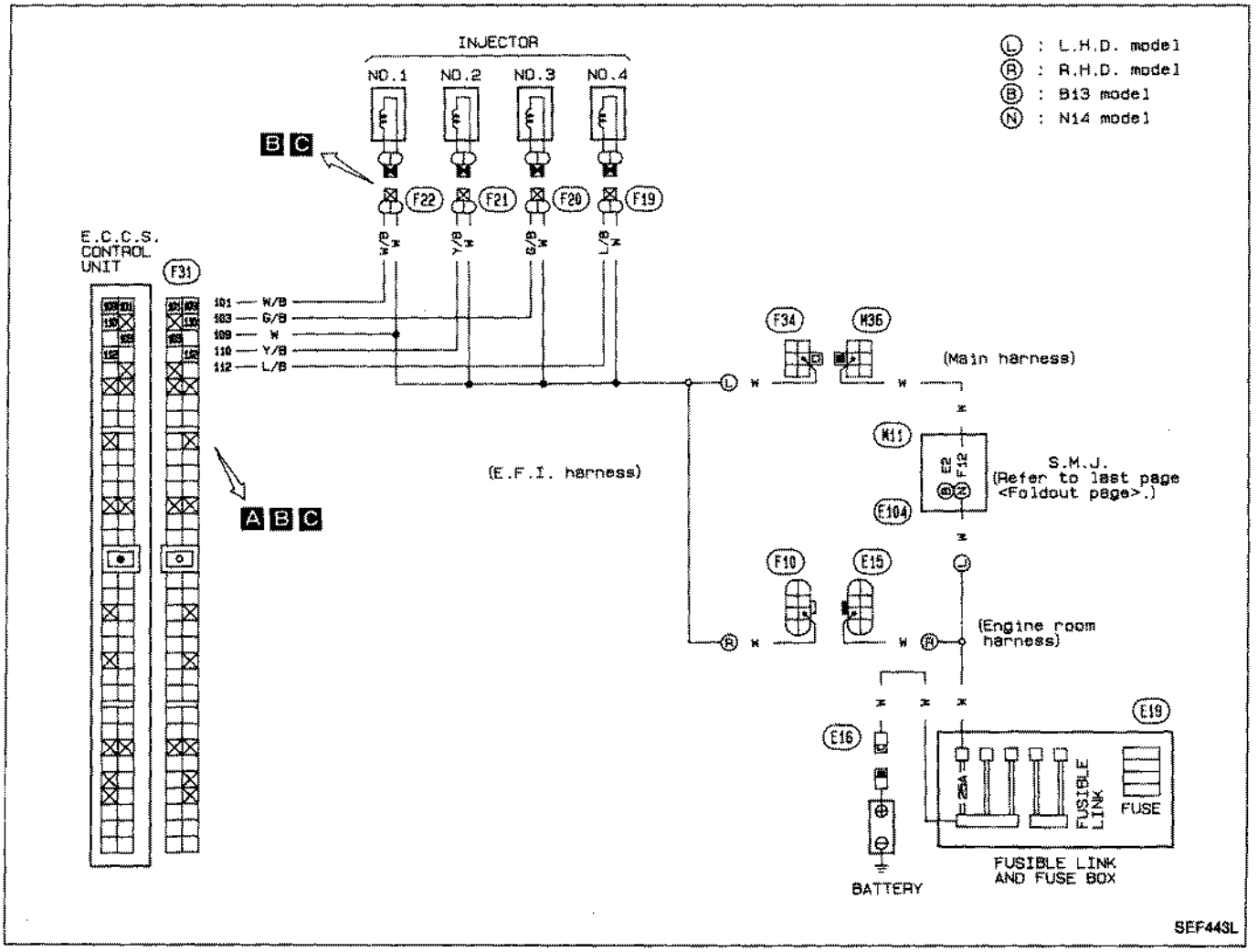
Diagnostic Procedure 31 (Cont'd)



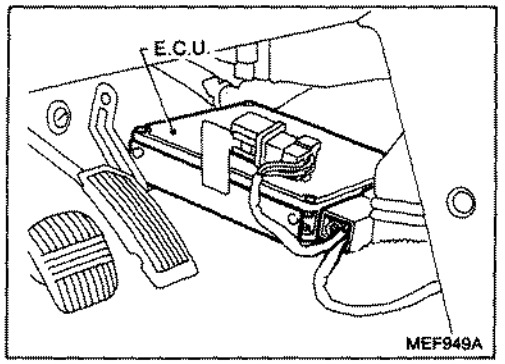
NOTE

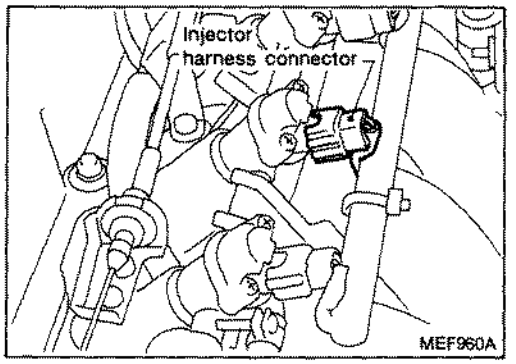
Diagnostic Procedure 32

INJECTOR (Not self-diagnostic item)



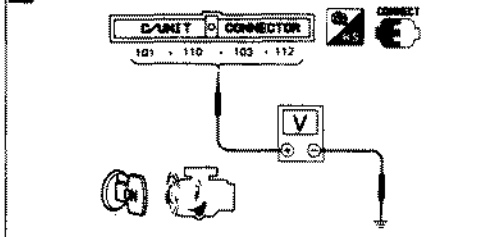
Harness layout





Diagnostic Procedure 32 (Cont'd)

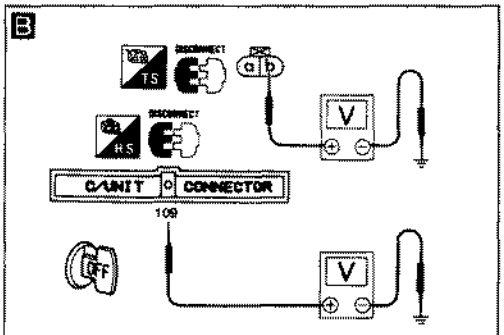
A



(101) : No. 1 cylinder (103) : No. 3 cylinder
(110) : No. 2 cylinder (112) : No. 4 cylinder

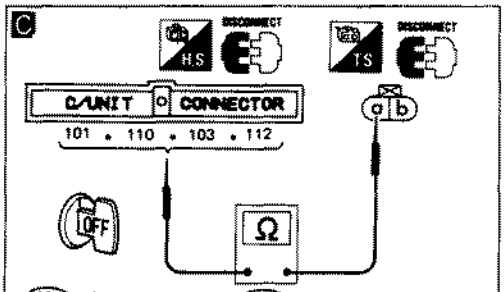
SEF974I

B



MEF983A

C



(101) : No. 1 cylinder (103) : No. 3 cylinder
(110) : No. 2 cylinder (112) : No. 4 cylinder

MEF984A

INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Start engine.
2) Check voltage between E.C.U. terminals (101), (110), (103), (112) and ground.
Voltage: Battery voltage

O.K. → INSPECTION END

N.G.

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect injector harness connector and E.C.U. harness connector.
3) Check voltage between terminal ⓑ and ground, E.C.U. terminal (109) and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F34), (M56) (L.H.D. models)
- Harness connectors (M11), (E104) (L.H.D. models)
- Harness connectors (F10), (E15) (R.H.D. models)
- 25A fusible link
- Harness continuity between battery and injector
- Harness continuity between battery and E.C.U.

If N.G., repair harness or connectors.

O.K.

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between terminal ⓐ and E.C.U. terminals (101), (110), (103), (112).
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT (Injector).
Refer to "Electrical Components Inspection".
(See page EF & EC-635.)

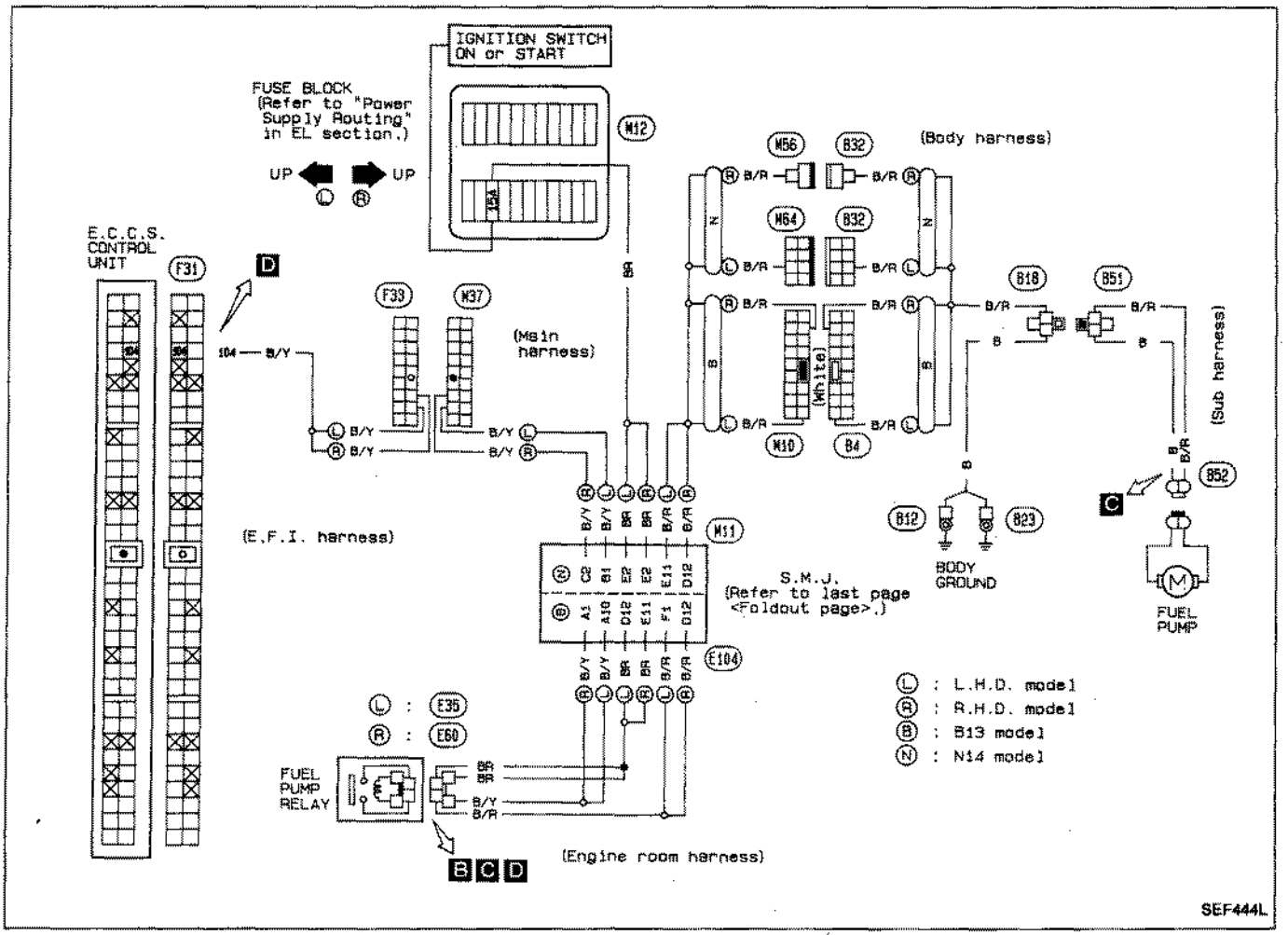
N.G. → Replace injector.

O.K.

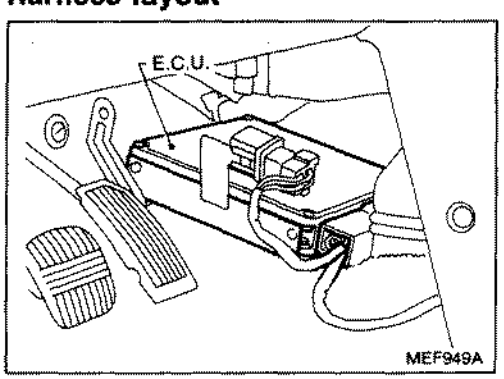
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

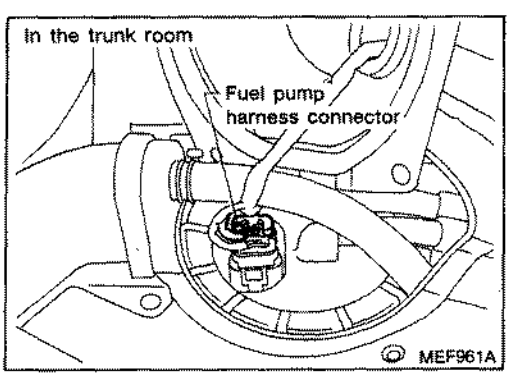
Diagnostic Procedure 33

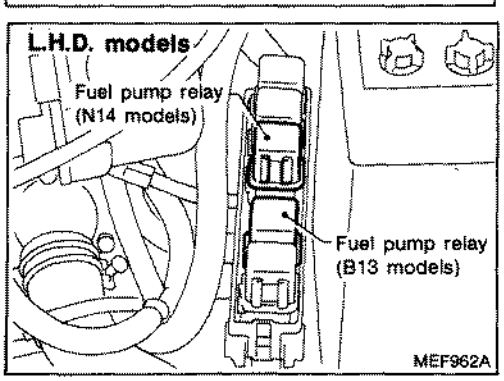
FUEL PUMP (Not self-diagnostic item)

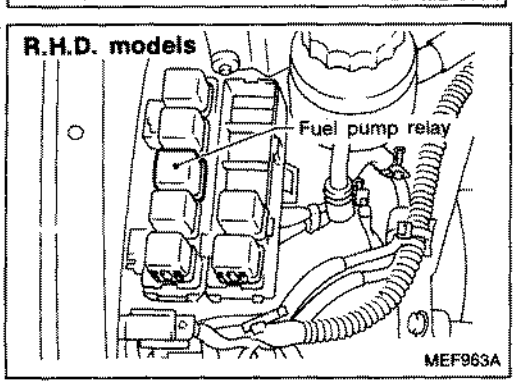


Harness layout



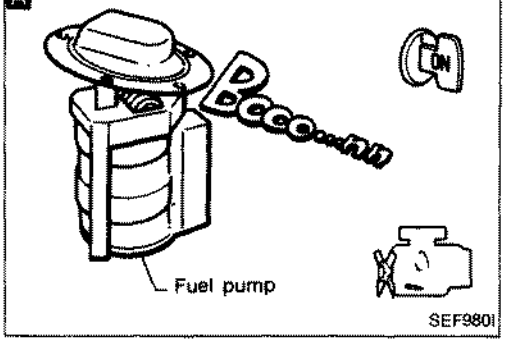






Diagnostic Procedure 33 (Cont'd)

A



INSPECTION START

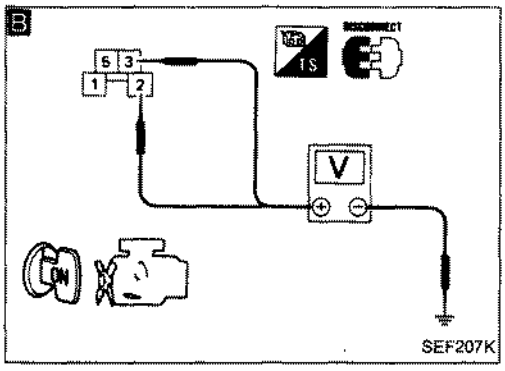
A

CHECK OVERALL FUNCTION.
1) Turn ignition switch "ON".
2) Listen to fuel pump operating sound.
Fuel pump should operate for 5 seconds after ignition switch is turned "ON".

O.K. → INSPECTION END

N.G.

B



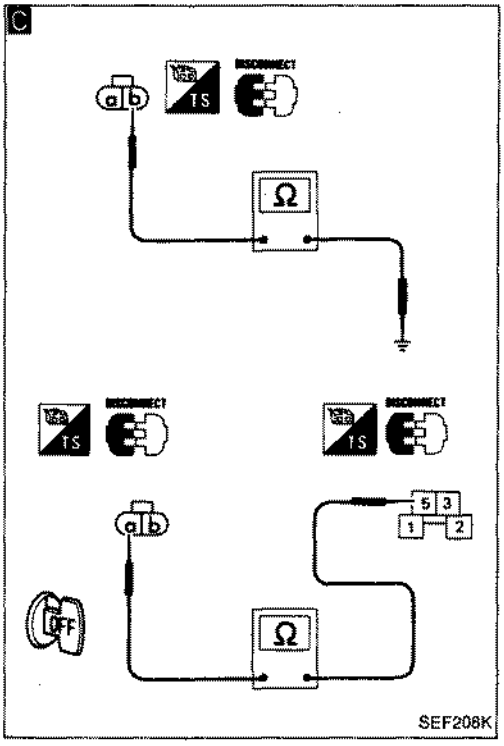
CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect fuel pump relay.
3) Turn ignition switch "ON".
4) Check voltage between terminals ②, ③ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M11), (E104)
- 15A fuse
- Harness continuity between fuse and fuel pump relay

If N.G., repair harness or connectors.

O.K.

C



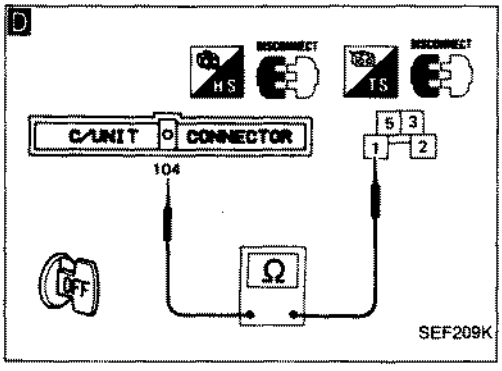
CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect fuel pump harness connector.
3) Check harness continuity between terminal ⓑ and body ground, terminal ⓐ and terminal ⑤.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (B16), (B51)
- Harness connectors (M11), (E104)
- Harness connectors (M10), (B4) (B13 models)
- Harness connectors (M64), (B32) (N14 L.H.D. models)
- Harness connectors (M56), (B32) (N14 R.H.D. models)
- Harness continuity between fuel pump and body ground
- Harness continuity between fuel pump and fuel pump relay

If N.G., repair harness or connectors.

O.K.

D



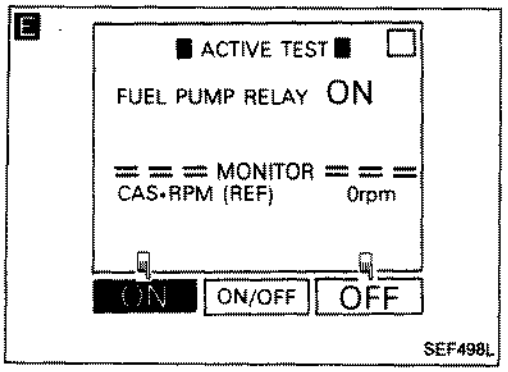
CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal (104) and terminal ①.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (M11), (E104)
- Harness connectors (F39), (B37)
- Harness continuity between E.C.U. and fuel pump relay

If N.G., repair harness or connectors.

O.K. → Ⓐ

Diagnostic Procedure 33 (Cont'd)



Ⓐ

CHECK COMPONENT
(Fuel pump relay).

1) Reconnect fuel pump relay, fuel pump harness connector and E.C.U. harness connector.
2) Ignition switch "ON".
3) Turn fuel pump relay "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

N.G. → Replace fuel pump relay.

OR

Refer to "Electrical Components Inspection". (See page EF & EC-635.)

O.K. ↓

CHECK COMPONENT
(Fuel pump).
Refer to "Electrical Components Inspection".
(See page EF & EC-631.)

N.G. → Replace fuel pump.

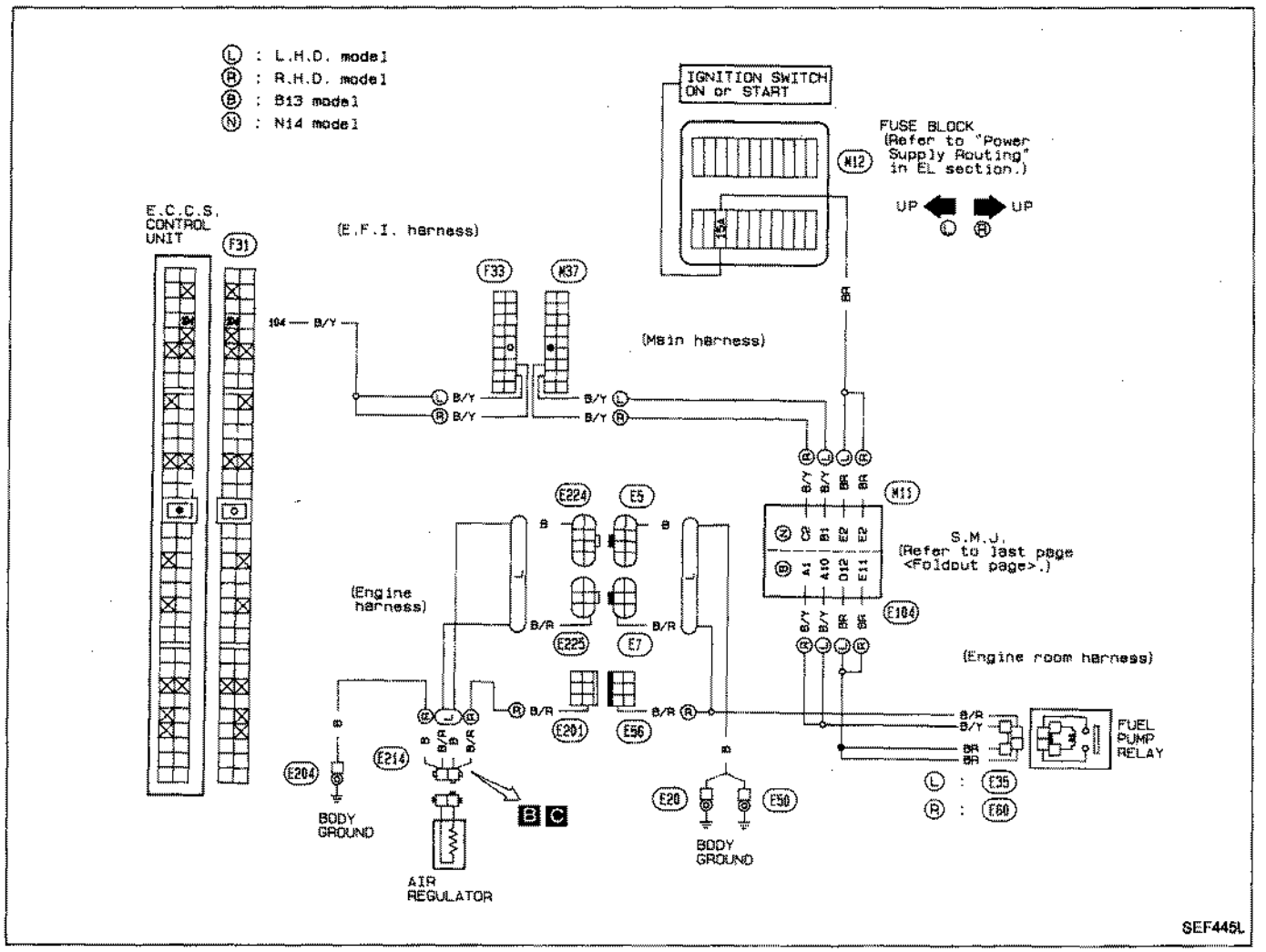
O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

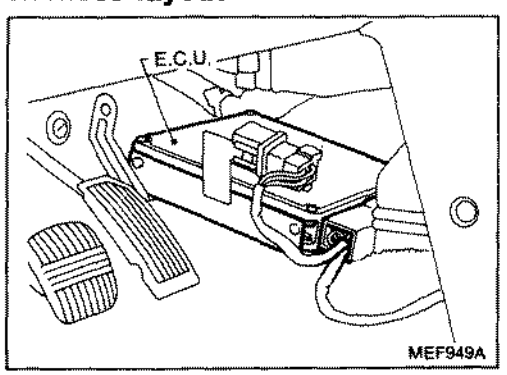
NOTE

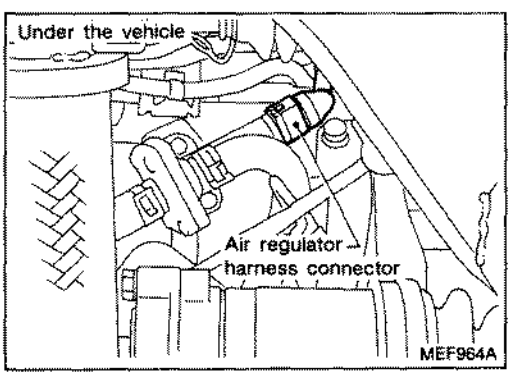
Diagnostic Procedure 34

AIR REGULATOR (Not self-diagnostic item)



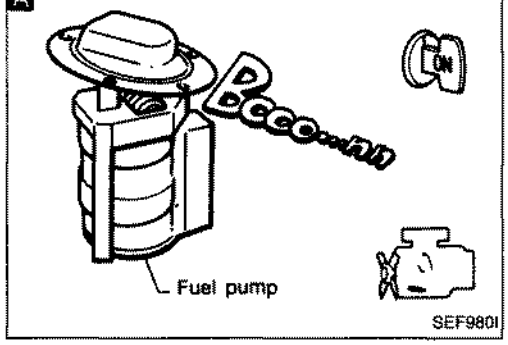
Harness layout



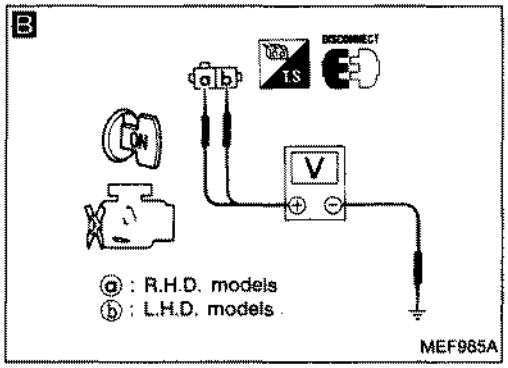


Diagnostic Procedure 34 (Cont'd)

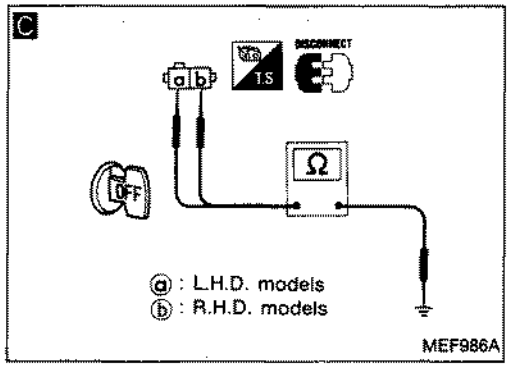
A



B



C



INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Turn ignition switch "ON".
2) Listen to fuel pump operating sound.
Fuel pump should operate for 5 seconds after ignition switch is turned "ON".

N.G. → Check fuel pump control circuit. (See page EF & EC-500.)

O.K.

B

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect air regulator harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ (R.H.D. models), terminal ⓑ (L.H.D. models) and ground.
Battery voltage should exist for 5 seconds after ignition switch is turned "ON".

N.G. → Check the following.
- Harness connectors (E225), (E7) (L.H.D. models)
- Harness connectors (E281), (E56) (R.H.D. models)
- Harness continuity between air regulator and fuel pump relay

If N.G., repair harness or connectors.

O.K.

C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓑ (R.H.D. models), terminal ⓐ (L.H.D. models) and body ground.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (E224), (E5) (L.H.D. models)
- Harness continuity between air regulator and body ground

If N.G., repair harness or connectors.

O.K.

CHECK COMPONENT (Air regulator).
Refer to "Electrical Components Inspection".
(See page EF & EC-634.)

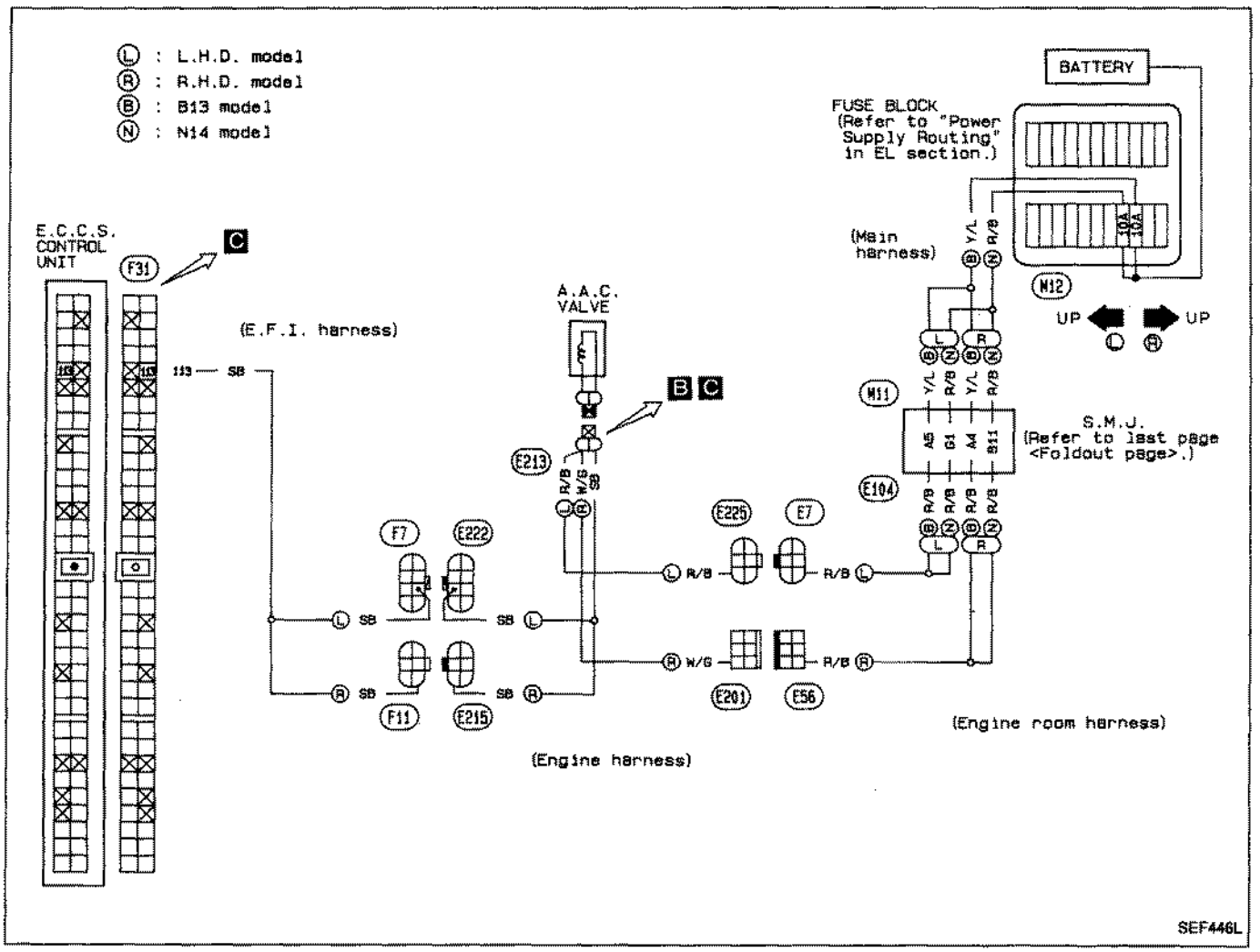
N.G. → Replace air regulator.

O.K.

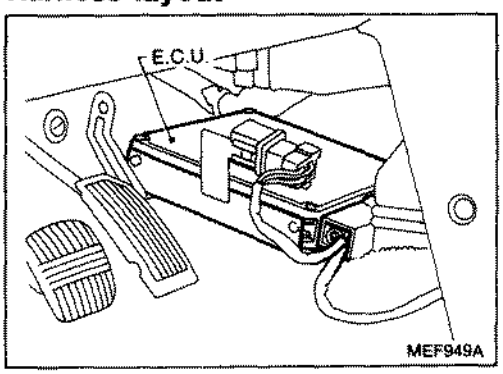
INSPECTION END

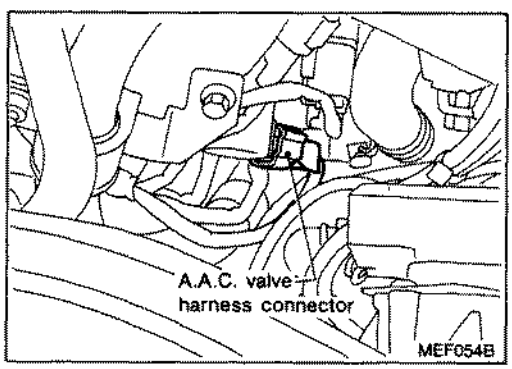
Diagnostic Procedure 35

A.A.C. VALVE (Not self-diagnostic item)



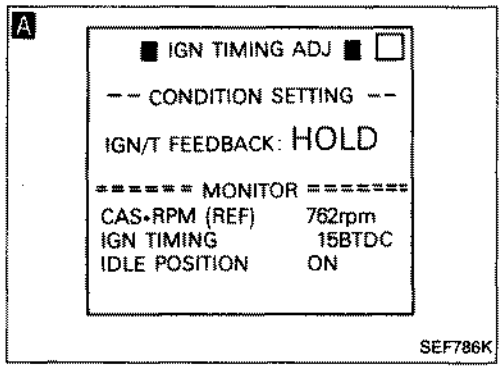
Harness layout



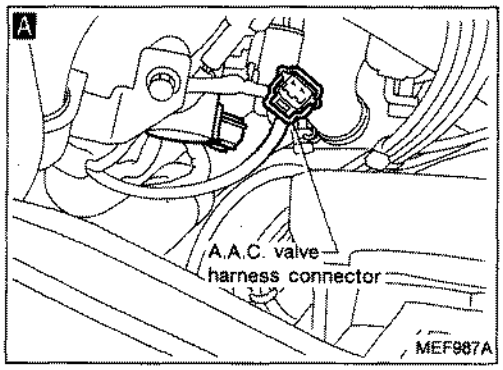


Diagnostic Procedure 35 (Cont'd)

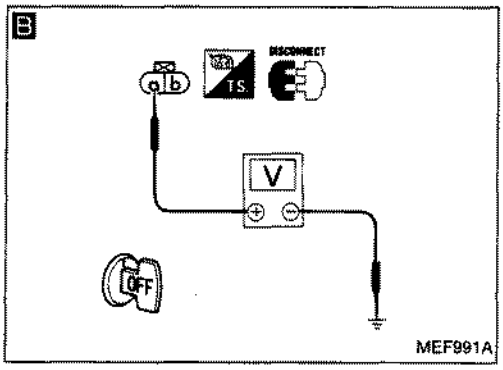
A



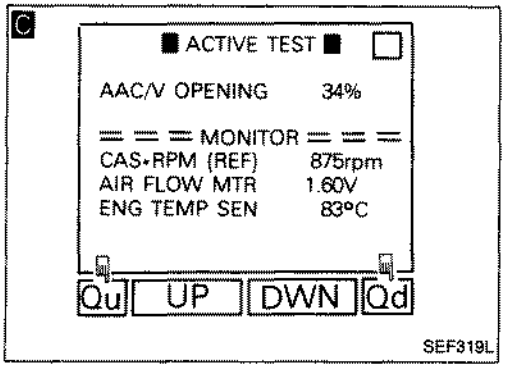
A



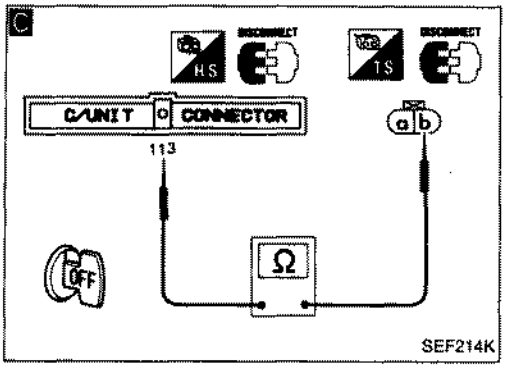
B



C



C



INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check idle speed.
850 ± 50 rpm
3) ● Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode.
● Disconnect A.A.C. valve harness connector.
4) Make sure that idle speed drops.

Drops → INSPECTION END

Does not drop ↓

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors E225 , E7 (L.H.D. models)
- Harness connectors E201 , E56 (R.H.D. models)
- Harness connectors M11 , E104
- 10A fuse
- Harness continuity between A.A.C. valve and fuse

If N.G., repair harness or connectors.

O.K. ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Reconnect A.A.C. valve harness connector.
2) Perform "AAC VALVE OPENING TEST" in "ACTIVE TEST" mode with CONSULT.

OR

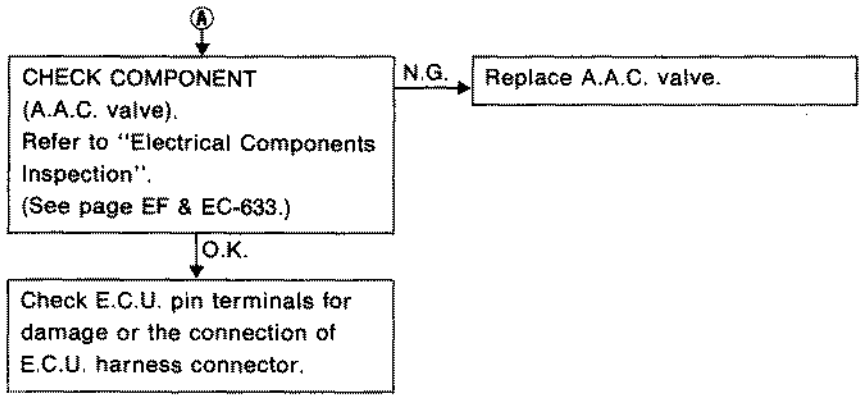
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal 113 and terminal ⓑ.
Continuity should exist.

N.G. → Check the following.
- Harness connectors F7, E222 (L.H.D. models)
- Harness connectors F11 , E215 (R.H.D. models)
- Harness continuity between E.C.U. and A.A.C. valve

If N.G., repair harness or connectors.

O.K. ↓ Ⓐ

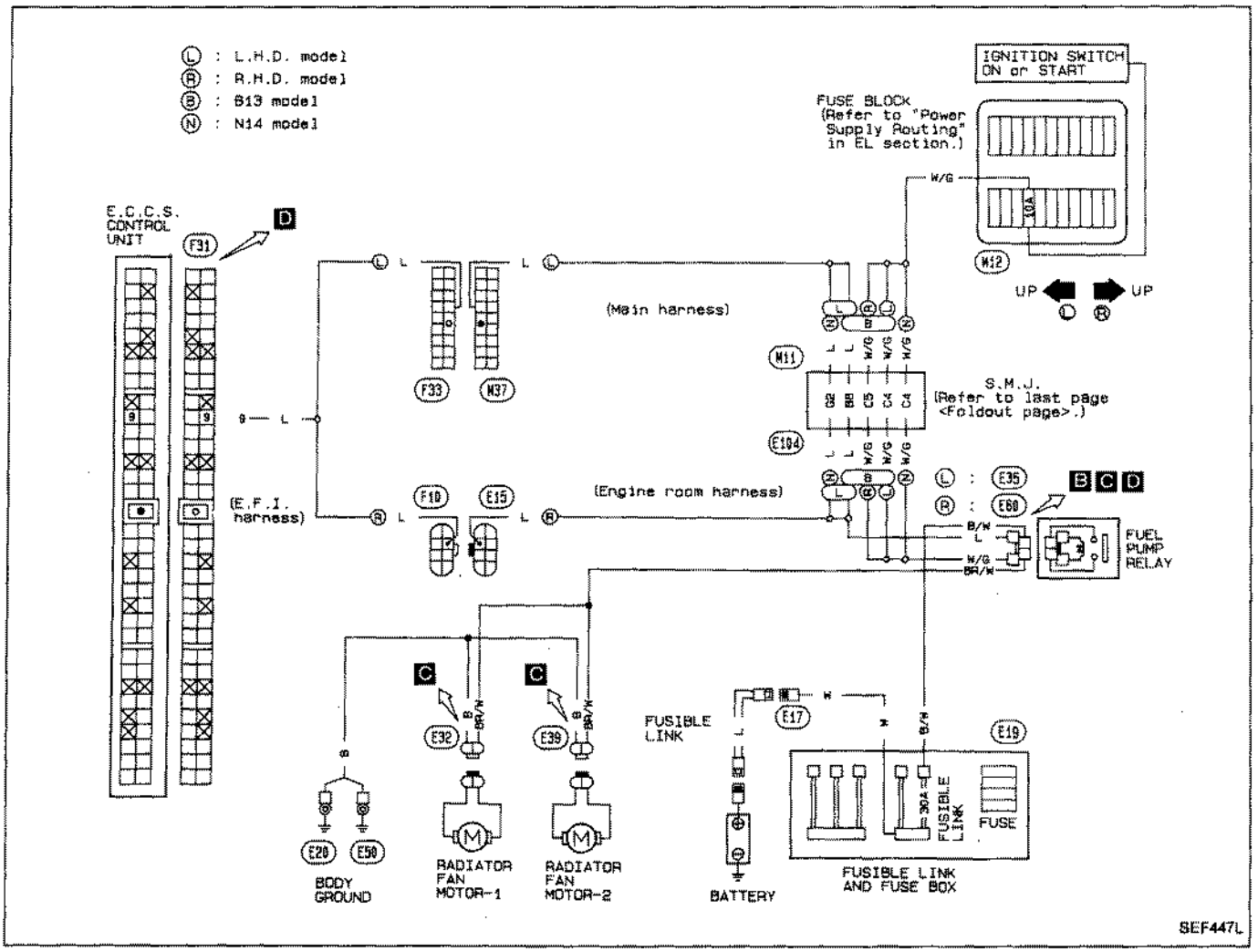
Diagnostic Procedure 35 (Cont'd)



NOTE

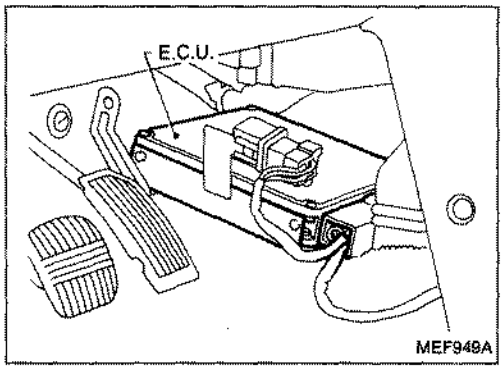
Diagnostic Procedure 36

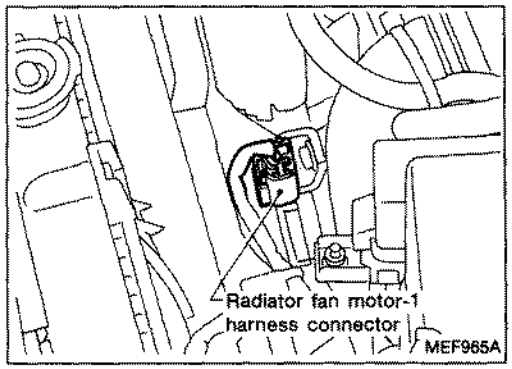
RADIATOR FAN CONTROL (Not self-diagnostic item)

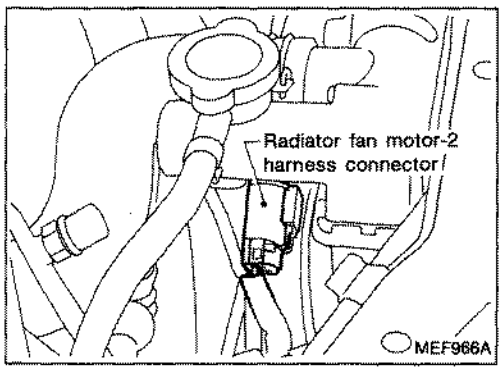


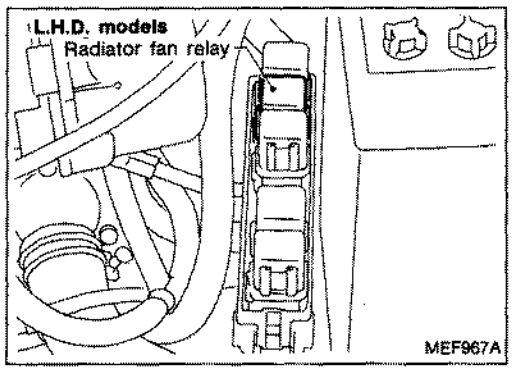
Diagnostic Procedure 36 (Cont'd)

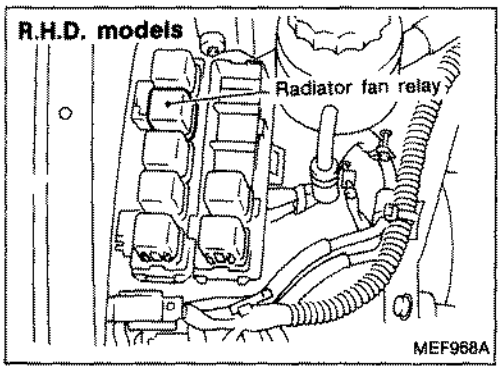
Harness layout







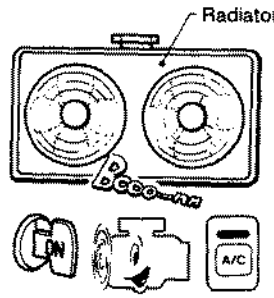




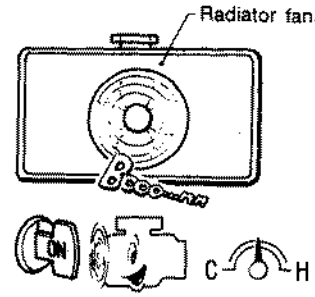
Diagnostic Procedure 36 (Cont'd)

A

With air conditioner

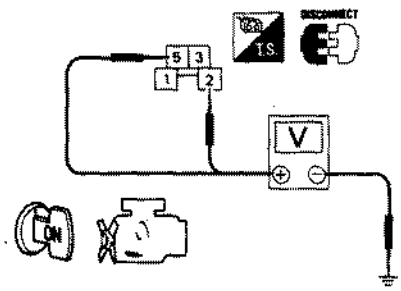


Without air conditioner



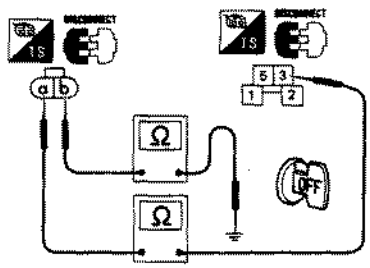
MEF988A

B



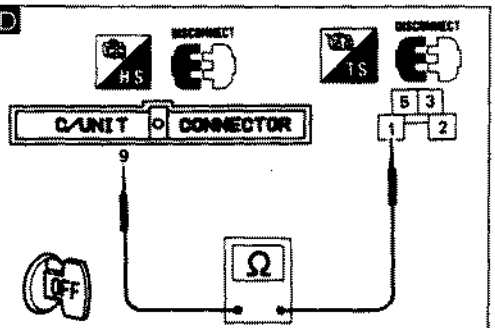
MEF989A

C



MEF990A

D



SEF999I

INSPECTION START

A

CHECK RADIATOR FAN OPERATION.

With air conditioner

1) Start engine.
2) Set temperature lever at full cold position.
3) Turn air conditioner switch "ON".
4) Turn blower fan switch "ON".
5) Run engine at idle for a few minutes with air conditioner operating.
6) Make sure that radiator 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 radiator fan begins to operate during warm-up.

O.K. → INSPECTION END

N.G. ↓

B

CHECK POWER SUPPLY.

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

Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M31), (E104)
- "L" fusible link
- 30A fusible link
- 10A fuse
- Harness continuity between battery and radiator fan relay
- Harness continuity between fuse and radiator fan relay

If N.G., repair harness or connectors.

O.K. ↓

C

CHECK GROUND CIRCUIT.

1) Turn ignition switch "OFF".
2) Disconnect radiator fan motor-1 harness connector and radiator fan motor-2 harness connector.
3) Check harness continuity between terminal ⓐ and terminal ③, terminal ⓑ and body ground.

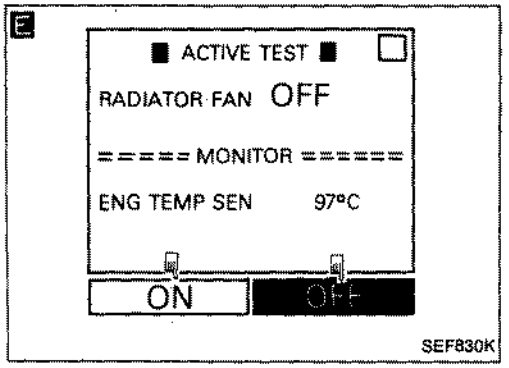
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

Ⓐ

Diagnostic Procedure 36 (Cont'd)



Ⓐ

D

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ⑨ and terminal ①.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F33), (M37) (L.H.D. models)
- Harness connectors (M11), (E104) (L.H.D. models)
- Harness connectors (F10), (E15) (R.H.D. models)
- Harness continuity between E.C.U. and radiator fan relay

If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT (Radiator fan relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-635.)

N.G. → Replace radiator fan relay.

O.K. ↓

E

CHECK COMPONENTS (Radiator fan motors).
1) Reconnect radiator fan relay, radiator fan motor harness connectors and E.C.U. harness connector.
2) Start engine.
3) Perform "RADIATOR FAN TEST" in "ACTIVE TEST" mode with CONSULT.

N.G. → Replace radiator fan motors.

OR

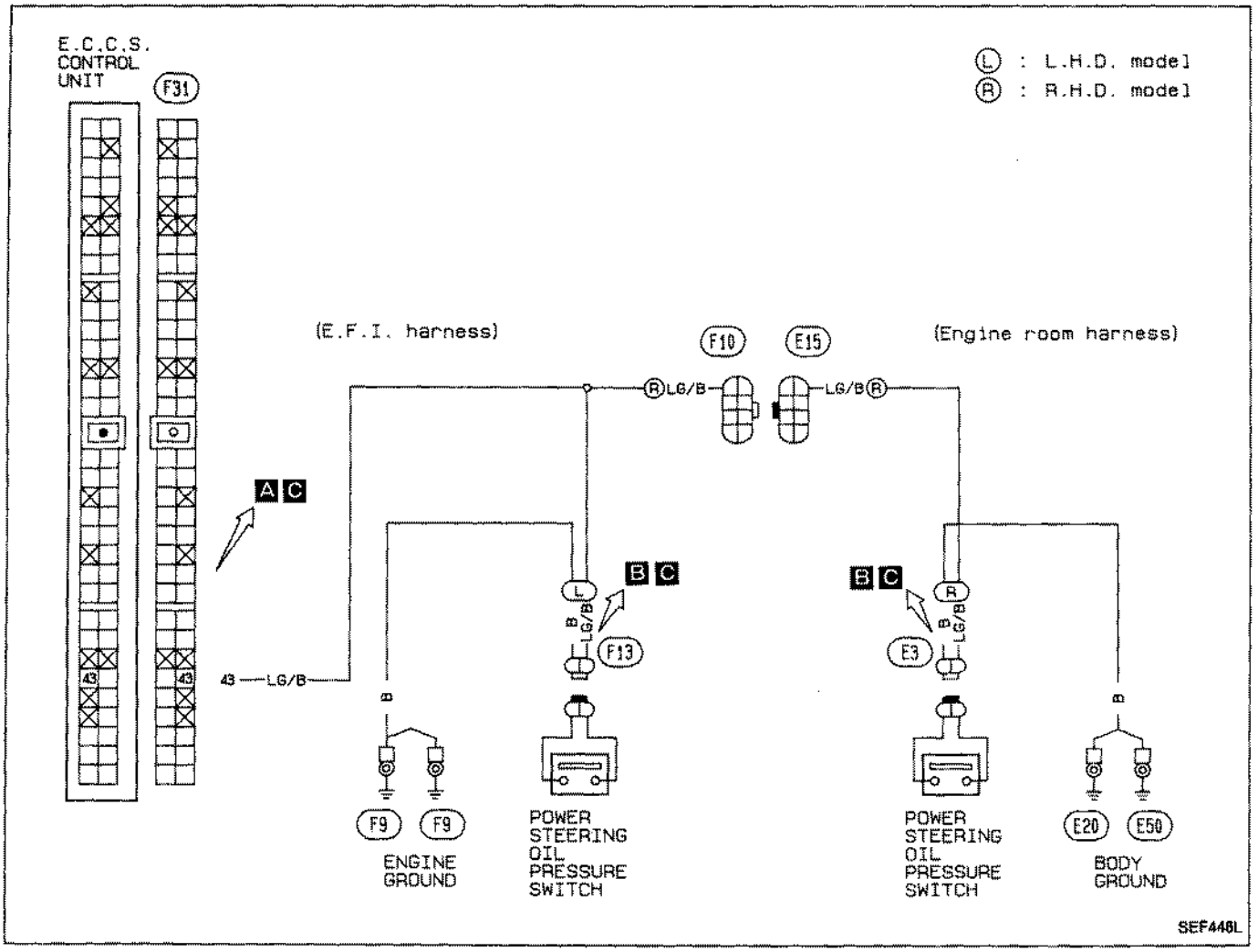
Refer to "Electrical Components Inspection".
(See page EF & EC-635.)

O.K. ↓

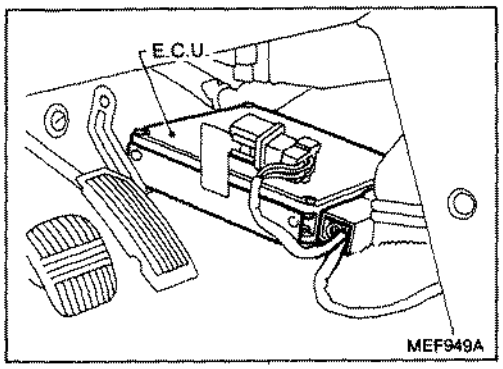
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

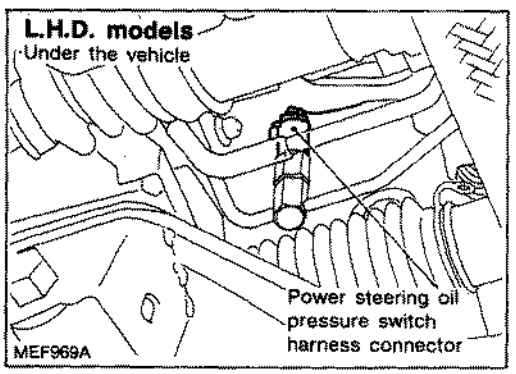
Diagnostic Procedure 37

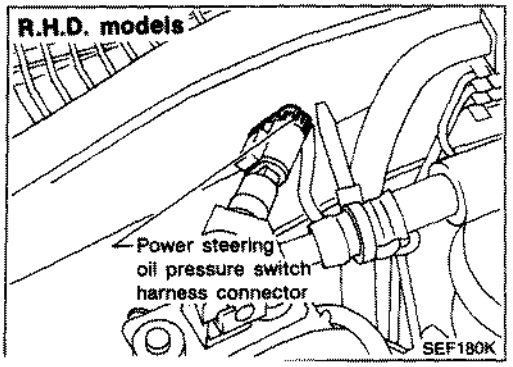
POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)



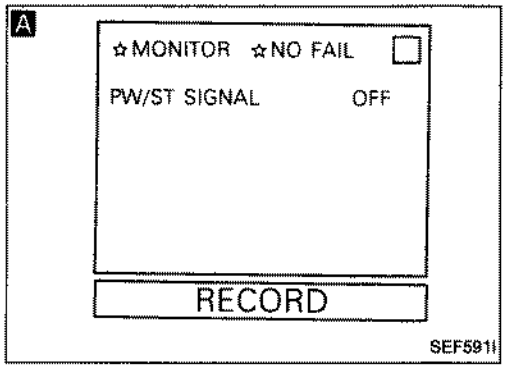
Harness layout

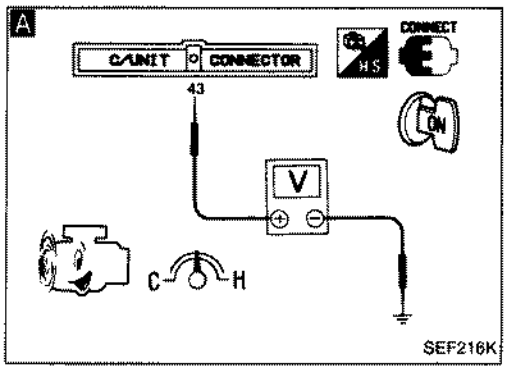


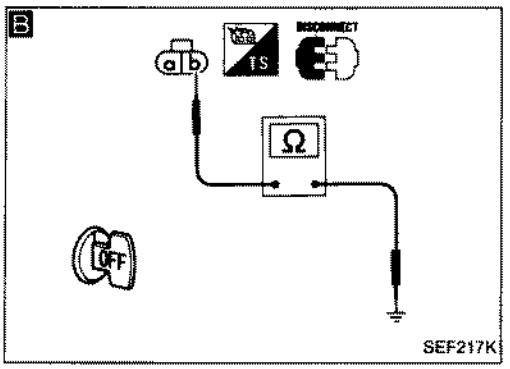


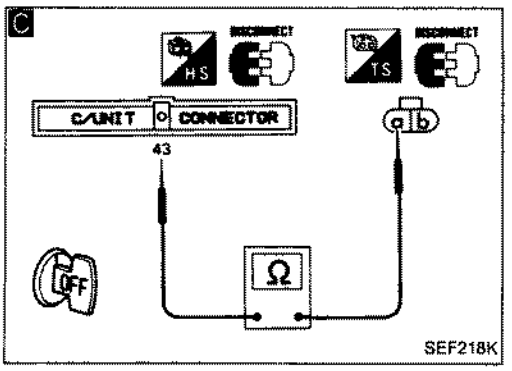


Diagnostic Procedure 37 (Cont'd)









INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check power steering oil pressure switch signal in "DATA MONITOR" mode with CONSULT.
Steering is neutral: OFF
Steering is turned: ON

OR

2) Check voltage between E.C.U. terminal ㊸ and ground.
Voltage:
When steering wheel is turned quickly.
Approximately 0V
Except above
Approximately 8 - 10V

O.K. → INSPECTION END

N.G. ↓

B

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect power steering oil pressure switch harness connector.
3) Check harness continuity between terminal ⓑ and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ㊸ and terminal ⓐ.
Continuity should exist.

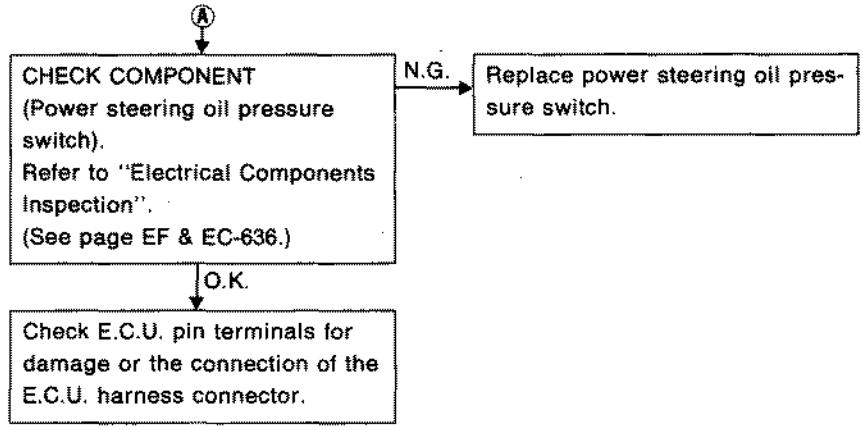
N.G. → Check the following.
- Harness connectors (F18), (E15) (R.H.D. models)
- Harness continuity between E.C.U. and power steering oil pressure switch

If N.G., repair harness or connectors.

O.K. ↓

Ⓐ

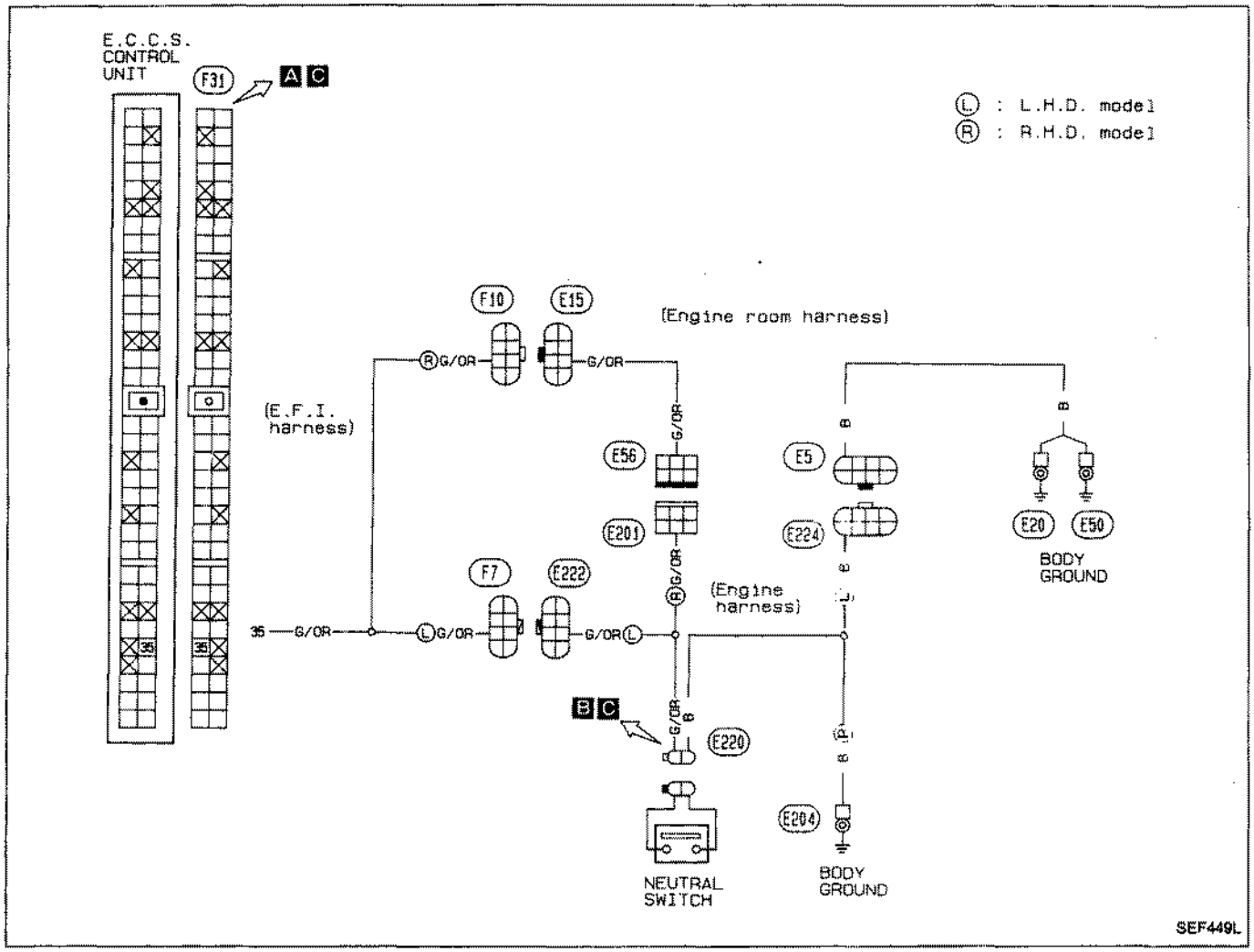
Diagnostic Procedure 37 (Cont'd)



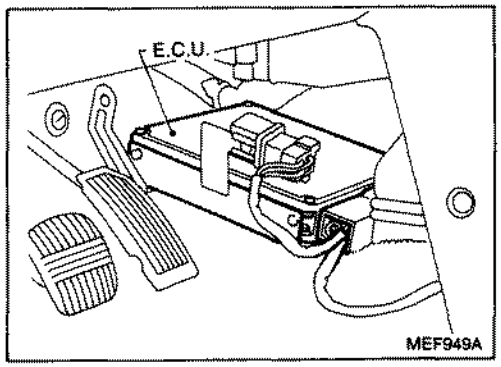
NOTE

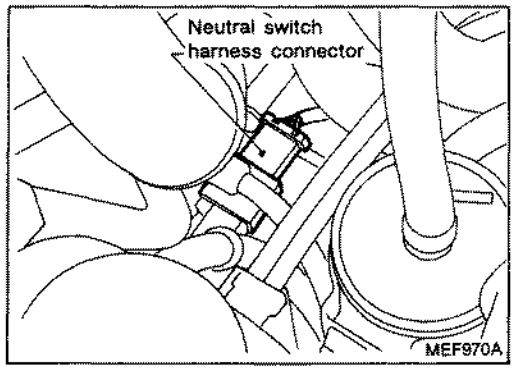
Diagnostic Procedure 38

NEUTRAL SWITCH (Not self-diagnostic item)

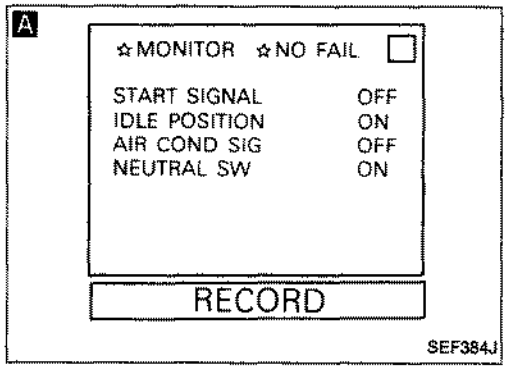


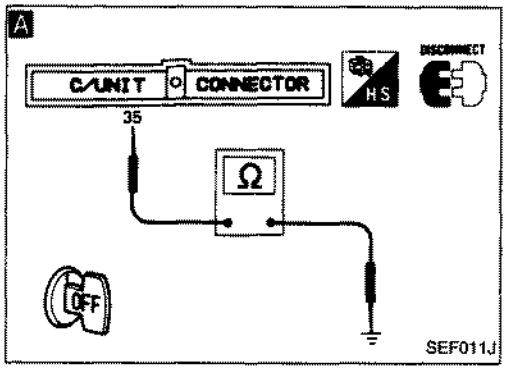
Harness layout

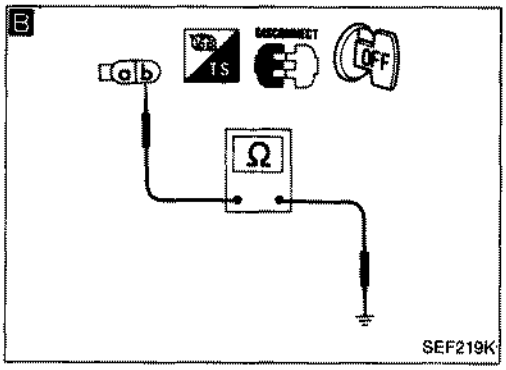


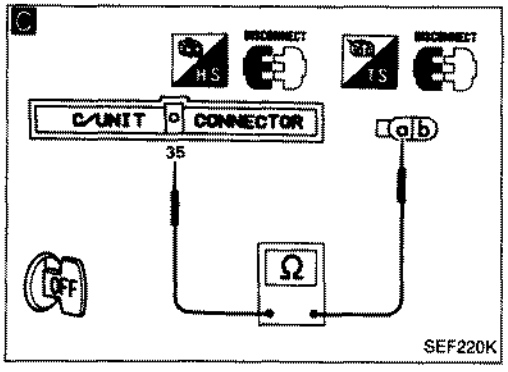


Diagnostic Procedure 38 (Cont'd)









INSPECTION START

A

CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON".
2) Check neutral switch signal in "DATA MONITOR" mode with CONSULT.

Neutral position: ON
Except above: OFF

O.K. → INSPECTION END

OR

1) Set shift lever to the neutral position.
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal ㉟ and body ground.

Continuity should exist.

N.G.

Turn ignition switch "OFF".

B

CHECK GROUND CIRCUIT.

1) Disconnect neutral switch harness connector.
2) Check harness continuity between terminal ⓑ and body ground.

Continuity should exist.

N.G. → Check the following.
- Harness connectors (E5), (E224) (L.H.D. models)
- Harness continuity between neutral switch and body ground

If N.G., repair harness or connectors.

O.K.

Disconnect E.C.U. harness connector.

C

CHECK INPUT SIGNAL CIRCUIT.

1) Check harness continuity between E.C.U. terminal ㉟ and terminal ⓐ.

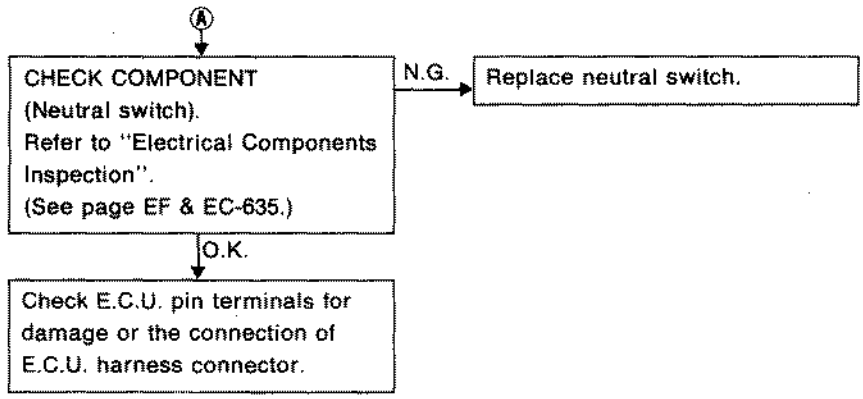
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F7), (E222) (L.H.D. models)
- Harness connectors (F10), (E15) (R.H.D. models)
- Harness connectors (E56), (E201) (R.H.D. models)
- Harness continuity between E.C.U. and neutral switch

If N.G., repair harness or connectors.

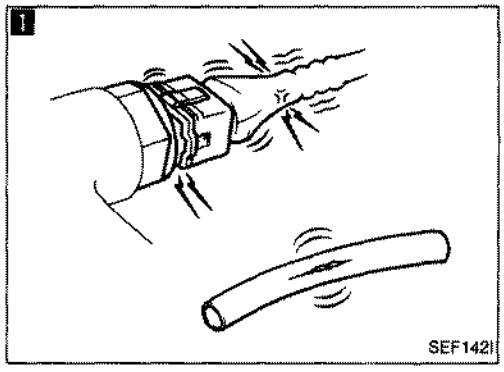
O.K. → Ⓐ

Diagnostic Procedure 38 (Cont'd)



Basic Inspection

1

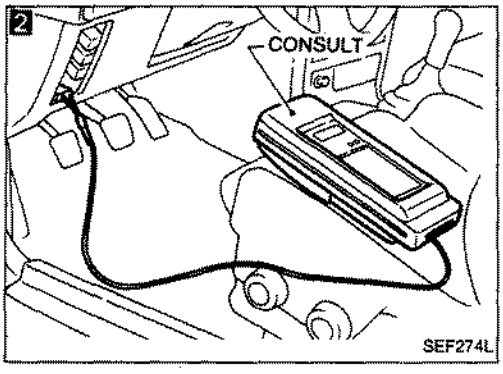

SEF142I

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 proper connections
- Vacuum hoses for splits, kinks, and proper connections
- Wiring for proper connections, pinches, and cuts

2

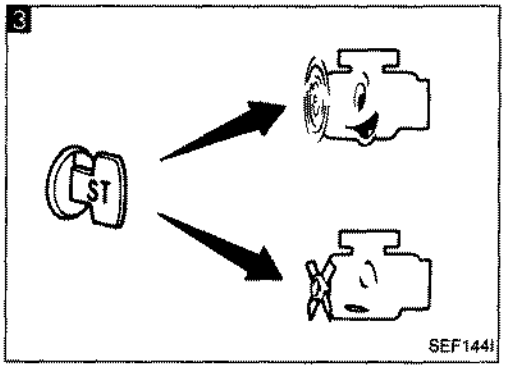


SEF274L

CONNECT CONSULT TO THE VEHICLE

Connect "CONSULT" to the diagnostic connector and select "ENGINE" from the menu. (Refer to page EF & EC-417.)

3



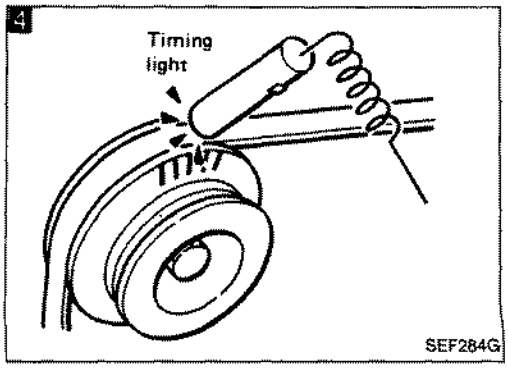
SEF144I

DOES ENGINE START?

No → Go to 6 .

Yes

4



SEF284G

CHECK IGNITION TIMING.

Warm up engine sufficiently and check ignition timing at idle using timing light. (Refer to page EF & EC-389.)

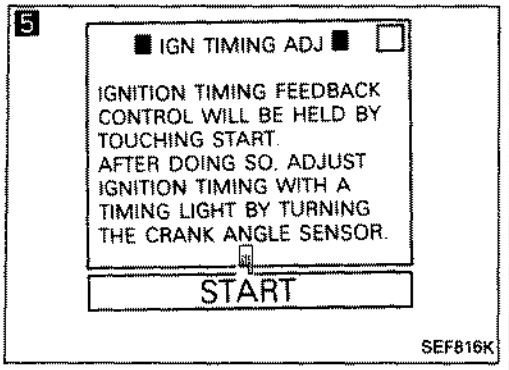
Ignition timing:
20° ± 2° B.T.D.C.

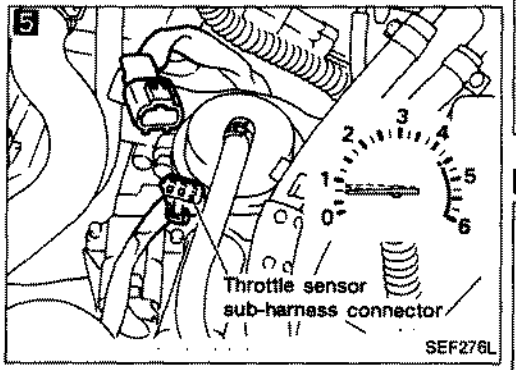
N.G. → Adjust ignition timing by turning crank angle sensor.

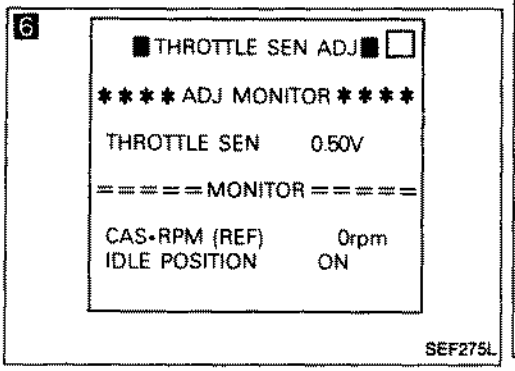
O.K.

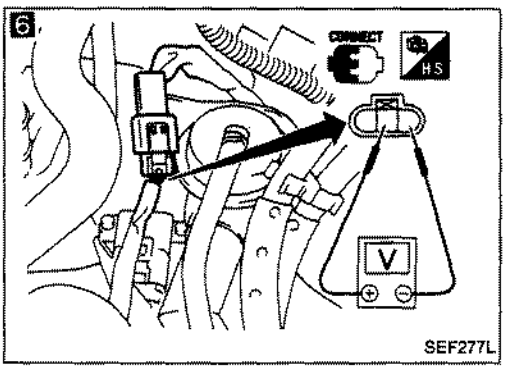
(Go to Ⓐ on next page.)

Basic Inspection (Cont'd)









Ⓐ

5 **CHECK IDLE ADJ. SCREW INITIAL SET RPM.**

1. Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. When touching "START", does engine rpm fall to 850±50 rpm (in "N" position)?

No → Adjust engine rpm by turning idle adjusting screw.

OR

When disconnecting throttle sensor sub-harness connector, does engine rpm fall to 850±50 rpm (in "N" position)?

Yes

6 **CHECK THROTTLE SENSOR IDLE POSITION.**

1. Perform "THROTTLE SEN. ADJ" in "WORK SUPPORT" mode.
2. Check that output voltage of throttle sensor is 0.45 to 0.55V. (Throttle valve fully closes.) and "IDLE POSITION" stays "ON".

N.G. →
1. Adjust output voltage by rotating throttle sensor body.
2. Disconnect throttle sensor harness connector for a few seconds and then reconnect it.
3. Confirm that "IDLE POSITION" stays "ON".

OR

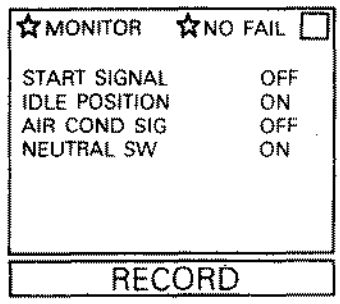
Measure output voltage of throttle sensor using voltmeter, and check that it is 0.45 to 0.55V. (Throttle valve fully closed.)

O.K.

(Go to Ⓑ on next page.)

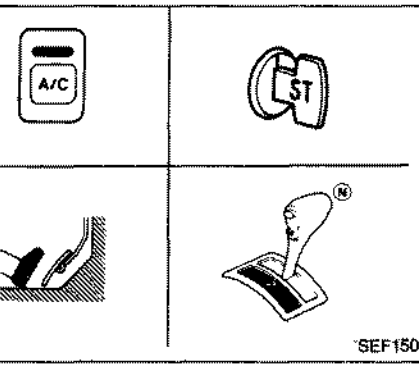
Basic Inspection (Cont'd)

7



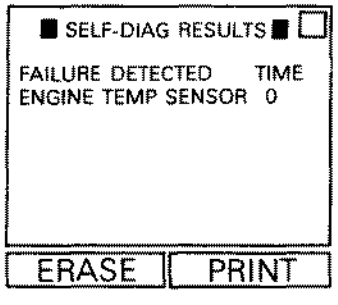
SEF821K

7



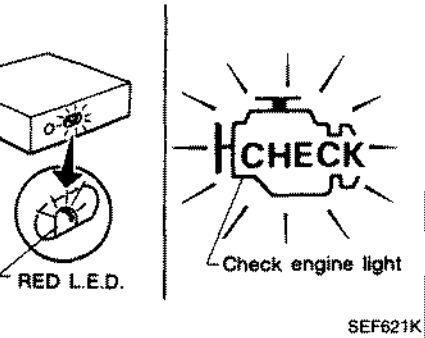
SEF150I

8



SEF822K

8



SEF621K

Ⓑ

7

CHECK SWITCH INPUT SIGNAL.

Select the following switches in "DATA MONITOR" mode,
a) Start signal,
b) Idle position,
c) Air conditioner signal,
d) Neutral (Parking) switch,
and check the switches' ON-OFF operation.

N.G. → Repair or replace the malfunctioning switch or its circuit.

OR

Remove E.C.U. from behind audio system panel and check the above switches' ON-OFF operation using voltmeter at each E.C.U. terminal.

Switch	Condition	Voltage (V)
Start signal	IGN → IGN ON → START	0 → Battery voltage
Idle position	Accelerator pedal released → Accelerator pedal fully depressed	0.45 - 0.55 → Approx. 4.0
A/C signal	A/C OFF → A/C ON (Engine running)	Approx. 8.0 → Approx. 0
Neutral (Parking) switch	Shift lever is Neutral position → Except Neutral position	0 → Approx. 6.0

O.K.

8

READ SELF-DIAGNOSTIC RESULTS.

1. Perform "SELF-DIAG RESULTS" mode.
2. Read out self-diagnostic results.
3. Is a failure detected?

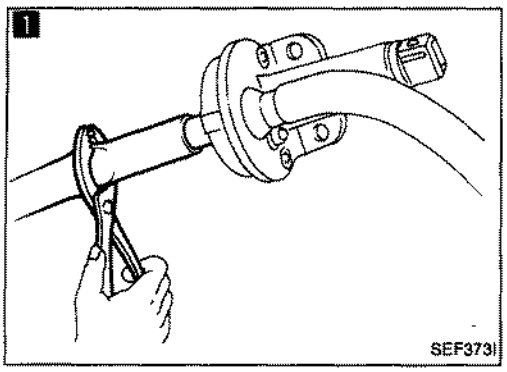
Yes → Go to the relevant inspection procedure.

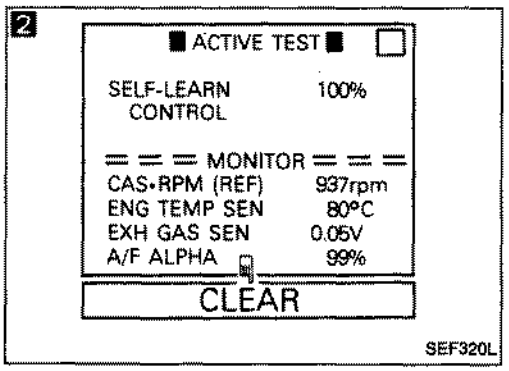
OR

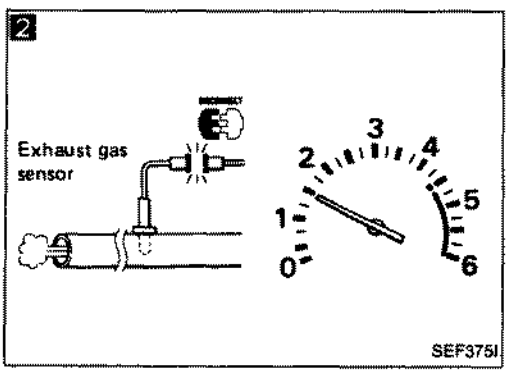
1. Set "Self-diagnostic results mode" in Mode II. (Refer to page EF & EC-412.)
2. Count the number of RED L.E.D. or check engine light flashes and read out the codes.
3. Does the code shown correspond to any malfunction?

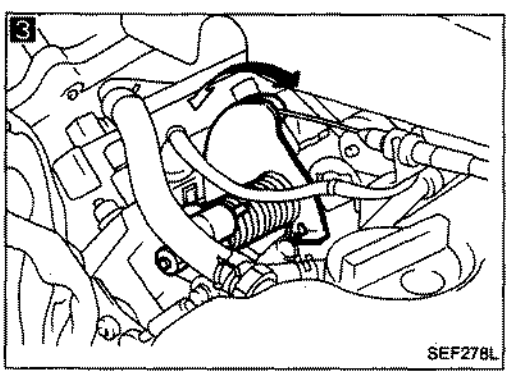
No

INSPECTION END









Diagnostic Procedure 1 — High Idling after Warm-up

1

CHECK AIR REGULATOR.
When pinching the air regulator hose, does the engine speed drop?

Yes → Check air regulator and circuit. (See page EF & EC-600.)

No ↓

2

CHECK INTAKE AIR LEAK.

1. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode.
2. Clear the self-learning control coefficient by touching "CLEAR".
3. Does the engine speed drop?

Yes → Discover air leak location and repair.

OR

1. Disconnect exhaust gas sensor harness connector.
2. After racing engine at 2,000 rpm under no-load for about 30 seconds, does the engine speed drop?

No ↓

3

CHECK THROTTLE LINKAGE.

1. Check that throttle linkage moves smoothly.
2. Confirm that throttle valve both fully opens and fully closes.

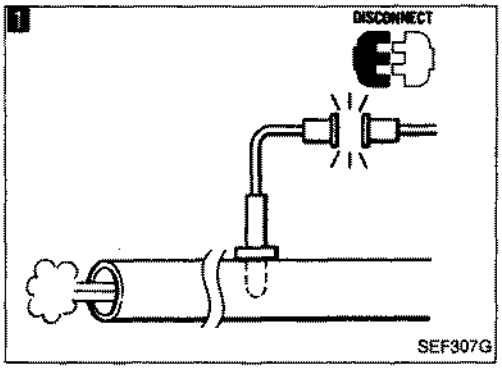
N.G. → Repair throttle linkage or sticking of throttle valve.

O.K. ↓

INSPECTION END

Diagnostic Procedure 2 — Hunting

1

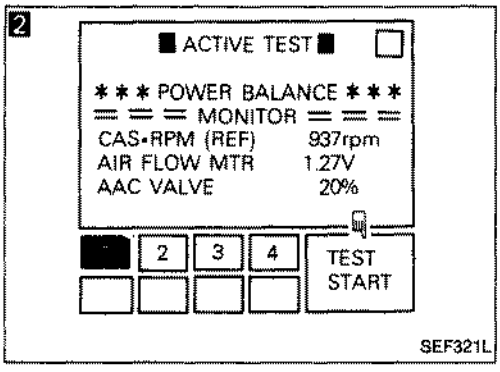


CHECK EXHAUST GAS SENSOR.
When disconnecting exhaust gas sensor harness connector, is the hunting fixed?

Yes → Check exhaust gas sensor. (See page EF & EC-590.)

No ↓

2



PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

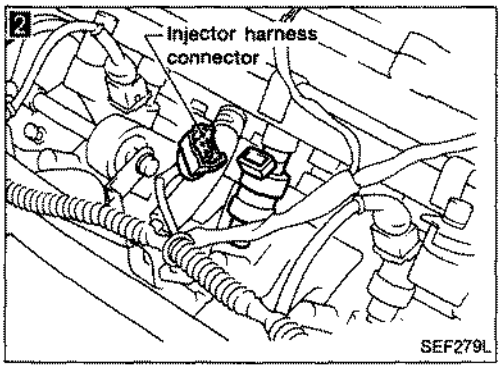
No → Go to 4.

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes ↓

2



3

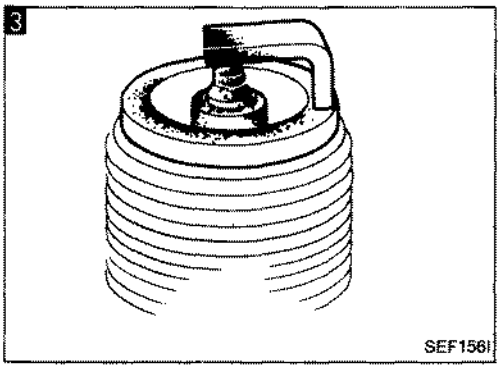
CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

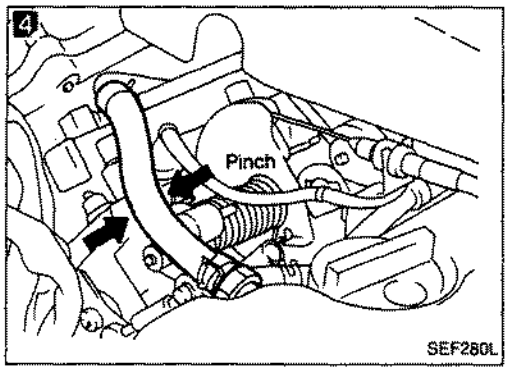
O.K. ↓

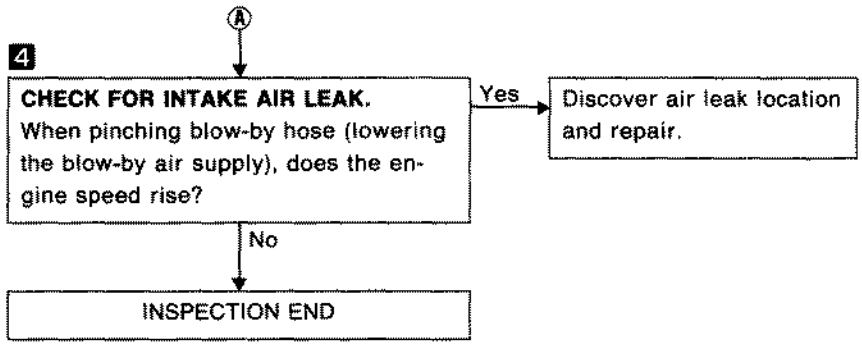
(Go to Ⓐ on next page.)

3



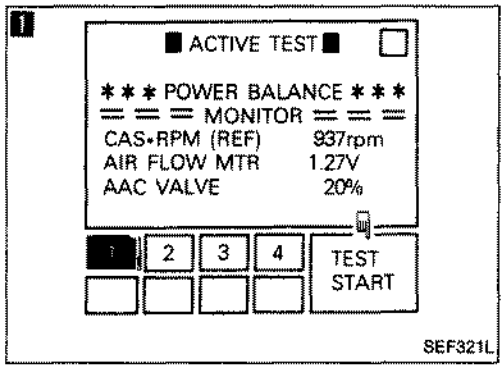
Diagnostic Procedure 2 — Hunting (Cont'd)





Diagnostic Procedure 3 — Unstable Idle

1



SEF321L

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

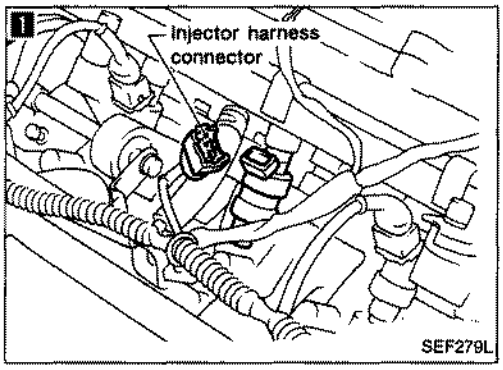
No → Go to 5.

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes

1



SEF279L

2

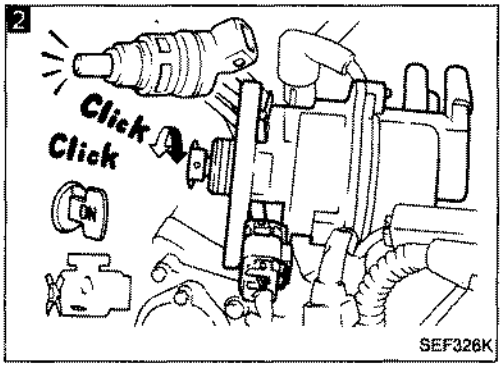
CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes

2



SEF326K

3

CHECK IGNITION SPARK.

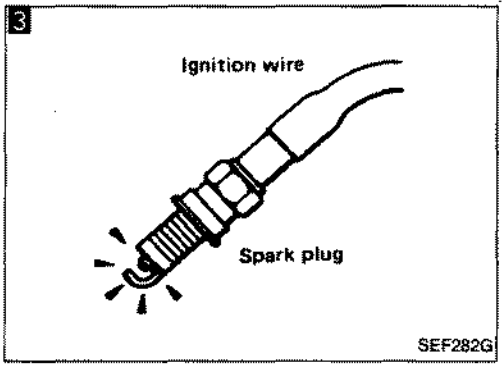
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor and their circuits. (See page EF & EC-576.)

O.K.

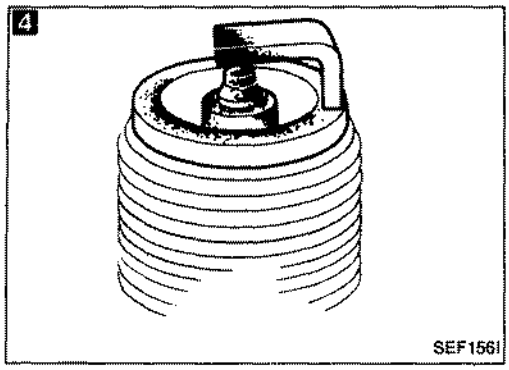
(Go to Ⓐ on next page.)

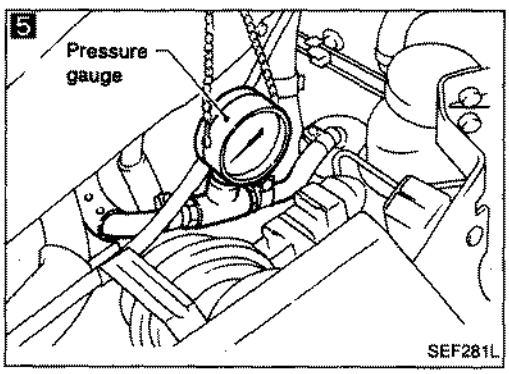
3



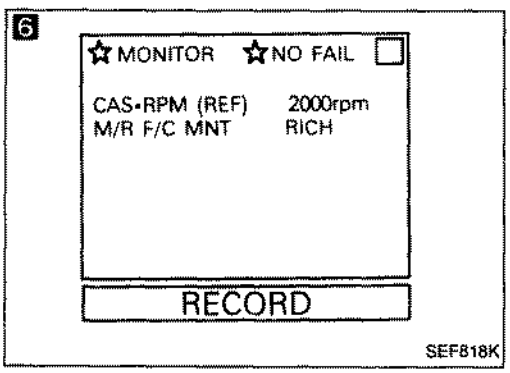
SEF282G

Diagnostic Procedure 3 — Unstable Idle (Cont'd)

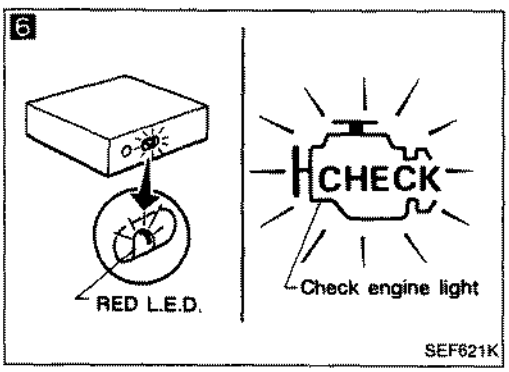

SEF156I



SEF281L



SEF818K



SEF621K

Ⓐ

4 **CHECK SPARK PLUGS.**
Remove the spark plugs and check for fouling, etc.
N.G. → Repair or replace spark plug(s).
O.K.

5 **CHECK FUEL PRESSURE.**
1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.
   At idle:
   Approx. 245 kPa
   (2.45 bar, 2.5 kg/cm², 36 psi)

N.G. → Check fuel pump and circuit.
O.K.

6 **CHECK EXHAUST GAS SENSOR.**
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.
   RICH→LEAN→RICH→ (1 time, 2 times)
   LEAN→RICH.....

N.G. → Replace exhaust gas sensor.

OR

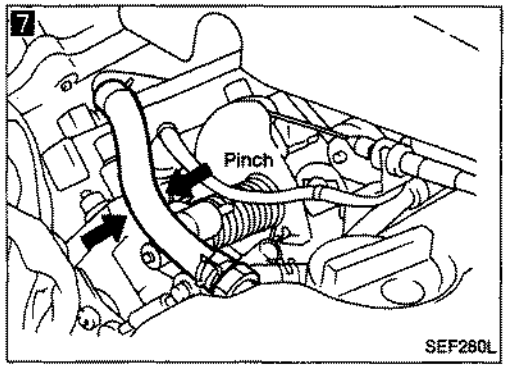
1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-412.)
2. Maintaining engine at 2,000 rpm under no-load, check to make sure that the RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

O.K.

(Go to Ⓑ on next page.)

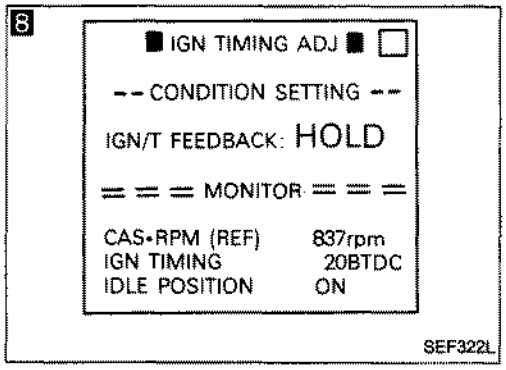
Diagnostic Procedure 3 — Unstable Idle (Cont'd)

7



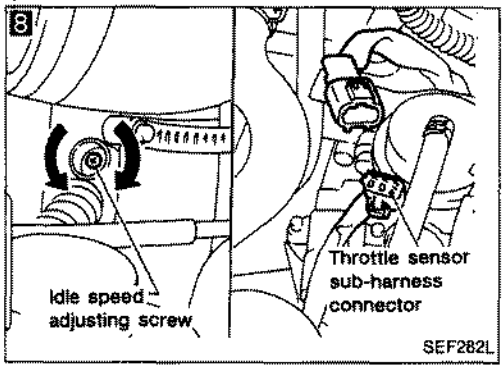
SEF280L

8



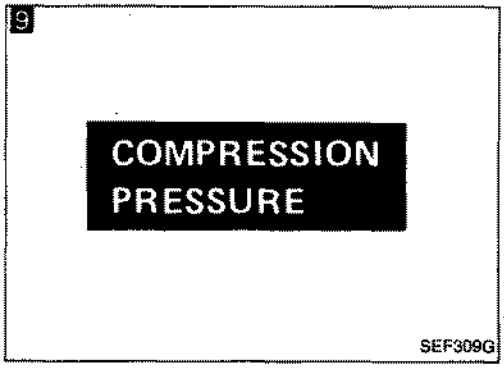
SEF322L

8



SEF282L

9



SEF309G

Ⓑ

7 **CHECK FOR INTAKE AIR LEAK.**
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?
- Yes → Discover air leak location and repair.
- No ↓

8 **CHECK IDLE ADJ. SCREW CLOGGING.**
1. Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. Can you set engine rpm at 850 ± 50 rpm (in "N" position) by turning idle adjusting screw?

— OR —

1. Disconnect throttle sensor harness connector.
2. Can you set engine rpm at 850 ± 50 rpm (in "N" position) by turning idle adjusting screw?

- No → Check for I.A.S. clogging or throttle valve clogging.
- Yes ↓

9 **CHECK COMPRESSION PRESSURE.**
- Check compression pressure.

Standard:
kPa (bar, kg/cm², psi)/300 rpm
1,126 (11.28, 11.5, 164)
Minimum:
kPa (bar, kg/cm², psi)/300 rpm
932 (9.32, 9.5, 135)
Difference between each cylinder:
kPa (bar, kg/cm², psi)/300 rpm
98 (0.98, 1.0, 14)

- N.G. → Check pistons, piston rings, valves, valve seats and cylinder head gaskets.
- O.K. ↓

10 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.
- N.G. → Repair or replace.
- O.K. ↓

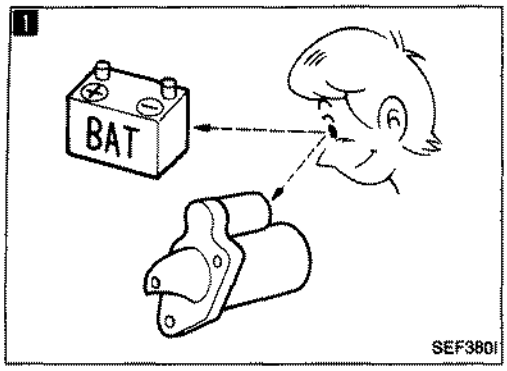
11 **TRY A KNOWN GOOD E.C.U.***

↓

INSPECTION END

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

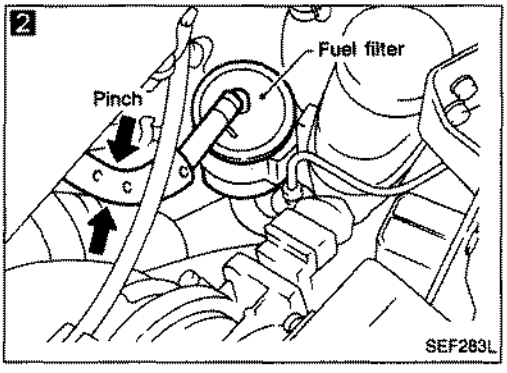
Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold



1 **CHECK BATTERY AND STARTER.**
Check battery and starter condition.
(Refer to EL section.)

N.G. → Repair or replace.

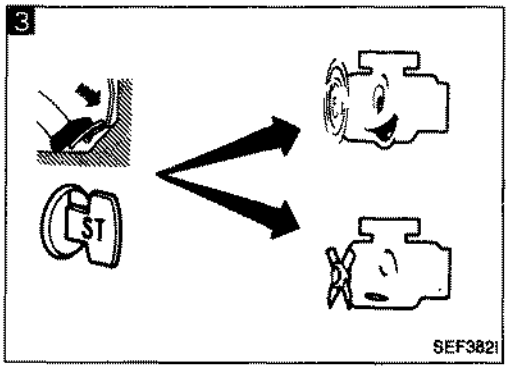
O.K. ↓



2 **CHECK FUEL PRESSURE.**
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-596.)

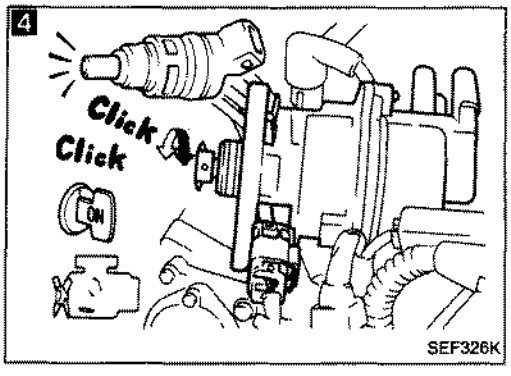
Yes ↓



3 **CHECK AIR REGULATOR AND A.A.C. VALVE.**
When pressing accelerator pedal fully, can you start the engine.

Yes → Check A.A.C. valve, air regulator and circuits. (See pages EF & EC-600, 606.)

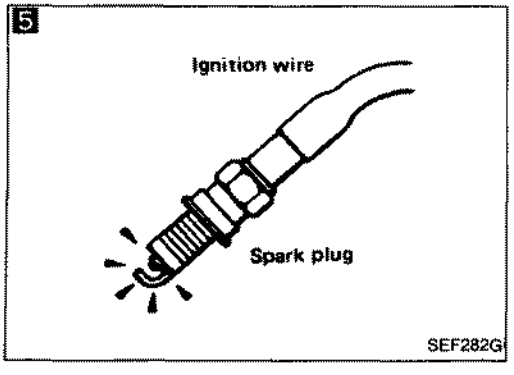
No ↓



4 **CHECK INJECTOR.**
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓



5 **CHECK IGNITION SPARK.**
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

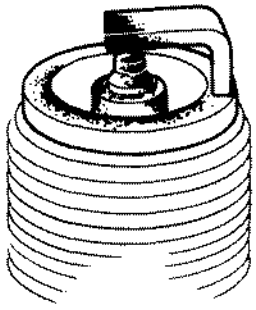
N.G. → Check ignition coil, power transistor and their circuits. (See page EF & EC-576.)

O.K. ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold (Cont'd)

6



SEF156I

Ⓐ

6 **CHECK SPARK PLUGS.**
Remove the spark plugs and check for fouling, etc.
N.G. → Repair or replace spark plug(s).
O.K. ↓

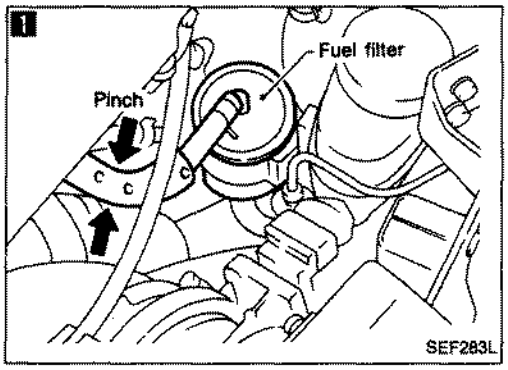
7 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.
N.G. → Repair or replace.
O.K. ↓

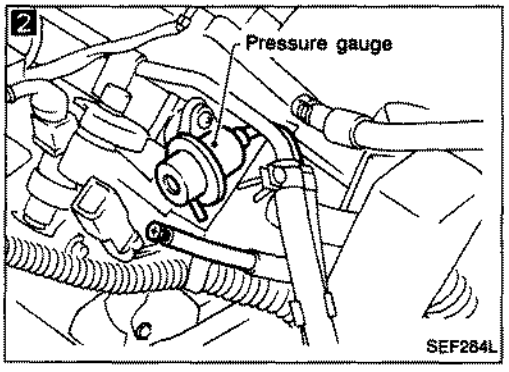
8 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-560.
N.G. → Repair or replace.
O.K. ↓

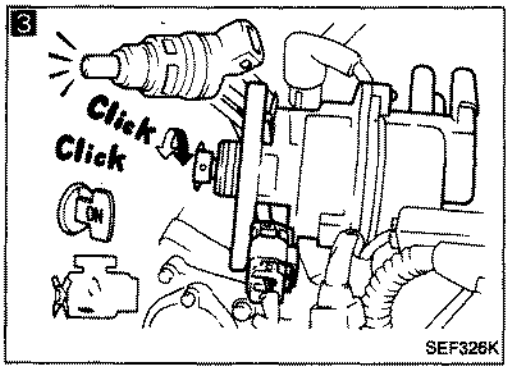
9 **TRY A KNOWN GOOD E.C.U.***
Trouble is fixed. → Replace E.C.U.
Trouble is not fixed. ↓

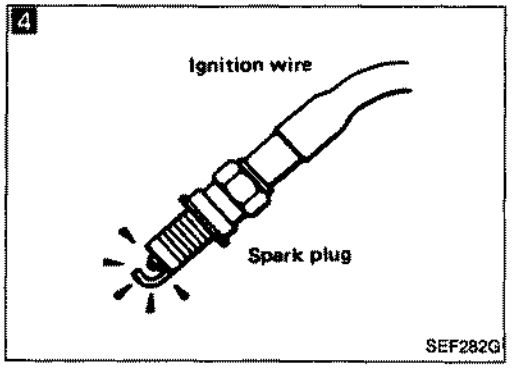
INSPECTION END

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









Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot

1

CHECK FUEL PRESSURE.
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-596.)

Yes ↓

2

CHECK FUEL VAPOR.
1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Can you start engine?

Yes → Check fuel properties.

No ↓

3

CHECK INJECTOR.
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

4

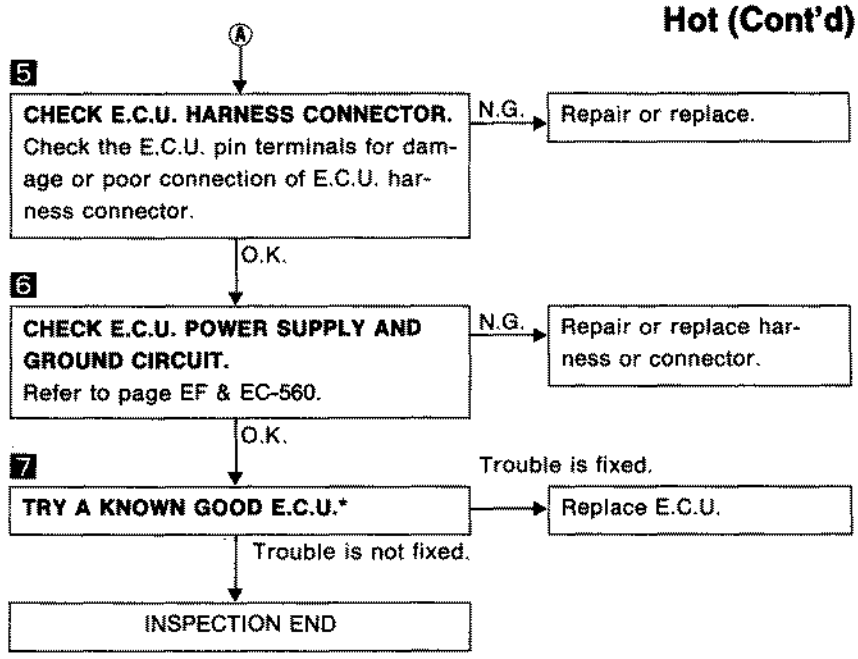
CHECK IGNITION SPARK.
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor and circuits. (See page EF & EC-576.)

O.K. ↓

(Go to Ⓐ on next page.)

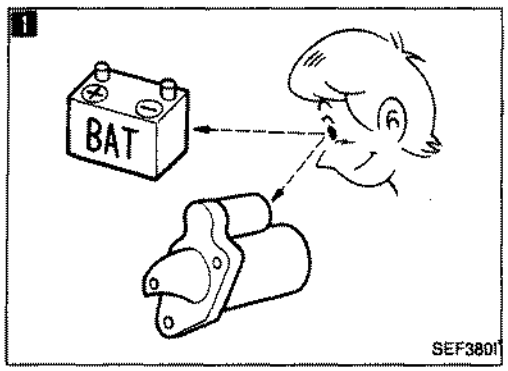
Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot (Cont'd)



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

Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions

1



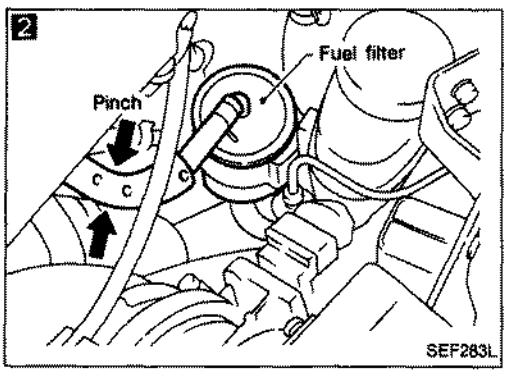
SEF380I

CHECK BATTERY AND STARTER.
Check battery and starter operation. (Refer to EL section.)

N.G. → Repair or replace.

O.K. ↓

2



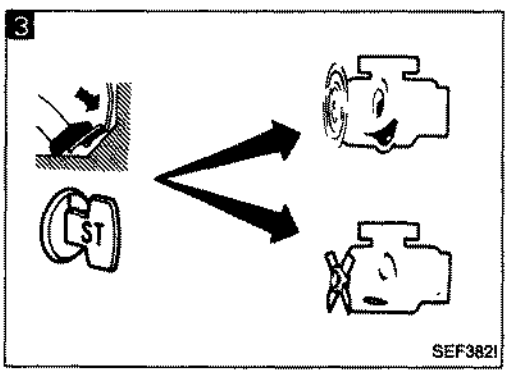
SEF283L

CHECK FUEL PRESSURE.
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-596.)

Yes ↓

3



SEF382I

CHECK INJECTOR FOR LEAKAGE.
When pressing accelerator pedal fully, can you start the engine.

Yes → Check injector(s) for leakage.

No ↓

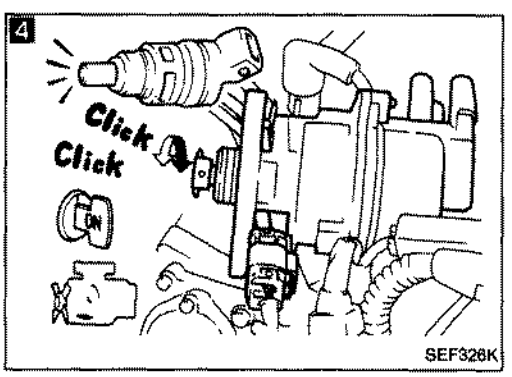
4

CHECK INJECTOR.
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injectors and circuits.

Yes ↓

5



SEF326K

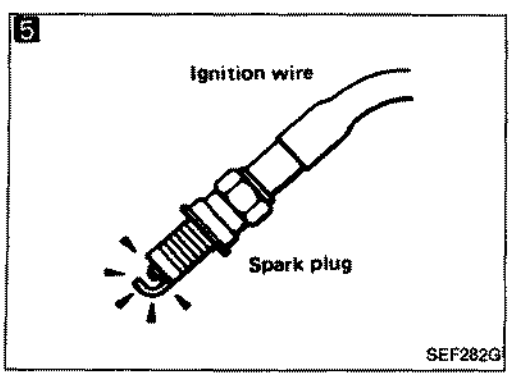
CHECK IGNITION SPARK.
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor and circuits. (See page EF & EC-576.)

O.K. ↓

(Go to Ⓐ on next page.)

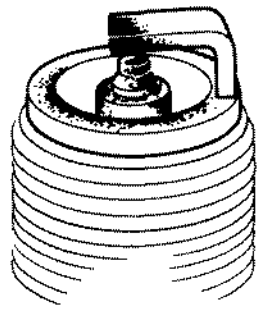
5



SEF282G

Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions (Cont'd)

6



SEF156I

Ⓐ

6 **CHECK SPARK PLUGS.**
Remove the spark plugs and check for fouling, etc.
N.G. → Repair or replace spark plug(s).
O.K. ↓

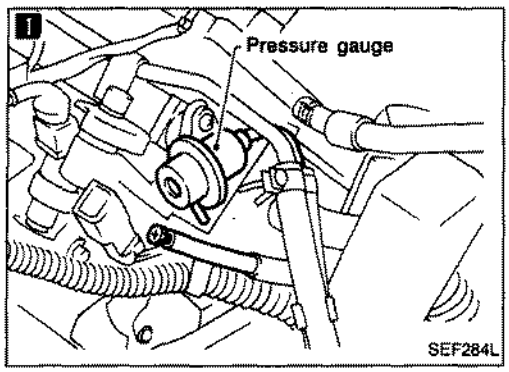
7 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.
N.G. → Repair or replace.
O.K. ↓

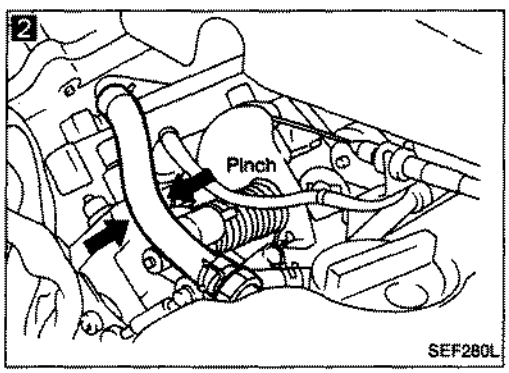
8 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-560.
N.G. → Repair or replace.
O.K. ↓

9 **TRY A KNOWN GOOD E.C.U.***
Trouble is fixed. → Replace E.C.U.
Trouble is not fixed. ↓

INSPECTION END

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





Diagnostic Procedure 7 — Hesitation when the Engine is Hot

1

CHECK FUEL VAPOR.
1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Test drive.
3. Does the hesitation disappear?

Yes → Check fuel properties.

No ↓

2

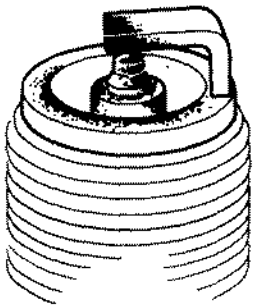
CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

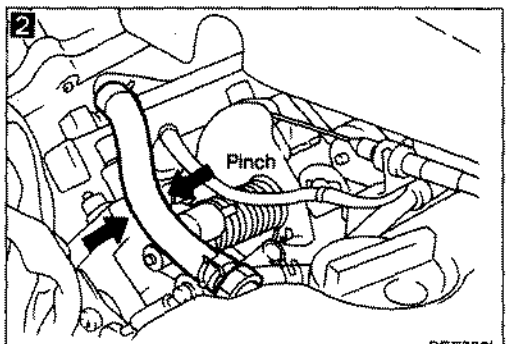
INSPECTION END

1



SEF156I

2



SEF280L

Diagnostic Procedure 8 — Hesitation when the Engine is Cold

1

CHECK SPARK PLUGS.
Remove spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K.

2

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No

3

TRY A KNOWN GOOD AIR FLOW METER.

Trouble is fixed. → Replace air flow meter.

Trouble is not fixed.

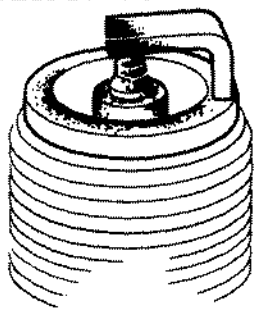
4

CHECK FOR INTAKE VALVE DEPOSITS.
If there are deposits on intake valves, remove them.

INSPECTION END

Diagnostic Procedure 9 — Hesitation under Normal Conditions

1



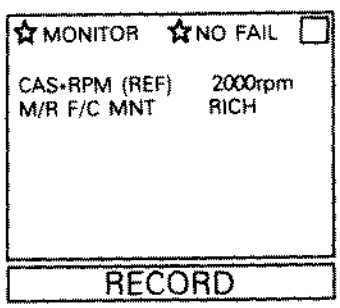
SEF156I

CHECK SPARK PLUGS.
Remove spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K.

2



SEF818K

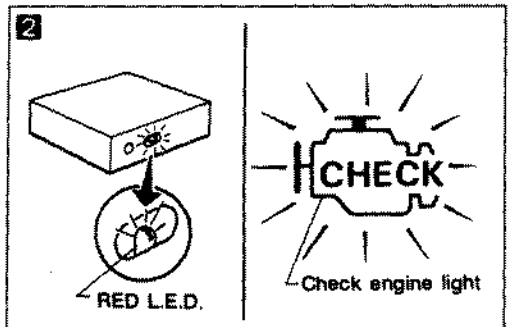
CHECK EXHAUST GAS SENSOR.

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

RICH→LEAN→RICH→ LEAN→RICH.....
(1 time, 2 times)

N.G. → Replace exhaust gas sensor.

OR

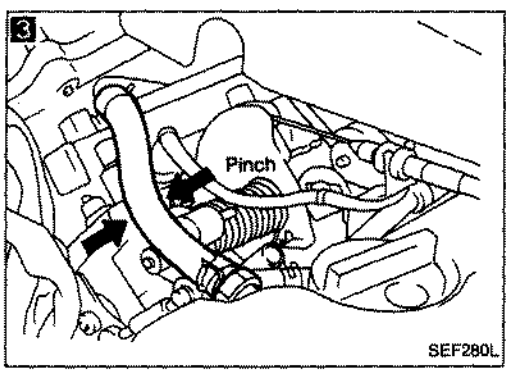


SEF621K

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-412.)
2. Maintaining engine at 2,000 rpm under no-load, check that the RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

O.K.

3



SEF280L

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

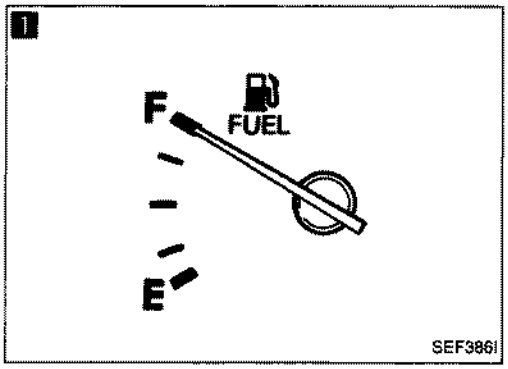
Yes → Discover air leak location and repair.

No

INSPECTION END

Diagnostic Procedure 10 — Engine Stalls when Turning

1



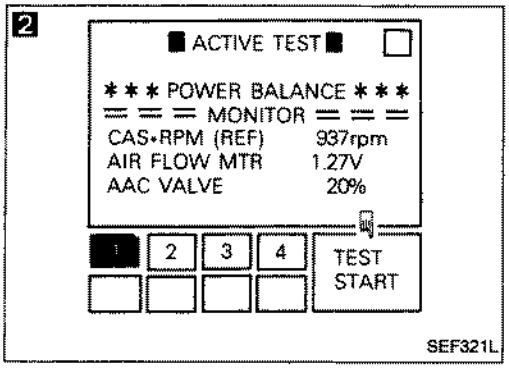
SEF386I

CHECK FUEL LEVEL.
Check to see that there is enough fuel in tank.

N.G. → Fill fuel tank with fuel.

O.K.

2



SEF321L

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

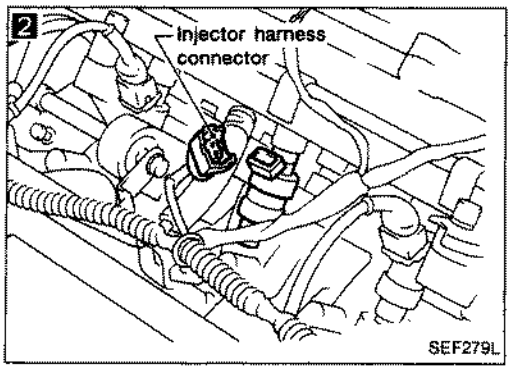
No → Go to 5 .

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes

2



SEF279L

3

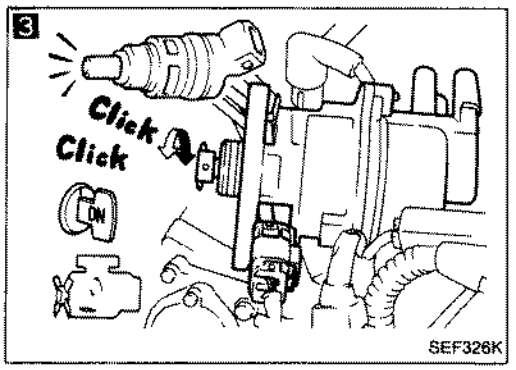
CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes

3



SEF326K

4

CHECK IGNITION SPARK.

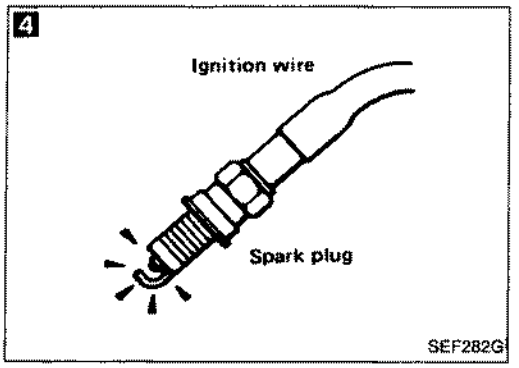
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor and circuits. (See page EF & EC-576.)

O.K.

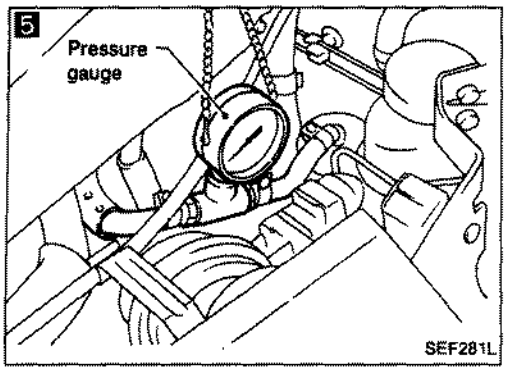
(Go to Ⓐ on next page.)

4



SEF282G

Diagnostic Procedure 10 — Engine Stalls when Turning (Cont'd)



Ⓐ

5

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:

Approx. 245 kPa (2.45 bar, 2.5 kg/cm², 36 psi)

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

Approx. 294 kPa (2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K.

6

CHECK E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K.

7

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-560.

N.G. → Repair or replace.

O.K.

8

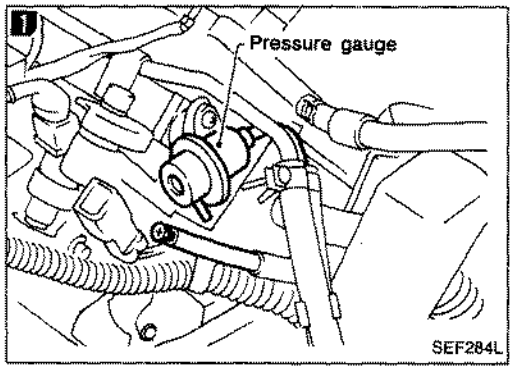
TRY A KNOWN GOOD E.C.U.*

INSPECTION END

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

Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot

1

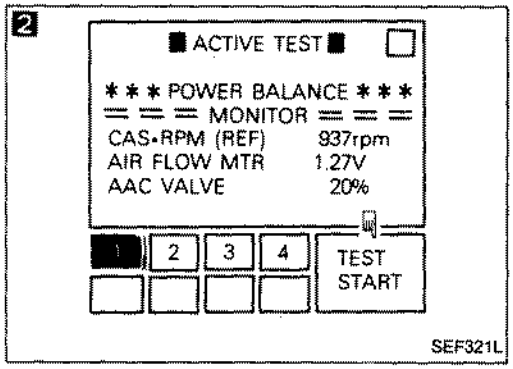


CHECK FUEL VAPOR.
1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Perform cruise test.
3. Does the engine stall disappear?

Yes → Check fuel properties.

No ↓

2



PERFORM POWER BALANCE TEST.
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

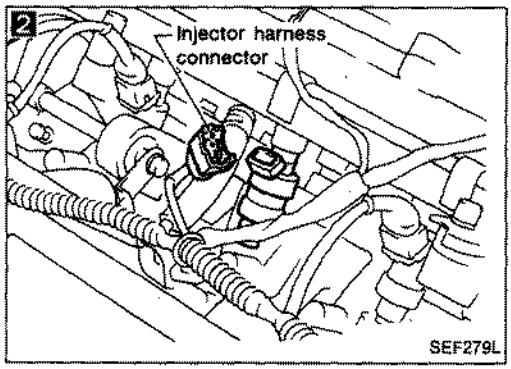
OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

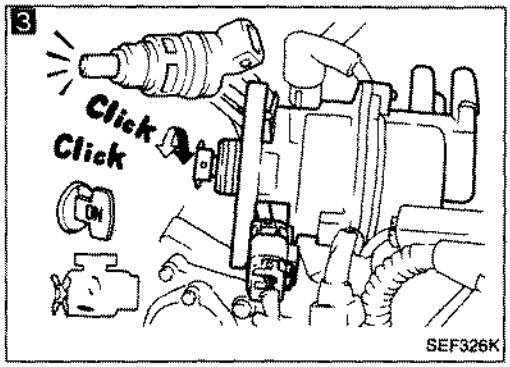
No → Go to 5.

Yes ↓

2



3



CHECK INJECTOR.
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

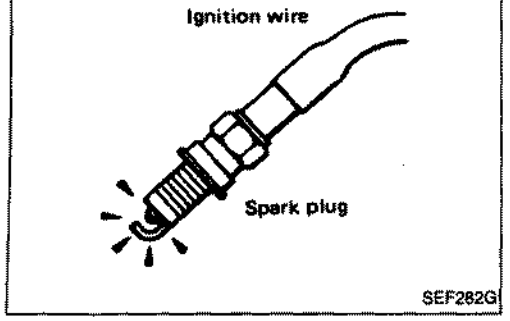
No → Check injector(s) and circuit(s).

Yes ↓

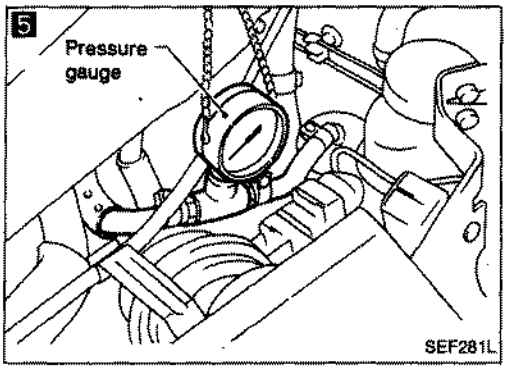
(Go to Ⓐ on next page.)

Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot (Cont'd)

4



5



Ⓐ

4 **CHECK IGNITION SPARK.**

1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor and their circuits. (See page EF & EC-576.)

O.K. ↓

5 **CHECK FUEL PRESSURE.**

1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)
A few seconds after ignition switch is turned from OFF to ON:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

6 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K. ↓

7 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-560.

N.G. → Repair or replace.

O.K. ↓

8 **TRY A KNOWN GOOD E.C.U.***

Trouble is fixed. → Replace E.C.U.

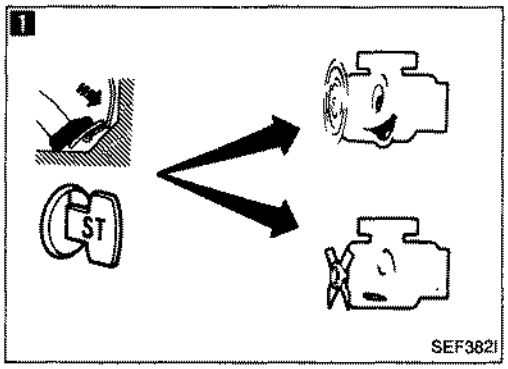
Trouble is not fixed. ↓

INSPECTION END

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

Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold

1



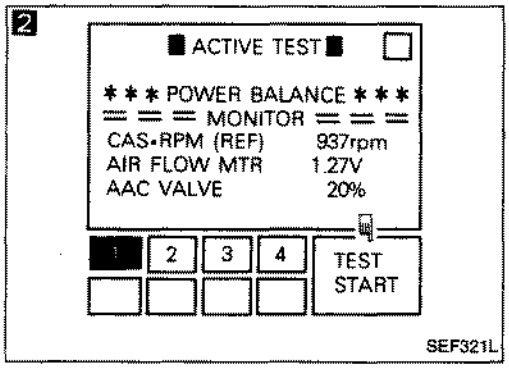
SEF382I

CHECK AIR REGULATOR AND A.A.C. VALVE.
When the engine is cold, can you start the engine when pressing accelerator pedal fully?

N.G. → Check A.A.C. valve, air regulator and circuits. (See pages EF & EC-600, 606.)

O.K. ↓

2



SEF321L

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

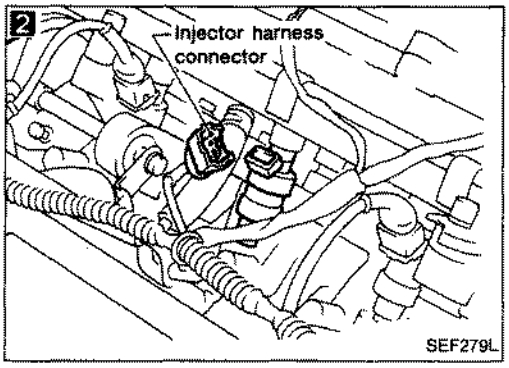
No → Go to 6.

— OR —

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes ↓

2



SEF279L

3

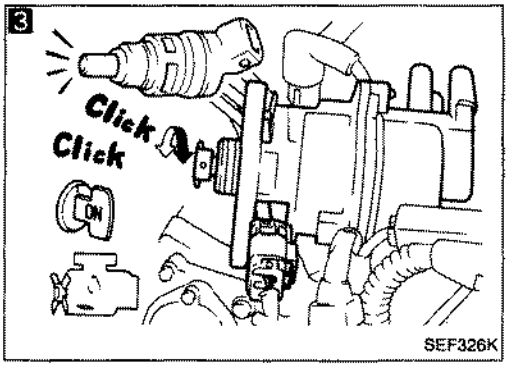
CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

N.G. → Check injector(s) and circuit(s).

O.K. ↓

3



SEF326K

4

CHECK IGNITION SPARK.

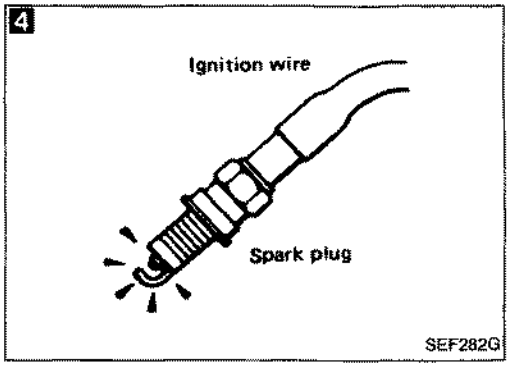
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor and circuits. (See page EF & EC-576.)

O.K. ↓

(Go to Ⓐ on next page.)

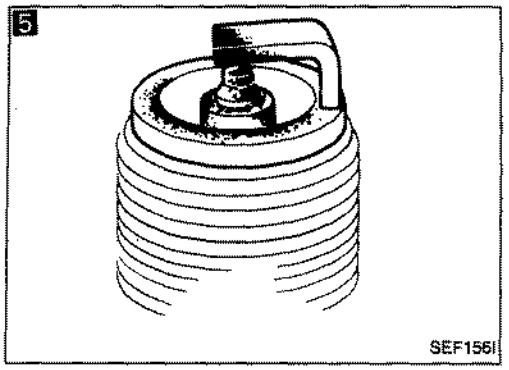
4



SEF282G

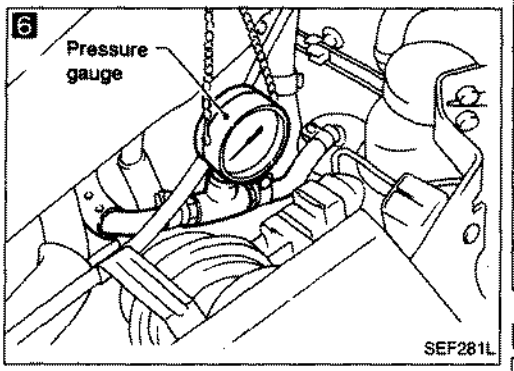
Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold (Cont'd)

5



SEF156I

6



SEF281L

Ⓐ

5 **CHECK SPARK PLUGS.**
Remove the spark plugs and check for fouling, etc.
N.G. → Repair or replace spark plug(s).
O.K. ↓

6 **CHECK FUEL PRESSURE.**
1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)
A few seconds after ignition switch is turned from OFF to ON:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.
O.K. ↓

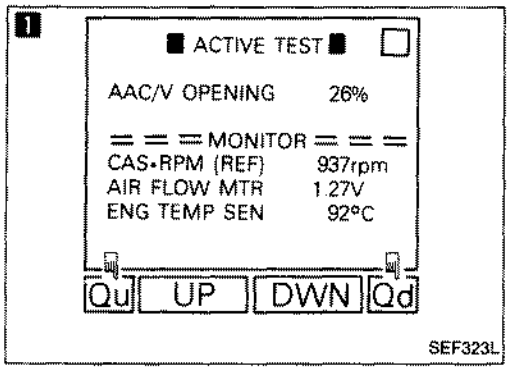
7 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.
N.G. → Repair or replace.
O.K. ↓

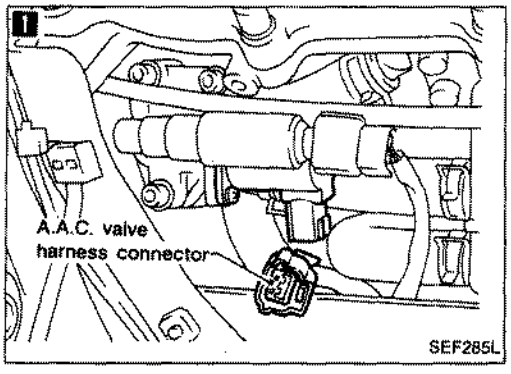
8 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-560.
N.G. → Repair or replace.
O.K. ↓

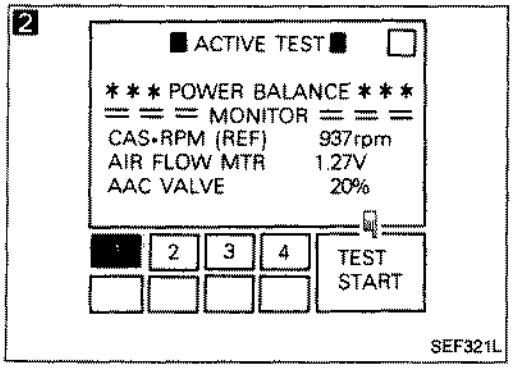
9 **TRY A KNOWN GOOD E.C.U.***
Trouble is fixed. → Replace E.C.U.
Trouble is not fixed. ↓

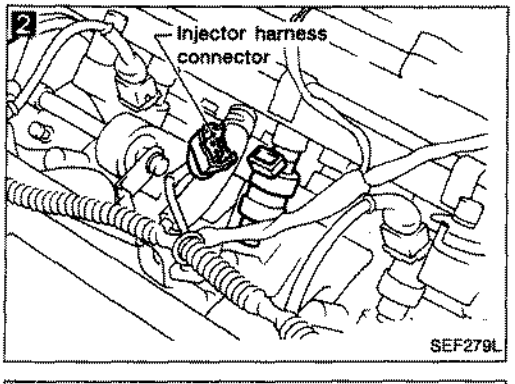
INSPECTION END

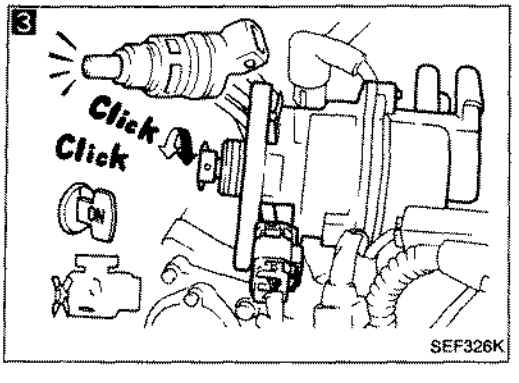
*: E.C.U. may be the cause of a problem, but this is rarely the case.











Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily

1

CHECK A.A.C. VALVE.

1. Select "A.A.C. VALVE OPENING" in "ACTIVE TEST" mode.
2. When touching "Qu" and "Qd", does the engine speed change according to the percent of A.A.C. valve opening?

No → Check A.A.C. valve and circuit. (See page EF & EC-606.)

OR

When disconnecting A.A.C. valve harness connector, does the engine speed drop?

Yes ↓

2

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 5.

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes ↓

3

CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

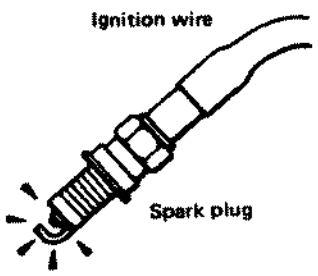
No → Check injector(s) and their circuit(s).

Yes ↓

(Go to Ⓐ on next page.)

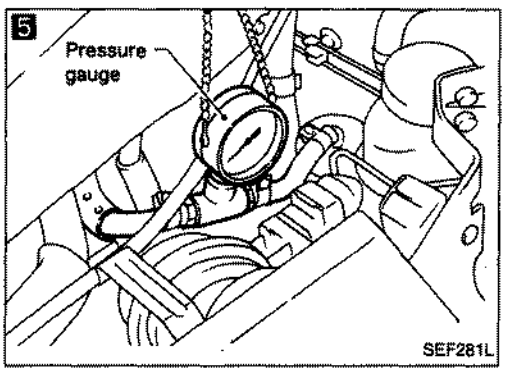
Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily (Cont'd)

4



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5



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Ⓐ

4 **CHECK IGNITION SPARK.**
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against an earth point with engine cranking.
4. Check for spark.

N.G. → Check ignition coil, power transistor and their circuits. (See page EF & EC-576.)

O.K. ↓

5 **CHECK FUEL PRESSURE.**
1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)
A few seconds after ignition switch is turned from OFF to ON:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

6 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K. ↓

7 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-560.

N.G. → Repair or replace.

O.K. ↓

8 **TRY A KNOWN GOOD E.C.U.***

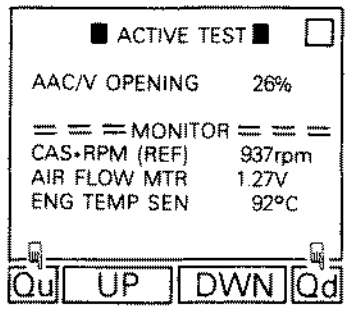
Trouble is not fixed. → Replace E.C.U.

Trouble is fixed ↓

INSPECTION END

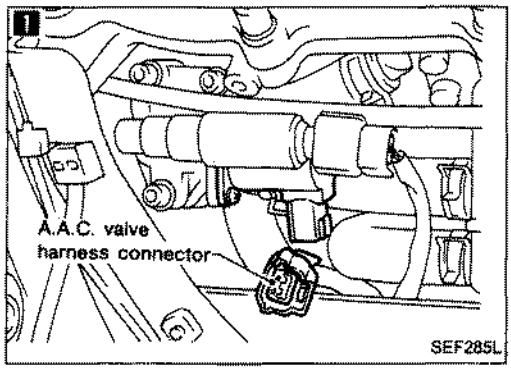
*: E.C.U. may be the cause of a problem, but this is rarely the case.

1



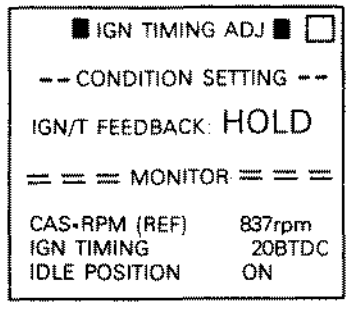
SEF323L

1



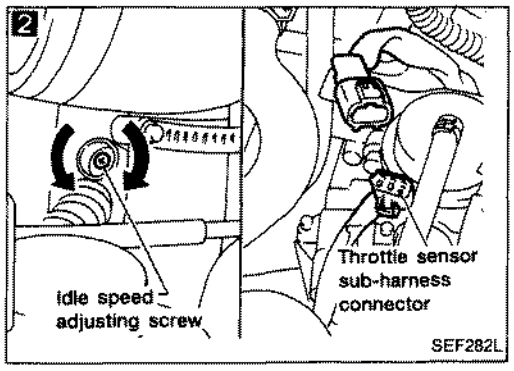
SEF285L

2



SEF322L

2



SEF282L

Diagnostic Procedure 14 — Engine Stalls after Decelerating

1

CHECK A.A.C. VALVE.

1. Select "A.A.C. VALVE OPENING" in "ACTIVE TEST" mode.
2. When touching "Qu" and "Qd", does the engine speed change according to the percent of A.A.C. valve opening?

No → Check A.A.C. valve and circuit. (See page EF & EC-606.)

OR

When disconnecting A.A.C. valve harness connector, does the engine speed drop?

Yes ↓

2

CHECK IDLE ADJ. SCREW CLOGGING.

1. Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. Can you set engine rpm at 850 ± 50 rpm (in "N" position) by turning idle adjusting screw?

No → Check for I.A.S. clogging or throttle chamber clogging.

OR

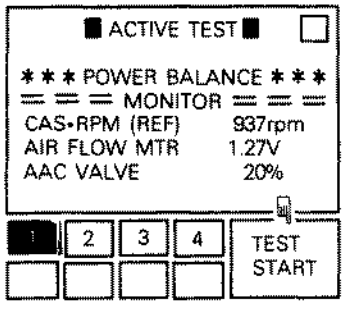
1. Disconnect throttle sensor harness connector.
2. Can you set engine rpm at 850 ± 50 rpm (in "N" position) by turning idle adjusting screw?

Yes ↓

(Go to Ⓐ on next page.)

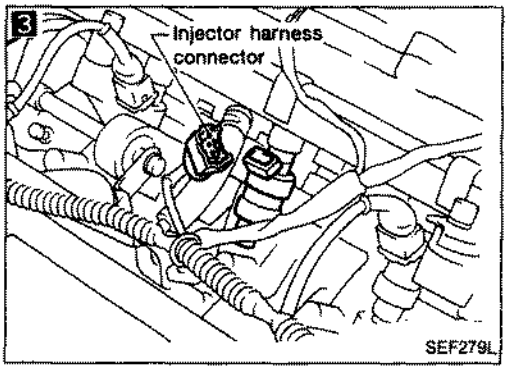
Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

3



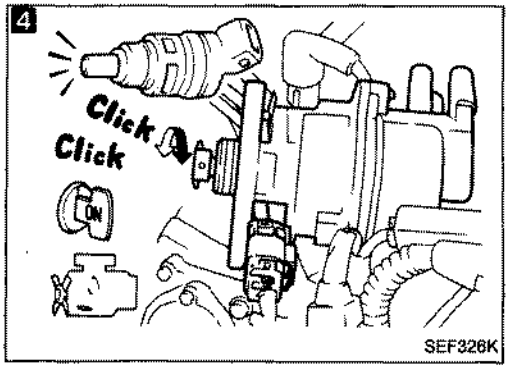
SEF321L

3



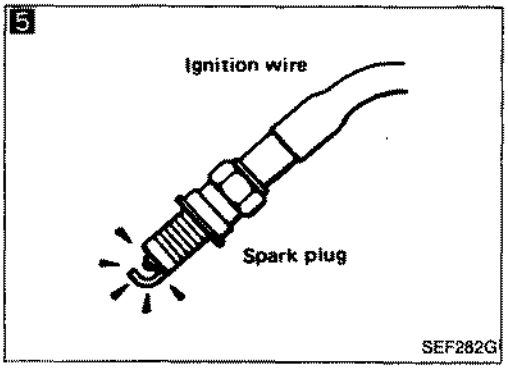
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Ⓐ

3

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 6.

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes

4

CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes

5

CHECK IGNITION SPARK.

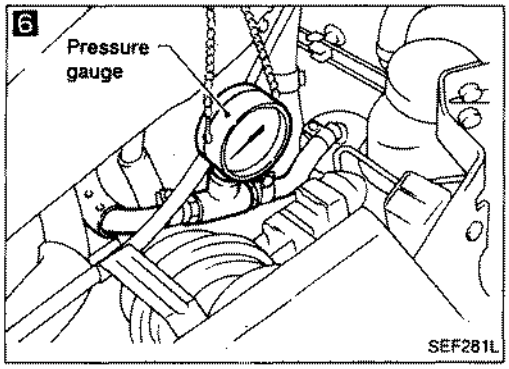
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

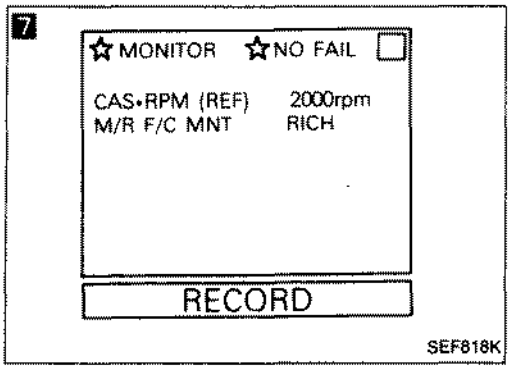
No → Check ignition coil, power transistor and circuits. (See page EF & EC-576.)

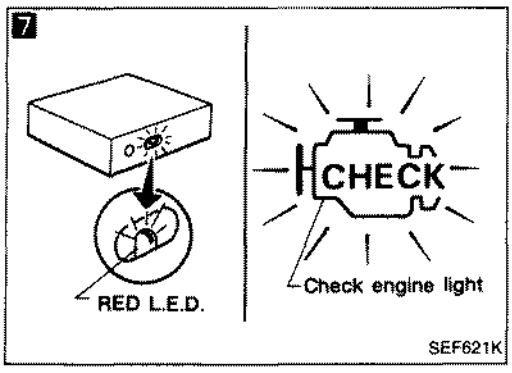
Yes

(Go to Ⓑ on next page.)

Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)







Ⓑ

6 **CHECK FUEL PRESSURE.**

1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)
A few seconds after ignition switch is turned from OFF to ON:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K.

7 **CHECK EXHAUST GAS SENSOR.**

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

RICH→LEAN→RICH→ (1 time, 2 times)
LEAN→RICH.....

N.G. → Replace exhaust gas sensor.

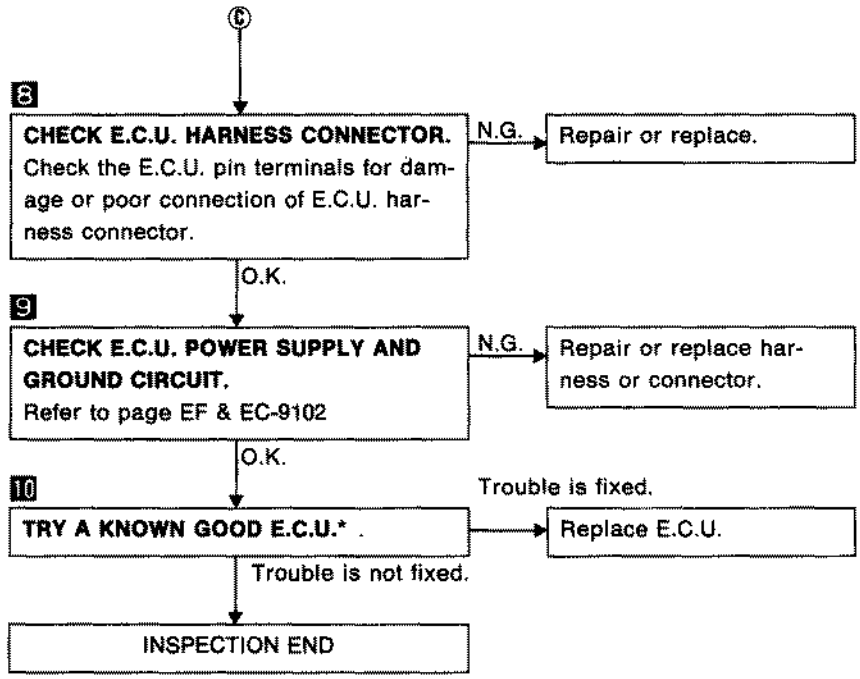
OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-412.)
2. Maintaining engine at 2,000 rpm under no load, check that the RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

O.K.

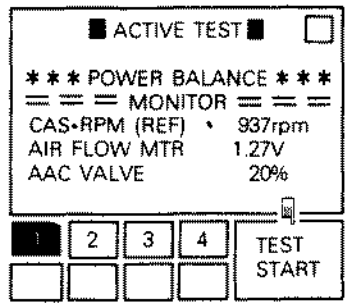
(Go to Ⓒ on next page.)

Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)



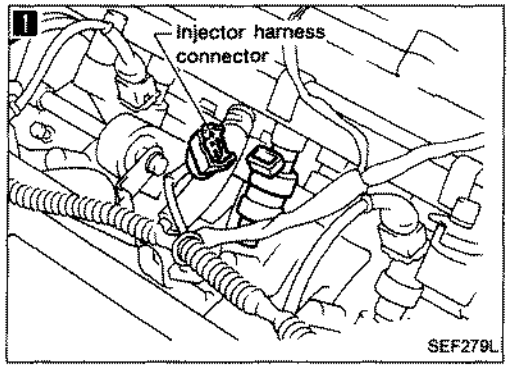
*: E.C.U. may be the cause of a problem, but this is rarely the case.

1



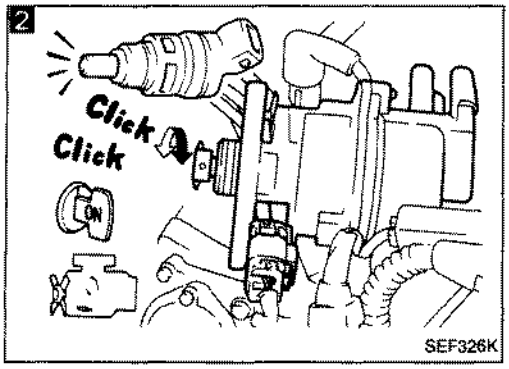
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1



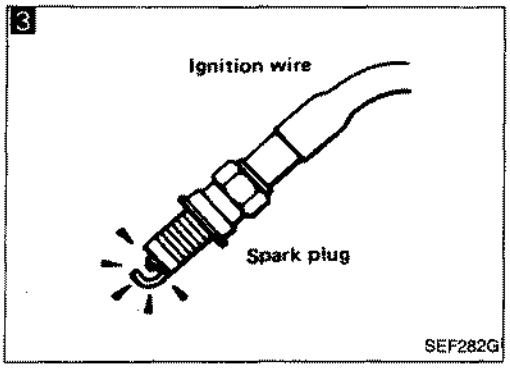
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2



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3



SEF282G

Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed

1

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

— OR —

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 4.

Yes ↓

2

CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

3

CHECK IGNITION SPARK.

1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

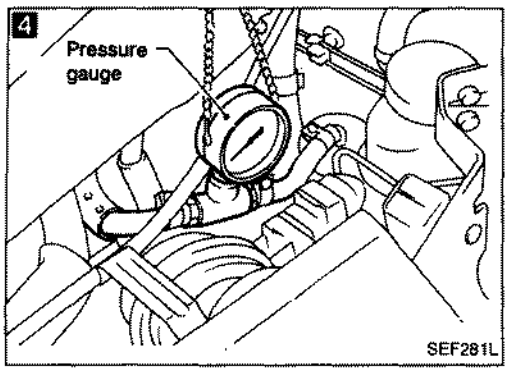
No → Check ignition coil, power transistor and circuits. (See page EF & EC-576.)

Yes ↓

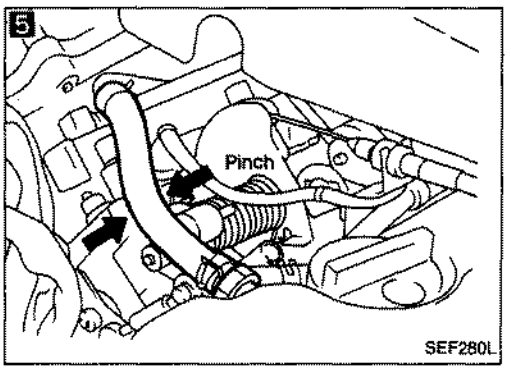
(Go to Ⓐ on next page.)

Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed (Cont'd)

4



5



Ⓐ

4 **CHECK FUEL PRESSURE.**
1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa (2.45 bar, 2.5 kg/cm², 36 psi)
A few seconds after ignition switch is turned from OFF to ON:
Approx. 294 kPa (2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pump, circuit and fuel pressure regulator.

O.K. ↓

5 **CHECK FOR INTAKE AIR LEAK.**
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

6 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K. ↓

7 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-560.

Yes → Repair or replace.

No ↓

8 **TRY A KNOWN GOOD E.C.U.***

Trouble is fixed. → Replace E.C.U.

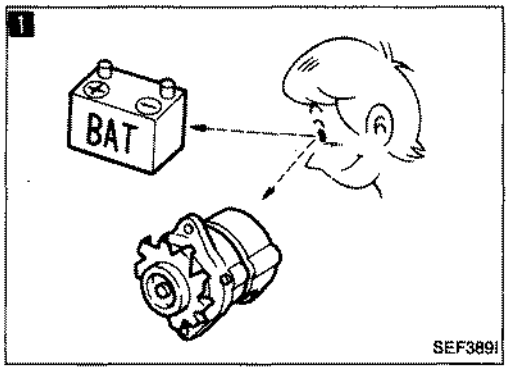
Trouble is not fixed. ↓

INSPECTION END

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

Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy

1



SEF389I

CHECK BATTERY AND ALTERNATOR.
Check battery and alternator condition. (Refer to EL section.)

N.G. → Repair or replace.

O.K. ↓

2

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

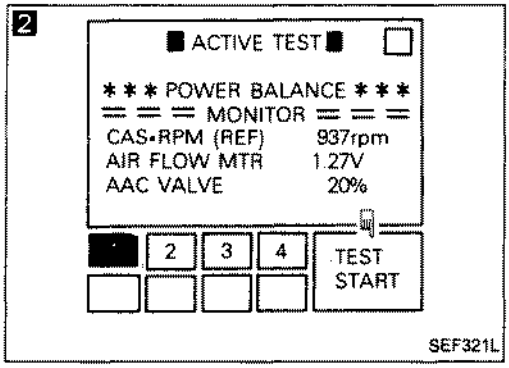
No → Go to 5.

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes ↓

2



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3

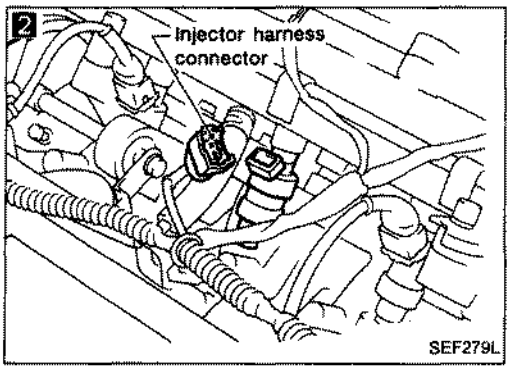
CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

2



SEF279L

4

CHECK IGNITION SPARK.

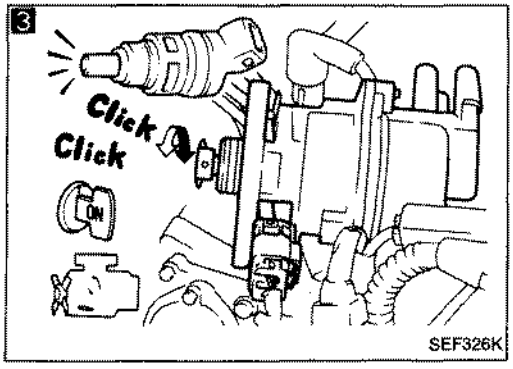
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor and circuits. (See page EF & EC-576.)

O.K. ↓

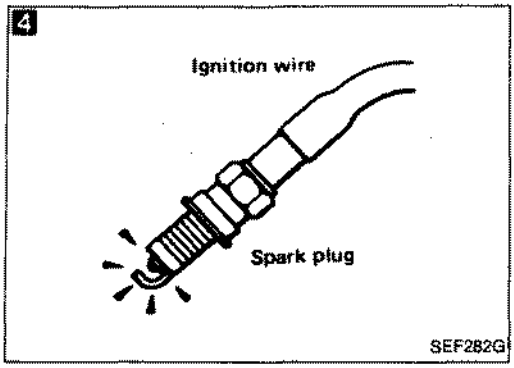
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3



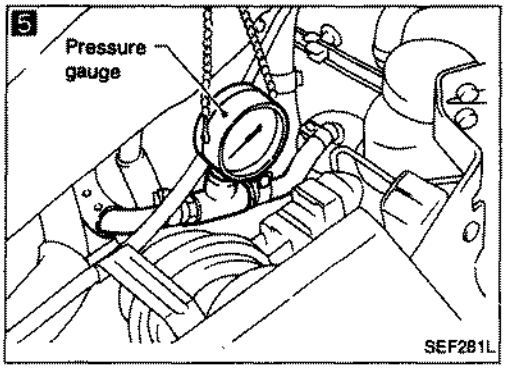
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Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy (Cont'd)



Ⓐ

5 **CHECK FUEL PRESSURE.**
1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)
A few seconds after ignition switch is turned from OFF to ON:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

6 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K. ↓

7 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-560.

N.G. → Repair or replace harness or connector.

O.K. ↓

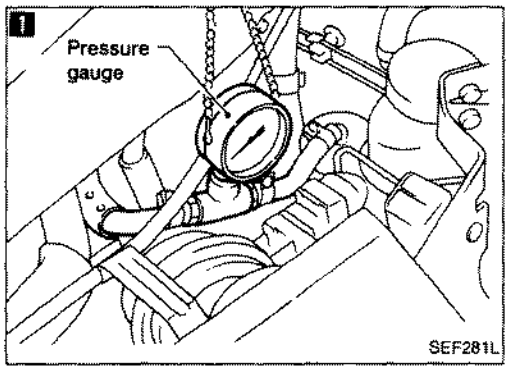
8 **TRY A KNOWN GOOD E.C.U.***

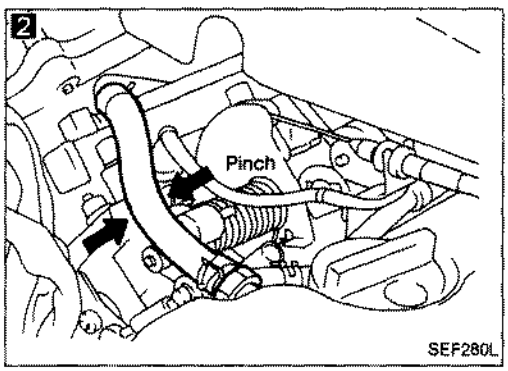
Trouble is fixed. → Replace E.C.U.

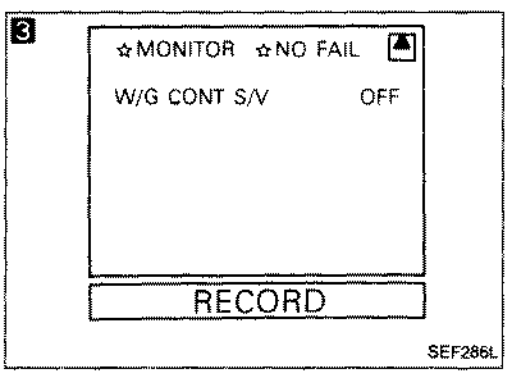
Trouble is not fixed. ↓

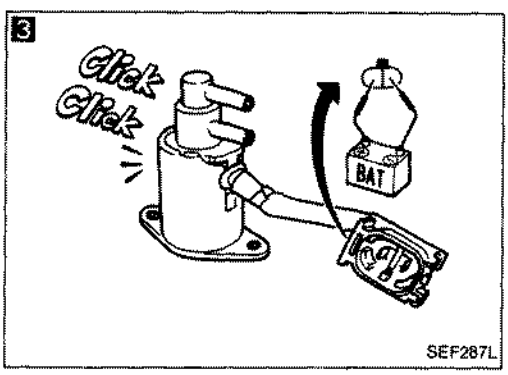
INSPECTION END

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









Diagnostic Procedure 17 — Lack of Power and Stumble

1

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero. (Refer to page EF & EC-638.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)
A few seconds after ignition switch is turned from OFF to ON:
Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

2

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

3

CHECK WASTEGATE VALVE CONTROL SOLENOID VALVE.

1. Check "W/G CONT S/V" in "DATA MONITOR" mode.
   At idle: OFF
   During acceleration: ON

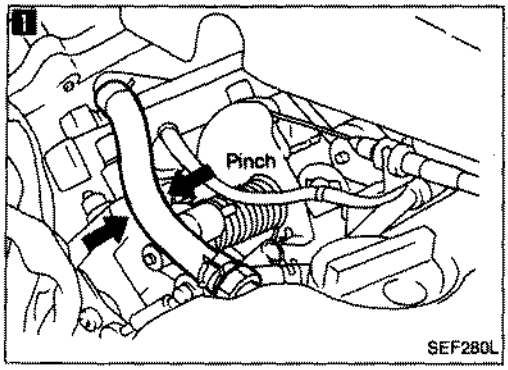
Yes → check wastegate valve control solenoid valve and circuit.

1. Disconnect wastegate valve control solenoid valve harness connector.
2. Supply wastegate valve control solenoid valve terminals with battery current and check operating sound.

No ↓

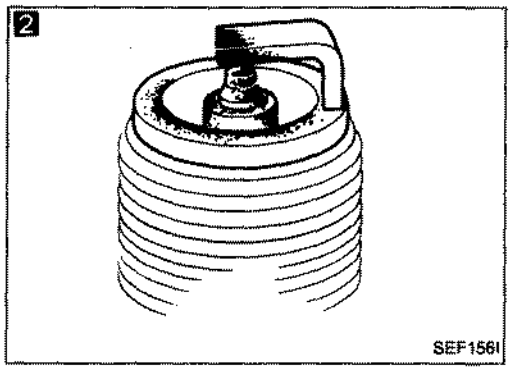
INSPECTION END

1



SEF280L

2



SEF156I

Diagnostic Procedure 18 — Detonation

1

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine rpm rise?

Yes → Discover air leak location and repair.

No ↓

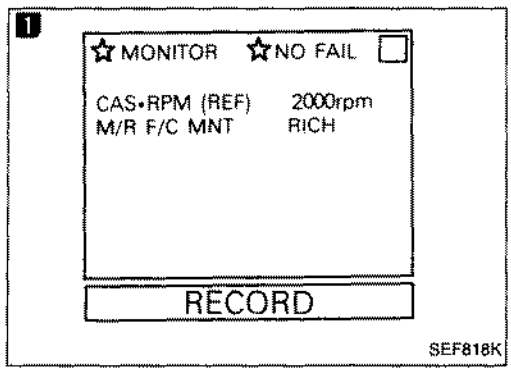
2

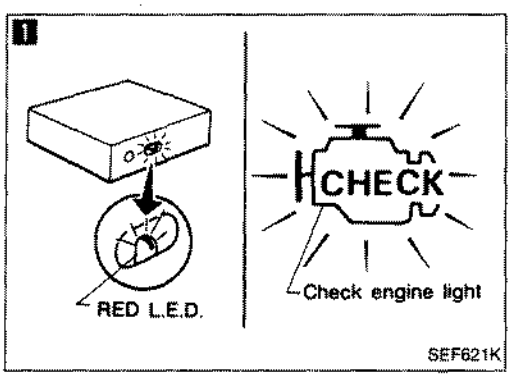
CHECK FOR OIL LEAK TO COMBUSTION CHAMBER.
Remove spark plugs and check for fouling with oil.

Yes → Check pistons, piston rings, valves, valve seats, valve oil seal, engine oil level, etc.

No ↓

INSPECTION END





Diagnostic Procedure 19 — Surge

CHECK EXHAUST GAS SENSOR.

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

RICH→LEAN→RICH→ LEAN→RICH.....
(1 time, 2 times)

N.G. → Replace exhaust gas sensor.

OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-412.)
2. Maintaining engine at 2,000 rpm under no load, check that the RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

O.K.

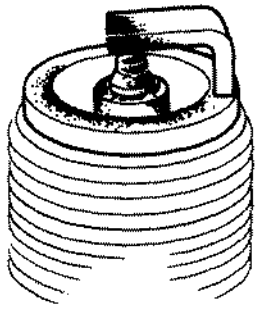
TRY A KNOWN GOOD E.C.U.* → Trouble is fixed. → Replace E.C.U.

Trouble is not fixed.

INSPECTION END

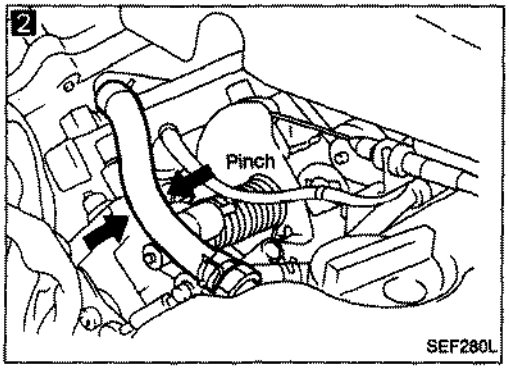
*: E.C.U. may be the cause of a problem, but this is rarely the case.

1



SEF156I

2



SEF280L

Diagnostic Procedure 20 — Backfire through the Intake

1

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K. ↓

2

CHECK INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

3

CHECK FOR INTAKE VALVE DEPOSITS.
If there are deposits on intake valves, remove them.

↓

INSPECTION END

Diagnostic Procedure 21 — Backfire through the Exhaust

1

CHECK ENGINE TEMPERATURE SENSOR.
Check engine temperature sensor and its circuit. (See page EF & EC-572.)

N.G. → Replace or repair.

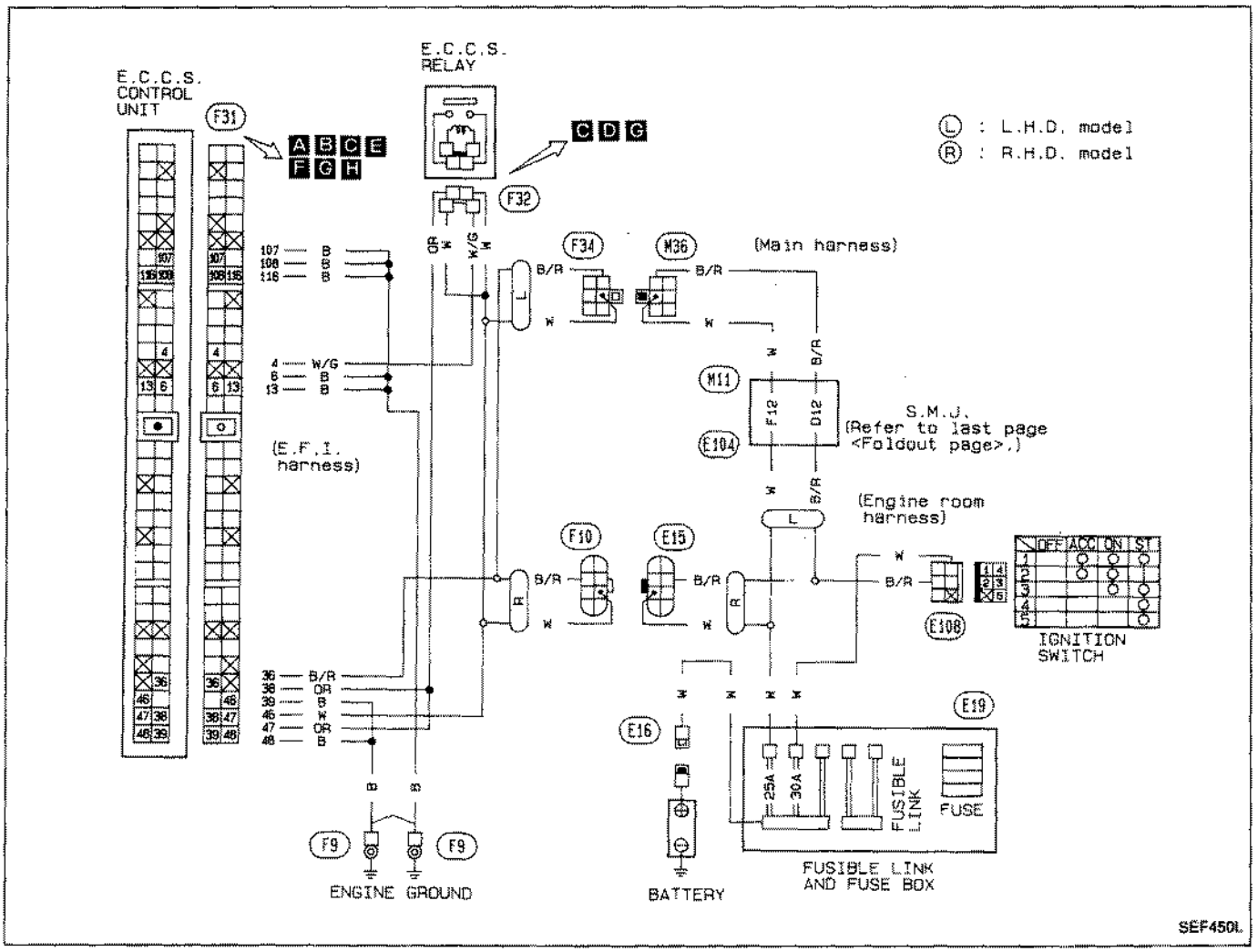
O.K. ↓

INSPECTION END

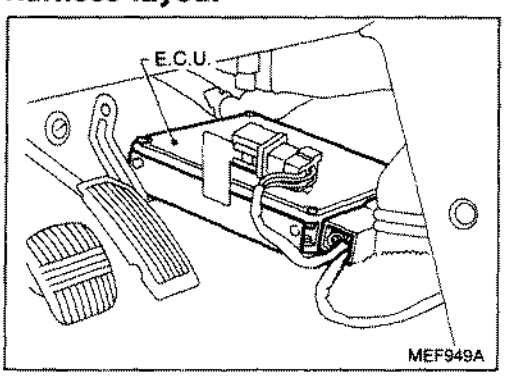
NOTE

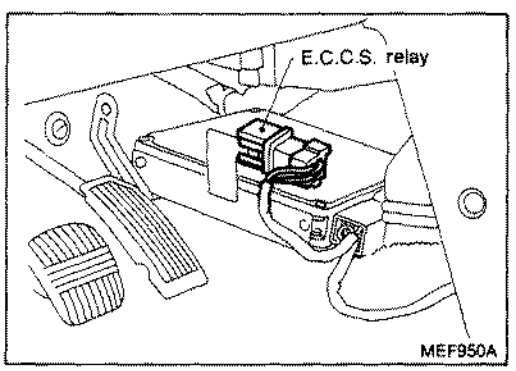
Diagnostic Procedure 22

MAIN POWER SUPPLY AND GROUND CIRCUIT (Not self-diagnostic item)



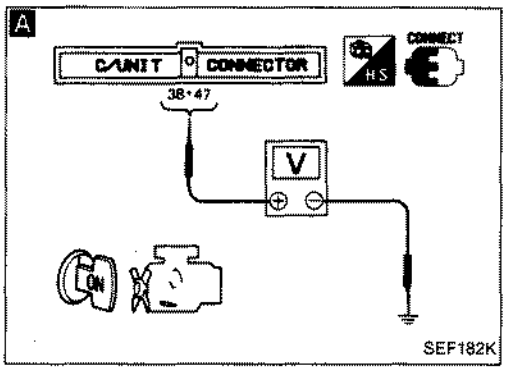
Harness layout





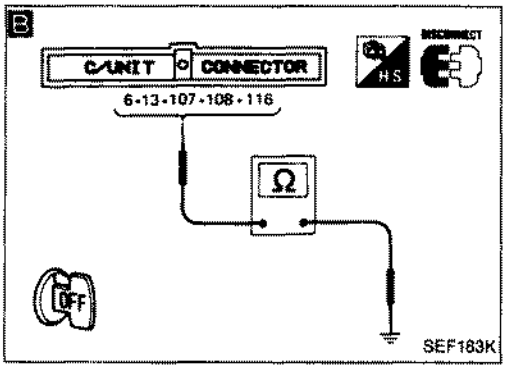
Diagnostic Procedure 22 (Cont'd)

A



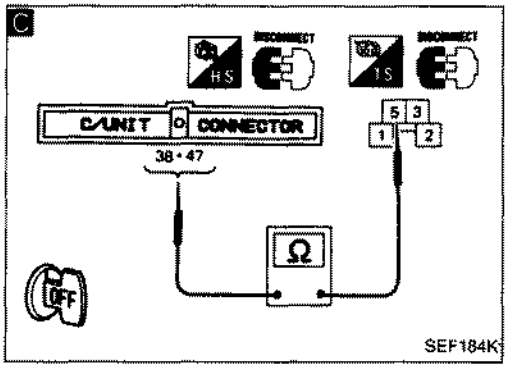
SEF182K

B



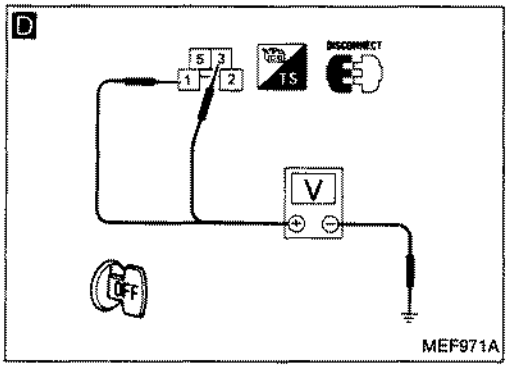
SEF183K

C



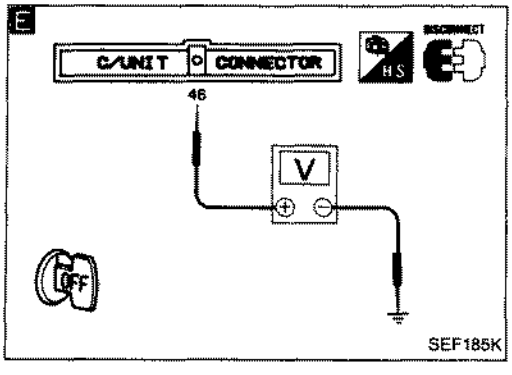
SEF184K

D



MEF971A

E



SEF185K

INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminals (38), (47) and ground.
Voltage: Battery voltage

O.K. → **B**

N.G. ↓

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminals (6), (13), (107), (108), (116) and engine ground.
Continuity should exist.
If N.G., repair harness or connectors.

O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

C

CHECK HARNESS CONTINUITY BETWEEN E.C.C.S. RELAY AND E.C.U.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Disconnect E.C.C.S. relay.
4) Check harness continuity between E.C.U. terminals (38), (47) and terminal (5).
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

D

CHECK VOLTAGE BETWEEN E.C.C.S. RELAY AND GROUND.
1) Check voltage between terminals (1), (3) and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F34), (M36) (L.H.D. models)
- Harness connectors (M11), (E184) (L.H.D. models)
- Harness connectors (F10), (E15) (R.H.D. models)
- "25A" fusible link
- Harness continuity between E.C.C.S. relay and battery

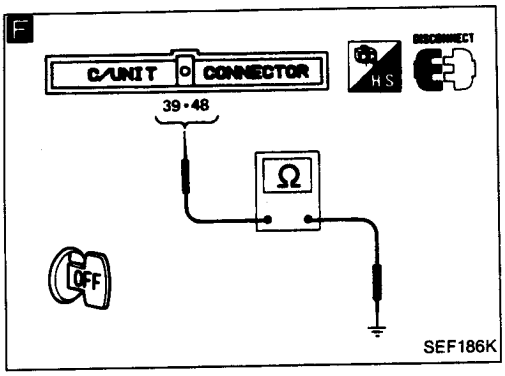
If N.G., repair harness or connectors.

O.K. ↓

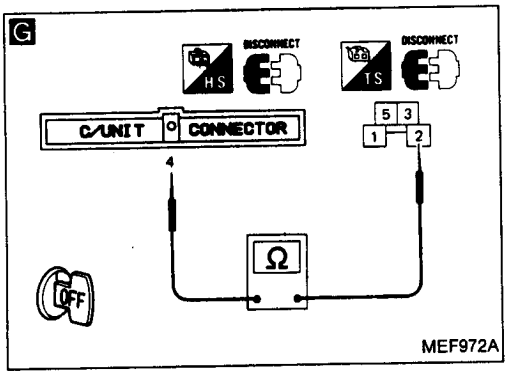
(A)

Diagnostic Procedure 22 (Cont'd)

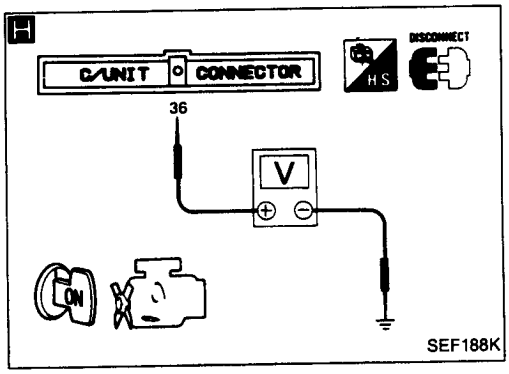
F



G



H



Ⓐ

E CHECK VOLTAGE BETWEEN E.C.U. AND GROUND.
1) Check voltage between E.C.U. terminal ㊻ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F34), (M36) (L.H.D. models)
- Harness connectors (M11), (E104) (L.H.D. models)
- Harness connectors (F10), (E15) (R.H.D. models)
- 25A fusible link
- Harness continuity between E.C.U. and battery

If N.G., repair harness or connectors.

O.K. ↓

F CHECK GROUND CIRCUIT.
1) Check harness continuity between E.C.U. terminals ㊴, ㊽ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

G CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between E.C.U. terminal ④ and terminal ②.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

H CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminal ㊱ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F34), (M36) (L.H.D. models)
- Harness connectors (M11), (E104) (L.H.D. models)
- Harness connectors (F10), (E15) (R.H.D. models)
- Harness continuity between E.C.U. and ignition switch

If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT (E.C.C.S. relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-635.)

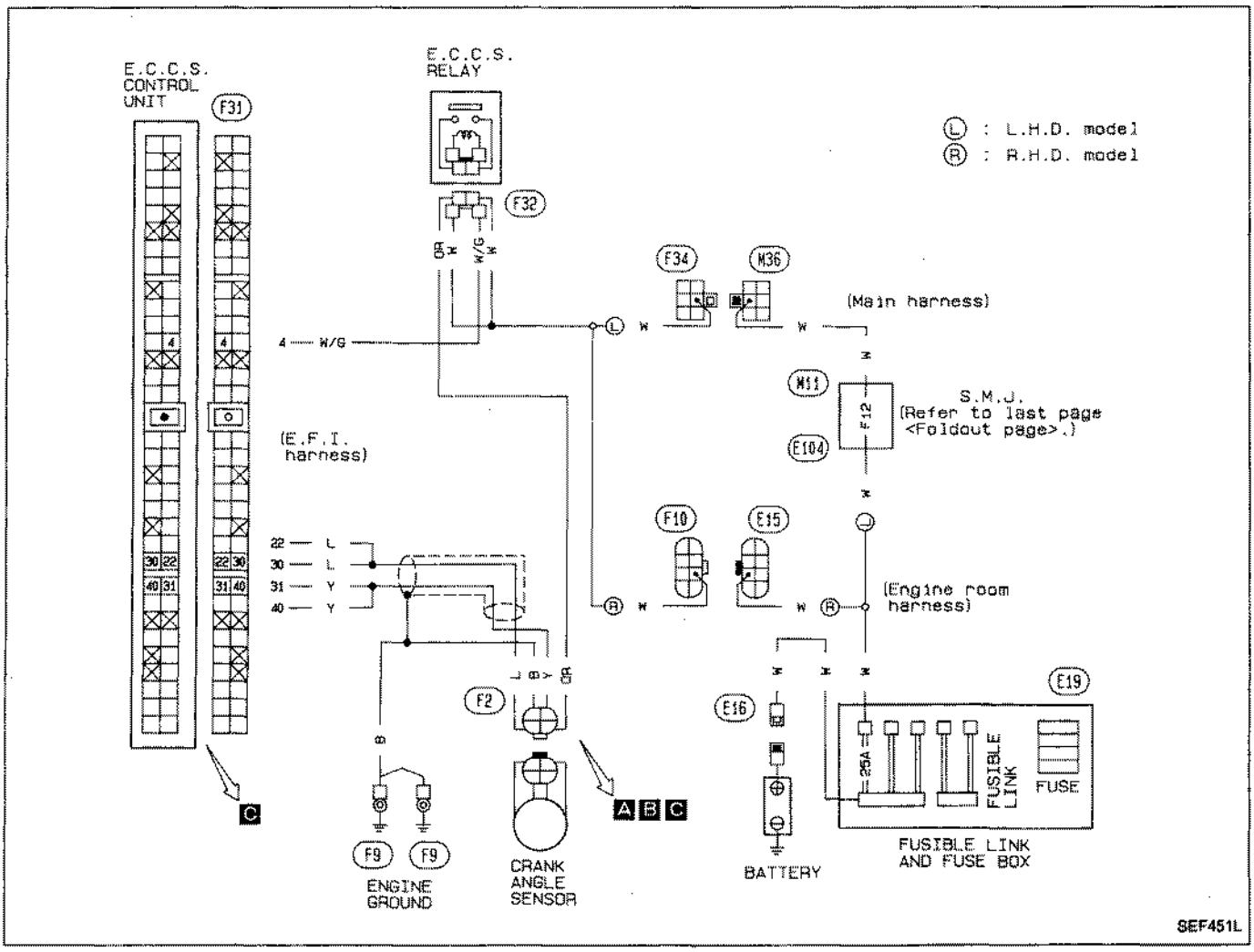
N.G. → Replace E.C.C.S. relay.

O.K. ↓

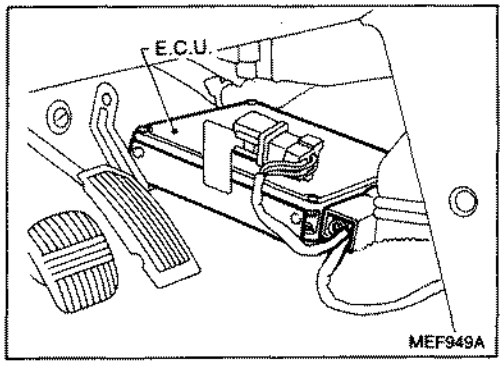
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

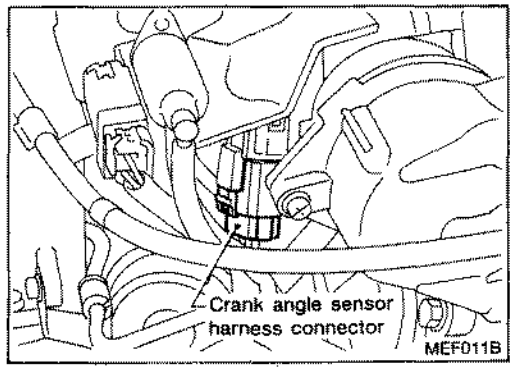
Diagnostic Procedure 23

CRANK ANGLE SENSOR (Code No. 11)

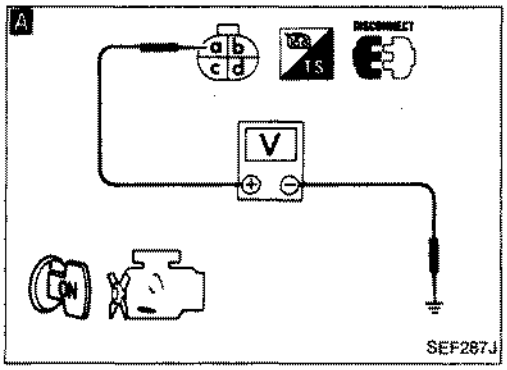


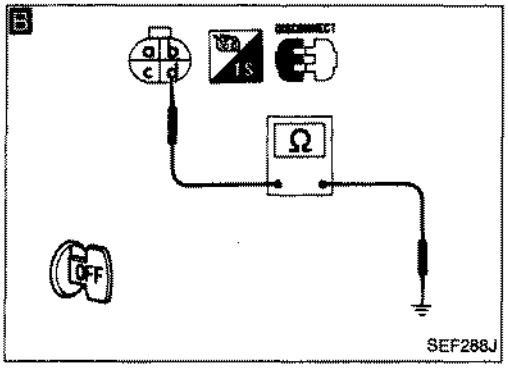
Harness layout

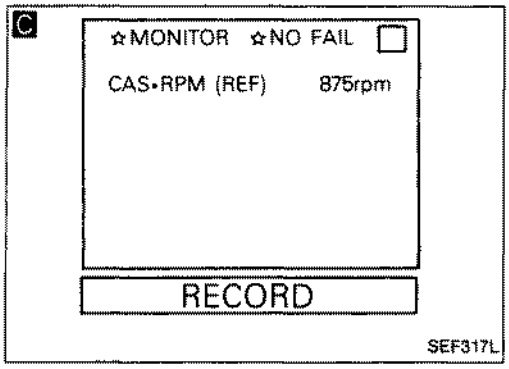


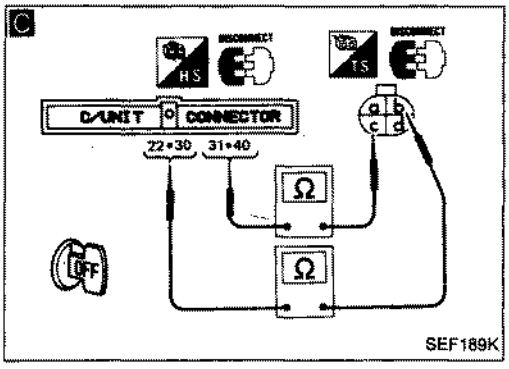


Diagnostic Procedure 23 (Cont'd)









INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect crank angle sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness continuity between crank angle sensor and E.C.C.S. relay

If N.G., repair harness or connectors.

O.K. ↓

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓓ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

C

CHECK INPUT SIGNAL CIRCUIT.

1) Reconnect crank angle sensor harness connector.
2) Start engine.
3) Read crank angle sensor signals in "DATA MONITOR" mode with CONSULT.
rpm: 925 $^{+25}_{-75}$

N.G. → Repair harness or connectors.

— OR —

1) Disconnect E.C.U. harness connector.
2) Check harness continuity between terminal ⓒ and E.C.U. terminals ㉛, ㊵ (1° signal), terminal ⓑ and E.C.U. terminals ㉒, ㉚ (180° signal).
Continuity should exist.

O.K. ↓

CHECK COMPONENT (Crank angle sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-629.)

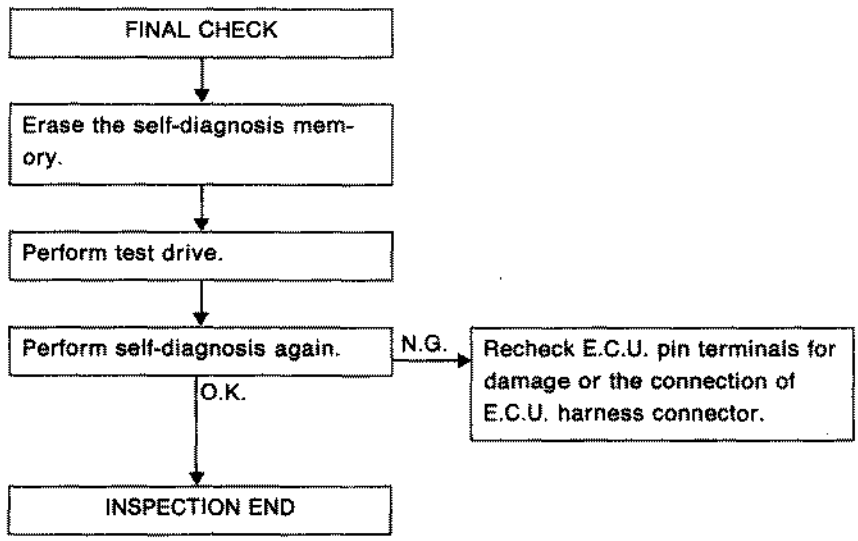
N.G. → Replace crank angle sensor.

O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 23 (Cont'd)

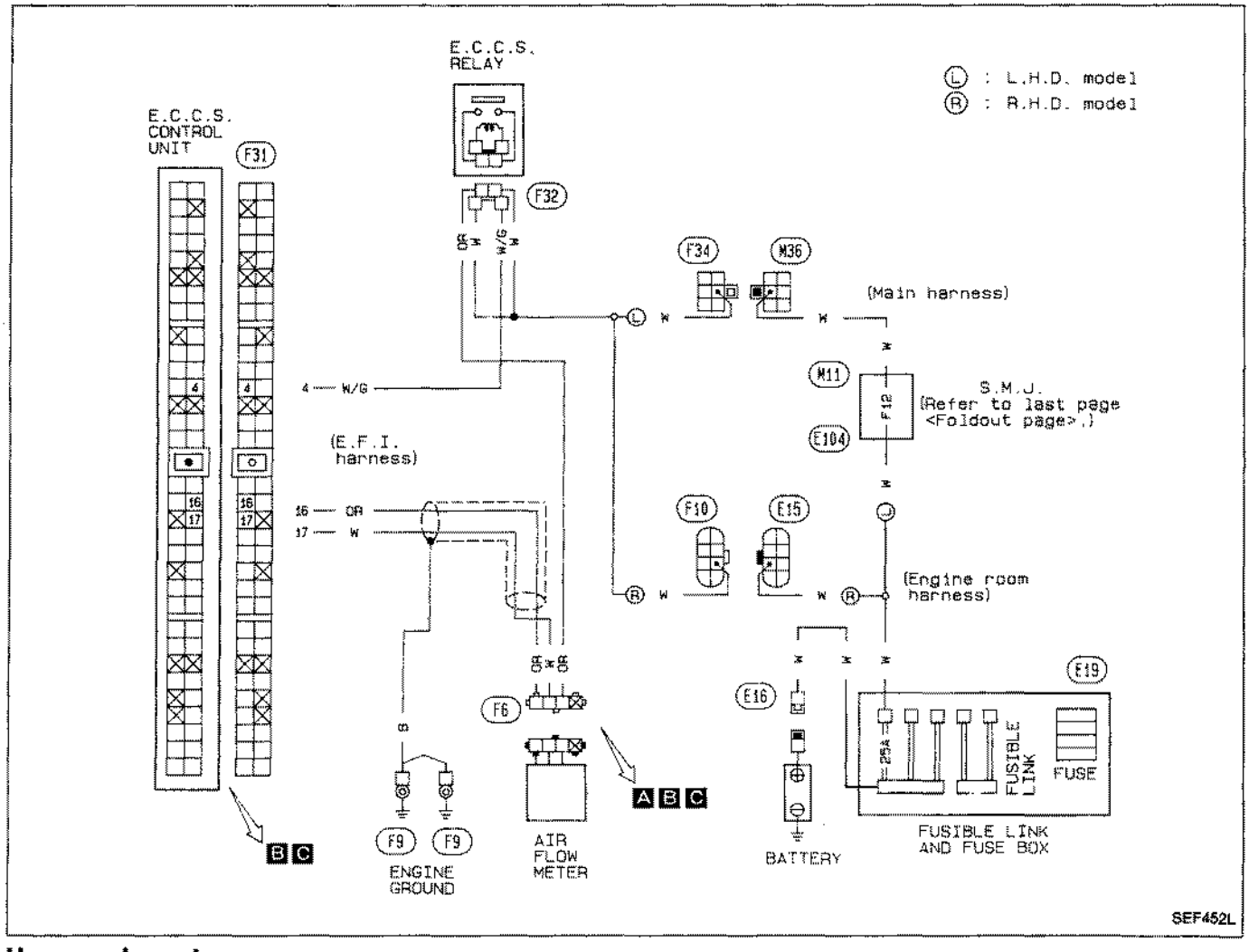
Perform FINAL CHECK by the following procedure after repair is completed.



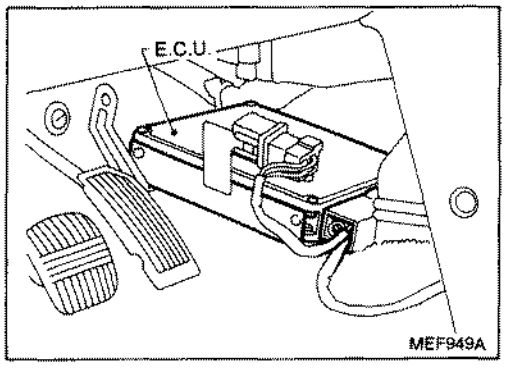
NOTE

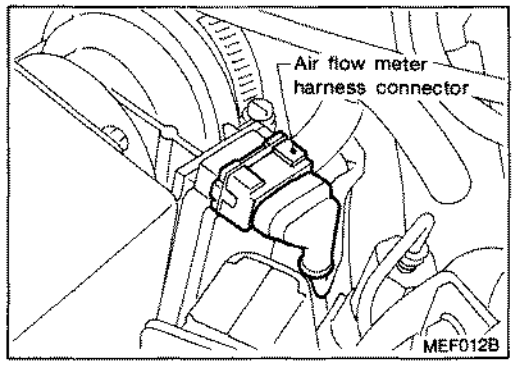
Diagnostic Procedure 24

AIR FLOW METER (Code No. 12)



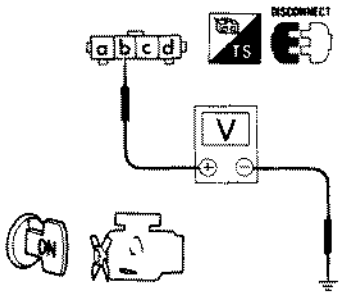
Harness layout





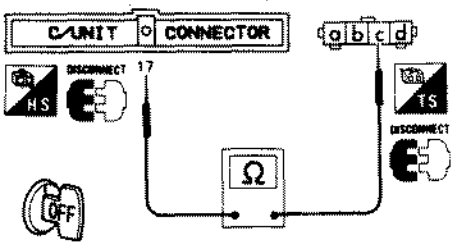
Diagnostic Procedure 24 (Cont'd)

A



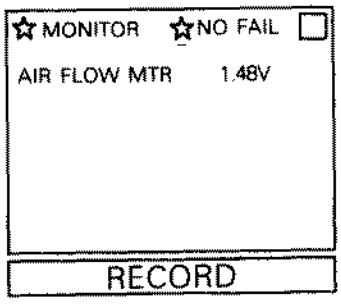
MEF973A

B



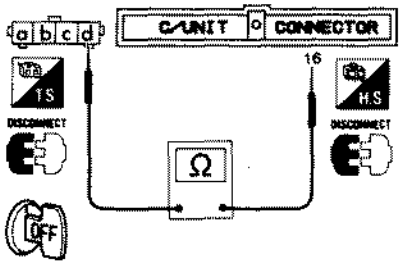
MEF974A

C



SEF824K

C



MEF975A

INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect air flow meter harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness continuity between air flow meter and E.C.C.S. relay

If N.G., repair harness or connectors.

O.K. ↓

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between terminal ⓒ and E.C.U. terminal ⑰.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

C

CHECK INPUT SIGNAL CIRCUIT.

1) Reconnect air flow meter harness connector and E.C.U. harness connector.
2) Start engine and warm it up sufficiently.
3) Read air flow meter signal in "DATA MONITOR" mode with CONSULT.
Voltage: 1.0 - 1.5V
(At idle)

N.G. → Repair harness or connectors.

OR

1) Check harness continuity between terminal ⓓ and E.C.U. terminal ⑯.
Continuity should exist.

O.K. ↓

CHECK COMPONENT (Air flow meter).
Refer to "Electrical Components Inspection".
(See page EF & EC-629.)

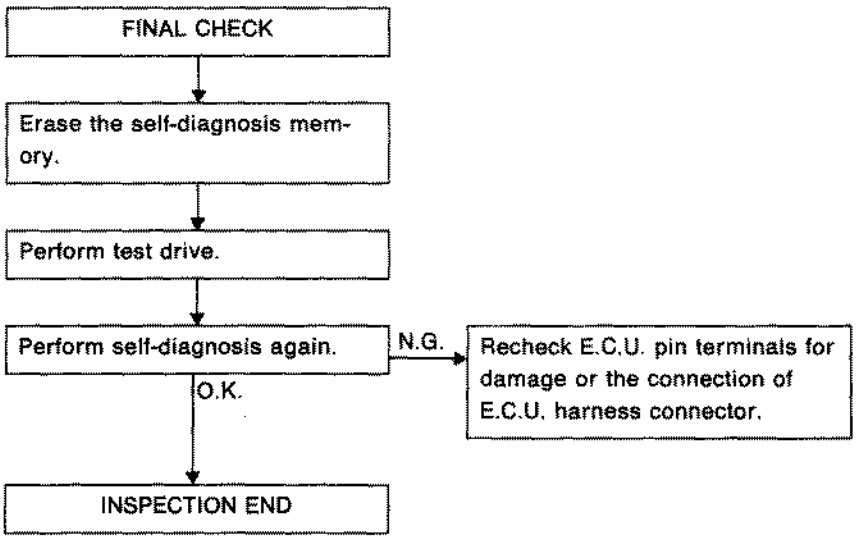
N.G. → Replace air flow meter.

O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 24 (Cont'd)

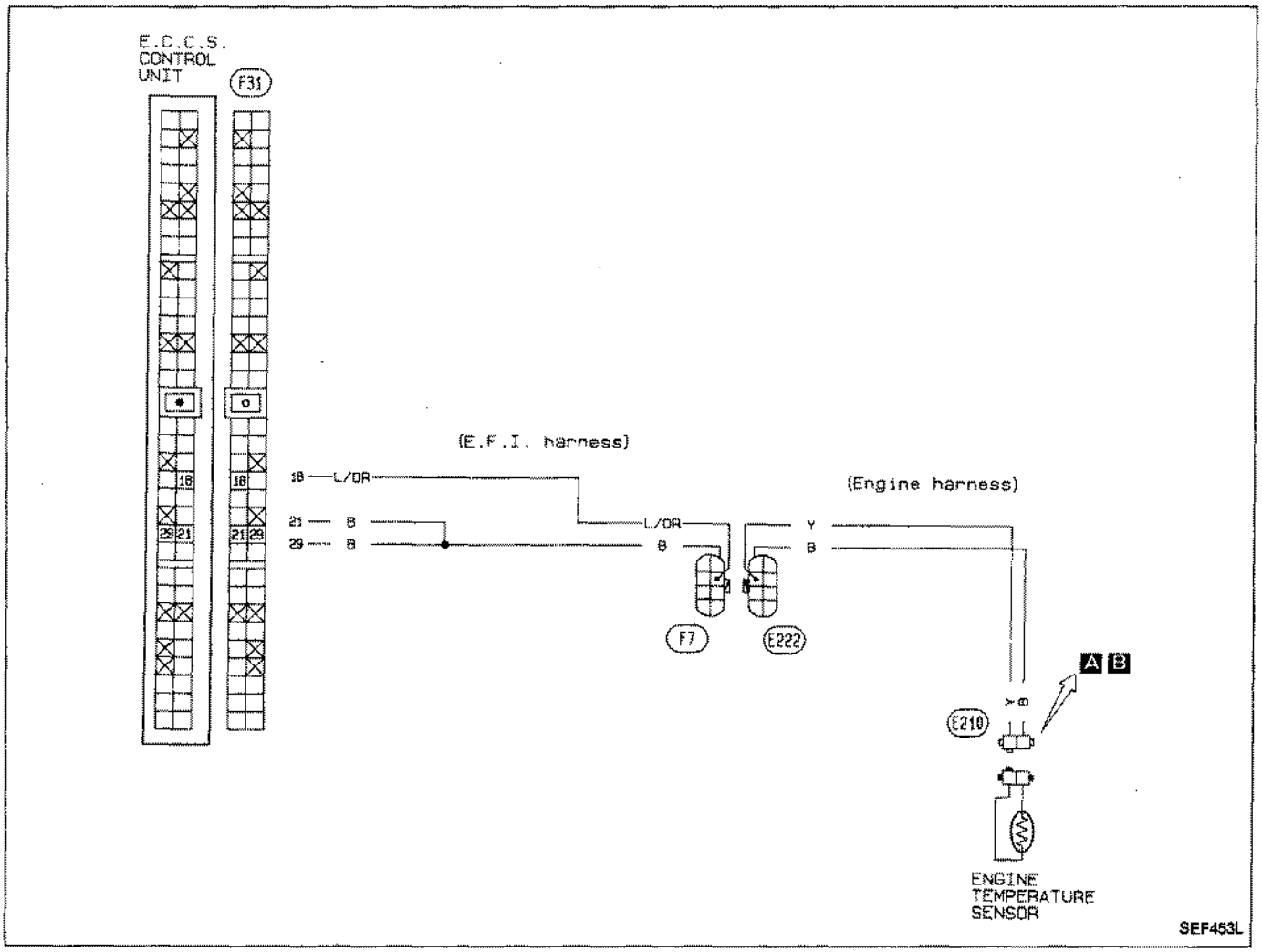
Perform FINAL CHECK by the following procedure after repair is completed.



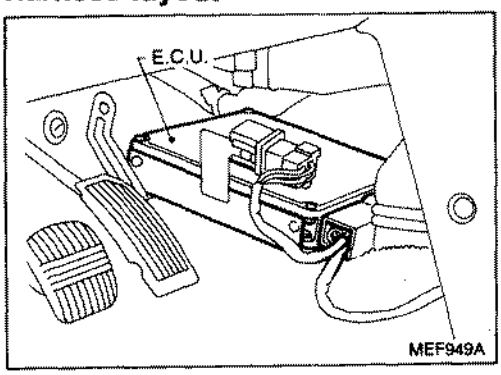
NOTE

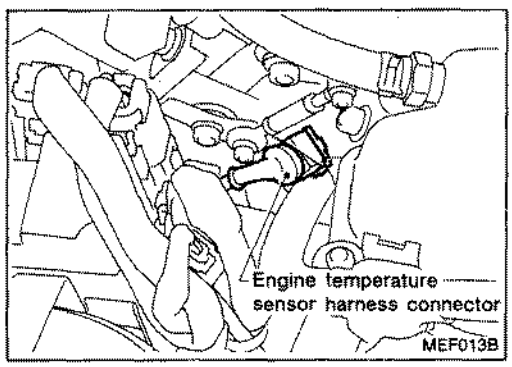
Diagnostic Procedure 25

ENGINE TEMPERATURE SENSOR (Code No. 13)



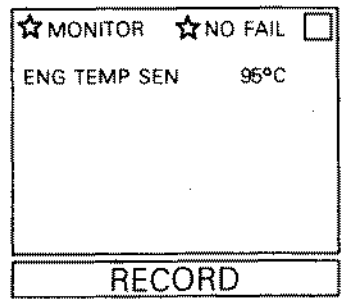
Harness layout





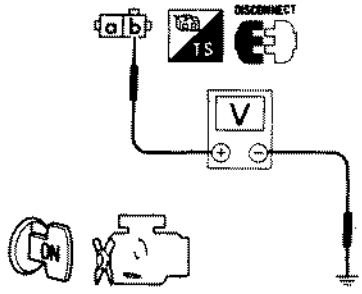
Diagnostic Procedure 25 (Cont'd)

A



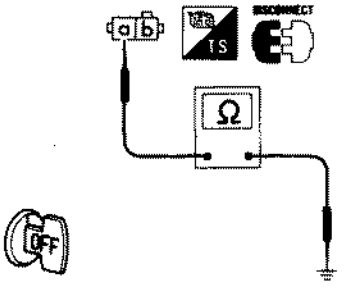
SEF825K

A



MEF976A

B



MEF977A

INSPECTION START

A

CHECK POWER SUPPLY.

1) Start engine and warm it up sufficiently.
2) Select engine temperature sensor signal in "DATA MONITOR" mode with CONSULT.
3) Stop engine
4) When restarting engine make sure that CONSULT indicates "ENG.TEMP SEN" is 50°C (122°F) or more.

OR

1) Disconnect engine temperature sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Approximately 5V

N.G. → Check the following.
- Harness connectors (F7), (E222)
- Harness continuity between E.C.U. and engine temperature sensor.

If N.G., repair harness or connectors.

O.K. ↓

B

CHECK GROUND CIRCUIT.

1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F7), (E222)
- Harness continuity between E.C.U. and engine temperature sensor.

If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT (Engine temperature sensor). Refer to "Electrical Components Inspection". (See page EF & EC- 630.)

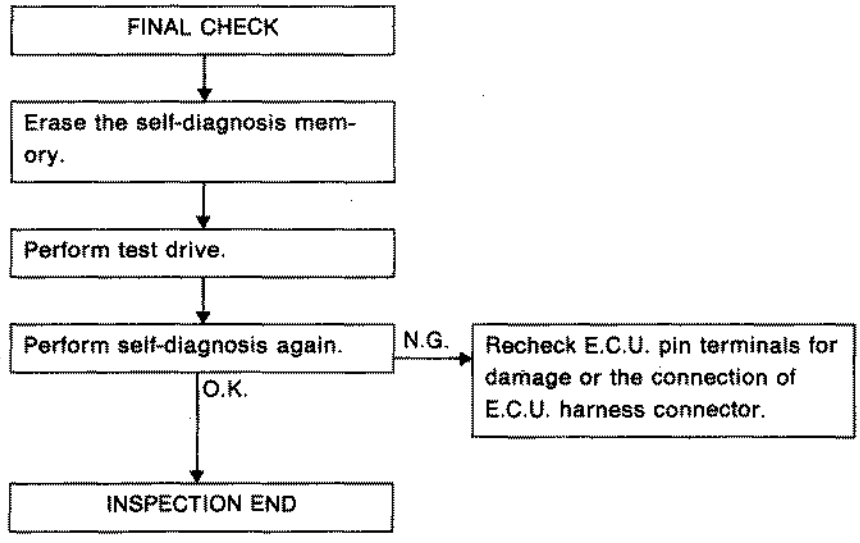
N.G. → Replace engine temperature sensor.

O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 25 (Cont'd)

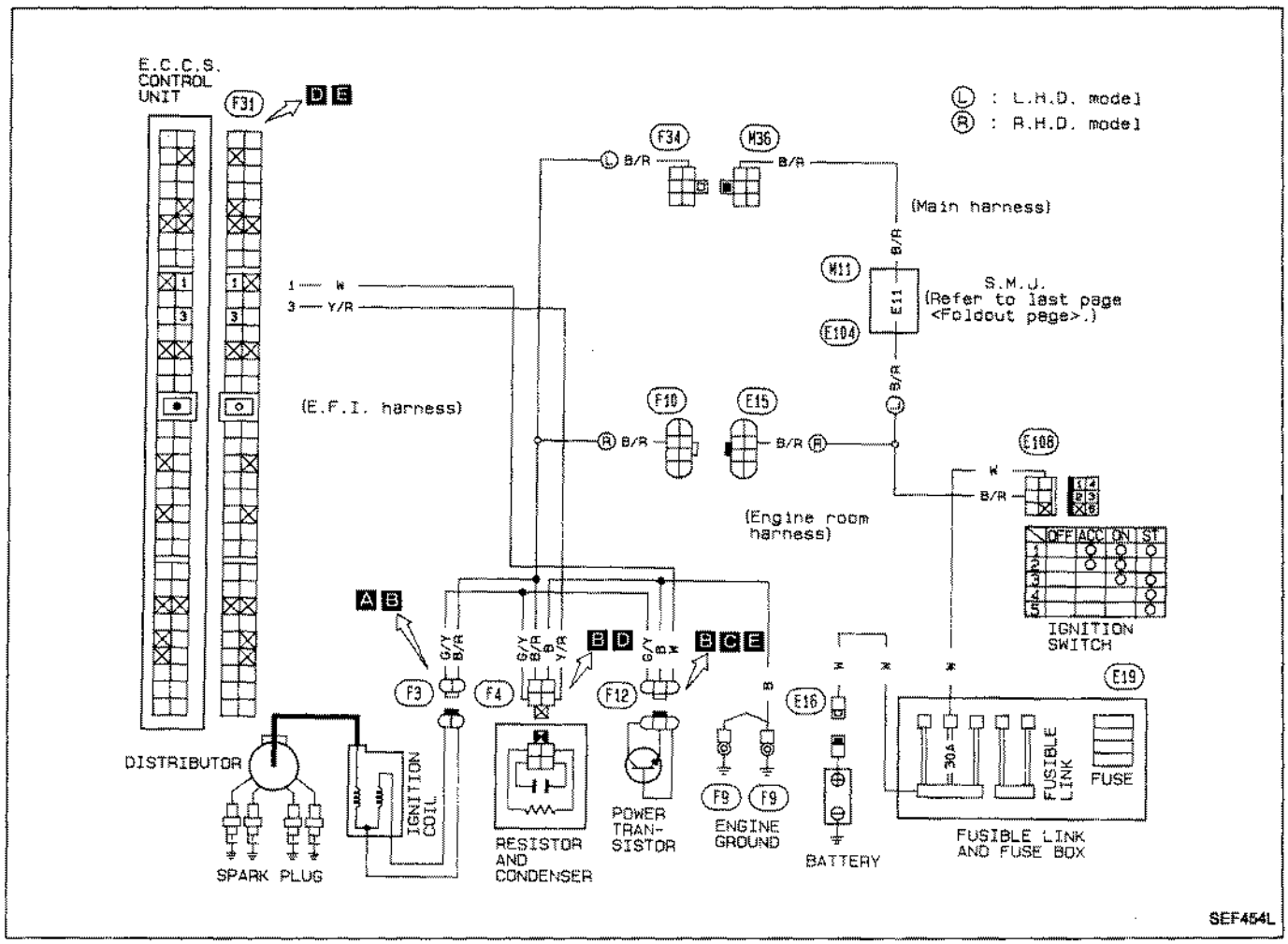
Perform FINAL CHECK by the following procedure after repair is completed.



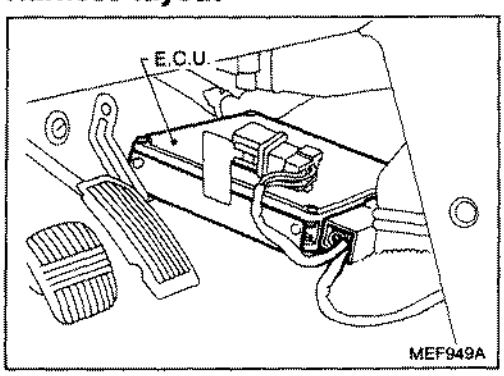
NOTE

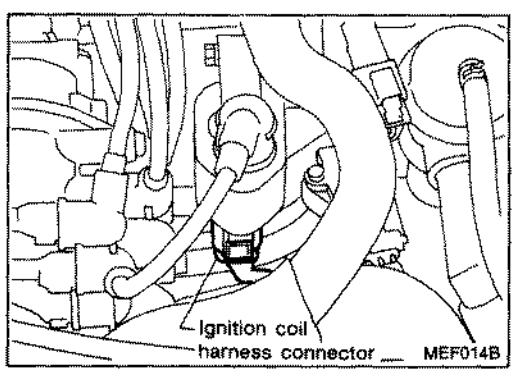
Diagnostic Procedure 26

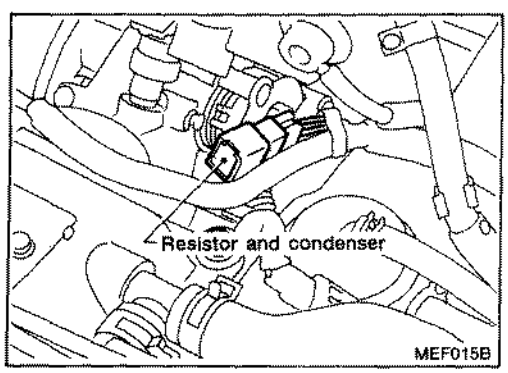
IGNITION SIGNAL (Code No. 21)

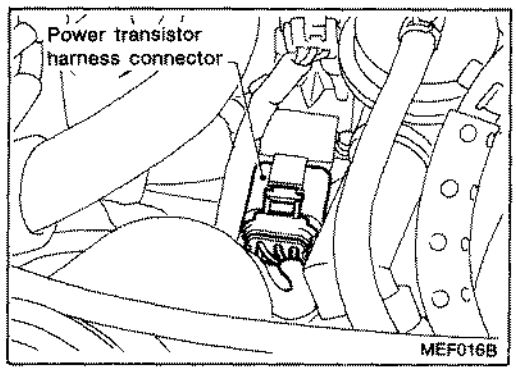


Harness layout

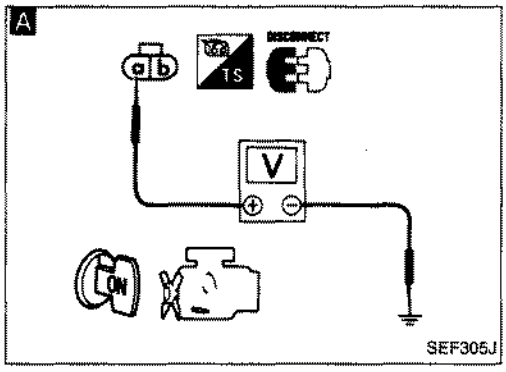


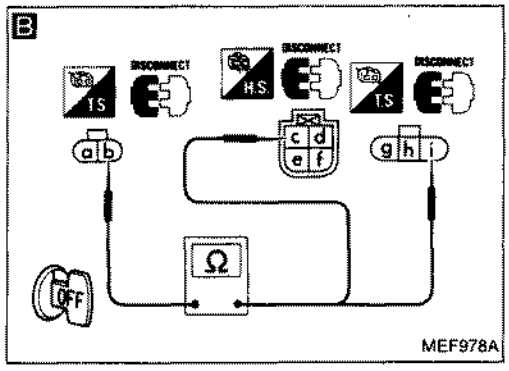


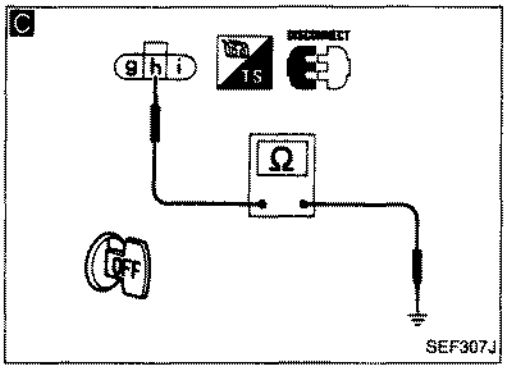


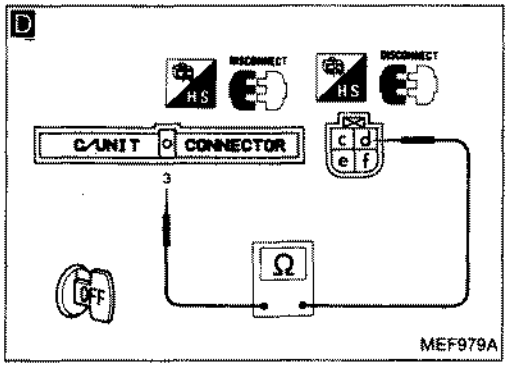


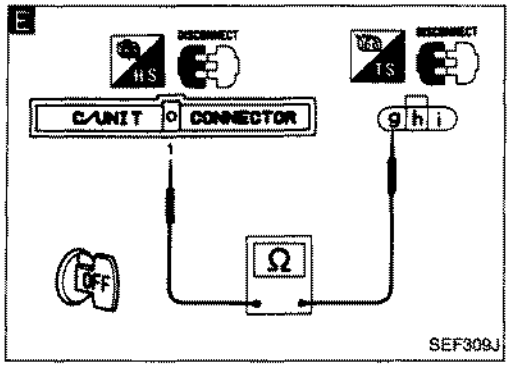
Diagnostic Procedure 26 (Cont'd)











INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect ignition coil harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors F34 , M56 (L.H.D. models)
- Harness connectors M31 , E104 (L.H.D. models)
- Harness connectors F18 , E15 (R.H.D. models)
- Harness continuity between ignition coil and ignition switch

If N.G., repair harness or connectors.

O.K. ↓

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect resistor harness connector.
3) Disconnect power transistor harness connector.

B 4) Check harness continuity between terminal ⓑ and terminals ⓒ , ⓘ .
Continuity should exist.

C 5) Check harness continuity between terminal ⓗ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

D

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between terminal ⓓ and E.C.U. terminal ③ .
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

E

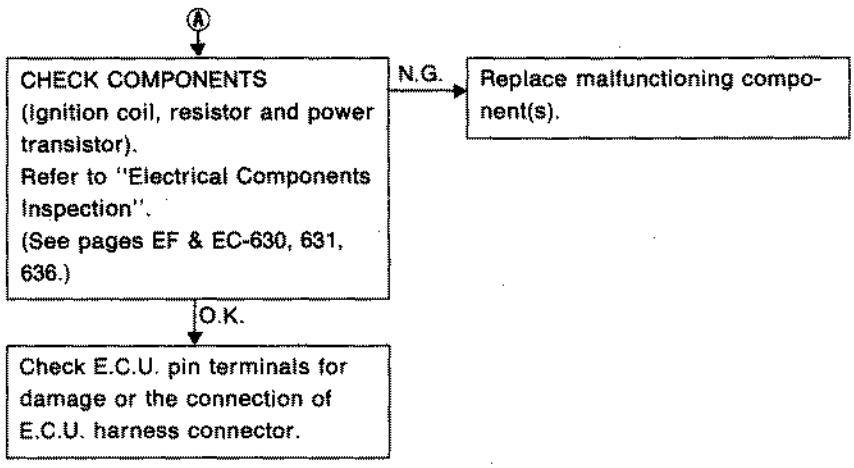
CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between terminal ⓖ and E.C.U. terminal ① .
Continuity should exist.

N.G. → Repair harness or connectors.

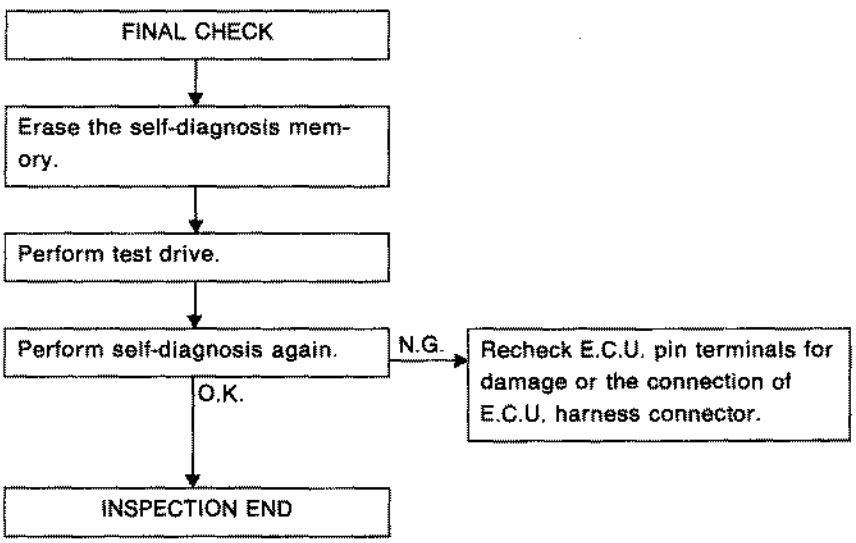
O.K. ↓

Ⓐ

Diagnostic Procedure 26 (Cont'd)



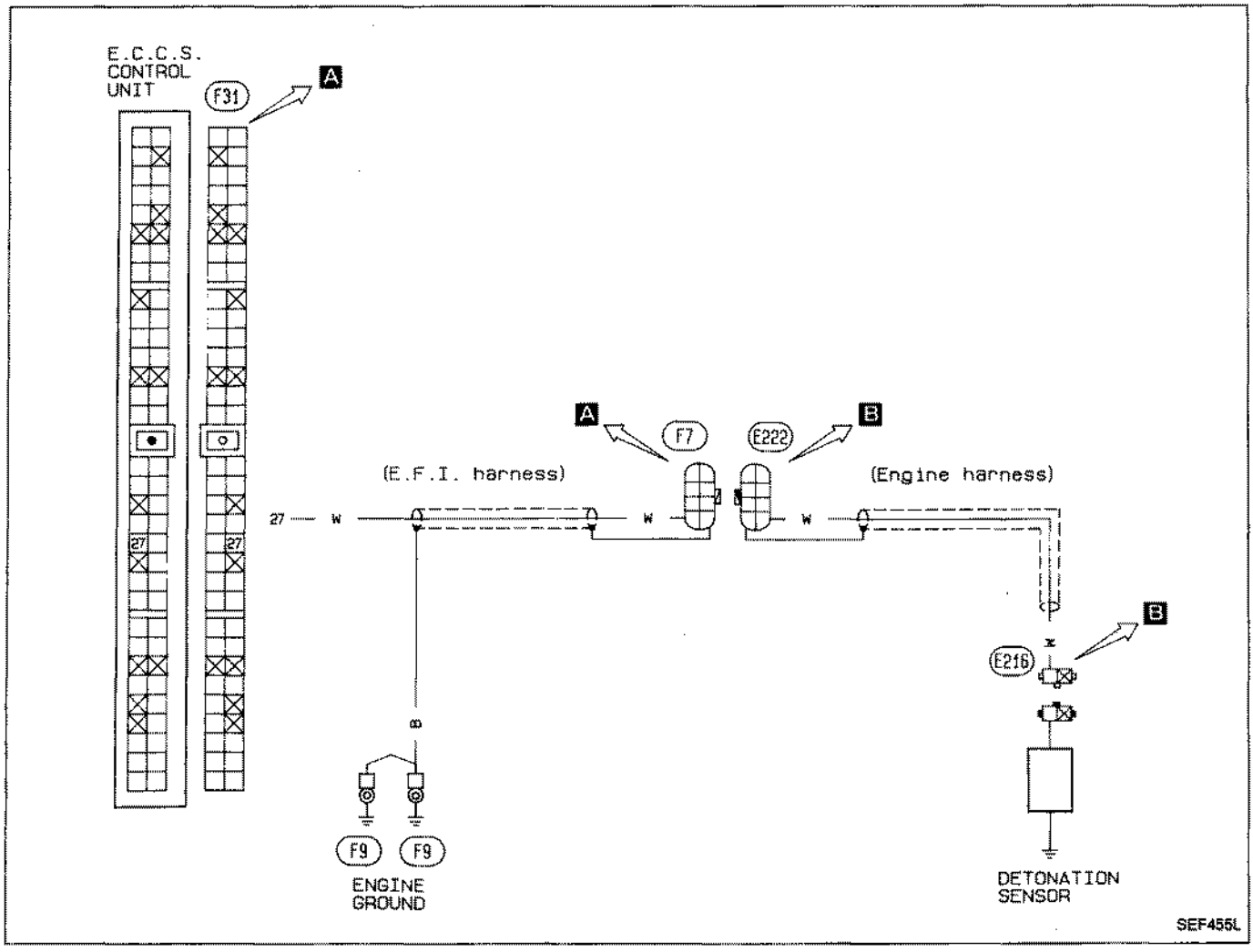
Perform FINAL CHECK by the following procedure after repair is completed.



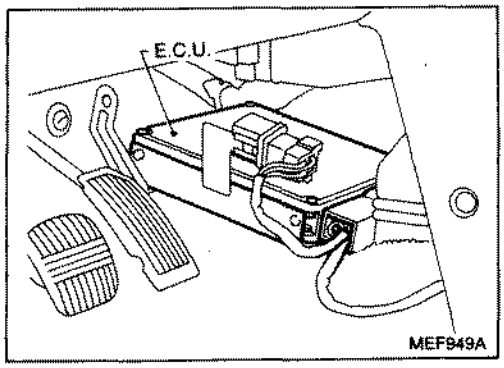
NOTE

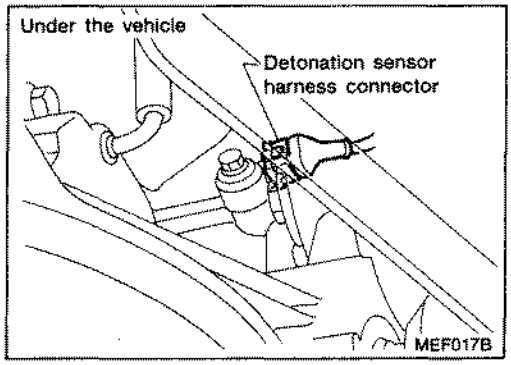
Diagnostic Procedure 27

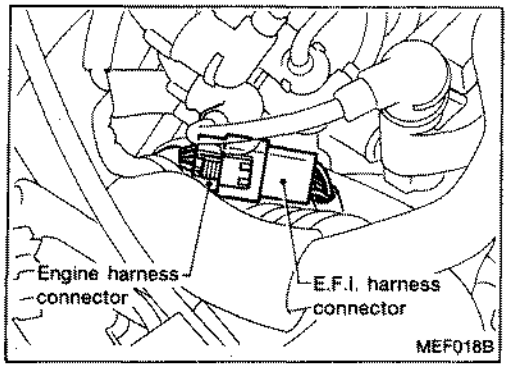
DETONATION SENSOR (Code No. 34)



Harness layout

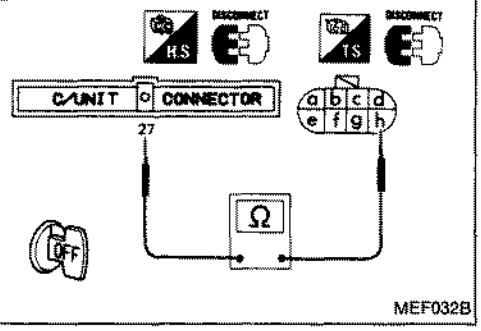






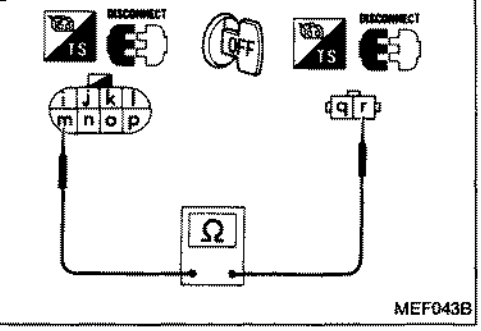
Diagnostic Procedure 27 (Cont'd)

A



MEF032B

B



MEF043B

INSPECTION START

CHECK INPUT SIGNAL CIRCUIT.
A 1) Disconnect E.C.U. harness connector, E.F.I. harness connector and engine harness connector.
2) Check harness continuity between terminal ⓗ and E.C.U. terminal ㉗.
Continuity should exist.
3) Disconnect detonation sensor harness connector.
B 4) Check harness continuity between terminal ⓜ and terminal ⓡ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT (Detonation sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-634.)

N.G. → Replace detonation sensor.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

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

FINAL CHECK

Erase the self-diagnosis memory.

Perform test drive.

Perform self-diagnosis again.

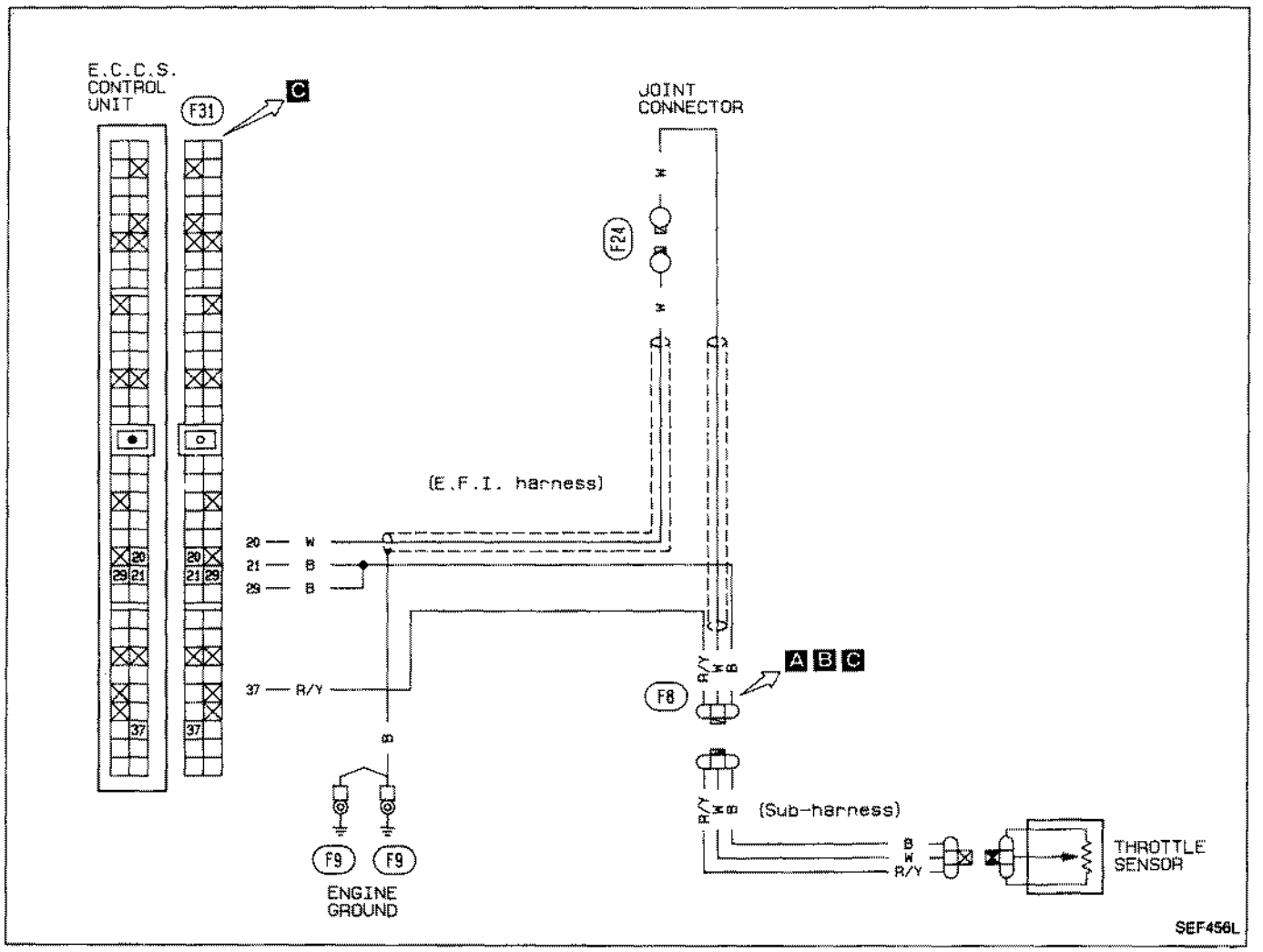
N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K.

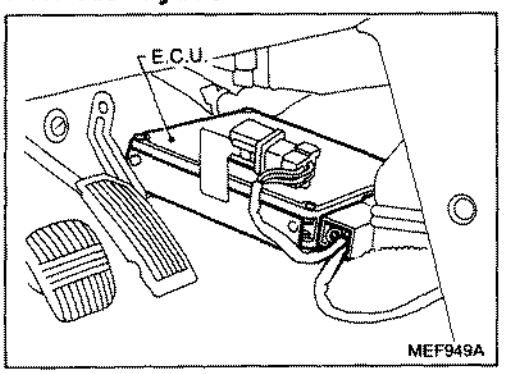
INSPECTION END

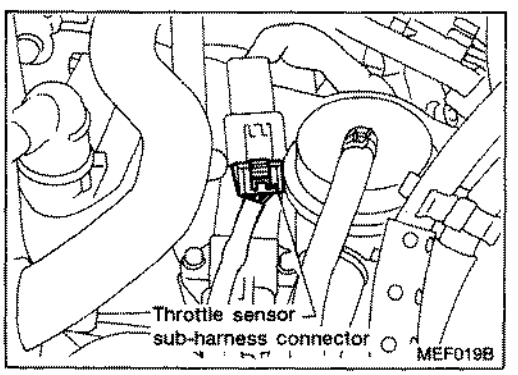
Diagnostic Procedure 28

THROTTLE SENSOR (Code No. 43)



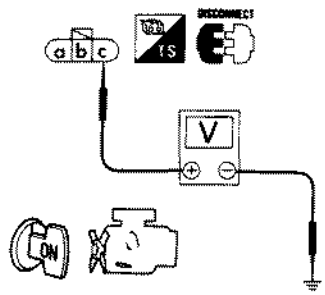
Harness layout





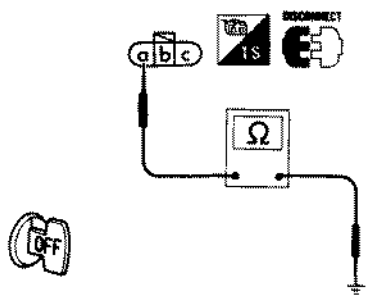
Diagnostic Procedure 28 (Cont'd)

A



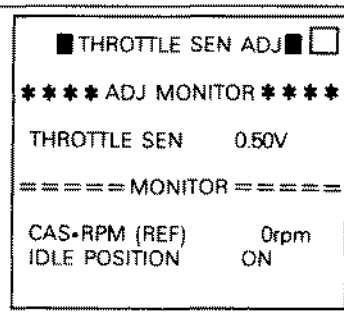
SEF033B

B



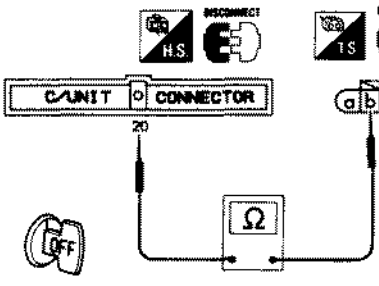
MEF034B

C



SEF275L

C



MEF035B

INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect throttle sensor sub-harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓒ and ground.
Voltage: Approximately 5V

N.G. → Repair harness or connectors.

O.K.

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

C

CHECK INPUT SIGNAL CIRCUIT.

1) Reconnect throttle sensor sub-harness connector.
2) Turn ignition switch "ON".
3) Read throttle sensor output voltage in "WORK SUPPORT" mode with CONSULT.
Throttle valve fully closed:
0.45 - 0.55V
Throttle valve fully open:
Approx. 4.0V

N.G. → Check the following.
- Joint connector (F24)
- Harness continuity between E.C.U. and throttle sensor

If N.G., repair harness or connectors.

OR

1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ⑳ and terminal ⓑ.
Continuity should exist.

O.K.

CHECK COMPONENT (Throttle sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-632.)

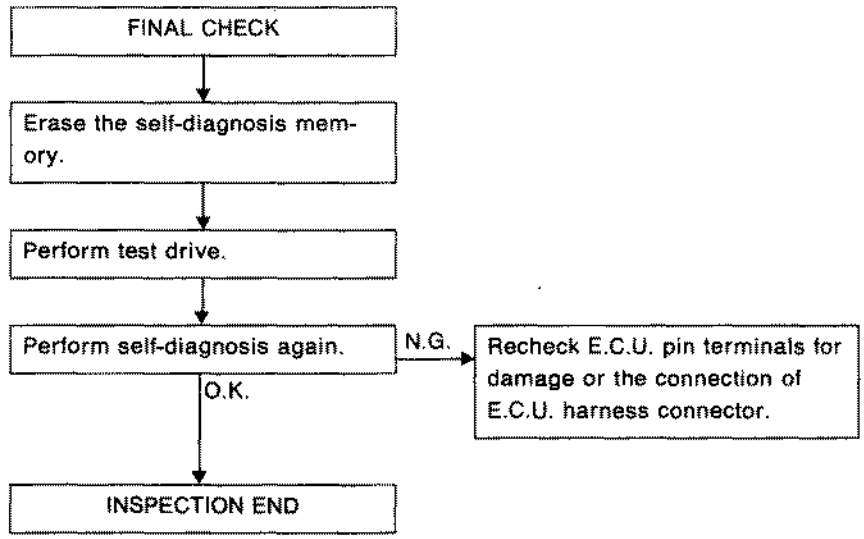
N.G. → Replace throttle sensor.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 28 (Cont'd)

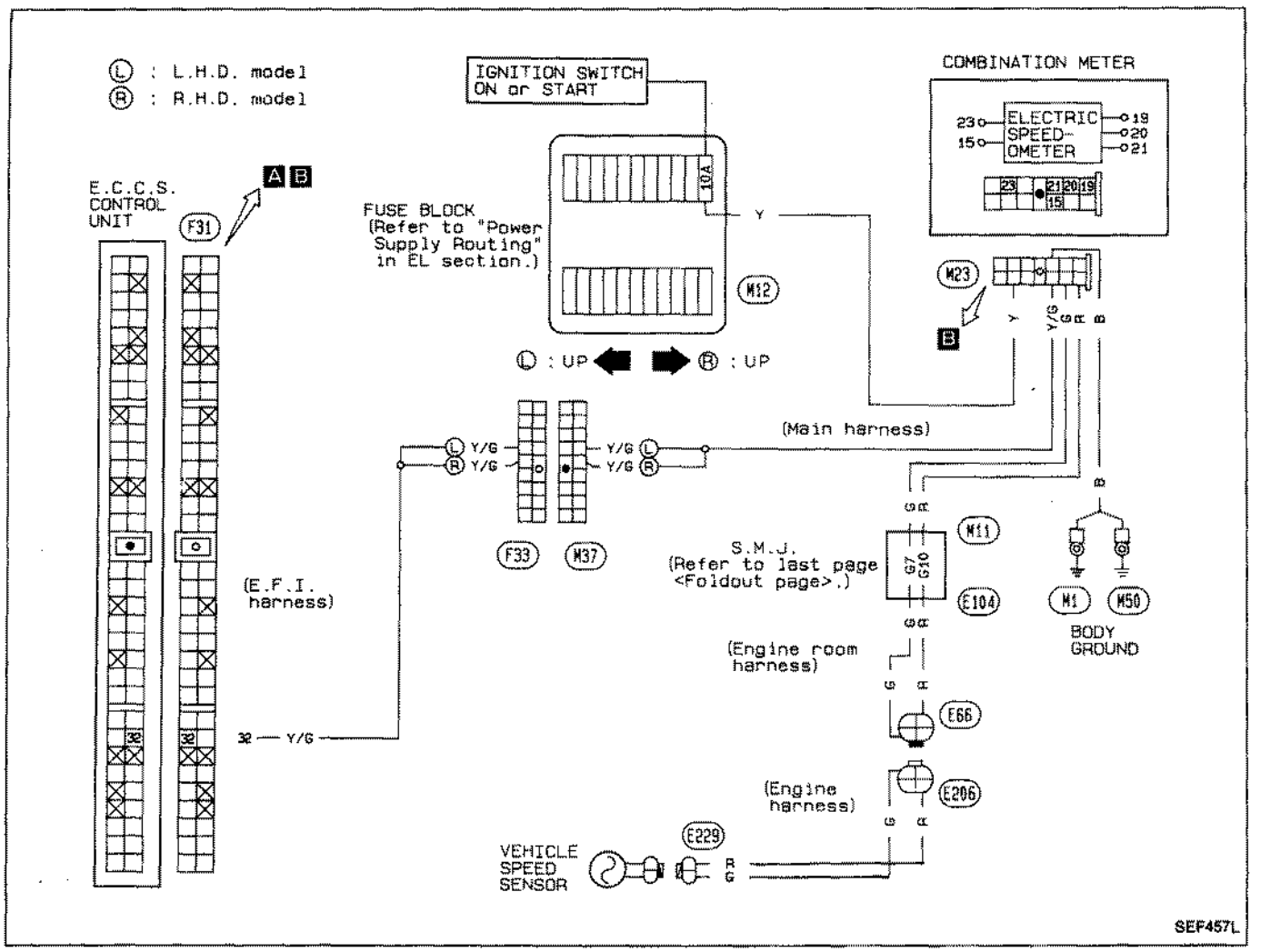
Perform FINAL CHECK by the following procedure after repair is completed.



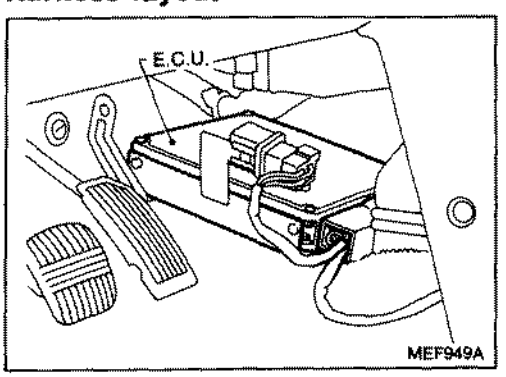
NOTE

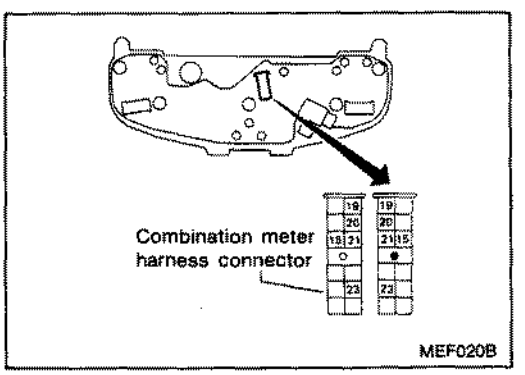
Diagnostic Procedure 29

VEHICLE SPEED SENSOR (Not self-diagnostic item)

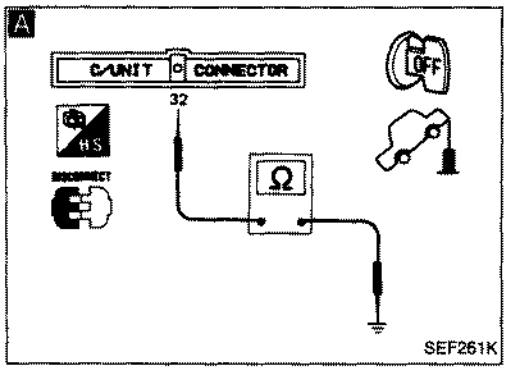


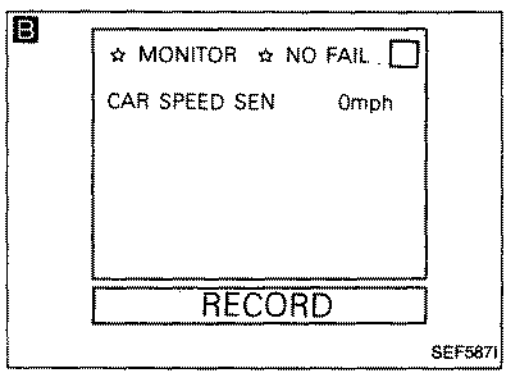
Harness layout

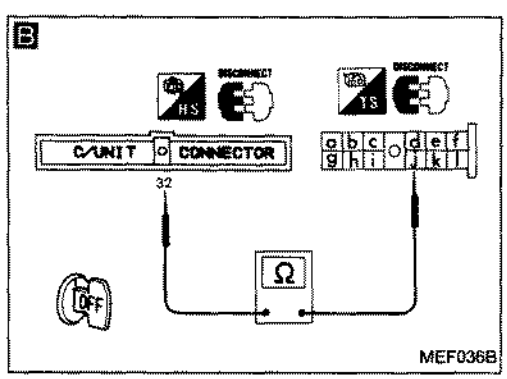




Diagnostic Procedure 29 (Cont'd)







INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Jack up front wheels.
2) Disconnect E.C.U. harness connector.
3) Rotate front wheel by hand.
4) Check harness continuity between E.C.U. terminal (32) and body ground.
Continuity should come and go.

O.K. → INSPECTION END

N.G.

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

N.G. → Check vehicle speed sensor and circuit.
(Refer to EL section.)

O.K.

B

CHECK INPUT SIGNAL CIRCUIT.
1) Reconnect E.C.U. harness connector.
2) Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT.
CONSULT value should be the same as the speedometer indication.

N.G. → Check the following.
- Harness connectors (F33), (M37)
- Harness continuity between E.C.U. and combination meter

If N.G., repair harness or connectors.

OR

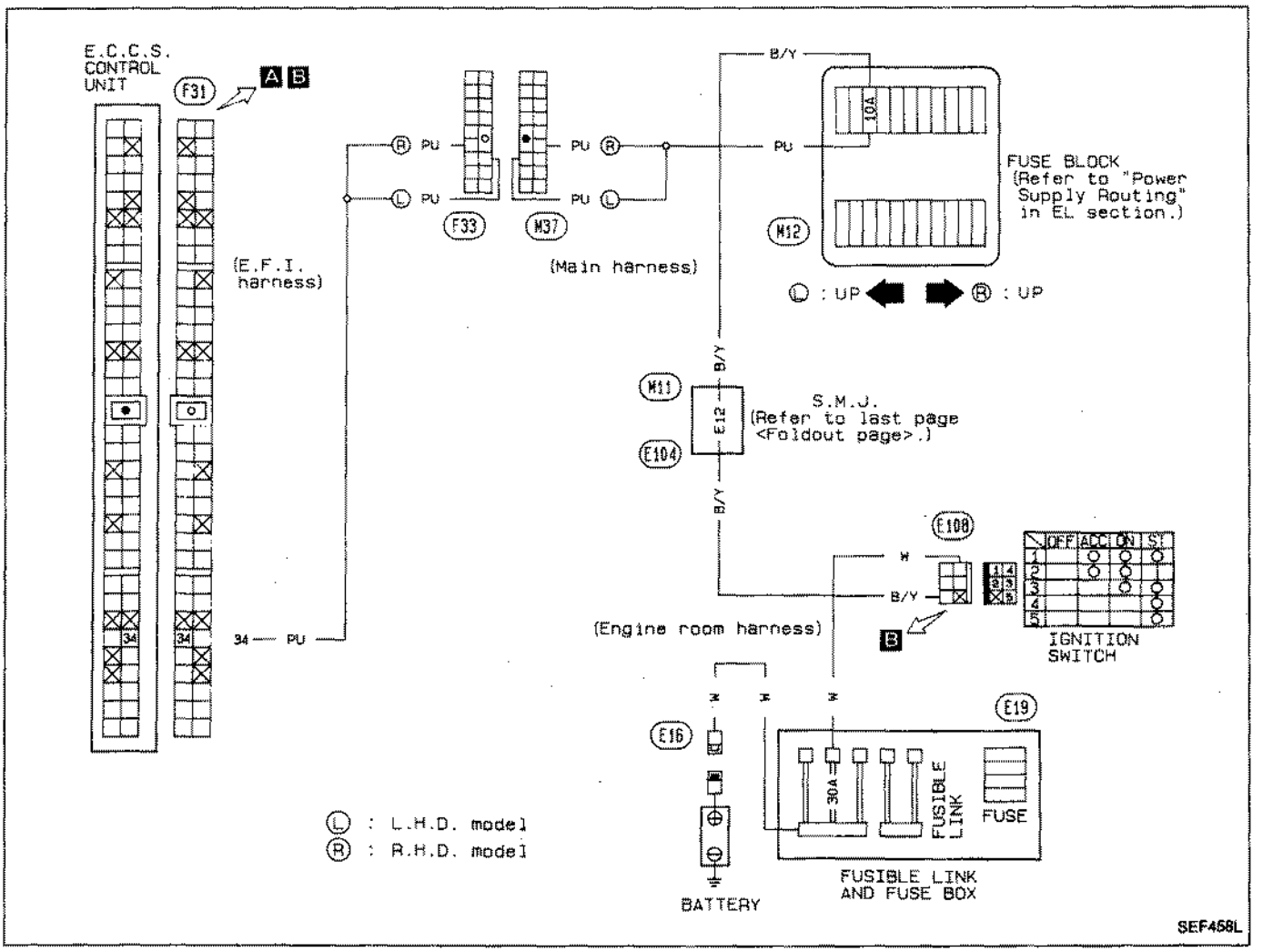
1) Turn ignition switch "OFF".
2) Disconnect combination meter harness connector.
3) Check harness continuity between E.C.U. terminal (32) and terminal (j).
Continuity should exist.

O.K.

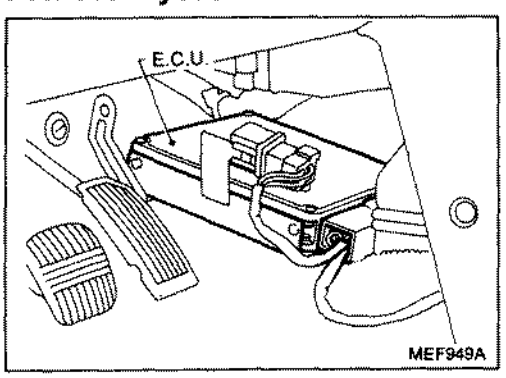
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 30

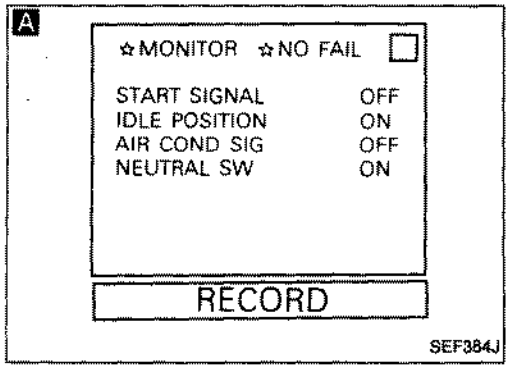
START SIGNAL (Not self-diagnostic item)

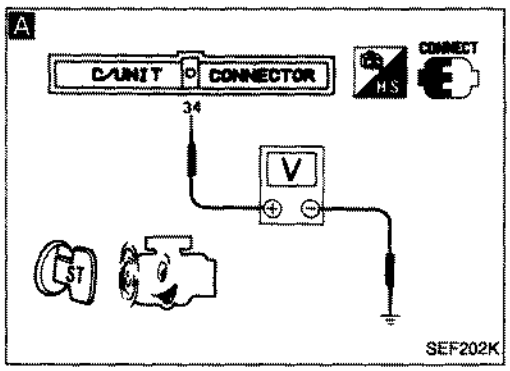


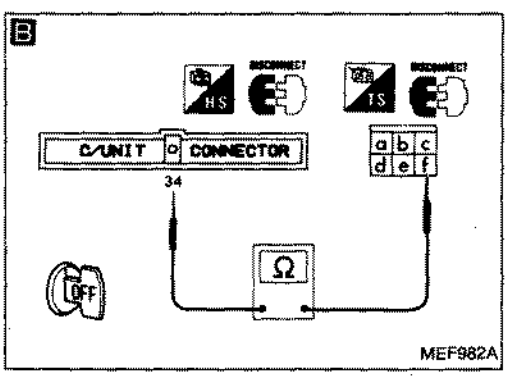
Harness layout



Diagnostic Procedure 30 (Cont'd)







INSPECTION START

A

CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON".
2) Check start signal in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

O.K. → INSPECTION END

OR

1) Turn ignition switch to "START".
2) Check voltage between E.C.U. terminal ㉞ and ground.

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

N.G.

B

CHECK INPUT SIGNAL CIRCUIT.

1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector and ignition switch harness connector.
3) Check harness continuity between E.C.U. terminal ㉞ and terminal ⓕ.

Continuity should exist.

N.G. → Check the following.
- Harness connectors (F33), (M57)
- Harness connectors (M11), (E104)
- 10A fuse
- Harness continuity between E.C.U. and ignition switch

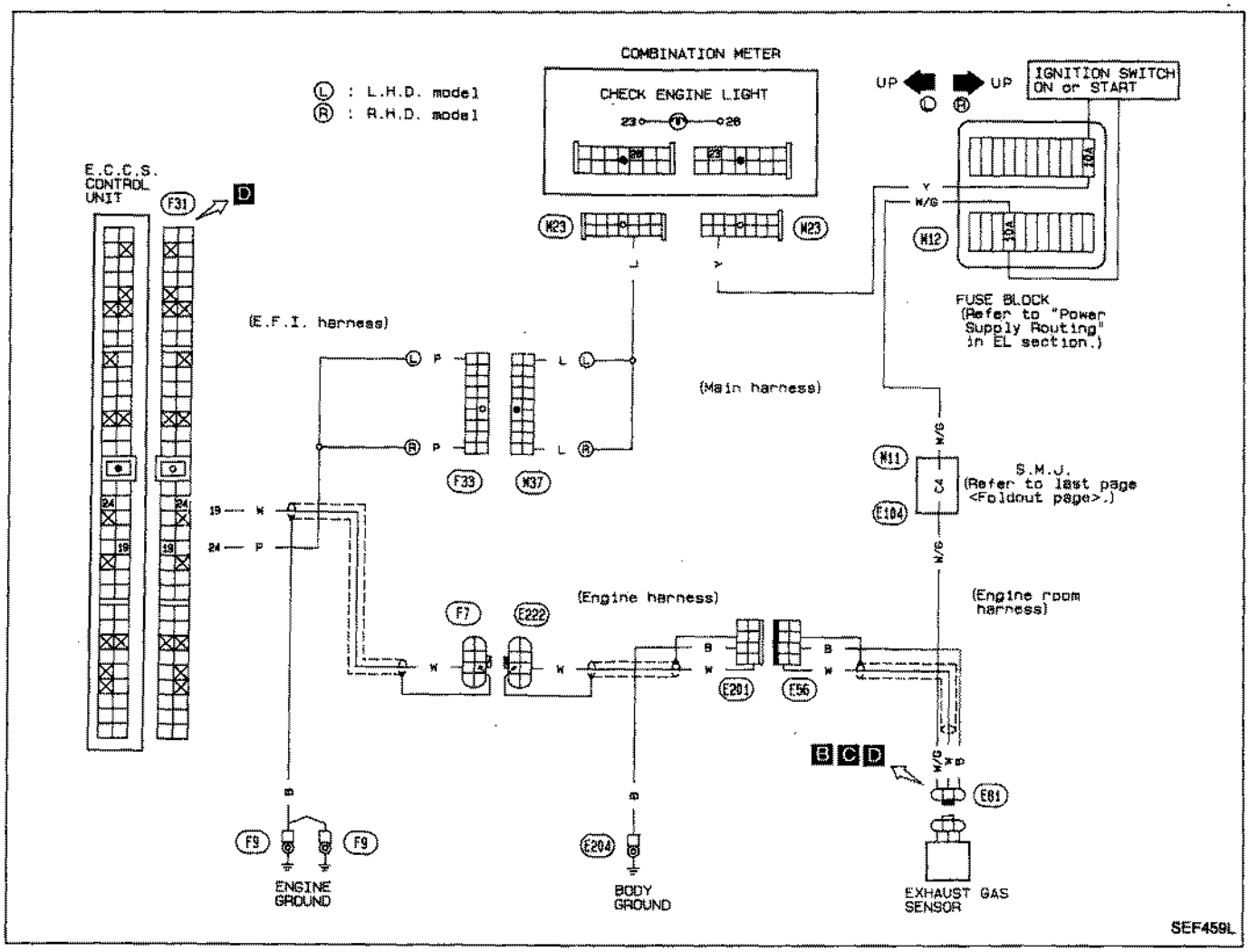
If N.G., repair harness or connectors.

O.K.

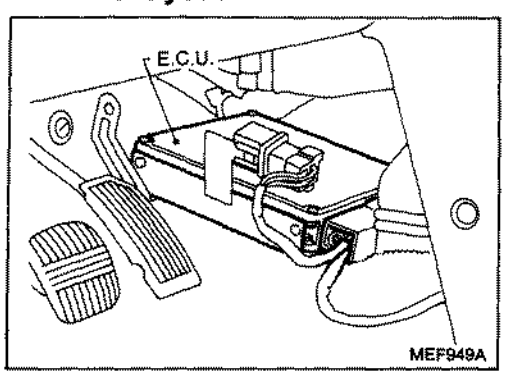
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

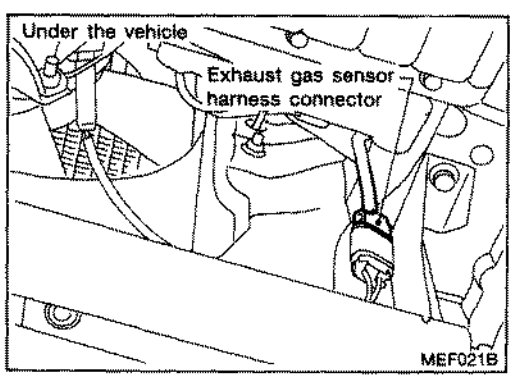
Diagnostic Procedure 31

EXHAUST GAS SENSOR (Not self-diagnostic item)



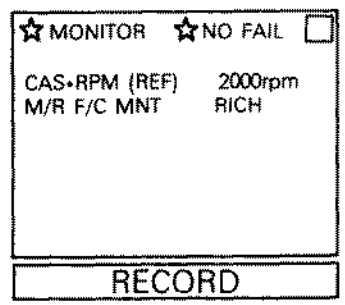
Harness layout





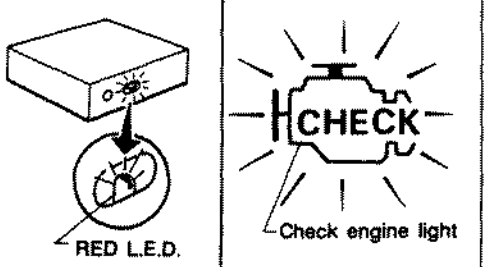
Diagnostic Procedure 31 (Cont'd)

A



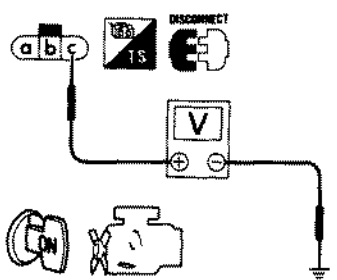
SEF818K

A



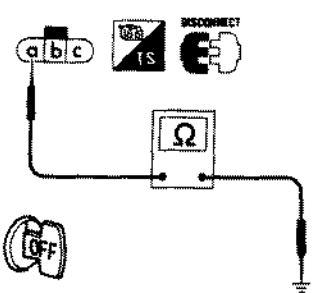
SEF621K

B



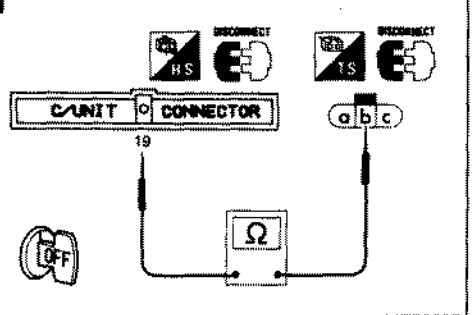
MEF037B

C



MEF038B

D



MEF039B

INSPECTION START

A

CHECK EXHAUST GAS SENSOR CIRCUIT.

1) Start engine and warm it up sufficiently.
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.

O.K. → INSPECTION END

OR

1) Start engine and warm it up sufficiently.
2) Run engine at about 2,000 rpm for about 2 minutes under no-load.
3) Set E.C.U. diagnosis mode to Mode II.
4) Keep engine speed at 2,000 rpm and make sure that the RED L.E.D. on E.C.U. or the check engine light on the instrument panel goes on and off more than 5 times during 10 seconds.

N.G. ↓

B

CHECK POWER SUPPLY.

1) Stop engine.
2) Disconnect exhaust gas sensor harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⑥ and ground.

Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M11) , (E14)
- 10A fuse
- Harness continuity between exhaust gas sensor and fuse

If N.G., repair harness or connectors.

O.K. ↓

C

CHECK GROUND CIRCUIT.

1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⑧ and body ground.

Continuity should exist.

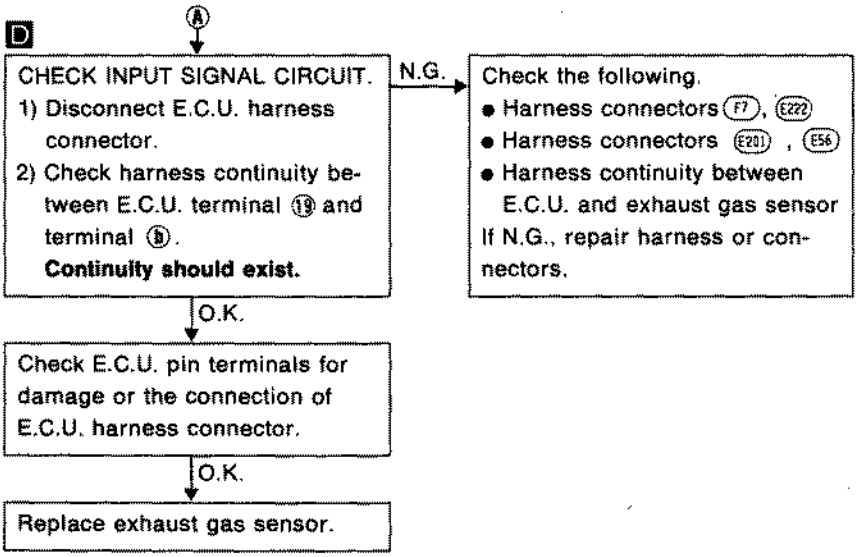
N.G. → Check the following.
- Harness connectors (E56) , (E28)
- Harness continuity between exhaust gas sensor and body ground

If N.G., repair harness or connectors.

O.K. ↓

Ⓐ

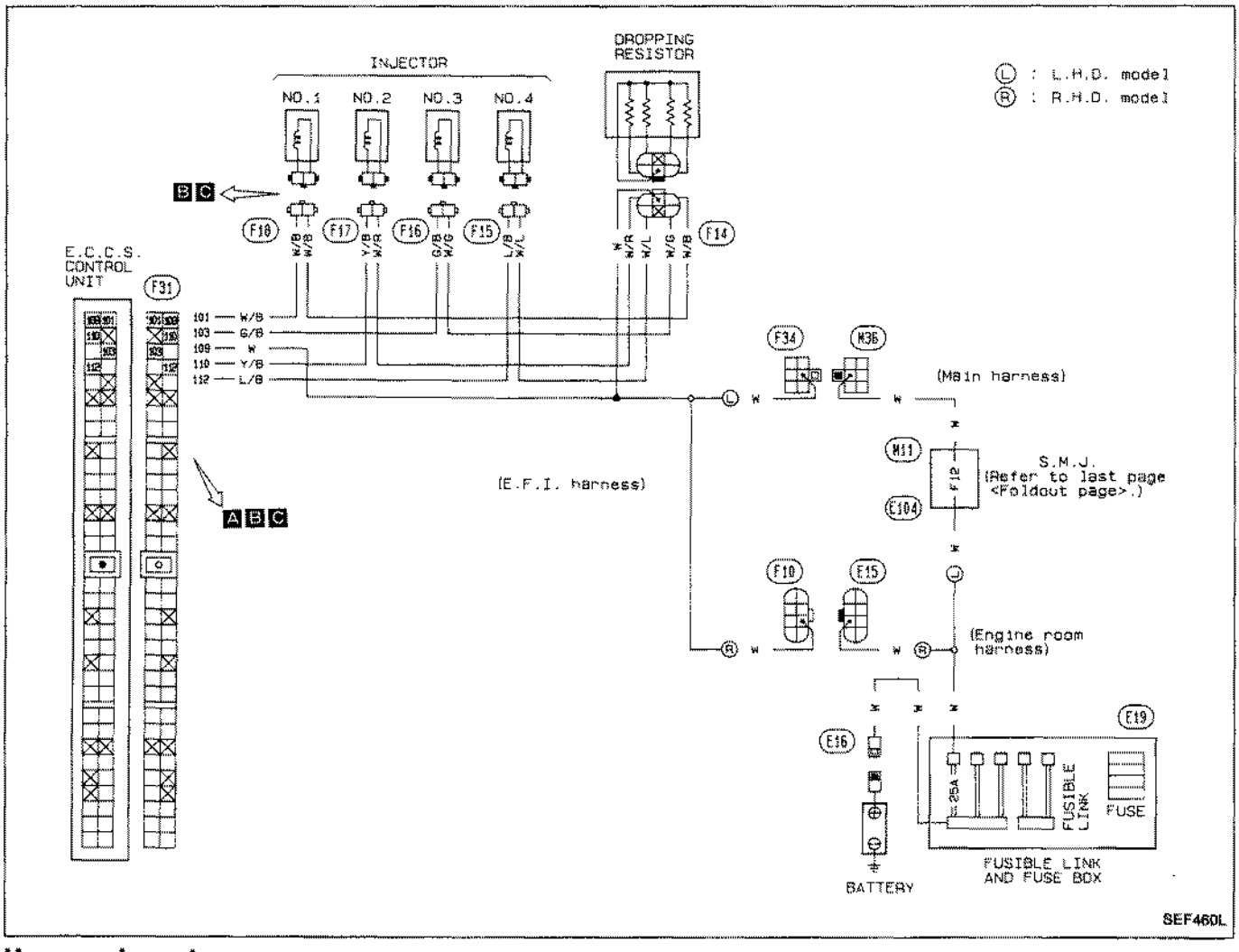
Diagnostic Procedure 31 (Cont'd)



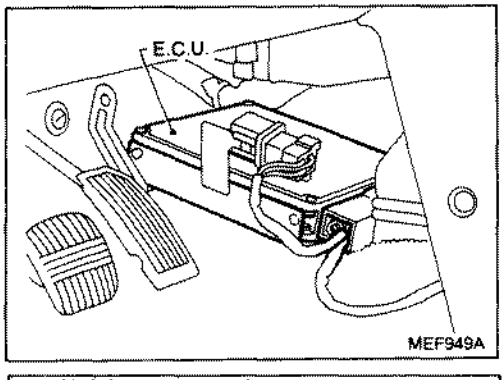
NOTE

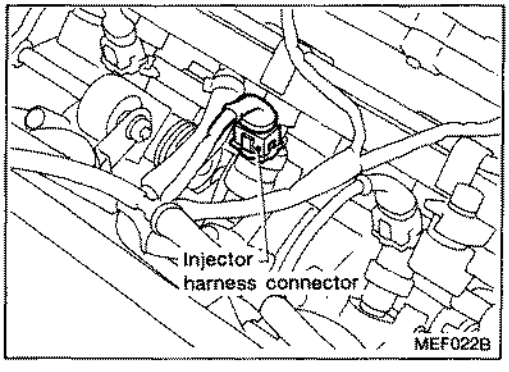
Diagnostic Procedure 32

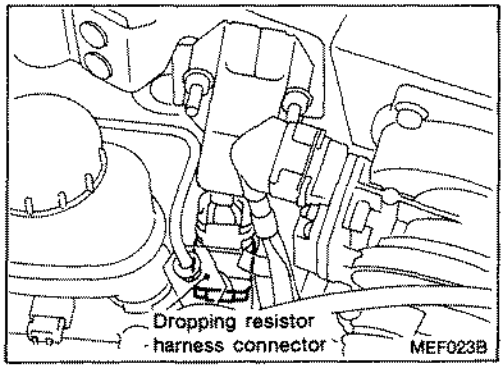
INJECTOR (Not self-diagnostic item)



Harness layout

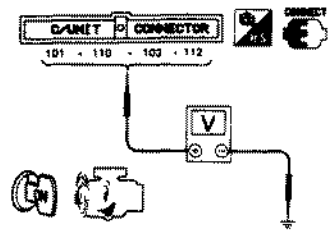






Diagnostic Procedure 32 (Cont'd)

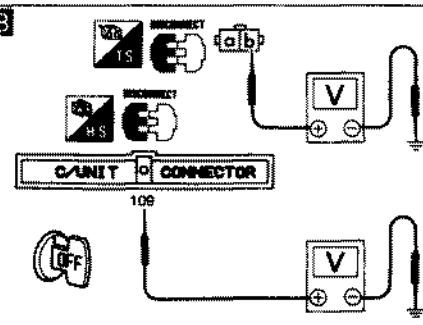
A



(101) : No. 1 cylinder (103) : No. 3 cylinder
(110) : No. 2 cylinder (112) : No. 4 cylinder

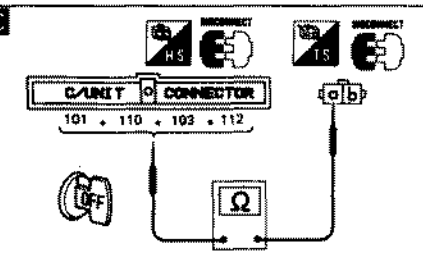
SEF974I

B



SEF205K

C



(101) : No. 1 cylinder (103) : No. 3 cylinder
(110) : No. 2 cylinder (112) : No. 4 cylinder

SEF206K

INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Start engine.
2) Check voltage between E.C.U. terminals (101), (110), (103), (112) and ground.
Voltage: Battery voltage

O.K. → INSPECTION END

N.G.

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect injector harness connector and E.C.U. harness connector.
3) Check voltage between terminal (b) and ground, E.C.U. terminal (109) and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F34), (M36) (L.H.D. models)
- Harness connectors (M11), (E104) (L.H.D. models)
- Harness connectors (F10), (E15) (R.H.D. models)
- 25A fusible link
- Dropping resistor
  Refer to "Electrical Components Inspection". (See page EF & EC-636.)
- Harness continuity between battery and injector
- Harness continuity between battery and E.C.U.

If N.G., repair harness or connectors.

O.K.

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between terminal (g) and E.C.U. terminals (101), (110), (103), (112).
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT (Injector).
Refer to "Electrical Components Inspection". (See page EF & EC-635.)

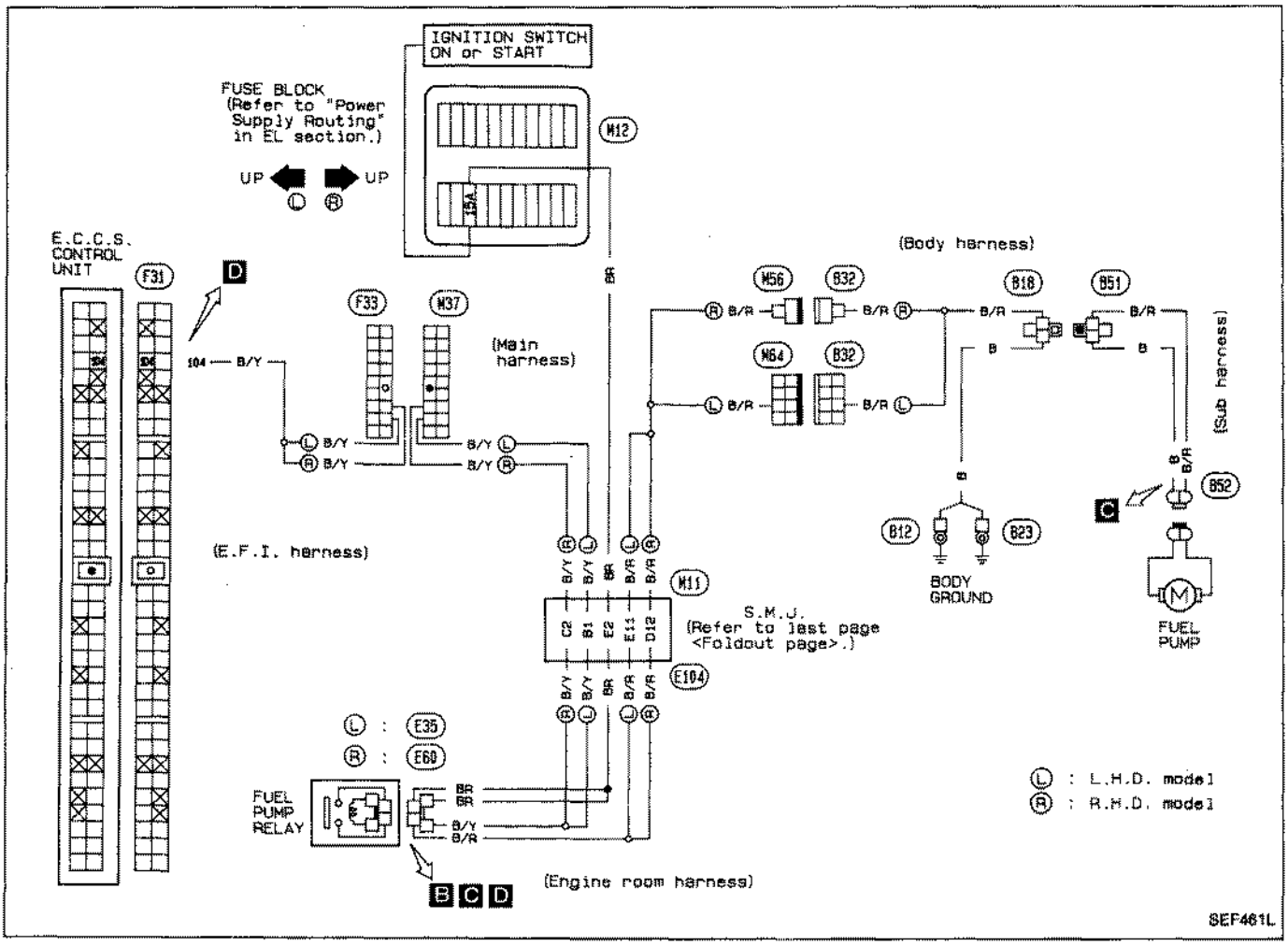
N.G. → Replace injector.

O.K.

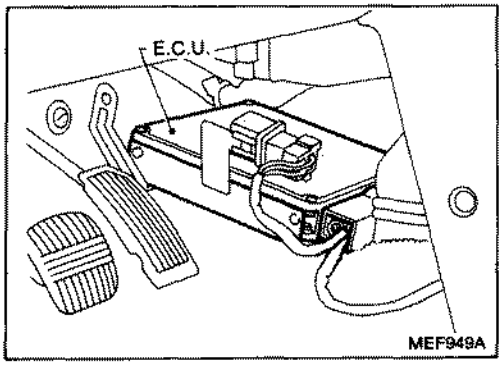
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

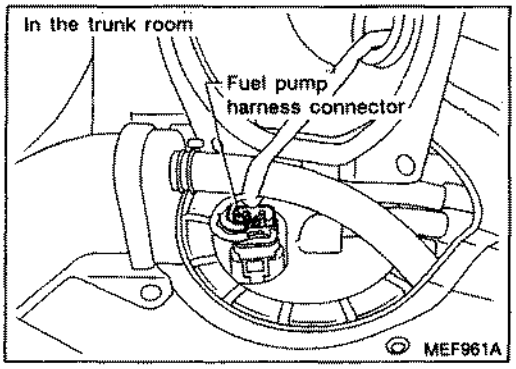
Diagnostic Procedure 33

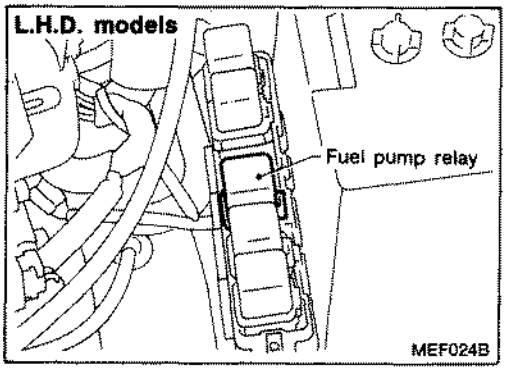
FUEL PUMP (Not self-diagnostic item)

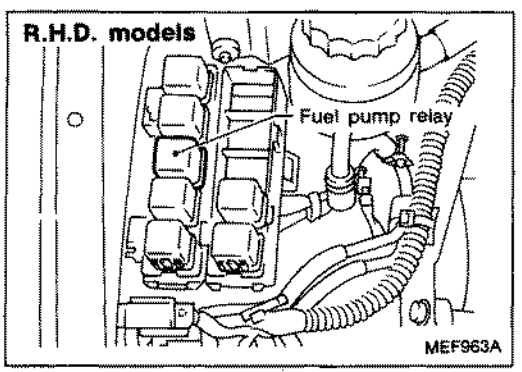


Harness layout



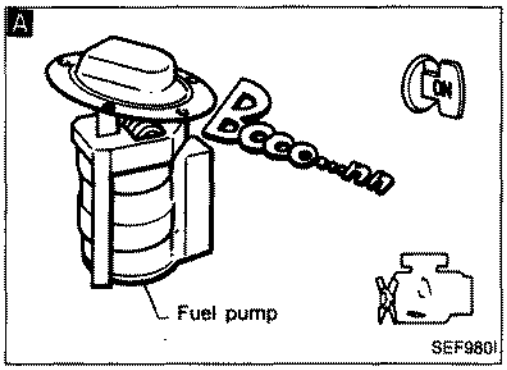






Diagnostic Procedure 33 (Cont'd)

A



INSPECTION START

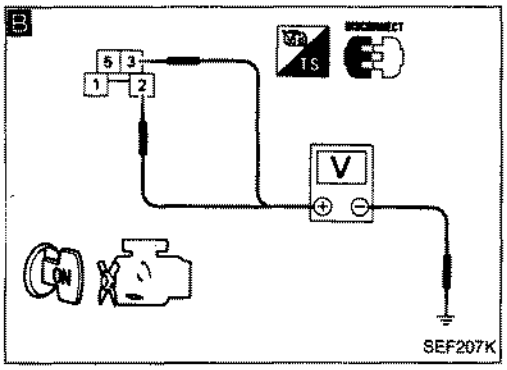
A

CHECK OVERALL FUNCTION.
1) Turn ignition switch "ON".
2) Listen to fuel pump operating sound.
Fuel pump should operate for 1 second after ignition switch is turned "ON".

O.K. → INSPECTION END

N.G.

B



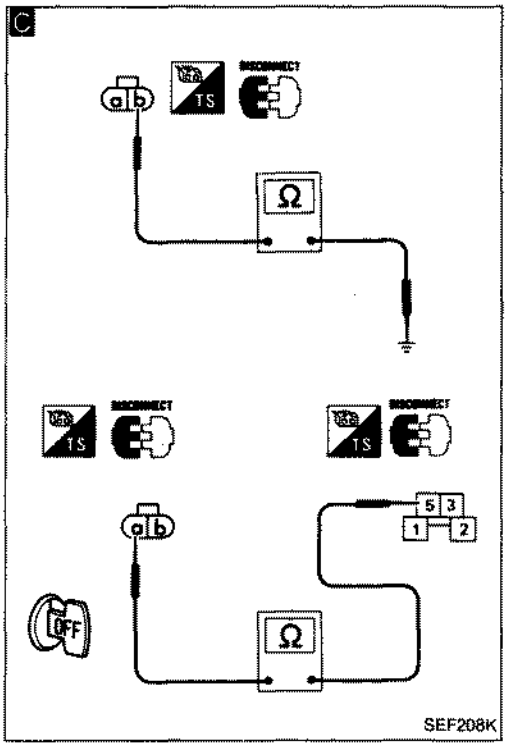
CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect fuel pump relay.
3) Turn ignition switch "ON".
4) Check voltage between terminals ②, ③ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M11), (E104)
- 15A fuse
- Harness continuity between fuse and fuel pump relay

If N.G., repair harness or connectors.

O.K.

C



CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect fuel pump harness connector.
3) Check harness continuity between terminal ⓑ and body ground, terminal ⓐ and terminal ⑤.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (B18), (B51)
- Harness connectors (M11), (E104)
- Harness connectors (M64), (B32) (L.H.D. models)
- Harness connectors (M56), (B32) (R.H.D. models)
- Harness continuity between fuel pump and body ground
- Harness continuity between fuel pump and fuel pump relay

If N.G., repair harness or connectors.

O.K.

D

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal (104) and terminal ①.
Continuity should exist.

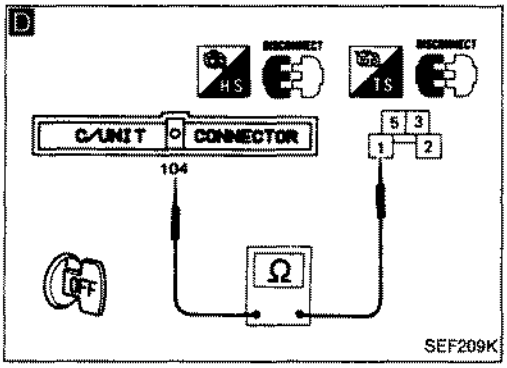
N.G. → Check the following:
- Harness connectors (F35), (M37)
- Harness connectors (M11), (E104)
- Harness continuity between E.C.U. and fuel pump relay

If N.G., repair harness or connectors.

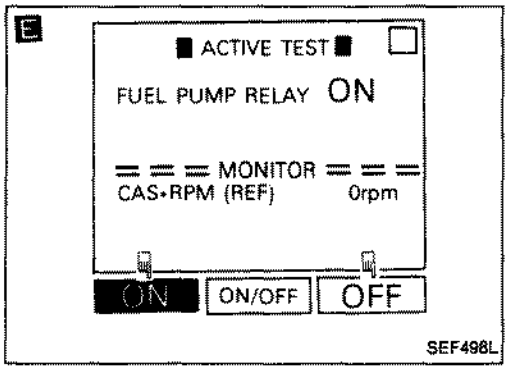
O.K.

Ⓐ

D



Diagnostic Procedure 33 (Cont'd)



E

CHECK COMPONENT
(Fuel pump relay).

1) Reconnect fuel pump relay, fuel pump harness connector and E.C.U. harness connector.
2) Ignition switch "ON".
3) Turn fuel pump relay "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

N.G. → Replace fuel pump relay.

OR

Refer to "Electrical Components Inspection". (See page EF & EC-635.)

O.K.

CHECK COMPONENT
(Fuel pump).
Refer to "Electrical Components Inspection".
(See page EF & EC-631.)

N.G. → Replace fuel pump.

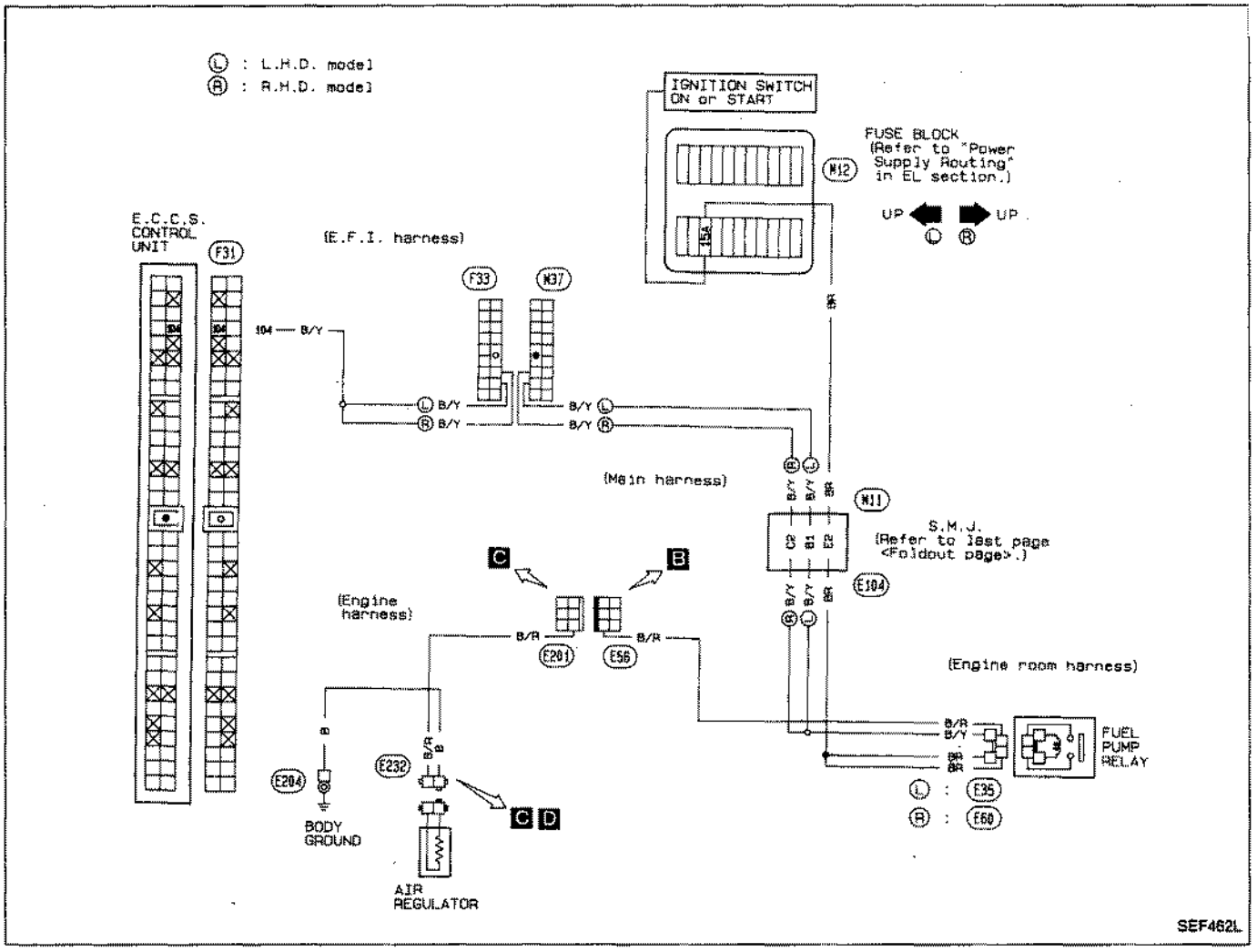
O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

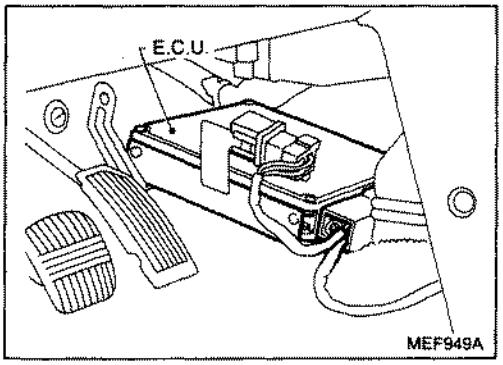
NOTE

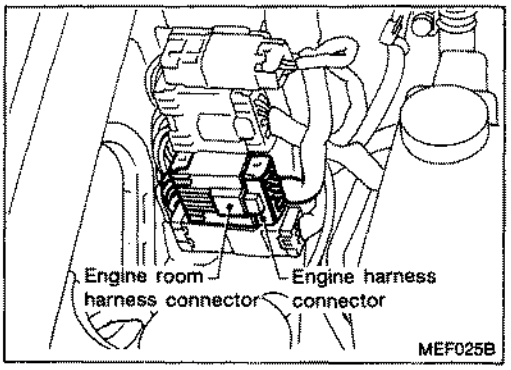
Diagnostic Procedure 34

AIR REGULATOR (Not self-diagnostic item)



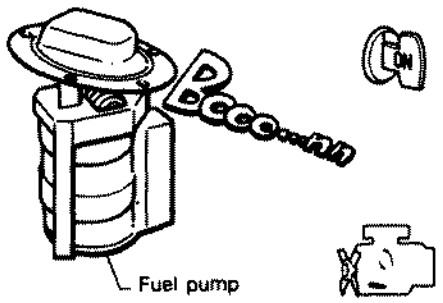
Harness layout



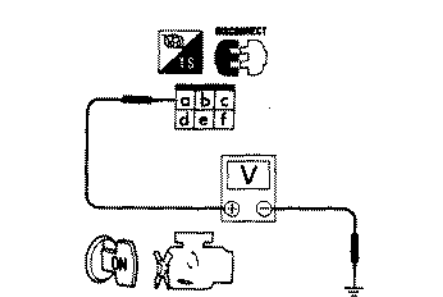


Diagnostic Procedure 34 (Cont'd)

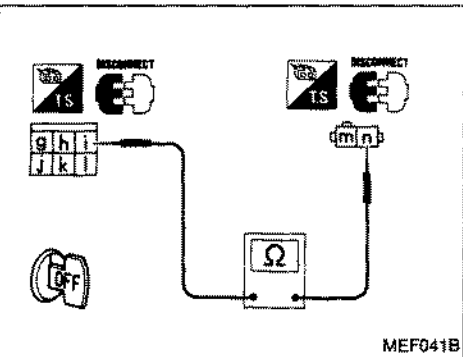
A



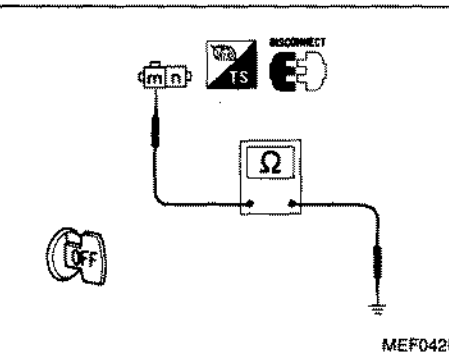
B



C



D



INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Turn ignition switch "ON".
2) Listen to fuel pump operating sound.
Fuel pump should operate for 1 second after ignition switch is turned "ON".

N.G. → Check fuel pump control circuit. (See page EF & EC-596.)

O.K.

CHECK POWER SUPPLY.
B 1) Turn ignition switch "OFF".
2) Disconnect engine room harness connector and engine harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ and ground.
Battery voltage should exist for 1 second after ignition switch is turned "ON".
5) Turn ignition switch "OFF".
6) Disconnect air regulator harness connector.
C 7) Check harness continuity between terminal ⓘ and terminal ⓝ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

D

CHECK GROUND CIRCUIT.
1) Check harness continuity between terminal ⓜ and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT (Air regulator).
Refer to "Electrical Components Inspection".
(See page EF & EC-634.)

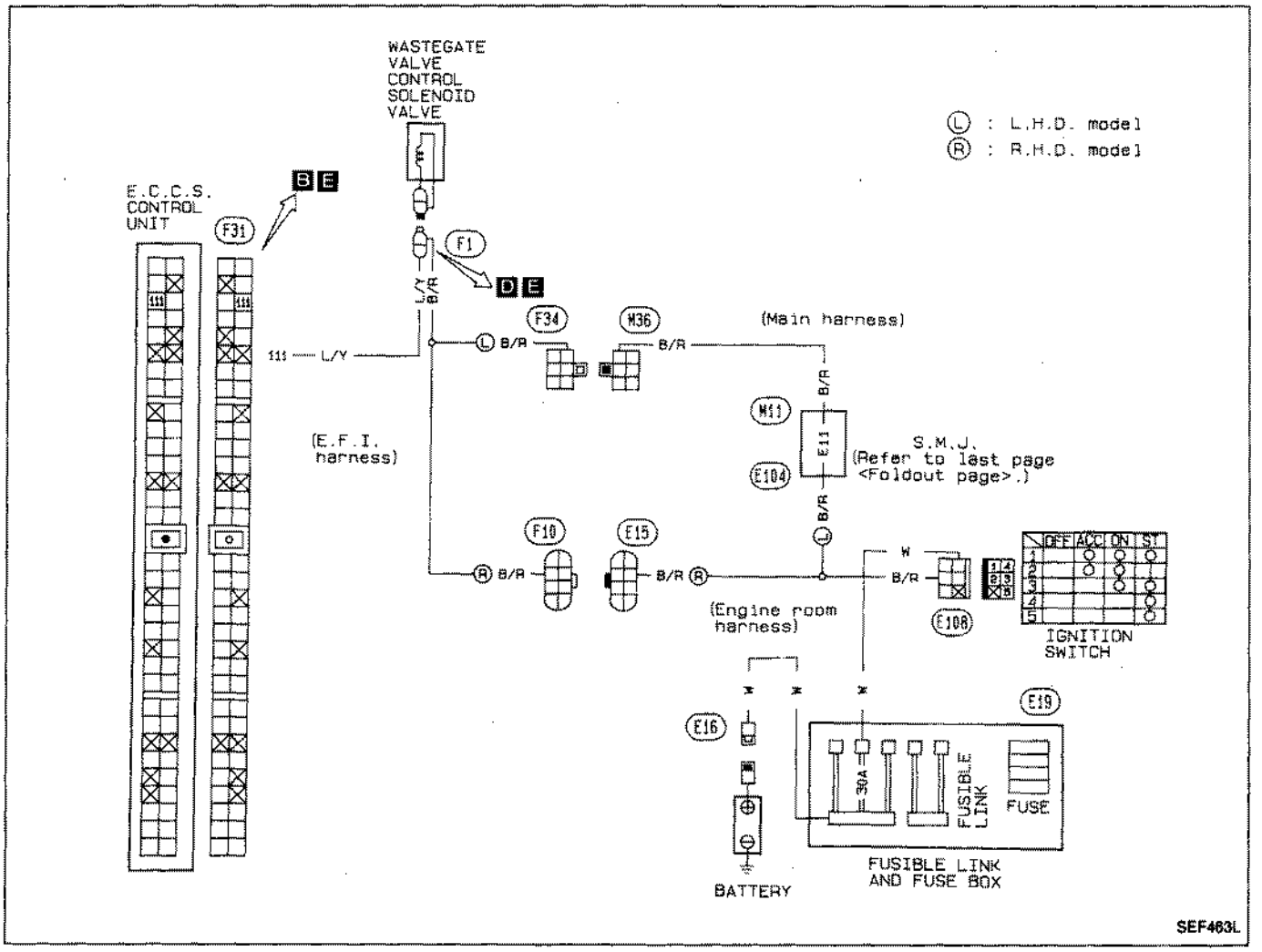
N.G. → Replace air regulator.

O.K.

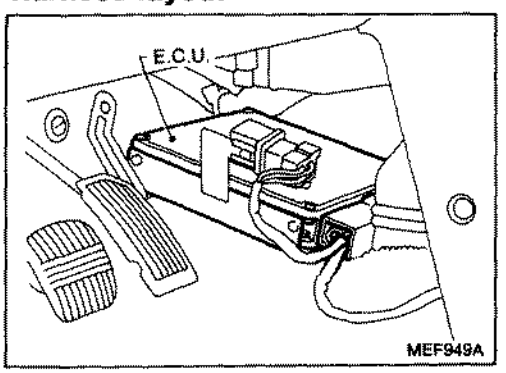
INSPECTION END

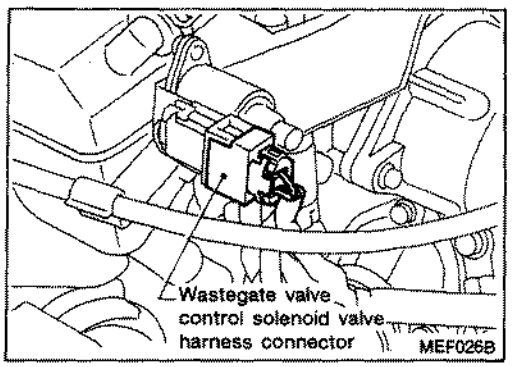
Diagnostic Procedure 35

WASTEGATE VALVE CONTROL (Not self-diagnostic item)



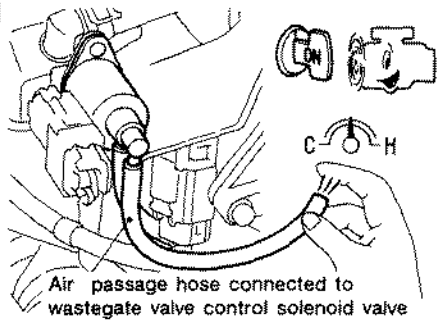
Harness layout



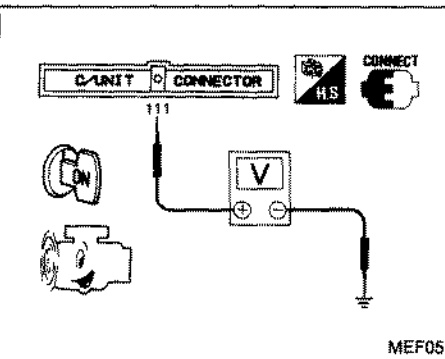


Diagnostic Procedure 35 (Cont'd)

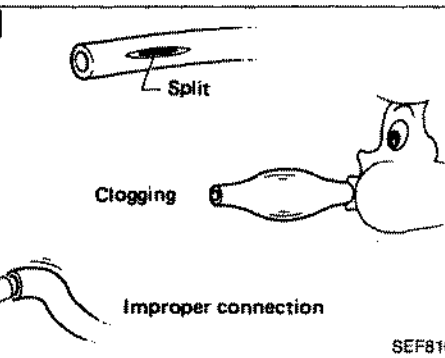
A



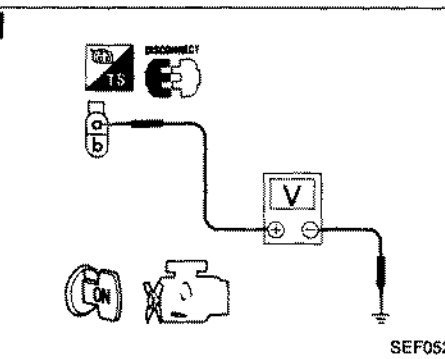
B



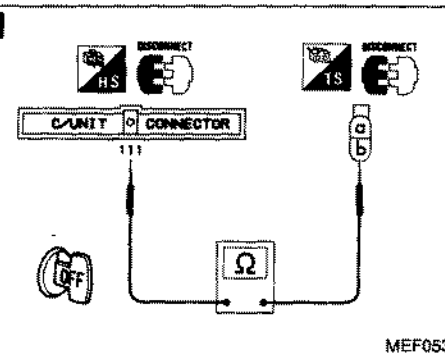
C



D



E



INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Perform self-diagnosis. Make sure that Code No. 34 is not displayed.
3) Stop engine.
4) Disconnect air passage hose to wastegate valve control solenoid valve and restart engine.
5) Make sure that boost pressure exists under the following conditions.
At idle:
Boost pressure should not exist.
When accelerator pedal is quickly depressed and released:
Boost pressure should exist.

O.K. → CHECK COMPONENT (Wastegate valve actuator).
Refer to "Electrical Components Inspection".
(See page EF & EC-637.)
If N.G., replace wastegate valve actuator.

O.K. → INSPECTION END

N.G.

B

CHECK CONTROL FUNCTION.
1) Check voltage between E.C.U. terminal (11) and ground under the following conditions.
Voltage:
At idle
Battery voltage
When accelerator pedal is quickly depressed and released
Approximately 0 - 1.0V

O.K. → **C**
Check air passage hose for clogging, cracks and proper connection.

N.G.

D

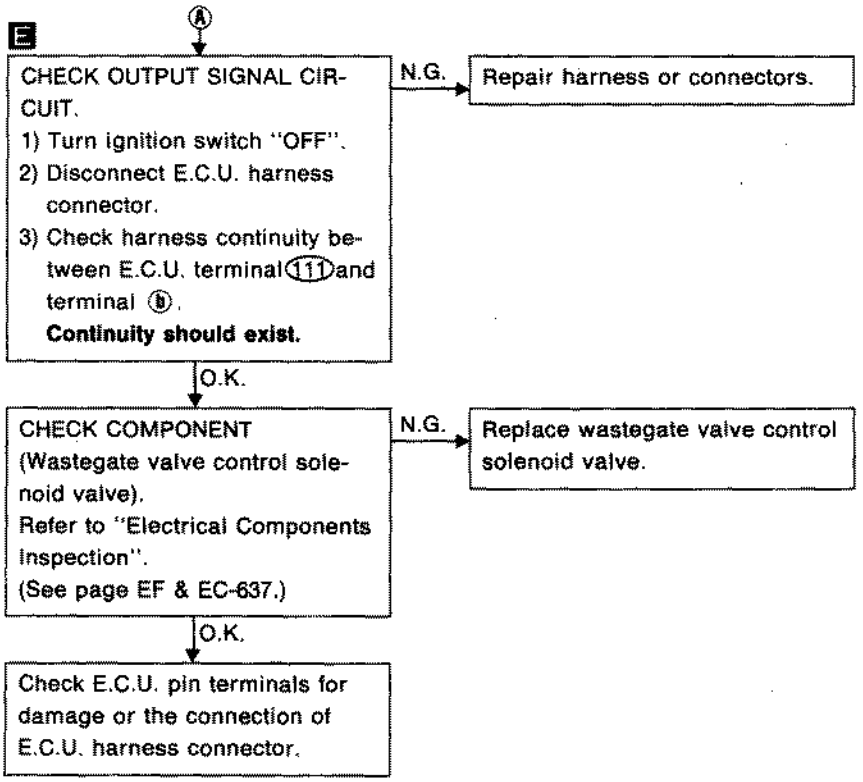
CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect wastegate valve control solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F34), (R36) (L.H.D. models)
- Harness connectors (M11), (E104) (L.H.D. models)
- Harness connectors (F10), (E15) (R.H.D. models)
- Harness continuity between wastegate valve control solenoid valve and ignition switch.

If N.G., repair harness or connectors.

O.K. → Ⓐ

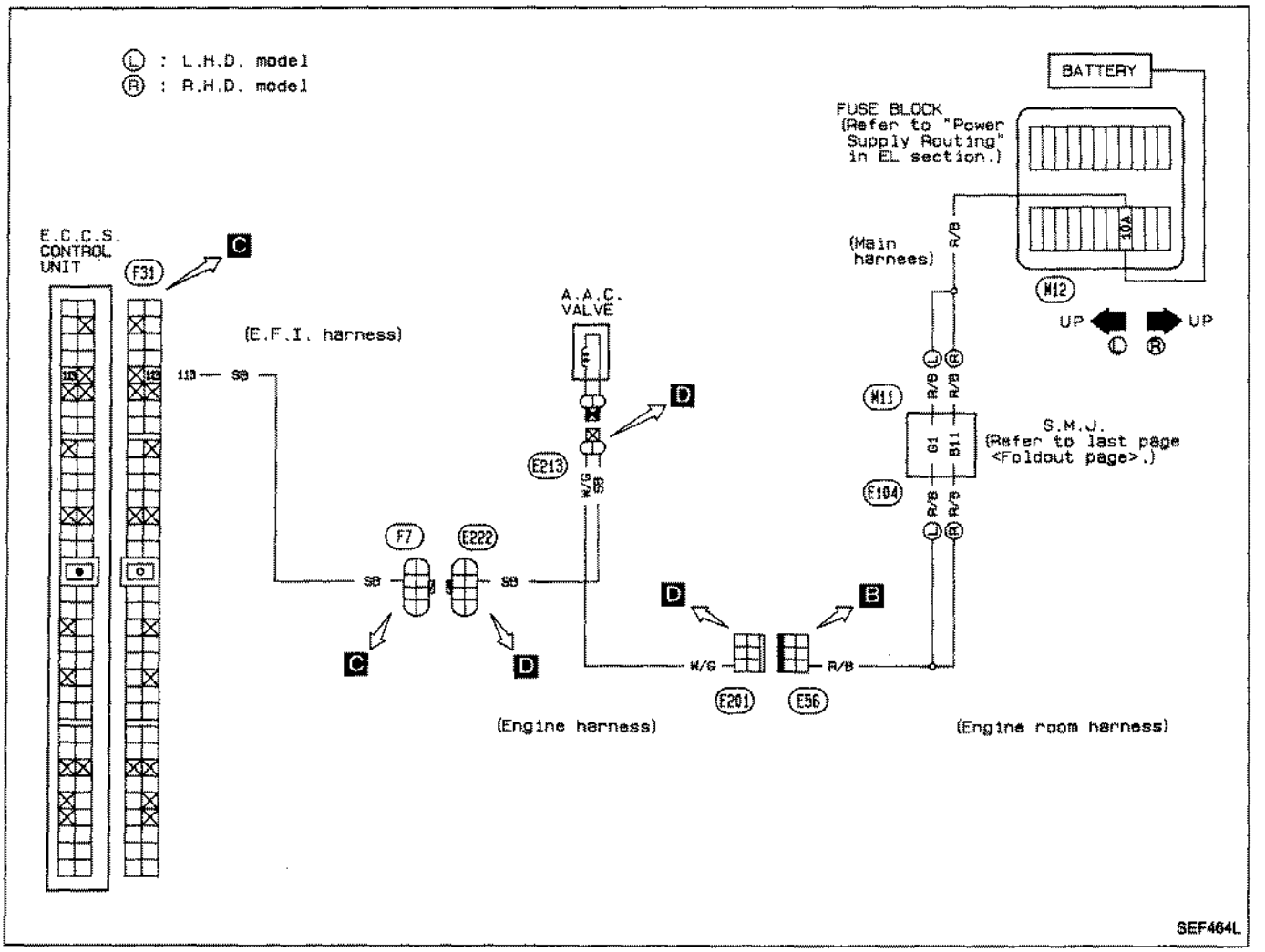
Diagnostic Procedure 35 (Cont'd)



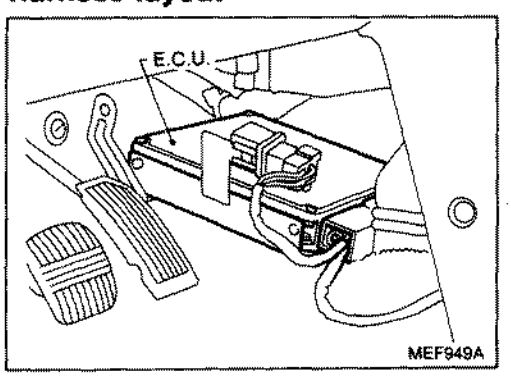
NOTE

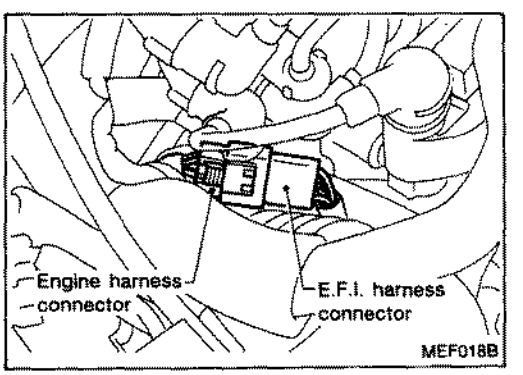
Diagnostic Procedure 36

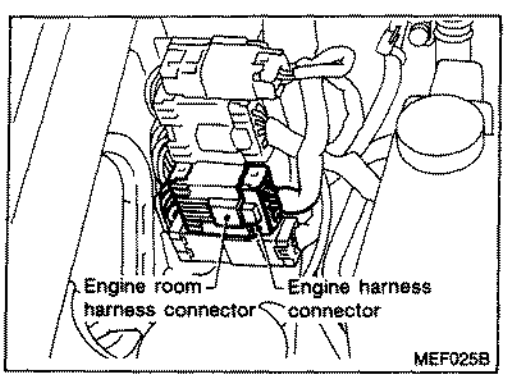
A.A.C. VALVE (Not self-diagnostic item)



Harness layout

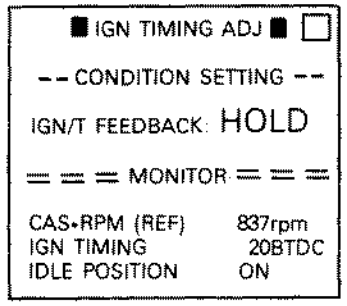






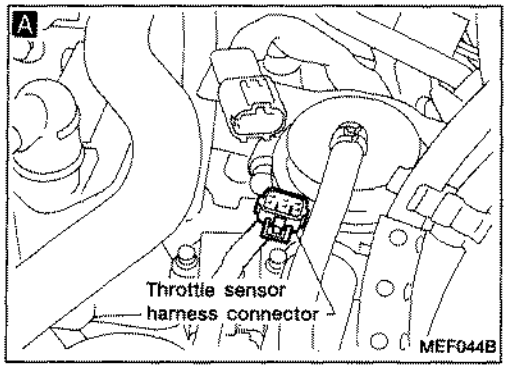
Diagnostic Procedure 36 (Cont'd)

A



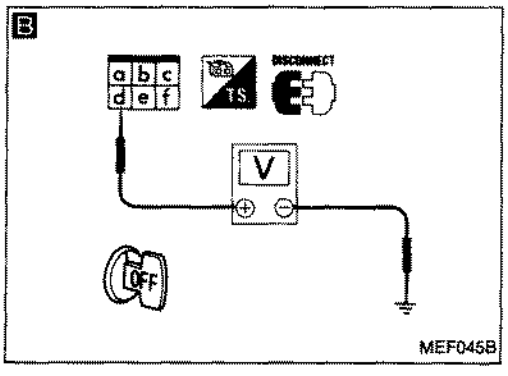
SEF322L

A



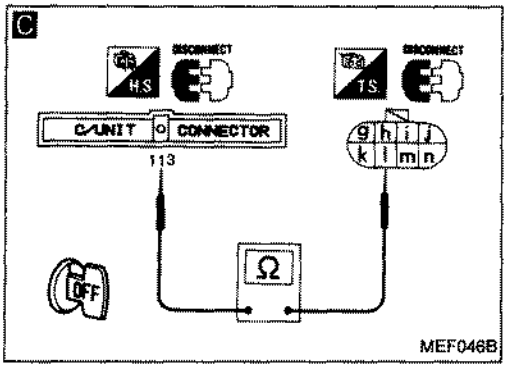
MEF044B

B



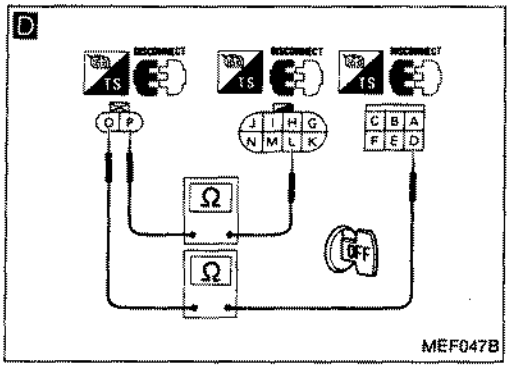
MEF045B

C



MEF046B

D



MEF047B

INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check idle speed.
925 $^{+25}_{-75}$ rpm

3)● Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode.
● Disconnect throttle sensor sub-harness connector.
4) Make sure that idle speed drops.

O.K. → INSPECTION END

N.G.

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect engine room harness connector and engine harness connector.
3) Check voltage between terminal ⓓ and ground.
Voltage: Battery voltage

N.G. → Check the following.
● Harness connectors (M1), (E104)
● 10A fuse
● Harness continuity between engine room harness connector and fuse
If N.G., repair harness or connectors.

O.K.

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector, E.F.I. harness connector and engine harness connector.
2) Check harness continuity between E.C.U. terminal (113) and terminal Ⓘ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

D

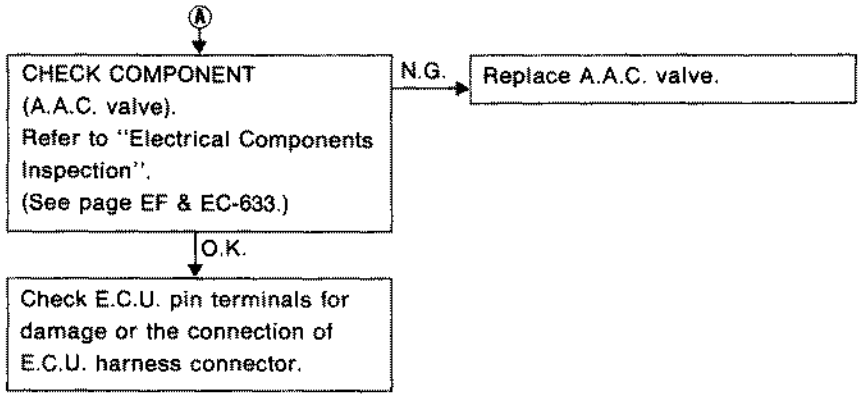
CHECK HARNESS CONTINUITY BETWEEN A.A.C. VALVE AND ENGINE HARNESS CONNECTORS.
1) Check harness continuity between terminal Ⓞ and terminal Ⓓ, terminal Ⓟ and terminal Ⓛ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

Ⓐ

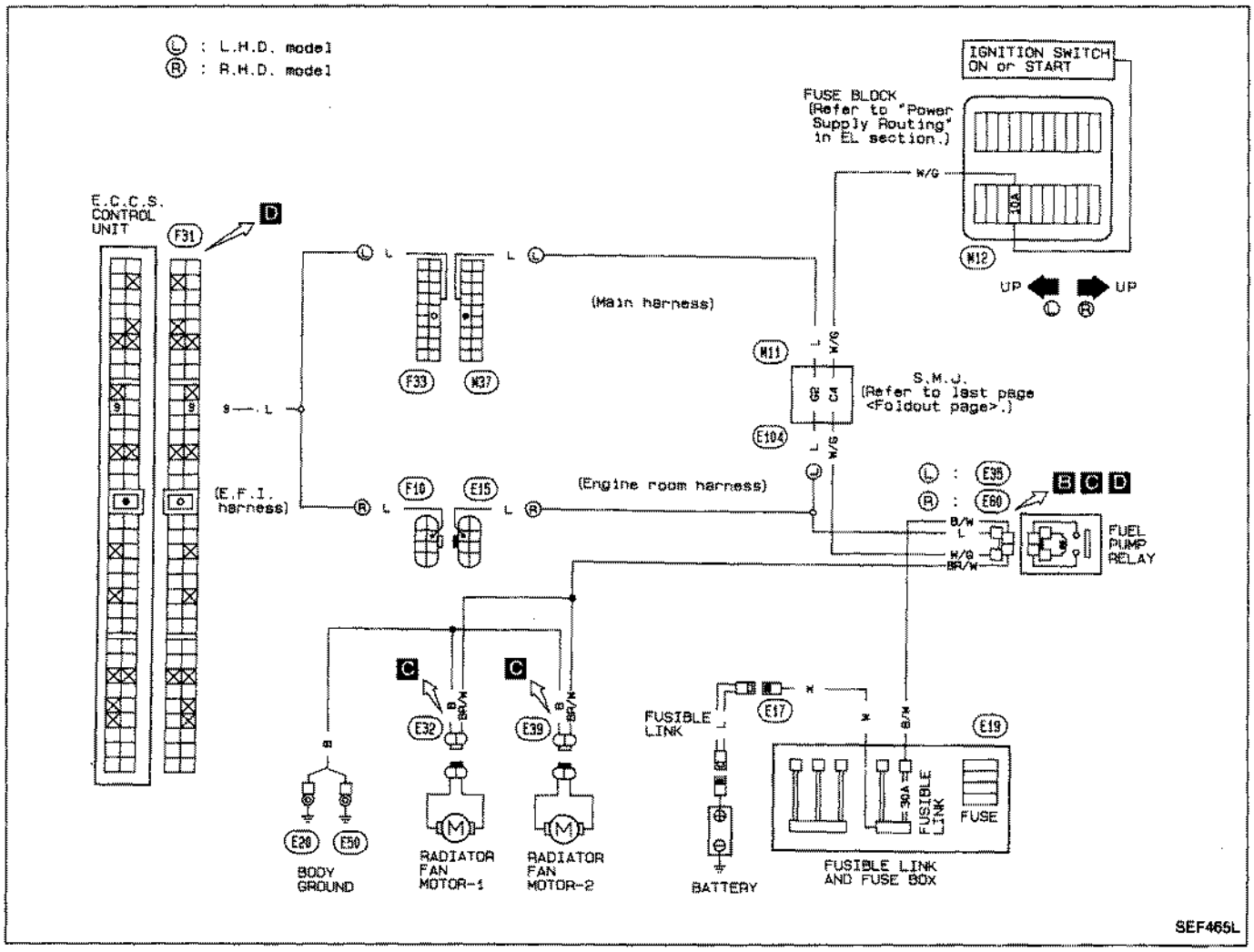
Diagnostic Procedure 36 (Cont'd)



NOTE

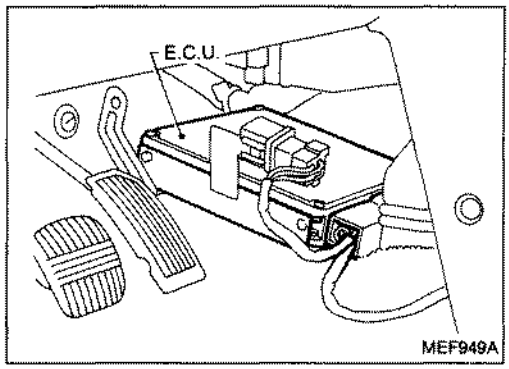
Diagnostic Procedure 37

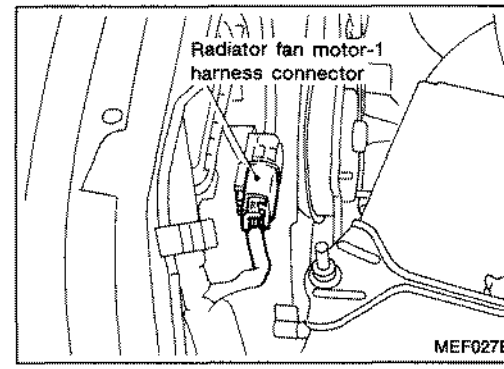
RADIATOR FAN CONTROL (Not self-diagnostic item)

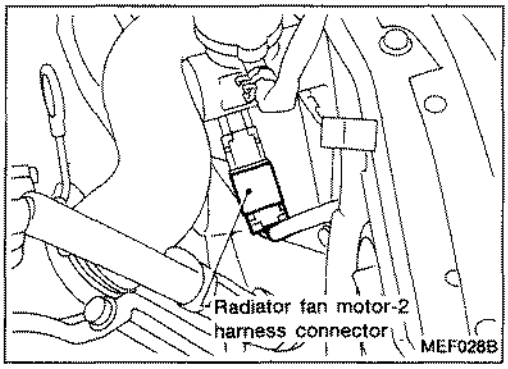


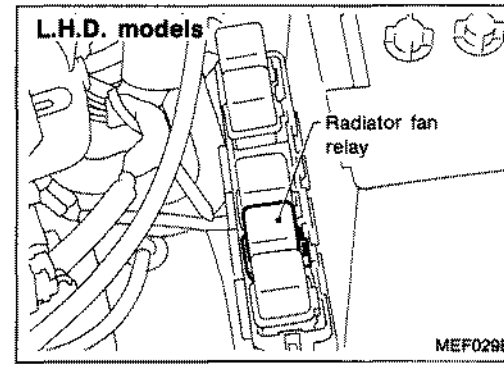
Diagnostic Procedure 37 (Cont'd)

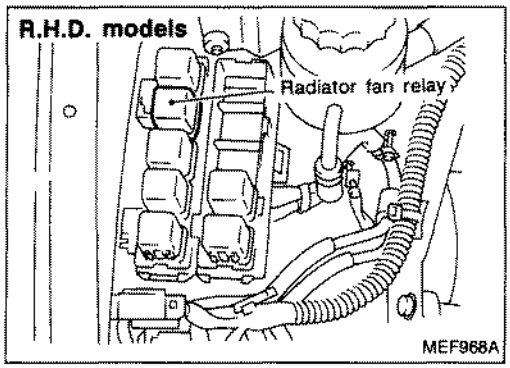
Harness layout







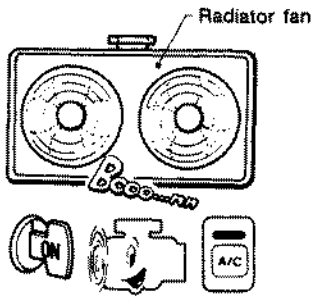




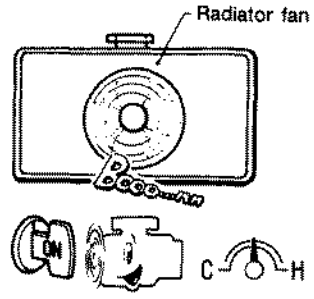
Diagnostic Procedure 37 (Cont'd)

A

With air conditioner

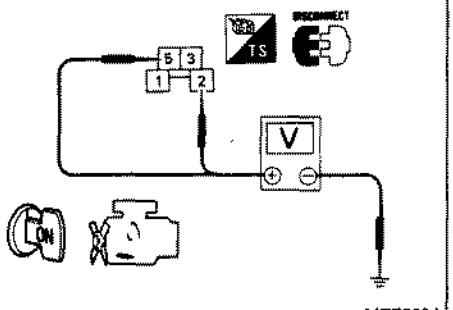


Without air conditioner



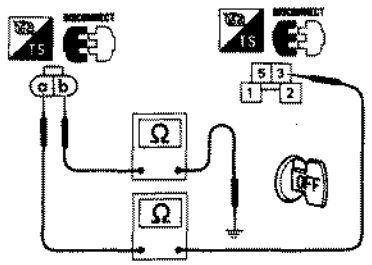
MEF988A

B



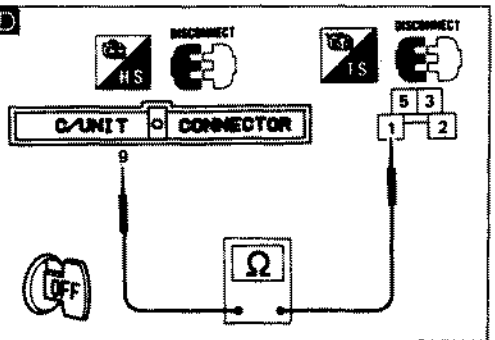
MEF989A

C



MEF990A

D



SEF999I

INSPECTION START

A

CHECK RADIATOR FAN OPERATION.

With air conditioner

1) Start engine.
2) Set temperature lever at full cold position.
3) Turn air conditioner switch "ON".
4) Turn blower fan switch "ON".
5) Run engine at idle for a few minutes with air conditioner operating.
6) Make sure that radiator 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 radiator fan begins to operate during warm-up.

O.K. → INSPECTION END

N.G. ↓

B

CHECK POWER SUPPLY.

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

N.G. → Check the following.
- Harness connectors (M11), (E104)
- "L" fusible link
- 30A fusible link
- 10A fuse
- Harness continuity between battery and radiator fan relay
- Harness continuity between fuse and radiator fan relay

If N.G., repair harness or connectors.

O.K. ↓

C

CHECK GROUND CIRCUIT.

1) Turn ignition switch "OFF".
2) Disconnect radiator fan motor-1 harness connector and radiator fan motor-2 harness connector.
3) Check harness continuity between terminal ⓐ and terminal ③, terminal ⑤ and body ground.
   Continuity should exist.

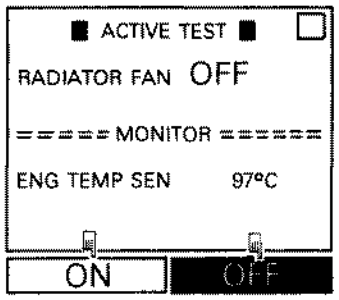
N.G. → Repair harness or connectors.

O.K. ↓

Ⓐ

Diagnostic Procedure 37 (Cont'd)

E



SEF830K

Ⓐ

D

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ⑨ and terminal ①.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F33), (M57) (L.H.D. models)
- Harness connectors (M11), (E104) (L.H.D. models)
- Harness connectors (F18), (E15) (R.H.D. models)
- Harness continuity between E.C.U. and radiator fan relay

If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT (Radiator fan relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-635.)

N.G. → Replace radiator fan relay.

O.K. ↓

E

CHECK COMPONENTS (Radiator fan motors).
1) Reconnect radiator fan relay, radiator fan motor harness connectors and E.C.U. harness connector.
2) Start engine.
3) Perform "RADIATOR FAN TEST" in "ACTIVE TEST" mode with CONSULT.

N.G. → Replace radiator fan motors.

OR

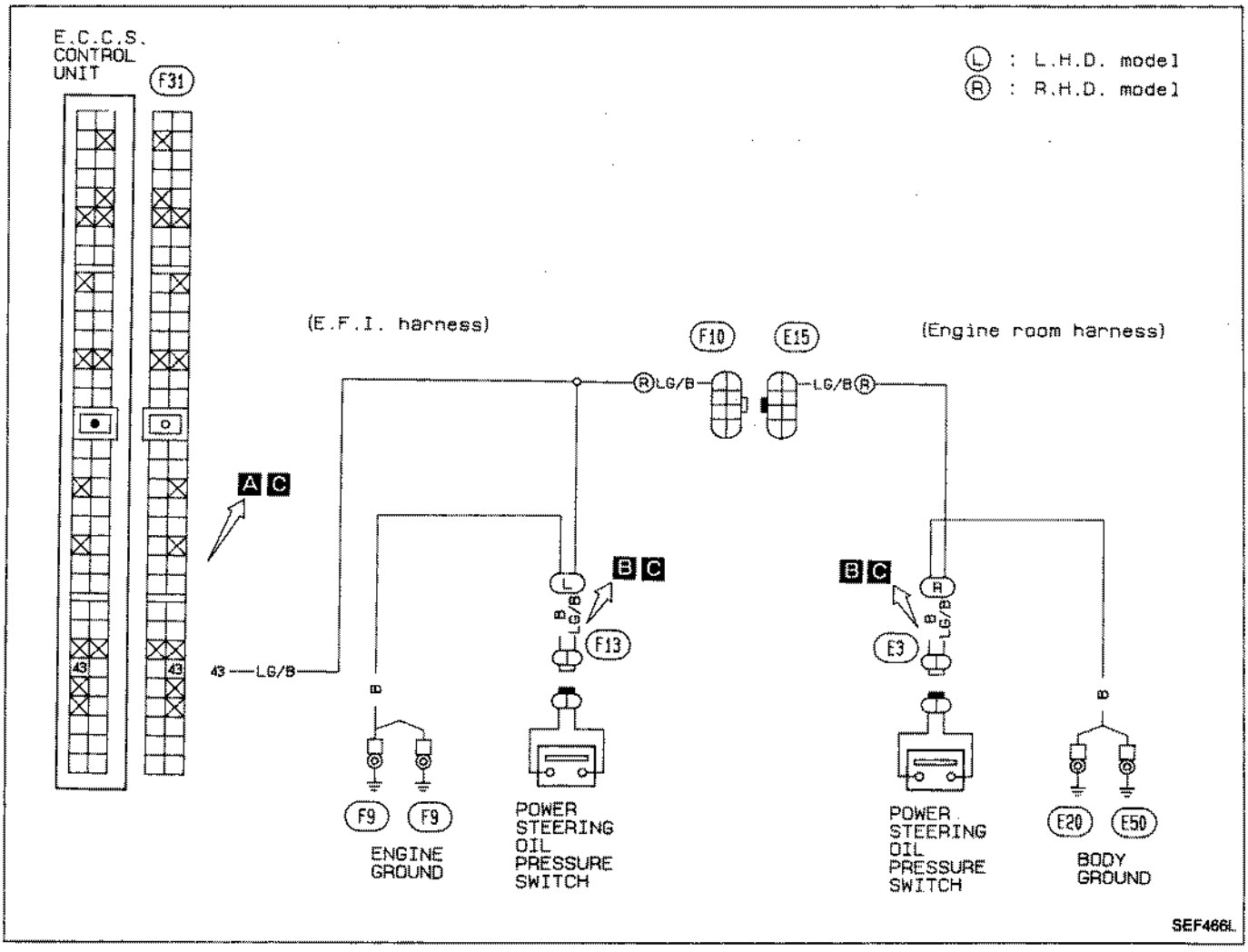
Refer to "Electrical Components Inspection".
(See page EF & EC-635.)

O.K. ↓

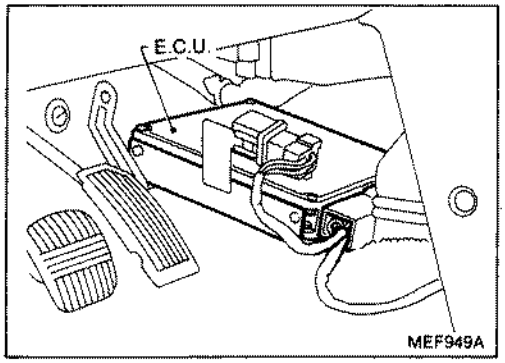
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

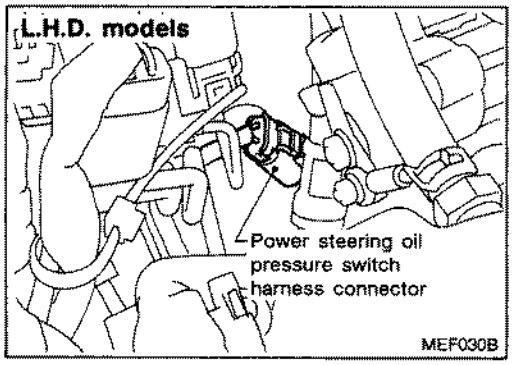
Diagnostic Procedure 38

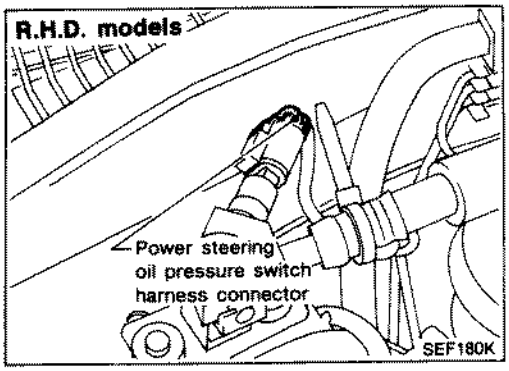
POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)



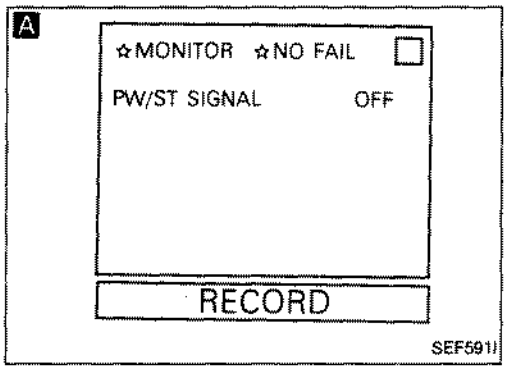
Harness layout

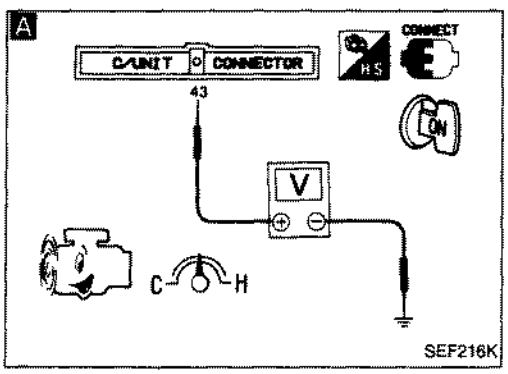


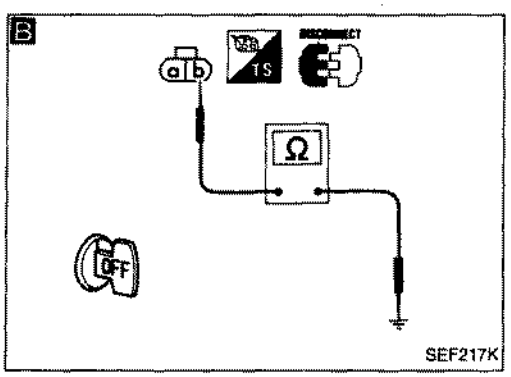


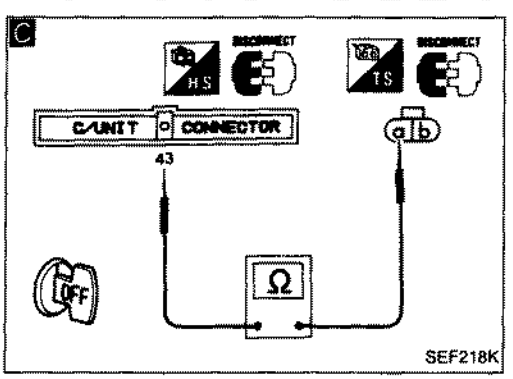


Diagnostic Procedure 38 (Cont'd)









INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check power steering oil pressure switch signal in "DATA MONITOR" mode with CONSULT.
Steering is neutral: OFF
Steering is turned: ON

O.K. → INSPECTION END

— OR —

2) Check voltage between E.C.U. terminal ㊸ and ground.
Voltage:
When steering wheel is turned quickly.
Approximately 0V
Except above
Approximately 8 - 10V

N.G.

B

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect power steering oil pressure switch harness connector.
3) Check harness continuity between terminal ⓑ and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

C

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ㊸ and terminal ⓐ.
Continuity should exist.

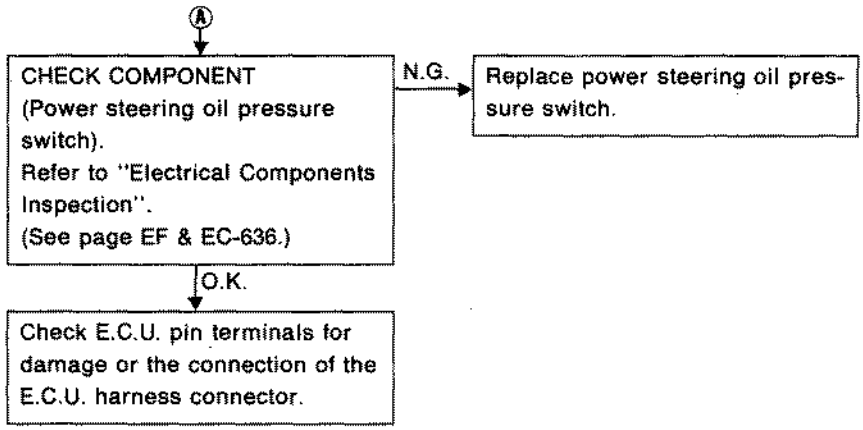
N.G. → Check the following.
- Harness connectors (F16), (E15) (R.H.D. models)
- Harness continuity between E.C.U. and power steering oil pressure switch

If N.G., repair harness or connectors.

O.K.

Ⓐ

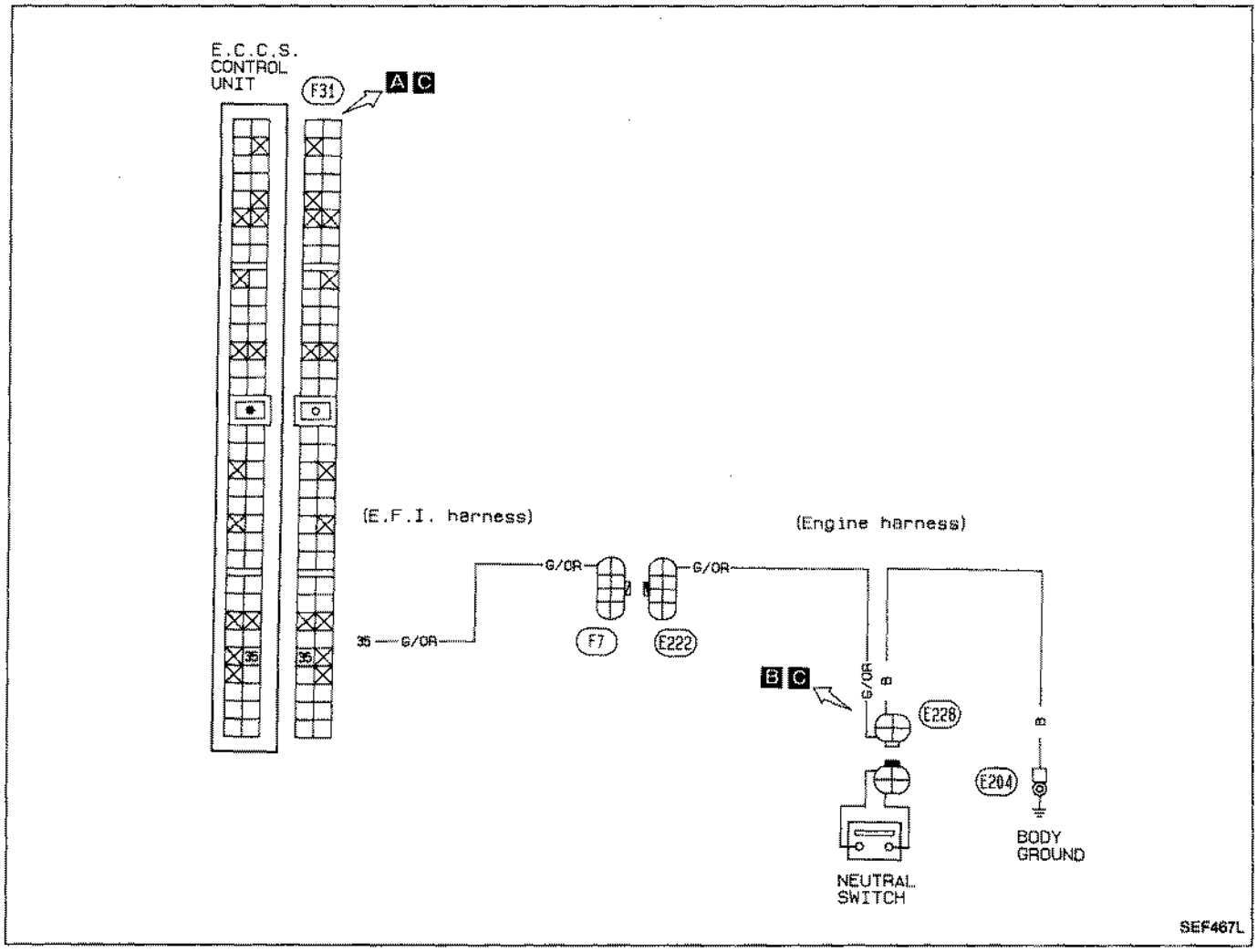
Diagnostic Procedure 38 (Cont'd)



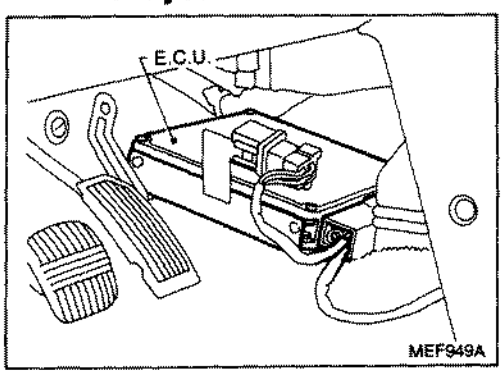
NOTE

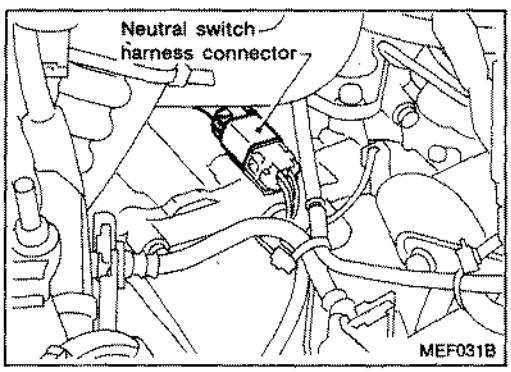
Diagnostic Procedure 39

NEUTRAL SWITCH (Not self-diagnostic item)



Harness layout





Diagnostic Procedure 39 (Cont'd)

A

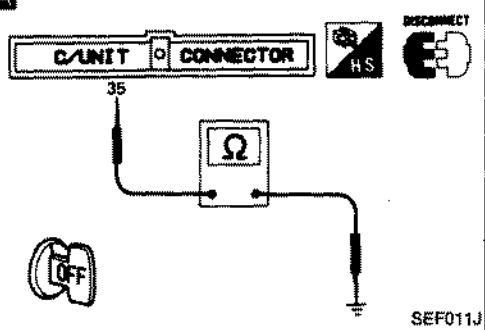
☆MONITOR ☆NO FAIL ☐

START SIGNAL	OFF
IDLE POSITION	ON
AIR COND SIG	OFF
NEUTRAL SW	ON

RECORD

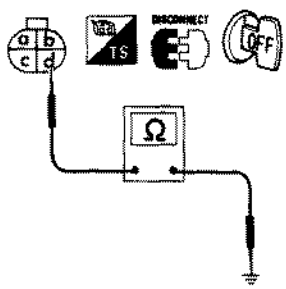
SEF384J

A



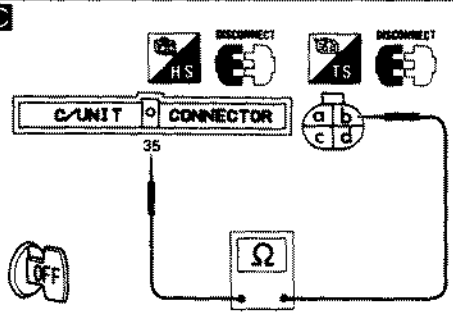
SEF011J

B



MEF048B

C



MEF049B

INSPECTION START

A

CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON".
2) Check neutral switch signal in "DATA MONITOR" mode with CONSULT.

Neutral position: ON
Except above: OFF

O.K. → INSPECTION END

OR

1) Set shift lever to the neutral position.
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal ㉟ and body ground.

Continuity should exist.

N.G.

Turn ignition switch "OFF".

B

CHECK GROUND CIRCUIT.

1) Disconnect neutral switch harness connector.
2) Check harness continuity between terminal ⓓ and body ground.

Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

Disconnect E.C.U. harness connector.

C

CHECK INPUT SIGNAL CIRCUIT.

1) Check harness continuity between E.C.U. terminal ㉟ and terminal ⓑ.

Continuity should exist.

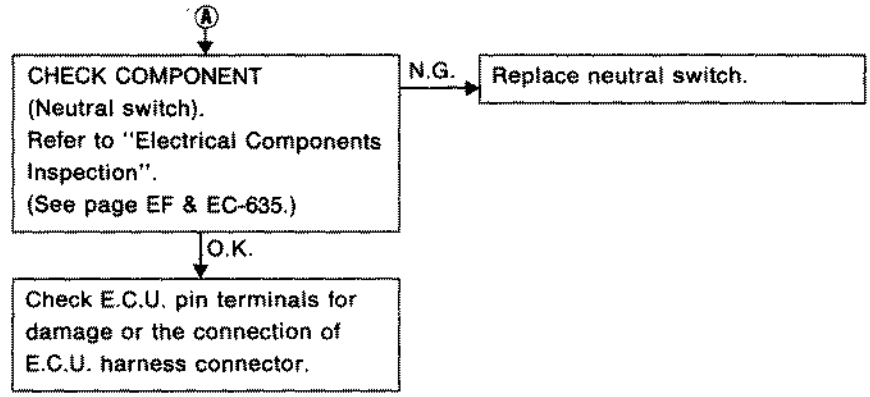
N.G. → Check the following.
- Harness connectors (F7), (E222)
- Harness continuity between E.C.U. and neutral switch

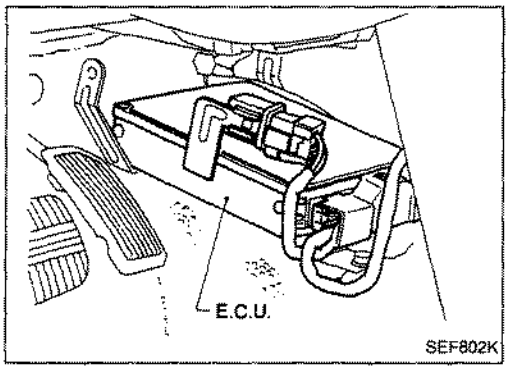
If N.G., repair harness or connectors.

O.K.

Ⓐ

Diagnostic Procedure 39 (Cont'd)

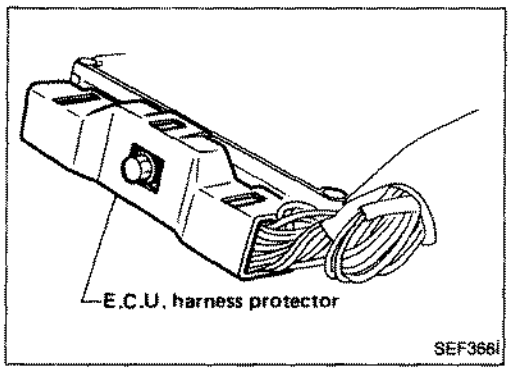




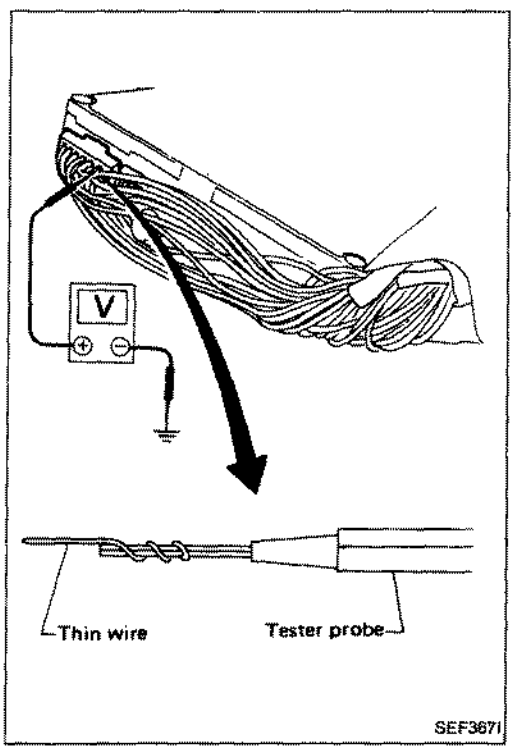
Electrical Components Inspection

E.C.U. INPUT/OUTPUT SIGNAL INSPECTION

1. E.C.U. is located behind the center console panel. For this inspection, remove the center console under cover.



2. Remove E.C.U. harness protector.



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

Electrical Components Inspection (Cont'd)

E.C.U. inspection table

*Date are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
1	Ignition signal	Engine is running. └ Idle speed	0.3 - 0.5V
		Engine is running. └ Engine speed is 2,000 rpm	0.7 - 0.8V
3	Ignition check	Engine is running. └ Idle speed	Approximately 12V
4	E.C.C.S. relay (Self-shut off)	Engine is running. Ignition switch "OFF" └ For approximately 2 seconds after turning ignition switch "OFF"	0 - 1V
		Ignition switch "OFF" └ Approximately 2 seconds after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
9	Radiator fan relay	Engine is running. └ Radiator fan is not operating.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Radiator fan is operating.	0.6 - 0.8V
11	Air conditioner relay	Engine is running. └ Both A/C switch and blower switch are "ON".	0.5 - 1V
		Engine is running. └ A/C switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
16	Air flow meter	Engine is running. (Warm-up condition) └ Idle speed	1.3 - 1.8V
		Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	1.6 - 2.1V
18	Engine temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with engine water temperature.
19	Exhaust gas sensor	Engine is running. └ After warming up sufficiently.	0 - Approximately 1.5V

Electrical Components Inspection (Cont'd)

*Date are reference values.

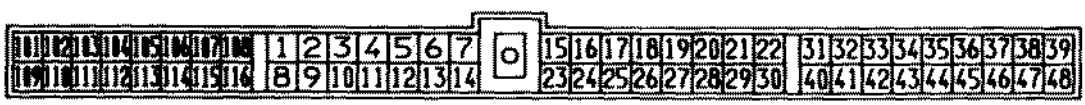
TER-MINAL NO.	ITEM	CONDITION	*DATA
20	Throttle sensor	Ignition switch "on" └Accelerator pedal released	0.45 - 0.55V
		Ignition switch "on" └Accelerator pedal fully depressed	Approximately 4V
22 30	Crank angle sensor (Reference signal)	Engine is running. └**Do not run engine at high speed under no-load.**	0.2 - 0.5V
27	Detonation sensor	Engine is running. └Idle speed	2.0 - 3.0V
31 40	Crank angle sensor (Position signal)	Engine is running. └**Do not run engine at high speed under no-load.**	2.0 - 3.0V
34	Start signal	Ignition switch "ON"	Approximately 0V
		Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
35	Neutral switch	Ignition switch "ON" └Neutral	0V
		Ignition switch "ON" └Except the above gear position	Approximately 6V
36	Ignition switch	Ignition switch "OFF"	0V
		Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
37	Throttle sensor power supply	Ignition switch "ON"	Approximately 5V
38 47	Power supply for E.C.U.	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
41	Air conditioner switch	Engine is running. └Both air conditioner switch and blower switch are "ON".	Approximately 0V
		Engine is running. └Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)

Electrical Components Inspection (Cont'd)

*Date are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
43	Power steering oil pressure switch	Engine is running. └Steering wheel is being turned.	0V
		Engine is running. └Steering wheel is not being turned.	8 - 10V
46	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
101	Injector No. 1	Engine is running	BATTERY VOLTAGE (11 - 14V)
103	Injector No. 3		
110	Injector No. 2		
112	Injector No. 4		
104	Fuel pump relay	Ignition switch "ON" └For 5 seconds after turning ignition switch "ON" Engine is running.	0.7 - 0.9V
		Ignition switch "ON" └5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
113	A.A.C. valve	Engine is running. └Idle speed	7 - 9V
		Engine is running. -Steering wheel is being turned. -Air conditioner is operating. -Rear defogger is "ON". └Headlamp are in high position.	3 - 6V

E.C.U. HARNESS CONNECTOR TERMINAL LAYOUT





SEF877K

Electrical Components Inspection (Cont'd)

E.C.U. inspection table

*Date are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
1	Ignition signal	Engine is running. └ Idle speed	0.3 - 0.5V
		Engine is running. └ Engine speed is 2,000 rpm	0.7 - 0.8V
3	Ignition check	Engine is running. └ Idle speed	Approximately 12V
4	E.C.C.S. relay (Self-shut off)	Engine is running. Ignition switch "OFF" └ For approximately 2 seconds after turning ignition switch "OFF"	0 - 1V
		Ignition switch "OFF" └ Approximately 2 seconds after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
9	Radiator fan relay	Engine is running. └ Radiator fan is not operating.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Radiator fan is operating.	0.6 - 0.8V
11	Air conditioner relay	Engine is running. └ Both A/C switch and blower switch are "ON".	0.5 - 1V
		Engine is running. └ A/C switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
16	Air flow meter	Engine is running. (Warm-up condition) └ Idle speed	1.0 - 1.5V
		Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	1.3 - 1.8V
18	Engine temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with engine water temperature.
19	Exhaust gas sensor	Engine is running. └ After warming up sufficiently.	0 - Approximately 1.5V

Electrical Components Inspection (Cont'd)

*Date are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
20	Throttle sensor	Ignition switch "on" └Accelerator pedal released	0.45 - 0.55V
		Ignition switch "on" └Accelerator pedal fully depressed	Approximately 4V
22 30	Crank angle sensor (Reference signal)	Engine is running. └**Do not run engine at high speed under no-load.**	0.2 - 0.5V
27	Detonation sensor	Engine is running. └Idle speed	2.0 - 3.0V
31 40	Crank angle sensor (Position signal)	Engine is running. └**Do not run engine at high speed under no-load.**	2.0 - 3.0V
34	Start signal	Ignition switch "ON"	Approximately 0V
		Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
35	Neutral switch	Ignition switch "ON" └Neutral	0V
		Ignition switch "ON" └Except the above gear position	Approximately 6V
36	Ignition switch	Ignition switch "OFF"	0V
		Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
37	Throttle sensor power supply	Ignition switch "ON"	Approximately 5V
38 47	Power supply for E.C.U.	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
41	Air conditioner switch	Engine is running. └Both air conditioner switch and blower switch are "ON".	Approximately 0V
		Engine is running. └Air conditioner switch is "OFF".	Approximately 8V

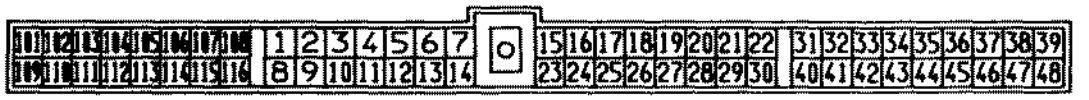
Electrical Components Inspection (Cont'd)

*Date are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
43	Power steering oil pressure switch	Engine is running. └Steering wheel is being turned.	0V
		Engine is running. └Steering wheel is not being turned.	8 - 10V
46	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
101	Injector No. 1	Engine is running	BATTERY VOLTAGE (11 - 14V)
103	Injector No. 3		
110	Injector No. 2		
112	Injector No. 4		
104	Fuel pump relay	Ignition switch "ON" └For 1 second after turning ignition switch "ON" Engine is running.	0.7 - 0.9V
		Ignition switch "ON" └1 second after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
111	Wastegate valve control solenoid valve	Engine is running. └Idle speed	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └Accelerator pedal is quickly depressed and released.	0 - 1.0V
113	A.A.C. valve	Engine is running. └Idle speed	9 - 14V
		Engine is running. -Steering wheel is being turned. -Air conditioner is operating. -Rear defogger is "ON". └Headlamp are in high position.	5 - 9V

Electrical Components Inspection (Cont'd)

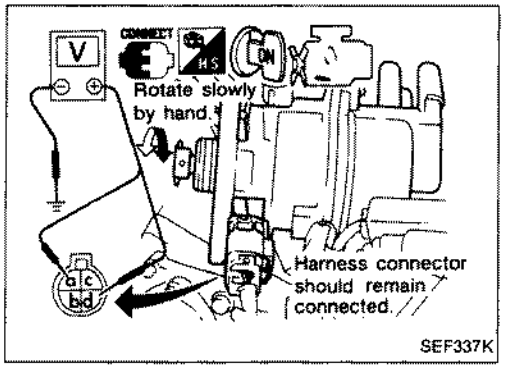
E.C.U. HARNESS CONNECTOR TERMINAL LAYOUT





SEF877K

Electrical Components Inspection (Cont'd)

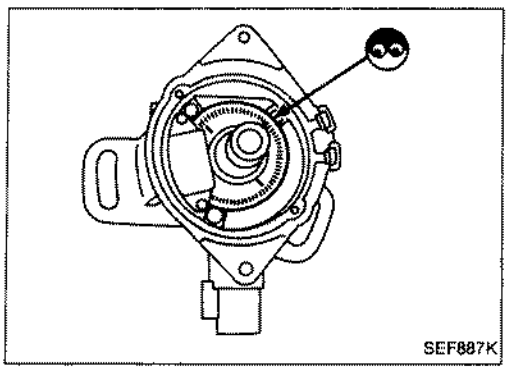


CRANK ANGLE SENSOR

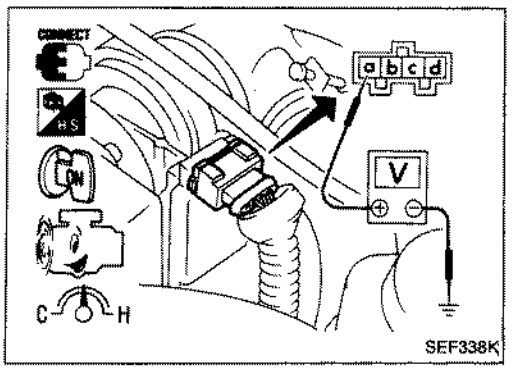
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch "ON".
4. Rotate distributor shaft slowly by hand and check voltage between terminals ⓒ, ⓓ and ground.

Terminal	Voltage
ⓒ (180° signal)	Tester's pointer fluctuates between 5V and 0V.
ⓓ (1° signal)	

If N.G., replace distributor assembly with crank angle sensor.



5. Visually check signal plate for damage or dust.

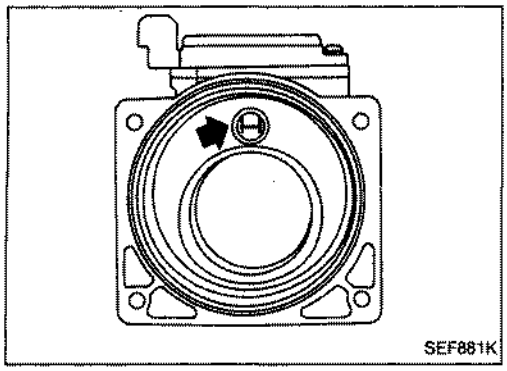


AIR FLOW METER

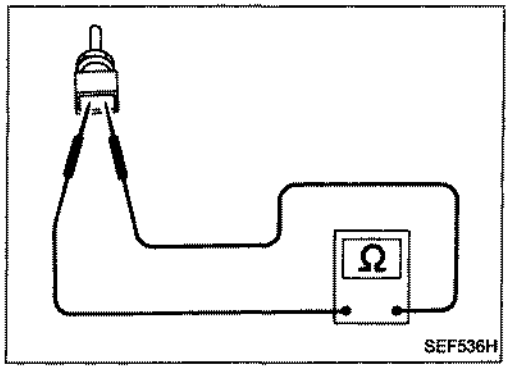
1. Peel air flow meter harness connector rubber as shown in the figure if the harness connector is connected.
2. Turn ignition switch "ON".
3. Start engine and warm it up sufficiently.
4. Check voltage between terminal ⓐ and ground.

Conditions	Voltage V
Ignition switch "ON" (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up sufficiently.)	SR20DE: 1.3 - 1.8V SR20DET: 1.0 - 1.5V

Electrical Components Inspection (Cont'd)


SEF881K

5. If N.G., remove air flow meter from air duct. Check hot wire for damage or dust.



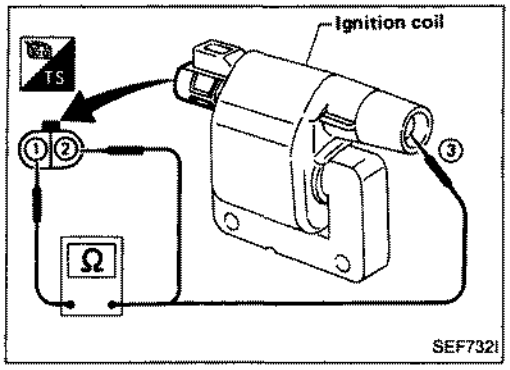
SEF536H

ENGINE TEMPERATURE SENSOR

1. Disconnect engine temperature sensor harness connector.
2. Check resistance as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.0
80 (176)	0.30 - 0.33

If N.G., replace engine temperature sensor.



SEF732I

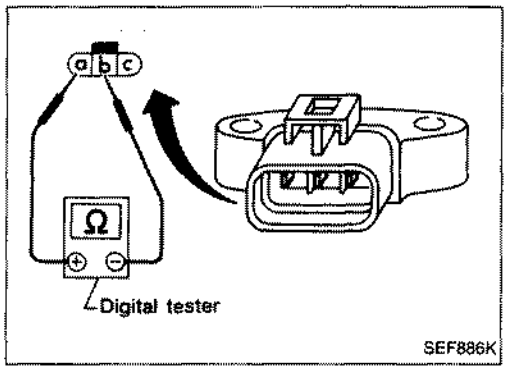
IGNITION COIL

1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.

Terminal	Resistance
① - ②	Approximately 1.0Ω
① - ③	Approximately 10 kΩ

If N.G., replace ignition coil.

Electrical Components Inspection (Cont'd)

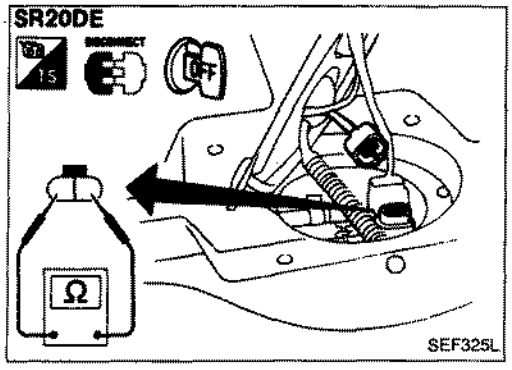


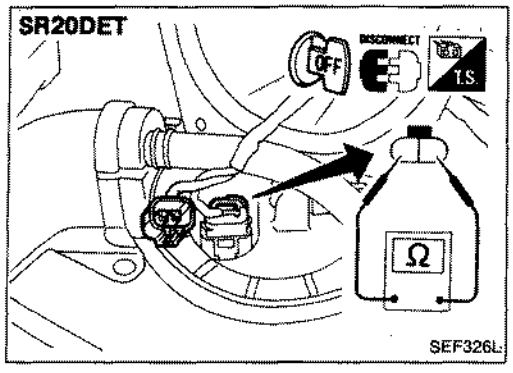
POWER TRANSISTOR

1. Disconnect power transistor harness connector.
2. Check power transistor continuity between terminals with a digital tester as shown in the figure.

⊖terminal side / ⊕terminal side	Terminal ⓐ		Terminal ⓑ		Terminal ⓒ	
	Resistance Ω	Result	Resistance Ω	Result	Resistance Ω	Result
Terminal ⓐ	—	—	∞	O.K.	∞	O.K.
	—	—	Not ∞ or 0	N.G.	Not ∞ or 0	N.G.
	—	—	0	N.G.	0	N.G.
Terminal ⓑ	∞	N.G.	—	—	∞	N.G.
	Not ∞ or 0	O.K.	—	—	Not ∞ or 0	O.K.
	0	N.G.	—	—	0	N.G.
Terminal ⓒ	∞	N.G.	∞	N.G.	—	—
	Not ∞ or 0	O.K.	Not ∞ or 0	O.K.	—	—
	0	N.G.	0	N.G.	—	—

If N.G., replace power transistor.





FUEL PUMP

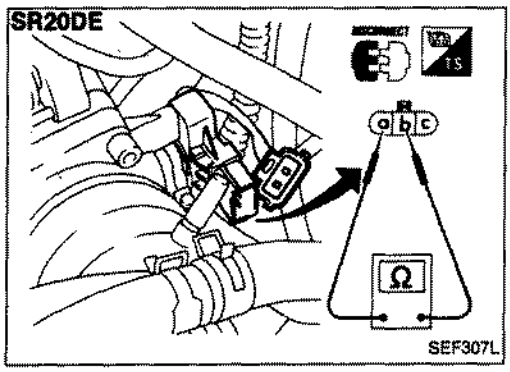
1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ⓐ and ⓑ.
   Resistance: Approximately 0.7Ω

If N.G., replace fuel pump.

Electrical Components Inspection (Cont'd)

EXHAUST GAS SENSOR

Refer to "Diagnostic Procedure 31".
(See page EF & EC-494, 590.)

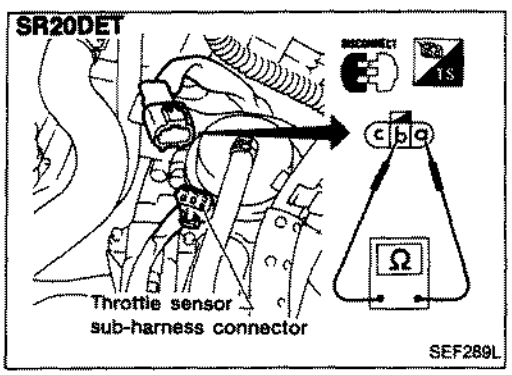


THROTTLE SENSOR

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

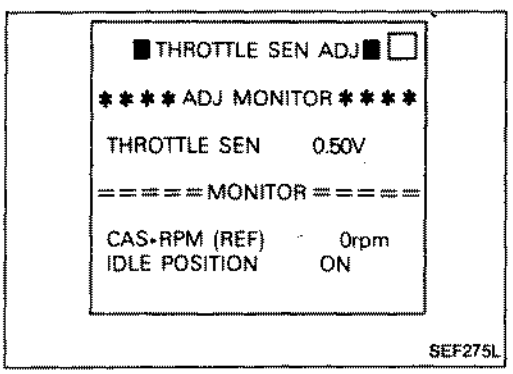
Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 2
Partially released	2 - 11
Completely depressed	Approximately 11

If N.G., replace throttle sensor.



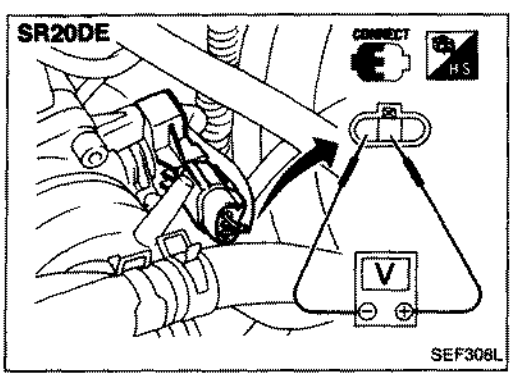
Adjustment

If throttle sensor is replaced or removed, it is necessary to install in proper position, by following the procedure as shown below:

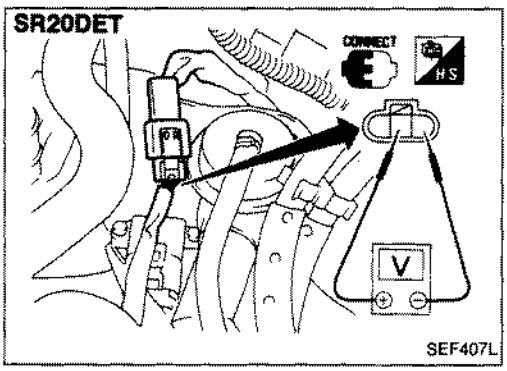


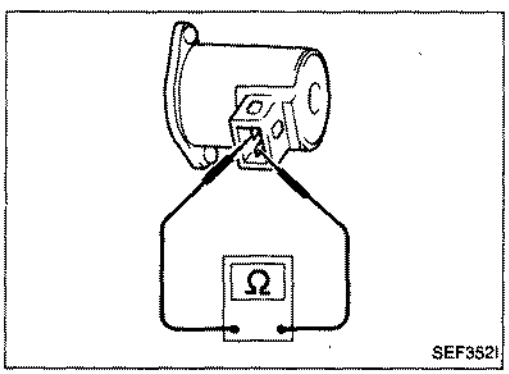
1. Install throttle sensor body in throttle chamber. Do not tighten bolts. Leave bolts loose.
2. Connect throttle sensor harness connector.
3. Start engine and warm it up sufficiently.
4. Perform "THROTTLE SEN ADJ" in "WORK SUPPORT" mode.

   Measure output voltage of throttle sensor using voltmeter.



5. Adjust by rotating throttle sensor body so that output voltage is 0.45 to 0.55V.
6. Tighten mounting bolts.
7. Disconnect throttle sensor harness connector for a few seconds and then reconnect it.





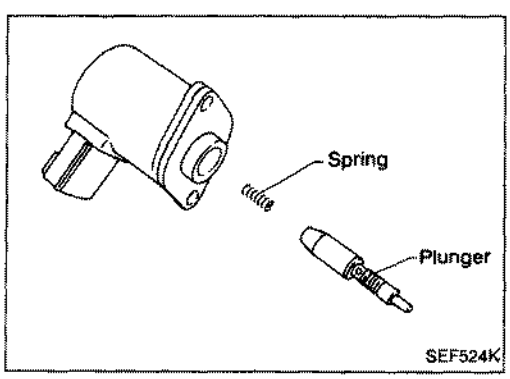
A.A.C. VALVE

Disconnect A.A.C. valve harness connector.

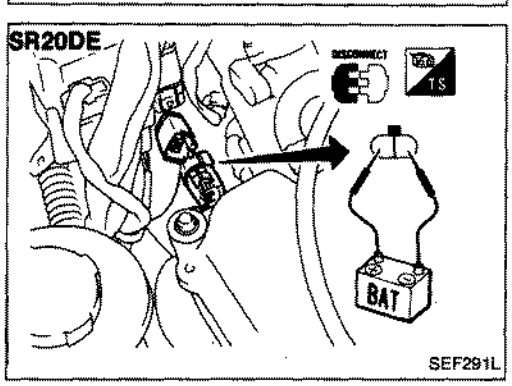
- Check A.A.C. valve resistance.

  Resistance:

  Approximately 10Ω



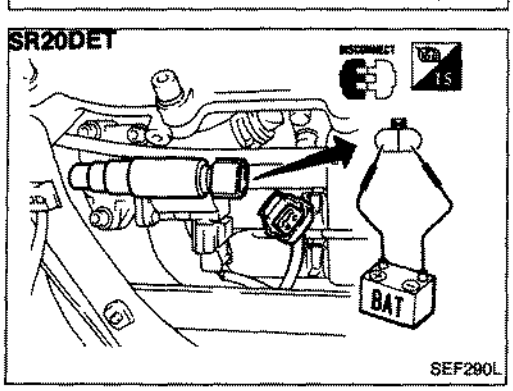
- Check plunger for seizing or sticking.
- Check for broken spring.



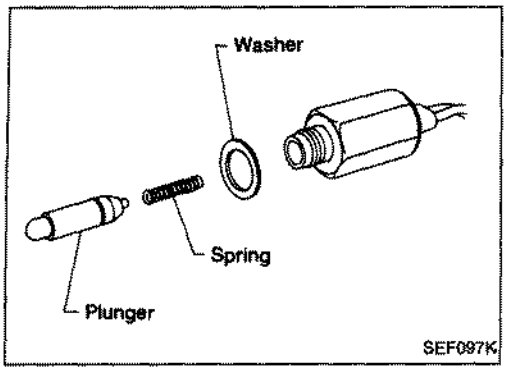
F.I.C.D. SOLENOID VALVE

Disconnect F.I.C.D. solenoid valve harness connector.

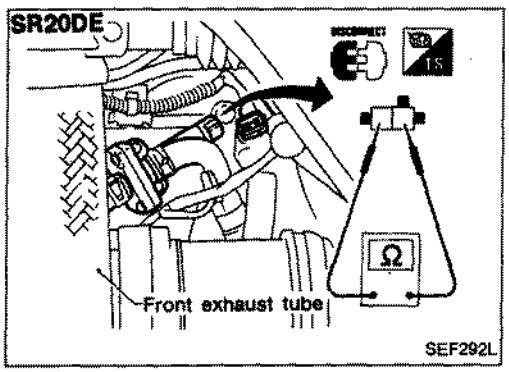
- Check for clicking sound when applying 12V direct current to terminals.



Electrical Components Inspection (Cont'd)



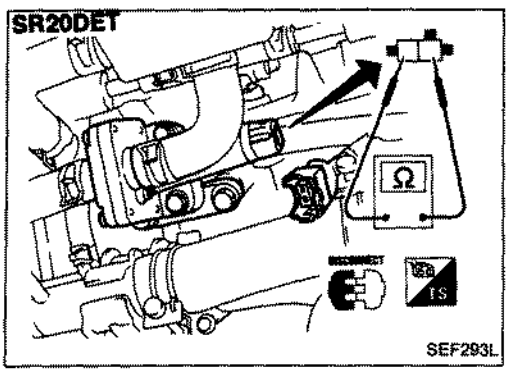
- Check plunger for seizing or sticking.
- Check for broken spring.

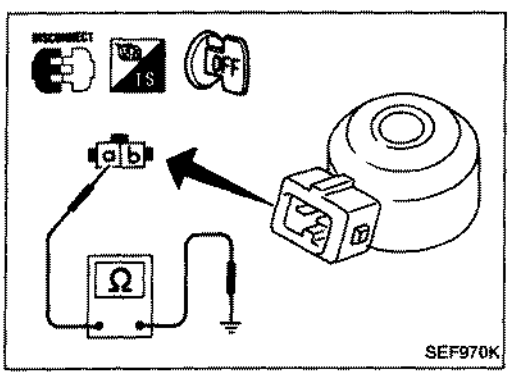


AIR REGULATOR

Disconnect air regulator harness connector.

- Check air regulator resistance.
  Resistance:
  Approximately 70 - 80Ω
- Check air regulator for clogging.





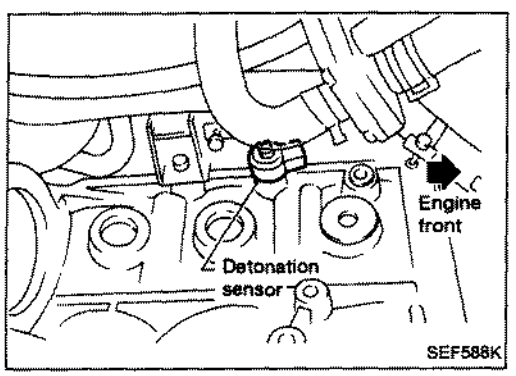
DETONATION SENSOR

1. Disconnect detonation sensor harness connector.
2. Check continuity between terminal ⓐ and ground.

Continuity should exist.

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

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

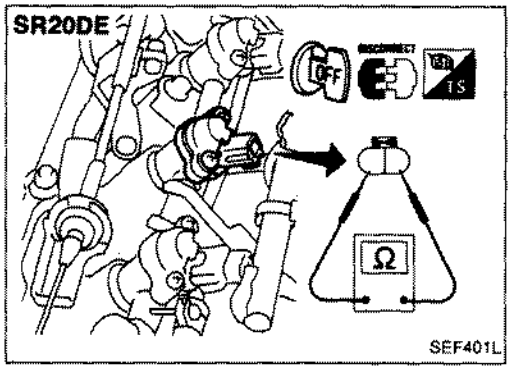


Installation

Install detonation sensor with connector side facing engine front.

- When installing detonation sensor, ensure both upper and lower sides of detonation sensor and cylinder block mating surface are clean and free from foreign particles.
- When tightening detonation sensor, be careful not to apply excessive force to connector.
- Make sure detonation sensor is not in contact with any adjacent part after installing.

Electrical Components Inspection (Cont'd)



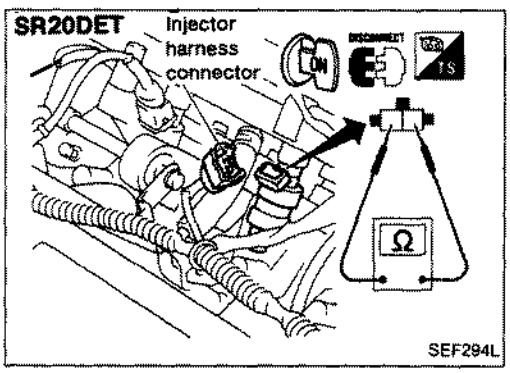
INJECTOR

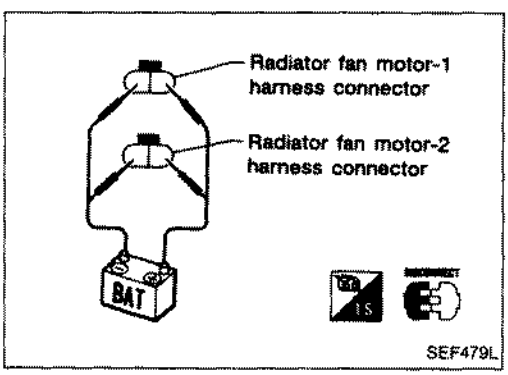
1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

Resistance:

SR20DE	10 - 14Ω
SR20DET	1 - 3Ω

If N.G., replace injector.



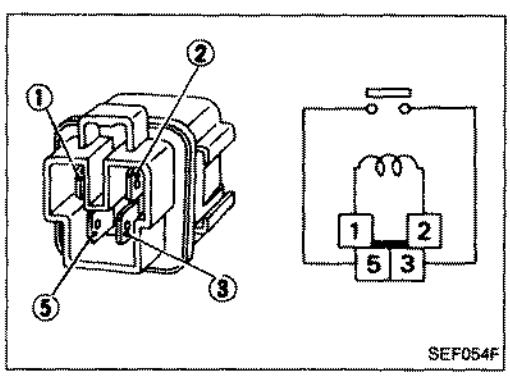


RADIATOR FAN MOTORS-1 AND -2

1. Disconnect radiator fan motor harness connectors.
2. Supply radiator fan motor terminals with battery voltage and check operation.

Radiator fan motor should operate.

If N.G., replace radiator fan motor.

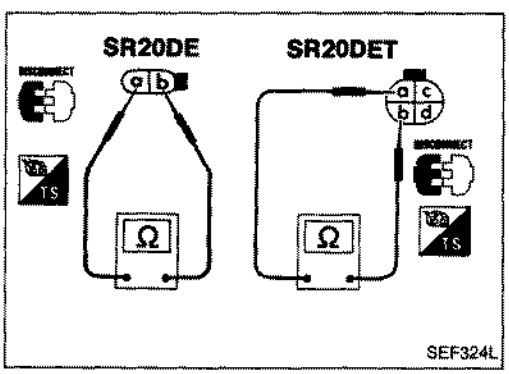


E.C.C.S. RELAY, RADIATOR FAN RELAY AND FUEL PUMP RELAY

Check continuity between terminals ③ and ⑤.

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

If N.G., replace neutral switch.



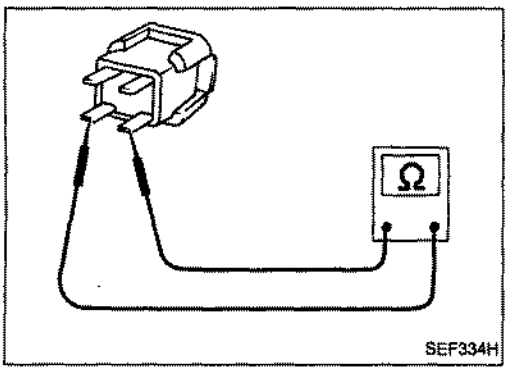
NEUTRAL SWITCH

Check continuity between terminals ⓐ and ⓑ.

Conditions	Continuity
Shift to Neutral	Yes
Shift to other position	No

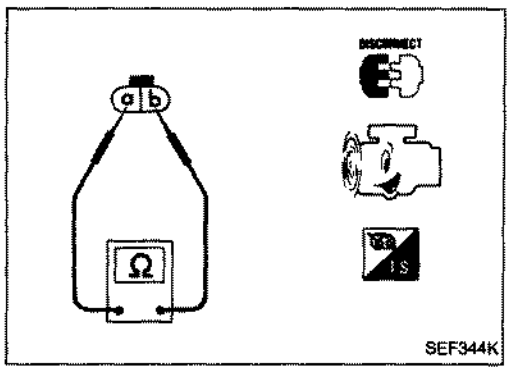
If N.G., replace neutral switch.

Electrical Components Inspection (Cont'd)



RESISTOR

1. Disconnect resistor harness connector.
2. Check resistance between terminals ⓐ and ⓑ.
   Resistance: Approximately 2.2kΩ
   If N.G., replace resistor.

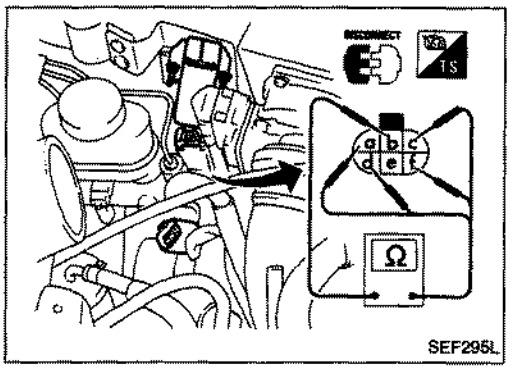


POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector.
2. Start engine.
3. Check continuity between terminals ⓐ and ⓑ.

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

If N.G., replace power steering oil pressure switch.



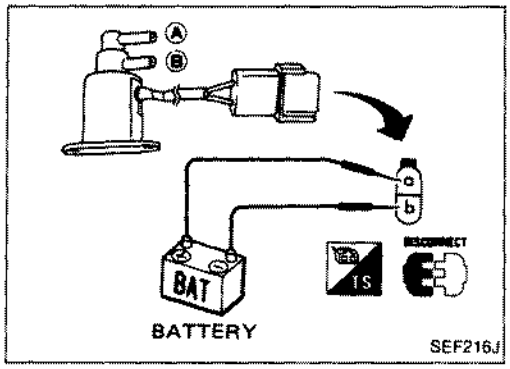
DROPPING RESISTOR

1. Disconnect dropping resistor harness connector.
2. Check resistance as shown in the figure.

Terminals	Resistance
ⓑ - ⓐ	5 - 7Ω
ⓑ - ⓒ	
ⓑ - ⓓ	
ⓑ - ⓕ	

If N.G., replace dropping resistor.

Electrical Components Inspection (Cont'd)

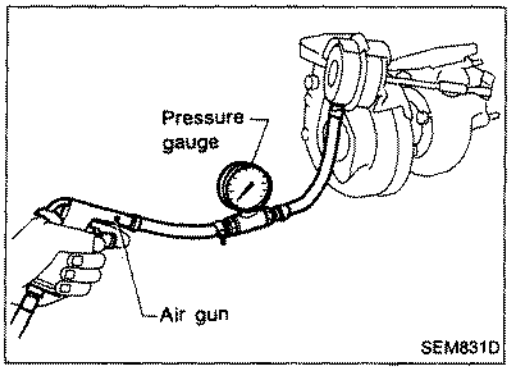


WASTEGATE VALVE CONTROL SOLENOID VALVE

Check air passage continuity.

condition	Air passage continuity between A and B
12V direct current supply between terminals a and b	Yes
No supply	No

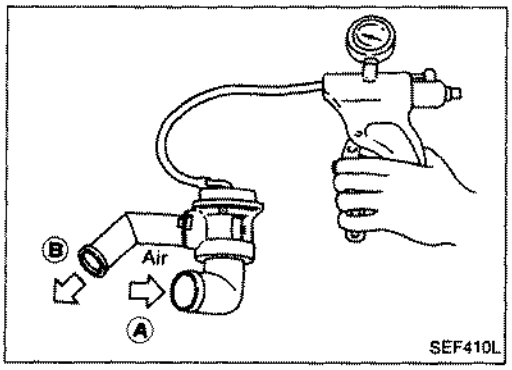
If N.G., replace solenoid valve.



WASTEGATE VALVE ACTUATOR

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 59 to 69 kPa (0.59 to 0.69 bar, 0.6 to 0.7 kg/cm^2, 9 to 10 psi).**



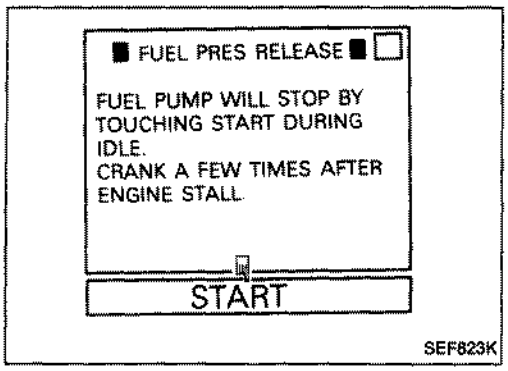
RECIRCULATION VALVE

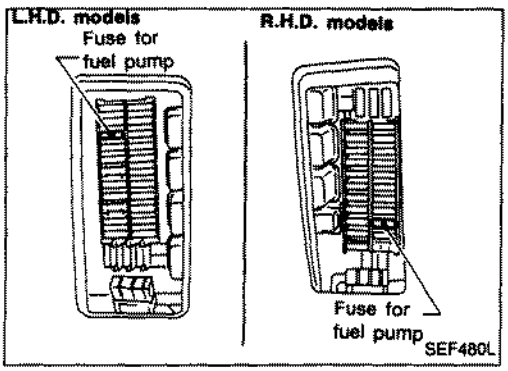
Check air passage continuity.

Condition	Air passage continuity between A and B
A vacuum of above –17.3 kPa (–173 mbar, –130 mmHg, –5.12 inHg) is applied to vacuum port	Yes
No vacuum applied	No

If N.G., replace recirculation valve.

Do not disassemble and adjust recirculation valve.





Releasing Fuel Pressure

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

1. Turn ignition switch "ON".
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 off.

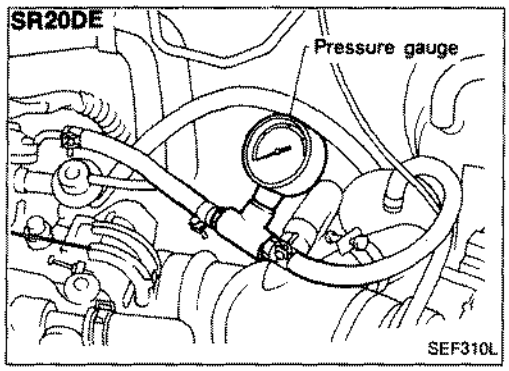
1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and re-insert fuel pump fuse.

Fuel Pressure Check

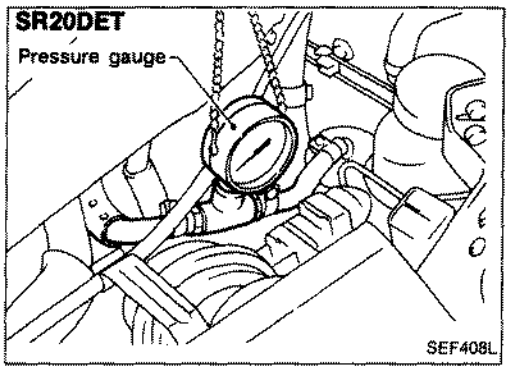
a. When reconnecting fuel line, always use new clamps.
b. Make sure that clamp screw does not contact adjacent parts.
c. Use a torque driver to tighten clamps.
d. Use Pressure Gauge to check fuel pressure.
e. Do not perform fuel pressure check while fuel pressure regulator control system is operating; otherwise, fuel pressure gauge might indicate incorrect readings.

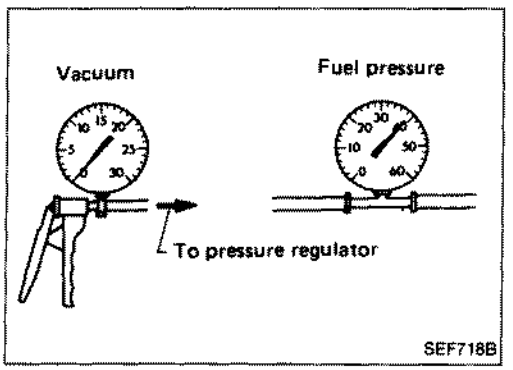
1. Release fuel pressure to zero.
2. Disconnect fuel hose between fuel filter and fuel tube (engine side).
3. Install pressure gauge between fuel filter and fuel tube.
4. Start engine and check for fuel leakage.

Fuel Pressure Check (Cont'd)



5. Read the indication of fuel pressure gauge.
   At idling:
   When fuel pressure regulator valve vacuum hose is connected
   Approximately 245 kPa (2.45 bar, 2.5 kg/cm^2, 36 psi)
   A few seconds after ignition switch is turned from OFF to ON
   Approximately 294 kPa (2.94 bar, 3.0 kg/cm^2, 43 psi)
6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
7. Plug intake manifold with a rubber cap.
8. Connect variable vacuum source to fuel pressure regulator.



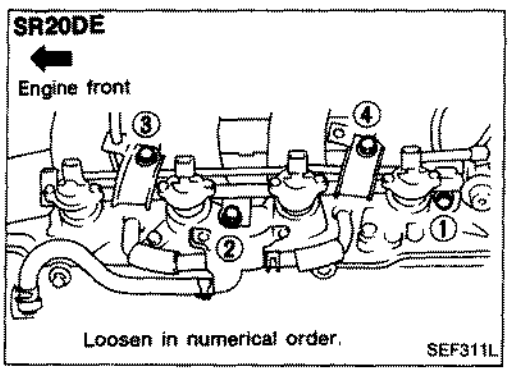


9. Start engine and read indication of fuel pressure gauge as vacuum is changed.

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

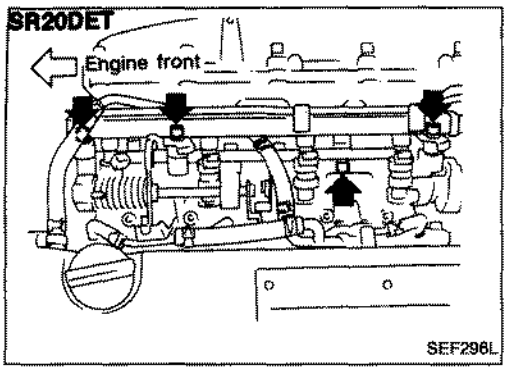
Injector Removal and Installation

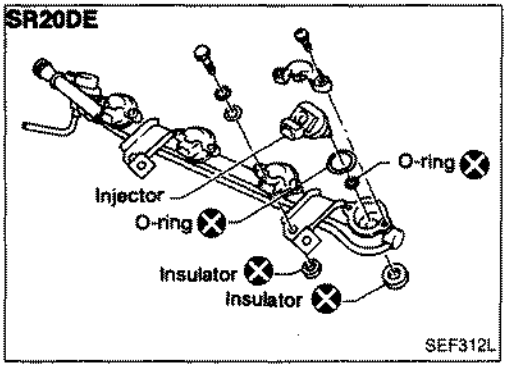
1. Release fuel pressure to zero.
2. Remove intercooler. (SR20DET only)
3. Disconnect injector harness connectors.
4. Disconnect vacuum hose from pressure regulator.
5. Disconnect fuel hoses from fuel tube assembly.



6. Remove injectors with fuel tube assembly.

Injector Removal and Installation (Cont'd)





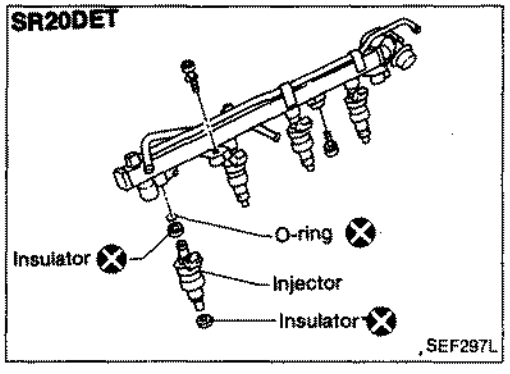
7. SR20DE: Push out any malfunctioning injector from fuel tube assembly.

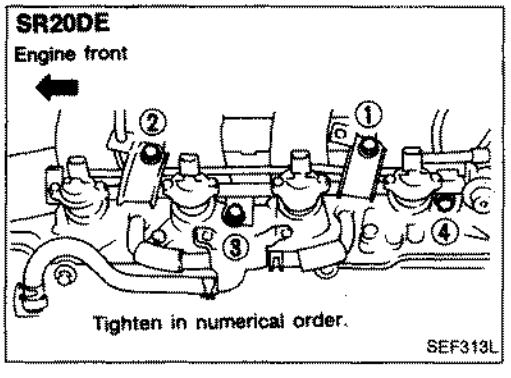
Do not extract injector by pinching connector.

SR20DET: Remove any malfunctioning injector from fuel tube assembly.

8. Replace or clean injector as necessary.
9. Install injector to fuel tube assembly.

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





10. Install injectors with fuel tube assembly to intake manifold. Tighten fuel tube bolts to the specified torque.

Tightening procedure:

(SR20DE)

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).

(SR20DET)

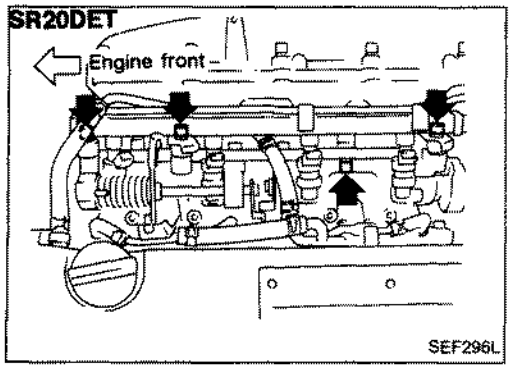
1) Tighten all bolts to 16 to 19 N·m (1.6 to 1.9 kg-m, 12 to 14 ft-lb).

11. Install fuel hoses to fuel tube assembly.

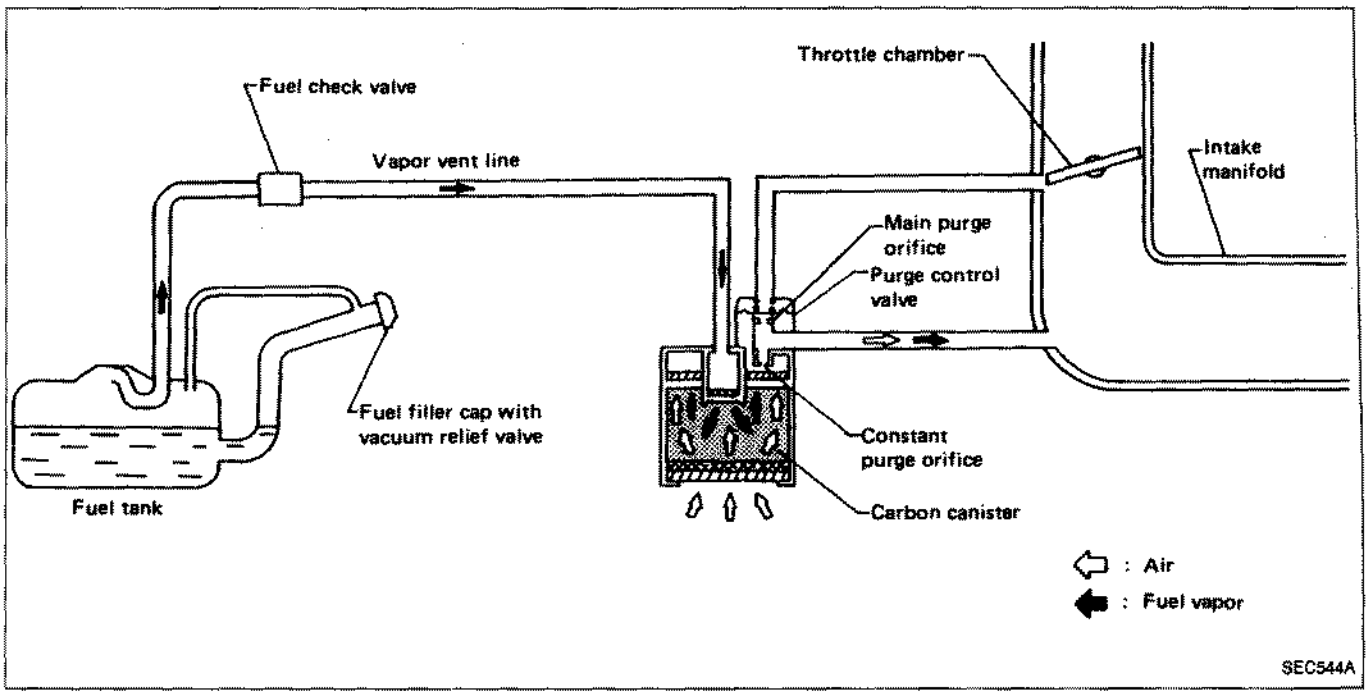
Lubricate fuel hoses with a smear of silicone oil.

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

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



Description

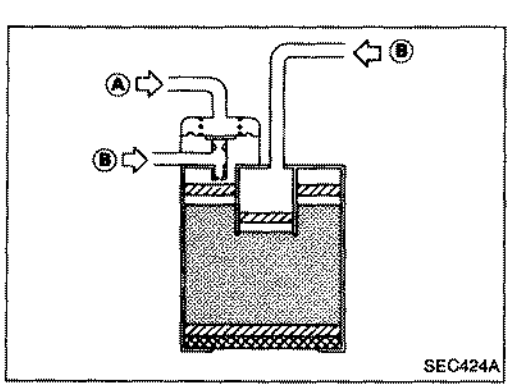


The evaporative emission control system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

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

The canister retains the fuel vapor until the canister is purged by the air drawn through the bottom of the canister to the intake manifold when the engine is running. When the engine runs at idle, the purge control valve is closed.

Only a small amount of stored vapor flows into the intake manifold through the constant purge orifice. As the engine speed increases, and the throttle vacuum rises higher, the purge control valve opens and the vapor is sucked into the intake manifold through both the main purge orifice and the constant purge orifice.



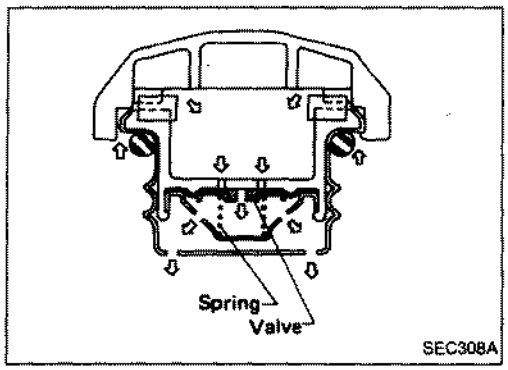
Inspection

CARBON CANISTER

Check carbon canister as follows:

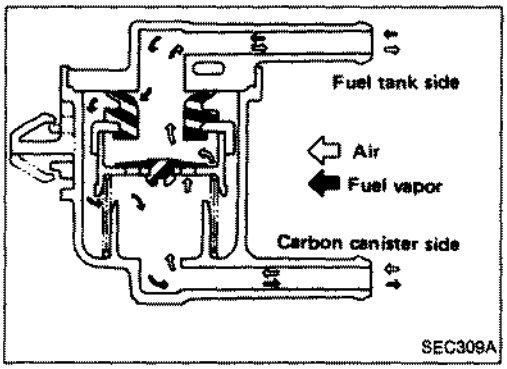
Ⓐ : Blow air and ensure that there is no leakage.
Ⓑ : Blow air and ensure that there is leakage.

Inspection (Cont'd)



FUEL TANK VACUUM RELIEF VALVE

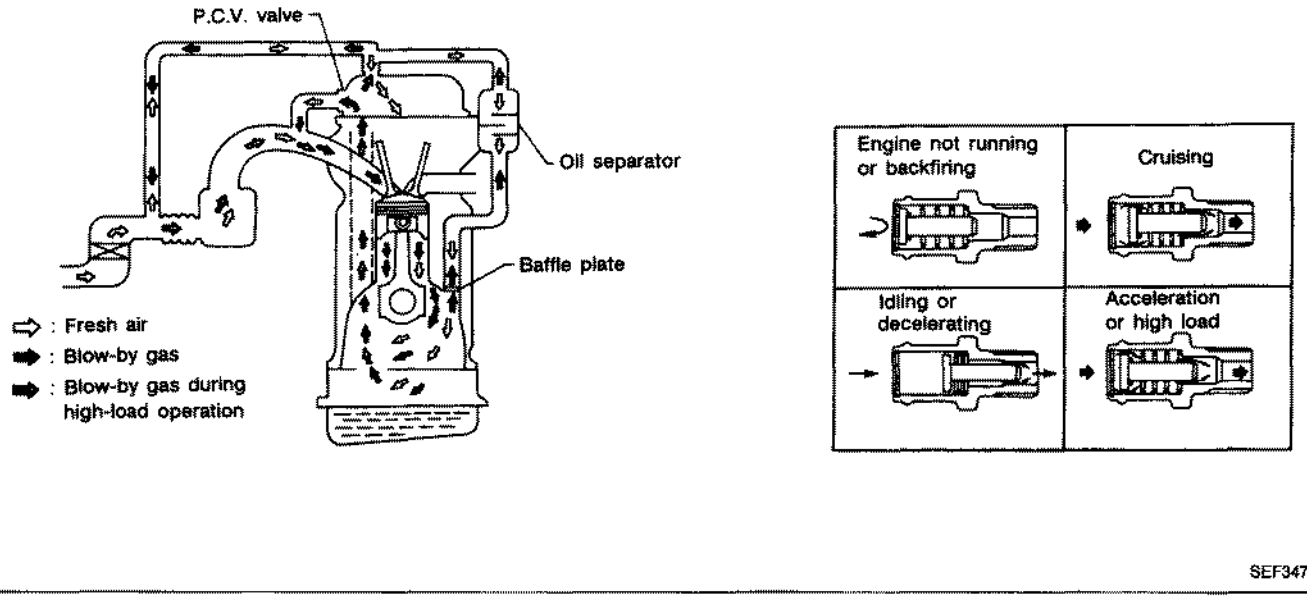
1. Wipe clean valve housing.
2. Suck air through the cap. A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition. Note also that, by further sucking air, the resistance should disappear with valve clicks.
3. If valve is clogged or if no resistance is felt, replace cap as an assembly.



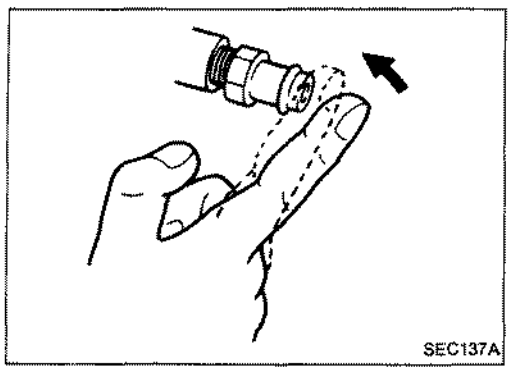
FUEL CHECK VALVE

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

Description



This system returns blow-by gas to both the intake manifold and air inlet tubes.
The positive crankcase ventilation (P.C.V.) 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 P.C.V. 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 inlet tubes, through the hose connecting air inlet tubes to rocker cover, into the crankcase.
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.
On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air inlet tubes under all conditions.

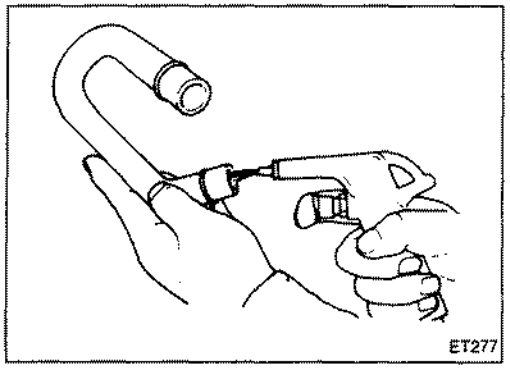


Inspection

P.C.V. (Positive Crankcase Ventilation)

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

Inspection (Cont'd)



VENTILATION HOSE

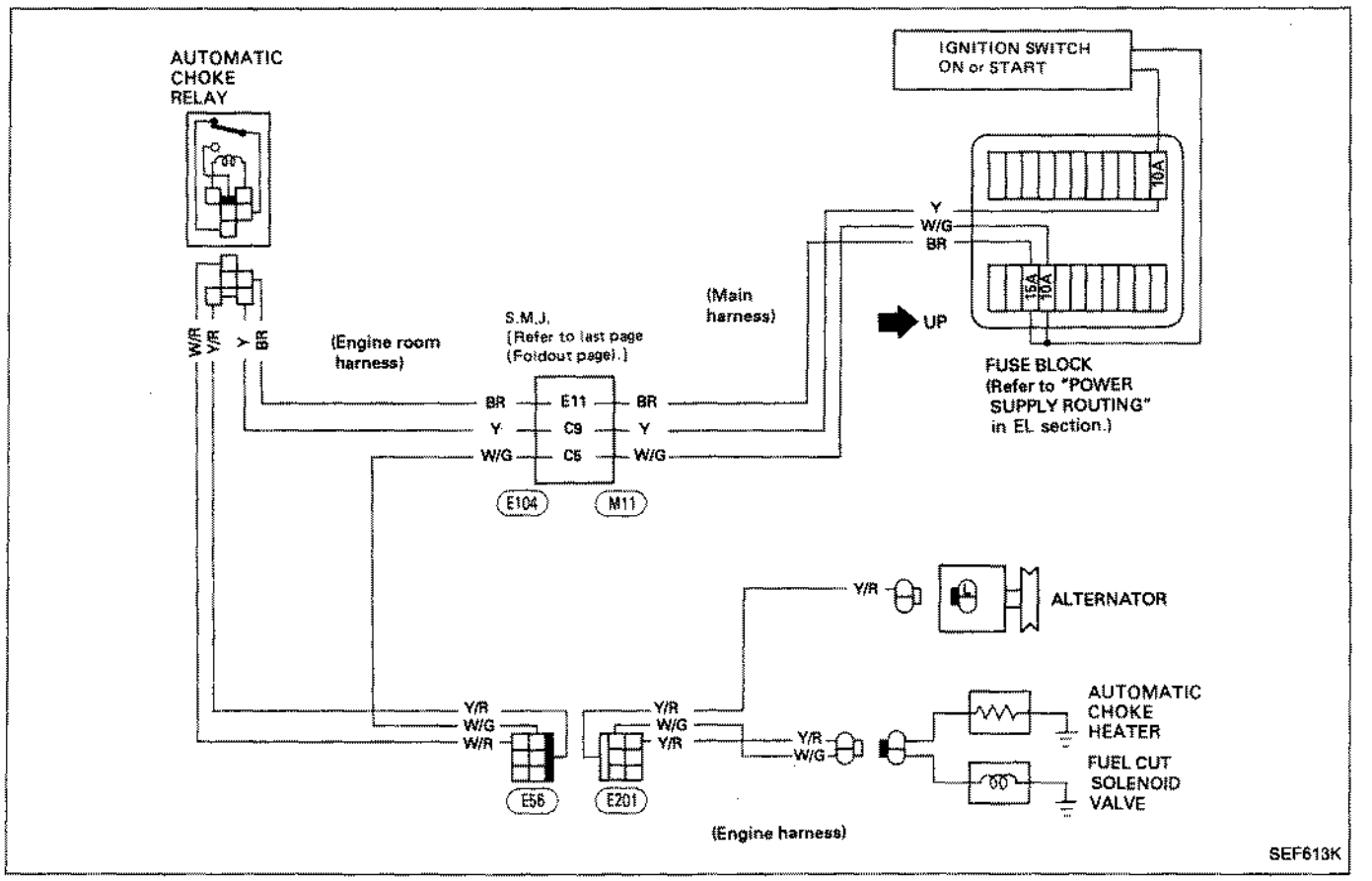
1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

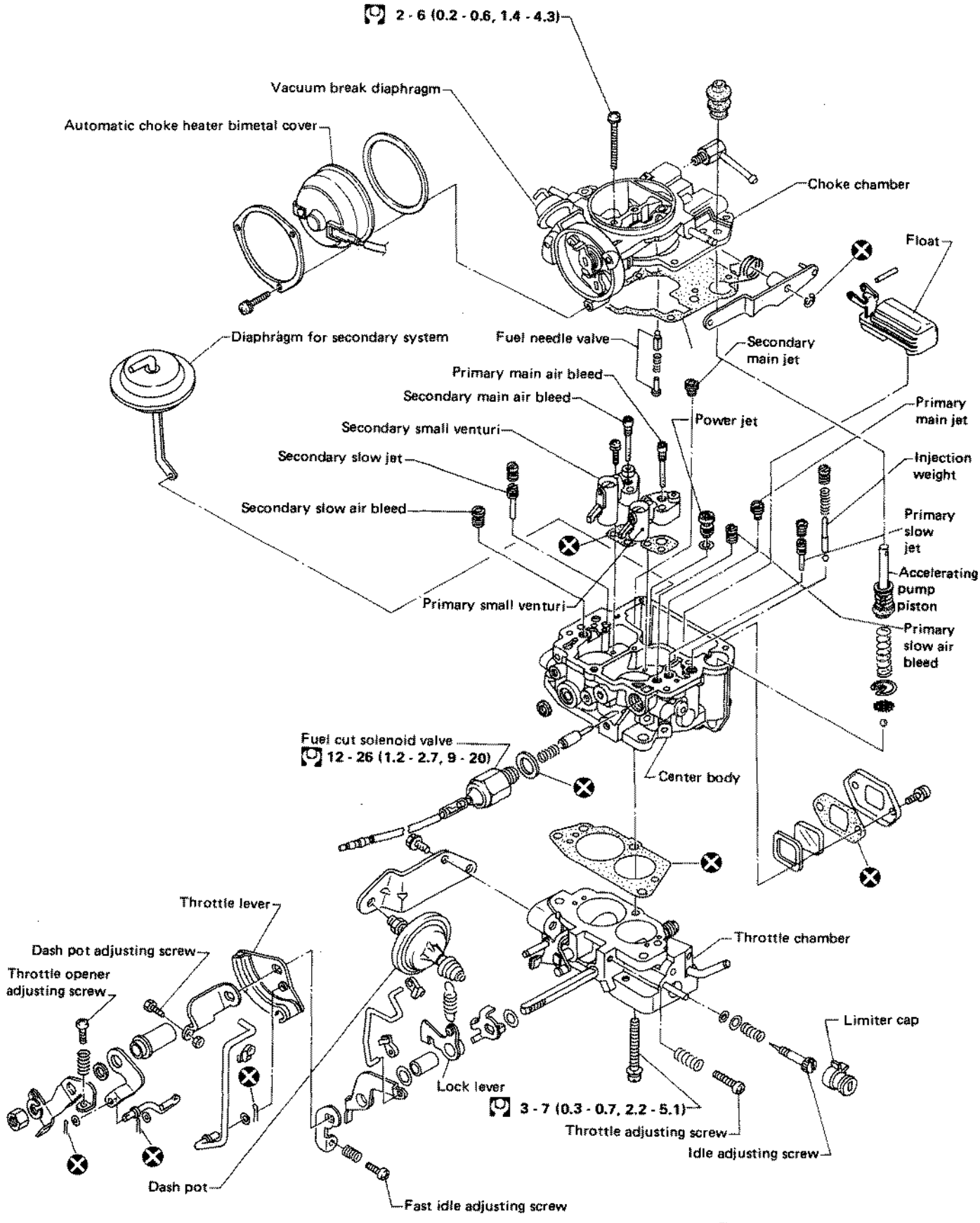
System Application

System \ Engine	E10S
A.T.C. air cleaner	X
Idle compensator	X
Automatic choke	X
Dash pot	X
Distributor vacuum advance system	X
Crankcase emission control system	X

X: Available

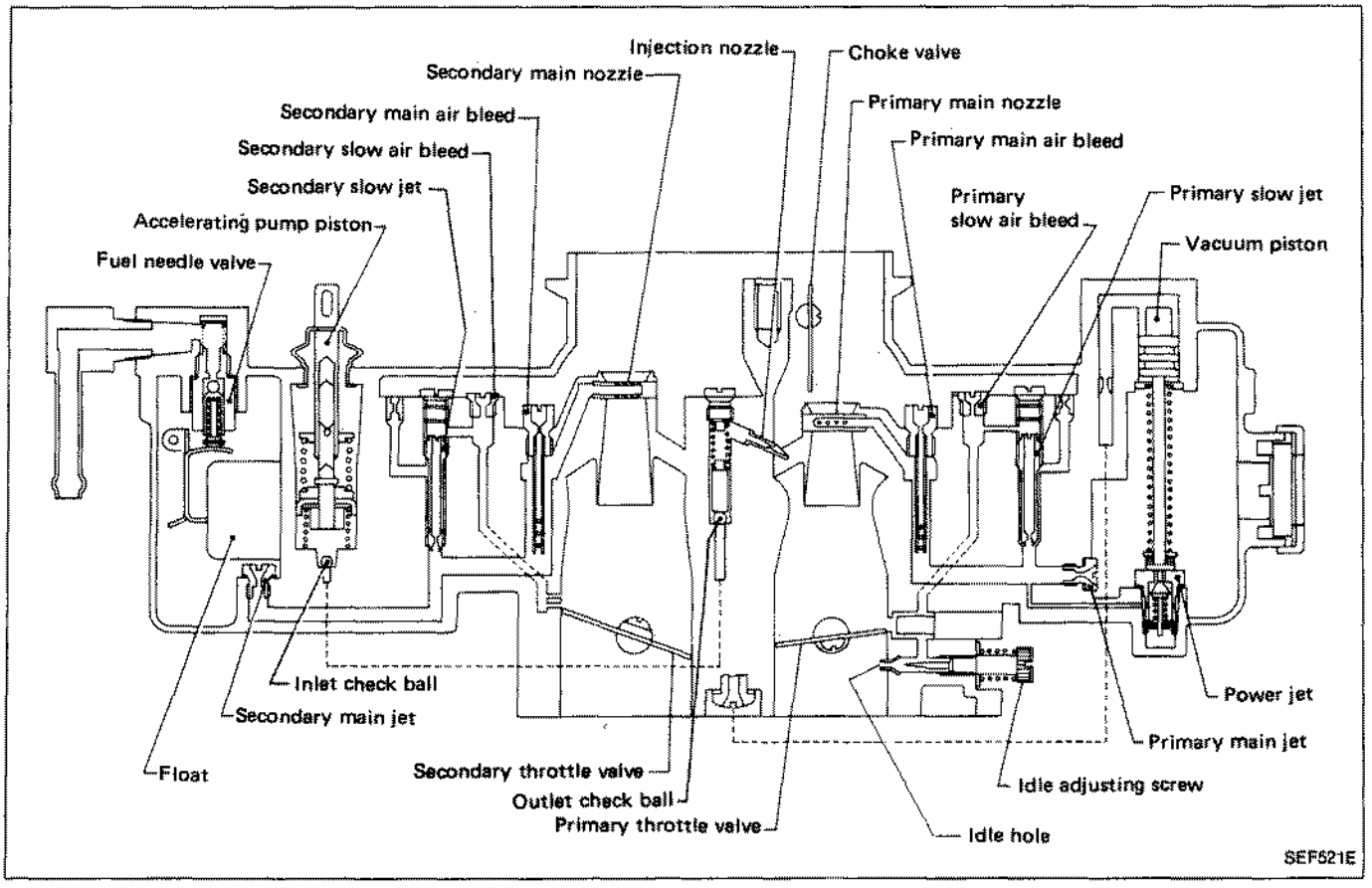
Wiring Diagram




2 - 6 (0.2 - 0.6, 1.4 - 4.3)
Vacuum break diaphragm
Automatic choke heater bimetal cover
Choke chamber
Float
Diaphragm for secondary system
Fuel needle valve
Secondary main jet
Primary main air bleed
Secondary main air bleed
Power jet
Primary main jet
Secondary small venturi
Secondary slow jet
Injection weight
Secondary slow air bleed
Primary slow jet
Accelerating pump piston
Primary small venturi
Primary slow air bleed
Fuel cut solenoid valve
12 - 26 (1.2 - 2.7, 9 - 20)
Center body
Throttle lever
Dash pot adjusting screw
Throttle opener adjusting screw
Throttle chamber
Limiter cap
Lock lever
3 - 7 (0.3 - 0.7, 2.2 - 5.1)
Throttle adjusting screw
Idle adjusting screw
Dash pot
Fast idle adjusting screw
: N·m (kg-m, ft-lb)

SEF914E

Structure


Injection nozzle
Choke valve
Secondary main nozzle
Primary main nozzle
Secondary main air bleed
Primary main air bleed
Secondary slow air bleed
Secondary slow jet
Primary slow air bleed
Primary slow jet
Accelerating pump piston
Vacuum piston
Fuel needle valve
Inlet check ball
Secondary main jet
Power jet
Primary main jet
Float
Secondary throttle valve
Idle adjusting screw
Outlet check ball
Primary throttle valve
Idle hole
SEF521E

Major Service Operation

The perfectly adjusted carburetor delivers the proper fuel and air ratios at all speeds for the particular engine for which it was designed.
The carburetor should be maintained in its original condition and will continue to deliver the proper ratios.
To maintain accurate carbureting through passages and discharge holes, extreme care must be taken in cleaning.

REMOVAL

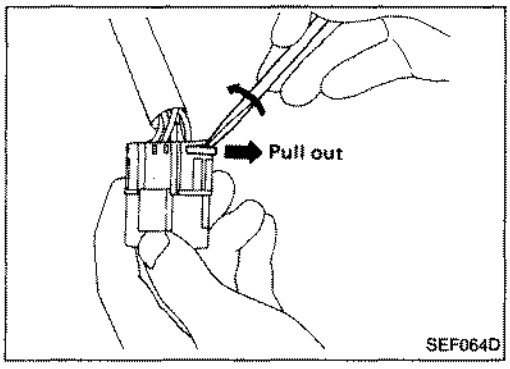
When removing carburetor from engine, take sufficient care to the following:

a. **When disconnecting fuel lines, do not spill fuel from fuel pipe.**
b. **When removing carburetor, do not drop any nut or bolt into intake manifold.**
c. **Be careful not to bend or scratch any part.**

CLEANING AND INSPECTION

Dirt, gum, water or carbon contamination in or on exterior moving parts of a carburetor often results in unsatisfactory performance. For this reason, efficient carbureting depends upon careful cleaning and inspection while servicing.
Before assembling and installing the carburetor, blow all passages and castings with compressed air and blow off all parts until dry.

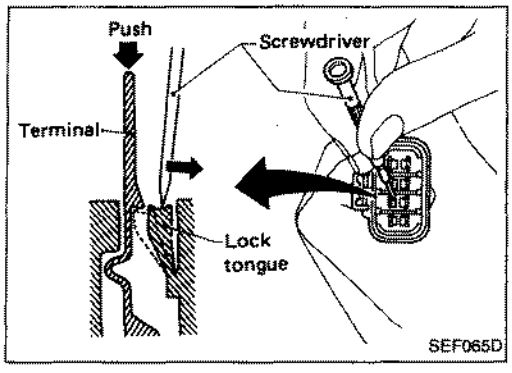
Do not pass drills or wires through calibrated jets or passages as this may enlarge orifice and seriously affect carburetor calibration.



Disassembling Carburetor Harness Connector

When replacing fuel cut solenoid and automatic choke heater (choke chamber assembly), it will be necessary to disassemble carburetor harness connector.

1. Remove rear clip.



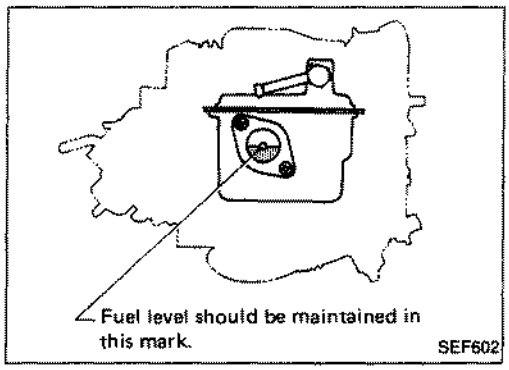
2. With a small screwdriver, tilt lock tongue and, at the same time, push out terminal.

CAUTION:

- **When extracting terminal, do not pull wire harness. Always push the top of terminal.**
- **Take care not to damage seal boot at the bottom of terminal.**
- **Do not let oil or gasoline adhere to seal boot.**

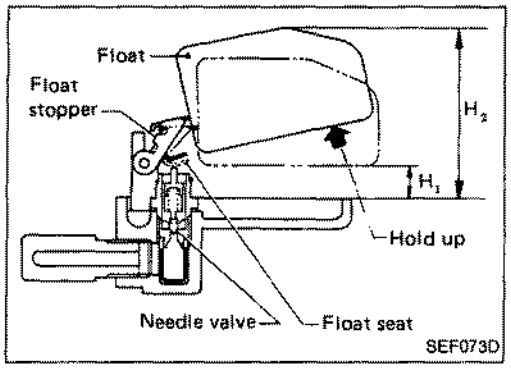
Idle Speed and Mixture Ratio

Refer to MA section for Inspection and Adjustment of idle speed and mixture ratio.



Fuel Level

Place vehicle in a level area and with engine idling, check fuel level through sight glass.
If N.G., adjust as follows.



1. Remove choke chamber.
2. Turn choke chamber upside down, raise float, then lower it until float seat contacts with needle valve and in that position check clearance H_1.
   H_1: 14.5 - 15.5 mm (0.571 - 0.610 in)
   If out of specification, adjust by bending float seat.
3. Raise float until float stopper touches the choke chamber, and check height H_2.
   H_2: 44.5 - 45.5 mm (1.752 - 1.791 in)
   If out of specification, adjust by bending float stopper.
4. Install choke chamber and recheck fuel level with engine idling.

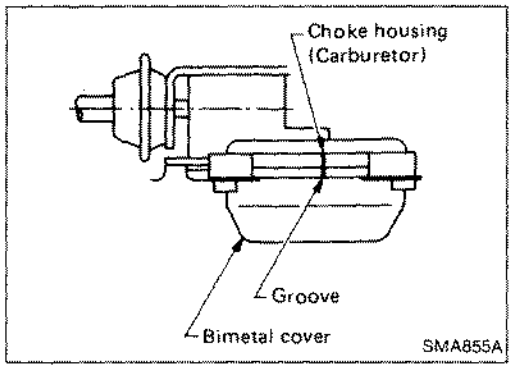
CAUTION:
Always replace choke chamber gasket with a new one.

Automatic Choke

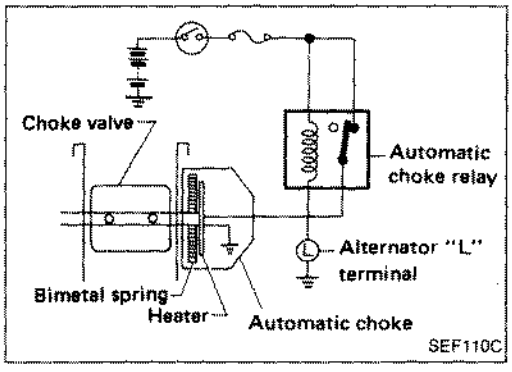
AUTOMATIC CHOKE ADJUSTMENT

1. With the engine cold and before starting it, fully open throttle valve and ensure that choke valve closes properly.
2. Push choke valve with a finger, and check for smooth movement.

Automatic Choke (Cont'd)



3. Check bimetal cover mark and choke housing mark. When bimetal cover is replaced, set bimetal cover mark so that it will be aligned with choke housing mark.



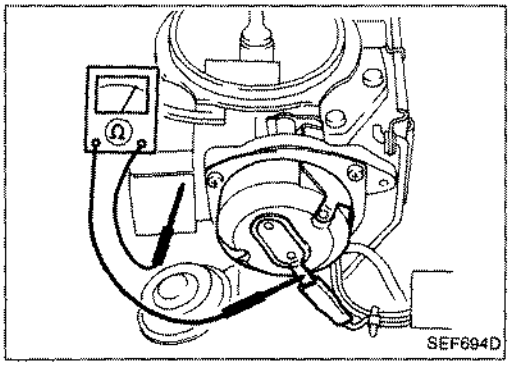
AUTOMATIC CHOKE INSPECTION

1. Check automatic choke heater source wiring for proper connection, then start engine.
2. After warming up the engine, ensure that choke valve is fully open.
3. If choke valve does not operate after warm-up, check choke heater circuit, choke heater and choke relay.

Choke heater circuit

Check continuity of circuit.

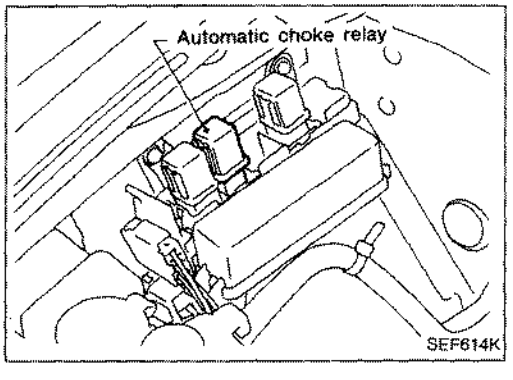
Refer to "Circuit Diagram" and "Wiring Diagram" in "ENGINE ELECTRICAL SYSTEM".



Choke heater

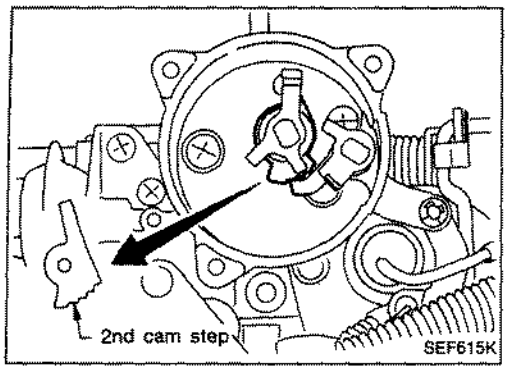
Check for continuity between choke heater connector and choke housing.

Continuity should exist.



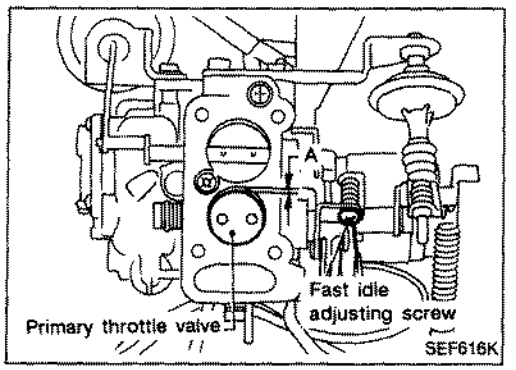
Choke relay

Automatic choke relay is installed in the engine room.
Check relay for proper operation.
Refer to "STANDARDIZED RELAY" in EL section.

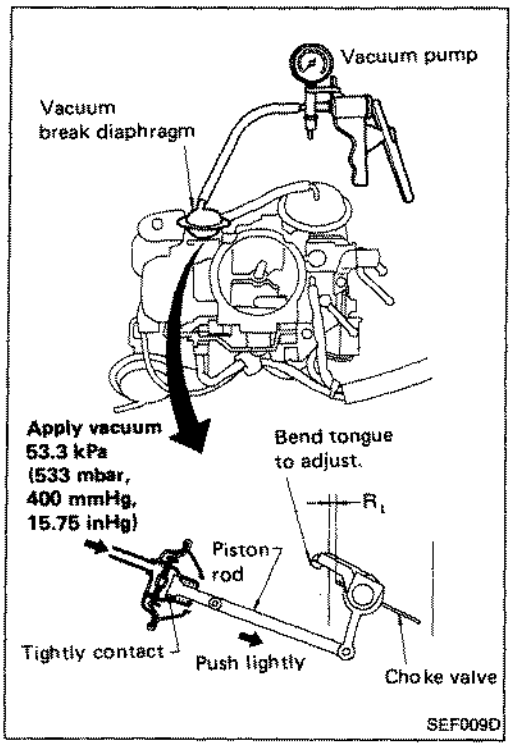


Fast Idle

1. Warm up engine. Remove automatic choke heater bimetal cover and set fast idle arm on 2nd cam step of fast idle cam.
2. Read engine speed.
   Fast idle speed (at 2nd cam step):
   2,200 ± 200 rpm

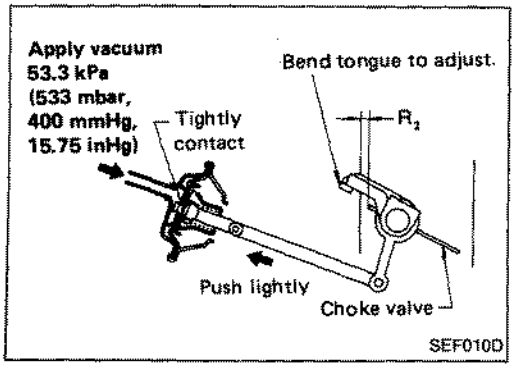


3. If out of specifications, remove carburetor and make fast idle adjustments as follows.
1) Place fast idle arm on 2nd step of fast idle cam.
2) Adjust clearance "A" between primary throttle valve and inner carburetor wall by turning fast idle adjusting screw.
   Clearance "A":
   0.47 ± 0.07 mm (0.0185 ± 0.0028 in)
4. After adjusting clearance "A", install carburetor on engine and check engine speed.
5. Install automatic choke heater bimetal cover.



Vacuum Break

1. With engine cold, visually check that choke valve is fully closed.
2. Apply vacuum to vacuum break diaphragm.
3. Lightly push piston rod in the direction that closes choke valve and check clearance "R_1".
   Clearance "R_1":
   1.31 ± 0.14 mm (0.0516 ± 0.0055 in)
   If out of specification, adjust "R_1" by bending tongue.



4. Lightly push piston rod toward diaphragm and check clearance "R_2".
   Clearance "R_2":
   1.84 ± 0.28 mm (0.0724 ± 0.0110 in)
   If out of specification, recheck and adjust clearance "R_1".

Accelerating Pump

1. With engine stopped, turn the throttle lever and ensure that the fuel is injected smoothly through the injector located in primary port.

A pump stroke limiter serves to inject a small amount of fuel immediately after throttle lever movement.

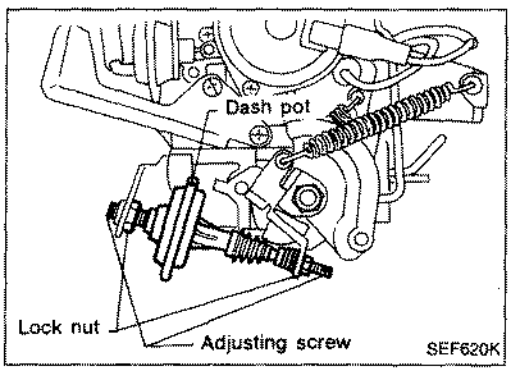
2. If accelerating pump is out of order, check link, lever pump piston, limiter, etc.

Do not bend stroke limiter.

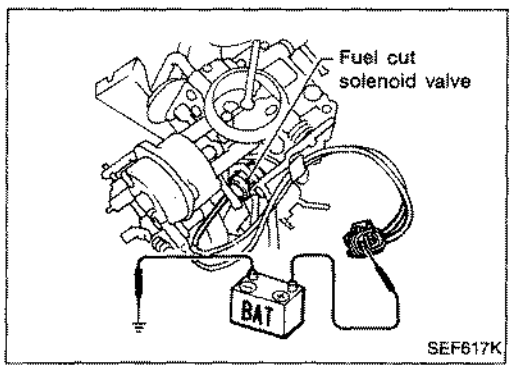
Dash Pot

1. Warm up engine sufficiently. Idle speed of engine and mixture must be well tuned.
2. Turn throttle lever by hand, and read engine speed when dash pot stem just touches stopper lever.

Dash pot touch speed:
1,900 ± 200 rpm



3. If out of specifications, adjust it by turning adjusting screws.
4. After adjusting, make sure that dash pot operates smoothly.



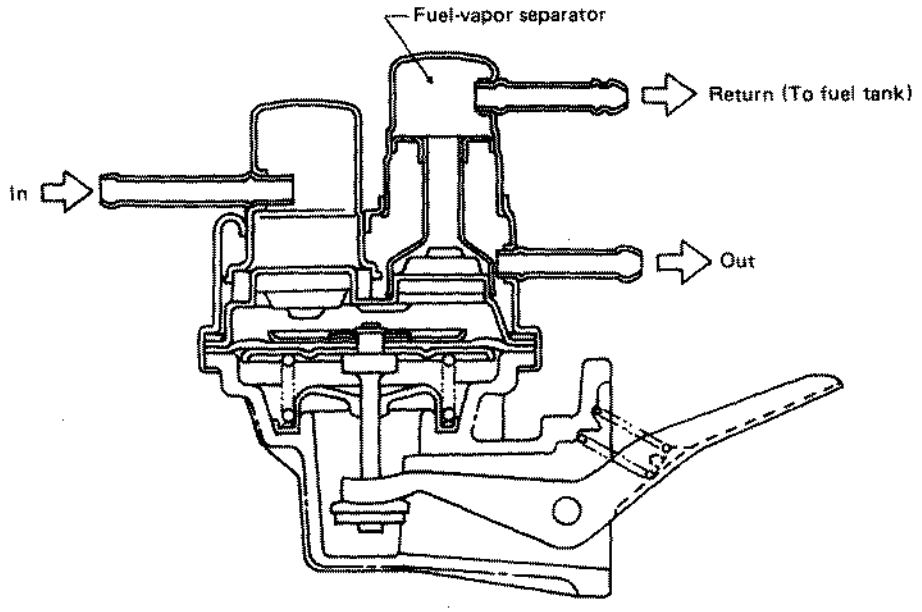
Fuel Cut Solenoid Valve

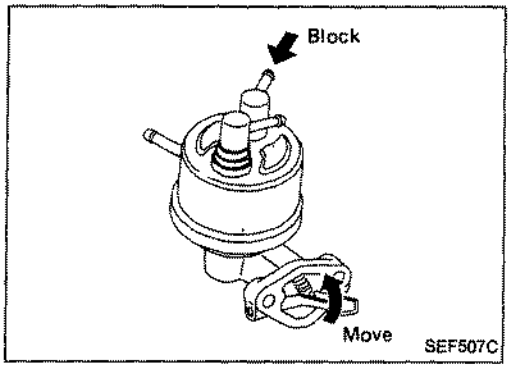
If the engine does not stop when the carburetor harness connector is disconnected, the solenoid valve is stuck or broken.

Connect solenoid valve lead wire to battery. Check "clicking" sound from solenoid valve when battery is connected and disconnected. If N.G., replace the solenoid valve.

After replacement, start engine and check to be sure that fuel is not leaking, and that fuel cut solenoid valve is in good condition.

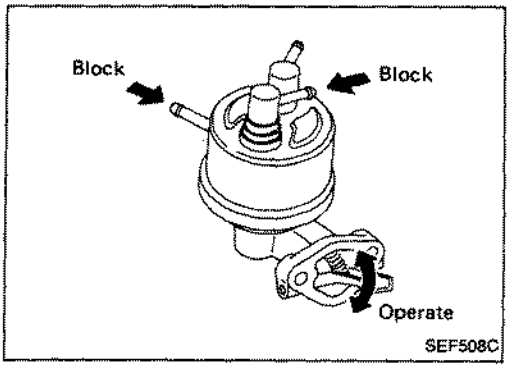
The fuel pump cannot be disassembled.



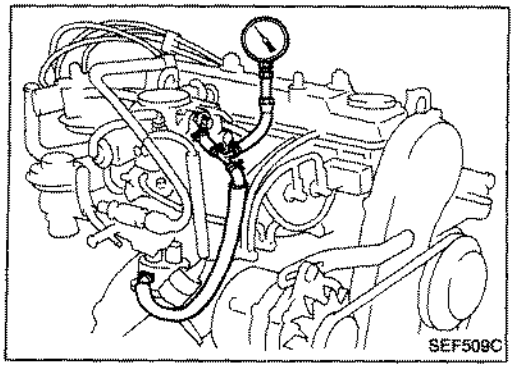


WARNING:
Before starting to work on any part of fuel system, disconnect ground cable from battery.
When disconnecting fuel hoses, use a container to catch fuel remaining in the hoses.

1. Flush pump by immersing it in a fuel bath and operating rocker arm a number of times.
2. Drain fuel from fuel pump. Then block off the inlet port and check that pump arm does not move.



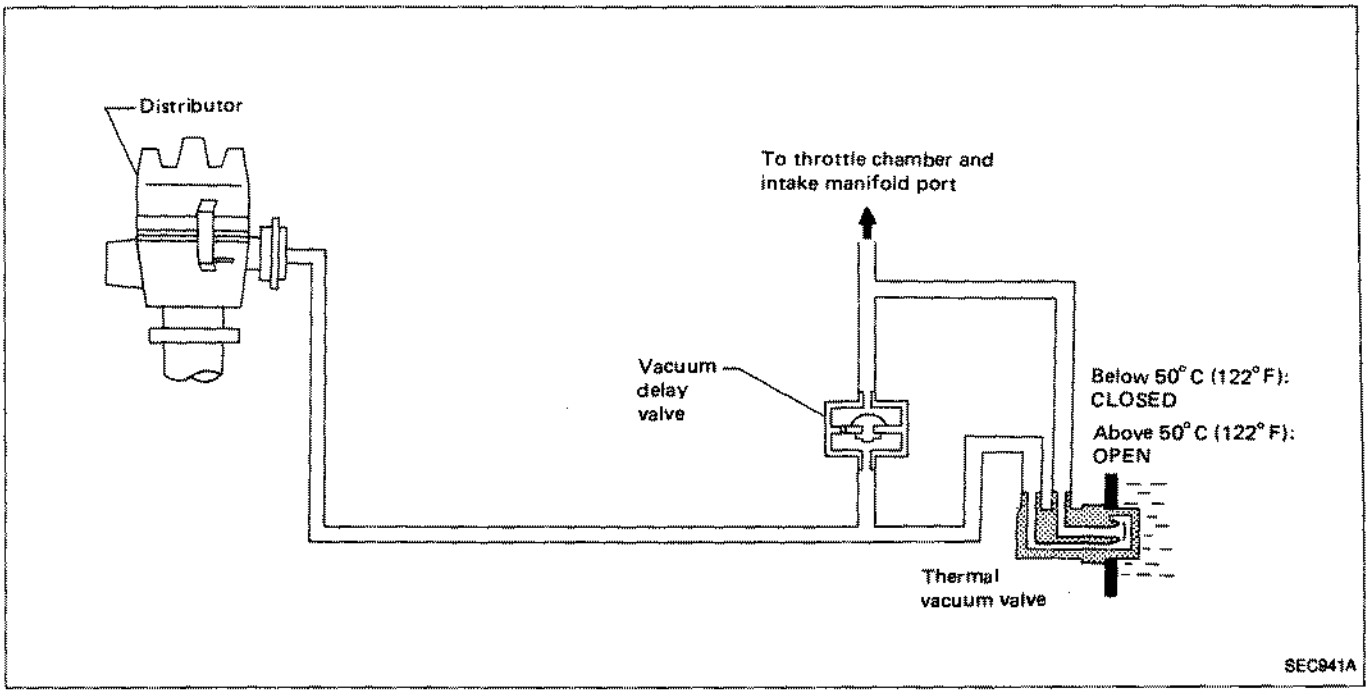
3. Remove your finger from the inlet port and listen for a suction sound which will confirm that a sufficient suction was produced.
4. Block off outlet port and return port and once again operate the pump arm. After air pressure has been built up, confirm that the pressure remains for two or three seconds.
5. Put a finger over the outlet port and return port and again build up pressure in the pump. Then submerse the pump in a fuel bath and check for air leaks.



Fuel pressure test

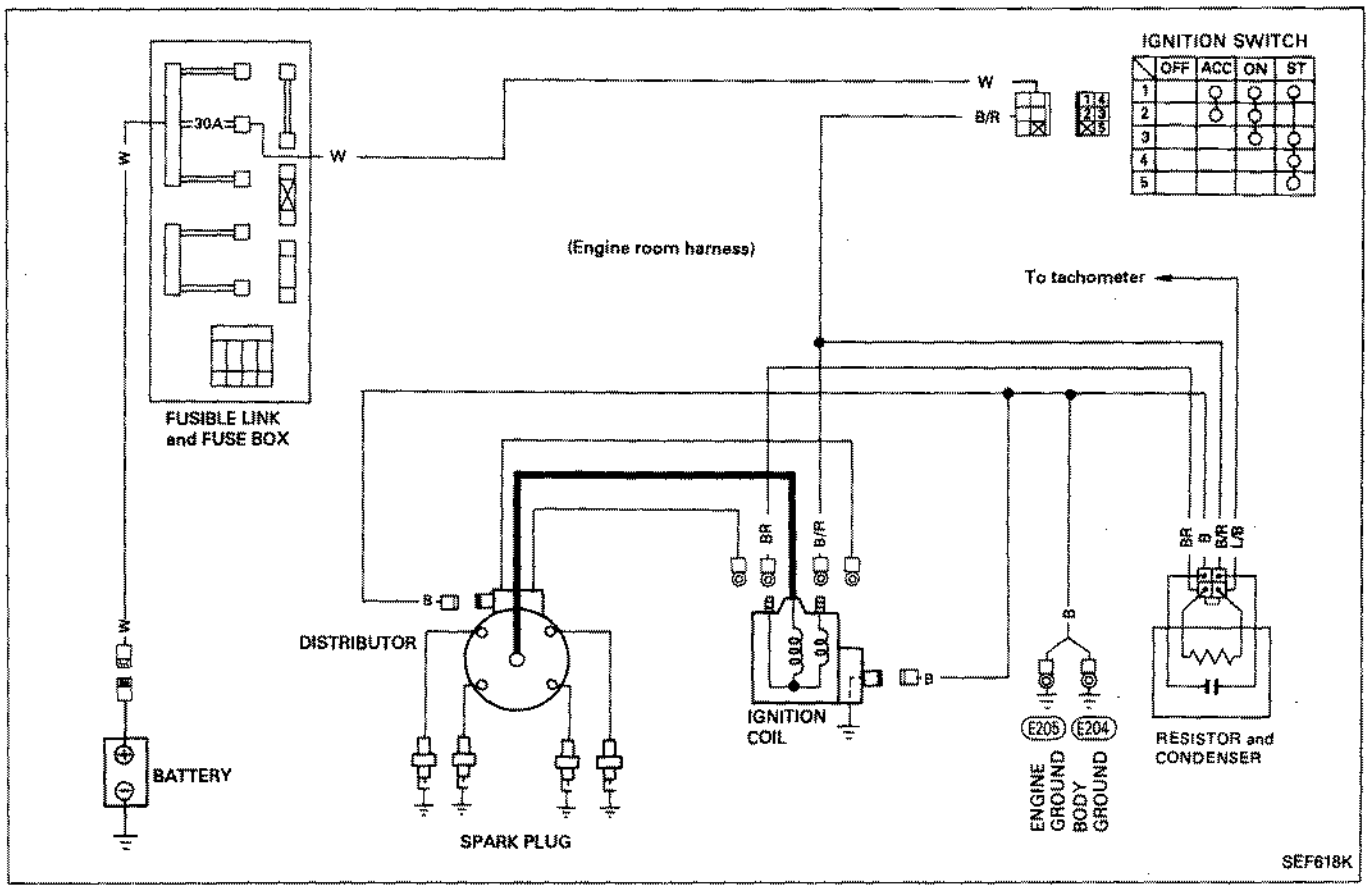
1. Connect T-connector and a suitable pressure gauge.
2. Disconnect fuel return hose and plug up outlet tube for return.
3. Check fuel pressure with engine running at various speeds.
   Fuel pump pressure:
   19.6 - 26.5 kPa (0.196 - 0.265 bar, 0.20 - 0.27 kg/cm^2, 2.8 - 3.8 psi)
   If out of specification, replace fuel pump.

Description



This system is designed to improve driveability when the engine is cold.

Wiring Diagram



Trouble-shooting

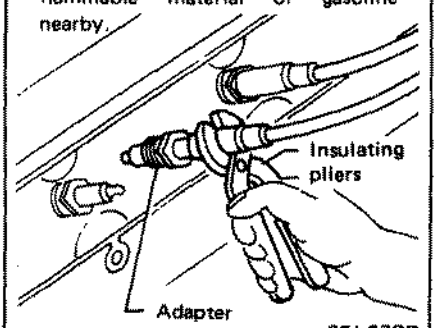
Engine turns erratically.

Engine turns but does not start.

Check ignition timing.
N.G. → Adjust.
O.K. →

Attach adapter *1 to high tension wire and position tip of adapter approx. 6 mm (0.24 in) away from cylinder block. With adapter held in that position, crank engine to see if spark jumps across gaps between tip and cylinder block at regular intervals.

Before cranking, disconnect harness connector to carburetor. Before operation, make sure there is no flammable material or gasoline nearby.



SEL578B

O.K. →

Check for burned or fouled spark plug.
N.G. → Clean or replace.
O.K. → Check fuel system.

N.G. →

Check high-tension wires. Refer to MA section.

O.K. →

Check air gap between reluctor and stator.

O.K. →

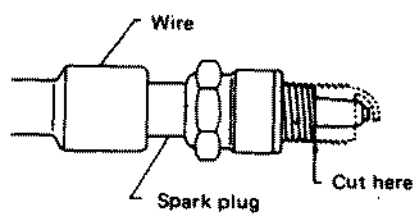
Check IC ignition system.
IC Ignition System is checked using a volt-ohmmeter.
Follow the steps in the sequence indicated. If a fault is in found, correct the problem before continuing. If all tests indicate "O.K." replace the IC Ignition Unit. DO NOT REPLACE THE UNIT UNTIL ALL TESTS HAVE BEEN COMPLETED AND INDICATE "O.K.".

Go to test table.

WARNING:
When current is flowing, never touch with bare hand high tension wires or any other parts with high voltage. If parts are moist, touching them could cause an electric shock, even if they are insulated. Always wear dry, well-insulated gloves or wrap affected parts with dry cloth before handling.

NOTE:
1. **When performing the following tests, use a multitester which can measure accurately in the following ranges; 0 to 20V. D.C.; 0 to 1,000Ω; 0 to 10V A.C.; 0 to 50,000Ω.**
2. **If possible, start the vehicles and let it run for 5 to 15 minutes with the hood closed. This will bring all components to normal operating temperature, and will make it easier to diagnose intermittent problems.**
3. **It is not necessary to disconnect the harness connectors when performing the tests which follow. Simply insert the meter probes into the back of appropriate connector cavity.**

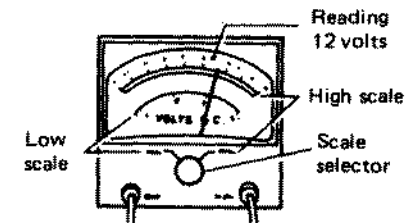
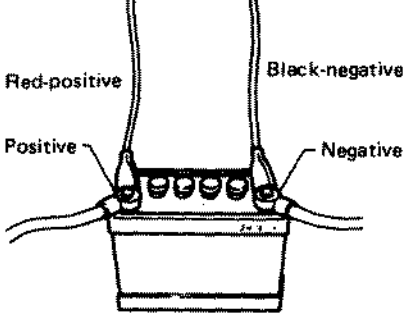
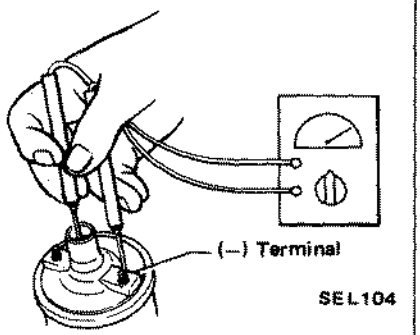
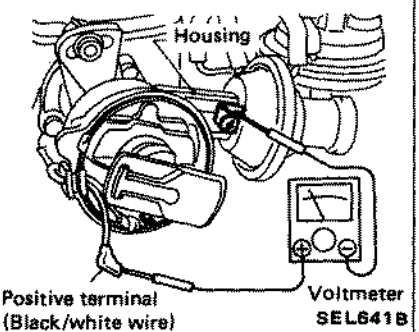
*1:
Preparation of spark plug for checking
Many things can be utilized as an adapter. However, it is recommended that a used spark plug whose threaded portion has been half cut off as shown in the figure be utilized.



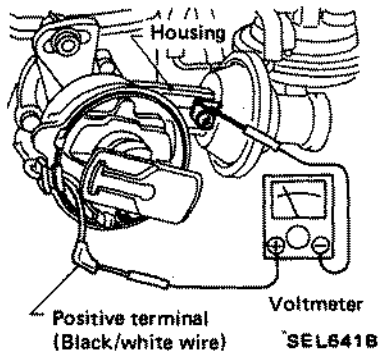
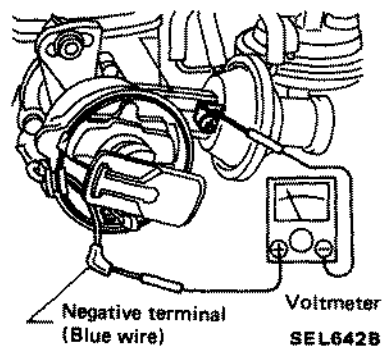
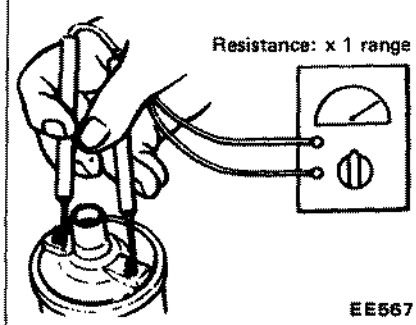
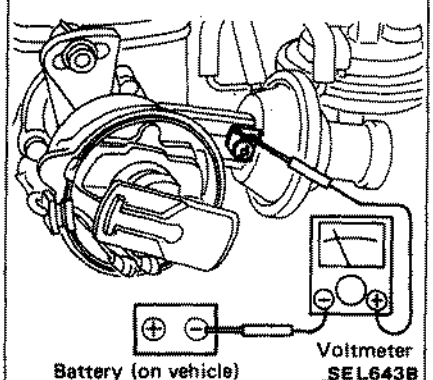
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Trouble-shooting (Cont'd)

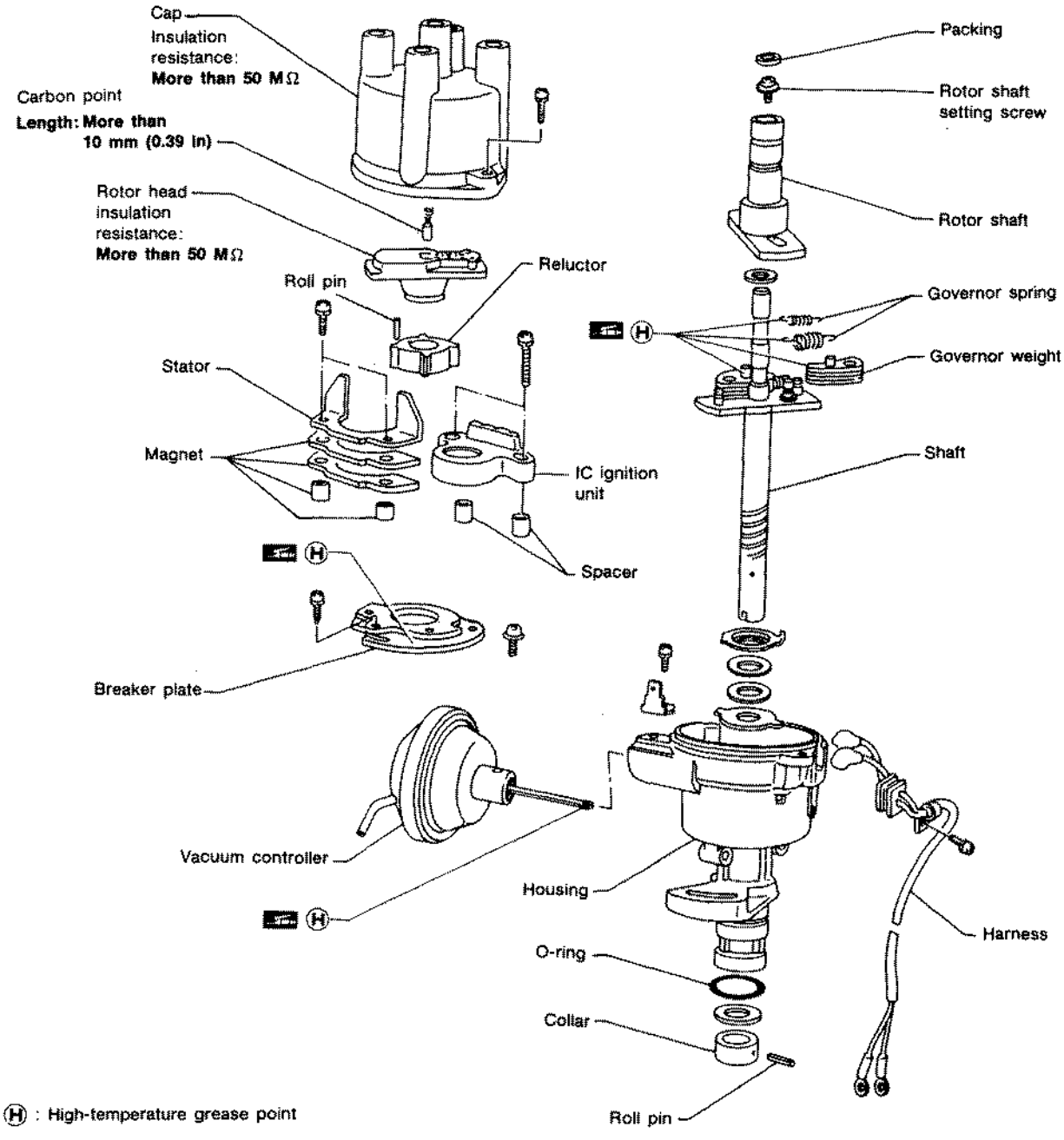
TEST TABLE

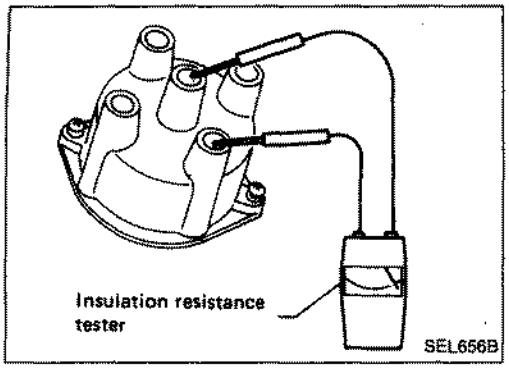
TEST STEP	TEST METHOD	CONDITIONS	RESULT	ACTION
1. Battery Voltage (no-load)		1. Ignition key in "OFF" position. 2. Connect voltmeter as illustrated and set to appropriate scale. 3. Read and record battery voltage reading.	11.5 - 12.5 volts	Proceed to Step 2.
			Below 11.5 volts	Battery, charging system or starting system — Faulty. Refer to applicable section in Service Manual to correct the situation.
2. Battery Cranking Voltage	 SEL103	1. Connect voltmeter as illustrated and set to appropriate scale. 2. Remove coil wire from distributor cap and ground it. 3. Read voltmeter while cranking engine for approximately 15 seconds. 4. Record battery cranking voltage reading.	Voltage reading greater than 9.6 volts	Battery O.K. Proceed to Step 3.
			Voltage reading less than 9.6 volts	Battery, charging system or starting system — Faulty. Refer to applicable sections in Service Manual to correct the situation.
3. Ignition Coil Secondary Circuit	 SEL104	1. Ignition key in "OFF" position. 2. Remove coil wire from coil. 3. Connect ohmmeter as illustrated.	Specified value (Refer to "Service Data and Specifications".)	Ignition coil secondary windings — O.K. Proceed to Step 4.
			Not within the specified values	Faulty ignition coil — replace.
4. Power Supply Circuit	 SEL641B	1. Connect voltmeter as illustrated and set to appropriate scale. 2. Turn ignition key to "ON" position.	11.5 - 12.5 volts	Proceed to Step 5.
			Below 11.5 volts	Check wiring from ignition switch to IC unit.

Trouble-shooting (Cont'd)

TEST STEP	TEST METHOD	CONDITIONS	RESULT	ACTION
5. Power Supply Circuit (Cranking)		1. Connect voltmeter as illustrated and set to appropriate scale. 2. Pull out coil wire from distributor cap and ground it. 3. Turn key to "START" position and observe voltmeter while engine is cranking.	Voltage reading is less than 1 volt below battery cranking voltage and is greater than 8.6 volts.	Proceed to Step 6.
			Voltage reading is more than 1 volt below battery cranking voltage and/or is below 8.6 volts.	Check ignition switch and wiring from switch to IC unit.
6. Ignition Primary Circuit		1. Connect voltmeter as illustrated and set to appropriate scale. 2. Ignition key in "ON" position.	11.5 - 12.5 volts	Proceed to Step 8.
			Below 11.5 volts	Proceed to Step 7.
7. Ignition Coil Primary Circuit		1. Ignition key in "OFF" position. 2. Coil wire removed from coil. 3. Connect ohmmeter as illustrated.	1.04 - 1.27 ohms	Ignition coil primary winding O.K. Check ignition switch and wiring from ignition switch to coil and IC unit.
			Resistance reading not between 1.04 - 1.27 ohms	Faulty ignition coil — replace.
8. I.C. Unit Ground Circuit		1. Connect voltmeter as illustrated and set to appropriate scale. 2. Pull out coil wire from distributor cap and ground it. 3. Turn key to "START" position and observe voltmeter while engine is cranking.	0.5 volts or less	Replace IC ignition unit assembly.
			More than 0.5 volts	Check distributor ground, wiring from chassis ground to battery including battery cable connections.

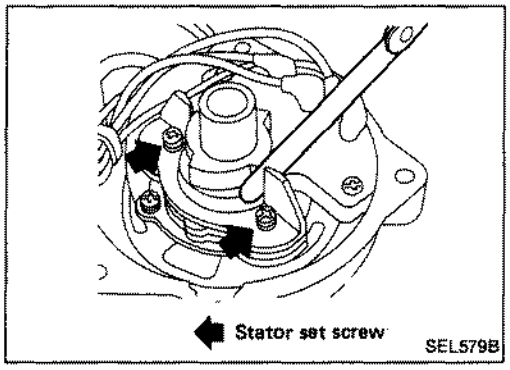
Construction





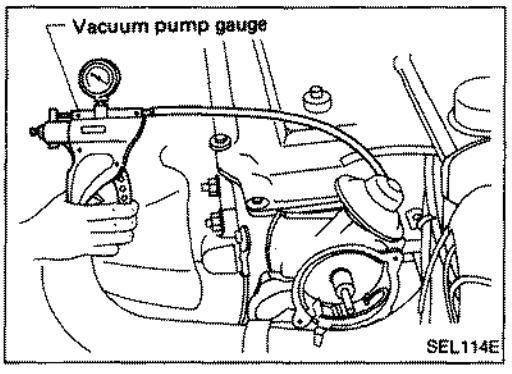
Cap and Rotor Head

1. Check cap and rotor head for dust, carbon deposits and cracks.
2. Measure insulation resistance between electrodes on ignition coil and side of spark plug.
   Insulation resistance:
   More than 50 [MΩ]
   - Less than specified value ... Replace.



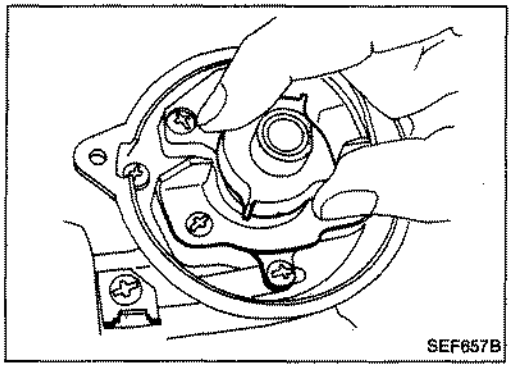
Air Gap Adjustment

- Adjust air gap between reluctor and stator.
  Loosen stator set screw and adjust gap with a gap gauge.
  Air gap:
  0.3 - 0.5 mm (0.012 - 0.020 in)



Vacuum Advance Check

1. Connect vacuum pump gauge to the vacuum controller and gradually draw a vacuum while watching breaker plate movement. Check for smooth operation with no evidence of binding.
2. Turn breaker plate right and left to check for freedom of movement.



Governor Advance Check

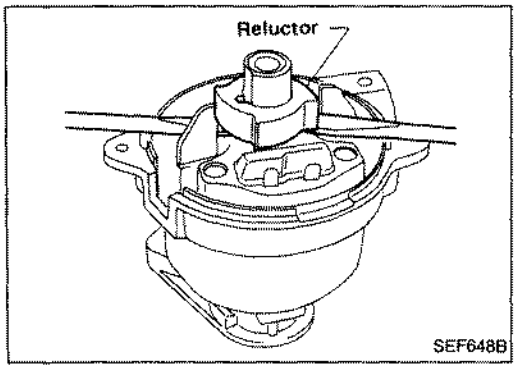
- Turn the reluctor counterclockwise, release it and check that the reluctor returns smoothly to the original position.

Disassembly

Carefully observe the following instructions during disassembly.

- **Put match mark across cam and shaft so that original combination can be restored at assembly.**
- **Inscribe a match mark across spring and mating parts so that spring can be replaced in its original position during assembly.**
  Be careful not to stretch or deform governor spring.

Disassembly (Cont'd)



RELUCTOR

When removing reluctor, be careful not to distort or damage the teeth.

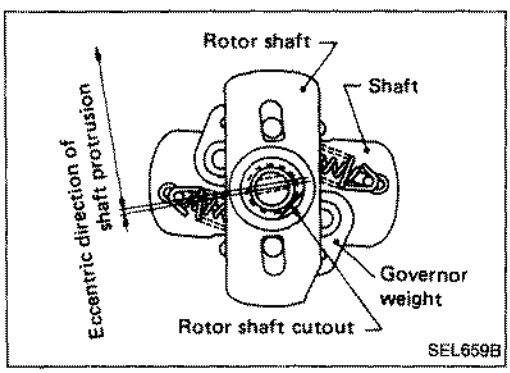
Assembly

Carefully observe the following instructions.

GREASE POINT

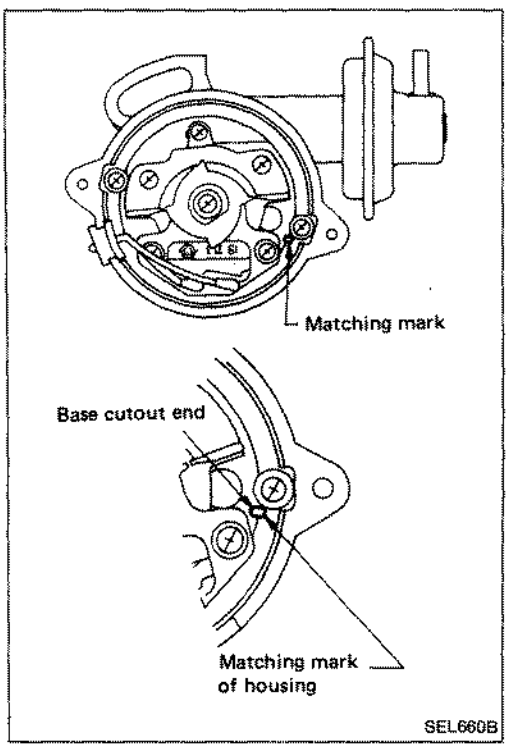
Apply high-temperature grease to:

- Shaft bearing metal
- Governor spring
- Frictional surface of governor weight
- Frictional surface of breaker plate



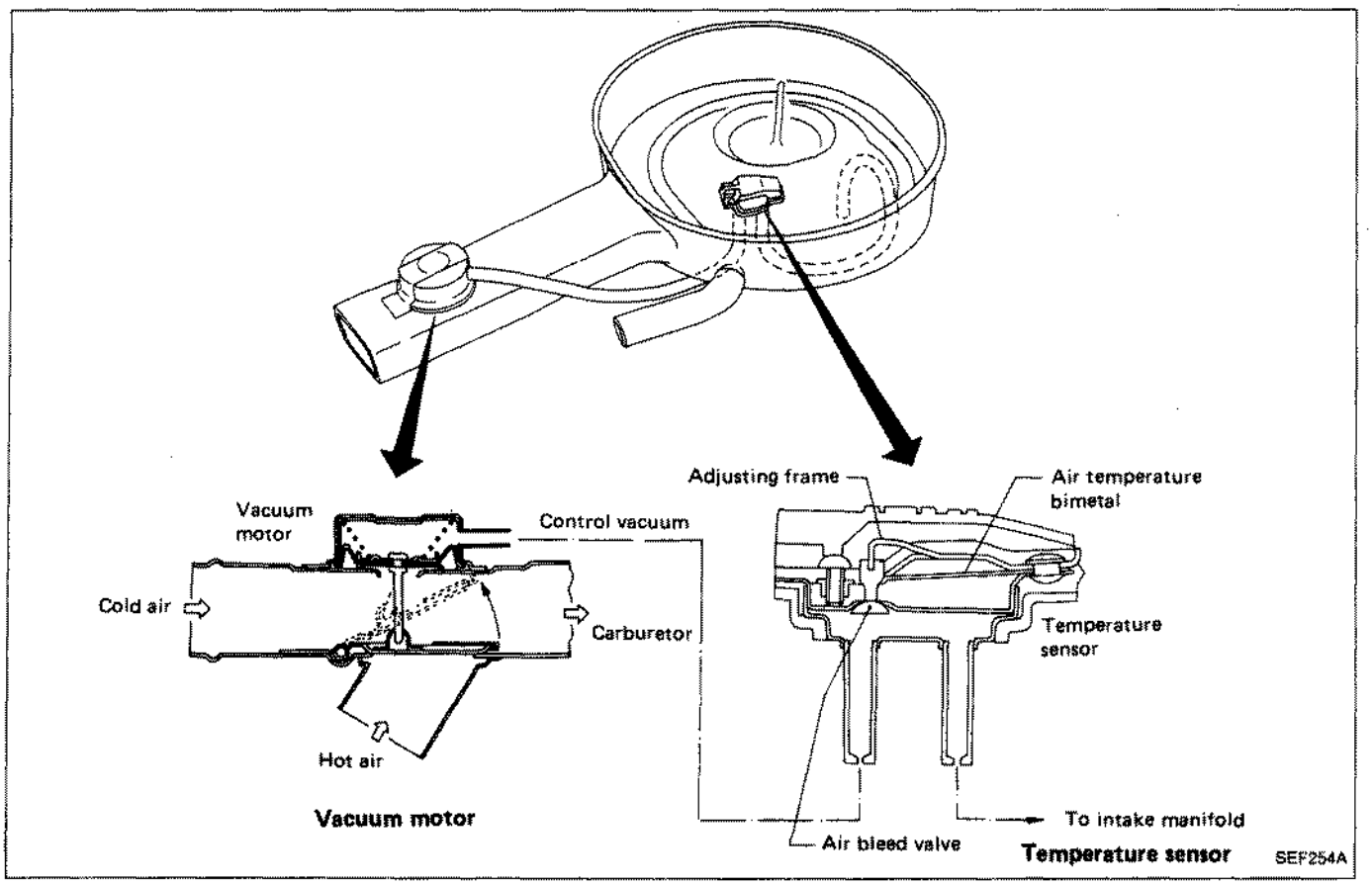
INSTALLATION OF ROTOR SHAFT

Position cutout direction of rotor shaft and eccentric direction of drive shaft protrusion as shown below; then install rotor shaft to drive shaft.



INSTALLATION OF BREAKER PLATE

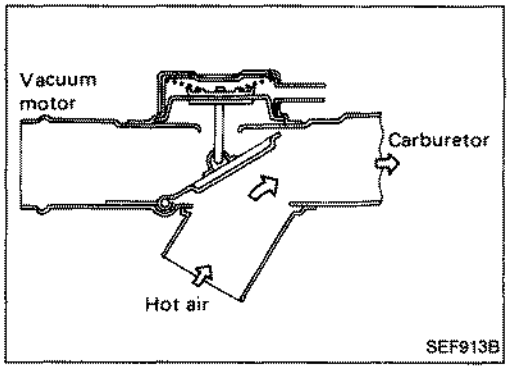
Ensure that aligning marks on breaker plate and housing are lined up properly.



The automatic temperature control system maintains the temperature of air sucked in the carburetor within a constant range, thereby enabling lean setting for carburetor calibration. In addition to this, the automatic temperature control system is effective in improving warm-up characteristics of the engine and to prevent carburetor from icing.

Operation

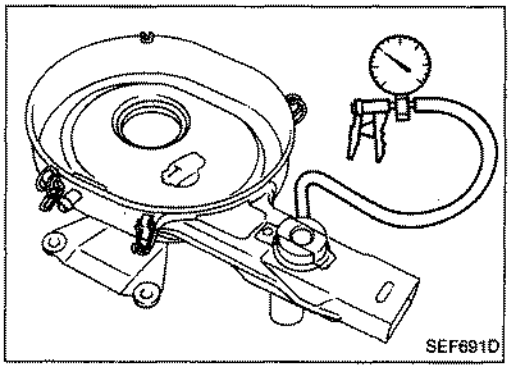
Temperature sensor		Vacuum motor		Inlet air
Ambient temperature around sensor °C (°F)	Operation	Intake manifold vacuum kPa (mbar, mmHg, inHg)	Operation	
Below 38 (100)	Closed	Above 25.3 (253, 190, 7.48)	Raised	Hot
		8.0 - 25.3 (80 - 253, 60 - 190, 2.36 - 7.48)	Partially raised	Cold + Hot
		Below 8.0 (80, 60, 2.36)	Down	Cold
Above 55 (131)	Open	Any value	Down	



Inspection

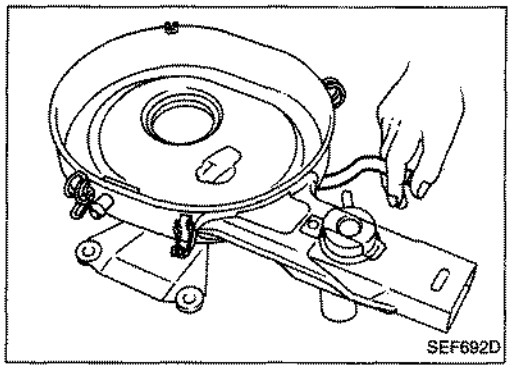
VACUUM HOSE

Check hoses for cracks, distortion and improper position.



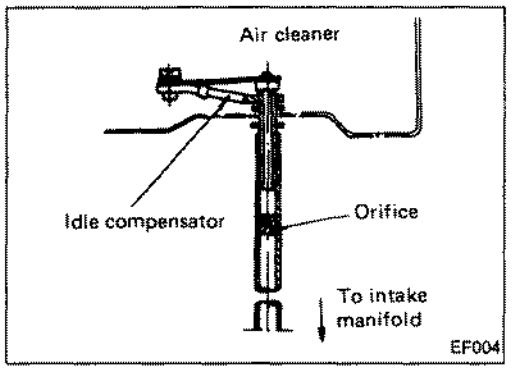
VACUUM MOTOR

Disconnect vacuum motor inlet vacuum hose, and connect another hose to the inlet to apply vacuum to vacuum motor. Then, confirm that the air control valve moves.



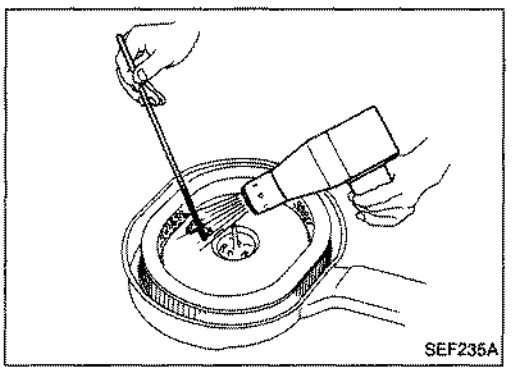
TEMPERATURE SENSOR

While engine is cold and idling, disconnect vacuum motor inlet vacuum hose and make sure that intake vacuum is present at end of vacuum hose. If vacuum is weak or is not present at all, check vacuum hoses for leakage. Replace temperature sensor if vacuum hoses are in good order.



Idle compensator opening temperature

Intake air temperature °C (°F)	Bimetal function
Below 55 (131)	Fully closed
55 - 65 (131 - 149)	Closed or open
Above 65 (149)	Fully open



Inspection

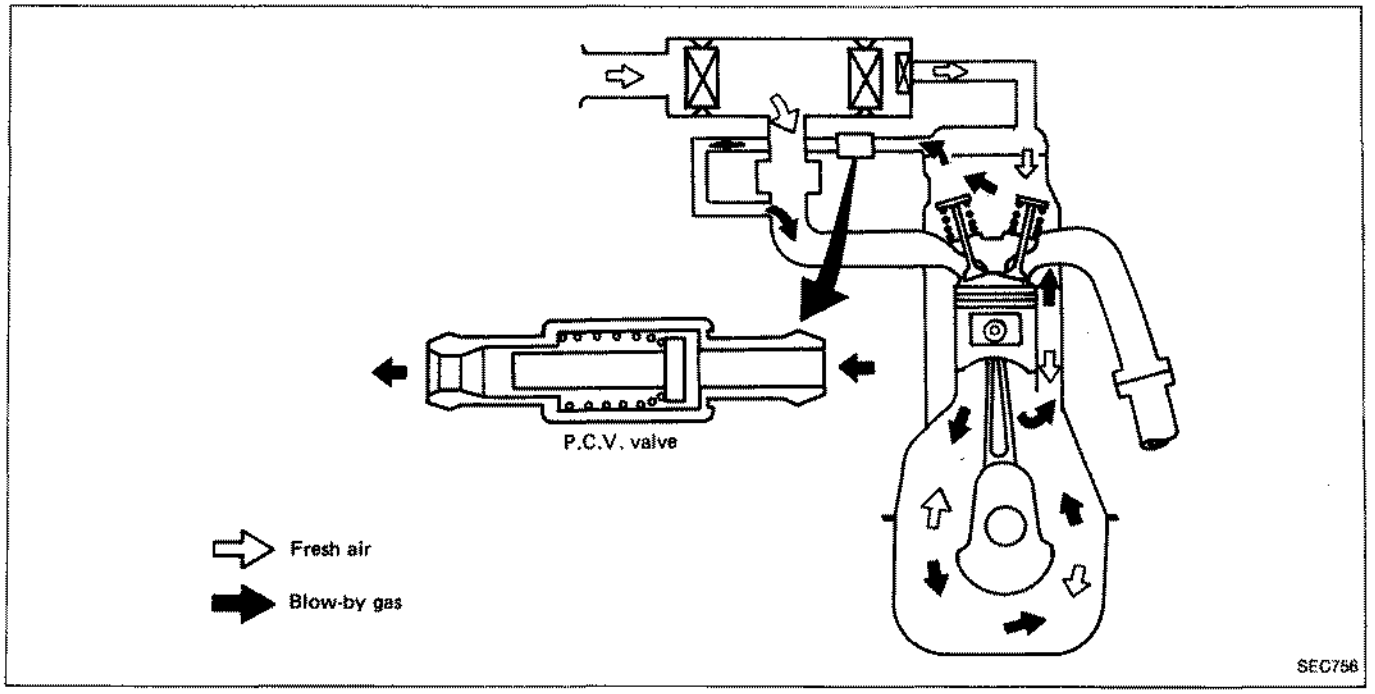
1. Warm up engine completely.
2. Open engine hood and remove air cleaner cover.
3. Direct warm air to idle compensator with a heat gun.
   And measure operating temperature of idle compensator.

Place thermometer as close as possible to idle compensator sensor.

4. Idle compensator is in good order if a "hissing" sound is heard when its temperature reaches operating temperature.
   If not, replace idle compensator.

Take care not to bend or damage bimetals of idle compensator.

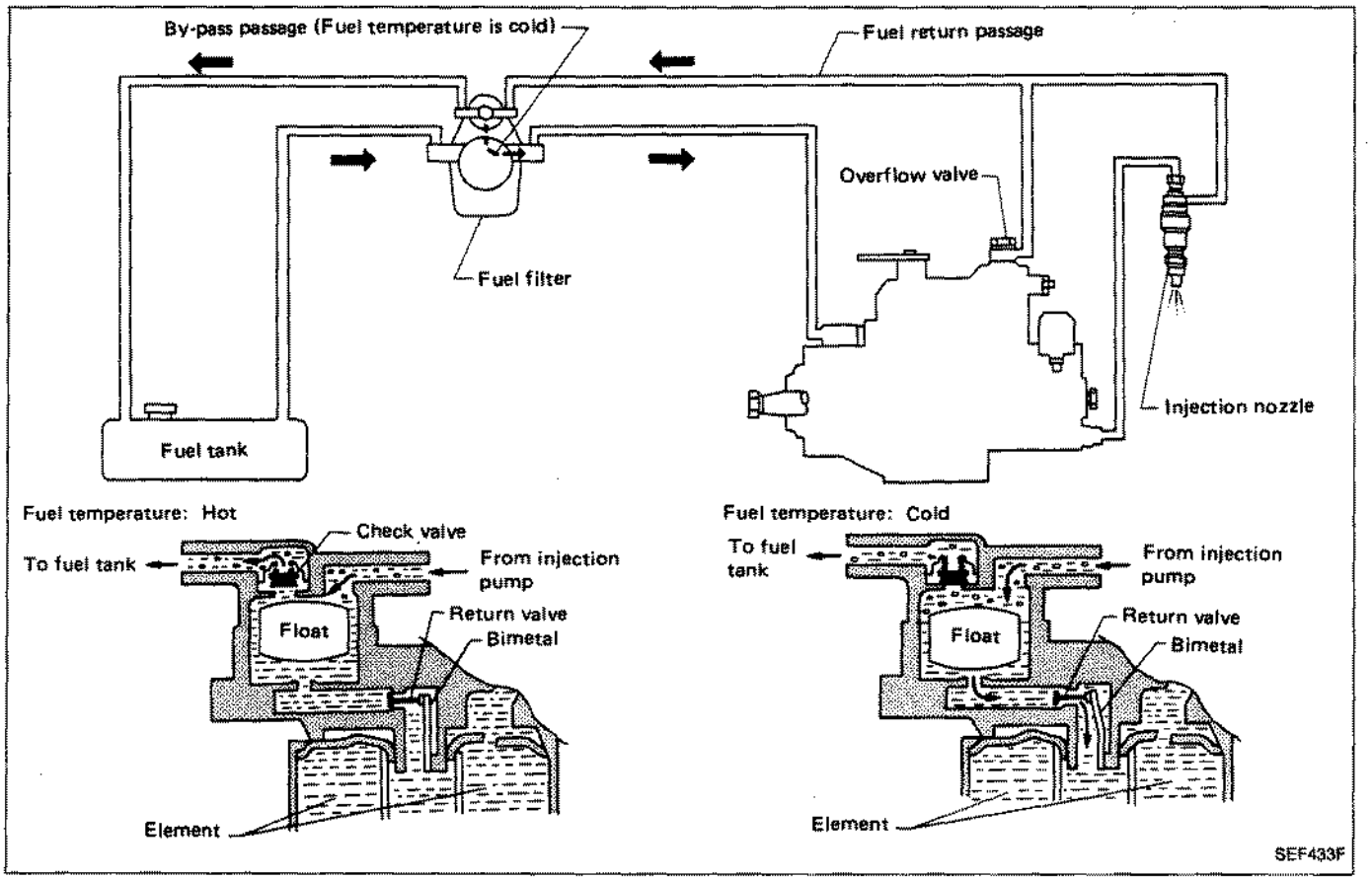
Description

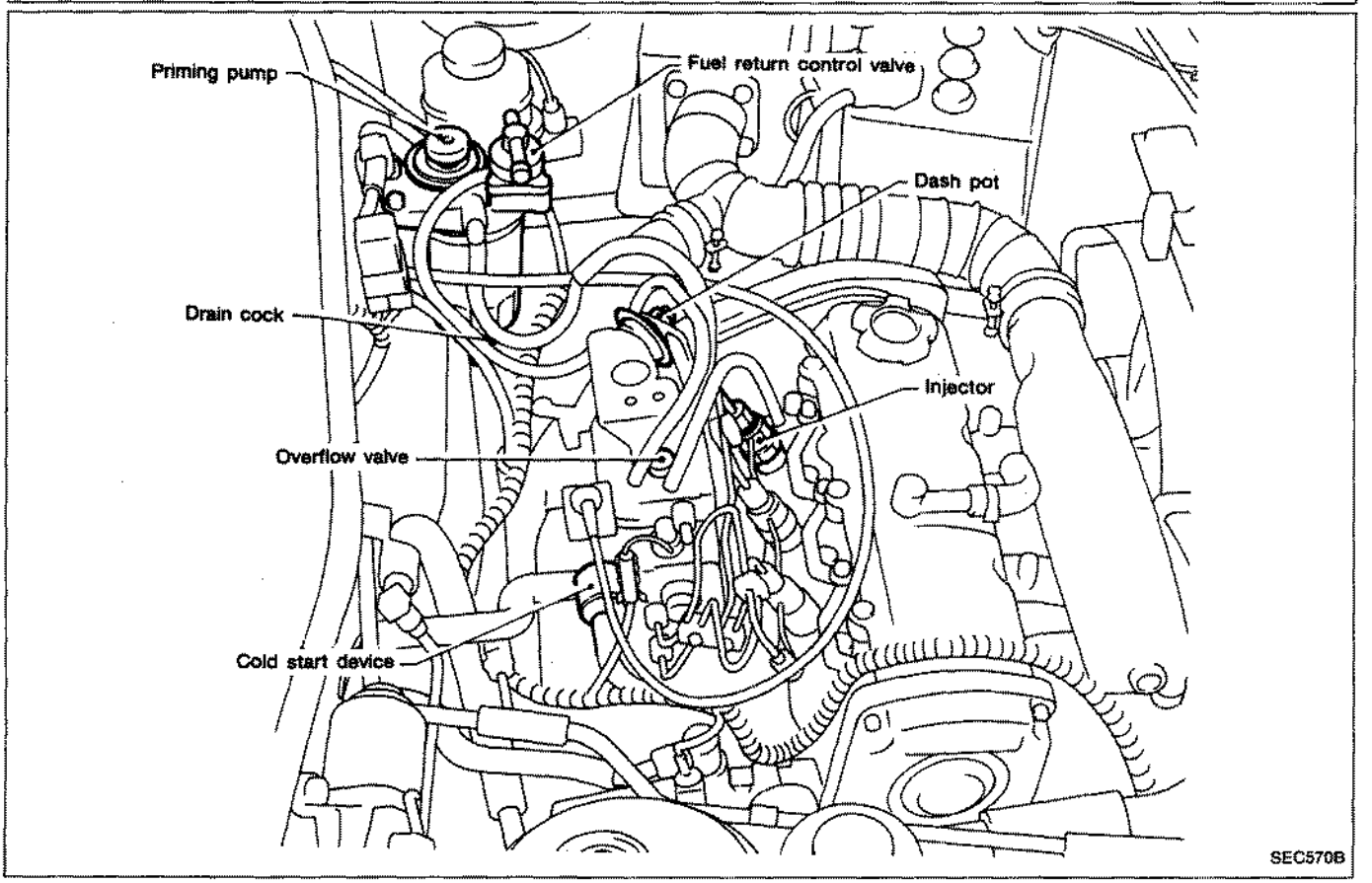


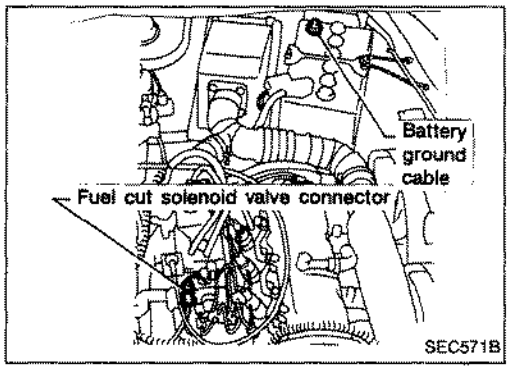
This system is designed to return the blow-by gas to the intake manifold and to charge fresh air into the crankcase. The positive crankcase ventilation (P.C.V.) valve is provided.

Inspection

Refer to MA section.

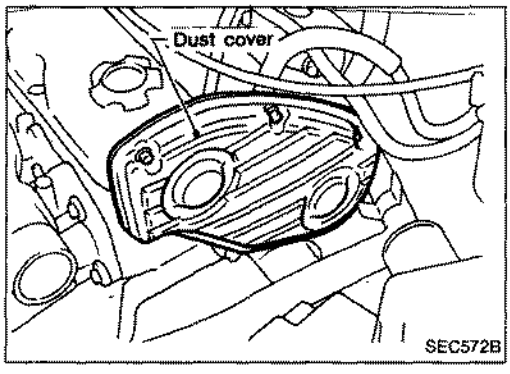

By-pass passage (Fuel temperature is cold)
Fuel return passage
Overflow valve
Fuel filter
Injection nozzle
Fuel tank
Fuel temperature: Hot
Check valve
To fuel tank
From injection pump
Float
Return valve
Bimetal
Element
Fuel temperature: Cold
To fuel tank
From injection pump
Float
Return valve
Bimetal
Element
SEF433F


Priming pump
Fuel return control valve
Dash pot
Drain cock
Injector
Overflow valve
Cold start device
SEC570B

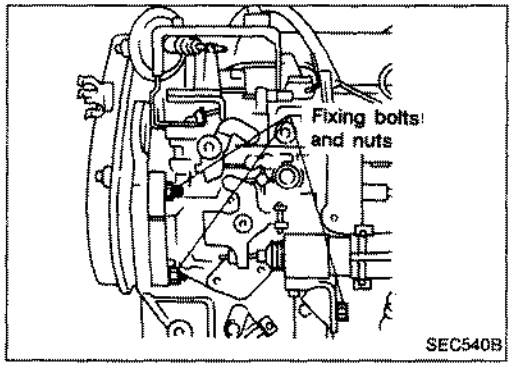


Removal

1. Disconnect battery ⊖ cable, fuel cut solenoid valve connector and accelerator wire.
2. Set No. 1 piston at T.D.C. on its compression stroke.
   T.D.C.: White painted mark
3. Disconnect water hoses for cold start device.
4. Remove fuel hoses (supply, return and spill) and injection tubes.



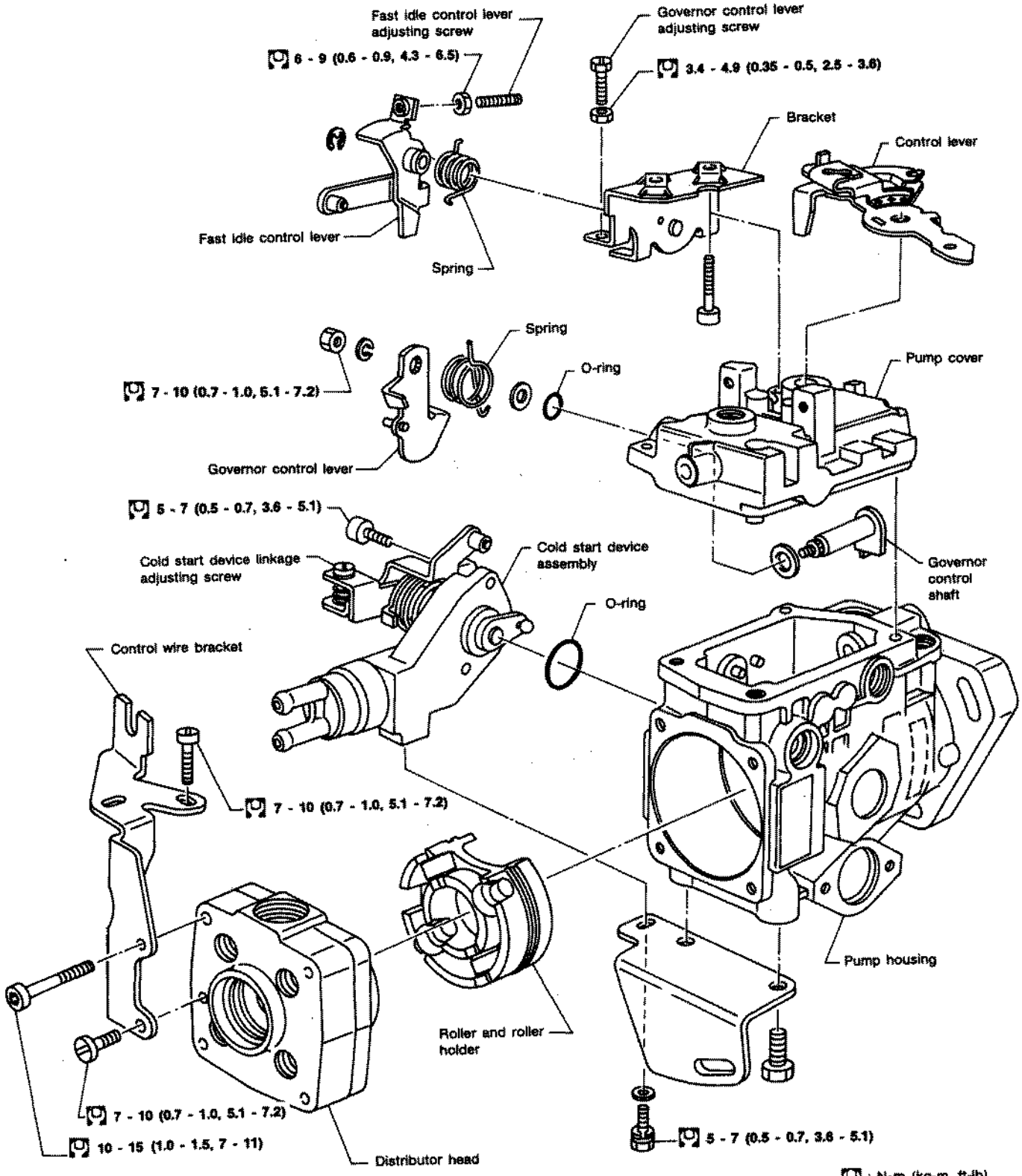
5. Remove air duct and injection pump timing belt cover.



6. Remove injection pump timing belt and sprocket.
7. Remove injection pump assembly.

Disassembly

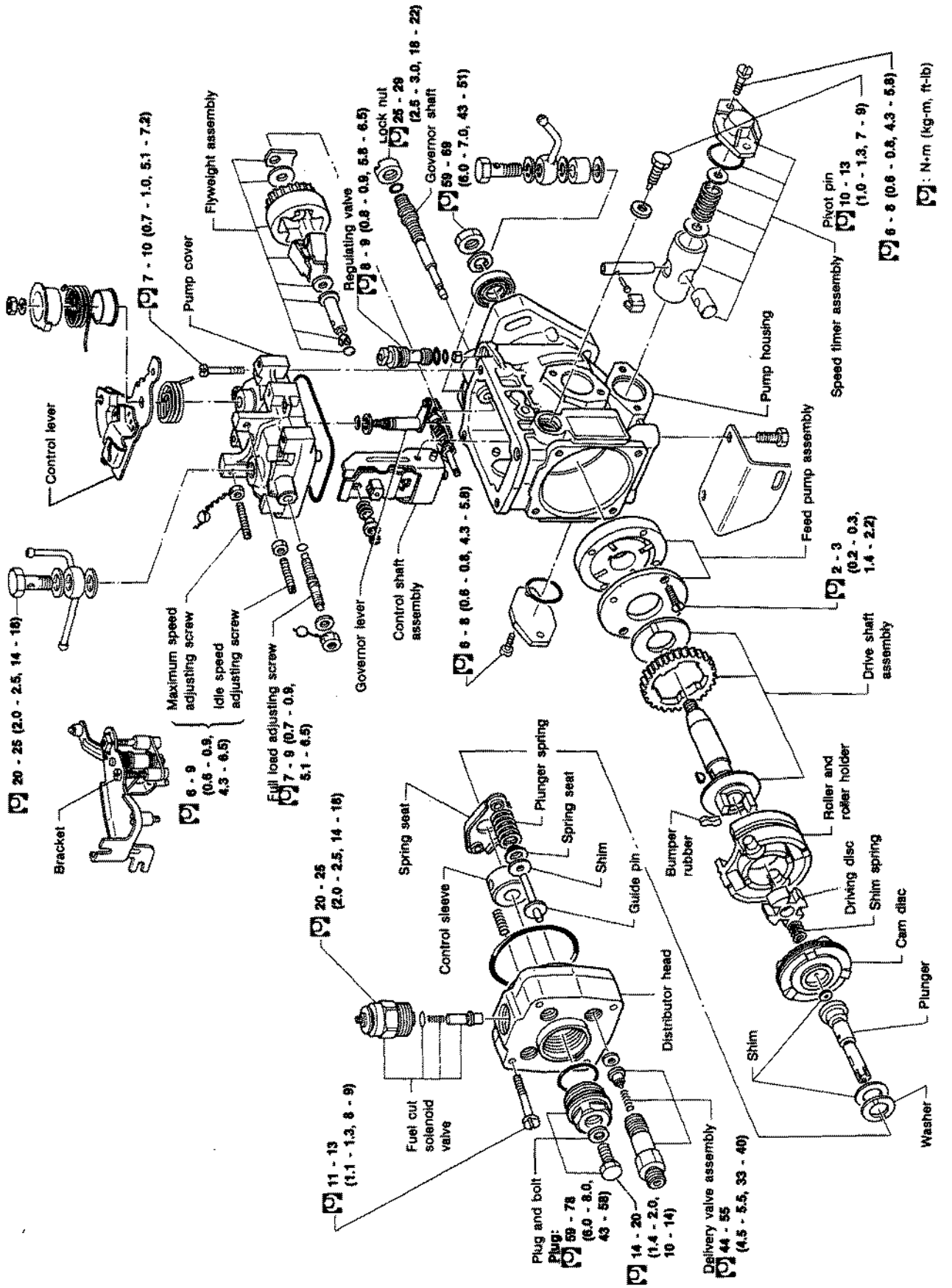
WITH COLD START DEVICE



SEF784A

Disassembly (Cont'd)

WITHOUT COLD START DEVICE



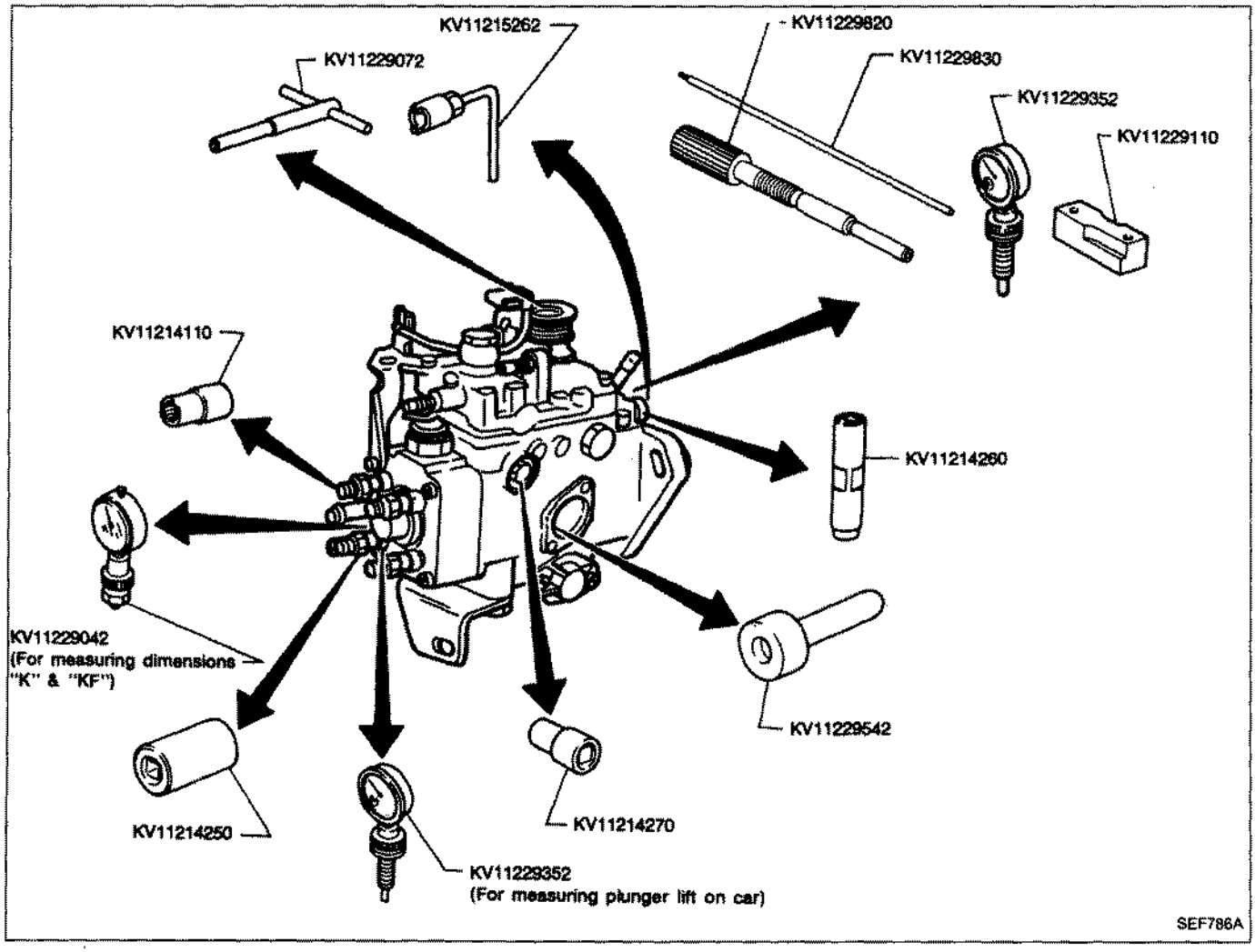
SEM449D

Disassembly (Cont'd)

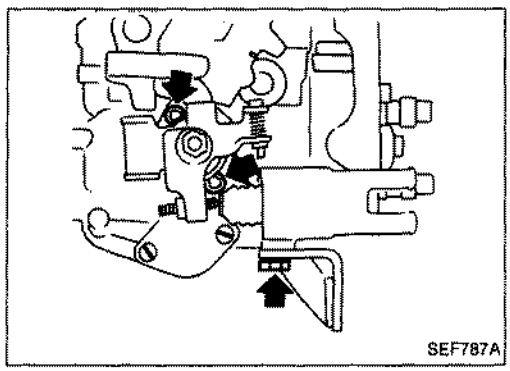
PREPARATION

- Before performing disassembly and adjustment, test fuel injection pump and note test results except when testing is impossible.
- Prior to beginning disassembly of fuel injection pump, clean all dust and dirt from its exterior.
- Disconnect overflow valve, and drain fuel.
- Clean work bench completely, removing all foreign matter.
- Collect only those service tools necessary for disassembling and reassembling.
- Be careful not to bend or scratch any parts.

Special tools are needed for disassembling and reassembling fuel injection pump.



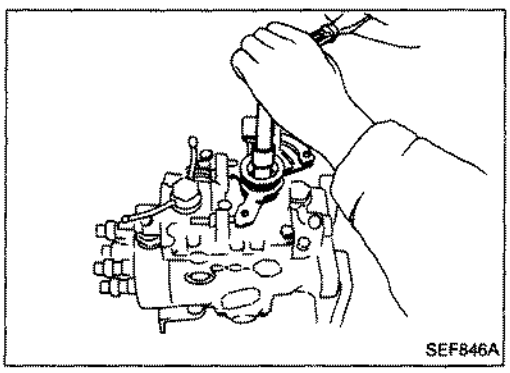
Disassembly (Cont'd)


SEF787A

COLD START DEVICE

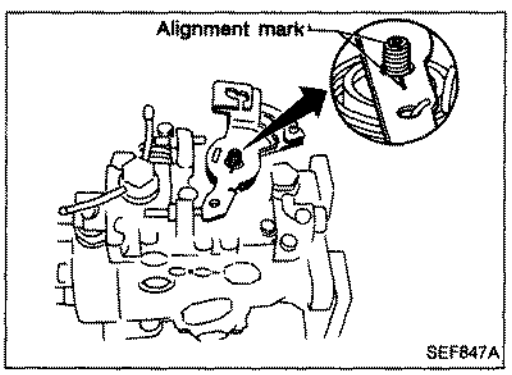
Remove cold start device assembly.

Never disassemble cold start device linkage.


SEF846A

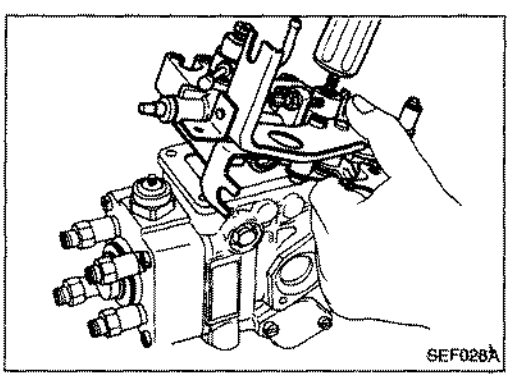
GOVERNOR COVER

1. Remove nut, spring washer, spring seat and spring from control lever.



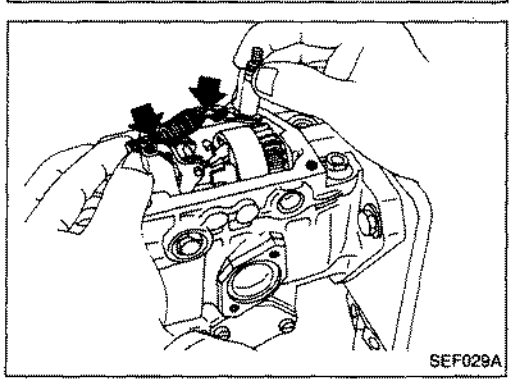
SEF847A

2. Draw alignment marks on control lever and control shaft.


SEF028A

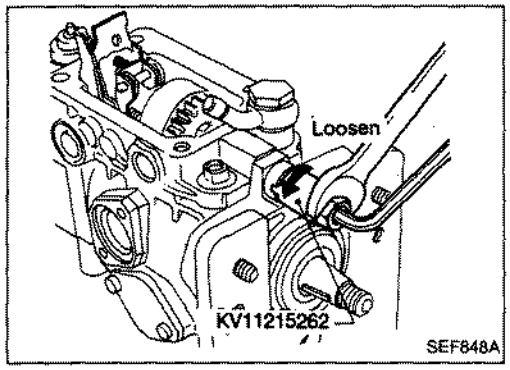
3. Remove governor cover.

Move control shaft down by lightly tapping end with a wooden mallet.


SEF029A

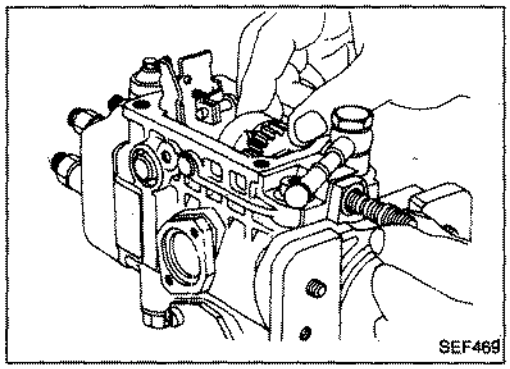
4. Remove control shaft from tension lever.

Disassembly (Cont'd)

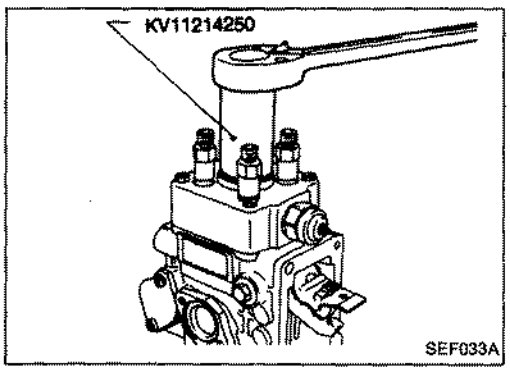


5. Remove governor shaft.

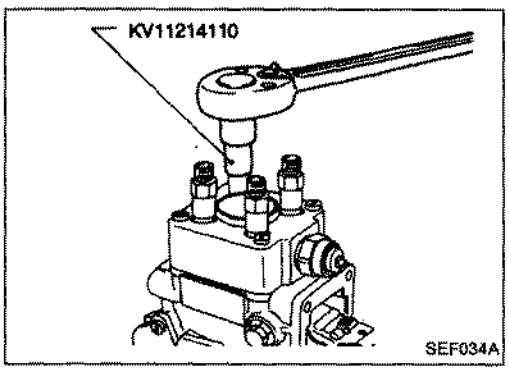
Loosen lock nut by turning it counterclockwise.



6. Remove governor sleeve, washer and flyweight, along with flyweight holder, then remove washer and shim(s).

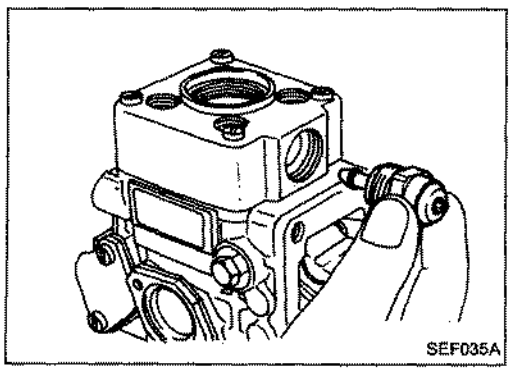


7. Remove plug.



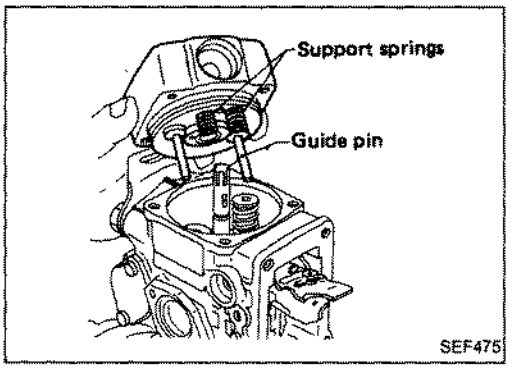
8. Remove delivery holder, spring, delivery valve and gasket.

Distributor head has letters (A, B, C and D) stamped on it. Remove lettered parts in alphabetical order and arrange neatly.



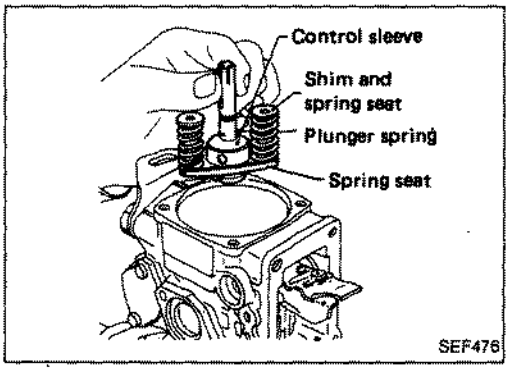
9. Remove fuel cut solenoid valve.

Disassembly (Cont'd)



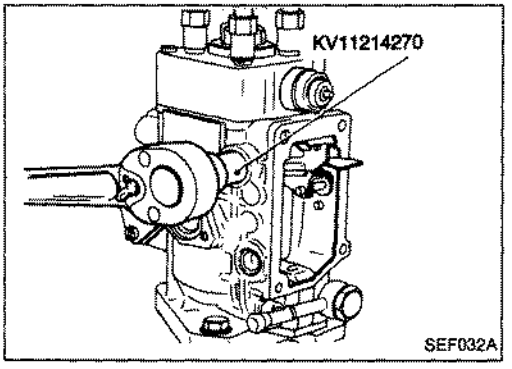
10. Remove distributor head.

Be careful not to drop the two support springs and guide pins.

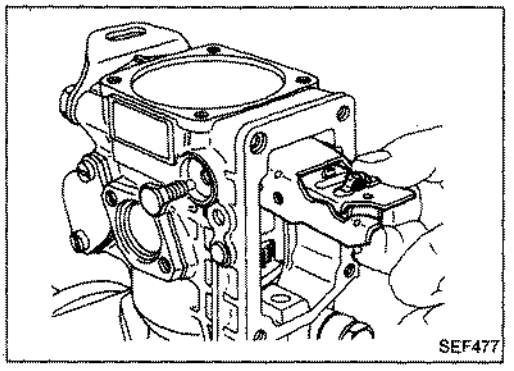


11. Remove plunger assembly.

Lift plunger, along with control sleeve, shim, spring seat and plunger spring.

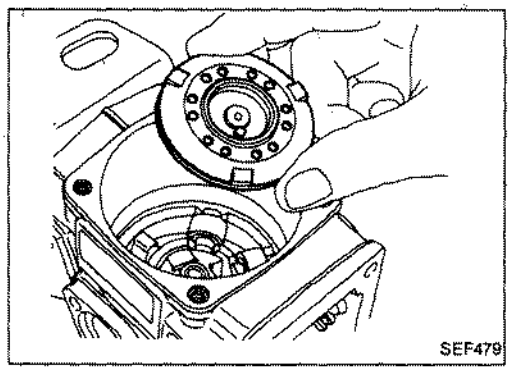


12. Loosen left and right governor pivot bolts.



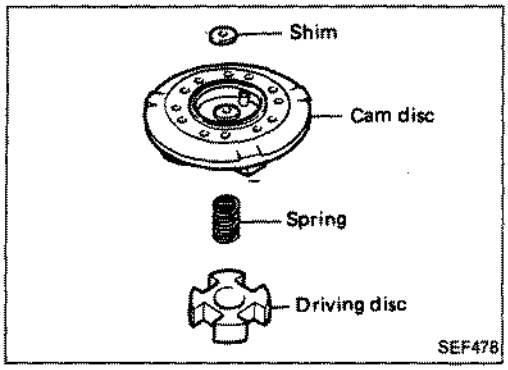
13. Remove governor lever assembly.

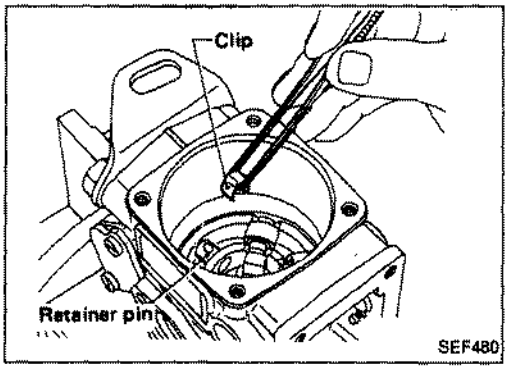
Avoid pulling on start spring and start idle spring.



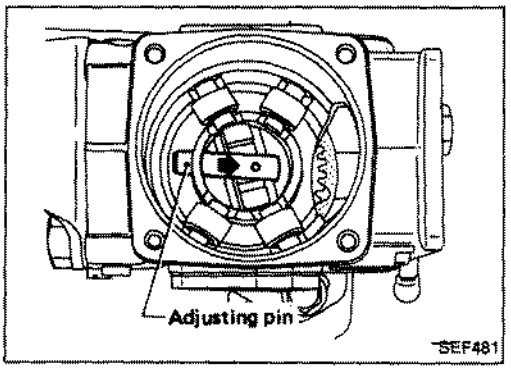
14. Remove shim, cam disc, spring and driving disc.

Disassembly (Cont'd)

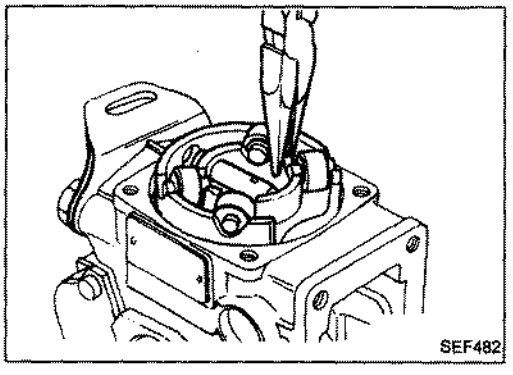




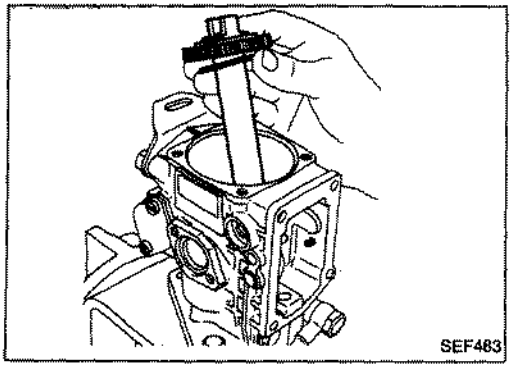
15. Remove clips and pins.



16. Move adjusting pin to center of roller holder, as shown.

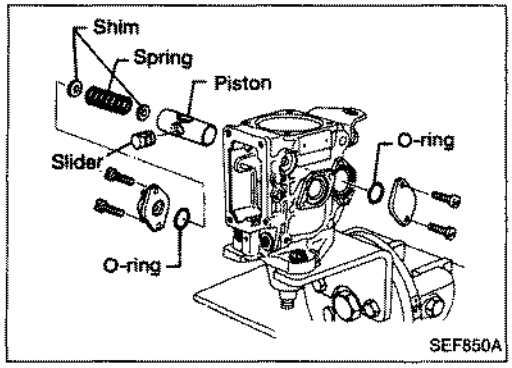


17. Lift out roller holder with rollers without tilting.
Be careful not to drop rollers.

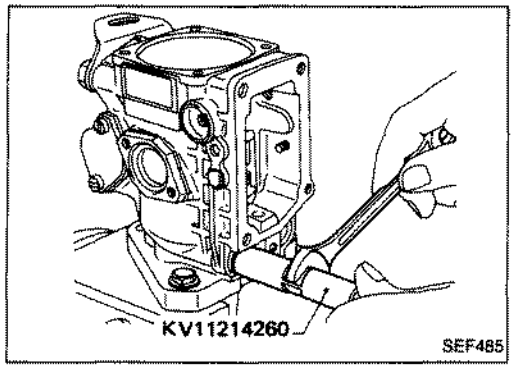


18. Remove drive shaft.
   a. **Be careful not to scratch inner surface of fuel injection pump body.**
   b. **Be careful not to drop the key.**

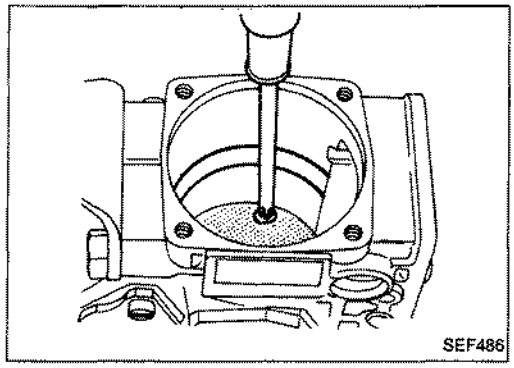
Disassembly (Cont'd)



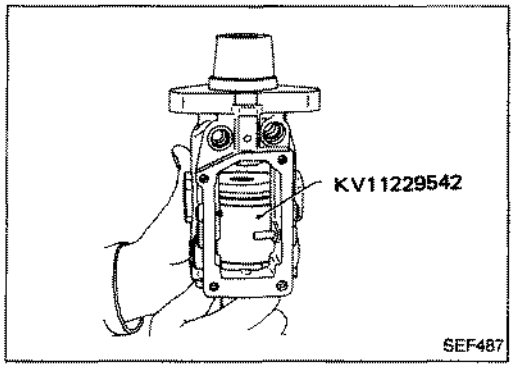
19. Remove speed timer cover, O-ring, shims, spring, piston and slider.



20. Remove regulating valve.



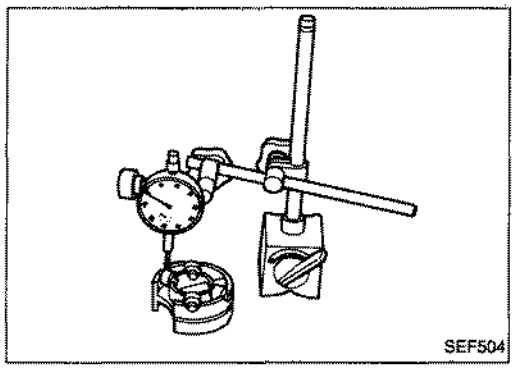
21. Loosen screw from feed pump cover.



22. Remove cover and feed pump assembly as a unit.
(1) Insert feed pump holder (KV11229542) into fuel injection pump housing.
(2) Turn injection pump's top side down, as shown.
(3) Remove cover and feed pump assembly as a unit.

a. If cover and feed pump assembly are hard to remove or are stuck midway, strike pump body lightly.

b. Do not move position of vanes.



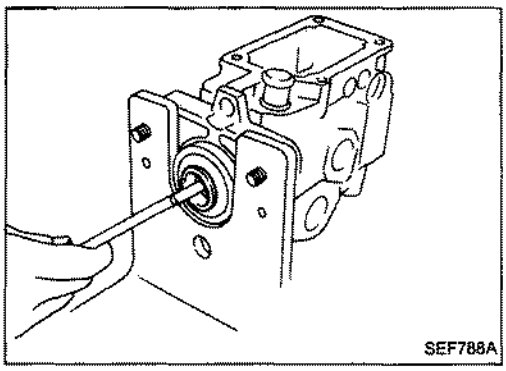
Inspection

1. Wash all parts completely.
2. Replace worn or damaged parts.
3. Control edge of plunger must be sharp and contact surfaces must not exhibit any noticeable running tracks. If such is not the case, replace plunger.
4. Check height of all rollers.

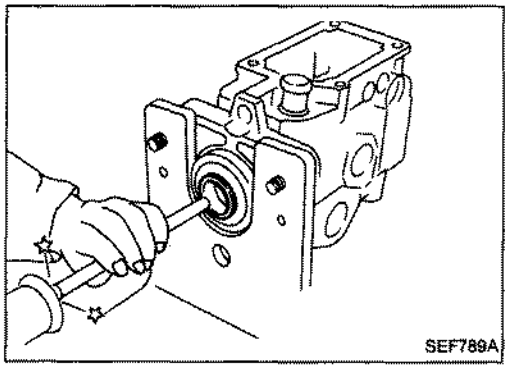
Difference in max. and min. roller height should be less than 0.02 mm (0.0008 in).

Inspection (Cont'd)

REPLACEMENT OF OIL SEAL


SEF788A

1. Remove oil seal.

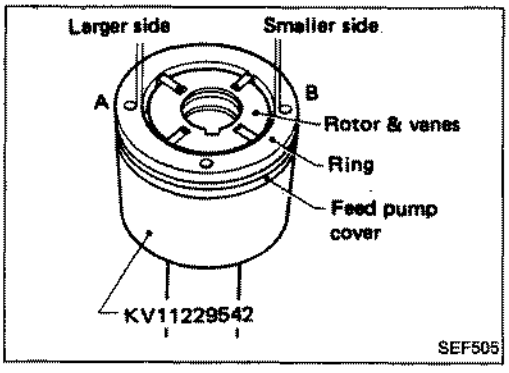

SEF789A

2. Apply grease to oil seal.
3. Install oil seal.

Assembly

Always replace the following service parts as assembly units.

- Distributor head, control sleeve and plunger
- Feed pump assembly (pump impeller and vanes with eccentric ring)
- Plunger spring kit
- Roller assembly
- Flyweight kit
- Governor lever assembly



SEF505

PREPARATION

Dip all movable parts and O-rings in test oil and clean.

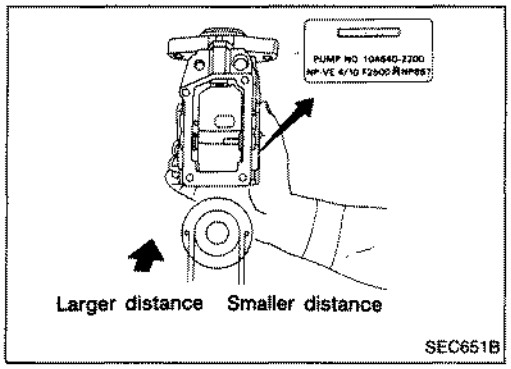
1. Set feed pump cover, rotor with vanes, and ring on special service tool KV11229542.

(1) Align the three holes in feed pump cover and ring.
(2) Do not change positions of vanes.
(3) Holes A and B in ring are not equally spaced to inner wall of ring.

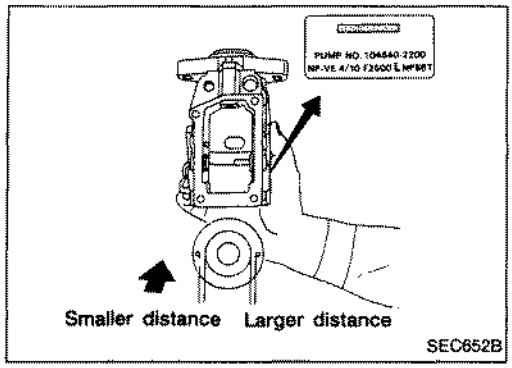
2. Install feed pump cover, rotor with vanes, and ring to pump housing.

Be careful to install liner correctly. If left and right are reversed, fuel will not be discharged from feed pump.

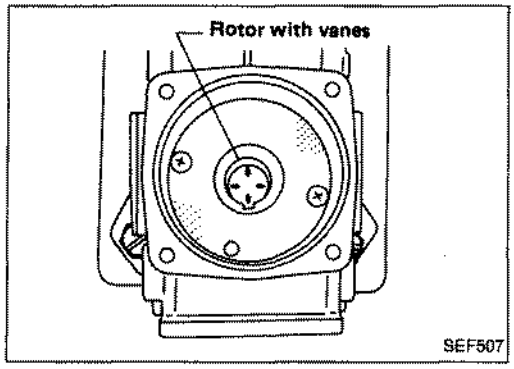
Assembly (Cont'd)



When fuel injection pump rotates in direction "R"



When fuel injection pump rotates in direction "L"

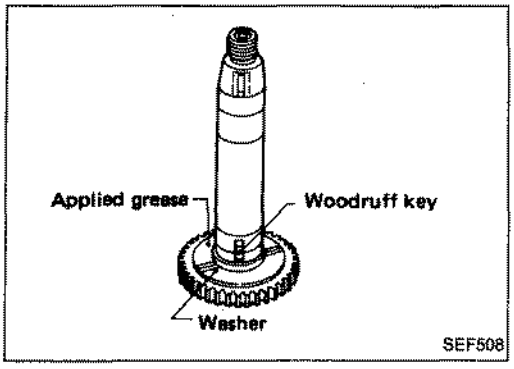


The following description applies to fuel injection pumps that rotate in direction "R".

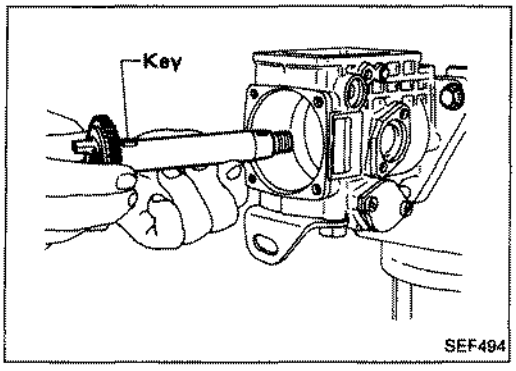
3. Turn fuel injection pump 180°, and remove service tool KV11229542. Tighten screw to retain pump cover.

a. When tightening screws, be careful not to scratch inner wall of pump housing.

b. After tightening screws, make sure rotor with vanes moves smoothly.



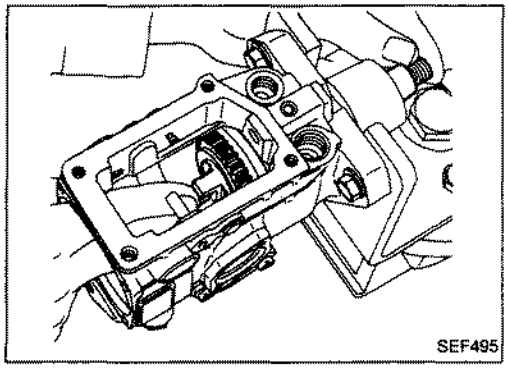
4. make sure drive shaft and gear are assembled properly, as shown.

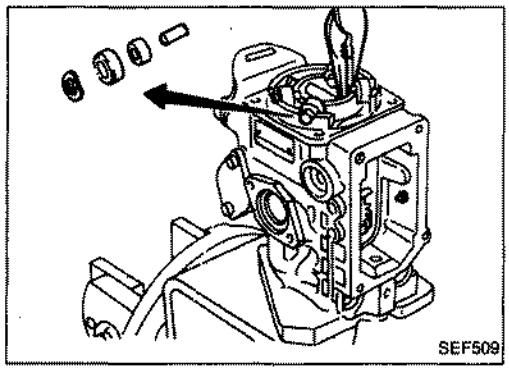


5. Install drive shaft to housing while key in drive shaft engages with key groove in rotor.

Be careful not to scratch oil seals and inner wall of housing.

Assembly (Cont'd)

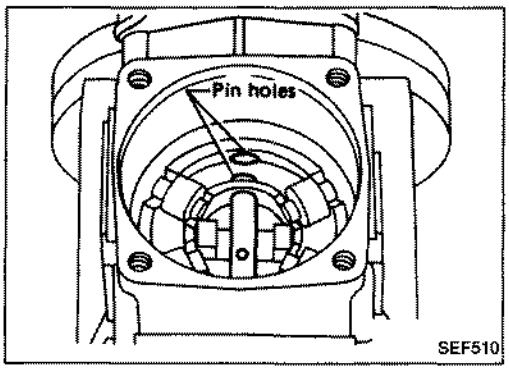

SEF495


SEF509

6. Set drive shaft's nail parallel to timer.
7. Install roller and holder.

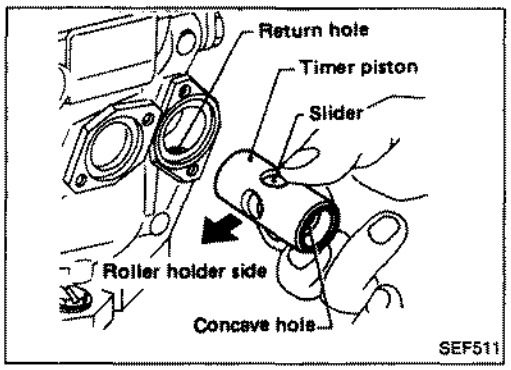
a. Do not interchange roller positions. If they are interchanged, refer to Inspection for correction.

b. Make sure washer is situated outward of rollers.



SEF510

8. Align holder and timer adjusting pin holes.

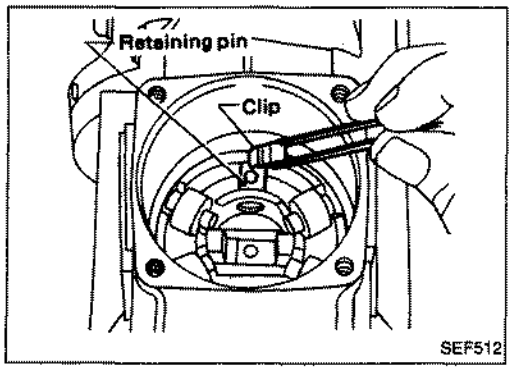


SEF511

9. Install timer piston and slider as a unit.

a. Make sure hole in slider faces towards roller holder.

b. Make sure concave hole in piston is on same side as return hole.

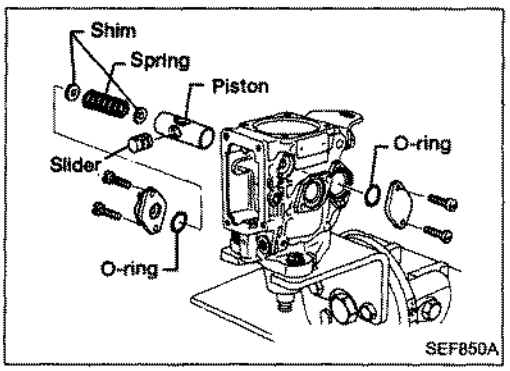


SEF512

10. Insert timer adjusting pin into timer piston slider, and secure with retaining pin and clip.

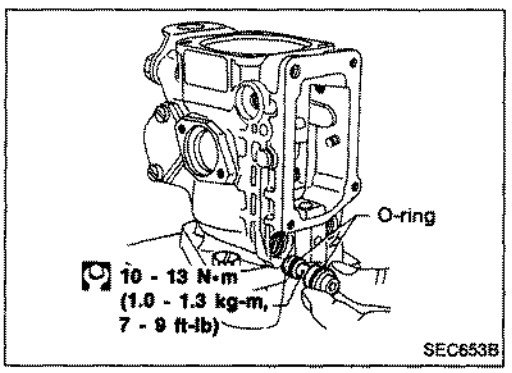
Make sure timer piston moves smoothly.

Assembly (Cont'd)



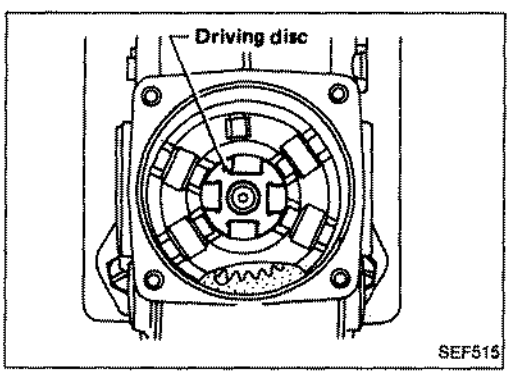
11. Install timer, using a 0.6 mm (0.024 in) thick shim, then install timer spring, shim, O-ring and cover, in that order.

a. Use at least one shim on each side of timer spring.
b. Use shims that were selected during bench test.

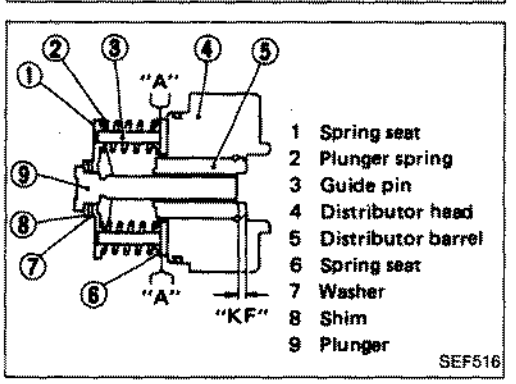


12. Install regulating valve.

Be careful not to scratch O-rings.



13. Install driving disc with its concave side facing up.

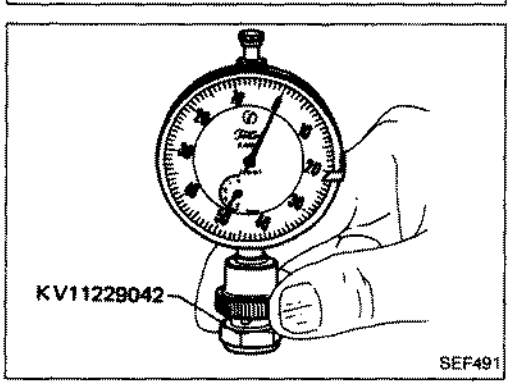


14. Measurement of plunger spring set length (dimension "KF")

Dimension "KF" is the distance between the end face of the distributor barrel and the end face of the plunger.

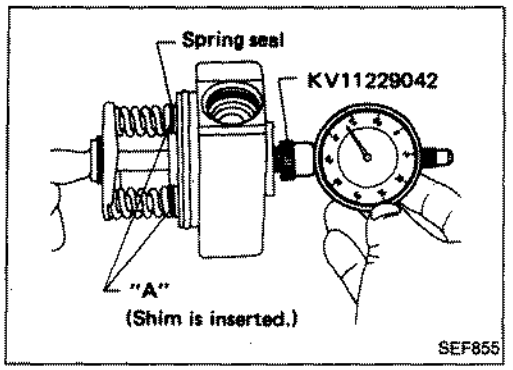
(1) Install distributor head, as shown.

Do not insert shim into "A" portion before measuring.



(2) Set dial gauge so that it can compress 10 mm (0.39 in), and reset to zero.

Assembly (Cont'd)



(3) Apply force (not enough to compress plunger spring) to plunger's bottom in axial direction, and measure dimension "KF" with dial gauge, as shown.

(4) Determine the shim to be used by calculating difference between standard and measured dimensions.

Refer to S.D.S. for "KF".

[Example]

When measured (dial gauge reading) value is 5.2 mm,

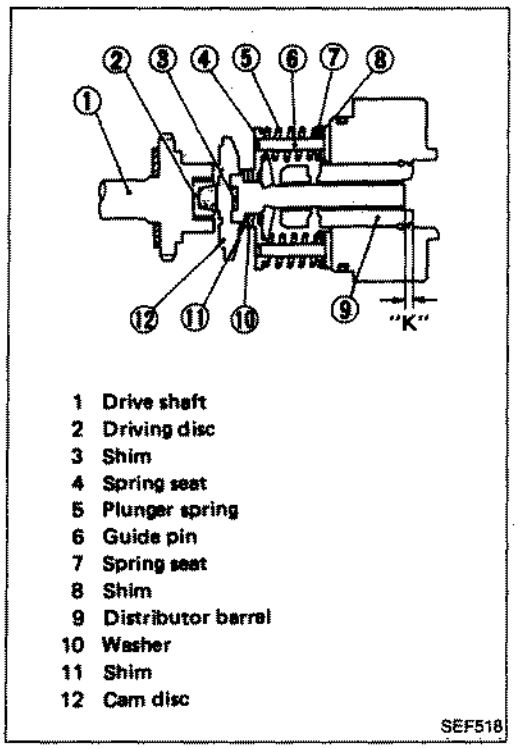
"KF" – 5.2 mm = Shim thickness to be used

a. When there are no shims available of a thickness which matches specified dimensions, use slightly thicker shims.

b. Use selected shim with distributor head.

c. Use the same size shim on each side of distributor head.

d. Refer to S.D.S. for available service parts.



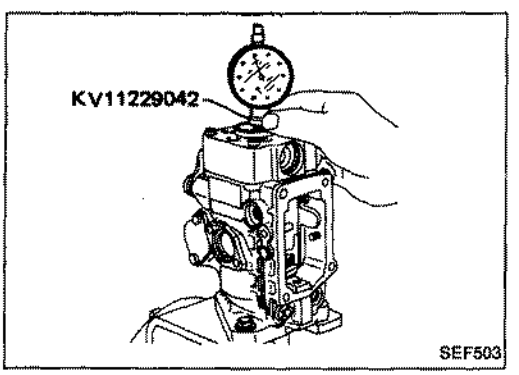
15. Adjustment of plunger dimensions (Measurement of dimension "K")

Dimension "K" is the distance from the end face of the distributor barrel to the end face of the plunger top, when the plunger is at the bottom dead center position.

(1) Install parts as shown.

a. Do not install "spring" on driving disc.

b. When inserting plunger and shim into cam disc, make sure drive pin is situated in groove at bottom of plunger.

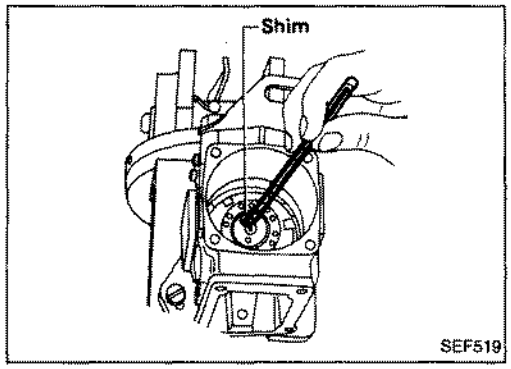


(2) Using a dial gauge, measure dimension as shown.

a. Rotate drive shaft so that plunger is set at bottom dead center.

b. Securely mount distributor head with screws.

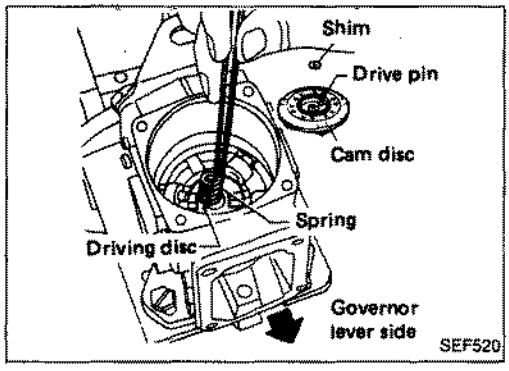
Assembly (Cont'd)



(3) Determine shim to be used by calculating difference between measured (dial gauge reading) value and standard dimension "K", and position that shim on plunger's bottom.

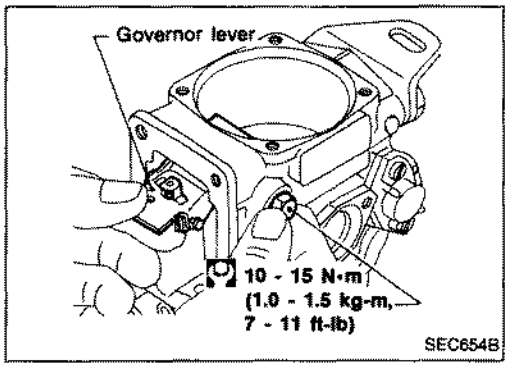
Refer to S.D.S. for "K".

a. When measured value is greater than standard dimension "K", use a thicker shim.
b. After shim has been positioned, measure dimension again to ensure that it is correct.
c. Refer to S.D.S. for available service parts.



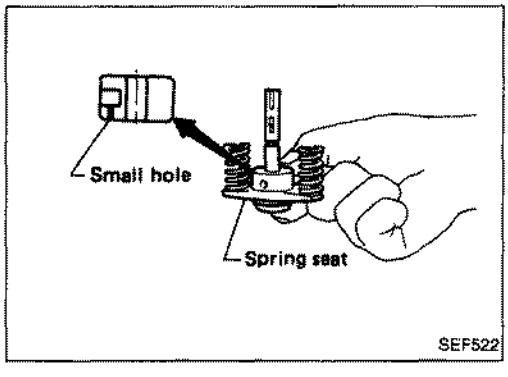
16. Install spring in top of driving disc, and install cam disc and shim in that order.

Make sure cam disc drive pin and drive shaft key way face governor lever side.



17. Install governor lever.

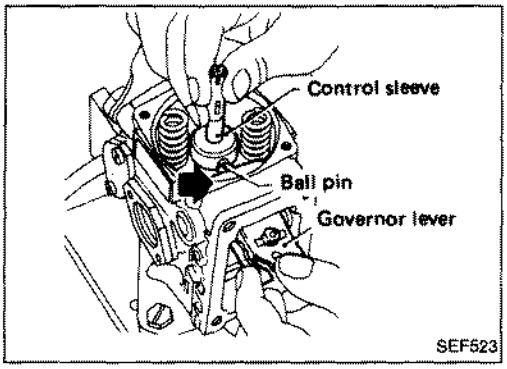
Avoid pulling on start spring and start idle spring.



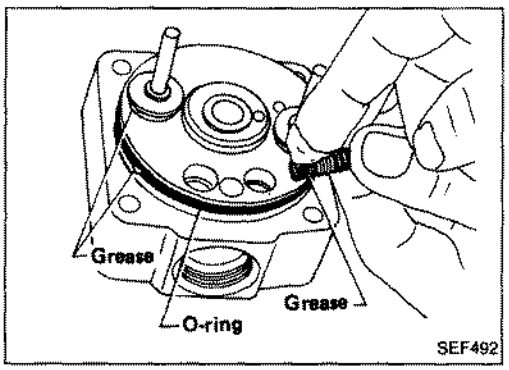
18. Install plunger assembly.

a. Make sure control sleeve is installed with its small hole facing spring seat side.

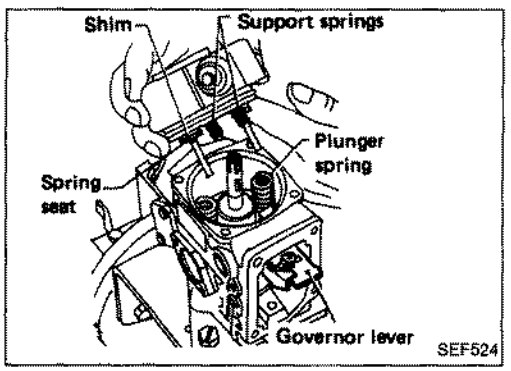
Assembly (Cont'd)



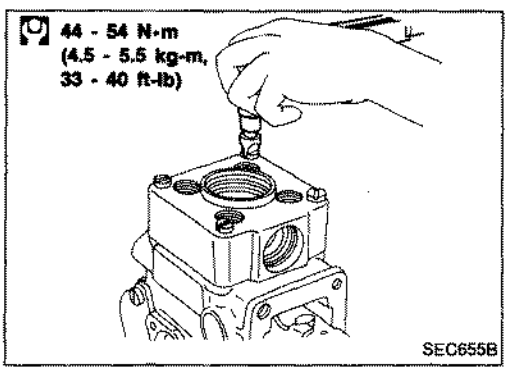
b. Insert ball pin for governor lever into hole in control sleeve (shown by arrow).



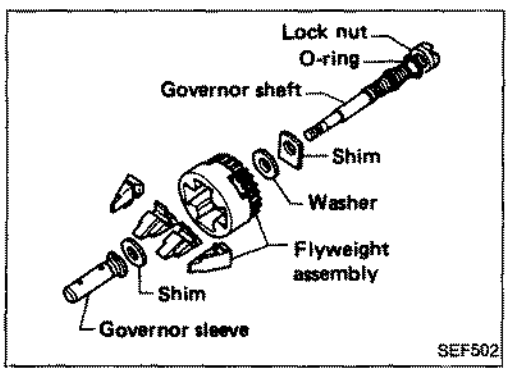
19. Apply a coat of grease to guide pin, shim and spring seat, and attach these parts to distributor head.



20. Install distributor head.
a. Always face support spring toward governor lever.
b. Be careful not to drop spring.
c. Make sure ball pin for governor lever is inserted properly into hole in control sleeve.
d. After installing distributor head, make sure plunger spring is at guide hole in spring seat.

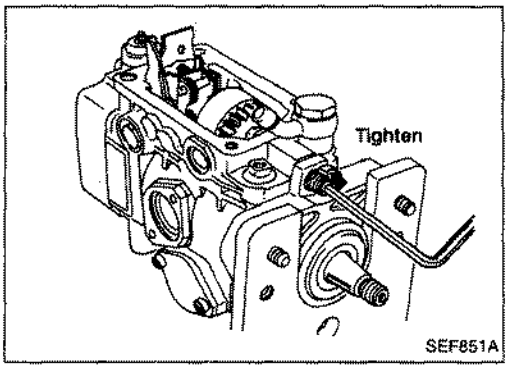


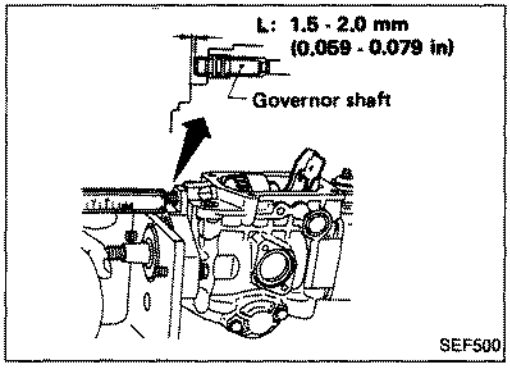
21. Tighten distributor head.



22. Attach flyweight assembly.
When installing governor shaft, be careful not to scratch O-rings.

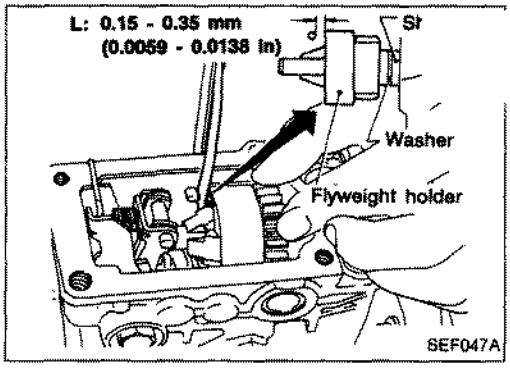
Assembly (Cont'd)



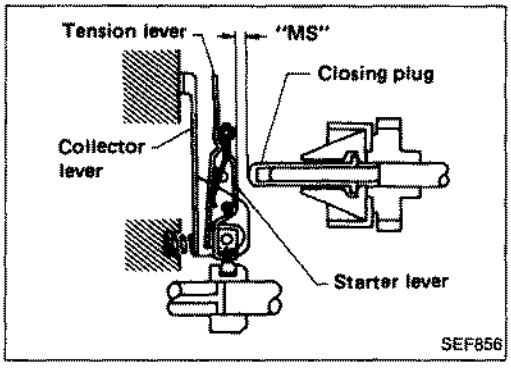


23. Adjust dimension "L", as shown.
    "L": 1.5 - 2.0 mm (0.059 - 0.079 in)

Governor shaft has a left-hand thread for injection pumps designed to rotate in "R" direction, and a right-hand thread for those rotating in "L" direction.

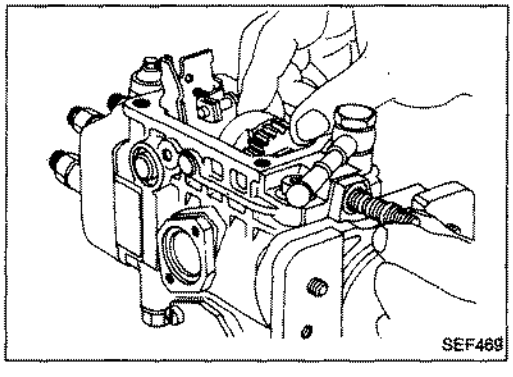


24. Measure axial play of flyweight holder. If it is not within specified range, adjust it by means of shim.
    "L": 0.15 - 0.35 mm (0.0059 - 0.0138 in)



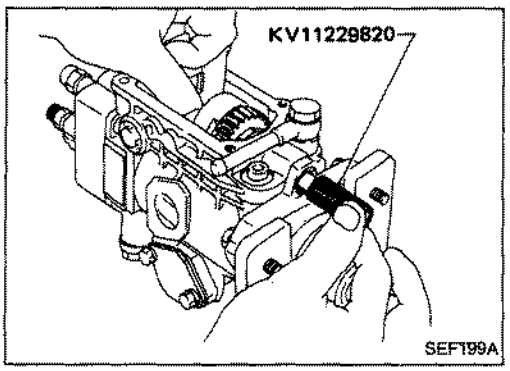
25. Measurement of dimension "MS" (for determining starting amount of fuel injection)

Dimension "MS" is the distance from closing plug to start lever.



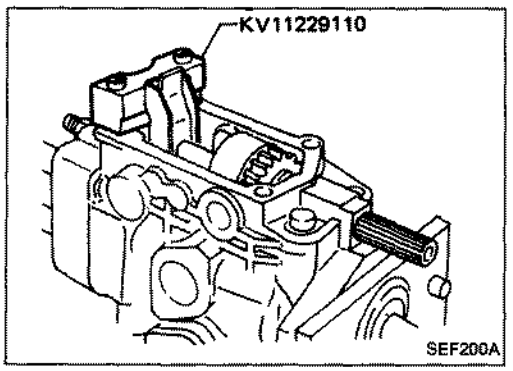
(1) Remove lock nut, governor shaft and flyweight assembly.

Assembly (Cont'd)

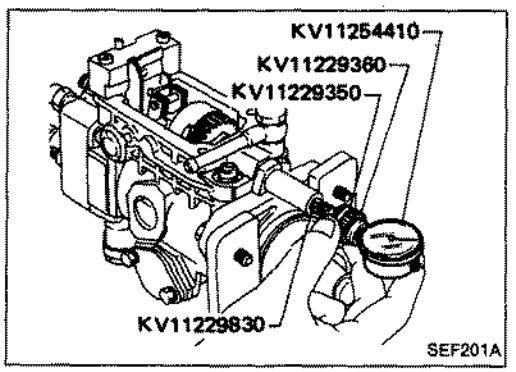


(2) Install Tool and flyweight assembly in place of governor shaft.

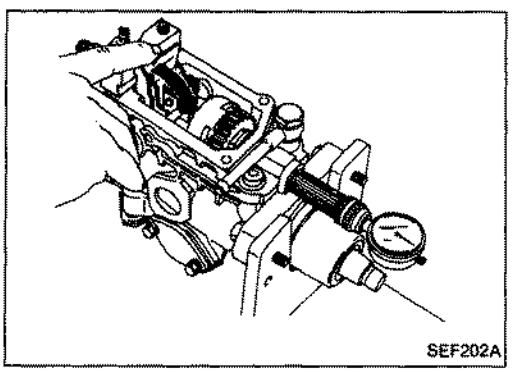
Be sure to install shim and washer when installing flyweight assembly.



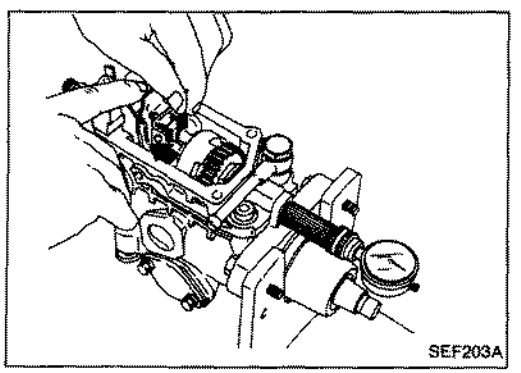
(3) Set Tool, as shown.



(4) Install dial gauge together with rod.



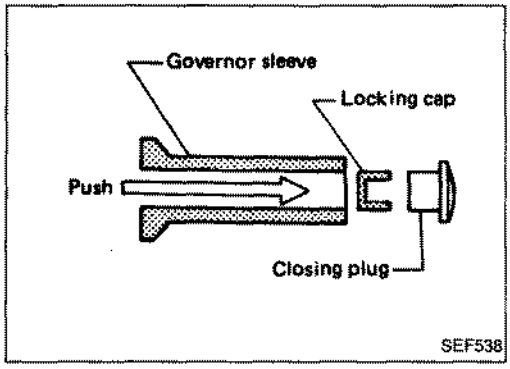
(5) Press governor sleeve to flyweight and set dial gauge to "0".



(6) Push tension lever until it contacts stopper pin. Return governor sleeve until start lever contacts tension lever, and read dial gauge.

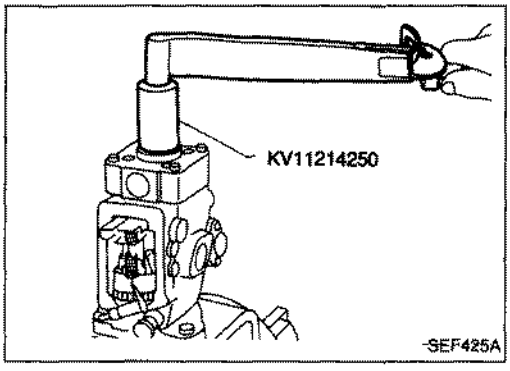
Refer to S.D.S. for "MS".

Assembly (Cont'd)



(7) If dial gauge indication is not within this range, replace closing plug and adjust dimension "MS" to that range.

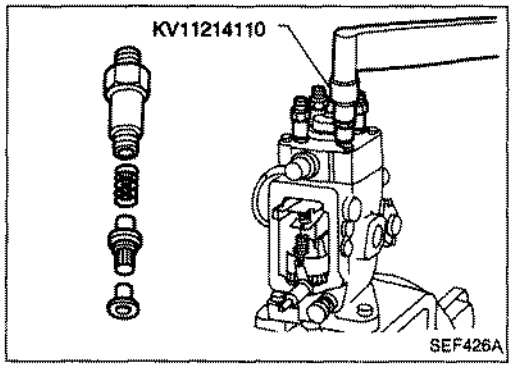
Refer to S.D.S. for available service parts.



26. Install new plug with new O-ring.

Always replace plugs with new ones.

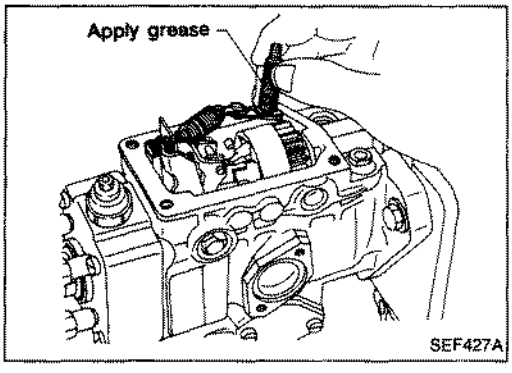
27. Install fuel cut solenoid valve.



28. Install delivery valve.

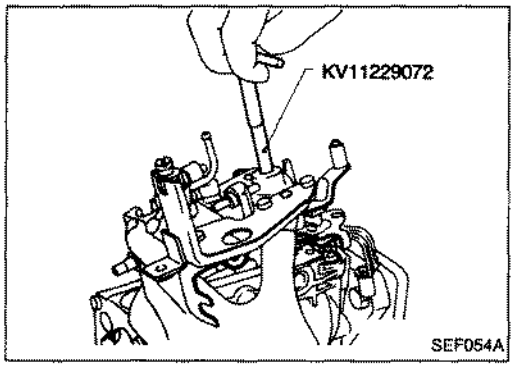
a. Always use new washers.

b. Make sure delivery valve is reinstalled in its original position.



29. Install control lever shaft.

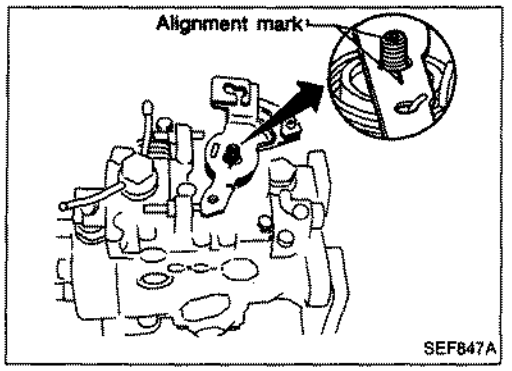
Apply a coat of grease to lever shaft end.



GOVERNOR COVER

1. Install governor cover.

Assembly (Cont'd)



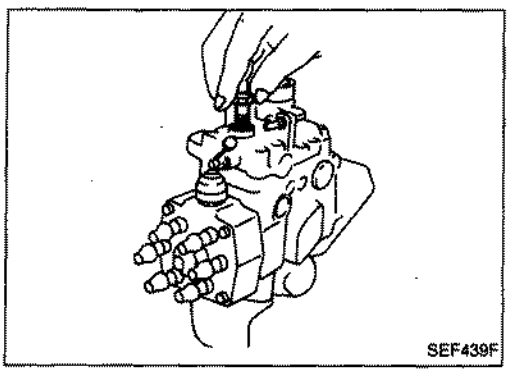
2. Install control lever assembly.

Align alignment marks of speed control lever and control lever shaft.

COLD START DEVICE

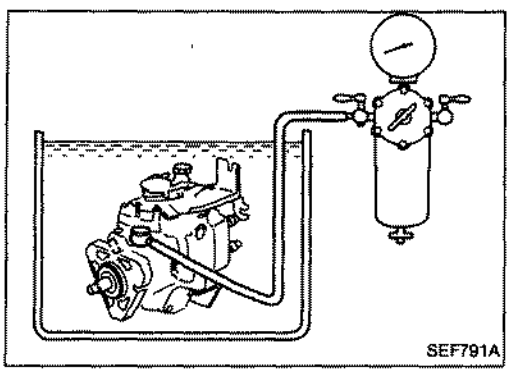
Install cold start device assembly.

Always use a new O-ring.



AIR TIGHTNESS TEST

1. Replace overflow connector with a bolt.



2. Connect an air hose to fuel inlet and immerse fuel injection pump in diesel fuel.

3. Apply grease of 392 kPa (3.9 bar, 4 kg/cm^2, 57 psi) and check that there are no leaks. If there is any leakage, repair it.

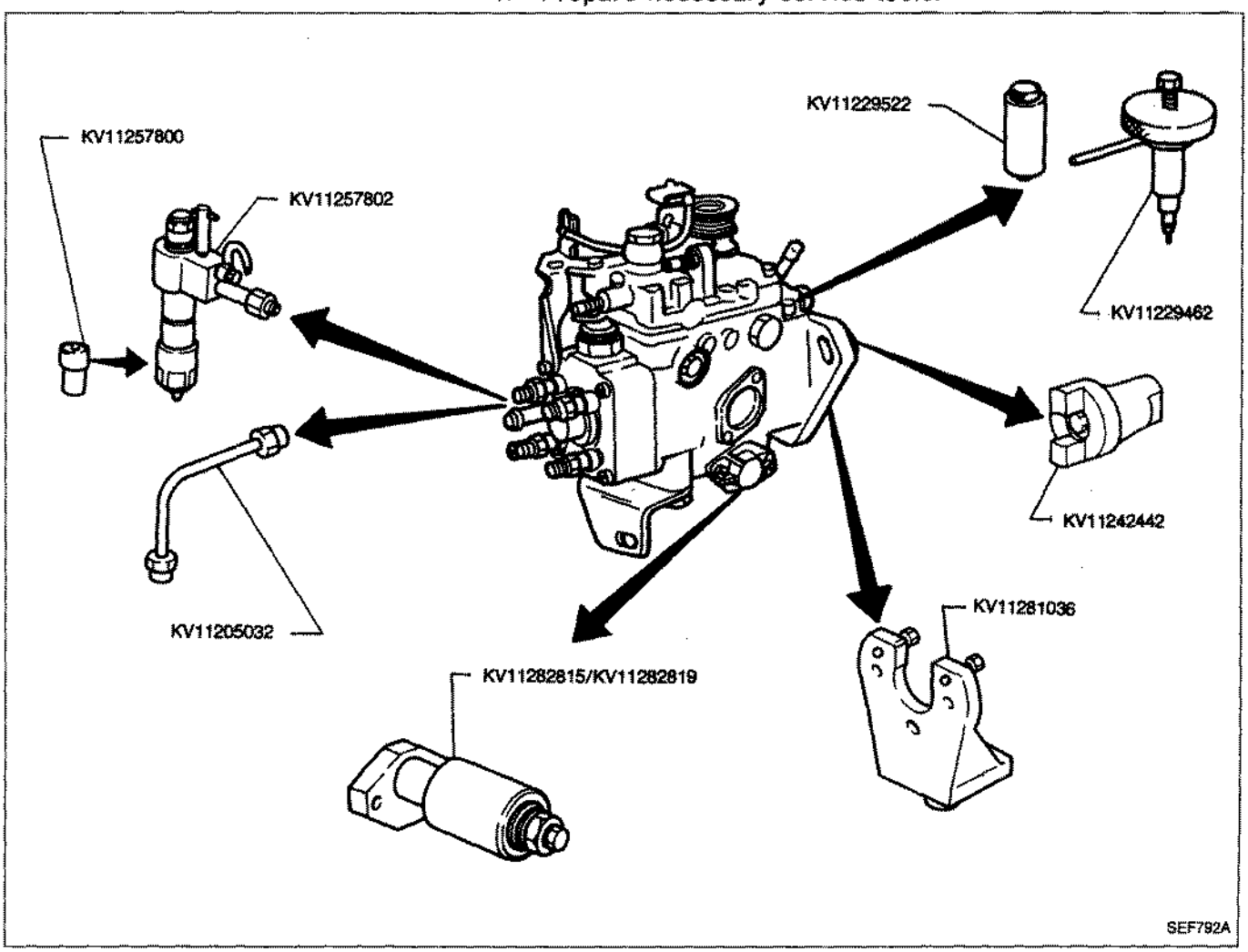
Testing of Injection Pump

PREPARATION

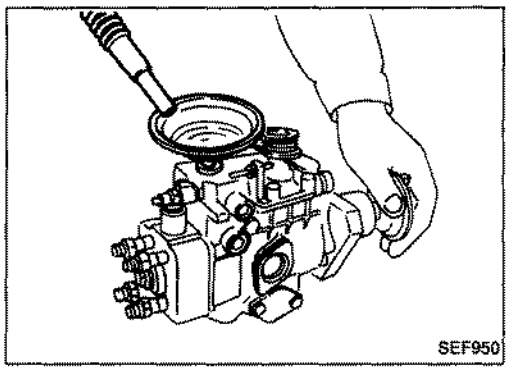
Injection pump test conditions

Nozzle		KV11257800
Nozzle holder		KV11257802
Nozzle starting pressure	kPa (bar, kg/cm^2, psi)	14,711 - 15,201 (147.1 - 152.0, 150 - 155, 2,133 - 2,204)
Nozzle tube Inner dia. × outer dia. × length	mm (in)	KV11205032 2.0 × 6.0 × 840 (0.079 × 0.236 × 33.07)
Fuel feed pressure	kPa (bar, kg/cm^2, psi)	20 (0.20, 0.2, 2.8)
Fuel (test oil)		ISO4113 or SAE J967d
Fuel temperature	°C (°F)	45 - 50 (113 - 122)
Rotating direction		Right (observed from the drive shaft)
Injection sequence		1-3-4-2

1. Prepare necessary service tools.

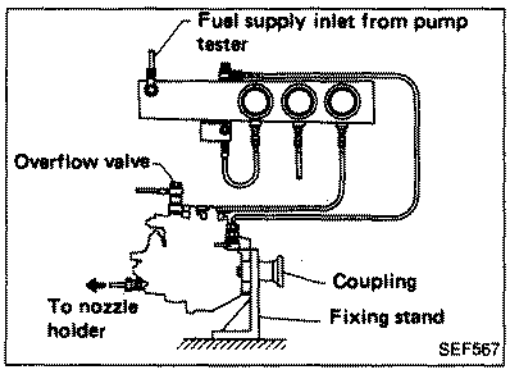


Testing of Injection Pump (Cont'd)


SEF950

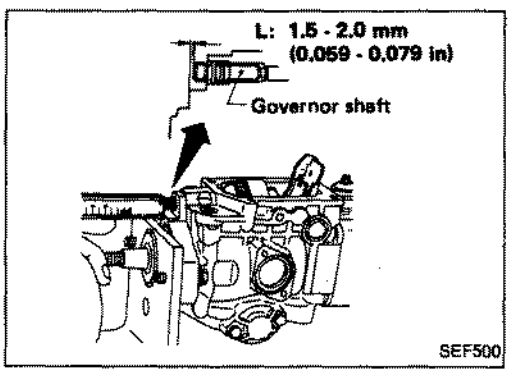
2. Pour test oil into fuel injection pump.

Test oil should be ISO4113, SAE J967d test oil or its equivalent.



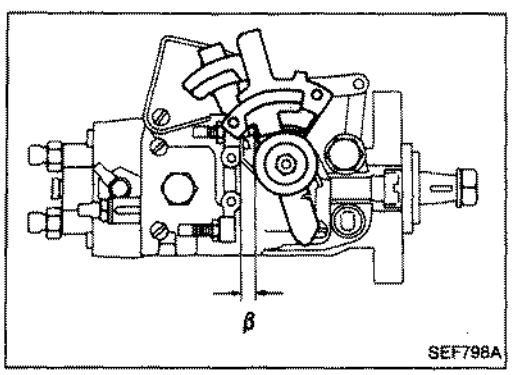
SEF567

3. Install fuel injection pump to pump tester.
4. Connect pump tester piping.



SEF500

5. Make sure governor shaft is properly installed.



SEF798A

6. Run in fuel injection pump as follows:
(1) Maintain test oil in tank at 45 to 50°C (113 to 122°F).
(2) Set control lever at "full-load" using a spring.

Set maximum speed adjusting screw in position shown, by turning counterclockwise.

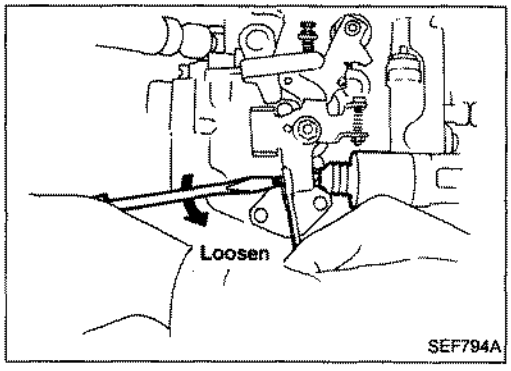
β: Refer to S.D.S.

(3) Furnish voltage of 12 volts to activate fuel cut solenoid valve.
(4) Rotate fuel injection pump by hand to see if it moves smoothly.
(5) Rotate fuel injection pump at 300 rpm to make sure all air inside pump chamber is discharged through overflow valve.
(6) Set feed oil pressure at 20 kPa (0.20 bar, 0.2 kg/cm^2, 2.8 psi).

Testing of Injection Pump (Cont'd)

(7) Run in fuel injection pump by rotating it at 1,000 rpm for ten minutes.

If fuel leakage, fuel injection failure or unusual noise is noticed, immediately halt pump tester operation and check fuel injection pump for abnormalities.



ADJUSTMENT

Preparation for vehicles with cold start device

Before adjustment, fully loosen cold start device adjusting screw.

m

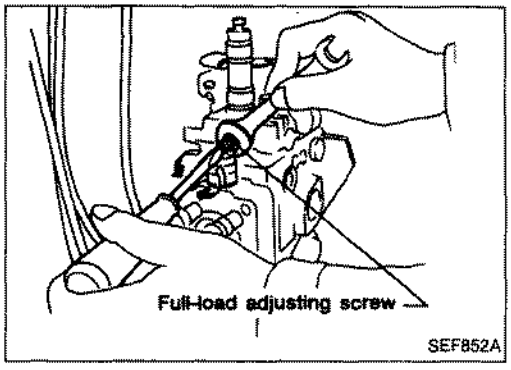
Preadjustment of full-load delivery

1. Set control lever at "full-load" by pulling spring or using a suitable equipment.

Set maximum speed adjusting screw in position shown, by turning counterclockwise. Refer to step 6-(2) in PREPARATION.

2. Furnish voltage of 12 volts to activate fuel cut solenoid valve.
3. Rotate fuel injection pump at specified rpm, and measure amount of fuel injection.

Refer to S.D.S. for full-load fuel injection quantity of adjustment value on fuel injection tester.

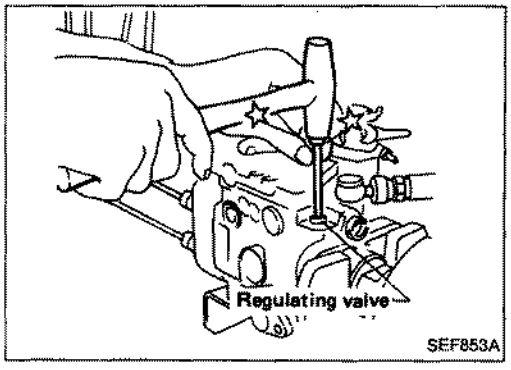


4. Calculate allowable imbalance of fuel injection quantity.

Allowable imbalance	=	Max. or Min. injection volume among delivery valves	−	Mean injection volume of all delivery valves

5. If the value of allowable imbalance is out of specification, change delivery valve assembly.

Turn adjusting screw clockwise to increase fuel injection.



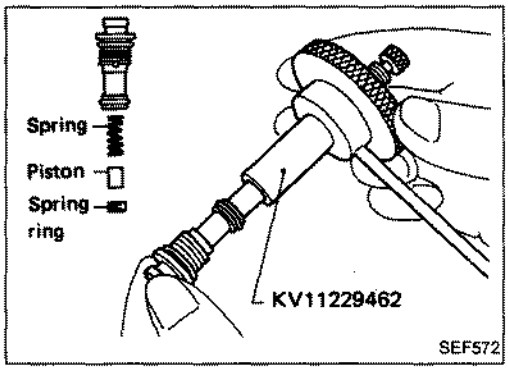
Adjustment of feed pump pressure

Measure feed pump pressure at specified fuel injection pump rpm.

a. When measured pressure is lower than specifications.

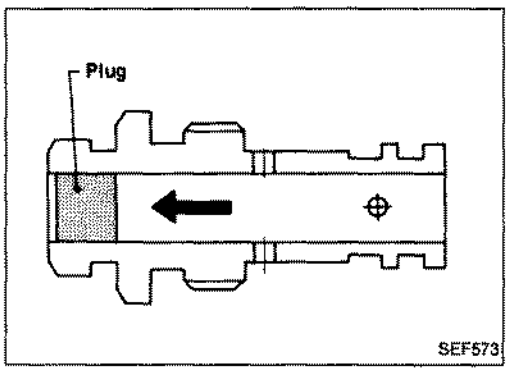
Push in plug that is driven into regulating valve body. Be careful not to push plug in too far.

Testing of Injection Pump (Cont'd)

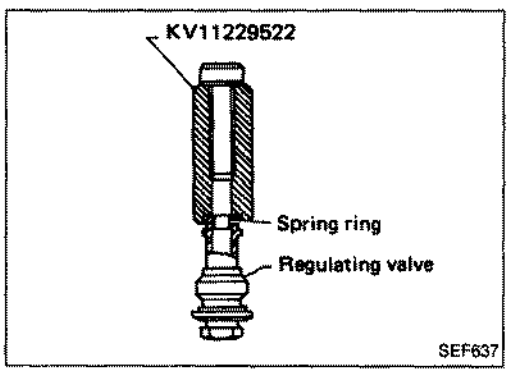


b. When measured pressure is higher than specifications.

(1) Remove regulating valve from fuel injection pump, and disassemble regulating valve using Tool.

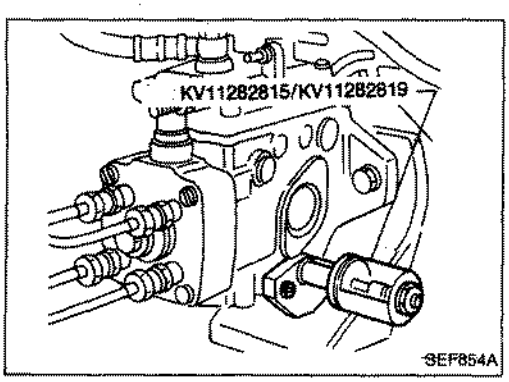


(2) Drive plug out until it is flush with end face of regulating valve.



(3) Install spring, piston and spring ring, in that order, to regulating valve.
Make sure spring ring is flush with end face of regulating valve body when it is pushed in.

(4) Attach regulating valve to fuel injection pump.
(5) Adjust feed pump pressure to specifications.



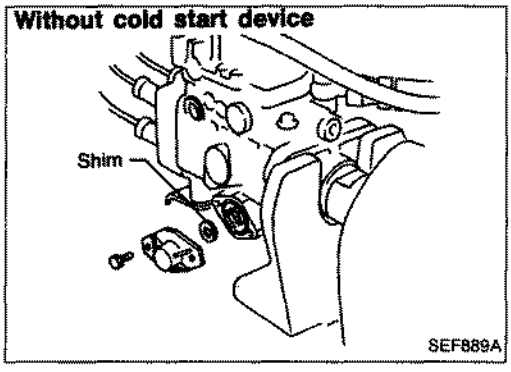
Adjustment of speed timer

1. Remove cover of timer, and attach Tool to that side.
   Without cold start device:
   High pressure side (Side without spring)
   With cold start device:
   Low pressure side (Spring side)

Testing of Injection Pump (Cont'd)

2. Measure timer piston strokes at specified fuel injection pump rpm.

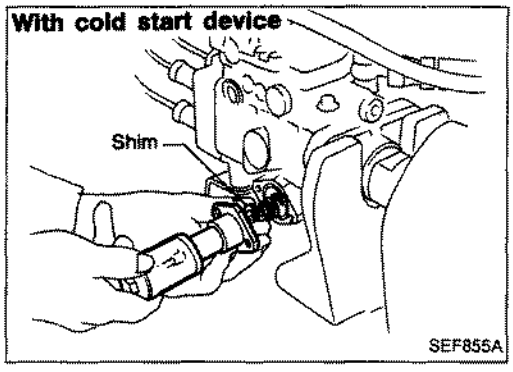
Refer to S.D.S. for timer piston stroke of adjustment value.

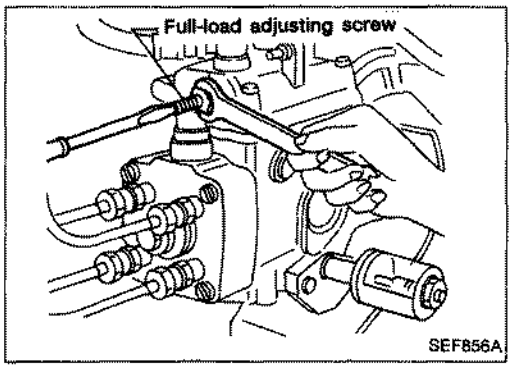


3. If timer piston stroke is not within specified range, remove cover from low-pressure side of timer and adjust piston stroke by adding shim(s).

a. Make sure at least one shim is used on each side of timer spring.

b. Refer to S.D.S. for available service parts.

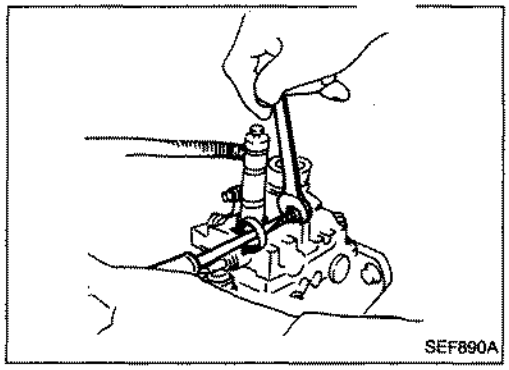




Adjustment of fuel injection under full-load

1. Set control lever at "full-load" by pulling spring or using a suitable equipment.
2. Furnish voltage of 12 volts to activate fuel cut solenoid valve.
3. Measure fuel injection at specified fuel injection pump rpm.
4. If fuel injection is not within standard range, adjust by turning full-load adjusting screw.

Testing of Injection Pump (Cont'd)


SEF890A

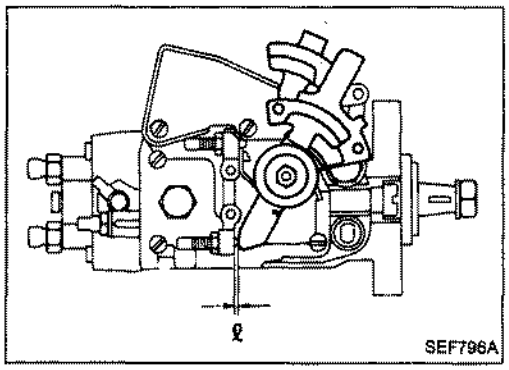
Adjustment of fuel injection during idle

1. Set control lever at idle speed position.
2. Furnish voltage of 12 volts to activate fuel cut solenoid valve.
3. Measure fuel injection at specified fuel injection pump rpm.

Refer to S.D.S. for idle fuel injection amount of adjustment value.

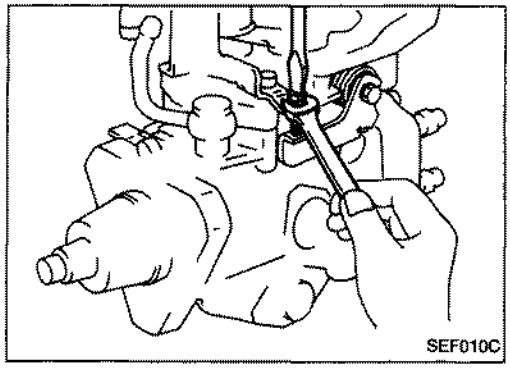
4. If fuel injection is not within specified range, adjust by turning idle speed adjusting screw.

a. Tightening this screw may change fuel injection amount.



SEF796A

b. Make sure control lever angle is set at the specified range. Refer to S.D.S.
If control lever angle is not within specified range, adjust by repositioning control lever on control shaft. (One serration pitch: 15°)
After control lever has been repositioned, be sure to measure amount of fuel injection at idle speed again.


SEF010C

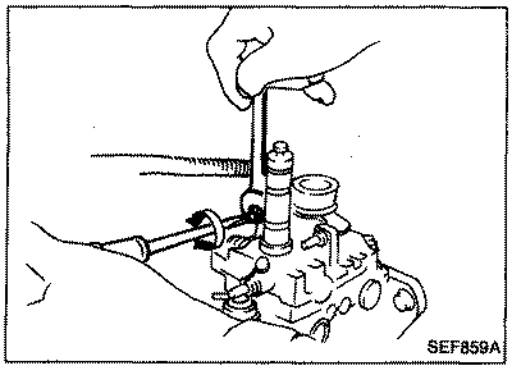
Adjustment of fuel injection during start

1. Set control lever at "full-load" by pulling spring or using a suitable equipment.
2. Furnish voltage of 12 volts to activate fuel cut solenoid valve.
3. Measure fuel injection at specified fuel injection pump rpm.

Refer to S.D.S. for start fuel injection amount of adjustment value.

4. If not within specifications, check to make sure "MS" dimension is within specification. Refer to step 25 for Injection Pump Assembly.

For vehicles with cold start device, refer to cold start device adjustment.


SEF859A

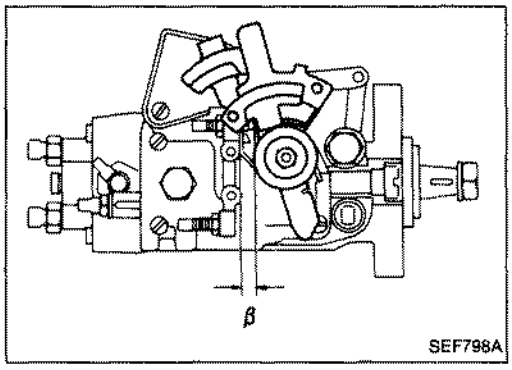
Adjustment of fuel injection at max. pump rpm

1. Set control lever at "full-load" by pulling spring or using a suitable equipment.
2. Furnish voltage of 12 volts to activate fuel cut solenoid valve.
3. Measure fuel injection at specified fuel injection rpm.

Refer to S.D.S. for max. pump speed fuel injection amount of adjustment value.

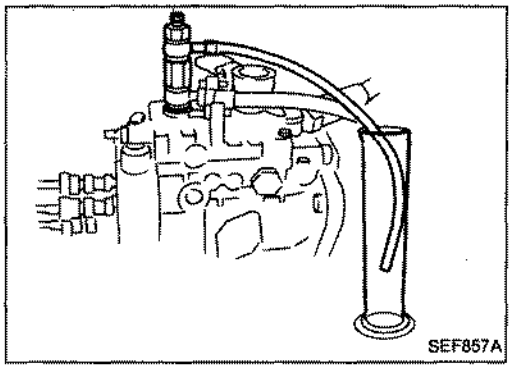
4. If fuel injection is not within standard range, adjust by turning max. speed adjusting screw.

Testing of Injection Pump (Cont'd)



a. Tightening screw may change fuel injection.
b. Make sure control lever angle is within the specified range. Refer to S.D.S.

5. Check injection pump condition, referring to inspection value.



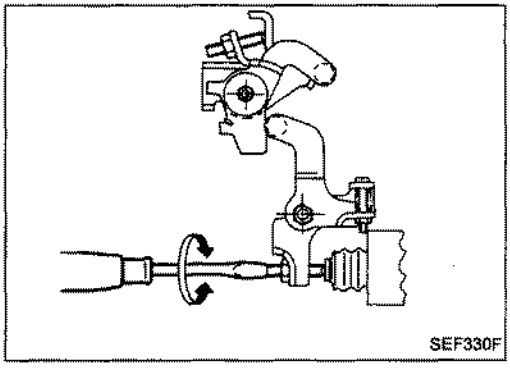
Measurement of overflow amount

1. Set control lever at "full-load" by pulling spring or using a suitable equipment.
2. Furnish voltage of 12 volts to activate fuel cut solenoid valve.
3. Measure fuel overflow at specified fuel injection rpm.

Refer to S.D.S. for overflow amount of inspection value.

Operation check of fuel cut solenoid valve

When engine is idling and fuel cut solenoid valve current is OFF, be sure there is no injection. This check has to be done for approx. 5 seconds.

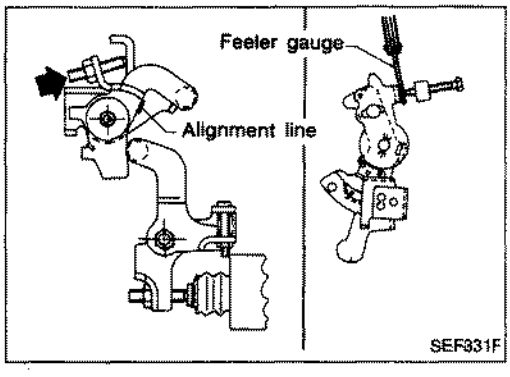


Cold start device adjustment — CD17

Cold start device adjustment should be done after all injection pump adjustments have finished.

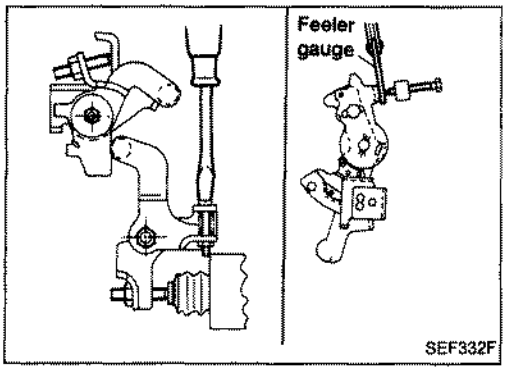
1. Measure ambient temperature with a thermometer.
2. At this time, ensure that speed timer piston stroke is the specified value.
   If not within specification, adjust timer stroke with cold start device adjusting screw.

Refer to S.D.S. for speed timer piston stroke and ambient temperature.



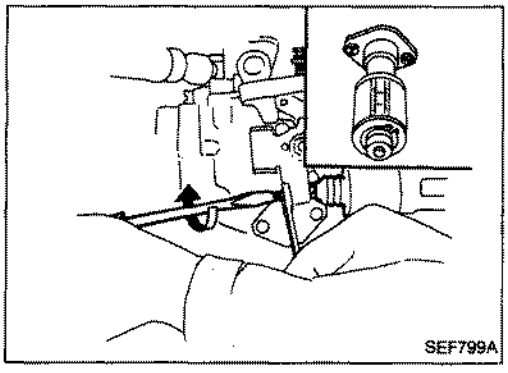
3. Insert 4.1±0.05 mm (0.1614±0.0020 in) feeler gauge between idle adjusting screw and control lever and align alignment line with fast idle control lever by adjusting fast idle control lever adjusting screw.

Testing of Injection Pump (Cont'd)



4. Fully loosen cold start device lever adjusting screw, select feeler gauge whose thickness equals the specified clearance [obtained from S.D.S.: $\ell \pm 0.05$ mm (0.0020 in)] between idle adjusting screw and stopper, and retighten cold start device lever adjusting screw until cold start device lever contacts fast idle control lever.

Temperature should be below 30°C (86°F) during adjustment.



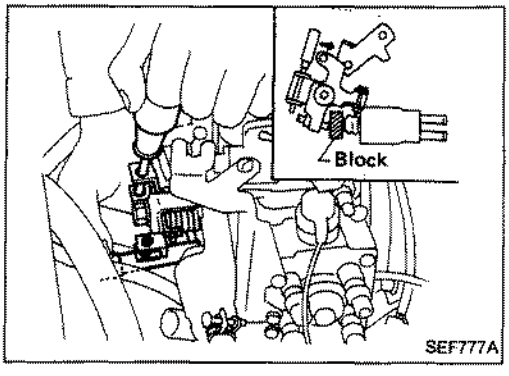
Cold start device adjustment — CD20

- **Cold start device adjustment should be done after all injection pump adjustments have finished.**
- **Temperature should be below 30°C (86°F) during adjustment.**

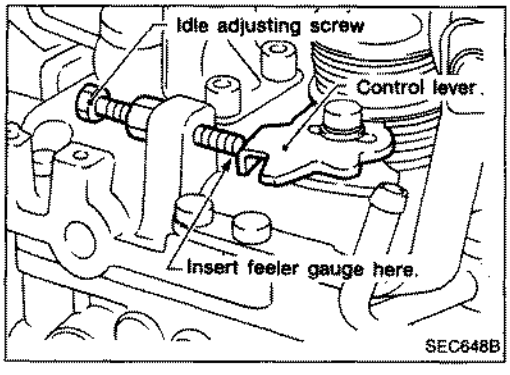
1. Measure ambient temperature with a thermometer.
2. At this time, ensure that speed timer piston stroke is the specified value.
   If not within specification, adjust timer stroke with cold start device adjusting screw.

Refer to S.D.S. for speed timer piston stroke and clearance.

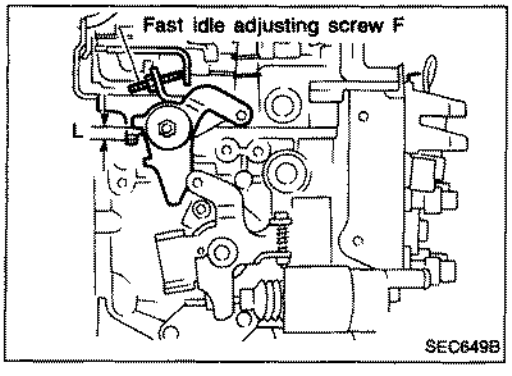
Preparation of cold start device



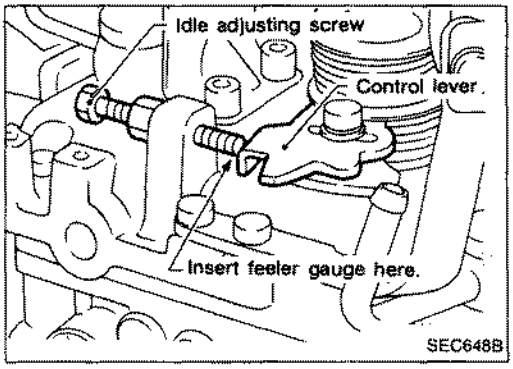
1. Turn cold start device linkage clockwise to disengage cold start device.
2. Set a suitable block [Thickness: about 15 mm (0.59 in)] between cold start device plunger and linkage rod.



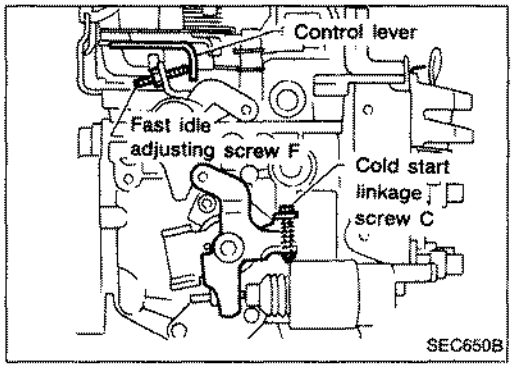
3. Insert 3.0 ± 0.05 mm (0.1181 ± 0.0020 in) feeler gauge between idle adjusting screw and control lever.
4. Adjust clearance L to 5.3 ± 0.05 mm (0.2087 ± 0.0020 in) by turning fast idle adjusting screw F.
5. Tighten fast idle adjusting screw lock nut.



Testing of Injection Pump (Cont'd)

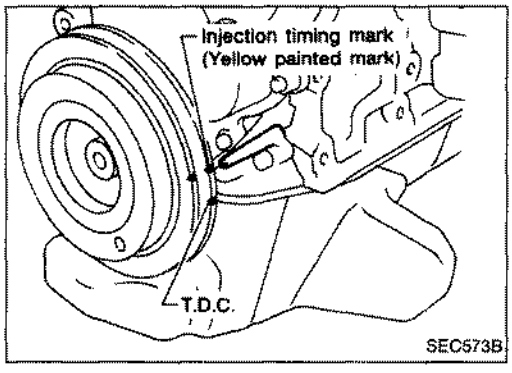


6. Select feeler gauge whose thickness equals the specified clearance [obtained from S.D.S.: $\ell \pm 0.05$ mm (0.0020 in)] between idle adjusting screw and control lever.
7. Insert the feeler gauge between idle adjusting screw and control lever.

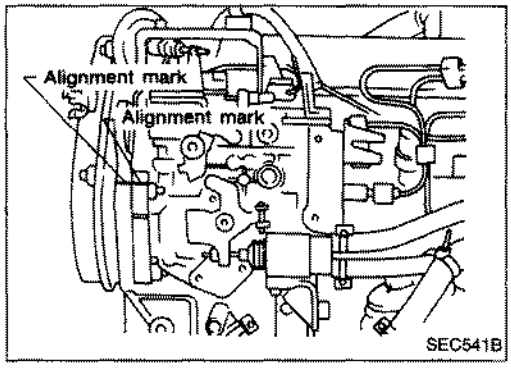


8. Turn cold start linkage screw C such that fast idle adjusting screw F slightly contacts control lever.

Installation



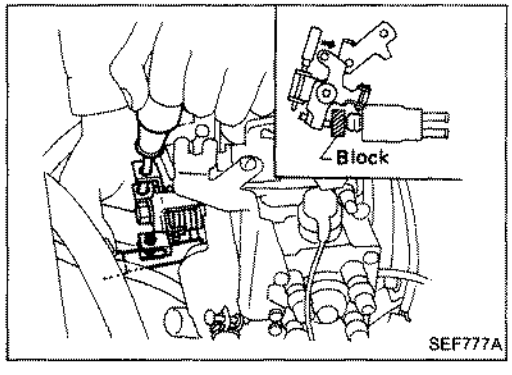
1. Set No. 1 piston at injection timing mark on its compression stroke.
   Injection timing mark: Yellow painted mark
   CD17: 11° ATDC
   CD20: 9° ATDC



2. Install injection pump and timing belt.
- Refer to MA section for installing timing belt.
- Temporarily secure injection pump bolts so alignment mark on injection pump flange meets the mark on injection pump bracket.

3. Adjust injection timing.

Adjustment

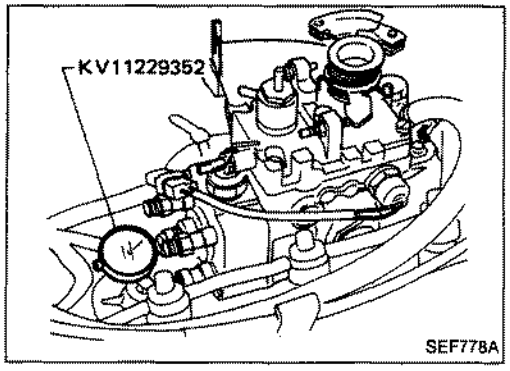


INJECTION TIMING ADJUSTMENT (Plunger lift adjustment)

Preparation of cold start device

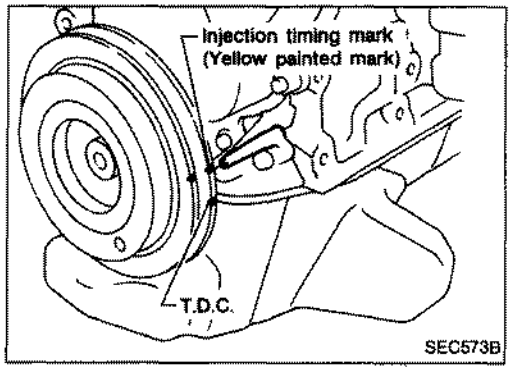
1. Turn cold start device linkage clockwise.
2. Set a suitable block [Thickness: about 15 mm (0.59 in)] between cold start device plunger and linkage rod.
3. Turn crankshaft 2 turns clockwise to set the device to normal position.

Adjustment (Cont'd)



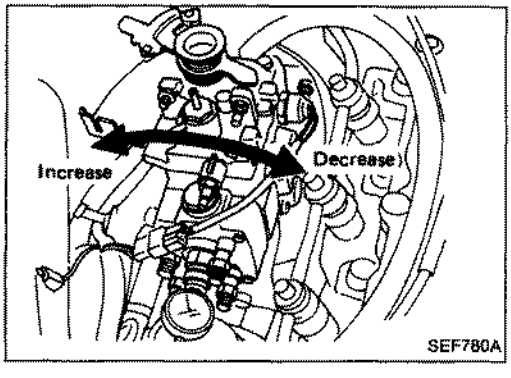
Checking

1. Set No. 1 piston at T.D.C. on its compression stroke.
   T.D.C.: White 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 20 to 25 degrees, then set dial gauge indicator to 0 mm (0 in).
6. Turn crankshaft clockwise and set the pump timing mark to the mark on the crankshaft pulley.
   Pump timing mark: Yellow painted mark
   CD17: 11° ATDC
   CD20: 9° ATDC
7. Read plunger lift.
   Plunger lift:
   0.79 - 0.85 mm (0.0311 - 0.0335 in) at pump timing mark

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

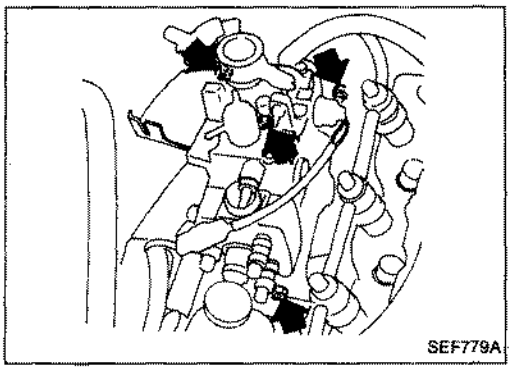


Adjusting

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

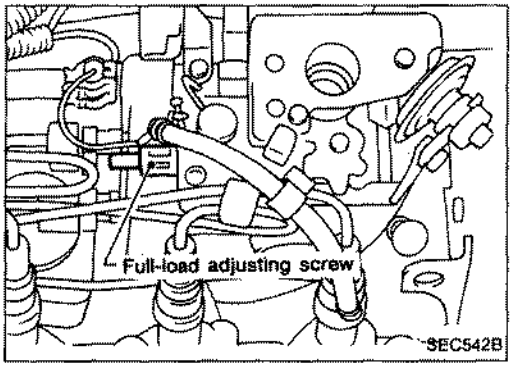
- **If indication is smaller than the specified value, turn pump body away from engine.**
- **If indication is larger than the specified value, turn pump body towards engine.**

Adjustment (Cont'd)

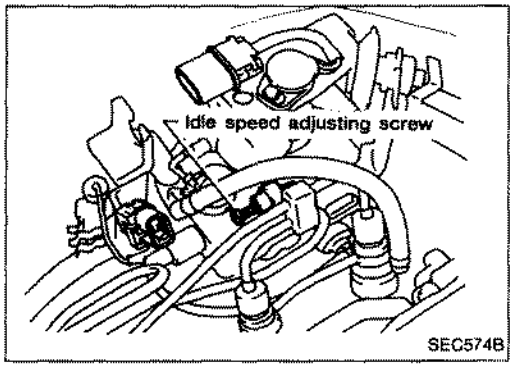

SEF779A

2. Tighten injection pump securing bolts and nuts.
   Nut:
   : 13 - 18 m
   (1.3 - 1.8 kg-m, 9 - 13 ft-lb)
   Bolt:
   : 45 - 60 N·m
   (4.6 - 6.1 kg-m, 33 - 44 ft-lb)
3. Remove dial gauge and install air bleeder with new washer.
4. Install injection tubes.
   Flare nut:
   : 22 - 25 N·m
   (2.2 - 2.5 kg-m, 16 - 18 ft-lb)
5. Bleed air from fuel system.

Refer to MA section.



SEC542B



SEC574B

IDLE SPEED AND MAXIMUM SPEED ADJUSTMENT

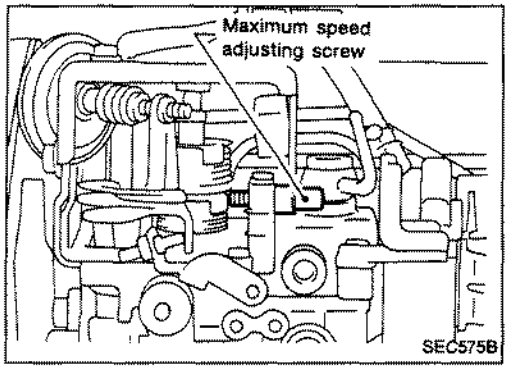
CAUTION:

- **Do not remove sealing caps unless absolutely necessary.**
- **Never disturb full-load adjusting screw because this alters the mixture ratio and may result in serious engine problems.**
- **Do not adjust maximum speed adjusting screw to a point exceeding specifications, because exceeding the maximum speed may cause engine damage.**
- **When attaching tachometer pickup, remove fuel tube clamps. (Refer to tachometer instructions.)**

Idle speed adjustment

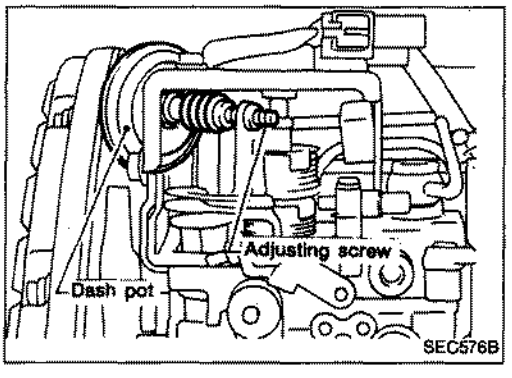
- Refer to MA section.
  Idle speed: 700^{+50}_{-0} rpm (M/T models)

Adjustment (Cont'd)



Maximum speed adjustment

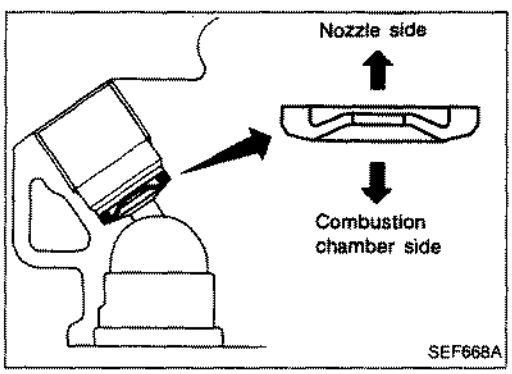
1. Start engine and warm it up until coolant temperature indicator points to middle of gauge.
2. Connect tachometer pickup to No. 1 fuel injection tube.
- Refer to the instructions on tachometer.
3. Depress accelerator pedal fully under no-load and read the tachometer indication.
   Maximum engine speed (Under no-load):
   CD17: 5,200 - 5,500 rpm
   CD20: 5,400 - 5,600 rpm
4. If indication is lower than specified maximum engine speed, adjust using maximum speed adjusting screw.
5. After adjustment, tighten lock nut securely and plug it with a sealing cap.



Dash pot adjustment

1. Warm up engine to normal operating temperature.
2. Attach tachometer and adjust touch speed using adjusting screw.
   Touch speed: 1,300 rpm

CAUTION:
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

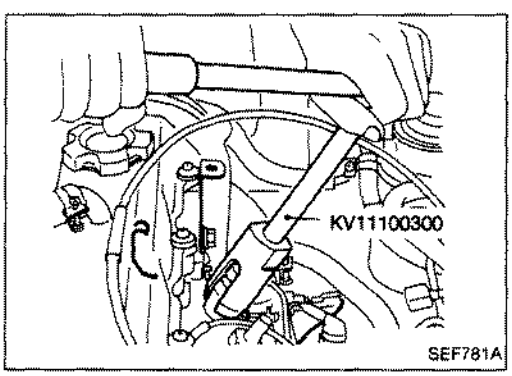
1. Remove fuel injection tube and spill tube.
2. Remove injection nozzle assembly.

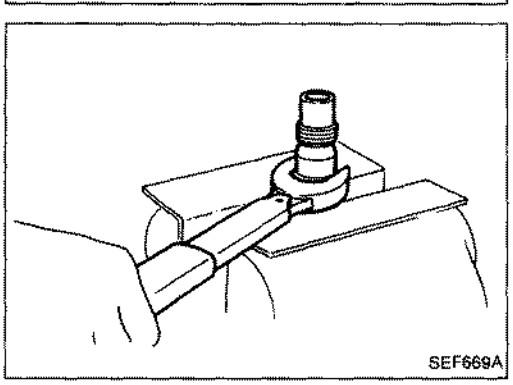
Also remove washers from nozzle end.

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)

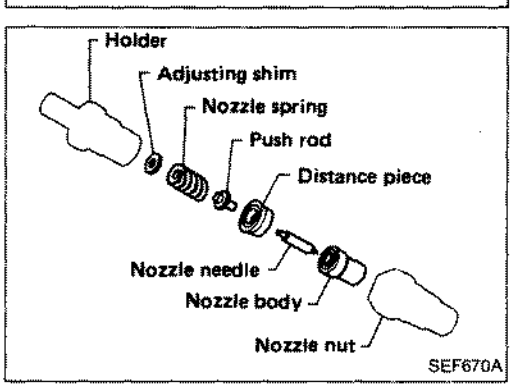
a. Always clean the nozzle holes.
b. Always use new injection nozzle gasket.
c. Note that small washer should be installed in specified direction.
d. Bleed air from fuel system.





Disassembly

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

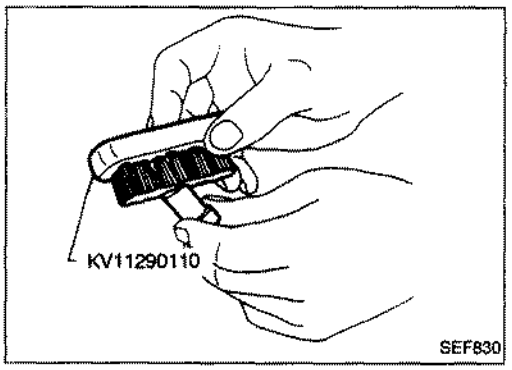


2. Arrange all disassembled parts in the order shown at left.

Inspection

Thoroughly clean all disassembled parts with fresh kerosene or solvent.

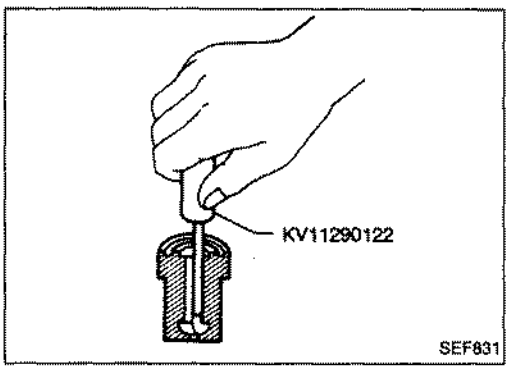
- If nozzle needle is damaged or fused, replace nozzle assembly with a new one.
- If end of nozzle needle is seized or excessively discolored, replace nozzle assembly.
- Check nozzle body and distance piece for proper contact. If excessively worn or damaged, replace nozzle assembly or distance piece.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



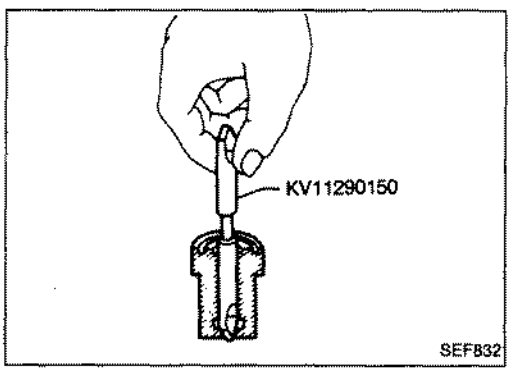
Cleaning

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.



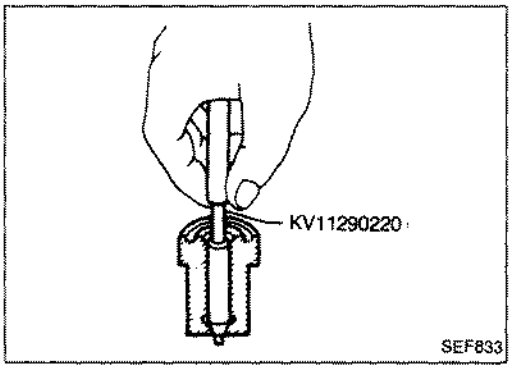
2. Clean oil sump of nozzle body using Tool.



3. Clean nozzle seat by using Tool.

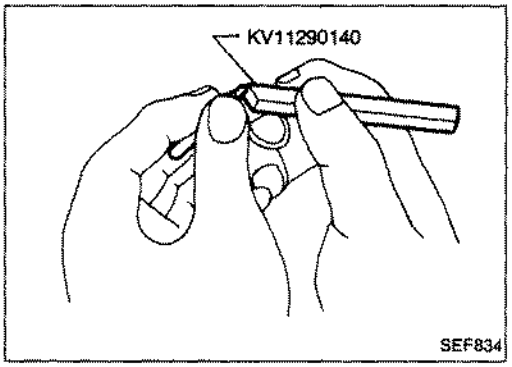
This job should be performed with extra precautions, since efficiency of nozzle depends greatly on a good nozzle seat.

Cleaning (Cont'd)

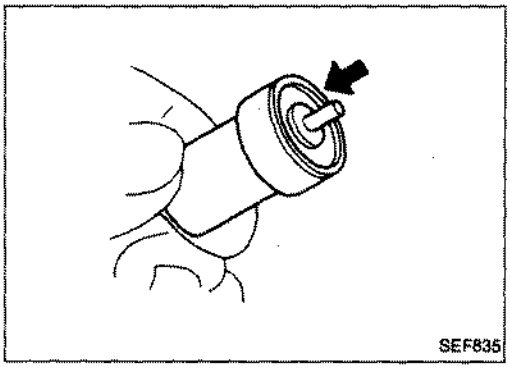


4. Clean spray hole of nozzle body by using Tool.

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

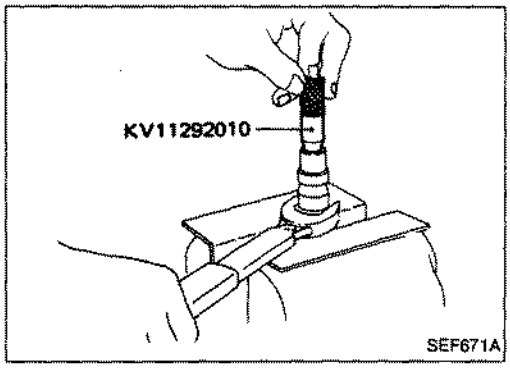


5. Decarbonate nozzle needle tip by using Tool.



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

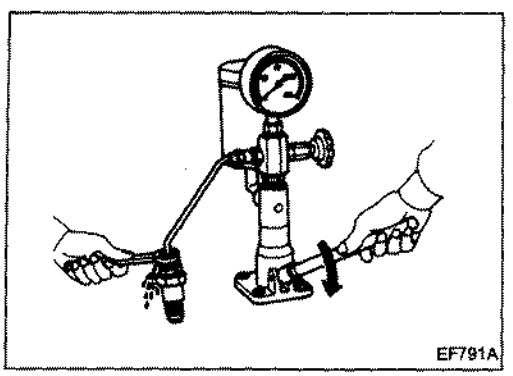
Assemble in the reverse order of disassembly, observing the following.

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)

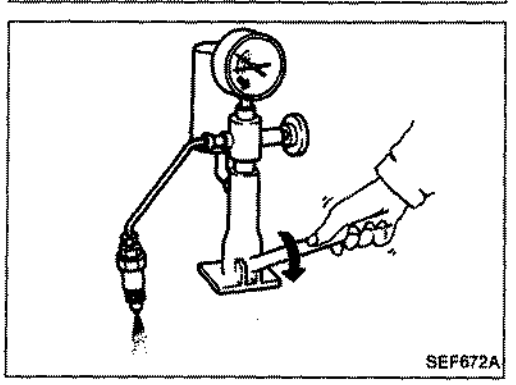
Test and Adjustment

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

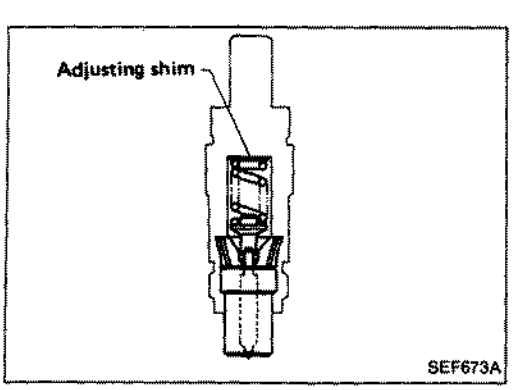
1. Install nozzle to injection nozzle tester and bleed air from flare nut.


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

Initial injection pressure:
Used
12,259 - 13,239 kPa (122.6 - 132.4 bar, 125 - 135 kg/cm^2, 1,778 - 1,920 psi)
New
12,749 - 13,534 kPa (127.5 - 135.3 bar, 130 - 138 kg/cm^2, 1,849 - 1,962 psi)

Always check initial injection pressure using a new nozzle.



SEF673A

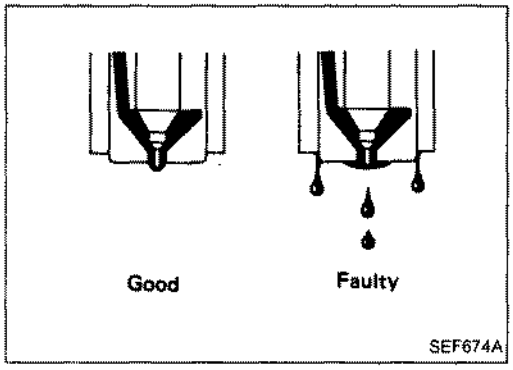
4. To adjust injection pressure, change adjusting shims.

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

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

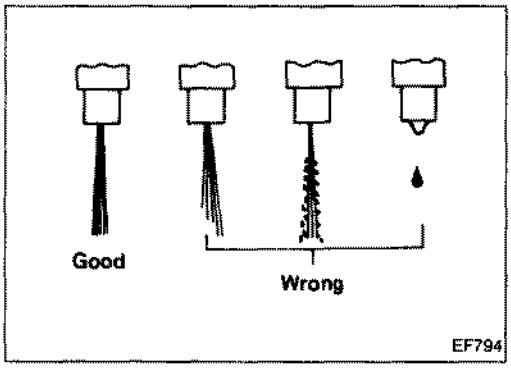
Refer to S.D.S. for adjusting shim.

Test and Adjustment (Cont'd)



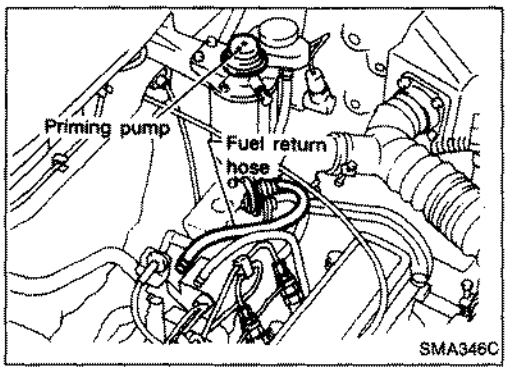
LEAKAGE TEST

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. Pump the tester handle one time per second.
2. Check the spray pattern.
3. If the spray pattern is not correct, clean or replace nozzle.



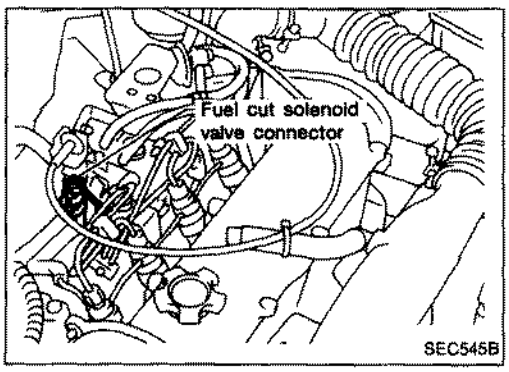
Priming Pump Check

Before checking priming pump, make sure that fuel filter is filled with fuel.

1. Disconnect fuel return hose.

Place a suitable container beneath hose end.

2. Pump priming pump and check that the fuel overflows from the hose end. If not, replace priming pump.

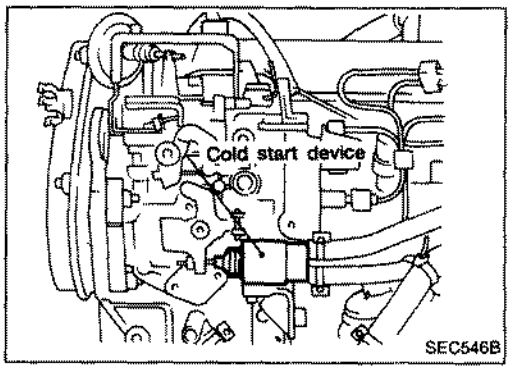


Fuel Cut Solenoid Valve

1. Disconnect fuel cut solenoid valve harness connector and check voltage.

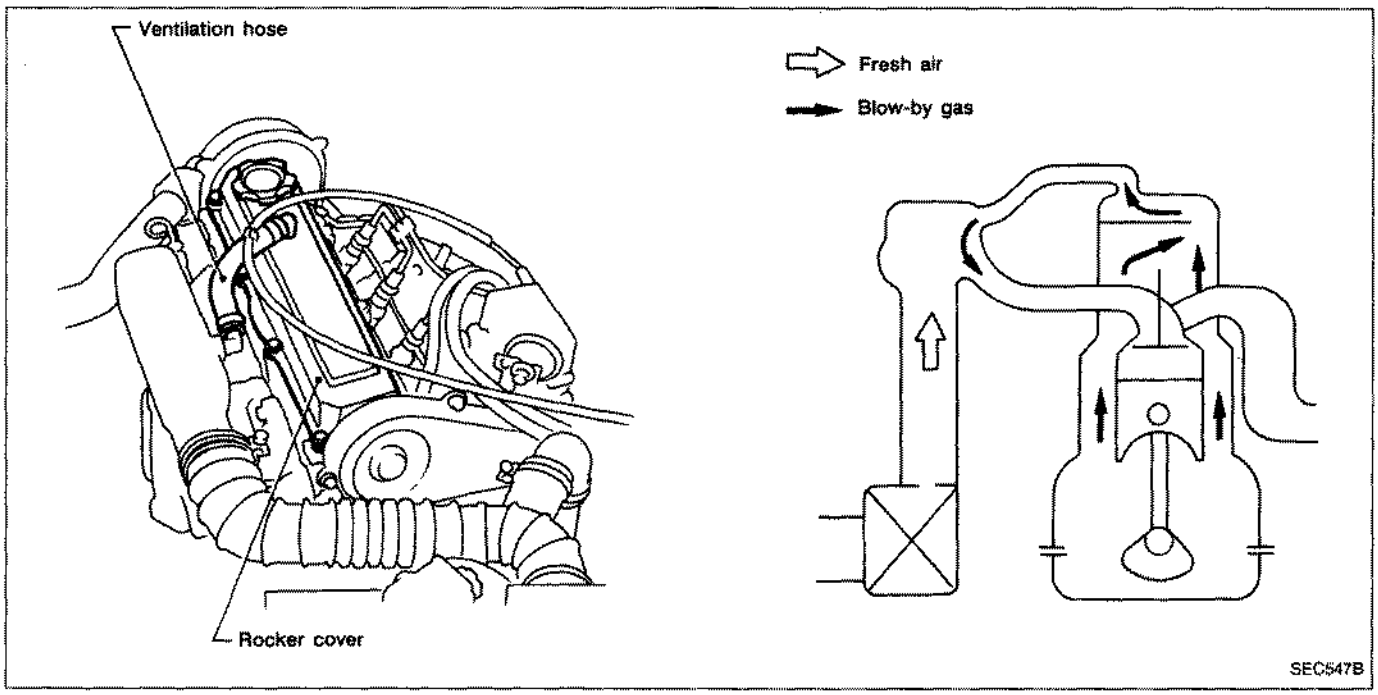
Ignition switch	Voltage
OFF	0V
ON	Battery voltage

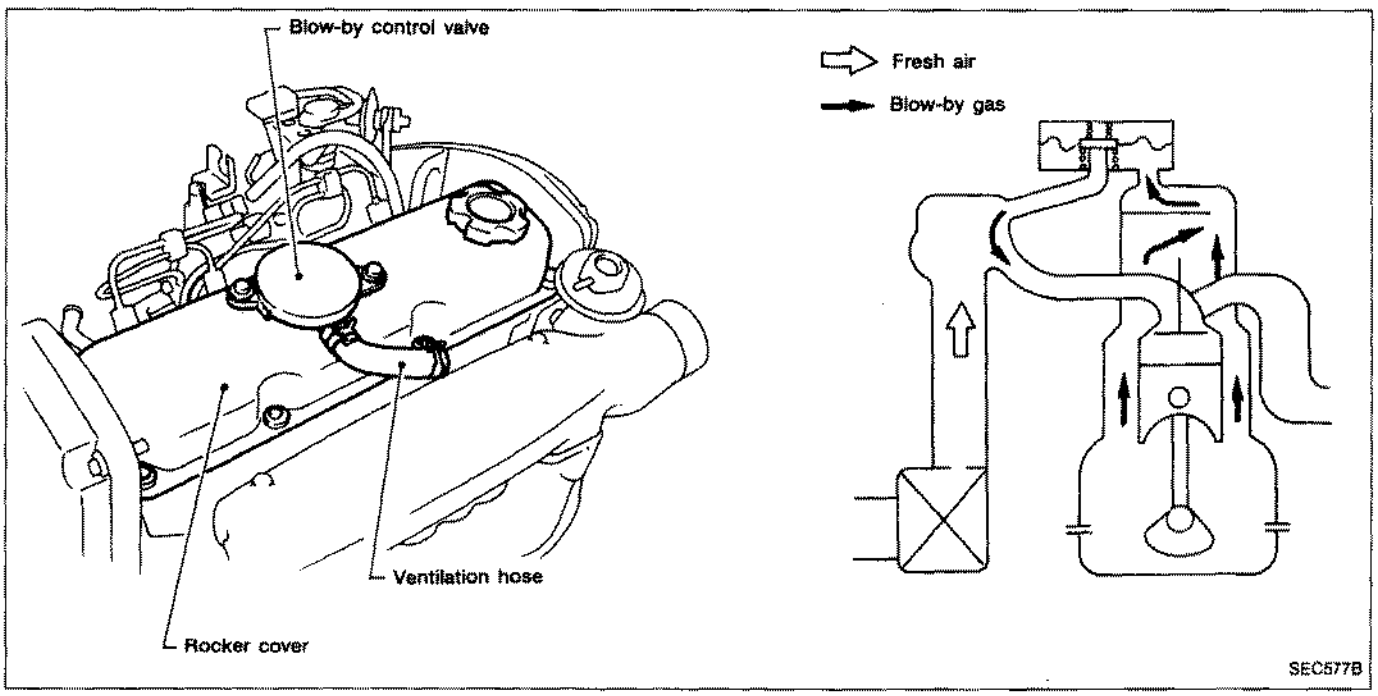
2. Check fuel cut solenoid valve for circuit continuity.
3. Remove fuel cut solenoid valve and check that plunger moves smoothly and that spring is normal.

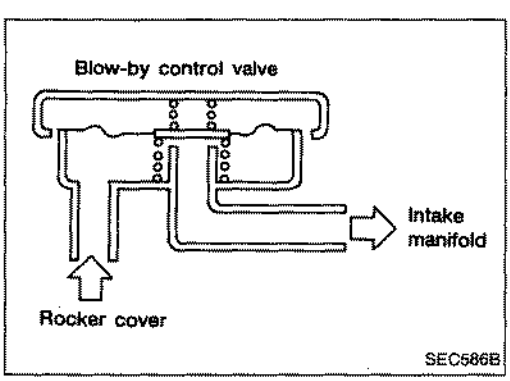


Cold Start Device

Refer to VE-TYPE INJECTION PUMP.





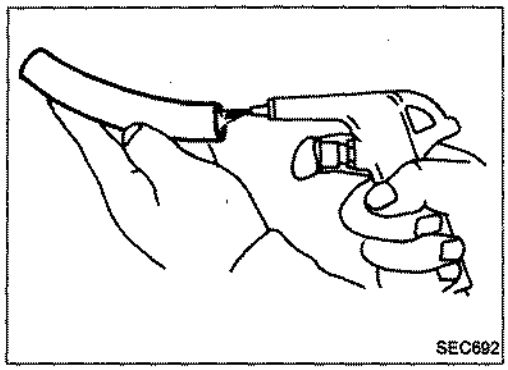


Blow-by Control Valve

- Check control valve for clogging and abnormalities.

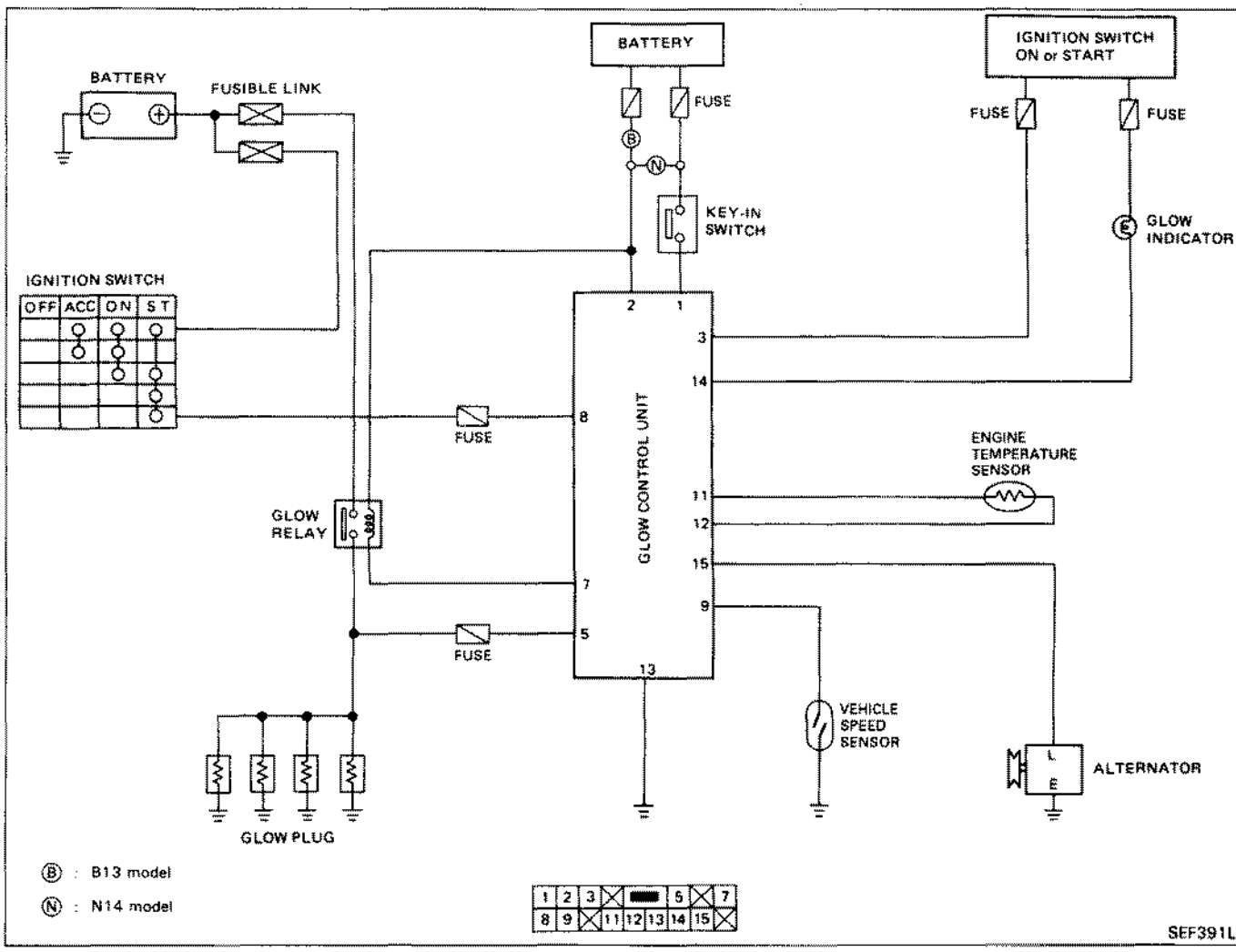
Blow-by Control Valve (Cont'd)

Ventilation Hose

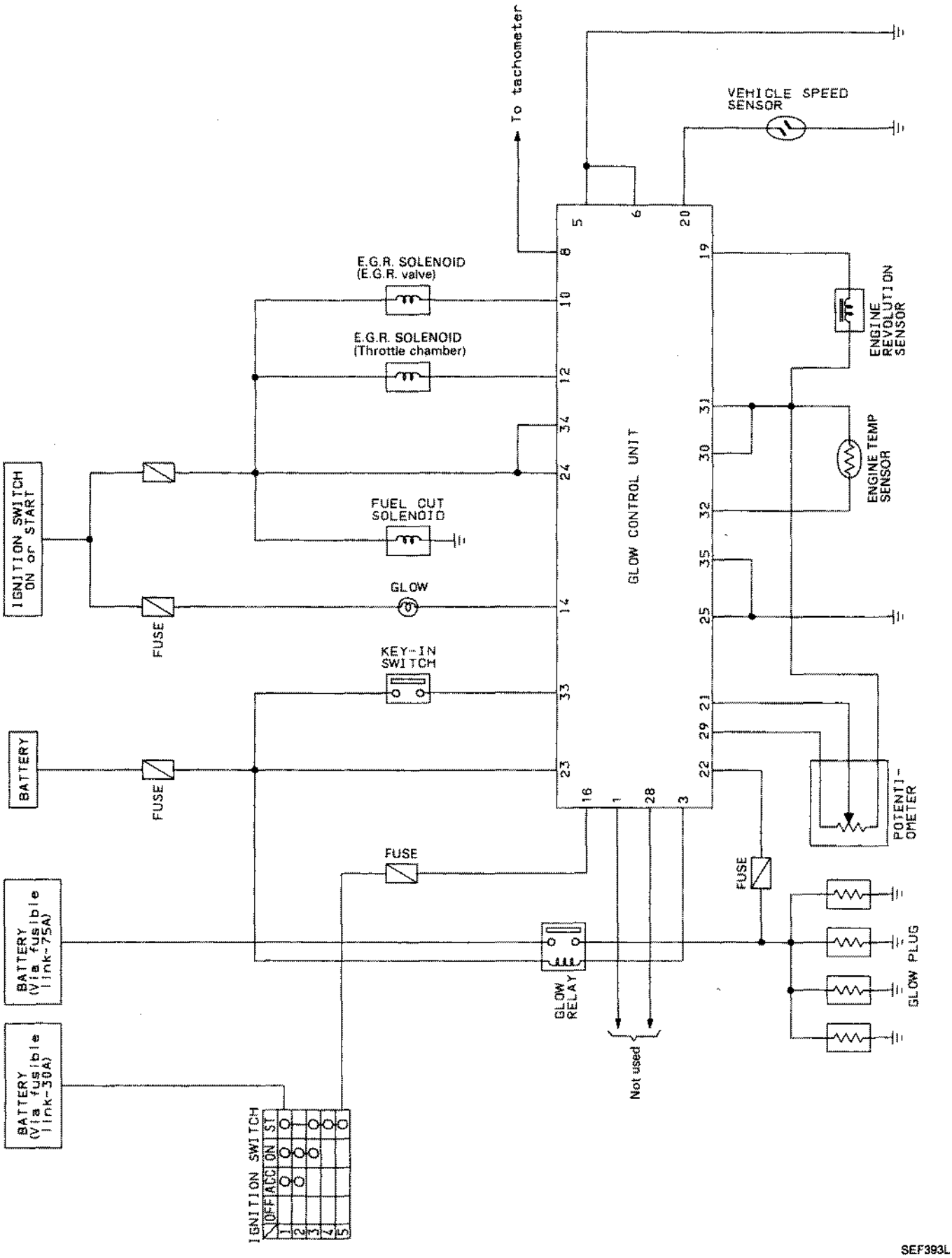

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1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

Schematic — Without E.G.R. system

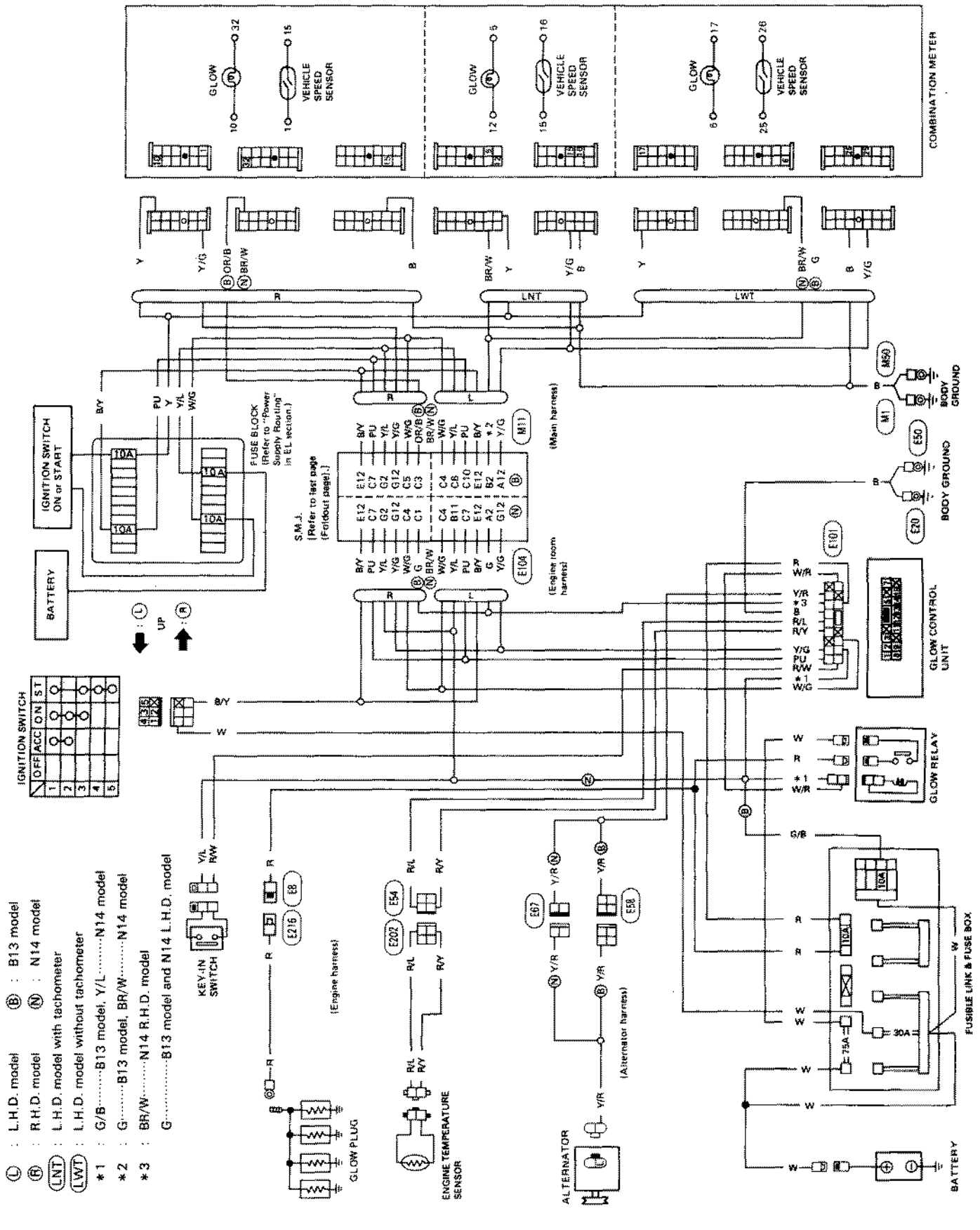


Schematic — With E.G.R. system



SEF393L

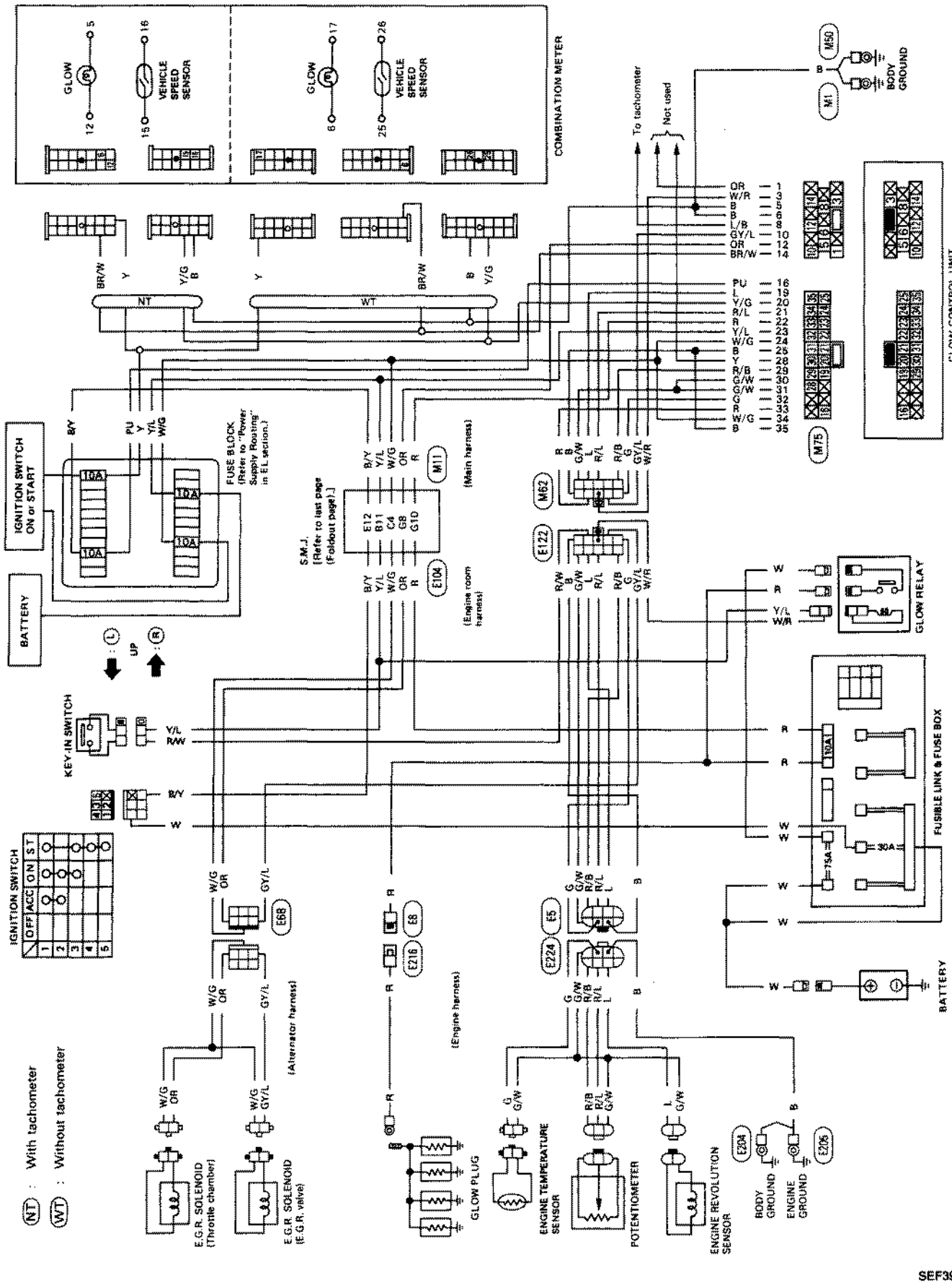
Wiring Diagram — Without E.G.R. system



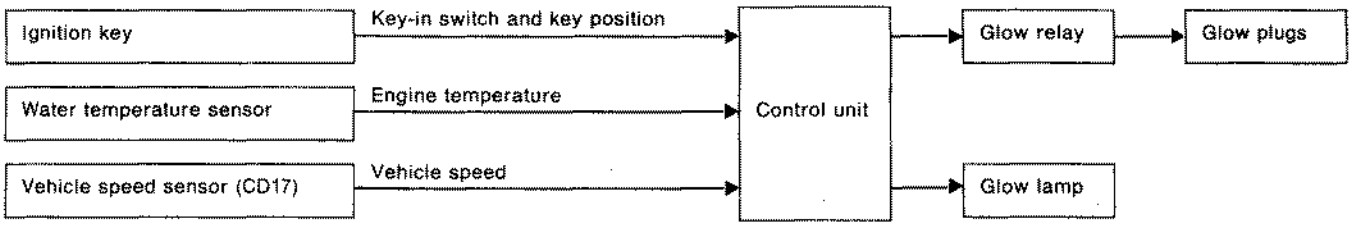
Ⓛ : L.H.D. model Ⓑ : B13 model
Ⓡ : R.H.D. model Ⓝ : N14 model
(LNT) : L.H.D. model with tachometer
(LWT) : L.H.D. model without tachometer
*1 : G/B·····B13 model, Y/L·····N14 model
*2 : G·····B13 model, BR/W·····N14 model
*3 : BR/W·····N14 R.H.D. model
G·····B13 model and N14 L.H.D. model

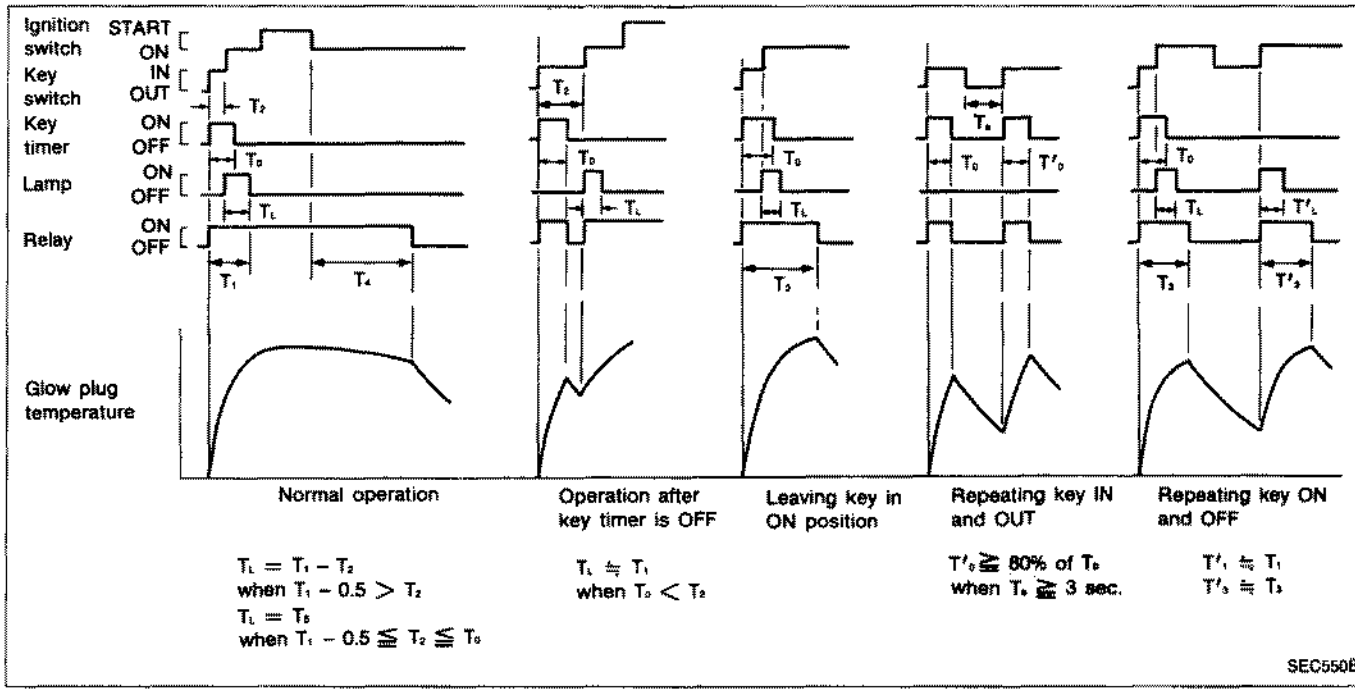
SEF392L

Wiring Diagram — With E.G.R. system



Description





When the ignition key is inserted into the key cylinder, the control unit turns on the relay and the "high-level" electric current flows through the glow plugs and heats them up quickly. When the ignition switch is turned on, the control unit turns on the indicator. After T_1 seconds have passed from key in, the control unit turns off the indicator.

While cranking, the relay remains on. The relay automatically turns off after T_4 seconds have passed from the engine start.

For CD17: When vehicle speed exceeds 12 km/h (7 MPH), the control unit stops the electric current to glow plugs to protect them.

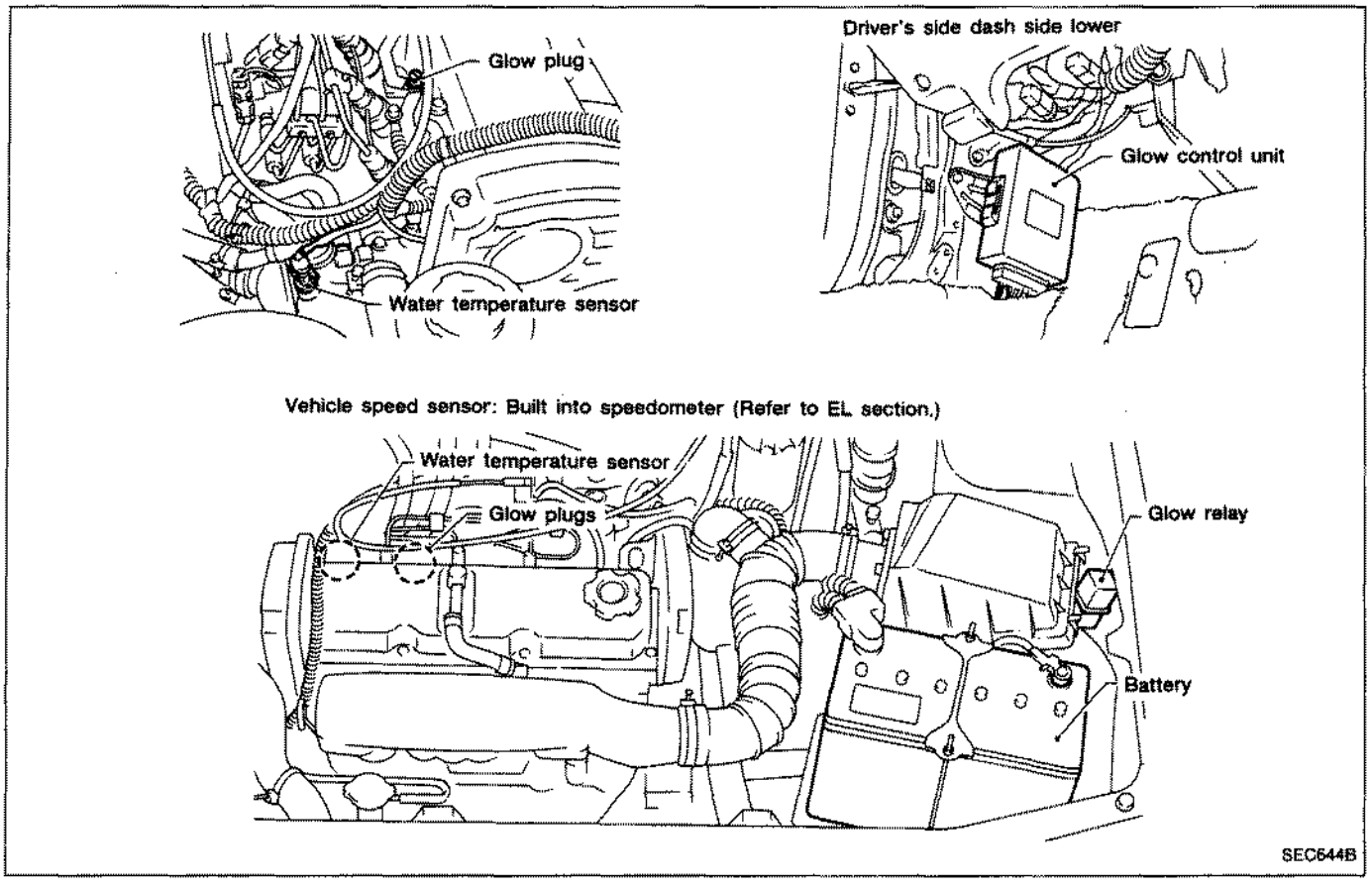
	Second	Water temp. sensor		Remarks
		Water temp. °C (°F)	Resistance (kΩ)	
T_5	2.8 - 3.8	—	—	
T_1	5.0 - 7.0	−25 (−13)	19.7	
	1.8 - 3.2	20 (68)	2.5	
	0.8 - 2.2	60 (140)	0.6	
T_3	17.0 - 23.0	Lower than 60 (140)	More than 0.6	
	4.0 - 6.0	Higher than 60 (140)	Less than 0.6	
T_4	255 - 345	Lower than 60 (140)	More than 0.6	When alternator is working
	Less than 10	Higher than 60 (140)	Less than 0.6	
(T_4)	15 - 25	Lower than 60 (140)	More than 0.6	When alternator is not working
	3 - 7	Higher than 60 (140)	Less than 0.6	
T_5	0.1 - 0.9	—	—	

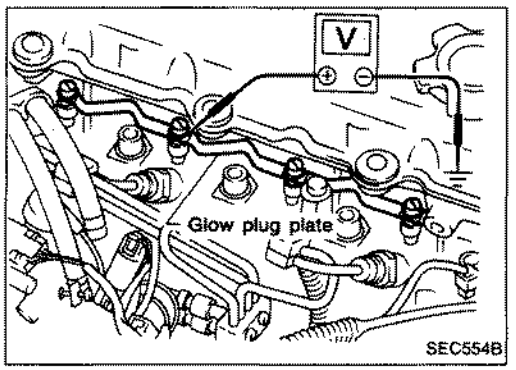
Trouble Diagnosis

ENGINE SYMPTOM	PARTS									
	QUICK-GLOW CONTROL UNIT	GLOW RELAY	ENGINE COOLANT TEMP SENSOR	GLOW PLUG	ALTER-NATOR	KEY-IN SWITCH	IGNITION SWITCH	GLOW INDI-CATOR LAMP	FUSE FUSIBLE LINK	BATTERY
Cannot be started	X	X	X	X		X	X		X	X
Hard to start	X	X	X	X		X	X		X	X
White smoke after starting	X	X	X	X	X		X		X	X
Rough idle after starting	X	X	X	X	X		X		X	X
Glow indicator does not come "ON"	X						X	X	X	X
Glow indicator does not go "OFF"	X						X	X		X

- Before checking quick-glow system, check engine condition, fuel ingredients and fuel injection system.
- Before checking component parts, check battery condition, fuse and fusible link.
- When checking component parts, check their related harnesses and connectors at the same time.
- Before replacing quick-glow control unit check all other component parts.

Parts Location

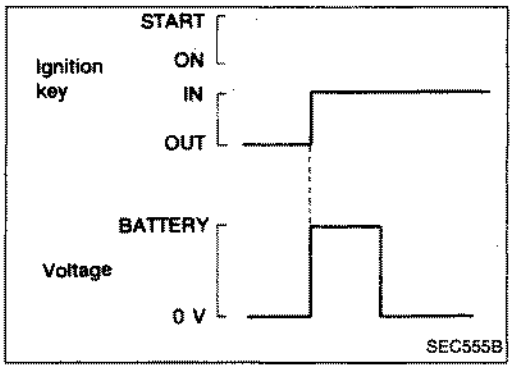




Component Parts Basic Check

ENTIRE SYSTEM CHECK

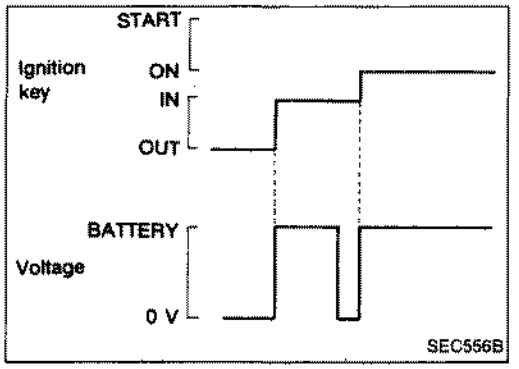
Set voltmeter between glow plug and engine body.



1. Key-in glow system
- Read voltage when ignition key is inserted into ignition switch.

Voltage:

Battery voltage for about 3 seconds



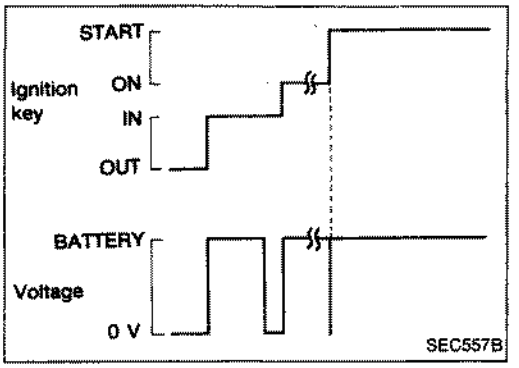
2. Quick-glow (Pre-glow) system
1) Turn ignition switch "ON" 3 or more seconds after key-in.
2) Read voltage

Voltage:

Battery voltage for about 20* seconds

*** Coolant temperature is lower than 60°C (140°F).**

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

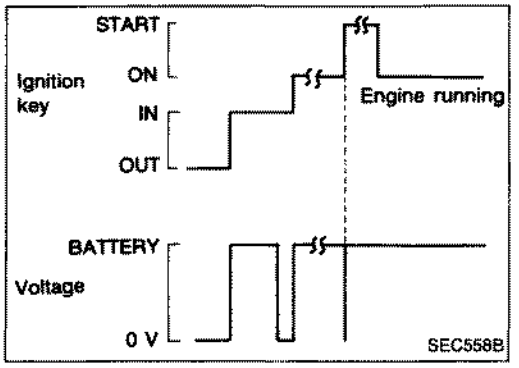


3. Quick-glow (Cranking) system
1) Disconnect "S" terminal for starter motor to prevent engine from cranking.
2) Read voltage when ignition key is turned to "START".

Voltage:

Battery voltage*

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



4. After-glow system
1) Connect "S" terminal to starter motor.
2) Start engine and read voltage.

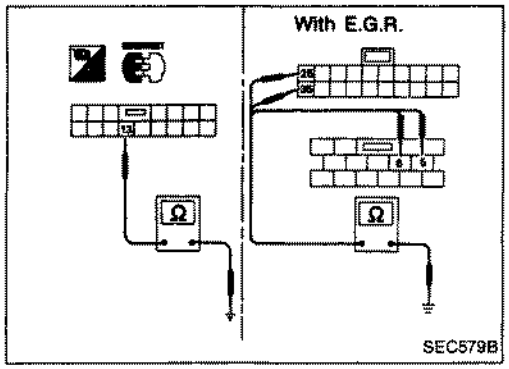
Voltage:

Battery voltage for 5* minutes

*** Coolant temperature is lower than 60°C (140°F).**

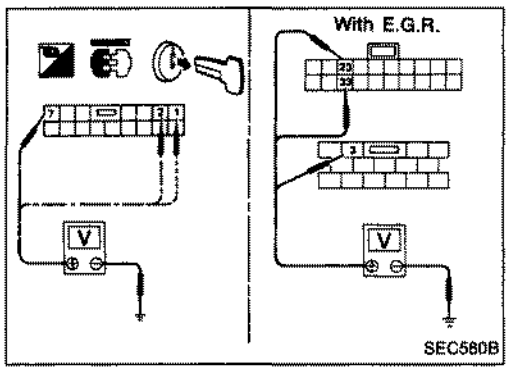
Component Parts Basic Check (Cont'd)

POWER SUPPLY FOR GLOW CONTROL UNIT



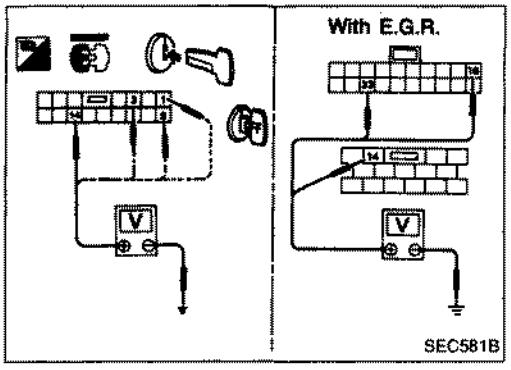
1. Disconnect "S" terminal for starter motor to prevent engine from cranking.
2. Disconnect glow control unit harness connector.
3. Check terminal(s) ⑬ (Models with E.G.R.: ⑤, ⑥, ㉕ and ㉟) for ground continuity.
   Continuity should exist (0Ω).

- If N.G., check ground harness.



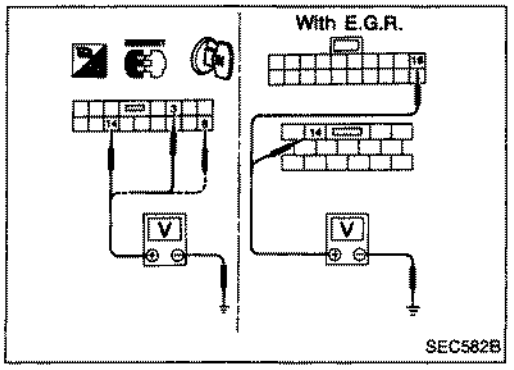
4. Check voltage at each terminal according to the following chart.

Terminal No.		Ignition switch position		Voltage
	E.G.R.			
②	㉓	OFF (Not inserted)		Battery voltage
⑦	③	OFF (Not inserted)		Battery voltage
①	㉝	OFF (Not inserted)		0V
		OFF (Inserted)		Battery voltage
③	㉔, ㉞	OFF		0V
		ON	START	Battery voltage
⑭	⑭	OFF		0V
		ON	START	Battery voltage
⑧	⑯	OFF	ON	0V
		START		Battery voltage

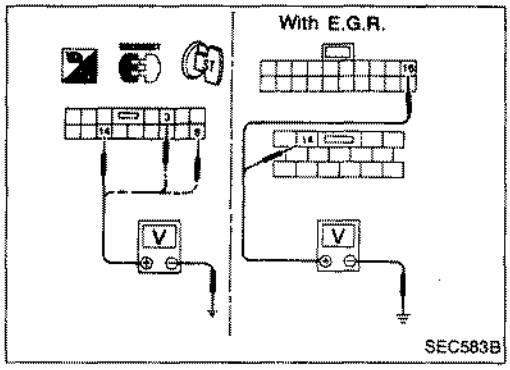


- If N.G., check component parts and their related harness according to the following chart.

Terminal No.		Parts which should be checked						
	E.G.R.	Battery	Fuse /Fusible link	Glow relay	Key-in switch	Ignition switch	Glow indicator bulb	Harness
②	㉓	X	X					X
⑦	③	X	X	X				X
①	㉝	X	X		X			
③	㉔, ㉞	X	X			X		X
⑭	⑭	X	X			X	X	X
⑧	⑯	X	X			X		X



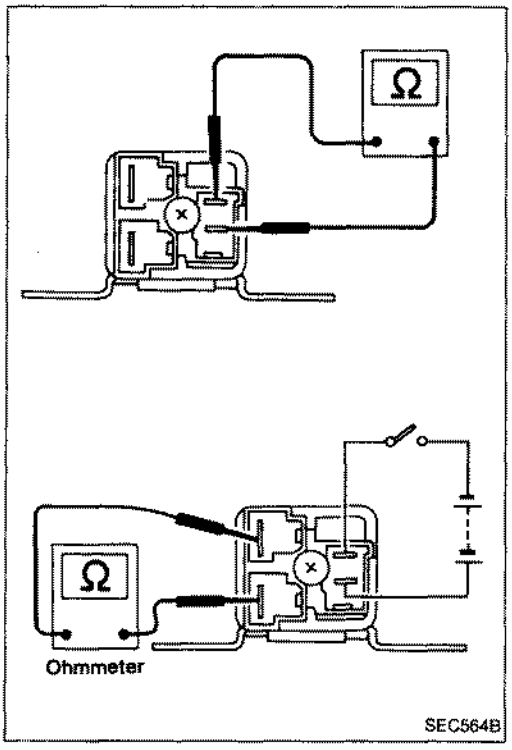
Component Parts Basic Check (Cont'd)

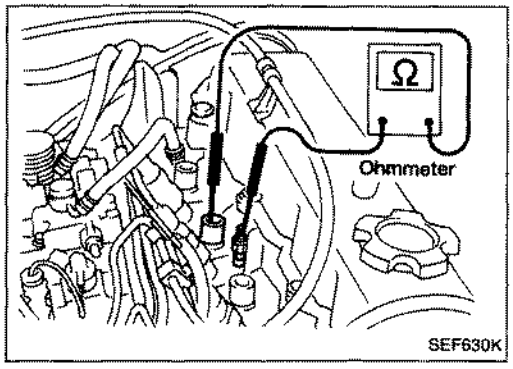


GLOW RELAY

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

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



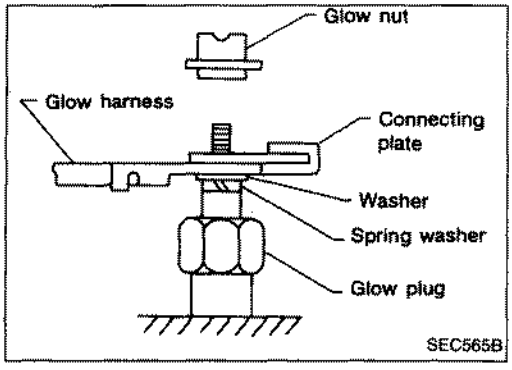


GLOW PLUG

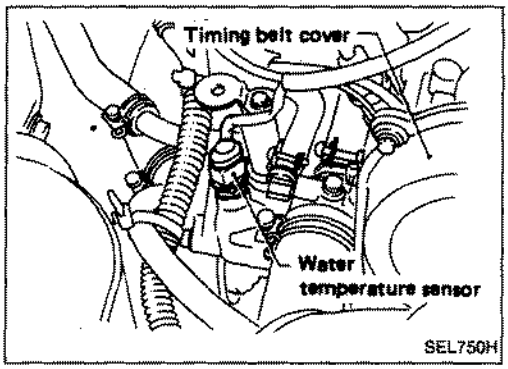
1. Disconnect glow control unit harness connector.
2. Check continuity between ground and terminal ⑤ of glow control unit harness connector.
   Continuity should exist.
3. Remove glow plug connecting plate.
4. Check each glow plug for continuity.
   Continuity should exist:
   Approximately 0.65Ω

- If N.G., replace glow plug.

5. Install glow plug connecting plate securely.



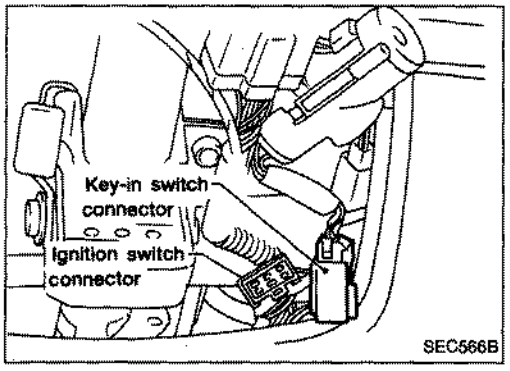
Component Parts Basic Check (Cont'd)



WATER TEMPERATURE SENSOR

Check water temperature sensor resistance.

Coolant temp. °C (°F)	Resistance kΩ
–15 (5)	11.5
0 (32)	5.6
10 (50)	3.7
40 (104)	1.2



KEY-IN SWITCH

Check continuity between terminals of key-in switch connector.

Ignition key	Continuity
Not inserted	No continuity
Inserted	Continuity should exist.

IGNITION KEY AND ALTERNATOR

Refer to EL section.

VEHICLE SPEED SENSOR

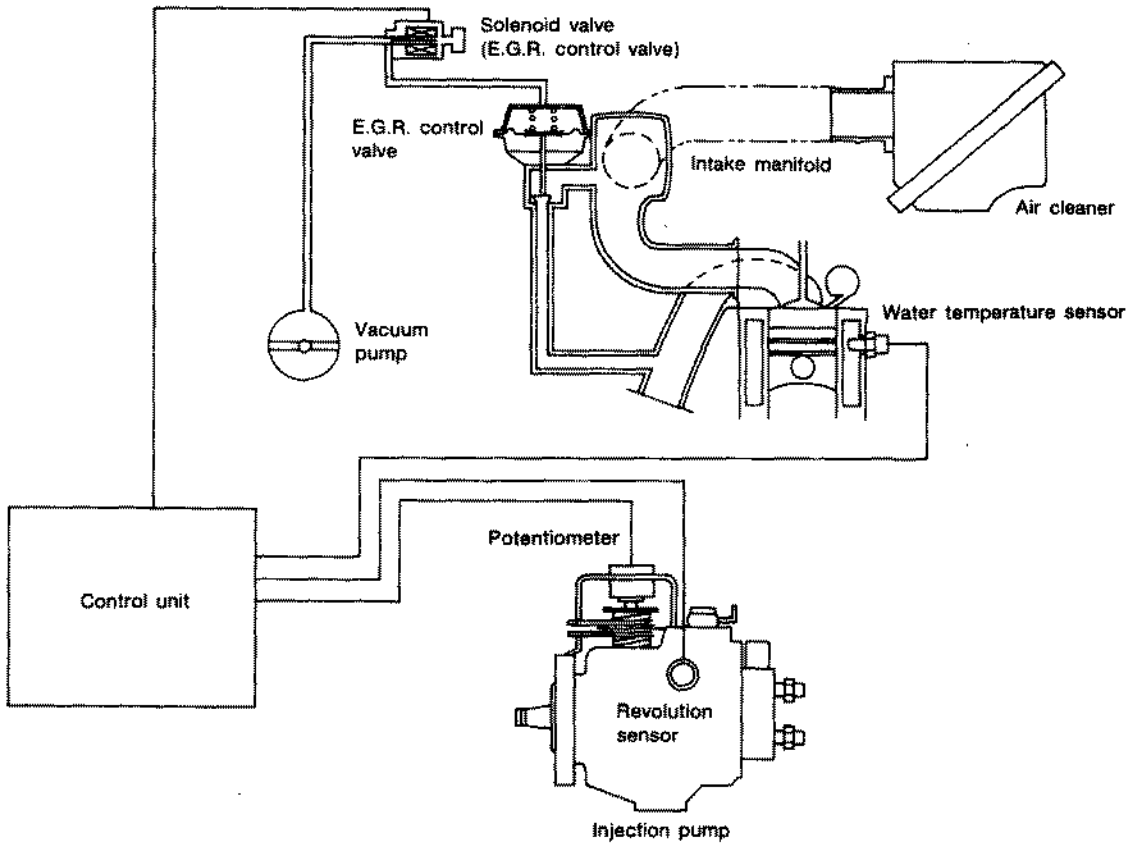
Read pulse from vehicle speed sensor.

Pulse: 637 pulses/min at 60 km/h (37 MPH)

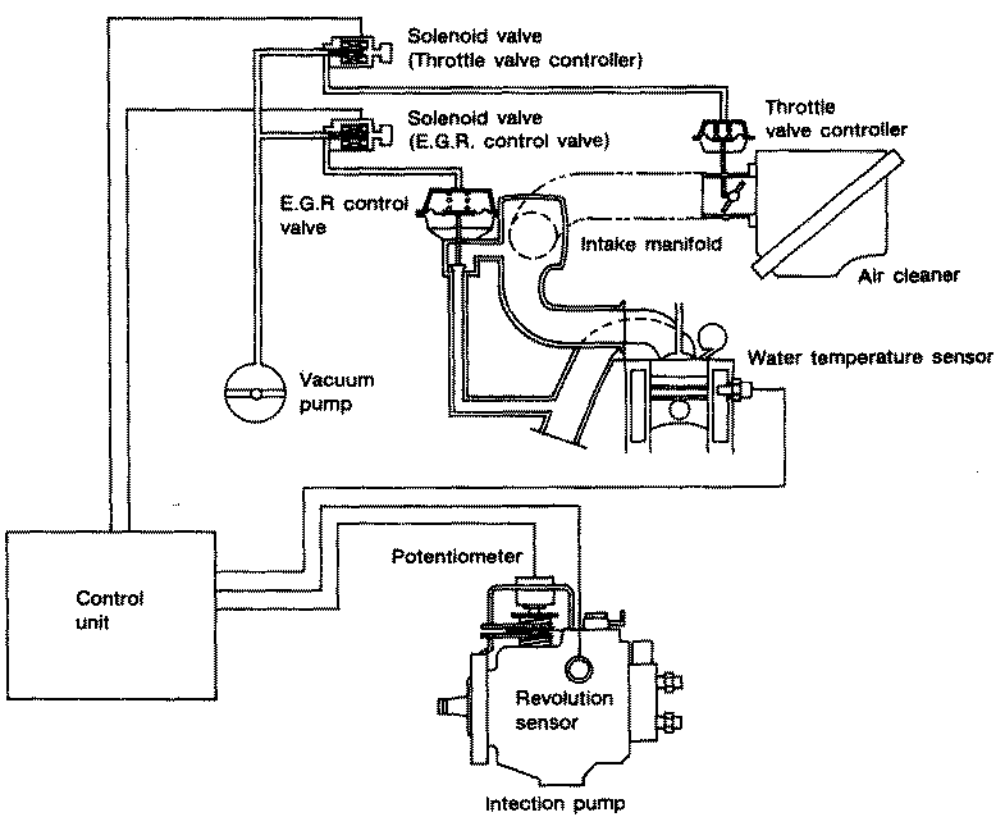
Refer to EL section.

System Diagram

CD17



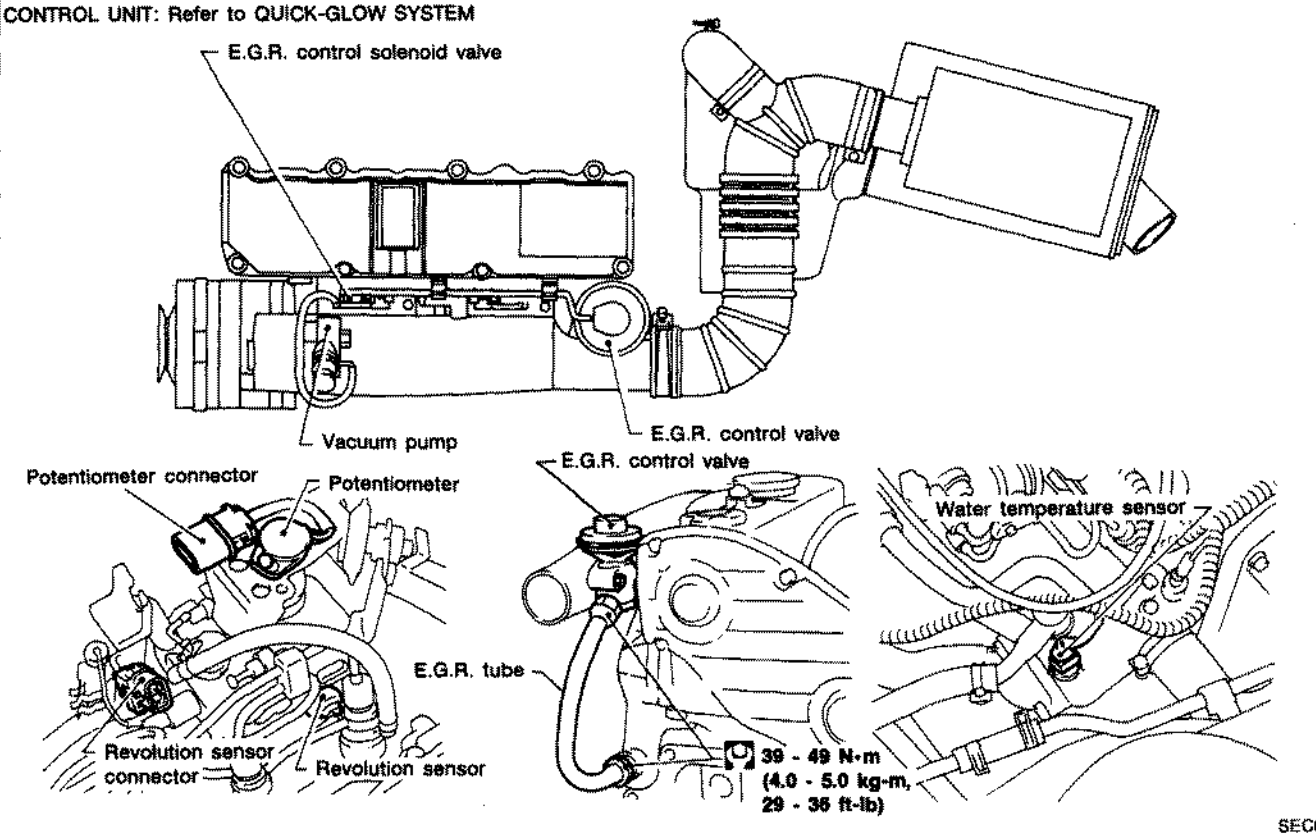
CD20



Parts Location

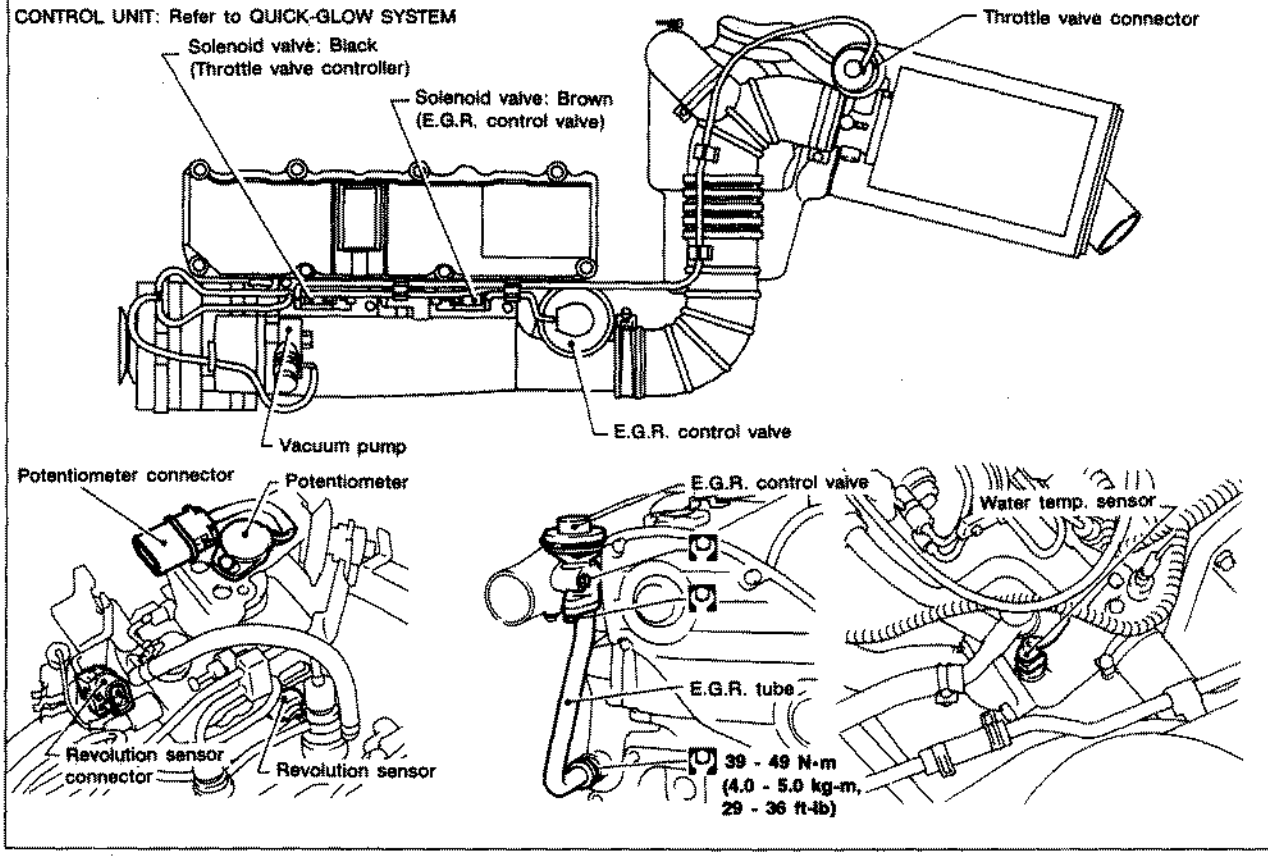
CD17

CONTROL UNIT: Refer to QUICK-GLOW SYSTEM



CD20

CONTROL UNIT: Refer to QUICK-GLOW SYSTEM



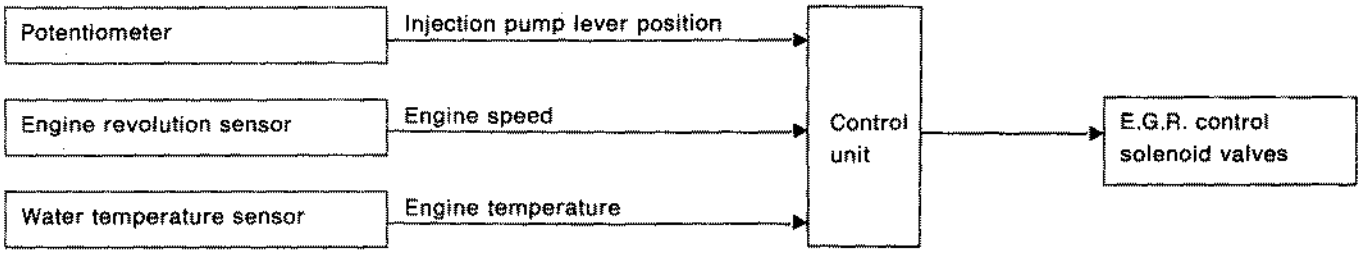
Schematic

Refer to QUICK-GLOW SYSTEM.

Wiring Diagram

Refer to QUICK-GLOW SYSTEM.

Description



The E.G.R. system is designed to control the formation of NOx emission by recirculating the exhaust gas into the intake manifold passage through the E.G.R. control valve.

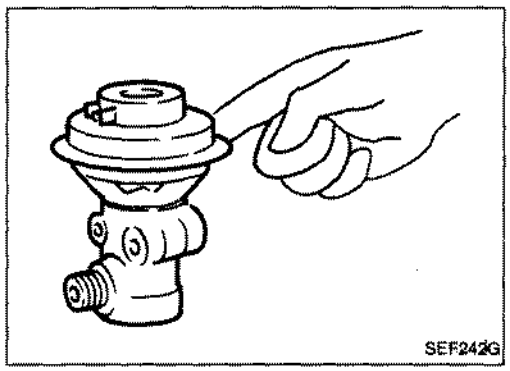
Operation

CD17

Water temperature °C (°F)	Load	E.G.R. control solenoid valve	E.G.R. control valve
Below 70 (158)	All	OFF (Closed)	Closed
Above 70 (158)	Light load	ON (Open)	Open
	Middle load	ON (Open)	Open
	Heavy load	OFF (Closed)	Closed

CD20

Water temperature °C (°F)	Load	Control solenoid valve		E.G.R. control valve	Throttle chamber control valve	Amount of E.G.R. gas
		E.G.R. valve	Throttle valve			
Below 60 (140)	All	OFF (Closed)	OFF (Closed)	Closed	Open	—
Above 60 (140)	Low load	ON (Open)	ON (Open)	Open	Closed	High
	Middle load	ON (Open)	OFF (Closed)	Open	Open	Low
	High load	OFF (Closed)	OFF (Closed)	Closed	Open	—

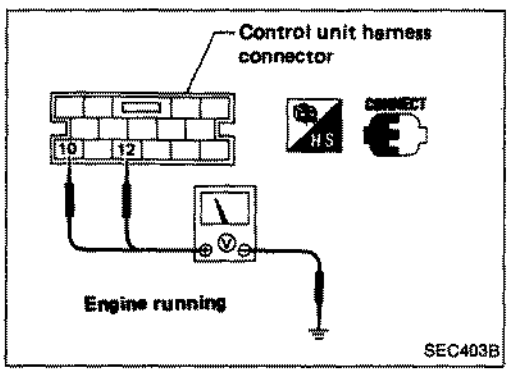

SEF242G

Inspection

ENTIRE SYSTEM

1. Check the vacuum hoses for loosening, flatting damage or improper connections.
2. Warm up engine sufficiently.
3. Place your finger on E.G.R. control valve diaphragm to ensure that the valve functions while racing engine.

- **Take care not to let your finger get caught between diaphragm and E.G.R. control valve body.**
- **Make sure that all harness connectors are connected securely.**



SEC403B

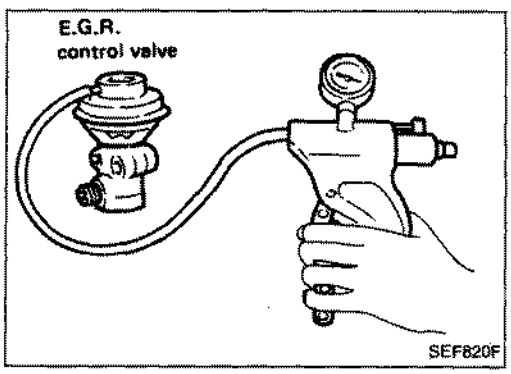
CONTROL UNIT OUTPUT SIGNAL

1. Check voltage between control unit terminals ⑩, ⑫ and ground.

Water temperature °C (°F)	Voltage of control unit terminals ⑩, ⑫
Below 60 (140)	Battery voltage
Above 60 (140)	0V

Terminal availability

	CD17	CD20
⑩	Yes	Yes
⑫	No	Yes



SEF820F

E.G.R. CONTROL VALVE

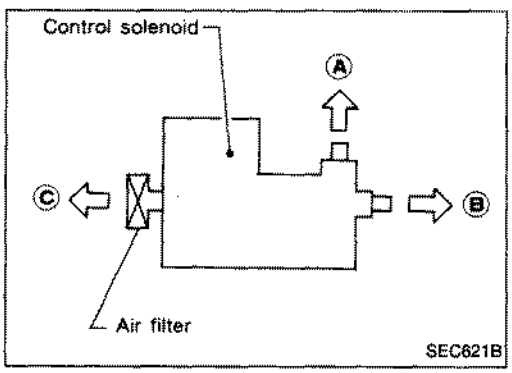
1. Supply the E.G.R. control valve with a vacuum of 40.0 kPa (400 mbar, 300 mmHg, 11.81 inHg) using a handy vacuum pump.
2. Place a finger on the diaphragm of the valve, and make sure that the diaphragm lifts up and down in response to the vacuum leading to the valve.

- **Do not supply the valve with an excessively high vacuum.**

Inspection (Cont'd)

THROTTLE CHAMBER CONTROL VALVE — CD20

Ensure that throttle chamber control valve is held (closed) at stopper when a vacuum pressure of approximately greater than –13.3 kPa (–133 mbar, –100 mmHg, –3.94 inHg) is applied from a vacuum handy pump to vacuum port.

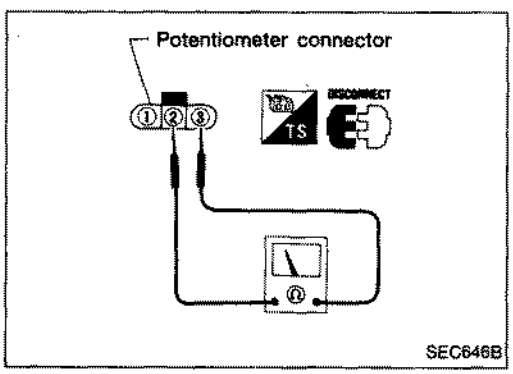


E.G.R. CONTROL SOLENOID VALVES

Check the solenoid valves for normal operation, after disconnecting the connector and all the vacuum hoses.
Supply the solenoid valves with battery voltage, and check whether there is continuity between ports A, B and C.

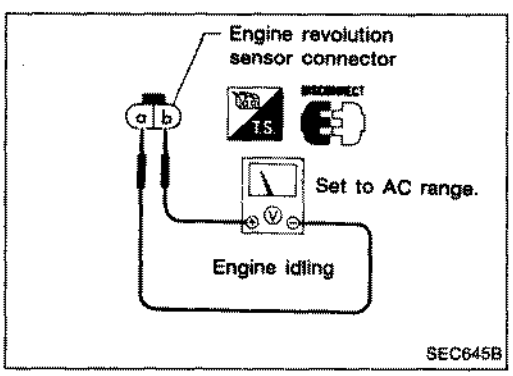
Item \ solenoid	OFF	ON
Continuity	A-C	A-B

Resistance: Approx. 35Ω



POTENTIOMETER

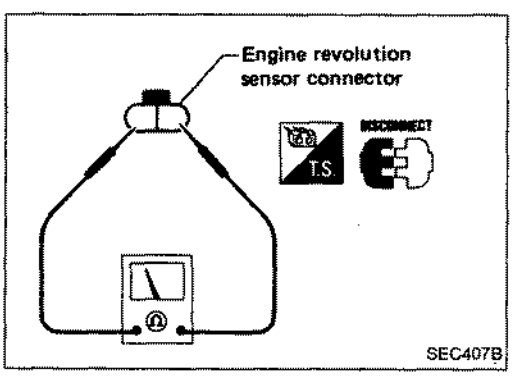
1. Disconnect potentiometer connector and connect ohmmeter as shown.
2. Make sure that the resistance changes when the control lever opening angle of the fuel injection pump is changed.
   Resistance: ① - ③ Approx. 5 kΩ



ENGINE REVOLUTION SENSOR

1. While idling engine, check AC voltage across terminal ⓐ and ⓑ.
   Engine idling: Approx. 0.8V

Check that AC voltage increases when engine speed is increased.



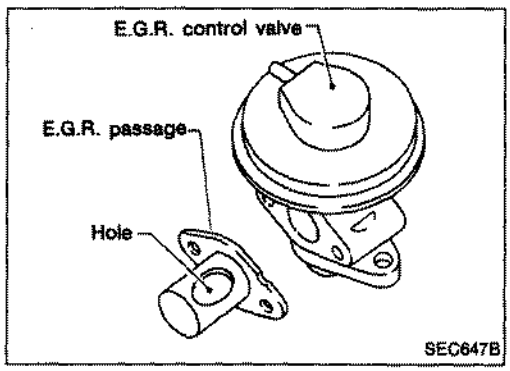
2. If voltage is not within specifications, conduct a continuity test.
   Resistance:
   Approx. 1.36 - 1.84 kΩ (continuity established)
3. Read pulse.
   Pulse: 37 pulses/8 engine revolutions

Inspection (Cont'd)

WATER TEMPERATURE SENSOR

- Check resistance of water temperature sensor. Resistance is shown in the illustration.

Refer to QUICK-GLOW SYSTEM.



Assembly

E.G.R. CONTROL VALVE

When installing gas passage, set open side up.

General Specifications

CARBURETOR

Engine				G13DS, GA14DS	GA14DS						
Destination				General areas		Europe, Hong Kong and Singapore (Models without catalyzer)		Europe (Models with catalyzer without E.G.R.)		Europe (Models with catalyzer and E.G.R.)	
Transaxle				M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T
Carburetor model				21L282-08	21L282-09	21L282-12	21L282-13	21L304-15	21L304-16	21L304-17	21L304-18
Throttle chamber bore mm (in)			P	28 (1.10)				30 (1.18)			
			S	32 (1.26)				34 (1.34)			
Large venturi diameter mm (in)			P	22 (0.87)							
			S	30 (1.18)							
Jet and air bleed size	Main jet	Standard	P	#96				#88			
			S	#135							
	Main air bleed		P	#70							
			S	#60							
	Slow jet		P	#40				#50			
			S	#80							
	Slow air bleed		P	#80							
			S	#80*1							
	Power jet			#55				—			
Choke type				Automatic choke							
Fast idle adjustment (At 2nd cam step)	Fast idle speed (A/T model in "N" position) rpm			2,400	M/T: 2,400 A/T: 2,700			M/T: 2,200 A/T: 2,500			
	Clearance "A" mm (in)			M/T: 0.62 ± 0.07 (0.0244 ± 0.0028) A/T: 0.79 ± 0.07 (0.0311 ± 0.0028)				M/T: 0.59 ± 0.07 (0.0232 ± 0.0028) A/T: 0.75 ± 0.07 (0.0295 ± 0.0028)			
Vacuum break adjustment mm (in)	Clearance "R_1"			1.22 ± 0.14 (0.0480 ± 0.0055)				1.44 ± 0.13 (0.0567 ± 0.0051)			
	Clearance "R_2"			2.15 ± 0.32 (0.0846 ± 0.0126)				2.42 ± 0.32 (0.0953 ± 0.0126)			
Dash pot or F.I. pot touch speed rpm				2,540 ± 200				2,500 ± 200			
Idle speed (A/T model in "N" position) rpm	Normal			750 ± 50	850 ± 50	750 ± 50	850 ± 50	750 ± 50	850 ± 50	750 ± 50	850 ± 50
	Air conditioner: ON			850 ± 50							
Idle CO%				1.5 ± 0.5				1.0 ± 0.5 *2			

P: Primary S: Secondary #: 1/100 mm
*1: This air bleed cannot be removed from carburetor.
*2: Disconnect exhaust gas sensor harness connector and A.I.V. control solenoid valve harness connector.

General Specifications (Cont'd)

Engine			GA16DS						GA14DS		GA16DS	
Destination			General areas		Europe (Models without catalyzer		Europe (Models with catalyzer)		Gulf standard			
Transaxle			M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T
Carburetor model			21L304-07	21L304-08	21L304-11	21L304-12	21L304-13	21L304-14	21L282-10	21L282-11	21L304-09	21L304-10
Throttle chamber bore mm (in)		P	30 (1.18)						28 (1.10)		30 (1.18)	
		S	34 (1.34)						32 (1.26)		34 (1.34)	
Large venturi diameter mm (in)		P	22 (0.87)									
		S	30 (1.18)									
Jet and air bleed size	Main jet	Standard P	#100				#92		#96		#100	
		S	#135									
	Main air bleed	P	#80				#70			#60	#80	#70
		S	#60									
	Slow jet	P	#40				#50		#40			
		S	#80									
	Slow air bleed	P	#80									
		S	#80*1									
	Power jet		#55				—		#55			
Choke type			Automatic choke									
Fast idle adjustment (At 2nd cam step)	Fast idle speed (A/T model in "N" position) rpm		M/T: 2,100 A/T: 2,400						M/T: 2,400 A/T: 2,700		M/T: 2,100 A/T: 2,400	
	Clearance "A" mm (in)		M/T: 0.59 ± 0.07 (0.0232 ± 0.0028) A/T: 0.75 ± 0.07 (0.0295 ± 0.0028)						M/T: 0.62 ± 0.07 (0.0244 ± 0.0028) A/T: 0.79 ± 0.07 (0.0311 ± 0.0028)		M/T: 0.59 ± 0.07 (0.0232 ± 0.0028) A/T: 0.75 ± 0.07 (0.0295 ± 0.0028)	
Vacuum break adjustment mm (in)	Clearance "R_1"		1.22 ± 0.14 (0.0480 ± 0.0055)				1.44 ± 0.13 (0.0567 ± 0.0051)		1.22 ± 0.14 (0.0480 ± 0.0055)			
	Clearance "R_2"		2.15 ± 0.32 (0.0846 ± 0.0126)				2.42 ± 0.32 (0.0953 ± 0.0126)		2.15 ± 0.32 (0.0846 ± 0.0126)			
Dash pot or F.I. pot touch speed rpm			2,500 ± 200						2,540 ± 200		2,500 ± 200	
Idle speed (A/T model in "N" position) rpm	Normal		750 ± 50	850 ± 50	750 ± 50	850 ± 50	750 ± 50	850 ± 50	750 ± 50	850 ± 50	750 ± 50	850 ± 50
	Air conditioner: ON		850 ± 50									
Idle CO%			1.5 ± 0.5				1.0 ± 0.5 *2		1.5 ± 0.5			

P: Primary S: Secondary #: 1/100 mm

*1: This air bleed cannot be removed from carburetor.

*2: Disconnect exhaust gas sensor harness connector and A.I.V. control solenoid valve harness connector.

Inspection and Adjustment

A.T.C. AIR CLEANER

Intake manifold vacuum –kPa (–mbar, –mmHg, –inHg)	Atmospheric temperature °C (°F)	
	Below 38 (100)	Above 48 (118)
Below 4.7 (47, 35, 1.38)	Cold air	Cold air
Above 16.7 (167, 125, 4.92)	Hot air	Cold air
VACUUM MOTOR –kPa (–mbar, –mmHg, –inHg)		
Opening starts	6.7 ± 2.0 (67 ± 20, 50 ± 15, 1.97 ± 0.59)	
Fully open	Over 13.3 ± 3.3 (133 ± 33, 100 ± 25, 3.94 ± 0.98)	

IDLE COMPENSATOR

Unit: °C (°F)

	GA16DS 4WD, B13 GA16DS for Europe, and Gulf standard	Others
Idle compensator partially opens (No. 1)	55 - 65 (131 - 149)	55 - 65 (131 - 149)
Idle compensator partially opens (No. 2)	65 - 75 (149 - 167)	—
Idle compensator fully opens	Above 65 (149) (No. 1) Above 75 (167) (No. 2)	65 (149)

IGNITION COIL

Primary voltage	V	12
Primary resistance [at 20°C (68°F)]	Ω	Approximately 1
Secondary resistance [at 20°C (68°F)]	kΩ	Approximately 10

MECHANICAL FUEL PUMP

Fuel pressure kPa (bar, kg/cm^2, psi)	20.6 - 34.3 (0.206 - 0.343, 0.21 - 0.35, 3.0 - 5.0)

DISTRIBUTOR AND CRANK ANGLE SENSOR

Firing order		1-3-4-2
Rotating direction		Counterclockwise
*Air gap	mm (in)	0.3 - 0.5 (0.012 - 0.020)
Cap insulation resistance	MΩ	More than 50
Rotor head insulation resistance	MΩ	More than 50
Cap carbon point length	mm (in)	10 (0.39)

*: Only for distributor

Inspection and Adjustment (Cont'd)

Ignition timing

Engine / Type	GA13DS	GA14DS	GA16DS		
			Gulf standard, Europe (Models without catalyzer)	Europe (Models with catalyzer)	General areas
Type I*1	2° ± 2° A.T.D.C.	0° ± 2° B.T.D.C.	2° ± 2° B.T.D.C.	2° ± 2° B.T.D.C.	3° ± 2° A.T.D.C.
Type II*2	9° ± 5° B.T.D.C.	10° ± 5° B.T.D.C.	10° ± 5° B.T.D.C.	10° ± 2° B.T.D.C.	12° ± 5° B.T.D.C.

*1: Type I: Distributor vacuum hose disconnected and plugged (models without catalyzer, and models with catalyzer without E.G.R.)
Boost sensor vacuum hose disconnected and plugged (models with catalyzer and E.G.R.)

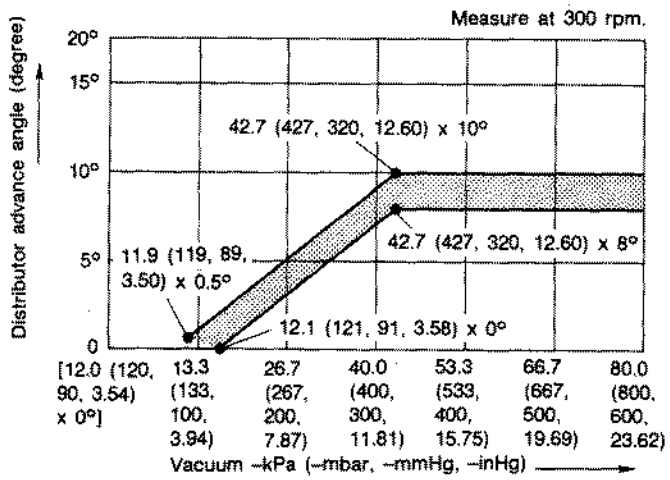
*2: Type II: Distributor vacuum hose connected (models without catalyzer, and models with catalyzer without E.G.R.)
Boost sensor vacuum hose connected (models with catalyzer and E.G.R.)

Distributor spark and advance curve

Engine / Advance curve	GA13DS	GA14DS					GA16DS				
Destination	General areas	General areas, Europe (Models without catalyzer)		Europe (Models with catalyzer without E.G.R.)	Gulf standard		General areas	Europe		Gulf standard	
Transaxle	M/T	M/T	A/T	M/T, A/T	M/T	A/T	M/T, A/T	M/T	A/T 4WD	M/T	A/T
Vacuum advance curve	Type A	Type B	Type C	Type D	Type B	Type F	Type B	Type E	Type F	Type F	Type G
Governor advance curve	Type I	Type II	Type II	Type II	Type II	Type II	Type III	Type IV	Type IV	Type IV	Type IV

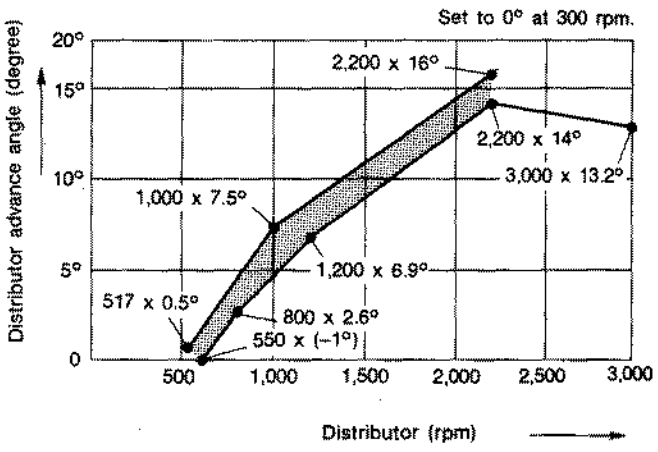
Inspection and Adjustment (Cont'd)

Type A



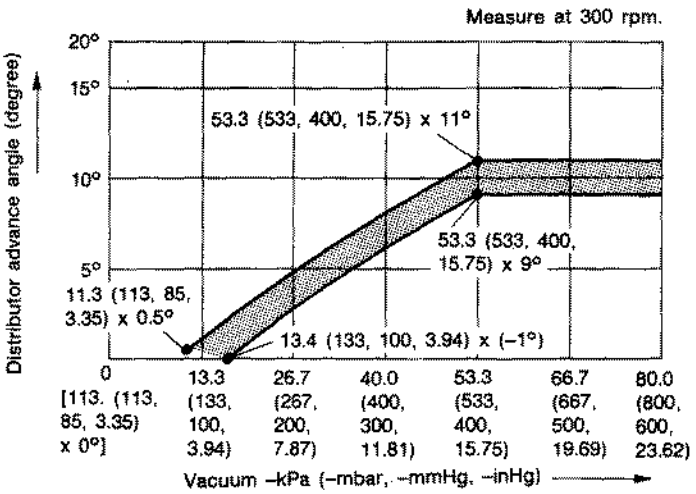
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Type I



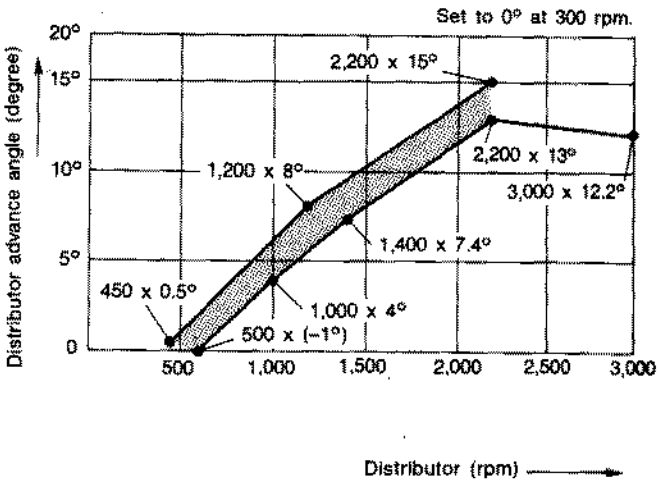
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Type B



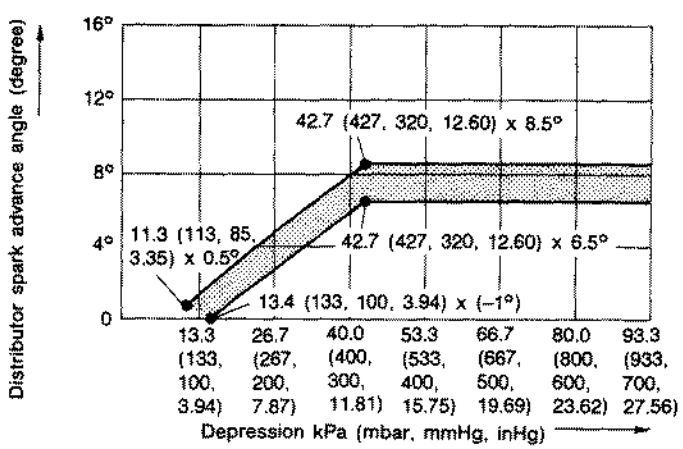
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Type II



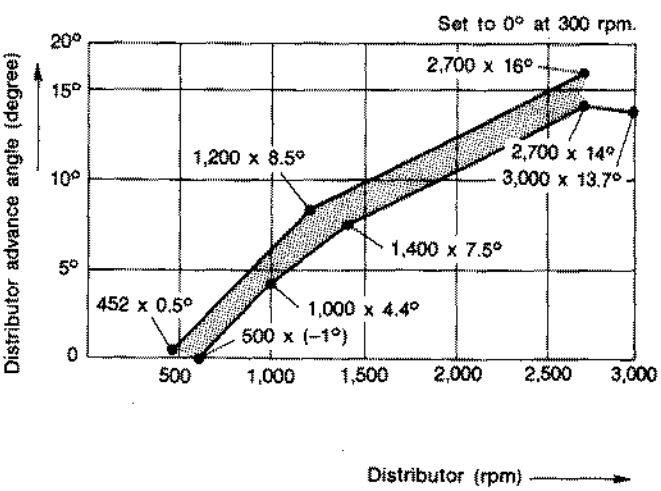
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Type C



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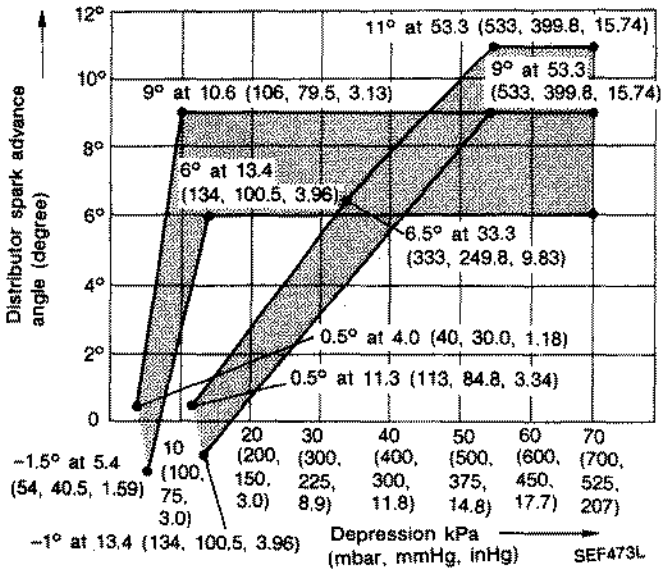
Type III



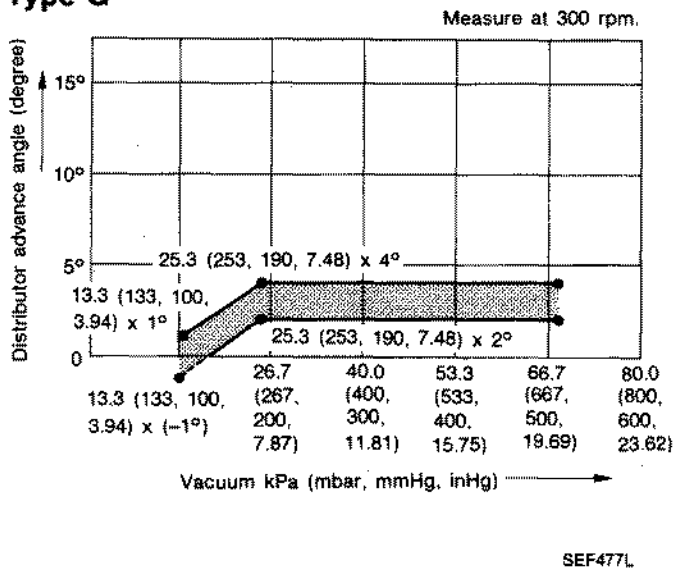
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Inspection and Adjustment (Cont'd)

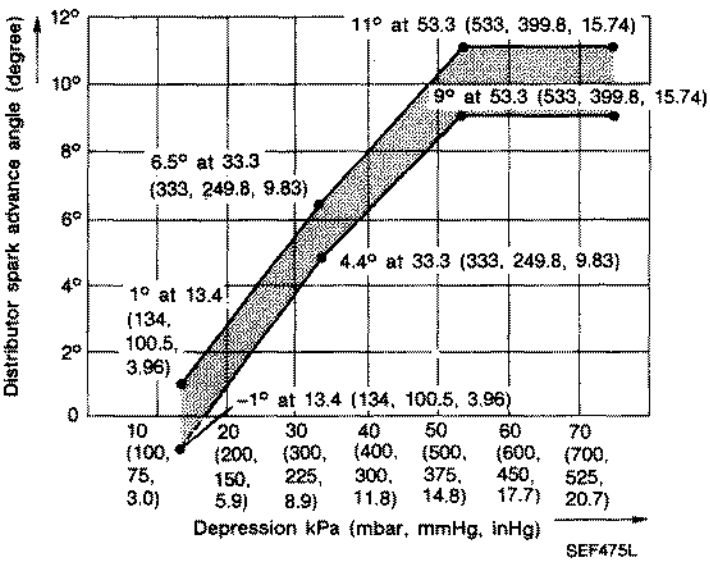
Type D



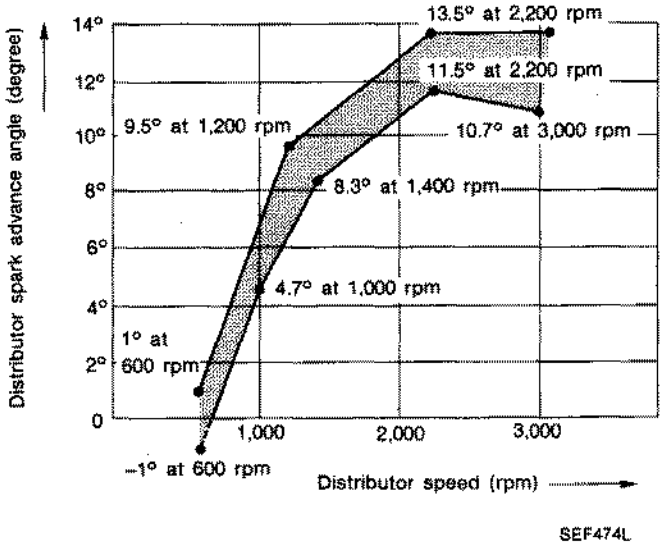
Type G



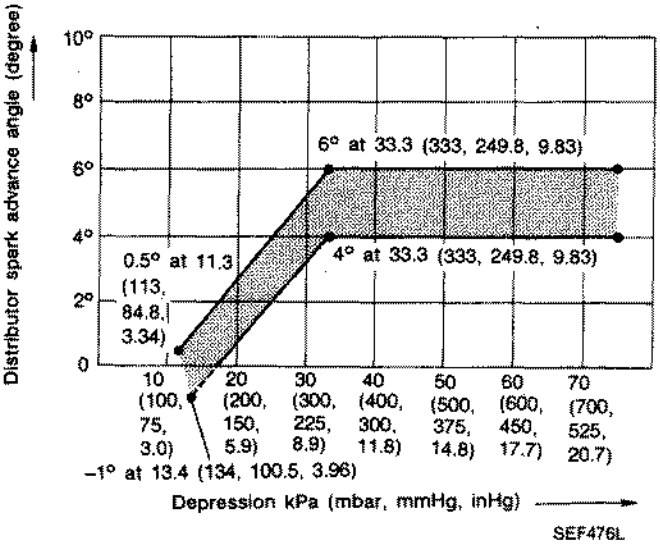
Type E



Type IV



Type F



General Specifications

PRESSURE REGULATOR	
Regulated pressure kPa (bar, kg/cm^2, psi)	299.1 (2.991, 3.05, 43.4)

Inspection and Adjustment

Idle speed*1 rpm	
No-load*2 (in "N" position)	M/T 750 ± 50 A/T 800 ± 50
Air conditioner: ON (in "N" position)	M/T 850 ± 50 A/T 850 ± 50
Ignition timing	10° ± 2° B.T.D.C.
Throttle sensor idle position V	0.40 - 0.60

*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 20°C (68°F)] Ω	Approximately 0.9
Secondary resistance [at 20°C (68°F)] kΩ	Approximately 13.0

AIR FLOW METER

Supply voltage V	Battery voltage
Output voltage V	1.0 - 1.5*

*: Engine is warmed up sufficiently and idling under no-load.

ENGINE TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
90 (194)	0.24 - 0.26
110 (230)	0.14 - 0.15

FUEL PUMP

Resistance Ω	Approximately 0.2

A.A.C. VALVE

Resistance Ω	Approximately 10.0

INJECTOR

Resistance Ω	Approximately 10.0

RESISTOR

Resistance kΩ	Approximately 2.2

THROTTLE SENSOR

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 0.5
Partially released	0.5 - 4
Completely depressed	Approximately 4

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

Engine	SR20DE	SR20DET
Idle speed*1 rpm		
No-load*2 (in "N" position)	850 ± 50	925 $^{+25}_{-75}$
Air conditioner: ON (in "N" position)	850 ± 50	925 $^{+25}_{-75}$
Ignition timing	15° ± 2° B.T.D.C.	20° ± 2° B.T.D.C.
Throttle sensor idle position V	0.45 - 0.55	

*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 20°C (68°F)]	Ω	Approximately 1.0
Secondary resistance [at 20°C (68°F)]	kΩ	Approximately 10.0

AIR FLOW METER

Supply voltage	V	Battery voltage (11 - 14)
Output voltage	V	SR20DE: 1.3 - 1.8* SR20DET: 1.0 - 1.5*

*: Engine is warmed up sufficiently and idling under no-load.

ENGINE TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
80 (176)	0.30 - 0.33

FUEL PUMP

Resistance	Ω	Approximately 0.7

A.A.C. VALVE

Resistance	Ω	Approximately 10.0

INJECTOR

Engine		SR20DE	SR20DET
Resistance	Ω	10 - 14	1 - 3

RESISTOR

Resistance	kΩ	Approximately 2.2

THROTTLE SENSOR

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 2
Partially released	2 - 11
Completely depressed	Approximately 11

General Specifications

CARBURETOR

Carburetor model			217260-B7
Throttle chamber bore mm (in)		P	26 (1.02)
		S	30 (1.18)
Venturi diameter mm (in)		P	19 (0.75)
		S	27 (1.06)
Main jet	Standard	P	#89
		S	#145
	1,000 m (3,300 ft)	P	#87
		S	#140
	2,000 m (6,600 ft)	P	#85
		S	#135
	3,000 m (9,900 ft)	P	#82
		S	#131
	4,000 m (13,200 ft)	P	#79
		S	#129
Main air bleed		P	#70
		S	#60
Slow jet		P	#40
		S	#80
Slow air bleed		P	#80
		S	#80
Power jet			#50
Choke type			Automatic choke
Fast idle adjustment			
Fast idle speed		rpm	2,200 ± 200
Clearance "A" (at 2nd step)		mm (in)	0.47 ± 0.07 (0.0185 ± 0.0028)
Vacuum break adjustment		mm (in)	
Clearance R_1			1.31 ± 0.14 (0.0516 ± 0.0055)
Clearance R_2			1.84 ± 0.28 (0.0724 ± 0.0110)
Dash pot adjustment			
Dash pot touch speed		rpm	1,900 ± 200
Dash pot gap		mm (in)	0.47 ± 0.1 (0.0185 ± 0.0039)
Float height mm (in)		H_1	14.5 - 15.5 (0.571 - 0.610)
		H_2	44.5 - 45.5 (1.752 - 1.791)

P: Primary S: Secondary #: 1/100 mm

Inspection and Adjustment

DISTRIBUTOR

Type	D4R83-38 [HITACHI make]
Firing order	1-3-4-2
Rotating direction	Counterclockwise
Air gap mm (in)	0.3 - 0.5 (0.012 - 0.020)
Cap insulation resistance MΩ	More than 50
Rotor head insulation resistance MΩ	More than 50
Cap-carbon point length mm (in)	10 (0.39)
Vacuum advance [Distributor degree/distributor –kPa (–mbar, –mmHg, –inHg)]	0/16.0 (160, 120, 4.72) 6.1/34.7 (347, 260, 10.24) 9.5/49.3 (493, 370, 14.57)
Centrifugal advance [Distributor degree/distributor rpm]	0/550 10.0/1,600

IGNITION COIL

Type	STC-143 [HANSHIN make]
Primary resistance [at 20°C (68°F)] Ω	1.0 - 1.3
Secondary resistance [at 20°C (68°F)] kΩ	8.4 - 12.6

A.T.C. AIR CLEANER

Intake manifold vacuum kPa (mbar, mmHg, inHg)	Atmospheric temperature °C (°F)	
	Below 38 (100)	Above 55 (131)
Below 8.0 (80, 60, 2.36)	Cool air	Cool air
Above 25.3 (253, 190, 7.48)	Hot air	Cool air

IDLE COMPENSATOR

Unit: °C (°F)

Idle compensator partially opens	55 - 65 (131 - 149)
Idle compensator fully opens	Above 65 (149)

MECHANICAL FUEL PUMP

Fuel pump capacity (at 3,000 rpm) mℓ (Imp fl oz)/20 seconds	500 (17.6)
Fuel pressure kPa (bar, kg/cm^2, psi)	19.6 - 26.5 (0.196 - 0.265, 0.20 - 0.27, 2.8 - 3.8)

VE-type Injection Pump

GENERAL SPECIFICATIONS

Unit : rpm

Engine		CD17	CD20
Idle speed	F.I.C.D.: OFF	700 $^{+50}_{-0}$	
	F.I.C.D.: ON	800	
Dash pot touch speed		1,300	
Maximum engine speed		5,200 - 5,500	

INSPECTION AND ADJUSTMENT

Installation of injection pump

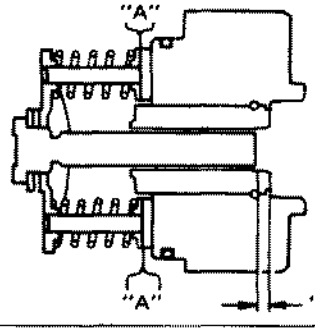
Engine		CD17	CD20
Plunger lift (Injection timing)	mm (in)	0.79 - 0.85 (0.0311 - 0.0335) (equivalent to 7° BTDC)	0.79 - 0.85 (0.0311 - 0.0335) (equivalent to 9° BTDC)

Pump numbers

Engine	Destination	Part number	Pump assembly number	Remarks
CD17	General areas	16700-59Y00	104740-2153	—
	Hong Kong	16700-63Y00	104740-2240	—
CD20	Europe	16700-57J00	104740-2183	Without tachometer
		16700-57J05	104740-2193	With tachometer
		16700-60J00	104740-2223	With E.G.R.

Use of adjustment value and adjusting shim when installing injection pump

Dimension "KF"	mm (in)	6.68 - 6.88 (0.2630 - 0.2709)

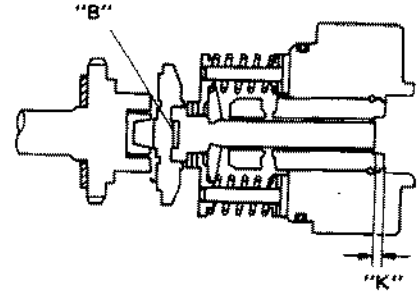


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Adjusting shim ("A" position)

Part number	Thickness mm (in)
16882-V0700	0.5 (0.020)
16882-V0701	0.8 (0.031)
16882-V0702	1.0 (0.039)
16882-V0703	1.2 (0.047)
16882-V0704	1.5 (0.059)
16882-V0705	1.8 (0.071)
16882-V0706	2.0 (0.079)

Dimension "K"	mm (in)	3.2 - 3.4 (0.126 - 0.134)



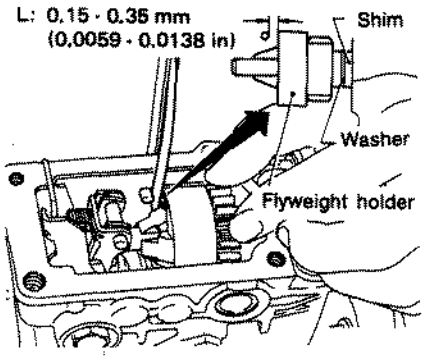
SEF639

Adjusting shim ("B" position)

Part number	Thickness mm (in)
16884-V0700	1.92 (0.0756)
16884-V0701	2.00 (0.0787)
16884-V0702	2.08 (0.0819)
16884-V0703	2.16 (0.0850)
16884-V0704	2.24 (0.0882)
16884-V0705	2.32 (0.0913)
16884-V0706	2.40 (0.0945)
16884-V0707	2.48 (0.0976)
16884-V0708	2.56 (0.1008)
16884-V0709	2.64 (0.1039)
16884-V0710	2.72 (0.1071)
16884-V0711	2.80 (0.1102)
16884-V0712	2.88 (0.1134)

VE-type Injection Pump (Cont'd)

Axial play of flyweight holder "L" mm (in)	0.15 - 0.35 (0.0059 - 0.0138)

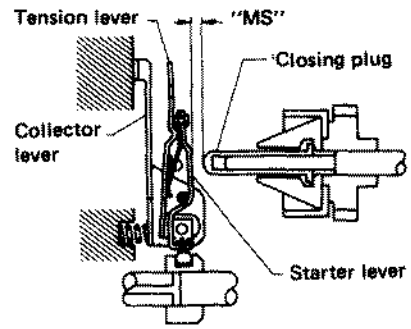


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Adjusting shim

Part number	Thickness mm (in)
19208-V0700	1.05 (0.0413)
19208-V0701	1.25 (0.0492)
19208-V0702	1.45 (0.0571)
19208-V0703	1.65 (0.0650)
19208-V0704	1.85 (0.0728)

Dimension "MS" mm (in)	0.7 - 0.9 (0.028 - 0.035)

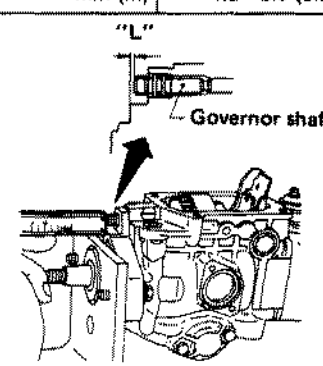


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Adjusting closing plug

Part number	Thickness mm (in)
19207-V0700	7.8 (0.307)
19207-V0701	8.0 (0.315)
19207-V0702	8.2 (0.323)
19207-V0703	8.4 (0.331)
19207-V0704	8.6 (0.339)
19207-V0705	8.8 (0.346)
19207-V0706	9.0 (0.354)
19207-V0707	9.2 (0.362)
19207-W1700	9.4 (0.370)
19207-W1701	9.6 (0.378)
19207-W1702	9.8 (0.386)
19207-W1703	10.0 (0.394)
19207-W1704	10.2 (0.402)
19207-W3400	10.4 (0.409)
19207-W3401	10.6 (0.417)

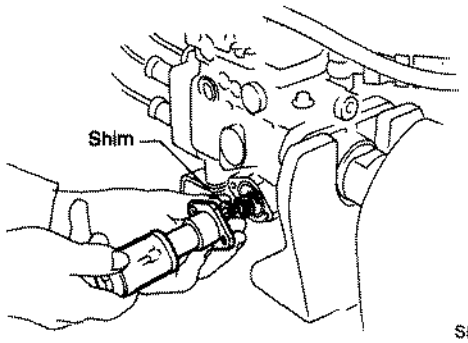
Dimension "L" mm (in)	1.5 - 2.0 (0.059 - 0.079)



SEF500

VE-type Injection Pump (Cont'd)

Speed timer adjusting shim



Part number	Thickness mm (in)
16880-43G10	0.1 (0.004)
16880-43G11	0.2 (0.008)
16880-43G12	0.25 (0.0098)
16880-43G13	1.0 (0.039)
16880-V7205	2.0 (0.079)
16880-59Y00	0.5 (0.020)
16880-59Y01	0.75 (0.0295)

Pump data is not yet available.
(Pump data will be given by Technical Bulletin or refer to CALIBRATION STANDARD published by ZEXEL.)

Adjustment values for injection pump tester

Feed pump pressure

Item / Part No. / Fuel injection pump rpm	Specified pressure kPa (bar, kg/cm^2, psi)
	16700-59Y00
1,200	294 - 373 (2.94 - 3.73, 3.0 - 3.8, 43 - 54)
1,800	432 - 510 (4.32 - 5.10, 4.4 - 5.2, 63 - 74)
2,500	598 - 677 (5.98 - 6.77, 6.1 - 6.9, 87 - 98)

Speed timer (Timer piston stroke)

Item / Part No. / Fuel injection pump rpm	Timer piston stroke mm (in)
	16700-59Y00
1,200	1.4 - 2.2 (0.055 - 0.087)
1,800	3.5 - 4.7 (0.138 - 0.185)
2,500	6.9 - 7.8 (0.272 - 0.307)

Fuel injection quantity

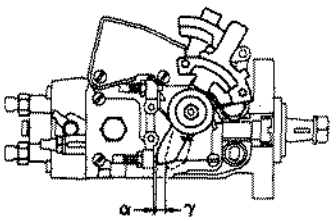
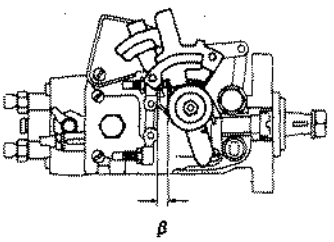
Item / Part No. / Setting condition of fuel injection pump	Fuel injection pump rpm	Standard fuel injection mℓ (Imp fl oz)/1,000 stroke
		16700-59Y00
Start	100	50.3 - 70.3 (1.77 - 2.47)
Idle	360	3.2 - 7.2 (0.11 - 0.25)
	600	Less than 3 (0.11)
Full-load	600	24.8 - 28.8 (0.87 - 1.01)
	1,000	26.6 - 28.6 (0.94 - 1.01)
	2,500	2.43 - 28.3 (0.86 - 1.00)
Partial-load*	700	2.2 - 11.2 (0.08 - 0.39)
Max. pump speed	2,700	11.3 - 18.3 (0.40 - 0.64)
	2,900	Less than 6 (0.21)
Fuel overflow		36 - 80 mℓ (1.27 - 2.82 Imp fl oz)/10 sec. at 1,200 rpm

*: This test is performed at control lever angle "γ".

VE-type Injection Pump (Cont'd)

Control lever angle adjustment (Adjusting screw length)

Unit: mm (in)

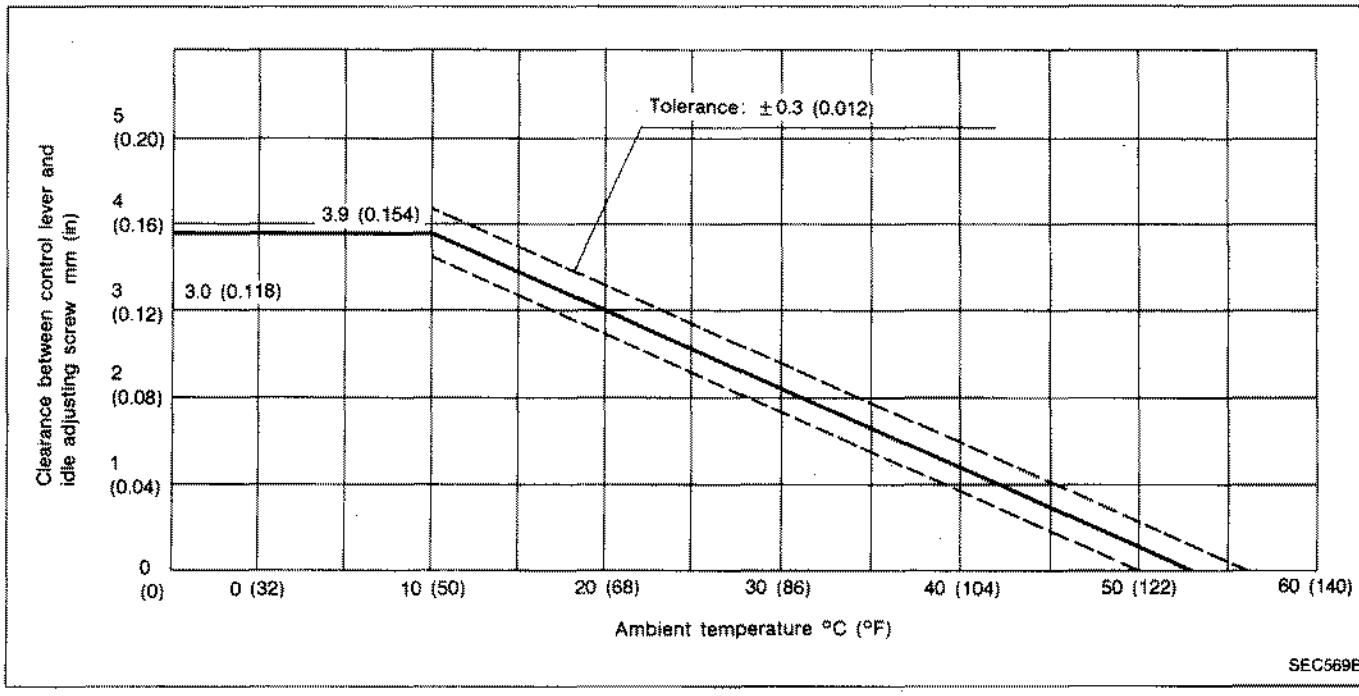
Illustration \ Part number		16700-59Y00
 α: Idle γ: Partial load SEF283C	α	15.4 - 18.1 (0.606 - 0.713)
	γ	8.6 - 9.2 (0.339 - 0.362)
 SEF798A	β	11.0 - 16.0 (0.433 - 0.630)

VE-type Injection Pump (Cont'd)

Cold start device adjustment

Part number: 16700-59Y00

Relationship between speed timer stroke and clearance between idle adjusting screw and control lever



Cold start device specifications

Ambient temperature °C (°F)	Speed timer stroke mm (in)	Clearance between control lever and idle adjusting screw mm (in)	Remarks
20 ± 0.5 (68 ± 0.9)	—	3.0 ± 0.3 (0.118 ± 0.012)	

VE-type Injection Pump (Cont'd)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Injection pump			
Securing bolt	45 - 60	4.6 - 6.1	33 - 44
Securing nut	13 - 18	1.3 - 1.8	9 - 13
Injection tube			
Flare nut	22 - 25	2.2 - 2.5	16 - 18

Injection Nozzle

INSPECTION AND ADJUSTMENT

Injection nozzle assembly

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

Initial injection pressure	
New	12,749 - 13,534 (127.5 - 135.3, 130 - 138, 1,849 - 1,962)
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

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Injection nozzle to engine	59 - 69	6.0 - 7.0	43 - 51
Injection to tube flare nut	22 - 25	2.2 - 2.5	16 - 18
Spill tube nut	39 - 49	4.0 - 5.0	29 - 36
Nozzle holder to nozzle nut	78 - 98	8.0 - 10.0	58 - 72

ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEMS

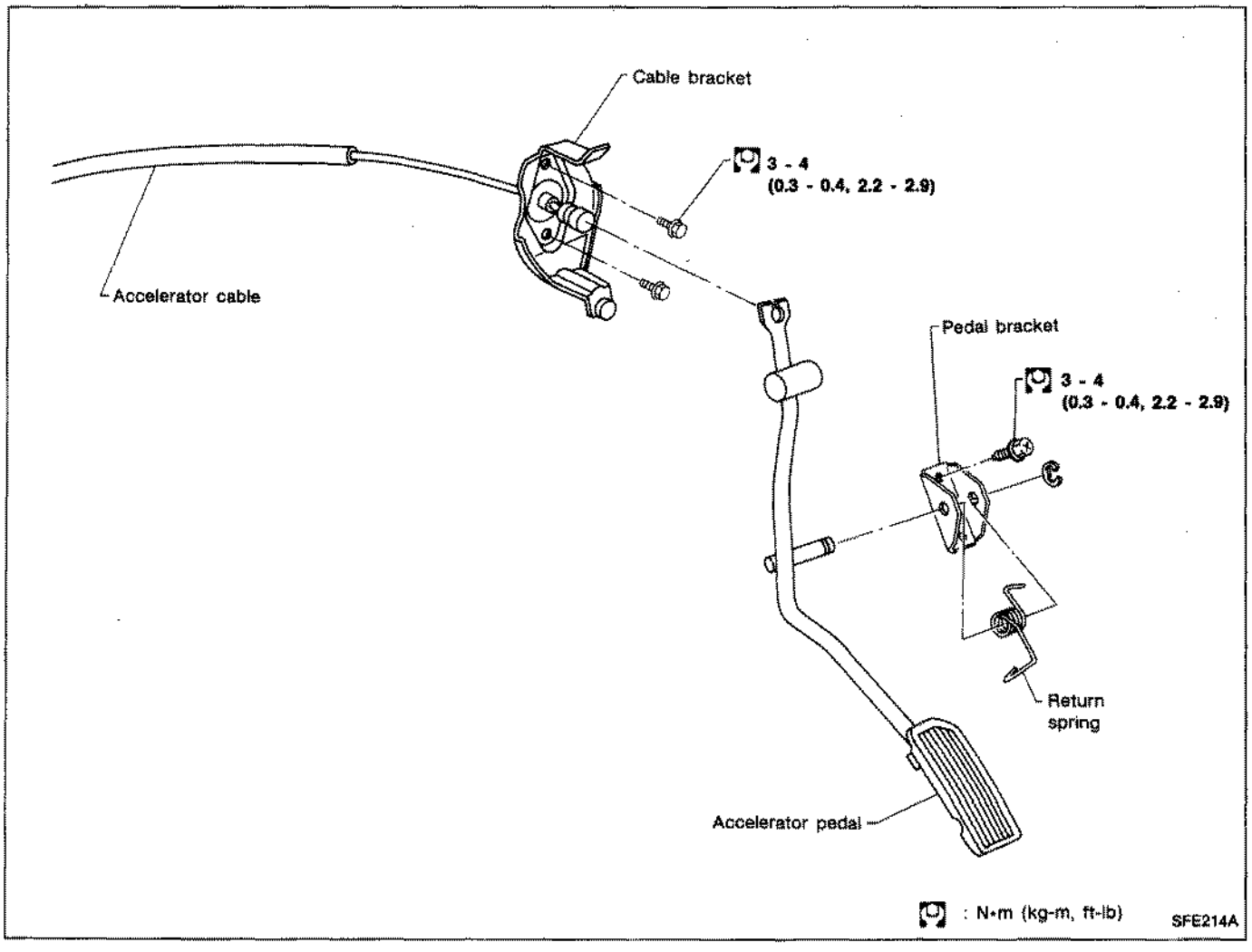
SECTION FE

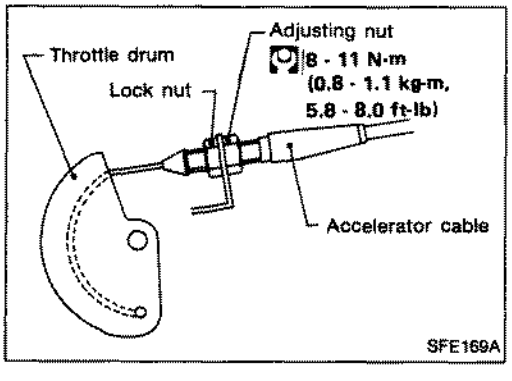
CONTENTS

ACCELERATOR CONTROL SYSTEM ..... FE- 2
FUEL SYSTEM ..... FE- 3
EXHAUST SYSTEM FE-10

CAUTION:

- **When removing accelerator cable, make a mark to indicate lock nut's initial position.**
- **Check that throttle valve opens fully when accelerator pedal is fully depressed and that it returns to idle position when pedal is released.**
- **Check accelerator control parts for improper contact with any adjacent parts.**
- **When connecting accelerator cable, be careful not to twist or scratch its inner wire.**





Adjusting Accelerator Cable

1. Tighten adjusting nut until throttle drum starts to move.
2. From that position turn back adjusting nut 1.5 to 2 turns, and fasten it with lock nut.

WARNING:

- **Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.**
- **Be sure to furnish workshop with a CO_2 fire extinguisher.**

CAUTION:

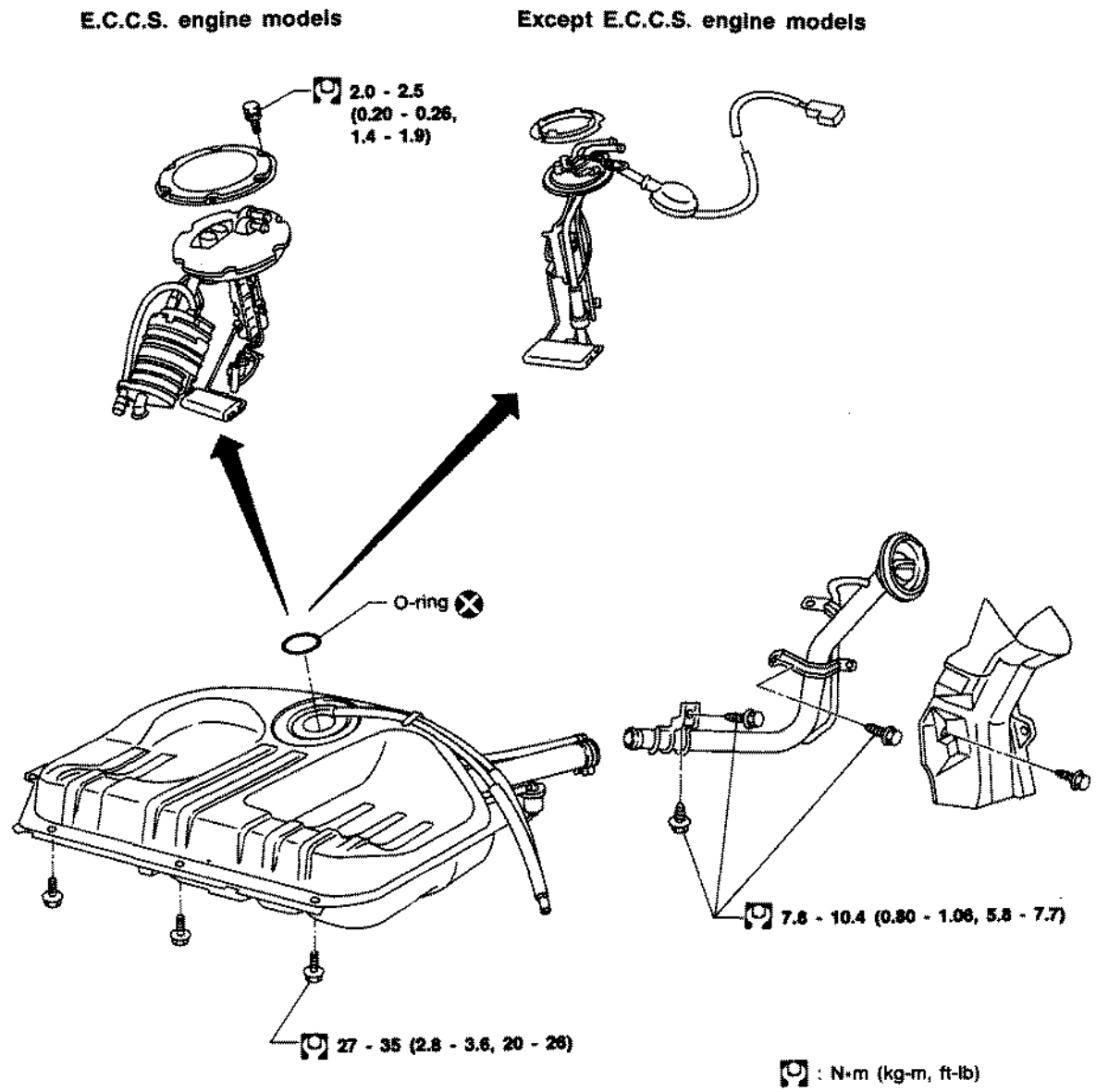
- **Before removing fuel line parts carry out the following procedures:**

a. **Put drained fuel in an explosion-proof container and put the lid on securely.**
b. **Release fuel pressure from fuel line. Refer to "Changing Fuel Filter" in MA section.**
c. **Disconnect battery ground cable.**

- **Always replace O-ring and clamps with new ones.**
- **Do not kink or twist tubes when they are being installed.**
- **After installing tubes, run engine and check for fuel leaks at connections.**

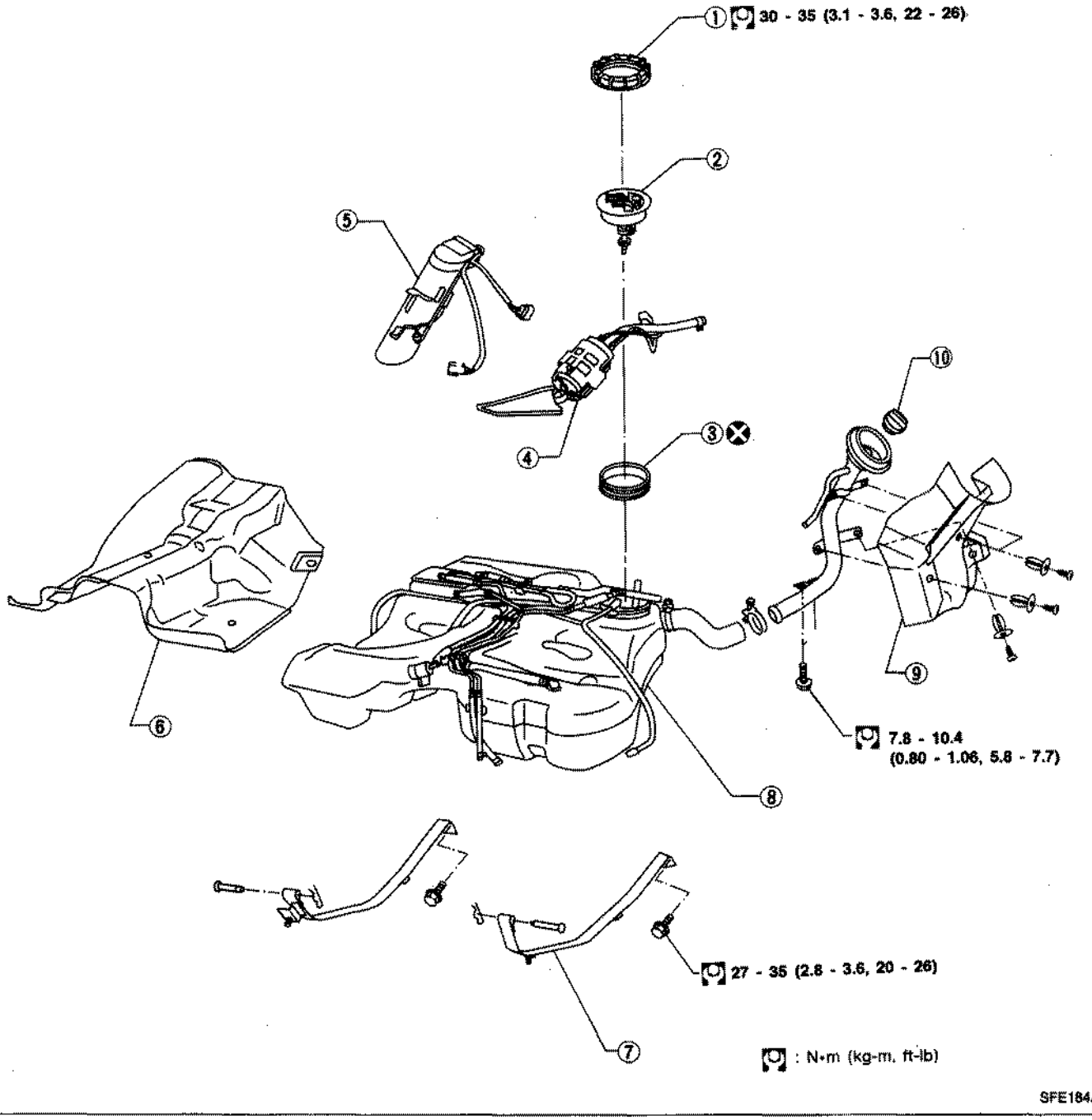
Fuel Tank

2WD models



Fuel Tank (Cont'd)

4WD models



① Lock ring
② Upper plate
③ O-ring
④ Fuel pump
⑤ Fuel gauge
⑥ Fuel tank protector
⑦ Mounting band
⑧ Fuel tank
⑨ Filler protector
⑩ Filler cap

Preparation

SPECIAL SERVICE TOOL

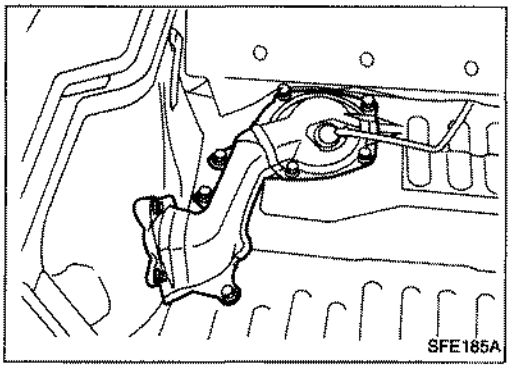
Tool number Tool name	Description
KV999G0010 Fuel tank lock ring socket	

Fuel tank

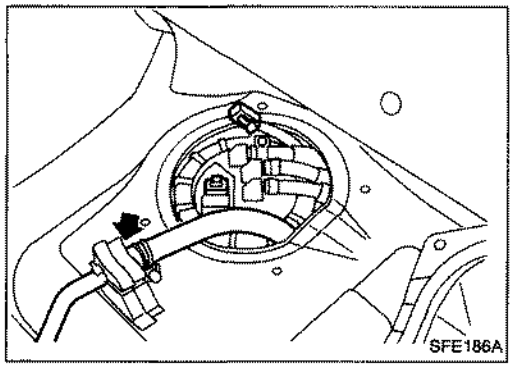
REMOVAL (4WD models)

CAUTION:

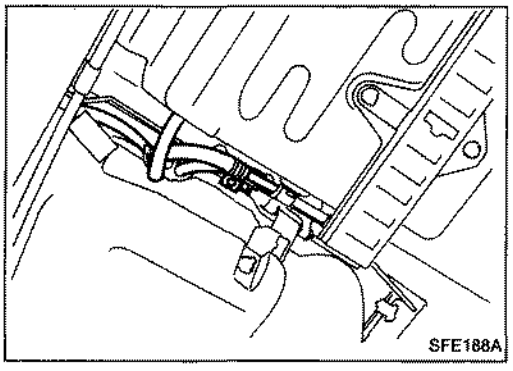
- **Do not disconnect any fuel line unless absolutely necessary.**
- **Plug hose and pipe openings to prevent entry of dust or oil.**



1. Release fuel pressure from fuel line.
   Refer to "Fuel Filter Replacement" in MA section.
2. Remove inspection hole cover and vent tube cover located on the luggage compartment floor.

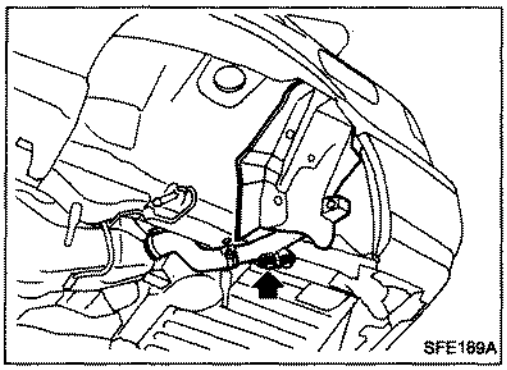


3. Disconnect fuel tubes and connector.

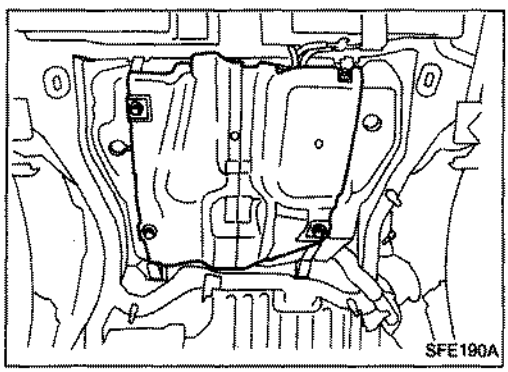


4. Remove propeller shaft, differential carrier, suspension member and drive shaft (Refer to RA section).
5. Disconnect tubes.

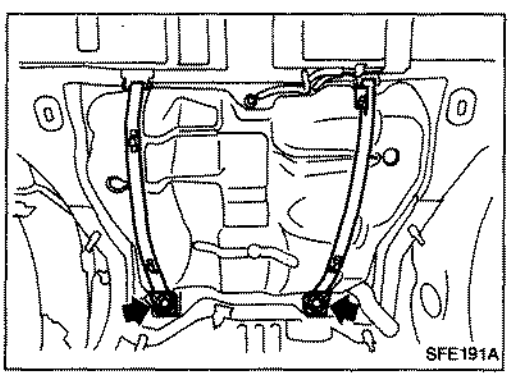
Fuel tank (Cont'd)



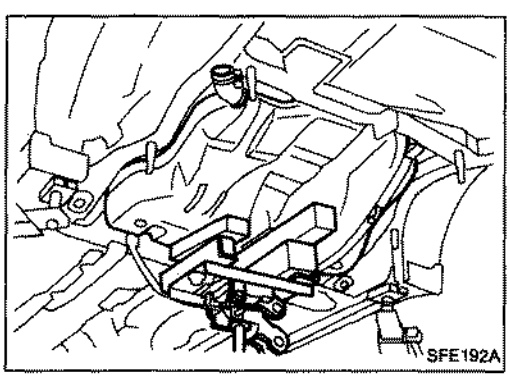
6. Remove filler protector and filler tube.



7. Remove fuel tank protector.



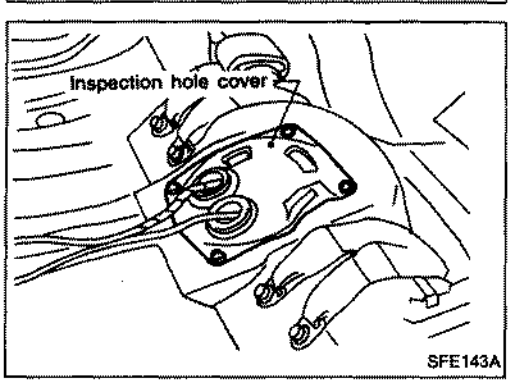
8. Remove tank mounting band bolts while supporting fuel tank.



9. Remove fuel tank.

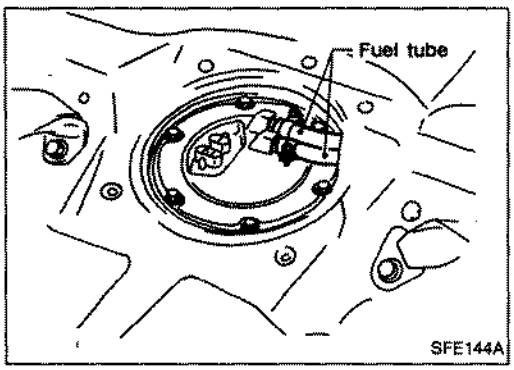
Fuel Pump and Gauge

REMOVAL (2WD E.C.C.S. engine models)

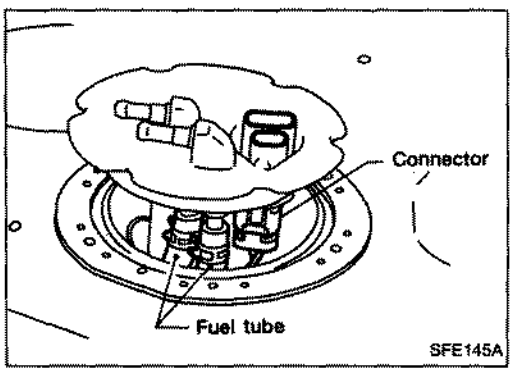


1. Release fuel pressure from fuel line.
   Refer to "Fuel Filter Replacement" in MA section.
2. Remove inspection hole cover located beneath the rear seat.

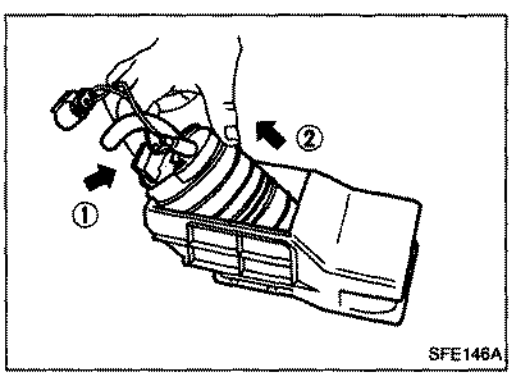
Fuel Pump and Gauge (Cont'd)



3. Disconnect fuel tubes and connectors.
4. Remove the six screws.



5. Remove fuel gauge assembly and disconnect tubes and connector.



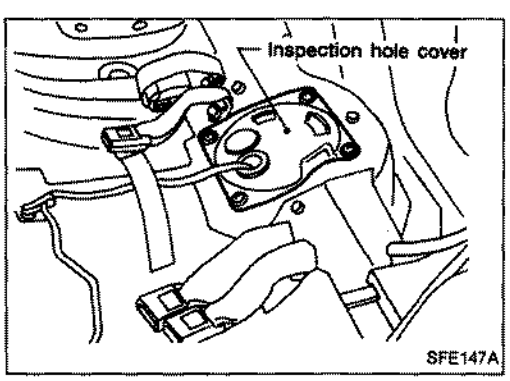
6. Remove fuel pump as shown in the figure.

INSTALLATION

Installation procedure is the reverse order of removal.

CAUTION:

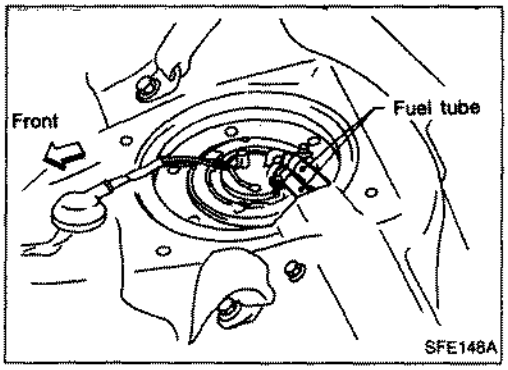
Tighten to specified torque.



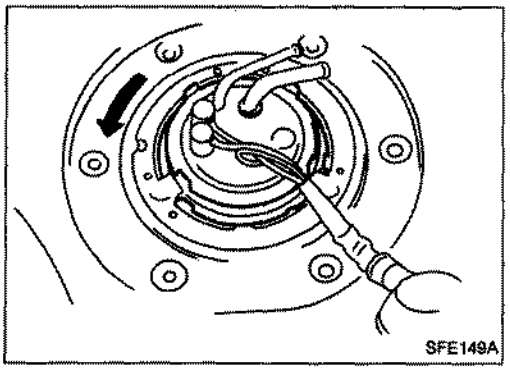
REMOVAL (2WD except E.C.C.S. engine models)

1. Remove inspection hole cover located beneath the rear seat.

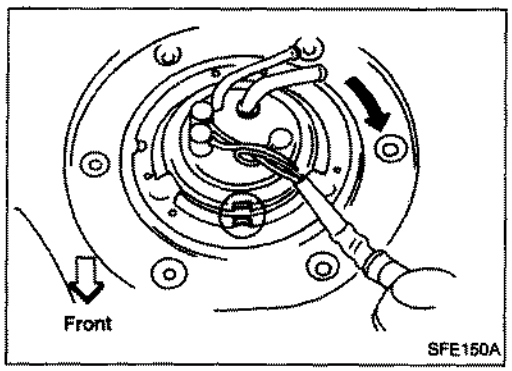
Fuel Pump and Gauge (Cont'd)



2. Disconnect fuel tubes.



3. Remove lock ring.
4. Remove fuel gauge.

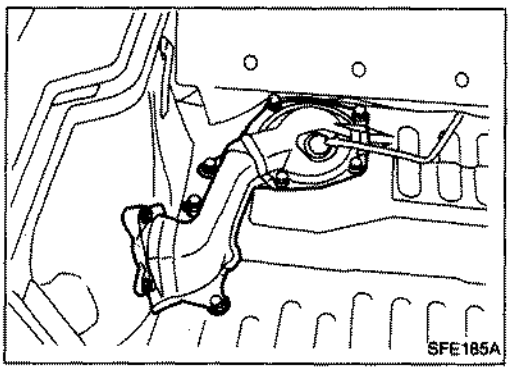


INSTALLATION

Installation procedure is the reverse order of removal.

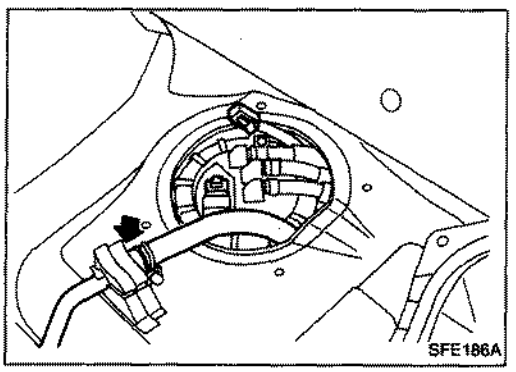
CAUTION:

- **Check alignment of the matchmarks.**
- **Lock the plate against the stopper.**



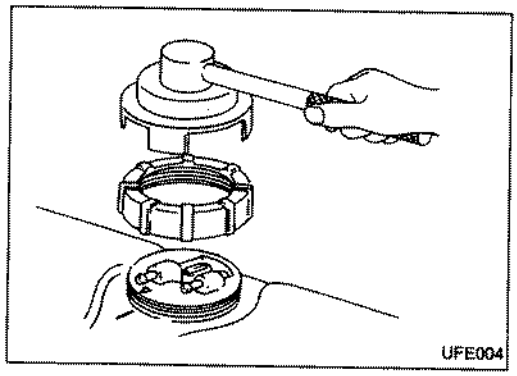
REMOVAL (4WD models)

1. Release fuel pressure from fuel line.
   Refer to "Fuel Filter Replacement" in MA section.
2. Remove inspection hole cover and vent tube cover located on the luggage compartment floor.

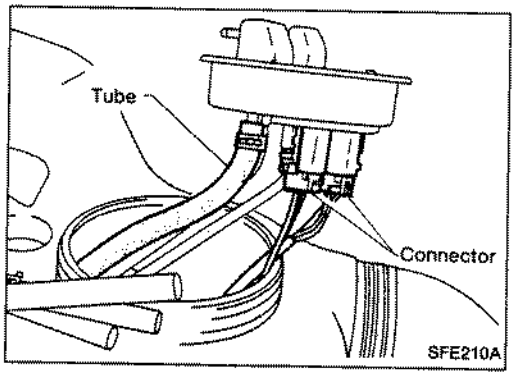


3. Disconnect fuel tubes and connector.

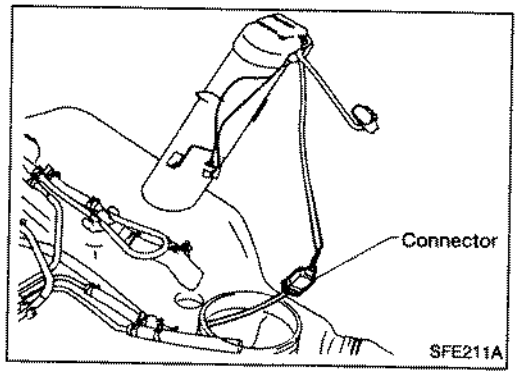
Fuel Pump and Gauge (Cont'd)



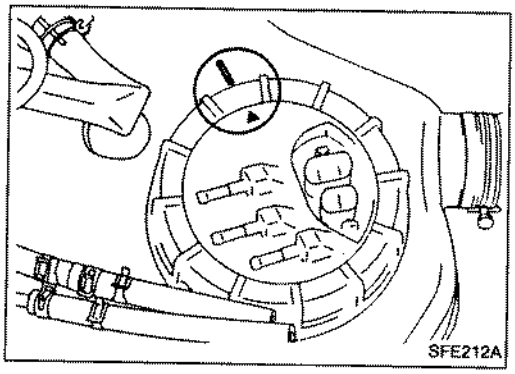
4. Remove lock nut using special service tool KV999G0010.
5. Remove upper plate.



6. While lifting upper plate, disconnect tube and harness connector and remove fuel pump.



7. Disconnect harness connector from inside of fuel tank and remove fuel gauge.

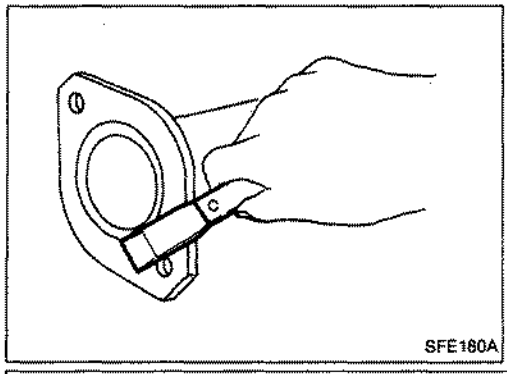


INSTALLATION

Installation procedure is the reverse order of removal.

CAUTION:

- **Check alignment on the matchmarks.**
- **Lock the lock nut.**

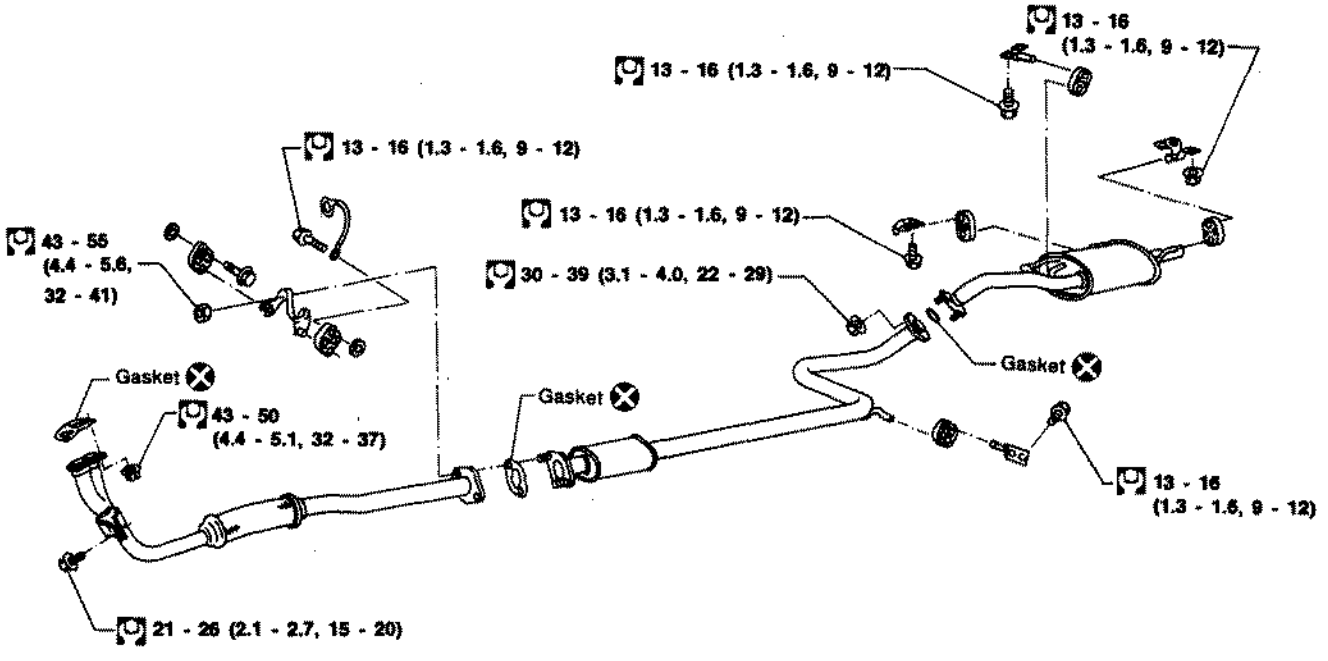


CAUTION:

- **Always replace exhaust gaskets with new ones when reassembling.**
  If gasket is left on flange surface, scrape off completely as shown at left.
- **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.**

2WD models without catalytic converter

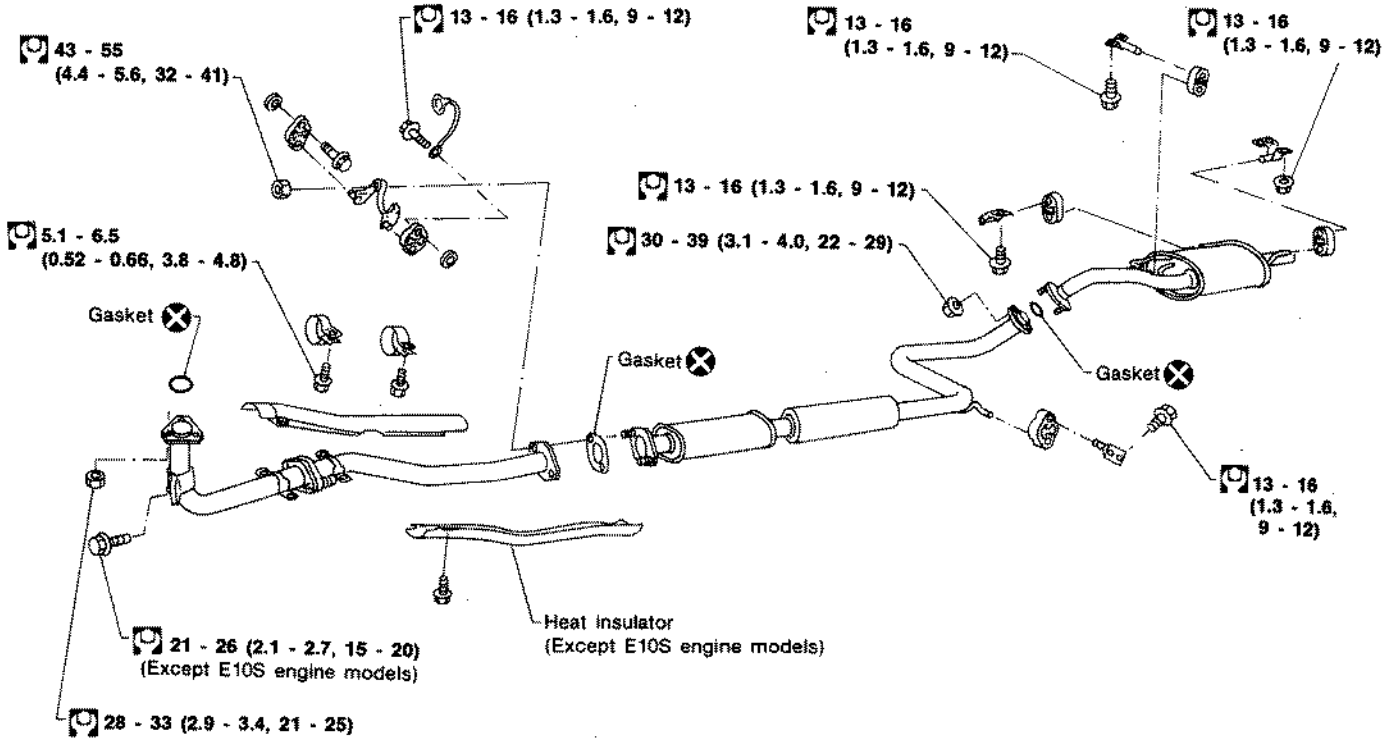
CD17 engine models



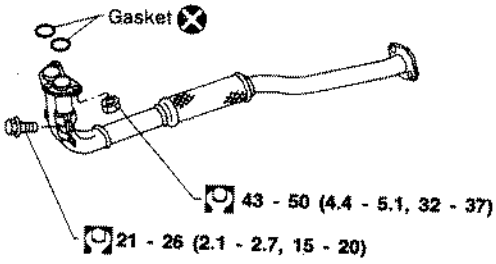
: N·m (kg-m, ft-lb)

SFE152A

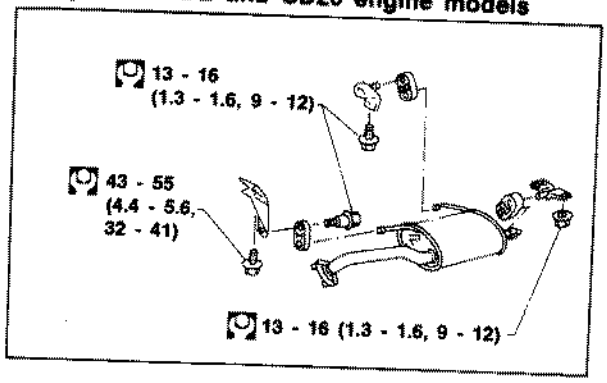
2WD models without catalytic converter



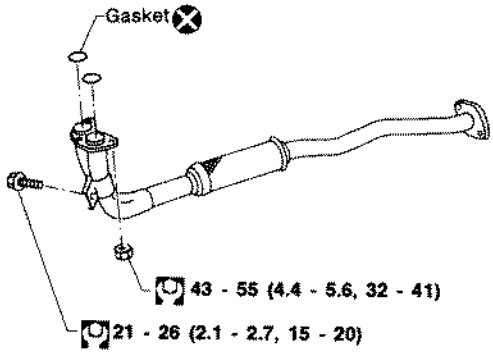
SR20DE engine models



Coupe, SR20DE and CD20 engine models



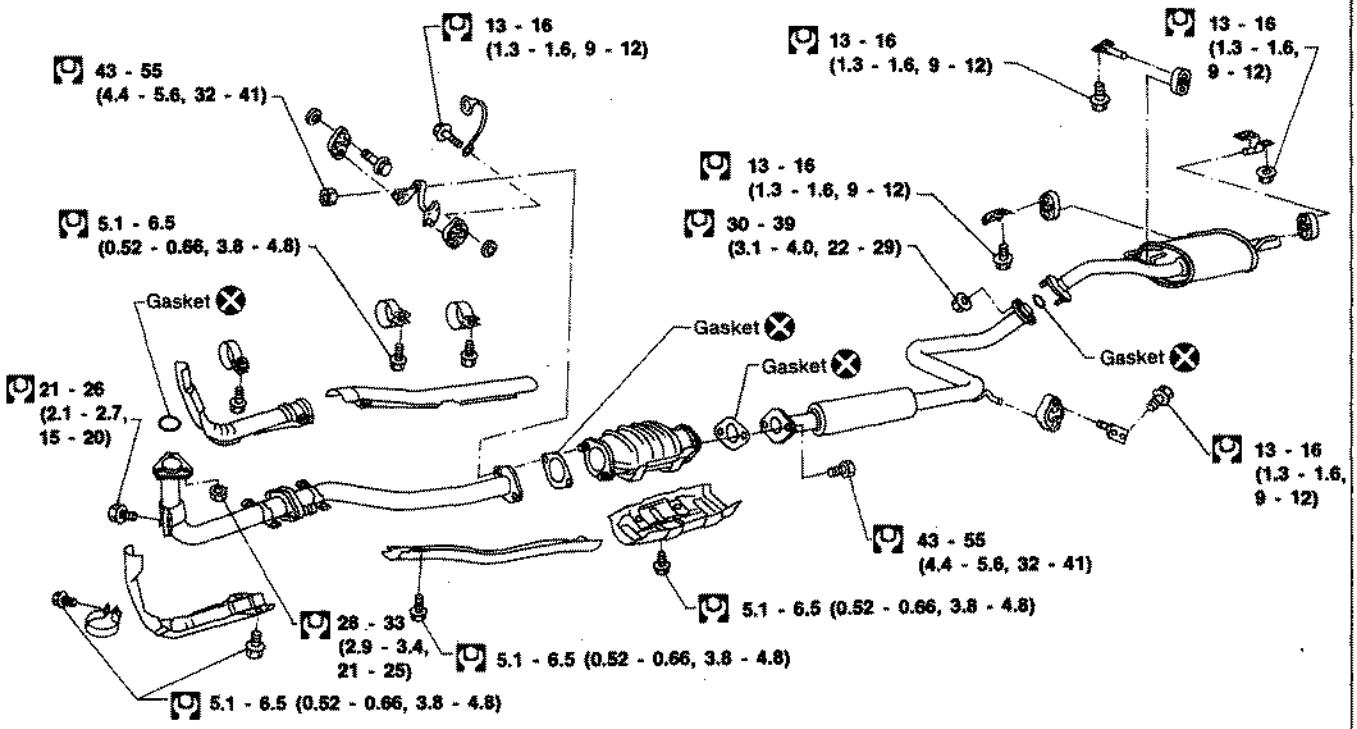
CD20 engine models



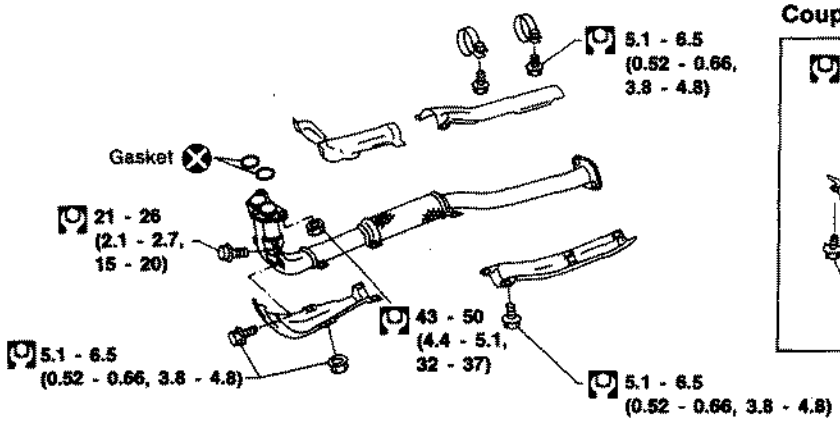
: N·m (kg-m, ft-lb)

SFE215A

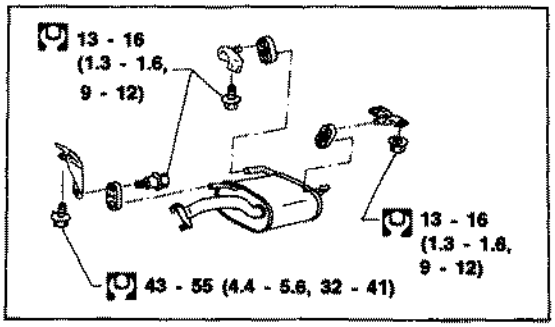
2WD models with catalytic converter



SR20DE engine models



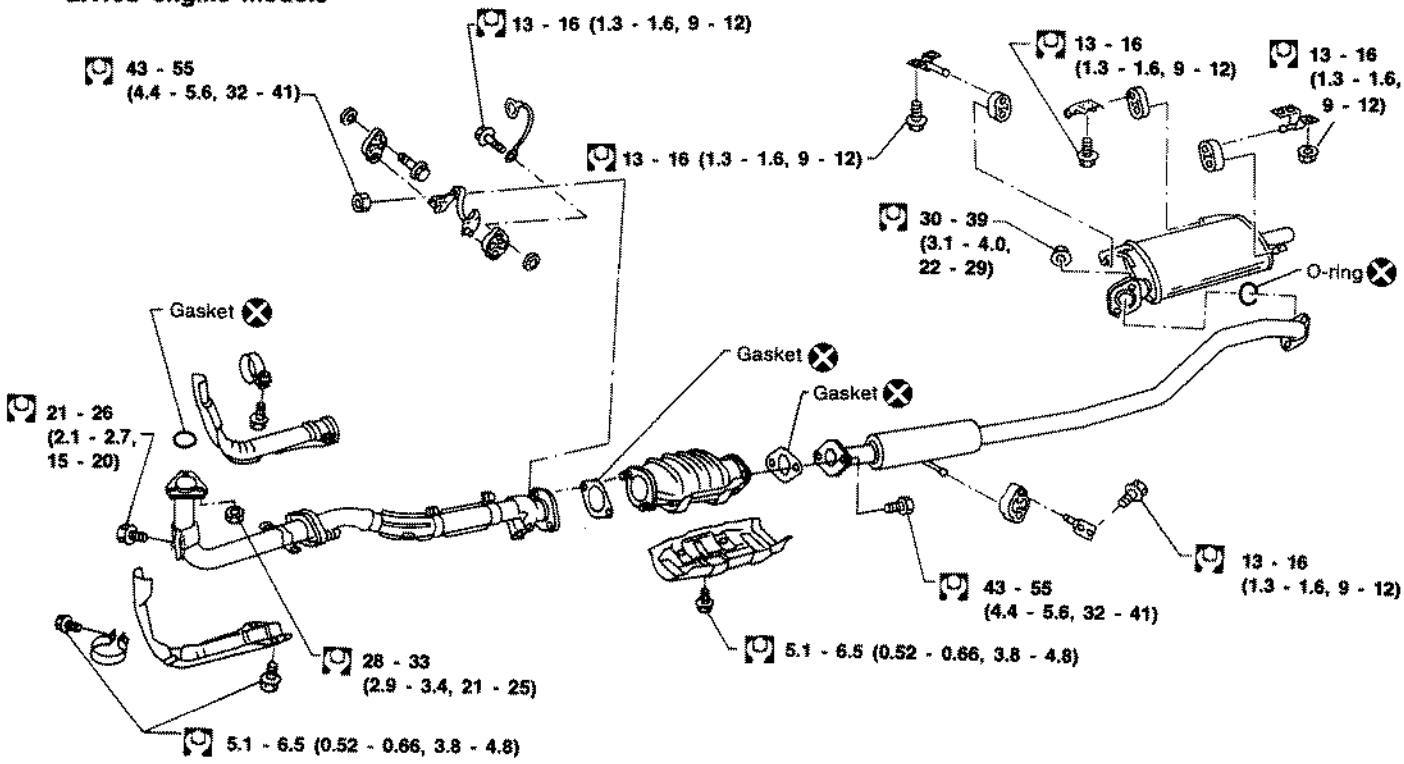
Coupe and SR20DE engine models



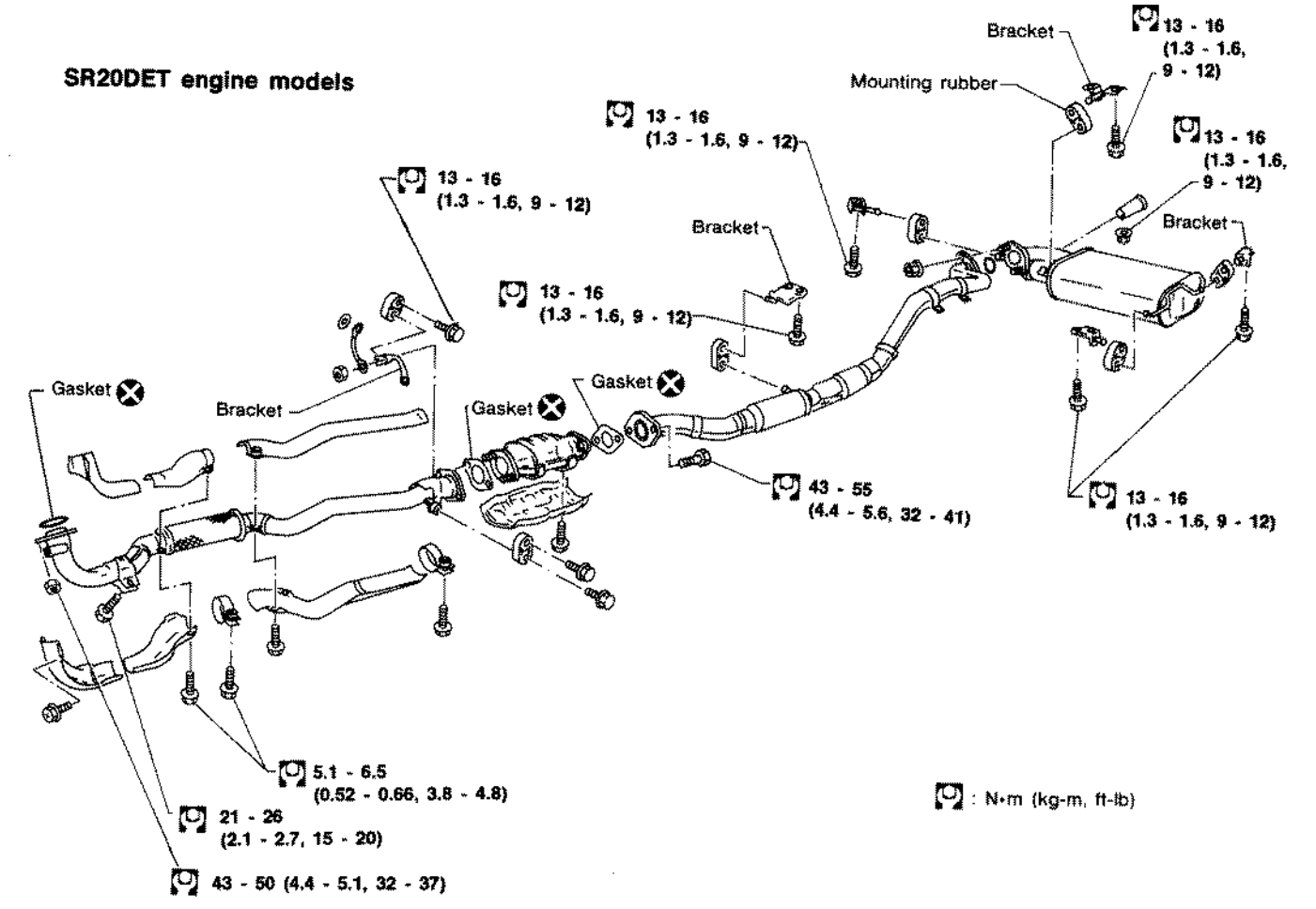
: N·m (kg-m, ft-lb)

SFE156A

4WD models
GA16S engine models

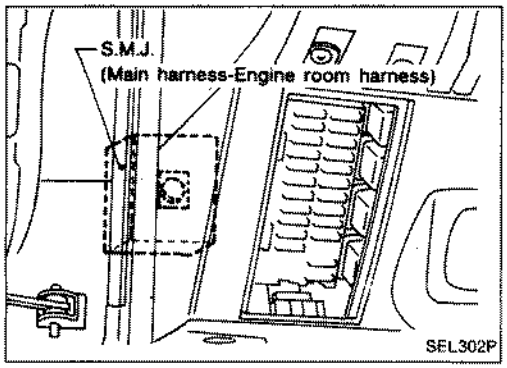


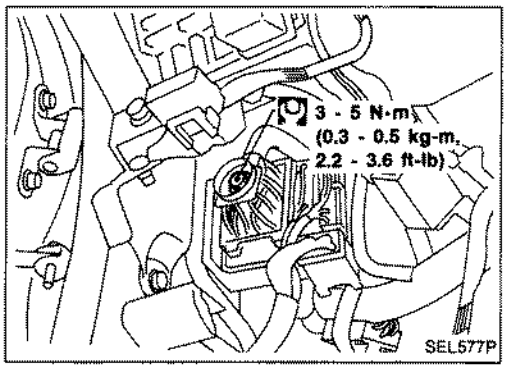
SR20DET engine models



: N•m (kg-m, ft-lb)

SFE193A





Terminal Arrangement

INSTALLATION

To install S.M.J., tighten to specified torque as required.

: 3 - 5 N·m
(0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb)

CAUTION:

Do not overtighten bolts, otherwise, they may be damaged.

Terminal Arrangement (Cont'd)

MAIN HARNESS

T.S.

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
D1	D2								D11	D12	
E1	E2								E11	E12	
F1	F2								F11	F12	
G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12
H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12
I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12

I1·I2		I3·I4		I5·I6		I7·I8		I9·I10		I11·I12	
H1	H2	H3·H4		H5·H6		H7·H8		H9·H10		H11	H12
G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12
F1	F2								F11	F12	
E1	E2								E11	E12	
D1	D2								D11	D12	
C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12

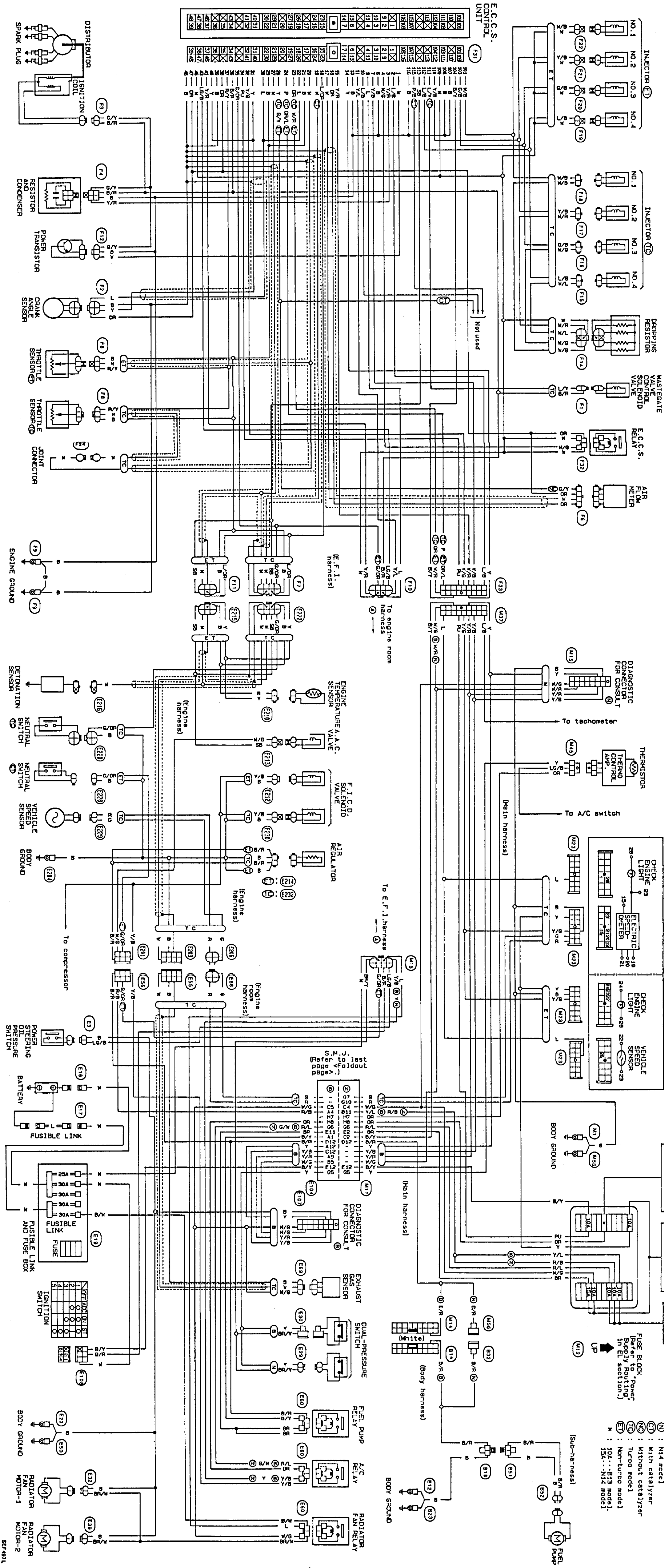
ENGINE ROOM HARNESS

H.S.

E. C. C. S. CONTROL UNIT

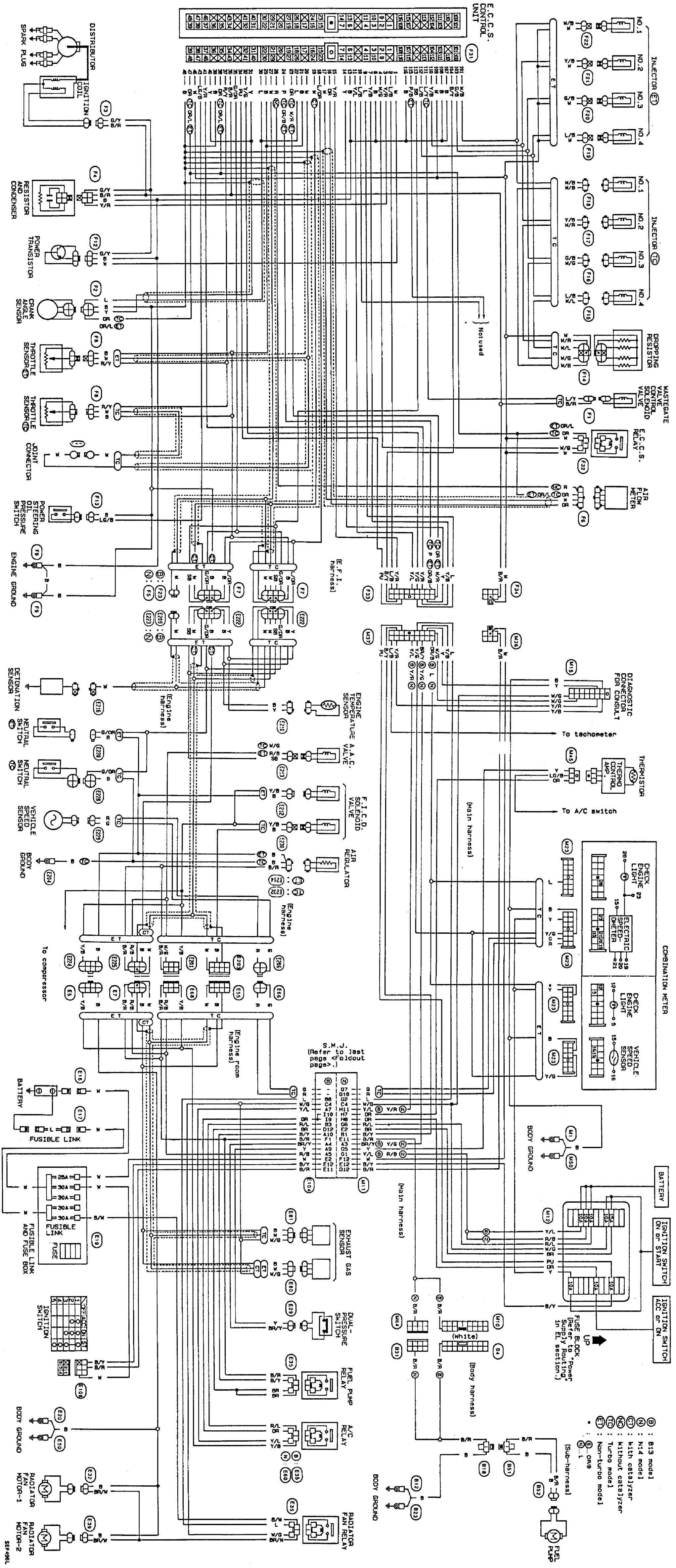
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NISSAN B13/N14 Series
(R.H.D. model with SR engine)
E.C.C.S. WIRING DIAGRAM



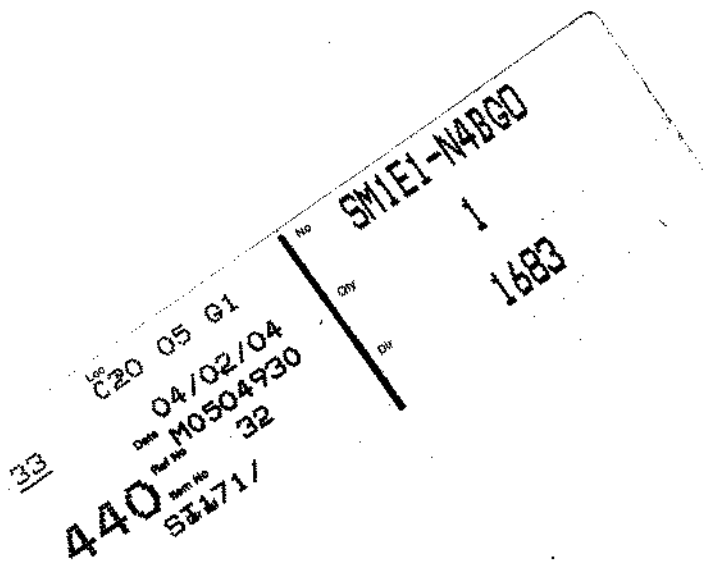
SEF497L

NISSAN B13/N14 Series
(L.H.D. model with SR engine)
E.C.C.S. WIRING DIAGRAM



SEF496L

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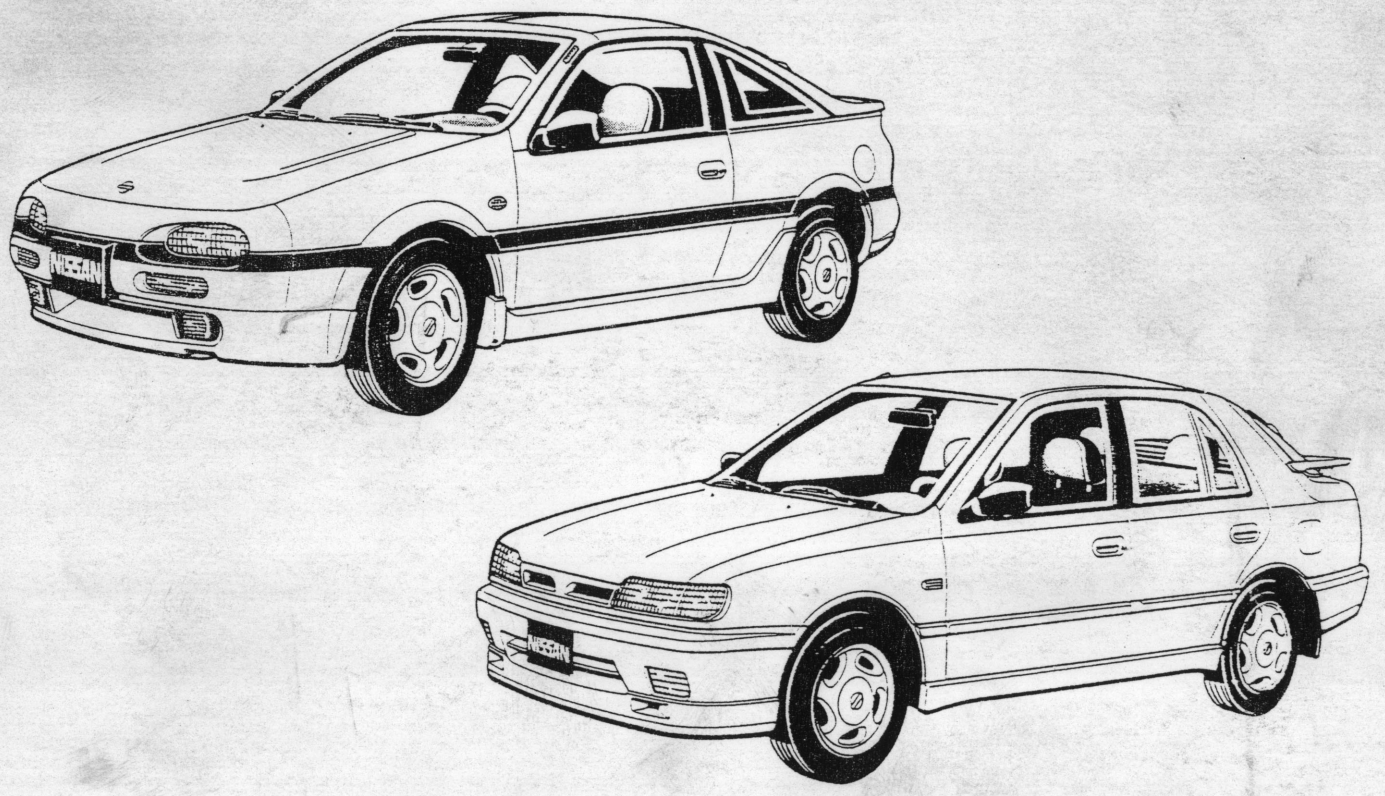
Printed in Japan

Edition: May 1991
Printing: January 1995 (10)
Publication No. SM1E-1N4BG0

NISSAN

MODEL B13 AND N14 SERIES

Volume 2



SERVICE MANUAL

NISSAN

MODEL B13 AND N14 SERIES

Volume 2

QUICK REFERENCE INDEX

GENERAL INFORMATION — GI

Volume 1

- MAINTENANCE — MA
- ENGINE MECHANICAL — EM
- ENGINE LUBRICATION & COOLING SYSTEMS — LC
- ENGINE FUEL & EMISSION CONTROL SYSTEM — EF &
- ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEMS — FE

Volume 2

- CLUTCH — CL
- MANUAL TRANSAXLE — MT
- AUTOMATIC TRANSAXLE — AT
- TRANSFER — TF
- PROPELLER SHAFT & DIFFERENTIAL CARRIER — PD
- FRONT AXLE & FRONT SUSPENSION — FA
- REAR AXLE & REAR SUSPENSION — RA
- BRAKE SYSTEM — BR
- STEERING SYSTEM — ST
- BODY — BF
- HEATER & AIR CONDITIONER — HA
- ELECTRICAL SYSTEM — EL

GI (General Information) section is contained in Volume 1 and Volume 2.

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FOREWORD

This manual (Volume 2) contains repair procedures for the following components of the model B13 and N14 series.

1. Chassis
   - Clutch
   - Transaxle unit
   - Axle & suspension unit
   - Transfer unit
   - Propeller shaft & Differential carrier
   - Brake system
   - Steering system
2. Body
3. Heater & air conditioner unit
4. Electrical system

For maintenance and repair procedures for the engine, refer to Volume 1 (Pub. No. SM1E-1N4BG0).

In order to assure your safety and the efficient functioning of the vehicle, this manual should be read thoroughly. It is especially important that the PRECAUTIONS in the GI section be completely understood before starting any repair task.

All information in this manual is based on the latest product information at the time of publication. The right is reserved to make changes in specifications and methods at any time without notice.

IMPORTANT SAFETY NOTICE

The proper performance of service is essential for both the safety of the technician 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 technician 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.

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Overseas Service Department
Tokyo, Japan

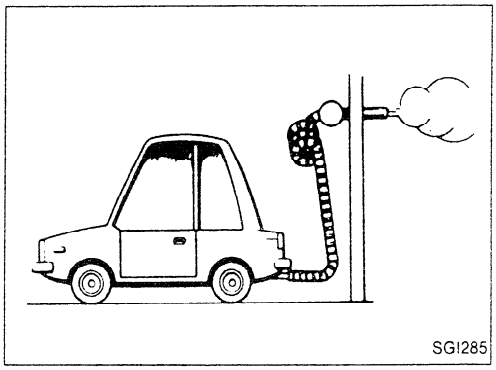
GENERAL INFORMATION

SECTION GI

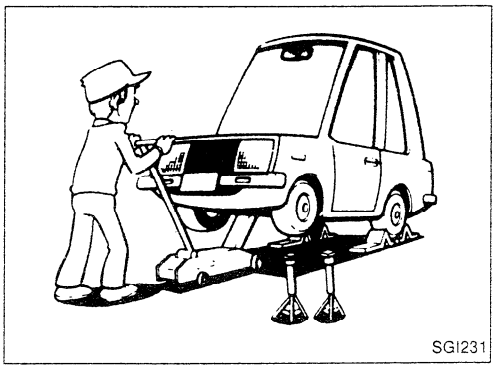
CONTENTS

PRECAUTIONS ..... GI- 2
HOW TO USE THIS MANUAL ..... GI- 8
HOW TO READ WIRING DIAGRAMS GI-10
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IDENTIFICATION INFORMATION GI-18
LIFTING POINTS AND TOW TRUCK TOWING GI-30
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TIGHTENING TORQUE OF STANDARD BOLTS GI-39

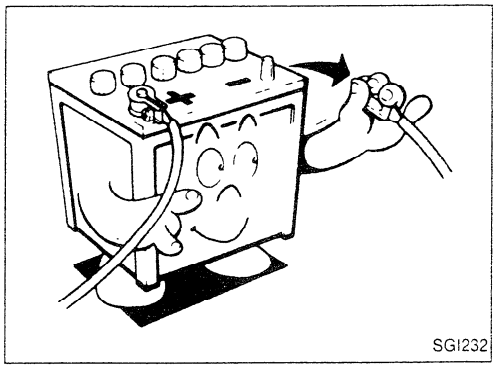
Observe the following precautions to ensure safe and proper servicing. These precautions are not described in each individual section.


SGI285

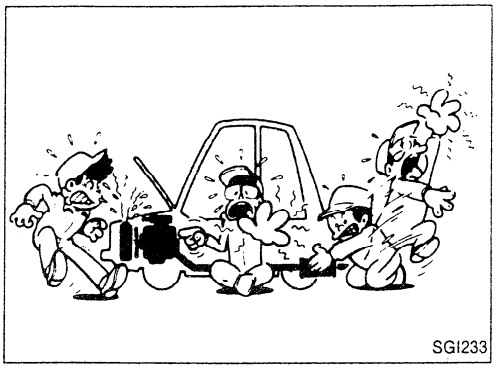
1. Do not operate the engine for an extended period of time without proper exhaust ventilation.
   Keep the work area well ventilated and free of any inflammable materials. Special care should be taken when handling any inflammable or poisonous materials, such as gasoline, refrigerant gas, etc. When 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

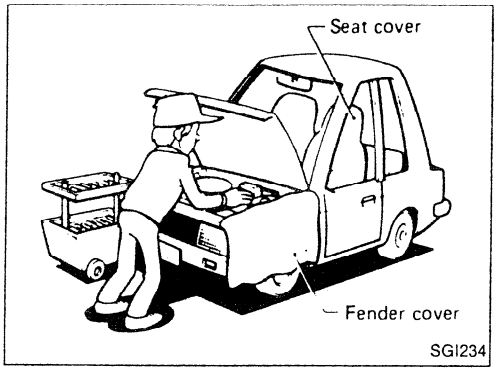
2. Before jacking up the vehicle, apply wheel chocks or other tire blocks to the wheels to prevent the vehicle from moving. After jacking up the vehicle, support the vehicle weight with safety stands at the points designated for proper lifting and towing before working on the vehicle.
   These operations should be done on a level surface.
3. 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.


SGI232

4. Before starting repairs which do not require battery power, always turn off the ignition switch, then disconnect the ground cable from the battery to prevent accidental short circuit.

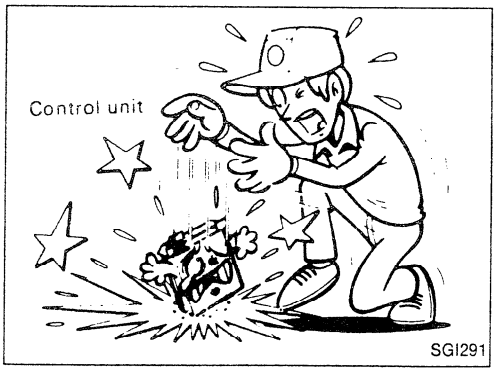

SGI233

5. To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe and muffler. Do not remove the radiator cap when the engine is hot.



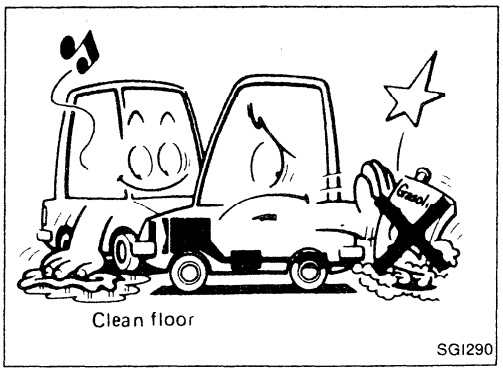
6. Before servicing the vehicle, protect fenders, upholstery and carpeting with appropriate covers.
   Take caution that keys, buckles or buttons on your person do not scratch the paint.

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



Precautions for E.F.I. or E.C.C.S. Engine

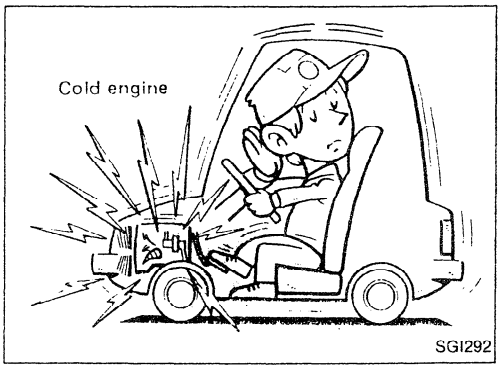
1. Before connecting or disconnecting E.F.I. or E.C.C.S. harness connector to or from any E.F.I. or E.C.C.S. control unit, be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal.
   Otherwise, there may be damage to control unit.
2. Before disconnecting pressurized fuel line from fuel pump to injectors, be sure to release fuel pressure to eliminate danger.
3. Be careful not to jar components such as control unit and air flow meter.



Precautions for Catalyst

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

1. Use unleaded gasoline only. Leaded gasoline will seriously damage the catalytic converter.
2. When checking for ignition spark or measuring engine compression, make tests quickly and only when necessary.
3. Do not run engine when the fuel tank level is low, otherwise the engine may misfire causing damage to the converter.
4. Do not place the vehicle on inflammable material. Keep inflammable material off the exhaust pipe.



Precautions for Turbocharger

The turbocharger turbine revolves at extremely high speeds and becomes very hot. Therefore, it is essential to maintain a clean supply of oil flowing through the turbocharger and to follow all required maintenance instructions and operating procedures.

For proper operation of the system, follow the procedure below.

1. Always use the recommended oil. Follow the instructions for proper time to change the oil and proper oil level.
2. Avoid accelerating engine to a high rpm immediately after starting.
3. If engine had been operating at high rpm for an extended period of time, let it idle for a few minutes prior to shutting it off.

Asbestos Safety Instructions (Based on United Kingdom and Republic of Ireland regulations)

This vehicle uses parts containing asbestos. Most are not hazardous but Brake and Clutch linings can be. Consult the manufacturer or his agent for further details. When working with these please observe the "Garage Workers' Asbestos Code" available through your Nissan Dealer, Local Authority or Health and Safety Executive. In particular, work in a well-ventilated place using, where possible, appropriate dust extraction equipment, and avoid creating dust. Dampen all asbestos/dust where possible prior to machining, cutting, cleaning, etc. Use only hand or low speed tools.

Dispose of all asbestos waste, wet rags, etc., in a closed container as directed by your local waste disposal authority.

Engine Oils

Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities must be provided.

HEALTH PROTECTION PRECAUTIONS

1. Avoid prolonged and repeated contact with oils, particularly used engine oils.
2. Wear protective clothing, including impervious gloves where practicable.
3. Do not put oily rags in pockets.
4. Avoid contaminating clothes, particularly underpants, with oil.
5. Heavily soiled clothing and oil-impregnated footwear should not be worn. Overalls must be cleaned regularly.
6. First Aid treatment should be obtained immediately for open cuts and wounds.
7. Use barrier creams, applying them before each work period, to help the removal of oil from the skin.
8. 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.
9. Do not use petrol, kerosine, diesel fuel, gas oil, thinners or solvents for cleaning skin.
10. If skin disorders develop, obtain medical advice without delay.
11. Where practicable, degrease components prior to handling.
12. 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.

(For the United Kingdom, see also HSE Cautionary Notice SHW 397 "Effects of Mineral Oil on the Skin".)

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 from country to country.

Precautions for Fuel

GASOLINE ENGINE:

For Europe

Catalytic converter equipped engines:
GA14DS engine models except for Switzerland ...
Unleaded gasoline of at least 91 octane (RON)
GA14DS engine models for Switzerland ...
Unleaded gasoline of at least 95 octane (RON)
Except GA14DS engine models ...
Unleaded gasoline of at least 95 octane (RON)

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

Except catalytic converter equipped engines:
For the United Kingdom and France only
GA14DS engine models ...
Unleaded gasoline of at least 91 octane (RON)
Except GA14DS engine models ...
Unleaded gasoline of at least 95 octane (RON)
Except the United Kingdom and France
GA14DS engine models ...
Unleaded or leaded gasoline of at least 91 octane (RON)
Except GA14DS engine models ...
Unleaded or leaded gasoline of at least 95 octane (RON)

Except Europe

Leaded gasoline of at least 88 octane (RON)

GA16DS engine models for Middle East ...
Leaded gasoline of at least 95 octane (RON)

DIESEL ENGINE*:

CD17 engine models ... Diesel fuel of at least 45 cetane
CD20 engine models ... 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:

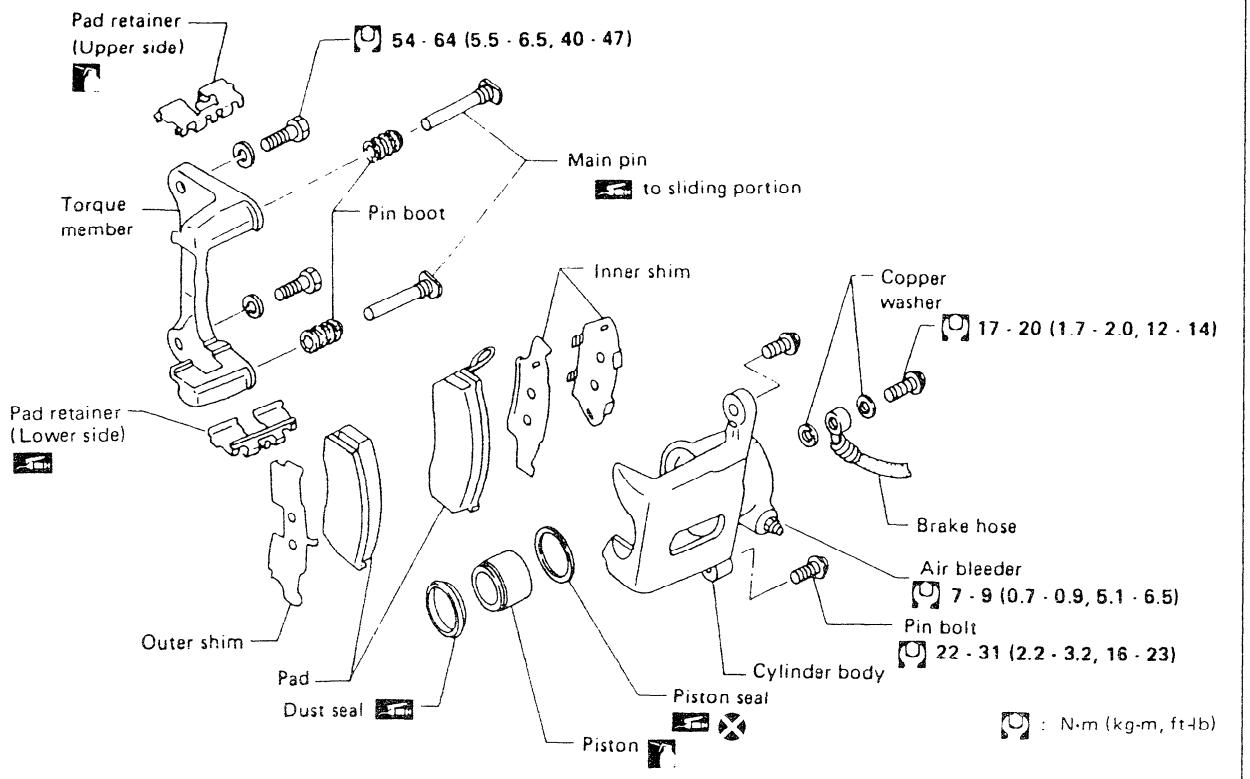
- **Do not use home heating oil, gasoline, or other alternate fuels in your diesel engine. The use of those can cause engine damage.**
- **Do not use summer fuel at temperature below –7°C (20°F). The cold temperatures will cause wax to form in the fuel. As a result, it may prevent the engine from running smoothly.**
- **Do not add gasoline or other alternate fuels to diesel fuel. Only under the following conditions may you use diesel fuel by mixing kerosene or regular gasoline (not premium gasoline) to prevent the fuel from thickening due to wax separation:**
  If the summer type diesel fuel is used at an ambient temperature below 0°C (32°F), add kerosene or regular gasoline but not more than 30% by volume. However, keep in mind that there may be less engine output performance due to the proportion of added fuel. The use of kerosene for motor vehicles is not permitted in some countries, e.g. U.K.

Precautions for Fuel (Cont'd)

Therefore, consult the relevant authorities before such mixtures are used.

1. **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.
2. **THE CONTENTS** are listed on the first page of each section.
3. **THE TITLE** is indicated on the upper portion of each page and shows the part or system.
4. **THE PAGE NUMBER** of each section consists of two letters which designate the particular section and a number (e.g. "BR-5").
5. **THE LARGE ILLUSTRATIONS** are exploded views (See below) and contain tightening torques, lubrication points 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"



6. **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.
7. The following **SYMBOLS AND ABBREVIATIONS** are used:

	:	Tightening torque
	:	Should be lubricated with grease. Unless otherwise indicated, use recommended multi-purpose grease.
	:	Should be lubricated with oil.
	:	Sealing point
	:	Checking point
	:	Always replace after every disassembly.
L.H., R.H.	:	Left-Hand, Right-Hand
FR, RR	:	Front, Rear

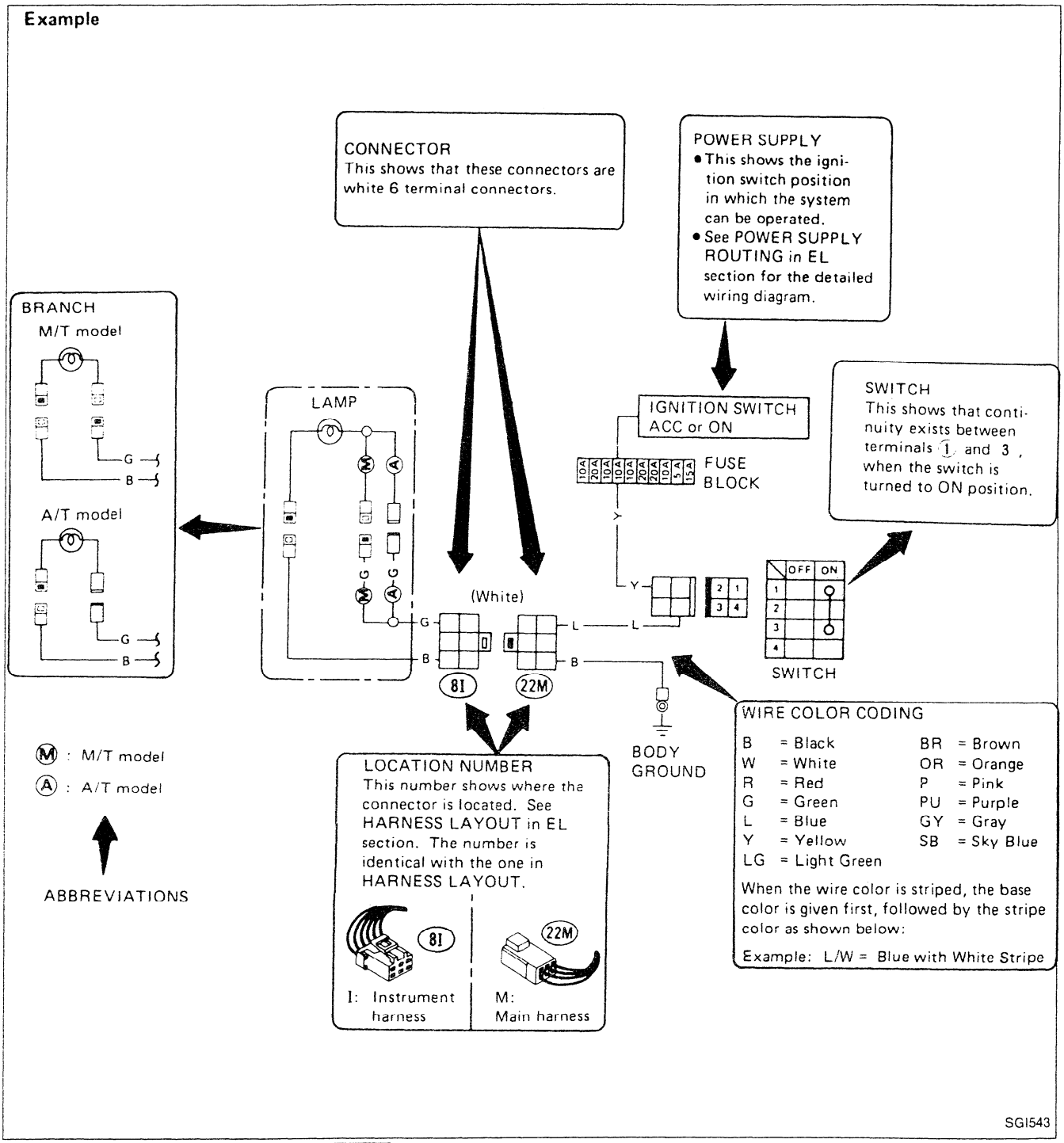
2WD	:	2-Wheel Drive
4WD	:	4-Wheel Drive
M/T	:	Manual Transaxle/Transmission
A/T	:	Automatic Transaxle/ Transmission
A/C	:	Air Conditioner
P/S	:	Power Steering
S.S.T.	:	Special Service Tools
S.D.S.	:	Service Data and Specifications
SAE	:	Society of Automotive Engineers, Inc.
G.C.C.	:	Gulf Cooperation Council
L.H.D.	:	Left-Hand Drive
R.H.D.	:	Right-Hand Drive

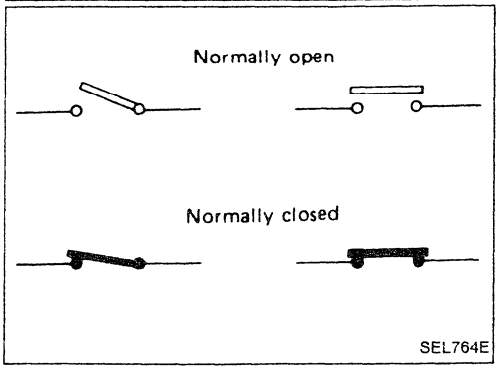
8. The **UNITS** given in this manual are primarily expressed as the SI UNIT (International System of Unit), and alternatively expressed in the metric system and in the yard/pound system.
   "Example"
   Tightening torque:
   59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)
9. **TROUBLE DIAGNOSES** are included in sections dealing with complicated components.
10. **SERVICE DATA AND SPECIFICATIONS** are contained at the end of each section for quick reference of data.
11. 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.

WIRING DIAGRAM

Symbols used in WIRING DIAGRAM are shown below:



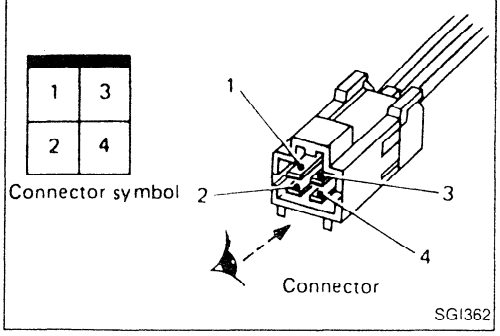


SWITCH POSITIONS

Wiring diagram switches are shown with the vehicle in the following condition.

- Ignition switch "OFF".
- Doors, hood and trunk lid/back door closed.
- Pedals are not depressed and parking brake is released.

Example

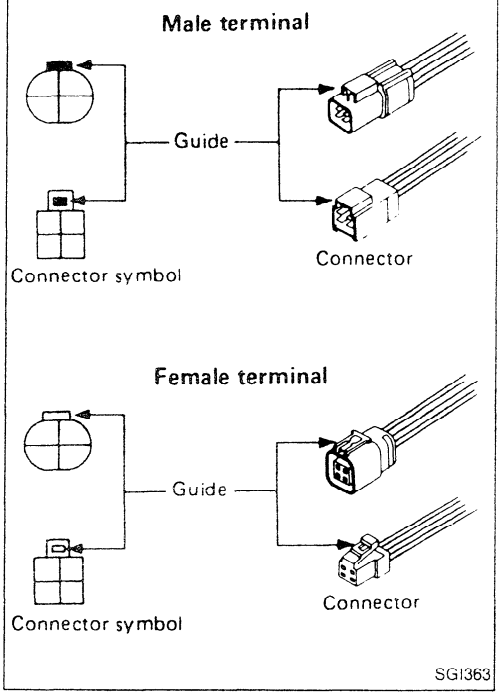


SGI362

CONNECTOR SYMBOLS

- All connector symbols in wiring diagrams are shown from the terminal side.

Example



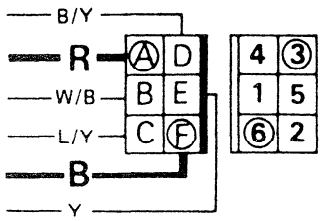
SGI363

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

MULTIPLE SWITCH

The continuity of the multiple switch is identified in the switch chart in wiring diagrams.

Example



WIPER SWITCH

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

Continuity circuit of wiper switch

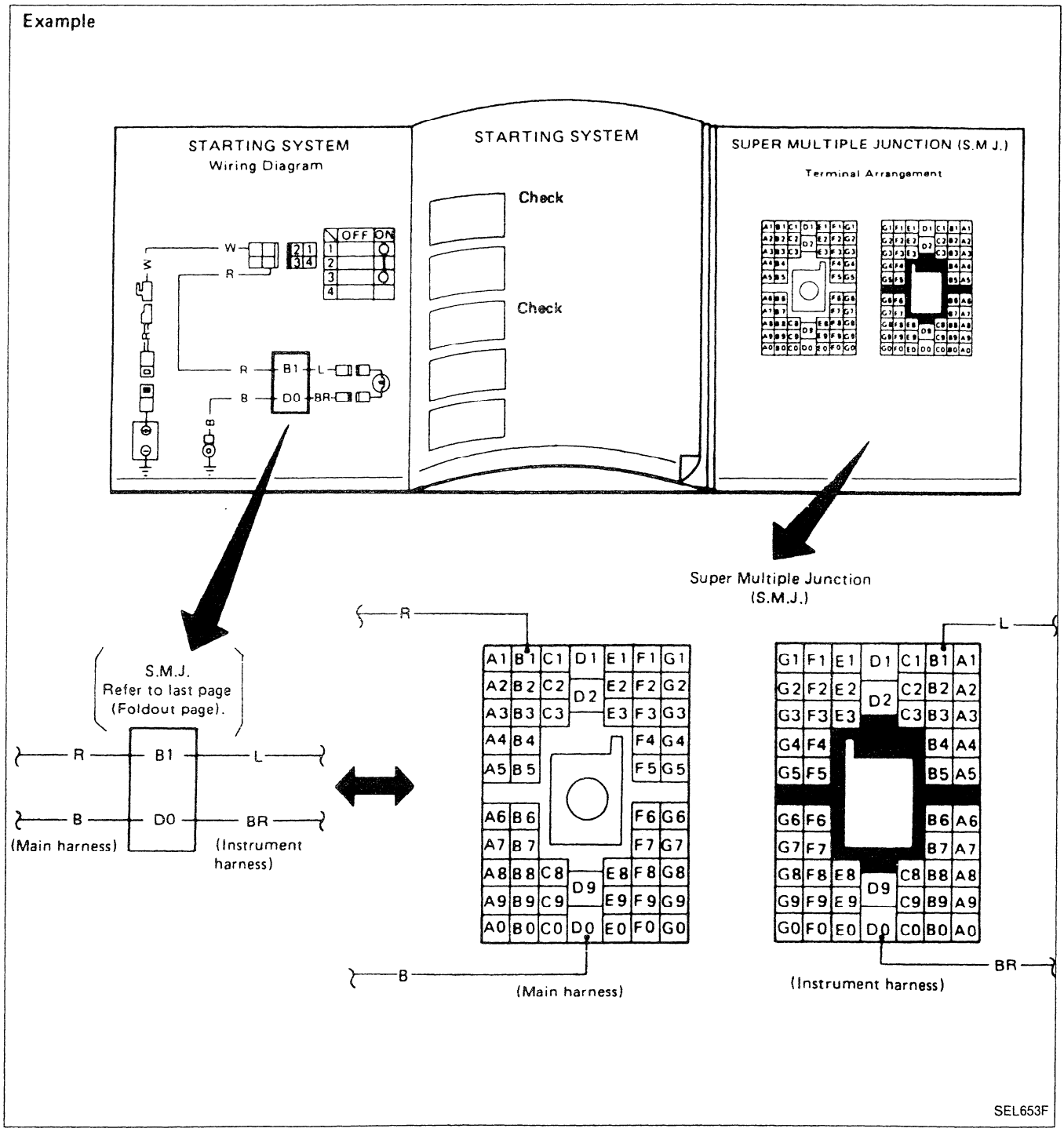
SWITCH POSITION	CONTINUITY CIRCUIT
OFF	3 - 4
INT	3 - 4, 5 - 6
LO	3 - 6
HI	2 - 6
WASH	1 - 6

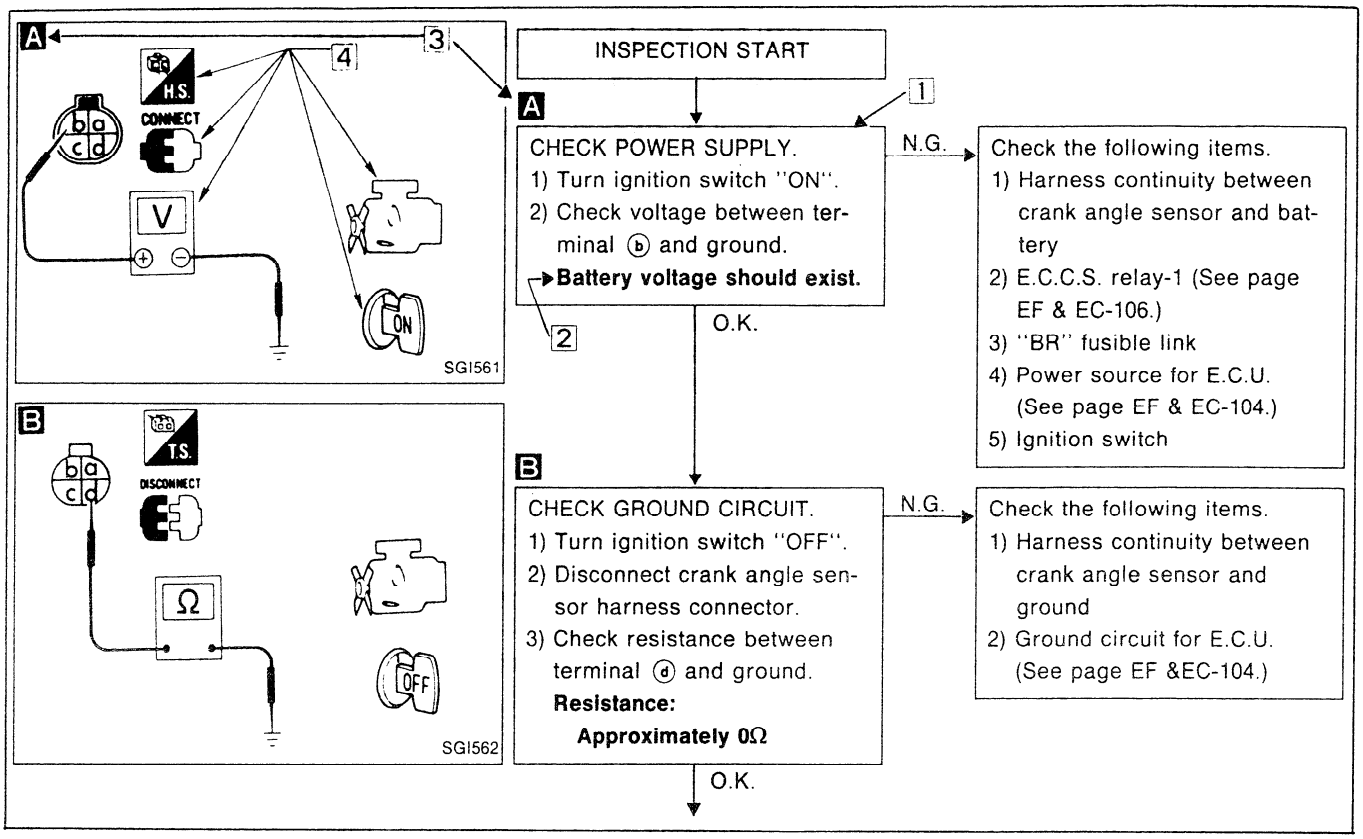
Example: Wiper switch in LO position
Continuity circuit: Red wire – Ⓐ terminal – ③ terminal – Wiper switch (● – ●: LO) – ⑥ terminal – Ⓕ terminal – Black wire

SGI365

SUPER MULTIPLE JUNCTION (S.M.J.)

- The "S.M.J." indicated in wiring diagrams is shown in a simplified form. The terminal arrangement should therefore be referred to in the foldout at the end of the Service Manual.
- The foldout should be spread to read the entire wiring diagram.





NOTICE

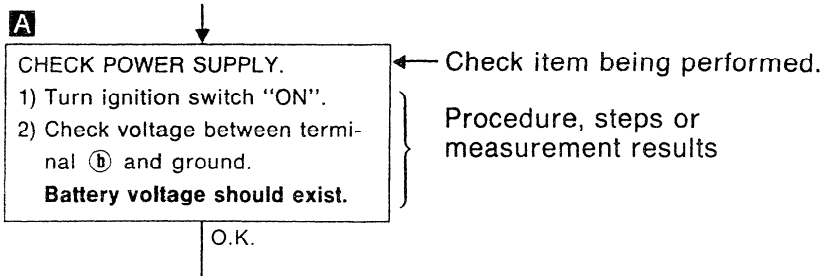
The flow chart indicates work procedures required to diagnose problems effectively. Observe the following instructions before diagnosing.

1) **Use the flow chart after locating probable causes of a problem following the "Preliminary Check" or the "Symptom Chart".**
2) **After repairs, recheck that the problem has been completely eliminated.**
3) **Refer to Component Parts Location and Harness Layout 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 perform circuit continuity between harness connectors more detail, such as in case of sub-harness is used, refer to Wiring Diagram and Harness Layout in EL section for identification of harness connectors.**
5) **When checking circuit continuity, ignition switch should be "OFF".**
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.**

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.



2 Measurement results

Required results are indicated in bold type in the corresponding block, as shown below:
These have the following meanings:

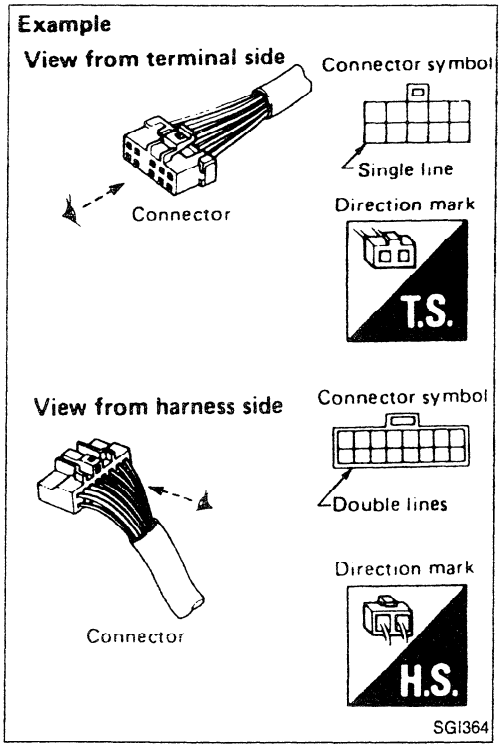
Battery voltage → 11 - 14V or approximately 12V
Voltage: Approximately 0V → Less than 1V

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 flowchart 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

A direction mark is shown to clarify the side of connector (terminal side or harness side).
Direction marks are mainly used in the illustrations indicating terminal inspection.

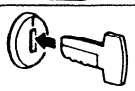
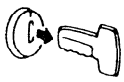
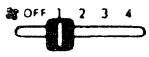
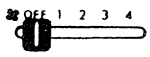
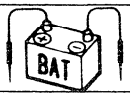
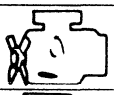
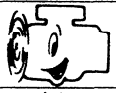
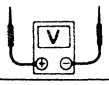
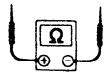
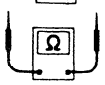
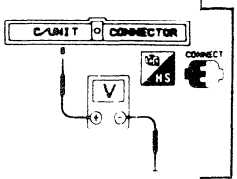
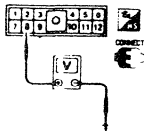
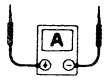
T.S. : **View from terminal side ... T.S.**

- **All connector symbols shown from the terminal side are enclosed by a single line.**

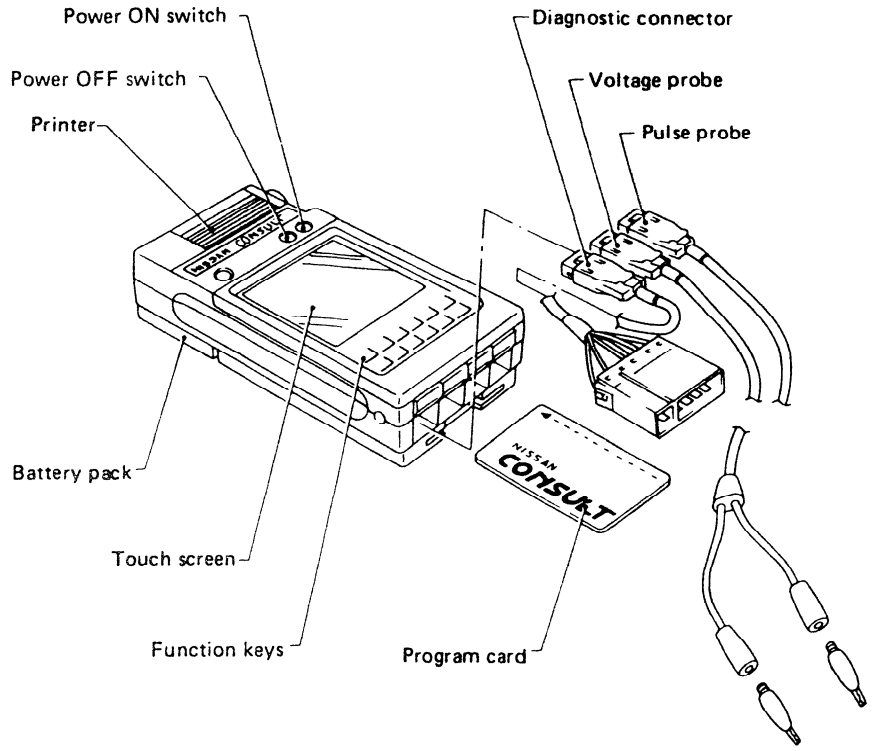
H.S. : **View from harness side ... H.S.**

- **All connector symbols shown from the harness side are enclosed by a double line.**

Key to symbols signifying measurements or procedures

Symbol	Symbol explanation	Symbol	Symbol explanation
	Check after disconnecting the connector to be measured.		Procedure with Consult
	Check after connecting the connector to be measured.		Procedure with CONSULT
	Insert key into ignition switch.		A/C switch is "OFF".
	Remove key from ignition switch.		A/C switch is "ON".
	Turn ignition switch to "OFF" position.		REC switch is "ON".
	Turn ignition switch to "ON" position.		REC switch is "OFF".
	Turn ignition switch to "START" position.		DEF switch is "ON".
	Turn ignition switch from "OFF" to "ACC" position.		VENT switch is "ON".
	Turn ignition switch from "ACC" to "OFF" position.		Fan switch is "ON". (At any position except for "OFF" position)
	Turn ignition switch from "OFF" to "ON" position.		Fan switch is "OFF".
	Turn ignition switch from "ON" to "OFF" position.		Apply battery voltage directly to components.
	Do not start engine, or check with engine stopped.		Drive vehicle.
	Start engine, or check with engine running.		Disconnect battery negative cable.
	Apply parking brake.		Depress brake pedal.
	Release parking brake.		Release brake pedal.
	Check after engine is warmed up sufficiently.		Depress accelerator pedal.
	Voltage should be measured with a voltmeter.		Release accelerator pedal.
 	Circuit resistance should be measured with an ohmmeter.		Pin terminal check for S.M.J. type E.C.U. and A/T control unit connectors. **For details regarding the terminal arrangement, refer to the foldout page.** 
	Current should be measured with an ammeter.		

Outside View



SGI619

System Application

System / Diagnostic mode	E.C.C.S. (GA16DE and SR20DE engines)
Work support	X
Self-diagnostic results	X
Data monitor	X
Active test	X
E.C.U. part number	X

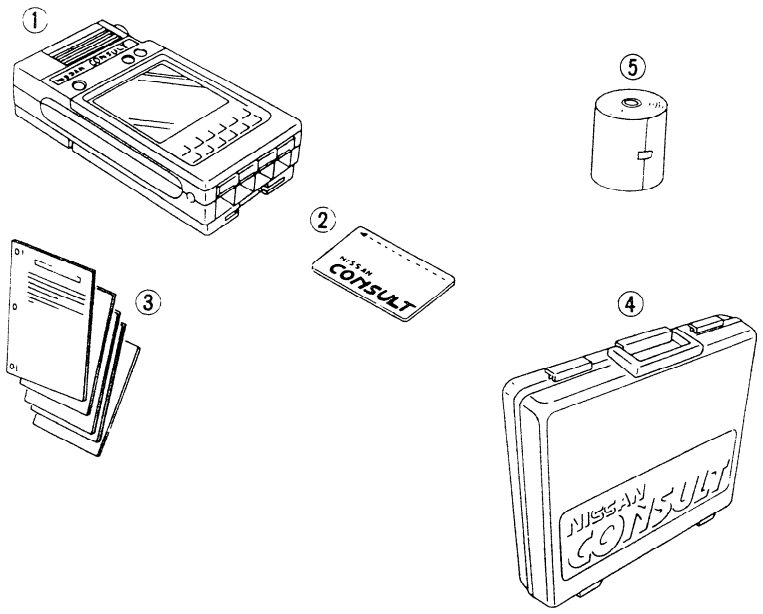
X: Applicable

Function

Diagnostic mode	Function
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.
Data monitor	Input/Output data in the control unit can be read.
Active test	Mode in which CONSULT drives some actuators apart from the control units and also shifts some parameters in a specified range.
E.C.U. part number	E.C.U. part number can be read.

Checking Equipment

When ordering this equipment, contact your NISSAN distributor.

Tool name	Description
NISSAN CONSULT kit ① CONSULT unit and accessories ② Program card ③ Operation manuals ④ Carrying case ⑤ Thermal paper (Rolls)	

MODEL B13 SERIES

Destination	Body	Grade / Transaxle / Engine	E10S	GA13DS	GA14DS		GA16DS		GA16DE		CD17
			RN4F30A	RS5F30A	RS5F30A	RL4F03A	RS5F31A	RL4F03A	RS5F31A	RL4F03A	RS5F30A
Except Europe and Middle East	R.H. drive	4-door Sedan LE	—	BAUARBF-SWA	BAVARBF-SWA	BAVARBA-SWA	BAYARBF-SWA	—	—	—	BVAARBF-NWA
		JX	BAJARDT-SWA	BAUARDF-SWA	BAVARDF-SWA	BAVARDA-SWA	—	—	—	—	—
		EX Saloon	EAJARFT-SWA	BAUARFF-SWA	BAVARFF-SWA	BAVARFA-SWA	BAYARFF-SWA	BAYARFA-SWA	—	—	—
		Super Saloon	—	BAUARGF-SWA	BAVARGF-SWA	BAVARGA-SWA	BAYARGF-SWA	BAYARGA-SWA	BAYARGF-EWA	BAYARGA-EWA	—
	L.H. drive	LE	—	BAUALBF-SWA	BAVALBF-SWA	BAVALBA-SWA	BAYALBF-SWA	—	—	—	BVAALBF-NWA
		JX	—	BAUALDF-SWA	BAVALDF-SWA	BAVALDA-SWA	BAYALDF-SWA	BAYALDA-SWA	—	—	—
		Ex Saloon	—	BAUALFF-SWA	BAVALFF-SWA	BAVALFA-SWA	BAYALFF-SWA	BAYALFA-SWA	—	—	—
		Super Saloon	—	—	—	—	BAYALGF-SWA	BAYALGA-SWA	BAYALGF-EWA	BAYALGA-EWA	—
	R.H. drive	Coupe T-bar roof Type B	—	—	—	—	—	—	GAYARVF-EWA	GAYARVA-EWA	—
			—	—	—	—	—	—	HAYARVF-EWA	HAYARVA-EWA	—
	L.H. drive	Coupe T-bar roof Type B	—	—	—	—	—	—	GAYALVF-EWA	GAYALVA-EWA	—
			—	—	—	—	—	—	HAYALVF-EWA	HAYALVA-EWA	—
Middle East	L.H. drive	4-door Sedan LE	—	—	BAVALBF-SKA	BAVALBA-SKA	—	—	—	—	—
		JX	—	—	BAVALDF-SKA	BAVALDA-SKA	BAYALDF-SKA	BAYALDA-SKA	—	—	—
		EX Saloon	—	—	BAVALFF-SKA	BAVALFA-SKA	BAYALFF-SKA	BAYALFA-SKA	—	—	—
		Super Saloon	—	—	—	—	BAYALGF-SKA	BAYALGA-SKA	—	—	—
		Coupe Type B	—	—	—	—	GAYALVF-SKA	GAYALVA-SKA	—	—	—
		T-bar roof Type B	—	—	—	—	HAYALVF-SKA	HAYALVA-SKA	—	—	—

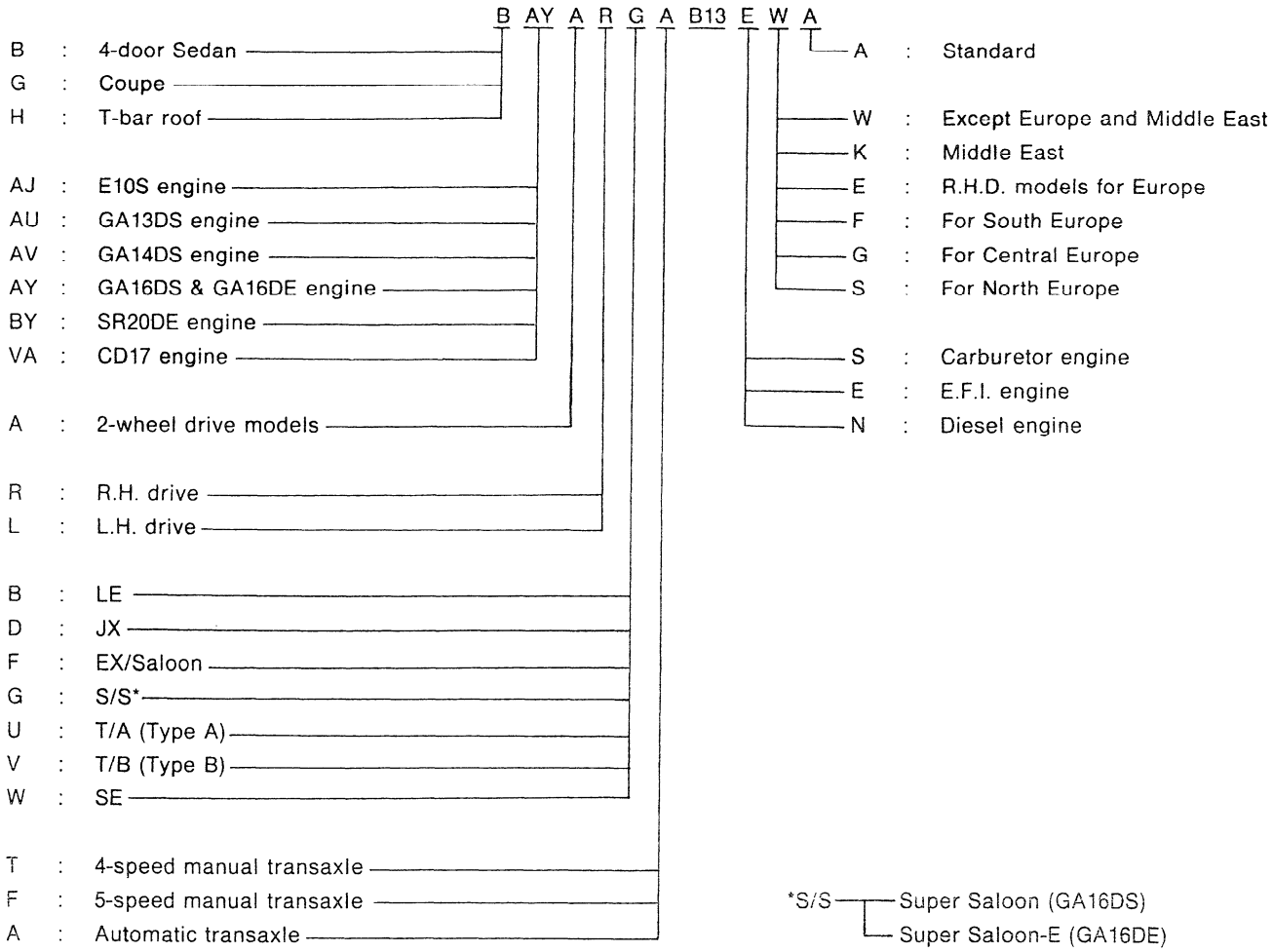
Model Variation (Cont'd)

MODEL B13 SERIES

Destination		Body	Grade (Engine / Transaxle)	GA16DS / RS5F31A	GA16DS / RL4F03A	SR20DE / RS5F32A
Europe	R.H. drive models	Coupe	Type A	GAYARUF-SEA	GAYARUA-SEA	—
			SE	—	—	GBYARWF-EEA
		T-bar roof	Type A	HAYARUF-SEA	HAYARUA-SEA	—
			SE	—	—	HBYARWF-EEA
	For South Europe	Coupe	Type A	GAYALUF-SFA	GAYALUA-SFA	—
			SE	—	—	GBYALWF-EFA
		T-bar roof	Type A	HAYALUF-SFA	HAYALUA-SFA	—
			SE	—	—	HBYALWF-EFA
	For Central Europe	Coupe	Type A	GAYALUF-SGA	GAYALUA-SGA	—
			SE	—	—	GBYALWF-EGA
		T-bar roof	Type A	HAYALUF-SGA	HAYALUA-SGA	—
			SE	—	—	HBYALWF-EGA
	For North Europe	Coupe	Type A	GAYALUF-SSA	GAYALUA-SSA	—
			SE	—	—	GBYALWF-ESA
		T-bar roof	Type A	HAYALUF-SSA	HAYALUA-SSA	—
			SE	—	—	HBYALWF-ESA

Model Variation (Cont'd)

Prefix and suffix designations:



Model Variation (Cont'd)

MODEL N14 SERIES

Destination		Body	Grade	Engine	GA14DS		GA16DS		SR20DE	SR20DET	CD20
				Transaxle	5-speed M/T	4-speed A/T	5-speed M/T	4-speed A/T	5-speed M/T	5-speed M/T	5-speed M/T
					RS5F30A	RL4F03A	RS5F31A	RL4F03A	RS5F32A	RS5F50A	RS5F31A
Europe	R.H. drive models	Sedan	L		BAVARBF-SEA	BAVARBA-SEA	—	—	—	—	BVCARBF-NEA
			LX		BAVARDF-SEA	BAVARDA-SEA	BAYARDF-SEA	BAYARDA-SEA	—	—	BVCARDF-NEA
			SLX		—	—	BAYARFF-SEA	BAYARFA-SEA	—	—	—
		3-door Hatchback	L		EAVARBF-SEA	—	—	—	—	—	—
			LX		EAVARDF-SEA	—	—	—	—	—	—
			SLX		—	—	EAYARFF-SEA	EAYARFA-SEA	—	—	—
			GTI		—	—	—	—	EBYARUF-EEA	—	—
			GTI-R		—	—	—	—	—	EBYNRRF-TEA	—
		5-door Hatchback	L		FAVARBF-SEA	FAVARBA-SEA	—	—	—	—	FVCARBF-NEA
			LX		FAVARDF-SEA	—	FAYARDF-SEA	FAYARDA-SEA	—	—	FVCARDF-NEA
			SLX		—	—	FAYARFF-SEA	FAYARFA-SEA	—	—	—
			GTI		—	—	—	—	FBYARUF-EEA	—	—
	For South Europe	Sedan	LX		BAVALDF-SFA	BAVALDA-SFA	—	—	—	—	BVCALDF-NFA
			SLX		BAVALFF-SFA	BAVALFA-SFA	BAYALFF-SFA	BAYALFA-SFA	—	—	BVCALFF-NFA
			SLX 4WD		—	—	BAYNLFF-SFA	—	—	—	—
		3-door Hatchback	L		EAVALBF-SFA	—	—	—	—	—	—
			LX		EAVALDF-SFA	EAVALDA-SFA	—	—	—	—	EVCALDF-NFA
			SLX		EAVALFF-SFA	—	EAYALFF-SFA	EAYALFA-SFA	—	—	EVCALFF-NFA
			GTI		—	—	—	—	EBYALUF-EFA	—	—
			GTI-R		—	—	—	—	—	EBYNLRF-TFA	—
		5-door Hatchback	LX		FAVALDF-SFA	—	—	—	—	—	FVCALDF-NFA
			SLX		FAVALFF-SFA	FAVALFA-SFA	FAYALFF-SFA	FAYALFA-SFA	—	—	FVCALFF-NFA
			GTI		—	—	—	—	FBYALUF-EFA	—	—
	For Central Europe	Sedan	LX		BAVALDF-SGA	—	—	—	—	—	BVCALDF-NGA
			SLX		BAVALFF-SGA	—	BAYALFF-SGA	BAYALFA-SGA	—	—	BVCALFF-NGA
			SLX 4WD		—	—	BAYNLFF-SGA	—	—	—	—
		3-door Hatchback	L		EAVALBF-SGA	—	—	—	—	—	—
			LX		EAVALDF-SGA	EAVALDA-SGA	—	—	—	—	EVCALDF-NGA
			SLX		EAVALFF-SGA	—	EAYALFF-SGA	EAYALFA-SGA	—	—	EVCALFF-NGA
			GTI		—	—	—	—	EBYALUF-EGA	—	—
			GTI-R		—	—	—	—	—	EBYNLRF-TGA	—
		5-door Hatchback	LX		FAVALDF-SGA	—	FAYALDF-SGA	—	—	—	FVCALDF-NGA
			SLX		FAVALFF-SGA	—	FAYALFF-SGA	FAYALFA-SGA	—	—	FVCALFF-NGA
			GTI		—	—	—	—	FBYALUF-EGA	—	—
	For North Europe	Sedan	L		BAVALBF-SSA	—	—	—	—	—	—
			LX		BAVALDF-SSA	—	BAYALDF-SSA	—	—	—	BVCALDF-NSA
			SLX		—	—	BAYALFF-SSA	BAYALFA-SSA	—	—	—
			SLX 4WD		—	—	BAYNLFF-SSA	—	—	—	—
		3-door Hatchback	L		EAVALBF-SSA	—	—	—	—	—	—
			LX		EAVALDF-SSA	EAVALDA-SSA	EAYALDF-SSA	—	—	—	—
			SLX		—	—	EAYALFF-SSA	EAYALFA-SSA	—	—	—
			GTI		—	—	—	—	EBYALUF-ESA	—	—
			GTI-R		—	—	—	—	—	EBYNLRF-TSA	—
		5-door Hatchback	LX		FAVALDF-SSA	—	FAYALDF-SSA	—	—	—	—
			SLX		—	—	FAYALFF-SSA	—	—	—	—
			GTI		—	—	—	—	FBYALUF-ESA	—	—

Model Variation (Cont'd)

Destination		Engine / Transaxle / Grade / Body		GA14DS		GA16DE	
				5-speed M/T	4-speed A/T	5-speed M/T	4-speed A/T
				RS5F30A	RL4F03A	RS5F31A	RL4F03A
Except Europe	R.H. drive	5-door Hatchback	K1	FAVAREF-SHA	FAVAREA-SHA	—	—
			J1J	—	—	FAYARGF-EHA	FAYARGA-EHA

Prefix and suffix designations:

F A Y A R G A N14 E H A

- B : 4-door Sedan
- E : 3-door Hatchback
- F : 5-door Hatchback

- AV : GA14DS engine
- AY : GA16DS or GA16DE engine
- BY : SR20DE or SR20DET engine
- VC : CD20 engine

- A : 2-wheel drive models
- N : 4-wheel drive models

- R : R.H. drive
- L : L.H. drive

- B : L
- D : LX
- E : K1
- F : SLX
- G : J1J
- R : GTI-R
- U : GTI

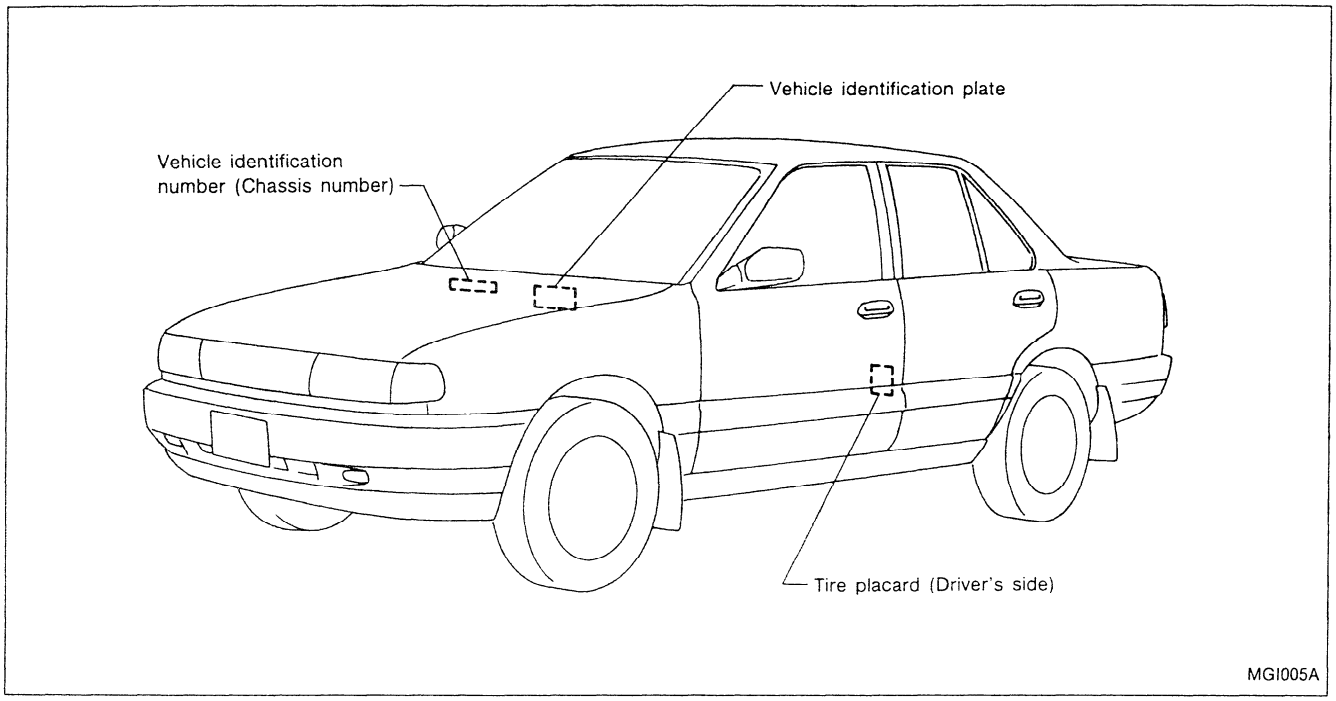
- F : 5-speed manual transaxle
- A : Automatic transaxle

- A : Standard

- H : Except for Europe
- E : R.H.D. models for Europe
- F : For South Europe
- G : For Central Europe
- S : For North Europe

- S : Carburetor engine
- E : E.F.I. engine
- N : Diesel engine
- T : Turbo engine

Identification Number



VEHICLE IDENTIFICATION NUMBER (Chassis number)

Prefix and suffix designations:

Model B13 series
(Except Europe)

B B A B13—XXXXXX

Body type
- B : Sedan
- G : Coupe
- H : T-bar roof

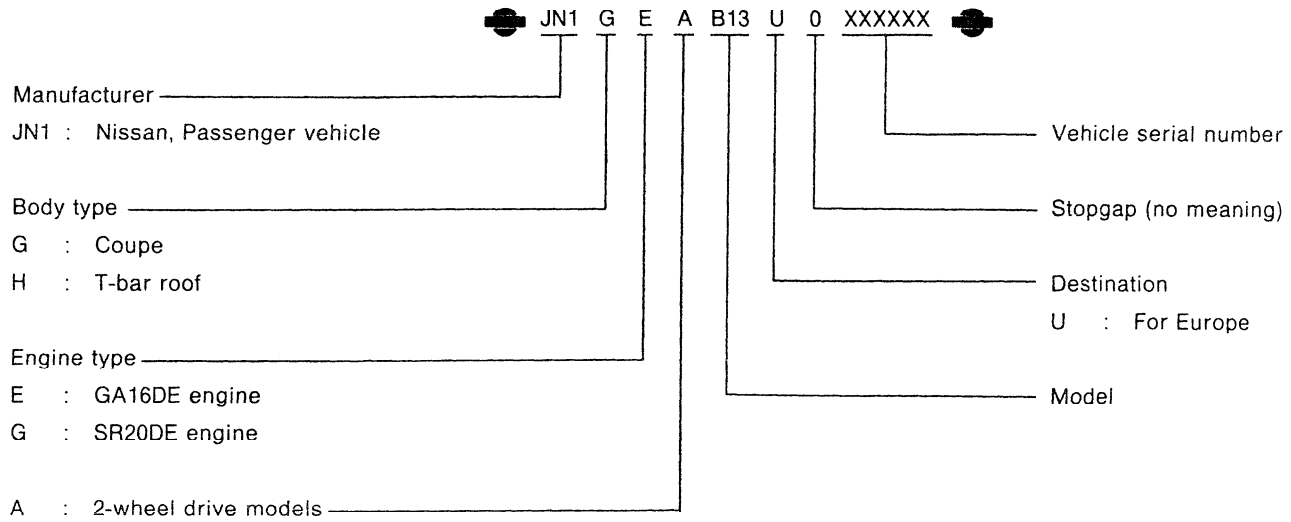
Engine type
- A : E10S engine
- B : GA13DS engine
- C : GA14DS engine
- E : GA16DS or GA16DE engine
- H : CD17 engine

A : 2-wheel drive models

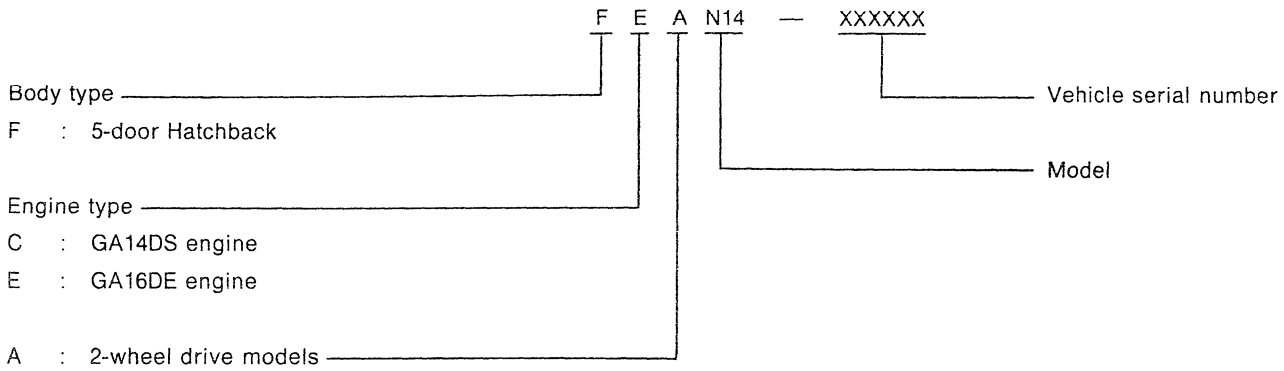
Model

Vehicle serial number

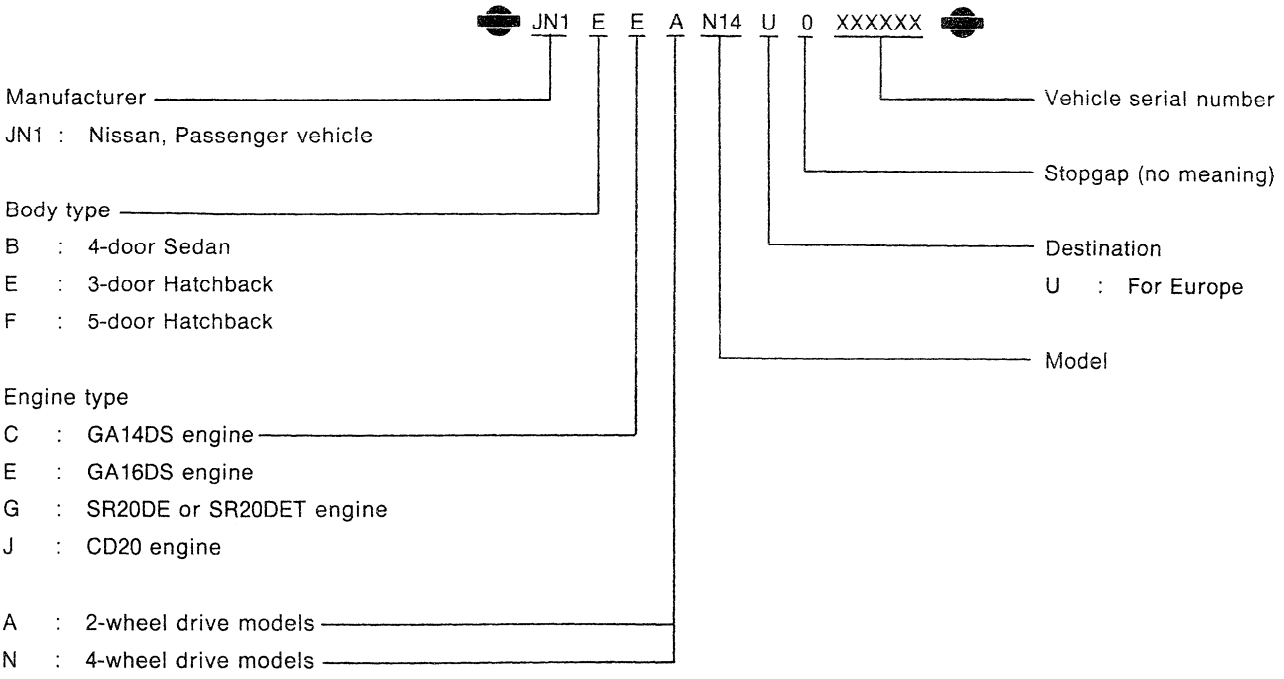
(For Europe)



Model N14 series
(Except Europe)



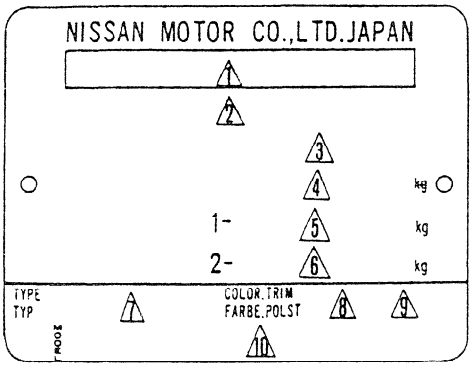
(For Europe)



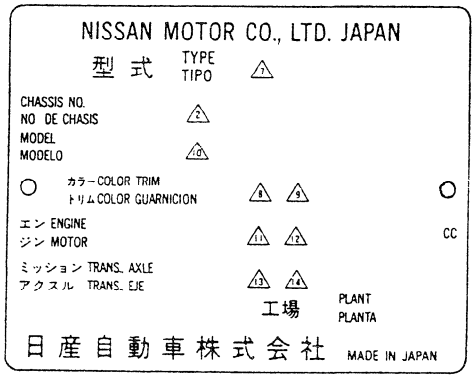
Identification Number (Cont'd)

IDENTIFICATION PLATE

Europe



Except Europe

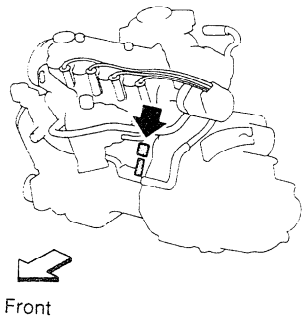


1 Type approval number
2 Vehicle identification number (Chassis number)
3 Gross vehicle weight
4 Gross combination weight
Gross vehicle weight
+ Gross trailing capacity (Weight)
5 Gross axle weight (Front)
6 Gross axle weight (Rear)
7 Type
8 Body color code
9 Trim color code
10 Model
11 Engine model
12 Engine displacement
13 Transaxle model
14 Axle model

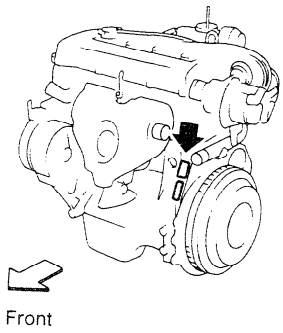
SGI704

ENGINE SERIAL NUMBER

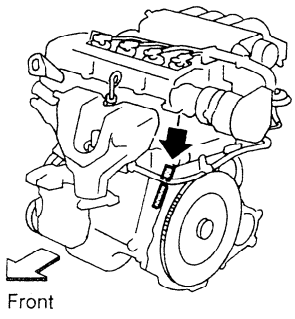
E10S engine



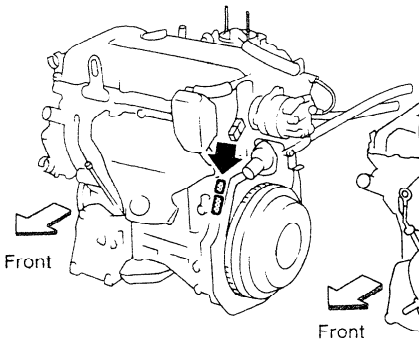
GA13DS, 14DS, 16DS engine



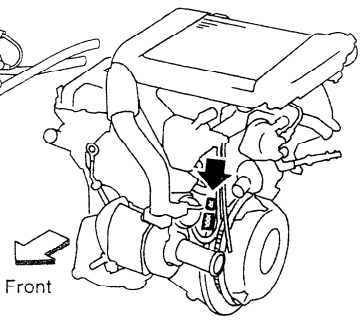
GA16DE engine



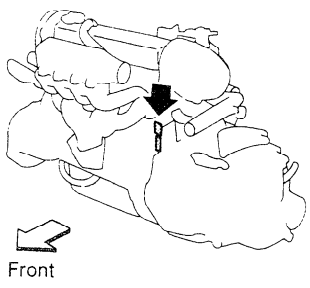
SR20DE engine



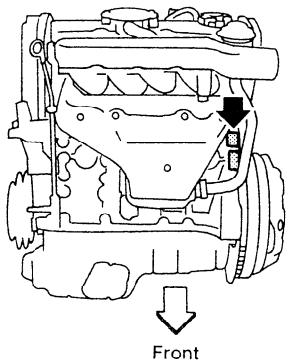
SR20DET engine



CD17 engine



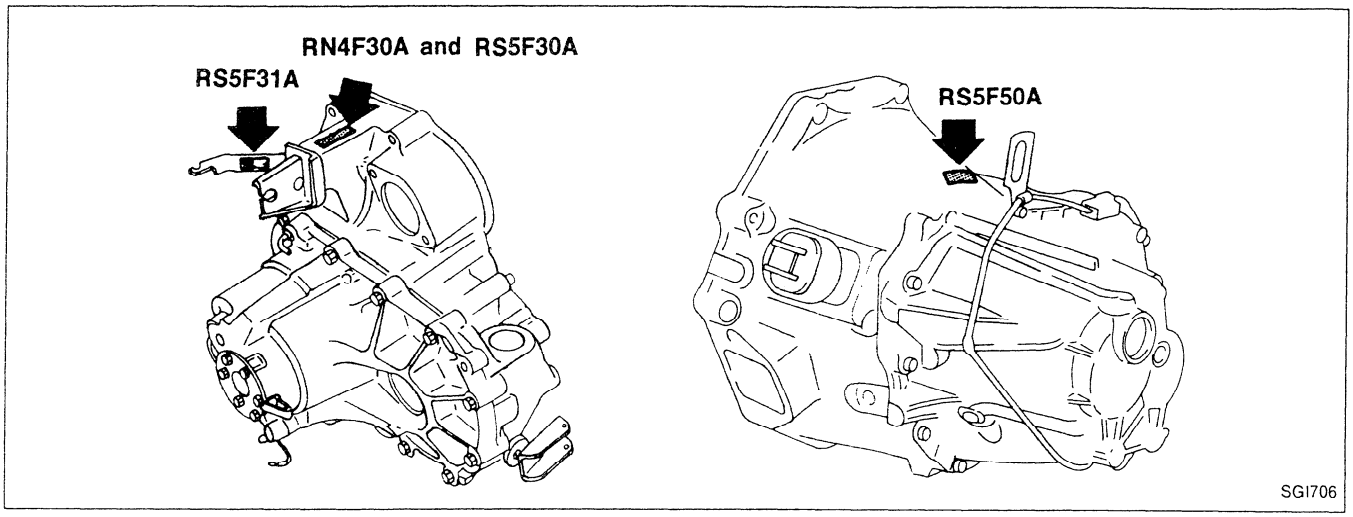
CD20 engine



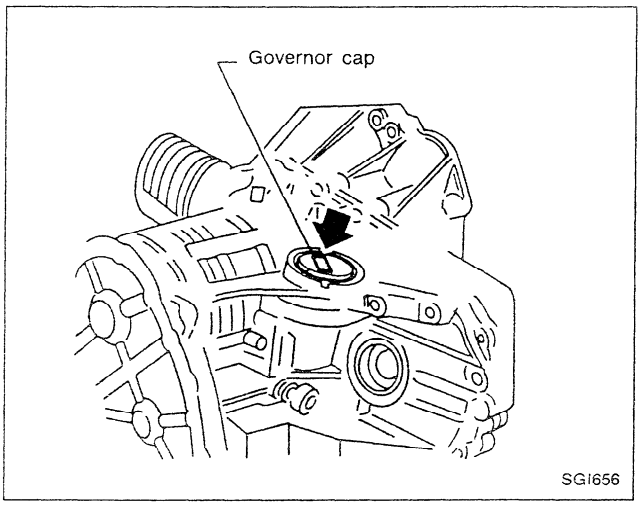
SGI705

Identification Number (Cont'd)

MANUAL TRANSAXLE NUMBER



AUTOMATIC TRANSAXLE NUMBER



Dimensions

MODEL B13 SERIES

Unit: mm (in)

	Sedan	Coupe
Overall length	4,210 (165.7)	4,140 (163.0) 4,135 (162.8)*4
Overall width	1,660 (65.4)*1 1,670 (65.7)	1,680 (66.1)
Overall height	1,375 (54.1)	1,310 (51.6) 1,315 (51.8)*2
Front tread	1,435 (56.5)*3 1,445 (56.9)	1,435 (56.5)*3 1,445 (56.9)
Rear tread	1,415 (55.7)*3 1,435 (56.5)	1,415 (55.7)*3 1,435 (56.5)
Wheelbase	2,430 (95.7)	2,430 (95.7)

*1: LE grade
*2: T-bar roof models
*3: 185/60R14 tire (Except Europe)/175/65R14 tire (For Europe)
*4: For Europe

MODEL N14 SERIES

Unit: mm (in)

	Sedan	3-door Hatchback	5-door Hatchback (For Europe)	5-door Hatchback (Except for Europe)
Overall length	4,230 (166.5)	3,975 (156.5)	4,145 (163.2)	4,145 (163.2)
Overall width	1,670 (65.7)	1,670 (65.7) 1,690 (66.5)*1	1,670 (65.7) 1,690 (66.5)*1	1,670 (65.7)
Overall height	1,395 (54.9) 1,410 (55.5)*2	1,395 (54.9) 1,410 (55.5)*2	1,395 (54.9)	1,385 (54.5)
Front tread	1,446 (56.9)*3 1,436 (56.5)*4	1,446 (56.9)*3 1,436 (56.5)*4	1,446 (56.9)*3 1,436 (56.5)*4	1,445 (56.9)
Rear tread	1,431 (56.3)*5 1,421 (55.9)*6	1,431 (56.3)*5 1,421 (55.9)*6	1,431 (56.3)*5 1,421 (55.9)*6	1,435 (56.5)
Wheelbase	2,430 (95.7)	2,430 (95.7)	2,430 (95.7)	2,430 (95.7)

*1: SR series engine models
*2: 4WD models
*3: Tire offset 40 mm (1.57 in)
*4: Tire offset 45 mm (1.77 in)
*5: 155SR13, 175/70R13 tire
*6: 175/65R14, 195/55R14 tire

Wheels and Tires

MODEL B13 SERIES

Except Europe

Wheels & tires \ Body			Coupe & T-bar roof model	Offset mm (in)	4-door sedan	Offset mm (in)
Wheel size	Steel	Standard	14 × 5-1/2JJ*8	45 (1.77)	13 × 5J	40 (1.57)
			13 × 5J*6	40 (1.57)		
		Option	—	—	14 x 5-1/2JJ*1	45 (1.77)
	Alu-minum	Option	13 × 5J*6	40 (1.57)	13 × 5J*7	40 (1.57)
			14 × 5-1/2JJ*8	45 (1.77)	14 × 5-1/2JJ*2	45 (1.77)
Tire size		Standard	185/60R14 82H*8 155/80R13 78S*6		155SR13*3 175/70R13 82S*4 6.15-13-4PR*5 155/80R13 78S*6	
		Option	175/70R13 82S*6		155SR13*5 175/70R13 82S*3,*6 185/60R14 82H*1 175/65R14 82H*1	

*1: GA16DS & GA16DE engine models
*2: Super saloon for GA16DS and GA16DE engine models
*3: Except E10S and GA16DE engine models
*4: GA16DE engine model
*5: E10S engine model
*6: For Middle East
*7: Except GA14DS engine for Middle East
*8: For General areas

For Europe

Wheels & tires \ Engine			GA16DS engine	Offset mm (in)	SR20DE engine	Offset mm (in)
Wheel size	Steel	Standard	14 × 5-1/2JJ	45 (1.77)	—	—
	Alu-minum	Standard	—	—	14 × 6JJ	40 (1.57)
		Option	14 × 5-1/2JJ	45 (1.77)	—	
	T-type	Standard	14 × 4T	40 (1.57)	15 × 4T	40 (1.57)
Tire size	Con-ven-tional	Standard	175/65R14 82H		195/55R14 82V	
	T-type	Standard	T115/70D14		T135/70D15	

Wheels and Tires (Cont'd)

MODEL N14 SERIES

Except Europe

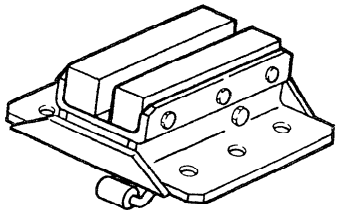
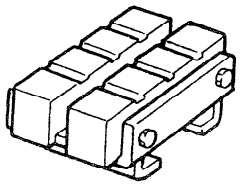
Wheel & Tire \ Engine			GA14DS		GA16DE	
				Offset mm (in)		Offset mm (in)
Wheel size	Steel	Standard	13 x 5J	40 (1.57)	14 x 5-1/2JJ	45 (1.77)
	Aluminum	Option	—	—	14 x 5-1/2JJ	45 (1.77)
Tire size			175/70R13 82S		175/65R14 82H	

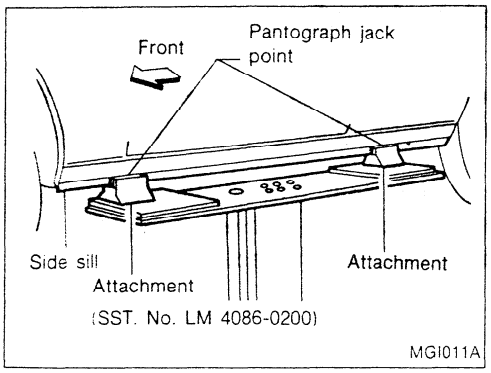
For Europe

Wheel & Tire \ Engine			GA14DS		GA16DS		SR20DE		SR20DET		CD20	
				Offset mm (in)		Offset mm (in)		Offset mm (in)		Offset mm (in)		Offset mm (in)
Wheel size	Steel	Standard	13 × 5J	40 (1.57)	13 × 5J	40 (1.57)	—	—	—	—	13 × 5J	40 (1.57)
	Aluminum		—	—	—	—	14 × 6JJ	40 (1.57)	14 × 6JJ	40 (1.57)	—	—
	Steel	Option	—	—	14 × 5-1/2JJ *3	45 (1.77)	14 × 6JJ	40 (1.57)	14 × 6JJ	40 (1.57)	—	—
	Aluminum		13 × 5J *5	40 (1.57)	13 × 5J *5	40 (1.57)	—	—	—	—	13 × 5J *5	40 (1.57)
	T-type	Standard	—	—	—	—	—	—	15 × 4T	40 (1.57)	—	—
		Option	14 × 4T	40 (1.57)	14 × 4T*1 15 × 4T*2	40 (1.57) 40 (1.57)	15 × 4T	40 (1.57)	—	—	14 × 4T	40 (1.57)
Tire size	Conventional	Standard	155SR13		175/70R13 82H		195/55R14 82V		195/55R14 82V		175/70R13 82S	
		Option	175/70R13 82S*4		175/65R14 82H*3		—		—		—	
	T-type	Standard	—		—		—		T135/70D15		—	
		Option	T115/70D14		T115/70D14*1 T135/70D15*2		T135/70D15		—		T115/70D14	

*1: Except SLX 4WD
*2: SLX 4WD
*3: Except North Europe
*4: Except R.H.D. models for Europe
*5: Except Central Europe

SPECIAL SERVICE TOOLS

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



Board-on Lift

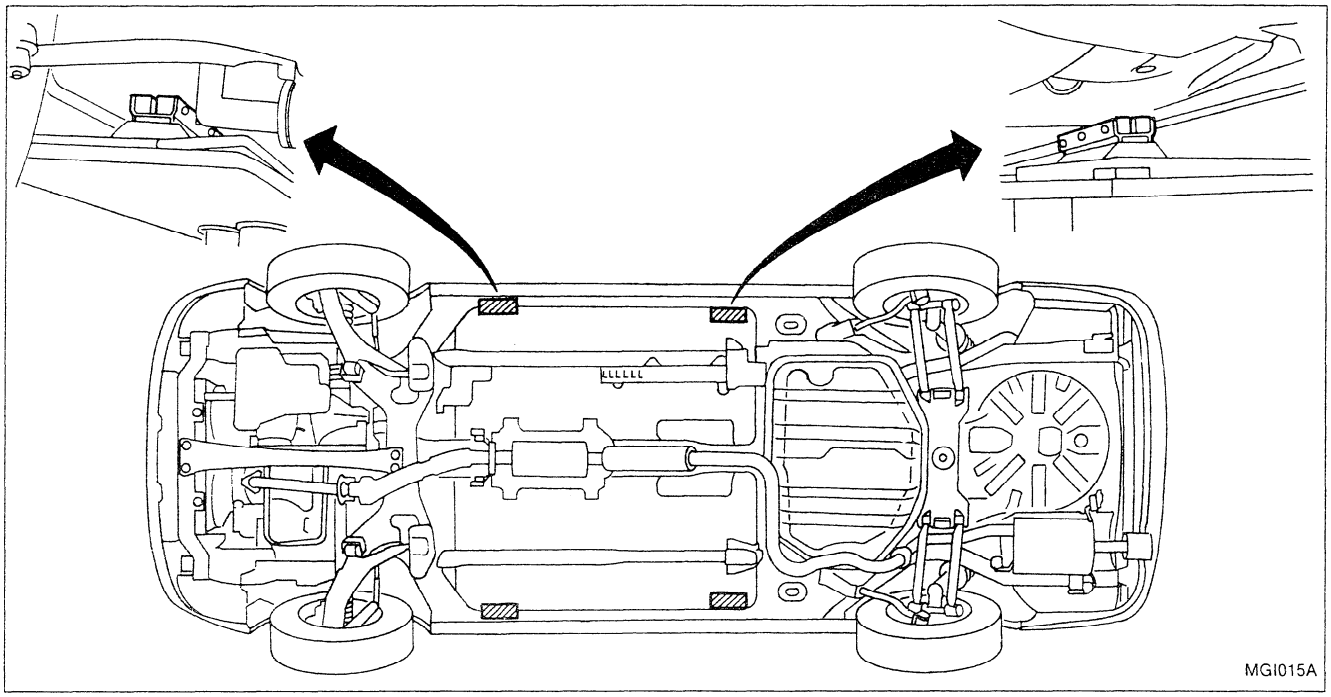
CAUTION:

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.**

Models with sill spoiler

Fix board-on lift attachments to inner side of sill when the side sill flange is covered by sill spoiler.

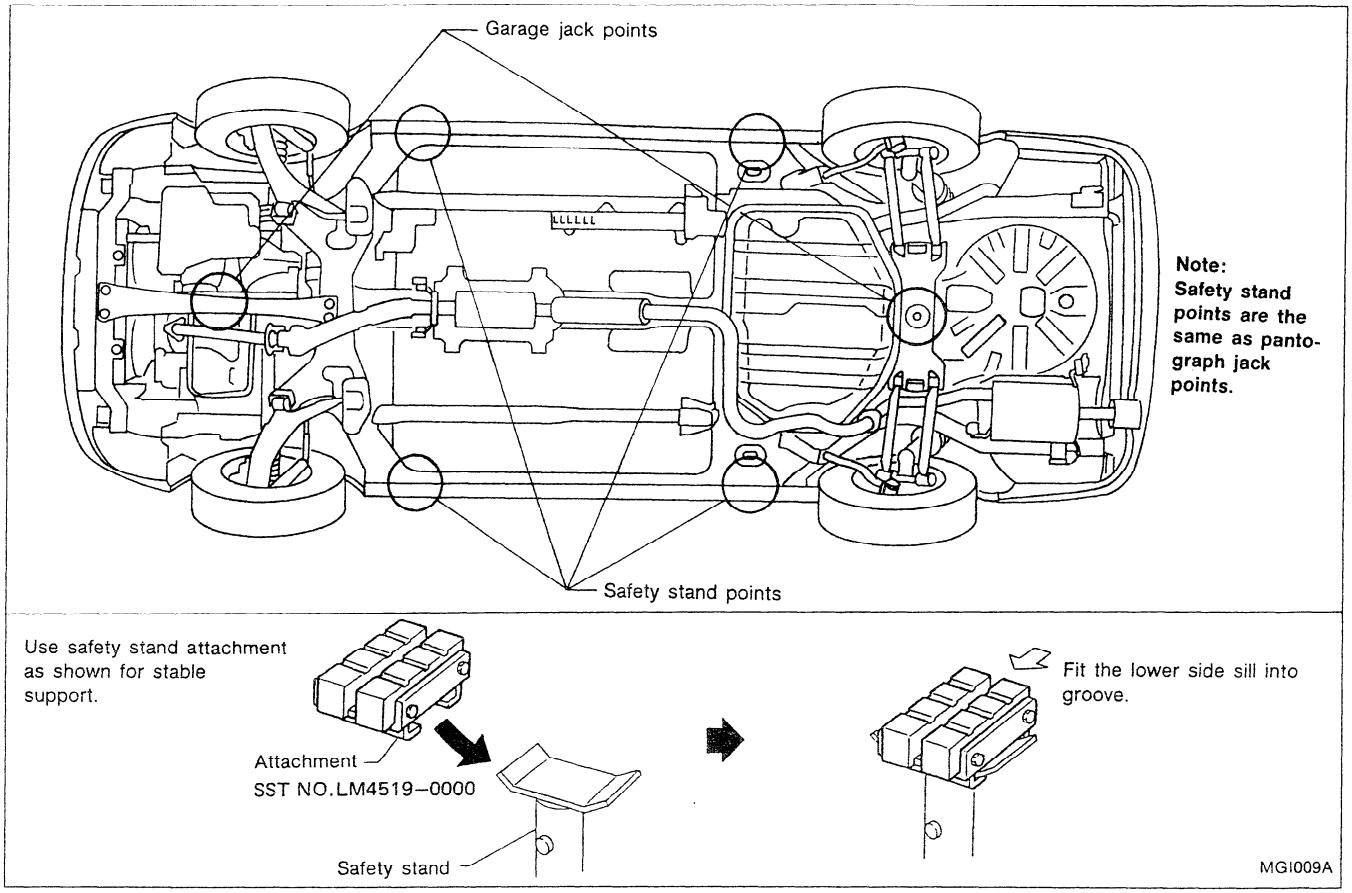


Garage Jack and Safety Stand

WARNING:

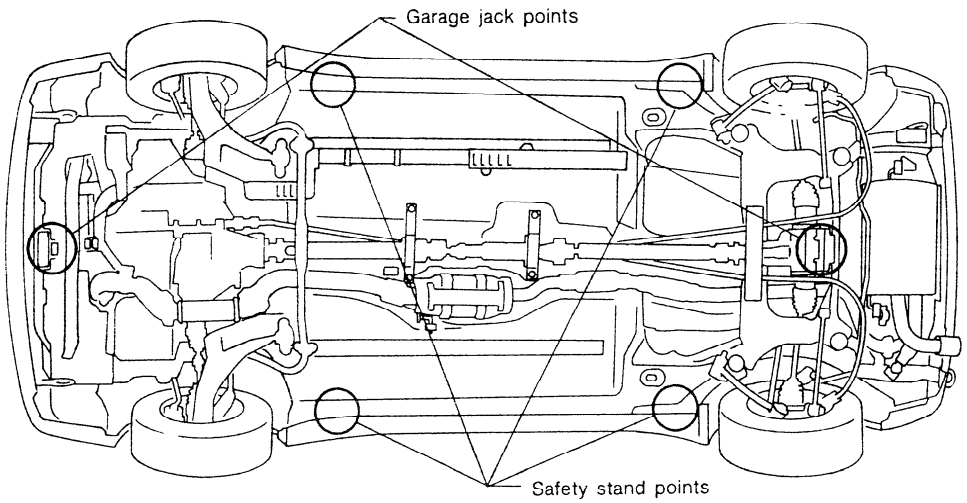
- **Never get under the vehicle while it is supported only by the jack. Always use safety stands when you have to get under the vehicle.**
- **Place wheel chocks at the front wheels when the rear wheels are raised and place wheel chocks at the rear wheels when the front wheels are raised.**

2-wheel drive models

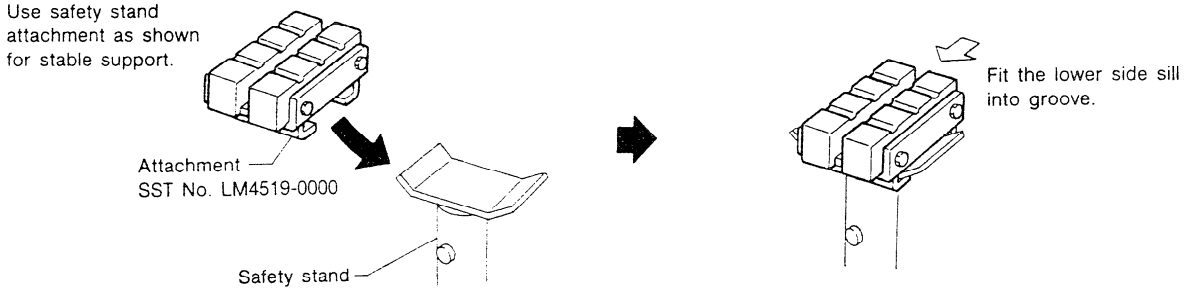


Garage Jack and Safety Stand (Cont'd)

4-wheel drive models



Note:
Safety stand points are the same as pantograph jack points.



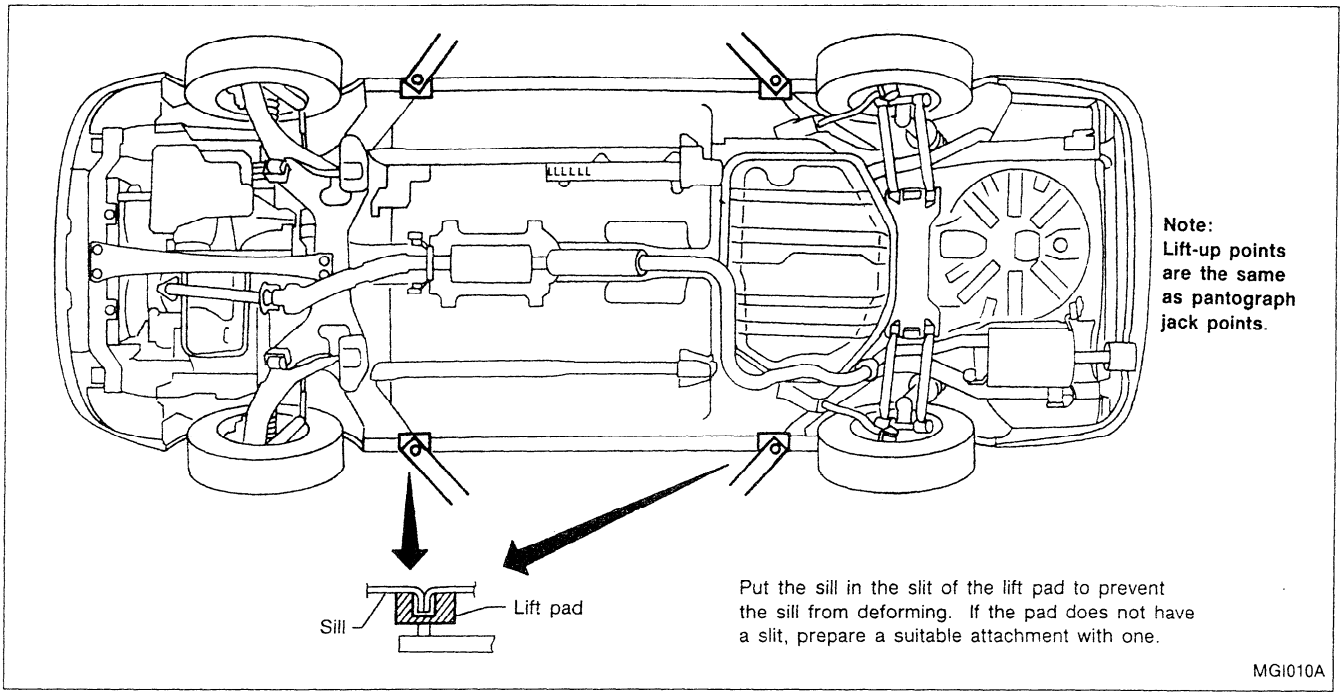
SGI707

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.

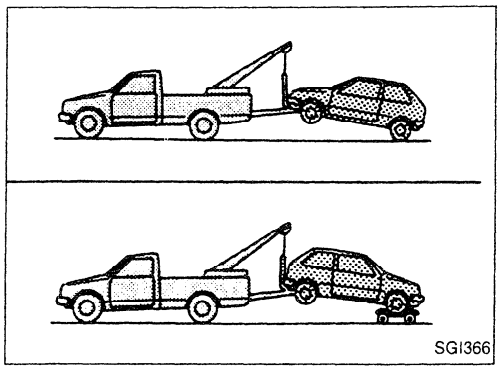
When setting the lift arm, do not allow the arm to contact the brake tubes and fuel lines.



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 a towing operation.**
- **When towing with the rear wheels on the ground, release the parking brake and move the gearshift lever to neutral ("N" position).**



2-WHEEL DRIVE MODELS

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

Tow Truck Towing (Cont'd)

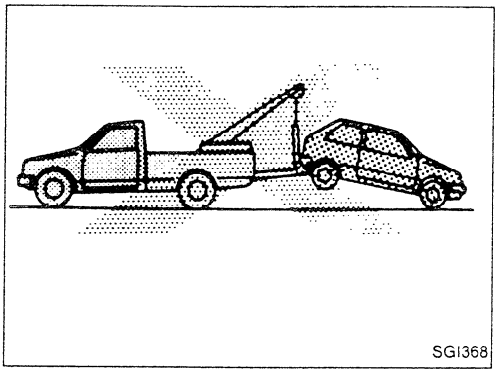
Towing an automatic transaxle model with four wheels on ground

Observe the following restricted towing speeds and distances.

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

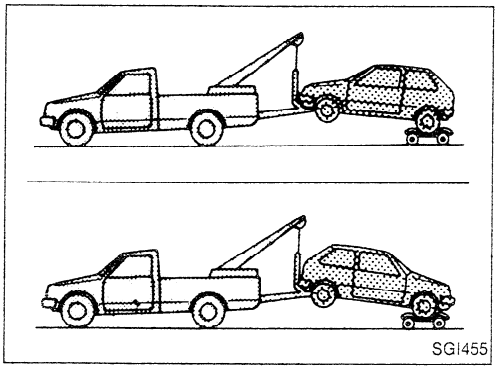
CAUTION:

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.


SGI368

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.


SGI455

4-WHEEL DRIVE MODELS

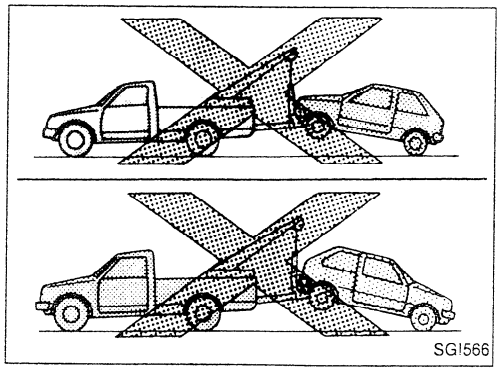
NISSAN recommends that the 4-wheel drive vehicle be towed with all wheels off the ground as follows:

1. Using a flat-bed truck.
2. Using a combination of a two truck and a dolly as illustrated.

Towing 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)

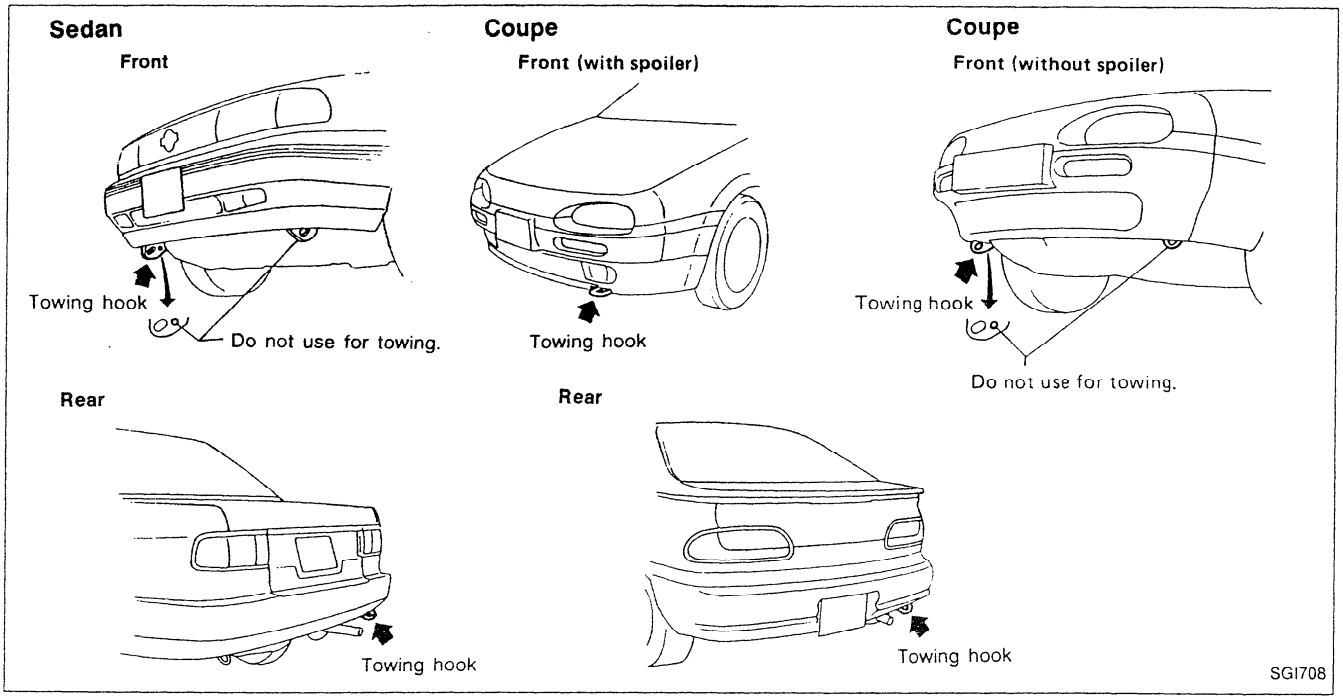

SGI566

Towing a 4-wheel drive model with front or rear wheels raised (With rear or front wheels on the ground)

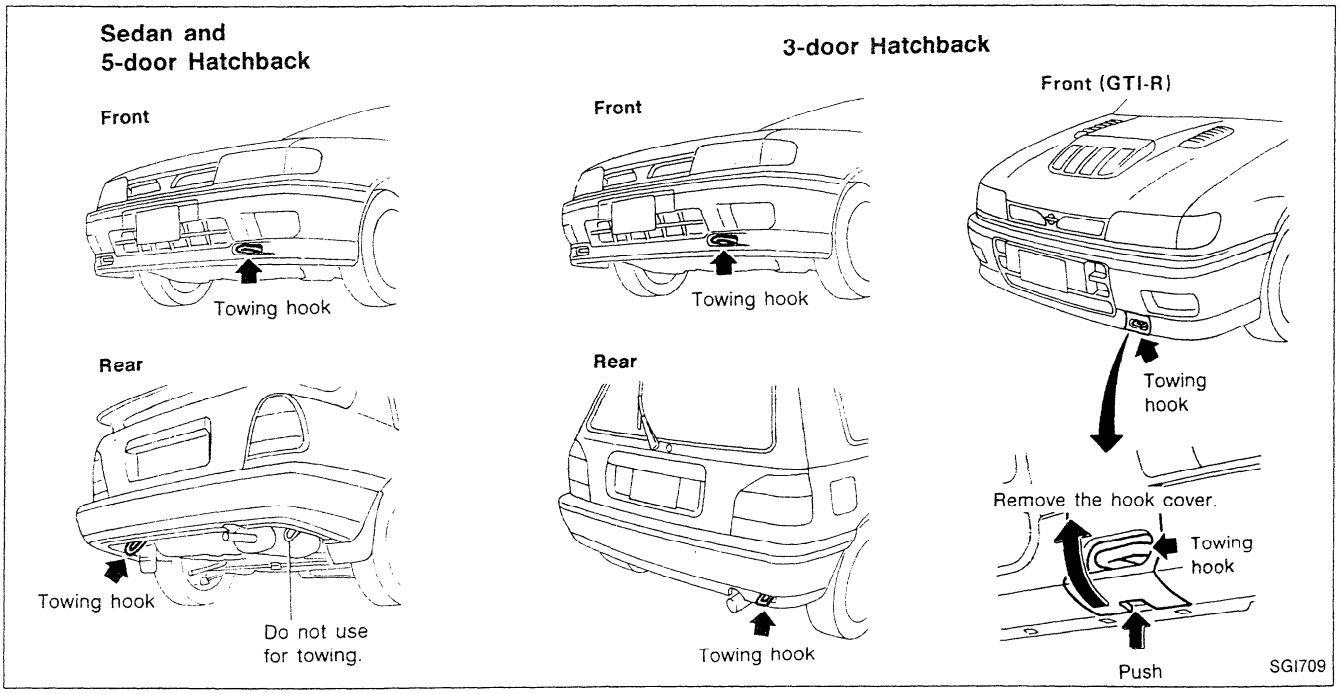
Never tow a 4-wheel drive model with front or rear wheels raised and rear or front wheels on the ground as this may cause serious and expensive damage to the transaxle. If it is necessary to tow the vehicle with the front or rear wheels raised, always use a towing dolly under the rear or front wheels.

Tow Truck Towing (Cont'd)

Model B13 series



Model N14 series



TOWING POINTS

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

CAUTION:

a. When doing on-the-car wheel balancing with a full-time 4WD vehicle, to prevent the wheels from rotating at different speeds or in different directions from each other (which could lead to damage to transaxle gear), always be sure to observe the following precautions:

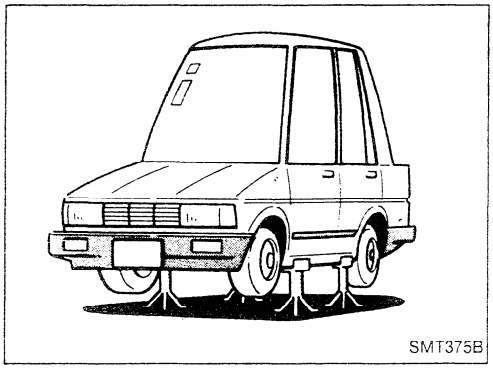
1) All four wheels should be jacked up, clearing the ground completely.

2) The wheels should be rotated with both the engine and the wheel balancer engaged.

3) The parking brake lever should be fully released.

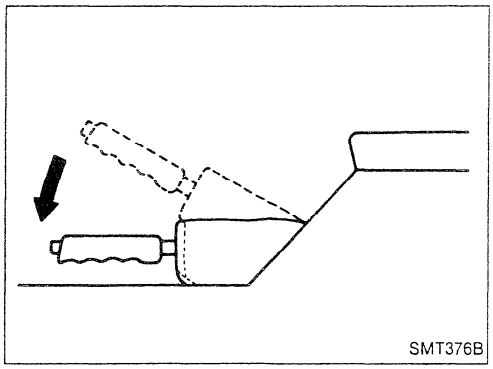
4) None of the brakes should be allowed to drag.

b. Avoid sudden acceleration, deceleration and braking.

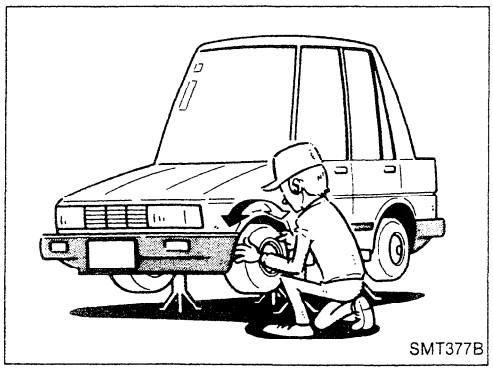

SMT375B

1. Jack up vehicle so that all four wheels can rotate.

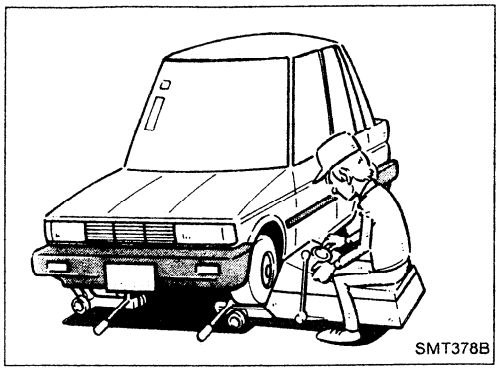
Make sure the vehicle is firmly supported on stands.


SMT376B

2. Release parking brake fully.


SMT377B

3. Make sure that brakes are not dragging on any of four wheels.


SMT378B

4. Place wheel to be balanced on wheel balancer.
   Follow the procedure specified by the wheel balancer manufacturer.

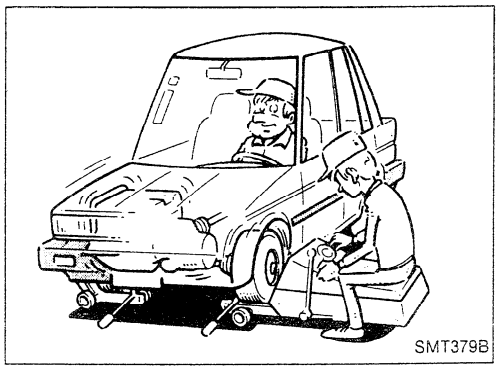
5. Start engine
6.

— **M/T MODEL** —

Put shift lever in 3rd or 4th gear and engage clutch slowly, then gradually increase speed to test speed.

— **A/T MODEL** —

Put shift lever into "D" position, then gradually increase speed to test speed.


SMT379B

7. Rotate wheels using both engine's driving force and wheel balancer driving force and check wheel balance.

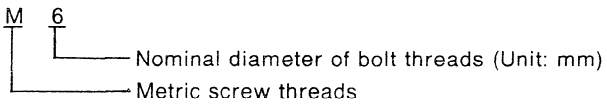
Assure that the other wheels will rotate at the same time.

Grade	Bolt size	Bolt diameter* mm	Pitch mm	Tightening torque (Without lubricant)					
				Hexagon head bolt			Hexagon flange bolt		
				N·m	kg-m	ft-lb	N·m	kg-m	ft-lb
4T	M6	6.0	1.0	5.1	0.52	3.8	6.1	0.62	4.5
	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	10	1.0	7
	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.

Grade	Mark
4T	4
7T	7
9T	9

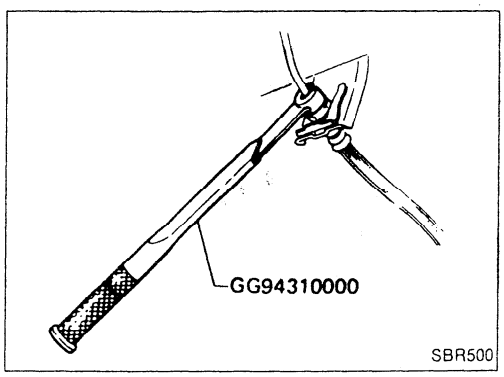
*: Nominal diameter



SECTION CL

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CLUTCH SYSTEM — Hydraulic Type (SR20DET engine models) ..... CL- 3
CLUTCH SYSTEM — Mechanical Type ..... CL- 4
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Precautions

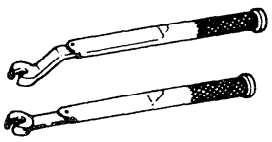
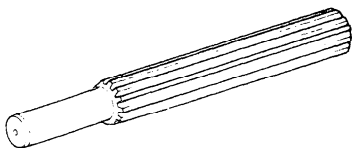
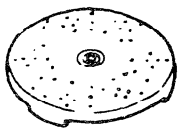
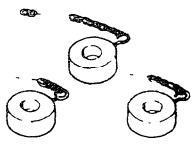
- **Recommended fluid is brake fluid "DOT 3".**
- **Do not reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**
- **When removing and installing clutch piping, use Tool.**
- **Use new brake fluid to clean or wash all parts of master cylinder, operating cylinder and clutch damper.**
- **Never use mineral oils such as gasoline or kerosene. It will ruin the rubber parts of the hydraulic system.**

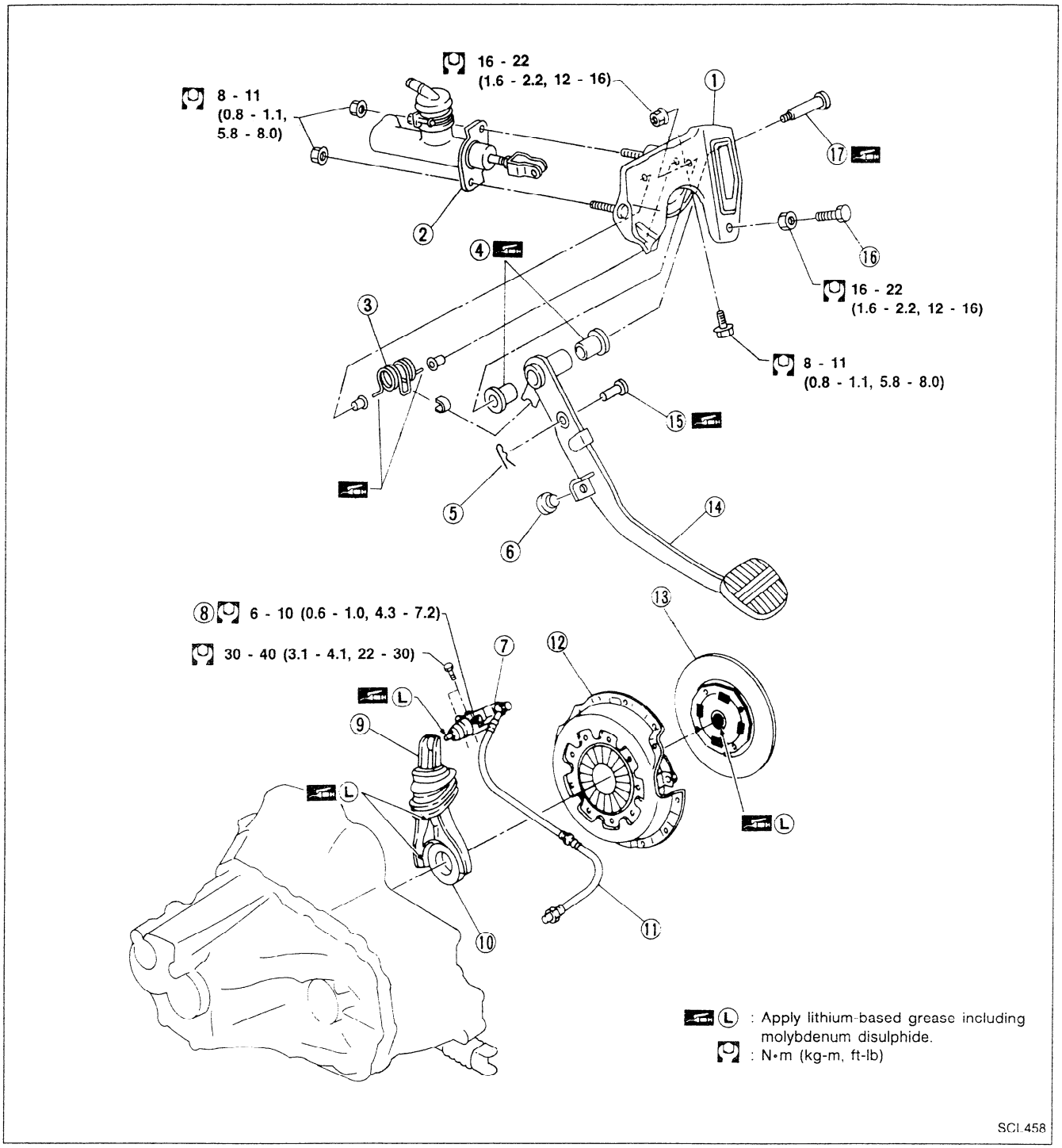
WARNING:
After cleaning clutch disc, wipe it with a dust collector. Do not use compressed air.

Preparation

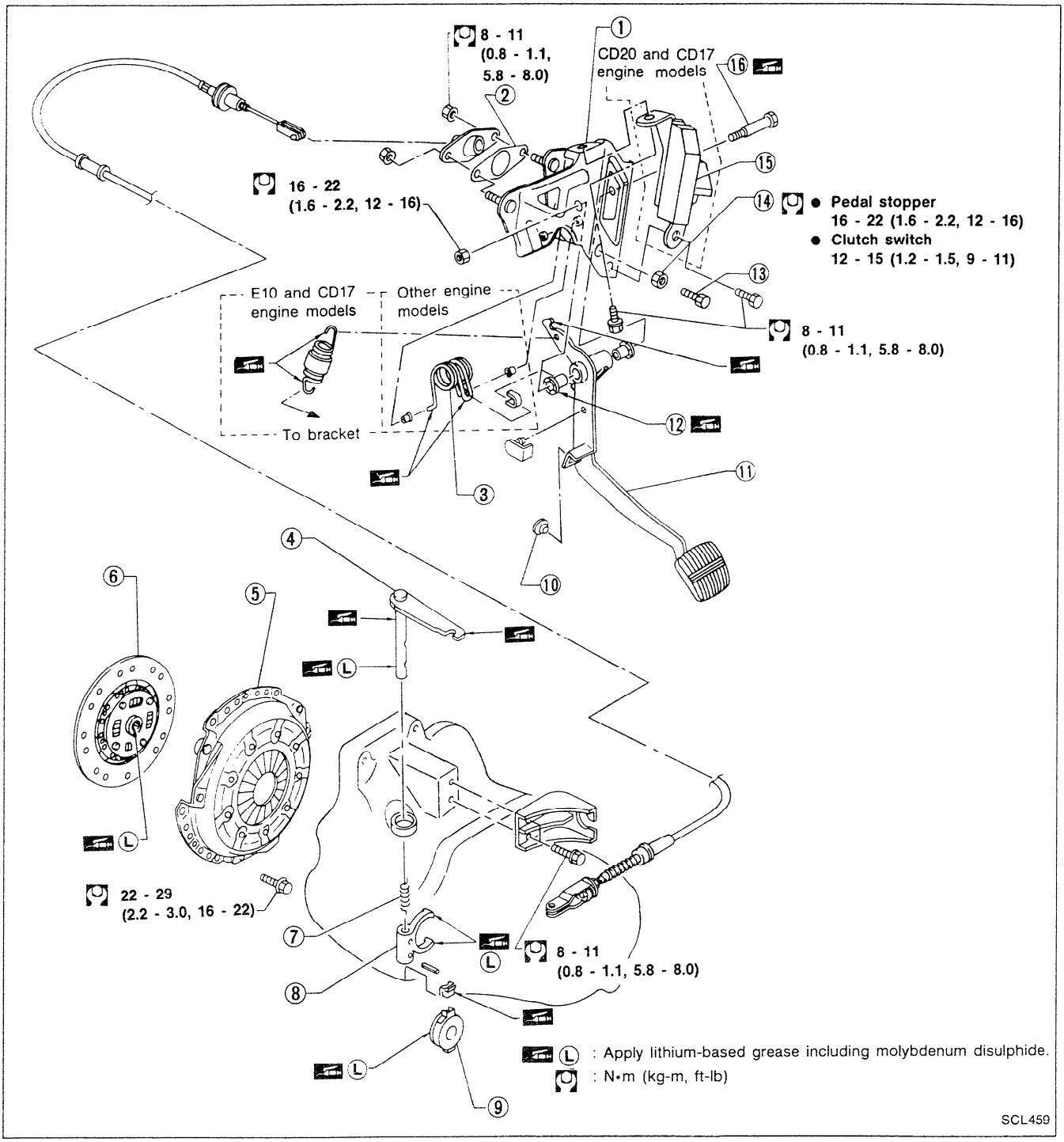
SPECIAL SERVICE TOOLS

*: Special tool or commercial equivalent

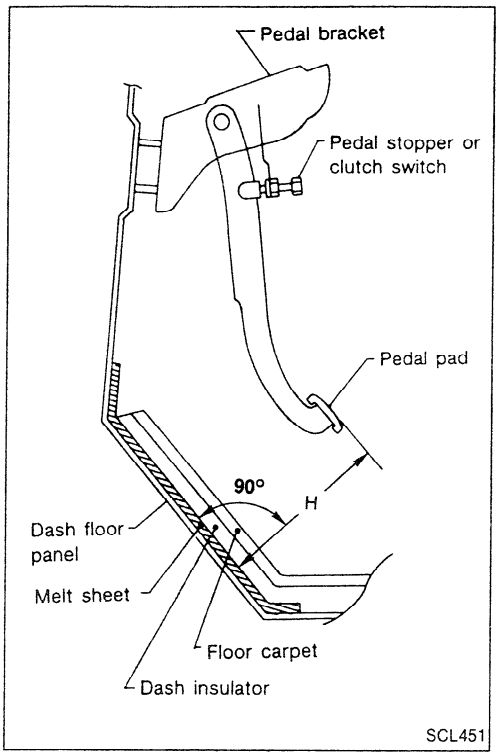
Tool number Tool name	Description	
GG94310000* Flare nut torque wrench		Removing and installing clutch piping
KV30101000* Clutch aligning bar		Installing clutch cover and clutch disc
ST20050010 Base plate		Inspecting diaphragm spring of clutch cover
ST20050100 Distance piece		Inspecting diaphragm spring of clutch cover
ST20050240* Diaphragm spring adjusting wrench		Adjusting unevenness of diaphragm spring of clutch cover



① Clutch pedal bracket
② Clutch master cylinder
③ Assist spring
④ Bushing
⑤ Pin
⑥ Stopper rubber
⑦ Operating cylinder
⑧ Air bleeder screw
⑨ Withdrawal lever
⑩ Release bearing
⑪ Clutch hose
⑫ Clutch cover
⑬ Clutch disc
⑭ Clutch pedal
⑮ Clevis pin
⑯ Pedal stopper
⑰ Fulcrum pin

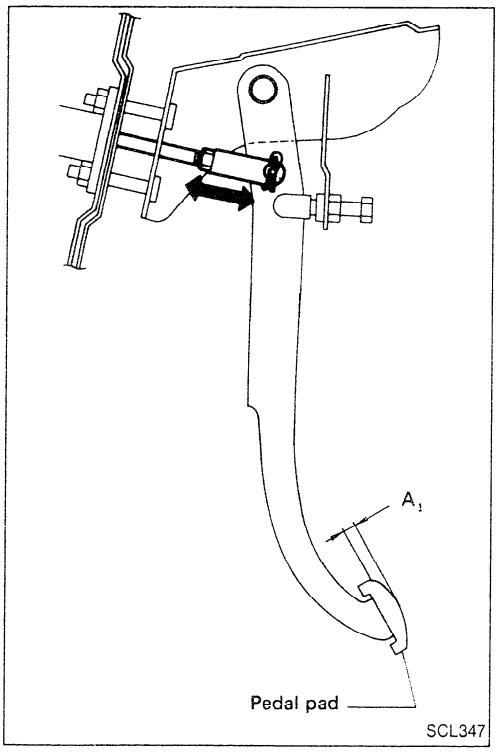


① Clutch pedal bracket
② Insulator
③ Assist spring
④ Withdrawal lever
⑤ Clutch cover
⑥ Clutch disc
⑦ Return spring
⑧ Clutch lever
⑨ Release bearing
⑩ Stopper rubber
⑪ Clutch pedal
⑫ Bushing
⑬ Pedal stopper or clutch switch
⑭ Lock nut
⑮ Mass damper
⑯ Fulcrum pin



Adjusting Clutch Pedal

1. Adjust pedal height with pedal stopper or clutch switch.
   Pedal height "H":
   Refer to S.D.S.

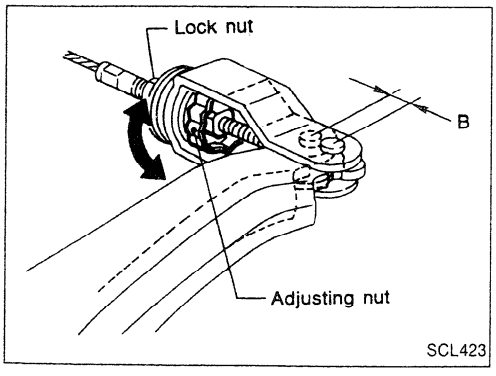


— For hydraulic type —

2. Adjust pedal free play with master cylinder push rod. Then tighten lock nut.
   Pedal free play "A_1":
   1.0 - 3.0 mm (0.039 - 0.118 in)

Pedal free play means the following total, measured at position of pedal pad:

- **Play due to clevis pin and clevis pin hole in clutch pedal.**



— For mechanical type —

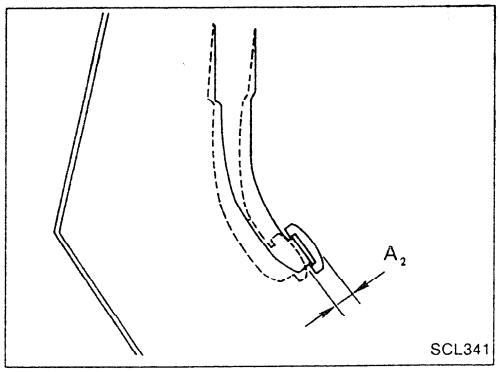
2. Adjust withdrawal lever play "B" according to the following procedure.

(1) Push withdrawal lever by hand until resistance is felt, and then tighten adjusting nut.

(2) Turn back adjusting nut 2.5 to 3.5 turns, and then tighten lock nut.

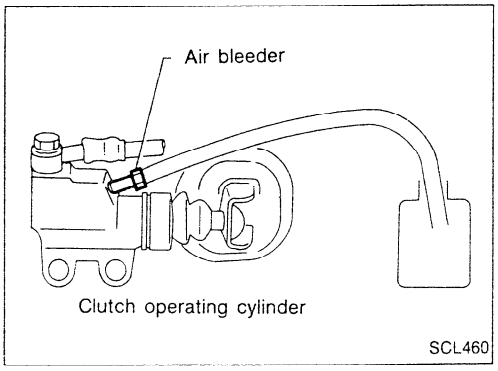
Withdrawal lever play "B":
2.5 - 3.5 mm (0.098 - 0.138 in)
Lock nut:
: 3 - 4 N·m (0.3 - 0.4 kg-m, 2.2 - 2.9 ft-lb)

Adjusting Clutch Pedal (Cont'd)



(3) As a final check, measure pedal free travel "A_2" at center of pedal pad.

Pedal free travel "A_2":
10.8 - 15.1 mm (0.425 - 0.594 in)



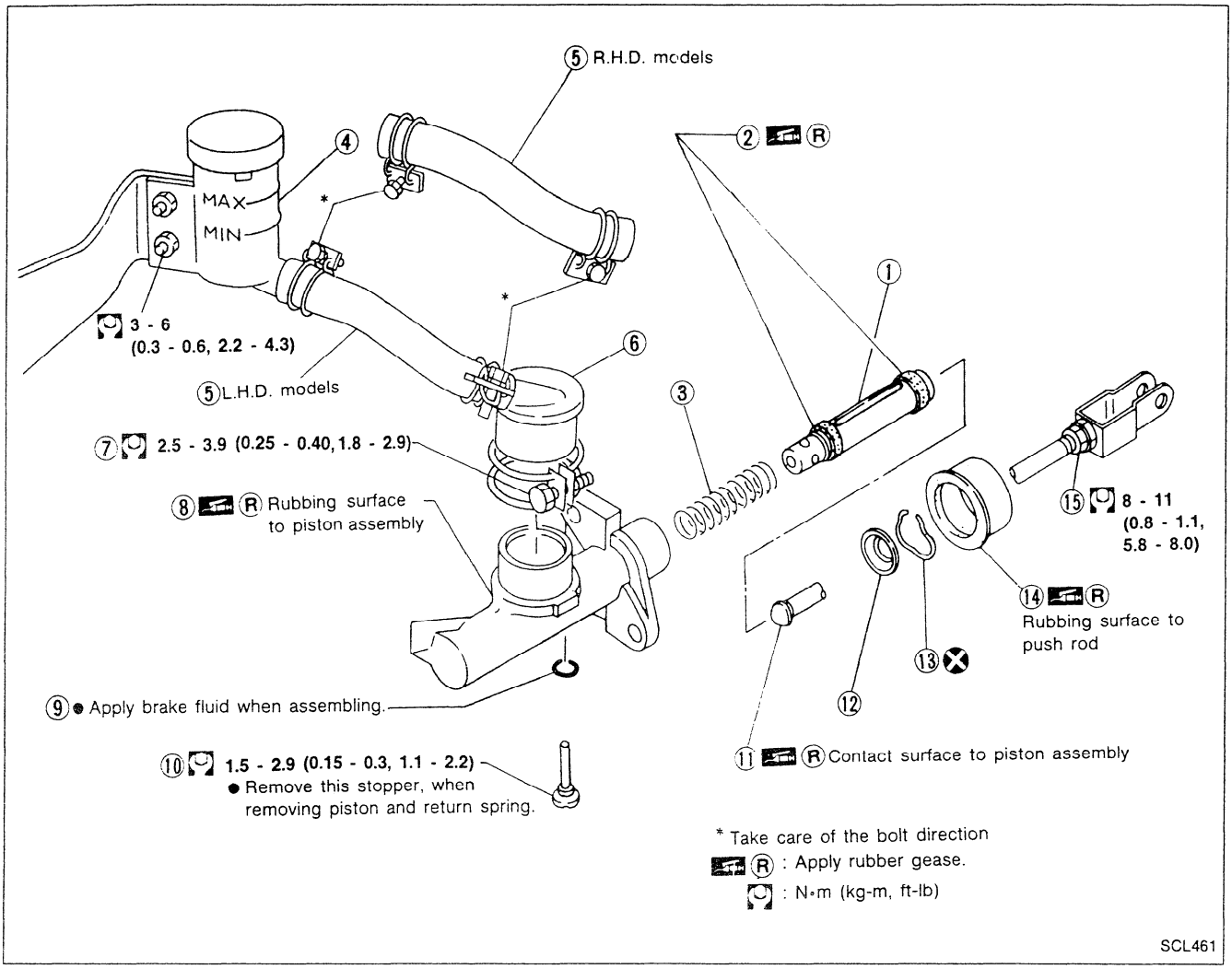
Bleeding Procedure — Hydraulic type

Bleed air according to the following procedure.

- **Carefully monitor fluid level at master cylinder during bleeding operation.**

1. Top up reservoir with recommended brake fluid.
2. Connect a transparent vinyl tube to air bleeder valve.
3. Fully depress clutch pedal several times.
4. With clutch pedal depressed, open bleeder valve to release air.
5. Close bleeder valve.
6. Repeat steps 3 through 5 above until clear brake fluid comes out of air bleeder valve.

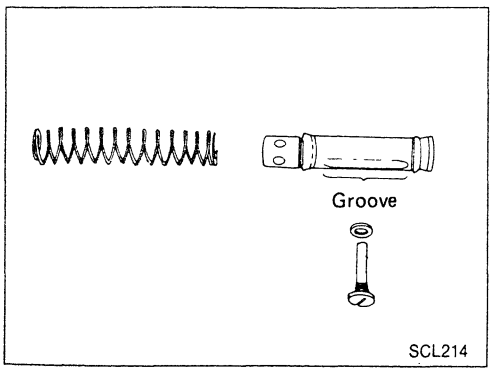
Clutch Master Cylinder



① Piston assembly
② Piston cup
③ Return spring
④ Reservoir tank
⑤ Reservoir hose
⑥ Reservoir cap
⑦ Reservoir band
⑧ Cylinder body
⑨ Packing
⑩ Valve stopper
⑪ Push rod
⑫ Stopper
⑬ Stopper ring
⑭ Dust cover
⑮ Lock nut

DISASSEMBLY AND ASSEMBLY

- Push piston into cylinder body with screwdriver when removing and installing valve stopper.



- Align groove of piston assembly and valve stopper when installing valve stopper.
- Check direction of piston cups.

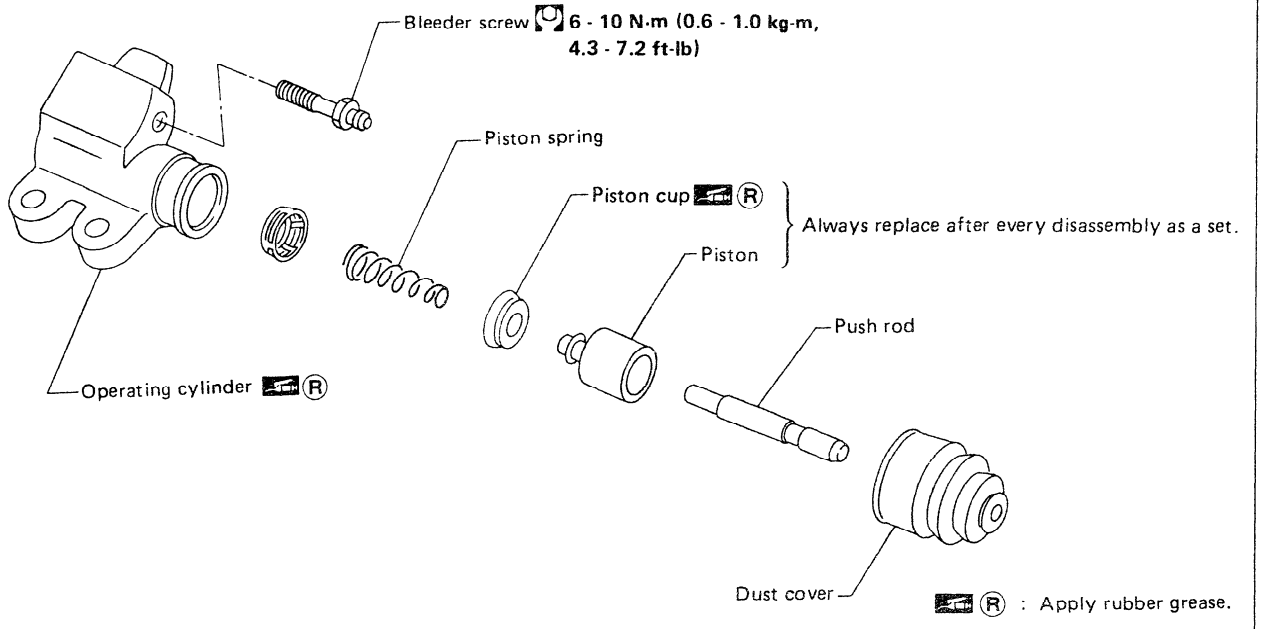
Clutch Master Cylinder (Cont'd)

INSPECTION

Check the following items, and replace if necessary.

- Rubbing surface of cylinder and piston, for uneven wear, rust or damage
- Piston with piston cup, for wear or damage
- Return spring, for wear or damage
- Dust cover, for cracks, deformation or damage
- Reservoir, for deformation or damage

Operating Cylinder

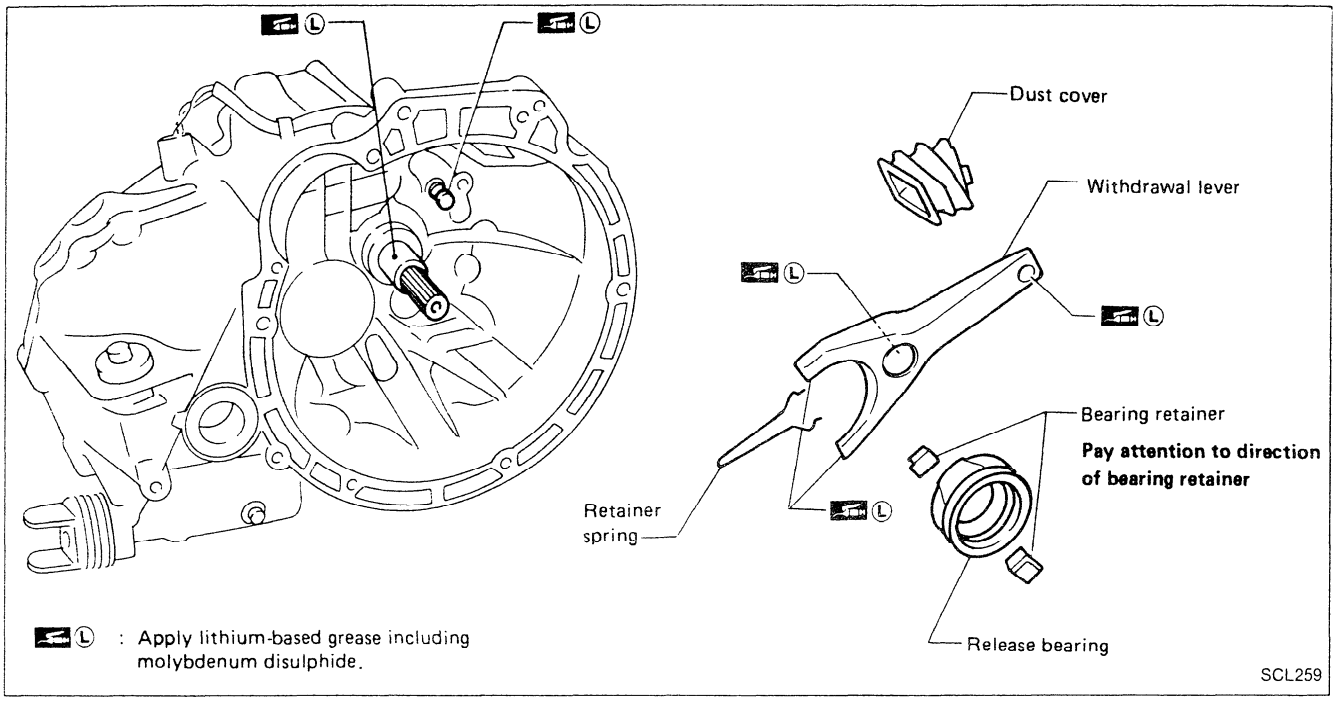


INSPECTION

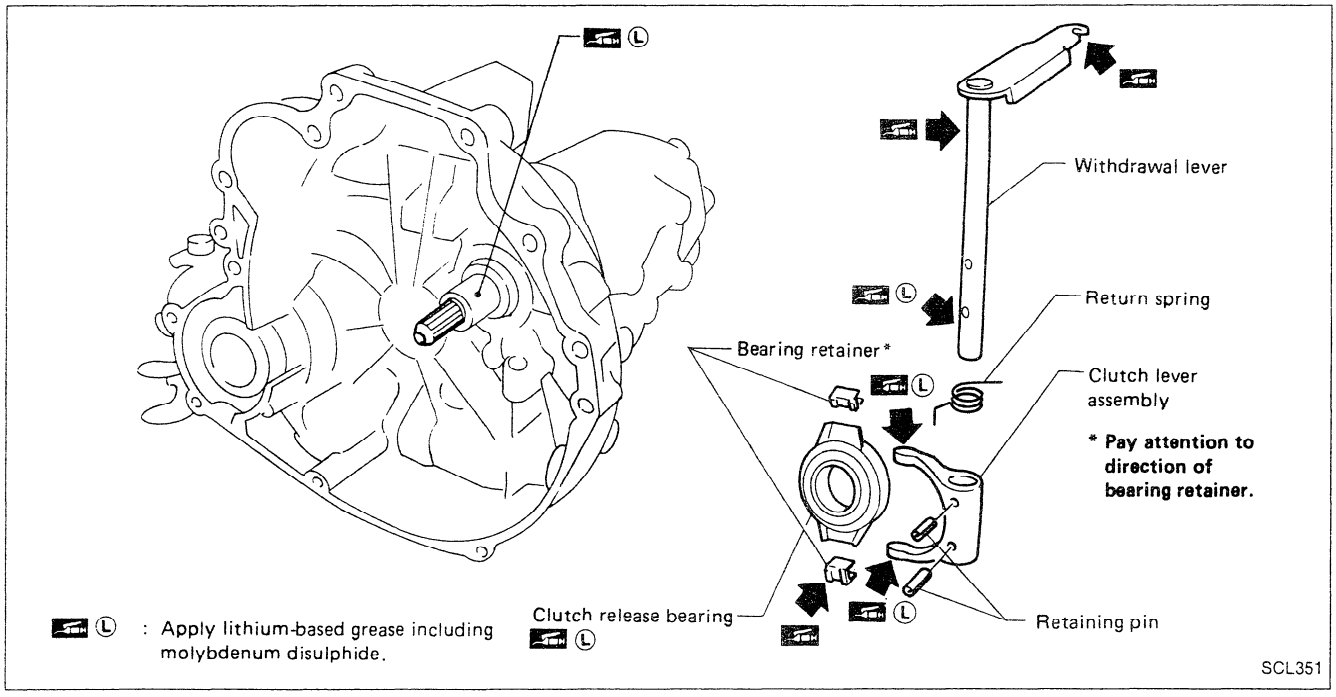
Check the following items, and replace if necessary.

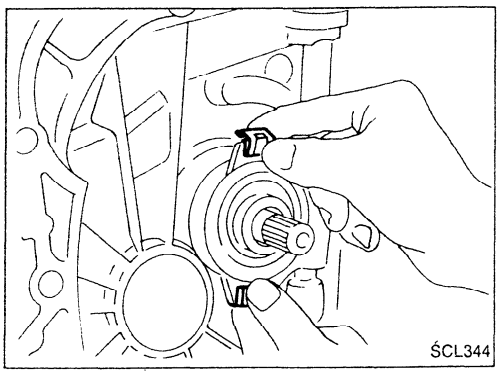
- Rubbing surface of cylinder and piston, for uneven wear, rust or damage
- Piston with piston cup, for wear or damage
- Piston spring, for wear or damage
- Dust cover, for cracks, deformation or damage

HYDRAULIC TYPE



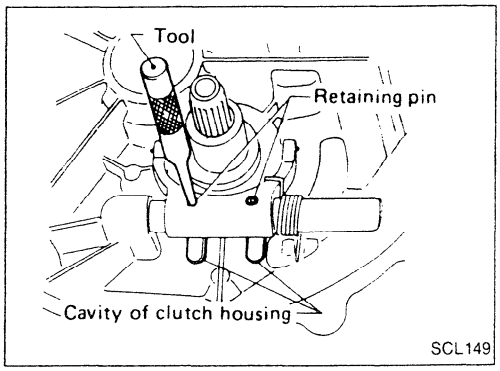
MECHANICAL TYPE




SCL344

REMOVAL AND INSTALLATION

- Remove release bearing by pulling bearing retainers outward.



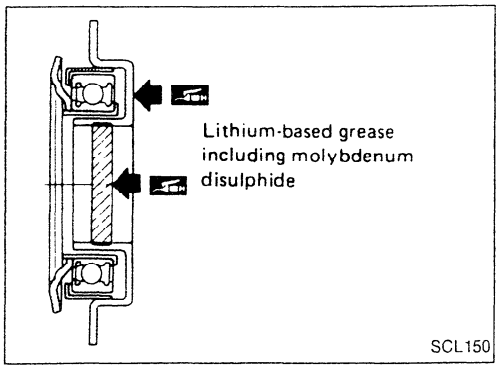
SCL149

- Align retaining pin with cavity of clutch housing and tap out retaining pin.

INSPECTION

Check the following items, and replace if necessary.

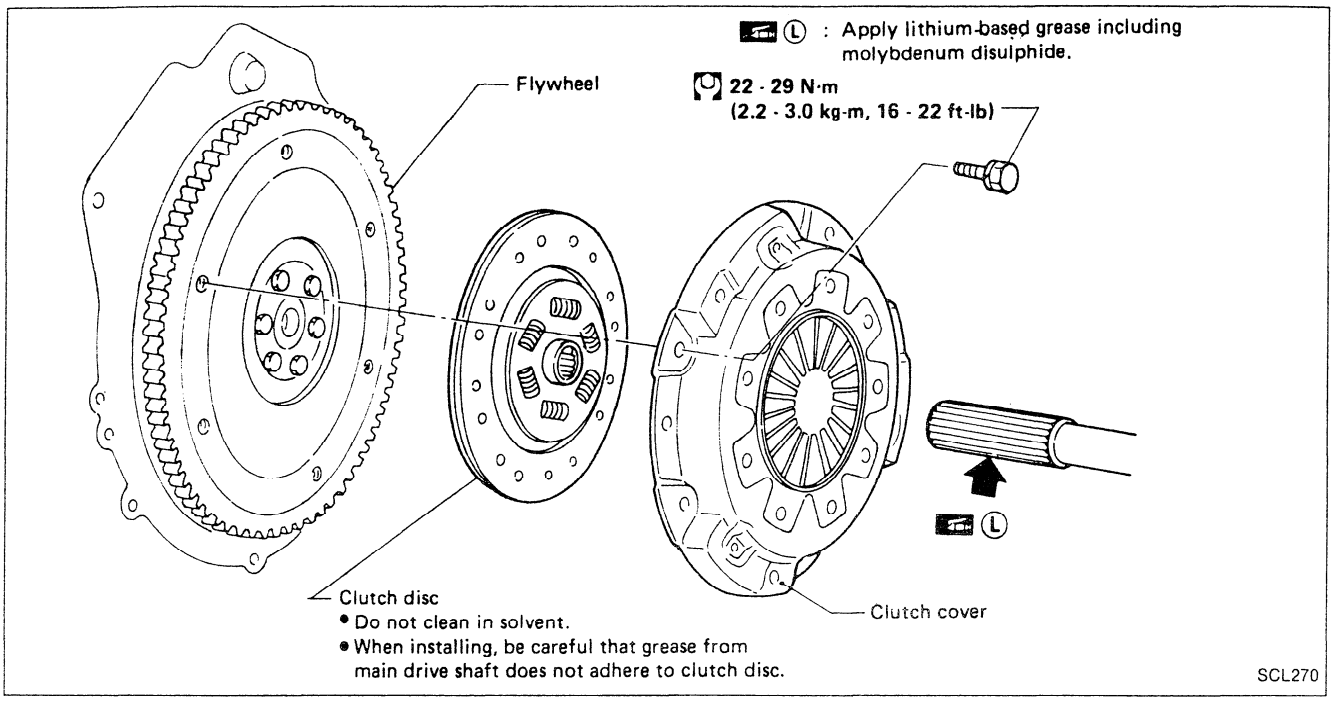
- Release bearing, to see that it rolls freely and is free from noise, cracks, pitting or wear
- Release sleeve and withdrawal lever rubbing surface, for wear, rust or damage

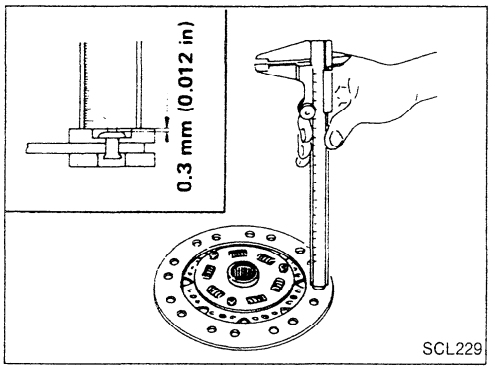


SCL150

LUBRICATION

- Apply recommended grease to contact surface and rubbing surface.
- **Too much lubricant might damage clutch disc facing.**



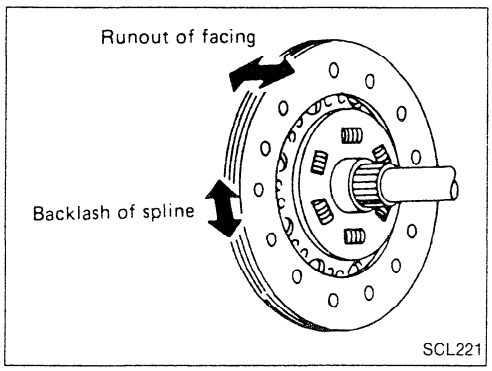


Clutch Disc

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.

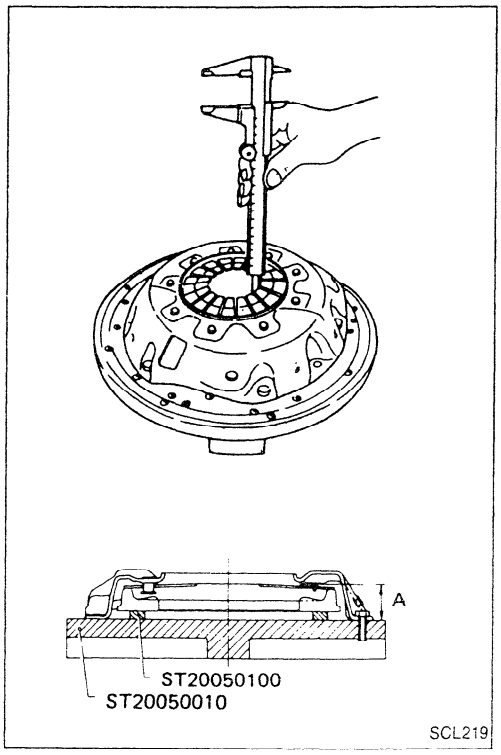
  Maximum backlash of spline (at outer edge of disc):

180CBL	**0.7 mm (0.028 in)**
190TBL, 200TBL	**0.8 mm (0.031 in)**
215TBL	**0.9 mm (0.035 in)**
240LTD	**1.0 mm (0.039 in)**

  Runout limit:
  1.0 mm (0.039 in)

  Distance of runout check point (from hub center):
  180CBL 85 mm (3.35 in)
  190TBL 90 mm (3.54 in)
  200TBL 95 mm (3.74 in)
  215TBL 102.5 mm (4.04 in)
  240LTD 115 mm (4.53 in)

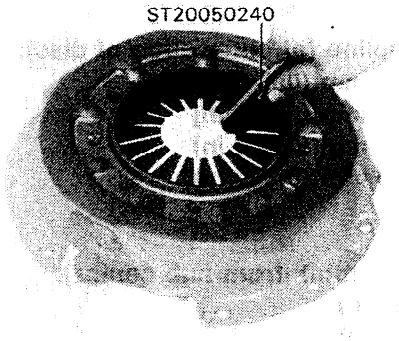
- Check clutch disc for burns, discoloration or oil or grease leakage. Replace if necessary.



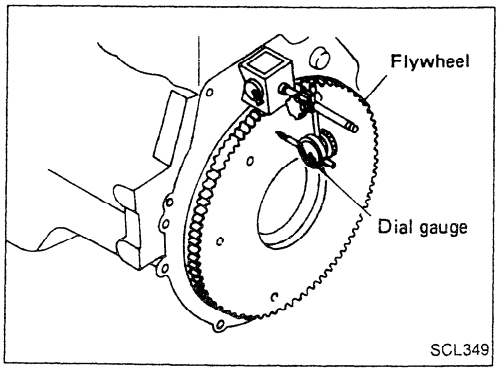
Clutch Cover and Flywheel

INSPECTION AND ADJUSTMENT

- Set Tools and check height and unevenness of diaphragm spring.
  Set specified feeler gauges on distance pieces (ST20050100) to obtain the same thickness as clutch disc.
  Thickness of feeler gauges:
  C180S, C190S and C200S (CD20 engine models)
  0.4 mm (0.016 in)
  C200S (4WD models with GA16DS engine)
  0.1 mm (0.004 in)
  C215S Not required
  C240S 0.3 mm (0.012 in)
  Diaphragm spring height "A":
  C180S 29 - 31 mm (1.14 - 1.22 in)
  C190S
  Except for models with CD17 engine
  29 - 31 mm (1.14 - 1.22 in)
  For models with CD17 engine
  31 - 33 mm (1.22 - 1.30 in)
  C200S 31 - 33 mm (1.22 - 1.30 in)
  C215S 30.5 - 32.5 mm (1.201 - 1.280 in)
  C240S 37.5 - 39.5 mm (1.476 - 1.555 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.



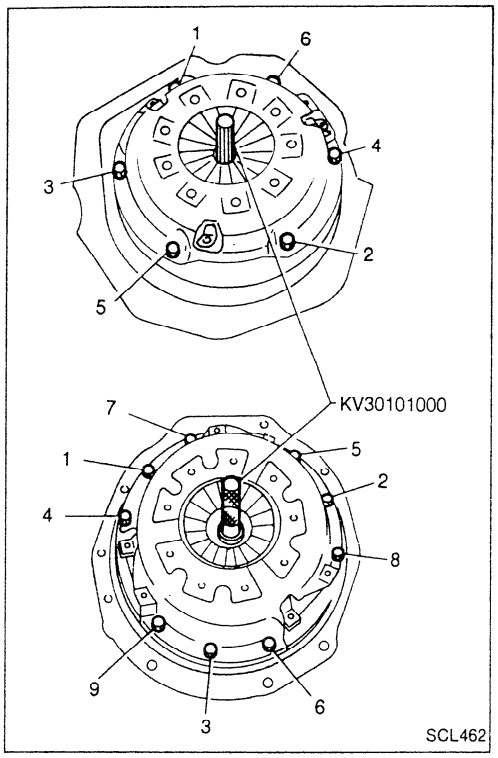
- Adjust unevenness of diaphragm spring with Tool.
  Uneven limit:
  C180S 1.0 mm (0.039 in)
  C190S, C200S and C215S 0.7 mm (0.028 in)
  C240S 0.5 mm (0.020 in)



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 in numerical order.
- **Be careful not to allow grease to contaminate clutch facing.**

General Specifications

CLUTCH CONTROL SYSTEM

Engine	Except for SR20DET	SR20DET
Type of clutch control	Mechanical	Hydraulic

CLUTCH MASTER CYLINDER

Inner diameter	mm (in)	15.87 (5/8)

CLUTCH OPERATING CYLINDER

Inner diameter	mm (in)	19.05 (3/4)

CLUTCH DISC

Unit: mm (in)

Engine	E10S, GA13DS, GA14DS	GA16DS (2WD), GA16DE, CD17	CD20	GA16DS (4WD)	SR20DE	SR20DET
Model	180CBL	190TBL	200TBL		215TBL	240LTD
Facing size (Outer dia. x inner dia. x thickness)	180 x 125 x 3.5 (7.09 x 4.92 x 0.138)	190 x 132 x 3.5 (7.48 x 5.20 x 0.138)	200 x 130 x 3.5 (7.87 x 5.12 x 0.138)		215 x 140 x 3.5 (8.46 x 5.51 x 0.138)	240 x 160 x 3.5 (9.45 x 6.30 x 0.138)
Thickness of disc assembly with load	8.0 - 8.4 (0.315 - 0.331) with 3,923 N (400 kg, 882 lb)			7.7 - 8.1 (0.303 - 0.319) with 3,923 N (400 kg, 882 lb)	7.6 - 8.0 (0.299 - 0.315) with 3,923 N (400 kg, 882 lb)	7.9 - 8.3 (0.311 - 0.327) with 4,904 N (500 kg, 1,103 lb)

CLUTCH COVER

Engine	E10S	GA13DS, GA14DS	GA16DS (2WD)	GA16DE	CD17	CD20, GA16DS (4WD)	SR20DE	SR20DET
Model	C180S		C190S			C200S	C215S	C240S
Full-load N (kg, lb)	2,746 (280, 617)	3,236 (330, 728)	3,432 (350, 772)	3,825 (390, 860)	2,844 (290, 639)	3,481 (355, 783)	4,413 (450, 992)	5,688 (580, 1,279)

Inspection and Adjustment

CLUTCH PEDAL

Unit: mm (in)

Applied model	2WD		4WD	
	R.H.D.	L.H.D.	GA16DS engine models	SR20DET engine models
Pedal height*	159 - 169 (6.26 - 6.65)	150 - 160 (5.91 - 6.30)	162 - 172 (6.38 - 6.77)	159 - 169 (6.26 - 6.65)
Pedal free play "A_1" (Backlash at clevis)	—			1 - 3 (0.04 - 0.12)
Pedal free travel "A_2"	10.8 - 15.1 (0.425 - 0.594)			—
Withdrawal lever play "B"	2.5 - 3.5 (0.098 - 0.138)			—

*: Measured from surface of melt sheet to surface of pedal pad.

CLUTCH DISC

Unit: mm (in)

Disc model	180CBL	190TBL	200TBL	215TBL	240LTD
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)	85 (3.35)	90 (3.54)	95 (3.74)	102.5 (4.04)	115 (4.53)
Maximum backlash of spline (at outer edge of disc)	0.7 (0.028)	0.8 (0.031)	0.8 (0.031)	0.9 (0.035)	1.0 (0.039)

CLUTCH COVER

Unit: mm (in)

Cover model	C180S	C190S		C200S	C215S	C240S
Diaphragm spring height	29 - 31 (1.14 - 1.22)	29 - 31 (1.14 - 1.22)	31 - 33 (1.22 - 1.30)*	31 - 33 (1.22 - 1.30)	30.5 - 32.5 (1.201 - 1.280)	37.5 - 39.5 (1.476 - 1.555)
Uneven limit of diaphragm spring toe height "A"	1.0 (0.039)	0.7 (0.028)				0.5 (0.020)

*: For models with CD17 engine

MANUAL TRANSAXLE

SECTION MT

CONTENTS

PREPARATION ..... MT- 2
ON-VEHICLE SERVICE ..... MT- 6
REMOVAL AND INSTALLATION ..... MT- 8
TRANSAXLE GEAR CONTROL MT-12

RN4F30A, RS5F30A, RS5F31A

MAJOR OVERHAUL MT-13
DISASSEMBLY MT-16
REPAIR FOR COMPONENT PARTS MT-19
ADJUSTMENT MT-32
ASSEMBLY MT-34

RS5F32A

MAJOR OVERHAUL MT-38
DISASSEMBLY MT-41
REPAIR FOR COMPONENT PARTS MT-44
ADJUSTMENT MT-64
ASSEMBLY MT-66

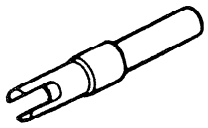
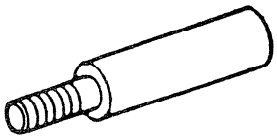
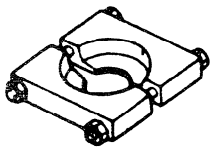
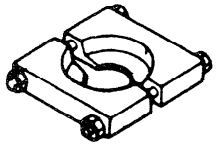
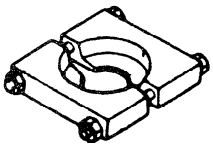
RS5F50A

MAJOR OVERHAUL MT-70
DISASSEMBLY MT-73
REPAIR FOR COMPONENT PARTS MT-77
ADJUSTMENT MT-92
ASSEMBLY MT-95

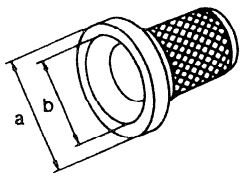
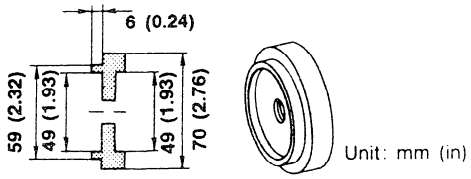
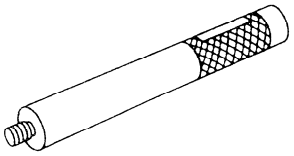
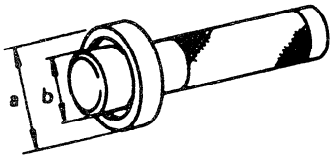
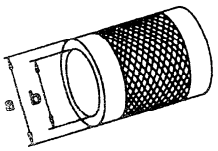
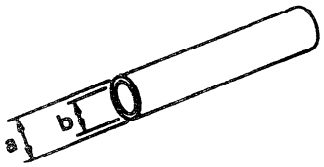
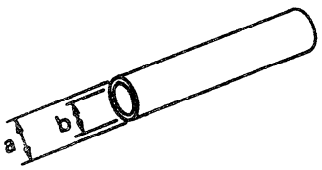
SERVICE DATA AND SPECIFICATIONS (S.D.S.) MT-100

SPECIAL SERVICE TOOLS

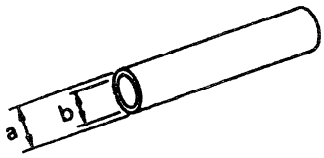
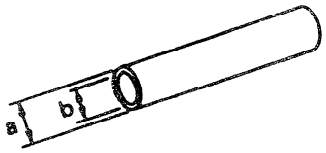
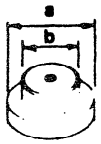
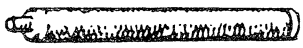
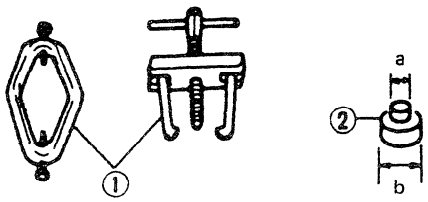
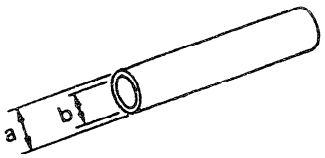
*: Special tool or commercial equivalent

Tool number Tool name	Description	
KV38105900· For F30A, F31A KV38106500·For F50A KV38107700·For F32A Preload adapter		Measuring turning torque of final drive assembly Measuring total turning torque (Except for F32A) 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)		Selecting differential side bearing adjusting shim (Use with KV38105900, KV38106500 or KV38107700.)
KV32101000* Pin punch		Removing and installing retaining pin
ST22730000* Puller		Removing mainshaft front and rear bearing inner race (Except for F32A) Removing 5th main gear (Except for F50A)
ST30031000* Puller		Removing differential side bearing inner race (F30A, F31A) Removing 3rd and 4th synchronizer Measuring wear of 2nd & 3rd baulk ring (F32A) Removing input shaft front and rear bearing (F50)
ST30021000* Puller		Removing 5th synchronizer Removing 3rd & 4th synchronizer (F50A) Removing 2nd & 3rd main gear (F50A)
ST33290001* Puller		Removing differential oil seal Removing mainshaft front bearing outer race (F30A, F31A) Removing differential side bearing outer race Removing mainshaft rear bearing outer race (F50A)

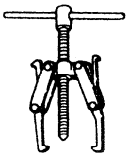
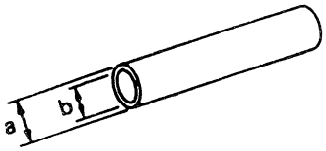
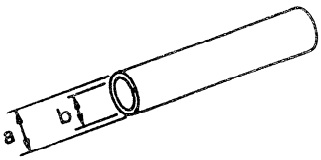
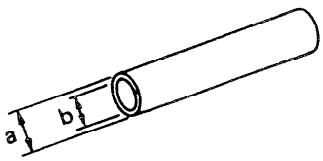
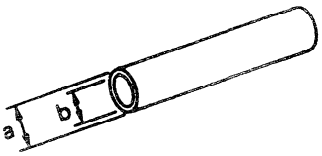
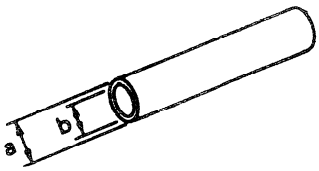
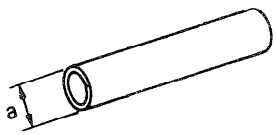
*: Special tool or commercial equivalent

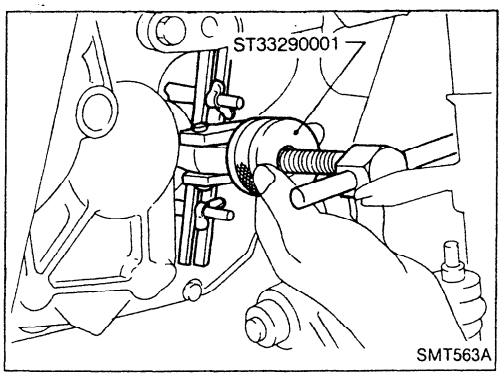
Tool number Tool name	Description	
ST33400001* Drift		Installing differential oil seal (F30A, F31A) **a: 60 mm (2.36 in) dia.** **b: 47 mm (1.85 in) dia.** (Except for right side of 4WD models)
KV31103000* Drift		Installing differential oil seal (F32A) Right and left sides (Use with ST35325000.)
ST35325000* Drift handle		Installing differential oil seal (F32A) (Use with KV31103000.)
KV38102100* Drift		Installing input shaft rear bearing (Except for F50A) **a: 44 mm (1.73 in) dia.** **b: 24.5 mm (0.965 in) dia.**
ST33200000* Drift		Installing mainshaft front bearing outer race (F30A, F31A) Installing mainshaft front bearing (F32A) **a: 60 mm (2.36 in) dia.** **b: 44.5 mm (1.752 in) dia.**
ST22350000* Drift		Installing input shaft front bearing (Except for F50A) **a: 34 mm (1.34 in) dia.** **b: 28 mm (1.10 in) dia.**
ST22452000* Drift		Installing 1st & 2nd synchronizer (Except for F50A) Installing 3rd & 4th synchronizer (F32A) Installing 3rd, 4th and 5th main gear (F50A) **a: 45 mm (1.77 in) dia.** **b: 36 mm (1.42 in) dia.**

*: Special tool or commercial equivalent

Tool number Tool name	Description	
ST37750000* Drift		Installing 5th main gear (Except for F50A) Installing 3rd & 4th synchronizer (F30A, F31A) Installing input shaft oil seal (Except for F50A) Installing 5th synchronizer (Except for F50A) Installing mainshaft rear bearing (F32A) **a: 40 mm (1.57 in) dia.** **b: 31 mm (1.22 in) dia.**
ST22360002* Drift		Installing mainshaft rear bearing inner race (F30A, F31A) **a: 29 mm (1.14 in) dia.** **b: 23 mm (0.91 in) dia.**
ST30621000* Drift		Installing differential side bearing outer race (Except for F50A) Installing mainshaft rear bearing outer race (F50A) (Use with ST30611000.) **a: 79 mm (3.11 in) dia.** **b: 59 mm (2.32 in) dia.**
ST30611000* Drift handle		(Use with ST30621000.)
ST3306S001 Differential side bearing puller set ① ST33051001 Puller ② ST33061000 Adapter		Removing differential side bearing inner race (F50A) **a: 28.5 mm (1.122 in) dia.** **b: 38 mm (1.50 in) dia.**
ST30600000 Drift		Installing input shaft front bearing (F50A) **a: 36 mm (1.42 in) dia.** **b: 31 mm (1.22 in) dia.**

COMMERCIAL SERVICE TOOLS

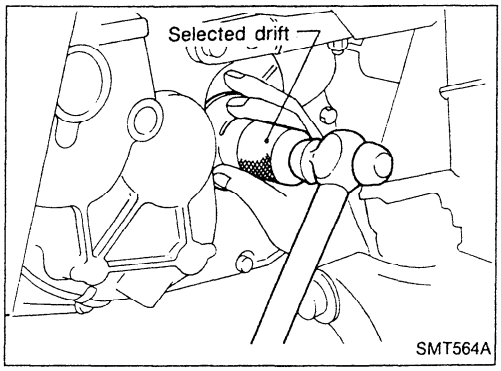
Tool name	Description	
Puller		Removing input shaft front bearing (Except for F50A) Removing mainshaft rear bearing (F32A)
Drift		Installing mainshaft front bearing inner race (F30A, F31A) **F30A a: 26 mm (1.02 in) dia.** **b: 21 mm (0.83 in) dia.** **F31A a: 31 mm (1.22 in) dia.** **b: 26 mm (1.02 in) dia.**
Drift		Installing differential side bearing inner race (Except for F50A) **a: 56 mm (2.20 in) dia.** **b: 50.5 mm (1.988 in) dia.**
Drift		Installing striking rod oil seal **a: 38 mm (1.50 in) dia.** **b: 32 mm (1.26 in) dia.**
Drift		Installing differential oil seal (Left side of F50A) **a: 88 mm (3.46 in) dia.** **b: 72 mm (2.83 in) dia.**
Drift		Installing differential side bearing inner race (F50A) **a: 45 mm (1.77 in) dia.** **b: 41 mm (1.61 in) dia.**
Drift		Installing differential side bearing outer race (F50A) **a: 69 mm (2.72 in) dia.**



Replacing Oil Seal

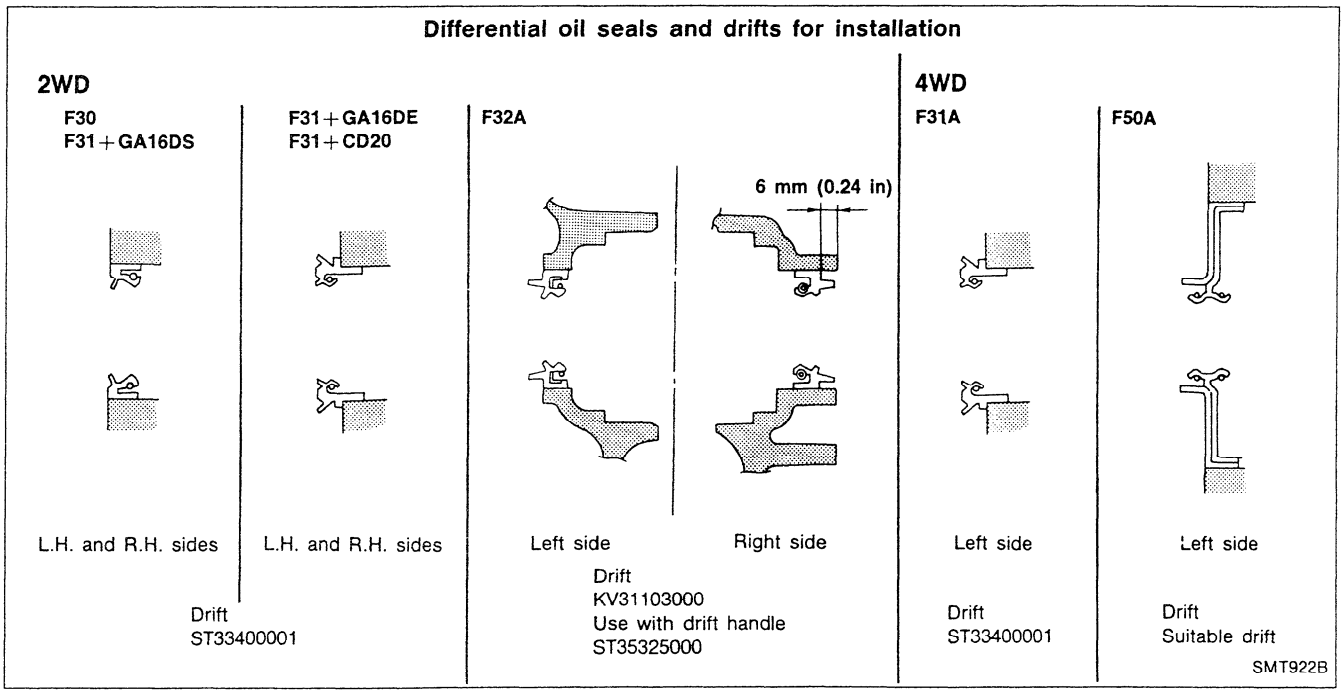
DIFFERENTIAL OIL SEAL

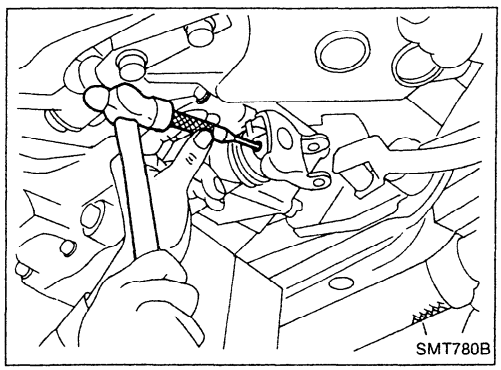
1. Drain gear oil from transaxle.
2. Remove drive shafts — Refer to section FA.
3. Remove differential oil seal.



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.

Differential oil seals and drifts for installation

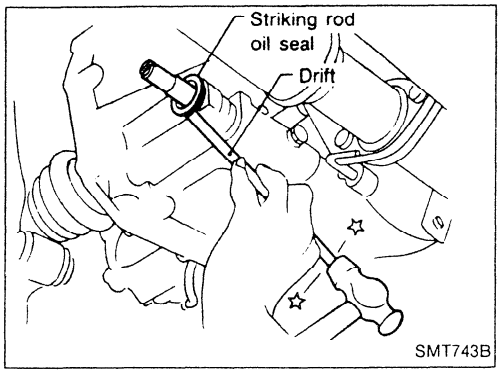




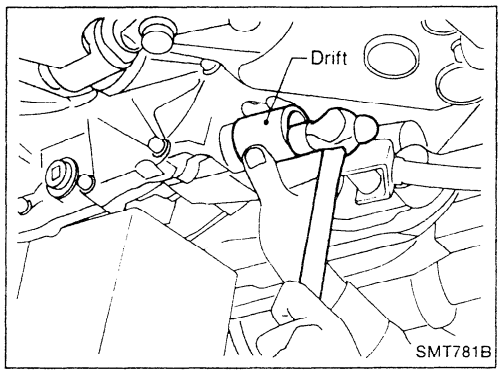
STRIKING ROD OIL SEAL

1. Remove transaxle control rod from yoke.
2. Remove yoke retaining pin.

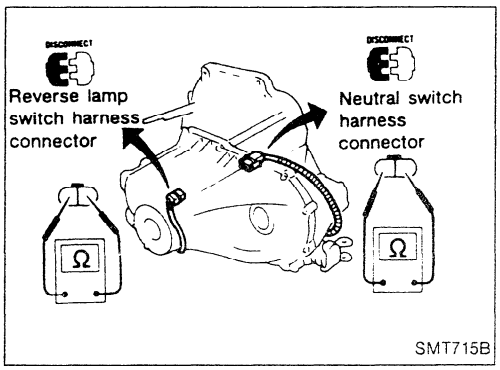
Replacing Oil Seal (Cont'd)



3. Remove striking rod oil seal.



4. Install striking rod oil seal.
- **Apply multi-purpose grease to seal lip of oil seal before installing.**



Check of Position Switch

— Except for RS5F50A —

BACK-UP LAMP SWITCH

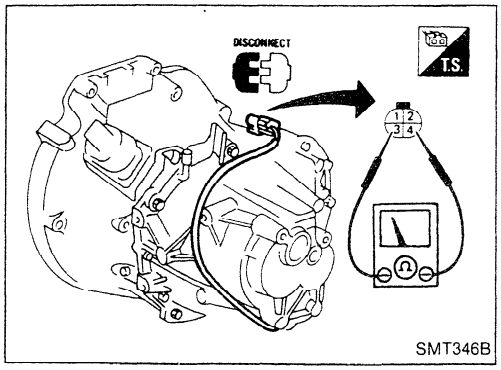
- Check continuity.

Gear position	Continuity
Reverse	Yes
Except reverse	No

NEUTRAL SWITCH

- Check continuity.

Gear position	Continuity
Neutral	Yes
Except neutral	No

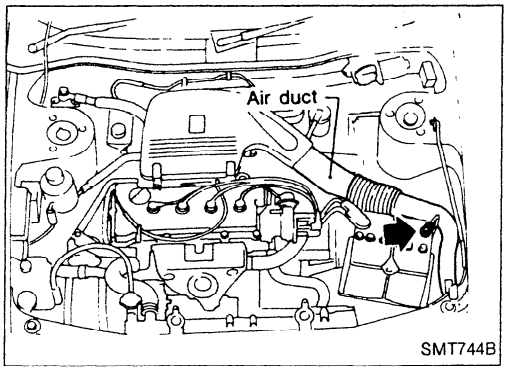


— RS5F50A —

BACK-UP LAMP SWITCH AND NEUTRAL SWITCH

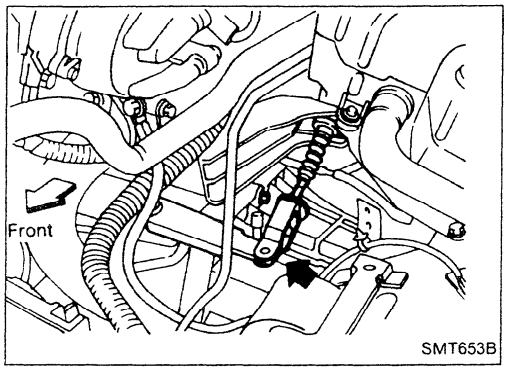
- Check continuity.

Gear position	Continuity
Reverse	② — ④
Neutral	① — ③
Except reverse and neutral	No

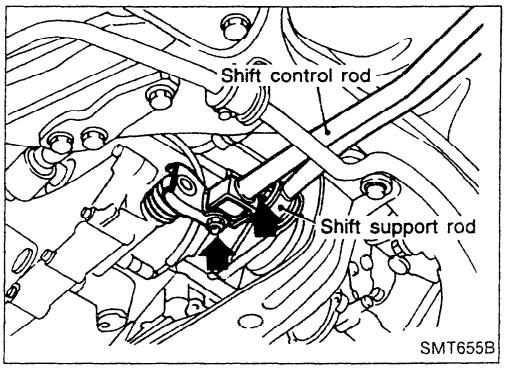


Removal

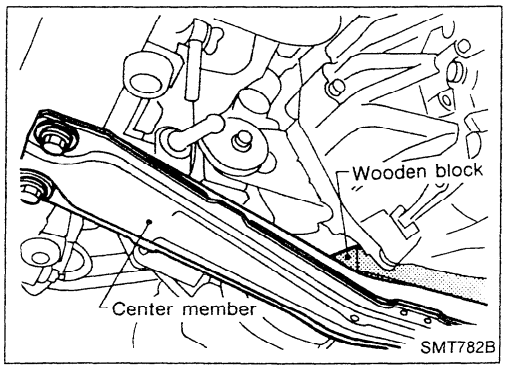
1. Remove battery negative terminal.
2. Remove air duct.



3. Disconnect clutch control cable. (Except for SR20DET engine models)
   Remove clutch operating cylinder from transaxle. (SR20DET engine models)
4. Disconnect speedometer cable from transaxle.
5. Disconnect back-up lamp switch, neutral switch and ground harness connectors.
6. Remove starter motor from transaxle.

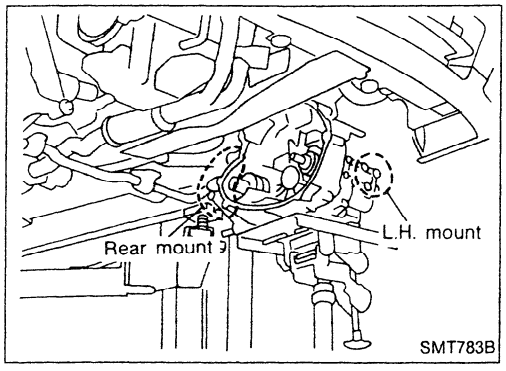


7. Remove shift control rod and support rod from transaxle.
8. Drain gear oil from transaxle and transfer.
9. Draw out drive shafts — Refer to section FA.
10. Support engine with hoist. (SR20DET engine models)
11. Remove transfer — Refer to section TF. (4WD models)

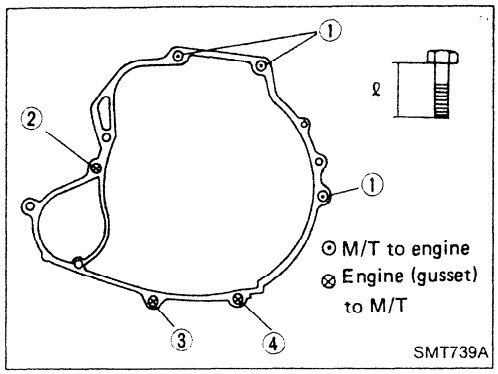


12. Jack up transaxle together with engine slightly and insert wooden block between center member and engine oil pan. (2WD models)

CAUTION:
Do not place jack under oil pan drain plug.



13. Remove rear and L.H. mounts supporting transaxle with jack.
14. Remove bolts securing transaxle.
15. Lower transaxle.

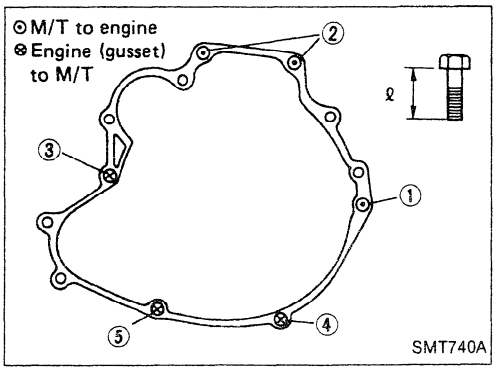


Installation

Tighten bolts securing transaxle and install any part removed.

- **E10S engine models**

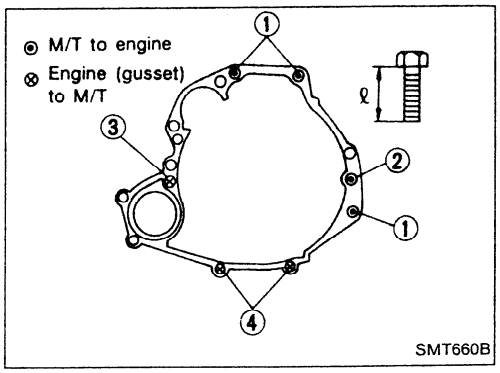
Bolt No.	Tightening torque N·m (kg-m, ft-lb)	ℓ mm (in)
1	16 - 21 (1.6 - 2.1, 12 - 15)	70 (2.76)
2	20 - 29 (2.0 - 3.0, 14 - 22)	70 (2.76)
3	16 - 21 (1.6 - 2.1, 12 - 15)	25 (0.98)
4	16 - 21 (1.6 - 2.1, 12 - 15)	25 (0.98)
Front gusset to engine	16 - 21 (1.6 - 2.1, 12 - 15)	20 (0.79)
Rear gusset to engine	16 - 21 (1.6 - 2.1, 12 - 15)	20 (0.79)



- **CD17 engine models**

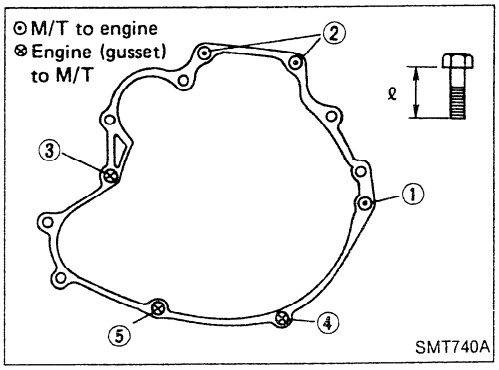
Bolt No.	Tightening torque N·m (kg-m, ft-lb)	ℓ mm (in)
1	30 - 40 (3.1 - 4.1, 22 - 30)	110 (4.33)
2	30 - 40 (3.1 - 4.1, 22 - 30)	70 (2.76)
3	44 - 54 (4.5 - 5.5, 33 - 40)	75 (2.95)
4	16 - 21 (1.6 - 2.1, 12 - 15)	30 (1.18)
5	16 - 21 (1.6 - 2.1, 12 - 15)	25 (0.98)
Front gusset to engine	30 - 40 (3.1 - 4.1, 22 - 30)	35 (1.38)
Rear gusset to engine	30 - 40 (3.1 - 4.1, 22 - 30)	25 (0.98)

Installation (Cont'd)



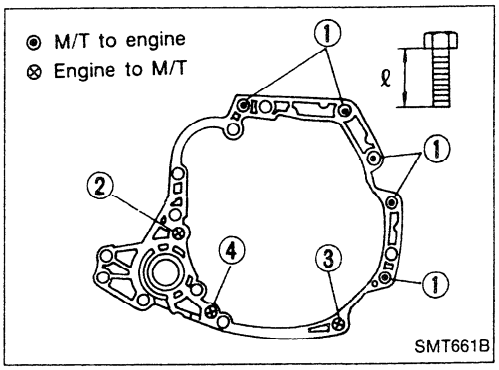
- **GA engine models (2WD)**

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	"ℓ" mm (in)
1	30 - 40 (3.1 - 4.1, 22 - 30)	70 (2.76)
2	30 - 40 (3.1 - 4.1, 22 - 30)	85 (3.35)
3	30 - 40 (3.1 - 4.1, 22 - 30)	30 (1.18)
4	16 - 21 (1.6 - 2.1, 12 - 15)	25 (0.98)
Front gusset to engine	30 - 40 (3.1 - 4.1, 22 - 30)	20 (0.79)
Rear gusset to engine	16 - 21 (1.6 - 2.1, 12 - 15)	16 (0.63)



- **CD20 engine models**

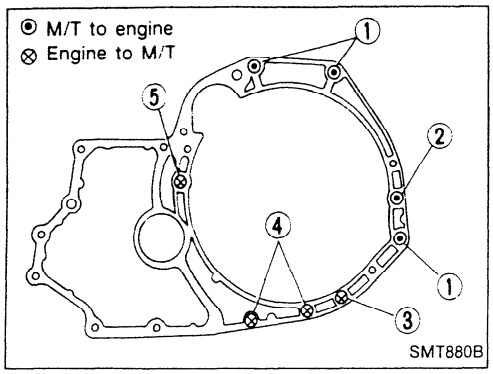
Bolt No.	Tightening torque N·m (kg-m, ft-lb)	"ℓ" mm (in)
1	30 - 40 (3.1 - 4.1, 22 - 30)	120 (4.72)
2	30 - 40 (3.1 - 4.1, 22 - 30)	85 (3.35)
3	44 - 54 (4.5 - 5.5, 33 - 40)	75 (2.95)
4	16 - 21 (1.6 - 2.1, 12 - 15)	30 (1.18)
5	16 - 21 (1.6 - 2.1, 12 - 15)	25 (0.98)
Front gusset to engine	30 - 40 (3.1 - 4.1, 22 - 30)	35 (1.38)
Rear gusset to engine	30 - 40 (3.1 - 4.1, 22 - 30)	40 (1.57)



- **SR engine models (2WD)**

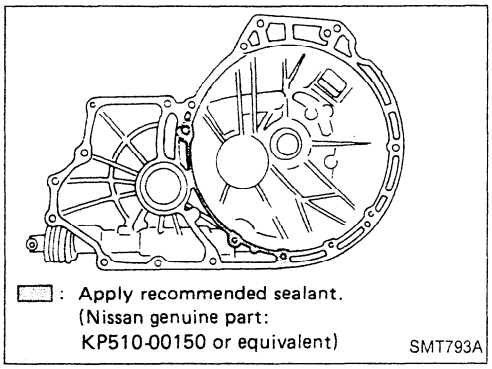
Bolt No.	Tightening torque N·m (kg-m, ft-lb)	"ℓ" mm (in)
1	70 - 79 (7.1 - 8.1, 51 - 59)	55 (2.17)
2	70 - 79 (7.1 - 8.1, 51 - 59)	65 (2.56)
3	30 - 40 (3.1 - 4.1, 22 - 30)	35 (1.38)
4	30 - 40 (3.1 - 4.1, 22 - 30)	45 (1.77)

Installation (Cont'd)

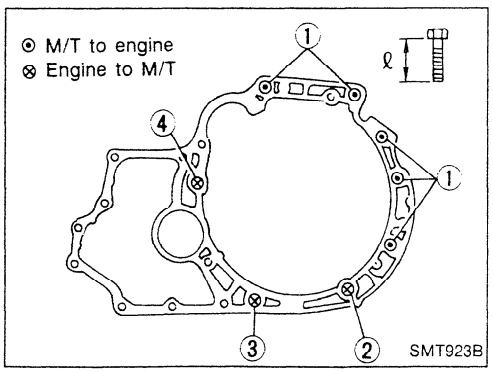


- **GA engine models (4WD)**

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	"ℓ" mm (in)
1	30 - 40 (3.1 - 4.1, 22 - 30)	70 (2.76)
2	30 - 40 (3.1 - 4.1, 22 - 30)	85 (3.35)
3	30 - 40 (3.1 - 4.1, 22 - 30)	55 (2.17)
4	30 - 40 (3.1 - 4.1, 22 - 30)	20 (0.79)
5	30 - 40 (3.1 - 4.1, 22 - 30)	40 (1.57)
Front gusset to engine	30 - 40 (3.1 - 4.1, 22 - 30)	35 (1.38)

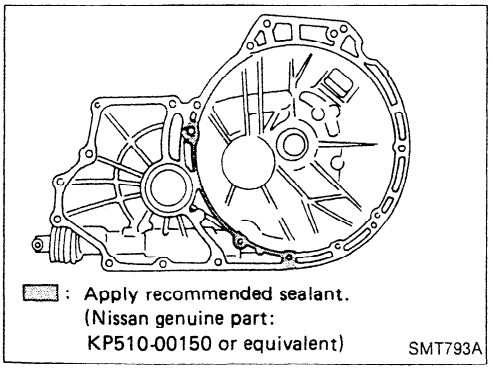


Apply sealant when installing transaxle as in illustration at left.

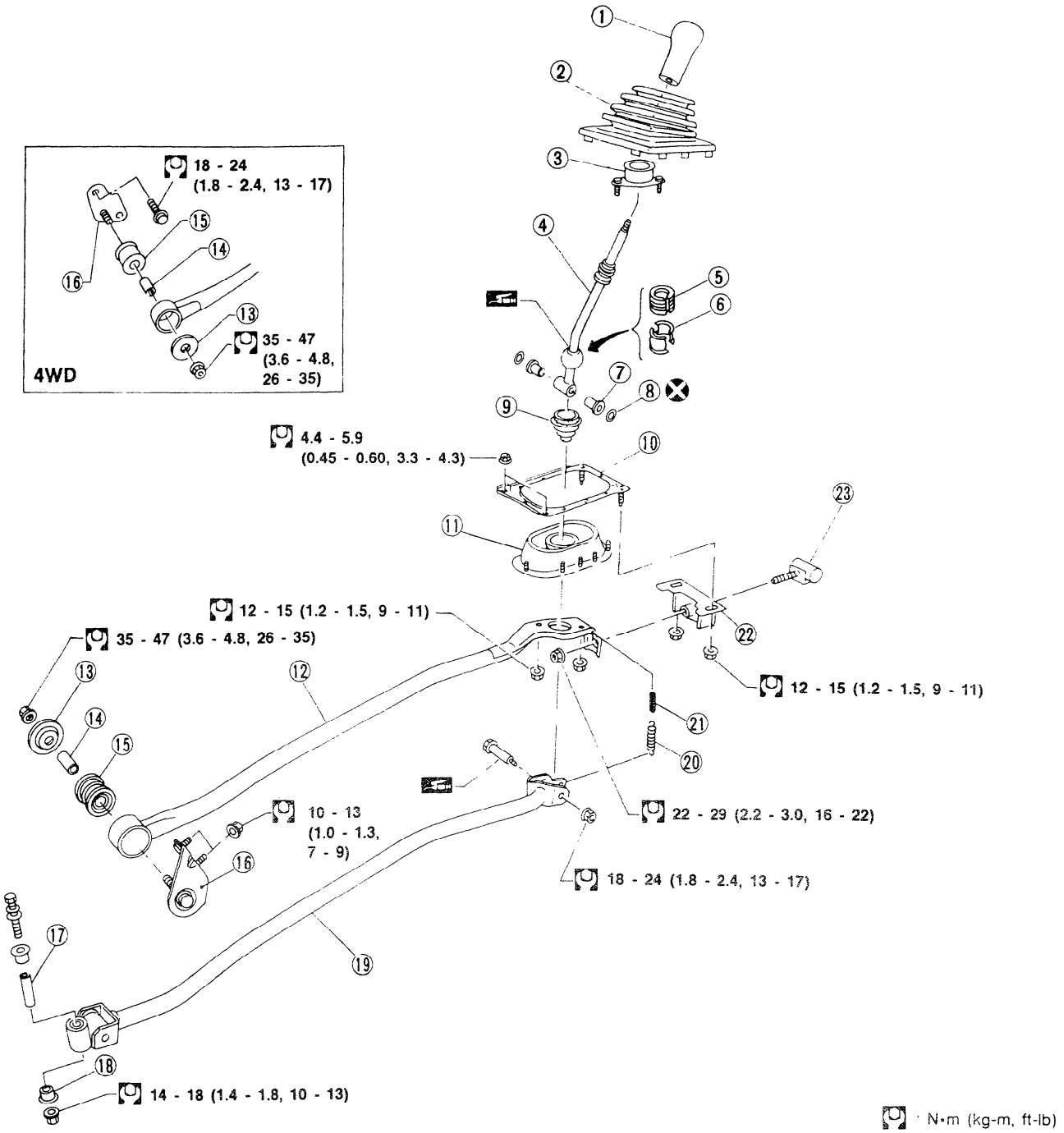


- **SR engine models (4WD)**

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	ℓ mm (in)
1	70 - 79 (7.1 - 8.1, 51 - 59)	80 (3.15)
2	30 - 40 (3.1 - 4.1, 22 - 30)	25 (0.98)
3	30 - 40 (3.1 - 4.1, 22 - 30)	40 (1.57)
4	70 - 79 (7.1 - 8.1, 51 - 59)	65 (2.56)



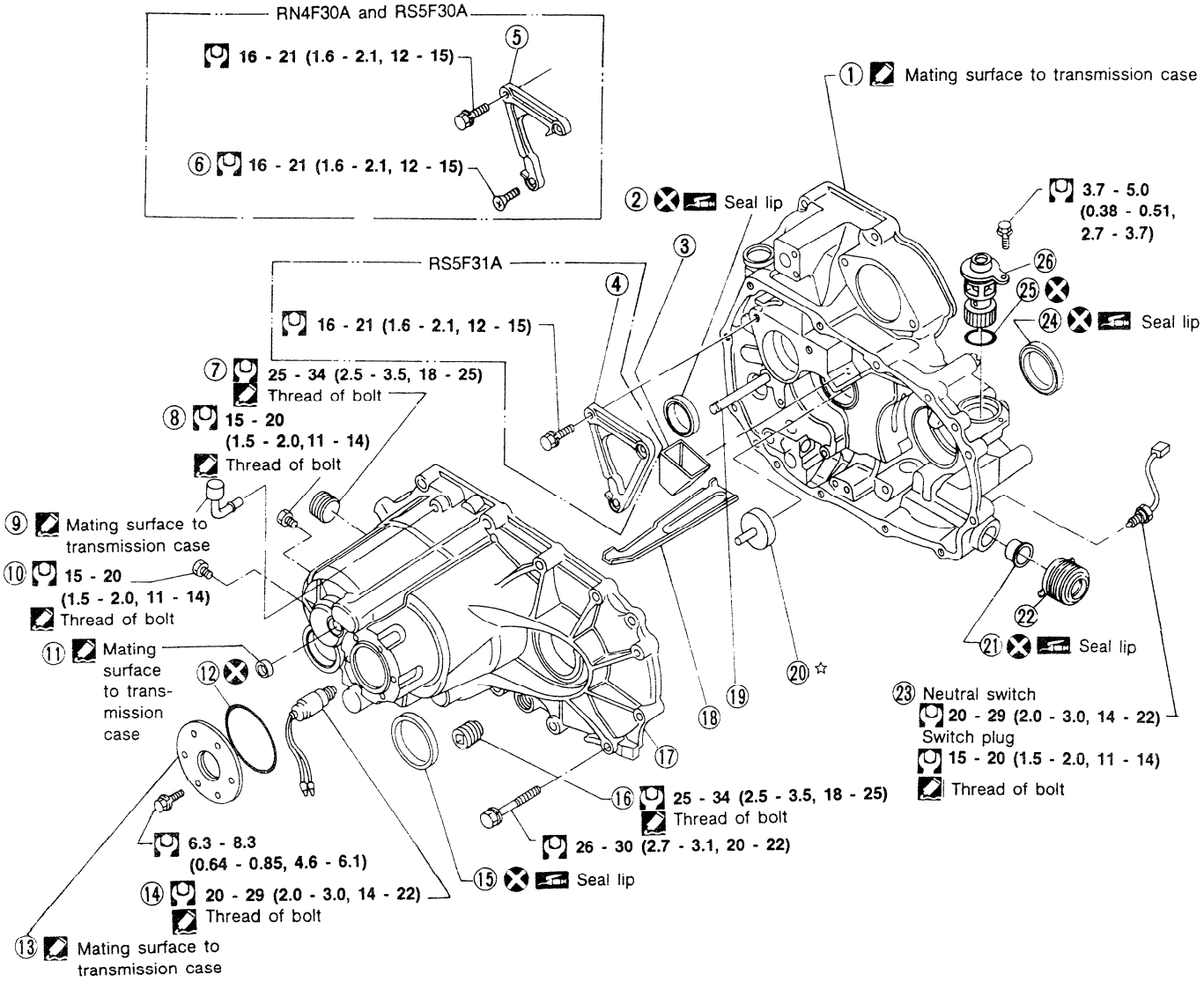
Apply sealant when installing transaxle as in illustration at left.



SMT882B

① Control lever knob
② Boot
③ Control lever socket
④ Control lever
⑤ Insulator
⑥ Seat
⑦ Bushing
⑧ O-ring
⑨ Dust boot
⑩ Plate bolt
⑪ Transaxle hole cover
⑫ Support rod
⑬ Plate
⑭ Collar
⑮ Bushing
⑯ Support rod bracket
⑰ Collar
⑱ Bushing
⑲ Control rod
⑳ Return spring
㉑ Return spring rubber
㉒ Holder bracket
㉓ Mass damper

Case Components

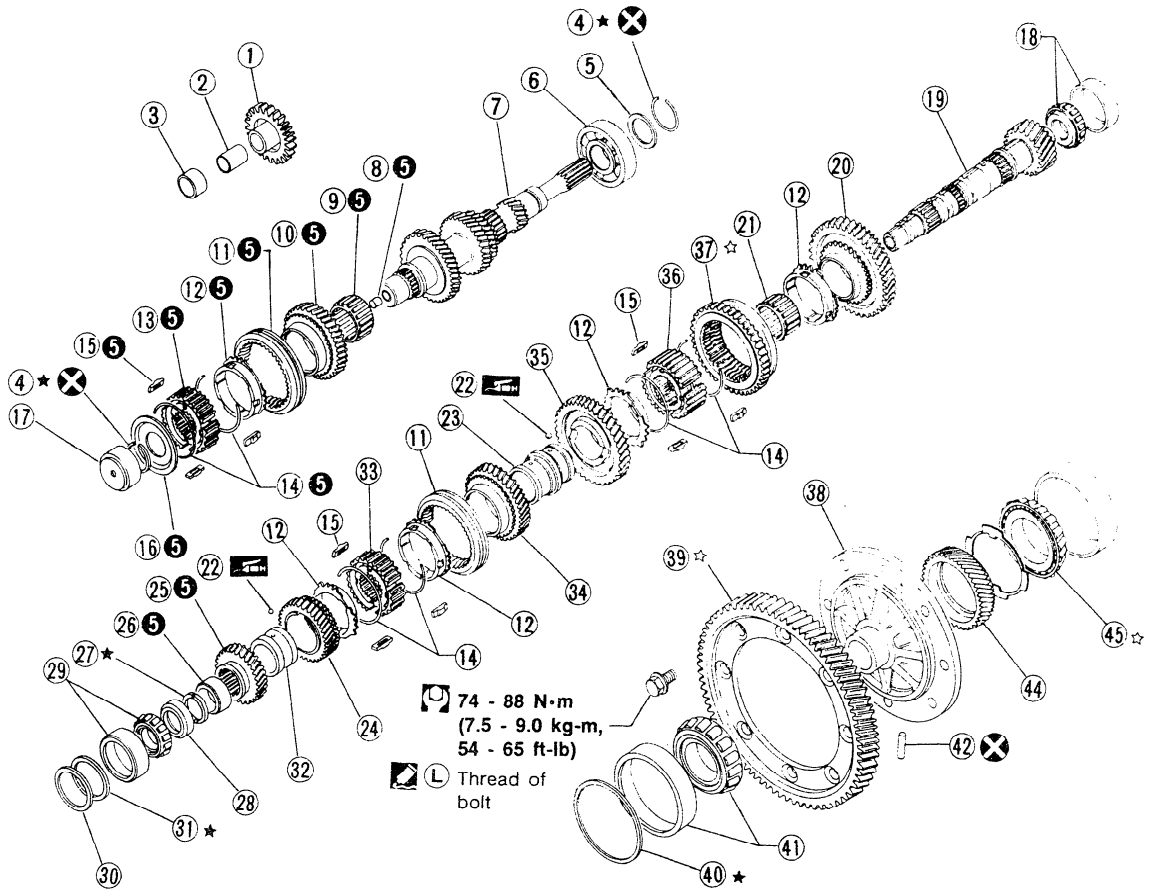


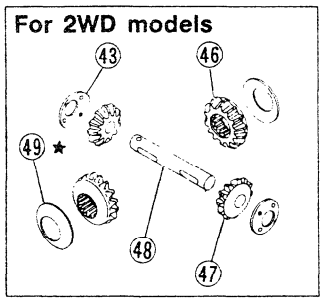
: N•m (kg-m, ft-lb)
: Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent.
☆ : Pay attention to its direction.

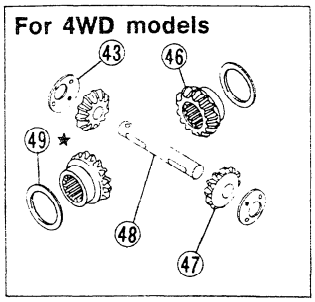
SMT746B

① Clutch housing
② Input shaft oil seal
③ Oil pocket
④ Bearing retainer
⑤ Bearing retainer
⑥ Torx screw
⑦ Filler plug
⑧ Switch plug
⑨ Air breather
⑩ Switch plug
⑪ Welch plug
⑫ O-ring
⑬ Case cover
⑭ Reverse lamp switch
⑮ Differential oil seal
⑯ Drain plug
⑰ Transmission case
⑱ Oil gutter
⑲ Reverse idler shaft
⑳ Oil channel
㉑ Striking rod oil seal
㉒ Boot
㉓ Neutral switch or switch plug
㉔ Differential oil seal
㉕ O-ring
㉖ Speedometer pinion assembly

Gear Components







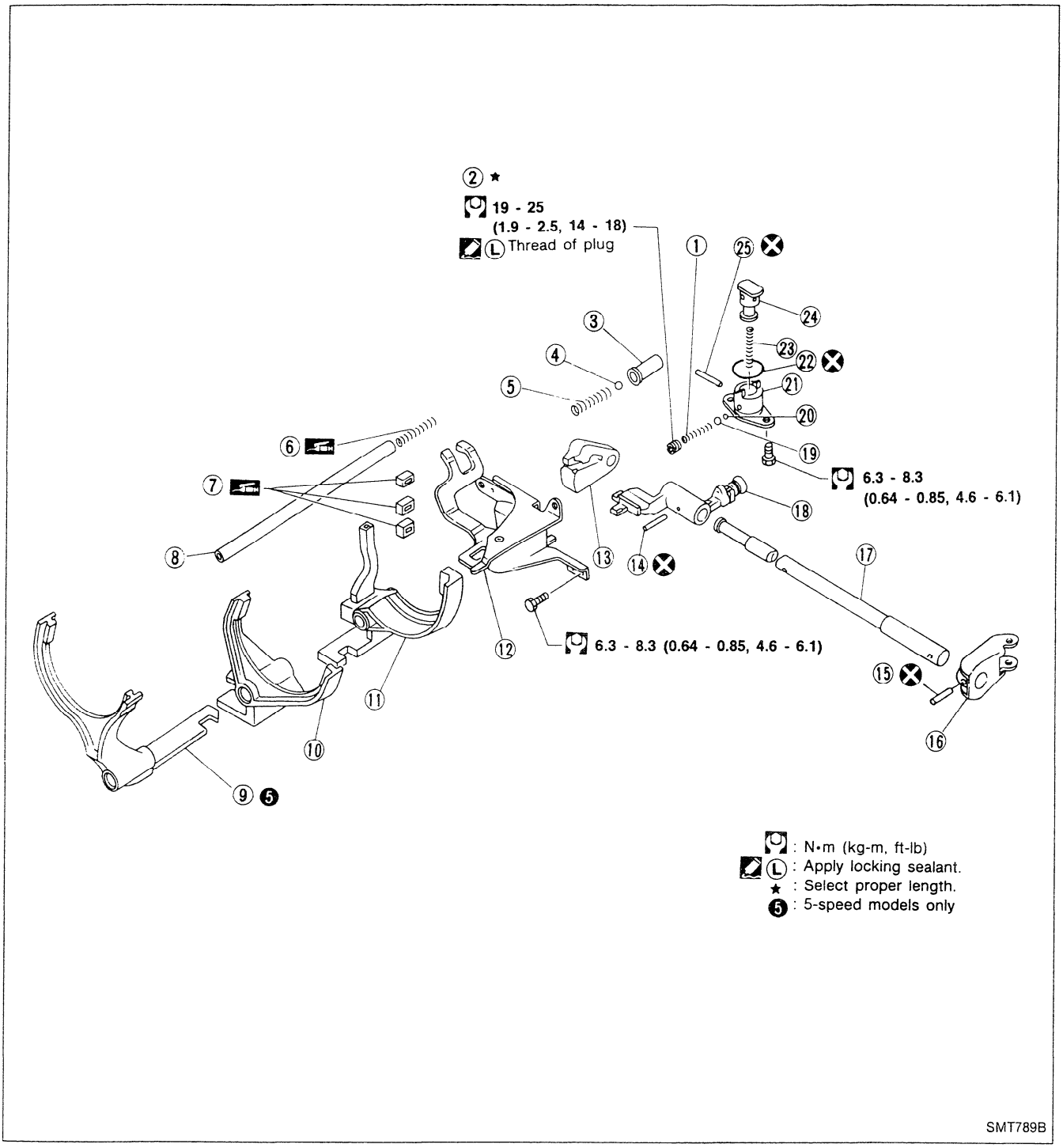
Apply gear oil to gears, shifts, synchronizers and bearings when assembling.

- Ⓛ : Apply locking sealant.
- ★ : Select proper thickness.
- ☆ : Pay attention to its directior
- ❺ : 5-speed models only

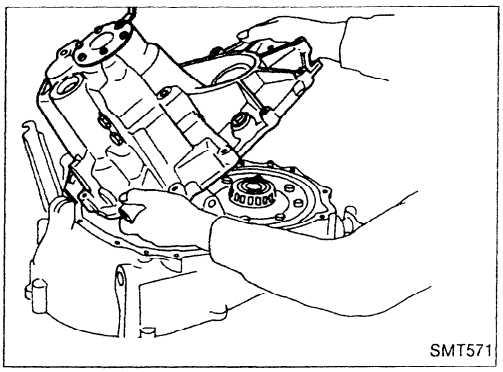
SMT953B

① Reverse idler gear
② Reverse idler bushing
③ Reverse idler spacer
④ Snap ring
⑤ Input gear spacer
⑥ Input shaft front bearing
⑦ Input shaft
⑧ Oil plug
⑨ 5th gear needle bearing
⑩ 5th input gear
⑪ Coupling sleeve
⑫ Baulk ring
⑬ 5th synchronizer hub
⑭ Spread spring
⑮ Shifting insert
⑯ 5th stopper
⑰ Input shaft rear bearing
⑱ Mainshaft front bearing
⑲ Mainshaft
⑳ 1st main gear
㉑ 1st gear needle bearing
㉒ Steel ball
㉓ 2nd & 3rd bushing
㉔ 4th main gear
㉕ 5th main gear
㉖ Thrust washer
㉗ Mainshaft C-ring
㉘ C-ring holder
㉙ Mainshaft rear bearing
㉚ Spacer
㉛ Mainshaft bearing adjusting shim
㉜ 4th bushing
㉝ 3rd & 4th synchronizer hub
㉞ 3rd main gear
㉟ 2nd main gear
㊱ 1st & 2nd synchronizer hub
㊲ Reverse main gear (Coupling sleeve)
㊳ Differential case
㊴ Final gear
㊵ Differential side bearing adjusting shim
㊶ Differential side bearing
㊷ Retaining pin
㊸ Pinion mate thrust washer
㊹ Speedometer drive gear
㊺ Speedometer stopper
㊻ Side gear
㊼ Pinion mate gear
㊽ Pinion mate shaft
㊾ Side gear thrust washer

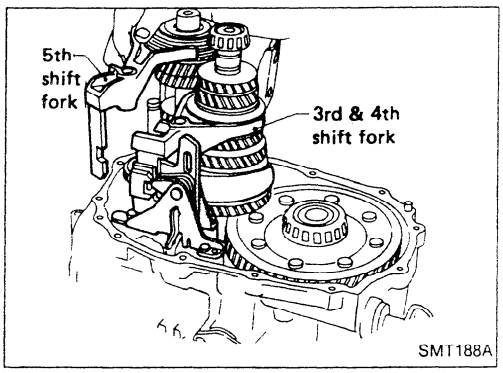
Shift Control Components



① Reverse check spring
② Reverse check plug
③ Check ball plug
④ Shift check ball
⑤ Check spring
⑥ Fork shaft support spring
⑦ Shifter cap
⑧ Fork shaft
⑨ 5th shift fork
⑩ 3rd & 4th shift fork
⑪ 1st & 2nd shift fork
⑫ Control bracket
⑬ Striking interlock
⑭ Retaining pin
⑮ Retaining pin
⑯ Yoke
⑰ Striking rod
⑱ Striking lever
⑲ Check ball (Large)
⑳ Check ball (Small)
㉑ Check sleeve
㉒ O-ring
㉓ Select return spring
㉔ Check plunger
㉕ Stopper pin

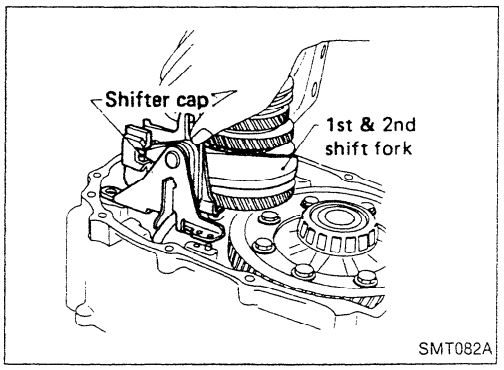


1. Remove transmission case while slightly tilting it to prevent 5th shift fork from interfering with case.



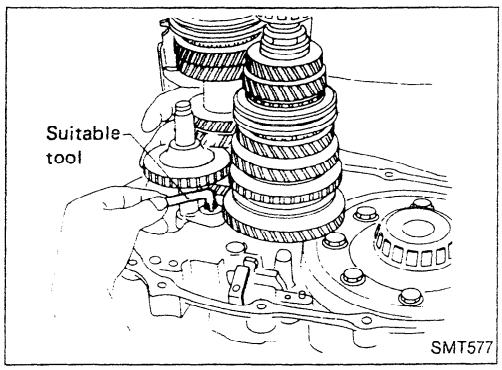
2. Draw out reverse idler spacer and fork shaft, then remove 5th and 3rd & 4th shift forks.

Be careful not to lose shifter cap.



3. Remove control bracket with 1st & 2nd shift fork.

Be careful not to lose shifter cap.

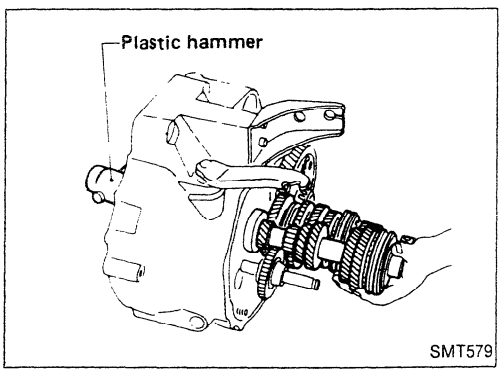


4. Remove gear components from clutch housing.

— RN4F30A and RS5F30A —

a. Remove three screws and detach bearing retainer.

One of these three screws is torx type and should be removed with a suitable tool, as shown.

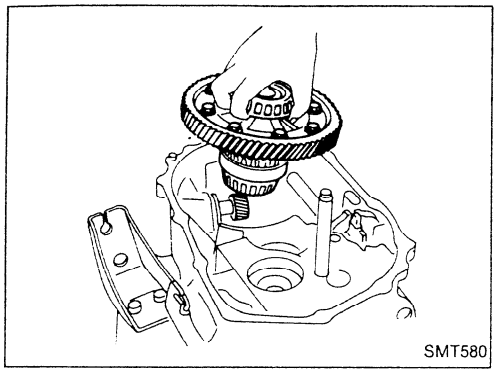


b. Remove input shaft together with mainshaft by tapping lightly.

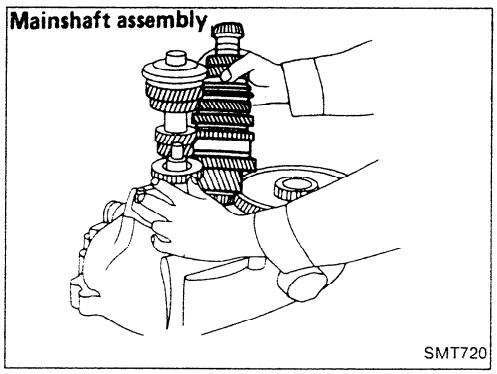
Always withdraw mainshaft straight out. Failure to do so can damage resin oil channel on clutch housing side.

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.


SMT580

c. Remove reverse idler gear and final drive assembly.

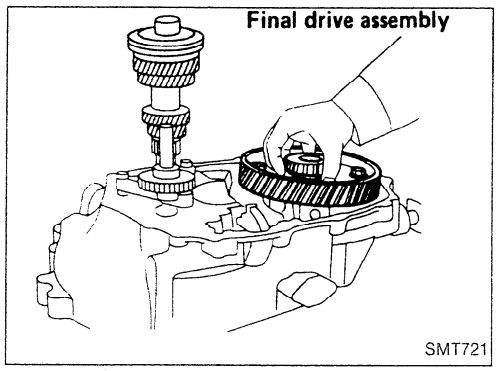


SMT720

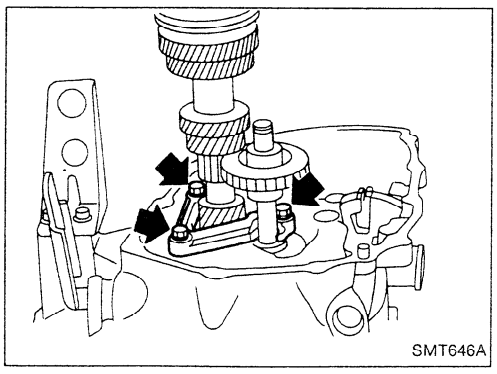
— RS5F31A —

a. Remove mainshaft and final drive assembly.

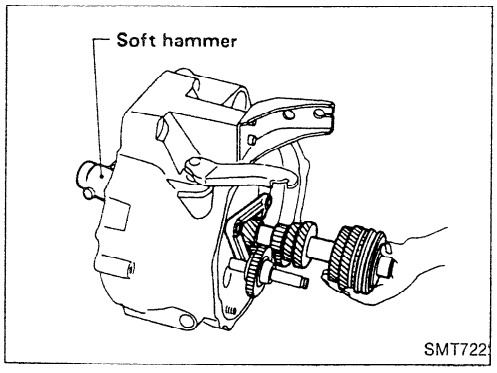
Always withdraw mainshaft straight out. Failure to do so can damage resin oil channel on clutch housing side.



SMT721


SMT646A

b. Remove bearing retainer securing bolts.

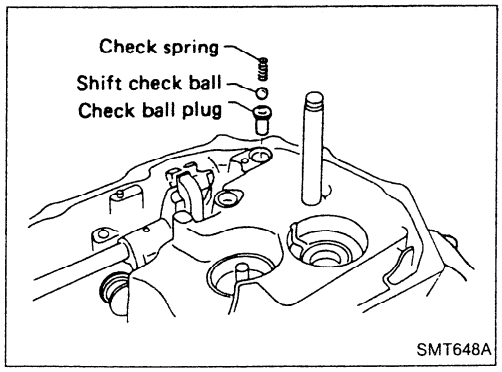


SMT722

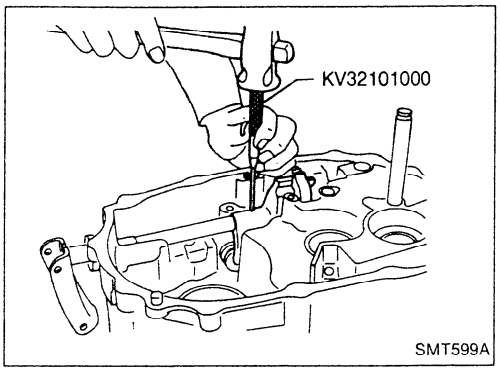
c. Remove input shaft together with bearing retainer and reverse idler gear by tapping lightly.

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.

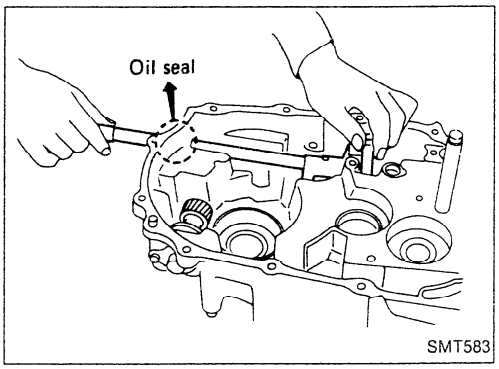


5. Remove oil pocket, shift check ball, check spring and check ball plug.

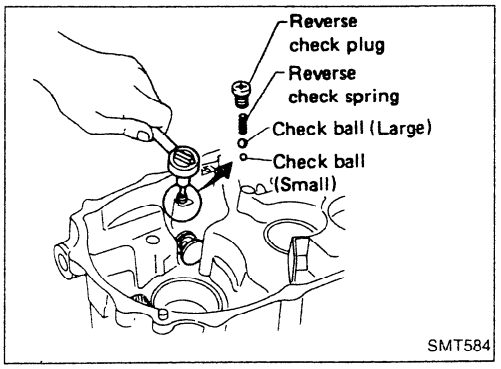


6. Drive retaining pin out of striking lever, then remove striking rod, striking lever and striking interlock.

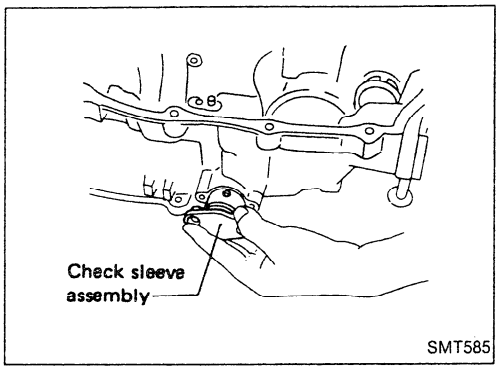
- **Select a position where retaining pin does not interfere with clutch housing when removing retaining pin.**



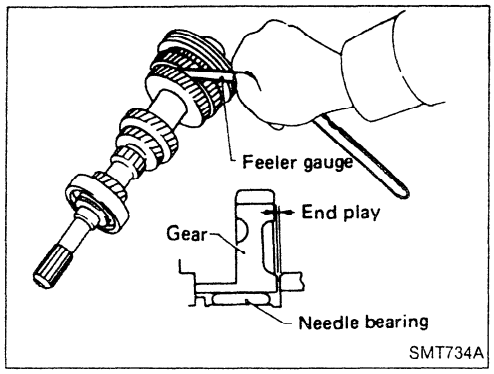
- **Be careful not to damage oil seal lip, when removing striking rod. If necessary, tape edges of striking rod.**



7. Remove reverse check plug, then detach reverse check spring and check balls.



8. Remove check sleeve assembly.



Input Shaft and Gears

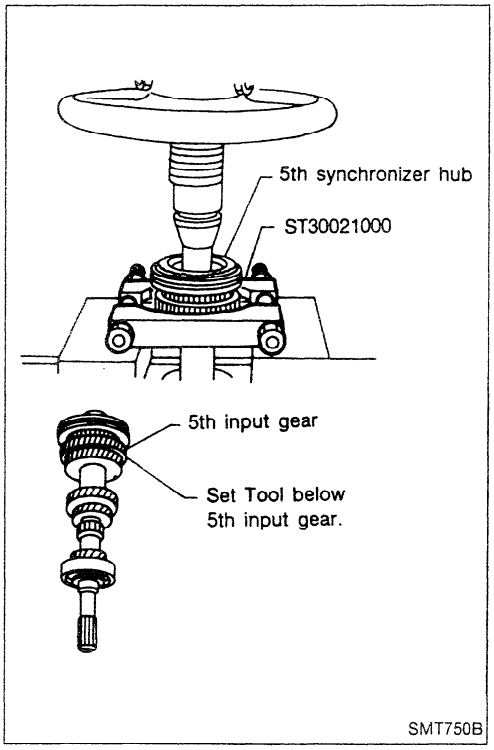
DISASSEMBLY

1. Before disassembly, check 5th input gear end play.

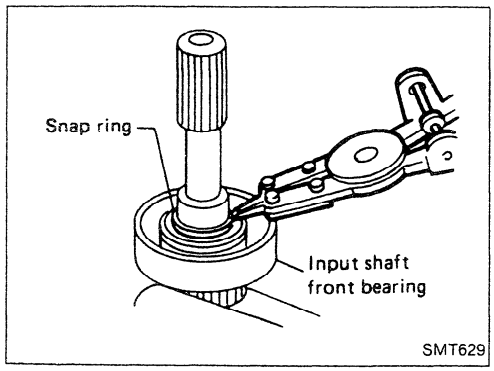
Gear end play

Gears	End play mm (in)
5th input gear	0.18 - 0.31 (0.0071 - 0.0122)

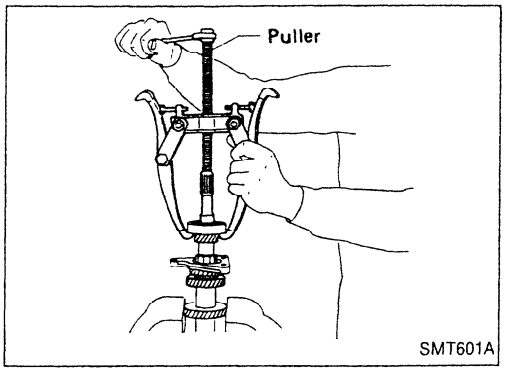
- If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of snap ring groove -- Refer to "Assembly".



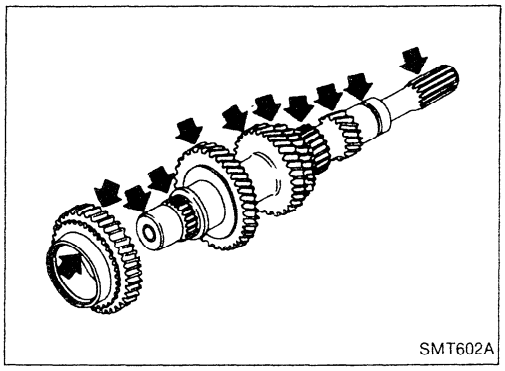
2. Remove snap ring and 5th stopper.
3. Remove 5th synchronizer, 5th input gear and 5th gear needle bearing.



4. Remove snap ring of input shaft front bearing and input gear spacer.



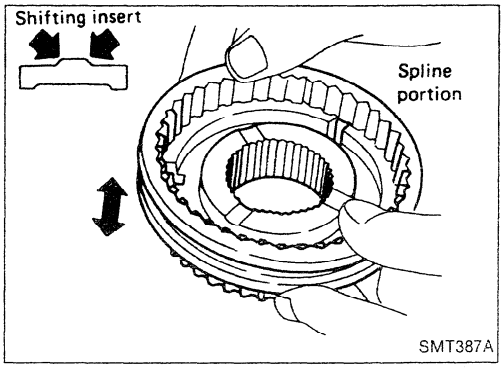
5. Pull out input shaft front bearing.
6. Remove bearing retainer.



INSPECTION

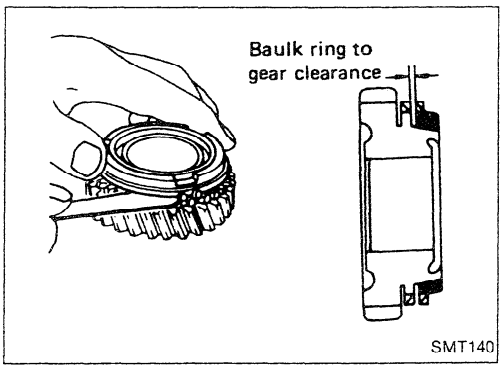
Gear and shaft

- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.



Synchronizer

- Check spline portion 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.

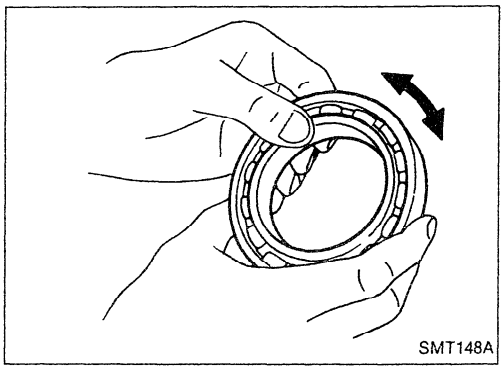
Clearance between baulk ring and gear:

Standard

1.0 - 1.35 mm (0.0394 - 0.0531 in)

Wear limit

0.7 mm (0.028 in)

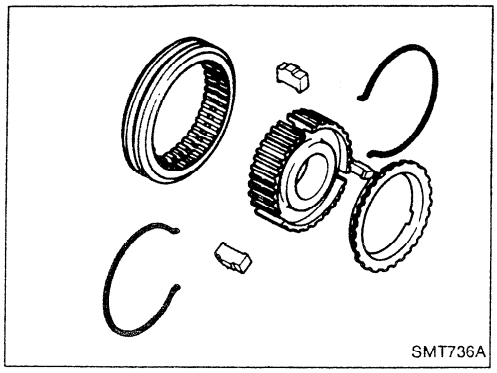


Bearing

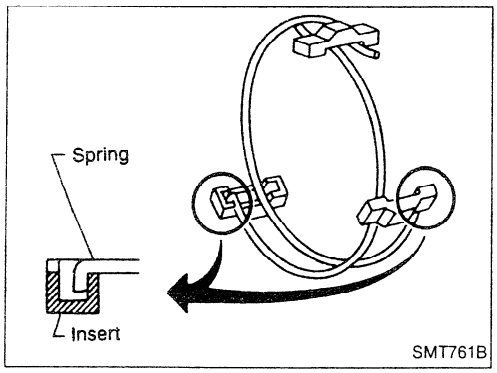
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

Input Shaft and Gears (Cont'd)

ASSEMBLY

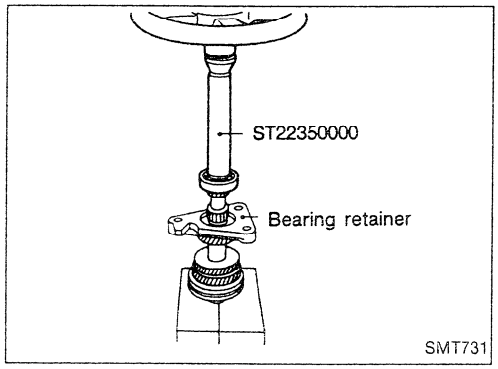

SMT736A

1. Assemble 5th synchronizer.



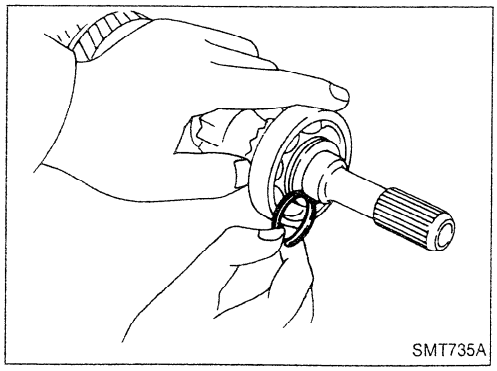
SMT761B

- **Be careful not to hook front and rear ends of spread spring to the same insert.**



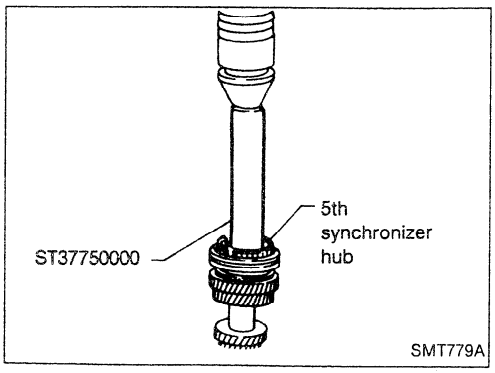
SMT731

2. Install bearing retainer.
3. Press on input shaft front bearing.
4. Install input gear spacer.


SMT735A

5. Select proper snap ring of input shaft front bearing to minimize clearance of groove in input shaft and then install it.

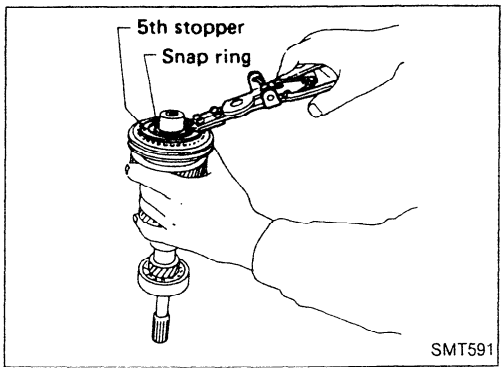
   Allowable clearance of groove:
   0 - 0.1 mm (0 - 0.004 in)
   Snap ring of input shaft front bearing:
   Refer to S.D.S.



SMT779A

6. Install 5th gear needle bearing, 5th input gear, 5th synchronizer and 5th stopper.
7. Measure gear end play as the final check — Refer to "Disassembly."

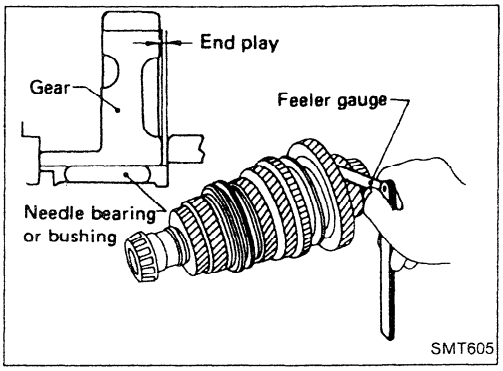
Input Shaft and Gears (Cont'd)



8. Select proper 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 S.D.S.

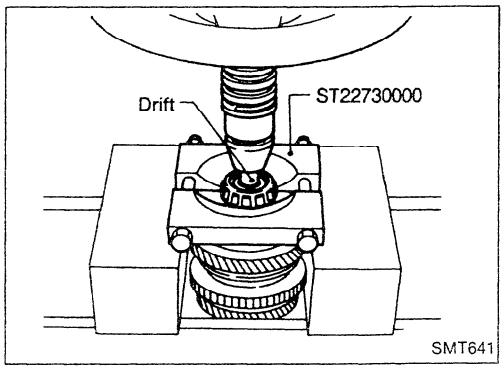
Mainshaft and Gears

DISASSEMBLY

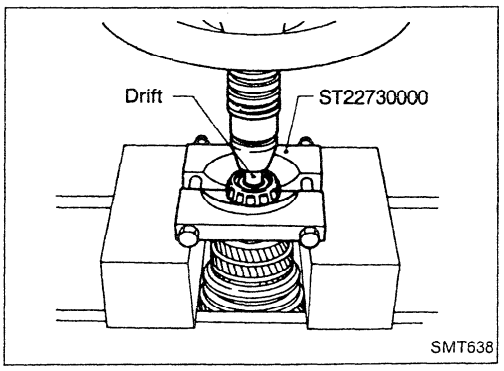


1. Before disassembly, check 1st, 2nd, 3rd and 4th main gear end plays.
   Gear end play
   Refer to S.D.S.

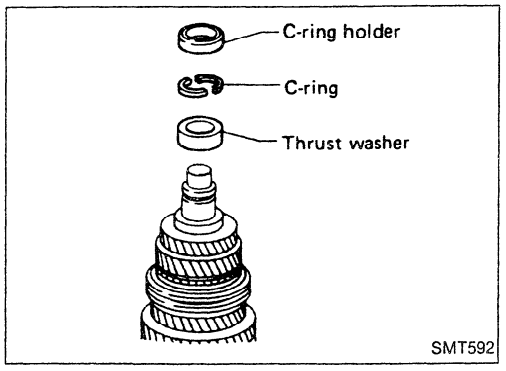
- If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of C-ring groove — Refer to "Assembly".



2. Press out mainshaft front bearing.

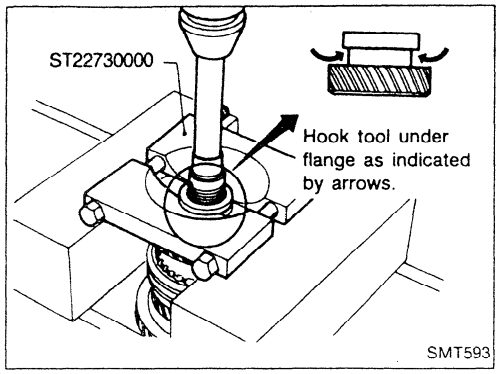


3. Press out mainshaft rear bearing.



4. Remove C-rings, C-ring holder and thrust washer.

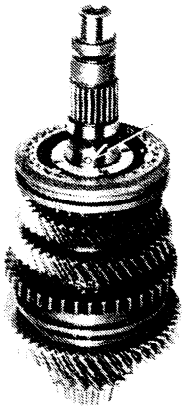
Mainshaft and Gears (Cont'd)



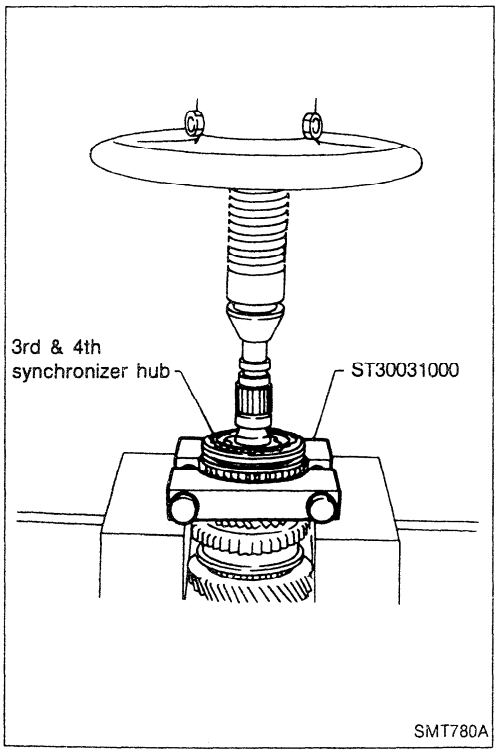
5. Press out 5th main gear.



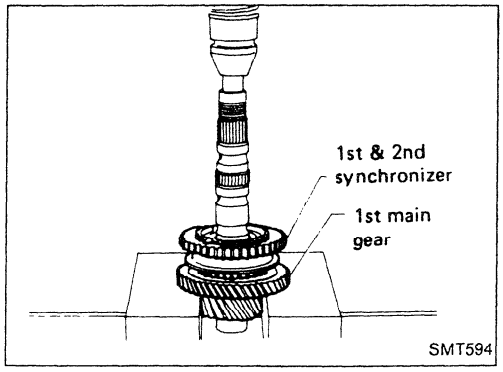




6. Remove 4th main gear, 4th bushing and steel ball.
- **Be careful not to lose steel ball.**



7. Remove 3rd & 4th synchronizer, 3rd main gear, 2nd & 3rd bushing, steel ball and 2nd main gear.
- **Be careful not to lose steel ball.**

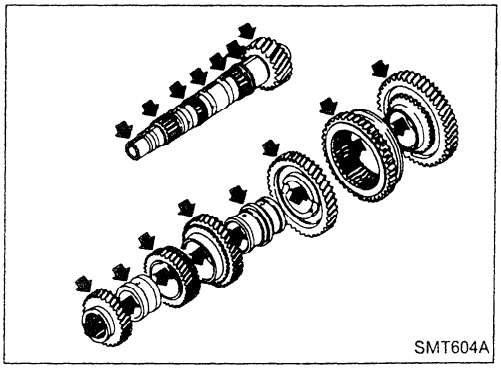


8. Remove 1st & 2nd synchronizer and 1st main gear, then remove 1st gear needle bearing.

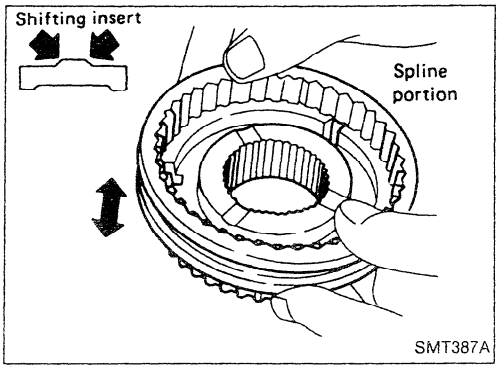
INSPECTION

Gear and shaft

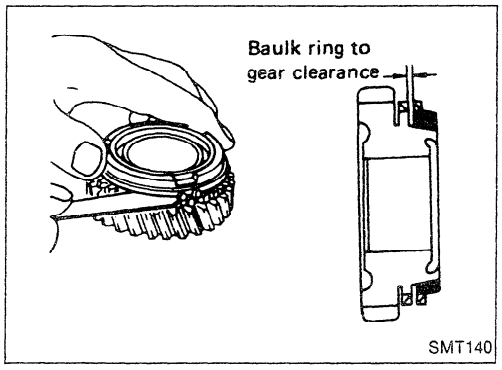
- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.



Synchronizer



- Check spline portion 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.

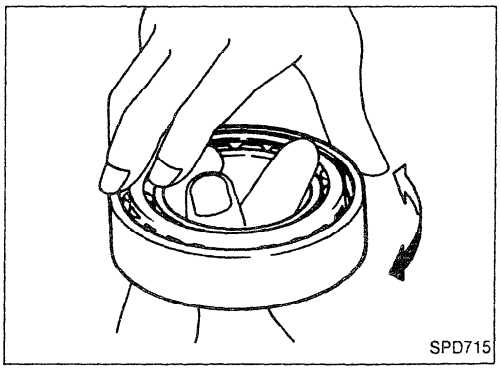
Clearance between baulk rings and 1st-4th main gears:

Standard

1.0 - 1.35 mm (0.0394 - 0.0531 in)

Wear limit

0.7 mm (0.028 in)

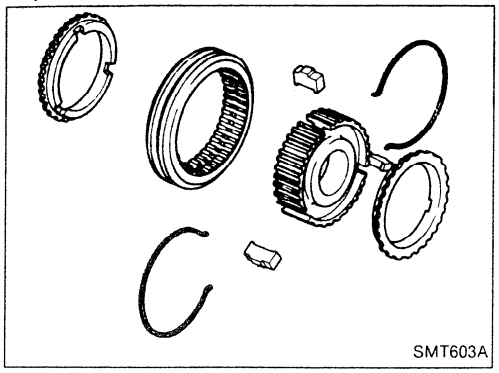


Bearing

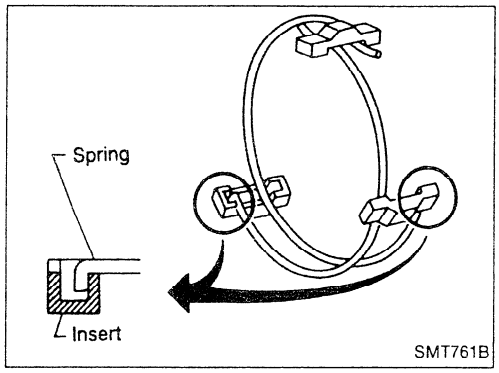
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing tapered roller bearing, replace outer and inner race as a set.**

Mainshaft and Gears (Cont'd)

ASSEMBLY

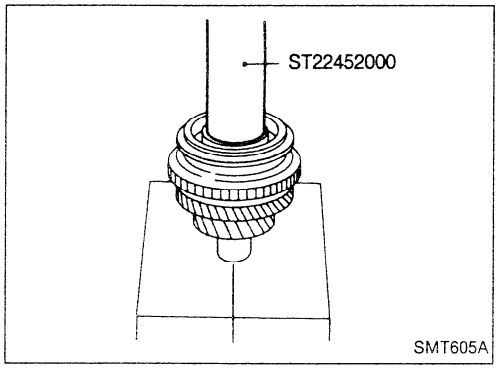

SMT603A

1. Assemble 1st & 2nd and 3rd & 4th synchronizers.



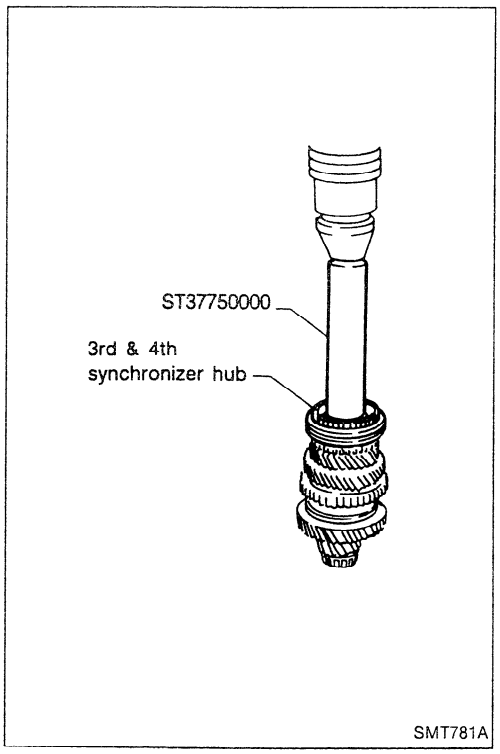
SMT761B

- **Be careful not to hook front and rear ends of spread spring to the same insert.**



SMT605A

2. Install 1st gear needle bearing and 1st main gear.
3. Press on 1st & 2nd synchronizer.

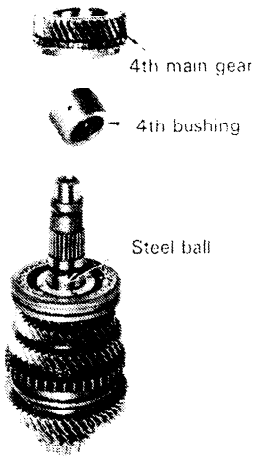


SMT781A

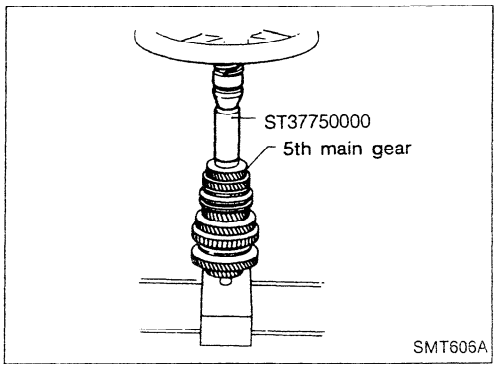
4. Install steel ball, 2nd main gear, 2nd & 3rd bushing, 3rd main gear and 3rd & 4th synchronizer.

- **Apply multi-purpose grease to steel ball before installing it.**
- **2nd & 3rd bushing has a groove in which steel ball fits.**

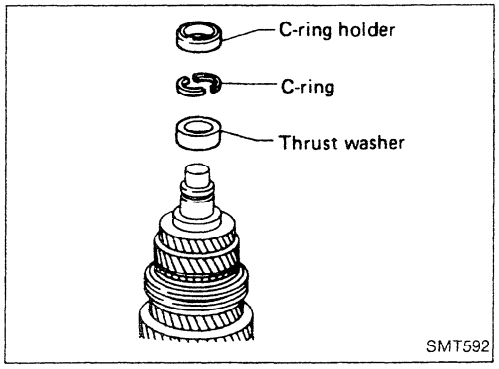
Mainshaft and Gears (Cont'd)



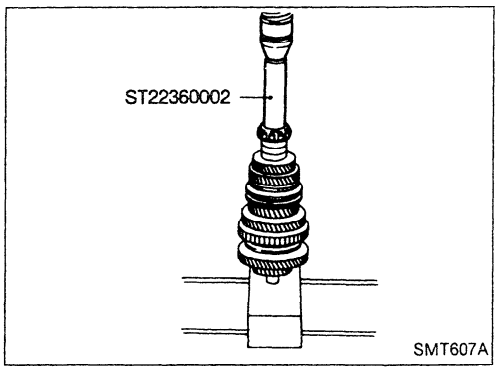
5. Install steel ball, 4th bushing and 4th main gear.
- **Apply multi-purpose grease to steel ball before installing it.**
- **4th bushing has a groove in which steel ball fits.**



6. Press on 5th main gear.

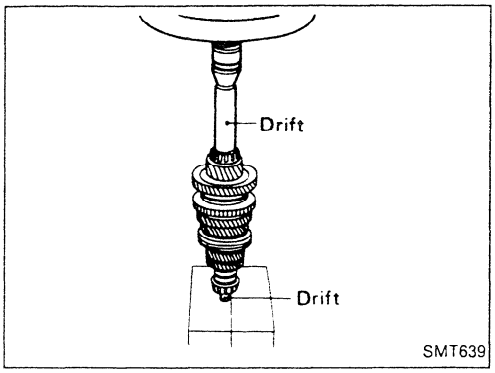


7. Install thrust washer.
8. Select proper C-ring to minimize clearance of groove in mainshaft and install it.
   Allowable clearance of groove:
   0 - 0.1 mm (0 - 0.004 in)
   Mainshaft C-ring:
   Refer to S.D.S.
9. Install C-ring holder.



10. Press on mainshaft rear bearing.

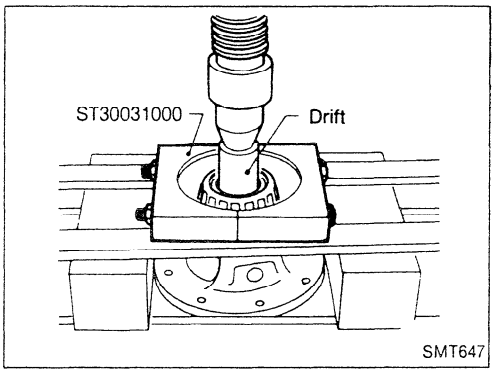
Mainshaft and Gears (Cont'd)



11. Press on mainshaft front bearing.
12. Measure gear end play as the final check — Refer to "Disassembly".

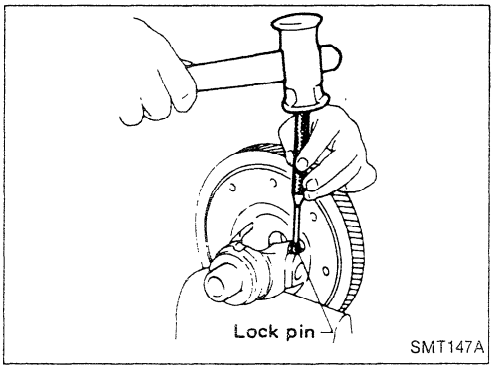
Final Drive

DISASSEMBLY



1. Remove final gear.
2. Remove speedometer drive gear by cutting it.
3. Press out differential side bearings.

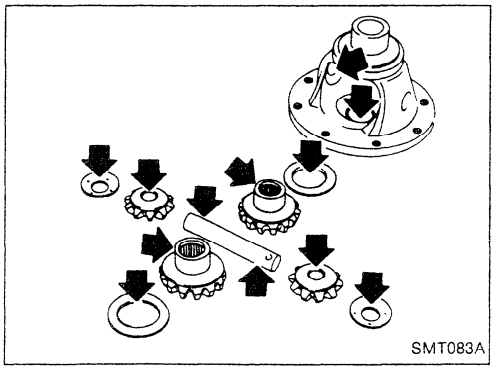
- **Be careful not to mix up the right and left bearings.**



4. Drive out retaining pin and draw out pinion mate shaft.
5. Remove pinion mate gears and side gears.

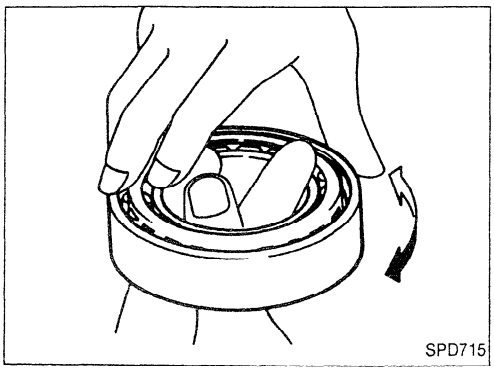
INSPECTION

Gear, washer, shaft and case



- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.

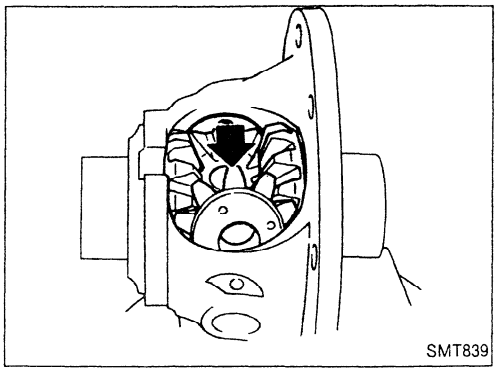
Bearing



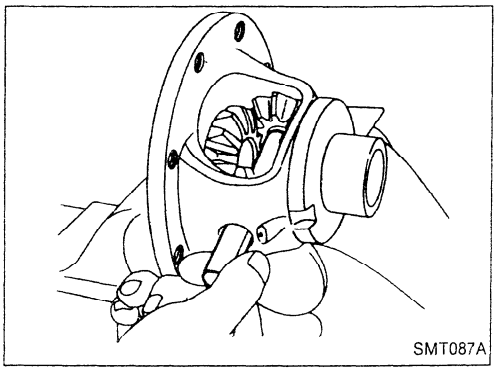
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing tapered roller bearing, replace outer and inner race as a set.**

Final Drive (Cont'd)

ASSEMBLY

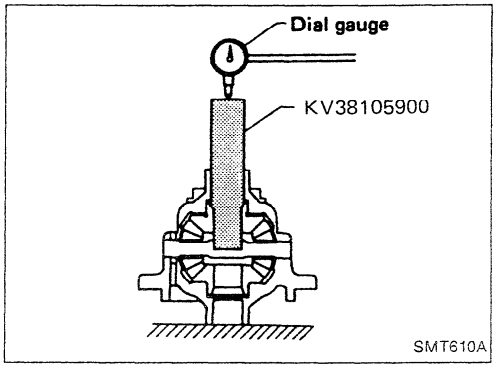

SMT839

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.

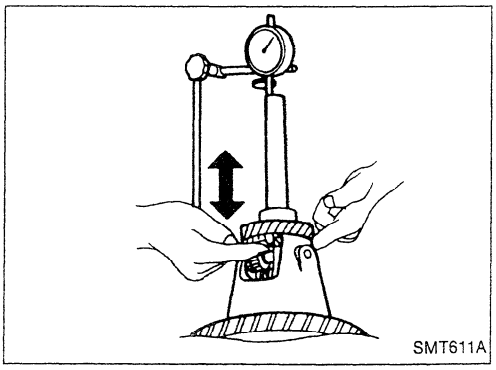
- **When inserting, be careful not to damage pinion mate thrust washers.**



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.


SMT611A

b. Move side gear up and down to measure dial indicator deflection. Always measure indicator deflection on both side gears.

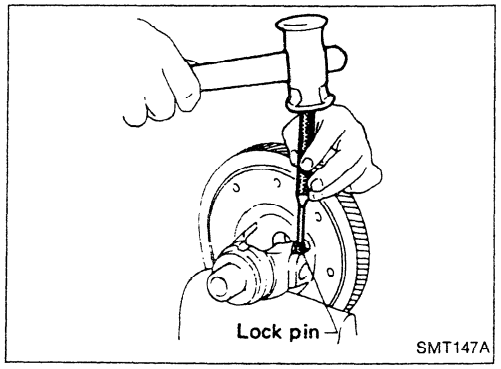
Clearance between side gear and differential case with washers:

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 washer:

Refer to S.D.S.

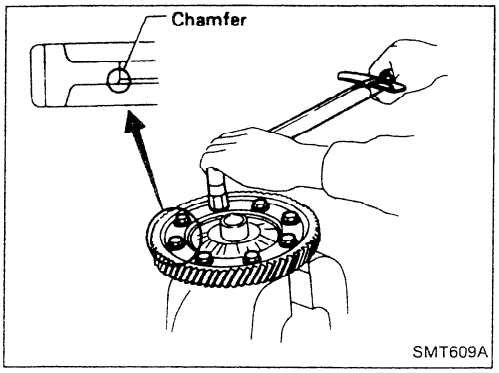


SMT147A

4. Install retaining pin.

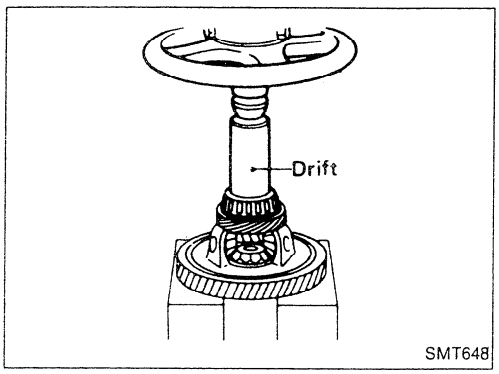
- **Make sure that retaining pin is flush with case.**

Final Drive (Cont'd)

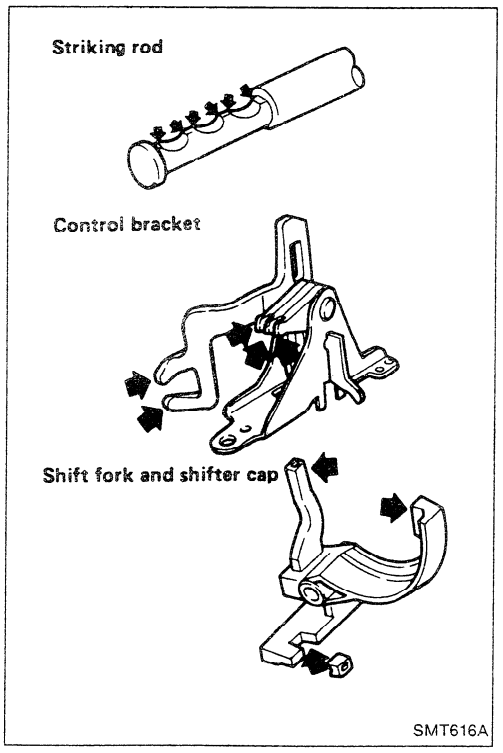


5. Install final gear.
- **Apply locking sealant to final gear fixing bolts before installing them.**

6. Install speedometer drive gear and stopper.



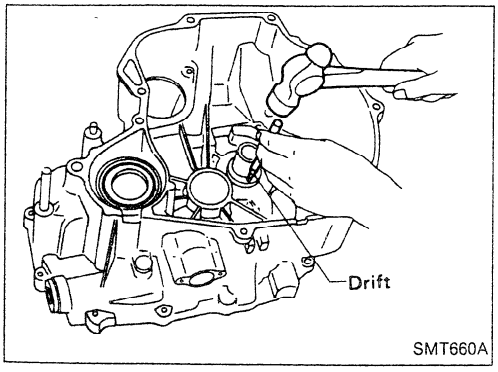
7. Press on differential side bearings.



Shift Control Components

INSPECTION

- Check contact surface and sliding surface for wear, scratches, projections or other damage.

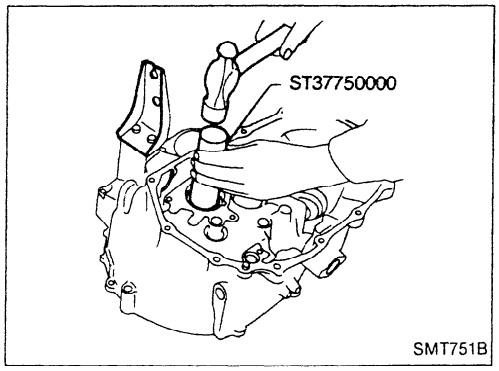


Case Components

Input shaft oil seal

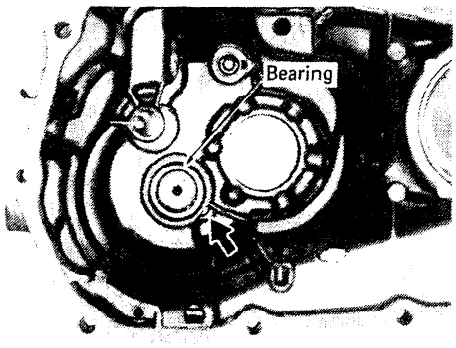
1. Drive out input shaft oil seal.

Case Components (Cont'd)



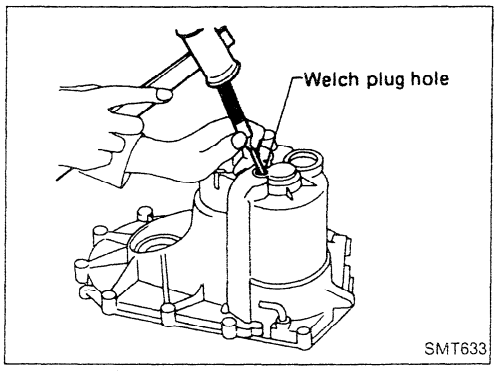
2. Install input shaft oil seal.

- **Apply multi-purpose grease to seal lip of oil seal before installing.**

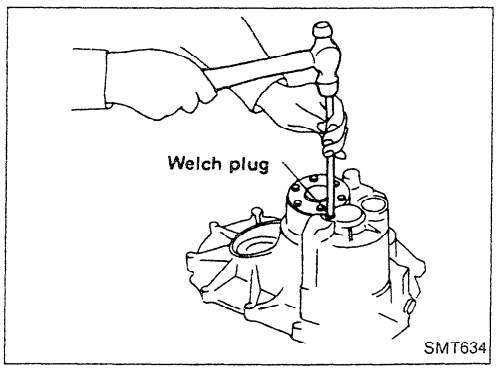


Input shaft rear bearing

1. Remove welch plug from transmission case.

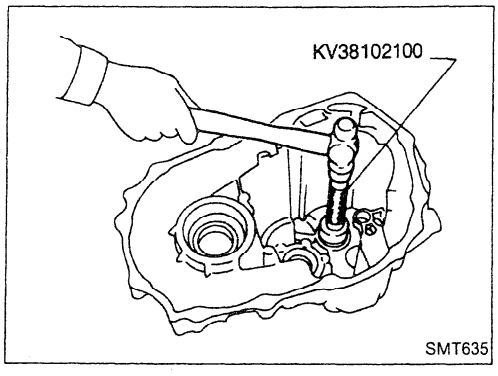


2. Remove input shaft rear bearing by tapping it from welch plug hole.



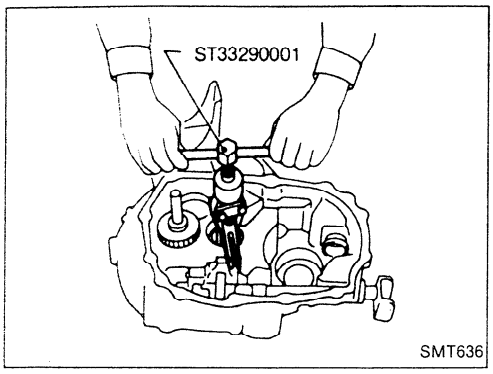
3. Install welch plug.

- **Apply recommended sealant to mating surface of transmission case.**



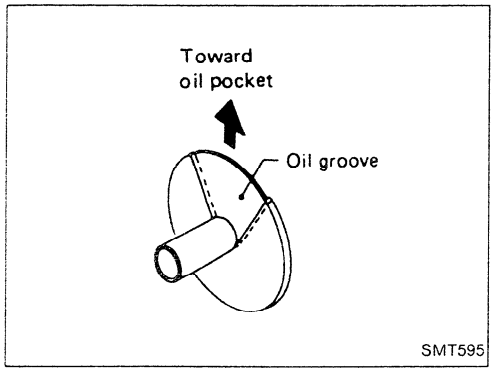
4. Install input shaft rear bearing.

Case Components (Cont'd)



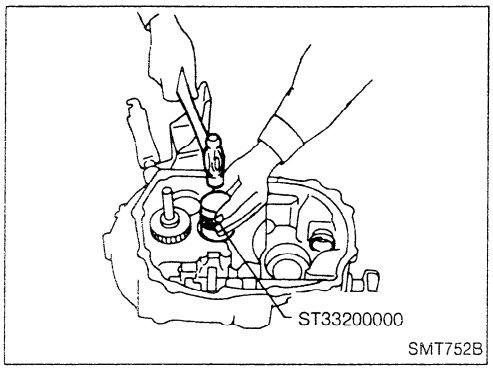
Mainshaft front bearing outer race and oil channel

1. Remove mainshaft front bearing outer race.
2. Remove oil channel.



3. Install oil channel.

- **Ensure that 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".**

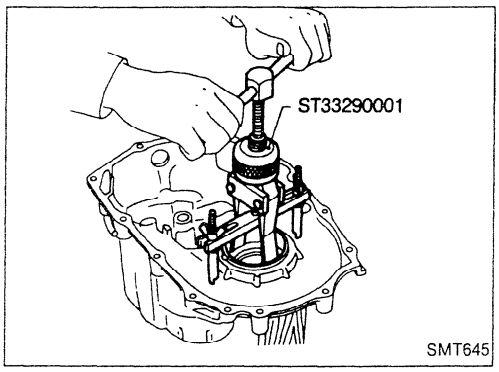
Differential side bearing outer race

- **Refer to "ADJUSTMENT".**

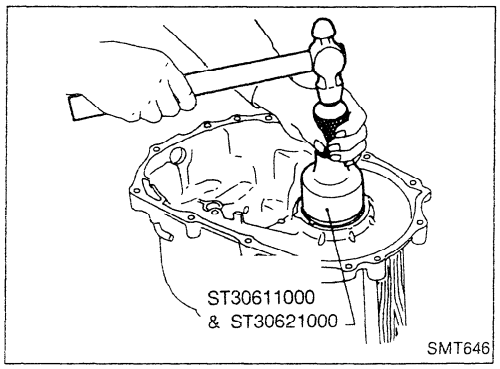
Differential Side Bearing Preload

If any of the following parts are replaced, adjust differential side bearing preload.

- **Differential case**
- **Differential side bearing**
- **Clutch housing**
- **Transmission case**

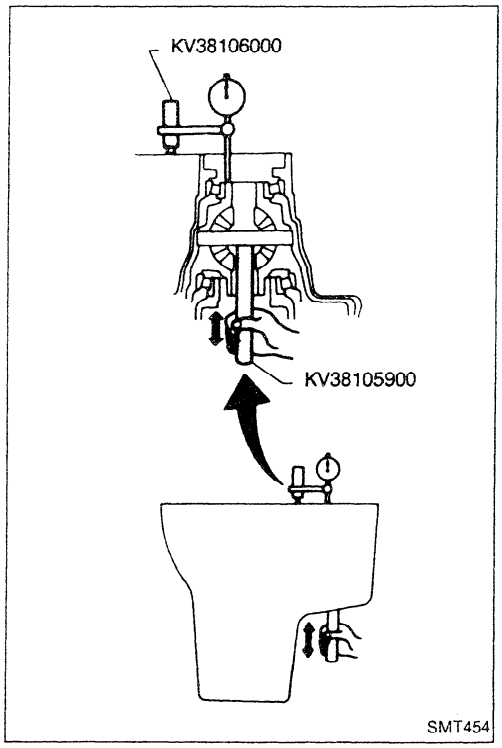


1. Remove differential side bearing outer race (transmission case side) and shim.



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.**

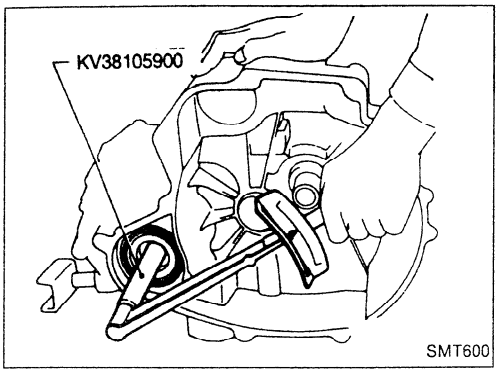


5. Set dial indicator on front end of differential case.
6. Insert Tool all the way into differential side gear.
7. Move Tool up and down and measure dial indicator deflection.
8. Select shim considering bearing preload.
   Suitable shim thickness =
   Dial indicator deflection
   + specified bearing preload
   Differential side bearing adjusting shims and preload:
   Refer to S.D.S.
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.**

Differential Side Bearing Preload (Cont'd)



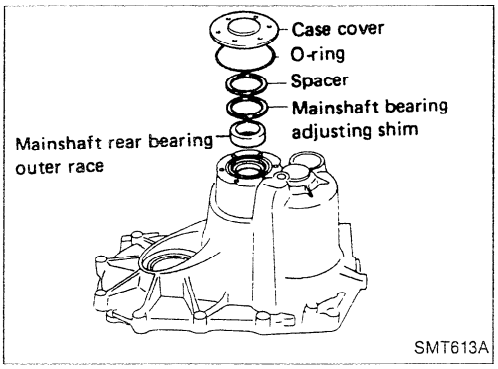
c. Measure turning torque of final drive assembly.
   Turning torque of final drive assembly (New bearing):
   Refer to S.D.S.

- **When old bearing is used again, turning torque will be slightly less than the above.**
- **Make sure torque in 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

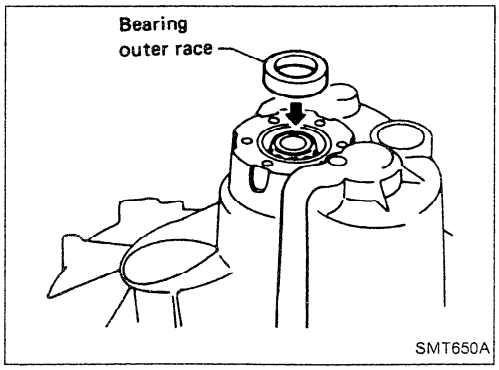
If any of the following parts are replaced, adjust mainshaft bearing preload.

- **Mainshaft**
- **Mainshaft bearings**
- **Clutch housing**
- **Transmission case**

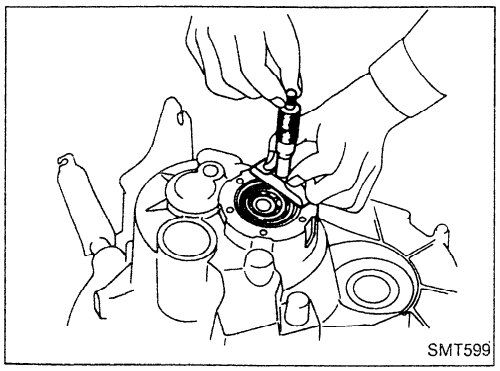


1. Remove case cover, O-ring, spacer, mainshaft bearing adjusting shim and mainshaft rear bearing outer race from transmission case.
2. Install mainshaft assembly on clutch housing.
3. Install transmission case on clutch housing.

- **Tighten transmission case fixing bolts to the specified torque.**



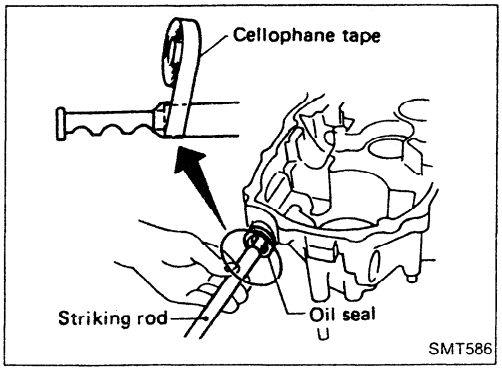
4. Reinstall mainshaft rear bearing outer race on inner race.



5. Measure distance from transmission case to bearing outer race.

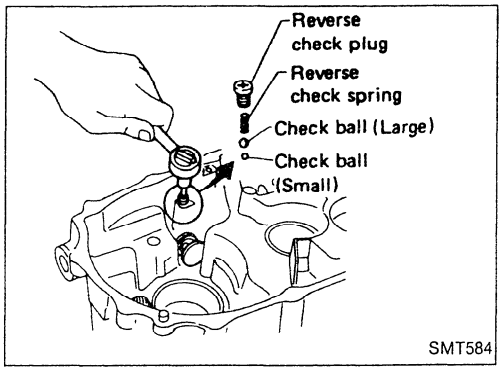
- **Make sure that bearing is properly seated.**

6. Select shim with S.D.S. table as a guide.
7. Check total turning torque after assembling — Refer to "ASSEMBLY".

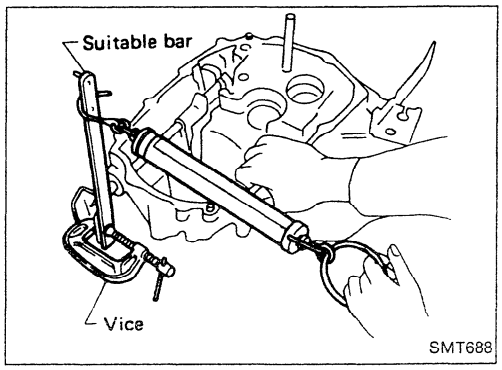


1. Install striking rod, lever and interlock.

- **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 check plug.

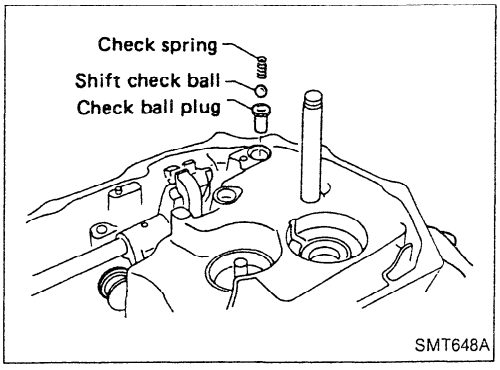


4. Check reverse check force.
   Reverse check force:
   Refer to S.D.S.

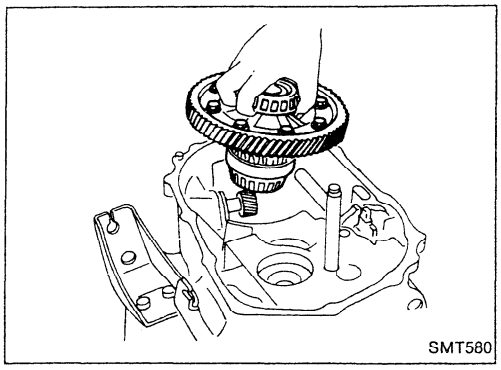
- If not within specification, select another check plug having a different length and reinstall it.
  Reverse check plug:
  Refer to S.D.S.

5. Install selected reverse check plug.

Apply locking sealant to thread of plug before installing it.



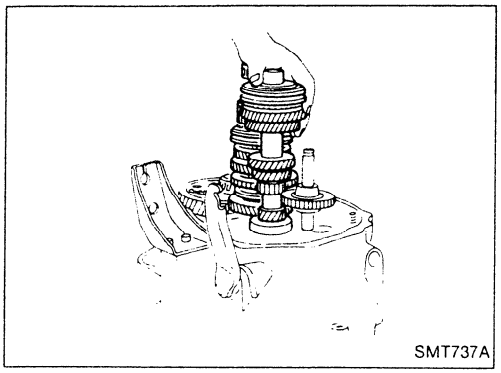
6. Install check ball plug, shift check ball and check spring.
7. Install oil pocket.



8. Install gear components onto clutch housing.

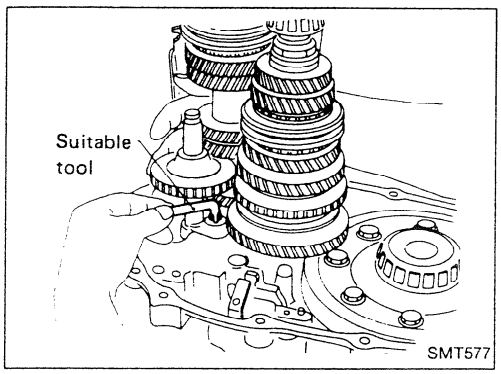
— RN4F30A and RS5F30A —

a. Install final drive assembly and reverse idler gear.


SMT737A

b. Install mainshaft and input gear as a set.

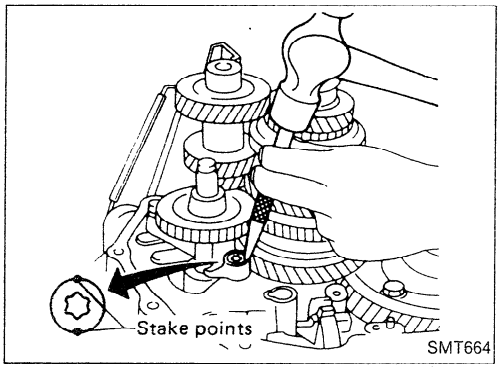
- **Take care not to damage oil seal lip with splines of input shaft while shaft is being inserted into clutch housing.**
- **Take care not to damage oil channel when inserting mainshaft into clutch housing.**



SMT577

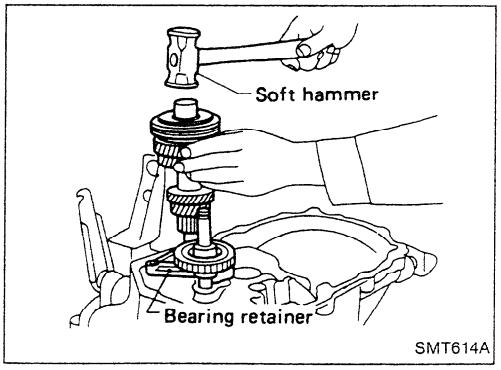
c. Install bearing retainer.

One of these three screws is torx type and should be installed with suitable tool, as shown.



SMT664

d. After installing torx screw, stake it at two points.

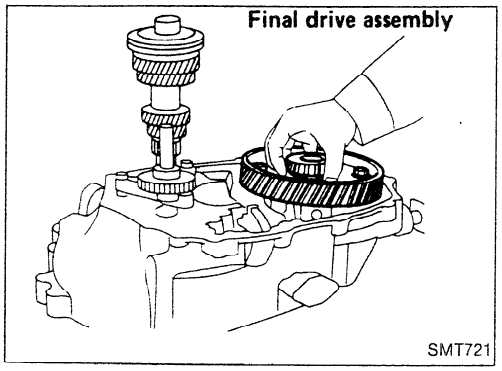


SMT614A

— **RS5F31A** —

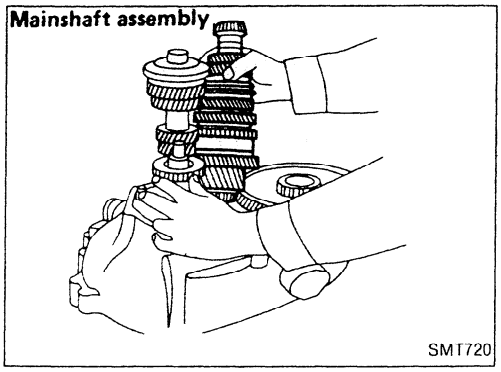
a. Install input shaft assembly and reverse idler gear.

- **Take care not to damage oil seal lip with splines of input shaft while shaft is being inserted into clutch housing.**



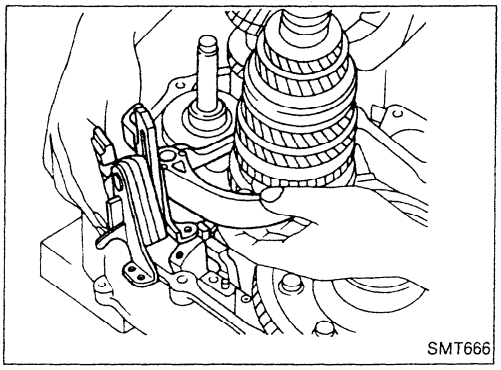
SMT721

b. Install final drive assembly.

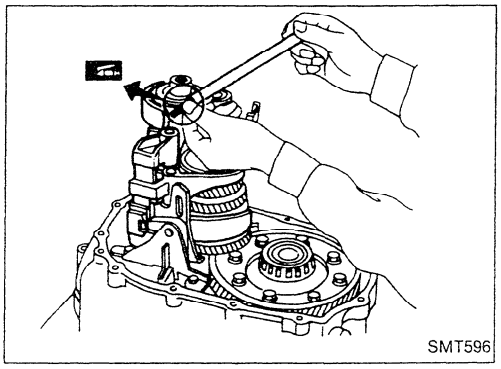


c. Install mainshaft assembly.

- **Take care not to damage oil channel when inserting mainshaft into clutch housing.**



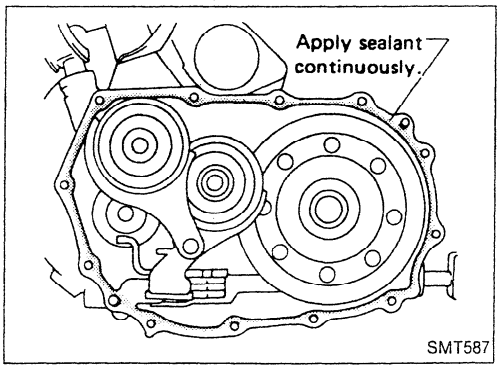
9. Apply grease to shifter caps, then install it to control bracket. Install control bracket with 1st & 2nd shift fork.
10. Install 3rd & 4th and 5th shift forks.



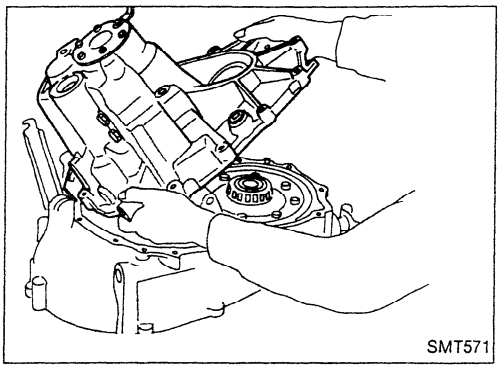
11. Insert fork shaft.

- **Apply multi-purpose grease to support spring before installing.**

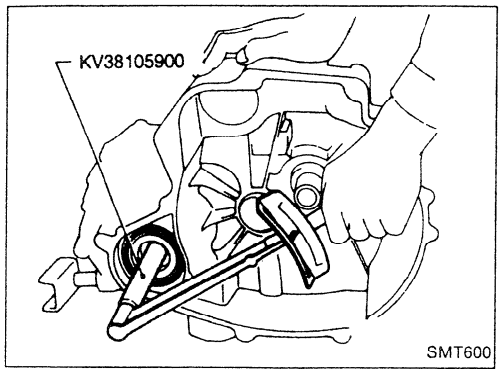
12. Install reverse idler spacer.



13. Apply recommended sealant to mating surface of clutch housing.



14. Install transmission case on clutch housing.

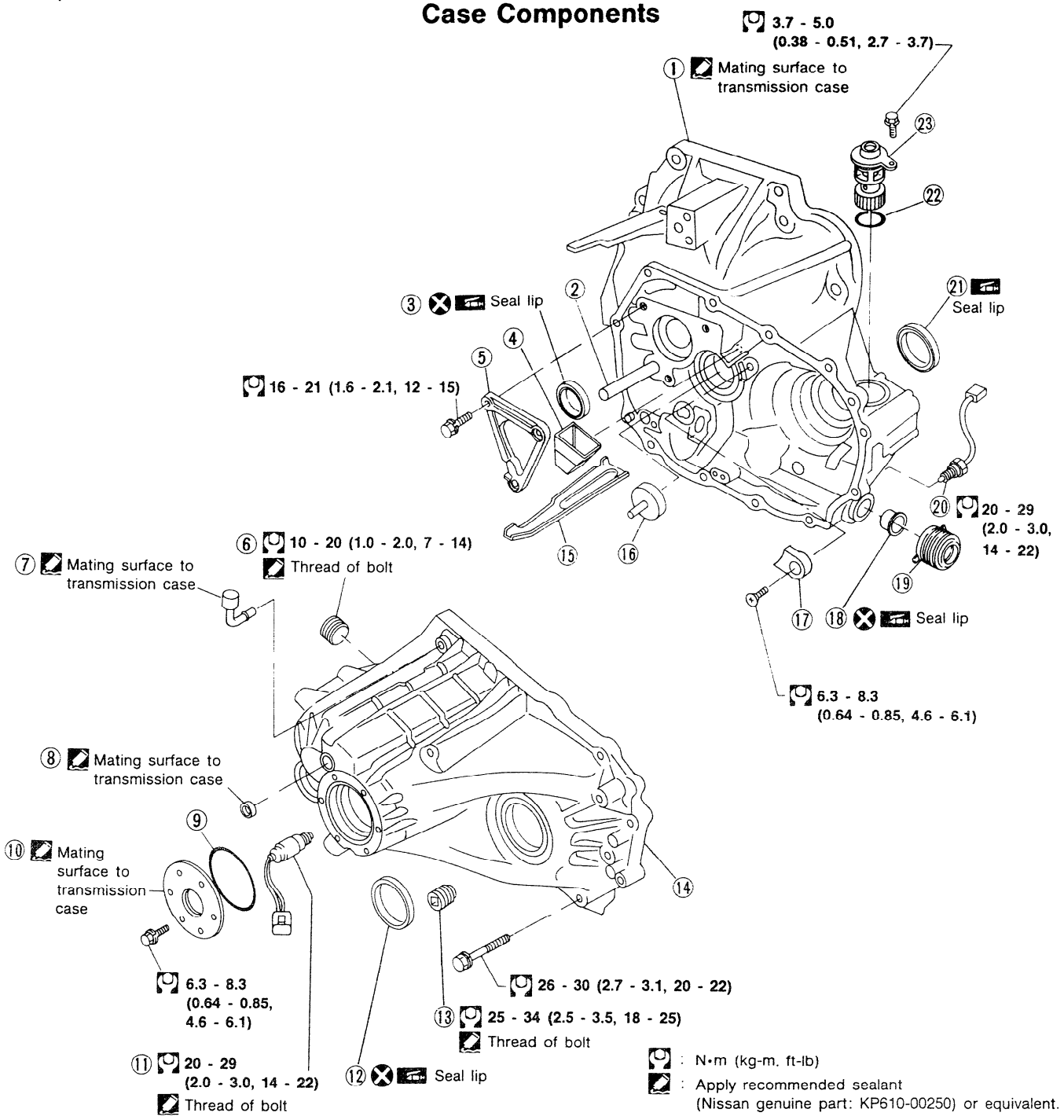


15. Measure total turning torque.

Total turning torque (New bearing):
Refer to S.D.S.

- **When old bearing is used again, turning torque will be slightly less than the above.**
- **Make sure torque is close to the specified range.**

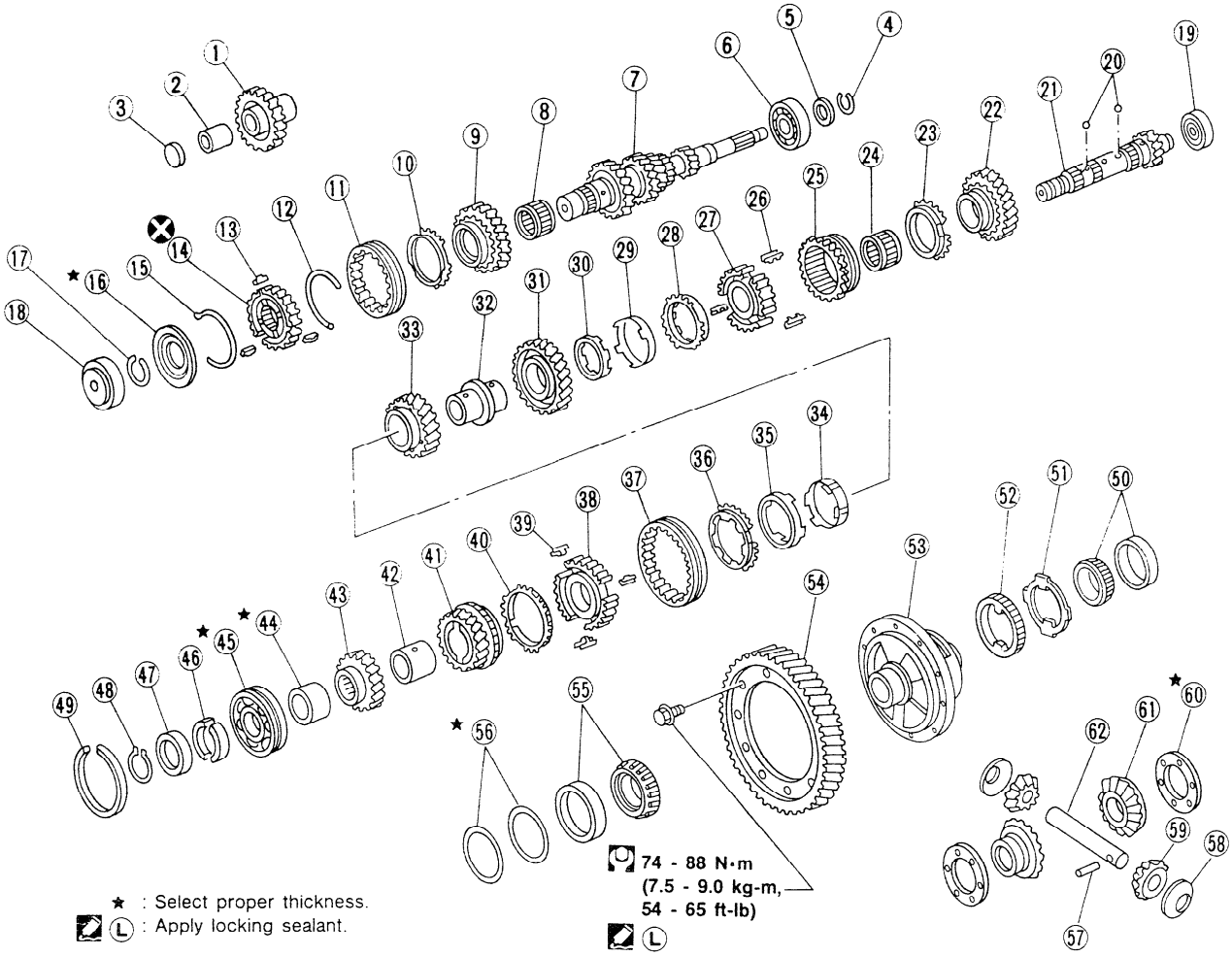
Case Components



SMT764B

① Clutch housing
② Reverse idler shaft
③ Input shaft oil seal
④ Oil pocket
⑤ Bearing retainer
⑥ Filler plug
⑦ Air breather
⑧ Welch plug
⑨ O-ring
⑩ Case cover
⑪ Reverse lamp switch
⑫ Differential oil seal
⑬ Drain plug
⑭ Transmission case
⑮ Oil gutter
⑯ Oil channel
⑰ Bearing retainer
⑱ Striking rod oil seal
⑲ Boot
⑳ Neutral switch
㉑ Differential oil seal
㉒ O-ring
㉓ Speedometer pinion assembly

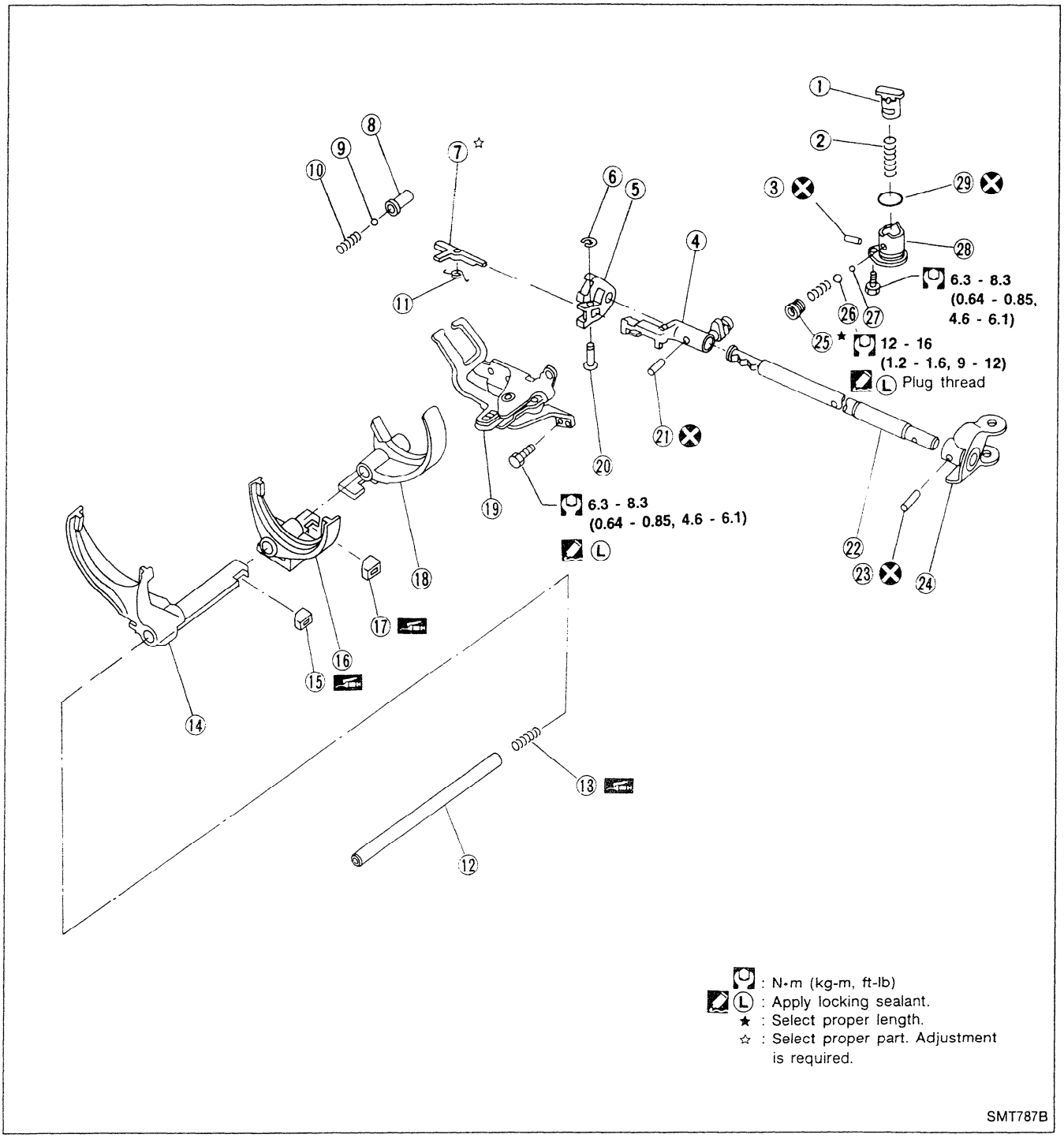
Gear Components



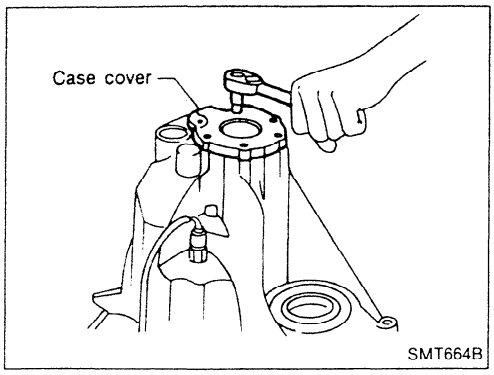
SMT462C

① Reverse idler gear
② Reverse idler bushing
③ Reverse idler spacer
④ Snap ring
⑤ Spacer
⑥ Input shaft front bearing
⑦ Input shaft
⑧ 5th gear needle bearing
⑨ 5th input gear
⑩ Baulk ring
⑪ Coupling sleeve
⑫ Spread ring
⑬ Insert spring
⑭ 5th gear synchronizer hub
⑮ Spread ring
⑯ 5th stopper
⑰ Snap ring
⑱ Input shaft bearing
⑲ Mainshaft front bearing
⑳ Steel ball
㉑ Mainshaft
㉒ 1st main gear
㉓ Baulk ring
㉔ 1st gear needle bearing
㉕ Reverse main gear (Coupling sleeve)
㉖ Insert spring
㉗ 1st & 2nd synchronizer hub
㉘ 2nd outer baulk ring
㉙ 2nd gear synchronizer cone
㉚ 2nd inner baulk ring
㉛ 2nd main gear
㉜ 2nd & 3rd bushing
㉝ 3rd main gear
㉞ 3rd inner baulk ring
㉟ 3rd gear synchronizer cone
㊱ 3rd outer baulk ring
㊲ Coupling sleeve
㊳ 3rd & 4th synchronizer hub
㊴ Insert spring
㊵ Baulk ring
㊶ 4th main gear
㊷ 4th gear bushing
㊸ 5th main gear
㊹ Spacer
㊺ Mainshaft rear bearing
㊻ C-ring
㊼ C-ring holder
㊽ Snap ring
㊾ Snap ring
㊿ Differential side bearing
(51) Speedometer stopper
(52) Speedometer drive gear
(53) Differential case
(54) Final gear
(55) Differential side bearing
(56) Differential side bearing adjusting shim
(57) Retaining pin
(58) Thrust washer
(59) Pinion mate gear
(60) Thrust washer
(61) Side gear
(62) Pinion mate shaft

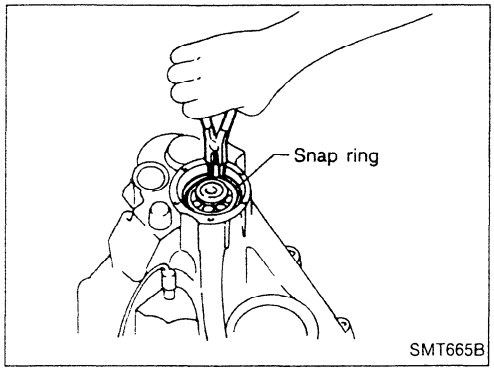
Shift Control Components



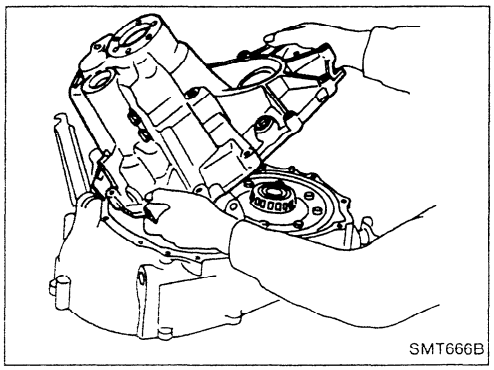
① Check plunger
② Select return spring
③ Stopper pin
④ Striking lever
⑤ Striking interlock
⑥ Snap ring
⑦ Reverse brake cam
⑧ Check ball plug
⑨ Shift check ball
⑩ Check spring
⑪ Reverse brake cam spring
⑫ Fork shaft
⑬ Fork shaft supporting spring
⑭ 5th shift fork
⑮ Shift cap
⑯ 3rd & 4th shift fork
⑰ Shift cap
⑱ 1st & 2nd shift fork
⑲ Control bracket
⑳ Control bracket pin
㉑ Retaining pin
㉒ Striking rod
㉓ Retaining pin
㉔ Yoke
㉕ Reverse check plug
㉖ Check ball (Large)
㉗ Check ball (Small)
㉘ Check sleeve
㉙ O-ring



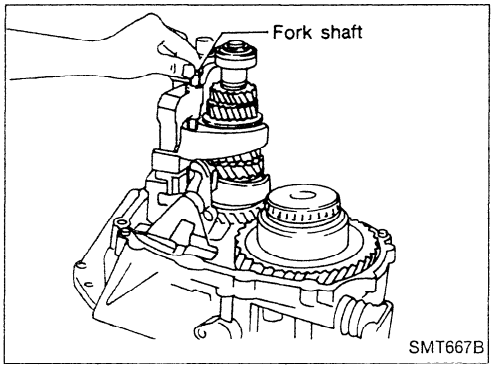
1. Remove case cover.



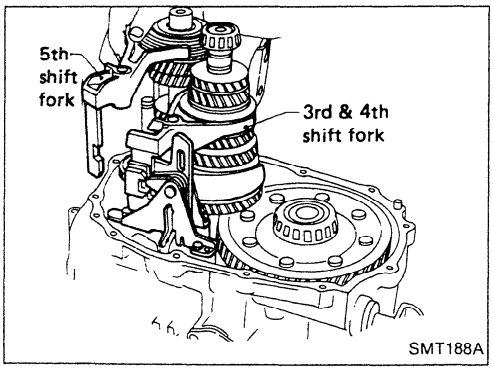
2. Remove mainshaft bearing snap ring.



3. Remove transmission case while slightly tilting it to prevent 5th shift fork from interfering with case.

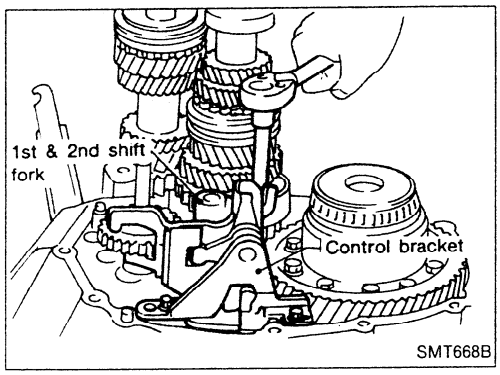


4. Draw out reverse idler spacer and fork shaft.

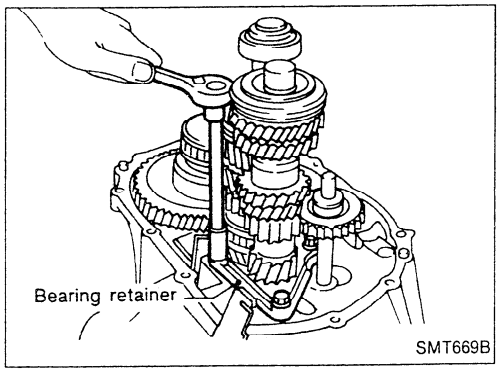


5. Remove 5th and 3rd & 4th shift forks.

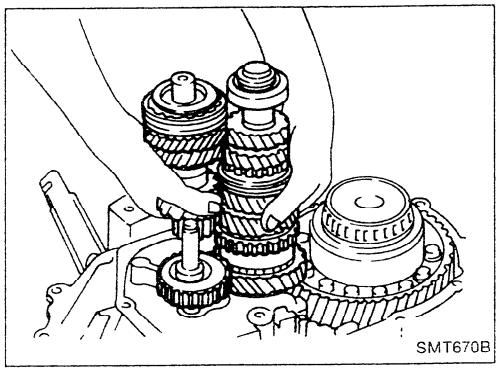
- **Be careful not to lose shifter cap.**



6. Remove control bracket with 1st & 2nd shift fork.

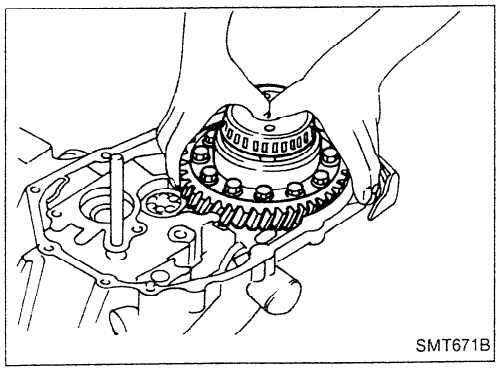


7. Remove gear components from clutch housing.
a. Remove input shaft front bearing retainer securing bolts.

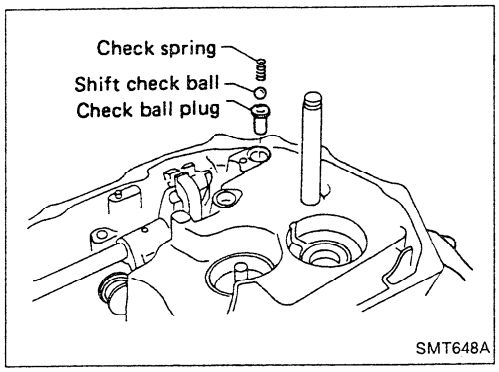


b. Remove input shaft with bearing retainer, mainshaft assembly and reverse idler gear.

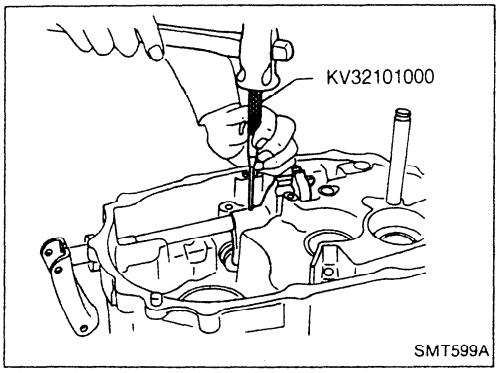
- **Always withdraw mainshaft straight out. Failure to do so can damage resin oil channel on clutch housing side.**
- **Do not draw out reverse idler shaft from clutch housing because these fittings will be loose.**
  When removing input shaft, be careful not to scratch oil seal lip with shaft spline.



c. Remove final drive assembly.

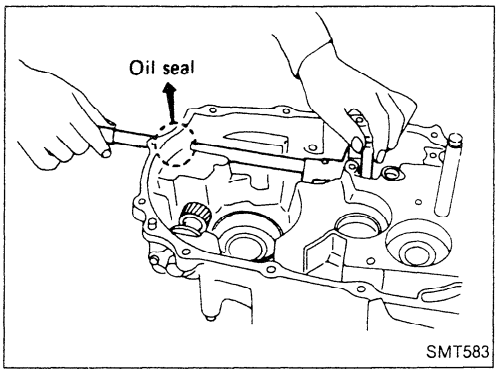


8. Remove oil pocket, shift check ball, check spring and check ball plug.

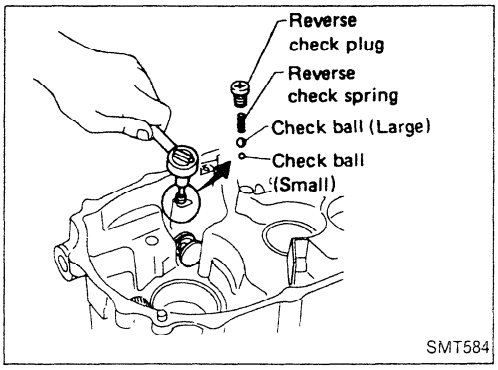


9. Drive retaining pin out of striking lever, then remove striking rod, striking lever and striking interlock.

- **Select a position where retaining pin does not interfere with clutch housing when removing retaining pin.**

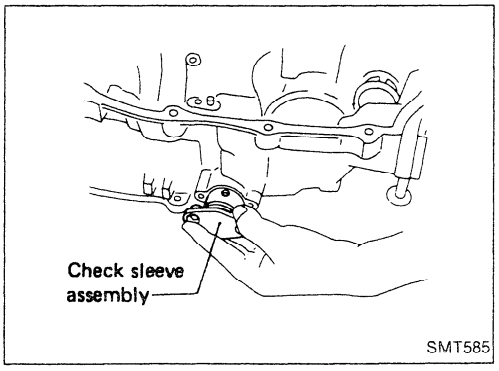


- **Be careful not to damage oil seal lip, when removing striking rod. If necessary, tape edges of striking rod.**

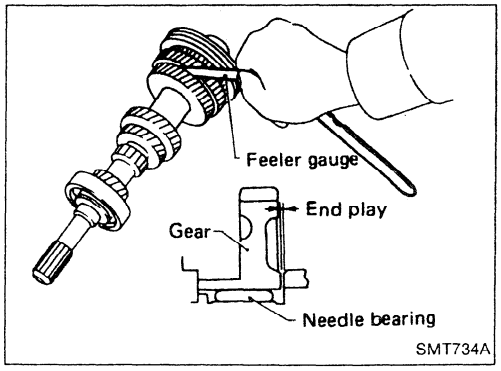


10. Remove reverse check plug, then detach reverse check spring and check balls.

- If the smaller ball does not come out, remove it together with check sleeve assembly.



11. Remove check sleeve assembly.



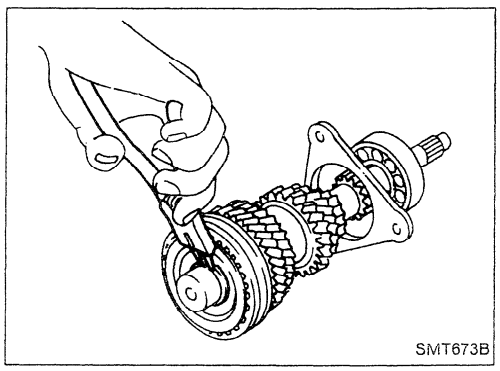
Input Shaft and Gears

DISASSEMBLY

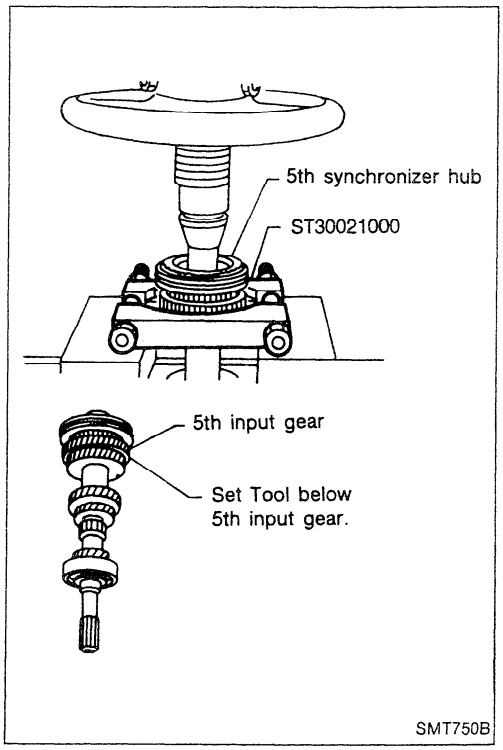
1. Before disassembly, check 5th input gear end play.

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 — Input Shaft and Gears".

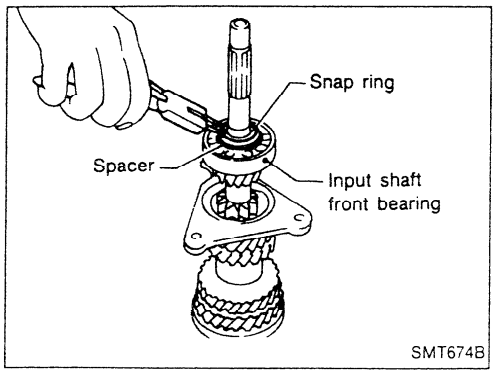


2. Remove snap ring and 5th stopper.

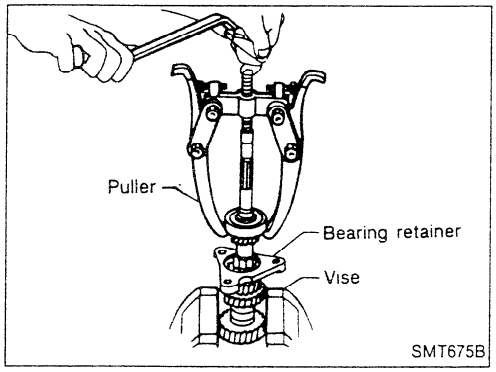


3. Remove 5th synchronizer, 5th input gear and 5th gear needle bearing.

Input Shaft and Gears (Cont'd)



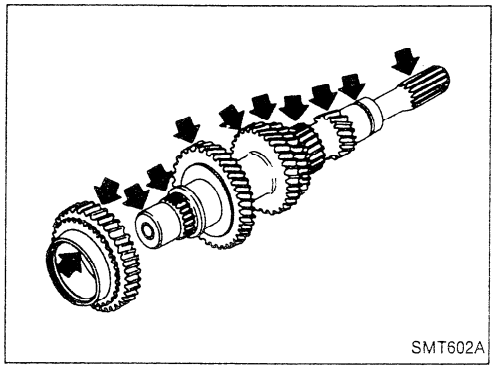
4. Remove snap ring of input shaft front bearing and input gear spacer.



5. Pull out input shaft front bearing.
6. Remove bearing retainer.

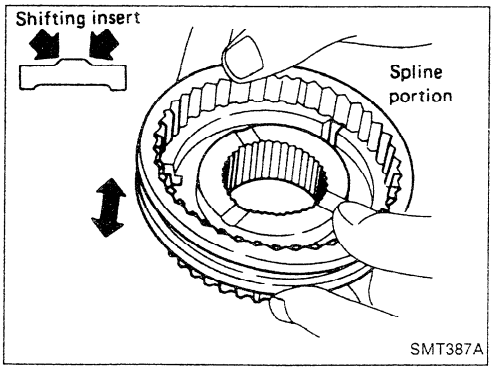
INSPECTION

Gear and shaft

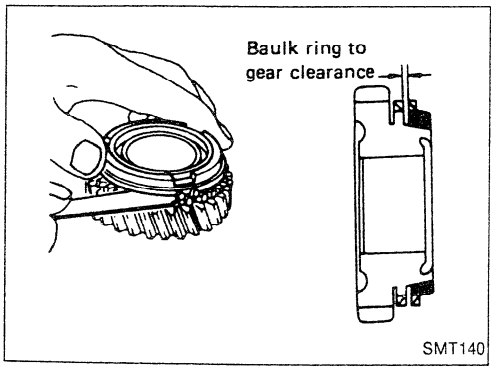


- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.

Synchronizer



- Check spline portion of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check insert springs for wear or deformation.



- Measure clearance between baulk ring and gear.

Clearance between baulk ring and gear:

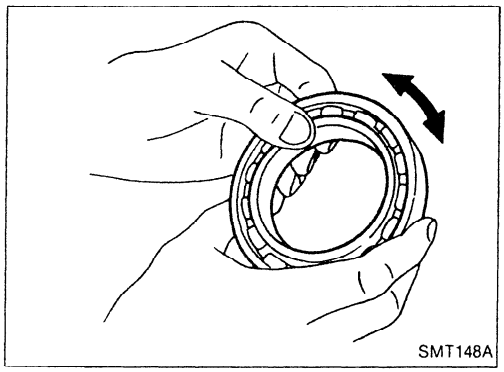
Standard

1.0 - 1.35 mm (0.0394 - 0.0531 in)

Wear limit

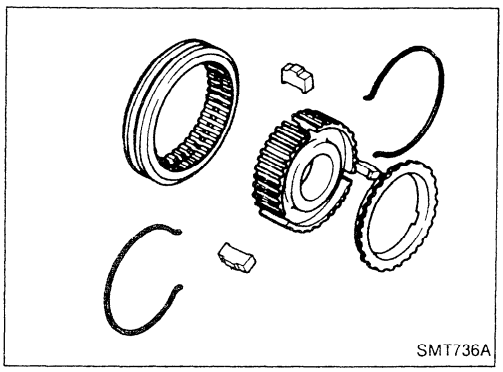
0.7 mm (0.028 in)

Input Shaft and Gears (Cont'd)


SMT148A

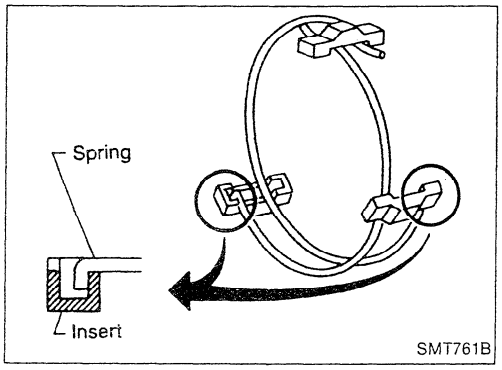
Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.


SMT736A

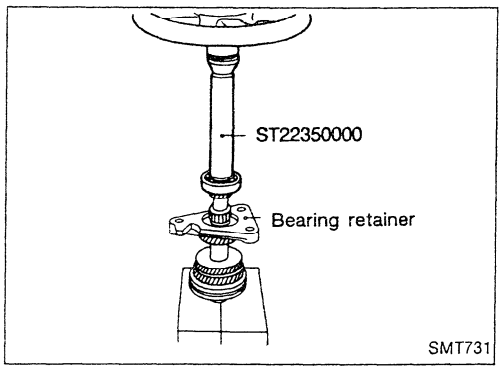
ASSEMBLY

1. Assemble 5th synchronizer.



SMT761B

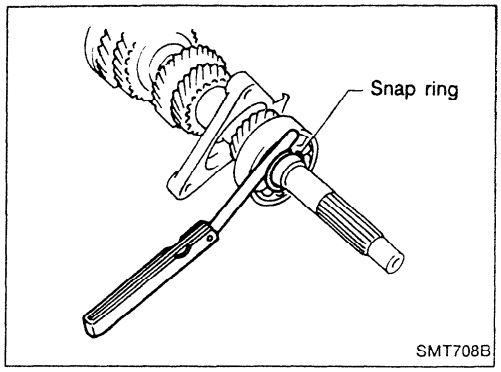
- **Be careful not to hook front and rear ends of spread spring to the same insert.**



SMT731

2. Install bearing retainer.
3. Press on input shaft front bearing.
4. Install input gear spacer.

Input Shaft and Gears (Cont'd)



5. Select proper 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:

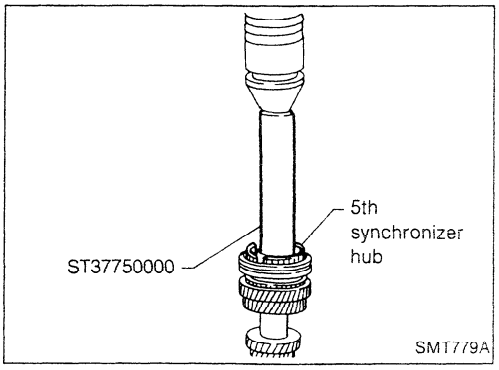
Thickness mm (in)	Part number
1.27 (0.0500)	32204-M8004
1.33 (0.0524)	32204-M8005
1.39 (0.0547)	32204-M8006
1.45 (0.0571)	32204-M8007

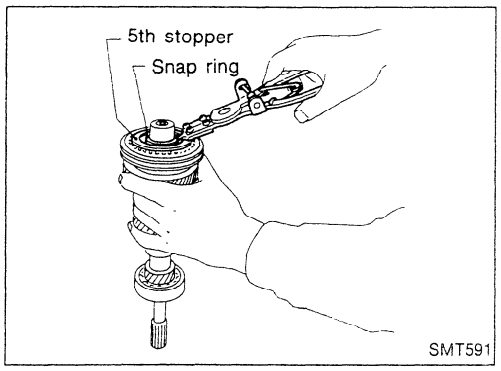
- **Be sure to replace 5th gear synchronizer hub with new one when it is removed.**

6. Install 5th gear needle bearing, 5th input gear, 5th synchronizer and 5th stopper.

- **Be sure to press input shaft in position vertically in relation to synchronizer hub.**

7. Measure gear end play as a final check — Refer to "Disassembly — Input Shaft and Gears".



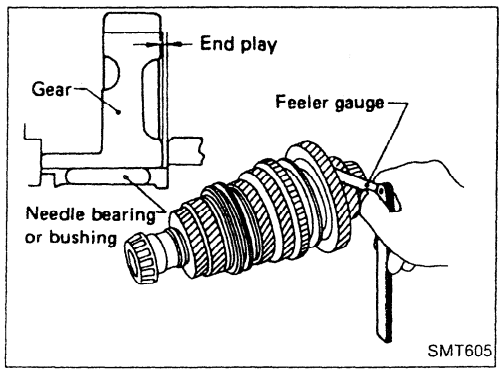


8. Select proper snap ring of 5th synchronizer hub to minimize clearance of groove in input shaft and install it.

Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)

Snap ring of 5th synchronizer:

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



Mainshaft and Gears

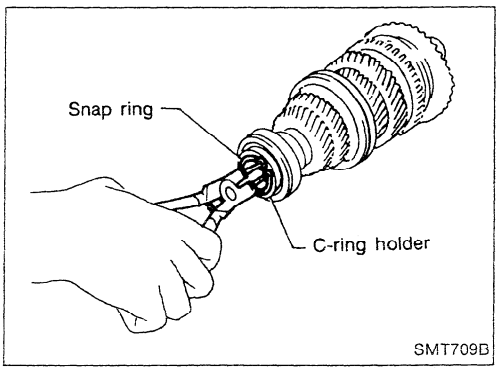
DISASSEMBLY

1. Before disassembly, measure gear end play.

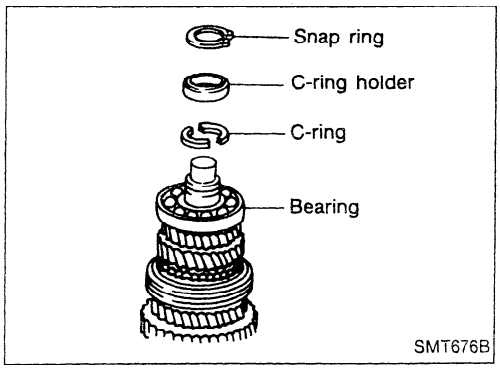
Gear end play:

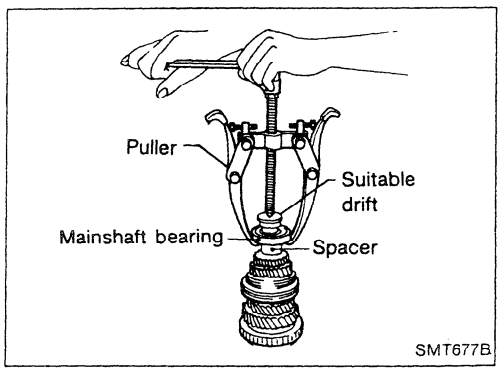
Gears	End play mm (in)
1st main gear	0.18 - 0.31 (0.0071 - 0.0122)
2nd-4th main gear	0.20 - 0.30 (0.0079 - 0.0118)

- If end play is not within the specified limit, disassemble and check the parts.



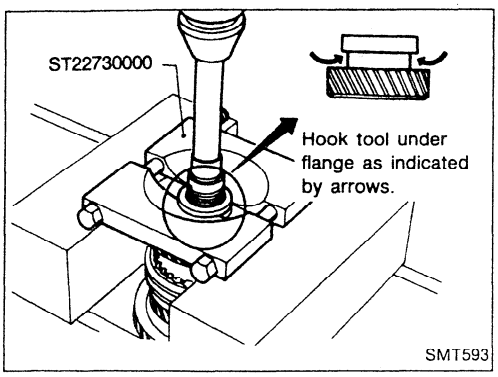
2. Remove mainshaft rear bearing snap ring, C-ring holder and C-rings.



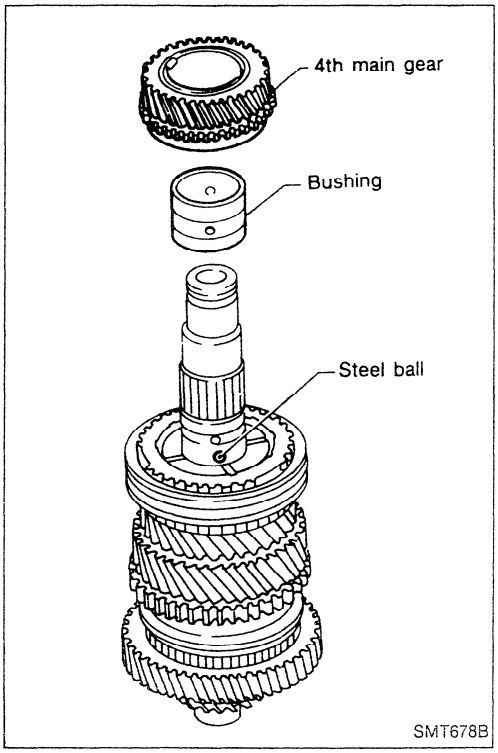


3. Remove mainshaft bearing and spacer.

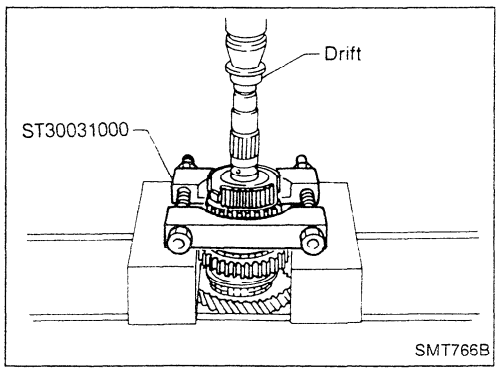
Mainshaft and Gears (Cont'd)



4. Remove 5th main gear.

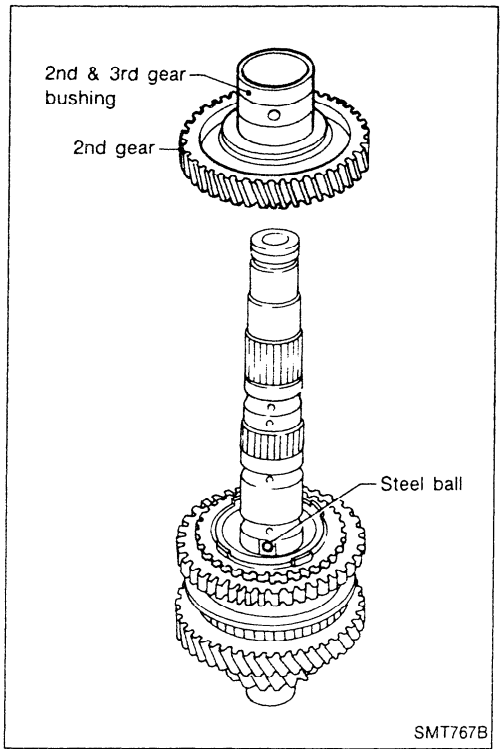


5. Remove 4th main gear, 4th gear bushing and steel ball.
- **Take care not to lose steel ball.**

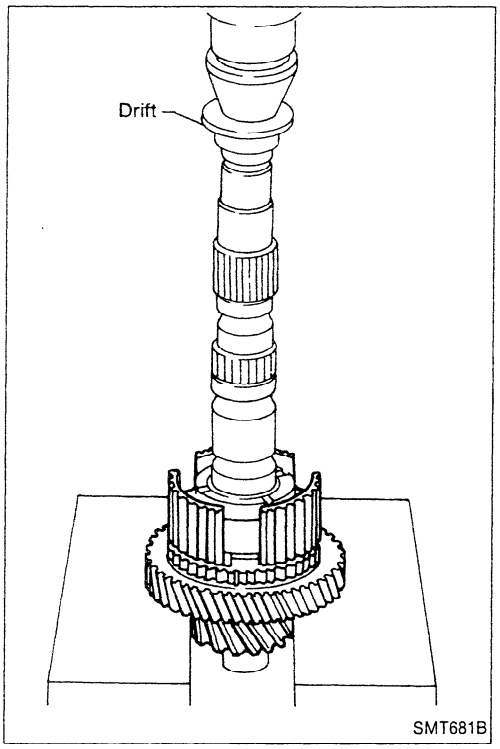


6. Remove 3rd & 4th synchronizer and 3rd main gear.

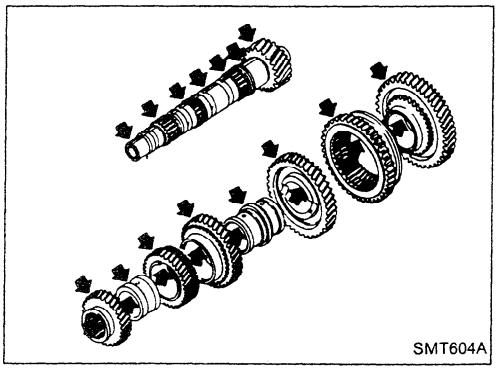
Mainshaft and Gears (Cont'd)



7. Remove 2nd & 3rd bushing and 2nd main gear.
- **Take care not to lose the steel ball.**



8. Remove 1st & 2nd synchronizer hub and 1st main gear.



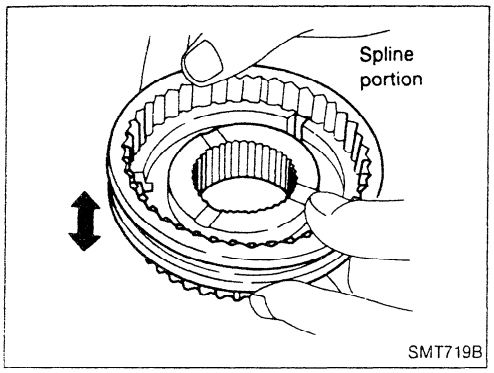
INSPECTION

Gear and shaft

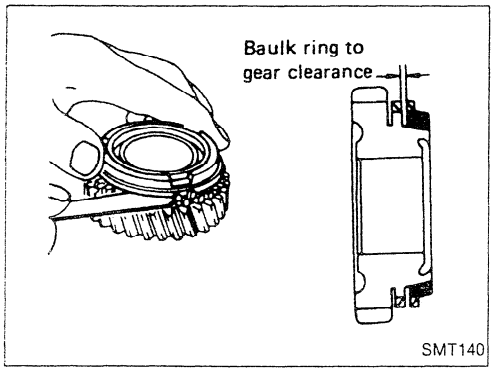
- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.

Mainshaft and Gears (Cont'd)

Synchronizer



- Check spline portion 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 gear only:

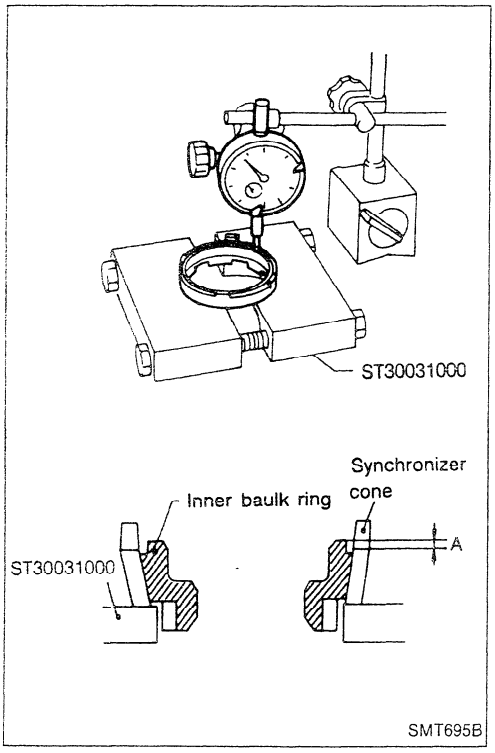
  Standard

  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.**



- 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:

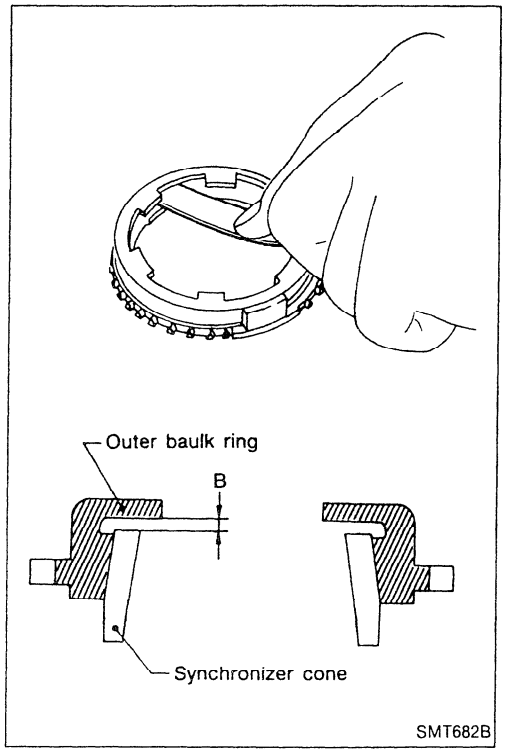
   A 0.7 - 0.9 mm (0.028 - 0.035 in)

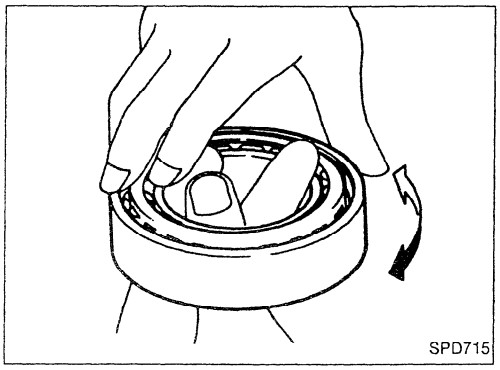
   B 0.6 - 1.1 mm (0.024 - 0.043 in)

   Wear limit:

   0.2 mm (0.008 in)

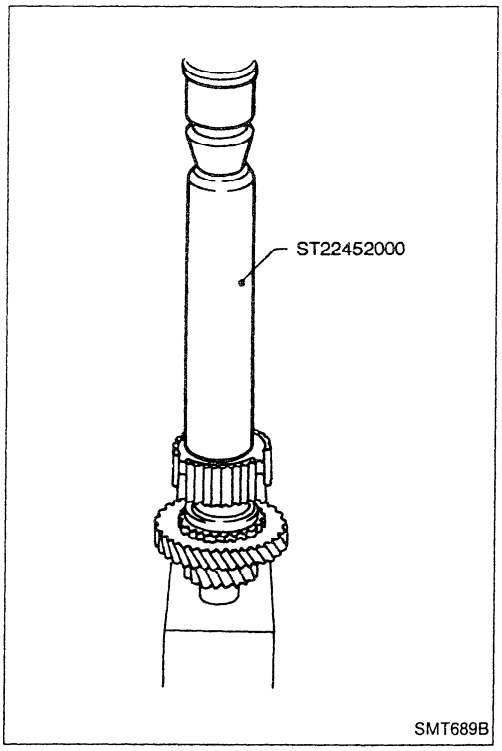
c. If dimension "A" or "B" is smaller than the wear limit, replace baulk ring.





Bearing

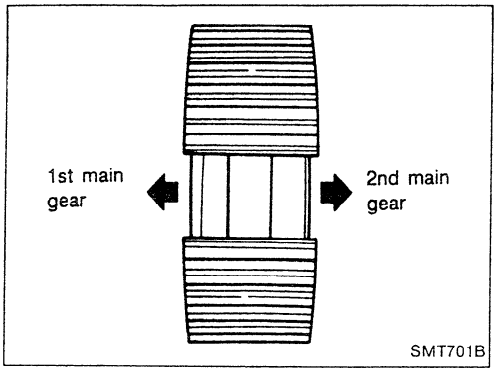
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **The mainshaft front bearing cannot be re-used. It must be replaced once removed.**



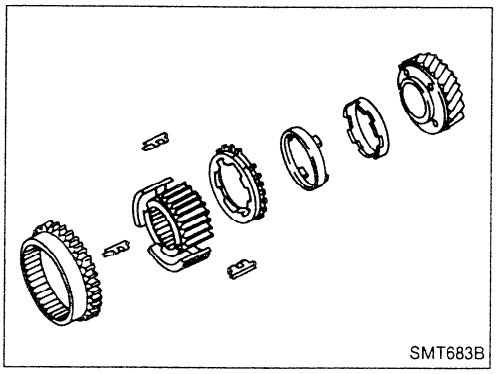
ASSEMBLY

1. Install 1st gear needle bearing, 1st main gear and baulk ring.
2. Press on 1st & 2nd synchronizer hub.

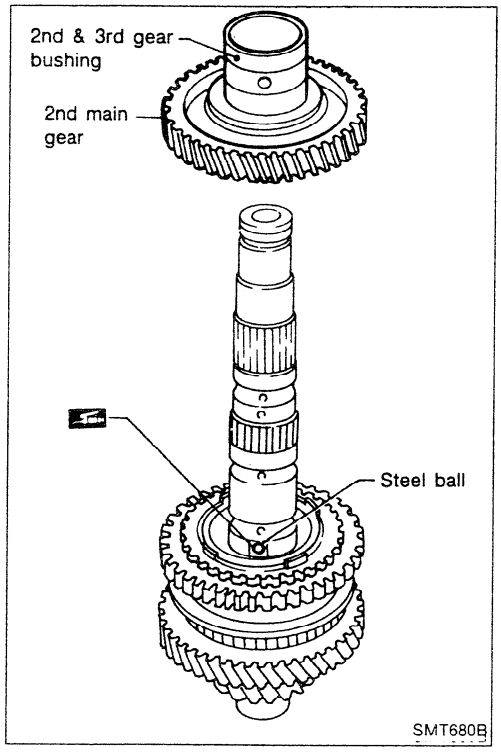
Mainshaft and Gears (Cont'd)



- **Ensure correct fitting of 1st & 2nd synchronizer hub.**

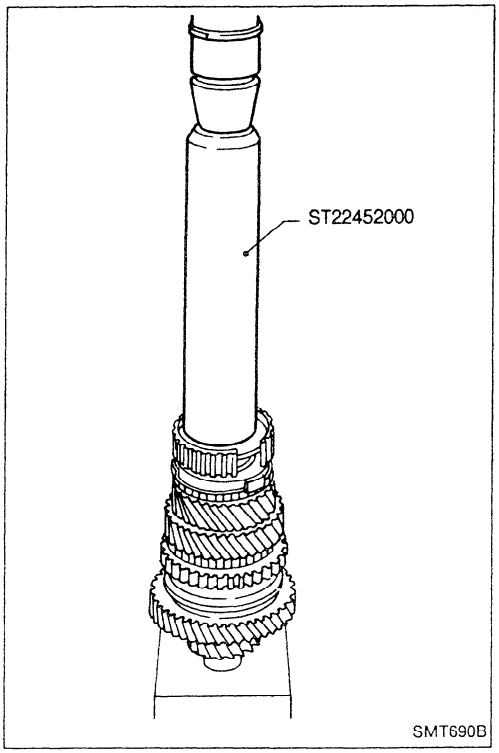


3. Install 2nd synchronizer cone, outer & inner baulk ring and 1st & 2nd coupling sleeve.

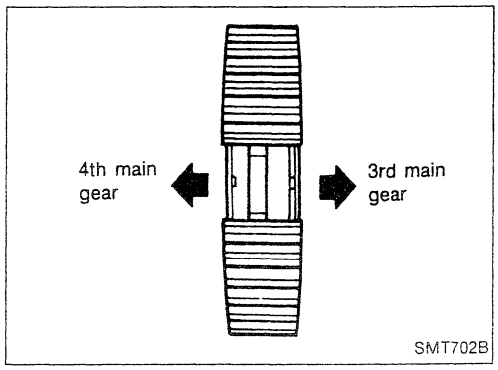


4. Install steel ball, 2nd main gear, 2nd & 3rd bushing.

- **Apply gear oil to 2nd & 3rd bushing before installing it.**
- **Apply multi-purpose grease to steel ball before installing it.**
- **2nd & 3rd bushing has a groove in which steel ball fits.**

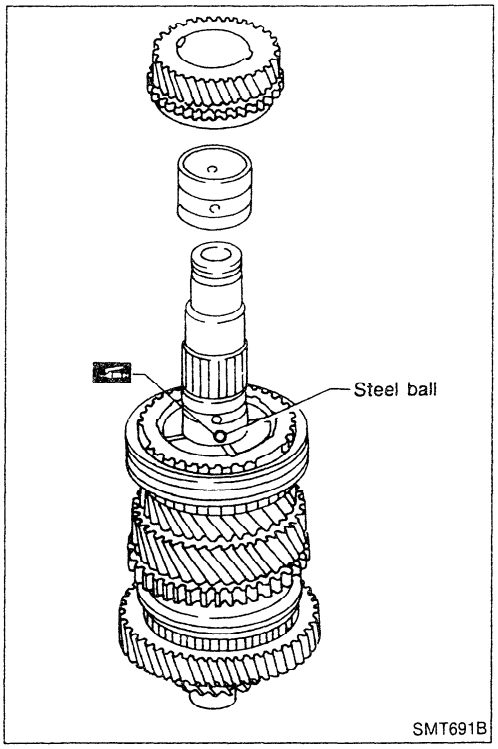


5. Install 3rd main gear, synchronizer cone, outer & inner baulk ring.
6. Press on 3rd & 4th synchronizer hub.



- **Ensure correct fitting of 3rd & 4th synchronizer hub.**

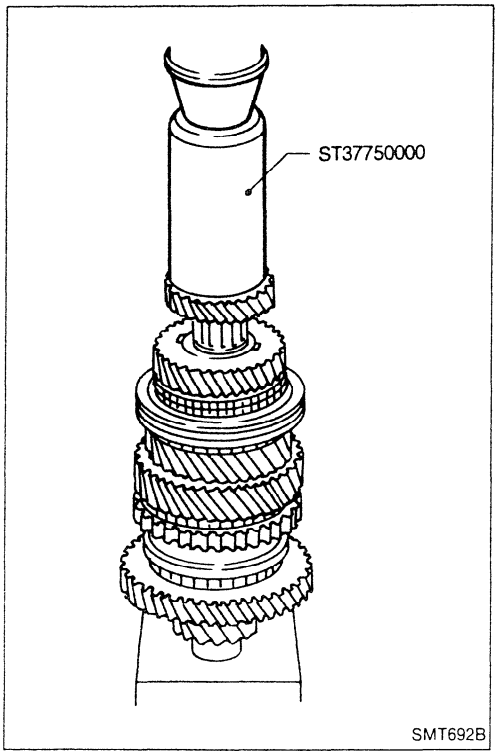
7. Install 3rd & 4th coupling sleeve and 4th baulk ring.



8. Install steel ball, 4th bushing and 4th main gear.

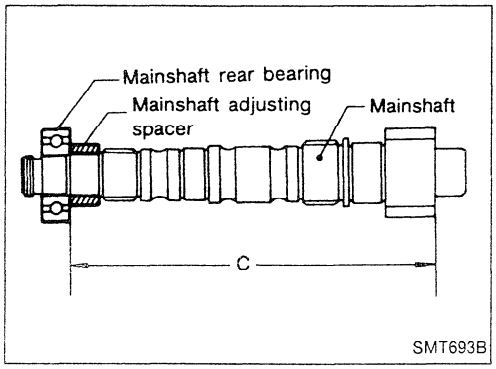
- **Apply multi-purpose grease to steel ball before installing it.**
- **4th bushing has a groove in which steel ball fits.**

Mainshaft and Gears (Cont'd)



SMT692B

9. Press on 5th main gear.



SMT693B

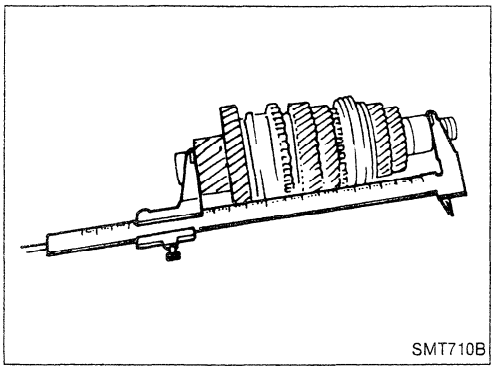
10. Select proper mainshaft bearing spacer to give correct bearing distance.

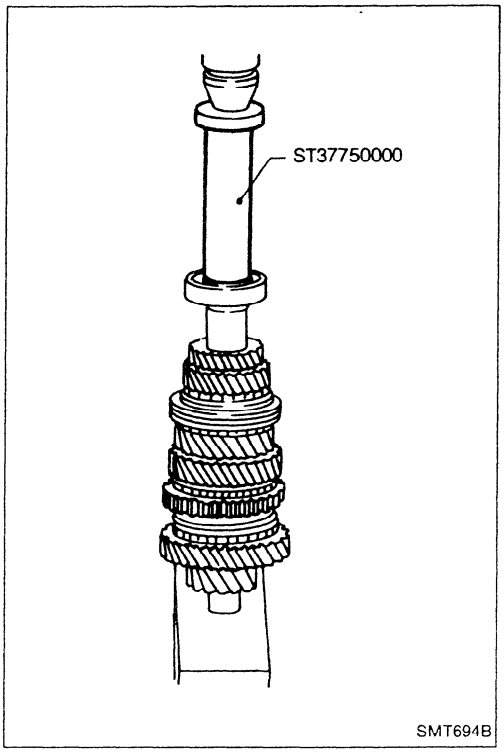
Bearing distance "C":

230.15 - 230.25 mm (9.0610 - 9.0649 in)

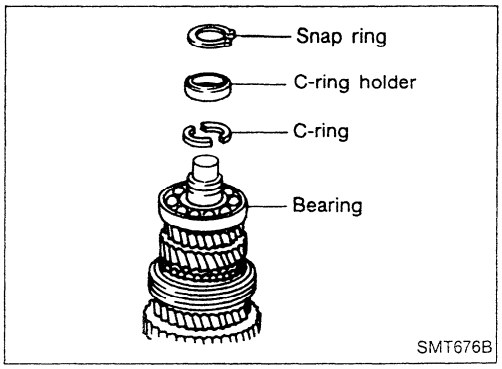
Spacers available:

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


SMT710B



11. Press on mainshaft rear bearing.

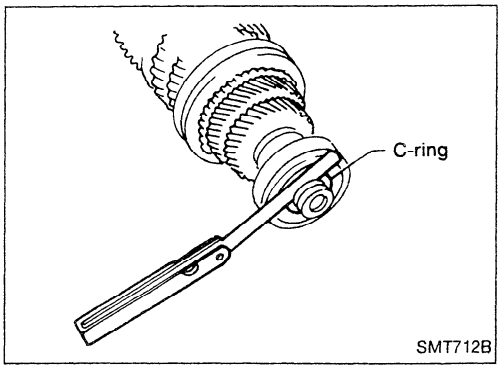


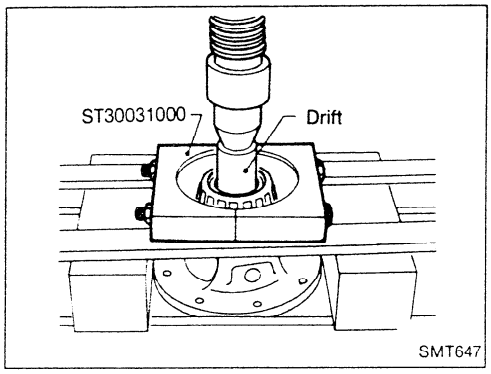
12. Select proper C-ring to minimize clearance of groove in mainshaft and install it.
    Allowable clearance of groove:
    0 - 0.1 mm (0 - 0.004 in)

Mainshaft C-rings:

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

13. Install C-ring holder and snap ring.
14. Measure gear end play as the final check — Refer to "Disassembly".



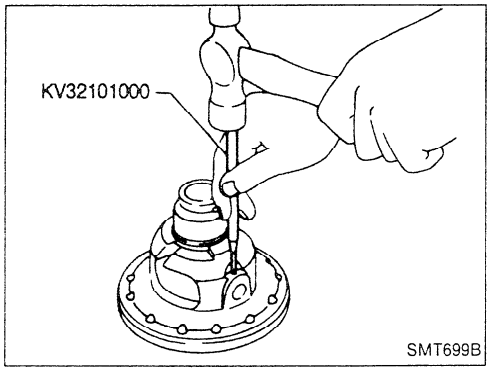


Final Drive

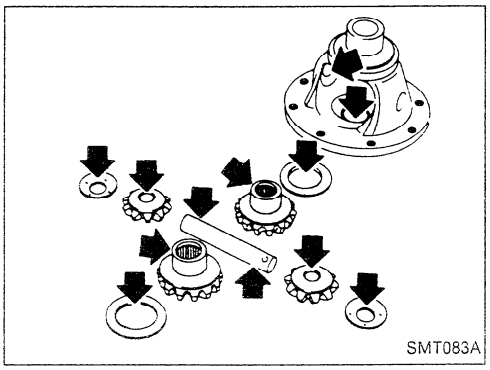
DISASSEMBLY

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.**



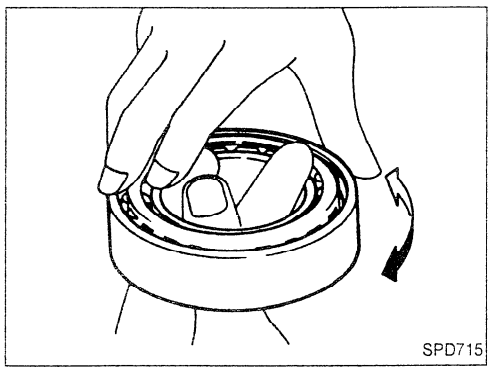
4. Drive out retaining pin and draw out pinion mate shaft.
5. Remove pinion mate gears and side gears.



INSPECTION

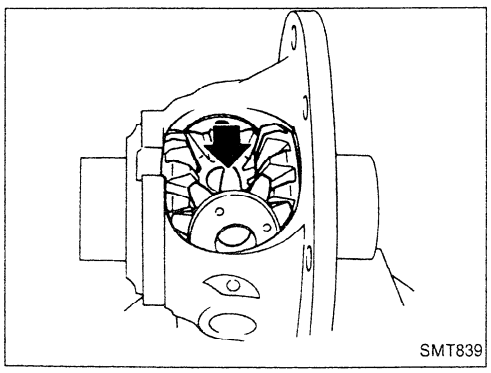
Gear, washer, shaft and case

- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.



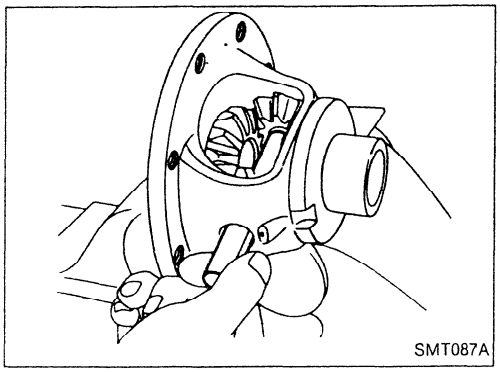
Bearing

- 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.**



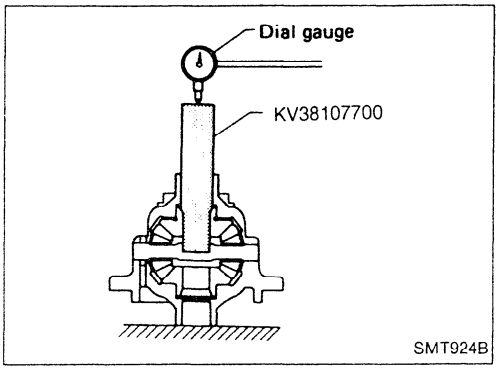
ASSEMBLY

1. Attach side gear thrust washers to side gears, then install pinion mate washers and pinion mate gears in place.



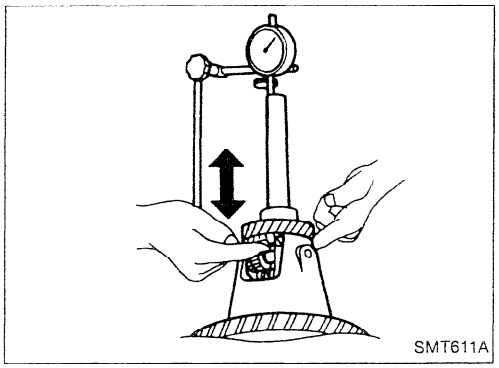
2. Insert pinion mate shaft.

- **When inserting, be careful not to damage pinion mate thrust washers.**



3. Measure clearance between side gear and differential case with washers following the procedure below:

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.

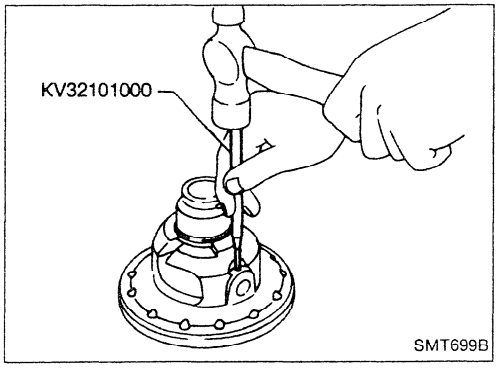
Clearance between side gear and differential case with washers:

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 washer:

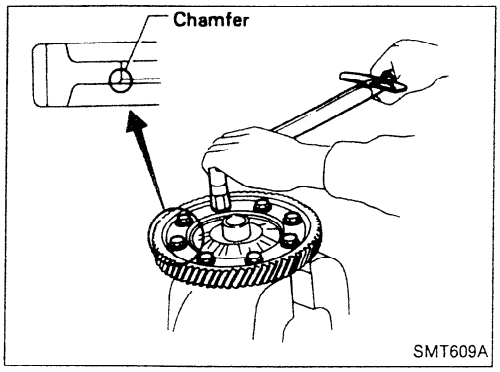
Refer to S.D.S.



4. Install retaining pin.

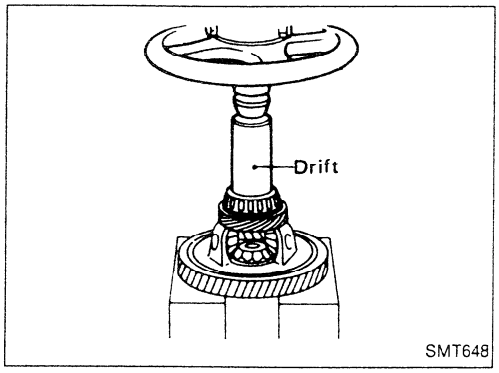
- **Make sure that retaining pin is flush with case.**

Final Drive (Cont'd)

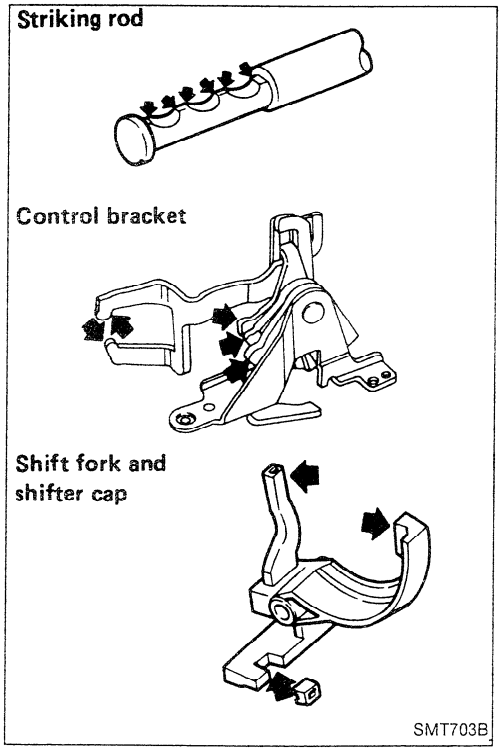


5. Install final gear.
- **Apply locking sealant to final gear fixing bolts before installing them.**

6. Install speedometer drive gear.



7. Press on differential side bearings.

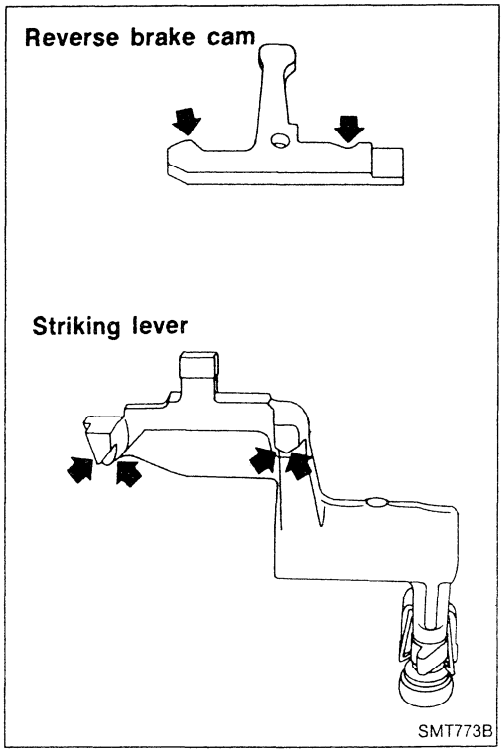


Shift Control Components

INSPECTION

- Check contact surface and sliding surface for wear, scratches, projections or other damage.

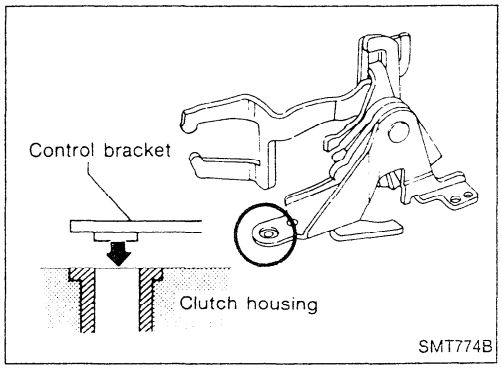
Shift Control Components (Cont'd)



ADJUSTMENT OF INPUT SHAFT BRAKING MECHANISM

1. Install striking lever & rod, striking interlock assembly and control bracket on clutch housing exactly.

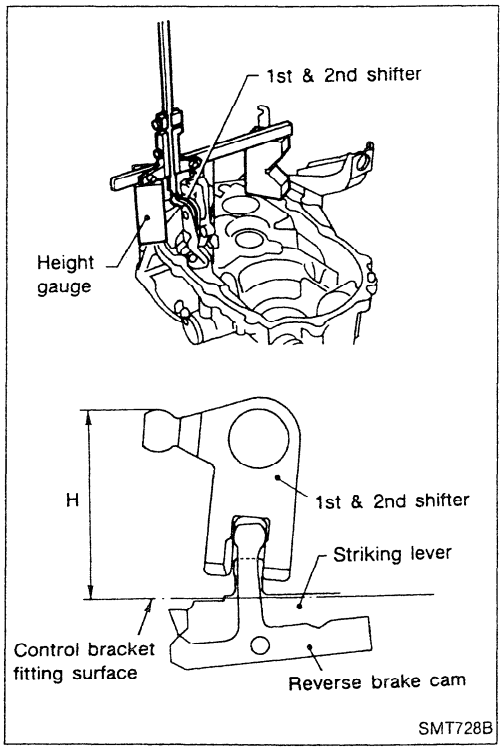
- **When installing control bracket on clutch housing, assure protrusion beneath bracket is correctly seated.**



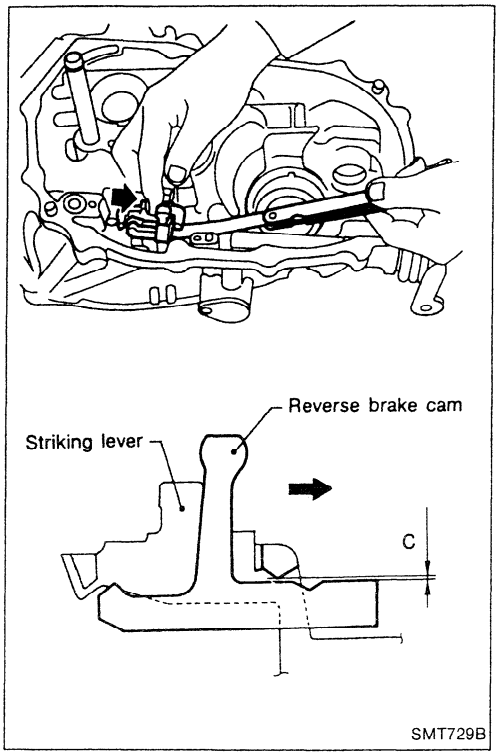
2. Measure maximum height "H" while shifting from neutral to reverse position.

   Maximum height "H":

   67.38 - 67.86 mm (2.6528 - 2.6716 in)



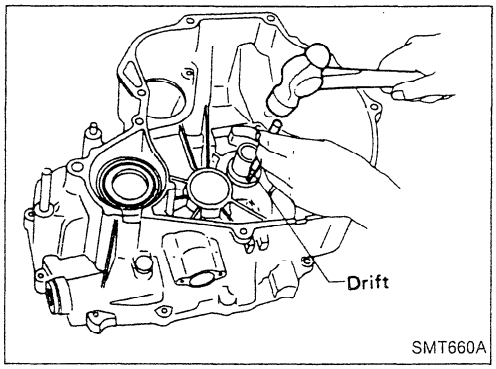
Shift Control Components (Cont'd)



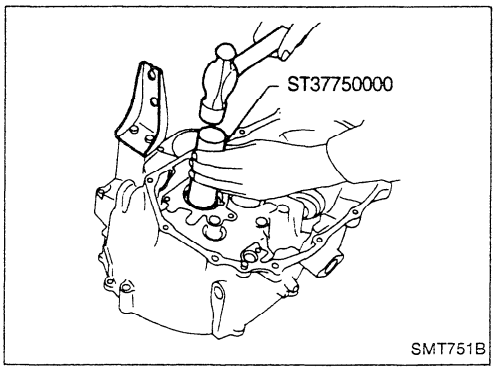
3. Measure clearance "C" between reverse brake cam and striking lever while shifting to reverse position.
   Clearance "C":
   0.05 - 0.20 mm (0.0020 - 0.0079 in)
   If "H" or "C" is not within specification, replace the following parts as a set.
   - **Striking lever assembly**
   - **Striking interlock assembly (This includes reverse brake cam.)**
   - **Control bracket assembly**

Case Components

Input shaft oil seal

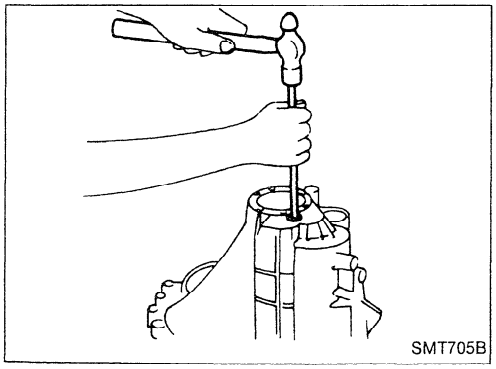


1. Drive out input shaft oil seal.



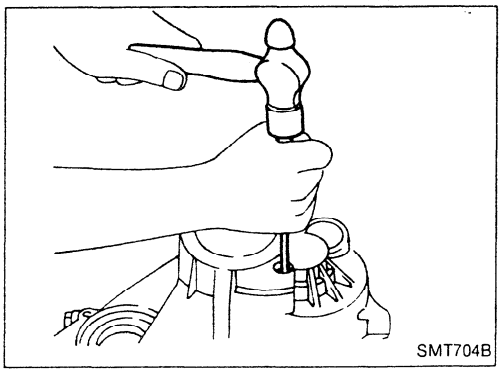
2. Install input shaft oil seal.
   - **Apply multi-purpose grease to seal lip of oil seal before installing.**

Input shaft rear bearing

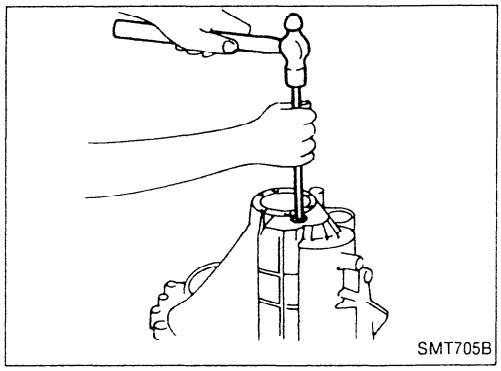


1. Remove welch plug from transmission case.

Case Components (Cont'd)

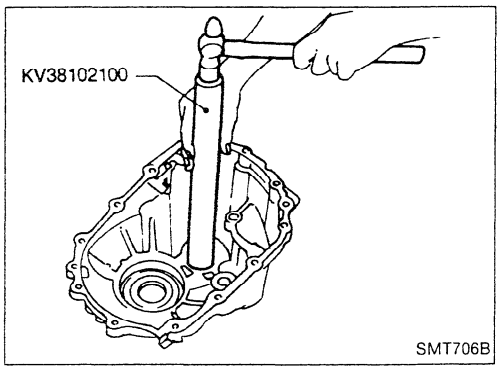


2. Remove input shaft rear bearing by tapping it from welch plug hole.



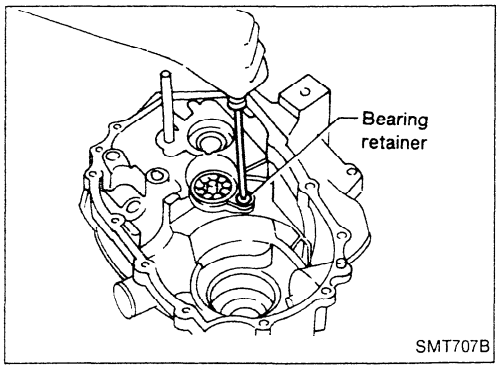
3. Install welch plug.

- **Apply recommended sealant to mating surface of transmission case.**

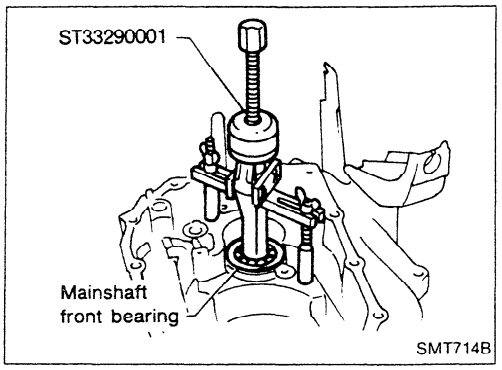


4. Install input shaft rear bearing.

Mainshaft front bearing and oil channel

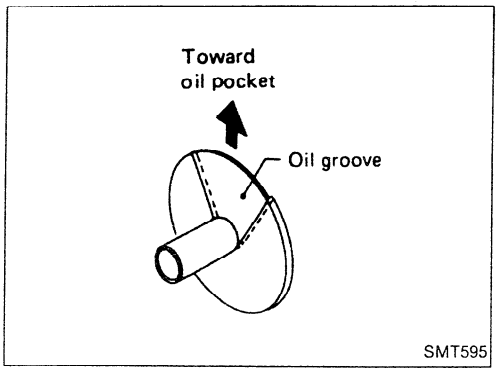


1. Remove mainshaft front bearing retainer.



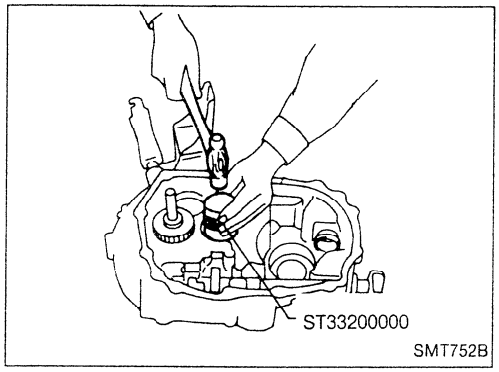
2. Remove mainshaft front bearing.
3. Remove oil channel.

Case Components (Cont'd)



4. Install oil channel.

- **Ensure that oil groove in oil channel always faces toward oil pocket when installing it on clutch housing.**



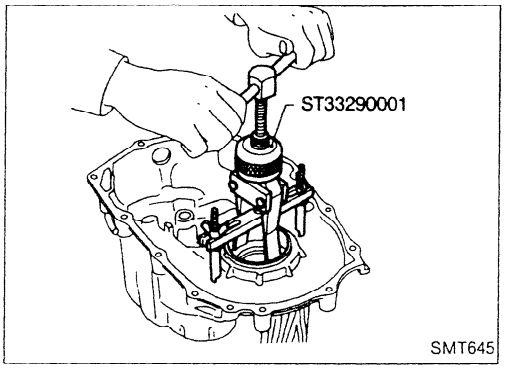
5. Install mainshaft front bearing.
6. Install mainshaft front bearing retainer.

Apply locking sealant to thread of screw before installation.

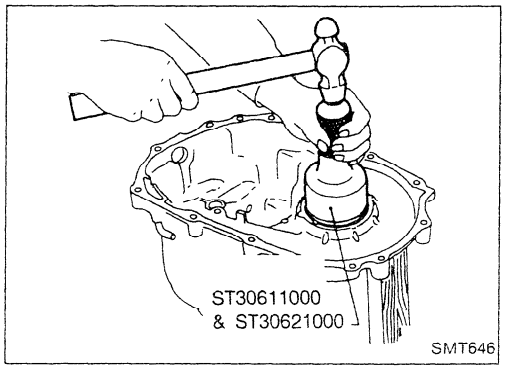
Differential Side Bearing Preload

If any of the following parts are replaced, adjust differential side bearing preload.

- **Differential case**
- **Differential side bearing**
- **Clutch housing**
- **Transmission case**

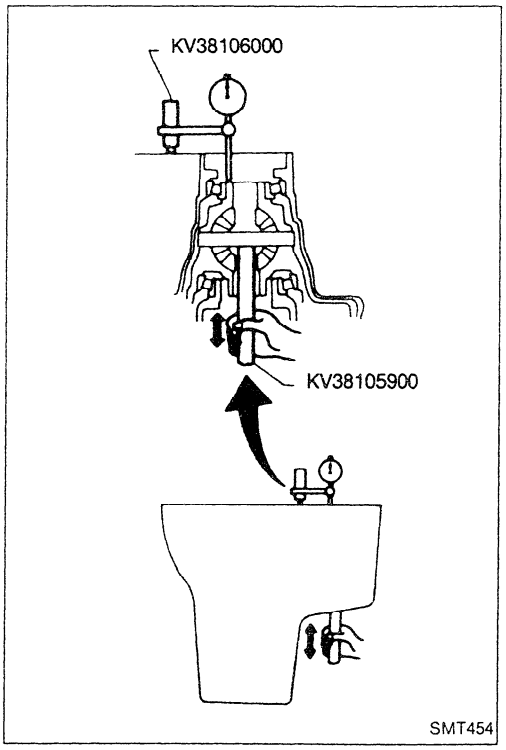


1. Remove differential side bearing outer race (transmission case side) and shim.



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 considering bearing preload.

Suitable shim thickness = Dial indicator deflection + Specified bearing preload

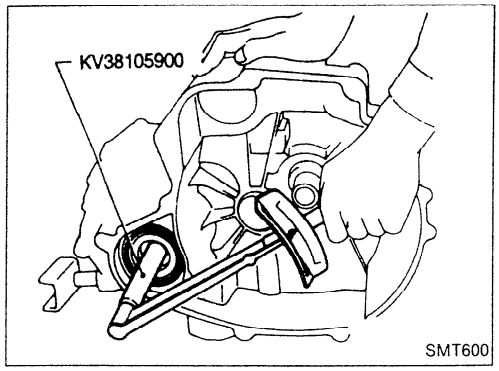
Differential side bearing adjusting shims and preload:
Refer to S.D.S.
Bearing preload:
0.25 - 0.30 mm (0.0098 - 0.0118 in)

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.**

Differential Side Bearing Preload (Cont'd)

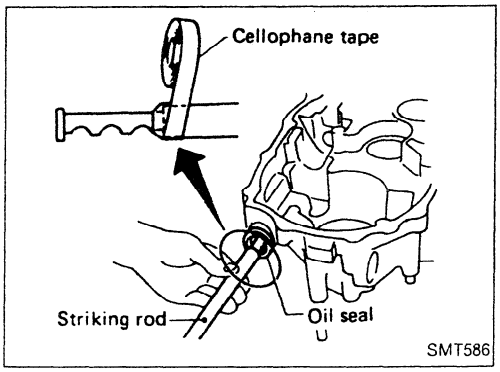


c. Measure turning torque of final drive assembly.

Turning torque of final drive assembly (New bearing):

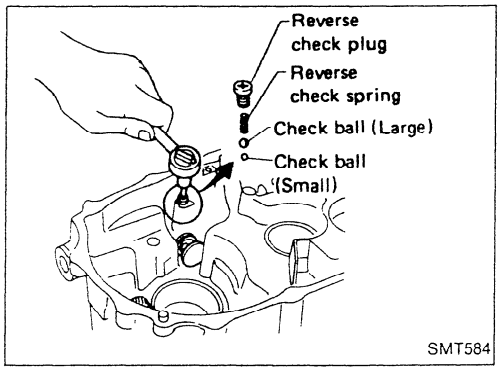
2.9 - 6.9 N·m (30 - 70 kg-cm, 26 - 61 in-lb)

- **When old bearing is used again, turning torque will be slightly less than the above.**
- **Make sure torque in 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.**

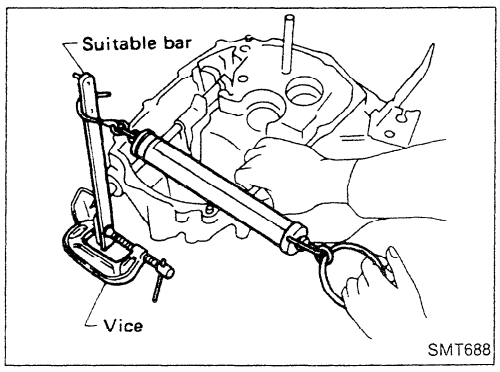


1. Install striking rod, lever and interlock.

- **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 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.

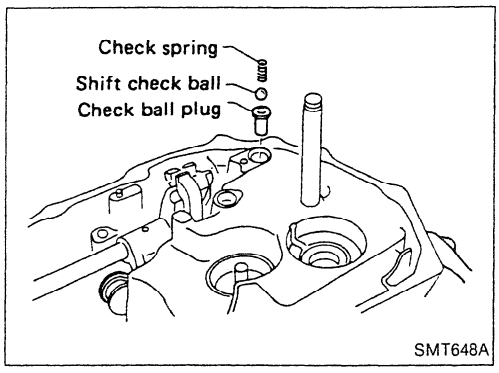
Available reverse check plugs:

Thickness mm (in)	Part number
7.1 (0.280)	32188-M8002
7.7 (0.303)	32188-M8003
8.3 (0.327)	32188-M8001*
8.9 (0.350)	32188-M8004

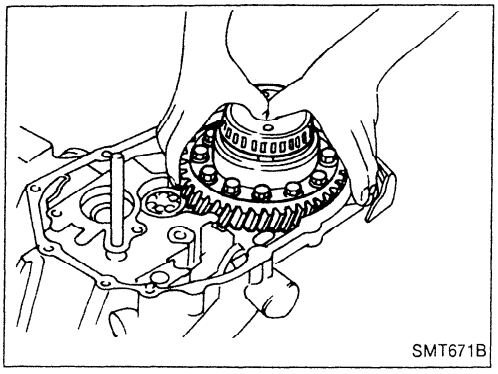
*Standard size check plug.

5. Install selected reverse check plug.

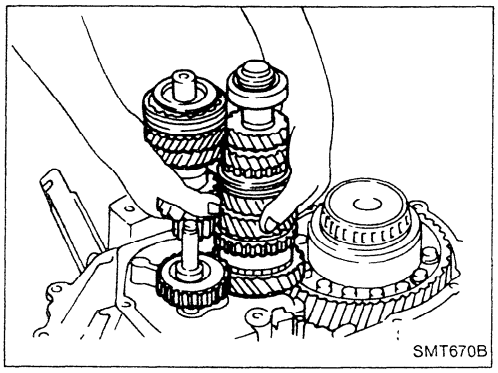
Apply locking sealant to thread of plug before installing it.



6. Install check ball plug, shift check ball and check spring.
7. Install oil pocket.

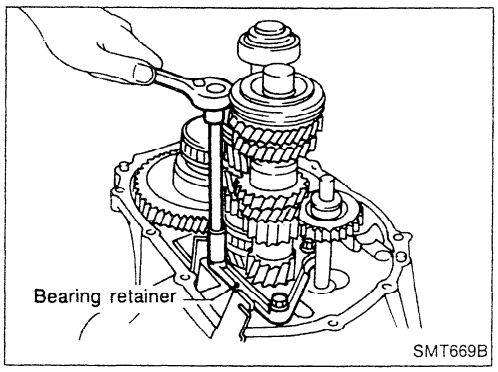

SMT671B

8. Install gear components onto clutch housing.
a. Install final drive assembly.


SMT670B

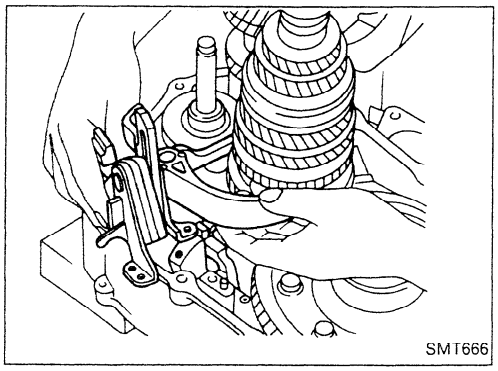
b. Install input shaft assembly with bearing retainer, mainshaft assembly and reverse idler gear.

- **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.**

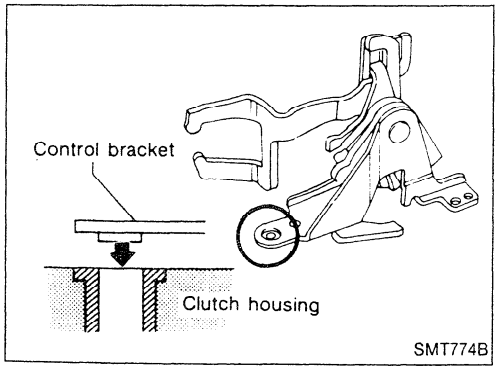


SMT669B

c. Install input shaft front bearing retainer.


SMT666

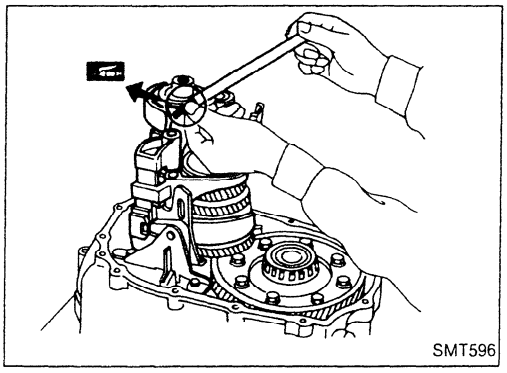
9. Apply grease to shifter caps, then install it to control bracket. Install control bracket with 1st & 2nd shift fork.



SMT774B

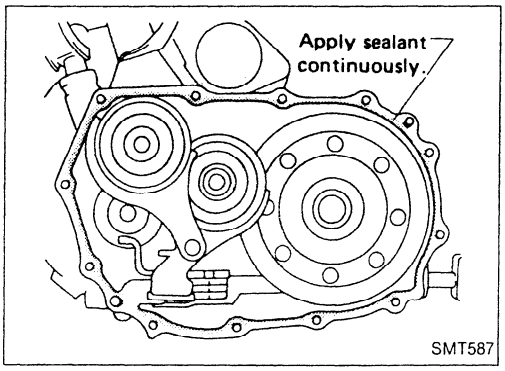
- When installing control bracket on clutch housing, ensure protrusion beneath bracket is correctly seated.

10. Install 3rd & 4th and 5th shift forks.

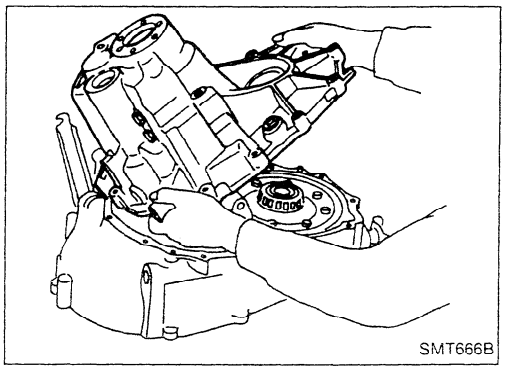


11. Insert fork shaft.
- **Apply multi-purpose grease to support spring before installing.**

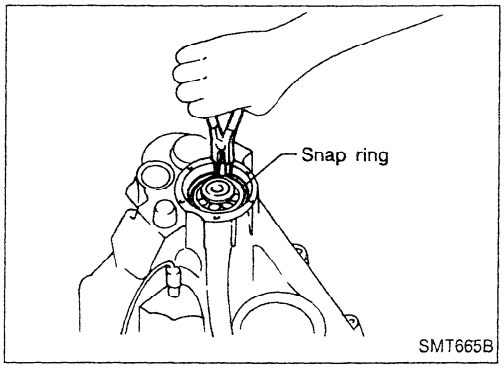
12. Install reverse idler spacer.



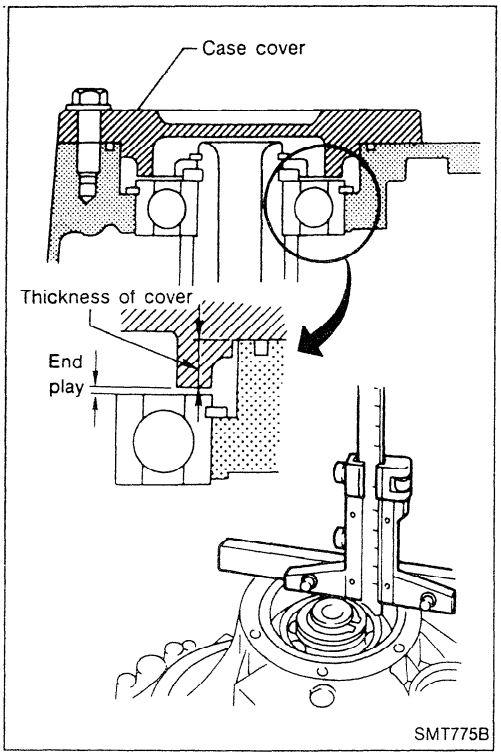
13. Apply recommended sealant to mating surface of clutch housing.



14. Install transmission case on clutch housing.



15. Install mainshaft front bearing snap ring.



16. Check mainshaft bearing end play.

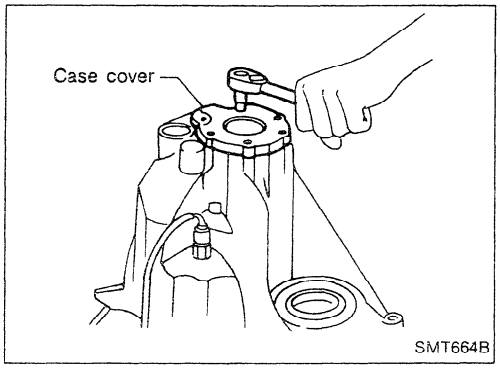
Mainshaft bearing end play:

0 - 0.1 mm (0 - 0.004 in)

- Make sure that bearing is properly seated. If not, tap main shaft end with a rubber hammer.
- If not within specification, select another case cover having a different thickness.

Available case covers:

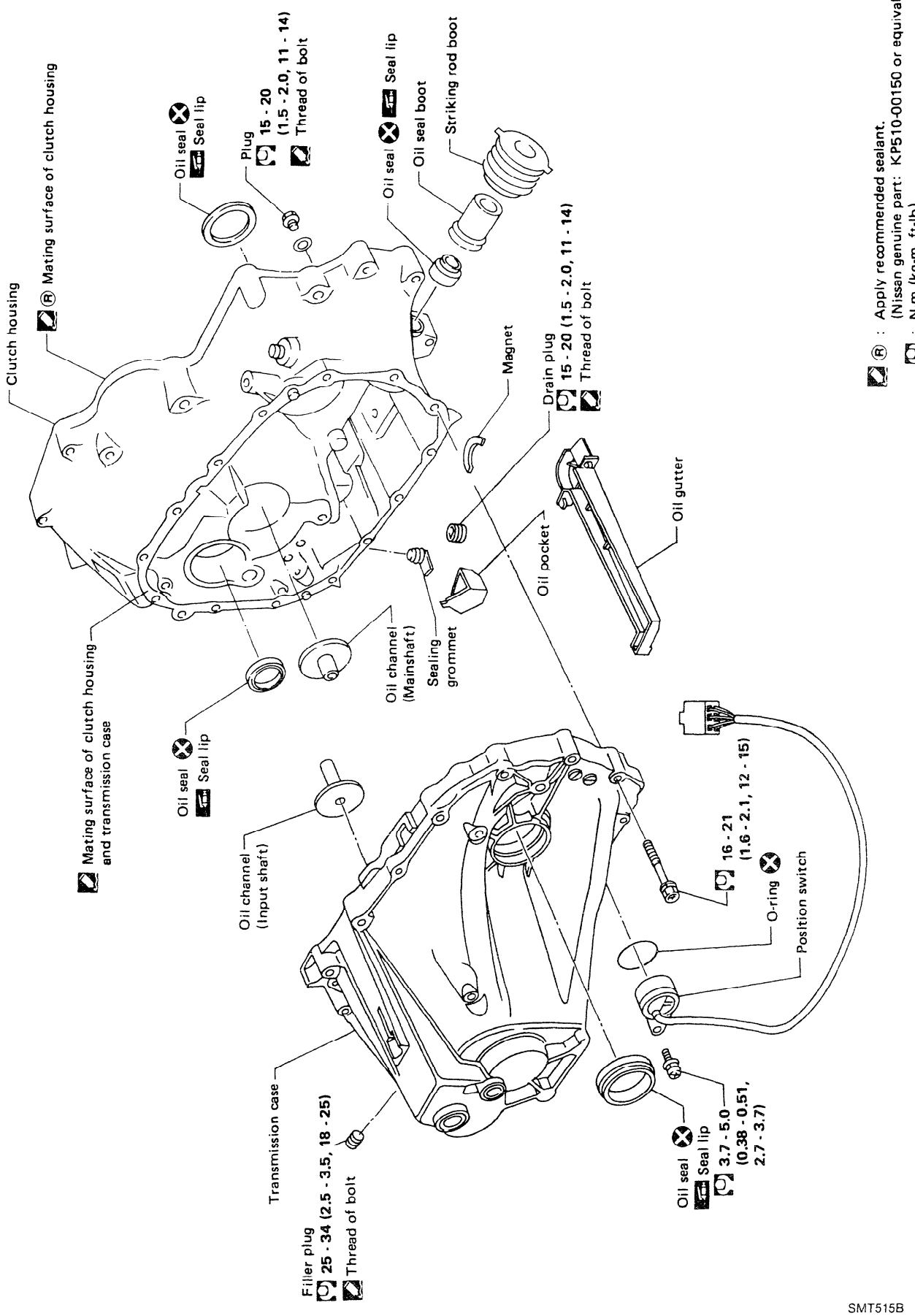
Refer to S.D.S.



17. Install O-ring and case cover on transmission case.

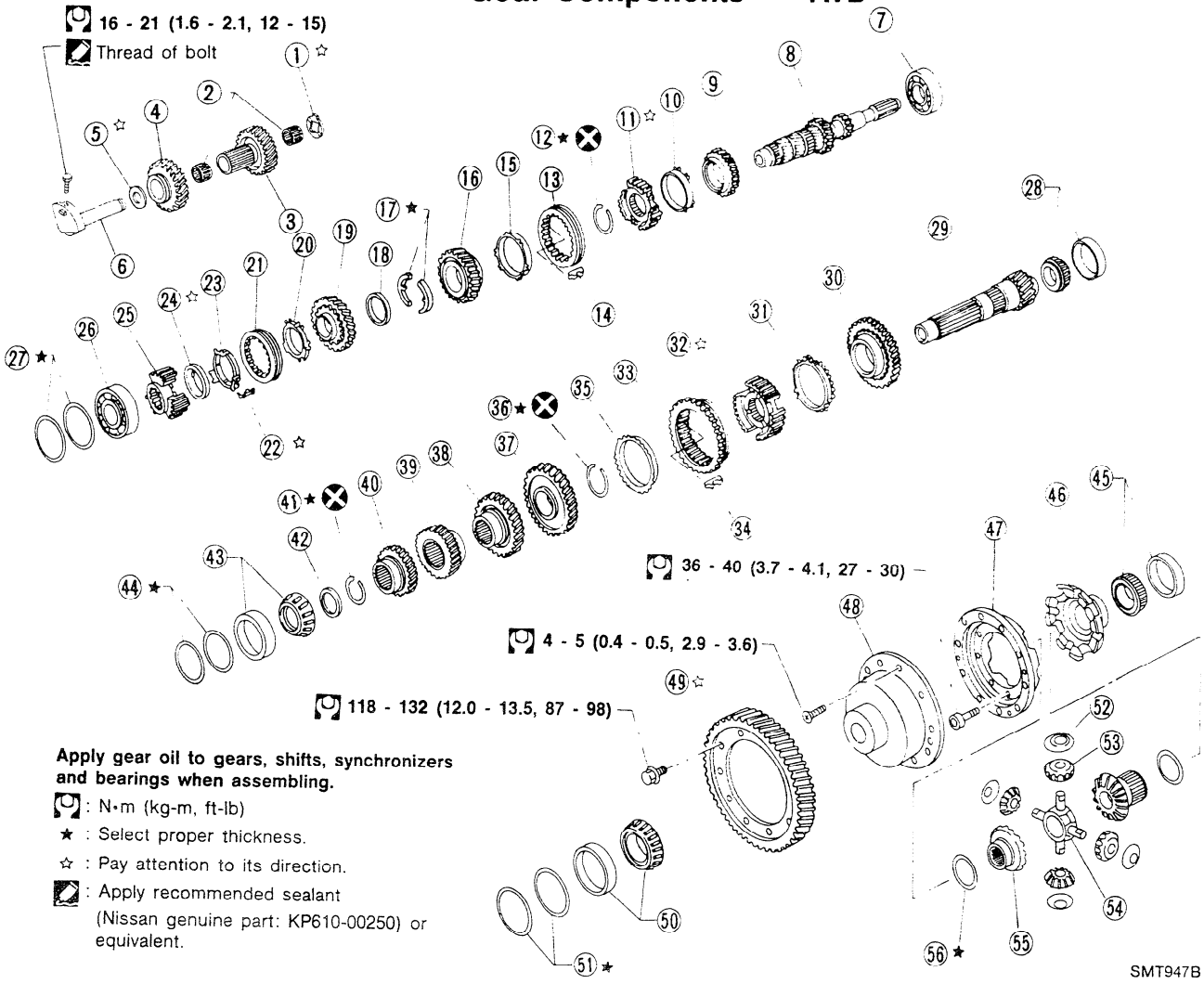
Apply recommended sealant to mating surface of transmission case.

Case Components



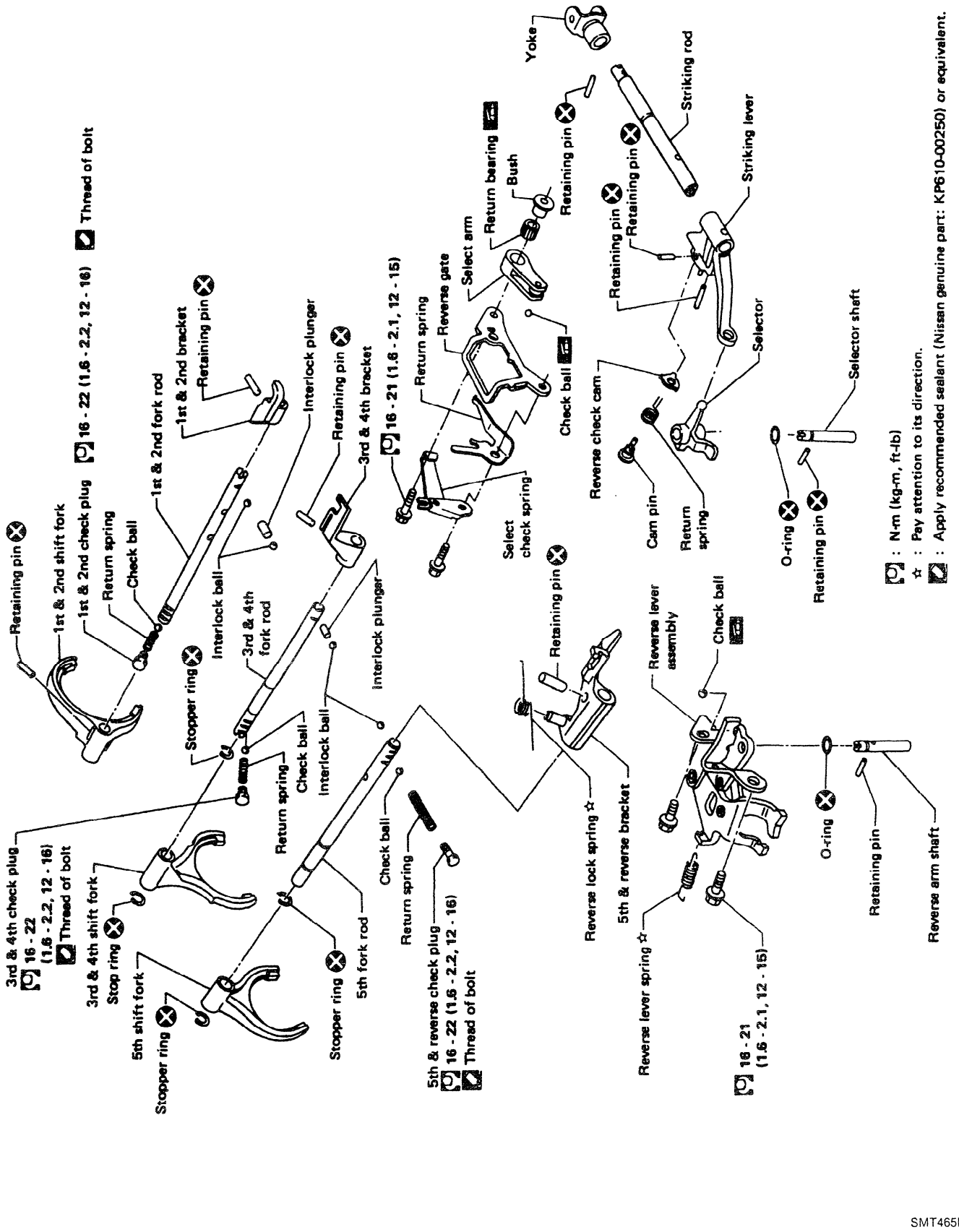
SMT515B

Gear Components — 4WD

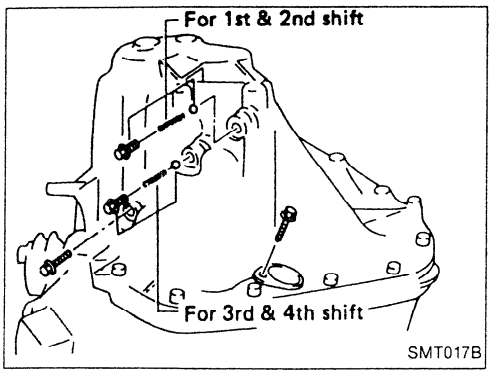


① Thrust washer
② Needle bearing
③ Reverse idler gear
④ Reverse idler gear
⑤ Thrust washer
⑥ Reverse idler shaft
⑦ Input shaft front bearing
⑧ Input shaft
⑨ 3rd input gear
⑩ 3rd baulk ring
⑪ 3rd & 4th synchronizer hub
⑫ Snap ring
⑬ Coupling sleeve
⑭ Insert spring
⑮ 4th baulk ring
⑯ 4th input gear
⑰ Input shaft thrust washer
⑱ Thrust washer ring
⑲ 5th input gear
⑳ 5th baulk ring
㉑ Coupling sleeve
㉒ Insert spring
㉓ Reverse baulk ring
㉔ Reverse synchronizer cone
㉕ 5th synchronizer hub
㉖ Input shaft rear bearing
㉗ Input shaft bearing adjusting shim
㉘ Mainshaft front bearing
㉙ Mainshaft
㉚ 1st main gear
㉛ 1st baulk ring
㉜ 1st & 2nd synchronizer hub
㉝ Reverse main gear (Coupling sleeve)
㉞ Insert spring
㉟ 2nd baulk ring
㊱ Snap ring
㊲ 2nd main gear
㊳ 3rd main gear
㊴ 4th main gear
㊵ 5th main gear
㊶ Snap ring
㊷ Thrust washer
㊸ Mainshaft rear bearing
㊹ Mainshaft bearing adjusting shim
㊺ Differential side bearing
㊻ Differential case
㊼ Differential case
㊽ Viscous coupling
㊾ Final gear
㊿ Differential side bearing
(51) Differential side bearing adjusting shim
(52) Thrust washer
(53) Pinion mate gear
(54) Pinion mate shaft
(55) Side gear
(56) Thrust washer

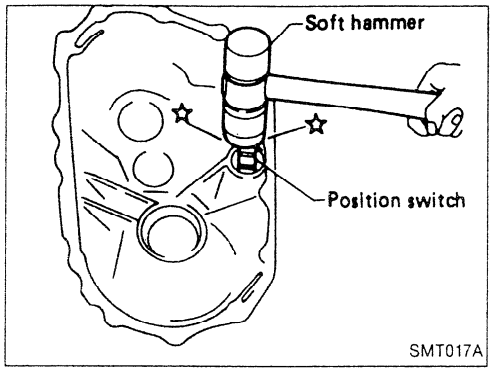
Shift Control Components



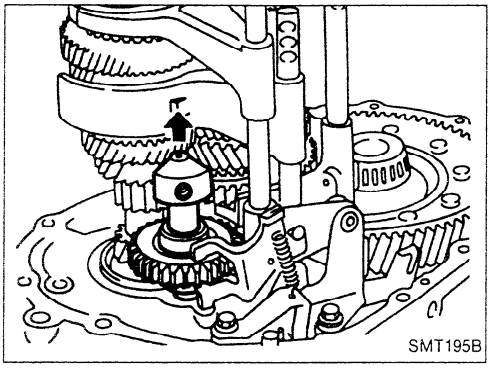
SMT465B



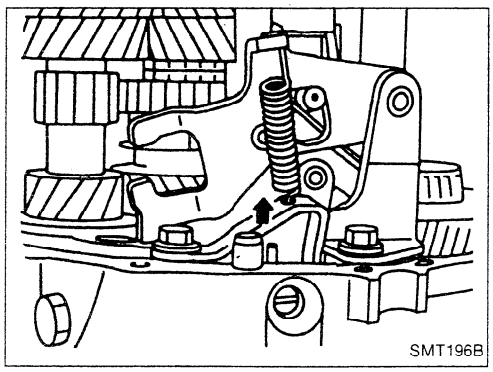
1. Before removing transmission case, remove bolts and plugs as shown left.
2. Remove transmission case.



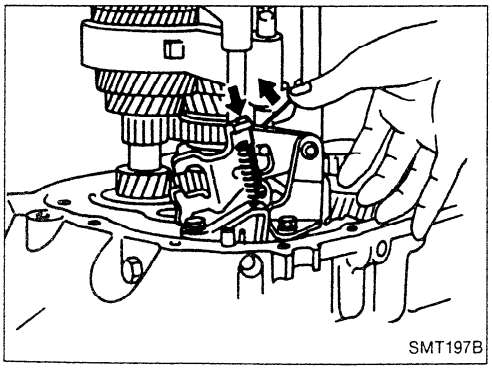
3. Remove position switch.



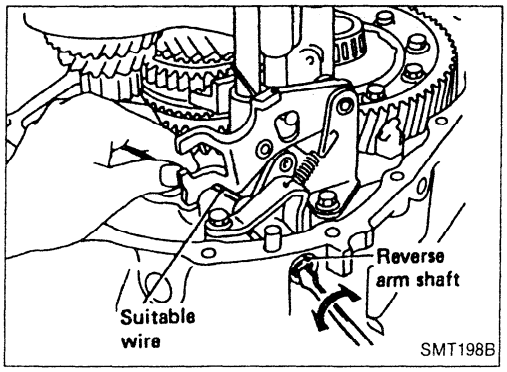
4. Mesh 4th gear, and then remove reverse idler shaft and reverse idler gear.



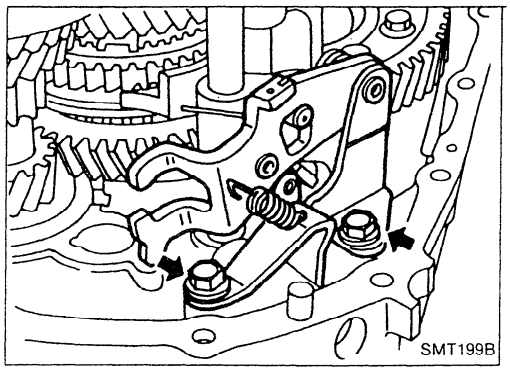
5. Pull out retaining pin from clutch housing.



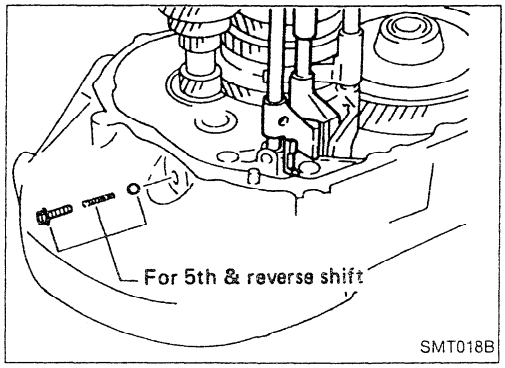
6. Remove reverse lever spring and reverse lock spring from reverse lever assembly.



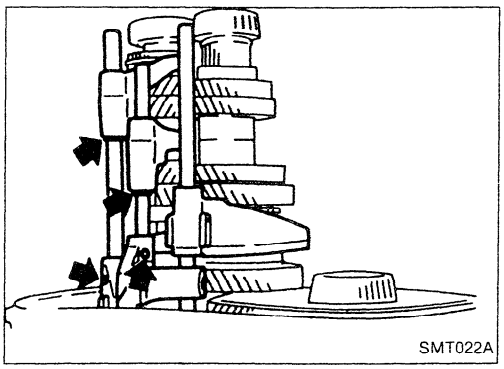
7. Remove reverse arm shaft while rotating it.



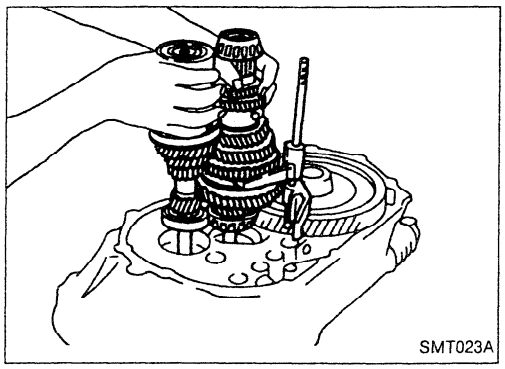
8. Remove reverse lever assembly.



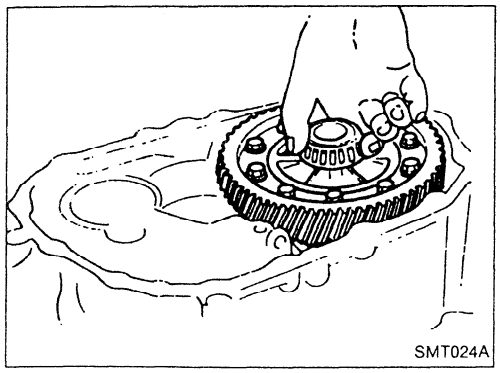
9. Remove 5th & reverse check plug, spring and ball.



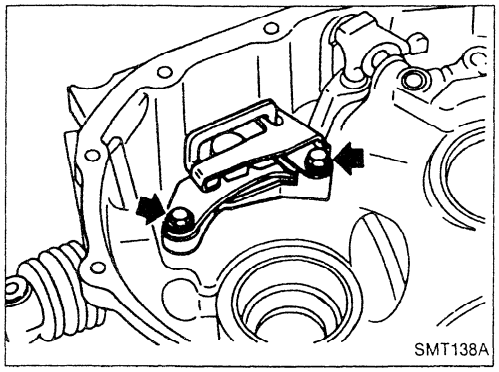
10. Remove stopper rings and retaining pins from 5th & reverse and 3rd & 4th fork rods.
11. Remove 5th & reverse and 3rd & 4th fork rods. Then remove forks and brackets.



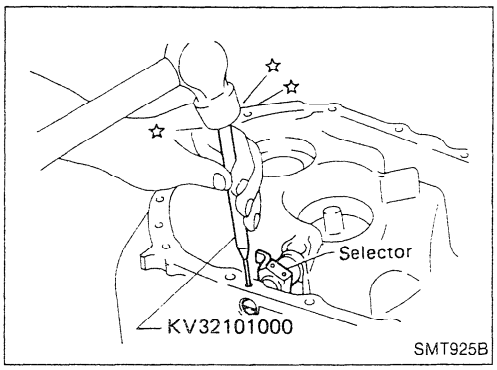
12. Remove both input and mainshafts with 1st & 2nd fork and fork rod as a set.


SMT024A

13. Remove final drive assembly.

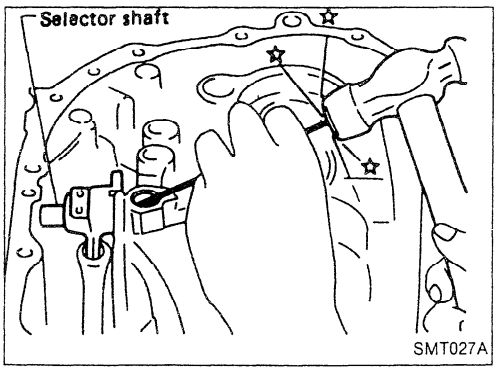

SMT138A

14. Remove reverse check assembly.

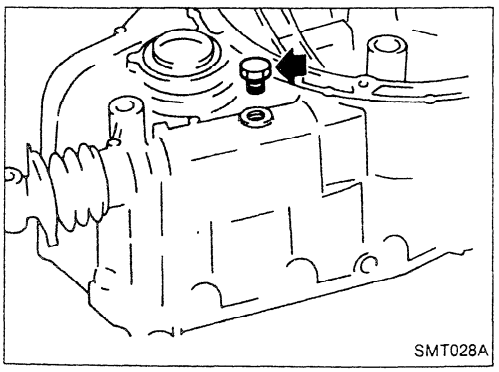


SMT925B

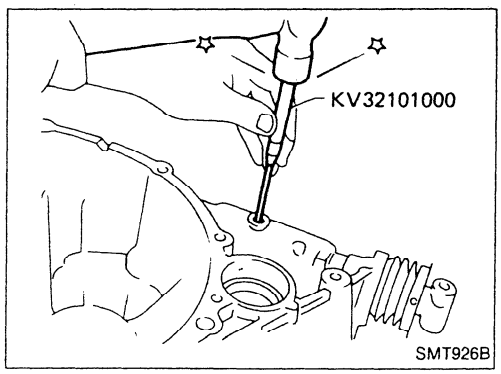
15. Remove retaining pin and detach the selector.



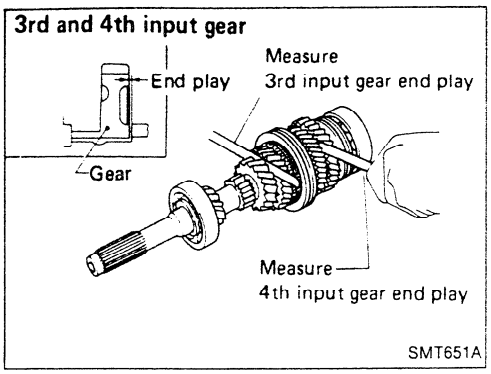
SMT027A


SMT028A

16. Remove plug for convenience in removing retaining pin which holds striking lever to striking rod.



17. Remove retaining pin and then withdraw striking lever and striking rod.



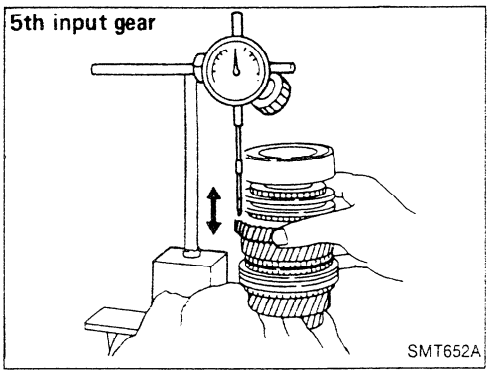
Input Shaft and Gears

DISASSEMBLY

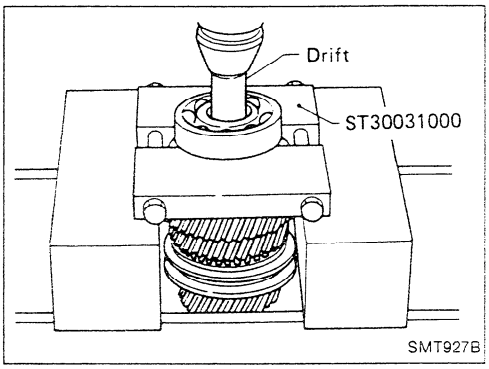
1. Before disassembly, check 3rd, 4th and 5th input gear end plays.

Gear end play

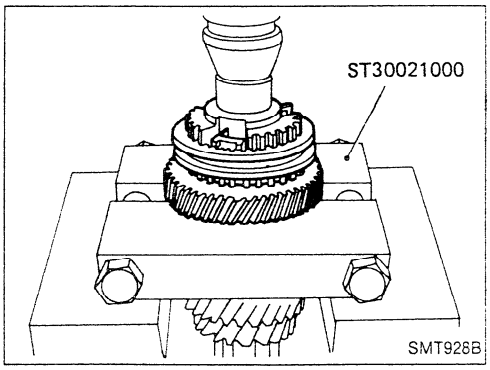
Gears	End play mm (in)
3rd input gear	0.23 - 0.43 (0.0091 - 0.0169)
4th input gear	0.25 - 0.55 (0.0098 - 0.0217)
5th input gear	0.23 - 0.48 (0.0091 - 0.0189)



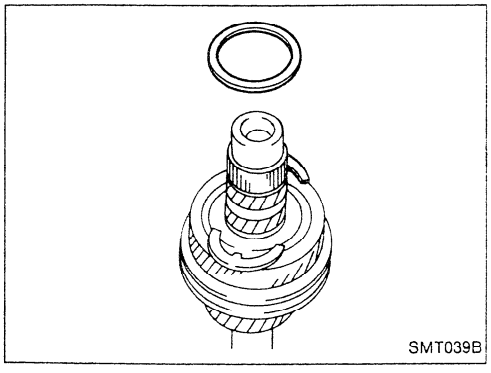
- If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of snap ring and thrust washer — Refer to "ASSEMBLY".



2. Remove input shaft rear bearing.

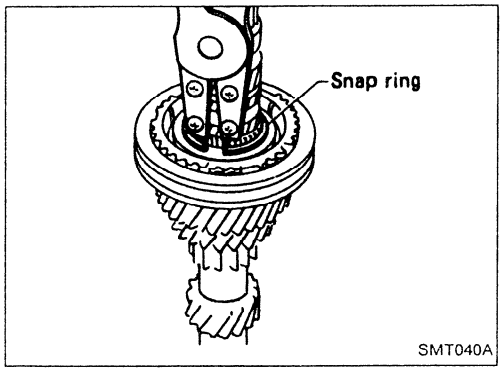


3. Remove 5th & reverse synchronizer and 5th input gear.

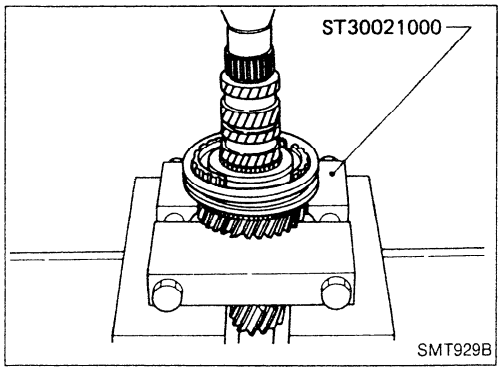


4. Remove thrust washer ring, thrust washers and 4th input gear.

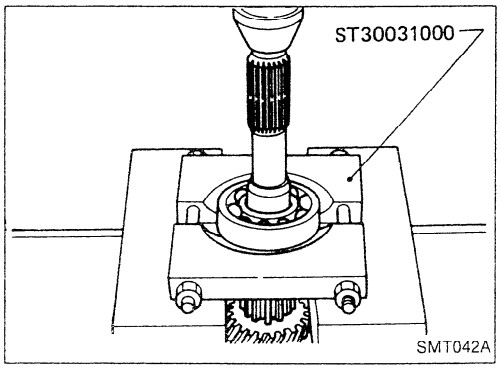
Input Shaft and Gears (Cont'd)



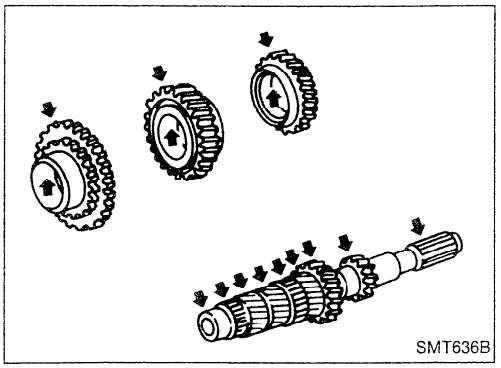
5. Remove snap ring.



6. Remove 3rd & 4th synchronizer and 3rd input gear.



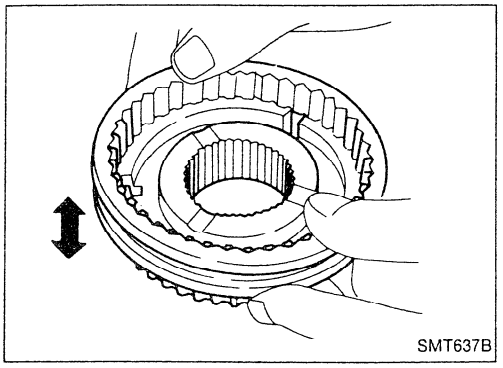
7. Remove input shaft front bearing.



INSPECTION

Gear and shaft

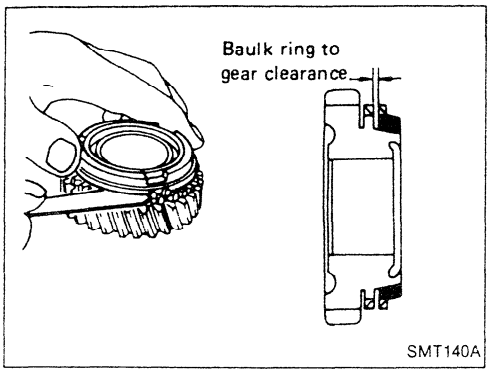
- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.



Synchronizer

- Check spline portion of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check insert springs for wear or deformation.

Input Shaft and Gears (Cont'd)



- Measure clearance between baulk ring and gear. (4th and 5th)

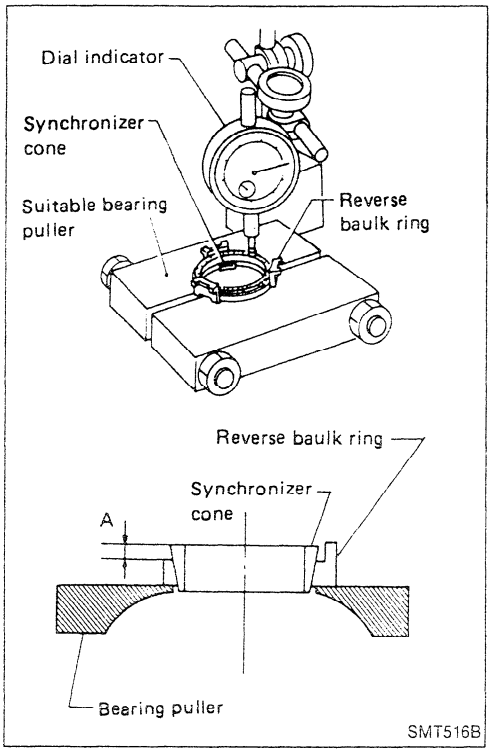
Clearance between baulk ring and gear:

Standard

1.0 - 1.35 mm (0.0394 - 0.0531 in)

Wear limit

0.7 mm (0.028 in)



- Measure wear of reverse baulk ring.

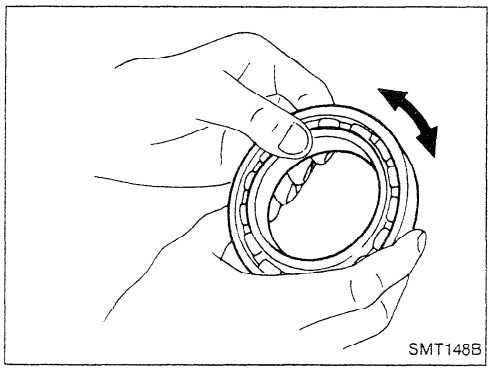
a. Place reverse baulk ring on Tool and then place reverse synchronizer cone on reverse baulk ring.

Make sure projection of synchronizer cone is positioned over the recess on suitable bearing puller.

b. While holding reverse synchronizer cone against reverse baulk ring as firmly as possible, measure dimension "A" with dial indicator.

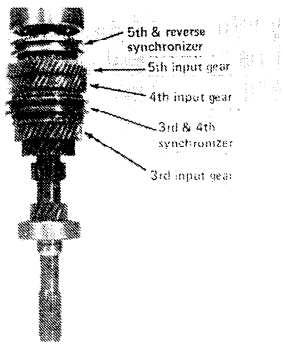
Wear limit: 1.2 mm (0.047 in)

c. If dimension "A" is smaller than the wear limit, replace baulk ring.

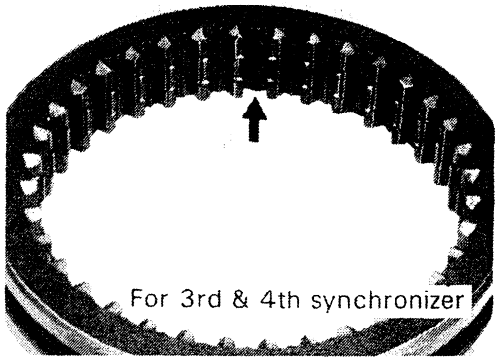


Bearing

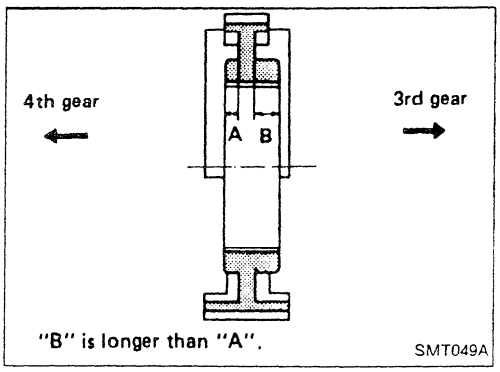
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.



ASSEMBLY



1. Place inserts in three grooves on coupling sleeve (3rd & 4th synchronizer).

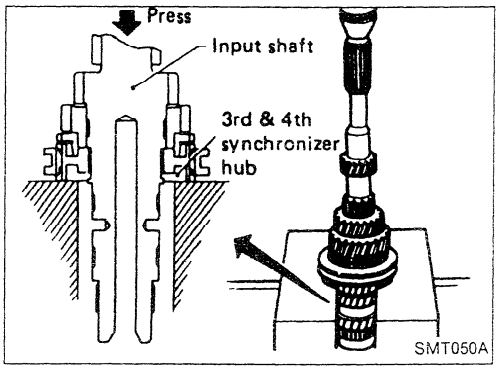


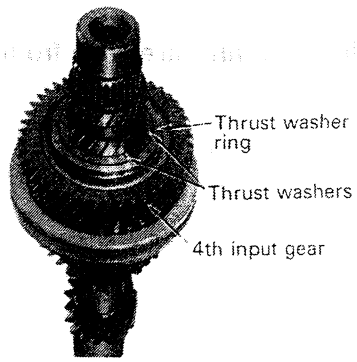
2. Install 3rd input gear and 3rd baulk ring.
3. Press on 3rd & 4th synchronizer hub.

- **Pay attention to its direction.**

4. Select proper snap ring of 3rd & 4th synchronizer hub to minimize clearance of groove, and then install it.

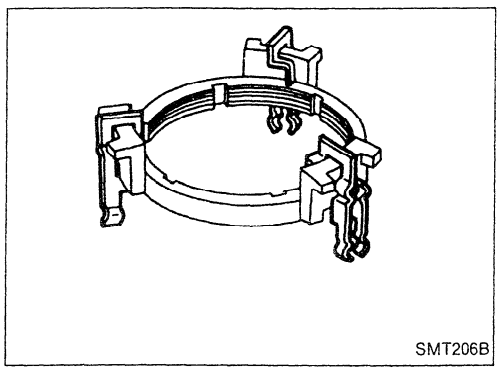
Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)
Snap ring of 3rd & 4th synchronizer hub:
Refer to S.D.S.





5. Install 4th input gear.
6. Select proper thrust washers to minimize clearance of groove.
   Then install them and thrust washer ring.

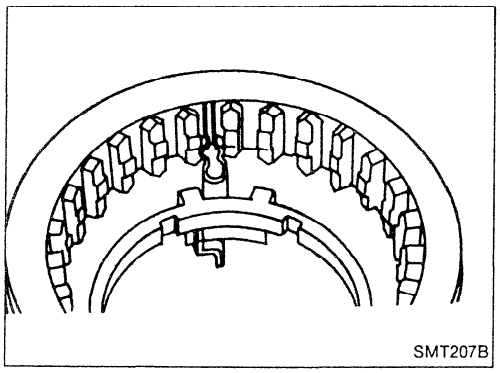
Allowable clearance of groove:
0 - 0.06 mm (0 - 0.0024 in)
Input shaft thrust washer:
Refer to S.D.S.



7. Install 5th & reverse synchronizer assembly.

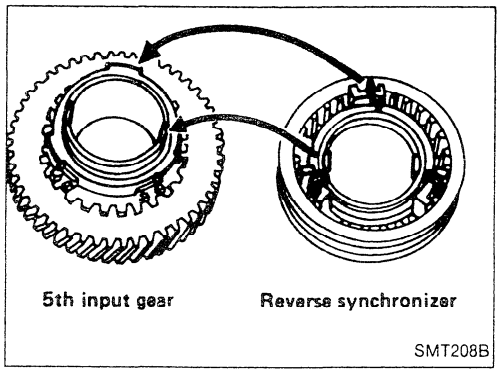
a. Hook insert springs on reverse baulk ring.

Input Shaft and Gears (Cont'd)


SMT207B

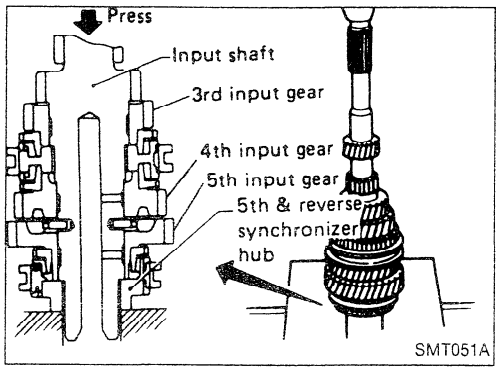
b. Install insert springs with reverse baulk ring onto coupling sleeve.
- **Pay attention to position of insert springs.**

c. Place 5th baulk ring on 5th input gear.
d. Install reverse synchronizer cone on reverse baulk ring.



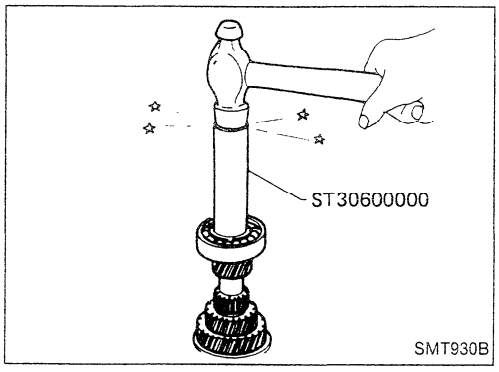
SMT208B

e. Place reverse synchronizer assembly on 5th input gear.
- **Mesh recesses of 5th input gear with projections of reverse synchronizer cone.**
- **Put insert spring mounts on reverse baulk ring upon those on 5th baulk ring.**



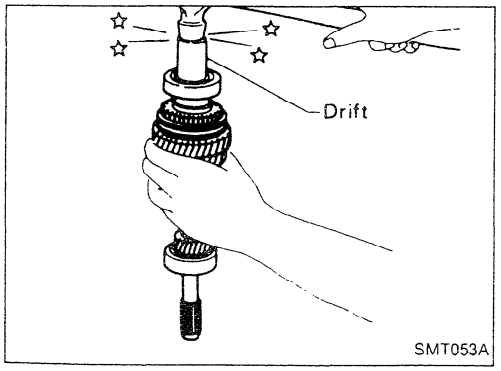
SMT051A

f. Press on 5th & reverse synchronizer assembly with 5th input gear.

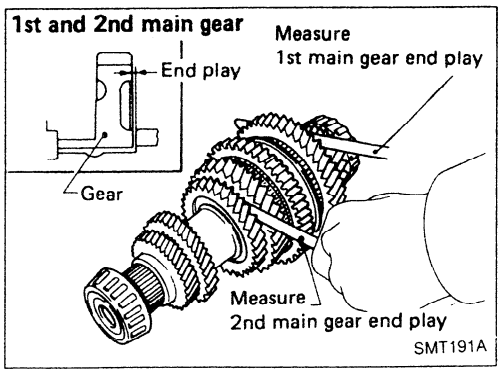


SMT930B

8. Install input shaft front and rear bearings.
9. Measure gear end play as the final check — Refer to "DISASSEMBLY".



SMT053A



Mainshaft and Gears

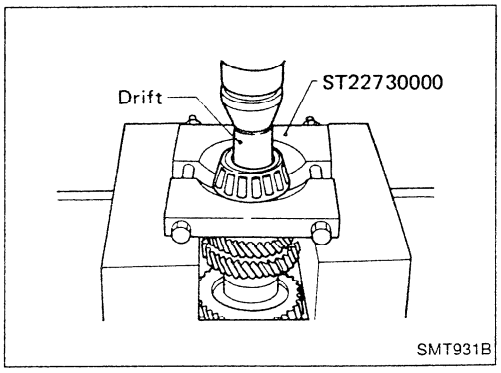
DISASSEMBLY

1. Before disassembly, check 1st and 2nd main gear end plays.

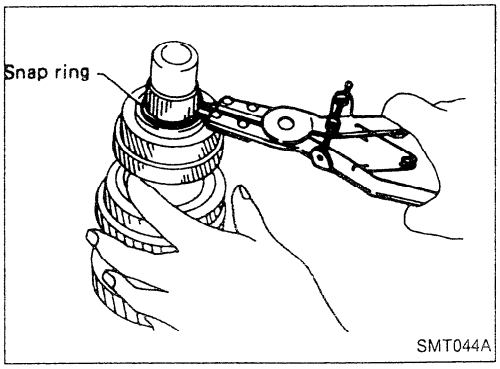
Gear end play

Gears	End play mm (in)
1st main gear	0.23 - 0.43 (0.0091 - 0.0169)
2nd main gear	0.23 - 0.58 (0.0091 - 0.0228)

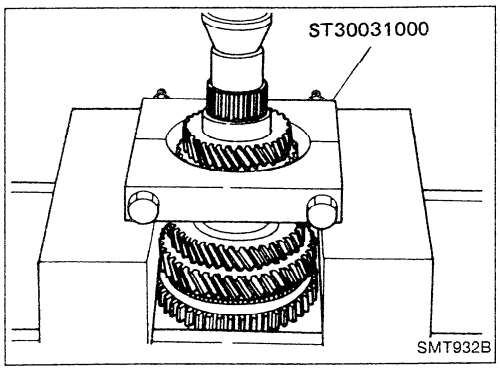
If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of snap ring — Refer to "ASSEMBLY".



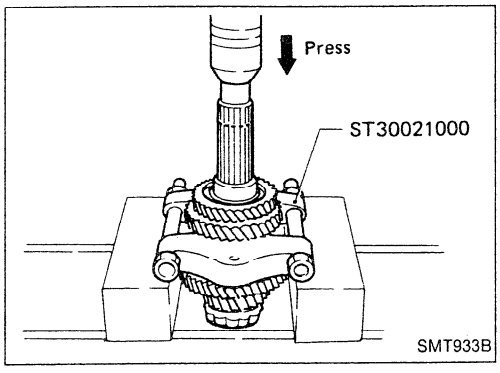
2. Press out mainshaft rear bearing.



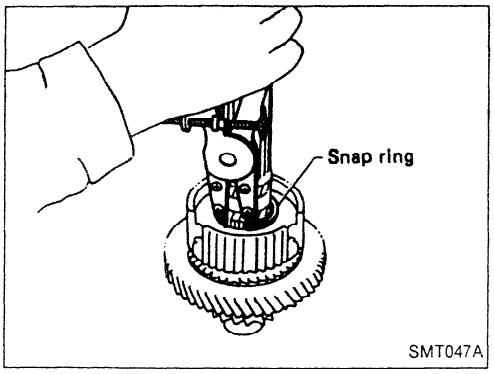
3. Remove thrust washer and snap ring.



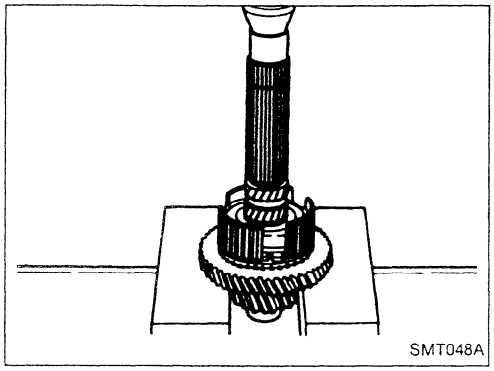
4. Press out 5th main gear and 4th main gear.



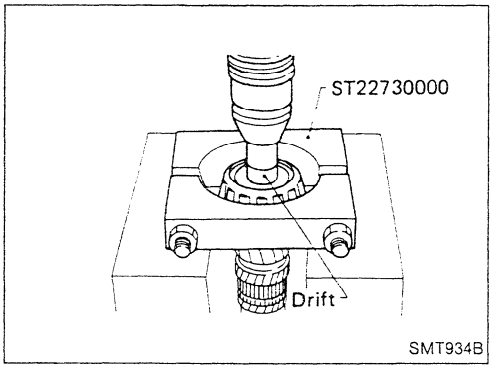
5. Press out 3rd main gear and 2nd main gear.



6. Remove snap ring.



7. Remove 1st & 2nd synchronizer hub and 1st main gear.

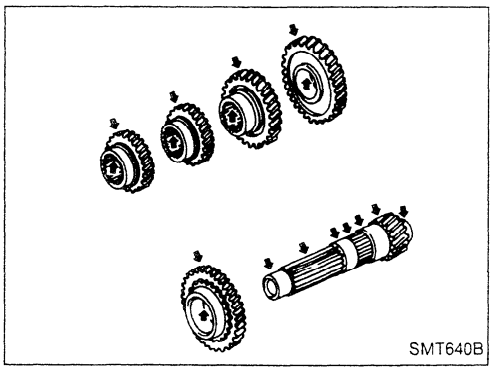


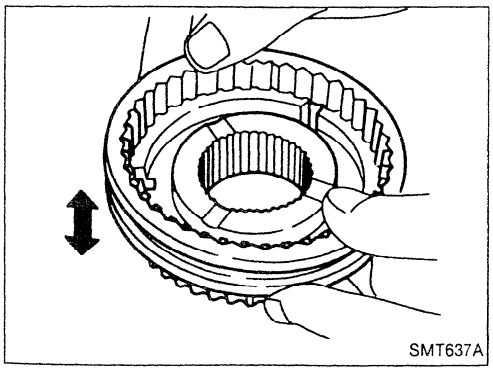
8. Remove mainshaft front bearing.

INSPECTION

Gear and shaft

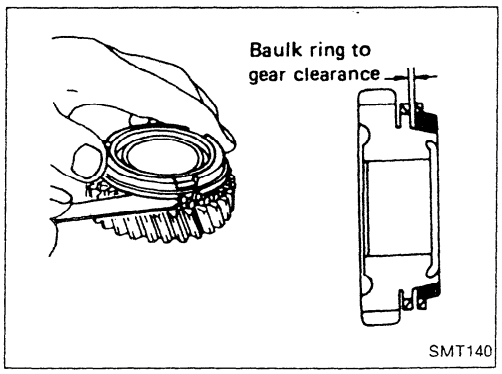
- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.





Synchronizer

- Check spline portion 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 (1st).

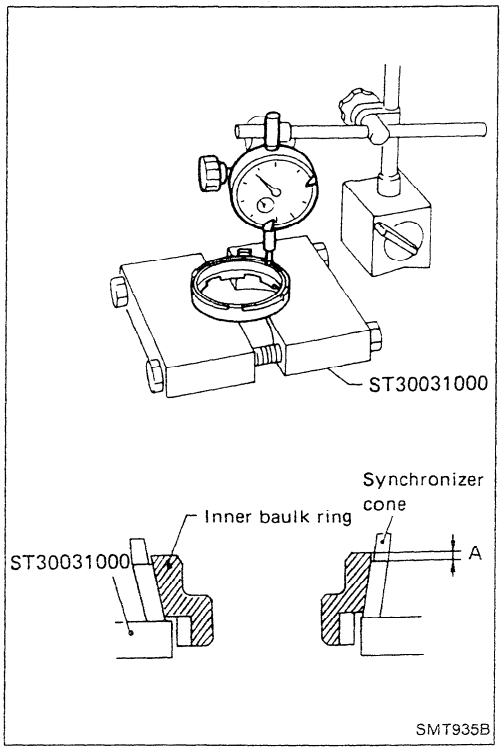
Clearance between baulk ring and gear:

Standard

1.0 - 1.35 mm (0.0394 - 0.0531 in)

Wear limit

0.7 mm (0.028 in)



- Measure wear of 2nd baulk rings.

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:

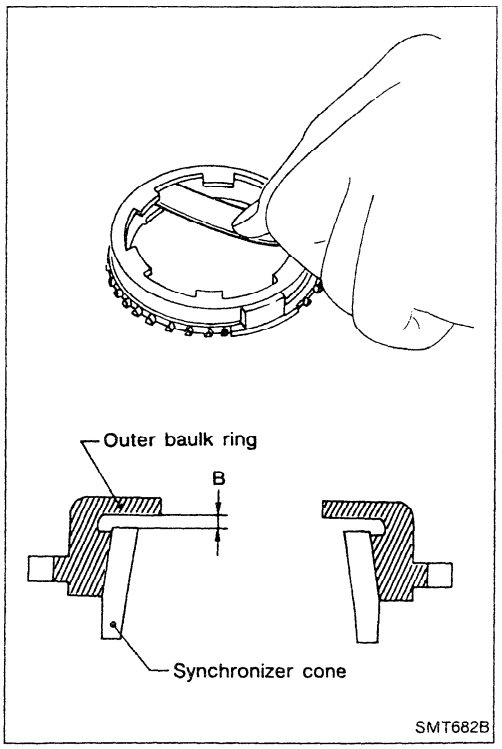
A 0.6 - 0.8 mm (0.024 - 0.031 in)

B 0.6 - 1.1 mm (0.024 - 0.043 in)

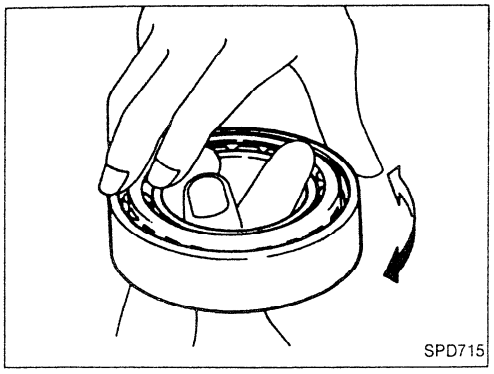
Wear limit:

0.2 mm (0.008 in)

c. If dimension "A" or "B" is smaller than the wear limit, replace baulk ring.

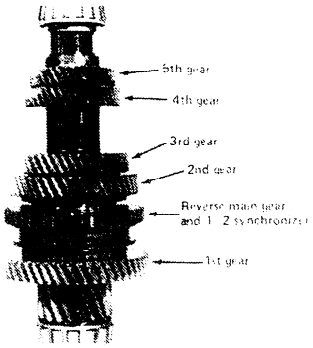


Mainshaft and Gears (Cont'd)

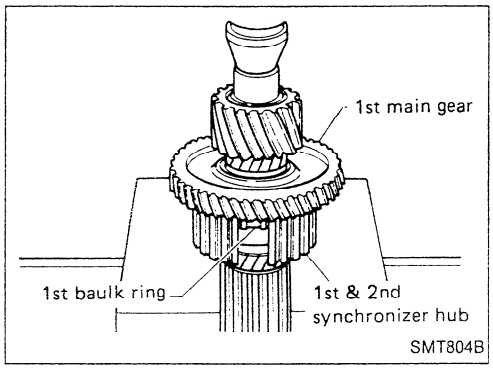

SPD715

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.**



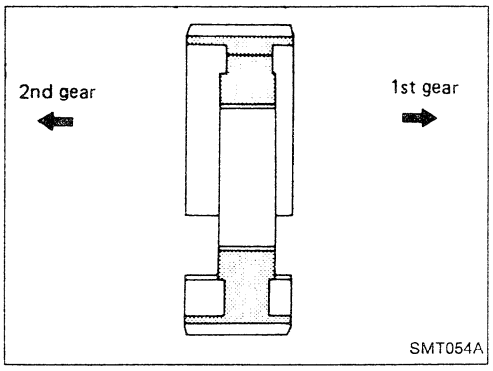
ASSEMBLY



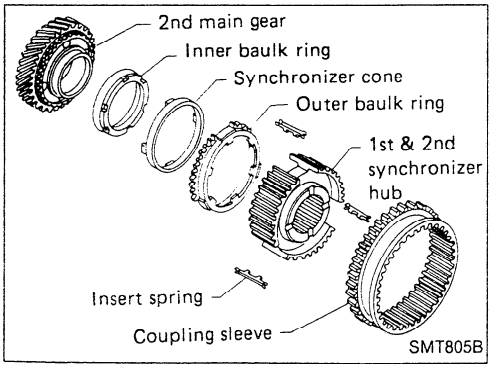
SMT804B

1. Press on 1st main gear, 1st baulk ring and 1st & 2nd synchronizer hub.
- **Pay attention to direction of 1st & 2nd synchronizer hub.**
2. Select proper snap ring of 1st & 2nd synchronizer hub to minimize clearance of groove and then install it.

Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)
Snap ring of 1st & 2nd synchronizer hub:
Refer to S.D.S.



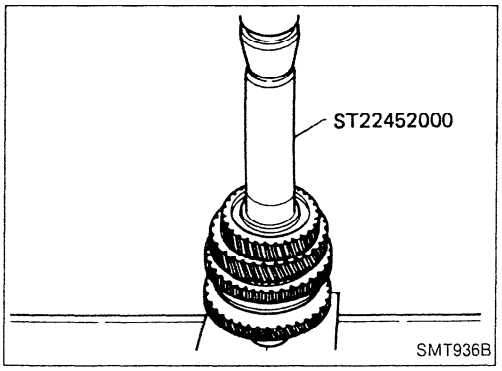
SMT054A



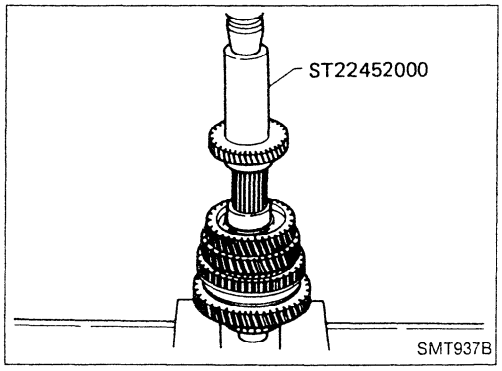
SMT805B

3. Install 2nd synchronizer cone, inner & outer baulk rings, insert springs and 1st & 2nd coupling sleeve.
4. Install 2nd main gear.
- Ensure four protrusions of 2nd synchronizer cone are set in holes of 2nd main gear.

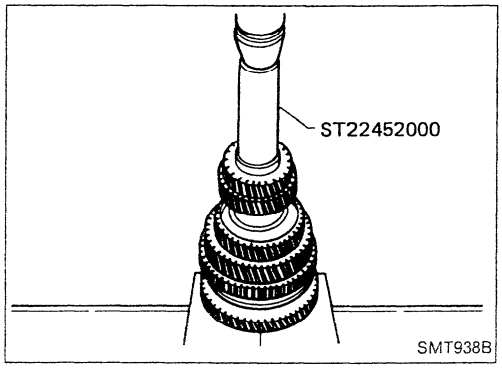
Mainshaft and Gears (Cont'd)



5. Press on 3rd main gear.

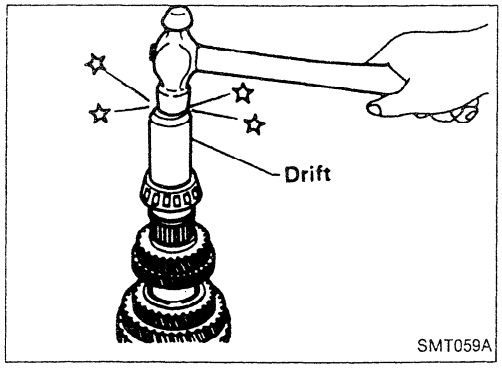


6. Press on 4th main gear.

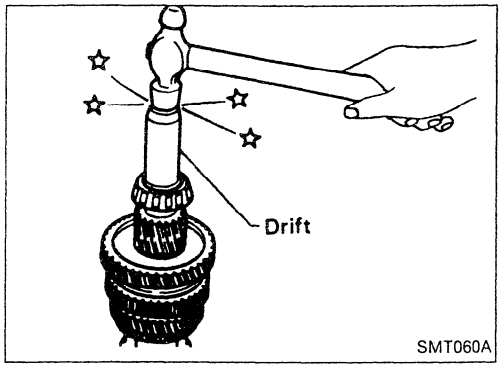


7. Press on 5th main gear.
8. Select proper snap ring of 5th main gear to minimize clearance of groove and then install it.

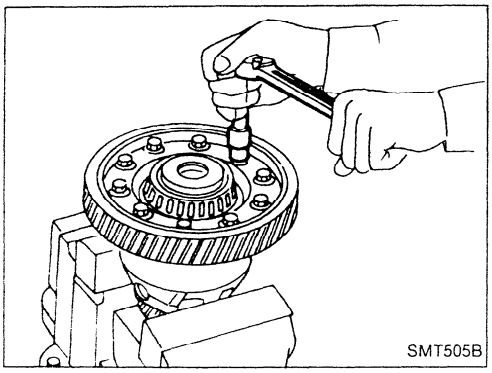
Allowable clearance of groove:
0 - 0.15 mm (0 - 0.0059 in)
Snap ring of 5th main gear:
Refer to S.D.S.



9. Press on thrust washer and press on mainshaft rear bearing.



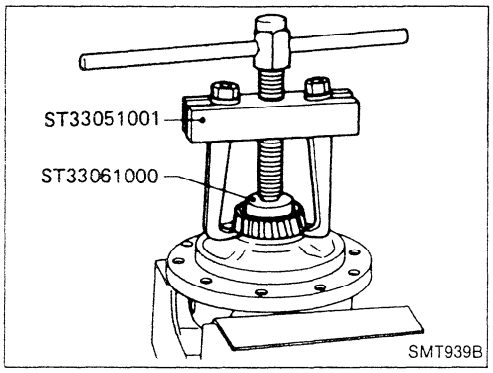
10. Press on mainshaft front bearing.
11. Measure gear end play as the final check — Refer to "Disassembly".


SMT505B

Final Drive (Center differential)

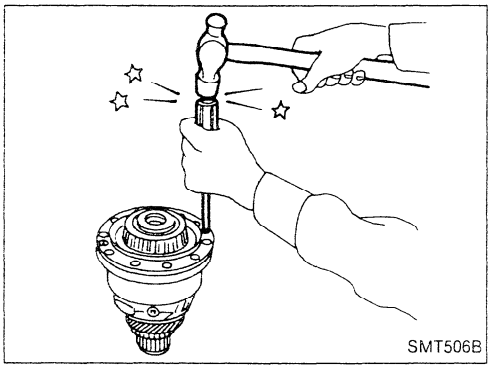
DISASSEMBLY

1. Remove final gear.

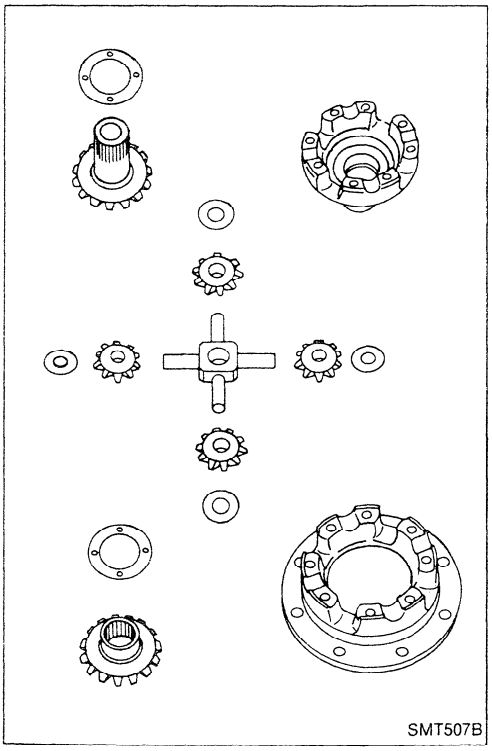


SMT939B

2. Press out differential side bearing.

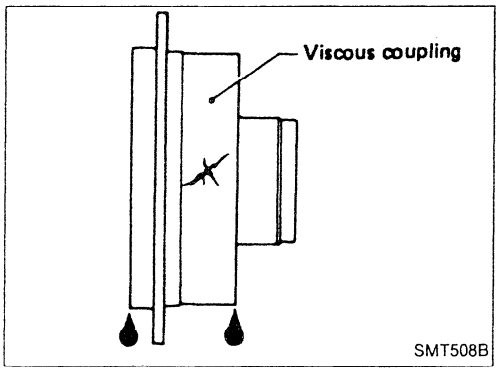

SMT506B

3. Remove viscous coupling.


SMT507B

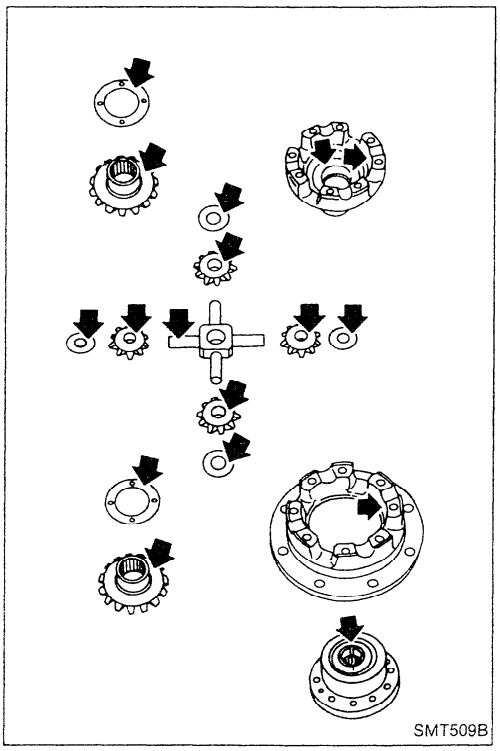
4. Disassemble differential case.

INSPECTION



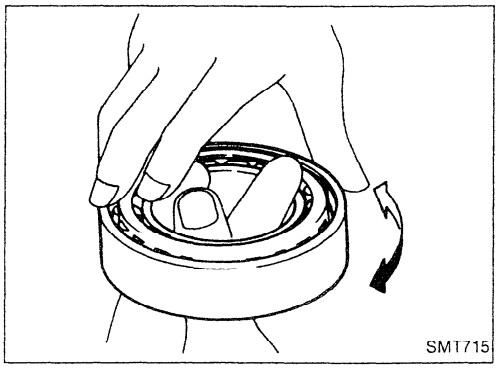
Viscous coupling

- Check case for cracks.
- Check silicone oil for leakage.



Gear, washer, shaft and case

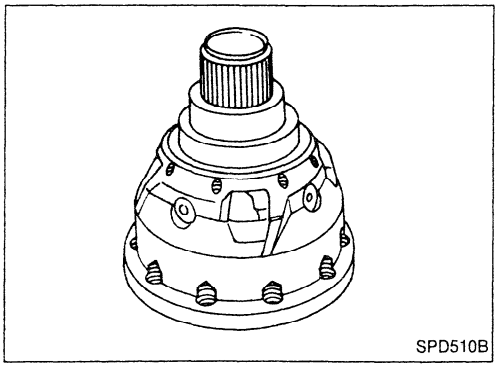
- Check mating surfaces of differential case, viscous coupling, side gear and pinion mate gear.
- Check washers for wear.



Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

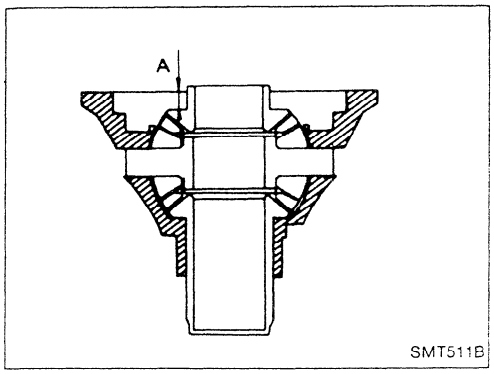
When replacing tapered roller bearing, replace outer and inner race as a set.



ASSEMBLY

1. Install side gear without thrust washers, pinion mate shaft and pinion mate gear.
2. Install differential case L.H. and R.H.

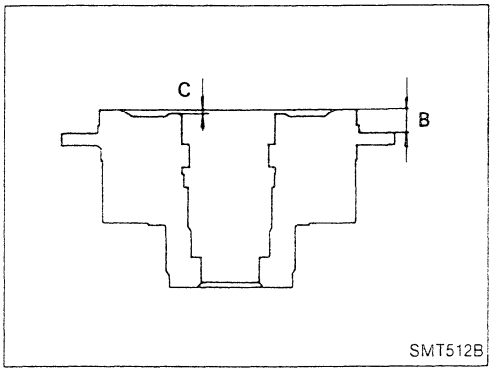
Final Drive (Center differential) (Cont'd)



— L.H. side gear —

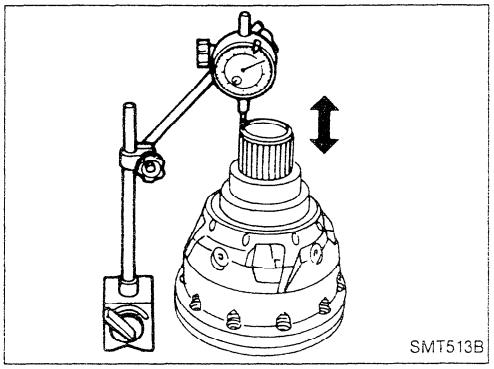
3. Measure clearance between side gear and viscous coupling following the procedure.

a. Measure dimension A between side gear and differential case.



b. Measure dimension B and C of viscous coupling
Clearance between side gear and viscous coupling with washer (A – B + C):
0.03 - 0.14 mm (0.0012 - 0.0055 in)

c. Select side gear thrust washer so clearance between side gear and viscous coupling is within specifications.
Side gear thrust washer: Refer to S.D.S.



— R.H. side gear —

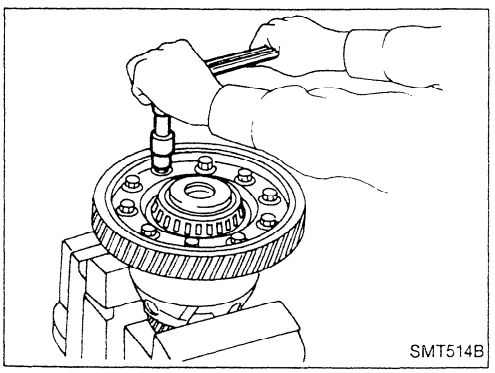
3. Measure clearance between side gear and differential case following the procedure.

a. Install L.H. side gear thrust washer as priority selected and install differential case assembly.

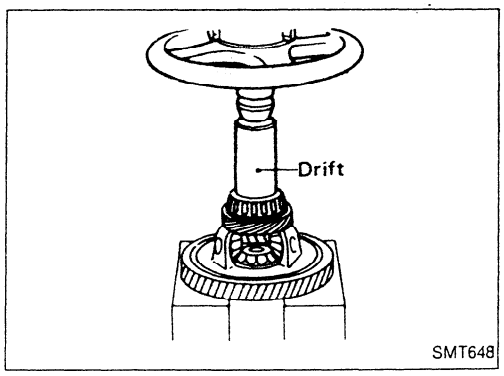
b. Set dial indicator on side gear.

c. Move R.H. side gear up and down to measure dial indicator deflection.
Clearance between side gear and differential case with washer:
0.03 - 0.14 mm (0.0012 - 0.0055 in)

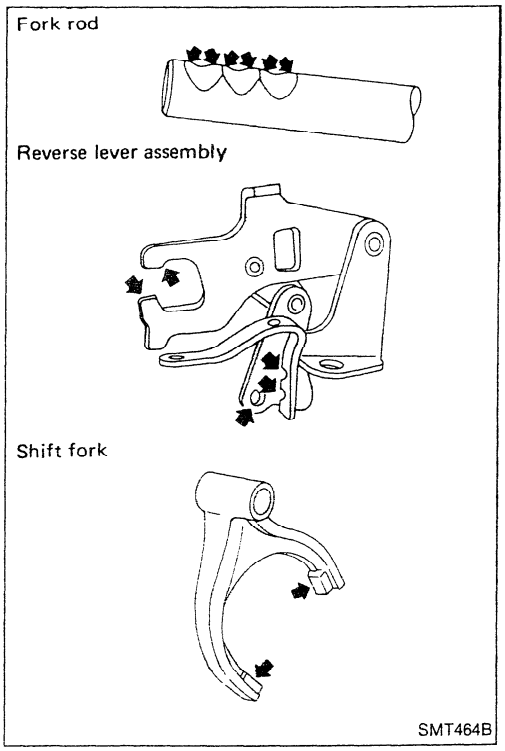
d. Select side gear thrust washer so clearance between side gear and differential case is within specifications.
Side gear thrust washer: Refer to S.D.S.



4. Install viscous coupling and final gear.



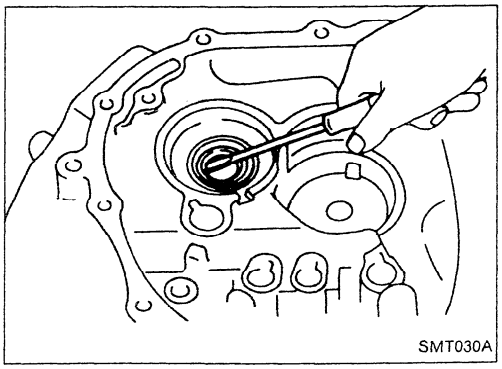
5. Press on differential side bearings.



Shift Control Components

INSPECTION

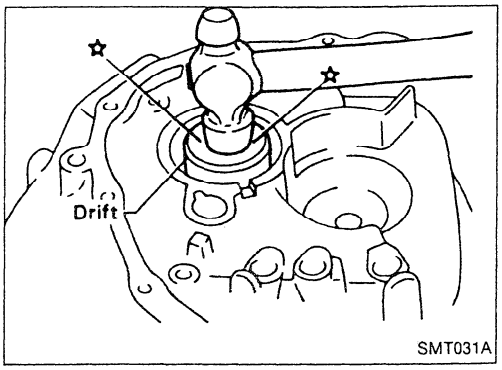
- Check contact surface and sliding surface for wear, scratches, projections or other damage.



Case Components

REMOVAL AND INSTALLATION

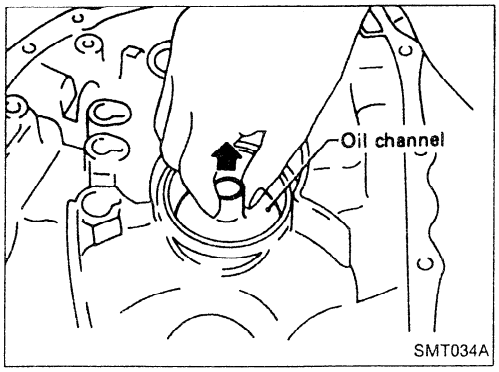
Input shaft oil seal



- **Apply multi-purpose grease to seal lip of oil seal before installing.**

Case Components (Cont'd)

Mainshaft front bearing outer race



Mainshaft rear bearing outer race — Refer to "ADJUSTMENT".

Differential side bearing outer race — Refer to "ADJUSTMENT".

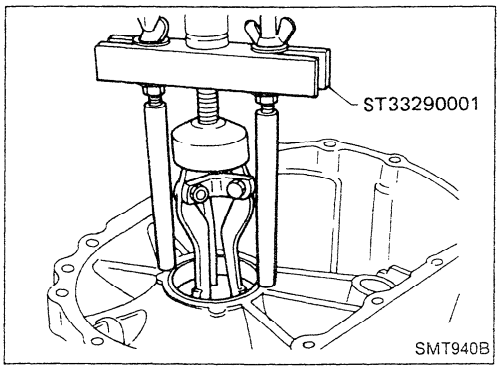
Input Shaft End Play and Differential Side Bearing Preload

If any of the following parts are replaced, adjust input shaft end play.

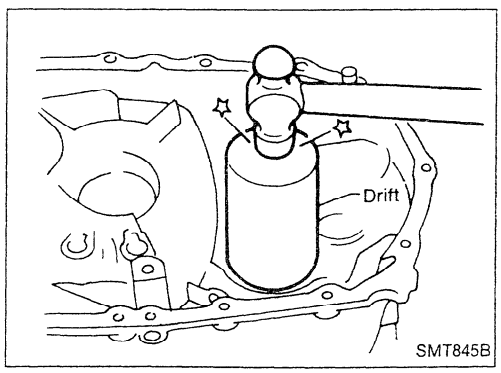
- **Input shaft**
- **Input shaft bearing**
- **Clutch housing**
- **Transmission case**

If any of the following parts are replaced, adjust differential side bearing preload.

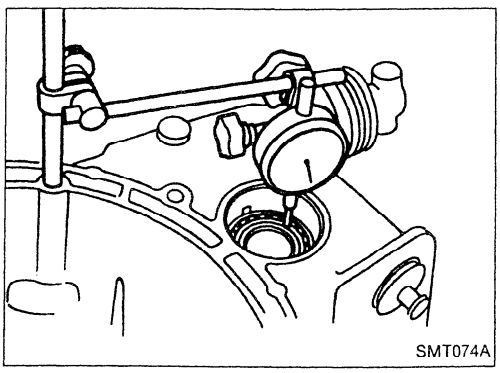
- **Differential case**
- **Differential side bearing**
- **Clutch housing**
- **Transmission case**



1. Remove differential side bearing outer race (transmission case side) and shim(s).



2. Reinstall differential side bearing outer race without shim(s).
3. Install input shaft and final drive assembly on clutch housing.
4. Install transmission case without input shaft bearing shim(s).
   Then tighten it to the specified torque.

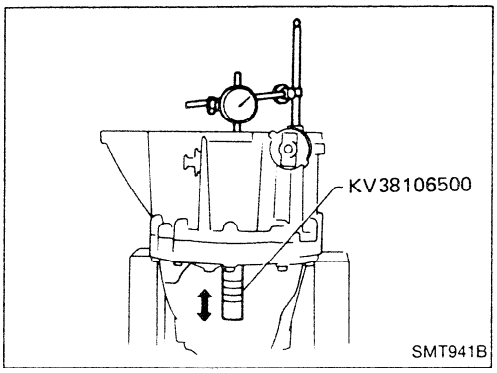


5. Using the following procedures, measure clearance between bearings and transmission case.

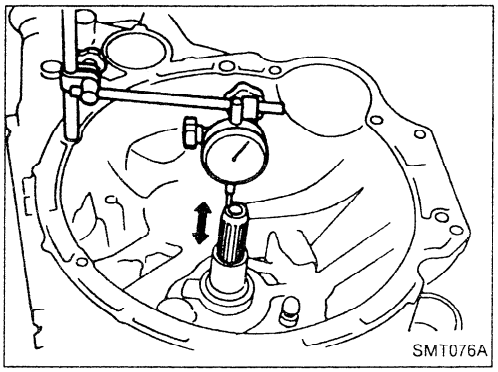
- **Differential side**

a. Attach dial indicator. If clamp diameter of dial indicator is too small or too large, attach dial indicator using a magnetic stand.

Input Shaft End Play and Differential Side Bearing Preload (Cont'd)

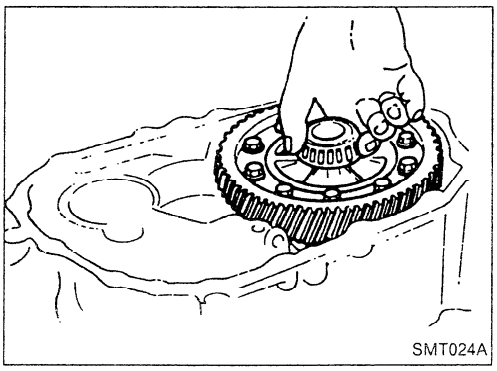


b. Insert Tool all the way into differential side gear. Move Tool up and down and measure dial indicator deflection.

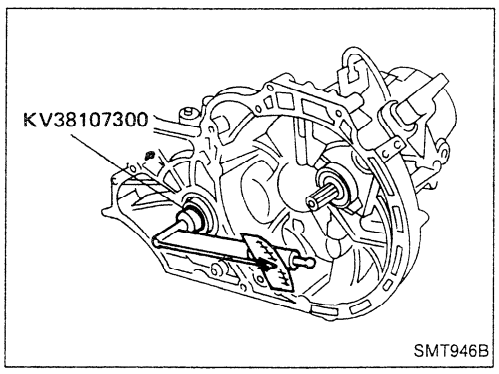


- **Input shaft side**

a. Set dial indicator on end of input shaft.
b. Move input shaft up and down and measure dial indicator deflection.
6. Select shims with proper thickness with S.D.S. table as a guide.
7. Install selected differential side bearing adjusting shim and differential side bearing outer race.



8. 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.**



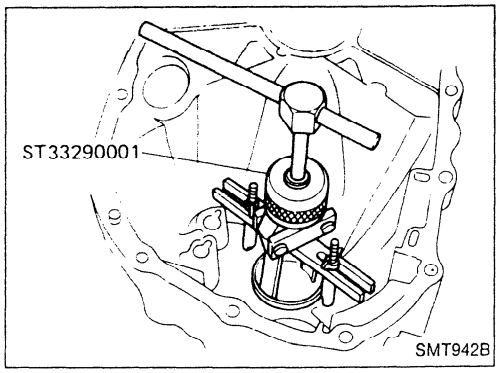
c. Measure turning torque of final drive assembly.
Turning torque of final drive assembly (New bearing):
4.9 - 7.8 N·m (50 - 80 kg-cm, 43 - 69 in-lb)
- **When old bearing is used again, turning torque will be slightly less than the above.**
- **Make sure torque is close to the specified range.**

Mainshaft Bearing Preload

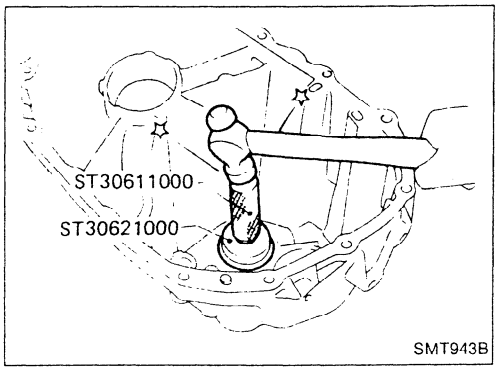
If any of the following parts are replaced, adjust mainshaft bearing preload.

- **Mainshaft**
- **Mainshaft bearings**
- **Clutch housing**
- **Transmission case**

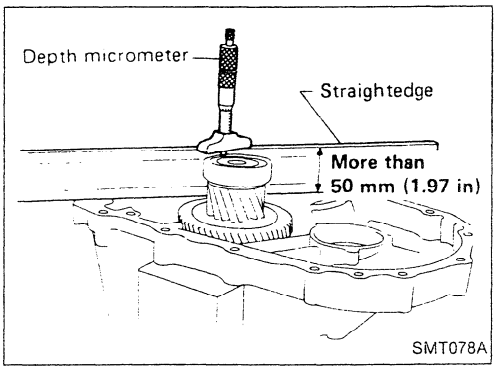
Mainshaft Bearing Preload (Cont'd)



1. Remove mainshaft rear bearing outer race and shim(s).



2. Reinstall mainshaft rear bearing outer race without shims.
3. Clean mating surfaces of clutch housing and transmission case with solvent.
4. Install mainshaft and mainshaft front bearing outer race into transmission case. Turn mainshaft while holding bearing outer race so that bearings are properly seated.

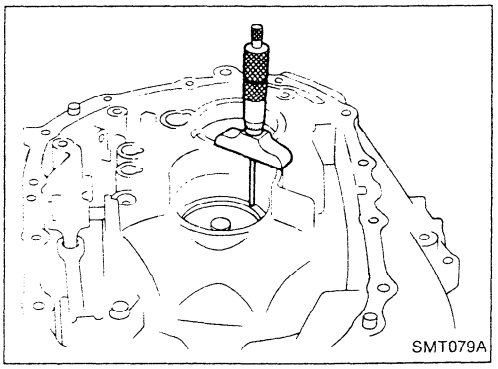


5. Put straightedge [width must be more than 50 mm (1.97 in)] on transmission case, and measure the distance from upper surface of straightedge to surface of the bearing outer race using a depth micrometer.

- **Measure at three places on bearing outer race, and take the average.**

6. Determine dimension A to be used by the following equation.

   Dimension A = Width of straightedge – measured distance



7. Measure the distance from mating surface of clutch housing to portion with which mainshaft front bearing outer race is to be mated.

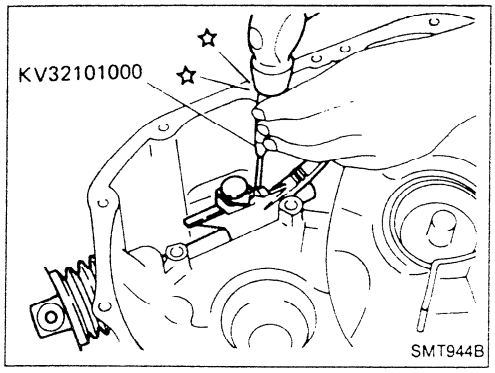
- **Measure at three places on the portion, and take the average.**

   Dimension B = Measured distance

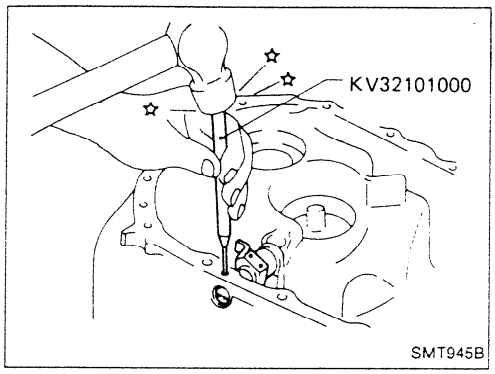
8. Determine dimension C to be used by the following equation.

   C = B – A

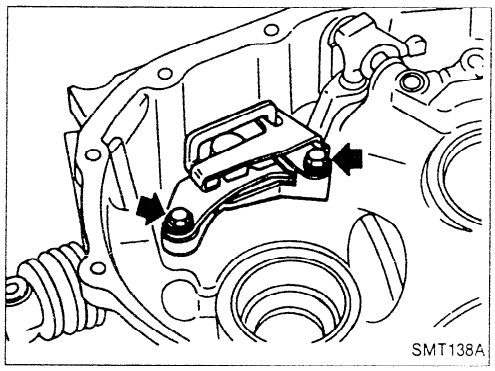
9. Determine total thickness of shims with S.D.S. table as a guide.
10. Install selected mainshaft bearing adjusting shim and mainshaft bearing outer race.
11. Check total turning torque after assembly — Refer to "ASSEMBLY".



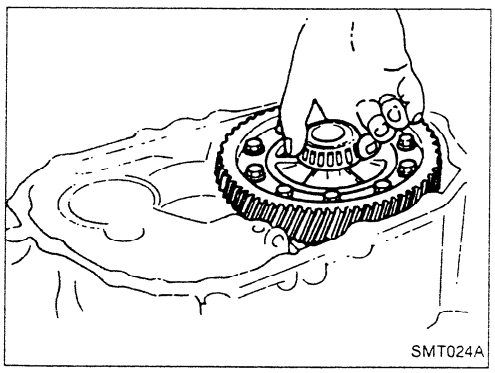
1. Install striking lever and striking rod.



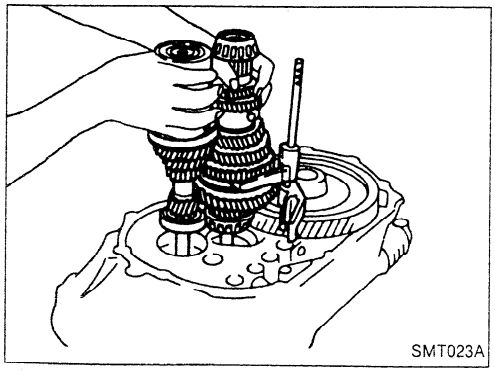
2. Install selector and retaining pin.



3. Install reverse gate assembly.

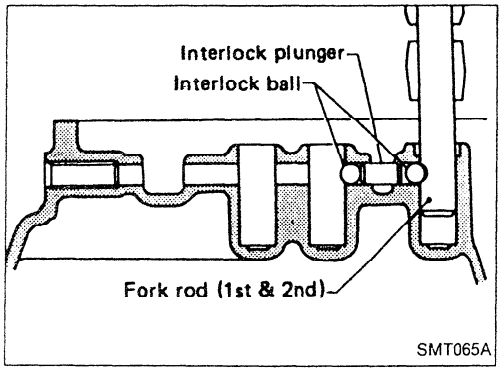


4. Install final drive assembly.

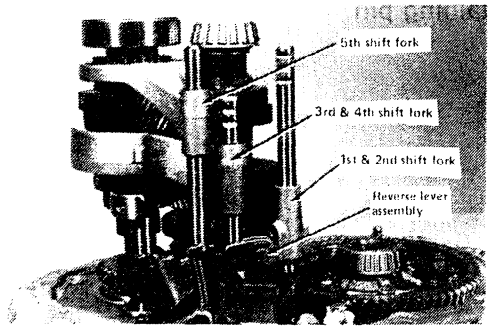


5. Install input shaft and mainshaft with 1st & 2nd shift fork assembly.

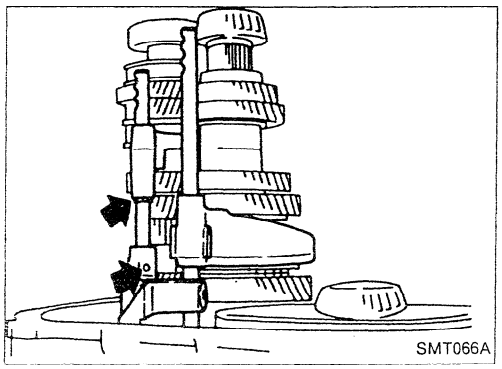
- **Be careful not to damage input shaft oil seal.**

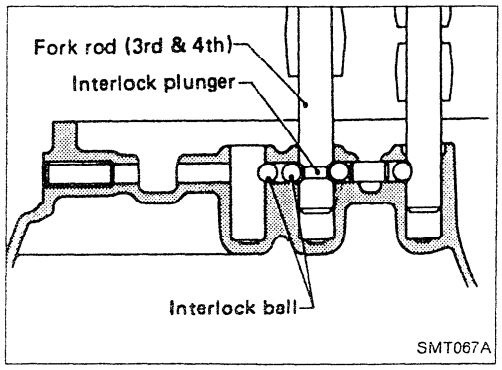


6. Install interlock balls and plunger.

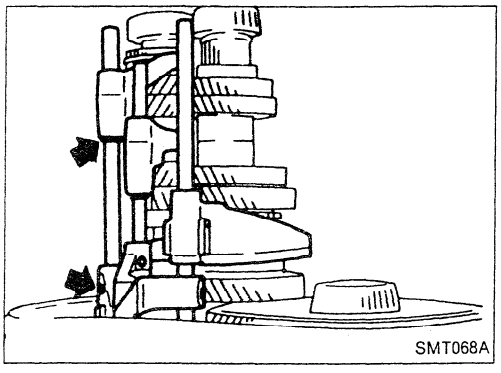


7. Install 3rd & 4th shift fork and bracket, then install 3rd & 4th shift rod, stopper ring and retaining pin.

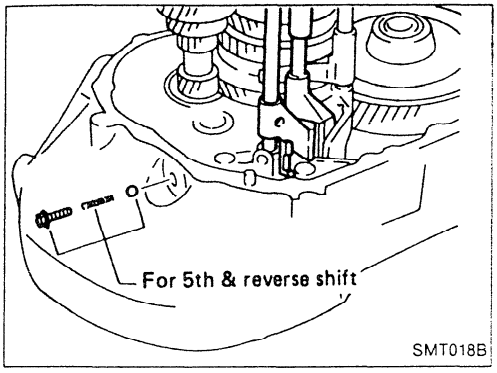




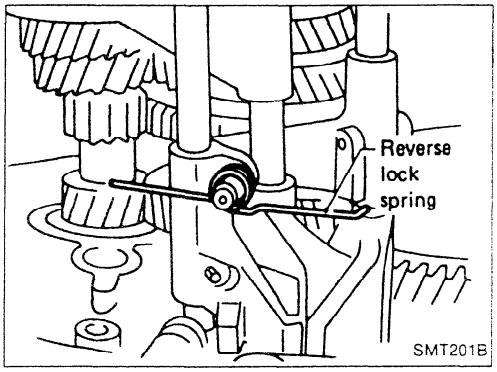
8. Install interlock balls.



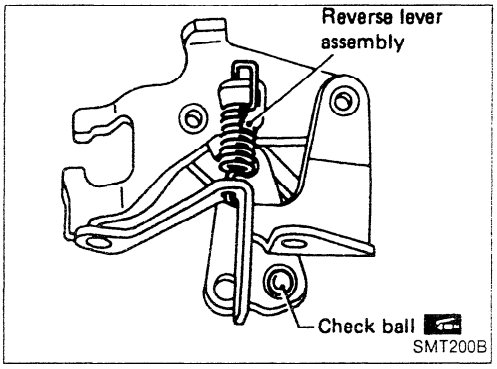
9. Install 5th shift fork and bracket, then install shift rod, stopper ring and retaining pin.



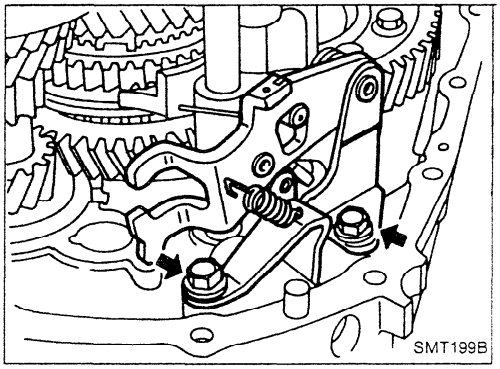
10. Install 5th & reverse check plug, spring and ball.



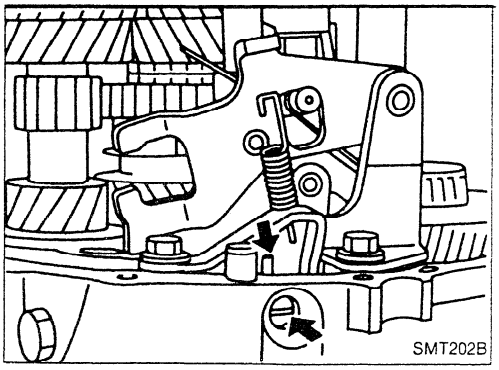
11. Reverse lever assembly
a. Install reverse lock spring on 5th & reverse bracket.
- **Pay attention to its direction.**



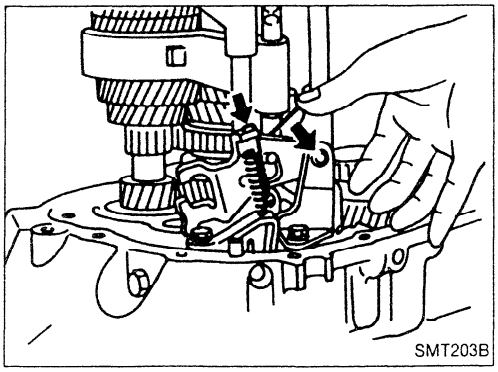
b. Install check ball and reverse lever spring on reverse lever assembly.
- **Apply multi-purpose grease to check ball.**
- **Pay attention to direction of reverse lever spring.**



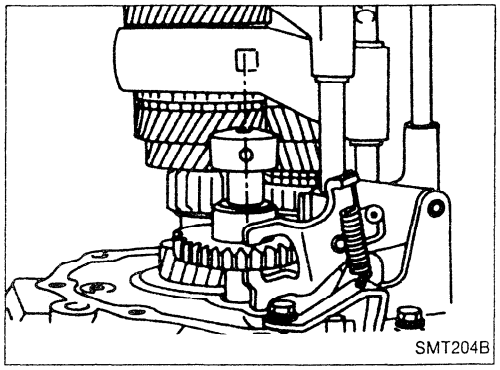
c. Install reverse lever assembly on clutch housing.



d. Install reverse arm shaft and retaining pin.

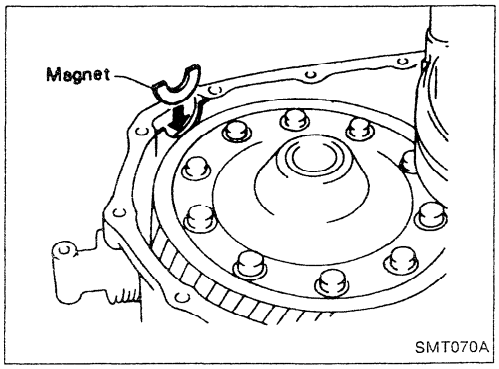

SMT203B

e. Hook reverse lock spring and reverse lever spring on reverse lever assembly.


SMT204B

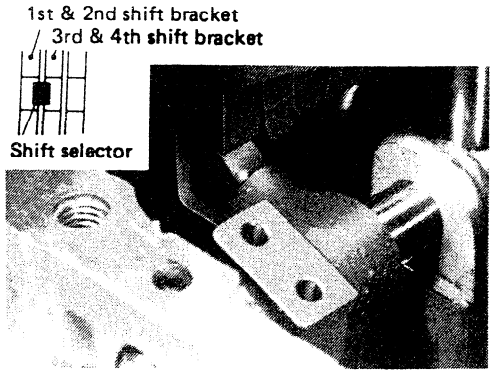
f. Mesh 4th gear, then install reverse idler gear and shaft.

- **Pay attention to direction of tapped hole.**



SMT070A

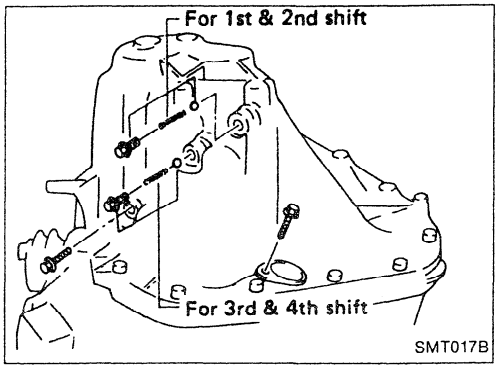
12. Place magnet on clutch housing.



13. If bearing preload was adjusted, install selected shim(s) into transmission case.

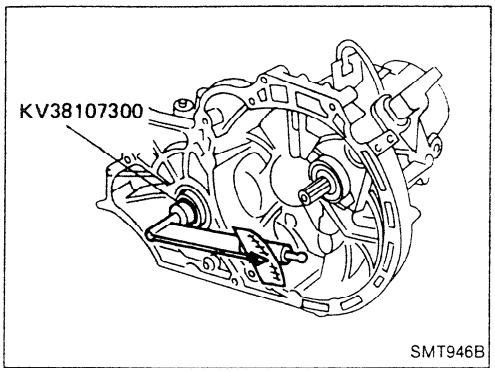
- **To aid in installation of transmission case, place shift selector in the 1st and 2nd shift bracket or between 1st and 2nd bracket and 3rd and 4th bracket.**

14. Apply sealant to mating surface of transmission case and install it.
15. Install position switch.



SMT017B

16. Apply sealant to threads of check plugs. Install balls, springs and plugs.
17. After assembly, check that you can shift into each gear smoothly.

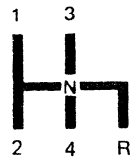
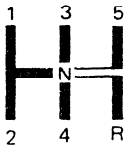


18. Measure total turning torque.
    Total turning torque (New bearing):
    8.8 - 21.6 N·m (90 - 220 kg-cm, 78 - 191 in-lb)

- **When old bearing is used again, preload will be slightly less than the above. Make sure torque is close to the specified range.**

General Specifications

TRANSAXLE

			2WD						4WD	
Engine			E10S	CD17	GA13DS, GA14DS	GA16DS	GA16DE	CD20	SR20DE	GA16DS	SR20DET
Transaxle model			RN4F30A	RS5F30A		RS5F31A			RS5F32A	RS5F31A	RS5F50A
Number of speeds			4	5							
Synchromesh type			Warner								
Shift pattern											
Gear ratio	1st		3.333	3.333	3.333	3.063	3.063	3.333	3.063	3.333	3.285
	2nd		1.955	1.955	1.955	1.826	1.826	1.955	1.826	1.955	1.850
	3rd		1.286	1.286	1.286	1.207	1.286	1.286	1.286	1.286	1.272
	4th		0.902	0.902	0.902	0.902	0.975	0.902	0.975	0.926	0.954
	5th		—	0.756	0.733	0.756	0.810	0.756	0.756	0.756	0.740
	Reverse		3.417	3.417	3.417	3.417	3.417	3.417	3.153	3.417	3.266
Number of teeth	Input gear	1st	15	15	15	16	16	15	16	15	14
		2nd	22	22	22	23	23	22	23	22	20
		3rd	28	28	28	29	28	28	28	28	33
		4th	41	41	41	41	40	41	40	41	44
		5th	—	45	45	45	42	45	45	45	50
		Rev.	12	12	12	12	12	12	13	12	14
	Main gear	1st	50	50	50	49	49	50	49	50	46
		2nd	43	43	43	42	42	43	42	43	37
		3rd	36	36	36	35	36	36	36	36	42
		4th	37	37	37	37	39	37	39	38	42
		5th	—	34	33	34	34	34	34	34	37
		Rev.	41	41	41	41	41	41	41	41	41
	Reverse idler gear		30						31	30	29/26
Oil capacity		ℓ (Imp pt)	2.6 (4-5/8)	2.8 (4-7/8)		2.9 (5-1/8)			3.5 - 3.7 (6-1/8 - 6-1/2)	2.9 (5-1/8)	4.2 (7-3/8)

FINAL GEAR

Engine		E10S	CD17	GA13DS, GA14DS	GA16DS (2WD)	GA16DE	CD20	SR20DE	GA16DS (4WD)	SR20DET
Final gear ratio		4.471	3.789	4.167	4.167	4.167	3.650	4.176	4.353	4.125
Number of teeth	Final gear/Pinion	76/17	72/19	75/18	75/18	75/18	73/20	71/17	74/17	66/16
	Side gear/Pinion mate gear	14/10	14/10	14/10	14/10	16/10	16/10	14/10	14/10	16/10

Inspection and Adjustment

RN4F30A, RS5F30A, 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)
N·m (kg-cm, in-lb)

4-speed models	15.7 - 22.6 (160 - 230, 139 - 200)
5-speed models	4.9 - 7.4 (50 - 75, 43 - 65)

Thickness 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

- **4-speed models**

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-M8000	4.05 (0.1594)	32348-M8006
3.70 (0.1457)	32348-M8001	4.12 (0.1622)	32348-M8007
3.77 (0.1484)	32348-M8002	4.19 (0.1650)	32348-M8008
3.84 (0.1512)	32348-M8003	4.26 (0.1677)	32348-M8009
3.91 (0.1539)	32348-M8004	4.33 (0.1705)	32348-M8010
3.98 (0.1567)	32348-M8005	4.40 (0.1732)	32348-M8011

- **5-speed models**

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

Inspection and Adjustment (Cont'd)

RN4F30A, RS5F30A, RS5F31A

AVAILABLE WASHERS

Differential side gear thrust washer

- **GA16DE models**

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
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

- **Except for GA16DE models**

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
0.76 - 0.81 (0.0299 - 0.0319)	38424-01M10
0.81 - 0.86 (0.0319 - 0.0339)	38424-01M11
0.86 - 0.91 (0.0339 - 0.0358)	38424-01M12
0.91 - 0.96 (0.0358 - 0.0378)	38424-01M13

AVAILABLE SHIMS

— MAINSHAFT AND DIFFERENTIAL SIDE BEARING PRELOAD AND ADJUSTING SHIM

Bearing preload

Unit: mm (in)

	Mainshaft bearing	Differential side bearing
RN4F30A RS5F30A	0.18 - 0.23 (0.0071 - 0.0091)	0.24 - 0.32 (0.0094 - 0.0126)
RS5F31A	0.18 - 0.27 (0.0071 - 0.0106)	0.20 - 0.25 (0.0079 - 0.0098)

Turning torque (New bearing)

Unit: N·m (kg-cm, in-lb)

	Final drive only	Total
RN4F30A RS5F30A	2.0 - 7.8 (20 - 80, 17 - 69)	3.9 - 12.3 (40 - 125, 35 - 109)
RS5F31A	2.0 - 7.8 (20 - 80, 17 - 69)	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

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

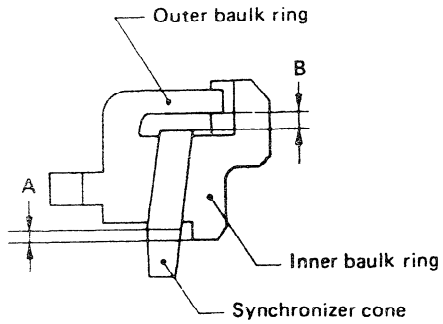
1st, 4th, 5th baulk ring

Unit: mm (in)

Standard	Wear limit
1.00 - 1.35 (0.0394 - 0.0531)	0.7 (0.028)

2nd and 3rd baulk ring

Unit: mm (in)



SMT044B

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 REVERSE CHECK PLUGS AND CASE COVERS

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

Case cover

Mainshaft bearing end play	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
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

Inspection and Adjustment (Cont'd)

RS5F32A

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

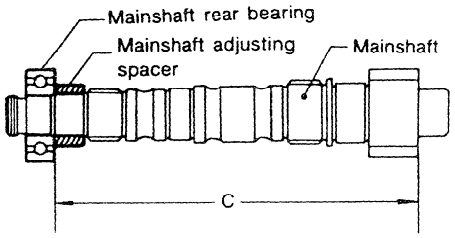
AVAILABLE C-RINGS

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

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

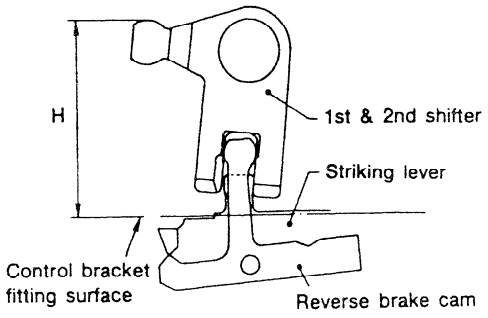
Allowable clearance between side gear and differential case with washer	0.1 - 0.2 mm (0.004 - 0.008 in)
Thickness mm (in)	Part number
0.75 - 0.80 (0.0295 - 0.0315)	38424-D2111
0.80 - 0.85 (0.0315 - 0.0335)	38424-D2112
0.85 - 0.90 (0.0335 - 0.0354)	38424-D2113
0.90 - 0.95 (0.0354 - 0.0374)	38424-D2114
0.95 - 1.00 (0.0374 - 0.0394)	38424-D2115

Inspection and Adjustment (Cont'd)

RS5F32A

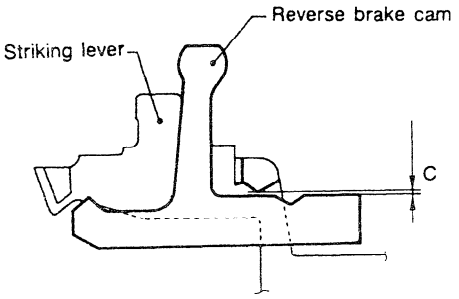
INPUT SHAFT BRAKING MECHANISM

Reverse brake cam



SMT735B

Maximum height "H" between the control bracket fitting surface and 1-2 shifter mm (in)	67 38 - 67.86 (2.6528 - 2.6716)



SMT736B

Clearance "C" between reverse brake cam and striking lever mm (in)	0.05 - 0.20 (0.0020 - 0.0079)

AVAILABLE SHIMS — DIFFERENTIAL SIDE BEARING PRELOAD AND ADJUSTING SHIM

Bearing preload

Unit: mm (in)

Differential side bearing	0.25 - 0.30 (0.0098 - 0.0118)

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

GEAR END PLAY

Gear	End play mm (in)
1st main gear	0.23 - 0.43 (0.0091 - 0.0169)
2nd main gear	0.23 - 0.58 (0.0091 - 0.0228)
3rd main gear	0.23 - 0.43 (0.0091 - 0.0169)
4th main gear	0.25 - 0.55 (0.0098 - 0.0217)
5th input gear	0.23 - 0.48 (0.0091 - 0.0189)

CLEARANCE BETWEEN BAULK RING AND GEAR

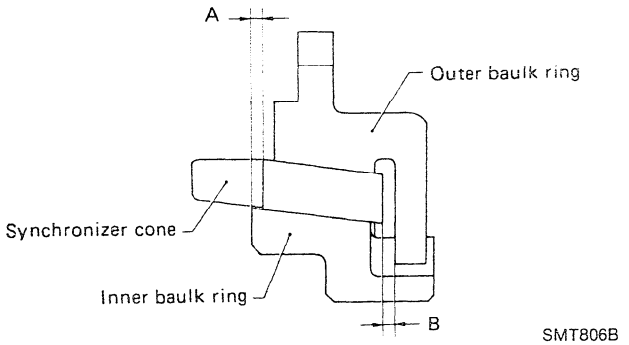
1st, 3rd, 4th & 5nd

Unit: mm (in)

	Standard	Wear limit
1st	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)

2nd baulk ring

Unit: mm (in)

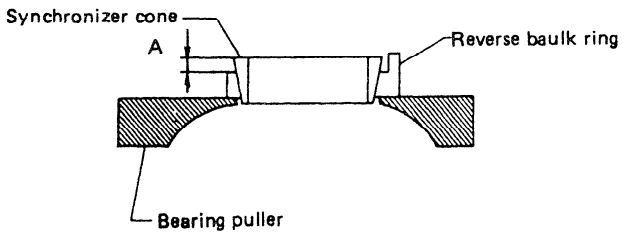


SMT806B

Dimension	Standard	Wear limit
A	0.6 - 0.8 (0.024 - 0.031)	0.2 (0.008)
B	0.6 - 1.1 (0.024 - 0.043)	

Reverse baulk ring

Unit: mm (in)



SMT517B

Dimension	Wear limit
A	1.2 (0.047)

AVAILABLE SNAP RINGS

3rd & 4th synchronizer hub (At input shaft)

Allowable clearance	0 - 0.15 mm (0 - 0.0059 in)
Thickness mm (in)	Part number
1.95 (0.0768)	32269-03E03
2.00 (0.0787)	32269-03E00
2.05 (0.0807)	32269-03E01
2.10 (0.0827)	32269-03E02

1st & 2nd synchronizer hub

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
1.95 (0.0768)	32269-03E03
2.00 (0.0787)	32269-03E00
2.05 (0.0807)	32269-03E01
2.10 (0.0827)	32269-03E02

5th main gear

Allowable clearance	0 - 0.15 mm (0 - 0.0059 in)
Thickness mm (in)	Part number
1.95 (0.0768)	32348-05E00
2.05 (0.0807)	32348-05E01
2.15 (0.0846)	32348-05E02
2.25 (0.0886)	32348-05E03

AVAILABLE WASHERS

Input shaft thrust washer

Allowable clearance	0 - 0.06 mm (0 - 0.0024 in)
Thickness mm (in)	Part number
4.500 (0.1772)	32278-03E01
4.525 (0.1781)	32278-03E02
4.550 (0.1791)	32278-03E03
4.575 (0.1801)	32278-03E04

Differential side gear thrust washer

Allowable clearance between side gear and differential case (viscous coupling) with washer		0.03 - 0.14 mm (0.0012 - 0.0055 in)
	Thickness mm (in)	Part number
Left side gear	0.75 - 0.80 (0.0295 - 0.0315)	38424-56E00
	0.80 - 0.85 (0.0315 - 0.0335)	38424-56E01
	0.85 - 0.90 (0.0335 - 0.0354)	38424-56E02
	0.90 - 0.95 (0.0354 - 0.0374)	38424-56E03
Right side gear	0.63 (0.0248)	38724-56E00
	0.72 (0.0283)	38724-56E01
	0.81 (0.0319)	38724-56E02
	0.90 (0.0354)	38724-56E03

AVAILABLE SHIMS
— INPUT SHAFT END PLAY AND MAINSHAFT AND DIFFERENTIAL SIDE BEARING PRELOAD AND ADJUSTING SHIM

Bearing preload and end play

Unit: mm (in)

Mainshaft bearing preload	0.25 - 0.30 (0.0098 - 0.0118)
Input shaft end play	−0.06 to 0 (−0.0024 to 0)
Differential side bearing	0.40 - 0.45 (0.0157 - 0.0177)

Turning torque (New bearing)

Unit: N·m (kg-cm, in-lb)

Final drive	4.9 - 7.8 (50 - 80, 43 - 69)
Total	8.8 - 21.6 (90 - 220, 78 - 191)

Mainshaft bearing adjusting shims

Thickness mm (in)	Part number
0.40 (0.0157)	32139-03E11
0.44 (0.0173)	32139-03E00
0.48 (0.0189)	32139-03E01
0.52 (0.0205)	32139-03E12
0.56 (0.0220)	32139-03E02
0.60 (0.0236)	32139-03E03
0.64 (0.0252)	32139-03E04
0.68 (0.0268)	32139-03E05
0.72 (0.0283)	32139-03E06
0.76 (0.0299)	32139-03E07
0.80 (0.0315)	32139-03E08
1.20 (0.0472)	32139-03E13

Inspection and Adjustment (Cont'd)

RS5F50A

Table for selecting mainshaft bearing adjusting shim

Unit: mm (in)

Dimension "C"	Suitable shim(s)
0.30 - 0.34 (0.0118 - 0.0134)	0.60 (0.0236)
0.34 - 0.38 (0.0134 - 0.0150)	0.64 (0.0252)
0.38 - 0.42 (0.0150 - 0.0165)	0.68 (0.0268)
0.42 - 0.46 (0.0165 - 0.0181)	0.72 (0.0283)
0.46 - 0.50 (0.0181 - 0.0197)	0.76 (0.0299)
0.50 - 0.54 (0.0197 - 0.0213)	0.80 (0.0315)
0.54 - 0.58 (0.0213 - 0.0228)	0.40 + 0.44 (0.0157 + 0.0173)
0.58 - 0.62 (0.0228 - 0.0244)	0.44 + 0.44 (0.0173 + 0.0173)
0.62 - 0.66 (0.0244 - 0.0260)	0.44 + 0.48 (0.0173 + 0.0189)
0.66 - 0.70 (0.0260 - 0.0276)	0.48 + 0.48 (0.0189 + 0.0189)
0.70 - 0.74 (0.0276 - 0.0291)	0.48 + 0.52 (0.0189 + 0.0205)
0.74 - 0.78 (0.0291 - 0.0307)	0.52 + 0.52 (0.0205 + 0.0205)
0.78 - 0.82 (0.0307 - 0.0323)	0.52 + 0.56 (0.0205 + 0.0220)
0.82 - 0.86 (0.0323 - 0.0339)	0.56 + 0.56 (0.0220 + 0.0220)
0.86 - 0.90 (0.0339 - 0.0354)	0.56 + 0.60 (0.0220 + 0.0236)
0.90 - 0.94 (0.0354 - 0.0370)	0.60 + 0.60 (0.0236 + 0.0236)
0.94 - 0.98 (0.0370 - 0.0386)	0.60 + 0.64 (0.0236 + 0.0252)
0.98 - 1.02 (0.0386 - 0.0402)	0.64 + 0.64 (0.0252 + 0.0252)
1.02 - 1.06 (0.0402 - 0.0417)	0.64 + 0.68 (0.0252 + 0.0268)
1.06 - 1.10 (0.0417 - 0.0433)	0.68 + 0.68 (0.0268 + 0.0268)
1.10 - 1.14 (0.0433 - 0.0449)	0.68 + 0.72 (0.0268 + 0.0283)
1.14 - 1.18 (0.0449 - 0.0465)	0.72 + 0.72 (0.0283 + 0.0283)
1.18 - 1.22 (0.0465 - 0.0480)	0.72 + 0.76 (0.0283 + 0.0299)
1.22 - 1.26 (0.0480 - 0.0496)	0.76 + 0.76 (0.0299 + 0.0299)
1.26 - 1.30 (0.0496 - 0.0512)	0.76 + 0.80 (0.0299 + 0.0315)
1.30 - 1.34 (0.0512 - 0.0528)	0.80 + 0.80 (0.0315 + 0.0315)
1.34 - 1.38 (0.0528 - 0.0543)	0.44 + 1.20 (0.0173 + 0.0472)
1.38 - 1.42 (0.0543 - 0.0559)	0.48 + 1.20 (0.0189 + 0.0472)
1.42 - 1.46 (0.0559 - 0.0575)	0.52 + 1.20 (0.0205 + 0.0472)
1.46 - 1.50 (0.0575 - 0.0591)	0.56 + 1.20 (0.0220 + 0.0472)

Input shaft bearing adjusting shims

Thickness mm (in)	Part number
0.40 (0.0157)	32225-08E00
0.44 (0.0173)	32225-08E01
0.48 (0.0189)	32225-08E02
0.52 (0.0205)	32225-08E03
0.56 (0.0220)	32225-08E04
0.60 (0.0236)	32225-08E05
0.64 (0.0252)	32225-08E06
0.68 (0.0268)	32225-08E07
0.72 (0.0283)	32225-08E08
0.76 (0.0299)	32225-08E09
0.80 (0.0315)	32225-08E10
1.20 (0.0472)	32225-08E11

Table for selecting input bearing adjusting shim

Unit: mm (in)

Dial indicator deflection	Suitable shim(s)
0.65 - 0.69 (0.0256 - 0.0272)	0.64 (0.0252)
0.69 - 0.73 (0.0272 - 0.0287)	0.68 (0.0268)
0.73 - 0.77 (0.0287 - 0.0303)	0.72 (0.0283)
0.77 - 0.81 (0.0303 - 0.0319)	0.76 (0.0299)
0.81 - 0.85 (0.0319 - 0.0335)	0.80 (0.0315)
0.85 - 0.89 (0.0335 - 0.0350)	0.40 + 0.44 (0.0157 + 0.0173)
0.89 - 0.93 (0.0350 - 0.0366)	0.44 + 0.44 (0.0173 + 0.0173)
0.93 - 0.97 (0.0366 - 0.0382)	0.44 + 0.48 (0.0173 + 0.0189)
0.97 - 1.01 (0.0382 - 0.0398)	0.48 + 0.48 (0.0189 + 0.0189)
1.01 - 1.05 (0.0398 - 0.0413)	0.48 + 0.52 (0.0189 + 0.0205)
1.05 - 1.09 (0.0413 - 0.0429)	0.52 + 0.52 (0.0205 + 0.0205)
1.09 - 1.13 (0.0429 - 0.0445)	0.52 + 0.56 (0.0205 + 0.0220)
1.13 - 1.17 (0.0445 - 0.0461)	0.56 + 0.56 (0.0220 + 0.0220)
1.17 - 1.21 (0.0461 - 0.0476)	0.56 + 0.60 (0.0220 + 0.0236)
1.21 - 1.25 (0.0476 - 0.0492)	0.60 + 0.60 (0.0236 + 0.0236)
1.25 - 1.29 (0.0492 - 0.0508)	0.60 + 0.64 (0.0236 + 0.0252)
1.29 - 1.33 (0.0508 - 0.0524)	0.64 + 0.64 (0.0252 + 0.0252)
1.33 - 1.37 (0.0524 - 0.0539)	0.64 + 0.68 (0.0252 + 0.0268)
1.37 - 1.41 (0.0539 - 0.0555)	0.68 + 0.68 (0.0268 + 0.0268)
1.41 - 1.45 (0.0555 - 0.0571)	0.68 + 0.72 (0.0268 + 0.0283)
1.45 - 1.49 (0.0571 - 0.0587)	0.72 + 0.72 (0.0283 + 0.0283)
1.49 - 1.53 (0.0587 - 0.0602)	0.72 + 0.76 (0.0283 + 0.0299)
1.53 - 1.57 (0.0602 - 0.0618)	0.76 + 0.76 (0.0299 + 0.0299)
1.57 - 1.61 (0.0618 - 0.0634)	0.76 + 0.80 (0.0299 + 0.0315)
1.61 - 1.65 (0.0634 - 0.0650)	0.80 + 0.80 (0.0315 + 0.0315)
1.65 - 1.69 (0.0650 - 0.0665)	0.44 + 1.20 (0.0173 + 0.0472)

Inspection and Adjustment (Cont'd)

RS5F50A

Differential side bearing adjusting shims

Thickness mm (in)	Part number
0.36 (0.0142)	38753-56E00
0.40 (0.0157)	38753-56E01
0.44 (0.0173)	38753-56E02
0.48 (0.0189)	38753-56E03
0.52 (0.0205)	38753-56E04
0.56 (0.0220)	38753-56E05
0.60 (0.0236)	38753-56E06
0.64 (0.0252)	38753-56E07
0.68 (0.0268)	38753-56E08
0.72 (0.0283)	38753-56E09
0.76 (0.0299)	38753-56E10
0.80 (0.0315)	38753-56E11
0.84 (0.0331)	38753-56E12
0.88 (0.0346)	38753-56E13
0.92 (0.0362)	38753-56E14

Table for selecting differential side bearing adjusting shim(s)

Unit: mm (in)

Dial indicator deflection	Suitable shim(s)
0.47 - 0.51 (0.0185 - 0.0201)	0.44 + 0.48 (0.0173 + 0.0189)
0.51 - 0.55 (0.0201 - 0.0217)	0.48 + 0.48 (0.0189 + 0.0189)
0.55 - 0.59 (0.0217 - 0.0232)	0.48 + 0.52 (0.0189 + 0.0205)
0.59 - 0.63 (0.0232 - 0.0248)	0.52 + 0.52 (0.0205 + 0.0205)
0.63 - 0.67 (0.0248 - 0.0267)	0.52 + 0.56 (0.0205 + 0.0220)
0.67 - 0.71 (0.0264 - 0.0280)	0.56 + 0.56 (0.0220 + 0.0220)
0.71 - 0.75 (0.0280 - 0.0295)	0.56 + 0.60 (0.0220 + 0.0236)
0.75 - 0.79 (0.0295 - 0.0311)	0.60 + 0.60 (0.0236 + 0.0236)
0.79 - 0.83 (0.0311 - 0.0327)	0.60 + 0.64 (0.0236 + 0.0252)
0.83 - 0.87 (0.0327 - 0.0343)	0.64 + 0.64 (0.0252 + 0.0252)
0.87 - 0.91 (0.0343 - 0.0358)	0.64 + 0.68 (0.0252 + 0.0268)
0.91 - 0.95 (0.0358 - 0.0374)	0.68 + 0.68 (0.0268 + 0.0268)
0.95 - 0.99 (0.0374 - 0.0390)	0.68 + 0.72 (0.0268 + 0.0283)
0.99 - 1.03 (0.0390 - 0.0406)	0.72 + 0.72 (0.0283 + 0.0283)
1.03 - 1.07 (0.0406 - 0.0421)	0.72 + 0.76 (0.0283 + 0.0299)
1.07 - 1.11 (0.0421 - 0.0437)	0.76 + 0.76 (0.0299 + 0.0299)
1.11 - 1.15 (0.0437 - 0.0453)	0.76 + 0.80 (0.0299 + 0.0315)
1.15 - 1.19 (0.0453 - 0.0469)	0.80 + 0.80 (0.0315 + 0.0315)
1.19 - 1.23 (0.0469 - 0.0484)	0.72 + 0.92 (0.0283 + 0.0362)
1.23 - 1.27 (0.0484 - 0.0500)	0.76 + 0.92 (0.0299 + 0.0362)
1.27 - 1.31 (0.0500 - 0.0516)	0.80 + 0.92 (0.0315 + 0.0362)

AUTOMATIC TRANSAXLE

SECTION AT

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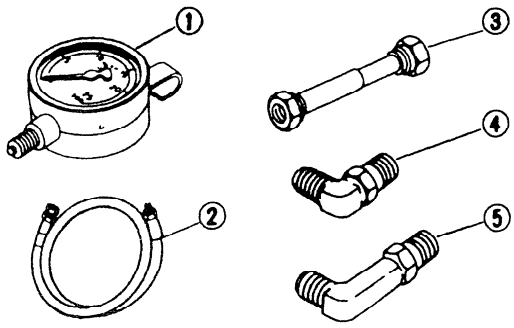
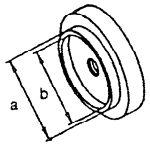
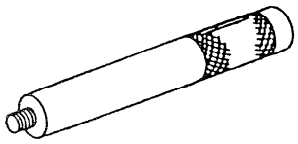
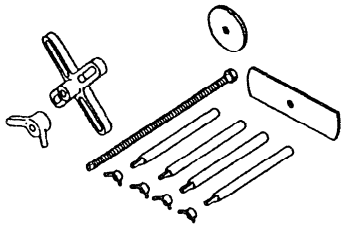
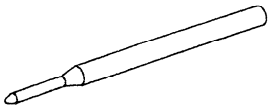
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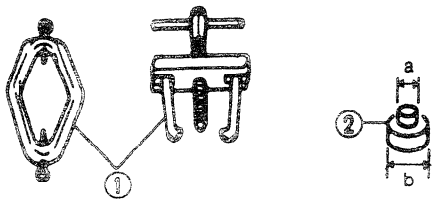
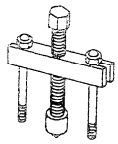
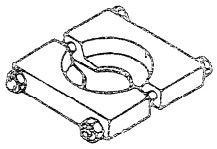
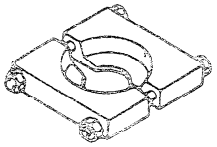
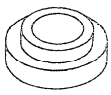
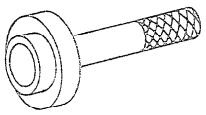
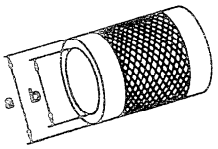
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

SPECIAL SERVICE TOOLS

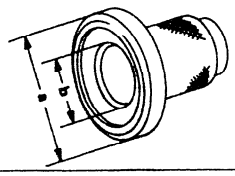
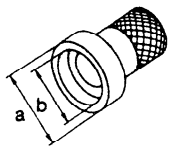
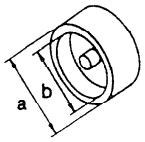
*: Special tool or commercial equivalent

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		Measuring line pressure and governor pressure
ST33290001 Puller		Removing differential side oil seal
KV31103000* Drift		Installing differential side oil seal (Use with ST35325000) **a: 76 mm (2.99 in) dia.** **b: 67 mm (2.64 in) dia.**
ST35325000 Drift		Installing differential side oil seal (Use with KV31103000)
KV31103200 Clutch spring compressor		Removing and installing clutch return spring
ST23540000* Pin punch		Removing and installing parking rod plate, manual plate and differential pinion mate shaft retaining pins
KV32101000* Pin punch		Installing throttle lever and manual shaft retaining pins

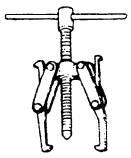
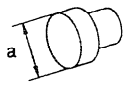
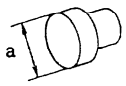
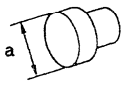
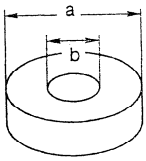
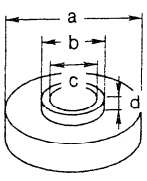
*: Special tool or commercial equivalent

Tool number Tool name	Description	
ST3306S001 Differential side bearing puller set ① ST33051001 Puller ② ST33061000 Adapter		Removing differential side bearing inner race **a: 28.5 mm (1.122 in) dia.** **b: 38 mm (1.50 in) dia.**
KV381054S0 Puller		⊛ Removing output shaft bearing outer race from bearing retainer ⊛ Removing output gear bearing outer race from bearing retainer ⊙ Removing idler gear bearing outer race
ST27180001 Puller		⊛ Removing idler gear ⊙ Removing output gear
ST30031000 Puller		Removing reduction gear bearing inner race
ST30021000 Puller		Removing differential side bearing
ST35272000* Drift		⊙ Installing reduction gear bearing inner race ⊙ Installing idler gear bearing inner race ⊙ Installing output gear bearing inner race
ST37830000* Drift		Installing idler gear bearing outer race
ST33200000* Drift		Installing differential side bearing **a: 60 mm (2.36 in) dia.** **b: 44.5 mm (1.752 in) dia.**

*: Special tool or commercial equivalent

Tool number Tool name	Description	
ST35271000* Drift		• Installing idler gear • Installing output gear **a: 76 mm (2.99 in) dia.** **b: 67 mm (2.64 in) dia.**
ST33400001* Drift		Installing output gear bearing outer race onto bearing retainer **a: 60 mm (2.36 in) dia.** **b: 42 mm (1.65 in) dia.**
KV40104840* Drift		Installing output shaft bearing outer race onto bearing retainer **a: 49 mm (1.93 in) dia.** **b: 42 mm (1.65 in) dia.**

COMMERCIAL SERVICE TOOLS

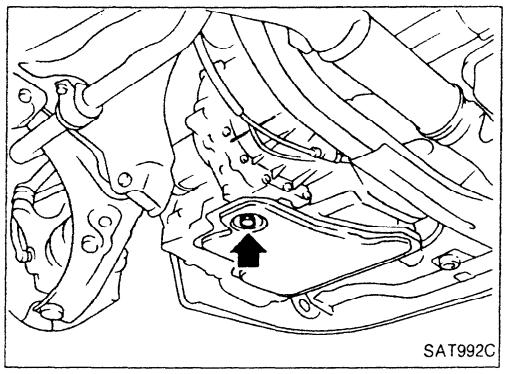
Tool name	Description	
Puller		• Removing idler gear and output gear bearing inner race • Removing differential side bearing • Removing and installing band servo piston snap ring
Drift		Removing idler gear bearing inner race **a: 34 mm (1.34 in) dia.**
Drift		Removing output gear bearing inner race **a: 33 mm (1.30 in) dia.**
Drift		Removing differential side bearing **a: 38 mm (1.50 in) dia.**
Drift		Removing output shaft bearing inner race **a: 70 mm (2.76 in) dia.** **b: 30 mm (1.18 in) dia.**
Drift		Installing output shaft bearing inner race **a: 70 mm (2.76 in) dia.** **b: 34 mm (1.34 in) dia.** **c: 30 mm (1.18 in) dia.** **d: 2 mm (0.08 in)**

Service Notice

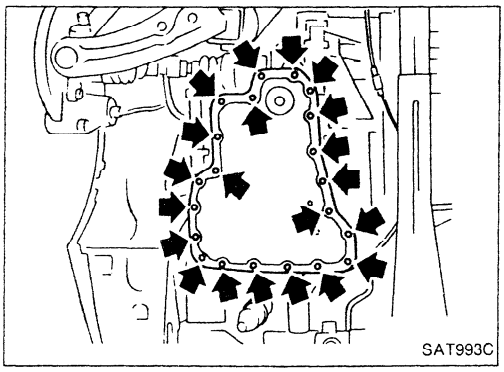
- Before proceeding with disassembly, thoroughly clean the outside of the transaxle. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common 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.
- 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 A.T.F. 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 A.T.F.

Control Valve Assembly and Accumulator

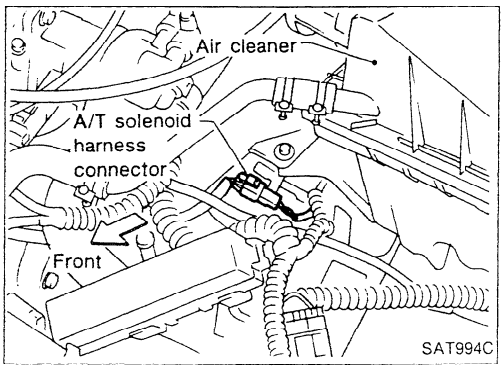
REMOVAL



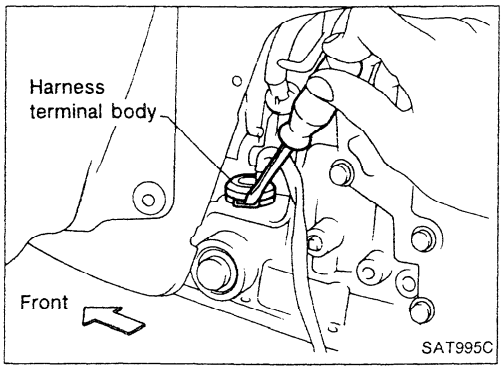
1. Drain A.T.F. from transaxle.



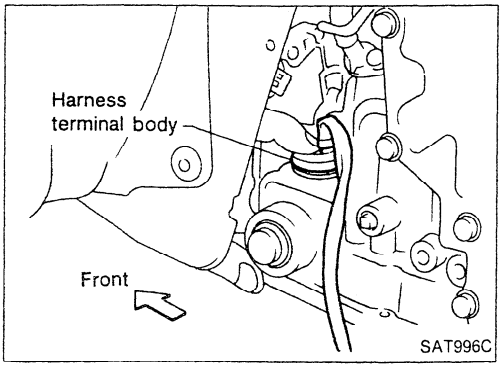
2. Remove oil pan and gasket.



3. Disconnect A/T solenoid harness connector.

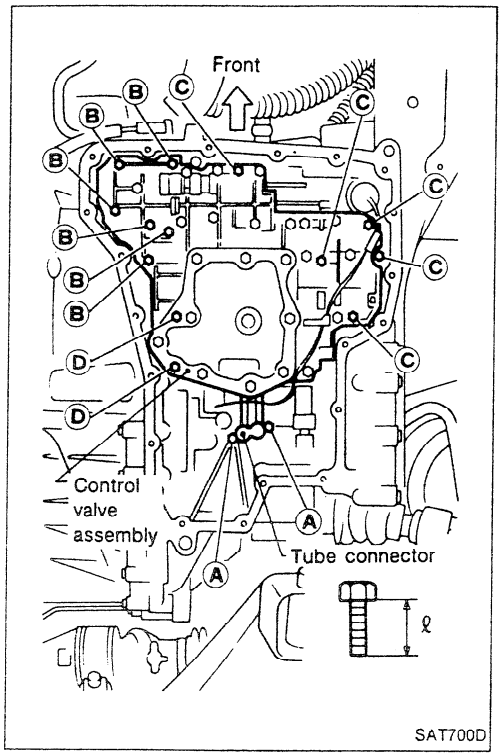


4. Remove stopper ring from A/T solenoid harness terminal body.



5. Pull out A/T solenoid harness from transmission case by pushing terminal body.

Control Valve Assembly and Accumulator (Cont'd)



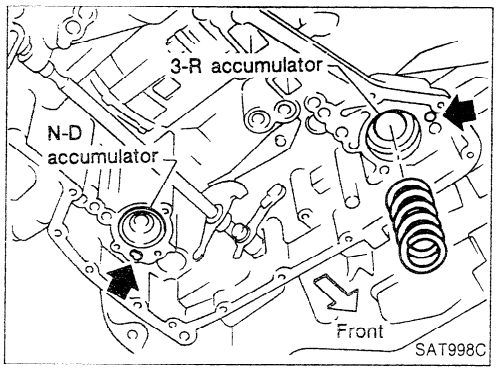
6. Remove control valve assembly by removing fixing bolts.

Bolt length, number and location:

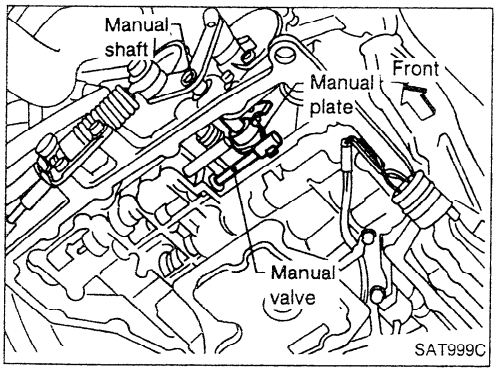
Bolt symbol	A	B	C	D
Bolt length "ℓ" mm (in)	25 0 (0.984)	33 0 (1 299)	40 0 (1.575)	43.5 (1 713)
Number of bolts	2	6	5	2
Tightening torque N m (kg-m, ft-lb)	7 - 9 (0 7 - 0 9, 5 1 - 6 5)			

- **Be careful not to drop manual valve, tube connector, tubes and 3-R accumulator return spring.**

7. Disassemble and inspect control valve assembly if necessary — Refer to "REPAIR FOR COMPONENT PARTS".



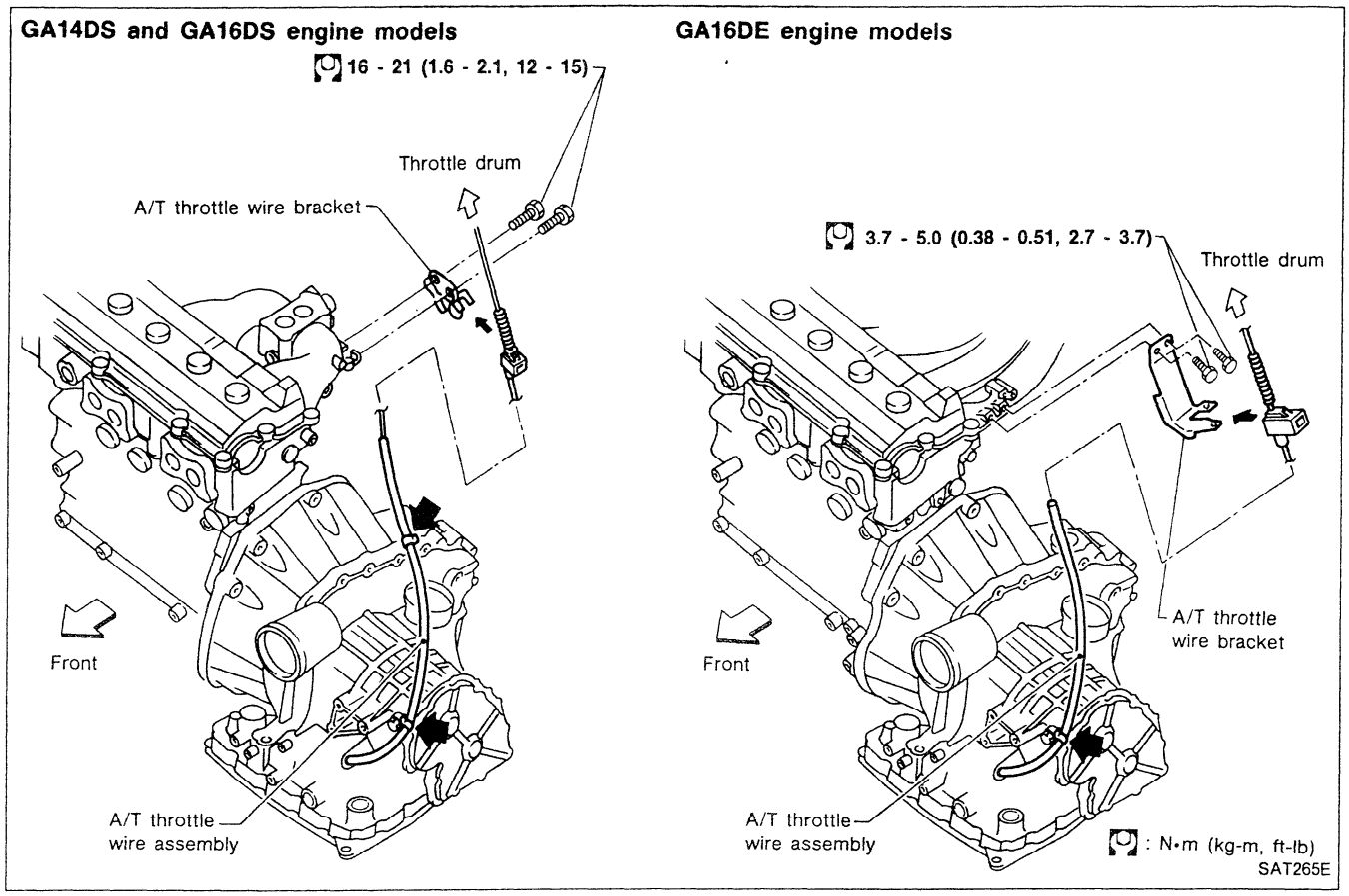
8. Remove 3-R and N-D accumulators by applying compressed air if necessary.
- **Hold each piston with a rag.**

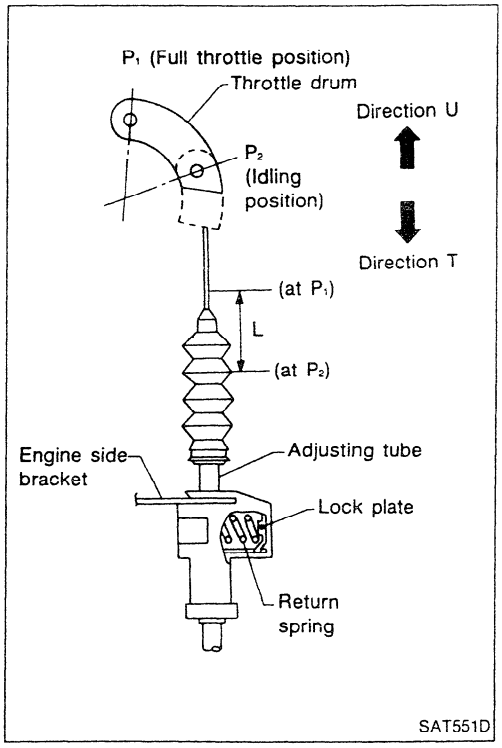


INSTALLATION

- **Set manual shaft in Neutral, 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.**

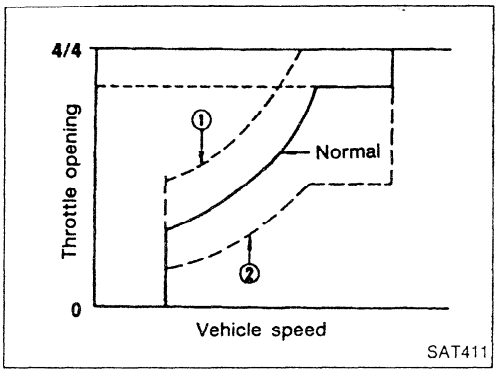
Throttle Wire Adjustment





1. Turn ignition switch to OFF.
2. While pressing lock plate, move adjusting tube in direction "T" (Transaxle side).
3. Return lock plate.
   (Adjusting tube is locked at this time.)
4. Move throttle drum from "P_2" to "P_1" quickly [Adjusting tube moves in direction "U" (Engine side) while depressing the lock plate.] Ensure that throttle wire stroke "L" is within the specified range, between full throttle and idle.
   Throttle wire stroke "L":
   40 - 42 mm (1.57 - 1.65 in)
   - **Adjust throttle wire stroke when throttle wire/accelerator wire is installed and adjusted.**
   - **Put mark on throttle wire to facilitate measuring wire stroke.**
5. Clamp throttle wire at proper positions shown in the illustration after adjusting throttle wire.
6. After properly adjusting and clamping throttle wire, ensure the parting line is as straight as possible.

Throttle Wire Adjustment (Cont'd)

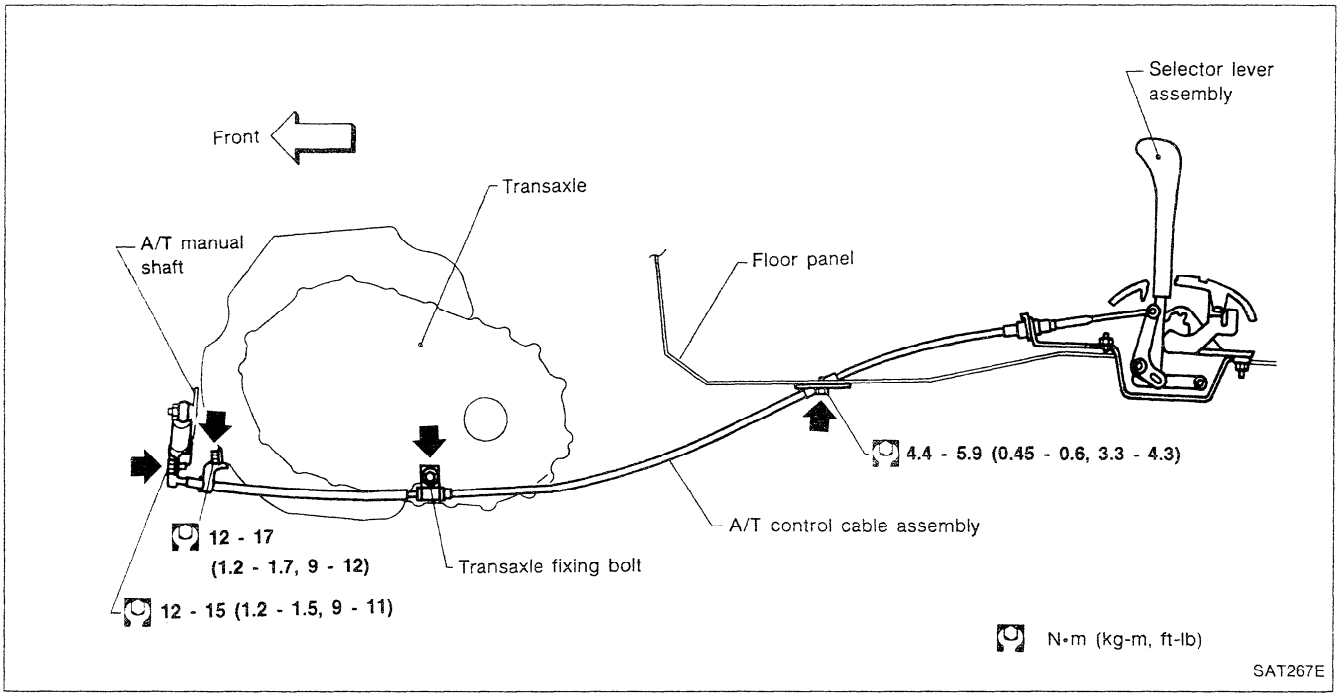


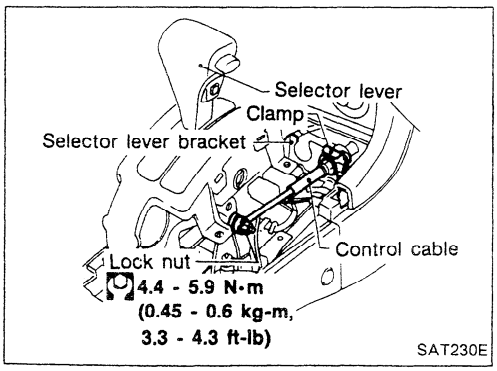
If throttle wire stroke is improperly adjusted the following problems may arise.

- When the throttle drum fully-open position "P_1" is too far in direction "T", the shift schedule will be as shown by ② in the figure, and the kickdown range will greatly increase.
- When the throttle drum fully-open position "P_1" is too far in direction "U", the shift schedule will be as shown by ① in the figure, and kickdown will not occur.

Control Cable Installation and Adjustment

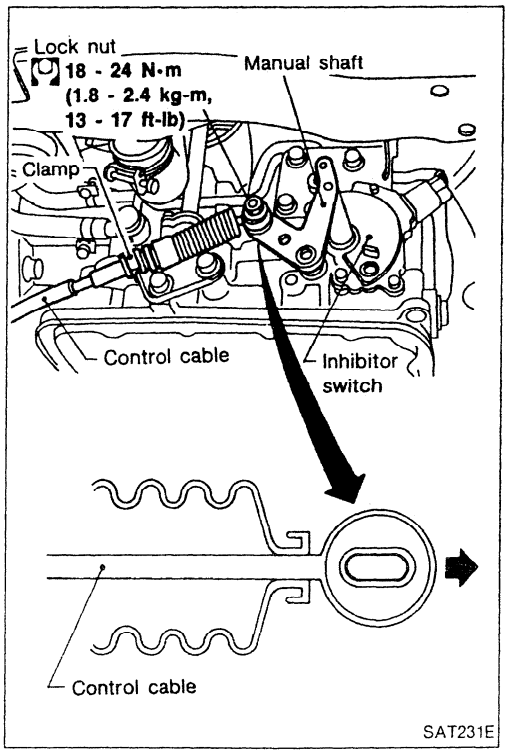
- Move selector lever from the "P" range to the "1" range. You should be able to feel the detents in each range. If the detents cannot be felt or the pointer indicating the range is improperly aligned, the control cable needs adjustment.
- Always adjust control cable when it is removed from selector lever or manual shaft.



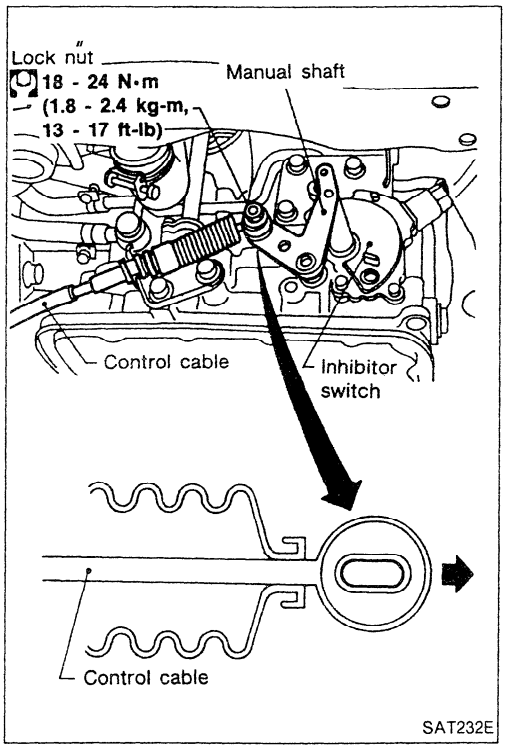


INSTALLATION

1. Place selector lever and manual shaft at "P" position.
2. Connect control cable to selector lever and tighten control cable lock nut. Clamp control cable to selector lever bracket.

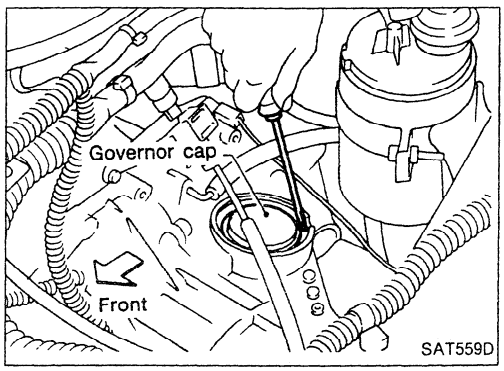


3. Connect control cable to manual shaft and clamp control cable to bracket at transaxle.
4. Pull control cable in the direction of the arrow shown in the illustration by specified force.
   Specified force: 6.9 N (0.7 kg, 1.5 lb)
5. Return control cable in the opposite direction of the arrow for 1.0 mm (0.039 in).
6. Tighten control cable lock nut.
7. Move selector lever from "P" range to "1" range and make sure that selector lever can be moved smoothly and without any sliding noise.
8. Apply grease to contacting areas of selector lever and control cable. Install any part removed.



ADJUSTMENT

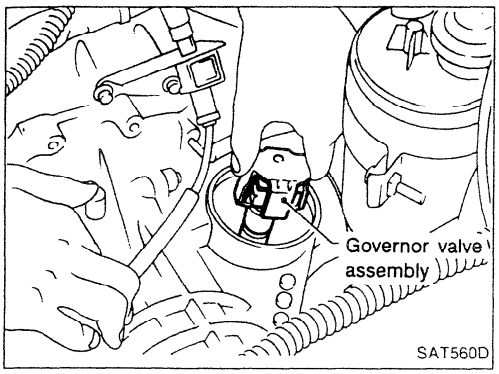
1. Loosen control cable lock nut at transaxle side.
2. Place selector lever and manual shaft at "P" position.
3. Pull control cable in the direction of the arrow shown in the illustration by specified force.
   Specified force: 6.9 N (0.7 kg, 1.5 lb)
4. Return control cable in the opposite direction of the arrow for 1.0 mm (0.039 in).
5. Tighten control cable lock nut.
6. Move selector lever from "P" range to "1" range 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.



Governor Valve

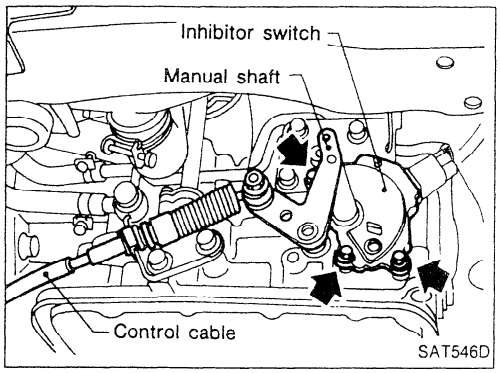
1. Remove air duct.
2. Remove governor cap snap ring and spacer.
3. Remove governor cap.

Governor Valve (Cont'd)

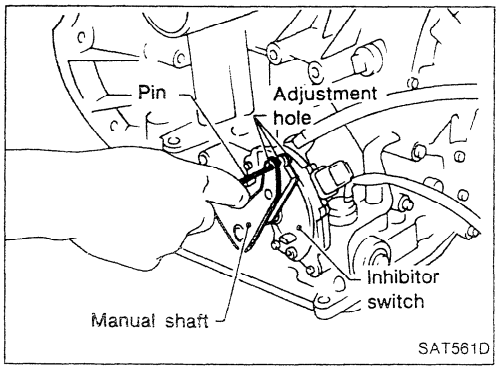


4. Remove governor valve assembly from transaxle.
5. Check governor valve assembly if necessary — Refer to "DISASSEMBLY".

Inhibitor Switch Adjustment

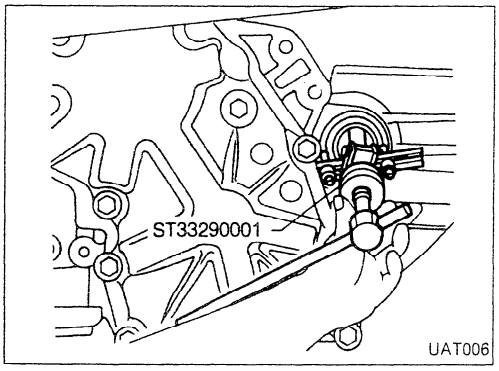


1. Remove control cable end from manual shaft.
2. Set manual shaft in "N" range.
3. Loosen inhibitor switch fixing bolts.

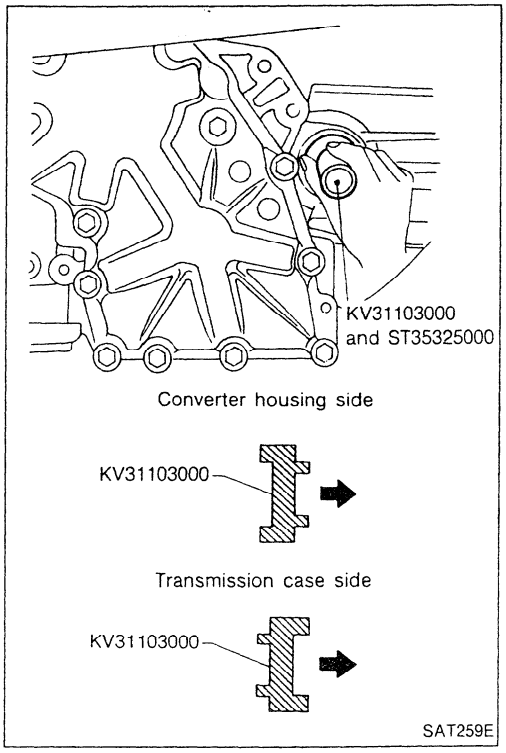


4. Insert 4.0 mm (0.157 in) dia. pin into adjustment hole in both inhibitor switch and manual shaft as near vertically as possible.
5. Tighten inhibitor switch fixing bolts.
6. Remove pin from adjustment hole after adjusting inhibitor switch.
7. Reinstall any part removed.
8. Adjust control cable — Refer to "Control Cable Installation and Adjustment".
9. Check continuity of inhibitor switch — Refer to "ELECTRICAL SYSTEM".

Differential Side Oil Seal Replacement

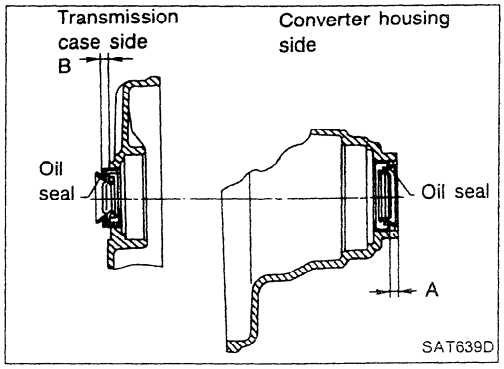


1. Remove drive shaft assemblies. — Refer to section FA.
2. Remove oil seals.



3. Install oil seals.

- **Apply A.T.F. to oil seal surface before installing.**

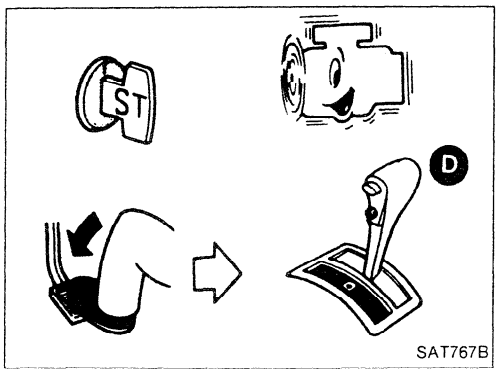


- **Install oil seals so that dimensions "A" and "B" are within specifications.**

Unit: mm (in)

A	B
5.5 - 6.5 (0.217 - 0.256)	0.5 (0.020) or less

4. Reinstall any part removed.



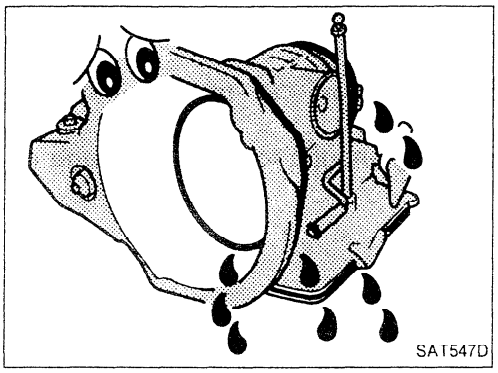
SAT767B

Preliminary Check (Prior to Road Testing)

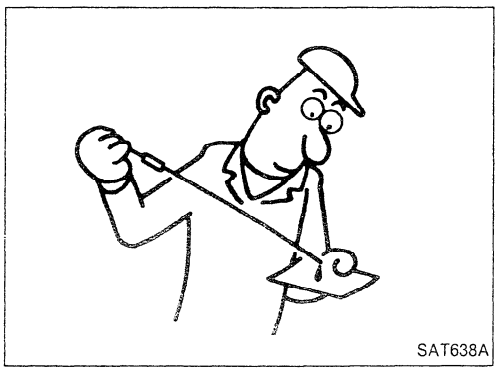
A/T FLUID CHECK

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" range and wait a few minutes.
3. Stop engine.


SAT547D

4. Check for fresh leakage.


SAT638A

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.

Road Testing

Perform road tests using "Symptom" chart. Refer to page AT-18.

"P" RANGE

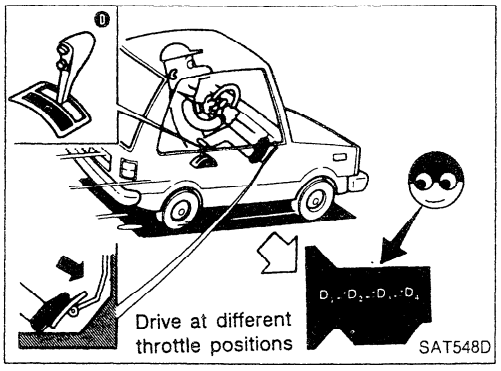
1. Place selector lever in "P" range and start engine. Stop engine and repeat the procedure in all ranges, including neutral.
2. Stop vehicle on a slight upgrade and place selector lever in "P" range. Release parking brake to make sure vehicle remains locked.

"R" RANGE

1. Manually move selector lever from "P" to "R", and note shift quality.
2. Drive vehicle in reverse long enough to detect slippage or other abnormalities.

"N" RANGE

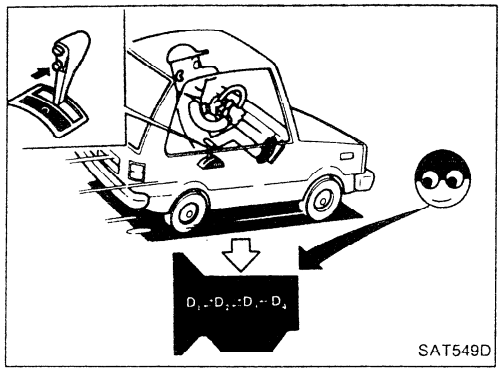
1. Manually move selector lever from "R" and "D" to "N" and note shift quality.
2. Release parking brake with selector lever in "N" range. Lightly depress accelerator pedal to make sure vehicle does not move. (When vehicle is new or soon after clutches have been replaced, vehicle may move slightly. This is not a problem.)



"D" RANGE

1. Manually shift selector lever from "N" to "D" range, and note shift quality.
2. Using the shift schedule as a reference, drive vehicle in "D" range. Record, on symptom chart, respective vehicle speeds at which up-shifting and down-shifting occur. These speeds are to be read at three different throttle positions (light, half and full), respectively. Also determine the timing at which shocks are encountered during shifting and which clutches are engaged.
3. Determine whether lock-up properly occurs while driving vehicle in proper gear position and at proper vehicle speed.

Road Testing (Cont'd)



4. Check to determine if shifting to overdrive gear cannot be made while O.D. control switch is "OFF".

5. While driving vehicle in the 60 to 70 km/h (37 to 43 MPH) range in "D_3" range at half to light throttle position, fully depress accelerator pedal to make sure transaxle downshifts from 3rd to 2nd gear.
6. While driving vehicle in the 25 to 35 km/h (16 to 22 MPH) ("D_2" range) at half to light throttle position, fully depress accelerator pedal to make sure transaxle downshifts from 2nd to 1st gear.

"2" RANGE

1. Shift to "2" range and make sure vehicle starts in 1st gear.
2. Increase vehicle speed to make sure transaxle upshifts from 1st to 2nd gear.
3. Further increase vehicle speed. Make sure transaxle does not upshift to 3rd gear.
4. While driving vehicle at the 25 to 35 km/h (16 to 22 MPH) with throttle at half to light position ("2_2" range), fully depress accelerator pedal to make sure transaxle downshifts from 2nd to 1st gear.
5. Allow vehicle to run idle while in "2" range to make sure that transaxle downshifts to 1st gear.
6. Move selector lever to "D" range and allow vehicle to operate at 30 to 40 km/h (19 to 25 MPH). Then, shift to "2" range to make sure transaxle downshifts to 2nd gear.

"1" RANGE

1. Place selector lever in "1" range and accelerate vehicle. Make sure transaxle does not shift from 1st to 2nd gear although vehicle speed increases.
2. While driving vehicle in "1" range, release accelerator pedal to make sure that engine compression acts as a brake.
3. Place selector lever in "D" or "2" range and allow vehicle to run at 15 to 25 km/h (9 to 16 MPH). Then move selector lever to "1" range to make sure transaxle downshifts to 1st gear.

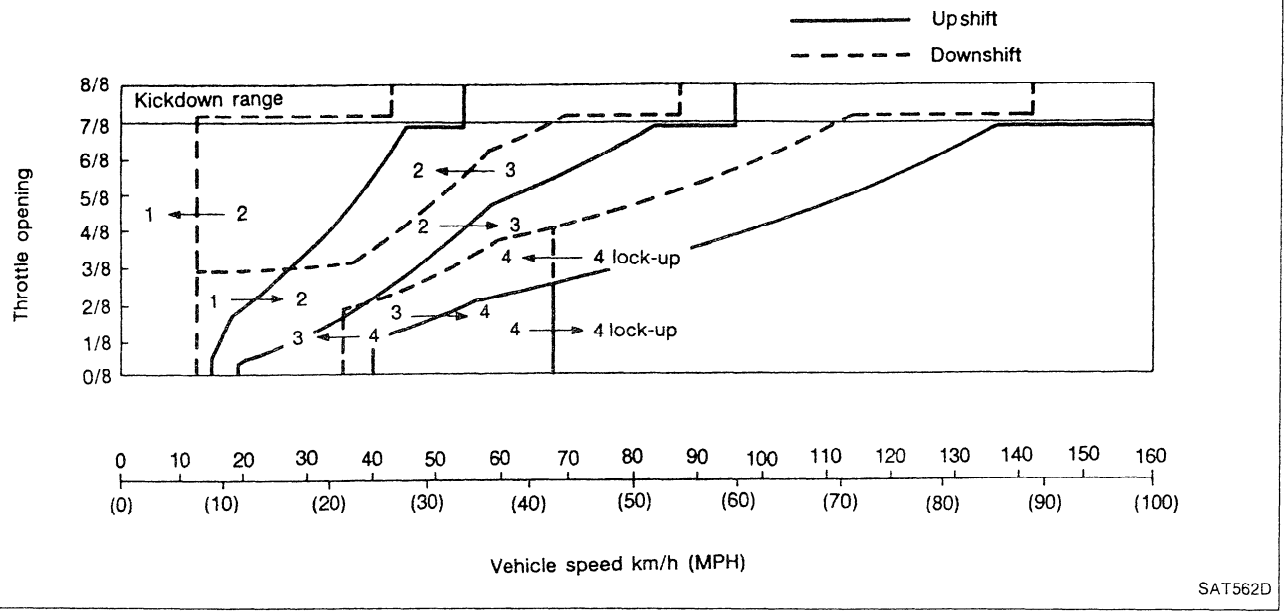
Road Testing (Cont'd)

VEHICLE SPEED WITH SHIFTING GEARS

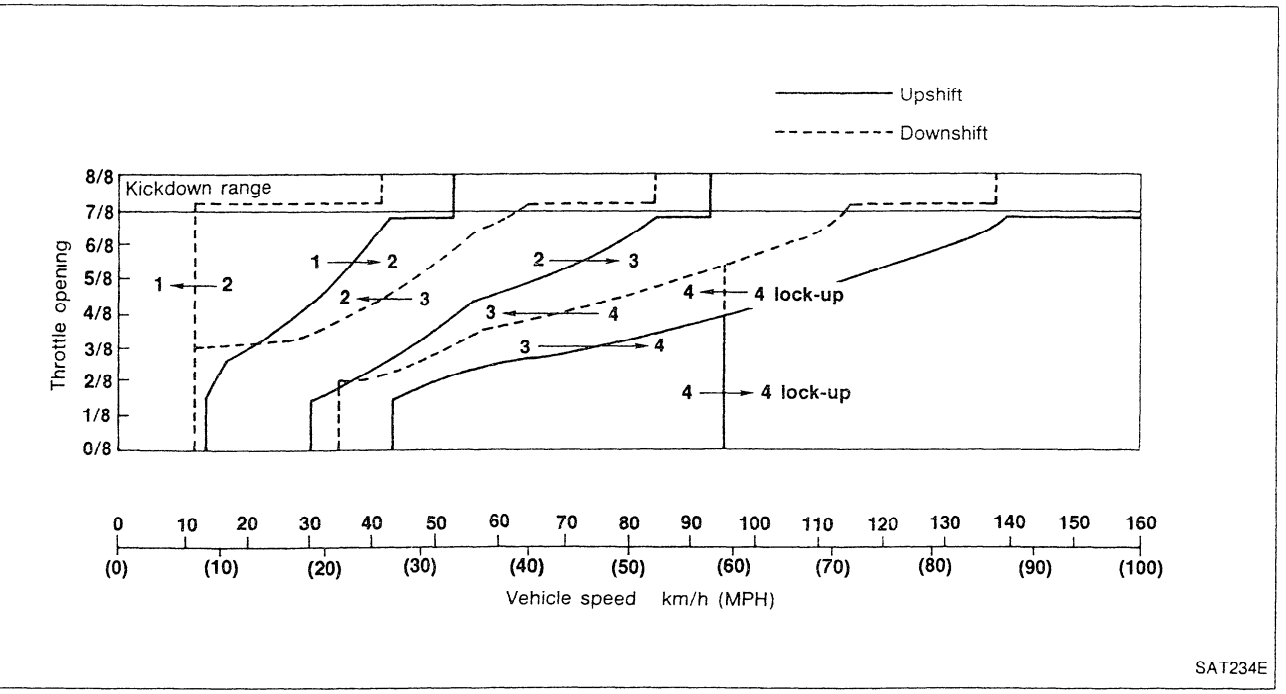
This check should be carried out when oil temperature is between 50 and 80°C (122 and 176°F) after the vehicle has been driven approx. 10 minutes.

SHIFT SCHEDULE

GA16DE engine

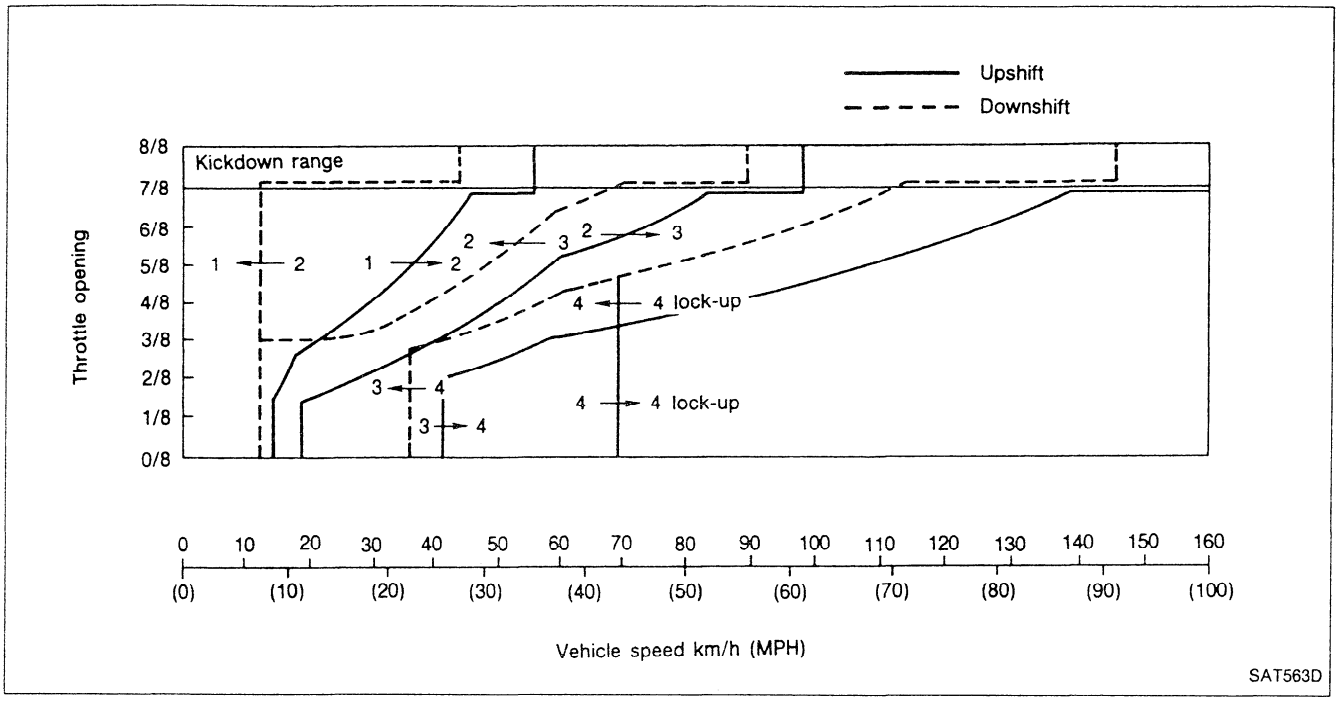


GA16DS engine for Europe

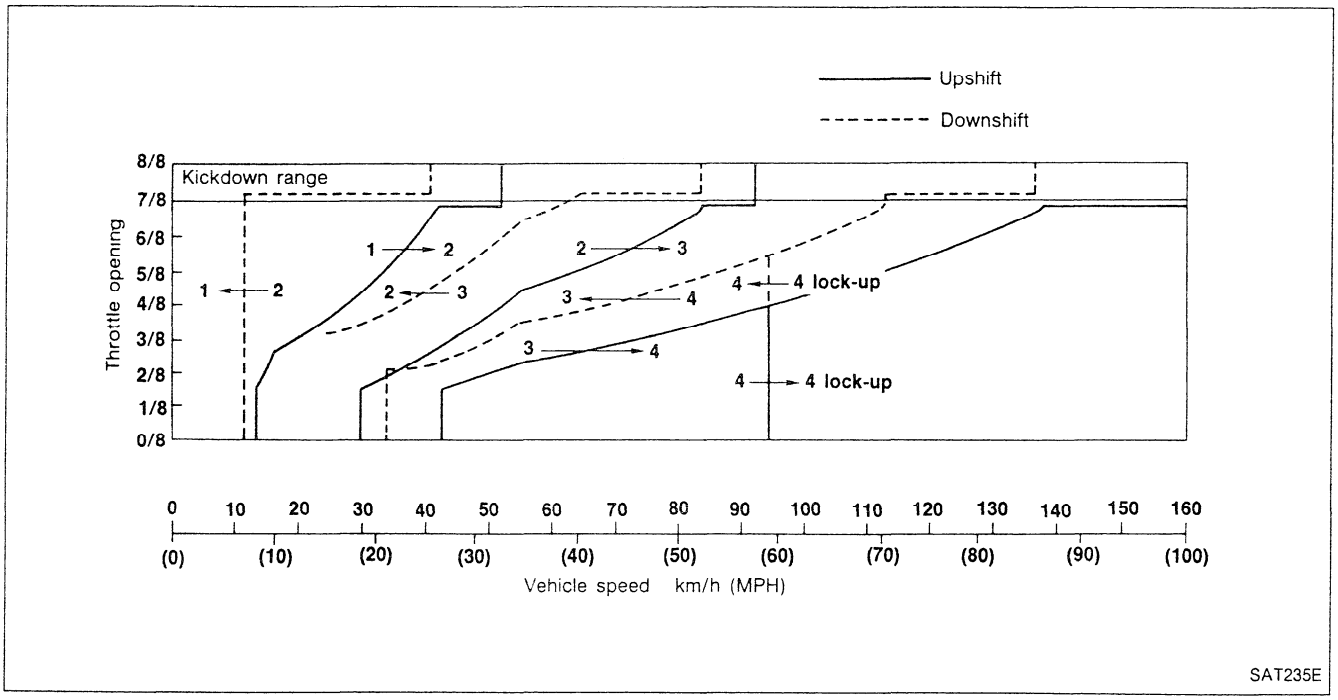


Road Testing (Cont'd)

- **GA16DS engine except for Europe**
- **GA14DS engine except for Europe and Middle East**



GA14DS engine for Europe and Middle East



Road Testing (Cont'd)

ROAD TEST SYMPTOM CHART

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.

[ ]: Valve expected to be malfunctioning

		ON VEHICLE														
		Oil level and oil quality	Control cable	Inhibitor switch and wiring	Throttle wire	Engine idling rpm	Line pressure	Control valve	Throttle valve & detent valve	Manual valve	Pressure regulator valve	3-4 shift valve	2-3 shift valve	1-2 shift valve	Overrun clutch control valve	Pressure modifier valve
Sharp shocks in shifting from "N" to "D" range		1	2		5	3	4	7								
Shift shocks	When shifting from 1st to 2nd or 2nd to 3rd	1	2		4	.	3	6								
	When shifting from 3rd to 4th	1	2		4	.	3	5								
	When shifting from D to 2 and 1 range. When O D. switch is set from "ON" to "OFF"	1	2	.	4	.	3	5								
	When shifting from 2nd to 1st in "1" range	1	2		4	.	3	5								
Shift slippage when upshifting	When shifting from 1st to 2nd	1	2		4	.	3	5								
	When shifting from 2nd to 3rd	1	2	.	4	.	3	6								
	When shifting from 3rd to 4th	1	2		4	.	3	5								
Shift slippage with accelerator pedal depressed	When shifting from 4th to 2nd	1	2	.	5	.	3	6								
	When shifting from 4th to 3rd	1	2	.	4	.	3	6								
	When shifting from 4th to 1st and shifting from 3rd to 1st	1	2	.	5	.	3	6								
Poor power/acceleration	When vehicle starts	1	2		4		3	6								
	When upshifting	1	2	.	4		3	7								
No engine braking	When shifting from "D" to "2" and "1" range	1	2	.	4	.	3	5								
	When O.D. switch is set from "ON" to "OFF"	1	2	.	4		3	7								
	When shifting from 2nd to 1st in "1" range	1	2		4		3	5								
Shift quality	Too low a gear change point from 2nd to 3rd and from 3rd to 2nd	1			3	.	2	6								
	Too high a gear change point from 2nd to 3rd and from 3rd to 2nd.	1	.	.	3	.	2	6								
	Too low a gear change point from 2nd to 1st in "1" range	1	.		3		2	6								
	Too high a gear change point from 2nd to 1st in "1" range.	1		.	3		2	6								

Road Testing (Cont'd)

ON VEHICLE																OFF VEHICLE																	
Kickdown modifier valve	1-2 accumulator valve	3-2 timing valve	1st reducing valve	Torque converter relief valve	Throttle modifier valve	4th speed cut valve	Lock-up control valve	4-2 sequence valve	Governor pressure	Governor valve	O.D. cancel solenoid	Accumulator 3-R	Accumulator N-D	Ignition switch and starter motor	O.D. control switch and wiring	Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low & reverse clutch	Brake band	Parking components							
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Road Testing (Cont'd)

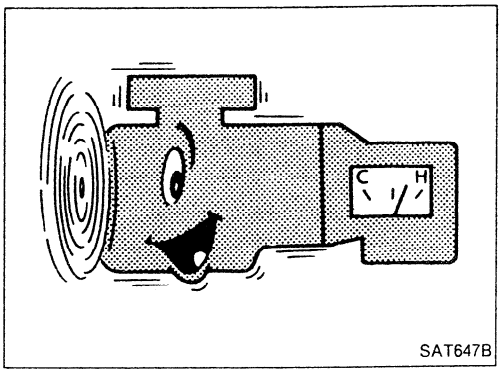
Numbers are arranged in order of probability.
Perform inspections starting with number one and work up.
Circled numbers indicate that the transaxle must be removed from the vehicle.

[ ]: Valve expected to be malfunctioning

		ON VEHICLE														
		Oil level and oil quality	Control cable	Inhibitor switch and wiring	Throttle wire	Engine idling rpm	Line pressure	Control valve	Throttle valve & detent valve	Manual valve	Pressure regulator valve	3-4 shift valve	2-3 shift valve	1-2 shift valve	Overrun clutch control valve	Pressure modifier valve
Shift quality	Failure to change gear from 4th to 2nd with accelerator pedal depressed.	1	.	.	3	.	2	6								
	Failure to change gear from 3rd to 2nd with accelerator pedal depressed.	1		.	3		2	6								
	Failure to change gear from 1st to 2nd in "D" and "2" range	1			3		2	6								
	Vehicle does not start from "1st" in "D" and "2" range.	1		.	3		2	6								
	Failure to change gear to 3rd and 4th in "D" range	1		.	3		2	6								
	Changes gear to 1st directly when selector lever is set from "D" to "1" range	1		.	3	.	2	6								
	Changes gear to 2nd in "1" range.	1	.	.	3	.	2	6								
Lock-up quality	Lock-up point is extremely high or low	1		.	3	.	2	6								
	Torque converter does not lock-up.	1	.	.	3	.	2	6								
Engine does not start in "P" and "N" ranges or engine starts in ranges other than "P" and "N" ranges.		.	2	3	.	.		.								
Vehicle moves with selector lever in "P" range.		.	1	.	.	.	.	.								

Road Testing (Cont'd)

ON VEHICLE																OFF VEHICLE								
Kickdown modifier valve	1-2 accumulator valve	3-2 timing valve	1st reducing valve	Torque converter relief valve	Throttle modifier valve	4th speed cut valve	Lock-up control valve	4-2 sequence valve	Governor pressure	Governor valve	O.D. cancel solenoid	Accumulator 3-R	Accumulator N-D	Ignition switch and starter motor	O.D. control switch and wiring	Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low & reverse clutch	Brake band	Parking components
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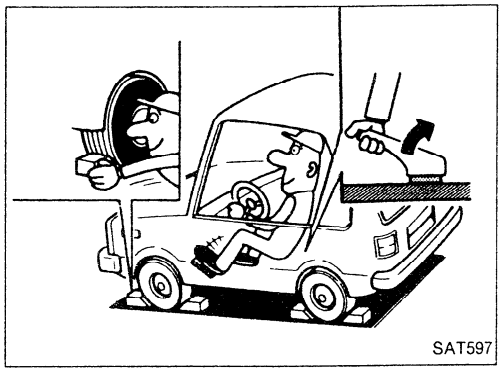
SAT647B

Stall Tasting

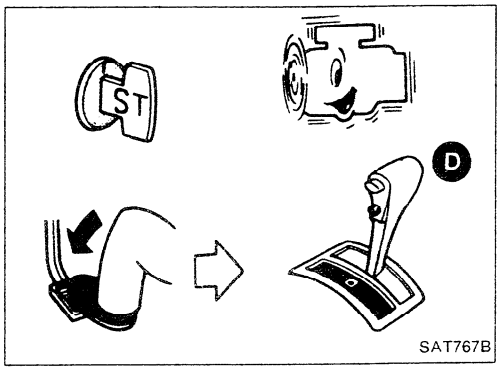
STALL TEST PROCEDURE

1. Check A/T and engine fluid levels. If necessary, add fluid.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

   A.T.F. operating temperature:
   50 - 80°C (122 - 176°F)

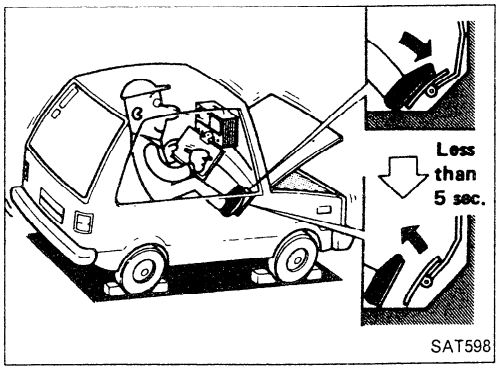

SAT597

3. Set parking brake and block wheels.
4. Install a tachometer where it can be seen by driver during test.



SAT767B

5. Start engine, apply foot brake, and place selector lever in "D" range.



SAT598

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.**

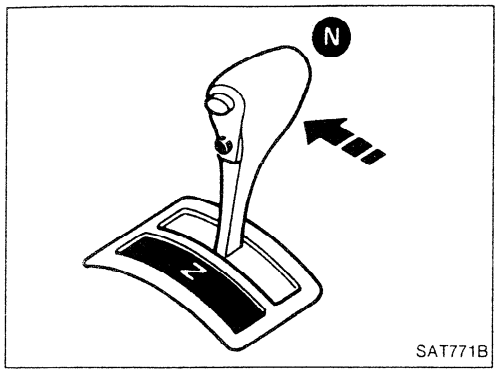
Stall revolution standard:

GA14DS engine:
For Europe 2,150 - 2,450 rpm
Except Europe 2,200 - 2,500 rpm

GA16DS engine:
For Europe and Middle East 2,450 - 2,750 rpm
Except Europe and Middle East 2,400 - 2,700 rpm

GA16DE engine 2,450 - 2,750 rpm

Stall Tasting (Cont'd)



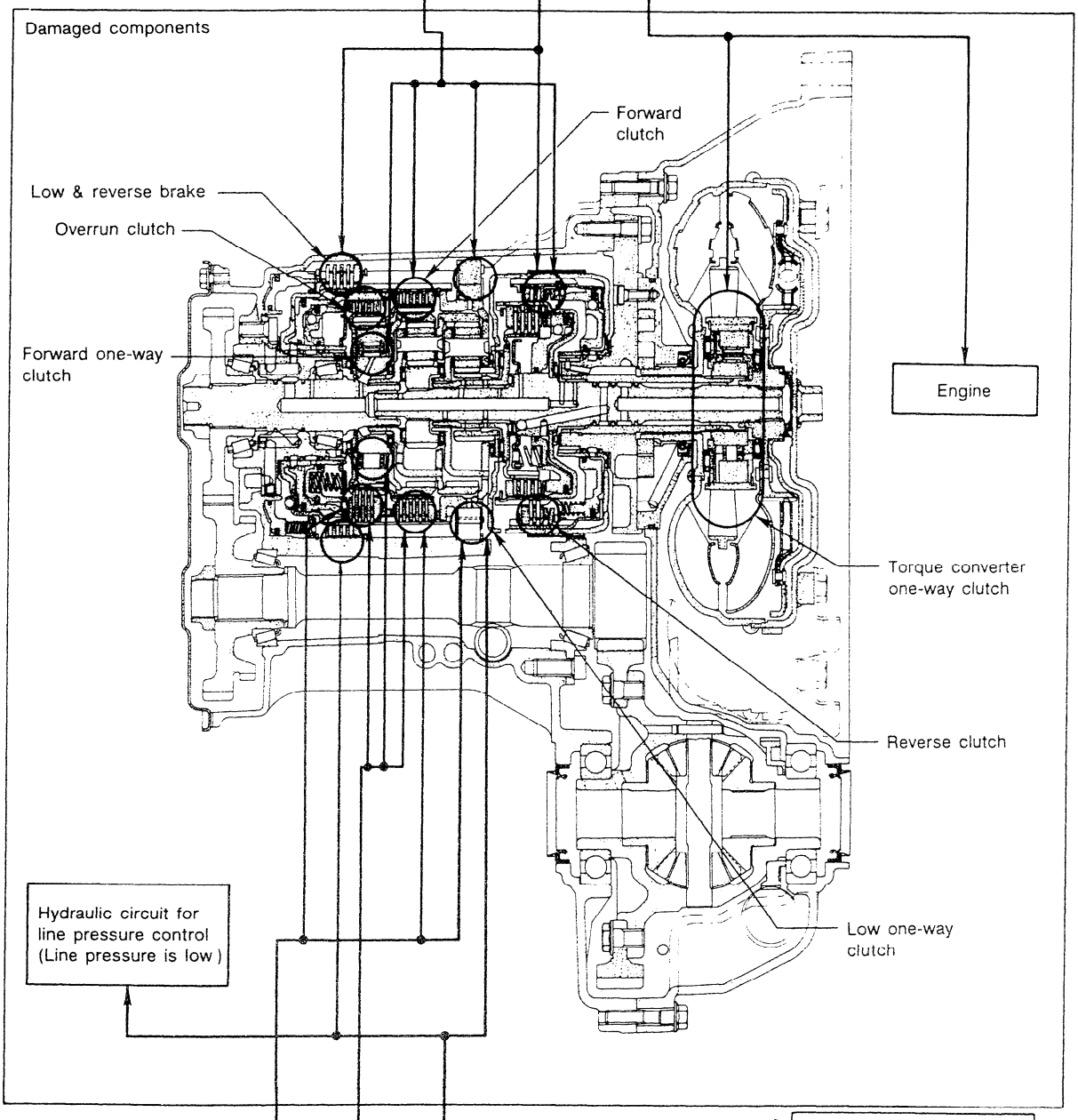
8. Shift selector lever to "N".
9. Cool off A.T.F.
   - **Run engine at idle for at least one minute.**
10. Perform stall tests in the same manner as in steps 5 through 9 with selector lever in "2", "1" and "R", respectively.

JUDGMENT OF STALL TEST

Judgement of stall test

Selector lever position	Judgment		
D	H	O	L
2	H	O	L
1	O	O	L
R	H	H	L

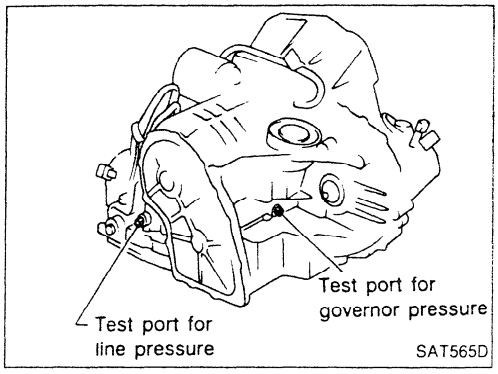
O : Stall revolution is normal.
H . Stall revolution is higher than specified
L : Stall revolution is lower than specified.



Selector lever position	Judgment			
D	H	H	H	O
2	H	H	H	O
1	O	H	H	O
R	O	O	H	O

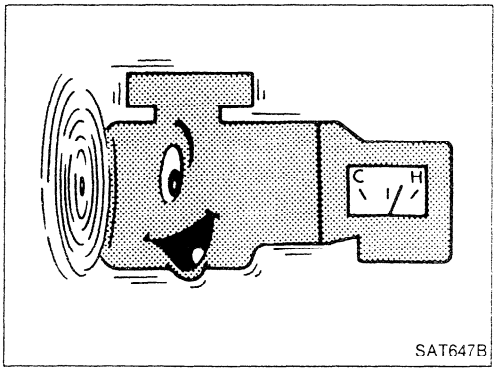
Clutches and brakes except high clutch and brake band are O K (Condition of high clutch and brake band cannot be confirmed by stall test)

SAT236E



Pressure Testing

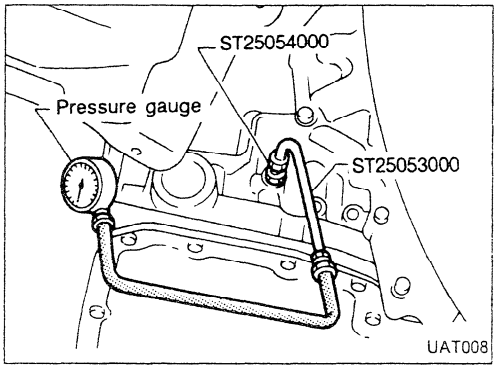
- Location of pressure test port.
- **Always replace pressure plugs as they are self-sealing bolts.**



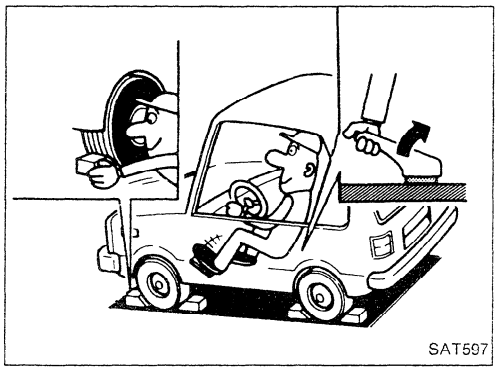
LINE PRESSURE TEST PROCEDURE

1. Check A/T and engine fluid levels. If necessary, add fluid.
2. Warm up engine until engine oil and A.T.F. reach operating temperature; after vehicle has been driven approx. 10 minutes.

   A.T.F. operating temperature:
   50 - 80°C (122 - 176°F)



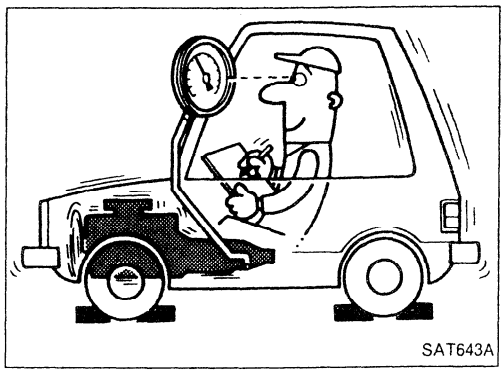
3. Install pressure gauge to line pressure port.



4. Set parking brake and block wheels.

Continue to depress brake pedal fully while performing line pressure test at stall speed.

Pressure Testing (Cont'd)


SAT643A

5. Start engine and measure line pressure at idle and stall speed.

Line pressure:

Engine speed rpm	Line pressure kPa (bar, kg/cm^2, psi)			
	R range	D range	2 range	1 range
Idle	883 (8.83, 9 0, 128)	539 (5.39, 5.5, 78)	588 (5.88, 6.0, 85)	883 (8.83, 9.0, 128)
Stall	1,765 (17.65, 18.0, 256)	1,079 (10.79, 11.0, 156)	883 (8.83, 9.0, 128)	1,079 (10.79, 11 0, 156)

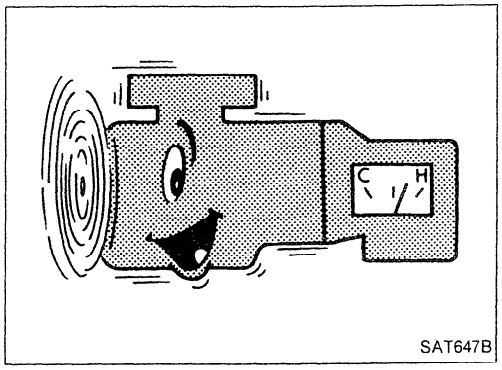
JUDGMENT OF LINE PRESSURE TEST

- **If line pressure does not rise, first check to make sure that throttle wire is connected properly.**

1) When line pressure while idling is low at all positions ("D", "2", "1", "R" and "P"), the problem may be due to:
- Wear on interior of oil pump
- Oil leakage at or around oil pump, control valve body, transmission case or governor
- Sticking pressure regulator valve
- Sticking pressure modifier valve

2) When line pressure while idling is low at a particular position, the problem may be due to the following:
- If oil leaks at or around low & reverse brake circuit, line pressure becomes low in "R" range but is normal in "P", "D", "2" or "1" range.

3) When line pressure is high while idling, pressure regulator valve may have stuck.



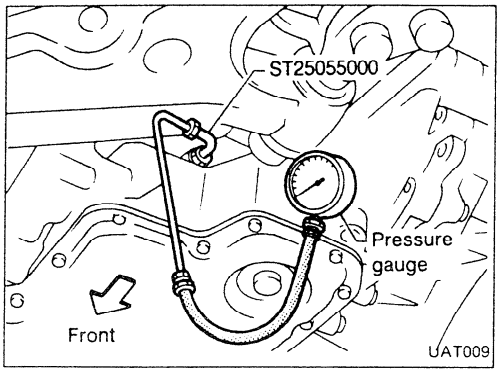
SAT647B

GOVERNOR PRESSURE TESTING

1. Check A/T and engine fluid levels. If necessary, add fluid.
2. Warm up engine until engine oil and A.T.F. reach operating temperature; after vehicle has been driven approx. 10 minutes.

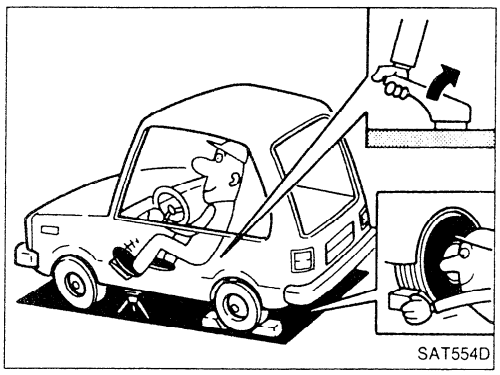
A.T.F. operating temperature:
50 - 80°C (122 - 176°F)

Pressure Testing (Cont'd)



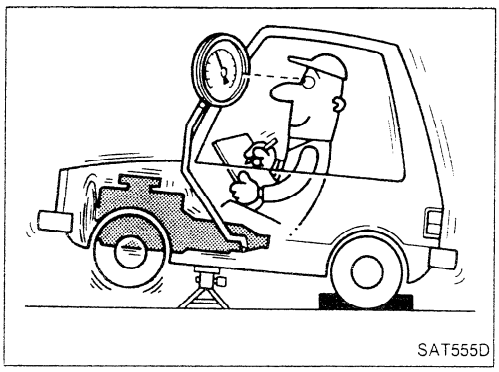
3. Remove L.H. side drive shaft.
4. Install pressure gauge to governor pressure port.
5. Reinstall drive shaft.

Make sure that pressure gauge adapter does not touch drive shaft.



6. Set parking brake and block rear wheels.
7. Jack up front wheels.
8. Set selector lever in D range and drive vehicle.

Be careful of rotating wheels.



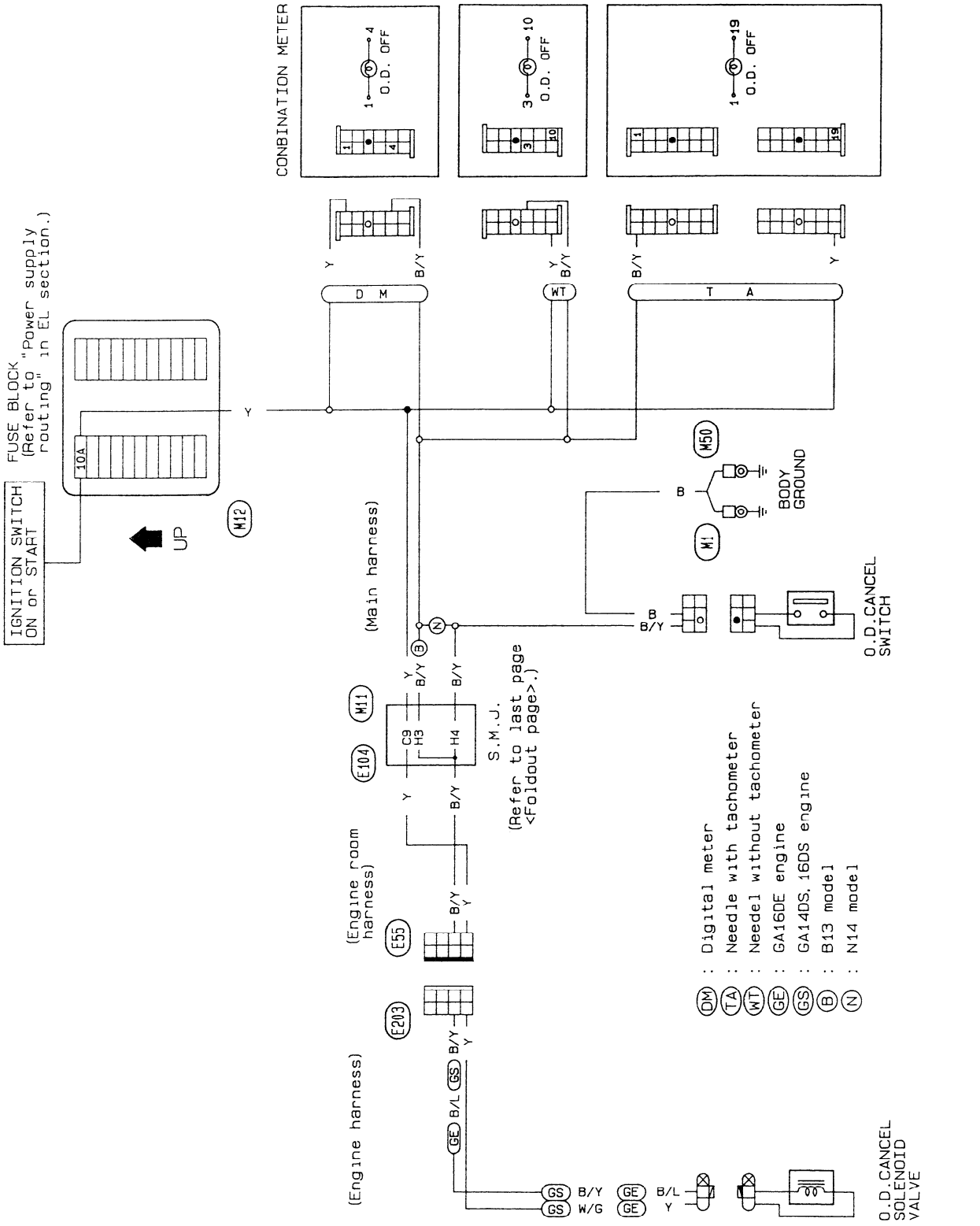
Governor pressure:

- **Governor pressure is not generated when vehicle is stopped. (front wheels are not rotating.)**
- **Governor pressure rises gradually in response to vehicle speed. (front wheel rotating speed.)**

If not, check governor valve assembly.
Refer to "DISASSEMBLY"

Wiring Diagram

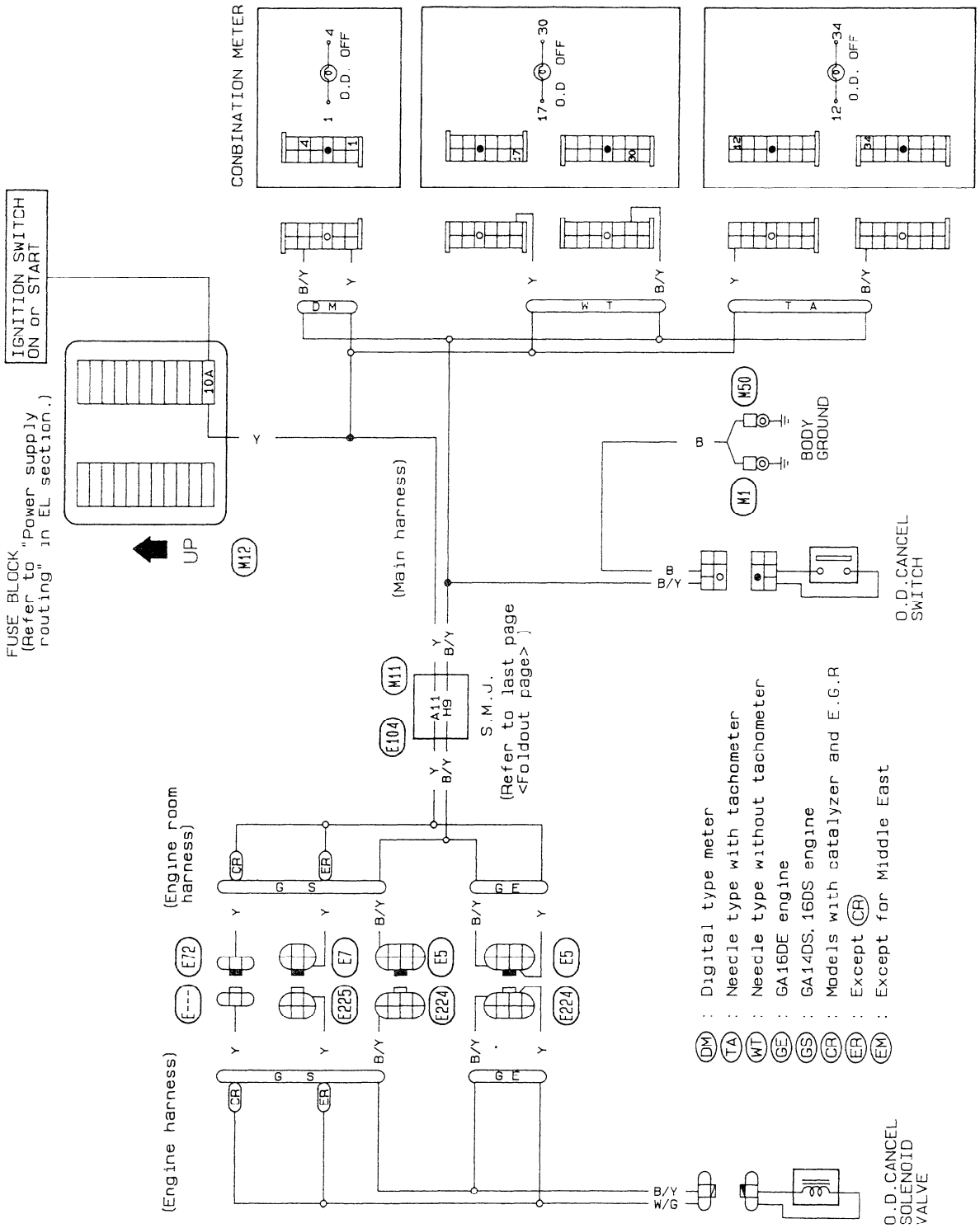
R.H.D. models



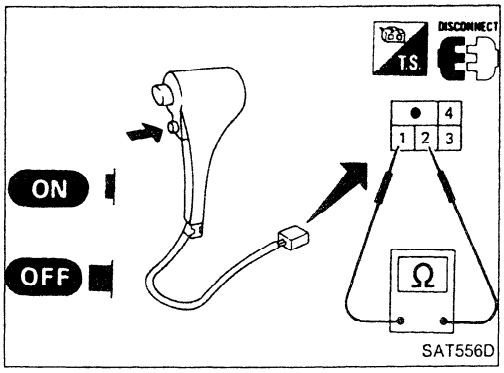
SAT269E

Wiring Diagram (Cont'd)

L.H.D. models



SAT268E

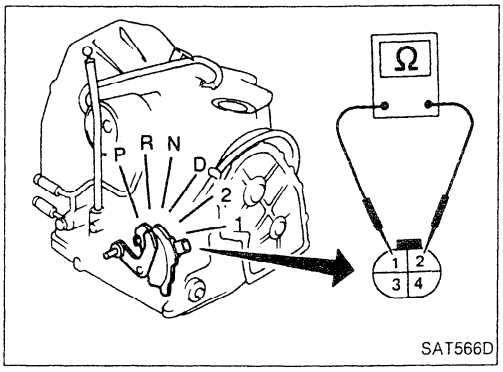


Component Check

OVERDRIVE CONTROL SWITCH

- Check continuity between two terminals.

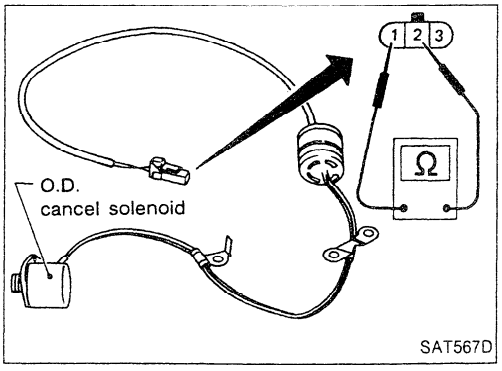
O.D. switch position	Continuity
ON	No
OFF	Yes



INHIBITOR SWITCH

- Check continuity in "N", "P" and "R" ranges.
- With control lever held in "N" range, turn manual lever an equal amount in both directions to see if current flow ranges are nearly the same. (When manual lever is in each position, continuity normally exists within 1.5° in either direction.) If current flows outside normal range, or if normal flow range is out of specifications, properly adjust inhibitor switch.

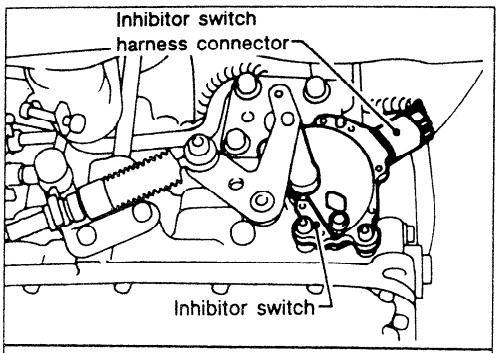
Terminal No. / Range	①	②	③	④
P N.	○——	——○		
R			○——	——○



O.D. CANCEL SOLENOID

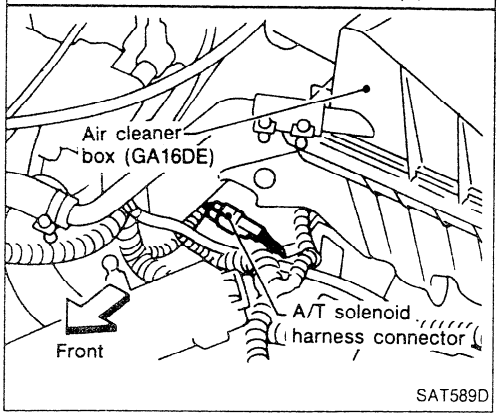
- Check resistance between terminals.

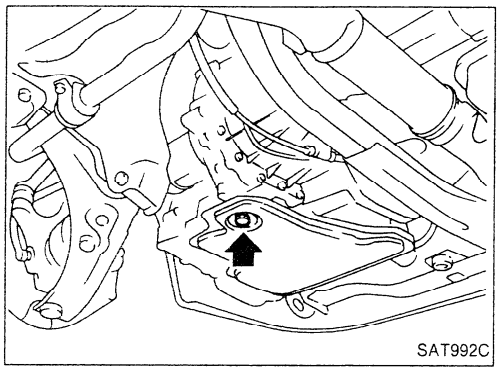
Terminal No.	Resistance
①—②	Approximately 25Ω



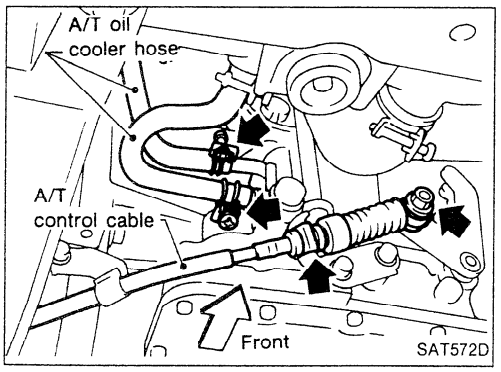
Removal

- Remove battery and bracket.
- Remove air duct. (GA16DE)
- Disconnect A/T solenoid harness connector and inhibitor switch harness connector.
- Disconnect throttle wire at engine side.

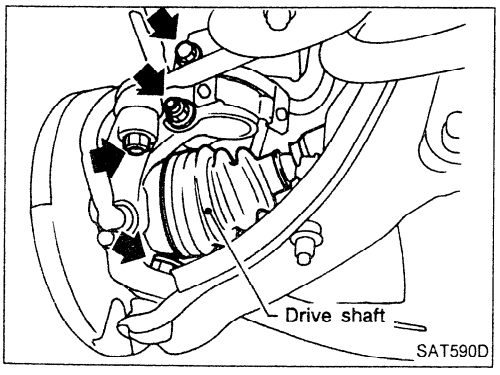




- Drain A.T.F.

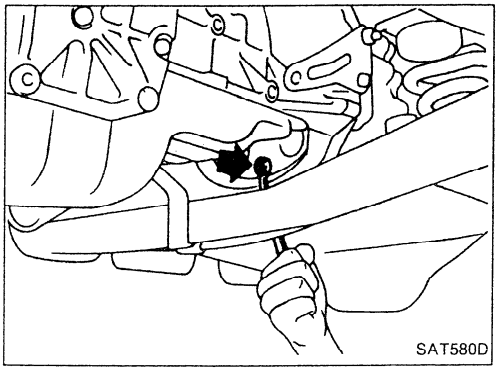


- Disconnect control cable from transaxle.
- Disconnect oil cooler hoses.



- Remove drive shafts — Refer to "Section FA".
- Remove exhaust front tube.
- Remove starter motor from transaxle.

Removal (Cont'd)

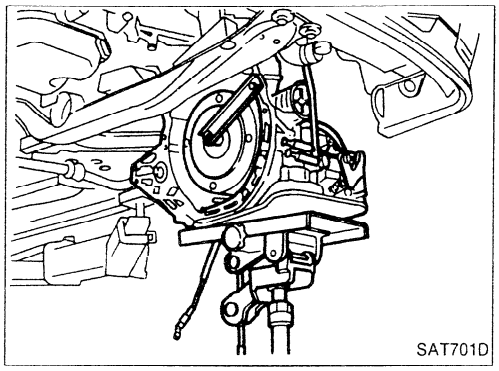


- Remove front and rear gussets and engine rear plate.
- Remove bolts securing torque converter to drive plate.

Rotate crankshaft for access to securing bolts.

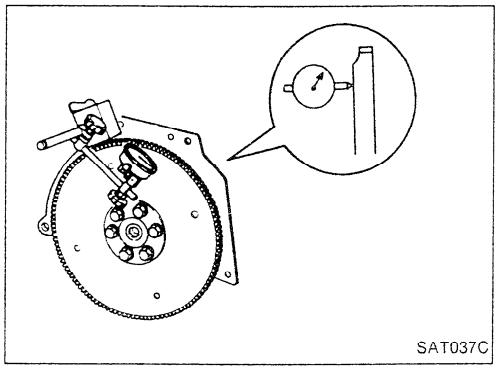
- Support engine by placing a jack under oil pan.

Do not place jack under oil pan drain plug.



- 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

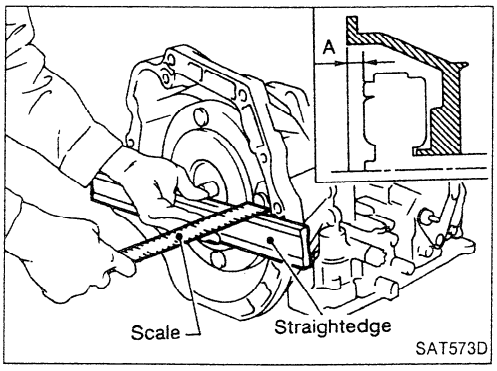


- Drive plate runout

  Maximum allowable runout:

  0.5 mm (0.020 in)

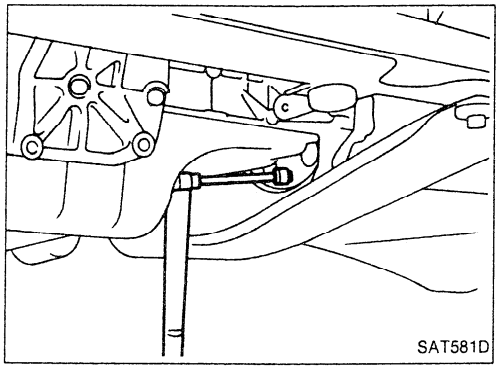
  If this runout is out of specification, replace drive plate with ring gear.



- When connecting torque converter to transaxle, measure distance "A" to be certain that they are correctly assembled.

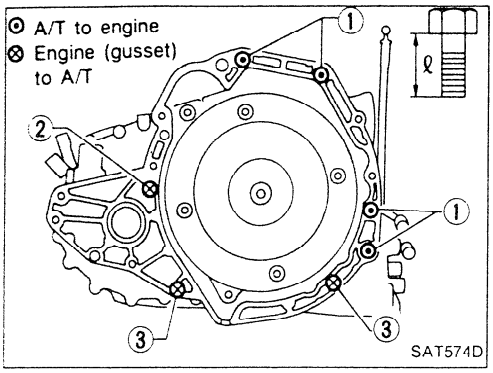
  Distance "A":

  21.1 mm (0.831 in) or more



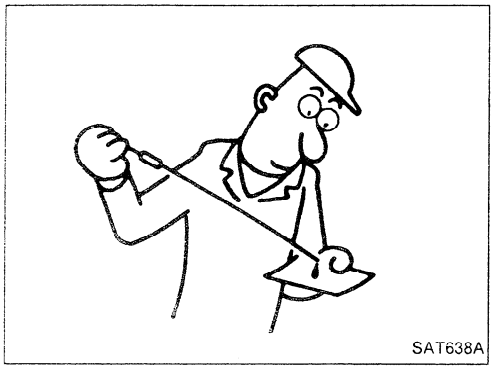
- Install converter to drive plate.
- **After converter is installed to drive plate, rotate crankshaft several turns and check to be sure that transaxle rotates freely without binding.**

Installation (Cont'd)



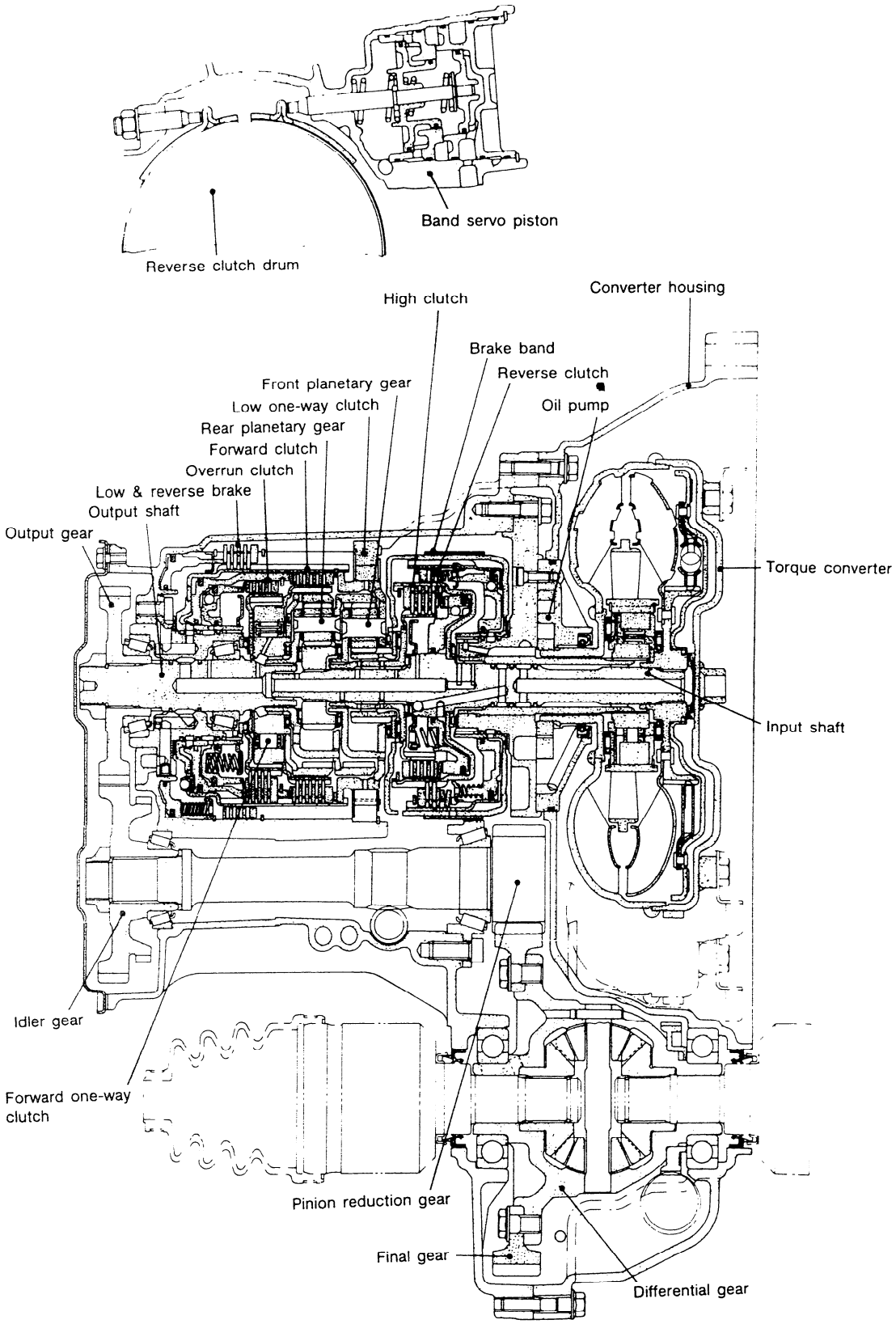
- Tighten bolts fixing transaxle

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	Bolt length "ℓ" mm (in)
①	30 - 40 (3.1 - 4.1, 22 - 30)	50 (1.97)
②	30 - 40 (3.1 - 4.1, 22 - 30)	30 (1.18)
③	16 - 21 (1.6 - 2.1, 12 - 15)	25 (0.98)
Front gusset to engine	30 - 40 (3.1 - 4.1, 22 - 30)	20 (0.79)
Rear gusset to engine	16 - 21 (1 6 - 2 1, 12 - 15)	16 (0.63)

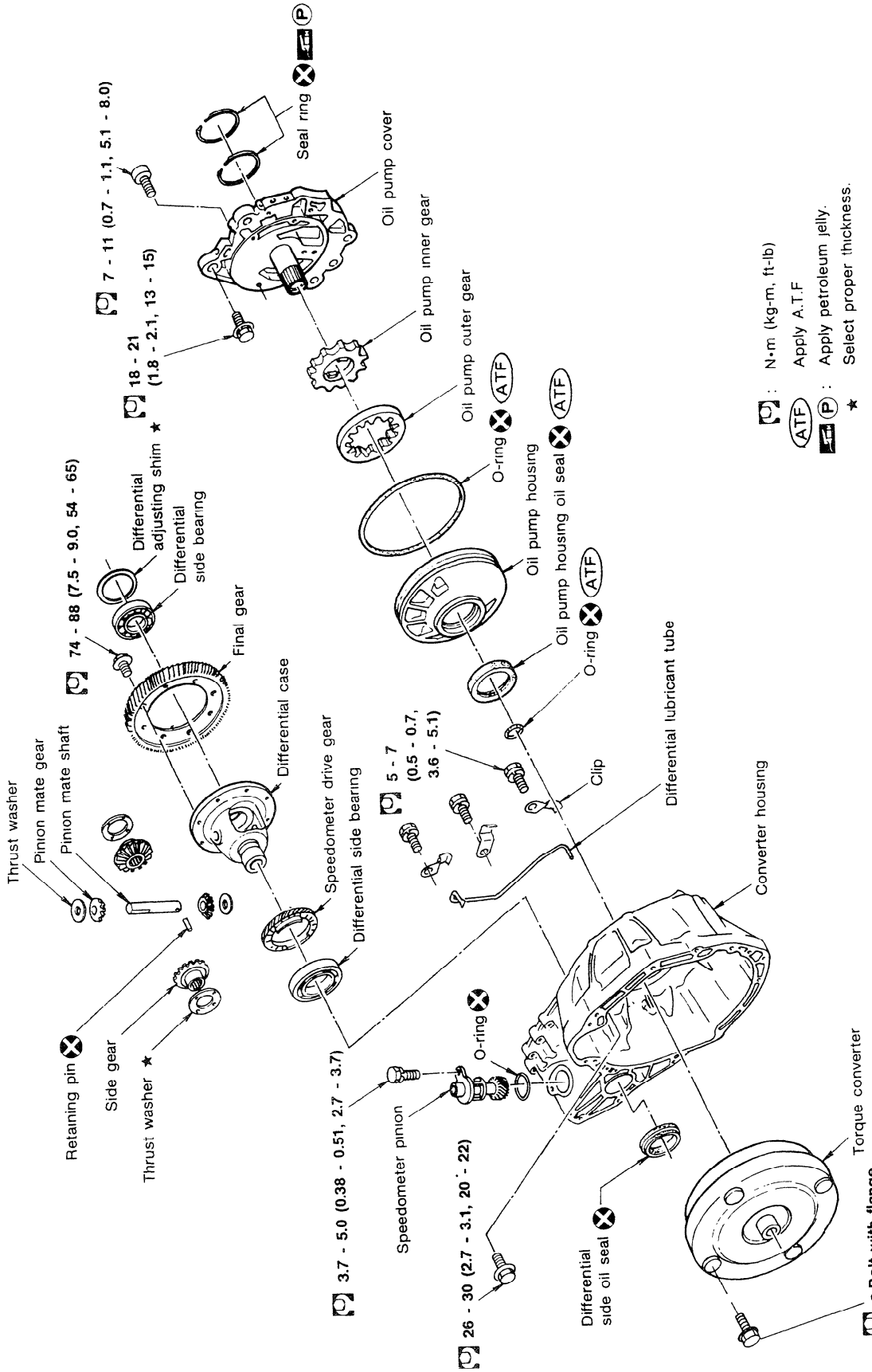


- Reinstall any part removed.
- Adjust control cable and throttle wire. Refer to "ON-VEHICLE SERVICE".
- Check inhibitor switch. Refer to "ELECTRICAL SYSTEM".
- Refill transaxle with A.T.F. and check fluid level.
- Move selector lever through all positions to be sure that transaxle operates correctly. With parking brake applied, idle engine. More selector lever through "N" to "D", to "2", to "1" and "R". A slight shock should be felt through the hand gripping the selector each time the transaxle is shifted.
- Perform road test — Refer to "ROAD TESTING".

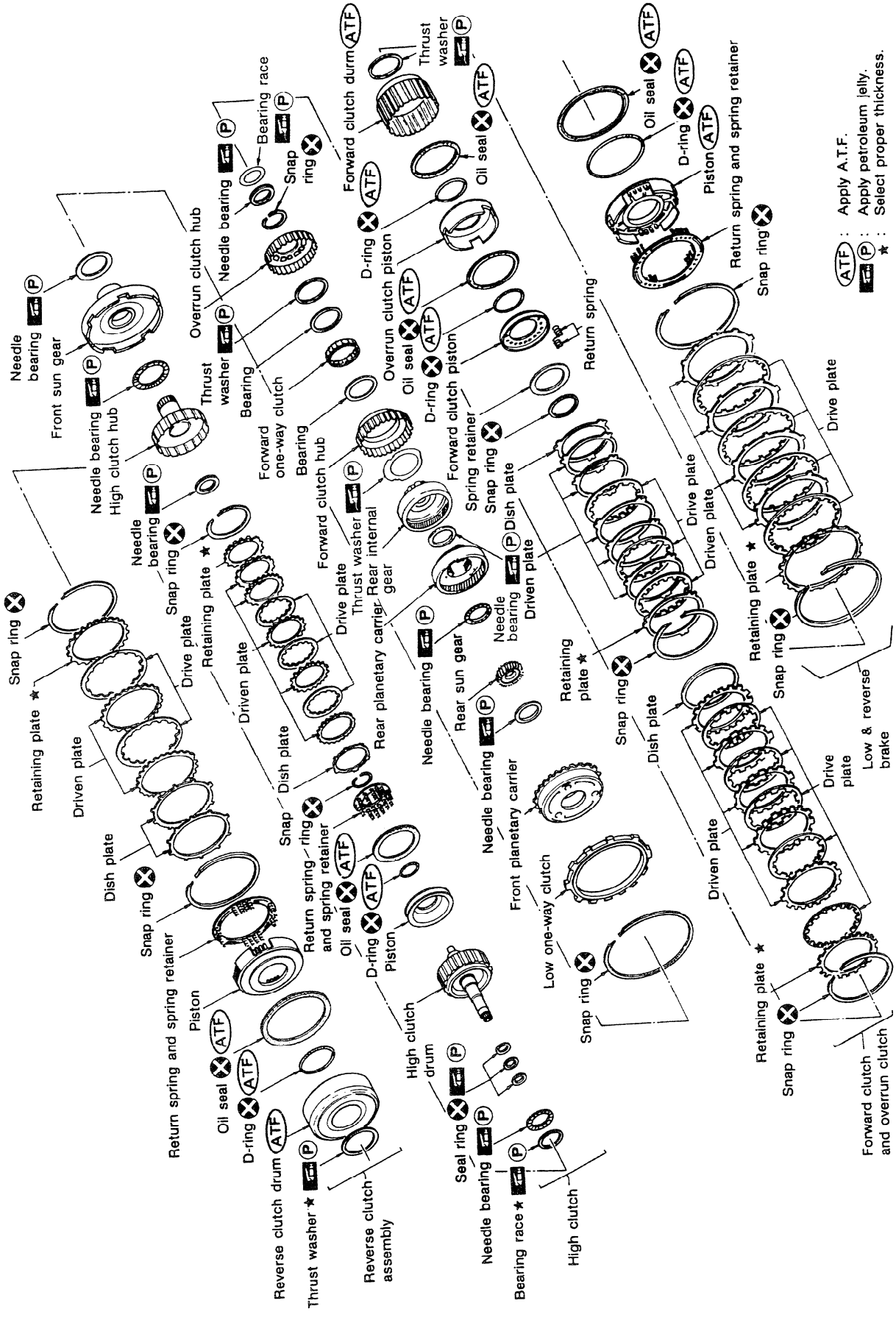
Cross-sectional View



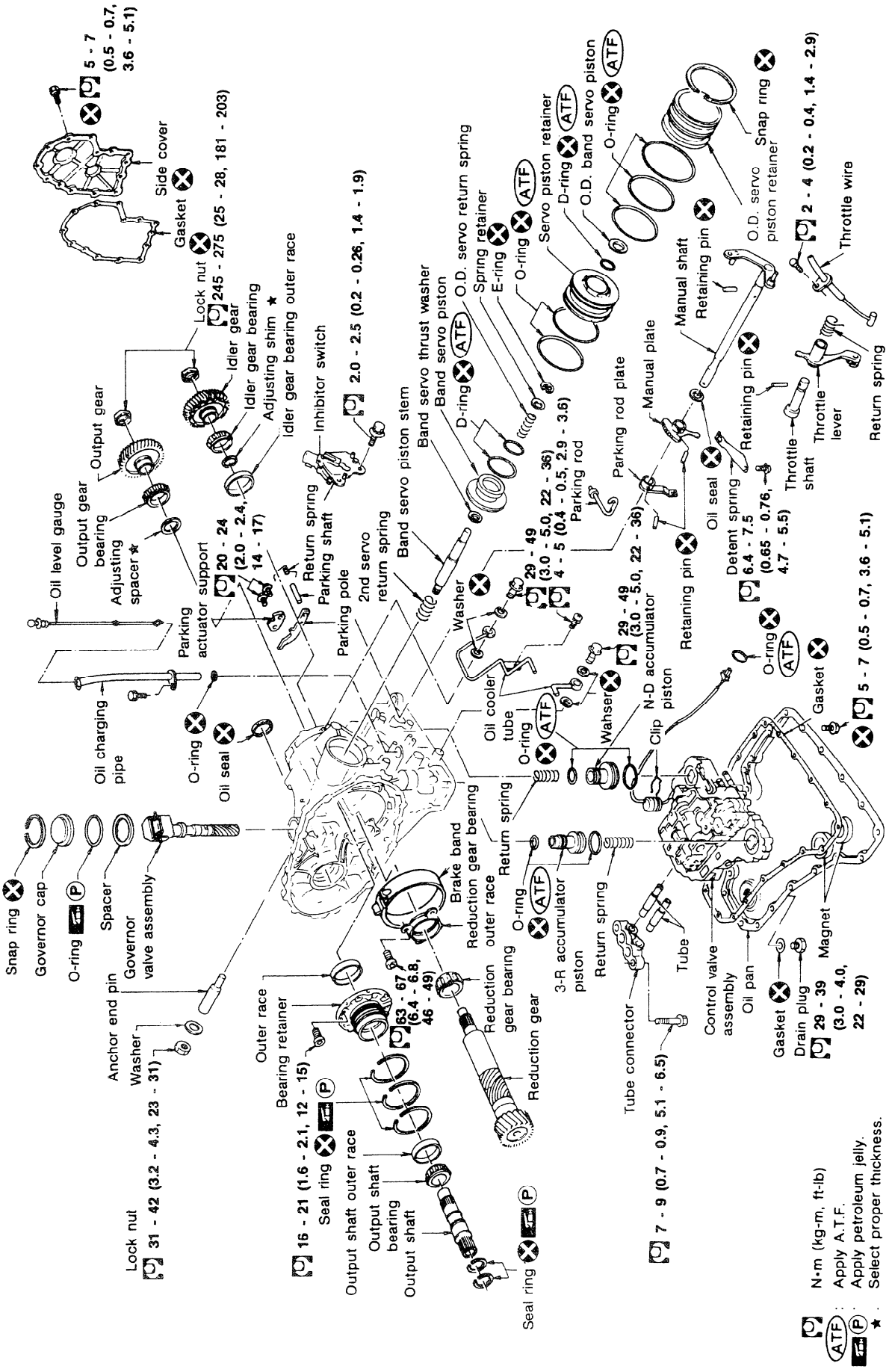
SAT213E


Seal ring
Oil pump cover
Oil pump inner gear
Oil pump outer gear
O-ring
Oil pump housing
Oil pump housing oil seal
O-ring
Clip
Differential lubricant tube
Converter housing
Torque converter
Differential side oil seal
O-ring
Speedometer pinion
Differential side bearing
Speedometer drive gear
Differential case
Final gear
Differential side bearing
Differential adjusting shim
Thrust washer
Pinion mate gear
Pinion mate shaft
Side gear
Thrust washer
Retaining pin
7 - 11 (0.7 - 1.1, 5.1 - 8.0)
18 - 21 (1.8 - 2.1, 13 - 15)
74 - 88 (7.5 - 9.0, 54 - 65)
5 - 7 (0.5 - 0.7, 3.6 - 5.1)
3.7 - 5.0 (0.38 - 0.51, 2.7 - 3.7)
26 - 30 (2.7 - 3.1, 20 - 22)
● Bolt with flange
44 - 59 (4.5 - 6.0, 33 - 43)
● Bolt without flange
39 - 49 (4.0 - 5.0, 29 - 36)
: N·m (kg-m, ft-lb)
ATF : Apply A.T.F
P : Apply petroleum jelly.
★ Select proper thickness.

SAT237E

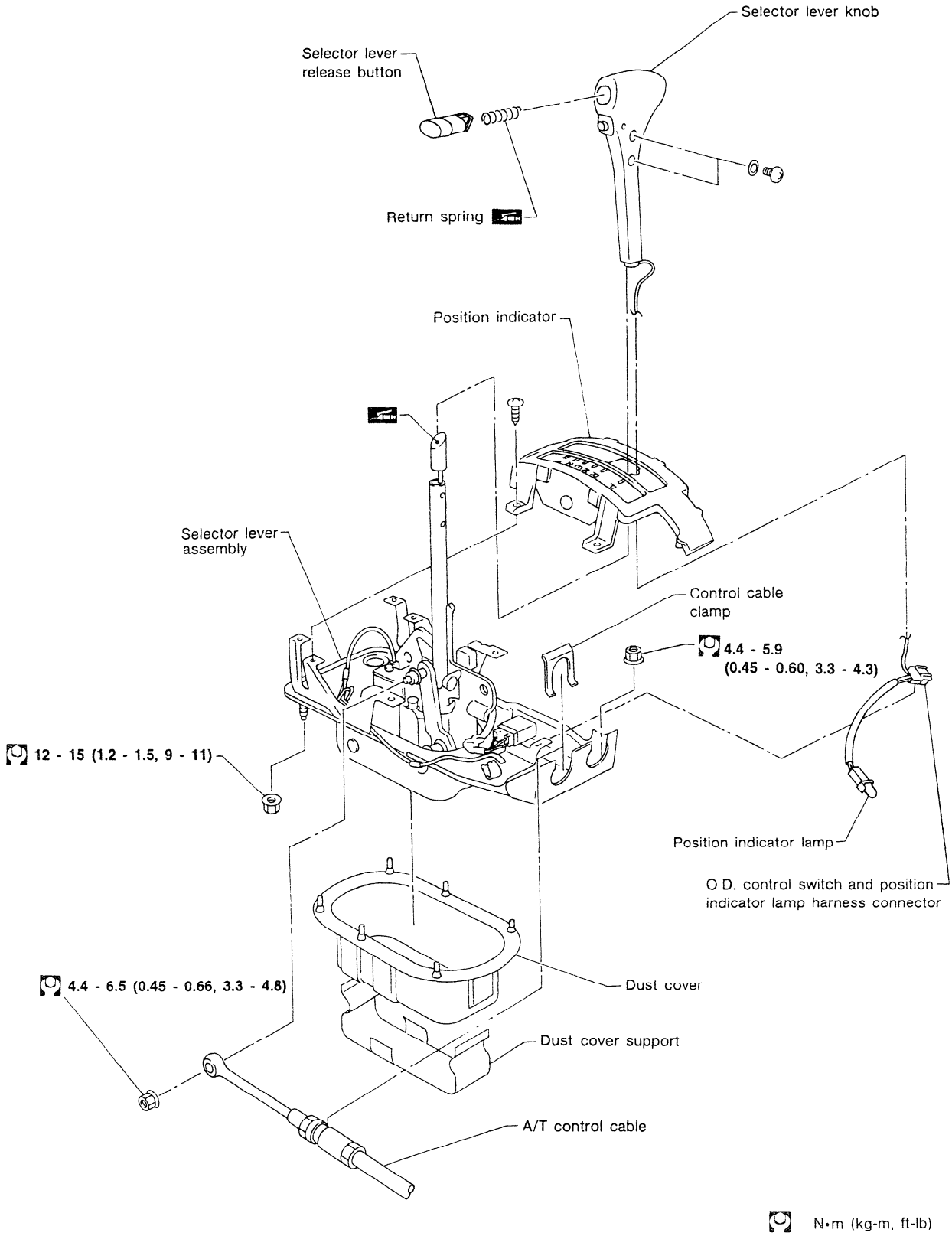

Snap ring
Retaining plate ★
Driven plate
Dish plate
Snap ring
Return spring and spring retainer
Piston
Oil seal (ATF)
D-ring (ATF)
Reverse clutch drum (ATF)
Thrust washer ★ (P)
Reverse clutch assembly
Needle bearing (P)
Front sun gear
Needle bearing (P)
High clutch hub
Needle bearing (P)
Snap ring
Drive plate
Retaining plate ★
Driven plate
Snap
Dish plate
Return spring ring and spring retainer
Oil seal (ATF)
D-ring (ATF)
Piston
High clutch drum
Seal ring (P)
Needle bearing (P)
Bearing race ★ (P)
High clutch
Overrun clutch hub
Needle bearing (P)
Thrust washer (P)
Bearing
Forward one-way clutch
Bearing
Forward clutch hub
Thrust washer (P)
Drive plate
Rear internal gear
Rear planetary carrier
Needle bearing (P)
Rear sun gear
Needle bearing (P)
Front planetary carrier
Low one-way clutch
Snap ring
Bearing race (P)
Snap ring
Forward clutch durm (ATF)
Thrust washer (P)
D-ring (ATF)
Overrun clutch piston
Oil seal (ATF)
D-ring (ATF)
Forward clutch piston
Spring retainer
Snap ring
Dish plate (P)
Driven plate
Needle bearing
Driven plate
Retaining plate ★
Snap ring
Dish plate
Driven plate
Driven plate
Retaining plate ★
Snap ring
Retaining plate ★
Snap ring
Return spring
Oil seal (ATF)
D-ring (ATF)
Piston (ATF)
Return spring and spring retainer
Snap ring
Drive plate
Drive plate
Low & reverse brake
Forward clutch and overrun clutch
(ATF) : Apply A.T.F.
(P) : Apply petroleum jelly.
★ : Select proper thickness.

SAT023E


Snap ring
Governor cap
O-ring (P)
Spacer
Governor valve assembly
Anchor end pin
Washer
Lock nut
31 - 42 (3.2 - 4.3, 23 - 31)
Outer race
Bearing retainer
16 - 21 (1.6 - 2.1, 12 - 15)
Seal ring (P)
Output shaft outer race
Output shaft bearing
Output shaft
Seal ring (P)
63 - 67 (6.4 - 6.8, 46 - 49)
Reduction gear bearing
Reduction outer race
Reduction gear
Brake band
Return spring
O-ring (ATF)
3-R accumulator piston
Return spring
Tube
Tube connector
7 - 9 (0.7 - 0.9, 5.1 - 6.5)
Control valve assembly
Oil pan
Gasket
Drain plug
29 - 39 (3.0 - 4.0, 22 - 29)
Magnet
5 - 7 (0.5 - 0.7, 3.6 - 5.1)
Gasket
O-ring (ATF)
Oil cooler tube
Wahser
N-D accumulator piston
Clip
Retaining pin
Oil seal
Detent spring
6.4 - 7.5 (0.65 - 0.76, 4.7 - 5.5)
Throttle shaft
Throttle lever
Return spring
Throttle wire
2 - 4 (0.2 - 0.4, 1.4 - 2.9)
Snap ring
O.D. servo piston retainer
Retaining pin
Manual shaft
Manual plate
Parking rod plate
Parking rod
29 - 49 (3.0 - 5.0, 22 - 36)
4 - 5 (0.4 - 0.5, 2.9 - 3.6)
Washer
Band servo piston stem
Band servo thrust washer
Band servo piston
O-ring (ATF)
O.D. servo return spring
Spring retainer
E-ring
O-ring (ATF)
Servo piston retainer
D-ring (ATF)
O.D. band servo piston
O-ring (ATF)
Oil level gauge
Oil charging pipe
O-ring
Oil seal
Parking actuator support
20 - 24 (2.0 - 2.4, 14 - 17)
Return spring
Parking shaft
Parking pole
2nd servo return spring
Output gear
Output gear bearing
Adjusting spacer ★
Lock nut
245 - 275 (25 - 28, 181 - 203)
Idler gear
Idler gear bearing
Adjusting shim ★
Idler gear bearing outer race
Inhibitor switch
2.0 - 2.5 (0.2 - 0.26, 1.4 - 1.9)
Side cover
Gasket
5 - 7 (0.5 - 0.7, 3.6 - 5.1)
N·m (kg-m, ft-lb)
Apply A.T.F.
Apply petroleum jelly.
Select proper thickness.

SAT270E

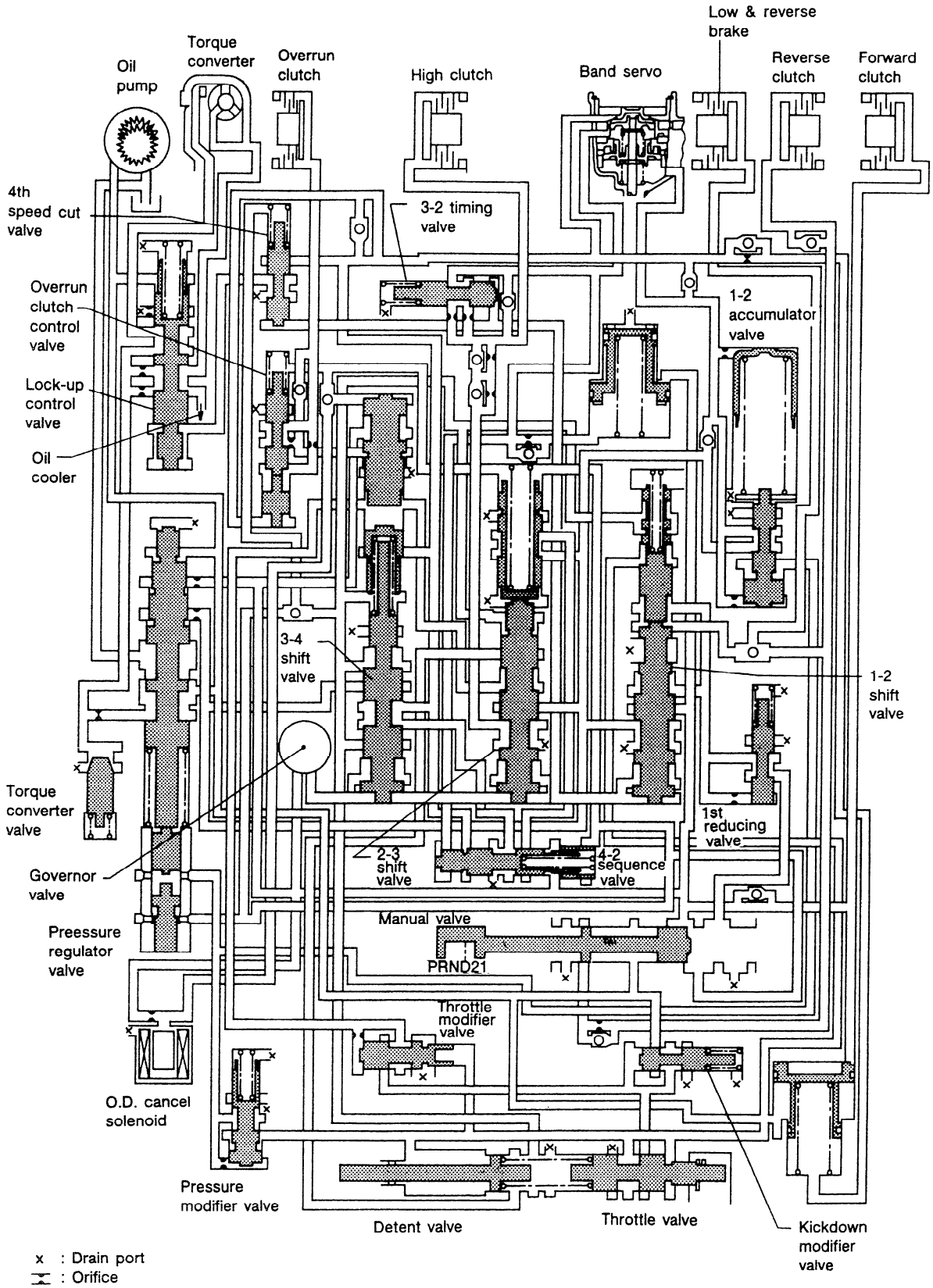
Shift Control Components



SAT238E

Hydraulic Control Circuit

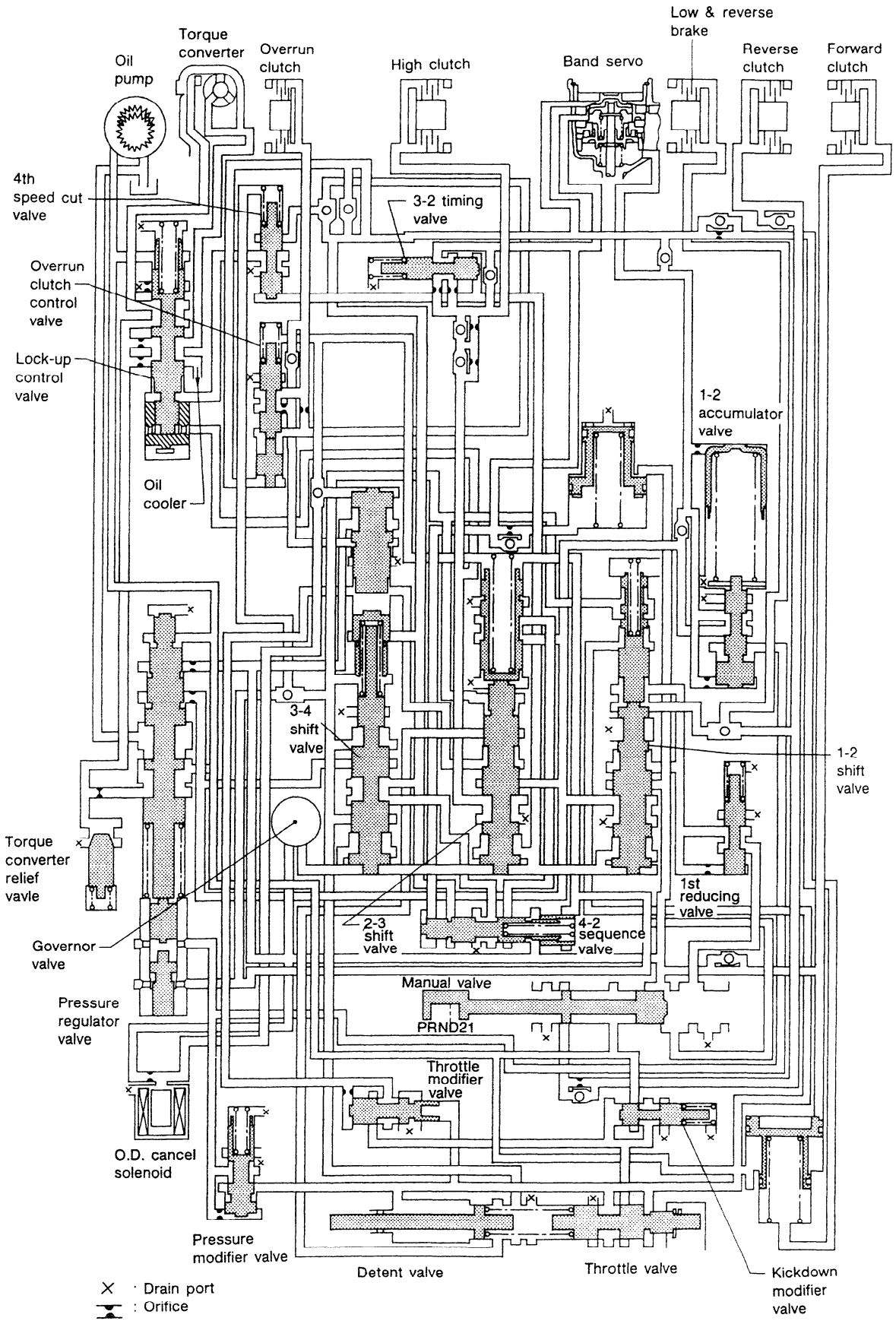
MODEL 31X74, 31X76 AND 31X77



SAT271E

Hydraulic Control Circuit (Cont'd)

MODEL 31X75 AND 31X79



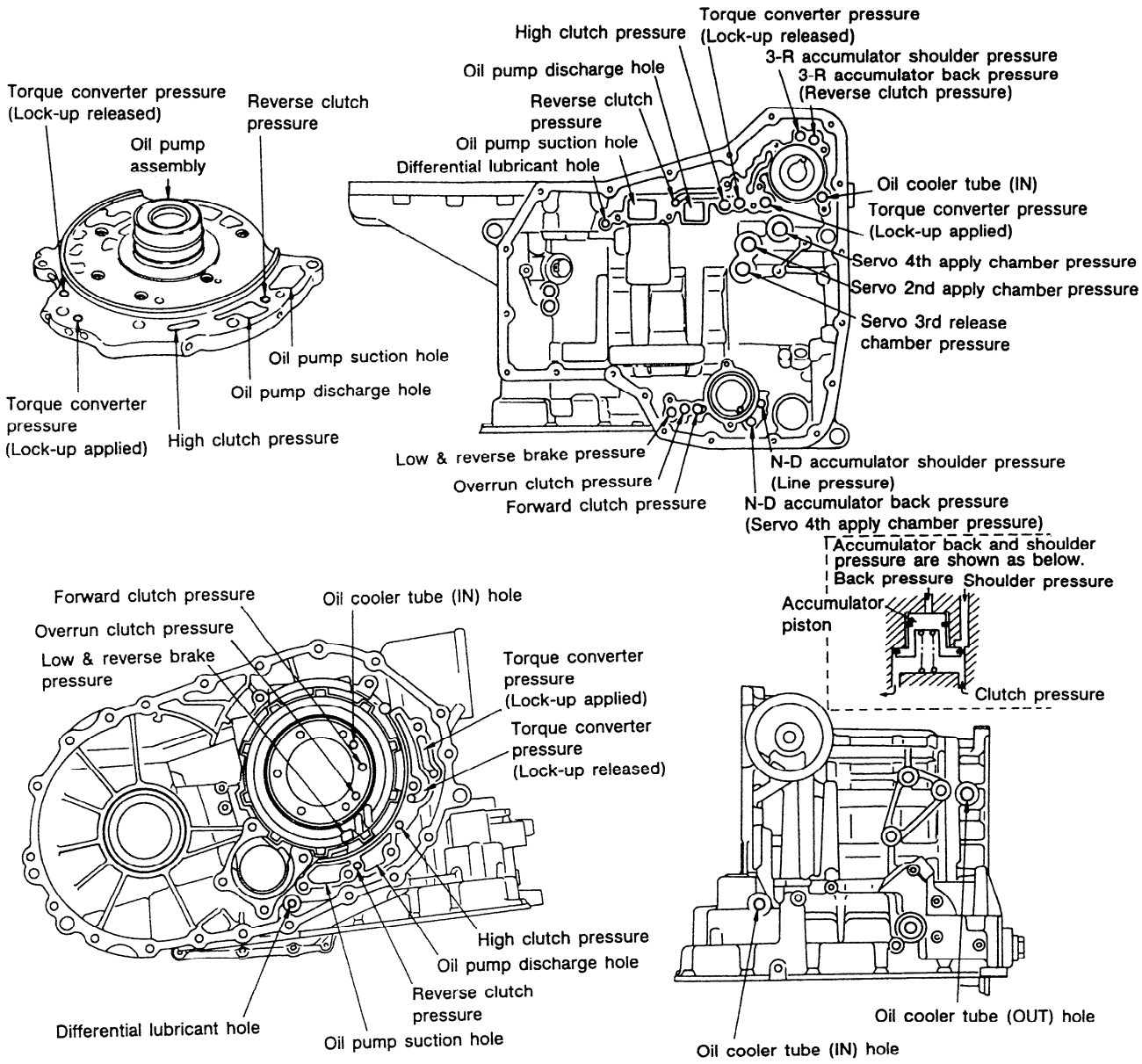
SAT280E

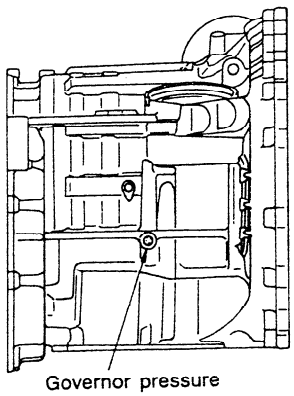
Mechanical Operation

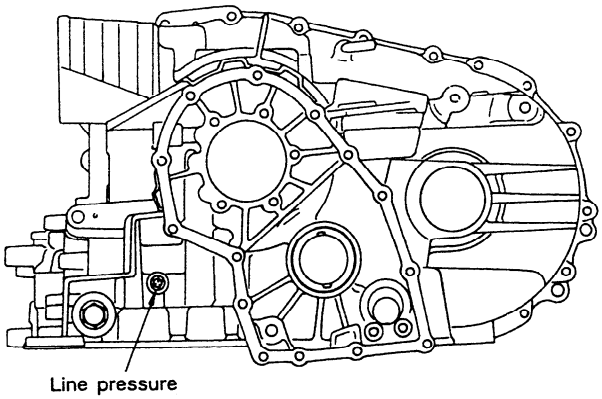
Shift position		Reverse clutch	High clutch	Forward clutch	Overrun clutch	Band servo			Forward one-way clutch	Low one-way clutch	Low & reverse brake	Lock-up	Remarks
						2nd apply	3rd release	4th apply					
P													PARK
R		○									○		REVERSE
N													NEUTRAL
D *4	1st			○	◎				●	●			Automatic shift 1 ↔ 2 ↔ 3 ↔ 4
	2nd			○	*1 ◎	○			●				
	3rd		○	○	◎	*2⊗	⊗		●				
	4th		○	⊗		*3⊗	⊗	○				○	
2	1st			○	○				●	●			Automatic shift 1 ↔ 2
	2nd			○	○	○			●				
1	1st			○	○				●		○		Locks (held stationary) in 1st speed 1 ← 2
	2nd			○	○	○			●				

*1: Operates when overdrive 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 to "OFF" position.
○: Operates
◎: Operates when throttle opening is less than 1/16.
●: Operates during "progressive" acceleration.
⊗: Operates but does not affect power transmission.

Oil Channel







SAT586D

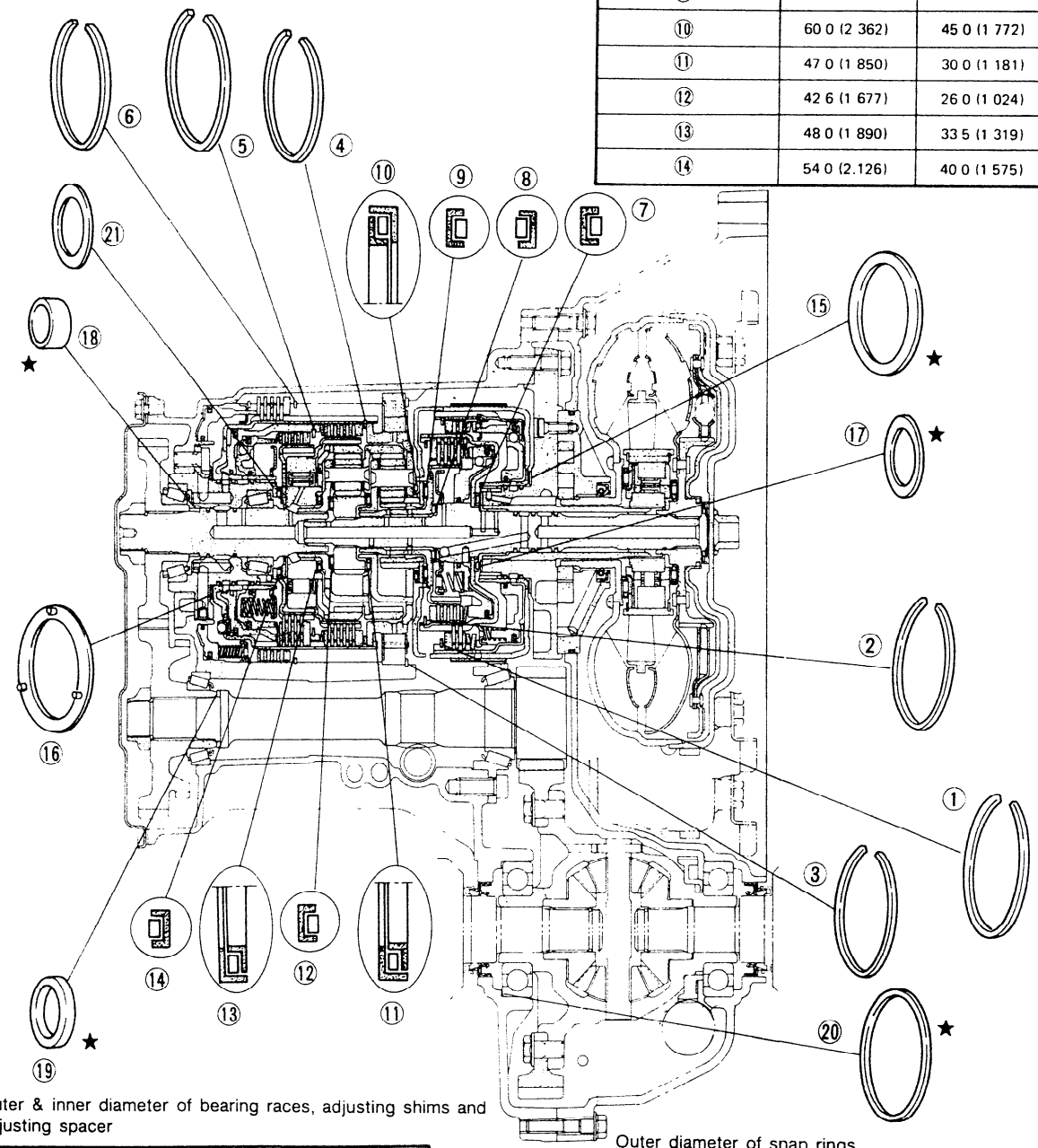
Locations of Adjusting Shims, Needle Bearings, Thrust Washers and Snap Rings

Outer diameter and color of thrust washers

Item number	Outer diameter mm (in)	Color
⑮	72 0 (2 835)	black
⑯	78.5 (3.091)	

Outer and inner diameter of needle bearings

Item number	Outer diameter mm (in)	Inner diameter mm (in)
⑦	47 0 (1.850)	32.0 (1 260)
⑧	35 0 (1 378)	20 0 (0 787)
⑨	60 0 (2 362)	42.0 (1 654)
⑩	60 0 (2 362)	45 0 (1 772)
⑪	47 0 (1 850)	30 0 (1 181)
⑫	42 6 (1 677)	26 0 (1 024)
⑬	48 0 (1 890)	33 5 (1 319)
⑭	54 0 (2.126)	40 0 (1 575)



Outer & inner diameter of bearing races, adjusting shims and adjusting spacer

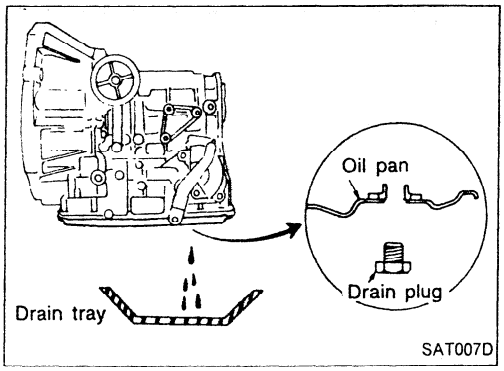
Item number	Outer diameter mm (in)	Inner diameter mm (in)
⑰	48 0 (1 890)	33.0 (1.299)
⑱	29 0 (1 142)	25 0 (0 984)
⑲	34 5 (1 358)	26 1 (1 028)
⑳	79 5 (3 130)	72 0 (2 835)
㉑	55 0 (2 165)	42 0 (1 654)

★: Select proper thickness

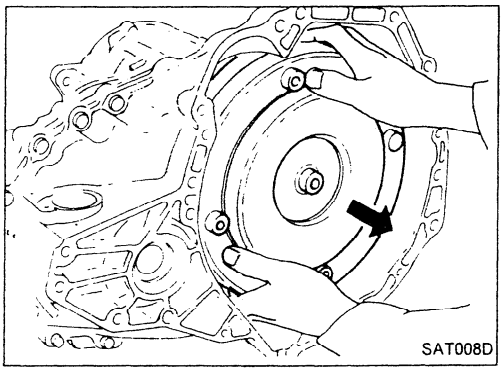
Outer diameter of snap rings

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	126 0 (4 96)
⑥	159.0 (6 26)

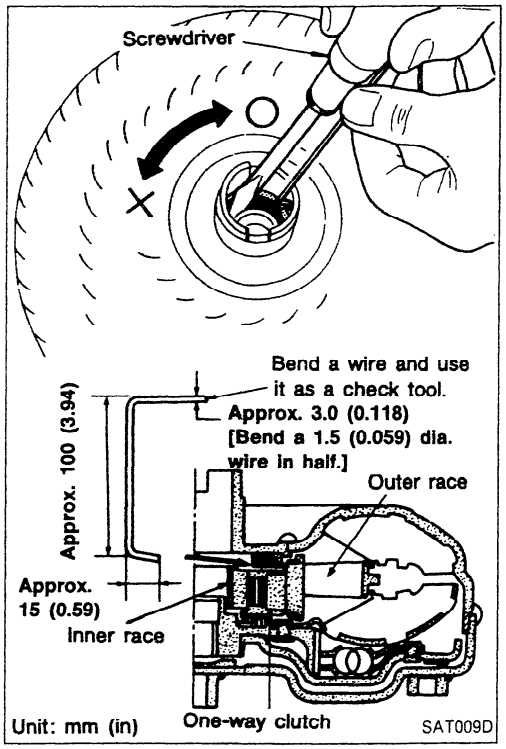
SAT212E



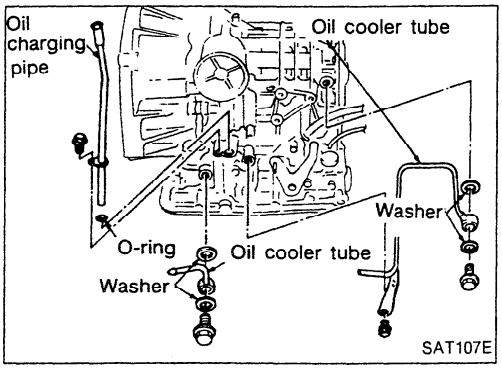
1. Drain A.T.F. through drain plug.



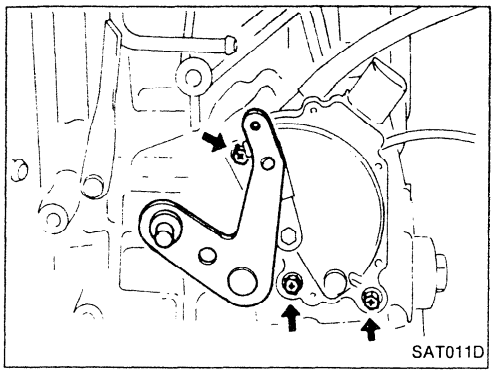
2. Remove torque converter.



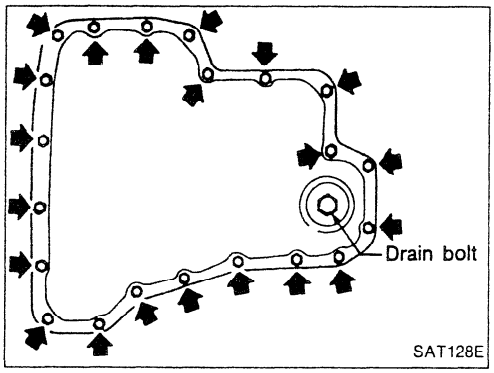
3. Check torque converter one-way clutch using check tool as shown at left.
   a. Insert check tool into the groove of bearing support built into one-way clutch outer race.
   b. While fixing bearing support with check tool, rotate one-way clutch spline using flat-bladed screwdriver.
   c. Check inner race rotates clockwise only. If not, replace torque converter assembly.



4. Remove oil charging pipe and oil cooler tube.

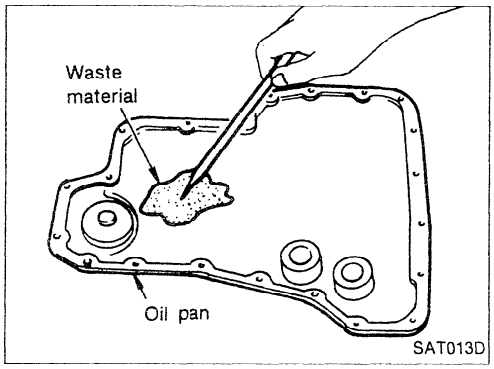

SAT011D

5. Set manual lever to "P" position.
6. Remove inhibitor switch.



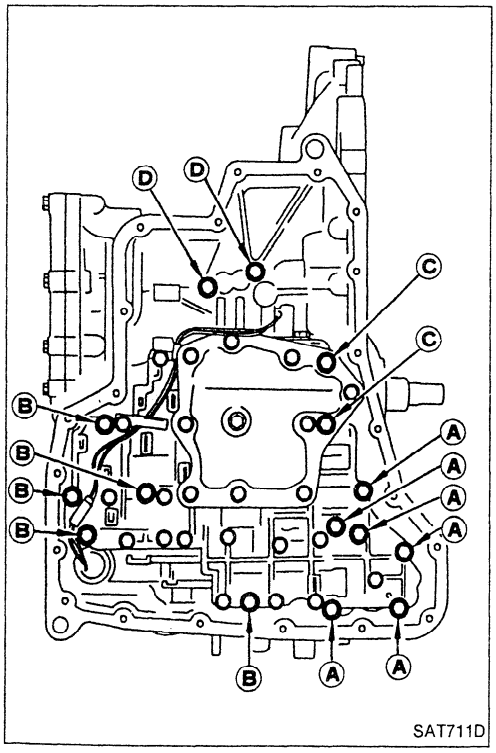
SAT128E

7. Remove oil pan and oil pan gasket.
- **Do not reuse oil pan bolts.**



SAT013D

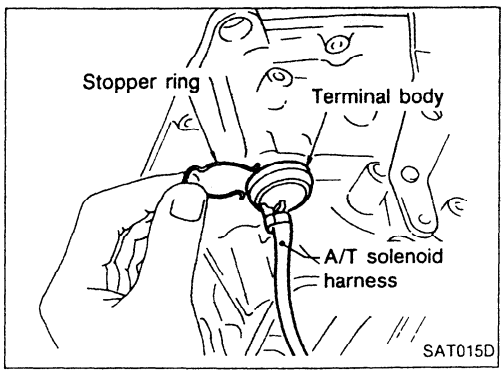
8. Check foreign materials in oil pan to help determine cause of malfunction. If the fluid is very dark, smells burned, or contains foreign particles, the frictional material (clutches, band) may need replacement. A tacky film that will not wipe clean indicates varnish build up which can cause valves, servo, and clutches to stick and may inhibit pump pressure.



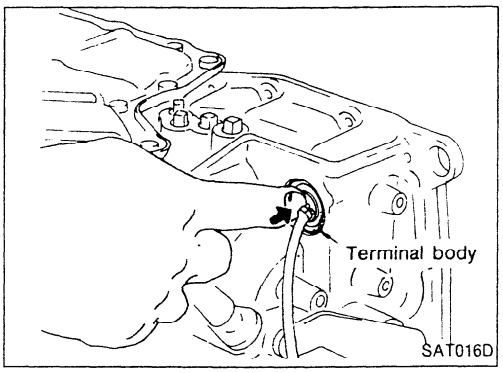
SAT711D

9. Remove control valve assembly according to the following procedures.

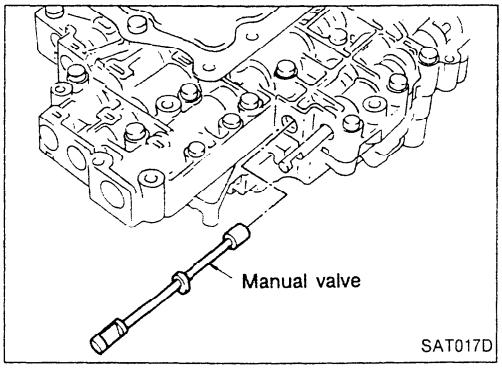
a. Remove control valve assembly mounting bolts Ⓐ, Ⓑ, Ⓒ and Ⓓ.



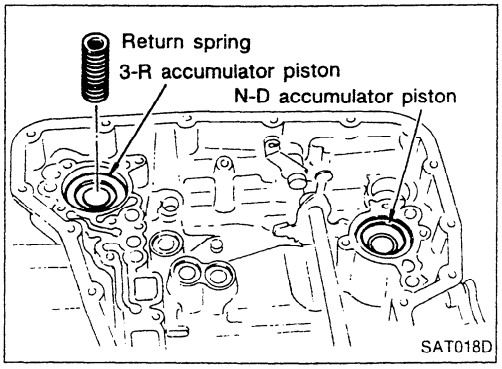
b. Remove stopper ring from terminal body.



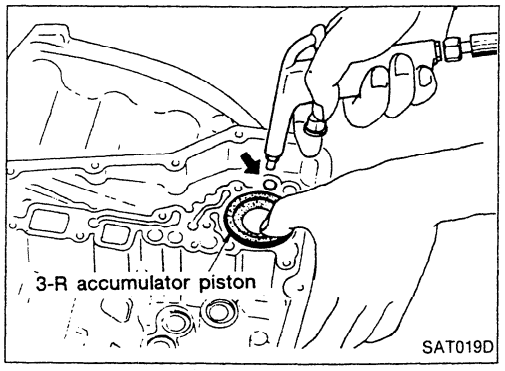
c. Push terminal body into transmission case and draw out solenoid harness.



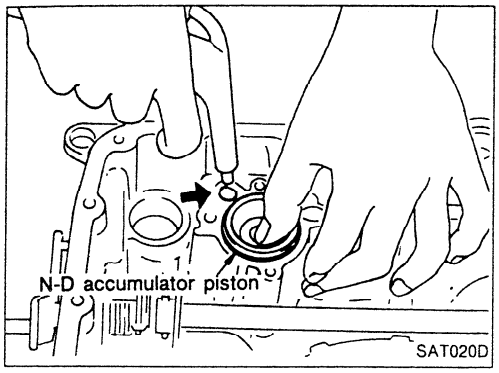
10. Remove manual valve from control valve assembly.



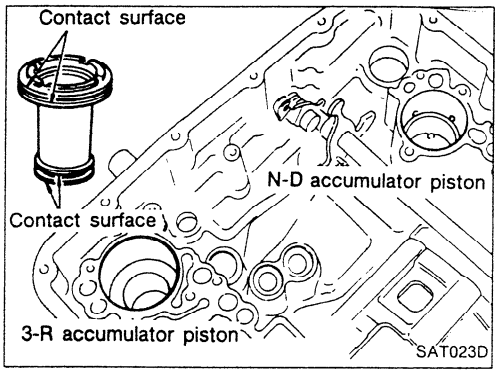
11. Remove return spring from 3-R accumulator piston.



12. Remove 3-R accumulator piston with compressed air.
13. Remove O-rings from 3-R accumulator piston.



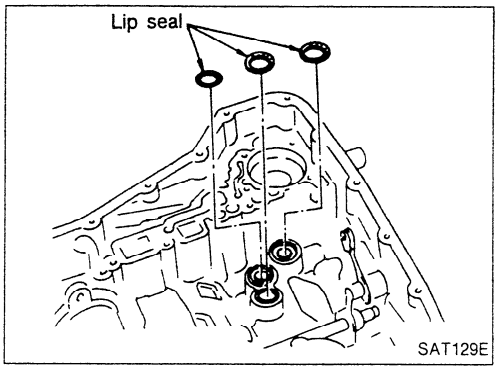
14. Remove N-D accumulator piston and return spring with compressed air.
15. Remove O-rings from N-D accumulator piston.



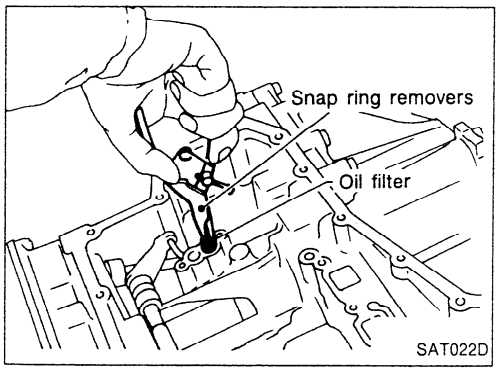
16. Check accumulator pistons and contact surface of transmission case for damage.
17. Check accumulator return springs for damage and free length.

Unit. mm (in)

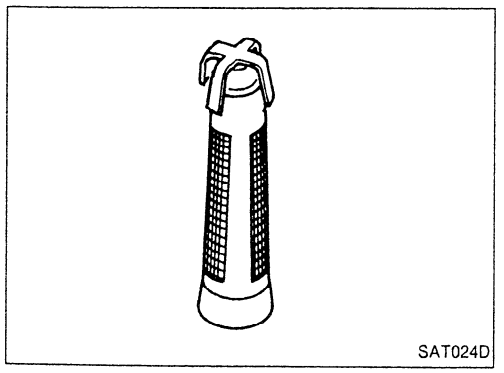
Spring	Free length	Outer diameter
3-R accumulator spring	56.4 (2.220)	21.0 (0.827)
N-D accumulator spring	43.5 (1.713)	28 0 (1.102)



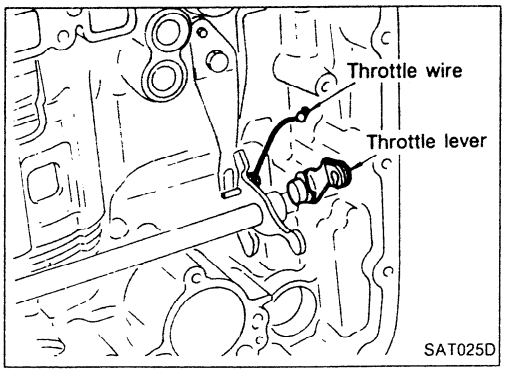
18. Remove lip seals from band servo oil port.



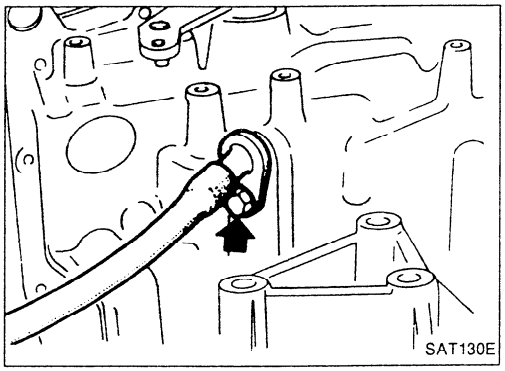
19. Remove oil filter for governor.



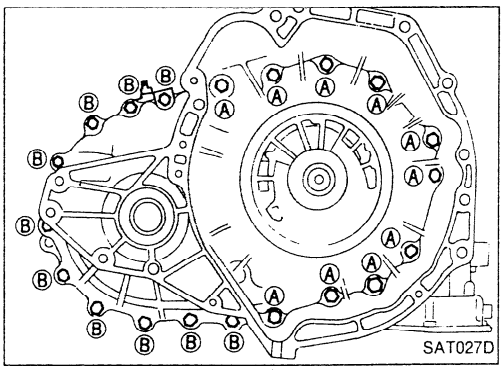
20. Check oil filter for governor for damage or clogging.



21. Remove throttle wire from throttle lever.

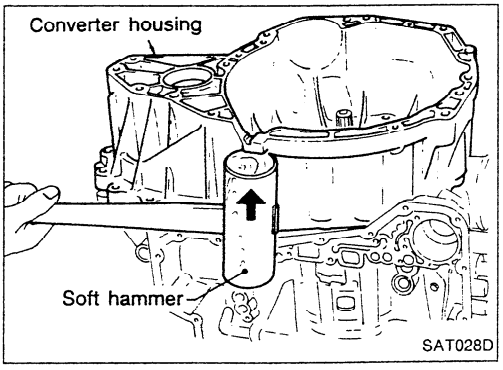


22. Remove throttle wire mounting bolt.
23. Draw out throttle wire from transmission case.

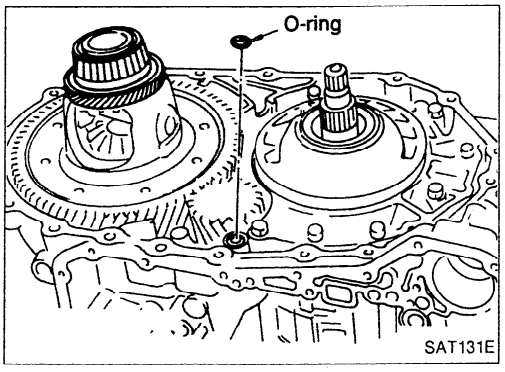


24. Remove converter housing according to the following procedures.

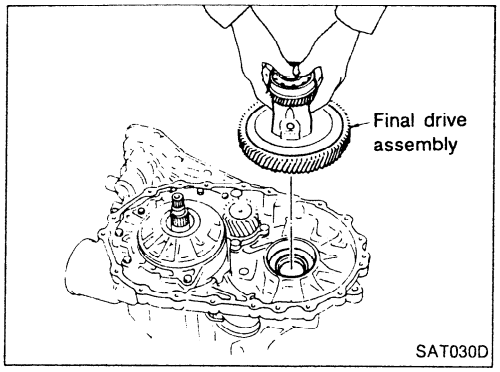
a. Remove converter housing mounting bolts Ⓐ and Ⓑ.



b. Remove converter housing.

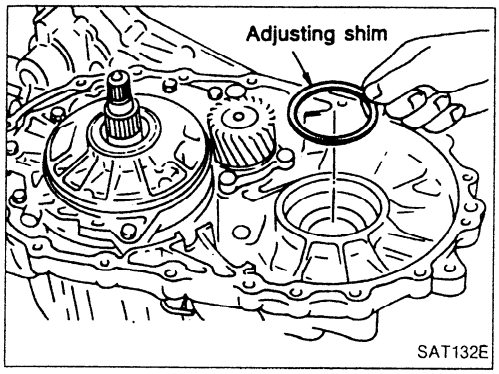


c. Remove O-ring from differential oil port.

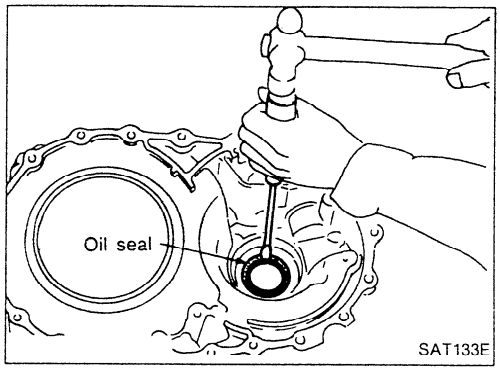


25. Remove final drive assembly from transmission case.

If it is difficult to lift up by hand, tap final drive slightly with a soft hammer.

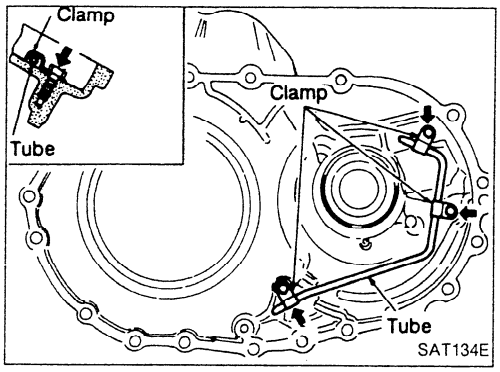


26. Remove differential side bearing adjusting shim from transmission case.

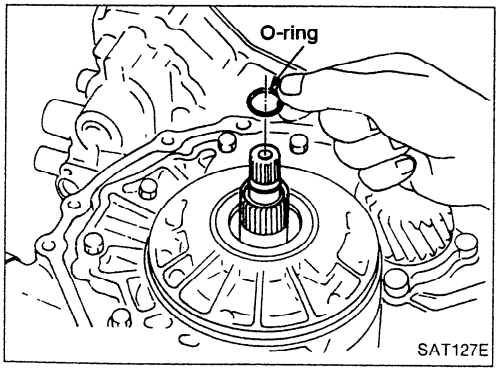


27. Remove oil seal from converter housing using a screwdriver.

- **Be careful not to damage housing.**

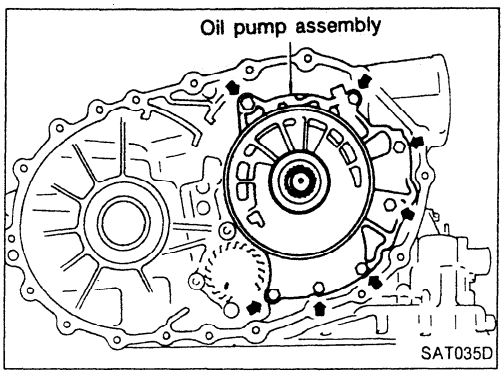


28. Remove oil tube from converter housing.

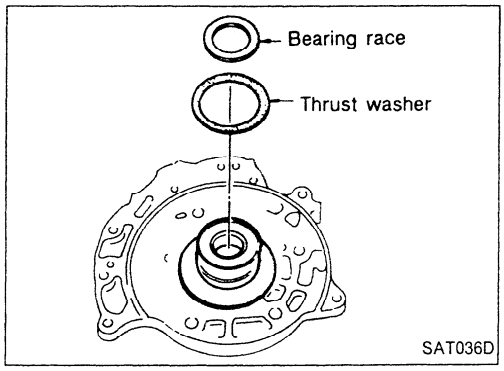


29. Remove oil pump according to the following procedures.

a. Remove O-ring from input shaft.

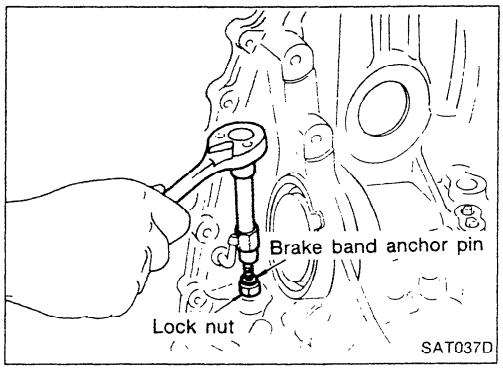


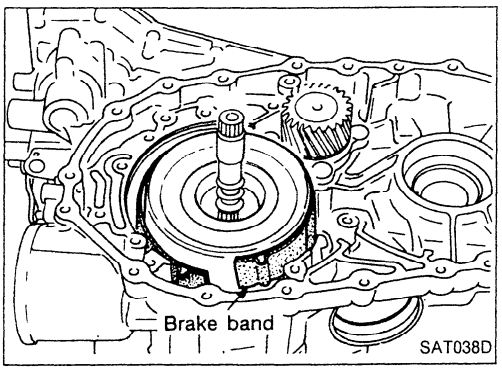
b. Remove oil pump assembly from transmission case.



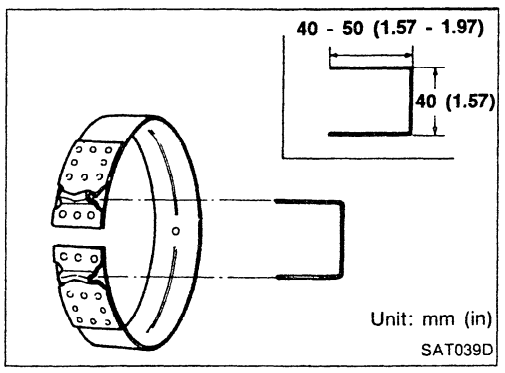
c. Remove thrust washer and bearing race from oil pump assembly.

30. Remove brake band according to the following procedures.
a. Loosen lock nut, then back off band servo anchor end pin.

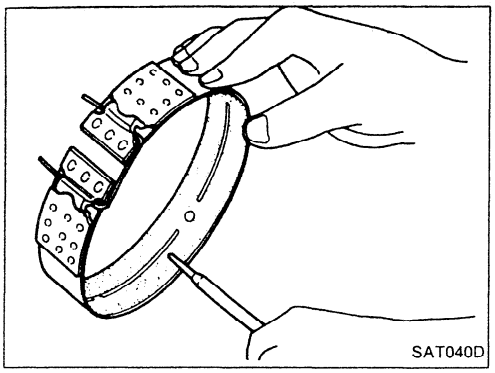




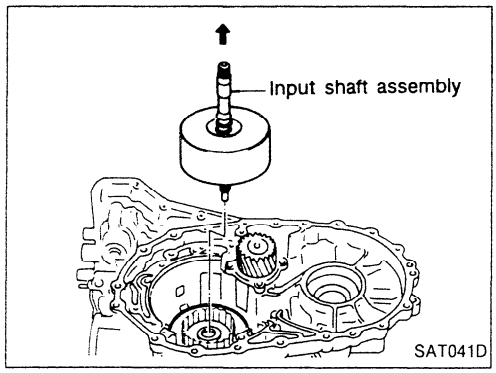
b. Remove brake band from transmission case.



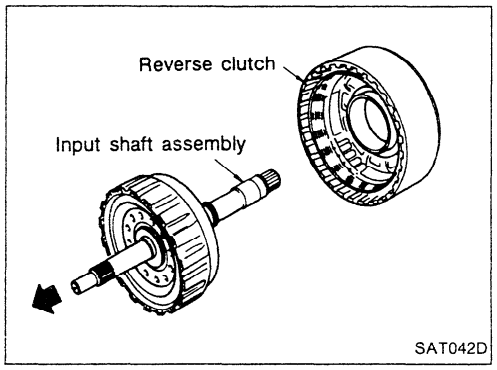
- **To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. When removing the brake band, always secure it with a clip as shown in the figure at left.**
  Leave the clip in position after removing the brake band.



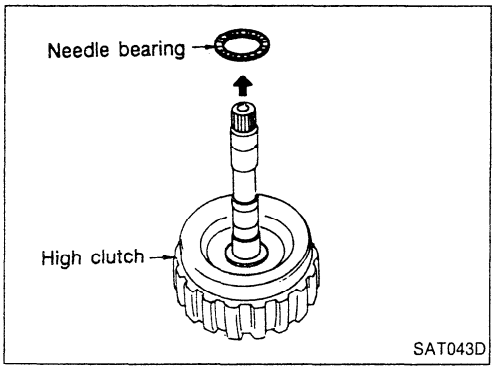
c. Check brake band facing for damage, cracks, wear or burns.



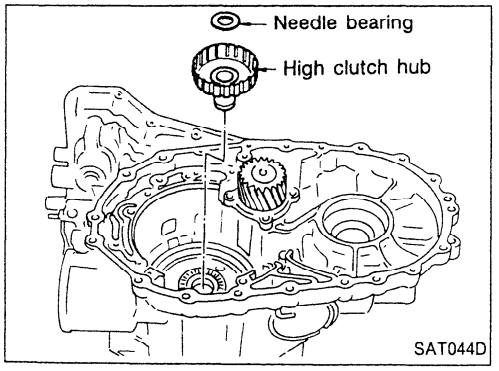
31. Remove input shaft assembly (high clutch) and reverse clutch according to the following procedures.
a. Remove input shaft assembly (high clutch) with reverse clutch.



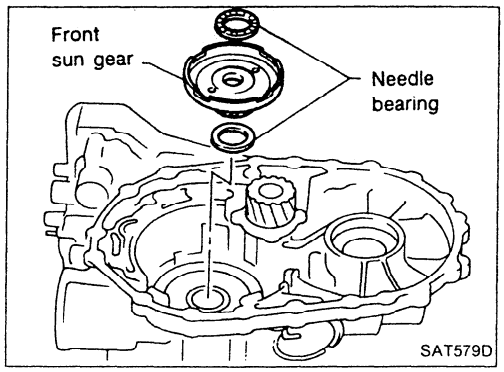
b. Remove input shaft assembly (high clutch) from reverse clutch.



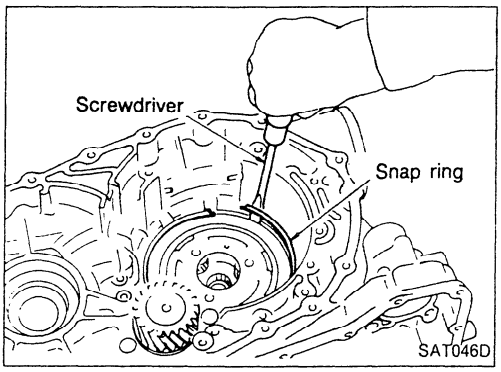
c. Remove needle bearing from high clutch drum.
d. Check input shaft assembly and needle bearing for damage or wear.



32. Remove high clutch hub and needle bearing from transmission case.
33. Check high clutch hub and needle bearing for damage or wear.

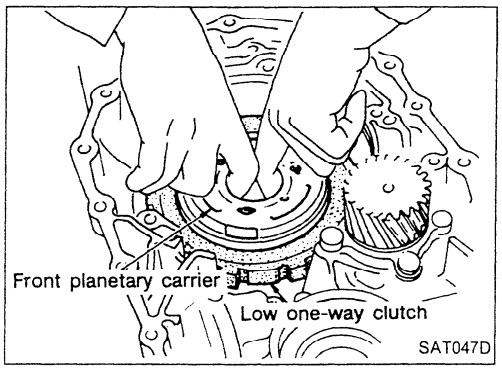


34. Remove front sun gear and needle bearings from transmission case.
35. Check front sun gear and needle bearings for damage or wear.

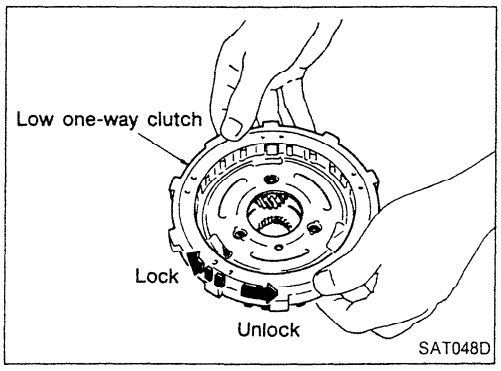


36. Remove front planetary carrier assembly and low one-way clutch according to the following procedures.

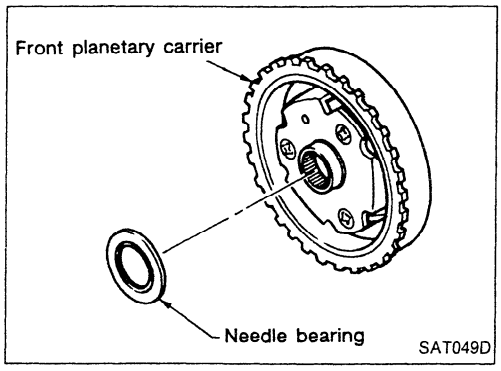
a. Remove snap ring using a screwdriver.



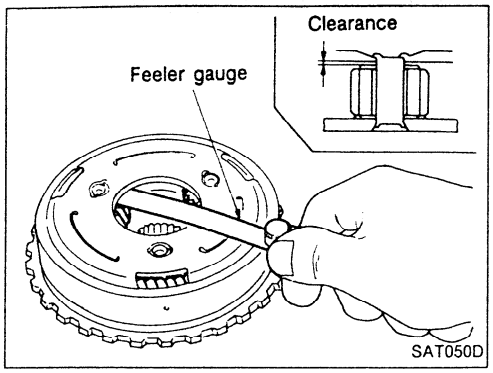
b. Remove front planetary carrier with low one-way clutch.



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.

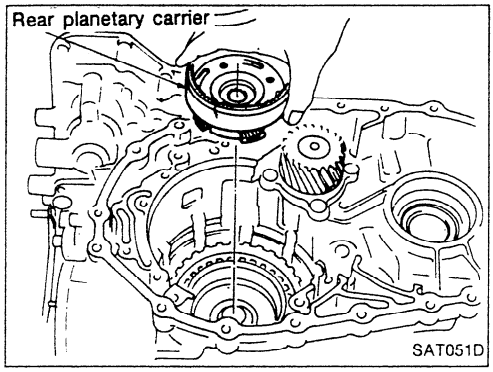


f. Check front planetary carrier, low one-way clutch and needle bearing for damage or wear.
g. Check clearance between pinion washer and planetary carrier using feeler gauge.

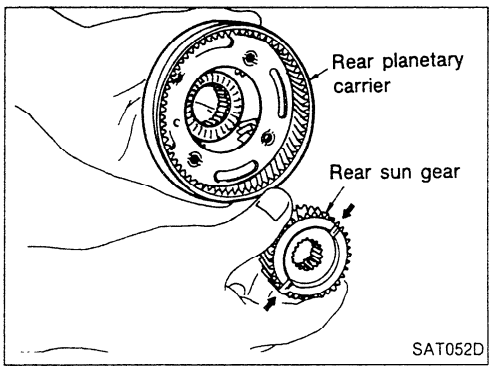
Standard clearance:

0.15 - 0.70 mm (0.0059 - 0.0276 in)

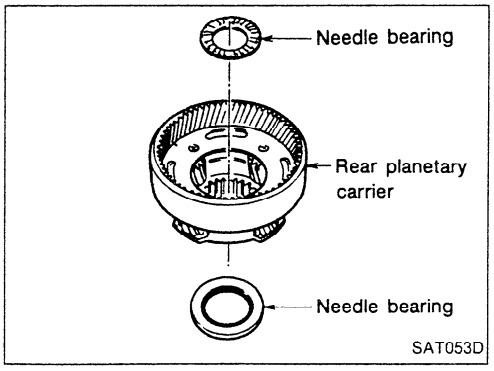
Replace if the clearance exceeds 0.80 mm (0.0315 in).



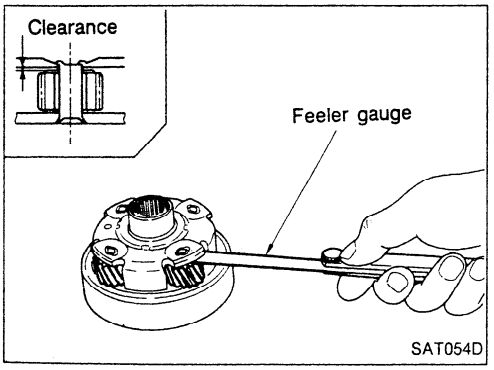
37. Remove rear planetary carrier assembly and rear sun gear according to the following procedures.
a. Remove rear planetary carrier assembly from transmission case.



b. Remove rear sun gear from rear planetary carrier.



c. Remove needle bearings from rear planetary carrier assembly.

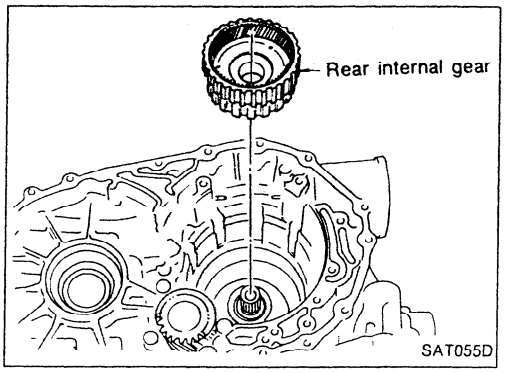


d. Check rear planetary carrier, rear sun gear and needle bearings for damage or wear.
e. Check clearance between pinion washer and rear planetary carrier using feeler gauge.

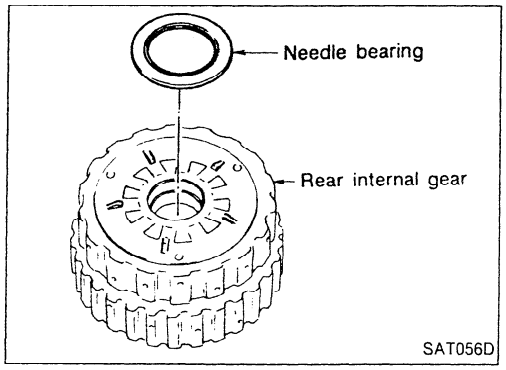
Standard clearance:

0.15 - 0.70 mm (0.0059 - 0.0276 in)

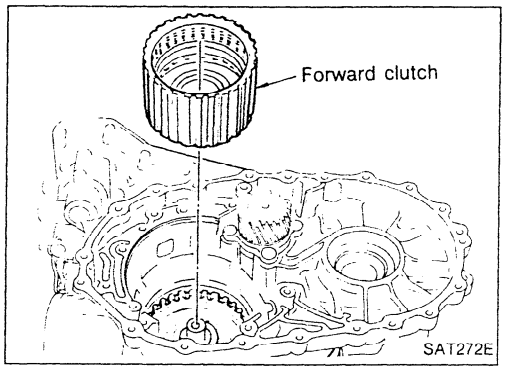
Replace if the clearance exceeds 0.80 mm (0.0315 in).



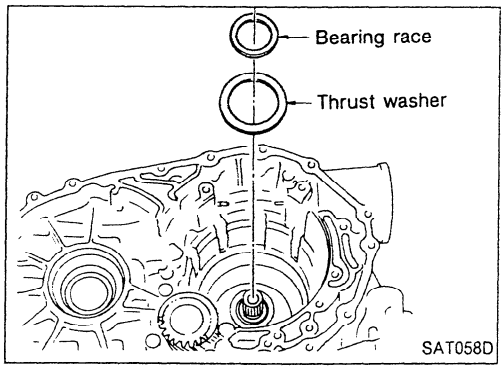
38. Remove rear internal gear from transmission case.



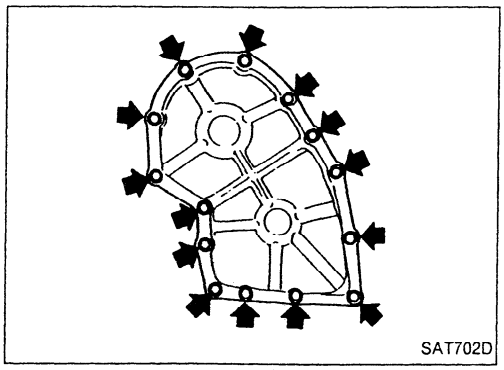
39. Remove needle bearing from rear internal gear.
40. Check needle bearing for damage or wear.



41. Remove forward clutch assembly from transmission case.



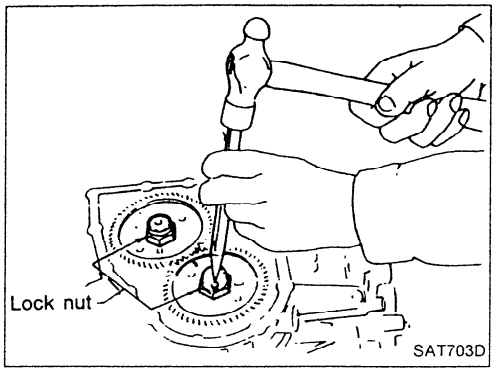
42. Remove thrust washer and bearing race from transmission case.



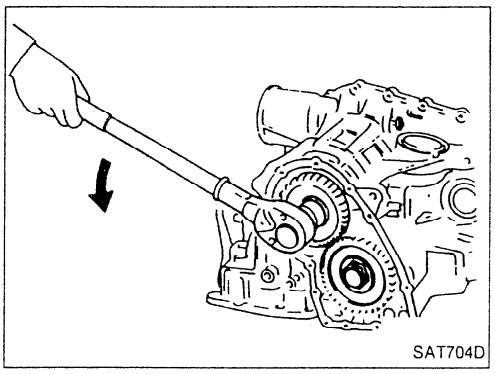
43. Remove output shaft, output gear and reduction gear according to the following procedures.

a. Remove side cover.

- **Do not reuse side cover bolts.**

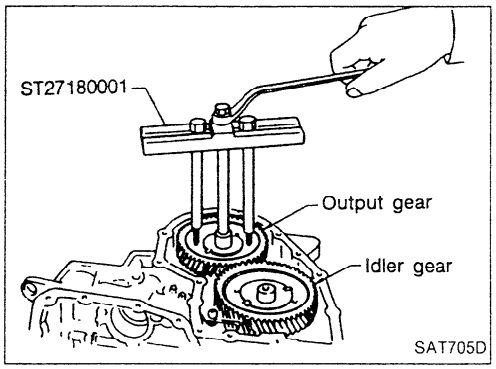


b. Set manual lever to "P" position to fix idler gear and output gear.
c. Unlock both idler gear and output gear lock nuts using a pin punch.

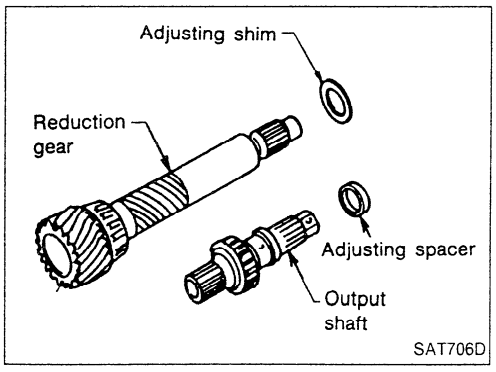


d. Remove idler gear and output gear lock nuts.

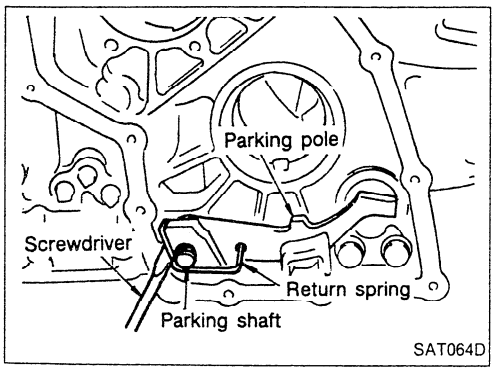
- **Do not reuse idler gear and output gear lock nuts.**



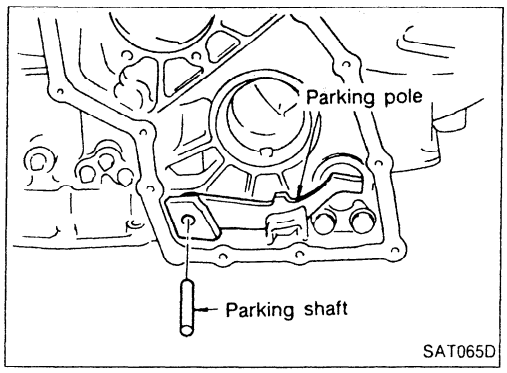
e. Remove idler gear and output gear using a puller.



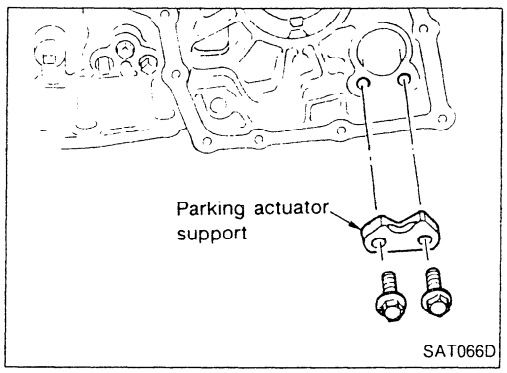
f. Remove reduction gear and output shaft from transmission case.
g. Remove adjusting shim from reduction gear.
h. Remove adjusting spacer from output shaft.



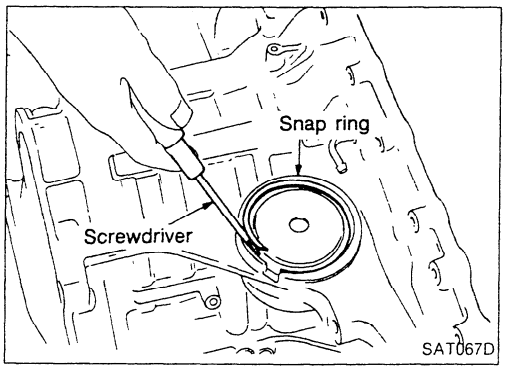
44. Remove return spring from parking shaft using a screwdriver.



45. Draw out parking shaft and remove parking pole from transmission case.
46. Check parking pole and shaft for damage or wear.

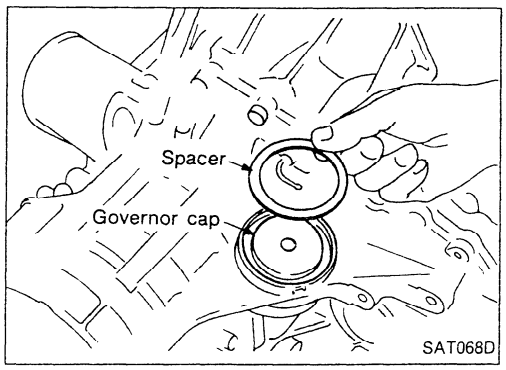


47. Remove parking actuator support from transmission case.
48. Check parking actuator support for damage or wear.

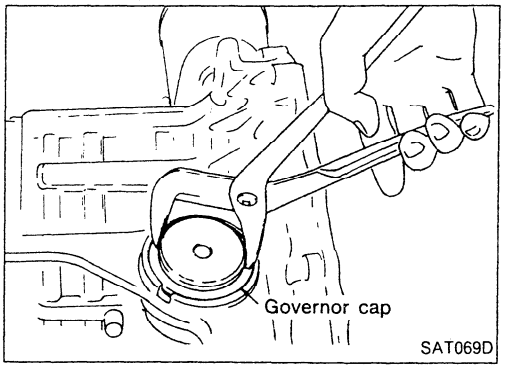


49. Remove governor valve assembly according to the following procedures.

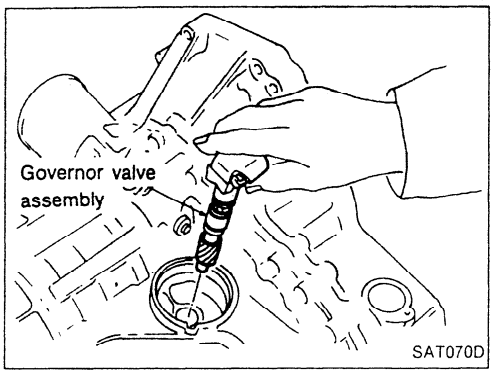
a. Remove snap ring using a screwdriver.



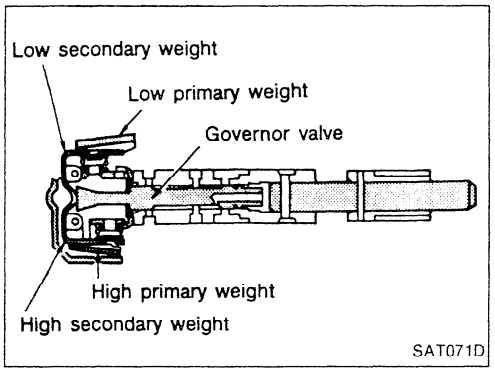
b. Remove spacer from governor cap.



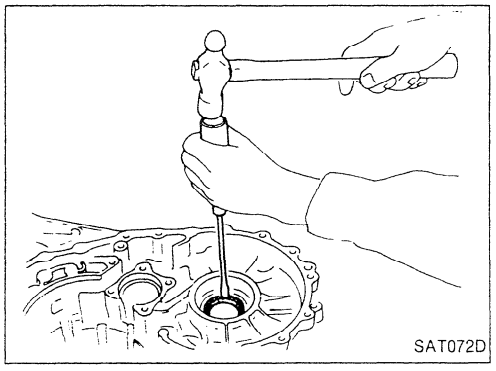
c. Remove governor cap using water pump pliers.
d. Remove O-ring from governor cap.



e. Remove governor valve assembly.



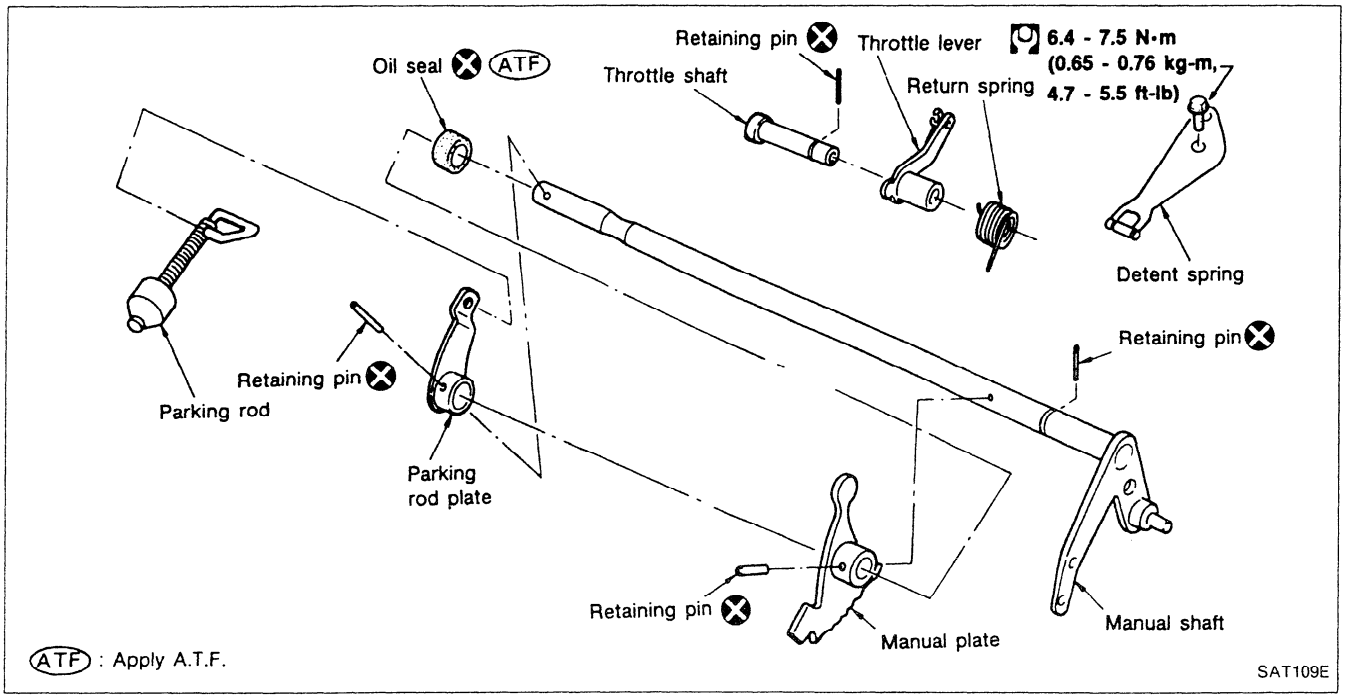
f. With low primary weight closed, place top of governor valve assembly down to make sure governor valve properly lowers under its own weight.
g. Place top of governor assembly down. Operate both low and high secondary weights to make sure governor valve functions properly.

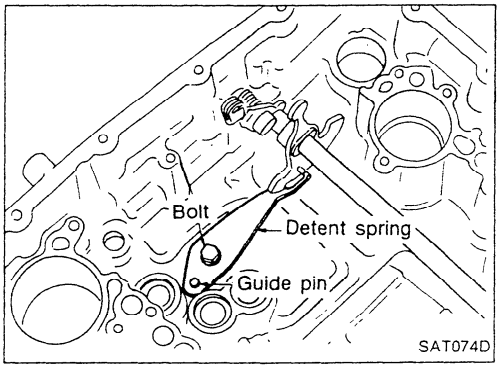


50. Remove side oil seal from transmission case using a screwdriver.

- **Be careful not to damage case.**

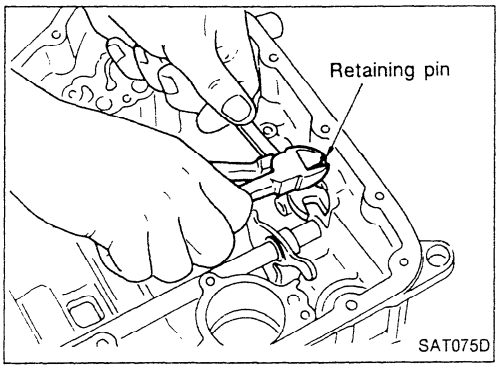
Manual Shaft and Throttle Lever



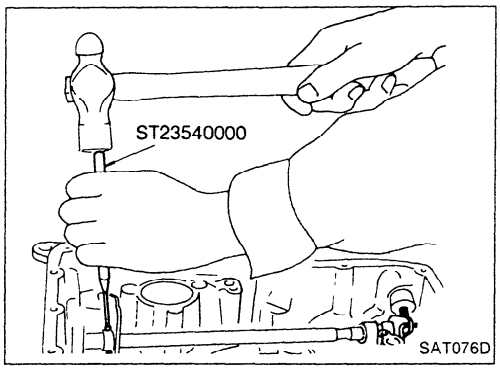


REMOVAL

1. Remove detent spring from transmission case.

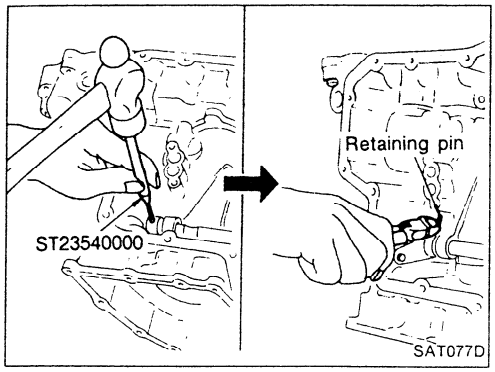


2. Pull out throttle shaft retaining pin, then draw out throttle shaft from transmission case.

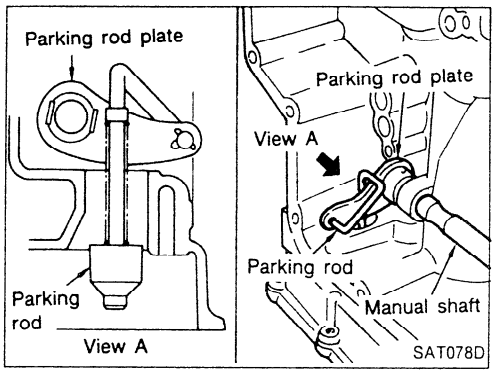


3. Drive out manual plate retaining pin.

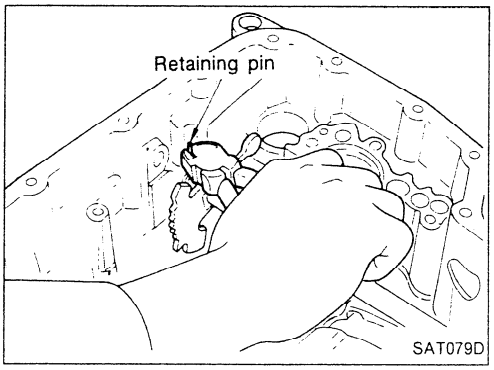
Manual Shaft and Throttle Lever (Cont'd)



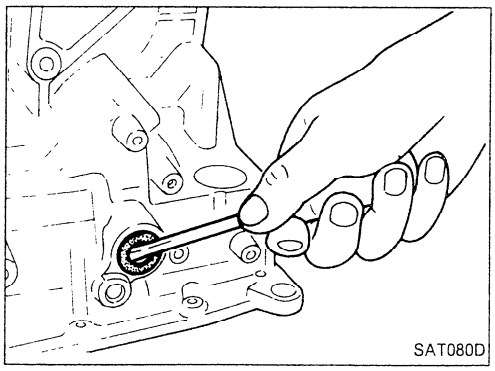
4. Drive and then pull out parking rod plate retaining pin.



5. Remove parking rod plate from manual shaft.
6. Draw out parking rod from transmission case.



7. Pull out manual shaft retaining pin.
8. Remove manual shaft and manual plate from transmission case.

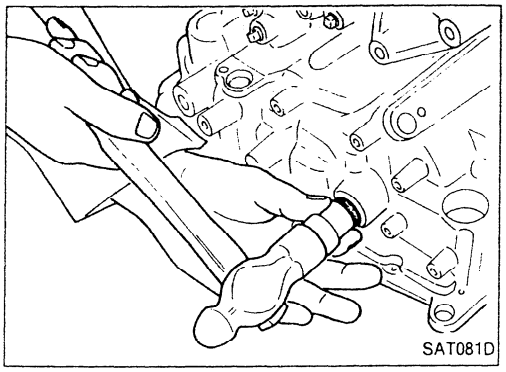


9. Remove manual shaft oil seal.

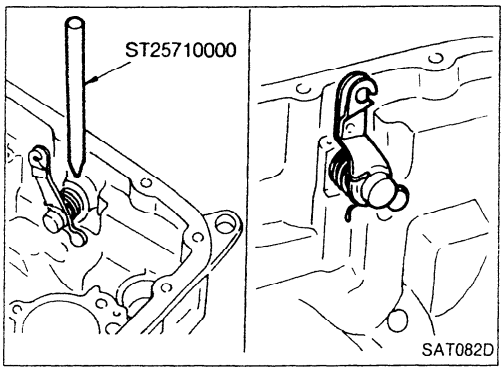
INSPECTION

- Check component parts for wear or damage. Replace if necessary.

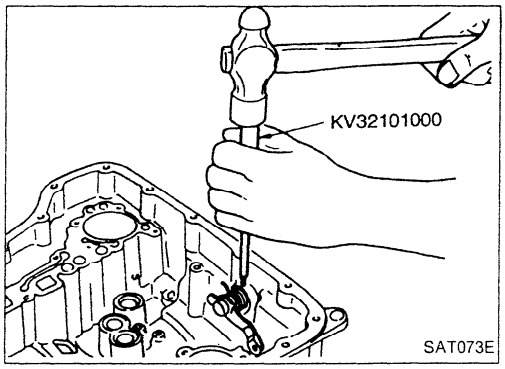
INSTALLATION



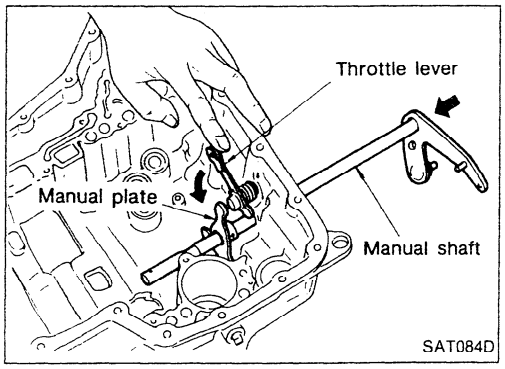
1. Install manual shaft oil seal.
- **Apply A.T.F. to outer surface of oil seal.**



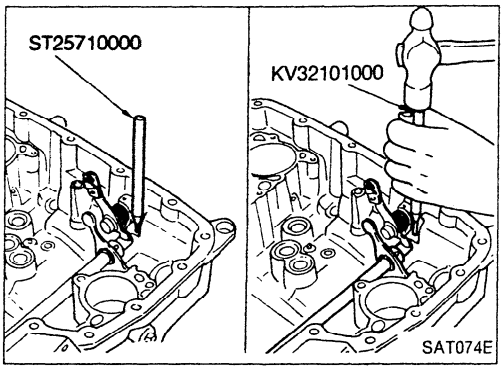
2. Install throttle lever and return spring on throttle shaft.
3. Install throttle lever assembly on transmission case.



4. Align groove of throttle shaft and hole of transmission case.
5. Install throttle shaft retaining pin.

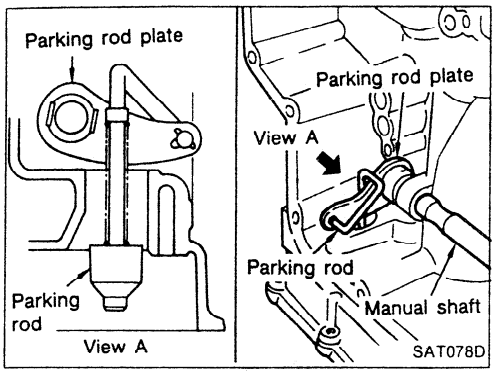


6. Move throttle lever in the direction of the arrow.
7. Install manual shaft and manual plate.

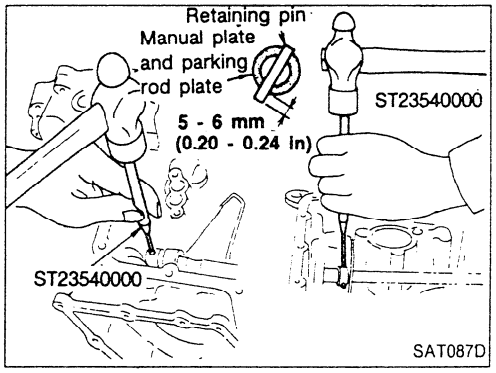


8. Align groove of manual shaft and hole of transmission case.
9. Install manual shaft retaining pin.

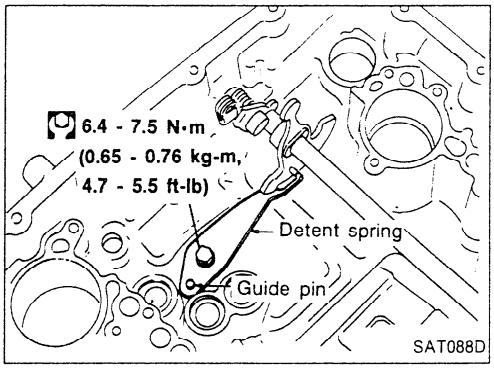
Manual Shaft and Throttle Lever (Cont'd)



10. Install parking rod to parking rod plate.
11. Install parking rod assembly to manual shaft.

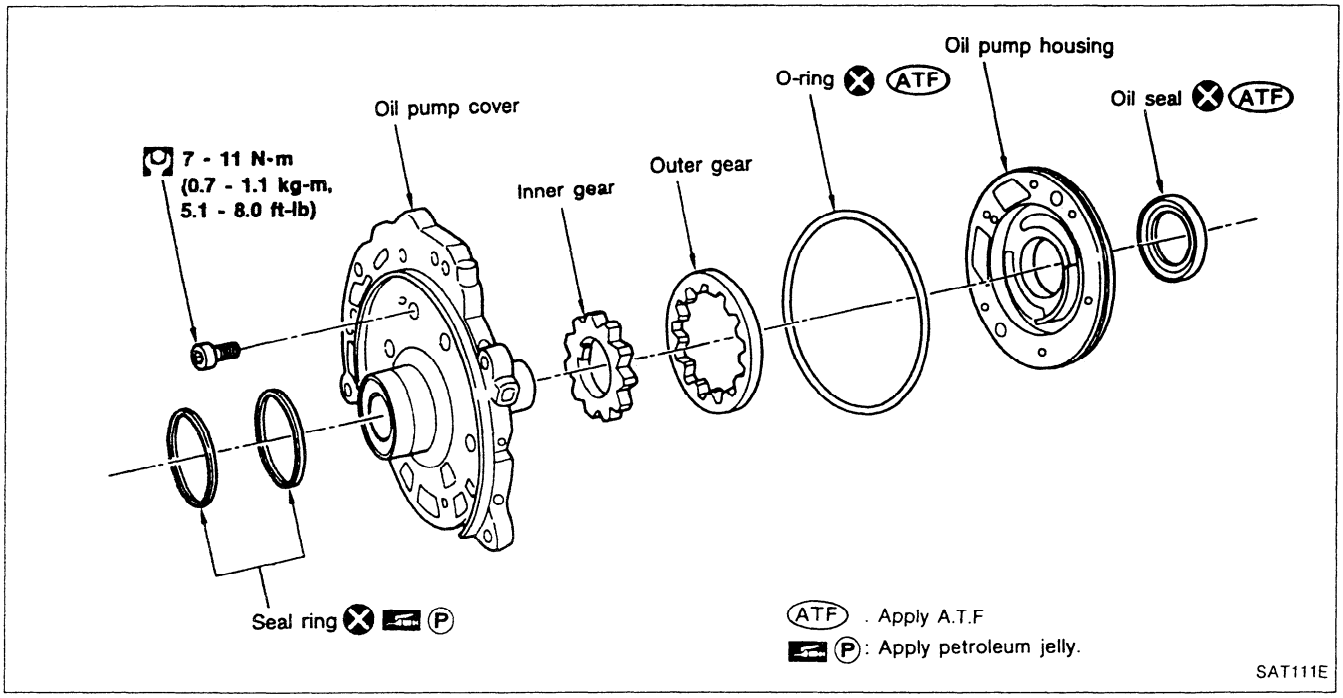


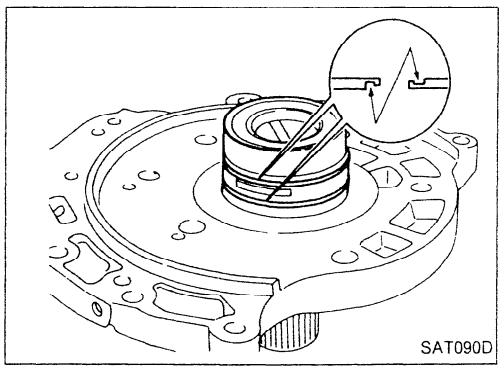
12. Install manual plate retaining pin and parking rod plate retaining pin.



13. Install detent spring.

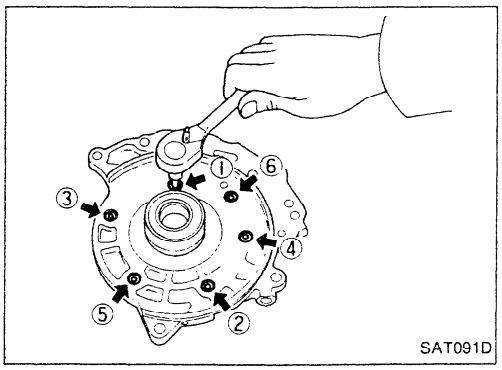
Oil Pump



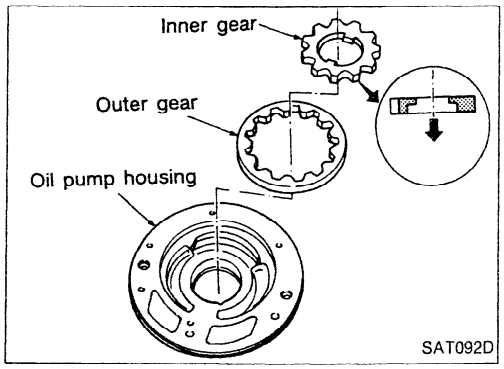


DISASSEMBLY

1. Remove seal rings by undoing hooks.

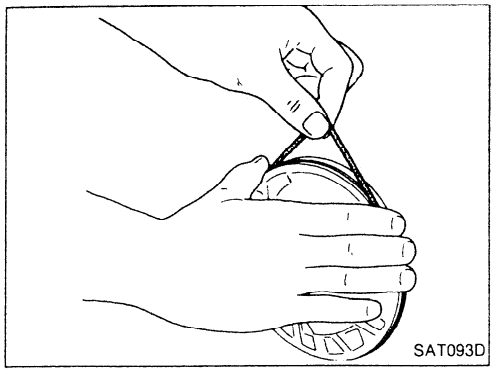


2. Loosen bolts in numerical order and remove oil pump cover.

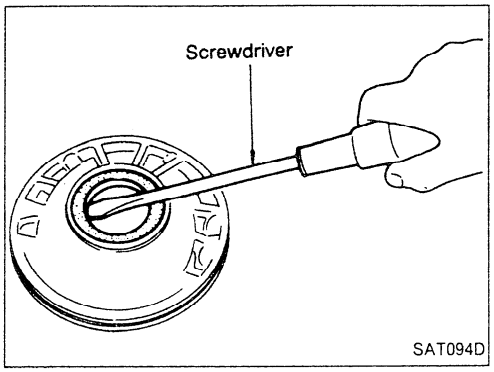


3. Remove inner and outer gear from oil pump housing.

Oil Pump (Cont'd)



4. Remove O-ring from oil pump housing.

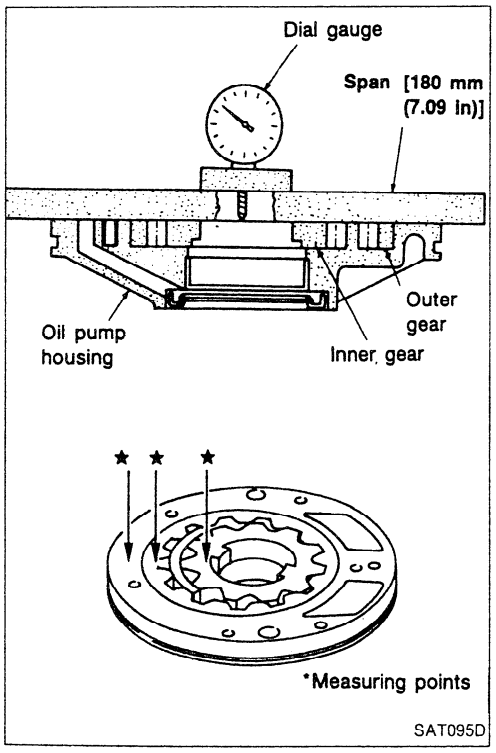


5. Remove oil pump housing oil seal.

INSPECTION

Oil pump housing, oil pump cover, inner gear and outer gear

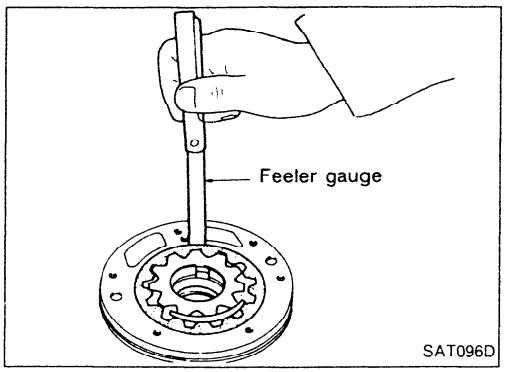
- Check for wear or damage.



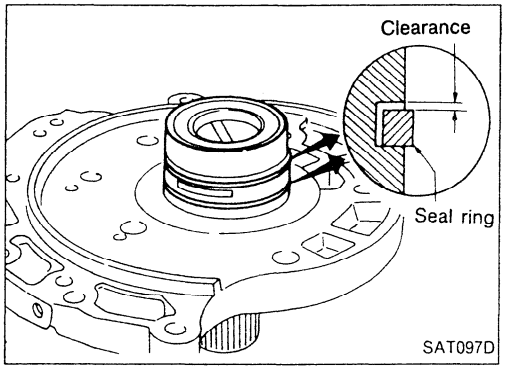
Side clearance

- 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 ranges.
  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 S.D.S.
- If clearance is more than standard, replace whole oil pump assembly except oil pump cover.

Oil Pump (Cont'd)

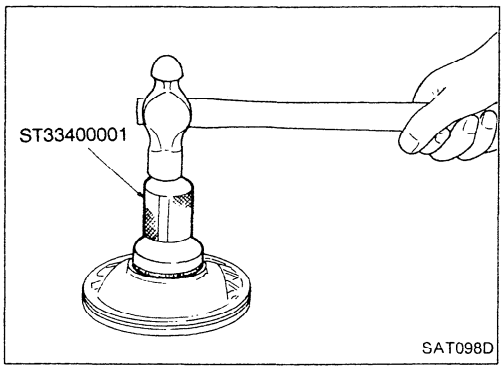


- Measure clearance between outer gear and oil pump housing.
  Standard clearance:
  0.08 - 0.15 mm (0.0031 - 0.0059 in)
- If not within standard clearance, replace whole oil pump assembly except oil pump cover.



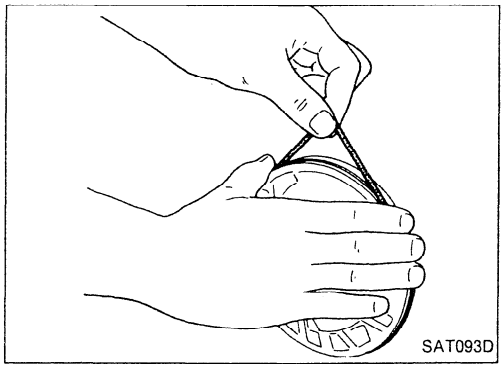
Seal ring clearance

- Install new seal rings onto oil pump cover.
- Measure clearance between seal ring and ring groove.
  Standard clearance:
  0.07 - 0.19 mm (0.0028 - 0.0075 in)
  Allowable limit:
  0.19 mm (0.0075 in)
- If not within wear limit, replace oil pump cover assembly.

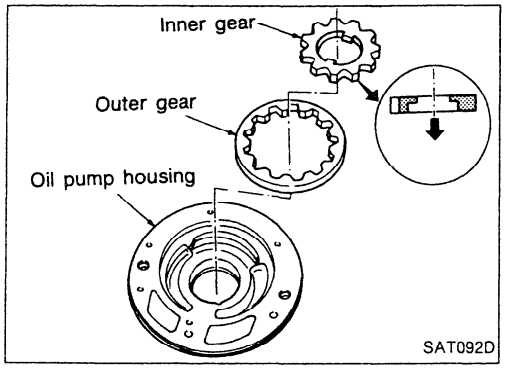


ASSEMBLY

1. Install oil seal on oil pump housing.

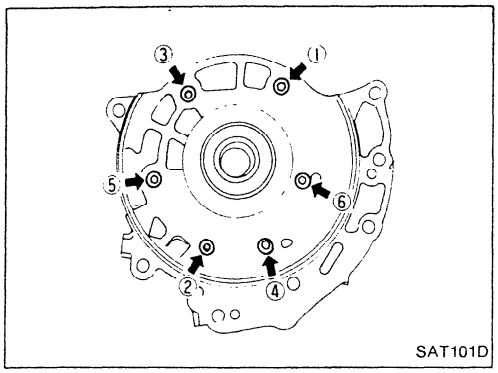


2. Install O-ring on oil pump housing.
- **Apply A.T.F. to O-ring.**



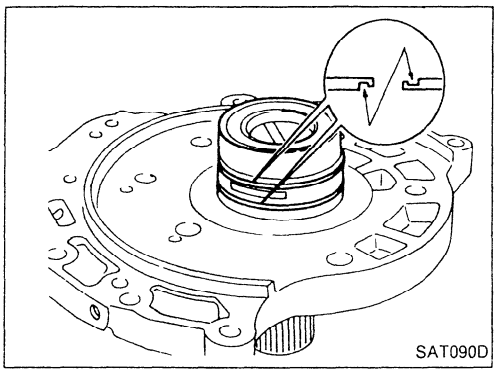
3. Install inner and outer gears on oil pump housing.
- **Take care with the direction of the inner gear.**

Oil Pump (Cont'd)



SAT101D

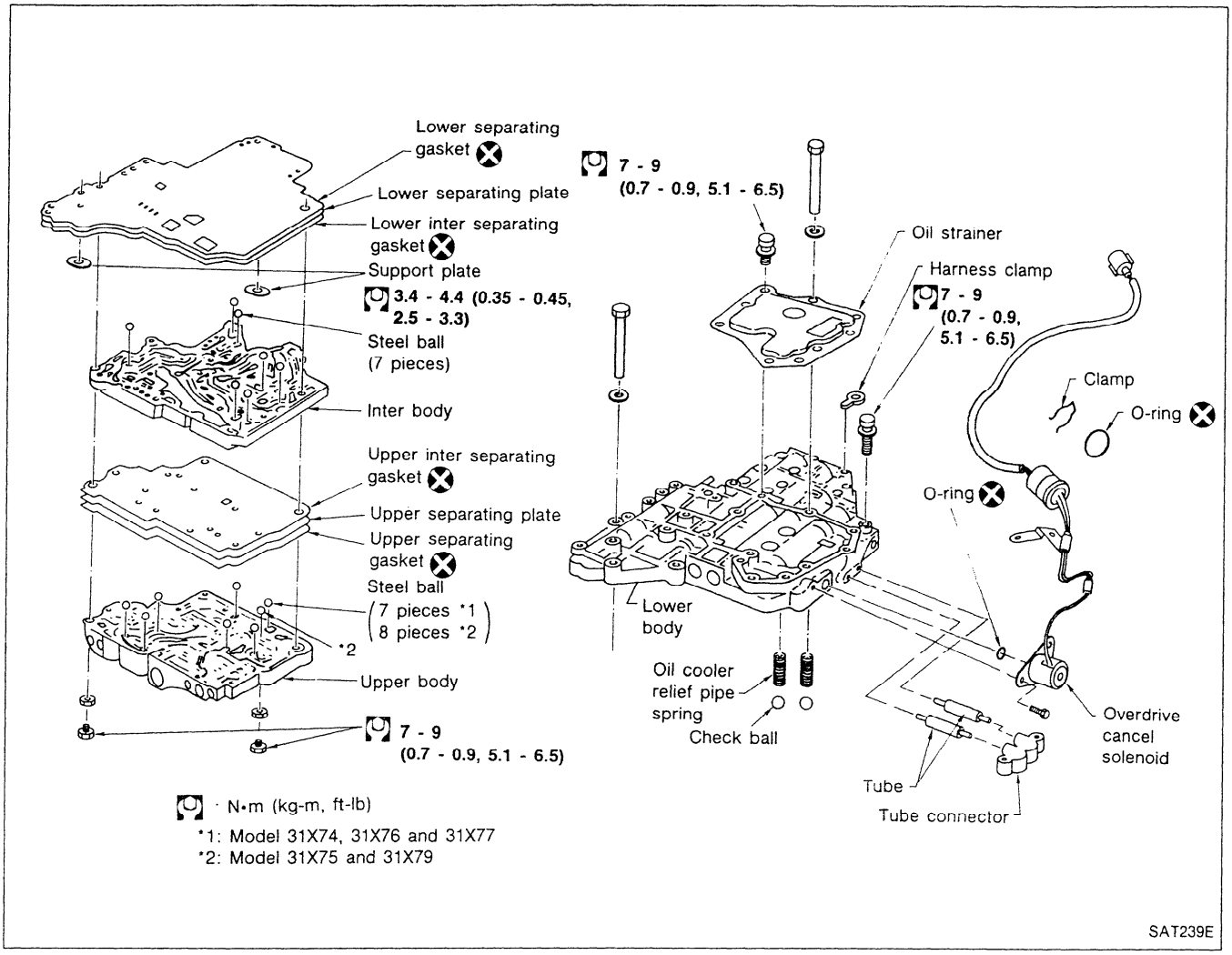
4. Install oil pump cover on oil pump housing.
a. Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly on oil pump housing assembly, then remove masking tape.
b. Tighten bolts in numerical order.

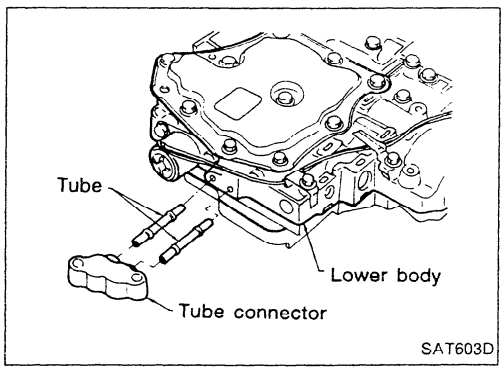

SAT090D

5. Install new seal rings carefully after packing ring groove with petroleum jelly and connect hooks.

- **Do not spread gap of seal ring excessively while installing. It may deform the ring.**

Control Valve Assembly

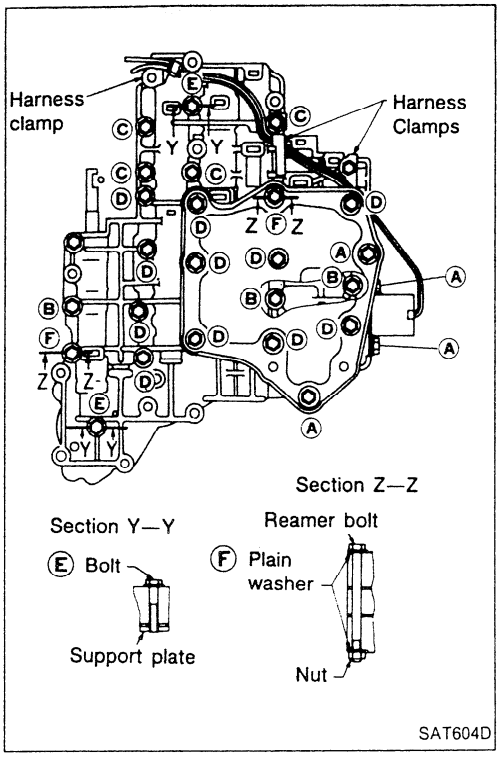




DISASSEMBLY

1. Remove tube connector and tube from control valve lower body.

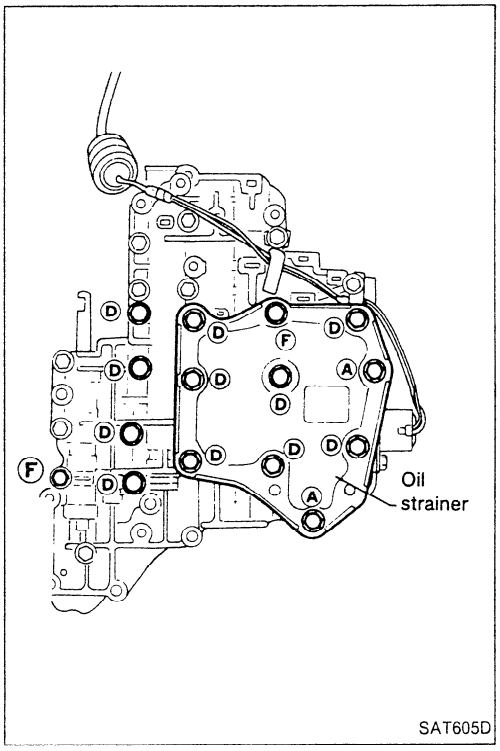
Control Valve Assembly (Cont'd)



2. Disassemble upper, inter and lower bodies using the following procedures.

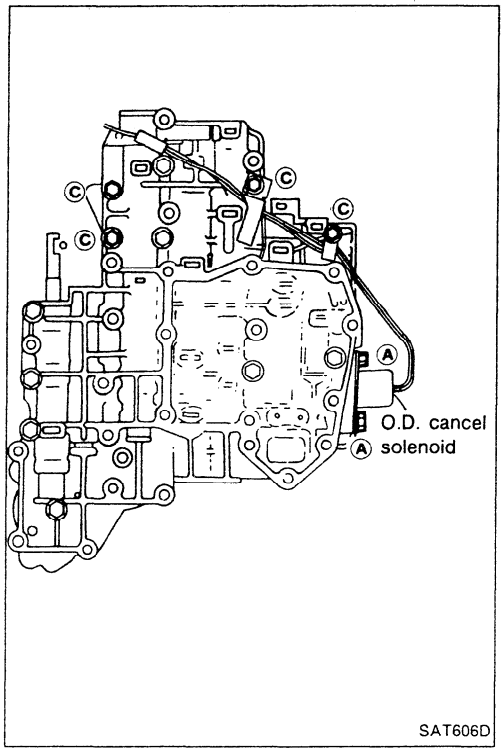
Bolt length, number and location:

Bolt symbol	A	B	C	D	E	F
Bolt length "ℓ" 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	4	3	6	11	2	2

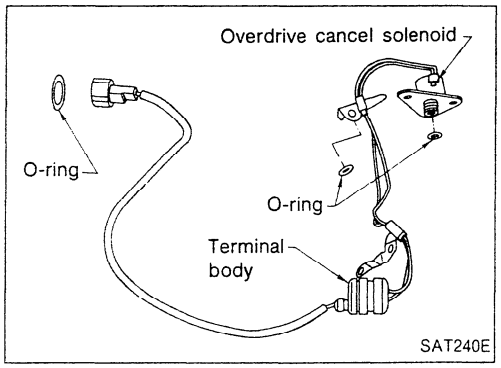


a. Remove bolts Ⓐ, Ⓓ and Ⓕ shown in the illustration.
b. Remove oil strainer from control valve assembly.

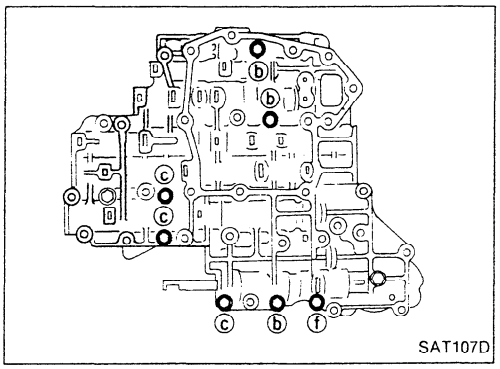
Control Valve Assembly (Cont'd)



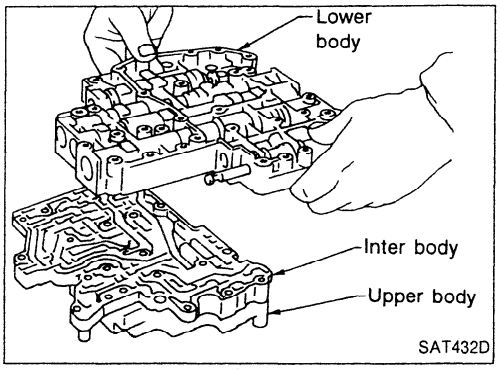
c. Remove O.D. cancel solenoid from control valve assembly.



d. Remove O-rings from O.D. cancel solenoid, and harness terminal body.

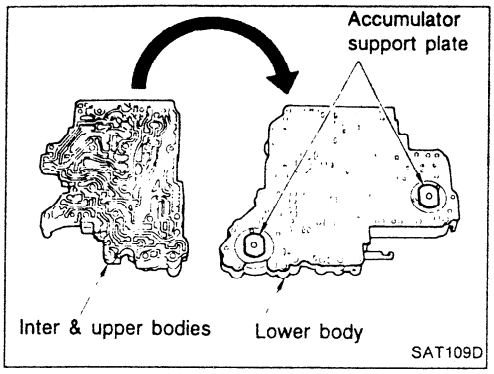


e. Place upper body facedown, and remove bolts.

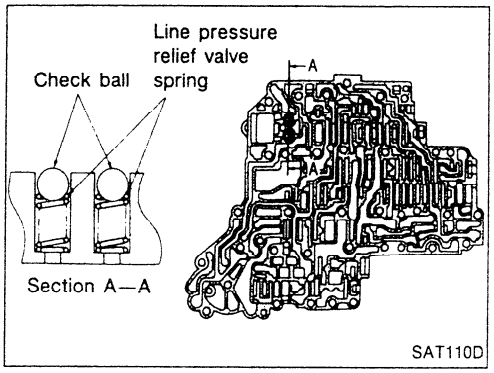


f. Remove lower body from inter body and upper body.

Control Valve Assembly (Cont'd)



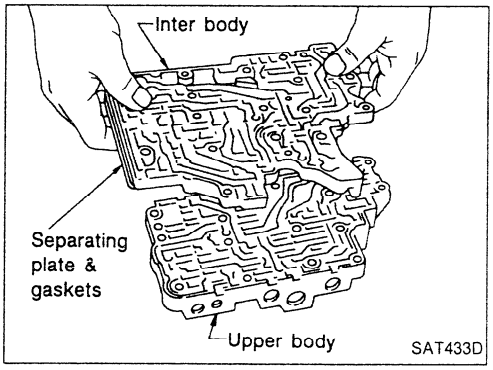
g. Turn over lower body, and remove accumulator support plate.



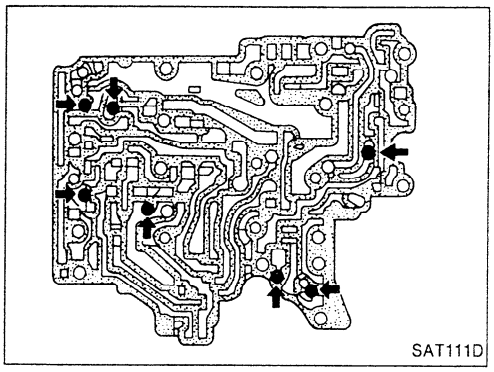
h. Remove separating plate and separating gaskets from lower body.

i. Remove steel balls and relief valve springs from lower body.

- **Be careful not to lose steel balls and relief valve springs.**



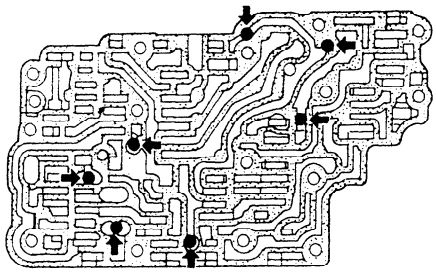
j. Remove inter body from upper body.



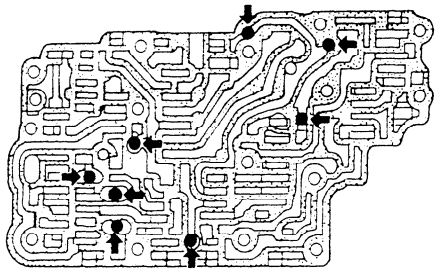
k. Check to see that steel balls are properly positioned in inter body and then remove them from inter body.

- **Be careful not to lose steel balls.**

Model 31X74, 31X76 and 31X77



Model 31X75 and 31X79

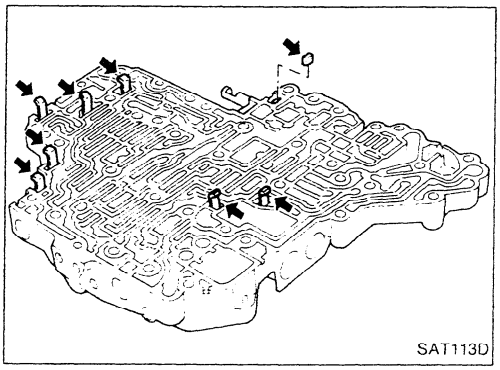


SAT241E

l. Remove separating plate and separating gaskets from upper body.

m. Check to see that steel balls are properly positioned in upper body and then remove them from upper body.

- **Be careful not to lose steel balls.**

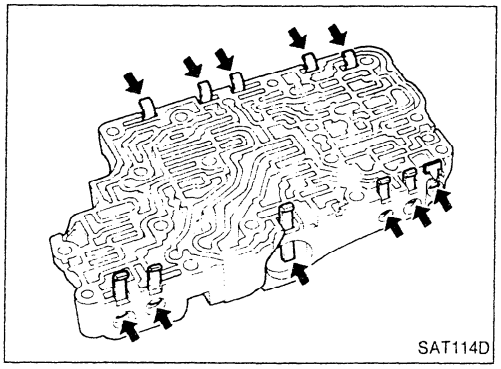


SAT113D

INSPECTION

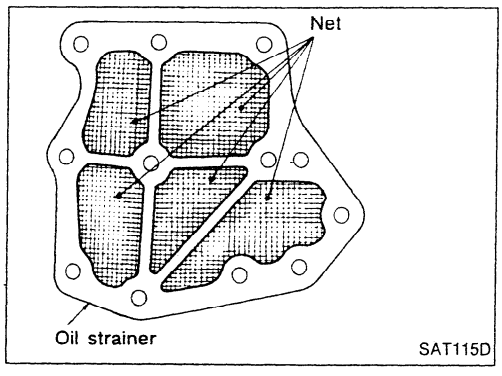
Lower and upper bodies

- Check to see that retainer plates are in proper position in lower body.



SAT114D

- Check to see that retainer plates are in proper position in upper body.
- **Be careful not to lose these parts.**

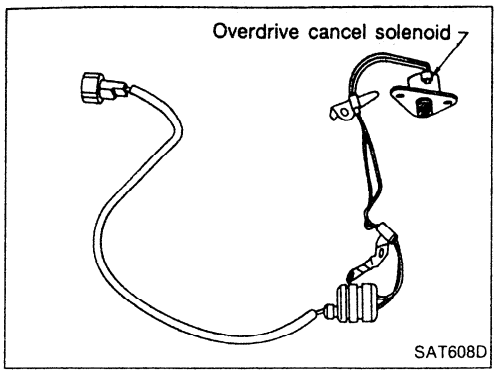


SAT115D

Oil strainer

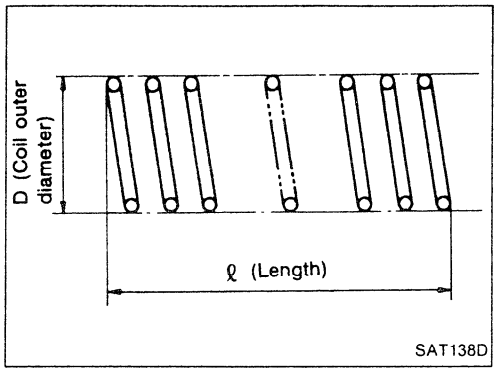
- Check wire netting of oil strainer for damage.

Control Valve Assembly (Cont'd)



O.D. cancel solenoid

- Measure resistance — Refer to "ELECTRICAL SYSTEM".



Oil cooler relief valve spring

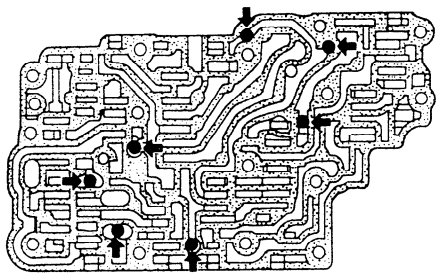
- Check for damage or deformation.
- Measure free length and outer diameter of valve spring.

Inspection standard:

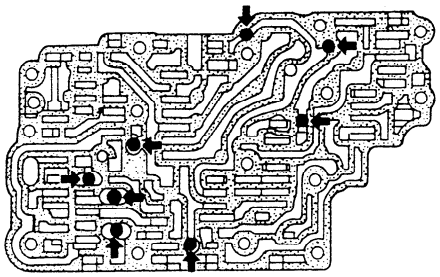
Unit: mm (in)

Part No.	ℓ	D
31872-31X00	17 02 (0 6701)	8.0 (0.315)

Model 31X74, 31X76 and 31X77



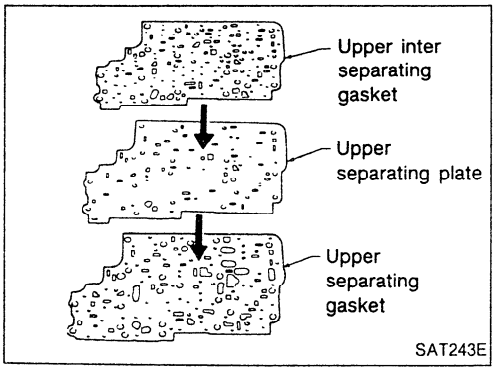
Model 31X75 and 31X79



ASSEMBLY

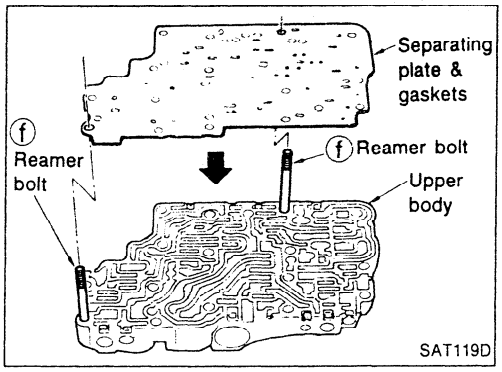
1. Install upper, inter and lower body.

a. Place oil circuit of upper body face up. Install steel balls in their proper positions.

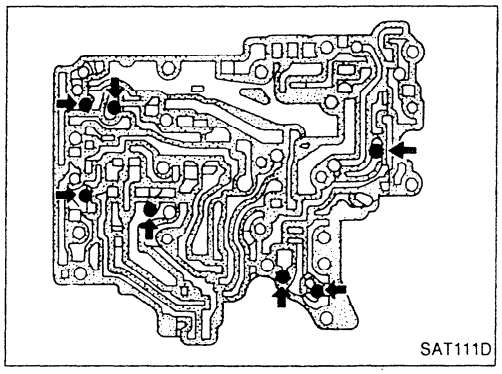


b. Install new upper separating gasket, new upper inter separating gasket and upper separating plate in order shown in illustration.

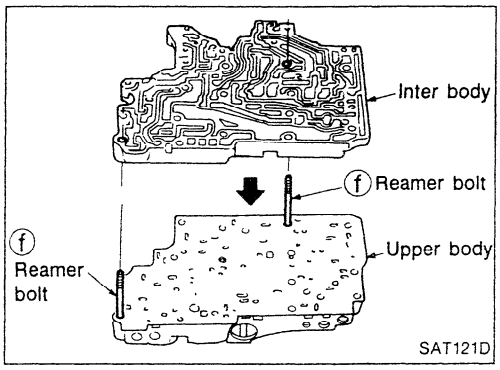
Control Valve Assembly (Cont'd)



c. Install reamer bolts ⓕ from bottom of upper body and install separating gaskets and separating plate as a set on upper body using reamer bolts as guides.

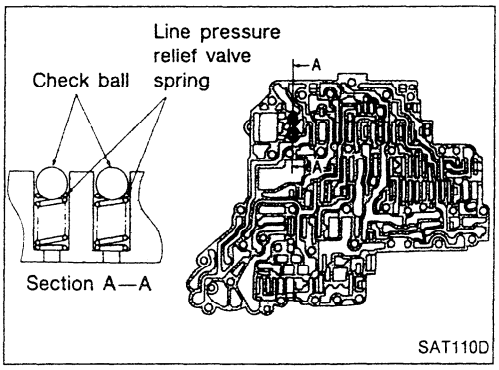


d. Place lower body side of inter body face up. Install steel balls in their proper positions.

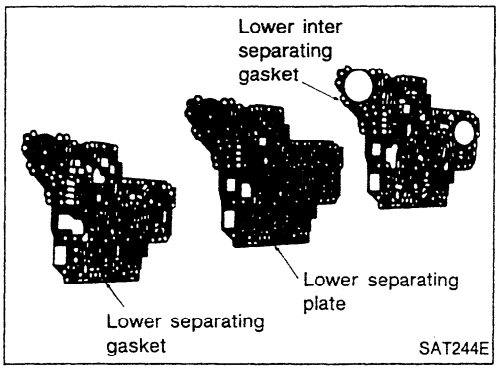


e. Install inter body on upper body using reamer bolts ⓕ as guides.

- **Be careful not to dislocate or drop steel balls.**

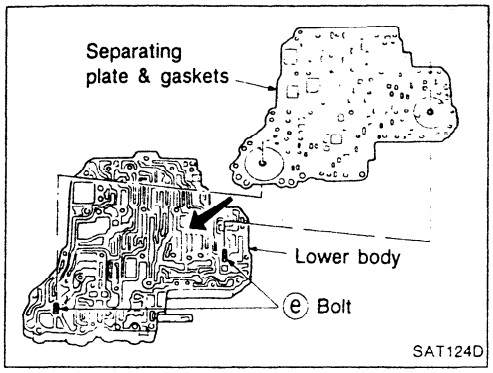


f. Install steel balls and relief valve springs in their proper positions in lower body.

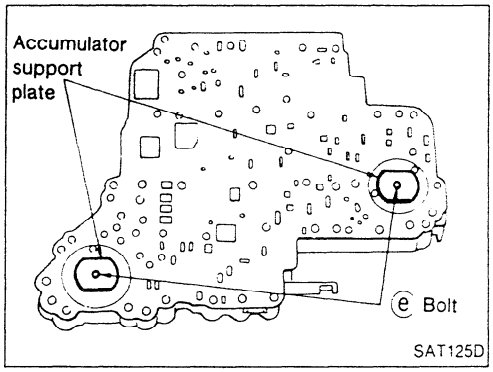


g. Install new lower separating gasket, new lower inter separating gasket and lower separating plate in order shown in illustration.

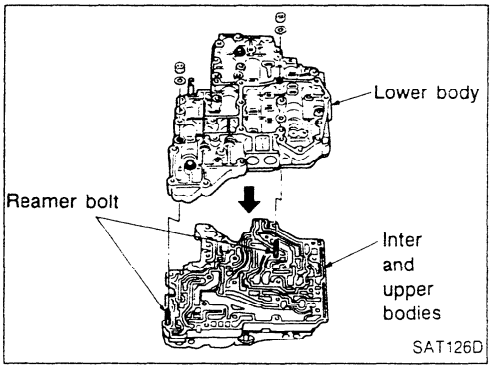
Control Valve Assembly (Cont'd)



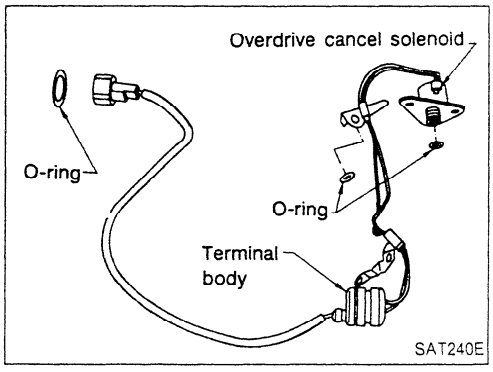
h. Install support plate fixing bolts ⓔ from bottom of lower body and install separating gaskets and separating plate as a set on lower body using bolts ⓔ as guides.



i. Temporarily install support plates on lower body.



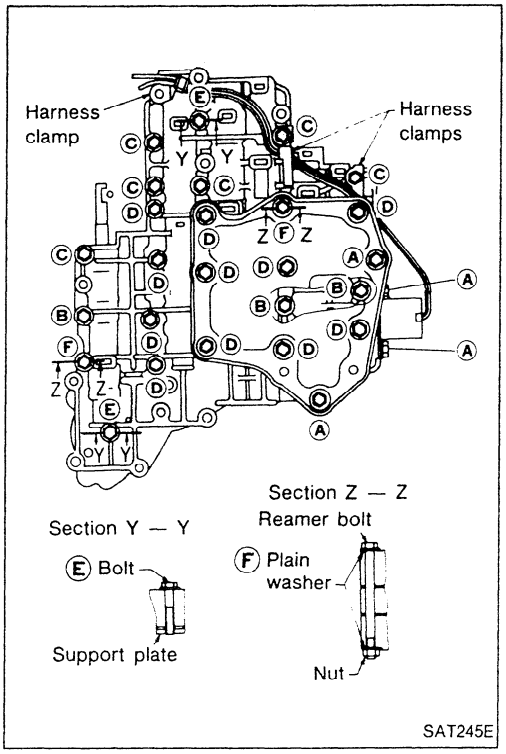
j. Install lower body on inter body using reamer bolts ⓕ as guides and tighten reamer bolts ⓕ slightly.



2. Install O-rings to O.D. cancel solenoid and terminal body.

- **Apply A.T.F. to O-rings.**

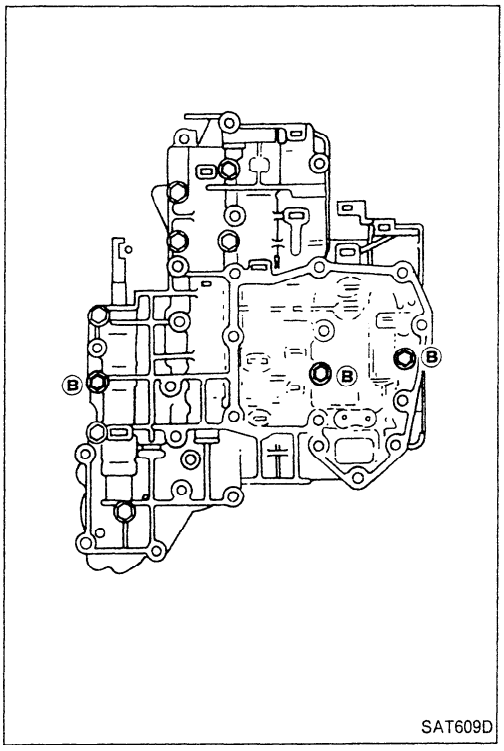
Control Valve Assembly (Cont'd)



3. Install and tighten bolts.

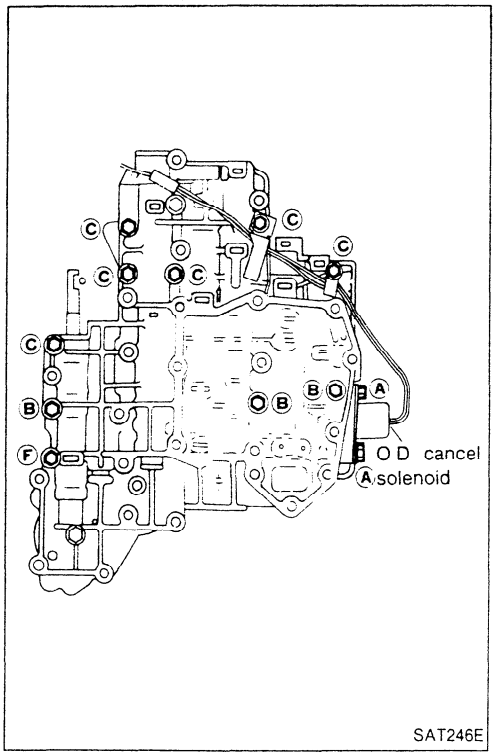
Bolt length, number and location:

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	4	3	6	11	2	2
Tightening torque N·m (kg-m, ft-lb)	7 - 9 (0.7 - 0.9, 5.1 - 6.5)				3.4 - 4.4 (0.35 - 0.45, 2.5 - 3.3)	7 - 9 (0.7 - 0.9, 5.1 - 6.5)



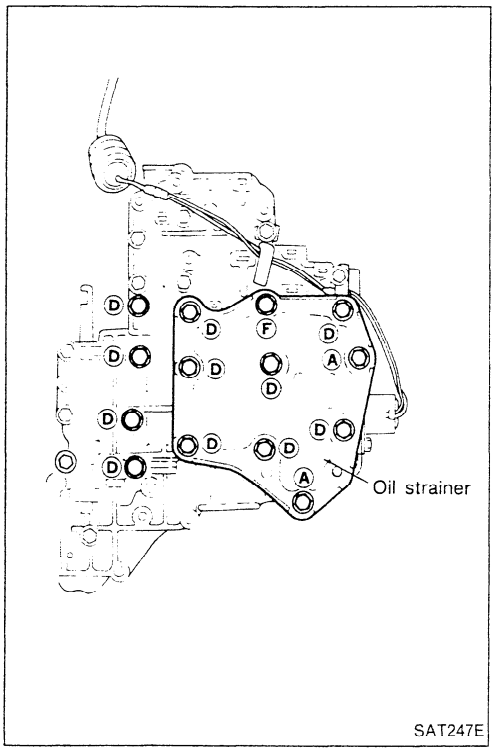
a. Install and tighten bolts Ⓑ slightly.

Control Valve Assembly (Cont'd)



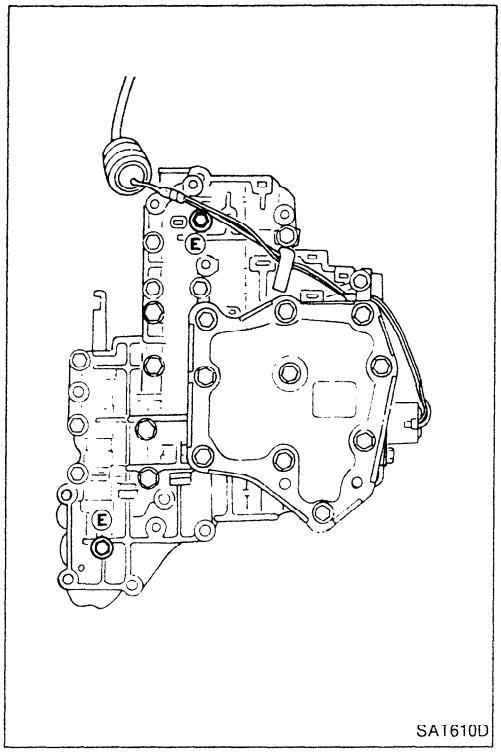
SAT246E

b. Install O.D. cancel solenoid to lower body.
c. Install and tighten bolts Ⓐ and Ⓒ slightly.
d. Remove both reamer bolts Ⓕ previously installed as guides. Install one reamer bolt Ⓕ (marked in illustration) from lower body side.
e. Tighten bolts Ⓐ, Ⓑ, Ⓒ and Ⓕ to specified torque.



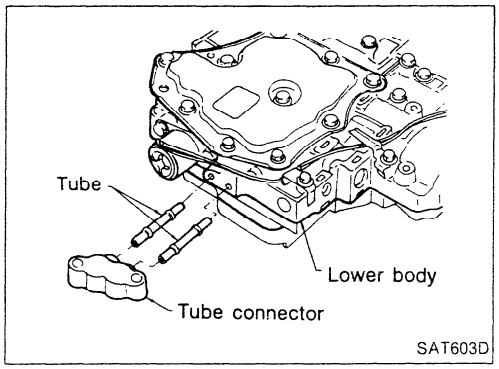
SAT247E

f. Install oil strainer and the other bolt Ⓕ (marked in illustration), then tighten bolts Ⓐ, Ⓓ and Ⓕ to specified torque.



SAT610D

g. Install support plates and tighten bolts Ⓔ to specified torque.

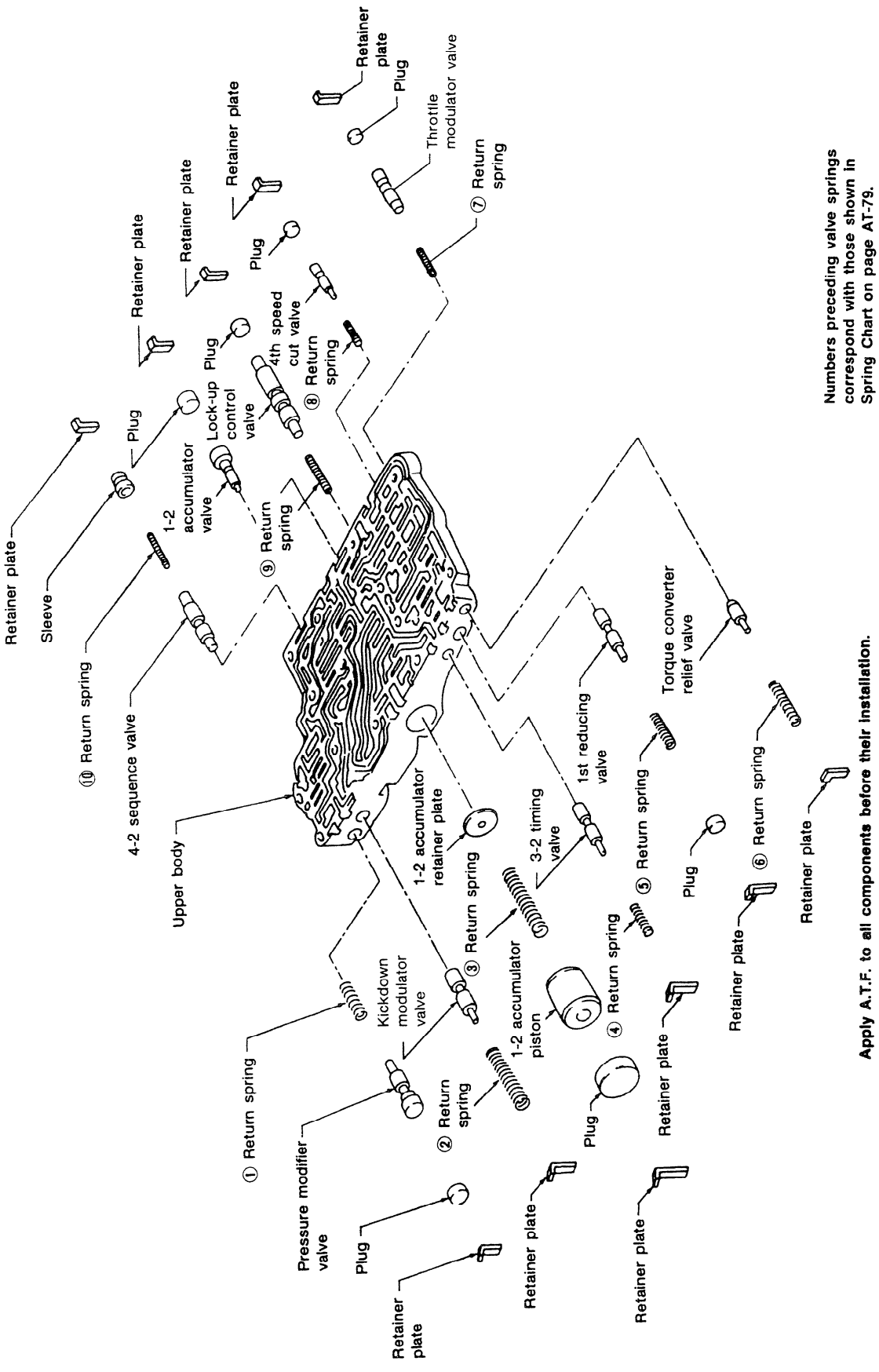


SAT603D

h. Install tube connector and tubes to lower body.

- **Install oil circuit side of tube connector face up.**

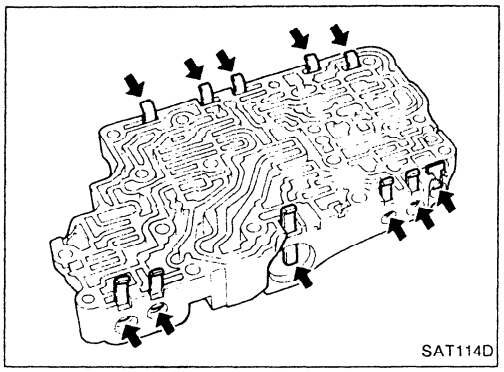
Control Valve Upper Body



SAT233E

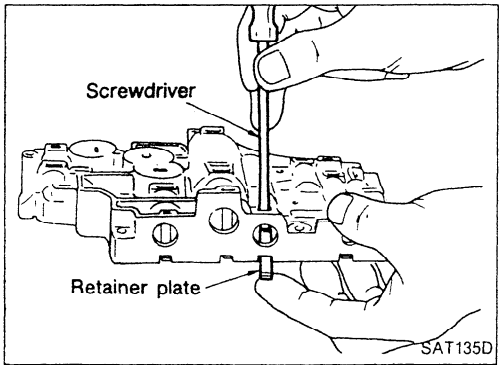
Control Valve Upper Body (Cont'd)

DISASSEMBLY


SAT114D

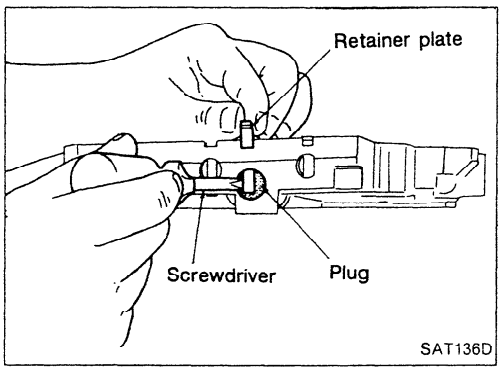
1. Remove valves at retainer plates.

- **Do not use a magnetic "hand".**



SAT135D

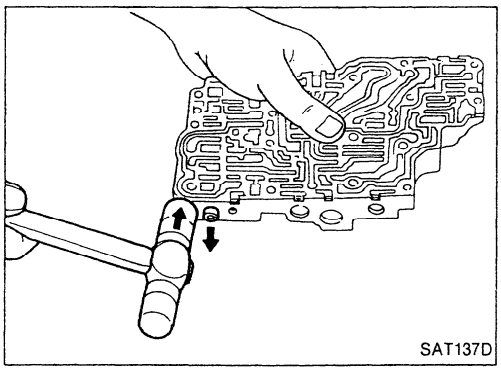
a. Use a screwdriver to pry out retainer plates.



SAT136D

b. Remove retainer plates while holding spring, plugs and sleeves.

- **Remove plug slowly to prevent internal parts from jumping out.**

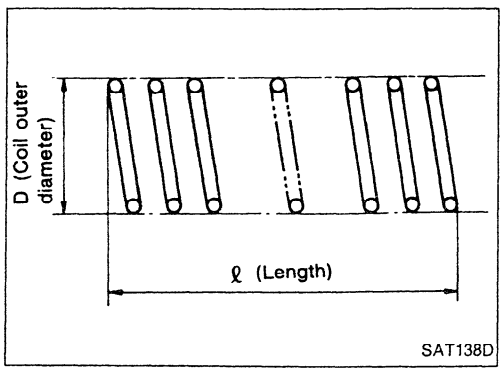

SAT137D

c. Place mating surface of valve 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.**

INSPECTION

Valve spring



SAT138D

- Measure free length and outer diameter of each valve spring. Also check for damage or deformation.
- Numbers of each valve spring listed in table below are the same as those in the figure on page AT-77.

Control Valve Upper Body (Cont'd)

Inspection standard:

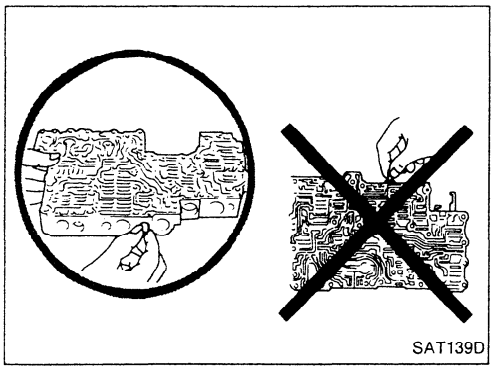
Unit: mm (in)

Parts	Item		Part No.	ℓ	D
①	Pressure modifier valve spring	Model 31X74, 31X75, 31X76, 31X79	31742-31X02	25.0 (0.984)	8.0 (0.315)
		Model 31X77	31742-31X10	25.0 (0.984)	8.2 (0.323)
②	Kickdown modulator valve spring		31742-31X03	40.5 (1.594)	9.0 (0.354)
③	1-2 accumulator valve spring	Model 31X74, 31X75, 31X76, 31X79	31742-31X04	51.14 (2.0134)	17.0 (0.669)
		Model 31X77	31742-31X63	50.9 (2.004)	12.6 (0.496)
④	3-2 timing valve spring		31736-21X00	26.3 (1.035)	7.2 (0.283)
⑤	1st reducing valve spring		31835-21X08	22.6 (0.890)	7.3 (0.287)
⑥	Torque converter relief valve spring		31742-31X06	23.5 (0.925)	7.4 (0.291)
⑦	Throttle modulator valve spring	Model 31X74, 31X76, 31X77	31742-31X07	29.5 (1.161)	5.5 (0.217)
		Model 31X75, 31X79	31742-31X65	29.5 (1.161)	5.5 (0.217)
⑧	4th speed cut valve spring	Model 31X74, 31X76, 31X77	31835-21X05	23.3 (0.917)	6.2 (0.244)
		Model 31X75, 31X79	31737-21X00	25.4 (1.000)	7.3 (0.287)
⑨	Lock-up control valve spring		31742-31X08	39.5 (1.555)	5.0 (0.197)
⑩	4-2 sequence valve spring		31742-31X09	39.5 (1.555)	5.1 (0.201)

- Replace valve springs if deformed or fatigued.

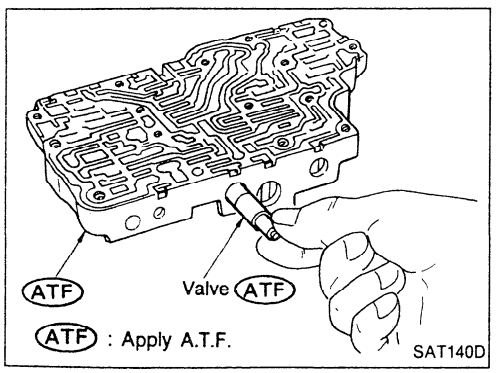
Control valves

- Check sliding surfaces of valves, sleeves and plugs.


SAT139D

ASSEMBLY

- **Lay the control valve body down when installing valves.**
- **Do not stand the control valve body on edge.**

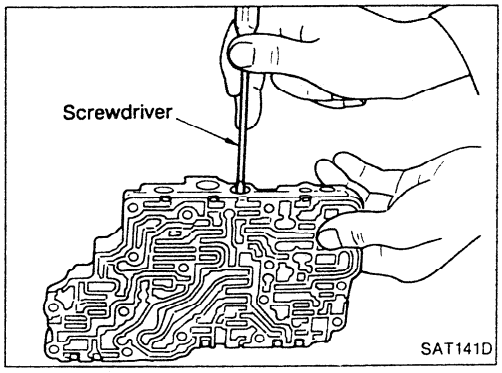


SAT140D

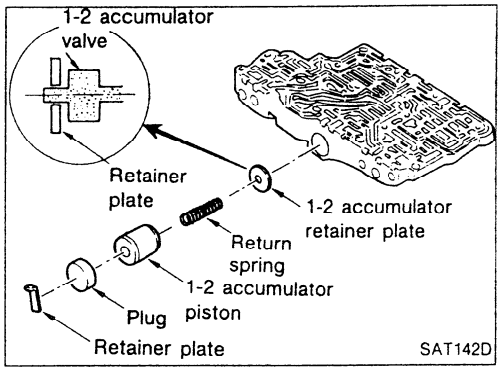
1. Lubricate the control valve body and all valves with A.T.F. Install control valves by sliding them carefully into their bores.

- **Be careful not to scratch or damage valve body.**

Control Valve Upper Body (Cont'd)

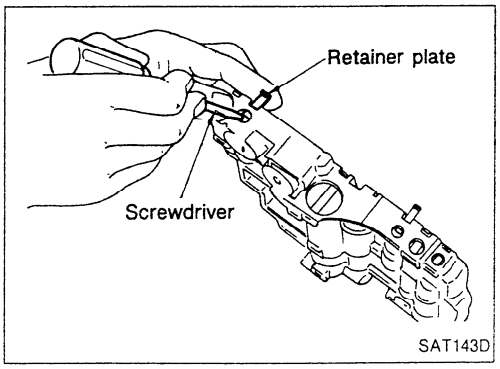


- Wrap a small screwdriver with vinyl tape and use it to insert the valves into their proper positions.

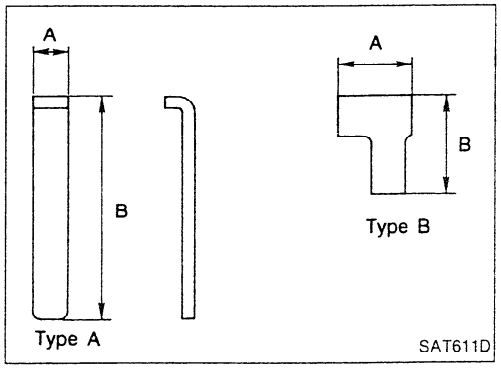


1-2 accumulator valve

- 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 and 1-2 accumulator piston.



2. Install retainer plates
- While pushing plug or return spring, install retainer plate.



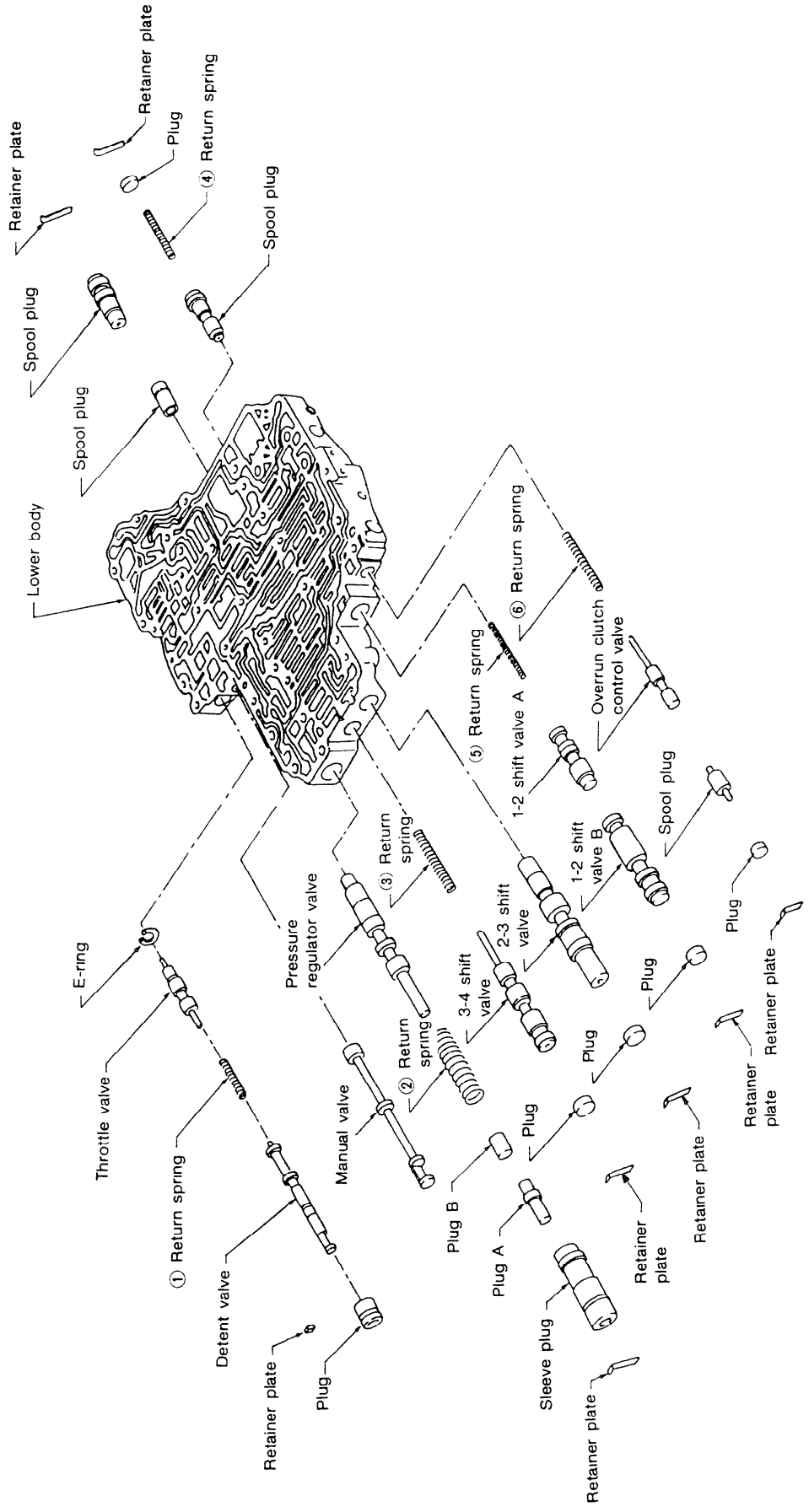
Retainer plate:

Unit: mm (in)

Name of control valves	Length A	Length B	Type
Pressure modifier valve	6.0 (0.236)	28.0 (1.102)	A
Lock-up control valve			
4-2 sequence valve			
Kickdown modulator valve	6.0 (0.236)	21.5 (0.846)	
3-2 timing valve			
1st reducing valve			
Throttle modulator valve			
4th speed cut valve			
1-2 accumulator valve	6.0 (0.236)	37.5 (1.476)	
Torque converter relief valve	13.0 (0.512)	17.0 (0.669)	B

- Install proper retainer plates.

Control Valve Lower Body



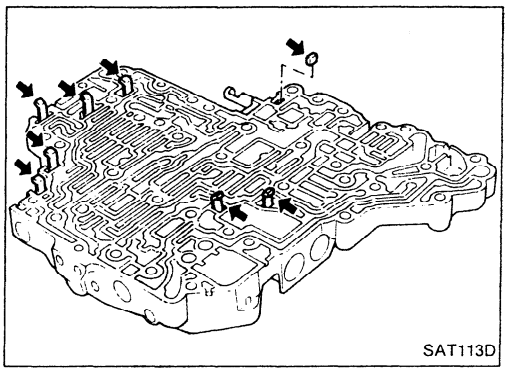
Numbers preceding valve springs correspond with those shown in Spring Chart on page AT-82.

Apply A.T.F. to all components before their installation.

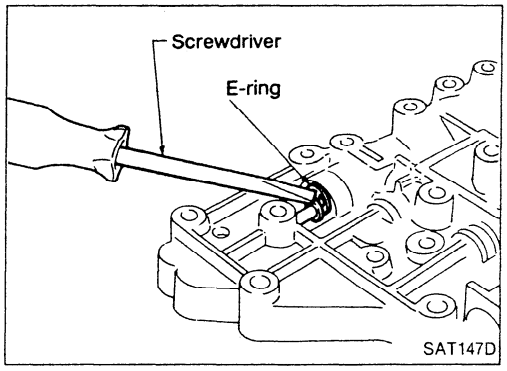
SAT248E

Control Valve Lower Body (Cont'd)

DISASSEMBLY



1. Remove valves at retainer plate.
   For removal procedures, refer to "DISASSEMBLY" in "Control Valve Upper Body".

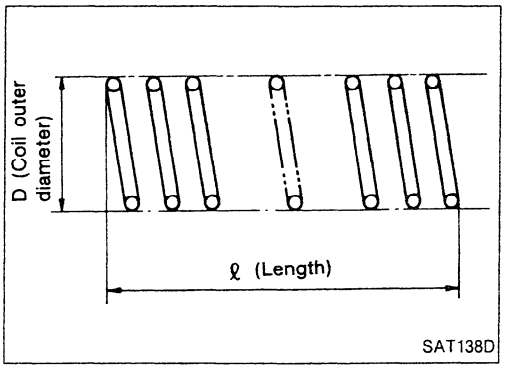


Throttle valve

- Remove throttle valve at E-ring.

INSPECTION

Valve springs



- Check each valve spring for damage or deformation. Also measure free length and outer diameter.
- Numbers for each valve spring listed in the table below are the same as those in the figure on page AT-81.

Inspection standard:

Unit: mm (in)

Parts / Item			Part No.	ℓ	D
①	Throttle valve & detent valve spring	Model 31X74, 31X75, 31X76, 31X79	31802-31X00	31.0 (1.220)	10.0 (0.394)
		Model 31X77	31802-31X01	33.0 (1.299)	10.0 (0.394)
②	Pressure regulator valve spring		31742-31X00	52.24 (2.0567)	15.0 (0.591)
③	3-4 shift valve spring		31762-31X00	52.0 (2.047)	8.0 (0.315)
④	2-3 shift valve spring		31762-31X01	52.7 (2.075)	7.0 (0.276)
⑤	1-2 shift valve spring		31762-31X02	45.9 (1.807)	5.3 (0.209)
⑥	Overrun clutch control valve spring		31742-31X60	48.9 (1.925)	7.0 (0.276)

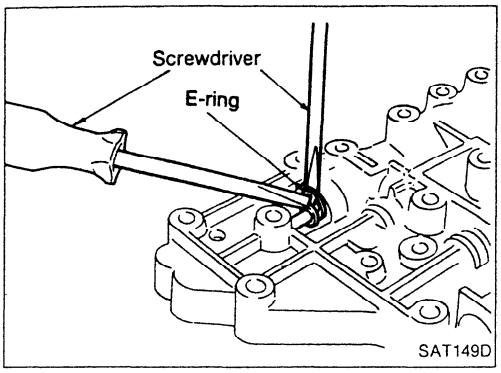
- Replace valve springs if deformed or fatigued.

Control valves

- Check sliding surfaces of control valves, sleeves and plugs for damage.

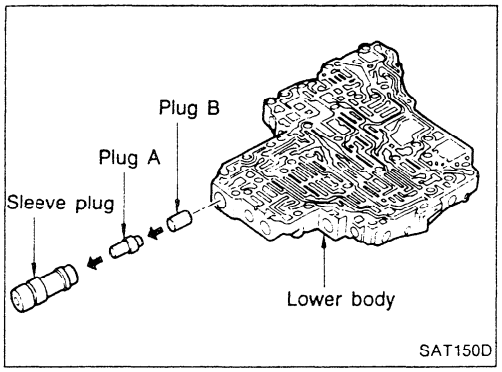
Control Valve Lower Body (Cont'd)

ASSEMBLY



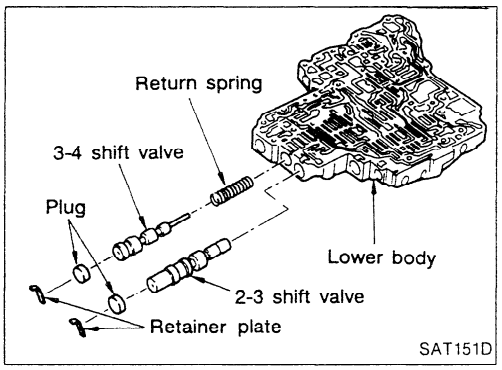
Throttle valve

- Insert throttle valve to control valve body and then install E-ring to throttle valve.



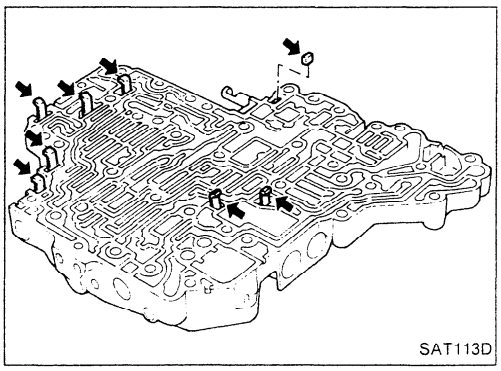
Pressure regulator valve

- Install pressure regulator valve after assembling sleeve plug, plug A and plug B.



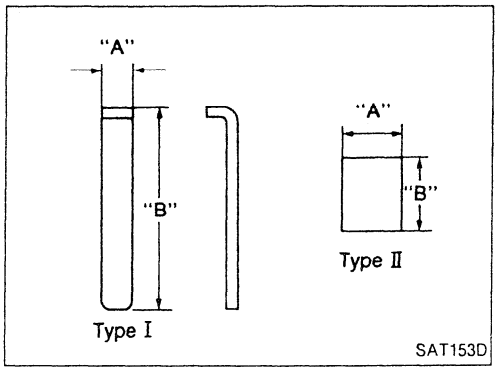
3-4 shift valve and 2-3 shift valve

- Install 3-4 shift valve and 2-3 shift valve after fixing plugs to retainer plates on the opposite side.



- Install control valves.
  For installation procedures, refer to "ASSEMBLY in "Control Valve Upper Body."

Control Valve Lower Body (Cont'd)



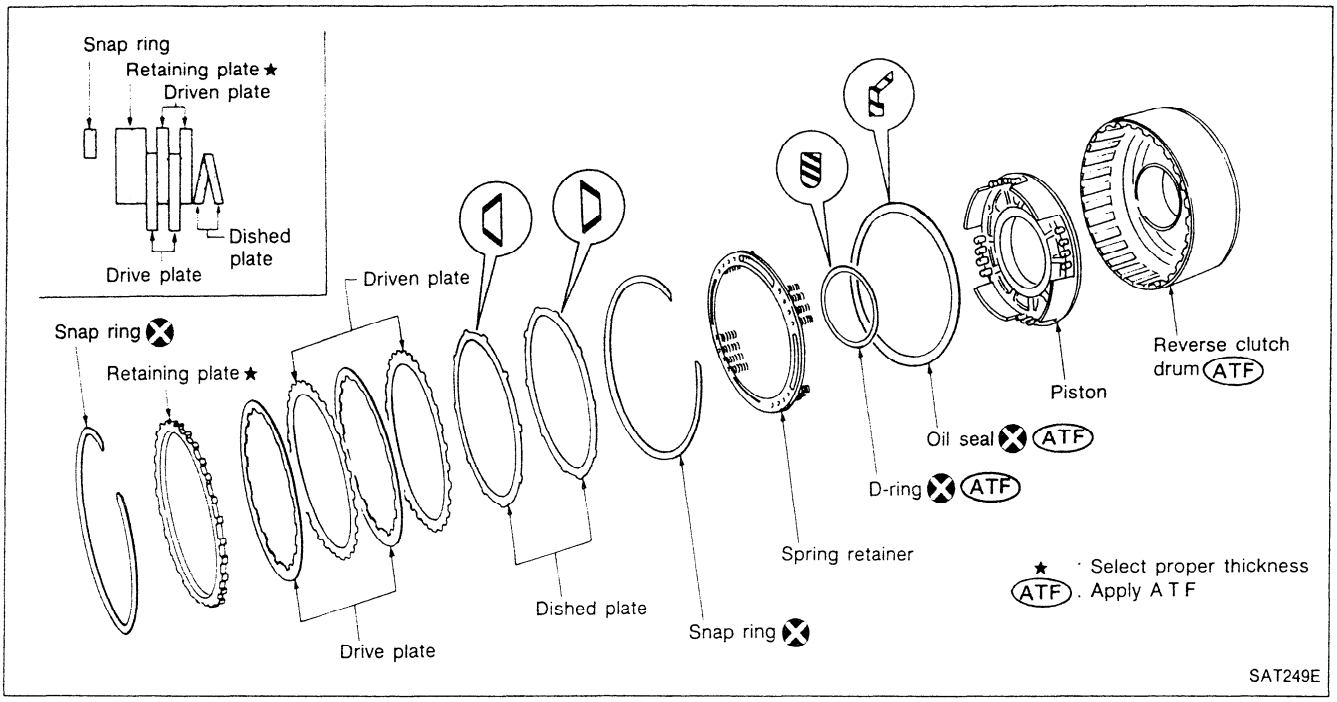
Retainer plate:

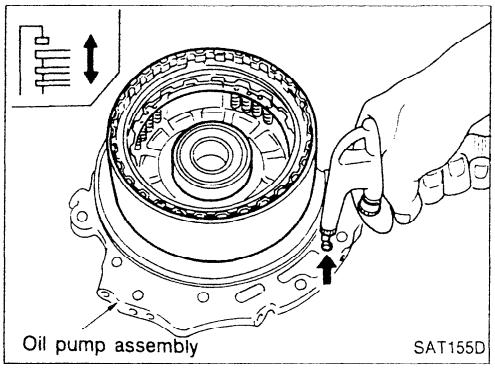
Unit: mm (in)

Name of control valve	Length A	Length B	Type
Throttle valve & detent valve	6.0 (0.236)	7.2 (0.283)	A
Pressure regulator valve	6.0 (0.236)	28.0 (1.102)	B
3-4 shift valve			
2-3 shift valve			
1-2 shift valve			
Overrun clutch control valve			

- Install proper retainer plates

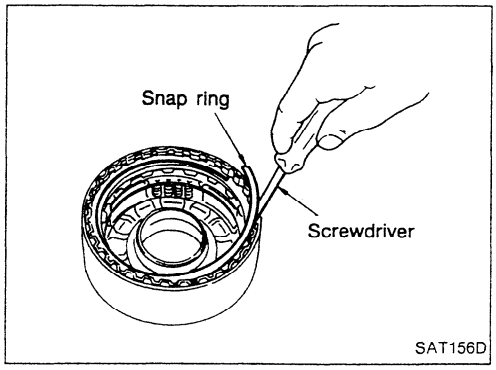
Reverse Clutch



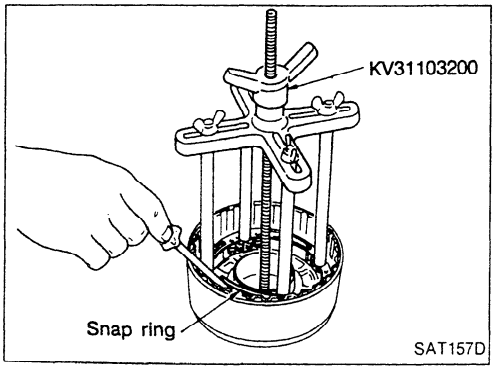


DISASSEMBLY

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.

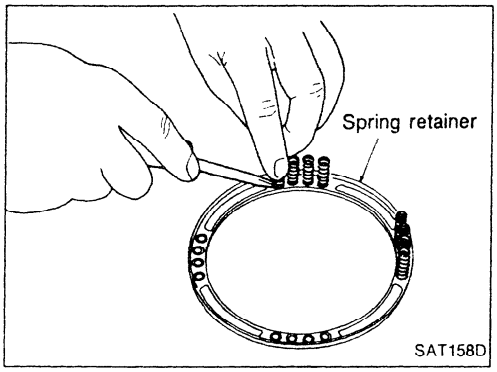


2. Remove snap ring.
3. Remove drive plates, driven plates, retaining plate, and dished plates.

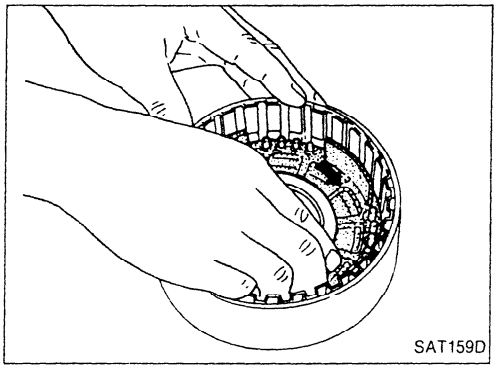


4. Set Tool on spring retainer and remove snap ring from reverse clutch drum while compressing return springs.
- **Set Tool directly above springs.**
- **Do not expand snap ring excessively.**

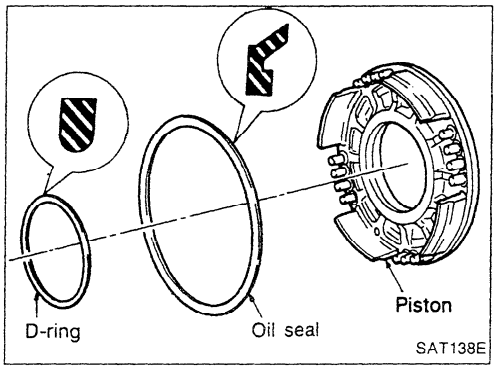
5. Remove spring retainer and return springs.



- **Do not remove return springs from spring retainer.**



6. Remove piston from reverse clutch drum by turning it.

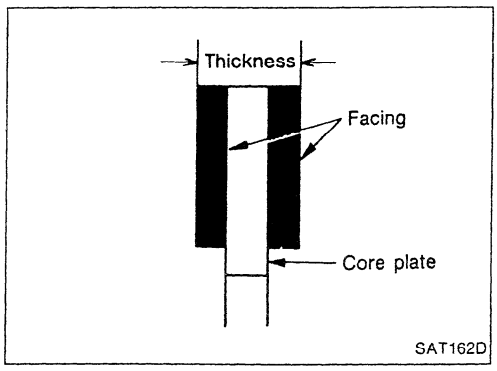


7. Remove D-ring and oil seal from piston.

INSPECTION

Reverse clutch snap ring, spring retainer and return springs

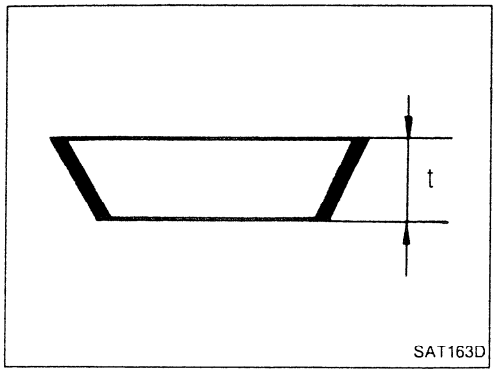
- Check for deformation, fatigue or damage.
- Replace if necessary.
- **When replacing spring retainer and return springs, replace them as a set.**



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)

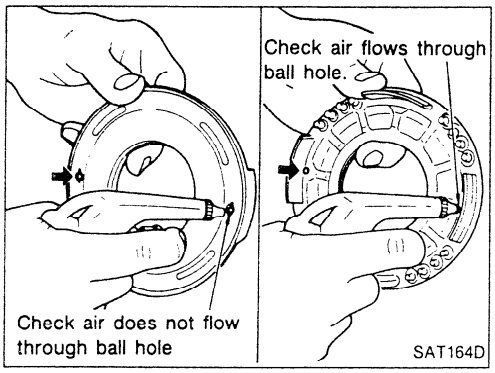


Reverse clutch dished plates

- Check for deformation or damage.
- Measure thickness of dished plate.

Thickness of dished plate:
2.89 - 3.19 mm (0.1138 - 0.1256 in)

- If deformed or fatigued, replace.



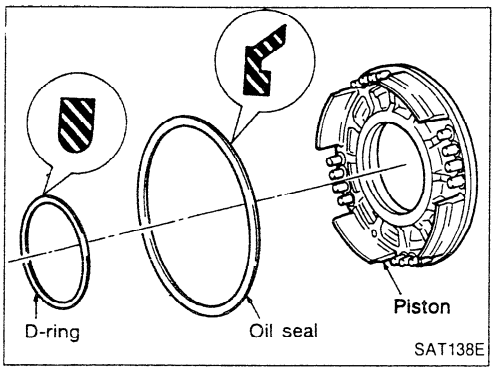
Reverse clutch piston

- 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

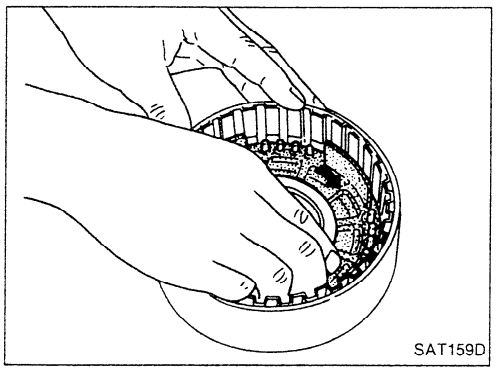
1. Install D-ring and oil seal on piston.

- **Take care with the direction of the oil seal.**
- **Apply A.T.F. to both parts.**

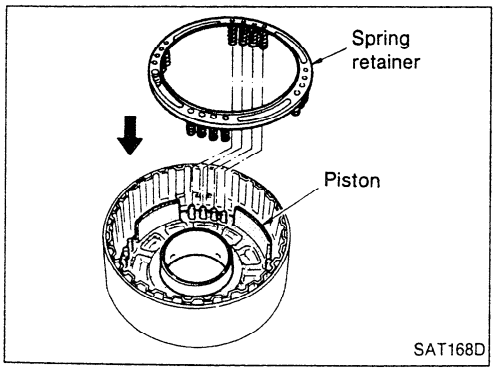


2. Install piston assembly by turning it slowly.

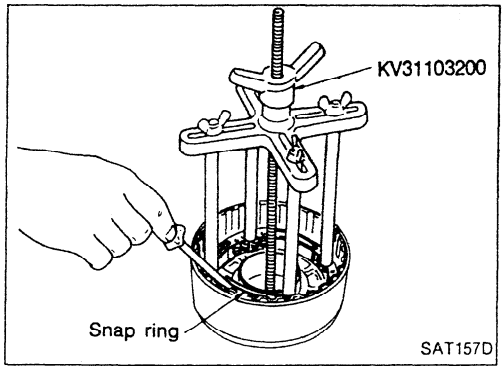
- **Apply A.T.F. to inner surface of drum.**



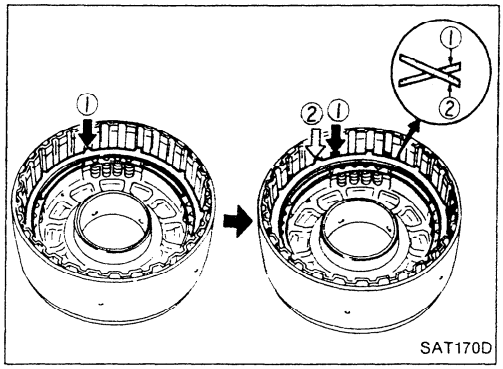
3. Install return springs and spring retainer on piston.



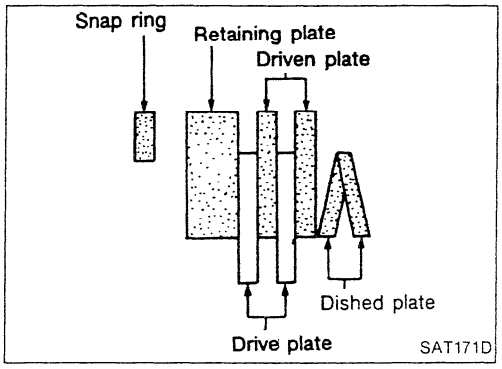
Reverse Clutch (Cont'd)

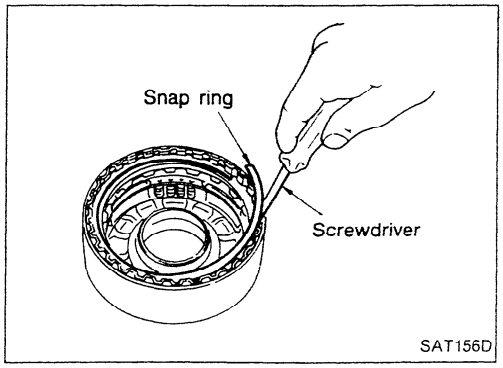


4. Set Tool on spring retainer and install snap ring while compressing return springs.
- **Set Tool directly above return springs.**

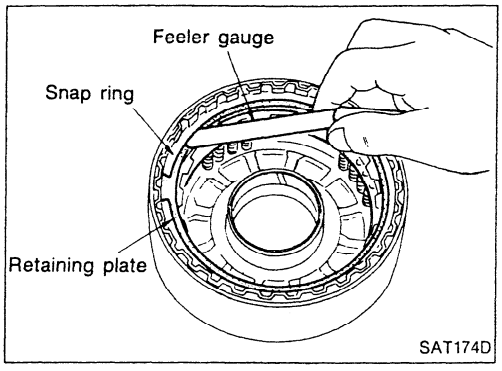


5. Install drive plates, driven plates, retaining plate and dished plates.
- **Do not align the projections of any two dished plates.**



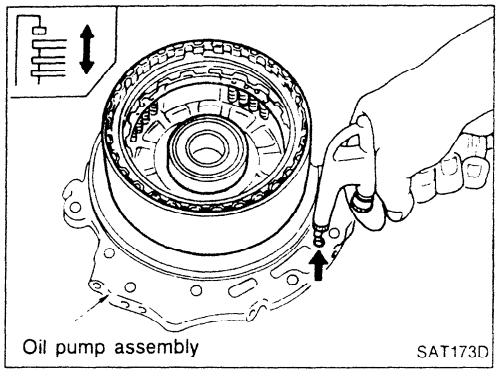


6. Install snap ring.



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 S.D.S.

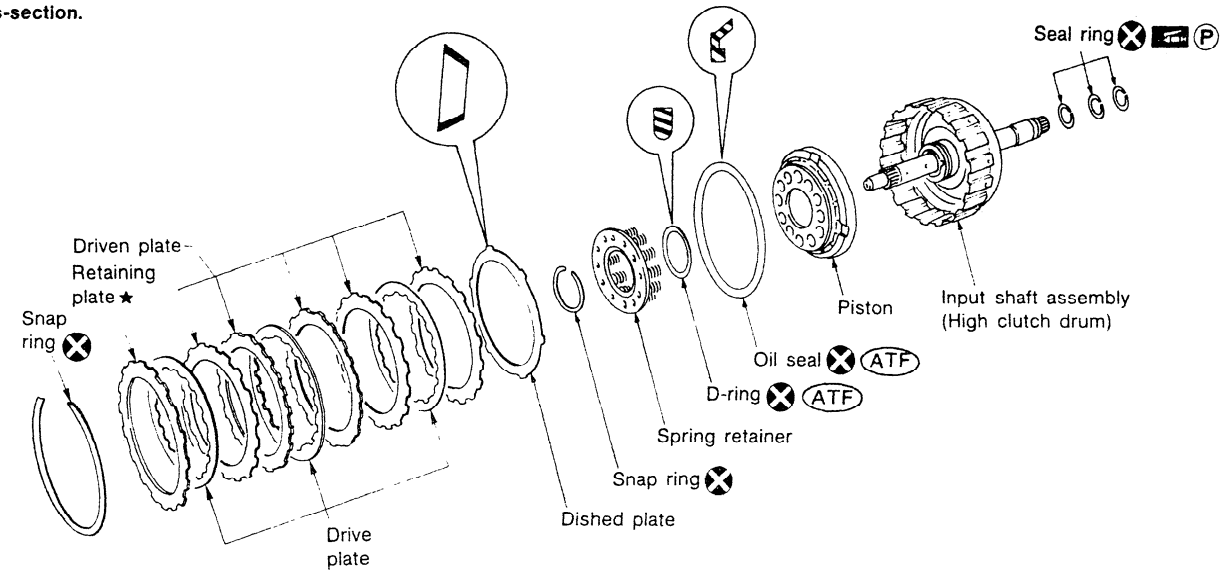
Reverse Clutch (Cont'd)



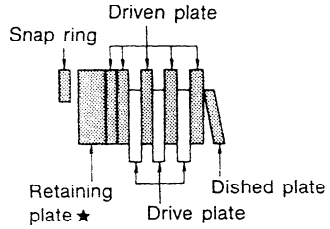
8. Check operation of reverse clutch.
   Refer to "DISASSEMBLY" in "Reverse Clutch."

High Clutch

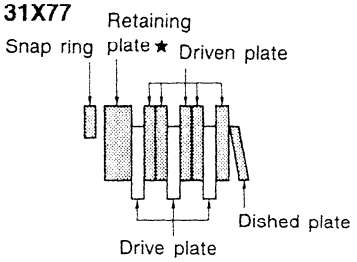
For the number of clutch sheets (drive plates and driven plates), refer to the below cross-section.



Model 31X74, 31X75, 31X76, 31X79

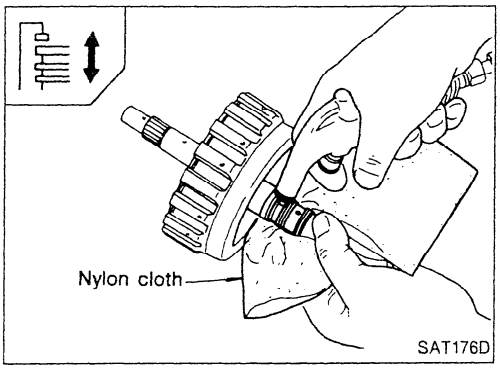


Model 31X77



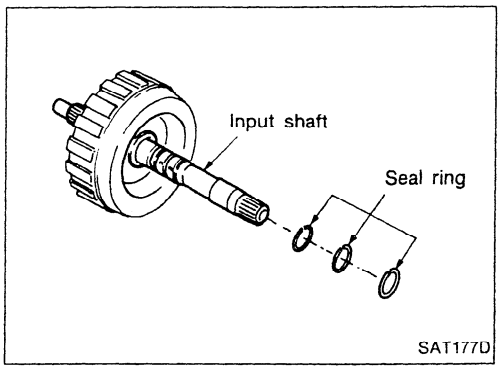
P Apply petroleum jelly.
ATF Apply A T F
★ Select proper thickness.

SAT250E



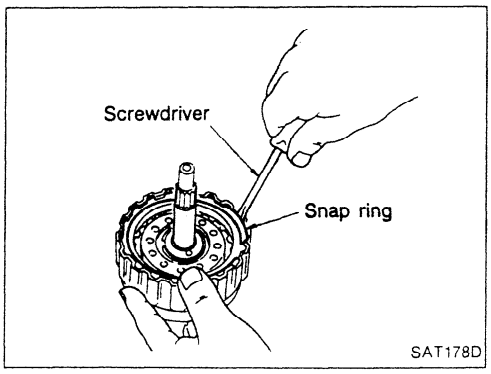
1. Check operation of high clutch.
a. Apply compressed air to oil hole of input shaft.
- **Stop up a hole on opposite side of input shaft.**

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.

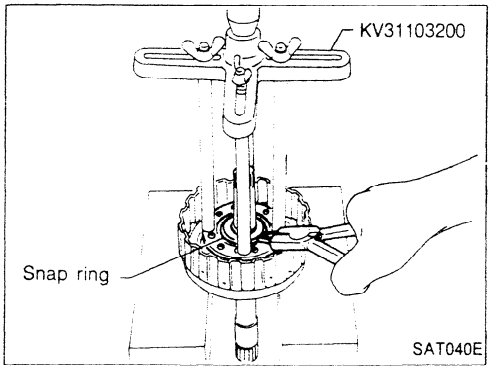


2. Remove seal rings from input shaft.

High Clutch (Cont'd)

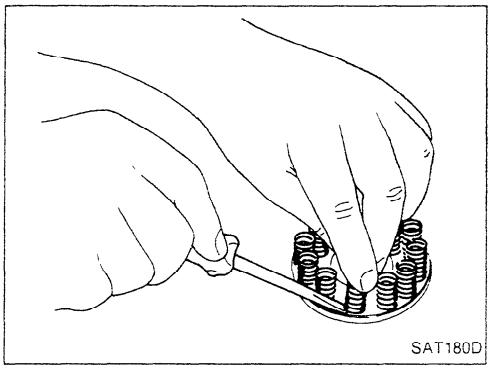


3. Remove snap ring.
4. Remove drive plates, driven plates, retaining plate and dished plate.

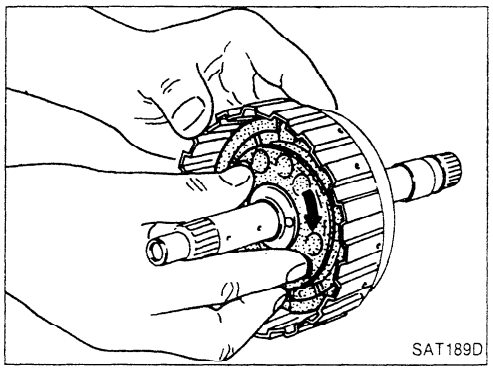


5. Set Tool on spring retainer and remove snap ring from high clutch drum while compressing return springs.
- **Set Tool directly above springs.**
- **Do not expand snap ring excessively.**

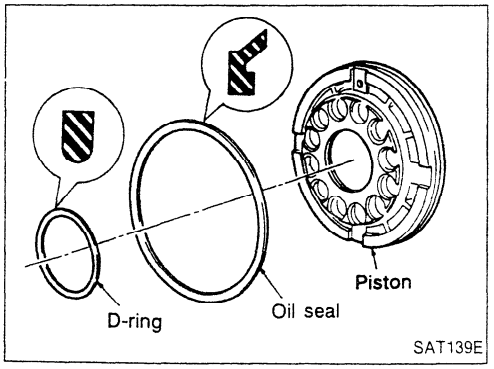
6. Remove spring retainer and return springs.



- **Do not remove return springs from spring retainer.**



7. Remove piston from high clutch drum by turning it.



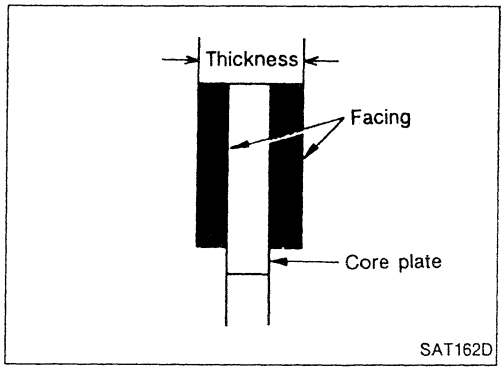
8. Remove D-ring and oil seal from piston.

High Clutch (Cont'd)

INSPECTION

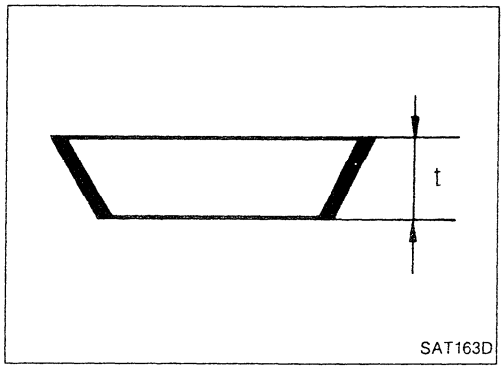
Reverse clutch snap ring, spring retainer and return springs

- Check for deformation, fatigue or damage.
- Replace if necessary.
- **When replacing spring retainer and return springs, replace them as a set.**



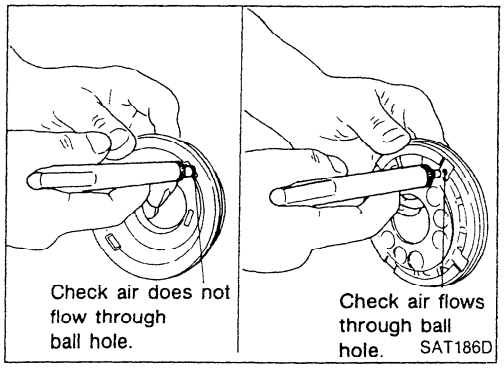
High clutch drive plates

- 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.



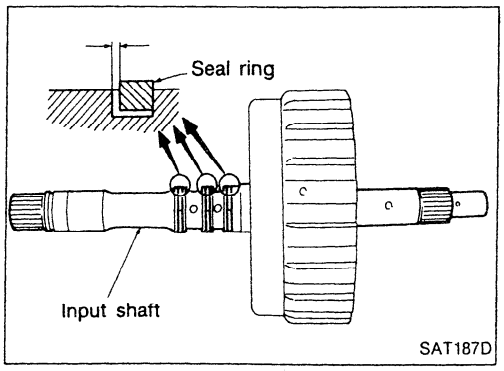
High clutch dished plate

- Check for deformation or damage.
- Measure thickness of dished plate.
  Thickness of dished plate:
  2.55 - 2.85 mm (0.1004 - 0.1122 in)
- If deformed or fatigued, 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.

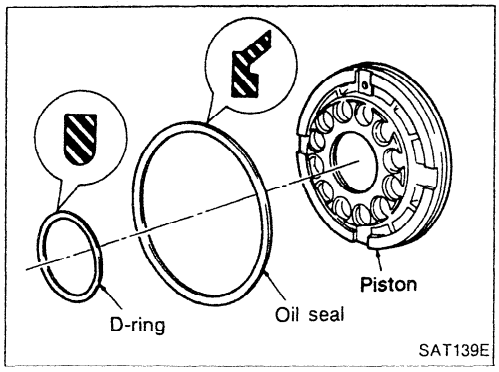


Seal ring clearance

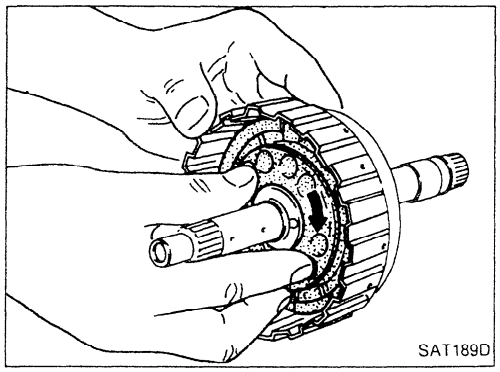
- Install new seal rings onto input shaft.
- Measure clearance between seal ring and ring groove.
  Standard clearance:
  0.08 - 0.23 mm (0.0031 - 0.0091 in)
  Allowable limit:
  0.23 mm (0.0091 in)
- If not within wear limit, replace input shaft assembly.

High Clutch (Cont'd)

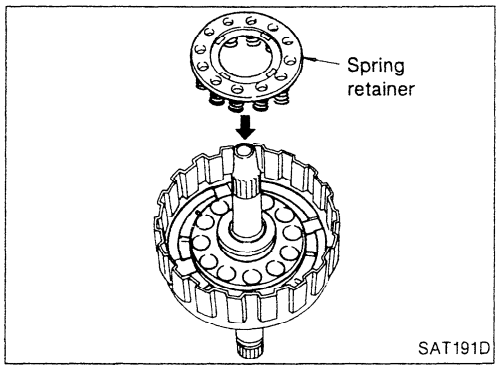
ASSEMBLY



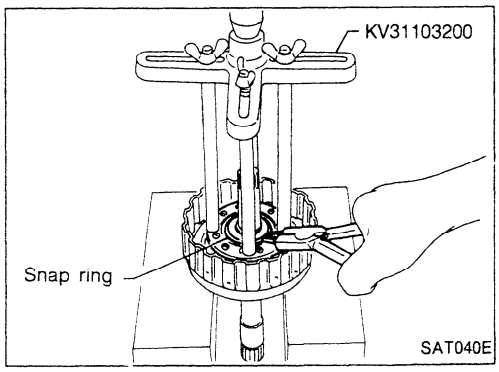
1. Install D-ring and oil seal on piston.
- **Take care with the direction of the oil seal.**
- **Apply A.T.F. to both parts.**



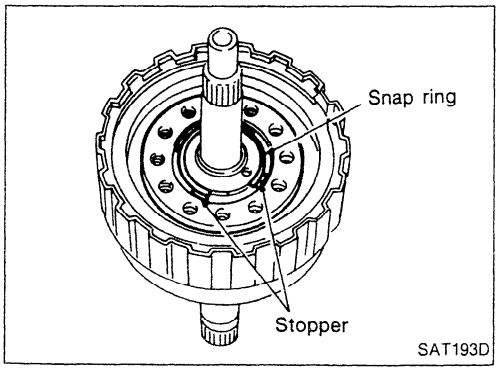
2. Install piston assembly by turning it slowly.
- **Apply A.T.F. to inner surface of drum.**



3. Install return springs and spring retainer on piston.

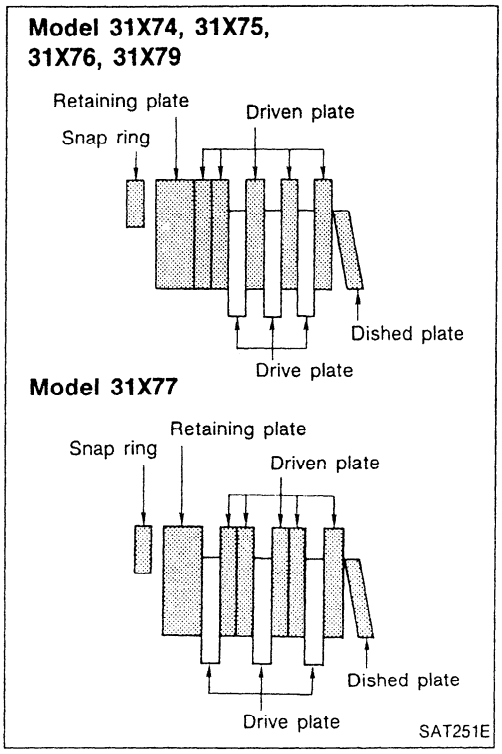


4. Set Tool on spring retainer and install snap ring while compressing return springs.
- **Set Tool directly above return springs.**

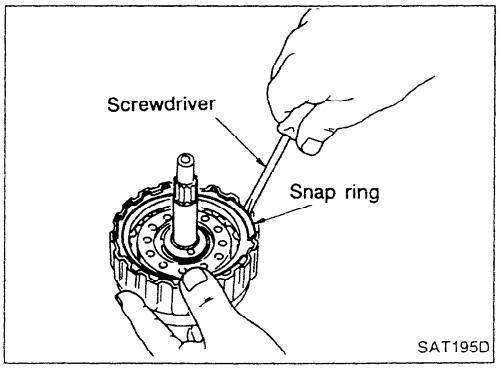


- **Do not align snap ring gap with spring retainer stopper.**

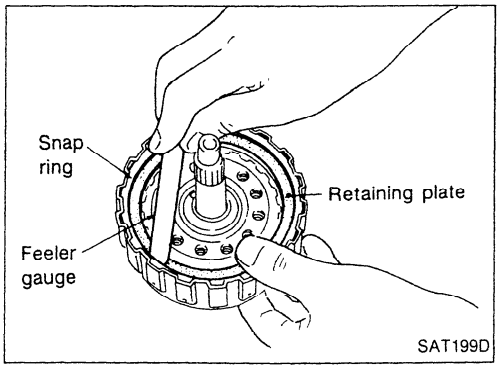
High Clutch (Cont'd)



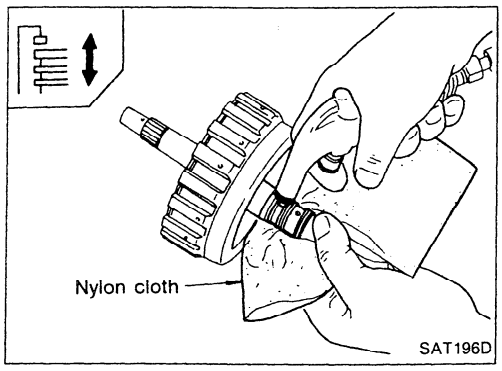
5. Install drive plates, driven plates, retaining plate and dished plate.



6. Install snap ring.

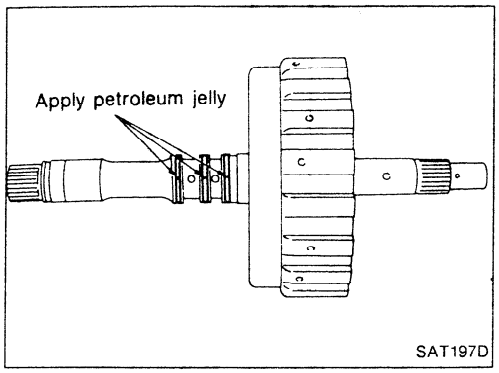


7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.
   Specified clearance:
   Standard: 1.4 - 1.8 mm (0.055 - 0.071 in)
   Allowable limit: 2.4 mm (0.094 in)
   Retaining plate: Refer to S.D.S.



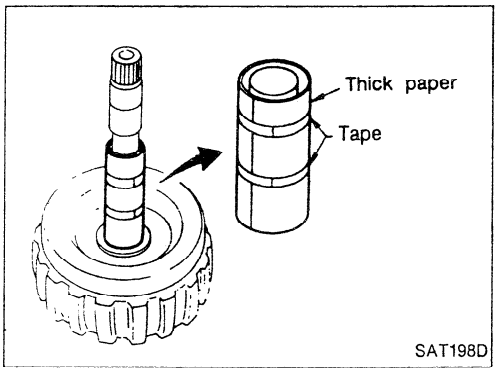
8. Check operation of high clutch.
   Refer to "DISASSEMBLY" in "High Clutch".

High Clutch (Cont'd)



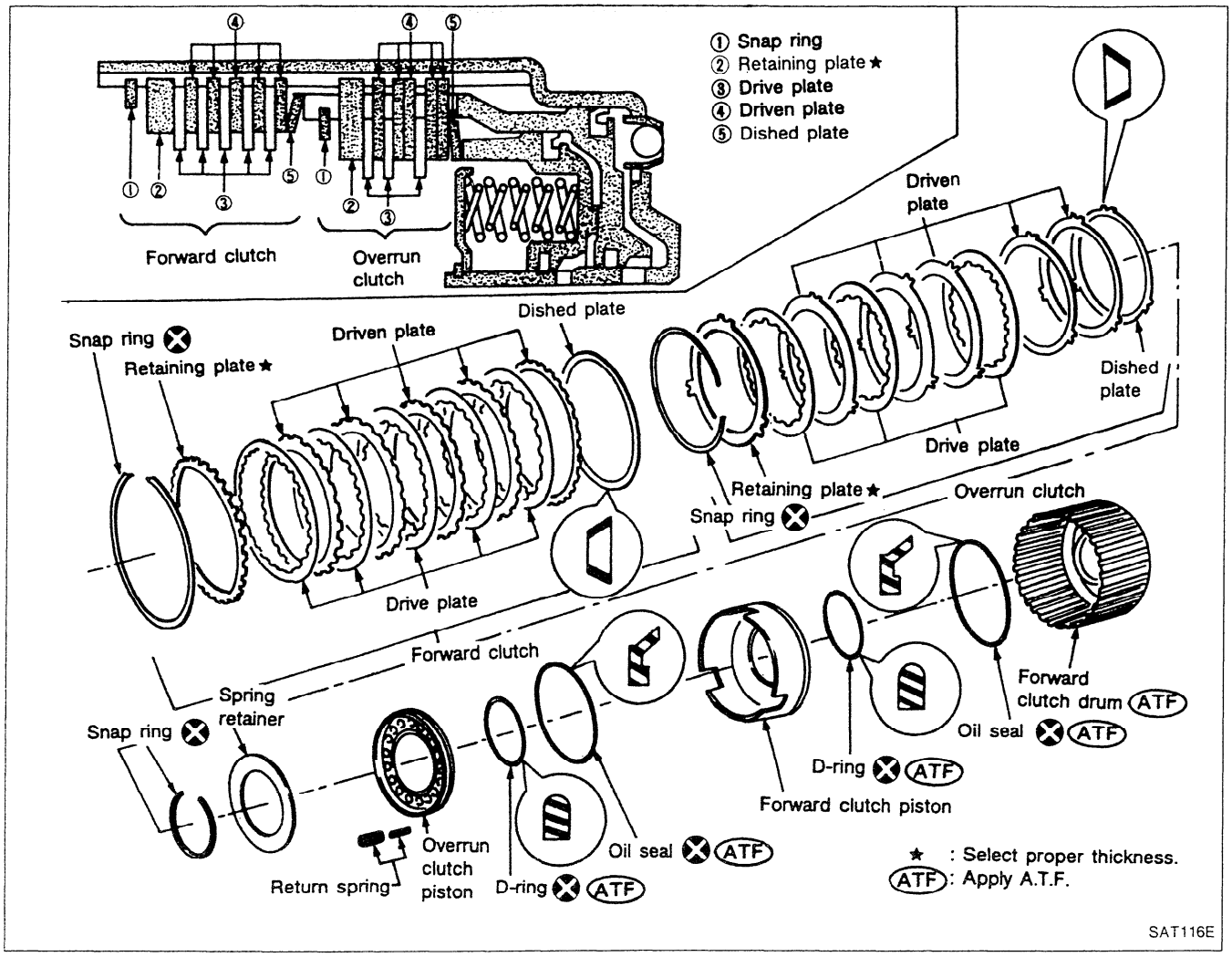
9. Install seal rings to input shaft.

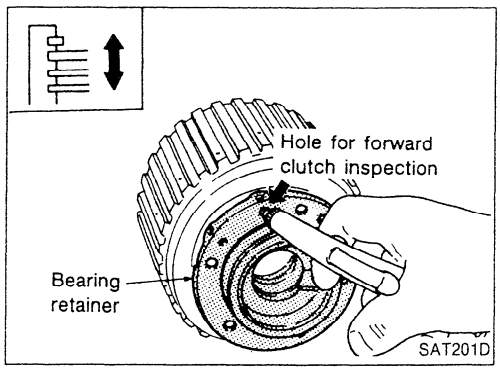
- **Apply petroleum jelly to seal rings.**



- **Roll paper around seal rings to prevent seal rings from spreading.**

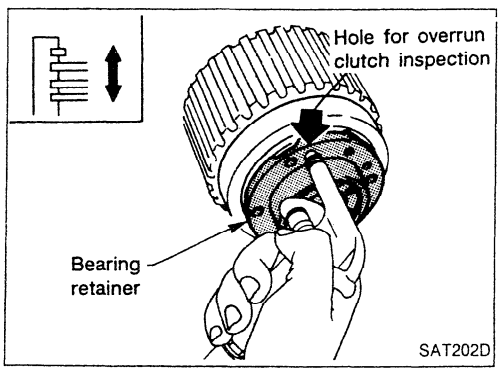
Forward Clutch and Overrun Clutch





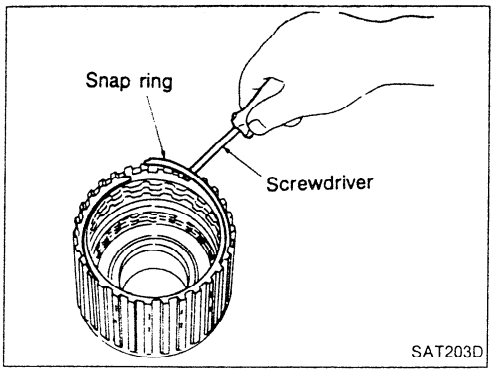
DISASSEMBLY

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.

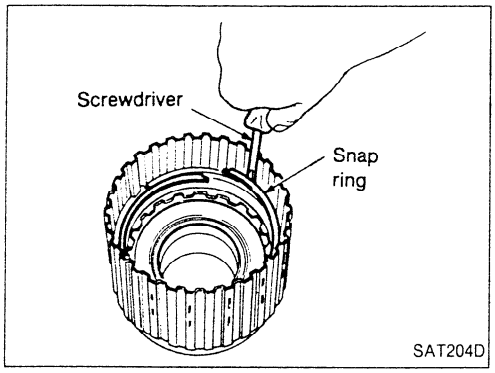


d. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.

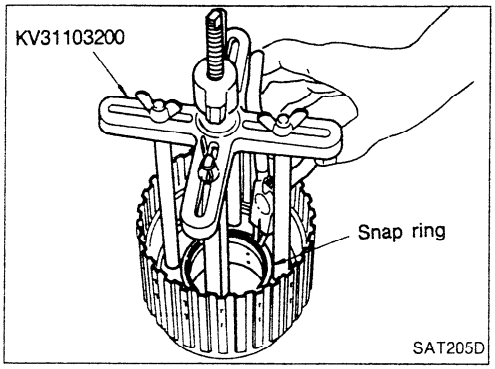
Forward Clutch and Overrun Clutch (Cont'd)



2. Remove snap ring for forward clutch.
3. Remove drive plates, driven plates, retaining plate and dished plate for forward clutch.

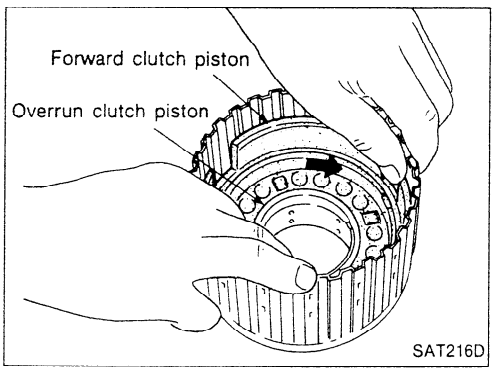


4. Remove snap ring for overrun clutch.
5. Remove drive plates, driven plates, retaining plate and dished plate for overrun clutch.

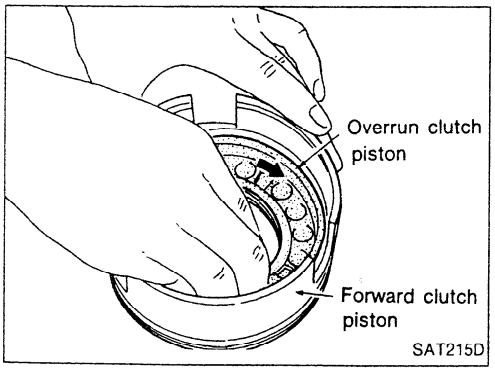


6. Set Tool on spring retainer and remove snap ring from forward clutch drum while compressing return springs.
- **Set Tool directly above return springs.**
- **Do not expand snap ring excessively.**

7. Remove spring retainer and return springs.

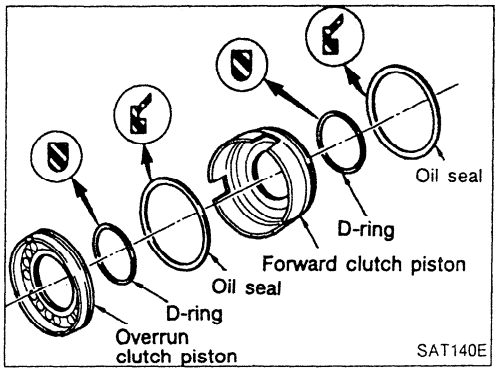


8. Remove forward clutch piston with overrun clutch piston from forward clutch drum by turning it.



9. Remove overrun clutch piston from forward clutch piston by turning it.

Forward Clutch and Overrun Clutch (Cont'd)

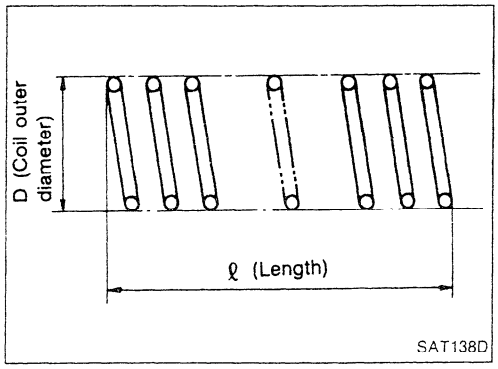


10. Remove D-rings and oil seals from forward clutch piston and overrun clutch piston.

INSPECTION

Snap rings and spring retainer

- Check for deformation, fatigue or damage.



Forward clutch and overrun clutch return springs

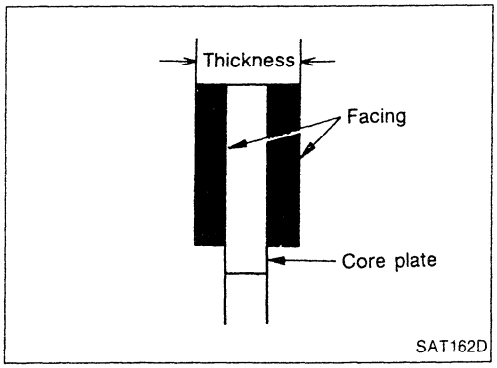
- Check for deformation or damage.
- Measure free length and outer diameter.

Inspection standard:

Unit: mm (in)

Parts		Part No.	ℓ	D
Return spring	Inner	31505-31X03	26.3 (1.035)	7.7 (0.303)
	Outer	31505-31X02	26.6 (1.047)	10.6 (0.417)

- 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)

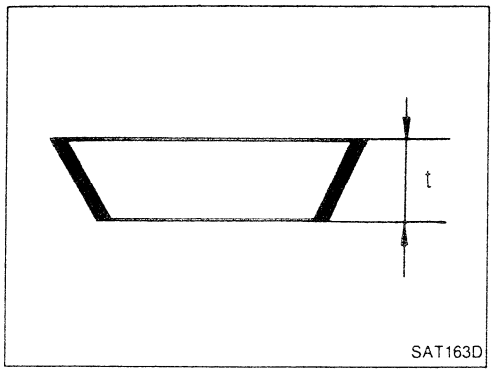
Overrun clutch

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 (Cont'd)



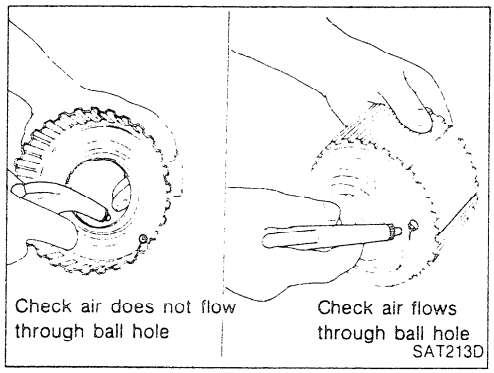
Forward clutch and overrun clutch dished plates

- Check for deformation or damage.
- Measure thickness of dished plate.

  Thickness of dished plate:

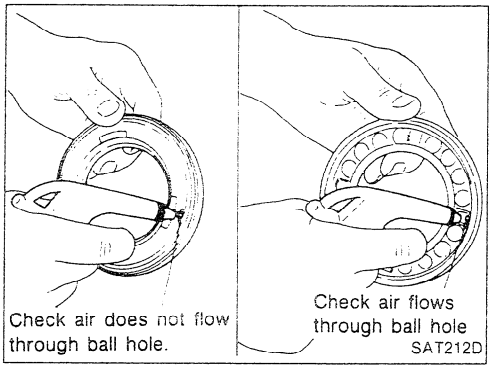
  Forward clutch: 2.35 - 2.65 mm (0.0925 - 0.1043 in)

  Overrun clutch: 2.00 - 2.30 mm (0.0787 - 0.0906 in)
- If deformed or fatigued, replace.



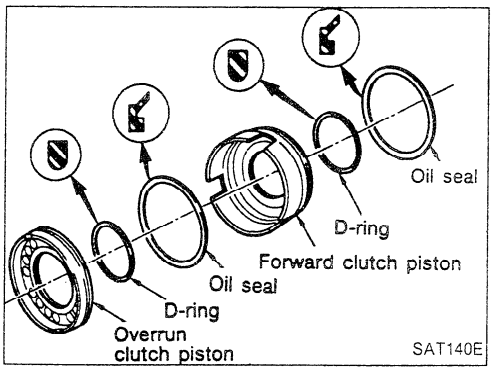
Forward clutch drum

- 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.



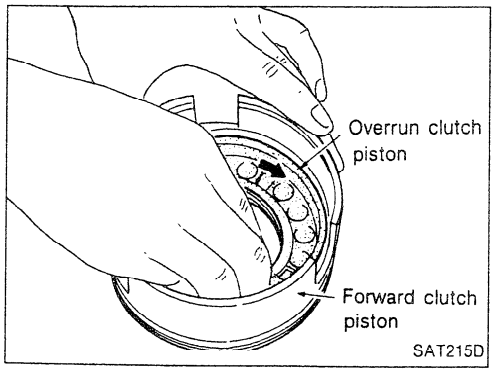
Overrun clutch piston

- 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.



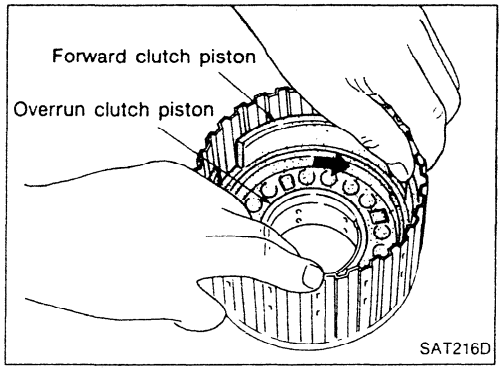
ASSEMBLY

1. Install D-rings and oil seals on forward clutch piston and overrun clutch piston.
   - **Take care with direction of oil seal.**
   - **Apply A.T.F. to both parts.**



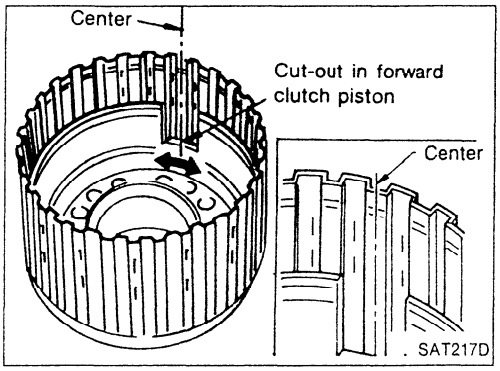
2. Install overrun clutch piston assembly on forward clutch piston while turning it slowly.
   - **Apply A.T.F. to inner surface of forward clutch piston.**

Forward Clutch and Overrun Clutch (Cont'd)

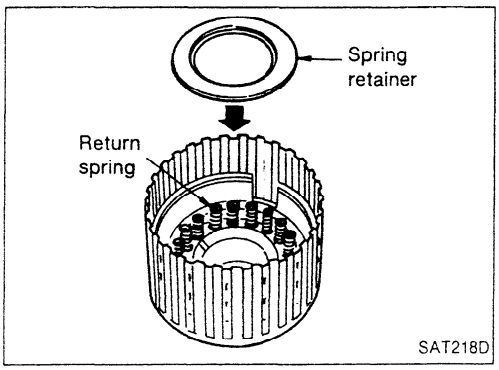


3. Install forward clutch piston assembly on forward clutch drum while turning it slowly.

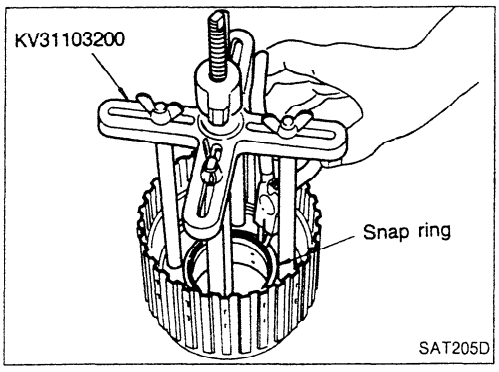
- **Apply A.T.F. to inner surface of drum.**



4. Align notch in forward clutch piston with groove in forward clutch drum.

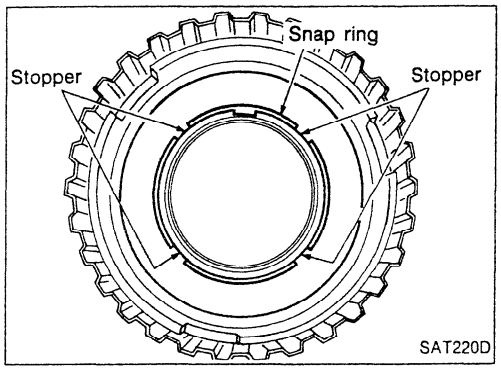


5. Install return springs on piston.
6. Install spring retainer on return springs.



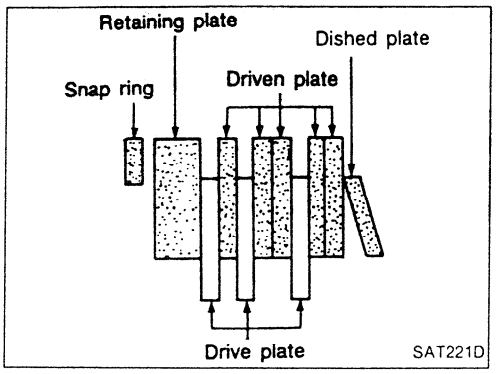
7. Set Tool on spring retainer and install snap ring while compressing return springs.

- **Set Tool directly above return springs.**

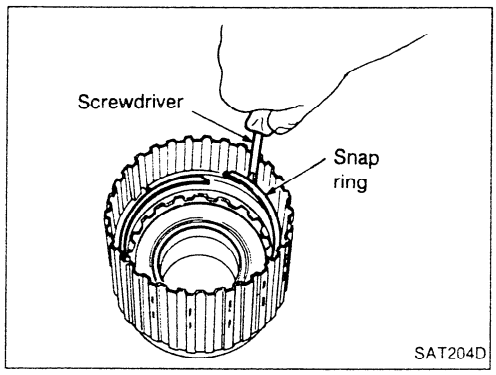


- **Do not align snap ring gap with spring retainer stopper.**

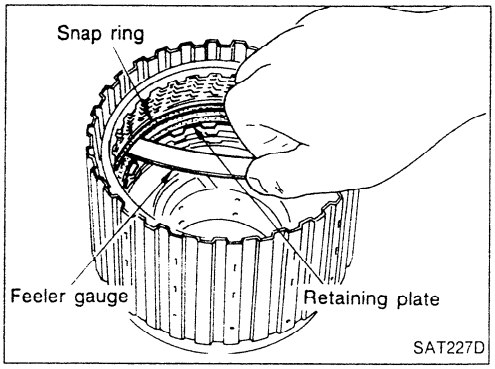
Forward Clutch and Overrun Clutch (Cont'd)



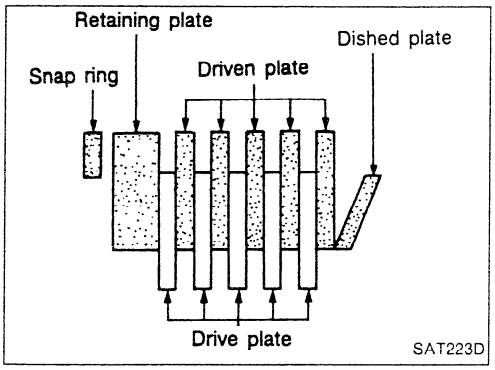
8. Install drive plates, driven plates, retaining plate and dished plate for overrun clutch.



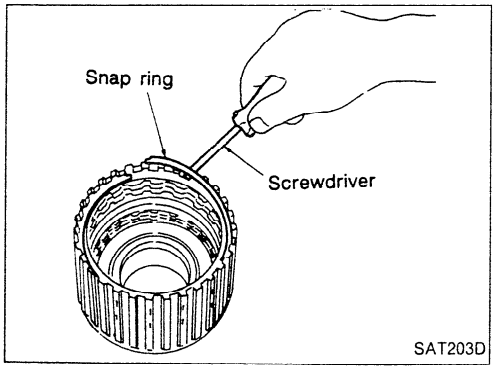
9. Install snap ring for overrun clutch.



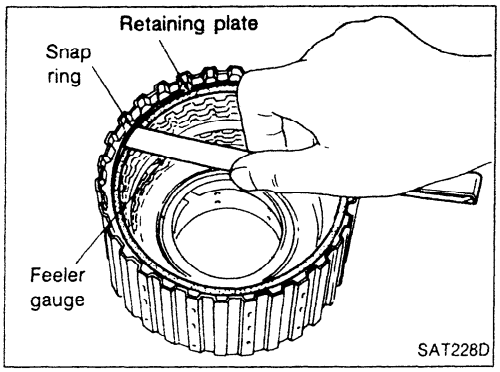
10. Measure clearance between overrun clutch retaining plate and snap ring.
    If not within allowable limit, select proper retaining plate.
    Specified clearance:
    Standard: 1.0 - 1.4 mm (0.039 - 0.055 in)
    Allowable limit: 2.0 mm (0.079 in)
    Overrun clutch retaining plate: Refer to S.D.S.



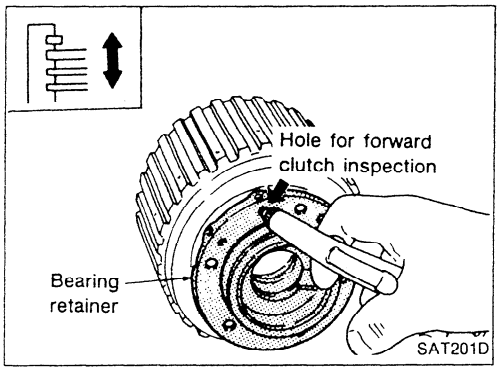
11. Install drive plates, driven plates, retaining plate and dished plate for forward clutch.



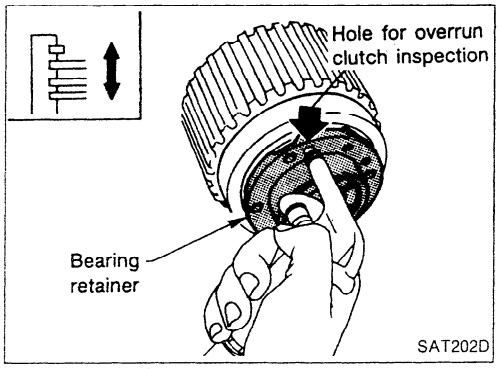
12. Install snap ring for forward clutch.



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 S.D.S.

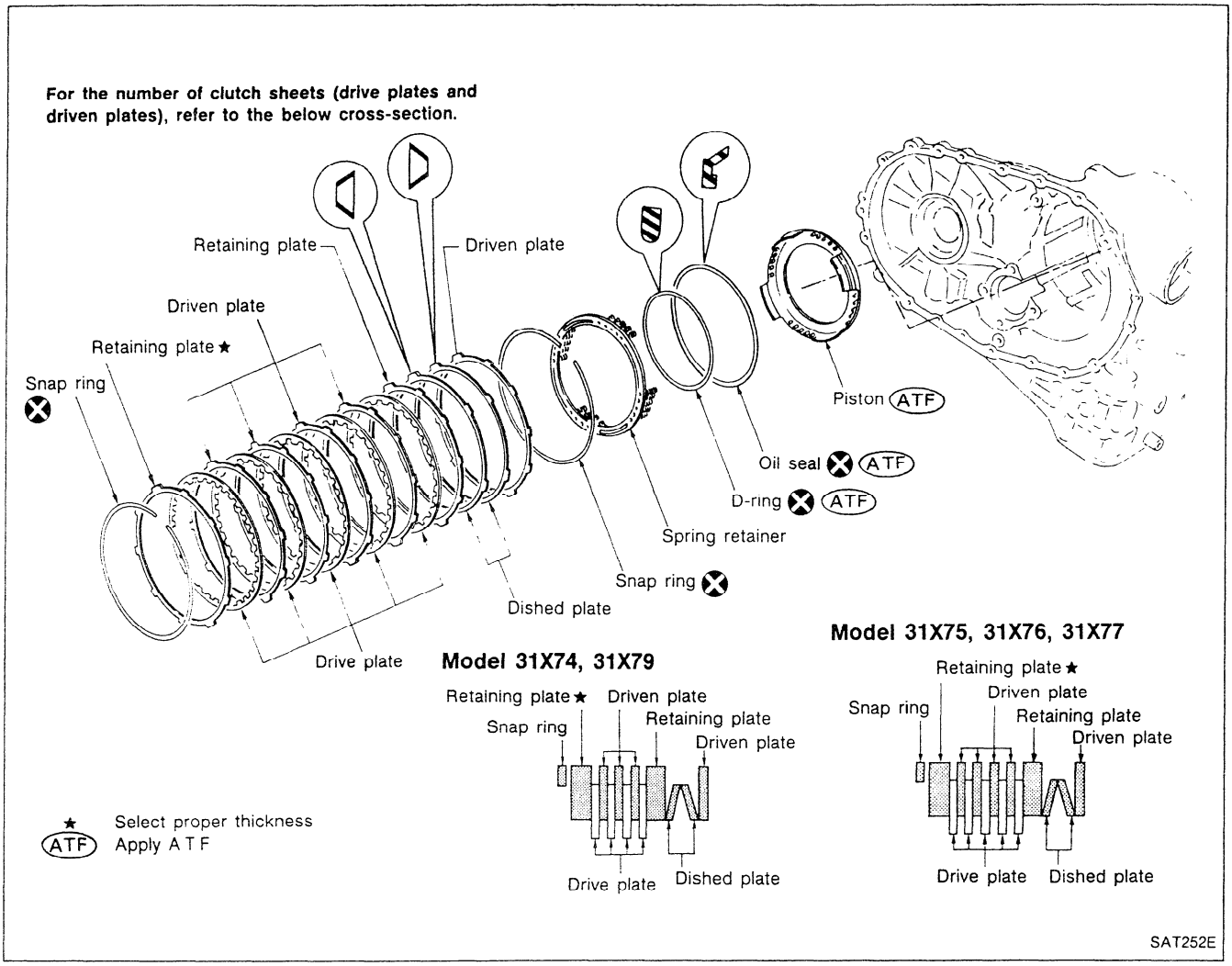


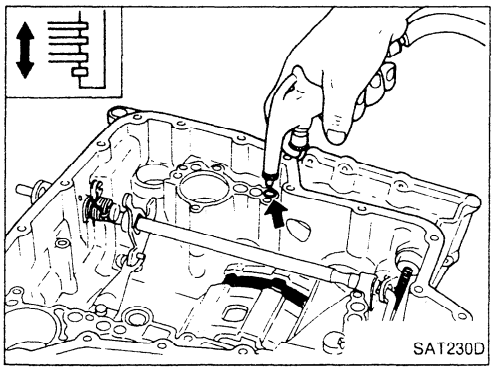
14. Check operation of forward clutch.
    Refer to "DISASSEMBLY" in "Forward Clutch and Overrun Clutch."



15. Check operation of overrun clutch.
    Refer to "DISASSEMBLY" in "Forward Clutch and Overrun Clutch."

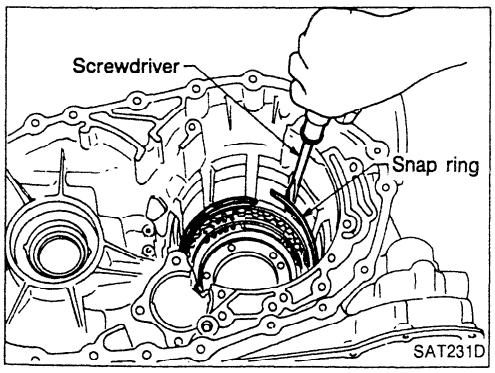
Low & Reverse Brake



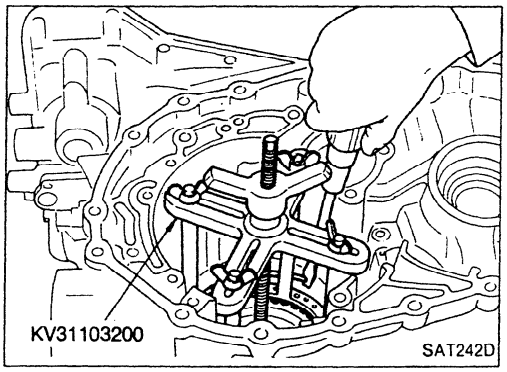


DISASSEMBLY

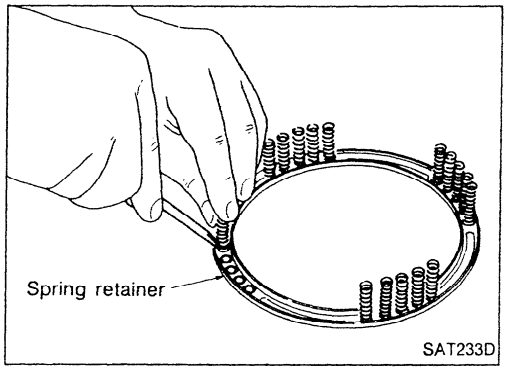
1. Check operation of low & reverse brake.
a. Apply compressed air to oil hole of transmission case.
b. Check to see that retaining plate moves to snap ring.
c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.



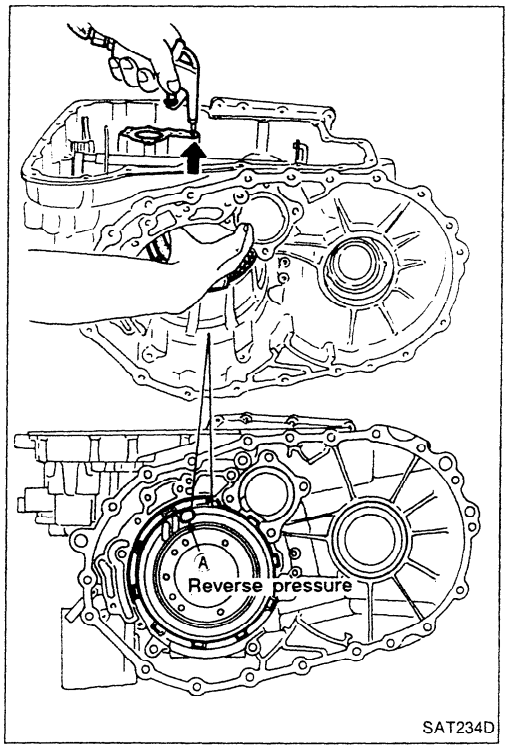
2. Stand transmission case.
3. Remove snap ring.
4. Remove drive plates, driven plates, retaining plates and dished plates from transmission case.



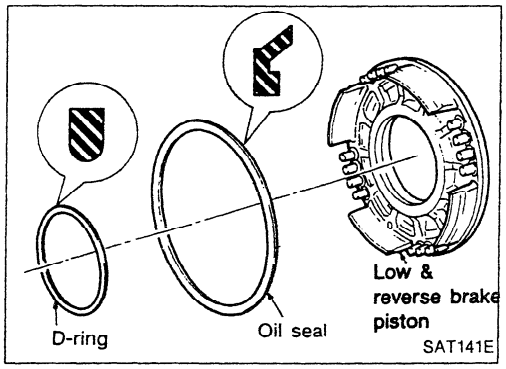
5. Set Tool on spring retainer and remove snap ring while compressing return springs.
- **Set Tool directly above return springs.**
- **Do not expand snap ring excessively.**
6. Remove spring retainer and return springs.



- **Do not remove return springs from spring retainer.**



7. Apply compressed air to oil hole of transmission case while holding piston.
8. Remove piston from transmission case by turning it.



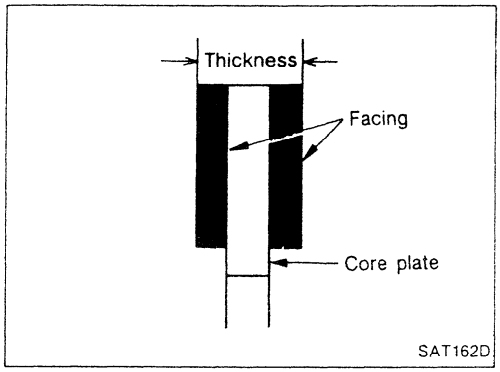
9. Remove D-ring and oil seal from piston.

Low & Reverse Brake (Cont'd)

INSPECTION

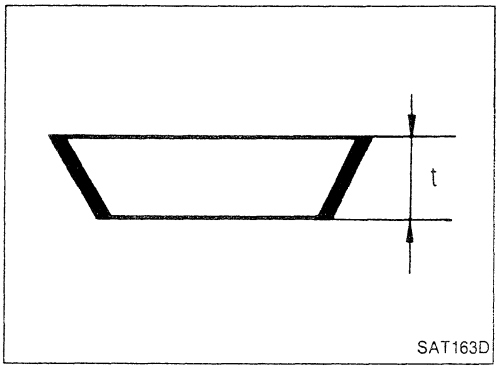
Low & reverse clutch snap ring, spring retainer and return springs

- 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.

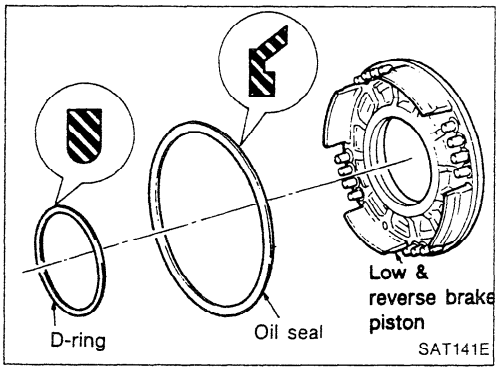


Low & reverse brake dished plates

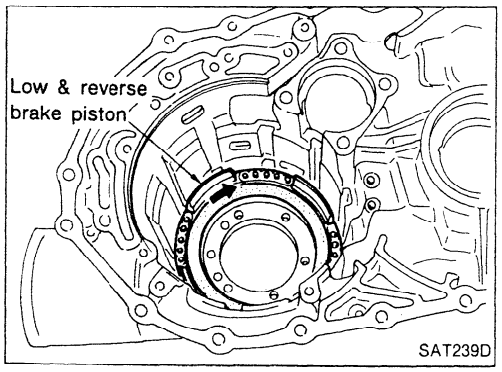
- Check for deformation or damage.
- Measure thickness of dished plate.
  Thickness of dished plate:
  3.00 - 3.30 mm (0.1181 - 0.1299 in)
- If deformed or fatigued, replace.

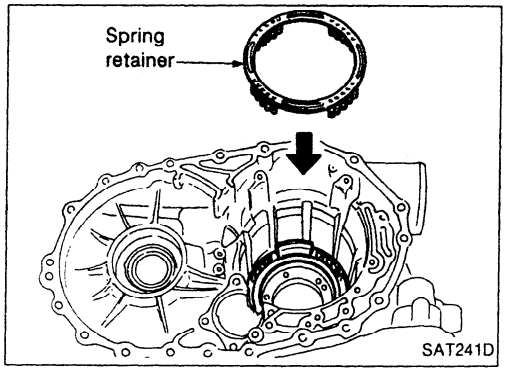
ASSEMBLY

1. Install D-ring and oil seal on piston.
- **Take care with the direction of the oil seal.**
- **Apply A.T.F. to both parts.**

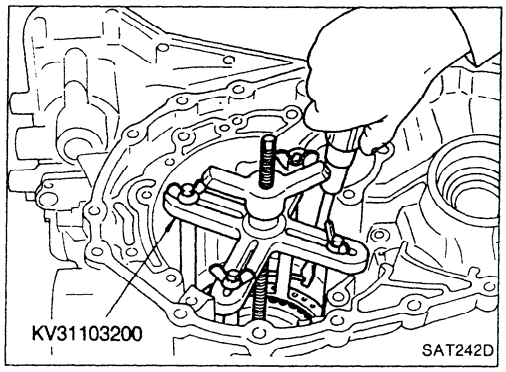


2. Stand transmission case.
3. Install piston assembly on transmission case while turning it slowly.
- **Apply A.T.F. to inner surface of transmission case.**

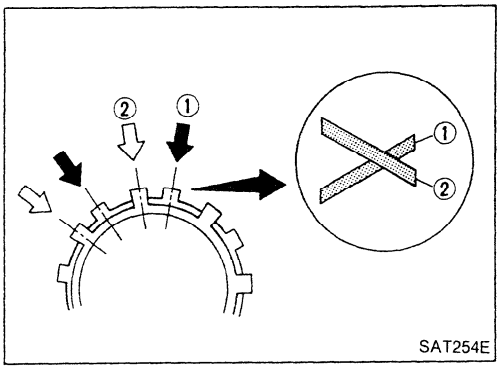




4. Install return springs and spring retainer on piston.

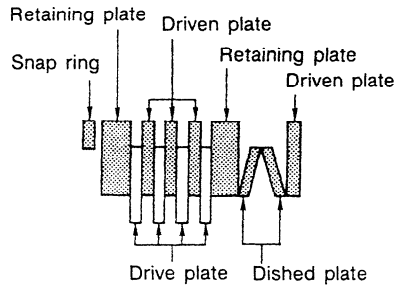


5. Install snap ring while compressing return springs.
- **Set Tool directly above return springs.**

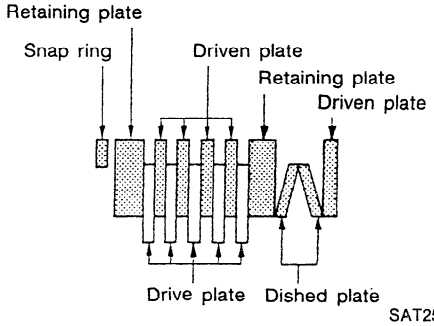


6. Install drive plates, driven plates, retaining plates and dished plates.
- **Do not align the projections on the two dished plates.**

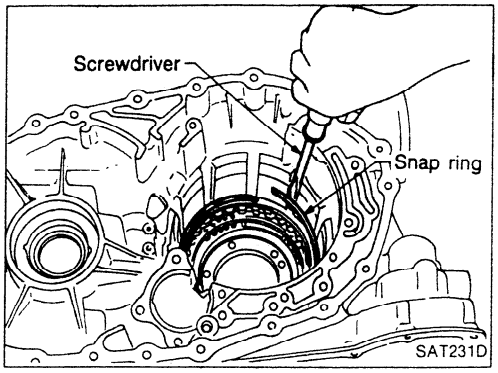
Model 31X74, 31X79



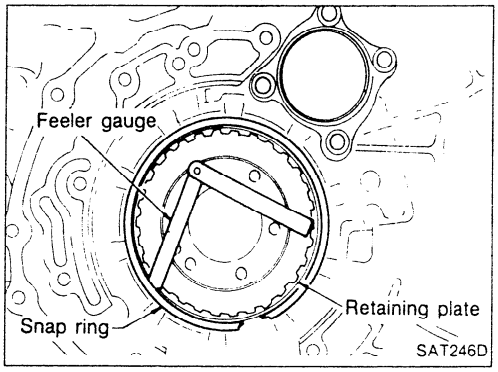
Model 31X75, 31X76, 31X77



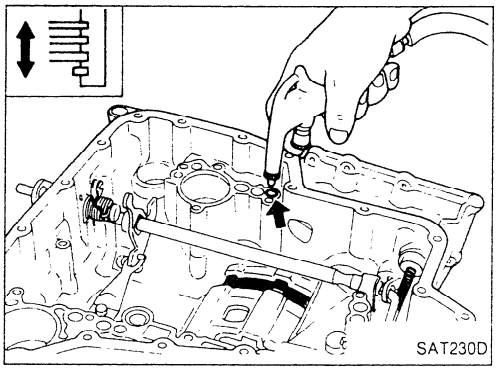
Low & Reverse Brake (Cont'd)



7. Install snap ring.

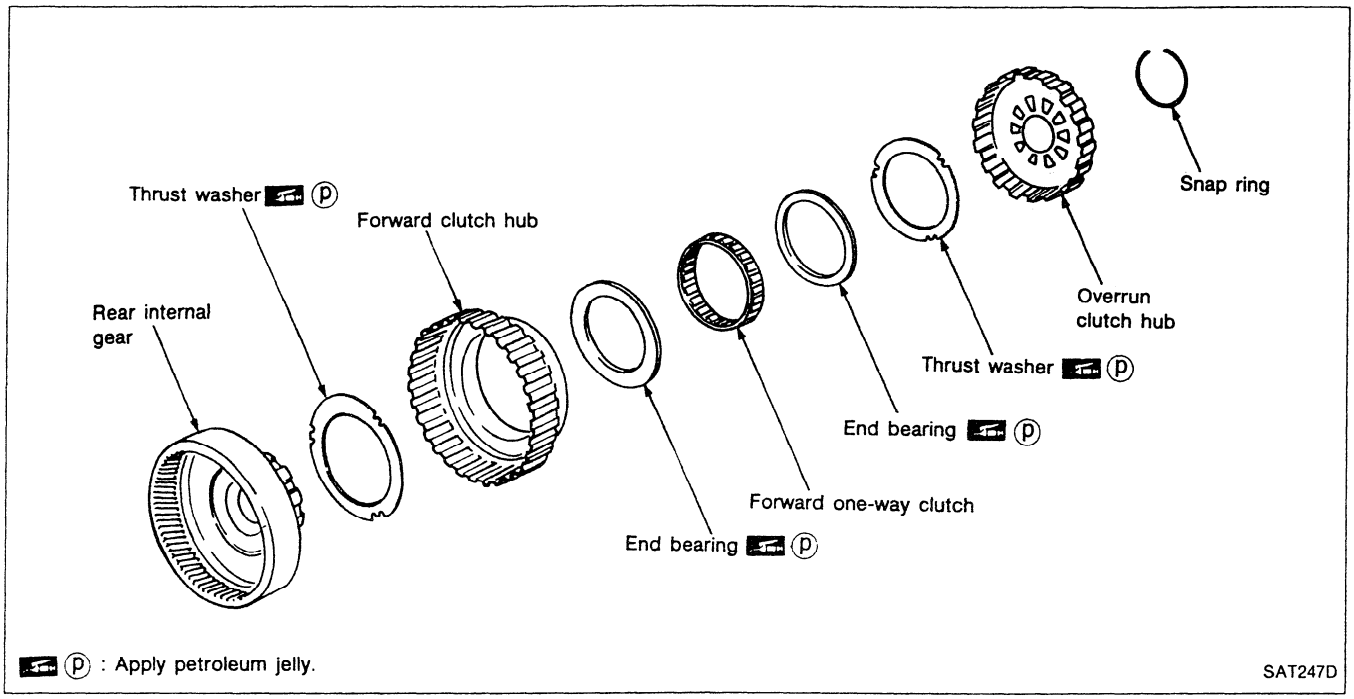


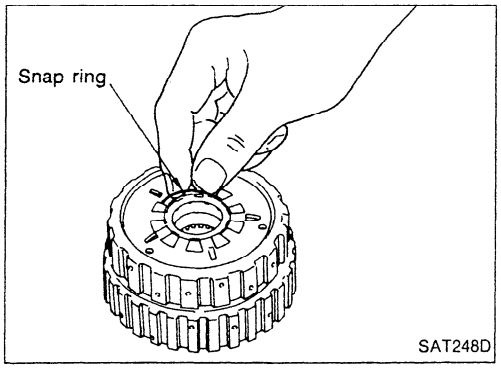
8. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate (front side).
   Specified clearance:
   Standard: 1.4 - 1.8 mm (0.055 - 0.071 in)
   Allowable limit:
   31X74, 31X79: 2.6 mm (0.102 in)
   31X75, 31X76, 31X77: 2.8 mm (0.110 in)
   Retaining plate: Refer to S.D.S.



9. Check operation of low & reverse brake.
   Refer to "DISASSEMBLY" in "Low & Reverse Brake."

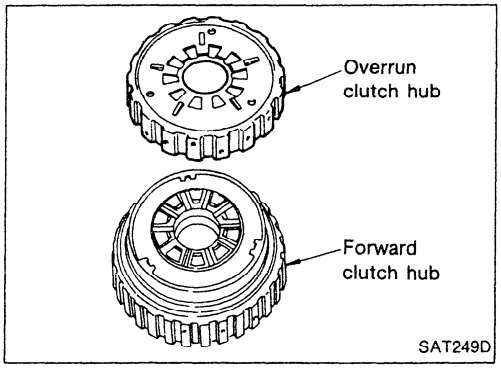
Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub





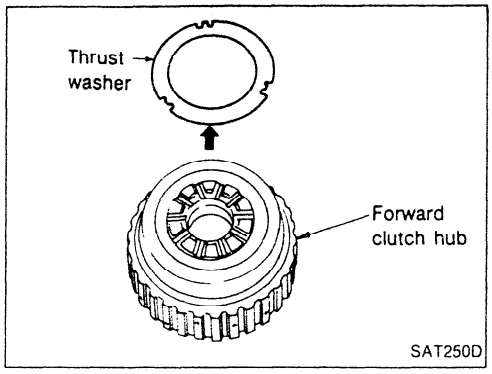
DISASSEMBLY

1. Remove snap ring from overrun clutch hub.

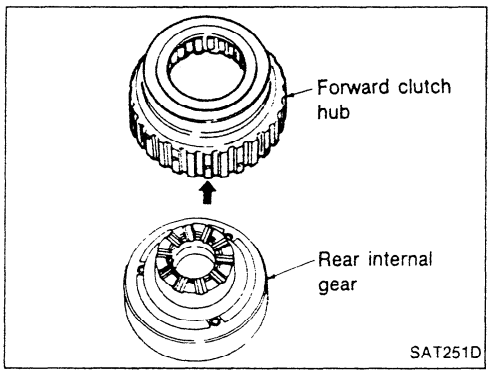


2. Remove overrun clutch hub from forward clutch hub.

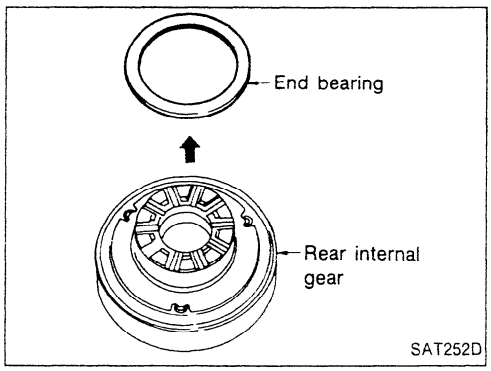
Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd)



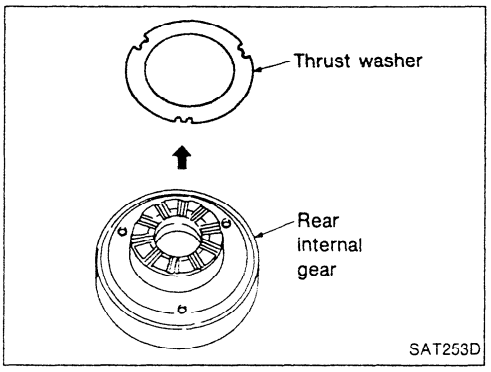
3. Remove thrust washer from forward clutch hub.



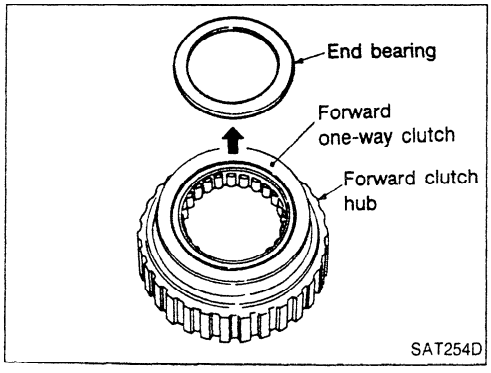
4. Remove forward clutch hub from rear internal gear.



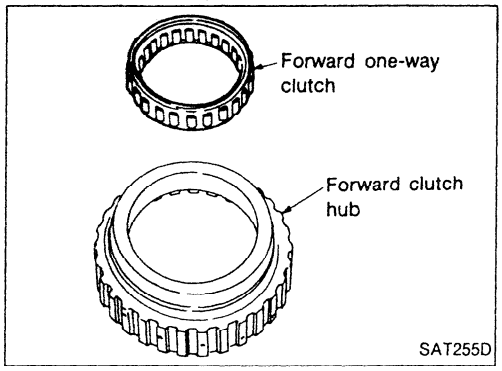
5. Remove end bearing from rear internal gear.



6. Remove thrust washer from rear internal gear.



7. Remove end bearing from forward one-way clutch.

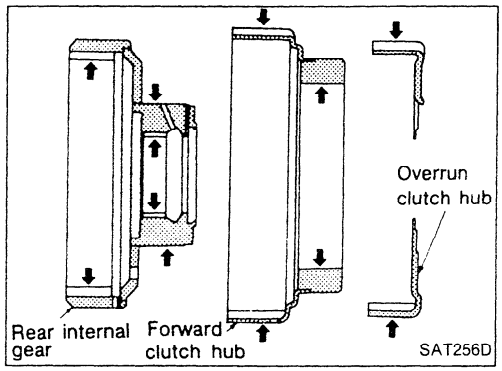


8. Remove one-way clutch from forward clutch hub.

INSPECTION

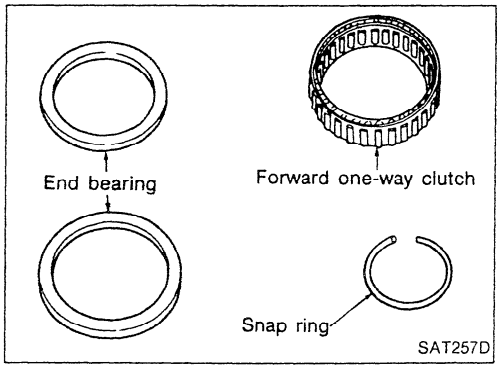
Rear internal gear, forward clutch hub and overrun clutch hub

- Check rubbing surface for wear or damage.



Snap ring, end bearings and forward one-way clutch

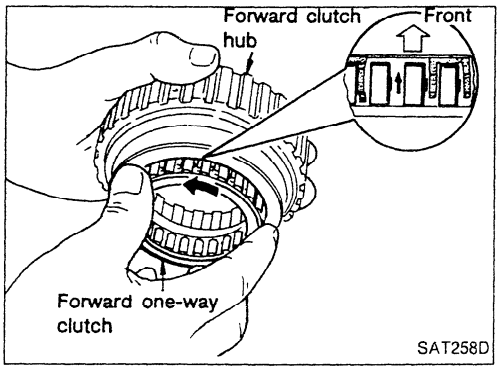
- Check snap ring and end bearings for deformation and damage.
- Check forward one-way clutch for wear and damage.



ASSEMBLY

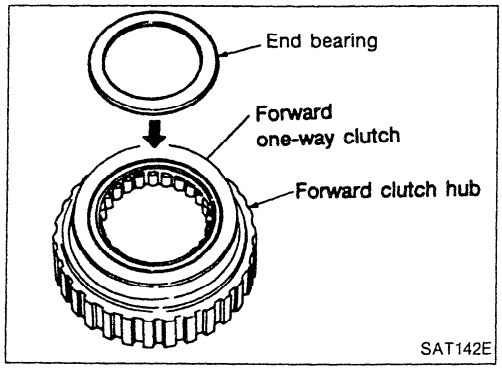
1. Install forward one-way clutch on forward clutch.

- **Take care with the direction of the forward one-way clutch.**

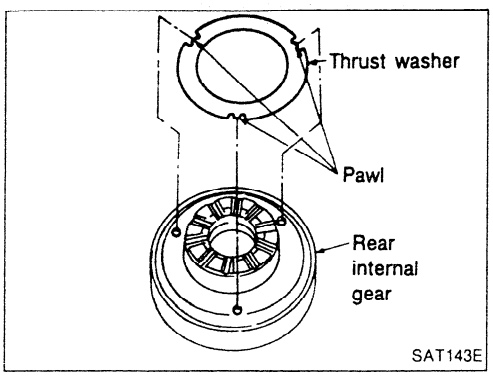


2. Install end bearing on forward one-way clutch.

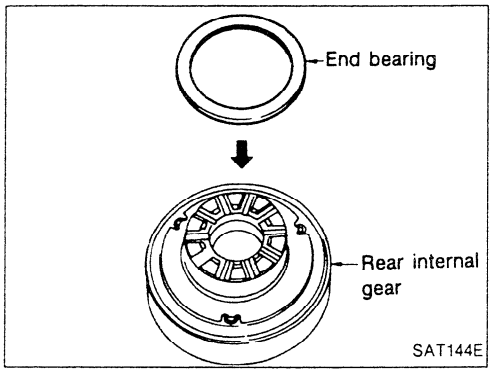
- **Apply petroleum jelly to end bearing.**



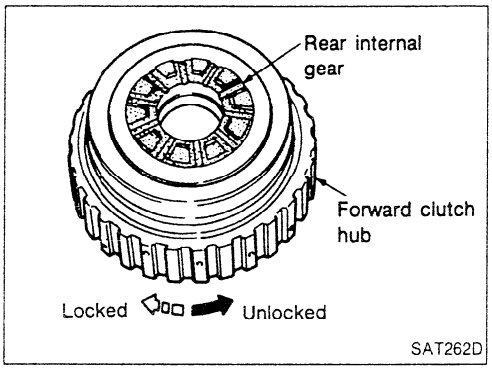
Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd)



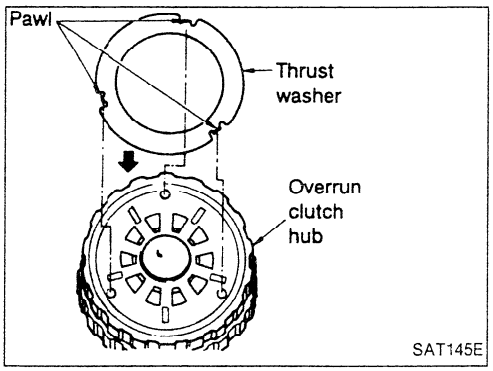
3. Install thrust washer on rear internal gear.
- **Apply petroleum jelly to thrust washer.**
- **Align pawls of thrust washer with holes of rear internal gear.**



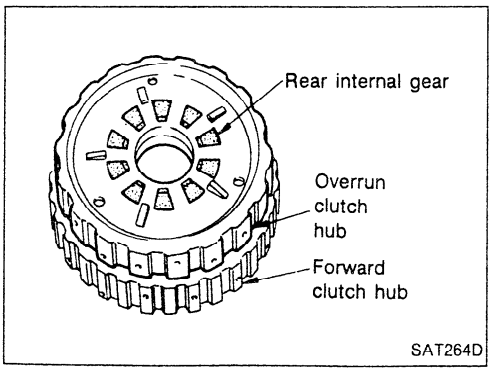
4. Install end bearing on rear internal gear.
- **Apply petroleum jelly to end bearing.**



5. Install forward clutch hub on rear internal gear.
- **Check operation of forward one-way clutch.**

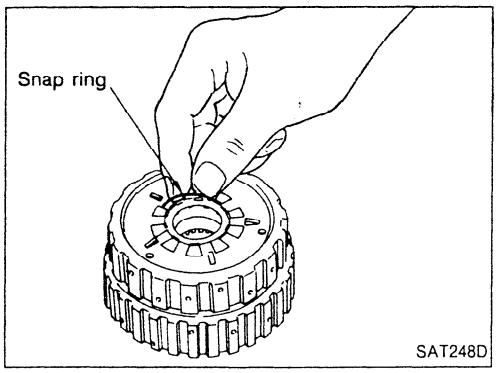


6. Install thrust washer on overrun clutch hub.
- **Apply petroleum jelly to thrust washer.**
- **Align pawls of thrust washer with holes of overrun clutch hub.**



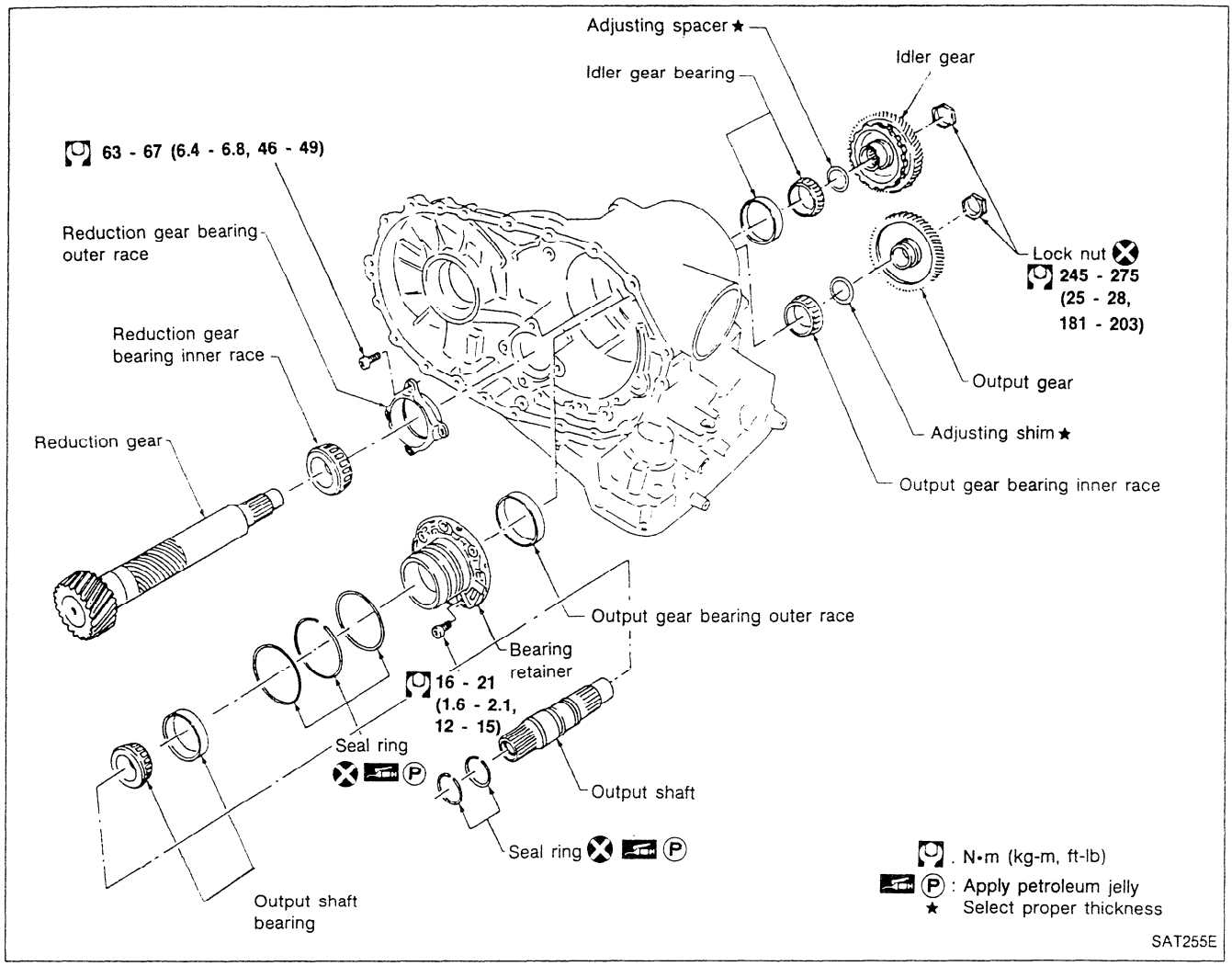
7. Install overrun clutch hub on rear internal gear.
- **Align projections of rear internal gear with holes of overrun clutch hub.**

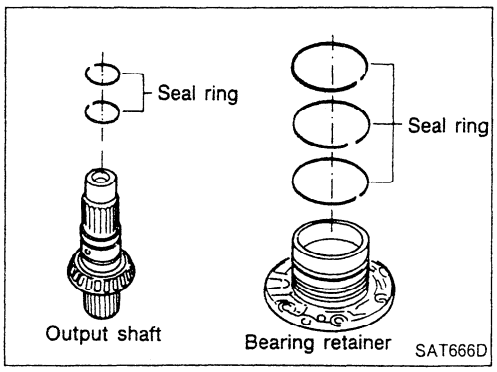
Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd)



8. Install snap ring to groove of rear internal gear.

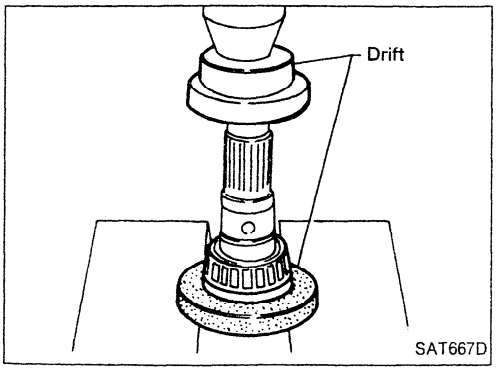
Output Shaft, Output Gear, Idler Gear, Reduction Gear and Bearing Retainer





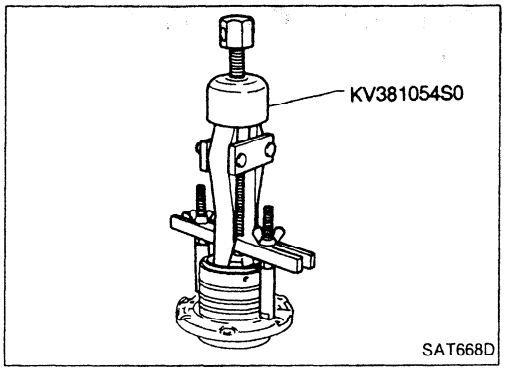
DISASSEMBLY

1. Remove seal rings from output shaft and bearing retainer.

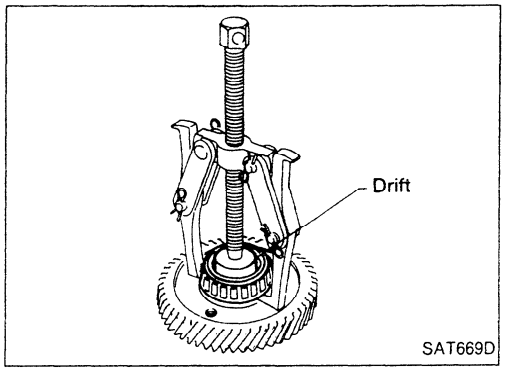


2. Press out output shaft bearing inner race.

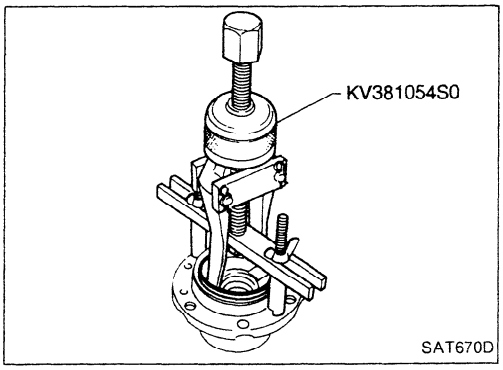
Output Shaft, Output Gear, Idler Gear, Reduction Gear and Bearing Retainer (Cont'd)



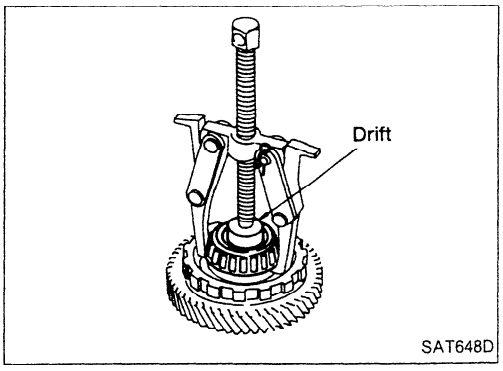
3. Remove output shaft bearing outer race from bearing retainer.



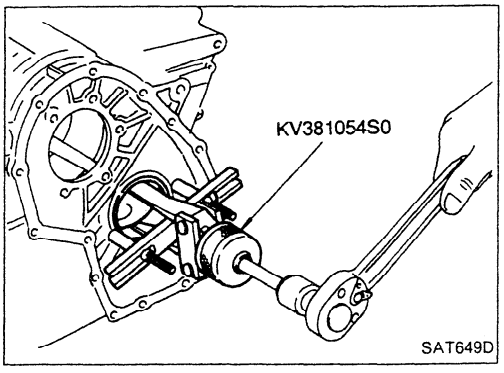
4. Remove output gear bearing inner race.



5. Remove output gear bearing outer race from bearing retainer.

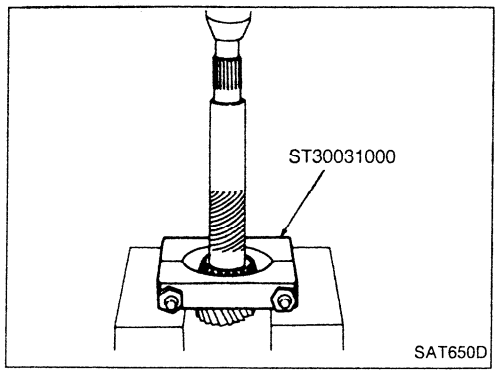


6. Remove idler gear bearing inner race.

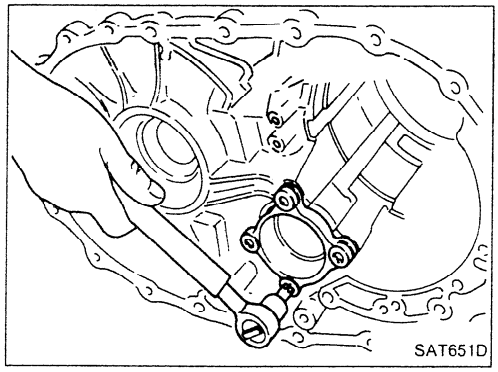


7. Remove idler gear bearing outer race from transmission case.

Output Shaft, Output Gear, Idler Gear, Reduction Gear and Bearing Retainer (Cont'd)



8. Press out reduction gear inner race from reduction gear.

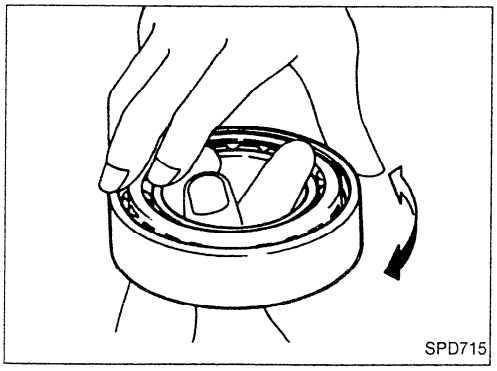


9. Remove reduction gear bearing outer race from transmission case.

INSPECTION

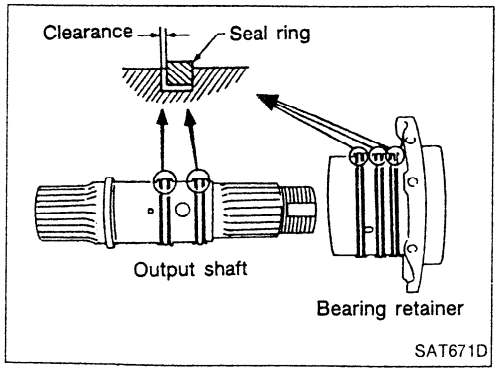
Output shaft, output gear, idler gear and reduction gear

- Check shafts for cracks, wear or bending.
- Check gears for wear, chips and cracks.



Bearings

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing taper roller bearing, replace inner and outer races 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)
  Wear limit:
  0.25 mm (0.0098 in)
- If not within wear limit, replace output shaft.

Output Shaft, Output Gear, Idler Gear, Reduction Gear and Bearing Retainer (Cont'd)

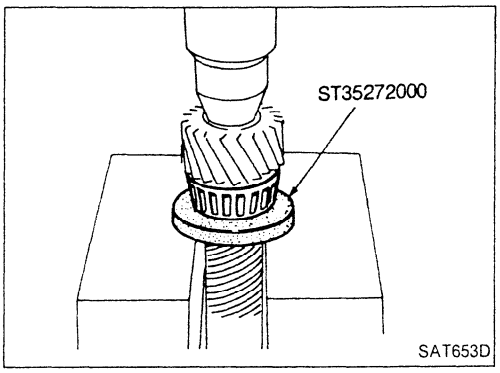
- Install new seal rings to bearing retainer.
- Measure clearance between seal ring and ring groove of bearing retainer.

  Standard clearance:

  0.10 - 0.25 mm (0.0039 - 0.0098 in)

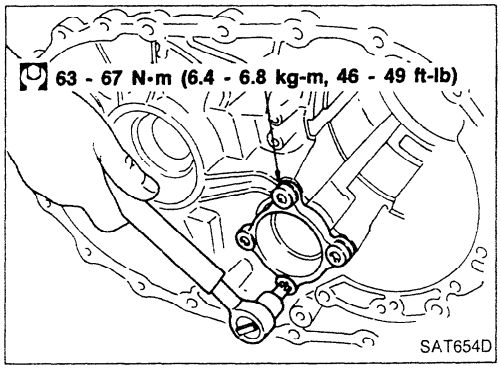
  Wear limit:

  0.25 mm (0.0098 in)
- If not within wear limit, replace bearing retainer.

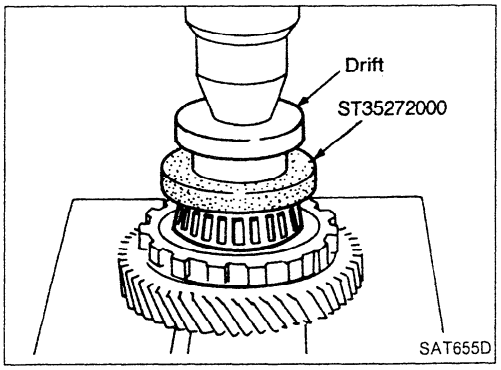


ASSEMBLY

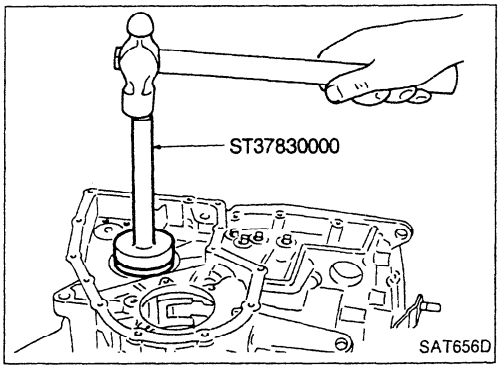
1. Press reduction gear bearing inner race on reduction gear.



2. Install reduction gear bearing outer race on transmission case.

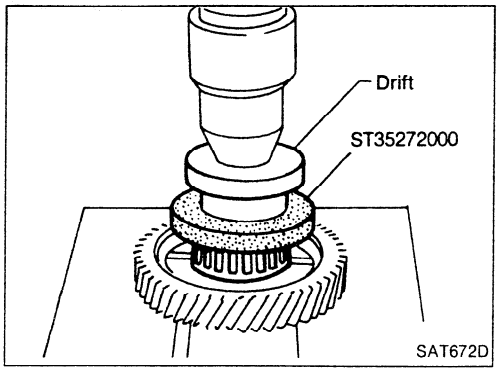


3. Press idler gear bearing inner race on idler gear.

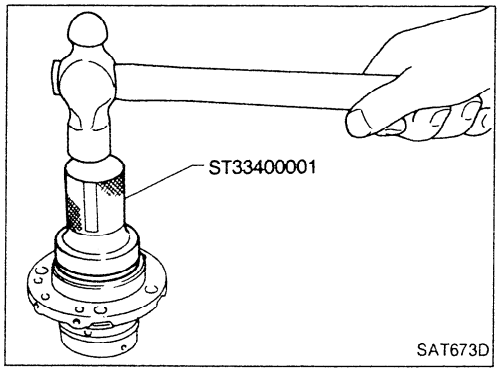


4. Install idler gear bearing outer race on transmission case.

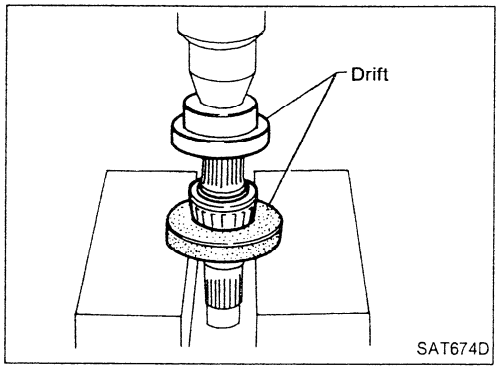
Output Shaft, Output Gear, Idler Gear, Reduction Gear and Bearing Retainer (Cont'd)



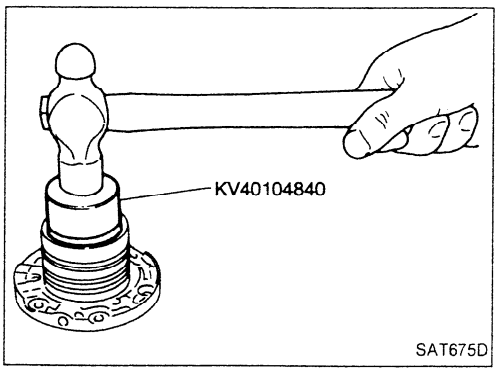
5. Press output gear bearing inner race on output gear.



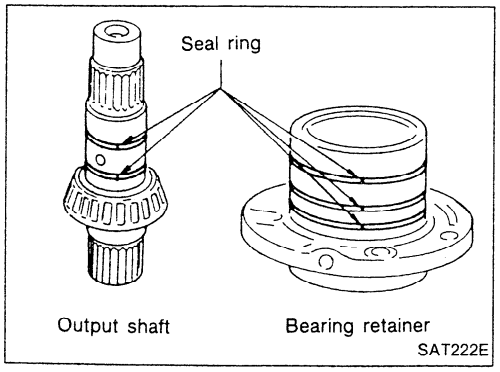
6. Install output gear bearing outer race on bearing retainer.



7. Press output shaft bearing inner race on output shaft.



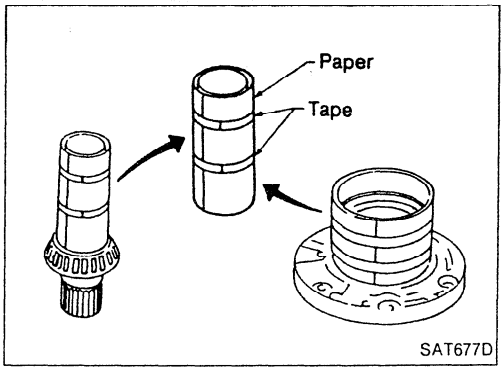
8. Install output shaft bearing outer race on bearing retainer.



9. Install new seal rings onto output shaft and bearing retainer.

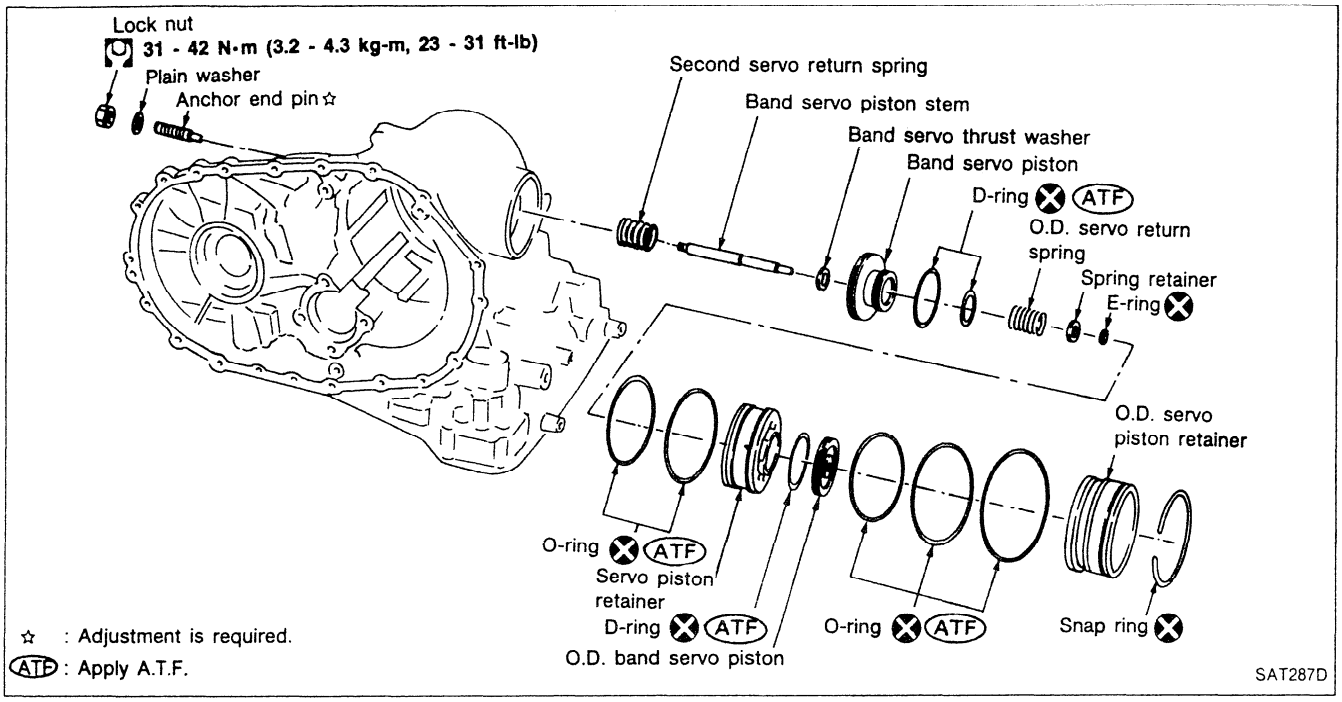
- **Apply petroleum jelly to seal rings.**

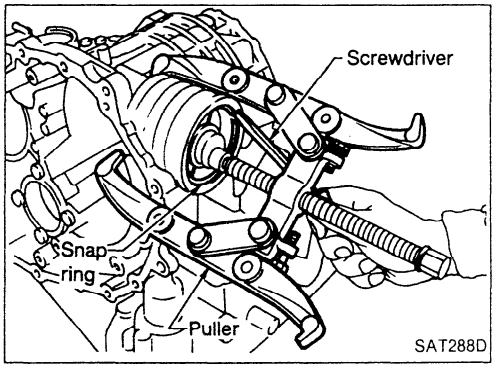
Output Shaft, Output Gear, Idler Gear, Reduction Gear and Bearing Retainer (Cont'd)



10. Roll paper around seal rings to prevent seal rings from spreading.

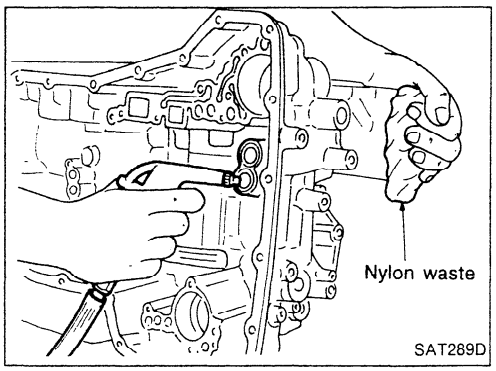
Band Servo Piston Assembly



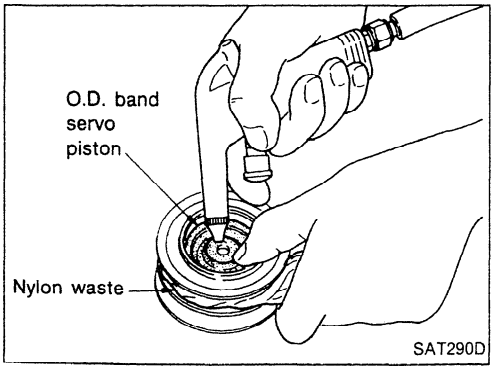


DISASSEMBLY

1. Remove band servo piston snap ring.

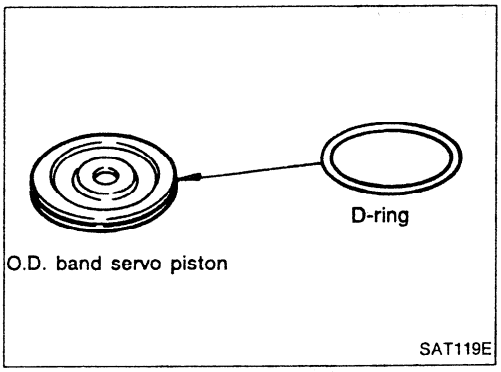


2. Apply compressed air to oil hole in transmission case to remove O.D. servo piston retainer and band servo piston assembly.
   - **Hold band servo piston assembly with a rag.**

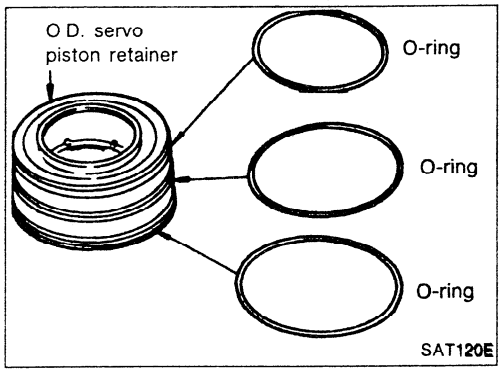


3. Apply compressed air to oil hole in O.D. servo piston retainer to remove O.D. band servo piston from retainer.
   - **Hold O.D. band servo piston while applying compressed air.**

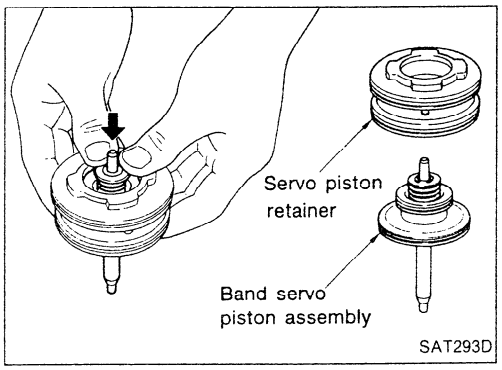
Band Servo Piston Assembly (Cont'd)



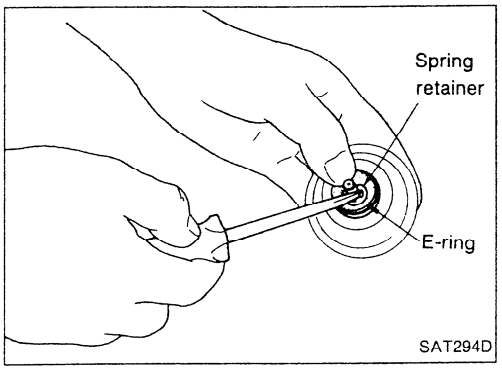
4. Remove D-ring from O.D. band servo piston.



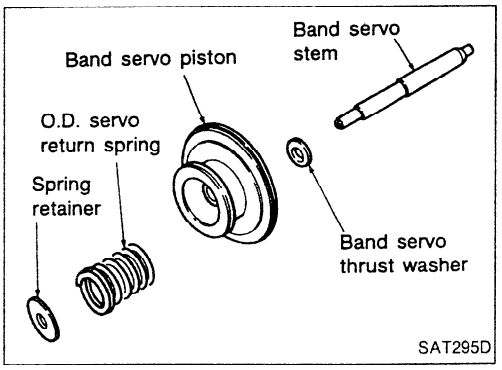
5. Remove O-rings from O.D. servo piston retainer.



6. Remove band servo piston assembly from servo piston retainer by pushing it forward.

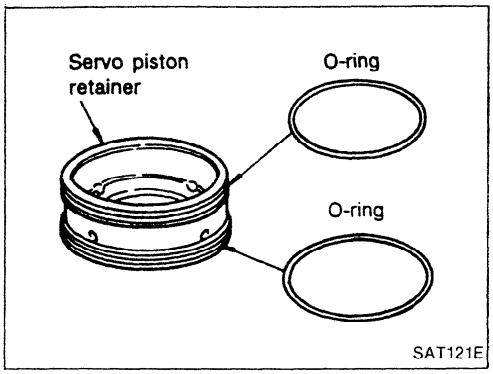


7. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.

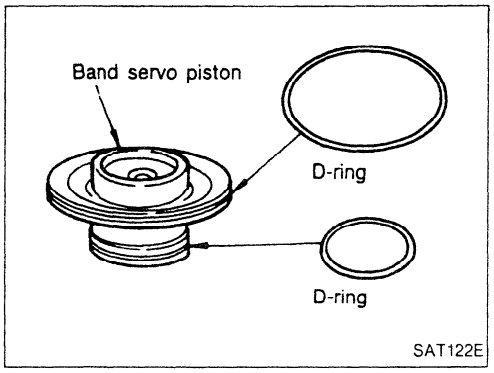


8. Remove O.D. servo return spring, band servo thrust washer and band servo piston stem from band servo piston.

Band Servo Piston Assembly (Cont'd)



9. Remove O-rings from servo piston retainer.

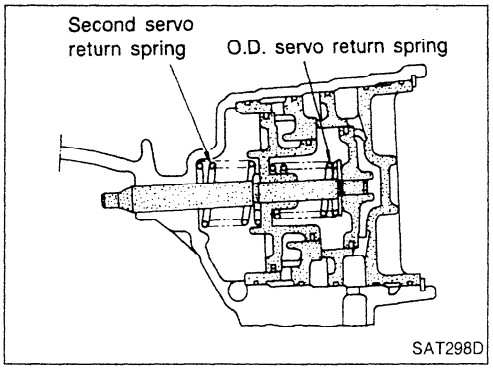


10. Remove D-rings from band servo piston.

INSPECTION

Pistons, retainers and piston stem

- Check frictional surfaces for abnormal wear or damage.



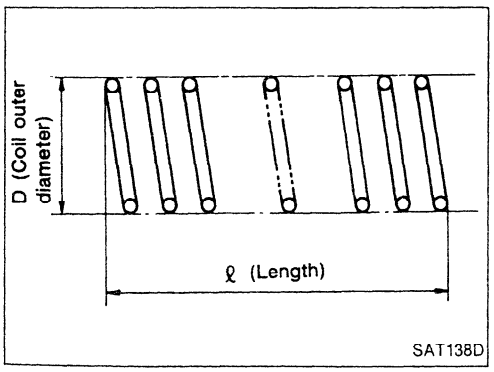
Return springs

- Check for deformation or damage.
- Measure free length and outer diameter.

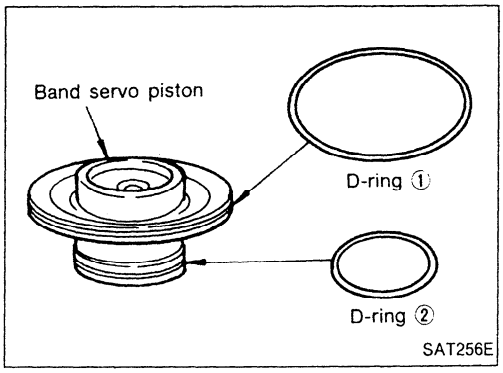
Inspection standard

Unit: mm (in)

Parts	Free length	Outer diameter
2nd servo return spring	32 5 (1.280)	25.9 (1.020)
O.D. servo return spring	31.0 (1.220)	21.7 (0.854)



Band Servo Piston Assembly (Cont'd)



ASSEMBLY

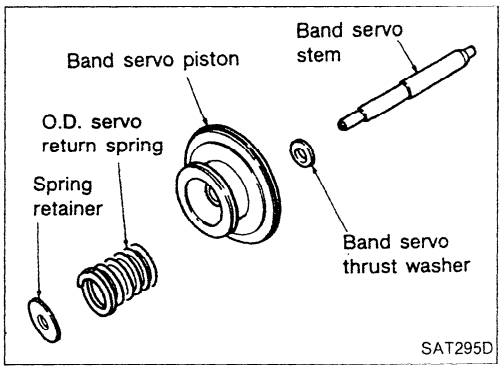
1. Install D-rings to band servo piston.

- **Apply A.T.F. to D-rings.**
- **Pay attention to the position of each D-ring.**

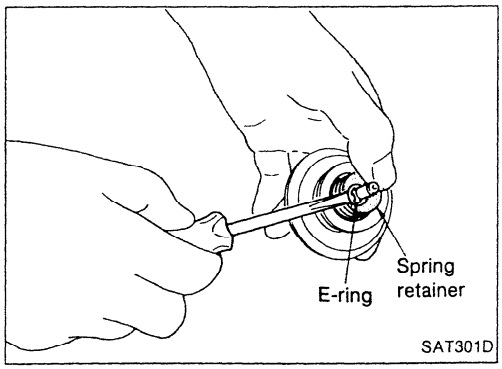
D-rings:

Unit: mm (in)

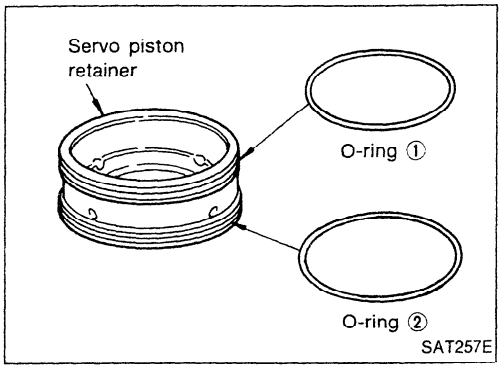
D-ring	Inner diameter	
	Model 31X74, 31X79	Model 31X75, 31X76, 31X77
①	51.9 (2.043)	53.8 (2.118)
②	29.8 (1.173)	31.7 (1.248)



2. Install band servo piston stem, band servo thrust washer, O.D. 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.

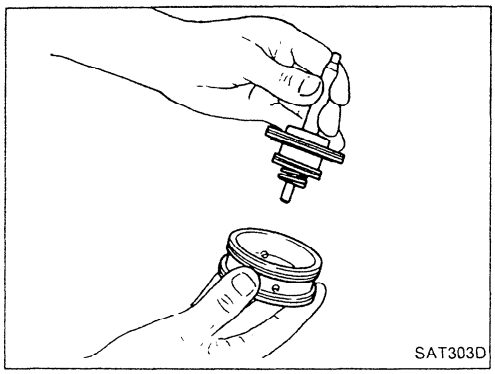
- **Apply A.T.F. to O-rings.**
- **Pay attention to the position of each O-ring.**

O-rings:

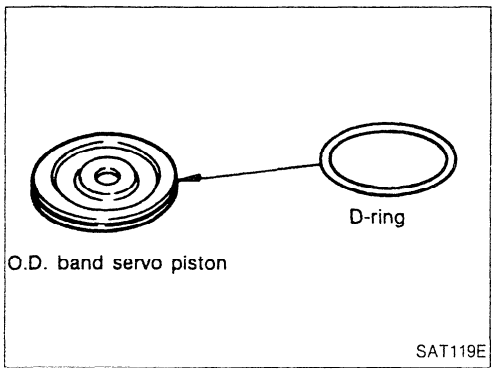
Unit: mm (in)

O-ring	Inner diameter
①	65.4 (2.575)
②	67.3 (2.650)

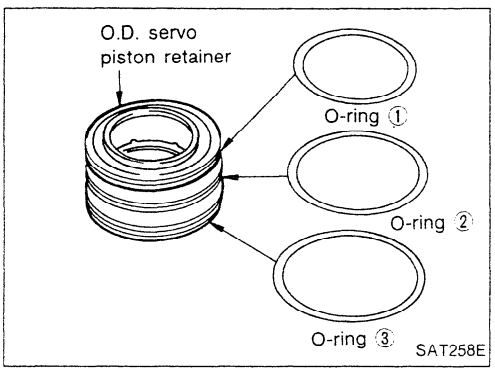
Band Servo Piston Assembly (Cont'd)



5. Install band servo piston assembly to servo piston retainer by pushing it inward.



6. Install D-ring to O.D. band servo piston.
- **Apply A.T.F. to D-ring.**

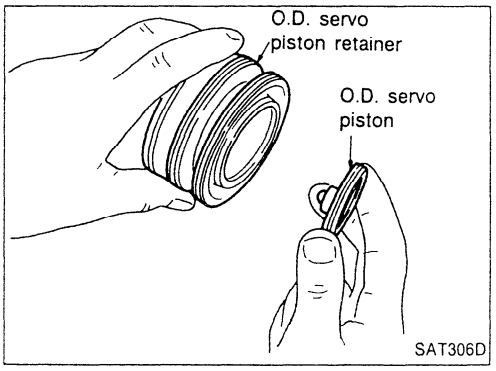


7. Install O-rings to O.D. servo piston retainer.
- **Apply A.T.F. to O-rings.**
- **Pay attention to the position of each O-ring.**

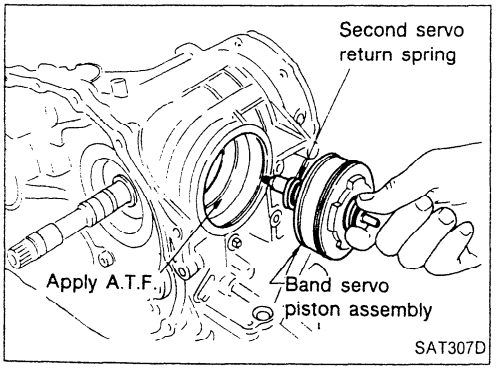
O-rings:

Unit: mm (in)

O-ring	Inner diameter
①	69.2 (2.724)
②	71.2 (2.803)
③	73.1 (2.878)

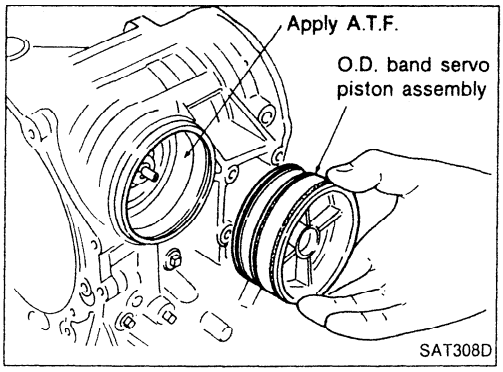


8. Install O.D. band servo piston to O.D. servo piston retainer.

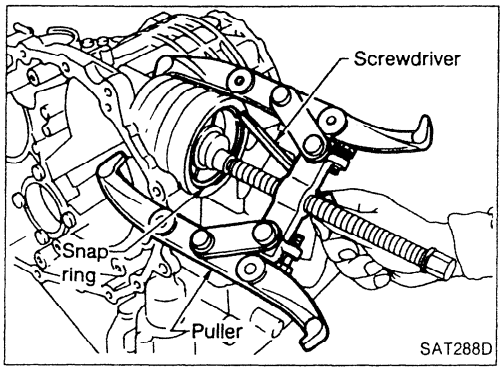


9. Install band servo piston assembly and 2nd servo return spring to transmission case.
- **Apply A.T.F. to O-ring of band servo piston and transmission case.**

Band Servo Piston Assembly (Cont'd)

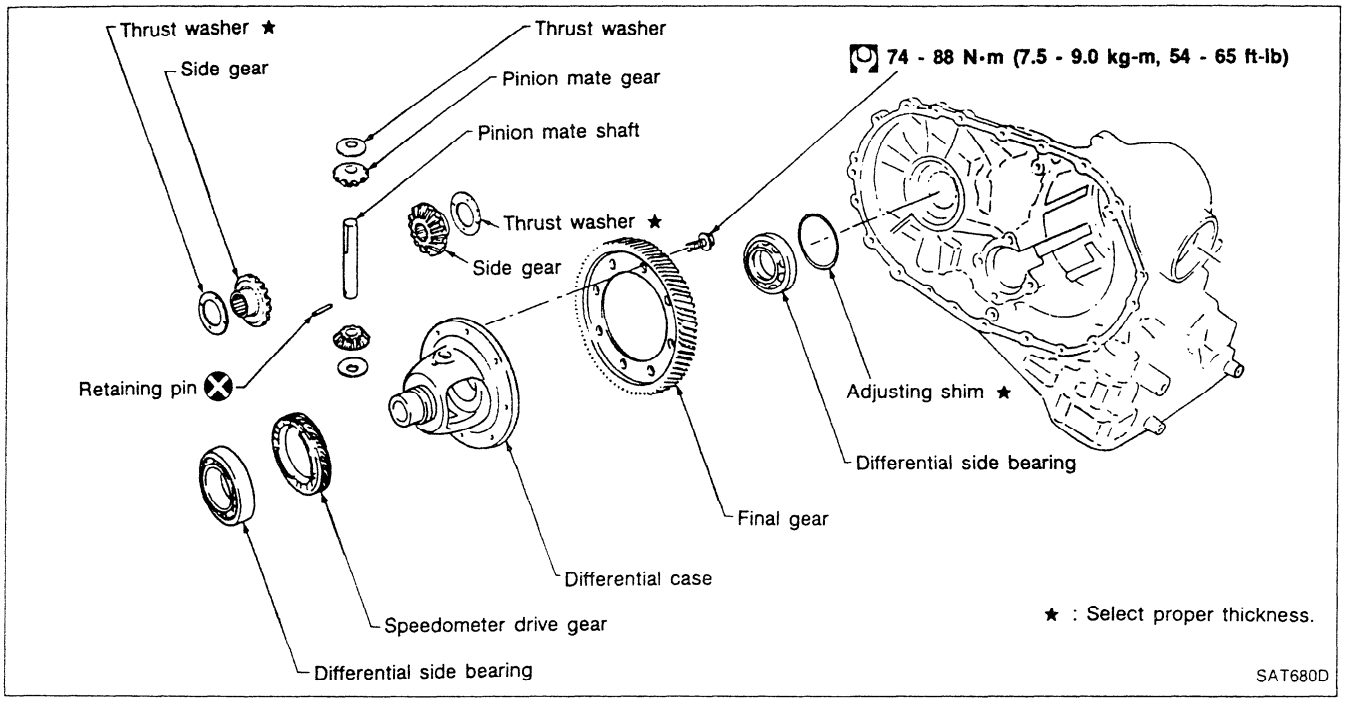


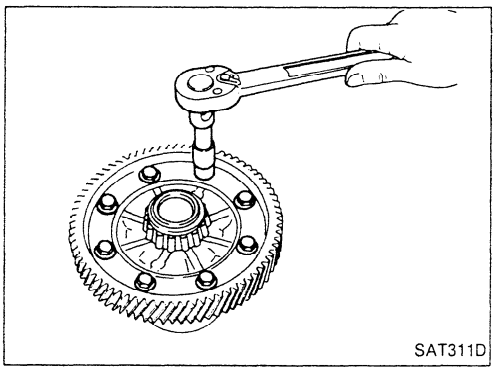
10. Install O.D. band servo piston assembly to transmission case.
- **Apply A.T.F. to O-ring of band servo piston and transmission case.**



11. Install band servo piston snap ring to transmission case.

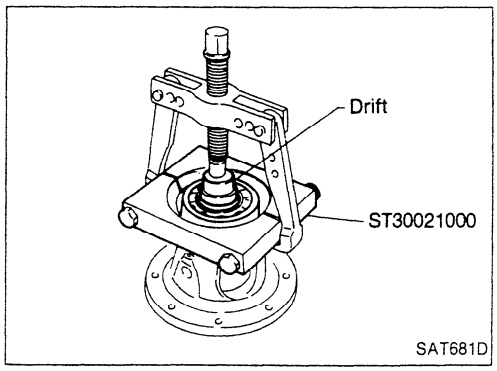
Final Drive



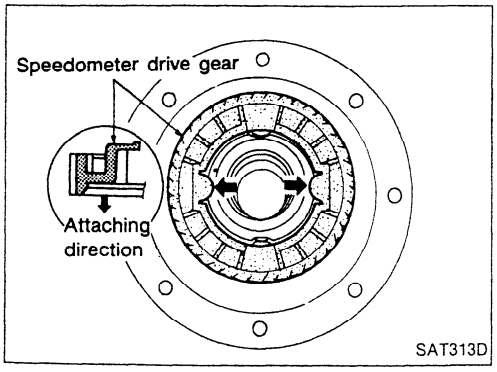


DISASSEMBLY

1. Remove final gear.

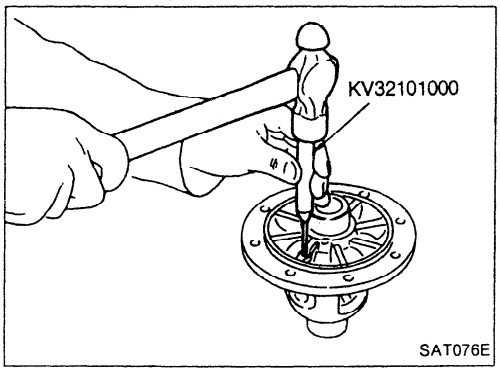


2. Press out differential side bearings.

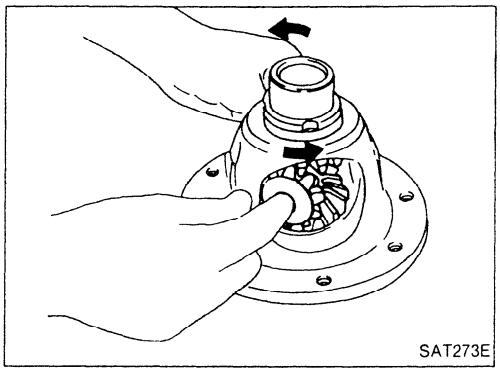


3. Remove speedometer drive gear.

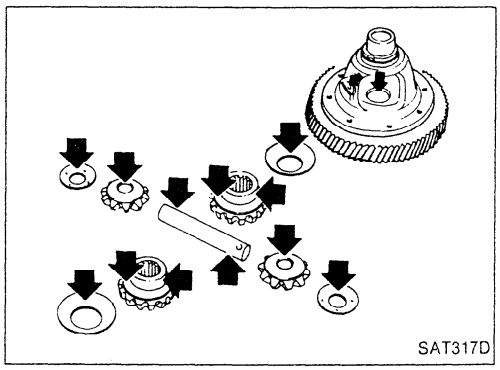
Final Drive (Cont'd)



4. Drive out pinion mate shaft retaining pin.



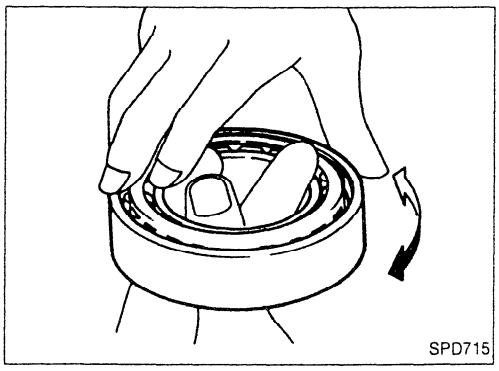
5. Draw out pinion mate shaft from differential case.
6. Remove pinion mate gears and side gears.



INSPECTION

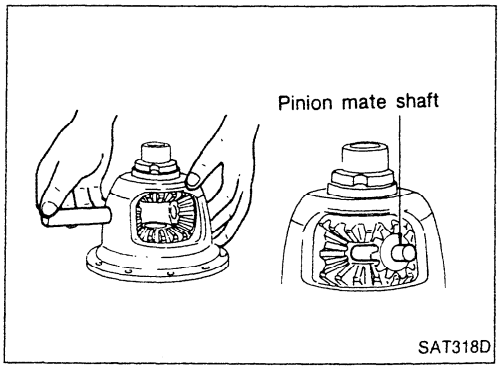
Gear, washer, shaft and case

- 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.

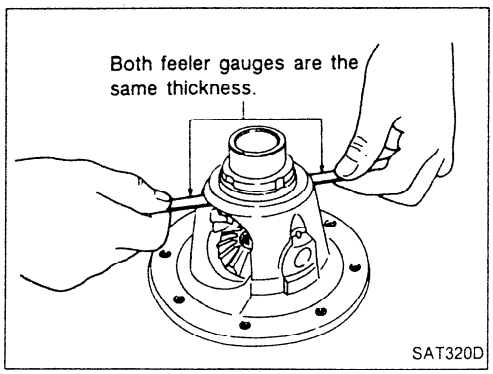


ASSEMBLY

1. Install side gears and thrust washers in differential case.
2. Install pinion mate gears and thrust washers in the differential case while rotating them.

- **Apply A.T.F. to all parts.**

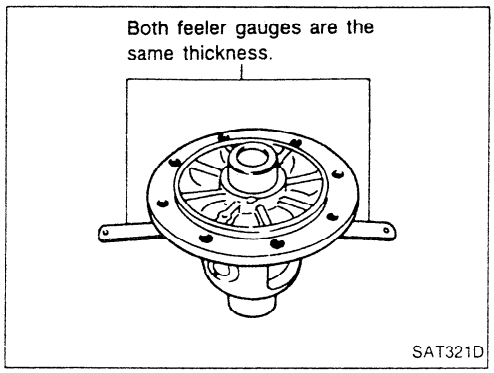
Final Drive (Cont'd)



3. Measure clearance between side gear and differential case with washers.

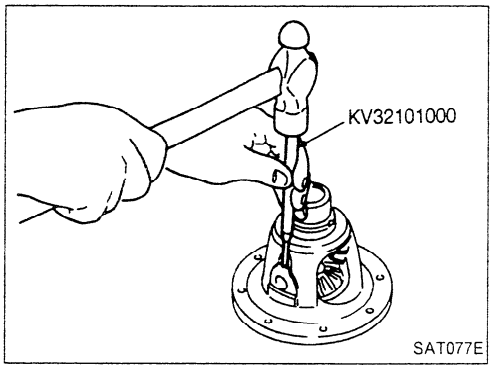
Clearance between side gear and differential case with washers:

0.1 - 0.2 mm (0.004 - 0.008 in)

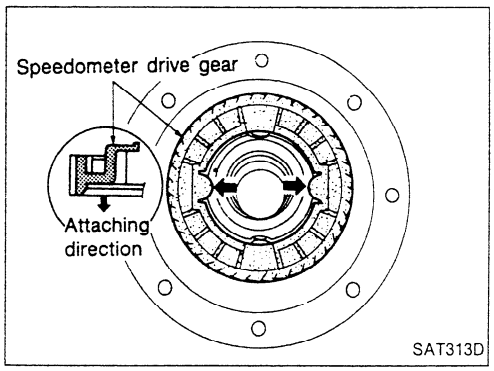


- If not within specification, adjust clearance by changing thickness of side gear thrust washers.

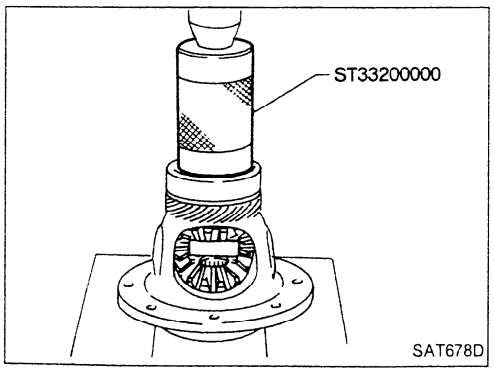
Side gear thrust washer: Refer to S.D.S.



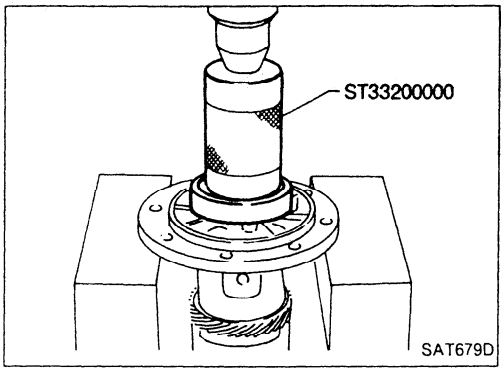
4. Install retaining pin.
- **Make sure that retaining pin is flush with case.**

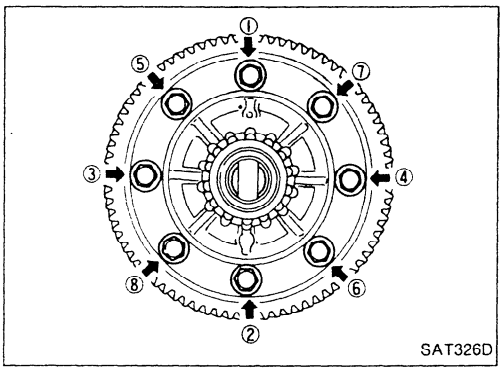


5. Install speedometer drive gear on differential case.
- **Align projection of speedometer drive gear with groove of differential case.**

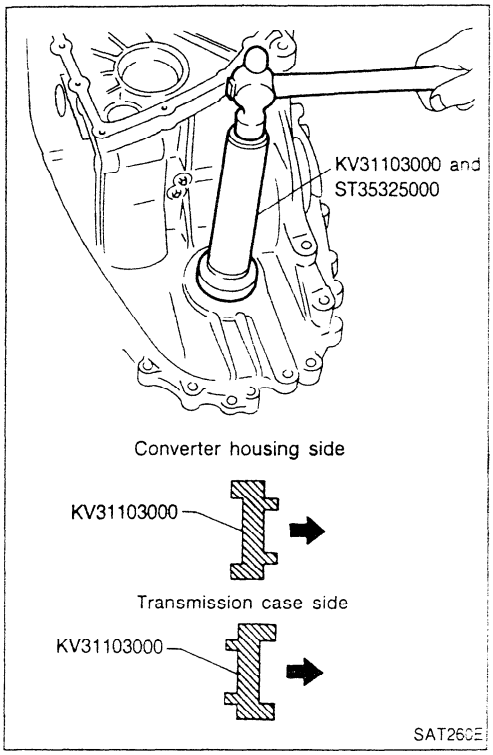


6. Press differential side bearings on differential case.



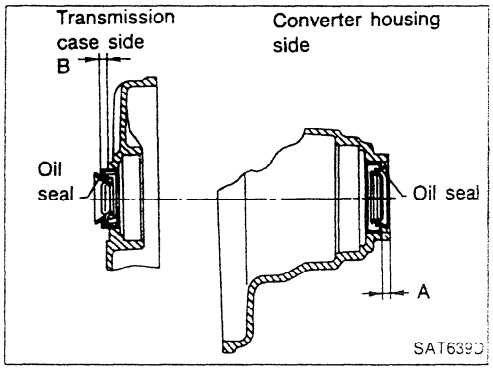


7. Install final gear and tighten fixing bolts in numerical order.



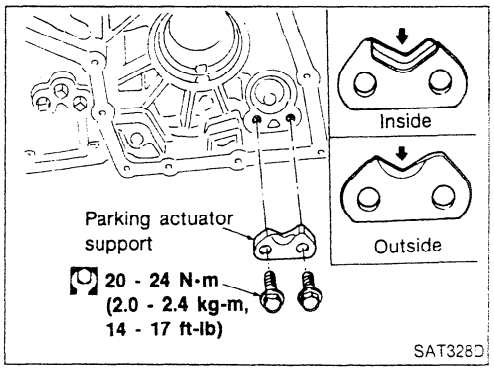
Assembly

1. Install differential side oil seals on transmission case and converter housing, so that "A" and "B" are within specifications.

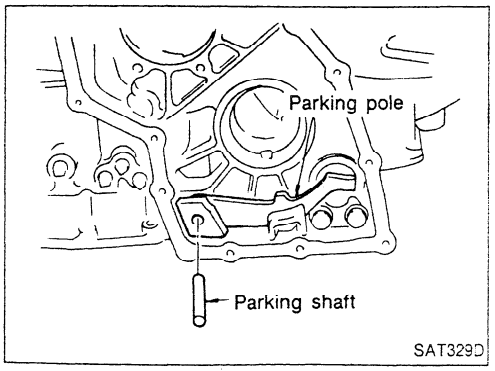


Unit: mm (in)

A	B
5.5 - 6.5 (0.217 - 0.256)	0.5 (0.020) or less



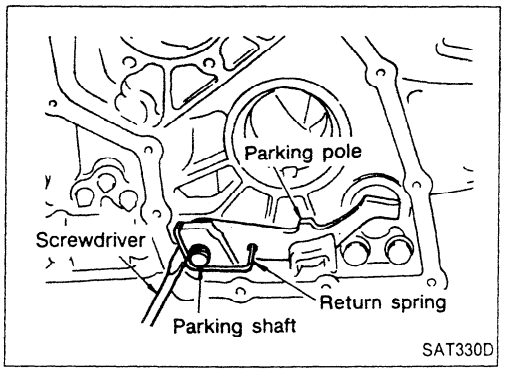
2. Install parking actuator support to transmission case.
- **Pay attention to direction of parking actuator support.**



3. Install parking pawl on transmission case and fix it with parking shaft.

Assembly (Cont'd)

4. Install return spring.

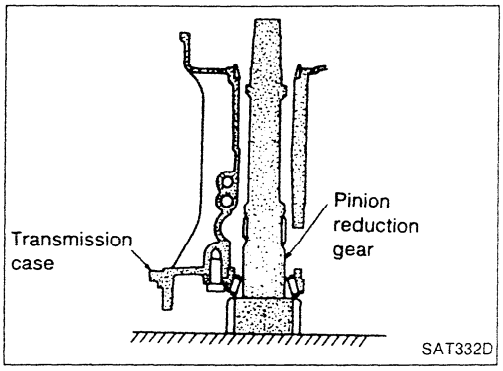


Adjustment

REDUCTION GEAR BEARING PRELOAD

1. Select proper thickness of reduction gear bearing adjusting shim using the following procedures.

a. Place reduction gear on transmission case as shown.

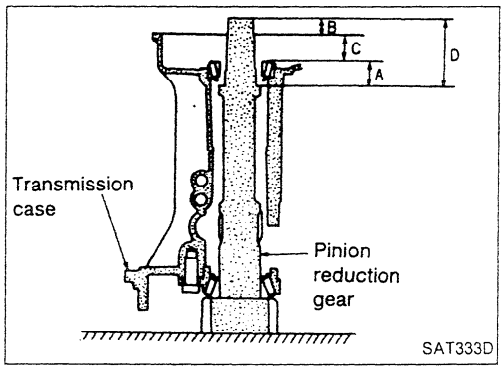


b. Place idler gear bearing on transmission case.

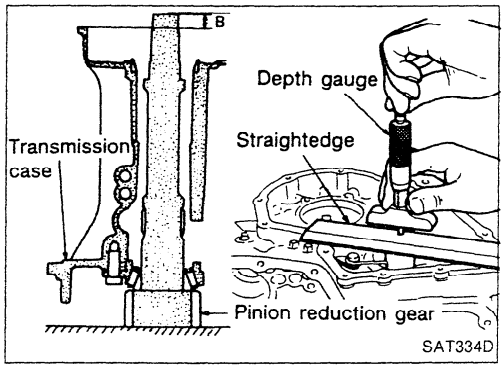
c. Measure dimensions "B", "C" and "D" and calculate dimension "A".

A = D − (B + C)

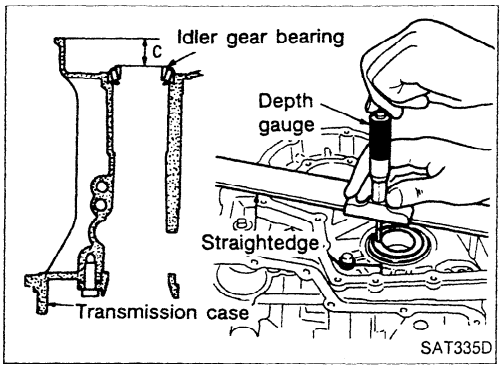
"A": Distance between surface of idler gear bearing inner race and adjusting shim mating surface of reduction gear.



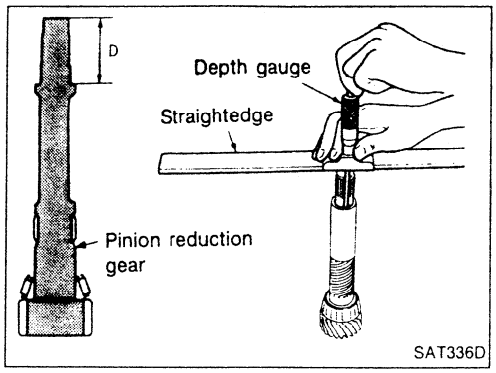
- Measure dimension "B" between end of reduction gear and surface of transmission case.
- **Measure in at least two places.**



- Measure dimension "C" between surface of idler gear bearing inner race and converter housing fitting surface of transmission case.
- **Measure in at least two places.**

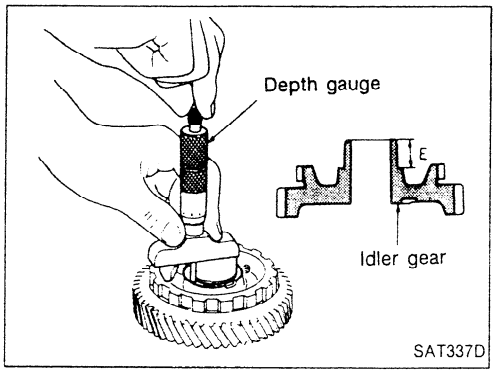


Adjustment (Cont'd)



- Measure dimension "D" between end of reduction gear and adjusting shim mating surface of reduction gear.
- **Measure in at least two places.**
- Calculate dimension "A"

  A = D – (B + C)



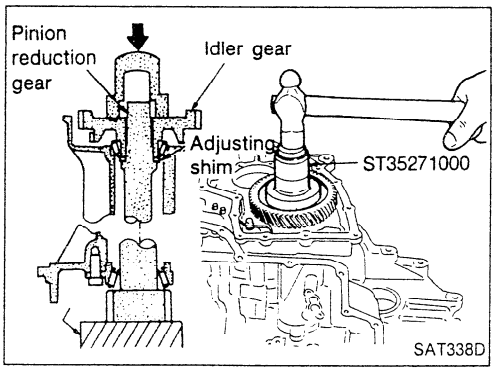
d. Measure dimension "E" between end of idler gear and idler gear bearing of idler gear inner race mating surface.

- **Measure in at least two places.**

e. Calculate "T" and select proper thickness of reduction gear bearing adjusting shim using S.D.S. table as a guide.

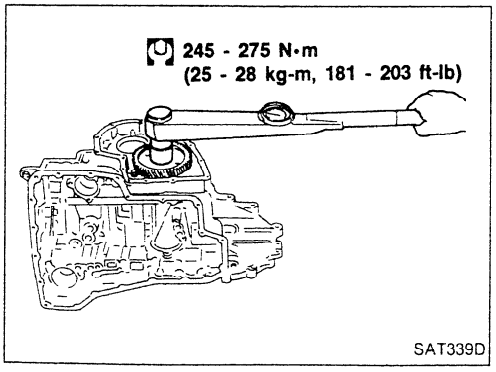
T = A – E

Reduction gear bearing adjusting shim:
Refer to S.D.S.



2. Install reduction gear and reduction gear bearing adjusting shim selected in step 2-e on transmission case.
3. Press idler gear bearing inner race on idler gear.
4. Press idler gear on reduction gear.

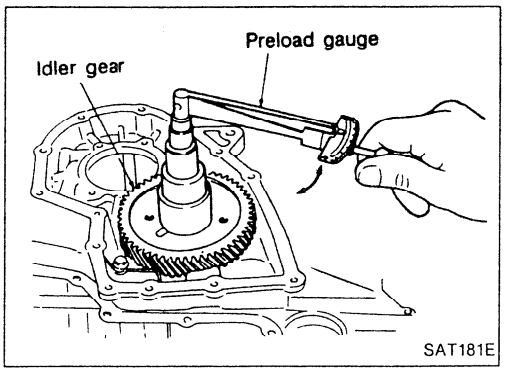
- **Press idler gear so that idler gear can be locked with parking pawl.**



5. Tighten idler gear lock nut to specified torque.

- **Lock idler gear with parking pawl when tightening lock nut.**

Adjustment (Cont'd)



6. Measure reduction gear bearing preload.

- **When measuring bearing preload, turn reduction gear in both directions several times to seat bearing rollers correctly.**

  Reduction gear bearing preload:

  0.11 - 0.69 N·m (1.1 - 7.0 kg-cm, 0.95 - 6.08 in-lb)

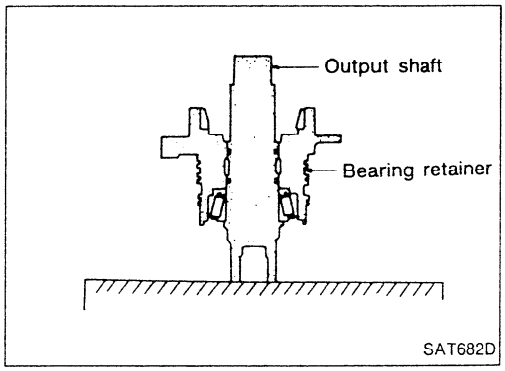
- **If not within specified range, readjust bearing preload.**

OUTPUT SHAFT BEARING PRELOAD

1. Select proper thickness of output shaft bearing adjusting spacer using the following procedures.

a. Remove paper rolled around output shaft.

b. Place bearing retainer on output shaft.

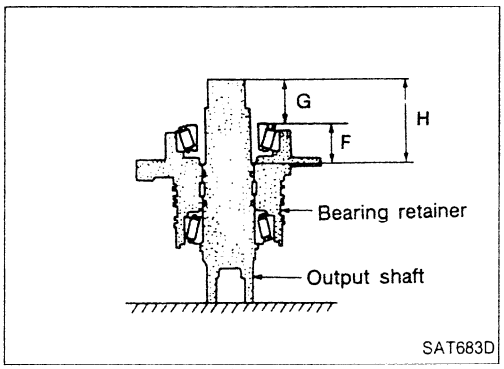


c. Place output gear bearing inner race on bearing retainer.

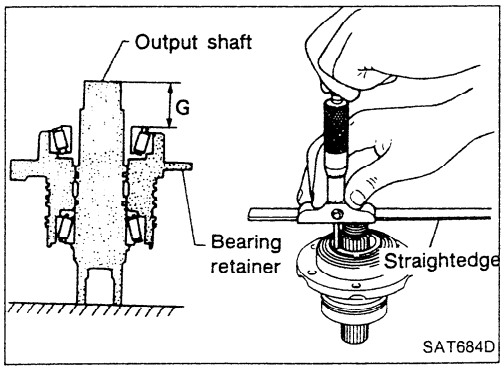
d. Measure dimensions "G" and "H" and calculate dimension "F".

"F": Distance between the surface of output gear bearing inner race and adjusting shim mating surface of output shaft.

F = H – G

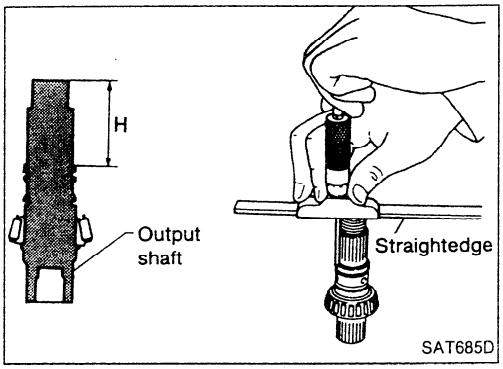


- Measure dimension "G" between end of output shaft and surface of output gear bearing inner race.
- **Measure in at least two places.**

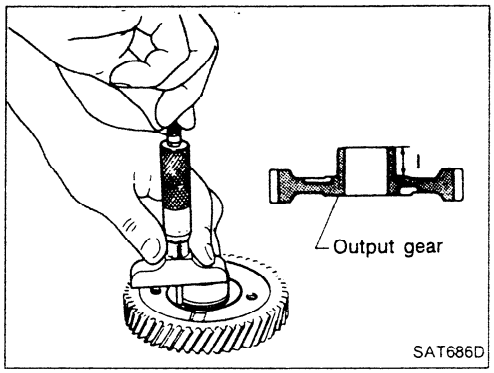


- Measure dimension "H" between end of output shaft and adjusting spacer mating surface of output shaft.
- **Measure in at least two places.**
- Calculate dimension "F".

  F = H – G



Adjustment (Cont'd)



e. Measure distance "I" between end of output gear (adjusting spacer mating surface) and bearing inner race fitting surface.

- **Measure in at least two places.**

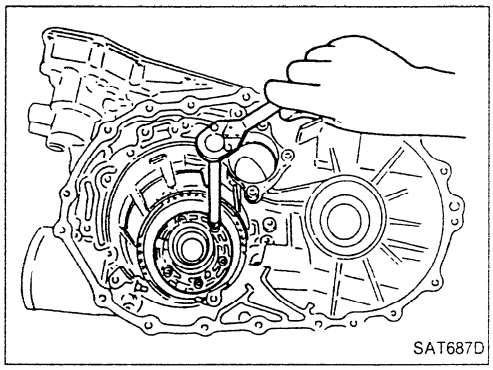
f. Calculate dimension "T_2".

"T_2": Distance between adjusting spacer mating surface of output gear and output shaft

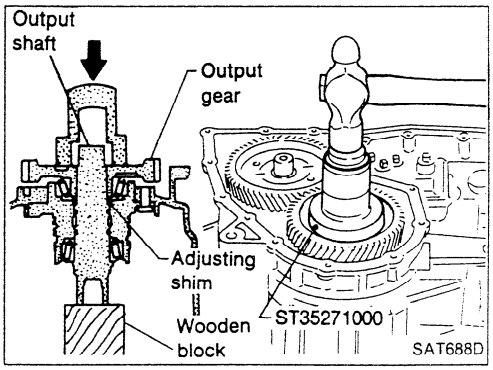
$T_2 = F - I$

g. Select proper thickness of output shaft bearing adjusting spacer using S.D.S. table as a guide.

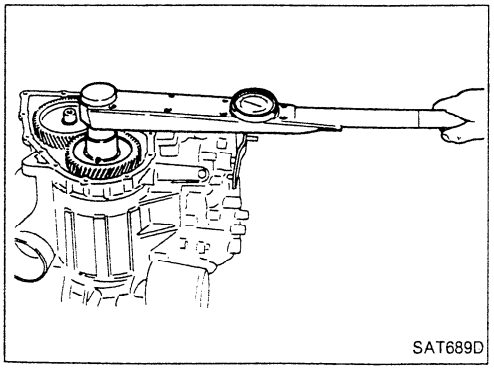
Output shaft bearing adjusting spacer:
Refer to S.D.S.



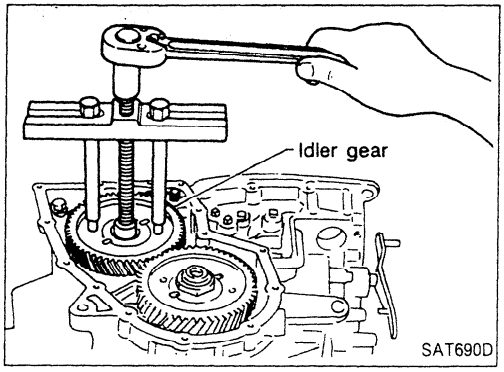
2. Install bearing retainer on transmission case.



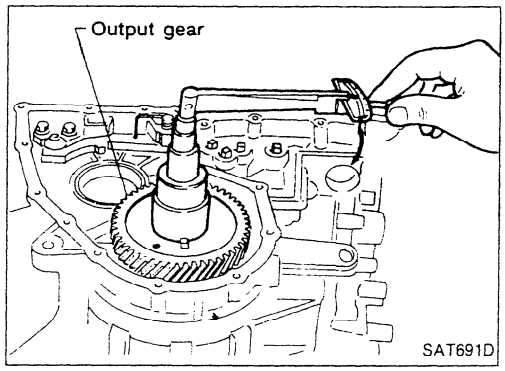
3. Place output shaft on bearing retainer.
4. Place output shaft bearing adjusting spacer selected in step 1-g on output shaft.
5. Press output gear bearing inner race on output gear.
6. Press output gear on output shaft.



7. Tighten output gear lock nut to specified torque.



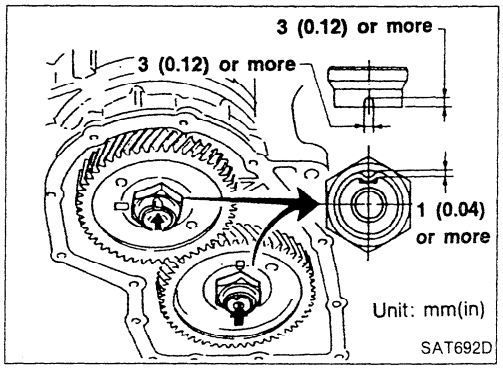
8. Remove idler gear to measure output shaft bearing preload.



9. Measure output shaft bearing preload.

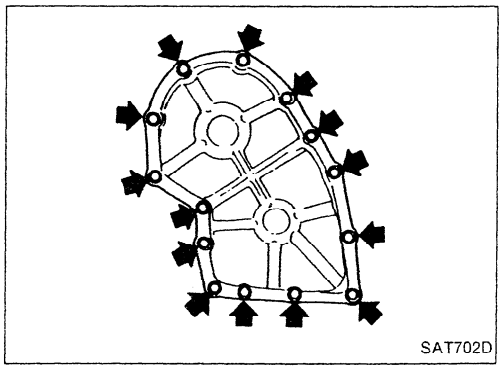
- **When measuring bearing preload, turn output shaft in both directions several times to seat bearing rollers correctly.**

Output shaft bearing preload:
0.25 - 0.88 N·m
(2.5 - 9.0 kg-cm, 2.2 - 7.8 in-lb)



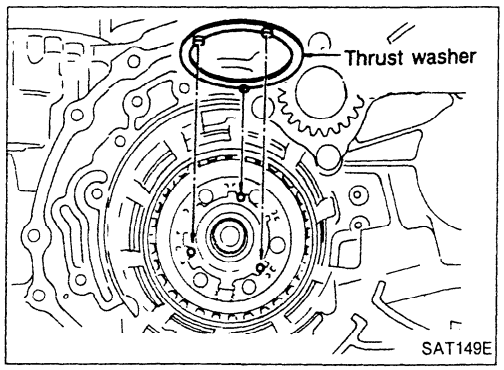
10. Install idler gear and tighten lock nut to specified torque.
11. After properly adjusting "turning" torque, clinch idler gear and output gear lock nuts as shown.

Assembly



1. Install new gasket and side cover on transmission case.

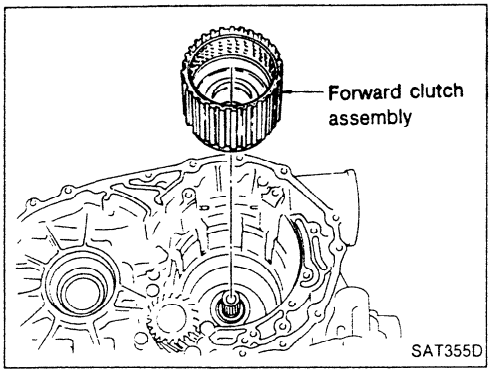
- **Always replace side cover bolts.**



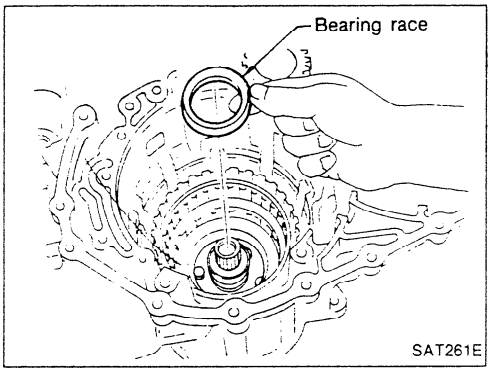
2. Remove paper rolled around bearing retainer.
3. Install thrust washer on bearing retainer.

- **Apply petroleum jelly to thrust washer.**

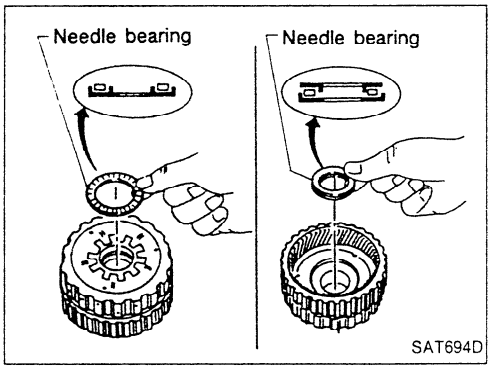
Assembly (Cont'd)



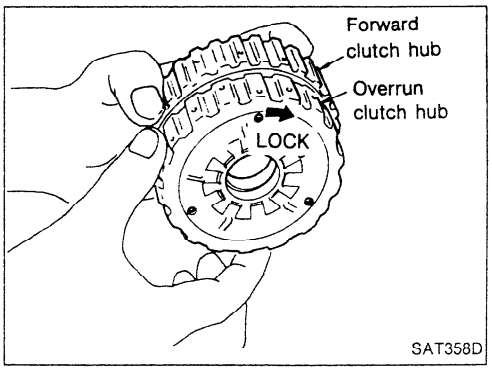
4. Install forward clutch assembly.
- **Align teeth of low & reverse brake drive plates before installing.**
- **Make sure that bearing retainer seal rings are not spread.**



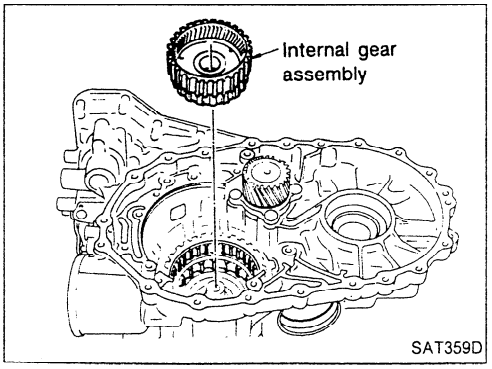
5. Install bearing race on bearing retainer.
- **Apply petroleum jelly to bearing race.**
- **Pay attention to direction of bearing race.**



6. Install needle bearings on rear internal gear.
- **Apply petroleum jelly to needle bearings.**
- **Pay attention to direction of needle bearing.**

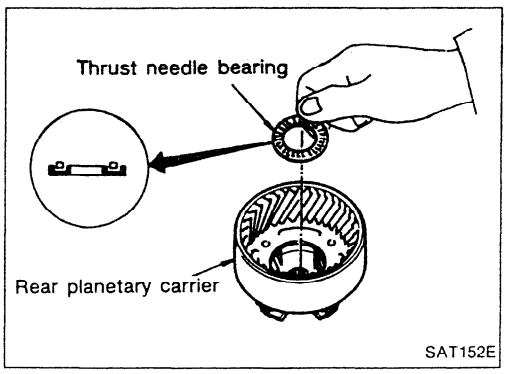


7. Hold forward clutch hub and turn overrun clutch hub. Check overrun clutch hub for directions of lock and unlock.
- If not as shown in illustration, check installed direction of forward one-way clutch.

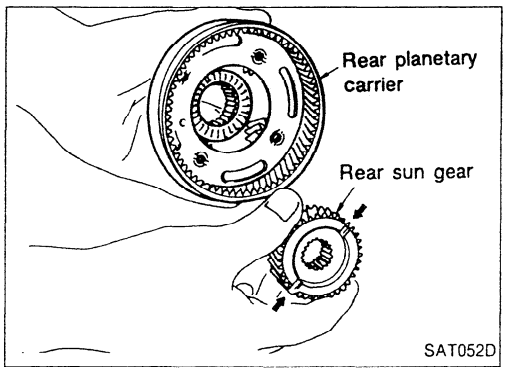


8. Install rear internal gear assembly.
- **Align teeth of forward clutch and overrun clutch drive plate.**

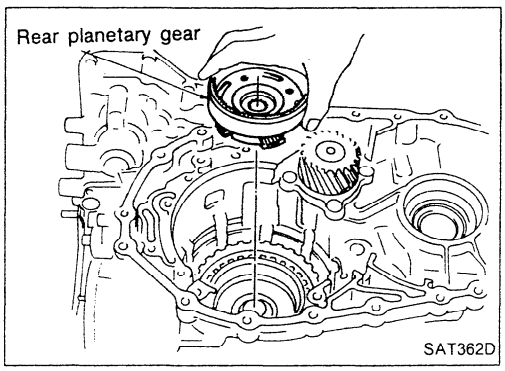
Assembly (Cont'd)



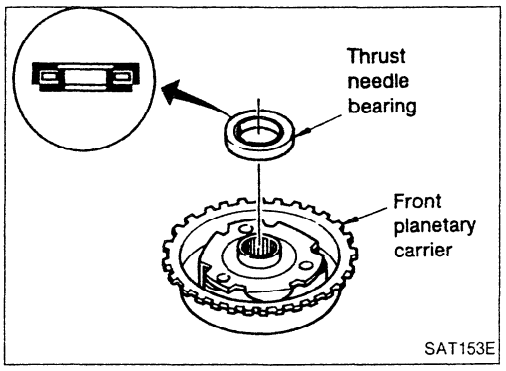
9. Install needle bearing on rear planetary carrier.
- **Apply petroleum jelly to needle bearing.**
- **Pay attention to direction of needle bearing.**



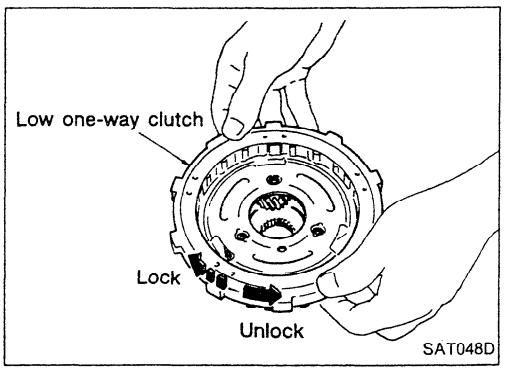
10. Install rear sun gear on rear planetary carrier.
- **Pay attention to direction of rear sun gear.**



11. Install rear planetary carrier on transmission case.

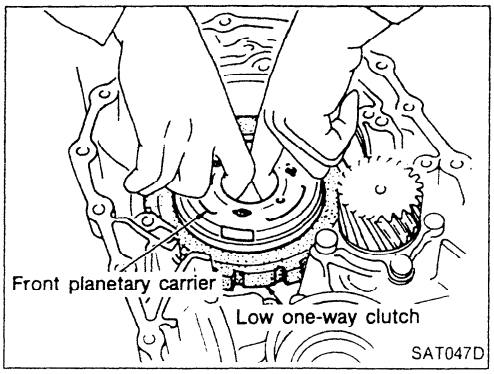


12. Install thrust needle bearing on front planetary carrier.
- **Apply petroleum jelly to thrust needle bearing.**
- **Pay attention to direction of thrust needle bearing.**

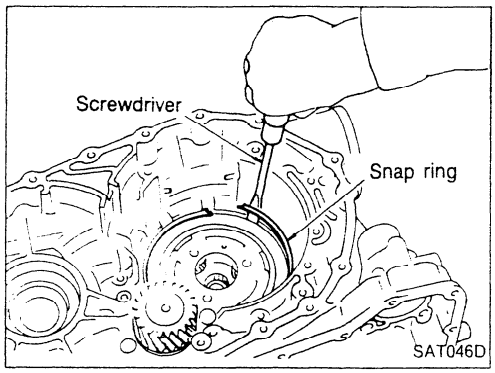


13. Install low one-way clutch to front planetary carrier by turning it in the direction of the arrow as shown.
14. While holding front planetary carrier, turn low one-way clutch.
    Check low one-way clutch for correct directions of lock and unlock.

Assembly (Cont'd)

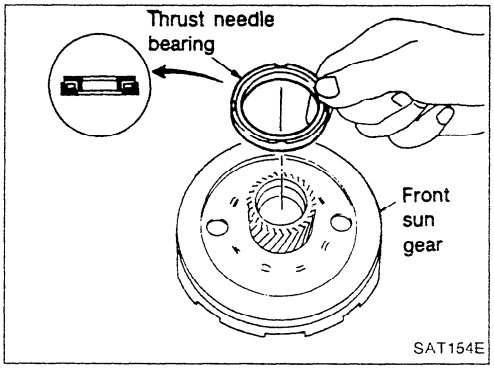


15. Install front planetary carrier assembly on transmissior case.



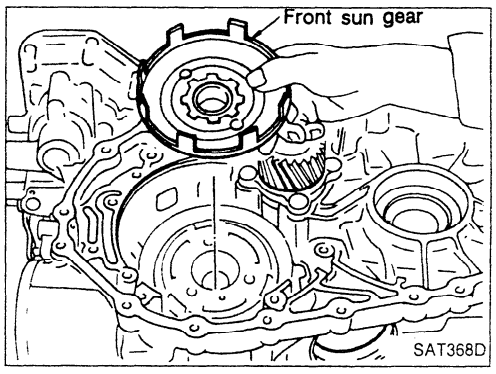
16. Install snap ring with screwdriver.

- **If forward clutch and bearings are not installed correctly snap ring will not fit groove of transmission case.**

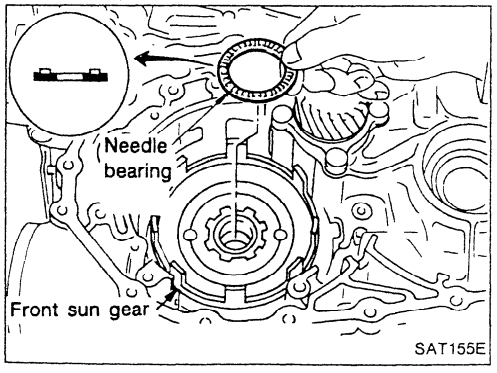


17. Install needle bearing on front sun gear.

- **Apply petroleum jelly to needle bearing.**
- **Pay attention to direction of needle bearing.**

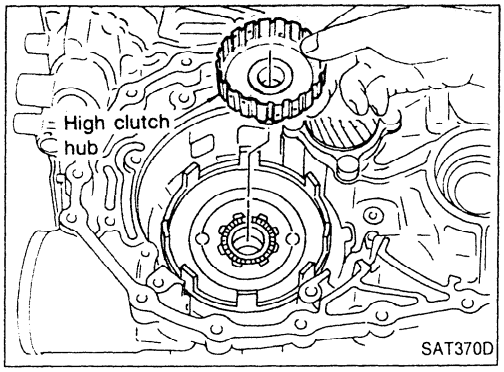


18. Install front sun gear on front planetary carrier.

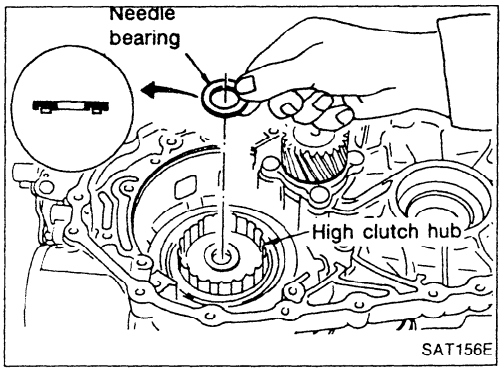


19. Install needle bearing on front sun gear.

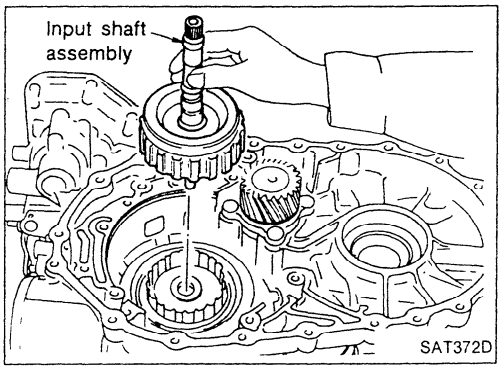
- **Apply petroleum jelly to needle bearing.**
- **Pay attention to direction of needle bearing.**



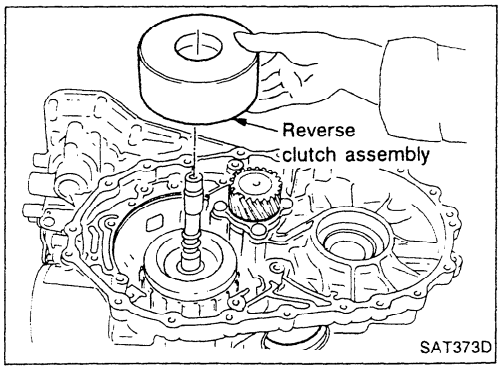
20. Install high clutch hub on front sun gear.



21. Install needle bearing on high clutch hub.
- **Apply petroleum jelly to needle bearing.**
- **Pay attention to direction of needle bearing.**



22. Remove paper rolled around input shaft.
23. Install input shaft assembly.
- **Align teeth of high clutch drive plates before installing.**

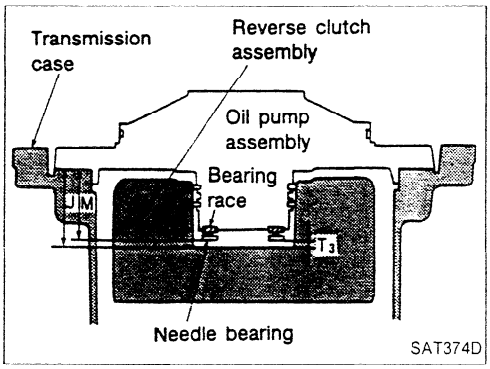


24. Install reverse clutch assembly.
- **Align teeth of reverse clutch drive plates before installing.**

Adjustment

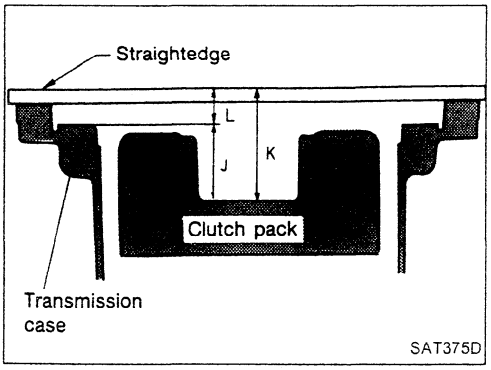
When any parts listed in the following table are replaced, total end play or reverse clutch end play must be adjusted.

Part name \ Item	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	•	•

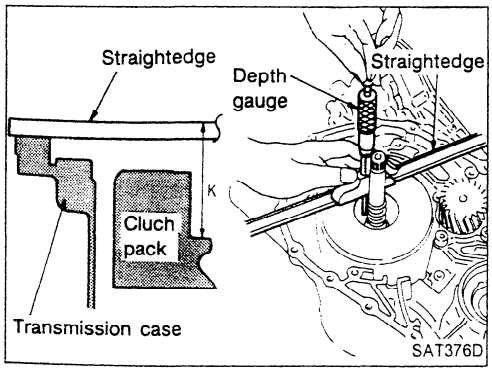


TOTAL END PLAY

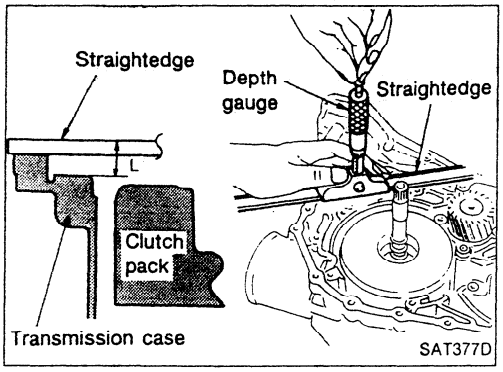
- Measure clearance between reverse clutch drum and needle bearing for oil pump cover.
- Select proper thickness of bearing race so that end play is within specifications.



1. Measure dimensions "K" and "L" and then calculate dimension "J".



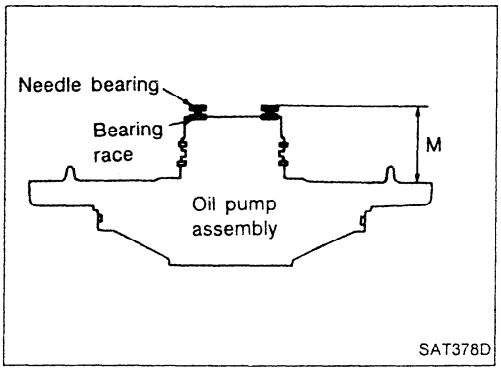
a. Measure dimension "K".



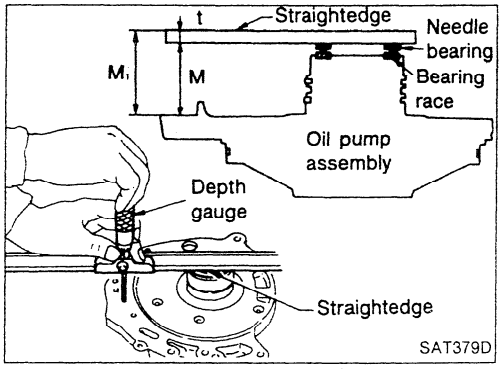
b. Measure dimension "L".
c. Calculate dimension "J".

"J": Distance between oil pump fitting surface of transmission case and needle bearing mating surface of high clutch drum.

J = K – L



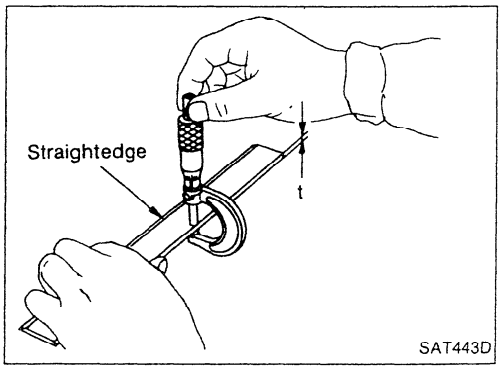
2. Measure dimension "M".
a. Place bearing race and needle bearing on oil pump assembly.



b. Measure dimension "M".

"M": Distance between transmission case fitting surface and needle bearing on oil pump cover.

M_1: Indication of gauge.



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":

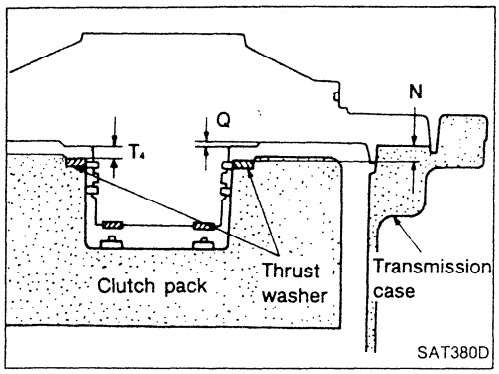
0.25 - 0.55 mm (0.0098 - 0.0217 in)

- Select proper thickness of bearing race so that total end play is within specifications.

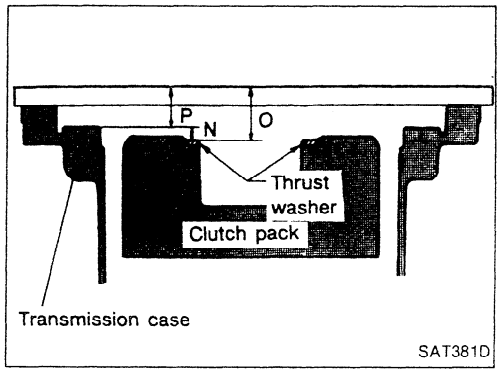
Bearing races: Refer to S.D.S.

Adjustment (Cont'd)

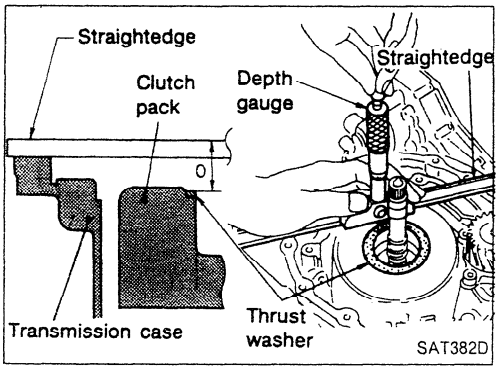
REVERSE CLUTCH END PLAY



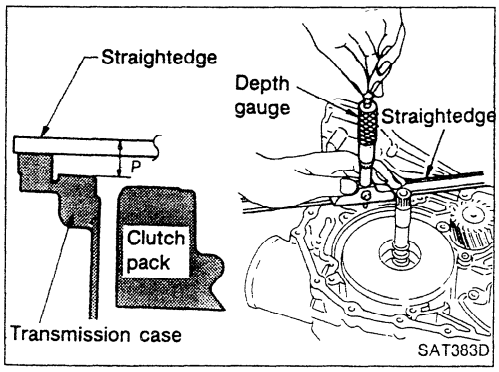
- Measure clearance between oil pump cover and thrust washer for reverse clutch drum.
- Select proper thickness of thrust washer so that end play is within specifications.



1. Measure dimensions "O" and "P" and then calculate dimension "N".



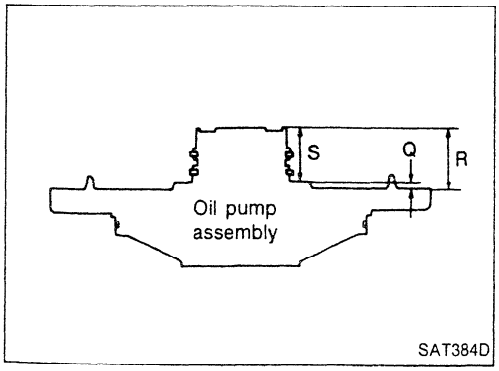
a. Place thrust washer on reverse clutch drum.
b. Measure dimension "O".



c. Measure dimension "P".
d. Calculate dimension "N".

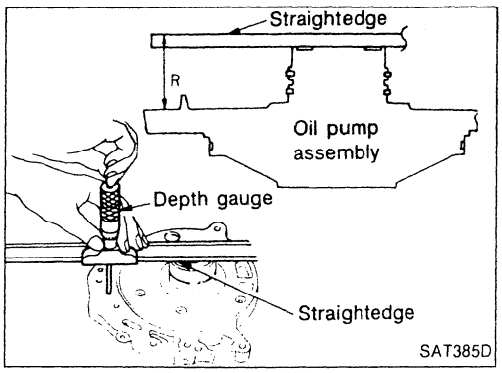
"N": Distance between oil pump fitting surface of transmission case and thrust washer on reverse clutch drum.

N = O – P

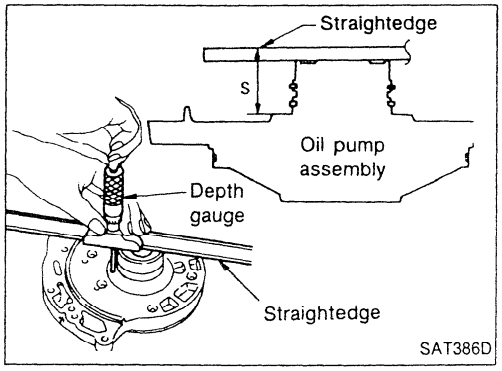


2. Measure dimensions "R" and "S" and then calculate dimension "Q".

Adjustment (Cont'd)



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".

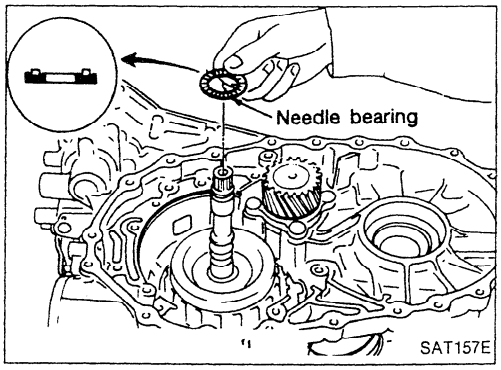
T_4 = N – Q

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 S.D.S.

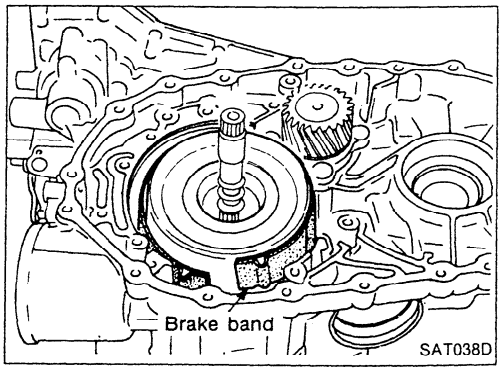


Assembly

1. Remove reverse clutch assembly and install needle bearing on high clutch assembly.

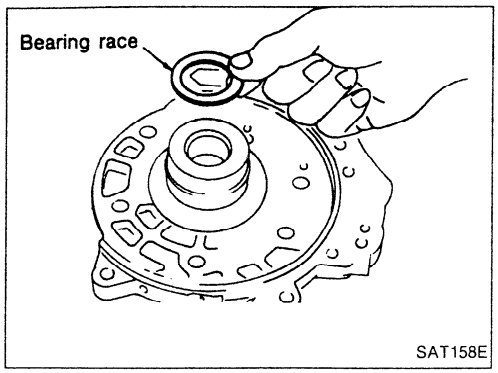
- **Pay attention to direction of needle bearing.**

2. Install reverse clutch assembly.

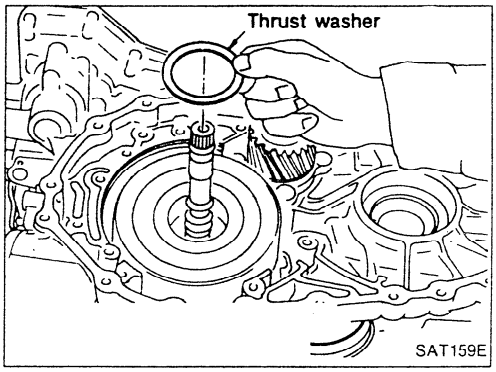


3. Install anchor end pin, washer and lock nut on transmission case.
4. Place brake band on periphery of reverse clutch drum. Then, tighten anchor end pin just enough so that brake band is fitted on periphery of reverse clutch drum uniformly.

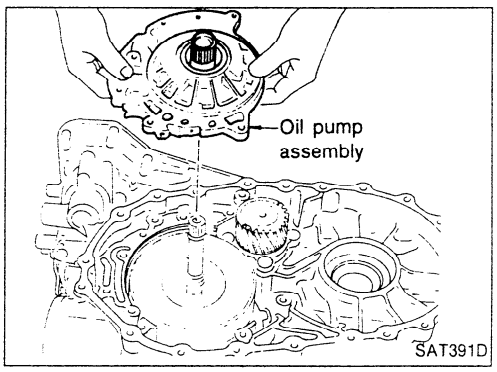
Assembly (Cont'd)



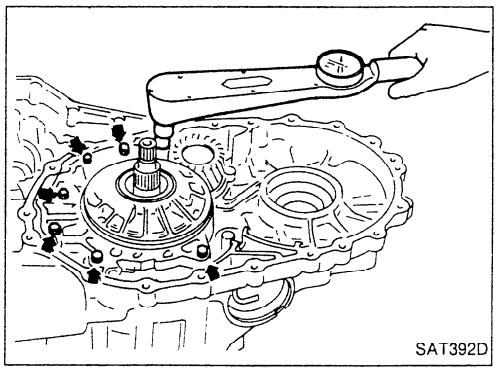
5. Place bearing race selected in total end play adjustment step on oil pump cover.
- **Apply petroleum jelly to bearing race.**



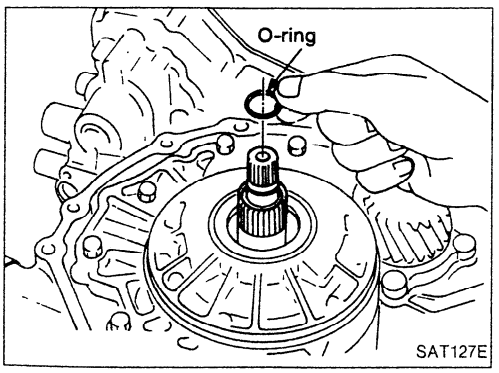
6. Place thrust washer selected in reverse clutch end play step on reverse clutch drum.
- **Apply petroleum jelly to thrust washer.**



7. Install oil pump assembly on transmission case.

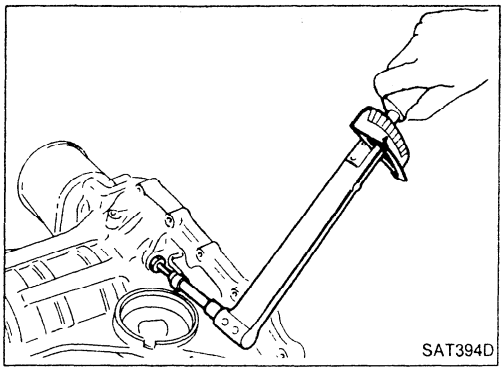


8. Tighten oil pump fixing bolts to specified torque.



9. Install O-ring to input shaft.
- **Apply A.T.F. to O-ring.**

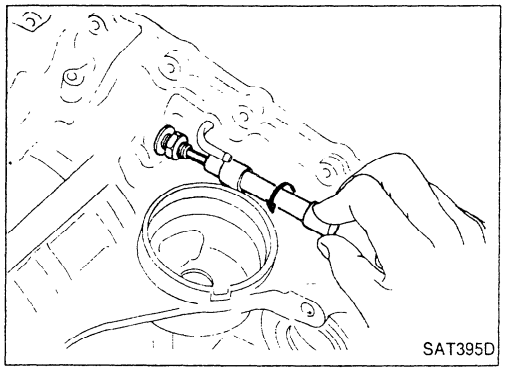
Assembly (Cont'd)



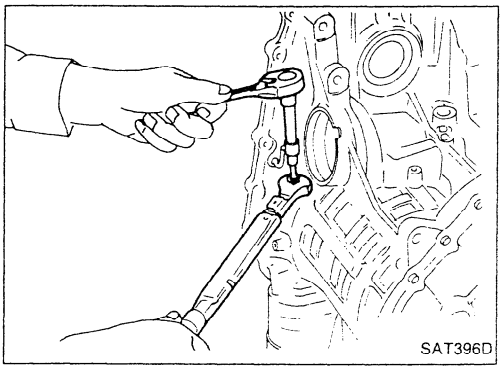
10. Adjust brake band.
a. Tighten anchor end pin to specified torque.

Anchor end pin:

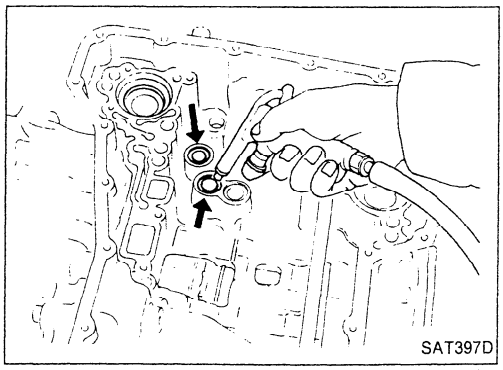
4 - 6 N·m (0.4 - 0.6 kg-m, 2.9 - 4.3 ft-lb)



b. Back off anchor end pin two and a half turns.



c. While holding anchor end pin, tighten lock nut.



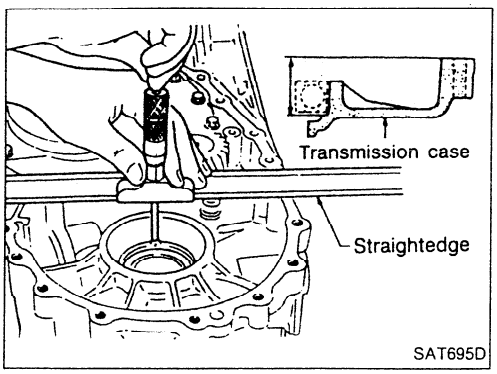
11. Apply compressed air to oil holes of transmission case and check operation of brake band.

Adjustment

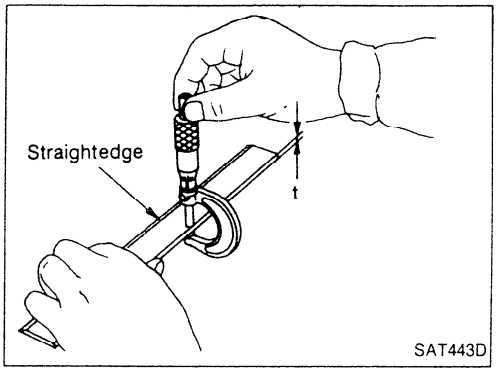
FINAL DRIVE END PLAY

- Measure clearance between differential side bearing and transmission case.
- Select proper thickness of adjusting shim so that end play is within specifications.

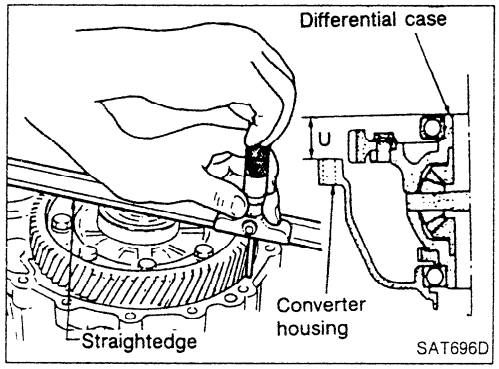
Adjustment (Cont'd)



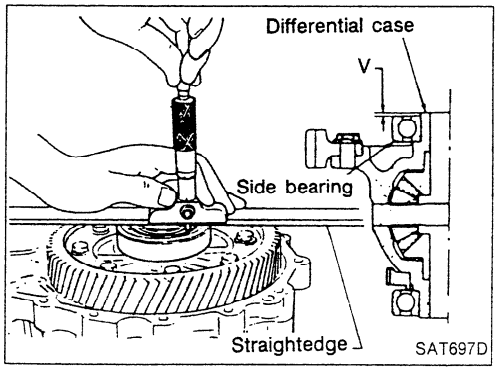
1. Measure dimension "T" between side bearing fitting surface of transmission case and converter housing fitting surface of transmission case.
   "T_1": indication of gauge



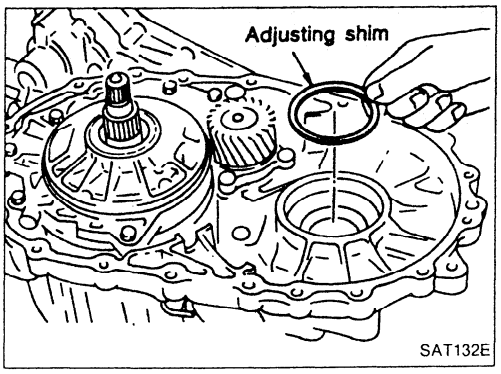
2. Measure thickness of straightedge "t".
   $T = T_1 - t$



3. Place final drive assembly on converter housing.
4. Measure dimension "U" between end of differential case and transmission case fitting surface of converter housing.

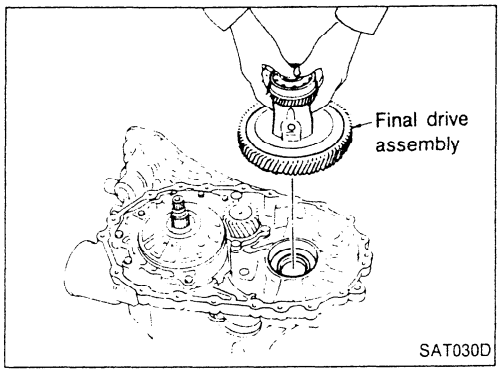


5. Measure dimension "V" between end of differential case and adjusting shim mating surface of differential side bearing.
6. Calculate final drive end play.
   Final drive end play:
   $T - U + V$
7. Select proper thickness of differential side bearing adjusting shim so that final drive end play is within specifications.
   Final drive end play:
   0 - 0.15 mm (0 - 0.0059 in)
   Differential side bearing adjusting shim:
   Refer to S.D.S.

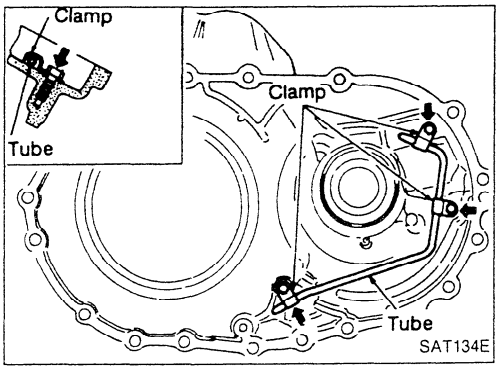


Assembly

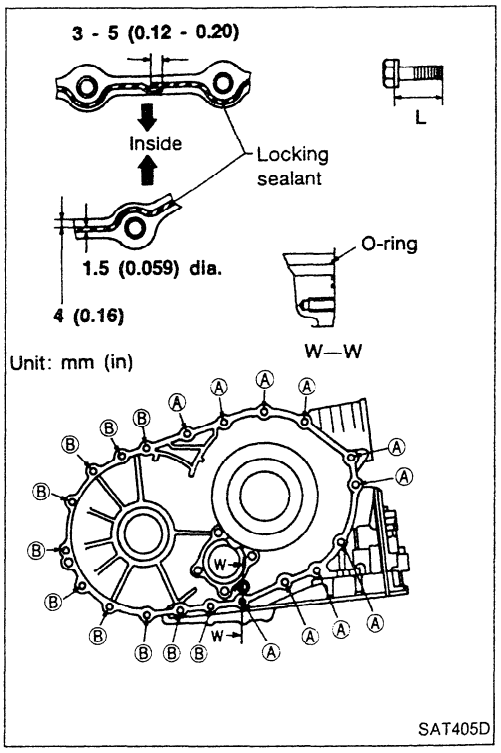
1. Install differential side bearing adjusting shim selected in final drive end play adjustment step on transmission case.



2. Install final drive assembly on transmission case.



3. Install oil tube on converter housing.

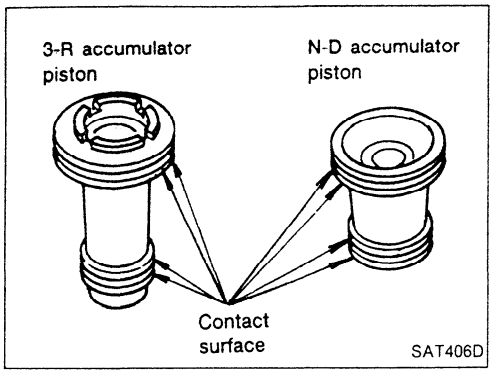


4. Install O-ring on differential oil port of transmission case.
5. Install converter housing on transmission case.

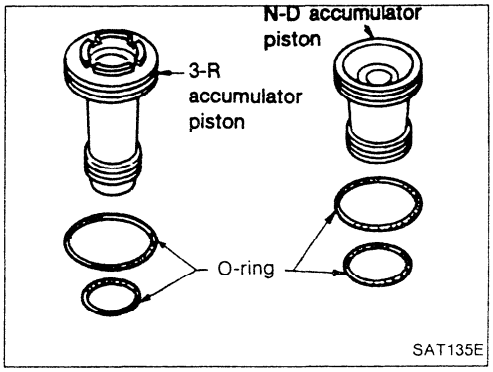
- **Apply locking sealant to mating surface of converter housing.**

Bolt	Length mm (in)
Ⓐ	30 (1.18)
Ⓑ	40 (1.57)

Assembly (Cont'd)



6. Install accumulator piston.
a. Check contact surface of accumulator piston for damage.

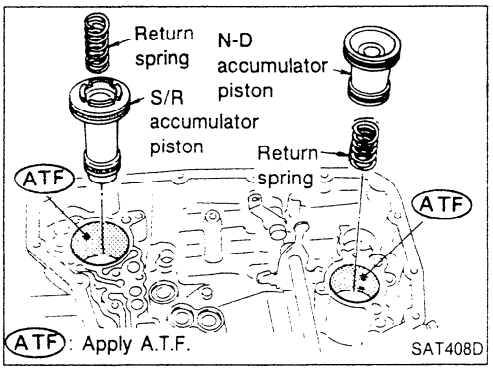


b. Install O-rings on accumulator piston.
- Apply A.T.F. to O-rings.

Accumulator piston O-rings:

Unit: mm (in)

Accumulator	Inner diameter (Small)	Inner diameter (Large)
3-R accumulator	26.9 (1.059)	44.2 (1.740)
N-D accumulator	34.6 (1.362)	39.4 (1.551)

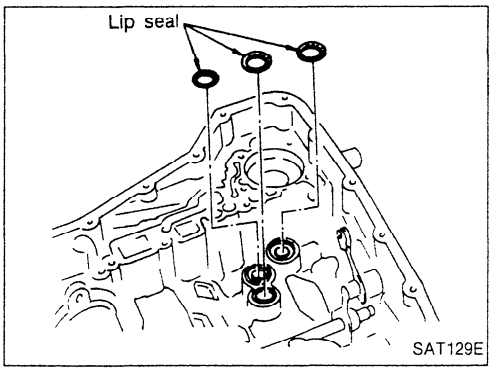


c. Install accumulator pistons and return springs on transmission case.
- **Apply A.T.F. to inner surface of transmission case.**

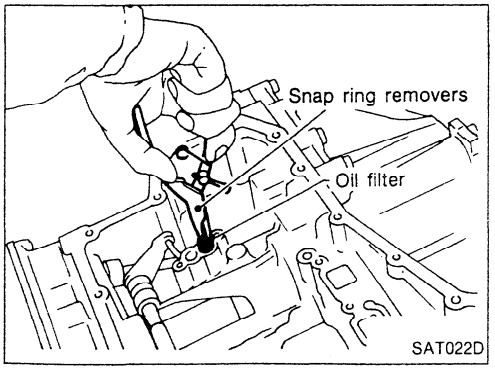
Return springs:

Unit: mm (in)

Spring	Free length	Outer diameter
3-R accumulator spring	56.4 (2.220)	21.0 (0.827)
N-D accumulator spring	43.5 (1.713)	28.0 (1.102)

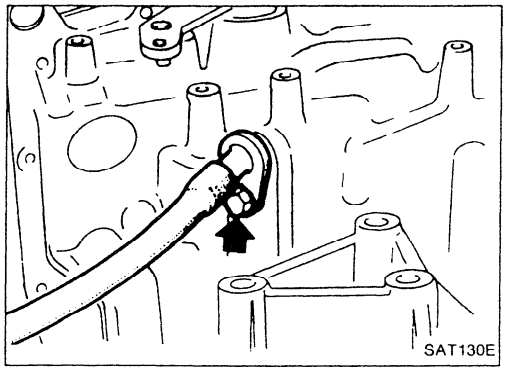


7. Install lip seals for band servo oil holes on transmission case.
- **Apply petroleum jelly to lip seals.**

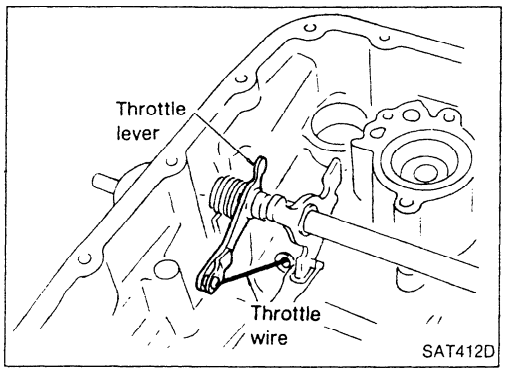


8. Install oil filter for governor valve.
- **Take care with its direction.**

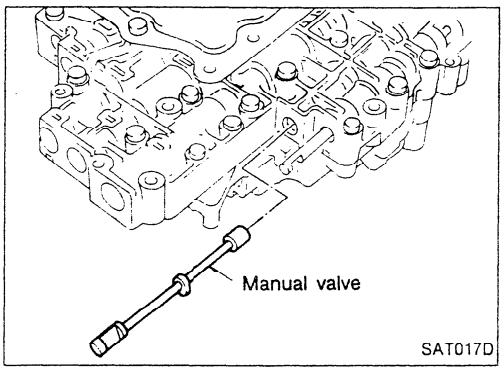
Assembly (Cont'd)



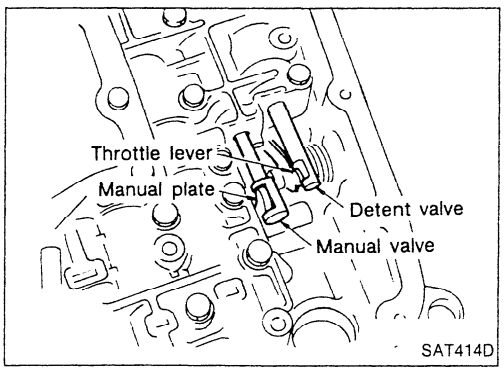
9. Install throttle wire to transmission case.



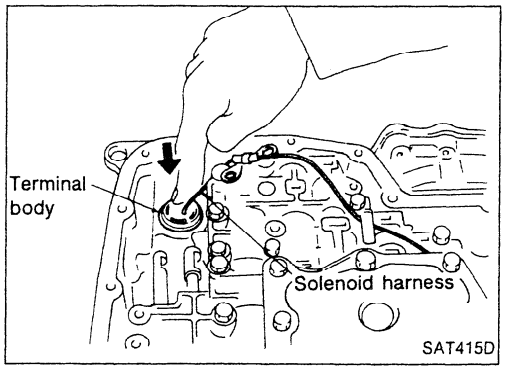
10. Install throttle wire to throttle lever.



11. Install control valve assembly.
a. Insert manual valve into control valve assembly.
- **Apply A.T.F. to manual valve.**

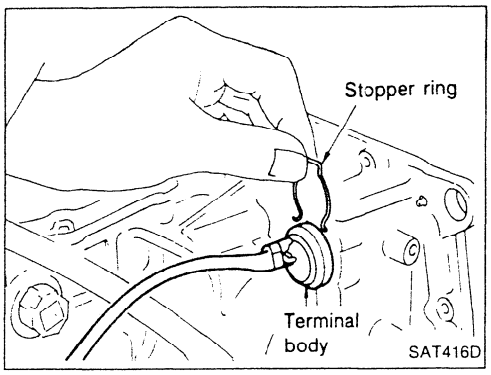


b. Set manual shaft in Neutral position.
c. Install control valve assembly on transmission case while aligning manual valve with manual plate and detent valve with throttle lever.

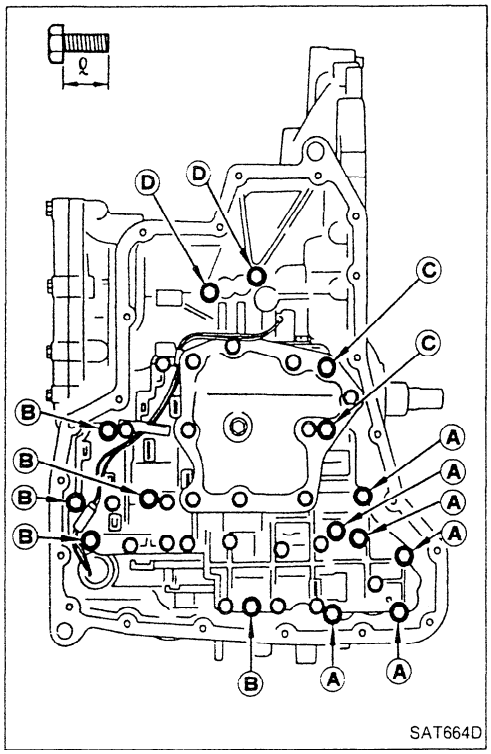


d. Pass solenoid harness through transmission case and install terminal body on transmission case by pushing it.

Assembly (Cont'd)



e. Install clip to terminal body.



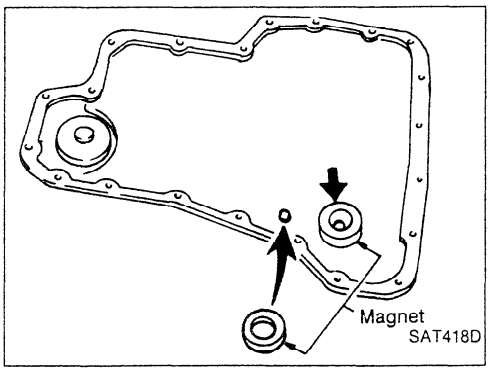
f. Tighten bolts Ⓐ, Ⓑ, Ⓒ and Ⓓ.

Bolt length, number and location:

Bolt	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Bolt length "ℓ" mm (in)	33.0 (1.299)	40.0 (1.575)	43.5 (1.713)	25.0 (0.984)
Number of bolts	6	5	2	2
Tightening torque N·m (kg-m, ft-lb)	7 - 9 (0.7 - 0.9, 5.1 - 6.5)			

12. Install oil pan.

a. Attach magnet to oil pan.

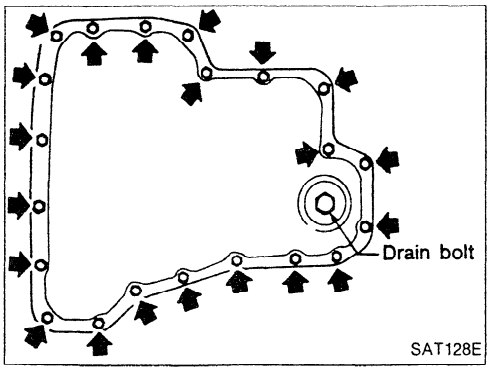


b. Install new oil pan gasket on transmission case.

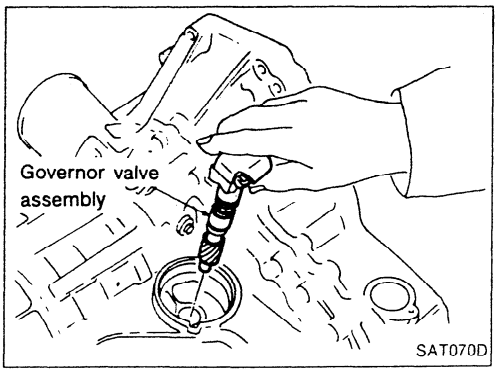
c. Install oil pan on transmission case.

- **Always replace oil pan bolts.**
- **Tighten the four bolts in a criss-cross pattern to prevent dislocation of gasket.**

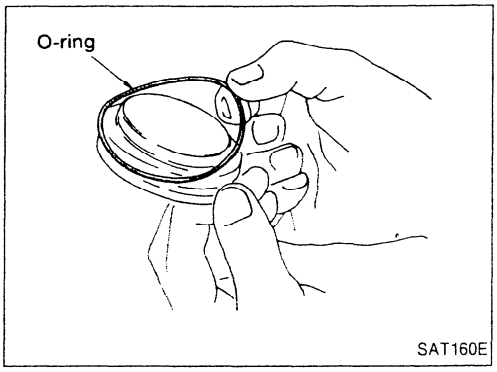
d. Tighten drain plug to specified torque.



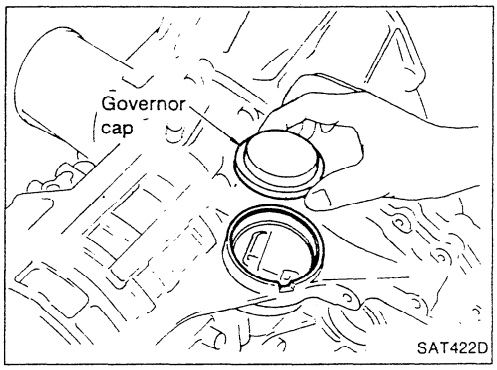
Assembly (Cont'd)



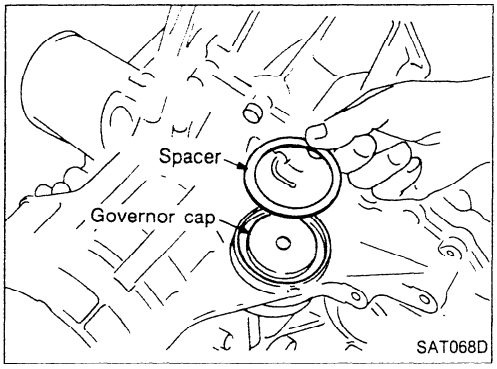
13. Install governor valve.
a. Install governor valve assembly into transmission case.



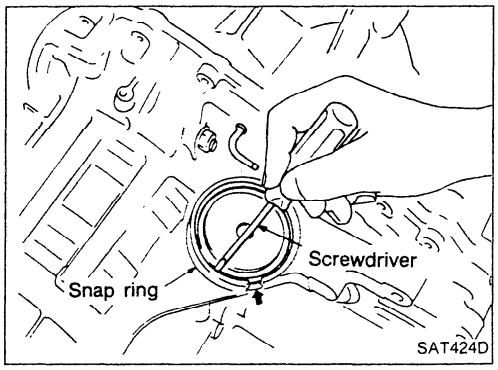
b. Install O-ring to governor cap.
- **Apply A.T.F. to O-ring.**



c. Install governor cap onto transmission case.

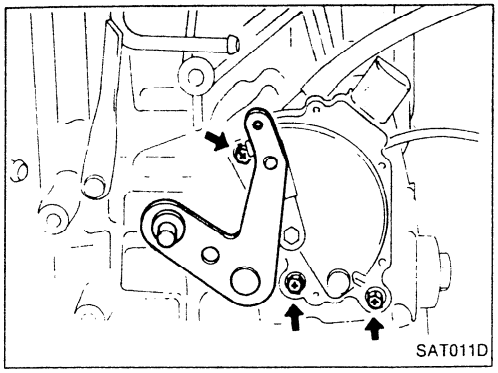


d. Place spacer on governor cap.

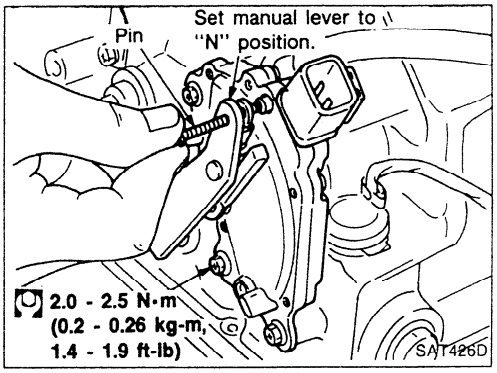


e. Install snap ring onto transmission case with a screwdriver.
- **Align snap ring gap with the notch of transmission case.**

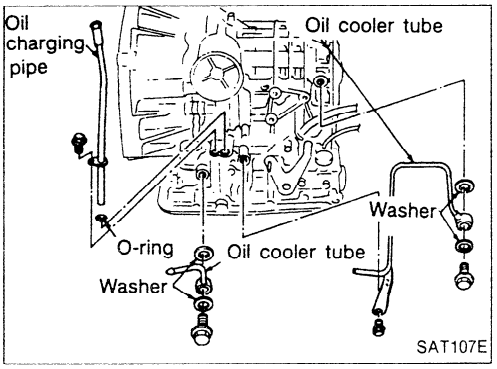
Assembly (Cont'd)



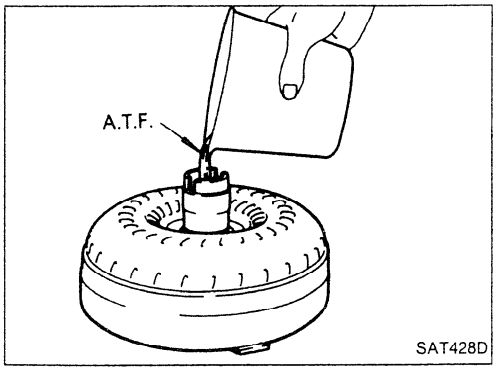
14. Install inhibitor switch.
a. Set manual lever in "P" position.
b. Temporarily install inhibitor switch on manual shaft.
c. Move selector lever to "N" position.



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.

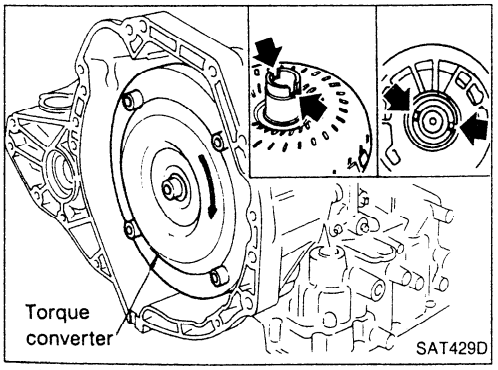


15. Install oil charging pipe and oil cooler tube to transmission case.

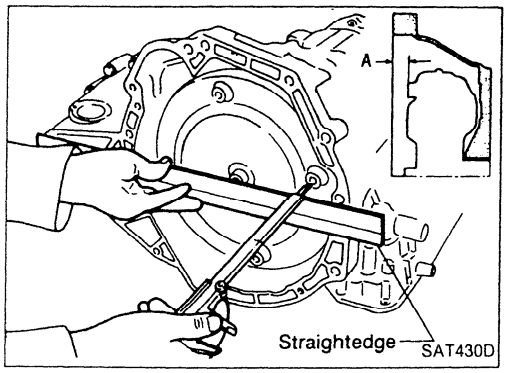


16. Install torque converter.
a. Pour A.T.F. into torque converter.

- **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.

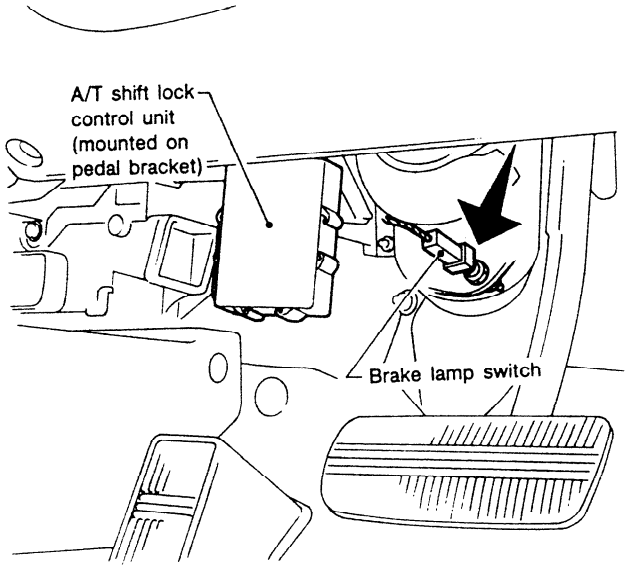


c. Measure distance "A" to check that torque converter is in proper position.

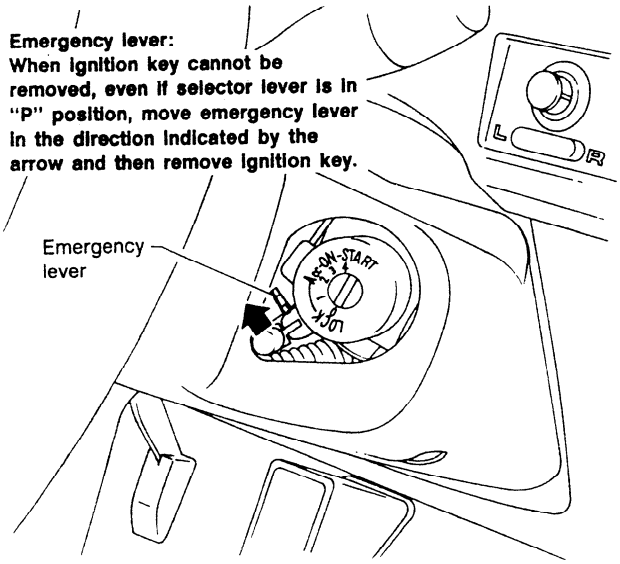
Distance "A":

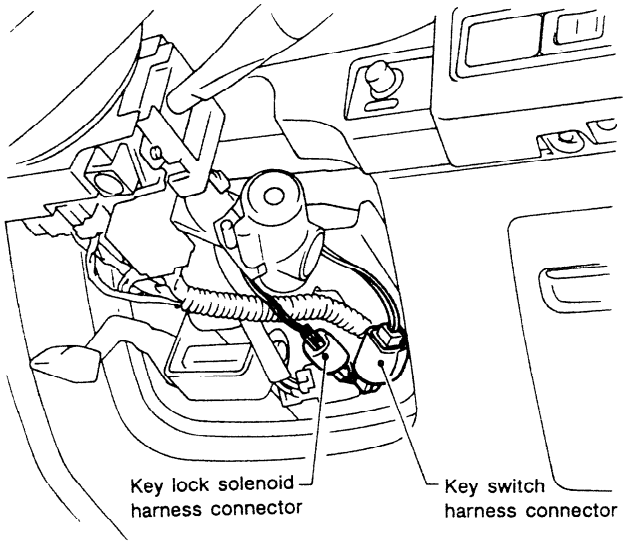
21.1 mm (0.831 in) or more

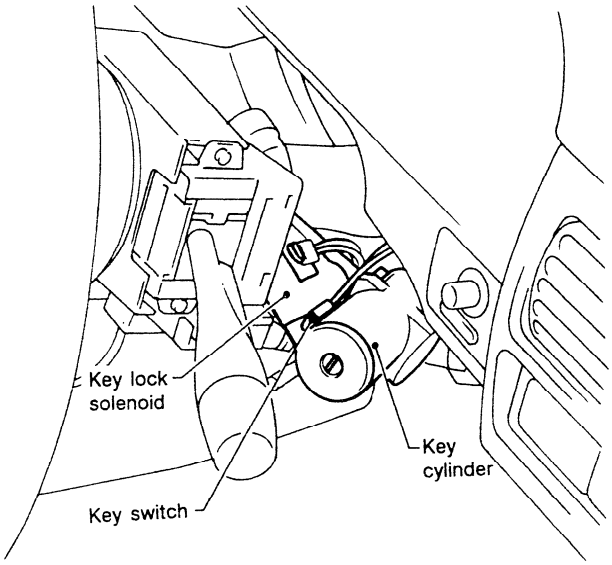
Shift Lock System Part Locations



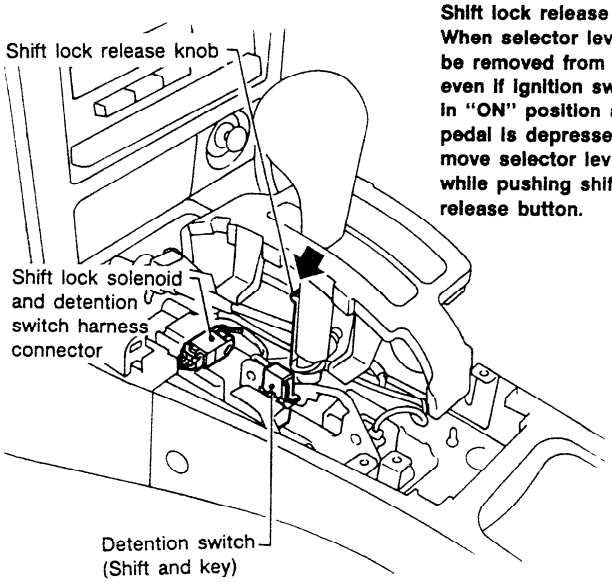
Emergency lever:
When ignition key cannot be removed, even if selector lever is in "P" position, move emergency lever in the direction indicated by the arrow and then remove ignition key.

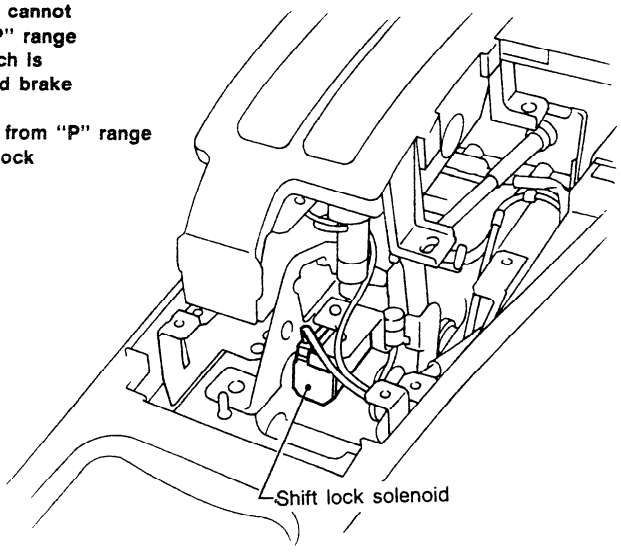






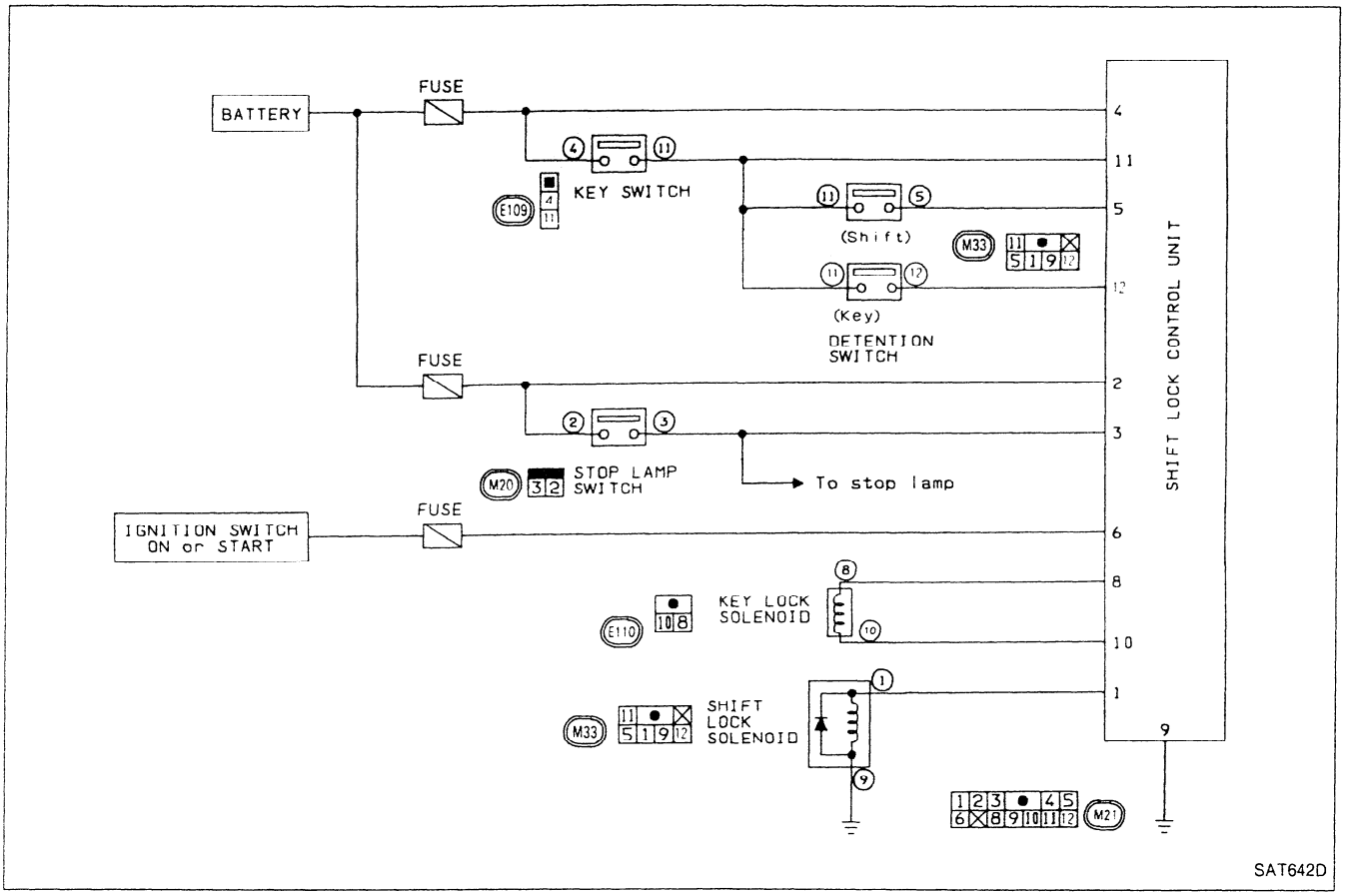
Shift lock release knob:
When selector lever cannot be removed from "P" range even if ignition switch is in "ON" position and brake pedal is depressed, move selector lever from "P" range while pushing shift lock release button.



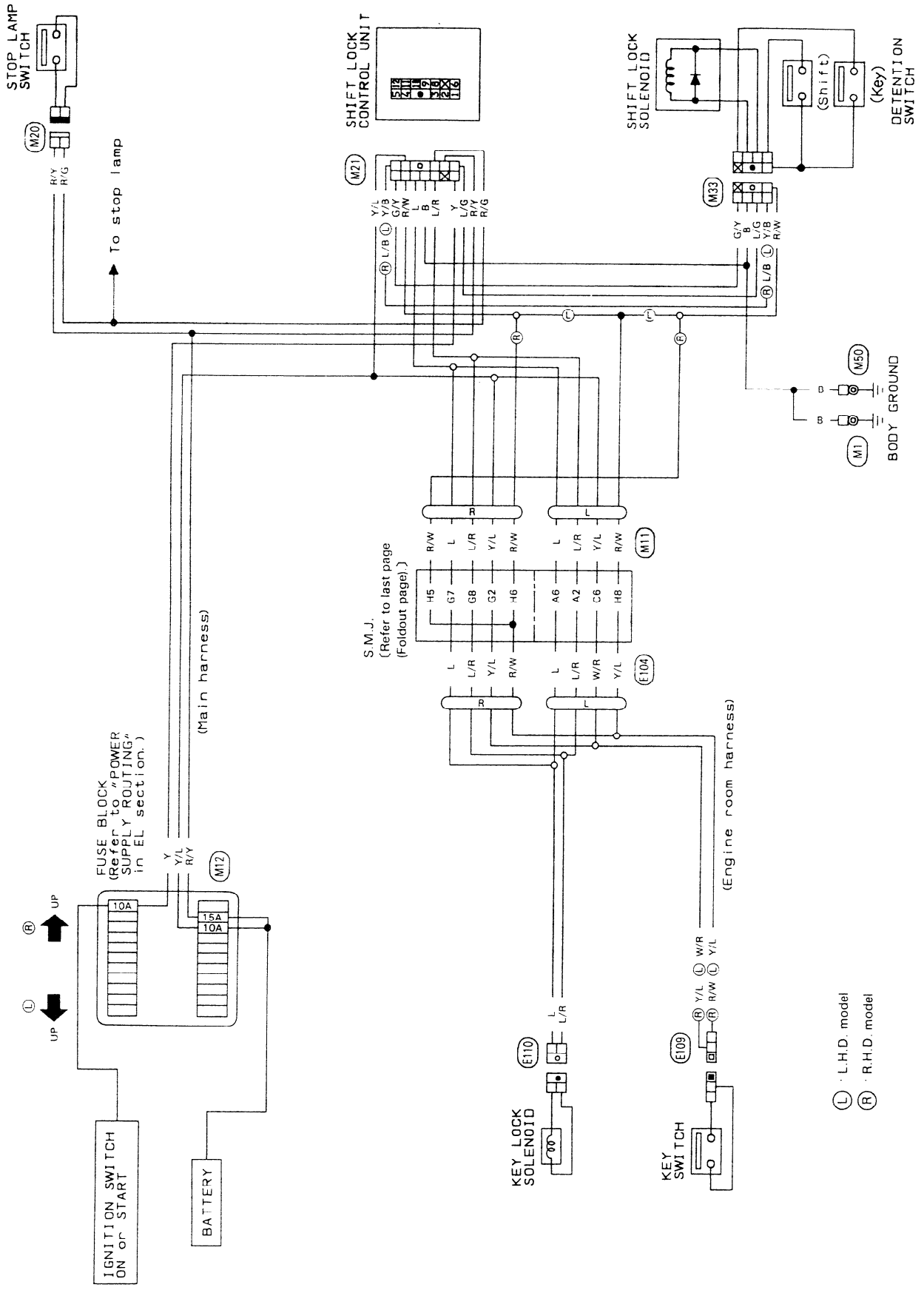


SAT576D

Circuit Diagram for Quick Pinpoint Check



Wiring Diagram

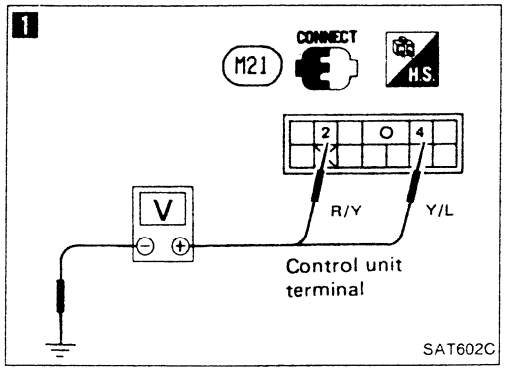


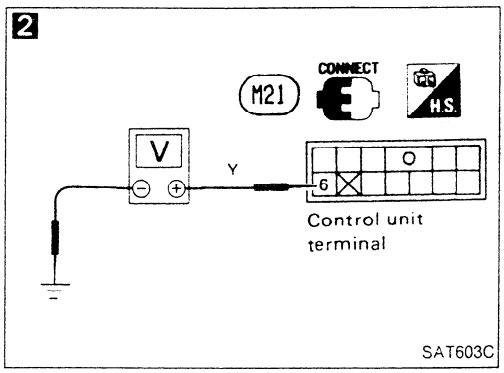
SAT643D

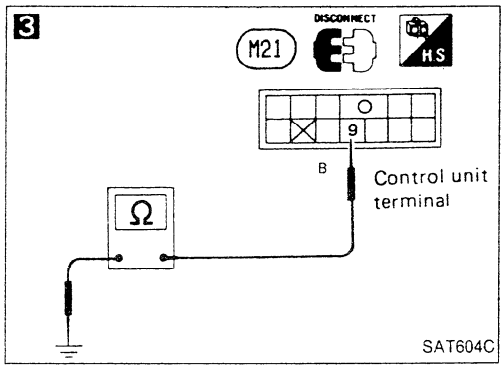
Diagnostic Procedure 1

SYMPTOM:

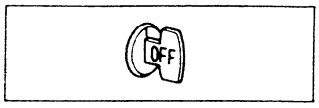
Selector lever cannot be moved from "P" range when ignition switch is set in "ON" position and brake pedal is applied, or can be moved when brake pedal is released.
Selector lever can be moved from "P" range when key is removed from key cylinder.







1 **CHECK POWER SOURCE.**

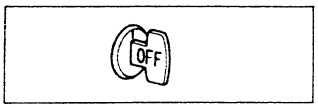
1. 

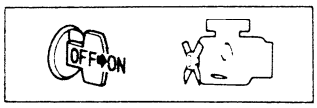
2. Check voltage between control unit harness terminals ②, ④ and ground.
Battery voltage should exist.

N.G. → Check the following items:
1. Harness continuity between battery and control unit harness terminals ②, ④
2. Fuse

O.K. ↓

2 **CHECK IGNITION SIGNAL.**

1. 

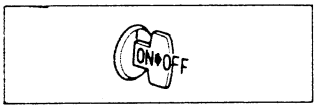
2. Check voltage between control unit harness terminal ⑥ and ground.
0V
3. 

4. Check voltage between control unit harness terminal ⑥ and ground.
Battery voltage should exist.

N.G. → Check the following items:
1. Harness continuity between battery and control unit harness terminal ⑥
2. Fuse
3. Ignition switch

O.K. ↓

3 **CHECK GROUND CIRCUIT FOR CONTROL UNIT.**

1. 

2. Disconnect control unit harness connector.
3. Check continuity between control unit harness terminal ⑨ and ground.
Continuity should exist.

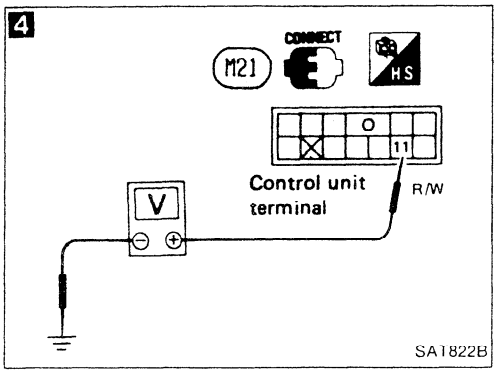
N.G. → Repair harness or connector.

O.K. ↓

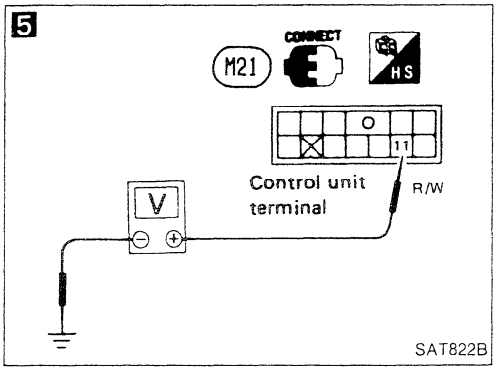
Ⓐ

Diagnostic Procedure 1 (Cont'd)

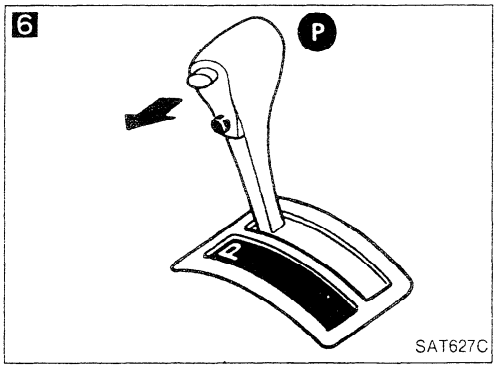
4



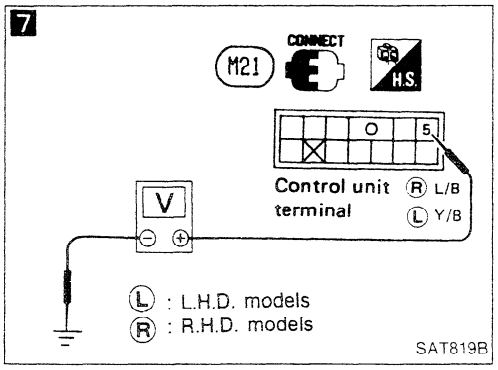
5



6

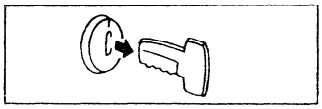


7



Ⓐ

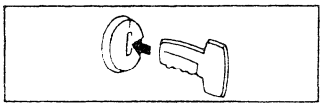
4 **CHECK INPUT SIGNAL (KEY SWITCH).**

1. Reconnect control unit harness connector.
2. 
3. Check voltage between control unit terminal ⑪ and ground.
   0V

N.G. → Check key switch. (Refer to "COMPONENT CHECK".)

O.K. ↓

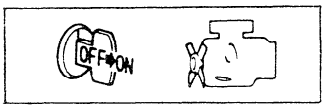
5

1. 
2. Check voltage between control unit harness terminal ⑪ and ground.
   Battery voltage should exist.

N.G. → Check the following items:
1. Harness continuity between control unit harness terminal ⑪ and key switch harness terminal ⑪.
2. Harness continuity between key switch harness terminal ④ and fuse
3. Key switch (Refer to "COMPONENT CHECK".)

O.K. ↓

CHECK INPUT SIGNAL (DETENTION SWITCH—SHIFT).

1. 

6 2. Set selector lever to "P" position and release selector lever button.

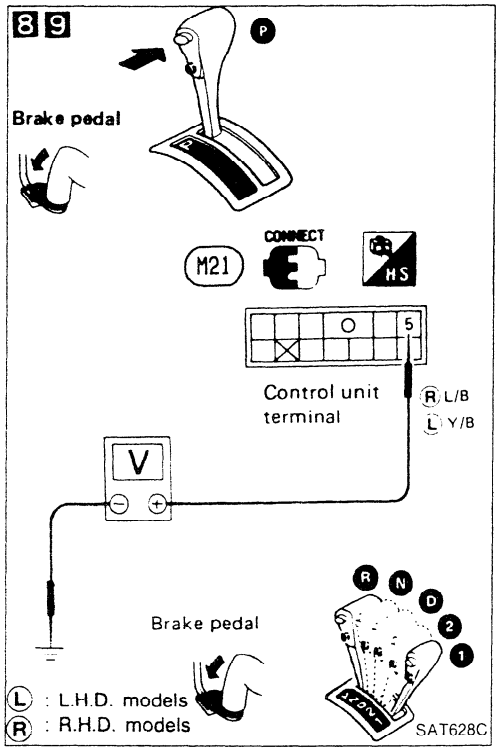
7 3. Check voltage between control unit harness terminal ⑤ and ground.
0V

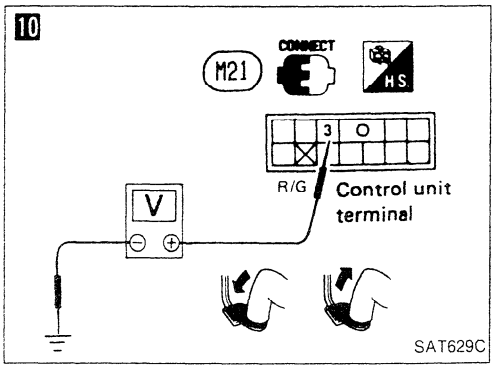
N.G. → Check detention switch—shift. (Refer to "COMPONENT CHECK".)

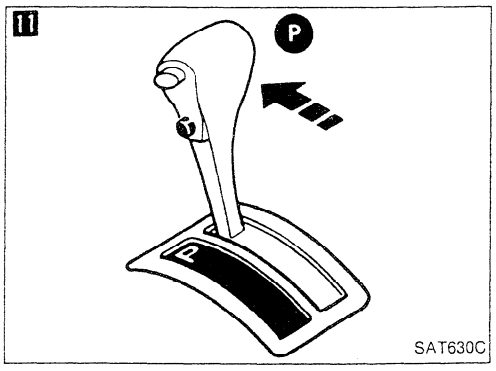
O.K. ↓

Ⓑ

Diagnostic Procedure 1 (Cont'd)



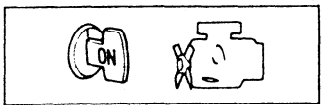




Ⓑ

CHECK INPUT SIGNAL (DETENTION SWITCH—SHIFT).

1.



8 2. Check voltage between control unit harness terminal ⑤ and ground with brake pedal depressed and selector lever button pushed.
Battery voltage should exist.

9 3. Check voltage between control unit harness terminal ⑤ and ground with selector lever set in any position except "P".
When selector lever cannot be moved from "P" position with brake pedal depressed, push shift lock release knob.
Battery voltage should exist.

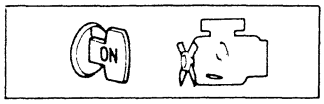
N.G. →

Check the following items:
1. Harness continuity between control unit harness terminal ⑤ and detention switch harness terminal ⑤
2. Harness continuity between detention switch harness terminal ⑪ and key switch harness terminal ⑪
3. Detention switch—shift (Refer to "COMPONENT CHECK".)

O.K. ↓

10

CHECK INPUT SIGNAL (STOP LAMP SWITCH).



- Check voltage between control unit harness terminal ③ and ground.

Brake pedal	Voltage
Depressed	Battery voltage
Released	0V

N.G. →

Check the following items:
1. Harness continuity between control unit harness terminal ③ and stop lamp switch harness terminal ③
2. Harness continuity between stop lamp switch harness terminal ② and fuse
3. Stop lamp switch (Refer to "COMPONENT CHECK".)

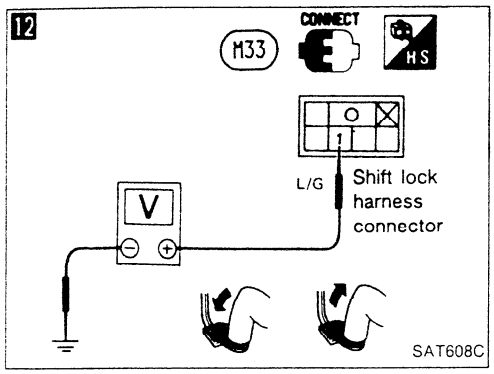
O.K. ↓

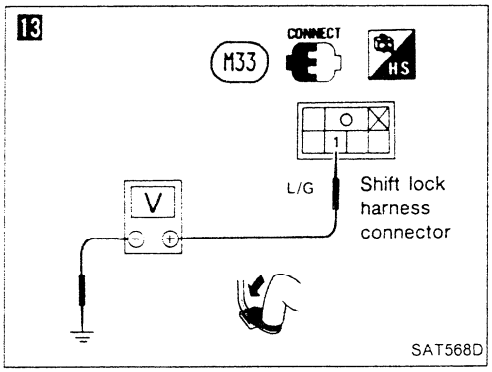
11

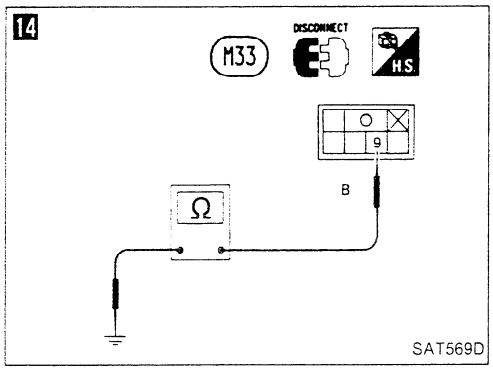
Set selector lever to "P" position.

Ⓒ

Diagnostic Procedure 1 (Cont'd)

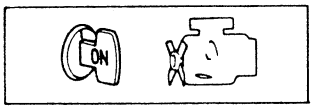






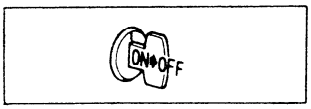
Ⓒ

CHECK OUTPUT SIGNAL (SHIFT LOCK SOLENOID).

1. 

12 2. Check voltage between shift lock harness connector terminal ① and body ground.

Brake pedal	Voltage
Depressed	Battery voltage
Released	0V

3. 

13 4. Check voltage between shift lock harness connector terminal ① and ground with brake pedal depressed.
0V

N.G. → Check harness continuity between control unit harness terminal ① and shift lock solenoid harness terminal ①.

O.K. ↓

14 **CHECK GROUND CIRCUIT FOR SHIFT LOCK SOLENOID.**
1. Disconnect shift lock harness connector.
2. Check continuity between shift lock harness terminal ⑨ and ground.
Continuity should exist.

N.G. → Repair harness or connector.

O.K. ↓

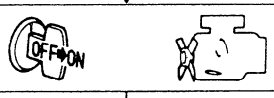
Check shift lock solenoid. (Refer to "COMPONENT CHECK".)

N.G. → Replace A/T shift lock control device assembly.

O.K. ↓

Reconnect shift lock harness connector.

↓



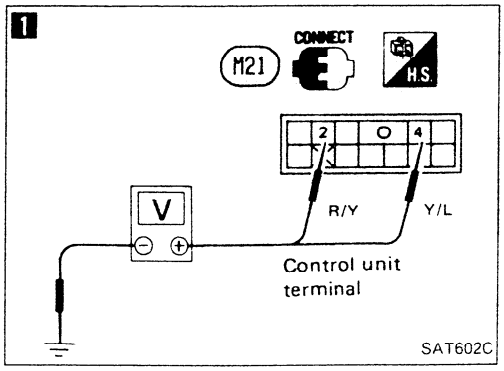
↓

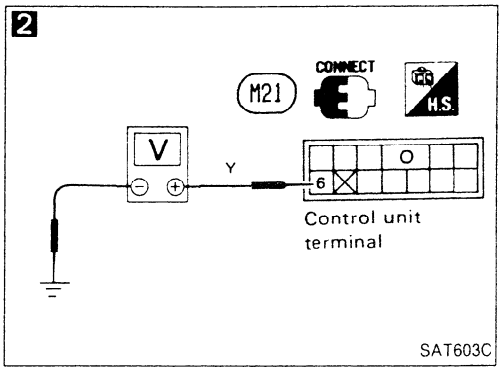
Recheck shift lock operation.

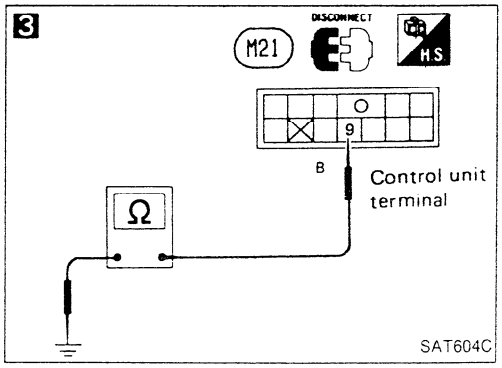
N.G. → 1. Perform control unit input/output signal inspection test.
2. If N.G., recheck harness connector connection.

O.K. ↓

INSPECTION END







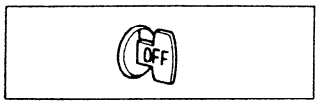
Diagnostic Procedure 2

SYMPTOM:

Ignition key cannot be removed when selector lever is set to "P" position or can be removed when selector lever is set to any position except "P".

1

CHECK POWER SOURCE.

1. 

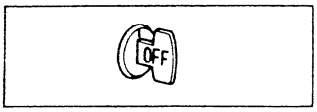
2. Check voltage between control unit harness terminals ②, ④ and ground.
   Battery voltage should exist.

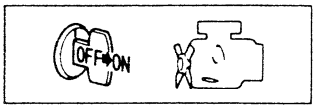
N.G. → Check the following items:
1. Harness continuity between battery and control unit harness terminals ②, ④
2. Fuse

O.K. ↓

2

CHECK IGNITION SIGNAL.

1. 

2. Check voltage between control unit harness terminal ⑥ and ground.
   0V
3. 

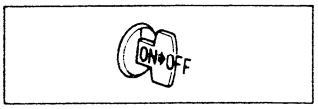
4. Check voltage between control unit harness terminal ⑥ and ground.
   Battery voltage should exist.

N.G. → Check the following items:
1. Harness continuity between battery and control unit harness terminal ⑥
2. Fuse
3. Ignition switch

O.K. ↓

3

CHECK GROUND CIRCUIT FOR CONTROL UNIT.

1. 

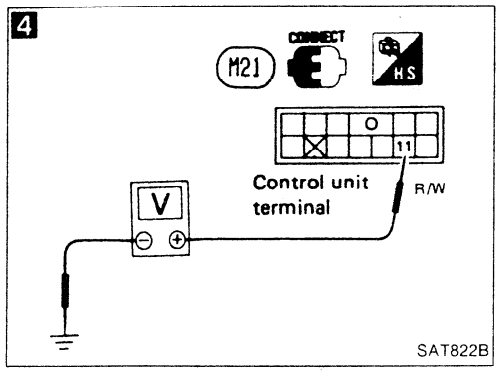
2. Disconnect control unit harness connector.
3. Check continuity between control unit harness terminal ⑨ and ground.
   Continuity should exist.

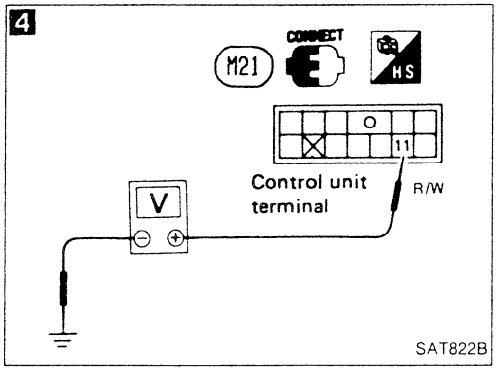
N.G. → Repair harness or connector.

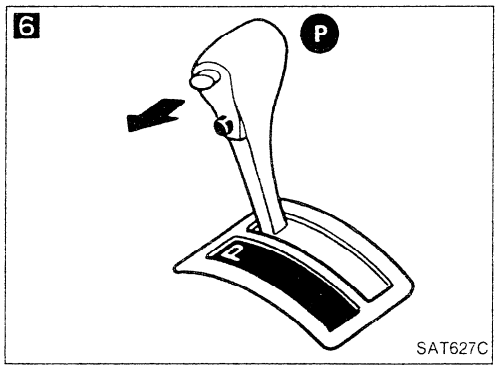
O.K. ↓

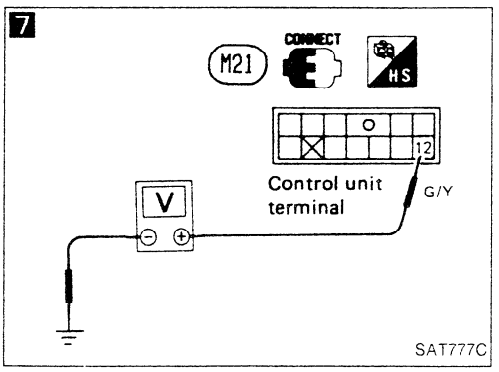
Ⓐ

Diagnostic Procedure 2 (Cont'd)



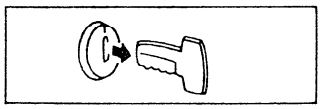






Ⓐ

4 **CHECK INPUT SIGNAL (KEY SWITCH).**

1. Reconnect control unit harness connector.
2. 

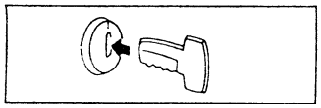
   When ignition key cannot be removed, even if selector lever is in "P" position, use emergency lever.
3. Check voltage between control unit terminal ⑪ and ground.

   0V

N.G. → Check key switch. (Refer to "COMPONENT CHECK".)

O.K. ↓

5

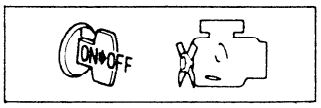
1. 
2. Check voltage between control unit harness terminal ⑪ and ground.

   Battery voltage should exist.

N.G. → Check the following items:
1. Harness continuity between control unit harness terminal ⑪ and key switch harness terminal ⑪.
2. Harness continuity between key switch harness terminal ④ and fuse
3. Key switch (Refer to "COMPONENT CHECK".)

O.K. ↓

CHECK INPUT SIGNAL (DETENTION SWITCH—KEY).

1. 

6 2. Set selector lever to "P" position and release selector lever button.

7 3. Check voltage between control unit harness terminal 12 and ground.

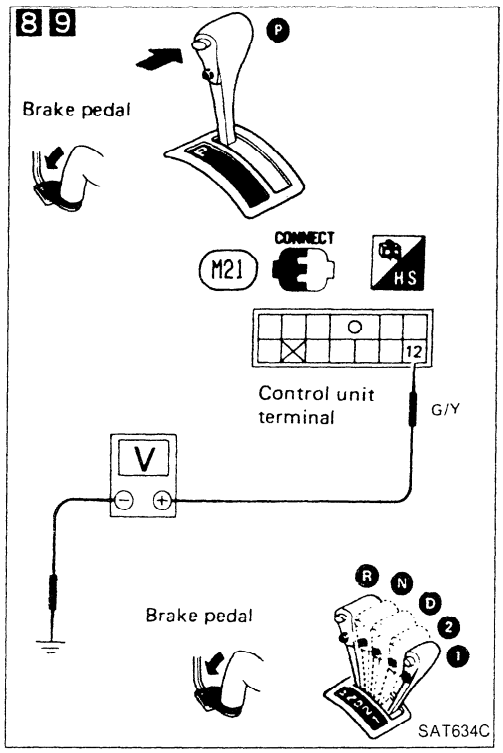
0V

N.G. → Check detention switch—key. (Refer to "COMPONENT CHECK".)

O.K. ↓

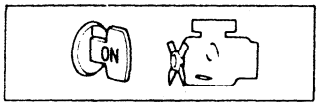
Ⓑ

Diagnostic Procedure 2 (Cont'd)



Ⓑ

CHECK INPUT SIGNAL (DETENTION SWITCH—KEY).



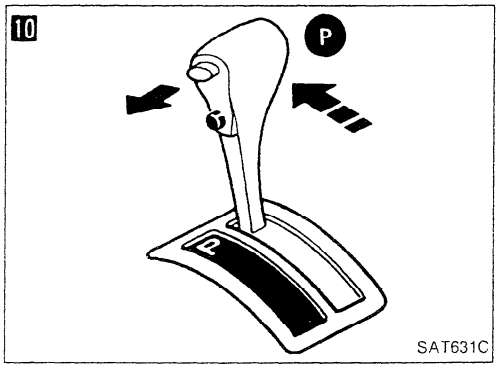
8 1. Check voltage between control unit harness terminal ⑫ and ground with brake pedal depressed and selector lever button pushed.
Battery voltage should exist.

9 2. Check voltage between control unit harness terminal ⑫ and ground with selector lever set in any position except "P".
Battery voltage should exist.

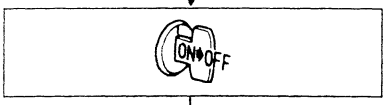
N.G. →

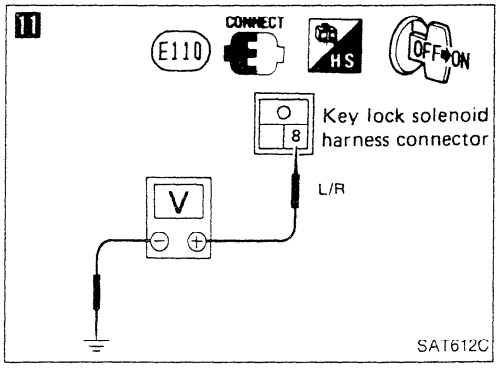
Check the following items:
1. Harness continuity between control unit harness terminal ⑫ and detention switch harness terminal ⑫
2. Harness continuity between detention switch harness terminal ⑪ and key switch harness terminal ⑪
3. Detention switch—key (Refer to "COMPONENT CHECK".)

O.K. ↓



10 Set selector lever to "P" position and release selector lever button.





11 **CHECK OUTPUT SIGNAL (KEY LOCK SIGNAL).**



Check voltage between key lock solenoid harness terminal ⑧ and ground at the moment ignition key is turned from OFF to ON.
Battery voltage should exist for approximately 0.1 seconds.

N.G. →

Check harness continuity between shift lock solenoid harness terminal ⑧ and control unit harness terminal ⑧.

O.K. ↓

N.G. →

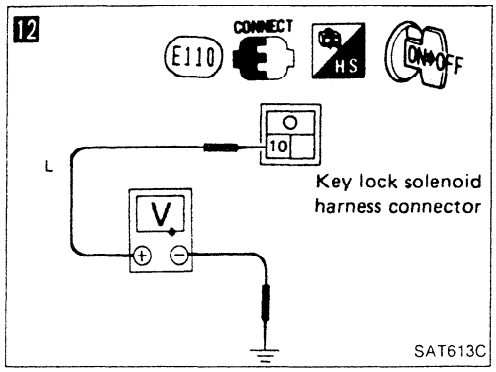
Repair harness or connector.

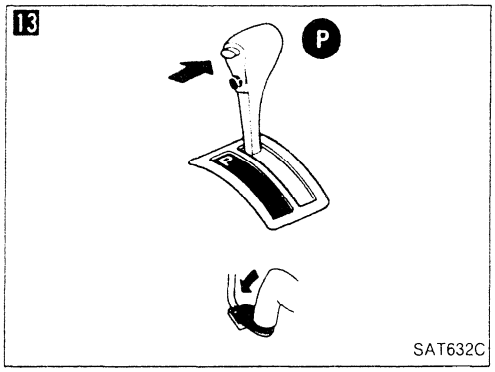
Replace control unit.

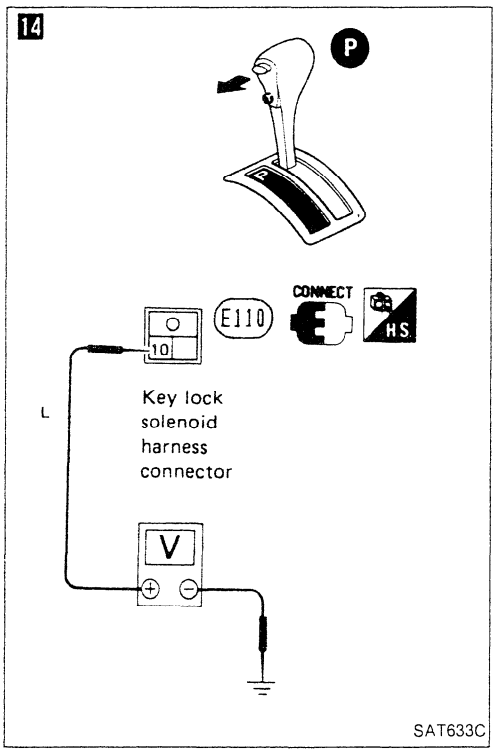
O.K. ↓

Ⓒ

Diagnostic Procedure 2 (Cont'd)



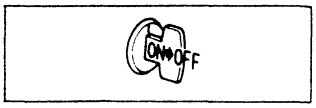




Ⓒ

12

CHECK OUTPUT SIGNAL (KEY UNLOCK SIGNAL CAUSED BY IGNITION SIGNAL).



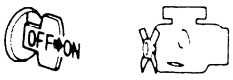
Check voltage between key lock solenoid harness terminal ⑩ and ground at the moment ignition key is turned from ON to OFF.
Battery voltage should exist for approximately 0.1 seconds.

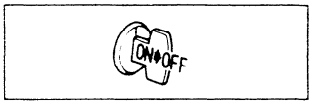
N.G. → Check harness continuity between shift lock solenoid harness terminal ⑩ and control unit harness terminal ⑩.

- O.K. → Replace control unit.
- N.G. → Repair harness or connector.

O.K.

13

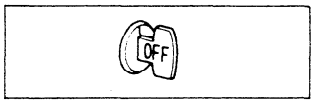


1. Push selector lever button with brake pedal depressed.
2. 

When turning ignition key, keep selector lever button pushed and brake pedal depressed.

14

CHECK OUTPUT SIGNAL (KEY UNLOCK SIGNAL CAUSED BY DETENTION SWITCH—KEY).



Check voltage between key lock solenoid harness terminal ⑩ and ground at the moment selector lever button is released.
Battery voltage should exist for approximately 0.1 seconds.

N.G. → Replace control unit.

O.K.

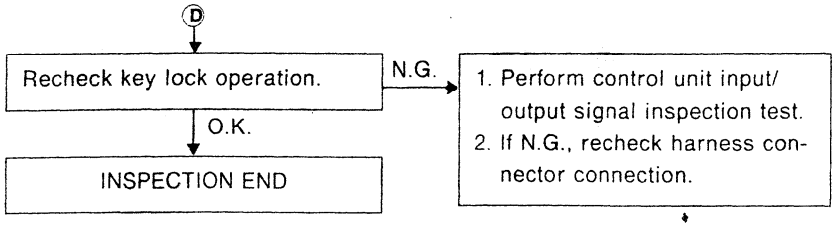
Check key lock solenoid. (Refer to "COMPONENT CHECK".)

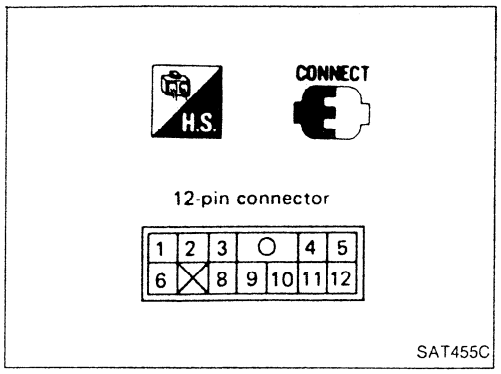
N.G. → Replace key lock solenoid.

O.K.

Ⓓ

Diagnostic Procedure 2 (Cont'd)





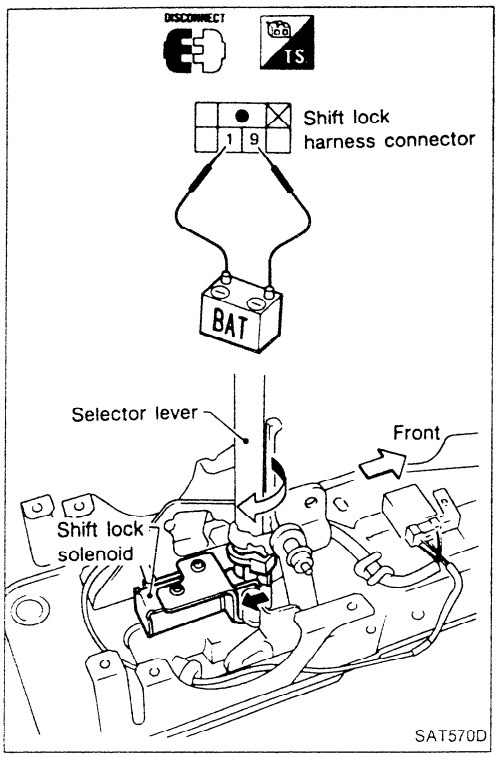
Shift Lock Control Unit Inspection

- Measure voltage between each terminal by following "SHIFT LOCK CONTROL UNIT INSPECTION TABLE".
- Pin connector terminal layout.

Shift Lock Control Unit Inspection (Cont'd)

SHIFT LOCK CONTROL UNIT INSPECTION TABLE (Data are reference values.)

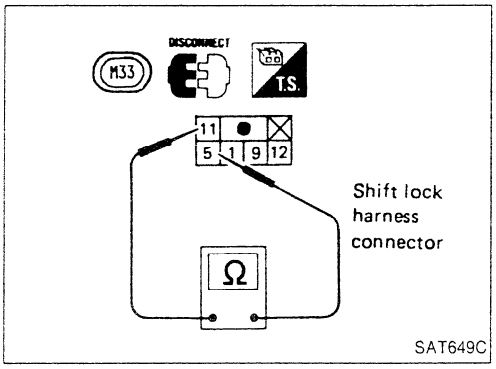
Terminal No. ⊕	Terminal No. ⊖	Item	Condition	Judgment standard
1	9	Shift lock signal	 When selector lever is set in "P" position and brake pedal is depressed	Battery voltage
			Except above	0V
2		Power source	Any condition	Battery voltage
3		Stop lamp switch	When brake pedal is depressed	Battery voltage
			When brake pedal is released	0V
4		Power source		Battery voltage
5		Detention switch (Shift)	• When key is inserted into key cylinder and selector lever is set in "P" position with selector lever button pushed • When selector lever is set in any position except "P".	Battery voltage
			Except above	0V
6		Ignition signal		Battery voltage
8	10	Key lock signal	When ignition switch is turned from LOCK, OFF or ACC to ON.	Battery voltage (Approximately 0.1 seconds)
			Except above	0V
9	—	Ground	—	—
10	8	Key unlock signal	When selector lever is set in "P" position and ignition key is turned from ON to LOCK, OFF or ACC with selector lever button released.	Battery voltage (Approximately 0.1 seconds)
			Except above	0V
11	9	Key switch	When key is inserted into key cylinder	Battery voltage
			When key is removed from key cylinder	0V
12		Detention switch (Key)	• When key is inserted into key cylinder and selector lever is set in "P" position with selector lever button pushed • When selector lever is set in any position except "P"	Battery voltage
			Except above	0V



Component Check

SHIFT LOCK SOLENOID

- Check operation by applying battery voltage to shift lock harness connector.

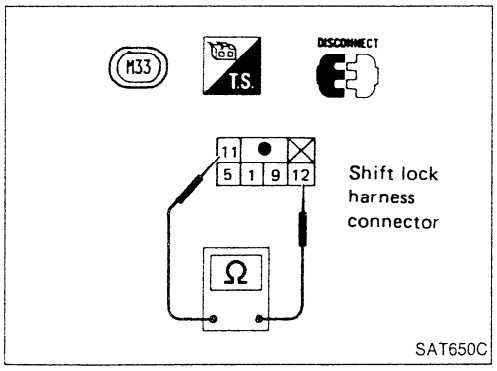


DETENTION SWITCH

Shift detention switch

- Check continuity between terminals ⑤ and ⑪ of shift lock harness connector.

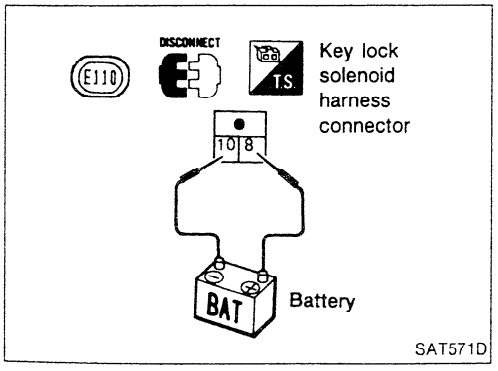
Condition	Continuity
When selector lever is set in "P" position with selector lever button pushed or selector lever is set in any position except "P".	Yes
Except the above	No



Key detention switch

- Check continuity between terminals ⑪ and ⑫ of shift lock harness connector.

Condition	Continuity
When selector lever is set in "P" position with selector lever button pushed or selector lever is set in any position except "P".	Yes
Except the above	No



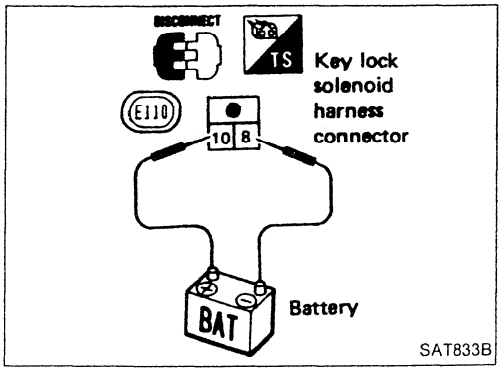
KEY LOCK SOLENOID

Operation of locking mechanism

- Check operation by applying battery voltage to key lock solenoid harness connector.

Operating sound must be emitted.

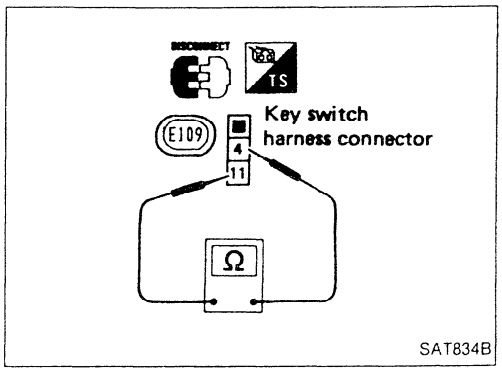
Component Check (Cont'd)



Operation of unlocking mechanism

- Check operation by applying battery voltage to key lock solenoid harness connector.

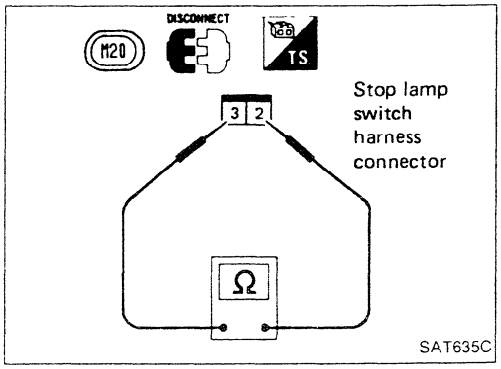
Operating sound must be emitted.



KEY SWITCH

- Check continuity between terminals ④ and ⑪ of key switch harness connector.

Condition	Continuity
When key is inserted into key cylinder	Yes
When key is removed from key cylinder	No



STOP LAMP SWITCH

- Check continuity between terminals ② and ③ of stop lamp switch harness connector.

Condition	Continuity
When brake pedal is depressed	Yes
When brake pedal is released	No

Check stop lamp switch after adjusting brake pedal — refer to section BR.

General Specifications

Applied model	GA14DS		GA16DS		GA16DE
	Except Europe and Middle East	Europe and Middle East	Europe	Except Europe	
Automatic transaxle model	RL4F03A				
Automatic transaxle assembly Model code number	31X74	31X79	31X75	31X76	31X77
Transaxle gear ratio					
1st	2.861 (2.8611)*				
2nd	1.562 (1.5622)*				
3rd	1.000 (1.0000)*				
4th	0.697 (0.6979)*				
Reverse	2.310 (2.3103)*				
Final drive	3.827	4.072 (4.0721)*		3.827	
Recommended oil	Automatic transaxle fluid Type DEXRON™				
Oil capacity ℓ (Imp qt)	7.0 (6-1/8)				

( )*: Gear ratio for Europe

Specifications and Adjustments

VEHICLE SPEED WHEN SHIFTING GEARS

Model 31X74

Throttle position	Vehicle speed km/h (MPH)						
	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$	$1_2 \rightarrow 1_1$
Full throttle	51 - 59 (32 - 37)	94 - 102 (58 - 63)	—	141 - 149 (88 - 93)	85 - 93 (53 - 58)	39 - 47 (24 - 29)	47 - 55 (29 - 34)
Half throttle	25 - 33 (16 - 21)	46 - 54 (29 - 34)	81 - 89 (50 - 55)	52 - 60 (32 - 37)	34 - 42 (21 - 26)	8 - 16 (5 - 10)	47 - 55 (29 - 34)

Model 31X76

Throttle position	Vehicle speed km/h (MPH)						
	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$	$1_2 \rightarrow 1_1$
Full throttle	50 - 58 (31 - 36)	92 - 100 (57 - 62)	—	139 - 147 (86 - 91)	83 - 91 (52 - 57)	39 - 47 (24 - 29)	47 - 55 (29 - 34)
Half throttle	25 - 33 (16 - 21)	45 - 53 (28 - 33)	81 - 89 (50 - 55)	51 - 59 (32 - 37)	34 - 42 (21 - 26)	7 - 15 (4 - 9)	47 - 55 (29 - 34)

Model 31X77

Throttle position	Vehicle speed km/h (MPH)						
	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$	$1_2 \rightarrow 1_1$
Full throttle	51 - 59 (32 - 37)	94 - 102 (58 - 63)	—	141 - 149 (88 - 93)	85 - 93 (53 - 58)	39 - 47 (24 - 29)	48 - 56 (30 - 35)
Half throttle	29 - 37 (18 - 23)	50 - 58 (31 - 36)	94 - 102 (58 - 63)	62 - 70 (39 - 43)	40 - 48 (25 - 30)	8 - 16 (5 - 10)	48 - 56 (30 - 35)

Specifications and Adjustments (Cont'd)

Model 31X75 and 31X79

Throttle position	Vehicle speed km/h (MPH)						
	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$	$1_2 \rightarrow 1_1$
Full throttle	48 - 56 (30 - 35)	88 - 96 (55 - 60)	—	133 - 141 (83 - 88)	80 - 88 (50 - 55)	37 - 45 (23 - 28)	45 - 53 (28 - 33)
Half throttle	23 - 31 (14 - 19)	49 - 57 (30 - 35)	92 - 100 (57 - 62)	65 - 73 (40 - 45)	32 - 40 (20 - 25)	7 - 15 (4 - 9)	45 - 53 (28 - 33)

VEHICLE SPEED WHEN PERFORMING LOCK-UP

Model 31X74 and 31X76

Throttle position	Gear position	Vehicle speed km/h (MPH)
		Lock-up "ON"
Half throttle	D_4	65 - 73 (40 - 45)

Model 31X77

Throttle position	Gear position	Vehicle speed km/h (MPH)
		Lock-up "ON"
Half throttle	D_4	64 - 72 (40 - 45)

Model 31X75 and 31X79

Throttle position	Gear position	Vehicle speed km/h (MPH)
		Lock-up "ON"
Half throttle	D_4	90 - 98 (56 - 61)

STALL REVOLUTION

Engine		Stall revolution rpm
GA14DS	Europe	2,200 - 2,500
	Except Europe	2,150 - 2,450
GA16DS	Europe and Middle East	2,450 - 2,750
	Except Europe and Middle East	2,400 - 2,700
GA16DE		2,450 - 2,750

THROTTLE WIRE ADJUSTMENT

Unit: mm (in)

Throttle wire stroke	40 - 42 (1.57 - 1.65)

LINE PRESSURE

Engine speed rpm	Line pressure kPa (bar, kg/cm^2, psi)			
	R range	D range	2 range	1 range
Idle	883 (8.83, 9.0, 128)	539 (5.39, 5.5, 78)	588 (5.88, 6.0, 85)	883 (8.83, 9.0, 128)
Stall	1,765 (17.65, 18.0, 256)	1,079 (10.79, 11.0, 156)	883 (8.83, 9.0, 128)	1,079 (10.79, 11.0, 156)

Specifications and Adjustments (Cont'd)

CONTROL VALVES

Control valve return springs

Unit: mm (in)

Parts		Model	Part No.	Free length	Outer diameter
Upper body	Pressure modifier valve spring	31X74, 31X75, 31X76, 31X79	31742-31X02	25.0 (0.984)	8.0 (0.315)
		31X77	31742-31X10	25.0 (0.984)	8.2 (0.323)
	Kickdown modulator valve spring		31742-31X03	40.5 (1.594)	9.0 (0.354)
	1-2 accumulator valve spring	31X74, 31X75, 31X76, 31X79	31742-31X04	51.14 (2.0134)	17.0 (0.669)
		31X77	31742-31X63	50.9 (2.004)	12.6 (0.496)
	3-2 timing valve spring		31736-21X00	26.3 (1.035)	7.2 (0.283)
	1st reducing valve spring		31835-21X08	22.6 (0.890)	7.3 (0.287)
	Torque converter relief valve spring		31742-31X06	23.5 (0.925)	7.4 (0.291)
	Throttle modulator valve spring	31X74, 31X76, 31X77	31742-31X07	29.5 (1.161)	5.5 (0.217)
		31X75, 31X79	31742-31X65	29.5 (1.161)	5.5 (0.217)
	4th speed cut valve spring	31X74, 31X76, 31X77	31835-21X05	23.3 (0.917)	6.2 (0.244)
		31X75, 31X79	31737-21X00	25.4 (1.000)	7.3 (0.287)
	Lock-up control valve spring		31742-31X08	39.5 (1.555)	5.0 (0.197)
	4-2 sequence valve spring		31742-31X09	39.5 (1.555)	5.1 (0.201)
	Oil cooler relief valve spring		31872-31X00	17.02 (0.6701)	8.0 (0.315)
Lower body	Throttle valve and detent valve spring	31X74, 31X75, 31X76, 31X79	31802-31X00	31.0 (1.220)	10.0 (0.394)
		31X77	31802-31X01	33.0 (1.299)	10.0 (0.394)
	Pressure regulator valve spring		31742-31X00	52.24 (2.0567)	15.0 (0.591)
	3-4 shift valve spring		31762-31X00	52.0 (2.047)	8.0 (0.315)
	2-3 shift valve spring		31762-31X01	52.7 (2.075)	7.0 (0.276)
	1-2 shift valve spring		31762-31X02	45.9 (1.807)	5.3 (0.209)
	Overrun clutch control valve spring		31742-31X60	48.9 (1.925)	7.0 (0.276)

Specifications and Adjustments (Cont'd)

CLUTCH AND BRAKES

Model		31X74	31X79	31X75	31X76	31X77
Reverse clutch						
Number of drive plates		2				
Number of driven plates		2				
Drive plate thickness	mm (in)					
Standard		2.0 (0.079)				
Wear 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		3				
Number of driven plates		5				
Drive plate thickness	mm (in)					
Standard		2.0 (0.079)				
Wear limit		1.8 (0.071)				
Clearance	mm (in)					
Standard		1.4 - 1.8 (0.055 - 0.071)				
Allowable limit		2.4 (0.094)				

Thickness of retaining plates	Thickness mm (in)	Part number	Thickness mm (in)	Part number
	3.6 (0.142)	31537-31X10	3.6 (0.142)	31537-31X10
	3.8 (0.150)	31537-31X11	3.8 (0.150)	31537-31X11
	4.0 (0.157)	31537-31X12	4.0 (0.157)	31537-31X12
	4.2 (0.165)	31537-31X13	4.2 (0.165)	31537-31X13
	4.4 (0.173)	31537-31X14	4.4 (0.173)	31537-31X14
	4.6 (0.181)	31537-31X15	4.6 (0.181)	31537-31X15
			4.8 (0.189)	31537-31X16

Specifications and Adjustments (Cont'd)

Model		31X74	31X79	31X75	31X76	31X77
Forward clutch						
Number of drive plates		5				
Number of driven plates		5				
Drive plate thickness	mm (in)					
Standard		1.8 (0.071)				
Wear 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		5				
Drive plate thickness	mm (in)					
Standard		1.6 (0.063)				
Wear 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)			31537-31X70	
		3.8 (0.150)			31537-31X71	
		4.0 (0.157)			31537-31X72	
		4.2 (0.165)			31537-31X73	
		4.4 (0.173)			31537-31X74	

Specifications and Adjustments (Cont'd)

Model	31X74	31X79	31X75	31X76	31X77
Low & reverse brake					
Number of drive plates	4		5		
Number of driven plates	4		5		
Drive plate thickness mm (in)					
Standard	2.0 (0.079)				
Wear limit	1.8 (0.071)				
Clearance mm (in)					
Standard	1.4 - 1.8 (0.055 - 0.071)		1.4 - 1.8 (0.055 - 0.071)		
Allowable limit	2.6 (0.102)		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, ft-lb)	4 - 6 (0.4 - 0.6, 2.9 - 4.3)				
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)				

Specifications and Adjustments (Cont'd)

Clutch and brake return springs

Unit: mm (in)

Return spring		Free length	Outer diameter
Forward clutch (Overrun clutch) (16 pcs)	Inner	26.3 (1.035)	7.7 (0.303)
	Outer	26.6 (1.047)	10.6 (0.417)

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	0.07 - 0.19 (0.0028 - 0.0075)	
Allowable limit	0.19 (0.0075)	

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 for model 31X74, 31X76 and 31X79

Thickness mm (in)	Part number
0.75 - 0.80 (0.0295 - 0.0315)	38424-31X00
0.80 - 0.85 (0.0315 - 0.0335)	38424-31X01
0.85 - 0.90 (0.0335 - 0.0354)	38424-31X02
0.90 - 0.95 (0.0354 - 0.0374)	38424-31X04

Differential side gear thrust washers for model 31X75 and 31X77

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

Differential case end play

Differential case end play mm (in)	0 - 0.15 (0 - 0.0059)

Specifications and Adjustments (Cont'd)

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

REDUCTION GEAR

Bearing preload

Reduction gear bearing preload N·m (kg-cm, in-lb)	0.11 - 0.69 (1.1 - 7.0, 0.95 - 6.08)

Reduction gear bearing adjusting shims

Thickness mm (in)	Part number
1.10 (0.0433)	31438-31X00
1.14 (0.0449)	31438-31X01
1.18 (0.0465)	31438-31X02
1.22 (0.0480)	31438-31X03
1.26 (0.0496)	31438-31X04
1.30 (0.0512)	31438-31X05
1.34 (0.0528)	31438-31X06
1.38 (0.0543)	31438-31X07
1.42 (0.0559)	31438-31X08
1.46 (0.0575)	31438-31X09
1.50 (0.0591)	31438-31X10
1.54 (0.0606)	31438-31X11
1.58 (0.0622)	31438-31X12
1.62 (0.0638)	31438-31X13
1.66 (0.0654)	31438-31X14
1.70 (0.0669)	31438-31X15
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
2.70 (0.1063)	31438-31X75
2.74 (0.1079)	31438-31X76
2.78 (0.1094)	31438-31X77
2.82 (0.1110)	31438-31X78

Specifications and Adjustments (Cont'd)

Table for selecting reduction gear bearing adjusting shim

Unit: mm (in)

Dimension "T"	Suitable shim(s)
1.13 - 1.17 (0.0445 - 0.0461)	1.10 (0.0433)
1.17 - 1.21 (0.0461 - 0.0476)	1.14 (0.0449)
1.21 - 1.25 (0.0476 - 0.0492)	1.18 (0.0465)
1.25 - 1.29 (0.0492 - 0.0508)	1.22 (0.0480)
1.29 - 1.33 (0.0508 - 0.0524)	1.26 (0.0496)
1.33 - 1.37 (0.0524 - 0.0539)	1.30 (0.0512)
1.37 - 1.41 (0.0539 - 0.0555)	1.34 (0.0528)
1.41 - 1.45 (0.0555 - 0.0571)	1.38 (0.0543)
1.45 - 1.49 (0.0571 - 0.0587)	1.42 (0.0559)
1.49 - 1.53 (0.0587 - 0.0602)	1.46 (0.0575)
1.53 - 1.57 (0.0602 - 0.0618)	1.50 (0.0591)
1.57 - 1.61 (0.0618 - 0.0634)	1.54 (0.0606)
1.61 - 1.65 (0.0634 - 0.0650)	1.58 (0.0622)
1.65 - 1.69 (0.0650 - 0.0665)	1.62 (0.0638)
1.69 - 1.73 (0.0665 - 0.0681)	1.66 (0.0654)
1.73 - 1.77 (0.0681 - 0.0697)	1.70 (0.0669)
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 - 1.97 (0.0760 - 0.0776)	1.90 (0.0748)
1.97 - 2.01 (0.0776 - 0.0791)	1.94 (0.0764)
2.01 - 2.05 (0.0791 - 0.0807)	1.98 (0.0780)
2.05 - 2.09 (0.0807 - 0.0823)	2.02 (0.0795)
2.09 - 2.13 (0.0823 - 0.0839)	2.06 (0.0811)
2.13 - 2.17 (0.0839 - 0.0854)	2.10 (0.0827)
2.17 - 2.21 (0.0854 - 0.0870)	2.14 (0.0843)
2.21 - 2.25 (0.0870 - 0.0886)	2.18 (0.0858)
2.25 - 2.29 (0.0886 - 0.0902)	2.22 (0.0874)
2.29 - 2.33 (0.0902 - 0.0917)	2.26 (0.0890)
2.33 - 2.37 (0.0917 - 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)
2.73 - 2.77 (0.1075 - 0.1091)	2.70 (0.1063)
2.77 - 2.81 (0.1091 - 0.1106)	2.74 (0.1079)
2.81 - 2.85 (0.1106 - 0.1122)	2.78 (0.1094)
2.85 - 2.89 (0.1122 - 0.1138)	2.82 (0.1110)

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)

Bearing preload

Output shaft bearing preload N·m (kg-cm, in-lb)	0.25 - 0.88 (2.5 - 9.0, 2.2 - 7.8)

Specifications and Adjustments (Cont'd)

Output shaft bearing adjusting spacers

Thickness mm (in)	Part number
5.62 (0.2213)	31437-31X00
5.66 (0.2228)	31437-31X01
5.70 (0.2244)	31437-31X02
5.74 (0.2260)	31437-31X03
5.78 (0.2276)	31437-31X04
5.82 (0.2291)	31437-31X05
5.86 (0.2307)	31437-31X06
5.90 (0.2323)	31437-31X07
5.94 (0.2339)	31437-31X08
5.98 (0.2354)	31437-31X09
6.02 (0.2370)	31437-31X10
6.06 (0.2386)	31437-31X11
6.10 (0.2402)	31437-31X12
6.14 (0.2417)	31437-31X13
6.18 (0.2433)	31437-31X14
6.22 (0.2449)	31437-31X15
6.26 (0.2465)	31437-31X16
6.30 (0.2480)	31437-31X17
6.34 (0.2496)	31437-31X18
6.38 (0.2512)	31437-31X19
6.42 (0.2528)	31437-31X20
6.46 (0.2543)	31437-31X21
6.50 (0.2559)	31437-31X22
6.54 (0.2575)	31437-31X23
6.58 (0.2591)	31437-31X24
6.62 (0.2606)	31437-31X60
6.64 (0.2614)	31437-31X78
6.66 (0.2622)	31437-31X61
6.68 (0.2630)	31437-31X79
6.70 (0.2638)	31437-31X62
6.72 (0.2646)	31437-31X80
6.74 (0.2654)	31437-31X63
6.76 (0.2661)	31437-31X81
6.78 (0.2669)	31437-31X64
6.80 (0.2677)	31437-31X82
6.82 (0.2685)	31437-31X65
6.84 (0.2693)	31437-31X83
6.86 (0.2701)	31437-31X66
6.88 (0.2709)	31437-31X84
6.90 (0.2717)	31437-31X67
6.92 (0.2724)	31437-31X46
6.94 (0.2732)	31437-31X68
6.96 (0.2740)	31437-31X47
6.98 (0.2748)	31437-31X69
7.00 (0.2756)	31437-31X48
7.02 (0.2764)	31437-31X70
7.06 (0.2780)	31437-31X71
7.10 (0.2795)	31437-31X72
7.14 (0.2811)	31437-31X73
7.18 (0.2827)	31437-31X74
7.22 (0.2843)	31437-31X75

Table for selecting output shaft bearing adjusting spacer

Unit: mm (in)

Dimension "T"	Suitable spacer
5.65 - 5.69 (0.2224 - 0.2240)	5.62 (0.2213)
5.69 - 5.73 (0.2240 - 0.2256)	5.66 (0.2228)
5.73 - 5.77 (0.2256 - 0.2272)	5.70 (0.2244)
5.77 - 5.81 (0.2272 - 0.2287)	5.74 (0.2260)
5.81 - 5.85 (0.2287 - 0.2303)	5.78 (0.2276)
5.85 - 5.89 (0.2303 - 0.2319)	5.82 (0.2291)
5.89 - 5.93 (0.2319 - 0.2335)	5.86 (0.2307)
5.93 - 5.97 (0.2335 - 0.2350)	5.90 (0.2323)
5.97 - 6.01 (0.2350 - 0.2366)	5.94 (0.2339)
6.01 - 6.05 (0.2361 - 0.2382)	5.98 (0.2354)
6.05 - 6.09 (0.2382 - 0.2398)	6.02 (0.2370)
6.09 - 6.13 (0.2398 - 0.2413)	6.06 (0.2386)
6.13 - 6.17 (0.2413 - 0.2429)	6.10 (0.2402)
6.17 - 6.21 (0.2429 - 0.2445)	6.14 (0.2417)
6.21 - 6.25 (0.2445 - 0.2461)	6.18 (0.2433)
6.25 - 6.29 (0.2461 - 0.2476)	6.22 (0.2449)
6.29 - 6.33 (0.2476 - 0.2492)	6.26 (0.2465)
6.33 - 6.37 (0.2492 - 0.2508)	6.30 (0.2480)
6.37 - 6.41 (0.2508 - 0.2524)	6.34 (0.2496)
6.41 - 6.45 (0.2524 - 0.2539)	6.38 (0.2512)
6.45 - 6.49 (0.2539 - 0.2555)	6.42 (0.2528)
6.49 - 6.53 (0.2555 - 0.2571)	6.46 (0.2543)
6.53 - 6.57 (0.2571 - 0.2587)	6.50 (0.2559)
6.57 - 6.61 (0.2587 - 0.2602)	6.54 (0.2575)
6.61 - 6.65 (0.2602 - 0.2618)	6.58 (0.2591)
6.65 - 6.69 (0.2618 - 0.2634)	6.62 (0.2606)
6.69 - 6.73 (0.2634 - 0.2650)	6.66 (0.2622)
6.73 - 6.77 (0.2650 - 0.2665)	6.70 (0.2638)
6.77 - 6.81 (0.2665 - 0.2681)	6.74 (0.2654)
6.81 - 6.85 (0.2681 - 0.2697)	6.78 (0.2669)
6.85 - 6.89 (0.2697 - 0.2713)	6.82 (0.2685)
6.89 - 6.93 (0.2713 - 0.2728)	6.86 (0.2701)
6.93 - 6.97 (0.2728 - 0.2744)	6.90 (0.2717)
6.97 - 7.01 (0.2744 - 0.2760)	6.94 (0.2732)
7.01 - 7.05 (0.2760 - 0.2776)	6.98 (0.2748)
7.05 - 7.09 (0.2776 - 0.2791)	7.02 (0.2764)
7.09 - 7.13 (0.2791 - 0.2807)	7.06 (0.2780)
7.13 - 7.17 (0.2807 - 0.2823)	7.10 (0.2795)
7.17 - 7.21 (0.2823 - 0.2839)	7.14 (0.2811)
7.21 - 7.25 (0.2839 - 0.2854)	7.18 (0.2827)
7.25 - 7.29 (0.2854 - 0.2870)	7.22 (0.2843)

Specifications and Adjustments (Cont'd)

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 races 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
2.2 (0.087)	31435-31X09

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
1.55 (0.0610)	31508-31X06

ACCUMULATOR

O-ring

Unit: mm (in)

Accumulator	Inner diameter (Small)	Inner diameter (Large)
3-R 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
3-R accumulator spring	56.4 (2.220)	21.0 (0.827)
N-D accumulator spring	43.5 (1.713)	28.0 (1.102)

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)
O.D. servo return spring	31.0 (1.220)	21.7 (0.854)

REMOVAL AND INSTALLATION

Distance between end of converter housing and torque converter	21.1 mm (0.831 in) or more
Drive plate runout limit	0.5 mm (0.020 in)

TRANSFER

SECTION TF

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FTY10A (SR20DET engine models)

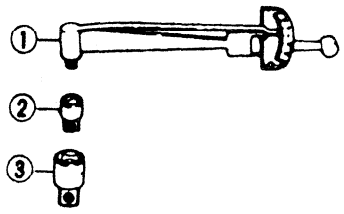
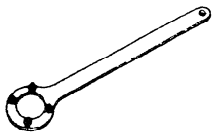
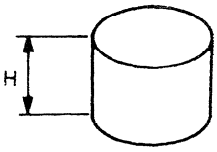
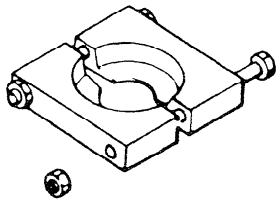
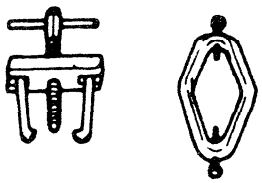
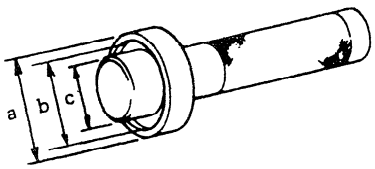
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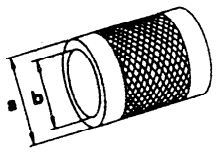
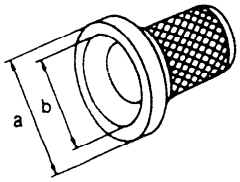
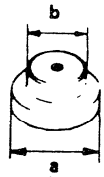
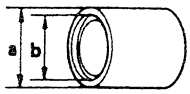
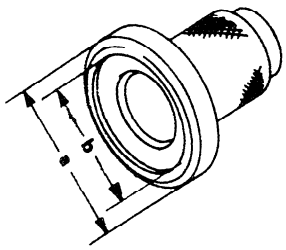
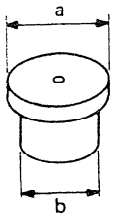
SERVICE DATA AND SPECIFICATIONS (S.D.S.) TF-68

SPECIAL SERVICE TOOLS

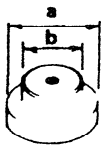
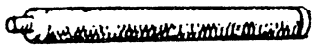
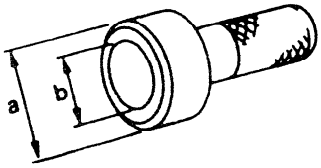
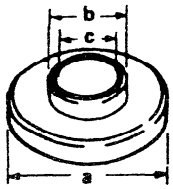
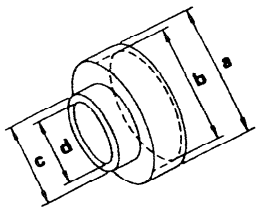
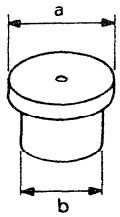
*: Special tool or commercial equivalent

Tool number Tool name	Description	
ST3127S000* Preload gauge ① GG91030000 Torque wrench ② HT62940000 Socket adapter ③ HT62900000 Socket adapter		Measuring pinion bearing preload
ST38060002* Pinion flange wrench		Removing and installing pinion nut
KV38101900* Master gauge	 H: 20 mm (0.79 in)	Selecting hypoid gear bearing adjusting shim
ST30021000* Puller		Removing hypoid gear and hypoid gear bearing
ST30031000* Puller		Removing countershaft bearing
ST33051001* Puller		① Removing ring gear bearing (R.H. side) ② Removing front differential side bearing (FTY10A)
ST33290001* Puller		① Removing pinion oil seal and drive shaft oil seal ② Removing front cover oil seal (FTY10A) ③ Removing adapter oil seal (VTY10A)
ST33230000* Drift	 a: 51 mm (2.01 in) dia. b: 41 mm (1.61 in) dia. c: 28.5 mm (1.122 in) dia.	① Installing drive shaft oil seal ② Installing front differential side bearing (FTY10A)

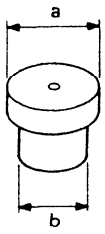
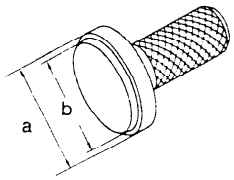
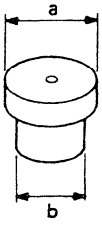
*: Special tool or commercial equivalent

Tool number Tool name	Description	
ST33200000 Drift	 **a: 60 mm (2.36 in) dia.** **b: 44.5 mm (1.752 in) dia.**	Installing companion flange (FTY10A)
ST33400001* Drift	 **a: 60 mm (2.36 in) dia.** **b: 47 mm (1.85 in) dia.**	Installing hypoid gear bearing
ST30613000* Drift	 **a: 72 mm (2.83 in) dia.** **b: 48 mm (1.89 in) dia.**	① Installing ring gear oil seal (Use with KV40101630.) ② Installing pinion rear bearing outer race
KV40101630* Drift	 **a: 68 mm (2.68 in) dia.** **b: 61 mm (2.40 in) dia.**	Installing ring gear oil seal (Use with ST30613000.)
KV40100621* Drift	 **a: 76 mm (2.99 in) dia.** **b: 69 mm (2.72 in) dia.**	① Installing pinion oil seal ② Installing ring gear bearing (R H. side of VTY10A) ③ Seating countershaft bearing (VTY10A)
ST33061000* Drift	 **a: 38 mm (1.50 in) dia.** **b: 28.5 mm (1.122 in) dia.**	Removing ring gear bearing (L.H. side of VTY10A) Removing front differential side bearing (FTY10A)

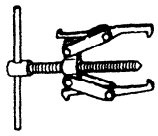
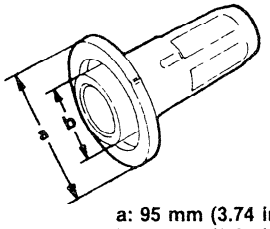
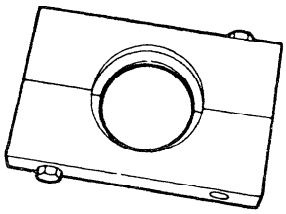
*: Special tool or commercial equivalent

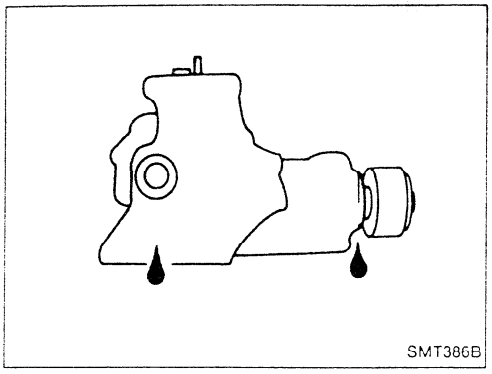
Tool number Tool name	Description	
ST30621000* Drift	 **a: 79 mm (3.11 in) dia.** **b: 59 mm (2.32 in) dia.**	① Installing hypoid gear bearing outer race (Use with ST30611000) ② Installing pinion front bearing outer race (FTY10A)
ST30611000* Drift handle		(Use with ST30621000)
ST30720000* Drift	 **a: 77 mm (3.03 in) dia.** **b: 55.5 mm (2.185 in) dia.**	Installing front cover oil seal (FTY10A)
ST30901000* Drift	 **a: 79 mm (3.11 in) dia.** **b: 45 mm (1.77 in) dia.** **c: 35 mm (1.38 in) dia.**	① Installing countershaft bearing ② Installing pinion front bearing inner race (FTY10A)
KV38102510* Drift	 **a: 71 mm (2.80 in) dia.** **b: 65 mm (2.56 in) dia.** **c: 55 mm (2.17 in) dia.** **d: 45 mm (1.77 in) dia.**	① Installing hypoid gear ② Installing pinion front bearing inner race (VTY10A)
ST19840000* Drift	 **a: 60 mm (2.36 in) dia.** **b: 34.8 mm (1.37 in) dia.**	① Removing ring gear bearing (R H. side of VTY10A) ② Installing ring gear bearing (L.H side of VTY10A) ③ Removing ring gear bearing (L.H side of FTY10A) ④ Installing ring gear bearing (R.H side of FTY10A)

*: Special tool or commercial equivalent

Tool number Tool name	Description	
ST33081000* Drift	 **a: 43 mm (1.69 in) dia.** **b: 33.5 mm (1.319 in) dia.**	Removing hypoid gear bearing
ST01500001* Drift	 **a: 89 mm (3.50 in) dia.** **b: 77 mm (3.03 in) dia.**	Installing pinion front bearing outer race
KV38104010 Drift	 **a: 67 mm (2.64 in) dia.** **b: 49 mm (1.93 in) dia.**	① Removing ring gear bearing (R H. side of FTY10A) ② Installing ring gear bearing (L.H. side of FTY10A)

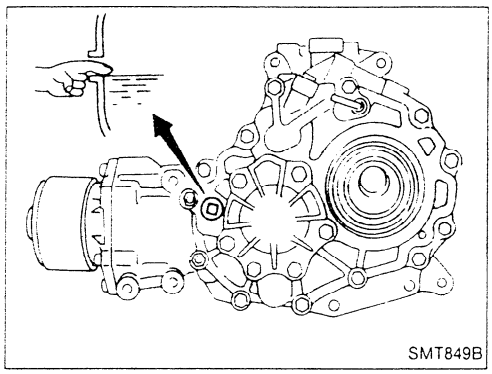
COMMERCIAL SERVICE TOOLS

Tool name	Description	
Puller		① Removing ring gear bearing (L.H. side) ② Removing viscous coupling (VTY10A)
Puller		Removing hypoid gear bearing outer race
Drift	 **a: 95 mm (3.74 in) dia.** **b: 58 mm (2.28 in) dia.**	Installing adapter oil seal (VTY10A)
Puller		Removing pinion front bearing inner race



Checking Transfer Oil

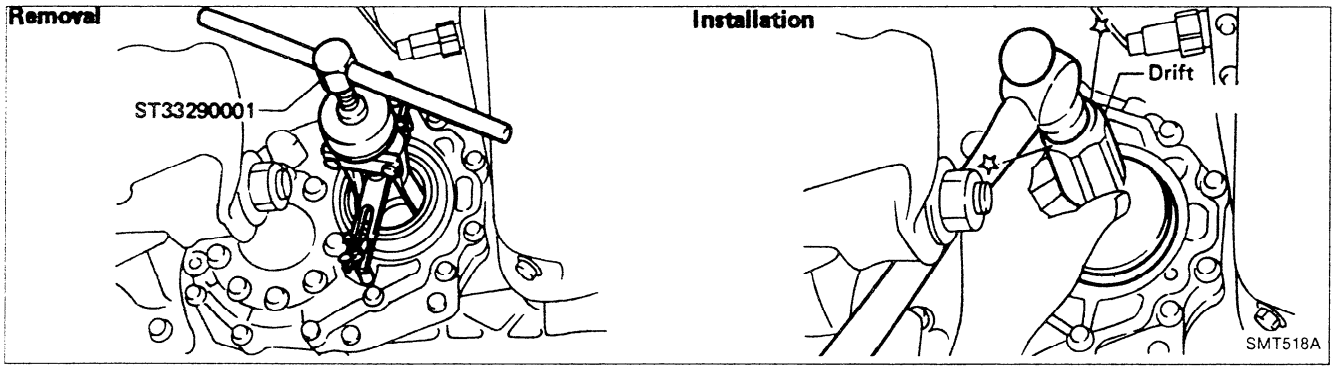
- Check transfer for leakage.



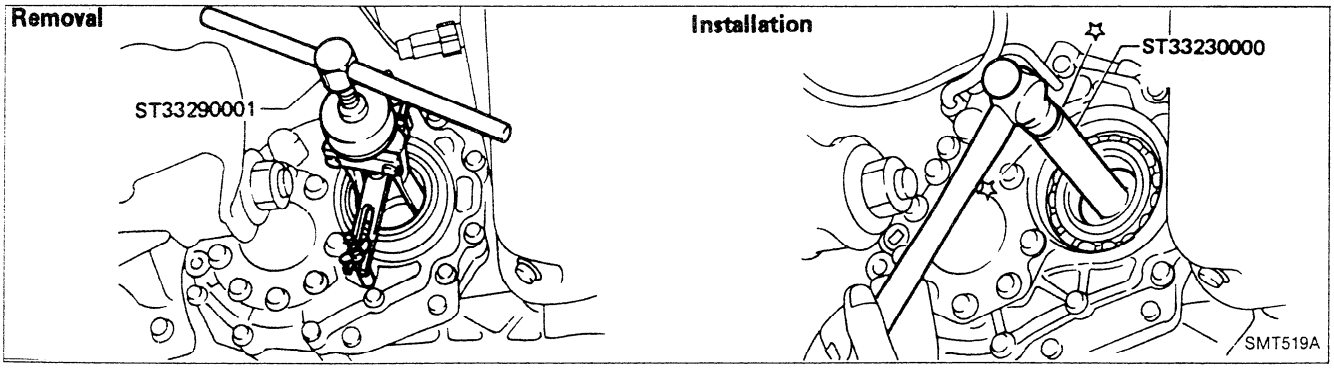
- Check oil level.

Replacing Oil Seal

ADAPTER OIL SEAL

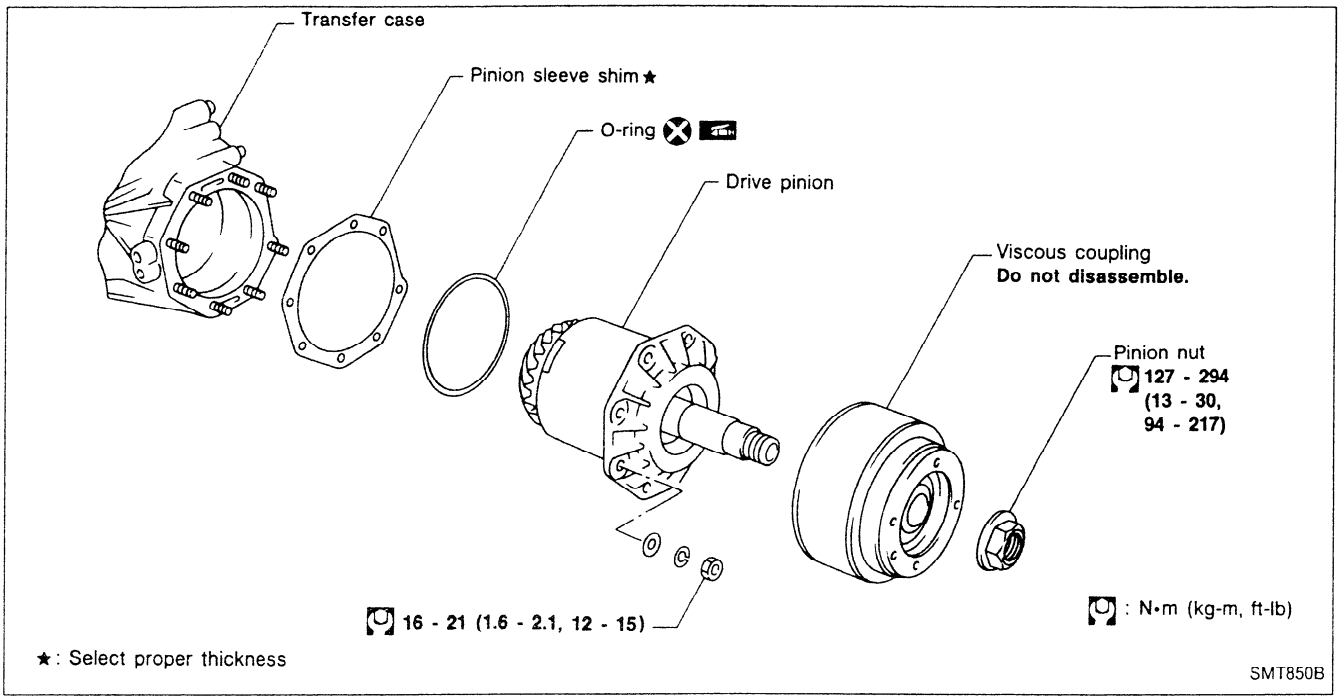


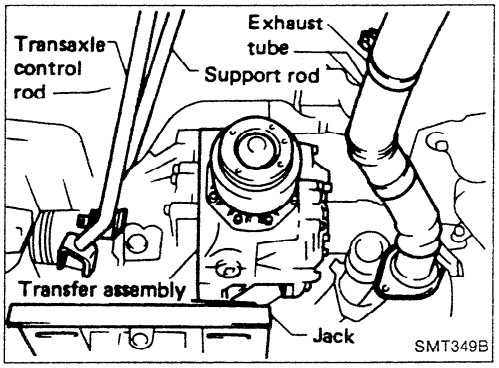
DRIVE SHAFT OIL SEAL

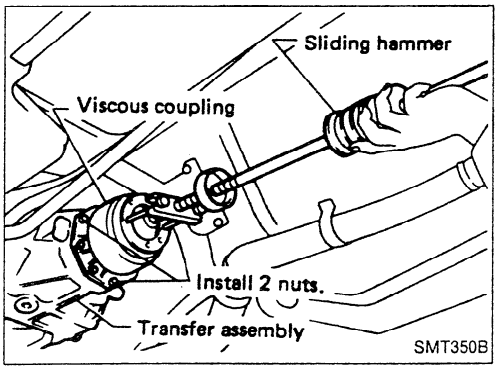


- Lubricate seal lips of drive shaft oil seal and adapter oil seal of transfer with multi-purpose grease before installing drive shaft.
- **Be careful not to damage drive shaft oil seal and adapter oil seal of transfer when installing drive shaft.**

Replacing Viscous Coupling







REMOVAL

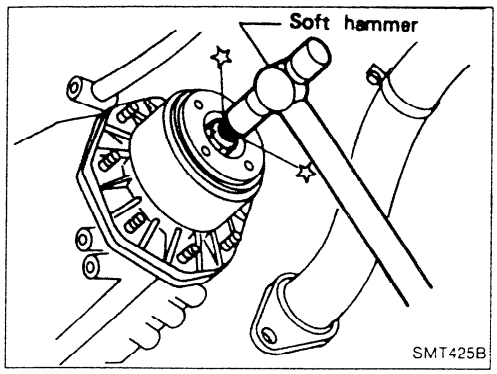
- Drain transfer oil.
- Remove front stabilizer bar.
- Remove transaxle control rod and support rod from transaxle.
- Remove propeller shaft from transfer.
- Separate center exhaust tube from front tube.
- Support transaxle and transfer by a jack.
- Remove rear mount.
- Remove pinion sleeve assembly using a sliding hammer.

Install 2 nuts to prevent the pinion sleeve assembly from dropping. Do not tighten nuts.

- Replacing viscous coupling

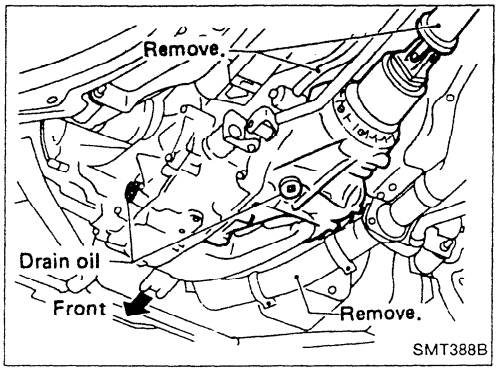
Refer to "REPAIR FOR COMPONENT PARTS".

Replacing Viscous Coupling (Cont'd)



INSTALLATION

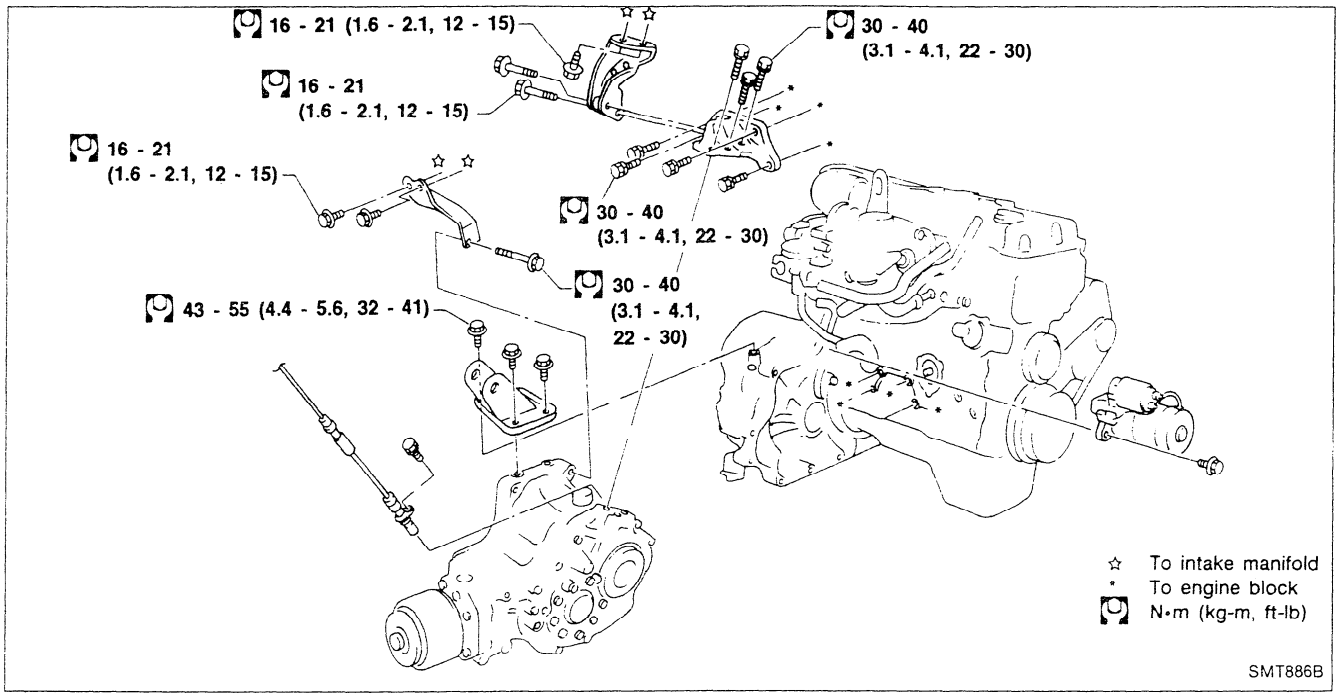
- Install O-ring on pinion sleeve and then install pinion sleeve shim and pinion sleeve.



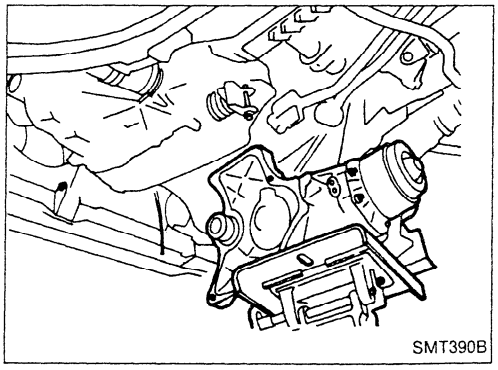
Removal

- Drain gear oil from transfer and transaxle.
- Remove exhaust front tube.
- Put matchmarks on flanges and then separate propeller shaft from transfer.
- Remove transaxle support rod from transfer.

- Remove R.H. drive shaft and oil filter.



- Remove parts shown in above illustration.
  - Rear mount bracket
  - Speedometer pinion
  - Stays and gusset
  - Starter motor



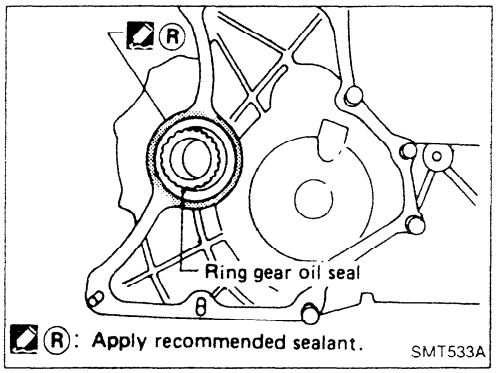
- Remove transfer fixing bolts, then lower transfer.

WARNING:

- **Support transaxle by a jack.**
- **Support transfer by a jack while removing it.**

Installation

- Lubricate seal lips of transfer side oil seal in transaxle and drive shaft oil seal and adapter oil seal of transfer, with multi-purpose grease before installing transfer and drive shaft.

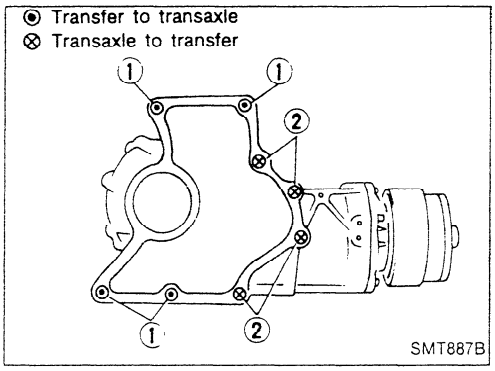


- Apply recommended sealant on transfer case as shown at left.

  Recommended sealant:

  Nissan genuine part (KP510-00150) or equivalent

- **Be careful not to damage transaxle oil seal when inserting spline portion of transfer ring gear into transaxle.**

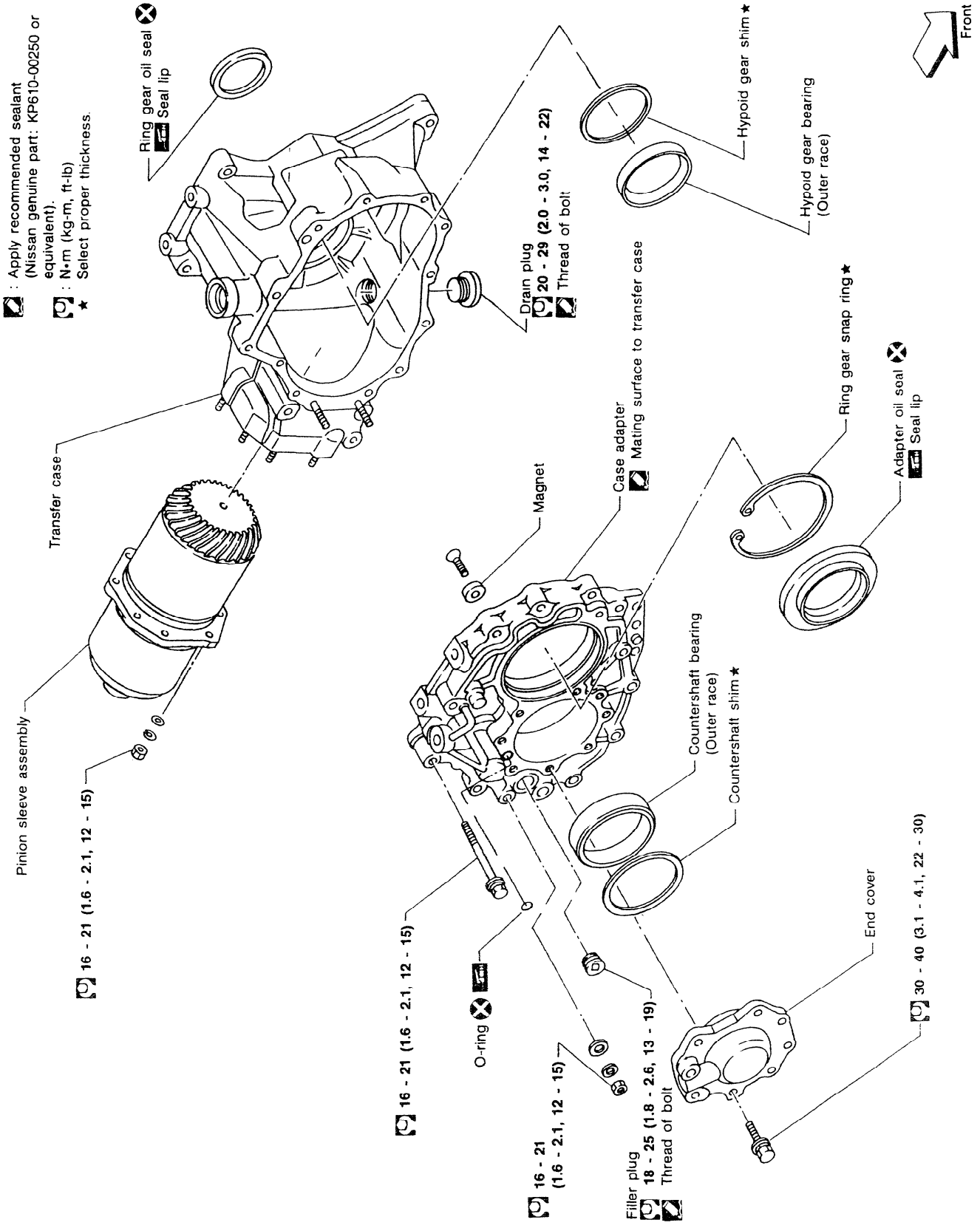


- Tighten bolts securing transfer.

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	ℓ mm (in)
1	30 - 40 (3.1 - 4.1, 22 - 30)	65 (2.56)
2	30 - 40 (3.1 - 4.1, 22 - 30)	65 (2.56)

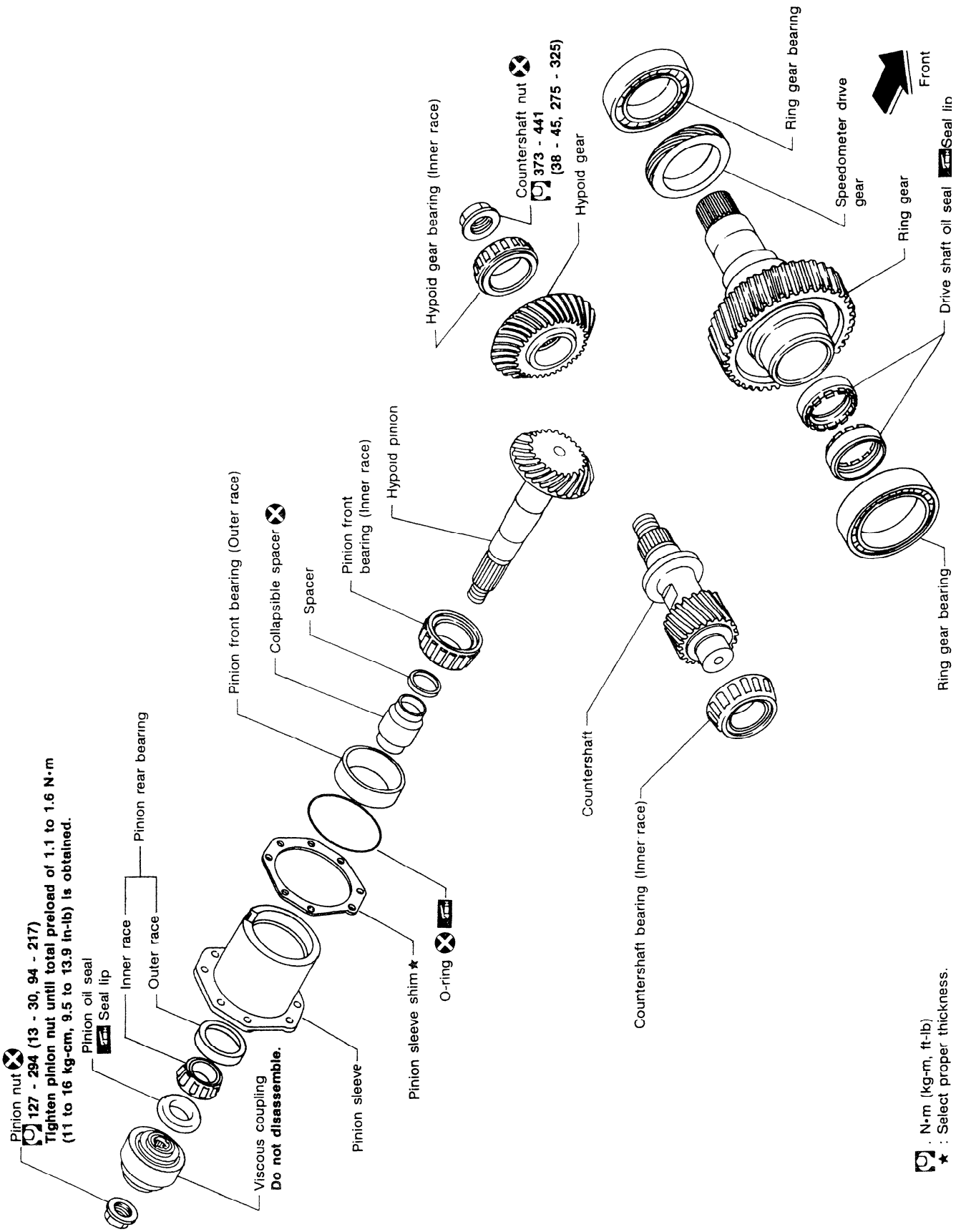
- **Be careful not to damage drive shaft oil seal and transfer front cover oil seal when installing drive shaft.**
- Refill with recommended gear oil.
- **Gear oil for transfer is different from that for transaxle.**

Case Components

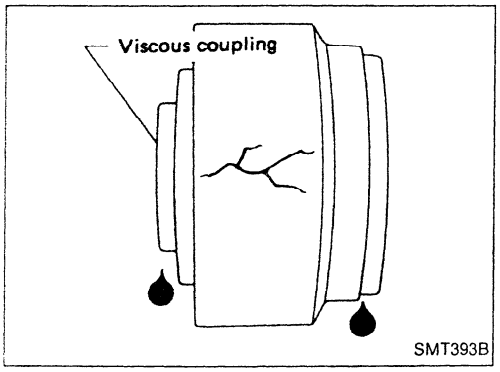


SMT851B

Gear Components

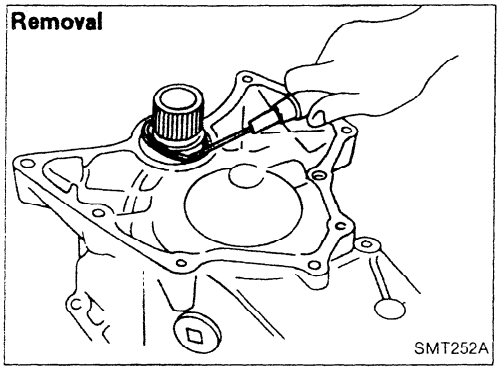


SMT852B



Viscous Coupling

- Check case for cracks.
- Check silicone oil for leakage.

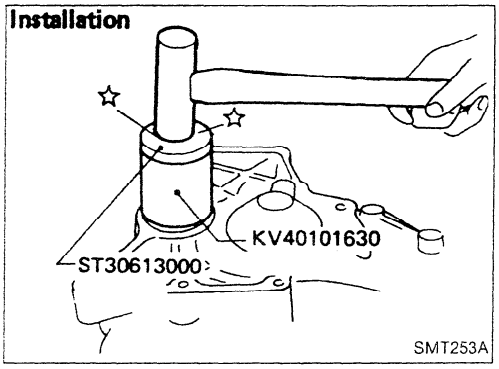


Oil Seal

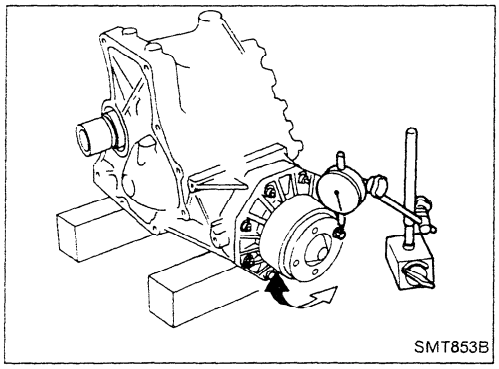
RING GEAR OIL SEAL

- Check ring gear oil seal for oil leakage.

Be careful not to damage ring gear when removing ring gear oil seal.



Apply multi-purpose grease to seal lip of oil seal before installing.



Gear Components

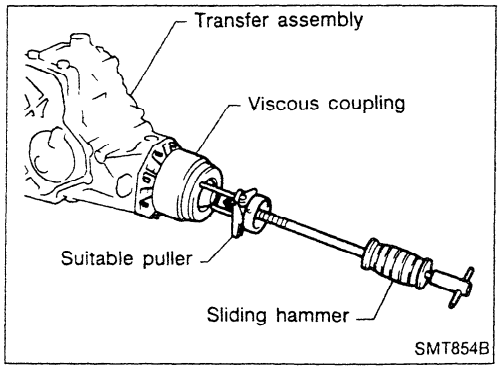
1. Check hypoid gear-to-pinion backlash.

a. Install a bolt in viscous coupling.

b. Measure hypoid gear-to-pinion backlash.

Hypoid gear-to-pinion backlash
(at bolt hole of companion flange):
0.08 - 0.12 mm (0.0031 - 0.0047 in)

c. If not within specification, adjust hypoid pinion height — Refer to "ADJUSTMENT".



2. Remove pinion sleeve assembly using a sliding hammer.

Install 2 nuts to prevent the pinion sleeve assembly from dropping. Do not tighten nuts.

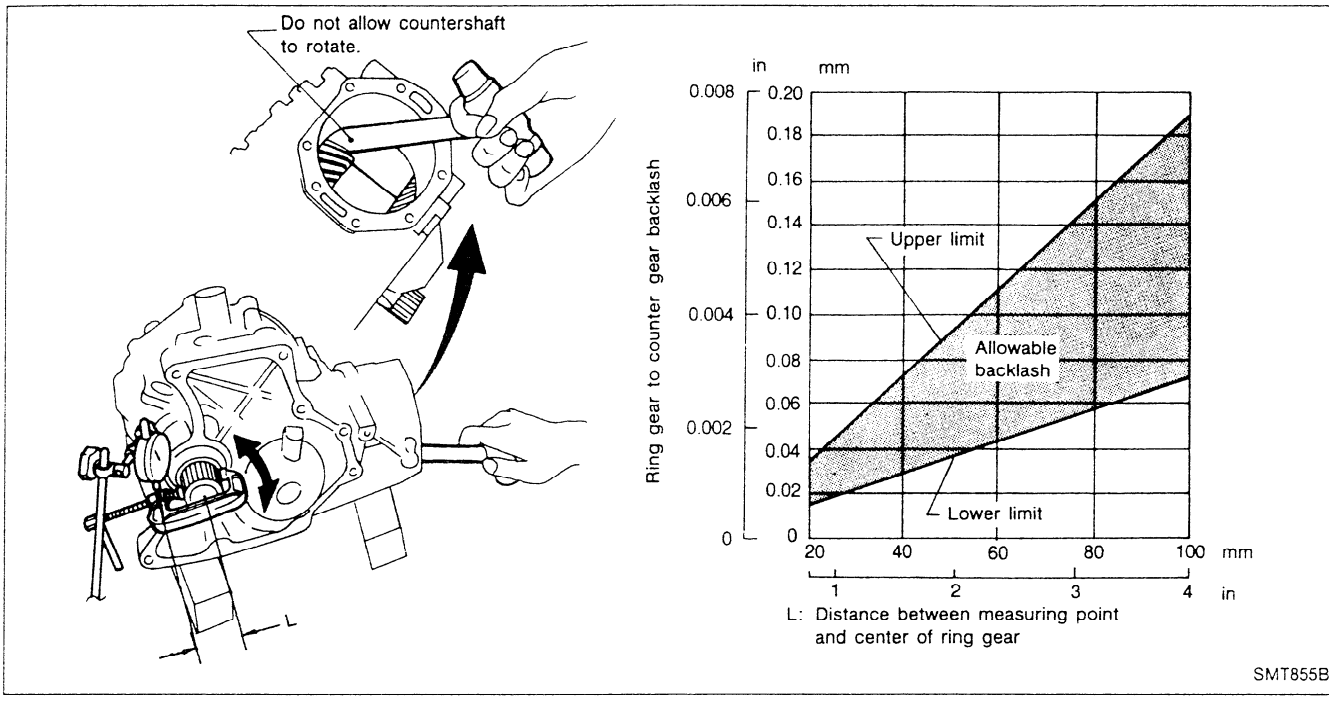
Gear Components (Cont'd)

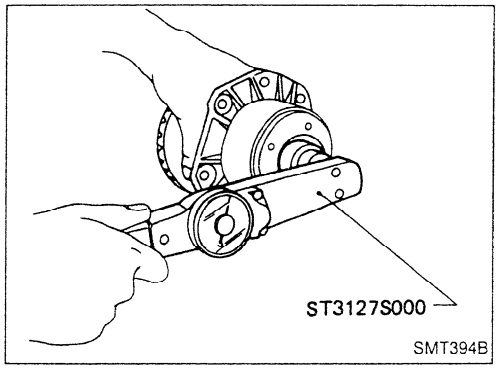
3. Check ring gear-to-counter gear backlash.

Ring gear-to-counter gear backlash (at ring gear spline):

0.02 - 0.04 mm (0.0008 - 0.0016 in)

If not within specification, disassemble and check transfe case, case adapter, ring gear and countershaft compc nents. Replace if necessary.



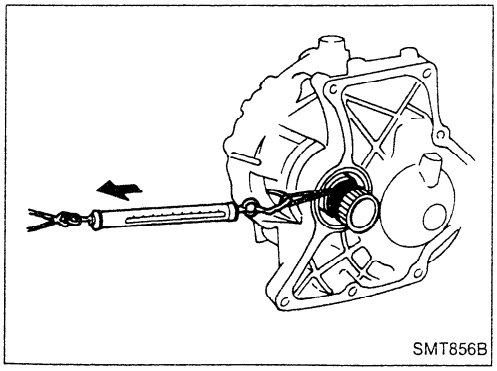


4. Check pinion bearing preload.
a. Turn hypoid pinion several times in both directions to sea bearings correctly.
b. Measure preload with Tool.

Pinion bearing preload:

1.1 - 1.6 N·m (11 - 16 kg-cm, 9.5 - 13.9 in-lb)

If not within specification, disassemble and adjust it — Refer to "REPAIR FOR COMPONENT PARTS".



5. Check countershaft bearing preload.
a. Wind a strong line on to ring gear spline.
b. Turn ring gear several times in both directions to sea bearing correctly.
c. Measure countershaft bearing preload.

Countershaft bearing preload (at outer diameter of ring gear spline):

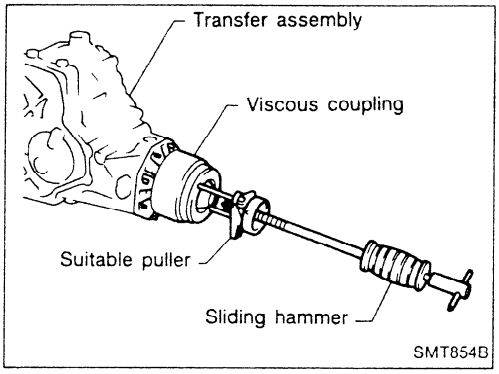
88 - 235 N (9 - 24 kg, 20 - 53 lb)

If not within specification, disassemble and adjust counter- shaft bearing preload — Refer to "ADJUSTMENT" anc check countershaft, hypoid gear and ring gear bearings.

Gear Components (Cont'd)

6. Check tooth contact — Refer to "TOOTH CONTACT".

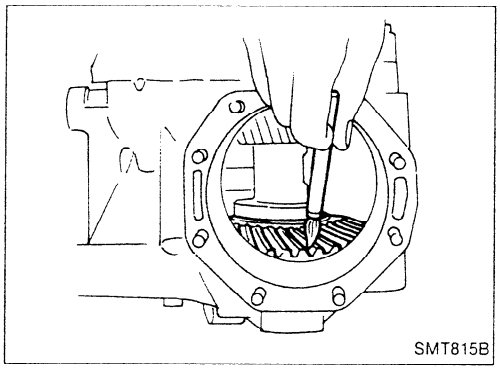
Check the gear tooth contact pattern to verify correct contact o
the hypoid gear and pinion.
A hypoid gear set not positioned properly may be noisy, hav
short life or both.



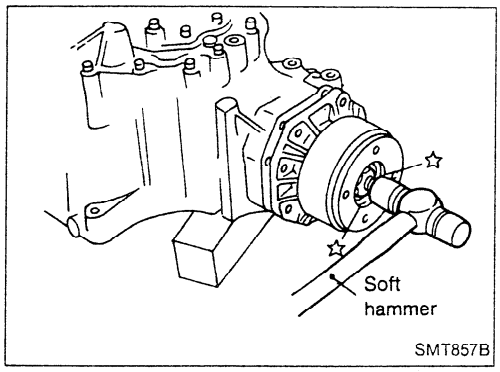
1. Remove pinion sleeve using a sliding hammer.

Install 2 nuts to prevent the pinion sleeve from dropping. Do no tighten nuts.

2. Thoroughly clean hypoid gear and pinion teeth.

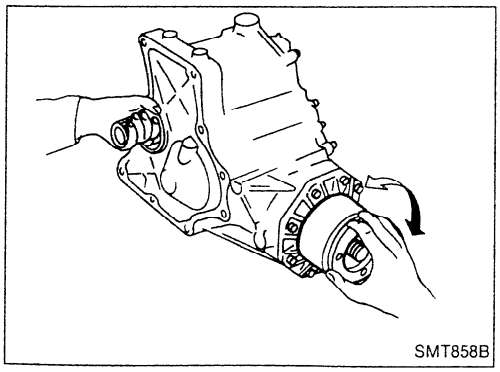


3. Sparingly apply a mixture of powdered ferric oxide and oi
or equivalent to 3 or 4 teeth of hypoid gear.



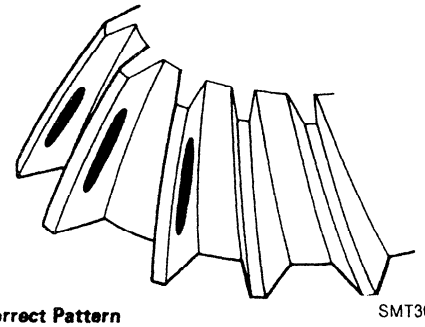
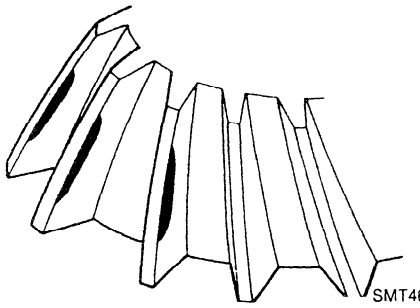
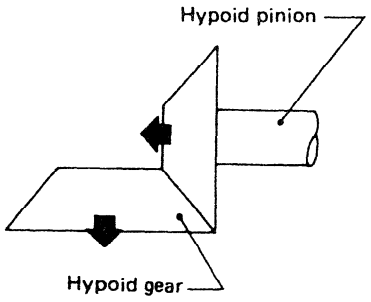
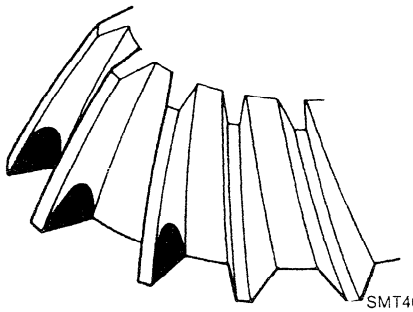
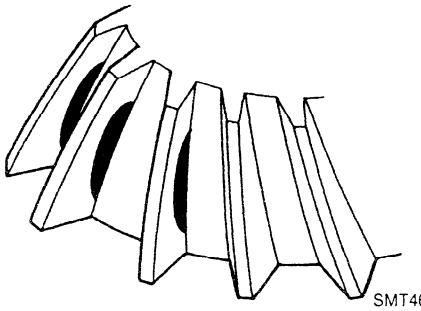
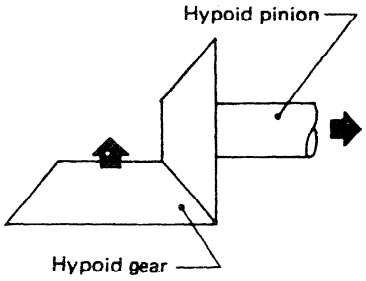
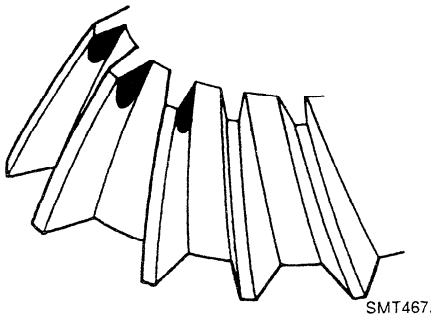
4. Install pinion sleeve shim and sleeve assembly.

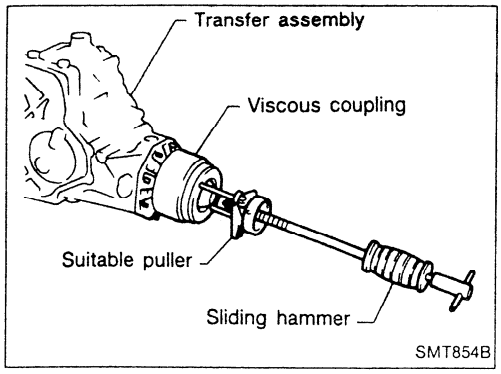
- **After installing pinion sleeve, tighten nuts to the specified torque.**



5. Hold ring gear spline steady by hand and rotate companion flange back and forth.
6. Remove pinion sleeve assembly.
7. Compare contact marks left on hypoid gear to those in the following illustration.

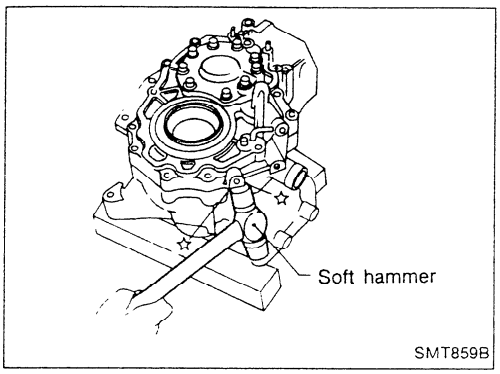
Tooth Pattern Interpretation

TOOTH PATTERN	
 **Correct Pattern** SMT364A	After adjustment, check hypoid gear to pinion gear backlash. — Refer to "PRE-DISASSEMBLY INSPECTION".
 SMT464A	**Adjustment**  SMT469A
 SMT465A	a. Increase thickness of countershaft shim and decrease thickness of hypoid gear shim. **Do not change total thickness of countershaft shim plus hypoid gear shim.** b. Decrease thickness of pinion sleeve shim.
 SMT466A	 SMT468A
 SMT467A	a. Increase thickness of hypoid gear shim and decrease thickness of countershaft shim. **Do not change total thickness of countershaft shim plus ring gear shim.** b. Increase thickness of pinion sleeve shim.

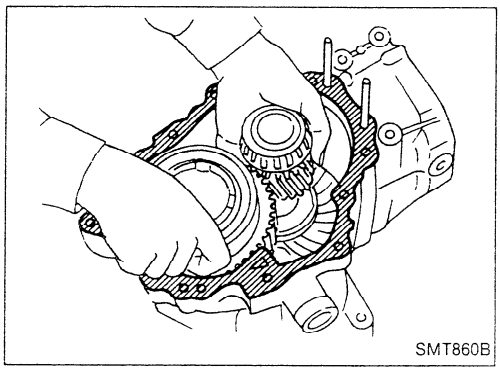


1. Remove pinion sleeve using a sliding hammer.

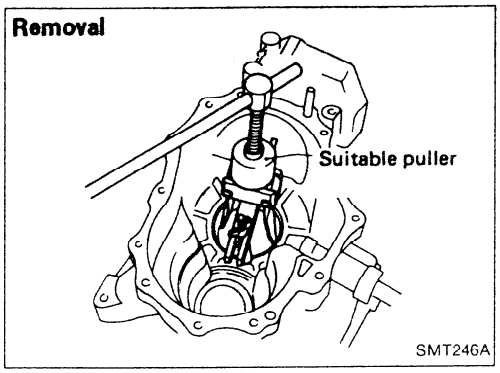
Install 2 nuts to prevent the pinion sleeve from dropping. Do not tighten nuts.



2. Remove all case adapter bolts and then remove case adapter by lightly tapping.



3. Remove ring gear and countershaft assembly as a set.



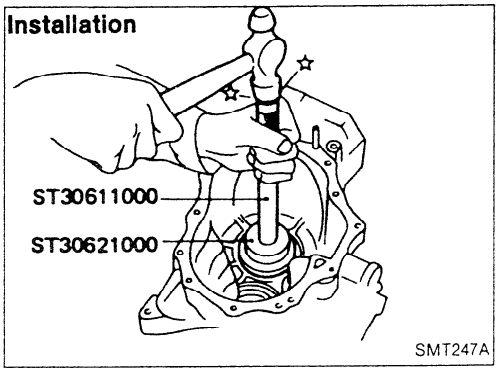
Transfer Case and Case Adapter

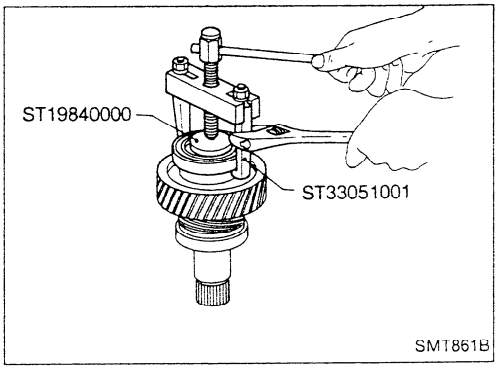
REMOVAL AND INSTALLATION

- Hypoid gear bearing outer race (Transfer case side)
- Adapter oil seal — Refer to "ON-VEHICLE SERVICE".

Install adapter oil seal after assembly.

- Shift shaft oil seal — Refer to "PRE-DISASSEMBLY INSPECTION".
- Ring gear oil seal — Refer to "PRE-DISASSEMBLY INSPECTION".

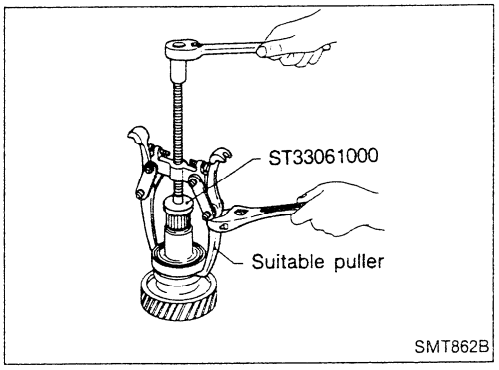


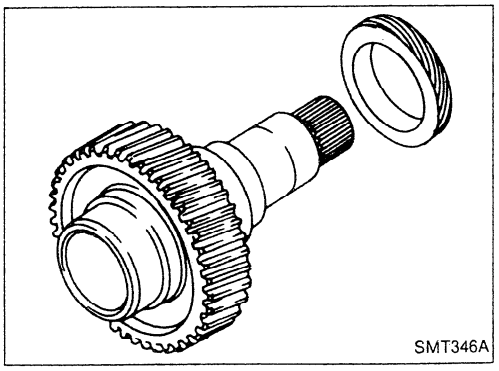


Ring Gear

DISASSEMBLY

1. Pull out ring gear bearings.
2. Remove speedometer drive gear.
3. Remove drive shaft oil seal — Refer to "ON-VEHICLE SERVICE".



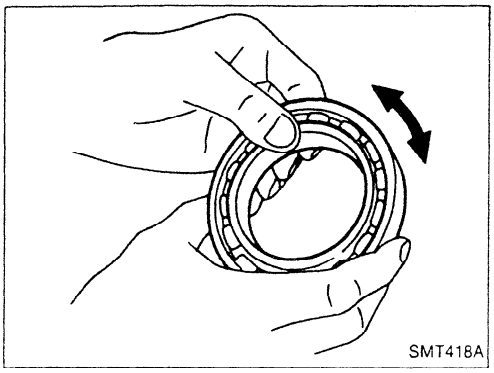


INSPECTION

Gear and shaft

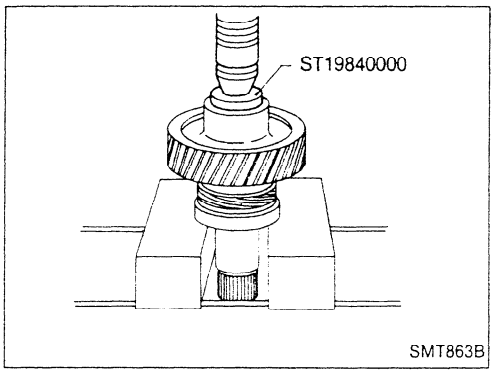
- Check gears for excessive wear, chips or cracks.
- Check shaft for cracks or wear.

Ring Gear (Cont'd)



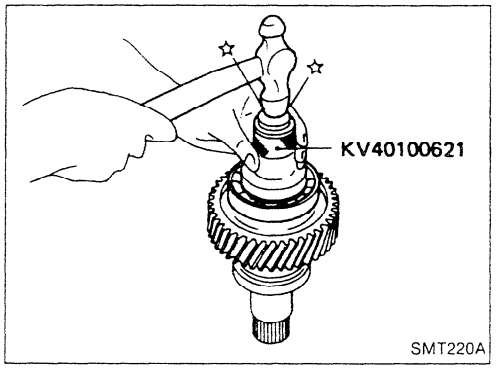
Bearings

- Make sure bearings roll freely and are free from nois cracks, pitting or wear.



ASSEMBLY

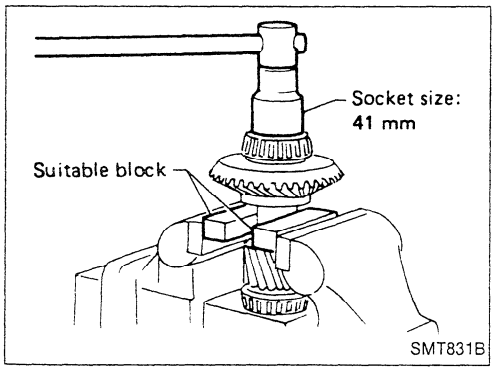
1. Install speedometer drive gear.
2. Press on ring gear bearings.
3. Install drive shaft oil seal — Refer to "ON-VEHICL SERVICE".



Countershaft

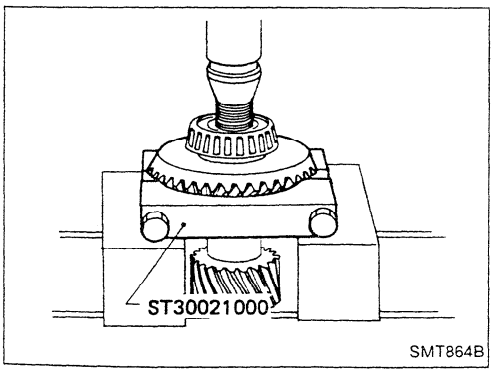
DISASSEMBLY

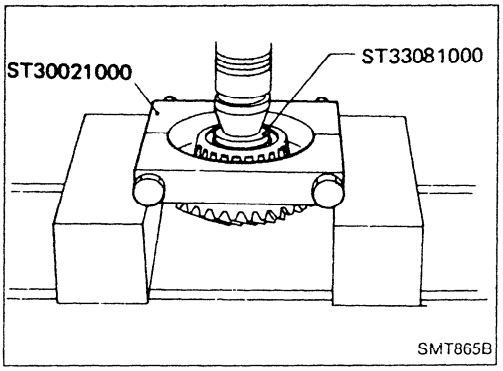
1. Remove countershaft nuts.



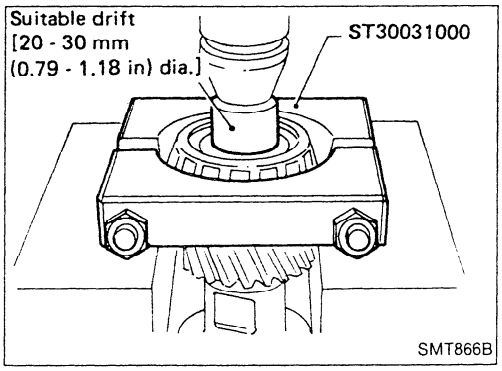
2. Press out hypoid gear together with hypoid gear bearing

Only use press — do not use puller. Puller could damage plu of countershaft.

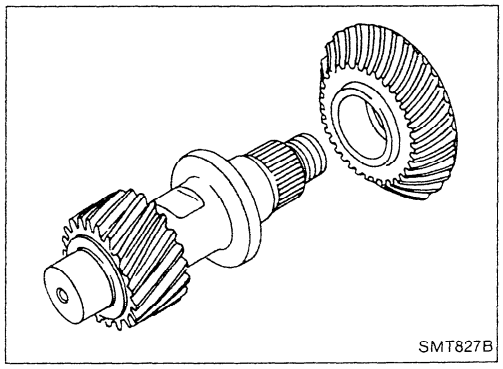




3. Press out hypoid gear bearing.



4. Press out countershaft bearing.



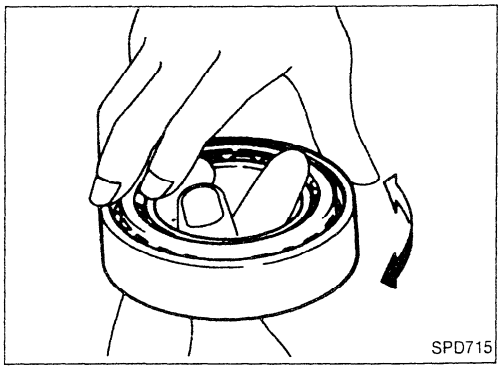
INSPECTION

Gears and shaft

- Check gears for excessive wear, chips or cracks.

When replacing hypoid gear, replace hypoid gear and hypoid pinion as a set.

- Check shaft for cracks or wear.



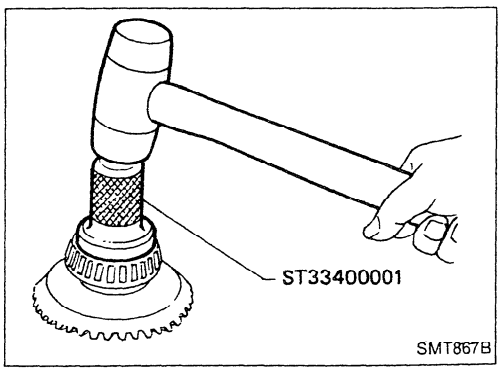
Bearings

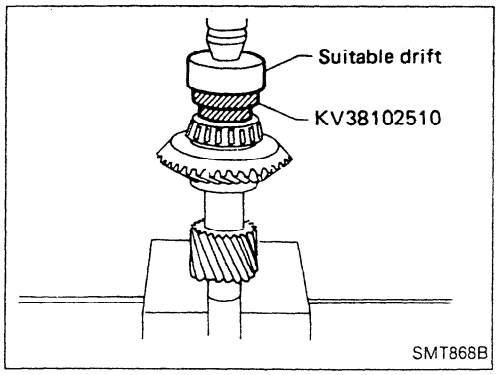
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

When replacing tapered roller bearing, replace outer and inner race as a set.

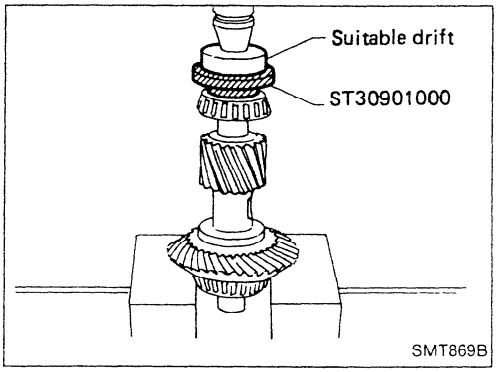
ASSEMBLY

1. Press on hypoid gear bearing.

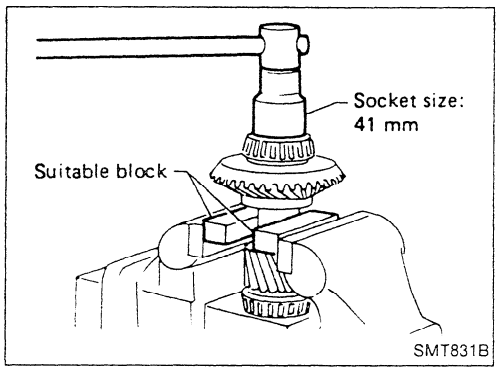




2. Press on hypoid gear together with hypoid gear bear



3. Press on countershaft bearing.



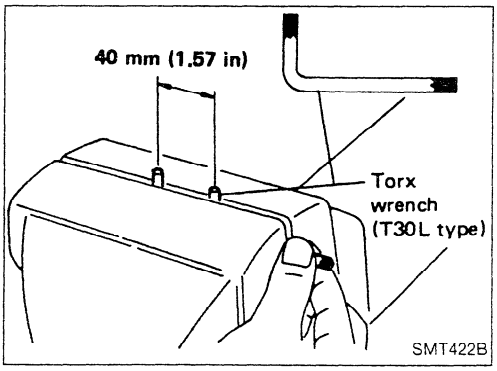
4. Install new countershaft nuts and tighten them.
   : 373 - 441 N·m (38 - 45 kg-m, 275 - 325 ft-lb)

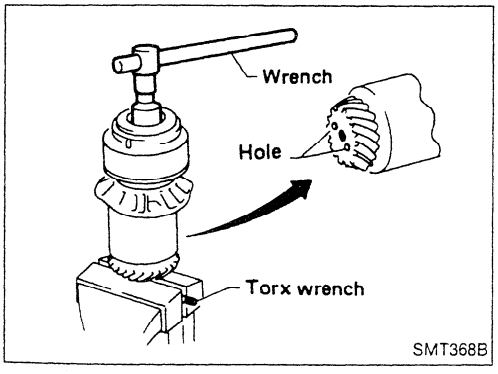
Pinion Sleeve

DISASSEMBLY

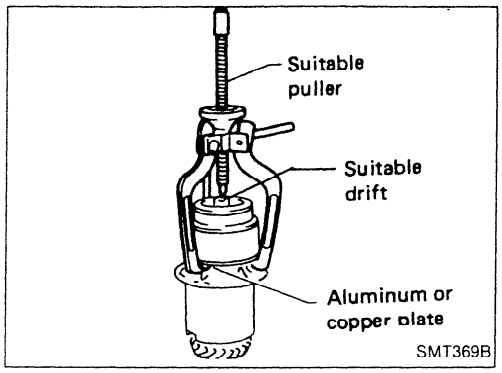
1. Before disassembly, check pinion bearing preload — F to "PRE-DISASSEMBLY INSPECTION".
2. Remove pinion nut.

a. Hold torx wrenches (T30L type) in vise.



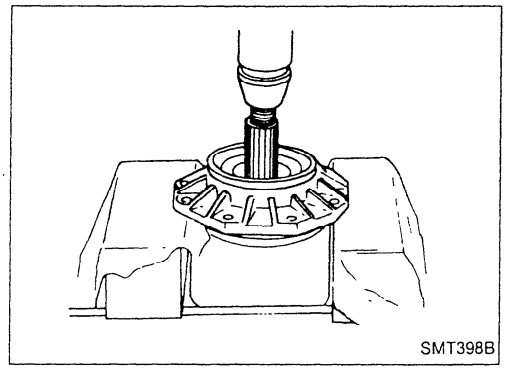


b. Put assembly on the vise aligning two holes with two wrenches.
c. Loosen pinion nut.

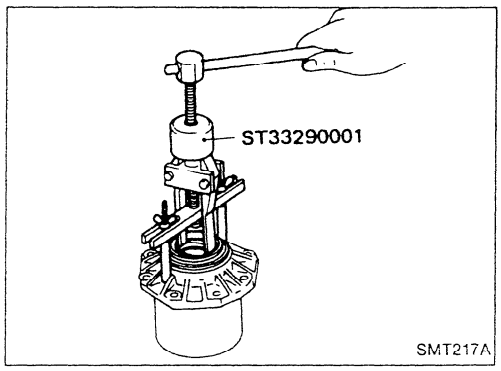


3. Remove viscous coupling with suitable puller and drift.

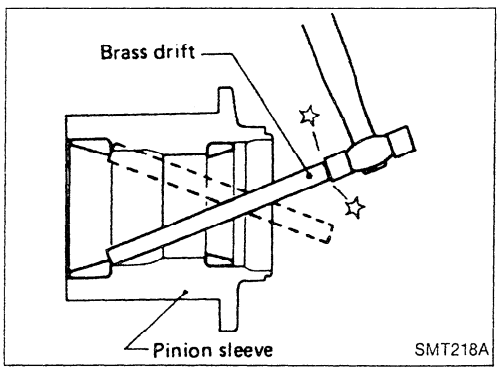
Insert aluminum or copper plates between puller and viscous coupling.



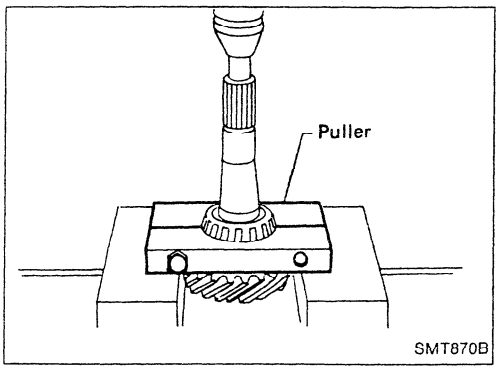
4. Press out hypoid pinion together with front bearing inner race, collapsible spacer and spacer.



5. Pull out pinion oil seal and remove pinion rear bearing inner race.



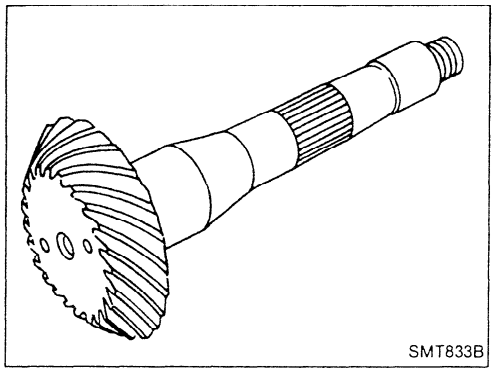
6. Remove bearing outer races with brass drift.



7. Remove pinion front bearing inner race.

Always replace after removing.

Pinion Sleeve (Cont'd)


SMT833B

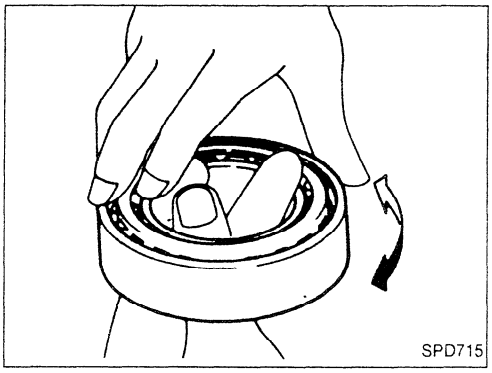
INSPECTION

Gear and shaft

- Check gears for excessive wear, chips or cracks.

When replacing hypoid pinion, replace hypoid gear and hyp pinion as a set.

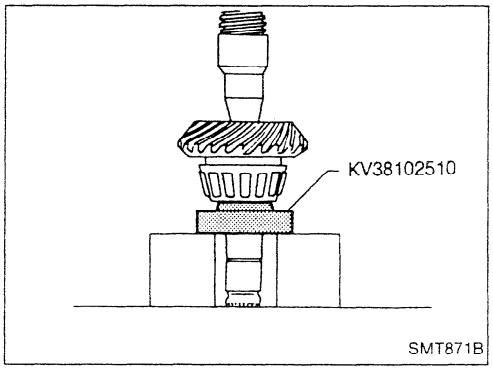
- Check shaft for cracks or wear.


SPD715

Bearing

- Make sure bearings roll freely and are free from noi cracks, pitting or wear.

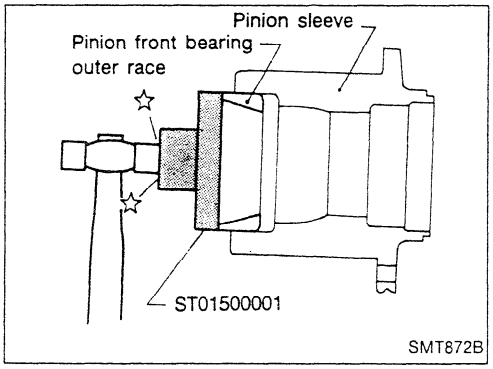
When replacing tapered roller bearing, replace outer and inr race as a set.



SMT871B

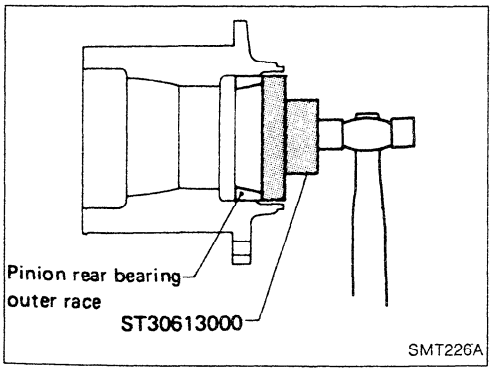
ASSEMBLY

1. Press on pinion front bearing inner race.



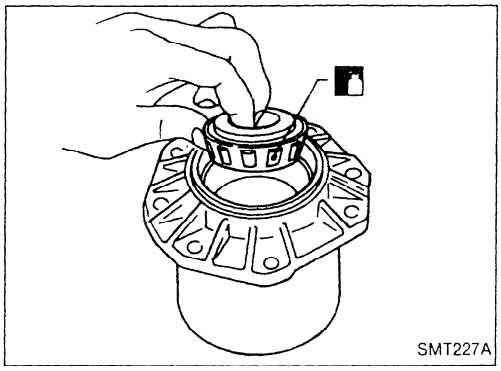
SMT872B

2. Press-fit front and rear bearing outer races.



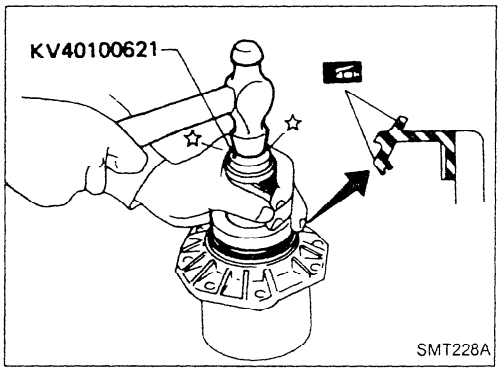
SMT226A

Pinion Sleeve (Cont'd)



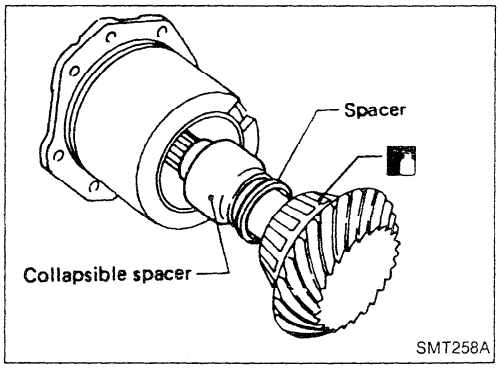
3. Place pinion rear bearing inner race in pinion sleeve.

Before installing, lubricate pinion rear bearing with recommended gear oil.

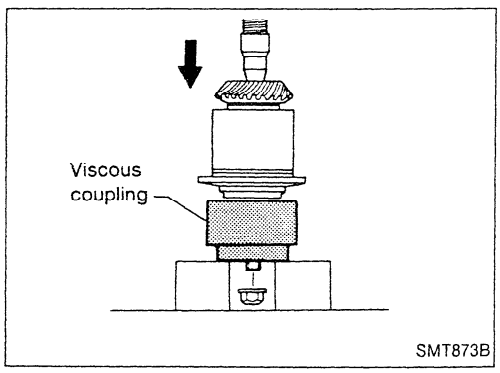


4. Install pinion oil seal.

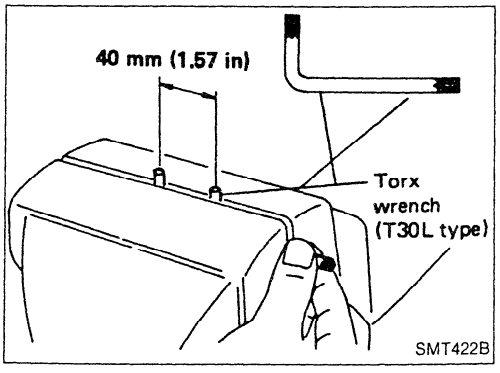
Before installing, apply multi-purpose grease to seal lip of oil seal.



5. Place spacer and new collapsible spacer on hypoid pinion and lubricate pinion front bearing with gear oil, and insert them in pinion sleeve.

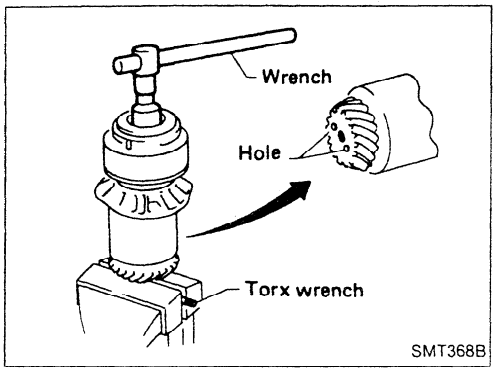


6. Press viscous coupling so pinion nut can be tightened.

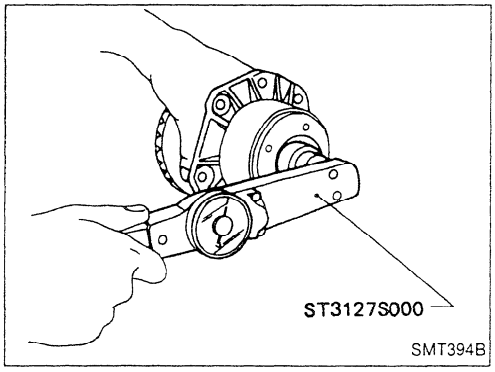


7. Tighten pinion nut slowly to the specified preload. Check bearing preload often to prevent over torque.

Pinion Sleeve (Cont'd)



Tightening torque of pinion nut:
127 - 294 N·m (13 - 30 kg-m, 94 - 217 ft-lb)



When checking preload, turn drive pinion in both direction several times to seat bearings correctly.

Pinion bearing preload:
1.1 - 1.6 N·m (11 - 16 kg-cm, 9.5 - 13.9 in-lb)

When replacing any part in chart below, the adjustments indicated by "x" are required.

Adjustment Application Chart

Determine the required adjustment

X: Necessary
Blank: Not necessary

Adjustment / Adjusting method / Replaced part	Ring gear end play	Countershaft bearing preload	Hypoid gear height	Hypoid pinion height
	Ring gear snap ring	Countershaft shim and Hypoid gear shim	Hypoid gear shim	Pinion sleeve shim
Transfer case set (Transfer case and case adapter)	X	X	X	X
Ring gear	X			
Ring gear bearing	X			
Hypoid gear set (Hypoid gear and pinion)		X	X	X
Countershaft		X		
Hypoid gear bearing		X	X	X
Countershaft bearing		X		
Hypoid pinion bearing				X
Pinion sleeve				X

Adjustment Sequence Chart

Perform required adjustment with this chart.
For details, refer to following pages.

Operation \ Adjustment		Ring gear end play	Countershaft bearing preload	Hypoid gear height	Hypoid pinion height
①	Selection of hypoid gear shim			1	
②	Removal of ring gear snap ring	1			
③	Installation of ring gear countershaft and case adapter	2	1	2	1
④	Selection of ring gear snap ring	3			
⑤	Selection of counter-shaft shim		2	3	
⑥	Selection of pinion sleeve shim				2
⑦	Hypoid gear-to-pinion backlash inspection		3	4	3
⑧	Check of tooth contact	4	4	5	4
⑨	Removal of end cover		5	6	
⑩	Removal of case adapter, ring gear and countershaft	5	6	7	5

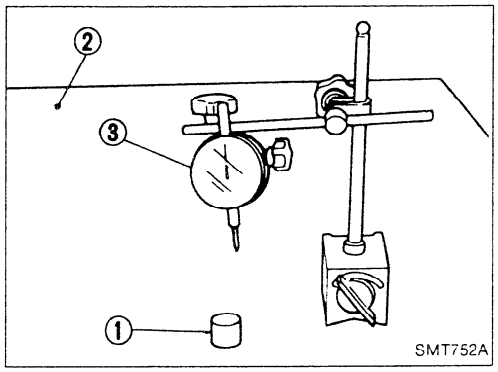
The numbers in the chart show the order of the operations required for each adjustment.

Adjustment Procedure

① SELECTION OF HYPOID GEAR SHIM

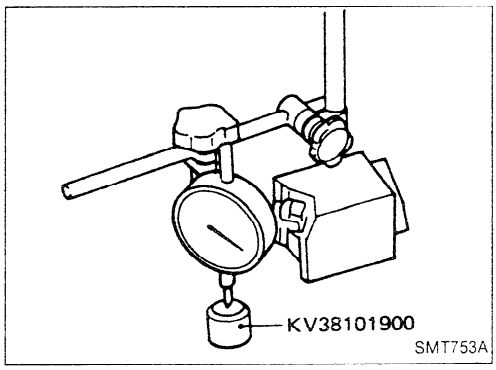
1. To simplify the adjustment, make a chart like the one below and write measurements on the chart.

FACTOR	HUNDREDTHS OF A MILLIMETER
A. Transfer case	
B. Hypoid gear	
C: Hypoid gear bearing	

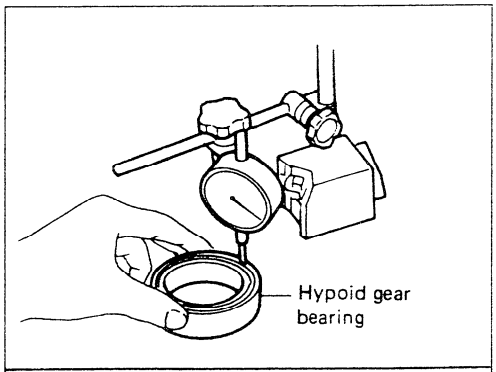


2. Measure hypoid gear bearing thickness.

a. Prepare required tools for measurement.
① Master gauge (KV38101900)
② Base plate
③ Dial indicator



b. Place dial indicator and master gauge on base plate.
c. Place dial indicator on top of master gauge and then adjust dial indicator scale to zero.
d. Carefully slide master gauge out from under dial indicator.

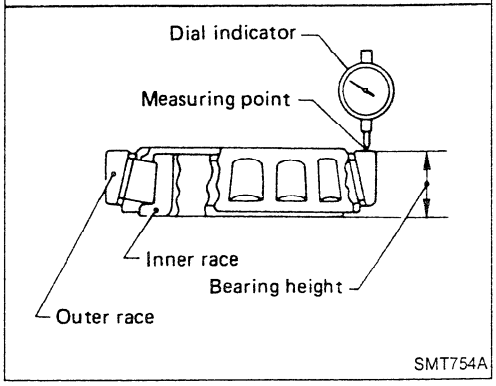


e. Place hypoid gear bearing inner race on base plate and then place hypoid gear bearing outer race on inner race.
f. Place dial indicator on top of outer race.
g. Read dial indicator.

- **If the needle fluctuates erratically then bearing is either dirty or defective and should be cleaned or replaced.**

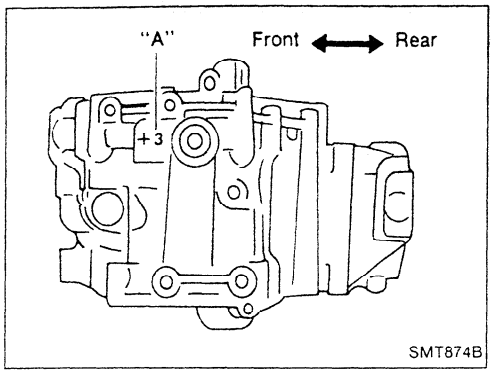
h. Determine factor "C" to be used by the following equation.

C = "Dial gauge deflection" x 100
(Bearing height = 20 mm (0.79 in) + Dial gauge deflection)

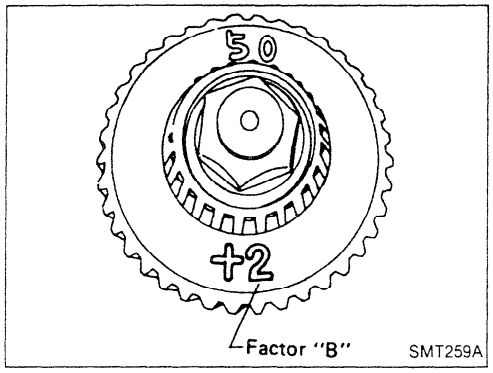


i. Write "C" on chart.

Adjustment Procedure (Cont'd)



3. Write figure marked on transfer case as factor "A" on chart.



4. Write figure marked on hypoid gear as factor "B" on chart.
5. Determine dimension "D" to be used by the following equation.

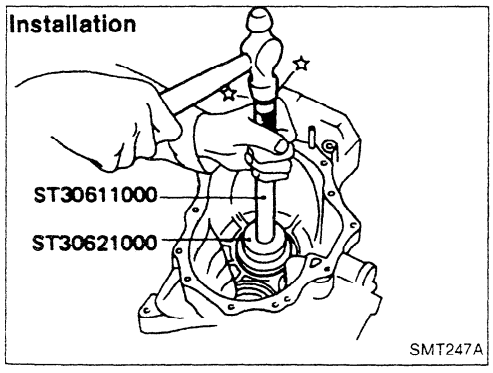
D = 100 + A – B – C

FOR EXAMPLE

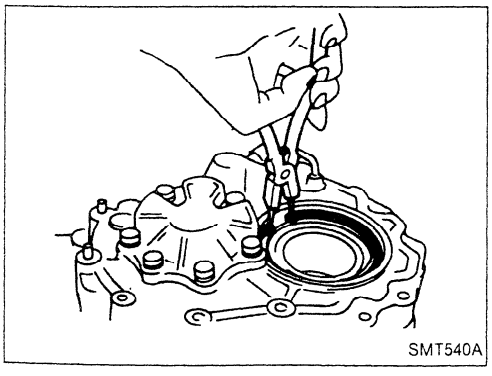
FACTOR	HUNDREDTHS OF A MILLIMETER
A. Transfer case	3
B. Hypoid gear	2
C. Hypoid gear bearing	9 (0.09 x 100)

D = 100 + 3 – 2 – 9 = 92

6. Select proper shims using S.D.S. table as a guide.



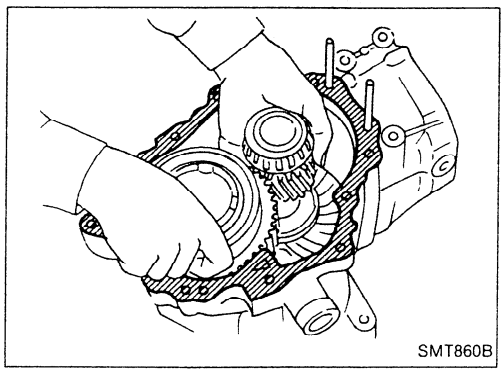
7. Install selected shims and hypoid gear bearing outer race (Transfer case side) in transfer case.



② REMOVAL OF RING GEAR SNAP RING

1. Remove adapter oil seal.
2. Remove ring gear snap ring.

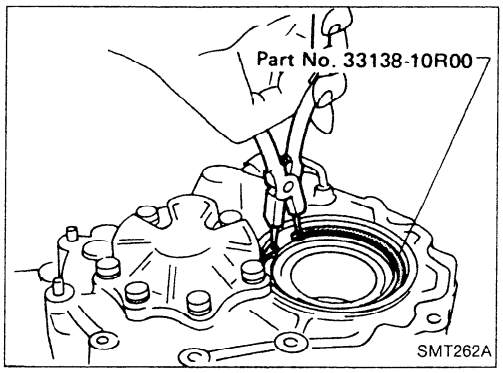
Adjustment Procedure (Cont'd)



③ INSTALLATION OF RING GEAR, COUNTERSHAFT AND CASE ADAPTER

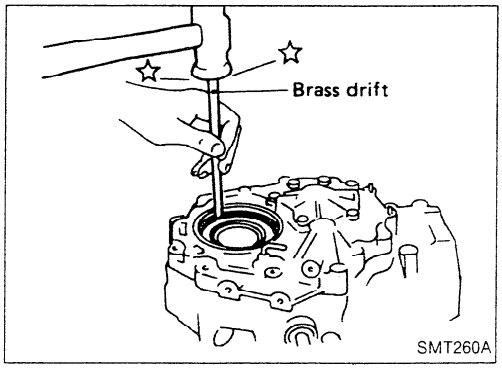
1. Install ring gear and countershaft.
2. Install case adapter.

Tighten bolts to the specified torque.

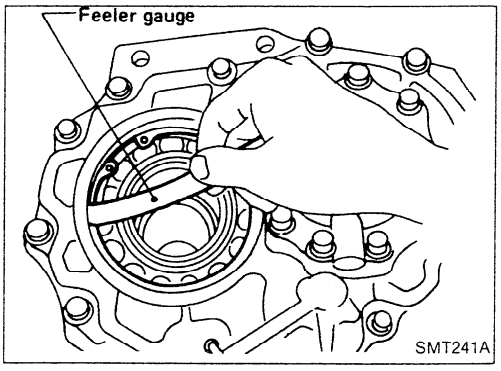


④ SELECTION OF RING GEAR SNAP RING

1. Install the thinnest snap ring [Part No. 33138-10R00, Thickness: 3.00 mm (0.1181 in)] in ring gear snap ring groove.

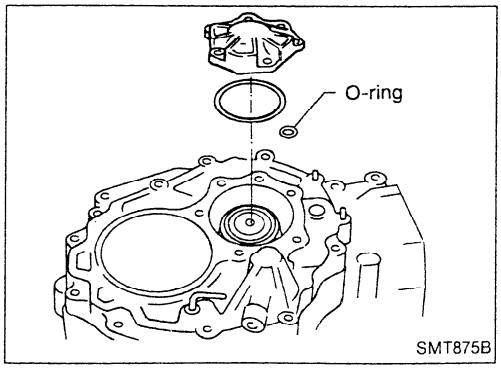


2. Tap ring gear snap ring lightly to seat it into groove.



3. Measure clearance of groove.
4. Select proper snap ring using S.D.S. table as a guide.
5. Remove snap ring (Part No. 33138-10R00).
6. Install selected snap ring in ring gear snap ring groove.
7. Measure clearance of groove (ring gear end play) as a final check.

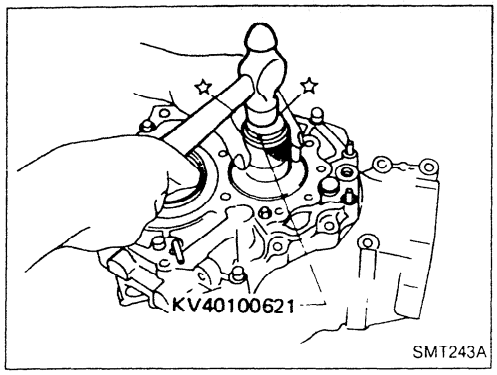
Allowable clearance of groove (Ring gear end play):
0 - 0.06 mm (0 - 0.0024 in)



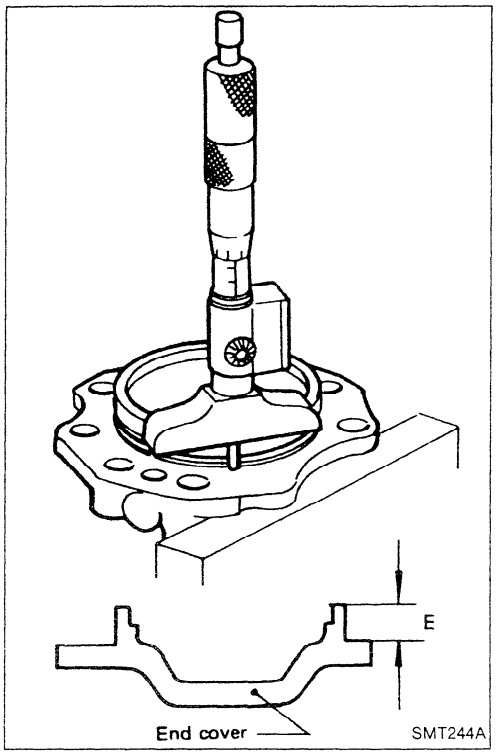
⑤ SELECTION OF COUNTERSHAFT SHIM

1. Remove end cover and countershaft shim.

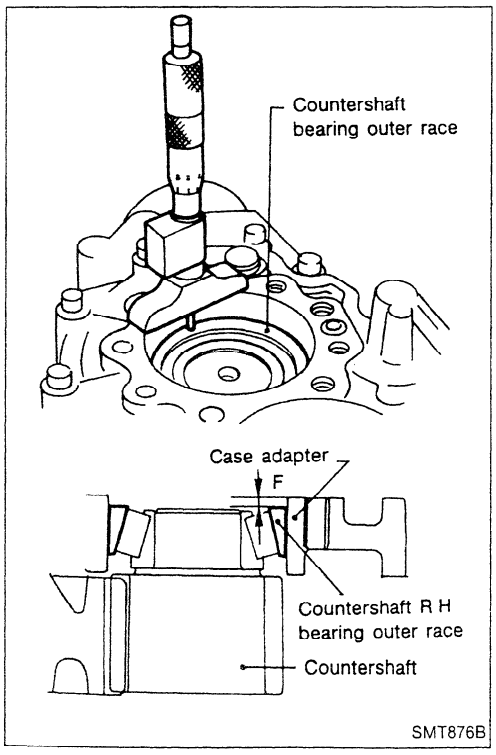
- Be careful not to lose O-ring.



2. Tap countershaft bearing outer race lightly to seat bearings properly.



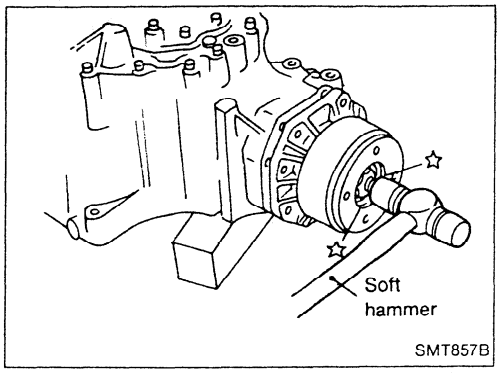
3. Measure factor "E".



4. Measure factor "F".
5. Determine dimension "G" to be used by the following equation.
   G = F — E
6. Select proper shims using S.D.S. table as a guide.
7. Install selected shims and end cover without O-ring in case adapter.

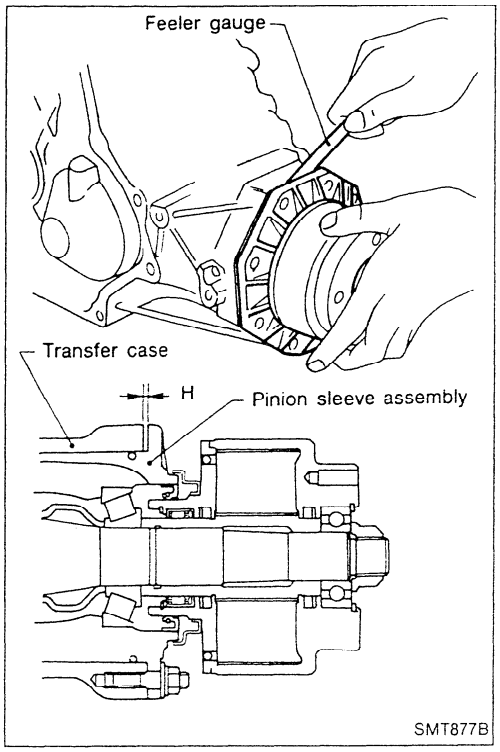
Tighten bolts to the specified torque.

8. Check countershaft preload as final check — Refer to "PRE-DISASSEMBLY INSPECTION".
   If not within specification, select countershaft shim again.

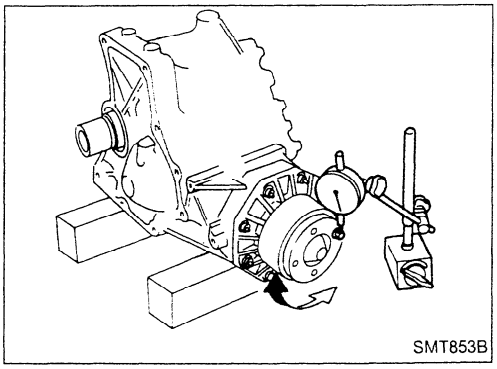


⑥ SELECTION OF PINION SLEEVE SHIM

1. Install pinion sleeve assembly without O-ring and shim.



2. While pushing pinion sleeve assembly, measure clearance "H" between transfer case and pinion sleeve, (at least 4 points) with feeler gauge.
3. Select proper shims using S.D.S. table as a guide.
4. Remove pinion sleeve assembly.



⑦ HYPOID GEAR-TO-PINION BACKLASH INSPECTION

1. Install pinion sleeve assembly with pinion sleeve shim.
2. Check hypoid gear-to-pinion backlash.

   Hypoid gear-to-pinion backlash:
   0.08 - 0.12 mm (0.0031 - 0.0047 in)

- If backlash is too small, decrease thickness of hypoid gear shim and increase thickness of countershaft shim by the same amount.
- If backlash is too great, reverse the above procedure.

Never change the total amount of shims as it will change the bearing preload.

3. Remove pinion sleeve assembly.

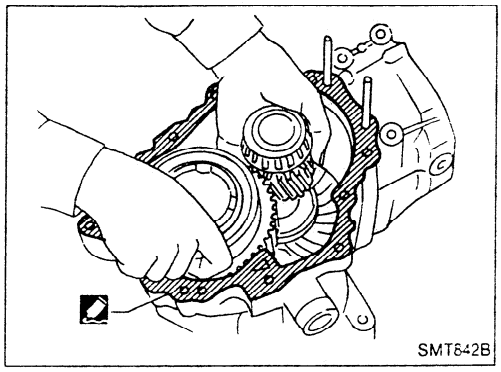
Adjustment Procedure (Cont'd)

⑧ CHECK OF TOOTH CONTACT — Refer to "TOOTH CONTACT".

Usually tooth contact pattern will be correct if you have selected the shims accurately.
However, in extremely rare cases you will have to use trial-and-error processes until the tooth contact pattern is right.
The tooth pattern is the best indication of how well a hypoid gear and pinion have been set up.

⑨ REMOVAL OF END COVER

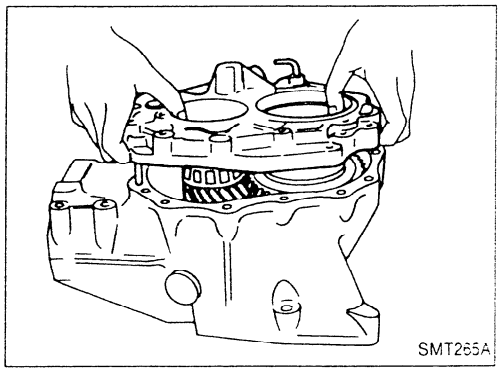
⑩ REMOVAL OF CASE ADAPTER, RING GEAR AND COUNTERSHAFT



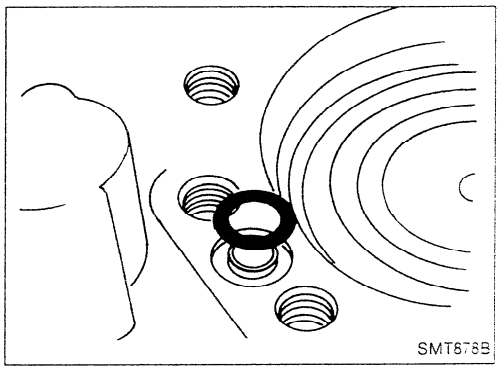
1. Install countershaft.
2. Install ring gear. Tilt countershaft a little to install ring gear more easily.
3. Clean mating surface of case adapter and transfer case.
4. Apply recommended sealant to mating surface of transfer case and case adapter.

Recommended sealant:

Nissan genuine part (KP610-00250) or equivalent

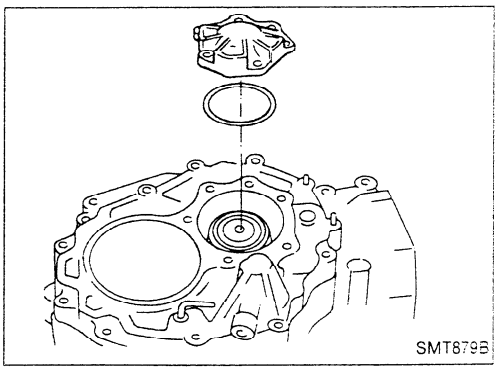


5. Install case adapter.

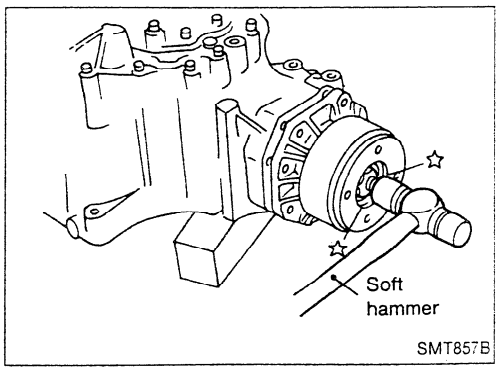


6. Install O-rings on case adapter and end cover.

Before installing, apply multi-purpose grease to O-rings.



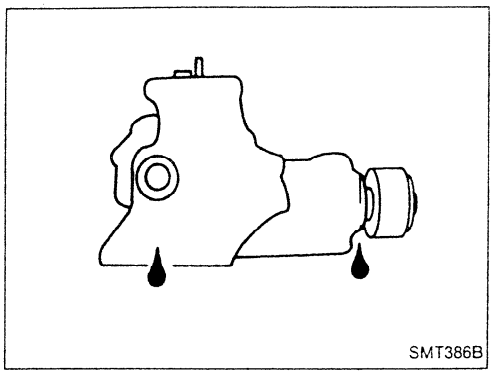
7. Install countershaft bearing outer race, countershaft shim and end cover.



8. Install O-ring on pinion sleeve and then install pinion sleeve shim and pinion sleeve assembly on transfer case.

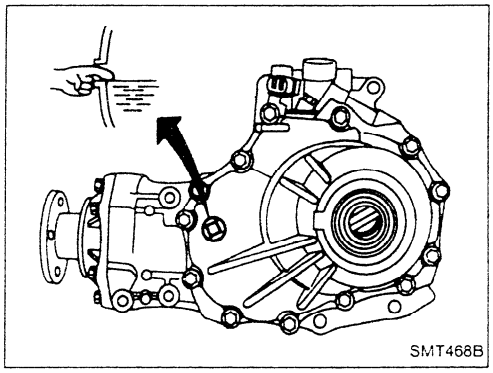
- **Before installing O-ring, apply multi-purpose grease to O-ring.**

9. Install adapter oil seal. Refer to "ON-VEHICLE SERVICE".

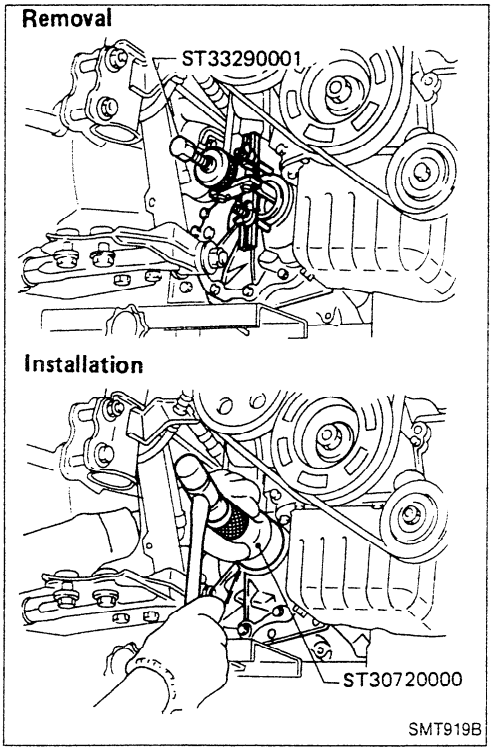


Checking Transfer Oil

- Check transfer oil for leakage.



- Check oil level.

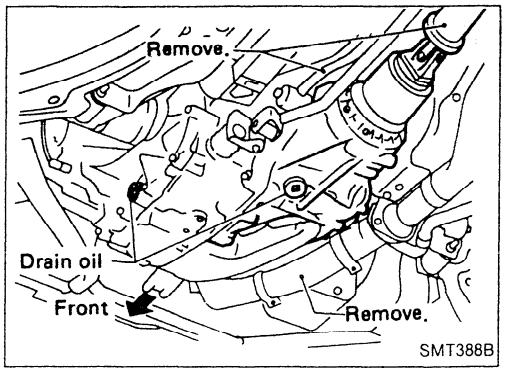


Replacing Oil Seal

FRONT COVER OIL SEAL

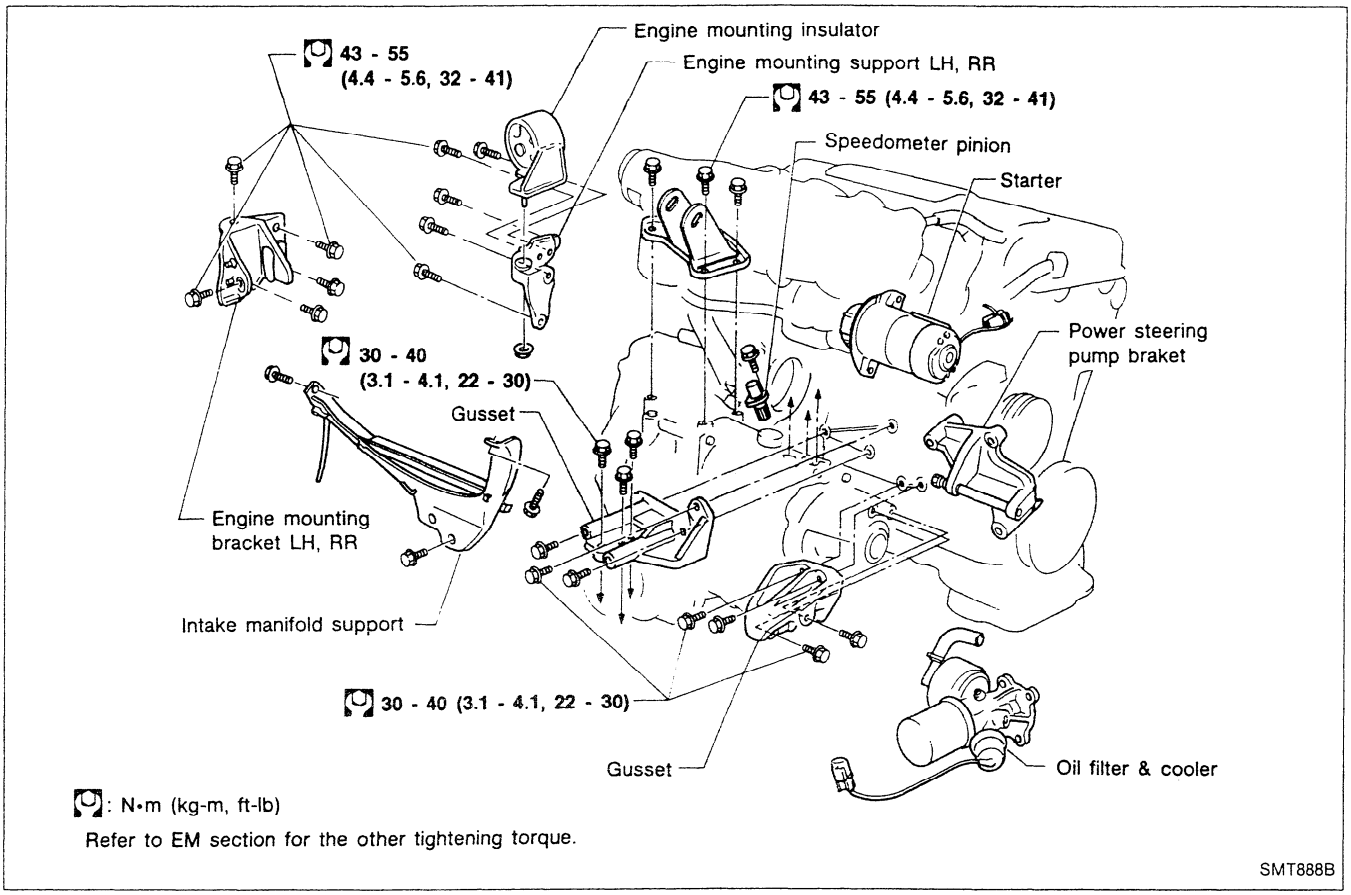
- Lubricate transfer front cover oil seal lips with multi purpose grease before installing drive shaft.

Be careful not to damage transfer front cover oil seal when installing drive shaft.



Removal

- Drain gear oil from transfer and transaxle.
- Remove exhaust front tube.
- Put matchmarks on flanges and then separate propeller shaft from transfer.
- Remove shift control rod and support rod from transaxle and transfer.
- Draw out drive shafts from transaxle — Refer to section FA.
- Remove clutch operating cylinder and hose from transaxle.
- **Support engine with hoist.**
- Remove engine mounting bracket LH and insulator located at left front corner of engine compartment.
- Remove parts shown in below illustration.



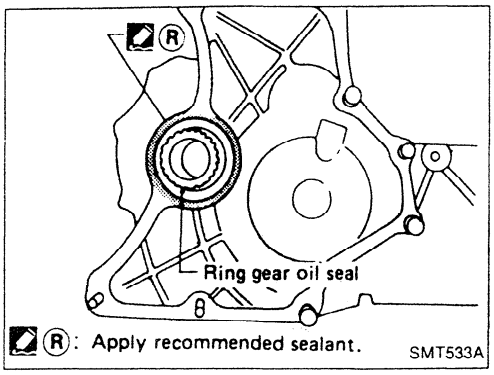
: N•m (kg-m, ft-lb)

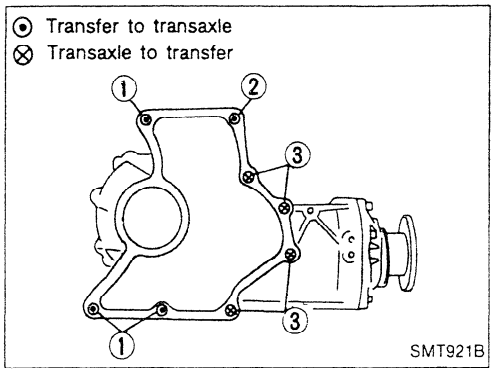
Refer to EM section for the other tightening torque.

- Separate transaxle from engine and transfer and slide transaxle to left side about 50 mm (1.97 in).
- Remove transfer fixing bolts, then lower transfer.

WARNING

- **Support transaxle by a jack.**
- **Support transfer by a jack while removing it.**
- **Be careful not to damage transaxle oil seal when removing transfer.**





Installation

- Lubricate transfer side oil seal lip in transaxle and transfer front cover oil seal with multi-purpose grease before installing transfer and drive shaft.
- Apply recommended sealant on transfer case as shown at left.

  Recommended sealant:

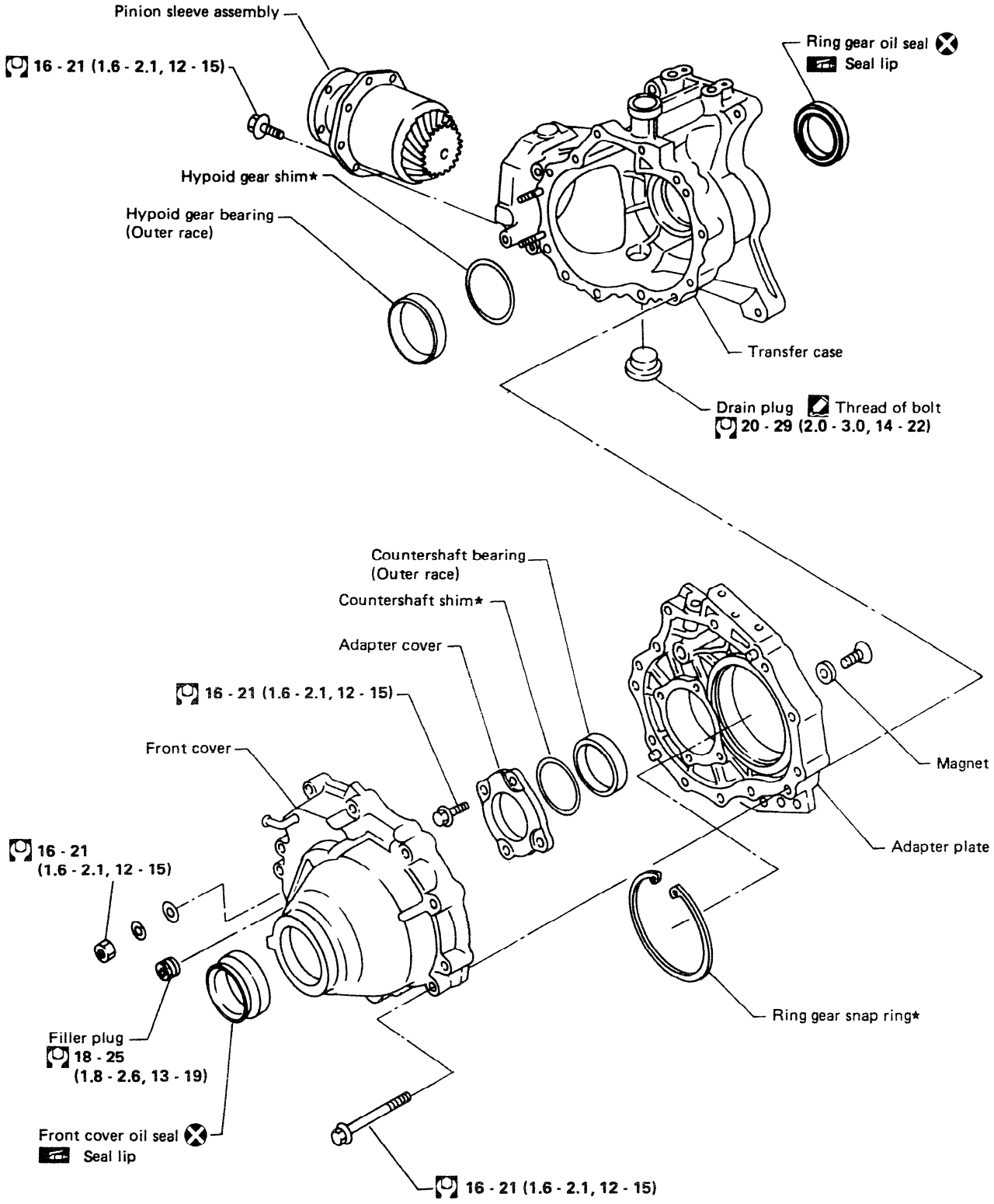
  Nissan genuine part (KP510-00150) or equivalent
- **Be careful not to damage transaxle oil seal when inserting spline portion of transfer ring gear and connect shaft into transaxle.**
- Tighten bolts securing transfer.

Bolt No.	Tightening torque N m (kg-m, ft-lb)	ℓ mm (in)
1	30 - 40 (3 1 - 4 1, 22 - 30)	65 (2.56)
2	30 - 40 (3 1 - 4 1, 22 - 30)	85 (3.35)
3	30 - 40 (3 1 - 4 1, 22 - 30)	65 (2 56)

- **Be careful not to damage drive shaft oil seal and transfer front cover oil seal when installing drive shaft.**
- Refill with recommended gear oil.

Gear oil for transfer is different from that for transaxle.

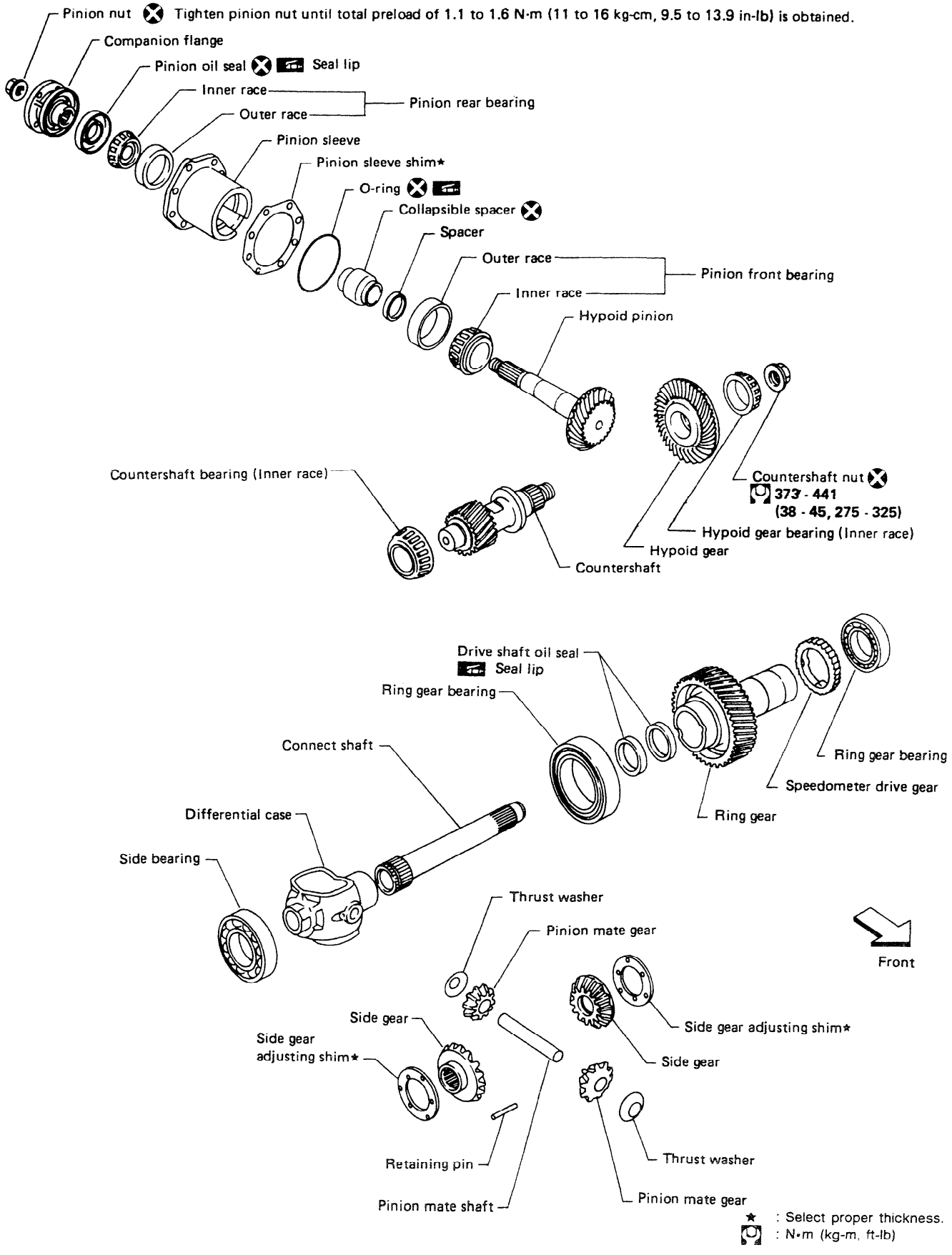
Case Components



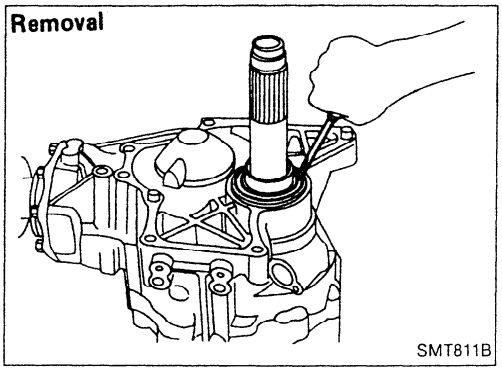
★ Select proper thickness.
: N·m (kg-m, ft-lb)

SMT809B

Gear Components



SMT810B

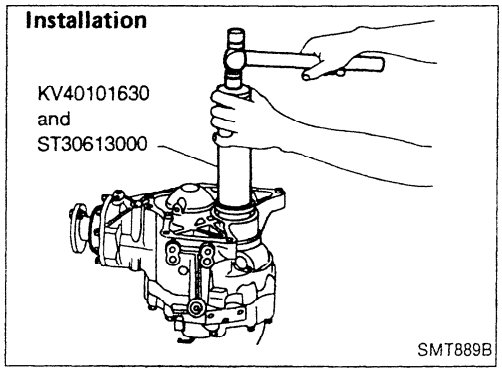


Oil seal

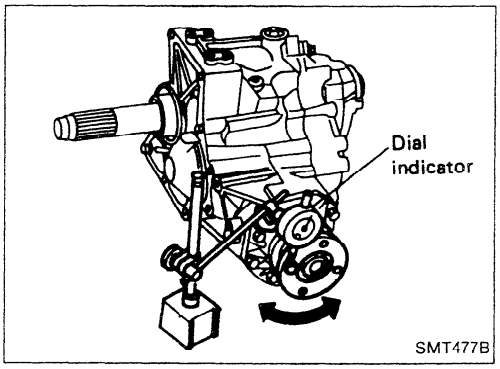
RING GEAR OIL SEAL

- Check ring gear oil seal for oil leakage.

Be careful not to damage ring gear when removing ring gear oil seal.



Apply multi-purpose grease to seal lip of oil seal before installing.



Gear Components

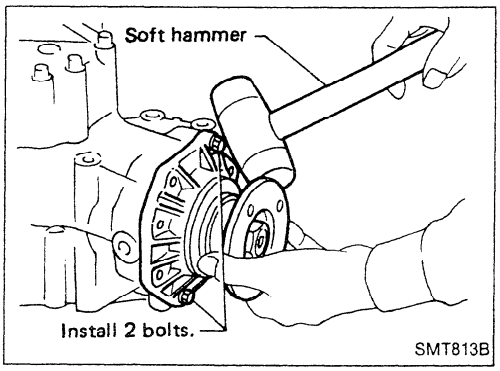
1. Check hypoid gear-to-pinion backlash.

a. Install a bolt and nut in one bolt hole of companion flange.

b. Measure hypoid gear-to-pinion backlash.

Hypoid gear-to-pinion backlash
(at bolt hole of companion flange):
0.10 - 0.15 mm (0.0039 - 0.0059 in)

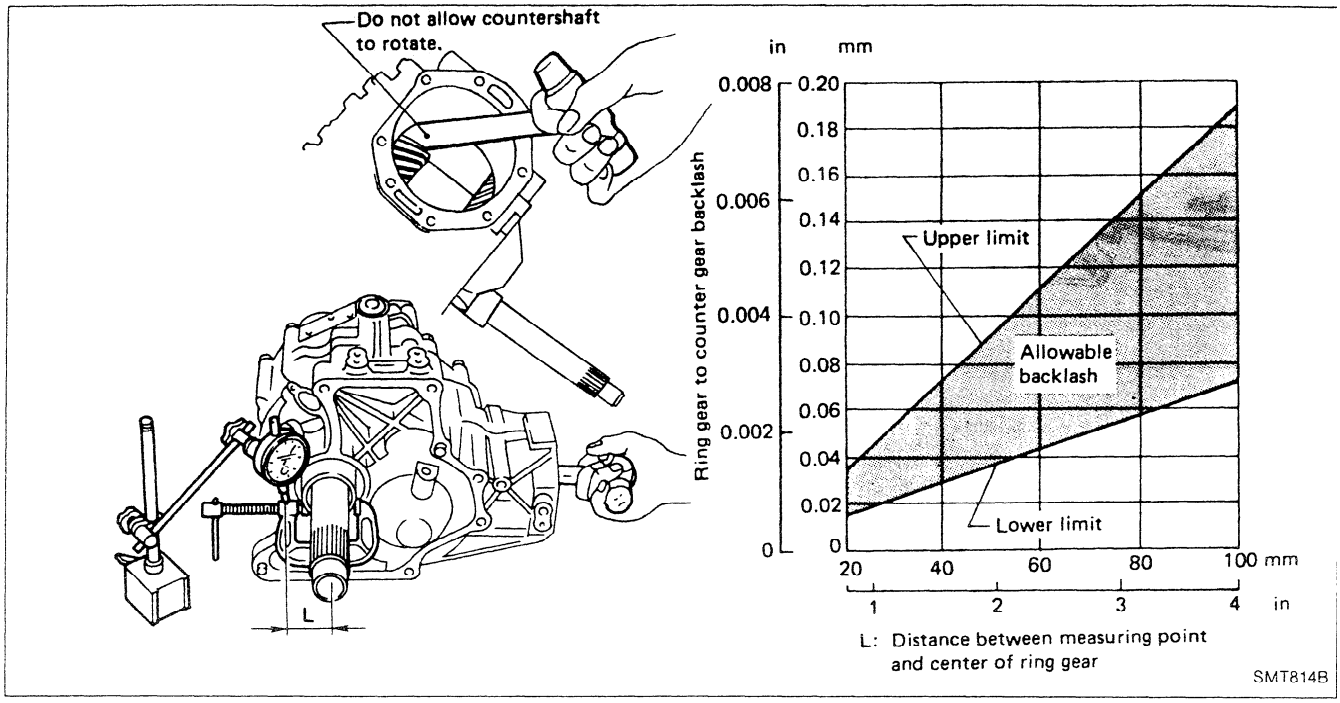
c. If not within specification, adjust hypoid pinion height.



2. Remove pinion sleeve assembly by tapping.

Install 2 bolts through pinion sleeve and onto transfer case to prevent the pinion sleeve assembly from dropping. Do not tighten bolts.

Gear Components (Cont'd)

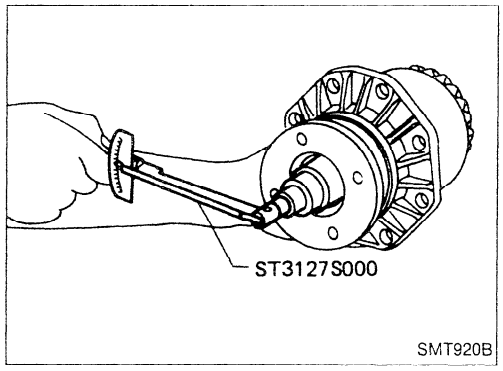


3. Check ring gear-to-counter gear backlash.

Ring gear-to-counter gear backlash:

0.02 - 0.04 mm (0.0008 - 0.0016 in)

If not within specification, disassemble and check transfer case, adapter plate, ring gear and countershaft components. Replace if necessary.



4. Check pinion bearing preload.

a. Turn hypoid pinion several times in both directions to seat bearings correctly.

b. Measure preload with Tool.

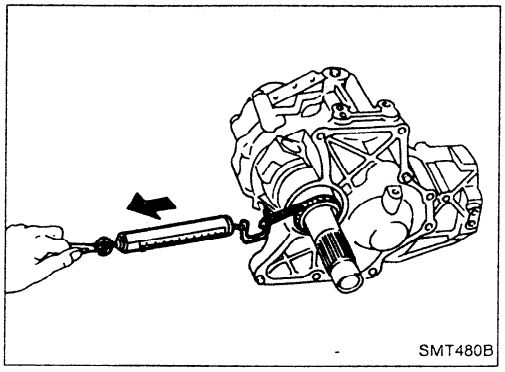
Pinion bearing preload:

1.1 - 1.6 N·m

(11 - 16 kg-cm, 9.5 - 13.9 in-lb)

If not within specification, disassemble and adjust it — Refer to "REPAIR FOR COMPONENT PARTS".

Gear Components (Cont'd)



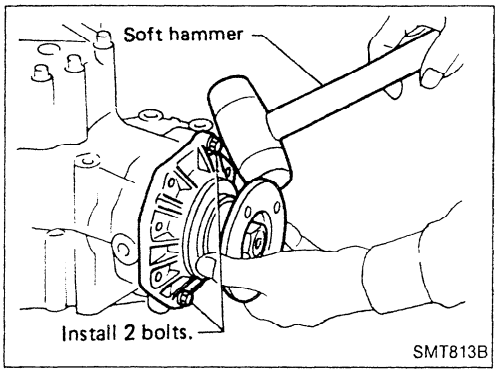
5. Check countershaft bearing preload.
a. Wind a strong line onto ring gear shaft.
b. Turn ring gear several times in both directions to seat bearing correctly.
c. Measure countershaft bearing preload.

Countershaft bearing preload
(at outer diameter of ring gear spline):
88 - 235 N (9 - 24 kg, 20 - 53 lb)

If not within specification, disassemble and adjust countershaft bearing preload — Refer to "ADJUSTMENT" and check countershaft, hypoid gear and ring gear bearings.

6. Check tooth contact — Refer to "TOOTH CONTACT".

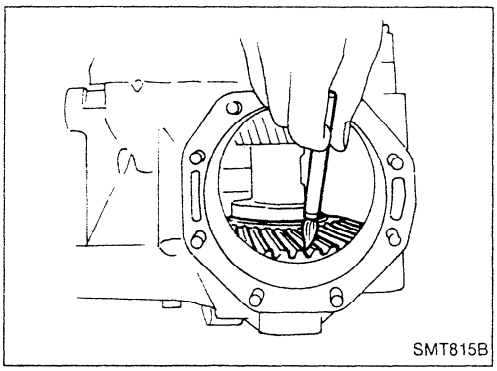
Check the gear tooth contact pattern to verify correct contact o
the hypoid gear and pinion.
A hypoid gear set not positioned properly may be noisy, have
short life or both.



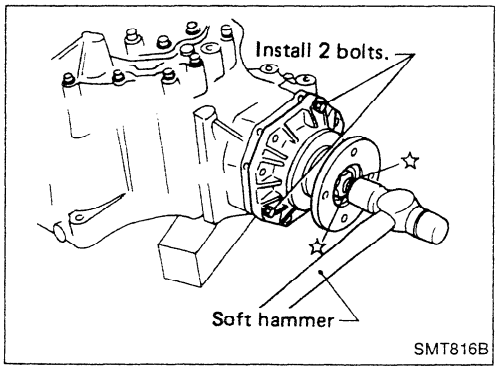
1. Remove pinion sleeve by lightly tapping.

Install 2 bolts through pinion sleeve and onto transfer case to prevent the pinion sleeve from dropping. Do not tighten bolts.

2. Thoroughly clean hypoid gear and pinion teeth.

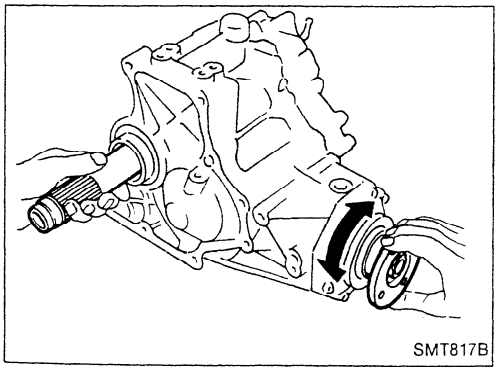


3. Sparingly apply a mixture of powdered ferric oxide and oi
or equivalent to 3 or 4 teeth of hypoid gear.



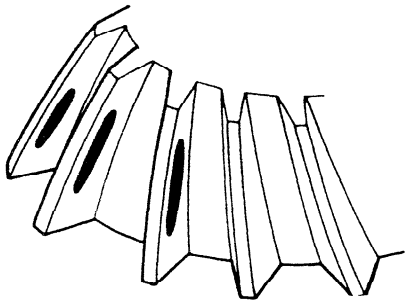
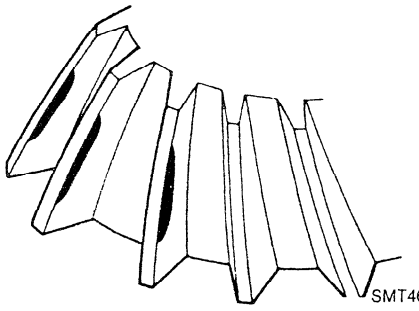
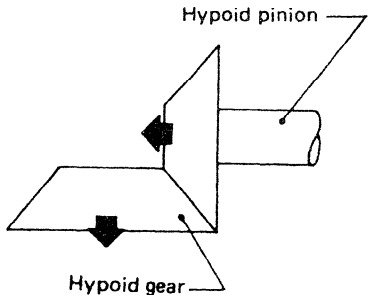
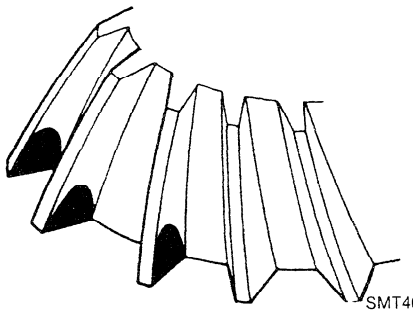
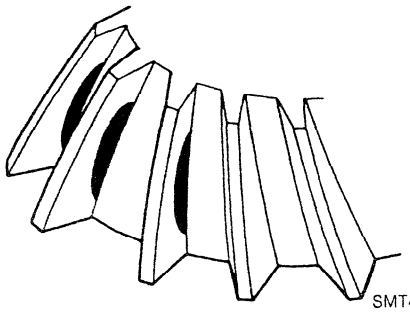
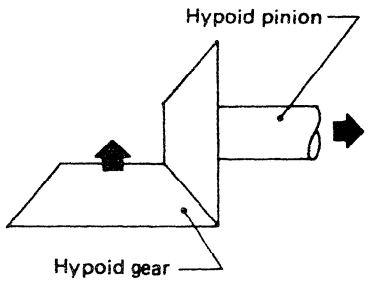
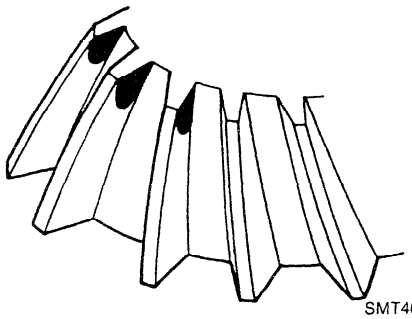
4. Install pinion sleeve shim and sleeve assembly.

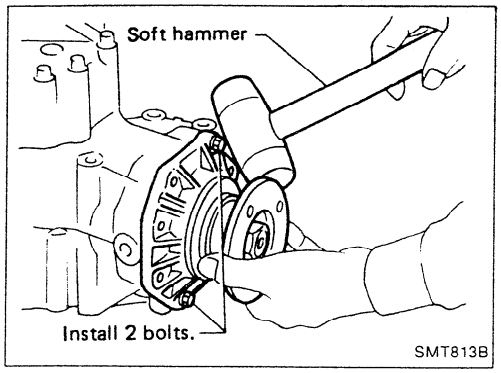
- **Install 2 bolts through pinion sleeve and onto transfer case. Do not tighten bolts. These bolts will guide pinion sleeve into case.**
- **After installing pinion sleeve, tighten bolts to the specified torque.**



5. Hold ring gear spline steady by hand and rotate companion flange back and forth.
6. Remove pinion sleeve assembly.
7. Compare contact marks left on hypoid gear to those in the following illustration.

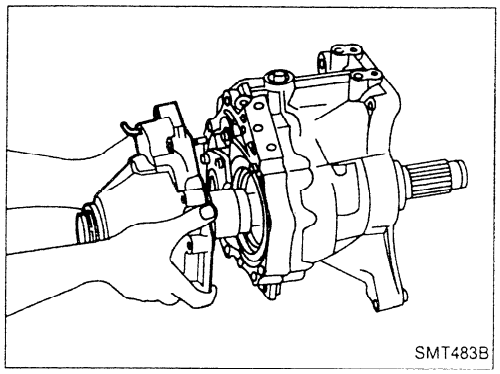
Tooth Pattern Interpretation

TOOTH PATTERN	
 Correct Pattern SMT364A	After adjustment, check hypoid gear to pinion gear backlash. — Refer to "PRE-DISASSEMBLY INSPECTION".
 SMT464A	**Adjustment**  SMT469A
 SMT465A	a. Increase thickness of countershaft shim and decrease thickness of hypoid gear shim. **Do not change total thickness of countershaft shim plus hypoid gear shim.** b. Decrease thickness of pinion sleeve shim.
 SMT466A	 SMT468A
 SMT467A	a. Increase thickness of hypoid gear shim and decrease thickness of countershaft shim. **Do not change total thickness of countershaft shim plus ring gear shim.** b. Increase thickness of pinion sleeve shim.



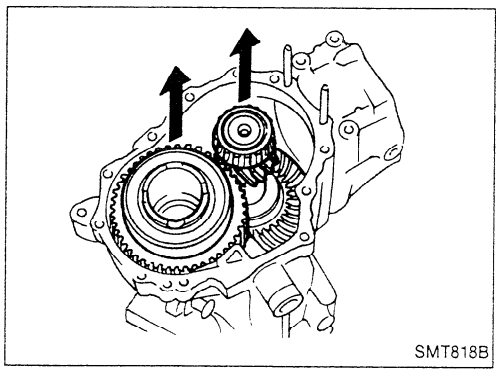
1. Remove pinion sleeve by lightly tapping.

Install 2 bolts through pinion sleeve and onto transfer case t prevent the pinion sleeve from dropping. Do not tighten bolts.

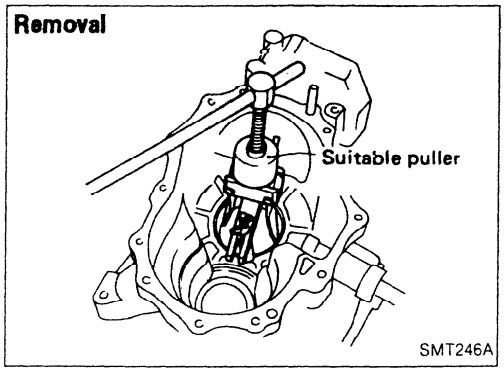


2. Remove all front cover bolts and then remove front cove with front differential by lightly tapping.

3. Remove adapter plate by lightly tapping.



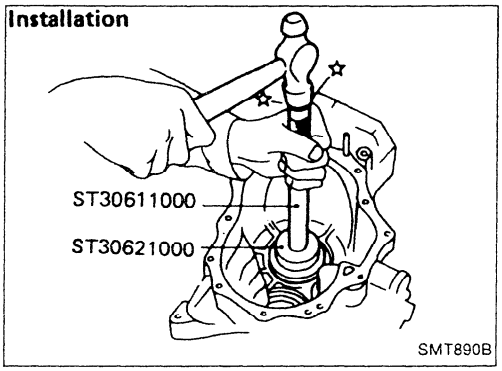
4. Remove ring gear, countershaft and shift fork assembly as a set.

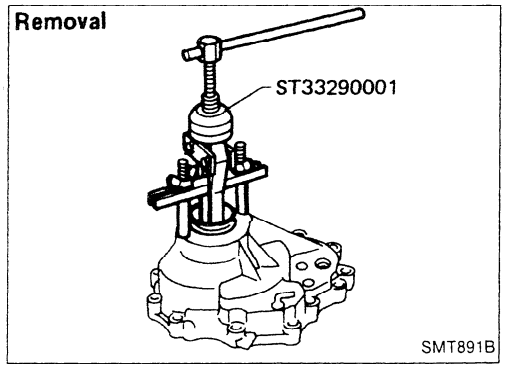


Transfer Case and Front Cover

REMOVAL AND INSTALLATION

- Hypoid gear bearing outer race

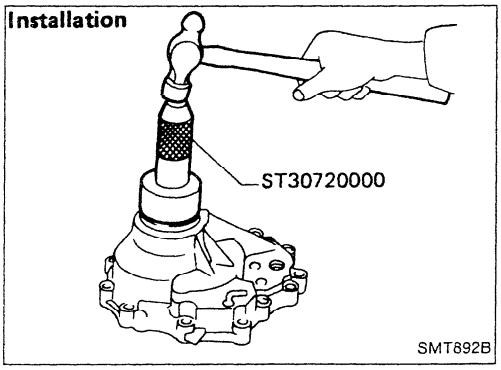


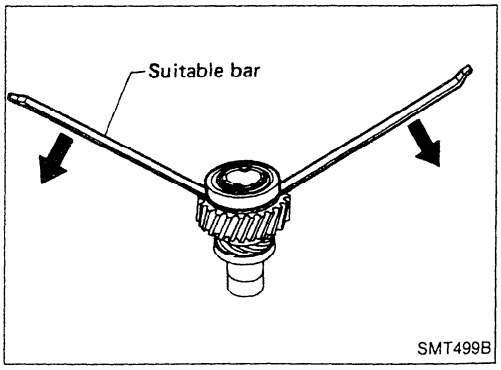


- Front cover oil seal

Install front cover oil seal after assembly.

- Refer to "PRE-DISASSEMBLY INSPECTION".



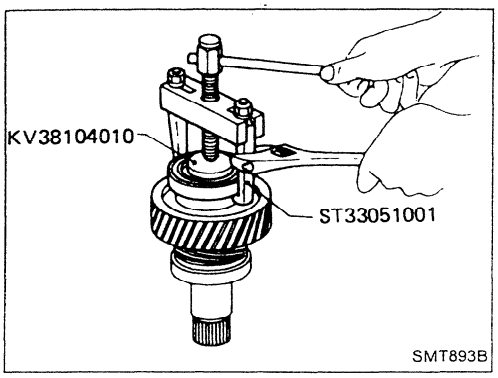


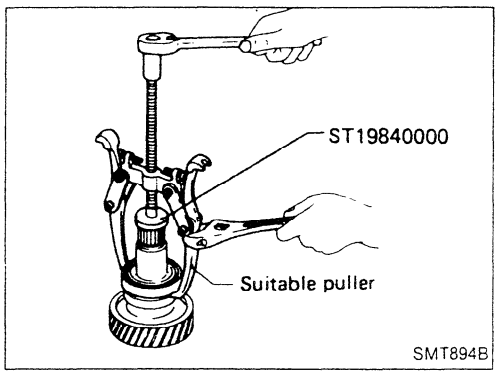
Ring Gear

DISASSEMBLY

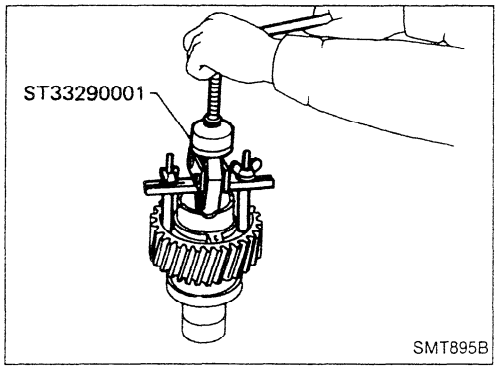
1. Pull out ring gear bearings.

Ring Gear (Cont'd)

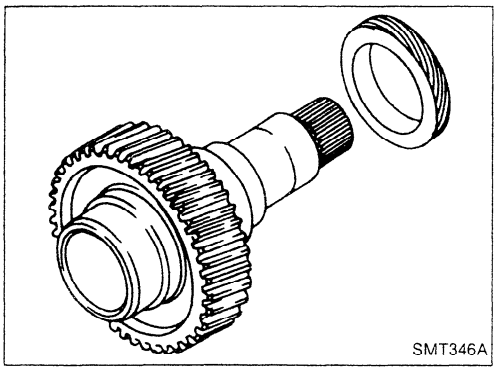




2. Remove speedometer drive gear.



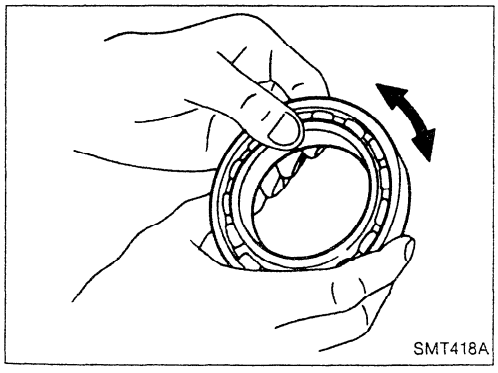
3. Remove drive shaft oil seal.



INSPECTION

Gear and shaft

- Check gears for excessive wear, chips or cracks.
- Check shaft for cracks or wear.

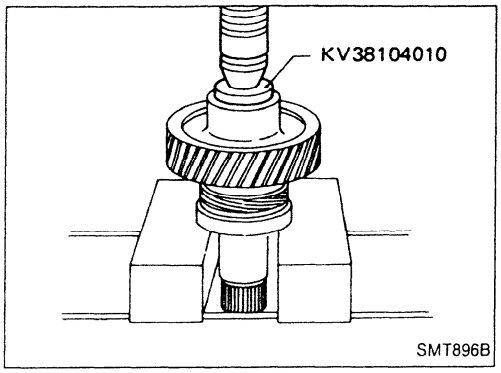


Bearings

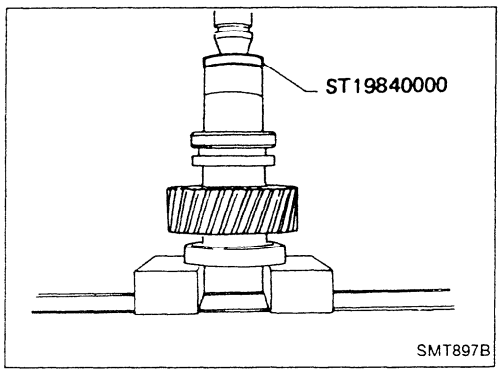
- Make sure bearings roll freely and are free from nois crack, pitting or wear.

Ring Gear (Cont'd)

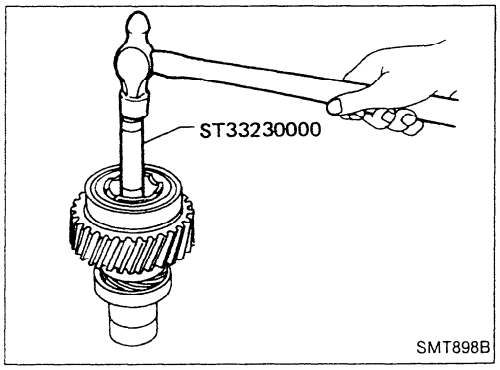
ASSEMBLY



1. Install speedometer drive gear.



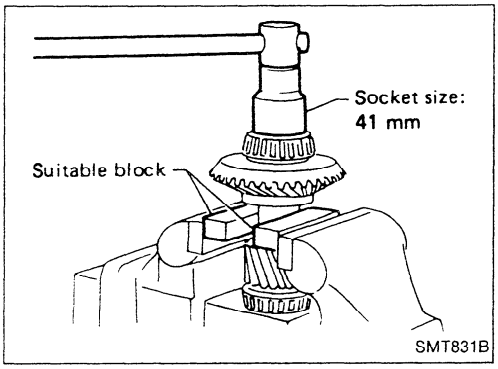
2. Press on ring gear bearings.



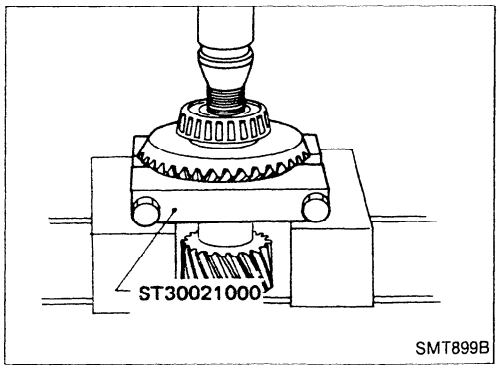
3. Install drive shaft oil seal.

Countershaft

DISASSEMBLY

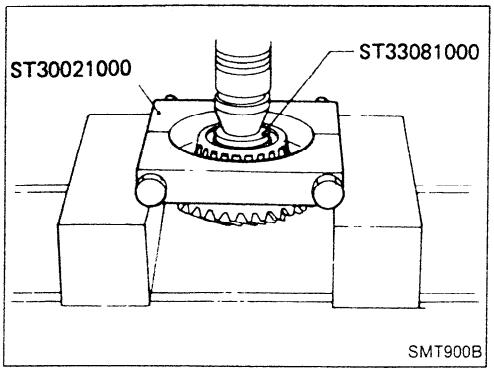


1. Remove countershaft nut.

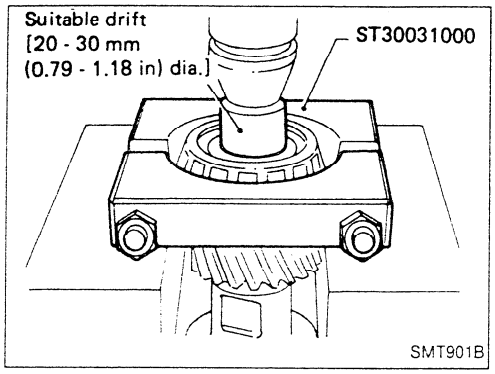


2. Press out hypoid gear together with hypoid gear bearing.

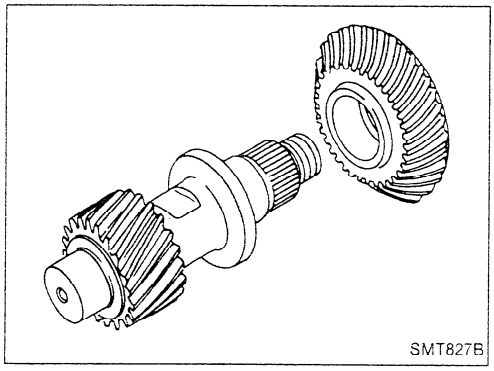
Countershaft (Cont'd)



3. Press out hypoid gear bearing.



4. Press out countershaft bearing.



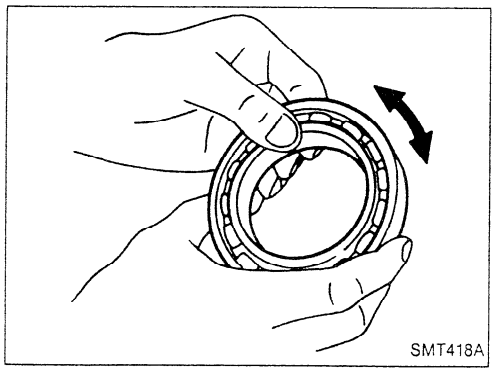
INSPECTION

Gears and shaft

- Check gears for excessive wear, chips or cracks.

When replacing hypoid gear, replace hypoid gear and hypoid pinion as a set.

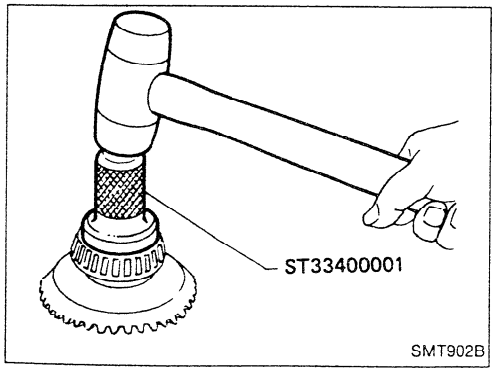
- Check shaft for cracks or wear.



Bearings

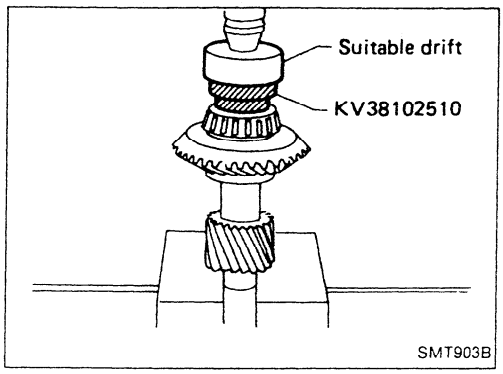
- Make sure bearings roll freely and are free from noise, crack, pitting or wear.

When replacing tapered roller bearing, replace outer and inner race as a set.

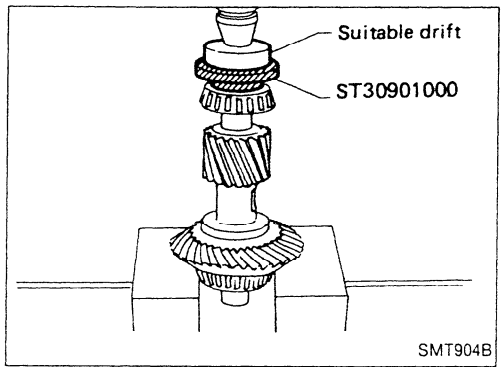


ASSEMBLY

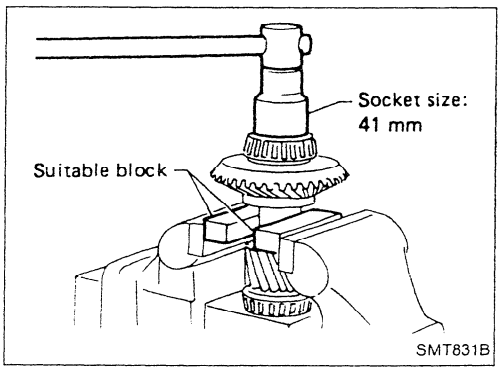
1. Press on hypoid gear bearing.



2. Press on hypoid gear together with hypoid gear bearing.



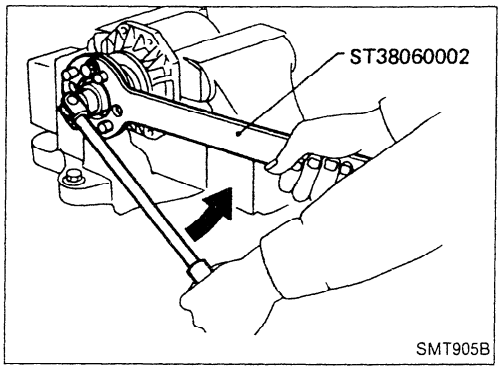
3. Press on countershaft bearing.



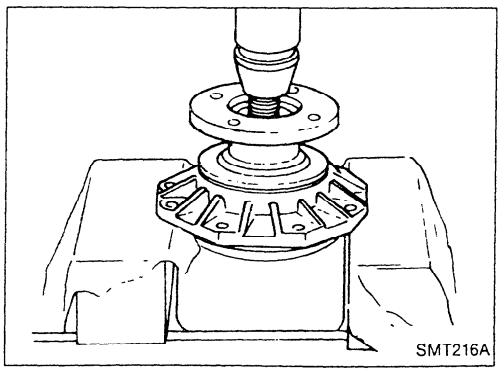
4. Install new countershaft nut.

Pinion Sleeve

DISASSEMBLY

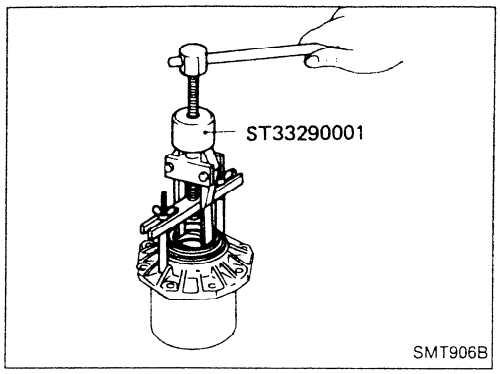


1. Before disassembly, check pinion bearing preload — Refer to "PRE-DISASSEMBLY INSPECTION".
2. Remove pinion nut.

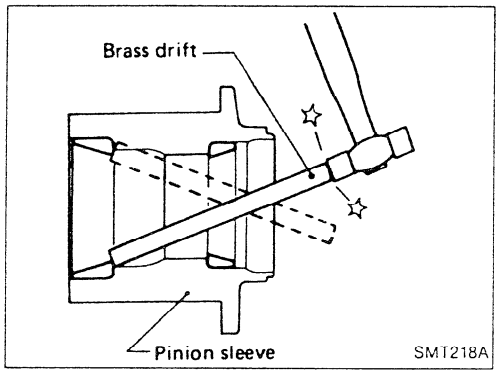


3. Press out hypoid pinion together with front inner race, collapsible spacer and spacer.

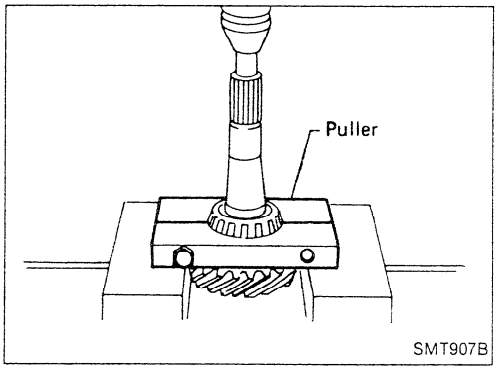
Pinion Sleeve (Cont'd)



4. Pull out pinion oil seal and remove pinion rear bearing inner cone.

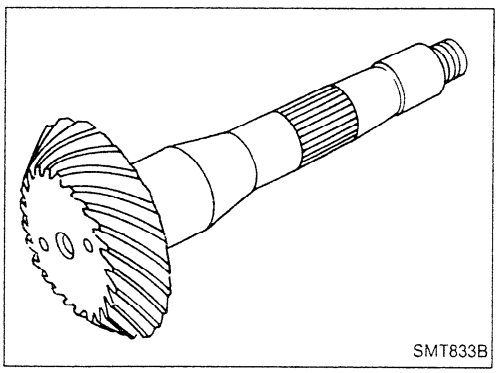


5. Remove bearing outer races with brass drift.



6. Remove pinion front bearing inner race.

Always replace after removing.



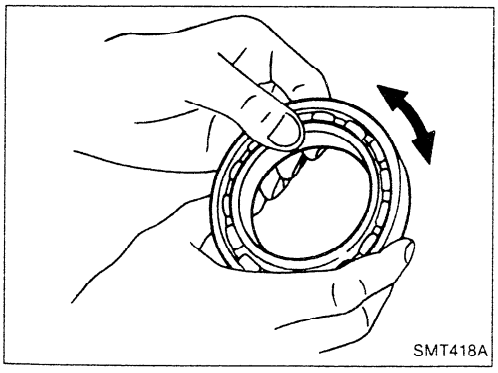
INSPECTION

Gear and shaft

- Check gears for excessive wear, chips or cracks.

When replacing hypoid pinion, replace hypoid gear and hypoid pinion as a set.

- Check shaft for cracks or wear.



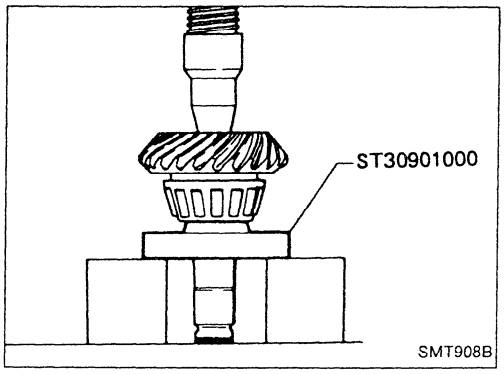
Bearing

- Make sure bearings roll freely and are free from noise, crack, pitting or wear.

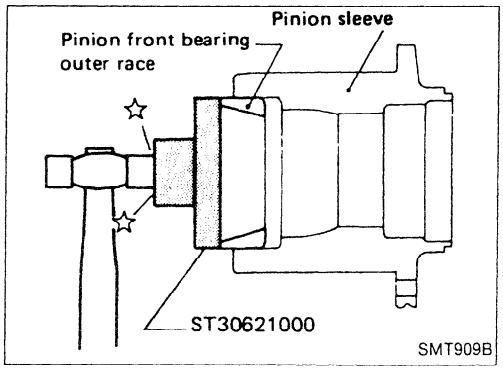
When replacing tapered roller bearing, replace outer and inner race as a set.

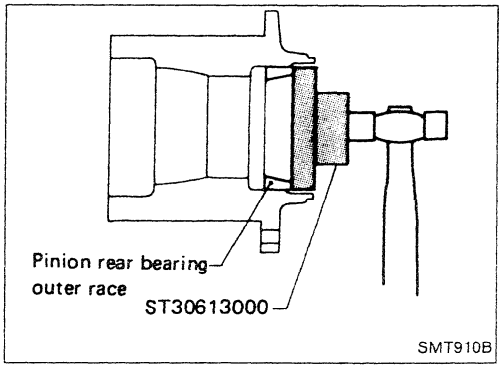
ASSEMBLY

1. Press fit pinion front bearing.



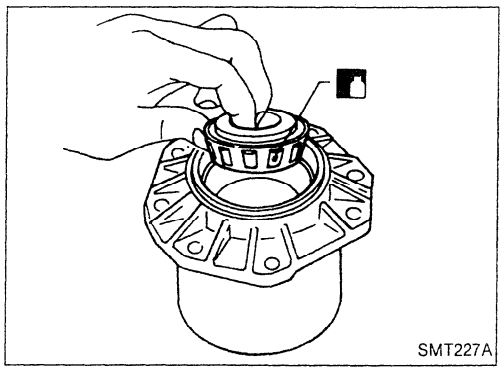
2. Press fit front and rear bearing outer races.





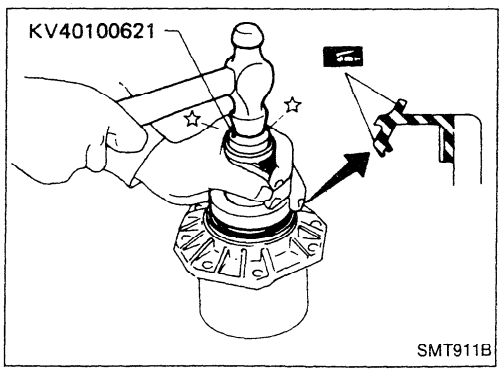
3. Place pinion rear bearing inner race in pinion sleeve.

Before installing, lubricate pinion rear bearing with recommended gear oil.

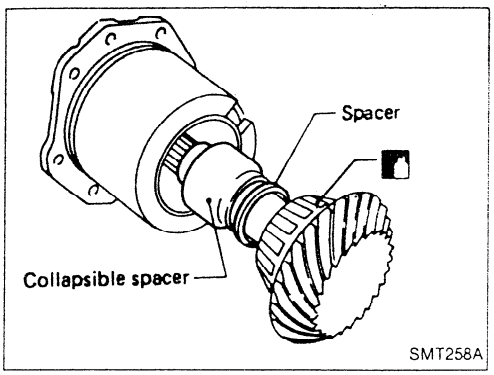


4. Install pinion oil seal.

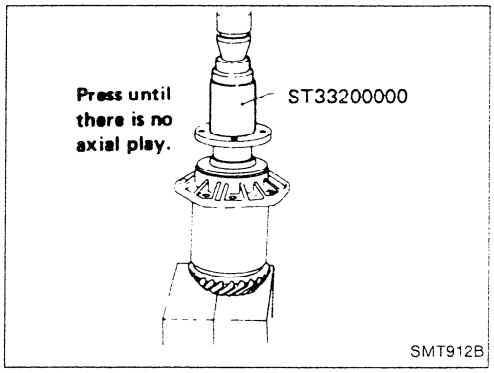
Before installing, apply multi-purpose grease to seal lip of oil seal.



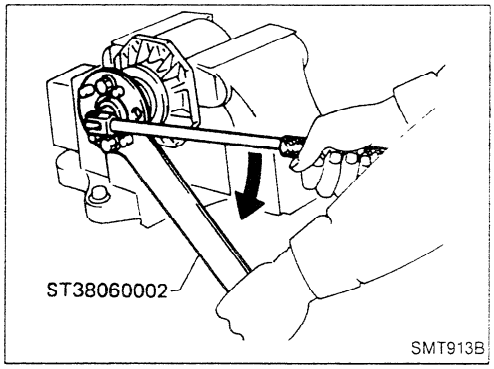
Pinion Sleeve (Cont'd)



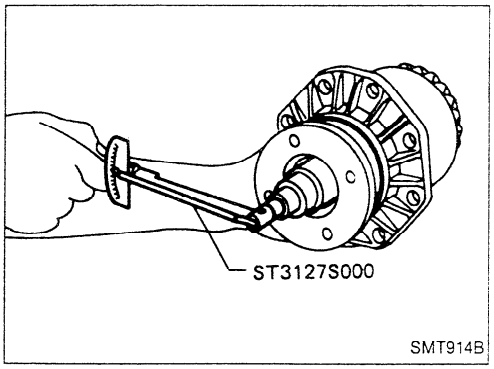
5. Place spacer and **new** collapsible spacer on hypoid pinion and lubricate pinion front bearing with gear oil, and insert them in pinion sleeve.



6. Press in companion flange until there is no axial end play.



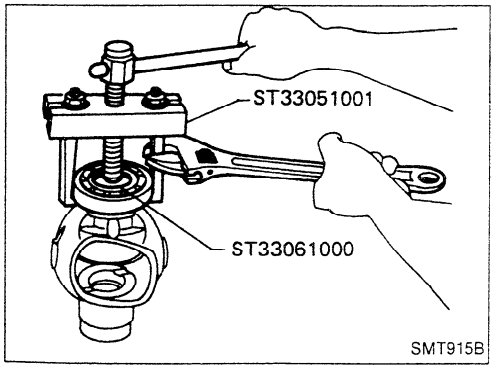
7. Tighten pinion nut slowly to the specified preload. Check bearing preload often to prevent over torque.



When checking preload, turn drive pinion in both directions several times to seat bearing correctly.

Pinion bearing preload:

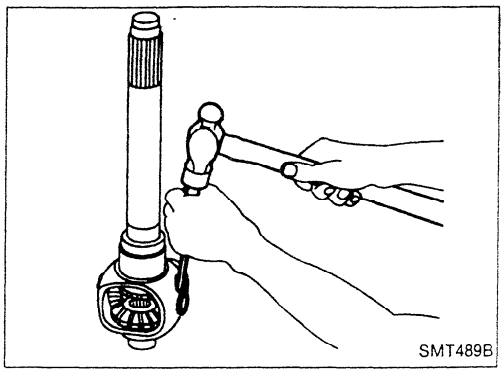
1.1 - 1.6 N·m (11 - 16 kg-cm, 9.5 - 13.9 in-lb)



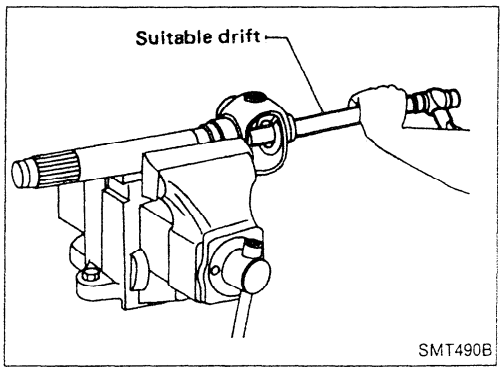
Front Differential

DISASSEMBLY

1. Remove front differential side bearing.

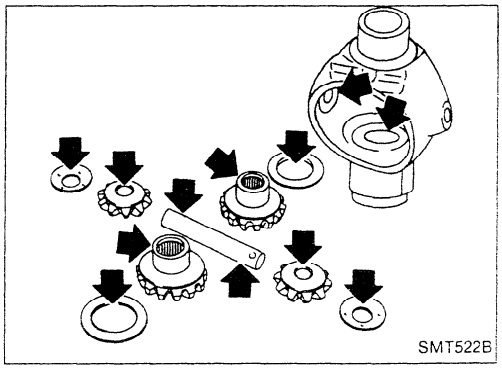

SMT489B

2. Drive out pinion mate shaft retaining pin.
3. Remove pinion mate shaft, pinion mate gear and side gear.



SMT490B

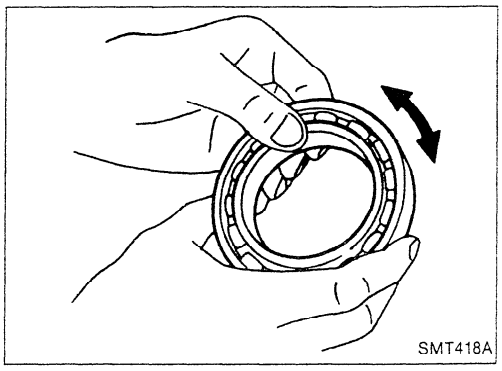
4. Remove connect shaft.


SMT522B

INSPECTION

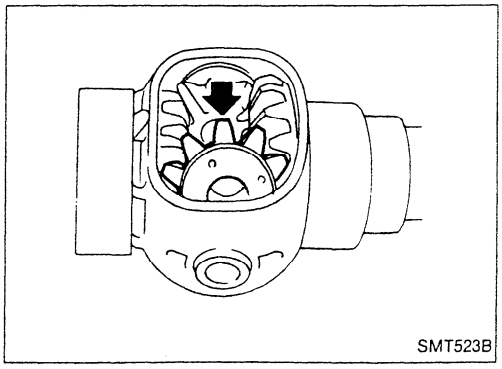
Gear, washer, shaft and case

- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.


SMT418A

Bearing

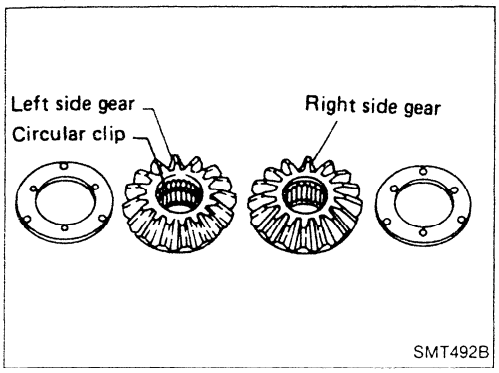
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.


SMT523B

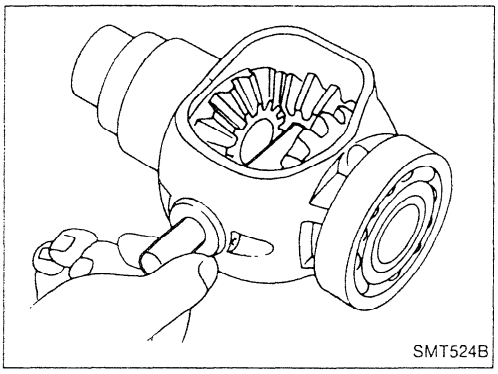
ASSEMBLY

1. Fit side gear thrust washers and side gears, then install pinion mate washers and pinion mate gears in case.

Front Differential (Cont'd)

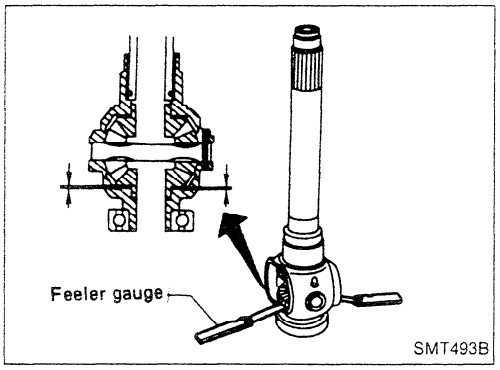


Take care to install left and right side gear correctly.



2. Insert pinion mate shaft.

When installing, be careful not to damage pinion mate thrus washers.



3. Measure clearance between side gear and differential case with washers.

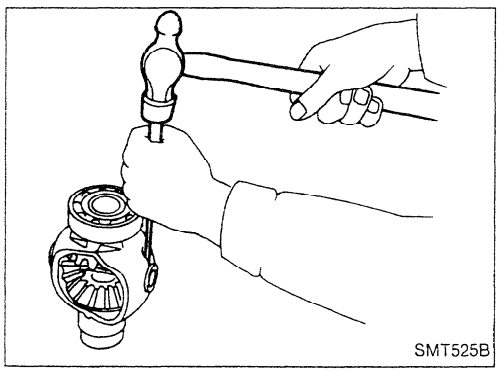
Clearance between side gear and differential case with washers:

0.1 - 0.2 mm (0.004 - 0.008 in)

If not within specification, adjust clearance by changing thickness of side gear thrust washers.

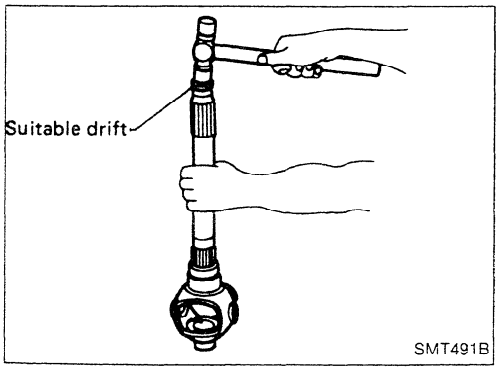
Side gear thrust washer:

Refer to S.D.S.

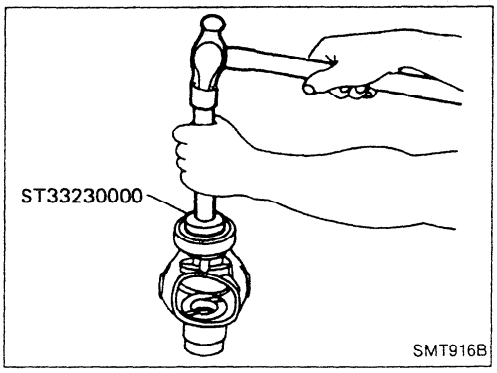


4. Install retaining pin.

Make sure that retaining pin is flush with case.



5. Install connect shaft by lightly tapping.



6. Press on differential side bearing.

It is necessary to adjust ring gear end play, countershaft bearing preload, hypoid gear and hypoid pinio height, front differential case end play when replacing any part in chart below.

Adjustment Application Chart

X: Necessary
Blank: Not necessary

Determine the required adjustment

Adjustment / Adjusting method / Replaced part	Ring gear end play Ring gear snap ring	Countershaft bearing preload Countershaft shim and Hypoid gear shim	Hypoid gear height Hypoid gear shim	Hypoid pinion height Pinion sleeve shim	Front differential case end play Front differential side bearing adjusting shim
Transfer case set (Transfer case, adapter plate and front cover)	X	X	X	X	X
Ring gear	X				X
Ring gear bearing	X				
Hypoid gear set (Hypoid gear and pinion)		X	X	X	
Countershaft		X			
Hypoid gear bearing		X	X	X	
Countershaft bearing		X			
Hypoid pinion bearing				X	
Pinion sleeve				X	
Front differential case					X
Front differential side bearing					X

Adjustment Sequence Chart

Perform required adjustment with this chart.

For details, refer to following pages.

Operation \ Adjustment		Ring gear end play	Countershaft bearing preload	Hypoid gear height	Hypoid pinion height	Front differential case end play
①	Selection of hypoid gear shim			1		
②	Removal of ring gear snap ring	1				
③	Installation of ring gear, countershaft and adapter plate	2	1	2	1	1
④	Selection of ring gear snap ring	3				
⑤	Selection of countershaft shim		2	3		
⑥	Selection of pinion sleeve shim				2	
⑦	Hypoid gear-to-pinion backlash inspection		3	4	3	
⑧	Selection of front differential side bearing shim					2
⑨	Tooth contact inspection	4	4	5	4	
⑩	Removal of adapter cover		5	6		
⑪	Removal of front cover, front differential, adapter plate, ring gear and countershaft	5	6	7	5	

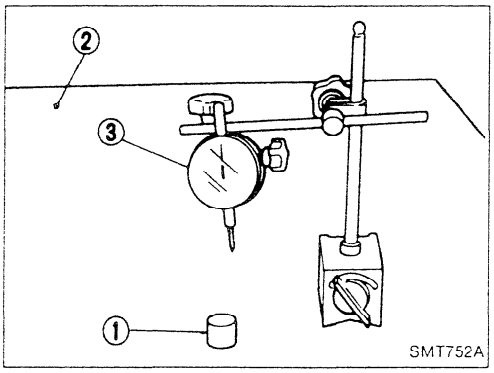
The numbers in the chart show the order of the operations required for each adjustment

Adjustment Procedure Chart

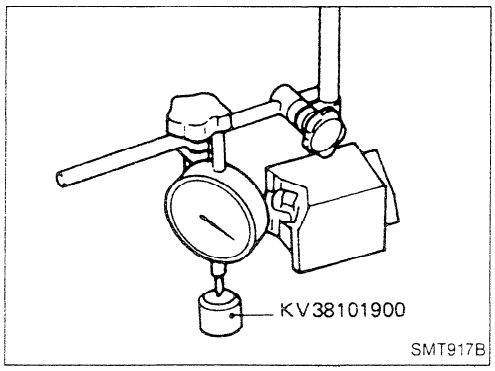
① SELECTION OF HYPOID GEAR SHIM

1. To simplify the adjustment, make a chart like the one below and write measurements on the chart.

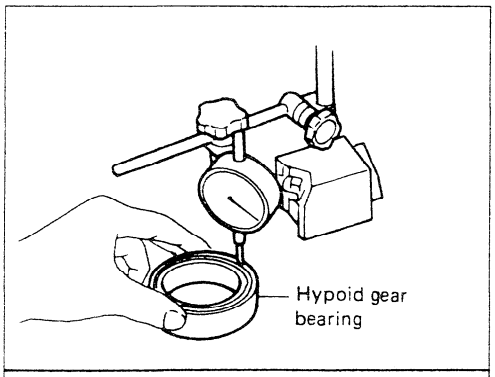
FACTOR	HUNDREDTHS OF A MILLIMETER
A: Hypoid gear	
B Hypoid gear bearing	



2. Measure hypoid gear bearing thickness.
a. Prepare required tools for measurement.
① Master Gauge KV38101900
② Base Plate
③ Dial Indicator



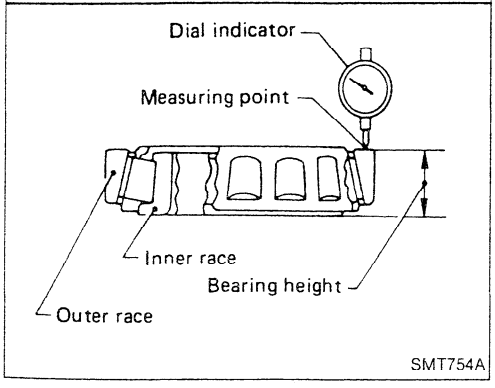
b. Place dial indicator and master gauge on base plate.
c. Place dial indicator on top of master gauge and then adjust dial indicator scale to zero.
d. Carefully slide master gauge out from under dial indicator.



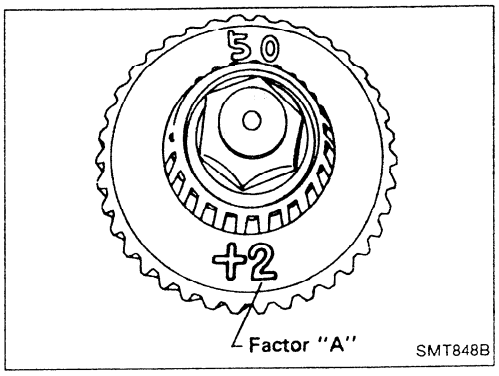
e. Place hypoid gear bearing inner race on base plate and then place hypoid gear bearing outer race on inner race.
f. Place dial indicator on top of outer race.
g. Read dial indicator.

- **If the needle fluctuates erratically then bearing is either dirty or defective and should be cleaned or replaced.**

h. Determine factor "B" to be used by the following equation.
B = "Dial gauge deflection" × 100
[Bearing height = 20 mm (0.79 in) + Dial gauge deflection]
i. Write "B" on chart.



Adjustment Procedure Chart (Cont'd)



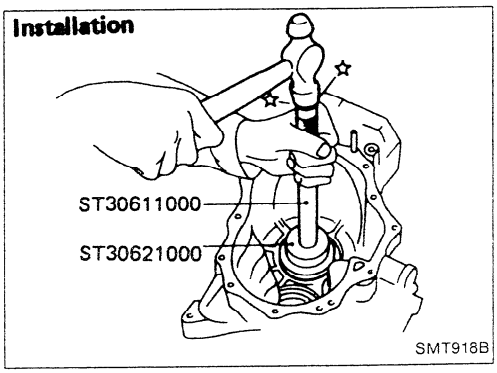
3. Write figure marked on hypoid gear as factor "A" on chart.
4. Determine dimension "C" to be used by the following equation.

C = 110 – A – B

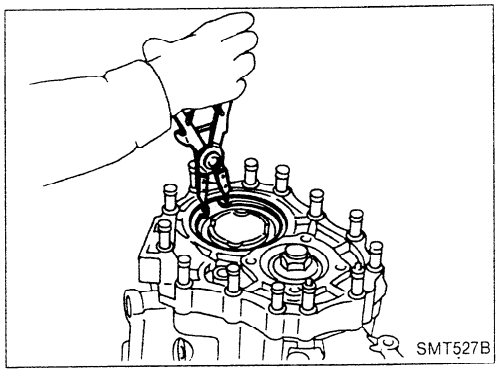
FOR EXAMPLE

FACTOR	HUNDREDTHS OF A MILLIMETER
A: Hypoid gear	2
B: Hypoid gear bearing	9 (0.09 × 100)

C = 110 – 2 – 9
= 99

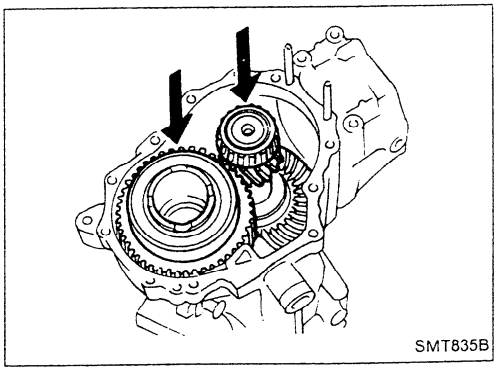


6. Select proper shims using S.D.S. table as a guide.
7. Install selected shims and hypoid gear bearing outer race (Transfer case side) in transfer case.



② REMOVAL OF RING GEAR SNAP RING

Removing ring gear snap ring.



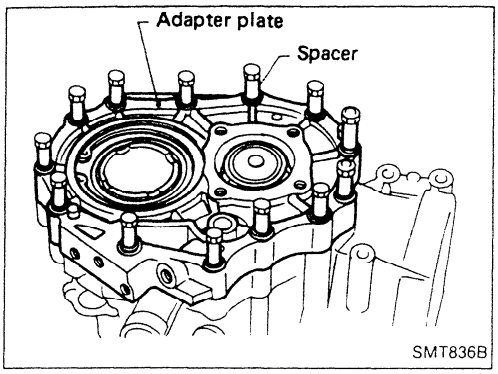
③ INSTALLATION OF RING GEAR, COUNTERSHAFT AND ADAPTER PLATE

1. Install ring gear and countershaft.
2. Install adapter plate.

Temporarily install spacers and tighten bolts to the specified torque.

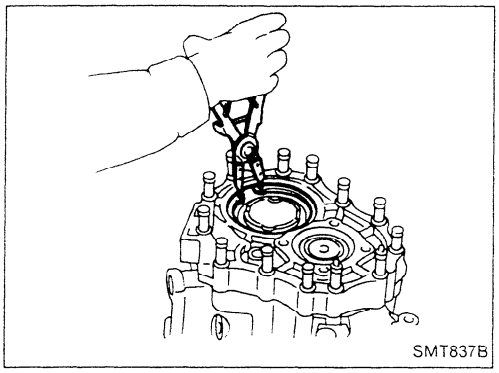
Spacer: 25 mm (0.98 in)

Adjustment Procedure Chart (Cont'd)

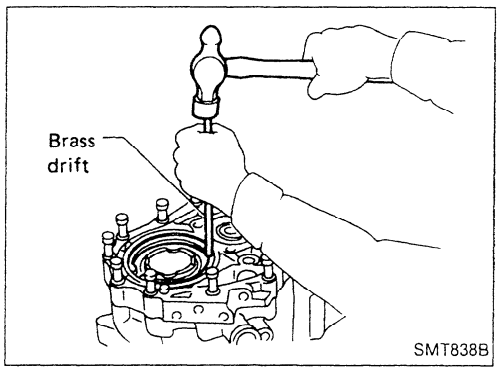


④ SELECTION OF RING GEAR SNAP RING

1. Install the thinnest snap ring [Part No. **33138-56E00, Thickness: 4.00 mm (0.1575 in)**] in ring gear snap ring groove.

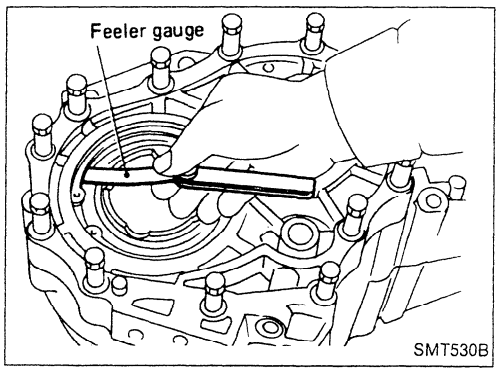


2. Tap ring gear snap ring lightly to seat it into groove.



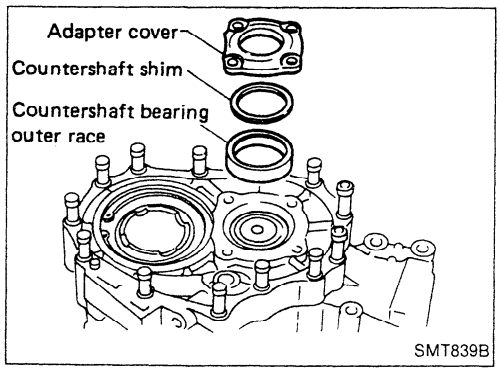
3. Measure clearance of groove.
4. Select proper snap ring using S.D.S. table as a guide.
5. Remove snap ring (Part No. 33138-56E00).
6. Install selected snap ring in ring gear snap ring groove.
7. Measure clearance of groove (ring gear end play) as a fina check.

Allowable clearance of groove (Ring gear end play):
0 - 0.06 mm (0 - 0.0024 in)

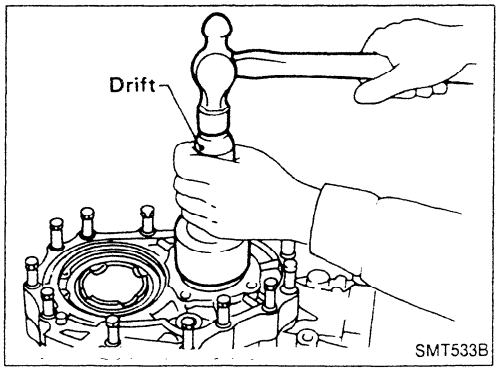


⑤ SELECTION OF COUNTERSHAFT SHIM

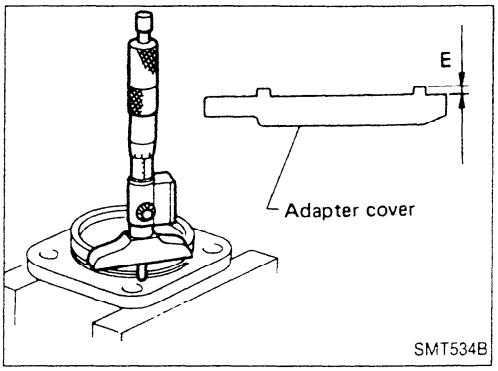
1. Remove adapter cover and countershaft shim.



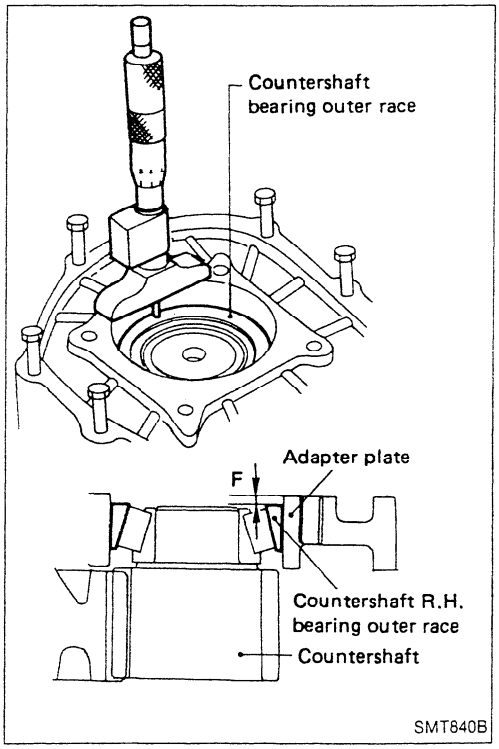
Adjustment Procedure Chart (Cont'd)



2. Tap countershaft bearing outer race lightly to seat bearings properly.



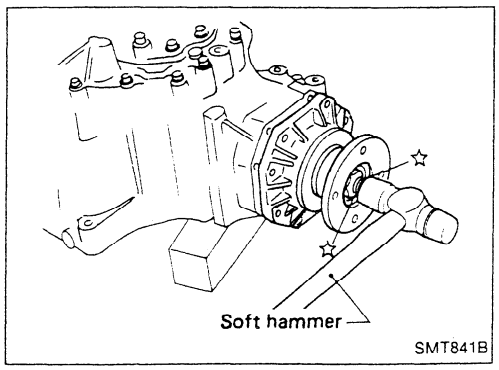
3. Measure factor "E".



4. Measure factor "F".
5. Determine dimension "G" to be used by the following equation.
   G = F – E
6. Select proper shims using S.D.S. table as a guide.
7. Install selected shims and adapter cover in adapter plate.

Tighten bolts to the specified torque.

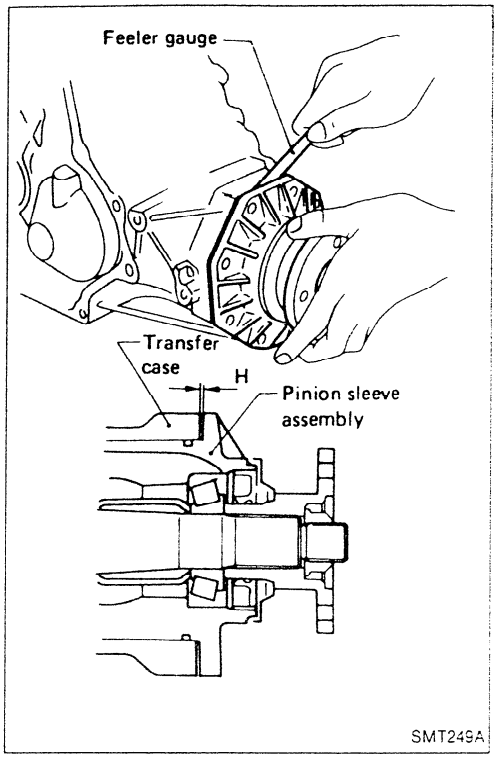
8. Check countershaft preload as final check — Refer to "PRE-DISASSEMBLY INSPECTION".
   If not within specification, select countershaft shim again.



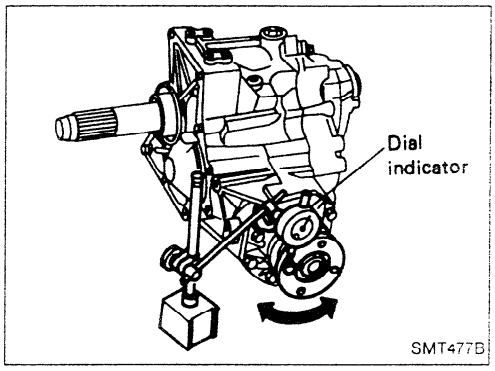
⑥ SELECTION OF PINION SLEEVE SHIM

1. Install pinion sleeve assembly without O-ring and shim.

Adjustment Procedure Chart (Cont'd)



2. While pushing pinion sleeve assembly, measure clearance "H" between transfer case and pinion sleeve at least 4 points with feeler gauge.
3. Select proper shims using S.D.S. table as a guide.
4. Remove pinion sleeve assembly.



⑦ HYPOID GEAR-TO-PINION BACKLASH INSPECTION

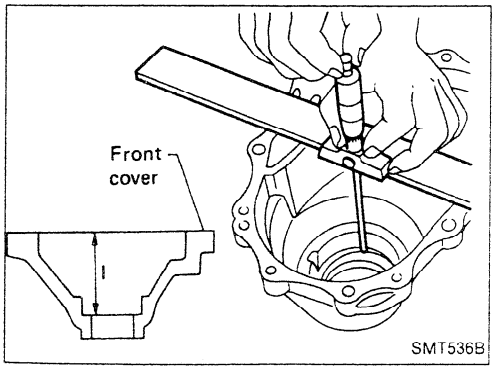
1. Install pinion sleeve assembly with pinion sleeve shim.
2. Check hypoid gear-to-pinion backlash.

Hypoid gear-to-pinion backlash:
0.10 - 0.15 mm (0.0039 - 0.0059 in)

- If backlash is too small, decrease thickness of hypoid gear shim and increase thickness of countershaft shim by the same amount.
- If backlash is too great, reverse the above procedure.

Never change the total amount of shims as it will change the bearing preload.

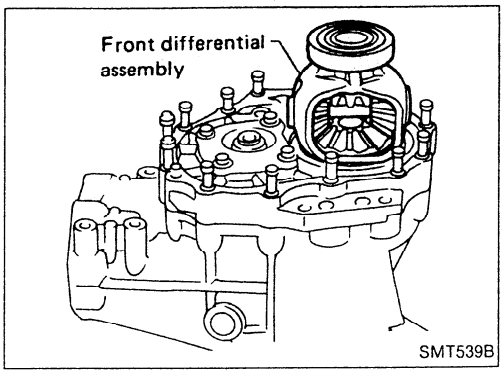
3. Remove pinion sleeve assembly.



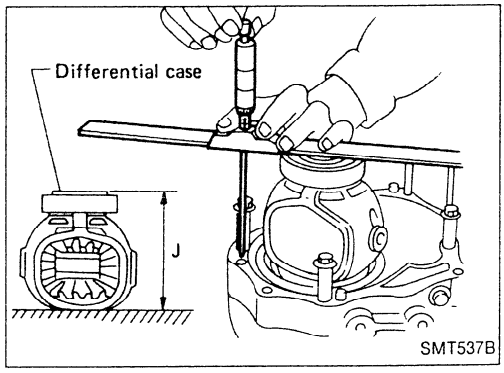
⑧ SELECTION OF FRONT DIFFERENTIAL SIDE BEARING SHIM

1. Measure factor "l".

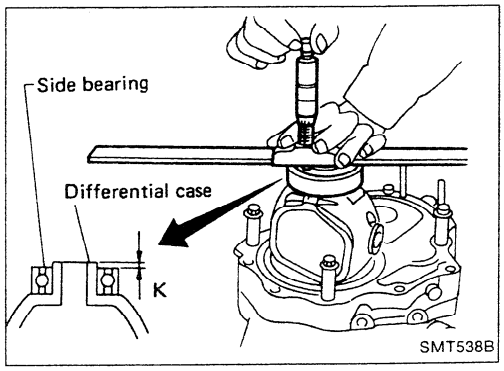
Adjustment Procedure Chart (Cont'd)



2. Install front differential assembly in adapter plate.



3. Measure factor "J".



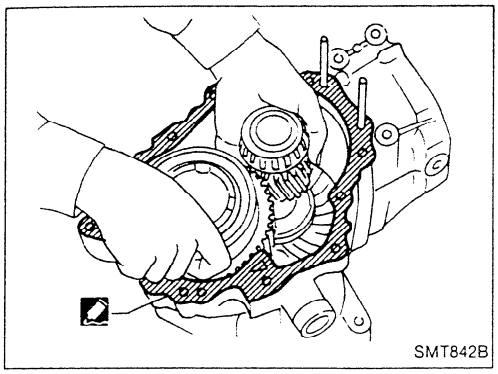
4. Measure factor "K".
   Front differential case end play (I – J + K):
   0.05 - 0.20 mm (0.0020 - 0.0079 in)
   Select proper shims using S.D.S. table as a guide.
5. Install front cover.

⑨ TOOTH CONTACT INSPECTION — Refer to "TOOTH CONTACT".

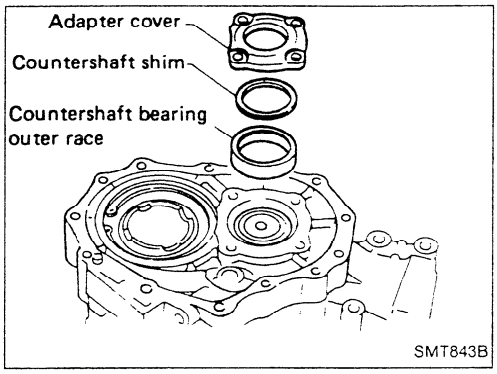
Usually tooth contact pattern will be correct if you have selected the shims accurately.
However, in extremely rare cases you will have to use trial-and-error processes until the tooth contact pattern is right.
The tooth pattern is the best indication of how well a hypoid gear and pinion have been set up.

⑩ REMOVAL OF ADAPTER COVER

⑪ REMOVAL OF FRONT COVER, FRONT DIFFERENTIAL, ADAPTER PLATE, RING GEAR AND COUNTERSHAFT

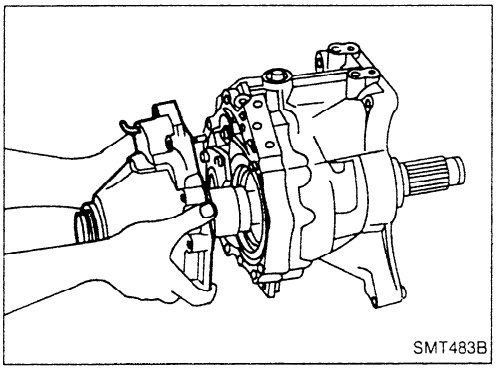

SMT842B

1. Install countershaft and ring gear as a set.
2. Clean adapter plate and transfer case mating surface.
3. Apply recommended sealant to transfer case and adapter plate mating surface.

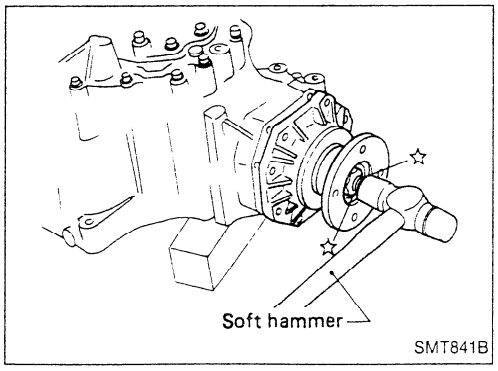


SMT843B

4. Install adapter plate.
5. Install countershaft bearing, countershaft shim and adapter cover.


SMT483B

6. Install front differential assembly and front cover.



SMT841B

7. Install O-ring on pinion sleeve and then install pinion sleeve shim and pinion sleeve.
8. Install front cover oil seal.

General Specifications

Vehicle model		GA16DS engine models	SR20DET engine models
Transfer model		VTY10A	FTY10A
Gear ratio		0.270	0.270
Number of teeth	Ring gear	47	47
	Counter gear	21	21
	Hypoid gear	38	38
	Hypoid pinion	23	23
Oil capacity ℓ (Imp qt)		1 1 (1)	1.5 (1-3/8)

Inspection and Adjustment

GEAR END PLAY (VTY10A & FTY10A)

Unit: mm (in)

Ring gear	0 - 0 06 (0 - 0 0024)

BEARING PRELOAD (VTY10A & FTY10A)

Hypoid pinion bearing	Adjusting method		Collapsible spacer
	Preload	N·m (kg-cm, in-lb) *2	1.1 - 1 6 (11 - 16, 9.5 - 13.9)
Counter-shaft bearing	Adjusting method		Shim (countershaft shim and hypoid gear shim)
	Preload	N (kg, lb)*1	88 - 235 (9 - 24, 20 - 53)
		mm (in)	0.20 - 0 26 (0 0079 - 0 0102)
Total pre-load		N m (kg-cm, in-lb) *2	2.0 - 3.9 (20 - 40, 17 - 35)

*1 at right gear spline outer diameter
*2 at pinion nut

GEAR BACKLASH

Unit: mm (in)

Transfer model	VTY10A	FTY10A
Ring gear-to-counter gear*1	0.02 - 0 04 (0.0008 - 0.0016)	0.02 - 0.04 (0.0008 - 0.0016)
Hypoid gear-to-pinion*2	0 08 - 0.12 (0.0031 - 0.0047)*2	0.10 - 0.15 (0.0039 - 0.0059)*3

*1: at ring gear spline
*2: at bolt hole in viscous coupling
*3: at bolt hole of companion flange

AVAILABLE SHIMS

Countershaft shims

Thickness mm (in)	Part number	
	VTY10A	FTY10A
0 40 (0.0157)	33123-06R00	33123-56E00
0 44 (0.0173)	33123-06R01	33123-56E01
0 48 (0.0189)	33123-06R02	33123-56E02
0.52 (0.0205)	33123-06R03	33123-56E03
0.56 (0.0220)	33123-06R04	33123-56E04
0.60 (0.0236)	33123-06R05	33123-56E05
0 64 (0.0252)	33123-06R06	33123-56E06
0.68 (0.0268)	33123-06R07	33123-56E07
0.72 (0.0283)	33123-06R08	33123-56E08
0.76 (0.0299)	33123-06R09	33123-56E09
0.92 (0 0362)	33123-06R10	33123-56E10
1.32 (0 0520)	33123-06R11	33123-56E11

Inspection and Adjustment (Cont'd)

Table for selecting suitable countershaft shim (VTY10A & FTY10A)

Unit: mm (in)

Dimension "G"	Suitable shim thickness	Appropriate shim
0.31 - 0.35 (0.0122 - 0.0138)	0.56 (0.0220)	0.56 (0.0220)
0.35 - 0.39 (0.0138 - 0.0154)	0.60 (0.0236)	0.60 (0.0236)
0.39 - 0.43 (0.0154 - 0.0169)	0.64 (0.0252)	0.64 (0.0252)
0.43 - 0.47 (0.0169 - 0.0185)	0.68 (0.0268)	0.68 (0.0268)
0.47 - 0.51 (0.0185 - 0.0201)	0.72 (0.0283)	0.72 (0.0283)
0.51 - 0.55 (0.0201 - 0.0217)	0.76 (0.0299)	0.76 (0.0299)
0.55 - 0.59 (0.0217 - 0.0232)	0.80 (0.0315)	0.40 + 0.40 (0.0157 + 0.0157)
0.59 - 0.63 (0.0232 - 0.0248)	0.84 (0.0331)	0.40 + 0.44 (0.0157 + 0.0173)
0.63 - 0.67 (0.0248 - 0.0264)	0.88 (0.0346)	0.40 + 0.48 (0.0157 + 0.0189)
0.67 - 0.71 (0.0264 - 0.0280)	0.92 (0.0362)	0.92 (0.0362)
0.71 - 0.75 (0.0280 - 0.0295)	0.96 (0.0378)	0.40 + 0.56 (0.0157 + 0.0220)
0.75 - 0.79 (0.0295 - 0.0311)	1.00 (0.0394)	0.40 + 0.60 (0.0157 + 0.0236)
0.79 - 0.83 (0.0311 - 0.0327)	1.04 (0.0409)	0.40 + 0.64 (0.0157 + 0.0252)
0.83 - 0.87 (0.0327 - 0.0343)	1.08 (0.0425)	0.40 + 0.68 (0.0157 + 0.0268)
0.87 - 0.91 (0.0343 - 0.0358)	1.12 (0.0441)	0.40 + 0.72 (0.0157 + 0.0283)
0.91 - 0.95 (0.0358 - 0.0374)	1.16 (0.0457)	0.40 + 0.76 (0.0157 + 0.0299)
0.95 - 0.99 (0.0374 - 0.0390)	1.20 (0.0472)	0.44 + 0.76 (0.0173 + 0.0299)
0.99 - 1.03 (0.0390 - 0.0406)	1.24 (0.0488)	0.48 + 0.76 (0.0189 + 0.0299)
1.03 - 1.07 (0.0406 - 0.0421)	1.28 (0.0504)	0.52 + 0.76 (0.0205 + 0.0299)
1.07 - 1.11 (0.0421 - 0.0437)	1.32 (0.0520)	1.32 (0.0520)
1.11 - 1.15 (0.0437 - 0.0453)	1.36 (0.0535)	0.60 + 0.76 (0.0236 + 0.0299)
1.15 - 1.19 (0.0453 - 0.0469)	1.40 (0.0551)	0.64 + 0.76 (0.0252 + 0.0299)
1.19 - 1.23 (0.0469 - 0.0484)	1.44 (0.0567)	0.68 + 0.76 (0.0268 + 0.0299)
1.23 - 1.27 (0.0484 - 0.0500)	1.48 (0.0583)	0.72 + 0.76 (0.0283 + 0.0299)
1.27 - 1.31 (0.0500 - 0.0516)	1.52 (0.0598)	0.76 + 0.76 (0.0299 + 0.0299)
1.31 - 1.35 (0.0516 - 0.0531)	1.56 (0.0614)	0.64 + 0.92 (0.0252 + 0.0362)
1.35 - 1.39 (0.0531 - 0.0547)	1.60 (0.0630)	0.68 + 0.92 (0.0268 + 0.0362)
1.39 - 1.43 (0.0547 - 0.0563)	1.64 (0.0646)	0.72 + 0.92 (0.0283 + 0.0362)
1.43 - 1.47 (0.0563 - 0.0579)	1.68 (0.0661)	0.76 + 0.92 (0.0299 + 0.0362)
1.47 - 1.51 (0.0579 - 0.0594)	1.72 (0.0677)	0.40 + 1.32 (0.0157 + 0.0520)
1.51 - 1.55 (0.0594 - 0.0610)	1.76 (0.0693)	0.44 + 1.32 (0.0173 + 0.0520)
1.55 - 1.59 (0.0610 - 0.0626)	1.80 (0.0709)	0.48 + 1.32 (0.0189 + 0.0520)
1.59 - 1.63 (0.0626 - 0.0642)	1.84 (0.0724)	0.52 + 1.32 (0.0205 + 0.0520)
1.63 - 1.67 (0.0642 - 0.0657)	1.88 (0.0740)	0.56 + 1.32 (0.0220 + 0.0520)
1.67 - 1.71 (0.0657 - 0.0673)	1.92 (0.0756)	0.60 + 1.32 (0.0236 + 0.0520)
1.71 - 1.75 (0.0673 - 0.0689)	1.96 (0.0772)	0.64 + 1.32 (0.0252 + 0.0520)
1.75 - 1.79 (0.0689 - 0.0705)	2.00 (0.0787)	0.68 + 1.32 (0.0268 + 0.0520)
1.79 - 1.83 (0.0705 - 0.0720)	2.04 (0.0803)	0.72 + 1.32 (0.0283 + 0.0520)

AVAILABLE SNAP RINGS

Ring gear snap rings

(VTY10A)

Unit: mm (in)

Thickness	Part number
3.00 (0.1181)	33138-10R00
3.04 (0.1197)	33138-10R01
3.08 (0.1213)	33138-10R02
3.12 (0.1228)	33138-10R03
3.16 (0.1244)	33138-10R04
3 20 (0 1260)	33138-10R05
3 24 (0.1276)	33138-10R06
3.28 (0.1291)	33138-10R07
3 32 (0.1307)	33138-10R08
3 36 (0.1323)	33138-10R09
3 40 (0.1339)	33138-10R10
3 44 (0.1354)	33138-10R11
3.48 (0.1370)	33138-10R12
3.52 (0.1386)	33138-10R13
3.56 (0.1402)	33138-10R14
3 60 (0.1417)	33138-10R15
3.64 (0.1433)	33138-10R16

(FTY10A)

Unit: mm (in)

Thickness	Part number
4.00 (0.1575)	33138-56E00
4.04 (0.1591)	33138-56E01
4 08 (0.1606)	33138-56E02
4.12 (0 1622)	33138-56E03
4.16 (0.1638)	33138-56E04
4.20 (0.1654)	33138-56E05
4.24 (0.1669)	33138-56E06
4 28 (0.1685)	33138-56E07
4 32 (0.1701)	33138-56E08
4.36 (0.1717)	33138-56E09
4.40 (0.1732)	33138-56E10
4.44 (0.1748)	33138-56E11
4.48 (0.1764)	33138-56E12
4.52 (0.1780)	33138-56E13
4.56 (0.1795)	33138-56E14
4 60 (0.1811)	33138-56E15
4.64 (0.1827)	33138-56E16

Table for selecting suitable ring gear snap ring

(VTY10A)

Unit: mm (in)

Measured clearance	Thickness of suitable snap ring
0.00 - 0.04 (0.0000 - 0.0016)	3.00 (0.1181)
0.04 - 0.08 (0.0016 - 0.0031)	3.04 (0.1197)
0.08 - 0.12 (0 0031 - 0.0047)	3 08 (0.1213)
0.12 - 0.16 (0.0047 - 0.0063)	3.12 (0.1228)
0 16 - 0.20 (0.0063 - 0.0079)	3 16 (0.1244)
0.20 - 0.24 (0 0079 - 0.0094)	3.20 (0.1260)
0.24 - 0.28 (0 0094 - 0 0110)	3 24 (0.1276)
0 28 - 0.32 (0 0110 - 0.0126)	3.28 (0.1291)
0 32 - 0.36 (0.0126 - 0.0142)	3.32 (0.1307)
0.36 - 0.40 (0.0142 - 0.0157)	3 36 (0.1323)
0 40 - 0 44 (0.0157 - 0.0173)	3 40 (0 1339)
0.44 - 0.48 (0.0173 - 0.0189)	3 44 (0 1354)
0.48 - 0.52 (0.0189 - 0 0205)	3.48 (0.1370)
0.52 - 0.56 (0.0205 - 0.0220)	3 52 (0.1386)
0.56 - 0.60 (0.0220 - 0.0236)	3.56 (0.1402)
0.60 - 0.64 (0.0236 - 0.0252)	3.60 (0.1417)
0.64 - 0.68 (0.0252 - 0.0268)	3.64 (0.1433)

(FTY10A)

Unit: mm (in)

Measured clearance	Thickness of suitable snap ring
0 00 - 0.04 (0.0000 - 0.0016)	4 00 (0.1575)
0.04 - 0.08 (0.0016 - 0.0031)	4.04 (0.1591)
0.08 - 0.12 (0.0031 - 0.0047)	4.08 (0.1606)
0.12 - 0.16 (0.0047 - 0.0063)	4.12 (0.1622)
0.16 - 0.20 (0.0063 - 0.0079)	4 16 (0.1638)
0.20 - 0.24 (0.0079 - 0.0094)	4.20 (0.1654)
0.24 - 0.28 (0.0094 - 0.0110)	4.24 (0.1669)
0.28 - 0.32 (0.0110 - 0.0126)	4.28 (0.1685)
0.32 - 0 36 (0.0126 - 0.0142)	4.32 (0.1701)
0.36 - 0.40 (0.0142 - 0.0157)	4 36 (0.1717)
0.40 - 0.44 (0.0157 - 0.0173)	4.40 (0.1732)
0.44 - 0.48 (0.0173 - 0.0189)	4.44 (0.1748)
0.48 - 0.52 (0.0189 - 0.0205)	4.48 (0.1764)
0.52 - 0.56 (0.0205 - 0.0220)	4.52 (0.1780)
0.56 - 0.60 (0.0220 - 0.0236)	4.56 (0.1795)
0 60 - 0.64 (0.0236 - 0.0252)	4 60 (0.1811)
0.64 - 0.68 (0.0252 - 0.0268)	4.64 (0.1827)

Hypoid gear shims (VTY10A & FTY10A)

Unit: mm (in)

Thickness	Part number
0 40 (0.0157)	33147-06R00
0.44 (0 0173)	33147-06R01
0.48 (0.0189)	33147-06R02
0.60 (0.0236)	33147-06R03
0.64 (0 0252)	33147-06R04
0 68 (0.0268)	33147-06R06
0 72 (0 0283)	33147-06R07
0 76 (0 0299)	33147-06R05

Table for selecting suitable hypoid gear shim

(VTY10A)

Unit: mm (in

Dimension "D"	Suitable shim thickness	Appropriate shim
70 - 74 (2.76 - 2.91)	0 80 (0.0315)	0.40 + 0.40 (0.0157 + 0.0157)
74 - 78 (2.91 - 3.07)	0 84 (0.0331)	0.40 + 0.44 (0.0157 + 0.0173)
78 - 82 (3 07 - 3.23)	0.88 (0 0346)	0.40 + 0.48 (0.0157 + 0 0189)
82 - 86 (3 23 - 3 39)	0 92 (0.0362)	0.44 + 0 48 (0 0173 + 0.0189)
86 - 90 (3 39 - 3.54)	0 96 (0.0378)	0.48 + 0 48 (0 0189 + 0 0189)
90 - 94 (3.54 - 3 70)	1 00 (0 0394)	0.40 + 0 60 (0.0157 + 0.0236)
94 - 98 (3.70 - 3.86)	1 04 (0 0409)	0.44 + 0 60 (0 0173 + 0.0236)
98 - 102 (3 86 - 4 02)	1.08 (0.0425)	0 48 + 0.60 (0.0189 + 0.0236)
102 - 106 (4.02 - 4.17)	1.12 (0.0441)	0.48 + 0.64 (0.0189 + 0.0252)
106 - 110 (4.17 - 4.33)	1.16 (0 0457)	0.48 + 0.68 (0.0189 + 0.0268)
110 - 114 (4 33 - 4.49)	1.20 (0.0472)	0.48 + 0.72 (0.0189 + 0.0283)

(FTY10A)

Unit: mm (in)

Dimension "C"	Suitable shim thickness	Appropriate shim
78 - 81 (3.07 - 3.19)	0.80 (0.0315)	0.40 + 0.40 (0.0157 + 0 0157)
82 - 85 (3.23 - 3.35)	0 84 (0.0331)	0.40 + 0.44 (0.0157 + 0.0173)
86 - 89 (3.39 - 3.50)	0 88 (0.0346)	0.40 + 0.48 (0.0157 + 0 0189)
90 - 93 (3 54 - 3.66)	0.92 (0.0362)	0.44 + 0.48 (0.0173 + 0.0189)
94 - 97 (3 70 - 3.82)	0.96 (0 0378)	0.48 + 0.48 (0.0189 + 0.0189)
98 - 101 (3.86 - 3.98)	1.00 (0.0394)	0.40 + 0.60 (0.0157 + 0.0236)
102 - 105 (4.02 - 4.13)	1.04 (0.0409)	0.44 + 0.60 (0.0173 + 0.0236)
106 - 109 (4.17 - 4.29)	1.08 (0.0425)	0.48 + 0.60 (0.0189 + 0.0236)
110 - 113 (4.43 - 4.45)	1.12 (0.0441)	0.48 + 0.64 (0.0189 + 0.0252)
114 - 117 (4 49 - 4.61)	1 16 (0.0457)	0.48 + 0.68 (0.0189 + 0.0268)
118 - 121 (4.65 - 4.76)	1.20 (0.0472)	0.48 + 0.72 (0.0189 + 0.0283)

Inspection and Adjustment (Cont'd)

Pinion sleeve shims (VTY10A & FTY10A)

Unit: mm (in)

Thickness	Part number
0.40 (0.0157)	33155-10R00
0.44 (0.0173)	33155-10R01
0.48 (0.0189)	33155-10R02
0.52 (0.0205)	33155-10R03
0.56 (0.0220)	33155-10R04
0.60 (0.0236)	33155-10R05
0.64 (0.0252)	33155-10R06
0.68 (0.0268)	33155-10R07
0.72 (0.0283)	33155-10R08
0.76 (0.0299)	33155-10R09

Table for selecting suitable pinion sleeve shim

(VTY10A & FTY10A)

Unit: mm (in)

Dimension "H"	Suitable shim thickness	Appropriate shim
0.64 - 0.67 (0.0252 - 0.0264)	0.84 (0.0331)	0.40 + 0.44 (0.0157 + 0.0173)
0.68 - 0.71 (0.0268 - 0.0280)	0.88 (0.0346)	0.40 + 0.48 (0.0157 + 0.0189)
0.72 - 0.75 (0.0283 - 0.0295)	0.92 (0.0362)	0.40 + 0.52 (0.0157 + 0.0205)
0.76 - 0.79 (0.0299 - 0.0311)	0.96 (0.0378)	0.40 + 0.56 (0.0157 + 0.0220)
0.80 - 0.83 (0.0315 - 0.0327)	1.00 (0.0394)	0.40 + 0.60 (0.0157 + 0.0236)
0.84 - 0.87 (0.0331 - 0.0343)	1.04 (0.0409)	0.40 + 0.64 (0.0157 + 0.0252)
0.88 - 0.91 (0.0346 - 0.0358)	1.08 (0.0425)	0.40 + 0.68 (0.0157 + 0.0268)
0.92 - 0.95 (0.0362 - 0.0374)	1.12 (0.0441)	0.40 + 0.72 (0.0157 + 0.0283)
0.96 - 0.99 (0.0378 - 0.0390)	1.16 (0.0457)	0.40 + 0.76 (0.0157 + 0.0299)
1.00 - 1.03 (0.0394 - 0.0406)	1.20 (0.0472)	0.44 + 0.76 (0.0173 + 0.0299)
1.04 - 1.07 (0.0409 - 0.0421)	1.24 (0.0488)	0.48 + 0.76 (0.0189 + 0.0299)
1.08 - 1.11 (0.0425 - 0.0437)	1.28 (0.0504)	0.52 + 0.76 (0.0205 + 0.0299)
1.12 - 1.15 (0.0441 - 0.0453)	1.32 (0.0520)	0.56 + 0.76 (0.0220 + 0.0299)
1.16 - 1.19 (0.0457 - 0.0469)	1.36 (0.0535)	0.60 + 0.76 (0.0236 + 0.0299)
1.20 - 1.23 (0.0472 - 0.0484)	1.40 (0.0551)	0.64 + 0.76 (0.0252 + 0.0299)
1.24 - 1.27 (0.0488 - 0.0500)	1.44 (0.0567)	0.68 + 0.76 (0.0268 + 0.0299)
1.28 - 1.31 (0.0504 - 0.0516)	1.48 (0.0583)	0.72 + 0.76 (0.0283 + 0.0299)
1.32 - 1.35 (0.0520 - 0.0531)	1.52 (0.0598)	0.76 + 0.76 (0.0299 + 0.0299)

Front differential side bearing adjusting shims

(FTY10A only)

Unit: mm (in)

Side bearing end play	0.05 - 0.20 (0.0020 - 0.0079)

Thickness mm (in)	Part number
0.40 (0.0157)	33147-06R00
0.44 (0.0173)	33147-06R01
0.48 (0.0189)	33147-06R02
0.60 (0.0236)	33147-06R03
0.64 (0.0252)	33147-06R04
0.68 (0.0268)	33147-06R06
0.72 (0.0283)	33147-06R07
0.76 (0.0299)	33147-06R05

AVAILABLE WASHERS

Front differential side gear thrust washers

(FTY10A only)

Unit: mm (in)

Clearance between side gear and differential case	0.1 - 0.2 (0.004 - 0.008)

Thickness mm (in)	Part number
0.75 - 0.80 (0.0295 - 0.0315)	38424-E3000
0.80 - 0.85 (0.0315 - 0.0335)	38424-E3001
0.85 - 0.90 (0.0335 - 0.0354)	38424-E3002
0.90 - 0.95 (0.0354 - 0.0374)	38424-E3003

PROPELLER SHAFT & DIFFERENTIAL CARRIER

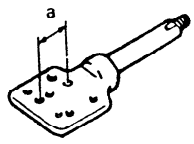
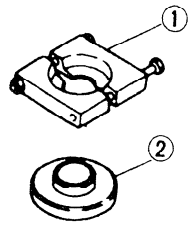
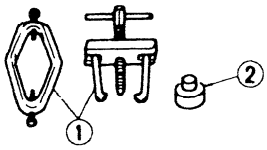
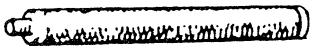
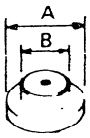
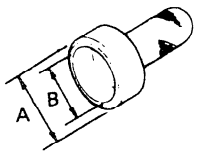
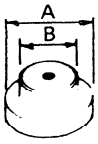
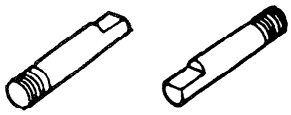
SECTION PD

CONTENTS

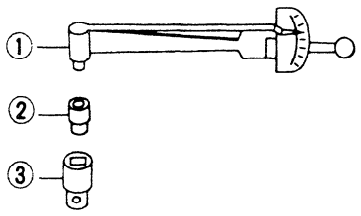
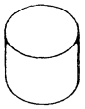
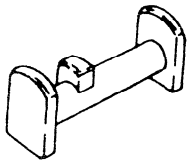
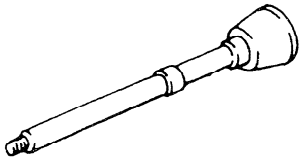
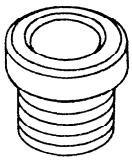
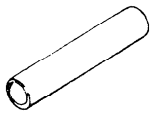
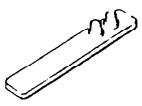
PREPARATION ..... PD- 2
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ON-VEHICLE SERVICE (Final drive) ..... PD- 7
REMOVAL AND INSTALLATION (Final drive) ..... PD- 9
FINAL DRIVE PD-10
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INSPECTION PD-16
ADJUSTMENT PD-17
ASSEMBLY PD-25
VISCOUS LIMITED SLIP DIFFERENTIAL CASE PD-30
SERVICE DATA AND SPECIFICATIONS (S.D.S.) PD-32

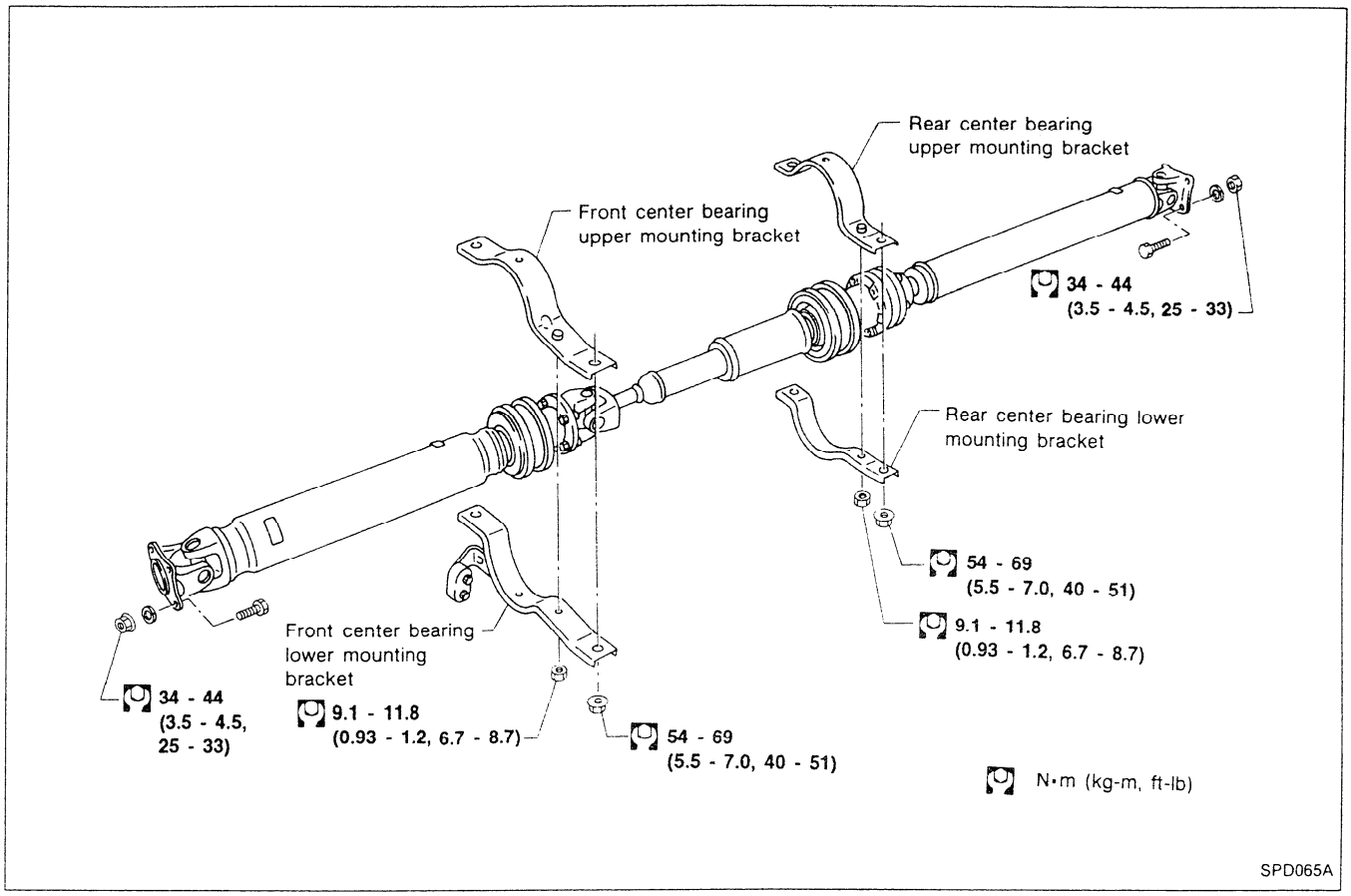
SPECIAL SERVICE TOOLS

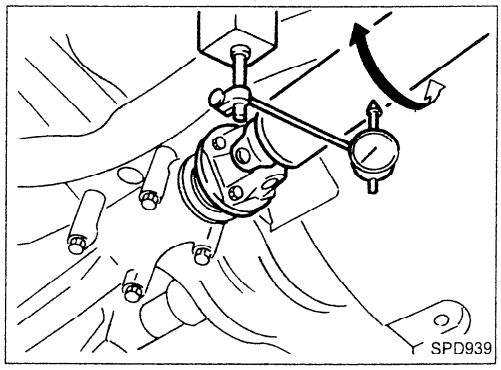
*. Special tool or commercial equivalent

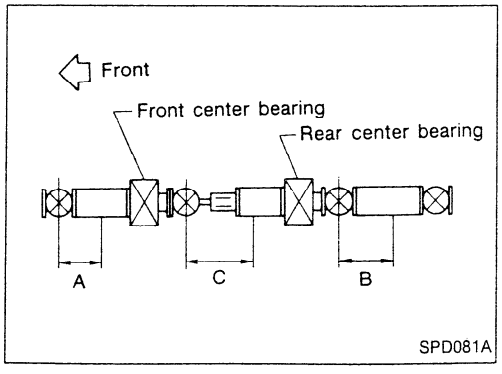
Tool number Tool name	Description	
KV38100800 Differential attachment	 **a: 152 mm (5.98 in)**	Mounting final drive (To use, make a new hole.)
ST3090S000 Drive pinion rear inner cone puller set ① ST30031000 Puller ② ST30901000 Base		Removing and installing drive pinion rear bearing inner cone
ST3306S001 Differential side bearing puller set ① ST33051001 Body ② ST33061000 Adapter		Removing and installing differential side bearing inner cone
ST30611000 Drift		Installing pinion rear bearing outer race
ST30701000* Drift		Installing pinion front bearing outer race **A: 61.5 mm (2.421 in) dia.** **B: 41 mm (1.61 in) dia.**
ST30720000 Oil seal drift		Installing front oil seal **A: 77 mm (3.03 in) dia.** **B: 55 mm (2.17 in) dia.**
ST30621000* Drift		Installing side bearing outer race and pinion rear bearing outer race **A: 79 mm (3.11 in) dia.** **B: 59 mm (2.32 in) dia.**
ST33720000 Differential side retainer guide		Installing side retainer

*: Special tool or commercial equivalent

Tool number Tool name	Description	
ST3127S000 Preload gauge ① GG91030000 Torque wrench ② HT62940000 Socket adapter ③ HT62900000 Socket adapter		Measuring pinion bearing preload and total preload
KV38101900 Master gauge 20.0 mm (0.787 in)		Selecting side bearing adjusting shim
ST32501000 Weight block		Selecting side bearing adjusting shim
ST31211000 Height gauge		Selecting pinion height adjusting washer
ST31212000 Dummy shaft		Selecting pinion height adjusting washer
ST31851000 Dummy shaft spacer		Installing dummy shaft without excessive play
ST31214000 Collar		Selecting pinion height adjusting washer
ST31213000* Stopper		Adjusting drive pinion bearing preload







On-vehicle Service

PROPELLER SHAFT VIBRATION

If vibration is present at high speed, inspect propeller shaft runout first.

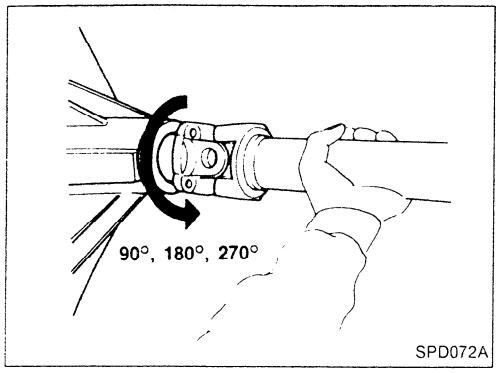
1. Raise rear wheels.
2. Measure propeller shaft runout at indicated points by rotating final drive companion flange with hands.

Runout limit: 0.6 mm (0.024 in)

Propeller shaft runout measuring points:

Distance "A"
GA16DS: 222.5 mm (8.76 in)
SR20DET: 234 mm (9.21 in)
Distance "B"
GA16DS: 317.5 mm (12.50 in)
SR20DET: 315 mm (12.40 in)
Distance "C"
GA16DS: 281 mm (11.06 in)
SR20DET: 272.5 mm (10.73 in)

On-vehicle Service (Cont'd)

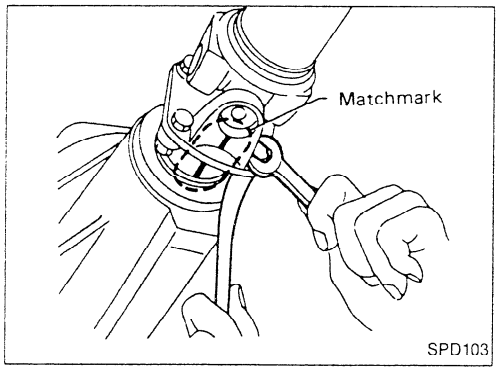


3. If runout exceeds specifications, disconnect propeller shaf at final drive companion flange; then rotate companior flange 90, 180 and 270 degrees and reconnect propelle shaft.
   Runout limit: 0.6 mm (0.024 in)
4. Check runout again. If runout still exceeds specifications replace propeller shaft assembly.
5. Perform road test.

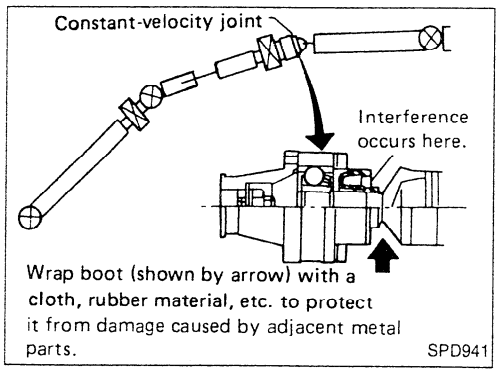
APPEARANCE CHECK

- Inspect propeller shaft tube surface for dents or cracks. If damaged, replace propeller shaft assembly.
- If center bearing is noisy or damaged, replace center bearing.

Removal and Installation

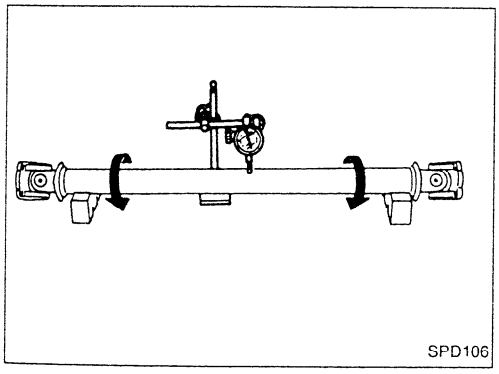


- Put matchmarks on flanges and separate propeller shaft from final drive.



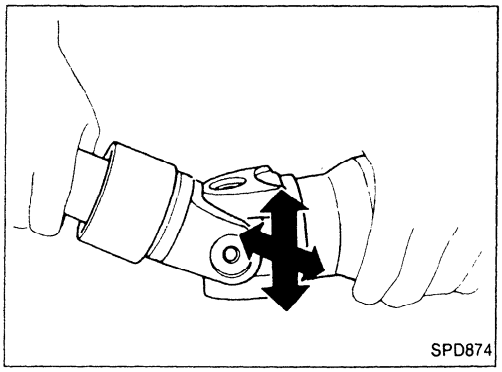
- Before removing/installing propeller shaft or moving it from one place to another, wrap boot located at constant-velocity joint with a cloth or rubber material to protect it against damage, as shown in figure at left.

Inspection



- Inspect propeller shaft runout. If runout exceeds specifications, replace propeller shaft assembly.
  Runout limit: 0.6 mm (0.024 in)

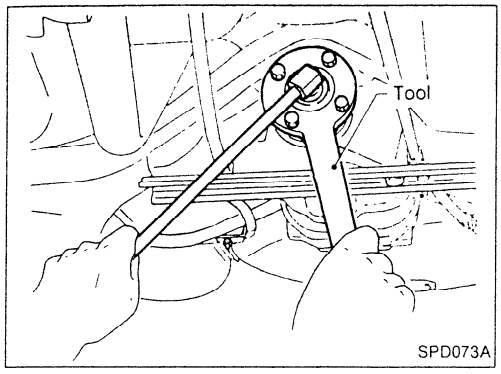
Inspection (Cont'd)



- Inspect journal axial play. If the play exceeds specifications, replace propeller shaft assembly.

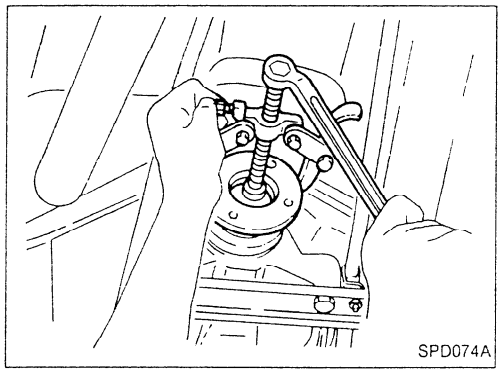
  Journal axial play:

  0 mm (0 in)

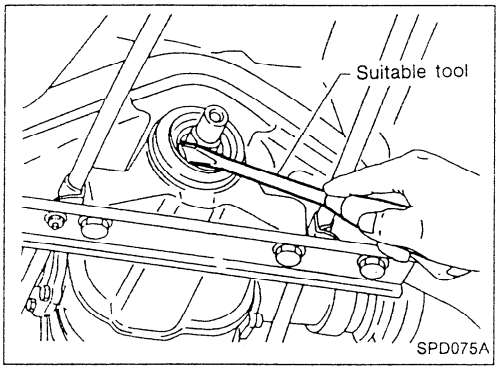


Front Oil Seal Replacement

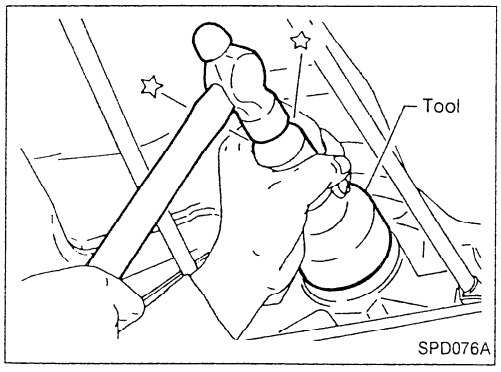
1. Remove propeller shaft.
2. Loosen drive pinion nut with Tool.



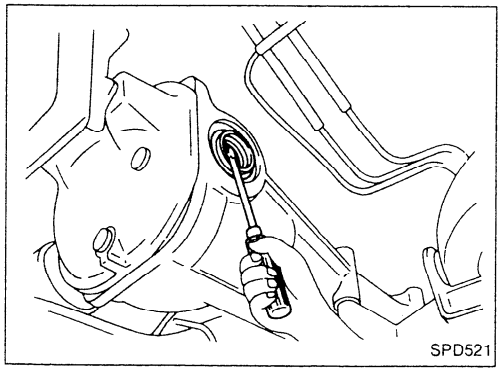
3. Remove companion flange.



4. Remove front oil seal.



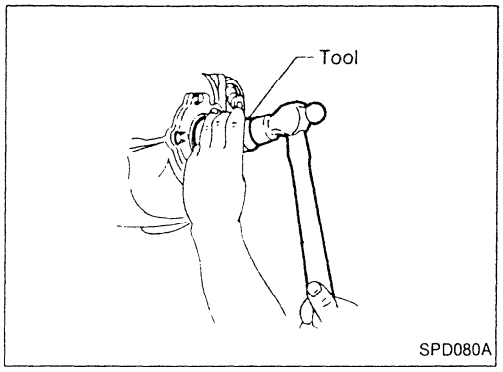
5. Apply multi-purpose grease to sealing lips of oil seal. Press front oil seal into carrier.
6. Install companion flange and drive pinion nut.
7. Install propeller shaft.



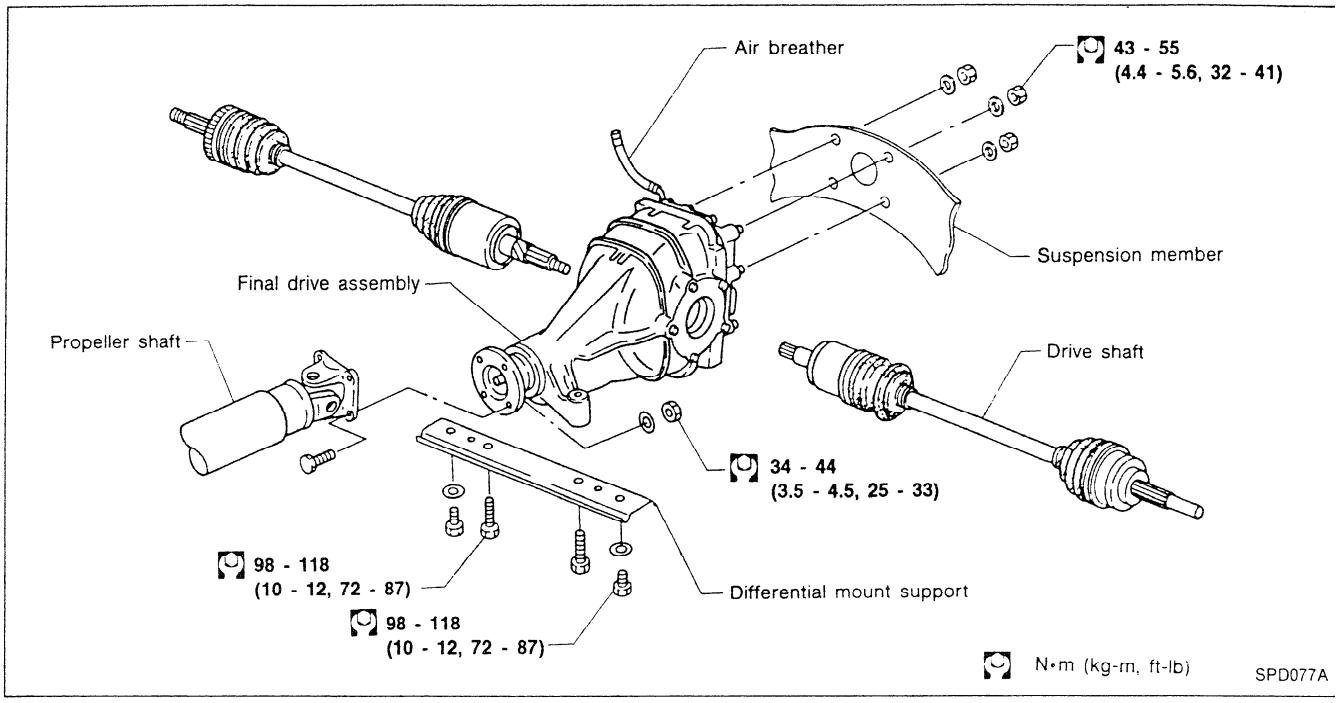
Side Oil Seal Replacement

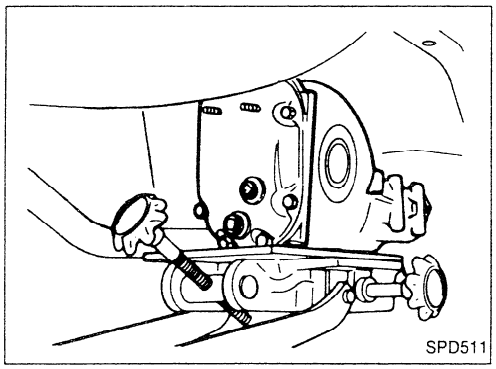
1. Remove drive shafts.
   Refer to RA section.
2. Remove oil seal.

Side Oil Seal Replacement (Cont'd)



3. Apply multi-purpose grease to sealing lips of oil seal. Press-fit oil seal into carrier with Tool.
   Tool number: ST33400001
4. Install drive shafts.



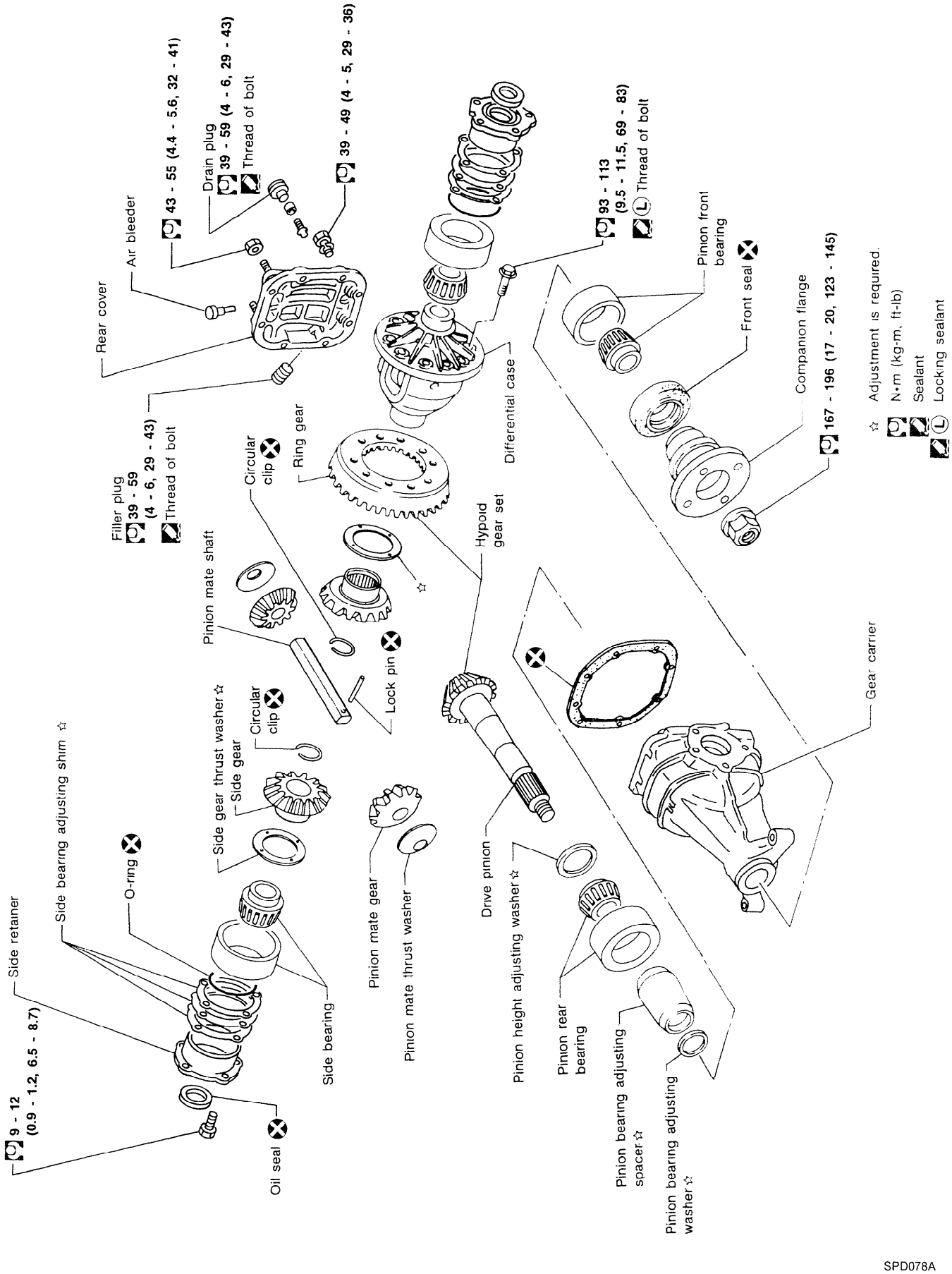


Removal

- Remove propeller shaft.
- Remove drive shafts.
  Refer to RA section.
- Disconnect breather hose from final drive side in advance.
- Support final drive with jack and disconnect differential mounting bracket from final drive.
- Disconnect final drive from mounting member.
- Remove final drive by moving it slightly forward and down.
- Remove final drive mounting member from body.

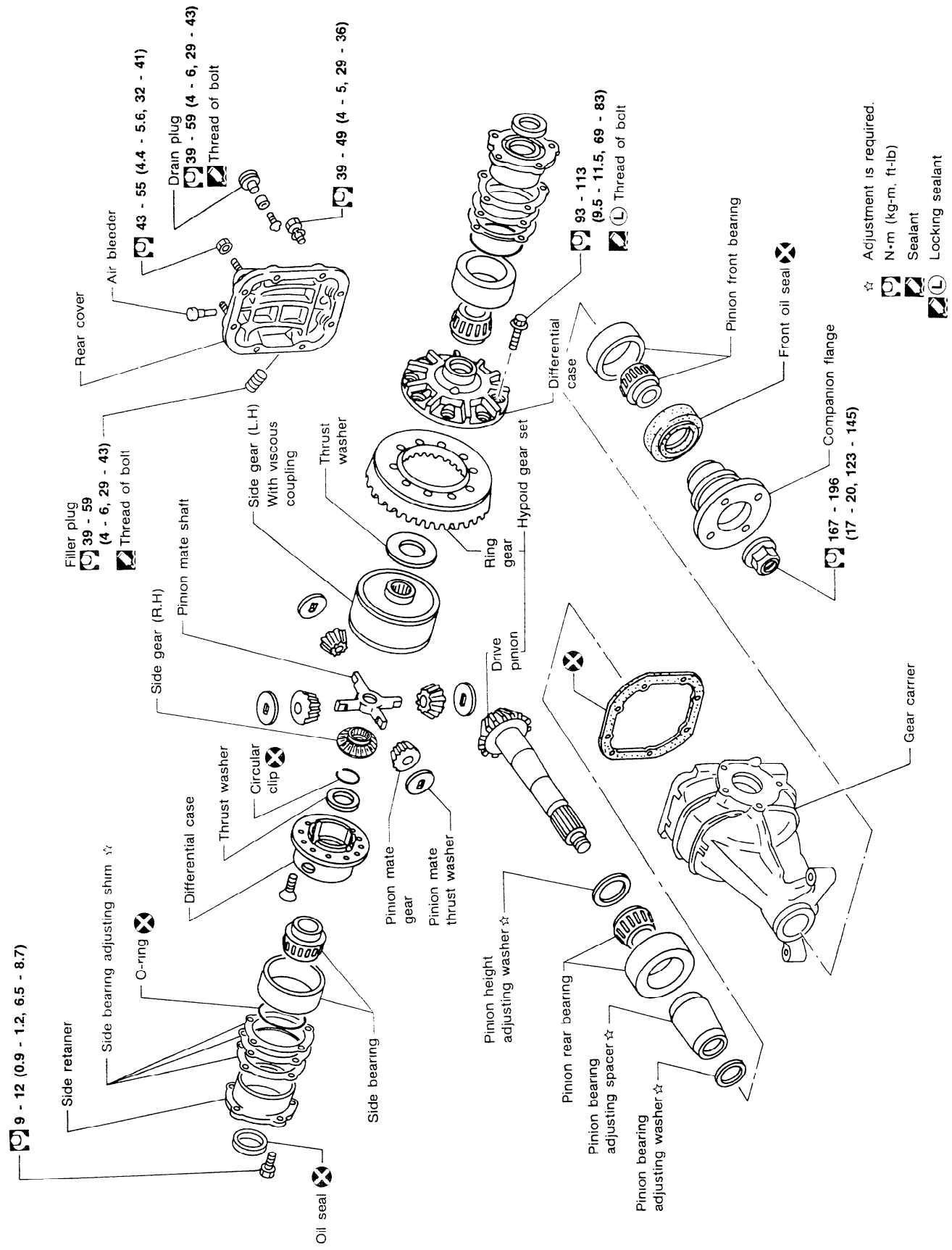
CAUTION:

Be careful not to damage spline, joint and front oil seal when removing propeller shaft.

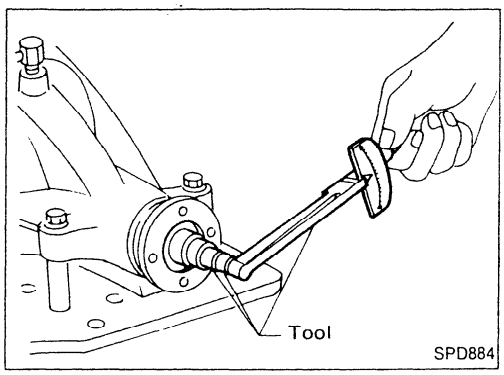

Rear cover
Air bleeder
43 - 55 (4.4 - 5.6, 32 - 41)
Drain plug
39 - 59 (4 - 6, 29 - 43)
Thread of bolt
39 - 49 (4 - 5, 29 - 36)
Filler plug
39 - 59 (4 - 6, 29 - 43)
Thread of bolt
Circular clip
Ring gear
Differential case
93 - 113 (9.5 - 11.5, 69 - 83)
Thread of bolt
Pinion front bearing
Front seal
Companion flange
167 - 196 (17 - 20, 123 - 145)
Pinion mate shaft
Hypoid gear set
Lock pin
Side gear thrust washer ☆
Side gear
Circular clip
Side bearing adjusting shim ☆
O-ring
Side retainer
9 - 12 (0.9 - 1.2, 6.5 - 8.7)
Oil seal
Side bearing
Pinion mate gear
Pinion mate thrust washer
Drive pinion
Pinion height adjusting washer ☆
Pinion rear bearing
Pinion bearing adjusting spacer ☆
Pinion bearing adjusting washer ☆
Gear carrier
☆ Adjustment is required.
N•m (kg-m, ft-lb)
Sealant
Locking sealant

SPD078A

R180V



SPD079A

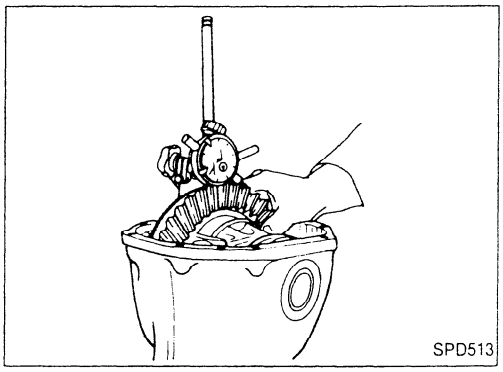


Pre-inspection

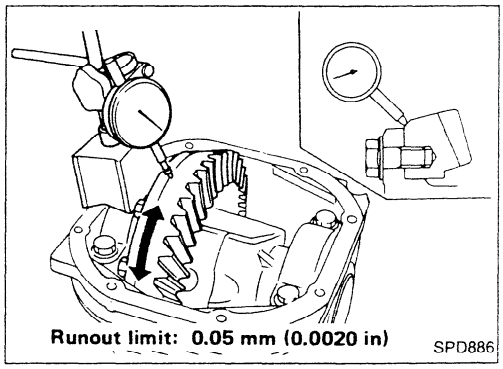
Before disassembling final drive, perform the following inspection.

- Total preload

1) Turn drive pinion in both directions several times to set bearing rollers.
2) Check total preload with Tool.
   Tool number: ST3127S000
   Total preload:
   1.0 - 1.6 N·m
   (10 - 16 kg-cm, 8.7 - 13.9 in-lb)



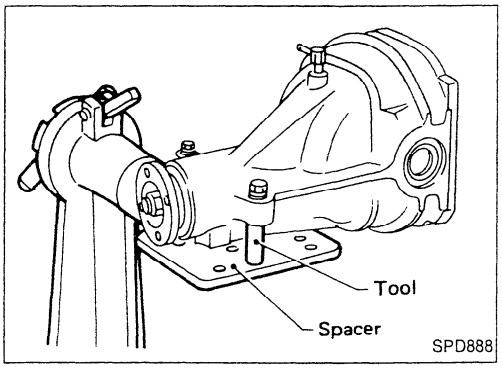
- Ring gear backlash
  Check ring gear backlash with a dial indicator at several points.
  Ring gear backlash:
  0.10 - 0.20 mm (0.0039 - 0.0079 in)



- Ring gear runout
  Check runout of ring gear with a dial indicator.
  Runout limit:
  0.05 mm (0.0020 in)
- Tooth contact
  Check tooth contact. (Refer to Adjustment.)

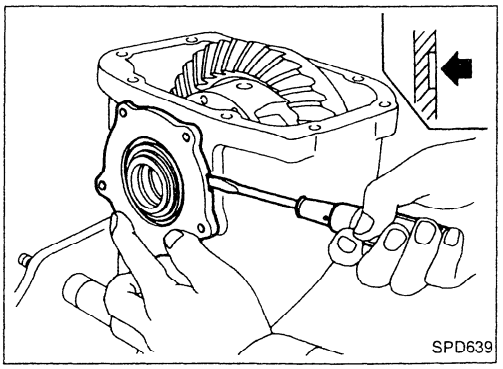
Differential Carrier

1. Using three 12 mm (0.5 in) spacers, mount final drive on Tool.
   Tool number: KV38100800

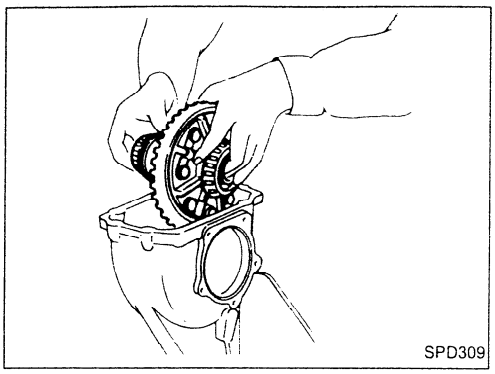


2. Mark side retainers for identification. Remove side retainers.

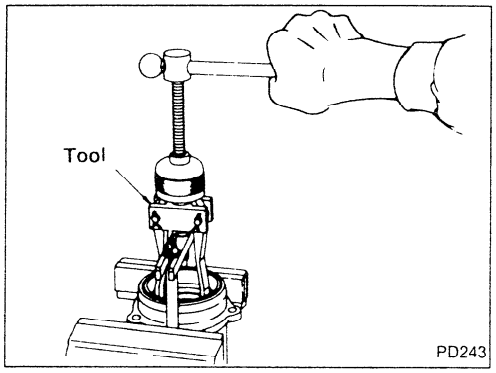
Be careful not to confuse right and left side retainers and shims.



Differential Carrier (Cont'd)



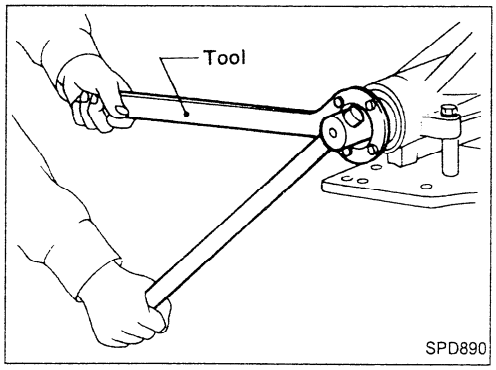
3. Extract differential case from final drive housing.



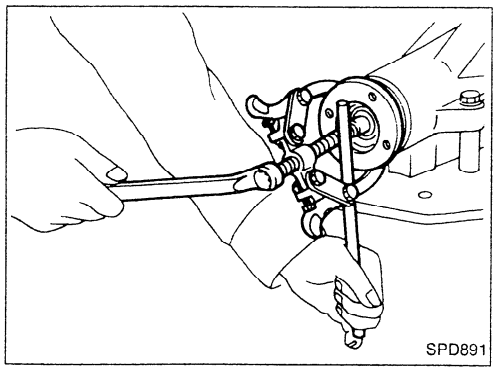
4. Remove side outer races.
   Tool number: ST33290001

Be careful to keep the side bearing outer races together with their respective inner cones — do not mix them up.

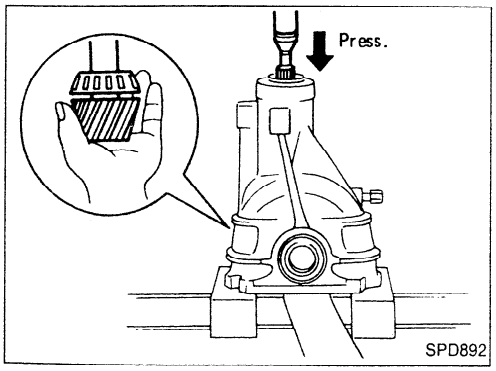
5. Remove side oil seal.



6. Loosen drive pinion nut.

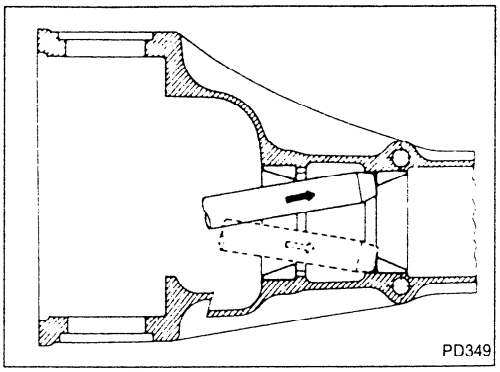


7. Remove companion flange with puller.

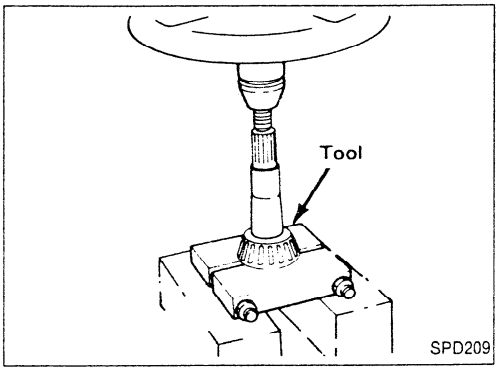


8. Take out drive pinion together with pinion rear bearing inner cone, drive pinion bearing spacer and pinion bearing adjusting washer.
9. Remove front oil seal.

Differential Carrier (Cont'd)

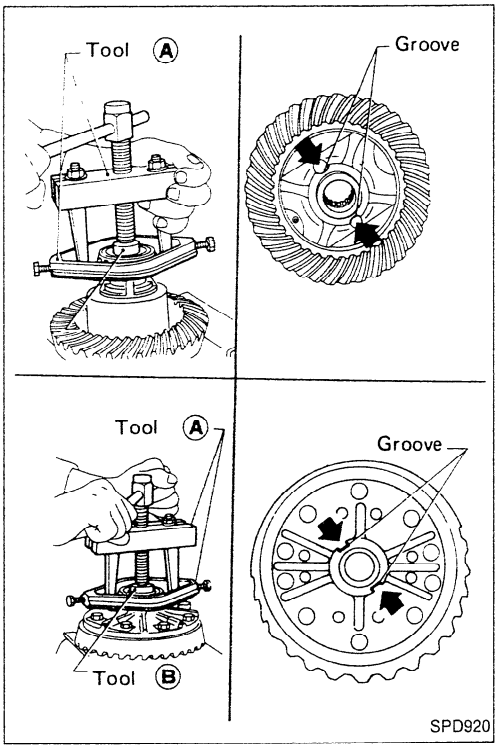


10. Remove pinion front and rear bearing outer races with brass drift.



11. Remove pinion rear bearing inner cone and drive pinion adjusting washer.
    Tool number: ST30031000

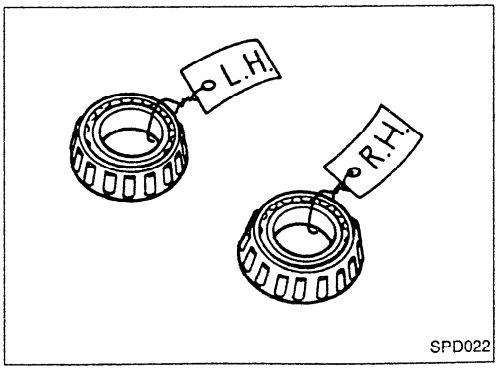
Differential Case



1. Remove side bearing inner cones.

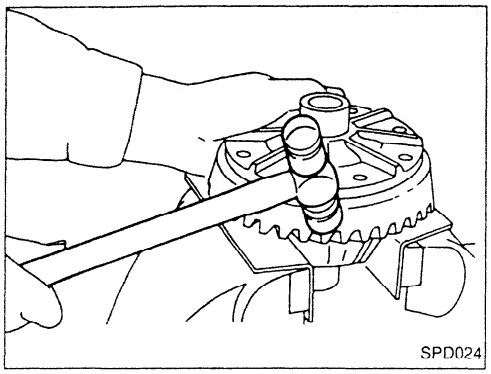
To prevent damage to bearing, engage puller jaws in grooves.

Tool number:
Ⓐ ST33051001
Ⓑ ST33061000



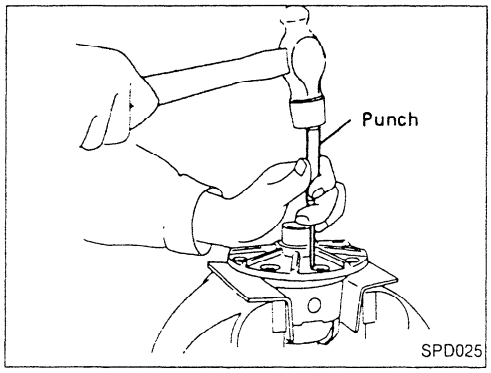
Be careful not to confuse the right and left hand parts.

Differential Case (Cont'd)



2. Loosen ring gear bolts in a criss-cross fashion.
3. Tap ring gear off differential case with a soft hammer.

Tap evenly all around to keep ring gear from binding.

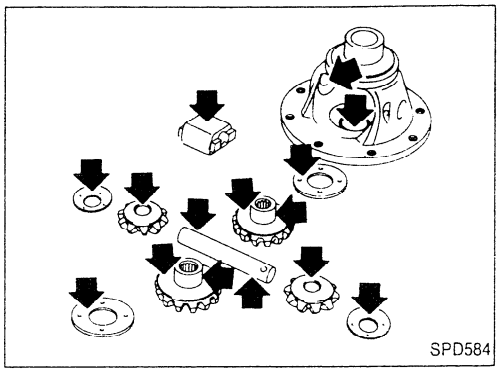


4. Drive out pinion mate shaft lock pin with Tool from ring gear side.

Lock pin is caulked at pin hole mouth on differential case.

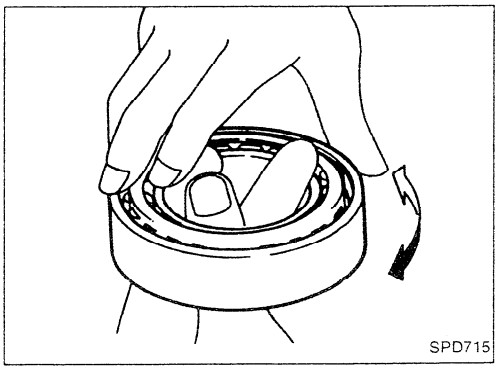
Ring Gear and Drive Pinion

Check gear teeth for scoring, cracks or chipping.
If any damaged part is evident, replace ring gear and drive pinion as a set (hypoid gear set).


SPD584

Differential Case Assembly

Check mating surfaces of differential case, side gears, pinion mate gears, pinion mate shaft, thrust block and thrust washers.

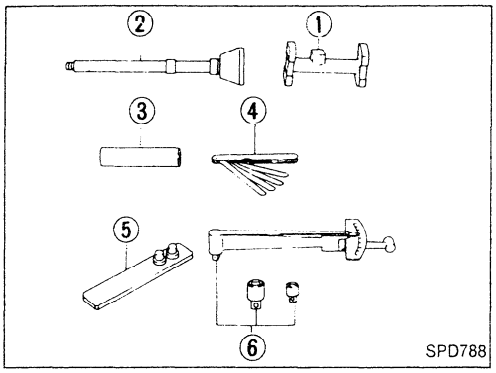

SPD715

Bearing

1. Thoroughly clean bearing.
2. Check bearing for wear, scratches, pitting or flaking.
   Check tapered roller bearing for smooth rotation. If damaged, replace outer race and inner cone as a set.

For quiet and reliable final drive operation, the following five adjustments must be made correctly:

1. Side bearing preload
2. Pinion gear height
3. Pinion bearing preload (Refer to ASSEMBLY.)
4. Ring gear-to-pinion backlash (Refer to ASSEMBLY.)
5. Ring and pinion gear tooth contact pattern

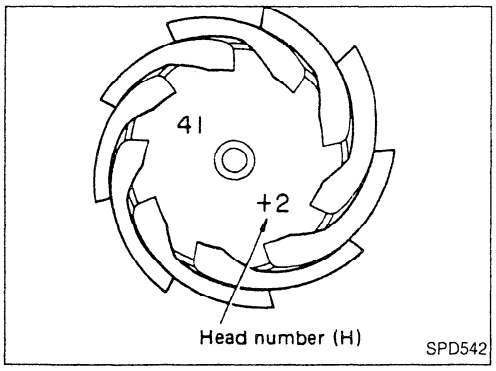


Drive Pinion Height

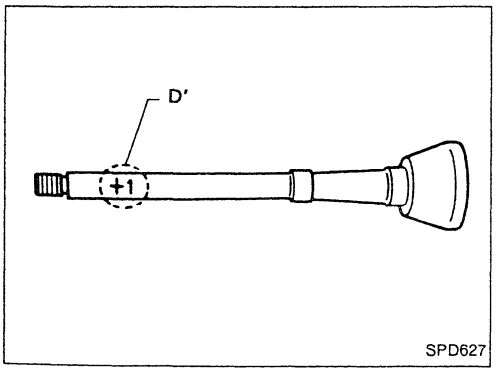
1. First prepare Tools for pinion height adjustment.
   - ① Height gauge (ST31211000)
   - ② Dummy shaft (ST31212000)
   - ③ Collar (ST31214000)
   - ④ Feeler gauge
   - ⑤ Stopper (ST31213000)
   - ⑥ Preload gauge (ST3127S000)

2. To simplify the job, make a chart, like the one below, to organize your calculations.

LETTERS	HUNDREDTHS OF A MILLIMETER
H: Head number	
D': Figure marked on dummy shaft	
S: Figure marked on height gauge	
N: Measuring clearance	
W: Thickness of washer used	

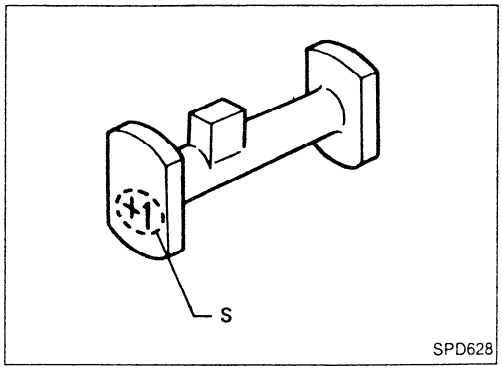


3. Write the following numbers down in the chart.
   H: Head number

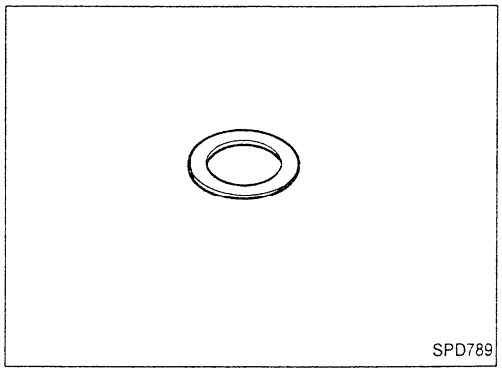


D': Figure marked on dummy shaft

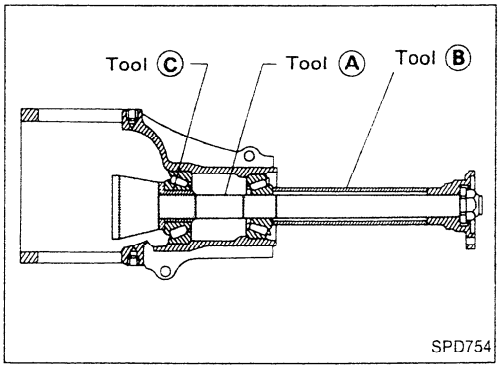
Drive Pinion Height (Cont'd)



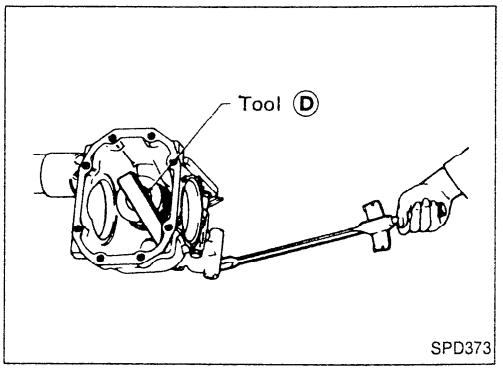
S: Figure marked on height gauge

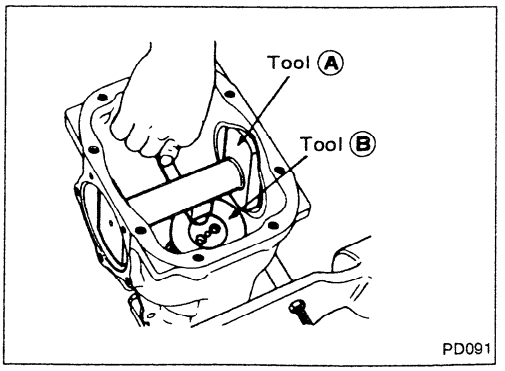


W: Thickness of washer used



4. Set Tool (Dummy shaft) as shown at left.
   Tool number:
   - Ⓐ **Dummy shaft (ST31212000)**
   - Ⓑ **Collar (ST31214000)**
   - Ⓒ **Dummy shaft spacer (ST31851000)**
   - Ⓓ **Stopper (ST31213000)**





5. Attach Tool (Height gauge) to gear carrier, and measure the clearance between the height gauge tip and the dummy shaft face.
   Tool number:
   - Ⓐ **Height gauge (ST31211000)**
   - Ⓑ **Dummy shaft (ST31212000)**

Drive Pinion Height (Cont'd)

6. Substitute these values into the equation to calculate the thickness of the washer.

If values signifying H, D' and S are not given, regard them as zero and calculate.

T: Thickness of washer

$$T = W + N + [(D' - H - S) \times 0.01] - 0.20$$

Example:

W = 3.09
N = 0.33
H = +2
D' = +1
S = +1

$$T = W + N + [(D' - H - S) \times 0.01] - 0.20$$

(1) D' ..... (+1)
− H ..... − (+2)

− 1

(2) − S ..... − (+1)

− 2

(3) − 2
× 0.01

− 0.02

(4) W 3.09
+ N ..... + 0.33

3.42

(5) + [− 0.02]

3.40

(6) − 0.20

3.20

7. Select the proper washer (Refer to S.D.S.).

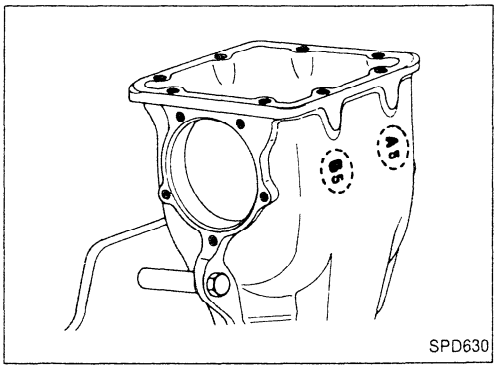
If you cannot find the desired thickness of washer, use washer so that thickness is the closest to the calculated value.

Example:
Calculated value ... T = 3.20 mm
Used washer ... T = 3.21 mm

Side Bearing Preload

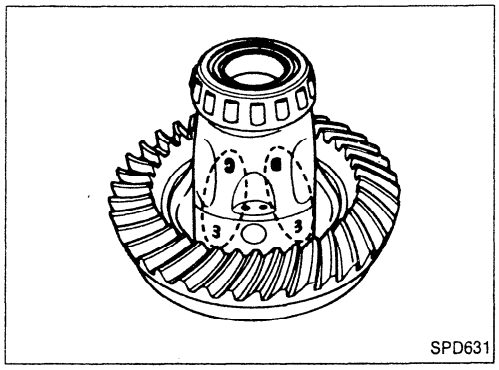
1. To simplify the job, make a chart like the one below to organize your calculation.

LETTERS	HUNDREDTHS OF A MILLIMETER
A - Left housing	
B - Right housing	
C - Differential case	
D - Differential case	
E - Left side bearing	
F - Right side bearing	
G_1 - Left side retainer	
G_2 - Right side retainer	



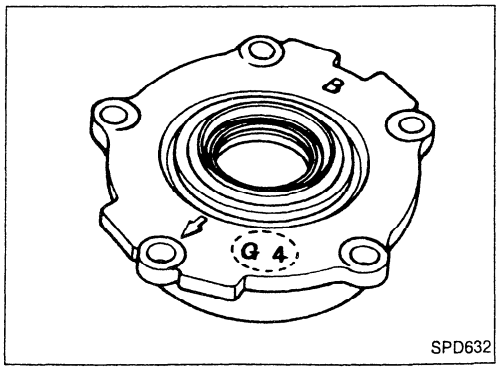
SPD630

2. Write the following numbers down in the chart.
   A & B: Figures marked on gear carrier



SPD631

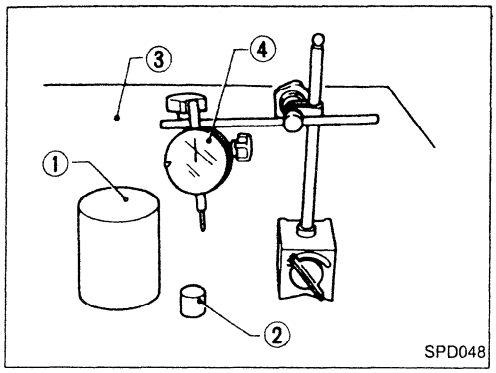
C & D: Figures marked on differential case



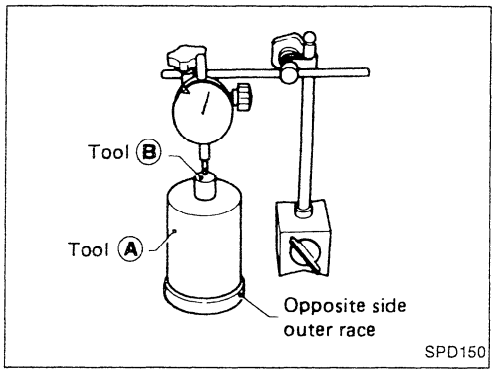
SPD632

G_1 & G_2: Figures marked on side retainer

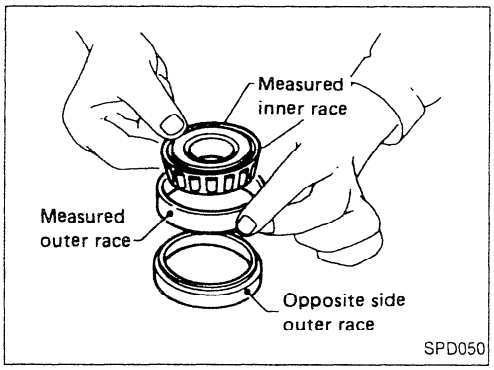
Side Bearing Preload (Cont'd)



3. Measure how far under standard thickness [20 mm (0.79 in the side bearings are.
   It will require tools shown at left.
   ① Weight block (ST32501000)
   ② Master gauge (KV38101900)
   ③ Base plate
   ④ Dial indicator

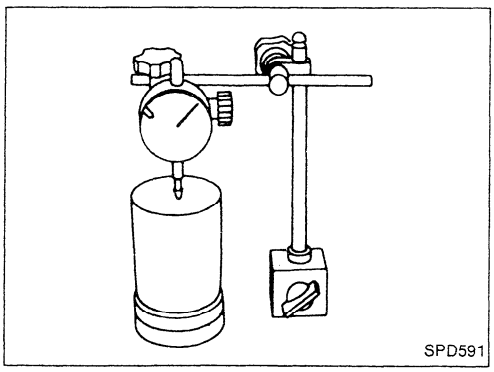


4. Place the outer race of the opposite side bearing to b measured.
5. Place a weight block on the outer race, and a master gaug on that block.
   Tool number:
   (A) ST32501000
   (B) KV38101900
6. Adjust dial indicator scale to zero.
7. Carefully slide master gauge and weight block out fro under dial indicator.

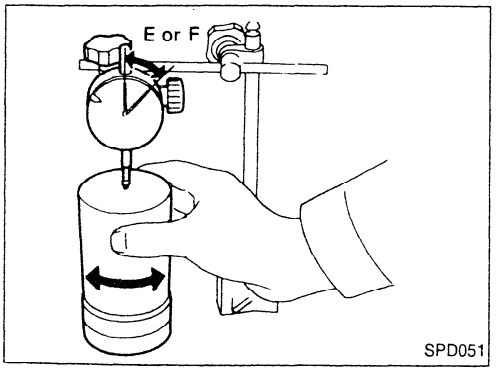


8. Lubricate side bearing and place the bearing outer rac and inner cone to be measured on the opposite side oute race.

If the bearing assembly is placed on the base plate, the bearin width cannot be accurately determined due to its cage being i contact with base plate.



9. Place weight block on side bearing.
10. Slide dial indicator on weight block.



11. Turn weight block a few times to ensure that bearing i properly seated.
12. Read dial indicator.
    Normal indication:
    0.10 - 0.30 mm (0.0039 - 0.0118 in)

If the needle fluctuates erratically then bearing is either dirty o damaged and should be cleaned or replaced.

Side Bearing Preload (Cont'd)

13. Measure both bearings in the same way and write the left side bearing measurement next to "E" and the right side bearing measurement next to "F".
14. Substitute these values into the equation to calculate the thickness of the shim.

If values signifying A, B, C, D, G_1 and G_2 are not given, regard them as zero and calculate.

Left side:

$$T_1 = (A + C + G_1 - D) \times 0.01 + 0.76 - E$$

Right side:

$$T_2 = (B + D + G_2) \times 0.01 + 0.76 - F$$

Side Bearing Preload (Cont'd)

Example:

A = 5	E = 0.11
B = 5	F = 0.15
C = 3	G_1 = 4
D = 3	G_2 = 1

Left side:

$T_1 = (A + C + G_1 - D) \times 0.01 + 0.76 - E$

$= (5 + 3 + 4 - 3) \times 0.01 + 0.76 - 0.11$

(1)

A	5
+ C	+3
	8
+ G_1	+4
	12
− D	−3
	9

(2)

	9
	× 0.01
	0.09

(3)

	0.09
	+ 0.76
	0.85

(4)

	0.85
− E	− 0.11
	0.74

$\therefore T_1 = 0.74$ mm

Right side:

$T_2 = (B + D + G_2) \times 0.01 + 0.76 - F$

$= (5 + 3 + 1) \times 0.01 + 0.76 - 0.15$

(1)

B	.....
+ D	+
+ G_2	..... +

(2)

	× 0.0
	0.0

(3)

	0.0
	+ 0.7
	0.8

(4)

	0.8
	− 0.1
	0.7

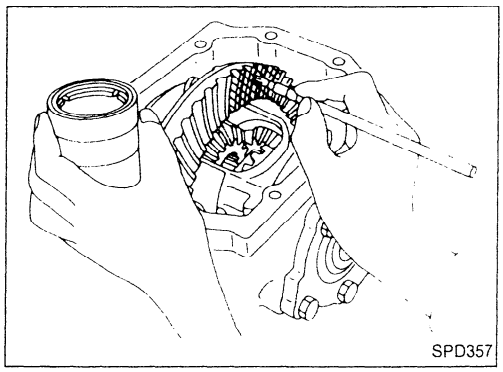
$\therefore T_2 = 0.70$ mm

15. Select the proper shims (Refer to S.D.S.).

If you cannot find the desired thickness of shims, use shims so that the total thickness is the closest to the calculated value.

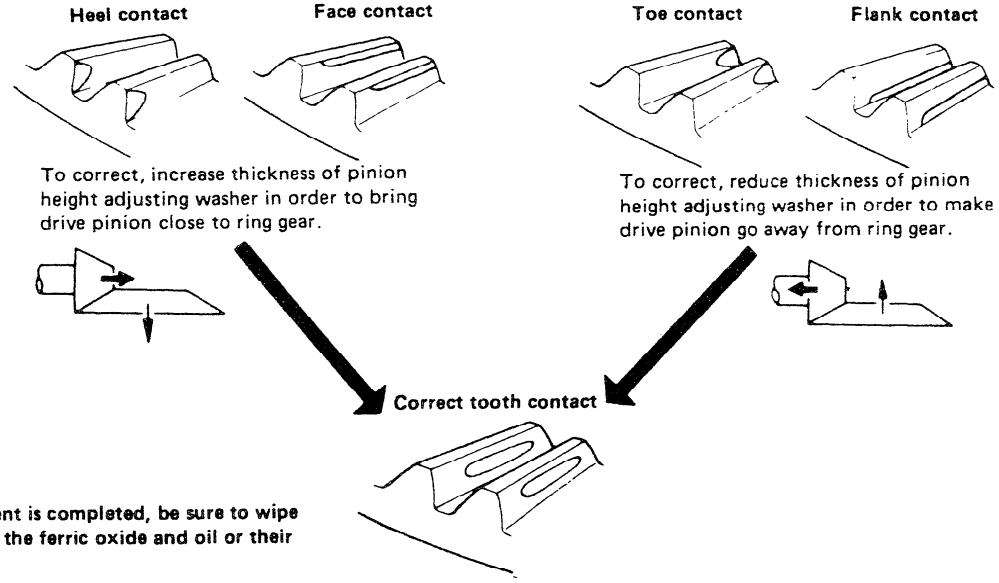
Tooth Contact

Checking of gear tooth contact pattern is necessary to verify correct relationship between ring gear and drive pinion.
Hypoid gear sets which are not positioned properly in relation to one another may be noisy, or have short lift, or both. With a pattern check, the most desirable contact for low noise level and long life can be assured.


SPD357

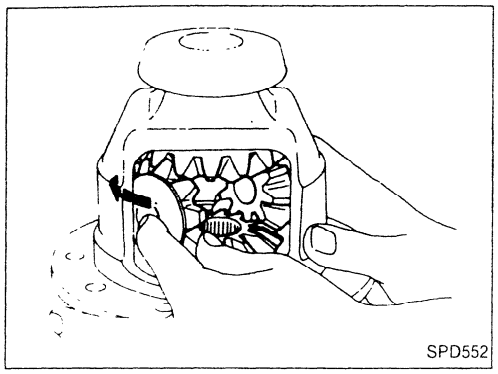
1. Thoroughly clean ring gear and drive pinion teeth.
2. Sparingly apply a mixture of powdered ferric oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.
3. Hold companion flange steady by hand and rotate the ring gear in both directions.

Usually the pattern will be correct if you have calculated the shims correctly and the backlash is correct.
However, in rare cases you may have to use trial-and-error processes until you get a good tooth contact pattern.
The tooth pattern is the best indication of how well a differential has been set up.



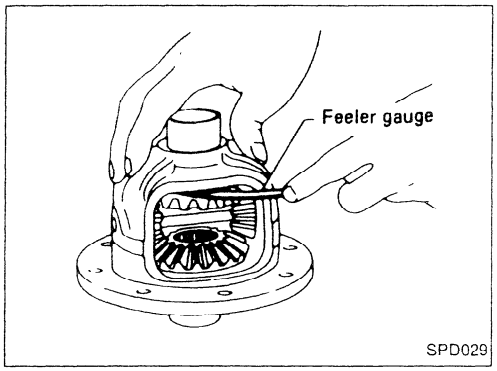
When adjustment is completed, be sure to wipe off completely the ferric oxide and oil or their equivalent.

SPD007


SPD552

Differential Case

1. Install side gears, pinion mate gears and thrust wash into differential case.

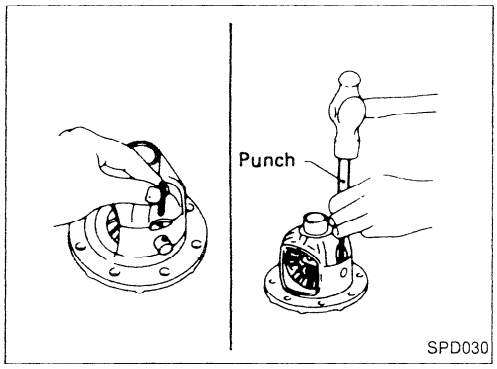


SPD029

2. Fit pinion mate shaft to differential case so that it meets lo pin holes.
3. Adjust backlash between side gear and pinion mate gear selecting side gear thrust washer. (Refer to S.D.S.)

Backlash between side gear and pinion mate gear (Clearance between side gear thrust washer and differential case):

0.10 - 0.20 mm (0.0039 - 0.0079 in)

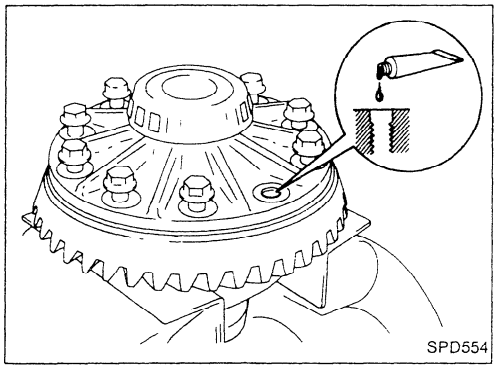


SPD030

4. Install pinion mate shaft lock pin with a punch.

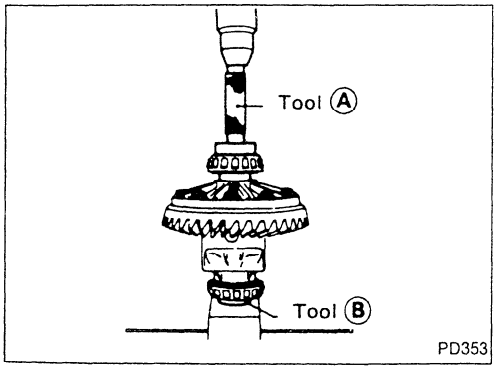
Make sure lock pin is flush with case.

5. Apply gear oil to gear tooth surfaces and thrust surfac and check to see they turn properly.


SPD554

6. Place differential case on ring gear.
7. Apply locking sealant to ring gear bolts, and install ther

Tighten bolts in a criss-cross fashion, lightly tapping bolt he with a hammer.

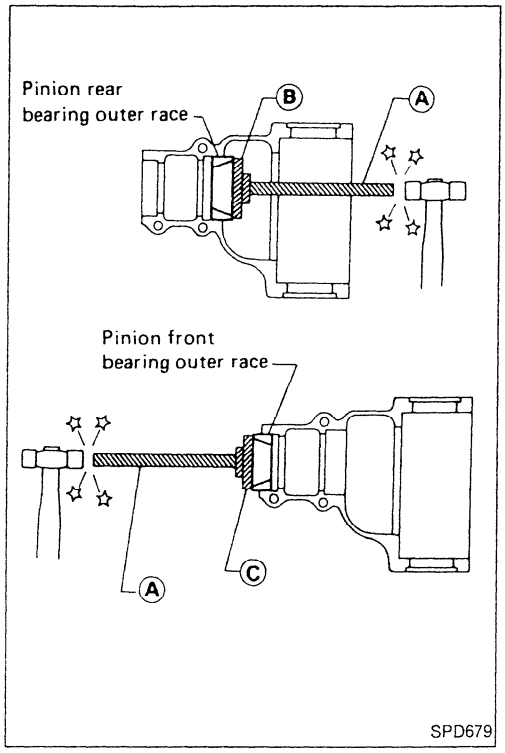


PD353

8. Select side bearing adjusting shims.
   Refer to ADJUSTMENT.
9. Install the shims behind each bearing and press on si bearing inner cones with Tool.

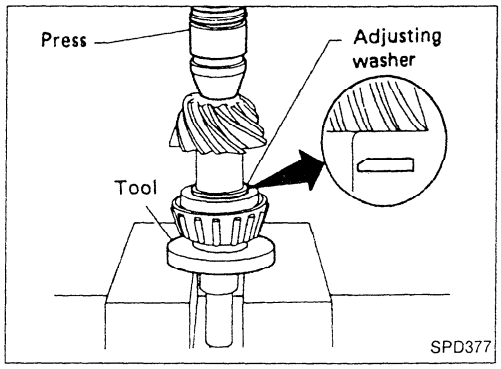
Tool number:

Ⓐ ST33230000
Ⓑ ST33061000

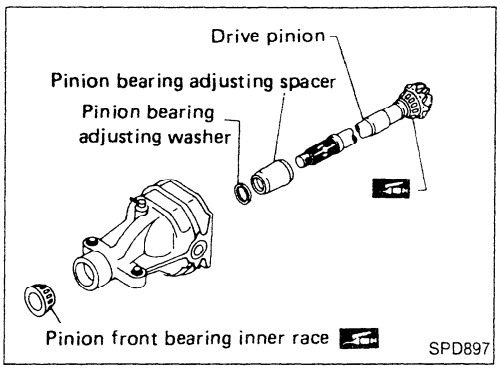


Differential Carrier

1. Press-fit front and rear bearing outer races with Tools.
   Tool number:
   - Ⓐ **ST30611000**
   - Ⓑ **ST30621000**
   - Ⓒ **ST30701000**

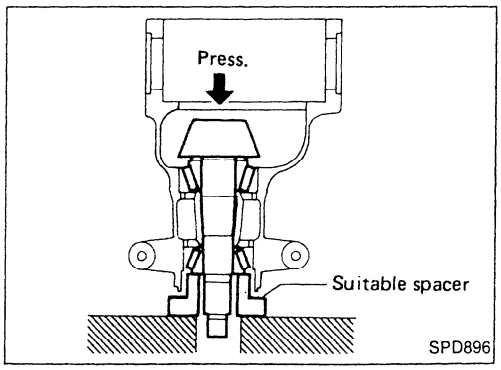


2. Select pinion height adjusting washer, referring to ADJUSTMENT.
3. Install pinion height adjusting washer in drive pinion, and press-fit rear bearing inner cone in it with a press and Tool.
   Tool number:
   ST30901000

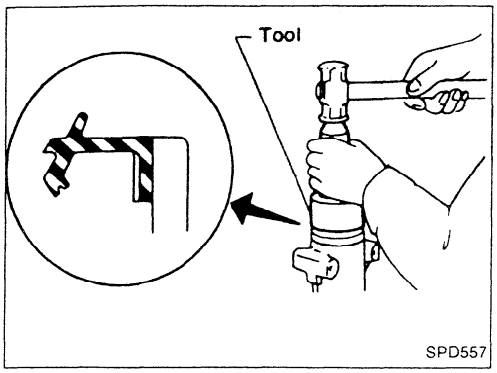


4. Set drive pinion assembly (as shown at left) in differential carrier and install drive pinion, using press and suitable tool.

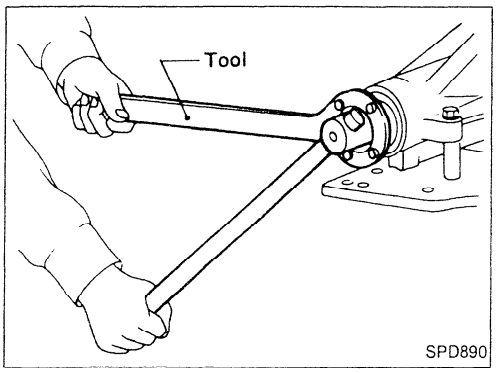
Stop when drive pinion touches bearing.



Differential Carrier (Cont'd)

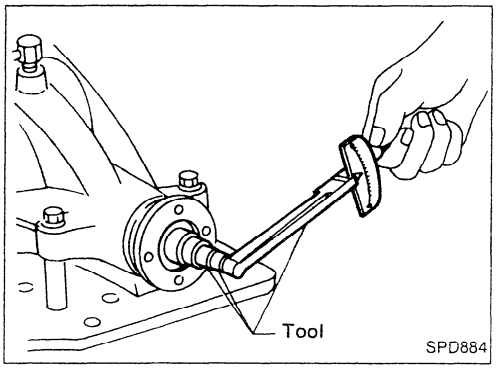


5. Apply multi-purpose grease to cavity at sealing lips of c seal.
   Install front oil seal.
   Tool number: ST30720000



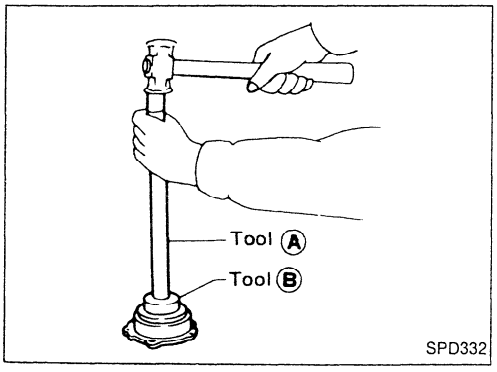
6. Install companion flange, and tighten pinion nut to specifie torque.

Ascertain that threaded portion of drive pinion and pinion n are free from oil or grease.

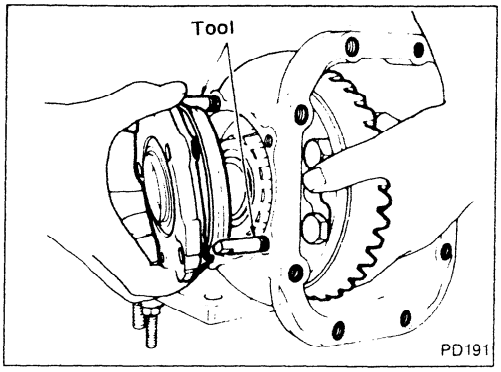


7. Turn drive pinion in both directions several times, an measure pinion bearing preload.
   Tool number: ST3127S000
   Pinion bearing preload (With oil seal):
   1.1 - 1.7 N·m (11 - 17 kg-cm, 9.5 - 14.8 in-lb)

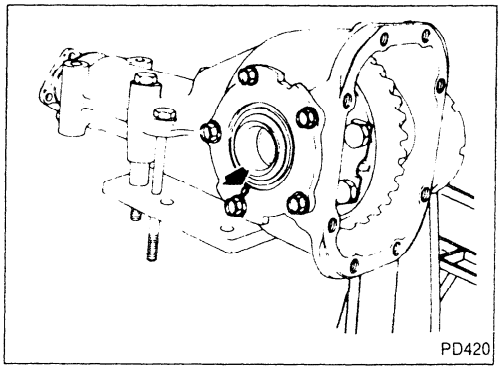
When pinion bearing preload is outside the specification replace pinion bearing adjusting washer and spacer with different thickness.



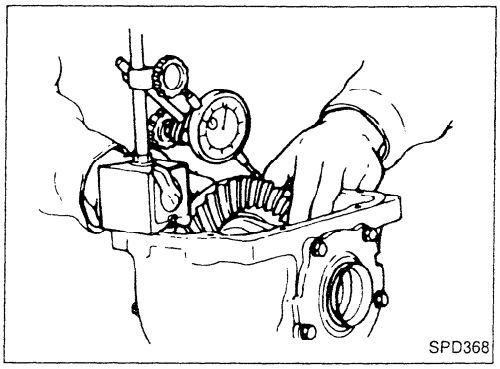
8. Select side retainer adjusting washer.
   Refer to Adjustment.
9. Press-fit side bearing outer race into side retainer.
   Tool number:
   Ⓐ ST30611000
   Ⓑ ST30621000



10. Install side oil seal.
11. Install differential case assembly.
12. Place side retainer adjusting shims and O-ring on side retainer, and install them in gear carrier.
    Tool number: ST33720000

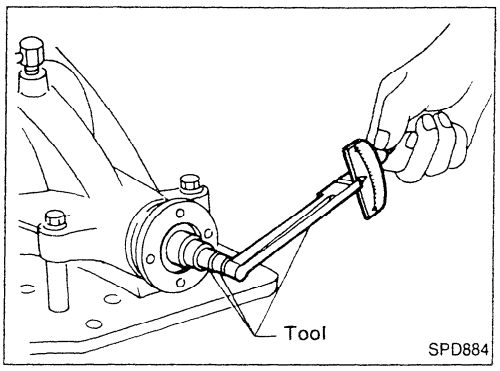


- **Align mark on side retainer and gear carrier.**



13. Measure ring gear-to-drive pinion backlash with a dial indicator.
    Ring gear-to-drive pinion backlash:
    0.10 - 0.20 mm (0.0039 - 0.0079 in)
- If backlash is too small, decrease thickness of right shim and increase thickness of left shim by the same amount.
- If backlash is too great, reverse the above procedure.

Never change the total amount of shims as it will change the bearing preload.



14. Check total preload with Tool.

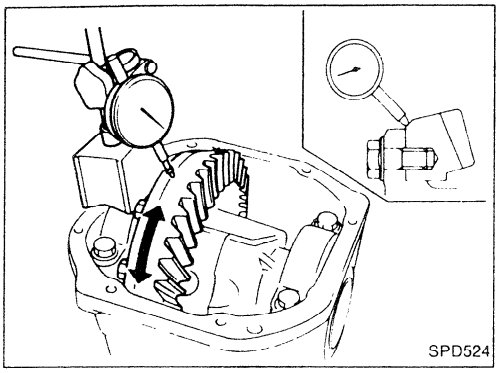
When checking preload, turn drive pinion in both directions several times to set bearing rollers.
Tool number: ST3127S000
Total preload:
1.0 - 1.6 N·m (10 - 16 kg-cm, 8.7 - 13.9 in-lb)

- If preload is too great, add the same amount of shims from each side.
- If preload is too small, remove the same amount of shims to each side.

Never add or remove a different number of shims for each side as it will change ring gear-to-drive pinion backlash.

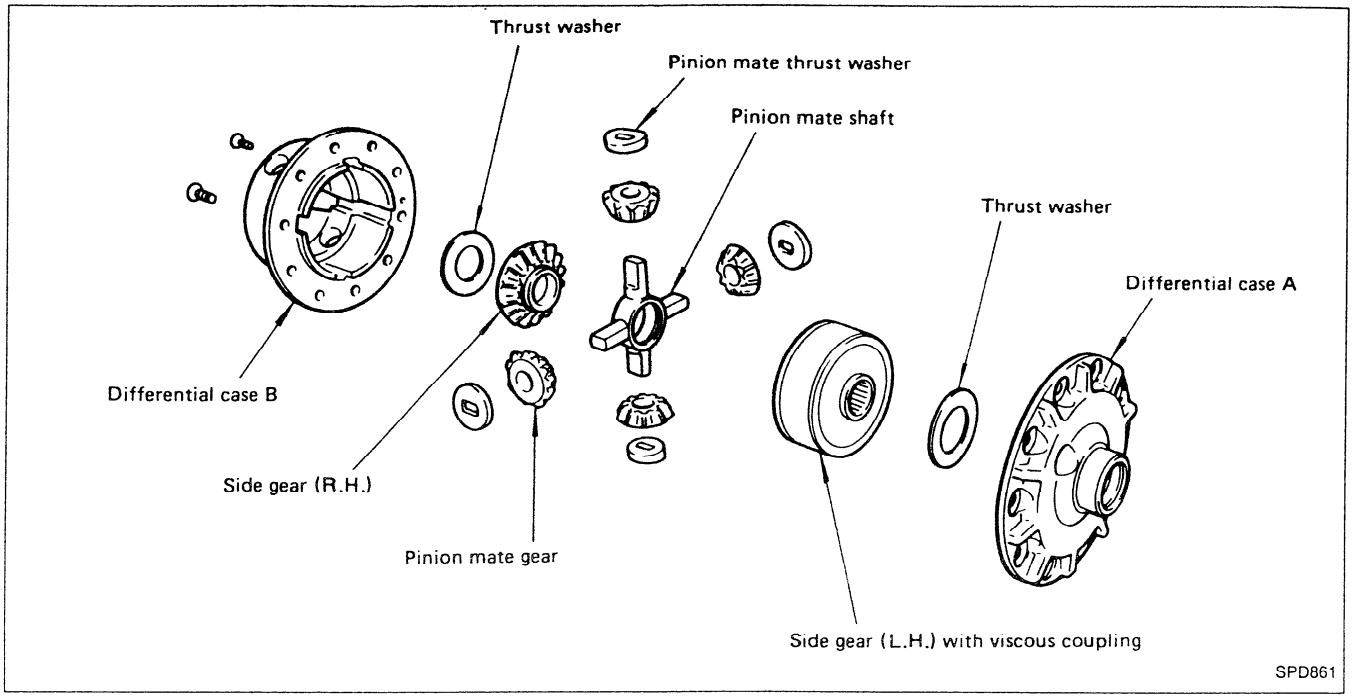
15. Recheck ring gear-to-drive pinion backlash because an increase or decrease in thickness of shims will cause change of ring gear-to-drive pinion backlash.

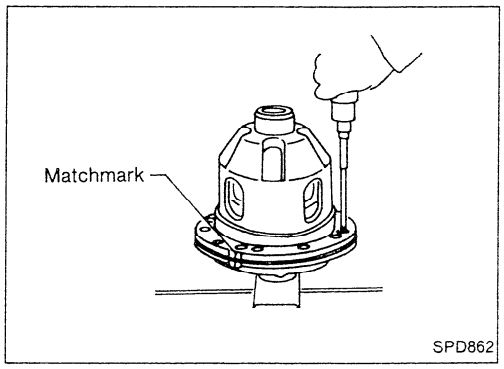
Differential Carrier (Cont'd)



16. Check ring gear runout with a dial indicator.
    Runout limit: 0.05 mm (0.0020 in)
- If backlash varies excessively in different places, the variance may have resulted from foreign matter caught between the ring gear and the differential case.
- If the backlash varies greatly when the ring gear runout is within the specified range, the hypoid gear set or differential case should be replaced.

17. Check tooth contact.
    Refer to ADJUSTMENT.
18. Install rear cover and gasket.





Disassembly and Assembly

1. Loosen screws on differential cases A and B.
2. Separate differential cases A and B.

CAUTION:
Assemble differential case firmly.

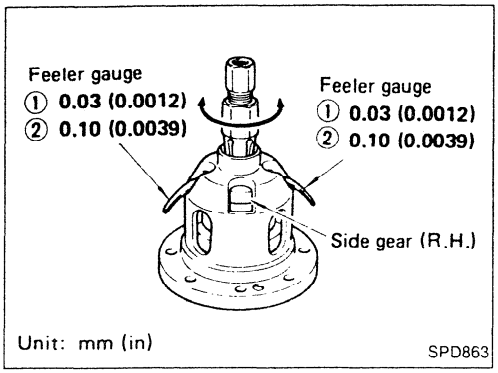
Inspection

CONTACT SURFACES

1. Clean the disassembled parts in suitable solvent and blow dry with compressed air.
2. If following surfaces are found to be burred or scratched, smooth with oil stone.

- Differential case A
- Differential case B
- Side gear
- Pinion mate gear
- Pinion mate shaft

3. Check viscous coupling for oil leakage. If necessary, replace it with new one.



Adjustment

THRUST WASHER SELECTION

Whenever side gears or pinion mate gears are replaced, select suitable thrust washers as follows:

1. Clean side gears and pinion mate gears using white gasoline.
2. Before assembling gears, apply hypoid gear oil to frictional surfaces.
3. Install the previously removed thrust washer on right side gear. On left side gear, install a suitable thrust washer. Temporarily tighten differential cases using two screws.
4. Position differential assembly so that right side gear is on the upper side. Place a 0.03 mm (0.0012 in) feeler gauge (for example) between right side gear and thrust washer.

Do not place feeler gauge at groove side of differential case.

5. Also place a 0.03 mm (0.0012 in) additional feeler gauge between right side gear and thrust washer so that it is positioned diagonal to (180° apart from) the feeler gauge described previously.
6. Rotate right side gear with a suitable tool attached to splines.
   If right side gear cannot be rotated, replace thrust washer used on left side gear with a thinner one.
7. Replace both 0.03 mm (0.0012 in) feeler gauges with 0.10 mm (0.0039 in) gauges. At this point, make sure right side gear does not rotate. If it does, replace thrust washer on left side gear with a thicker one so that right side gear does not rotate.
8. As explained in above example, select suitable thrust washers to ensure that:

a) Both side gears rotate. [0.03 mm (0.0012 in) feeler gauges are used in this case.]
b) Side gear is held stationary. [0.10 mm (0.0039 in) feeler gauges are used in this case.]
   (Refer to S.D.S.)

Propeller Shaft

GENERAL SPECIFICATIONS

Engine	SR20DET	GA16DS
Propeller shaft model	4F63A-VL91	4F56A-VL91
Number of joints	4	
Coupling method with transfer	Flange type	
Type of journal bearings	Shell type (Non-disassembly type)	
Shaft length (Joint to joint) mm (in)		
1st	588 (23.15)	560 (22.05)
2nd	500 (19.69)	507 (19.96)
3rd	680 (26.77)	690 (27.17)
Shaft outer diameter mm (in)		
1st	70 (2.76)	
2nd	63.5 (2.500)	
3rd	70 (2.76)	

INSPECTION AND ADJUSTMENT

Unit: mm (in)

Propeller shaft model	4F63A-VL91, 4F56A-VL91
Propeller shaft runout limit	0.6 (0.024)
Journal axial play	0 (0)

Final Drive

GENERAL SPECIFICATIONS

Engine	GA16DS	SR20DET
Final drive model	R180	R180V
Ring gear pitch diameter mm (in)	181 (7.13)	
Gear ratio	3.700	
Number of teeth (Ring gear/Drive pinion)	37/10	
Oil capacity (approx.) ℓ (Imp pt)	1.0 (1-3/4)	
Differential case	2 pinion	Viscous L.S.D.

INSPECTION AND ADJUSTMENT

Drive pinion bearing adjusting method	Pinion bearing adjusting washer
Ring gear backlash mm (in)	0.10 - 0.20 (0.0039 - 0.0079)
Drive pinion preload (With front oil seal) N·m (kg-cm, in-lb)	1.1 - 1.7 (11 - 17, 9.5 - 14.8)
Total preload N·m (kg-cm, in-lb)	1.0 - 1.6 (10 - 16, 8.7 - 14)
Side bearing adjusting method	Adjusting shim
Side gear to pinion mate gear backlash (Clearance between side gear and differential case) mm (in)	0.10 - 0.20 (0.0039 - 0.0079)
Ring gear runout mm (in)	0.05 (0.0020)

Available pinion height adjusting washers

Thickness mm (in)	Part number
3.09 (0.1217)	38154-P6017
3.12 (0.1228)	38154-P6018
3.15 (0.1240)	38154-P6019
3.18 (0.1252)	38154-P6020
3.21 (0.1264)	38154-P6021
3.24 (0.1276)	38154-P6022
3.27 (0.1287)	38154-P6023
3.30 (0.1299)	38154-P6024
3.33 (0.1311)	38154-P6025
3.36 (0.1323)	38154-P6026
3.39 (0.1335)	38154-P6027
3.42 (0.1346)	38154-P6028
3.45 (0.1358)	38154-P6029
3.48 (0.1370)	38154-P6030
3.51 (0.1382)	38154-P6031
3.54 (0.1394)	38154-P6032
3.57 (0.1406)	38154-P6033
3.60 (0.1417)	38154-P6034
3.63 (0.1429)	38154-P6035
3.66 (0.1441)	38154-P6036

Final Drive (Cont'd)

Available drive pinion bearing preload adjusting washers

Thickness mm (in)	Part number
6.31 (0.2484)	38127-01G14
6.33 (0.2492)	38127-01G13
6.35 (0.2500)	38127-01G12
6.37 (0.2508)	38127-01G11
6.39 (0.2516)	38127-01G10
6.41 (0.2524)	38127-01G09
6.43 (0.2531)	38127-01G08
6.45 (0.2539)	38127-01G07
6.47 (0.2547)	38127-01G06
6.49 (0.2555)	38127-01G05
6.51 (0.2563)	38127-01G04
6.53 (0.2571)	38127-01G03
6.55 (0.2579)	38127-01G02
6.57 (0.2587)	38127-01G01
6.59 (0.2594)	38127-01G00

Available drive pinion bearing preload adjusting spacers

Length mm (in)	Part number
52.20 (2.0551)	38130-78500
52.40 (2.0630)	38131-78500
52.60 (2.0709)	38132-78500
52.80 (2.0787)	38133-78500
53.00 (2.0866)	38134-78500
53.20 (2.0945)	38135-78500

Available side bearing adjusting washers

Thickness mm (in)	Part number
0.20 (0.0079)	38453-21100
0.25 (0.0098)	38453-21101
0.30 (0.0118)	38453-21102
0.40 (0.0157)	38453-21103
0.50 (0.0197)	38453-21104

Available side gear thrust washers

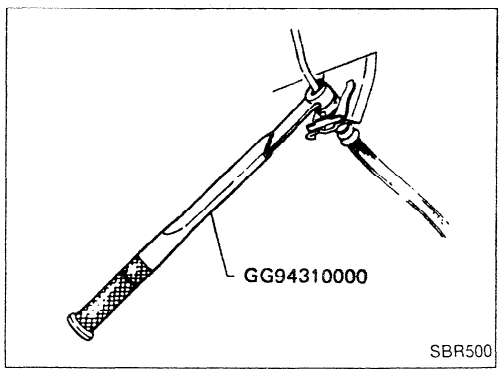
	Thickness mm (in)	Part number
Standard type	0.75 - 0.78 (0.0295 - 0.0307)	38424-W2010
	0.78 - 0.81 (0.0307 - 0.0319)	38424-W2011
	0.81 - 0.84 (0.0319 - 0.0331)	38424-W2012
	0.84 - 0.87 (0.0331 - 0.0343)	38424-W2013
	0.87 - 0.90 (0.0343 - 0.0354)	38424-W2014
	0.90 - 0.93 (0.0354 - 0.0366)	38424-W2015
	0.93 - 0.96 (0.0366 - 0.0378)	38424-W2016
	0.96 - 0.99 (0.0378 - 0.0390)	38424-W2017
Viscous type	0.80 (0.0315)	38424-20R00
	0.85 (0.0335)	38424-20R11
	0.90 (0.0354)	38424-20R01
	0.95 (0.0374)	38424-20R12
	1.00 (0.0394)	38424-20R02
	1.05 (0.0413)	38424-20R13
	1.10 (0.0433)	38424-20R03
	1.15 (0.0453)	38424-20R08
	1.20 (0.0472)	38424-20R04
	1.25 (0.0492)	38424-20R09
	1.30 (0.0512)	38424-20R05
	1.35 (0.0531)	38424-20R10
	1.40 (0.0551)	38424-20R06
	1.45 (0.0571)	38424-20R14
	1.50 (0.0591)	38424-20R07
	1.55 (0.0610)	38424-20R15
	1.60 (0.0630)	38424-20R16
	1.65 (0.0650)	38424-20R17
	1.70 (0.0669)	38424-20R18
	1.75 (0.0689)	38424-20R19
	1.80 (0.0709)	38424-20R20
	1.85 (0.0728)	38424-20R21
	1.90 (0.0748)	38424-20R22
	1.95 (0.0768)	38424-20R23

FRONT AXLE & FRONT SUSPENSION

SECTION FA

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SERVICE DATA AND SPECIFICATIONS (S.D.S.) FA-41



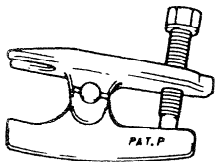
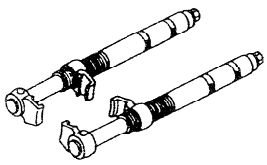
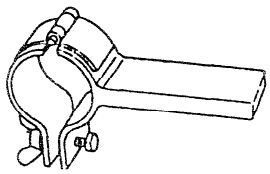
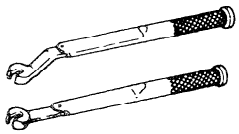
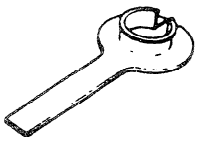
Precautions

- **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.**

Preparation

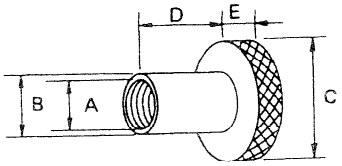
SPECIAL SERVICE TOOLS

*: Special tool or commercial equivalent

Tool number Tool name	Description	
HT72520000* Ball joint remover		Removing tie-rod outer end and lower ball joint
HT71780000* Spring compressor		Removing and installing coil spring
ST35652000* Strut attachment		Fixing strut assembly
GG94310000* Flare nut torque wrench		Removing and installing brake piping
KV38106700* KV38106800* Differential side oil seal protector	 L.H.: KV38106700 R.H.: KV38106800	Installing drive shaft

Preparation (Cont'd)

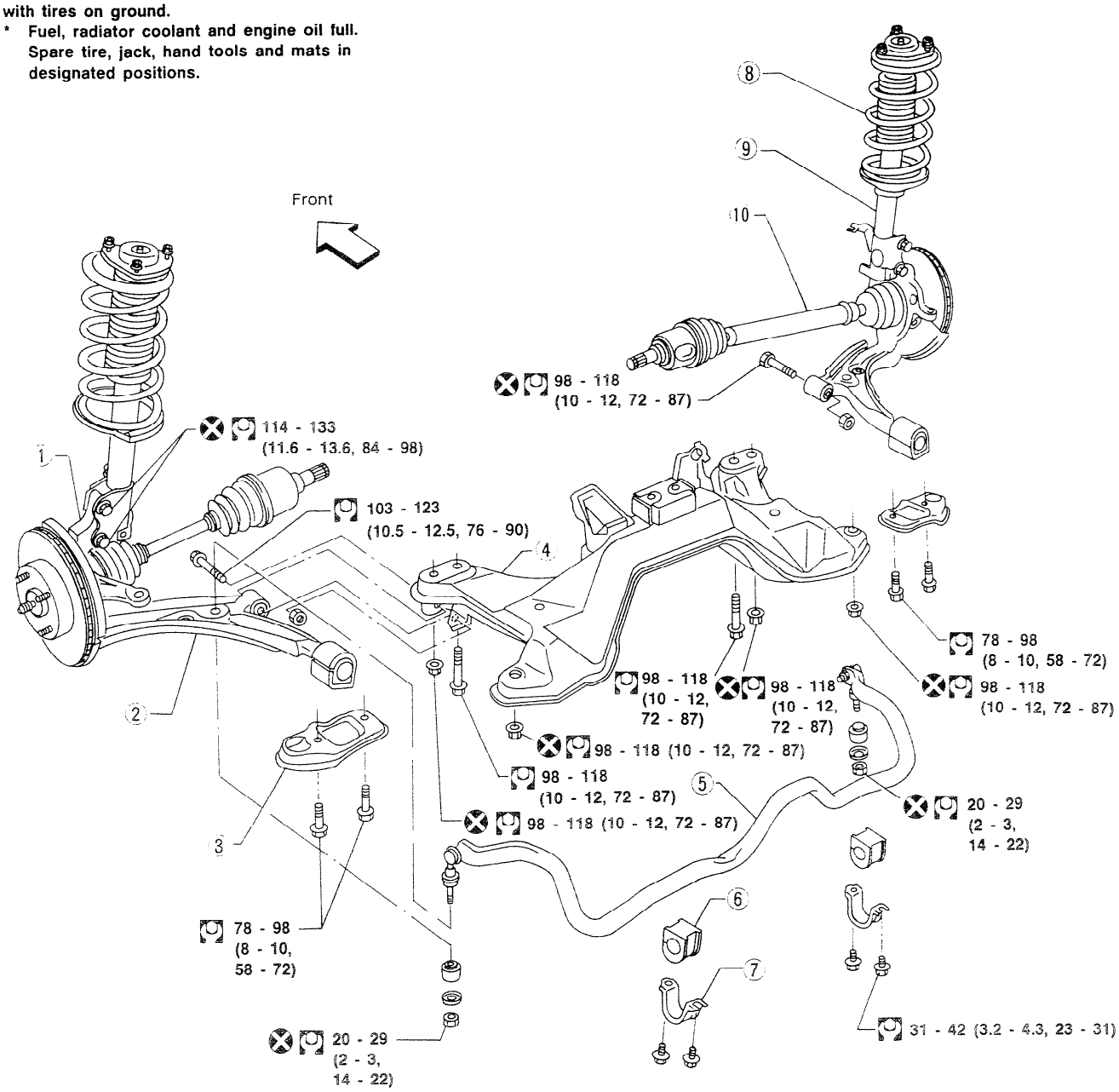
COMMERCIAL SERVICE TOOLS

Tool name	Description	
Attachment Wheel alignment		Measure wheel alignment **A: Screw M22 x 1.5** **B: 35 (1.38) dia.** **C: 65 (2.56) dia.** **D: 56 (2.20)** **E: 12 (0.47)** Unit: mm (in)

2WD MODELS

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)

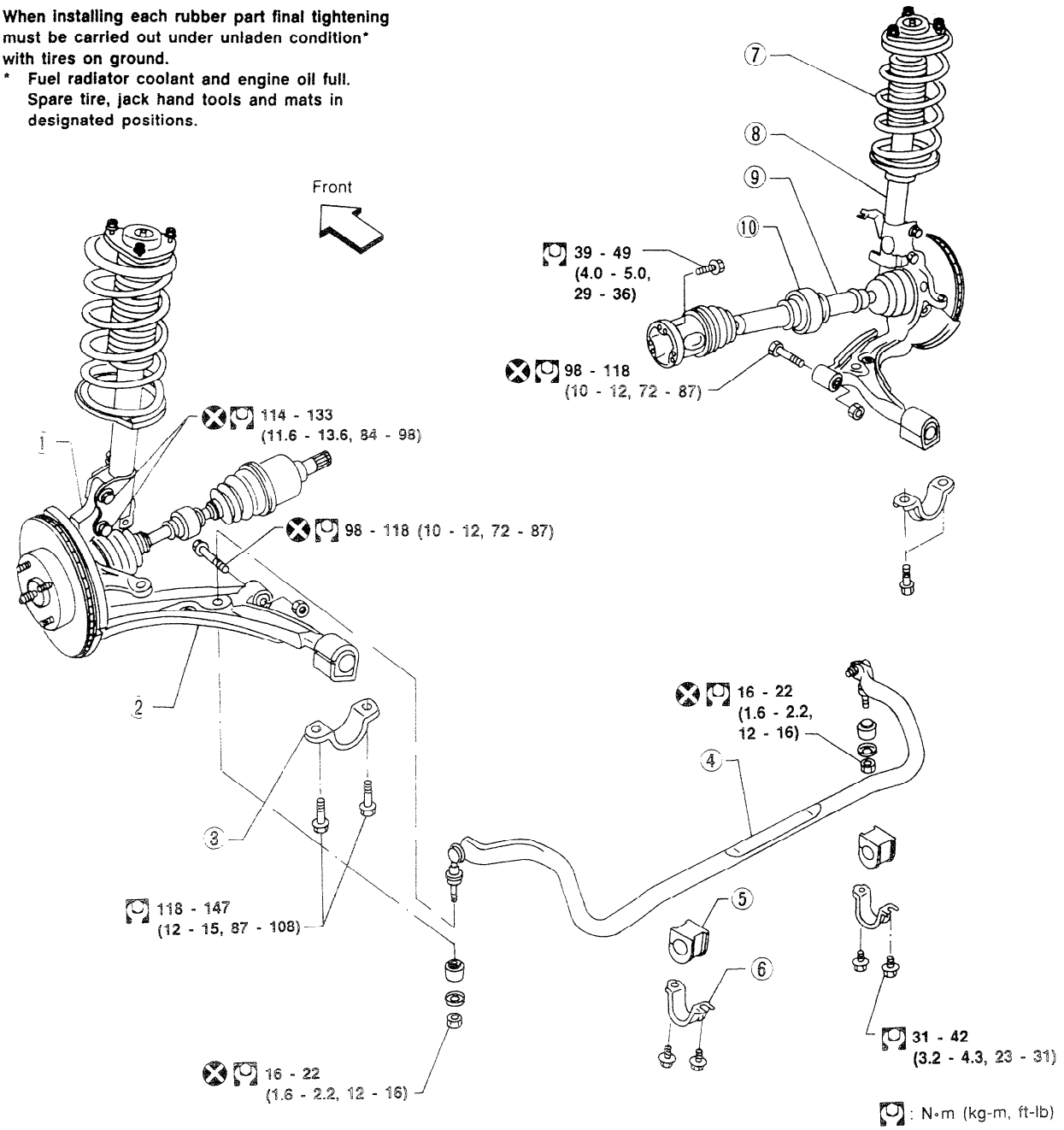
SFA152B

① Knuckle assembly
② Transverse link
③ Compression rod clamp
④ Front suspension member
⑤ Stabilizer bar
⑥ Bushing
⑦ Bracket
⑧ Coil spring
⑨ Strut assembly
⑩ Drive shaft

4WD MODELS

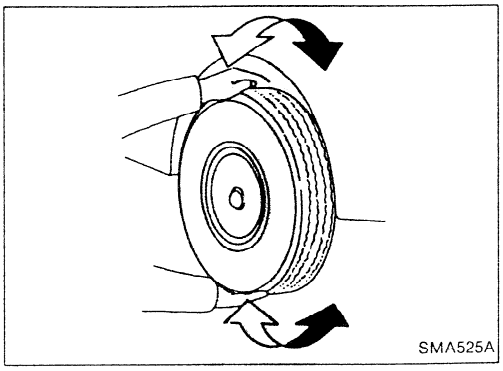
When installing each rubber part final tightening must be carried out under unladen condition* with tires on ground.

*** Fuel radiator coolant and engine oil full. Spare tire, jack hand tools and mats in designated positions.**



SFA133B

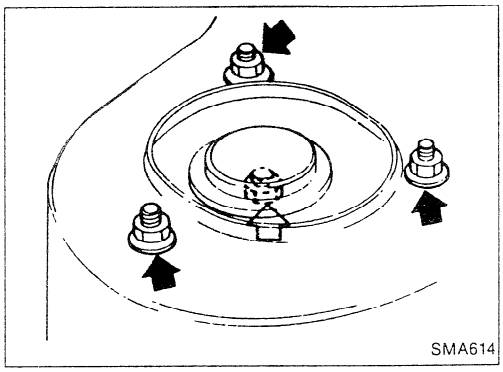
① Knuckle assembly
② Transverse link
③ Compression rod clamp
④ Stabilizer bar
⑤ Bushing
⑥ Bracket
⑦ Coil spring
⑧ Strut assembly
⑨ Drive shaft
⑩ Damper


SMA525A

Front Axle and Front Suspension Parts

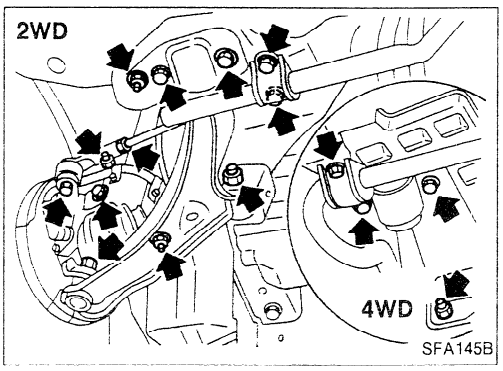
Check front axle and front suspension parts for looseness, cracks, wear or other damage.

- Shake each front wheel to check for excessive play.

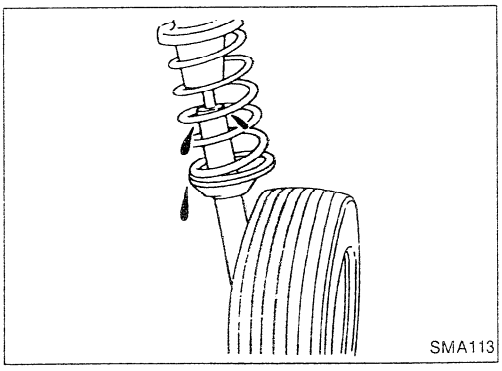

SMA614

- Make sure that cotter pin is inserted.
- Retighten all nuts and bolts to the specified torque.

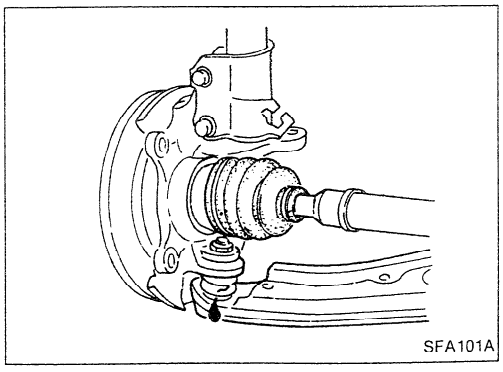
Tightening torque:
Refer to FRONT SUSPENSION.



SFA145B

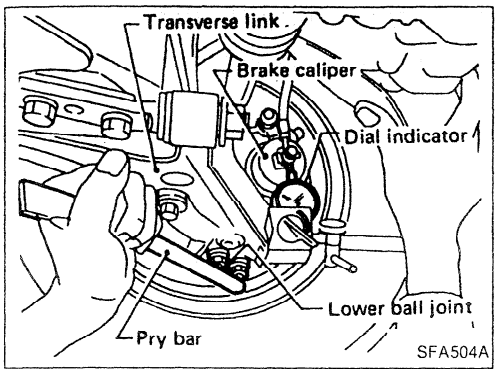

SMA113

- Check strut (shock absorber) for oil leakage or other damage.


SFA101A

- 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)

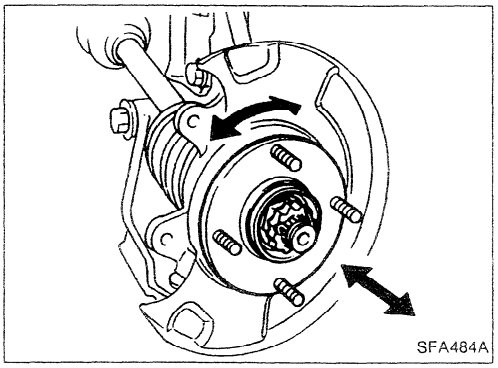


- Check suspension ball joint end play.

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.

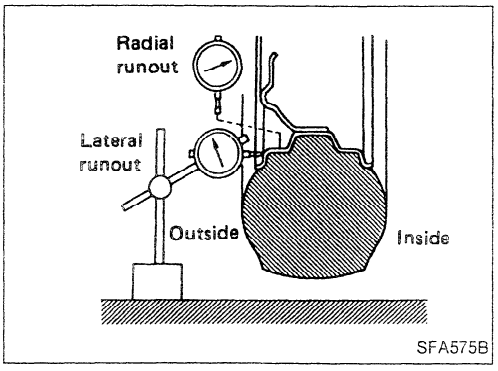


Front Wheel Bearing

- 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.



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.

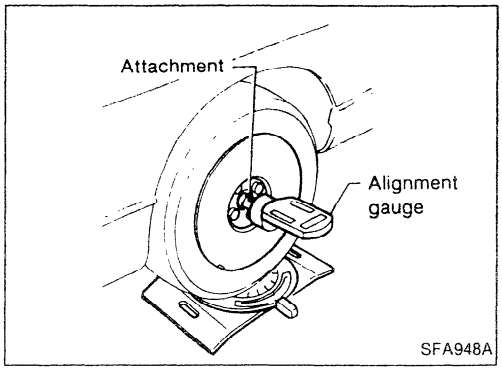
PRELIMINARY INSPECTION

1. Check tires for wear and improper inflation.
2. Check wheel runout.

Wheel runout:
Refer to S.D.S.

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 properly by using the standard bounce test.
7. Check vehicle posture (Unladen).

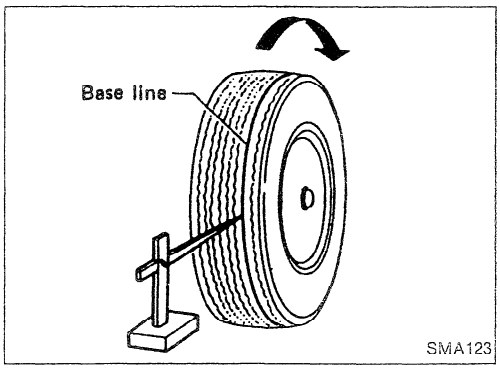
Front Wheel Alignment (Cont'd)



CAMBER, CASTER AND KINGPIN INCLINATION

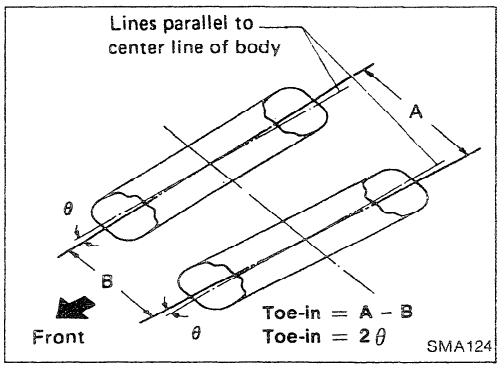
Camber, caster and kingpin inclination are preset at factory and cannot be adjusted.

1. Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge.
   Camber:
   Refer to S.D.S.
   Caster:
   Refer to S.D.S.
   Kingpin inclination:
   Refer to S.D.S.
2. If camber, caster and kingpin inclination are not within specification, inspect and replace any damaged or worn front suspension parts.



TOE-IN

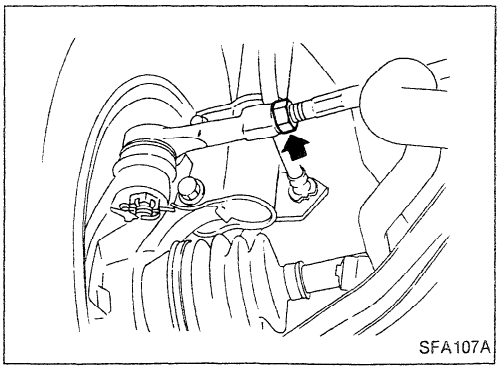
1. Draw a base line across the tread.
2. After lowering front of vehicle, move it up and down to eliminate friction, and set steering wheel in straight-ahead position.



3. Measure toe-in.

- Measure distance "A" and "B" at the same height as hub center.
  Total toe-in (Unladen):

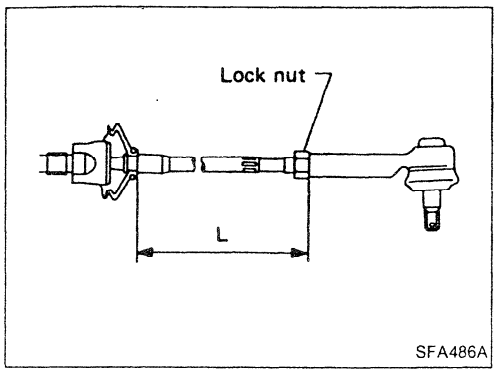
A − B	**1 - 3 mm (0.04 - 0.12 in)**
2θ	**6' - 18'**



4. Adjust toe-in by varying the length of steering tie-rods.

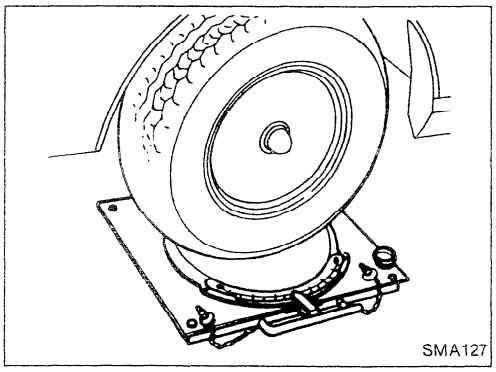
a. Loosen lock nuts.
b. Adjust toe-in by screwing tie-rods in and out.

Front Wheel Alignment (Cont'd)



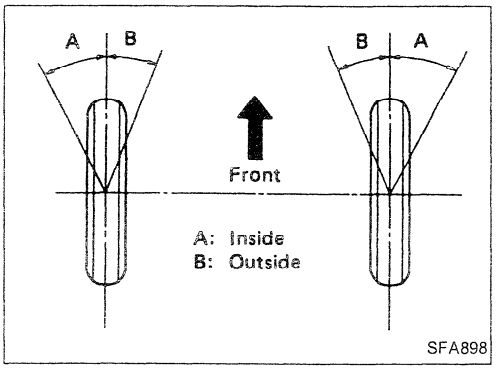
Standard length "L":
Refer to ST section.

c. Tighten lock nuts to specified torque.
Lock nut tightening torque:
Refer to ST section.



FRONT WHEEL TURNING ANGLE

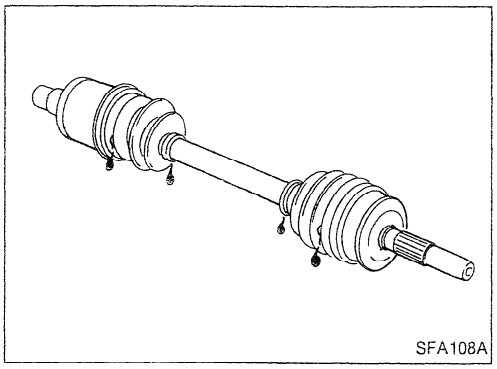
1. Set wheels in straight-ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.



2. Rotate steering wheel all the way right and left with a force of 98 to 147 N (10 to 15 kg, 22 to 33 lb) while engine is running at idle and measure turning angle.

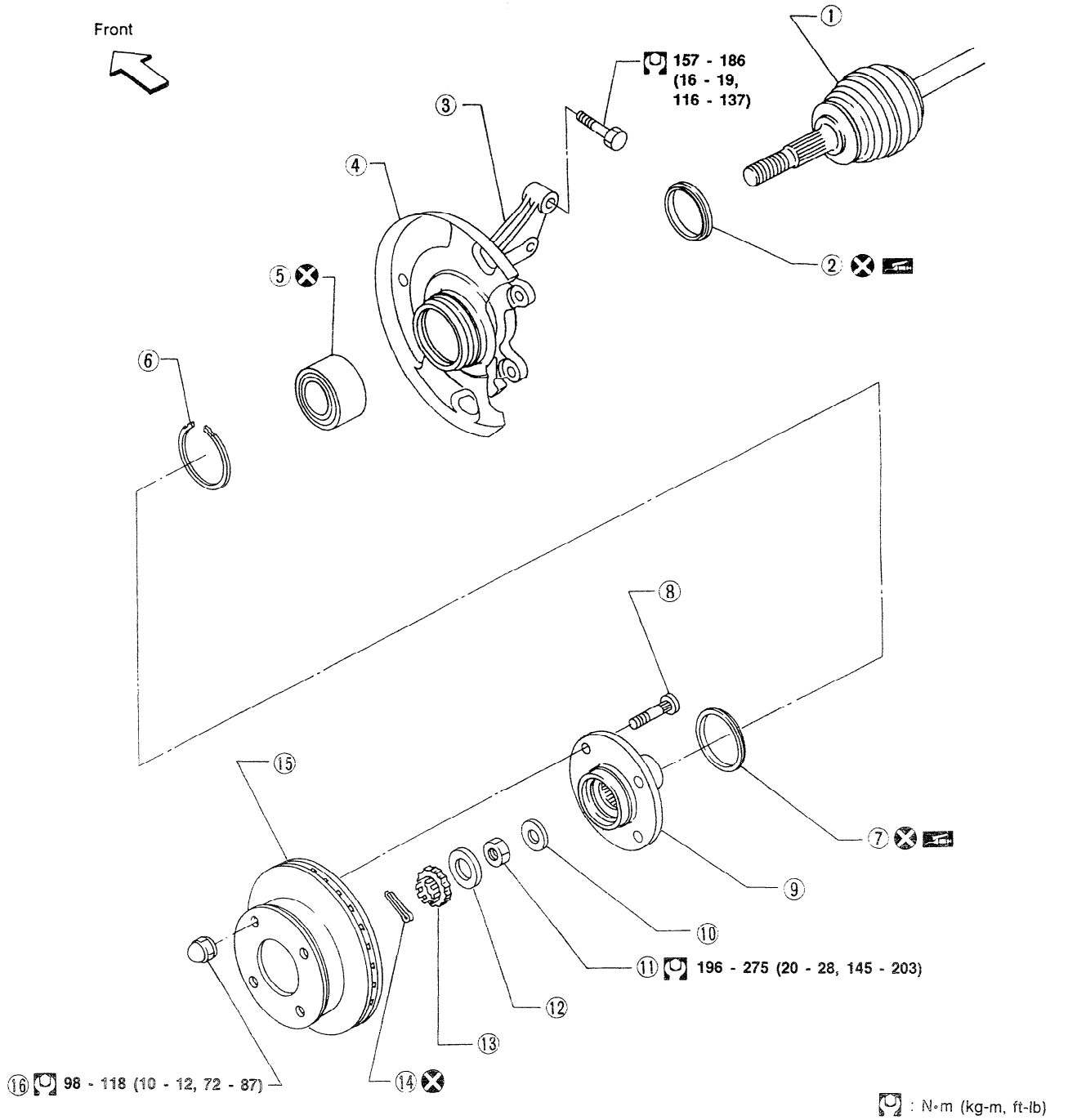
Do not hold the steering wheel on full lock for more than 15 seconds.

Wheel turning angle (Full turn):
Refer to S.D.S.

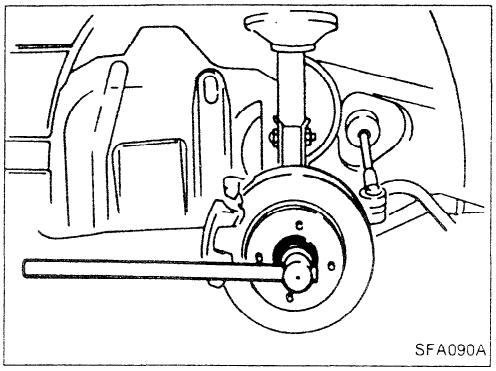


Drive Shaft

Check for grease leakage or other damage.

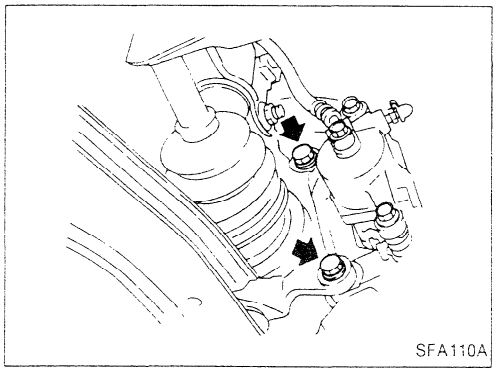


① Drive shaft
② Inner grease seal
③ Knuckle
④ Baffle plate
⑤ Wheel bearing assembly
⑥ Snap ring
⑦ Outer grease seal
⑧ Wheel bolt
⑨ Wheel hub
⑩ Plain washer
⑪ Wheel bearing lock nut
⑫ Insulator
⑬ Adjusting cap
⑭ Cotter pin
⑮ Disc rotor
⑯ Wheel nut


SFA090A

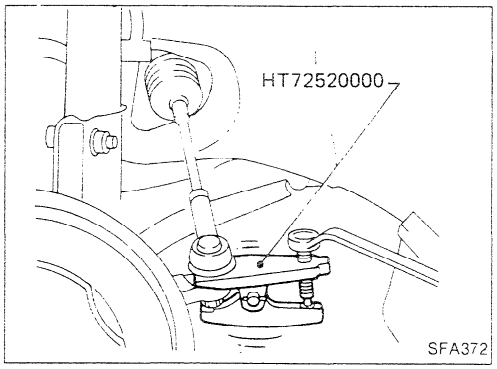
Removal

- Remove wheel bearing lock nut while depressing brake pedal.


SFA110A

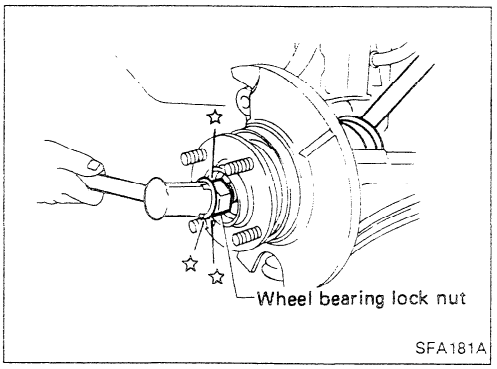
- Remove brake caliper assembly.

Brake hose does not need to be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out.
Make sure brake hose is not twisted.



SFA372

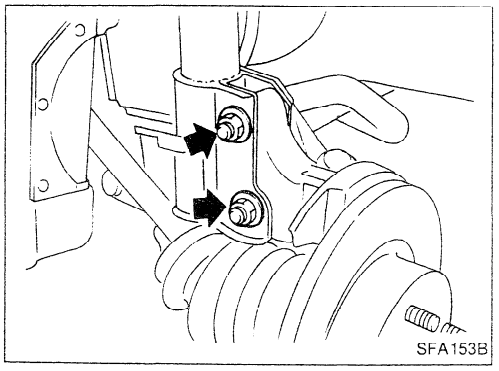
- Remove tie-rod ball joint.



SFA181A

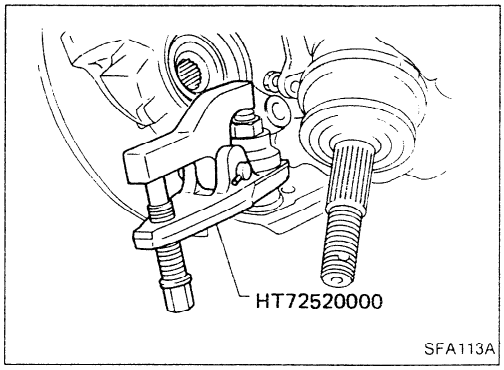
- Separate drive shaft from knuckle by slightly tapping it.

Cover boots with waste cloth so as not to damage them when removing drive shaft.


SFA153B

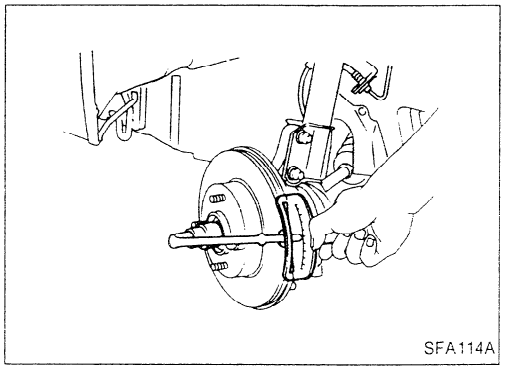
- Remove strut lower mounting bolts.

Removal (Cont'd)

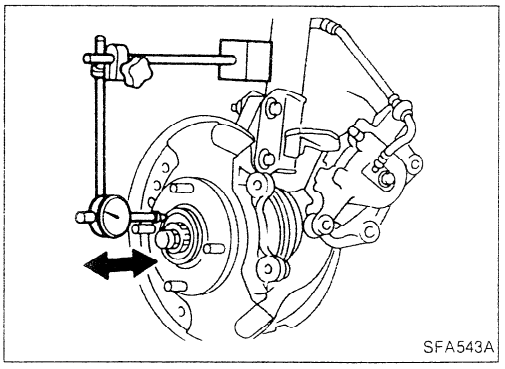


- Loosen lower ball joint tightening nut.
- Separate knuckle from lower ball joint stud with Tool.
- Remove knuckle from transverse link.

Installation



- Install knuckle with wheel hub.
- Tighten wheel bearing lock nut.
  : 196 - 275 N·m
  (20 - 28 kg-m, 145 - 203 ft-lb)
- Check that wheel bearings operate smoothly.

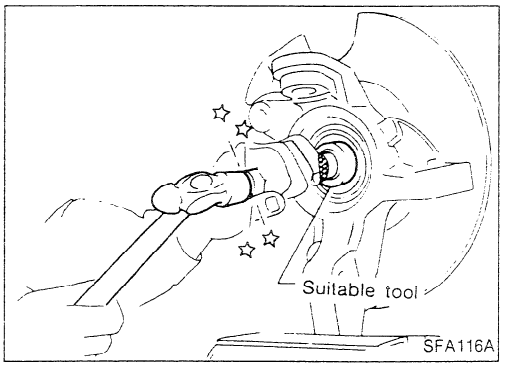


- Check wheel bearing axial end play.
  Axial end play:
  0.05 mm (0.0020 in) or less

Disassembly

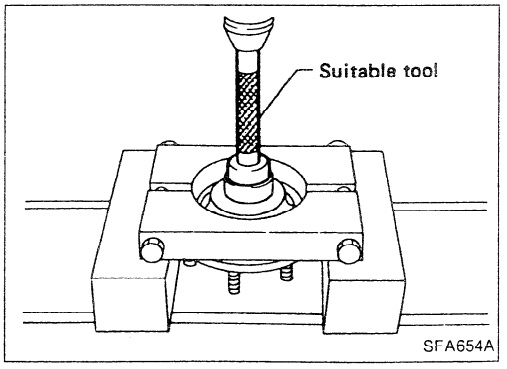
CAUTION:
When removing wheel hub or wheel bearing from knuckle, replace wheel bearing assembly (outer race, inner races and grease seals) with a new one.

WHEEL HUB



Drive out hub with inner race (outside) from knuckle with a suitable tool.

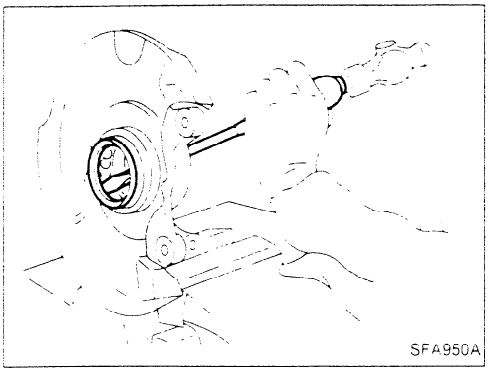
WHEEL BEARING



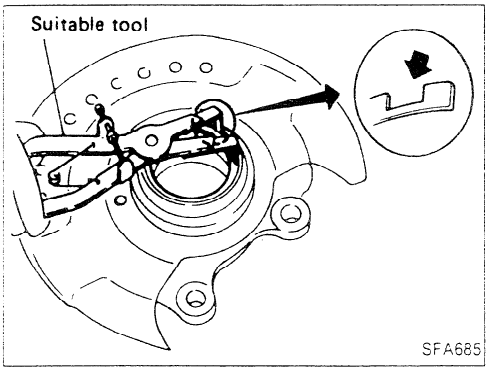
When replacing wheel bearing, replace wheel bearing assembly (including inner and outer races).

- Remove bearing inner race (outside), then remove outer grease seal.

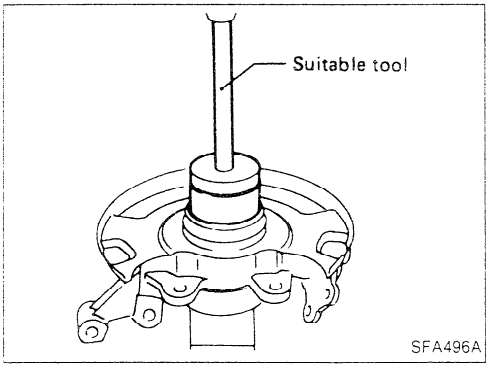
Disassembly (Cont'd)



- Remove inner and outer grease seals from knuckle.



- Remove snap ring.



- Press out bearing outer race.

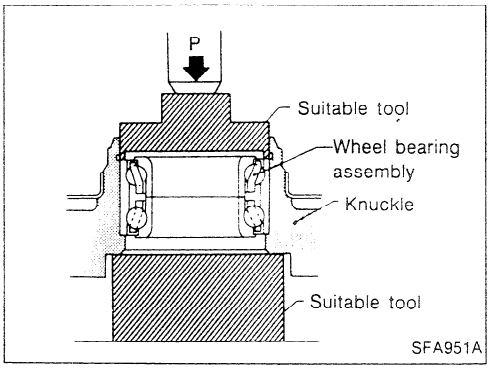
Inspection

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

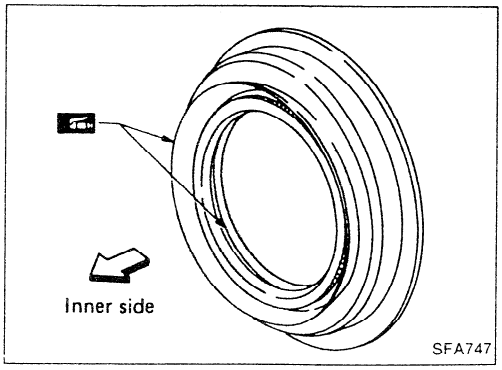
1. Press new wheel bearing assembly into knuckle.
   Maximum load P:
   29 kN (3 t, 3.3 US ton, 3.0 Imp ton)

CAUTION:

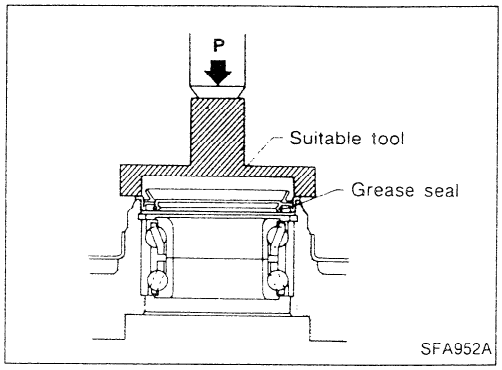
- **Do not press inner race of wheel bearing assembly.**
- **Do not apply oil or grease to mating surfaces of wheel bearing outer race and knuckle.**

2. Install snap ring into groove of knuckle.

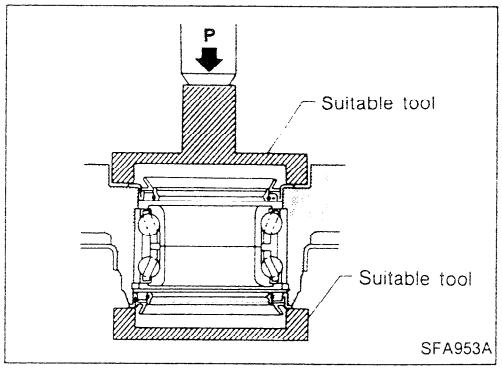
Assembly (Cont'd)



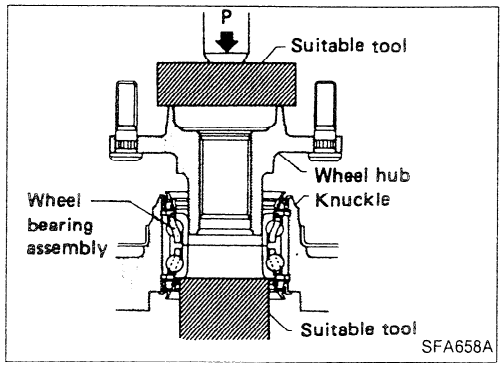
3. Pack grease seal lip with multi-purpose grease.



4. Install outer grease seal.

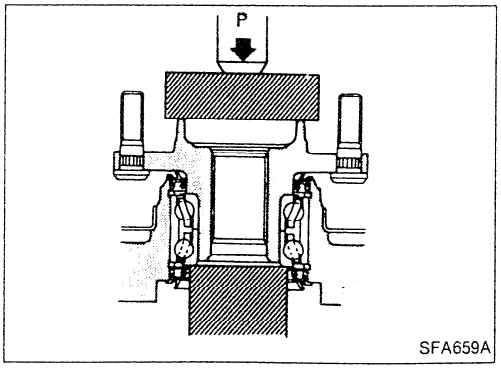


5. Install inner grease seal.



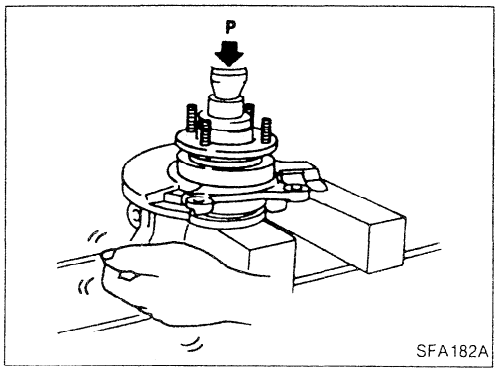
6. Press wheel hub into knuckle.
   Maximum load P:
   29 kN (3 ton, 3.3 US ton, 3.0 Imp ton)

Be careful not to damage grease seal.

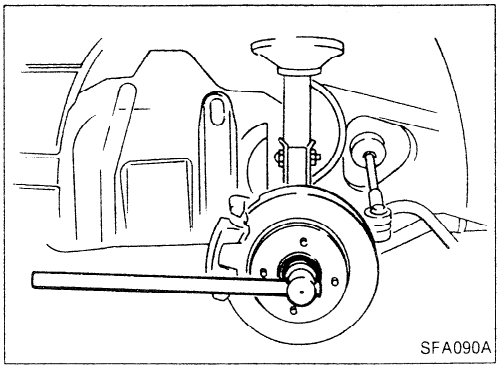


7. Check bearing operation.
a. Add load P with press.
   Load P:
   34.3 - 49.0 kN
   (3.5 - 5.0 ton, 3.9 - 5.5 US ton, 3.44 - 4.92 Imp ton)

Assembly (Cont'd)



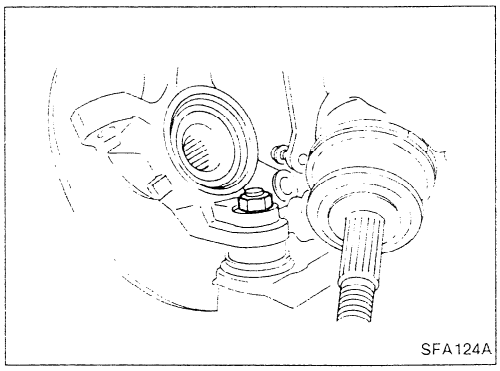
b. Spin knuckle several turns in both directions.
c. Make sure that wheel bearings operate smoothly.


SFA090A

Removal

- Remove wheel bearing lock nut.
- Remove brake caliper assembly.

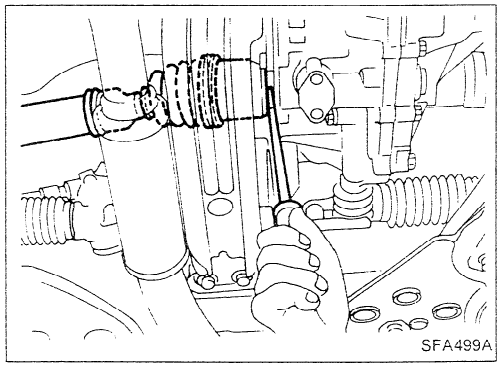
Brake hose need not be disconnected from brake caliper.
Be careful not to depress brake pedal, or piston will pop out.
Do not puller or twist brake hose.


SFA124A

- Remove tie-rod ball joint.
- Separate drive shaft from knuckle by lightly tapping it. If it is hard to remove, use a puller.

When removing drive shaft, cover boots with waste cloth to prevent damage to them.

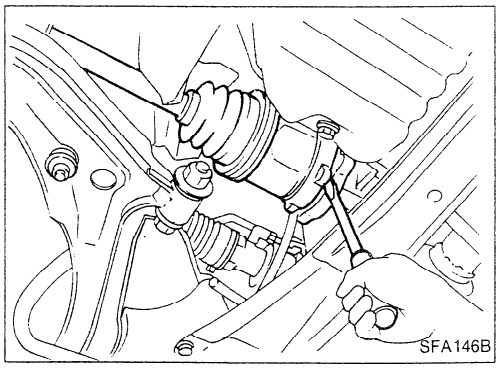
Refer to FRONT AXLE — Wheel Hub and Knuckle.

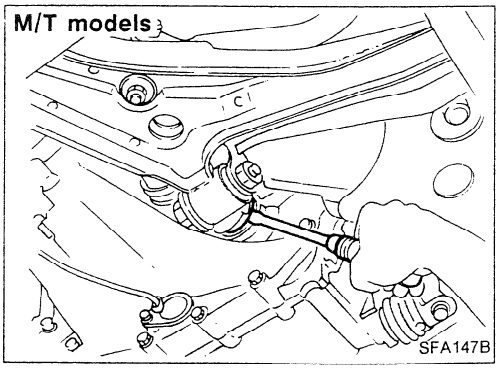

SFA499A

1. Remove right drive shaft from transaxle.

— Models without support bearing —

— Models with support bearing —


SFA146B



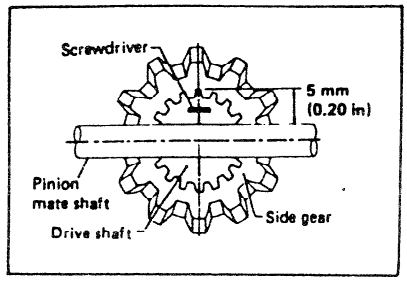
SFA147B

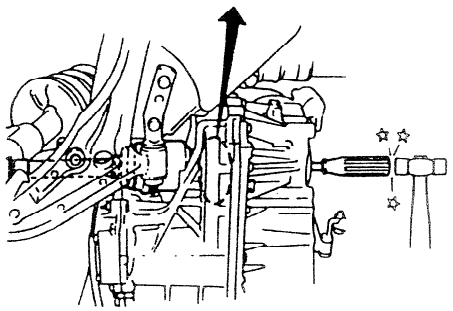
2. Remove left drive shaft from transaxle.

— For M/T models —

Removal (Cont'd)

A/T models



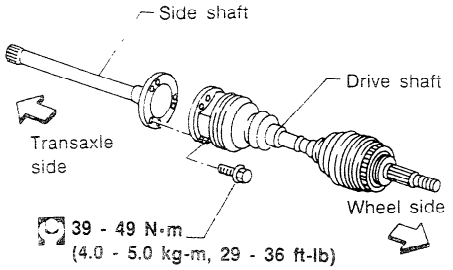


SFA730

— For A/T models —

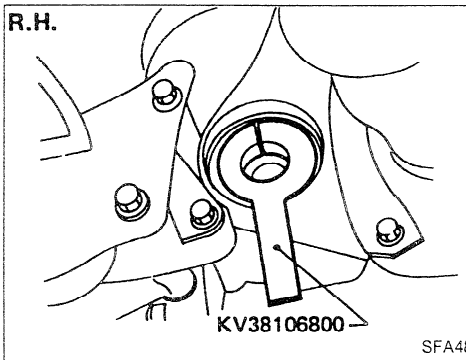
- Remove left drive shaft with a suitable tool.

Be careful not to damage pinion mate shaft and side gear.



SFA150B

— For 4WD models (SR20DET: Left drive shaft, GA16DS: Right drive shaft) —

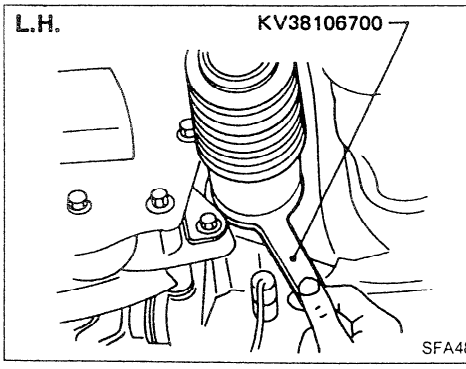


SFA482

Installation

TRANSAXLE SIDE

1. Drive a new oil seal to transaxle. Refer to section MT or AT.
2. Set Tool along the inner circumference of oil seal.



SFA483

3. Insert drive shaft into transaxle. Be sure to properly align the serrations 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.

Installation (Cont'd)

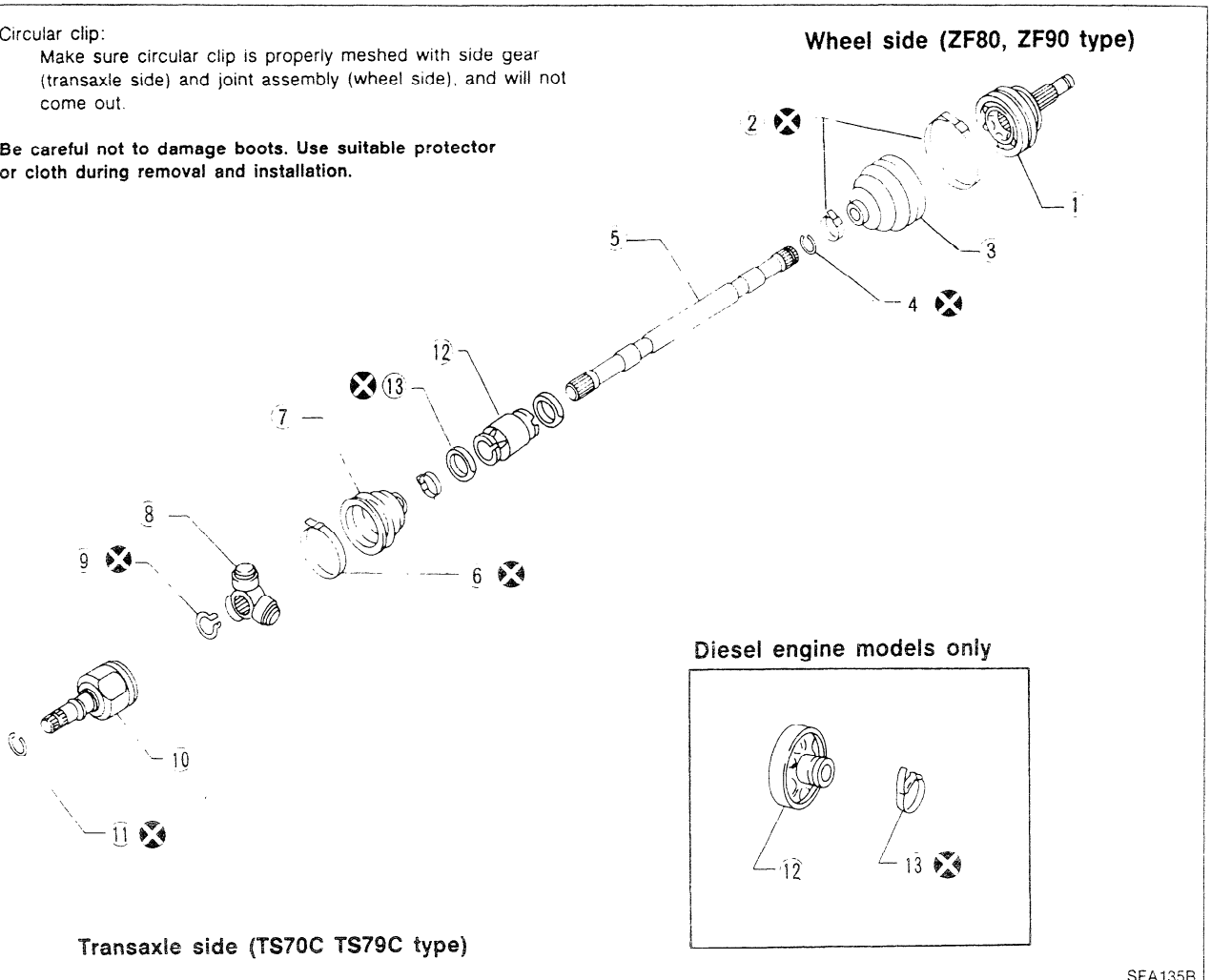
WHEEL SIDE

- Install drive shaft into knuckle.
- Tighten wheel bearing lock nut. Refer to section Installation in FRONT AXLE — Wheel Hub and Knuckle.

Components

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.

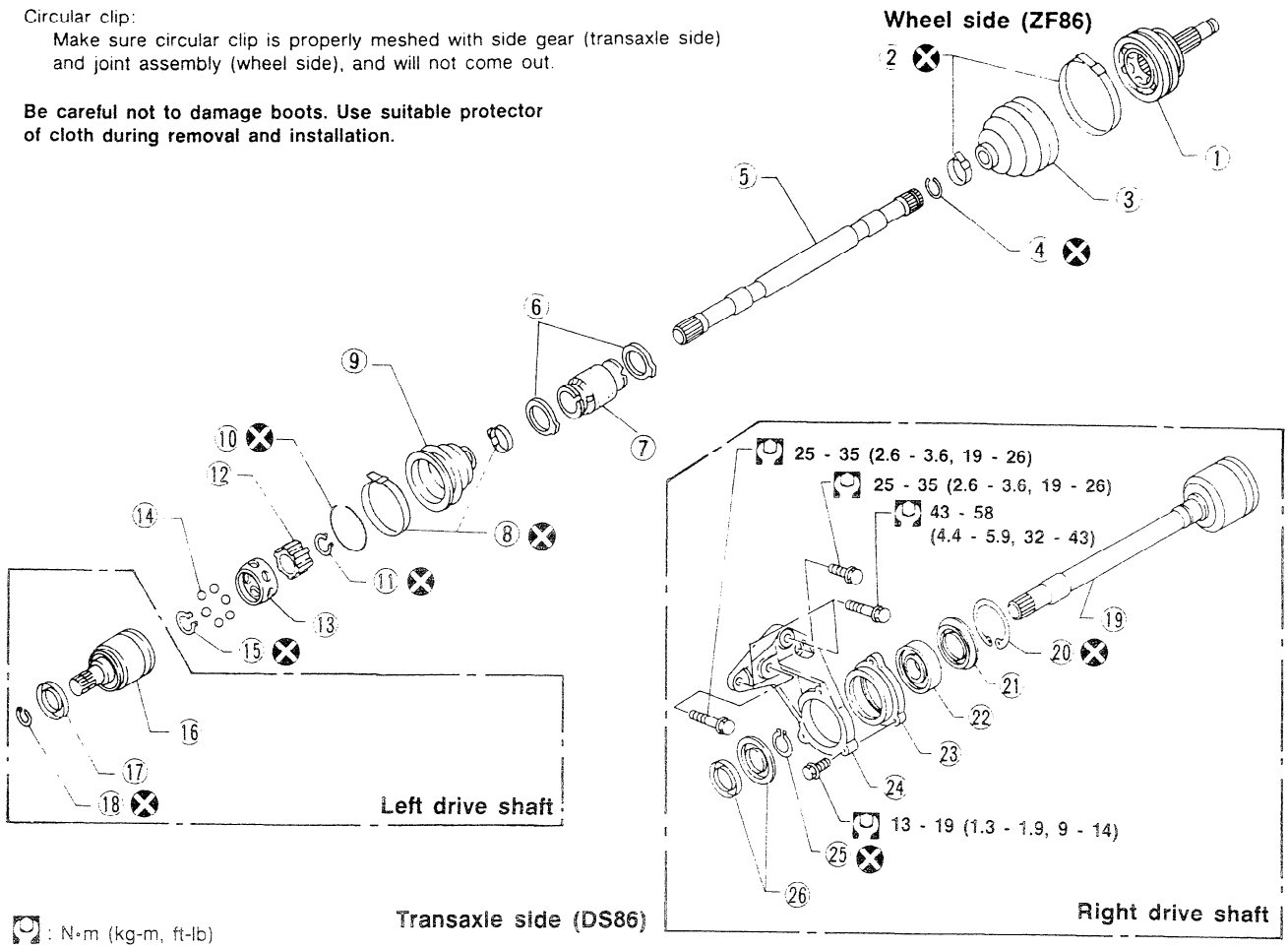


① Joint assembly
② Boot band
③ Boot
④ Circular clip B
⑤ Drive shaft
⑥ Boot band
⑦ Boot
⑧ Spider assembly
⑨ Snap ring C
⑩ Slide joint housing
⑪ Circular clip
⑫ Dynamic damper
⑬ Dynamic damper band

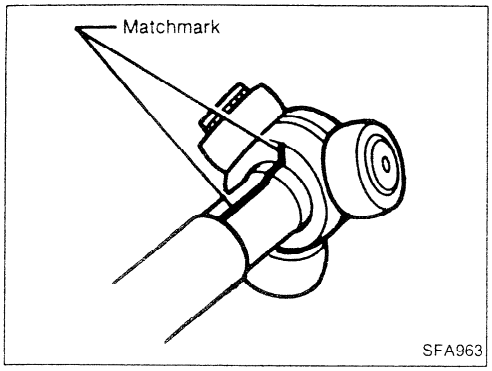
Components (Cont'd)

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 of cloth during removal and installation.



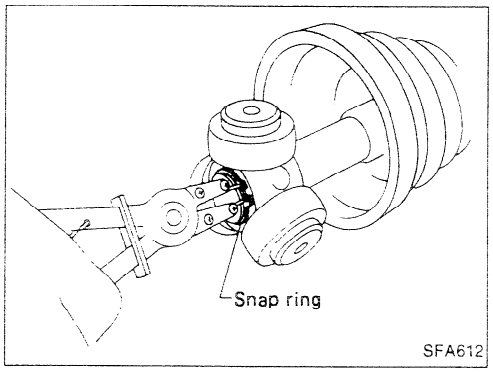
① Joint assembly
② Boot band
③ Boot
④ Circular clip B
⑤ Drive shaft
⑥ Band
⑦ Dynamic damper
⑧ Boot band
⑨ Boot
⑩ Snap ring A
⑪ Snap ring B
⑫ Inner race
⑬ Cage
⑭ Ball
⑮ Snap ring C
⑯ Slide joint housing
⑰ Dust shield
⑱ Circular clip A
⑲ Slide joint housing with extension shaft
⑳ Snap ring E
㉑ Dust shield
㉒ Support bearing
㉓ Support bearing retainer
㉔ Bracket
㉕ Snap ring D
㉖ Dust shield



Disassembly

TRANSAXLE SIDE (TS70C, TS79C type)

1. Remove boot bands.
2. Put matchmarks on slide joint housing and drive shaft before separating joint assembly.
3. Put matchmarks on spider assembly and drive shaft.

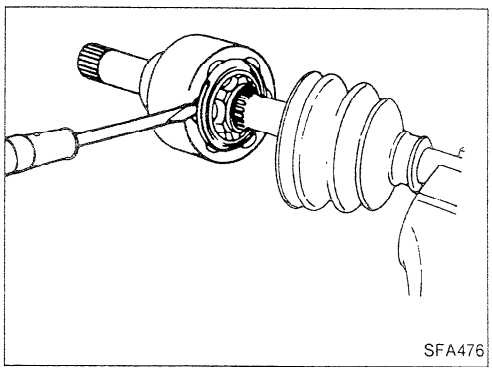


4. Pry off snap ring, then remove spider assembly.

CAUTION:
Do not disassemble spider assembly.

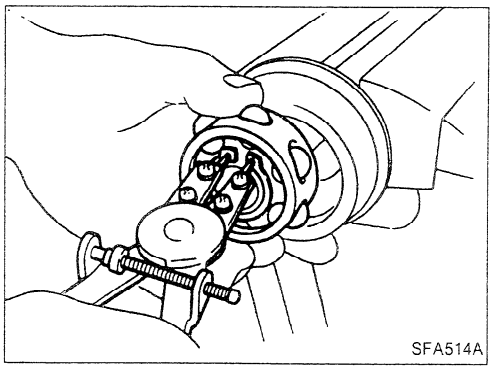
5. Draw out boot.

Cover drive shaft serration with tape to prevent damage to the boot.



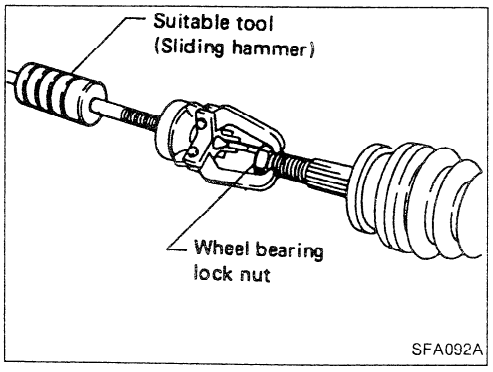
TRANSAXLE SIDE (DS86 type)

1. Remove boot bands.
2. Put matchmarks on slide joint housing and inner race, before separating joint assembly.
3. Pry off snap ring "A" with a screwdriver, and pull out slide joint housing.



4. Put matchmarks on inner race and drive shaft.
5. Pry off snap ring "C", then remove ball cage, inner race and balls as a unit.
6. Pry off snap ring "B".
7. Draw out boot.

Cover drive shaft serrations with tape so as not to damage the boot.



WHEEL SIDE (ZF80, ZF90, BF86 type)

CAUTION:
The joint on the wheel side cannot be disassembled.

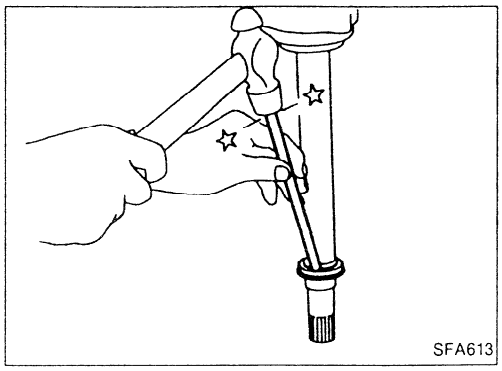
- Before separating joint assembly, put matchmarks on drive shaft and joint assembly.
- Separate joint assembly with a suitable tool.

Be careful not to damage threads on drive shaft.

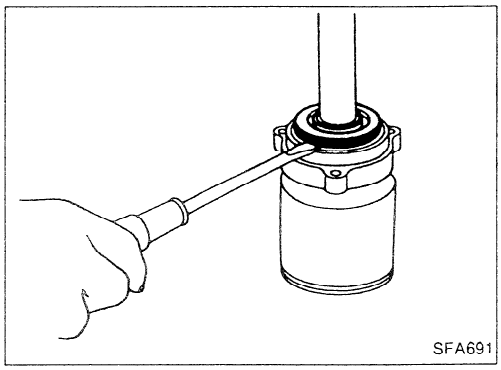
- Remove boot bands.

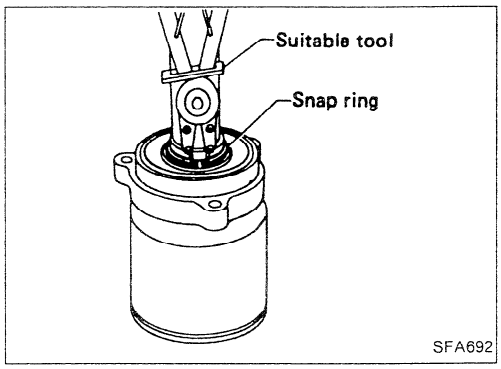
Disassembly (Cont'd)

SUPPORT BEARING


SFA613

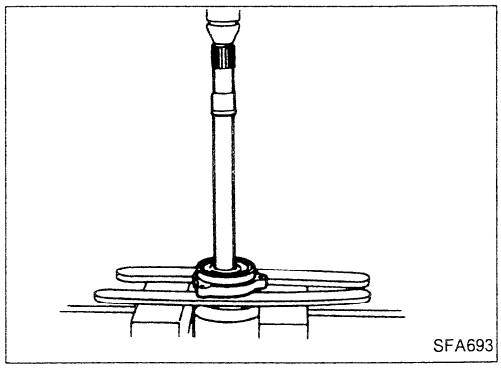
- Remove dust shield.


SFA691

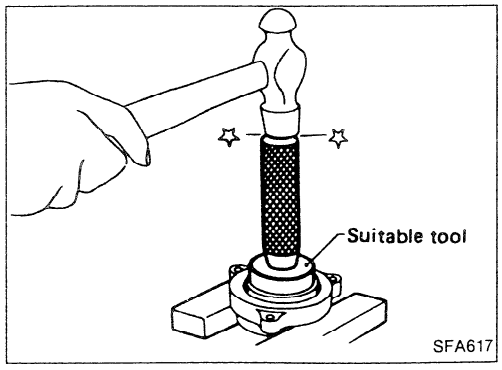


SFA692

- Pry off snap ring.


SFA693

- Press support bearing assembly out of drive shaft.



SFA617

- Press support bearing out of retainer.

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.

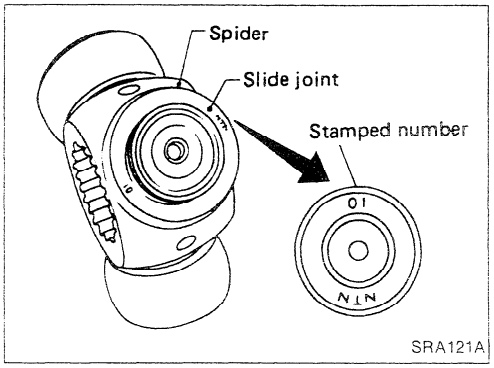
BOOT

Check boot for fatigue, cracks, or wear. Replace boot with new boot bands.

JOINT ASSEMBLY (Transaxle side)

TS70C, TS79C type

- Check spider assembly for bearing, roller and washer damage. Replace spider assembly if necessary.
- Check housing for any damage. Replace housing set and spider assembly, if necessary.



- When replacing only spider assembly, select a new spider assembly from among those listed in table below. Ensure the number stamped on sliding joint is the same as that stamped on new part.

Housing alone cannot be replaced. It must be replaced together with spider assembly.

TS70C

Stamped number	Part No.
00	39720-51E00
01	39720-51E01
02	39720-51E02
03	39720-51E03

TS79C

Stamped number	Part No.
00	39720-61E00
01	39720-61E01
02	39720-61E02
03	39720-61E03
04	39720-61E04
05	39720-61E05
06	39720-61E06

DS86 type

- Replace joint assembly if it is deformed or damaged.

JOINT ASSEMBLY (Wheel side)

Replace joint assembly if it is deformed or damaged.

Inspection (Cont'd)

SUPPORT BEARING

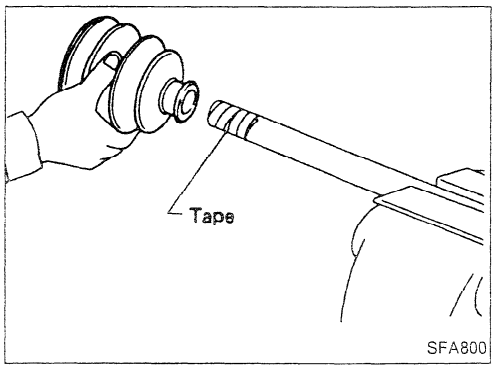
Make sure wheel bearing rolls freely and is free from noise, cracks, pitting or wear.

SUPPORT BEARING BRACKET

Check support bearing bracket for cracks with a magnetic exploration or dyeing test.

Assembly

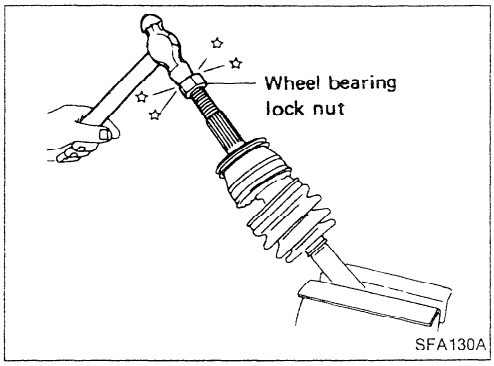
- **After drive shaft has been assembled, ensure that it moves smoothly over its entire range without binding.**
- **Use NISSAN GENUINE GREASE or equivalent after every overhaul.**



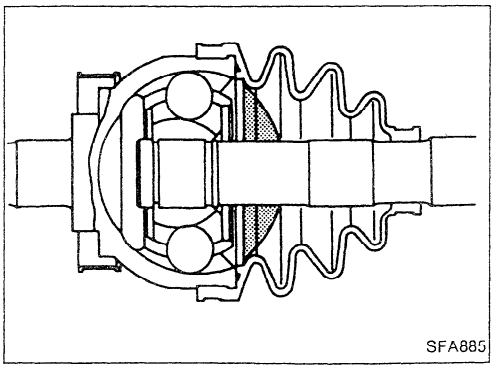
WHEEL SIDE (ZF80, ZF90, BF86 type)

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 properly aligned.

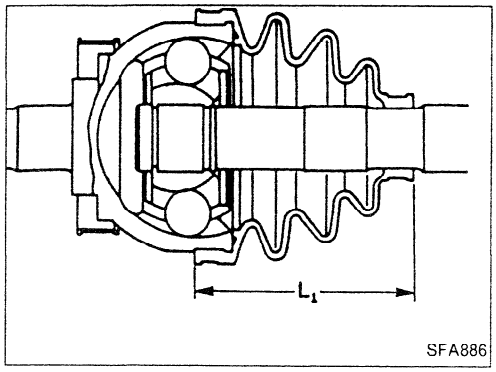


3. Pack drive shaft with specified amount of grease.

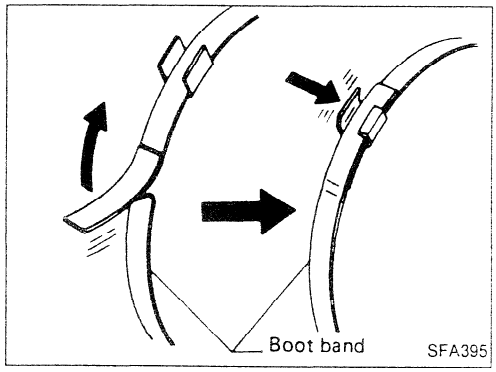
Specified amount of grease:

ZF80	**90 - 100 g (3.17 - 3.53 oz)**
ZF90	**155 - 175 g (5.47 - 6.17 oz)**
BF86	**105 - 125 g (3.70 - 4.41 oz)**

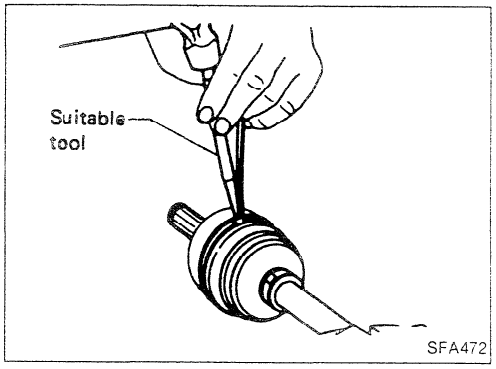
Assembly (Cont'd)



4. Make sure that boot is properly installed on the drive shaft groove.
   Set boot so that it does not swell and deform when its length is "L_1".
   Length "L_1":
   ZF80 90.5 - 92.5 mm (3.563 - 3.642 in)
   ZF90 96 - 98 mm (3.78 - 3.86 in)
   BF86 99.5 - 101.5 mm (3.917 - 3.996 in)



5. Lock new larger and smaller boot bands securely with a suitable tool.

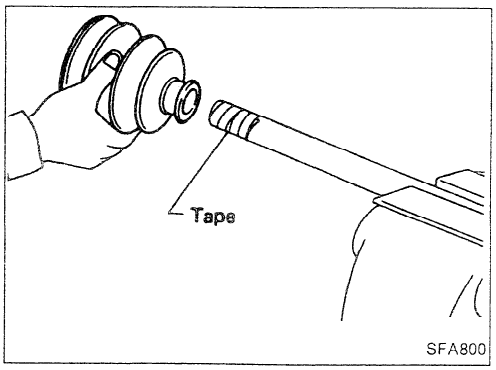


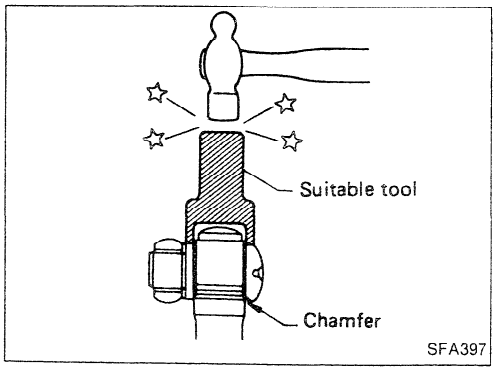
TRANSAXLE SIDE

(TS70C, TS79C type)

1. Install boot and new small boot band on drive shaft.

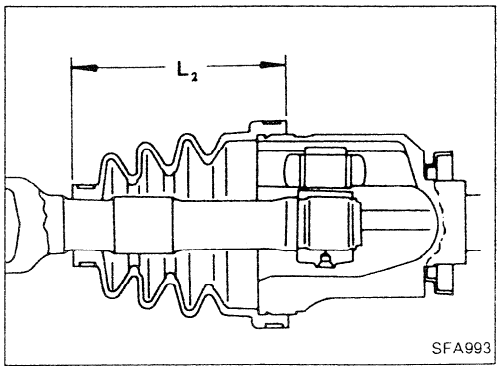
Cover drive shaft serration with tape to prevent damage to boot during installation.





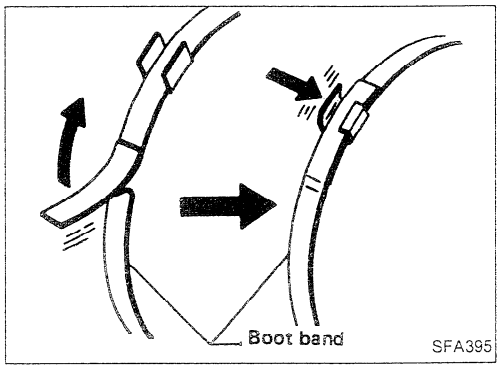
2. Install spider assembly securely, making sure marks are properly aligned.
   - Press-fit with spider assembly serration chamfer facing shaft.
3. Install new snap ring.

Assembly (Cont'd)



4. Pack drive shaft with specified amount of grease.
   Specified amount of grease:
   TS70C 185 - 195 g (6.52 - 6.88 oz)
   TS79C 225 - 235 g (7.94 - 8.29 oz)
5. Install slide joint housing.
6. Set boot so that it does not swell and deform when its length is "L_2".
   Length "L_2":
   TS70C 95.5 - 97.5 mm (3.760 - 3.839 in)
   TS79C 101.5 - 103.5 mm (4.00 - 4.07 in)

Make sure that boot is properly installed on the drive shaft groove.

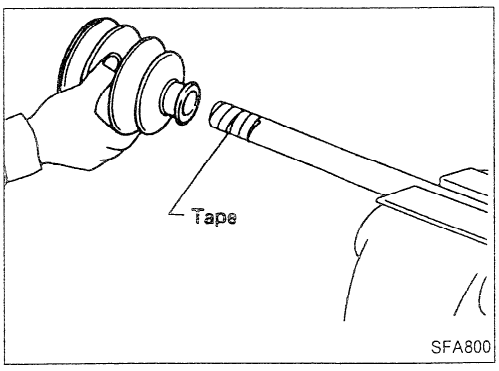


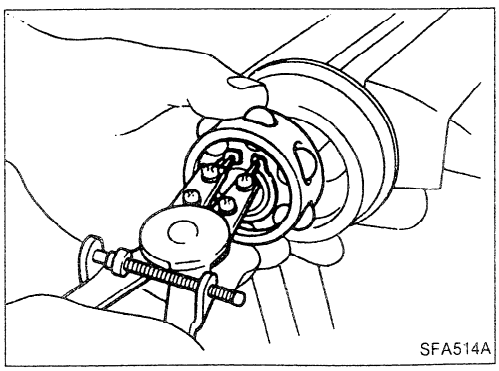
7. Lock new larger and smaller boot bands securely with a suitable tool.

(DS86 type)

1. Install boot and new small boot band on drive shaft.

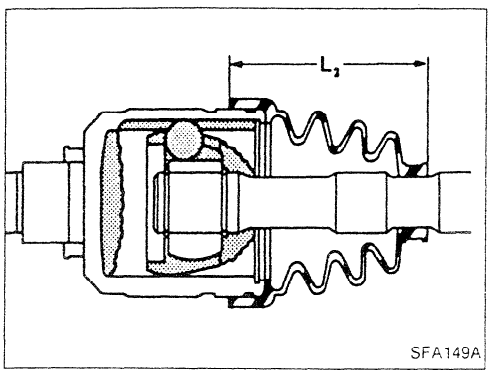
Cover drive shaft serration with tape to prevent damage boot during installation.



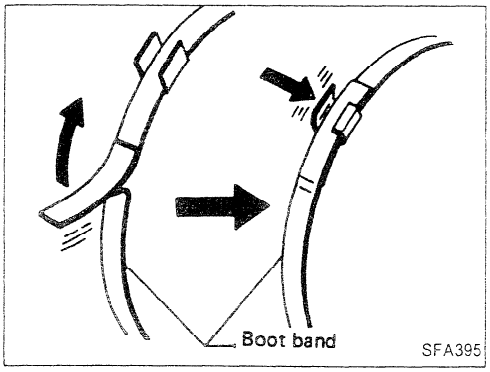


2. Install new snap ring "B", then securely install ball cage, inner race and balls as a unit, making sure the marks which were made during disassembly are properly aligned.
3. Install new snap ring "C".

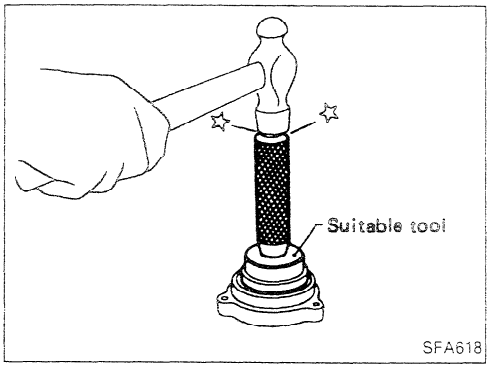
Assembly (Cont'd)



4. Pack drive shaft with specified amount of grease.
   Specified amount of grease:
   140 - 160 g (4.94 - 5.64 oz)
5. Install slide joint housing, then install new snap ring "A".
6. Make sure that boot is properly installed on the drive shaft groove.
   Set boot so that it does not swell and deform when its length is "L_2".
   Length "L_2":
   97 - 99 mm (3.82 - 3.90 in)

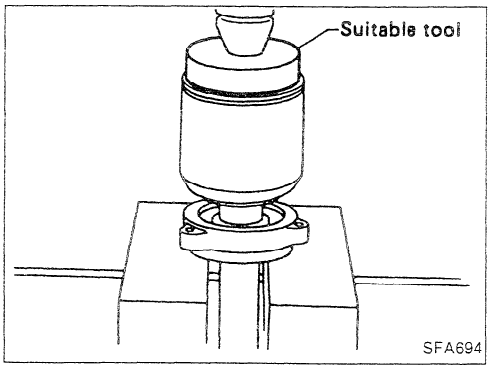


7. Lock new larger and smaller boot bands securely with a suitable tool.

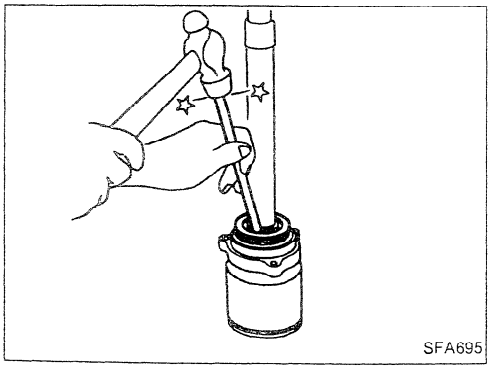


SUPPORT BEARING

- Press bearing into retainer.

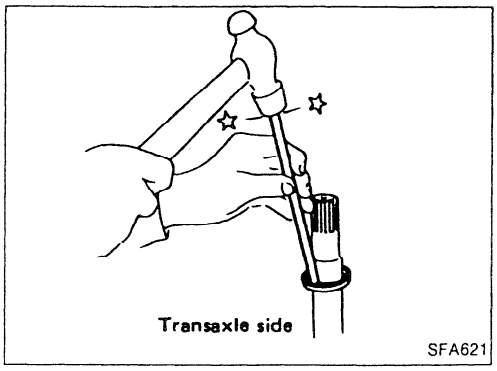


- Press drive shaft into bearing.

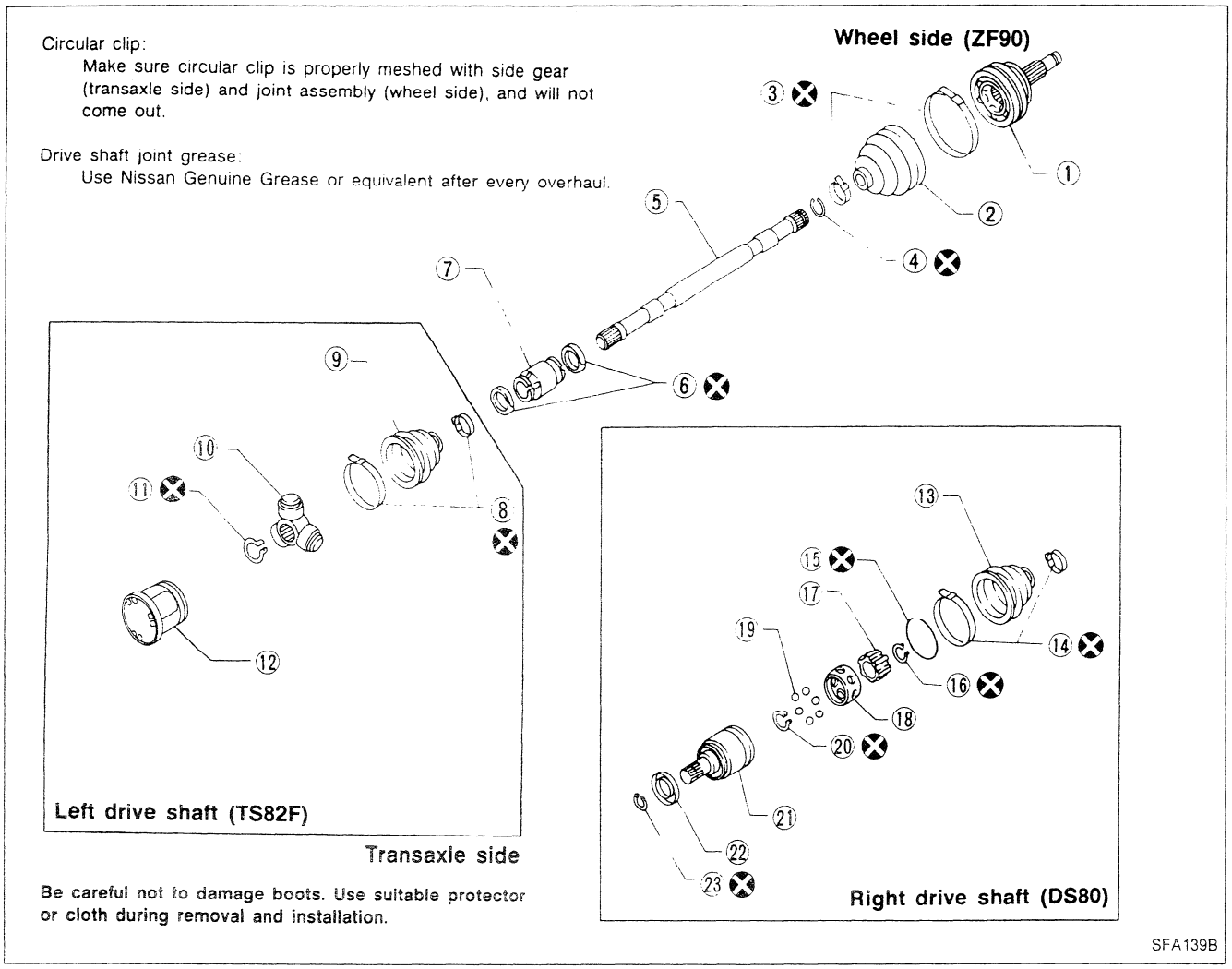


- Install snap ring.
- Install new dust shield.

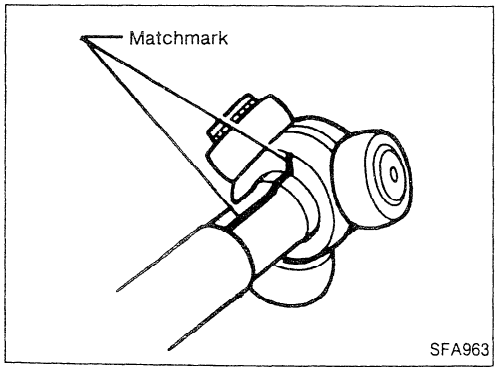
Assembly (Cont'd)



Components



① Joint assembly
② Boot
③ Boot band
④ Circular clip "B"
⑤ Drive shaft
⑥ Damper band
⑦ Dynamic damper
⑧ Boot band
⑨ Boot
⑩ Spider assembly
⑪ Snap ring "C"
⑫ Slide joint housing
⑬ Boot
⑭ Boot band
⑮ Snap ring "A"
⑯ Snap ring "B"
⑰ Inner race
⑱ Cage
⑲ Ball
⑳ Snap ring "C"
㉑ Slide joint housing
㉒ Dust shield
㉓ Circular clip

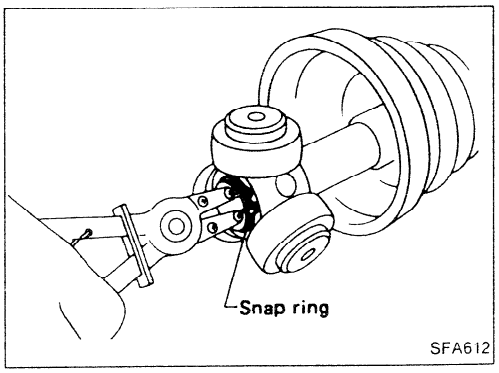


Disassembly

TRANSAXLE SIDE (TS82F)

1. Remove boot bands.
2. Put matchmarks on slide joint housing and drive shaft before separating joint assembly.
3. Put matchmarks on spider assembly and drive shaft.

Disassembly (Cont'd)

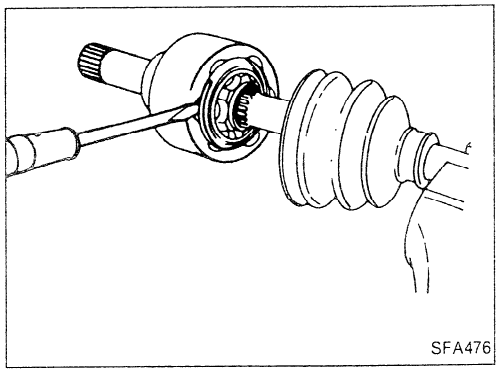


4. Pry off snap ring, then remove spider assembly.

CAUTION:
Do not disassemble spider assembly.

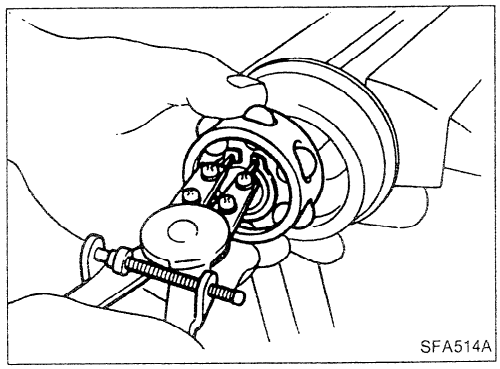
5. Draw out boot.

Cover drive shaft serration with tape so as not to damage the boot.



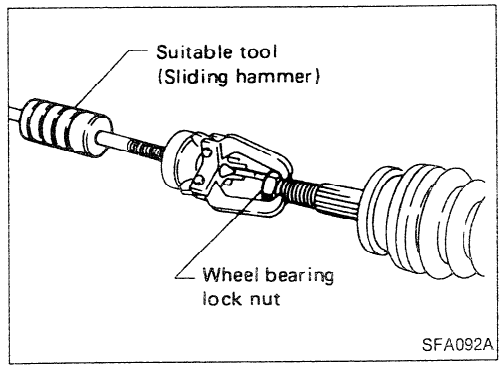
TRANSAXLE SIDE (DS80, DS90)

1. Remove boot bands.
2. Put matchmarks on slide joint housing and inner race, before separating joint assembly.
3. Pry off snap ring "A" with a screwdriver, and pull out slide joint housing.



4. Put matchmarks on inner race and drive shaft.
5. Pry off snap ring "C", then remove ball cage, inner race and balls as a unit.
6. Pry off snap ring "B".
7. Draw out boot.

Cover drive shaft serration with tape so as not to damage the boot.



WHEEL SIDE (ZF90)

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 suitable tool.

Be careful not to damage threads on drive shaft.

- Remove boot bands.

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

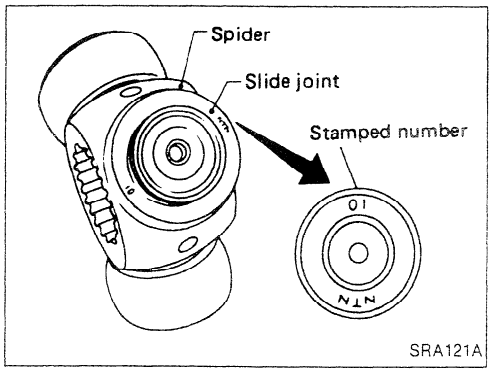
Check boot for fatigue, cracks, or wear. Replace boot with new boot bands.

Inspection (Cont'd)

JOINT ASSEMBLY — Transaxle side

TS82F type

- Check spider assembly for bearing, roller and washer damage. Replace spider assembly if necessary.
- Check housing for any damage. Replace housing set and spider assembly, if necessary.



- When replacing only spider assembly, select a new spider assembly from among those listed in table below. Ensure the number stamped on sliding joint is the same as that stamped on new part.

Housing alone cannot be replaced. It must be replaced together with spider assembly.

Stamped number	Part No.
10	39720-10V10
11	39720-10V11
12	39720-10V12

DS80 type

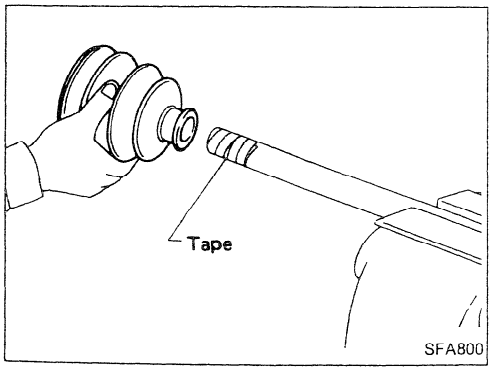
Replace joint assembly if it is deformed or damaged.

JOINT ASSEMBLY — Wheel side (ZF90)

Replace joint assembly if it is deformed or damaged.

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.**

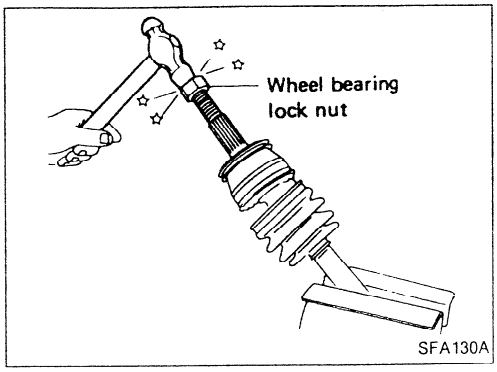


WHEEL SIDE (ZF90)

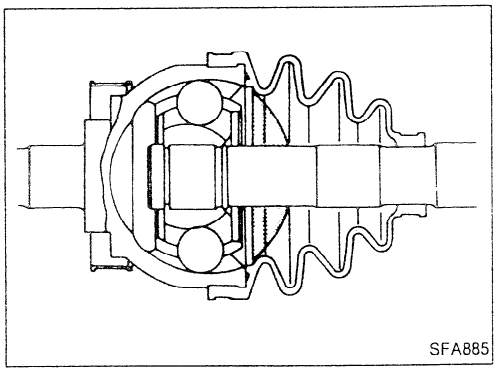
1. Install boot and new small boot band on drive shaft.

Cover drive shaft serration with tape so as not to damage boot during installation.

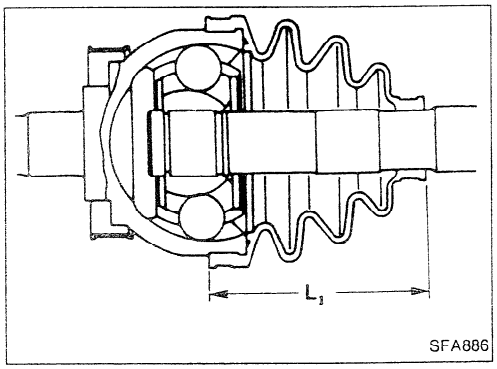
Assembly (Cont'd)



2. Set joint assembly onto drive shaft by lightly tapping it. Install joint assembly securely, ensuring marks which were made during disassembly are properly aligned.

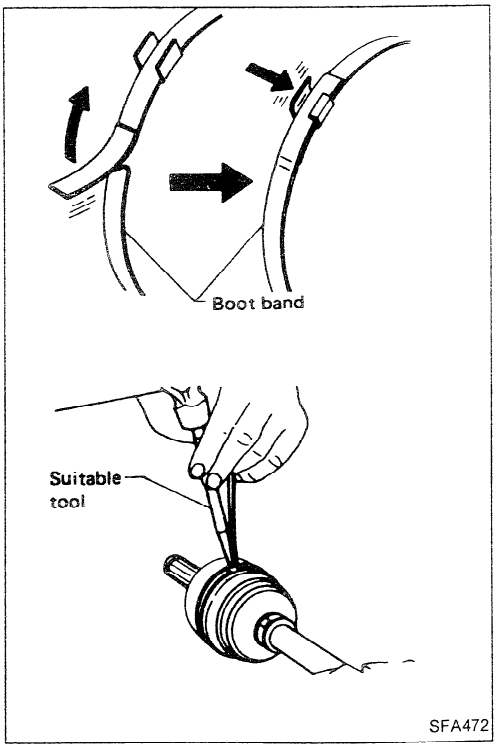


3. Pack drive shaft with specified amount of grease.
   Specified amount of grease:
   160 - 170 g (5.64 - 6.00 oz)



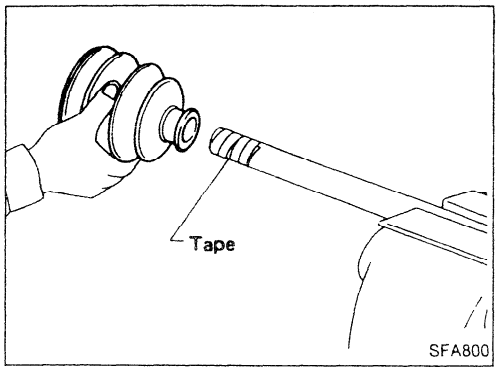
4. Set boot so that it does not swell and deform when its length is "L_1".
   Length "L_1":
   96 - 98 mm (3.78 - 3.86 in)

Make sure that boot is properly installed on the drive shaft groove.



5. Lock new larger and smaller boot bands securely with a suitable tool.

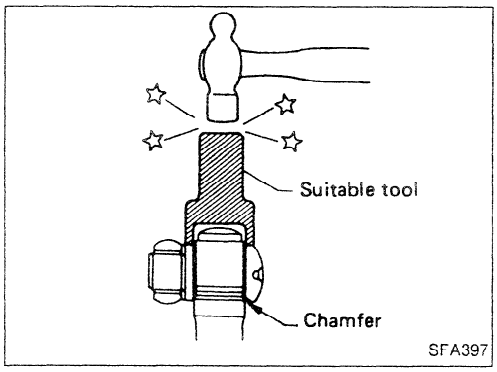
Assembly (Cont'd)



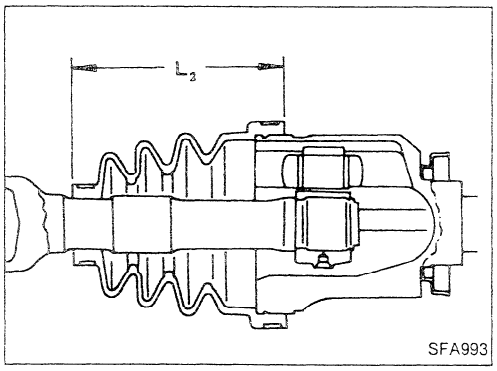
TRANSAXLE SIDE (TS82F)

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.

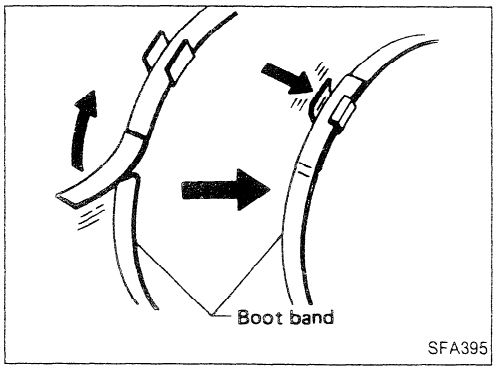


2. Install spider assembly securely, making sure marks are properly aligned.
- Press-fit with spider assembly serration chamfer facing shaft.
3. Install new snap ring.

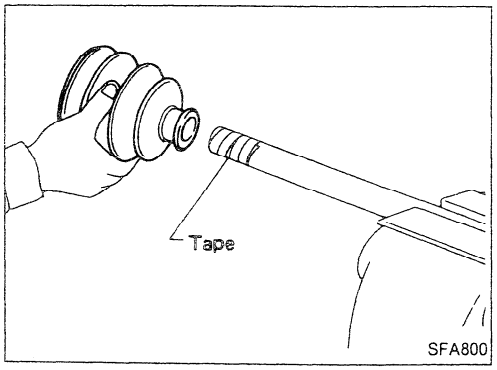


4. Pack drive shaft with specified amount of grease.
   Specified amount of grease:
   185 - 195 g (6.52 - 6.88 oz)
5. Install slide joint housing.
6. Set boot so that it does not swell and deform when its length is "L_2".
   Length "L_2":95 - 97 mm (3.74 - 3.82 in)

Make sure that boot is properly installed on the drive shaft groove.



7. Lock new larger and smaller boot bands securely with a suitable tool.

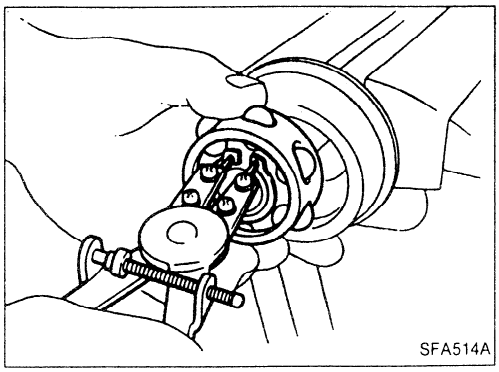


TRANSAXLE SIDE (DS80, DS90)

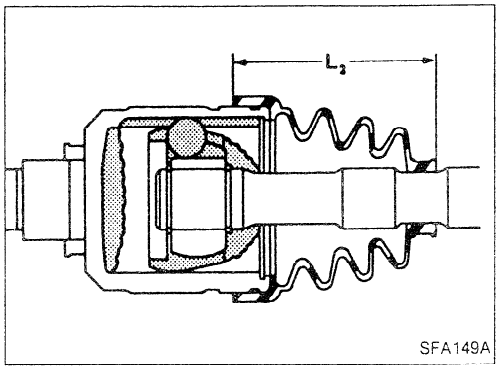
1. Install boot and new small boot band on drive shaft.

Cover drive shaft serration with tape so as not to damage boot during installation.

Assembly (Cont'd)


SFA514A

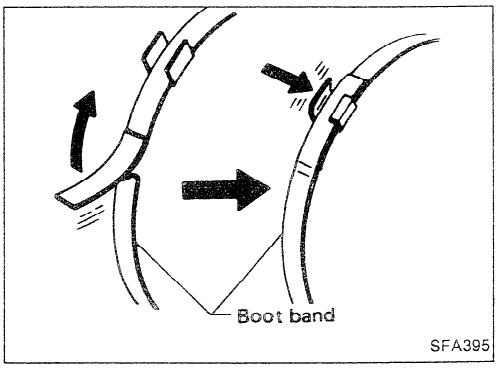
2. Install new snap ring "B", then securely install ball cage, inner race and balls as a unit, making sure the marks which were made during disassembly are properly aligned.
3. Install new snap ring "C".



SFA149A

4. Pack drive shaft with specified amount of grease.
   Specified amount of grease:
   DS80 90 - 110 g (3.17 - 3.88 oz)
   DS90 165 - 175 g (5.82 - 6.17 oz)
5. Install slide joint housing, then install new snap ring "A".
6. Set boot so that it does not swell and deform when its length is "L_3".
   Length "L_3":
   DS80 86 - 88 mm (3.39 - 3.46 in)
   DS90 97 - 99 mm (3.82 - 3.90 in)

Make sure that boot is properly installed on the drive shaft groove.



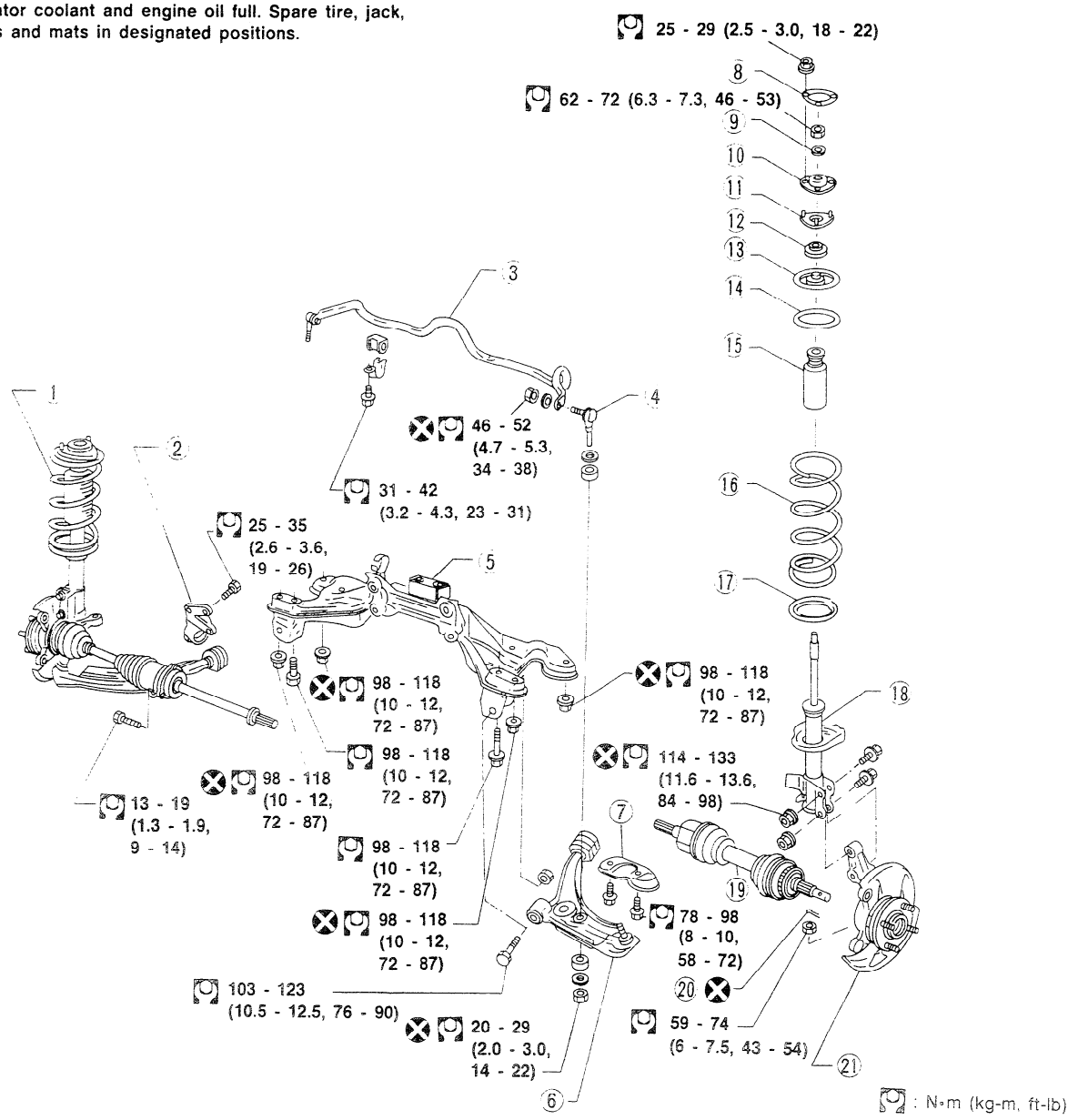
SFA395

7. Lock new larger and smaller boot bands securely with a suitable tool.

2WD MODELS

When installing stabilizer bar and transverse link, final tightening requires to 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.**



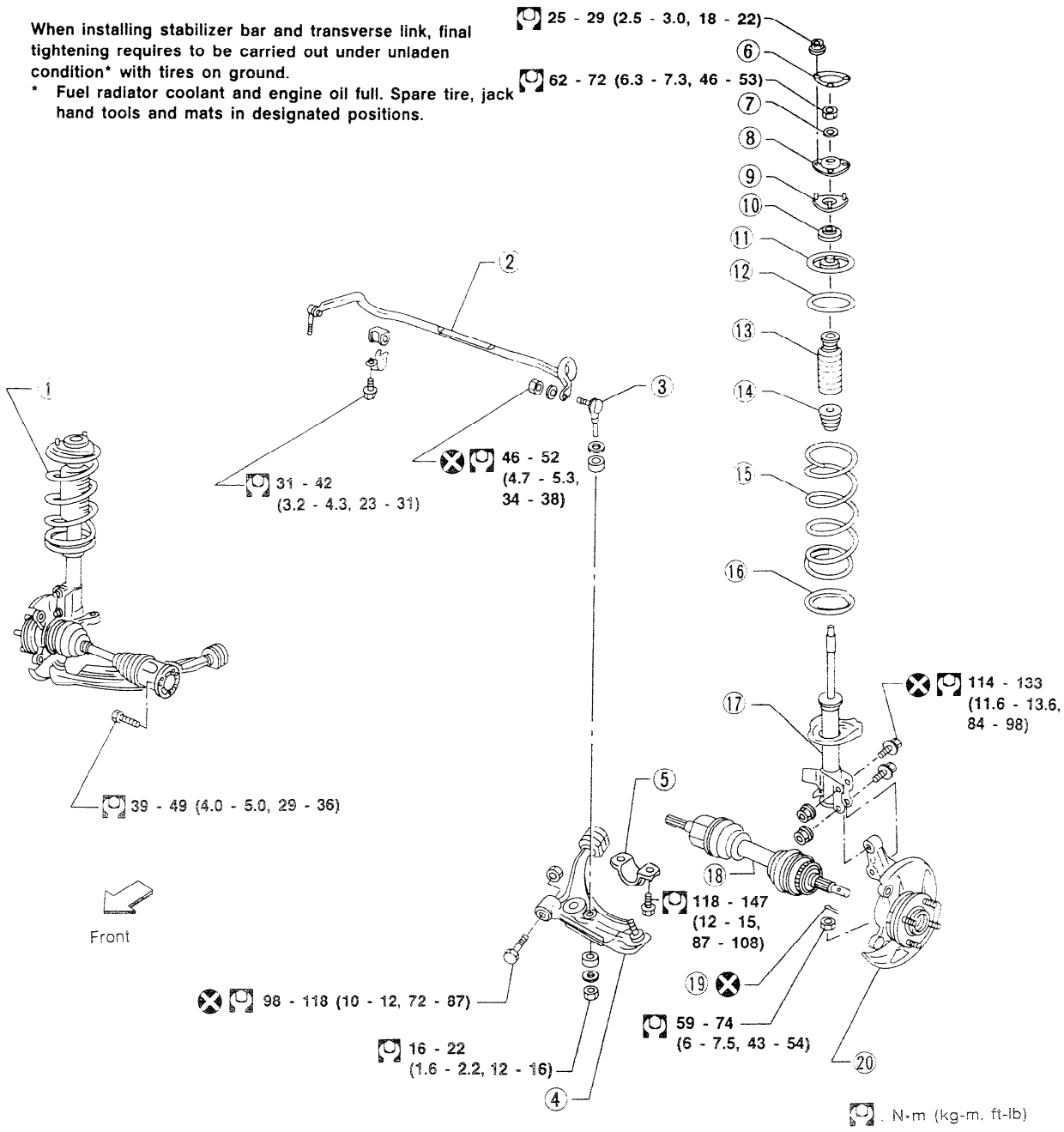
SFA154B

① Shock absorber assembly
② Support bearing bracket
③ Stabilizer bar
④ Connecting rod
⑤ Front suspension member
⑥ Transverse link
⑦ Compression rod clamp
⑧ Gasket
⑨ Washer
⑩ Strut mounting insulator
⑪ Strut insulator bracket
⑫ Thrust bearing
⑬ Upper spring seat
⑭ Rubber seat
⑮ Bumper rubber
⑯ Coil spring
⑰ Rubber seat
⑱ Strut assembly
⑲ Drive shaft
⑳ Cotter pin
㉑ Wheel hub assembly

4WD MODELS

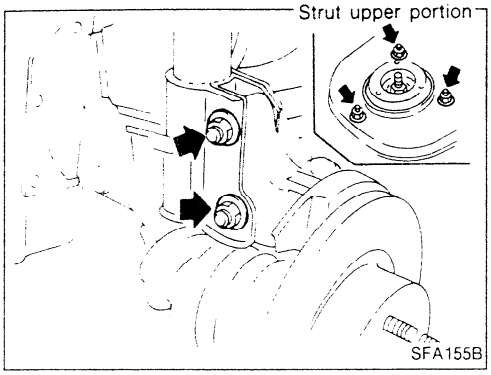
When installing stabilizer bar and transverse link, final tightening requires to be carried out under unladen condition* with tires on ground.

* Fuel radiator coolant and engine oil full. Spare tire, jack hand tools and mats in designated positions.



SFA141B

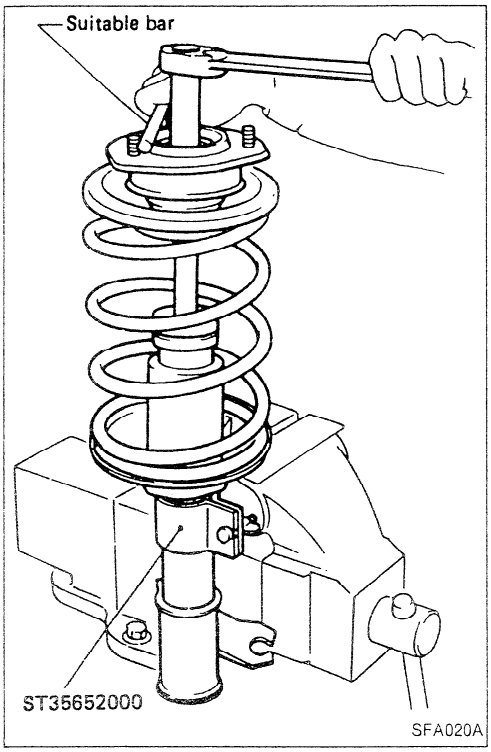
① Shock absorber assembly
② Stabilizer bar
③ Connecting rod
④ Transverse link
⑤ Compression rod clamp
⑥ Gasket
⑦ Washer
⑧ Strut mounting insulator
⑨ Strut insulator bracket
⑩ Thrust bearing
⑪ Upper spring seat
⑫ Rubber seat
⑬ Dust cover
⑭ Bound bumper rubber
⑮ Coil spring
⑯ Rubber seat
⑰ Strut assembly
⑱ Drive shaft
⑲ Cotter pin
⑳ Wheel hub assembly



Removal and Installation

- Remove strut assembly fixing bolts and nuts (to hoodledge).

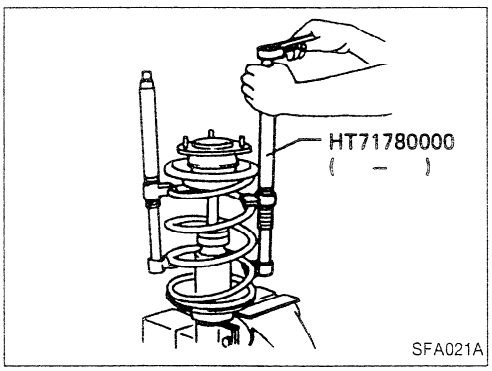
Do not remove piston rod lock nut on vehicle.



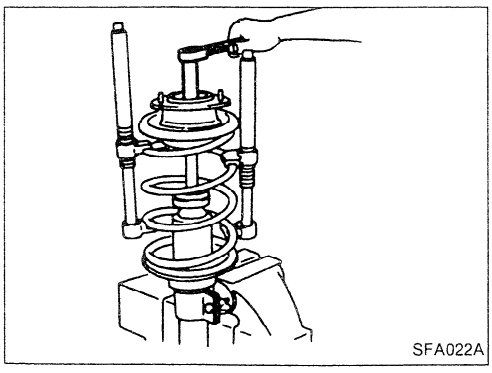
Disassembly

1. Set strut assembly on vise with Tool, then loosen piston rod lock nut.

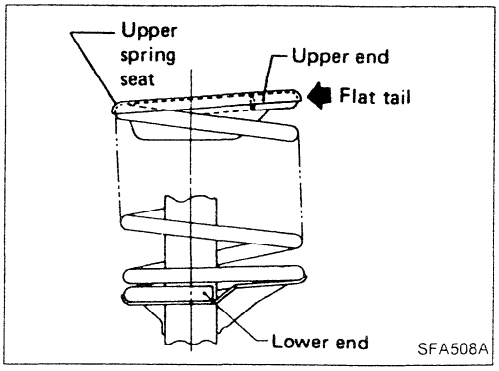
Do not remove piston rod lock nut.



2. Compress spring with Tool so that the strut mounting insulator can be turned by hand.

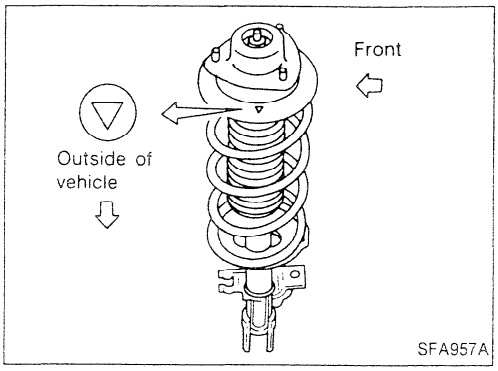


3. Remove piston rod lock nut.

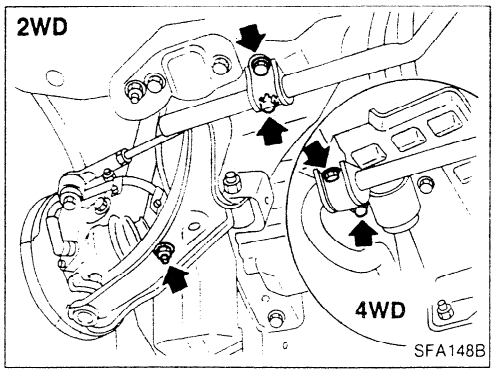


Assembly

- When installing coil spring on strut, it must be positioned as shown in the figure at left.

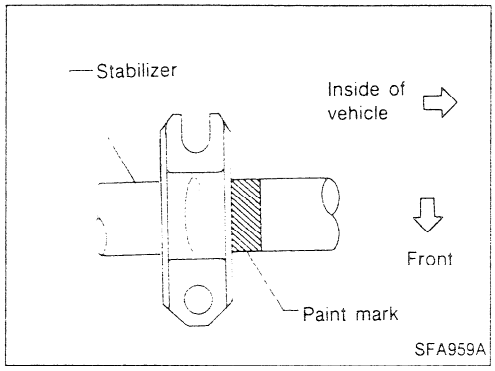


- When installing spring seat, make sure that it is positioned as shown.

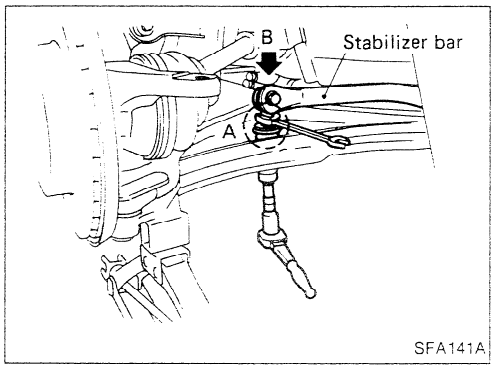


Removal and Installation

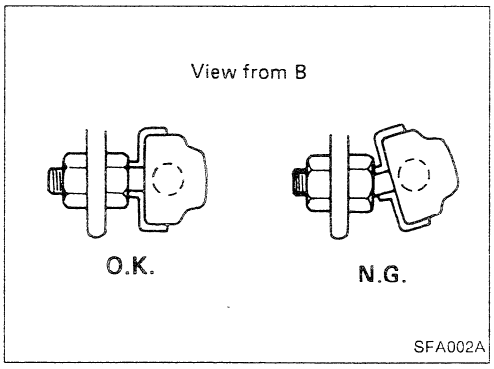
- Remove stabilizer bar.



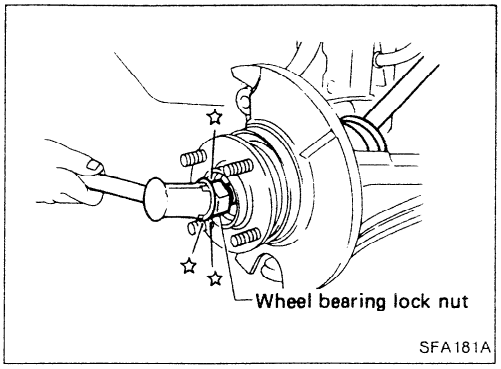
- When installing stabilizer, make sure that paint mark and clamp face in their correct directions.



- When removing and installing stabilizer bar, fix portion A.



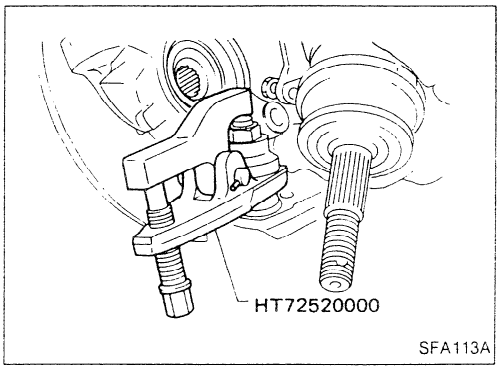
- Install stabilizer bar with ball joint socket properly placed.



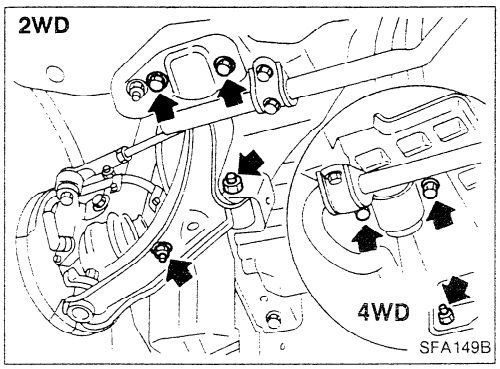
Removal and Installation

1. Remove wheel bearing lock nut.
2. Remove tie-rod ball joint.
3. Remove strut lower bracket fixing bolts and nuts.
4. Separate drive shaft from knuckle by slightly tapping drive shaft end.

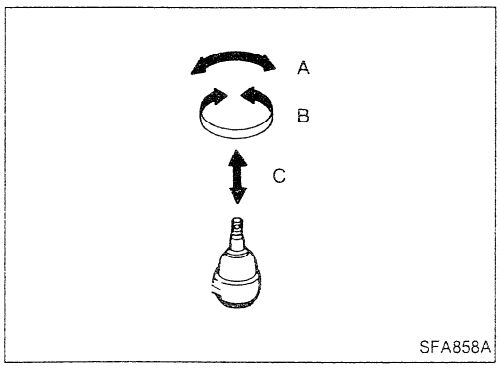
Cover boots with waste cloth so as not to damage them when removing drive shaft.



5. Separate lower ball joint stud from knuckle with Tool. Refer to FRONT AXLE — Wheel Hub and Knuckle.



6. Remove bolts and nuts as shown at left.



Inspection

- Check ball joint for play. If ball stud is worn, play in axial direction is excessive or joint is hard to swing, replace lower ball joint.
  Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.
  Swinging force "A":
  (measuring point: cotter pin hole of ball stud)
  7.8 - 57.9 N (0.8 - 5.9 kg, 1.8 - 13.0 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)
- Check dust cover for damage. Replace it and cover clamp if necessary.

General Specifications — Model B13

SUSPENSION

Suspension type	Strut type independent suspension

COIL SPRING

R.H.D. except for Europe

Applied model	Sedan								Coupe	
	E10S		GA13DS & Except S/S* model for GA14DS, GA16DS		CD17, GA16DE M/T & Except S/S* model for GA14DS, GA16DS A/T		GA16DE & S/S* model for GA14DS, GA16DS			
	M/T				A/T, M/T		A/T		M/T	A/T
	Standard	Option	Standard	Option	Standard	Option	Standard	Option		
Wire diameter mm (in)										
Left	11.4 (0.449)	11.6 (0.457)		11.8 (0.465)		12.0 (0.472)		12.1 (0.476)	11.8 (0.465)	12.0 (0.472)
Right	11.6 (0.457)	11.8 (0.465)		12.0 (0.472)		12.1 (0.476)		12.3 (0.484)	12.0 (0.472)	12.1 (0.476)
Coil diameter mm (in)										
Left	130 (5.12)									
Right										
Free length mm (in)										
Left	335 (13.19)	345 (13.58)		355 (13.98)		365 (14.37)		375 (14.76)	355 (13.98)	365 (14.37)
Right	345 (13.58)	355 (13.98)		365 (14.37)		375 (14.76)		385 (15.16)	365 (14.37)	375 (14.76)
Spring constant N/mm (kg/mm, lb/in)										
Left	19.6 (2.0, 112)									
Right										
Identification color										
Left	White x 2, Red x 1	White x 2, Yellow x 1		White x 2, Light green x 1		White x 2, Purple x 1		Pink x 2, Yellow x 1	White x 2, Light green x 1	White x 2, Purple x 1
Right	White x 2, Yellow x 1	White x 2, Light green x 1		White x 2, Purple x 1		Pink x 2, Yellow x 1		Pink x 2, White x 1	White x 2, Purple x 1	Pink x 2, Yellow x 1

*S/S: Super Saloon

General Specifications — Model B13 (Cont'd)

R.H.D. for Europe

Applied model	GA16DS		SR20DE
	M/T	A/T	
Wire diameter mm (in)			
Left	11.8 (0.465)	12.0 (0.472)	12.3 (0.484)
Right	12.0 (0.472)	12.1 (0.476)	12.5 (0.492)
Coil outer diameter mm (in)	130 (5.12)		
Free length mm (in)			
Left	355 (13.98)	365 (14.37)	360 (14.17)
Right	365 (14.37)	375 (14.76)	370 (14.57)
Spring constant N/mm (kg/mm, lb/in)	19.6 (2.0, 112)		21.6 (2.2, 123)
Identification color			
Left	White × 2, Light green × 1	White × 2, Purple × 1	Orange × 2, Light blue × 1
Right	White × 2, Purple × 1	Pink × 2, Yellow × 1	Orange × 2, Orange × 1

L.H.D. except for Europe & Middle East

Applied model	Sedan				Coupe	
	GA13DS & Except EX/S* model for GA14DS	GA16DS		GA16DE, CD17 & EX/S* model for GA14DS		
		M/T	A/T		M/T	A/T
Wire diameter mm (in)						
Standard	11.8 (0.465)		12.0 (0.472)		12.0 (0.472)	12.1 (0.476)
Option	12.0 (0.472)		12.1 (0.476)		—	—
Coil diameter mm (in)						
Standard	130 (5.12)					
Option						
Free length mm (in)						
Standard	355 (13.98)		365 (14.37)		365 (14.37)	375 (14.76)
Option	365 (14.37)		375 (14.76)		—	—
Spring constant N/mm (kg/mm, lb/in)	19.6 (2.0, 112)					
Identification color						
Standard	White x 2, Light green x 1		White x 2, Purple x 1		White x 2, Purple x 1	Pink x 2, Yellow x 1
Option	White x 2, Purple x 1		Pink x 2, Yellow x 1		—	—

*EX/S: EX Saloon

General Specifications — Model B13 (Cont'd)

L.H.D. for Europe

Applied model	GA16DS		SR20DE
	M/T	A/T	
Wire diameter mm (in)	12.0 (0.472)	12.1 (0.476)	12.3 (0.484)
Coil outer diameter mm (in)	130 (5.12)		
Free length mm (in)	365 (14.37)	375 (14.76)	360 (14.17)
Spring constant N/mm (kg/mm, lb/in)	19.6 (2.0, 112)		21.6 (2.2, 123)
Identification color	White × 2, Purple × 1	Pink × 2, Yellow × 1	Orange × 2, Light blue × 1

For Middle East

Applied model	Sedan		Coupe		T-bar roof
	M/T	A/T	M/T	A/T	
Wire diameter mm (in)	12.1 (0.476)	12.3 (0.484)	12.0 (0.472)	12.1 (0.476)	
Coil outer diameter mm (in)	130 (5.12)				
Free length mm (in)	375 (14.76)	385 (15.16)	365 (14.37)	375 (14.76)	
Spring constant N/mm (kg/mm, lb/in)	19.6 (2.0, 112)				
Identification color	Pink × 2, Yellow × 1	Pink × 2, White × 1	White × 2, Purple × 1	Pink × 2, Yellow × 1	

SHOCK ABSORBER OR STRUT

R.H.D. except for Europe

Applied model	Sedan				Coupe
	Standard			Option (Heavy Duty model)	
	Except CD17 & GA16DE	CD17		GA16DE	
		Without P/S	With P/S		
Strut type	Double-acting hydraulic				
Damping force [at 0.3 m (1.0 ft)/sec.] N (kg, lb)					
Expansion	1,138 - 1,530 (116 - 156, 256 - 344)		922 - 1,236 (94 - 126, 207 - 278)	1,138 - 1,530 (116 - 156, 256 - 344)	
Compression	333 - 510 (34 - 52, 75 - 115)		265 - 422 (27 - 43, 60 - 95)	333 - 510 (34 - 52, 75 - 115)	
Piston rod diameter mm (in)	18 (0.71)			20 (0.79)	18 (0.71)

General Specifications — Model B13 (Cont'd)

L.H.D. except for Europe & Middle East

Applied model	Sedan					Coupe
	Standard			Option		
	Except GA16DE		GA16DE	Heavy Duty model	Head Suspension model	
	Without P/S	With P/S				
Strut type	Double-acting hydraulic					
Damping force [at 0.3 m (1.0 ft)/sec.] N (kg, lb)						
Expansion	1,138 - 1,530 (116 - 156, 256 - 344)	922 - 1,236 (94 - 126, 207 - 278)		1,138 - 1,530 (116 - 156, 256 - 344)		
Compression	333 - 510 (34 - 52, 75 - 115)	265 - 422 (27 - 43, 60 - 95)		333 - 510 (34 - 52, 75 - 115)		
Piston rod diameter mm (in)	18 (0.71)			20 (0.79)	18 (0.71)	

For Europe

Applied model	GA16DS		SR20DE
	R.H.D.	L.H.D.	
Strut type	Double-acting hydraulic		
Damping force [at 0.3 m (1.0 ft)/sec.] N (kg, lb)			
Expansion	1,000 - 1,353 (102 - 138, 225 - 304)	834 - 1,128 (85 - 115, 187 - 254)	1,265 - 1,687 (129 - 172, 284 - 379)
Compression	314 - 471 (32 - 48, 71 - 106)	382 - 559 (39 - 57, 86 - 126)	432 - 647 (44 - 66, 97 - 146)
Piston rod diameter mm (in)	18 (0.71)		

For Middle East

Applied model	Without A.B.S.		With A.B.S.
	Except 175 tire	175 tire	
Strut type	Double-acting hydraulic		
Damping force [at 0.3 m (1.0 ft)/sec.] N (kg, lb)			
Expansion	1,138 - 1,530 (116 - 156, 256 - 344)	922 - 1,236 (94 - 126, 207 - 278)	
Compression	333 - 510 (34 - 52, 75 - 115)	265 - 422 (27 - 43, 60 - 95)	
Piston rod diameter mm (in)	18 (0.71)		

General Specifications — Model B13 (Cont'd)

STABILIZER BAR

Except for Europe & Middle East

Applied model	Sedan	Coupe
Bar diameter mm (in)		
Outer diameter	28.6 (1.126)	28 (1.10)
Inner diameter	20.6 (0.811)	—
Identification color	Orange	Purple

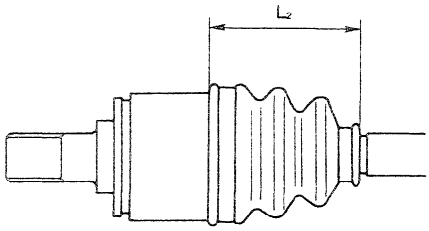
For Europe & Middle East

Applied model	Middle East	Europe	
		GA16DS R.H.D.	
Bar diameter mm (in)			
Outer diameter	28.6 (1.126)		28 (1.10)
Inner diameter	20.6 (0.811)		—
Identification color	Orange		Purple

DRIVE SHAFT

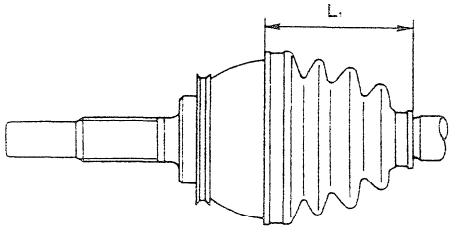
Applied model	Except GA16DS, GA16DE, SR20DE engines	GA16DE, GA16DS	SR20DE
Joint type			
Transaxle side	TS70C	TS79C	DS86
Wheel side	ZF80	ZF90	BF86
Applied grease			
Quality	Nissan genuine grease or equivalent		
Capacity g (oz)			
Transaxle side	185 - 195 (6.52 - 6.88)	225 - 235 (7.94 - 8.29)	140 - 160 (4.94 - 5.64)
Wheel side	90 - 100 (3.17 - 3.53)	155 - 175 (5.47 - 6.17)	105 - 125 (3.70 - 4.41)
Boot length mm (in)			
Transaxle side "L_2"	95.5 - 97.5 (3.760 - 3.839)	101.5 - 103.5 (4.00 - 4.07)	97 - 99 (3.82 - 3.90)
Wheel side "L_1"	90.5 - 92.5 (3.563 - 3.642)	96 - 98 (3.78 - 3.86)	99.5 - 101.5 (3.917 - 3.996)

Transaxle side



SFA961A

Wheel side



SFA962A

Inspection and Adjustment — Model B13

WHEEL ALIGNMENT (Unladen*1)

Except for Europe & Middle East

Applied model	Standard			Option
	Sedan		Coupe	
	Except CD17	CD17		
Camber degree	−1°00′ to 0°15′			−0°50′ to 0°40′
Caster degree	1°05′ - 2°35′			1°05′ - 2°35′
Kingpin inclination degree	13°15′ - 14°45′			12°50′ - 14°20′
Total toe-in mm (in)	1 - 3 (0.04 - 0.12)			
Total toe-in degree	6′ - 18′			
Front wheel turning angle				
Full turn*2 degree				
13-inch wheel				
Inside	39° - 43°	36° - 40°	39° - 43°	39° - 43°
Outside	34°	32°	34°	34°
14-inch wheel				
Inside	33° - 37°			
Outside	30°			

For Europe & Middle East

Applied model		Europe	Middle East
Camber	degree	−1°00′ to 0°30′	−0°50′ to 0°40′
Caster	degree	1°05′ - 2°35′	0°55′ - 2°25′
Kingpin inclination	degree	13°15′ - 14°45′	12°50′ - 14°20′
Total toe-in	mm (in)	0 - 4 (0 - 0.16)	1 - 3 (0.04 - 0.12)
	degree	0′ - 22′	6′ - 18′
Front wheel turning angle			
Full turn*2	degree		
Inside		33° - 37°	39° - 43°
Outside		30°	34°

*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) is 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine at idle.

WHEEL BEARING

Applied model		All
Axial end play	mm (in)	Less than 0.05 (0.0020)
Lock nut tightening torque	N·m (kg-m, ft-lb)	196 - 275 (20 - 28, 145 - 203)
Preload	N·m (kg-cm, in-lb)	1.31 (13.4, 11.6)
At knuckle arm	N (kg, lb)	8.8 (0.9, 2.0)

LOWER BALL JOINT

Applied model		All
Axial end play	mm (in)	0 (0)
Swinging force	N (kg, lb)	
At cotter pin hole		7.8 - 57.9 (0.8 - 5.9, 1.8 - 13.0)
Rotating torque	N·m (kg-cm, in-lb)	0.5 - 3.4 (5 - 35, 4.3 - 30.4)

WHEEL RUNOUT

Unit: mm (in)

Wheel type	Aluminum wheel	Steel wheel
Maximum radial runout limit	0.3 (0.012)	0.5 (0.020)
Maximum lateral runout limit	0.3 (0.012)	0.8 (0.031)

General Specifications — Model N14

SUSPENSION

Suspension type	Strut type independent suspension

COIL SPRING

Except for Europe

Applied model	GA14DS		GA16DE	
	M/T	A/T	M/T	A/T
Wire diameter mm (in)				
Left	11.6 (0.457)	11.8 (0.465)		12.0 (0.472)
Right	11.8 (0.465)	12.0 (0.472)		12.1 (0.476)
Coil diameter mm (in)	130 (5.12)			
Left				
Right				
Free length mm (in)				
Left	345 (13.58)	355 (13.98)		365 (14.37)
Right	355 (13.98)	365 (14.37)		375 (14.76)
Spring constant N/mm (kg/mm, lb/in)	19.6 (2.0, 112)			
Identification color				
Left	White x 2, Yellow x 1	White x 2, Light green x 1		White x 2, Purple x 1
Right	White x 2, Light green x 1	White x 2, Purple x 1		Pink x 2, Yellow x 1

R.H.D. for Europe

Applied model	2WD				4WD
	GA14DS, GA16DS		CD20	SR20DE	
	M/T	A/T			
Wire diameter mm (in)					
Left	11.8 (0.465)	12.0 (0.472)	12.1 (0.476)	12.3 (0.484)	12.7 (0.500)
Right	12.0 (0.472)	12.1 (0.476)	12.3 (0.484)	12.5 (0.492)	12.9 (0.508)
Coil diameter mm (in)	130 (5.12)				
Left					
Right					
Free length mm (in)					
Left	355 (13.98)	365 (14.37)	375 (14.76)	360 (14.17)	390 (15.35)
Right	365 (14.37)	375 (14.76)	385 (15.16)	370 (14.57)	400 (15.75)
Spring constant N/mm (kg/mm, lb/in)	19.6 (2.0, 112)				21.6 (2.2, 123)
Identification color					
Left	White × 2, Light green × 1	White × 2, Purple × 1	Pink × 2, Yellow × 1	Orange × 2, Light blue × 1	Pink × 2, Orange × 1
Right	White × 2, Purple × 1	Pink × 2, Yellow × 1	Pink × 2, White × 1	Orange × 2, Orange × 1	Light blue × 2, Orange × 1

General Specifications — Model N14 (Cont'd)

L.H.D. for Europe

Applied model	2WD				4WD	
	GA14DS M/T	GA14DS A/T & GA16DS	CD20	SR20DE	GA16DS	SR20DET
Wire diameter mm (in)	11.8 (0.465)	12.0 (0.472)	12.1 (0.476)	12.5 (0.492)	12.3 (0.484)	12.9 (0.508)
Coil diameter mm (in)	130 (5.12)					
Free length mm (in)	355 (13.98)	365 (14.37)	375 (14.76)	370 (14.57)	390 (15.35)	400 (15.75)
Spring constant N/mm (kg/mm, lb/in)	19.6 (2.0, 112)			21.6 (2.2, 123)	19.6 (2.0, 112)	21.6 (2.2, 123)
Identification color	White × 2, Light green × 1	White × 2, Purple × 1	Pink × 2, Yellow × 1	Orange × 2, Orange × 1	Orange × 1, Light green × 1, Blue × 1	Light blue × 2, Orange × 1

SHOCK ABSORBER OR STRUT

Except for Europe

Applied model	ALL
Strut type	Double-acting hydraulic
Damping force N (kg, lb) [at 0.3 m (1.0 ft)/sec.]	
Expansion	922 - 1,236 (94 - 126, 207 - 278)
Compression	265 - 422 (27 - 43, 60 - 95)
Piston rod diameter mm (in)	18 (0.71)

For Europe

Applied model	2WD				4WD	
	GA14DS, GA16DS		SR20DE		GA16DS	SR20DET
	R.H.D.	L.H.D.	R.H.D.	L.H.D.		
Strut type	Double-acting hydraulic					
Damping force N (kg, lb) [at 0.3 m (1.0 ft)/sec.]						
Expansion	1,000 - 1,353 (102 - 138, 225 - 304)	834 - 1,128 (85 - 115, 187 - 254)	1,000 - 1,353 (102 - 138, 225 - 304)	1,265 - 1,687 (129 - 172, 284 - 379)	1,000 - 1,353 (102 - 138, 225 - 304)	1,265 - 1,687 (129 - 172, 284 - 379)
Compression	314 - 471 (32 - 48, 71 - 106)	382 - 559 (39 - 57, 86 - 126)	520 - 755 (53 - 77, 117 - 170)	432 - 647 (44 - 66, 97 - 146)	226 - 363 (23 - 37, 51 - 82)	432 - 647 (44 - 66, 97 - 146)
Piston rod diameter mm (in)	18 (0.71)					

General Specifications — Model N14 (Cont'd)

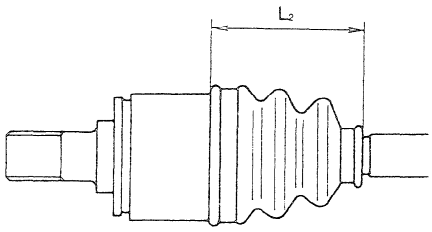
STABILIZER BAR

Applied model	2WD			4WD
	R.H.D.		L.H.D.	
	Except SR20DE	SR20DE		
Bar diameter mm (in)				
Outer	28.6 (1.126)	28 (1.10)		28 (1.10)
Inner	20 6 (0.811)	—		—
Identification color	Orange	Purple		Yellow

DRIVE SHAFT

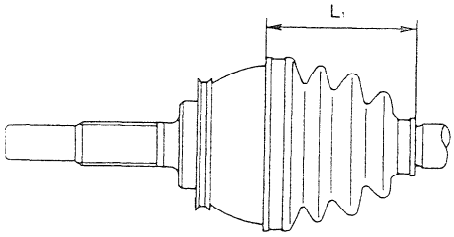
Applied model	2WD			4WD	
	GA14DS CD20	GA16DS GA16DE	SR20DE	GA16DS	SR20DET
Joint type					
Transaxle side	TS70C	TS79C	DS86	Right: DS80 Left: TS82F	Right: DS90 Left: TS82F
Wheel side	ZF80	ZF90	BF86	ZF90	ZF90
Applied grease					
Quality	Nissan genuine grease or equivalent				
Capacity g (oz)					
Transaxle side	185 - 195 (6.52 - 6.88)	225 - 235 (7 94 - 8.29)	140 - 160 (4.94 - 5.64)	R: 90 - 110 (3.17 - 3.88) L: 185 - 195 (6.52 - 6.88)	R: 165 - 175 (5.82 - 6.17) L: 185 - 195 (6.52 - 6.88)
Wheel side	90 - 100 (3.17 - 3.53)	155 - 175 (5.47 - 6.17)	105 - 125 (3.70 - 4.41)	160 - 170 (5.64 - 6.00)	160 - 170 (5.64 - 6.00)
Boot length mm (in)					
Transaxle side "L_2"	95.5 - 97.5 (3.760 - 3.839)	101.5 - 103.5 (4.00 - 4.07)	97 - 99 (3.82 - 3.90)	R: 86 - 88 (3.39 - 3.46) L: 95 - 97 (3.74 - 3.82)	R: 97 - 99 (3.82 - 3.90) L: 95 - 97 (3.74 - 3.82)
Wheel side "L_1"	90.5 -92.5 (3.563 - 3.642)	96 - 98 (3.78 - 3.86)	99.5 - 101.5 (3.917 - 3.996)	96 - 98 (3.78 - 3.86)	96 - 98 (3.78 - 3.86)

Transaxle side



SFA961A

Wheel side



SFA962A

Inspection and Adjustment — Model N14

WHEEL ALIGNMENT (Unladen*1)

Applied model	2WD			4WD	
	13-inch wheel		14-inch wheel	13-inch wheel	14-inch wheel
	Except CD engine	CD engine			
Camber degree	−1°00′ to 0°30′			−0°40′ to 0°50′	
Caster degree	0°40′ - 2°10′			0°30′ - 2°00′	
Kingpin inclinatidegree	13°15′ - 14°45′			12°15′ - 13°45′	
Total toe-in mm (in)	0 - 4 (0 - 0.16)				
degree	0′ - 22′				
Front wheel turning angle					
Full turn*2 degree					
Inside	39° - 43°	36° - 40°	33° - 37°	37° - 41°	34° - 38°
Outside	34°	32°	30°	31°	29°

*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) is 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine at idle.

WHEEL BEARING

Applied model	All
Axial end play mm (in)	Less than 0.05 (0.0020)
Lock nut tightening torque N·m (kg-m, ft-lb)	196 - 275 (20 - 28, 145 - 203)
Preload N·m (kg-cm, in-lb)	1.31 (13.4, 11.6)
At knuckle arm N (kg, lb)	8.8 (0.9, 2.0)

LOWER BALL JOINT

Applied model	All
Axial end play mm (in)	0 (0)
Swinging force N (kg, lb) At cotter pin hole	7.8 - 57.9 (0.8 - 5.9, 1.8 - 13.0)
Rotating torque N·m (kg-cm, in-lb)	0.5 - 3.4 (5 - 35, 4.3 - 30.4)

WHEEL RUNOUT

Unit: mm (in)

Wheel type	Aluminum wheel	Steel wheel
Maximum radial runout limit	0.3 (0.012)	0.5 (0.020)
Maximum lateral runout limit	0.3 (0.012)	0.8 (0.031)

REAR AXLE & REAR SUSPENSION

SECTION RA

CONTENTS

PRECAUTIONS AND PREPARATION ..... RA- 2

2WD

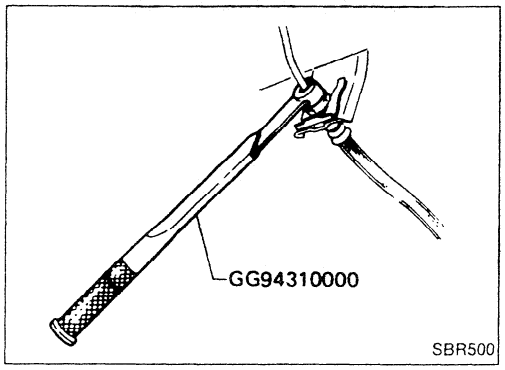
REAR AXLE AND REAR SUSPENSION ..... RA- 3
CHECK AND ADJUSTMENT — On-vehicle ..... RA- 4
REAR AXLE — Wheel Hub ..... RA- 7
REAR SUSPENSION ..... RA- 9
REAR SUSPENSION — Coil Spring and Strut Assembly RA-11
REAR SUSPENSION — Stabilizer Bar RA-13

4WD

REAR AXLE AND REAR SUSPENSION RA-14
CHECK AND ADJUSTMENT — On-vehicle RA-15
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REAR AXLE — Wheel Hub and Knuckle RA-19
REAR AXLE — Drive Shaft RA-23
REAR SUSPENSION RA-30
REAR SUSPENSION — Coil Spring and Strut Assembly RA-32
REAR SUSPENSION — Stabilizer Bar RA-34

2WD & 4WD

SERVICE DATA AND SPECIFICATIONS (S.D.S.) RA-35

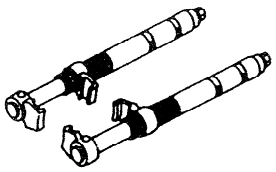
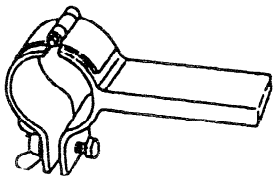
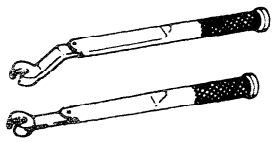


Precautions

- **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 Tool when removing or installing brake tubes.**
- **When removing each suspension part, check wheel alignment and adjust if necessary.**
- **Do not jack up at the parallel links.**

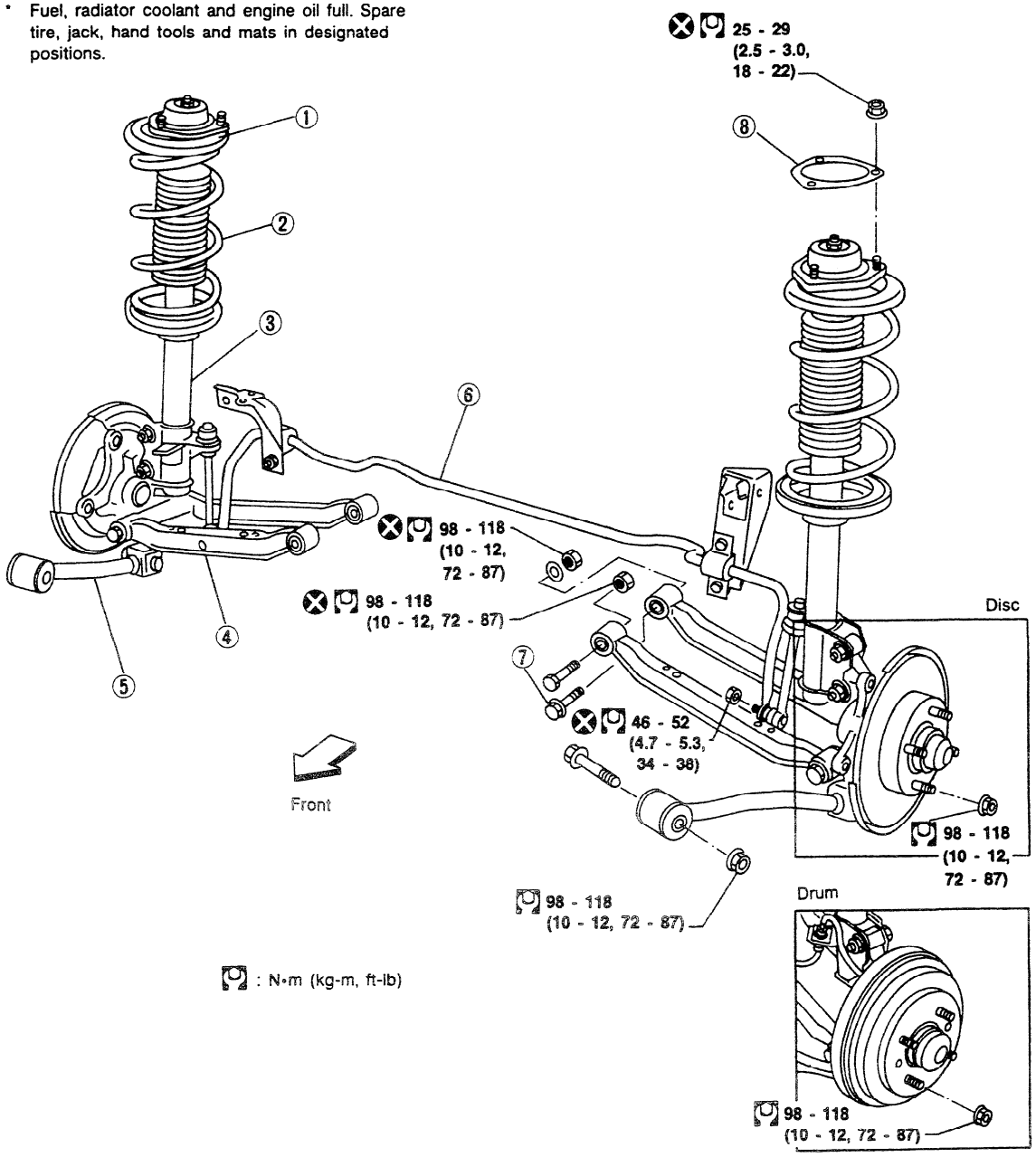
Preparation

SPECIAL SERVICE TOOLS

Tool number Tool name	Description	
HT71780000 Spring compressor		Removing and installing coil spring
ST35652000 Strut attachment		Fixing strut assembly
GG94310000 Flare nut torque wrench		Removing and installing brake piping

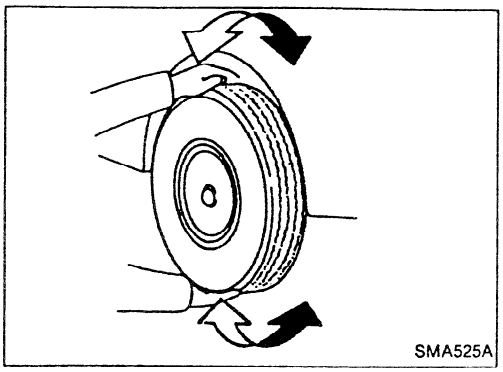
When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.

* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.



SRA350A

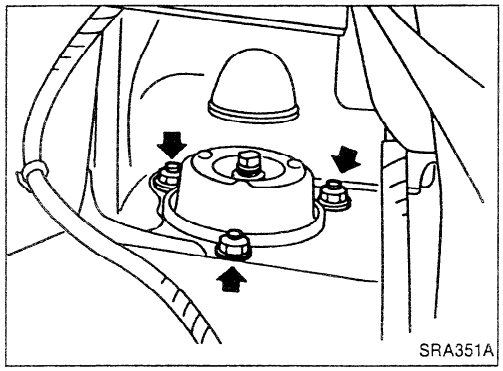
① Strut mounting insulator assembly
② Coil spring
③ Strut assembly
④ Parallel link
⑤ Radius rod
⑥ Stabilizer bar
⑦ Adjusting bolt
⑧ Gasket


SMA525A

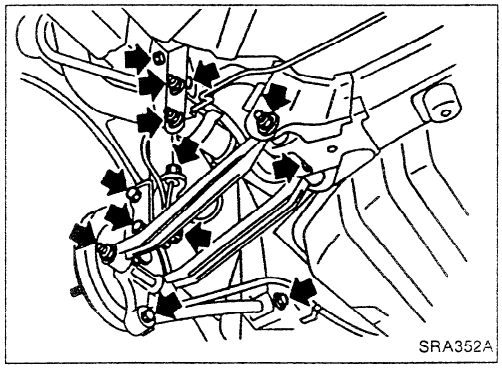
Rear Axle and Rear Suspension Parts

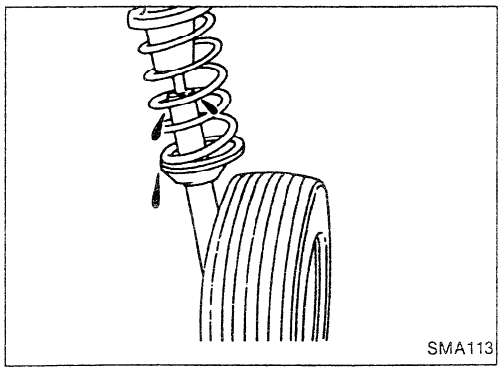
Check axle and suspension parts for looseness, wear or damage.

- Shake each rear wheel to see excessive play.

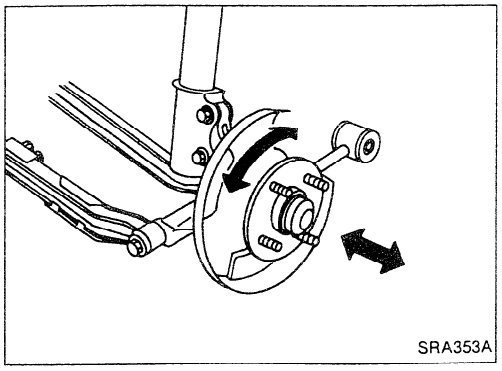

SRA351A

- Retighten all nuts and bolts to the specified torque.
  Tightening torque: Refer to REAR SUSPENSION.


SRA352A

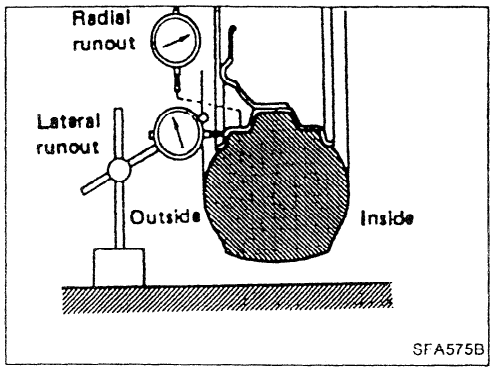

SMA113

- Check strut (shock absorber) for oil leakage or other damage.


SRA353A

Rear Wheel Bearing

- Check axial end play.
  Axial end play:
  0.05 mm (0.0020 in) or less
- Check that wheel bearings operate smoothly.
- Check tightening torque of wheel bearing lock nut.
  : 186 - 255 N·m
  (19 - 26 kg-m, 137 - 188 ft-lb)
- If there is any axial end play or wheel bearing does not turn smoothly, replace wheel bearing assembly. Refer to REAR AXLE — Wheel Hub.



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 looseness.
- Check wheel runout.
  Wheel runout: Refer to S.D.S. in FA section.
- Check that rear strut (shock absorber) works properly.
- Check rear axle and rear suspension parts for looseness.
- Check vehicle posture (Unladen*).
  *: Fuel, radiator and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

CAMBER

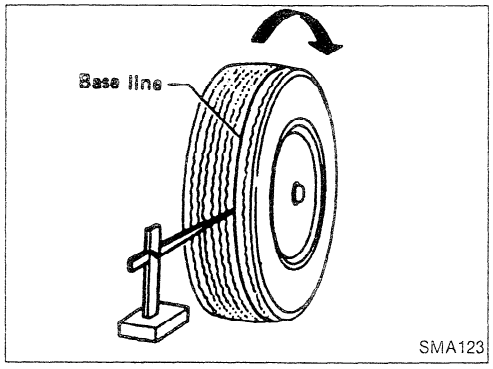
Camber is preset at factory and cannot be adjusted.

Camber:

B13 models
–1°55′ to –0°25′

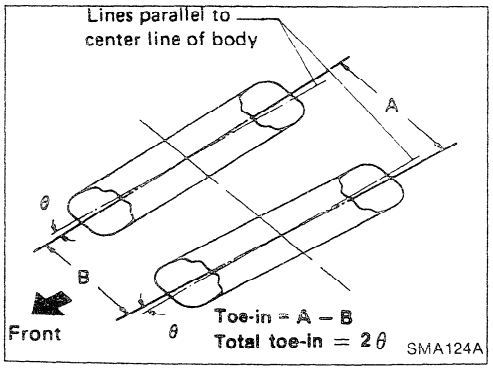
N14 models
–1°40′ to –0°10′

- If the camber is not within specification, inspect and replace any damaged or worn rear suspension parts.



TOE-IN

1. Draw a base line across the tread.
   - After lowering rear of vehicle, move it up and down to eliminate friction.

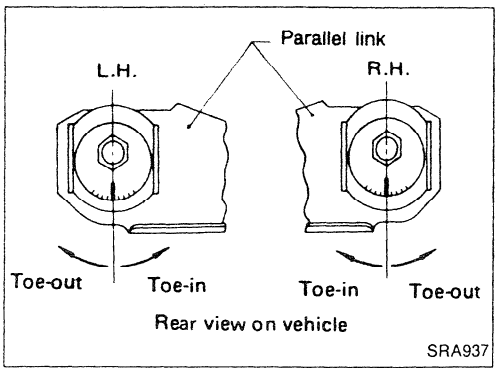


2. Measure toe-in.
   - Measure distance "A" and "B" at the same height as hub center.

Total toe-in:

A – B	–1 to 3 mm (–0.04 to 0.12 in)
2θ	–6′ to 18′

Rear Wheel Alignment (Cont'd)

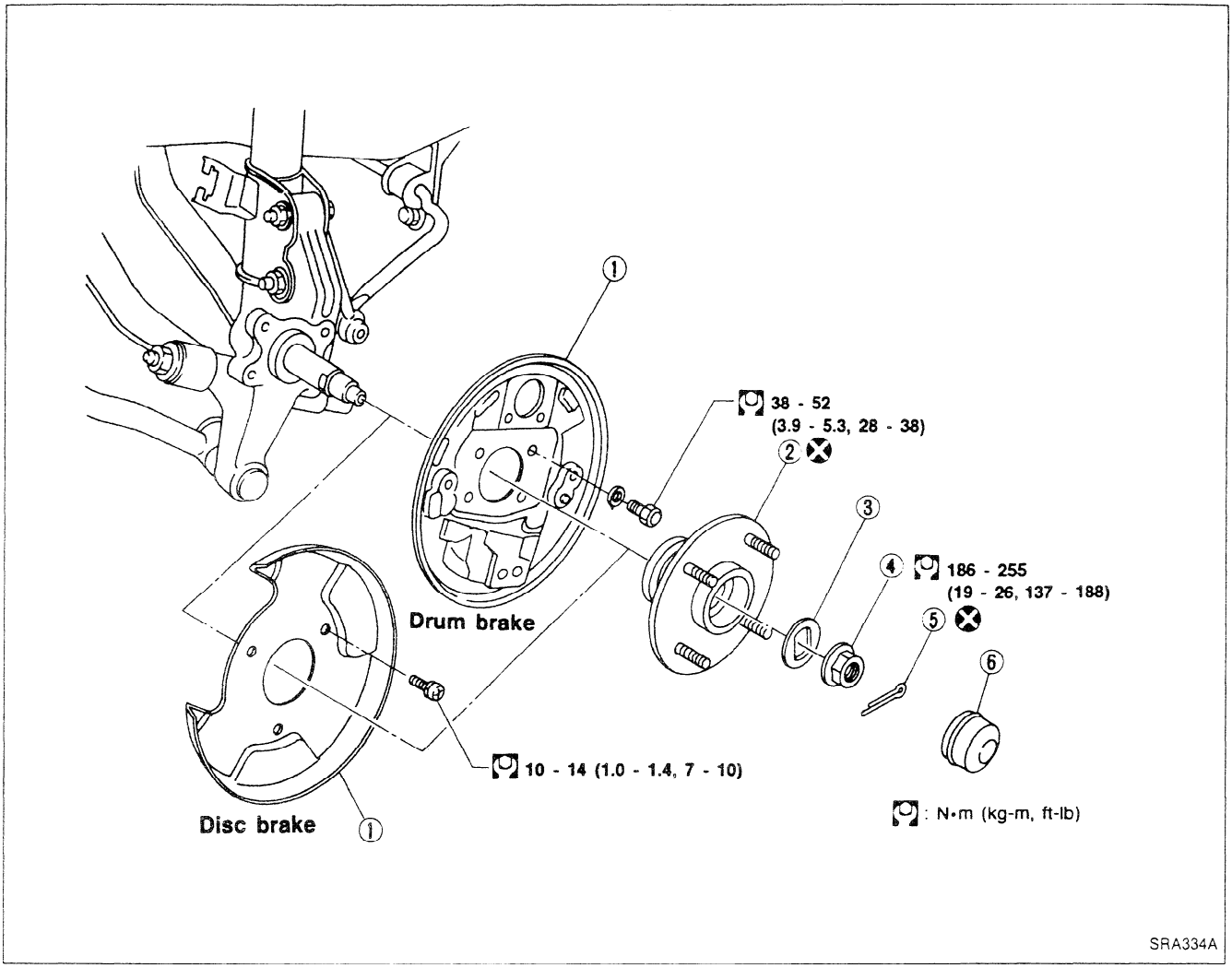


3. Loosen adjusting pin fixing nuts.
4. Adjust toe-in by turning adjusting pins.

Toe changes about 2.0 mm (0.079 in) [One side] with each graduation of the adjusting pin.

5. Tighten adjusting pin fixing nuts to the specified torque.

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

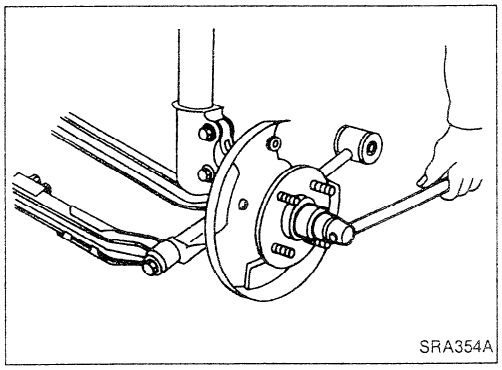


① Baffle plate
② Wheel hub bearing
③ Washer
④ Wheel bearing lock nut
⑤ Cotter pin
⑥ Hub cap

Removal

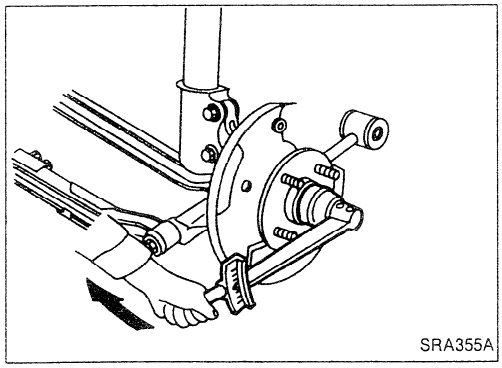
CAUTION:
Wheel hub bearing usually does not require maintenance. If any of the following symptoms are noted, replace wheel hub bearing assembly.

- Growling noise is emitted from wheel hub bearing during operation.
- Wheel hub bearing drags or turns roughly when hub is turned with your hand after bearing lock nut is tightened to specified torque.
- If the wheel hub bearing assembly is removed, it must be renewed. The old assembly must not be re-used.


SRA354A

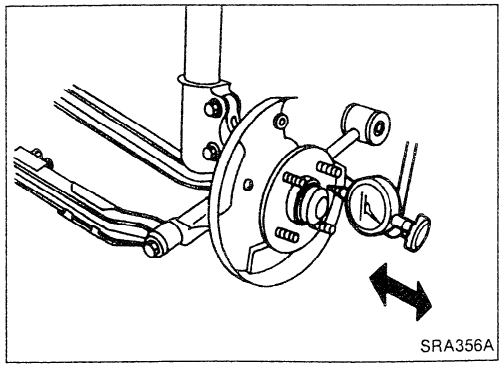
1. Remove brake caliper assembly and rotor.
2. Remove wheel bearing lock nut.

Brake hose does not need to be disconnected from brake caliper.
Be careful not to depress brake pedal, or piston will pop out.
Make sure brake hose is not twisted.


SRA355A

Installation

- Install wheel hub bearing.
- Tighten wheel bearing lock nut.
  : 186 - 255 N·m
  (19 - 26 kg-m, 137 - 188 ft-lb)
- Check that wheel bearings operate smoothly.

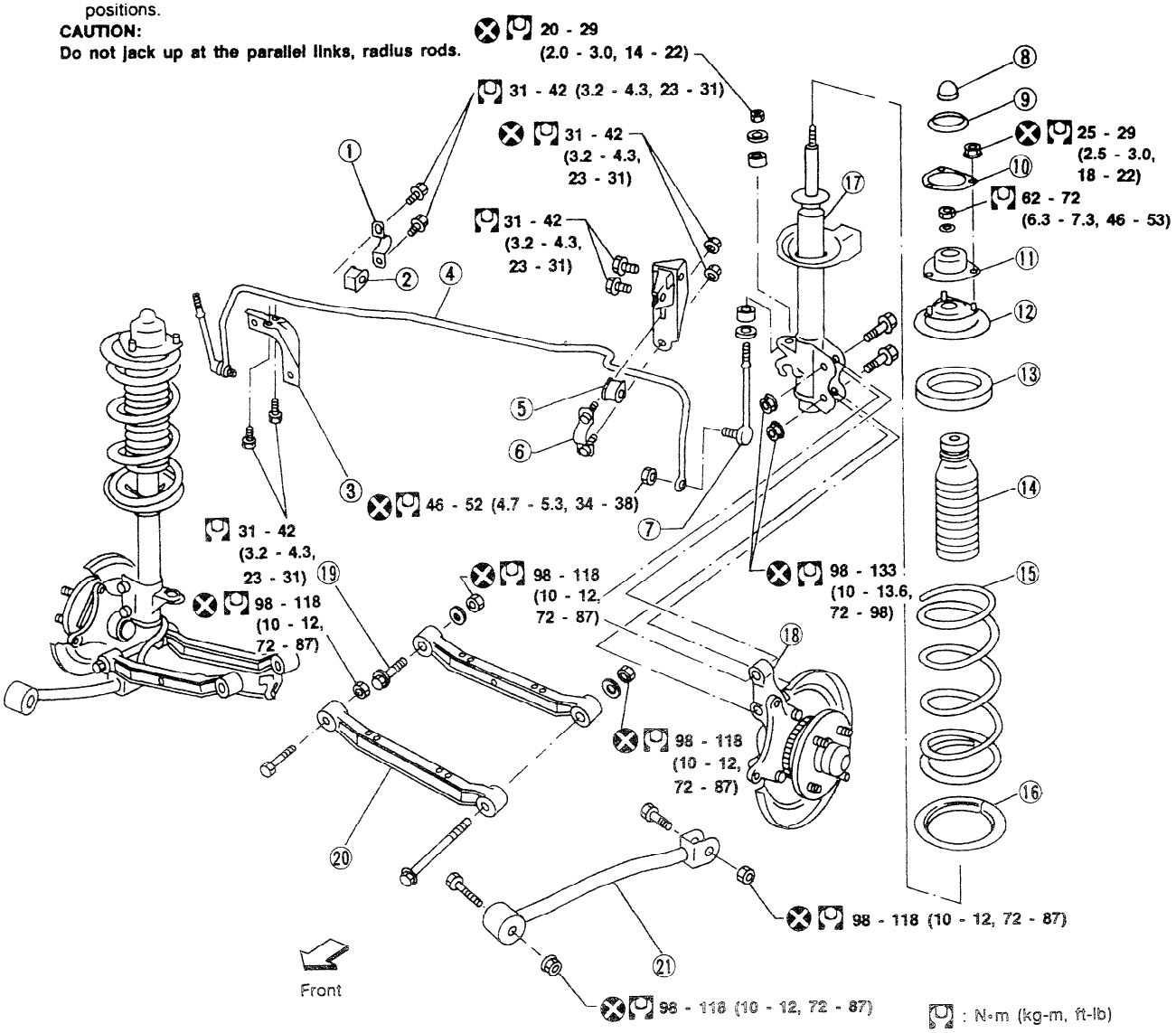

SRA356A

- Check wheel bearing axial end play.
  Axial end play:
  0.05 mm (0.0020 in) or less

When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.

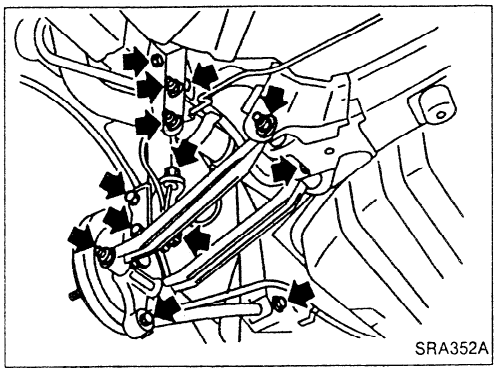
* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

CAUTION:
Do not jack up at the parallel links, radius rods.



SRA357A

① Clamp
② Bushing
③ Bracket
④ Stabilizer bar
⑤ Bushing
⑥ Clamp
⑦ Connecting rod
⑧ Cap
⑨ Strut seal
⑩ Gasket
⑪ Strut mounting case
⑫ Upper seat
⑬ Rubber seat
⑭ Dust cover
⑮ Coil spring
⑯ Rubber seat
⑰ Strut assembly
⑱ Knuckle assembly
⑲ Adjusting bolt
⑳ Parallel link
㉑ Radius rod


SRA352A

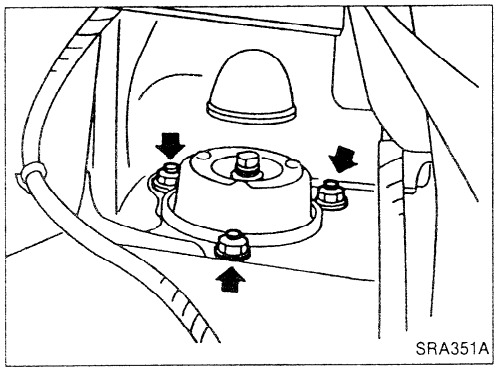
Removal and Installation

CAUTION:

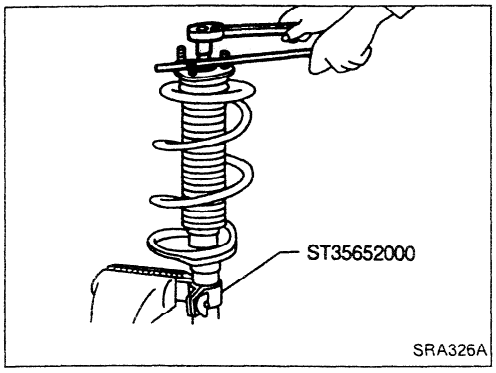
Do not jack up at the parallel links or radius rods.

- Remove suspension assembly.

1. Remove brake caliper assembly and rotor.
2. Remove parallel link fixing bolt, radius rod fixing bolt, stabilizer fixing bolt and stabilizer connecting rod.


SRA351A

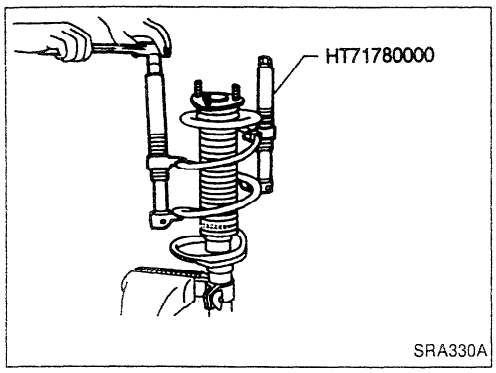
3. Remove rear seat and finisher. Refer to section BF.
4. Remove strut securing nuts (Upper side). Then pull out strut assembly.



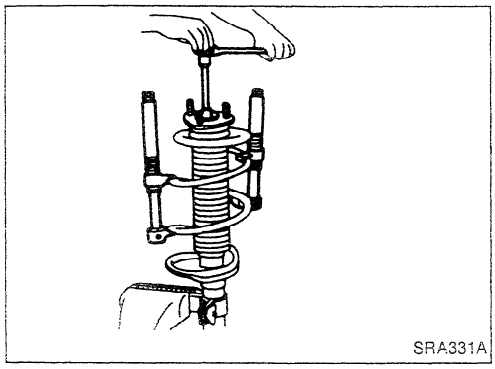
Disassembly

1. Set strut assembly in vise with attachment, then loosen piston rod lock nut.

Do not remove piston rod lock nut.



2. Compress spring with Tool so that the strut mounting insulator can be turned by hand.



3. Remove piston rod lock nut.
4. Remove spring, complete with Tool.

Inspection

STRUT 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.

SPRING RUBBER SEAT AND DUST COVER

Check rubber parts for deterioration or cracks.
Replace if necessary.

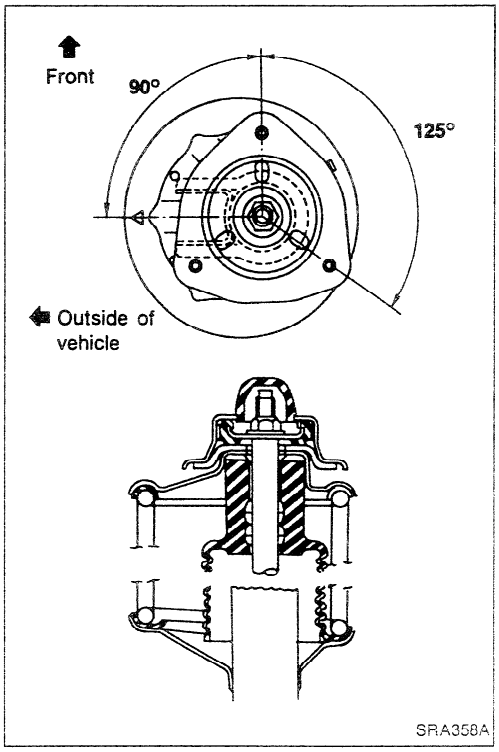
STRUT MOUNTING INSULATOR

- Check cemented rubber-to-metal portion for melting or cracks.
- Check rubber parts for deterioration.

Inspection (Cont'd)

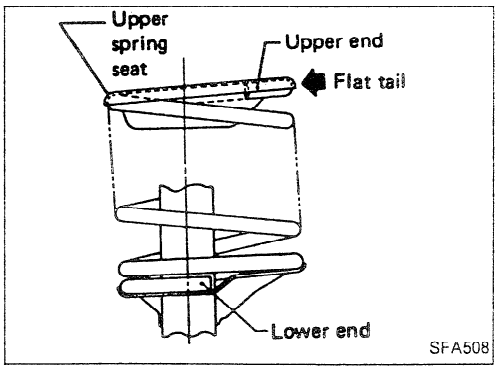
COIL SPRING

Check for cracks, deformation or other damage.
Replace if necessary.

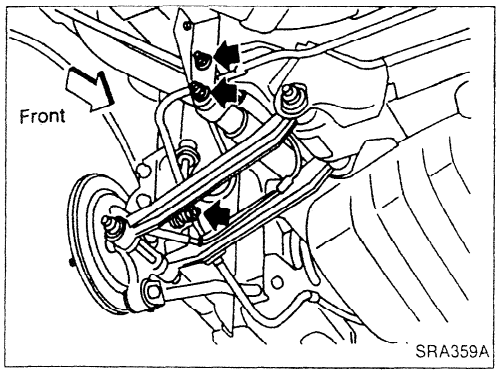


Assembly

1. Locate upper spring seat as shown.

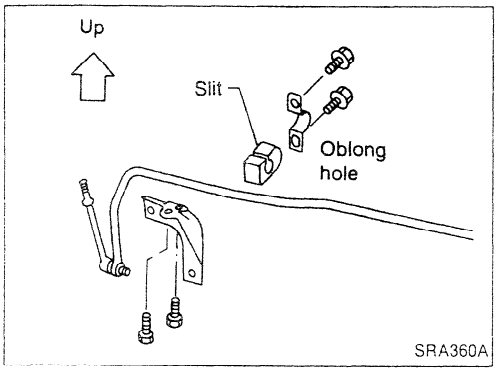


2. When installing coil spring on strut, there must be 2 identification color marks on the lower side.
3. After placing coil spring in position on lower spring seat tighten lock nut, and release spring compressor gradually.

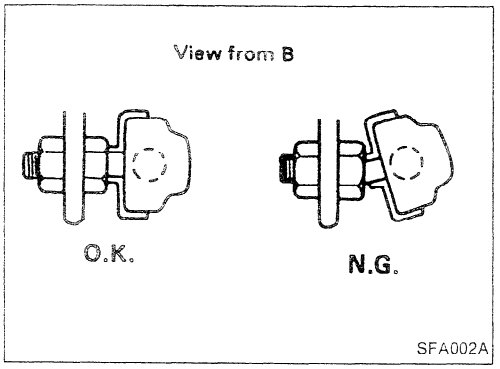


Removal and Installation

- Remove stabilizer bar.

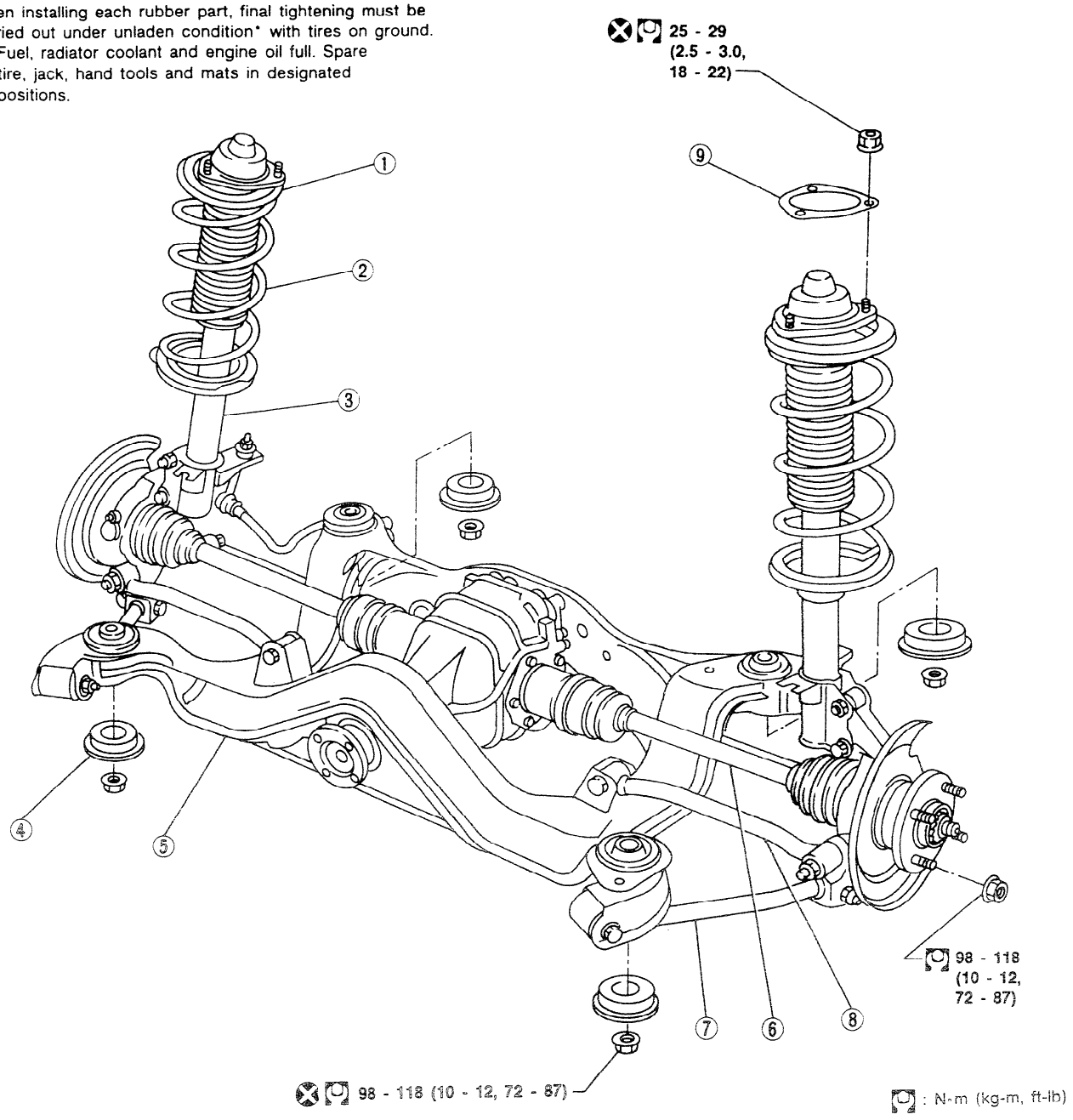


- When installing stabilizer, it must be positioned as shown.



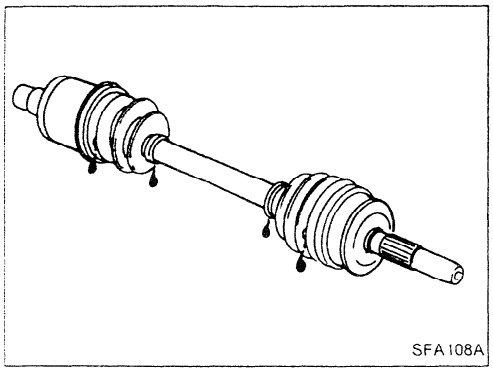
- Install stabilizer bar with ball joint socket properly placed.

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.



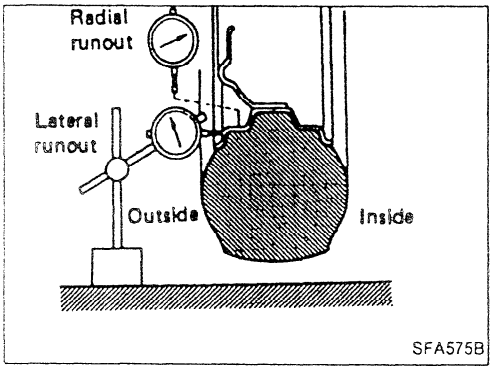
SRA403A

① Strut mounting insulator assembly
② Coil spring
③ Strut assembly
④ Stopper
⑤ Suspension member
⑥ Drive shaft
⑦ Radius rod
⑧ Parallel link
⑨ Gasket


SFA108A

Drive Shaft

- Check for grease leakage or other damage.



SFA575B

Rear Wheel Alignment

PRELIMINARY INSPECTION

Make following checks. Adjust, repair or replace if necessary.

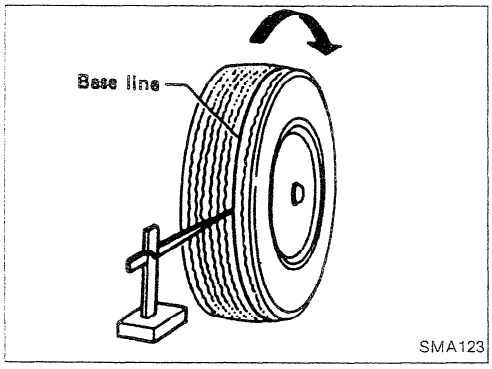
- Check tires for wear and for improper inflation.
- Check rear wheel bearings for looseness.
- Check wheel runout.
  Wheel runout: Refer to S.D.S. in FA section.
- Check that rear strut (shock absorber) works properly.
- Check rear axle and rear suspension parts for looseness.
- Check vehicle posture (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:
–0°55′ to 0°35′

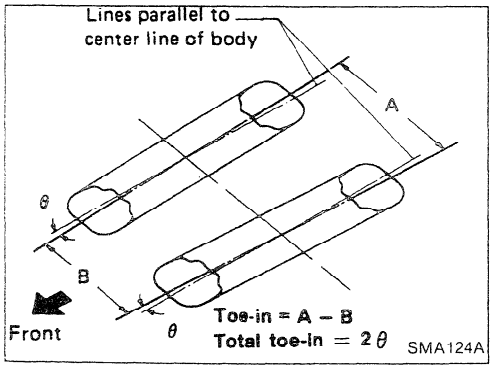
- If the camber is not within specification, inspect and replace any damaged or worn rear suspension parts.



SMA123

TOE-IN

1. Draw a base line across the tread.
- After lowering rear of vehicle, move it up and down to eliminate friction.



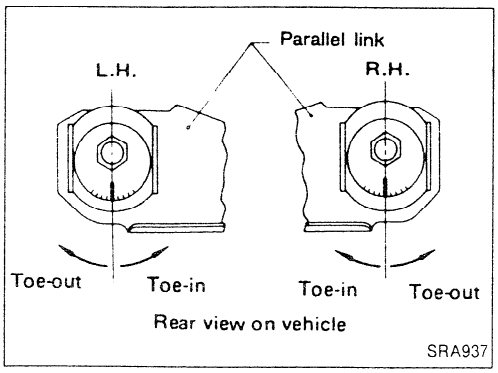
SMA124A

2. Measure toe-in.
- Measure distance "A" and "B" at the same height as hub center.

Total toe-in:

A – B	**–1 to 3 mm (–0.04 to 0.12 in)**
2θ	**–6′ to 18′**

Rear Wheel Alignment (Cont'd)



3. Loosen adjusting pin fixing nuts.
4. Adjust toe-in by turning adjusting pins.

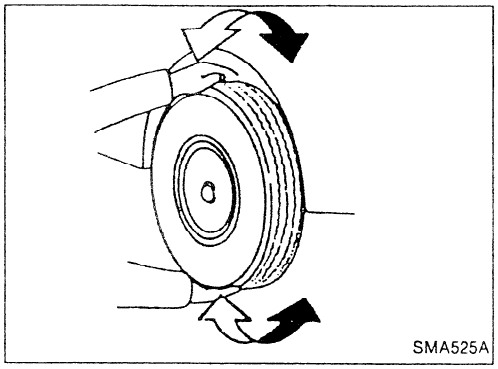
Toe changes about 2.0 mm (0.079 in) [One side] with each graduation of the adjusting pin.

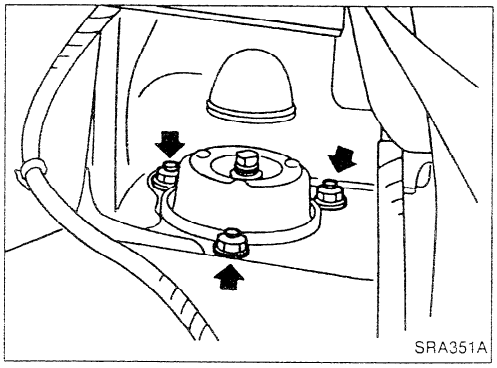
5. Tighten adjusting pin fixing nuts to the specified torque.
   : 98 - 118 N·m
   (10 - 12 kg-m, 72 - 87 ft-lb)

Rear Axle and Rear Suspension Parts

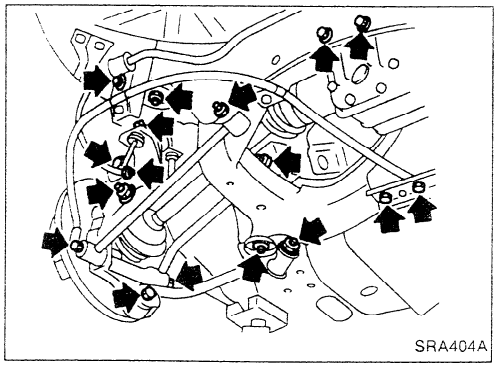
Check axle and suspension parts for looseness, wear or damage.

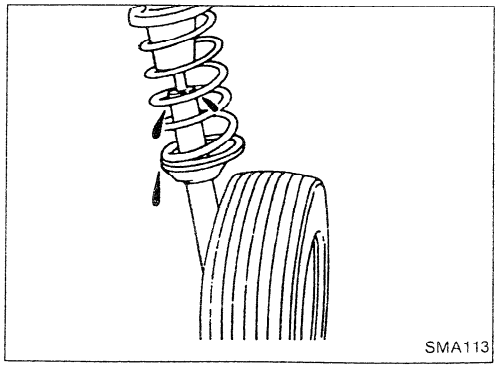
- Shake each rear wheel to see excessive play.



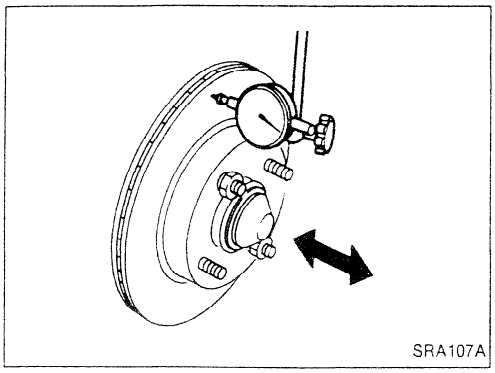


- Retighten all nuts and bolts to the specified torque.
  Tightening torque: Refer to REAR SUSPENSION.



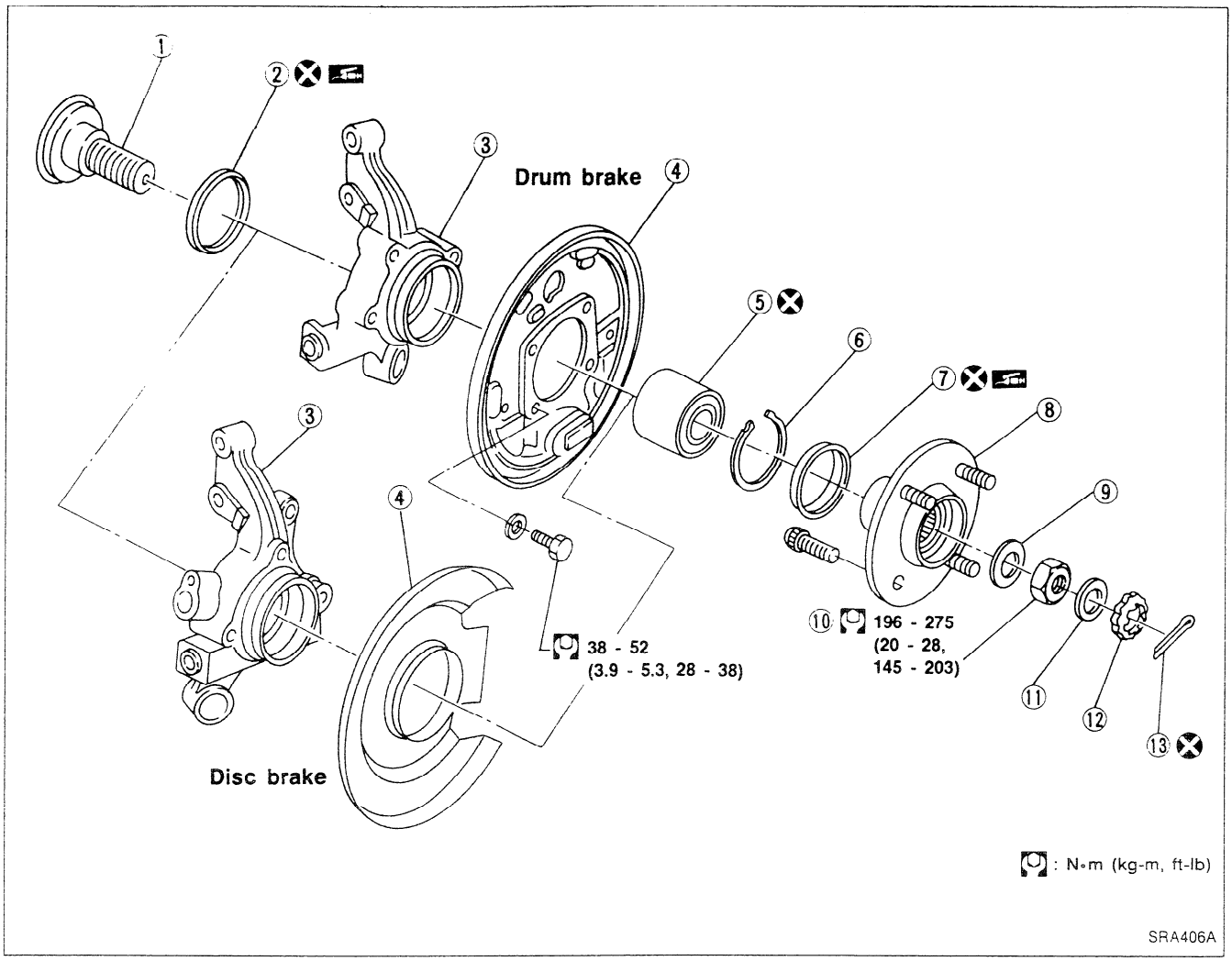


- Check strut (shock absorber) for oil leakage or other damage.

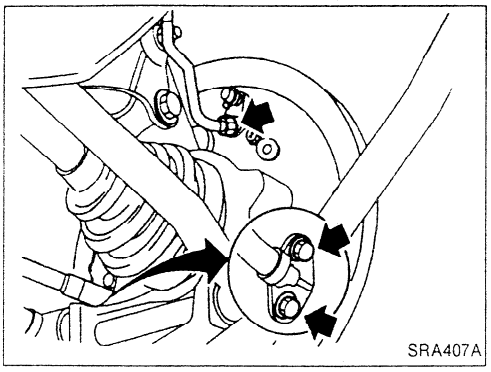

SRA107A

Rear Wheel Bearing

- Check axial end play.
  Axial end play:
  0.05 mm (0.0020 in) or less
- Check that wheel bearings operate smoothly.
- Check tightening torque of wheel bearing lock nut.
  : 196 - 275 N·m
  (20 - 28 kg-m, 145 - 203 ft-lb)
- If there is any axial end play or wheel bearing does not turn smoothly, replace wheel bearing assembly. Refer to REAR AXLE — Wheel Hub.



① Drive shaft
② Inner grease seal
③ Knuckle
④ Baffle plate
⑤ Wheel bearing assembly
⑥ Snap ring
⑦ Outer grease seal
⑧ Wheel hub
⑨ Washer
⑩ Wheel bearing lock nut
⑪ Insulator
⑫ Adjusting cap
⑬ Cotter pin

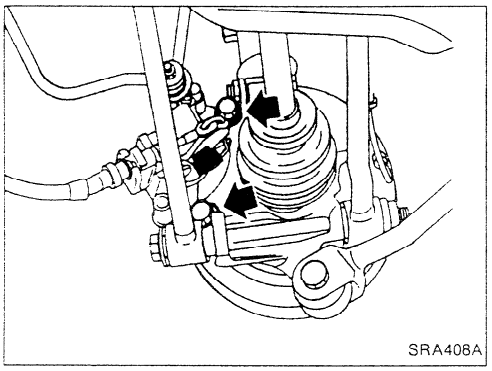

SRA407A

Removal

For drum brake models

- Remove wheel bearing lock nut.
- Disconnect brake hydraulic line and parking brake cable.

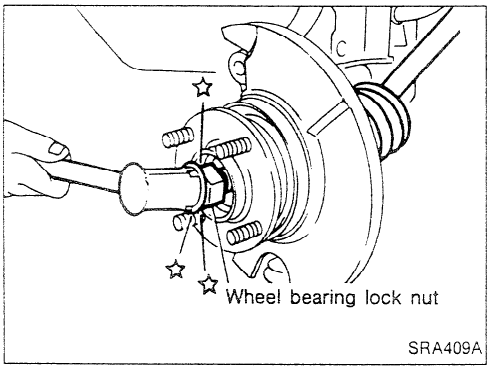
CAUTION:
Use Tool when removing or installing brake tubes.


SRA408A

For disc brake models

- Remove wheel bearing lock nut.
- Remove brake caliper assembly and rotor.
- Remove parking brake cable.
- Remove A.B.S. sensor. (Models with A.B.S. only)

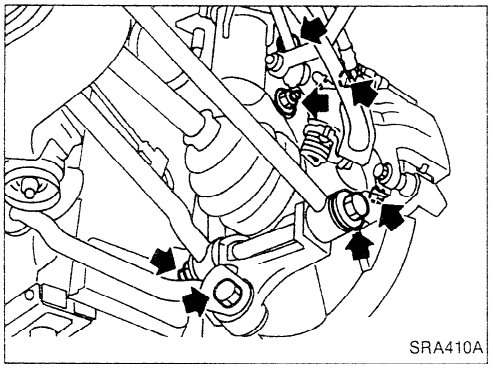
Brake hose need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out. Make sure brake hose is not twisted.



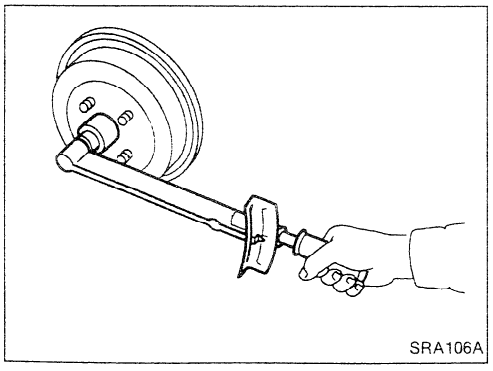
SRA409A

- Separate drive shaft from knuckle by slightly tapping it.

Cover boots with waste cloth so as not to damage them when removing drive shaft.


SRA410A

- Remove nuts and bolts.

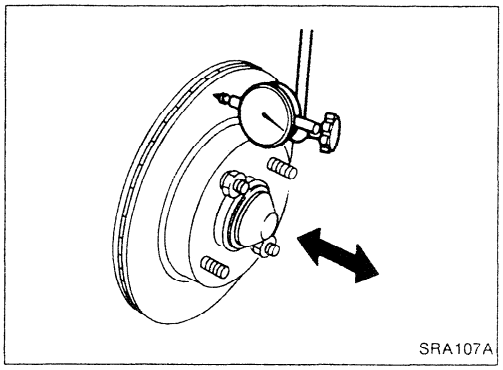

SRA106A

Installation

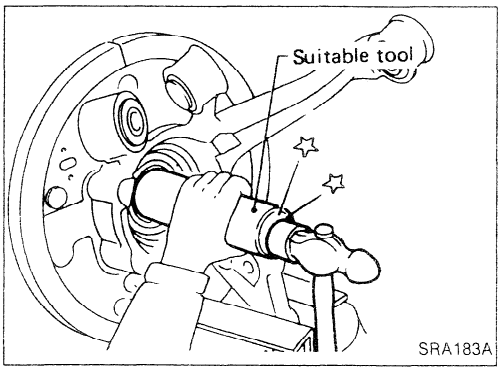
- Install axle housing with wheel hub.
- Tighten wheel bearing lock nut.

: 196 - 275 N·m (20 - 28 kg-m, 145 - 203 ft-lb)

Installation (Cont'd)



- Check wheel bearing axial end play.
  Axial end play: 0.05 mm (0.0020 in) or less

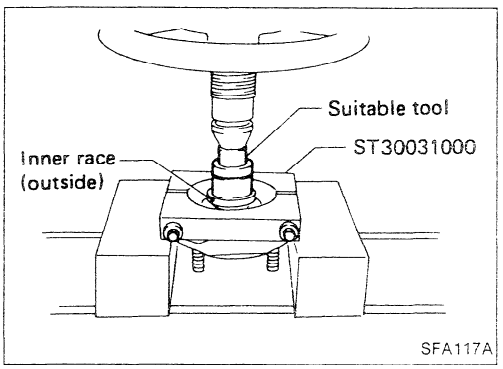


Disassembly

CAUTION:
When removing wheel hub or wheel bearing from knuckle, replace wheel bearing assembly (outer race, inner races and grease seal) with a new one.

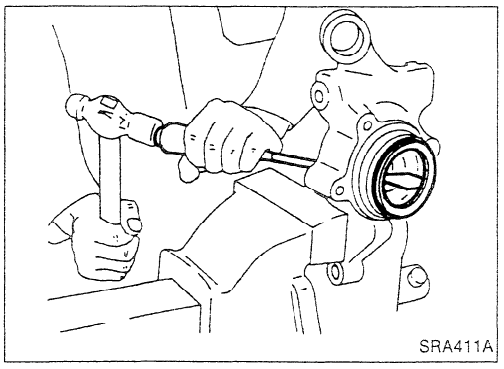
WHEEL HUB

- Drive out hub with inner race (Outside) from knuckle with Tool.

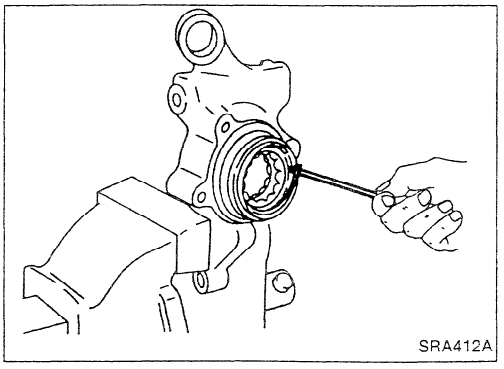


WHEEL BEARING

- Drive out bearing inner race (Outside), then remove outer grease seal.

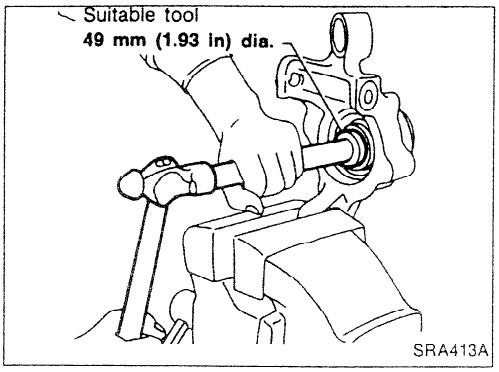


- Drive out bearing inner race (Inside), inner and outer grease seals.



- Remove snap rings.

Disassembly (Cont'd)



- Drive out bearing outer race.

Inspection

WHEEL HUB AND KNUCKLE

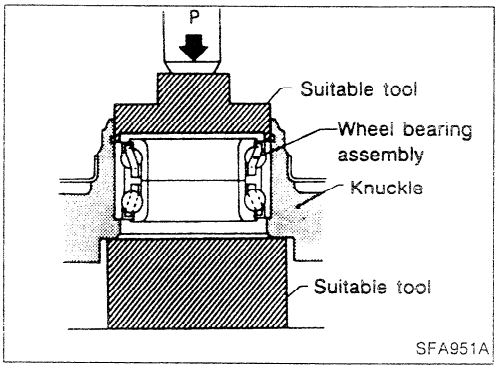
- Check wheel hub for cracks by using a magnetic exploration or dyeing test.
- Check rubber bushings for wear or other damage.

If necessary, replace radius rod bushing with a suitable tool.

SNAP RING

Check snap rings for wear or cracks.
Replace if necessary.

Assembly

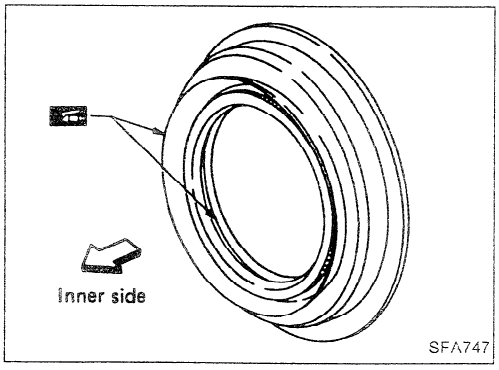


1. Press new wheel bearing assembly into knuckle.
   Maximum load P:
   29 kN (3 t, 3.3 US ton, 3.0 Imp ton)

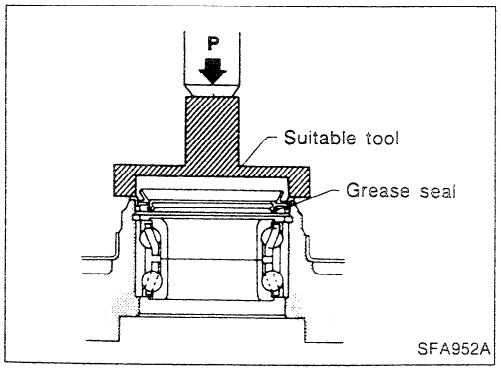
CAUTION:

- **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.**

2. Install snap ring into groove of knuckle.

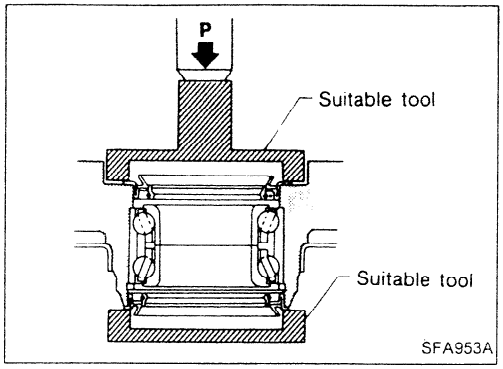


3. Pack grease seal lip with multi-purpose grease.

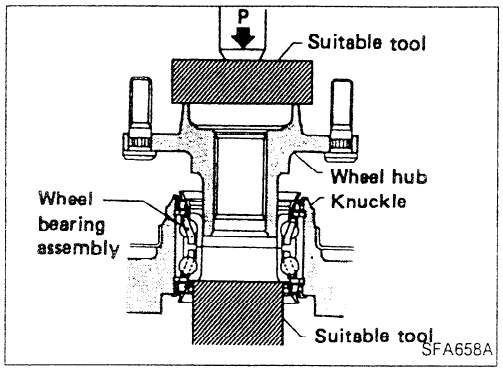


4. Install outer grease seal.

Assembly (Cont'd)

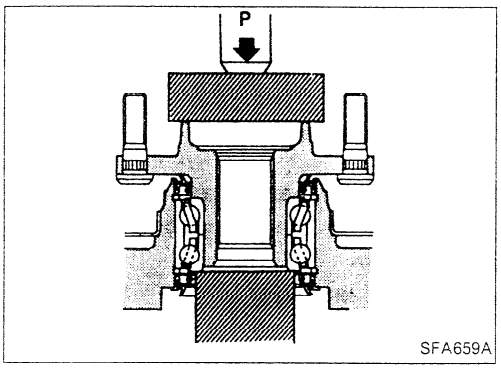


5. Install inner grease seal.

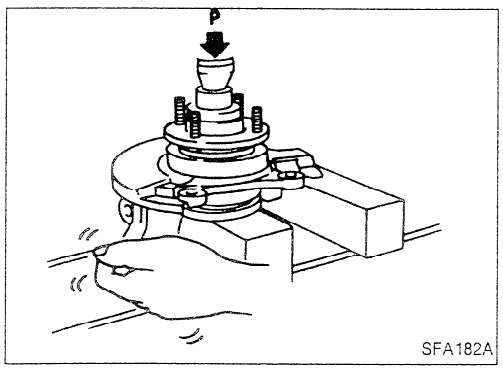


6. Press wheel hub into knuckle.
   Maximum load P:
   29 kN (3 ton, 3.3 US ton, 3.0 Imp ton)

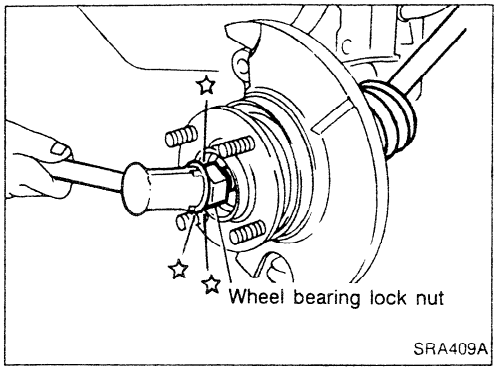
Be careful not to damage grease seal.



7. 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)



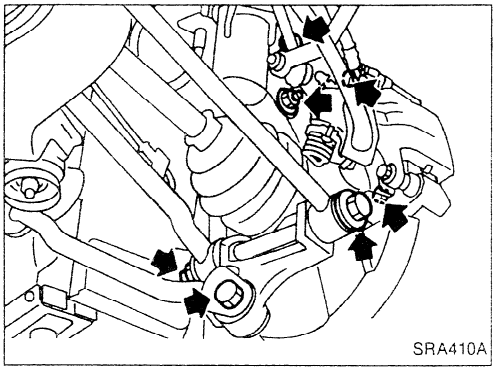
b. Spin knuckle several turns in both directions.
c. Make sure that wheel bearings operate smoothly.



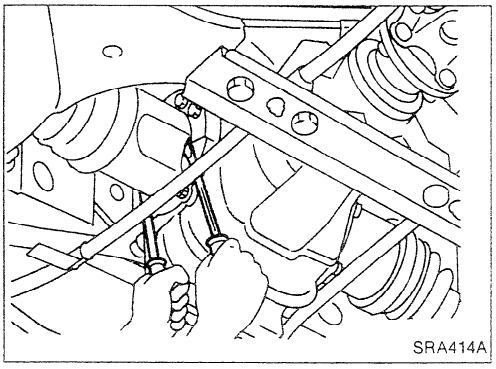
Removal and Installation

- Remove wheel bearing lock nut.
- Separate drive shaft from knuckle by slightly tapping it.

Cover boots with cloth so as not to damage them when removing drive shaft.



- Remove parallel link and radius rod fixing bolts.



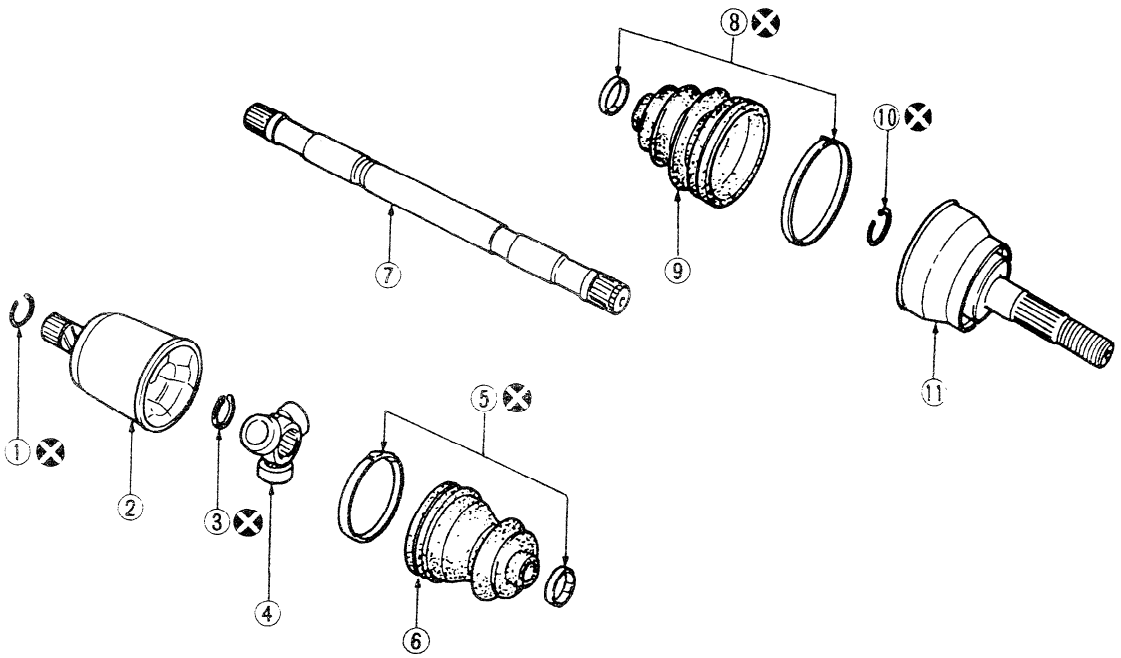
- Extract drive shaft from final drive gear by prying it with a suitable tool.

CAUTION:
Be careful not to damage oil seal of final drive gear. Make sure that circular clip is properly meshed with side gear and will not come out.

Components

Circular clip:
Make sure circular clip is properly installed with side gear (final drive side) and joint assembly (wheel side), and will not come out.
Drive shaft joint grease:
Use Nissan Genuine Grease or equivalent after every overhaul.

Wheel side (ZF80, ZF90)

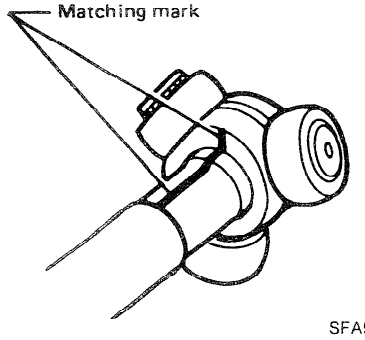


Final drive side (TS70C, TS79C)

Be careful not to damage boots. Use suitable protector or cloth during removal and installation.

SRA415A

① Circular clip
② Slide joint housing
③ Snap ring
④ Spider assembly
⑤ Boot band
⑥ Boot
⑦ Drive shaft
⑧ Boot band
⑨ Boot
⑩ Circular clip
⑪ Joint assembly



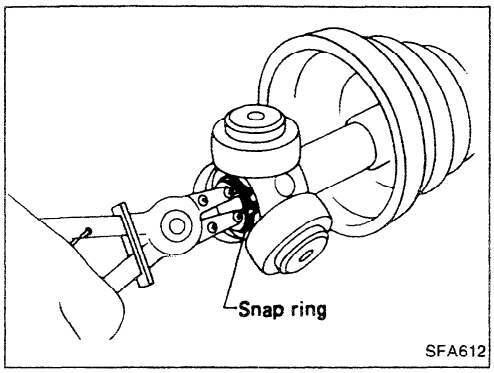
SFA963

Disassembly

FINAL DRIVE SIDE (TS70C, TS79C)

1. Remove boot bands.
2. Put matchmarks on slide joint housing and drive shaft before separating joint assembly.
3. Put matchmarks on spider assembly and drive shaft.

Disassembly (Cont'd)

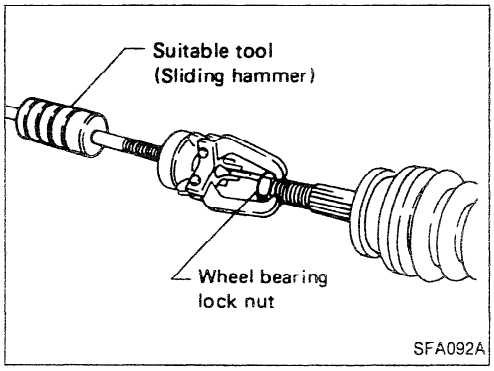


4. Pry off snap ring, then remove spider assembly.

CAUTION:
Do not disassemble spider assembly.

5. Draw out boot.

Cover drive shaft serration with tape so as not to damage the boot.



WHEEL SIDE (ZF80, ZF90)

CAUTION:
The joint on the wheel side cannot be disassembled.

- Before separating joint assembly, put matchmarks on drive shaft and joint assembly.
- Separate joint assembly with a suitable tool.

Be careful not to damage threads on drive shaft.

- Remove boot bands.

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.

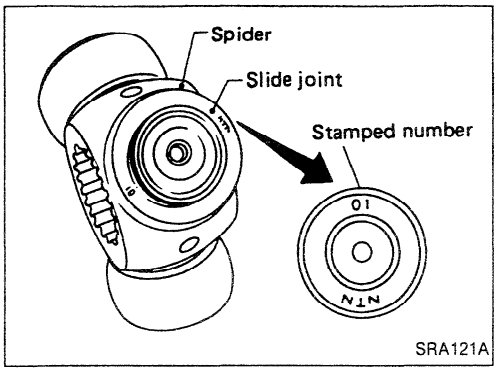
BOOT

Check boot for fatigue, cracks, or wear. Replace boot with new boot bands.

JOINT ASSEMBLY (Final drive side)

- Check spider assembly for bearing, roller and washer damage. Replace spider assembly if necessary.
- Check housing for any damage. Replace housing set and spider assembly, if necessary.

Inspection (Cont'd)



- When replacing only spider assembly, select a new spider assembly from among those listed in table below. Ensure the number stamped on sliding joint is the same as that stamped on new part.

Housing alone cannot be replaced. It must be replaced together with spider assembly.

TS70C

Stamped number	Part No.
00	39720-51E00
01	39720-51E01
02	39720-51E02
03	39720-51E03

TS79C

Stamped number	Part No.
00	39720-61E00
01	39720-61E01
02	39720-61E02
03	39720-61E03
04	39720-61E04
05	39720-61E05
06	39720-61E06

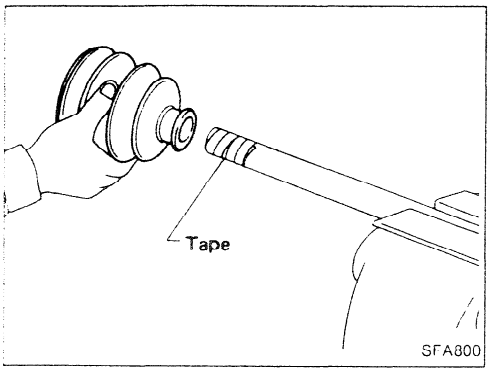
JOINT ASSEMBLY (Wheel side)

Replace joint assembly if it is deformed or damaged.

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.**

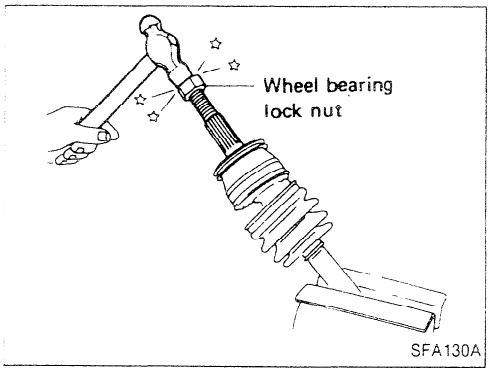
Assembly (Cont'd)



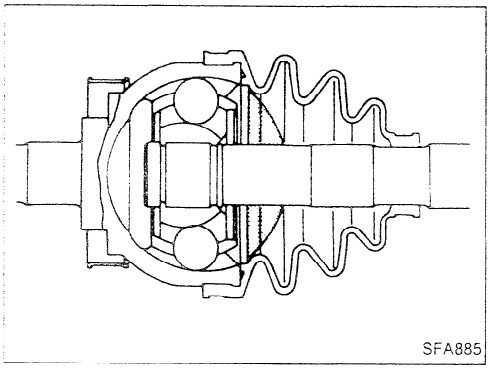
WHEEL SIDE (ZF80, ZF90)

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.

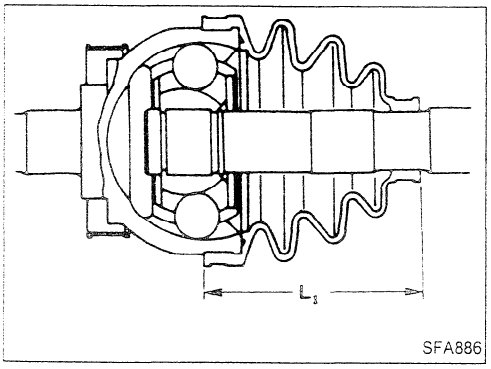


2. Set joint assembly onto drive shaft by lightly tapping it. Install joint assembly securely, ensuring marks which were made during disassembly are properly aligned.



3. Pack drive shaft with specified amount of grease.

Specified amount of grease:
ZF80: 90 - 100 g (3.17 - 3.53 oz)
ZF90: 160 - 170 g (5.64 - 6.00 oz)

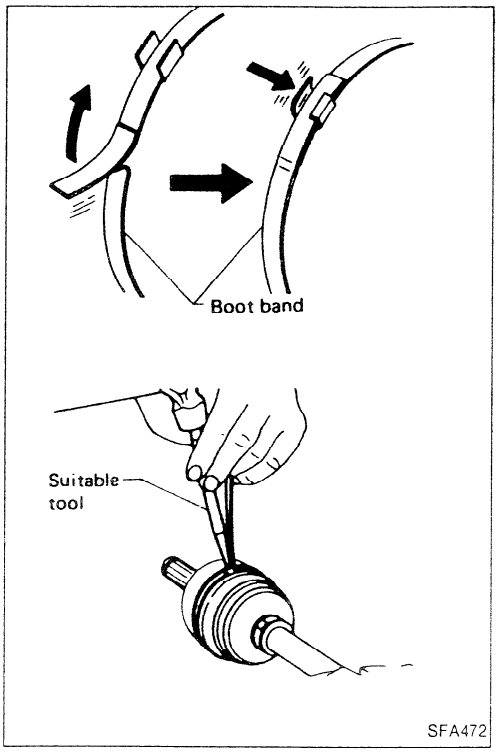


4. Set boot so that it does not swell and deform when its length is "L_1".

Length "L_1":
ZF80: 90.5 - 92.5 mm (3.563 - 3.642 in)
ZF90: 96 - 98 mm (3.78 - 3.86 in)

Make sure that boot is properly installed on the drive shaft groove.

Assembly (Cont'd)

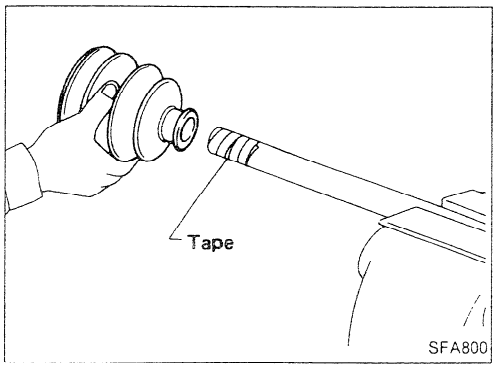


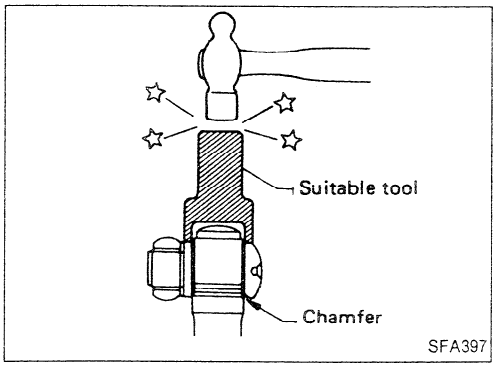
5. Lock new larger and smaller boot bands securely with a suitable tool.

FINAL DRIVE SIDE (TS70C, TS79C)

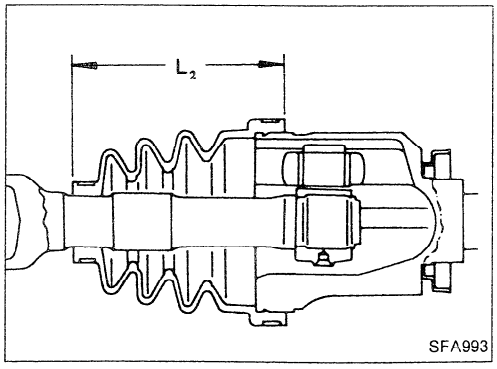
1. Install boot and new small boot band on drive shaft.

Cover drive shaft serration with tape so as not to damage boot during installation.



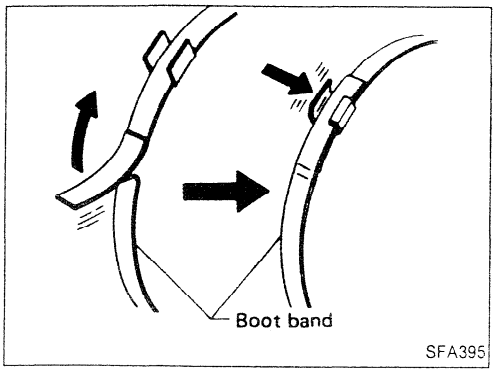


2. Install spider assembly securely, making sure marks are properly aligned.
- Press-fit with spider assembly serration chamfer facing shaft.
3. Install new snap ring.



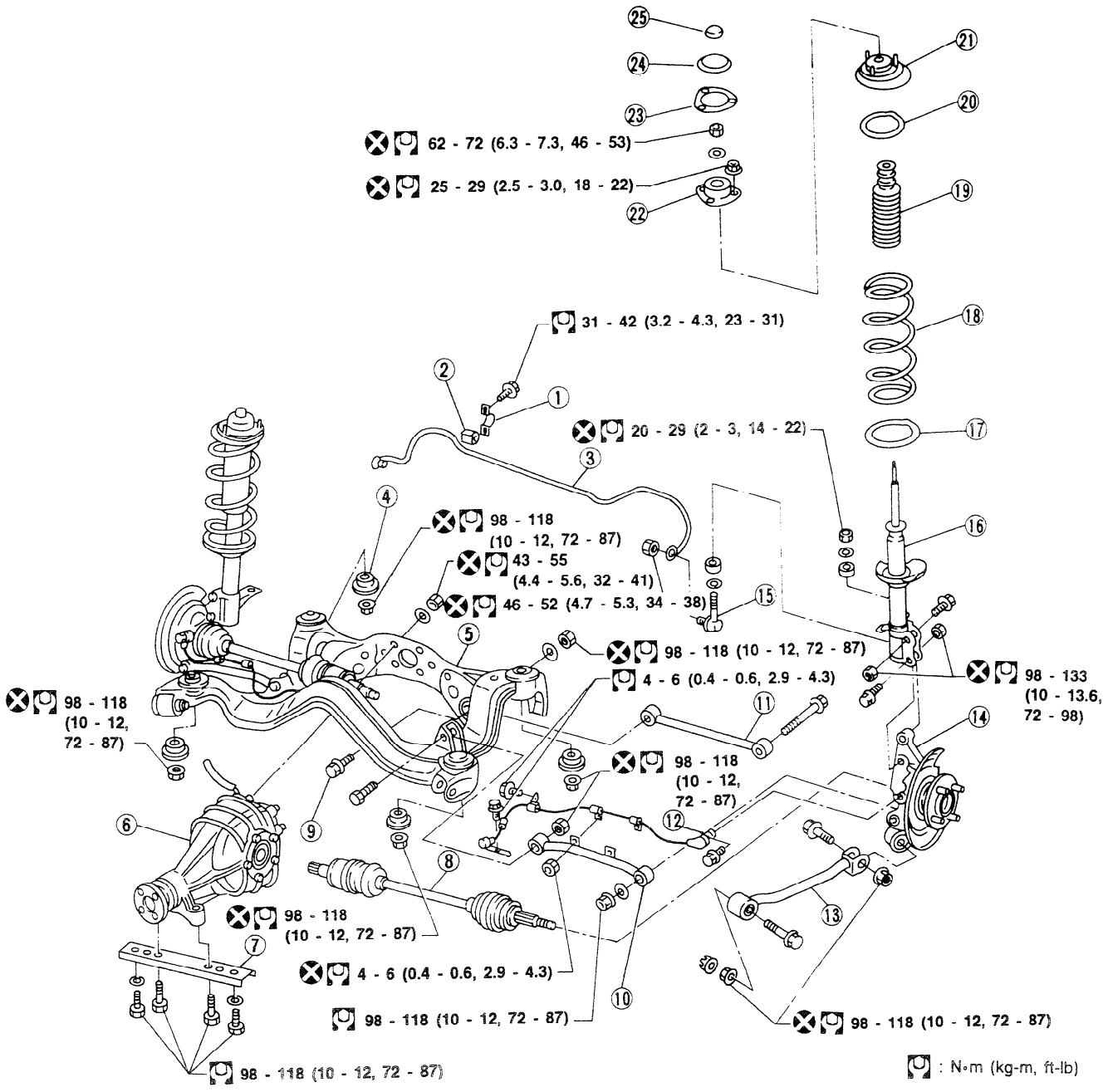
4. Pack drive shaft with specified amount of grease.
   Specified amount of grease:
   TS70C: 185 - 195 g (6.52 - 6.88 oz)
   TS79C: 225 - 235 g (7.94 - 8.29 oz)
5. Install slide joint housing.
6. Set boot so that it does not swell and deform when its length is "L_2".
   Length "L_2":
   TS70C: 95.5 - 97.5 mm (3.760 - 3.839 in)
   TS79C: 101.5 - 103.5 mm (4.00 - 4.07 in)

Assembly (Cont'd)



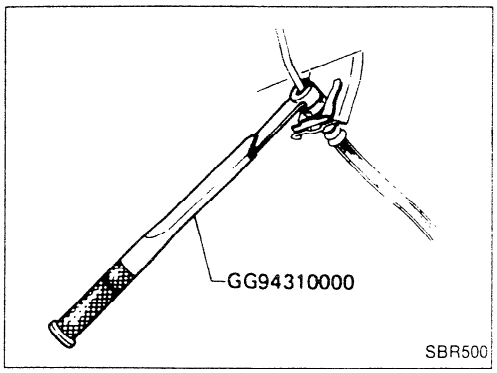
Make sure that boot is properly installed on the drive shaft groove.

7. Lock new larger and smaller boot bands securely with a suitable tool.



SRA416A

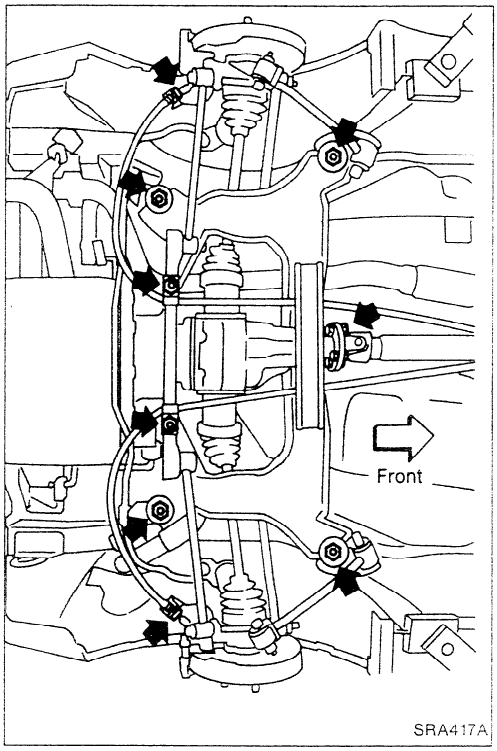
① Clamp
② Bushing
③ Stabilizer bar
④ Stopper
⑤ Suspension member
⑥ Rear differential gear assembly
⑦ Bracket
⑧ Drive shaft
⑨ Adjusting bolt
⑩ Parallel link (Front)
⑪ Parallel link (Rear)
⑫ A.B.S. sensor
⑬ Radius rod
⑭ Knuckle assembly
⑮ Connecting rod
⑯ Strut assembly
⑰ Rubber seat
⑱ Coil spring
⑲ Dust cover
⑳ Rubber seat
㉑ Upper seat
㉒ Strut mounting case
㉓ Gasket
㉔ Strut seal
㉕ Cap



Removal and Installation

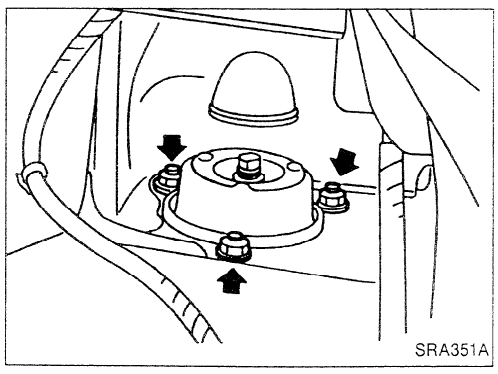
CAUTION:
Do not jack up at the parallel links or radius rods.

- Disconnect brake hydraulic line and parking brake cable at equalizer.

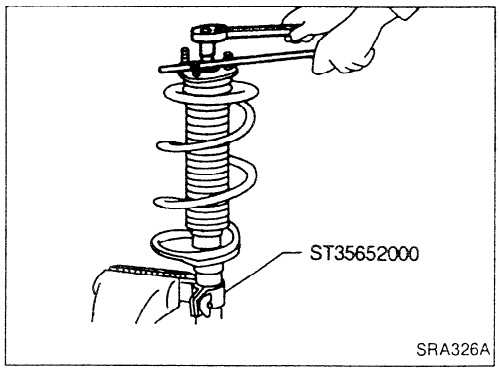


- Remove suspension assembly.

1. Remove brake caliper assembly and rotor.
2. Remove parallel link fixing bolt, radius rod fixing bolt, stabilizer fixing bolt and stabilizer connecting rod.



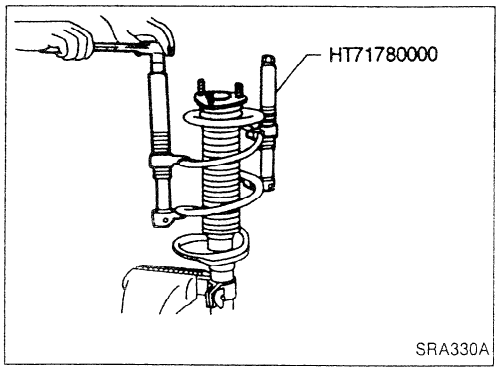
3. Remove rear seat and finisher. Refer to section BF.
4. Remove strut securing nuts (Upper side). Then pull out strut assembly.



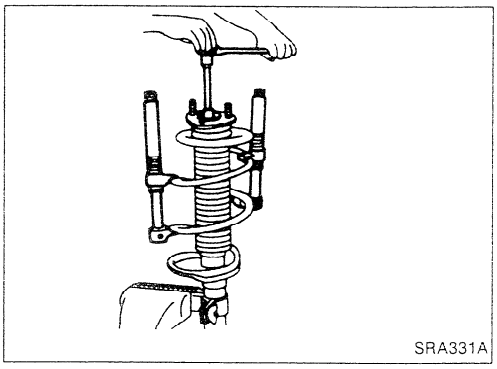
Disassembly

1. Set strut assembly in vise with attachment, then loosen piston rod lock nut.

Do not remove piston rod lock nut.



2. Compress spring with Tool so that the strut mounting insulator can be turned by hand.



3. Remove piston rod lock nut.
4. Remove spring, complete with Tool.

Inspection

STRUT 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.

SPRING RUBBER SEAT AND DUST COVER

Check rubber parts for deterioration or cracks.
Replace if necessary.

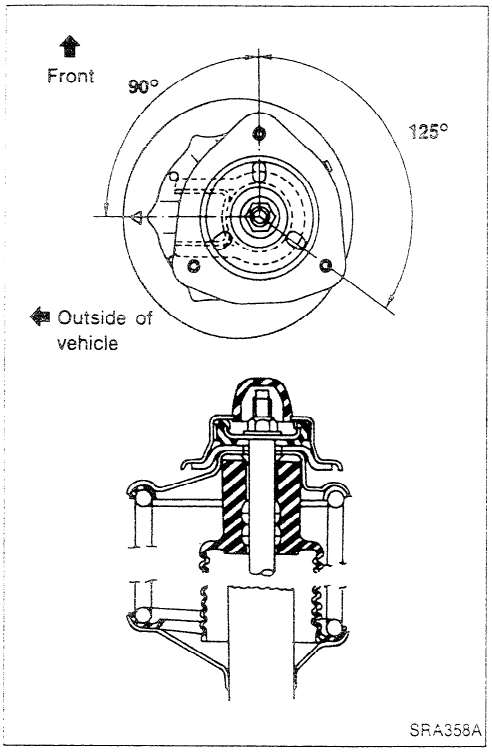
STRUT MOUNTING INSULATOR

- Check cemented rubber-to-metal portion for melting or cracks.
- Check rubber parts for deterioration.

Inspection (Cont'd)

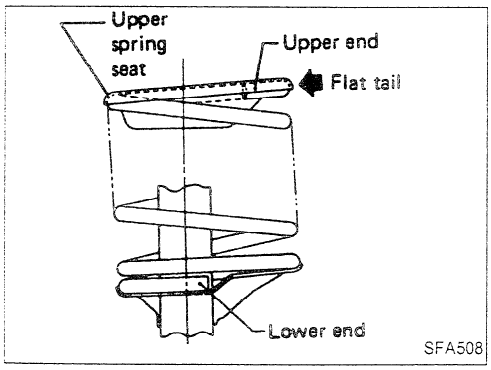
COIL SPRING

Check for cracks, deformation or other damage.
Replace if necessary.

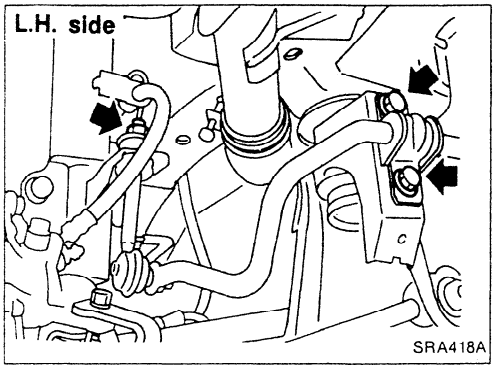


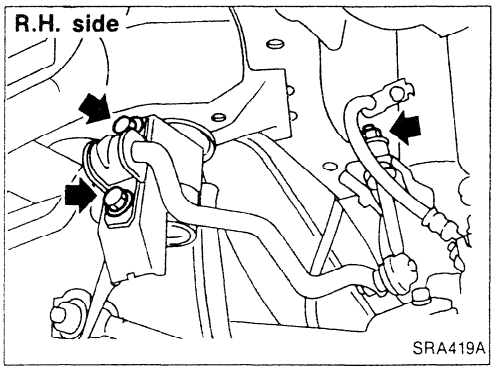
Assembly

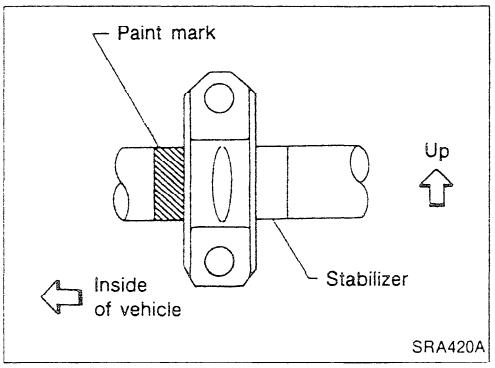
1. Locate upper spring seat as shown.



2. When installing coil spring on strut, there must be 2 identification color marks on the lower side.
3. After placing coil spring in position on lower spring seat tighten lock nut, and release spring compressor gradually.







Removal and Installation

- Remove stabilizer bar.

- When installing stabilizer, make sure that paint mark and clamp face in their correct directions.

General Specifications — Model B13

SUSPENSION

Suspension type	Strut type parallel link independent suspension

COIL SPRING

Except for Middle East & Europe

Applied model	Sedan								Coupe
	E10S	GA13, 14, 16DS				GA16DE		CD17	
		S/S* model		Except S/S* model					
		Standard	Option	Standard	Option	Standard	Option	Standard	Option	
Wire diameter mm (in)	11.2 (0.441)	11.1 (0.437)				11.2 (0.441)		11.1 (0.437)	10.7 (0.421)
Coil diameter mm (in)	130 (5.12)								
Free length mm (in)	321 (12.64)	341 (13.43)	311 (12.24)	331 (13.03)	341 (13.43)	321 (12.64)		331 (13.03)	311 (12.24)
Spring constant N·m (kg-m, ft-lb)	18 (1.8, 13)	16 (1.6, 12)	18 (1.8, 13)	16 (1.6, 12)		18 (1.8, 13)		16 (1.6, 12)	
Identification color	Pink × 2, Light green × 1	Pink × 2, Pink × 1	Light green × 2, Light green × 1	Pink × 2, Light blue × 1	Pink × 2, Pink × 1	Pink × 2, Light green × 1		Pink × 2, Light blue × 1	Light green × 2, Yellow × 1

S/S*: Super Saloon

For Middle East

Applied model	Sedan			Coupe & T-bar roof	
	Except S/S* model		S/S* model		
	Option	Standard	Option	Without A.B.S.	With A.B.S.
Wire diameter mm (in)	11.1 (0.437)	11.2 (0.441)	11.1 (0.437)	10.7 (0.421)	11.1 (0.437)
Coil diameter mm (in)	130 (5.12)				
Free length mm (in)	331 (13.03)	321 (12.64)	341 (13.43)	321 (12.64)	301 (11.85)
Spring constant N·m (kg-m, ft-lb)	16 (1.6, 12)	18 (1.8, 13)	16 (1.6, 12)	16 (1.6, 12)	18 (1.8, 13)
Identification color	Pink × 2, Light blue × 1	Pink × 2, Light green × 1	Pink × 2, Pink × 1	Light green × 2, Light blue × 1	Light green × 2, Purple × 1

S/S*: Super Saloon

For Europe

Applied model	Coupe		T-bar roof	
	GA16DS	SR20DE	GA16DS	SR20DE
Wire diameter mm (in)	10.7 (0.421)	11.1 (0.437)	10.7 (0.421)	11.1 (0.437)
Coil diameter mm (in)	130 (5.12)			
Free length mm (in)	311 (12.24)	301 (11.85)	321 (12.64)	311 (12.24)
Spring constant N·m (kg-m, ft-lb)	16 (1.6, 12)	18 (1.8, 13)	16 (1.6, 12)	18 (1.8, 13)
Identification color	Light green × 2, Yellow × 1	Light green × 2, Purple × 1	Light green × 2, Light blue × 1	Light green × 2, Light green × 1

General Specifications — Model B13 (Cont'd)

STRUT

Except for Middle East & Europe

Applied model	Sedan		Coupe
		Hard suspension model for GA16D	
Strut type	Double-acting hydraulic		
Damping force [at 0.3 m (1.0 ft)/sec.] N (kg, lb)			
Expansion	539 - 736 (55 - 75, 121 - 165)	696 - 951 (71 - 97, 157 - 214)	
Compression	226 - 363 (23 - 37, 51 - 82)	314 - 490 (32 - 50, 71 - 110)	
Piston rod diameter mm (in)	18 (0.71)		

For Middle East & Europe

Applied model	Middle East		Europe		
			GA16DS		SR20DE
	Standard	Option	Without A.B.S.	With A.B.S.	
Strut type	Double-acting hydraulic				
Damping force [at 0.3 m (1.0 ft)/sec.] N (kg, lb)					
Expansion	539 - 736 (55 - 75, 121 - 165)	539 - 736 (55 - 75, 121 - 165)	412 - 579 (42 - 59, 93 - 130)	412 - 579 (42 - 59, 93 - 130)	490 - 686 (50 - 70, 110 - 154)
Compression	226 - 363 (23 - 37, 51 - 82)	226 - 363 (23 - 37, 51 - 82)	265 - 422 (27 - 43, 60 - 95)	265 - 422 (27 - 43, 60 - 95)	324 - 500 (33 - 51, 73 - 112)
Piston rod diameter mm (in)	18 (0.71)				

STABILIZER BAR

Applied model	Except Europe	Europe			
		R.H.D.		L.H.D.	
		GA16DS	SR20DE	GA16DS	SR20DE
Bar diameter mm (in)	10 (0.39)	9 (0.35)	14 (0.55)	10 (0.39)	14 (0.55)
Identification color	Orange	Red	White	Orange	White

Inspection and Adjustment — Model B13

WHEEL ALIGNMENT (Unladen*1)

Applied model		Coupe	Sedan
Camber	degree	−1°55′ to −0°25′	
Toe-in	mm (in)	−1 to 3 (−0.04 to 0.12)	
Total toe-in	degree	−6′ to 18′	

*1: Fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools and mats in designated positions.

WHEEL BEARING

Brake	Drum	Disc
Wheel bearing axial end play mm (in)	Less than 0.05 (0.0020)	
Wheel bearing lock nuts		
Tightening torque N·m (kg-m, ft-lb)	186 - 255 (19 - 26, 137 - 188)	
Wheel bearing preload		
At wheel center N·m (kg-cm, in-lb)	0.18 - 0.94 (1.8 - 9.6, 1.6 - 8.3)	
At wheel hub bolt N (kg, lb)	3.9 - 18.6 (0.4 - 1.9, 0.9 - 4.2)	

General Specifications — Model N14

SUSPENSION

Suspension type	Strut type parallel link independent suspension

COIL SPRING

Except for Europe

Applied model	Without A.B.S.	With A.B.S.
Wire diameter mm (in)	11.2 (0.441)	11.4 (0.449)
Coil diameter mm (in)	130 (5.12)	
Free length mm (in)	351 (13.82)	331 (13.03)
Spring constant N·m (kg-m, ft-lb)	16 (1.6, 12)	18 (1.8, 13)
Identification color	Purple × 2, Orange × 1	Pink × 1, Purple × 2

For Europe

Applied model	2WD								4WD	
	3-door Hatchback			5-door Hatchback			4-door Sedan		GA16DS	SR20DET
	GA14DS & CD20	GA16DS	SR20DE	GA14DS	GA16DS & CD20	SR20DE	GA14DS	GA16DS & CD20		
Wire diameter mm (in)	11.1 (0.437)	11.1 (0.437)	11.2 (0.441)	11.1 (0.437)	11.2 (0.441)	11.5 (0.453)	11.1 (0.437)	11.1 (0.437)	11.6 (0.457)	9.7 - 11.9 (0.382 - 0.469)
Coil diameter mm (in)	130 (5.12)									
Free length mm (in)	331 (13.03)	341 (13.43)	321 (12.64)	341 (13.43)	351 (13.82)	341 (13.43)	331 (13.03)	341 (13.43)	351 (13.82)	314 (12.36)
Spring constant N·m (kg-m, ft-lb)	16 (1.6, 12)	16 (1.6, 12)	18 (1.8, 13)	16 (1.6, 12)	16 (1.6, 12)	18 (1.8, 13)	16 (1.6, 12)	16 (1.6, 12)	20 (2.0, 14)	14 - 24 (1.4 - 2.4, 10 - 17)
Identification color	Pink × 2, Light blue × 1	Pink × 2, Pink × 1	Pink × 2, Light green × 1	Pink × 2, Pink × 1	Purple × 2, Orange × 1	Purple × 2, White × 1	Pink × 2, Light blue × 1	Pink × 2, Pink × 1	Yellow × 2, Yellow × 1	White × 2, Light blue × 1

General Specifications — Model N14 (Cont'd)

SHOCK ABSORBER OR STRUT

Except for Europe

Applied model		All
Strut type		Double-acting hydraulic
Damping force [at 0.3 m (1.0 ft)/sec]	N (kg, lb)	
Expansion		539 - 736 (55 - 75, 121 - 165)
Compression		226 - 363 (23 - 37, 51 - 82)
Piston rod diameter	mm (in)	18 (0.71)

For Europe

Applied model		2WD				4WD		
		GA14DS & CD20	GA16DS		SR20DE	GA16DS		SR20DET
			Without A.B.S.	With A.B.S.		Without A.B.S.	With A.B.S.	
Strut type		Double-acting hydraulic						
Damping force [at 0.3 m (1.0 ft) sec]	N (kg, lb)							
Expansion		412 - 579 (42 - 59, 93 - 130)	412 - 579 (42 - 59, 93 - 130)	412 - 579 (42 - 59, 93 - 130)	490 - 686 (50 - 70, 110 - 154)	490 - 686 (50 - 70, 110 - 154)	490 - 686 (50 - 70, 110 - 154)	667 - 902 (68 - 92, 150 - 203)
Compression		265 - 422 (27 - 43, 60 - 95)	265 - 422 (27 - 43, 60 - 95)	265 - 422 (27 - 43, 60 - 95)	324 - 500 (33 - 51, 73 - 112)	265 - 422 (27 - 43, 60 - 95)	265 - 422 (27 - 43, 60 - 95)	314 - 471 (32 - 48, 71 - 106)
Piston rod diameter	mm (in)	18 (0.71)	22 (0.87)	22 (0.87)	22 (0.87)	18 (0.71)	18 (0.71)	22 (0.87)

STABILIZER BAR

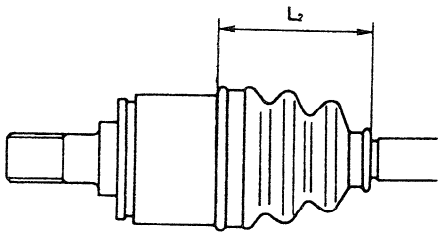
Applied model		2WD			4WD	
		Except SR20DE		SR20DE	GA16DS	SR20DET
		R.H.D.	L.H.D.			
Bar diameter	mm (in)	9 (0.35)	10 (0.39)	14 (0.55)	10 (0.39)	15 (0.59)
Identification color		Red	Orange	White	Red	Green

General Specifications — Model N14 (Cont'd)

DRIVE SHAFT

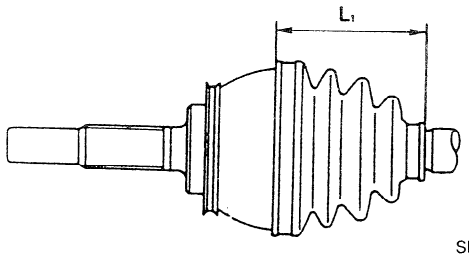
Applied model	GA16DS	SR20DET
Joint type		
Final drive side	TS70C	TS79C
Wheel side	ZF80	ZF90
Applied grease		
Quality	Nissan genuine grease or equivalent	
Capacity g (oz)		
Final drive side	185 - 195 (6.52 - 6.88)	225 - 235 (7.94 - 8.29)
Wheel side	90 - 100 (3.17 - 3.53)	160 - 170 (5.64 - 6.00)
Boot length mm (in)		
Final drive side "L_2"	95.5 - 97.5 (3.760 - 3.839)	101.5 - 103.5 (4.00 - 4.07)
Wheel side "L_1"	90.5 - 92.5 (3.563 - 3.642)	96 - 98 (3.78 - 3.86)

Final drive side



SFA961A

Wheel side



SFA962A

Inspection and Adjustment — Model N14

WHEEL ALIGNMENT (Unladen*1)

Applied model		2WD	4WD
Camber	degree	−1°40′ to −0°10′	−0°55′ to 0°35′
Toe-in	mm (in)	−1 to 3 (−0 04 to 0 12)	
Total toe-in	degree	−6′ to 18′	

*1: Fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools and mats in designated positions.

WHEEL BEARING

Brake	2WD	4WD
Wheel bearing axial end play mm (in)	Less than 0.05 (0.0020)	
Wheel bearing lock nuts		
Tightening torque N·m (kg-m, ft-lb)	186 - 255 (19 - 26, 137 - 188)	196 - 275 (20 - 28, 145 - 203)
Wheel bearing preload		
At wheel center N·m (kg-cm, in-lb)	0 18 - 0 94 (1.8 - 9 6, 1 6 - 8.3)	1 31 (13.4, 11.6)
At wheel hub bolt N (kg, lb)	3 9 - 18 6 (0 4 - 1.9, 0 9 - 4 2)	9.8 (1.0, 2.2)

BRAKE SYSTEM

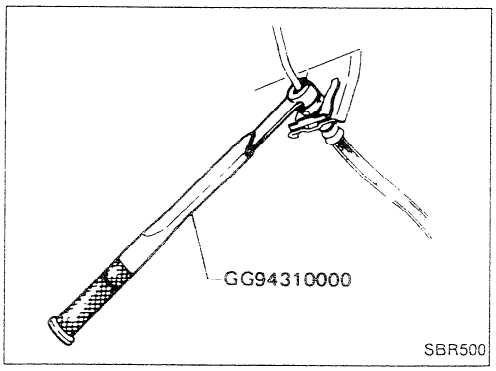
SECTION BR

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PRECAUTIONS AND PREPARATION ..... BR- 2
CHECK AND ADJUSTMENT ..... BR- 3
AIR BLEEDING ..... BR- 4
BRAKE HYDRAULIC LINE ..... BR- 5
CONTROL VALVE ..... BR- 8
BRAKE PEDAL AND BRACKET ..... BR- 13
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SERVICE DATA AND SPECIFICATIONS (S.D.S.) BR-100

Precautions

- Use brake fluid "DOT 3".
- 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 or wash all parts of master cylinder, disc brake caliper and wheel cylinder, use clean brake fluid.
- Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of hydraulic system.



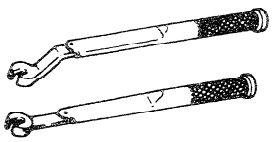
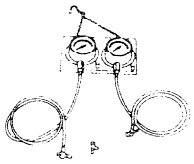
- Use Tool when removing and installing brake tube.

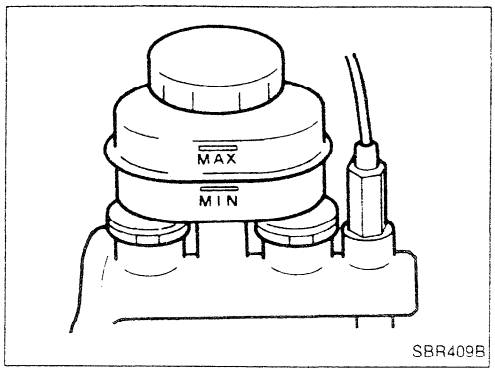
WARNING:

- Clean brake pads and shoes with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.

Preparation

SPECIAL SERVICE TOOLS

Tool number Tool name	Description	
GG94310000 Flare nut torque wrench		Removing and installing each brake piping
KV991V0010 Brake fluid pressure gauge		Measuring brake fluid pressure



Checking Brake Fluid Level

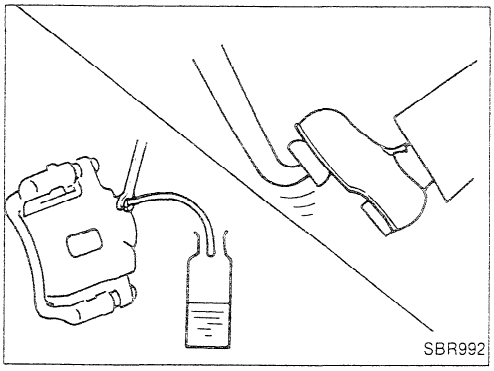
- Check fluid level in reservoir tank. It should be between Max. and Min. lines on reservoir tank.
- If fluid level is extremely low, check brake system for leaks.
- When brake warning lamp comes on even when parking brake lever is released, check brake system for leaks.

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.

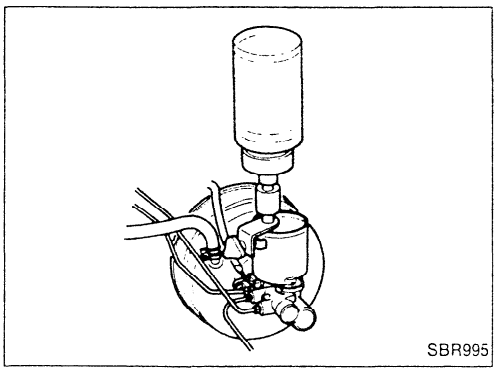


Changing Brake Fluid

CAUTION:

- **Refill with new brake fluid "DOT 3".**
- **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.**

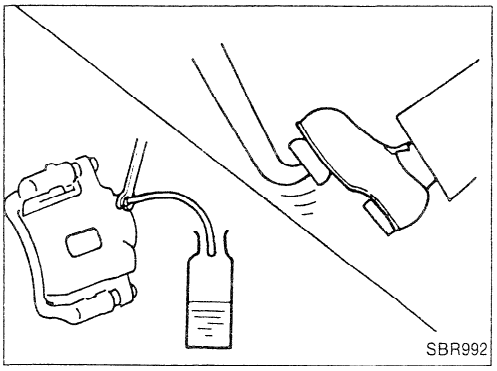
1. Connect a vinyl tube to each air bleeder valve.
2. Drain brake fluid from each air bleeder valve by depressing brake pedal.
3. Refill until new brake fluid comes out of each air bleeder valve.
   Use same procedure as in bleeding hydraulic system to refill brake fluid.
   Refer to "Bleeding Procedure" in "AIR BLEEDING".


SBR995

Bleeding Procedure

CAUTION:

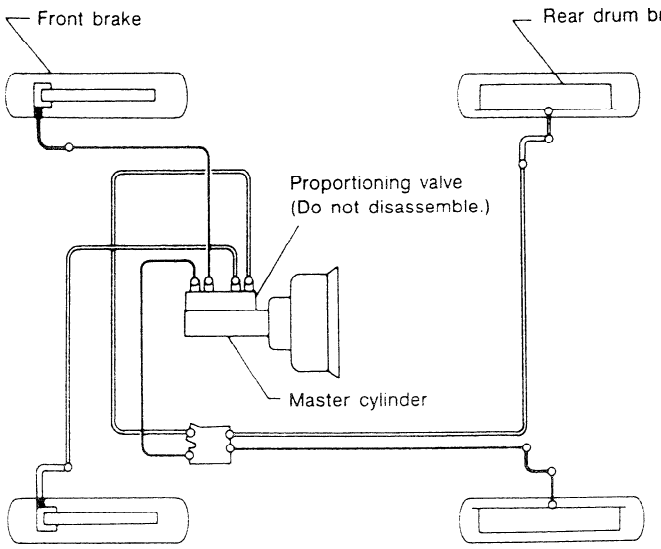
- **Carefully monitor brake fluid level at master cylinder during bleeding operation.**
- **Fill reservoir with new brake fluid "DOT 3". Make sure it is full at all times while bleeding air out of system.**
- **Place a container under master cylinder to avoid spillage of brake fluid.**


SBR992

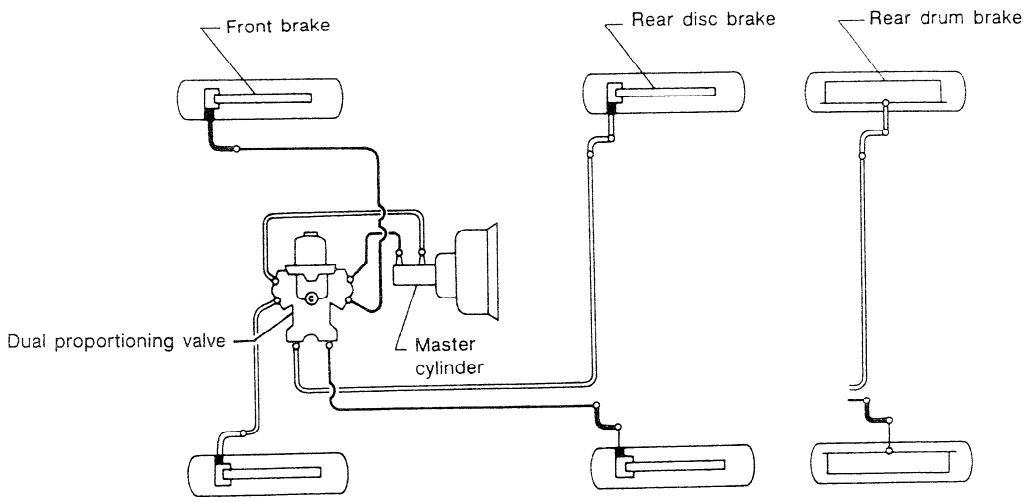
1. Connect a transparent vinyl tube to air bleeder valve.
2. Fully depress brake pedal several times.
3. With brake pedal depressed, open air bleeder valve to release air.
4. Close air bleeder valve.
5. Release brake pedal slowly.
6. Repeat steps 2. through 5. until clear brake fluid comes out of air bleeder valve.

- Bleed air in the following order.
  Left rear brake
  ↓
  Right front brake
  ↓
  Right rear brake
  ↓
  Left front brake

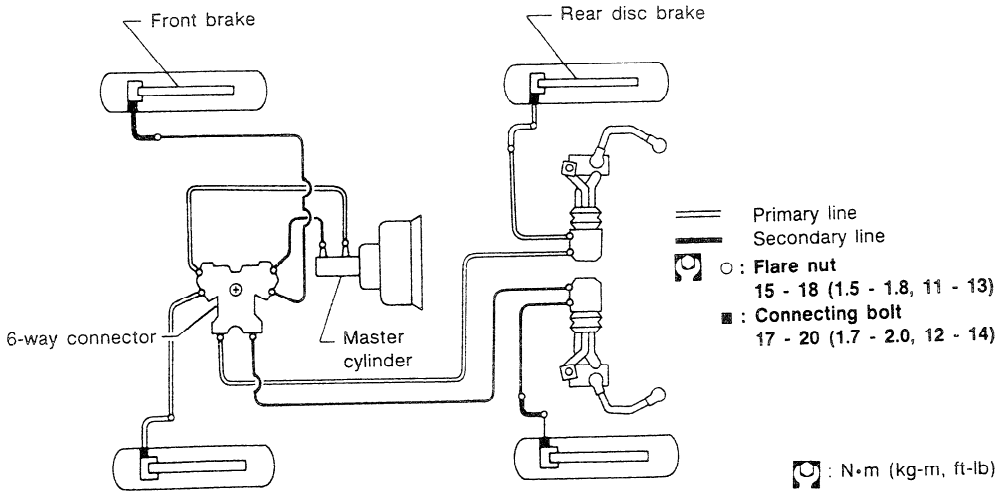
Without anti-lock braking system
(Models with dual proportioning valve built into master cylinder)(built-in type)



Without anti-lock braking system
(Models with dual proportioning valve separated from master cylinder)(separated type)

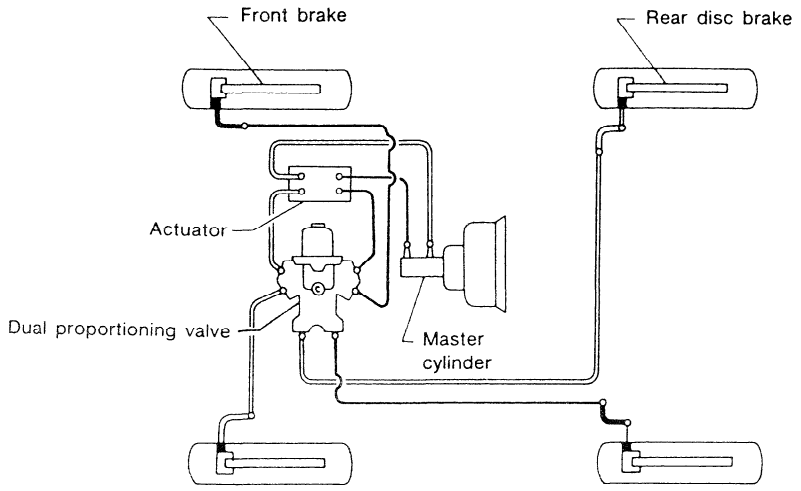


Without anti-lock braking system
(Models with twin load sensing valve)

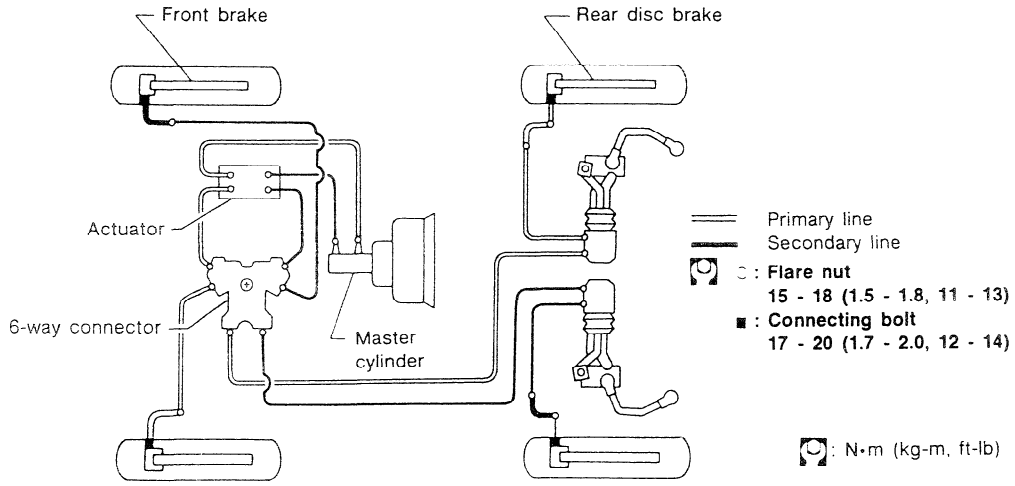


SBR760B

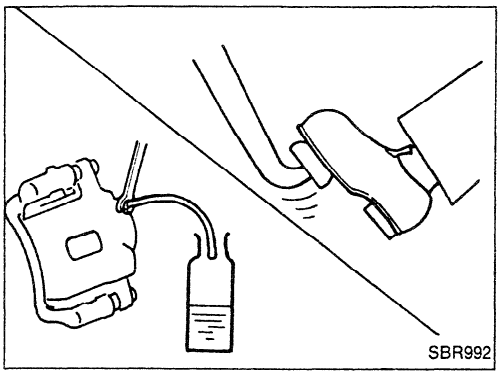
With anti-lock braking system



With anti-lock braking system (Models with twin load sensing valve)



SBR761B



Removal

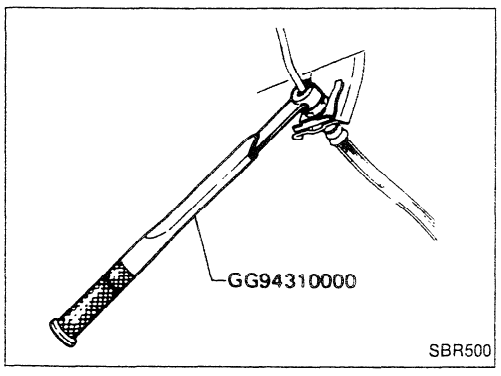
CAUTION:

- **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 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.

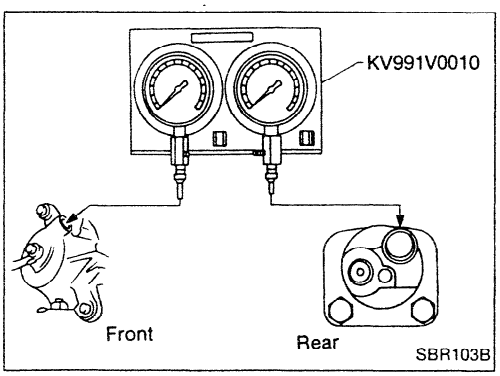


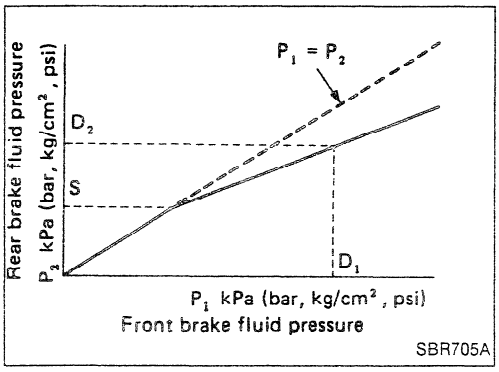
Installation

CAUTION:

- **Refill with new brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**

1. Tighten all flare nuts and connecting bolts.
   Specification:
   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" in "AIR BLEEDING".





Proportioning Valve

INSPECTION

CAUTION:

- **Carefully monitor brake fluid level at master cylinder.**
- **Use new brake fluid "DOT 3".**
- **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 2 seconds after front brake pressure reaches specified value.**
- **For models with A.B.S. disconnect harness connectors from A.B.S. actuator relay before checking.**

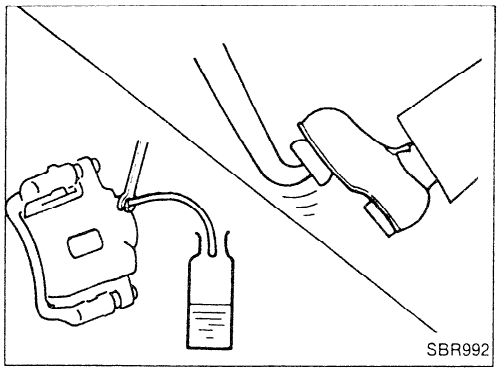
1. Connect Tool to air bleeders of front and rear brakes on either L.H. and R.H. side.
2. Bleed air from the Tool.
3. Check fluid pressure by depressing brake pedal.

Applied models	Except Europe		Europe			
			2WD	4WD		
	With A.B.S.	Without A.B.S.	With rear drum brake	With A.B.S.	GA16DS	SR20DET
Applied pressure (Front brake) kPa (bar, kg/cm², psi)	4,904 (49.0, 50, 711)	7,355 (73.6, 75, 1,067)	6,865 (68.6, 70, 995)		7,355 (73.6, 75, 1,067)	6,375 (63.7, 65, 924)
Output pressure (Rear brake) kPa (bar, kg/cm², psi)	1,961 - 2,354 (19.6 - 23.5, 20 - 24, 284 - 341)	4,511 - 4,805 (45.1 - 48.1, 46 - 49, 654 - 697)	SR20DET 3,629 - 3,923, (36.3 - 39.2, 37 - 40, 526 - 569) Except SR20DET 3,923 - 4,315 (39.2 - 43.2, 40 - 44, 569 - 626)		4,511 - 4,805 (45.1 - 48.1, 46 - 49, 654 - 697)	L.H.D 3,432 - 3,825 (34.3 - 38.2, 35 - 39, 498 - 555) R.H.D. 4,119 - 4,511 (41.2 - 45.1, 42 - 46, 597 - 654)

If output pressure is out of specifications, replace dual proportioning valve (separated type) or master cylinder assembly (built-in type).

4. Bleed air after disconnecting the Tool. Refer to "Bleeding Procedure" in "AIR BLEEDING".

Proportioning Valve (Cont'd)

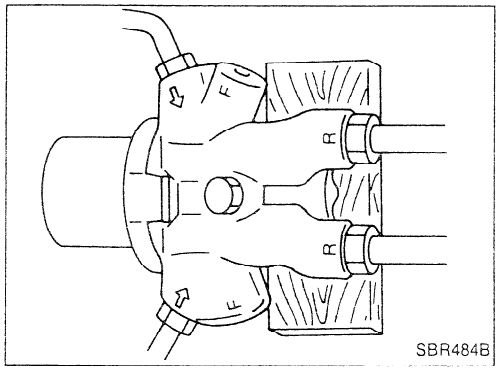

SBR992

REMOVAL (Separated type)

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.**

1. Connect a vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve by depressing brake pedal.



SBR484B

3. Loosen flare nut with wooden block placed between proportioning valve and dash panel.
4. Remove proportioning valve mounting bolt, then remove flare nut.

INSTALLATION (Separated type)

CAUTION:

- **Refill with new brake fluid "DOT 3".**
- **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.

   Specification:

   Flare nut

   15 - 18 N·m

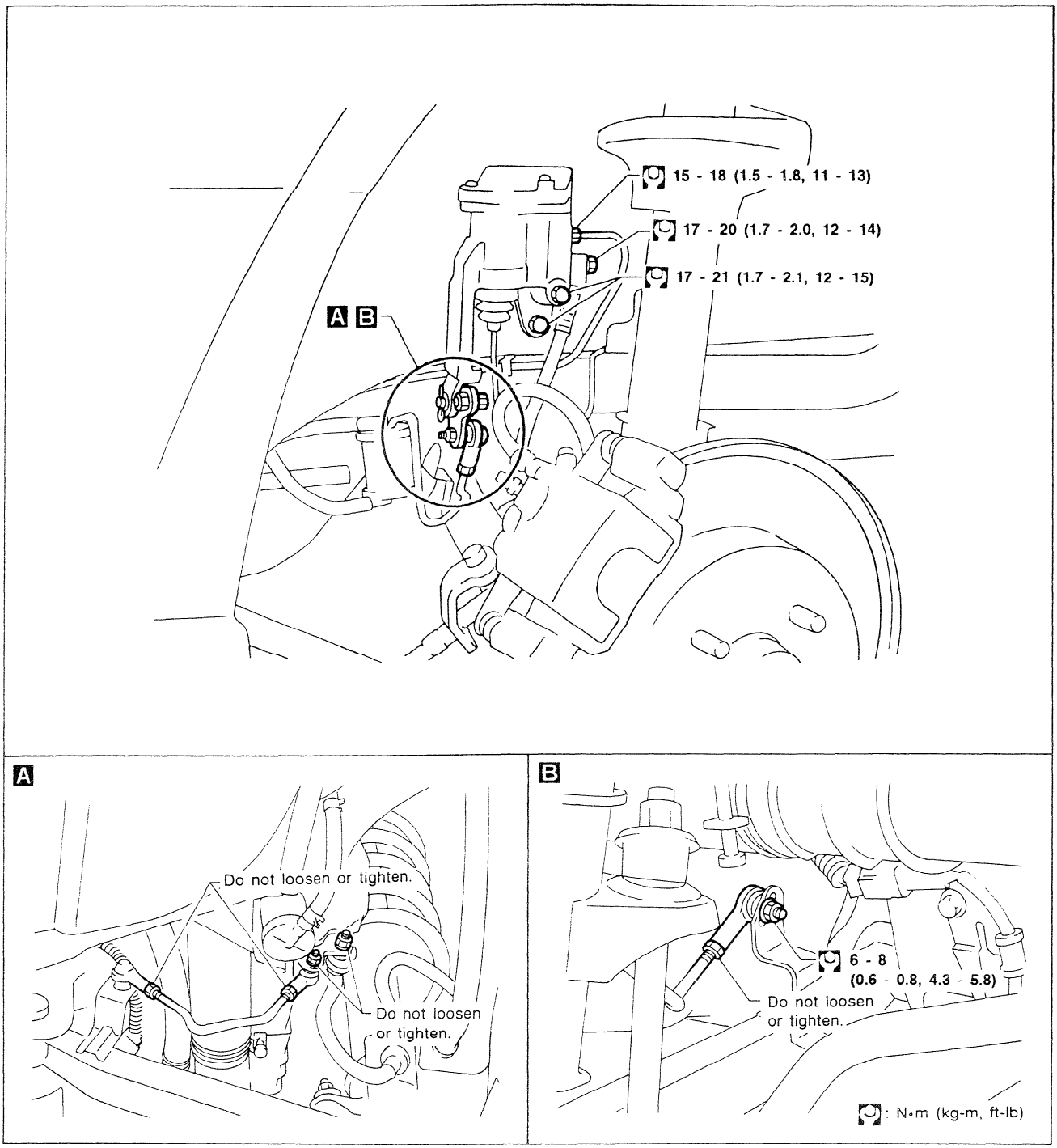
   (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
3. Refill until new brake fluid comes out of each air bleeder valve.
4. Bleed air. Refer to "Bleeding Procedure" in "AIR BLEEDING".

REMOVAL AND INSTALLATION (Built-in type)

Always replace together with master cylinder as an assembly.

- Refer to "MASTER CYLINDER".

Twin Load Sensing Valve

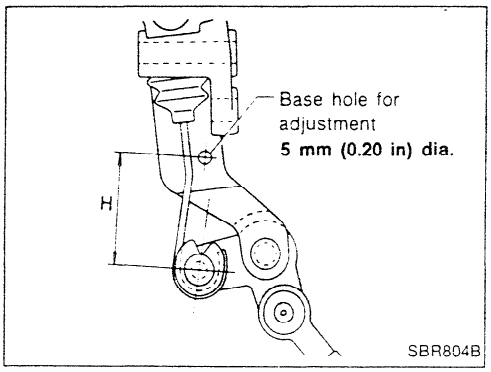


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When replacing load sensing valve, it should be replaced with rod as an assembly.

Twin Load Sensing Valve (Cont'd)

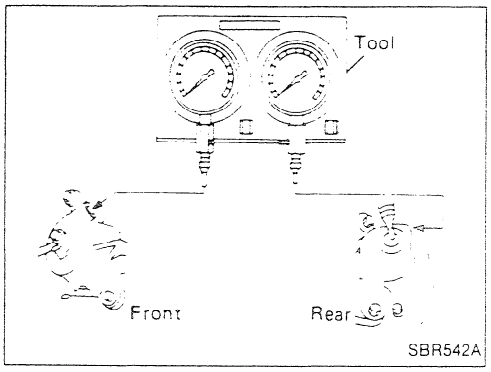
INSPECTION



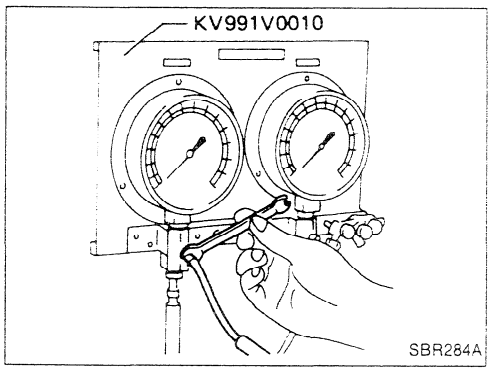
CAUTION:

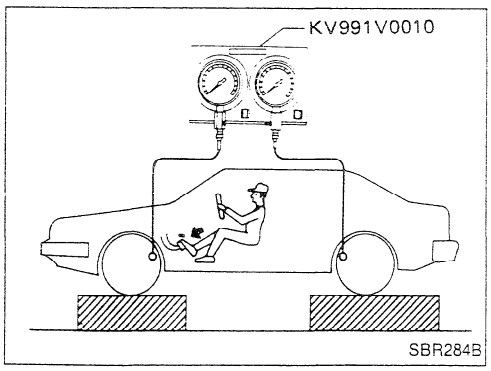
- **Carefully monitor brake fluid level at master cylinder.**
- **Use new brake fluid "DOT 3".**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on paint areas, wash it away with water immediately.**
- **Depress pedal slowly when raising front brake pressure.**
- **Check rear brake pressure 2 seconds after front brake pressure reaches specified value.**
- **For models with A.B.S. disconnect harness connectors from A.B.S. actuator relay before checking.**

1. Check length "H" in unladen condition.
   "Unladen"
   Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
   Length "H":
   SR20DE 38.2 mm (1.504 in) or more
   GA16DS 39.0 mm (1.535 in) or more



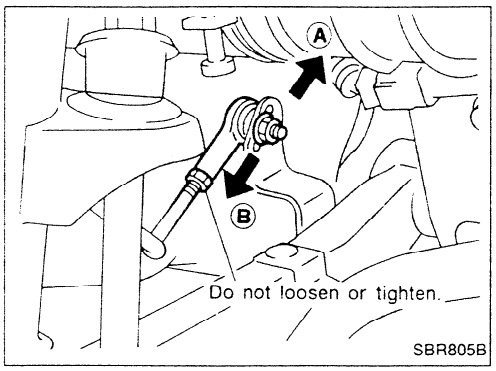
2. Connect tool to air bleeders of front and rear brakes on either L.H. and R.H. side.
3. Bleed air from Tool.





4. With one person aboard depress brake pedal until master cylinder oil pressure reaches 4,904 kPa (49.0 bar, 50 kg/cm^2, 711 psi). Hold brake pedal in that position and read rear brake oil pressure on pressure gauge indicator.
   Rear brake pressure:
   SR20DE
   1,667 - 3,138 kPa
   (16.7 - 31.4 bar, 17 - 32 kg/cm^2, 242 - 455 psi)
   GA16DS
   981 - 1,863 kPa
   (9.8 - 18.6 bar, 10 - 19 kg/cm^2, 142 - 270 psi)
5. Depress brake pedal until master cylinder oil pressure reaches 9,807 kPa (98.1 bar, 100 kg/cm^2, 1,422 psi). With brake pedal held in that position, read rear brake oil pressure on pressure gauge indicator.
   Rear brake pressure:
   SR20DE
   2,648 - 4,119 kPa
   (26.5 - 41.2 bar, 27 - 42 kg/cm^2, 384 - 597 psi)
   GA16DS
   1,471 - 2,354 kPa
   (14.7 - 23.5 bar, 15 - 24 kg/cm^2, 213 - 341 psi)

Twin Load Sensing Valve (Cont'd)



6. If rear brake pressure is out of specifications, adjust rod mounting so that rear brake pressure is within specifications.

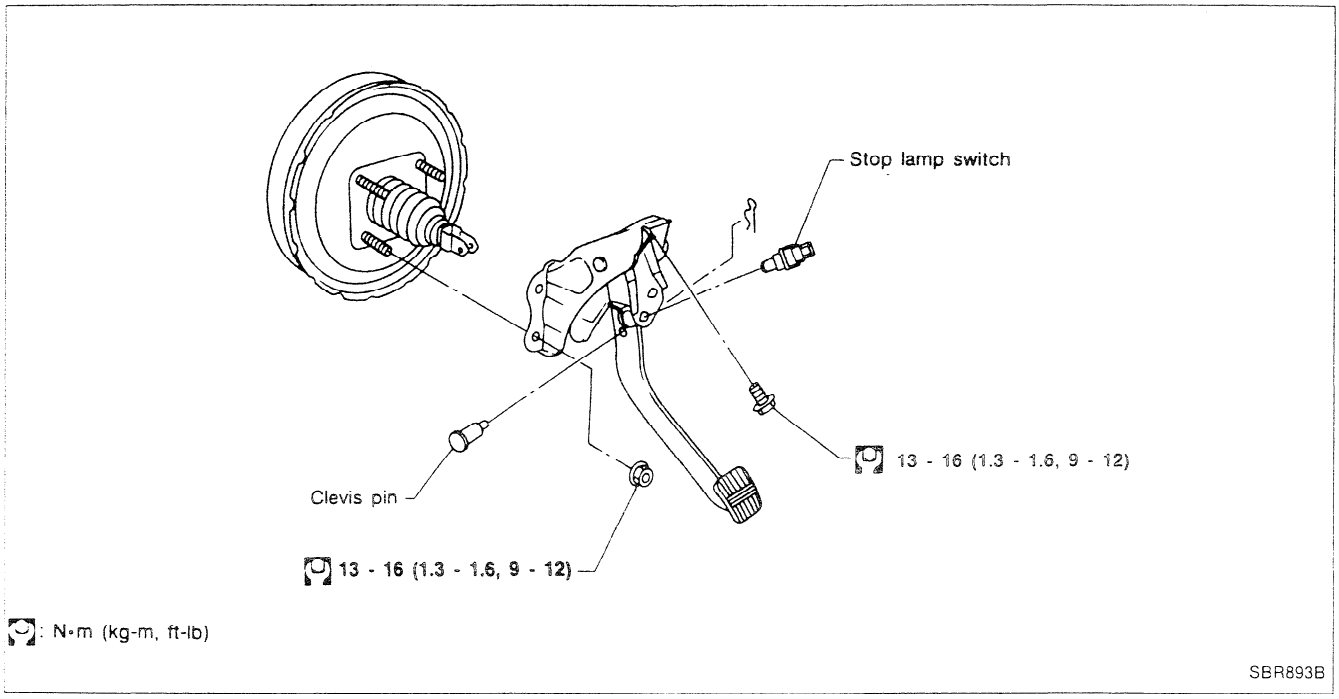
   Adjusting direction:

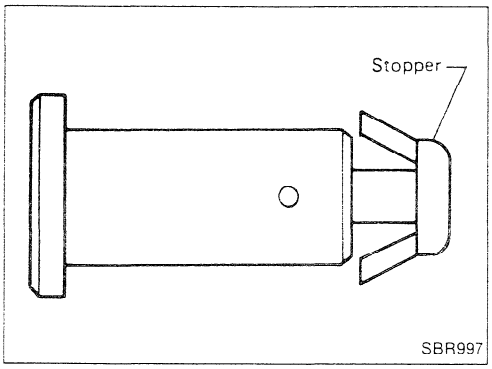
   - **Ⓐ: If rear brake pressure is lower than specifications**
   - **Ⓑ: If rear brake pressure is higher than specifications.**

   If it is impossible to adjust load sensing valve correctly, it is out of order. Replace load sensing valve assembly.

7. Check length "H" again. For details, refer to step 1.
   If length "H" is out of specifications, adjust rod mounting again (step 6).

Removal and Installation

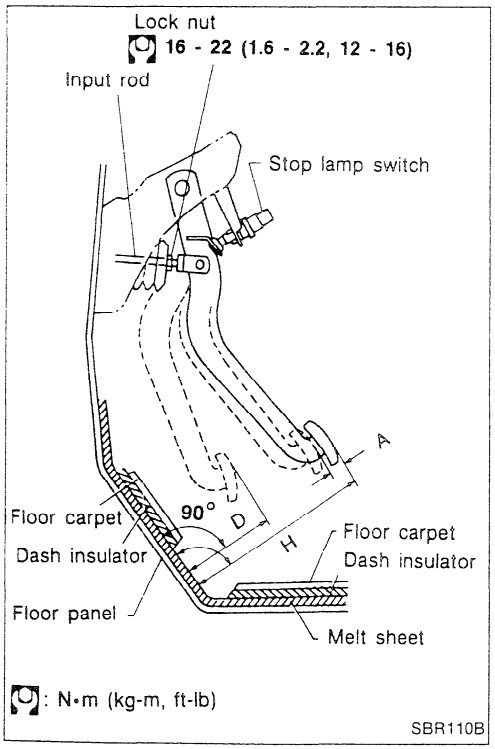




Inspection

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 S.D.S.

D: Depressed height
Refer to S.D.S.
Under force of 490 N (50 kg, 110 lb) with engine running

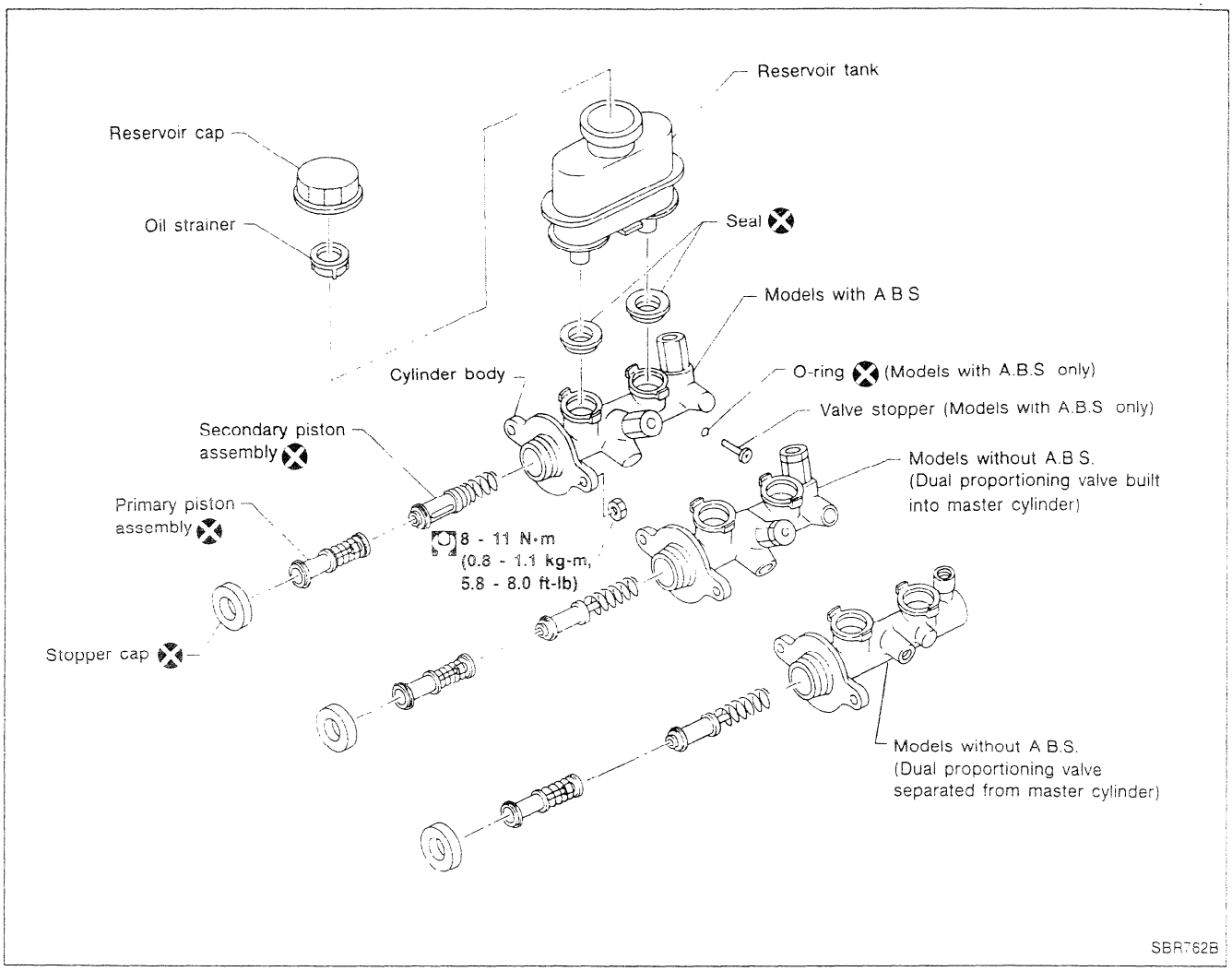
A: Pedal free play
Refer to S.D.S.

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.

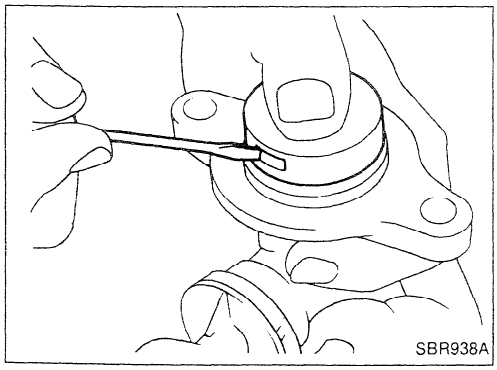


Removal

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.

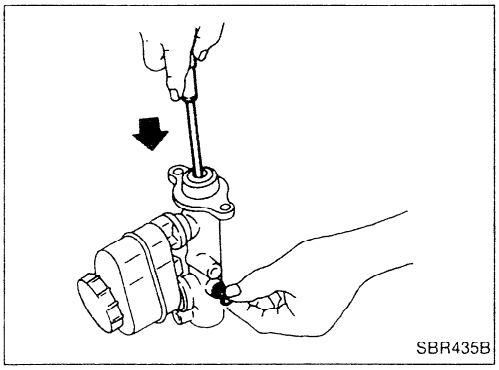
1. Connect a vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve, depressing brake pedal to empty fluid from master cylinder.
3. Remove brake pipe flare nuts.
4. Remove master cylinder mounting nuts.



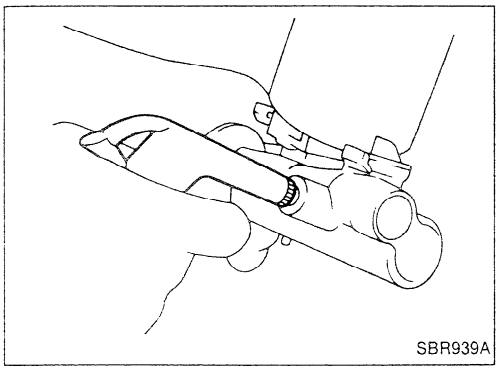
Disassembly

1. Bend claws of stopper cap outward.

Disassembly (Cont'd)


SBR435B

2. Remove valve stopper while piston is pushed into cylinder. (Models with A.B.S. only)


SBR939A

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 for the following items.

Replace any part if damaged.

Master cylinder:

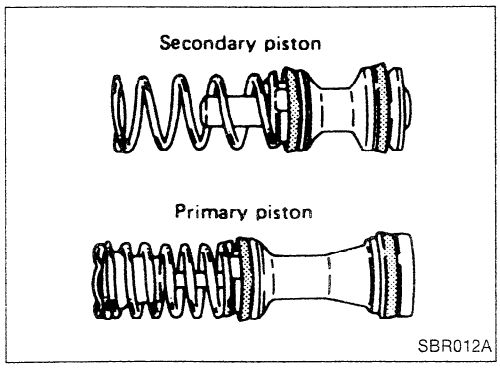
- Pin holes or scratches on inner wall.

Piston:

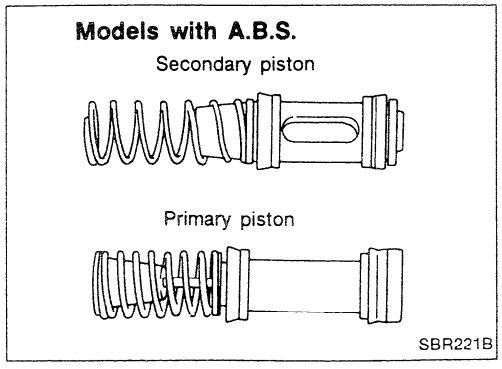
- Deformation of or scratches on piston cups.

Stopper cap:

- Damage or excessive deformation of claws.



SBR012A



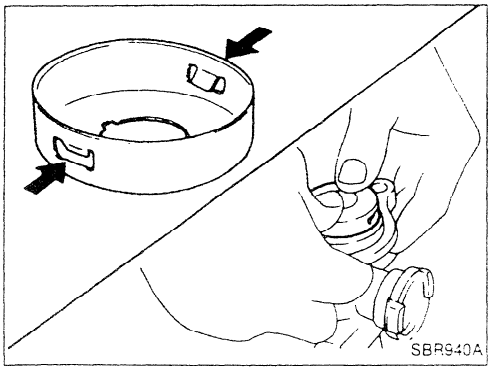
SBR221B

Assembly

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 (For models with A.B.S. only).**

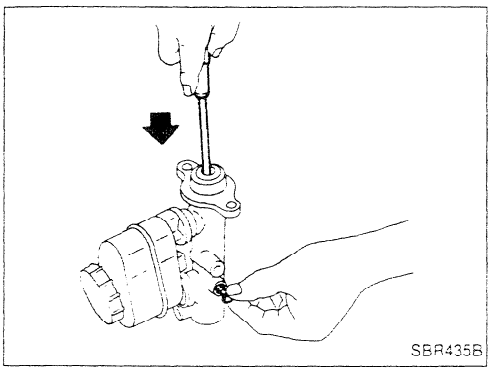
Assembly (Cont'd)



2. Install stopper cap.

Before installing stopper cap, ensure that claws are bent inward.

3. Push reservoir tank seals.
4. Push reservoir tank into master cylinder.



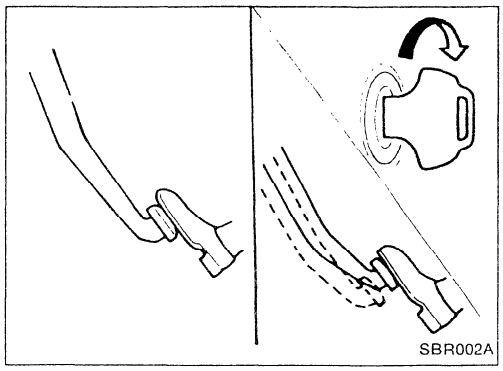
5. Install valve stopper while piston is pushed into cylinder. (Models with A.B.S. only)

Installation

CAUTION:

- **Refill with new brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**

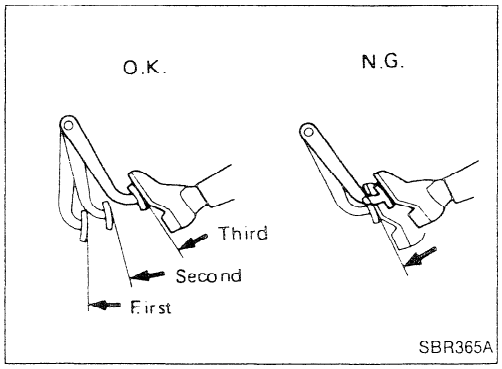
1. Place master cylinder onto brake booster and secure mounting nuts lightly.
2. Fit flare nuts to master cylinder.
3. Tighten mounting nuts.
   Specification:
   8 - 11 N·m
   (0.8 - 1.1 kg-m, 5.8 - 8.0 ft-lb)
4. Tighten flare nuts.
   Specification:
   15 - 18 N·m
   (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
5. Bleed air. Refer to "Bleeding Procedure" in "AIR BLEEDING".



On-vehicle Service

OPERATING CHECK

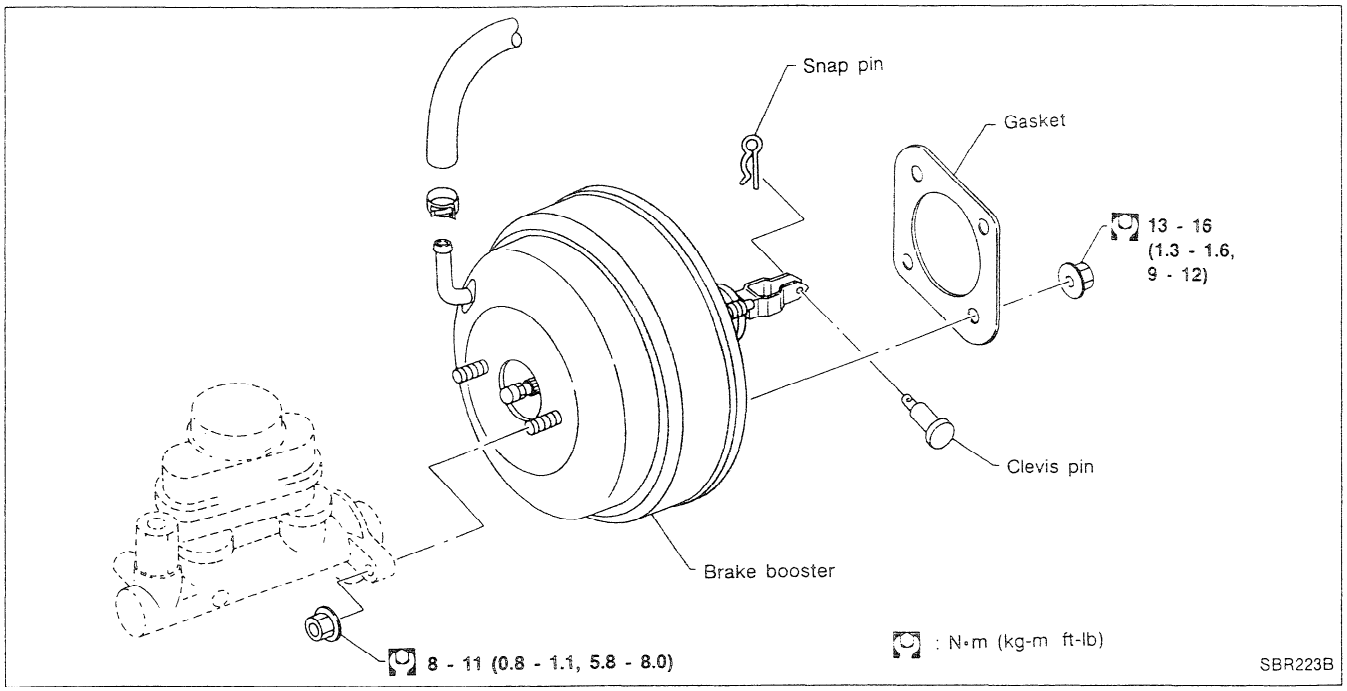
- Depress brake pedal several times with engine off, and check that there is no change in pedal stroke.
- Depress brake pedal, then start engine. If pedal goes down slightly, operation is normal.



AIRTIGHT CHECK

- Start engine, and stop it after one or two minutes. Depress brake pedal several times slowly. If pedal goes further down the first time and gradually rises after second or third time, booster is airtight.
- Depress brake pedal while engine is running, and stop engine with pedal depressed. If there is no change in pedal stroke after holding pedal down **30 seconds**, brake booster is airtight.

Removal



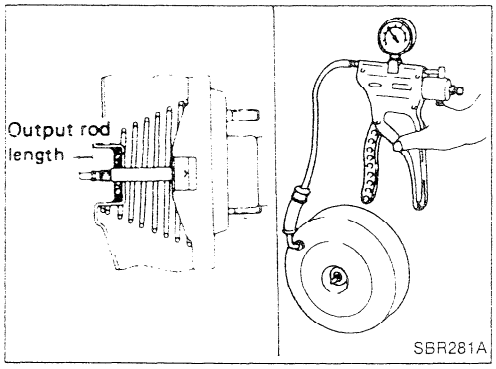
Removal (Cont'd)

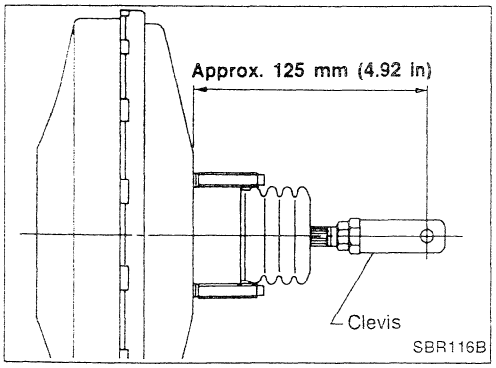
CAUTION:

- **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.**
- **Take care not to damage brake booster mounting bolt thread when installing. Due to the acute angle of installation, the threads can be damaged on the metal surrounding the bulkhead holes.**

(For GA16DE engine models)

- **It is necessary to remove intake manifold first because space around booster is limited.**





Inspection

OUTPUT ROD LENGTH CHECK

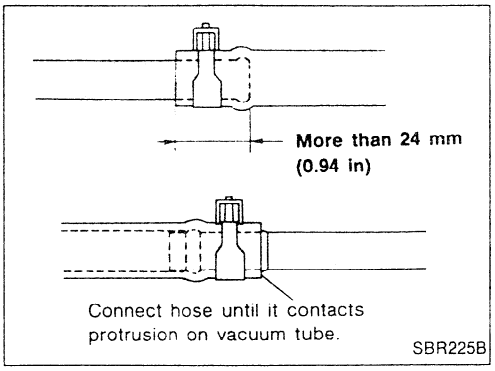
1. Supply brake booster with vacuum of –66.7 kPa (–667 mbar, –500 mmHg, –19.69 inHg) using a handy vacuum pump.
2. Check output rod length.
   Specified length:
   S180 or C180
   4.875 - 5.125 mm (0.1919 - 0.2018 in)
   M165T, M195T, S205 or C205
   10.275 - 10.525 mm (0.4045 - 0.4144 in)

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 3".**
- **Never reuse drained brake fluid.**

1. Before fitting booster, temporarily adjust clevis to dimension shown. (Does not apply to vehicles fitted with A.B.S.)
2. Fit booster, then secure mounting nuts (brake pedal bracket to master cylinder) 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 "Installation" in "MASTER CYLINDER".
6. Bleed air. Refer to "Bleeding Procedure" in "AIR BLEEDING".

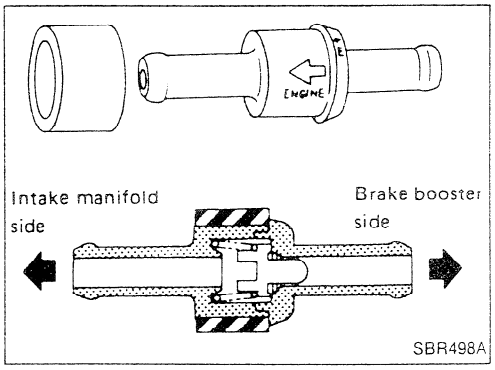


Removal and Installation

CAUTION:

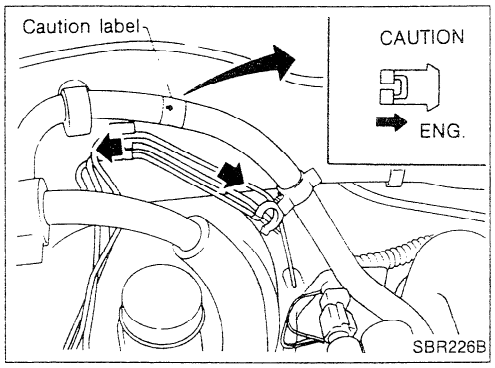
When installing vacuum hoses, pay attention to the following points.

- **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.**

TYPE 1



TYPE 2

Inspection

HOSES AND CONNECTORS

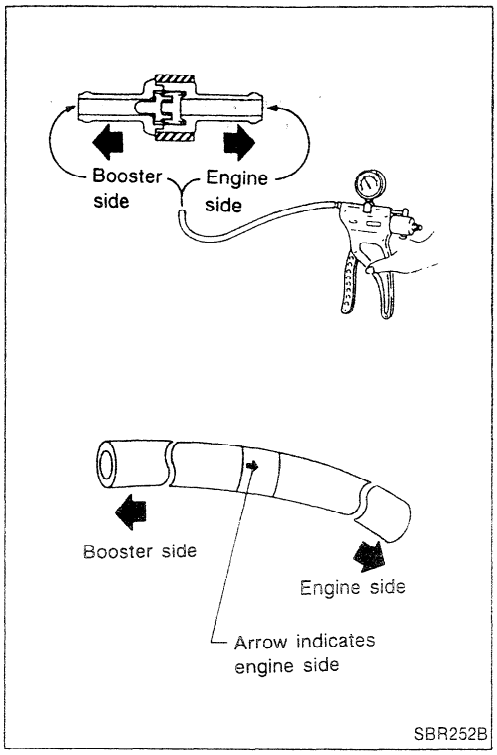
Check vacuum lines, connections and check valve for airtightness, improper attachment chafing and deterioration.

Inspection (Cont'd)

CHECK VALVE

Check vacuum with a vacuum pump.

Connect to booster side	Vacuum should exist.
Connect to engine side	Vacuum should not exist.



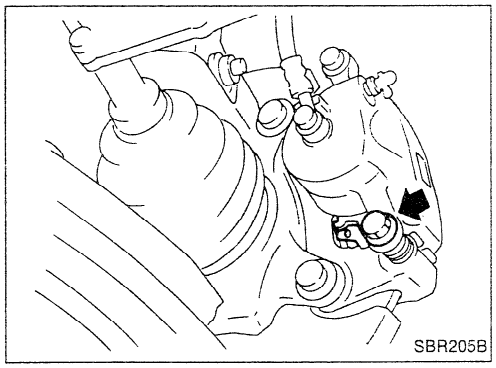
Pad Replacement

WARNING:

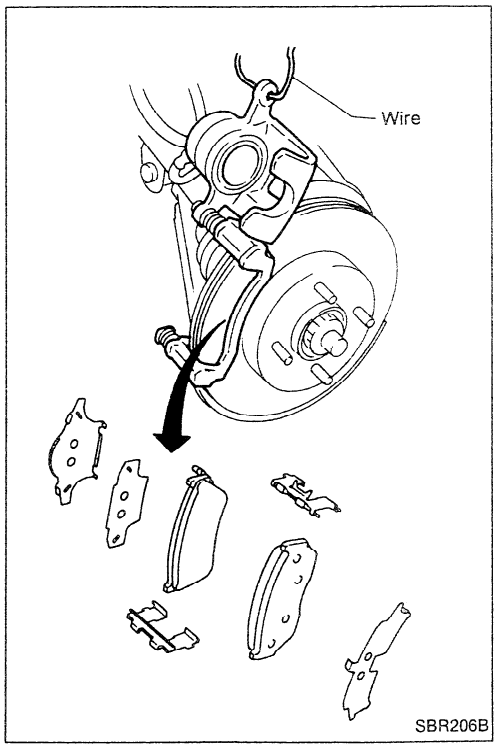
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.

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.**


SBR205B

1. Remove master cylinder reservoir cap.
2. Remove pin bolt.



SBR206B

3. Open cylinder body upward. Then remove pad retainers, and inner and outer shims.

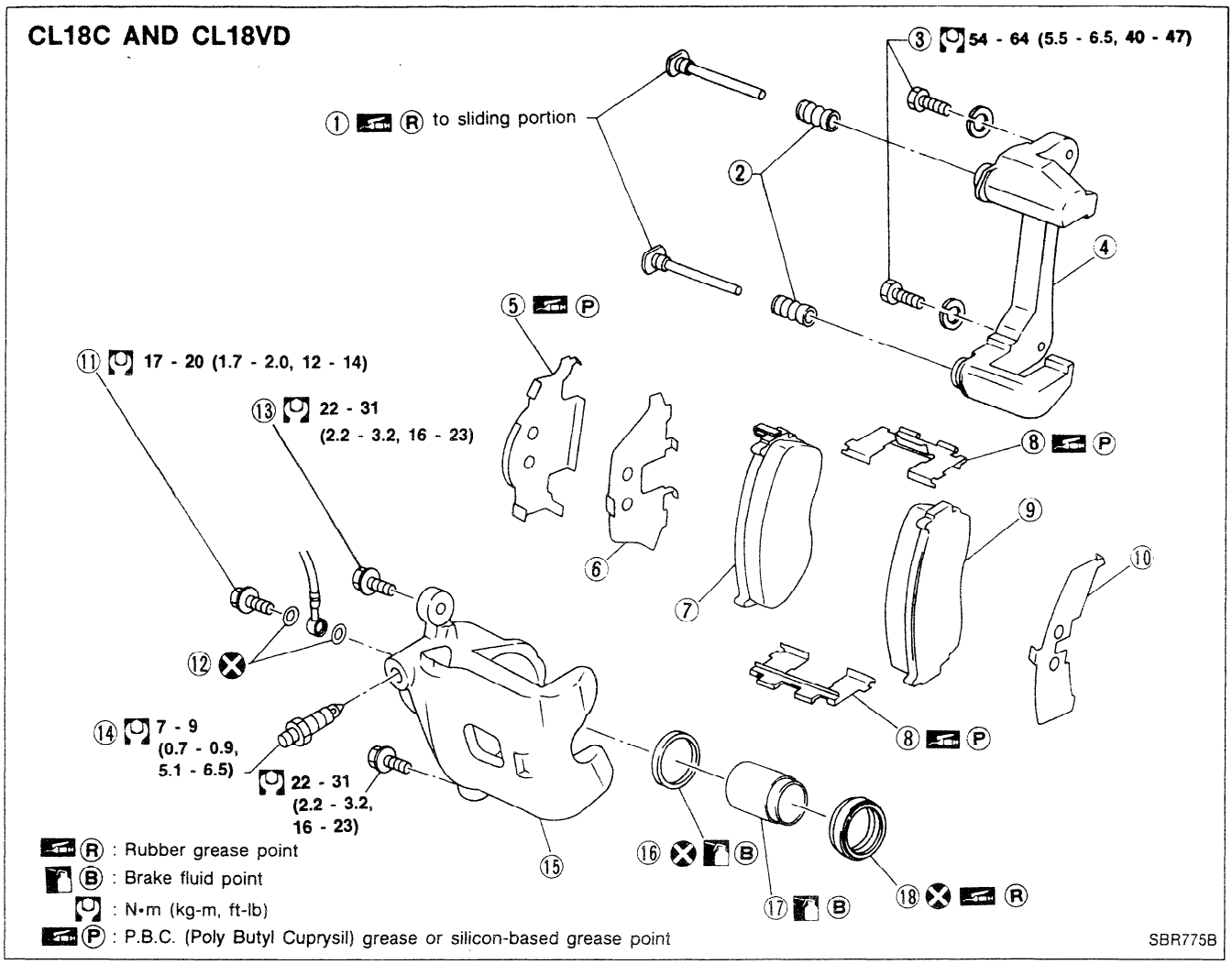
   Standard pad thickness:

   10 mm (0.39 in)

   Pad wear limit:

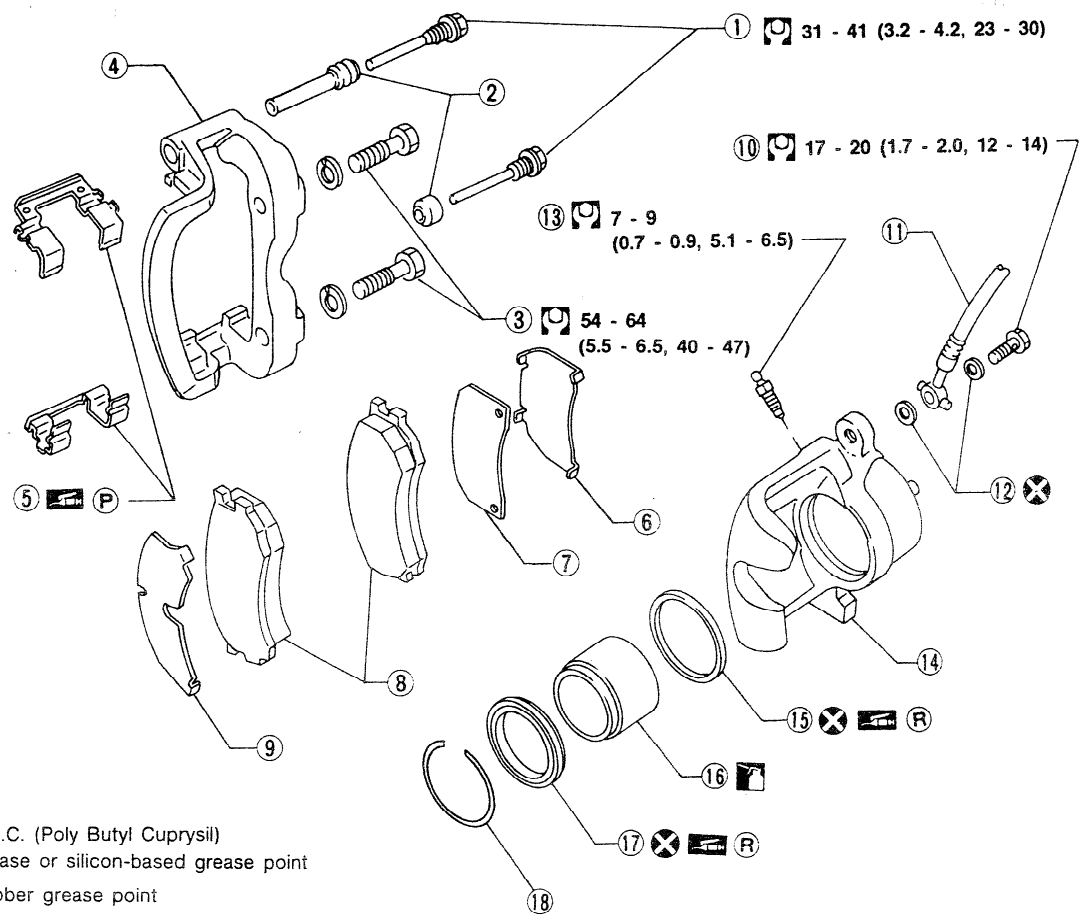
   2.0 mm (0.079 in)

Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.



① Main pin
② Pin boot
③ Torque member fixing bolt
④ Torque member
⑤ Shim cover
⑥ Inner shim
⑦ Inner pad
⑧ Pad retainer
⑨ Outer pad
⑩ Outer shim
⑪ Connecting bolt
⑫ Copper washer
⑬ Main pin bolt
⑭ Bleed valve
⑮ Cylinder body
⑯ Piston seal
⑰ Piston
⑱ Piston boot

AD22VF



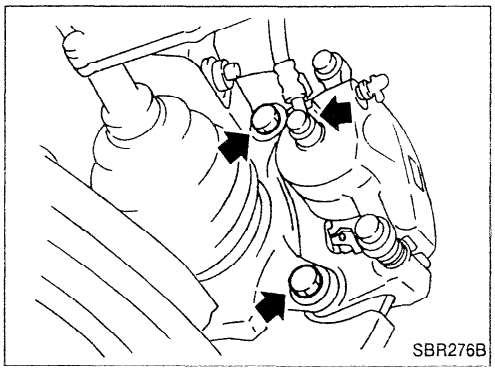
SBR806B

① Main pin bolt
② Pin boot
③ Torque member fixing bolt
④ Torque member
⑤ Pad retainer
⑥ Shim cover
⑦ Inner shim
⑧ Pad
⑨ Outer shim
⑩ Connecting bolt
⑪ Brake hose
⑫ Copper washer
⑬ Air bleeder
⑭ Cylinder body
⑮ Piston seal
⑯ Piston
⑰ Piston boot
⑱ Piston boot retainer

Removal

WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.

CAUTION:
Suspend caliper assembly with wire so as not to stretch brake hose.

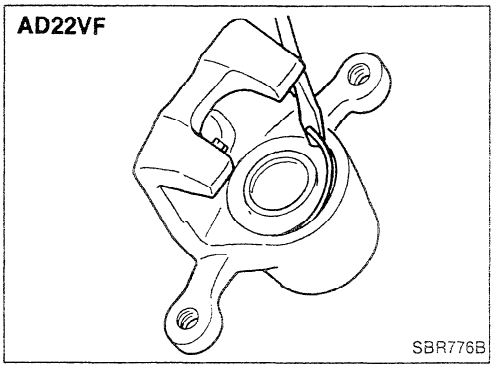

SBR276B

Remove torque member fixing bolts and connecting bolt.

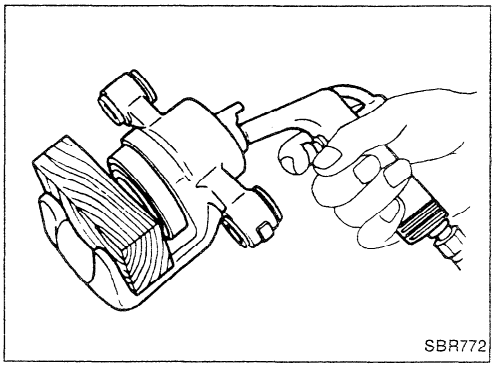
It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly.

Disassembly

AD22VF


SBR776B

1. Remove piston boot retainer with a screwdriver.


SBR772

WARNING:
Do not place your fingers in front of piston.

CAUTION:
Do not scratch or score cylinder wall.

2. Push out piston with dust seal with compressed air.
3. 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.

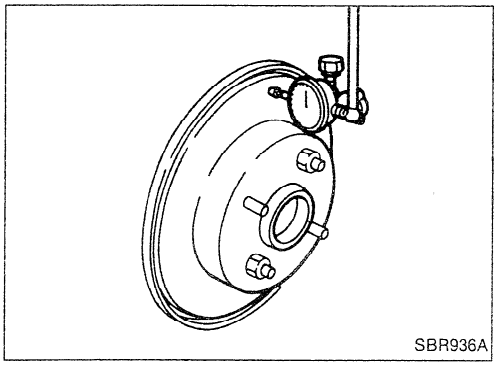
SLIDE PIN, PIN BOLT AND PIN COVER

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

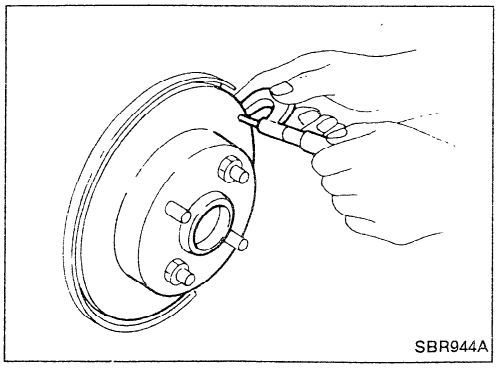
RUNOUT

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.

3. Change relative positions of rotor and wheel hub so that runout is minimized.

Maximum runout
0.07 mm (0.0028 in)

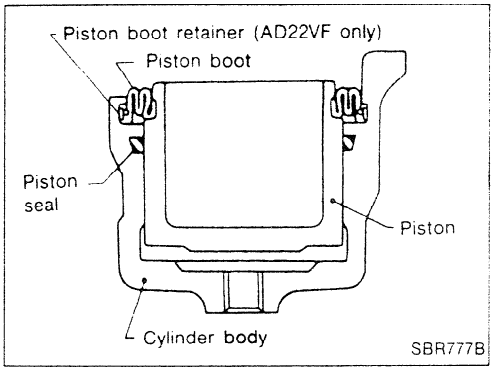

SBR944A

THICKNESS

Rotor repair limit:
Minimum thickness
CL18C 12.0 mm (0.472 in)
CL18VD 18.0 mm (0.709 in)
AD22VF 24.0 mm (0.945 in)
Thickness variation (At least 8 portions)
Maximum 0.02 mm (0.0008 in)

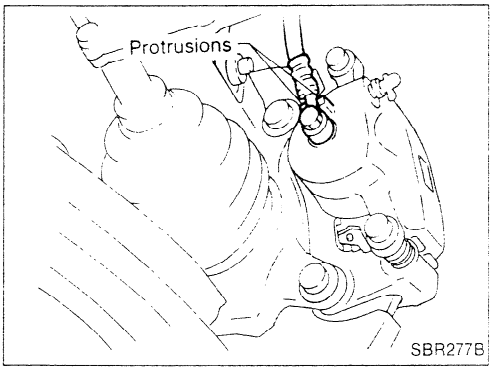
Replace rotor if any of the above did not meet the specifications.

Inspection — Rotor (Cont'd)



Assembly

1. With piston boot fitted to piston, insert piston boot into groove on cylinder body and install piston.
2. Properly secure piston boot
3. Secure piston boot with retainer. (AD22VF model only)

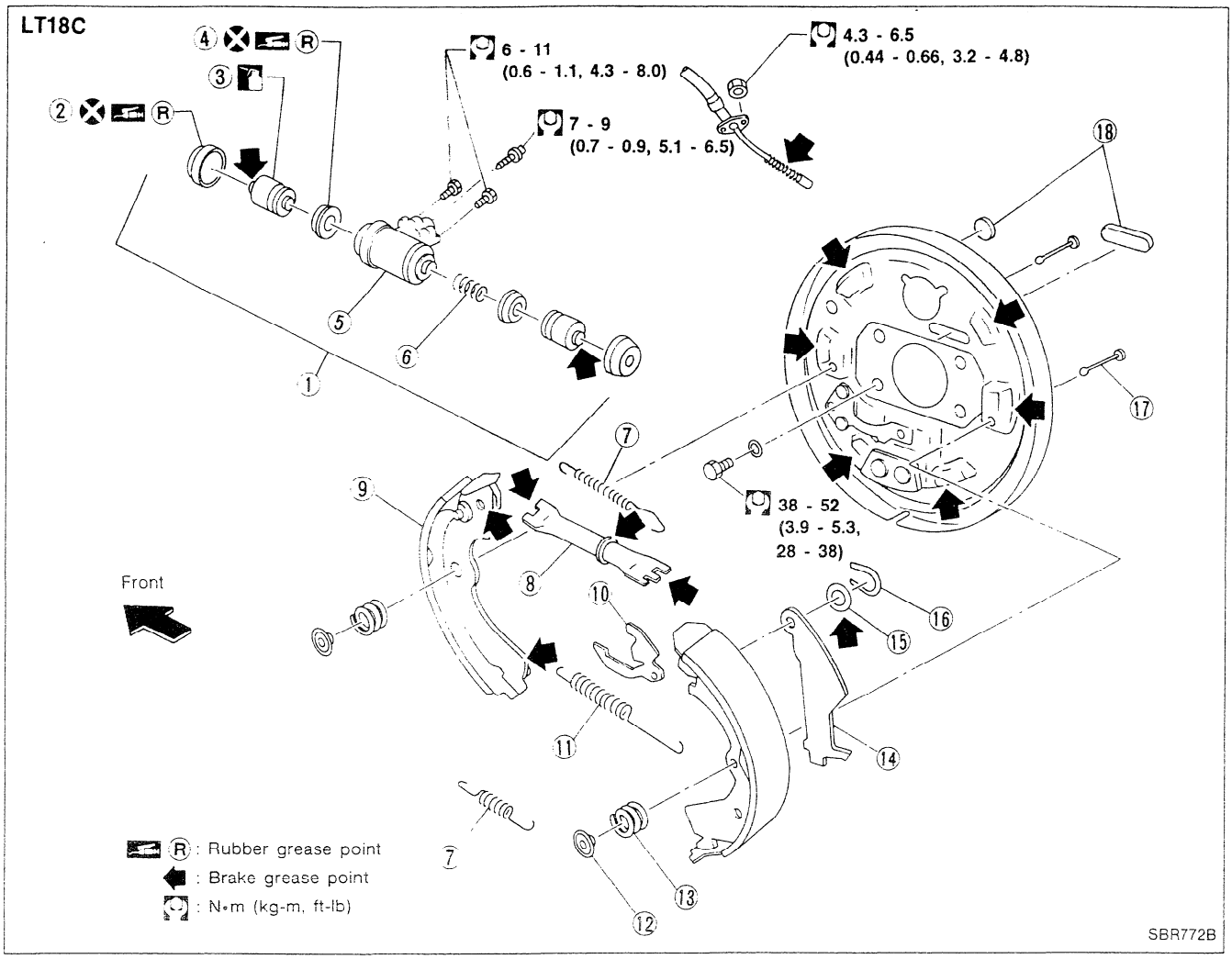


Installation

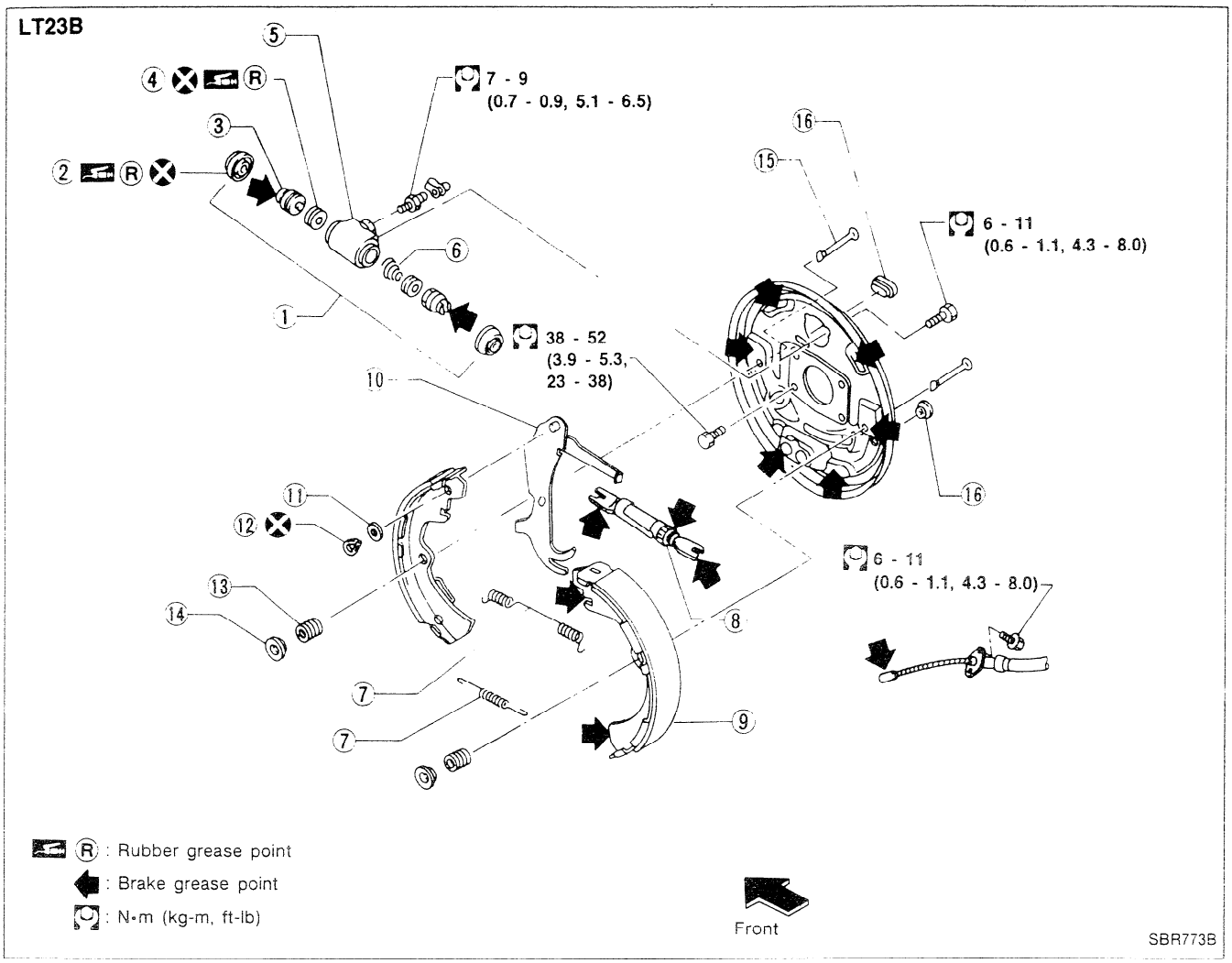
CAUTION:

- **Refill with new brake fluid "DOT 3".**
- **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" in "AIR BLEEDING".



① Wheel cylinder assembly
② Boot
③ Piston
④ Piston cup
⑤ Cylinder body
⑥ Spring
⑦ Return spring
⑧ Adjuster
⑨ Shoe
⑩ Adjuster lever
⑪ Adjuster spring
⑫ Retainer
⑬ Shoe hold-down spring
⑭ Toggle lever
⑮ Washer
⑯ Retainer ring
⑰ Shoe hold-down pin
⑱ Plug



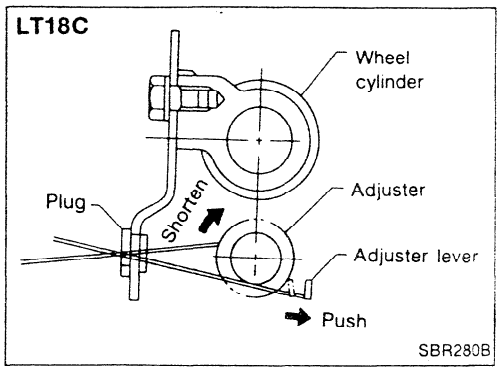
① Wheel cylinder assembly
② Boot
③ Piston
④ Piston cup
⑤ Cylinder body
⑥ Spring
⑦ Return spring
⑧ Adjuster
⑨ Shoe
⑩ Toggle lever
⑪ Washer
⑫ Retainer ring
⑬ Spring
⑭ Retainer
⑮ Shoe hold-down pin
⑯ Plug

Removal

WARNING:
Clean brake lining with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.

CAUTION:
Make sure parking brake lever is released completely.

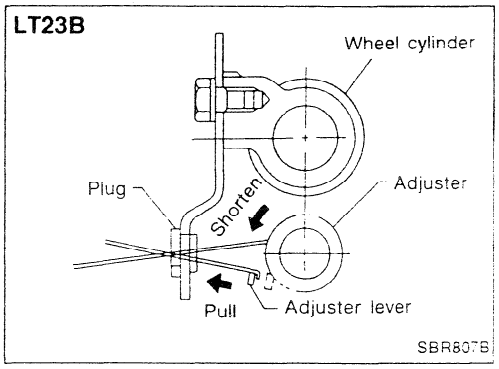
Removal (Cont'd)

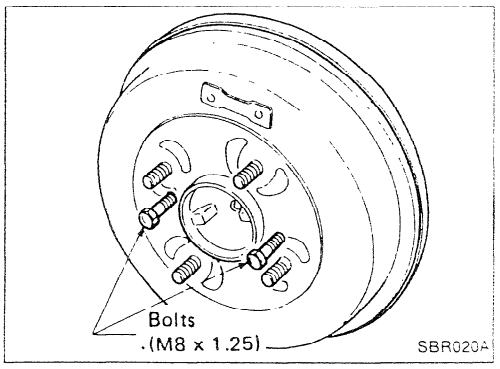


1. Release parking brake lever fully, then remove drum.

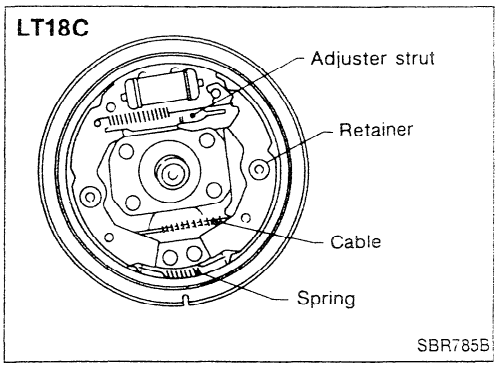
If drum is hard to remove, the following procedures should be carried out.

a. Remove plug. Then shorten adjuster to make clearance between brake shoe and drum as shown.





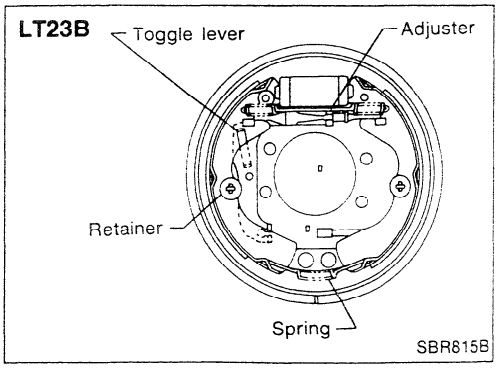
b. Tighten the two bolts gradually.



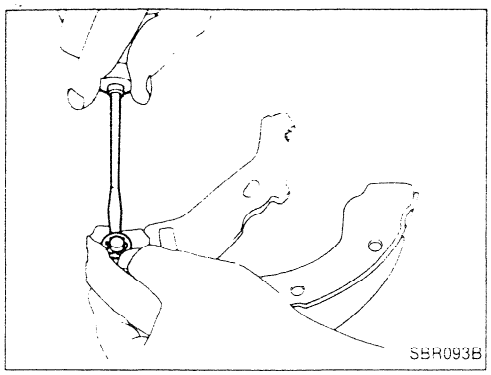
2. After removing retainer, remove spring by rotating shoes.

Be careful not to damage parking brake cable when separating it.

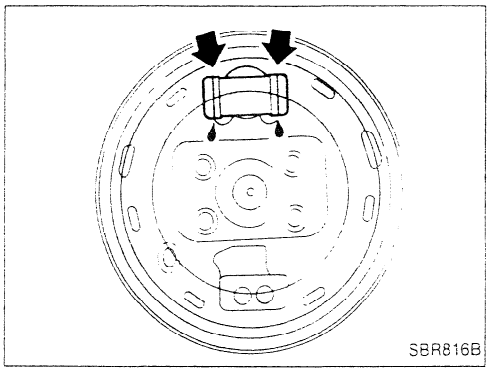
3. Remove adjuster.
4. Disconnect parking brake cable from toggle lever.



Removal (Cont'd)

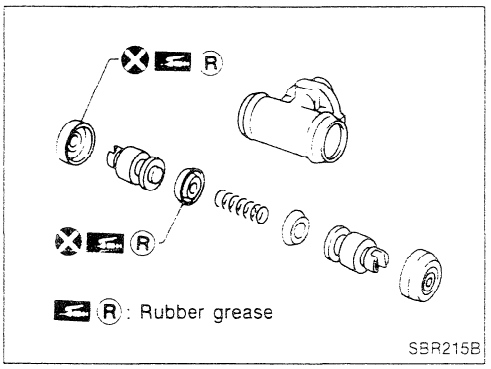


5. Remove retainer ring with a suitable tool. Then separate toggle lever and brake shoe.



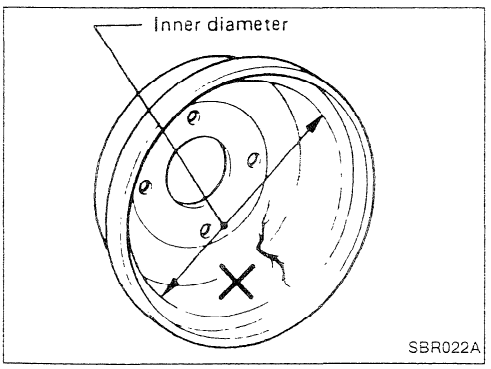
Inspection — Wheel Cylinder

- Check wheel cylinder for leakage.
- Check for wear, damage and loose conditions. Replace if any such condition exists.



Wheel Cylinder Overhaul

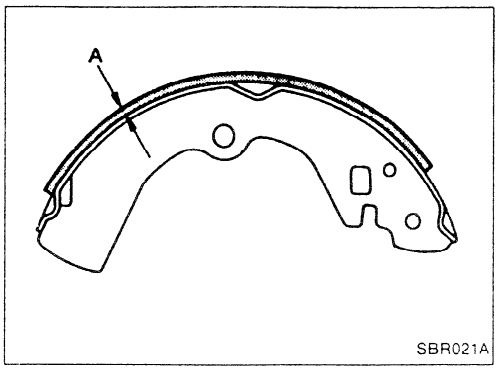
Pay attention so as not to scratch cylinder when installing pistons.



Inspection — Drum

Maximum inner diameter:
LT18C 181 mm (7.13 in)
LT23B 230 mm (9.06 in)
Out-of-roundness:
0.03 mm (0.0012 in) or less

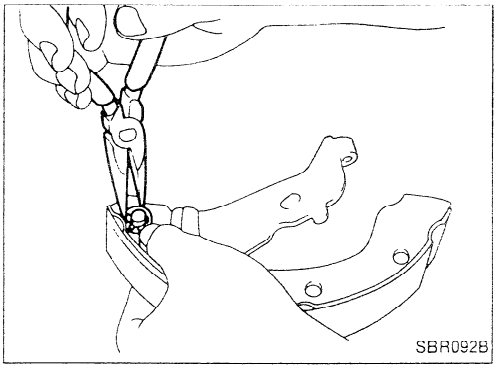
- Contact surface should be fine finished with No. 120 to 150 emery paper.
- Using a drum lathe, lathe brake drum if it shows scoring, partial wear or stepped wear.
- After brake drum has been completely reconditioned or replaced, check drum and shoes for proper contact pattern.



Inspection — Lining

Check lining thickness.

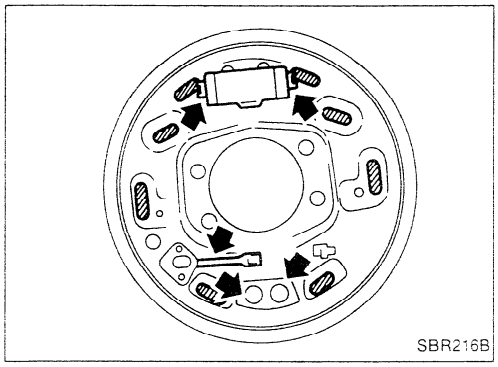
Lining wear limit (A):
1.5 mm (0.059 in)



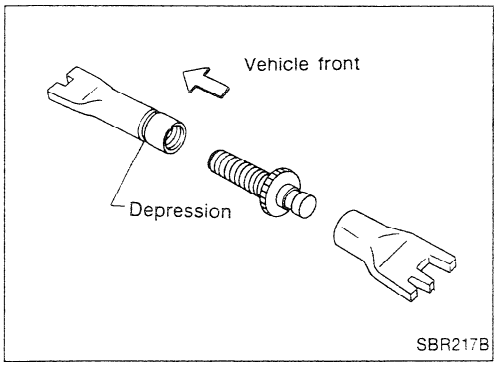
Installation

Always perform shoe clearance adjustment. Refer to "Adjustment" in "PARKING BRAKE CONTROL".

1. Fit toggle lever to brake shoe with retainer ring.
   LT18C: Trailing side
   LT23B: Leading side



2. Apply brake grease to the contact areas shown at left.



— LT18C —

3. Shorten adjuster by rotating it.

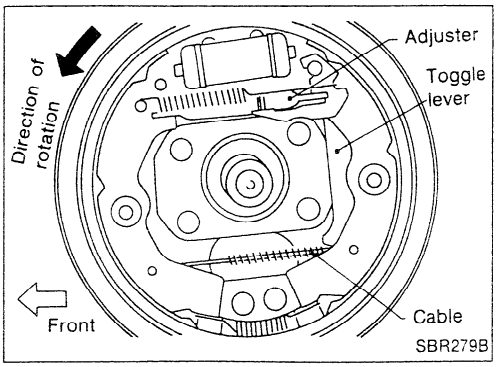
- **Pay attention to direction of adjuster.**

Wheel	Screw	Depression
Left	Left-hand thread	Yes
Right	Right-hand thread	No

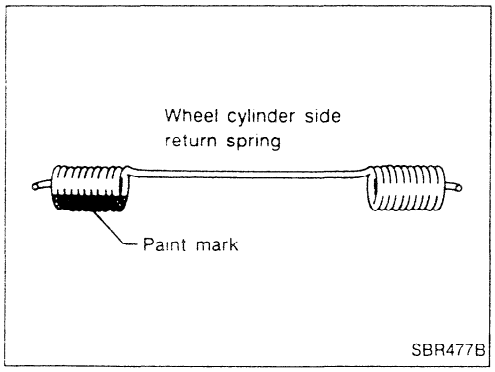
4. Connect parking brake cable to toggle lever.
5. Install all parts.
6. Check all parts are installed properly.

Pay attention to direction of adjuster.

7. Install brake drum.
8. When installing new wheel cylinder or overhauling wheel cylinder, bleed air. Refer to "Bleeding procedure" in "AIR BLEEDING".

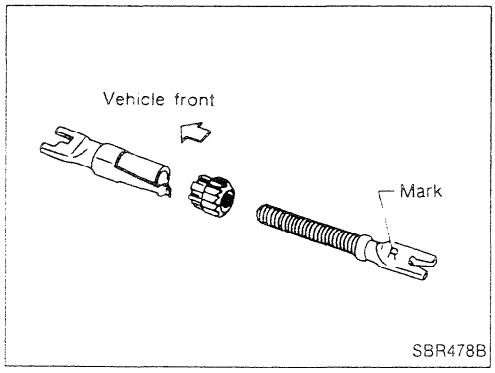


Installation (Cont'd)



— LT23B —

- Install return spring so that paint mark faces downward (adjuster side).



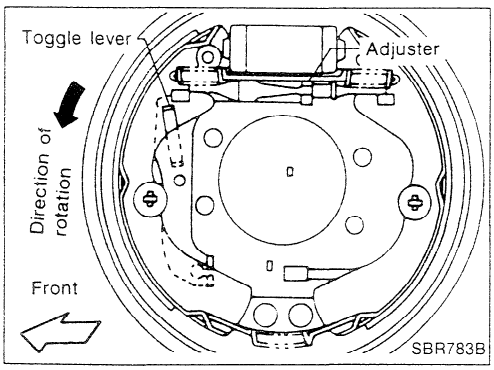
3. Shorten adjuster by rotating it.

CAUTION:

Pay attention to adjuster assembly direction since stamped mark and wheel locations differ for left-hand and right-hand brakes.

Wheel	Screw	Indication mark
Left	Left-hand thread	"R"
Right	Right-hand thread	"L"

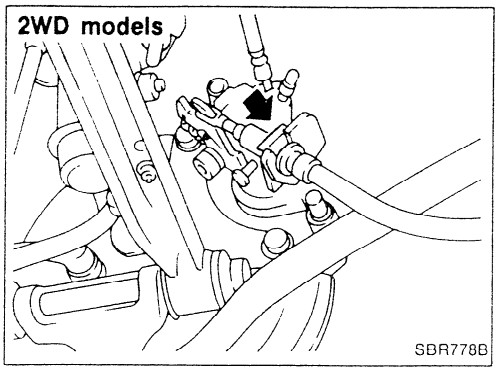
4. Connect parking brake cable to toggle lever.
5. Install all parts.

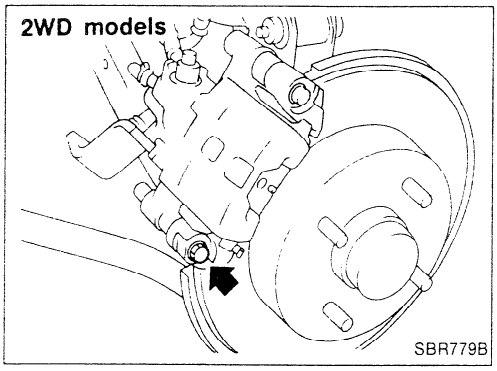


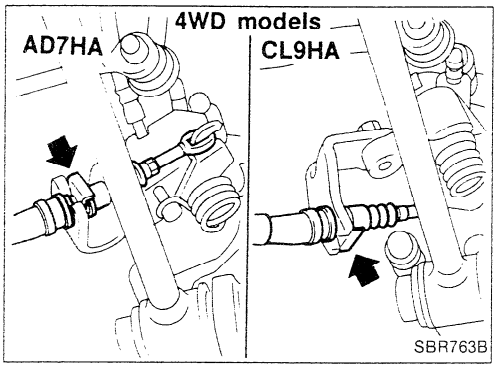
6. Check all parts are installed properly.

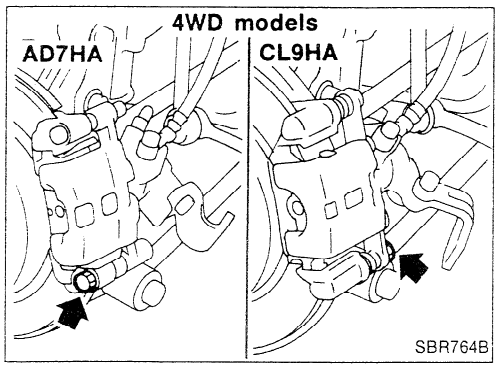
Pay attention to direction of adjuster assembly.

7. Install brake drum.
8. When installing new wheel cylinder, bleed air. Refer to "Bleeding procedure" in "AIR BLEEDING".









Pad Replacement

WARNING:

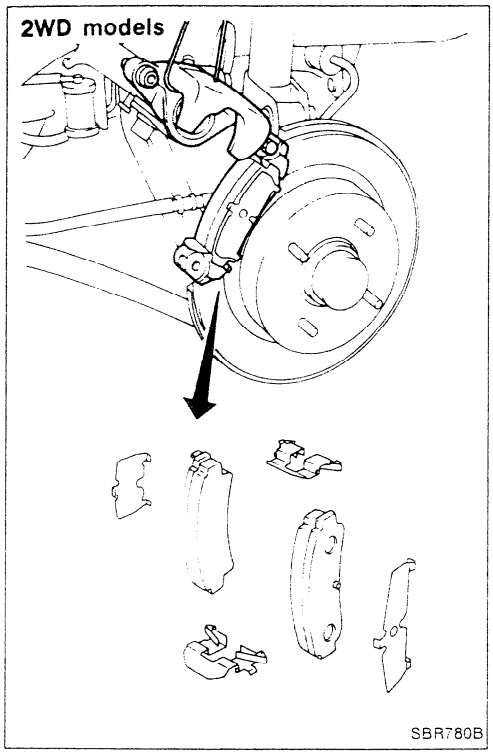
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.

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 in 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.**

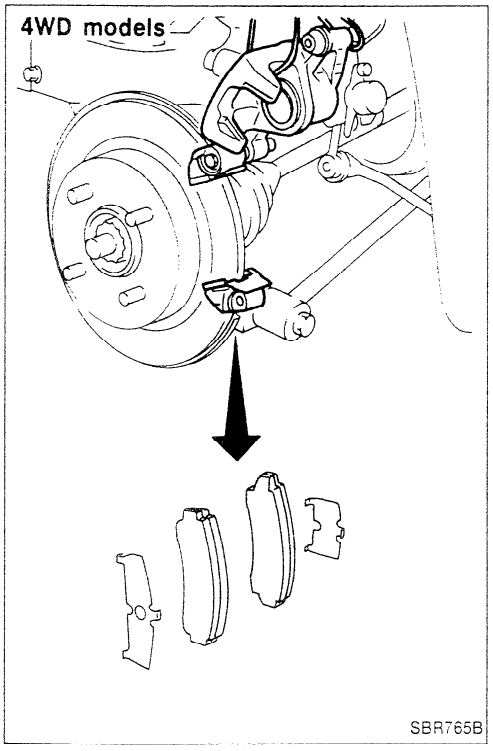
1. Remove master cylinder reservoir cap.
2. Remove brake cable lock spring.
3. Disconnect cable.
4. Remove pin bolt.

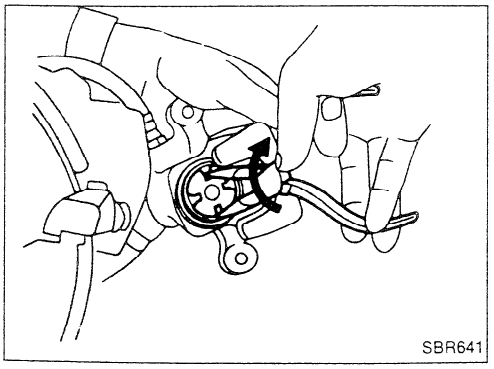
Pad Replacement (Cont'd)



5. Open cylinder body upward. Then remove pad retainers, and inner and outer shims.

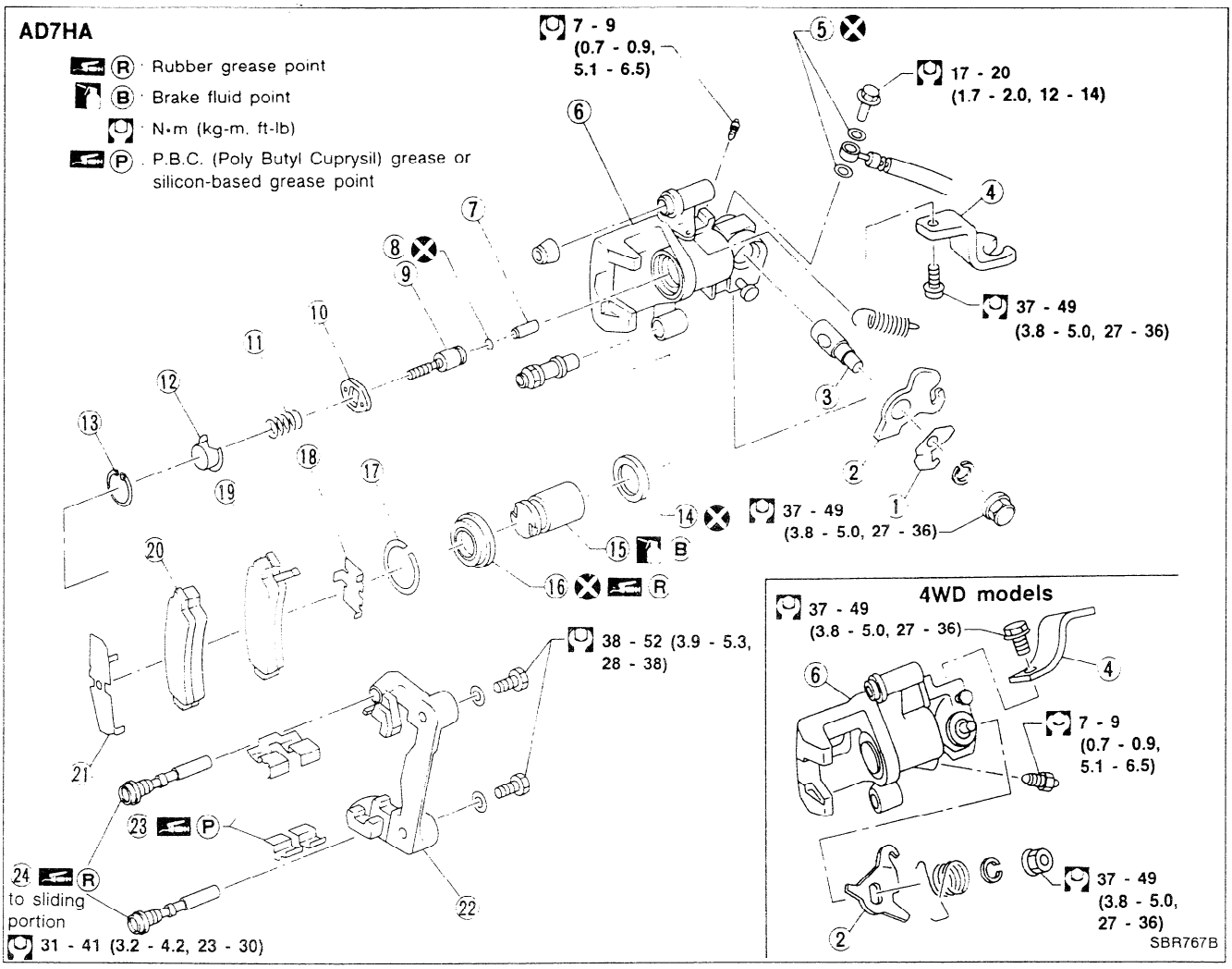
Standard pad thickness:
10 mm (0.39 in)
Pad wear limit:
2.0 mm (0.079 in)



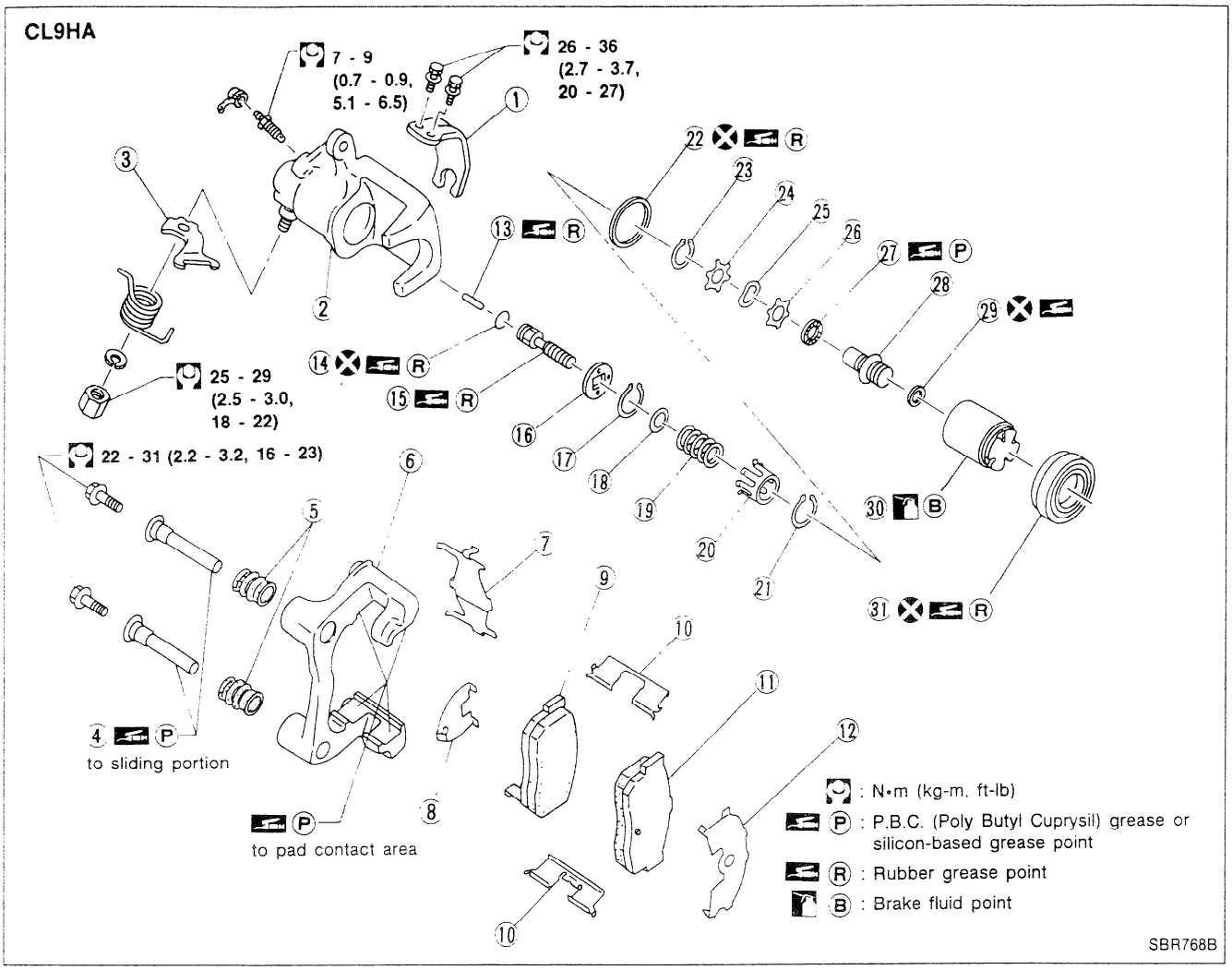


6. When installing new pads, push piston into cylinder body by turning piston clockwise.

Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.



① Spring
② Toggle lever
③ Cam
④ Cable guide
⑤ Copper washer
⑥ Cylinder
⑦ Strut
⑧ O-ring
⑨ Push rod
⑩ Key plate
⑪ Spring
⑫ Spring cover
⑬ Snap ring
⑭ Piston seal
⑮ Piston
⑯ Piston boot
⑰ Piston boot retainer
⑱ Inner shim
⑲ Inner pad
⑳ Outer pad
㉑ Outer shim
㉒ Torque member
㉓ Pad retainer
㉔ Slide pin bolt

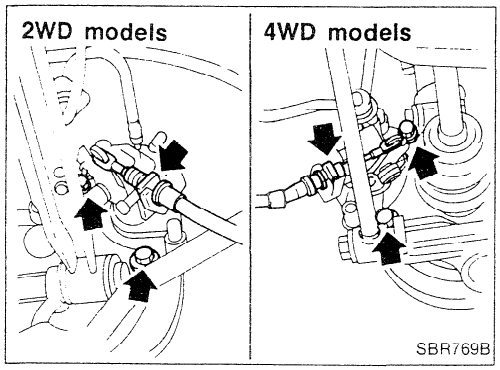


① Cable guide
② Cylinder
③ Toggle lever
④ Pin
⑤ Pin boot
⑥ Torque member
⑦ Retainer
⑧ Inner shim
⑨ Inner pad
⑩ Pad retainer
⑪ Outer pad
⑫ Outer shim
⑬ Strut
⑭ O-ring
⑮ Push rod
⑯ Key plate
⑰ Snap ring
⑱ Seat
⑲ Spring
⑳ Spring cover
㉑ Snap ring
㉒ Piston seal
㉓ Snap ring
㉔ Spacer
㉕ Wave washer
㉖ Spacer
㉗ Bearing
㉘ Adjuster
㉙ Cup
㉚ Piston
㉛ Piston boot

Removal

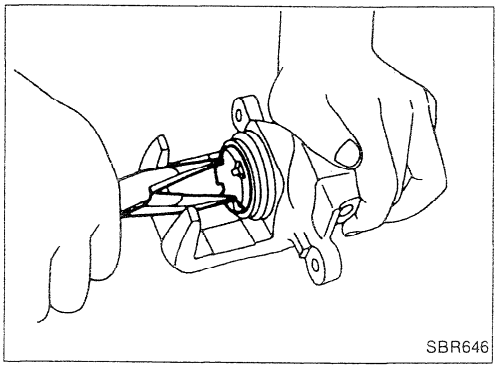
WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.

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.

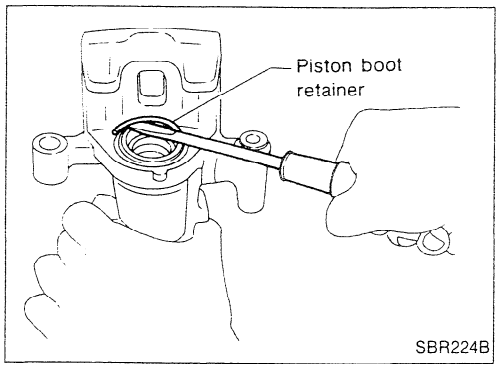
It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly.



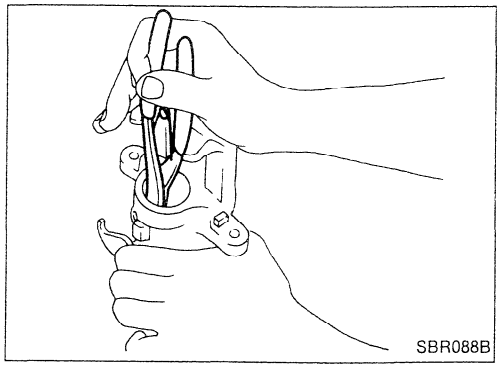
Disassembly

AD7HA

1. Remove piston by turning it counterclockwise with suitable long nose pliers.



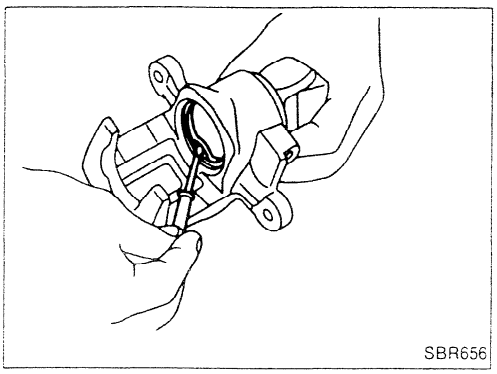
2. Remove piston boot retainer with a suitable tool and remove piston boot.



3. Disassemble cylinder body.

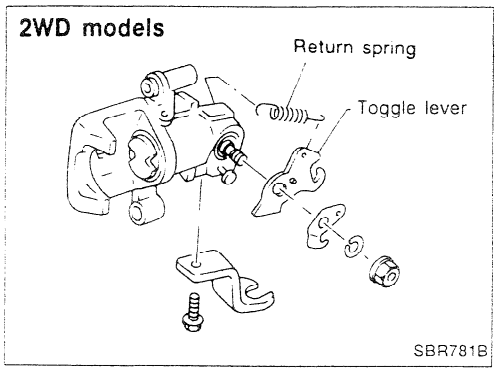
a. Pry off snap ring with suitable pliers, then remove spring cover, spring, key plate, push rod and strut.

Disassembly (Cont'd)


SBR656

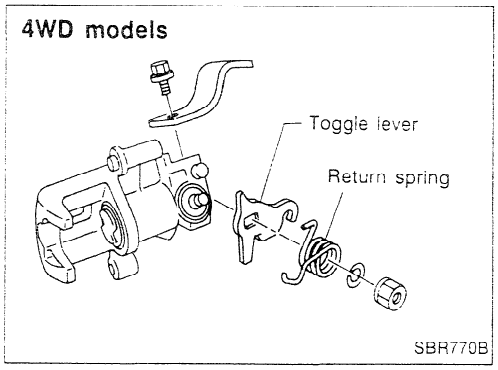
b. Remove piston seal.

Be careful not to damage cylinder body.



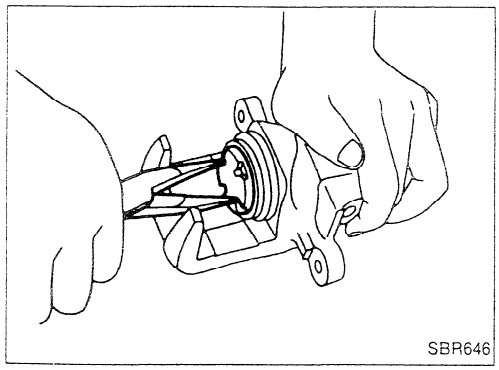
SBR781B

4. Remove return spring and toggle lever.

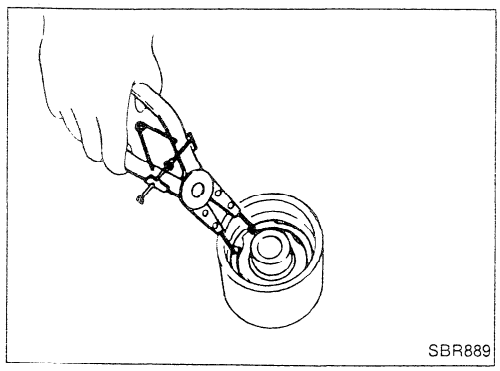


SBR770B

CL9HA

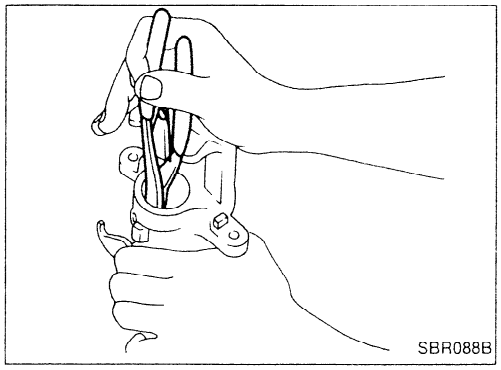

SBR646

1. Remove piston by turning it counterclockwise with suitable long nose pliers.

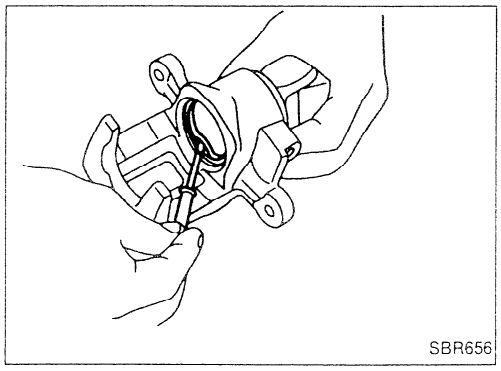

SBR889

2. Pry off snap ring from piston with suitable pliers and remove adjusting nut.

Disassembly (Cont'd)


SBR088B

3. Disassemble cylinder body.
a. Pry off snap ring with suitable pliers, then remove spring cover, spring and seat.
b. Pry off snap ring, then remove key plate, push rod and rod.


SBR656

c. Remove piston seal.

Be careful not to damage cylinder body.

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 materials is stuck to sliding surface.

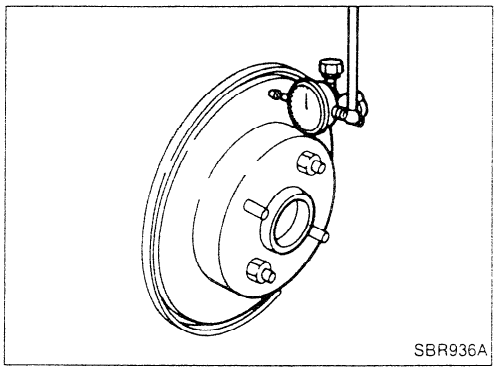
PIN AND PIN BOOT

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

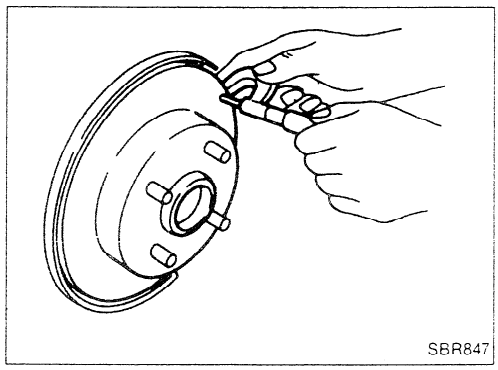
RUNOUT

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 RA.

3. Change relative positions of rotor and wheel hub so that runout is minimized.

Maximum runout
0.07 mm (0.0028 in)


SBR847

THICKNESS

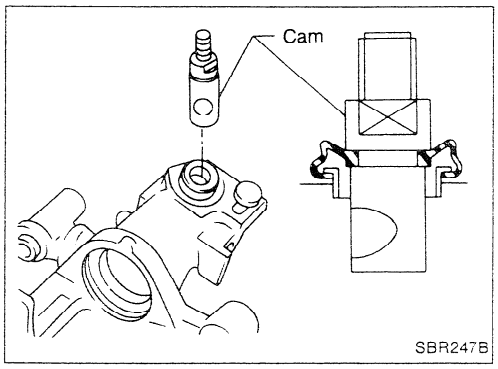
Rotor repair limit:
Minimum thickness
AD7HA 6.0 mm (0.236 in)
CL9HA 8.0 mm (0.315 in)
Thickness variation (At least 8 portions)
Maximum 0.02 mm (0.0008 in)

Replace rotor if any of the above did not meet the specifications.

Assembly

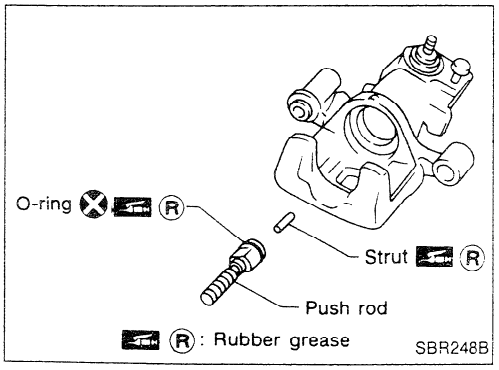
AD7HA

1. Insert cam with depression facing towards open end of cylinder.



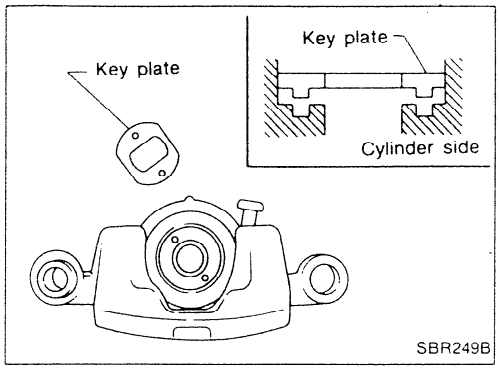
SBR247B

2. Generously apply rubber grease to strut and push rod to make insertion easy.

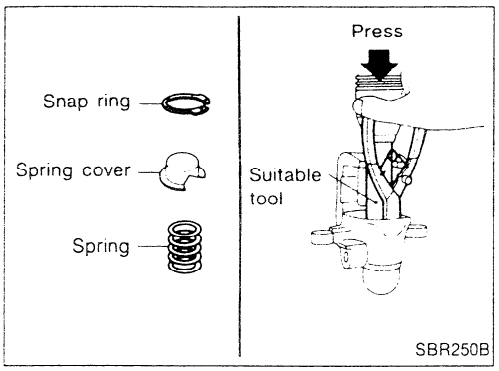


SBR248B

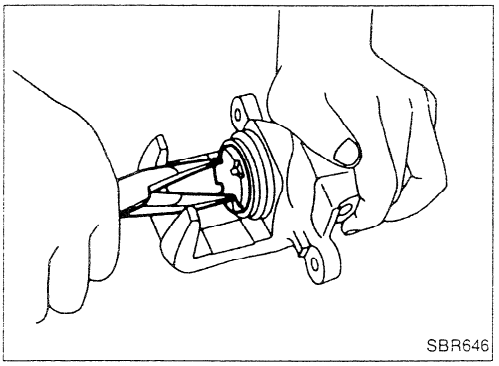
Assembly (Cont'd)



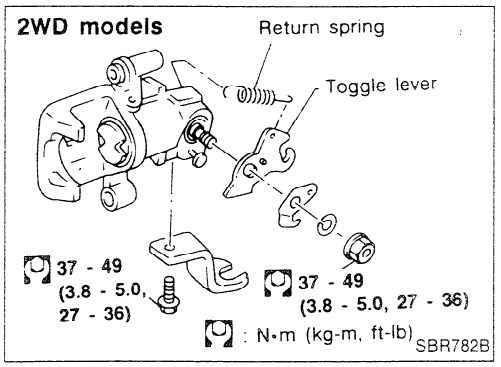
3. Match depressions in cylinder bottom with key plate protrusions.



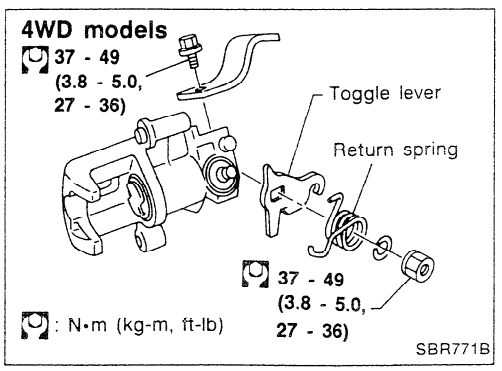
4. Install spring, spring cover and snap ring with a suitable tool.



5. Fit piston by turning it clockwise with suitable long nose pliers.

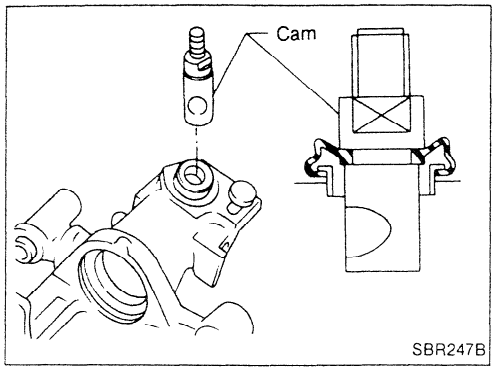


6. Fit toggle lever and return spring.

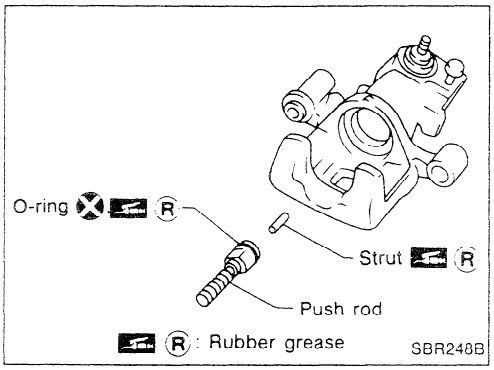


Assembly (Cont'd)

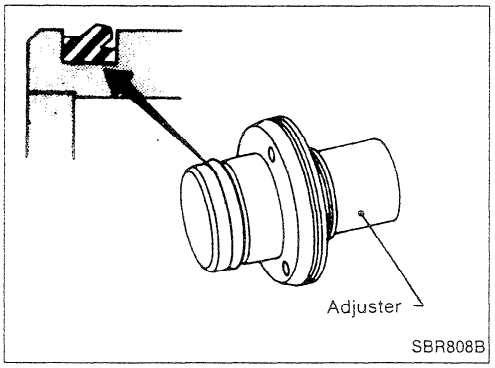
CL9HA



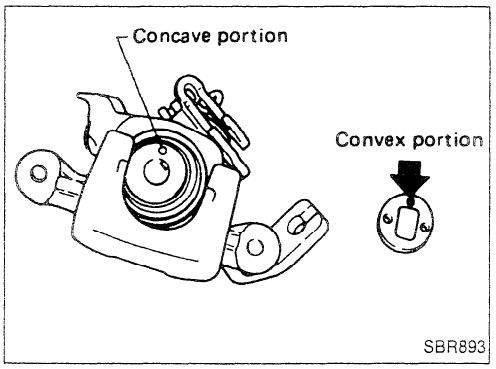
1. Insert cam with depression facing towards open end of cylinder.



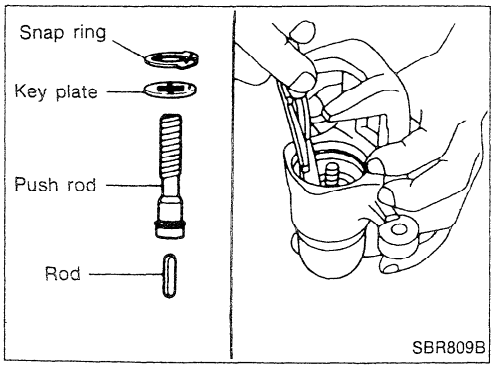
2. Generously apply rubber grease to strut and push rod to make insertion easy.



3. Install cup in the specified direction.

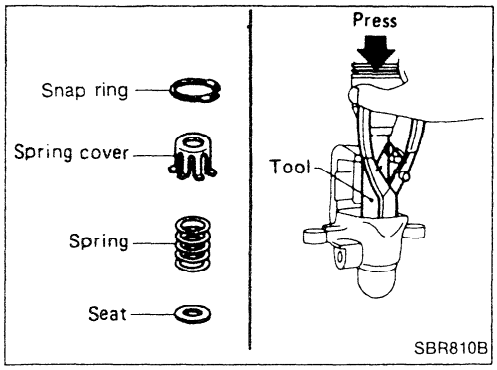


4. Match convex portion of key plate with concave portion of cylinder.

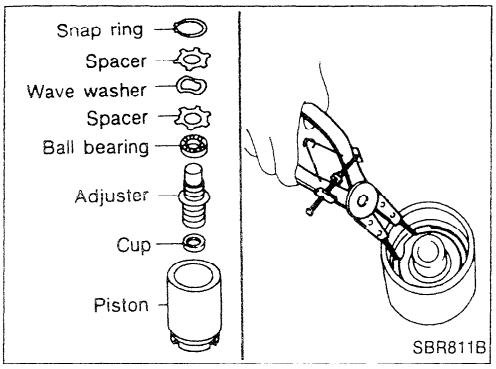


5. Install snap ring with a suitable tool.

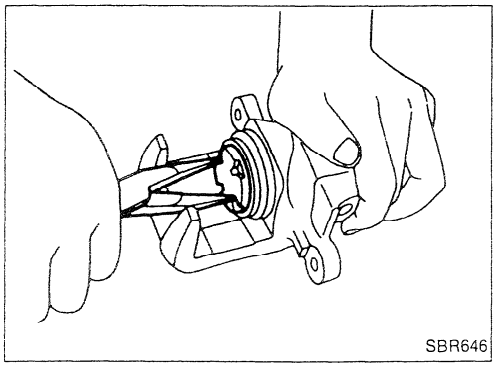
Assembly (Cont'd)



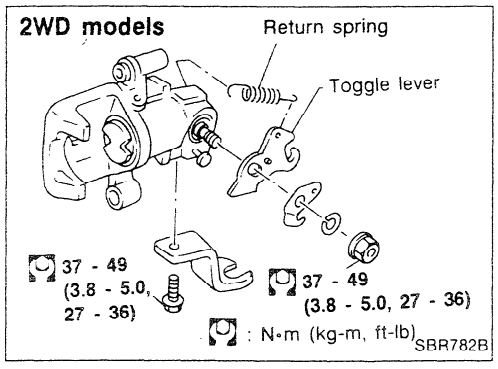
6. Install seat, spring, spring cover and snap ring with a suitable tool.



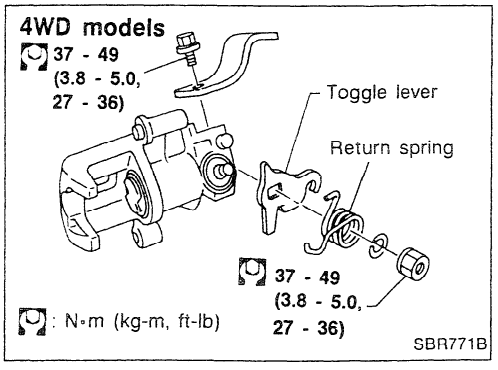
7. Install cup, adjuster, bearing, spacers, washers and snap ring with a suitable tool.



8. Fit piston by turning it clockwise with suitable long nose pliers.



9. Fit toggle lever and return spring.

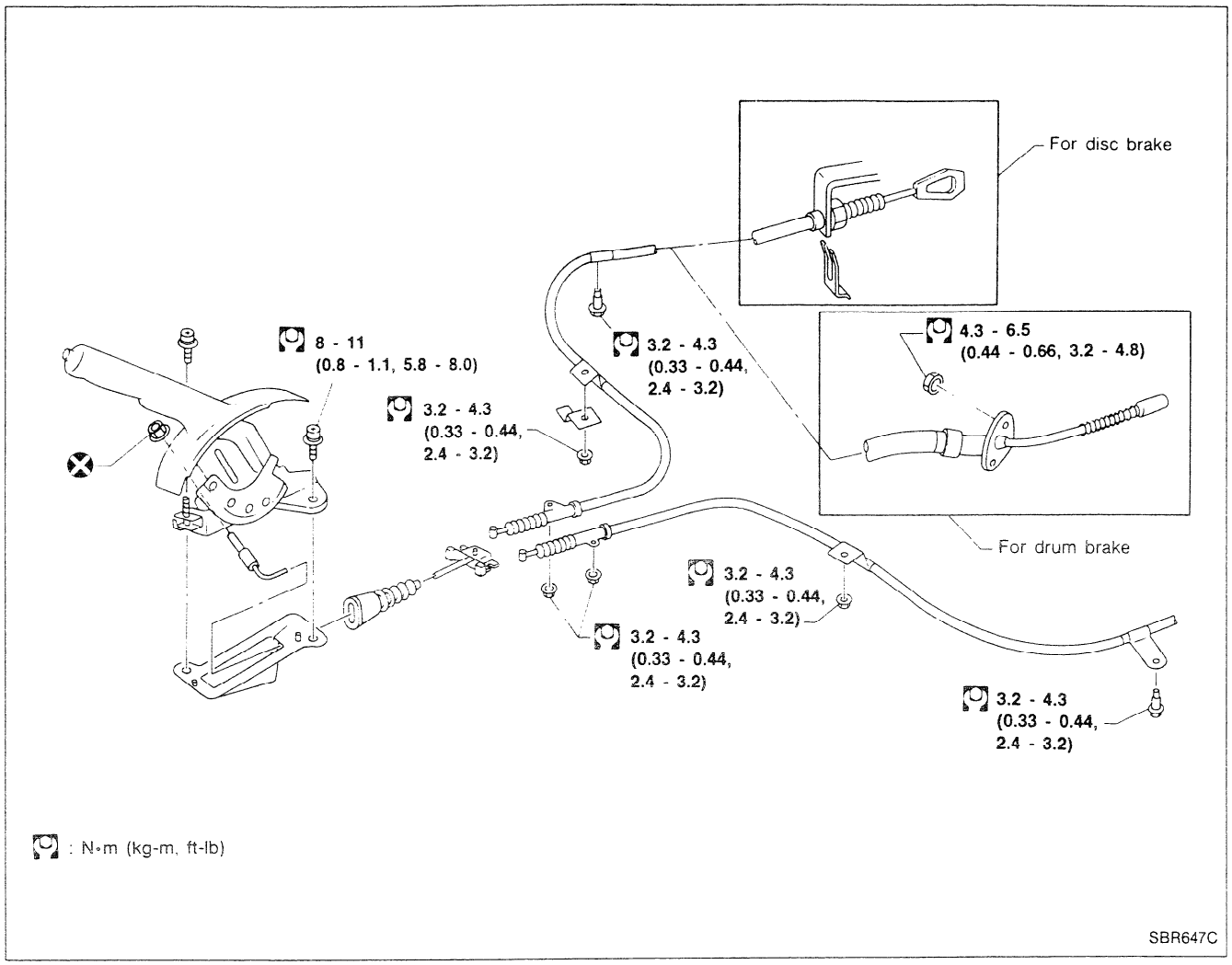


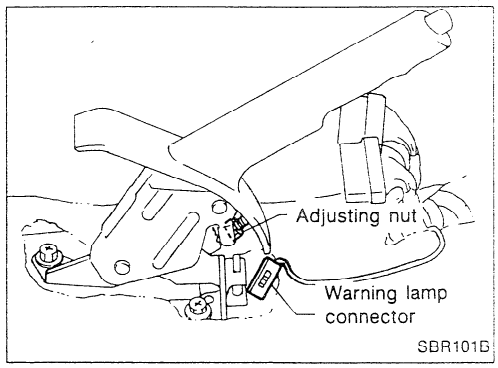
Installation

CAUTION:

- **Refill with new brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**

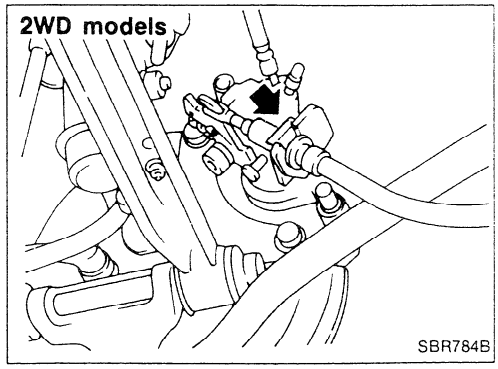
1. Install brake hose to caliper securely.
2. Install all parts and secure all bolts.
3. Bleed air. Refer to "Bleeding Procedure" in "AIR BLEEDING".





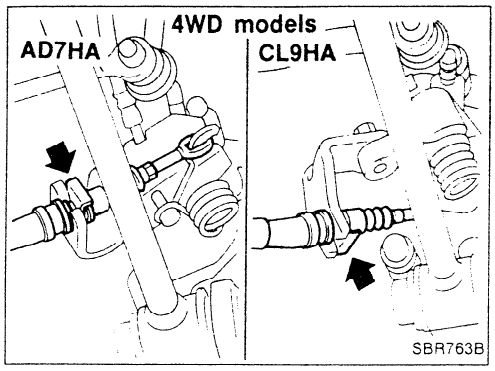
Removal and Installation

1. To remove parking brake cable, first remove center console.
2. Disconnect warning lamp connector.
3. Remove bolts, slacken off and remove adjusting nut.



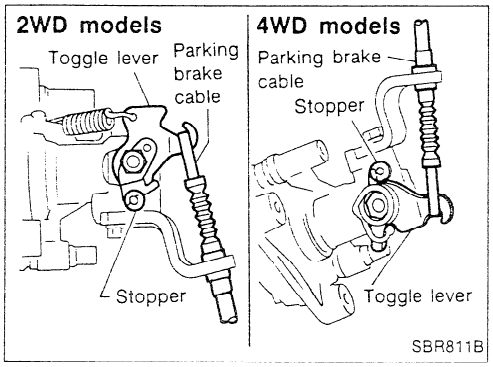
4. Remove lock plate and disconnect cable (disc brake only). For drum brake models, refer to "Removal" in "REAR DRUM BRAKE".

Removal and Installation (Cont'd)



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

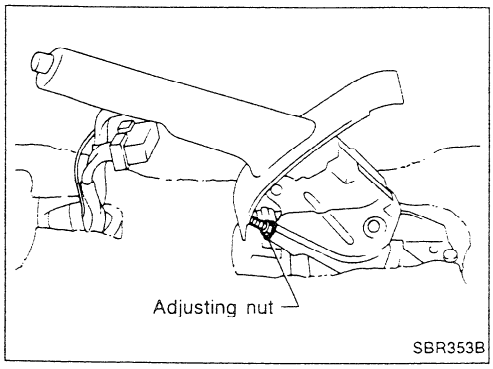
Before or after adjustment, pay attention to the following points.

a. For rear disc brake be sure that toggle lever returns to stopper when parking brake lever is released.
b. There is no drag when parking brake lever is released.

1. Adjust clearance between shoe and drum/pad and rotor as follows:

— LT23B —

a. Pull parking brake lever several times until clicking sound does not occur from rear brake.

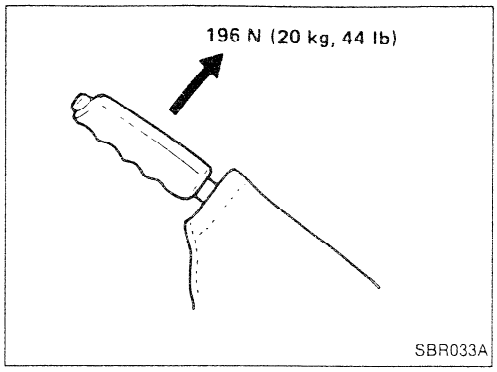


— OTHERS —

a. Release parking brake lever and loosen adjusting nut.
b. Depress brake pedal fully at least 10 times.

2. Pull control lever 4 - 5 notches. Then adjust control lever by turning adjusting nut.

Adjustment (Cont'd)



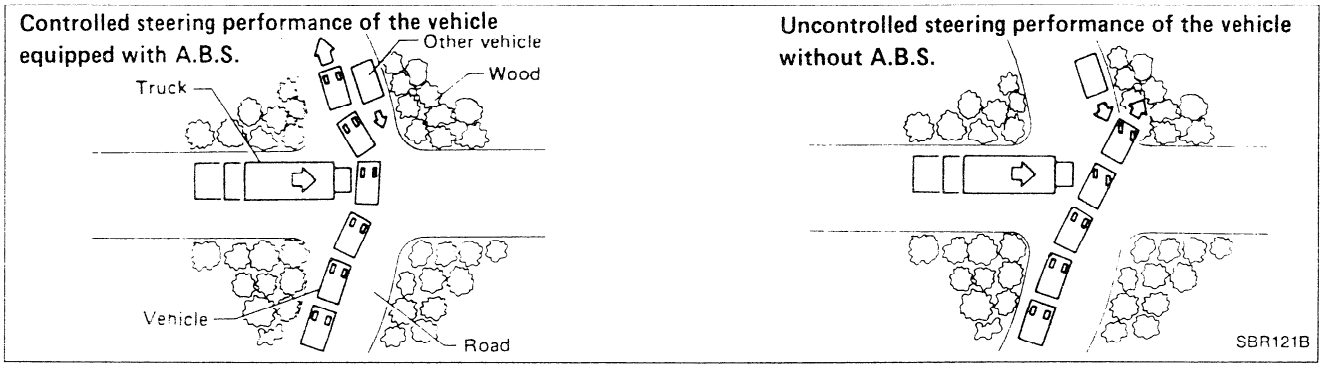
3. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.
   Number of notches:
   Drum brake 5 - 6
   Disc brake 7 - 8

4. Bend parking brake warning lamp switch plate so that brake warning lamp comes on when ratchet at parking brake control lever is pulled "A" notches and goes out when fully released.
   Number of "A" notches : 1 or less

Purpose

- Excessive braking in any condition (Dry or wet) will adversely affect the normal turning of the vehicle's wheels and they may lock up.
- When the front wheels are locked, a vehicle cannot be controlled by the steering system.
- When the rear wheels are locked, the vehicle will enter a flat spin.

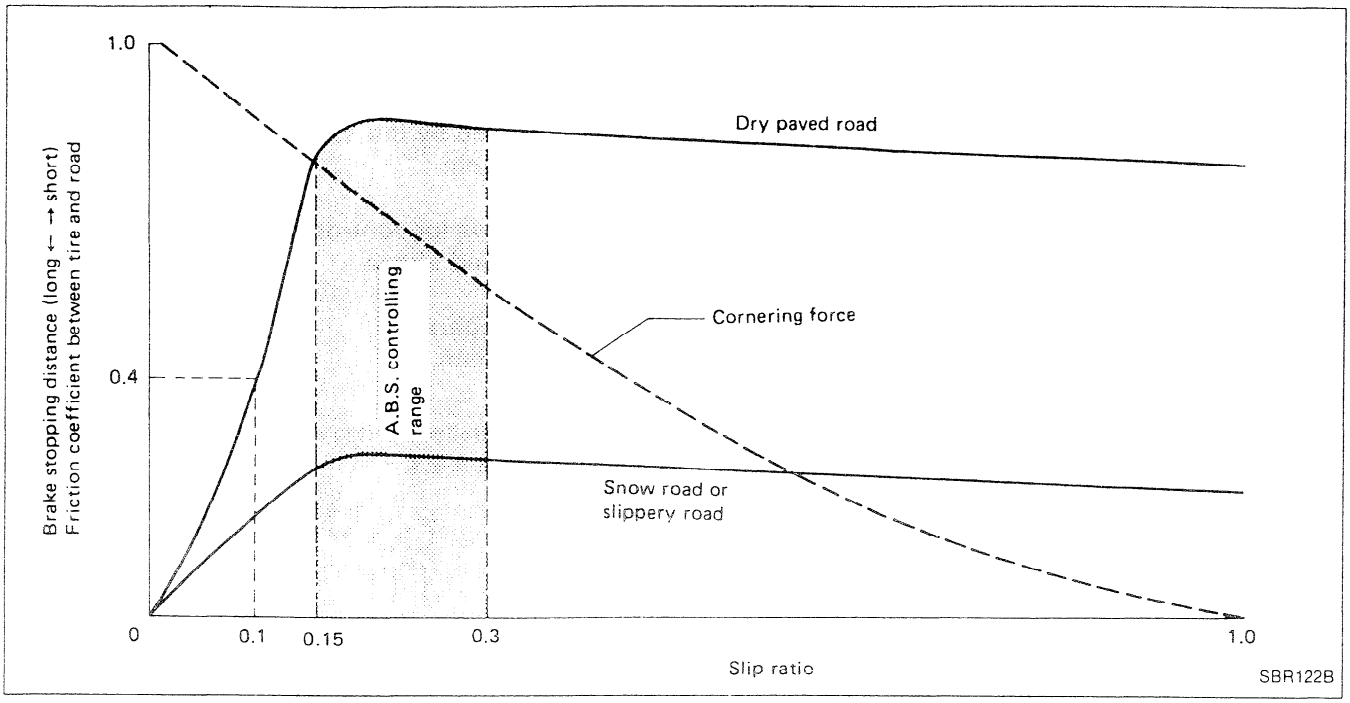
The A.B.S., by the use of electronic and hydraulic components, allows for control of braking force so that locking of the wheels can be avoided in the circumstances described above.
The A.B.S.:
1) Ensures proper tracking performance through steering wheel operation.
2) Enables obstacles to be avoided through steering wheel operation.
3) Ensures vehicle stability by preventing flat spins.



Operation

The A.B.S. is controlled by an electronic control unit (E.C.U.), which receives signals from various sensors relating to vehicle condition, speed, etc.
The hydraulic circuit is controlled by an actuator containing an electric motor, pump and 2 solenoids. The E.C.U. directs the actuator to increase, hold or decrease hydraulic pressure to all or individual wheels.
The E.C.U. receives information regarding wheel speed from sensors, mounted one per wheel.
When excessive braking force causes a wheel to lock, the E.C.U. sends a 5 amp current to the actuator to release the locked wheel.
As the wheel unlocks, it can be steered. The E.C.U. senses wheel speed is increasing and re-applies hydraulic pressure. The wheel locks again, is released, steered, braked, and so on. This continuous locking and unlocking of the wheels allows for rapid speed reduction and the vehicle to be steered in the correct manner.
The hydraulic pressure can also be "held" constant by a 2 amp current sent from the E.C.U. to the actuator.
The rear wheels utilize a load-sensing valve to further prevent wheel locking, especially under minimum vehicle load conditions.
However, when the vehicle speed is less than 10 km/h (6MPH), this system does not work.

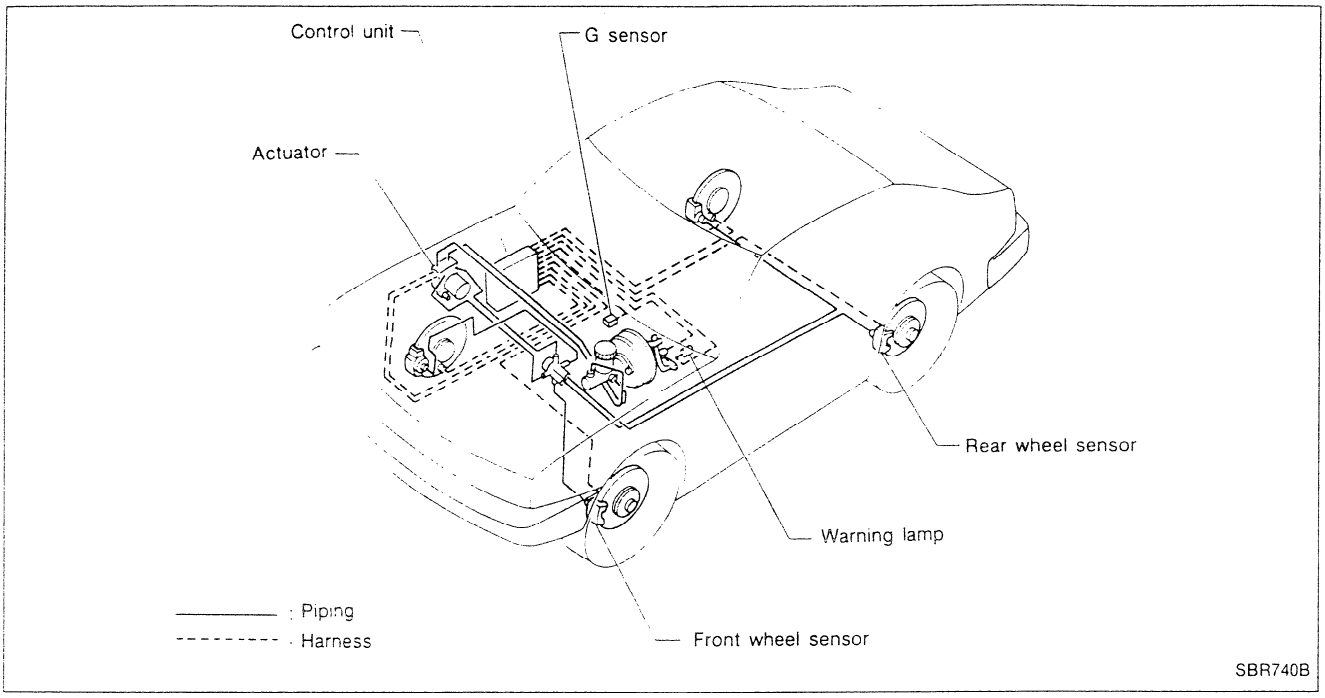
Operation (Cont'd)

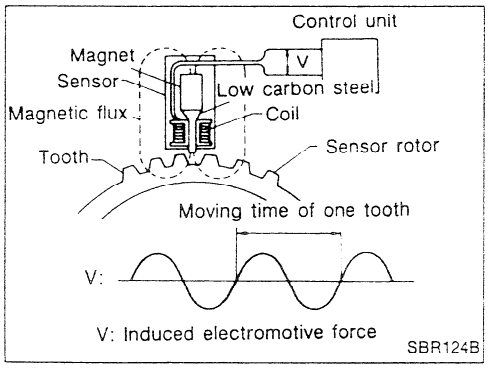


$$\text{SLIP RATIO} = \frac{\text{VEHICLE SPEED} - \text{WHEEL SPEED}}{\text{VEHICLE SPEED}}$$

- The applied brake condition is expressed by a slip ratio, as shown above. If the slip ratio is in the range from 0.15 to 0.3, the wheel has adequate cornering performance, and also minimum stopping distance can be achieved.
- The slip ratio formula indicates the control of wheel speed by the brakes.
  The Anti-lock Braking System (A.B.S.) controls brake fluid pressure using the slip ratios and locking condition calculation contained in the A.B.S. control unit.
- To adjust wheel speed so that the optimum slip ratio can be obtained, the A.B.S. must sense wheel speed and vehicle speed through a wheel speed sensor.
  If the brake is applied, especially in the locked wheel condition, the vehicle speed differs from the wheel speed.
- After the wheel speed changes from the vehicle speed due to excessive brake force, the A.B.S. calculates vehicle speed when the reduced wheel speed reaches the minimum.

System Components

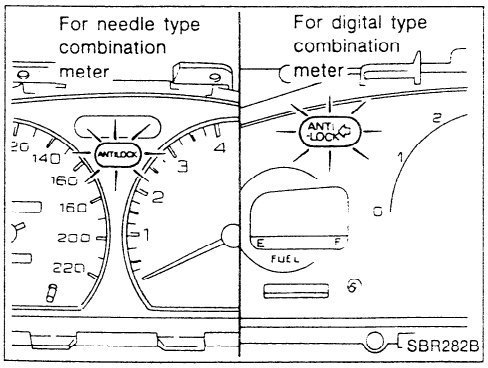




System Description

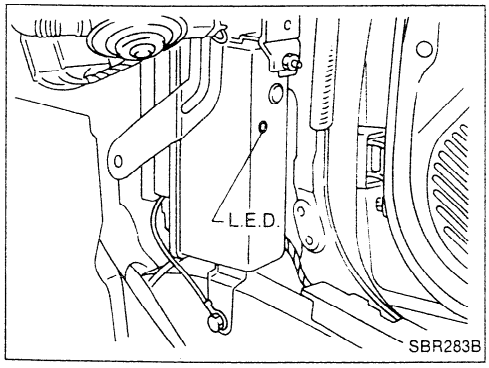
SENSOR

The sensor unit consists of a gear-shaped rotor and a sensor element which contains a bar magnet around which a coil is wound. The sensor is installed on the back side of the brake rotor. Sine-wave current is generated by the sensor as the wheel rotates. The frequency and voltage increase(s) as the rotating speed increases.



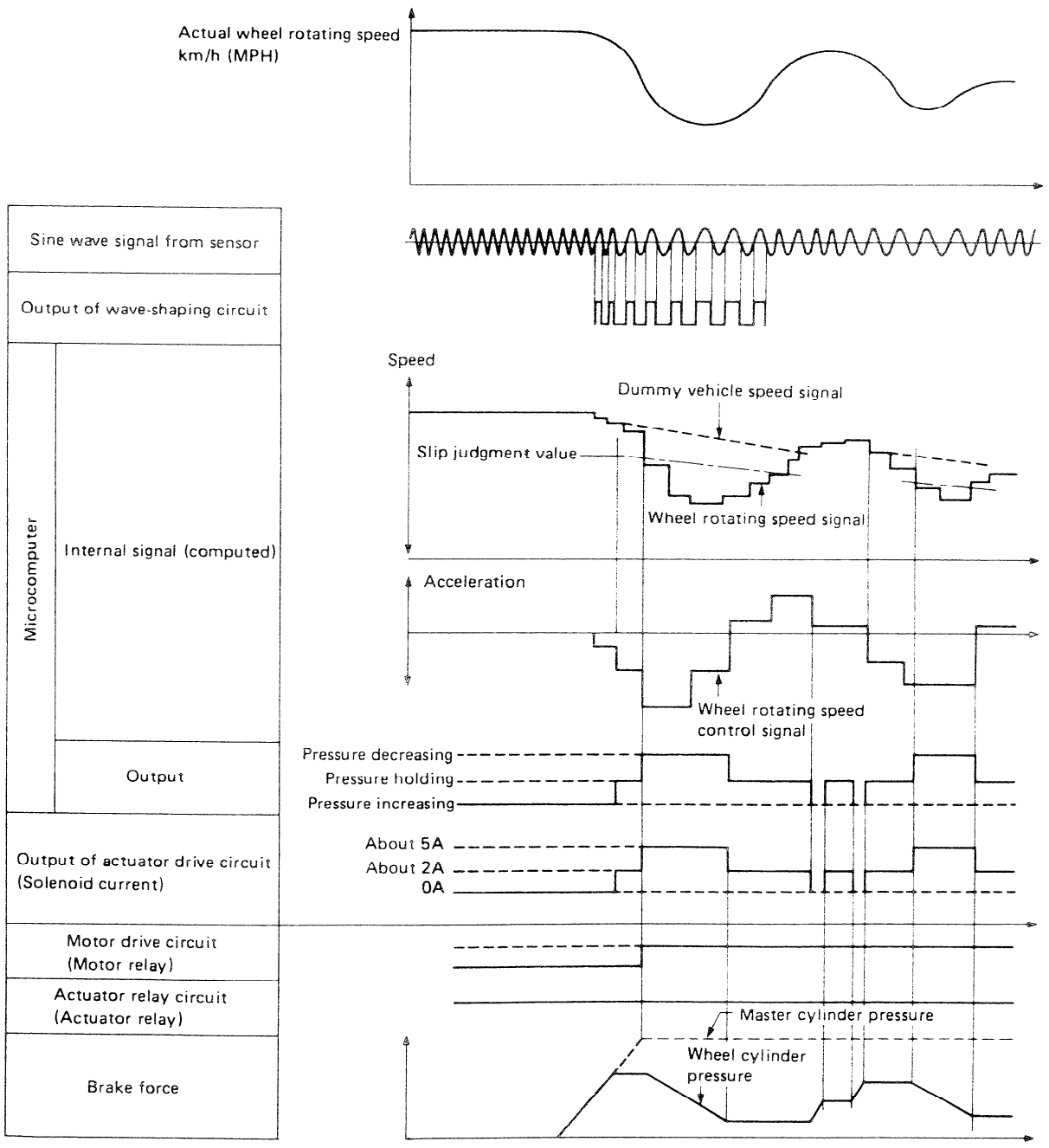
CONTROL UNIT

The control unit computes the rotating speed of the wheel by the signal current sent from the sensor, and supplies a DC current of about 5 amperes, about 2 amperes, or 0 amperes to the actuator solenoid valve provided for each wheel by changing its internal resistance. It also controls ON-OFF operation of the valve relay and pump relay. If any electrically detectable malfunction should occur in the system, the control unit causes the warning light to light up, and the L.E.D. indicator to flash the number of times which corresponds to the malfunction location. In this condition, the A.B.S. will be deactivated by the control unit, and the vehicle's braking system reverts to normal operation.



System Description (Cont'd)

CONTROL UNIT CONTROL CHART



SBR127B

System Description (Cont'd)

G SENSOR (4WD models only)

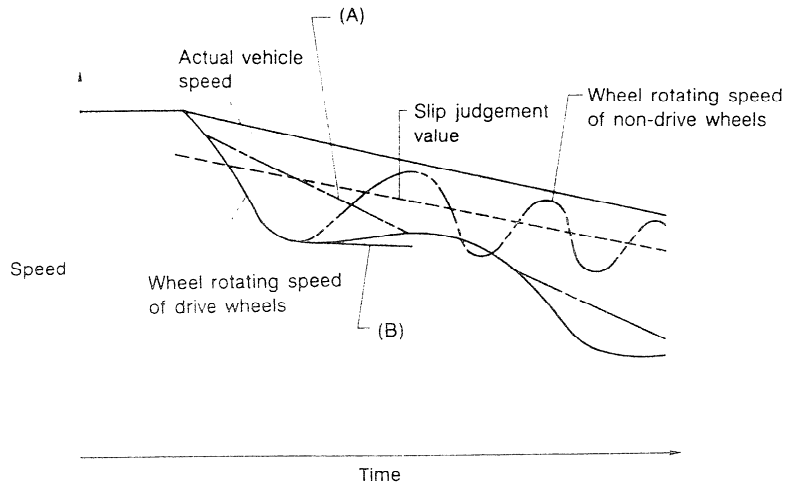
Since engine power can be delivered simultaneously to all four wheels, the 4WD model has the following characteristics:

(A) Ease of synchronous wheel rotation

(B) High rotational inertia of wheels

The above two characteristics (A) and (B) have a tendency to increase while vehicle is being driven on road surfaces with low frictional coefficients. These characteristics also have a tendency to increase due to the limited slip differential that utilizes viscous coupling, etc.

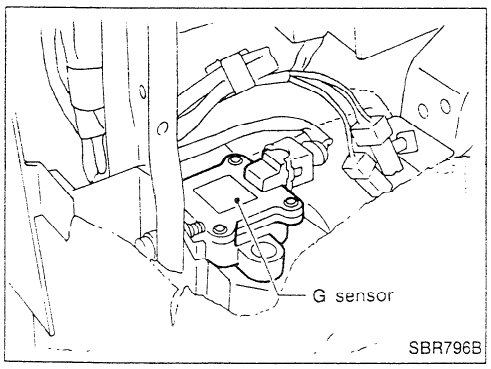
The following figure shows the effect of characteristics (A) and (B) on the ABS.



(A) Dummy vehicle speed:
Rotation of each wheel tends to synchronize, leading to a wider deviation from actual vehicle speed.

(B) Rotating speed recovery is slow due to high rotational inertial of each wheel.

SBR741B



SBR796B

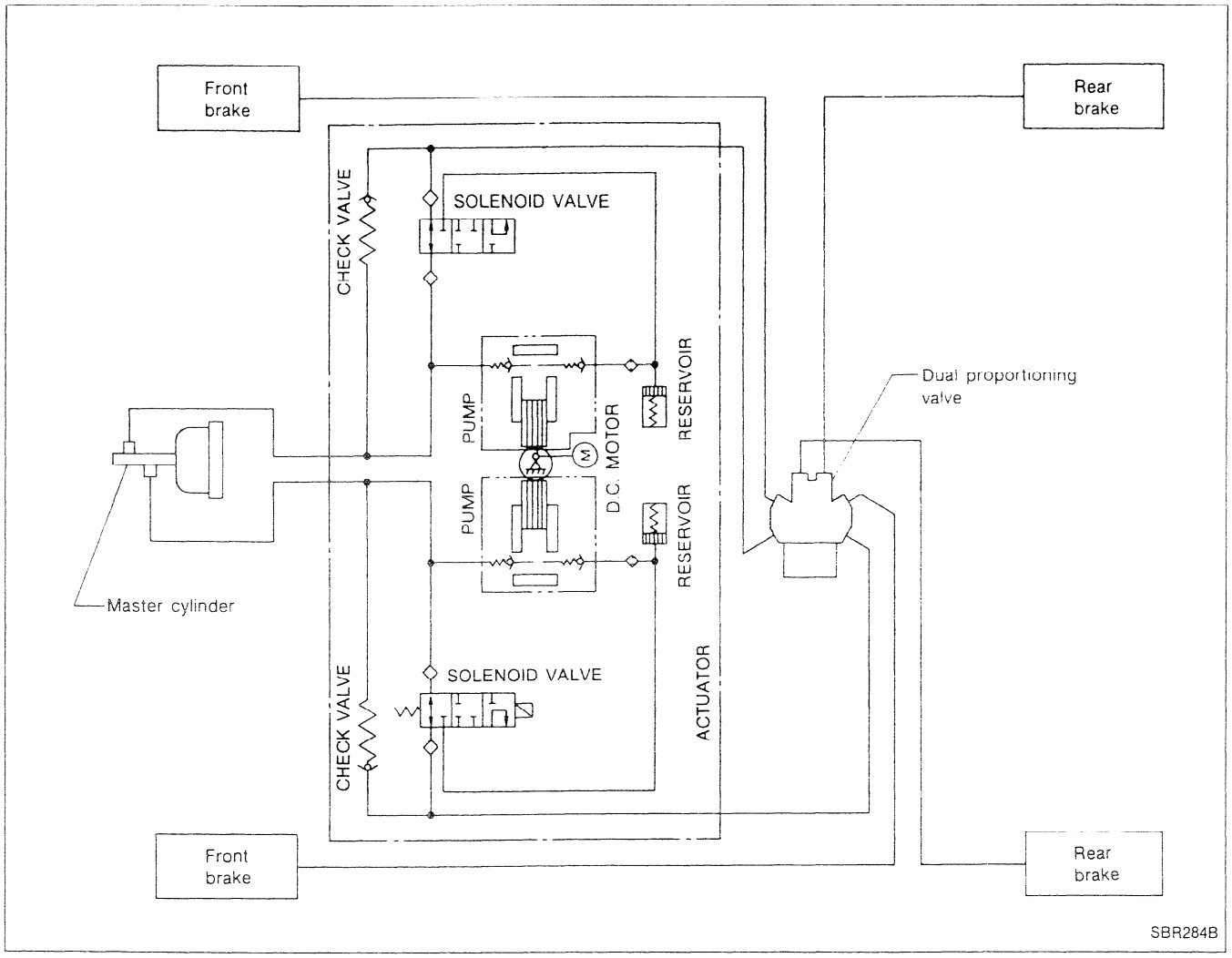
In general, 4WD and ABS are made compatible with each other by utilizing the following techniques:

- The ABS does not operate with the center differential locked.
- 4WD is set in the 2WD mode during braking.
- Torque distribution to the front and rear wheels is controlled in response to ABS action.

The G sensor indirectly senses the frictional coefficient of different road surfaces during braking to control the ABS accordingly. In other words, control of the center differential, etc. are not required anymore.

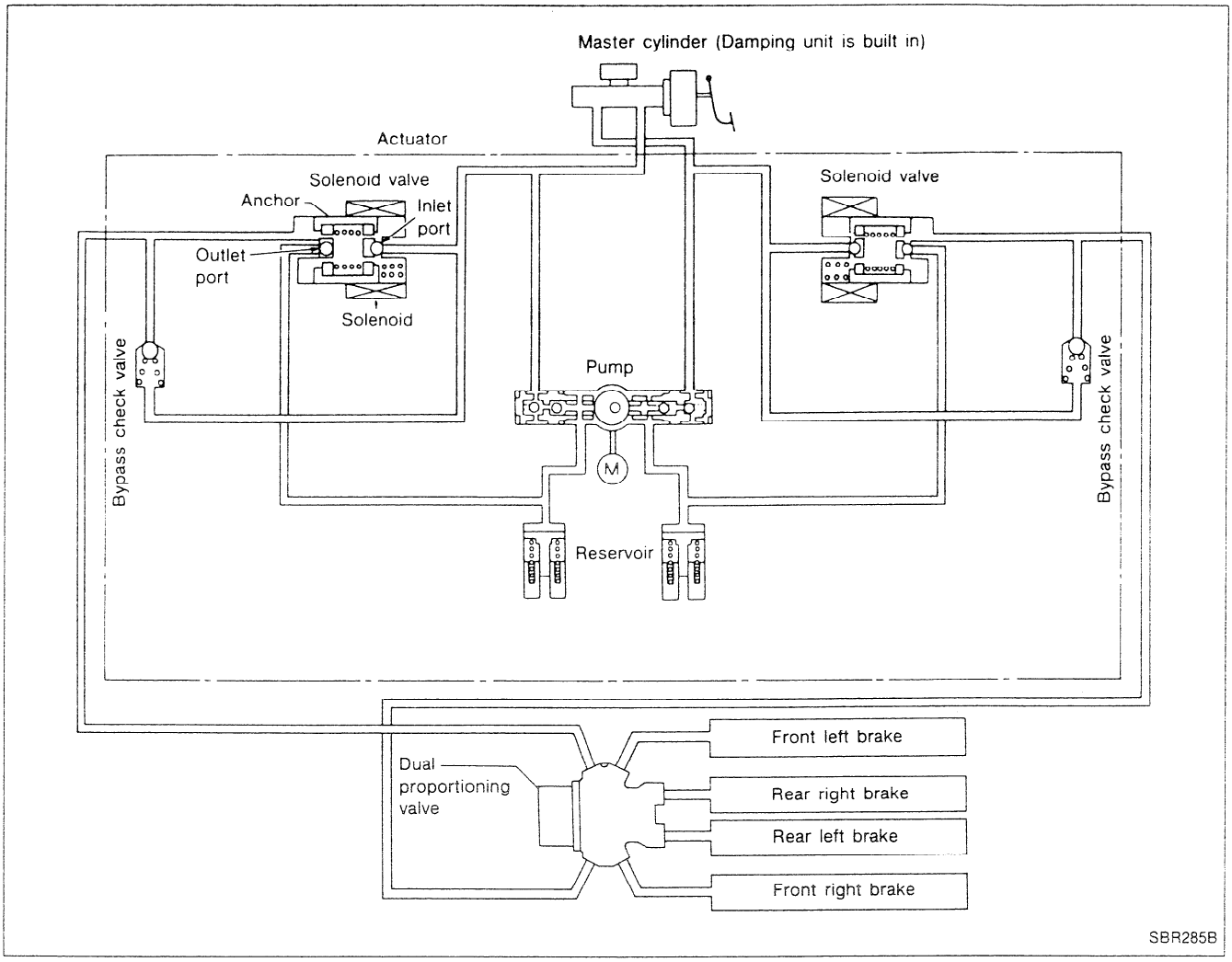
System Description (Cont'd)

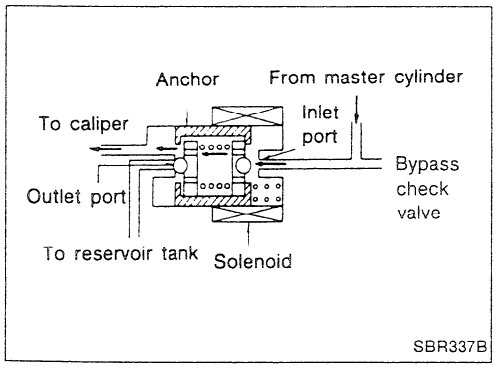
ACTUATOR

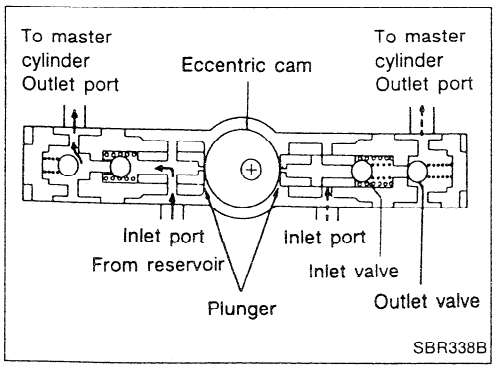


The actuator consists of solenoid valves, a pump, reservoir (for pressure decreasing). The solenoid valve changes its spool position corresponding to the control unit output amperage: it forms a pressure decreasing circuit at about 5 amperes, a pressure holding circuit at about 2 amperes, and a pressure increasing circuit at 0 amperes. When the pressure decreasing circuit is formed, the brake fluid in the caliper flows into the reservoir and the pressure drops. The pump delivers the fluid to the master cylinder. When the pressure holding circuit is formed, the caliper line is cut off, and the fluid pressure in the caliper is held constant.

Operation of Actuator Hydraulic Circuit







COMPONENT PARTS AND THEIR FUNCTIONS

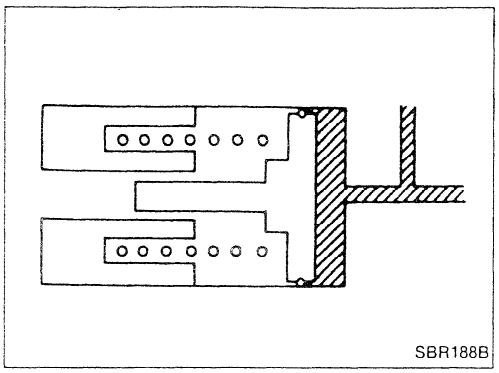
Solenoid valve

Current flowing through the solenoid controls the anchor position. Thus, the required ports open or close so that brake pressure to the caliper is adjusted properly.

Pump

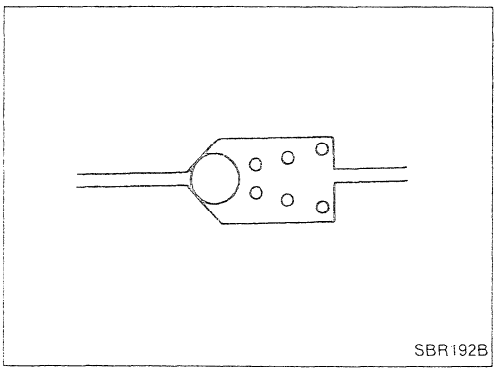
The pump delivers **brake fluid to the master cylinder to decrease fluid pressure in the caliper.** When the pump shaft's eccentric cam pushes the plunger to the left (as shown in the figure), oil from the reservoir is delivered to the master cylinder via the inlet and outlet ports and the inlet and outlet valves. At this point, the plunger on the right side of the pump is held stationary so that both the inlet and outlet ports as well as the inlet and outlet valves are closed. In this manner, the valve controls suction and discharge.

Operation of Actuator Hydraulic Circuit (Cont'd)


SBR188B

Reservoir

The reservoir temporarily stores brake fluid returning from the calipers as required in order to provide a smooth pressure decrease in the calipers.

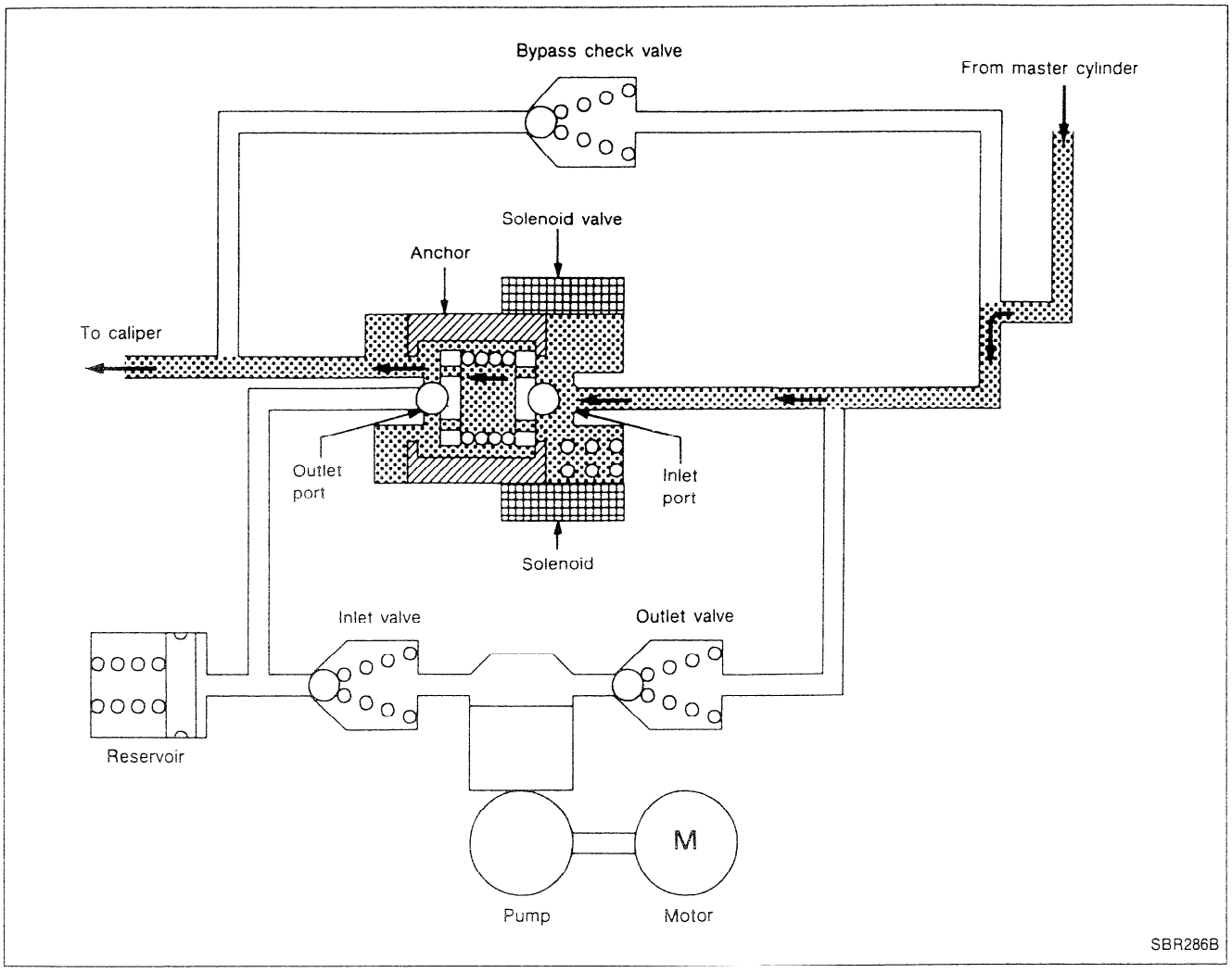

SBR192B

Bypass check valve

During brake release, brake fluid returns from the caliper to the master cylinder through this valve without entering the solenoid valve.

Operation of Actuator Hydraulic Circuit (Cont'd)

NORMAL BRAKE OPERATION (A.B.S. is not operating)



Description

Electric current to the solenoid ... 0 [A]

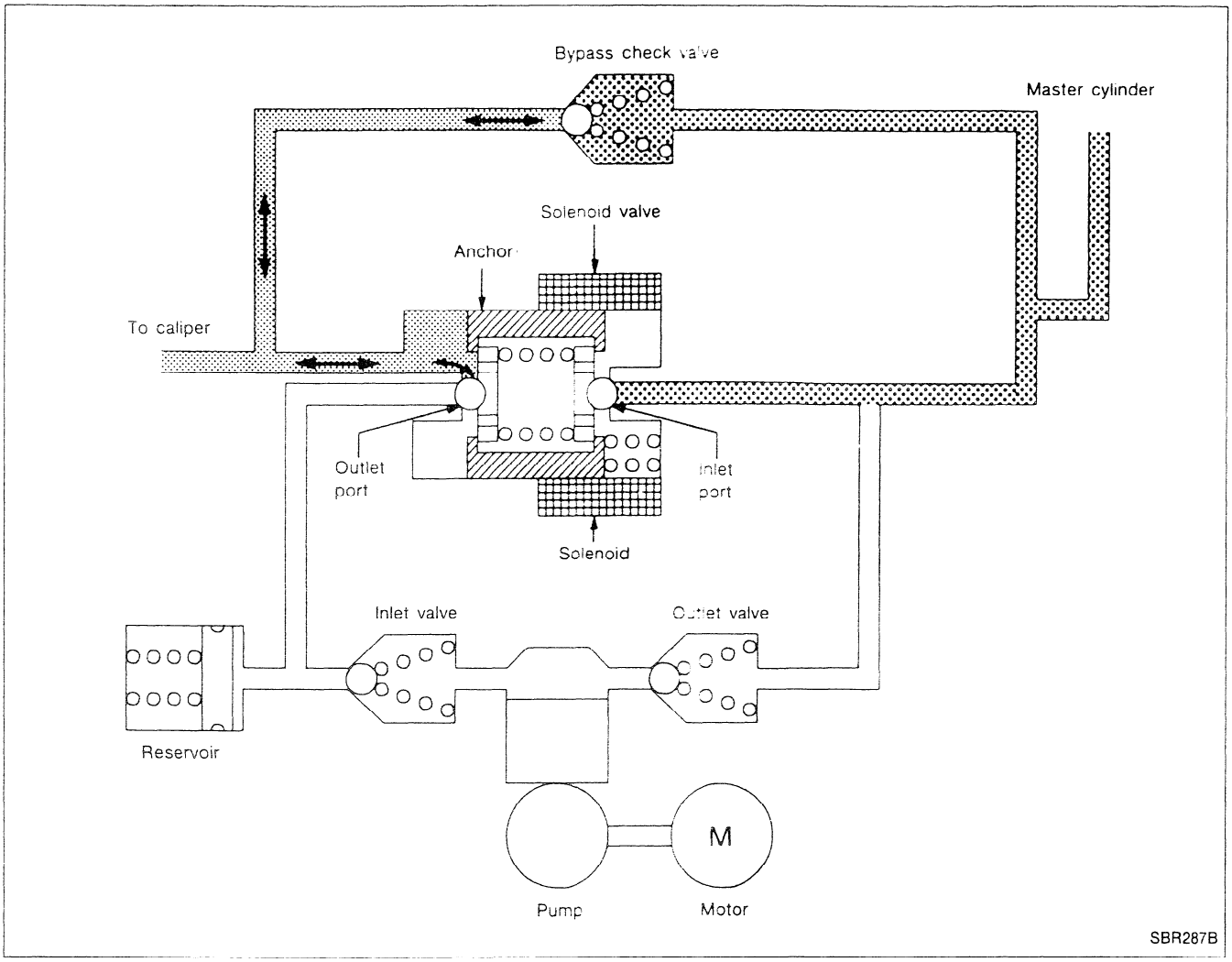
1. Magnetic force is not produced at the solenoid valve so that the anchor is not attracted toward the solenoid.
2. The inlet port is opened and the outlet port is closed.
3. Master cylinder brake fluid pressure is directly transmitted to the caliper (= disc brake) via the inlet port of the solenoid valve.
   ➡ Since the outlet port of the solenoid valve is closed, brake fluid pressure is not delivered to the reservoir.

Operation of Actuator Hydraulic Circuit (Cont'd)

ANTI-LOCK OPERATION

The following operations are repeated in a very short period of time (during pressure "Hold" and "Decrease"). As a result, each wheel is prevented from locking up.

Operation during pressure "Hold" (Wheels begin to slip)



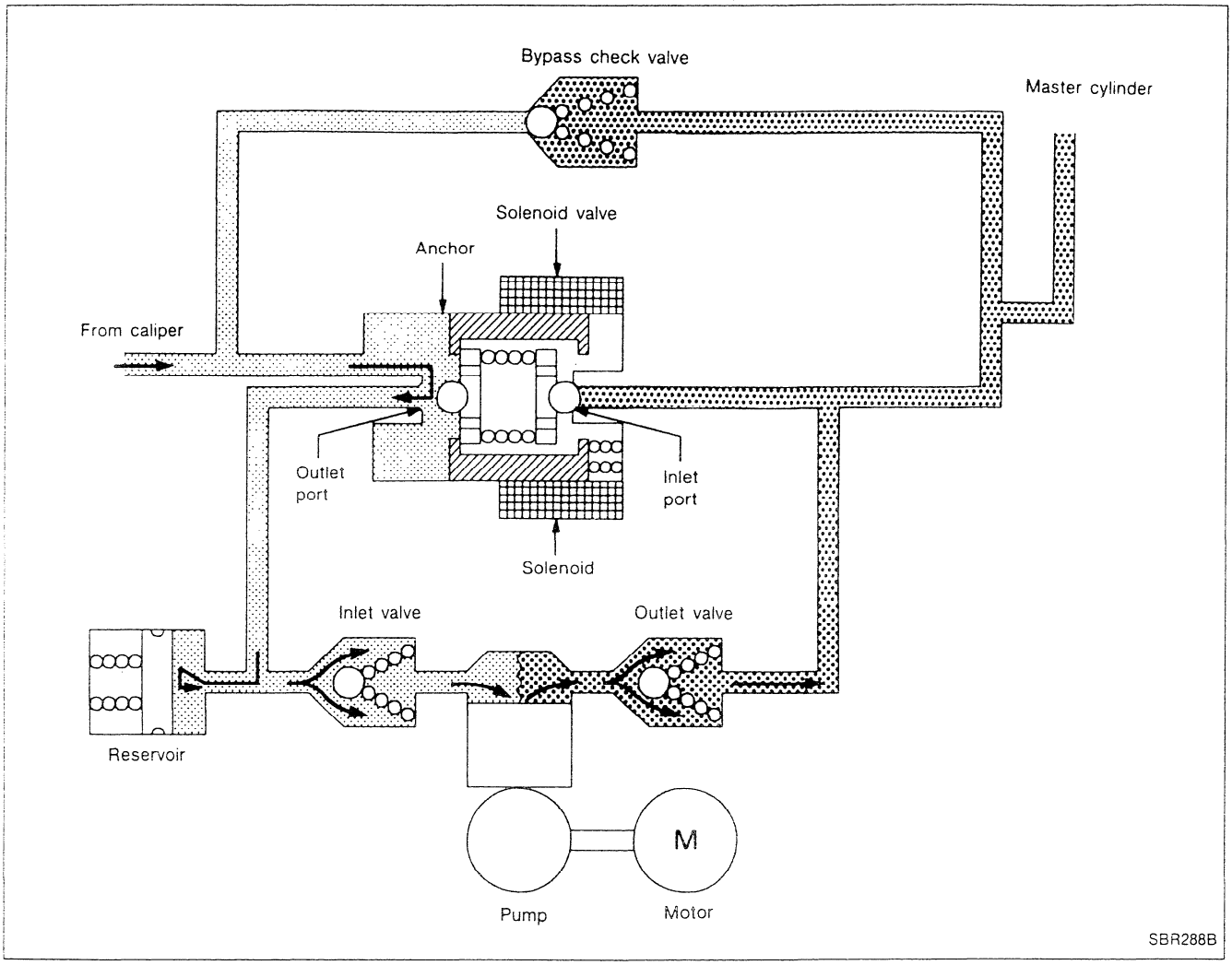
Description

Electric current to the solenoid ... 2 [A]

1. Magnetic force produced by current "2[A]" attracts the anchor to a position where the anchor and return spring are balanced. (Travel distance is small.)
2. Both inlet and outlet ports are closed.
3. Master cylinder fluid pressure is not delivered to the solenoid valve so that caliper pressure is held.
   ➡ Caliper fluid pressure is not delivered to the reservoir since the outlet port of the solenoid valve is closed. The bypass check valve is closed due to high master cylinder fluid pressure.

Operation of Actuator Hydraulic Circuit (Cont'd)

Operation during pressure "Decrease" (Wheels slip excessively)



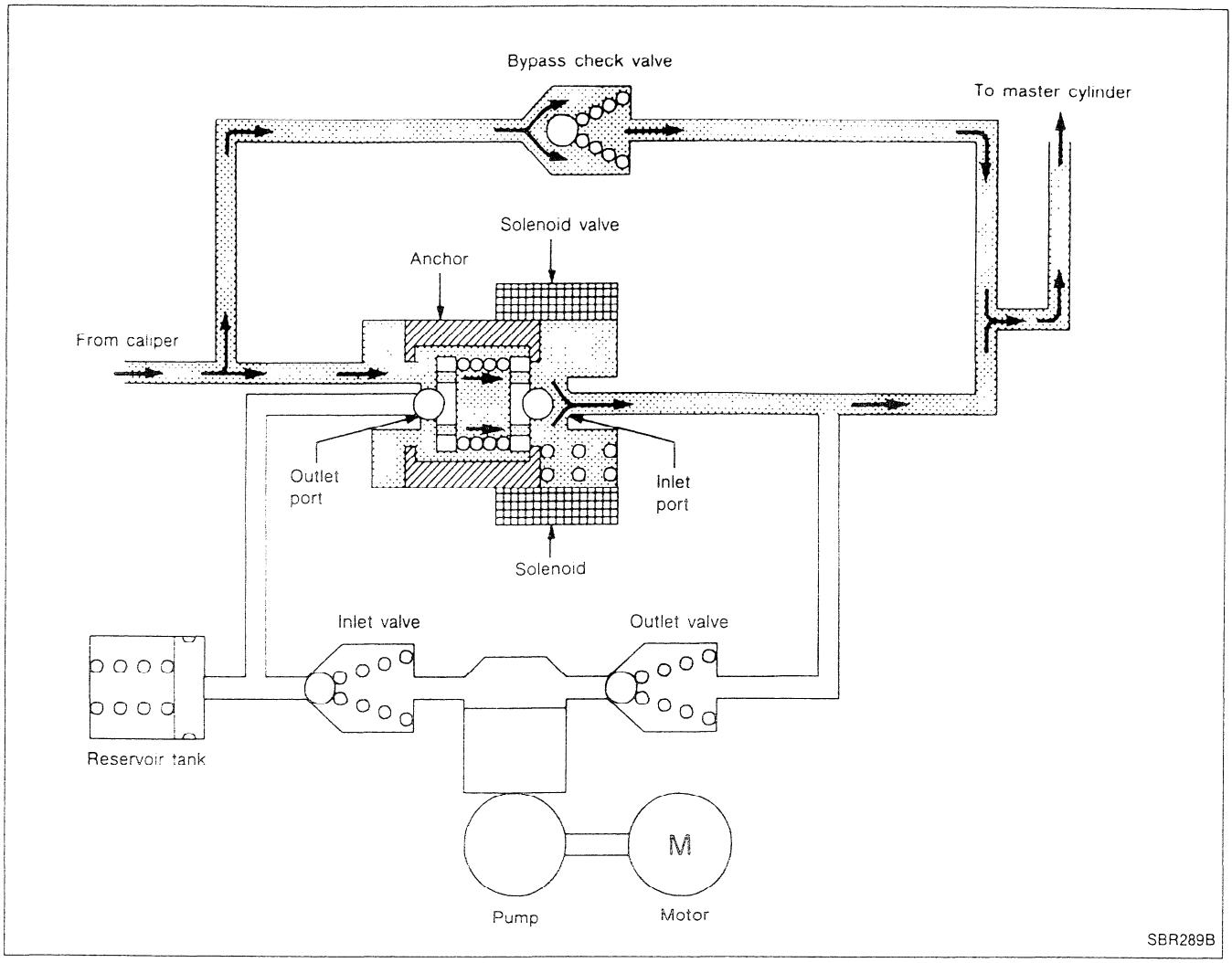
Description

Electric current to the solenoid ... 5 [A]

1. Magnetic force of the solenoid increases to attract the anchor further.
2. The inlet port remains closed and the outlet port opens.
3. Master cylinder fluid pressure does not act on the caliper since the inlet port of the solenoid valve is closed.
4. Caliper pressure is delivered to the reservoir via the outlet port of the solenoid valve so that it decreases.
5. Current "5[A]" to the solenoid is controlled and the pump motor activates at the same time. This has brake fluid (which returns to the reservoir) return to the master cylinder.
6. The damping unit which is built into the master cylinder activates to reduce the high pressure of the brake fluid from being applied to the master cylinder. Therefore, brake pedal "kickback" is prevented.

Operation of Actuator Hydraulic Circuit (Cont'd)

OPERATION DURING BRAKE RELEASE



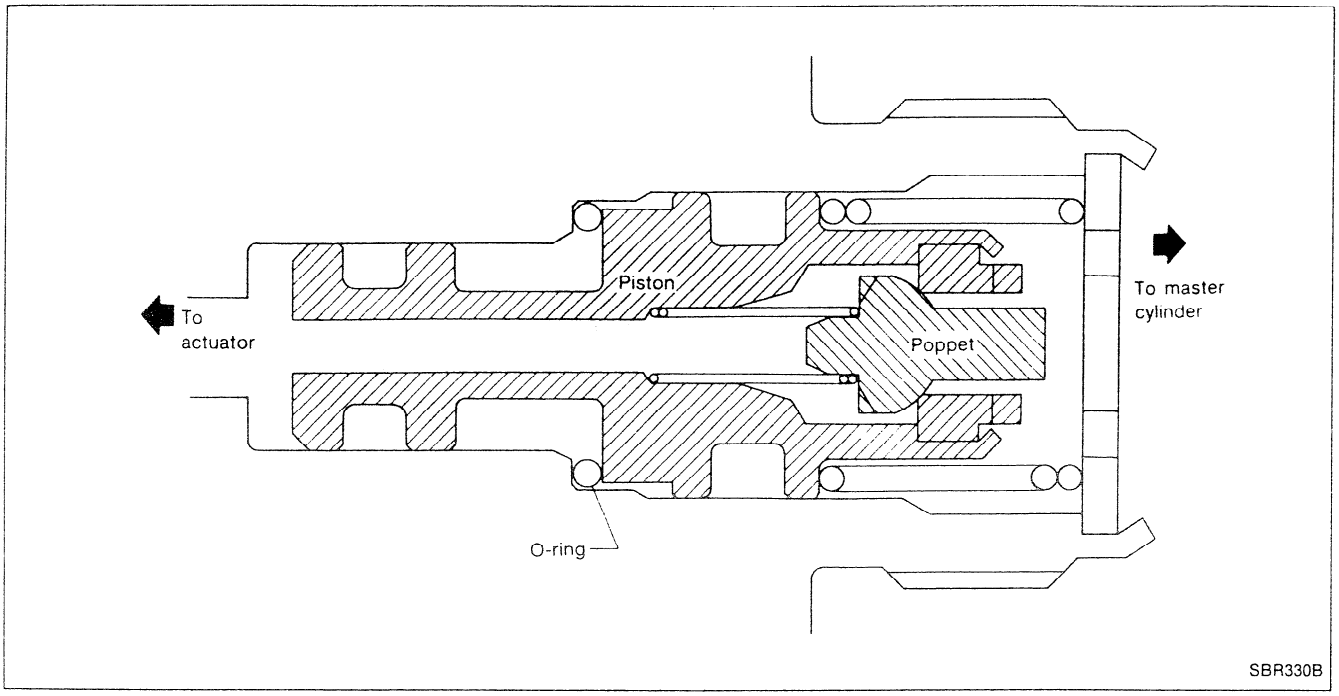
Description

Electric current to the solenoid ... 0 [A]

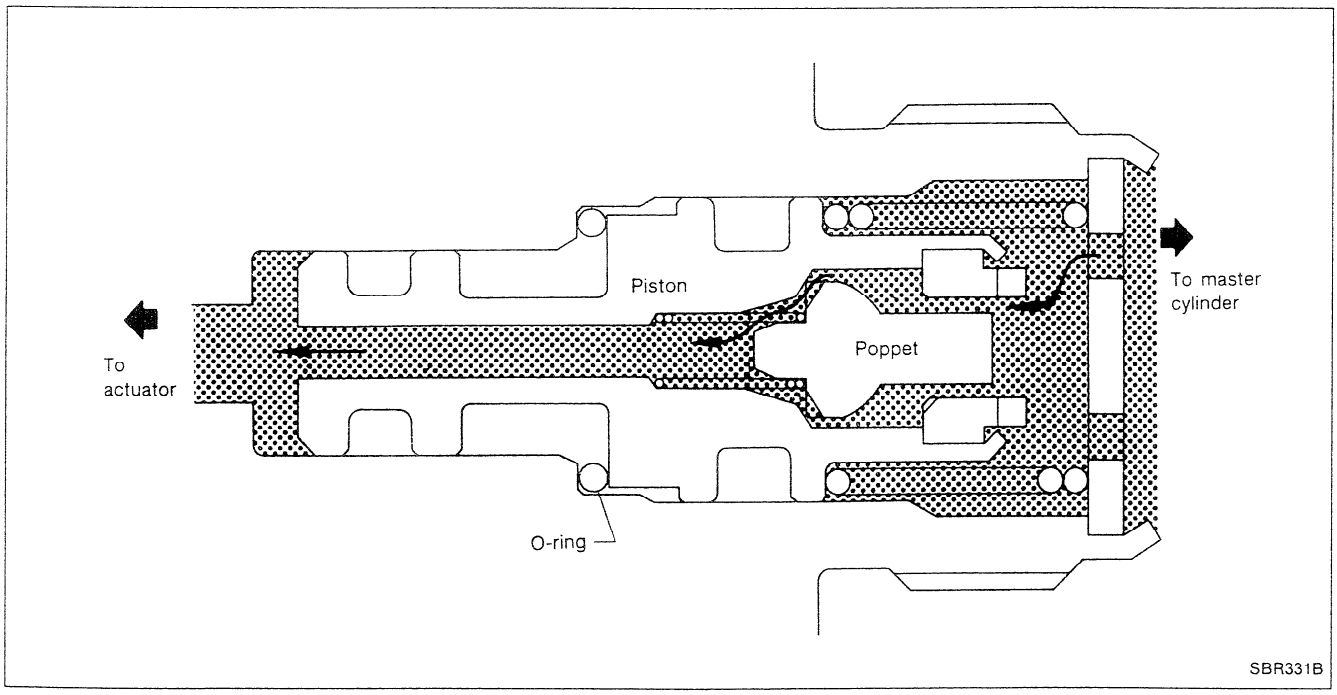
Master cylinder fluid pressure decreases so that the bypass valve opens. This allows caliper fluid pressure to return to the master cylinder.

Operation of Damping Unit Hydraulic Circuit

CONSTRUCTION OF DAMPING UNIT (Built into master cylinder)



INCREASE OPERATION

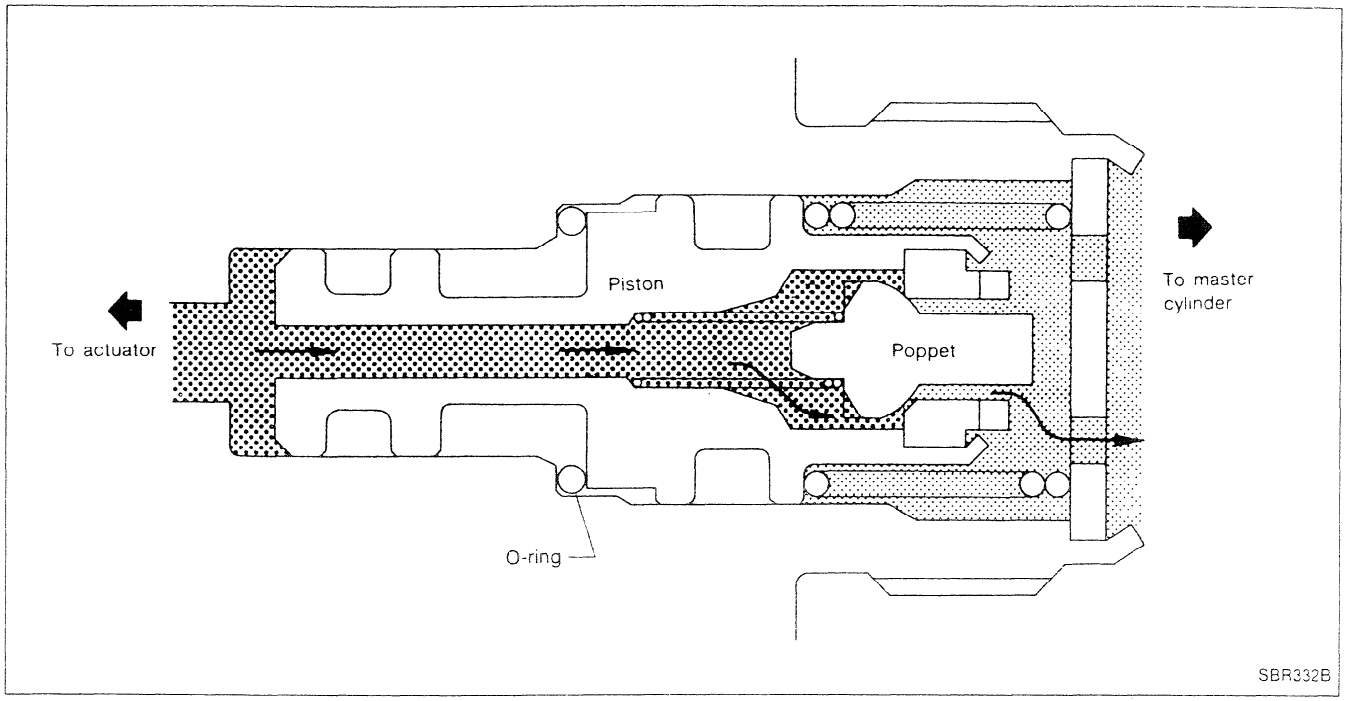


Description

1. When the brake pedal is depressed, the master cylinder produces pressure on the brake fluid.
2. This pressure is applied to the piston and the poppet of the damping unit so that the passage between the poppet and the piston is opened.
3. The brake fluid pressure is applied to the actuator.

Operation of Damping Unit Hydraulic Circuit (Cont'd)

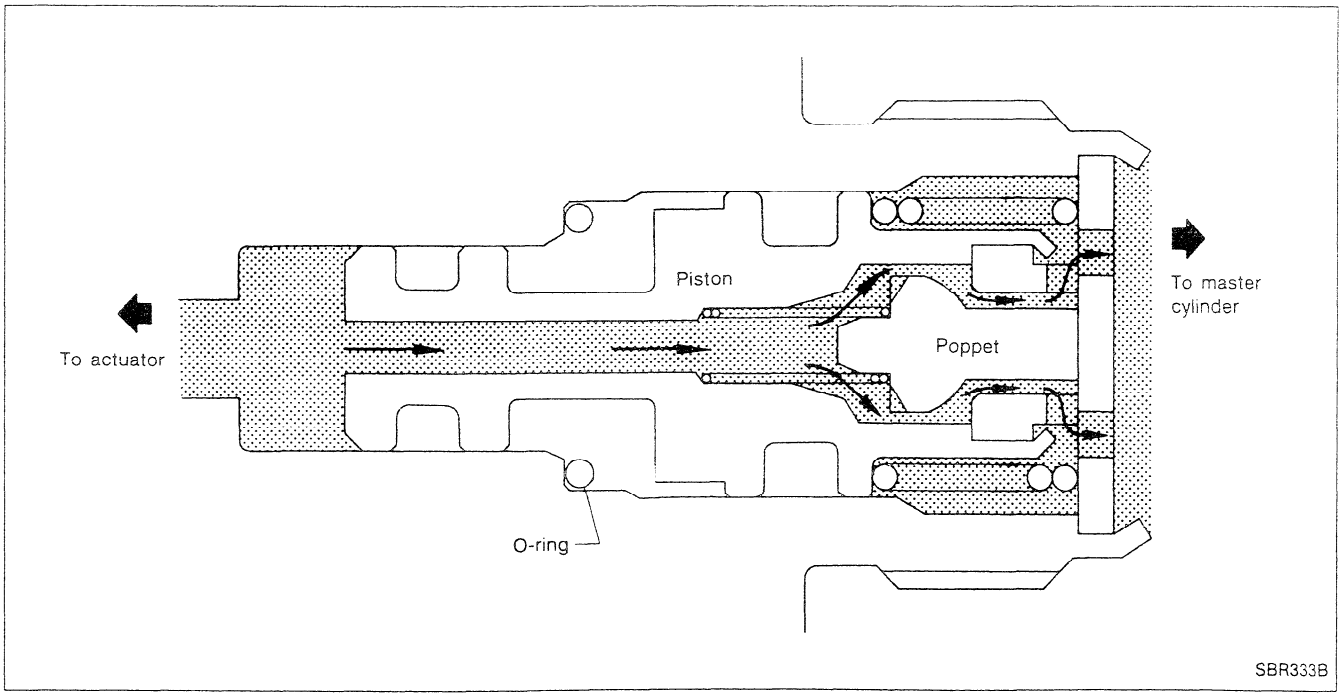
DAMPING OPERATION (During decreasing operation of actuator)



Description

1. While the brake pedal is being depressed, the master cylinder and actuator produce fluid pressure. Because of the application of these pressures to the poppet and the piston respectively, they are positioned as shown.
2. The passage between the poppet and the piston is very small so that it works as an orifice. Therefore, brake pedal "kickback" is prevented.

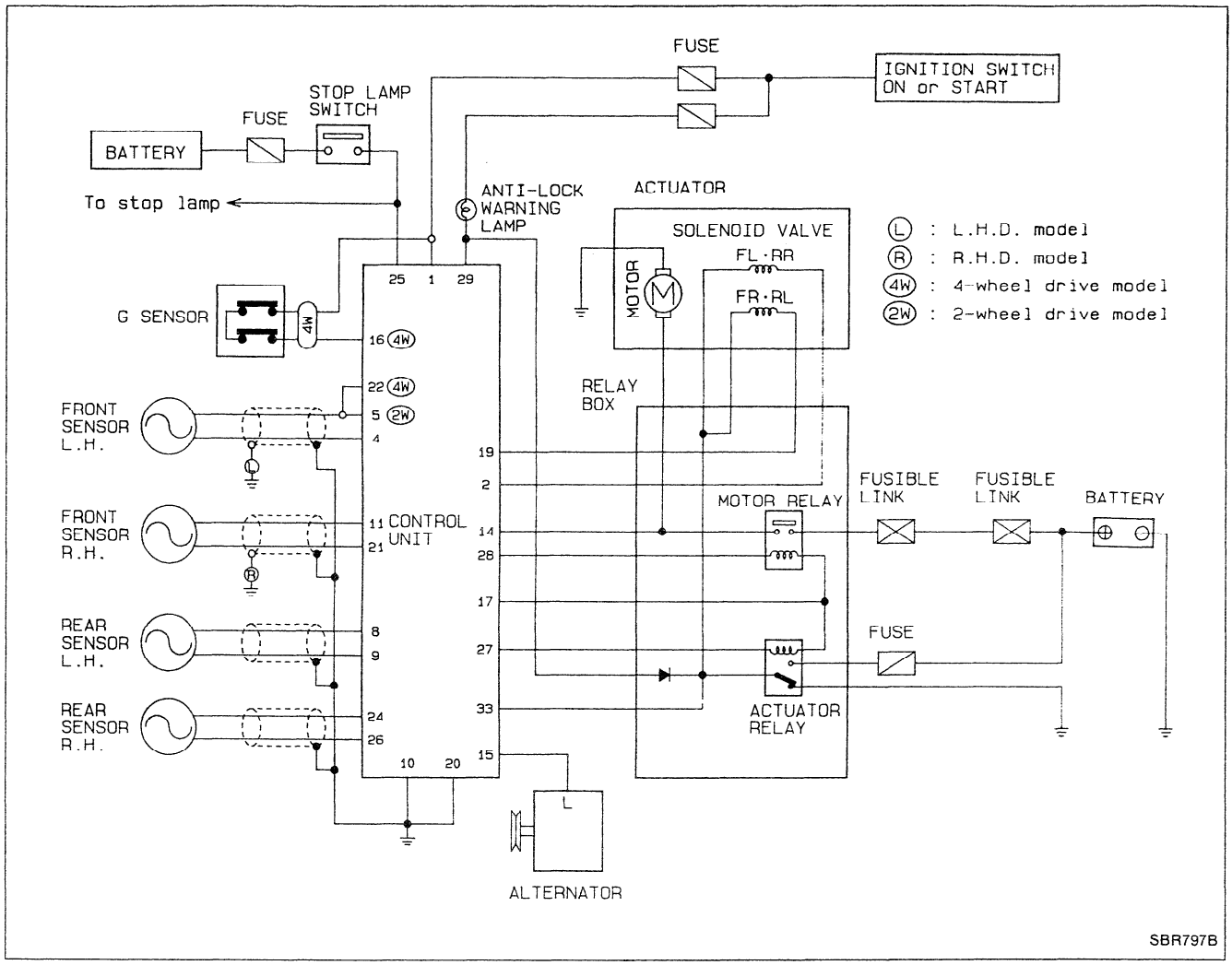
RELEASING OPERATION (Brake pedal release)



Description

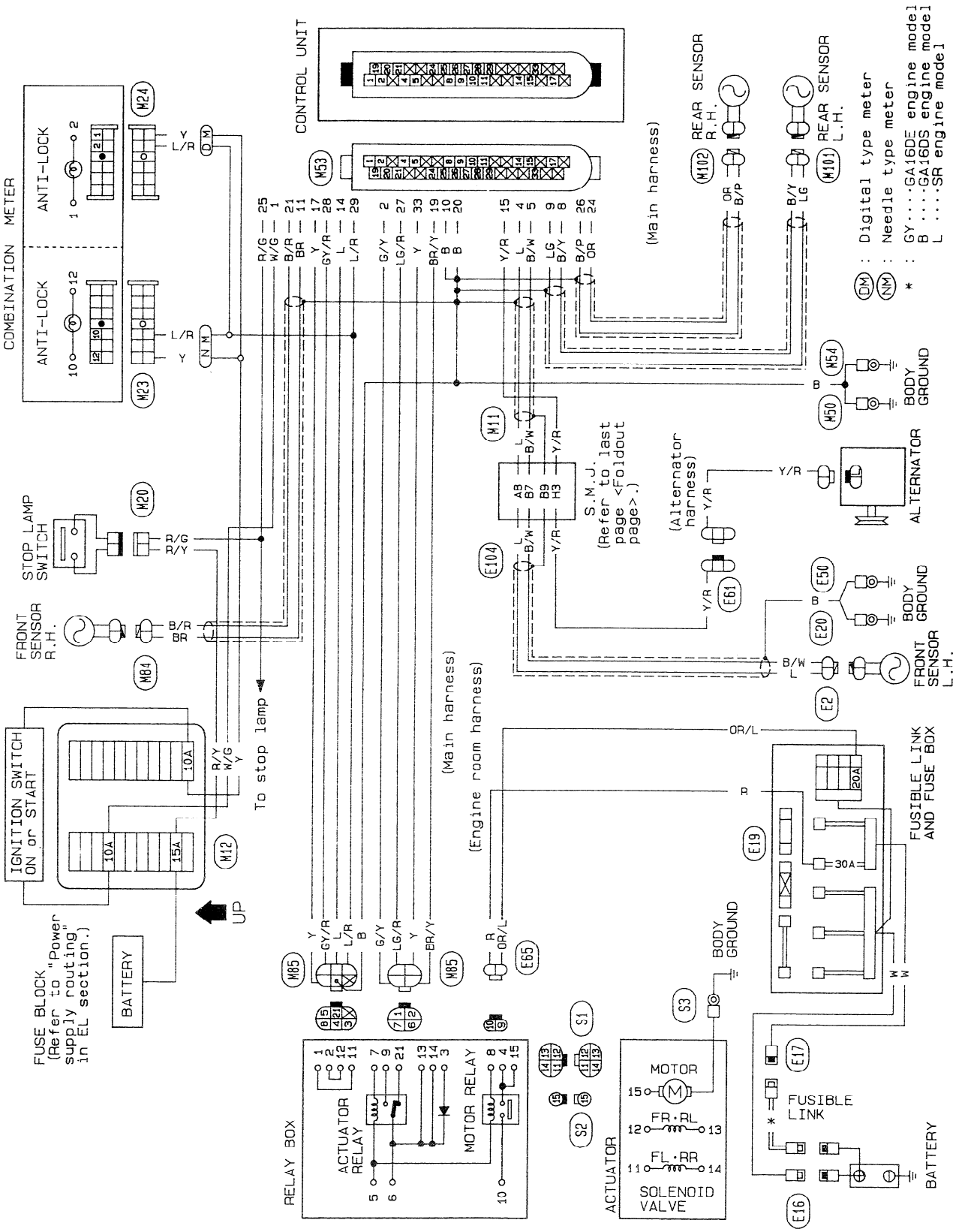
1. The fluid pressure of the actuator side is much higher than the pressure of the master cylinder side. Therefore, the piston moves to the body end as shown.
2. The brake fluid is returned through the passage between the piston and the poppet.

Circuit Diagram



Wiring Diagram

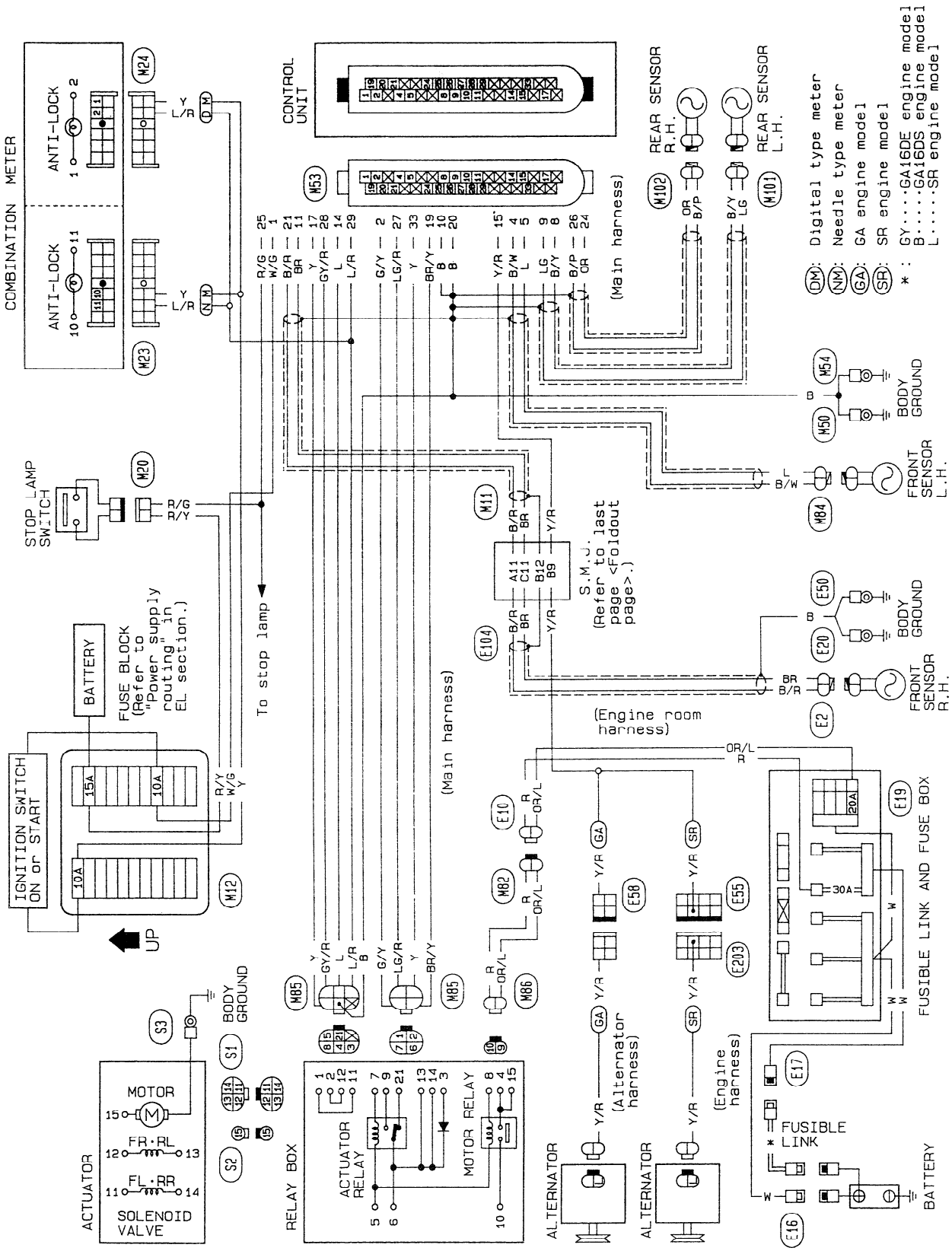
B13 L.H.D. MODELS



SBR798B

Wiring Diagram (Cont'd)

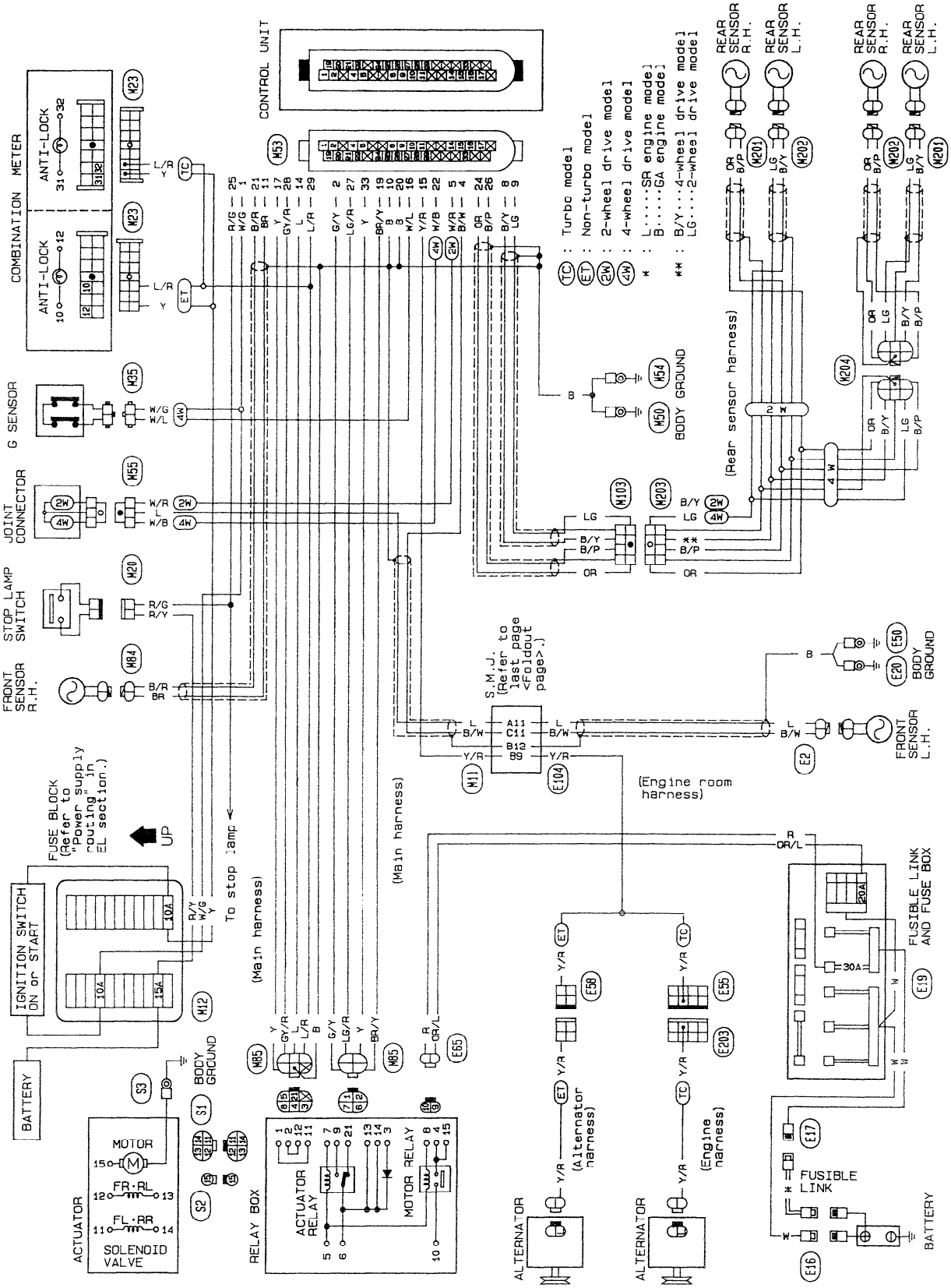
B13 R.H.D. MODELS



SBR799B

Wiring Diagram (Cont'd)

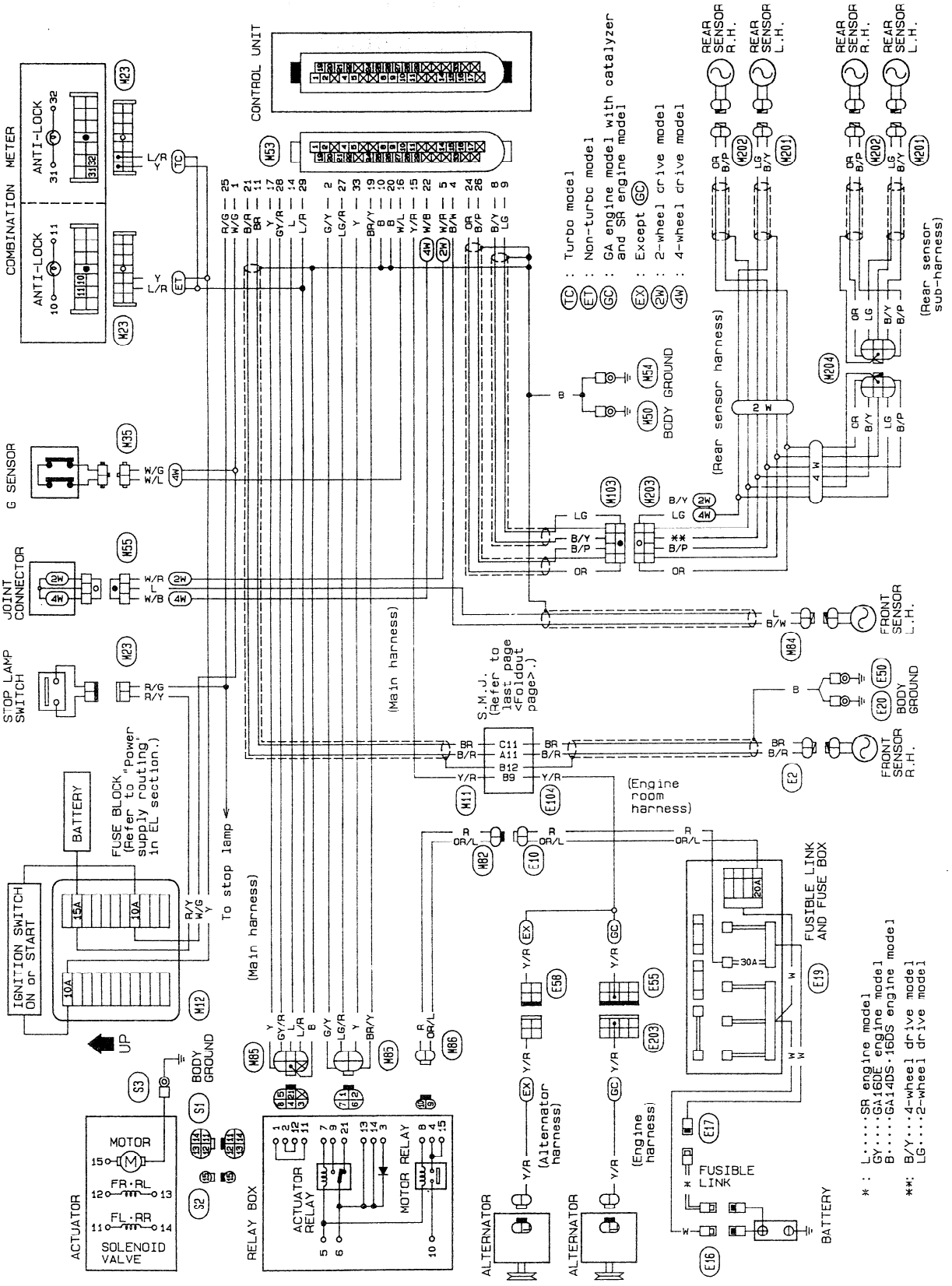
N14 L.H.D. MODELS



SBR800B

Wiring Diagram (Cont'd)

N14 R.H.D. MODELS

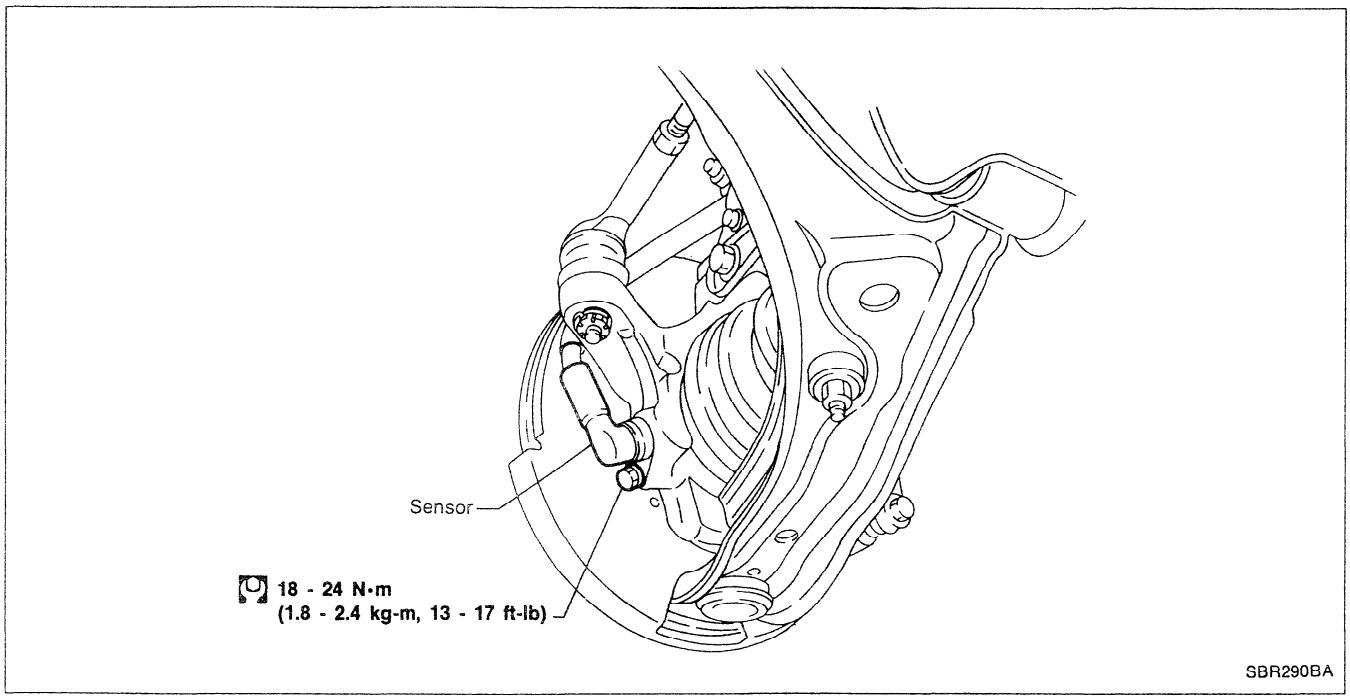


SBR801B

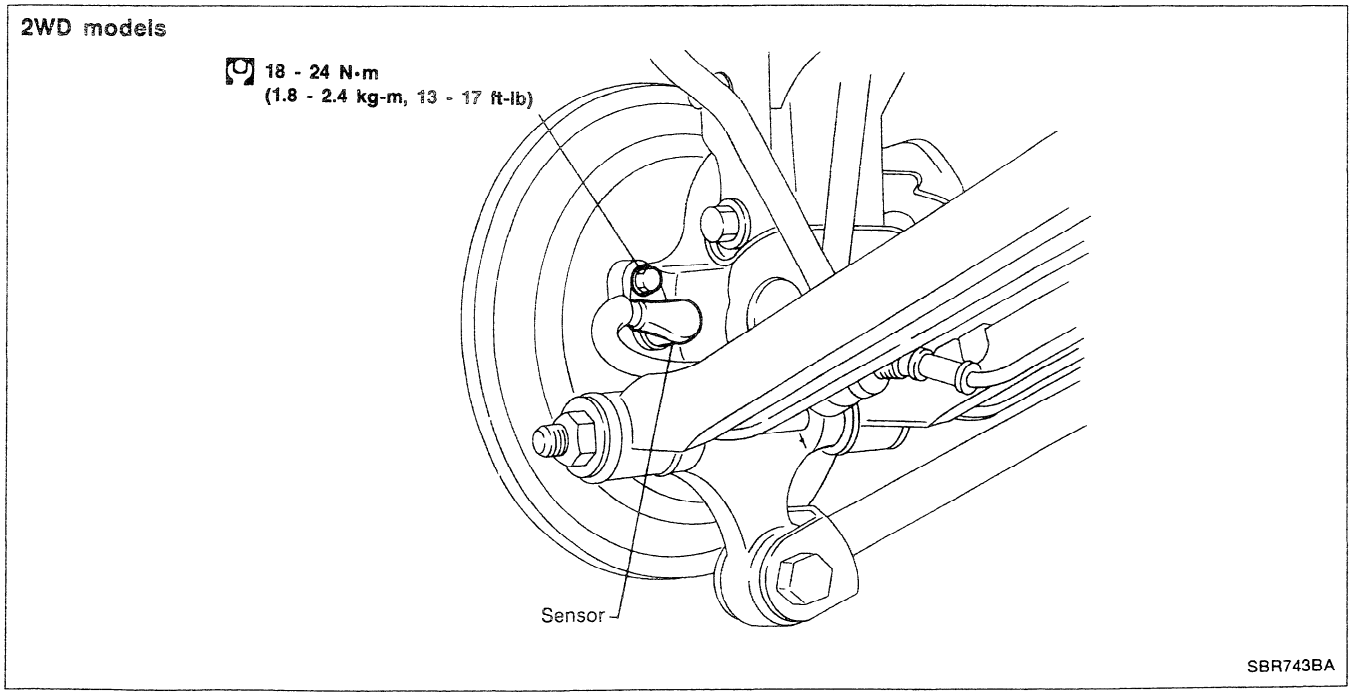
Removal and Installation

CAUTION:
Be careful not to damage sensor edge and sensor rotor teeth.

FRONT WHEEL SENSOR

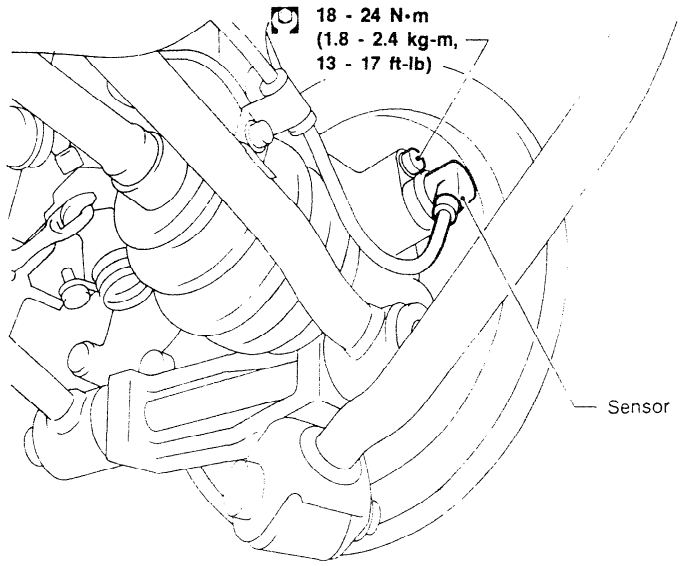


REAR WHEEL SENSOR

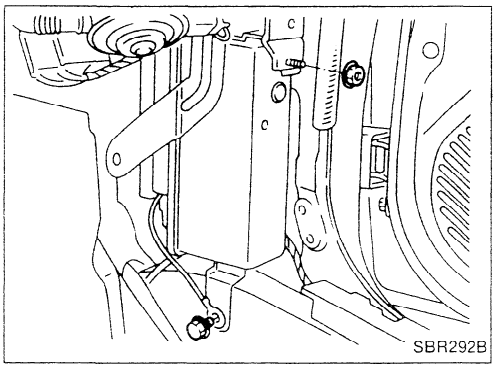


Removal and Installation (Cont'd)

4WD models



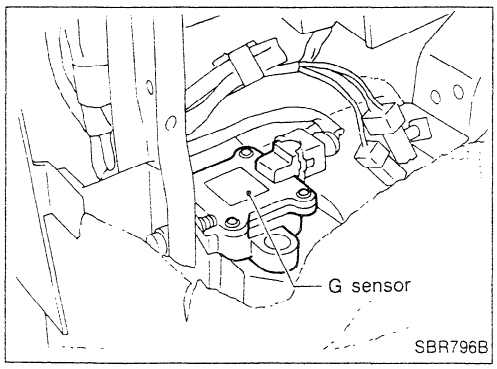
SBR744BA



SBR292B

CONTROL UNIT

Location: Front passenger side dash side lower.



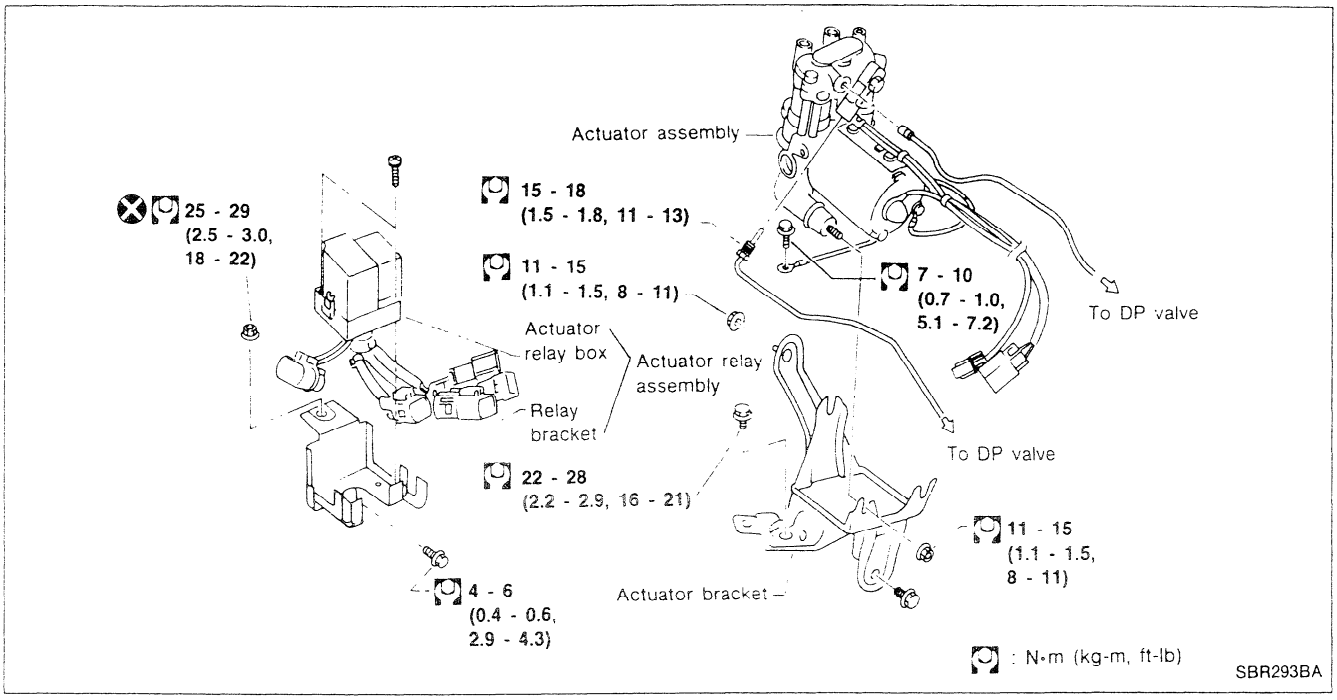
SBR796B

G SENSOR

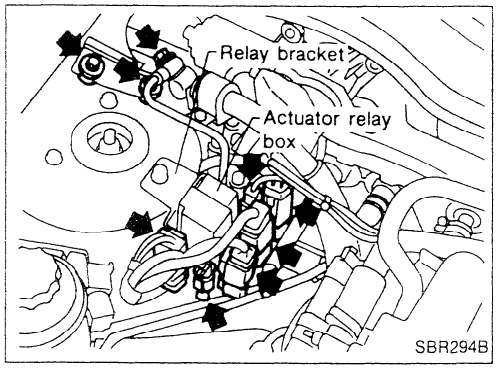
Always replace G sensor if bumped or dropped. Otherwise, performance characteristics of G sensor will be changed, which in turn changes ABS control performance characteristics.

Removal

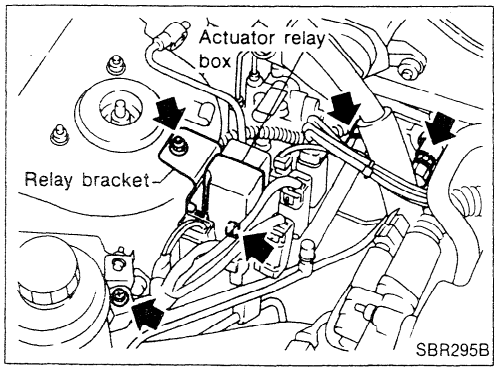
ACTUATOR (L.H.D. models)



1. Disconnect battery cable.
2. Drain brake fluid. Refer to "Changing Brake Fluid" in "CHECK AND ADJUSTMENT".
3. Drain power steering fluid. Refer to section ST.
4. Discharge air conditioner refrigerant. Refer to section HA.

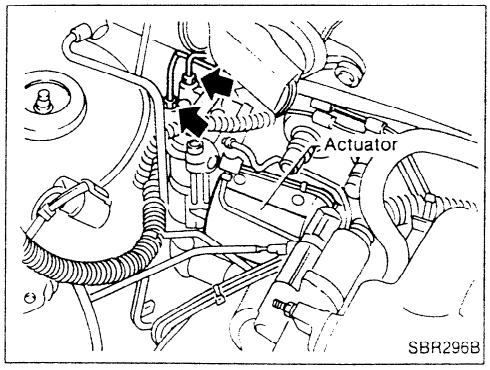


5. Disconnect power steering fluid pipe and hose.
6. Disconnect all connectors from actuator relay bracket.



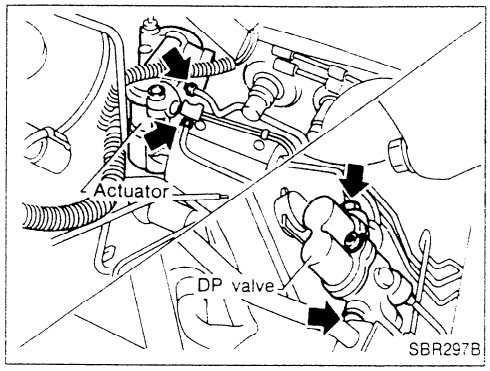
7. Remove mounting nut for relay bracket.
8. Remove mounting bolt for relay bracket. (This bolt is located just under the relay.)
9. Remove actuator relay box with bracket.
10. Remove air conditioner tubes.

Removal (Cont'd)

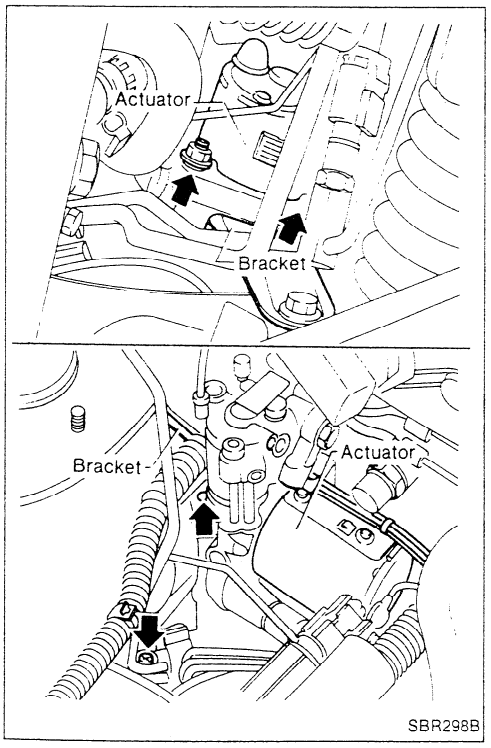


11. Disconnect top two brake pipes from actuator. (Pipes from master cylinder to actuator)

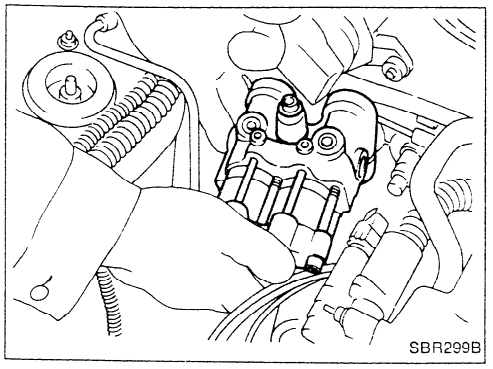
It is not necessary to remove these pipes.



12. Remove the other two brake pipes. (Pipes from actuator to DP valve)

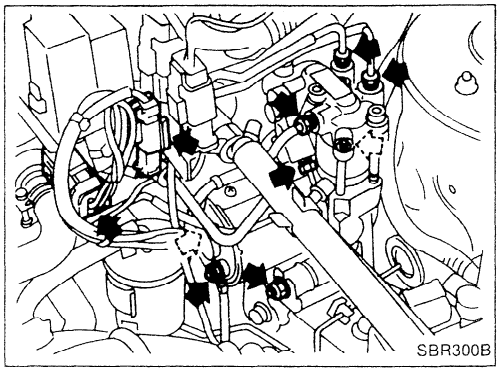


13. Remove/loosen mounting nuts between actuator and bracket.
14. Remove actuator grounding bolt.



15. Draw out actuator as shown.

Removal (Cont'd)


SBR300B

ACTUATOR (R.H.D.)

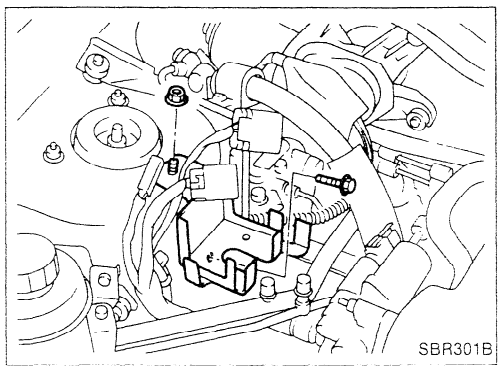
1. Disconnect battery cable.
2. Drain brake fluid. Refer to "Changing Brake Fluid" in "CHECK AND ADJUSTMENT".
3. Discharge air conditioner refrigerant. Refer to section HA. Then, remove air conditioner tubes.
4. Disconnect connector from actuator relay.
5. Remove grounding cable from actuator.
6. Remove/loosen actuator mounting nuts and draw out actuator.

Installation

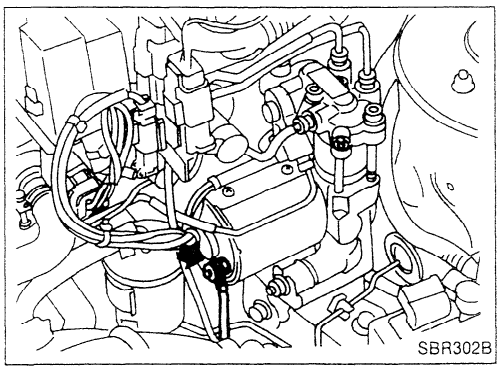
CAUTION:

After installation, pay attention to the following points.

- **Refill brake fluid and bleed air. Refer to "CHECK AND ADJUSTMENT" and "AIR BLEEDING" respectively.**
- **Charge air conditioner refrigerant. Refer to section HA.**
- **For L.H.D. models, refill power steering fluid. Refer to section ST.**


SBR301B

- Installation procedure is basically the reverse order of removal.
- For L.H.D. models, it is recommended to install relay bracket first. Then install actuator relay box.


SBR302B

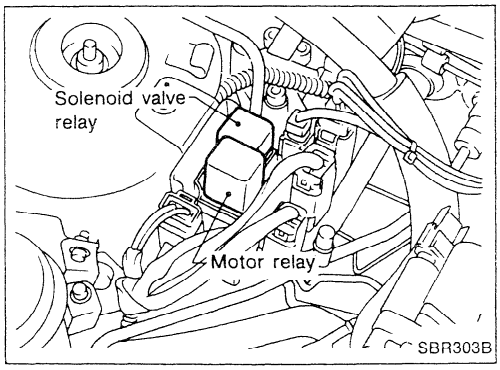
- For R.H.D. models, tighten ground cable nut to specified torque to prevent poor grounding or damage to bolt.

  Specification:

  2.2 - 2.6 N·m

  (0.22 - 0.27 kg-m, 1.6 - 2.0 ft-lb)

Removal and Installation



SBR303B

ACTUATOR RELAYS

METAL BODY: MOTOR RELAY

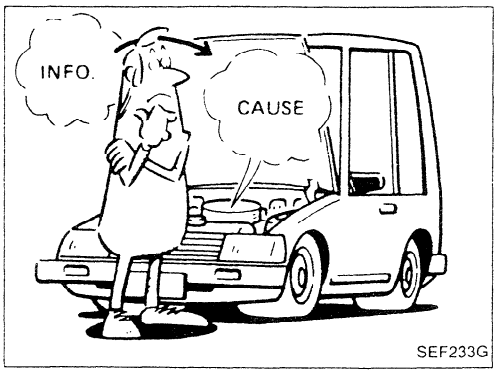
LIGHT BLUE: SOLENOID VALVE RELAY

1. Disconnect battery cable.
2. Remove actuator relay cover.

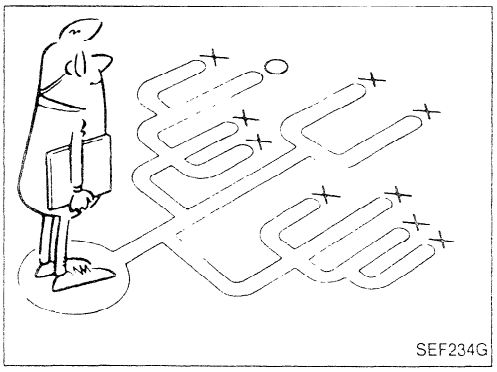
It is not necessary to remove the two screws for relay box.

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SEF233G


SEF234G

How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

The A.B.S. system has an electronic control unit to control major functions. The control unit accepts input signals from sensors and instantly drives actuators. It is essential that both kinds of signals are proper and stable. At the same time, it is important that there are no conventional problems such as air leaks in the booster or lines, lack of brake fluid, or other problems with brake system.

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

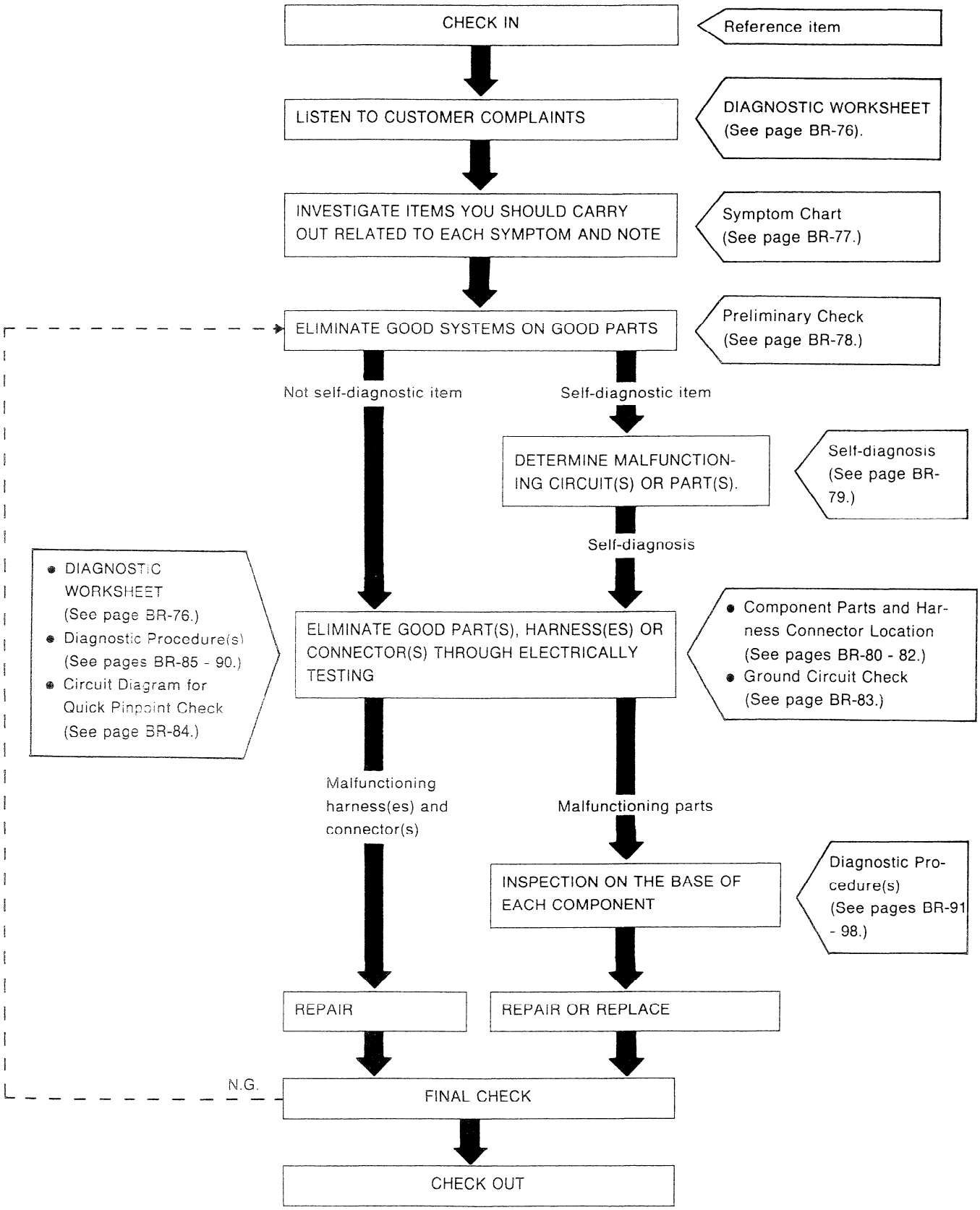
A visual check only may not find the cause of the problems, so a road test should be carried out.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a A.B.S. 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 A.B.S. controlled vehicle.

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

WORK FLOW



How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

KEY POINTS

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

SBR339B

DIAGNOSTIC WORKSHEET

There are many kinds of operating conditions that lead to customer complaints, even if the system is normal.
A good grasp of such conditions can make trouble-shooting faster and more accurate.
In general, feelings for a problem depend on each customer's information. It is therefore important to fully understand the symptoms or under what conditions a customer complains.
Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for trouble-shooting.

Worksheet sample

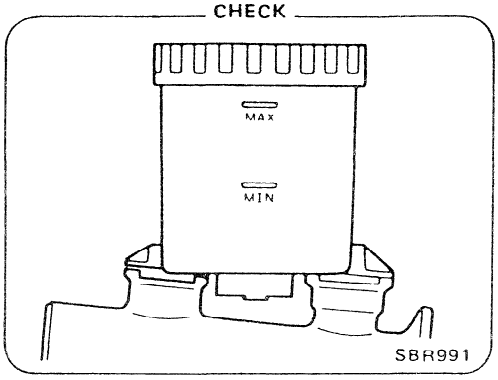
Customer name MR/MS		Model & Year			VIN		
Engine #		Trans.			Mileage		
Incident Date		Manuf. Date			In Service Date		
Symptoms	☐ Pedal vibration and noise	☐ Warning activates	☐ Long stopping distance	☐ Unexpected pedal action	☐ A.B.S. doesn't work	☐ A.B.S. works but warning activates	☐ A.B.S. works frequently
Engine conditions	☐ When starting ☐ After starting ☐ Engine speed: 5,000 rpm or more						
Road conditions	☐ Low friction road (☐ Snow ☐ Gravel ☐ Other) ☐ Protrusion						
Driving conditions	☐ High speed cornering ☐ Vehicle speed: Greater than 10 km/h (6 MPH) ☐ Vehicle speed: 10 km/h (6 MPH) or less ☐ Vehicle is stopped						
Applying brake conditions	☐ Suddenly ☐ Gradually						
Other conditions	☐ Operation of electrical equipment ☐ Large pedal stroke ☐ Operation of clutch						

Symptom Chart

PROCEDURE	REFERENCE PAGE	SYMPTOM	Pedal vibration & noise	Warning activates	Long stopping distance	Unexpected pedal action	A.B.S. doesn't work	A.B.S. works but warning activates	A.B.S. works frequently	Warning never activates
Electrical Components Inspection	BR-99	G sensor		○			○		○	
	BR-99	Solenoid Valve Relay					○	○		○
	BR-99	Actuator Motor Relay					○			
—	BR-83	Ground Circuit Check	○				○		○	○
Diagnostic Procedure (Select inspection with L.E.D. flashing No.)	BR-98	Diagnostic Procedure 15 (L.E.D. comes off)	○	○	○	○	○	○		
	BR-97	Diagnostic Procedure 14 (L.E.D. flashing No. 16)	○	○	○	○	○	○		
	BR-97	Diagnostic Procedure 13 (L.E.D. flashing No. 15)	○	○	○	○	○	○	○	
	BR-96	Diagnostic Procedure 12 (L.E.D. flashing No. 11)	○	○	○	○	○	○		
	BR-95	Diagnostic Procedure 11 (L.E.D. flashing No. 10)	○	○	○	○	○	○		
	BR-93	Diagnostic Procedure 10 (L.E.D. flashing No. 9)	○	○	○	○	○	○		
	BR-92	Diagnostic Procedure 9 (L.E.D. flashing No. 5 - 8)	○	○	○	○	○	○		
	BR-91	Diagnostic Procedure 8 (L.E.D. flashing No. 1 - 3)	○	○	○	○	○	○		
Diagnostic Procedure	BR-90	Diagnostic Procedure 7								○
	BR-89	Diagnostic Procedure 6							○	
	BR-88	Diagnostic Procedure 5						○		
	BR-88	Diagnostic Procedure 4					○			○
	BR-87	Diagnostic Procedure 3				○				
	BR-87	Diagnostic Procedure 2			○					
	BR-85	Diagnostic Procedure 1	○							
—	BR-79	Self-diagnosis	○	○	○	○	○	○	○	○
—	BR-78	Preliminary Check			○	○			○	

Preliminary Check

CHECK

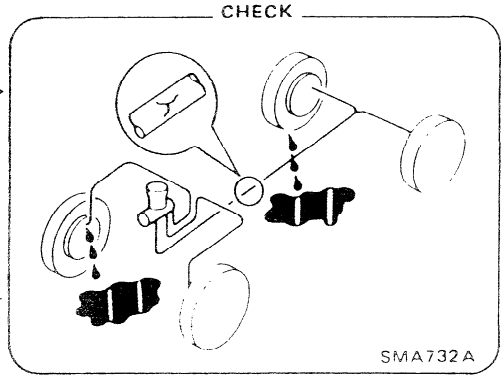


Check brake fluid level in reservoir tank.

N.G. → Fill up brake fluid.

O.K. →

CHECK

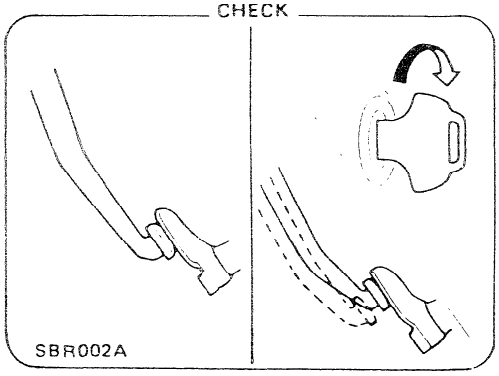


Check brake system.
Refer to CHECK AND ADJUSTMENT.

← N.G. Repair brake system.

O.K. ↓

CHECK

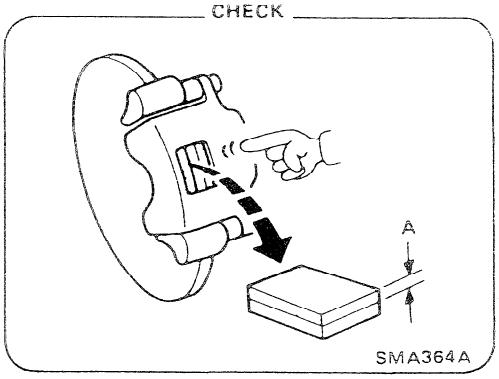


Check brake booster operation and airtightness.
Refer to "Inspection" of BRAKE BOOSTER.

← N.G. Repair or replace booster system.

O.K. ←

CHECK



Check brake pads and rotor.
Refer to "Inspection" of FRONT and REAR DISC BRAKE.

N.G. → Replace malfunctioning parts.

Self-diagnosis

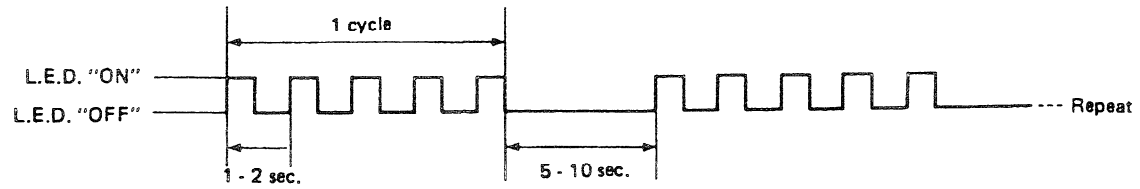
CHECKING THE NUMBER OF L.E.D. FLASHES

When a problem occurs in the A.B.S., the warning light on the instrument panel comes on. As shown in the Table, the control unit performs self-diagnosis.
To obtain satisfactory self-diagnosing results, the vehicle must be driven above 30 km/h (19 MPH) for at least one minute before the self-diagnosis is performed. After the vehicle is stopped, the number of L.E.D. flashes is counted while the engine is running.
The L.E.D. is located on the control unit, identifying a malfunctioning part or unit by the number of flashes. Both the warning light and the L.E.D. persistently activate, even after a malfunctioning part or unit has been repaired, unless the ignition switch is turned "OFF". After repairs, turn the ignition switch "OFF". Then start the engine and drive the vehicle over 30 km/h (19 MPH) for at least one minute to ensure that the malfunctioning part or unit has been repaired properly.
If more than two circuits malfunction at the same time, the L.E.D. will flash to indicate one of the malfunctioning circuits. After the circuit has been repaired, the L.E.D. will then flash to indicate that the other circuit is malfunctioning.

No. of L.E.D. flashes	Malfunctioning parts or circuit	Diagnostic Procedure
1	Left front actuator solenoid circuit	8
2	Right front actuator solenoid circuit	8
3	Both actuator solenoid circuits	8
5	Left front wheel sensor circuit	9
6	Right front wheel sensor circuit	9
7	Right rear wheel sensor circuit	9
8	Left rear wheel sensor circuit	9
9	Motor and motor relay	10
10	Solenoid valve relay	11
11	G sensor circuit	12
15	Sensor rotor	13
*16	Control unit	14
Warning activates and L.E.D. "OFF"	Power supply and ground circuit	15

Example

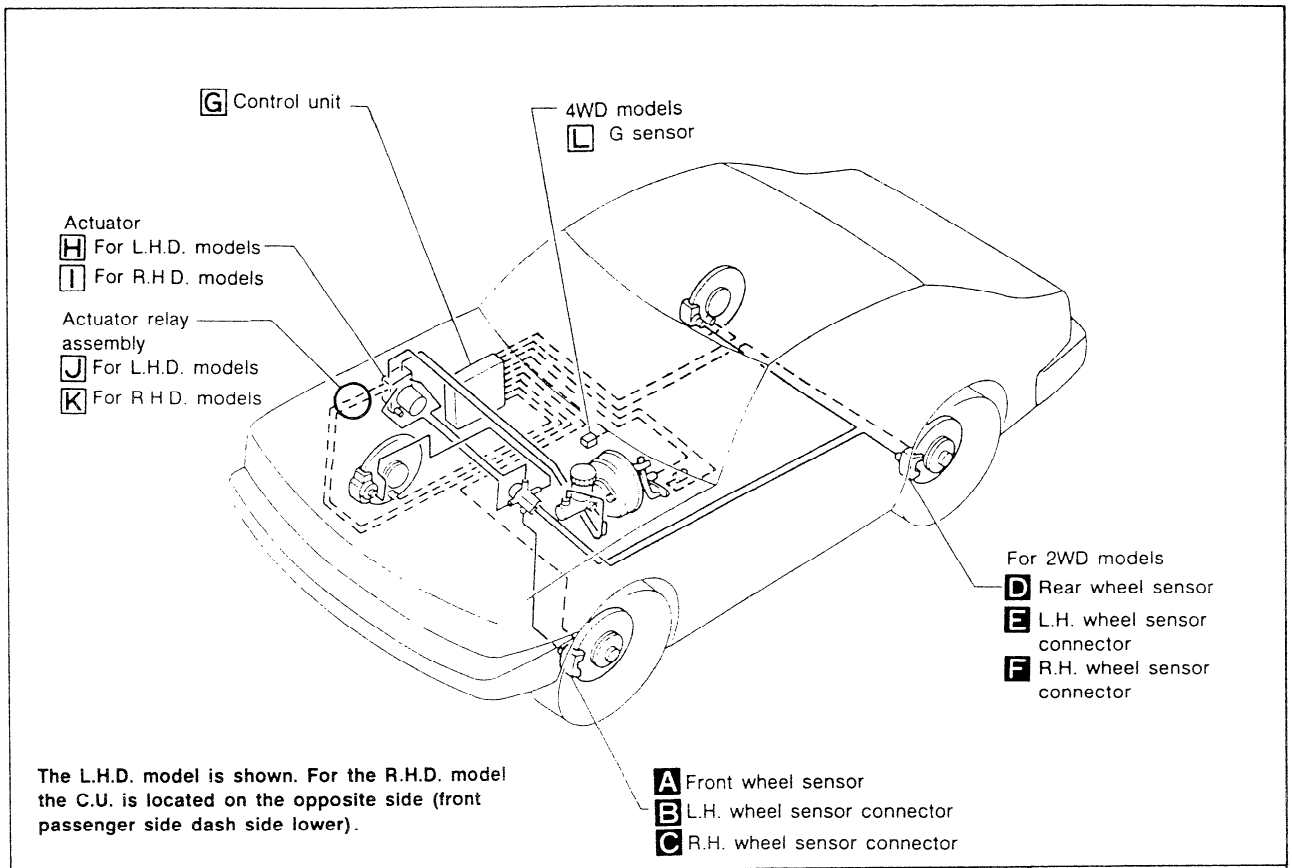
Improper operation of left front wheel sensor circuit



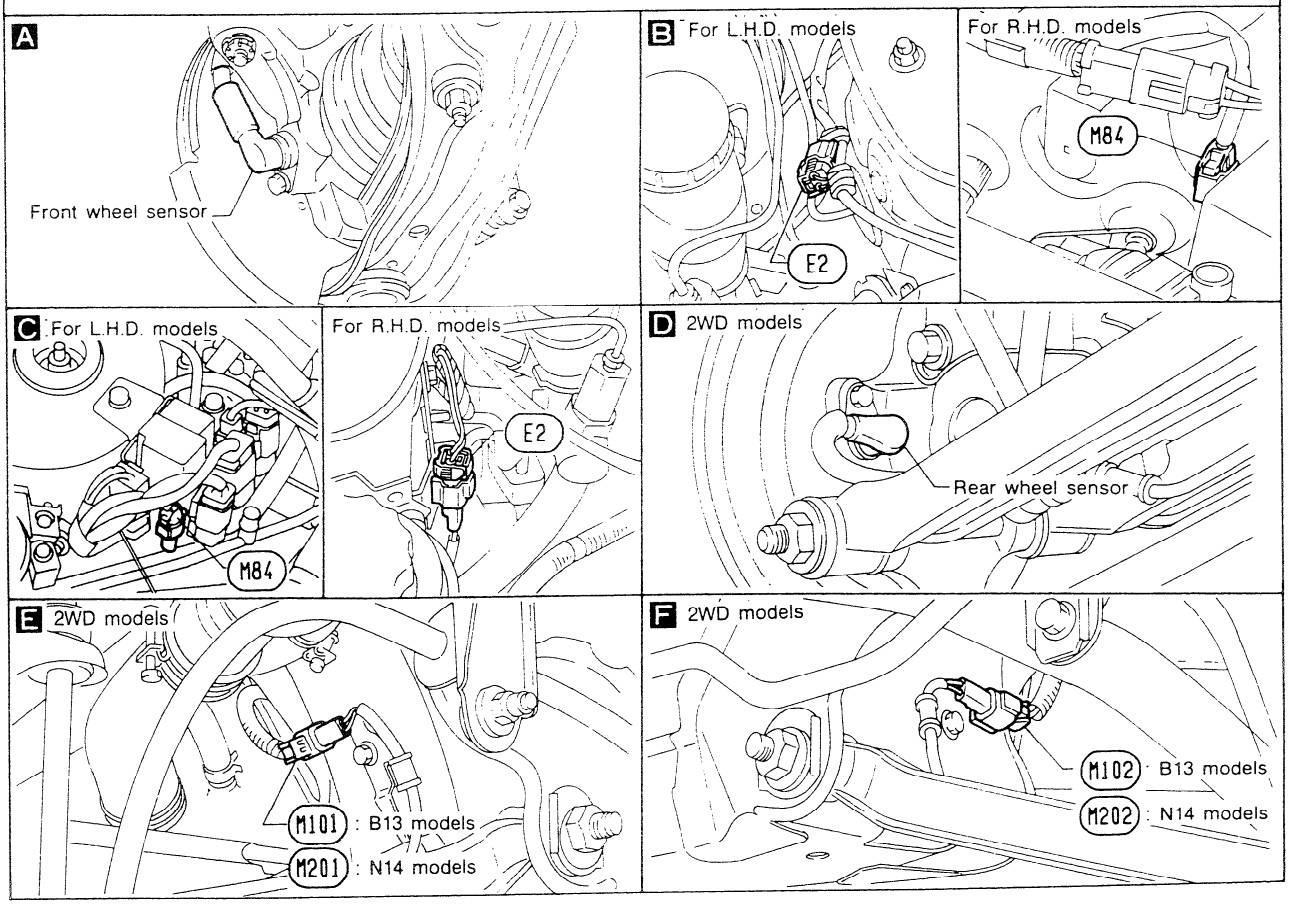
SBR745B

* Turn off the engine, and start it again by slowly turning the ignition key (quickly doing so may cause the ABS warning light to stay on when there is nothing wrong). If the light stays on, carry out the diagnostic procedure.

Component Parts and Harness Connector Location

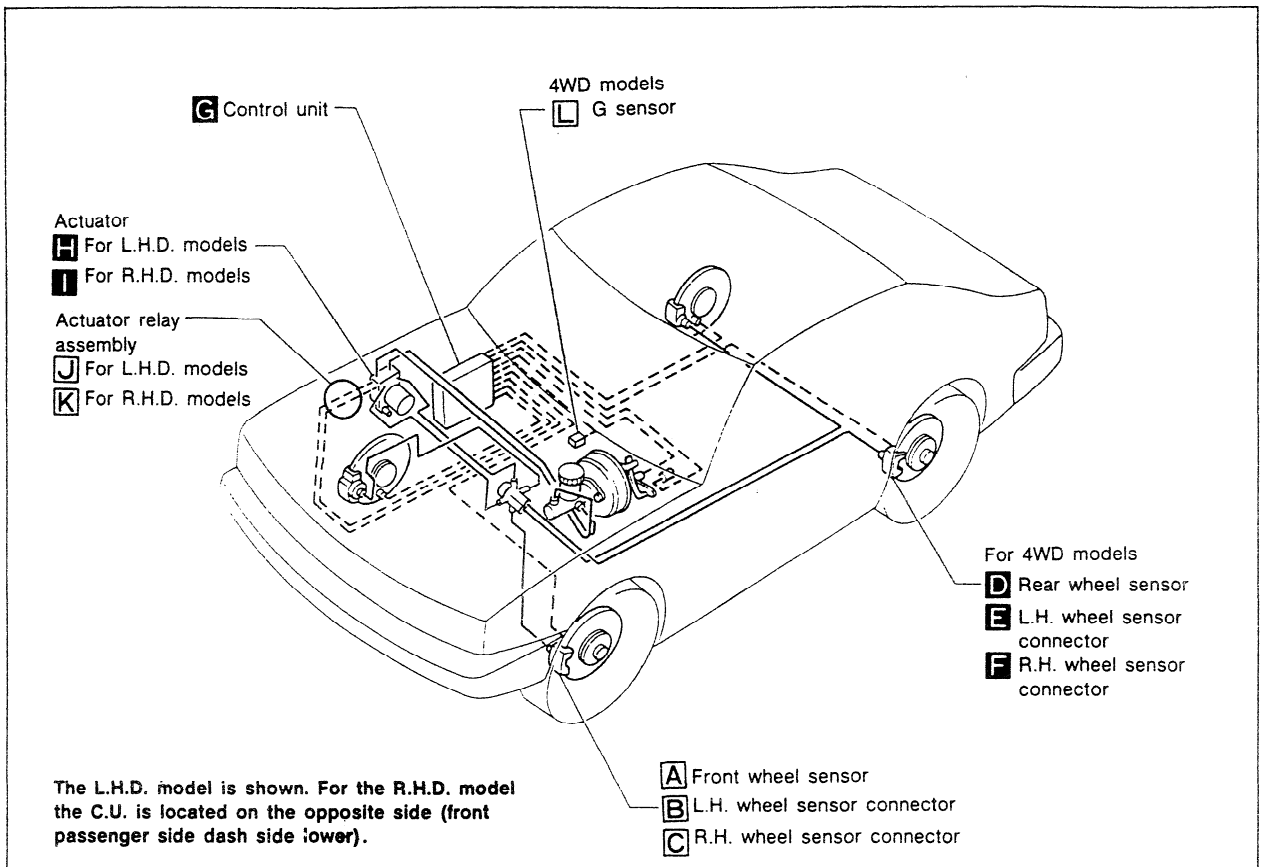


The L.H.D. model is shown. For the R.H.D. model the C.U. is located on the opposite side (front passenger side dash side lower).

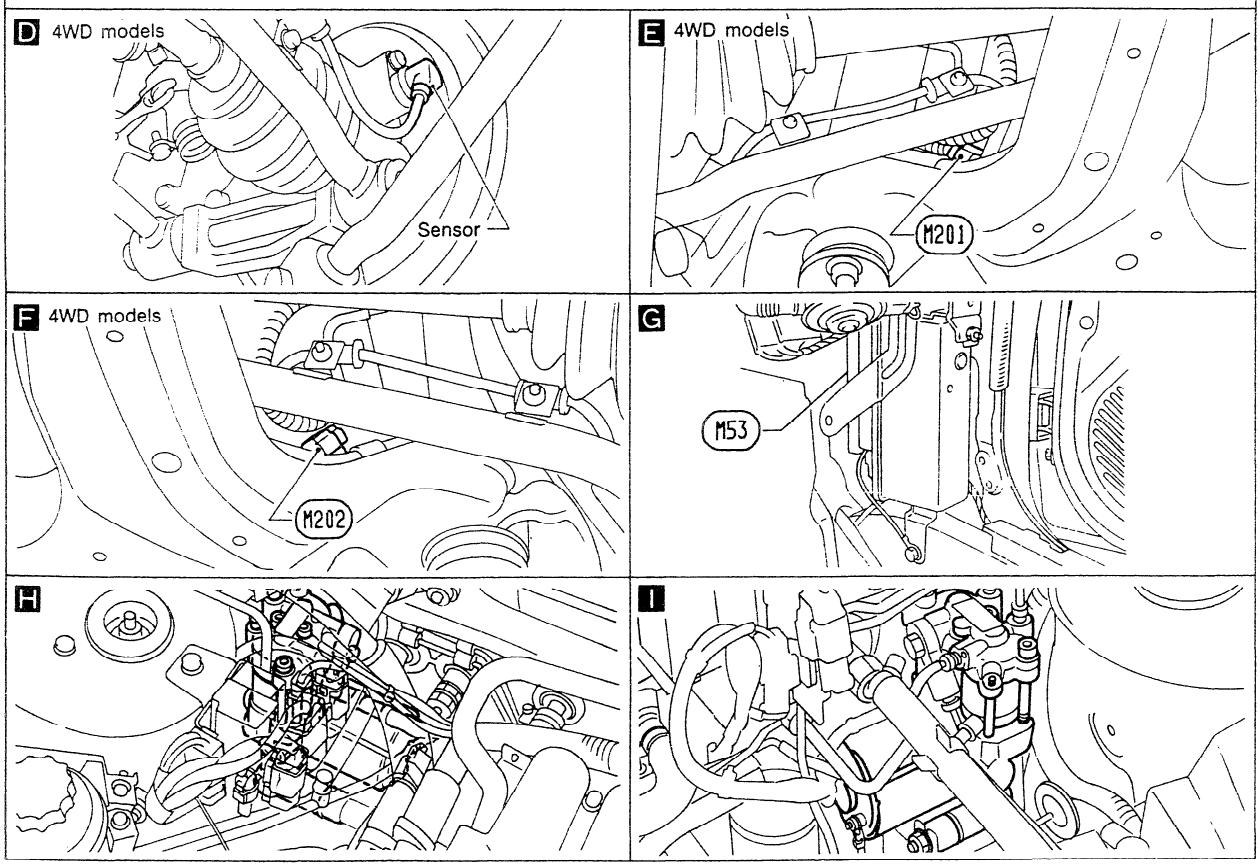


SBR746B

Component Parts and Harness Connector Location (Cont'd)

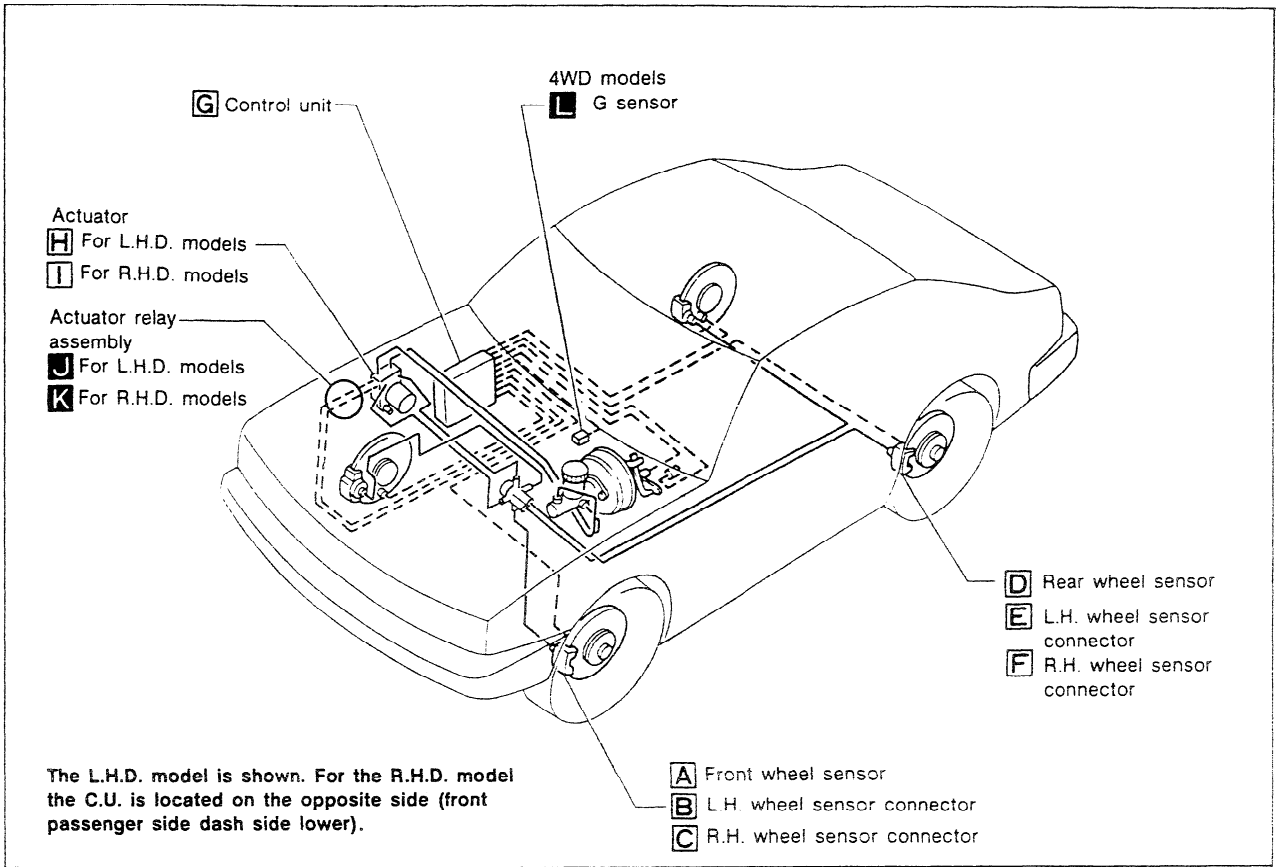


The L.H.D. model is shown. For the R.H.D. model the C.U. is located on the opposite side (front passenger side dash side lower).

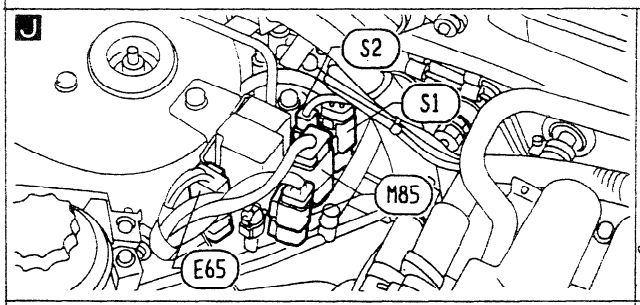


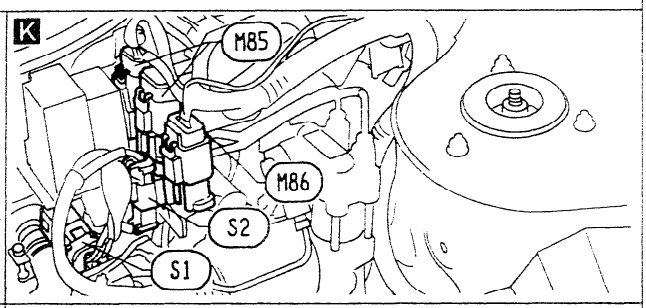
SBR747B

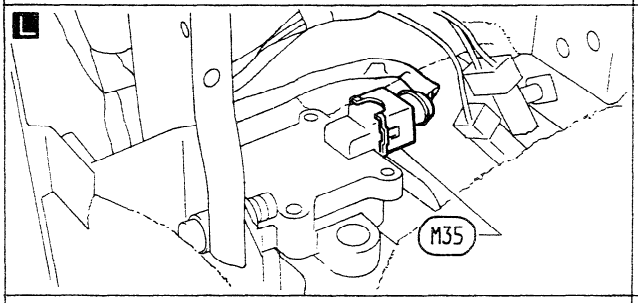
Component Parts and Harness Connector Location (Cont'd)



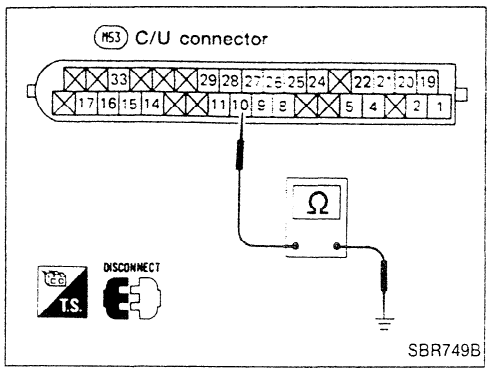
The L.H.D. model is shown. For the R.H.D. model the C.U. is located on the opposite side (front passenger side dash side lower).







SBR748B



Ground Circuit Check

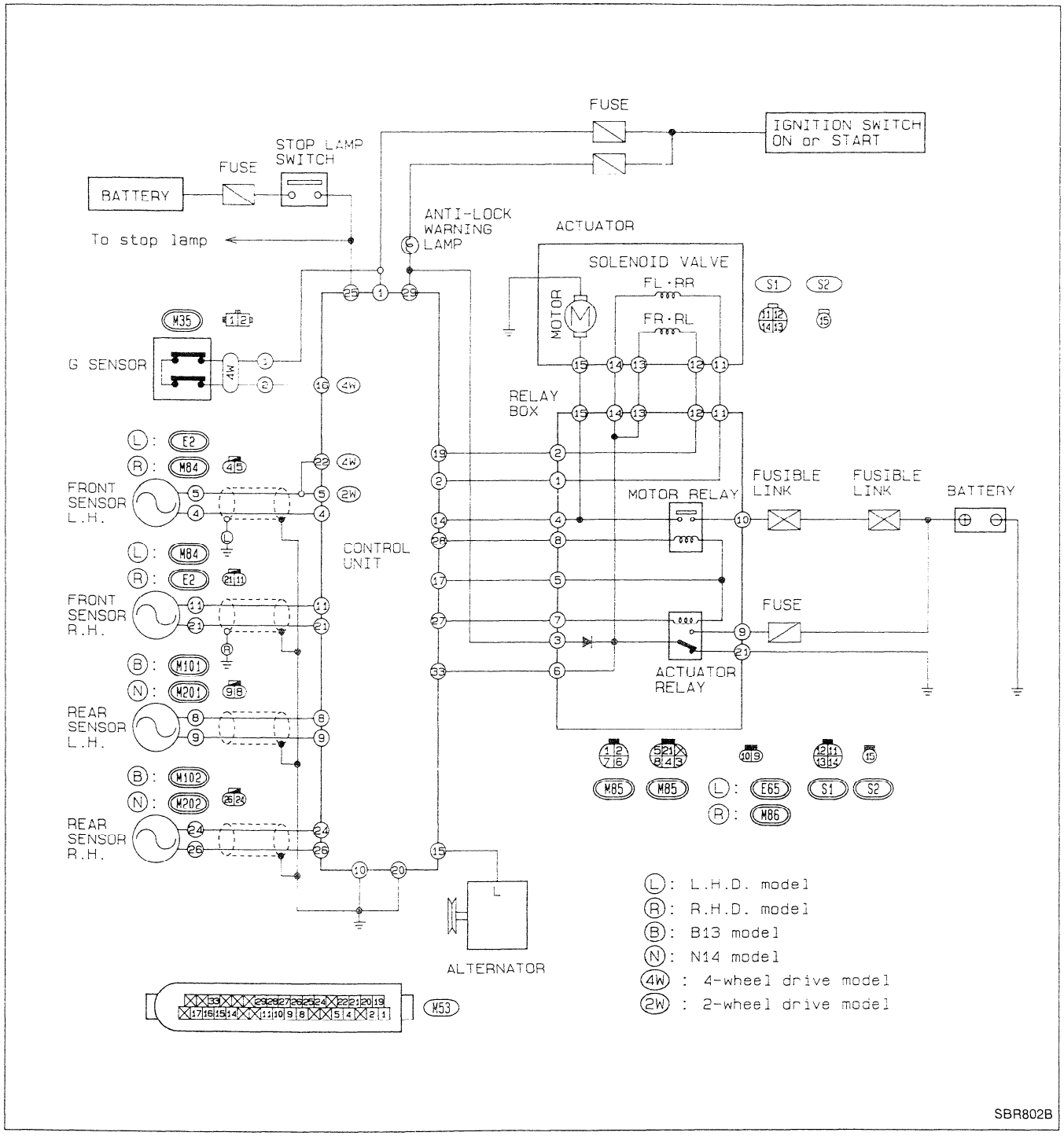
CONTROL UNIT GROUND CIRCUIT

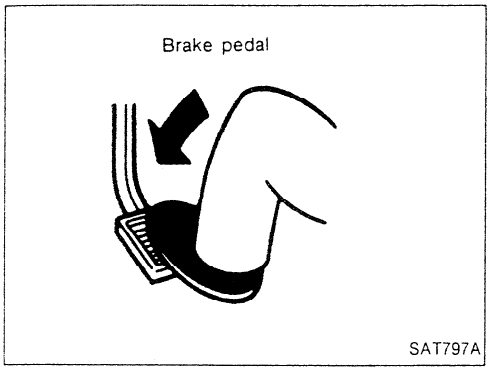
- Check continuity between control unit connector terminal ⑩ and ground.

Continuity should exist.

Circuit Diagram for Quick Pinpoint Check

- The unit side connectors with a double circle "◯" are connected to the harness side connectors shown in the "Component Parts and Harness Connector Location". (See page BR-80.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle " ○ ".





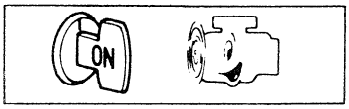
Diagnostic Procedure 1

SYMPTOM: Pedal vibration and noise

Refer to worksheet result.

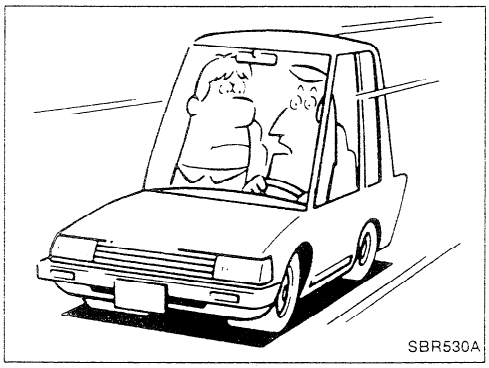
Check whether the symptom appears only when brake is applied suddenly.
- Yes → When brake is suddenly applied, A.B.S. works and produces pedal vibration or noise.
- No ↓

Check whether the symptom appears only when engine is started.

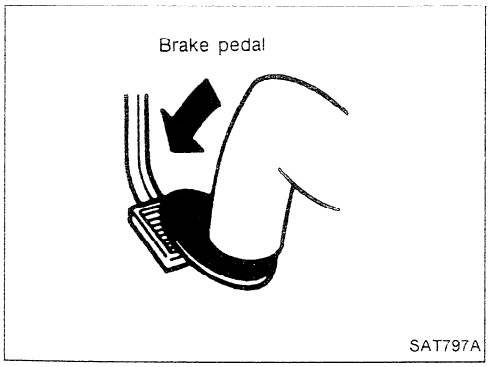


- Yes → Carry out self-diagnosis (See page BR-79.)
- No ↓

Check whether the symptom appears only when the vehicle speed is within 10 km/h (6 MPH) after starting engine.
- Yes → Check whether the symptom disappears within 5 seconds.
  - No → Ⓐ
  - Yes → A.B.S. may sometimes operate when load is high and voltage is low due to insufficient alternator output.
- No ↓

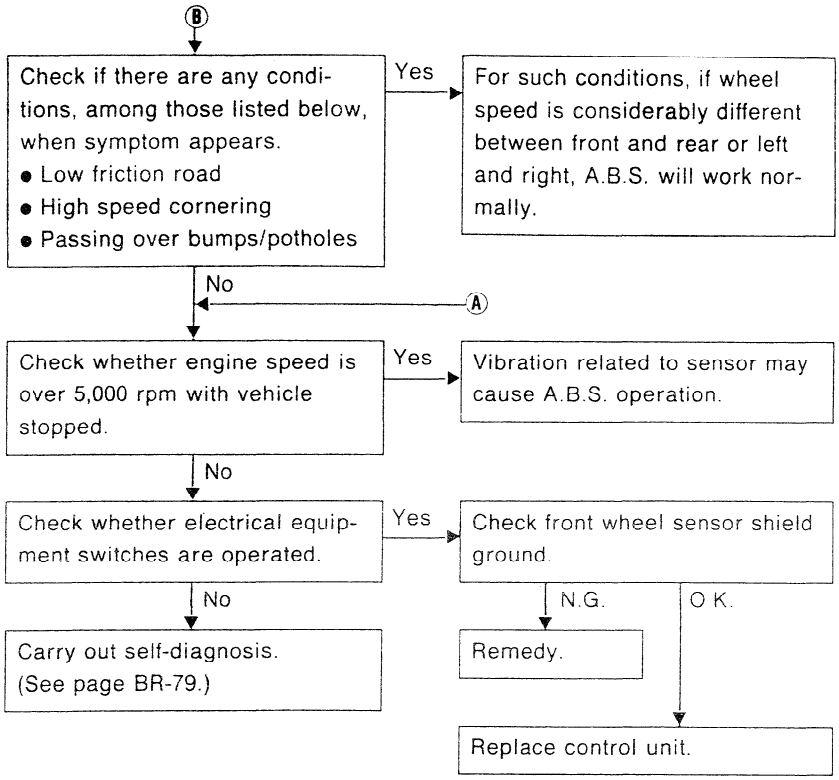


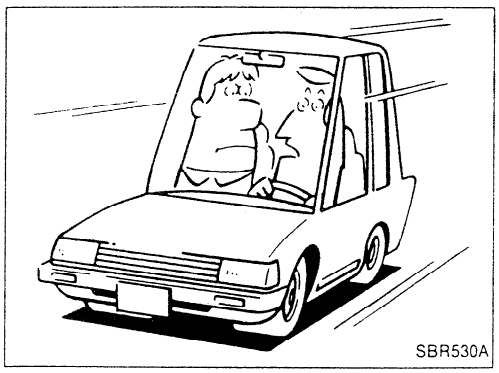
Check whether the symptom appears while the vehicle is being driven.
- No → Ⓐ
- Yes ↓



Check whether the symptom appears when brake is applied gradually.
- No (Appears when brake is not applied.) → Check if there are any conditions, among those listed below, when symptom appears.
  - Shifting
  - Operating clutch
  - Passing over bumps/potholes
  - No → Ⓐ
  - Yes → Under these conditions individual wheel speed can change suddenly. This may sometimes cause the A.B.S. to operate.
- Yes ↓ Ⓑ

Diagnostic Procedure 1 (Cont'd)




SBR530A

Diagnostic Procedure 2

SYMPTOM: Long stopping distance

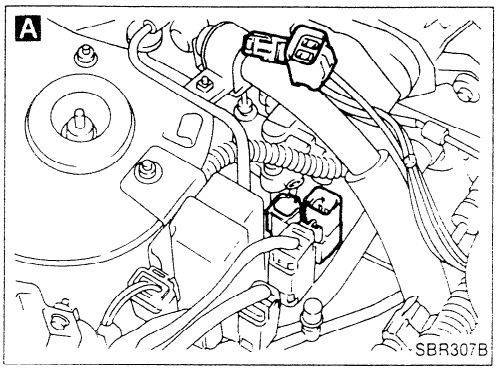
Refer to worksheet results.

Check if road condition is slippery with snow or gravel.
- Yes → Stopping distance may be longer than vehicles which are not equipped with A.B.S.
- No ↓

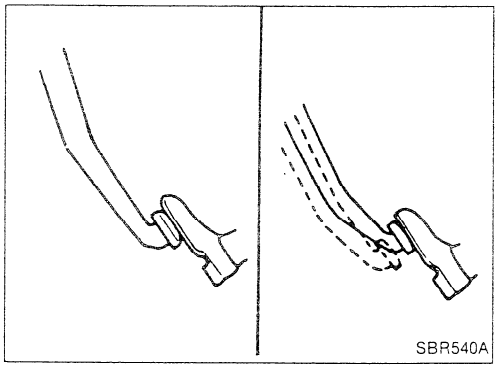
A

Disconnect actuator connector and check whether stopping distance is still long.
- No → Carry out self-diagnosis. (See page BR-79.)
- Yes ↓

Perform Preliminary Check and air bleeding.



SBR307B


SBR540A

Diagnostic Procedure 3

SYMPTOM: Unexpected pedal action

Refer to worksheet results.

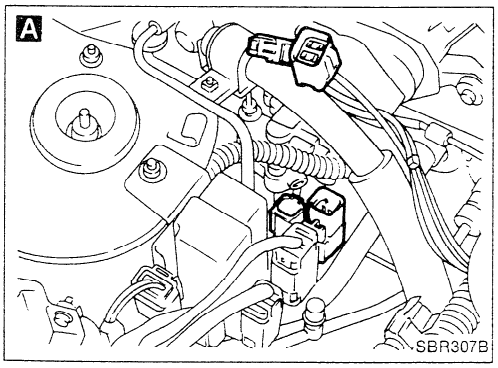
Check whether brake pedal stroke is large.
- Yes → Vehicle equipped with A.B.S. may have a tendency for large pedal strokes.
- No ↓

Check that brake pedal force is firm but brake is effective.
- Yes → Normal condition.
- No ↓

A

Disconnect actuator connector and check whether brake is effective.
- Yes → Carry out self-diagnosis. (See page BR-79.)
- No ↓

Perform Preliminary Check. (See page BR-78.)

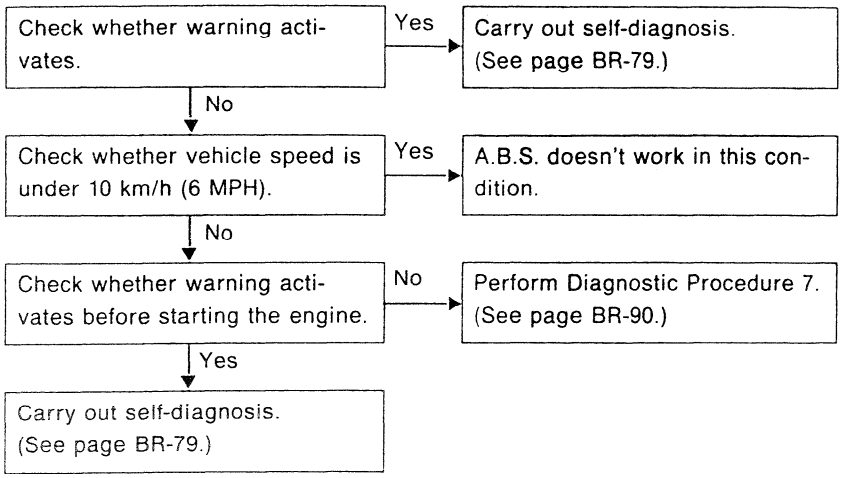


SBR307B

Diagnostic Procedure 4

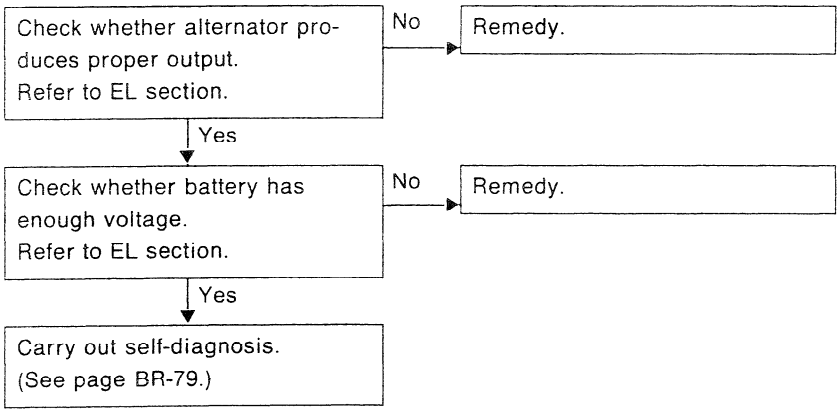
SYMPTOM: A.B.S. doesn't work.

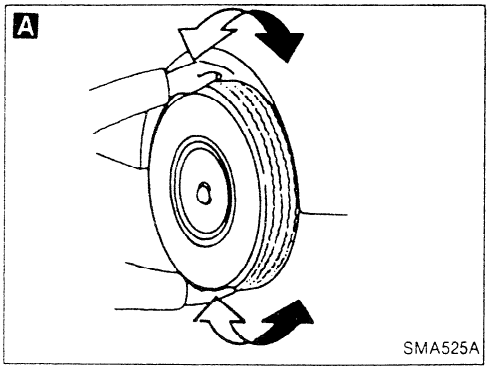
Refer to worksheet results.



Diagnostic Procedure 5

SYMPTOM: A.B.S. works but warning activates.





Diagnostic Procedure 6

SYMPTOM: A.B.S. works frequently.

CHECK BRAKE FLUID PRESSURE.
Check whether brake fluid pressure distribution is normal.
For details, refer to "CONTROL VALVE".

No → Perform Preliminary Check.

Yes ↓

A

Check whether front axles have excessive looseness.

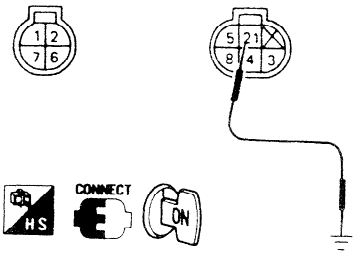
Yes → Remedy.

No ↓

Perform Diagnostic Procedure 13 and Ground Circuit Check.
(See pages BR-97 and 83.)

A

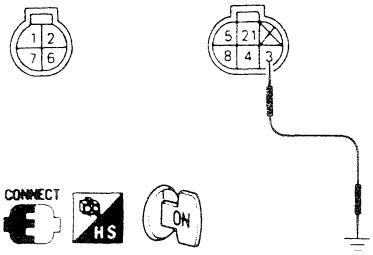
(M85) Actuator relay connector



SBR308B

B

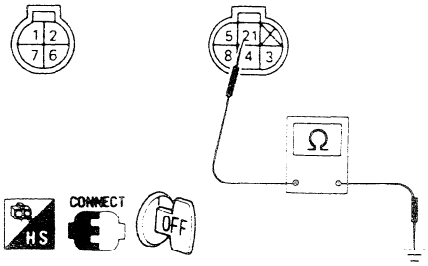
(M85) Actuator relay connector



SBR309B

C

(M85) Actuator relay connector



SBR310B

Diagnostic Procedure 7

SYMPTOM: Warning never activates.

INSPECTION START

A

Check warning by grounding actuator relay connector terminal (21).
Warning should activate.

O.K. → Ⓐ (See below.)

N.G.

B

Check warning by grounding actuator relay connector terminal (3).
Warning should activate.

N.G. → Check bulb or repair harness.

O.K.

Check solenoid valve relay.
Refer to "SOLENOID VALVE RELAY" in "Electrical Components Inspection".
(See page BR-99.)

O.K. → Replace actuator relay box.

N.G.

Replace solenoid valve relay.

Ⓐ

C

Check continuity between actuator relay connector terminal (21) and ground.
Continuity should exist.

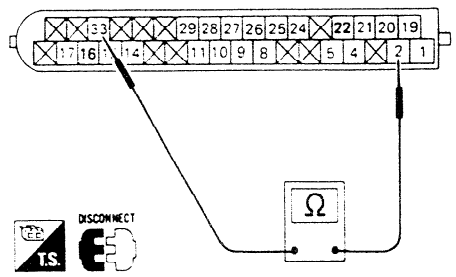
N.G. → Repair harness.

O.K.

Repair harness between control unit connector terminal (29) and actuator relay connector terminal (3).

A

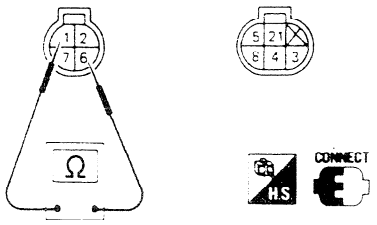
M53 C/U connector



SBR750B

B

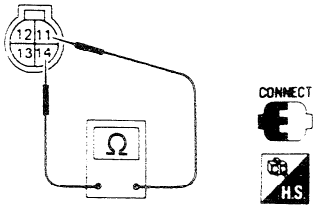
M45 Actuator relay connector



SBR312B

C

S1 Actuator connector



SBR313B

Diagnostic Procedure 8

ACTUATOR SOLENOID (L.E.D. flashing number 1 - 3)

INSPECTION START
Remove battery negative terminal connector.

A

CHECK SOLENOID VALVE RESISTANCE.
Check resistance between control unit connector (vehicle side) terminals.
Flashing number 1:
Terminals ㉝ and ②
Flashing number 2:
Terminals ㉝ and ⑲
Flashing number 3:
Terminals ㉝ and ②
Terminals ㉝ and ⑲
Resistance: Approx. 3Ω

O.K. → Replace control unit.

N.G. ↓

B

Check resistance between actuator relay connector terminals.
Flashing number 1:
Terminals ⑥ and ①
Flashing number 2:
Terminals ⑥ and ②
Flashing number 3:
Terminals ⑥ and ①
Terminals ⑥ and ②
Resistance: Approx. 3Ω

O.K. → Repair harness between actuator relay connector and control unit connector.

N.G. ↓

C

Check resistance between actuator relay connector terminals.
Flashing number 1:
Terminals ⑪ and ⑭
Flashing number 2:
Terminals ⑫ and ⑬
Flashing number 3:
Terminals ⑪ and ⑭
Terminals ⑫ and ⑬
Resistance: Approx. 3Ω

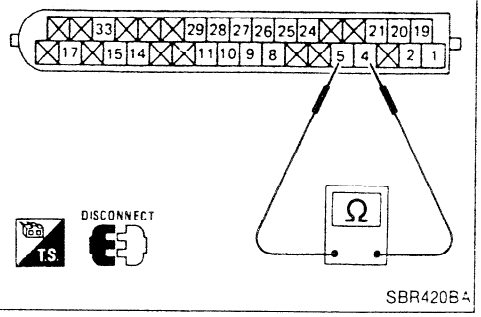
O.K. → Replace actuator relay assembly.

N.G. ↓

Replace actuator.

A

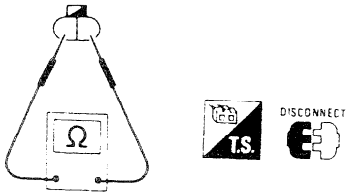
C/U connector



SBR420BA

B

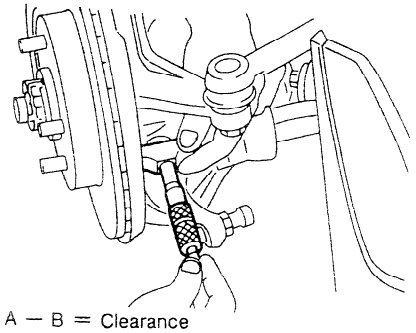
Sensor connector



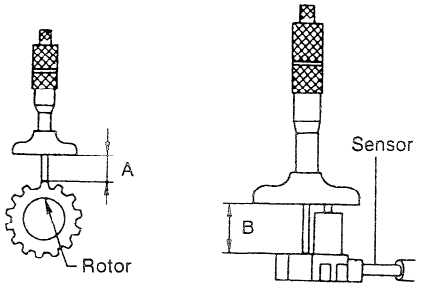
SBR880BA

C

Front sensor



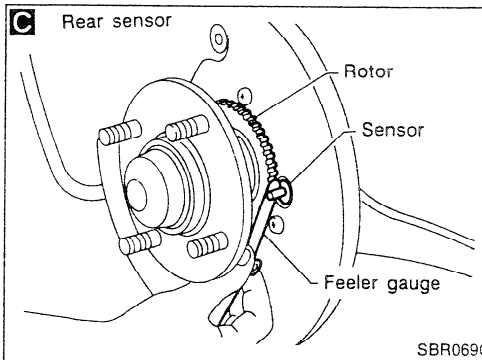
A — B = Clearance



SBR172C

C

Rear sensor



SBR069C

Diagnostic Procedure 9

WHEEL SPEED SENSOR (LED flashing number 5 - 8)

INSPECTION START
Remove battery negative terminal connector.

A

CHECK SPEED SENSOR RESISTANCE.
Check resistance between control unit connector (vehicle side) terminals as shown.
Flashing number 5 (Fr. LH): 2WD ④ and ⑤
4WD ④ and ㉒
Flashing number 6 (Fr. RH): ⑪ and ㉑
Flashing number 7 (Rr. RH): ㉔ and ㉖
Flashing number 8 (Rr. LH): ⑧ and ⑨
Resistance: 0.8 - 1.3 kΩ

OK → Ⓐ (See below.)

NG

B

Check resistance for sensor.
Resistance: 0.8 - 1.3 kΩ

NG → Replace sensor.

OK

Repair harness between sensor connector and control unit connector.

Ⓐ

Note

WHEEL SENSOR MECHANICAL CHECK

Check for inflation pressure, wear and size of each tire.

NG → Note: Adjust tire pressure or replace tire(s).

OK

Note

Check wheel bearing axial end play.
Refer to FA or RA section ("Front/Rear Wheel Bearing", "ON-VEHICLE SERVICE").

NG → Note: Follow the direction in FA or RA section ("Front/Rear Wheel Bearing", "ON-VEHICLE SERVICE").

OK

C Note

Check clearance between sensor and rotor.
Clearance: 0.1 - 1.1 mm (0.004 - 0.043 in)

NG → Note: Clean sensor fixing portion, or replace sensor.

OK

Note

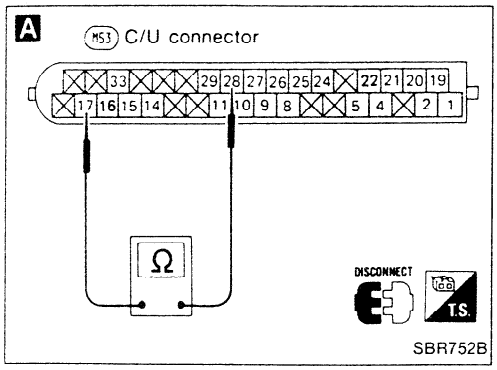
Check sensor rotor for teeth damage.

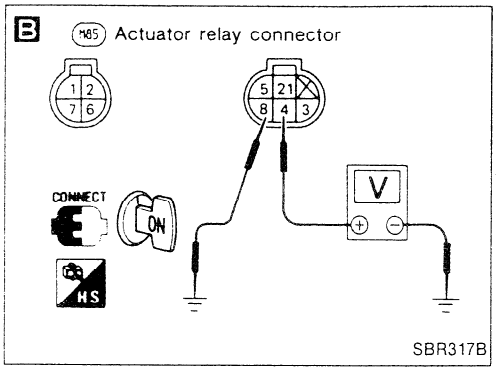
NG → Note: Replace sensor rotor (with drive shaft, wheel hub).

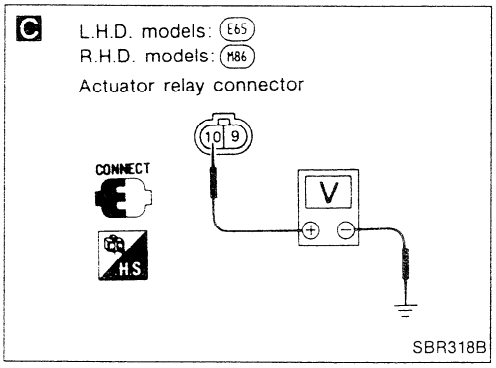
OK

Replace control module.

Note: Wheel position should be distinguished by code No.







Diagnostic Procedure 10

ACTUATOR MOTOR RELAY (L.E.D. flashing number 9)

INSPECTION START

A

CHECK MOTOR RELAY SOLENOID RESISTANCE.
Check resistance between control unit connector (vehicle side) terminals ⑰ and ㉘.
Resistance: 33 - 60Ω

N.G. → Ⓐ (See next page.)

O.K. ↓

B

- Connect harness connector to control unit.
- Check voltage between actuator relay connector terminal ④ and ground by grounding actuator relay connector terminal ⑧.
  Voltage: Battery voltage
- At same time, check actuator motor operation.
  Actuator motor should be operated.

O.K. → Repair harness between actuator relay connector terminal ④ and control unit connector terminal ④ or replace control unit.

N.G. ↓

Did battery voltage exist between actuator relay connector terminal ④ and ground?

Yes → Ⓑ (See next page.)

No ↓

C

Check voltage between actuator relay connector terminal ⑩ and ground.
Voltage: Battery voltage

N.G. → Repair harness between actuator relay connector terminal ⑩ and battery. For details, refer to "Power Supply Routing" in section EL.

O.K. ↓

Check motor relay. Refer to "ACTUATOR MOTOR RELAY" in "Electrical Components Inspection".
(See page BR-99.)

N.G. → Replace motor relay.

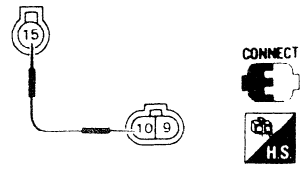
O.K. ↓

Replace actuator relay assembly.

Diagnostic Procedure 10 (Cont'd)

D

(S2) Actuator connector



L.H.D. models: (E65)
R.H.D. models: (M86)
Actuator relay connector

SBR319B

D (B)

Does actuator motor operate with jumper cable between actuator relay connector terminal ⑩ and actuator connector terminal ⑮.

Yes → Replace actuator relay assembly.

No ↓

Check actuator motor ground cable.

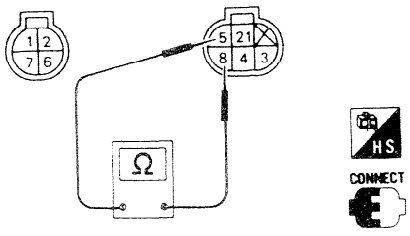
O.K. → Replace actuator.

N.G. ↓

Repair ground cable or tighten grounding portion.

E

(M85) Actuator relay connector



SBR320B

E (A)

Check resistance between actuator relay connector terminals ⑤ and ⑧.
Resistance: 33 - 60Ω

O.K. → Repair harness between control unit connector and actuator relay connector.

N.G. ↓

Check motor relay. Refer to "ACTUATOR MOTOR RELAY" in "Electrical Components Inspection" (See page BR-99).

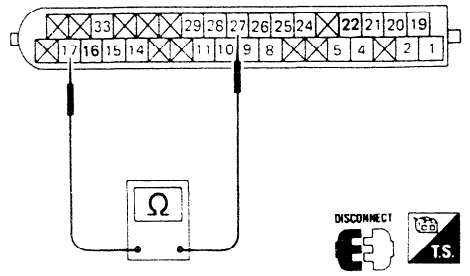
N.G. → Replace motor relay.

O.K. ↓

Replace actuator relay assembly.

A

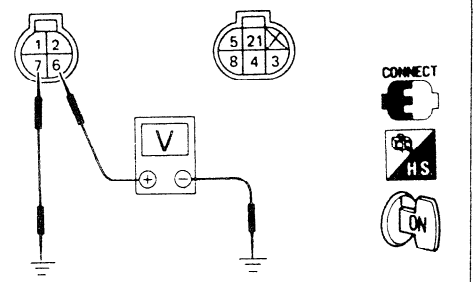
(M53) C/U connector



SBR753B

B

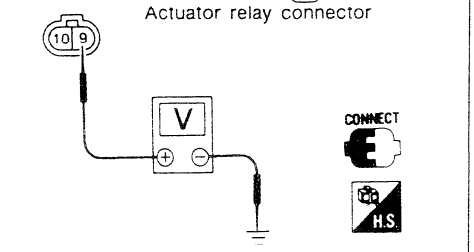
(M85) Actuator relay connector



SBR322B

C

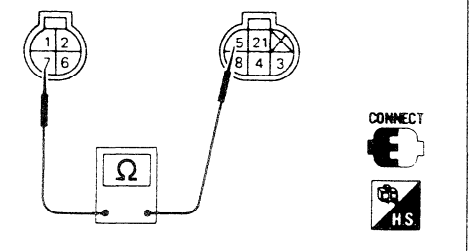
L.H.D. models: (E65)
R.H.D. models: (M86)
Actuator relay connector



SBR323B

D

(M85) Actuator relay connector



SBR324B

Diagnostic Procedure 11

ACTUATOR SOLENOID VALVE RELAY (L.E.D. flashing number 10)

INSPECTION START

A

CHECK SOLENOID VALVE RELAY RESISTANCE.
Check resistance between control unit connector terminals (27) and (17).
Resistance: 75 - 90Ω

N.G. → (A) (See below.)

O.K.

B

- Connect harness connector to control unit.
- Check voltage between actuator relay connector terminal (6) and ground by grounding actuator relay connector terminal (7).

Voltage: Battery voltage

O.K. → Repair harness between actuator relay connector terminal (6) and control unit connector terminal (33) or replace control unit.

N.G.

C

Check voltage between actuator relay connector terminal (9) and ground.
Voltage: Battery voltage

N.G. → Repair harness between actuator connector terminal (9) and battery. For details, refer to "Power Supply Routing" in section EL.

O.K.

Check solenoid valve relay. Refer to "SOLENOID VALVE RELAY" in "Electrical Components Inspection". (See page BR-99).

N.G. → Replace solenoid valve relay.

O.K.

Replace actuator relay assembly.

D

(A)

Check resistance between actuator relay connector terminals (5) and (7).
Resistance: 75 - 90Ω

O.K. → Repair harness between control unit connector and actuator relay connector.

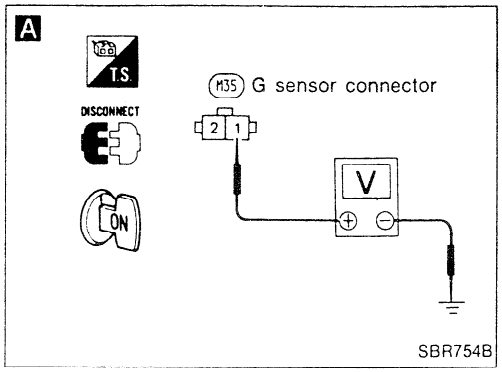
N.G.

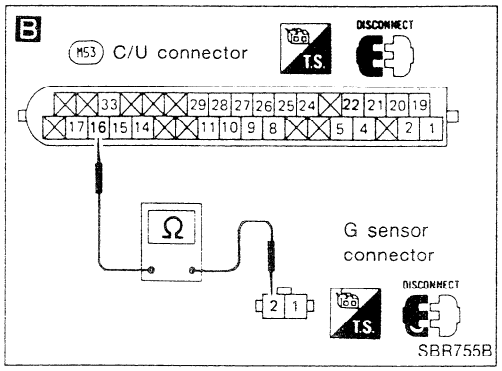
Check solenoid valve relay. Refer to "SOLENOID VALVE RELAY" in "Electrical Components Inspection". (See page BR-99).

O.K. → Replace actuator relay assembly.

N.G.

Replace solenoid valve relay.





Diagnostic Procedure 12

G SENSOR (L.E.D. flashing number 11)

INSPECTION START

Check G sensor. Refer to "G SENSOR" in "Electrical Components Inspection". (See page BR-99.)

N.G. → Replace G sensor.

O.K.

A

Check voltage between G sensor connector terminal ① and ground.
Battery voltage should exist.

N.G. → Repair harness between G sensor connector terminal ① and battery. For details, refer to "Power Supply Routing" in section EL.

O.K.

B

- Disconnect harness connector from control unit.
- Check continuity between control unit connector terminal ⑯ and G sensor connector terminal ②.

Continuity should exist.

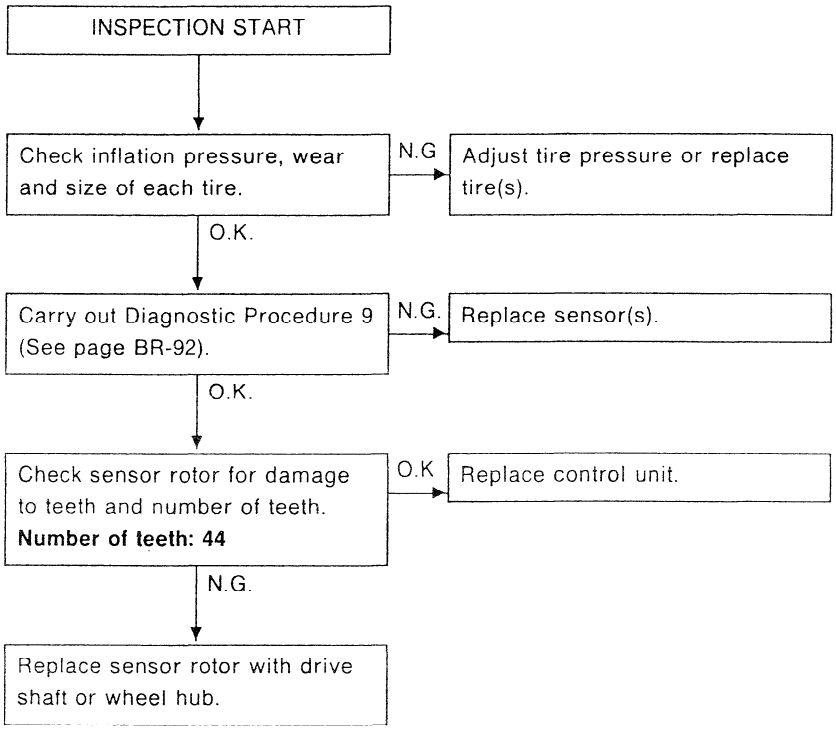
N.G. → Repair harness.

O.K.

Replace control unit.

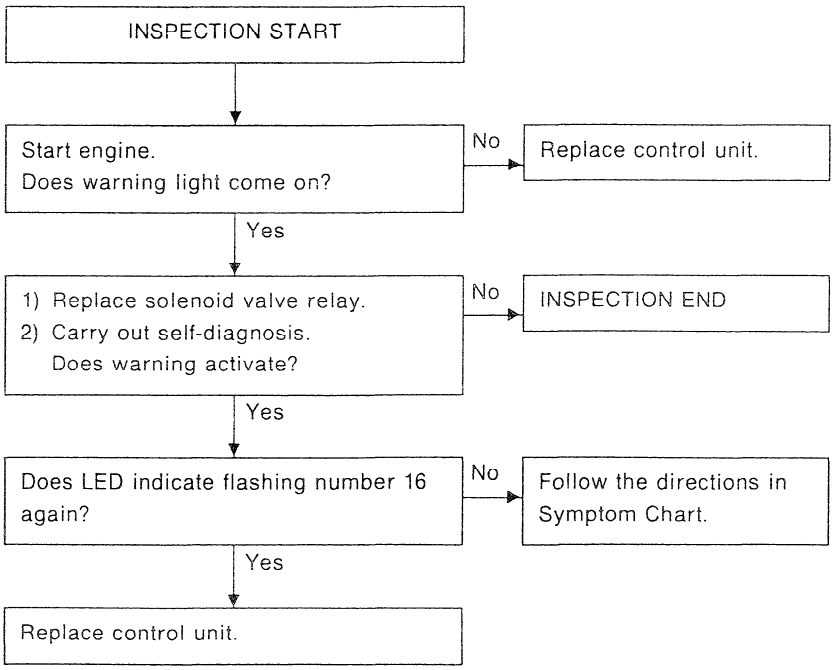
Diagnostic Procedure 13

SENSOR AND SENSOR ROTOR (L.E.D. flashing number 15)



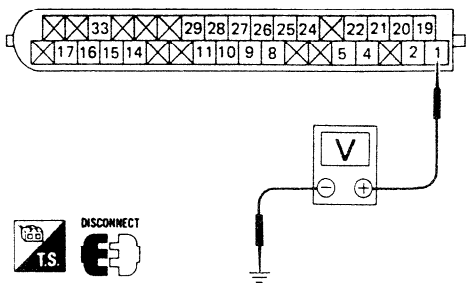
Diagnostic Procedure 14

CONTROL UNIT (L.E.D. flashing number 16)



A

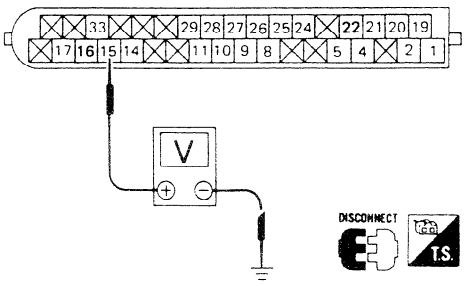
(M53) C/U connector



SBR756B

B

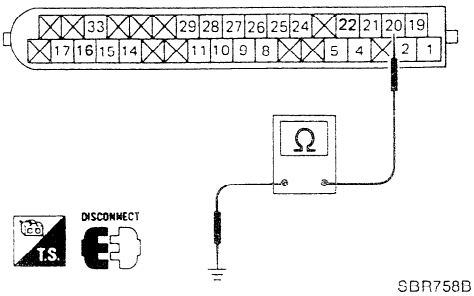
(M53) C/U connector



SBR757B

C

(M53) C/U connector



SBR758B

Diagnostic Procedure 15

CONTROL UNIT OR POWER SUPPLY AND GROUND CIRCUIT (Warning activates but L.E.D. comes off.)

INSPECTION START

A

CHECK CONTROL UNIT POWER SUPPLY.
Disconnect control unit connector.
Check voltage between control unit connector (vehicle side) terminal ① and body ground with ignition switch turned on.
Battery voltage should exist.

N.G. → Repair harness between control unit connector terminal ① and battery. For details, refer to "Power Supply Routing" in section EL.

O.K. ↓

B

CHECK ALTERNATOR L TERMINAL VOLTAGE.
Check voltage between control unit connector (vehicle side) terminal ⑮ and body ground after engine starting.
Voltage: 6V or more

N.G. → Check if other warning activate.

Yes → Repair harness between alternator and control unit.

No → Malfunctioning alternator.

O.K. ↓

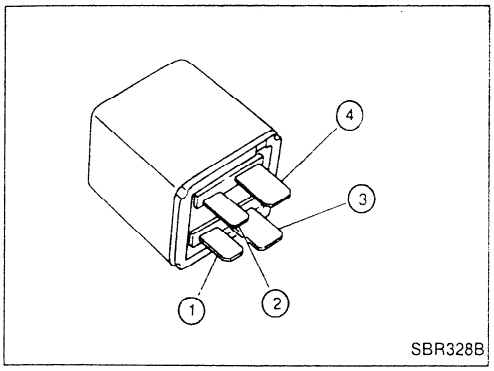
C

Check continuity between control unit connector (vehicle side) terminal ⑳ and body ground with ignition switch "OFF".

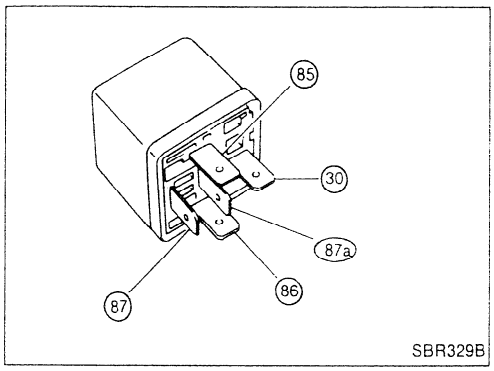
N.G. → Repair ground harness

O.K. ↓

Replace control unit



SBR328B



SBR329B

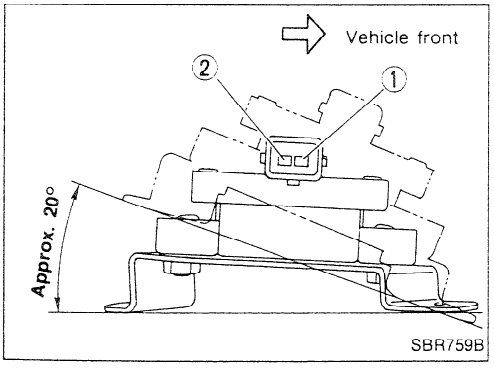
Electrical Components Inspection

ACTUATOR MOTOR RELAY

Condition	Continuity existence between terminals ③ and ④
Battery voltage not applied between terminals ① and ②.	No
Battery voltage applied between terminals ① and ②.	Yes

SOLENOID VALVE RELAY

Condition	Continuity existence between terminals ㉚ and ㊼	Continuity existence between terminals ㉚ and ㊼
Battery voltage not applied between terminals ㉟ and ㊱.	Yes	No
Battery voltage applied between terminals ㉟ and ㊱.	No	Yes



SBR759B

G SENSOR

Condition	Resistance between terminals ① and ②	Continuity
Installed in vehicle	Less than 100Ω	Yes
Tilted as shown in figure	Over 100 kΩ	No

General Specifications — B13 models

BRAKE UNIT (Except Middle East & Europe)

Applied model		Except GA16D engine models		GA16D engine models	
		Standard	Option	Without A.B.S.	With A.B.S.
Front brake					
Brake model		CL18C		CL18VD	
Cylinder bore diameter	mm (in)	48.1 (1.894)			
Lining length x width x thickness	mm (in)	106 x 43 x 10 (4.17 x 1.69 x 0.39)			
Rotor outer diameter x thickness	mm (in)	240 x 12 (9.45 x 0.47)		240 x 18 (9.45 x 0.71)	
Rear brake					
Brake model		LT18C			AD7HA
Cylinder bore diameter	mm (in)	15.9 (5/8)			30.16 (1.1874)
Lining length x width x thickness	mm (in)	172.8 x 30 x 4 (6.80 x 1.18 x 0.16)			94 x 29 x 10 (3.70 x 1.14 x 0.39)
Drum inner diameter or rotor outer diameter x thickness	mm (in)	180 (7.09)			234 x 7 (9.21 x 0.28)
Master cylinder					
Cylinder bore diameter	mm (in)	19.05 (3/4)			20.64 (13/16)
Control valve		D.P.V.*1			D.P.V.*2
Split point [kPa (bar, kg/cm^2, psi)] x reducing ratio		3,923 (39.2, 40, 569) x 0.2			1,471 (14.7, 15, 213) x 0.2
Brake booster					
Booster model		C180 or S180	C205 or S205		M165T
Diaphragm diameter	mm (in)	180 (7)	205 (8)		Primary: 180 (7) Secondary: 155 (6)
Recommended brake fluid		DOT 3			

*1: Dual proportioning valve built into master cylinder (built-in type)
*2: Dual proportioning valve separated from master cylinder (separated type)

General Specifications — B13 models (Cont'd)

BRAKE UNIT (Middle East & Europe)

Applied model	Middle East			Europe		
	GA14DS	GA16DS			SR20DE	
	Without A.B.S.	With A.B.S.	Without A.B.S.	With A.B.S.	Without A.B.S.	With A.B.S.
Front brake						
Brake model	CL18C	CL18VD			AD22VF	
Cylinder bore diameter mm (in)	48.1 (1.894)				54.0 (2.126)	
Lining length x width x thickness mm (in)	106 x 43 x 10 (4.17 x 1.69 x 0.39)				106.8 x 41.8 x 10 (4.20 x 1.646 x 0.39)	
Rotor outer diameter mm (in)	240 x 12 (9.45 x 0.47)	240 x 18 (9.45 x 0.71)			257 x 26 (10.12 x 1.02)	
Rear brake						
Brake model	LT18C	AD7HA	LT18C	AD7HA	CL9HA	
Cylinder bore diameter mm (in)	15.9 (5/8)	30.16 (1.1874)	15.9 (5/8)	30.16 (1.1874)	33.96 (1.3370)	
Lining length x width x thickness mm (in)	172.8 x 30 x 4 (6.80 x 1.18 x 0.16)	94 x 29 x 10 (3.70 x 1.14 x 0.39)	172.8 x 30 x 4 (6.80 x 1.18 x 0.16)	94 x 29 x 10 (3.70 x 1.14 x 0.39)	89.1 x 39.5 x 10 (3.508 x 1.555 x 0.39)	
Drum inner diameter or rotor outer diameter x thickness mm (in)	180 (7.09)	234 x 7 (9.21 x 0.28)	180 (7.09)	234 x 7 (9.21 x 0.28)	258 x 9 (10.16 x 0.35)	
Master cylinder						
Cylinder bore diameter mm (in)	19.05 (3/4)	20.64 (13/16)			22.22 (7/8)	
Control valve	D.P.V*1	D.P.V*2	R.H.D.: D.P.V.*2 L.H.D.: D.P.V.*1	Twin load sensing valve		
Split point [kPa (bar, kg/cm², psi)] x reducing ratio	3,923 (39.2, 40, 569) x 0.2	1,471 (14.7, 15, 213) x 0.2	3,432 (34.3, 35, 498) x 0.2	Variable		
Brake booster						
Booster model	C205 or S205	M165T		M195T		
Diaphragm diameter mm (in)	205 (8)	Primary: 180 (7) Secondary: 155 (6)		Primary: 205 (8) Secondary: 180 (7)		
Recommended brake fluid	DOT 3					

*1: Dual proportioning valve built into master cylinder (built-in type)
*2: Dual proportioning valve separated from master cylinder (separated type)

General Specifications — N14 models

BRAKE UNIT (Except Europe)

Applied model	2WD		
	GA14DS	GA16DE	
	Without A.B.S		With A.B.S.
Front brake			
Brake model	CL18C	CL18VD	
Cylinder bore diameter mm (in)	48.1 (1.894)		
Lining length x width x thickness mm (in)	106 x 43 x 10 (4.17 x 1.69 x 0.39)		
Rotor outer diameter x thickness mm (in)	240 x 12 (9.45 x 0.47)	240 x 18 (9.45 x 0.71)	
Rear brake			
Brake model	LT18C		AD7HA
Cylinder bore diameter mm (in)	15.9 (5/8)		30.16 (1.1874)
Lining length x width x thickness mm (in)	172.8 x 30 x 4 (6.80 x 1.18 x 0.16)		94 x 29 x 10 (3.70 x 1.14 x 0.39)
Drum inner diameter or rotor outer diameter x thickness mm (in)	180 (7.09)		234 x 7 (9.21 x 0.28)
Master cylinder			
Cylinder bore diameter mm (in)	19.05 (3/4)	20.64 (13/16)	
Control valve	D.P.V.*1	D.P.V.*2	
Split point [kPa (bar, kg/cm^2, psi)] x reducing ratio	3,923 (39.2, 40, 569) x 0.2		1,471 (14.7, 15, 213) x 0.2
Brake booster			
Booster model	C205 or S205	M165T	
Diaphragm diameter mm (in)	205 (8)	Primary: 180 (7) Secondary: 155 (6)	
Recommended brake fluid	DOT 3		

*1: Dual proportioning valve built into master cylinder (built-in type)
*2: Dual proportioning valve separated from master cylinder (separated type)

General Specifications — N14 models (Cont'd)

N14 MODELS

BRAKE UNIT (Europe)

Applied model	2WD			4WD			
	GA14, 16DS CD20	GA16DS	SR20DE	GA16DS		SR20DET	
	Without A.B.S.	With A.B.S.		Without A.B.S.	With A.B.S.	Without A.B.S.	With A.B.S.
Front brake							
Brake model	CL18VD		AD22VF	CL18VD		AD22VF	
Cylinder bore diameter mm (in)	48.1 (1.894)		54.0 (2.126)	48.1 (1.894)		54.0 (2.126)	
Lining mm (in) length x width x thickness	106 x 43 x 10 (4.17 x 1.69 x 0.39)		106.8 x 41.8 x 10 (4.20 x 1.646 x 0.39)	106 x 43 x 10 (4.17 x 1.69 x 0.39)		106.8 x 41.8 x 10 (4.20 x 1.646 x 0.39)	
Rotor outer diameter mm (in)	240 x 18 (9.45 x 0.71)		257 x 26 (10.12 x 1.02)	240 x 18 (9.45 x 0.71)		257 x 26 (10.12 x 1.02)	
Rear brake							
Brake model	LT18C	AD7HA	CL9HA	LT23B	AD7HA	CL9HA	
Cylinder bore diameter mm (in)	15.9 (5/8)	30.16 (1.1874)	33.96 (1.3370)	15.9 (5/8)	30.16 (1.1874)	33.96 (1.3370)	
Lining mm (in) length x width x thickness	172.8 x 30 x 4 (6.80 x 1.18 x 0.16)	94 x 29 x 10 (3.70 x 1.14 x 0.39)	89.1 x 39.5 x 10 (3.508 x 1.555 x 0.39)	219.4 x 40 x 4.5 (8.64 x 1.57 x 0.177)	94 x 29 x 10 (3.70 x 1.14 x 0.39)	89.1 x 39.5 x 10 (3.508 x 1.555 x 0.39)	
Drum inner diameter or rotor outer diameter x thickness mm (in)	180 (7.09)	234 x 7 (9.21 x 0.28)	258 x 9 (10.16 x 0.35)	228.6 (9)	234 x 7 (9.21 x 0.28)	258 x 9 (10.16 x 0.35)	
Master cylinder							
Cylinder bore diameter mm (in)	20.64 (13/16)		22.22 (7/8)	20.64 (13/16)		23.81 (15/16)	
Control valve	R.H.D.: D.P.V.*2 L.H.D.: D.P.V.*1	Twin load sensing valve		D.P.V.*1	D.P.V.*2	R.H.D.: D.P.V.*2 L.H.D.: D.P.V.*1	D.P.V.*2
Split point [kPa (bar, kg/cm^2, psi)] x reducing ratio	3,432 (34.3, 35, 498) x 0.2	Variable		3,923 (39.2, 40, 569) x 0.2	3,432 (34.3, 35, 498) x 0.2	2,942 (29.4, 30, 427) x 0.4	3,432 (34.3, 35, 498) x 0.1
Brake booster							
Booster model	M165T	M195T					
Diaphragm diameter mm (in)	Primary: 180 (7) Secondary: 155 (6)	Primary: 205 (8) Secondary: 180 (7)					
Recommended brake fluid	DOT 3						

*1: Dual proportioning valve built into master cylinder (built-in type)
*2: Dual proportioning valve separated from master cylinder (separated type)

Inspection and Adjustment

DISC BRAKE

Unit: mm (in)

Brake model	Front			Rear	
	CL18C	CL18VD	AD22VF	AD7HA	CL9HA
Lining wear limit Minimum thickness	2.0 (0.079)				1.5 (0.059)
Rotor repair limit Minimum thickness	10.0 (0.394)	16.0 (0.630)	24.0 (0.945)	6.0 (0.236)	8.0 (0.315)
Maximum runout	0.07 (0.0028)				
Maximum thickness variation	0.02 (0.0008)				

DRUM BRAKE

Unit: mm (in)

Brake model	Rear	
	LT18C	LT23B
Lining wear limit Minimum thickness	1.5 (0.059)	
Drum repair limit Maximum inner diameter	181 (7.13)	230 (9.06)
Out-of-round	0.03 (0.0012)	

BRAKE PEDAL

Unit: mm (in)

	2WD		4WD	
	R.H.D.	L.H.D.	R.H.D.	L.H.D.
Free height				
M/T	155 - 165 (6.10 - 6.50)	148 - 158 (5.83 - 6.22)	158 - 168 (6.22 - 6.61)	157 - 167 (6.18 - 6.57)
A/T	164 - 174 (6.46 - 6.85)	157 - 167 (6.18 - 6.57)	—	—
Depressed height [under force of 490 N (50 kg, 110 lb) with engine running]	See next page.			
Clearance between switches and pedal stopper bracket	0.1 - 0.3 (0.004 - 0.012)			
Pedal free play	1 - 3 (0.04 - 0.12)			

PARKING BRAKE CONTROL

Brake type	Drum	Disc
Control type	Center lever	
Number of notches [under force of 196 N (20 kg, 44 lb)]	5 - 6	7 - 8
Number of notches when warning switch comes on	1 or less	

Inspection and Adjustment (Cont'd)

BRAKE PEDAL

Depressed Height [Under force of 490 N (50 kg, 110 lb) with engine running]

Europe

Unit: mm (in)

Applied model		2WD			4WD		
		Except SR20DE		SR20DE	GA16DS		SR20DET
		Without A.B.S.	With A.B.S.	—	Without A.B.S.	With A.B.S.	—
L.H.D.	M/T	75 (2.95) or more	75 (2.95) or more	90 (3.54) or more	75 (2.95) or more	75 (2.95) or more	85 (3.35) or more
	A/T	75 (2.95) or more	80 (3.15) or more	—	—	—	—
R.H.D.	M/T	80 (3.15) or more	80 (3.15) or more	85 (3.35) or more	—	—	80 (3.15) or more
	A/T	85 (3.35) or more	85 (3.35) or more	—	—	—	—

Except Europe

Unit: mm (in)

Applied model		N14 and B13		N14	B13
		GA16D		GA14D	Others
		Without A.B.S.	With A.B.S.		
L.H.D.	M/T	75 (2.95) or more	75 (2.95) or more	75 (2.95) or more	80 (3.15) or more
	A/T	80 (3.15) or more	85 (3.35) or more	80 (3.15) or more	85 (3.35) or more
R.H.D.	M/T	80 (3.15) or more	80 (3.15) or more	80 (3.15) or more	80 (3.15) or more
	A/T	85 (3.35) or more	85 (3.35) or more	85 (3.35) or more	90 (3.54) or more

STEERING SYSTEM

SECTION ST

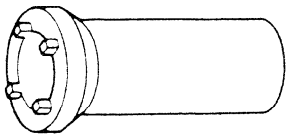
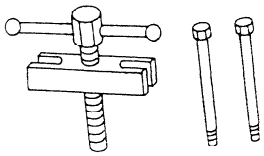
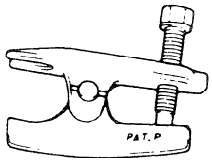
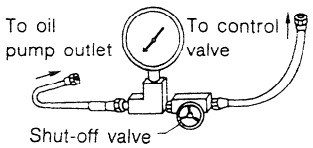
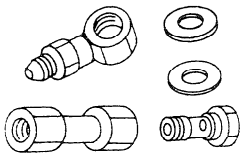
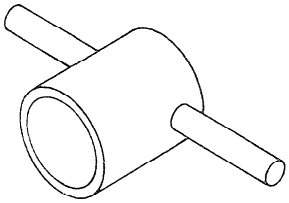
CONTENTS

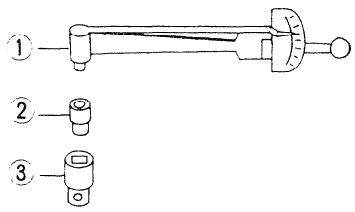
PRECAUTIONS ..... ST- 2
PREPARATION ..... ST- 3
ON-VEHICLE INSPECTION ..... ST- 5
STEERING WHEEL AND STEERING COLUMN ..... ST- 9
MANUAL STEERING GEAR AND LINKAGE (Model R24S and R24N) ST-15
POWER STEERING GEAR AND LINKAGE (Model PR24SC) ST-22
POWER STEERING OIL PUMP ST-34
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ST-37

- The power steering gear and oil pump should be disassembled only when repairing an "oil leak". they should not be disassembled to repair any other steering defect, steering noise, etc.
- 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 in a parts rack so they can be put back in the unit in their proper positions.
- Use a nylon cloth or paper towel for wiping parts clean. Common shop rags can leave lint that might interfere with the operation.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Before assembly, apply a coat of recommended A.T.F.* to hydraulic parts. Vaseline may be applied to O-rings and seals. Do not use any grease.
- Gaskets, seals and O-rings should be replaced. Care should be taken to avoid damaging O-rings, seals and gaskets when assembling. It is also very important to perform functional tests whenever it is designated.

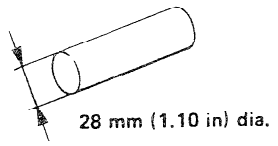
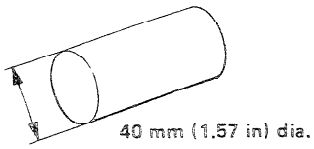
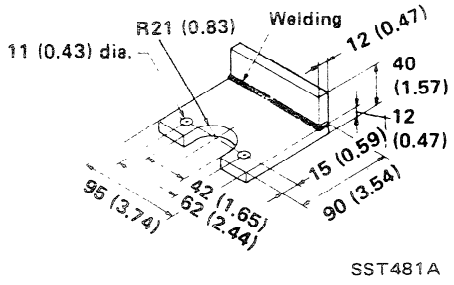
*: Automatic transmission fluid

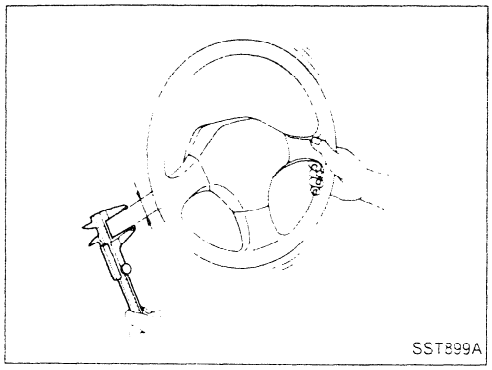
SPECIAL SERVICE TOOLS

Tool number Tool name	Description		Unit application	
			Manual steering	Power steering
KV48102000 End cover socket wrench		Removing and installing rear cover and end cover	X	X
KV48100700 Torque adapter		Measuring pinion rotating torque	—	X
KV48101100 Torque adapter		Measuring pinion rotating torque	X	—
ST27180001 Steering wheel puller		Removing and installing steering wheel	X	X
HT72520000 Ball joint remover		Removing ball joint	X	X
ST27091000 Pressure gauge		Measuring oil pressure	—	X
KV48102500 Pressure gauge adapter		Measuring oil pressure	—	X
KV48104400 Rack seal ring reformer		Reforming teflon ring	—	X

Tool number Tool name	Description	Unit application	
		Manual steering	Power steering
ST3127S000 ① GG91030000 Torque wrench ② HT62940000 Socket adapter ③ HT62900000 Socket adapter	Measuring turning torque 	X	X

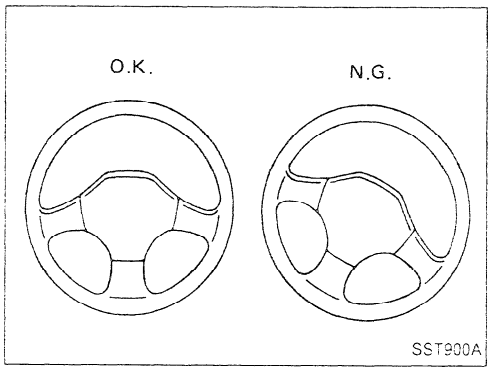
COMMERCIAL SERVICE TOOLS

Tool name	Description	Unit application	
		Manual steering	Power steering
Rear oil seal drift	Installing rear oil seal 	—	X
Pinion oil seal drift	Installing pinion oil seal 	—	X
Oil pump attachment	Disassembling and assembling oil pump  SST481A Unit: mm (in)	— (For oil pump)	— (For oil pump)


SST899A

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.



SST900A

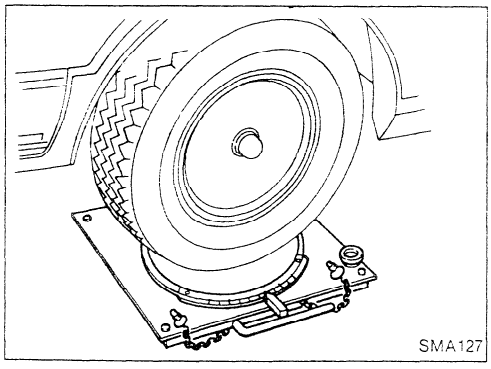
Checking Neutral Position on Steering Wheel

Pre-checking

- Make sure that wheel alignment is correct.
  Wheel alignment:
  Refer to section FA for S.D.S.
- Verify that the steering gear is centered before removing the steering wheel.

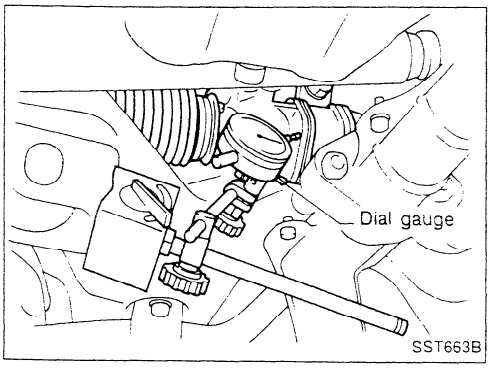
Checking

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.


SMA127

Front Wheel Turning Angle

1. Rotate steering wheel all the way right and left; measure turning angle.
   Turning angle of full turns:
   Refer to section FA for S.D.S.
2. If it is not within specification, check rack stroke.
   Rack stroke "L":
   Refer to S.D.S.



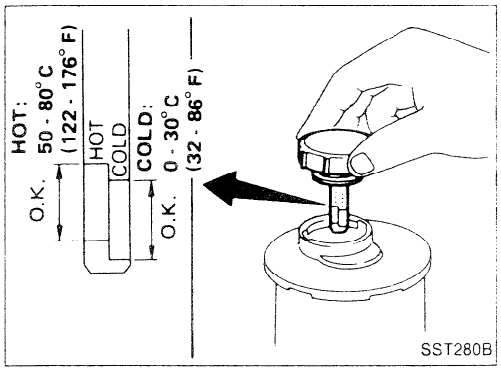
SST663B

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 proper installation of gear housing clamps.

Checking and Adjusting Drive Belts

Refer to section MA for Drive Belt Inspection.



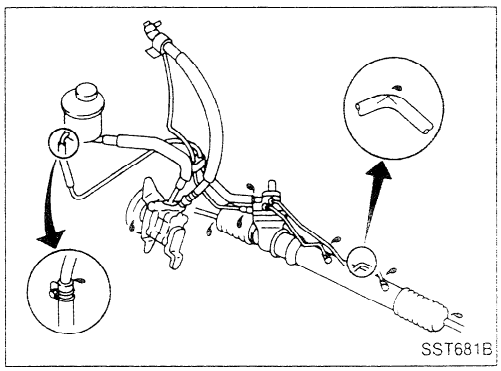
Checking Fluid Level

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 improper attachment and for 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

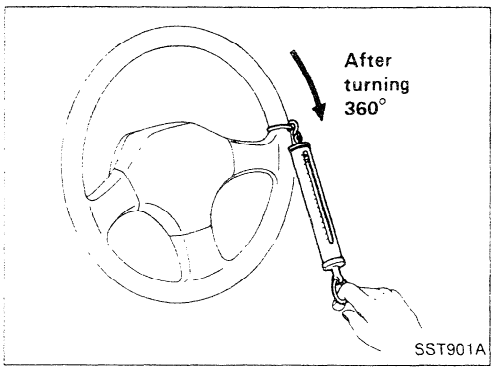
1. Raise front end of vehicle until wheels are clear of the ground.
2. Add fluid into oil tank to specified level. Meanwhile quickly turn steering wheel fully to right and left and lightly touch steering stoppers.
   Repeat steering wheel operation until fluid level no longer decreases.
3. Start engine.
   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.



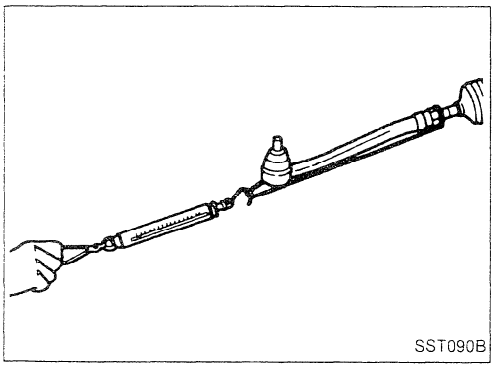
Checking Steering Wheel Turning Force

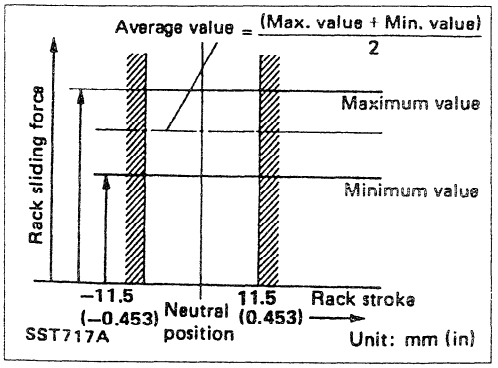
1. Park vehicle on a level, dry surface and set parking brake.
2. Start engine.
3. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F).]

Tires need to be inflated to normal pressure.

4. Check steering wheel turning force when steering wheel has been turned 360° from the neutral position.

Steering wheel turning force:
39 N (4 kg, 9 lb) or less





5. If steering wheel turning force is out of specifications, check rack sliding force to detect condition of steering gear assembly.

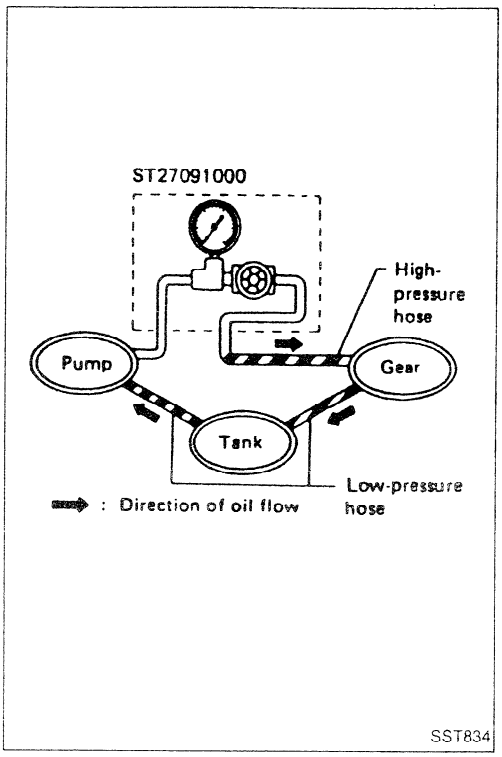
a. Disconnect steering column lower joint and knuckle arms from the gear.
b. Start and run engine at idle to make sure steering fluid has reached normal operating temperature.
c. While pulling tie-rod slowly in the ±11.5 mm (±0.453 in) range from the neutral position, make sure rack sliding force is within specification.

Average rack sliding force:
Less than 226 N (23 kg, 51 lb)

d. Check sliding force outside above range.

Maximum rack sliding force:
Not more than 39 N (4 kg, 9 lb) beyond above value

6. If rack sliding force is not within specification, overhaul 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 60 to 80°C (140 to 176°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.

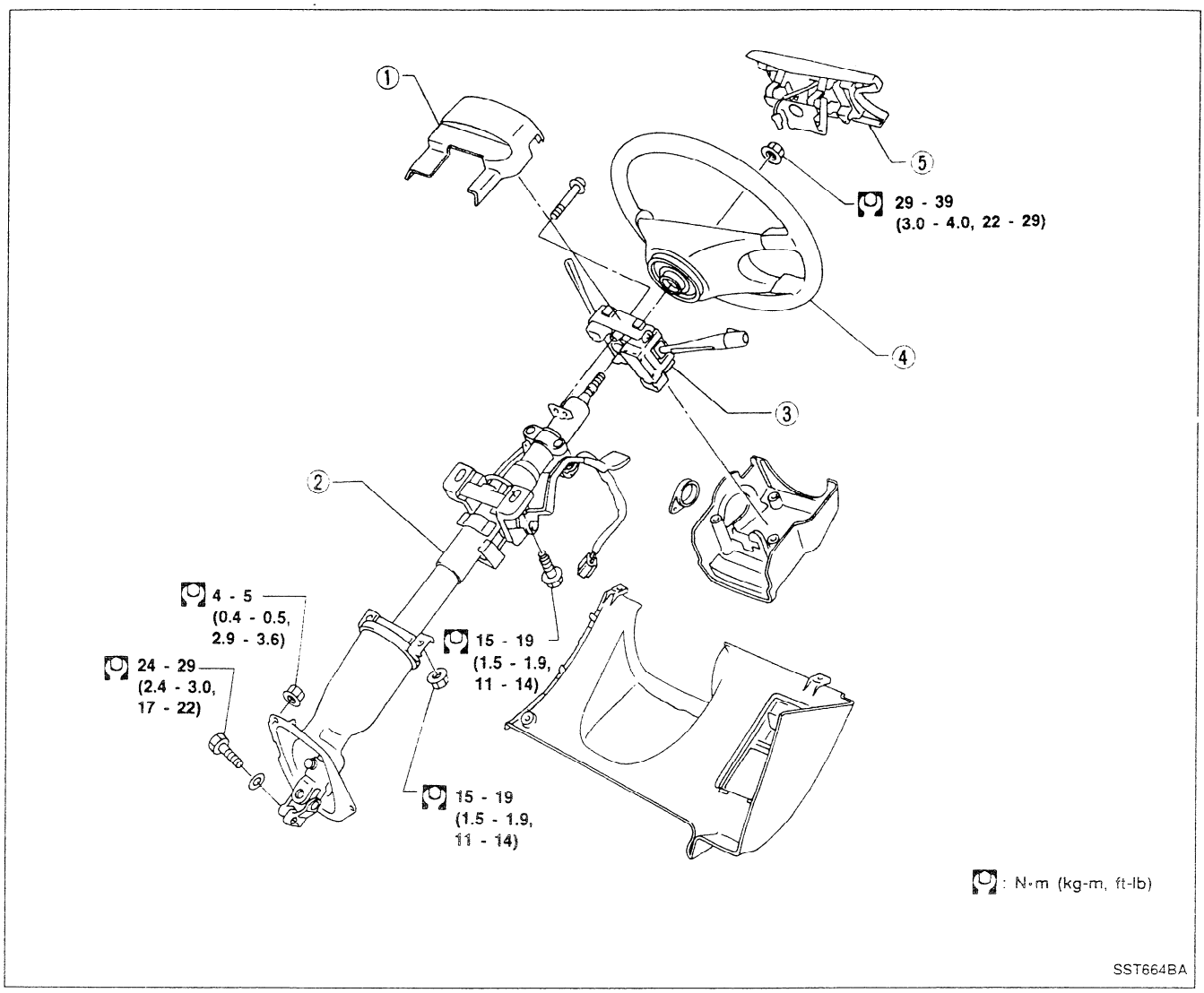
Oil pump maximum standard pressure:
Except CD17 engine
7,649 - 8,238 kPa
(76.5 - 82.4 bar, 78 - 84 kg/cm^2, 1,109 - 1,194 psi)
CD17 engine
6,669 - 7,257 kPa
(66.7 - 72.6 bar, 68 - 74 kg/cm^2, 967 - 1,052 psi)

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.

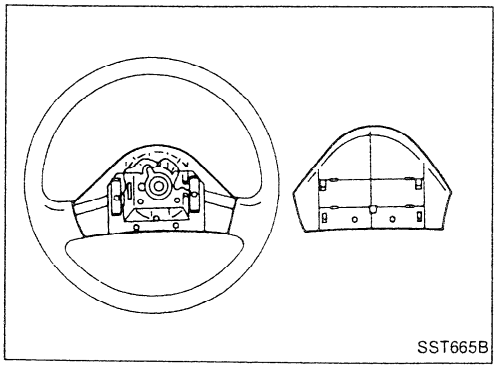
CAUTION:

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.
6. After checking hydraulic system, remove Tool and add fluid as necessary, then completely bleed air out of system.



① Column cover
② Steering column assembly
③ Combination switch
④ Steering wheel
⑤ Horn pad



Removal

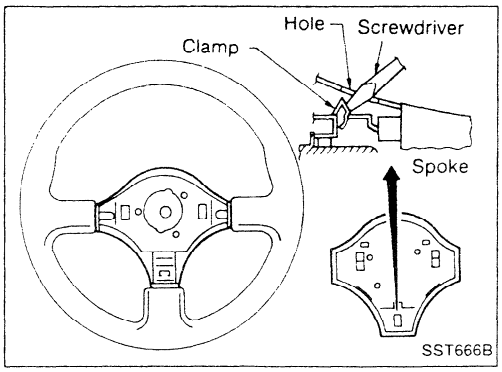
STEERING WHEEL

1. Remove horn pad.

— Two spoke type —

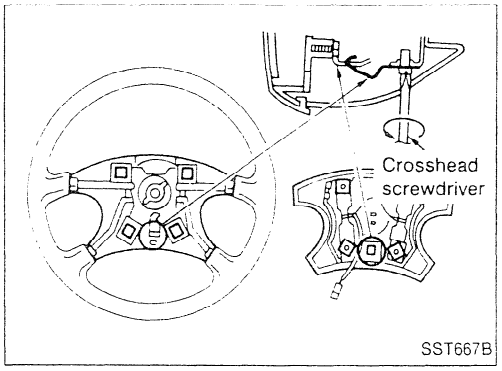
- Horn pad is installed using pawls (plastic) and clamps. To remove horn pad, pry pawls by hand and push clamps with a standard screwdriver inserted between pad and steering wheel.

Removal (Cont'd)



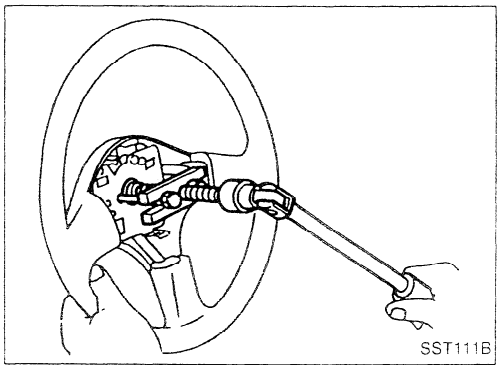
— Three spoke type —

- Horn pad is installed using three clamps. To remove horn pad, insert a standard screwdriver into hole on back of lower spoke and pry clamps up.

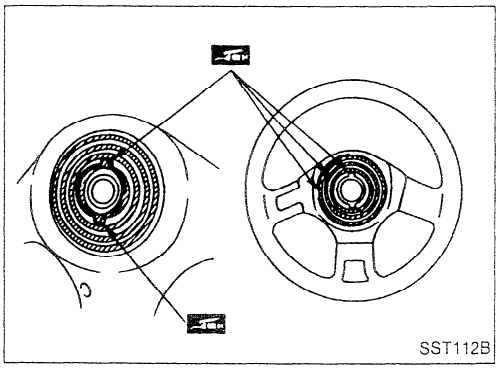


— Four spoke type —

- Insert a crosshead screwdriver into hole on lower side of spoke and remove clamps. Lift horn pad off by hand.



2. Remove steering wheel with Tool.

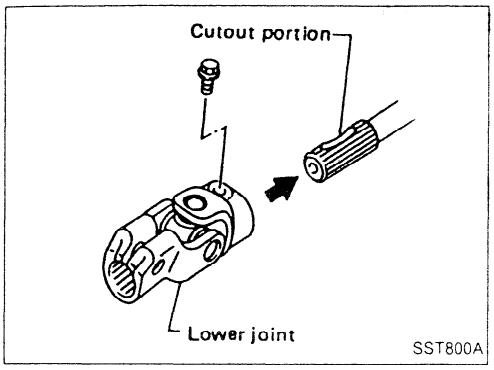


Installation

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.

Installation (Cont'd)



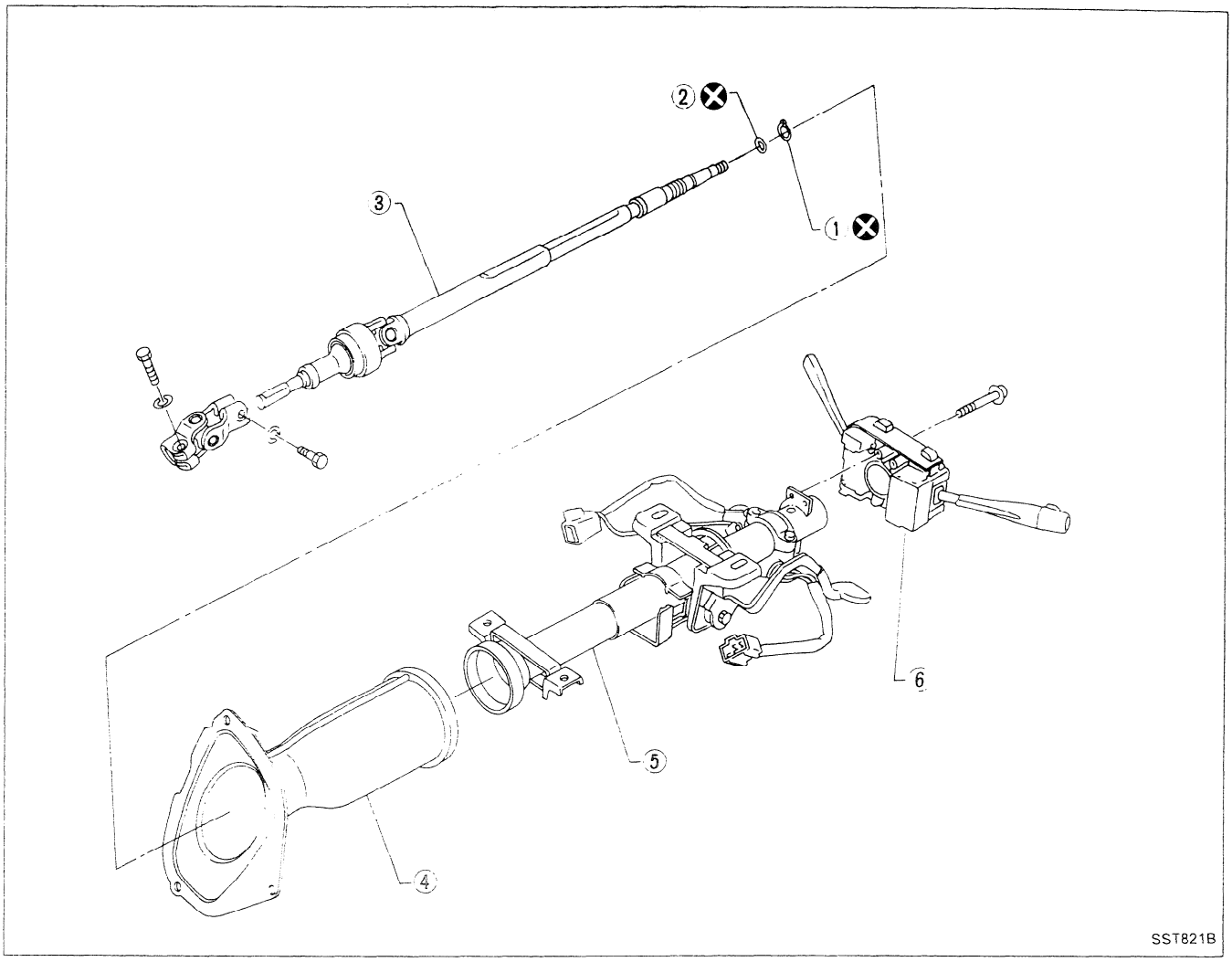
STEERING COLUMN

- 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.

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.

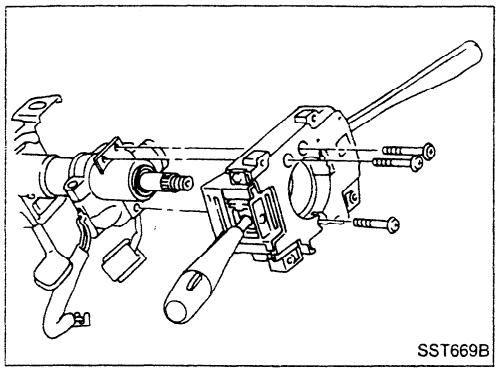
Disassembly and Assembly



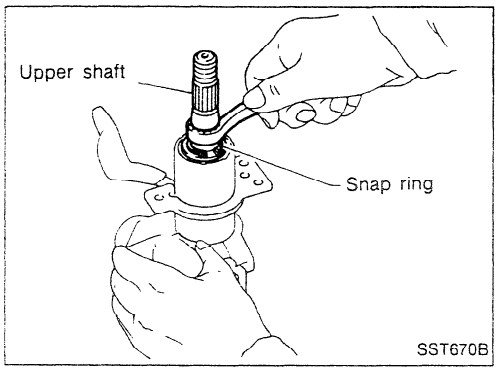
① Snap ring
② O-ring
③ Column shaft assembly
④ Boot
⑤ Jacket tube assembly
⑥ Combination switch

- When disassembling and assembling, unlock steering lock with key.

Disassembly and Assembly (Cont'd)

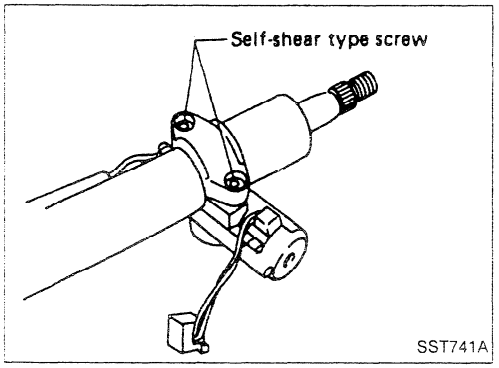

SST669B

- Remove combination switch.



SST670B

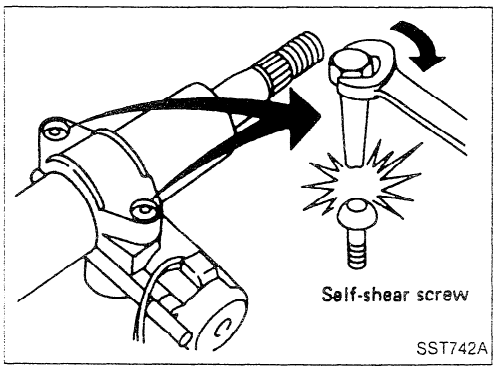
- Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.
- Install snap ring on upper shaft with a suitable tool.



SST741A

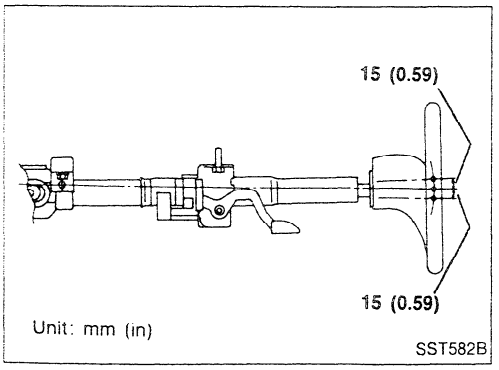
- Steering lock

a. Break self-shear type screws with a drill or other appropriate tool.



SST742A

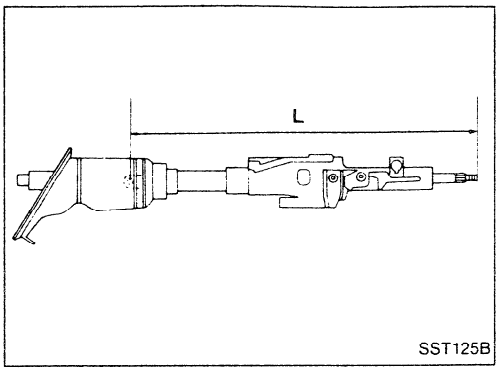
b. Install self-shear type screws and then cut off self-shear type screw heads.



SST582B

Tilt mechanism

- After installing steering column, check tilt mechanism operation.



Inspection

- When steering wheel can not be rotated smoothly, check the steering column for the following matters and replace damaged parts.

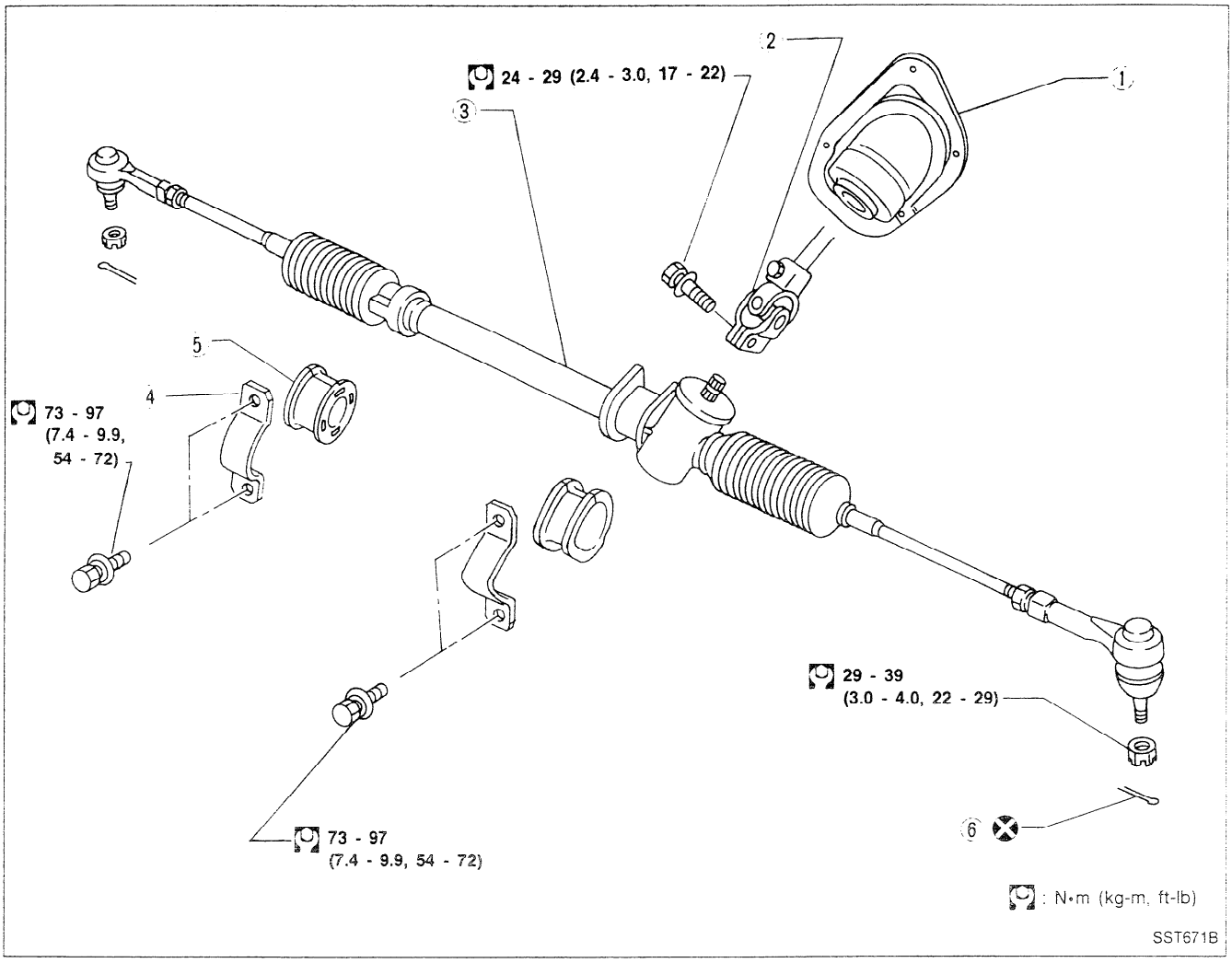
a. Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.

b. Check jacket tube for deformation or breakage. Replace if necessary.

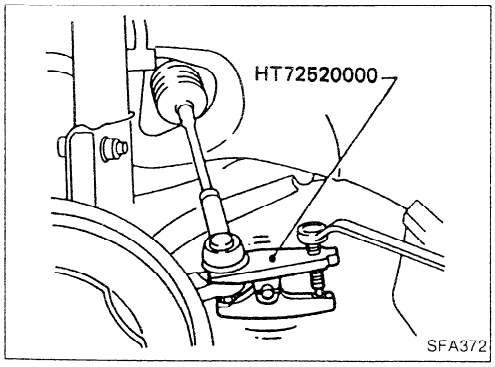
- When the vehicle is involved in a light collision, check column length "L". If it is not within specifications, replace steering column as an assembly.

Column length "L":
536.2 - 537.8 mm (21.11 - 21.17 in)

Removal and Installation

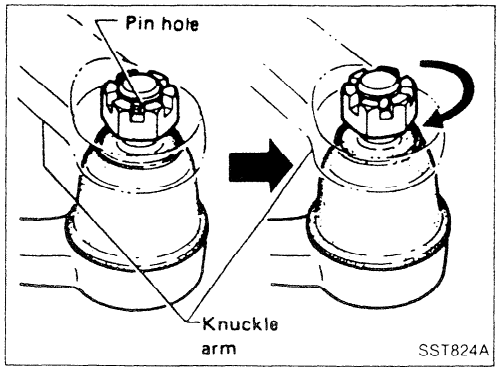


① Hole cover
② Lower joint
③ Manual steering gear assembly
④ Steering gear mounting clamp
⑤ Rack mounting insulator
⑥ Cotter pin



- Detach tie-rod ball studs from knuckle arms with Tool.

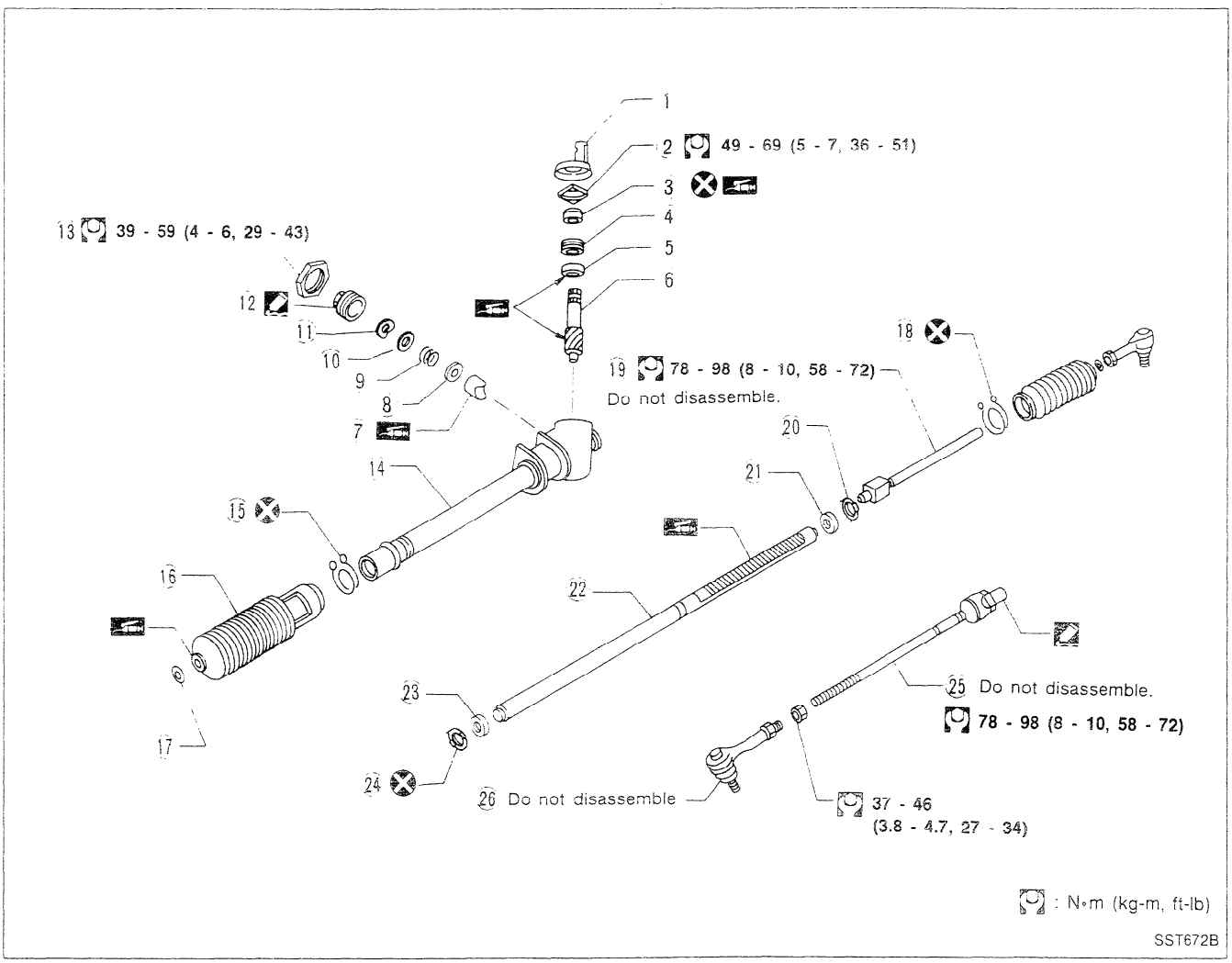
Removal and Installation (Cont'd)



- 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).
- Tighten nut further to align nut groove with the first pin hole so cotter pin can be installed.

CAUTION:
Tightening torque must not exceed 49 N·m (5 kg-m, 36 ft-lb).

Disassembly



① Guide chip
② Rear cover lock nut
③ Dust seal
④ Rear cover
⑤ Pinion bearing
⑥ Pinion assembly
⑦ Retainer
⑧ Spring seat
⑨ Retaining spring
⑩ Plain washer
⑪ Wave washer
⑫ Adjusting screw
⑬ Adjusting lock nut
⑭ Gear housing assembly
⑮ Boot clamp
⑯ Boot
⑰ Boot band
⑱ Boot clamp
⑲ Tie-rod inner socket
⑳ Lock plate
㉑ Spacer
㉒ Rack
㉓ Spacer
㉔ Lock plate
㉕ Tie-rod inner socket
㉖ Tie-rod outer socket

Inspection

BOOT

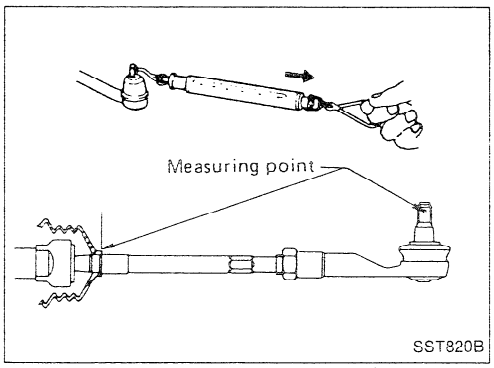
Check condition of boot. If it is cracked excessively, replace it.

RACK

Thoroughly examine rack gear. If rack gear is damaged, cracked or worn, replace.

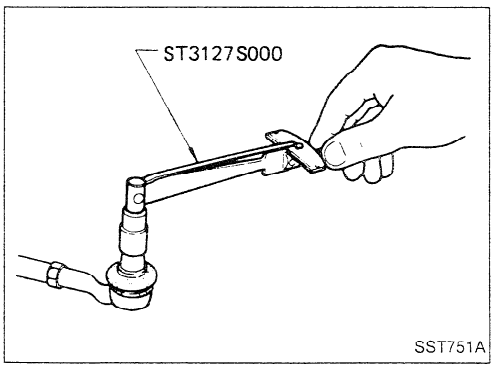
PINION ASSEMBLY

- Thoroughly examine pinion gear. If pinion gear is damaged, cracked or worn, replace.
- Inspect bearings to see that they roll freely and are free from cracked, pitted, or worn balls, rollers and races. Replace if necessary.

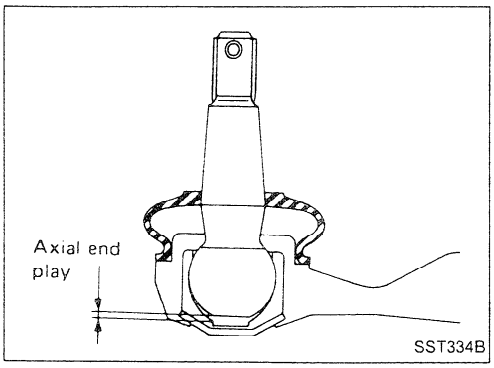


TIE-ROD OUTER AND INNER SOCKET

- Check ball joint for swinging force.
  Tie-rod outer ball joint:
  At cotter pin hole
  6.9 - 64.7 N (0.7 - 6.6 kg, 1.5 - 14.6 lb)
  Tie-rod inner ball joint:
  14.7 - 21.6 N (1.5 - 2.2 kg, 3.3 - 4.9 lb)



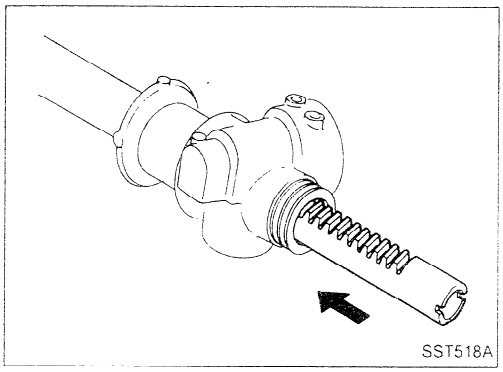
- Check ball joint for rotating torque.
  Tie-rod outer ball joint:
  0.3 - 2.9 N·m
  (3 - 30 kg-cm, 2.6 - 26.0 in-lb)



- Check ball joint for axial end play.
  Tie-rod outer ball joint:
  Less than 0.5 mm (0.020 in)
  Tie-rod inner ball joint:
  0 mm (0 in)

Inspection (Cont'd)

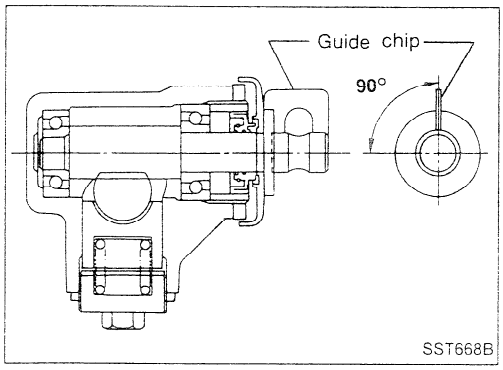
- Check condition of dust cover. If it is cracked excessively, replace it.


SST518A

Assembly and Adjustment

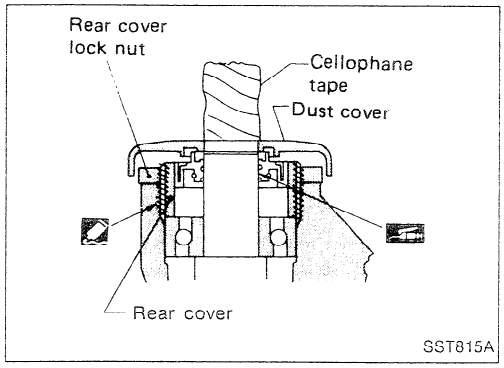
STEERING GEAR

1. Insert rack gear from gear housing side.
2. Set rack gear in neutral position.



SST668B

3. Insert pinion assembly, then set guide chip at neutral position as shown in figure. Pinion rack gear should be held in place.

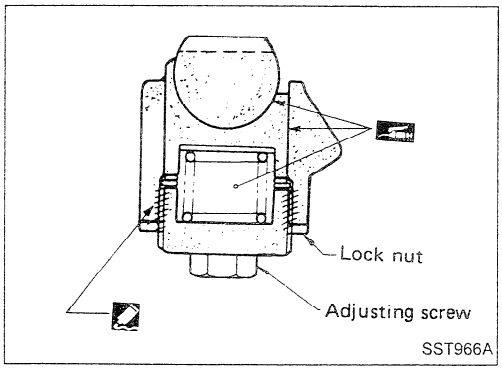


SST815A

4. Install rear cover with Tool and secure with lock nut.
   Tool number: KV48102000

- **Before installing rear cover, apply locking sealant to threaded areas. Do not allow sealant to get into pinion bearing.**
- **Apply a coat of multi-purpose grease to sealing lips of dust seal.**

CAUTION:
Wrap cellophane tape around pinion gear end when installing dust seal.



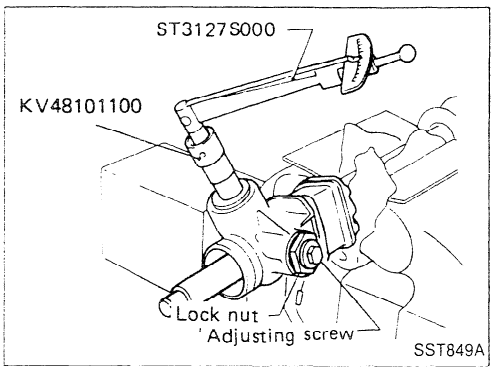
SST966A

5. Insert retainer, spring, plain washer and wave washer. Then, install adjusting screw.

- Apply a coat of locking sealant to threaded areas of retainer cover.

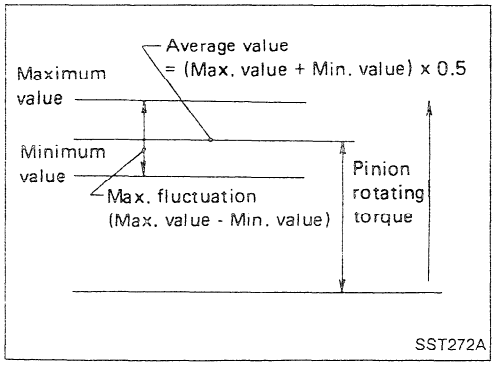
Assembly and Adjustment (Cont'd)

6. Adjust pinion rotating torque as follows:
a. Set gears to Neutral position.
b. Loosen lock nut.
c. Tighten adjusting screw two times to a torque of 2.9 N·m (30 kg-cm, 26 in-lb).
d. Loosen adjusting screw and retighten it to a torque of 0.2 N·m (2 kg-cm, 1.7 in-lb).
e. Rotate pinion to move rack back and forth two times, and return it to Neutral position.



f. Slowly rotate the pinion and measure rotating torque in the ±180° range from Neutral position.
Find the position where the rotating torque is at its maximum.

g. Loosen adjusting screw at the position where the rotating torque is at its maximum.
h. Tighten adjusting screw to a torque of 2.9 N·m (30 kg-cm, 26 in-lb). Then back it off by 50° to 70°.
i. Prevent adjusting nut from rotating and tighten lock nut to specified torque 39 to 59 N·m (4 to 6 kg-m, 29 to 43 ft-lb) holding adjusting screw in place.



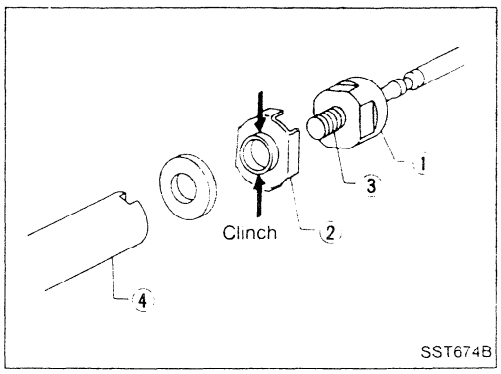
j. While slowly rotating pinion in the ±100° range from Neutral position, make sure its rotating torque is within the specifications.

Average value in the ±100° range from neutral position:
0.7 - 1.2 N·m
(7 - 12 kg-cm, 6.1 - 10.4 in-lb)
Max. allowable fluctuation within ±100° range from neutral position:
Below 0.3 N·m (3 kg-cm, 2.6 in-lb)
Max. allowable fluctuation within ±500° range from neutral position:
Below 0.5 N·m (5 kg-cm, 4.3 in-lb)

k. If pinion rotating torque is not within the specifications, readjust.

If pinion rotating torque is outside the specifications after adjustment has been made, replace retaining spring.

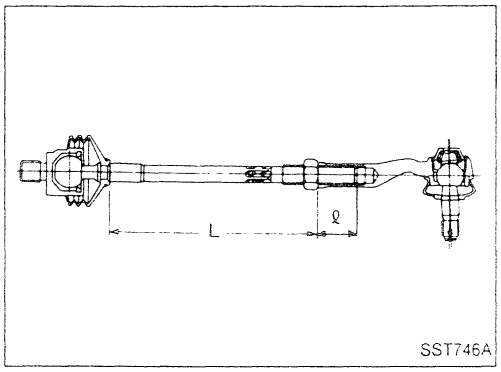
Assembly and Adjustment (Cont'd)



SST674B

7. Install new lock plate.
- Attach lock plate ② to side rod inner socket ①.
- Apply locking sealant to inner socket threads ③. Screw inner socket into rack ④ and tighten to specified torque.
- Clinch two places of lock plate at rack's groove.

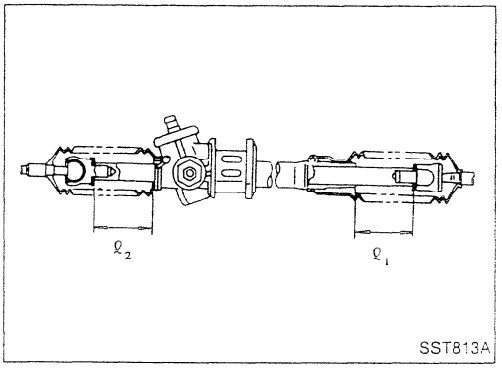
CAUTION:
To prevent scratching the boot, remove burrs from lock plate.



SST746A

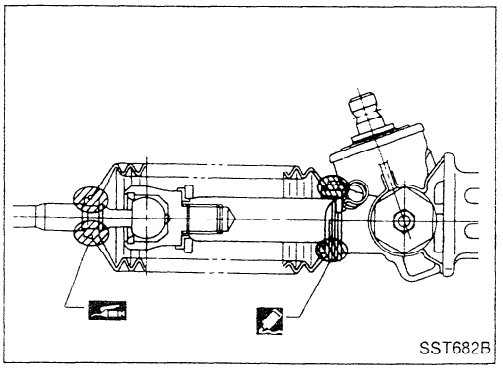
TIE-ROD AND BOOT

1. Install boot on tie-rod inner socket.
2. Apply locking sealant to threaded portion of inner socket and install tie-rod inner socket to rack end together with new lock plate.
3. Install lock nut and outer socket to inner socket. Adjust tie-rod length "L" and tighten lock nut.
   Tie-rod length "L": Refer to S.D.S.
   Screwed length "ℓ": 32 mm (1.26 in) or more



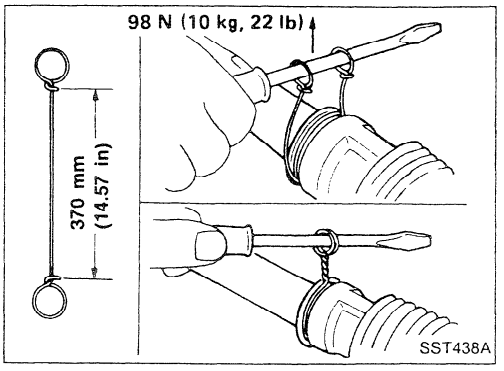
SST813A

4. Measure rack stroke.
   Measure length "ℓ":
   Refer to S.D.S.


SST682B

5. Install boot to gear housing.

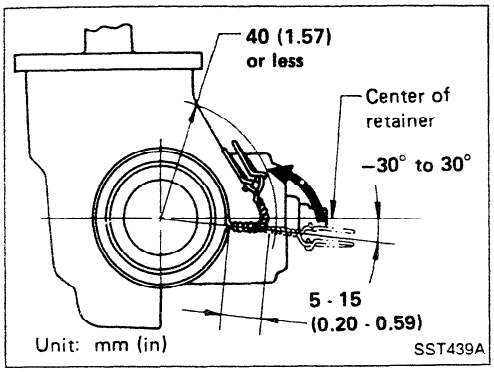
Apply sealant between boot and gear housing.



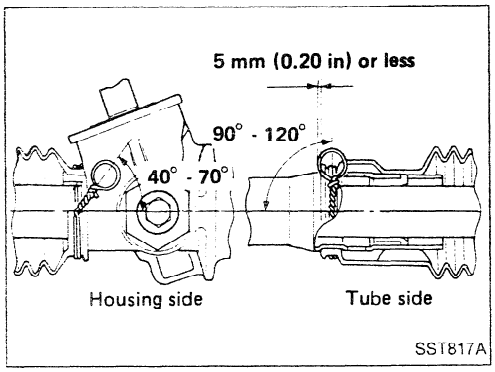
SST438A

6. Install boot clamps.
- To install, wrap boot clamp around boot groove twice. Tighten clamp by twisting rings at both ends four or four and one-half turns with screwdriver while pulling with a force of approx. 98 N (10 kg, 22 lb).

Assembly and Adjustment (Cont'd)

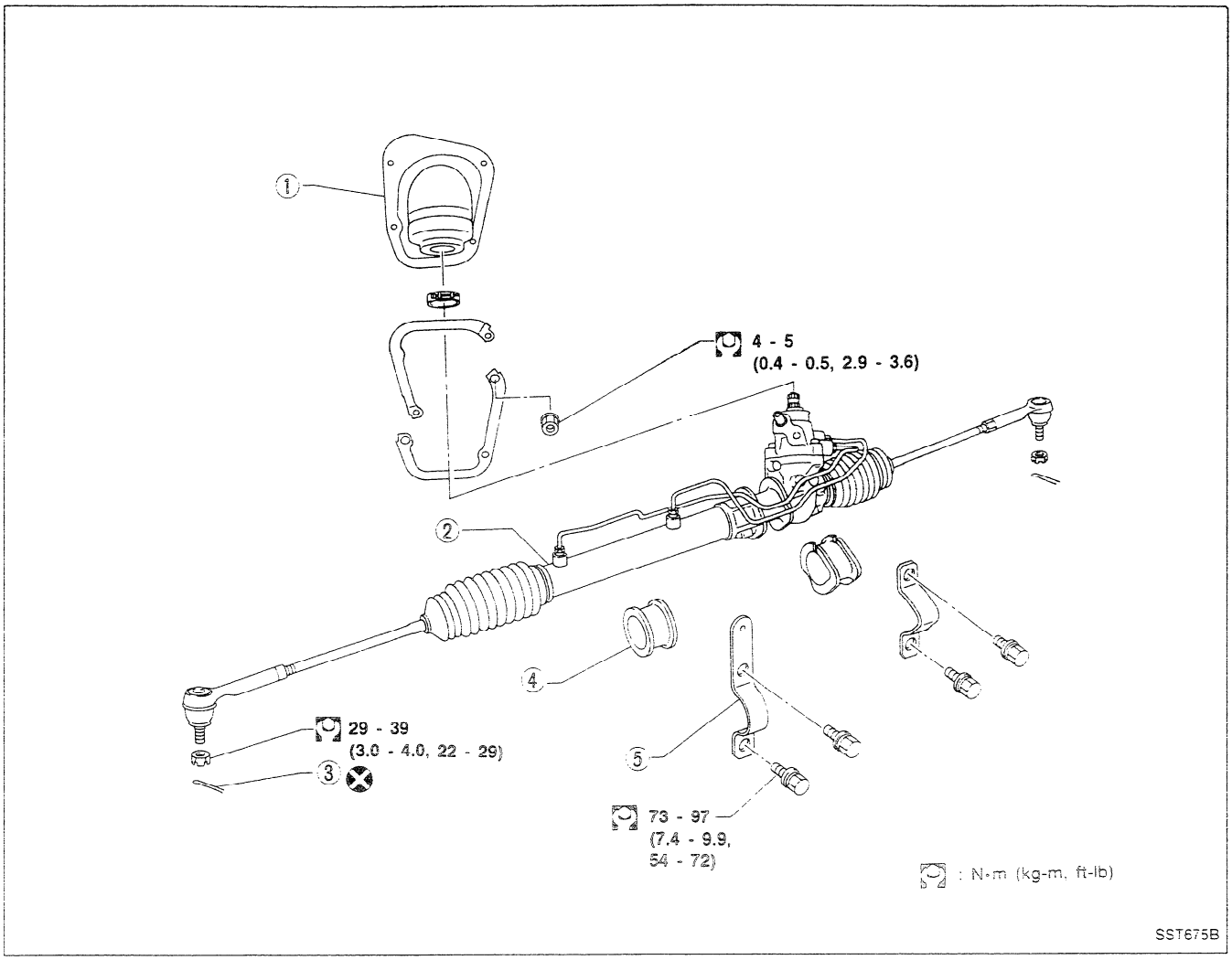


- Install boot clamp so that it is to the rear of the vehicle when gear housing is attached to the body. (This will avoid interference with other parts.)



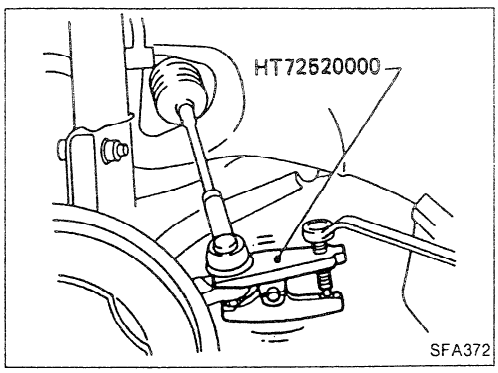
- After twisting boot clamp four or four and one-half turns, bend twisted end diagonally so it does not contact boot.

Removal and Installation



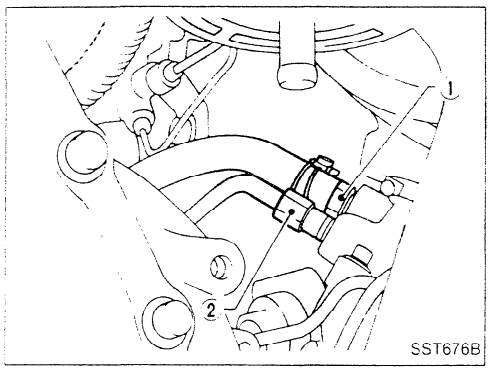
① Hole cover
② Gear and linkage assembly
③ Cotter pin
④ Rack mounting insulator
⑤ Gear housing mounting bracket

* **On N14 GTI-R left-hand drive models; engine must be removed (in advance.)**



* Detach tie-rod outer sockets from knuckle arms with Tool.

Removal and Installation (Cont'd)



- Install pipe connector.
- Observe specified tightening torque when tightening high-pressure and low-pressure pipe connectors. Excessive tightening will damage threads of connector or O-ring.
- The O-ring in low-pressure pipe connector is larger than that in high-pressure connector. Take care to install the proper O-ring.

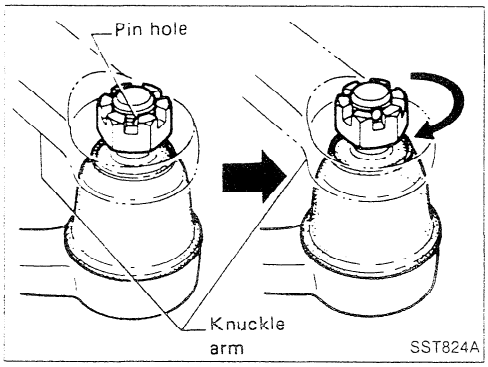
Connector tightening torque:

Low-pressure side "1"

27 - 39 N·m (2.8 - 4.0 kg-m, 20 - 29 ft-lb)

High-pressure side "2"

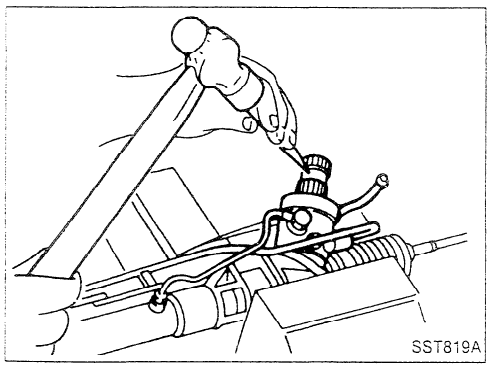
15 - 25 N·m (1.5 - 2.5 kg-m, 11 - 18 ft-lb)



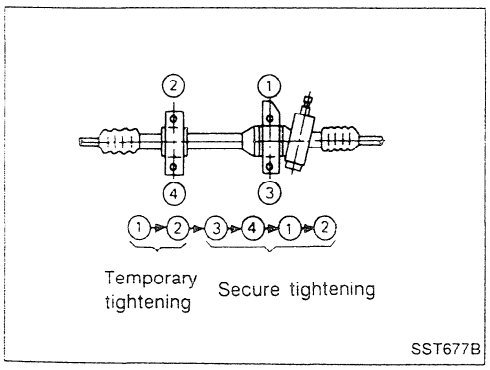
- Initially, tighten nut on tie-rod outer socket and knuckle arm to 29 to 39 N·m (3 to 4 kg-m, 22 to 29 ft-lb). Then tighten further to align nut groove with first pin hole so that cotter pin can be installed.

CAUTION:

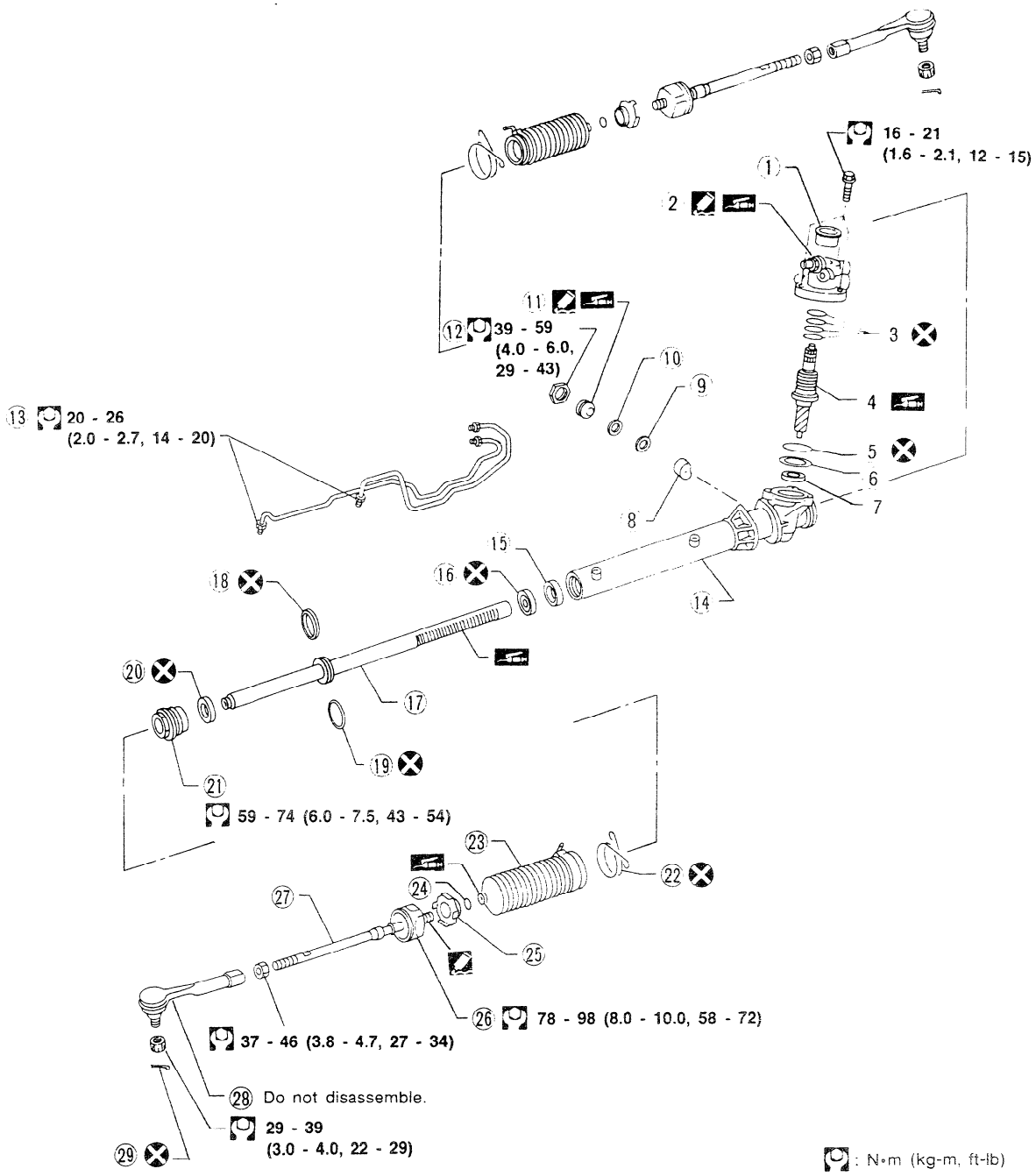
Tightening torque must not exceed 49 N·m (5 kg-m, 36 ft-lb).



- Before removing lower joint from gear, set gear in neutral (wheels in straight-ahead position). After removing lower joint, put matching mark on pinion shaft and pinion housing to record neutral position of gear.
- To install, set left and right dust boots to equal deflection, and attach lower joint by aligning matching marks of pinion shaft and pinion housing.

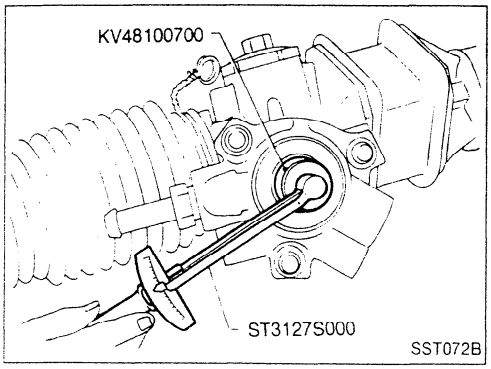


- Tighten gear housing mounting bracket bolts in the order shown.



SST678B

① Rear housing cover
② Rear housing assembly
③ Pinion seal ring
④ Pinion assembly
⑤ O-ring
⑥ Shim
⑦ Pinion oil seal
⑧ Retainer
⑨ Washer
⑩ Spring disc
⑪ Adjusting screw
⑫ Lock nut
⑬ Gear housing tube
⑭ Gear housing
⑮ Center bushing
⑯ Rack oil seal
⑰ Rack assembly
⑱ Rack seal ring
⑲ O-ring
⑳ Rack oil seal
㉑ End cover assembly
㉒ Boot clamp
㉓ Dust boot
㉔ Boot band
㉕ Lock plate
㉖ Tie-rod inner socket
㉗ Tie-rod
㉘ Tie-rod outer
㉙ Cotter pin



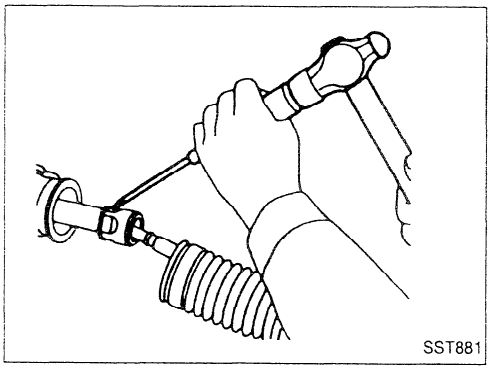
Disassembly

1. Prior to disassembling, measure pinion rotating torque. Record the pinion rotating torque as a reference.

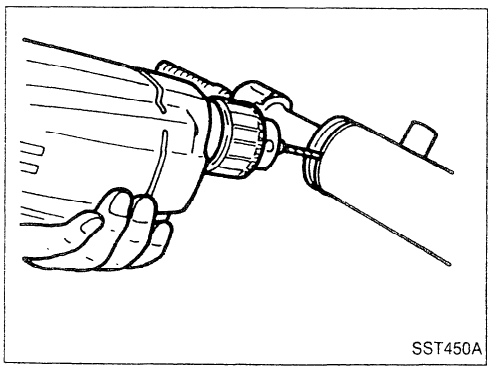
- **Before measuring, disconnect gear housing tube and drain fluid.**
- **Use soft jaws when holding steering gear housing. Handle gear housing carefully, as it is made of aluminum. Do not grip cylinder in a vise.**

2. Remove pinion gear.

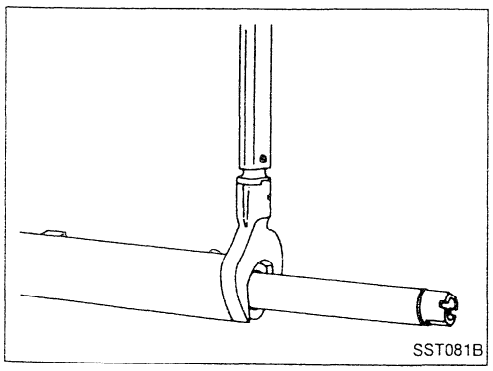
Be careful not to damage pinion gear when removing pinion seal ring.



3. Remove tie-rod outer sockets and boots.
4. Loosen tie-rod inner socket by prying up staked portion, and remove socket.
5. Remove retainer.
6. Remove pinion assembly.

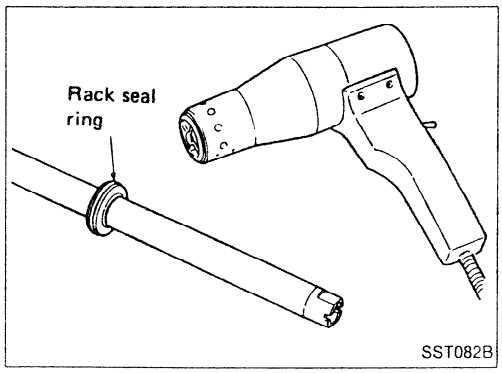


7. Drill staked portion of gear housing end with drill of 2 to 2.5 mm (0.079 to 0.098 in) diameter, until the staking is eliminated.



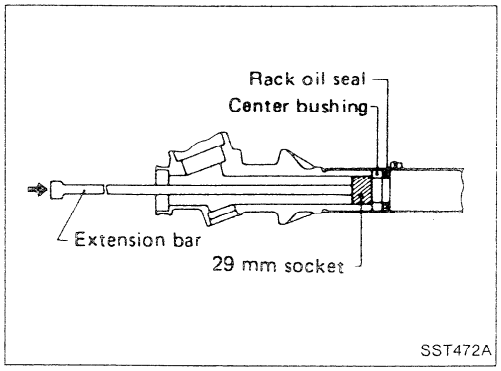
8. Remove end cover assembly with a suitable tool.
9. Draw out rack assembly.

Disassembly (Cont'd)



10. Remove rack seal ring.
- Using a heat gun, heat rack seal to approximately 40°C (104°F).
- Remove rack seal ring.

Be careful not to damage rack.



11. Remove center bushing and rack oil seal using tape wrapped socket and extension bar.

Do not scratch inner surfaces of pinion housing.

Inspection

Thoroughly clean all parts in cleaning solvent or automatic transmission fluid "DEXRON™" type, and blow dry with compressed air, if available.

BOOT

Check condition of boot. If cracked excessively, replace it.

RACK

Thoroughly examine rack gear. If damaged, cracked or worn, replace it.

PINION ASSEMBLY

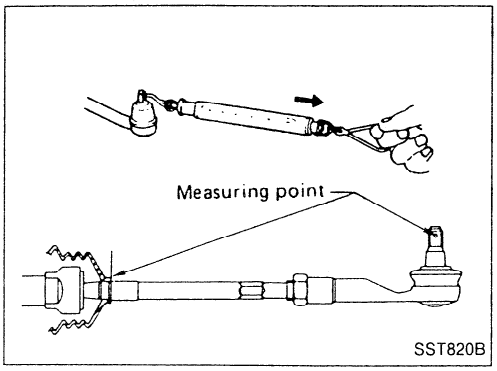
- Thoroughly examine pinion gear. If pinion gear is damaged, cracked or worn, replace it.
- Inspect bearings to see that they roll freely and are free from cracked, pitted, or worn balls, rollers and races. Replace if necessary.

GEAR HOUSING CYLINDER

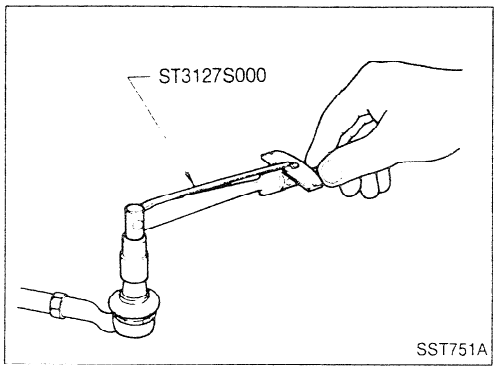
Check gear housing cylinder bore for scratches or other damage. Replace if necessary.

Inspection (Cont'd)

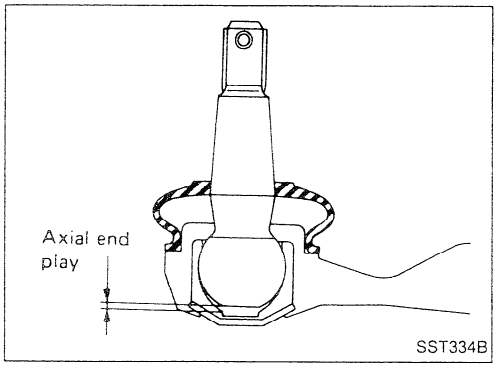
TIE-ROD OUTER AND INNER SOCKET



- Check ball joint for swinging force.
  Tie-rod outer ball joint:
  At cotter pin hole
  6.9 - 64.7 N
  (0.7 - 6.6 kg, 1.5 - 14.6 lb)
  Tie-rod inner ball joint:
  14.7 - 21.6 N
  (1.5 - 2.2 kg, 3.3 - 4.9 lb)

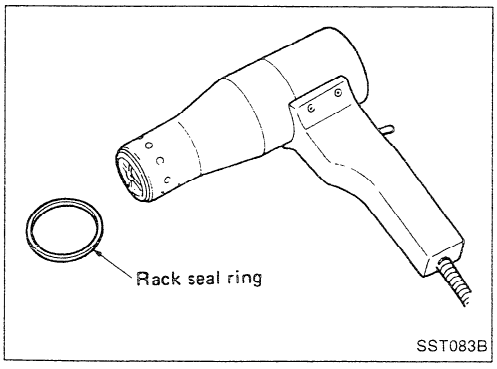


- Check ball joint for rotating torque.
  Tie-rod outer ball joint:
  0.3 - 2.9 N·m
  (3 - 30 kg-cm, 2.6 - 26.0 in-lb)

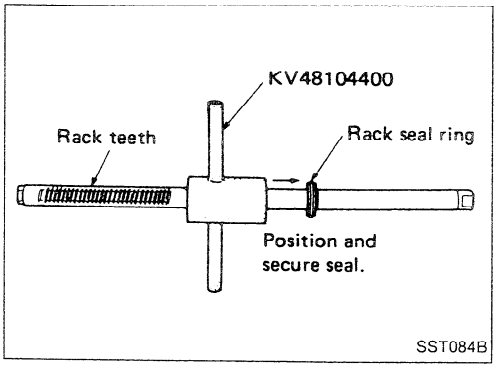


- Check ball joint for axial end play.
  Tie-rod outer ball joint:
  Less than 0.5 mm (0.020 in)
  Tie-rod inner ball joint:
  0 mm (0 in)
- Check condition of dust cover. If cracked excessively, replace it.

Assembly



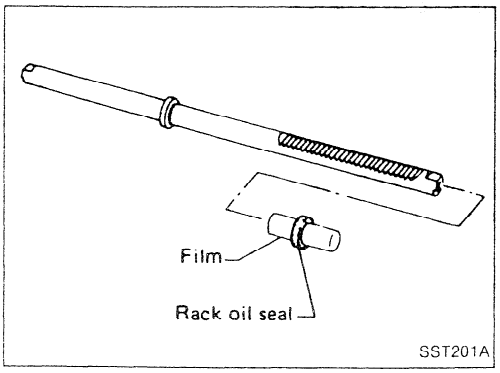
1. Using a heat gun, heat new rack seal ring (made of Teflon) to approximately 40°C (104°F) and install it onto rack with your hand.



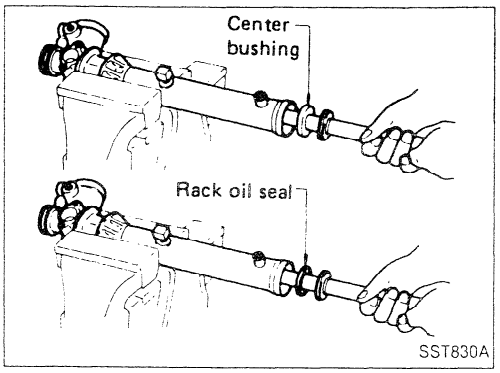
2. Using Tool, compress periphery of rack seal ring to position and secure it on rack.

Always insert Tool from the rack gear side.

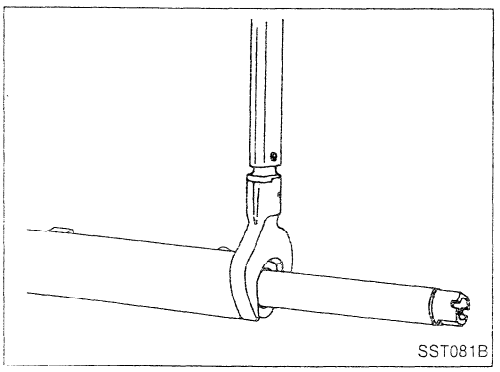
Assembly (Cont'd)



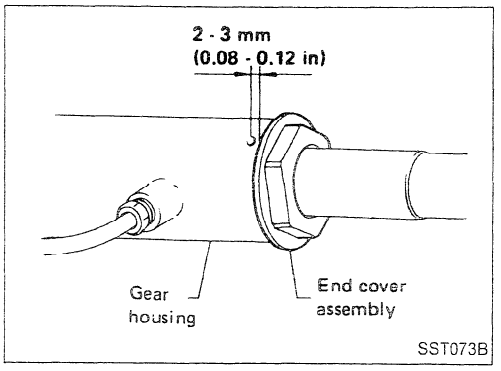
3. Insert new rack oil seal.
- **Place plastic film into rack oil seal to prevent damage by rack teeth.**
- **Do not forget to remove plastic film after rack oil seal is positioned properly.**
- **Make sure lips of rack oil seal face each other.**



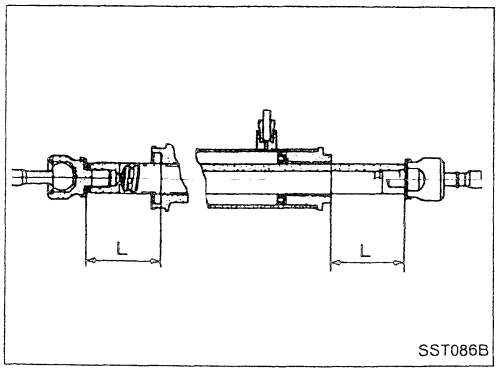
4. Install center bushing and rack oil seal with rack assembly.



5. Tighten end cover assembly with a suitable tool.

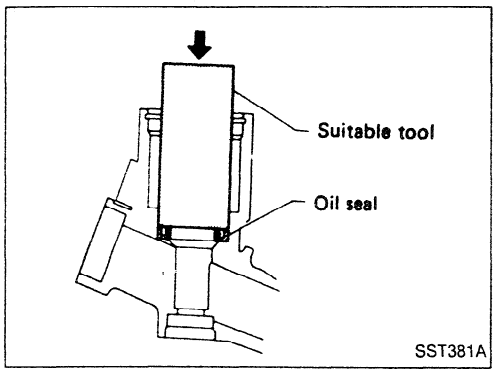


6. Fasten end cover assembly to gear housing by staking.



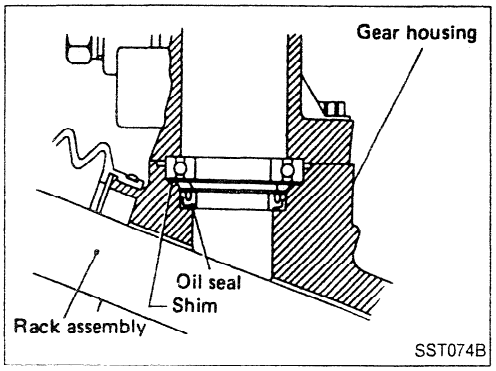
7. Set rack gear in neutral position.
   Rack stroke "L":
   Refer to S.D.S.

Assembly (Cont'd)

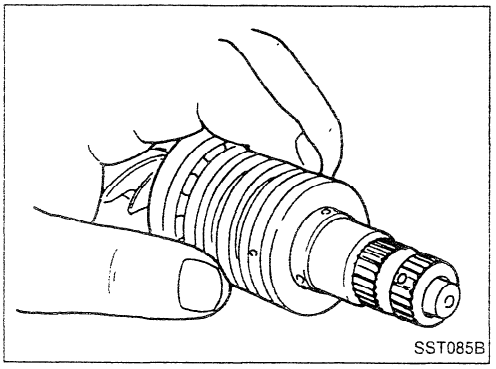


8. Coat seal lip of new pinion oil seal with multi-purpose grease and install it to pinion housing of gear housing with a suitable tool.

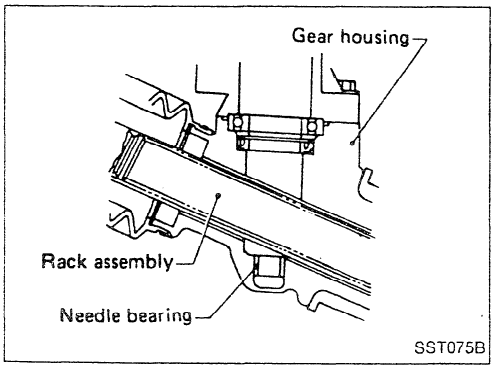
Make sure lip of oil seal faces up when installed.



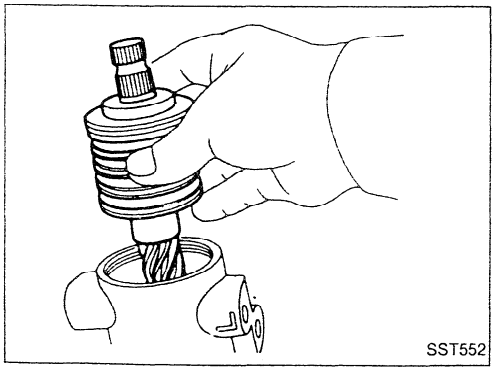
9. Install pinion bearing adjusting shim(s).
- Whenever pinion assembly, gear housing and rear housing are disassembled, replace shim(s) with new ones. Always use the same number of shim(s) when replacing.



10. Install new pinion seal ring (made of Teflon) on pinion gear assembly.
- Using a heat gun, heat pinion seal ring to approximately 40°C (104°F) before installing it onto pinion gear assembly.
- Make sure pinion seal ring is properly settled in valve groove.



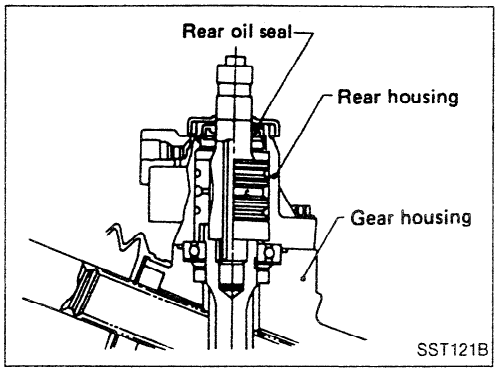
11. Apply a coat of multi-purpose grease to needle bearing roller and oil seal lip before installing pinion assembly in gear housing.



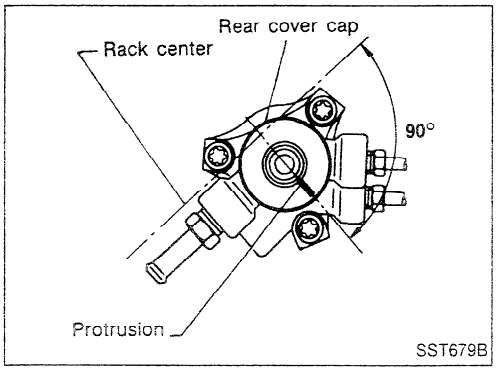
12. Install pinion assembly to pinion housing.

Be careful not to damage pinion oil seal.

Assembly (Cont'd)

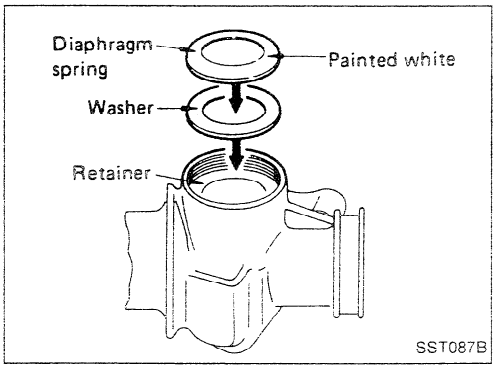


13. Apply a coat of multi-purpose grease to new rear oil seal lip before installing rear housing.



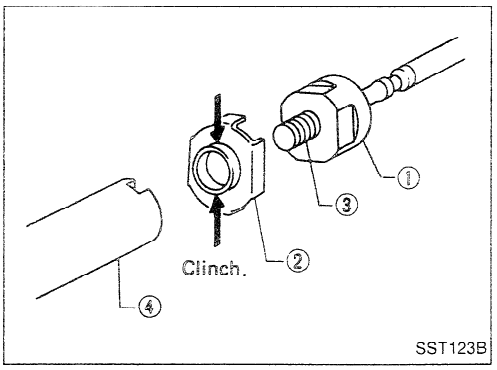
14. Install rear cover cap so that protrusion of rear housing cover is positioned as shown in figure at left when rack is centralized.

Be careful not to damage worm ring and oil seal.



15. Install diaphragm spring into gear housing.
- Always install retainer, spring washer and diaphragm spring in that order.
- Make sure convex end (painted white) of diaphragm spring faces outward when installing.

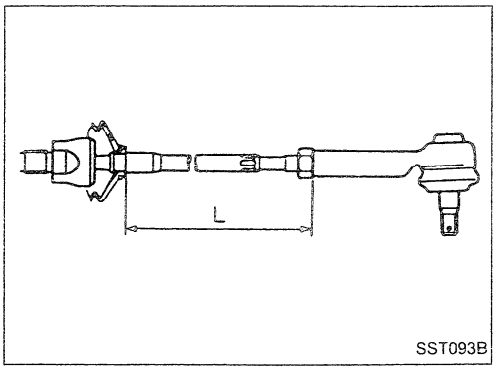
16. Install retainer and adjusting screw temporarily.



17. Install new lock plate.
- Attach lock plate ② to side rod inner socket ①.
- Apply locking sealant to inner socket threads ③. Screw inner socket into rack ④ and tighten to specified torque.
- Clinch two places of lock plate at rack's groove.

CAUTION:

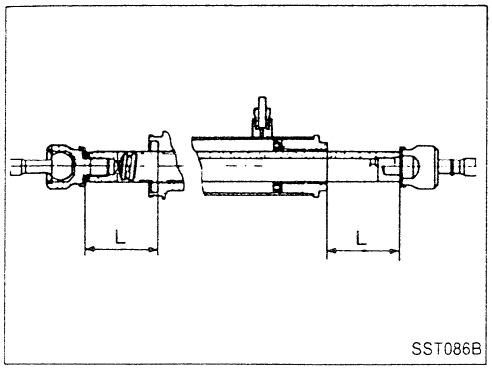
To prevent scratching the boot, remove burrs from lock plate.



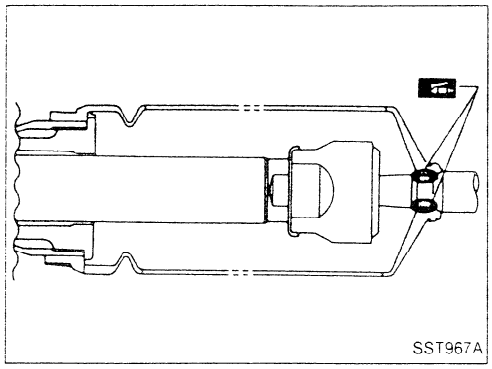
18. Tighten outer socket lock nut.

Tie-rod length "L":
Refer to S.D.S.

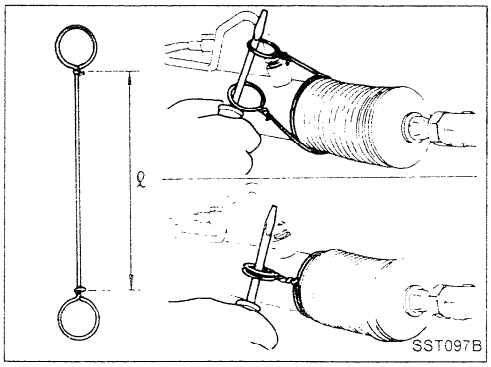
Assembly (Cont'd)



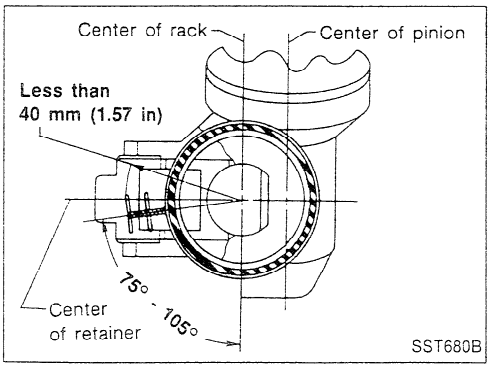
19. Measure rack stroke.
    Rack stroke "L":
    Refer to S.D.S.



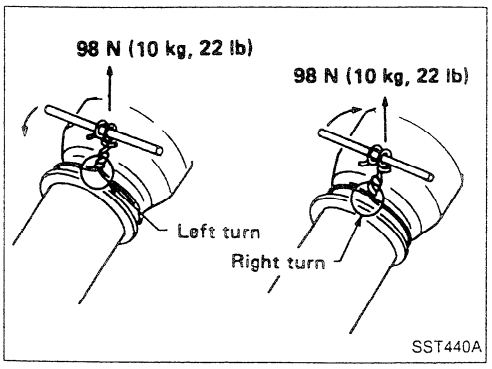
20. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.



21. Install boot clamps.
- To install, wrap boot clamp around boot groove twice. Tighten clamp by twisting rings at both ends 4 to 4-1/2 turns with screwdriver while pulling with a force of approx. 98 N (10 kg, 22 lb).

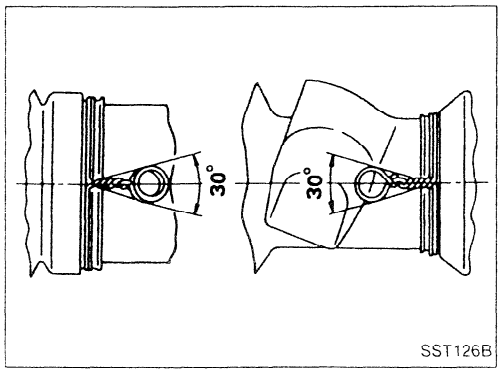


- Install boot clamps so they are behind the gear housing when it is attached to the vehicle. (This will prevent interference with other parts.)

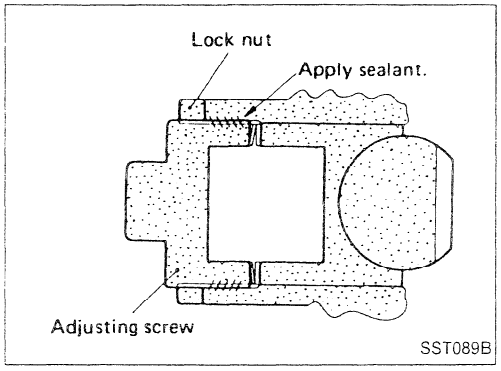


- Twist boot clamp in the direction shown in figure at left.

Assembly (Cont'd)



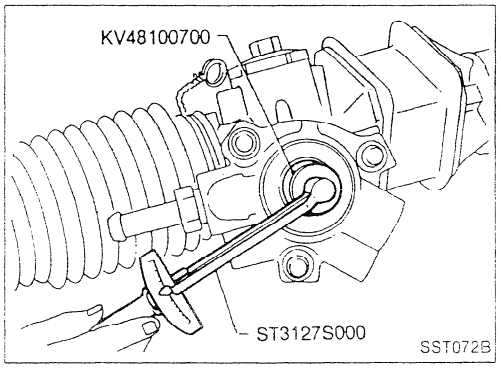
- After twisting boot clamp, bend twisted and diagonally so it does not contact boot.



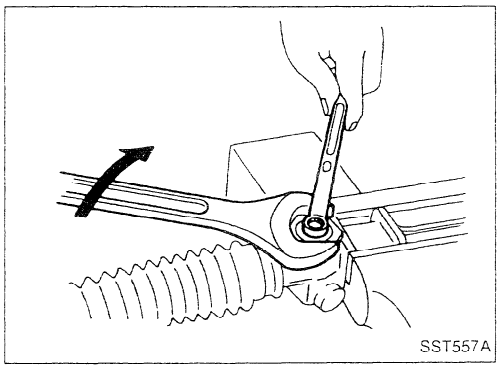
Adjustment

Adjust pinion rotating torque as follows:

1. Set rack to the neutral position without fluid in the gear.
2. Coat the adjusting screw with locking sealant and screw it in.
3. Lightly tighten lock nut.
4. Tighten adjusting screw to a torque of 4.9 to 5.9 N·m (50 to 60 kg-cm, 43 to 52 in-lb).
5. Loosen adjusting screw, then retighten it to 0.2 N·m (2 kg-cm, 1.7 in-lb).

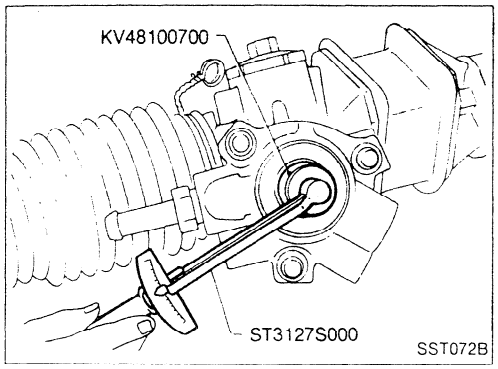


6. Move rack over its entire stroke several times.
7. Measure pinion rotating torque within the range of 180° from neutral position.
   Stop the gear at the point of maximum torque.
8. Loosen adjusting screw, then retighten it to 4.9 N·m (50 kg-cm, 43 in-lb).
9. Loosen adjusting screw by 40° to 60°.



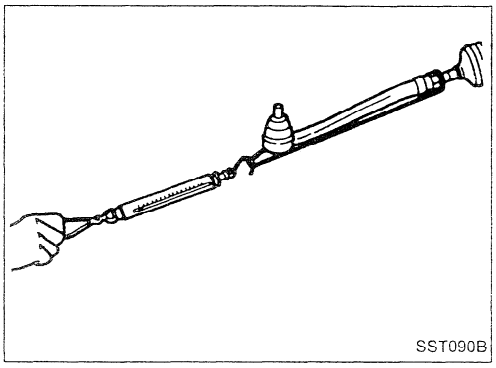
10. Prevent adjusting screw from turning, and tighten lock nut to specified torque.

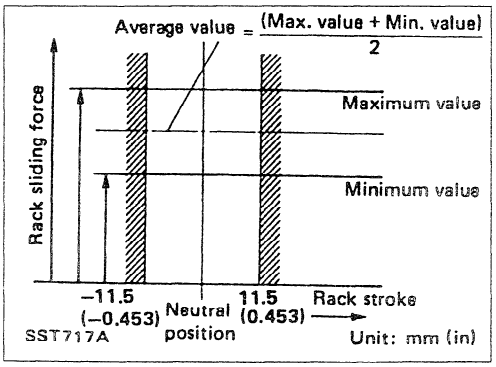
Adjustment (Cont'd)



11. Measure pinion rotating torque.
    Within ±100° from the neutral position:
    Average rotating torque
    0.8 - 1.3 N·m (8 - 13 kg-cm, 6.9 - 11.3 in-lb)
    Maximum torque deviation
    0.4 N·m (4 kg-cm, 3.5 in-lb)
    Except for above measuring range:
    Maximum rotating torque
    1.9 N·m (19 kg-cm, 16 in-lb)
    Maximum force deviation
    0.6 N·m (6 kg-cm, 5.2 in-lb)

- If pinion rotating torque is not within specifications, readjust it starting from procedure 4. If pinion rotating torque is still out of specifications after readjustment, replace steering gear assembly.

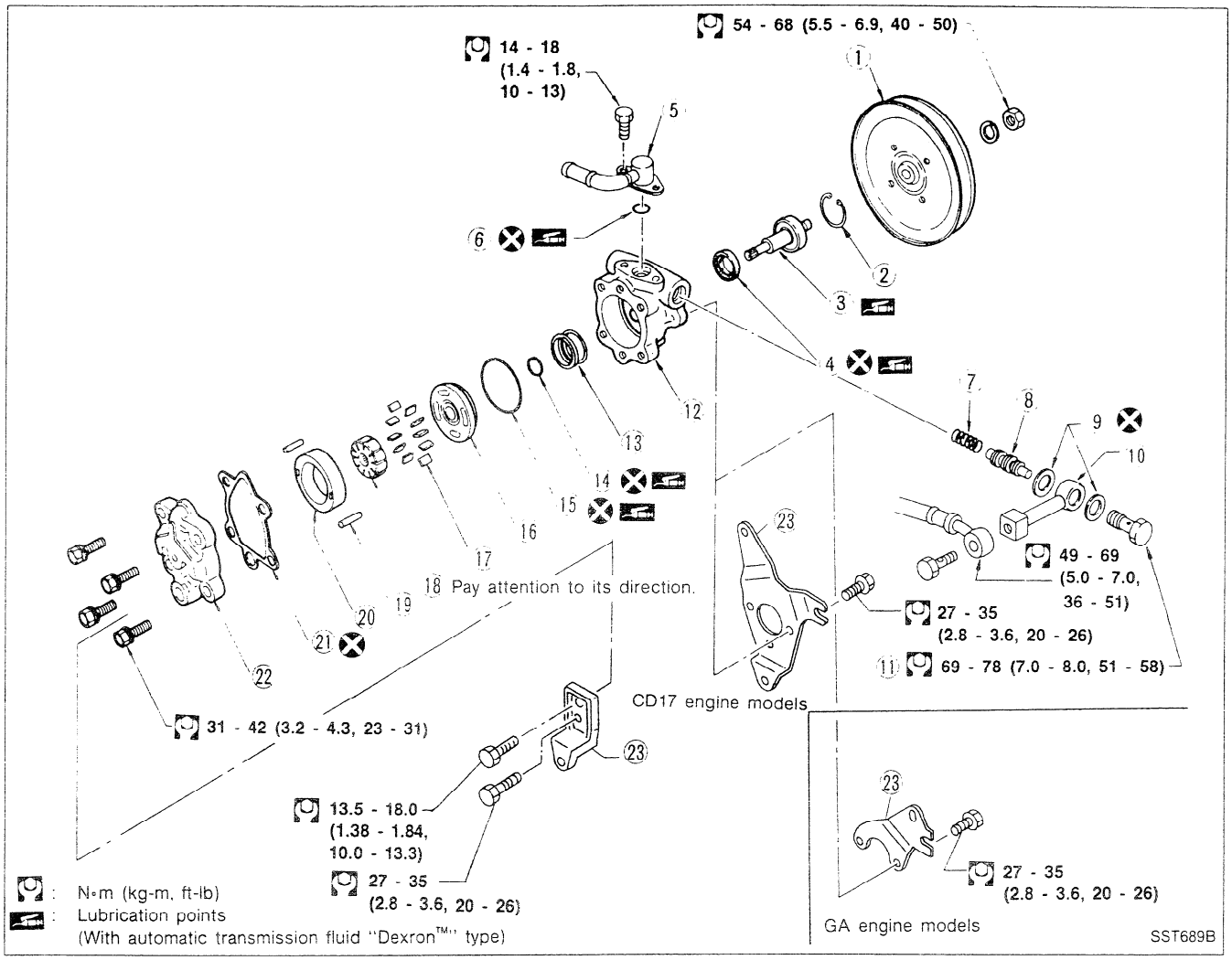




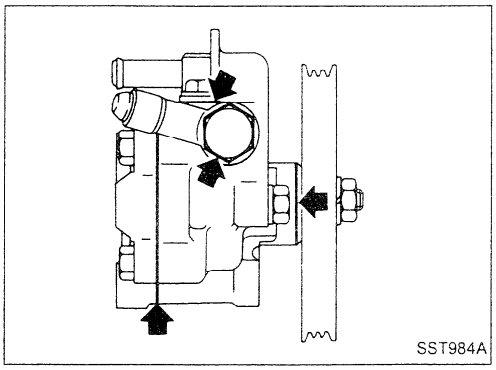
12. Check rack sliding force on vehicle as follows:
a. Install steering gear onto vehicle, but do not connect tie-rod to knuckle arm.
b. Connect all piping and fill with steering fluid.
c. Start engine and bleed air completely.
d. Disconnect steering column lower joint from the gear.
e. Keep engine at idle and make sure steering fluid has reached normal operating temperature.
f. While pulling tie-rod slowly in the ±11.5 mm (±0.453 in) range from the neutral position, make sure rack sliding force is within specification.
    Average rack sliding force:
    Less than 226 N (23 kg, 51 lb)
g. Check sliding force outside above range.
    Maximum rack sliding force:
    Not more than 39 N (4 kg, 9 lb) beyond above value

- If rack sliding force is not within specification, readjust by repeating adjustment procedure from the beginning.
- If rack sliding force is still out of specification after readjustment, gear assembly needs to be replaced.

Disassembly and Assembly



① Pulley
② Snap ring
③ Drive shaft
④ Oil seal
⑤ Suction pipe
⑥ O-ring
⑦ Spring
⑧ Control valve
⑨ Washer
⑩ Joint
⑪ Connector bolt
⑫ Front housing
⑬ Spring
⑭ O-ring
⑮ O-ring
⑯ Front side plate
⑰ Vane
⑱ Rotor
⑲ Pin
⑳ Cam ring
㉑ Gasket
㉒ Rear housing
㉓ Mounting bracket



Pre-disassembly Inspection

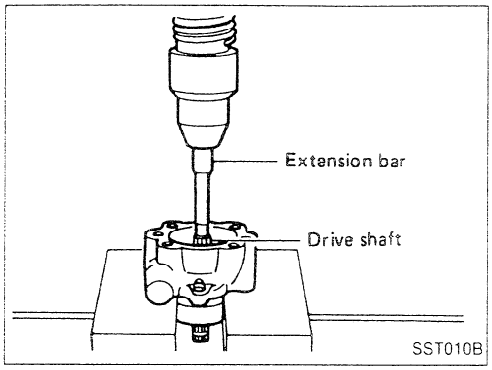
Disassemble the power steering oil pump only if the following items are found.

- Oil leak from any point shown in the figure.
- Deformed or damaged pulley.

Disassembly

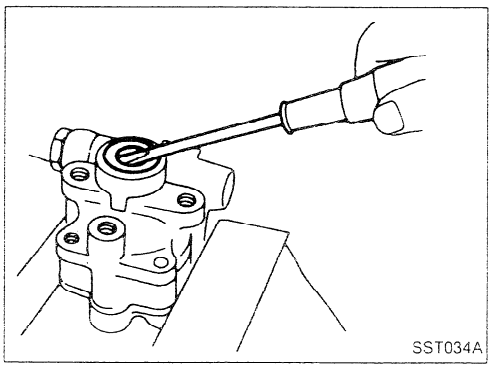
CAUTION:

- **Parts which can be disassembled are strictly limited. Never disassemble parts other than those specified.**
- **Disassemble in as clean a place as possible.**
- **Clean your hands before disassembly.**
- **Do not use rags; use nylon cloths or paper towels.**
- **Follow the procedures and cautions in the Service Manual.**
- **When disassembling and reassembling, do not let foreign matter enter or contact the parts.**



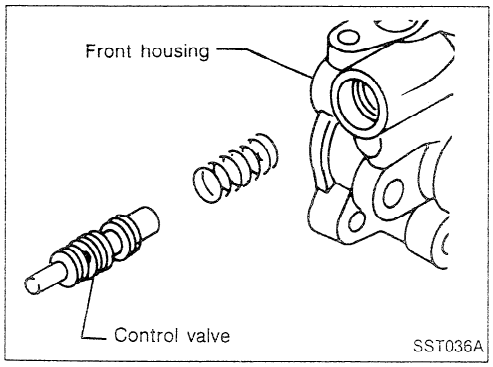
- Remove snap ring, then draw drive shaft out.

Be careful not to drop drive shaft.



- Remove oil seal.

Be careful not to damage front housing.

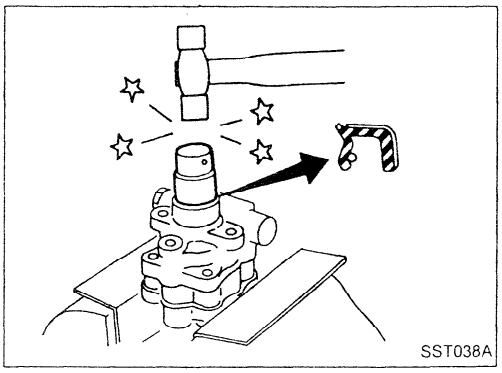


- Remove connector.

Be careful not to drop control valve.

Inspection

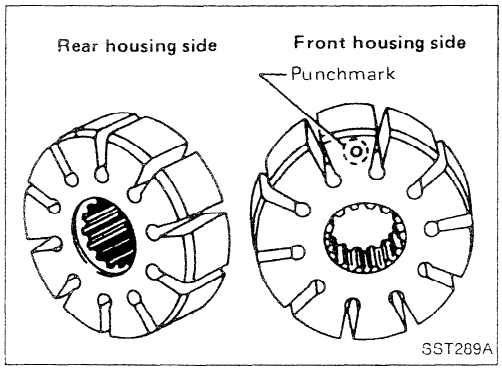
Inspect each component part for wear, deformation, scratches, and cracks. If damage is found, replace the part.


SST038A

Assembly

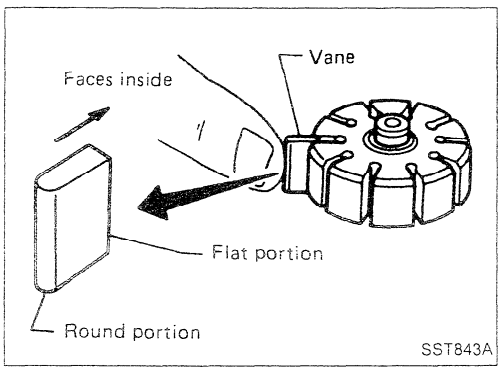
Assemble oil pump, noting the following instructions.

- Make sure O-rings and oil seal are properly installed.
- Always install new O-rings and oil seal.
- Be careful of oil seal direction.
- Cam ring, rotor and vanes must be replaced as a set if necessary.
- Coat each part with A.T.F. when assembling.



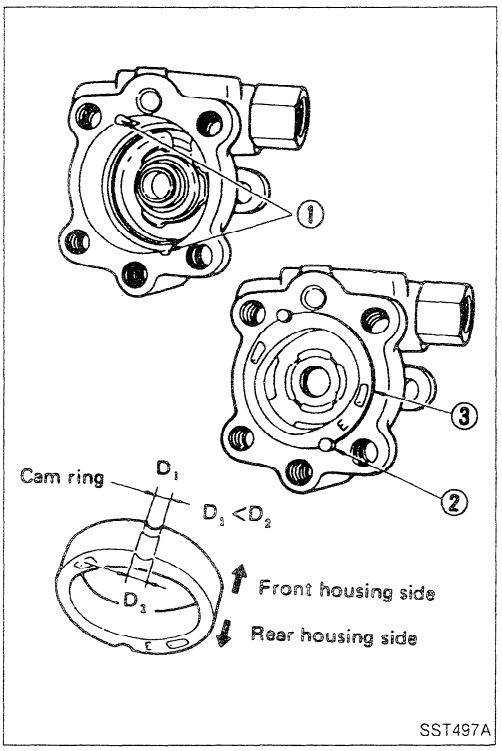
SST289A

- Pay attention to the direction of rotor.



SST843A

- When assembling vanes to rotor, rounded surfaces of vanes must face cam ring side.



SST497A

- Insert pin ② into pin groove ① of front housing and front side plate. Then install cam ring ③ as shown at left.

General Specifications

Applied model	Except Europe			Europe		
Steering model	Manual steering	Power steering		Manual steering	Power steering	
Steering gear type	R24S	PR24SC		R24N	PR24SC	
					2WD	4WD
Turns of steering wheel (Lock to lock)	3.75*1 4.01*2 4.21*3	R.H.D. 2.97*1 3.17*2, 3.33*3	L.H.D. 2.74*1, 2.93*2 3.07*3	3.75*1 4.21*3	3.33*3 3.17*2 2.97*1 (Except SR20DE) 2.93*1 (SR20DE)	2.83*3 2.72*1 (GA16DS) 2.69*1 (SR20DET)
Steering column type	Collapsible, tilt					

*1: Models equipped with 14-inch tires
*2: Diesel engine models equipped with 13-inch tires
*3: Gasoline engine models equipped with 13-inch tires

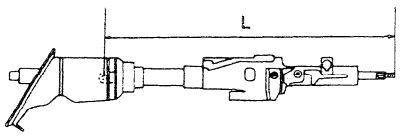
Inspection and Adjustment

GENERAL

Steering wheel axial play mm (in)	0 (0)
Steering wheel play limit mm (in)	35 (1.38)
Maximum movement of gear housing mm (in)	±2 (±0.08)

STEERING COLUMN

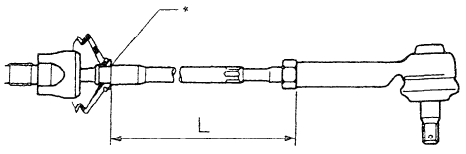
Steering column length "L" mm (in)	536.2 - 537.8 (21.11 - 21.17)



SST125B

STEERING GEAR AND LINKAGE

Steering gear type	R24S, R24N	PR24SC
Side rod outer ball joint Swinging force at cotter pin hole N (kg, lb)	6.9 - 64.7 (0.7 - 6.6, 1.5 - 14.6)	
Rotating torque N·m (kg-cm, in-lb)	0.3 - 2.9 (3 - 30, 2.6 - 26.0)	
Axial end play limit mm (in)	Less than 0.5 (0.020)	
Side rod inner ball joint Swinging force* N (kg, lb)	14.7 - 21.6 (1.5 - 2.2, 3.3 - 4.9)	
Axial end play limit mm (in)	0 (0)	
Side rod standard length "L" mm (in)	184 (7.24)	



SST304B

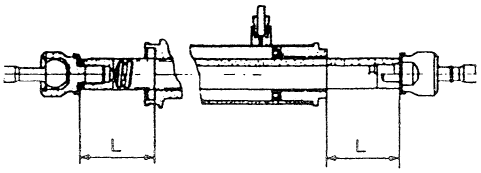
*: Measuring point

Inspection and Adjustment (Cont'd)

STEERING GEAR AND LINKAGE (Cont'd)

	2WD	4WD
Rack stroke "L" mm (in)	65.5 (2.579)*1 70.0 (2.756)*2, 73.5 (2.894)*3	60.0*1 62.5*3

*1: Models equipped with 14-inch tires
*2: Diesel engine models equipped with 13-inch tires
*3: Gasoline engine models equipped with 13-inch tires



SST086B

Steering gear type	R24S, R24N	PR24SC
Retainer adjustment		
Adjusting screw N·m (kg-cm, in-lb)		
Initial tightening torque	2.9 (30, 26)	4.9 (50, 43)
Retightening torque after loosening	0.2 (2, 1.7)	0.2 (2, 1.7)
Tightening torque after gear has settled	2.9 (30, 26)	4.9 (50, 43)
Returning angle degree	50° - 70°	40° - 60°
Pinion gear preload without gear oil N·m (kg-cm, in-lb)		
Within ± 100° from the neutral position		
Average rotating torque	0.7 - 1.2 (7 - 12, 6.1 - 10.4)	0.8 - 1.3 (8 - 13, 6.9 - 11.3)
Maximum torque deviation	0.3 (3, 2.6)	0.4 (4, 3.5)
Except above range		
Maximum rotating torque	1.5 (15, 13)	1.9 (19, 16)
Maximum torque deviation	0.5 (5, 4.3)	0.6 (6, 5.2)

POWER STEERING

Steering gear type	PR24SC
Rack sliding force N (kg, lb)	
Under normal operating oil pressure	
Range within ± 11.5 mm (± 0.453 in) from the neutral position	Less than 226 (23, 51)
Except above range	Not more than 39 (4, 9) beyond above value
Steering wheel turning force (Measured at one full turn from the neutral position) N (kg, lb)	39 (4, 9) or less
Fluid capacity (Approximate) ℓ (Imp qt)	1 (7/8)
Oil pump maximum pressure kPa (bar, kg/cm², psi)	Except CD17 engine 7 649 - 8,238 (76 5 - 82.4, 78 - 84, 1,109 - 1,194) CD17 engine 6,669 - 7,257 (66.7 - 72.6, 68 - 74, 967 - 1,052)

SECTION BF

CONTENTS

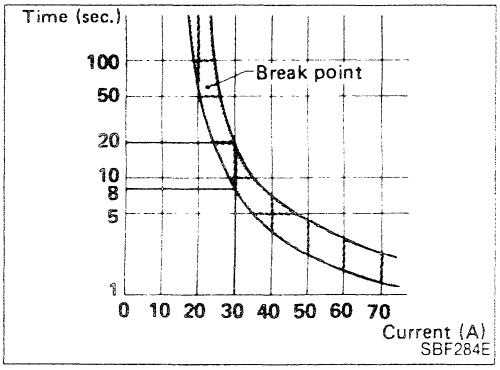
GENERAL SERVICING
(Including "Clip and Fastener") ..... BF- 2
BODY END ..... BF- 6
DOOR
(Including "Power Window" and "Power Door Lock") ..... BF- 18
INSTRUMENT PANEL ..... BF- 59
INTERIOR AND EXTERIOR
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SEAT ..... BF- 96
SUN ROOF BF-104
T-BAR ROOF BF-108
WINDSHIELD AND WINDOWS BF-110
MIRROR — Door Mirror BF-119
REAR AIR SPOILER BF-122
BODY ALIGNMENT BF-125

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

☆ For seat belt, refer to MA section.

Precautions

- 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 installation. 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.



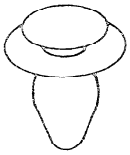
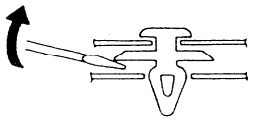
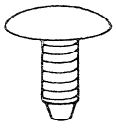
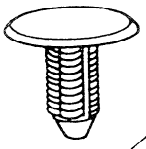
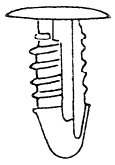
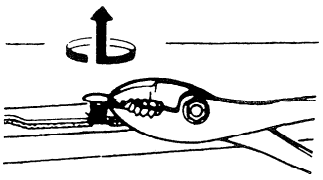
Circuit Breaker Inspection

For example, when current is 30A, the circuit is broken within 8 to 20 seconds.
Circuit breakers are used in the following systems.

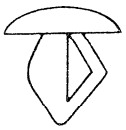
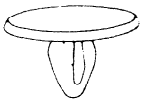
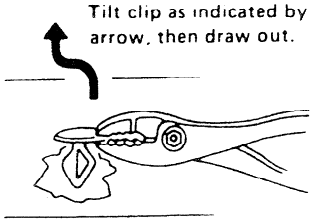
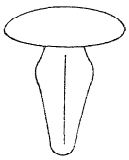
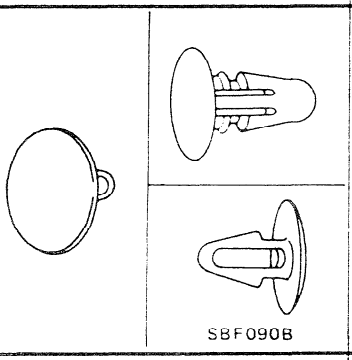
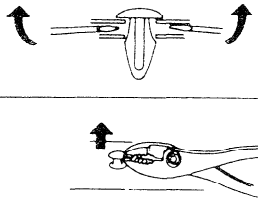
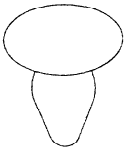
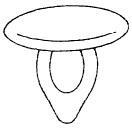
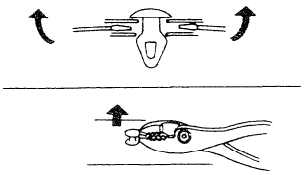
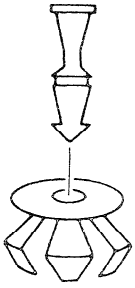
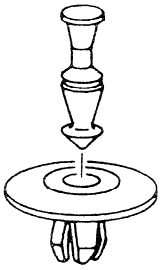
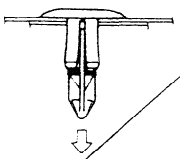
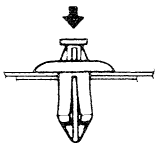
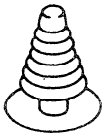
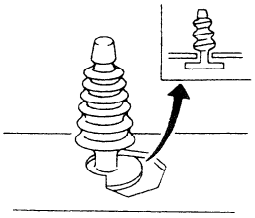
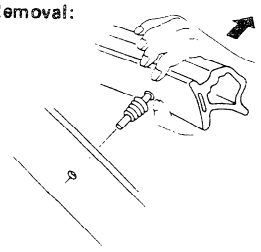
- Power window & power door lock
- Power sun roof

Clip and Fastener

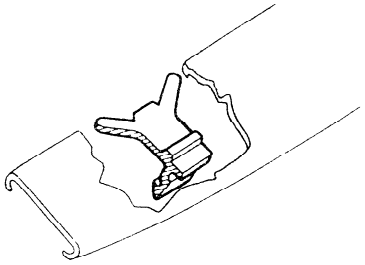
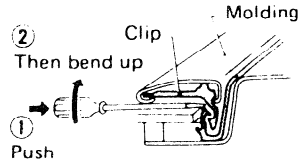
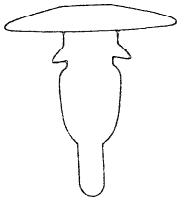
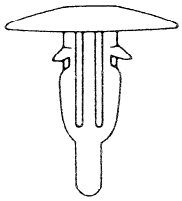
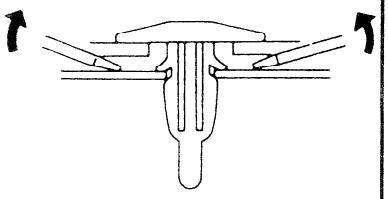
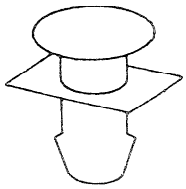
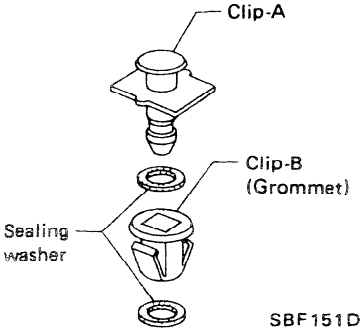
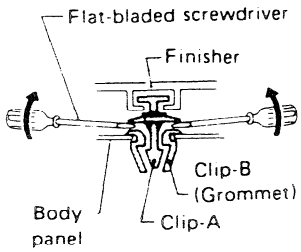
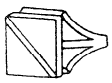
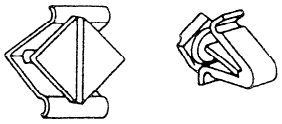
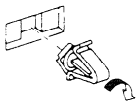
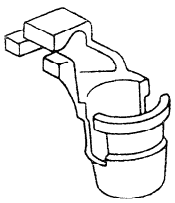
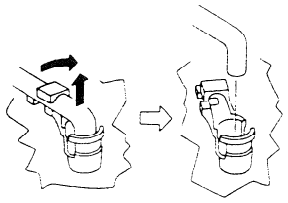
- Clips and fasteners in BF section correspond to the following numbers and symbols.
- Replace any clips and/or fasteners which are damaged during removal or installation.

No.	Symbol	Shape	Removal & Installation
C101	 SBF092B	 SBF109B	**Removal:** **Remove by bending up with a flat-bladed screwdriver.**  **SBF094B**
C102	 SBF113B	 SBF114B  SBF137B	 **Removal:** **Pull up while rotating.** **SBF115B**

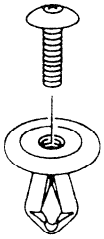
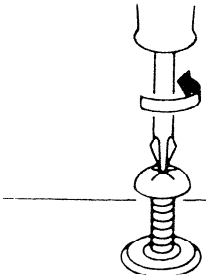
Clip and Fastener (Cont'd)

No.	Symbol	Shape	Removal & Installation
C105	 SBF141B	 SBF142B	Removal: Tilt clip as indicated by arrow, then draw out.  SBF143B
C106	 SBF089B	 SBF090B	Removal: Remove with flat-bladed screwdriver or pliers.  SBF091B
C110	 SBF290C	 SBF291C	Removal: Remove with a flat-bladed screwdriver or pliers.  SBF292C
C203	 SBF318C	 SBF319C	Push center pin to catching position. (Do not remove center pin by hitting it.) Push  Push  Installation: SBF708E
CE103	 SBF103B	 SBF104B	Removal:  SBF147B

Clip and Fastener (Cont'd)

No.	Symbol	Shape	Removal & Installation
CE106	 SBF653B		**Removal:**  SBF654B
CE117	 SBF173D	 SBF174D	**Removal:** **Remove with a flat-bladed screwdriver or pliers.**  SBF175D
CF118	 SBF150D	 SBF151D	**Removal:**  SBF652B
CG101	 SBF144B	 SBF145B	**Removal**  **Rotate 45° to remove.**  **Removal** **Installation**  SBF085B
CR103	 SBF768B		**Removal:** **Holder portion of clip must be spread out to remove rod.**  SBF770B

Clip and Fastener (Cont'd)

No.	Symbol	Shape	Removal & Installation
CS102	 SBF138B	 SBF139B	**Removal:** **Screw out with a Phillips screwdriver.**  SBF140B

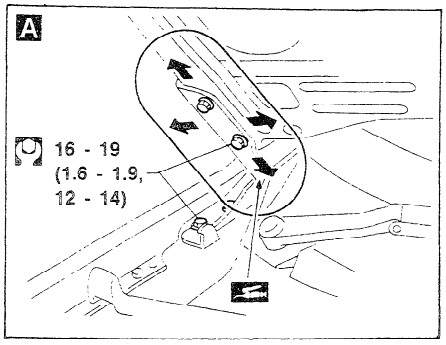
- When removing or installing hood, trunk lid or back door, place a cloth or other padding on hood, trunk lid or back door corners to avoid scratching vehicle body.
- Bumper fascia: It is made of plastic, so do not use excessive force and take care to keep oil away from it.
- Hood adjustment: Adjust 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.

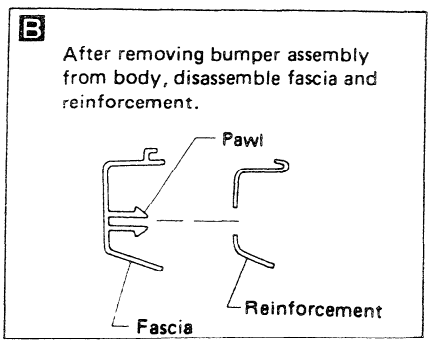
Body Front End

B13 SEDAN

REMOVAL — Front bumper assembly

① Remove left and right engine undercovers.
② Remove bolts securing left and right fender protectors to bumper fascia.
③ Remove left and right fender protectors.
④ Remove clips (CS102) from lower side of apron at bumper fascia opening.
⑤ Remove screws located at wheel opening.
⑥ Remove the two bolts securing left fender bracket. Similarly, remove right fender bracket.
⑦ Extract bumper assembly.
⑧ Disassemble fascia and reinforcement.





Body Front End (Cont'd)

Hood lock adjustment

- Adjust hood so that hood primary lock meshes at a position 1 to 1.5 mm (0.039 to 0.059 in) lower than fender.
- After hood lock adjustment, adjust bumper rubber.
- When securing hood lock, ensure it does not tilt. Striker must be positioned at the center of hood primary lock.
- After adjustment, ensure that hood primary and secondary lock operate properly.

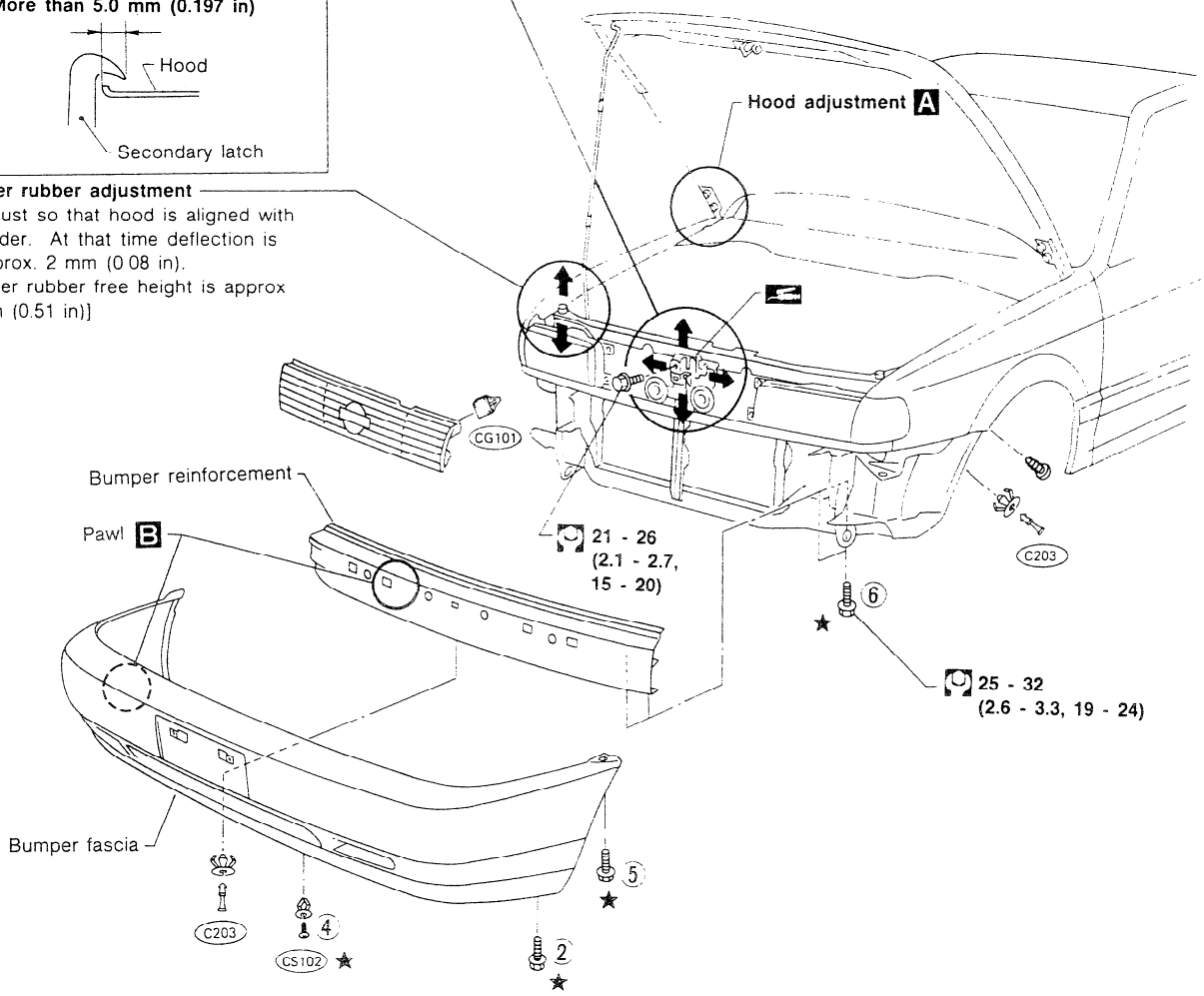
Hood lock secondary latch hooking length

More than 5.0 mm (0.197 in)

Bumper rubber adjustment

- Adjust so that hood is aligned with fender. At that time deflection is approx. 2 mm (0.08 in).

[Bumper rubber free height is approx 13 mm (0.51 in)]



★ : Bumper assembly mounting bolts & clips

: N•m (kg-m, ft-lb)

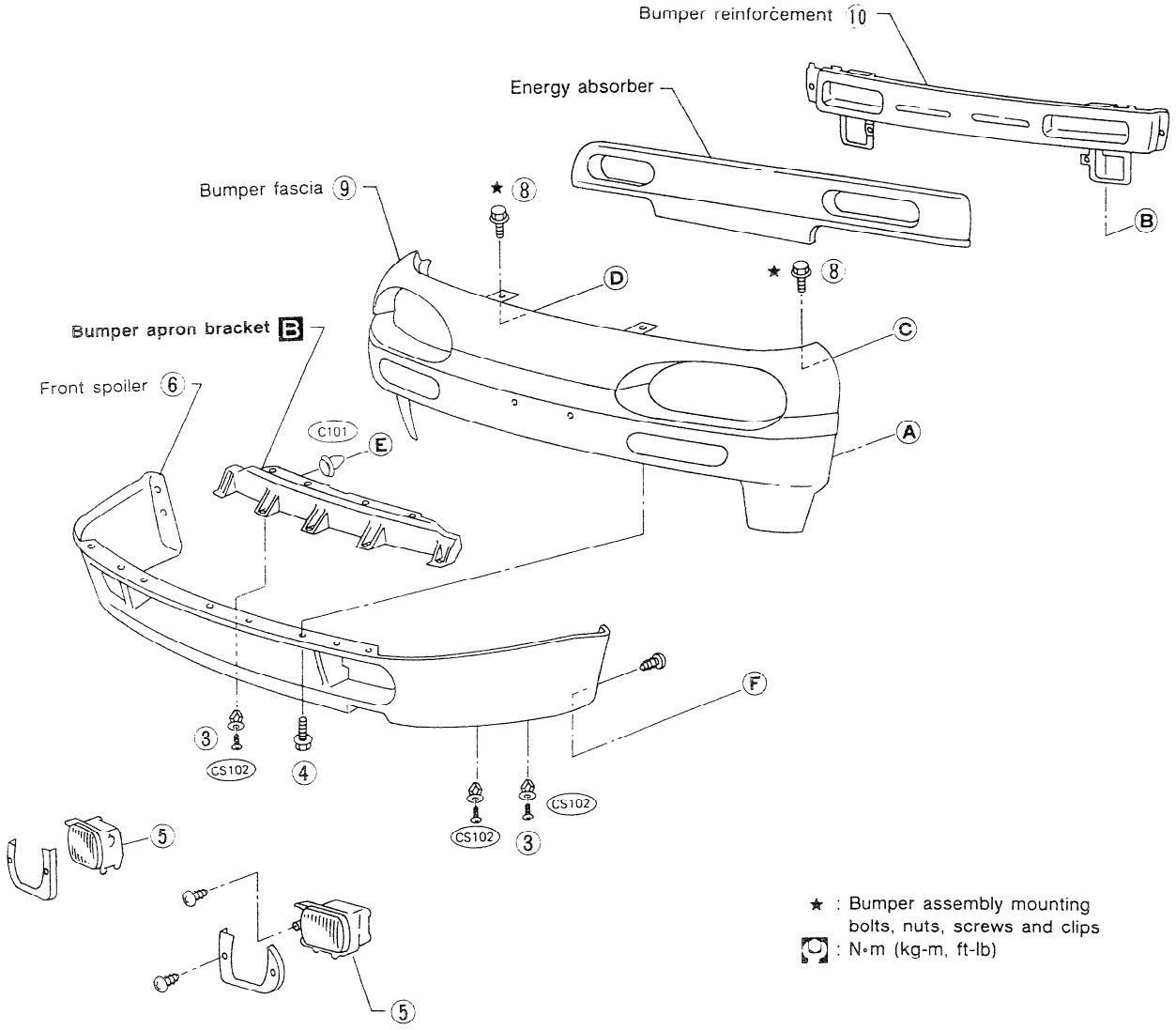
MBF267A

Body Front End (Cont'd)

B13 COUPE

REMOVAL — Front bumper assembly

1. Remove left and right engine undercovers.
2. Remove left and right fender protectors.
3. Remove the nine clips (CS102) from front spoiler lower side; remove the four screws (two on each side) from left and right fender lower sides.
4. Remove the eight bolts through spoiler opening.
5. Disconnect left and right fog lamp harness connectors.
6. Remove front spoiler.
7. Remove the ten nuts (five on each side) from left and right bumper sides.
8. Remove the six bolts from bumper upper side.
9. Extract bumper fascia.
10. Remove bumper reinforcement.



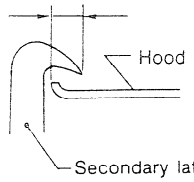
Body Front End (Cont'd)

Hood lock adjustment

- Adjust hood so that hood primary lock meshes at a position 1 to 1.5 mm (0.039 to 0.059 in) lower than fender.
- After hood lock adjustment, adjust bumper rubber.
- When securing hood lock, ensure it does not tilt. Striker must be positioned at the center of hood primary lock
- After adjustment, ensure that hood primary and secondary lock operate properly.

Hood lock secondary latch hooking length

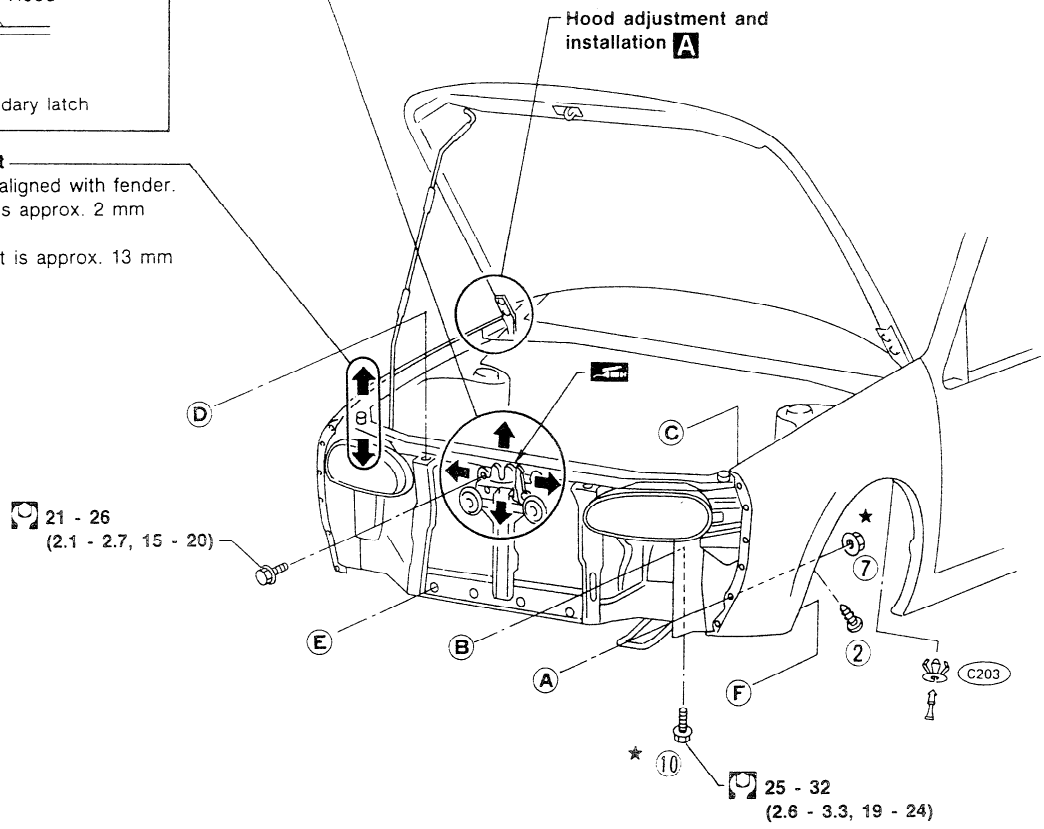
More than 5.0 mm (0.197 in)

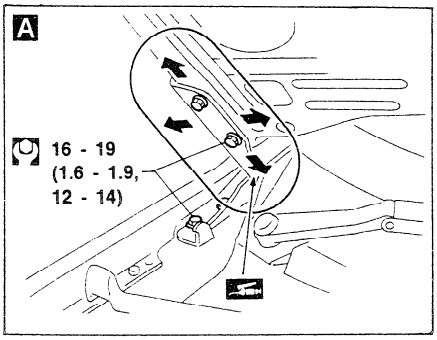


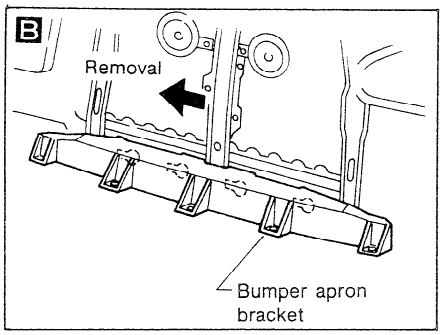
Bumper rubber adjustment

- Adjust so that hood is aligned with fender. At that time deflection is approx. 2 mm (0.08 in).

[Bumper rubber free height is approx. 13 mm (0.51 in).]







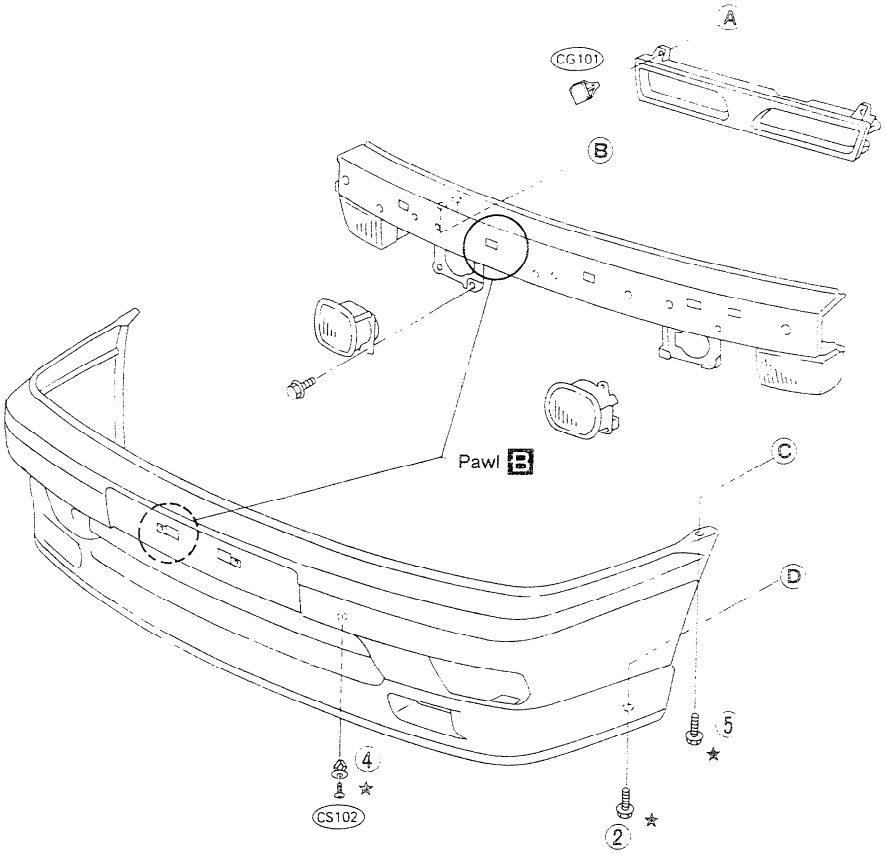
MBF268A

Body Front End (Cont'd)

N14

REMOVAL — Front bumper assembly

① Remove left and right engine undercovers.
② Remove bolts securing left and right fender protectors to bumper fascia.
③ Remove left and right fender protectors.
④ Remove clips (CS102) from lower side of apron at bumper fascia opening.
⑤ Remove screws located at wheel opening.
⑥ Remove the two bolts securing left fender bracket. Similarly, remove right fender bracket.
⑦ Extract bumper assembly.
⑧ Disassemble fascia and reinforcement.



★ : Bumper assembly mounting bolts, nuts, screws and clips
: N•m (kg-m, ft-lb)

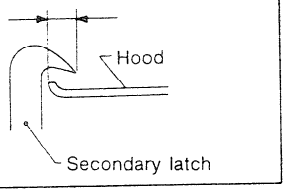
Body Front End (Cont'd)

Hood lock adjustment

- Adjust hood so that hood primary lock meshes at a position 1 to 1.5 mm (0.039 to 0.059 in) lower than fender.
- After hood lock adjustment, adjust bumper rubber.
- When securing hood lock, ensure it does not tilt. Striker must be positioned at the center of hood primary lock.
- After adjustment, ensure that hood primary and secondary lock operate properly

Hood lock secondary latch hooking length

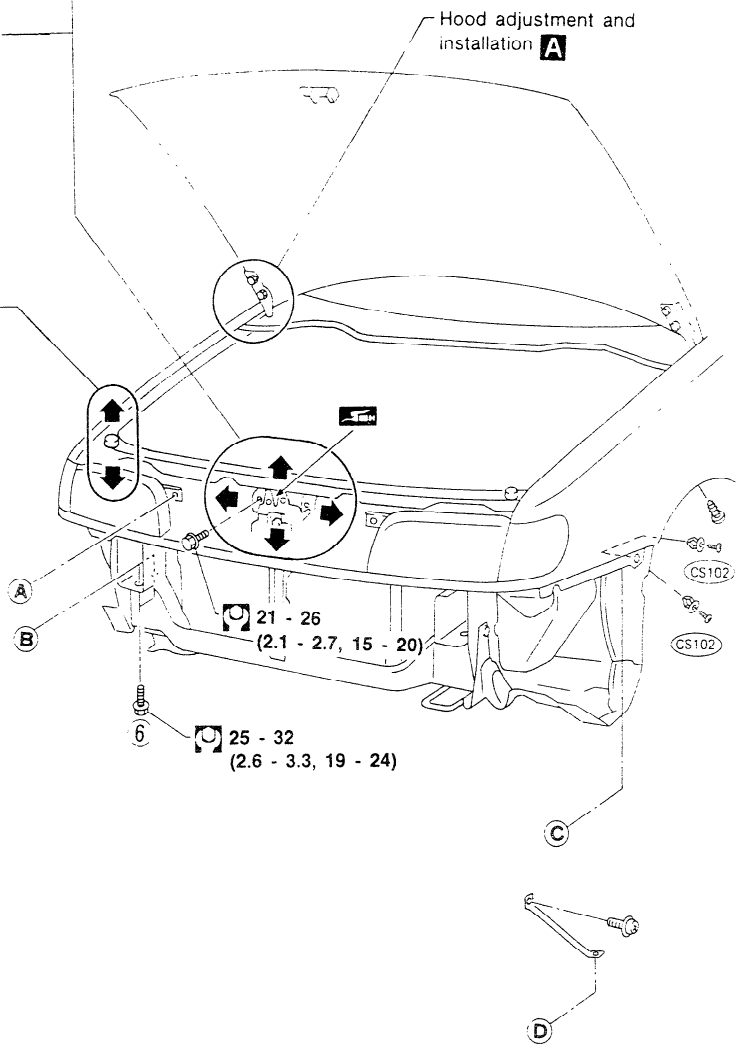
More than 5.0 mm (0.197 in)



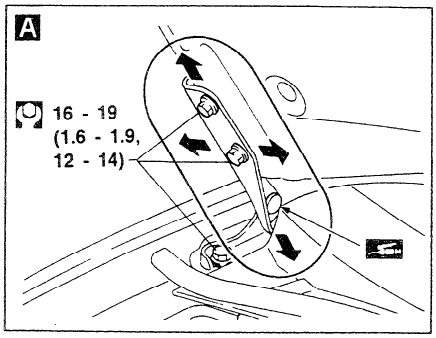
Bumper rubber adjustment

- Adjust so that hood is aligned with fender. At that time deflection is approx. 2 mm (0.08 in).

[Bumper rubber free height is approx 13 mm (0.51 in)]

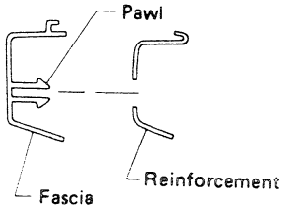


A



B

After removing bumper assembly from body, disassemble fascia and reinforcement.



MBF269A

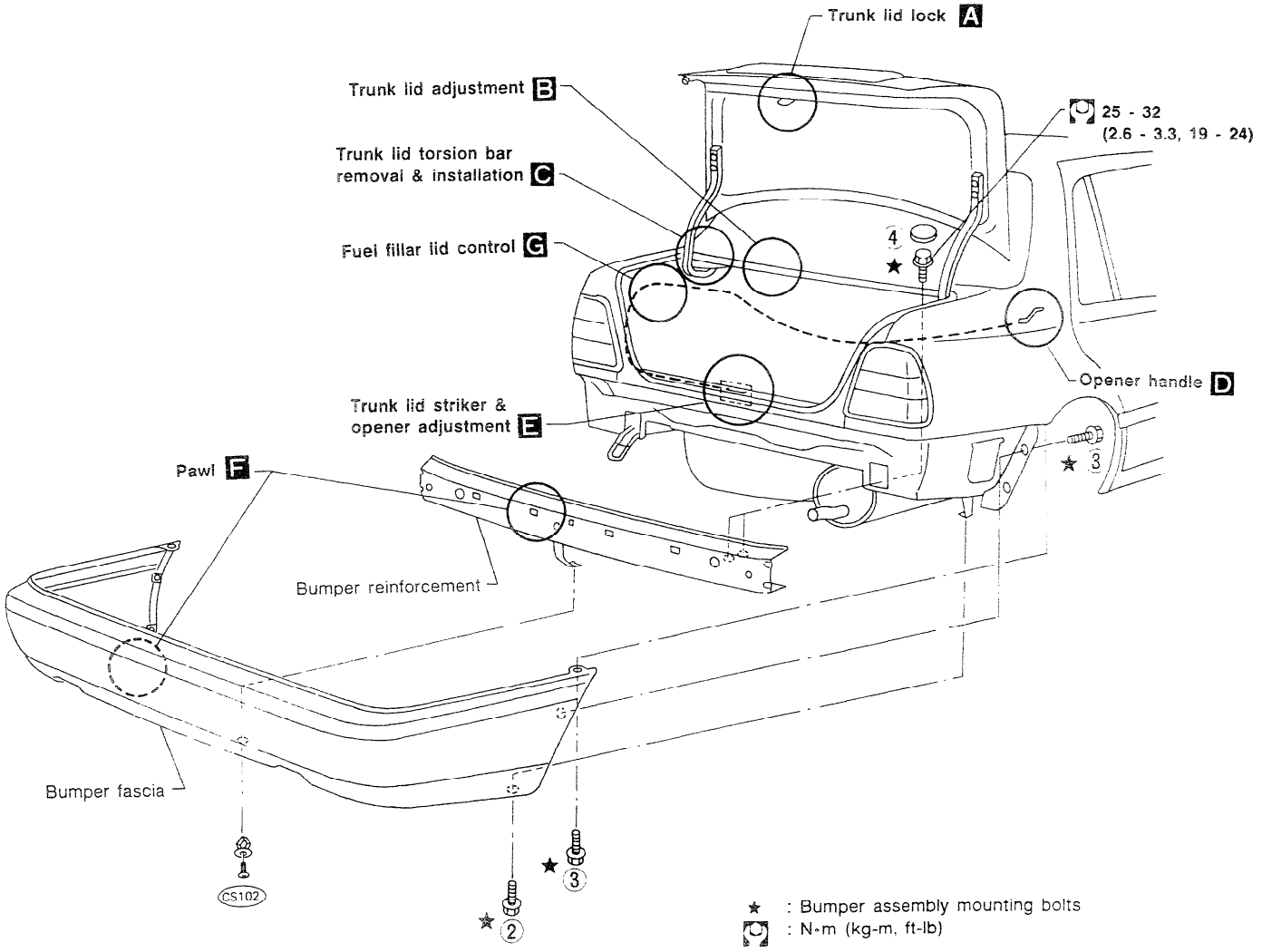
Body Rear End and Opener

B13 SEDAN
N14 SEDAN

- 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 installing/adjusting opener, make sure that trunk lid and fuel filler lid open

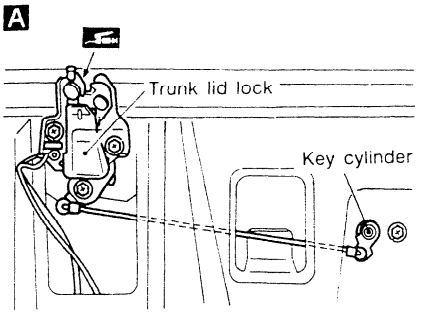
REMOVAL — Rear bumper assembly

① Remove trunk trim. Refer to "LUGGAGE COMPARTMENT TRIM" in "Interior" for details.
② Remove the two screws from lower side of each side bumper.
③ Remove screws securing wheelarch to each side bumper.
④ Working inside trunk, remove left and right plugs from floor, then remove the four bolts.
⑤ Extract bumper assembly.
⑥ Disassemble fascia and reinforcement.

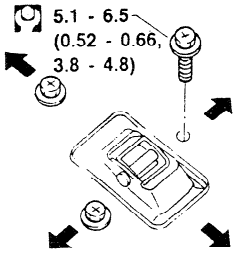


Body Rear End and Opener (Cont'd)

A

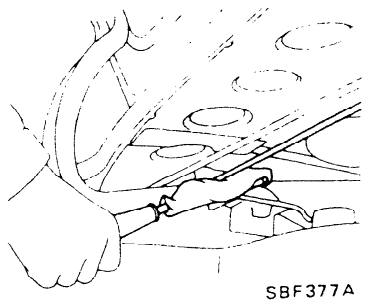


B



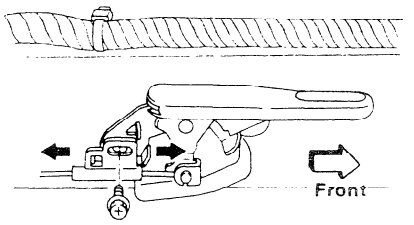
N14 Sedan Basically the same as the B13 Sedan

C

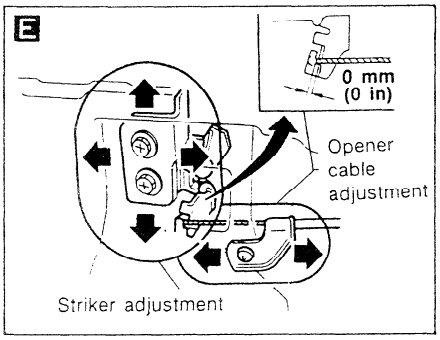


SBF377A

D

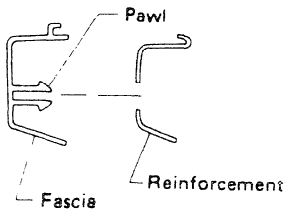


E

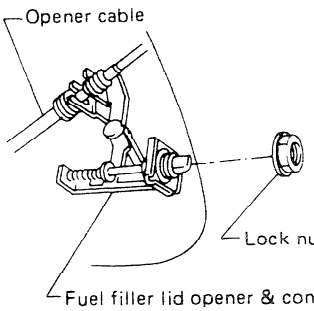


F

After removing bumper assembly from body, disassemble fascia and reinforcement.



G

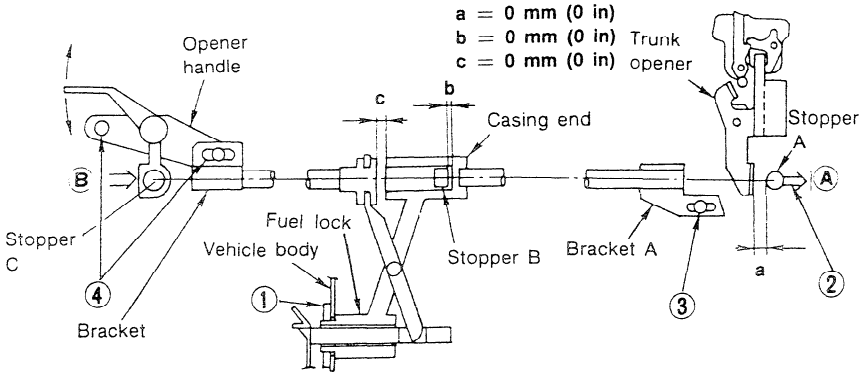


Trunk lid and fuel filler lid opener installation

Installation (Refer to figure below)

1. Temporarily route cable and secure fuel lock to vehicle body.
2. Lightly pull stopper A (at cable end) in direction Ⓐ to eliminate clearance **b** between stopper B and casing end.
3. Secure bracket A to vehicle body so that clearance **a** between stopper A and trunk striker is 0 mm (0 in). (At this point, do not pull striker lever.)
4. Attach stopper C to handle. While lightly pushing cable in direction Ⓑ shown by arrow (do not allow any clearance **c** at fuel lock casing end to occur), secure handle to vehicle body.

Ensure that clearances a and b are eliminated after installation.



Adjustment procedures are the same for both B13 Sedan and N14.

MBF270A

Body Rear End and Opener (Cont'd)

B13 COUPE

- 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:

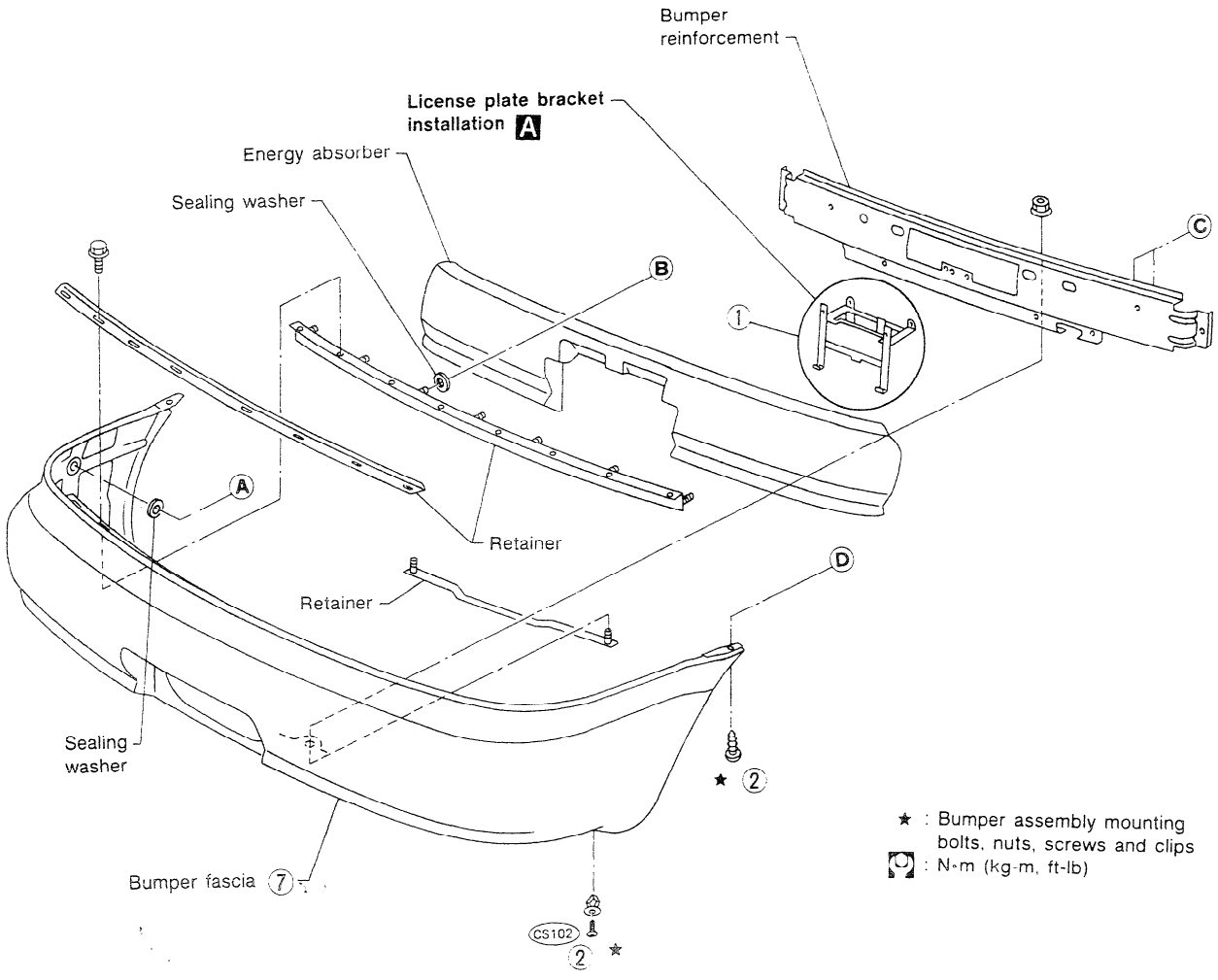
a. **Be careful not to scratch back door stay when installing back door. A scratched stay may cause gas leakage.**

b. **The contents of the back door stay are under pressure. Do not take apart, puncture, apply heat or allow fire near it.**

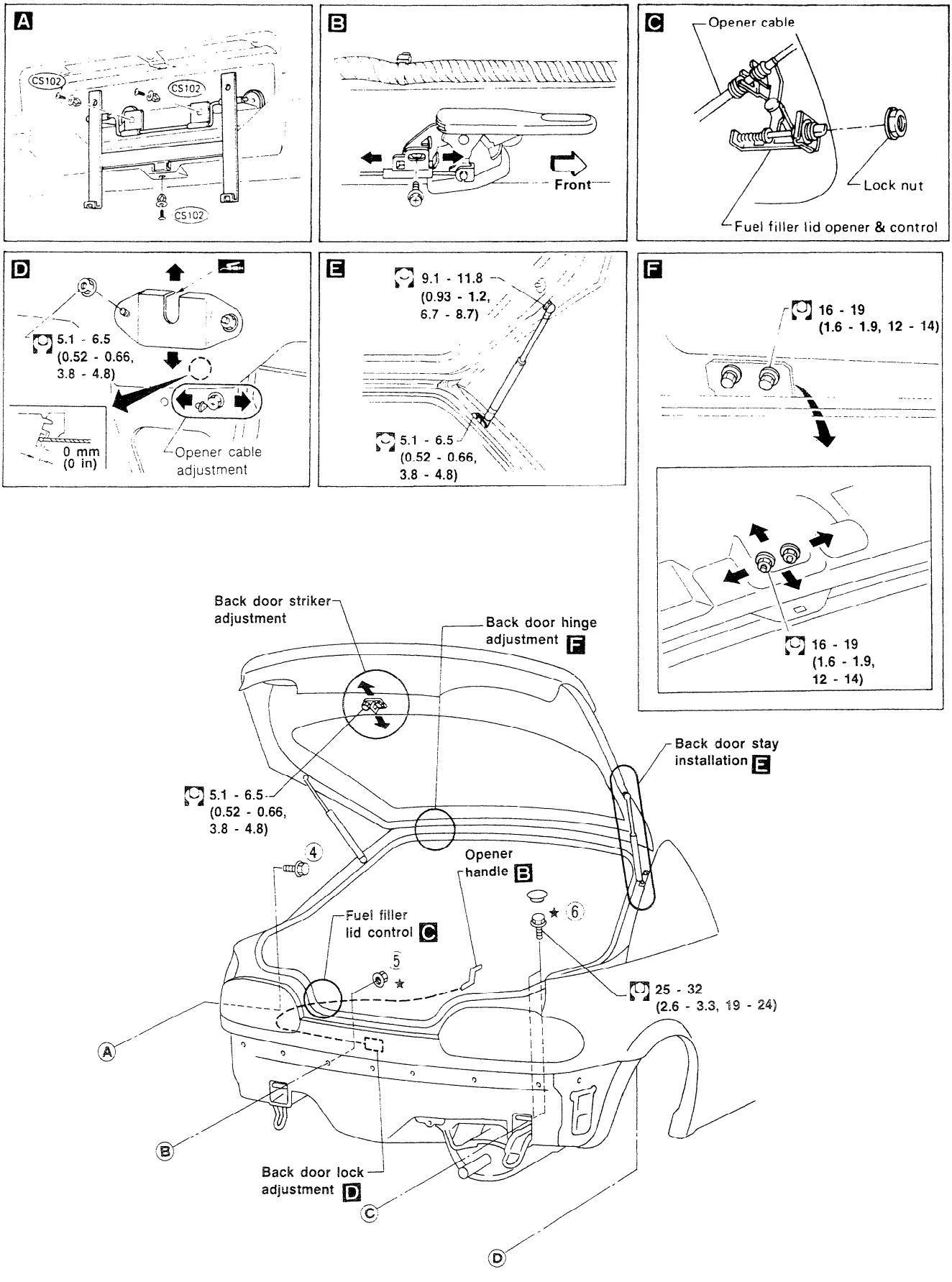
- Opener cable: Do not attempt to bend cable using excessive force.
- After installation, make sure that trunk lid/back door and fuel filler lid open smoothly.

REMOVAL — Rear bumper assembly

① Remove license plate and license plate bracket **A**.
② Remove screw and clip (CS102) from lower side of each side bumper.
③ Remove luggage room trim. Refer to "SIDE, LUGGAGE AND FLOOR TRIM" in "Interior" for details.
④ Working inside luggage room, remove bolt securing each bumper side to fender.
⑤ Working inside luggage room, remove the seven nuts from center of luggage compartment.
⑥ Also remove left and right plugs from floor, then remove bolts.
⑦ Pull bumper fascia out, remove license lamp harness connector.



Body Rear End and Opener (Cont'd)



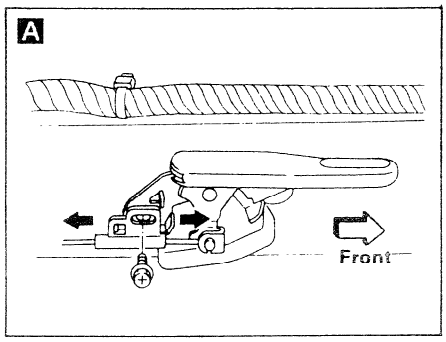
MBF271A

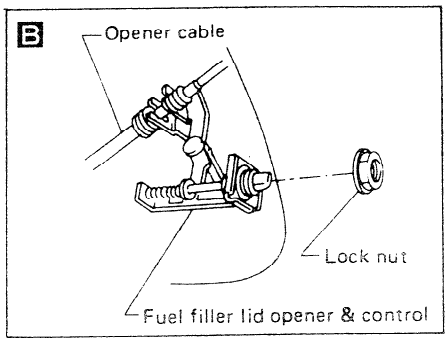
Body Rear End and Opener (Cont'd)

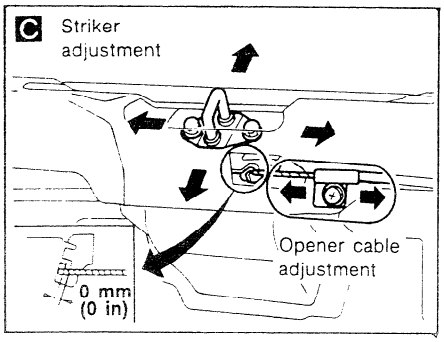
N14 5-DOOR HATCHBACK AND 3-DOOR HATCHBACK

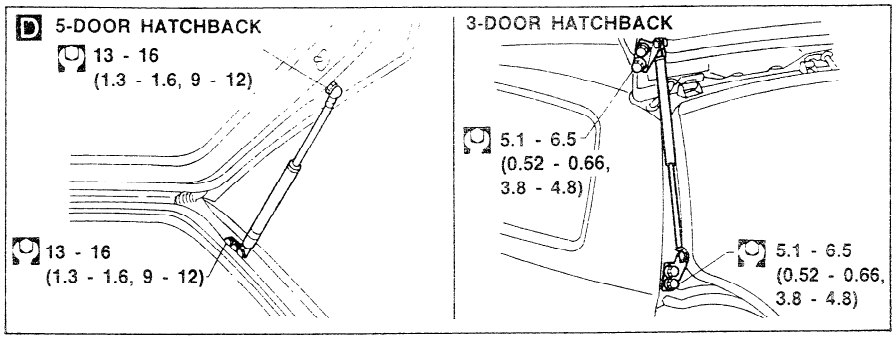
REMOVAL — Rear bumper assembly

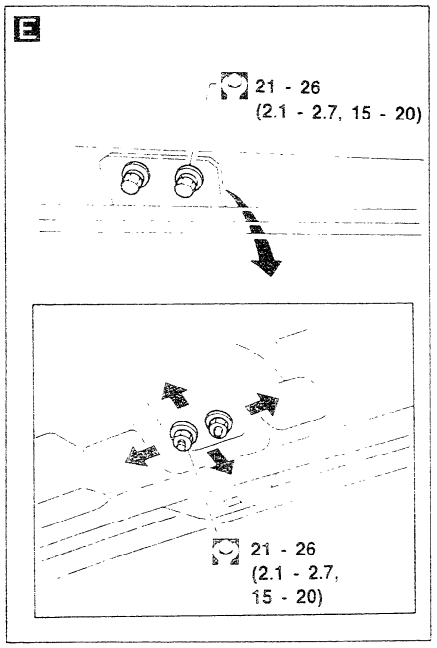
① Remove the two screws from lower side of each side bumper.
② Remove screws securing wheelarch to each side bumper.
③ Working inside luggage room, remove left and right plugs from floor, then remove the four bolts.
④ Extract bumper assembly.
⑤ Disassemble fascia and reinforcement.

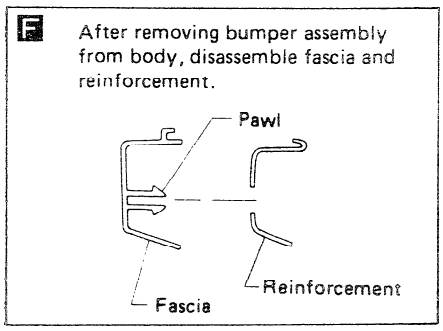




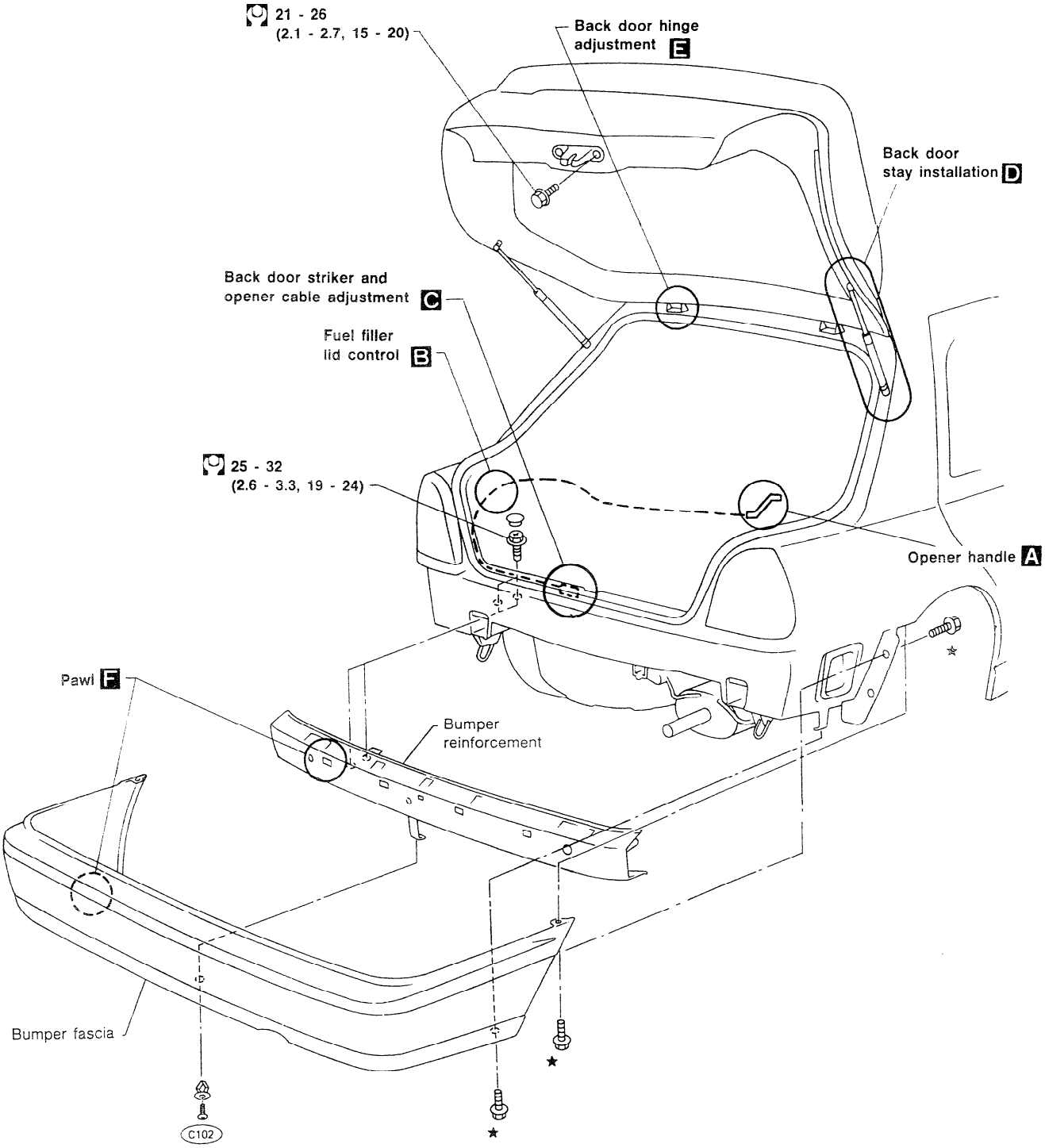








Body Rear End and Opener (Cont'd)



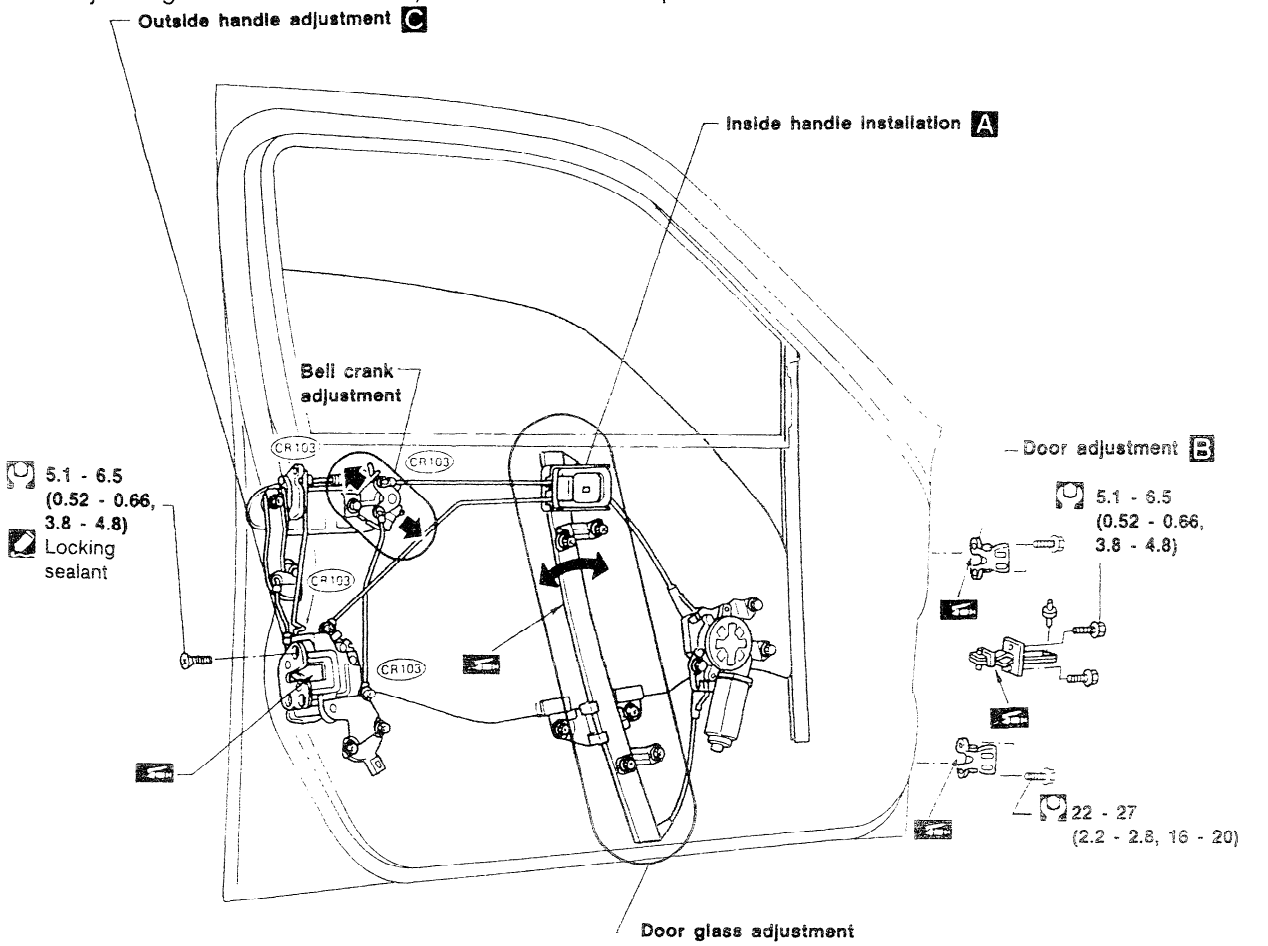
: N·m (kg-m, ft-lb)

MBF272A

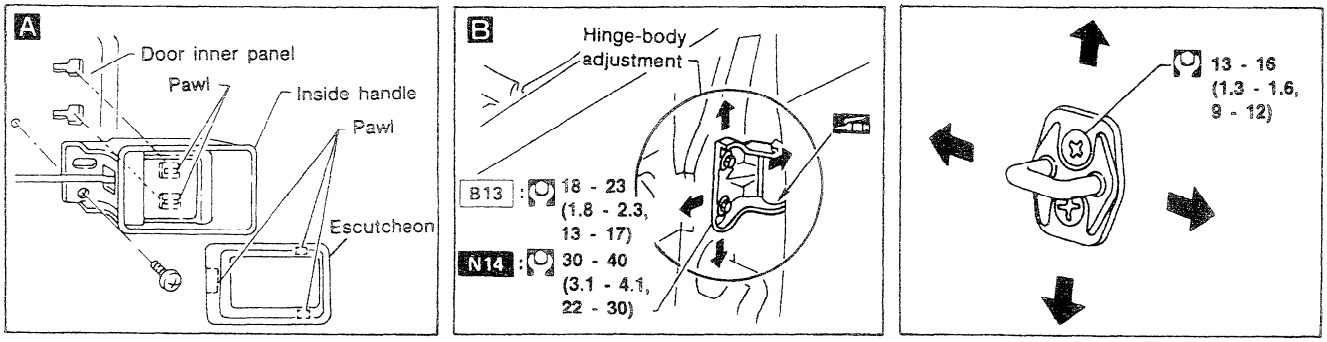
Front Door

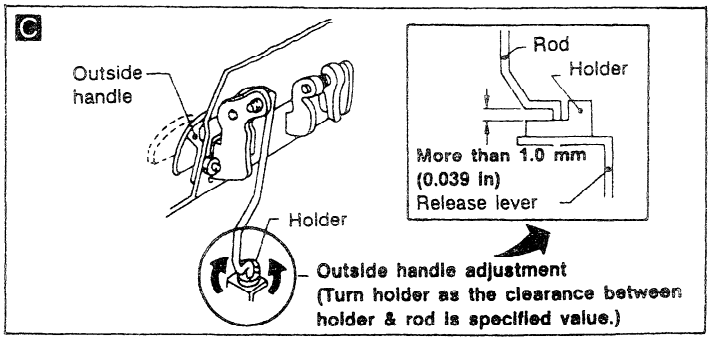
B13 SEDAN
N14 SEDAN AND 5-DOOR HATCHBACK

- When removing door, be sure not to scratch vehicle body.
- After adjusting door or door lock, check door lock operation.



Striker adjustment

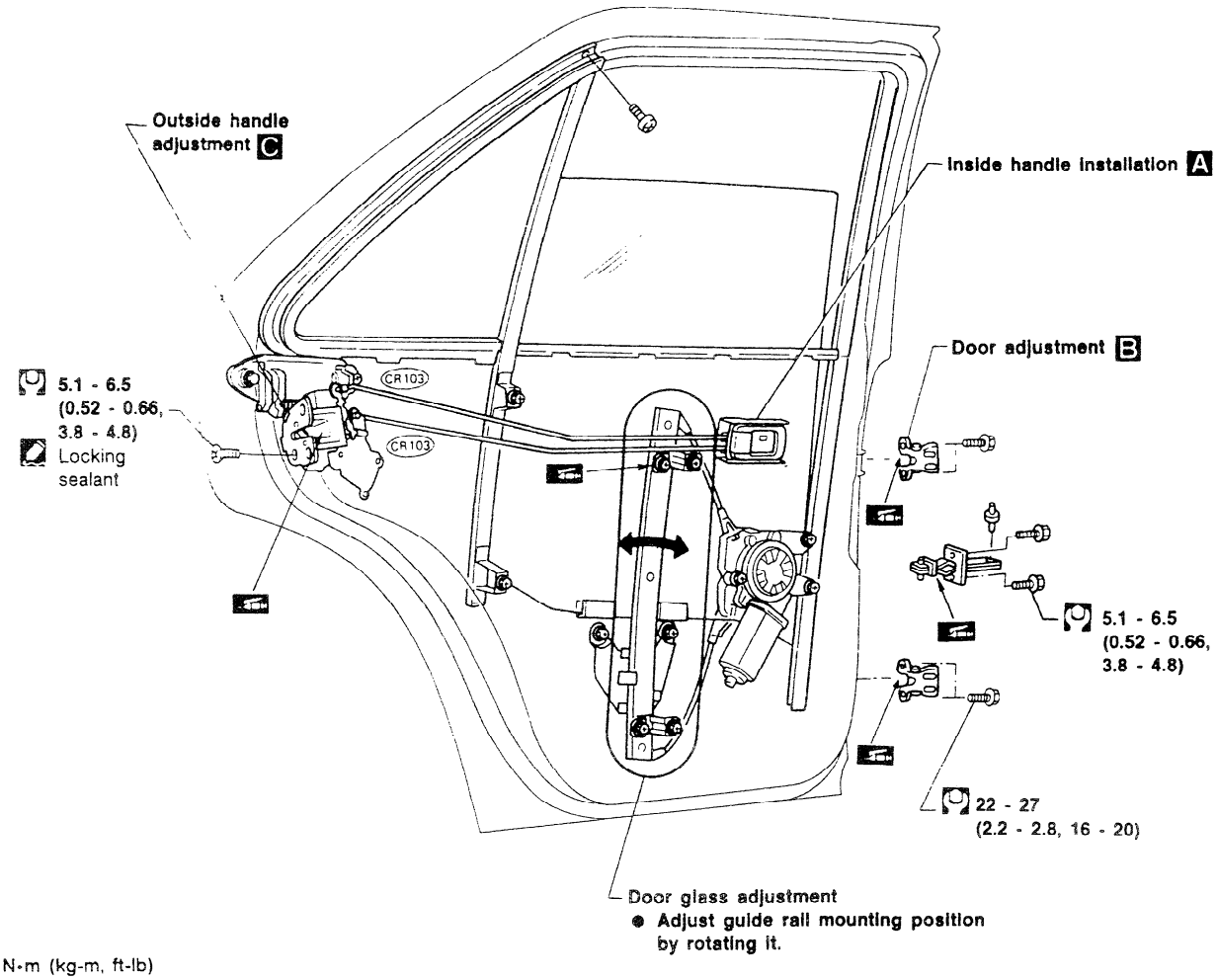




MBF273AB

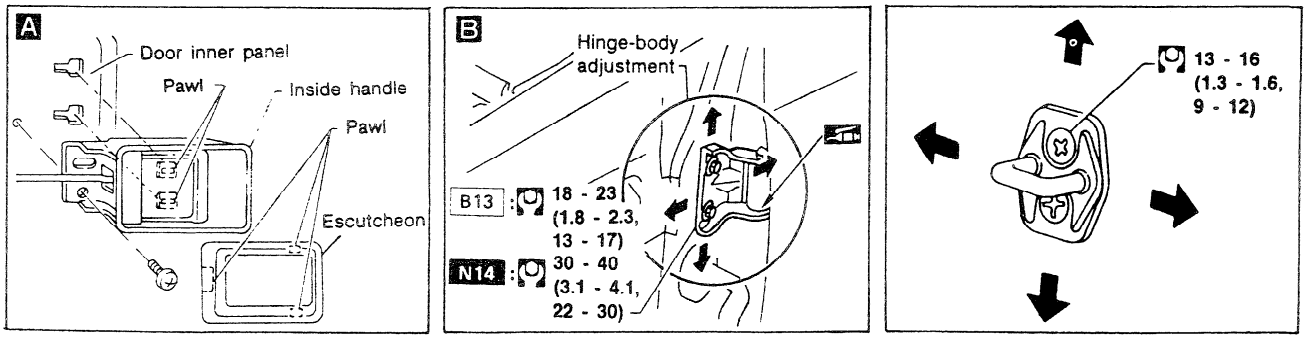
Rear Door

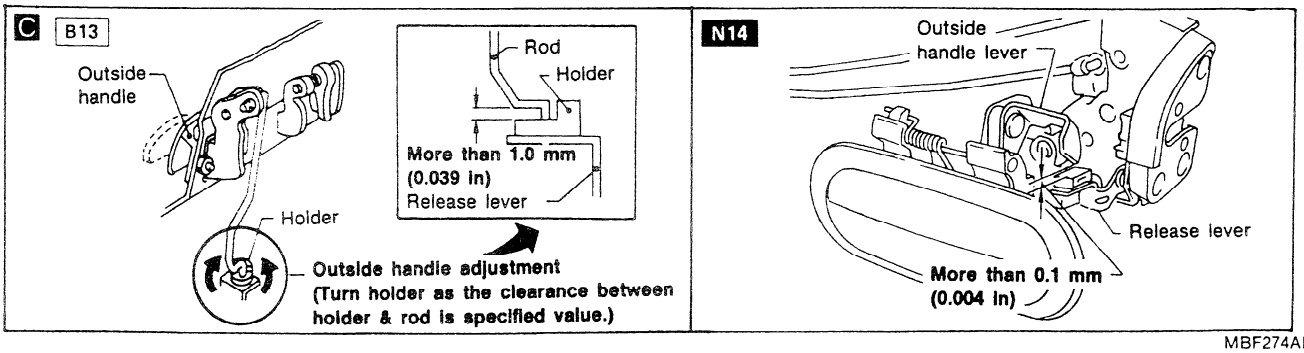
B13 SEDAN
N14 SEDAN AND 5-DOOR HATCHBACK



: N·m (kg-m, ft-lb)

Striker adjustment

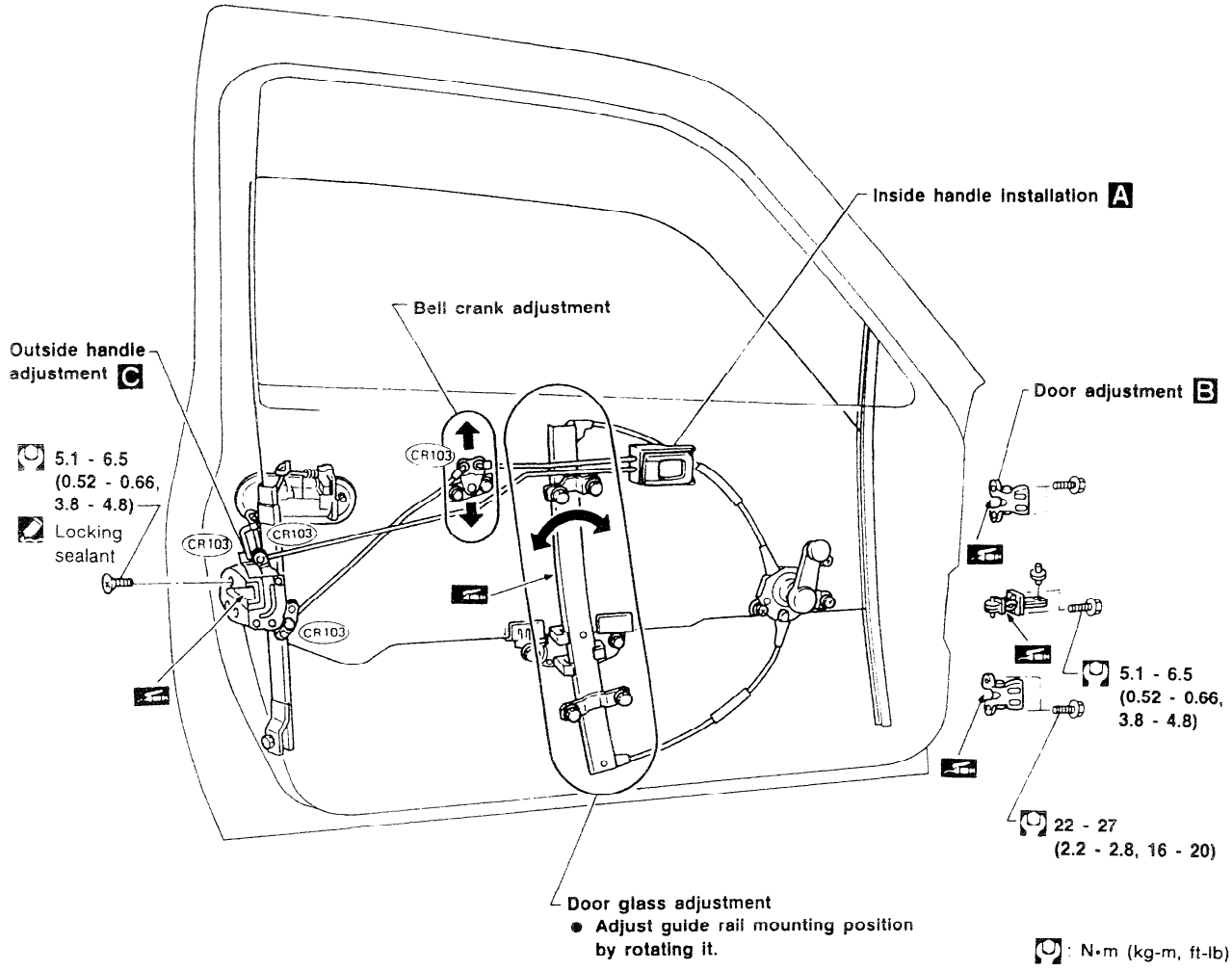


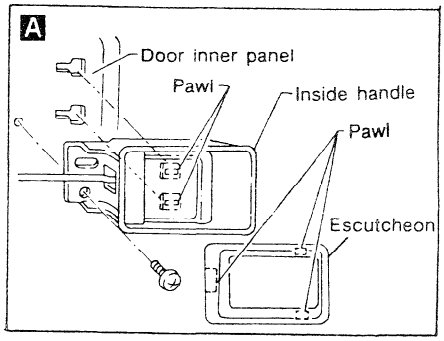


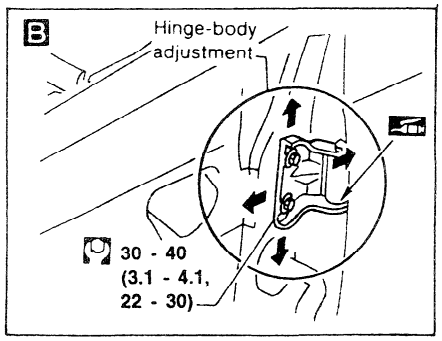
MBF274AB

Front Door

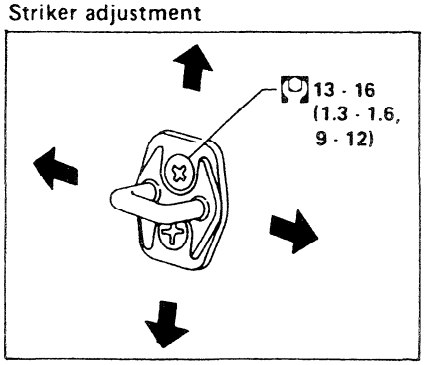
N14 3-DOOR HATCHBACK

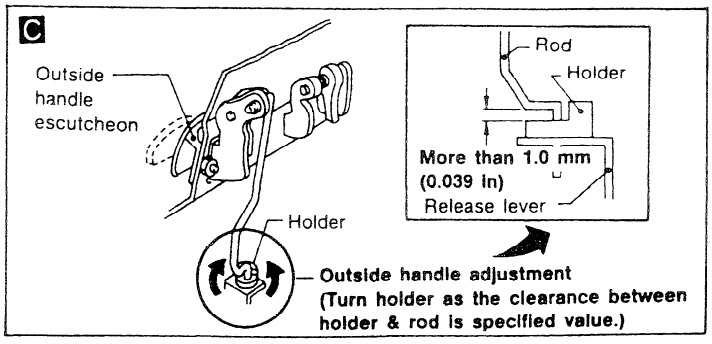






Striker adjustment

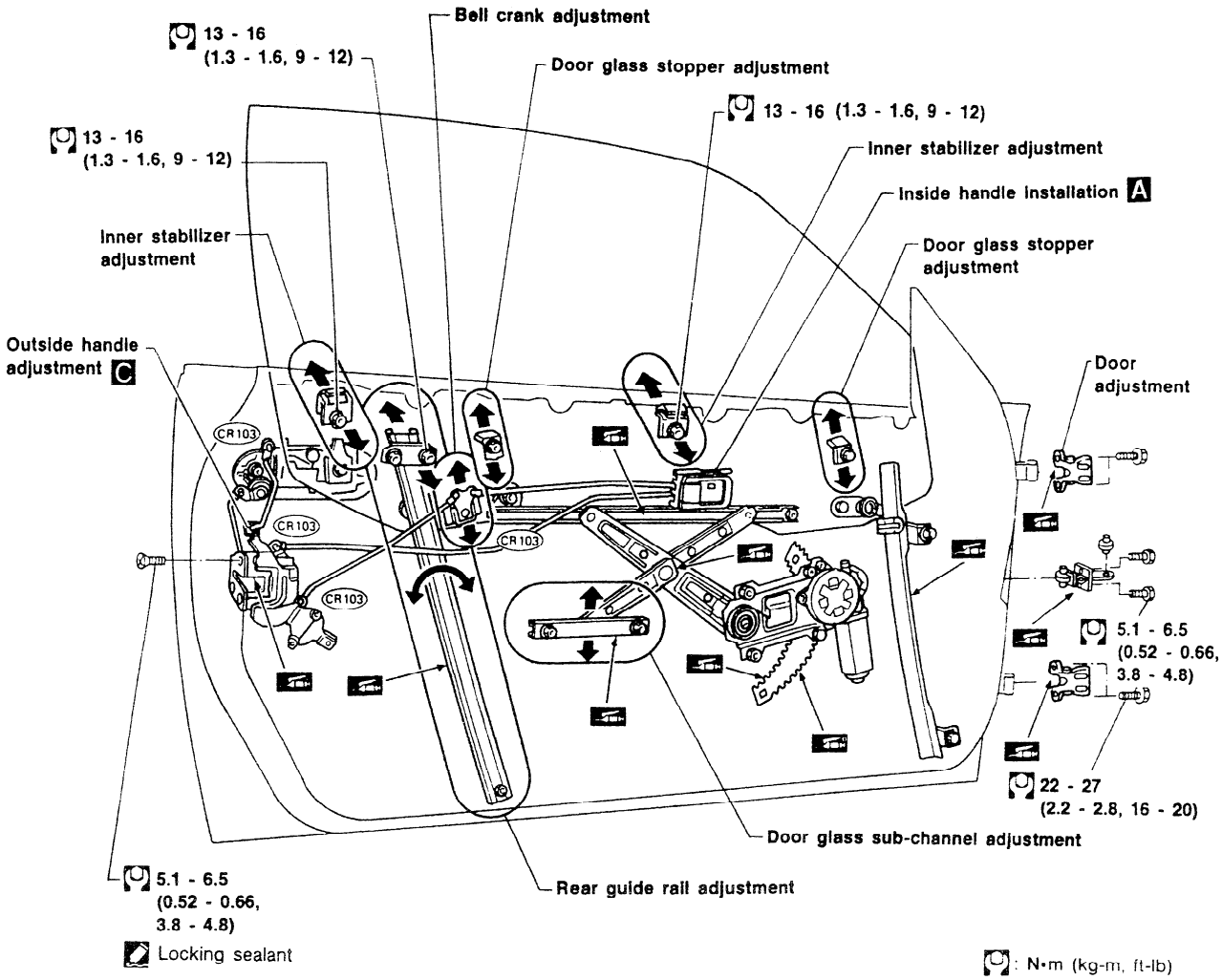


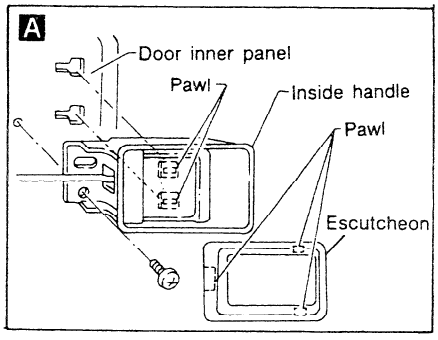


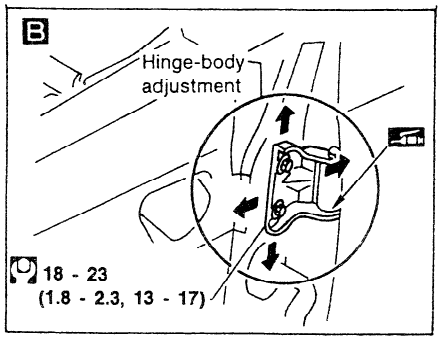
MBF276AA

Front Door (Cont'd)

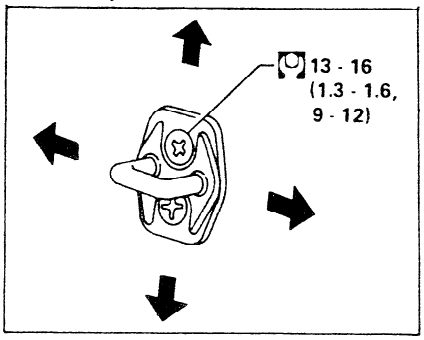
B13 COUPE

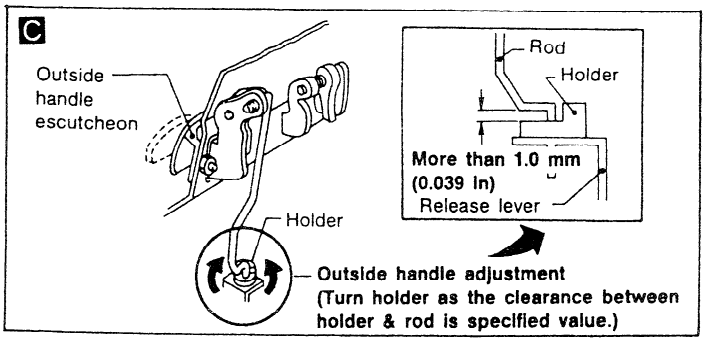






Striker adjustment

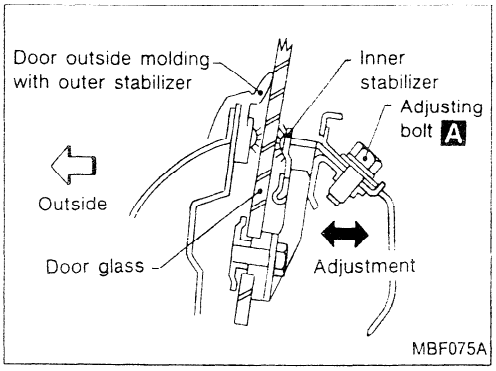


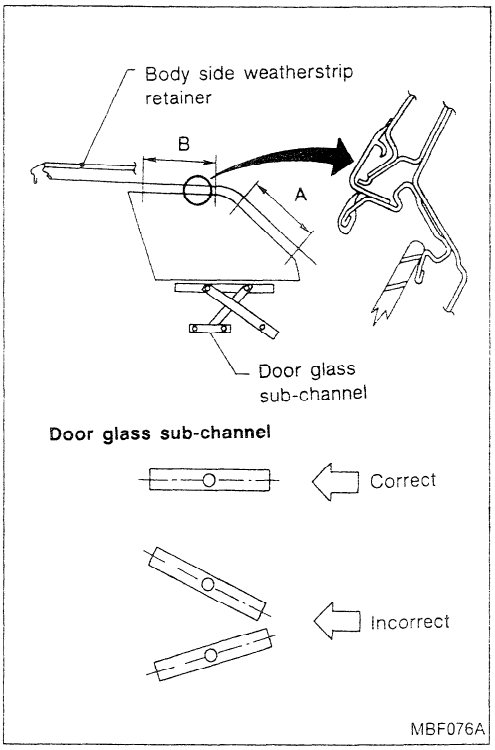


MBF275AA

Front Door (Cont'd)

- When removing and installing the door glass, remove the door outside molding. (For the removal and installation procedure, refer to "Exterior".)
- When adjusting the door glass, it is not necessary to remove the door outside molding.
- The outer stabilizer is an integral part of the door outside molding. It can neither be removed nor adjusted.





DOOR GLASS ADJUSTMENT

1. Inner stabilizer adjustment

a. Set door glass in fully raised (closed) position.
b. Lightly press door glass upper end outward so that glass outer surface contacts outer stabilizer. With glass held in that position, press inner stabilizer to glass inner surface and tighten adjusting bolt A.

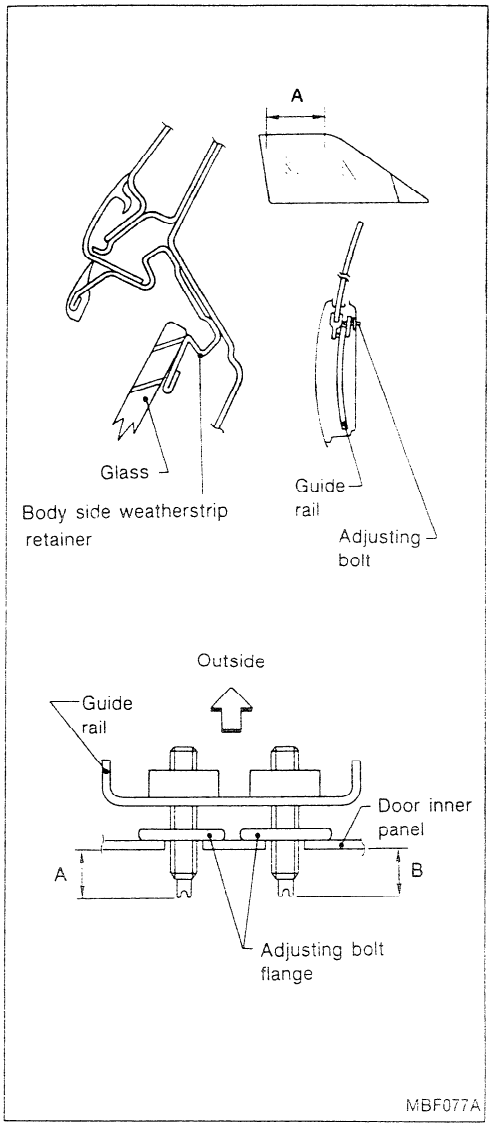
CAUTION:
Make sure nap portions of stabilizers are clean and free from oil, grease, etc.

2. Door glass sub-channel adjustment

Adjust door glass sub-channel until clearances A and B match body side weatherstrip retainer.

CAUTION:
- **Make sure door glass sub-channel is horizontal.**
- **Adjust clearances A and B simultaneously when adjusting guide rail (described under "5. Guide Rail Adjustment").**

Front Door (Cont'd)



3. Guide rail adjustment

a. Adjust rear adjusting bolt until door glass lightly contacts body side weatherstrip retainer at "A". From that position, turn adjusting bolt approximately two rotations counterclockwise.

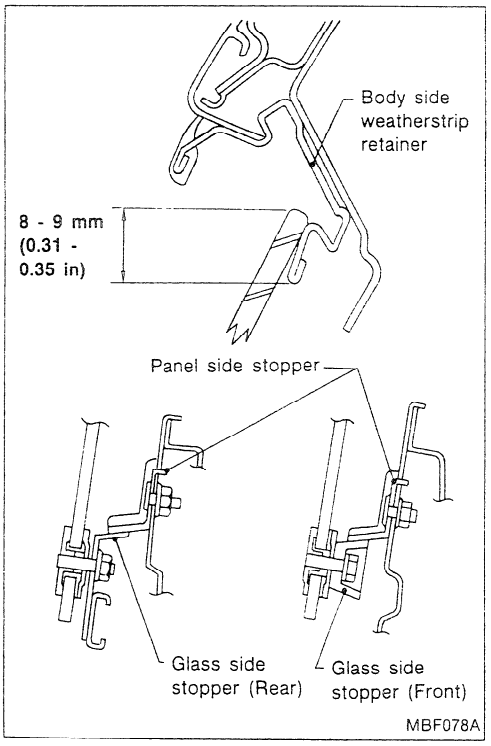
CAUTION:

- **Turn adjusting bolt clockwise to move door glass upper end outward.**
- **Turn adjusting bolt counterclockwise to move door glass upper end inward.**

b. After adjusting guide rail, turn front adjusting bolt until its flange lightly contacts inner panel and tighten lock nut.

CAUTION:

Make sure both adjusting bolts protrude equally (A = B).



4. Glass upper end adjustment

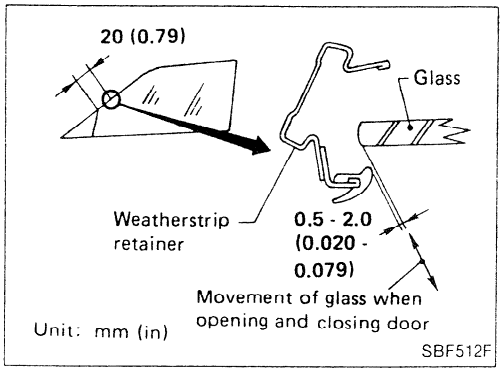
a. Adjust inner stabilizer stopper height until door glass upper end clearance is as shown in figure at left, and tighten lock nut.

b. Make sure door glass stopper is in contact with door panel stopper during adjustment.

CAUTION:

Make sure front and rear stoppers are in contact with their mating stoppers when body side weatherstrip is parallel to door glass upper end. If not, adjust door glass sub-channel. (Refer to "2. Door glass sub-channel adjustment".)

Front Door (Cont'd)

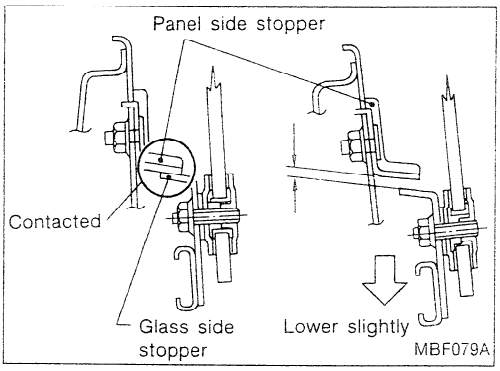


5. Guide rail adjustment ②

a. Adjust the guide rail so that the clearance between the upper end of the glass and weatherstrip retainer is 0.5 to 2.0 mm (0.020 to 0.079 in), 20 mm (0.79 in) from the end of the weatherstrip in the door corner.

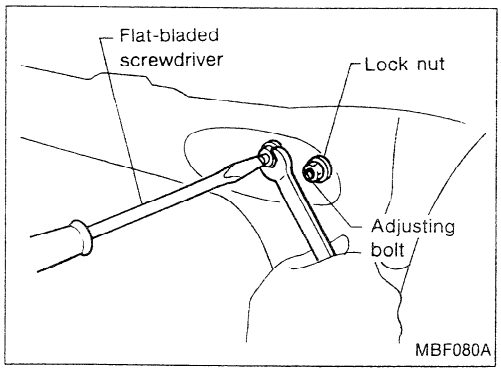
b. After adjustment, open and close the door several times to confirm that the outer periphery of the glass will not contact the weatherstrip retainer. If any contact occurs, perform the adjustment as mentioned in "2. Door glass sub-channel adjustment" again.

CAUTION:
Do not allow the adjusting bolt to rotate when loosening the guide rail lock nut.



c. Lower the glass slightly until the glass side stopper comes off the panel side stopper.

CAUTION:
Do not lower the glass excessively.



6. After completing door glass adjustment, retighten all lock nuts.

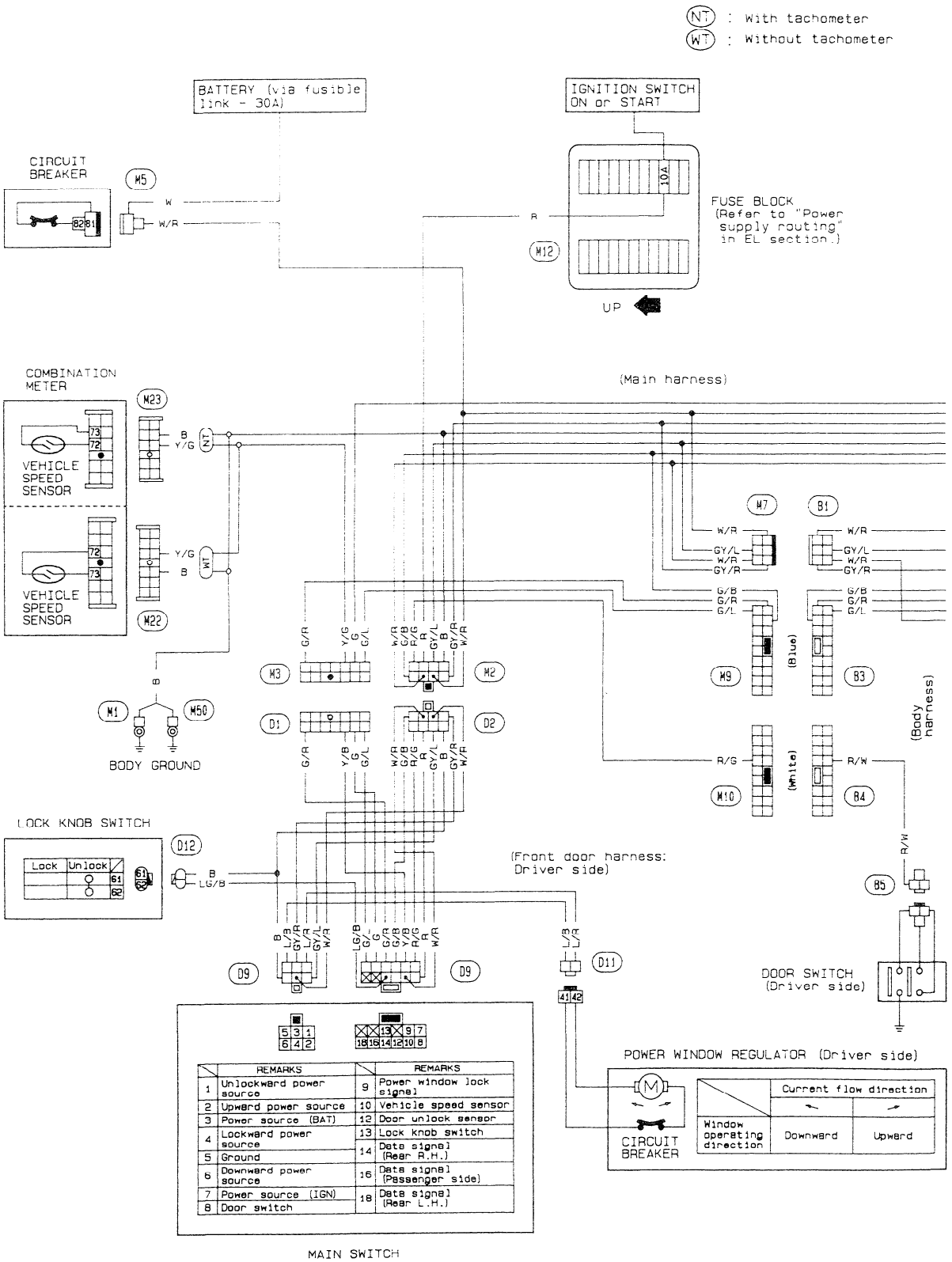
CAUTION:
While tightening lock nuts, hold adjusting bolts using a standard screwdriver to prevent them from turning.

NOTE

Power Window and Power Door Lock

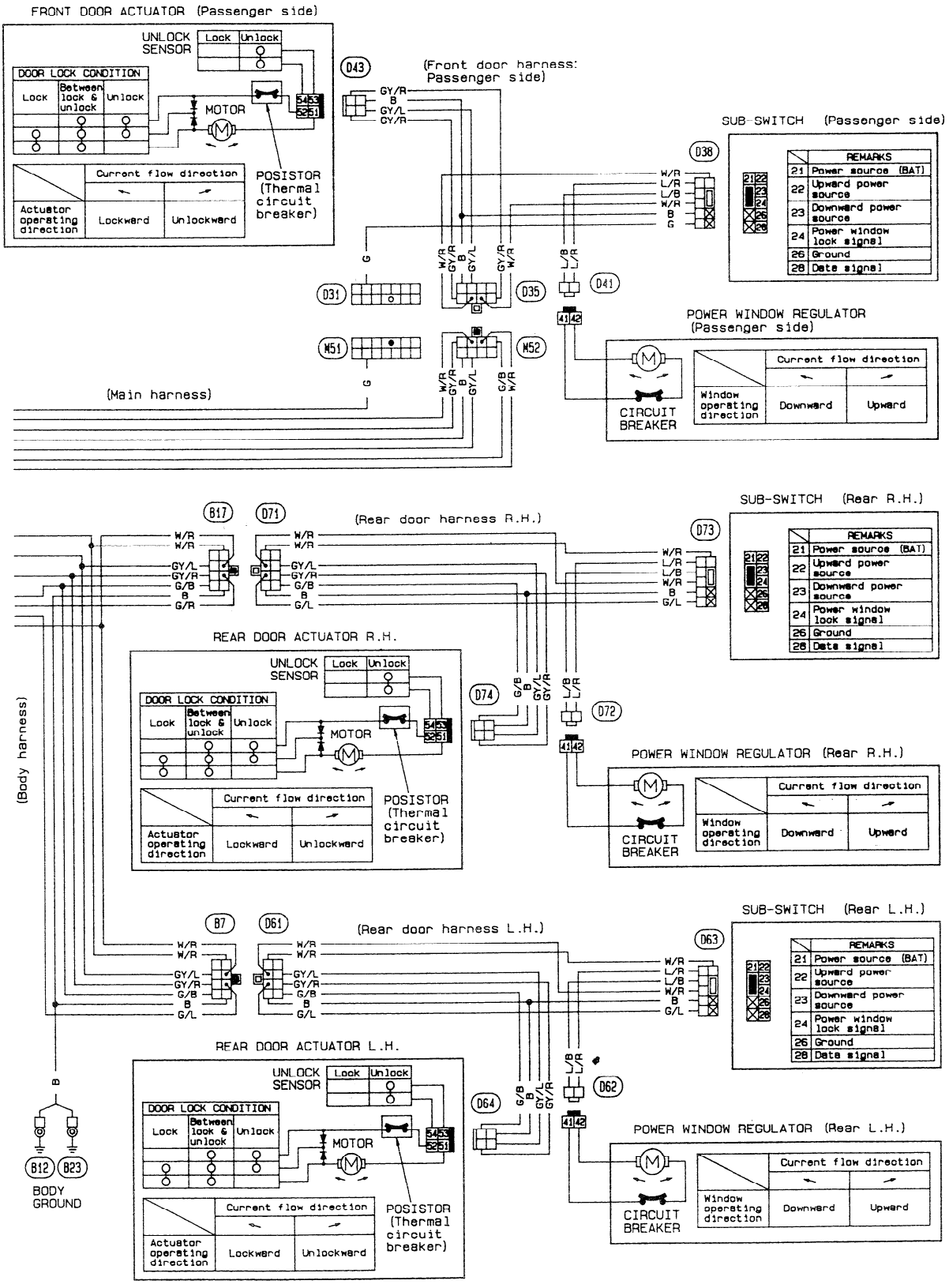
WIRING DIAGRAM

B13 SEDAN L.H. drive models



	REMARKS		REMARKS
1	Unlockward power source	9	Power window lock signal
2	Upward power source	10	Vehicle speed sensor
3	Power source (BAT)	12	Door unlock sensor
4	Lockward power source	13	Lock knob switch
5	Ground	14	Data signal (Rear R.H.)
6	Downward power source	16	Data signal (Passenger side)
7	Power source (IGN)	18	Data signal (Rear L.H.)
8	Door switch		

Power Window and Power Door Lock (Cont'd)

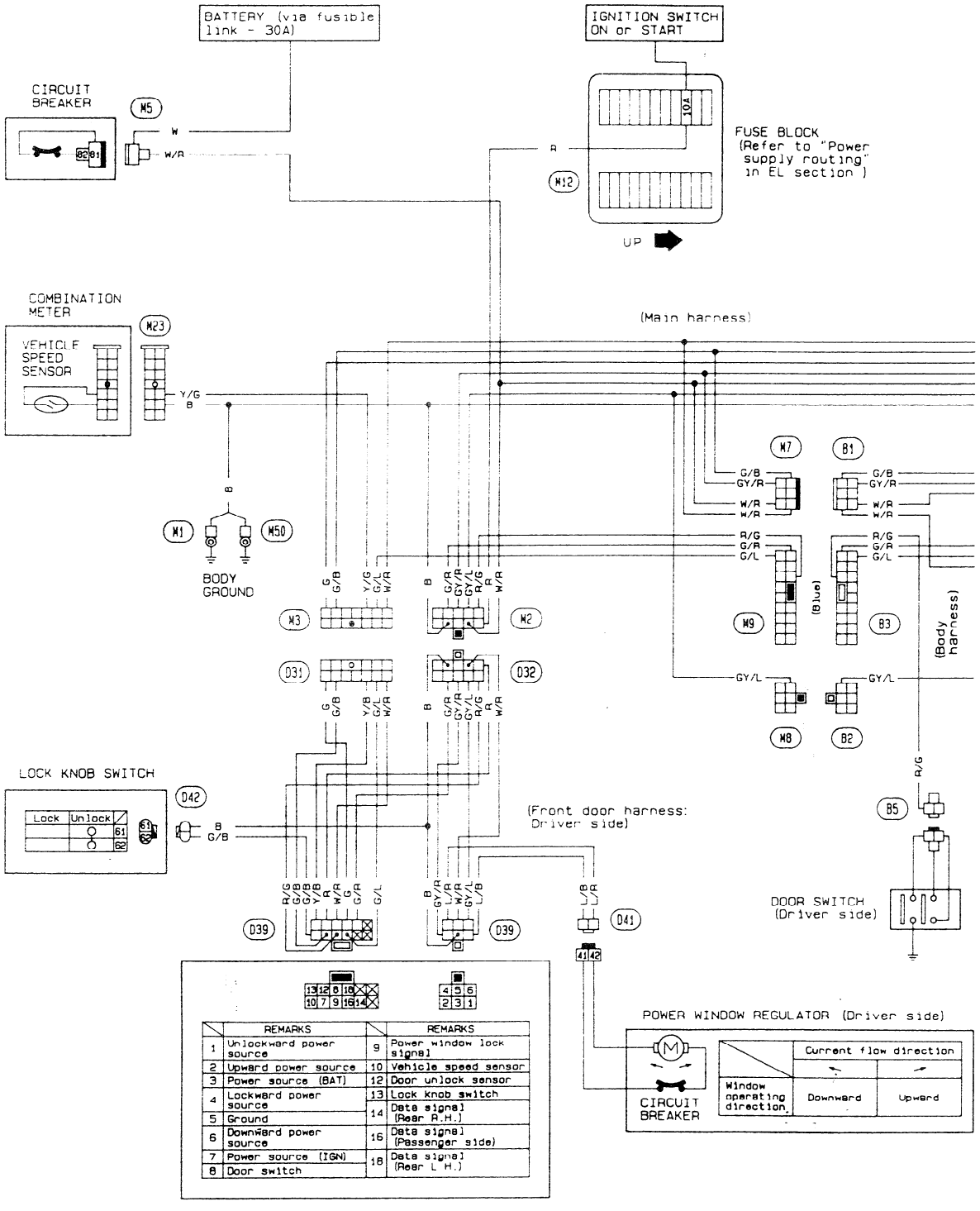


SBF075G

Power Window and Power Door Lock (Cont'd)

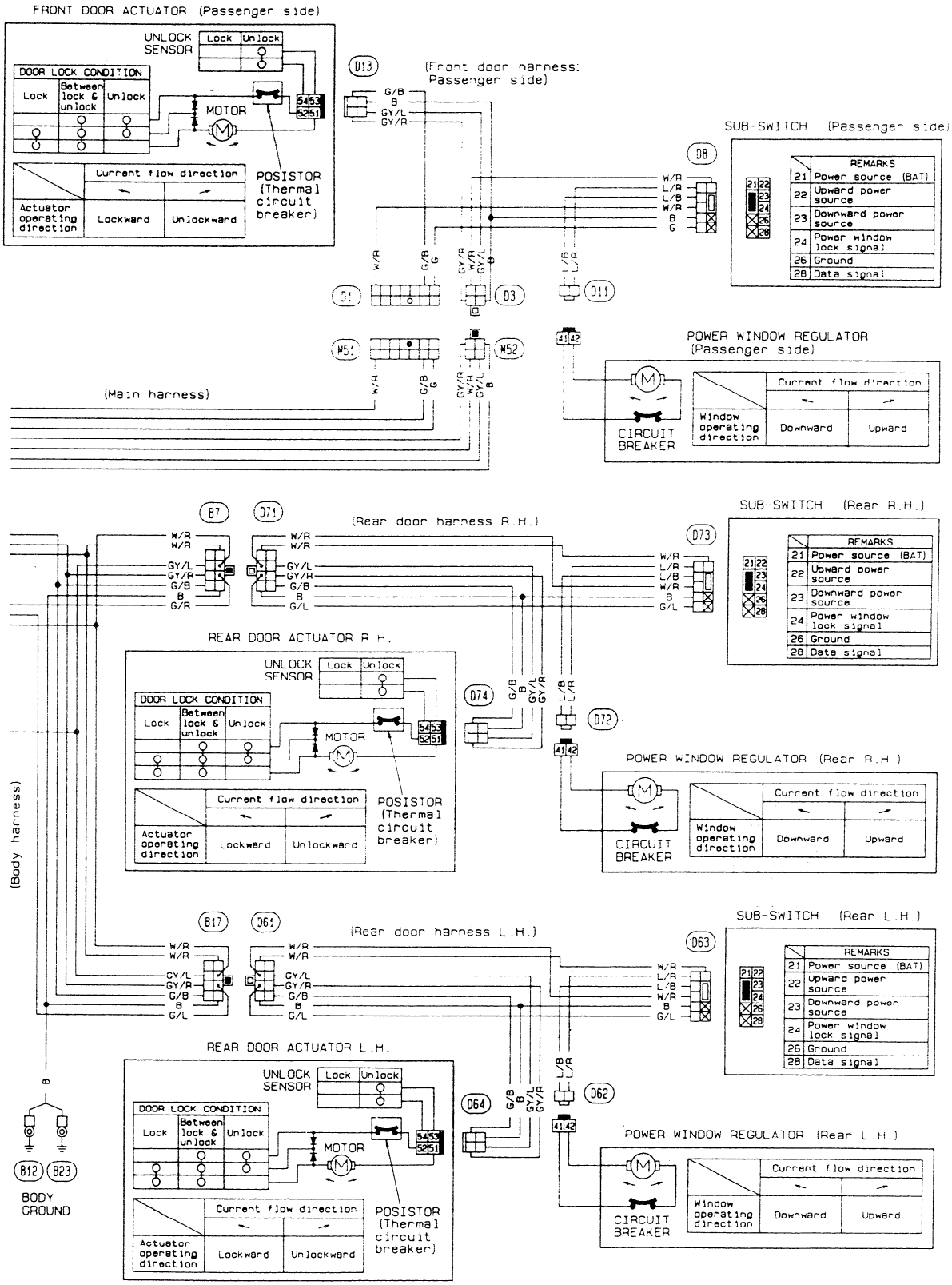
WIRING DIAGRAM

B13 SEDAN R.H. drive models



	REMARKS		REMARKS
1	Unlockward power source	9	Power window lock signal
2	Upward power source	10	Vehicle speed sensor
3	Power source (BAT)	12	Door unlock sensor
4	Lockward power source	13	Lock knob switch
		14	Data signal (Rear R.H.)
5	Ground	16	Data signal (Passenger side)
6	Downward power source	18	Data signal (Rear L.H.)
7	Power source (IGN)		
8	Door switch		

Power Window and Power Door Lock (Cont'd)

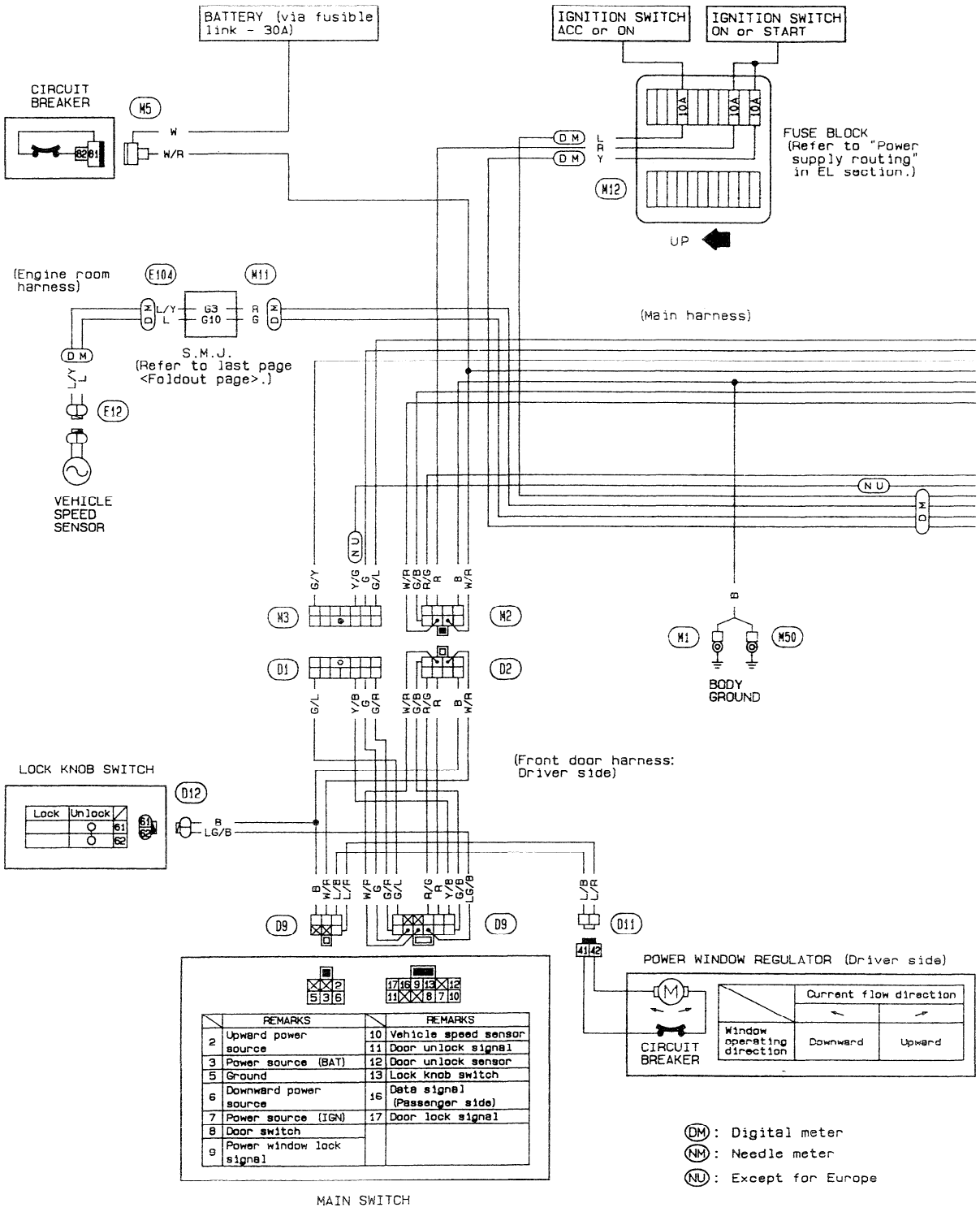


SBF688F

Power Window and Power Door Lock (Cont'd)

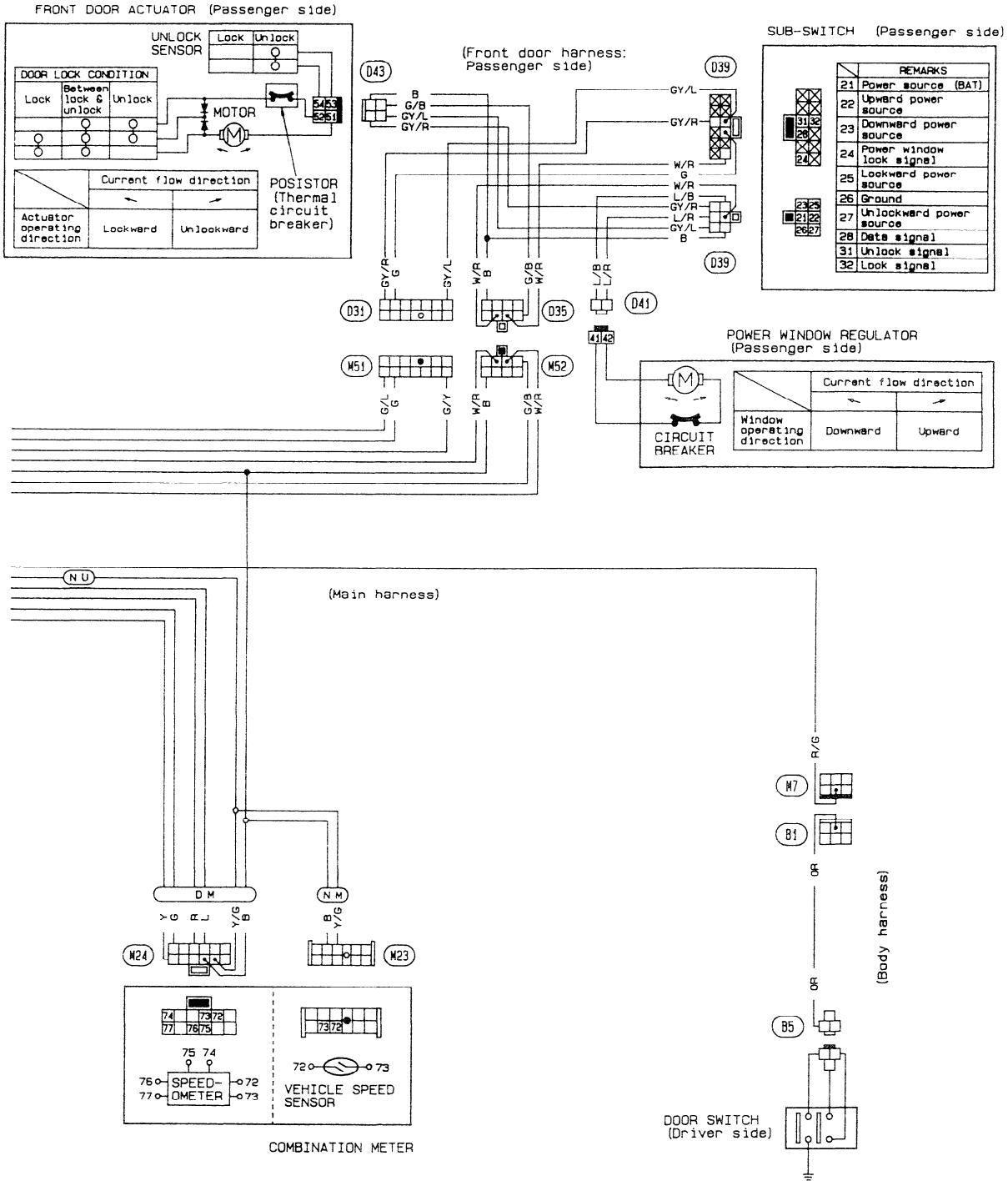
WIRING DIAGRAM

B13 COUPE L.H. drive models



	REMARKS		REMARKS
2	Upward power source	10	Vehicle speed sensor
3	Power source (BAT)	11	Door unlock signal
5	Ground	12	Door unlock sensor
6	Downward power source	13	Lock knob switch
7	Power source (IGN)	16	Data signal (Passenger side)
8	Door switch	17	Door lock signal
9	Power window lock signal		

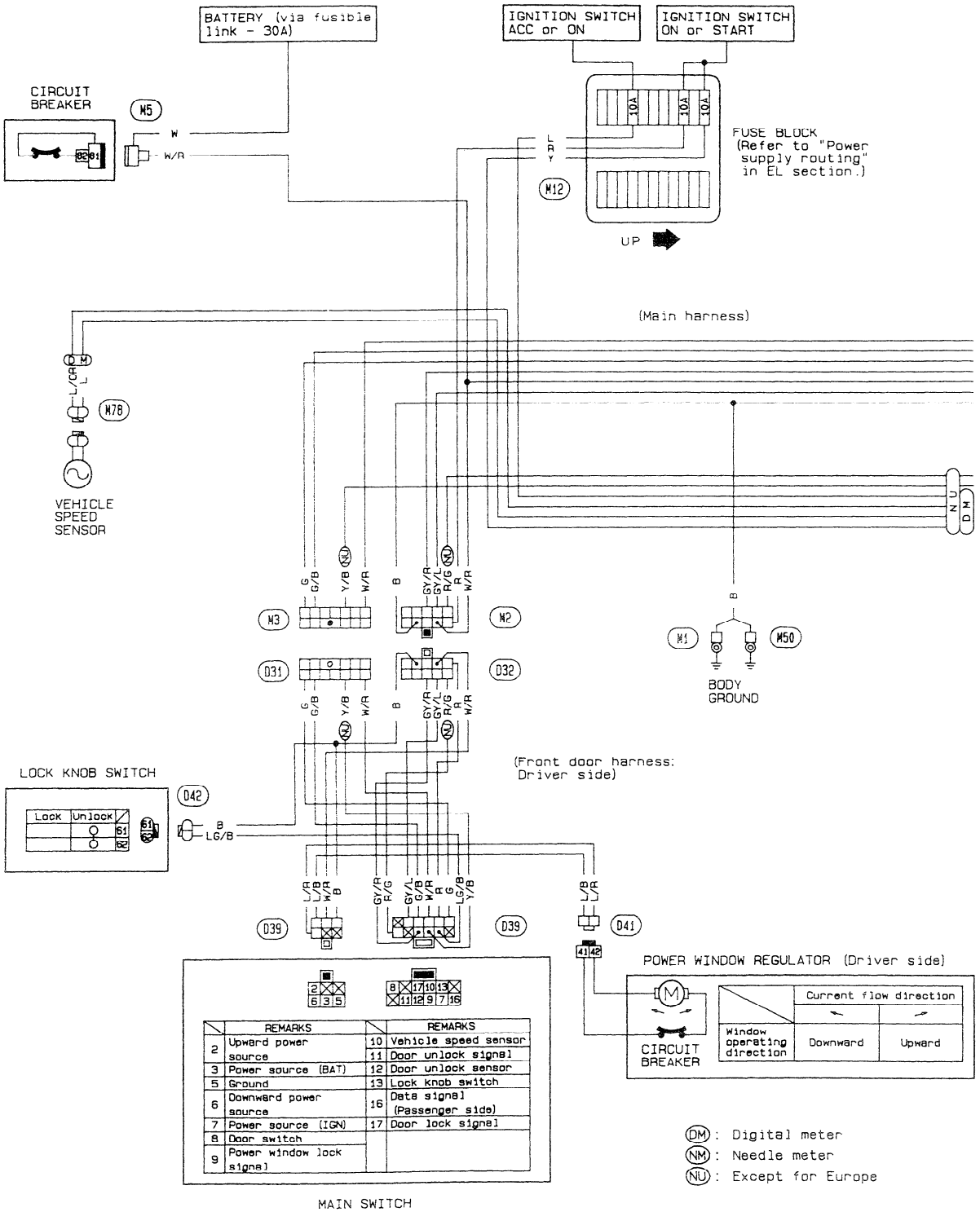
Power Window and Power Door Lock (Cont'd)



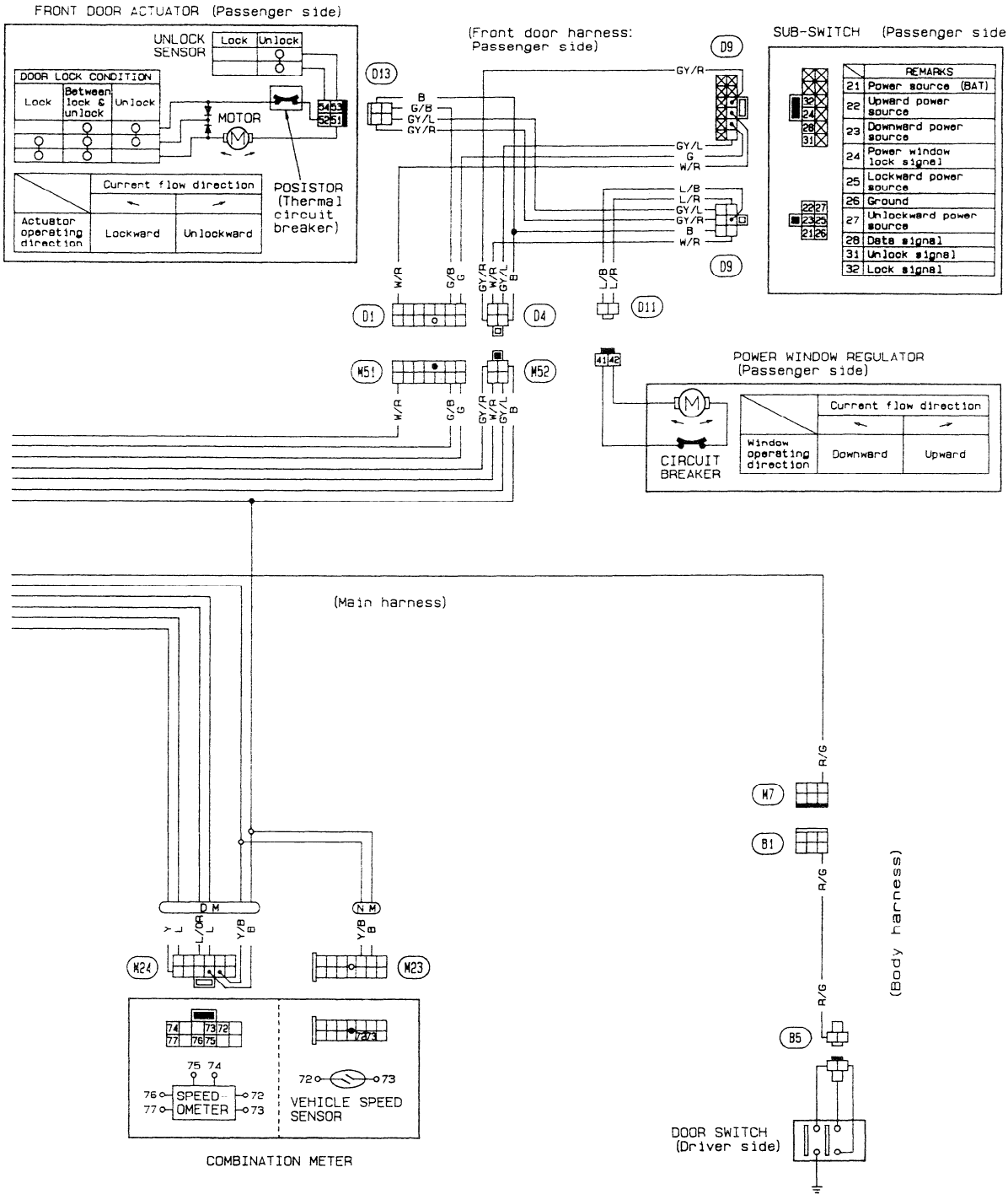
SBF077G

WIRING DIAGRAM

B13 **COUPE R.H. drive models.**



	REMARKS		REMARKS
2	Upward power source	10	Vehicle speed sensor
3	Power source (BAT)	11	Door unlock signal
5	Ground	12	Door unlock sensor
6	Downward power source	13	Lock knob switch
7	Power source (IGN)	16	Data signal (Passenger side)
8	Door switch	17	Door lock signal
9	Power window lock signal		

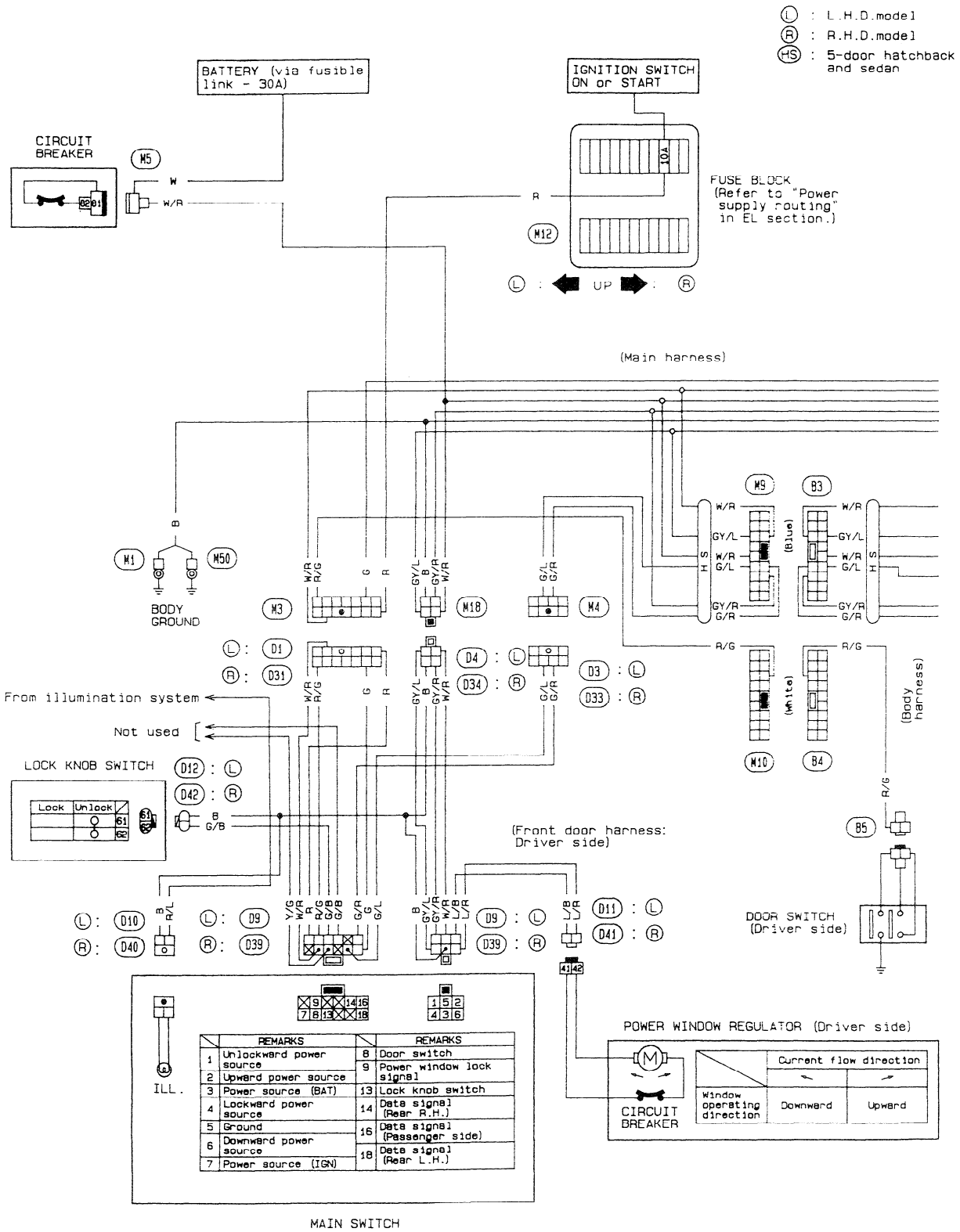

FRONT DOOR ACTUATOR (Passenger side)
UNLOCK SENSOR
Lock
Unlock
DOOR LOCK CONDITION
Lock
Between lock & unlock
Unlock
MOTOR
POSISTOR (Thermal circuit breaker)
Current flow direction
Actuator operating direction
Lockward
Unlockward
(Front door harness: Passenger side)
D13
D9
D1
D4
D11
M51
M52
B
G/B
GY/L
GY/R
G
W/R
L/B
L/R
SUB-SWITCH (Passenger side)
REMARKS
21 Power source (BAT)
22 Upward power source
23 Downward power source
24 Power window lock signal
25 Lockward power source
26 Ground
27 Unlockward power source
28 Data signal
31 Unlock signal
32 Lock signal
POWER WINDOW REGULATOR (Passenger side)
CIRCUIT BREAKER
Window operating direction
Downward
Upward
(Main harness)
D M
N M
M24
M23
COMBINATION METER
SPEEDOMETER
VEHICLE SPEED SENSOR
M7
B1
B5
R/G
(Body harness)
DOOR SWITCH (Driver side)

SBF078G

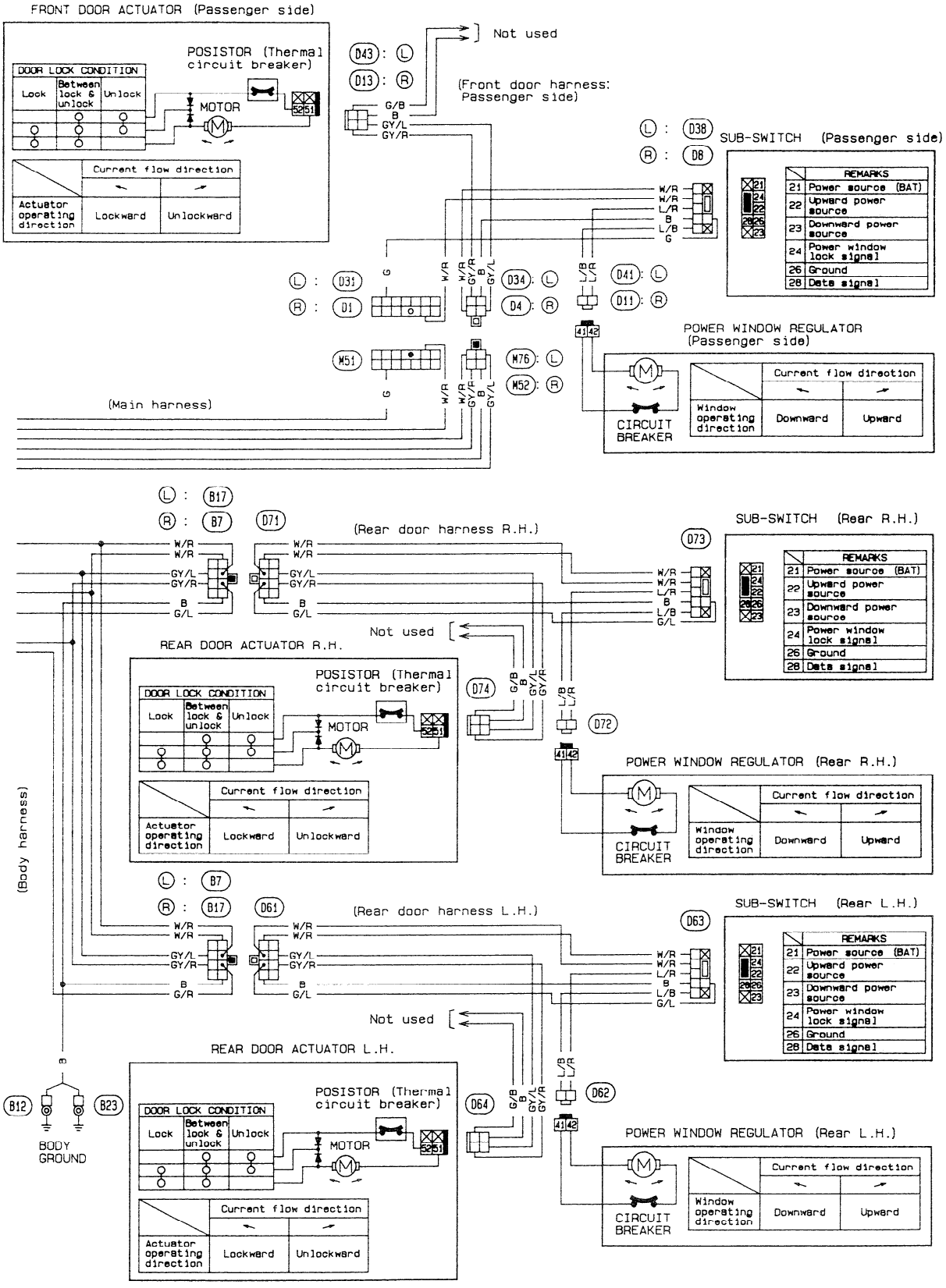
Power Window and Power Door Lock (Cont'd)

WIRING DIAGRAM

N14



Power Window and Power Door Lock (Cont'd)



SBF079G

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Circuit Diagram for Quick Pinpoint Check BF-40
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41(Check door lock operation circuit.) BF-43
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(Check door lock operation circuit.) BF-44
Diagnostic Procedure 3
(Check lock knob switch circuit.) BF-47
Diagnostic Procedure 4 (Except Coupe)
(Check door lock actuator circuit.) BF-49
Diagnostic Procedure 5
(Check driver's side window motor circuit.) BF-50
Diagnostic Procedure 6
(Check passenger power window circuit.) BF-51
Diagnostic Procedure 7
(Check power window lock signal circuit.) BF-52
Diagnostic Procedure 8
(Check data line signal circuit.) BF-53
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(Check detecting switch circuit.) BF-54
Diagnostic Procedure 10 (Vehicles equipped with timer control system)
(Check driver's side door switch circuit.) BF-56
Electrical Components Inspection BF-58

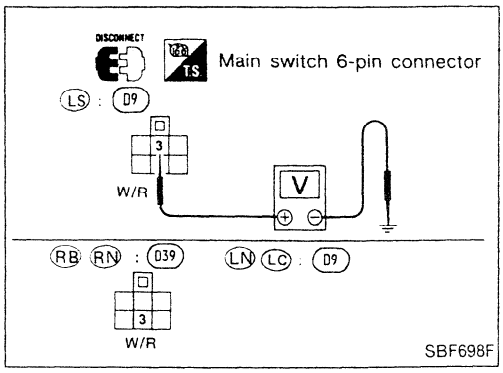
Since left and right component parts are basically the same, harness layout and methods for electrical components inspection are shown for one side only.
Although methods for checking component parts on both sides are described in the flow chart, making it easier to troubleshoot, apply checking procedures to either side that have malfunction during trouble diagnoses.

The following ABBREVIATIONS are used in this Trouble Diagnoses.

Ⓛ : Left-hand drive models
Ⓡ : Right-hand drive models
Ⓝ : N14 models
(LB) : B13 Left-hand drive models
(RB) : B13 Right-hand drive models
(LN) : N14 Left-hand drive models
(RN) : N14 Right-hand drive models
Ⓢ : B13 Sedan
Ⓒ : B13 Coupe
(LS) : B13 Sedan Left-hand drive models
(RS) : B13 Sedan Right-hand drive models
(LC) : B13 Coupe Left-hand drive models
(RC) : B13 Coupe Right-hand drive models
(EC) : Except B13 Coupe

Symptom Chart

Procedure	Main Power Supply and Ground Circuit Check			Diagnostic Procedure										Electrical Components Inspection			Remarks
Reference Page	BF-38	BF-38	BF-38	BF-43	BF-44	BF-47	BF-49	BF-50	BF-51	BF-52	BF-53	BF-54	BF-56	BF-58	BF-58	BF-58	—
Applicable models	All	All	All	(EC)	ⓒ	All	(EC)	All	All	All	All	All	All	Lock knob switch	Door lock actuator(s)	Power window motor(s)	—
SYMPTOM	Procedure 1	Procedure 2	Procedure 3	Procedure 1	Procedure 2	Procedure 3	Procedure 4	Procedure 5	Procedure 6	Procedure 7	Procedure 8	Procedure 9	Procedure 10				
Power windows and power door locks cannot be operated.	○			(EC)	ⓒ	○	(EC)	○	○	○	○			○	○	○	—
Power door locks and passenger power window cannot be operated.		ⓒ		(EC)	ⓒ	○	(EC)		○	○	○			○	○	○	—
Power door locks cannot be operated by either the main or lock knob switches but power windows can be operated.				(EC)	ⓒ	○	(EC)							○	○		—
Power door locks cannot be operated by lock knob switch but can be operated by main switch.						(EC)								(EC)			—
One or two door locks cannot be operated.							(EC)								○		—
Power windows cannot be operated but power door locks can be operated.			○					○	○	○	○					○	—
Driver side power window cannot be operated but other windows can be operated.								○								○	—
Passenger power windows cannot be operated but door locks can be operated.		(EC)							○		○					○	—
Passenger power windows cannot be operated by main switch but can be operated by passenger's switches.										○	○						—
Power window lock cannot be operated.										○							—
Vehicle speed sensor system for power door locks cannot be operated.												○					Models equipped with the system.
Timer control system for power windows cannot be operated.													○				

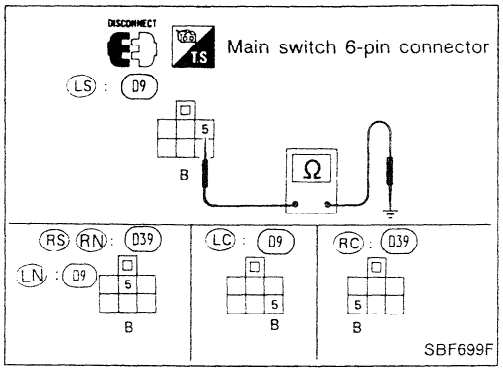


Main Power Supply and Ground Circuit Check

PROCEDURE 1

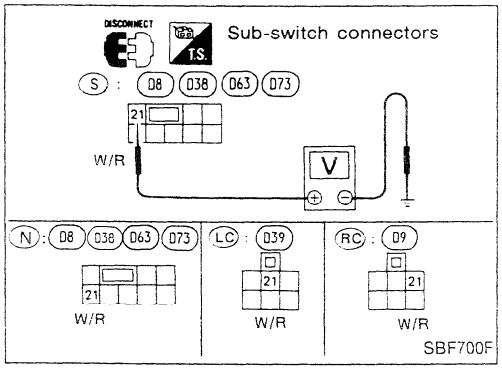
Main power supply

Terminals	Battery voltage exists
③ - Ground	Yes



Ground circuit

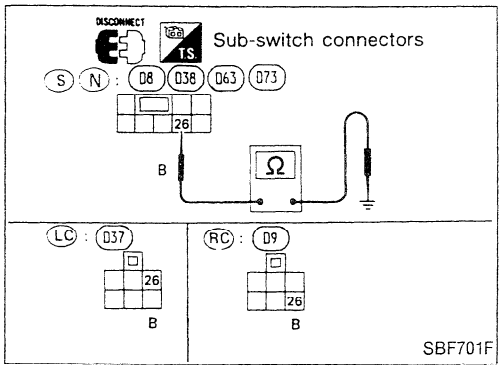
Terminals	Continuity
⑤ - Ground	Yes



PROCEDURE 2

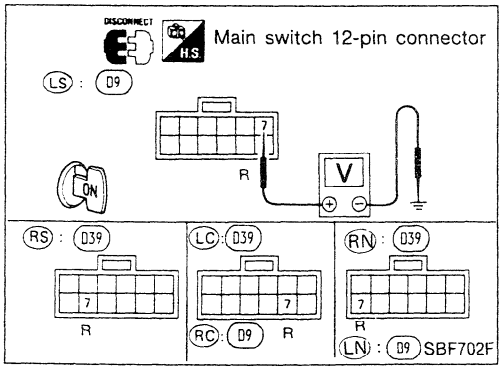
Power supply for sub-switch (passenger)

Terminals	Battery voltage exists
㉑ - Ground	Yes



Ground circuit for sub-switch (passenger)

Terminals	Continuity
㉖ - Ground	Yes

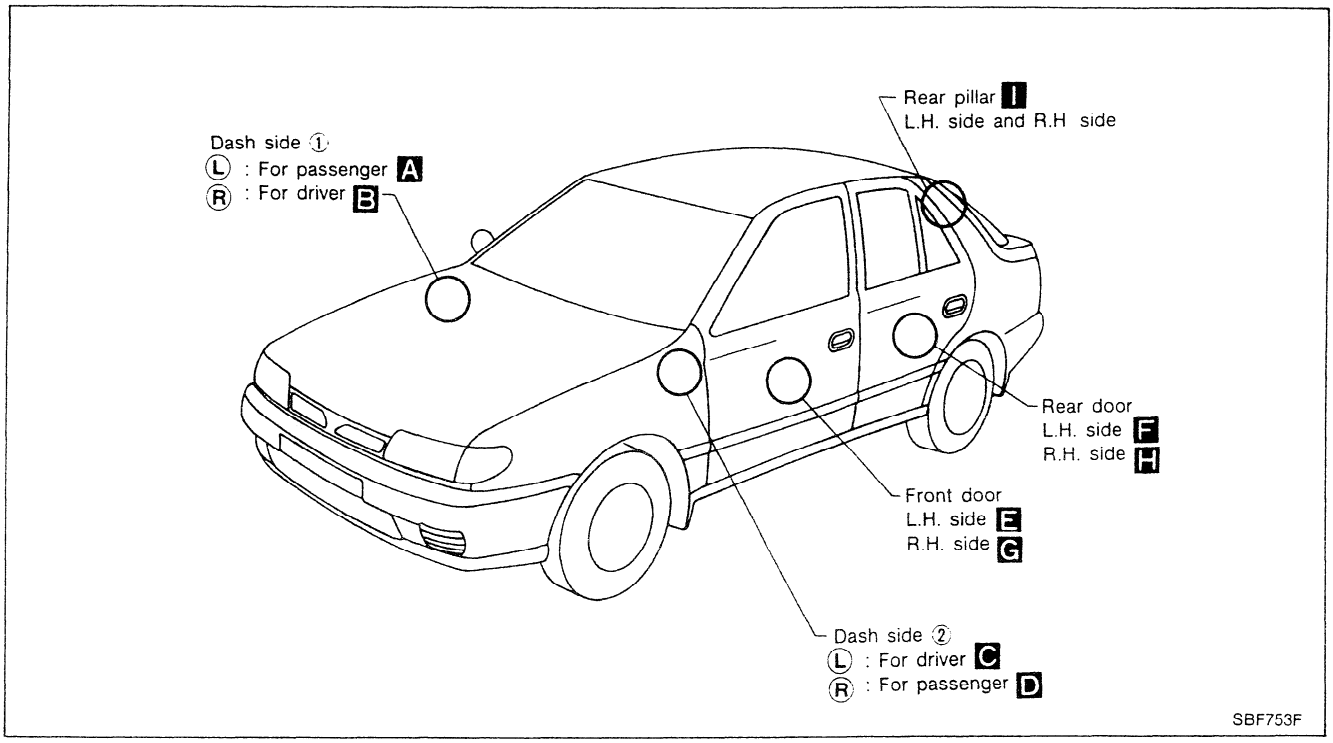


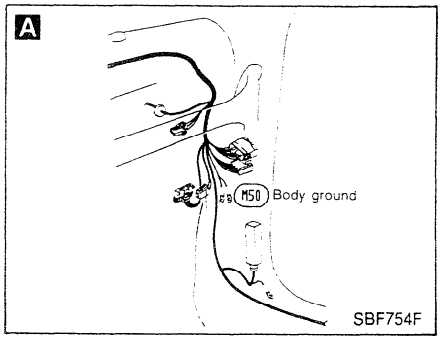
PROCEDURE 3

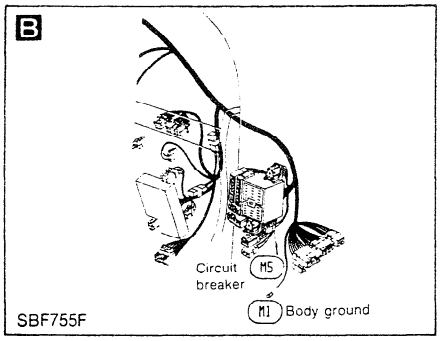
Power supply for ignition signal

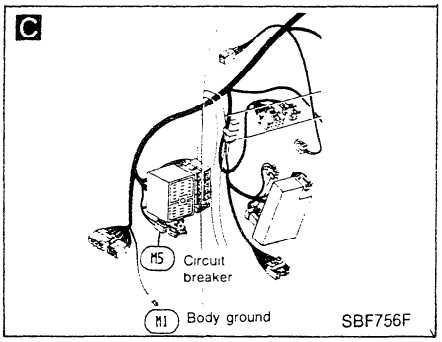
Terminals	Ignition switch	Battery voltage exists
⑦ - Ground	ON	Yes

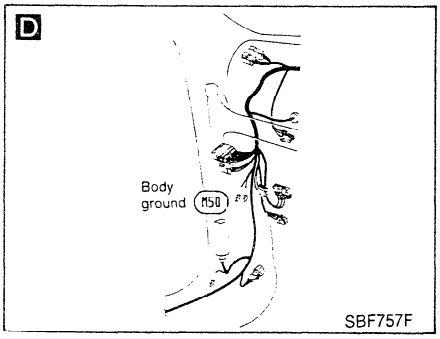
Harness Layout

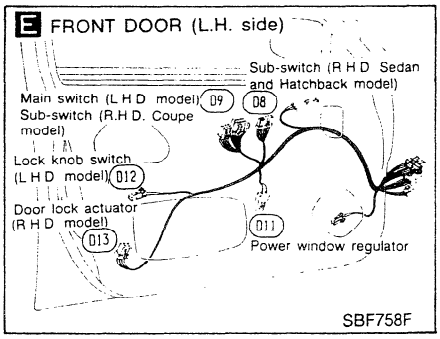


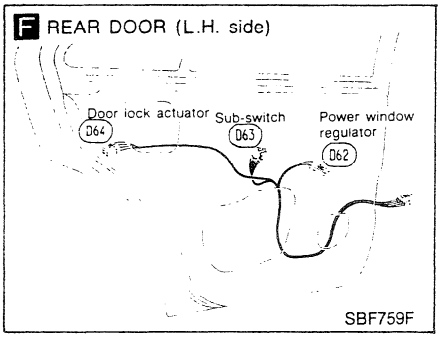


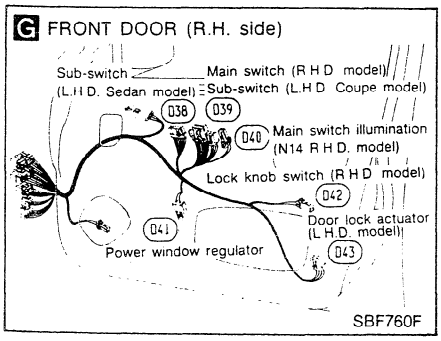


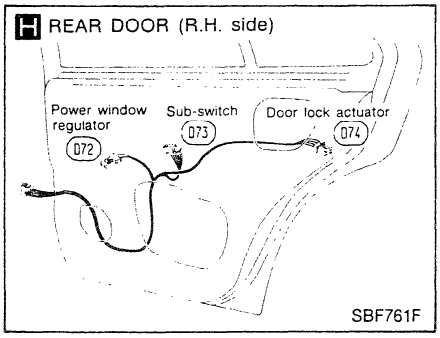


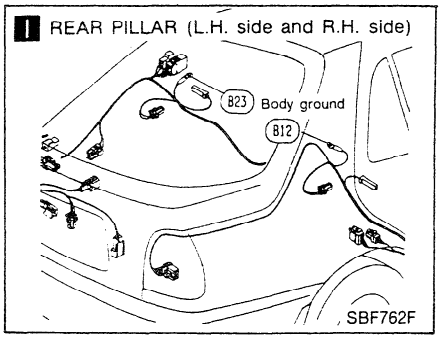






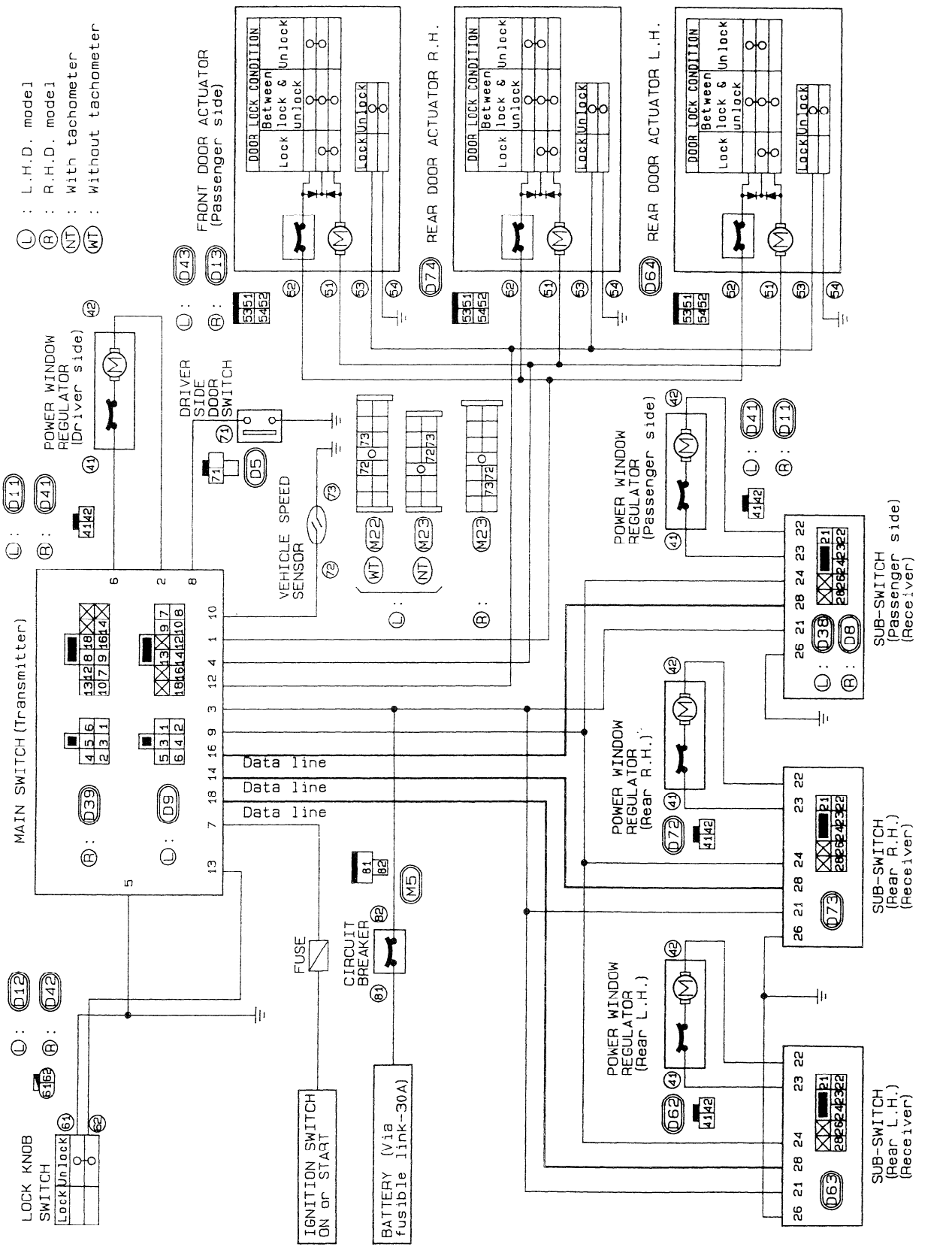






Circuit Diagram for Quick Pinpoint Check

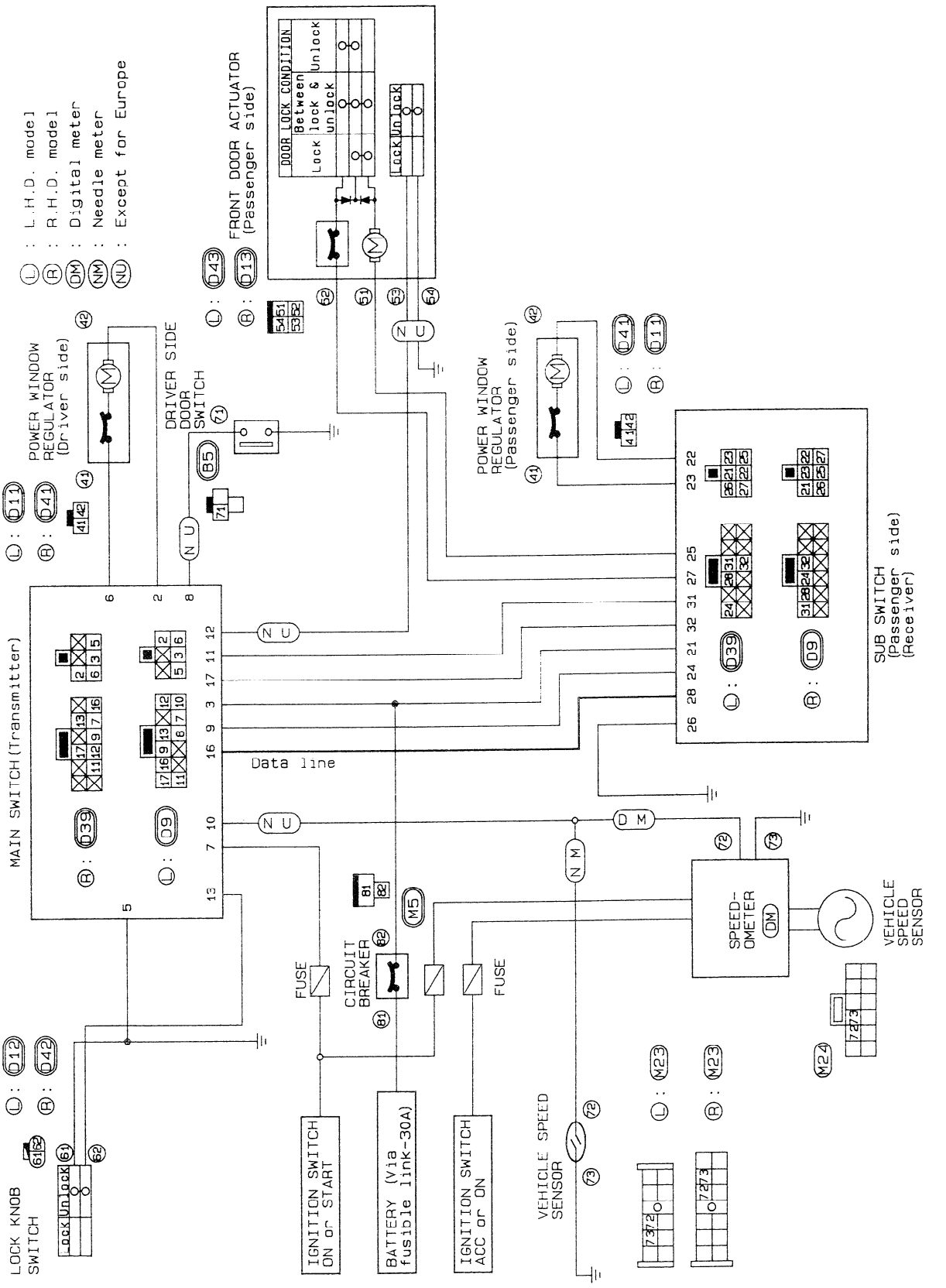
B13 **SEDAN**



SBF080G

Circuit Diagram for Quick Pinpoint Check (Cont'd)

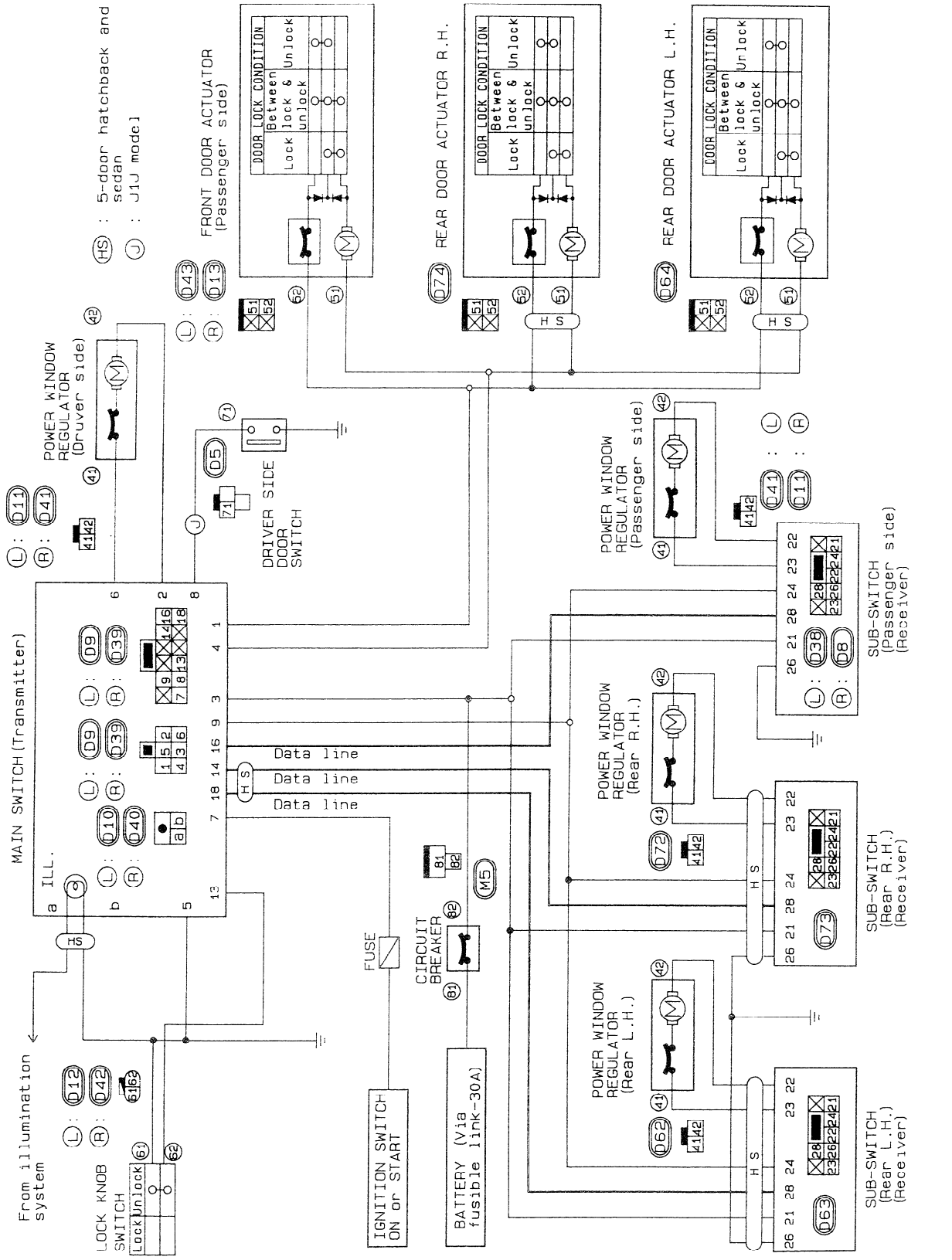
B13 COUPE



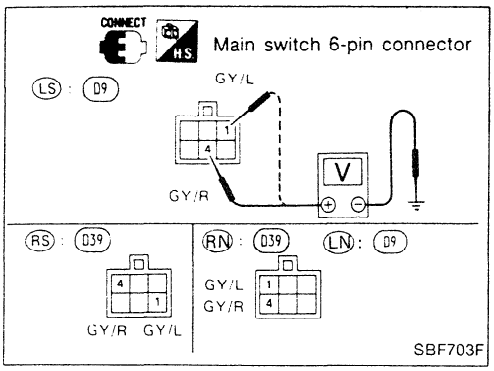
SBF081G

Circuit Diagram for Quick Pinpoint Check (Cont'd)

N14



SBF082G



Diagnostic Procedure 1 (Except Coupe)

SYMPTOM:

Power door locks cannot be operated by either the main or door lock knob switches but power windows can be operated.

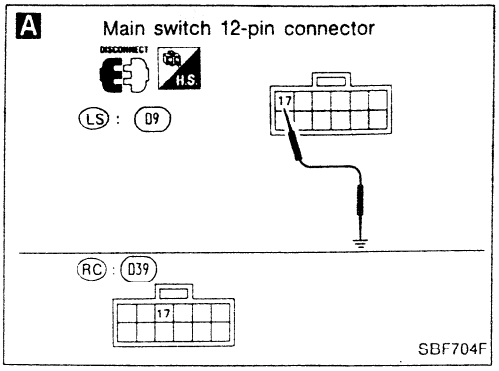
CHECK DOOR LOCK OPERATION CIRCUIT.
Check voltage for main switch 6-pin connector.

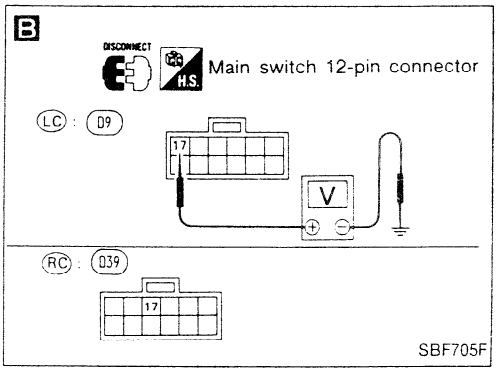
N.G. → Replace main switch.

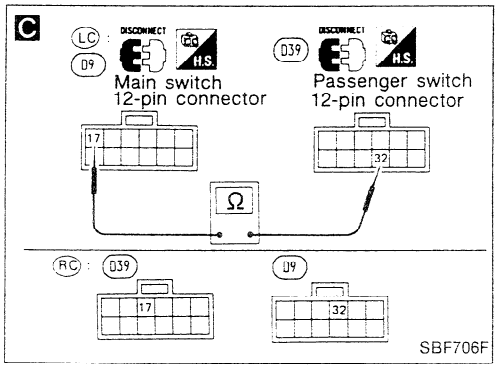
Terminals	Main switch operation	Voltage
1 - Ground	Unlock	0V → 12V → 0V
4 - Ground	Lock	0V → 12V → 0V

O.K.

Go to Diagnostic Procedure 4.
(See page BF-49.)







Diagnostic Procedure 2 (Coupe)

SYMPTOM:

Power door locks cannot be operated.

A

CHECK DOOR LOCK OPERATION CIRCUIT.

1) Disconnect 12-pin connector from main switch.
2) Check door lock actuators by grounding terminal ⑰.

Terminals	Result
⑰ - Ground	Should be locked.

O.K. → (Go to Ⓐ on next page.)

N.G. ↓

B

Check battery voltage existance.

Terminals	Battery voltage exists
⑰ - Ground	Yes

O.K. → (Go to Ⓑ on next page.)

N.G. ↓

C

1) Disconnect connector from passenger switch.
2) Check continuity.

Terminals	Continuity
⑰ - ㉜	Yes

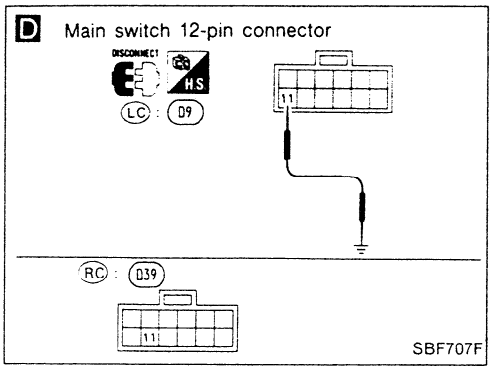
N.G. → Repair harness.

O.K. ↓

Replace passenger switch.

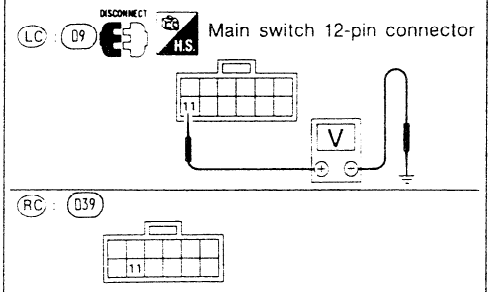
Diagnostic Procedure 2 (Coupe) (Cont'd)

D Main switch 12-pin connector



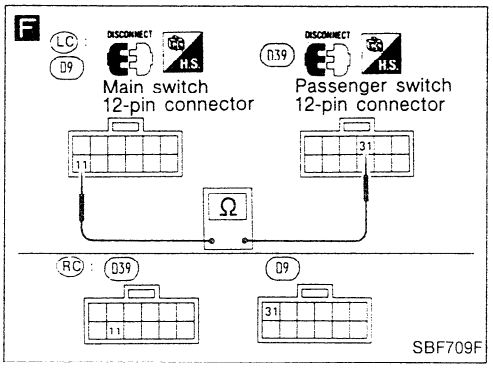
SBF707F

E Main switch 12-pin connector



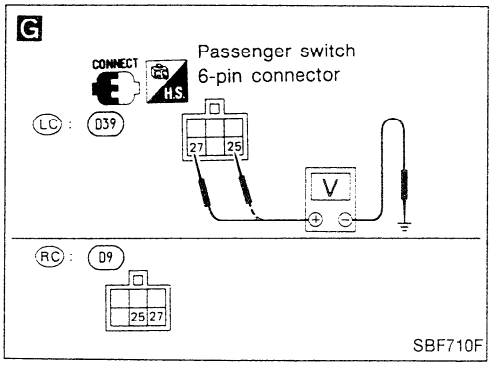
SBF708F

F Main switch 12-pin connector / Passenger switch 12-pin connector



SBF709F

G Passenger switch 6-pin connector



SBF710F

(A)

D Check door lock actuators by grounding terminal (11).

Terminals	Result
(11) - Ground	Should be unlocked.

O.K. → (Go to (C) on next page.)

N.G.

E Check battery voltage existance.

Terminals	Battery voltage exists
(11) - Ground	Yes

O.K. → (Go to (B) below.)

N.G.

F
1) Disconnect connector from passenger switch.
2) Check continuity.

Terminals	Continuity
(11) - (31)	Yes

N.G. → Repair harness.

O.K.

Replace front passenger switch.

(B)

G Check voltage for passenger switch 6-pin connector.

Terminals	Main switch operation	Voltage
(27) - Ground	Unlock	0V → 12V → 0V
(25) - Ground	Lock	0V → 12V → 0V

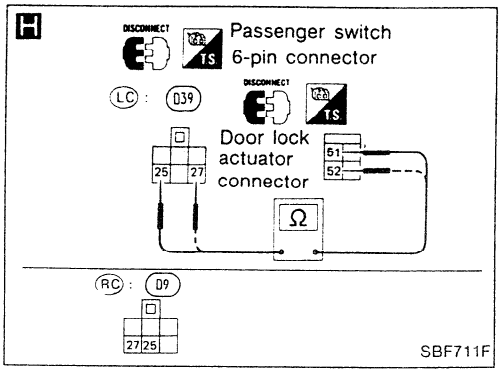
N.G. → Replace passenger switch.

O.K.

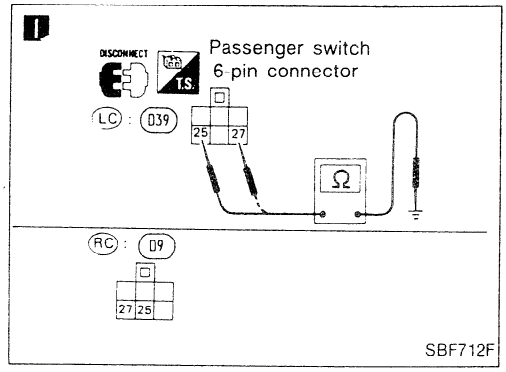
(Go to (C) on next page.)

Diagnostic Procedure 2 (Coupe) (Cont'd)

H



I



H

Ⓒ

Check door lock actuator circuit.
1) Disconnect 6-pin connector from passenger switch.
2) Disconnect connector from passenger door lock actuator.
3) Check continuity.

Terminals	Continuity
㉕ - ㊶	Yes
㉗ - ㊷	

N.G. → Repair harness.

O.K. ↓

I

Does continuity exist?

Terminals
㉕ - Ground
㉗ - Ground

Yes → Repair harness.
There will be incorrect grounding between terminals ㉕ and ㊶, ㉗ and ㊷.

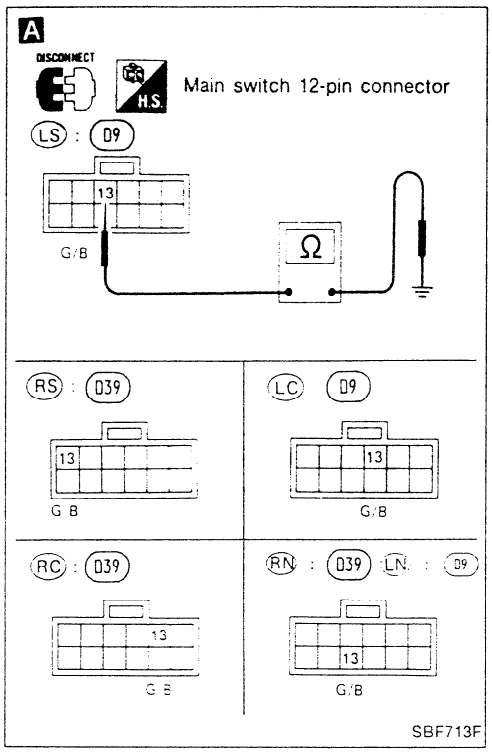
No ↓

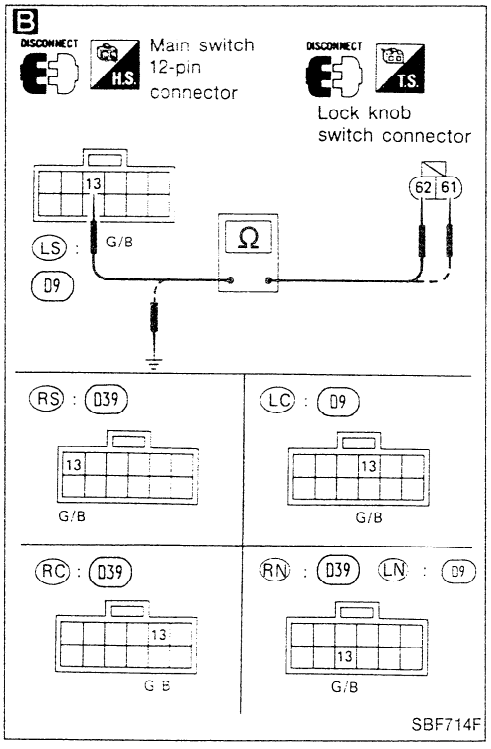
Go to DOOR LOCK ACTUATOR in Electrical Components Inspection. (See page BF-58.)

O.K. → Check system again.

N.G. ↓

Replace door lock actuator.





Diagnostic Procedure 3

(EXCEPT COUPE)

SYMPTOM:

Door locks cannot be operated by lock knob switch but can be operated by main switch.

(COUPE)

SYMPTOM:

Door locks cannot be operated by lock knob switch.

A

CHECK LOCK KNOB SWITCH CIRCUIT.
1) Disconnect 12-pin connector from main switch.
2) Check continuity.

Terminals	Door lock condition	Continuity
13 - Ground	Lock	No
	Unlock	Yes

O.K. → Replace main switch.

N.G. ↓

B

1) Disconnect connector from lock knob switch.
2) Check continuity.

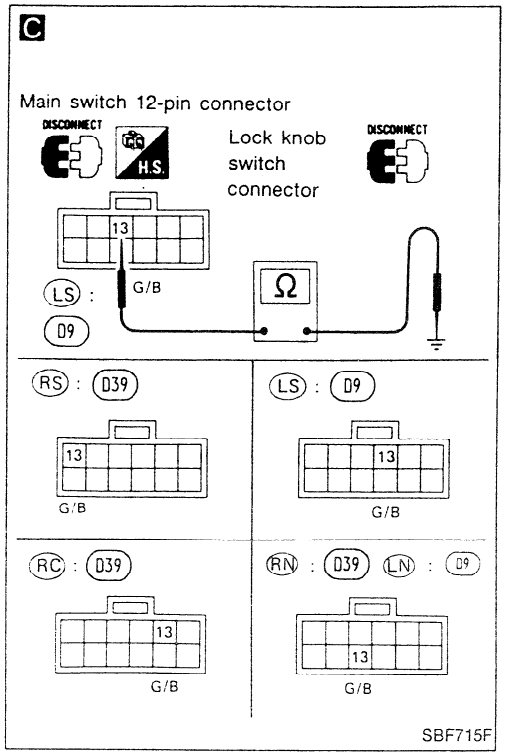
Terminals	Continuity
13 - 62	Yes
61 - Ground	Yes

N.G. → Repair harness.

O.K. ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 3 (Cont'd)



C

(A)

Check continuity.

Terminals	Continuity
(13) - Ground	Yes

Yes → Repair harness. There will be incorrect grounding between terminals (13) and (62).

No

Go to LOCK KNOB SWITCH in Electrical Components Inspection. (See page BF-58.)

O.K. → Check system again.

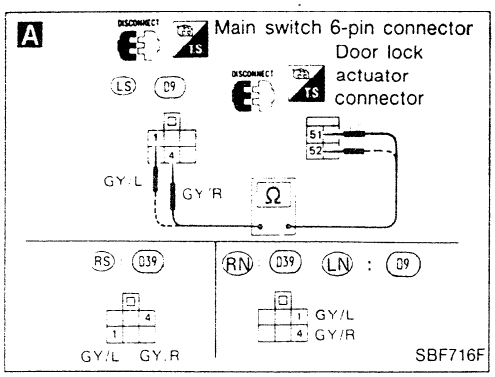
N.G.

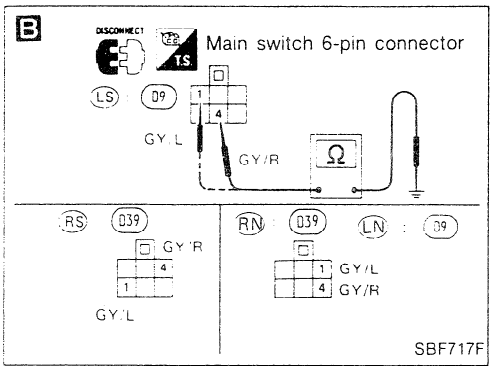
Check lock & unlock switch harness for open and short circuit.

N.G. → Repair harness.

O.K.

Replace lock knob switch.





Diagnostic Procedure 4 (Except Coupe)

SYMPTOM:

One or two door locks cannot be operated.

A

CHECK DOOR LOCK ACTUATOR CIRCUIT.

1) Disconnect 6-pin connector from main switch.
2) Disconnect connector from inoperative door lock actuator(s).
3) Check continuity.

Terminals	Continuity
④ - ⑤1	Yes
① - ⑤2	Yes

N.G. → Repair harness

O.K. ↓

B

Does continuity exist?

Terminals
④ - Ground
① - Ground

Yes → Repair harness. There will be incorrect grounding between terminals ④ and ⑤1, ① and ⑤2.

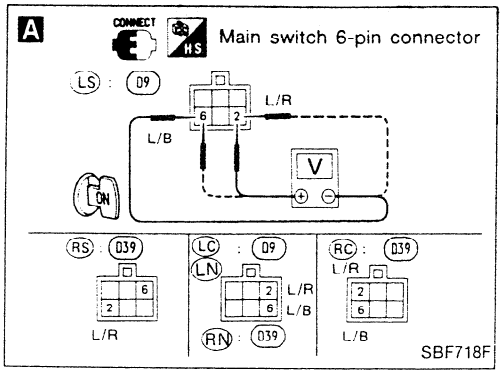
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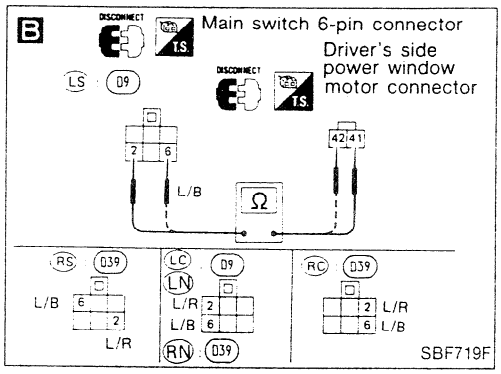
Go to DOOR LOCK ACTUATOR in Electrical Components Inspection. (See page BF-58.)

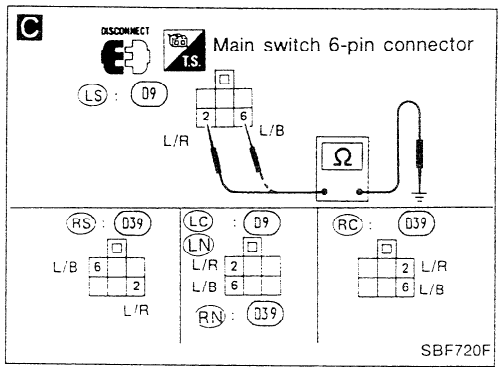
O.K. → Check system again.

N.G. ↓

Replace door lock actuator.







Diagnostic Procedure 5

SYMPTOM:

Driver's side power window cannot be operated but other power windows can be operated.

A

CHECK DRIVER's SIDE POWER WINDOW MOTOR CIRCUIT.
Check voltage for main switch 6-pin connector.

Terminals		Main switch operation	Battery voltage exists
①	○		
2	6	Up	Yes
6	2	Down	Yes

N.G. → Replace main switch.

O.K. ↓

B

1) Disconnect 6-pin connector from main switch, and connector from driver side power window motor.
2) Check continuity.

Terminals	Continuity
2 - 42 6 - 41	Yes

N.G. → Repair harness.

O.K. ↓

C

Does continuity exist?

Terminals
2 - Ground
6 - Ground

Yes → Repair harness.
There will be incorrect grounding.

No ↓

Go to POWER WINDOW MOTOR in Electrical Components Inspection. (See page BF-58.)

O.K. → Check system again.

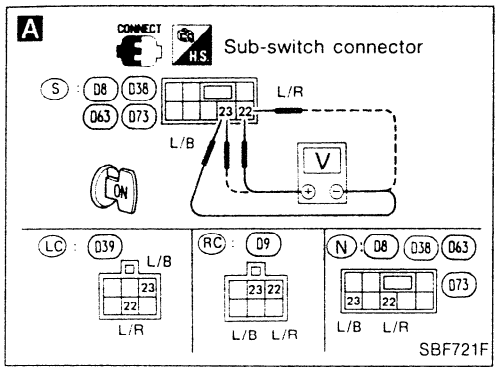
N.G. ↓

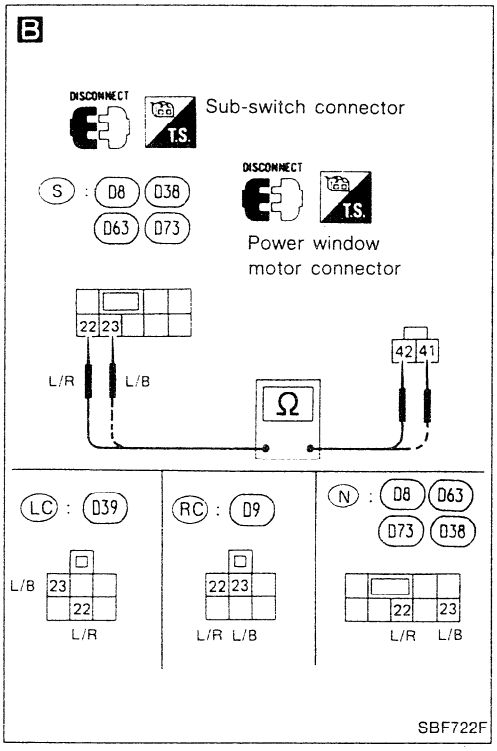
Check power window motor harness for open or short circuit.

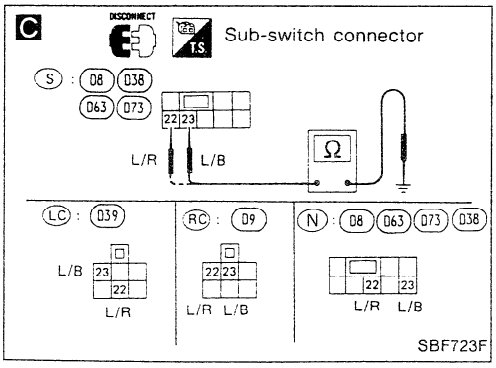
N.G. → Repair harness.

O.K. ↓

Replace power window motor.







Diagnostic Procedure 6

SYMPTOM:

Passenger power windows cannot be operated but door locks can be operated.

A

CHECK PASSENGER POWER WINDOW CIRCUIT.
Check voltage for sub-switch connector.

Terminals ⊕	Terminals ⊖	Sub-switch operation	Voltage
22	23	Up	12V
23	22	Down	12V

N.G. → Replace sub-switch.

O.K. ↓

B

1) Disconnect connector from sub-switch and power window motor.
2) Check continuity.

Terminals	Continuity
22 - 42	Yes
23 - 41	Yes

N.G. → Repair harness.

O.K. ↓

C

Does continuity exist?

Terminals
22 - Ground
23 - Ground

Yes → Repair harness. There will be incorrect grounding.

No ↓

Go to POWER WINDOW MOTOR in Electrical Components Inspection. (See page BF-58.)

O.K. → Check system again.

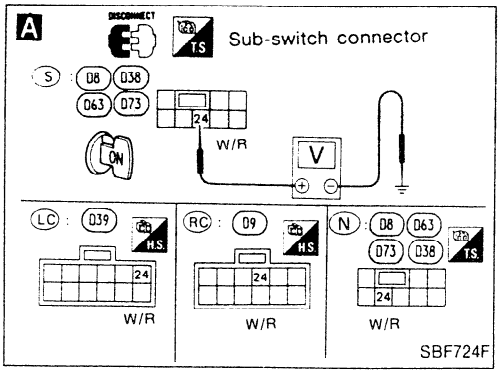
N.G. ↓

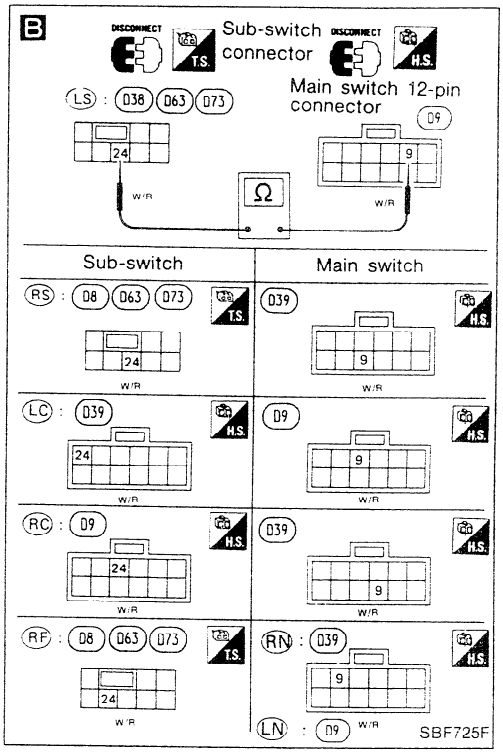
Check power window motor harness for open or short circuit.

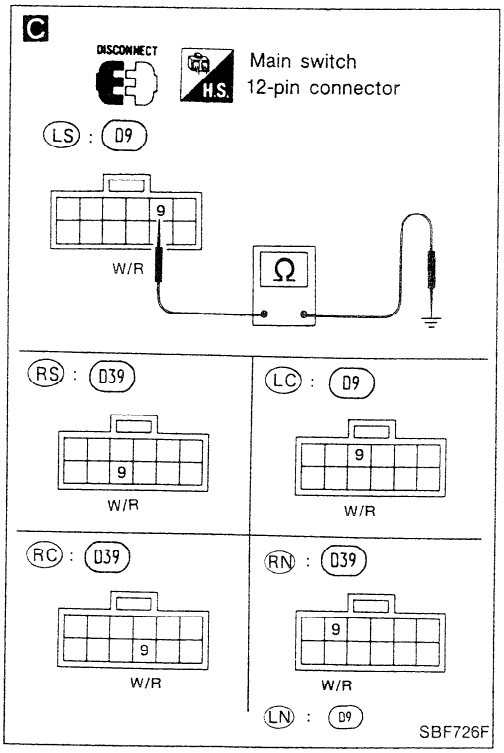
N.G. → Repair harness.

O.K. ↓

Replace power window motor.







Diagnostic Procedure 7

SYMPTOM:

Passenger power windows cannot be operated by either the passenger's switches or main switch.

A

CHECK POWER WINDOW LOCK SIGNAL CIRCUIT.

1) Disconnect connectors from sub-switches.
2) Check battery voltage between terminal ㉔ for each connector and ground while ignition switch is "ON".

Terminals	Power window lock switch	Battery voltage exists
㉔ - Ground	ON	No
	OFF	Yes

O.K. → Replace sub-switch.

N.G. ↓

B

1) Disconnect 12-pin connector from main switch.
2) Check continuity between terminal ㉔ for each connector and ⑨ for main switch connector.

Terminals	Continuity
㉔ - ⑨	Yes

N.G. → Repair harness.

O.K. ↓

C

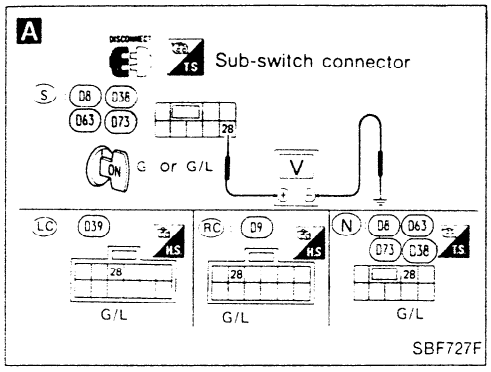
Does continuity exist?

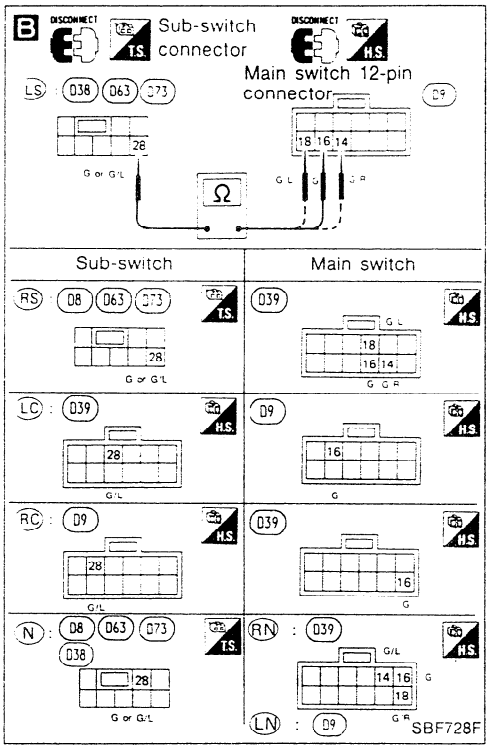
Terminals
⑨ - Ground

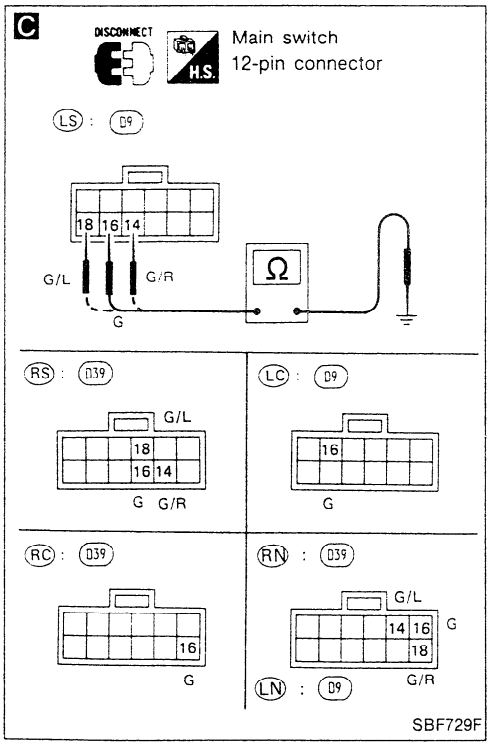
Yes → Repair harness. There will be incorrect grounding.

No ↓

Replace main switch.







Diagnostic Procedure 8

SYMPTOM:

Passenger power windows cannot be operated by main switch but can be operated by passenger's switches.

A

CHECK DATA LINE SIGNAL CIRCUIT.

1) Disconnect connectors from all switches except main switch.
2) Check voltage while power window lock switch is "OFF".

Terminals	Main switch operation	Voltage
(28) - Ground	Up	Above 12V
	Down	Approx. 4V
	No operation	Approx. 0V

O.K. → Replace Main switch.

N.G. ↓

B

1) Disconnect 12-pin connector from main switch.
2) Check continuity.

	Terminals
Passenger	(16) - (28)
Rear left	(18) - (28)
Rear right	(14) - (28)

Continuity should exist.

N.G. → Repair harness.

O.K. ↓

C

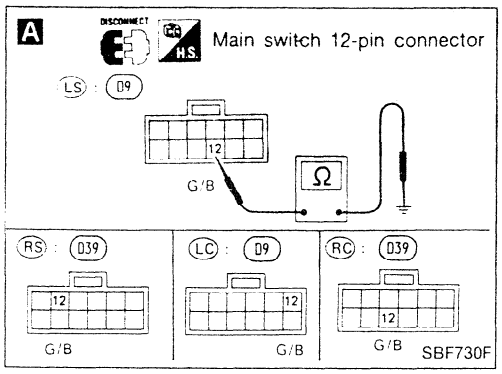
Does continuity exist?

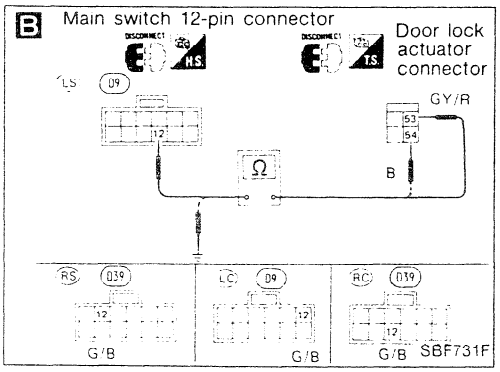
	Terminals
Passenger	(16) - Ground
Rear left	(18) - Ground
Rear right	(14) - Ground

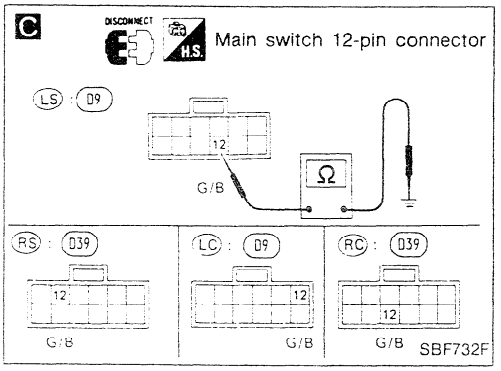
Yes → Repair harness. There will be incorrect grounding.

No ↓

Replace main switch.







Diagnostic Procedure 9

SYMPTOM:

Power door locks cannot be operated by vehicle speed sensor system.

A

CHECK DETECTING SWITCH CIRCUIT.

1) Disconnect 12-pin connector from main switch.
2) Check continuity between terminal ⑫ and body ground.

Condition	Continuity
All doors except driver's are locked	No
One of passenger doors is unlocked.	Yes

O.K. → (Go to Ⓐ on next page.)

N.G. ↓

Disconnect door lock actuator connector.

B

Check continuity between terminals ⑫ and ⑤③, ⑤④ and body ground.

N.G. → Repair harness.

O.K. ↓

C

Does continuity exist?

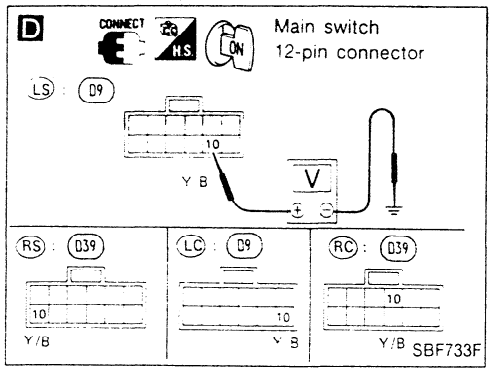
Terminals
⑫ - Ground

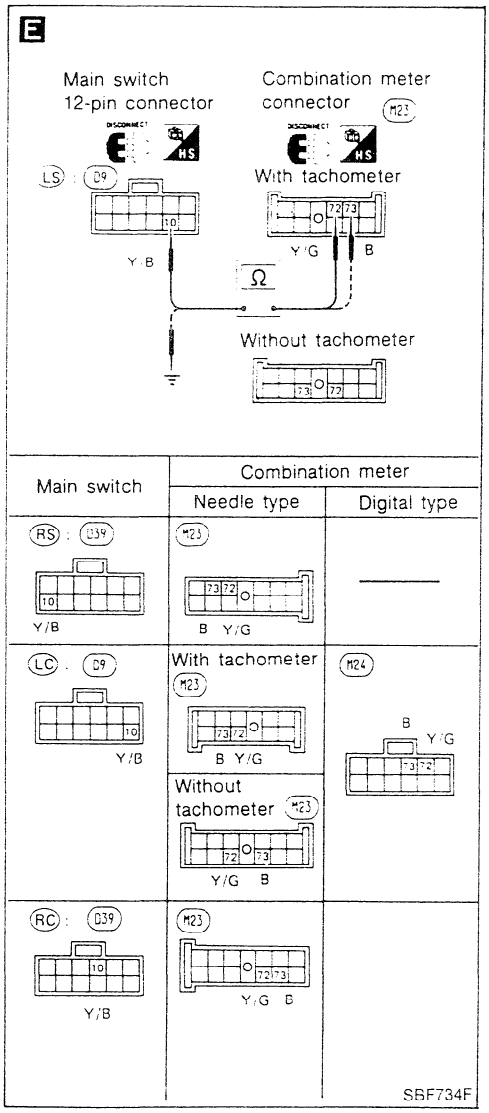
Yes → Repair harness. There will be incorrect grounding.

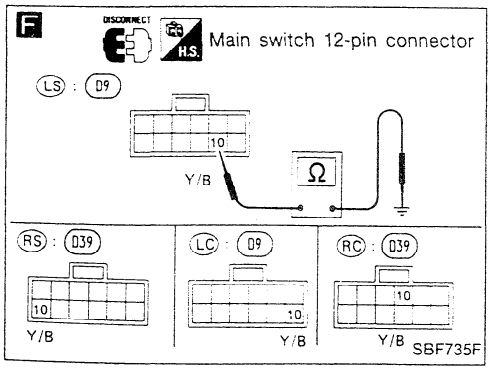
No ↓

Replace detecting switch.

Diagnostic Procedure 9 (Cont'd)







D

1) Apply wheel chocks and jack up front of vehicle.
2) Check voltage for main switch connector between terminal ⑩ and body ground, while turning front wheel slowly.

Voltage (Approx. 7V) should come and go.

O.K → Replace main switch.

N.G.

E

Disconnect meter connector. Check continuity between terminals ⑩ and ⑫, ⑬ and body ground.

N.G. → Repair harness.

O.K.

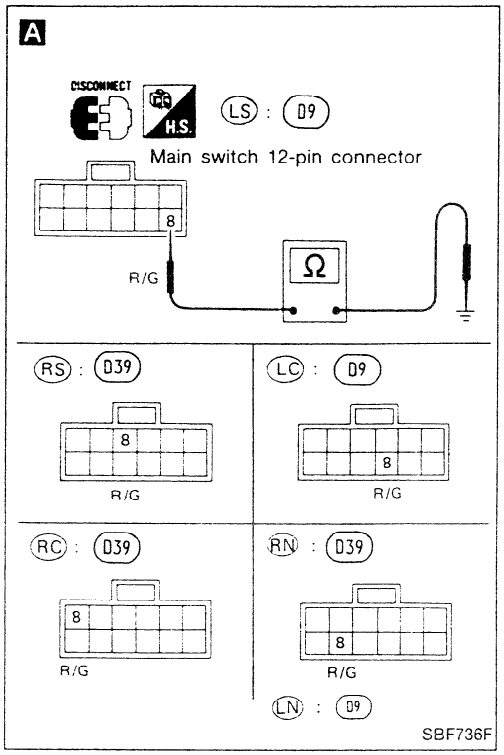
F

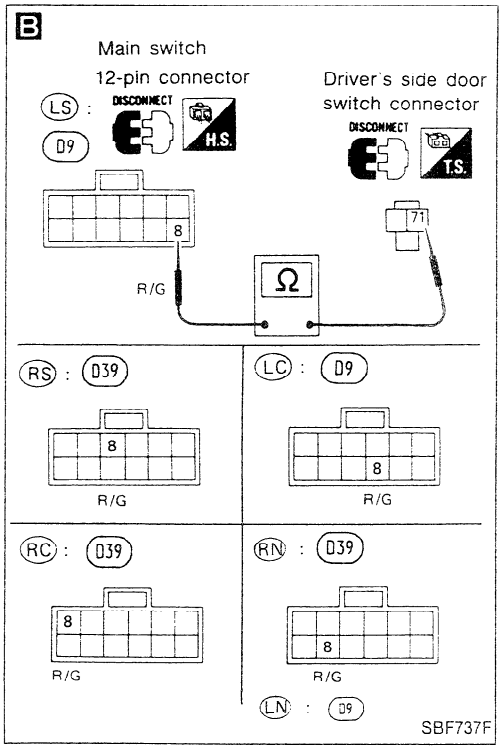
Check continuity between terminal ⑩ and body ground.

Yes → Repair harness. There will be incorrect grounding.

No

Replace speedometer.





Diagnostic Procedure 10

SYMPTOM:

Power window cannot be operated by timer control system.

A

CHECK DRIVER'S SIDE DOOR SWITCH CIRCUIT.
1) Disconnect 12-pin connector from main switch.
2) Check continuity.

Terminal	Driver's side door	Continuity
(8) - Body ground	Open	Yes
	Closed	No

O.K. → Replace main switch.

N.G. ↓

B

1) Disconnect connector for driver's side door switch.
2) Check continuity.

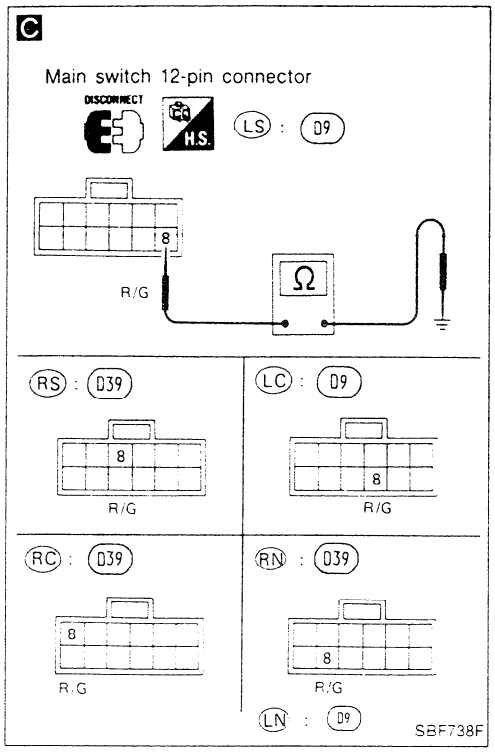
Terminal	Continuity
(8) - (31)	Yes

N.G. → Repair harness.

O.K. ↓

(Go to (A) on next page.)

Diagnostic Procedure 10 (Cont'd)



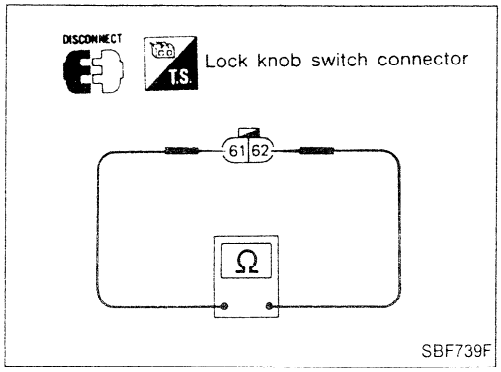
C

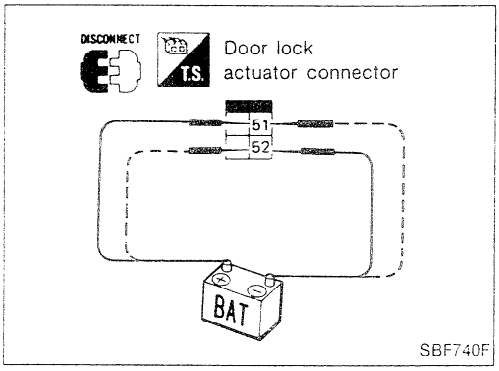
A

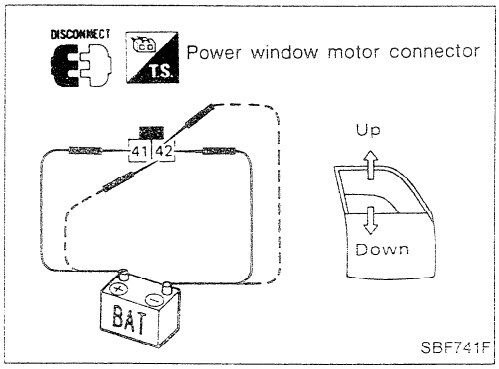
Does continuity exist between terminal 8 and body ground.

Yes → Repair harness. There will be incorrect grounding.

No → Replace driver's side door switch.







Electrical Components Inspection

LOCK KNOB SWITCH

Terminals	Condition	Continuity
⑥① - ⑥②	Locked	No
	Unlocked	Yes

DOOR LOCK ACTUATOR

	Terminals		Operation
	⊕	⊖	
Passenger (Front and rear)	⑤①	⑤②	Lock
	⑤②	⑤①	Unlock

POWER WINDOW MOTOR

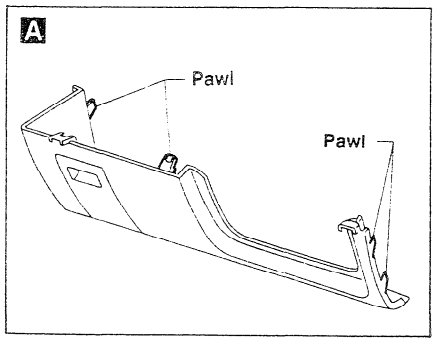
Terminals		Operation
⊕	⊖	
④①	④②	Downward
④②	④①	Upward

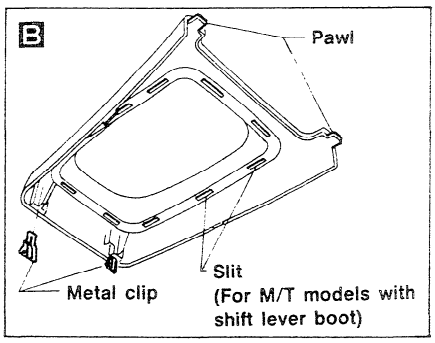
B13

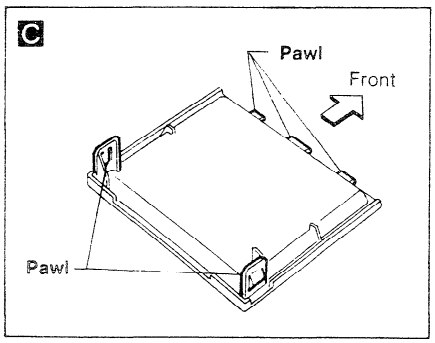
CAUTION:
a. **Disconnect ground terminal from battery in advance.**
b. **Be careful not to scratch pad and other parts.**

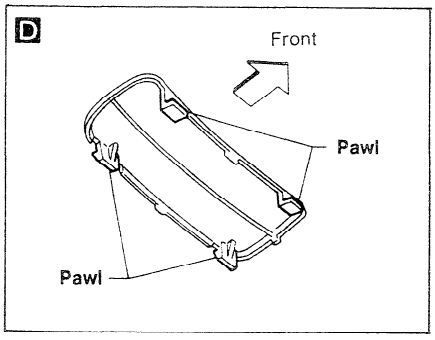
REMOVAL — Instrument panel assembly

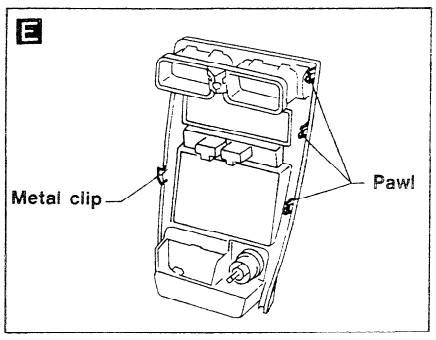
① Remove steering wheel. (Refer to ST section.)
② Remove steering column cover and combination switch.
③ Remove instrument lower cover on driver's side. A
④ Remove A/T finisher or shift lever boot. B
⑤ Remove instrument lower center cover. C
⑥ Remove console mask. D
⑦ Remove console box.
⑧ Remove cluster lid C. E
⑨ Remove cluster lid A.
⑩ Remove combination meter.
(When removing needle type combination meter, disconnect speedometer cable from A/T or M/T transaxle inside engine compartment.)
⑪ Remove radio.
⑫ Remove A/C or heater control.
⑬ Remove cassette deck.
⑭ Remove cup holder.
⑮ Remove glove box.
⑯ Remove instrument lower cover on passenger side. F
⑰ Remove instrument panel reinforcement.
⑱ Remove instrument lower panel center.
⑲ Remove instrument lower cover.
⑳ Remove instrument upper mask.
㉑ Remove instrument panel and pads.

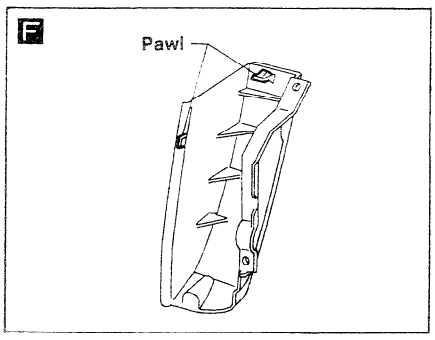


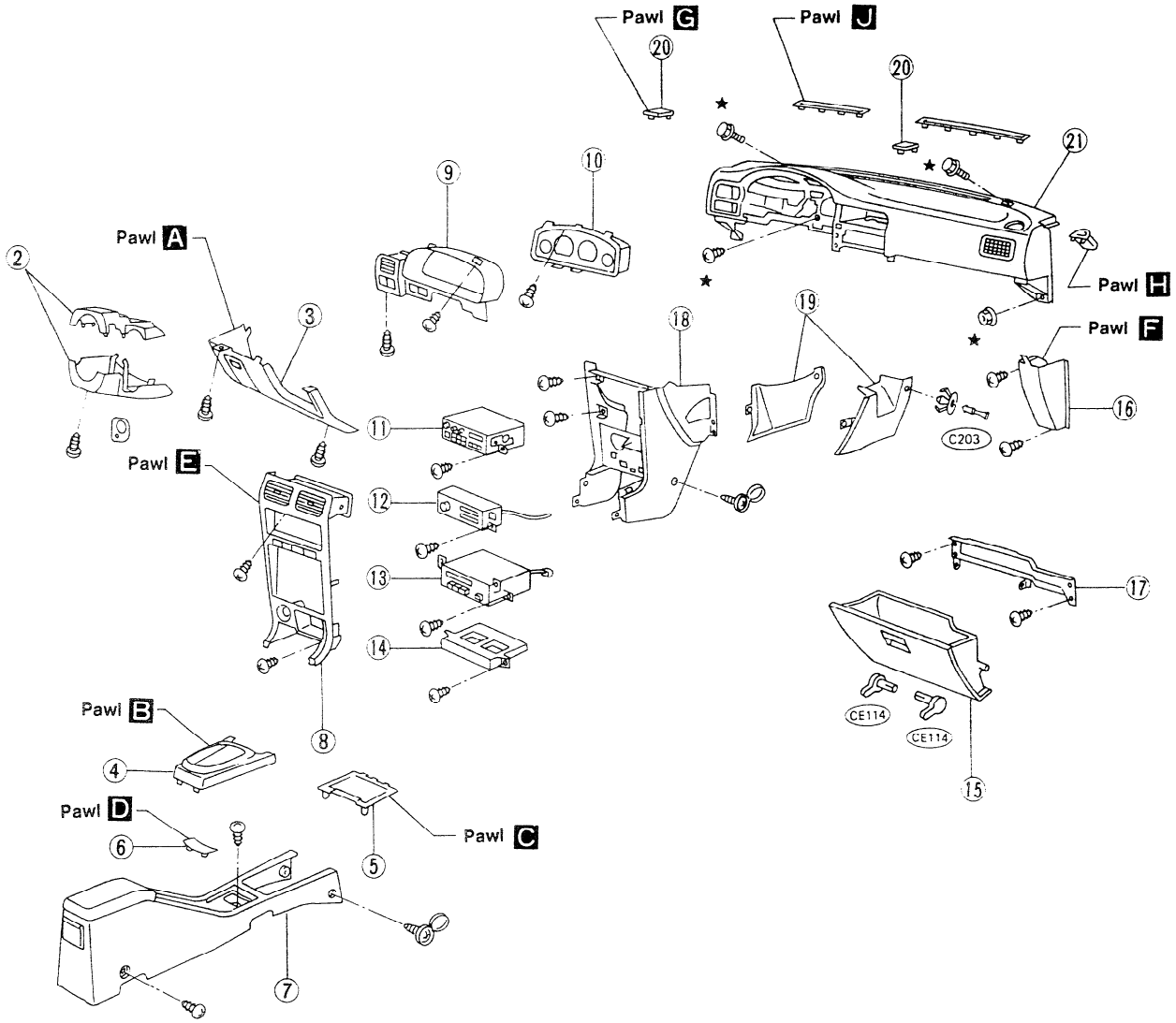




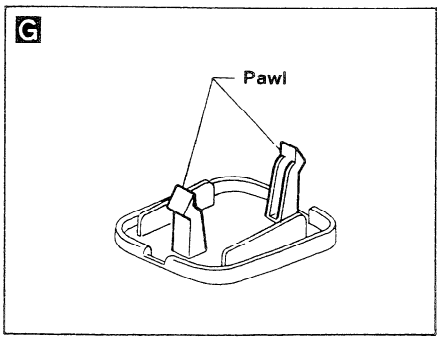


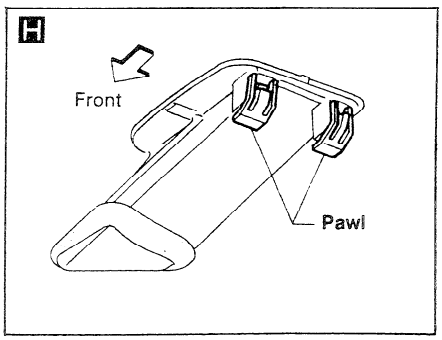


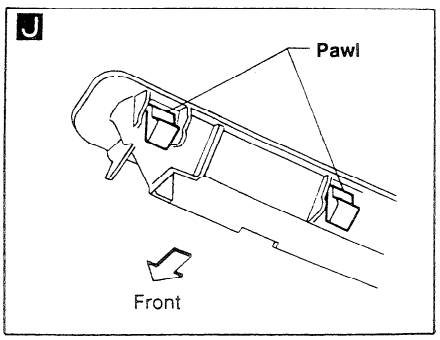




★: Instrument panel assembly mounting bolts and nuts





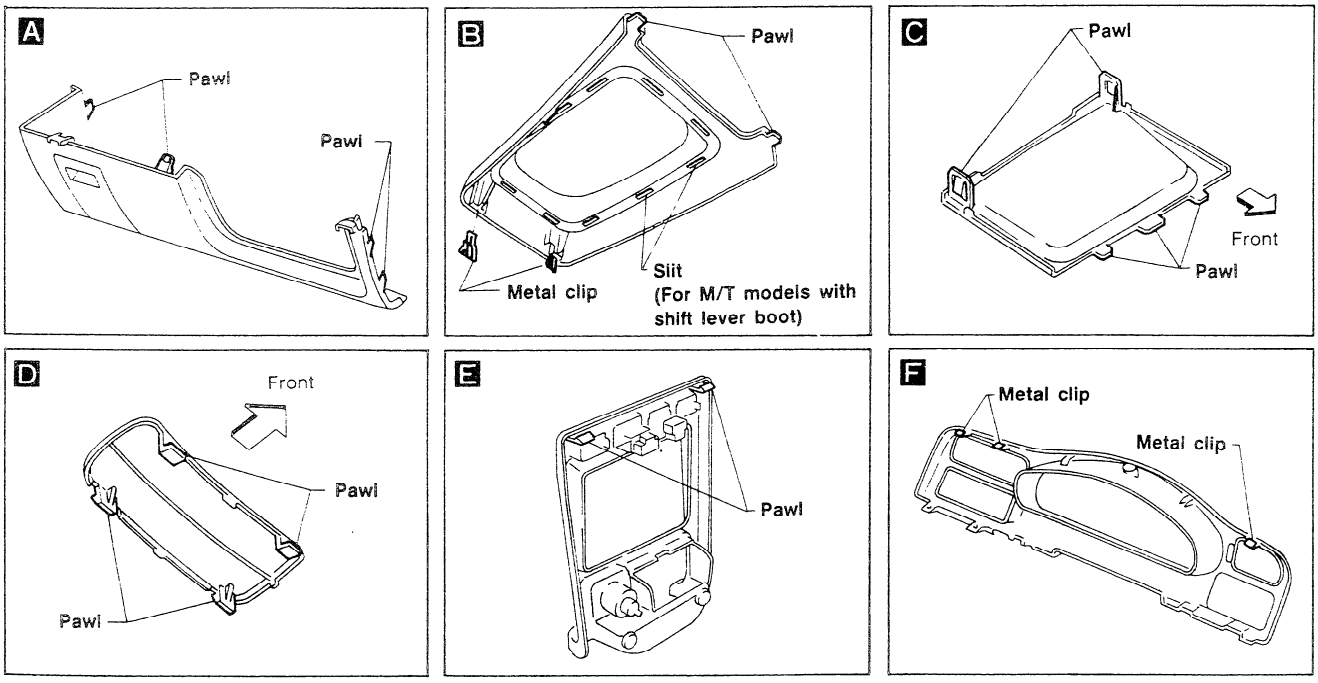


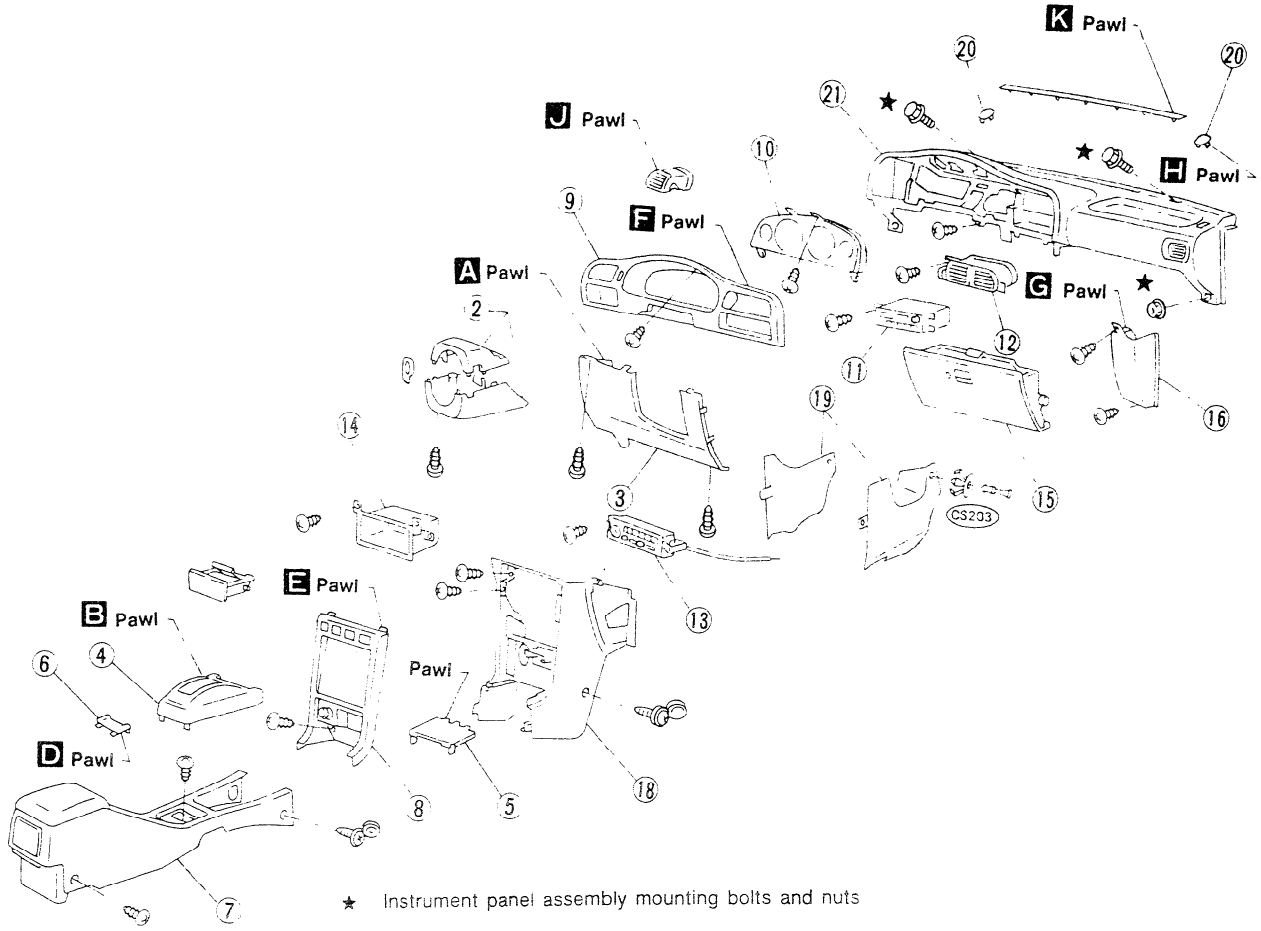
MBF081A

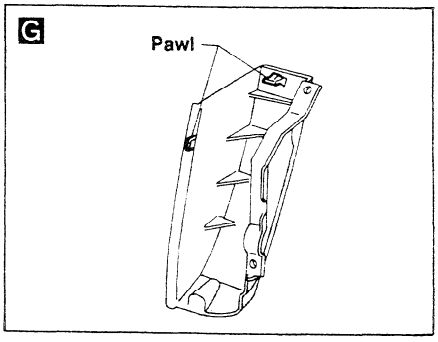
N14

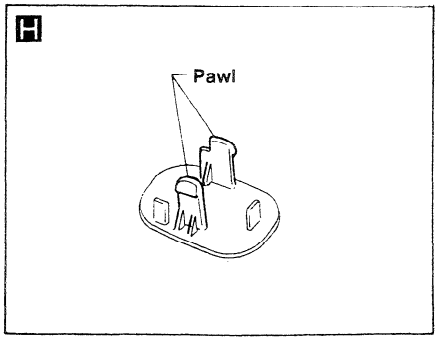
REMOVAL — Instrument panel assembly

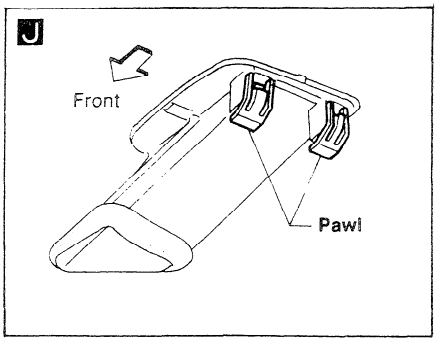
① Remove steering wheel. (Refer to ST section.)
② Remove steering column cover and combination switch.
③ Remove instrument lower cover on driver's side. A
④ Remove A/T finisher or shift lever bolt. B
⑤ Remove instrument lower center cover. C
⑥ Remove console mask. D
⑦ Remove console box.
⑧ Remove cluster lid C. E
⑨ Remove cluster lid A. F
⑩ Remove combination meter.
(Disconnect speedometer cable from A/T or M/T transaxle inside engine compartment.)
⑪ Remove radio with cassette deck.
⑫ Remove center ventilator.
⑬ Remove A/C or heater control.
⑭ Remove deck pocket.
⑮ Remove glove box.
⑯ Remove instrument lower cover on passenger side. G
⑰ Remove instrument panel reinforcement.
⑱ Remove instrument lower panel center.
⑲ Remove instrument lower cover.
⑳ Remove instrument upper mask.
㉑ Remove instrument panel and pads.

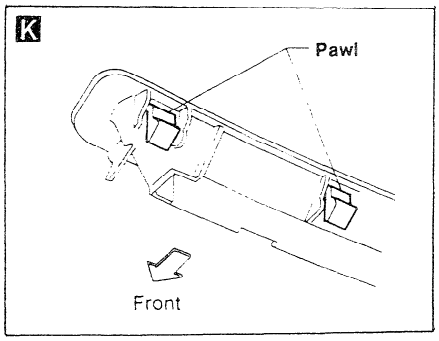



K Pawl
J Pawl
F Pawl
A Pawl
H Pawl
G Pawl
E Pawl
B Pawl
D Pawl
Pawl
CS203
★ Instrument panel assembly mounting bolts and nuts


G
Pawl


H
Pawl


J
Front
Pawl


K
Pawl
Front

MBF278A

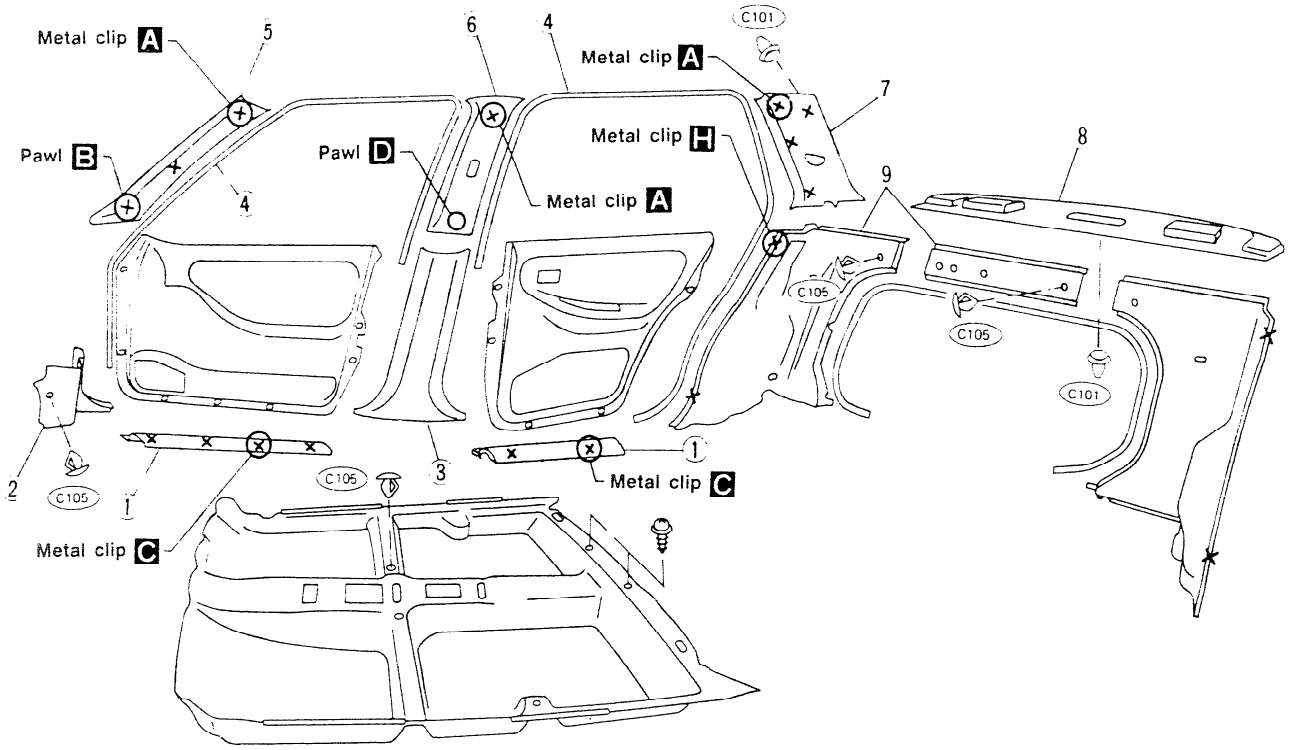
Interior

B13 SEDAN

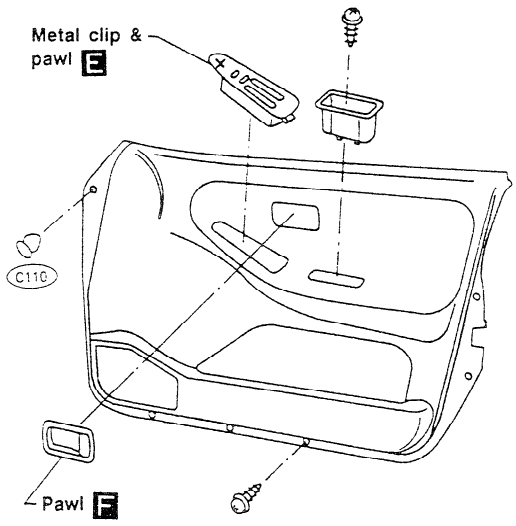
SIDE AND FLOOR TRIM

CAUTION:

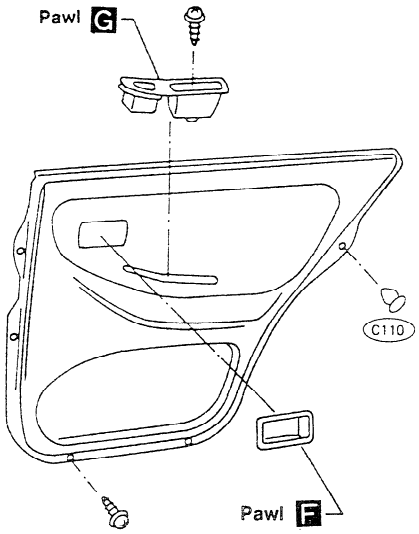
Warp the tip of a flat-bladed screwdriver with a cloth when removing metal clips from garnishes.



Front door



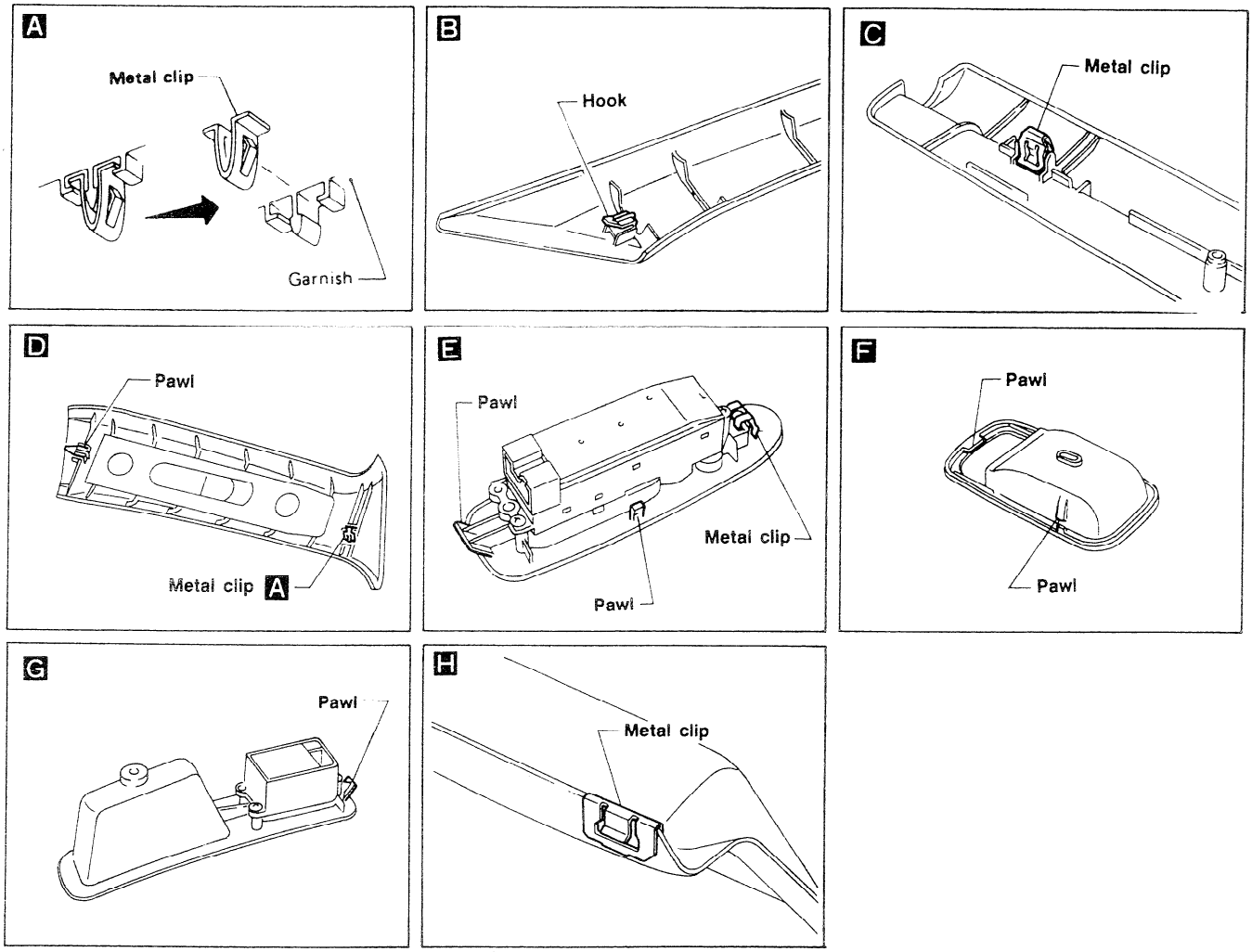
Rear door



Interior (Cont'd)

REMOVAL — Body side trim

① Remove front and rear kicking plates.
② Remove dash side finisher.
③ Remove center pillar lower garnish.
④ Remove front and rear body side welts.
⑤ Remove front pillar garnish.
⑥ Remove center pillar upper garnish.
⑦ Remove rear pillar garnish.
⑧ Remove rear parcel shelf.
⑨ Remove rear seatback finisher.



MBF279A

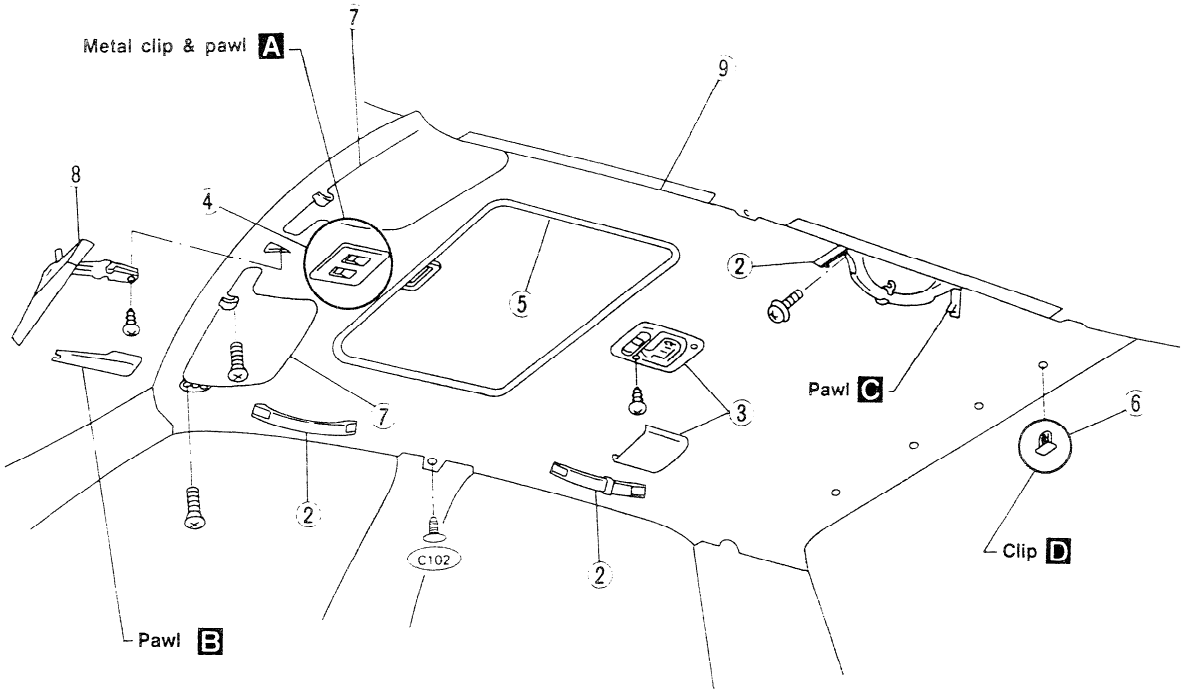
Interior

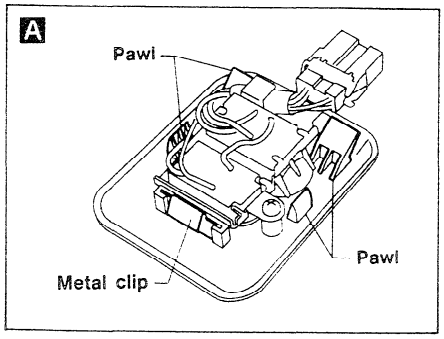
B13 SEDAN

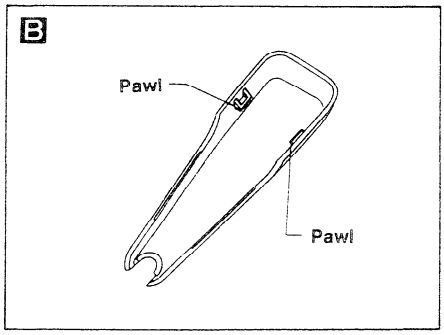
ROOM TRIM

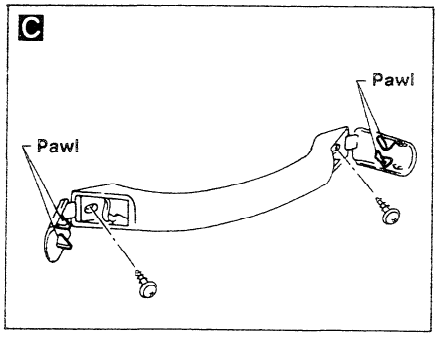
REMOVAL — Headlining

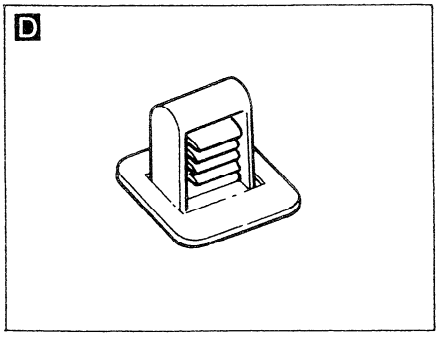
① Remove body side trim. Refer to "REMOVAL — Body side trim" for details.
② Remove assist grips.
③ Remove interior lamp.
④ Remove sunroof switch. (Models equipped with sunroof)
⑤ Remove sunroof welt. (Models equipped with sunroof)
⑥ Remove clip D.
⑦ Remove sunvisors.
⑧ Remove rear-view mirror.
⑨ Remove headlining.







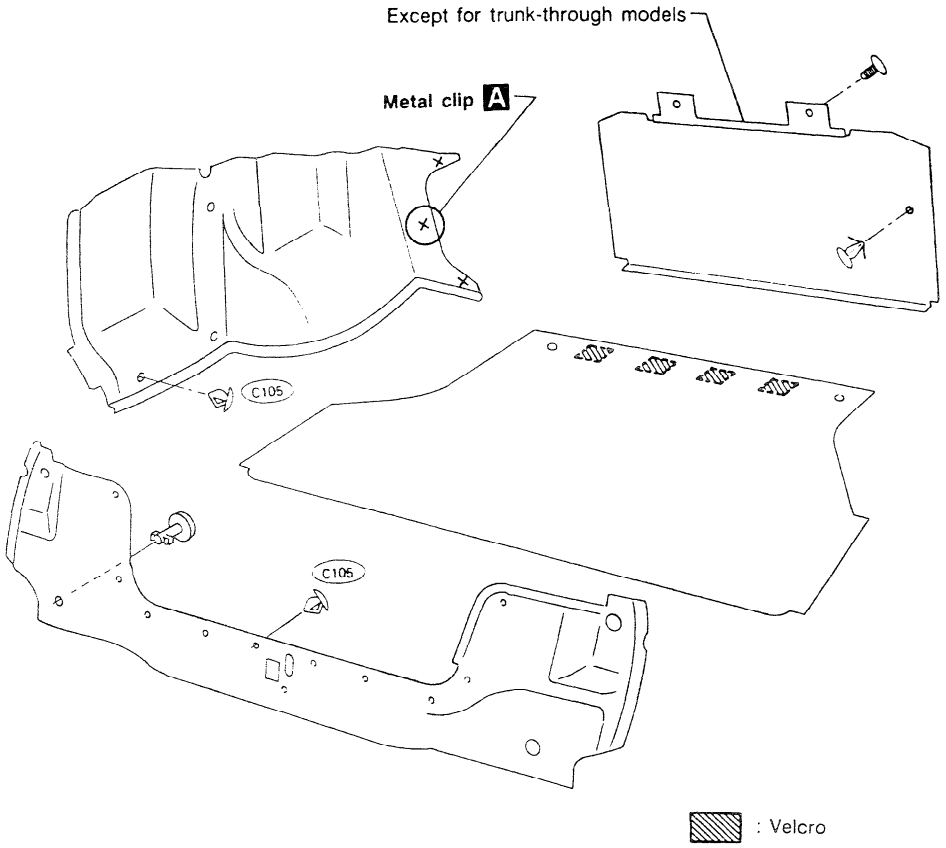




MBF280A

Interior (Cont'd)

LUGGAGE ROOM TRIM



SBF807G

B13 COUPE

SIDE, LUGGAGE AND FLOOR TRIM

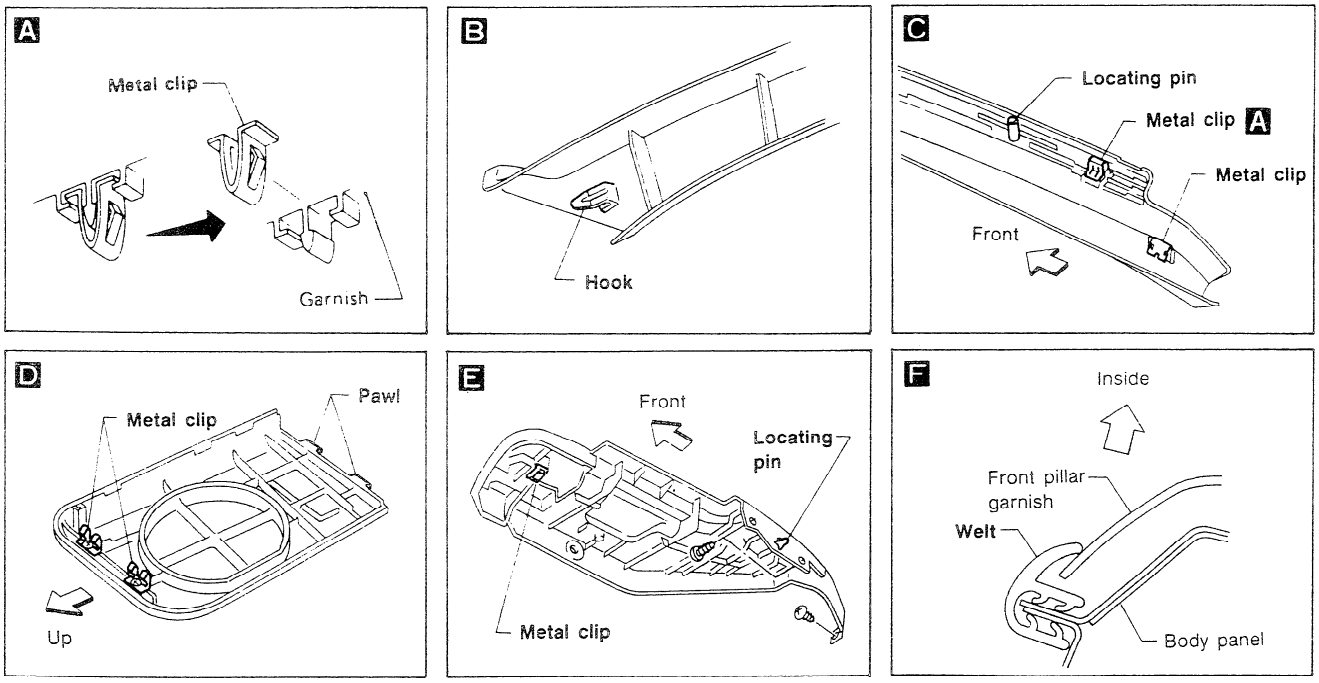
CAUTION:

a. Be sure to remove front pillar, luggage side upper garnish, luggage side lower garnish and luggage room rear upper garnish by pulling them straight out.

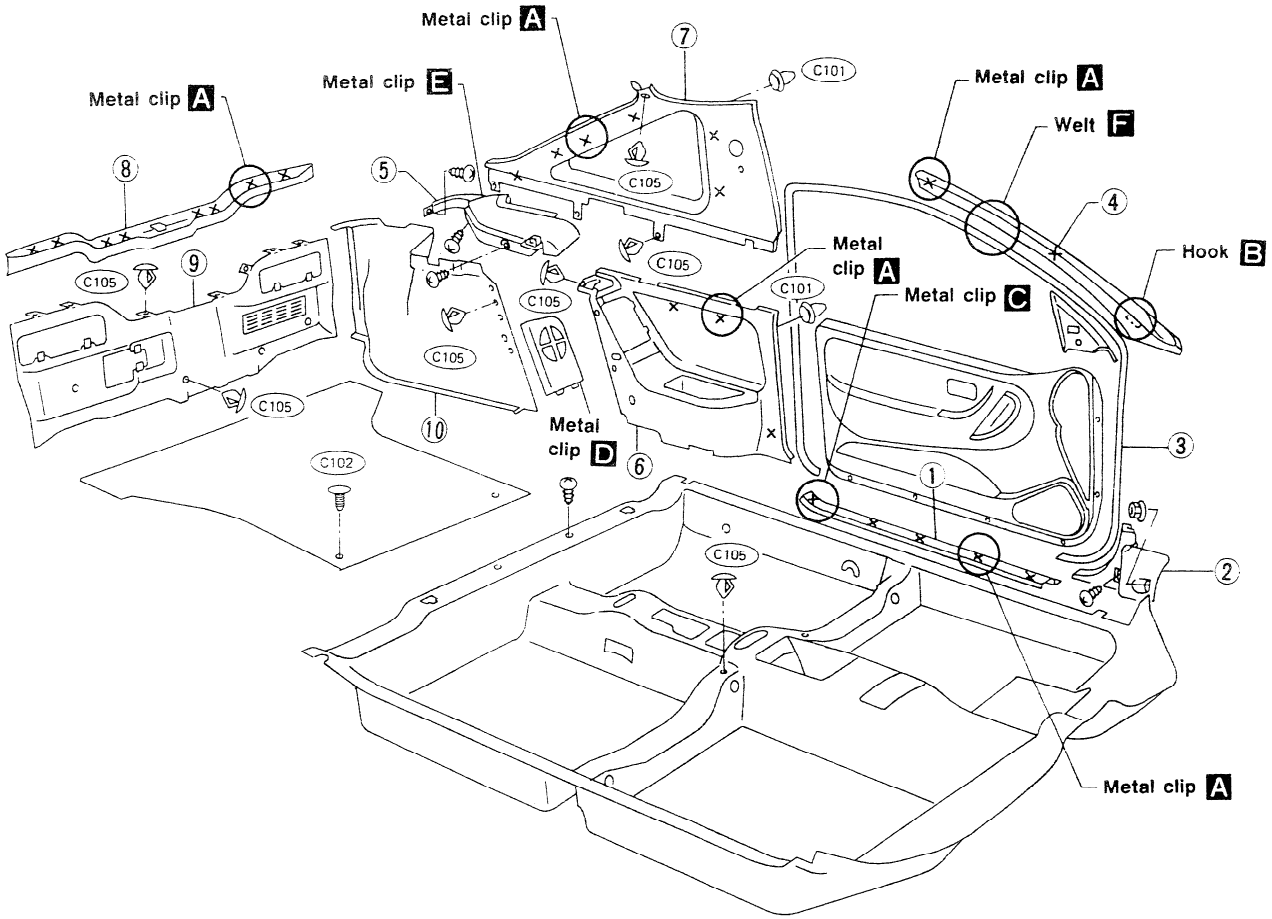
b. Wrap the tip of flat-bladed screwdriver with a cloth when removing metal clips from garnishes.

REMOVAL — Body side trim

① Remove kicking plate.
② Remove dash side finisher.
③ Remove body side welt.
④ Remove front pillar garnish.
⑤ Remove luggage room side upper finisher.
⑥ Remove luggage side lower finisher.
⑦ Remove luggage side upper finisher.
⑧ Remove luggage room rear upper finisher.
⑨ Remove luggage room rear finisher.
⑩ Remove luggage room side finisher.



Interior (Cont'd)



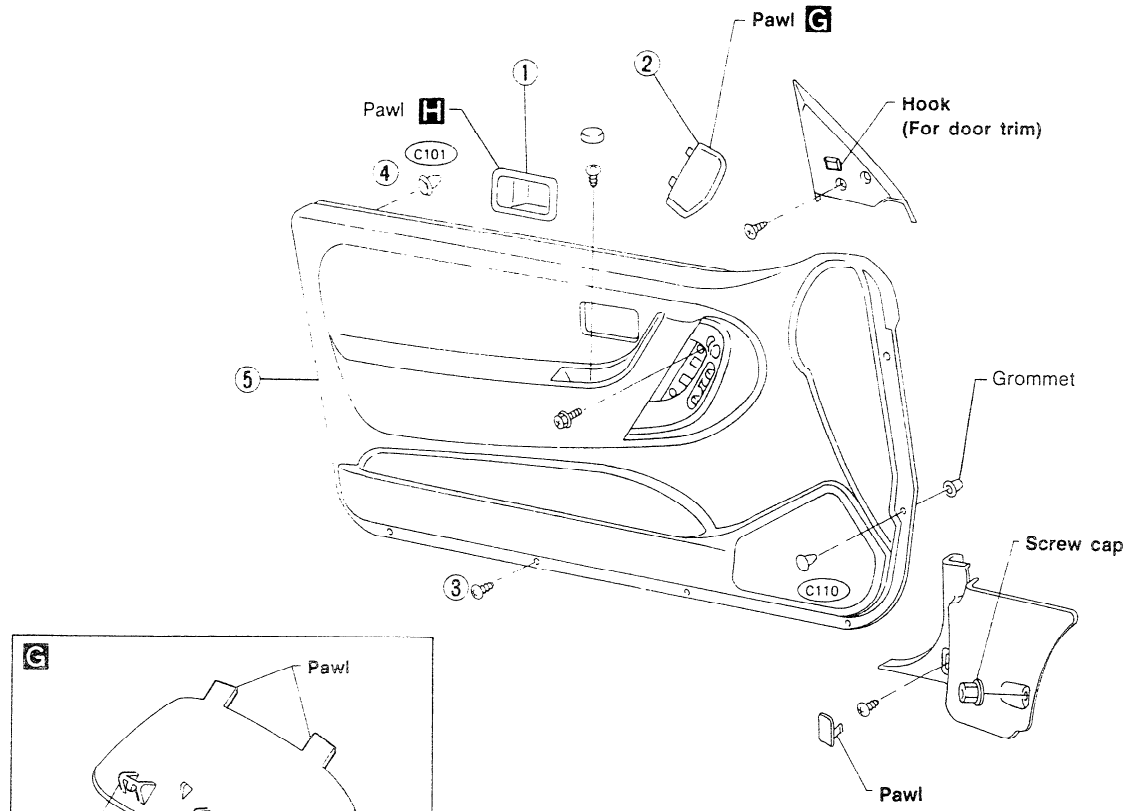
MBF082A

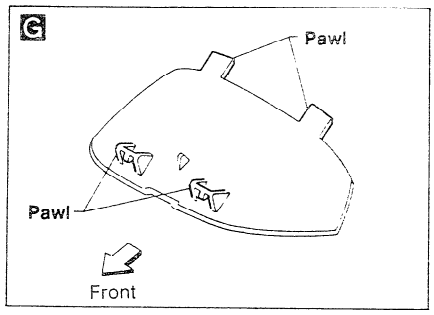
Interior (Cont'd)

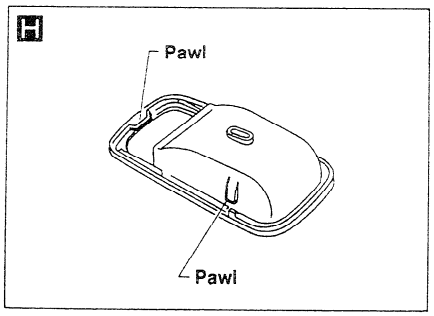
DOOR TRIM

REMOVAL — Door trim

① Remove inside handle escutcheon. (Refer to "DOOR".)
② Remove door grip escutcheon.
③ Remove the seven screws.
④ Remove clips securing door finisher.
⑤ Lift out door finisher. Disconnect main and door harness.







MBF282A

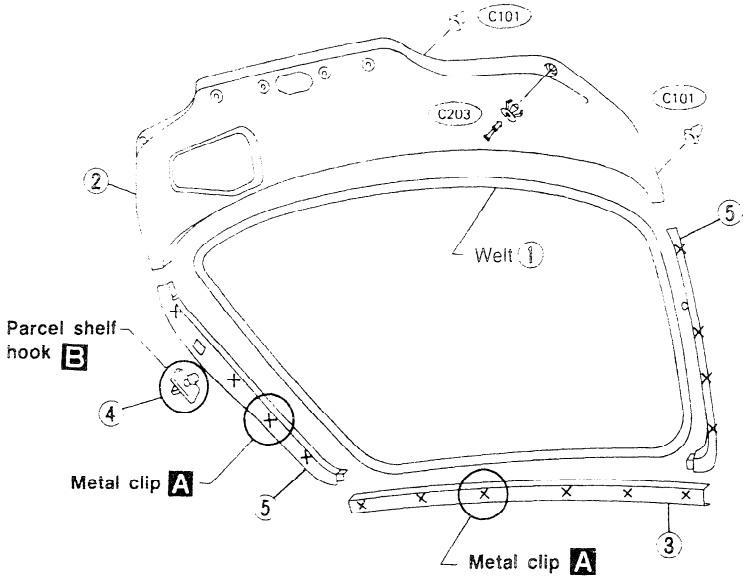
Interior (Cont'd)

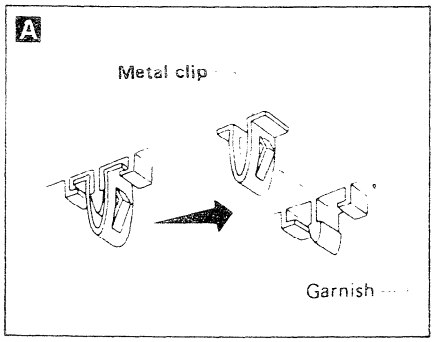
BACK DOOR TRIM

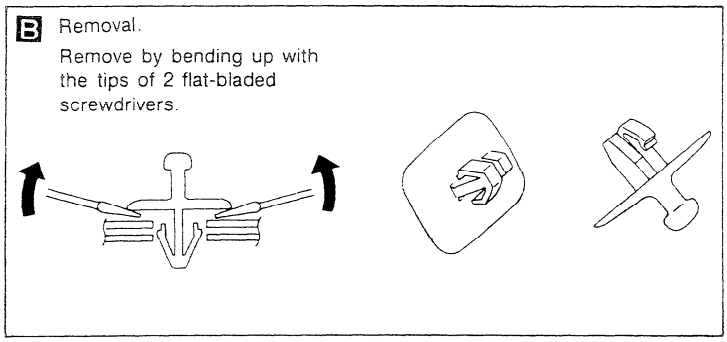
CAUTION:
Wrap the tip of flat-bladed screwdriver with a cloth when removing metal clips from garnishes.

REMOVAL — Back door trim

① Remove back door window welt.
② Remove back door lower finisher.
③ Remove back door upper finisher.
④ Remove parcel shelf hook.
⑤ Remove back door side finisher.







MBF084A

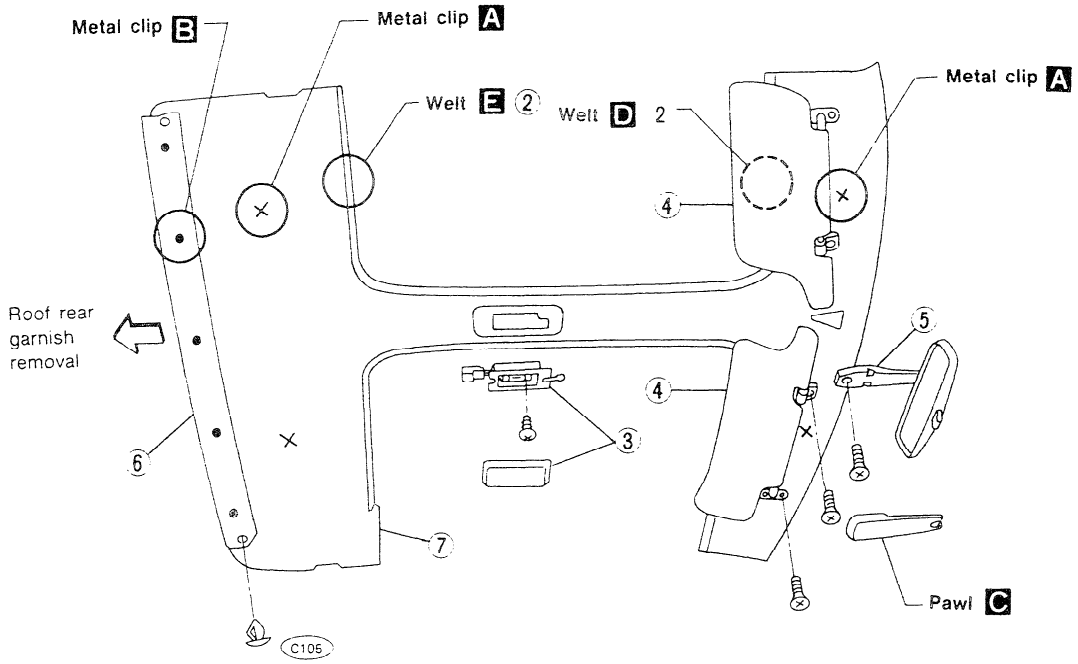
Interior (Cont'd)

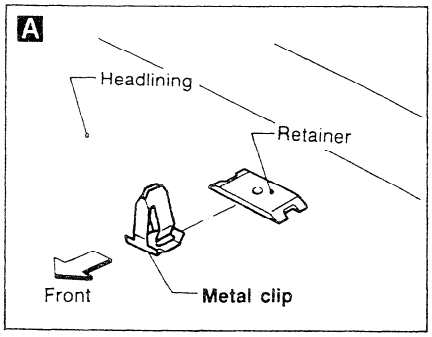
ROOF TRIM

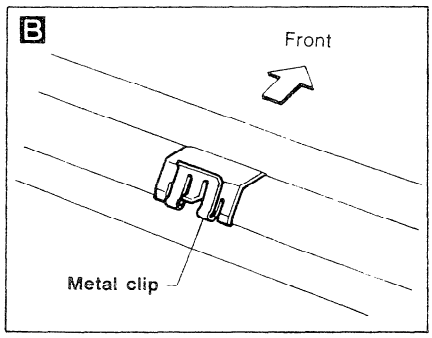
CAUTION:
Wrap the tip of long flat-bladed screwdriver with cloth when removing metal clips from roof garnish.

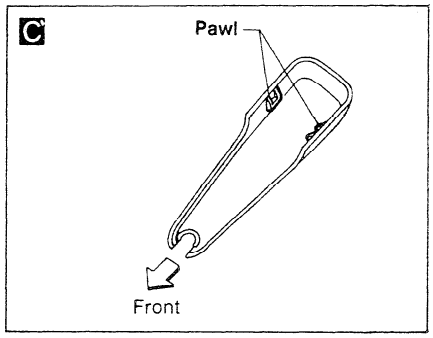
REMOVAL — Headlining

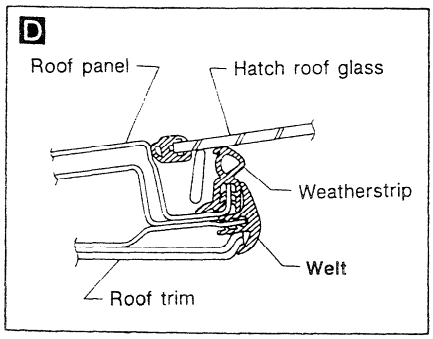
① Remove body side trim. Refer to "REMOVAL — Body side trim" for details.
② Remove welt.
③ Remove interior lamp assembly.
④ Remove left and right sunvisors.
⑤ Remove rear-view mirror.
⑥ Remove roof rear garnish.
⑦ Remove headlining.

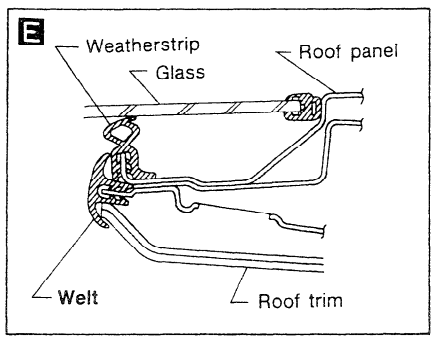












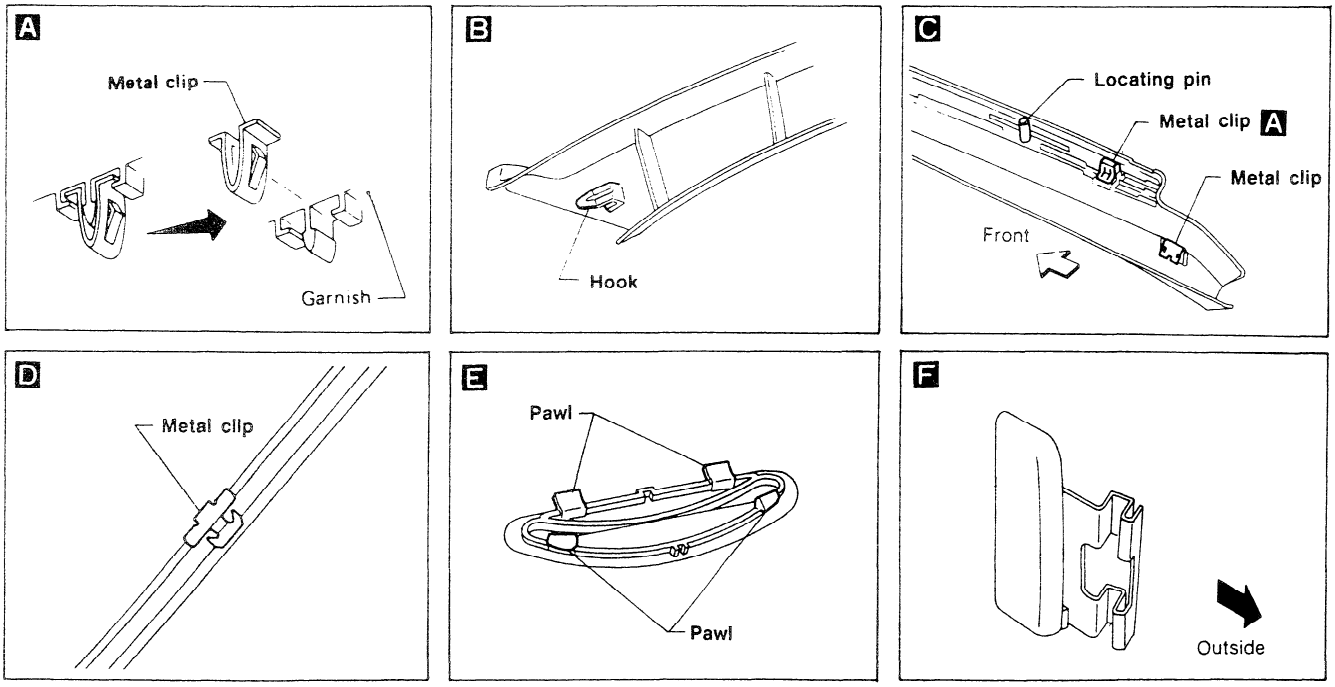
MBF085A

N14 SEDAN

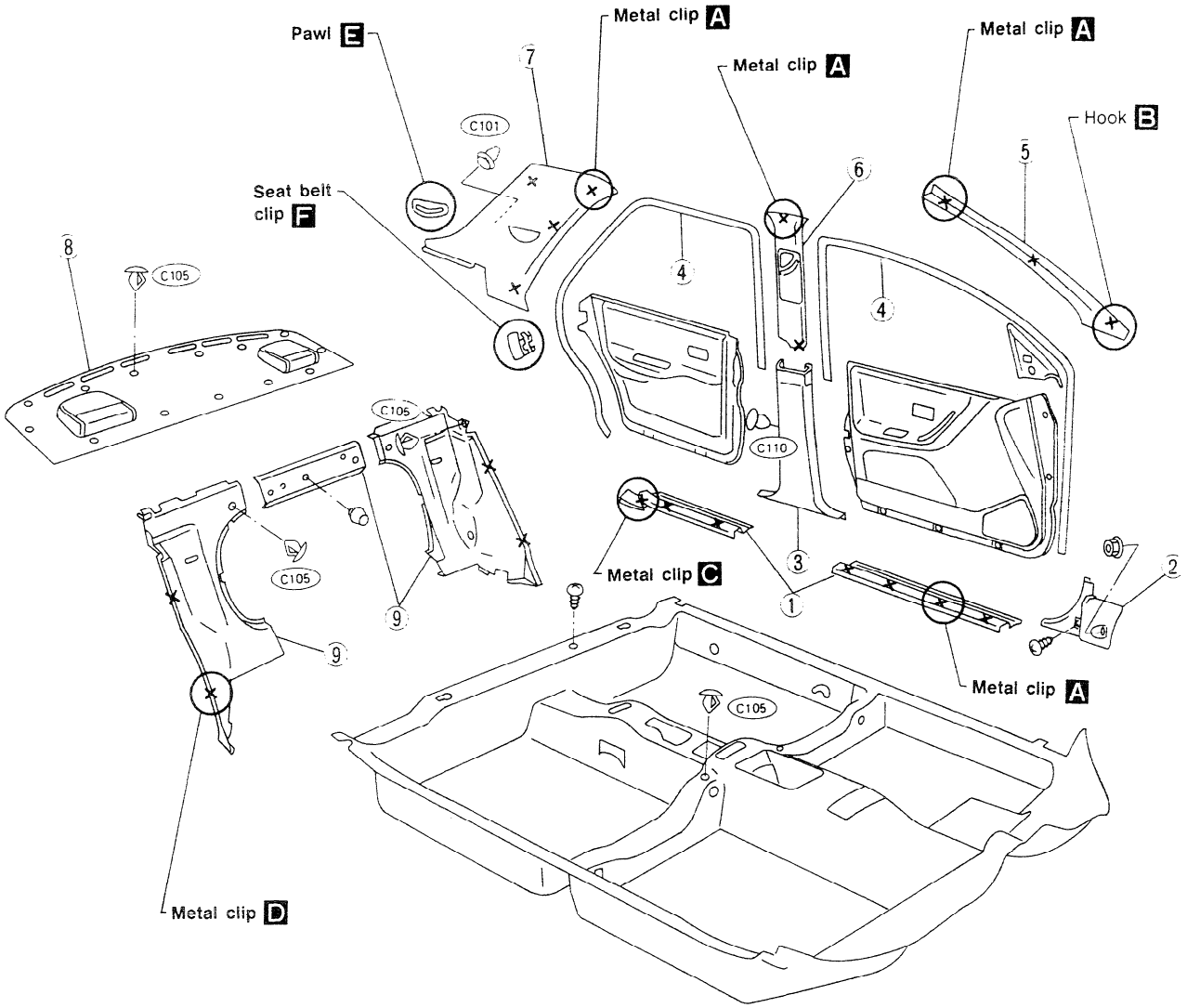
SIDE AND FLOOR TRIM

REMOVAL — Body side trim

① Remove front and rear kicking plates.
② Remove dash side finisher.
③ Remove center pillar lower garnish.
④ Remove front and rear body side welts.
⑤ Remove front pillar garnish.
⑥ Remove center pillar upper garnish.
⑦ Remove rear pillar finisher.
⑧ Remove rear parcel shelf.
⑨ Rear seatback finisher.



Interior (Cont'd)

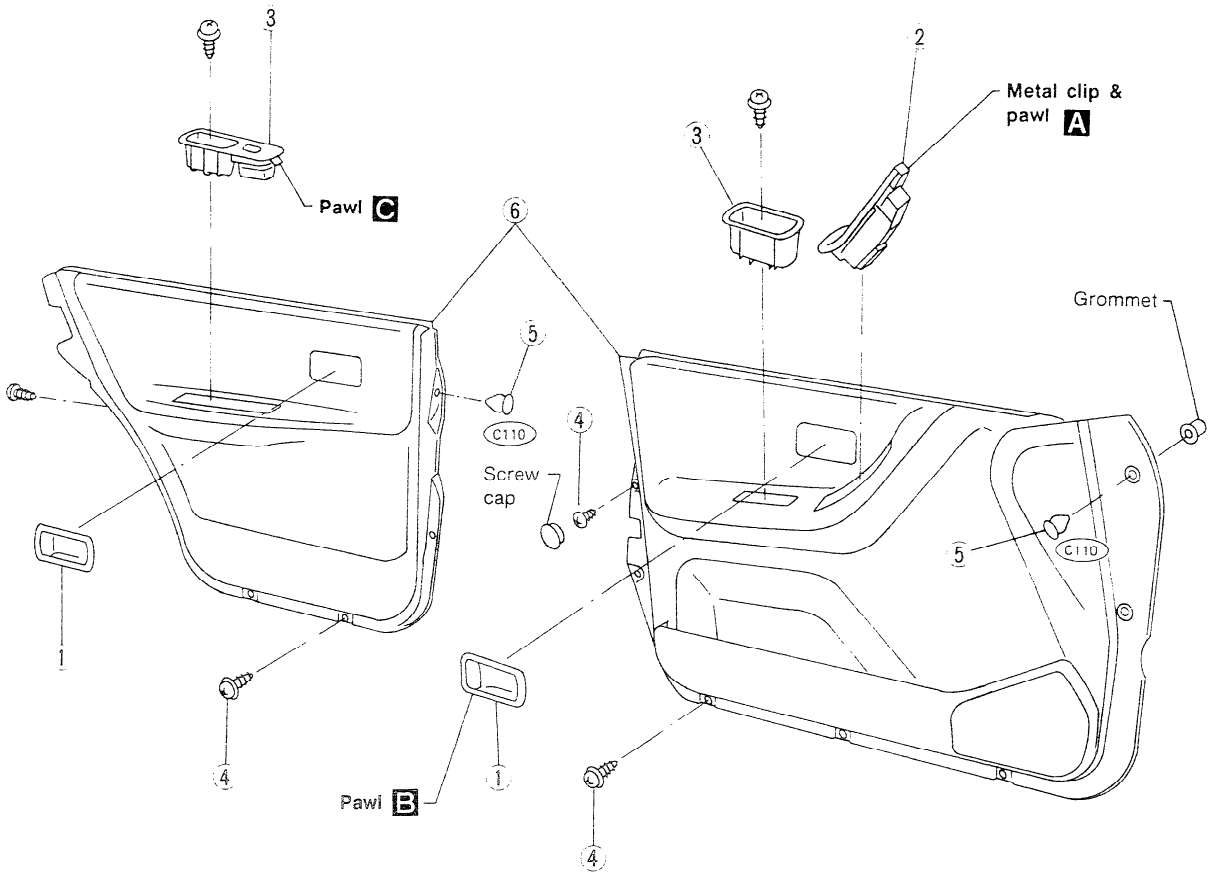


MBF283A

Interior (Cont'd)

DOOR TRIM REMOVAL — Door trim

① Remove inside handle escutcheon.
(Refer to "DOOR".)
② Remove power window switch finisher.
③ Remove door grip escutcheon.
④ Remove screws.
⑤ Remove clips securing door finisher.
⑥ Lift out door finisher. Disconnect main and door harnesses.



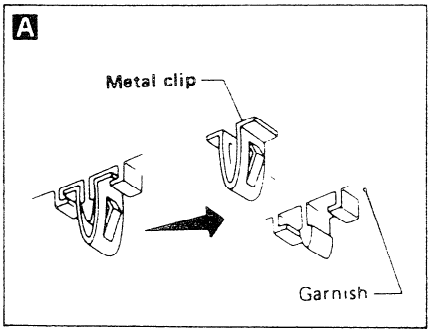
MBF284A

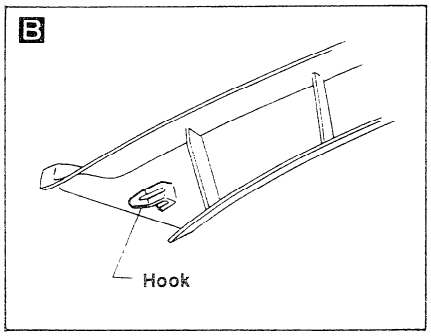
N14 5-DOOR HATCHBACK

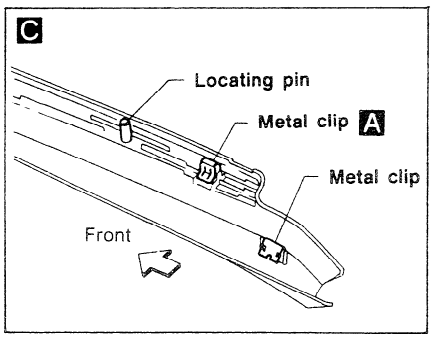
SIDE, LUGGAGE AND FLOOR TRIM

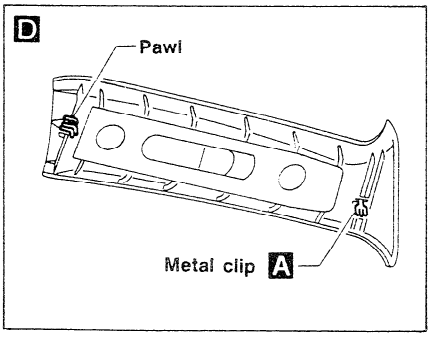
REMOVAL — Body side trim

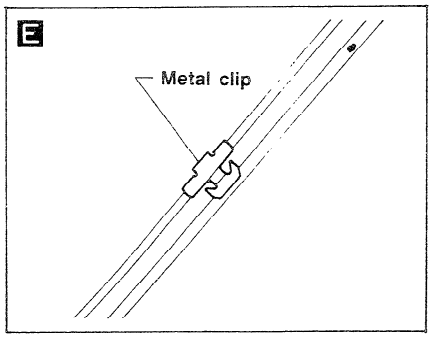
① Remove front and rear kicking plates.
② Remove dash side finisher.
③ Remove center pillar lower garnish.
④ Remove front and rear body side welts.
⑤ Remove front pillar garnish.
⑥ Remove center pillar garnish.
⑦ Remove rear parcel shelf side finisher.
⑧ Remove rear pillar finisher.
⑨ Remove rear wheelhouse finisher.
⑩ Remove luggage room rear plate.
⑪ Remove luggage room rear finisher.
⑫ Remove luggage room side lower finisher.



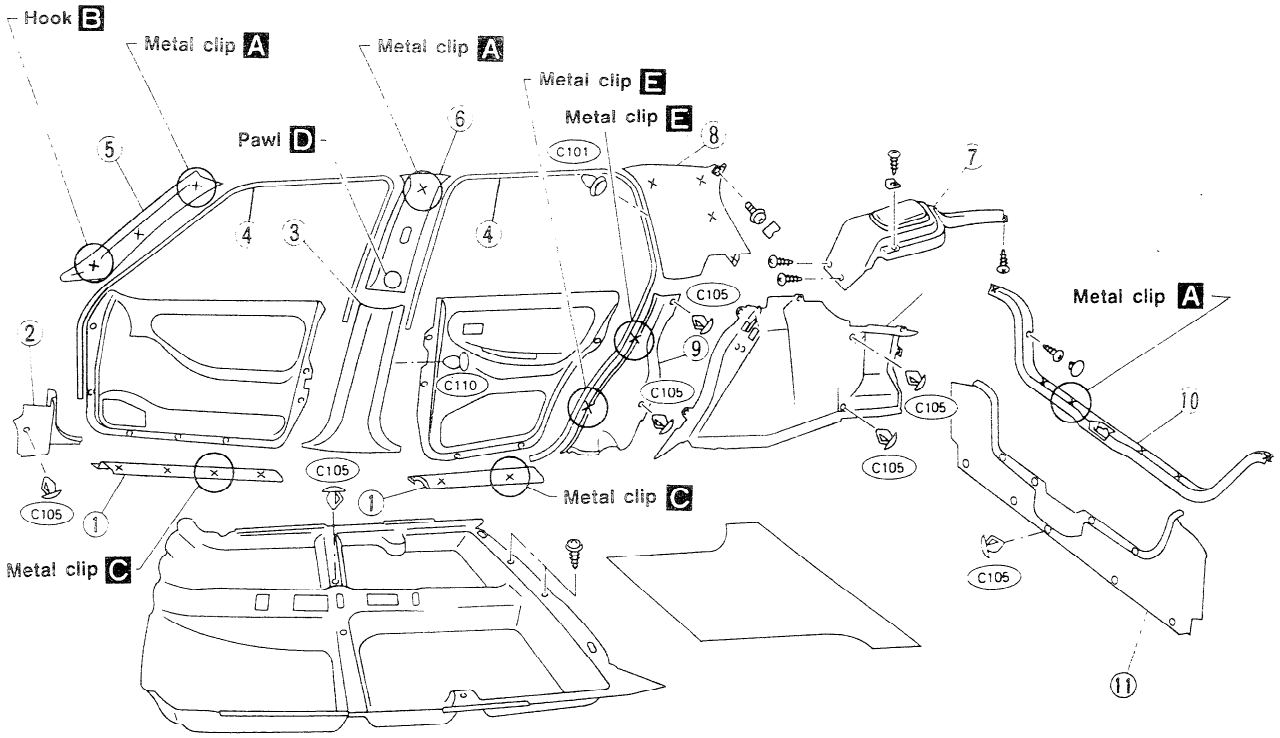








Interior (Cont'd)



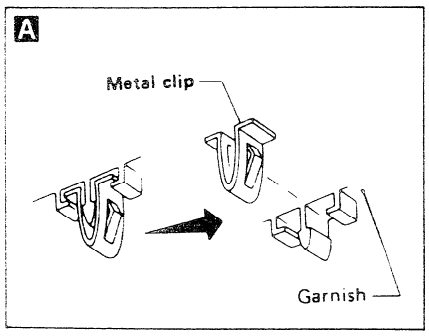
MBF285A

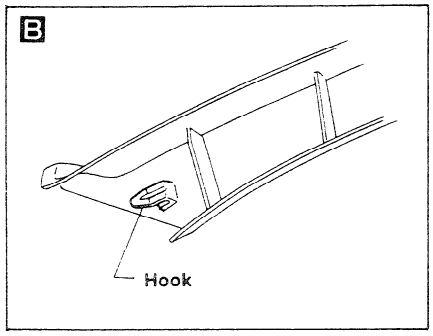
N14 3-DOOR HATCHBACK

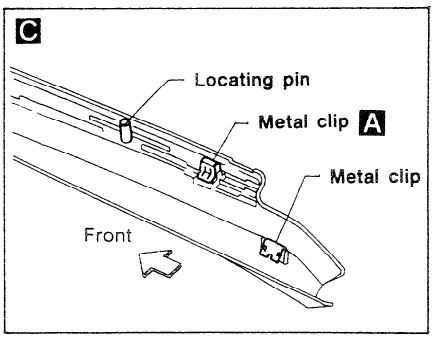
SIDE, LUGGAGE AND FLOOR TRIM

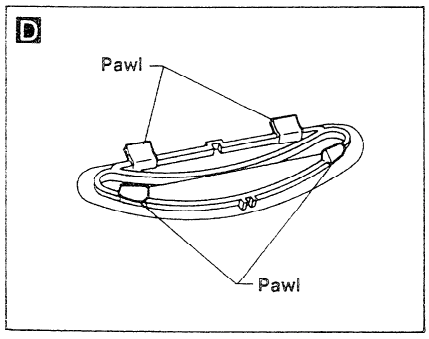
REMOVAL — Body side trim

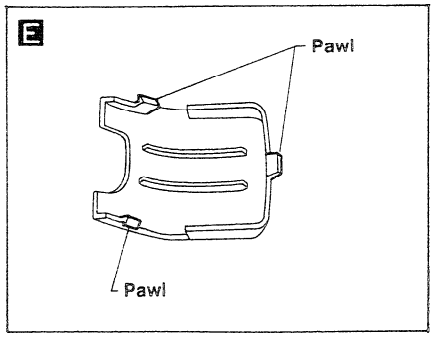
① Remove kicking plate.
② Remove dash side finisher.
③ Remove body side welt.
④ Remove rear parcel shelf side finisher.
⑤ Remove luggage rear plate.
⑥ Remove luggage rear finisher.
⑦ Remove rear side finisher.
⑧ Remove luggage side lower finisher.
⑨ Remove rear pillar finisher.



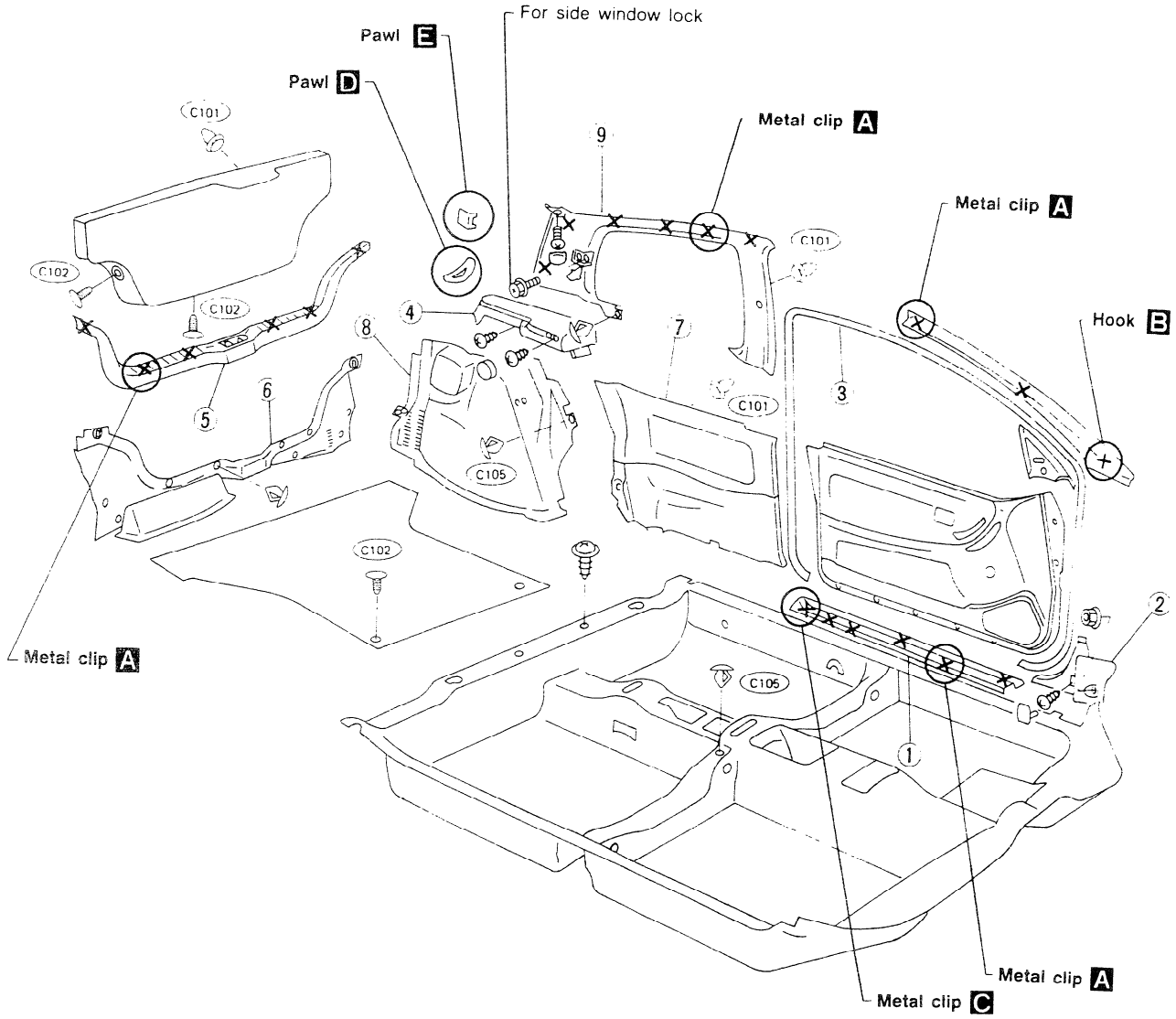








Interior (Cont'd)



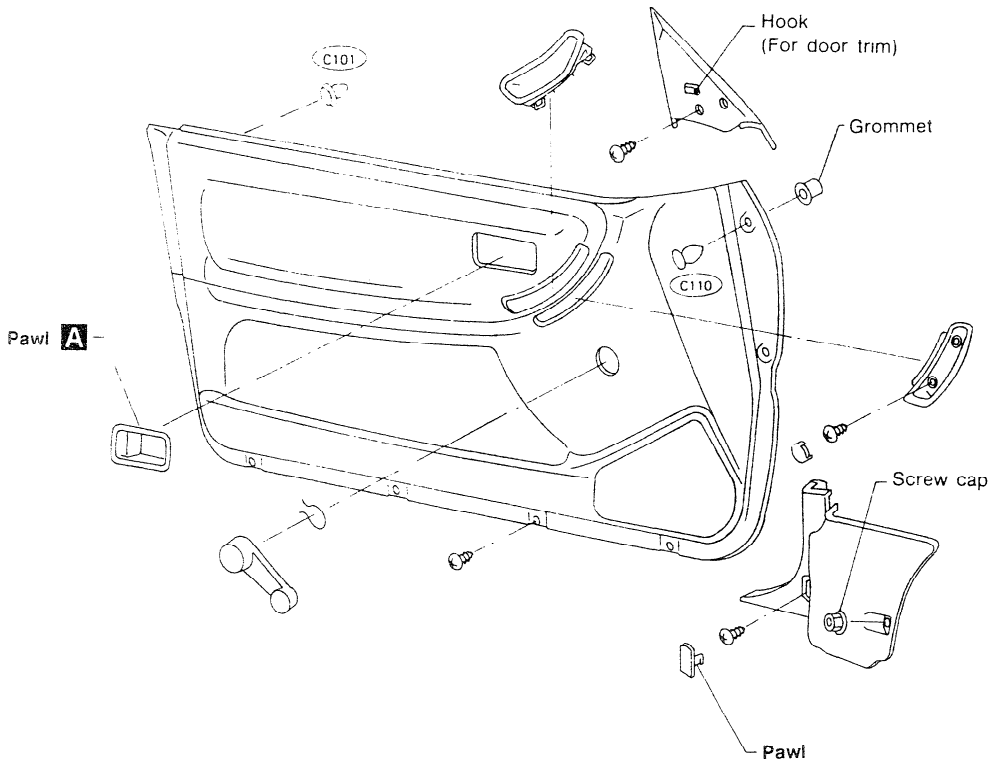
MBF286A

Interior (Cont'd)

DOOR TRIM REMOVAL — Door trim

REMOVAL — Door trim

① Remove inside handle escutcheon. (Refer to "DOOR".)
② Remove window regulator handle (Manual window models).
③ Remove door grip escutcheon.
④ Remove the four screws.
⑤ Remove clips securing door finisher.
⑥ Lift out door finisher.



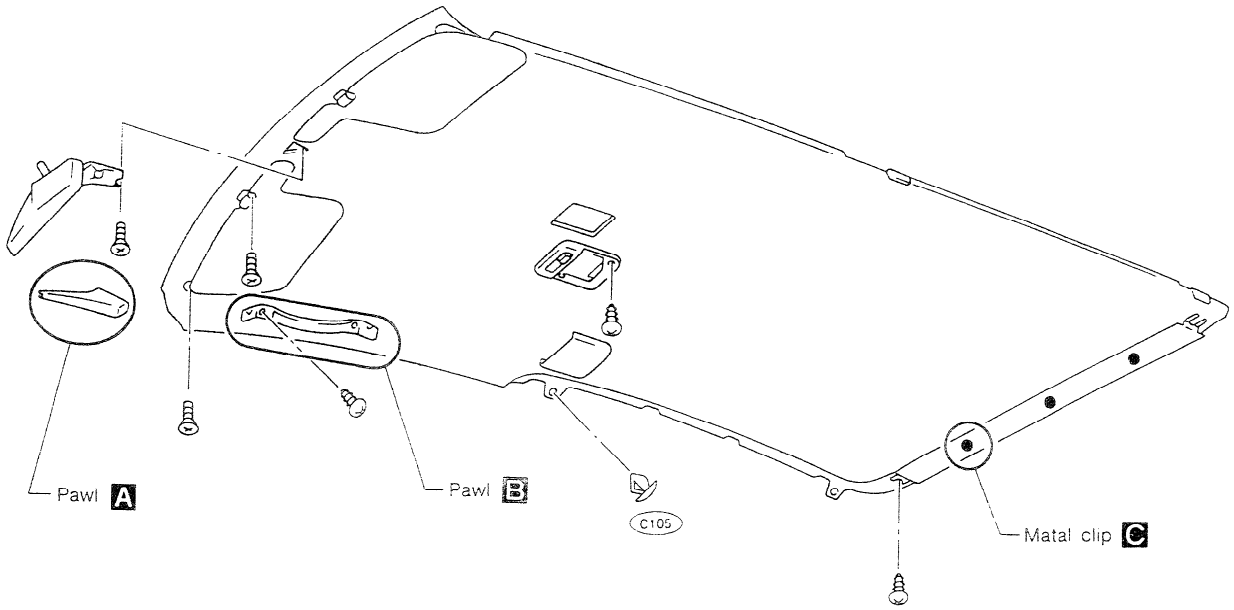
MBF287A

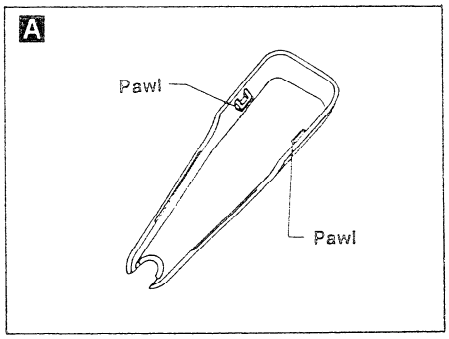
N14 5-DOOR HATCHBACK AND 3-DOOR HATCHBACK

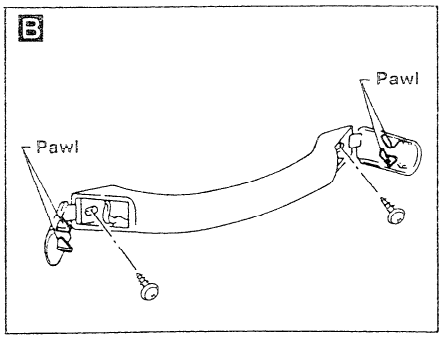
ROOM TRIM

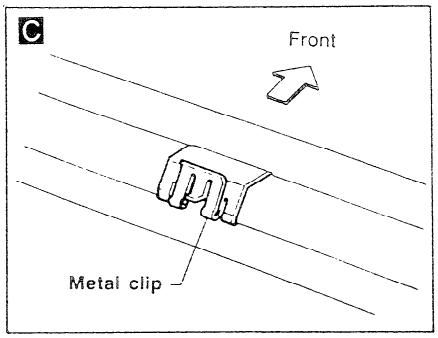
REMOVAL — Headlining

① Remove body side trim. Refer to "REMOVAL — Body side trim" for details.
② Remove assist grip.
③ Remove interior lamp.
④ Remove rear roof garnish.
⑤ Remove sunvisors.
⑥ Remove rear-view mirror.
⑦ Remove headlining.









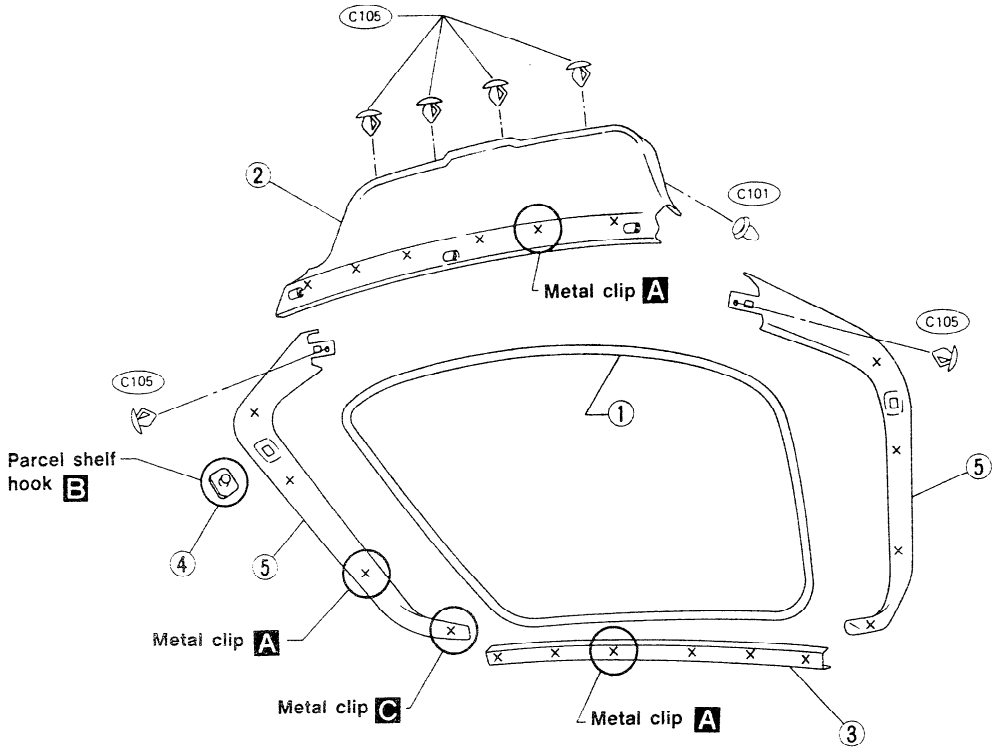
MBF341A

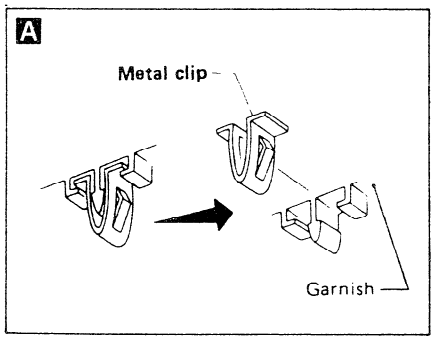
N14 5-DOOR HATCHBACK
BACK DOOR TRIM

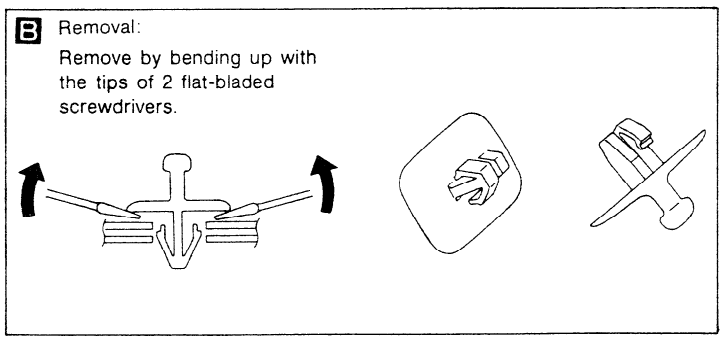
CAUTION:
Warp the tip of a flat-bladed screwdriver with a cloth when removing metal clips from garnishes.

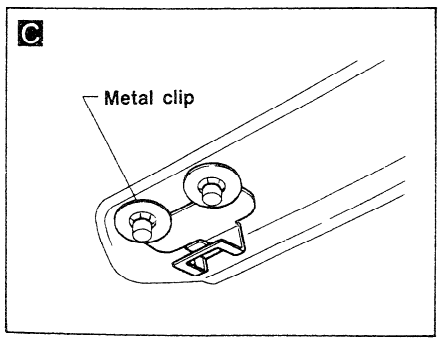
REMOVAL — Back door window welt.

① Remove back door window welt.
② Remove back door lower finisher.
③ Remove back door upper finisher.
④ Remove parcel shelf hook.
⑤ Remove back door side finisher.





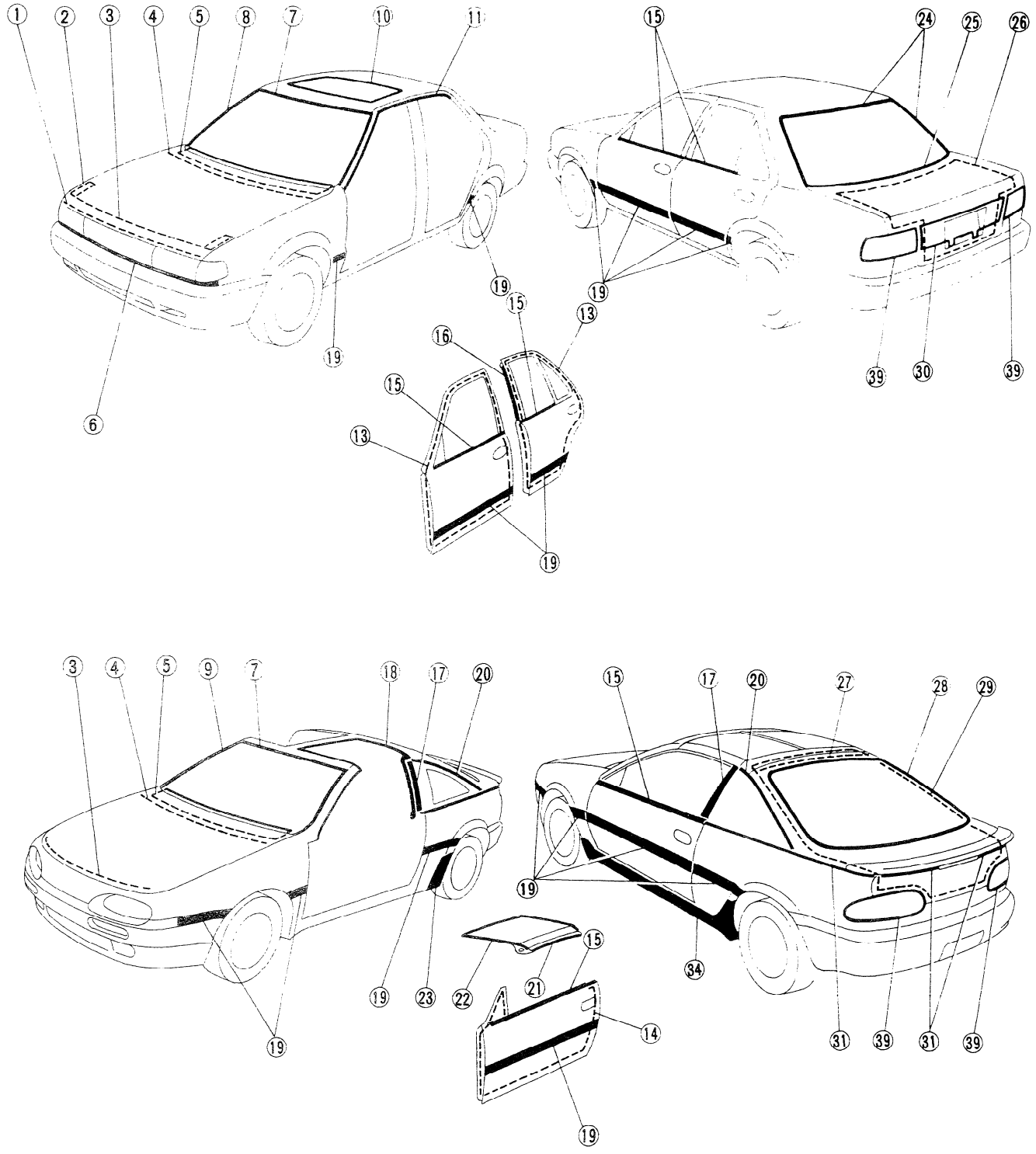




MBF166A

Exterior

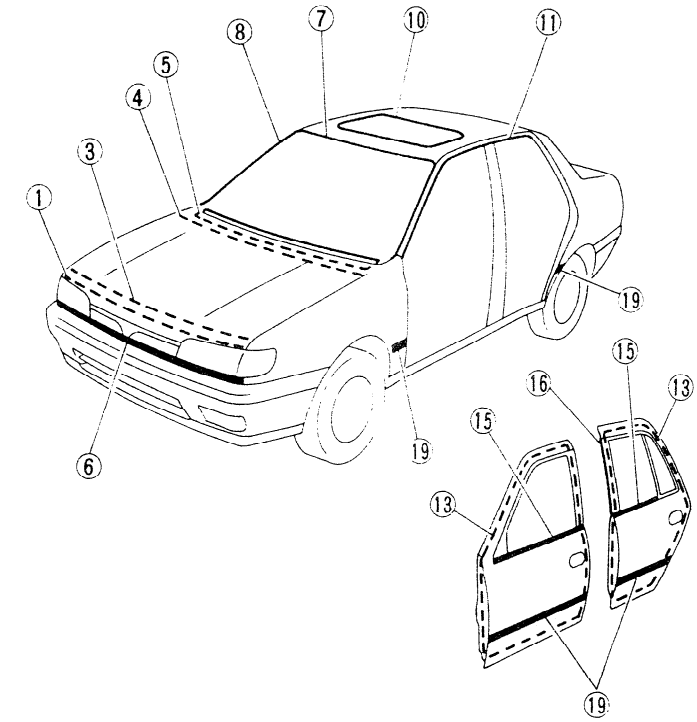
B13

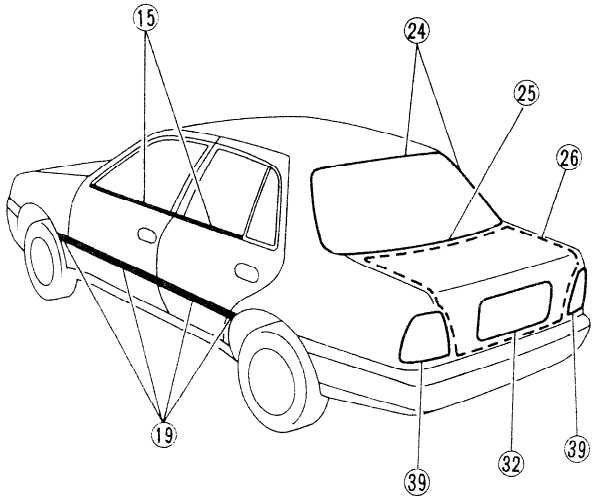


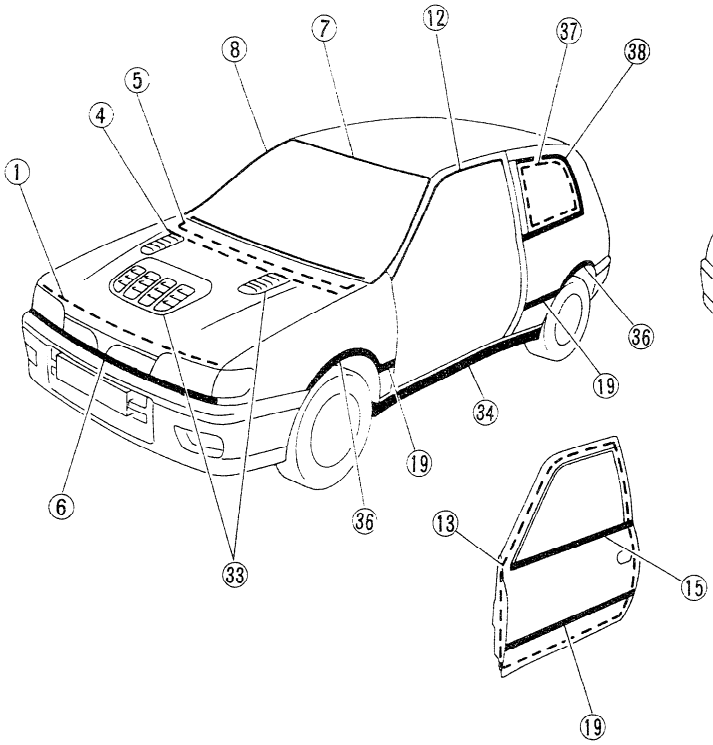
MBF086A

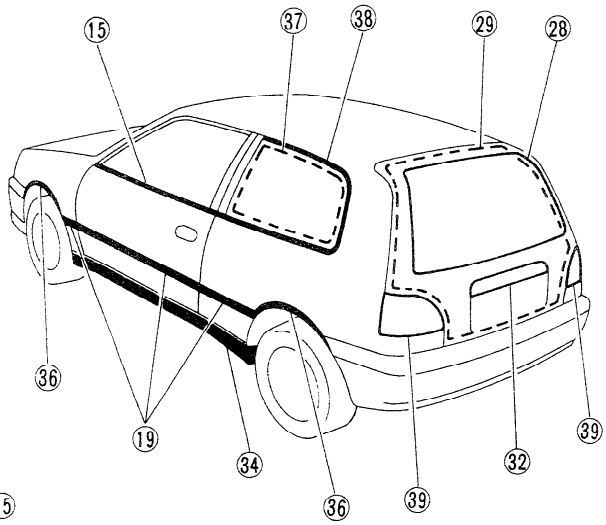
Exterior (Cont'd)

N14

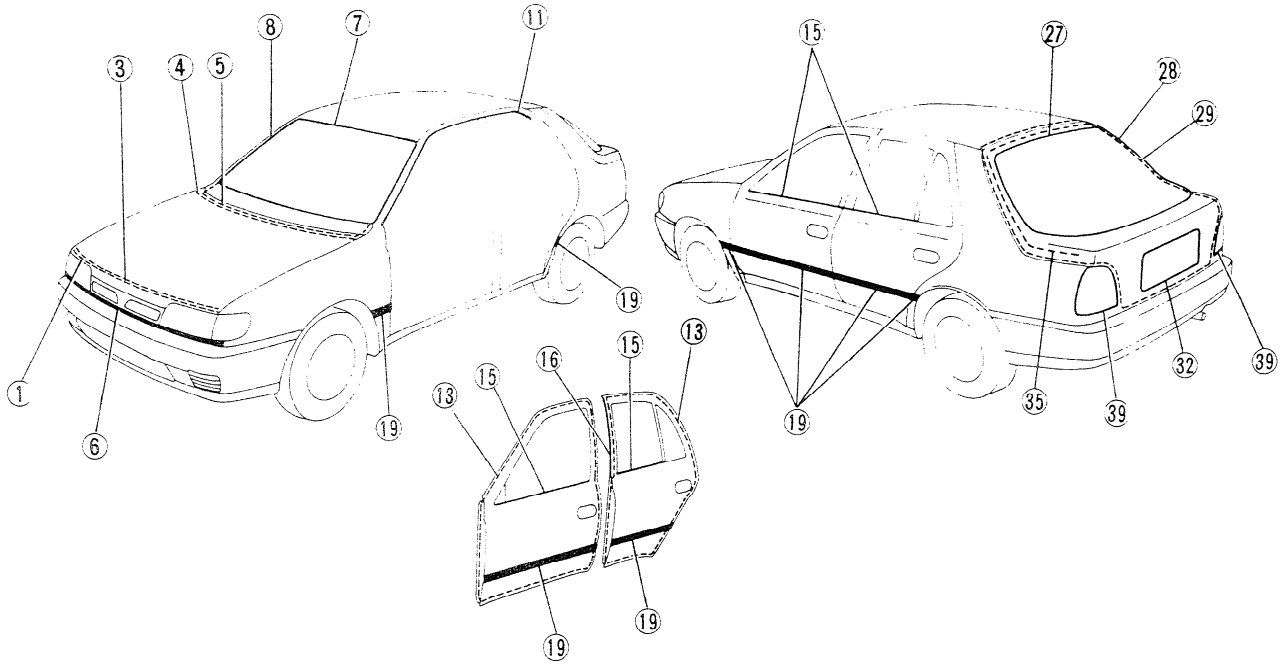








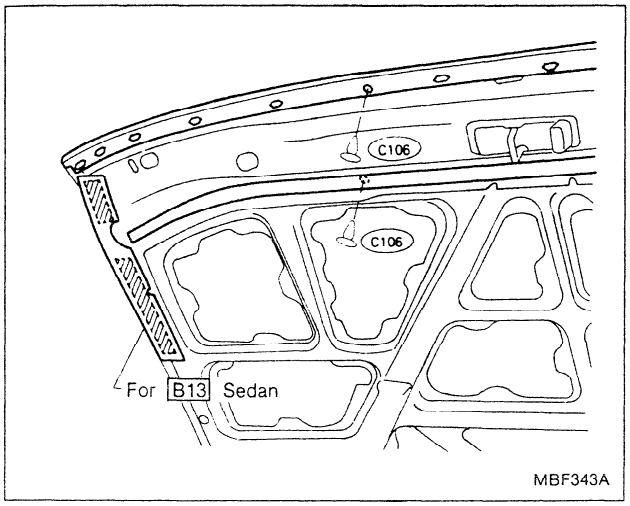
Exterior (Cont'd)



MBF342A

Exterior (Cont'd)

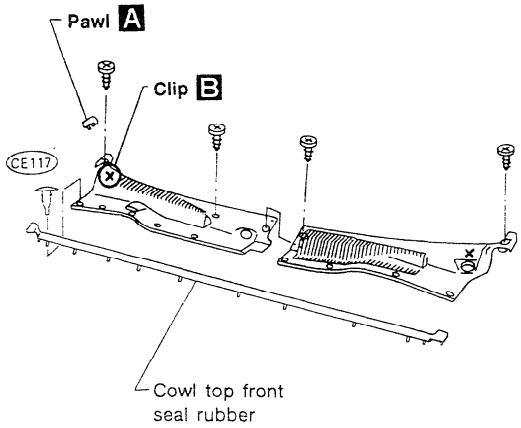
① ② ③ Hood front sealing rubber



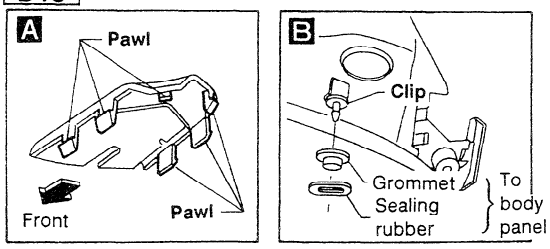
MBF343A

④ ⑤ B13 Cowl top grille and cowl top front sealing rubber

B13 COUPE

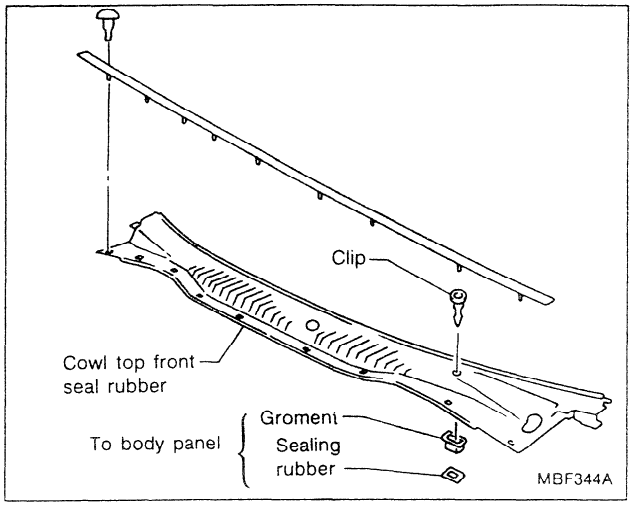


B13 SEDAN: Basically the same as the Coupe.



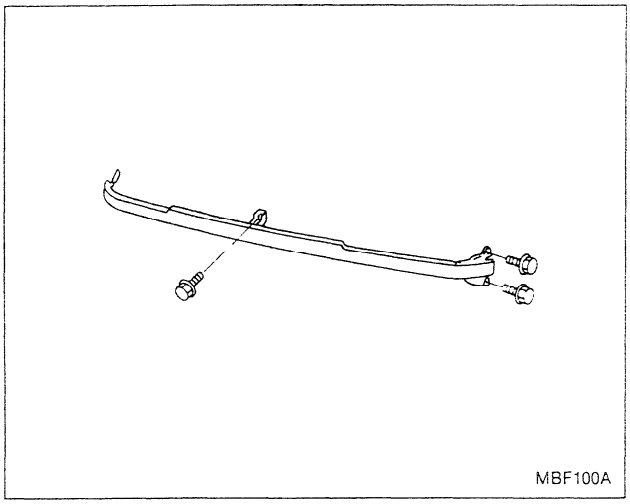
MBF126A

N14



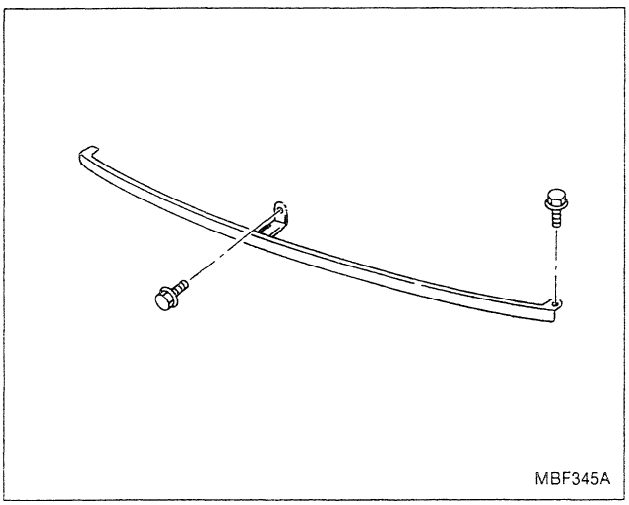
MBF344A

⑥ B13 Front bumper apron



MBF100A

N14



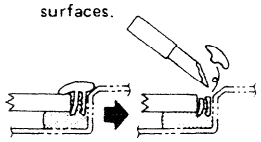
MBF345A

Exterior (Cont'd)

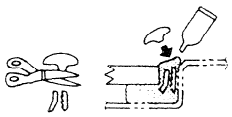
⑦ Windshield upper molding

Method 1

Cut off top portion of molding and clean glass and panel surfaces.



Apply sealant to top portion of molding.



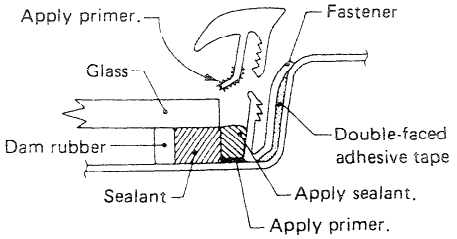
Cut off lower portion of new molding.



Finish well to give it a good appearance.

Method 2

1. Cut off sealant at glass end.
2. Clean the side on which panel was mounted.
3. Set molding fastener and apply sealant to body panel, and apply primer to molding and body.



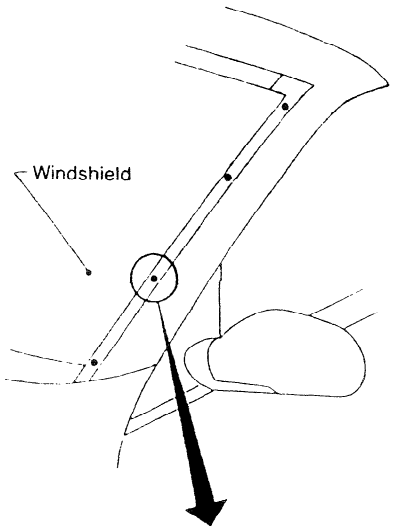
4. Install molding by aligning the molding mark located on center with vehicle center.
   Be sure to install tightly so that there is no gap around the corner.

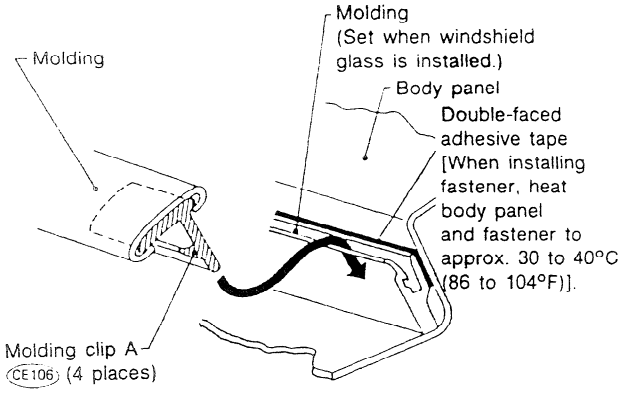
SBF161E

⑧ Windshield side molding (B13 SEDAN and N14)

It is mounted with screws.

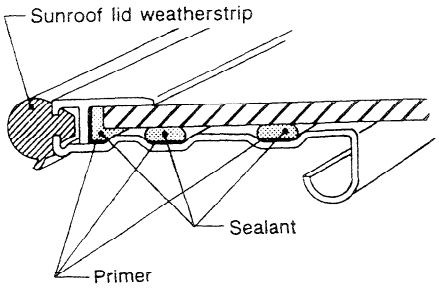
⑨ Windshield side molding





MBF127A

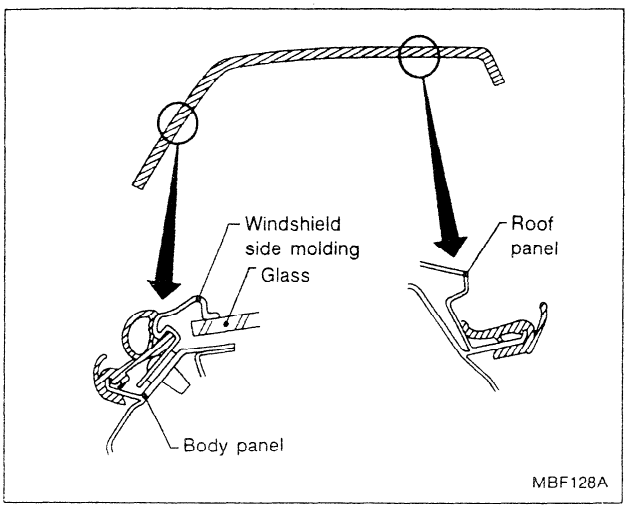
⑩ Sunroof lid weatherstrip



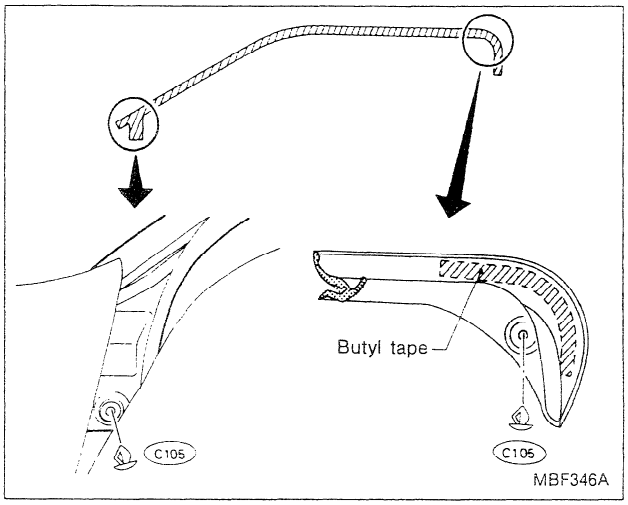
MBF109A

Exterior (Cont'd)

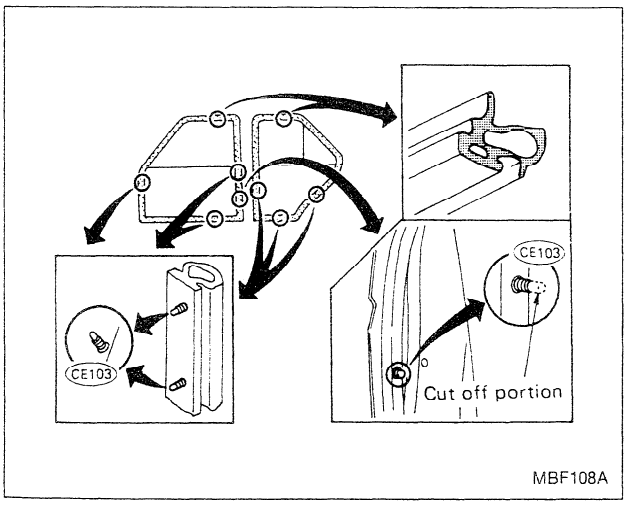
⑪ Body side drip weatherstrip



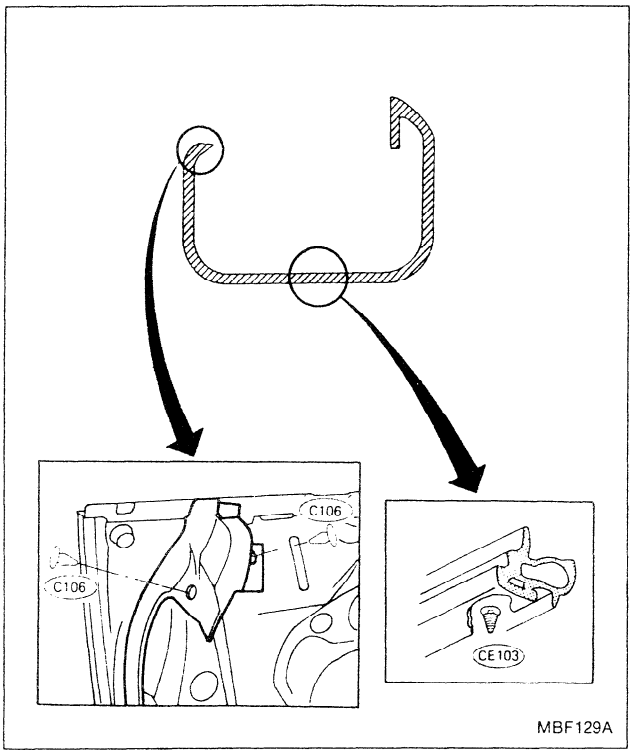
⑫ Body side drip weatherstrip



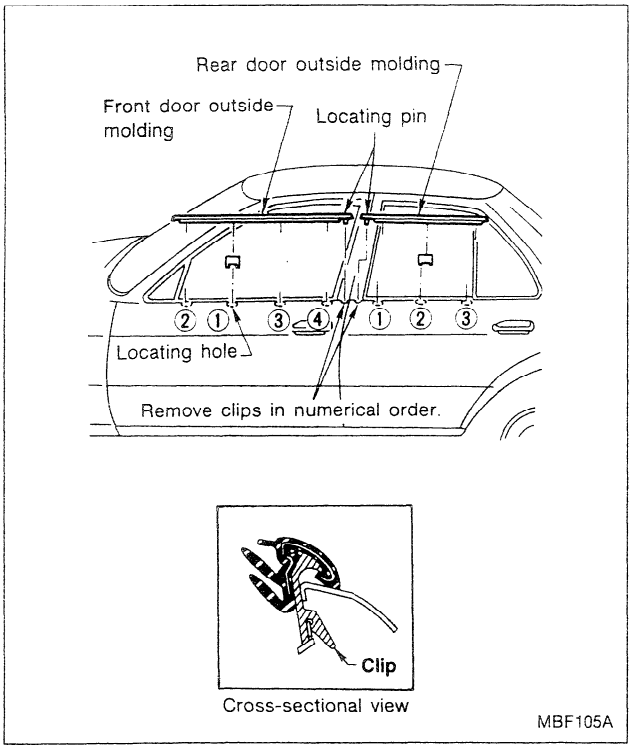
⑬ Door weatherstrip



⑭ Door weatherstrip

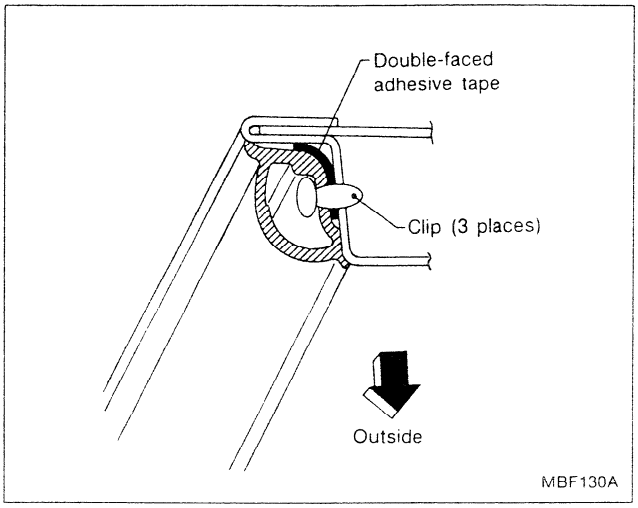


⑮ Door waist outside molding

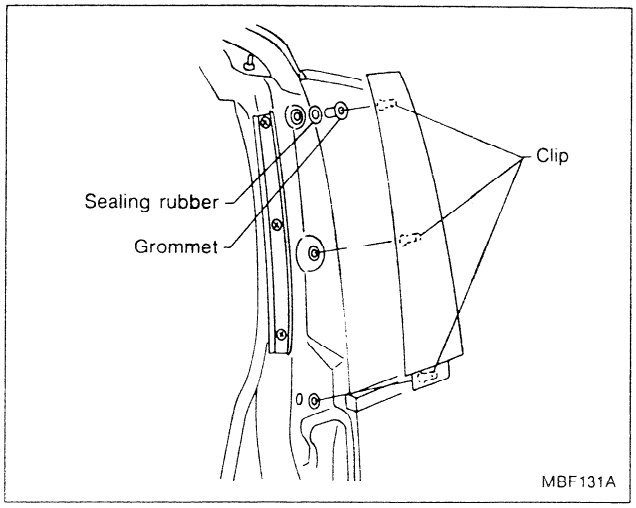


Exterior (Cont'd)

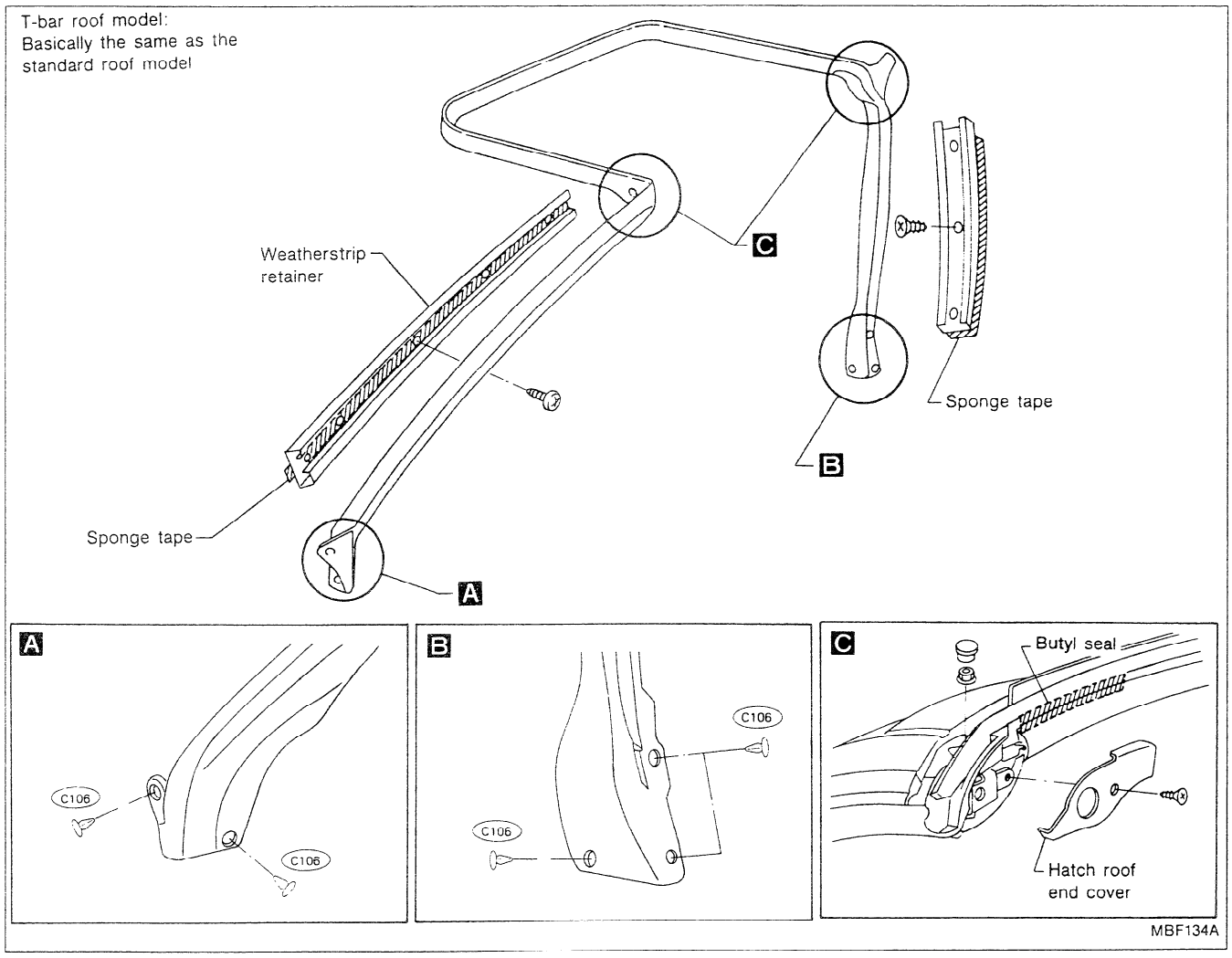
⑯ Rear door parting seal



⑰ Lock pillar finisher



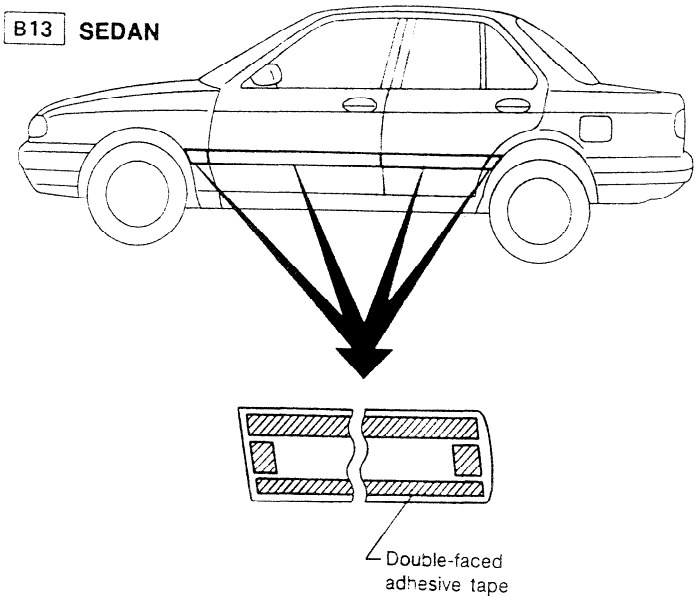
⑱ Body side weatherstrip (COUPE)



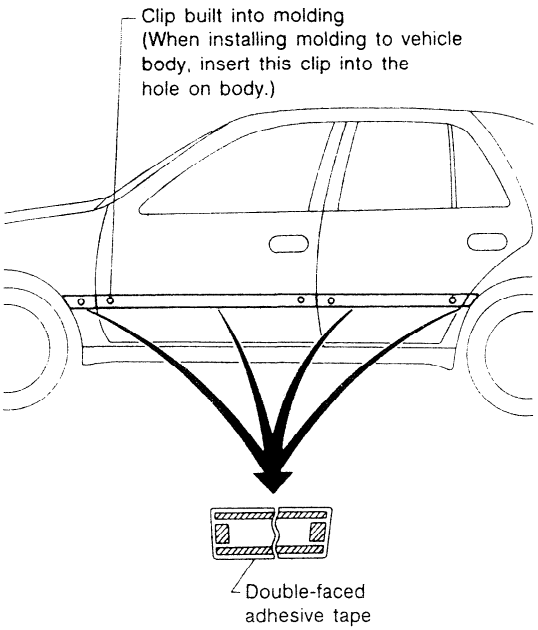
Exterior (Cont'd)

⑲ Side guard molding

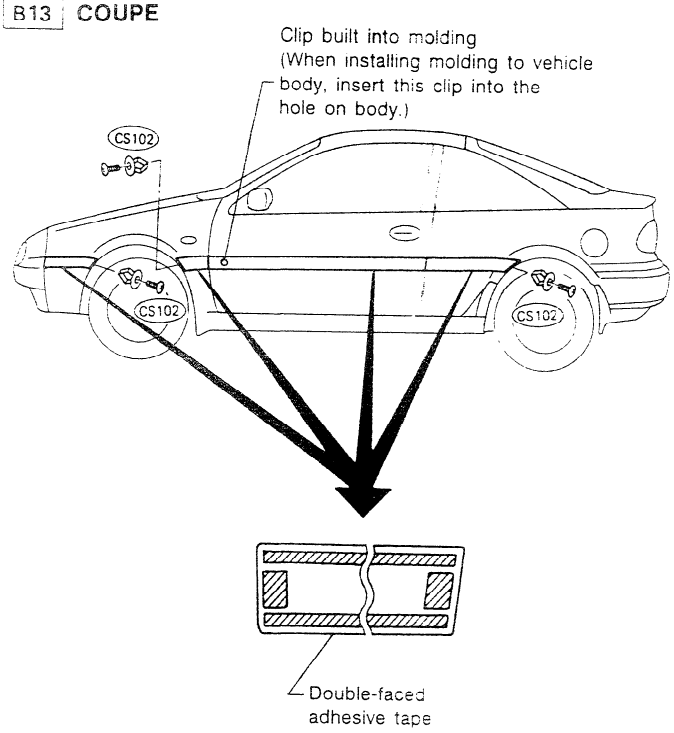
B13 SEDAN



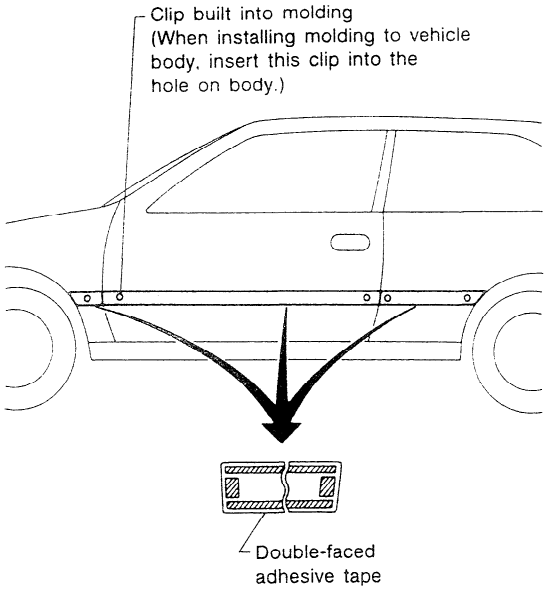
N14 SEDAN and 5-DOOR HATCHBACK



B13 COUPE



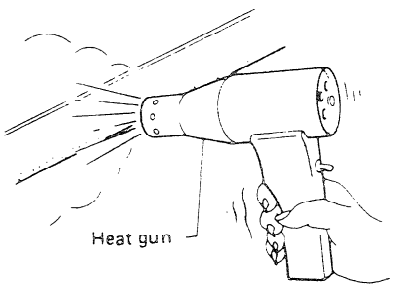
N14 3-DOOR HATCHBACK



- Original side guard molding is affixed to body panel with double-faced adhesive tape, sealant and clips.
- The repair parts are also affixed with double-faced adhesive tape and clips.

- **Removal:**

1. Heat molding portion to 30 to 40°C (86 to 104°F) with a heat gun.



SBF455A

2. Raise end of molding and, while cutting off bonding agent, detach molding.

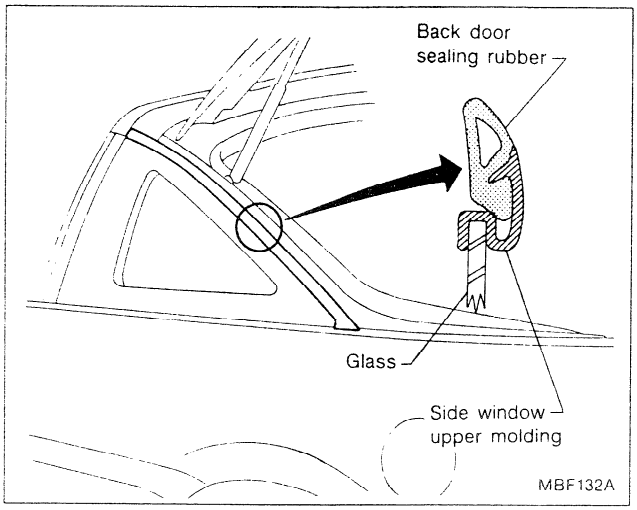
- **Installation:**

1. Remove all traces of bonding agent from body panel. Then clean contact face of body.
2. Heat body panel and molding to 30 to 40°C (86 to 104°F) with a heat gun. Then install molding.

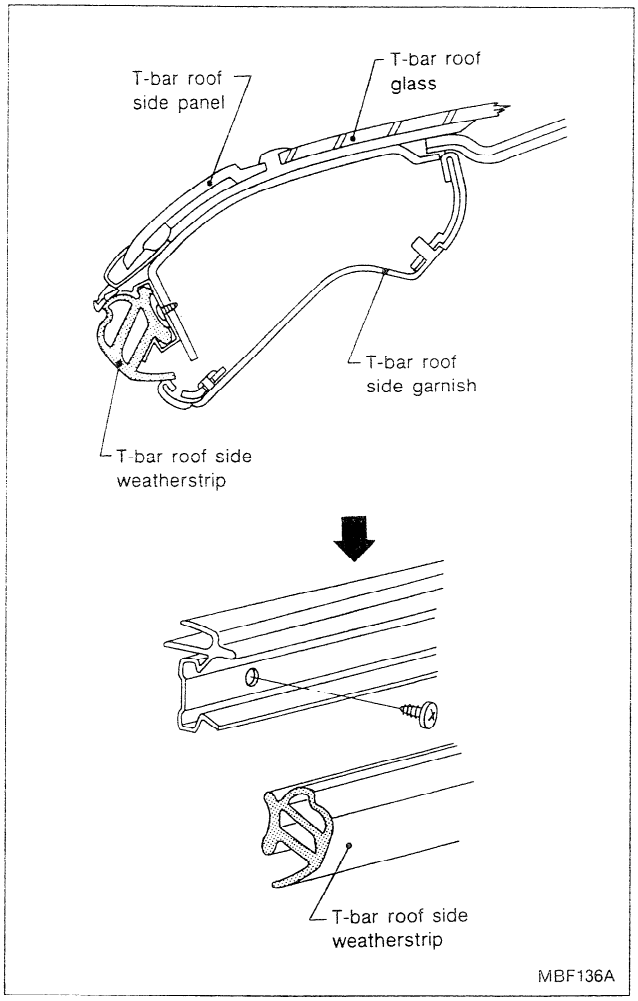
MBF347A

Exterior (Cont'd)

⑳ Side window upper molding



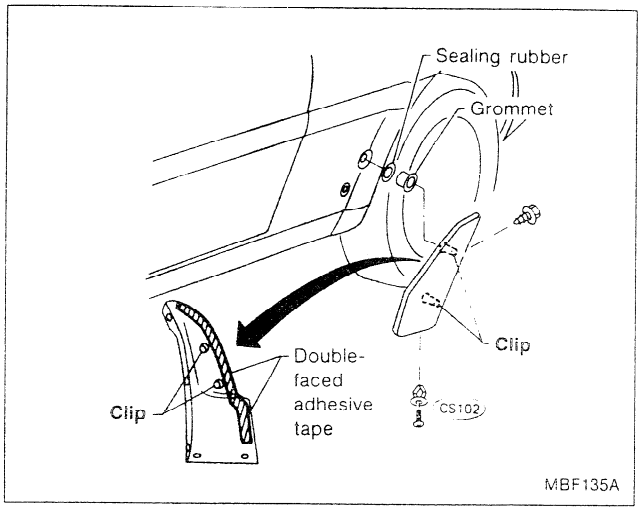
㉑ T-bar roof side weatherstrip



㉒ T-bar roof sash and T-bar roof weatherstrip

These are part of the T-bar roof glass and cannot be removed. (Refer to "T-BAR ROOF".)
If they are damaged, replace entire T-bar roof glass assembly.

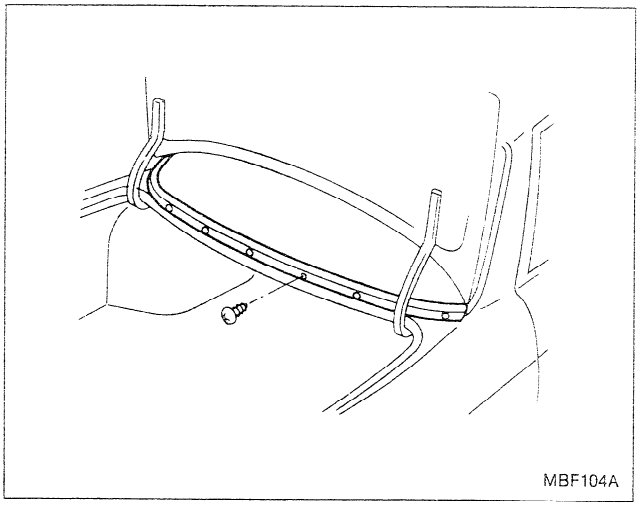
㉓ Fillet molding



㉔ Rear window upper and side molding

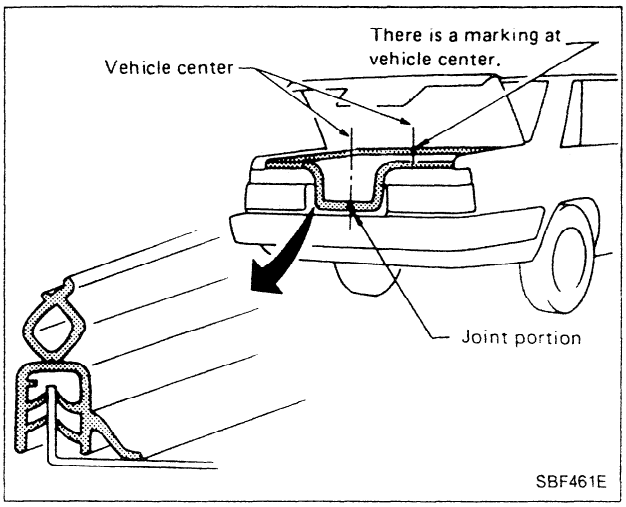
Basically the same as windshield upper molding
Refer to "⑥ Windshield upper molding".

㉕ Rear window lower molding

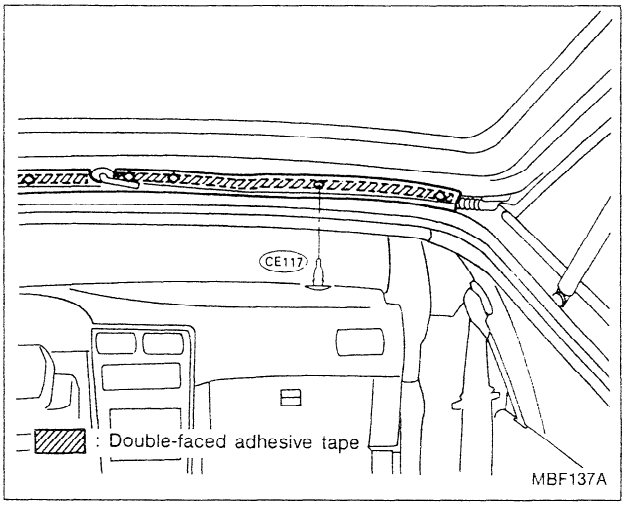


Exterior (Cont'd)

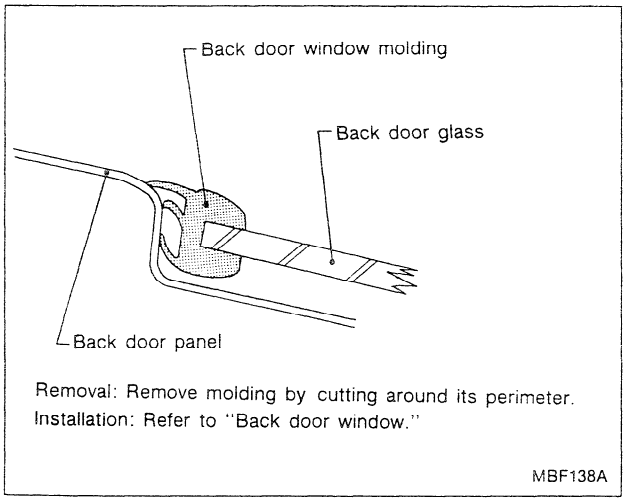
㉖ Trunk lid weatherstrip



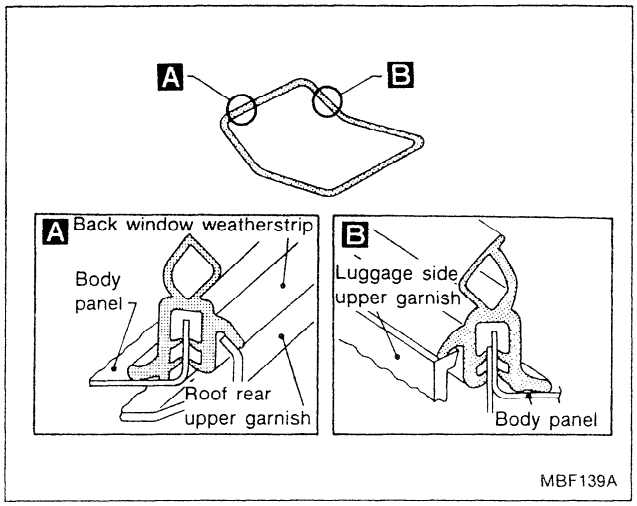
㉗ Back door sealing rubber



㉘ Back door window molding

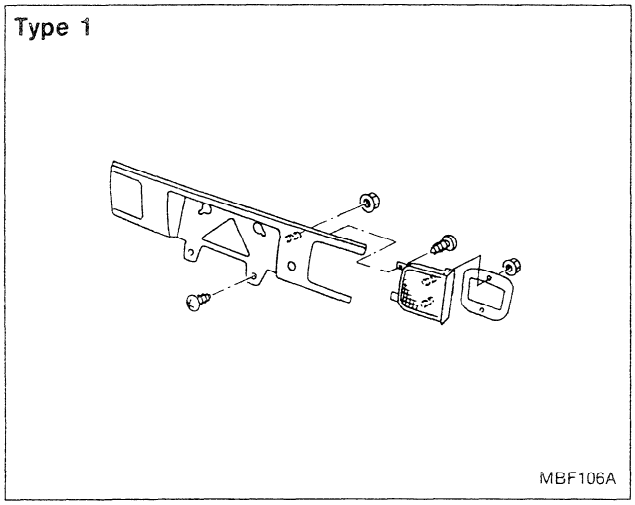


㉙ Back door weatherstrip

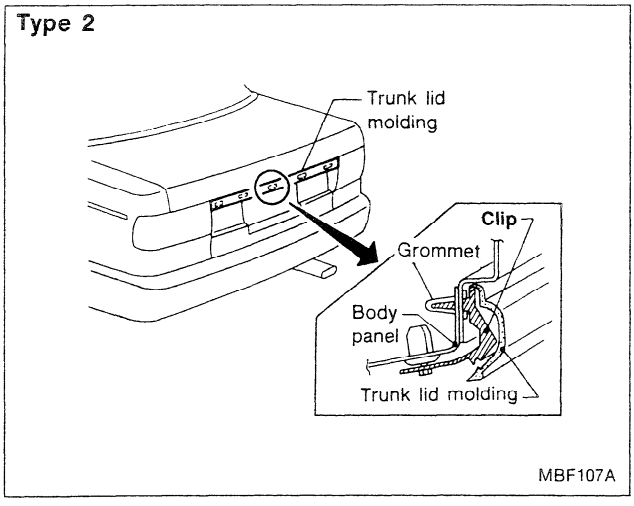


㉚ Trunk lid finisher

Type 1

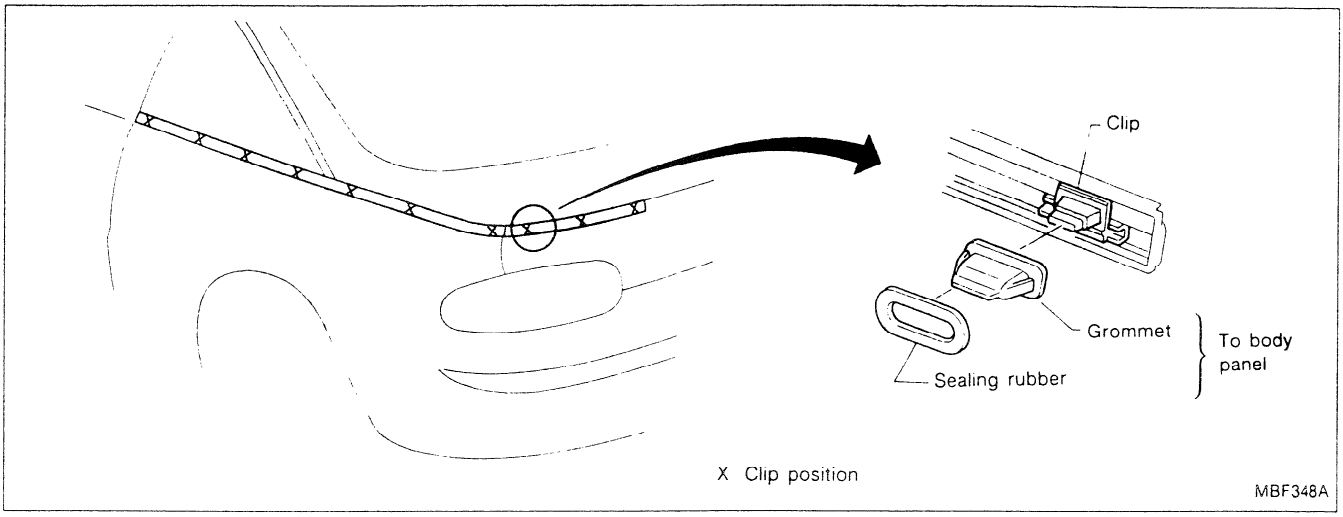


Type 2

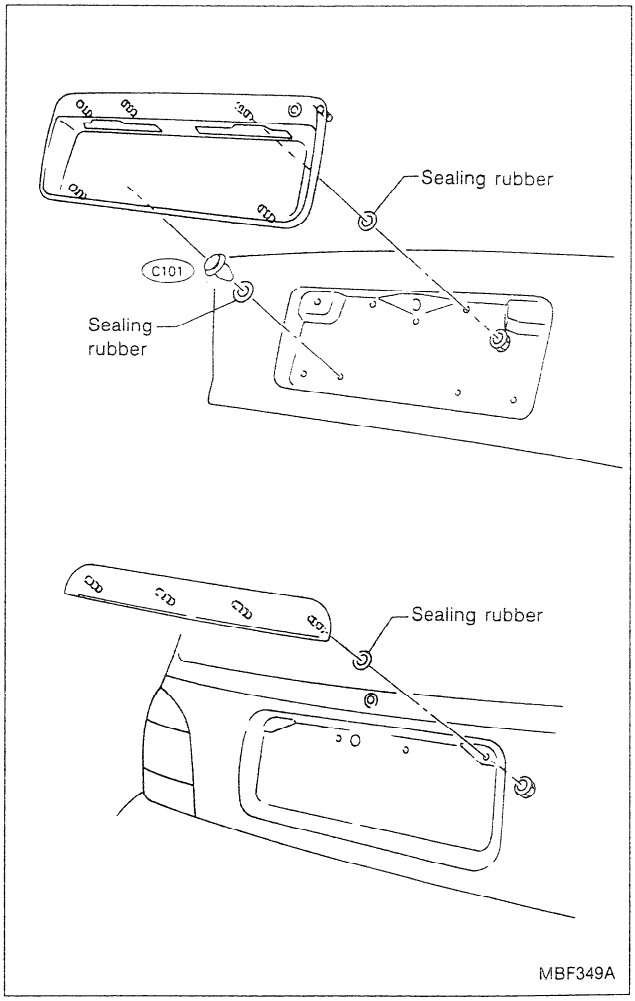


Exterior (Cont'd)

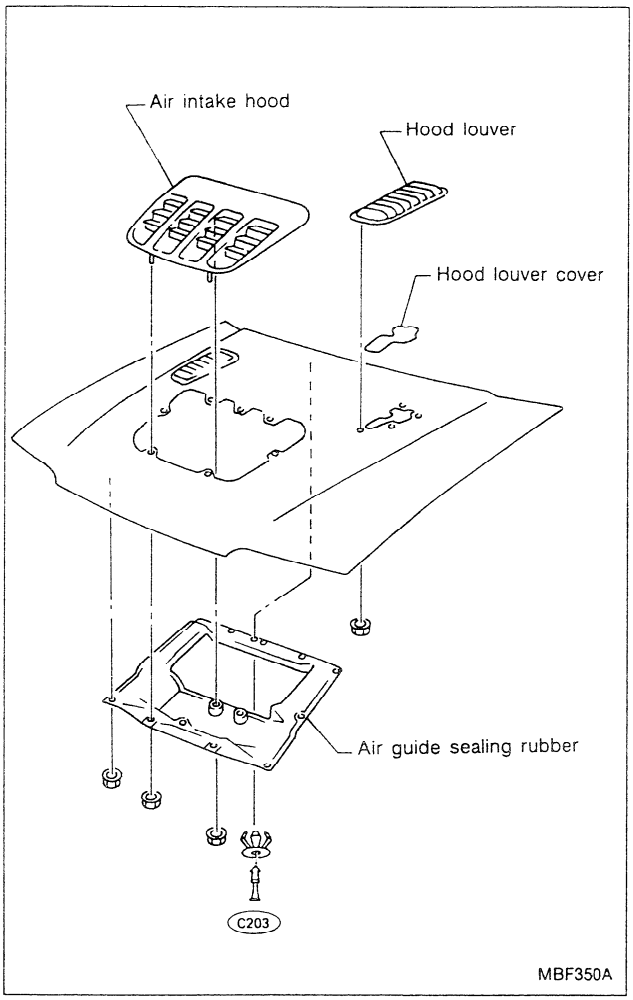
㉛ Side window lower molding and back door molding



㉜ Trunk lid finisher and back door finisher

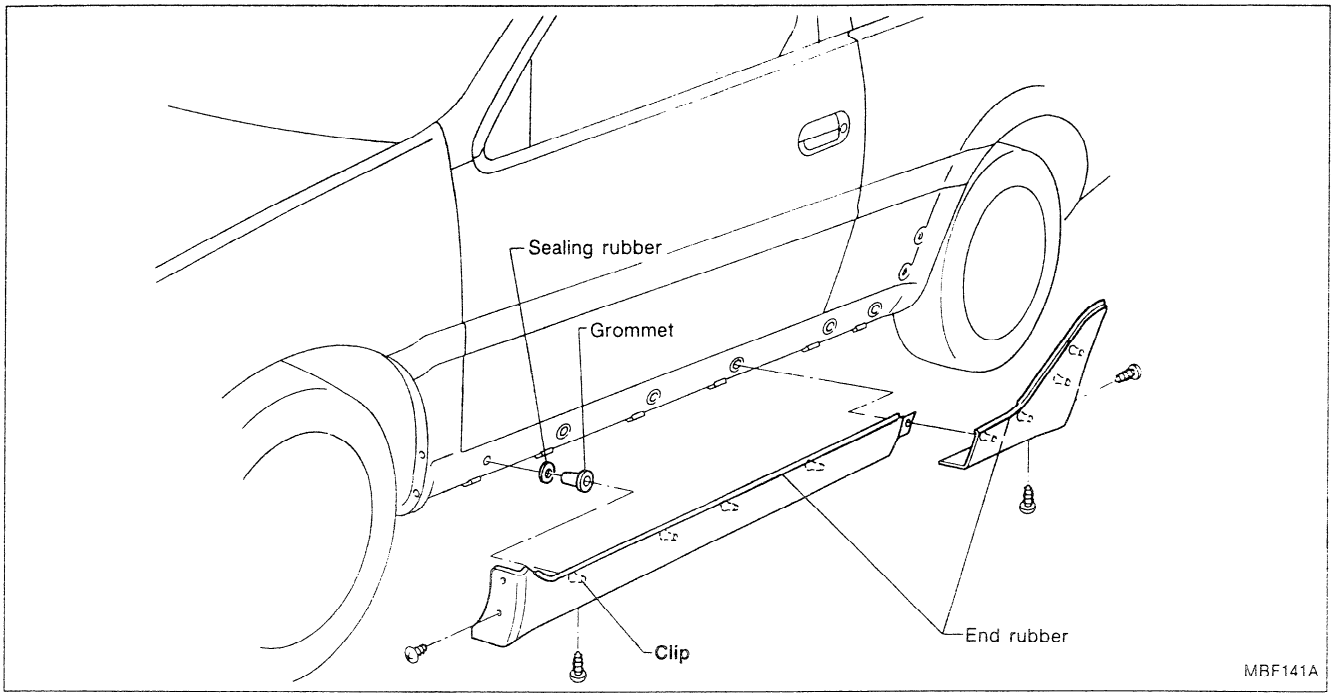


㉝ Air intake

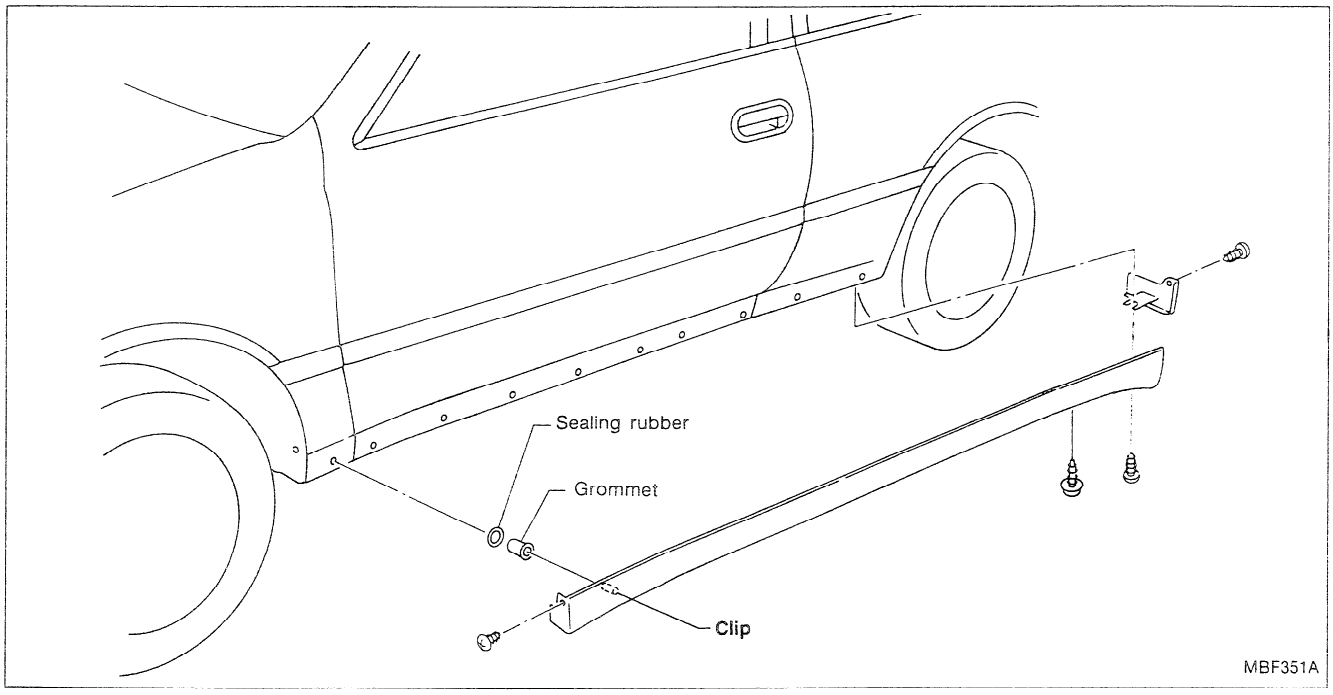


Exterior (Cont'd)

㉞ Side mudguard B13

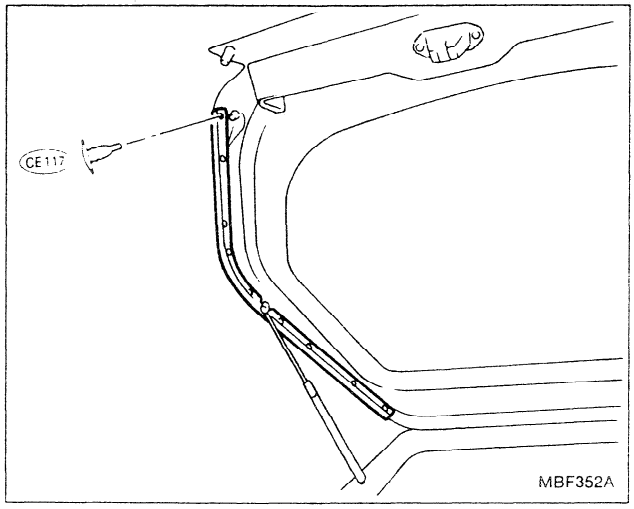


N14

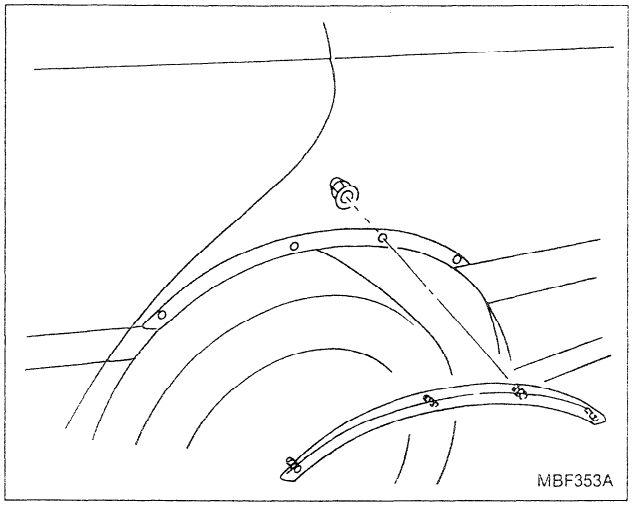


Exterior (Cont'd)

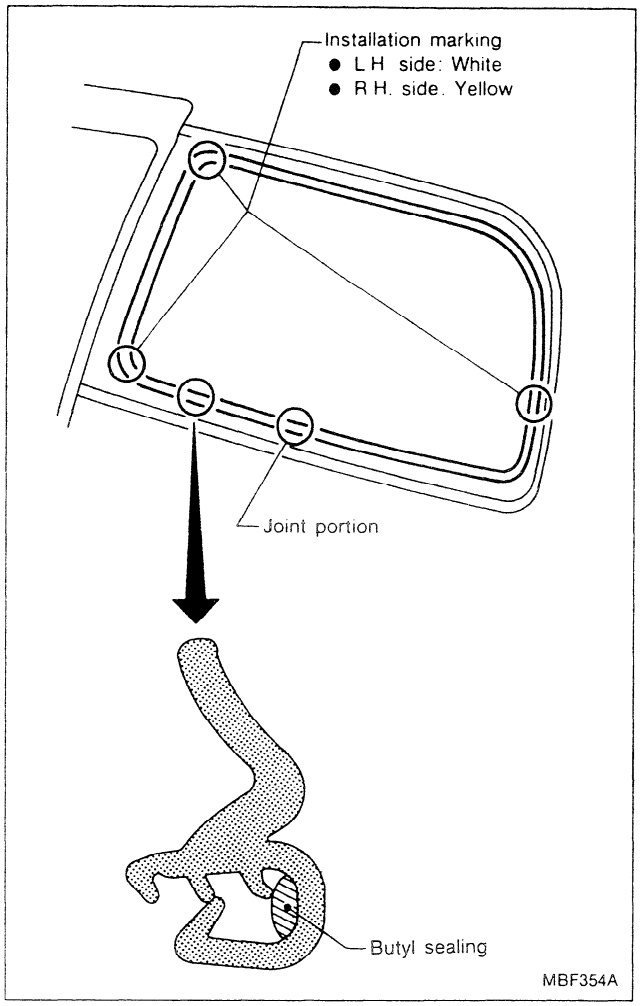
㉟ Back door side sealing rubber



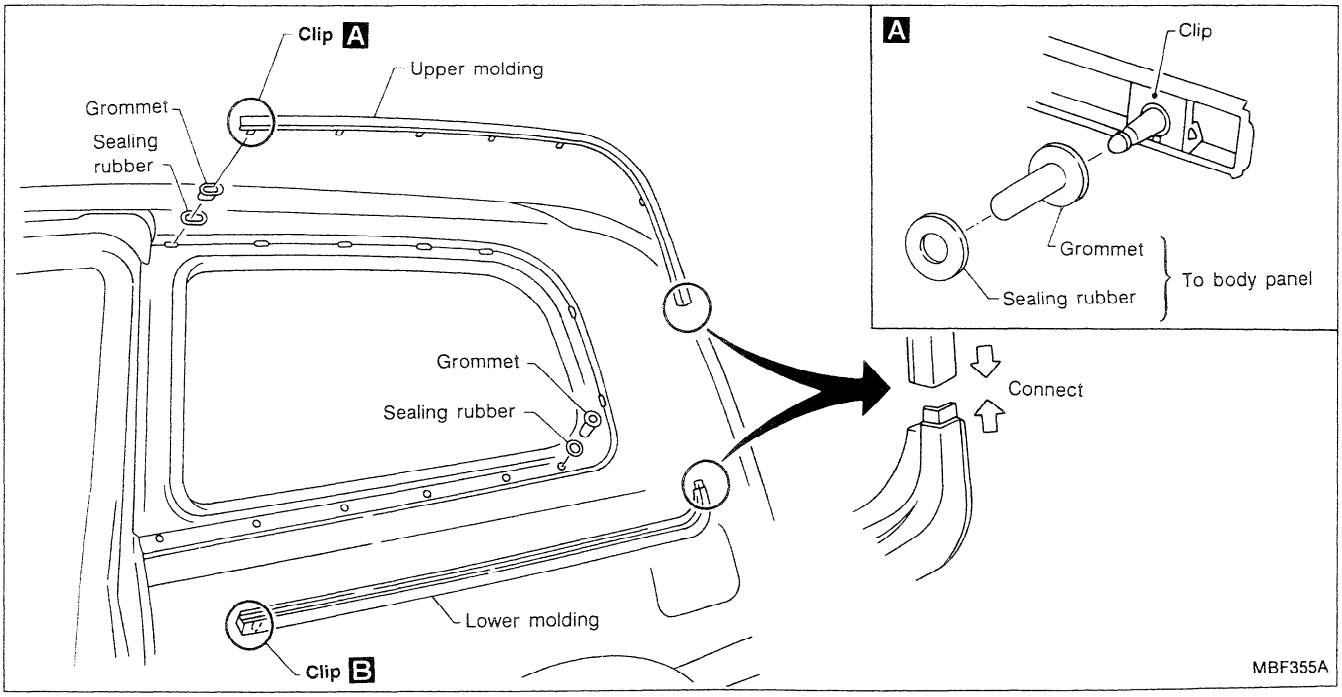
㊱ Fillet molding



㊲ Side window weatherstrip



㊳ Side window weatherstrip

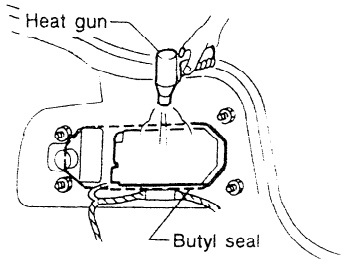


Exterior (Cont'd)

㊴ Rear combination lamp

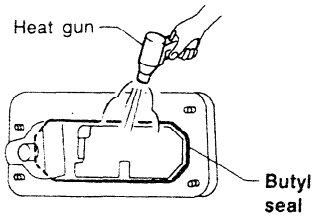
- Rear combination lamps are installed with nuts and butyl seal.

Removal



- Warn up lamp assembly area to a temperature slightly below 60°C (140°F)

Installation



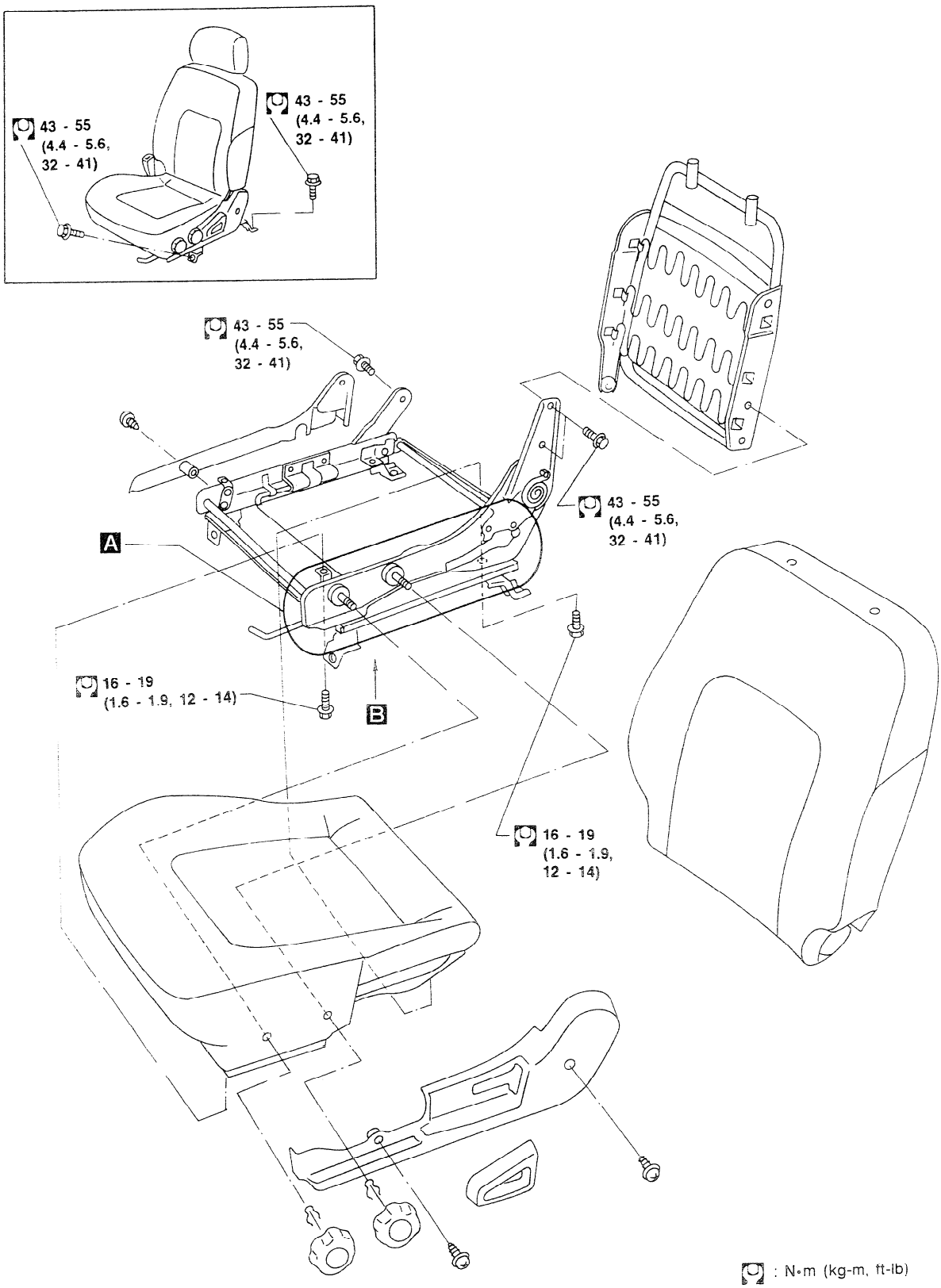
- Apply butyl seal evenly as it tends to become thin in the corners.
- Warm up lamp assembly area to a temperature slightly below 60°C (140°C)

MBF120A

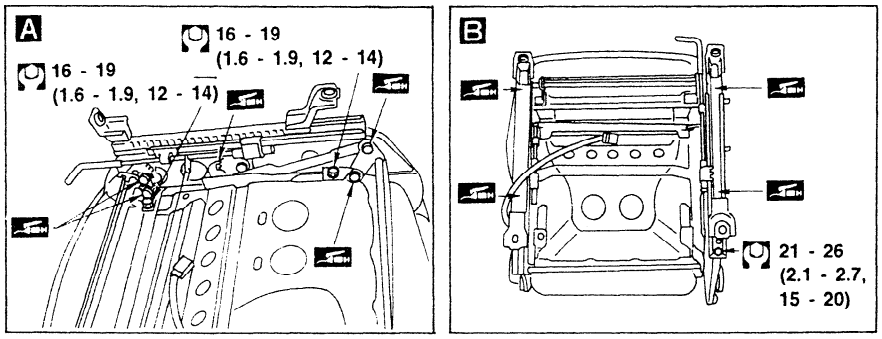
- When removing or installing the seat trim, carefully handle it to keep dirt out and avoid damage.

Front Seat

B13



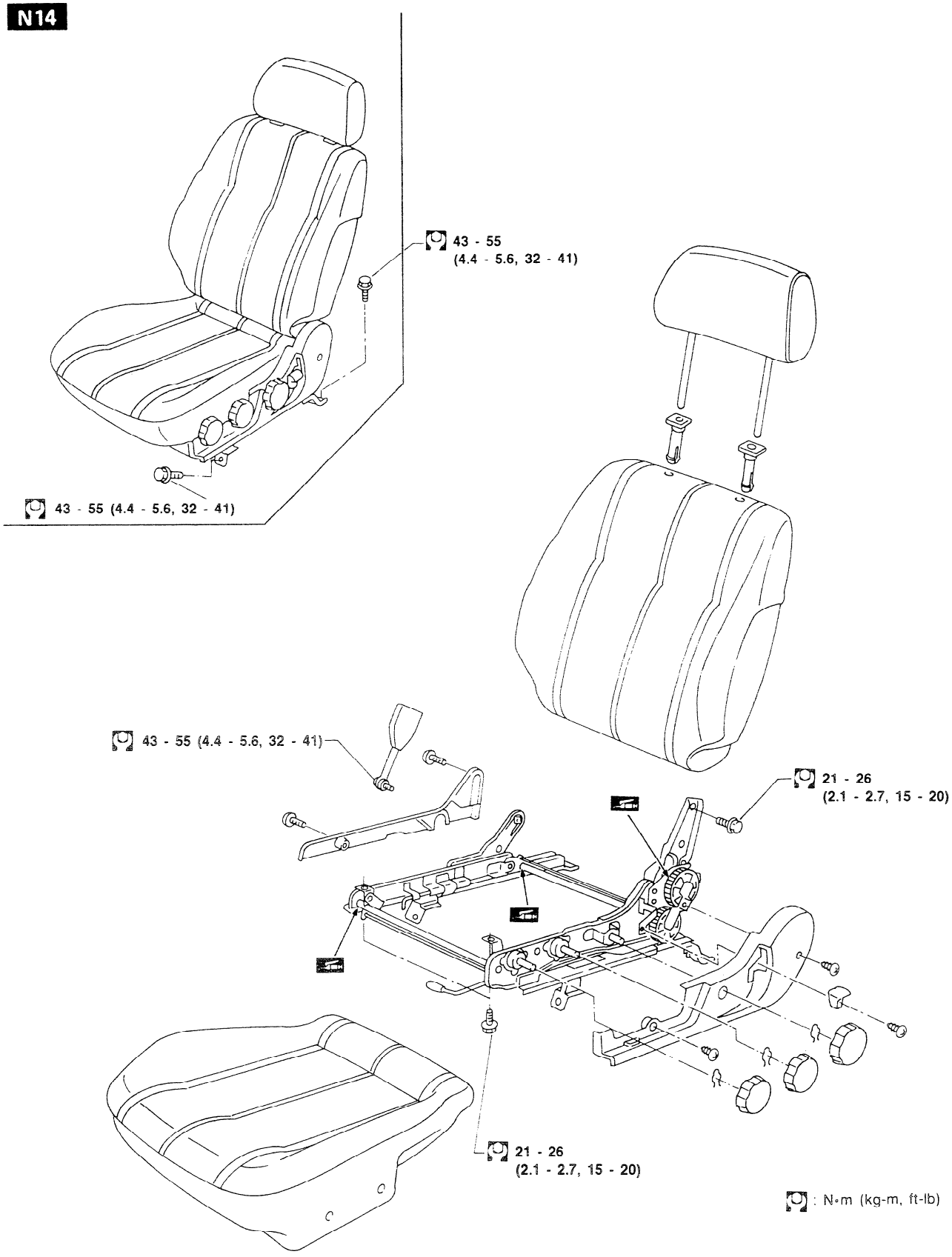
Front Seat (Cont'd)



MBF098A

Front Seat (Cont'd)

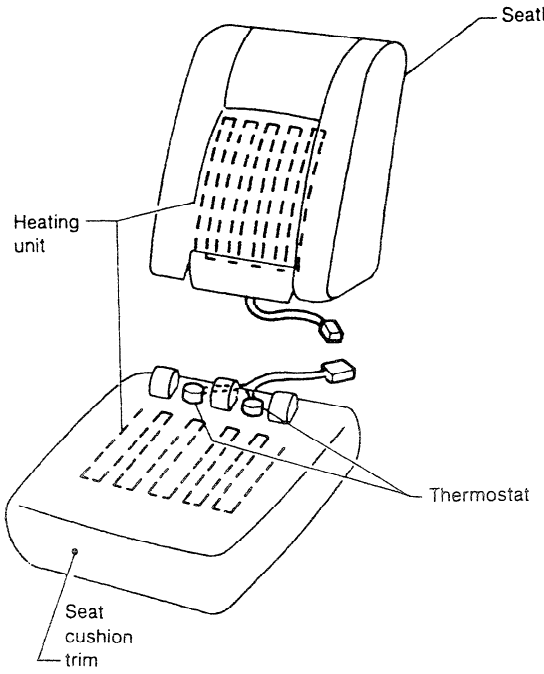
N14



MBF308A

Front Seat (Cont'd)

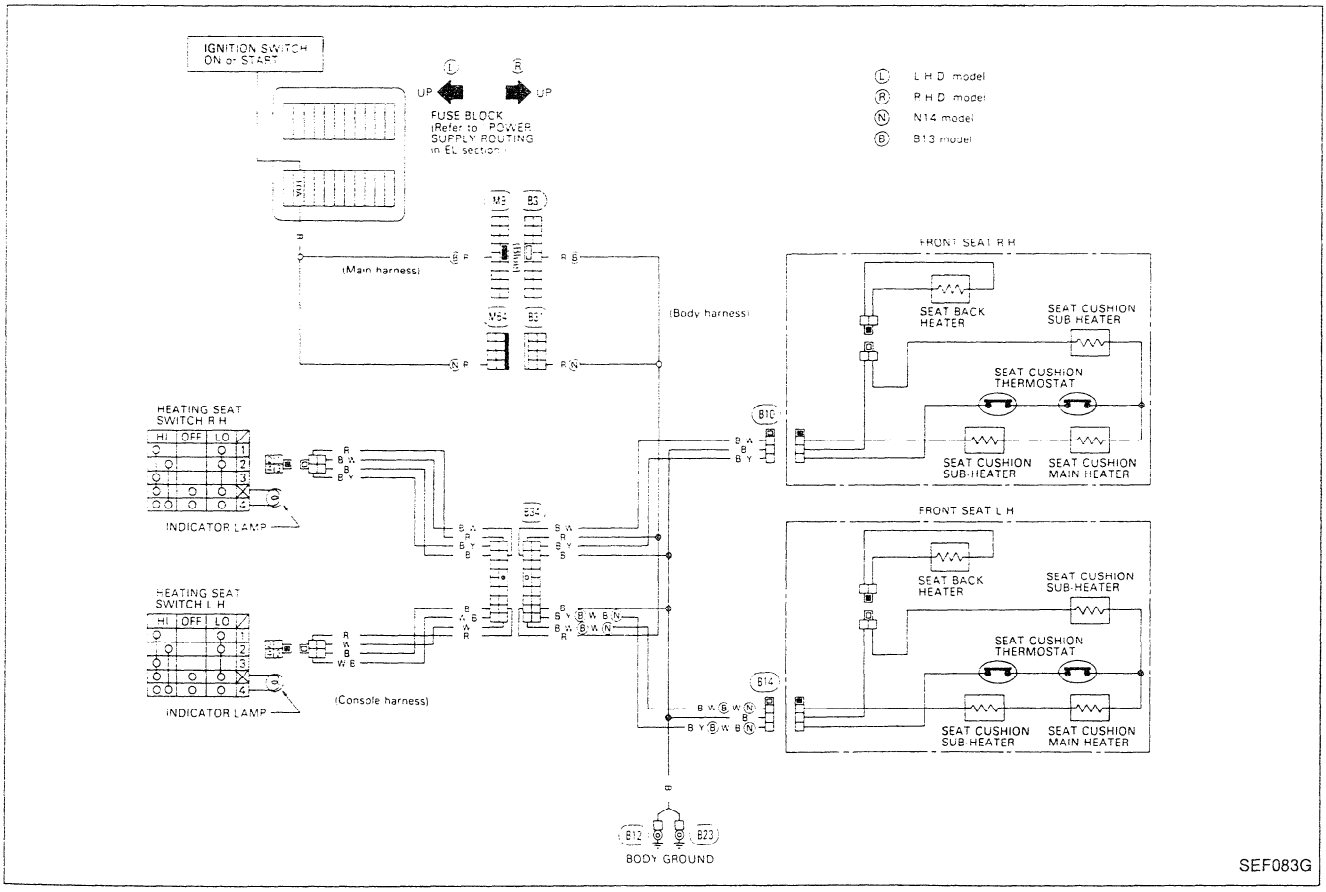
- Heating unit is unitized with trim. When handling trim, be extremely careful not to scratch heating unit.
- Do not use any organic solvent, such as thinner, benzene, alcohol, gasoline, etc. to clean trim.
- Always replace heating unit and trim as a unit.



Trim temperature °C (°F)	Increasing to 35 - 45 (95 - 113)	Decreasing to 15 - 25 (59 - 77)
Thermostat operation	OFF	ON

SBF563B

Wiring diagram/Heated seat

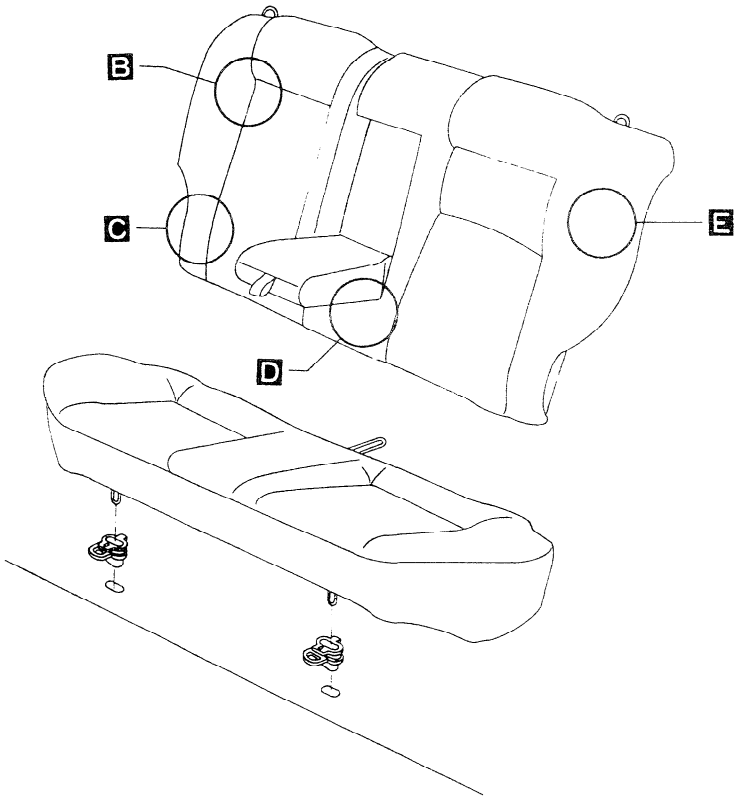


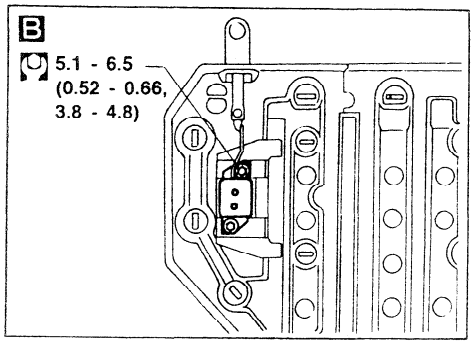
SEF083G

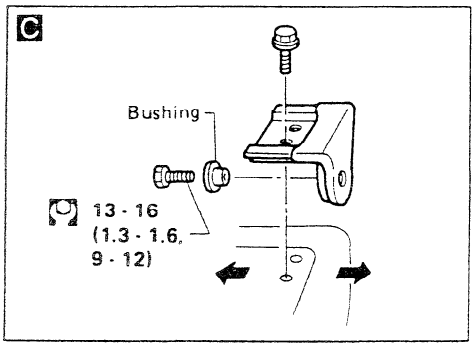
Rear Seat

B13 Sedan

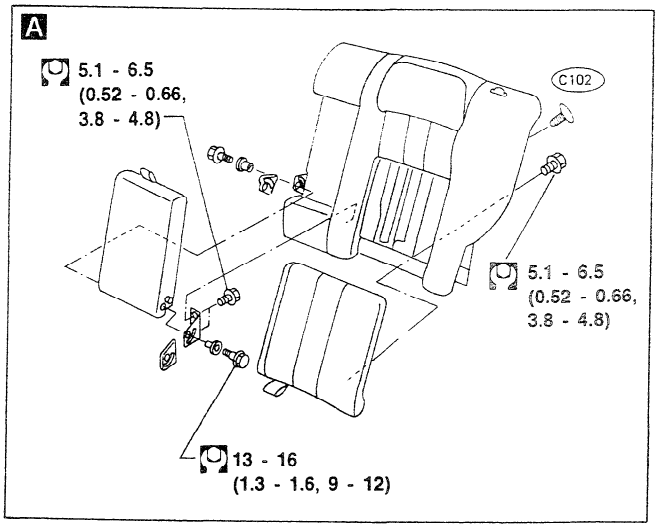
N14 Sedan

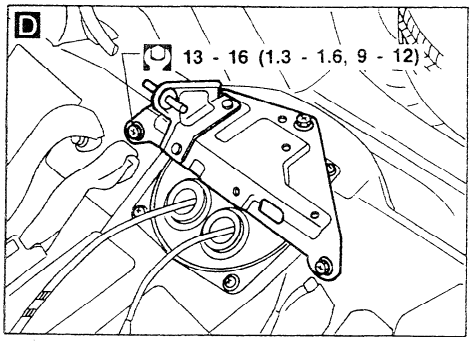


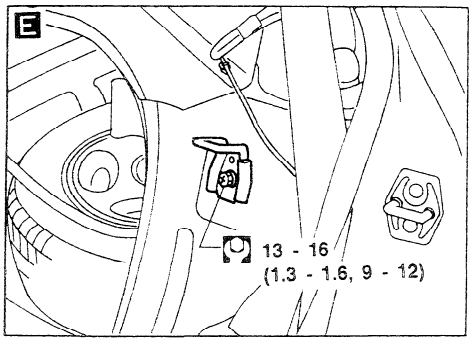




: N·m (kg-m, ft-lb)



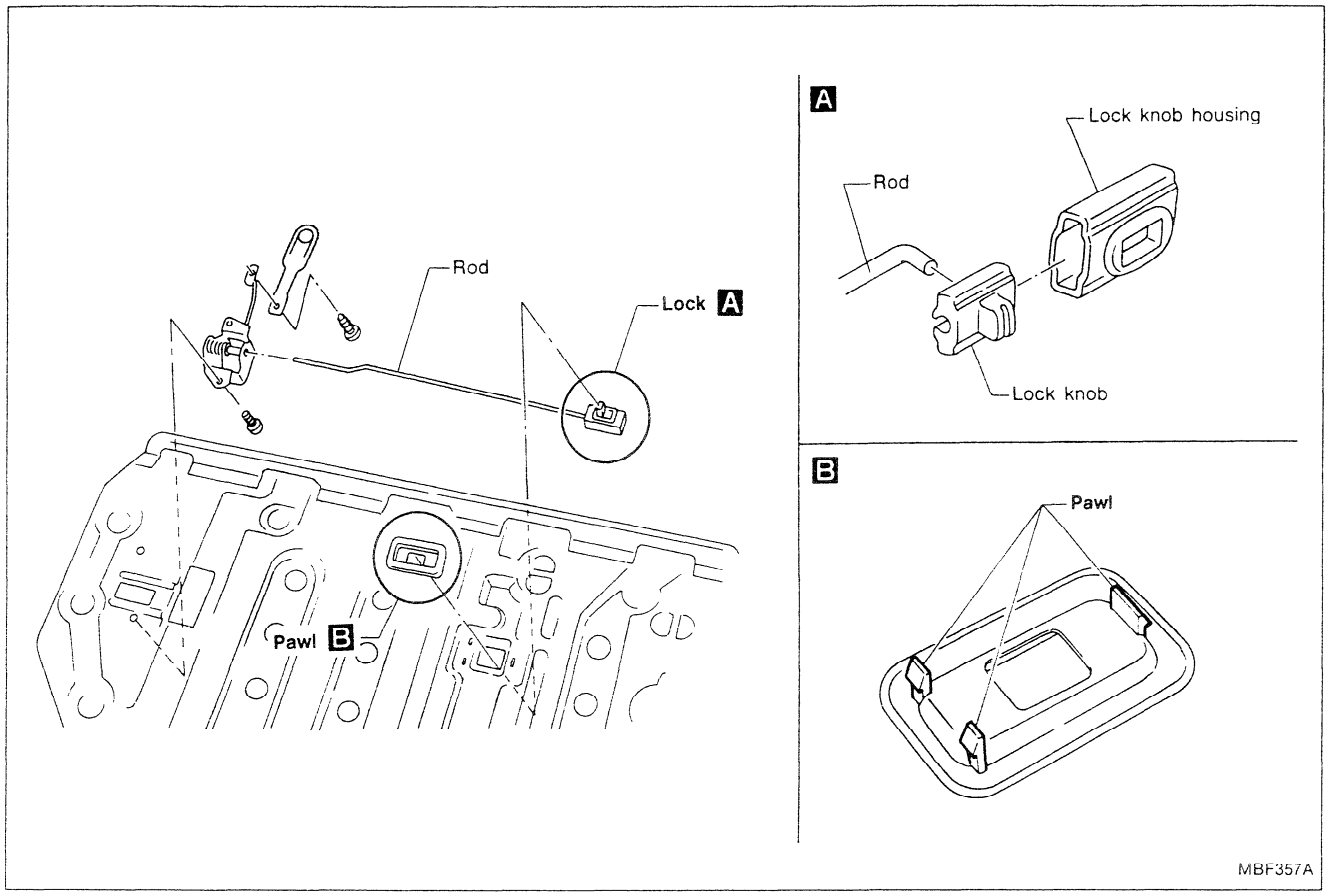




MBF356A

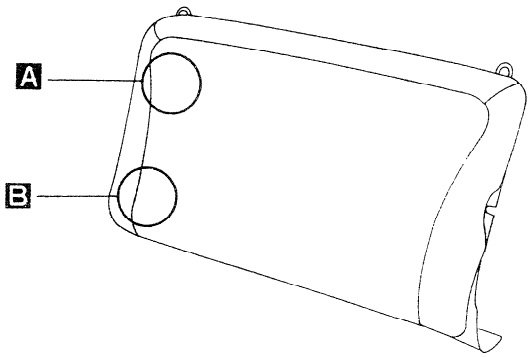
Rear Seat (Cont'd)

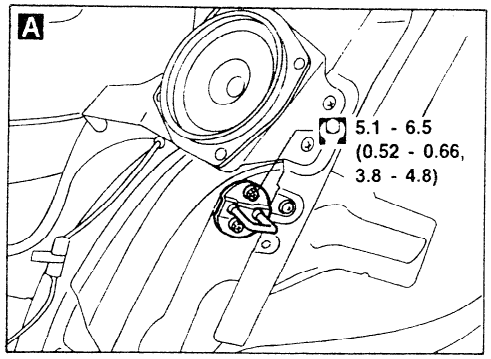
N14 Sedan rear seatback lock

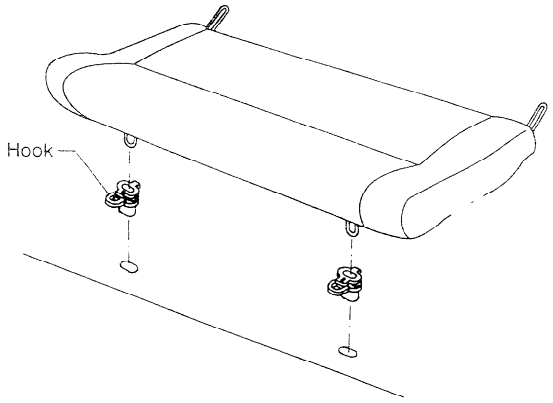


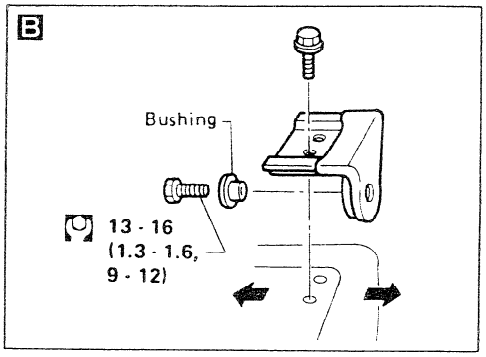
Rear Seat (Cont'd)

B13 Coupe









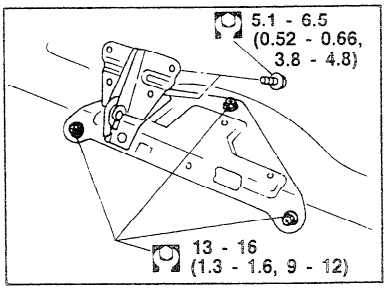
: N•m (kg-m, ft-lb)

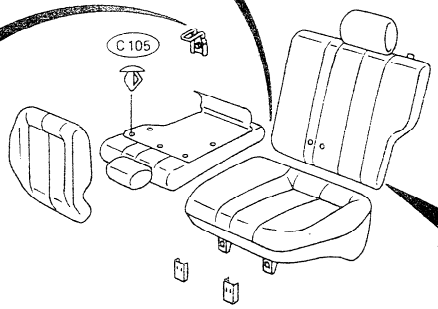
MBF358A

N14 5-DOOR HATCHBACK

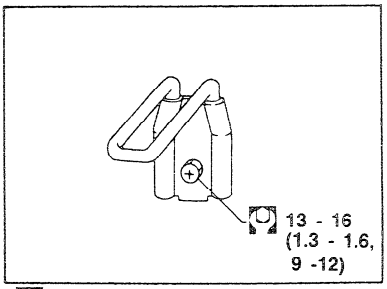
N14 3-DOOR HATCHBACK: Basically the same as the 5-DOOR HATCHBACK

Center bracket installation

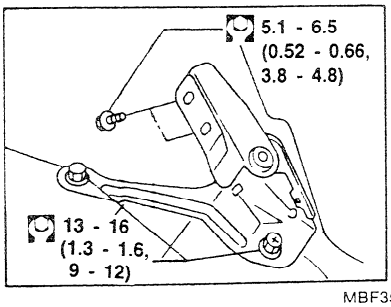




Striker installation



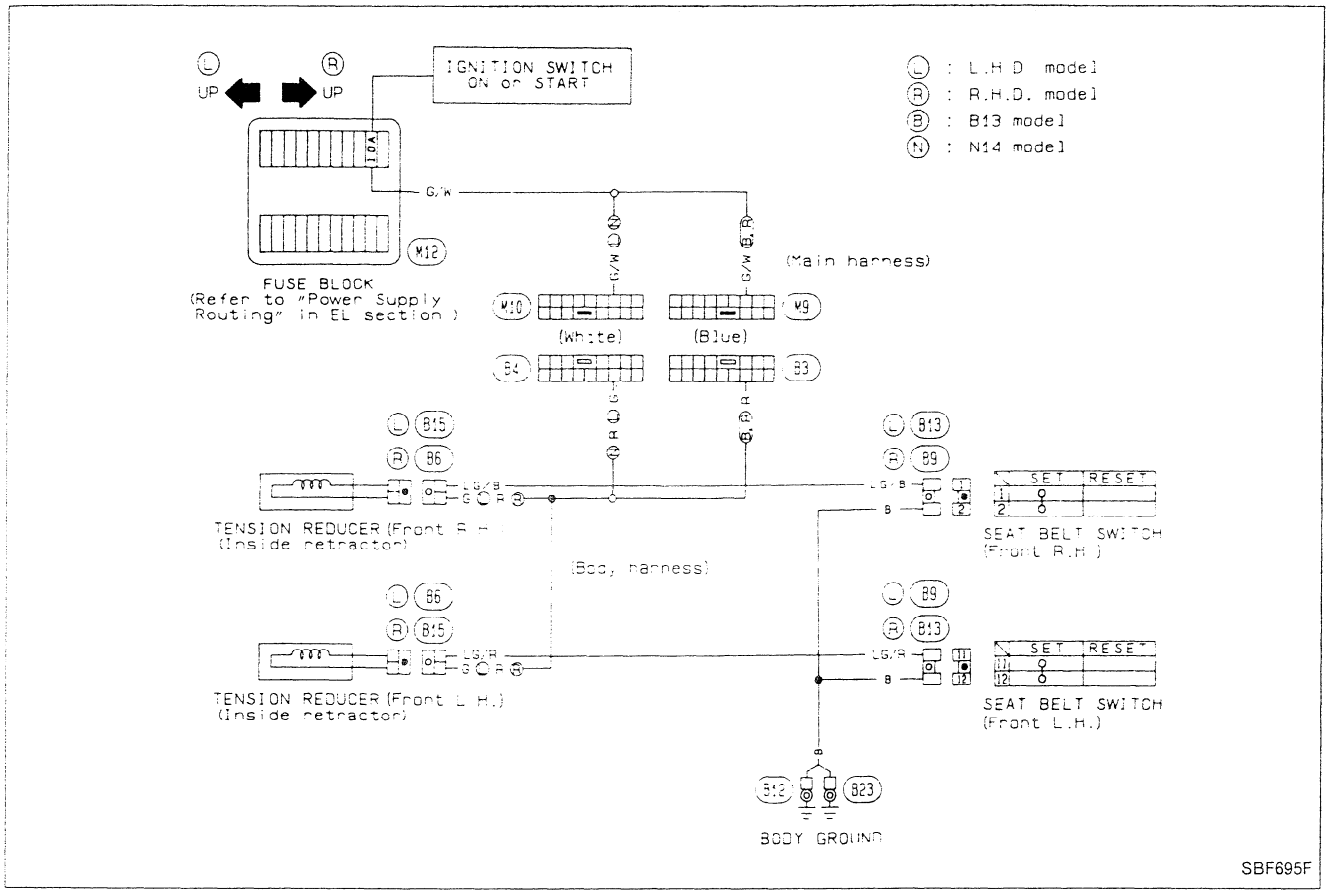
Seat back adjustment

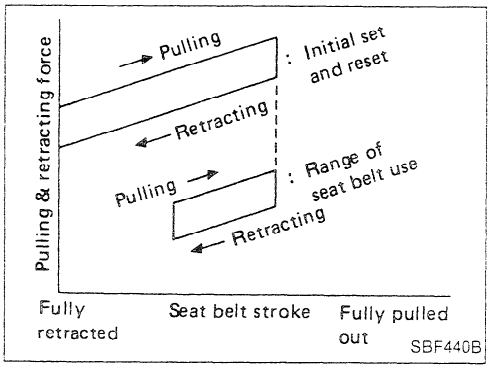


: N•m (kg-m, ft-lb)

MBF359A

TENSION RELEASE MECHANISM WIRING DIAGRAM





TENSION RELEASE MECHANISM OPERATION

- After any adjustment, check sunroof operation and lid alignment.
- Handle finisher plate and glass lid with care so not to damage it.
- It is desirable for easy installation to mark each point before removal.

CAUTION:

a. Always work with a helper.

b. Remove sunroof frame from rear door opening.

REMOVAL — Sunroof lid assembly

① Open sunroof shade.
② Close sunroof lid.
③ Remove side trim clips.
④ Remove the six nuts securing sunroof lid assembly to link assembly.

REMOVAL — Shade assembly

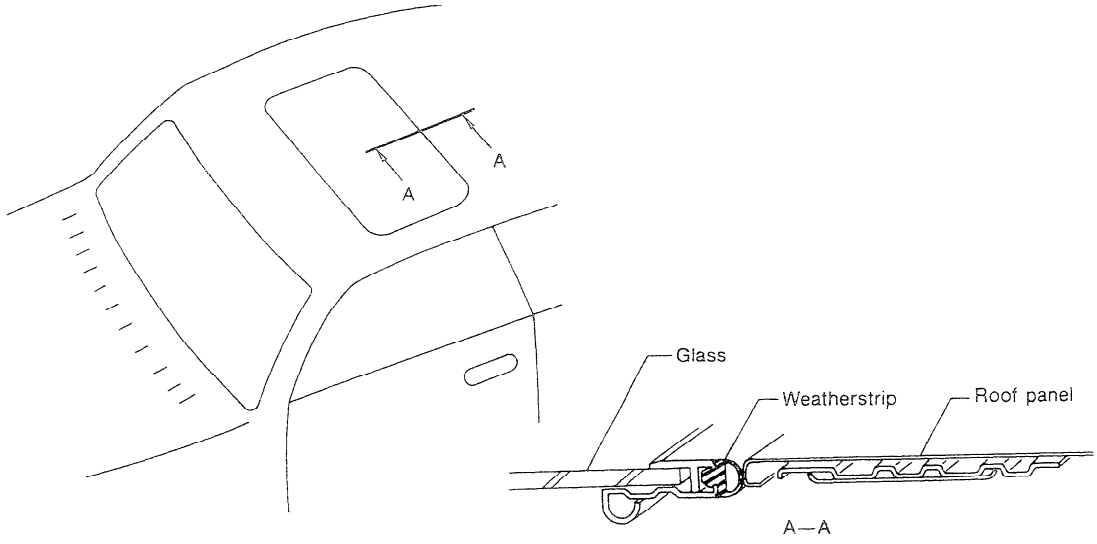
⑤ After removing sunroof lid assembly, remove screws securing rear drains to roof.
⑥ Remove rear drain.
⑦ Remove shade assembly.

REMOVAL — Sunroof assembly

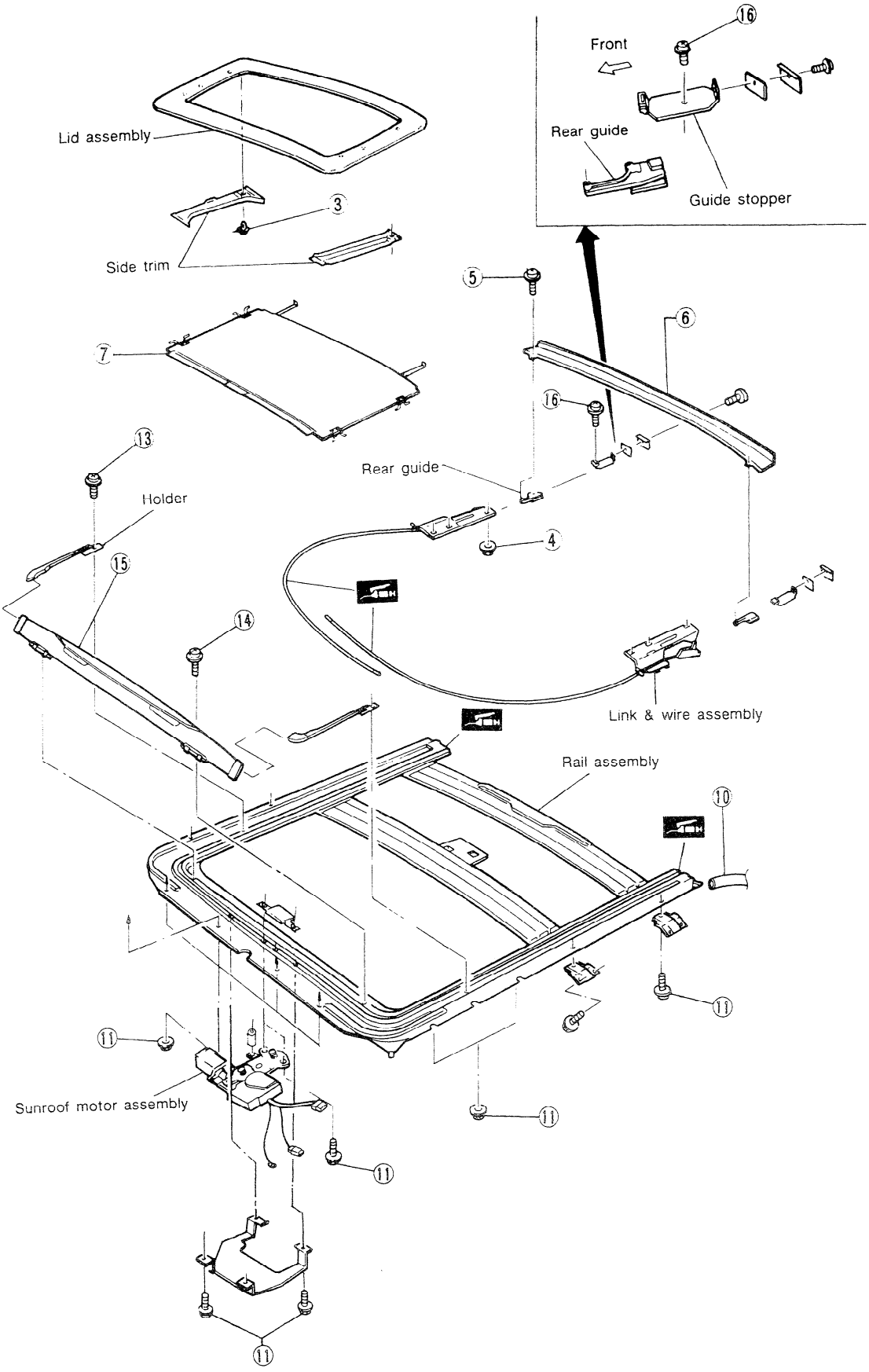
⑧ Remove headlining. For details, refer to "ROOF TRIM" in "Interior".
⑨ Disconnect interior lamp harness.
⑩ Disconnect front and rear drain hoses.
⑪ Remove nuts and bolts securing sunroof rail and motor to roof.
⑫ Remove sunroof assembly.

REMOVAL — Link & wire assembly

⑬ After removing shade assembly and sunroof assembly, remove the two screws securing holders to sunroof rail.
⑭ Remove the two screws securing window deflector to sunroof rail.
⑮ Remove window deflector.
⑯ Remove the two screws securing guide stoppers to sunroof rail.



SBF918F

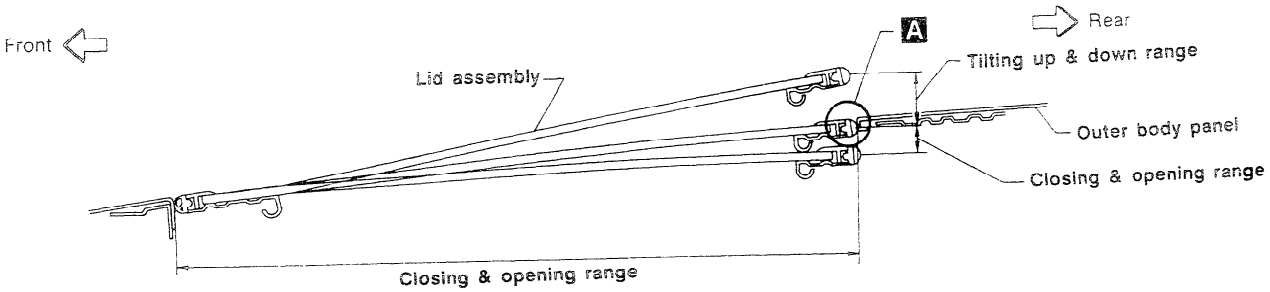

Front
Rear guide
Guide stopper
Lid assembly
Side trim
Rear guide
Holder
Link & wire assembly
Rail assembly
Sunroof motor assembly

SBF919F

ADJUSTMENT

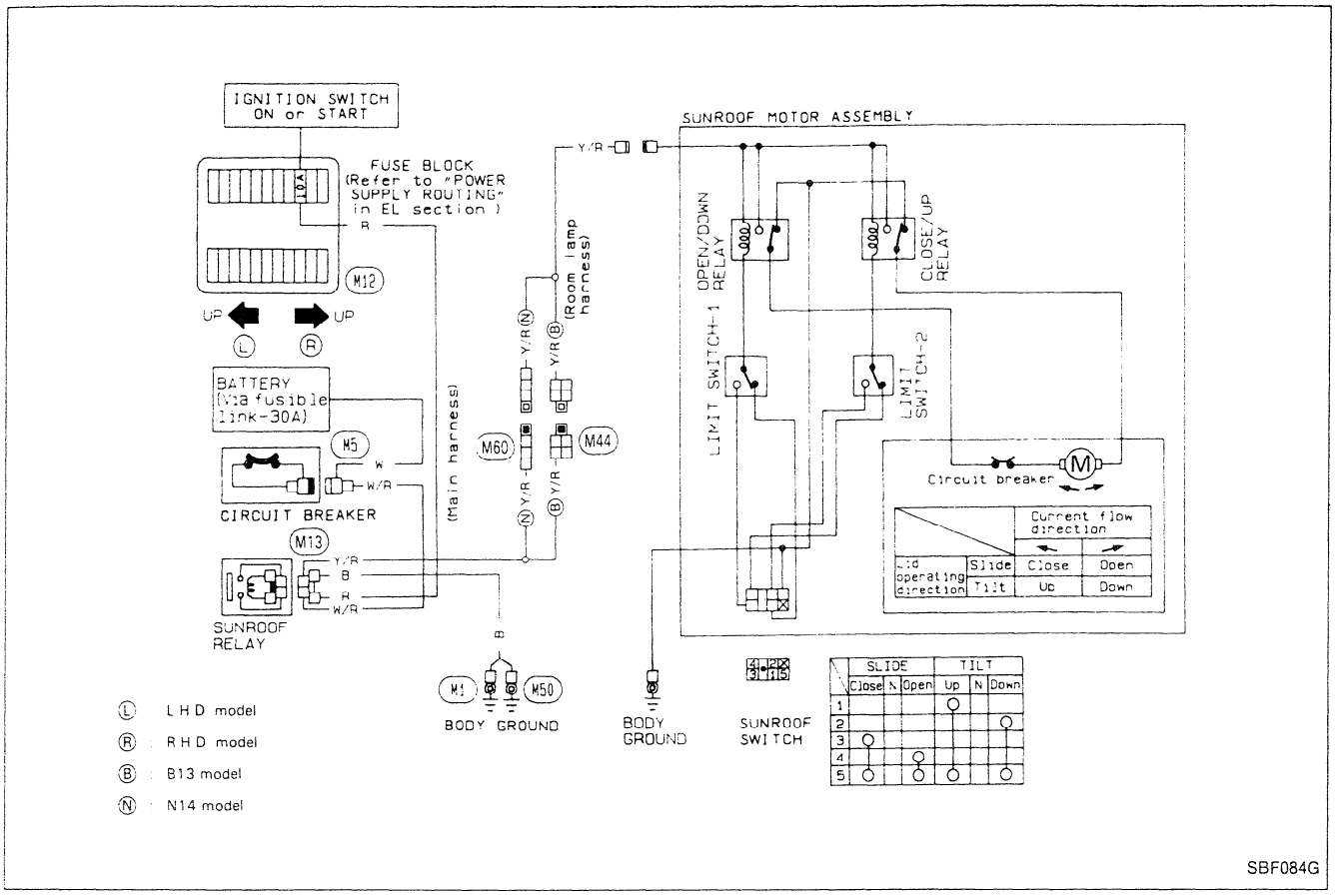
When motor & limit SW assembly and sunroof rail assembly are being installed, perform operations in the following sequence:

1. Make sure that link and wire assemblies are arranged in lateral symmetry.
2. Connect sunroof connector to sunroof switch and positive (+) power supply.
3. Set lid assembly to fully closed position A by operating CLOSE switch and TILT switch.
4. Fit outer side of lid assembly to the surface of roof on body outer panel.
5. Remove motor, and keep CLOSE switch pressed until motor pinion gear reaches the end of its rotating range.
6. Install motor.
7. Check that motor drive gear fits snugly in wires.
8. Press TILT-UP switch to check lid assembly for normal tilting.
9. Check sunroof lid assembly for normal operations (tilt-up, tilt-down, open, and close).

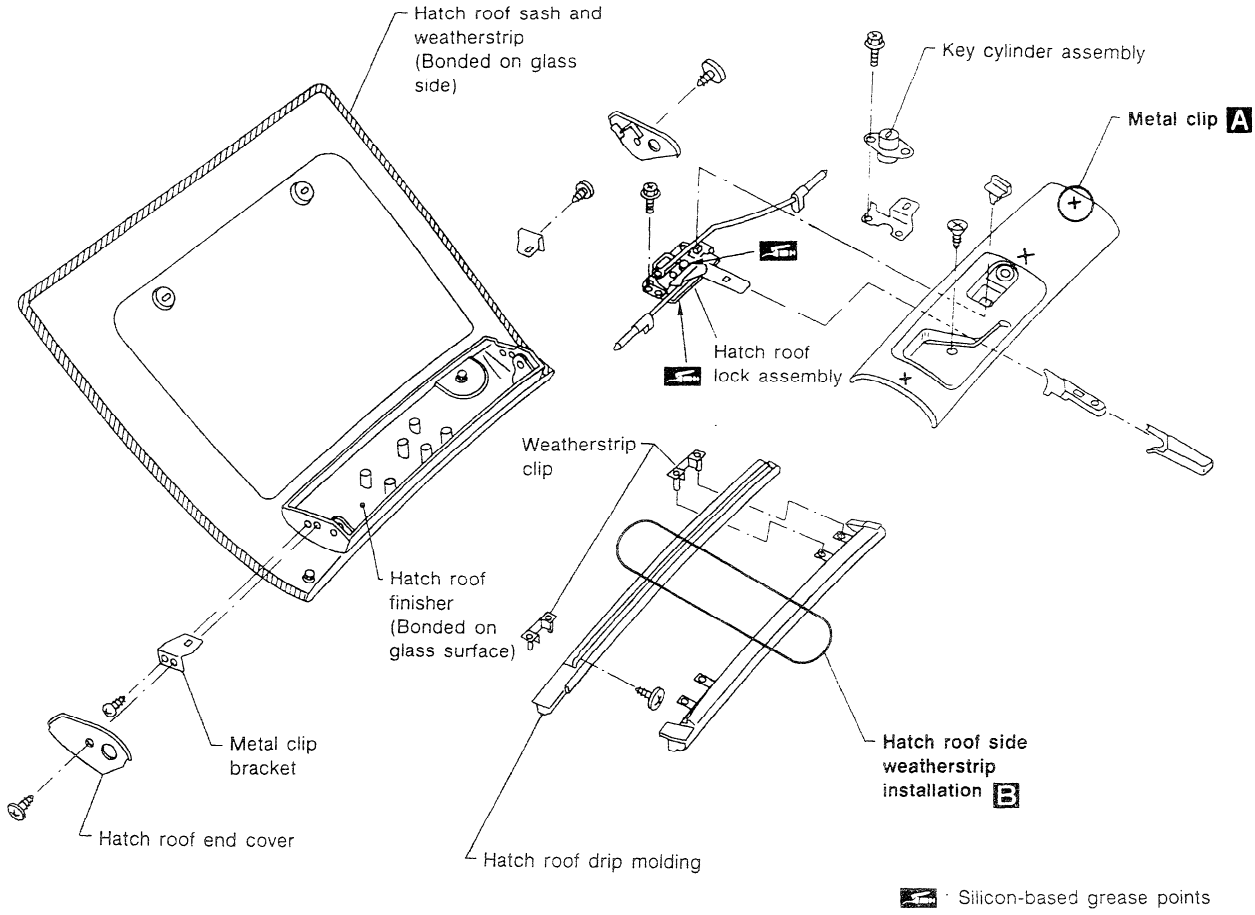


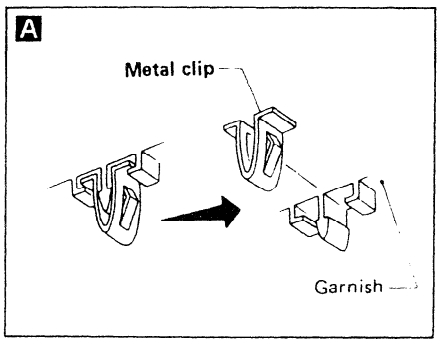
SBF920F

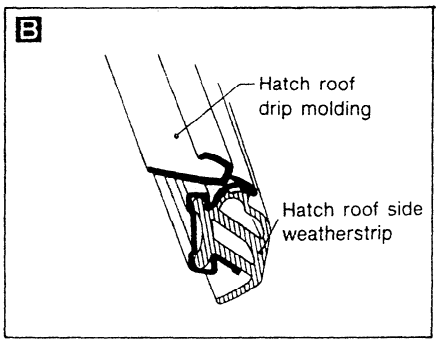
Wiring Diagram

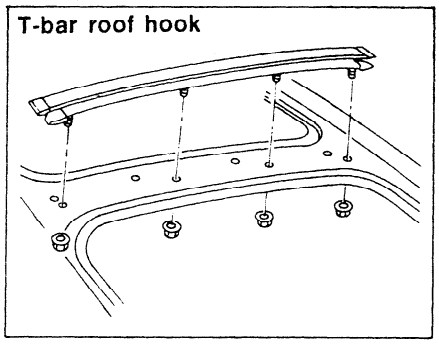


- Handle T-bar roof glass with care so not to damage it.
- Apply sealant to portions susceptible to water leakage if necessary.
- Side molding, sash, lock basement and glass of T-bar roof constitute one unit and cannot be disassembled.

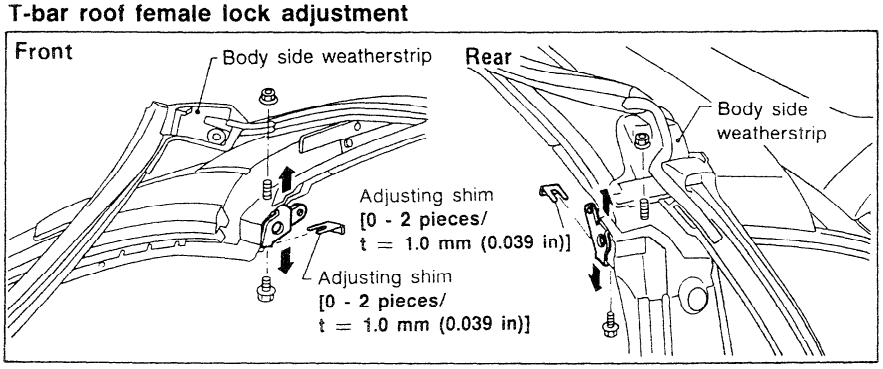


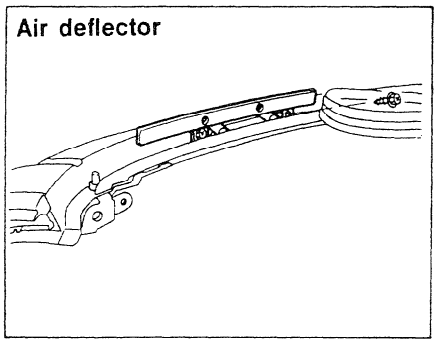






T-bar roof female lock adjustment



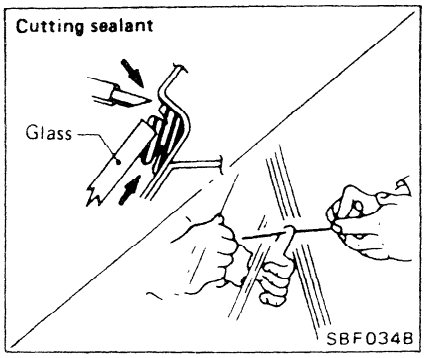


MBF142A

Windshield and Rear Window

REMOVAL

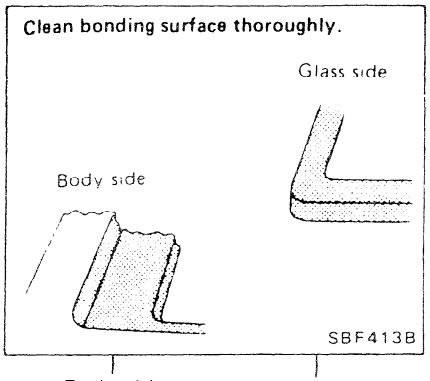
After removing moldings, remove glass.



CAUTION:
Be careful not to scratch glass when removing.

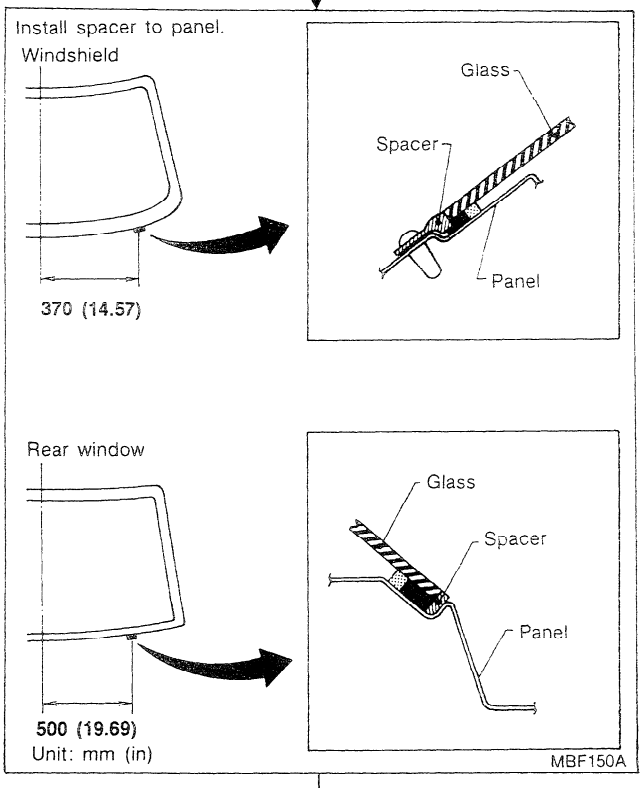
INSTALLATION

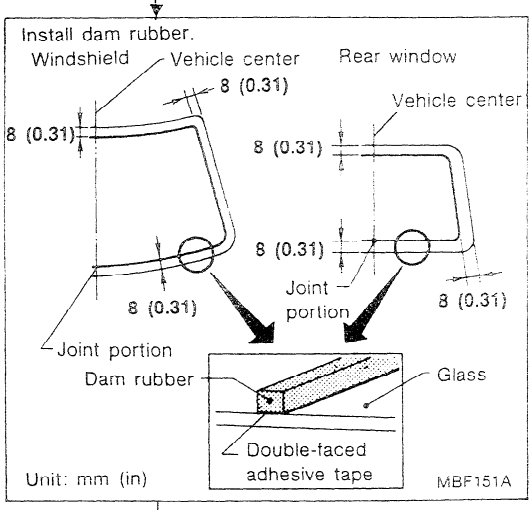
- Use genuine Nissan Sealant kit or equivalent. Follow instructions furnished with it.
- After installation, the vehicle should remain stationary for about 24 hours.
- Do not use sealant which is more than 12 months past its production date.
- Do not leave cartridge unattended with its cap open.
- Keep primers and sealant in a cool, dry place. Ideally, they should be stored in a refrigerator.

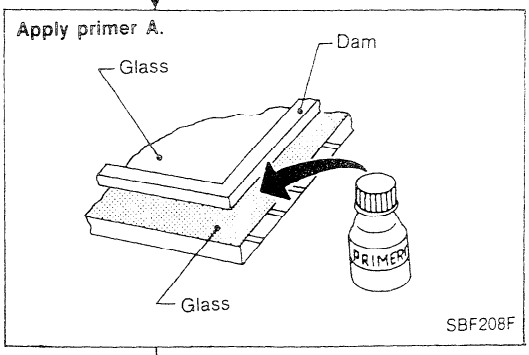


WARNING:
Keep heat or open flames away as primers are flammable.

Body side — B13 — N14 — Glass side



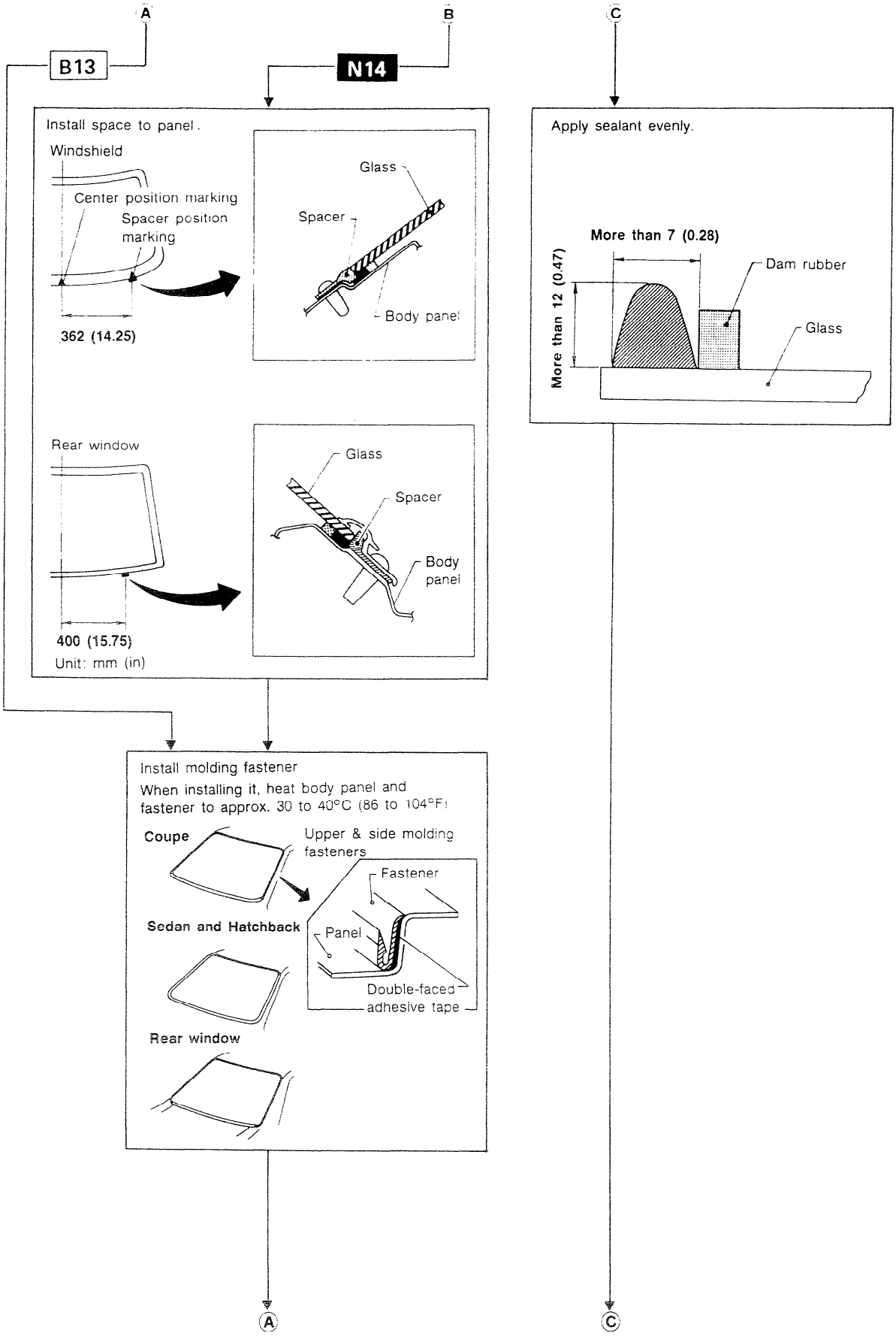




CAUTION:
Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

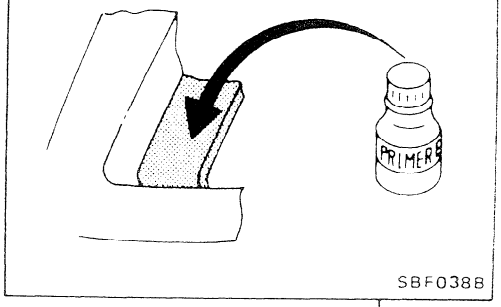
Ⓐ Ⓑ Ⓒ

Windshield and Rear Window (Cont'd)



Ⓐ

Apply primer E.



CAUTION:
Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

Ⓒ

Set glass in position and press glass lightly and evenly.

CAUTION:
Windshield glass should be installed within 15 minutes of applying sealant: sealant starts to harden 15 minutes after it is applied.

Check for water leakage.

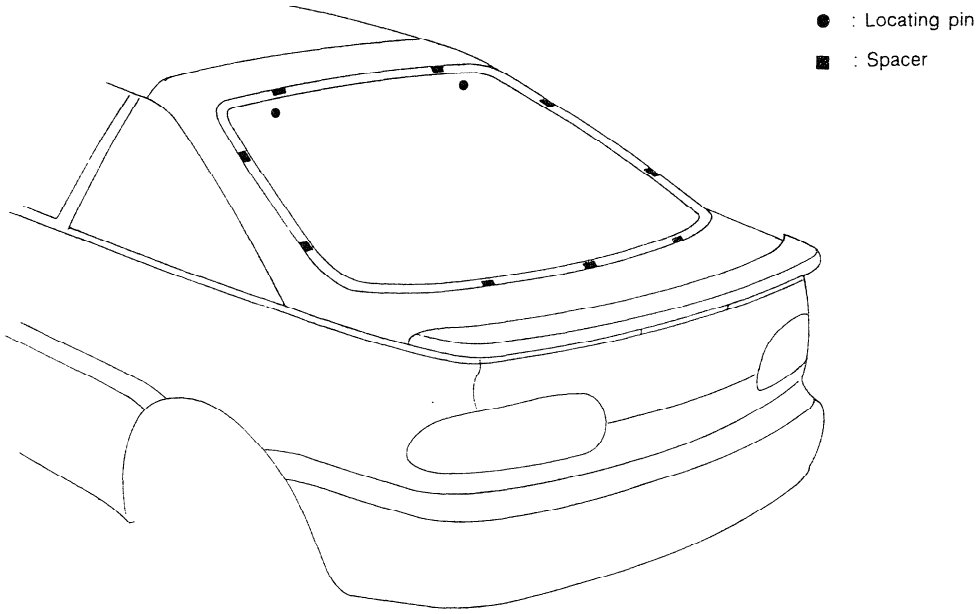
Install moldings.

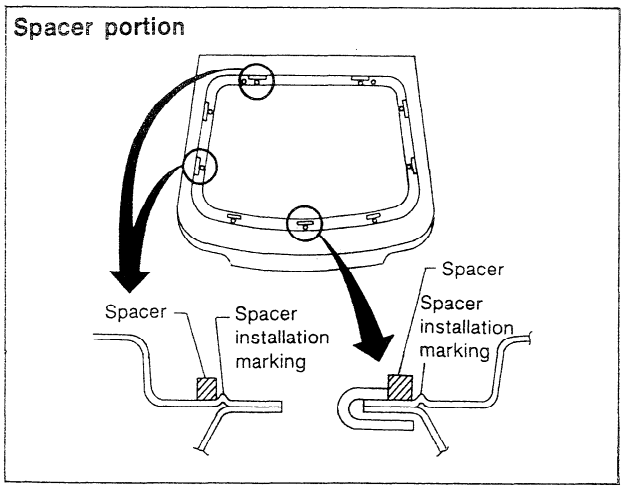
CAUTION:
Molding must be installed securely so that it is in position and leaves no gap.

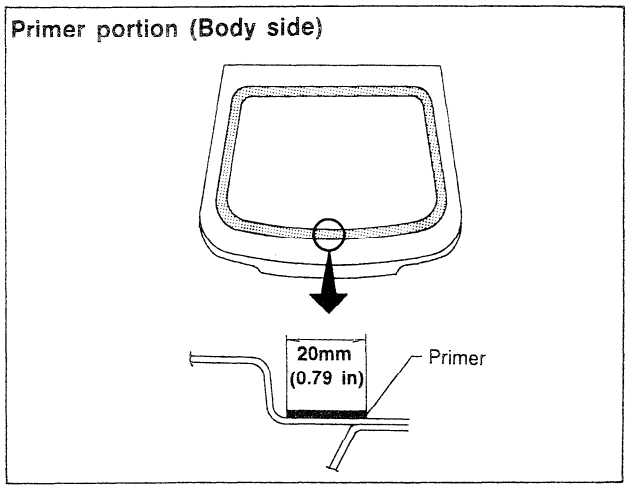
Back Door Window

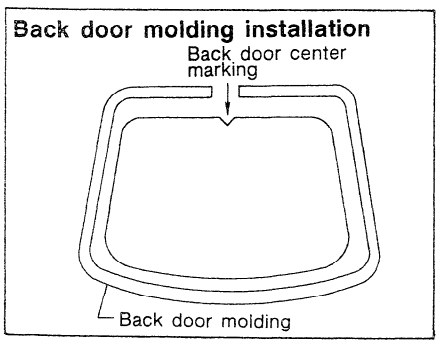
COUPE

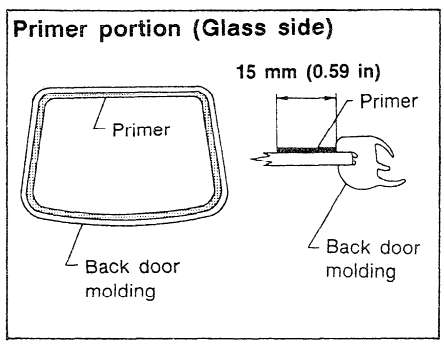
- Construction and removal/reinstallation method of back door window are basically the same as those of windshield.
- For sealant drying time, refer to "Drying Time for Sealant".

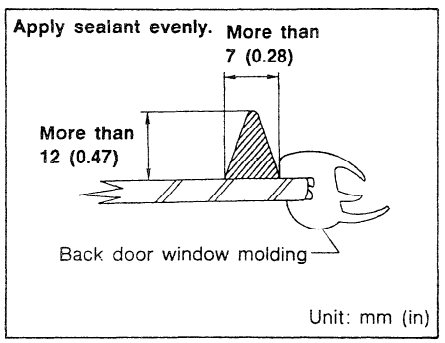








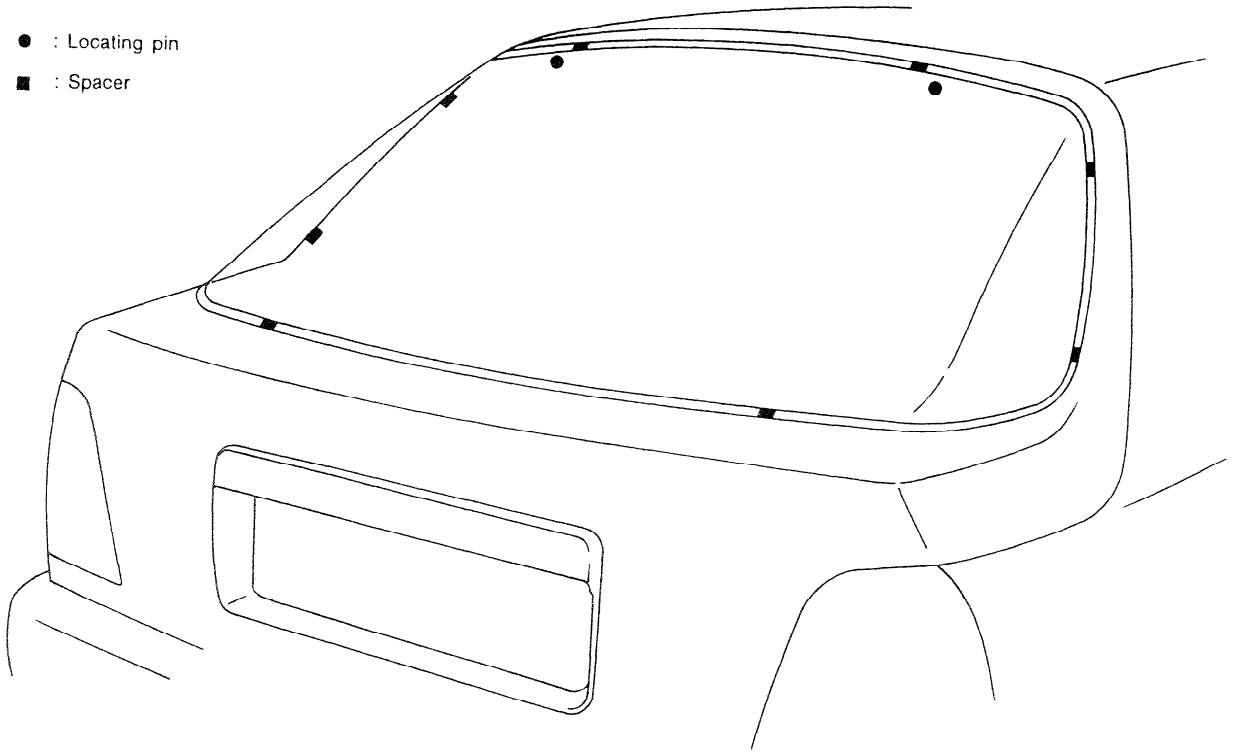


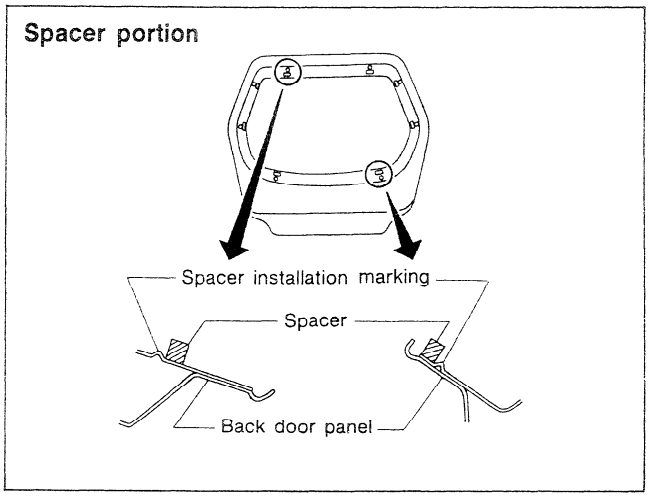


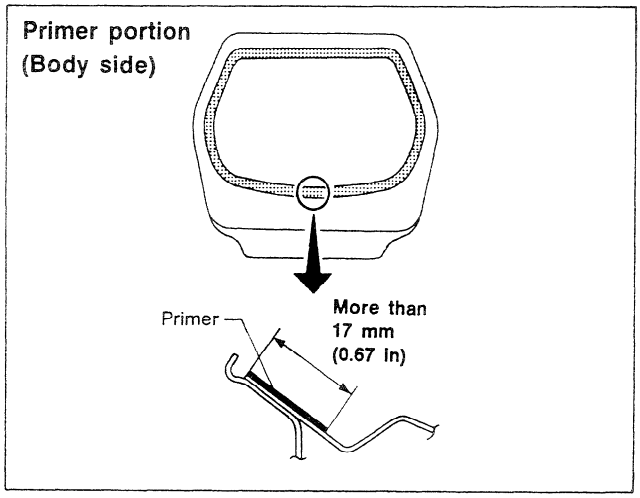
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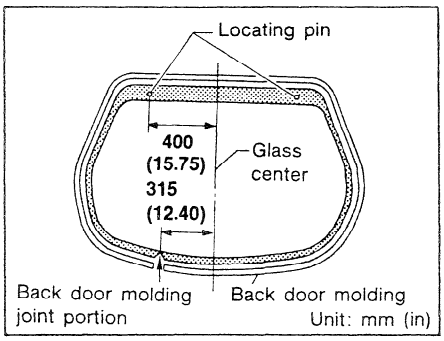
Back Door Window (Cont'd)

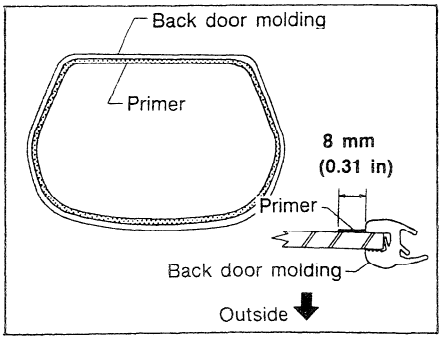
N14 5-DOOR HATCHBACK

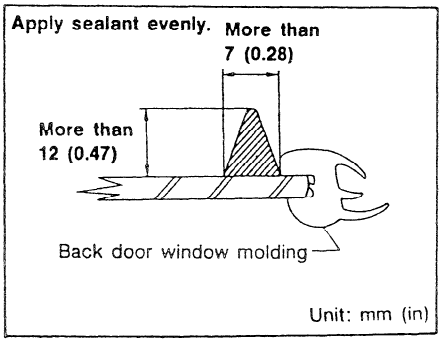












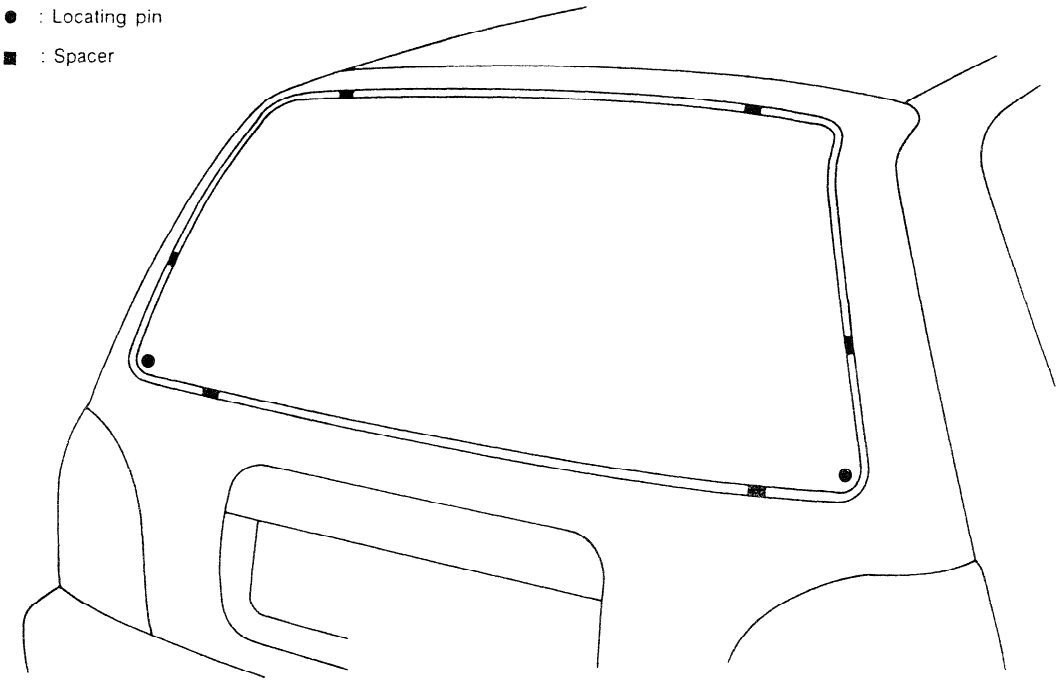
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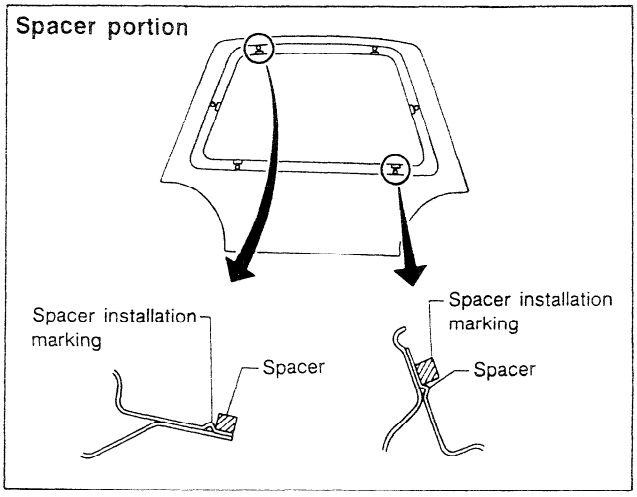
Back Door Window (Cont'd)

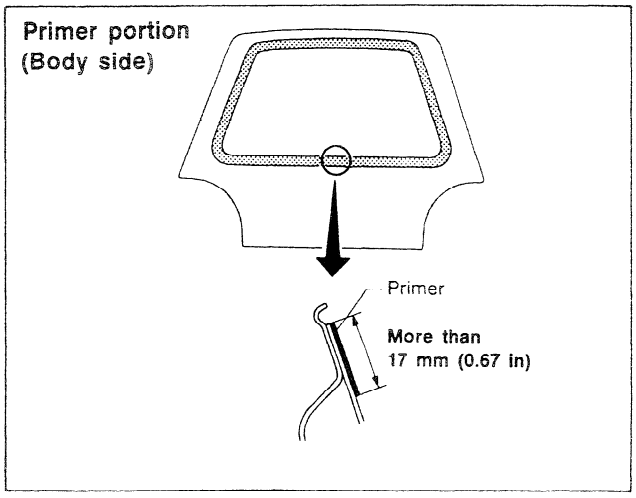
N14 3-DOOR HATCHBACK

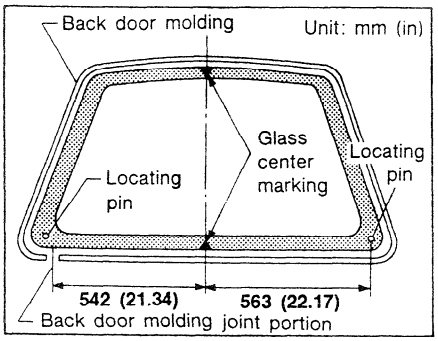
● : Locating pin

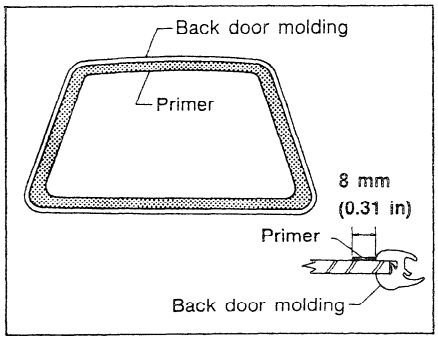
■ : Spacer

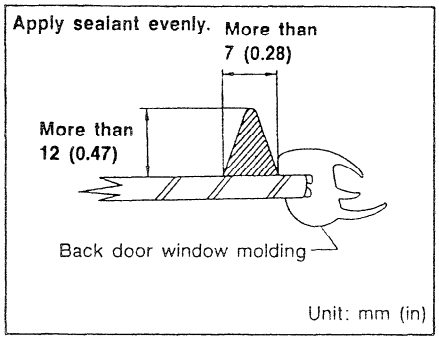








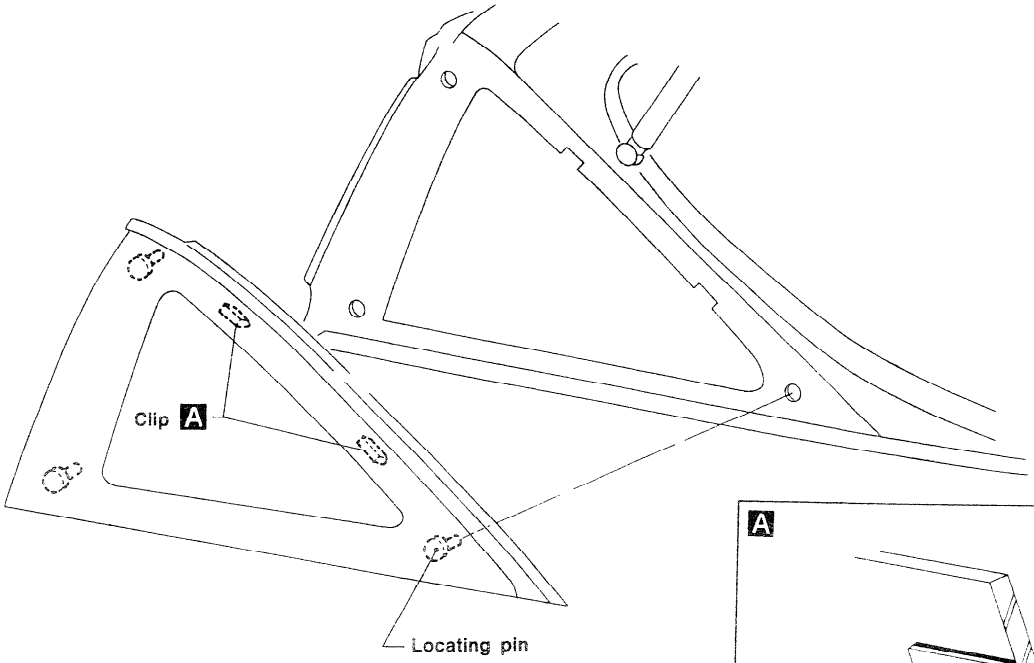


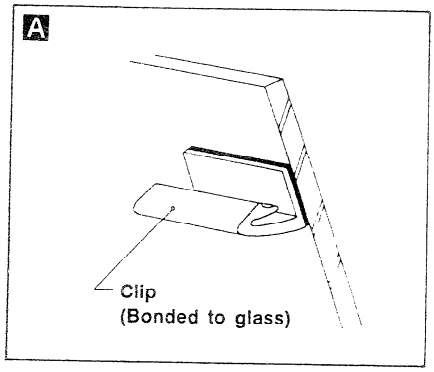


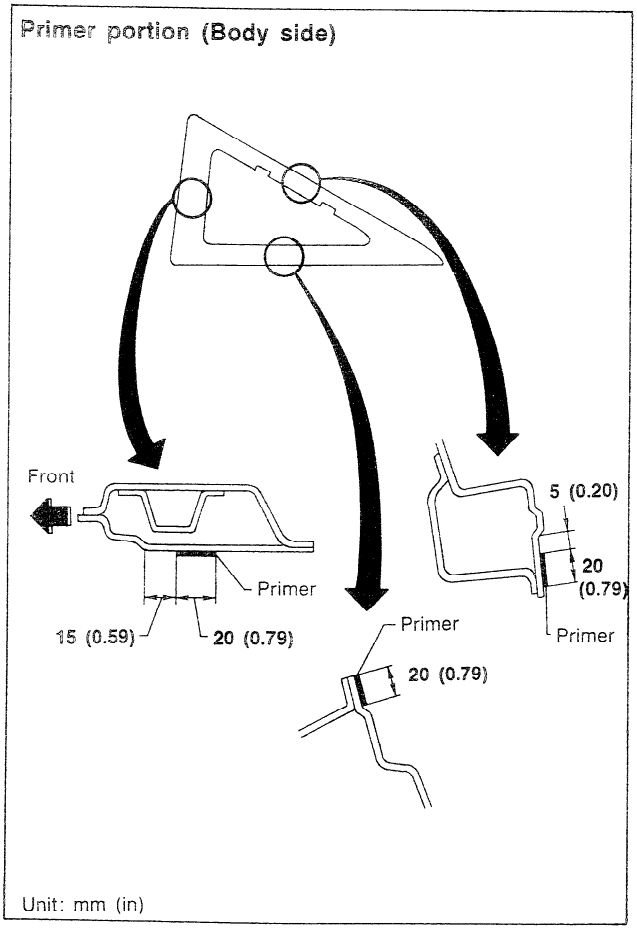
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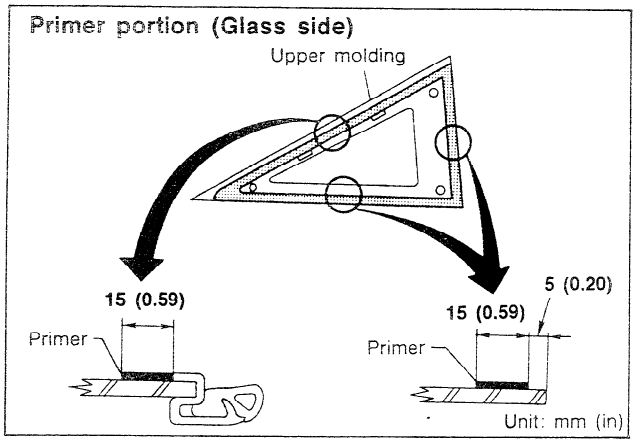
Side Window

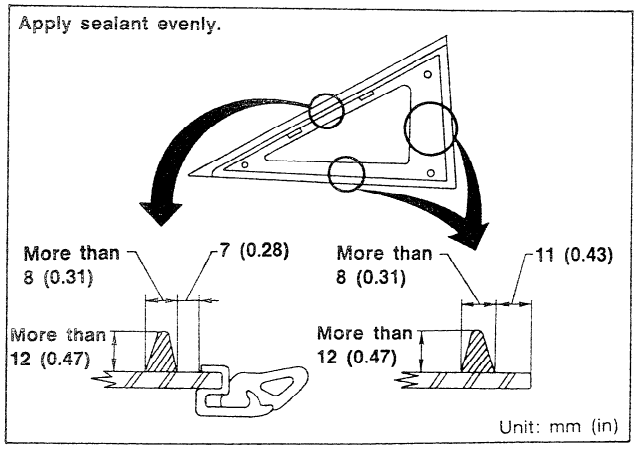
COUPE







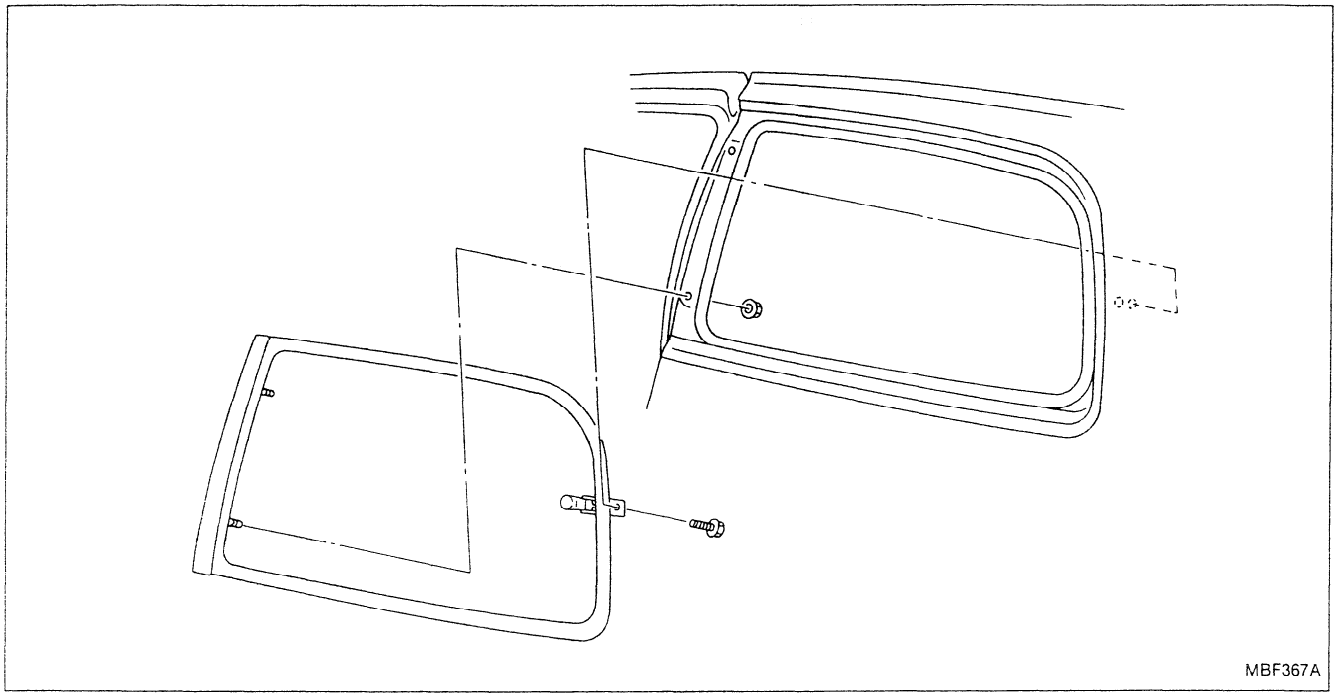




MBF143A

Side Window (Cont'd)

N14 3-DOOR HATCHBACK



Drying Time for Sealant

Reference: Time required for sealant to dry to desired hardness.

B13

Unit: days

Relative humidity % / Temperature °C (°F)	Windshield and rear window			Side window			Back door window		
	90	50	25	90	50	25	90	50	25
40 (104)	1.5	2.5	5.0	1.0	2.0	4.0	2.0	3.0	6.0
25 (77)	2.5	4.0	7.5	2.0	3.0	5.5	3.0	5.0	9.0
5 (41)	5.0	13.0	21.0	3.5	9.5	15.0	6.0	15.5	24.5

N14

Unit: days

Relative humidity % / Temperature °C (°F)	Windshield			Rear window			Back door window		
	90	50	25	90	50	25	90	50	25
40 (104)	1.5	2.5	5.0	1.5	2.5	4.5	2.0	3.0	6.0
25 (77)	2.5	4.0	7.5	2.0	4.0	7.0	3.0	5.0	9.5
5 (41)	5.0	13.0	21.0	4.5	12.0	19.0	6.0	16.0	25.0

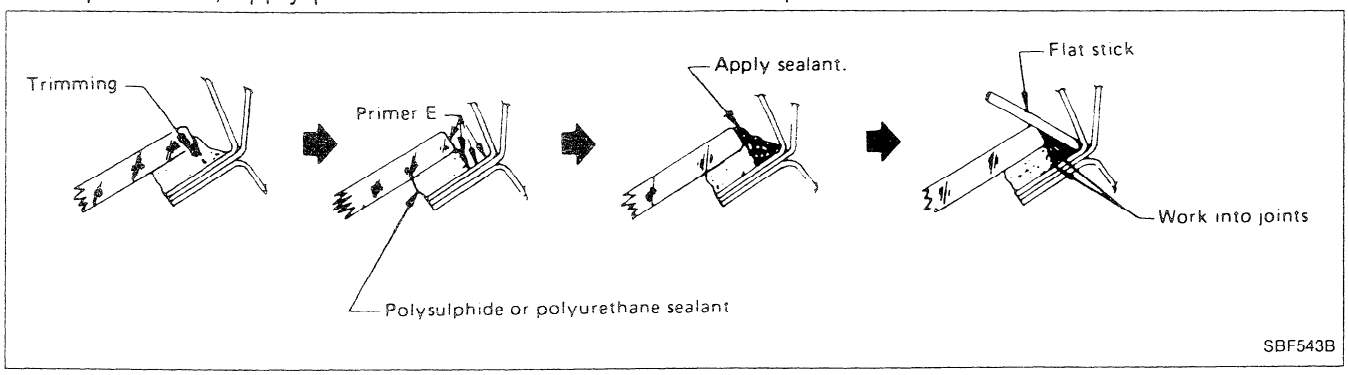
CAUTION:
Advise the user of the fact that vehicle should not be driven on rough roads or surfaces until sealant has properly vulcanized.

Repairing Water Leaks for Windshield and Rear Window

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 and then sealant to the leak point.

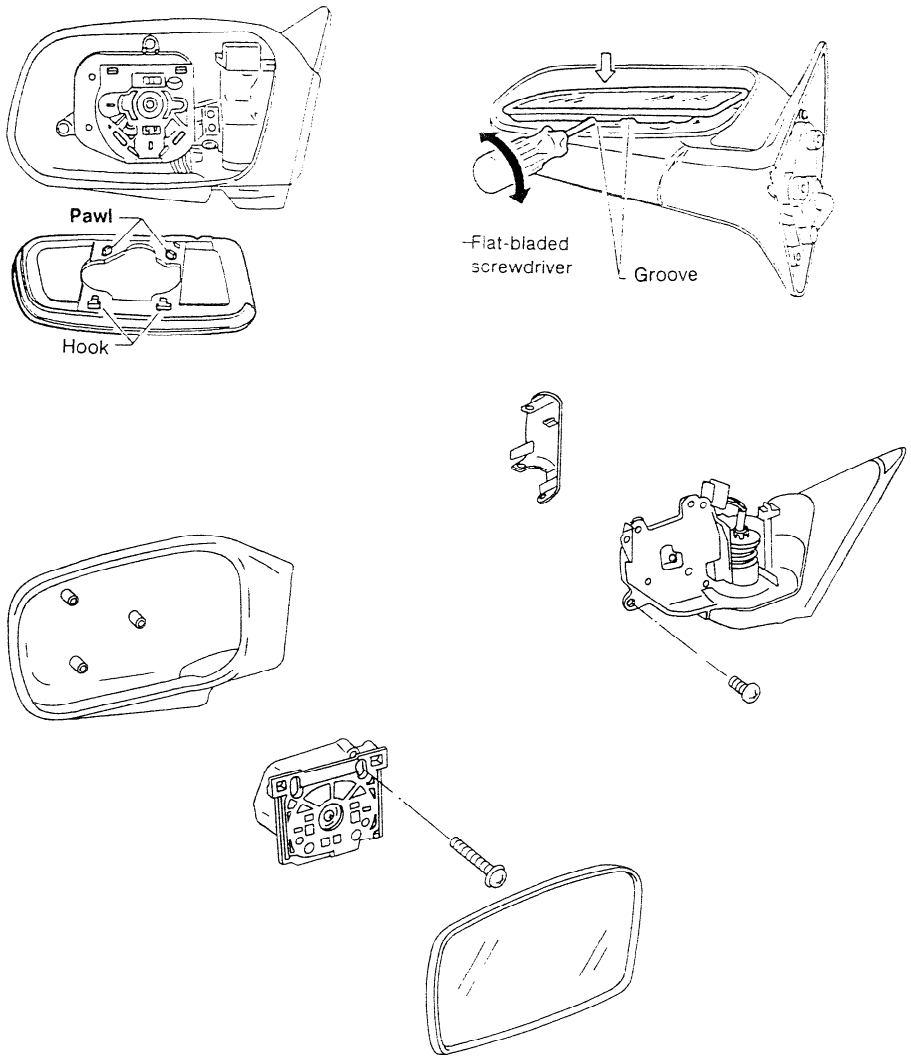


Afterwards, install molding securely.

Door Mirror

REMOVAL

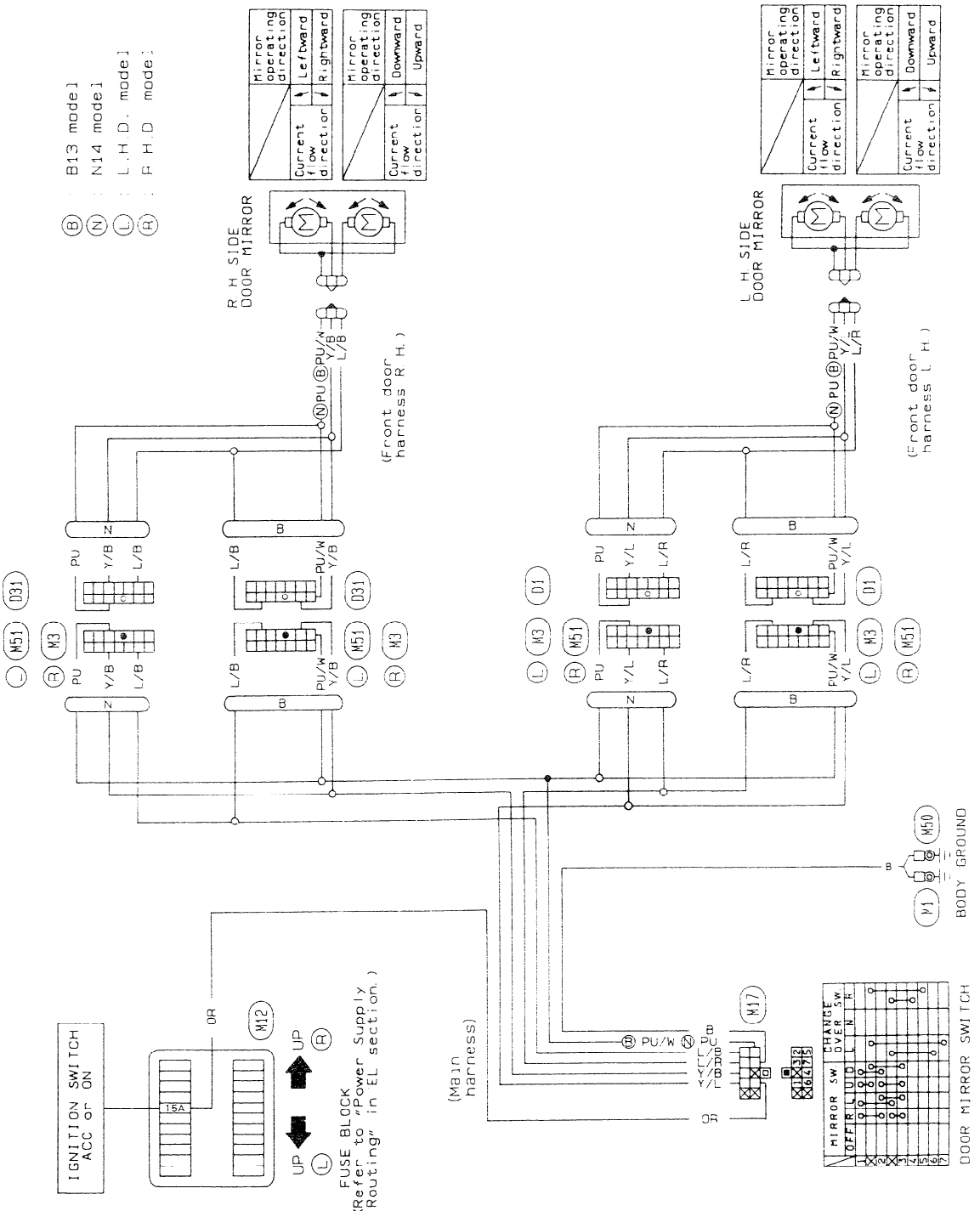
- Wrap flat-bladed screwdriver with a cloth to prevent scratching rear of door mirror. Do not insert screwdriver too far.



MBF145A

Door Mirror/Wiring Diagram

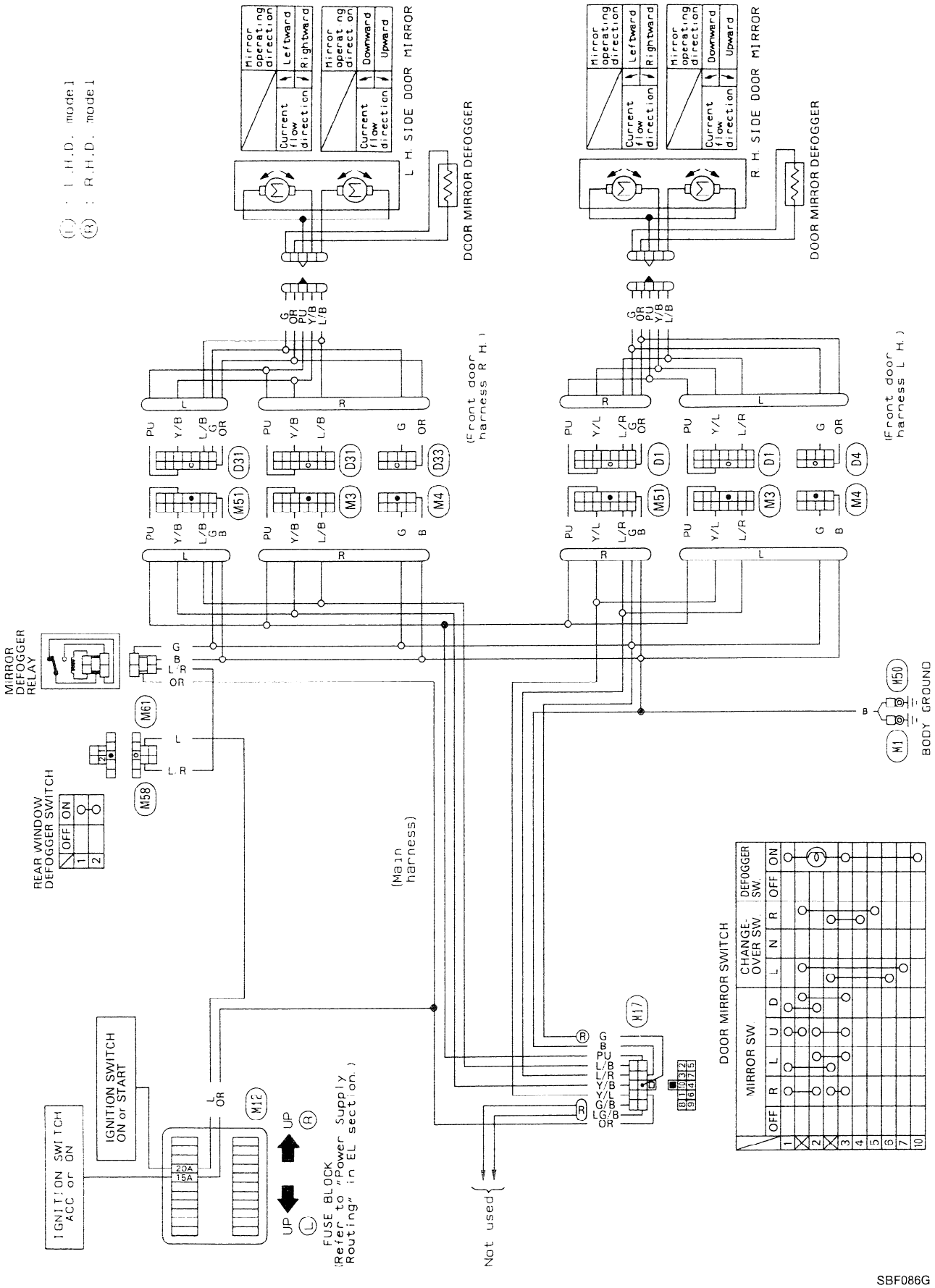
Without heated mirror



SBF085G

Door Mirror/Wiring Diagram (Cont'd)

With heated mirror

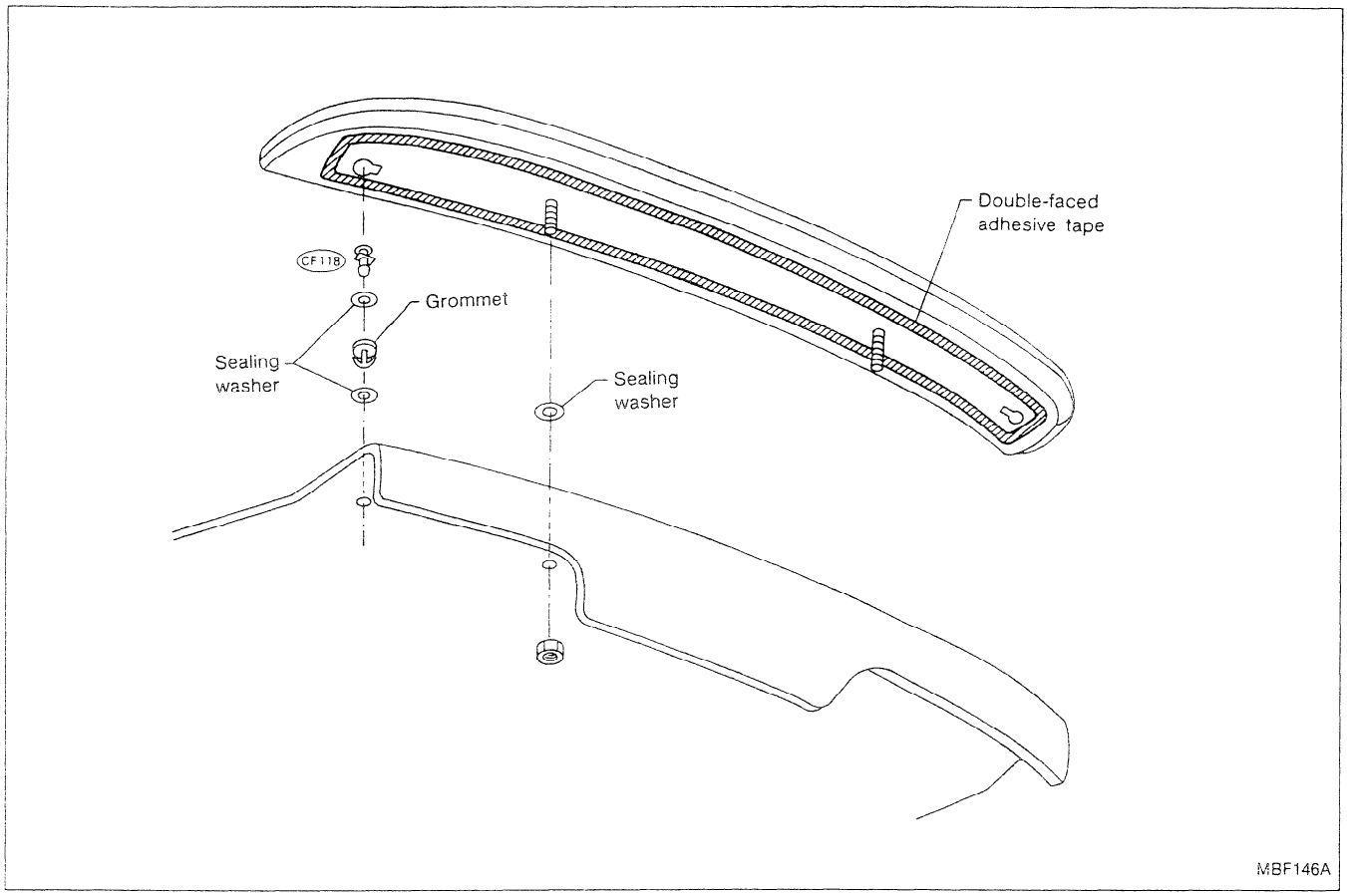


SBF086G

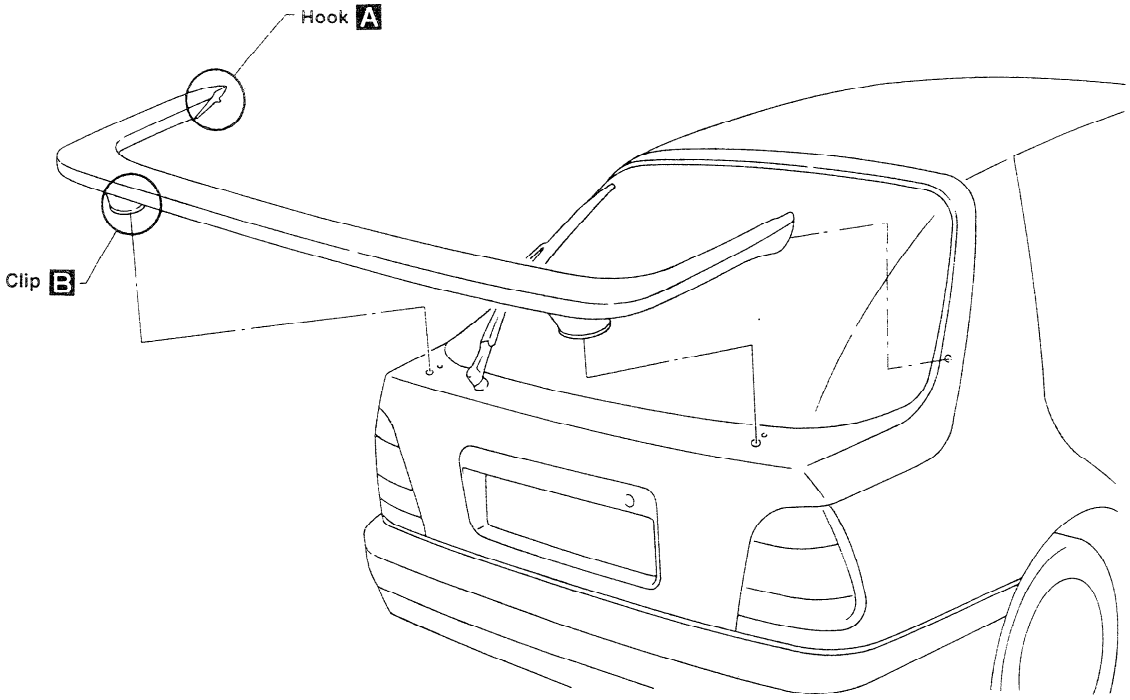
- When installing, make sure that there are not gaps or waves at ends of air spoiler.
- Before installing spoiler, clean and remove oil from surface where spoiler will be mounted.

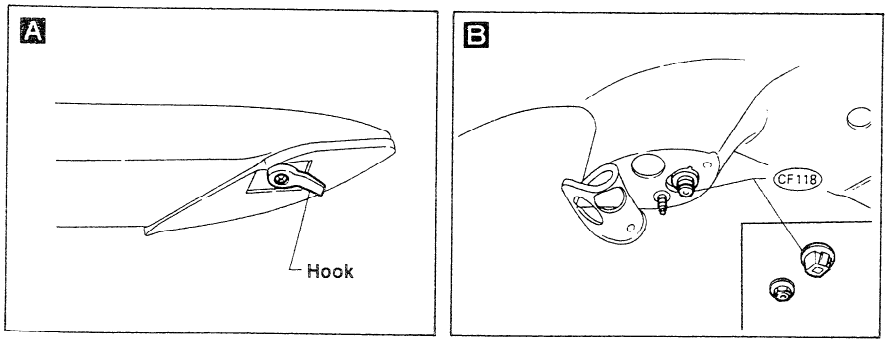
B13 COUPE

REAR AIR SPOILER



N14 5-DOOR HATCHBACK
REAR AIR SPOILER

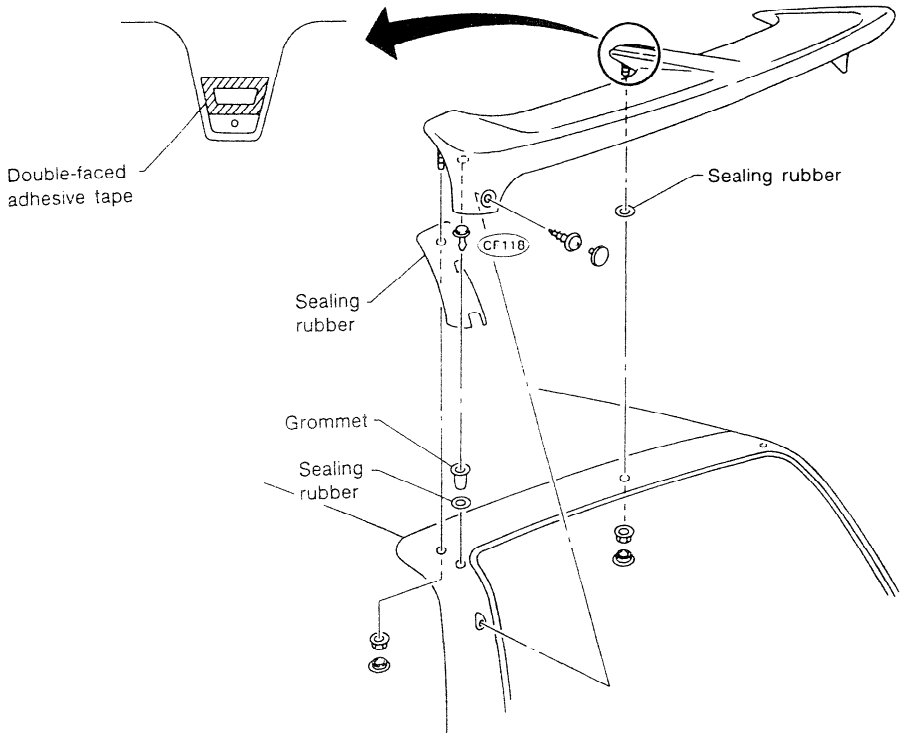




MBF169A

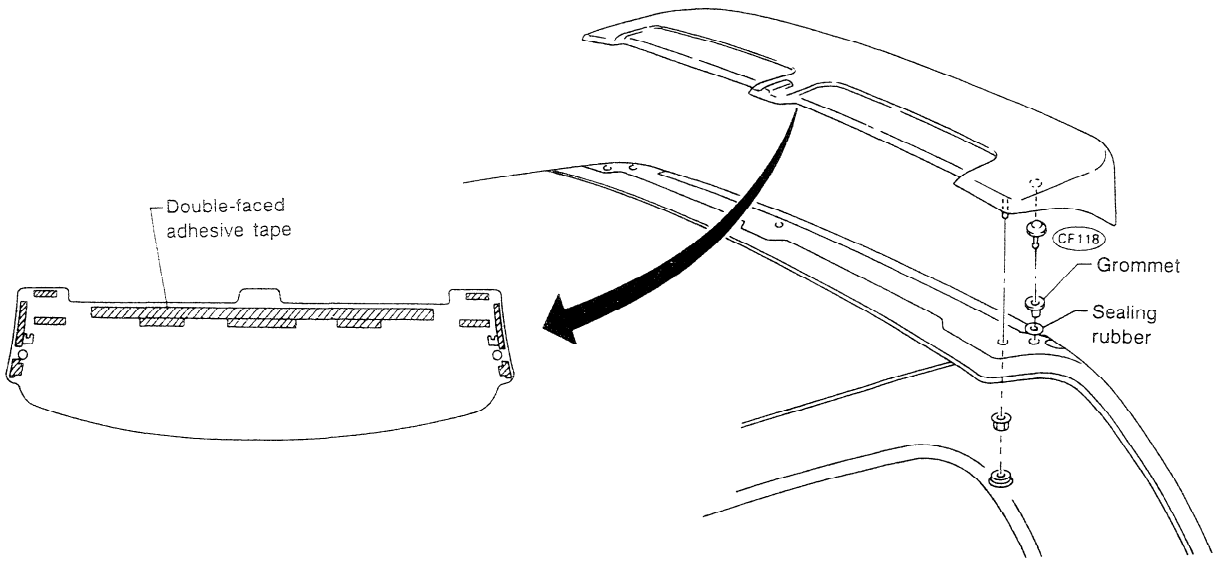
N14 3-DOOR HATCHBACK
REAR AIR SPOILER

Type 1



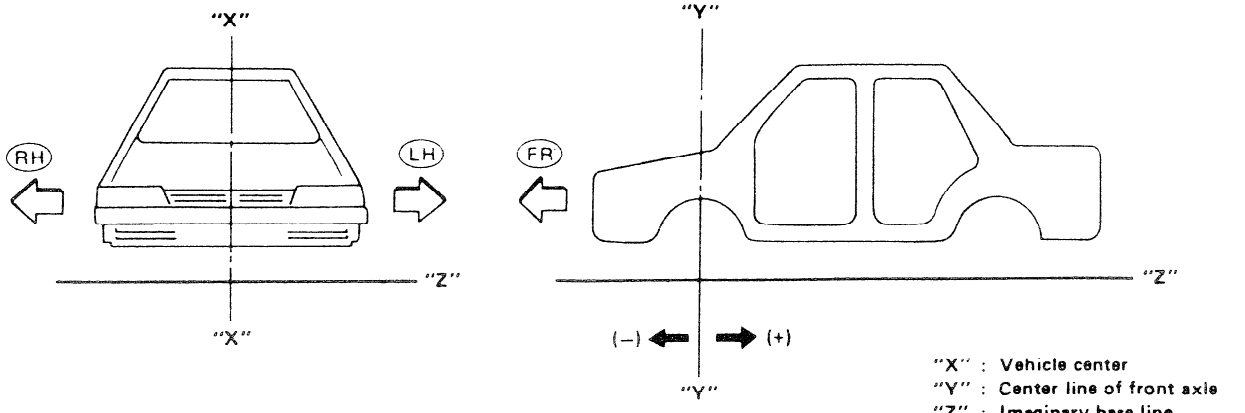
MBF368A

Type 2



MBF369A

- All dimensions indicated in figures are actual ones.
- When a tram tracking gauge is used, adjust both pointers to equal length and 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".

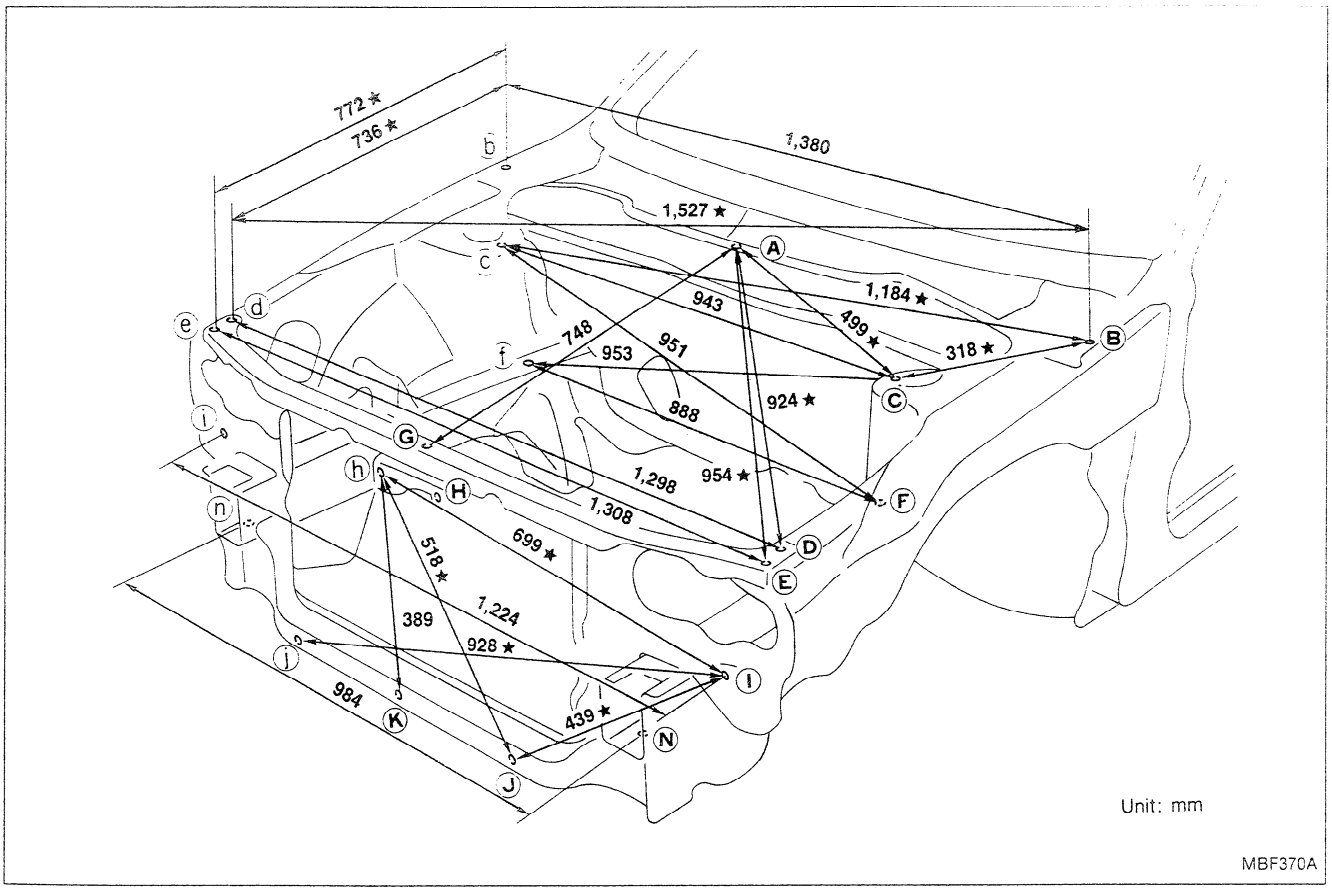


"X" : Vehicle center
"Y" : Center line of front axle
"Z" : Imaginary base line
[200 mm below datum line ("OZ" at design plan)]

(LH) : L.H. side
(RH) : R.H. side

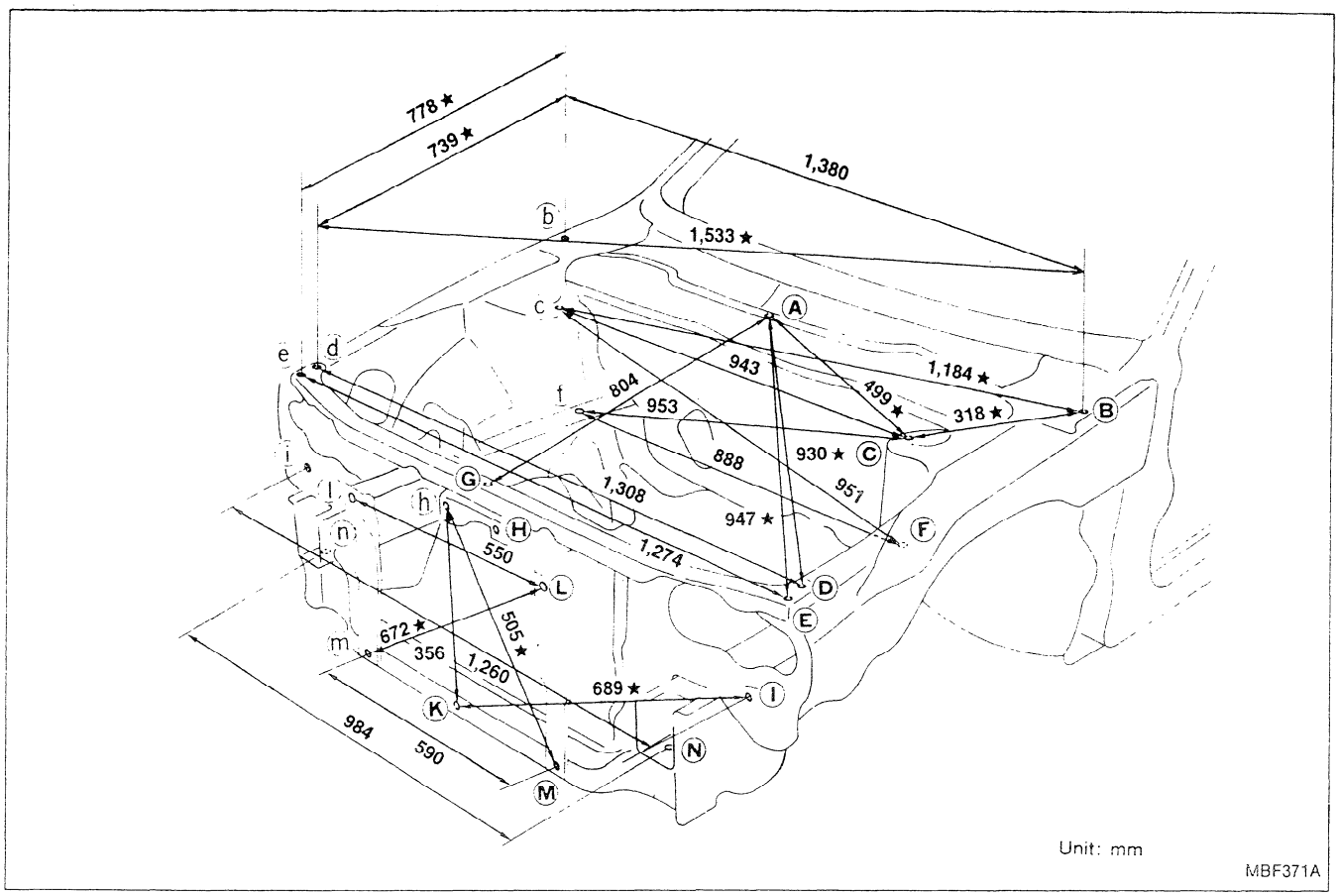
Engine Compartment

MEASUREMENT B13 Sedan

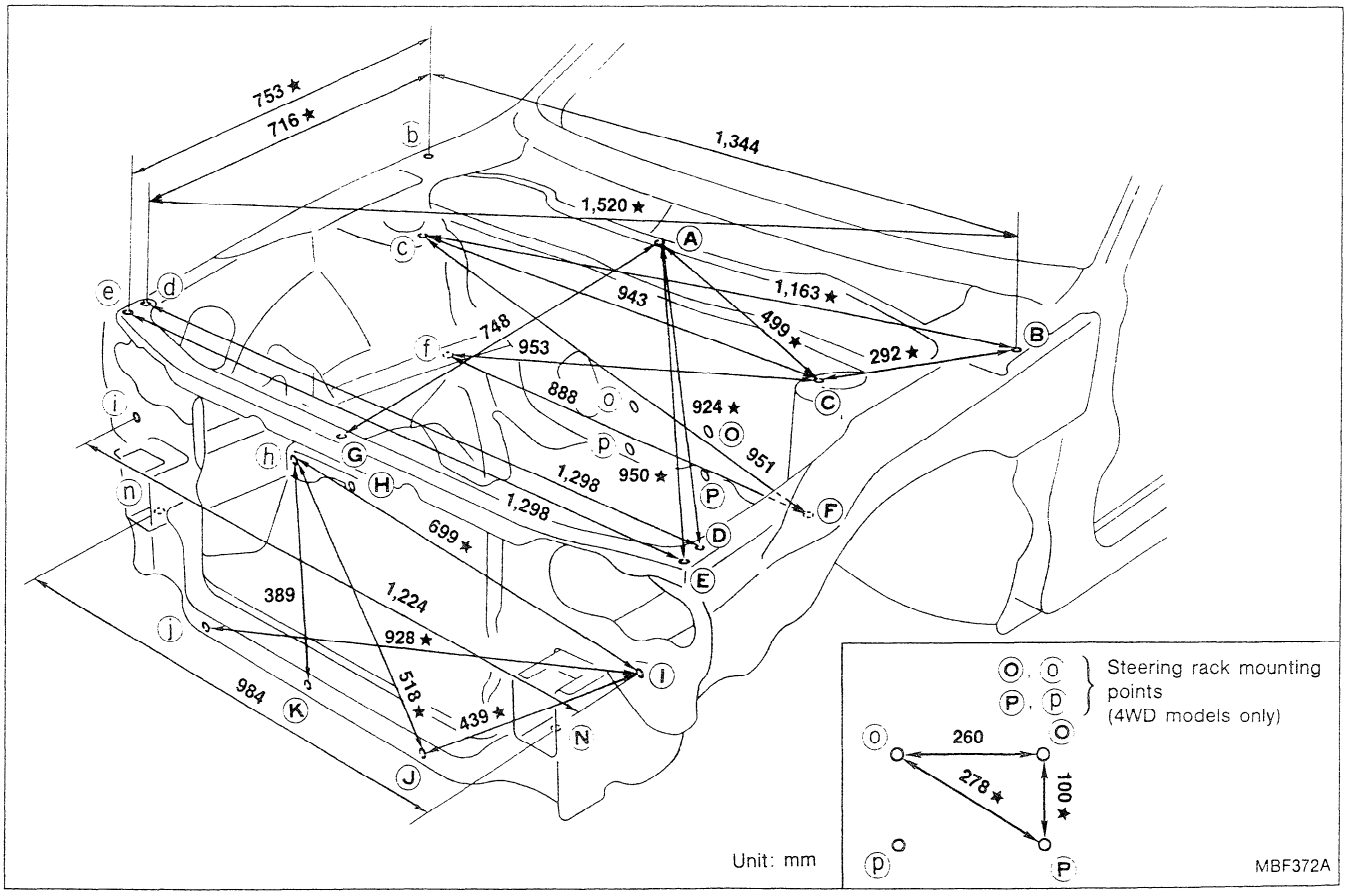


Engine Compartment (Cont'd)

MEASUREMENT B13 Coupe



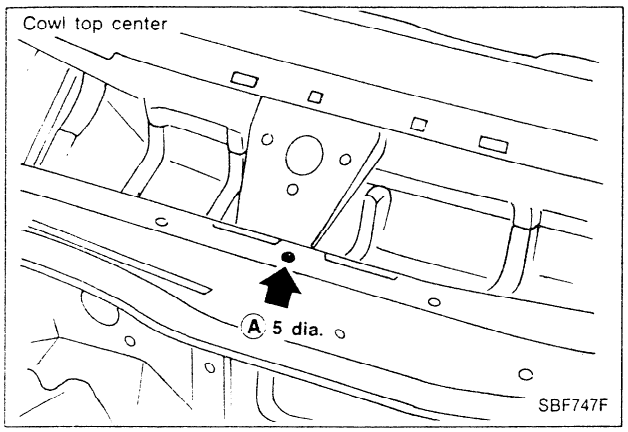
MEASUREMENT N14

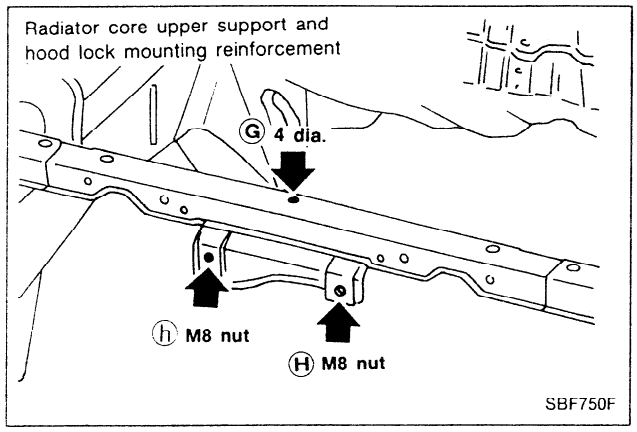


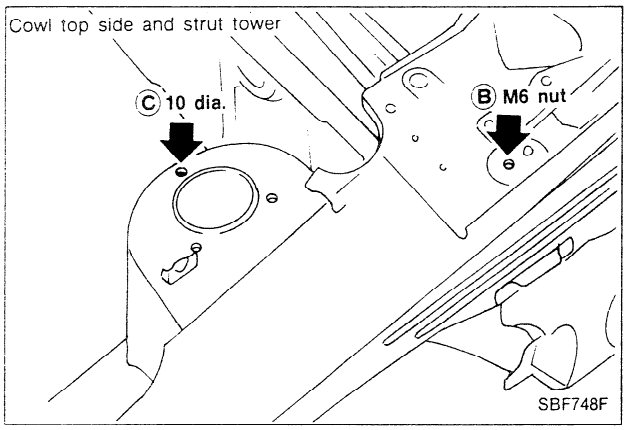
Engine Compartment (Cont'd)

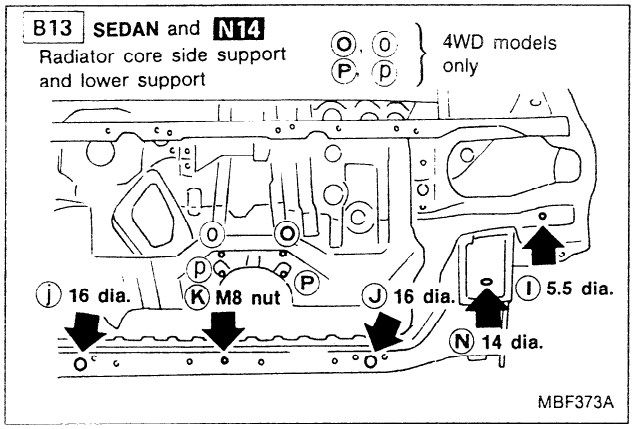
MEASUREMENT POINTS

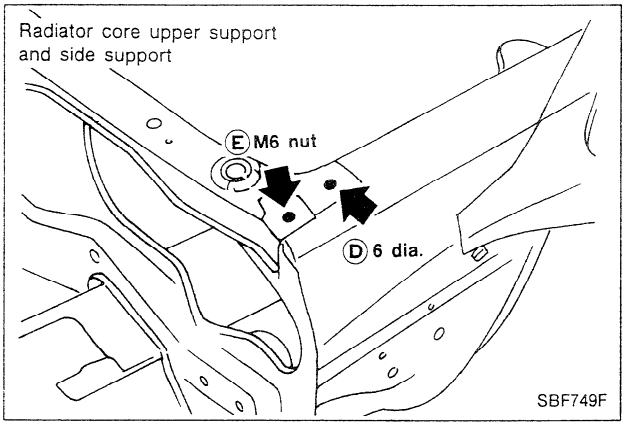
Unit: mm

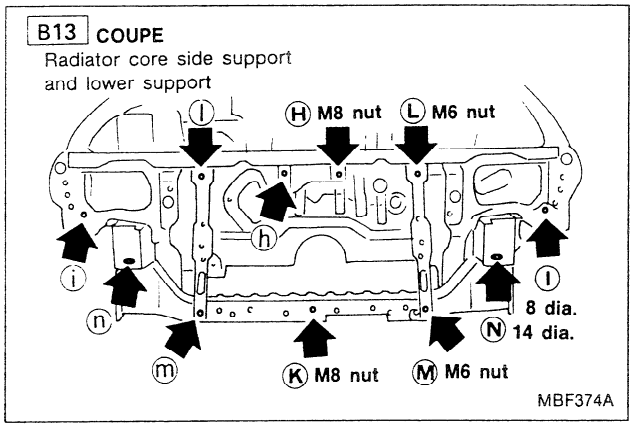


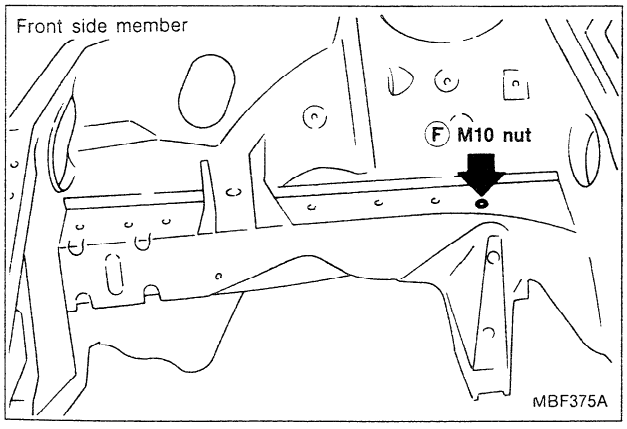








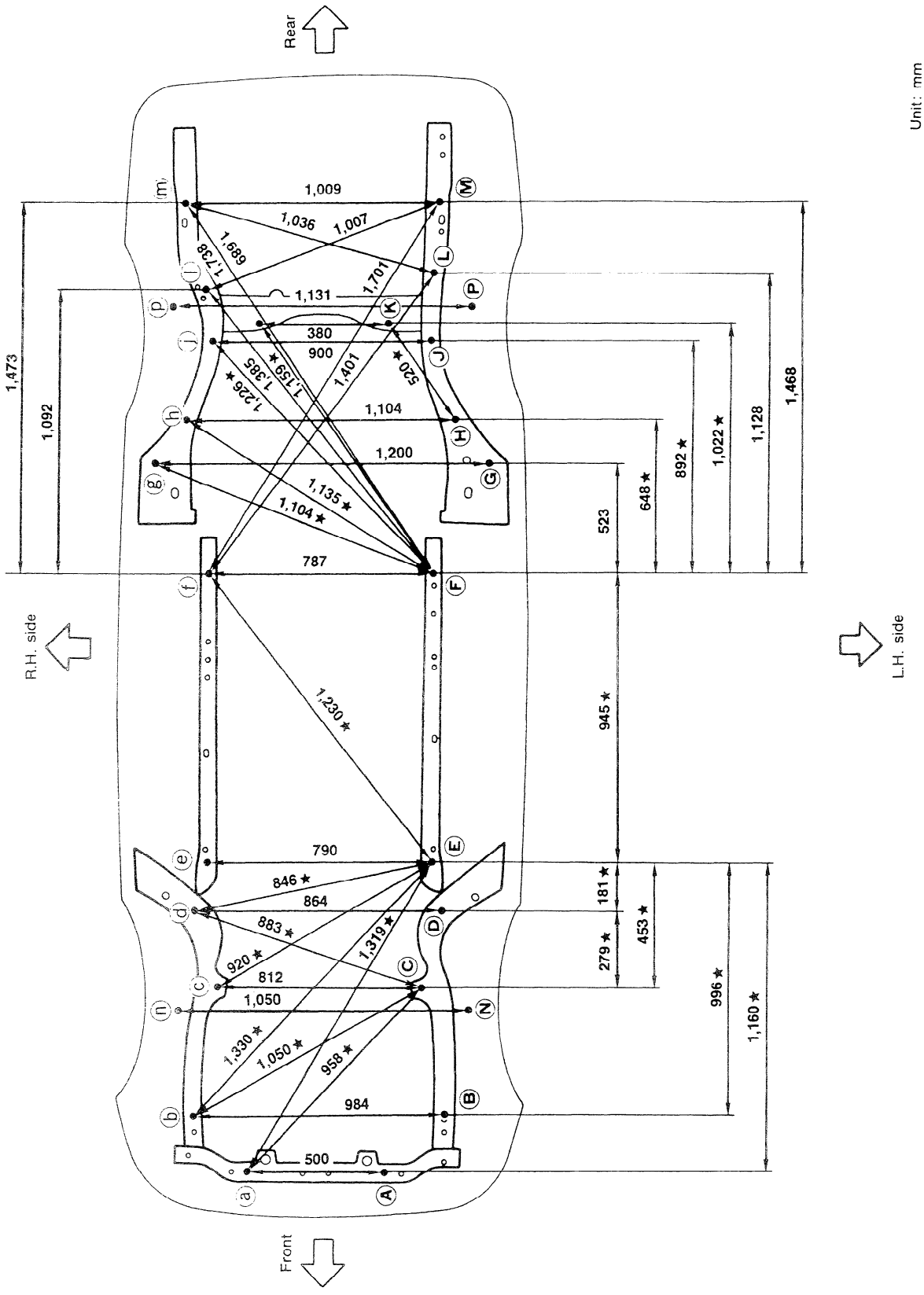




Underbody

MEASUREMENT

2WD models



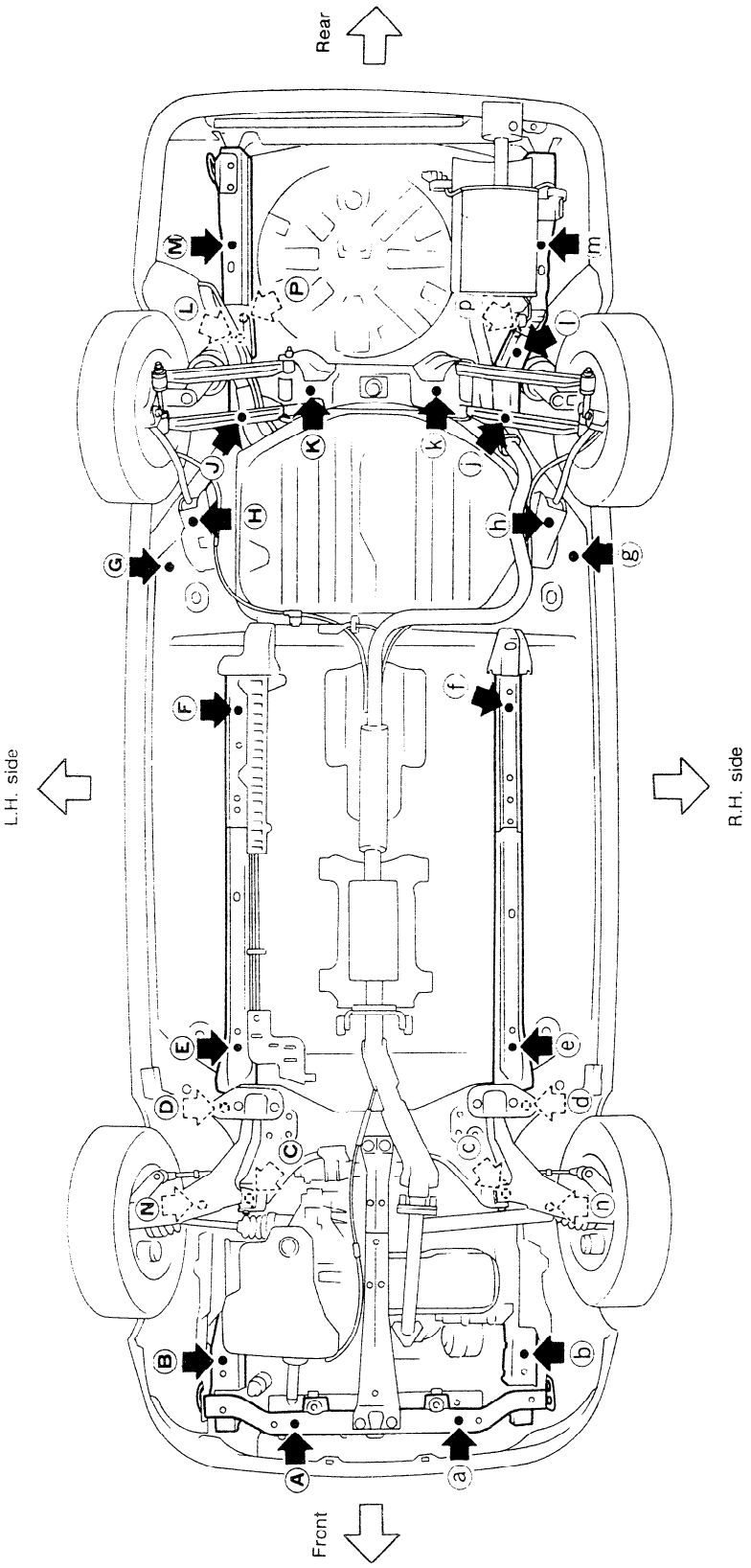
Top view (of vehicle)
All dimensions indicated in this figure are actual ones.
(There are no projected dimensions.)

MBF376A

Underbody (Cont'd)

MEASUREMENT POINTS

2WD models



MBF377A

Underbody (Cont'd)

2WD models

Unit: mm

Front side member and front extension

Coordinates:

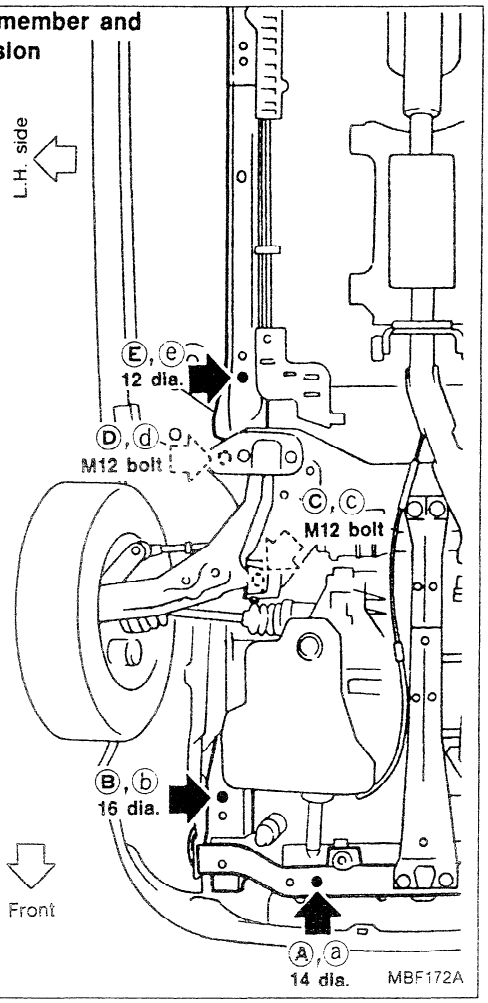
Ⓐ, ⓐ
X: 250
Y: –632
Z: 225

Ⓑ, ⓑ
X: 492
Y: –450
Z: 355

Ⓒ, ⓒ
X: 406
Y: 64
Z: 173

Ⓓ, ⓓ
X: 432
Y: 338
Z: 128

Ⓔ, ⓔ
X: 395
Y: 515
Z: 129.2



MBF172A

Rear side member and rear extension

Coordinates:

Ⓕ, ⓕ
X: 393.5
Y: 1,460
Z: 126.9

Ⓖ, ⓖ
X: 600
Y: 1,930
Z: 227.5

Ⓗ, ⓗ
X: 552
Y: 2,085.9
Z: 176.5

Ⓙ, ⓙ
X: 450
Y: 2,325
Z: 338

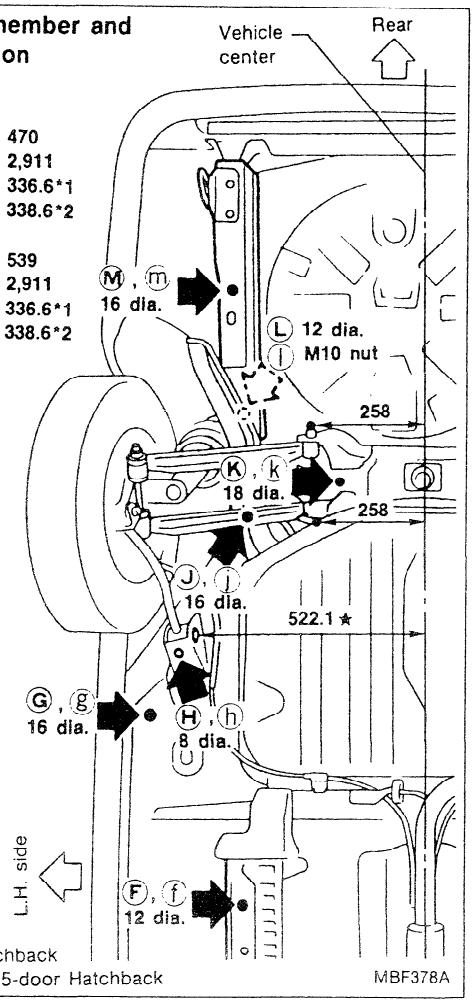
Ⓚ, ⓚ
X: 190
Y: 2,459
Z: 194.8

Ⓛ
X: 438.3
Y: 2,567
Z: 338

Ⓘ
X: 461.2
Y: 2,528.2
Z: 338

Ⓜ
X : 470
Y : 2,911
Z : 336.6*1
338.6*2

ⓜ
X : 539
Y : 2,911
Z : 336.6*1
338.6*2



*1: 3-door Hatchback
*2: Sedan and 5-door Hatchback

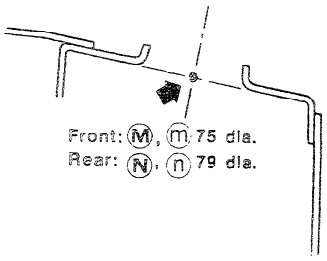
MBF378A

Front and rear strut tower centers

Coordinates:

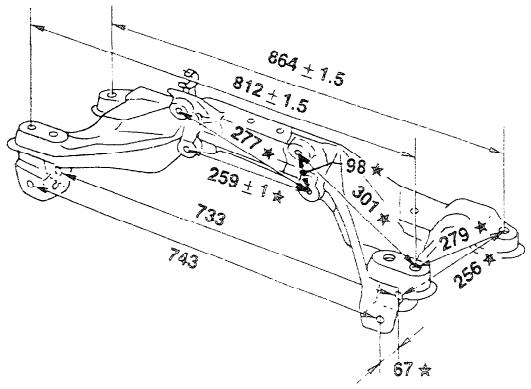
Ⓜ, ⓜ
X: 525.2
Y: 17.5
Z: 754.5

Ⓝ, ⓝ
X: 565.3
Y: 2,495.8
Z: 776.2



MBF171AA

Front suspension member

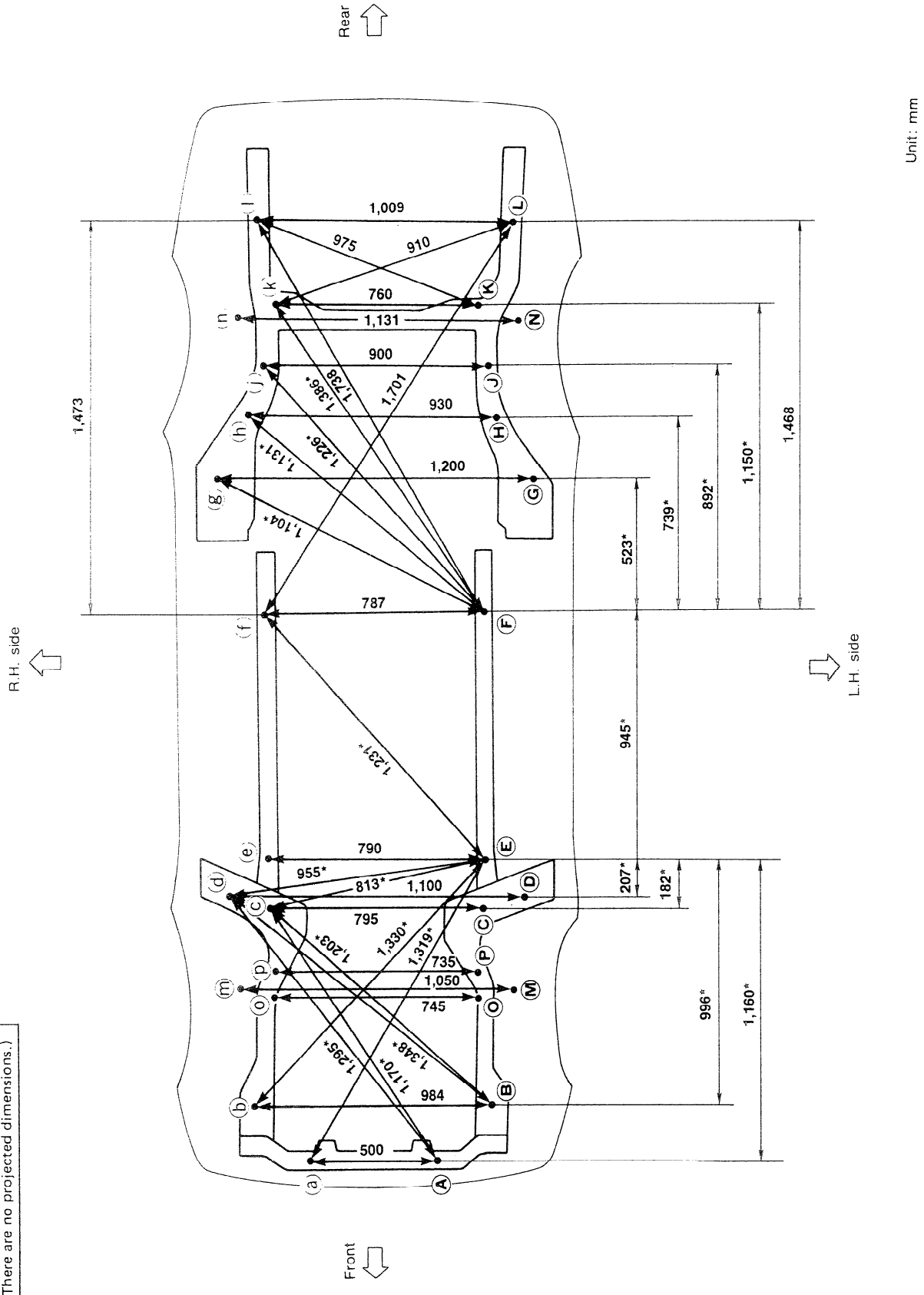


SBF742F

Underbody (Cont'd)

MEASUREMENT

4WD models



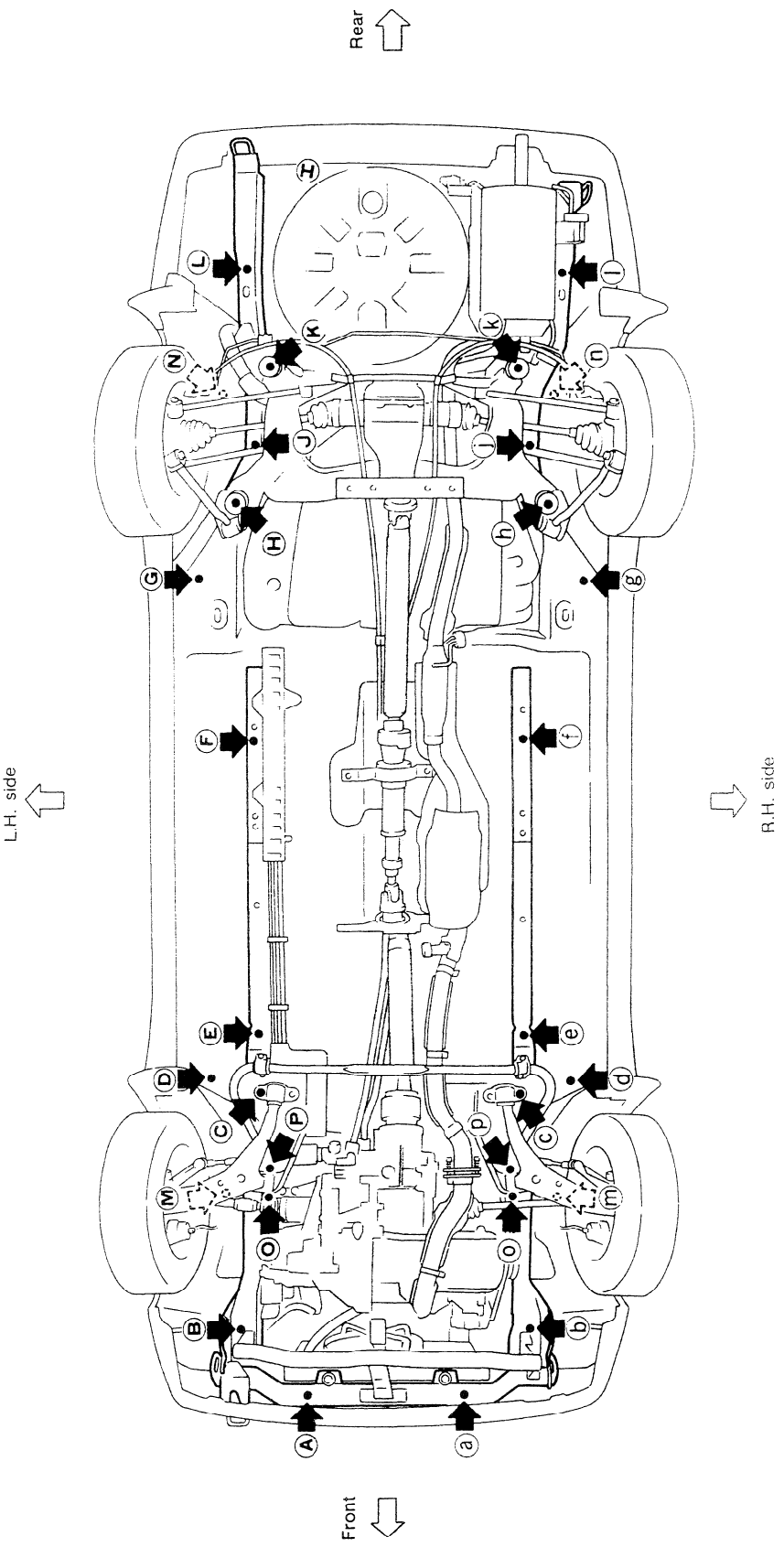
Top view (of vehicle)
All dimensions indicated in this figure are actual ones.
(There are no projected dimensions.)

MBF380A

Underbody (Cont'd)

MEASUREMENT POINTS

4WD models

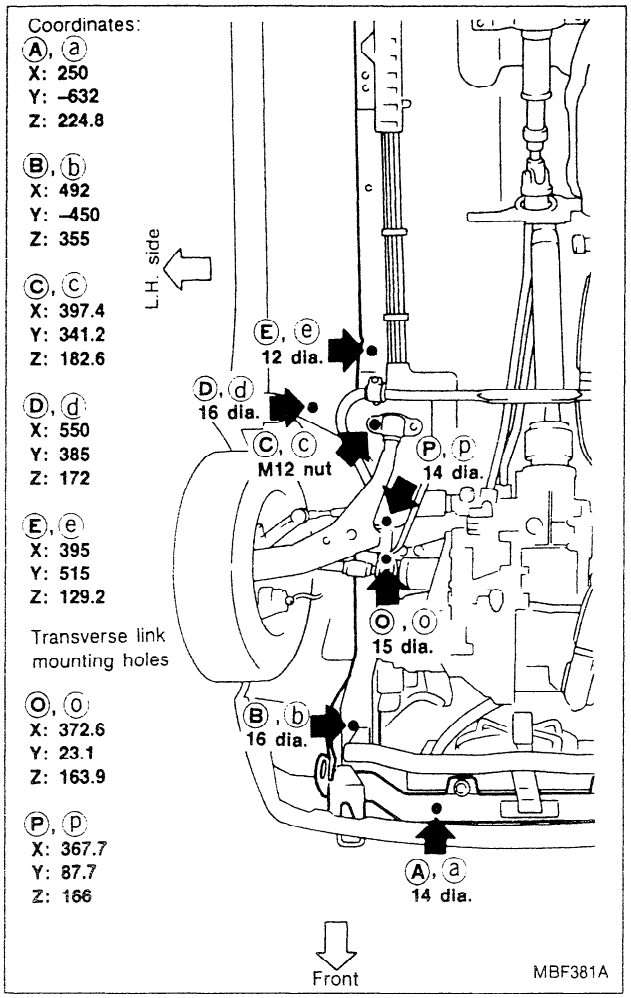


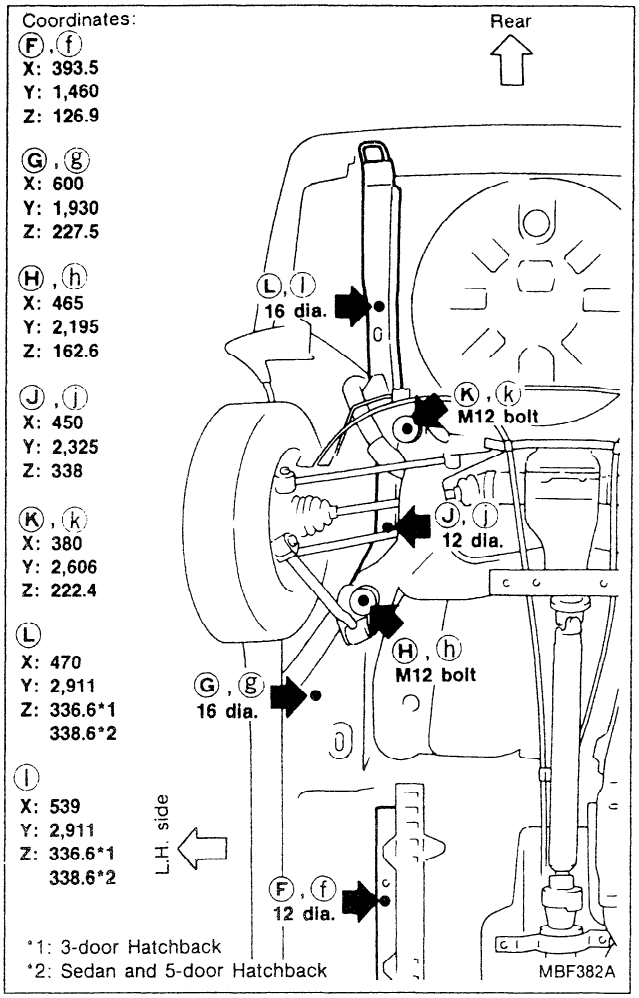
MBF379A

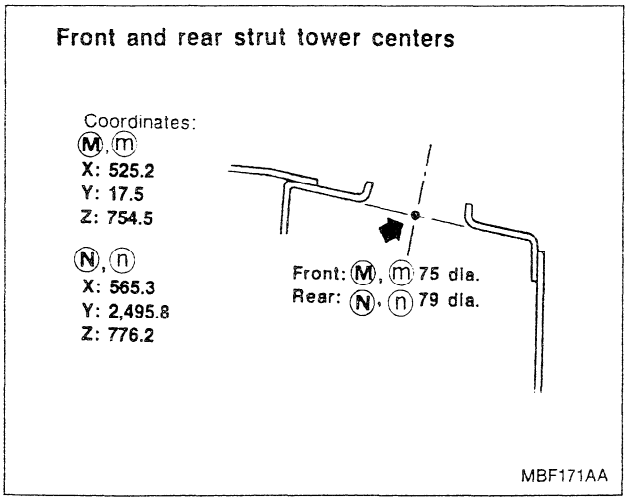
Underbody (Cont'd)

4WD models

Unit: mm







HEATER & AIR CONDITIONER

SECTION HA

CONTENTS

DESCRIPTION — Overall System ..... HA- 2
OPERATIONAL CHECK ..... HA- 6
DESCRIPTION — Refrigeration System ..... HA- 8
DIAGNOSES — Overall System ..... HA- 13
PRECAUTIONS FOR REFRIGERANT CONNECTIONS ..... HA- 23
EVACUATING, CHARGING AND CHECKING ..... HA- 24
SERVICE PROCEDURES ..... HA- 39
COMPRESSOR OIL — Checking and Adjusting ..... HA- 45
COMPRESSOR — Model NVR 140S (ATSUGI make) ..... HA- 47
COMPRESSOR — Model DKV-14D (ZEXEL make) ..... HA- 51
COMPRESSOR — Model DKV-14C (ZEXEL make) ..... HA- 52
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DOOR CONTROL HA-121
DESCRIPTION — Push Control HA-124
PUSH CONTROL UNIT HA-128
PREPARATION HA-131
SERVICE DATA AND SPECIFICATIONS (S.D.S.) HA-140

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".

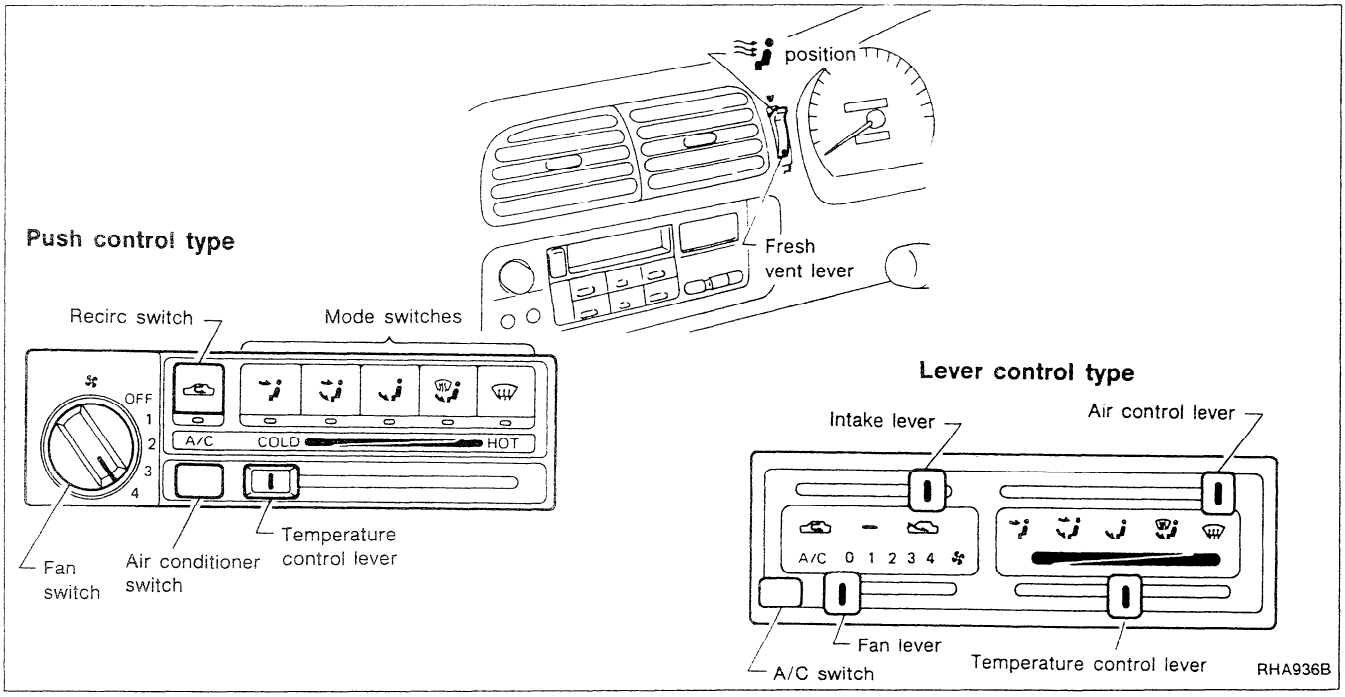
Introduction

Besides a lever control system, a push control system is newly applied to B13/N14 models.

Features

The push control system operates the intake and mode door motors to activate the doors corresponding to each button. When the MODE switch is pushed at "DEF" or "F/D", the push control amplifier automatically sets the intake door to "FRE" to prevent windshield fogging.

Control Operation



FAN SWITCH OR FAN LEVER

This switch or lever turns the fan ON and OFF, and controls fan speed.

MODE SWITCHES OR AIR CONTROL LEVER

These switches or air control lever allow you to select the outlet air flow.

TEMPERATURE CONTROL LEVER

This lever allows you to adjust the temperature of the outlet air.

RECIRC SWITCH OR INTAKE LEVER

OFF position or slide to : Outside air is drawn into the passenger compartment when this switch is OFF.
ON position or slide to : Interior air is recirculated inside the vehicle.

AIR CONDITIONER SWITCH

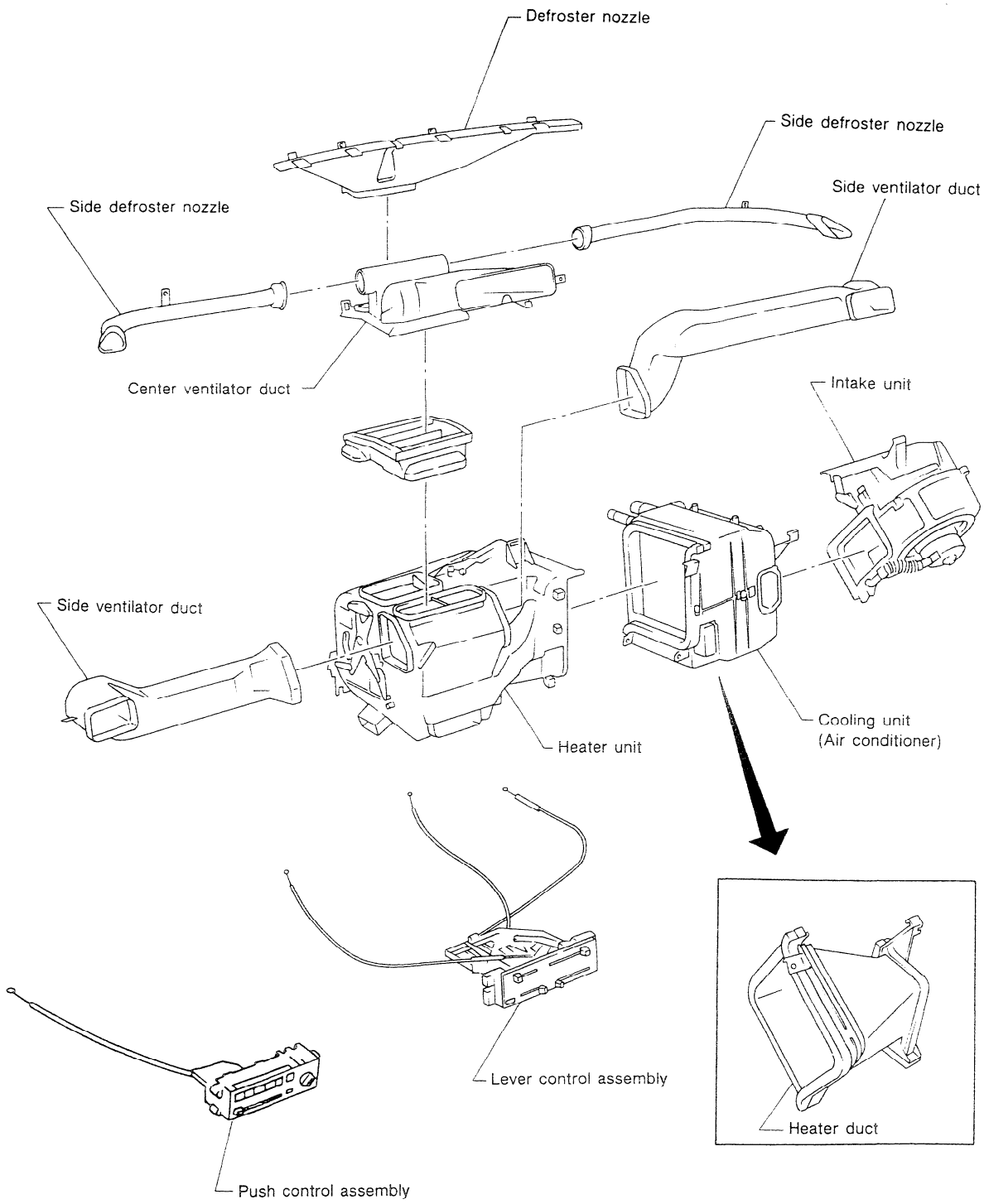
Start the engine, move the fan control lever to the desired (1 to 4) position and push the air conditioner switch to turn ON the air conditioner. The indicator light will come on when the air conditioner is ON. To stop the air conditioner, push the switch again to return it to the original position.

The air conditioner cooling function operates only when the engine is running.

Fresh Vent Lever (Except Europe models)

In order to prevent unpleasant hot air in the heater mode, or especially in the FOOT, FOOT/DEF or DEF modes, this system can provide cold air flow to the ventilator ducts directly (by-passing the heater core) by means of a fresh vent lever beside the center vent duct.

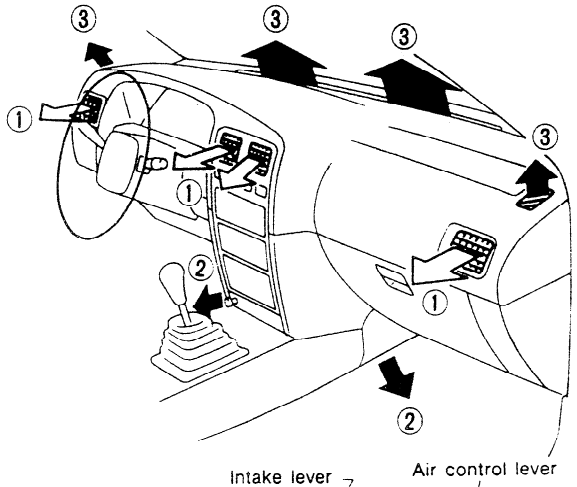
Component Layout

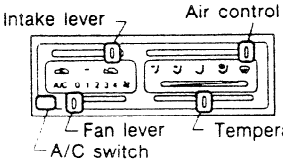


This illustration is for L.H. drive models.
R.H. drive models are basically the same.

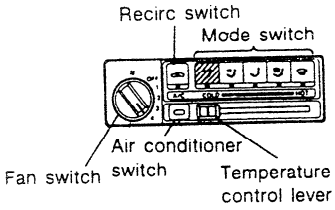
RHA897B

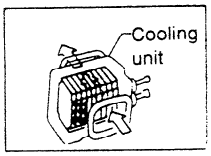
Air Flow

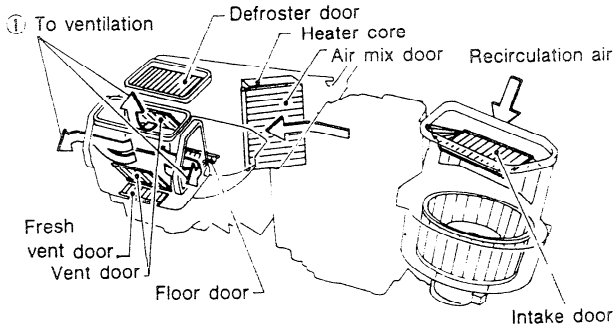




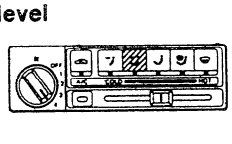
Ventilation

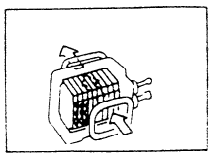


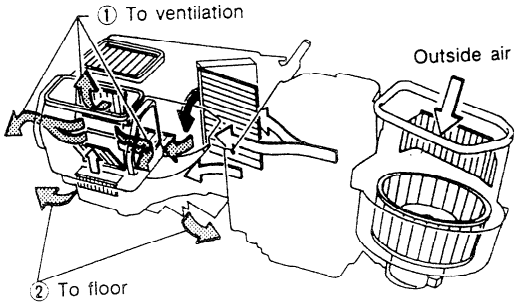




Bi-level

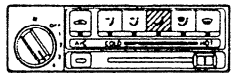


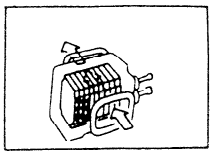


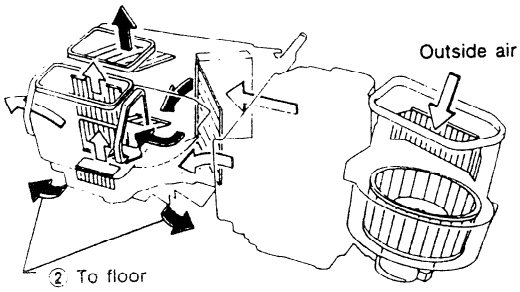


These illustrations are for L.H. drive models.
R.H. drive models are basically the same.

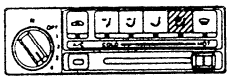
Floor

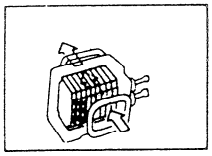


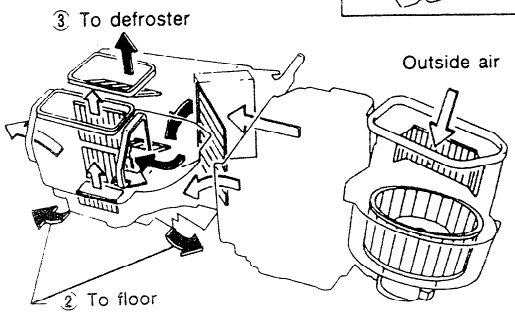




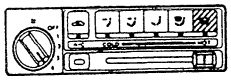
Floor and defroster

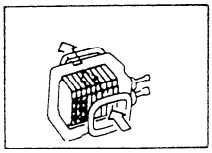


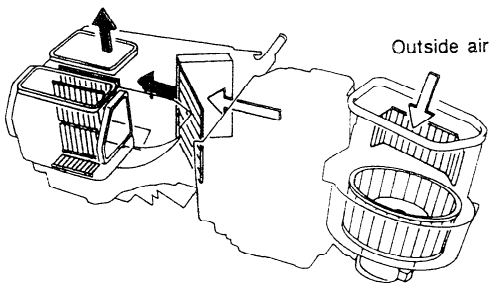




Defroster







: Air passed through heater core
: Mixed air (+)
: Air not passed through heater core

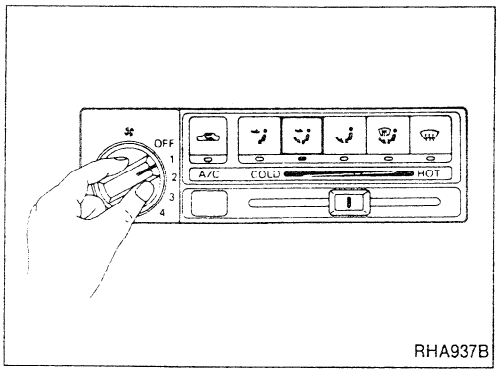
RHA895B

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.
Fresh vent "OFF"

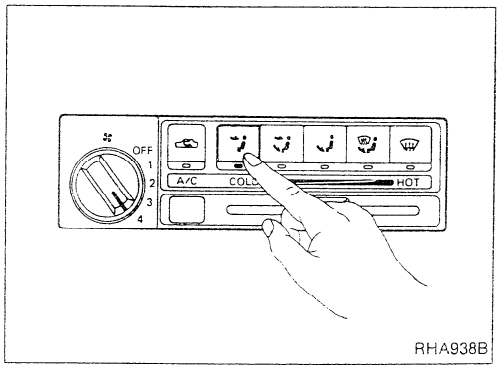


RHA937B

PROCEDURE:

1. Check blower

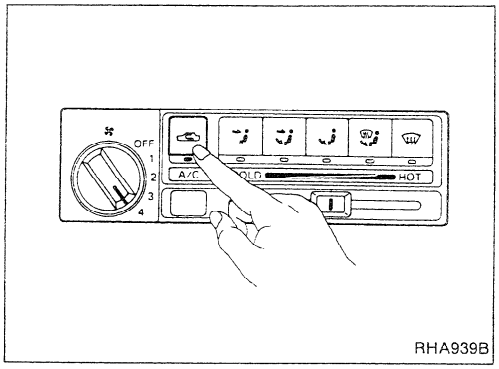
1) Turn or slide fan lever to 1-speed.
   Blower should operate on 1-speed.
2) Then turn or slide fan lever to 2-speed.
3) Continue checking blower speed until all four speeds are checked.
4) Leave blower on 4-speed.



RHA938B

2. Check discharge air

1) Press the VENT button or slide air control lever to VENT.
   VENT indicator should light. (Push control type only)
2) Confirm that all discharge air comes out of face vents.
3) Press the B/L button or slide air control lever to B/L.
   B/L indicator should light. (Push control type only)
4) Confirm that discharge air comes out of face vents and foot vents.
5) Press the FOOT button or slide air control lever to FOOT.
   FOOT indicator should light. (Push control system only)
6) Confirm that discharge air comes out of foot vents, with some air from defroster vents.
7) Press the F/D button or slide air control lever to F/D.
   F/D indicator should light. (Push control type only)
8) Confirm that discharge air comes out of foot vents, with some air from defroster vents. Intake door position is at FRE. (L.H.D. models push control type only)
9) Press the DEF button or slide air control lever to DEF.
   DEF indicator should light. (Push control type only)
10) The discharge air should be coming only from defroster vents. At the same time the intake door position should be at FRE. (L.H.D. models push control type only)

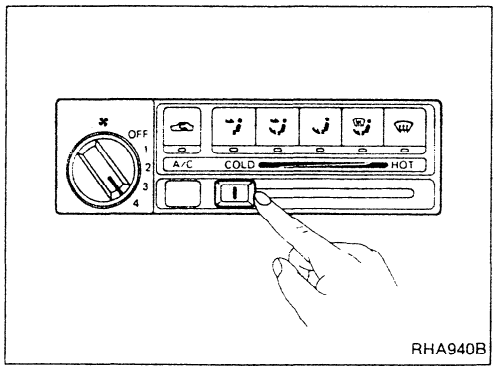


RHA939B

3. Check RECIRC

1) Press RECIRC button or slide intake lever to RECIRC.
   RECIRC indicator should light. (Push control type only)
2) Listen for intake door position change (you should hear blower sound change slightly).

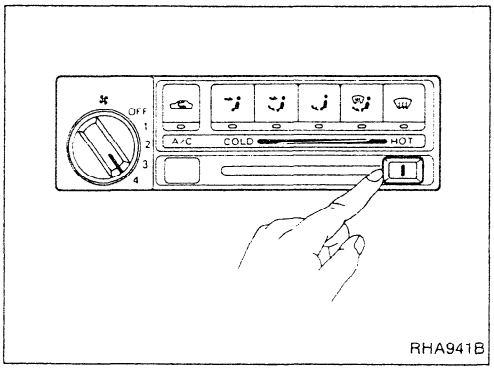
Operational Check (Cont'd)



RHA940B

4. Check temperature decrease

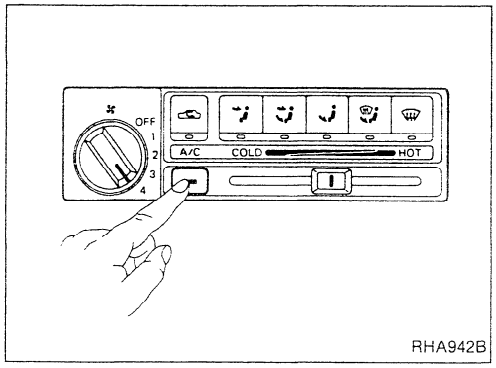
1) Slide temperature control lever to full cold.
2) Check for cold air at discharge air outlets.



RHA941B

5. Check temperature increase

1) Slide temperature control lever to full hot.
2) Check for hot air at discharge air outlets.



RHA942B

6. Check air conditioner switch

Move the fan control lever to the desired (1 to 4-speed) position and push the air conditioner button to turn ON the air conditioner.
The indicator light should come on when air conditioner is ON.

Refrigeration Cycle

REFRIGERANT FLOW

The refrigerant flows in the standard pattern, that is, through the compressor, the condenser, the receiver drier, through the 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.

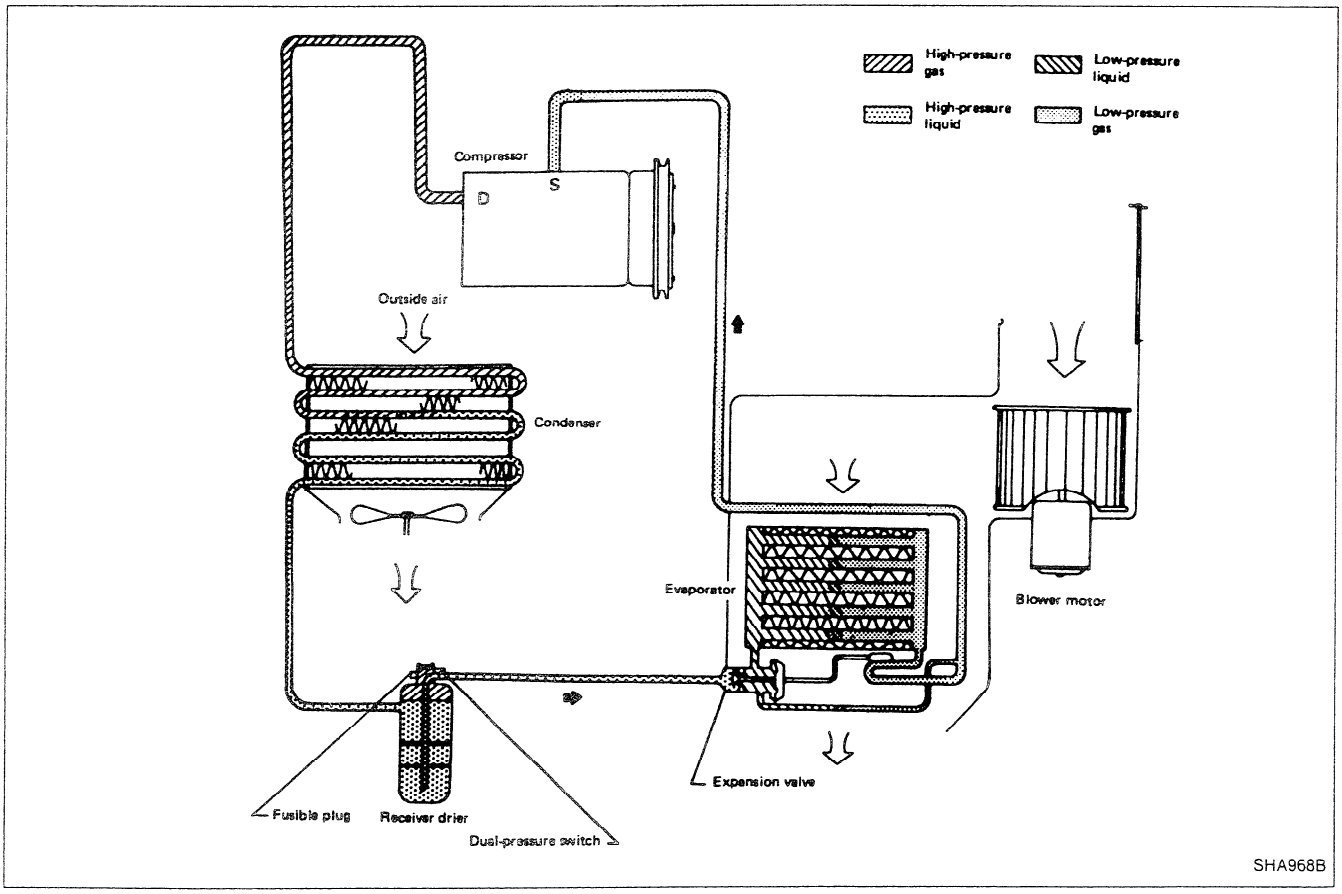
REFRIGERANT SYSTEM PROTECTION

Dual-pressure switch

The refrigerant system is protected against excessively high or low pressures by the dual-pressure switch, located on the receiver drier. If the system pressure rises above, or falls below the specifications, the dual-pressure switch opens to interrupt the compressor operation.

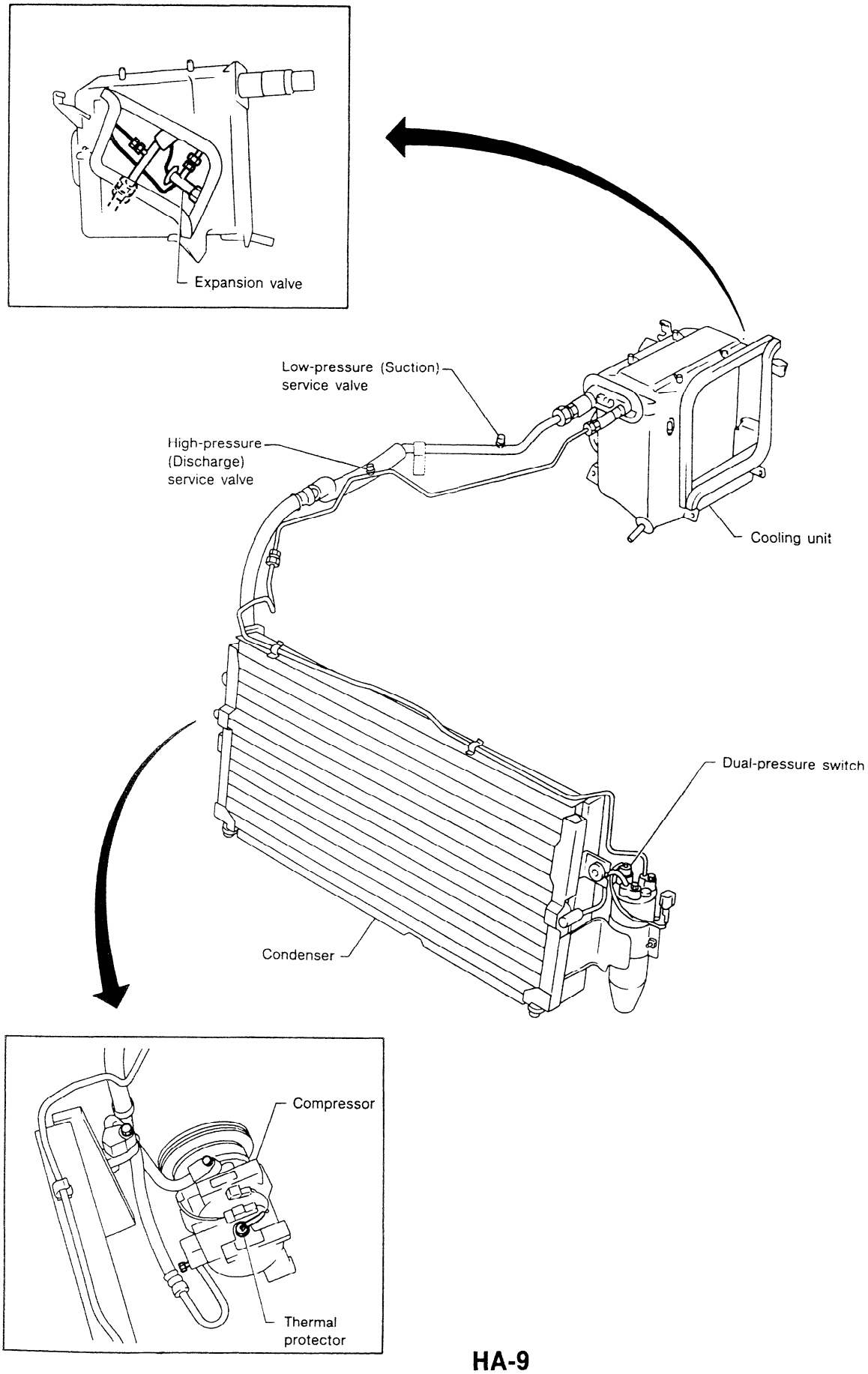
Fusible plug

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 receiver drier.



Refrigerant System

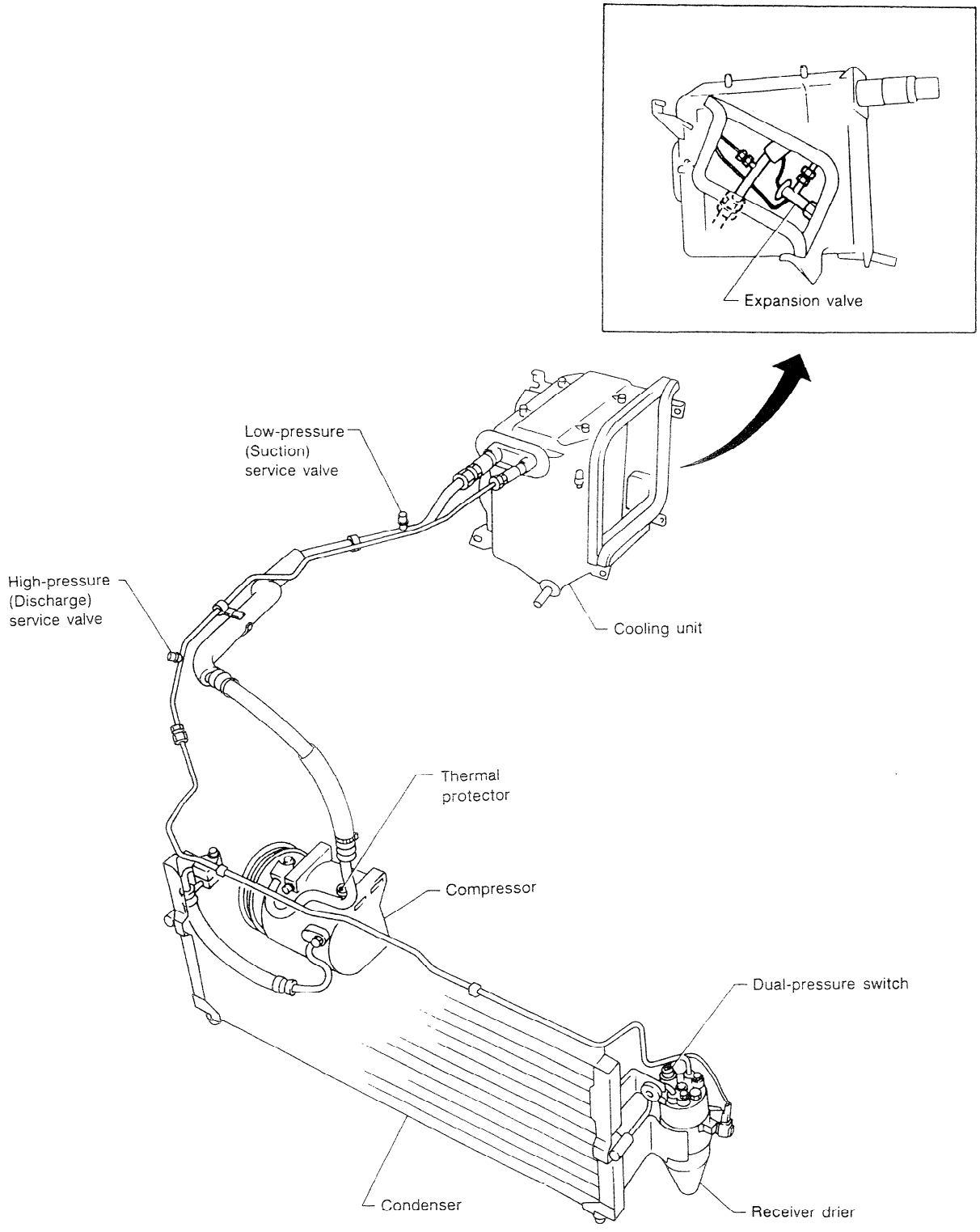
EXCEPT FOR SR20DE ENGINE — L.H.D. MODELS



RHA272C

Refrigerant System (Cont'd)

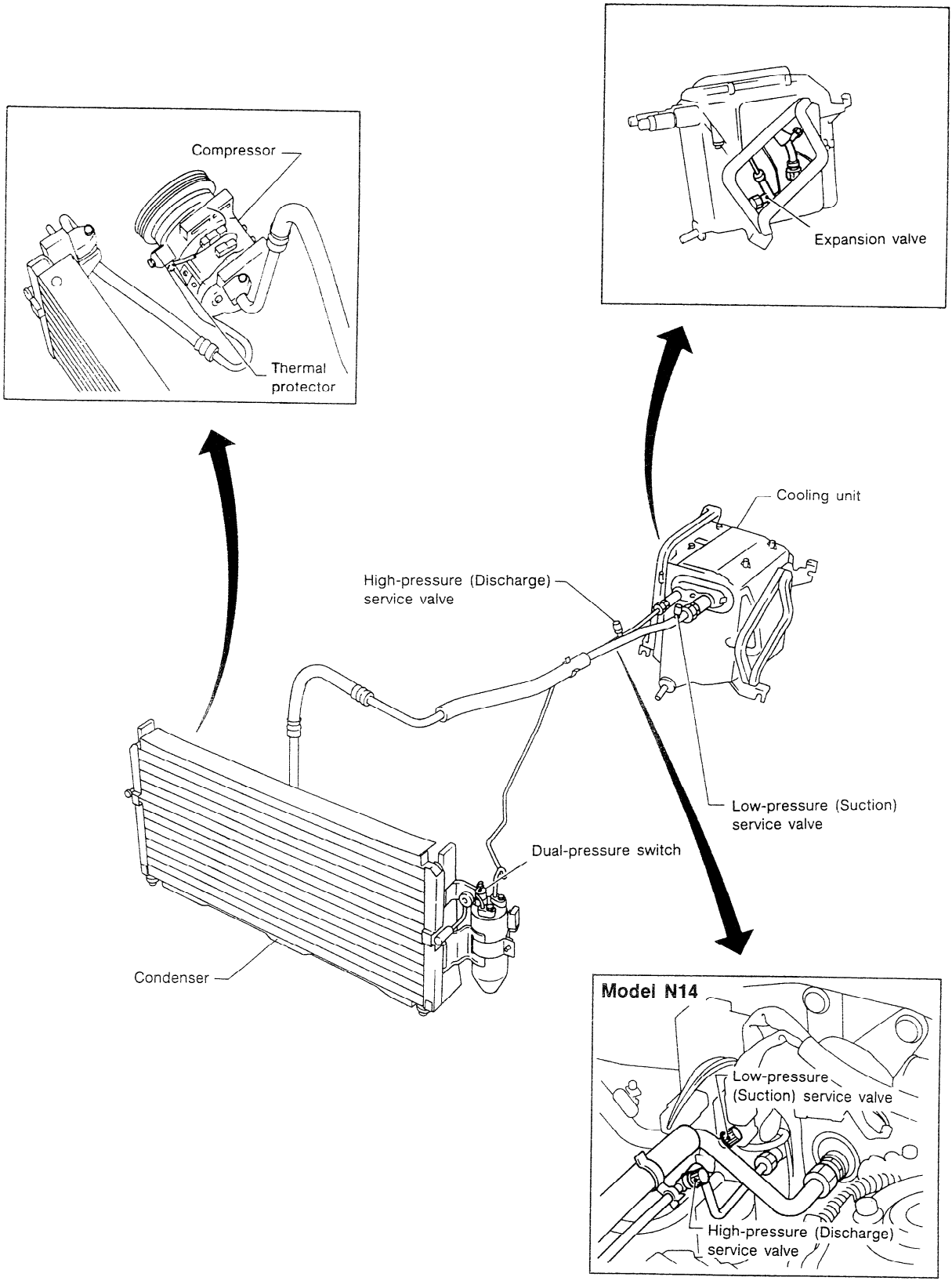
SR20DE ENGINE — L.H.D. MODELS



SHA869C

Refrigerant System (Cont'd)

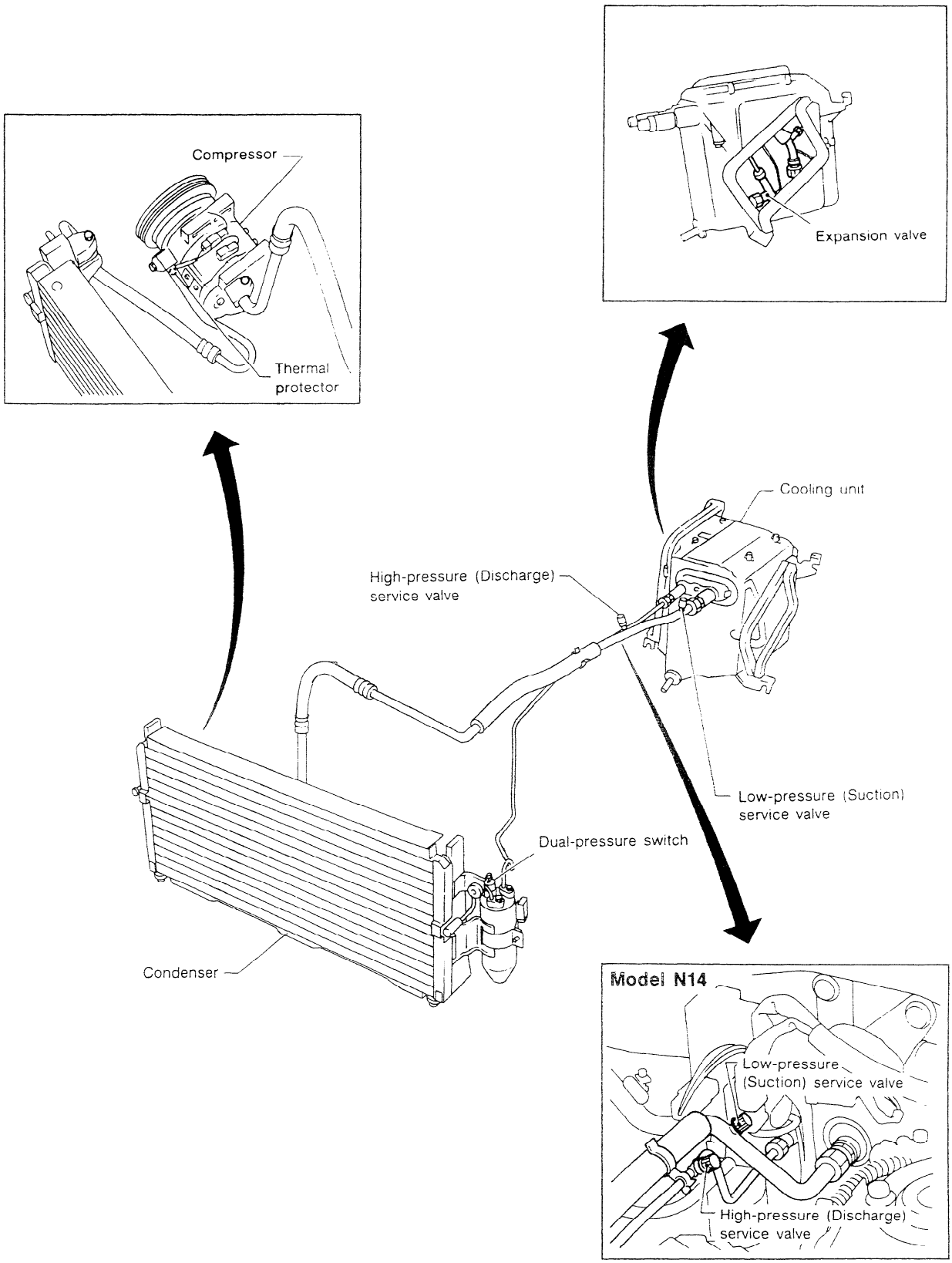
EXCEPT FOR SR20DE ENGINE — R.H.D. MODELS



RHA944B

Refrigerant System (Cont'd)

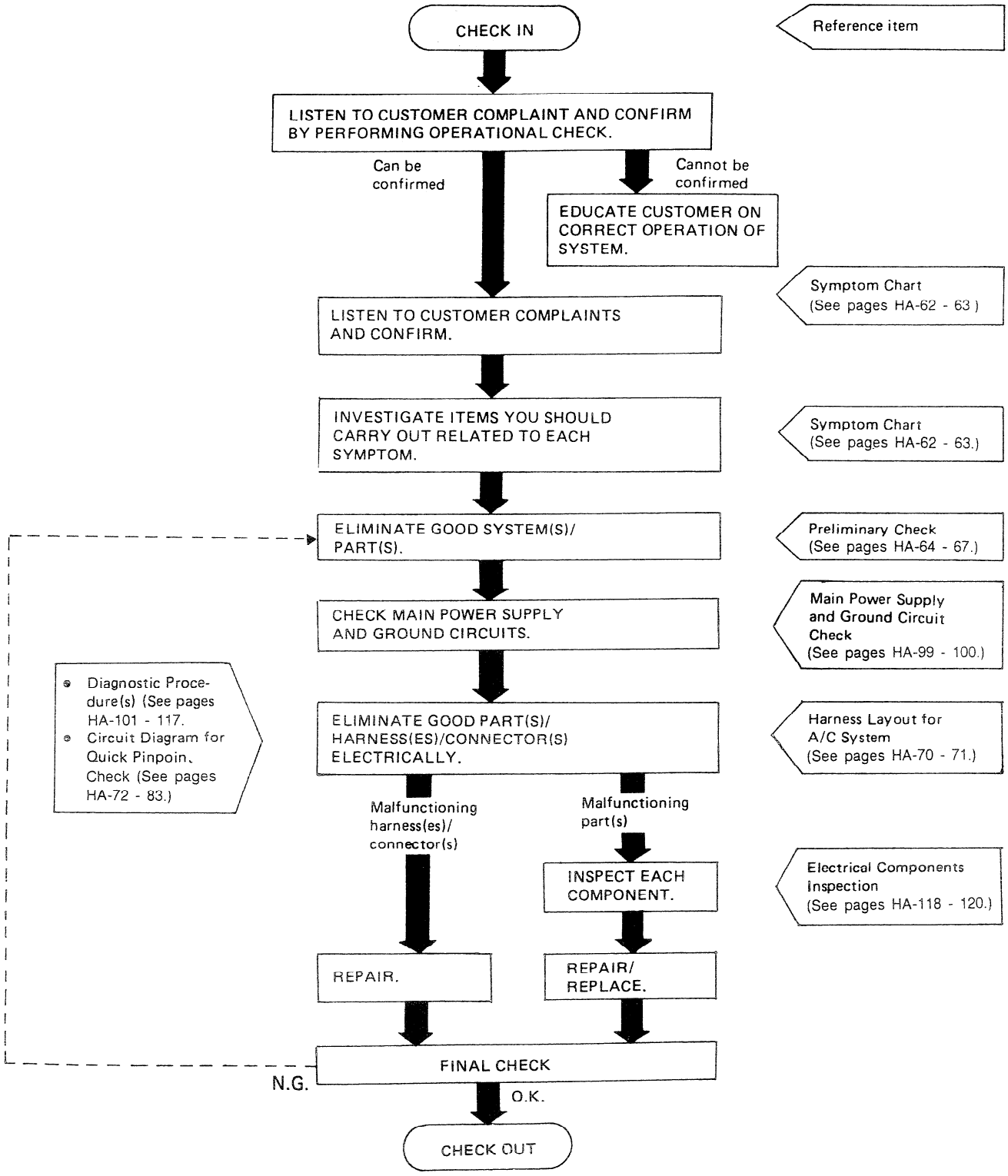
SR20DE ENGINE — R.H.D. MODELS



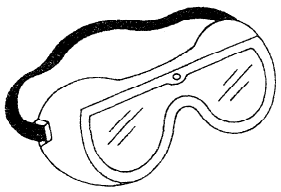
RHA273C

How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW

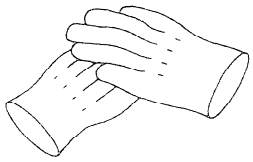


Goggles



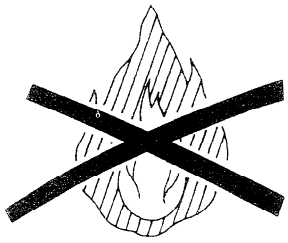
RHA260B

Gloves



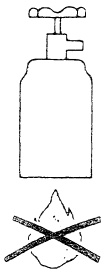
RHA261B

Avoid Open Flame

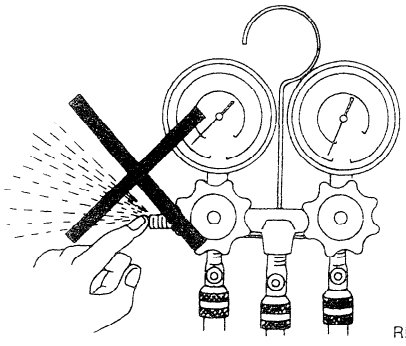


RHA262B

No Direct Heat on Container



RHA263B



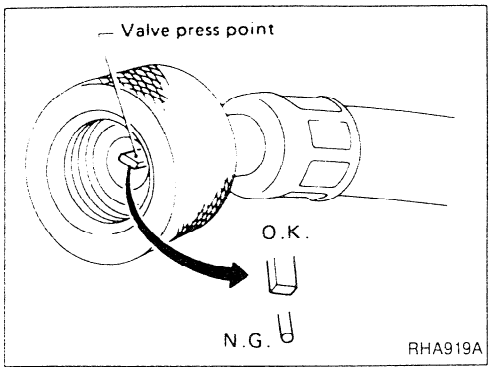
RHA676B

PRECAUTIONS FOR THE HANDLING OF REFRIGERANT

- **Always wear eye protection when working around the system.**
- **Always be careful that refrigerant does not come in contact with your skin.**
- **Keep refrigerant containers stored below 40°C (104°F) and never drop from high places.**
- **Work in well-ventilated area because refrigerant gas evaporates quickly and breathing may become difficult due to the lack of oxygen.**
- **Keep refrigerant away from open flames because poisonous gas will be produced if it burns.**
- **Do not increase can temperature beyond 40°C (104°F) in charging.**
- **Do not heat refrigerant container with an open flame. There is a danger that container will explode.**

CAUTION:

- **Do not use steam to clean surface of condenser or evaporator. Be sure to use cold water or compressed air.**
- **Compressed air must never be used to clean a dirty line.**
- **Do not release refrigerant into the atmosphere.**



- Do not use manifold gauge whose press point shape is different from that shown. Otherwise, insufficient evacuating may occur.

- Do not over-tighten service valve cap.
- Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.

Performance Chart

TEST CONDITION

Testing must be performed as follows:

Vehicle location: In doors or in the shade (in a well ventilated place)
Doors: Closed
Door window: Open
Hood: Open
TEMP. lever position: Max. COLD
Air control lever position or mode switch: (Ventilation)
INTAKE lever position : (Recirculation)
FAN lever position or recirc switch: Max. position
Engine speed: 1,500 rpm
Time required before starting testing after air conditioner starts operating: More than 10 minutes

TEST READING (Model B13 L.H.D.)

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)	5.9 - 7.8 (43 - 46)
	25 (77)	8.0 - 10.7 (46 - 51)
	30 (86)	11.0 - 14.4 (52 - 58)
	35 (95)	14.8 - 19.4 (59 - 67)
60 - 70	20 (68)	7.8 - 9.9 (46 - 50)
	25 (77)	10.7 - 13.6 (51 - 56)
	30 (86)	14.4 - 18.2 (58 - 65)
	35 (95)	19.4 - 24.8 (67 - 77)

Ambient air temperature-to-compressor 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)	608 - 912 (6.08 - 9.12, 6.2 - 9.3, 88 - 132)	177 - 245 (1.77 - 2.45, 1.8 - 2.5, 26 - 36)
	25 (77)	814 - 1,147 (8.14 - 11.47, 8.3 - 11.7, 118 - 166)	186 - 255 (1.86 - 2.55, 1.9 - 2.6, 27 - 37)
	30 (86)	1,020 - 1,402 (10.20 - 14.02, 10.4 - 14.3, 148 - 203)	196 - 265 (1.96 - 2.65, 2.0 - 2.7, 28 - 38)
	35 (95)	1,236 - 1,638 (12.36 - 16.38, 12.6 - 16.7, 179 - 237)	226 - 314 (2.26 - 3.14, 2.3 - 3.2, 33 - 46)

Performance Chart (Cont'd)

TEST READING (Model B13 R.H.D.)

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)	
40 - 60	20 (68)	3.5 - 5.2 (38 - 41)
	25 (77)	5.8 - 8.6 (42 - 47)
	30 (86)	9.2 - 13.2 (49 - 56)
	35 (95)	13.4 - 19.0 (56 - 66)
60 - 80	20 (68)	5.2 - 7.6 (41 - 46)
	25 (77)	8.6 - 12.0 (47 - 54)
	30 (86)	13.2 - 18.0 (56 - 64)
	35 (95)	19.0 - 24.5 (66 - 76)

Ambient air temperature-to-compressor 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)		
40 - 80	20 (68)	785 - 1,020 (7.85 - 10.20, 8.0 - 10.4, 114 - 148)	137 - 196 (1.37 - 1.96, 1.4 - 2.0, 20 - 28)
	25 (77)	932 - 1,216 (9.32 - 12.16, 9.5 - 12.4, 135 - 176)	147 - 216 (1.47 - 2.16, 1.5 - 2.2, 21 - 31)
	30 (86)	1,108 - 1,432 (11.08 - 14.32, 11.3 - 14.6, 161 - 208)	157 - 255 (1.57 - 2.55, 1.6 - 2.6, 23 - 37)
	35 (95)	1,304 - 1,716 (13.04 - 17.16, 13.3 - 17.5, 189 - 249)	177 - 294 (1.77 - 2.94, 1.8 - 3.0, 26 - 43)

Performance Chart (Cont'd)

TEST READING (Model N14)

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)	
40 - 60	20 (68)	3.4 - 5.0 (38 - 41)
	25 (77)	5.5 - 8.1 (42 - 47)
	30 (86)	8.4 - 12.2 (47 - 54)
	35 (95)	11.9 - 17.1 (53 - 63)
60 - 80	20 (68)	5.0 - 7.0 (41 - 45)
	25 (77)	8.1 - 11.1 (47 - 52)
	30 (86)	12.2 - 16.4 (54 - 62)
	35 (95)	17.1 - 23.5 (63 - 74)

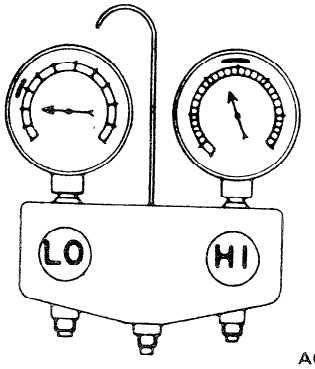
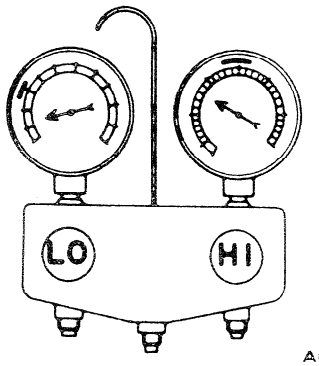
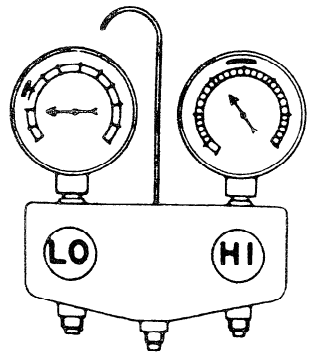
Ambient air temperature-to-compressor pressure table

Ambient air		High-pressure (Discharge side) kPa(bar, kg/cm², psi)	Low-pressure (Suction side) kPa (bar, kg/cm², psi)
Relative humidity %	Air temperature °C (°F)		
40 - 80	20 (68)	834 - 1,098 (8.34 - 10.98, 8.5 - 11.2, 121 - 159)	127 - 186 (1.27 - 1.86, 1.3 - 1.9, 18 - 27)
	25 (77)	1,000 - 1,314 (10.00 - 13.14, 10.2 - 13.4, 145 - 191)	137 - 216 (1.37 - 2.16, 1.4 - 2.2, 20 - 31)
	30 (86)	1,177 - 1,540 (11.77 - 15.40, 12.0 - 15.7, 171 - 223)	147 - 245 (1.47 - 2.45, 1.5 - 2.5, 21 - 36)
	35 (95)	1,353 - 1,804 (13.53 - 18.04, 13.8 - 18.4, 196 - 262)	167 - 294 (1.67 - 2.94, 1.7 - 3.0, 24 - 43)

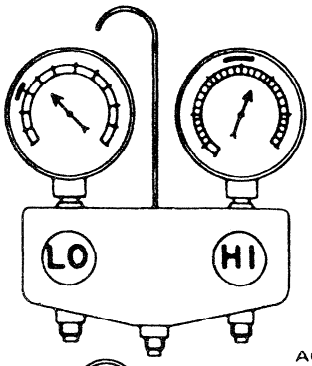
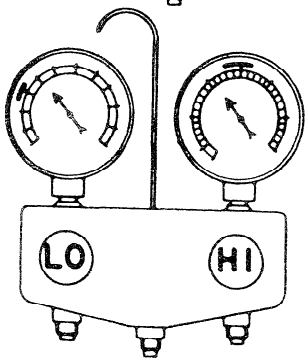
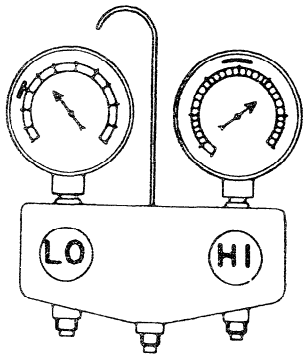
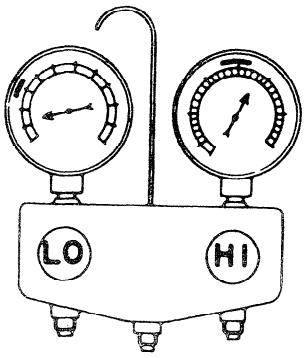
Performance Test Diagnoses

Characteristics revealed by the manifold gauge readings for the air conditioning system are shown in the following.
For how to do the performance test, refer to the item "Performance Chart".

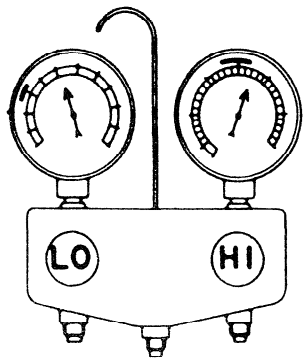
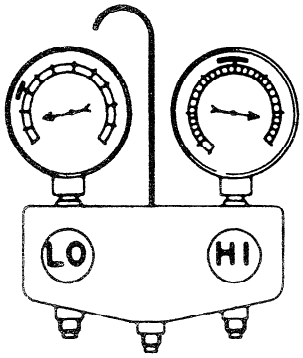
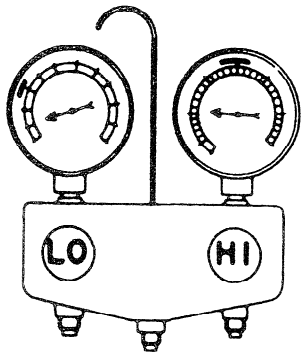
In the following table, the portion smeared with ink on each gauge scale indicates the range showing that the air conditioning system is in good order. This range is described in Performance Chart.

Condition		Probable cause	Corrective action
INSUFFICIENT REFRIGERANT CHARGE			
 AC352A	Insufficient cooling. Bubbles appear in sight glass.	Refrigerant is low, or leaking slightly.	1. Leak test. 2. Repair leak. 3. Charge system. **Evacuate, as necessary, and recharge system.**
ALMOST NO REFRIGERANT			
 AC353A	No cooling action. A lot of bubbles or something like mist appears in sight glass.	Serious refrigerant leak.	**Stop compressor immediately.** 1. Leak test. 2. Discharge system. 3. Repair leak(s). 4. Replace receiver drier if necessary. 5. Check oil level. 6. Evacuate and recharge system.
MALFUNCTIONING EXPANSION VALVE			
 AC354A	Slight cooling. Sweat or frosting on expansion valve inlet.	Expansion valve restricts refrigerant flow. ● Expansion valve is clogged. ● Expansion valve is inoperative. Valve stuck closed. Thermal bulb has lost charge.	If valve inlet reveals sweat or frost: 1. Discharge system. 2. Remove valve and clean it. Replace it if necessary. 3. Evacuate system. 4. Charge system. If valve does not operate: 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.

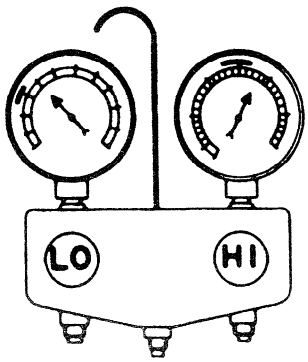
Performance Test Diagnoses (Cont'd)

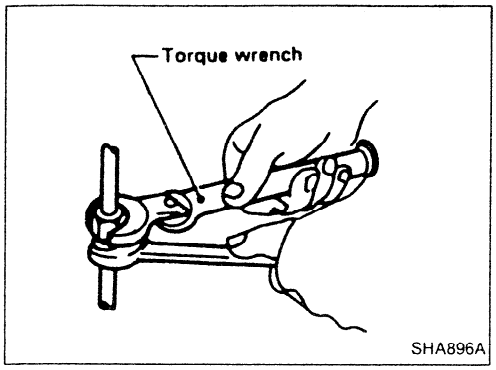
Condition		Probable cause	Corrective action
 AC355A	Insufficient cooling. Sweat on suction line.	Expansion valve allows too much refrigerant through evaporator.	Check valve for operation. If suction side does not show a pressure decrease, replace valve.
 AC356A	No cooling. Sweat or frosting on suction line.	Malfunctioning expansion valve.	1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.
AIR IN SYSTEM  AC359A	Insufficient cooling. Sight glass shows occasional bubbles.	Air mixed with refrigerant in system.	1. Discharge system. 2. Replace receiver drier. 3. Evacuate and charge system.
MOISTURE IN SYSTEM  AC360A	After short operation, suction side may show vacuum pressure reading. During this condition, discharge air will be warm. As a warning of this, reading vibrates around 39 kPa (0.39 bar, 0.4 kg/cm^2, 6 psi).	Drier is saturated with moisture. Moisture has frozen in expansion valve. Refrigerant flow is restricted.	1. Discharge system. 2. Replace receiver drier (twice if necessary). 3. Evacuate system completely. (Repeat 30-minutes evacuating three times.) 4. Recharge system.

Performance Test Diagnoses (Cont'd)

Condition		Probable cause	Corrective action
MALFUNCTIONING CONDENSER  AC361A	No cooling action: engine may overheat. Bubbles appear in sight glass of drier. Suction line is very hot.	Usually a malfunctioning condenser.	• Check radiator fan motors. • Check condenser for dirt accumulation. • Check engine cooling system for overheating. • Check for refrigerant overcharging. **If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging.**
HIGH PRESSURE LINE BLOCKED  AC362A	Insufficient cooling. Frosted high pressure liquid line.	Drier clogged, or restriction in high pressure line.	1. Discharge system. 2. Remove receiver drier or strainer and replace it. 3. Evacuate and charge system.
MALFUNCTIONING COMPRESSOR  AC363A	Insufficient cooling.	Internal problem in compressor, or damaged gasket and valve.	1. Discharge system. 2. Remove and check compressor. 3. Repair or replace compressor. 4. Check oil level. 5. Replace receiver drier. 6. Evacuate and charge system.

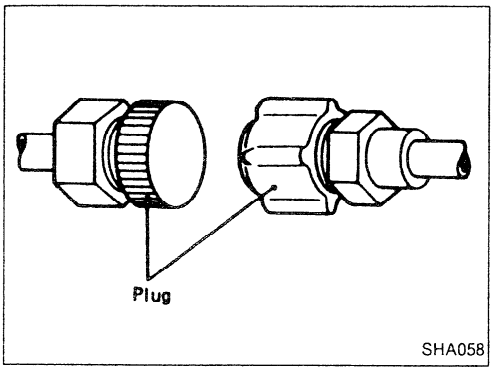
Performance Test Diagnoses (Cont'd)

Condition		Probable cause	Corrective action
TOO MUCH OIL IN SYSTEM (Excessive)  AC364A	Insufficient cooling.	Too much oil circulates with refrigerant, causing the cooling capacity of the system to be reduced.	Refer to COMPRESSOR OIL for correcting oil level.

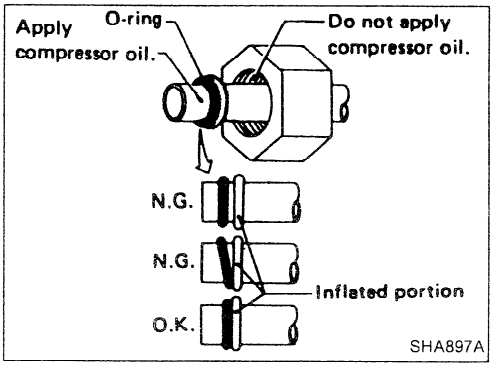


WARNING:
Gradually loosen discharge side hose fitting, and remove it after remaining pressure has been released.
CAUTION:
When replacing or cleaning refrigerant cycle components, observe the following.

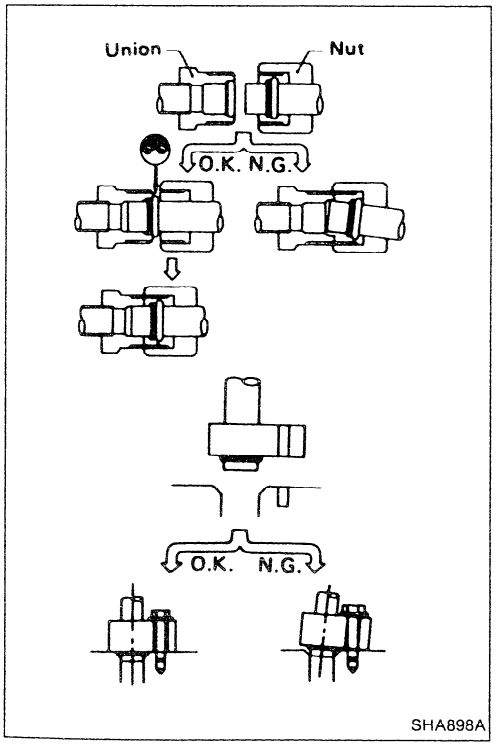
- **Do not leave compressor on its side or upside down for more than 10 minutes, as compressor oil will enter low pressure chamber.**
- **When connecting tubes, always use a torque wrench and a back-up wrench.**



- After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.



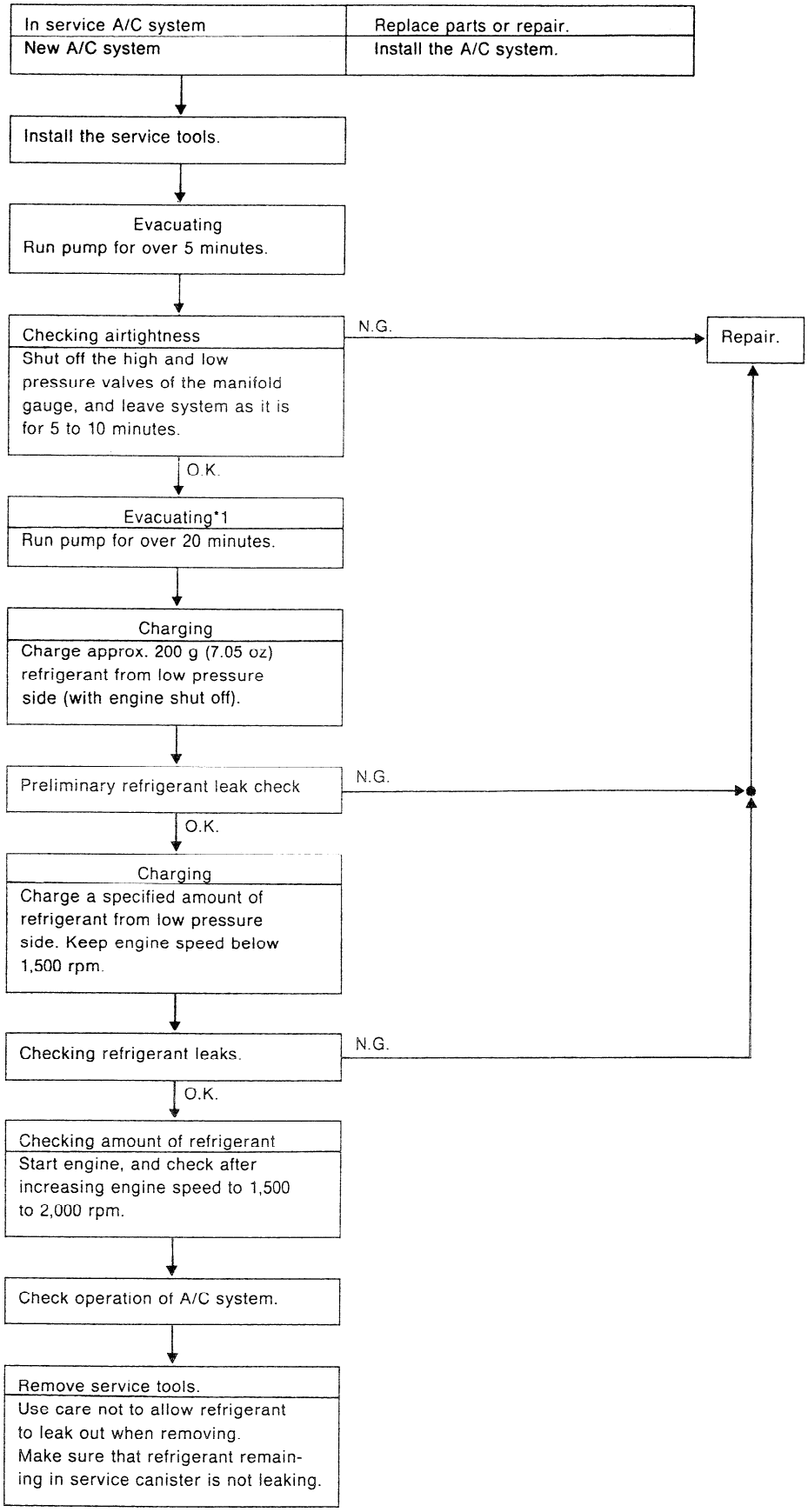
- Always replace used O-rings.
- When connecting tube, apply compressor oil to portions shown in illustration. Be careful not to apply oil to threaded portion.
- O-ring must be closely attached to inflated portion of tube.



- After inserting tube into union until O-ring is no longer visible,tighten nut to specified torque.
- 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.

Refrigerant Charging Procedure

WORK PROCEDURE

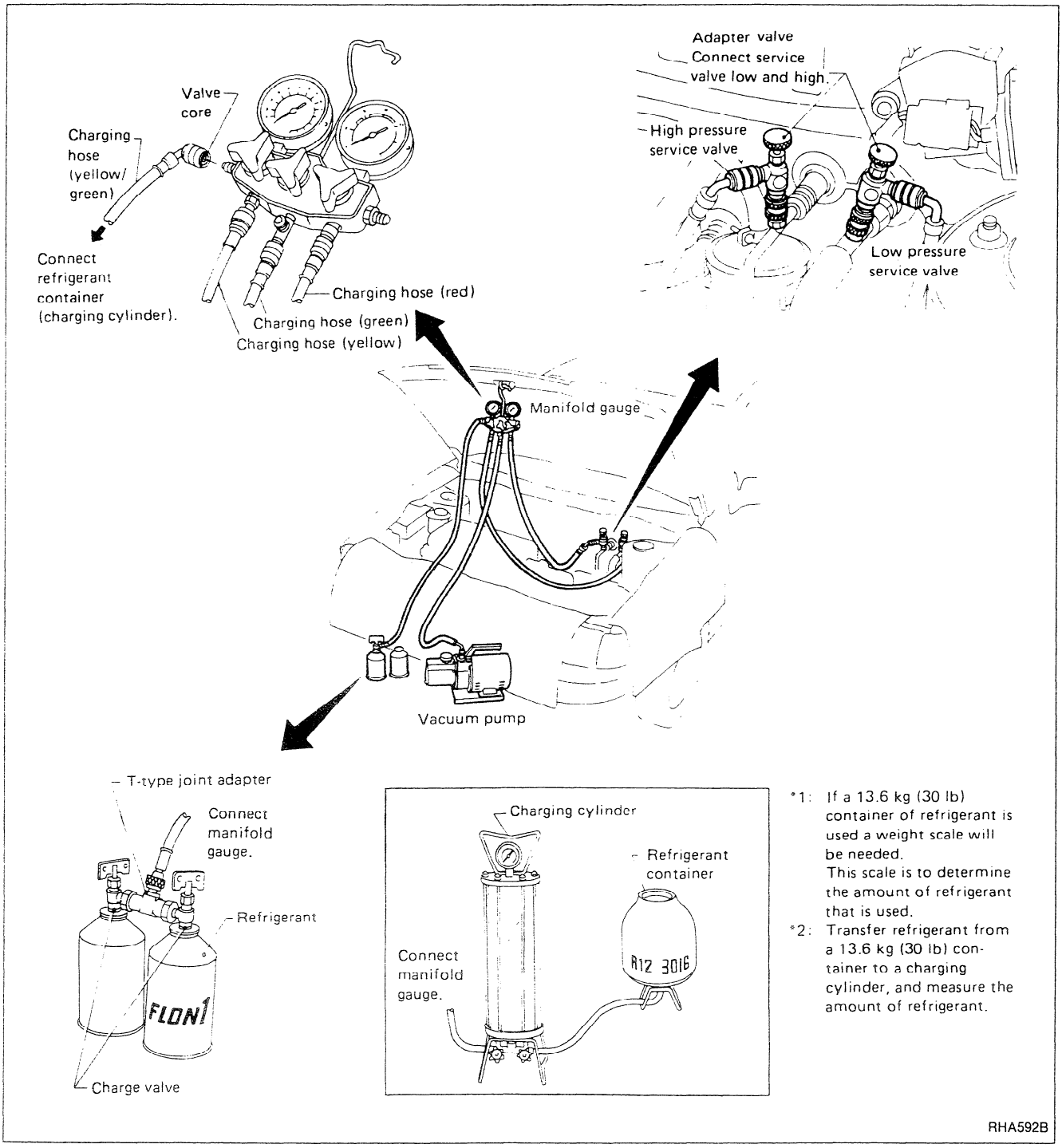


*1: Working operation depends upon the performance of the pump and the weather.

Refrigerant Charging Procedure (Cont'd)

SETTING OF SERVICE TOOLS

Make sure that the service tools are set as indicated below and that no refrigerant is leaking.



*1: If a 13.6 kg (30 lb) container of refrigerant is used a weight scale will be needed.
This scale is to determine the amount of refrigerant that is used.

*2: Transfer refrigerant from a 13.6 kg (30 lb) container to a charging cylinder, and measure the amount of refrigerant.

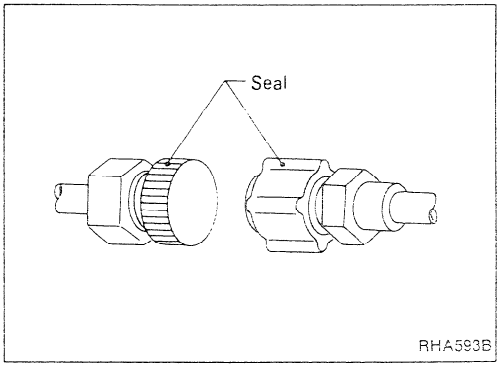
RHA592B

Evacuation

Why evacuation is needed

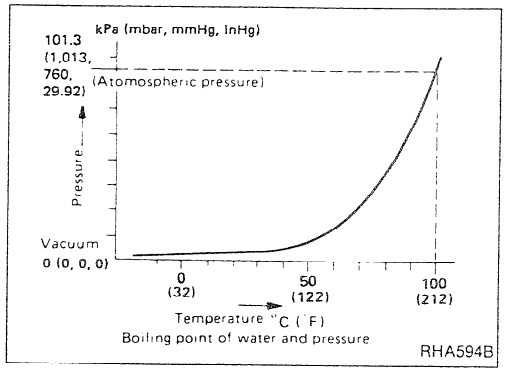
When installing a car air conditioner, it is essential to completely remove air and water from the inside of the refrigeration system beforehand. This process is called evacuation. If the air conditioner is operated without completely removing these substances, the following abnormalities may result.

- Poor cooling due to reduction in the thermal exchange rate in condenser
- Moisture recirculating together with the refrigerant through the refrigeration system freezes at the port of the cold expansion valve. This impedes the normal refrigerant flow, thus lowering the cooling efficiency.
- The refrigerant reacts with water chemically, generating corrosive hydrochloric acid thus causing corrosion to the refrigeration system components.



CAUTION:

- **When installing an air conditioner in the vehicle, the pipes must be connected as the final stage of the operation. The seal caps of the pipes and other components must not be removed until their removal is required for connection.**
- **Before installing any air conditioner component that has been stored in a cool location to a vehicle that has been exposed to the hot sun, leave the component as it is for some time in a hot location with its seal cap unremoved. This step is necessary to prevent condensation of moisture inside the cold component.**
- **Thoroughly remove moisture from the refrigeration system before charging the refrigerant.**



Relation between boiling point of water and atmospheric pressure

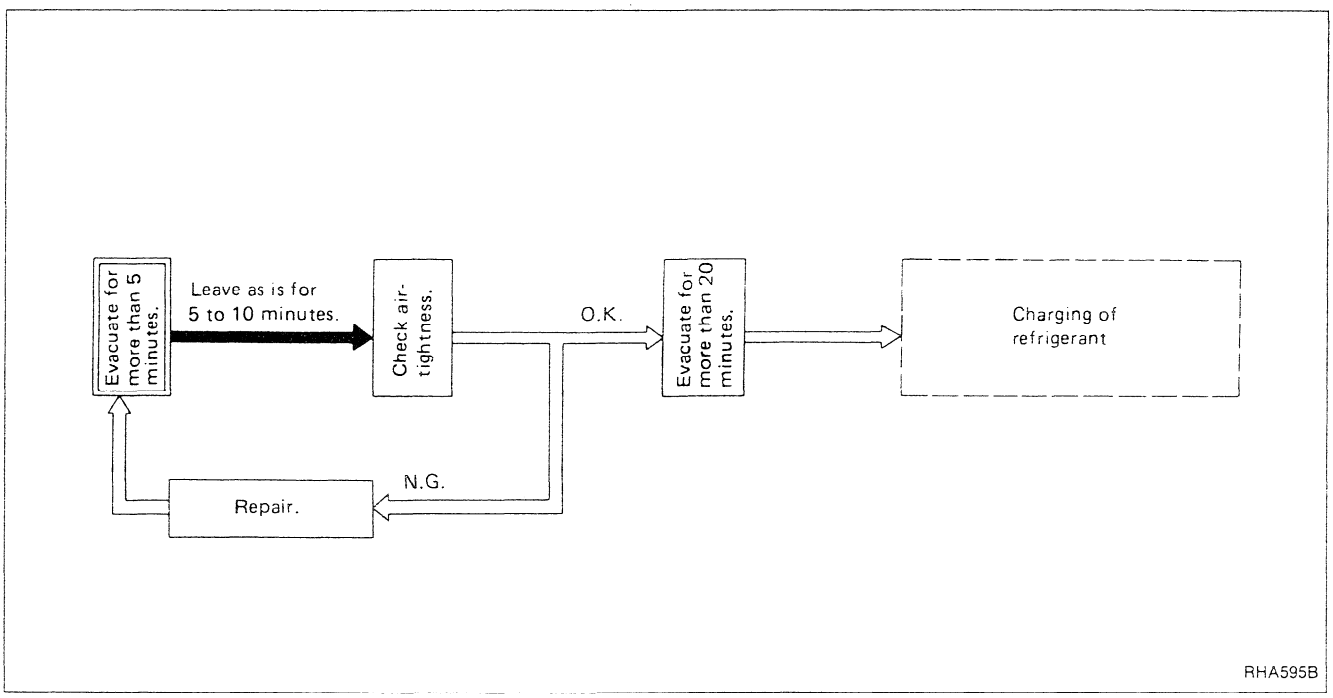
Water boils at 100°C (212°F) under normal atmospheric pressure. The boiling point lowers with the atmospheric pressure. This characteristic of water is utilized to purge it from the system. The pressure inside the refrigeration system is lowered by a vacuum pump so that water can evaporate at a normal temperature. The water vapor is then discharged to the outside together with the air.

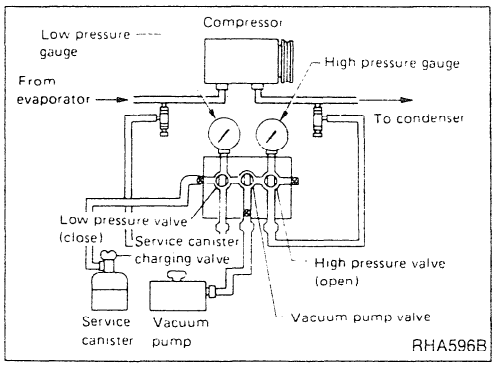
Evacuation (Cont'd)

Vacuum pump

The degree of evacuation greatly affects the cooling capacity of the air conditioner and the service life of the refrigeration system components. However, use of a vacuum pump having insufficient capacity results in prolonged evacuation. It is necessary to use a vacuum pump with a sufficiently large capacity and also to maintain the pump to ensure its original pumping capacity.

EVACUATION PROCEDURE

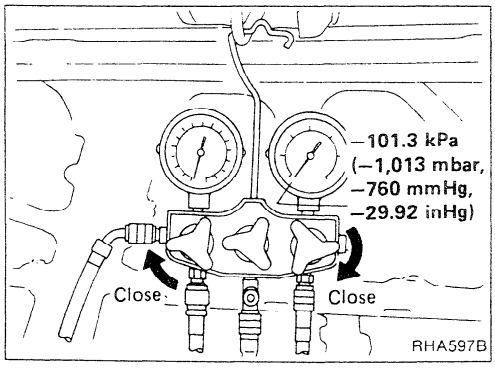




1. Completely tighten the low pressure and high pressure adapter valves.

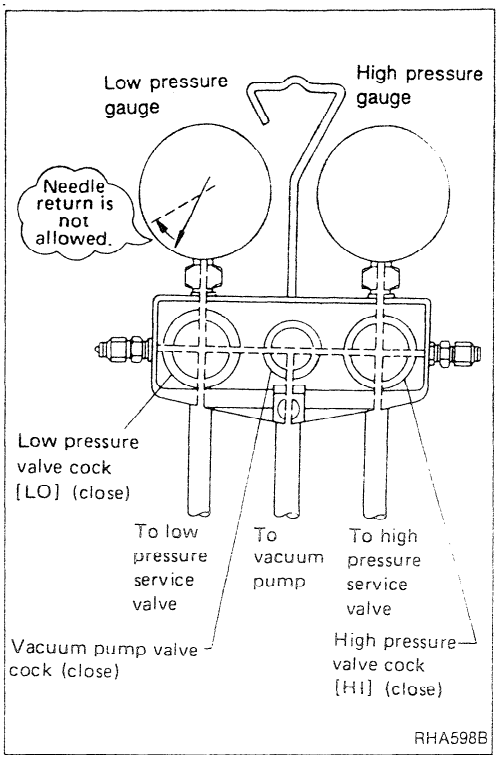
Tightening of the valves opens the service canister valve.

2. Open the high and low pressure valves and vacuum pump valve of the gauge manifold.
3. Run the vacuum pump.



4. Perform evacuation for more than five minutes to stabilize the vacuum inside the system. Check to ensure that the low pressure gauge indicates −98.6 to −101.3 kPa (−986 to −1,013 mbar, −740 to −760 mmHg, −29.13 to −29.92 inHg).
5. Shut off the high and low pressure valves and vacuum pump valve of the gauge manifold.

Evacuation (Cont'd)



CHECKING AIRTIGHTNESS

1. Shut off the high and low pressure valves and vacuum pump valve of the gauge manifold, and leave the system as it is for 5 to 10 minutes.
2. Make sure that the needle of the low pressure gauge will not move back toward the atmospheric pressure side (gauge pressure 0).

If any reverse movement is noted, it indicates poor system airtightness. Service the system until airtightness is complete. If pressure changes approx. 13.3 kPa (133 mbar, 100 mmHg, 3.94 inHg) in 10 minutes, the refrigerant in the system will be exhausted in about one month.

MAINTENANCE

If inadequate airtightness is detected, check and service the following portions:

Leak from pipe joints	Leak from gauge manifold
• Contaminated, damaged, or deformed O-ring • No oil applied when connecting pipe • Excessive or insufficient tightening of pipe joint	• Malfunctioning hose • Improper installation of gauge • Malfunctioning valve • Malfunctioning packing

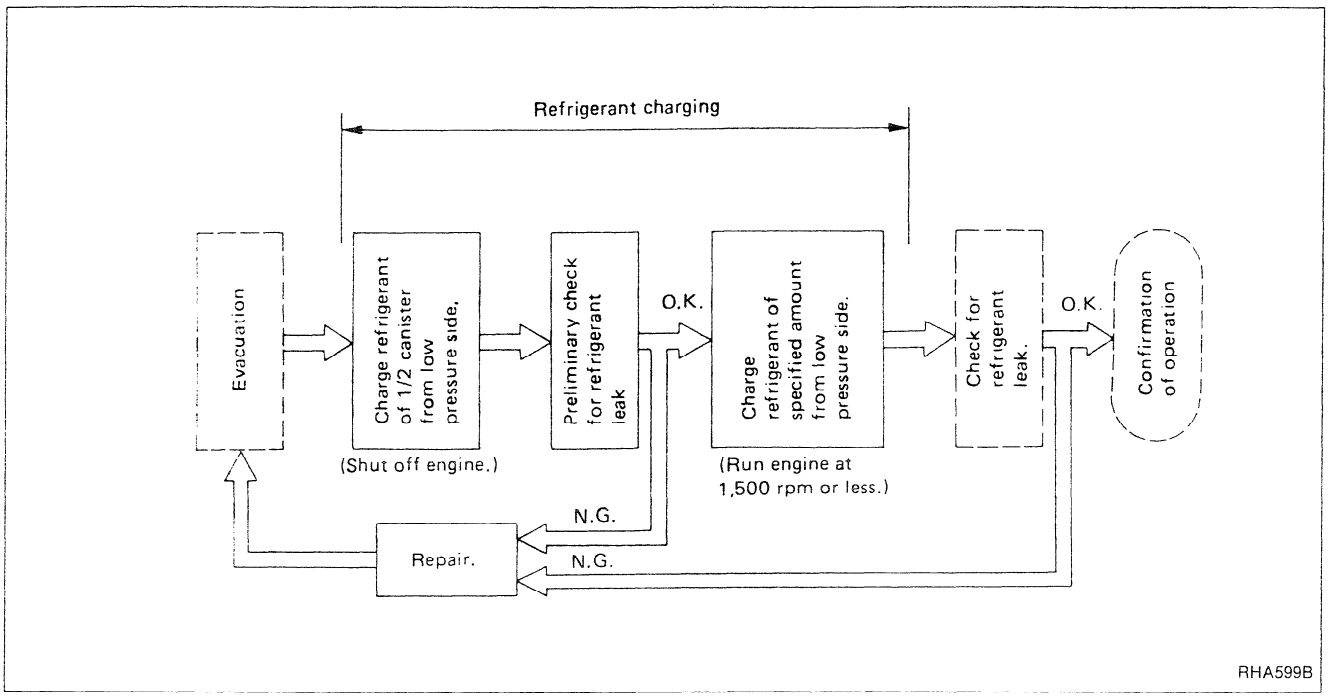
EVACUATION

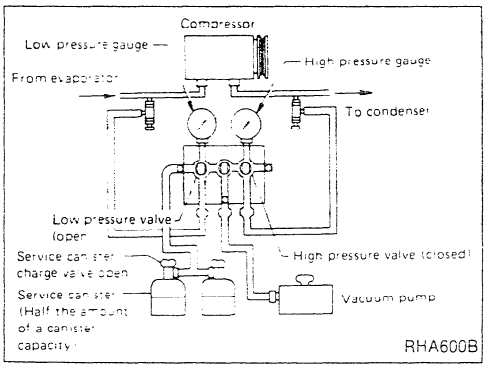
If no abnormality is found during the airtightness check, perform evacuation again for more than 20 minutes.

1. Run the vacuum pump.
2. Open the high and low pressure valve and vacuum pump valve of the gauge manifold.
3. Evacuate for more than 20 minutes.
4. Close the high and low pressure valves and vacuum pump valve of the gauge manifold.

Charging Refrigerant

WORK PROCEDURE





PRELIMINARY CHARGING PROCEDURE

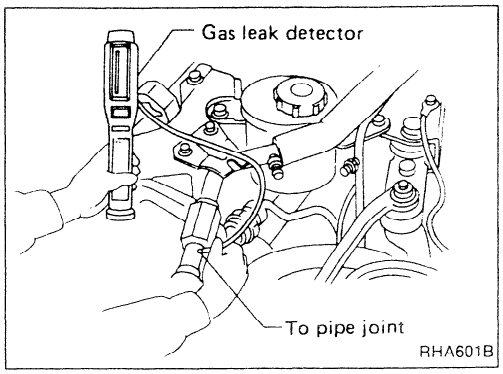
This operation is performed to check the refrigerant leakage and to protect the compressor.

1. Turn the charge valve handle to open a hole in the service canister to allow the refrigerant to flow through the gauge manifold.
2. Open the low pressure valve of the gauge manifold, and charge the refrigerant into the system from the low pressure side.
3. After charging approx. 200 g (7.05 oz) of refrigerant, shut off the low pressure valve.

CAUTION:

- **The refrigerant charging operation must be performed after shutting off the engine. If the compressor is operated with an insufficient amount of refrigerant, the compressor may seize up due to a lack of return of the compressor oil.**
- **Do not shake nor hold the refrigerant canister upside down.**

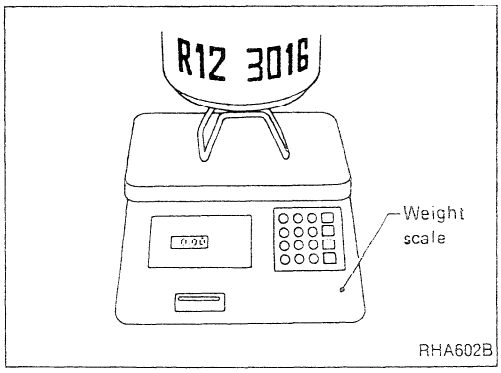
Charging Refrigerant (Cont'd)



PRELIMINARY CHECK FOR REFRIGERANT LEAKS

1. Make sure that the gauge manifold valve is closed.
2. Check for refrigerant leak from each connector in the system using the leak detector.

At this point, the pressure in the system is not high. Only large amounts of refrigerant leak due to loose pipe joints, etc. can be detected.



CHARGING REFRIGERANT

1. Make sure that the valves of the gauge manifold are closed.
2. Start the engine, and run the compressor.
3. Slowly open the low pressure valve of the gauge manifold.
4. Charge the specified amount of refrigerant.

The charged amount of refrigerant can be determined by subtracting the weight of the canister measured after charging from its weight measured before charging.

WARNING:

Never attempt to open the high pressure valve while the engine is running. If opened, the pressure in the refrigerant canister will increase, thus causing an explosion.

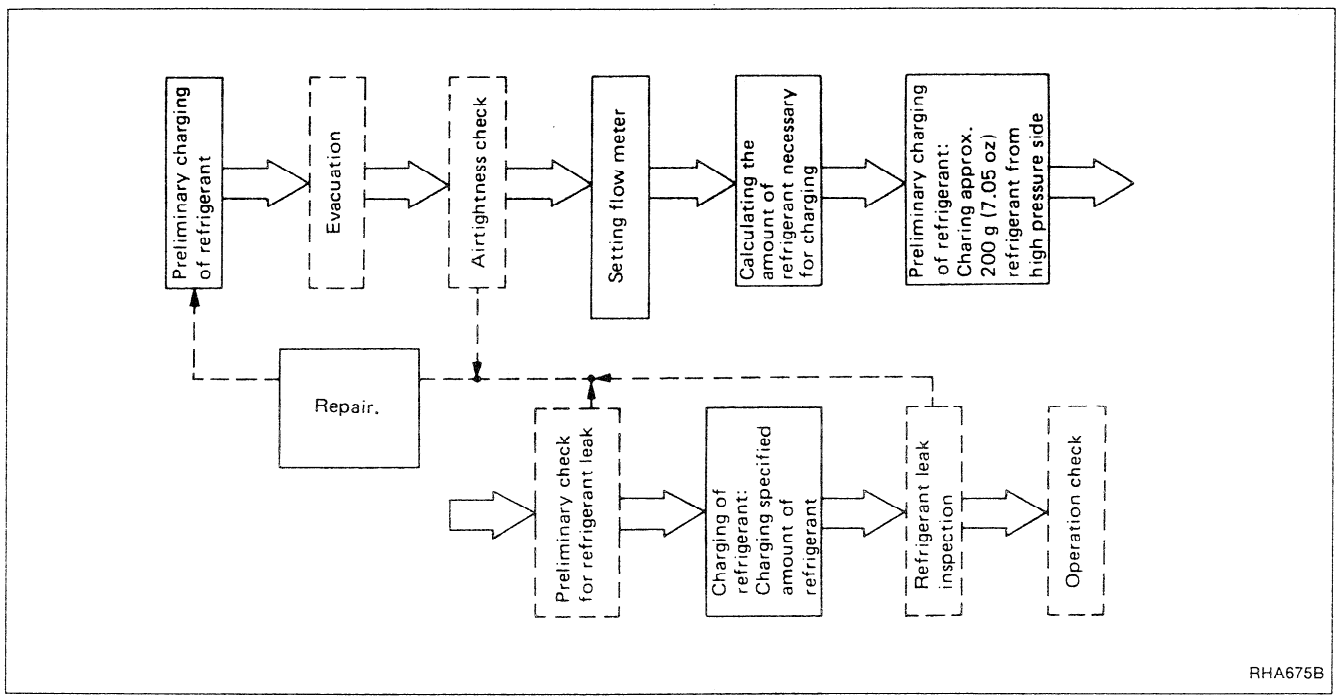
CHARGING REFRIGERANT WITHOUT USING T-JOINT ADAPTER

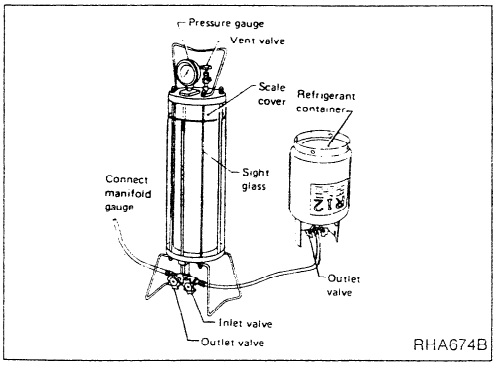
If the service canister used for charging is empty, replace the canister with a new one, and proceed as follows:

1. Make sure by shaking the canister that no refrigerant is left inside.
2. Shut off all the valves of the gauge manifold.
3. Disconnect the charge valve from the emptied canister, and attach it to a new service canister.
4. Run the vacuum pump, and open the vacuum valve (center) of the gauge manifold to purge air from the inside of the hose.
5. Run the vacuum pump for approx. 30 seconds.
6. Shut off the vacuum valve (center) and stop the vacuum pump.
7. Unseal the new canister, and open the charge valve.
8. Open the low pressure valve to charge the refrigerant into the system.

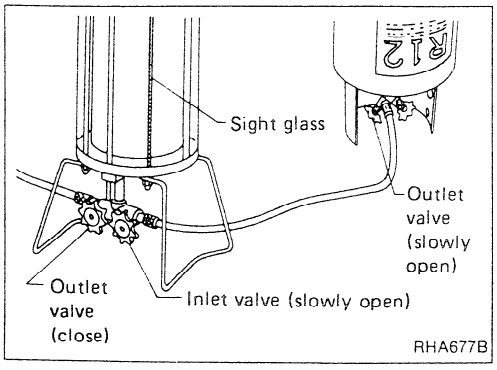
Charging Refrigerant — Charging cylinder

WORK PROCEDURE





Install the charging cylinder correctly to the vehicle. Refer to "SETTING OF SERVICE TOOLS" in "Refrigerant Charging Procedure".

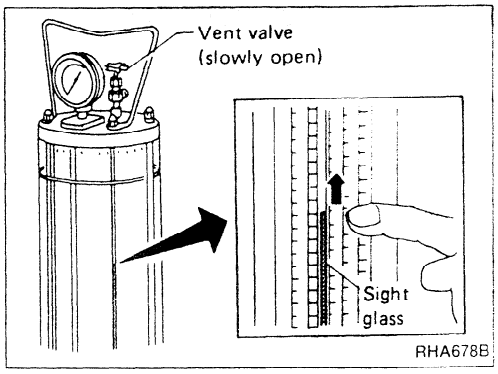


PRELIMINARY CHARGING OF REFRIGERANT-1

1. Make sure that the inlet and outlet valves of the charging cylinder are closed.
2. Slowly open the outlet valve of a refrigerant container [13.6 kg (30 lb)].
3. Slowly open the inlet valve of the charging cylinder.

The refrigerant will flow into the sight glass of the charging cylinder as the valve is opened.

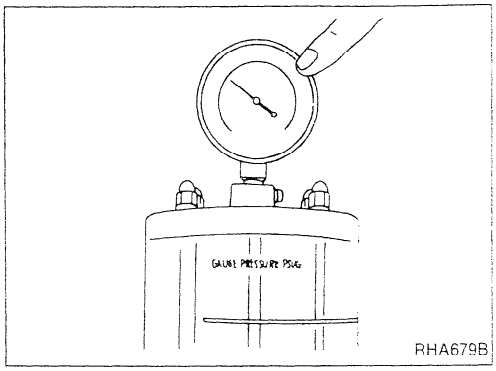
Charging Refrigerant — Charging cylinder (Cont'd)



4. Slowly open the upper vent valve to release pressure from the charging cylinder. While doing so, continue charging until the required amount of refrigerant is reached.

The refrigerant volume changes with the temperature and pressure. It is necessary to charge refrigerant with a little more than the required amount (indicated on the sight glass). Refer to the CAUTION label attached on the vehicle, or to the Service Manual.

5. Close the inlet valve and upper vent valve of the charging cylinder.



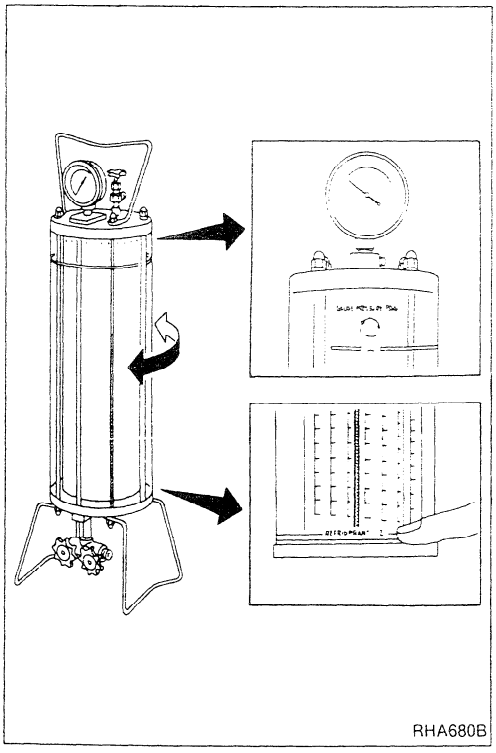
6. Turn on the heater switch (the charging cylinder is provided with a heater.)

The refrigerant charging time can be reduced by heating the refrigerant to increase its pressure. In this case, do not allow the pressure in the cylinder to rise higher than 1,030 kPa (10.30 bar, 10.5 kg/cm^2, 150 psi). (If pressure rises above this level, turn off the heater.)

The pressure in the charging cylinder can be measured by the upper pressure gauge.

EVACUATION AND AIRTIGHTNESS CHECK

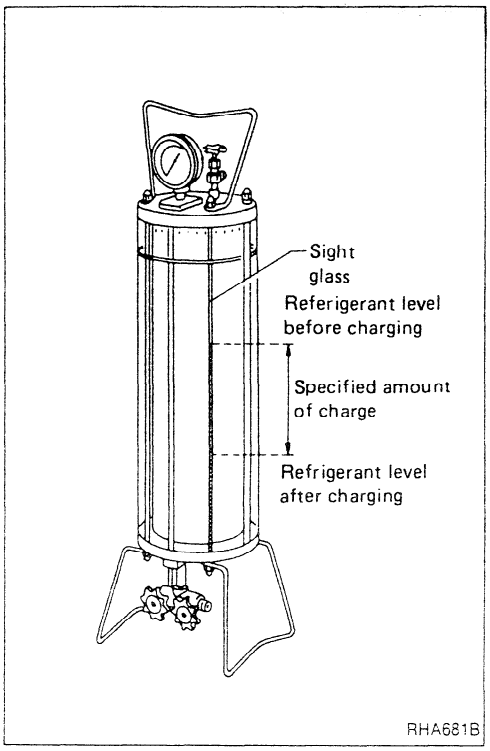
Refer to "EVACUATION" and "CHECKING AIRTIGHTNESS" in "Evacuation".



SETTING OF FLOW METER

1. Rotate the charging cylinder main body until the scale for R12 is at the correct position on the sight glass.
2. Read the charging cylinder pressure gauge.
3. Rotate the charging cylinder so that the scale of the charging cylinder agrees with the pressure value indicated on the pressure gauge.
4. Open the outlet valve of the charging cylinder.

Charging Refrigerant — Charging cylinder (Cont'd)

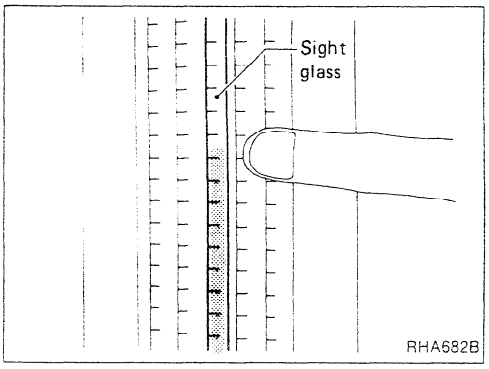


CALCULATING CHARGING AMOUNT OF REFRIGERANT

1. Record the amount of refrigerant in the sight glass before charging.
2. Subtract the required amount of refrigerant (charge quantity specified for the vehicle) from the amount of refrigerant recorded in step 1. Charge refrigerant into the system until the remaining value equals to the value indicated on the sight glass.

Example:

Level in sight glass: 3 lb 8 oz
Charge specification (from S.D.S.) 2.0 - 2.4 lb.
Calculate charge quantity into lb and oz as follows: 1 lb = 16 oz, and 0.1 lb = 1.6 oz, so that 2.0 lb = 32 oz, 2.4 lb = 32 + (4 x 1.6) = 32 + 6.4 = 38.4, round off to 38. Therefore our charge quantity will be between 32 and 38 oz, or 2 lb 0 oz to 2 lb 6 oz. Subtract 2 lb 6 oz from the level in the sight glass (3 lb 8 oz) = 1 lb 2 oz.
This will be our ending point.



PRELIMINARY CHARGING OF REFRIGERANT-2

1. Slowly open the high pressure side valve of the manifold gauge to charge refrigerant from the high pressure side.
2. Close the high pressure valve after charging approx. 200 g (7.05 oz) refrigerant.

CAUTION:

The refrigerant in the charging cylinder is kept in the liquid state, so the refrigerant should be charged from high pressure side. Do not start the engine with the high pressure valve kept open.

PRELIMINARY CHECK FOR REFRIGERANT LEAKS

Refer to "PRELIMINARY CHECK FOR REFRIGERANT LEAKS" in "Charging Refrigerant".

CHARGING REFRIGERANT

1. Slowly open the high pressure valve of the manifold gauge, and charge the calculated amount of refrigerant in "CALCULATING CHARGING AMOUNT OF REFRIGERANT".

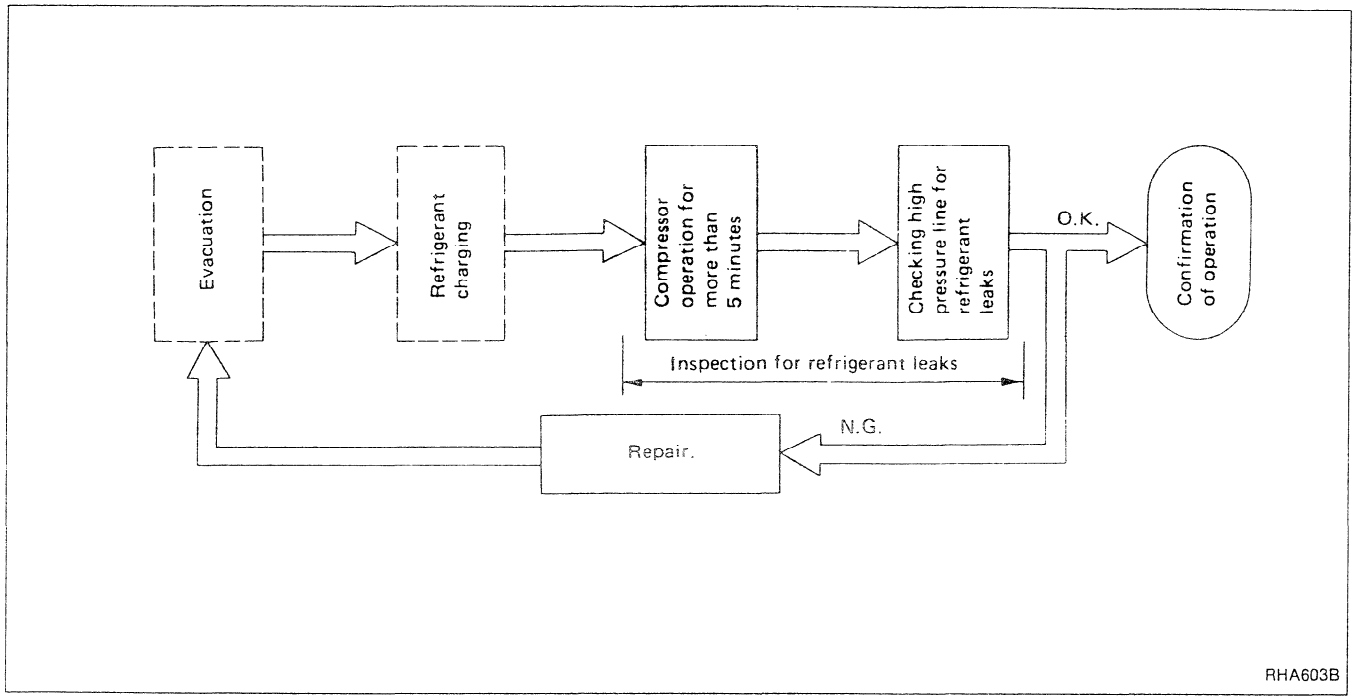
CAUTION:

The refrigerant in the charging cylinder is kept in the liquid state, so the refrigerant should be charged from high pressure side. Do not start the engine with the high pressure valve kept open.

2. Close the high pressure valve of the manifold gauge.
3. Make sure that the calculated amount of refrigerant is in the sight glass.
4. Close the charging cylinder outlet valve.
5. Turn off the heater if it is on (when using heater equipped type).

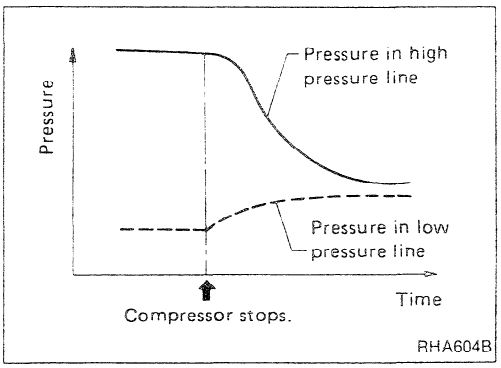
Inspection for Refrigerant Leaks

WORK PROCEDURE



To facilitate inspection for refrigerant leaks, establish the following conditions:

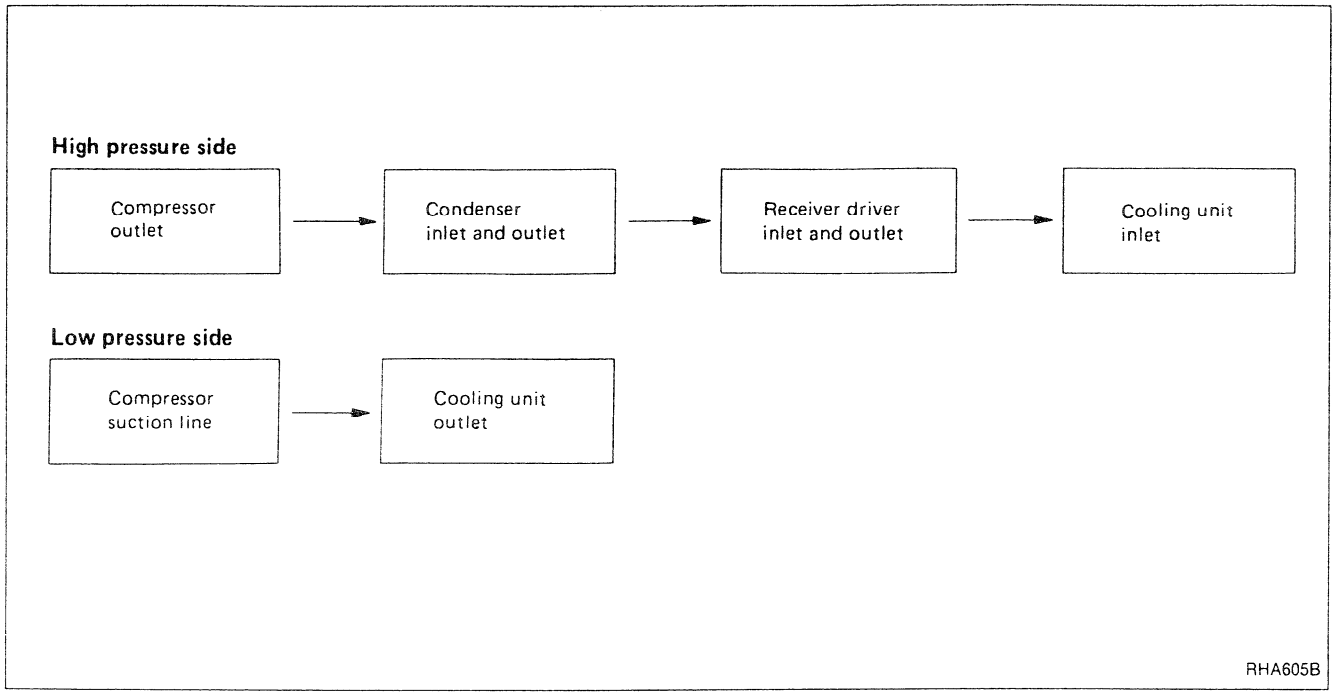
- Start the engine.
- Run the air conditioner.
- Set the blower fan control to MAX.
- Set the temperature control to FULL COLD.
- Run the refrigerant system for more than 5 minutes after setting the above-mentioned conditions (to circulate the refrigerant through the system).



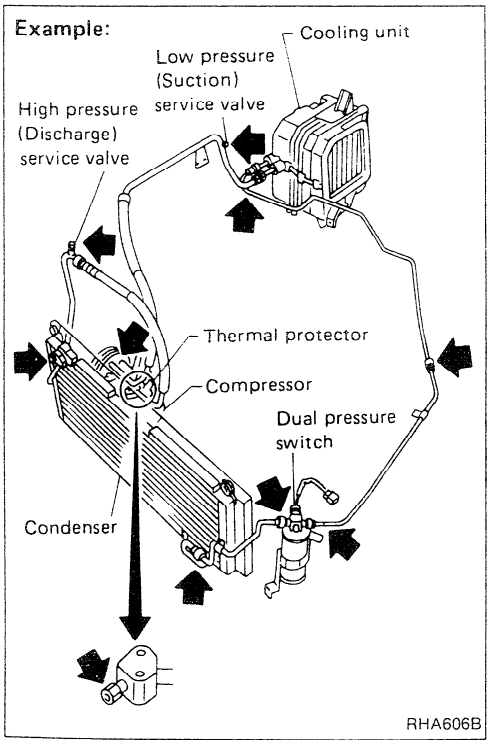
Refrigerant leaks should be checked immediately after stopping the engine, beginning with the high pressure line, using a gas leak tester. This is because the pressure in the high pressure line drops gradually after the refrigerant circulation stops while the pressure in the low pressure line rises gradually as shown in the graph. Leaks can be detected easily when pressure is high.

Inspection for Refrigerant Leaks (Cont'd)

INSPECTION PROCEDURE



To prevent detecting errors, make sure that there is no refrigerant vapor or tobacco smoke in the vicinity of the vehicle. It is also necessary to shield the vehicle from the wind so that the leaking refrigerant is not blown away.



INSPECTION POINTS

Check carefully each of the pipe joints. To check, wipe the portion to be checked with waste cloth, and move the tester probe all around the joint.

Compressor

Check the shaft seals and bolt holes, and also around the magnet clutch.

Receiver drier

Check the pressure valve, safety valve and the fusible plug mounts.

Service valves

Check all around the service valves.
Ensure that each valve core is not loose.
The service valve cap must be attached to the valve (to prevent leak).
Also check that there are no foreign objects inside the cap.

Inside of cooling unit

To check, insert the leak tester probe into the drain hose immediately after stopping the engine. (Keep the probe inserted for more than 10 seconds.)

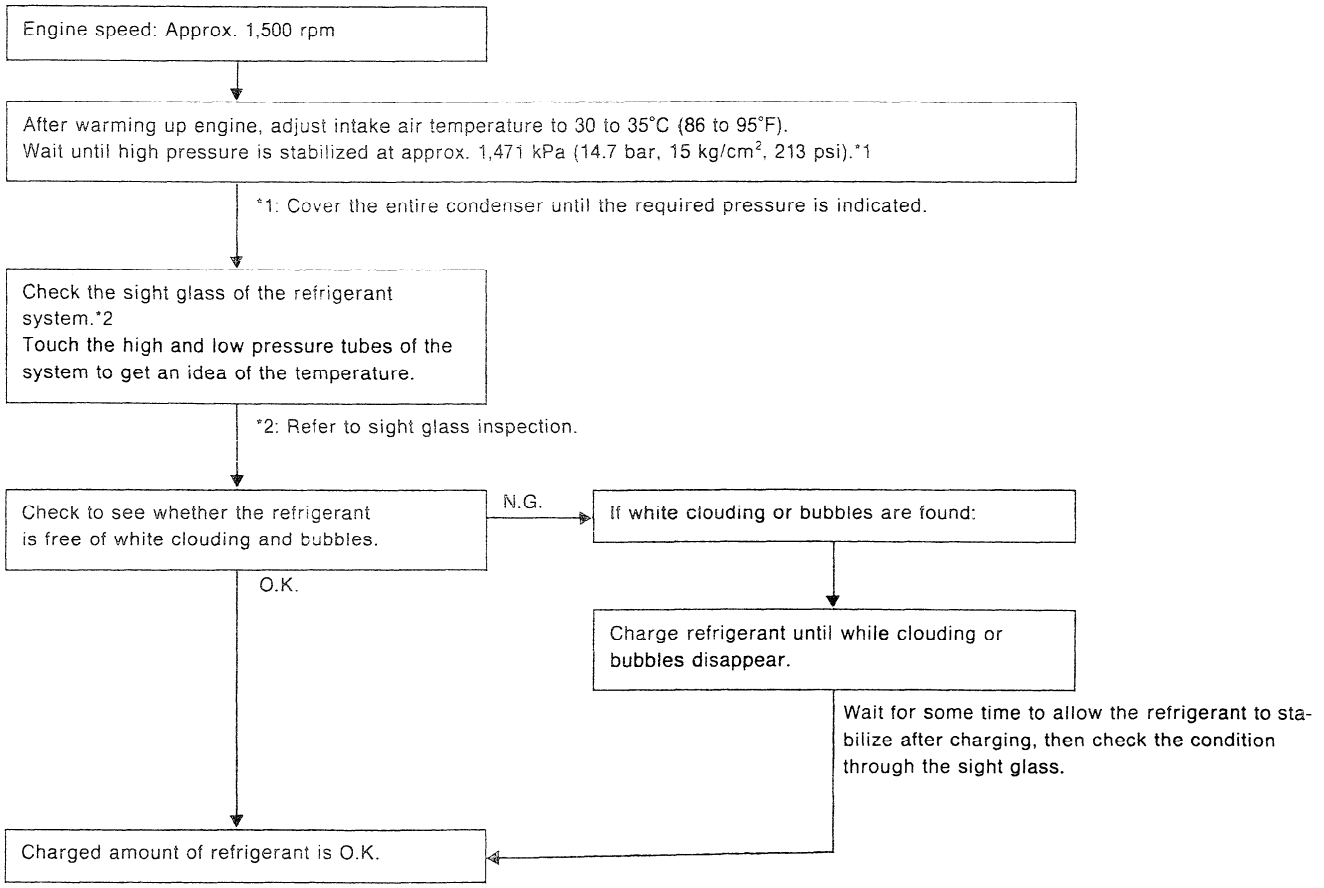
Confirmation of Amount of Charged Refrigerant

The amount of refrigerant charged into the system can be observed through the sight glass by watching the flow of the refrigerant and by reading the high pressure and low pressure manifold gauges under the following conditions:

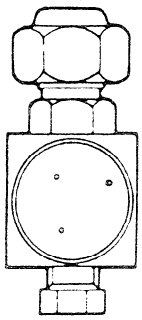
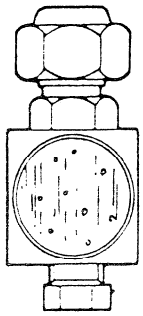
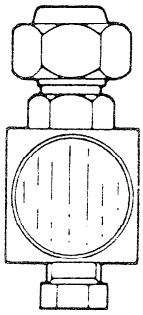
CONDITIONS

- Doors:
  Close completely.
- Window glasses:
  Close completely.
- Intake door position:
  RECIRC
- Mode door position:
  VENT
- Blower fan:
  HI
- TEMP control:
  Optional (Set so that intake air temperature is 30 to 35°C (86 to 95°F).
- AIR CON switch:
  ON
- Engine speed:
  Approx. 1,500 rpm

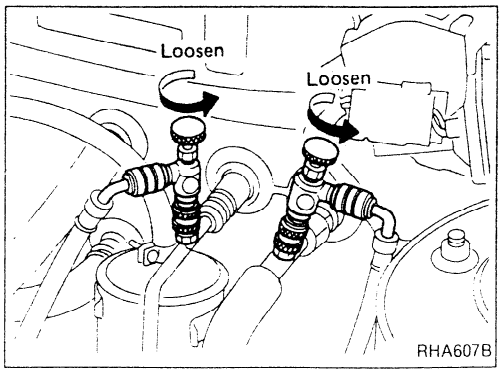
WORK PROCEDURE



Confirmation of Amount of Charged Refrigerant (Cont'd)

Amount of charge / Check item	Appropriate	Refrigerant is insufficient	Almost no refrigerant	Overcharged, or air in system
Temperature of high and low pressure pipes	High pressure side is hot while low pressure side is cold.	High pressure side is warm and low pressure side is somewhat cold.	No difference is felt between high and low presser sides.	High pressure side is very hot.
Flow of refrigerant viewed through sight glass	Mostly transparent. Occasionally some bubbles are seen when engine rpm is increased or decreased. 	Bubbles are always flowing. Refrigerant is cloudy. 	Nothing is visible. 	If overcharged, no bubbles are seen. If there is air in the system, large bubbles are seen.
Pressure	Normal high pressure: 1,373 - 1,765 kPa (13.7 - 17.7 bar, 14 - 18 kg/cm^2, 199 - 256 psi) Normal low pressure: 147 - 294 kPa (1.47 - 2.94 bar, 1.5 - 3 kg/cm^2, 21 - 43 psi)	Both high and low pressure values are insufficient.	High pressure value is very small.	Both high and low pressure values are excessive.
Action to take	**Bubbles may be generated when the receiver drier strainer is clogged, or when the expansion valve is opened excessively.**	Add refrigerant after checking for leaks.	Check the refrigerant system.	Stop the compressor and extract excessive refrigerant. If air is found, perform evacuation, then charge the specified amount of refrigerant.

CAUTION:
The condition of bubbles seen through the sight glass as well as the intake and discharge pressures are influenced by the ambient temperature, wind velocity, weather, and by the air temperature in front of the condenser, etc.



Recovery Procedure

REMOVAL OF REFRIGERANT CHARGING DEVICE

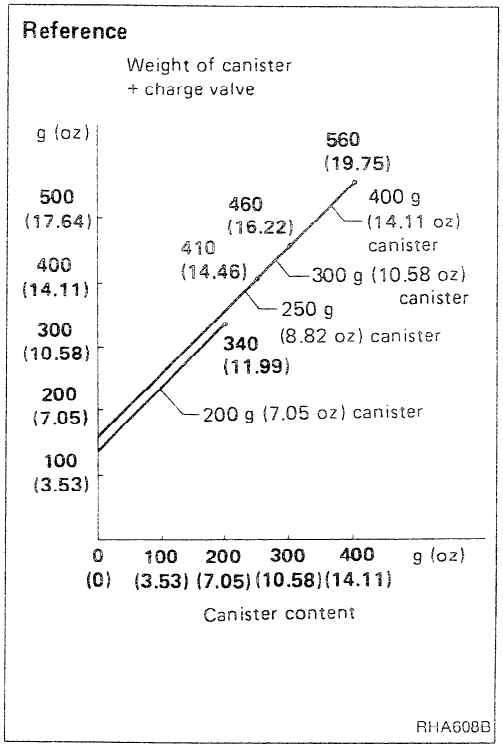
1. Completely loosen the adapter valves of the low pressure and high pressure lines.

The inner valve of the adapter valve will prevent the refrigerant from leaking out.

2. Remove both the high-pressure and low-pressure side adapter valves from the on-vehicle service valve.

If adapter valve is not used for charging, proceed as follows to minimize the refrigerant discharge into the atmosphere.

3. Loosen the nut of the low pressure charging hose while pressing it against the service valve to prevent refrigerant leakage.
4. After loosening the nut, quickly remove the charge valve from the service valve.
5. Wait until the high pressure gauge indication drops to below 981 kPa (9.8 bar, 10 kg/cm^2, 142 psi), then similarly disconnect the high pressure charging hose.



DISPOSAL OF RESIDUAL REFRIGERANT

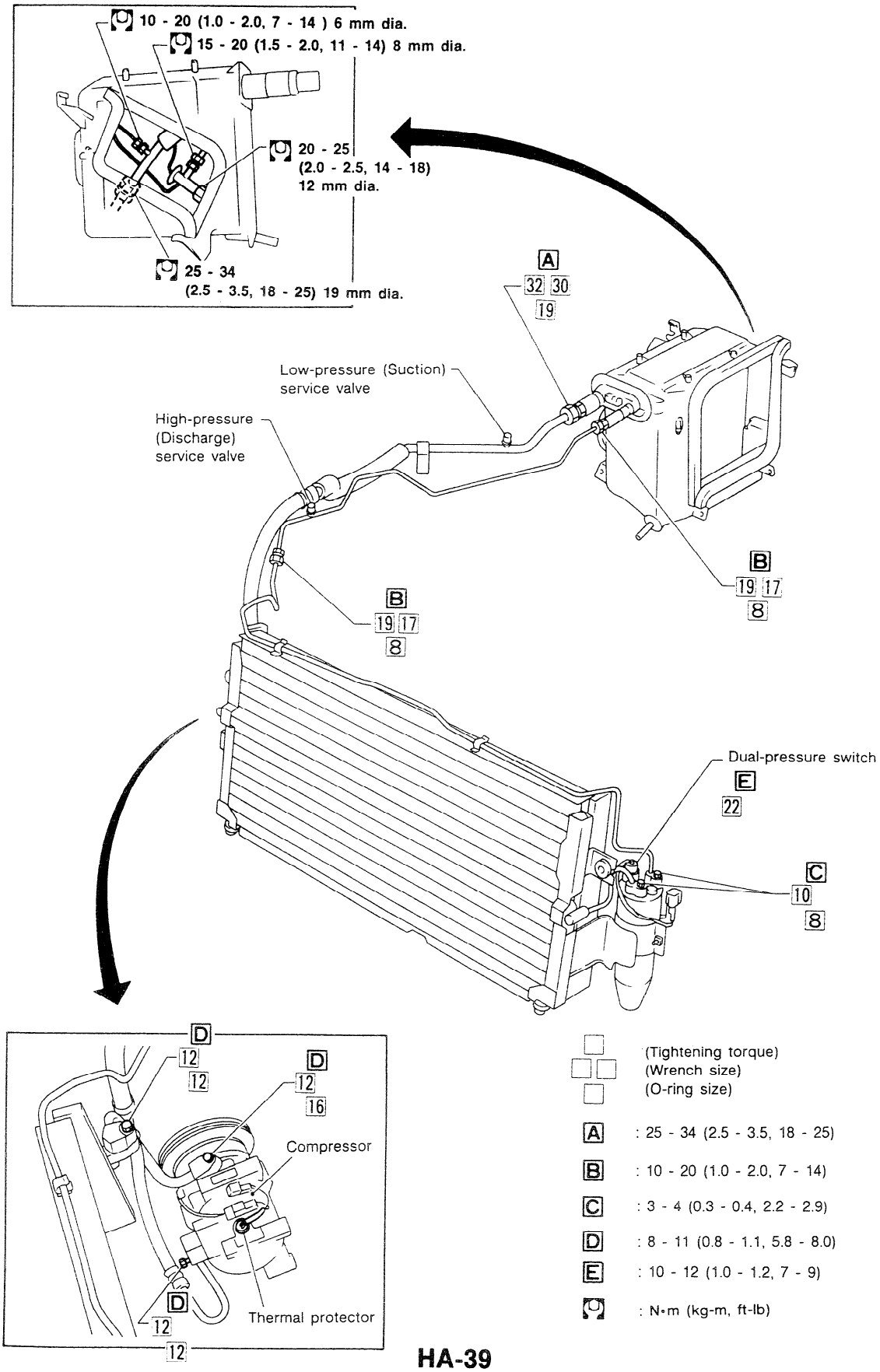
Securely shut off each of the charge valves, adapter valves and manifold gauge valves to prevent the residual refrigerant from leaking out. Keep these valves in a safe location for the next charging.

The amount of refrigerant remaining in a service canister can be estimated from the Table shown here. It is recommended that a label be attached indicating the remaining amount in the canister.

Refrigerant Lines

- **Refer to "Precautions for Refrigerant Connection" on page HA-23.**

EXCEPT FOR SR20DE ENGINE — L.H.D. MODELS



(Tightening torque)
(Wrench size)
(O-ring size)

A : 25 - 34 (2.5 - 3.5, 18 - 25)

B : 10 - 20 (1.0 - 2.0, 7 - 14)

C : 3 - 4 (0.3 - 0.4, 2.2 - 2.9)

D : 8 - 11 (0.8 - 1.1, 5.8 - 8.0)

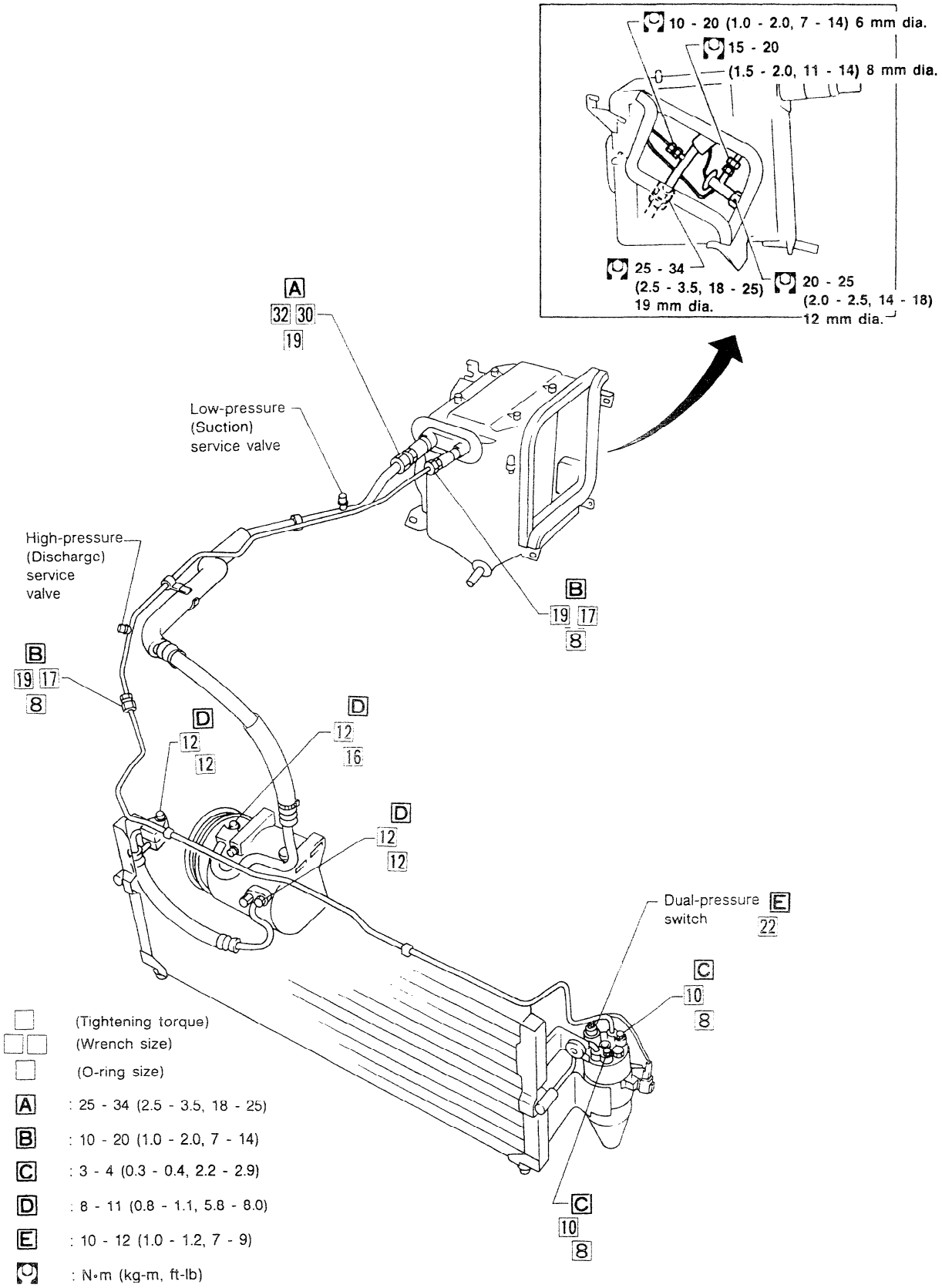
E : 10 - 12 (1.0 - 1.2, 7 - 9)

: N•m (kg-m, ft-lb)

RHA065C

Refrigerant Lines (Cont'd)

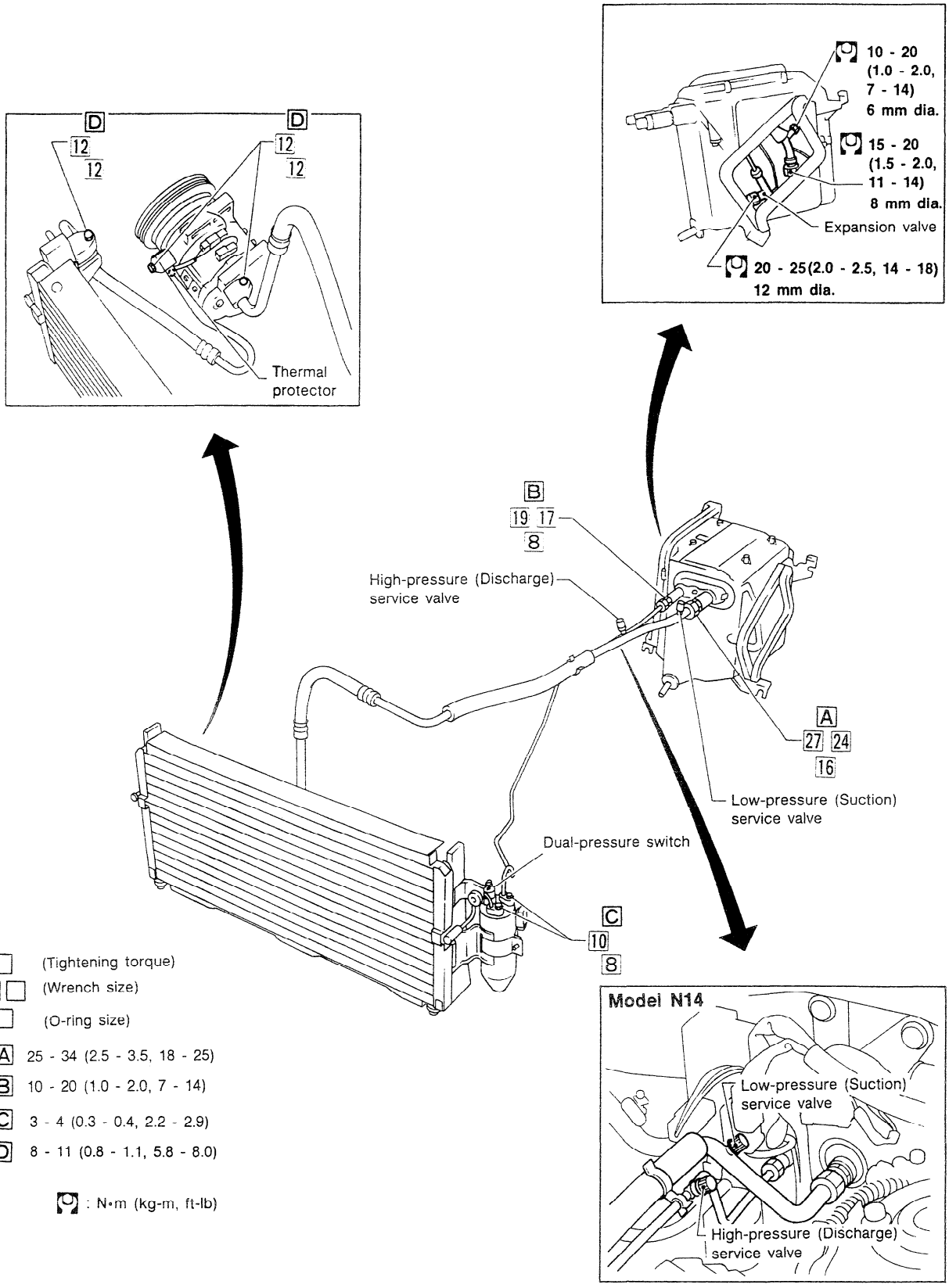
SR20DE ENGINE — L.H.D. MODELS



RHA066C

Refrigerant Lines (Cont'd)

EXCEPT FOR SR20DE ENGINE — R.H.D. MODELS



(Tightening torque)
(Wrench size)
(O-ring size)

A 25 - 34 (2.5 - 3.5, 18 - 25)

B 10 - 20 (1.0 - 2.0, 7 - 14)

C 3 - 4 (0.3 - 0.4, 2.2 - 2.9)

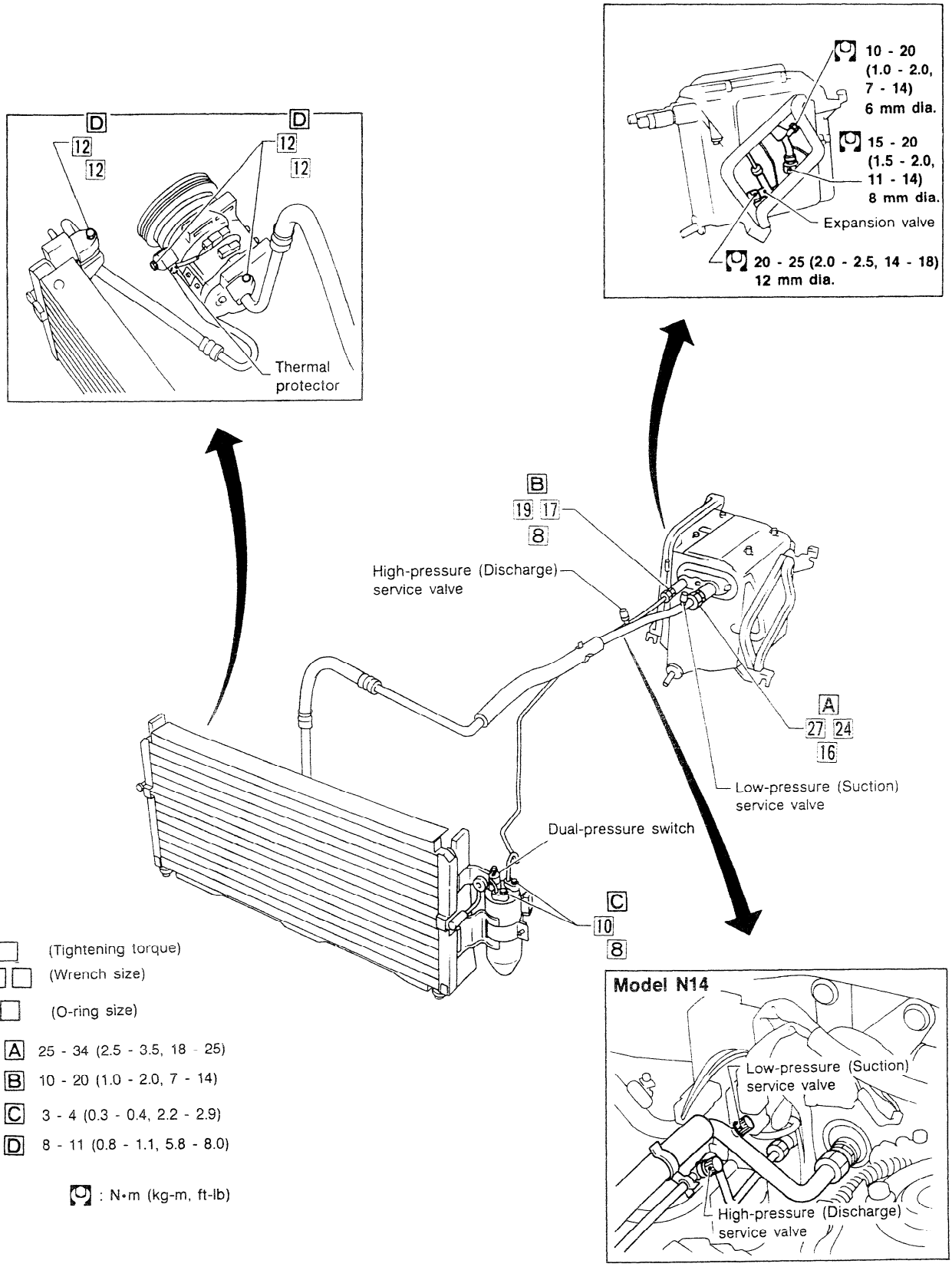
D 8 - 11 (0.8 - 1.1, 5.8 - 8.0)

: N•m (kg-m, ft-lb)

RHA912B

Refrigerant Lines (Cont'd)

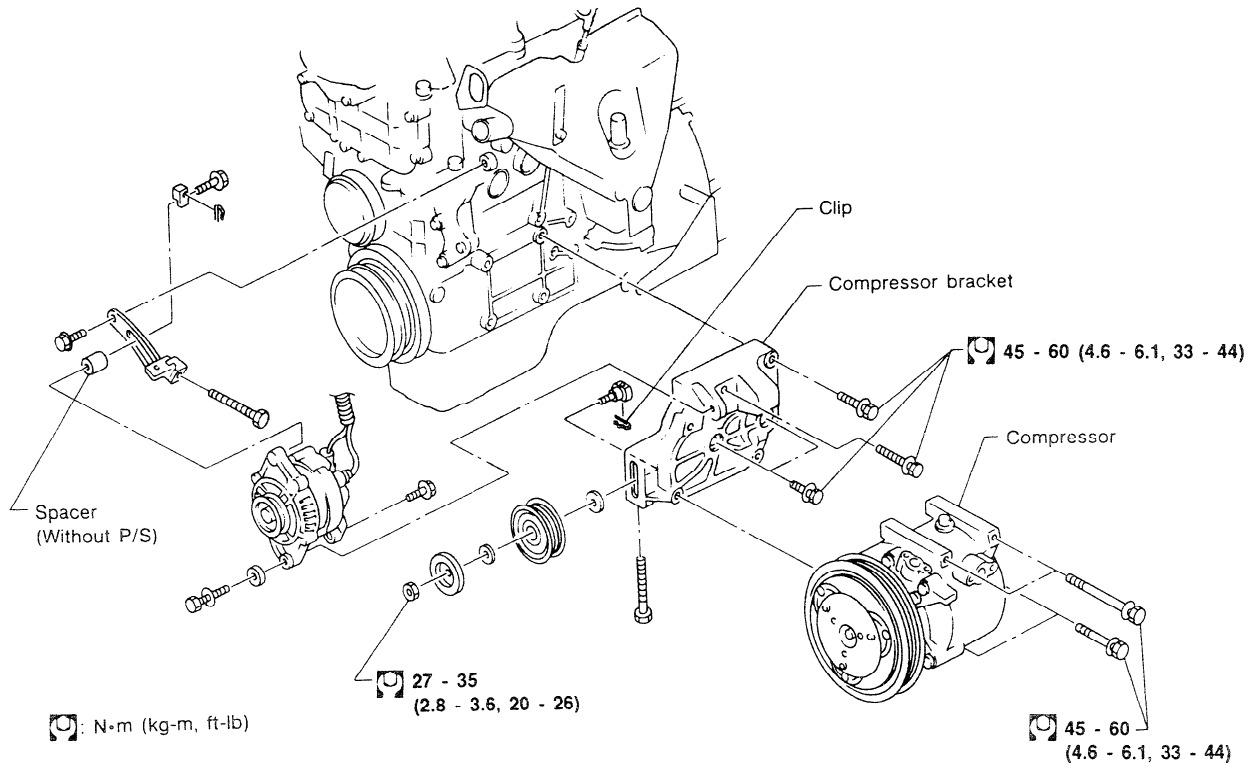
SR20DE ENGINE — R.H.D. MODELS



RHA274C

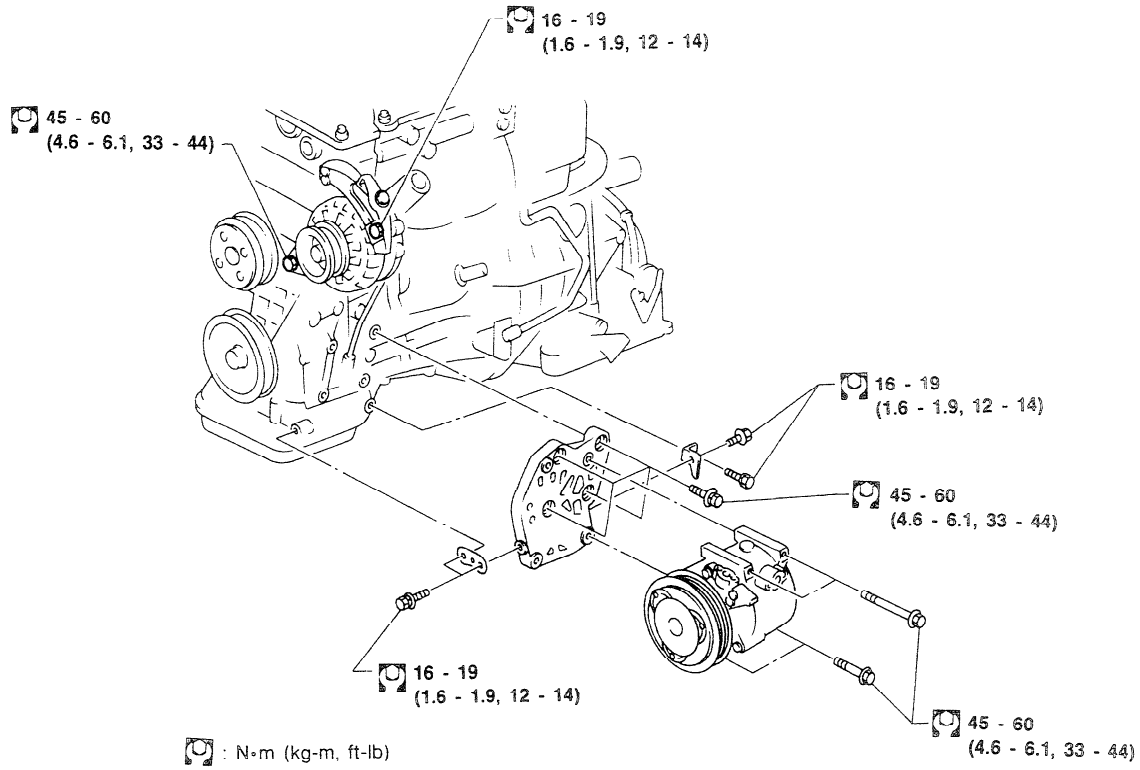
Compressor Mounting

Except for SR20DE engine models

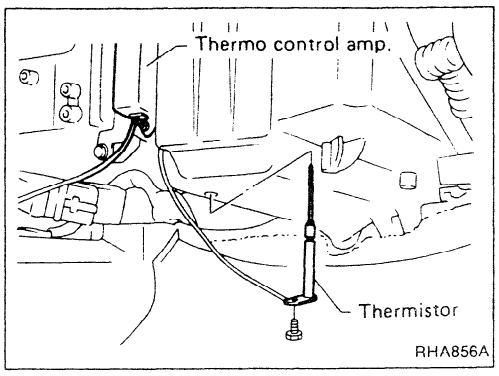


RHA067C

SR20DE engine models



RHA068C



Thermo Control Amp.

REPLACEMENT

Remove screws, which secure thermistor locating stay, from front of cooling unit. Replace thermo control amp. assembly with a new one. (Cooling unit need not be removed during the replacement.)

Belt Tension

- **Refer to MA section.**

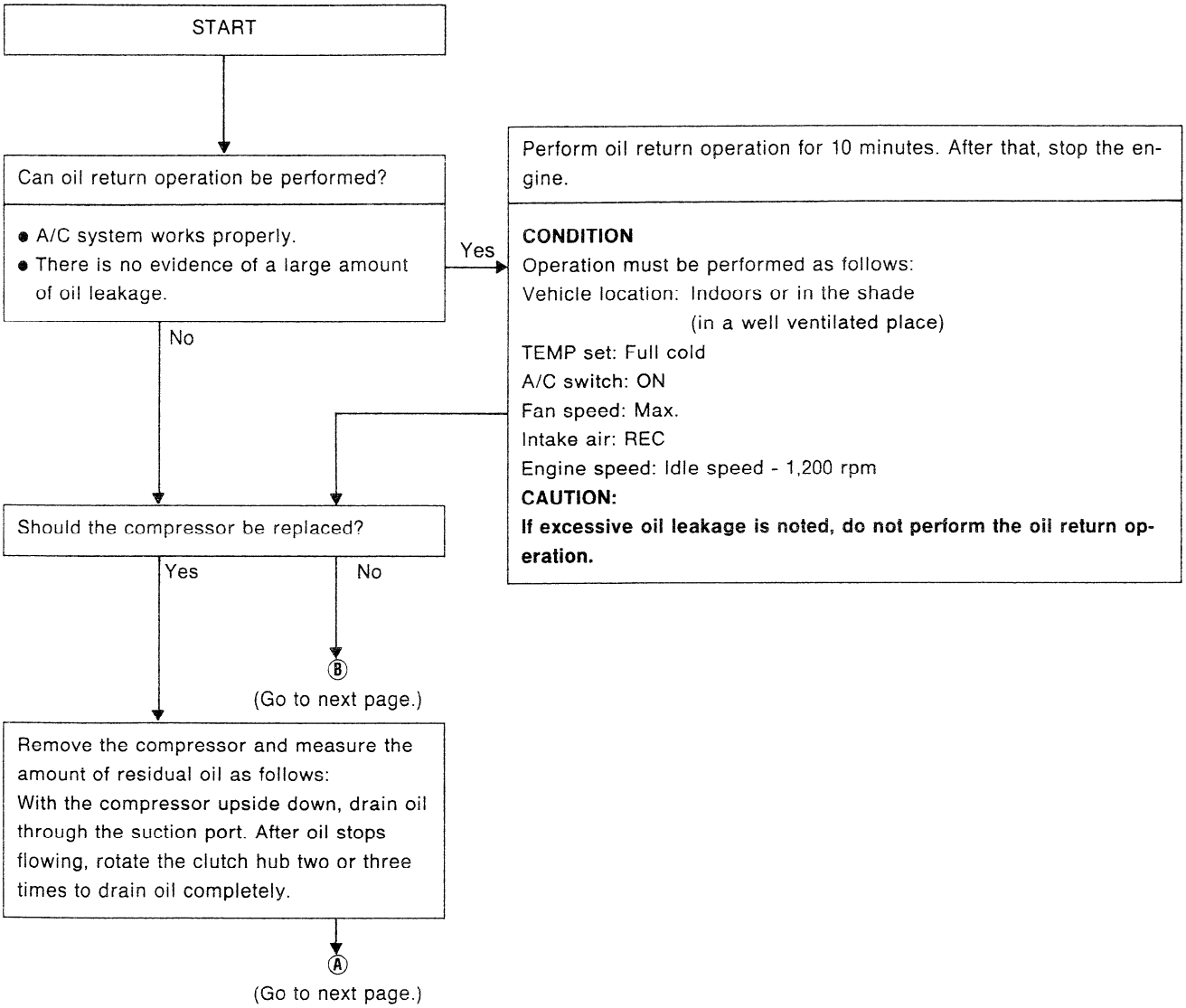
Fast Idle Control Device (F.I.C.D.)

- **Refer to EF & EC section.**

Maintenance of Oil Quantity in Compressor

The oil used to lubricate the compressor circulates through the system with the refrigerant. Whenever any component of the system is replaced or a large amount of gas leakage occurs, add oil to the compressor to maintain the specified amount.
If oil quantity is not maintained properly, the following malfunctions may result:

- Lack of oil: May lead to a seized compressor
- Excessive oil: Inadequate cooling (thermal exchange impeded)



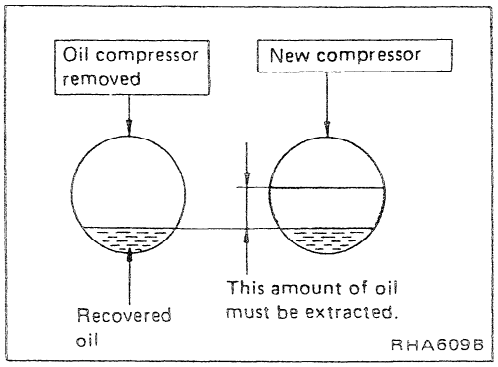
Maintenance of Oil Quantity in Compressor (Cont'd)

Ⓐ

Decide on the amount of oil to be drained from the new compressor in accordance with the table on the right.

Extract as much oil as necessary from the new compressor.
(refer to the table at right.)

Ⓑ



A new compressor is charged with the specified amount of oil (the overall amount needed in the system). So some oil needs to be drained from a new compressor to ensure that the amount of oil in the compressor is the same as was in the old compressor.

Amount of oil to be extracted from new compressor

Unit: mℓ (Imp fl oz)

Type	Pre-charged amount of oil in new compressor	Recovered amount of oil from old compressor	Amount of oil to be drained from new compressor
DKV14B DKV14C DKV14D	200 (7.0)	Less than 70 (2.5)	110 (3.9)
		Greater than 70 (2.5)	200 (7.0) – [Recovered amount + 20 (0.7)]
NVR140 NVR140S	200 (7.0)	Less than 90 (3.2)	90 (3.2)
		Greater than 90 (3.2)	200 (7.0) – [Recovered amount + 20 (0.7)]
DKS16H DKS16N	200 (7.0)	Less than 130 (4.6)	70 (2.5)
		Greater than 130 (4.6)	200 (7.0) – [Recovered amount + 20 (0.7, 0.7)]
MJS130 MJS170	150 (5.3)	—	80 (2.8)

Pre-charged amount of oil for some models differs from figures listed above. Refer to S.D.S. for each model when servicing compressor oil.

Ⓑ

Is there any part to be replaced? (Evaporator, condenser, receiver drier or in case there is evidence of a large amount of oil leakage.)

Yes →

No ↓

Carry out the A/C performance test.

After replacing any of the following major components of the system, be sure to add the correct amount of oil to the system.

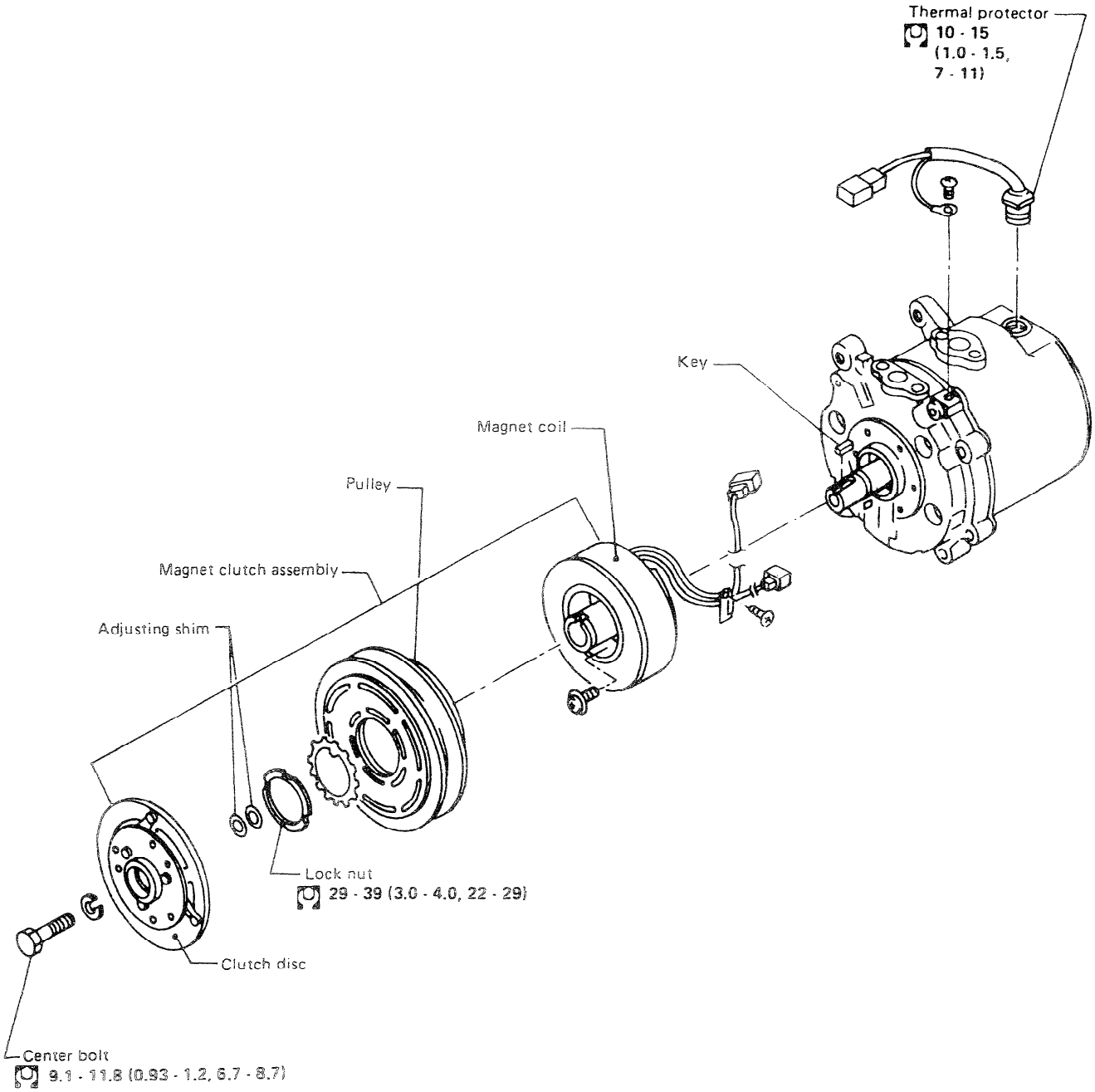
Amount of oil to be added

Part replaced	Oil to be added to system		Remarks
	Amount of oil mℓ (Imp fl oz)	Ratio (%)	
Evaporator	45 - 75 (1.6 - 2.6)	30	—
Condenser	30 - 50 (1.1 - 1.8)	20	—
Receiver drier	15 - 25 (0.5 - 0.9)	10	—
In case of refrigerant leak	30 - 50 (1.1 - 1.8)	—	Large leak
	—	—	Small leak*

*: If refrigerant leak is small, no addition of oil is needed.
"Ratio" in this table indicates the ratio of added oil to the overall amount of oil needed in the system.

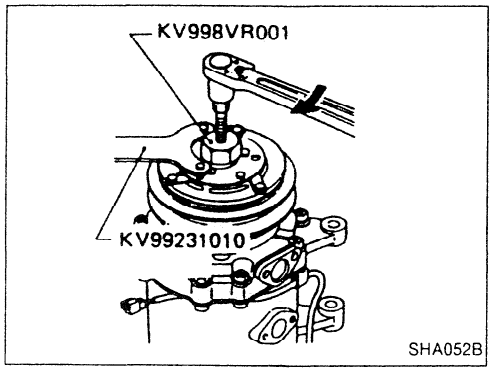
Precautions

- Plug all openings to prevent moisture and foreign matter from entering.
- Do not leave compressor on its side or upside down for more than 10 minutes.
- When replacing or repairing compressor, check compressor oil level in system.
- When replacing with a new compressor, drain specified oil from new compressor. Refer to COMPRESSOR OIL.
- Be sure there is no oil or dirt on frictional surface of clutch disc and pulley.
- When replacing compressor clutch, be careful not to scratch shaft or bend pulley.
- When replacing compressor clutch assembly, do not forget BREAK-IN OPERATION.



: N·m (kg-m, ft-lb)

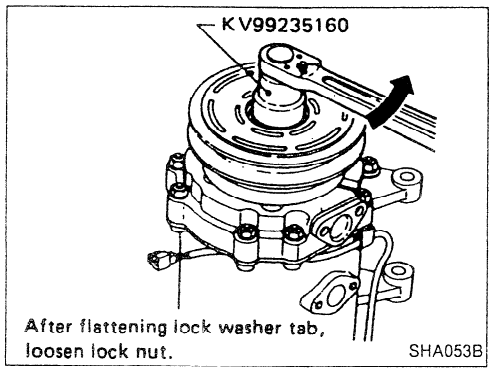
RHA283



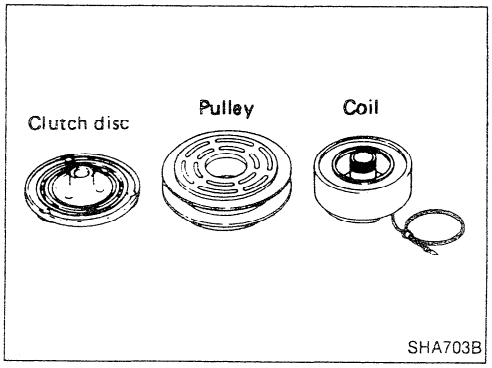
Compressor Clutch

REPLACEMENT

- When removing center bolt, hold clutch disc with clutch disc wrench.
- Using clutch disc puller, clutch disc can be removed.



- Bend down pawl of lock washer.
- When removing pulley, remove lock nut with nut wrench.



INSPECTION

Clutch disc

If the contact surface shows signs of damage due to excessive heat, the drive plate and pulley should be replaced.

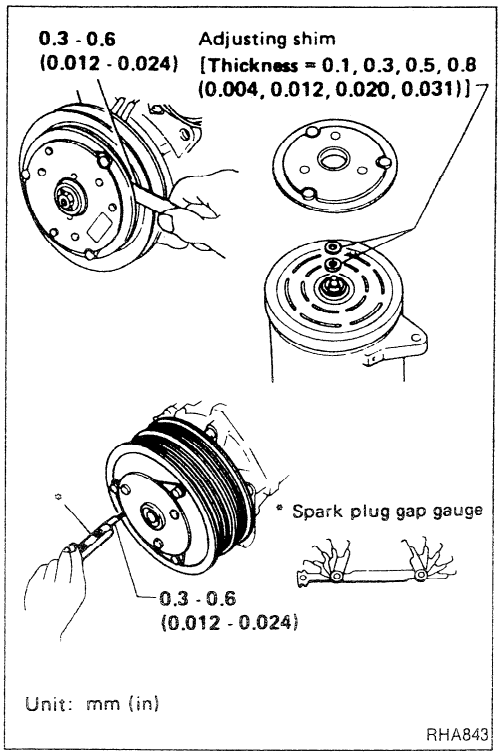
Pulley

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 drive plate 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.

Compressor Clutch (Cont'd)

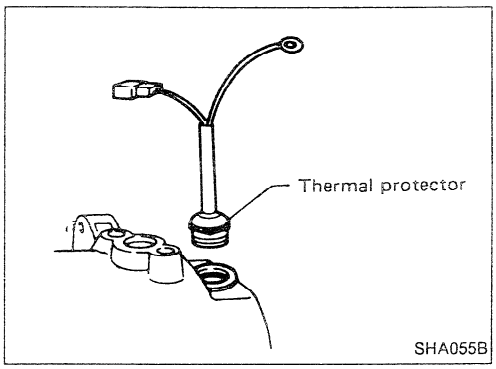


ADJUSTMENT

- When assembling clutch disc, adjust disc-to-pulley clearance with shims.

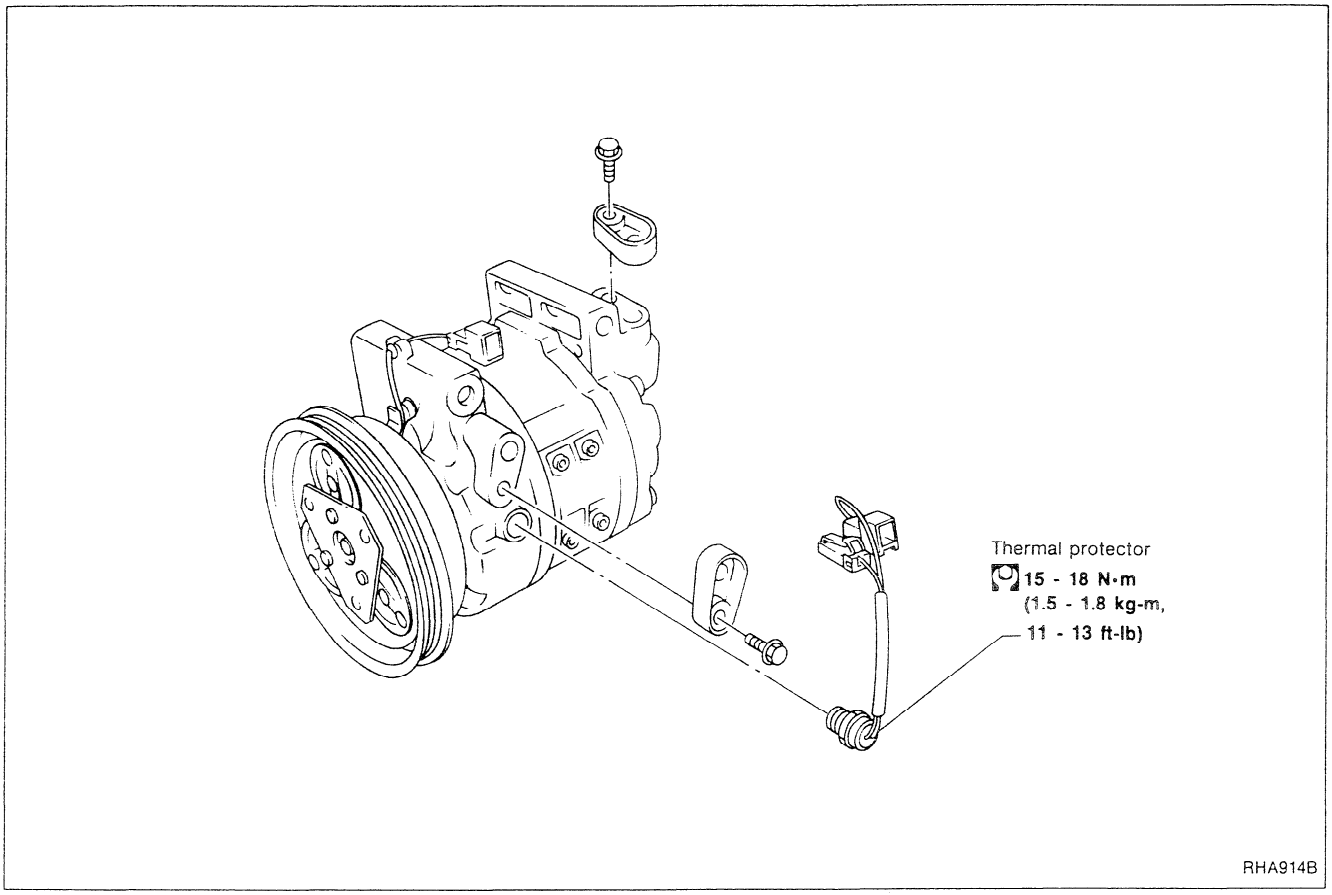
BREAK-IN OPERATION

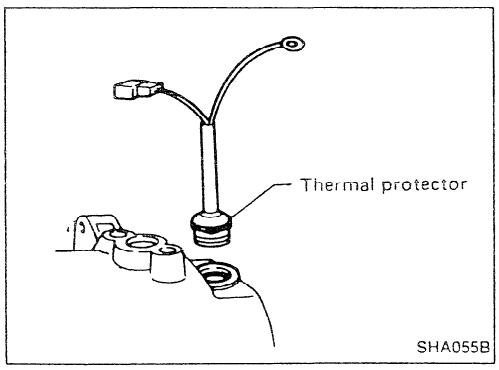
When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch about thirty times.
Break-in operation raises the level of transmitted torque.



Thermal Protector

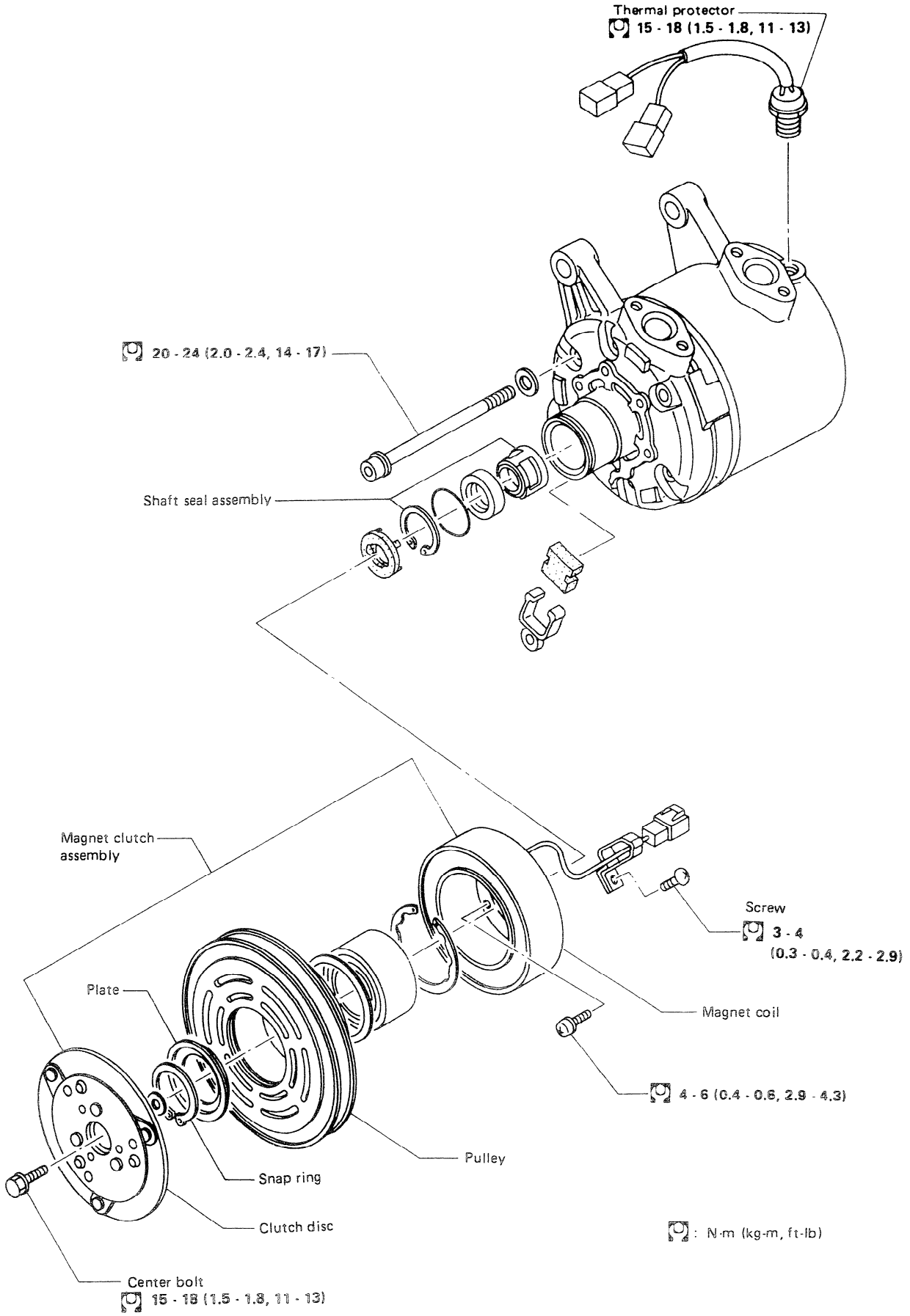
- When servicing, do not allow foreign matter to get into compressor.
- Check continuity between two terminals.



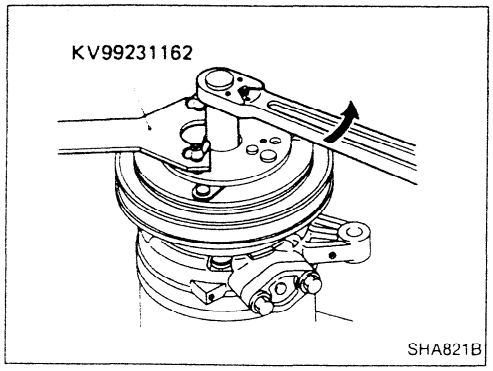


Thermal Protector

- When servicing, do not allow foreign matter to get into compressor.
- Check continuity between two terminals.


Thermal protector
15 - 18 (1.5 - 1.8, 11 - 13)
20 - 24 (2.0 - 2.4, 14 - 17)
Shaft seal assembly
Magnet clutch assembly
Screw
3 - 4 (0.3 - 0.4, 2.2 - 2.9)
Plate
Magnet coil
4 - 6 (0.4 - 0.6, 2.9 - 4.3)
Pulley
Snap ring
Clutch disc
Center bolt
15 - 18 (1.5 - 1.8, 11 - 13)
: N·m (kg-m, ft-lb)

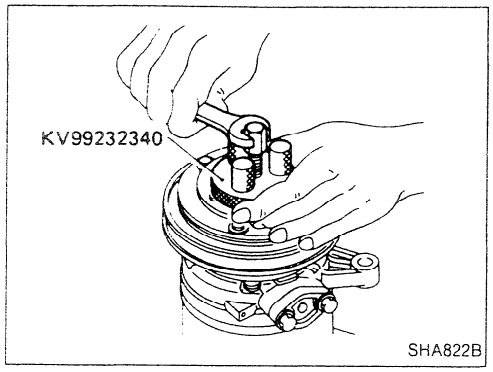
RHA402



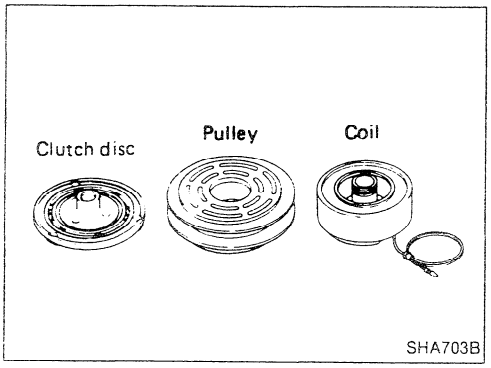
Compressor Clutch

REMOVAL

- When removing center bolt, hold clutch disc with clutch disc wrench.



- Using clutch disc puller clutch disc can be removed easily.



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.

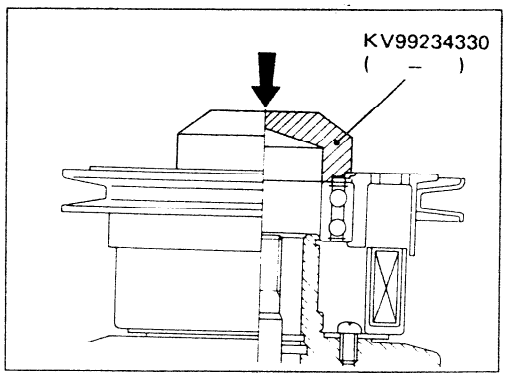
Coil

Check coil for loose connection or cracked insulation.

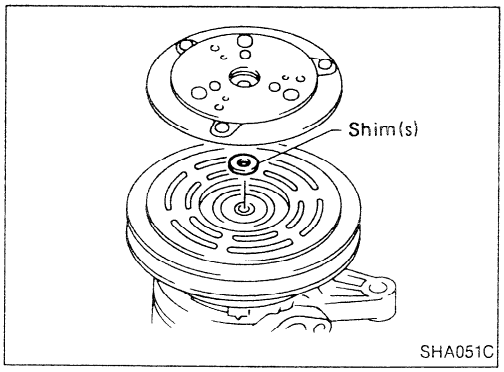
INSTALLATION

- Position coil assembly on compressor body. Be sure that the electrical terminals are reassembled in the original position. Install and tighten coil mounting screws evenly.

Compressor Clutch (Cont'd)

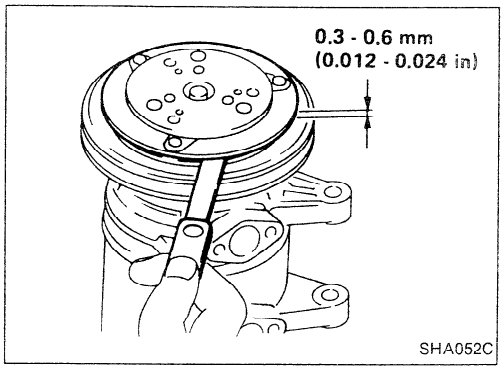


- Press pulley assembly onto the neck of coil assembly using pulley installer.
- Wipe oil thoroughly off the clutch surface.



ADJUSTMENT

- Select adjusting shim(s) which give(s) the correct clearance between pulley and clutch disc.
- Using a plastic mallet, tape clutch disc in place on drive shaft.
- Do not use excessive force with a plastic mallet or in a press, or internal damages may result.
- Place spring washer and center bolt onto drive shaft. Tighten center bolt to drive clutch wheel onto drive shaft.



- Check clearance around the entire periphery of clutch disc.

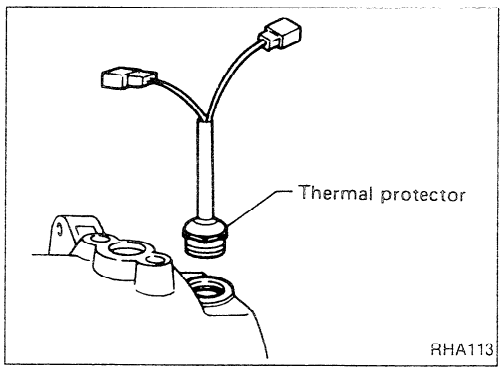
  Disc-to-pulley clearance:

  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

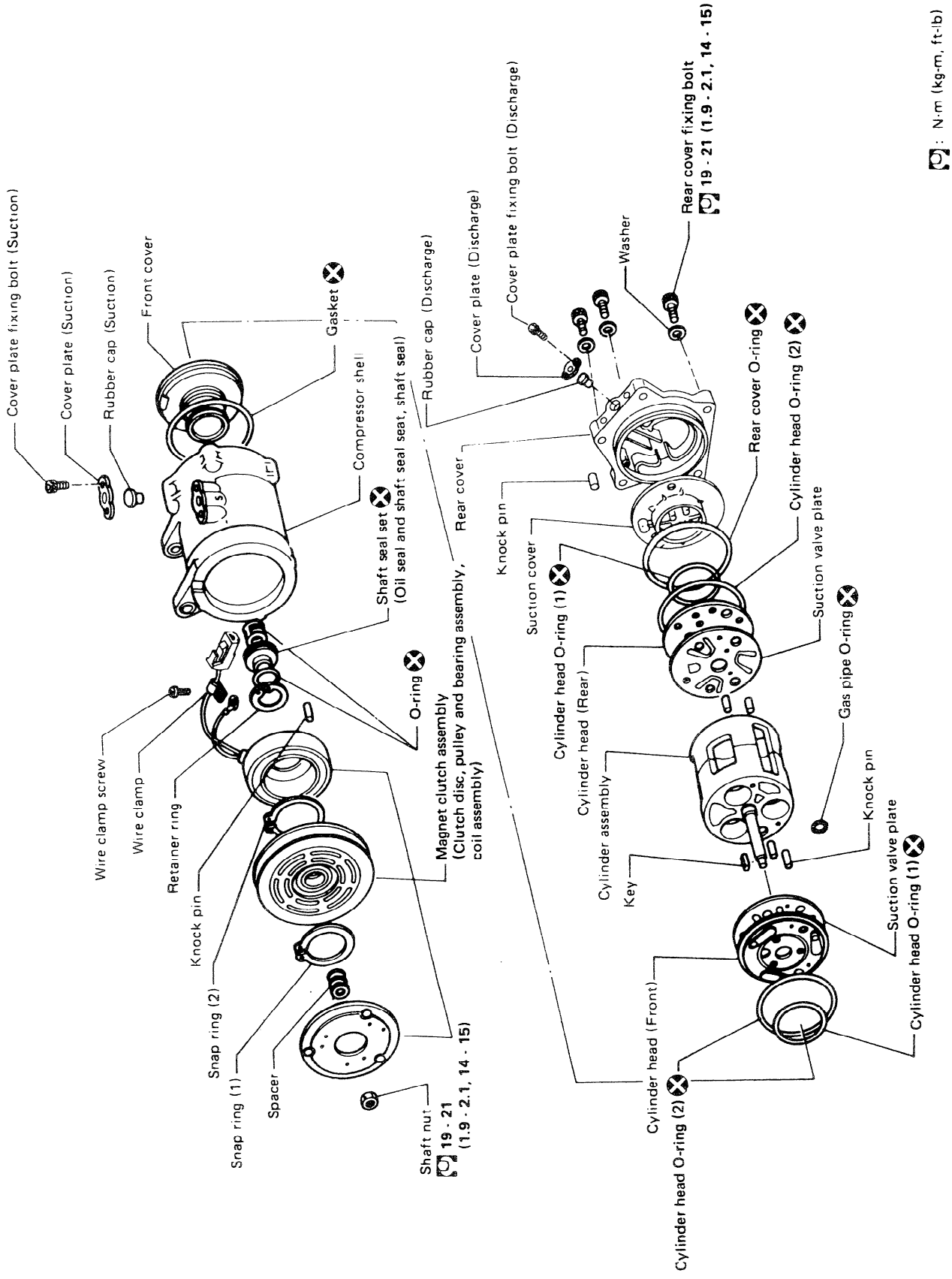
When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch about thirty times. Break-in operation raises the level of transmitted torque.



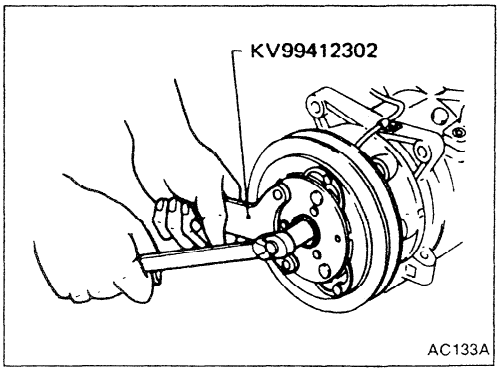
Thermal Protector

INSPECTION

- When servicing, do not allow foreign matter to get into compressor.
- Check continuity between two terminals.


Cover plate fixing bolt (Suction)
Cover plate (Suction)
Rubber cap (Suction)
Front cover
Gasket
Compressor shell
Shaft seal set
(Oil seal and shaft seal seat, shaft seal)
Rubber cap (Discharge)
Cover plate (Discharge)
Cover plate fixing bolt (Discharge)
Rear cover
Knock pin
Suction cover
Cylinder head O-ring (1)
Cylinder head (Rear)
Cylinder assembly
Key
Cylinder head (Front)
Cylinder head O-ring (2)
Washer
Rear cover fixing bolt
19 - 21 (1.9 - 2.1, 14 - 15)
Rear cover O-ring
Cylinder head O-ring (2)
Suction valve plate
Gas pipe O-ring
Knock pin
Suction valve plate
Cylinder head O-ring (1)
O-ring
Magnet clutch assembly
(Clutch disc, pulley and bearing assembly, coil assembly)
Wire clamp screw
Wire clamp
Retainer ring
Knock pin
Snap ring (2)
Snap ring (1)
Spacer
Shaft nut
19 - 21
(1.9 - 2.1, 14 - 15)
: N·m (kg-m, ft-lb)

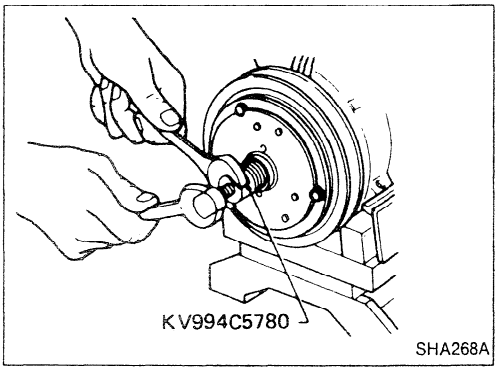
SHA365B



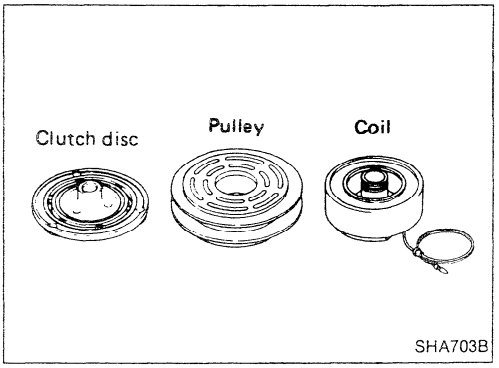
Compressor Clutch

REMOVAL

- When removing shaft nut, hold clutch disc with clutch disc wrench.



- Using clutch disc puller, clutch disc can be removed easily.



INSPECTION

Clutch disc

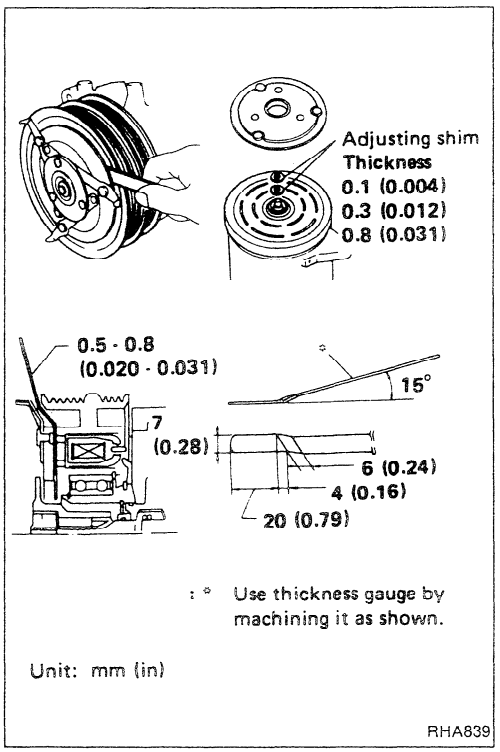
If the contact surface shows signs of damage due to excessive heat, the drive plate and pulley should be replaced.

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 drive plate 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.

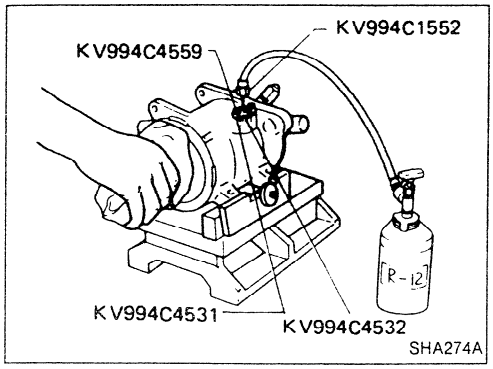


ADJUSTMENT

- When assembling clutch disc, adjust disc-to-pulley clearance with shims.

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.

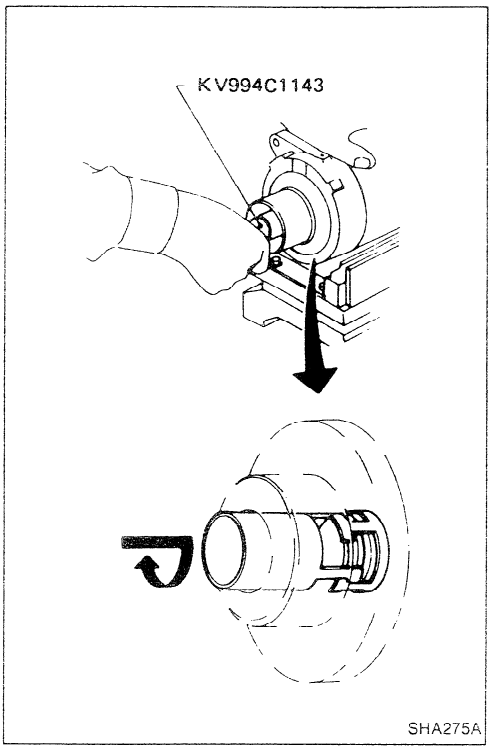


Shaft Seal

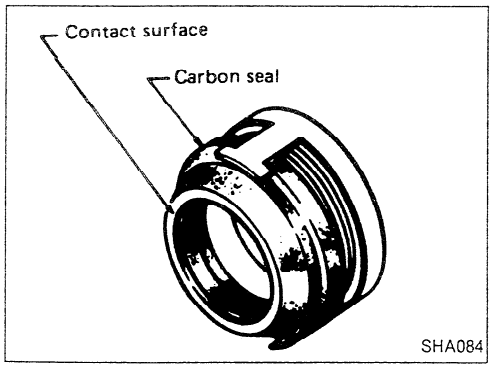
REMOVAL

- Before disassembling, be sure to measure the amount of oil. After assembling, charge with the same amount of new oil.
- When removing seat, apply pressure with refrigerant.

CAUTION:
Do not use air to prevent entry of moisture, dust, etc.

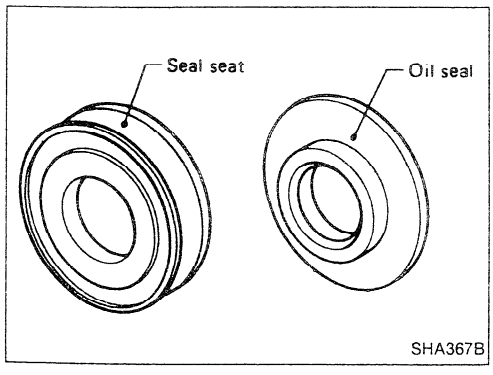


- Using shaft seal remover and installer, depress carbon seal and hook the case of shaft seal.



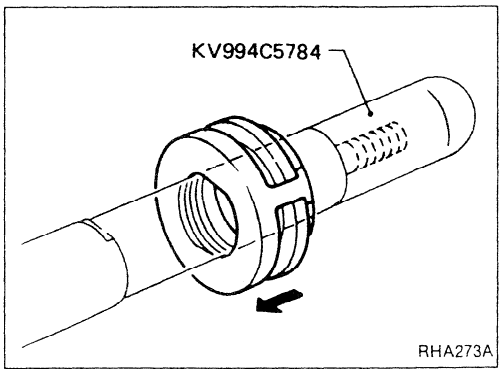
INSPECTION

- Check the carbon seal surface of shaft seal for damage.



- Check O-ring and the carbon seal contact surface of shaft seal seat for damage. Make sure the O-ring contact surface at front cover is not damaged.

Shaft Seal (Cont'd)

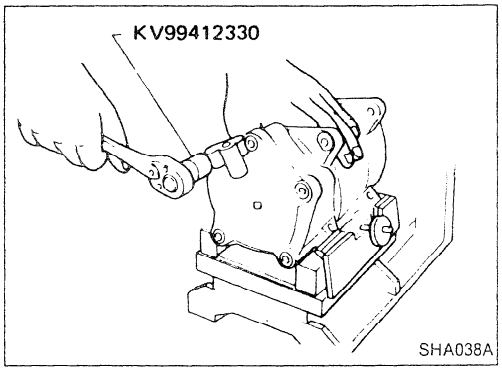


INSTALLATION

- When installing shaft seal;

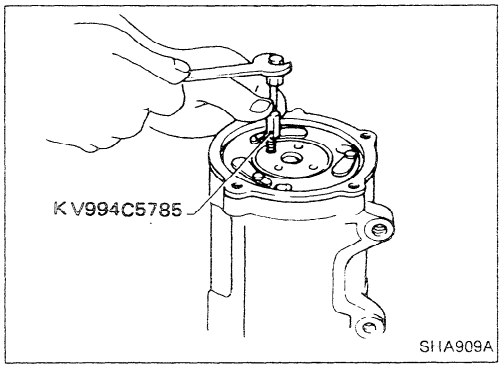
1) Cap shaft seal pilot to the top end of compressor shaft.
2) Using shaft seal remover and installer, insert shaft seal with shaft seal case and shaft cutout aligned.
   Apply force to turn the seal somewhat to the left and right. Insure that shaft seal seats properly in the shaft cutout.

Cylinder Head, Valve and Cylinder



REMOVAL (Rear)

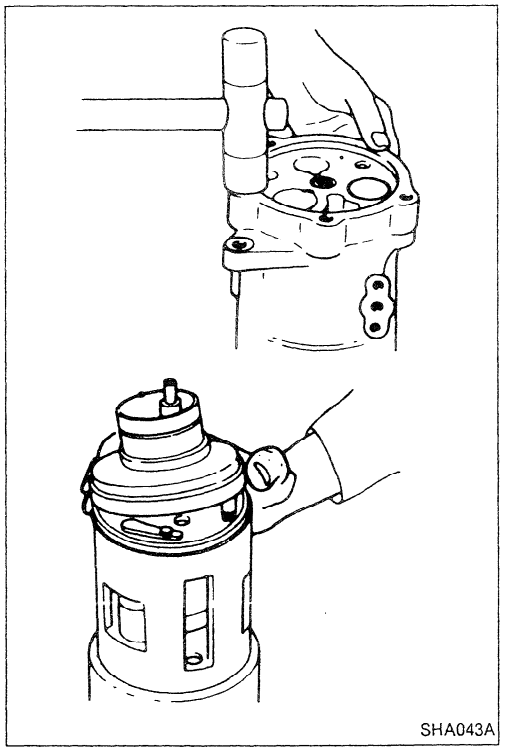
- Using Allen socket, remove rear cover.



- Using cylinder head remover, remove rear cylinder head.

INSPECTION

- Check suction valve plate and cylinder head for signs of damage.



REMOVAL (Front)

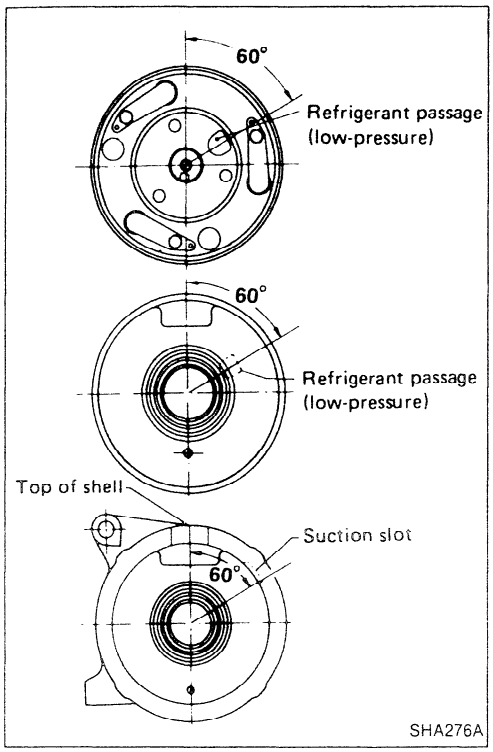
- With the front facing downward, support compressor shell. Using a plastic mallet, tap at the rear end of the shell flange, driving shell straight downward.
- Detach front cover from cylinder assembly.

INSPECTION

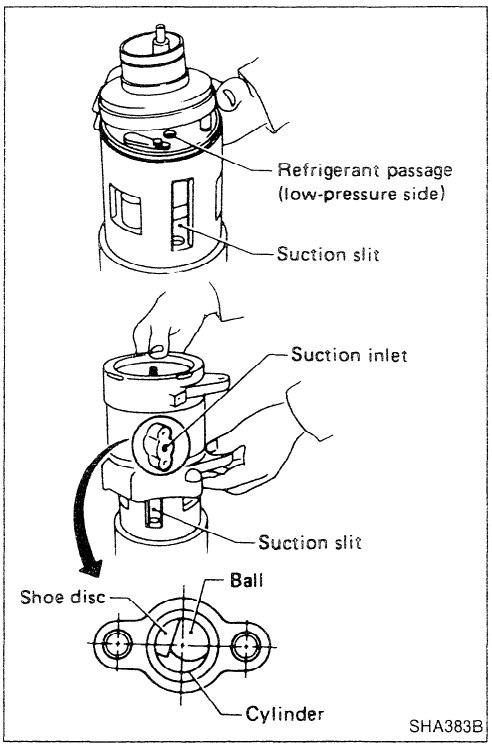
- Check suction valve plate and cylinder head for signs of damage.
- Check to make sure contact surfaces of cylinders, compressor shaft and compressor shell are free from any sign of scratches.

Cylinder Head, Valve and Cylinder (Cont'd)

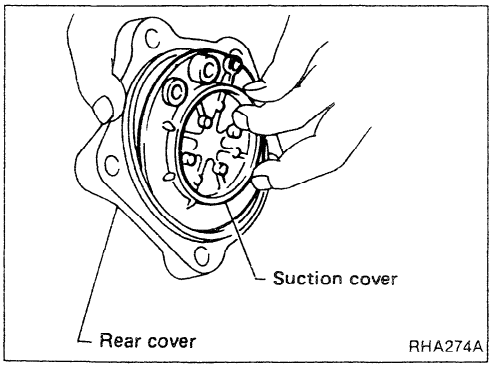
INSTALLATION



1. Front cover must be installed so that the cutout portions of front cover and shell are aligned.
   For this purpose, install front cover on cylinder head so that angle between threaded hole in front cover and low-pressure side refrigerant passage in cylinder head is about 60°.

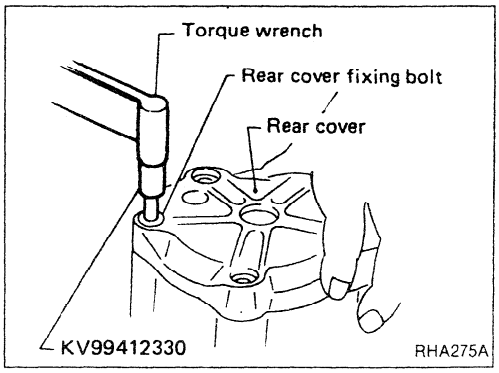


2. When installing shell on cylinder, adjust position of shell so that suction inlet of shell opens in the same direction as suction slit of cylinder visible in suction inlet by removing suction valve.



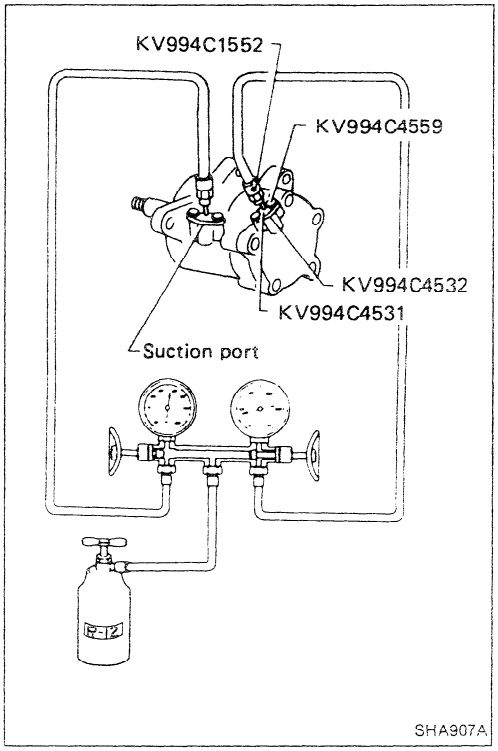
- When installing suction cover to rear cover, align knock pin.

Cylinder Head, Valve and Cylinder (Cont'd)



- Using Allen socket, install rear cover.

Leak Test



- Charge refrigerant from suction side and evacuate air from discharge side. Then conduct leak test.

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(Noise) ..... HA- 67
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Diagnostic Procedure 5
(SYMPTOM: Magnet clutch does not operate when A/C switch and fan switch are ON.
— Except for GA16DE and SR20DE engine models) HA-110
Diagnostic Procedure 6
(SYMPTOM: Illumination or indicators of push control unit do not come on.
— For push control type) HA-114
Electrical Components Inspection HA-118

Symptom Chart

DIAGNOSTIC TABLE

PROCEDURE	Preliminary Check				Diagnostic Procedure						Main Power Supply and Ground Circuit Check				
REFERENCE PAGE	HA-64	HA-65	HA-66	HA-67	HA-101	HA-103	HA-105	HA-106	HA-110	HA-114	HA-99	HA-99	HA-99	HA-100	HA-99
SYMPTOM	Preliminary check 1: For L.H.D. model only	Preliminary check 2	Preliminary check 3	Preliminary check 4	Diagnostic procedure 1	Diagnostic procedure 2: For push control type	Diagnostic procedure 3: For push control type	Diagnostic procedure 4: For GA16DE and SR20DE engine models	Diagnostic procedure 5: Except for GA16DE and SR20DE engine models	Diagnostic procedure 6: For push control type	20A Fuses: For L.H.D. model only	15A Fuses: For R.H.D. model only	10A Fuse	Push control unit	Thermo control amp.
A/C does not blow cold air.		❶			○			○	○		○	○	○		○
Blower motor does not rotate.		❶			❷						○	○			
Air outlet does not change.			❶			❷							○	○	
Intake door does not change.							❶						○	○	
Intake door is not set at "FRESH" in DEF or F/D mode. (L.H.D. model only)	❶						○						○	○	
Magnet clutch does not operate when A/C switch and fan switch are ON.		❶						❷	❷				○		○
Illumination or indicators of push control unit do not come on.										❶			○		
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

HA-120	Blower motor	○	○																		
HA-120	Resistor	○	○																		
HA-118	A/C switch	○		○	○	○	○	○	○	○											
—	REC switch			○	○					○											
—	VENT switch					○	○	○	○												
—	B/L switch					○	○	○	○												
—	FOOT switch					○	○	○	○												
—	F/D switch					○	○	○	○												
—	DEF switch					○	○	○	○												
HA-120	Fan switch	○	○	○	○					○	○	○	○	○	○	○	○	○	○	○	○
—	Mode door motor					○															
—	Intake door motor						○														
HA-119	A/C relay	○		○						○											
HA-119	Thermo control amp.	○		○						○											
HA-118	Dual-pressure switch	○		○						○											
—	Compressor (Magnet clutch)	○		○						○											
HA-119	Thermal protector	○		○						○											
Refer to EF & EC section	E.C.C.S. control unit	○		○						○											
Refer to EL section	Illumination system																				
—	Knob illumination																				
—	Harness	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

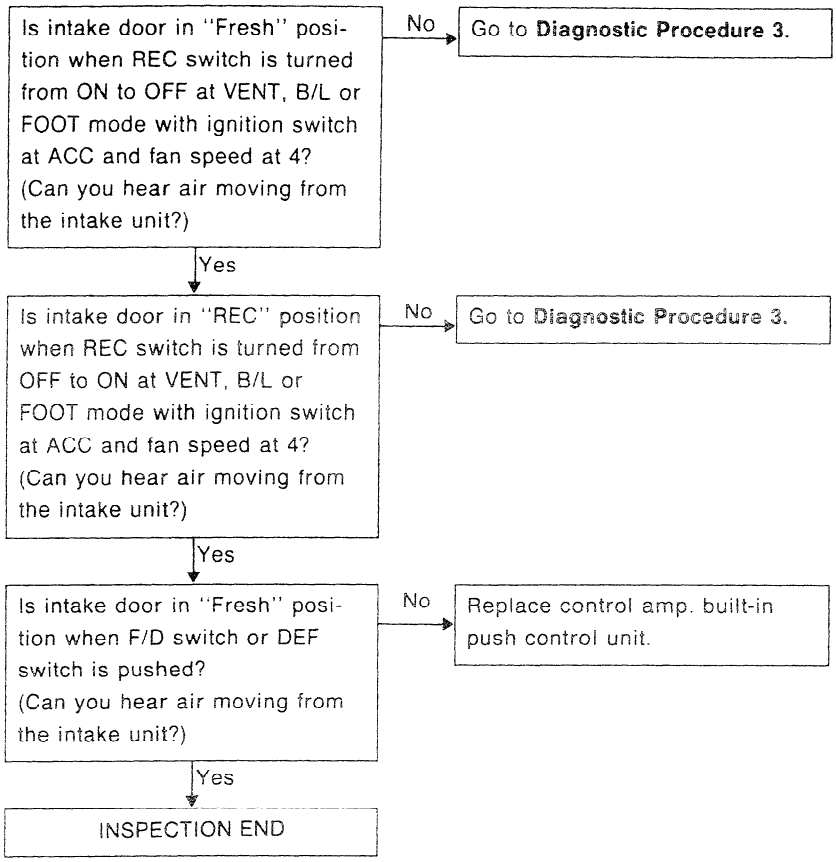
Push control unit

Compressor

Preliminary Check

PRELIMINARY CHECK 1: FOR L.H.D. MODEL ONLY

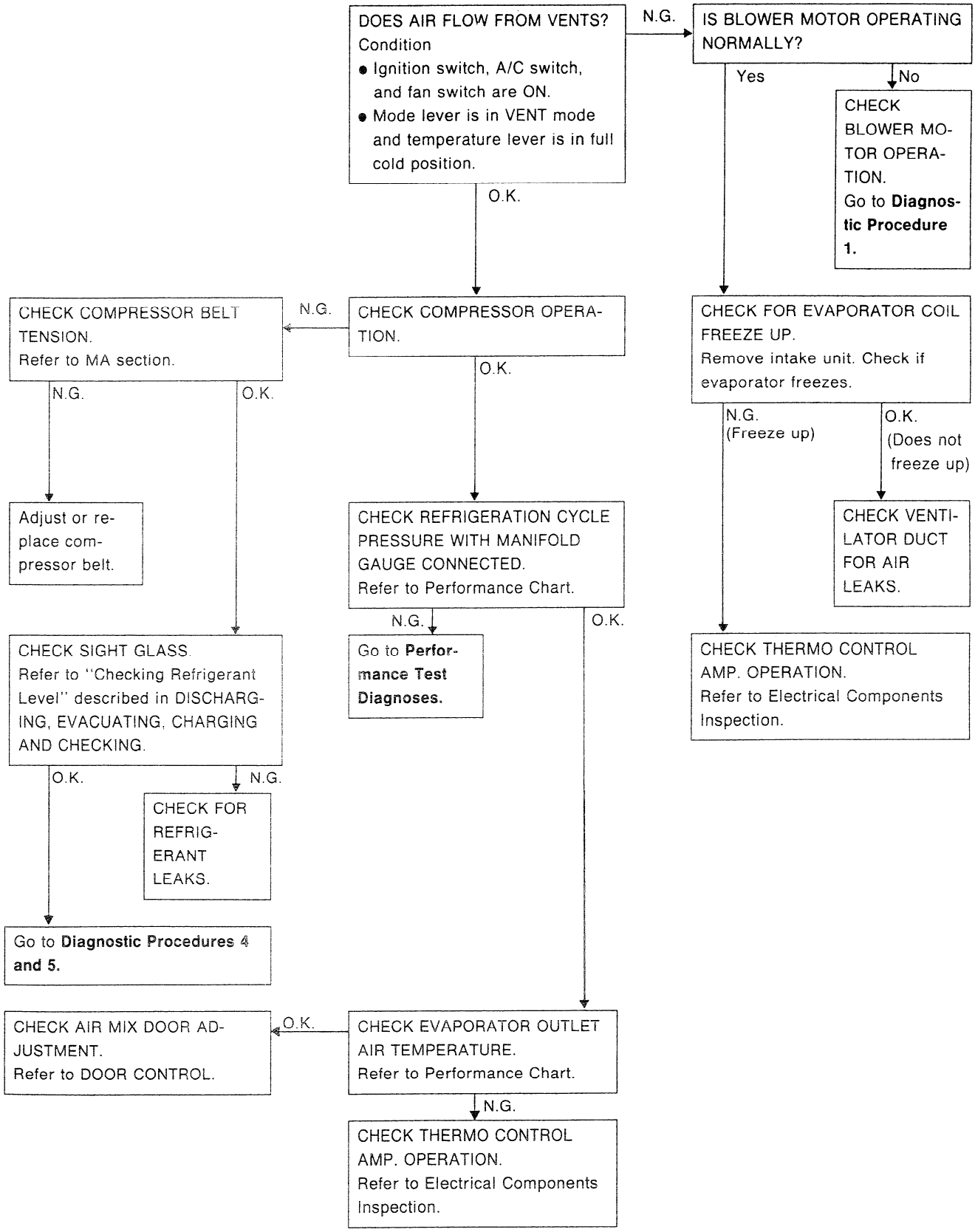
Intake door is not set at "FRESH" in DEF or F/D mode.



Preliminary Check (Cont'd)

PRELIMINARY CHECK 2

A/C does not blow cold air.



PRELIMINARY CHECK 3

Air outlet does not change.

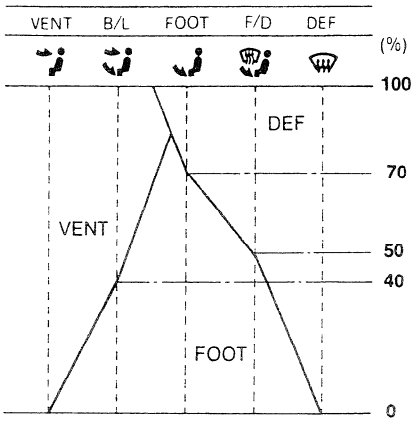
DOES AIR COME OUT FROM EACH DUCT NORMALLY WHEN EACH MODE SWITCH IS PUSHED WITH IGNITION SWITCH AT ACC?

No → Go to **Diagnostic Procedure 2.**

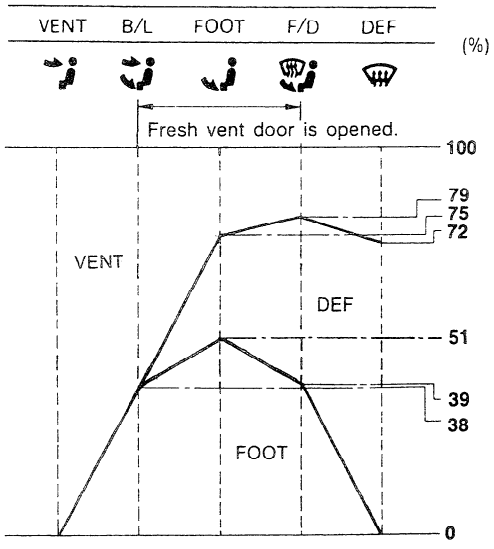
Switch		Indicator illuminates					Air outlet
Mode							
		○					VENT
			○				FOOT & VENT
				○			FOOT & DEF
					○		FOOT & DEF
						○	DEF

Air distribution ratios

Except Europe models



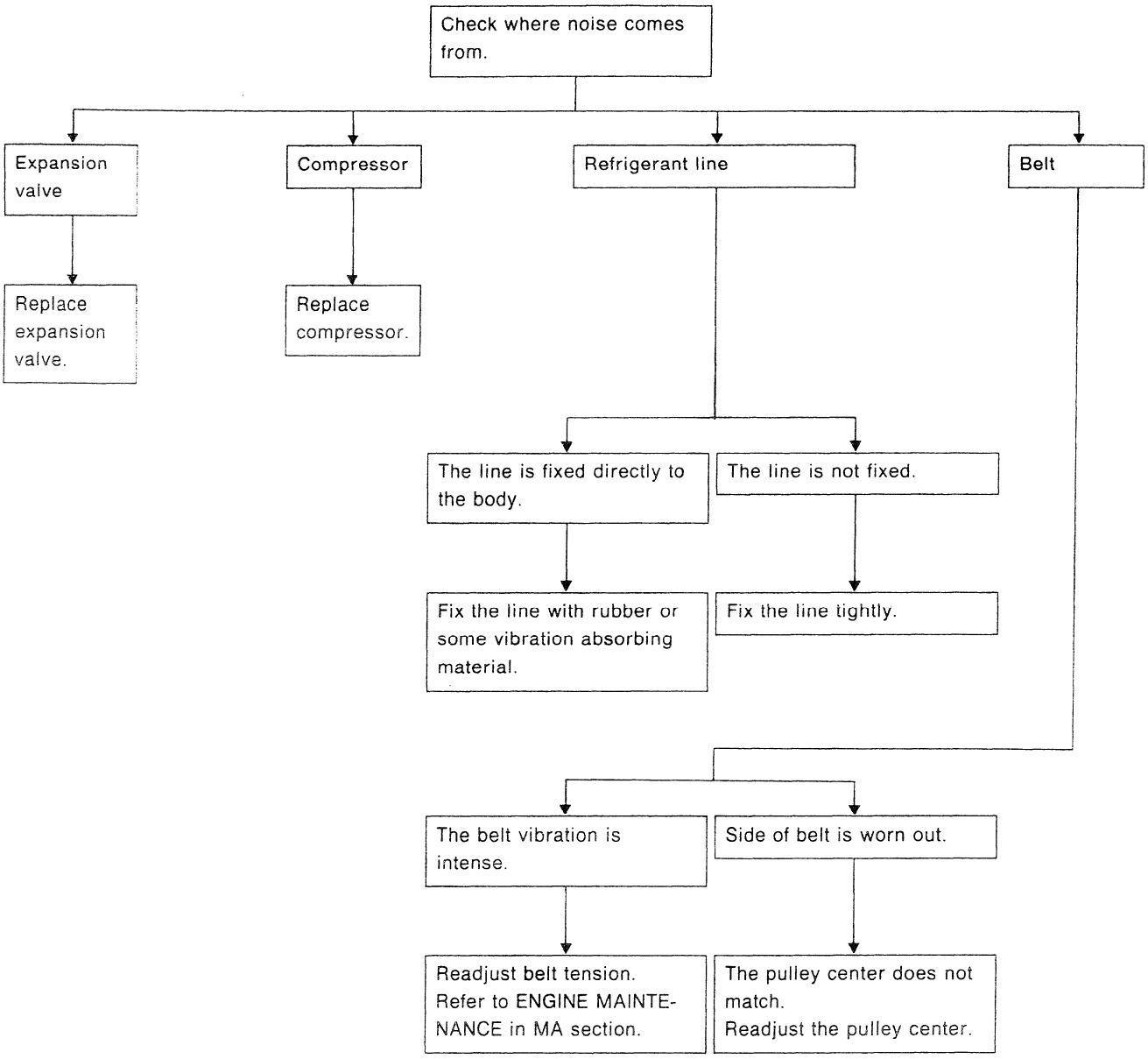
Europe models



Yes → INSPECTION END

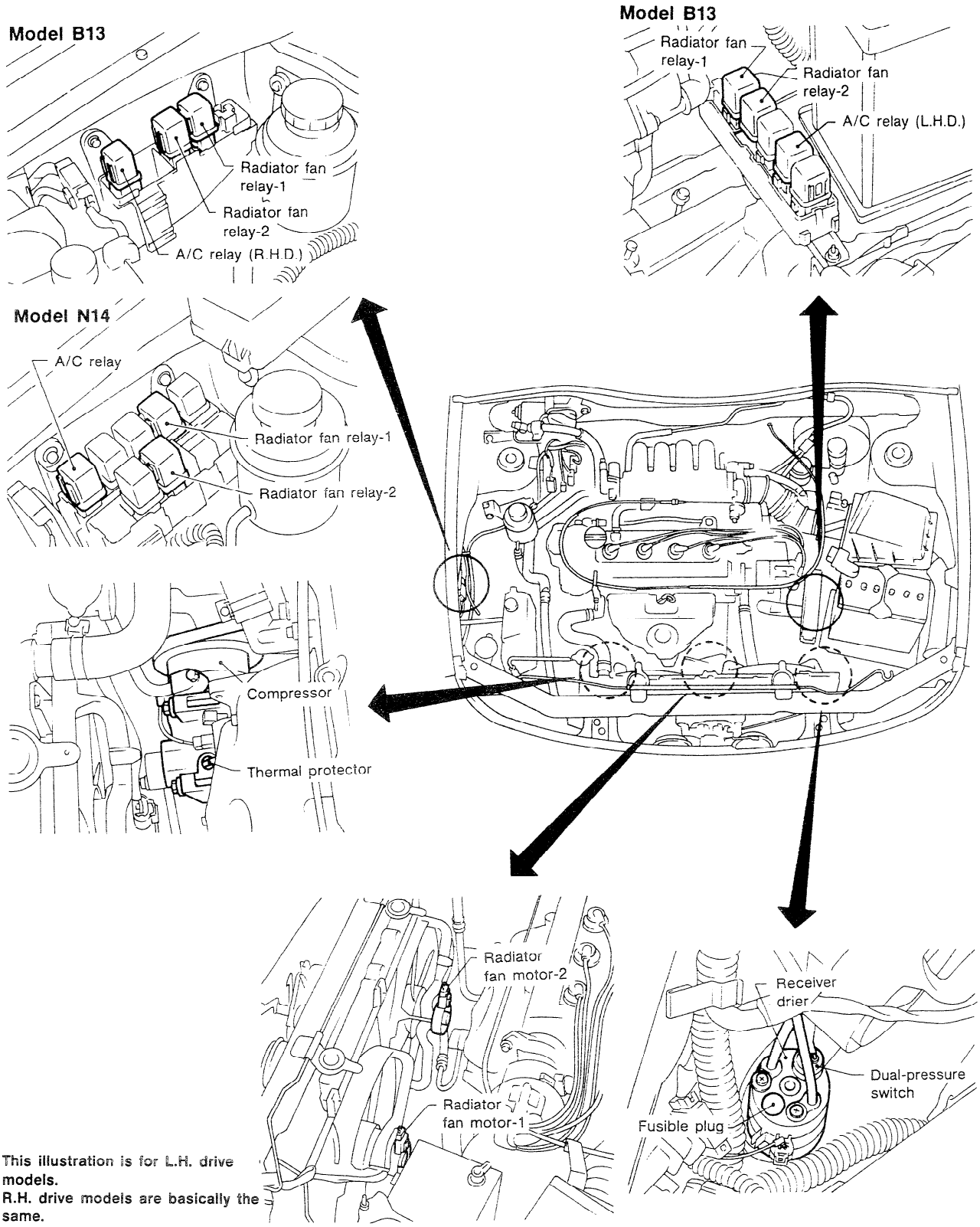
PRELIMINARY CHECK 4

Noise



A/C Component Layout

ENGINE COMPARTMENT

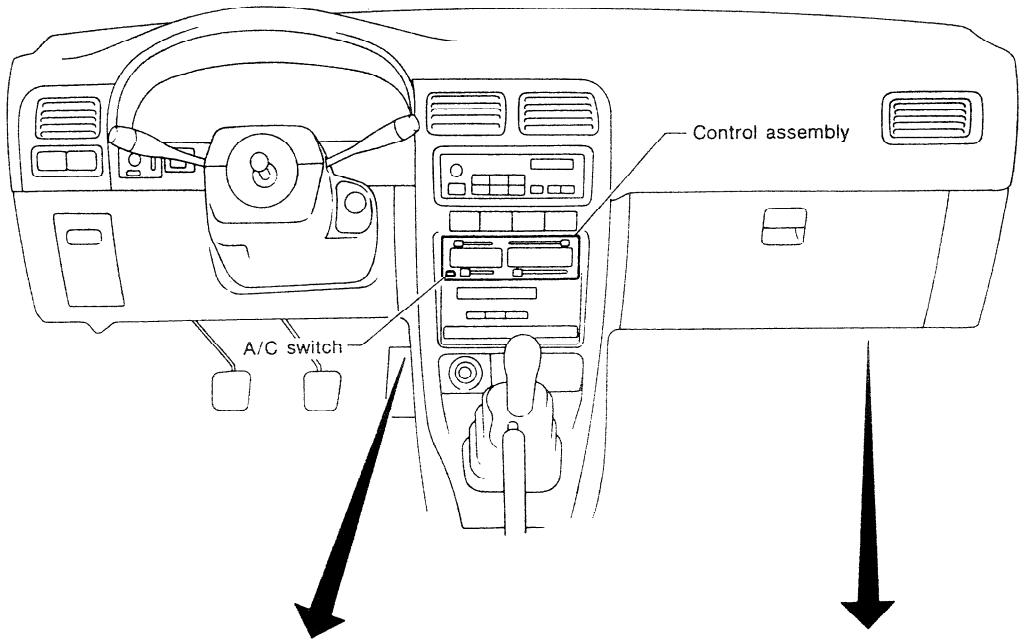


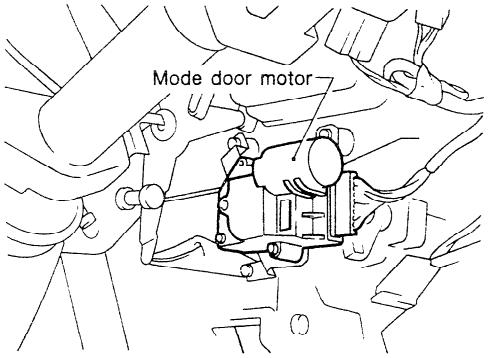
This illustration is for L.H. drive models.
R.H. drive models are basically the same.

RHA915B

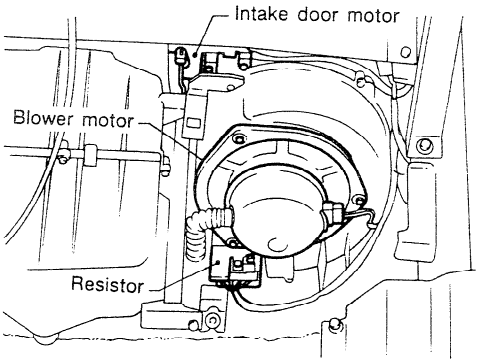
A/C Component Layout (Cont'd)

PASSENGER COMPARTMENT





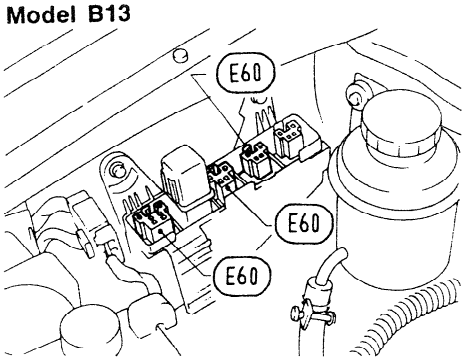
This illustration is for L.H. drive models.
R.H. drive models are basically the same.



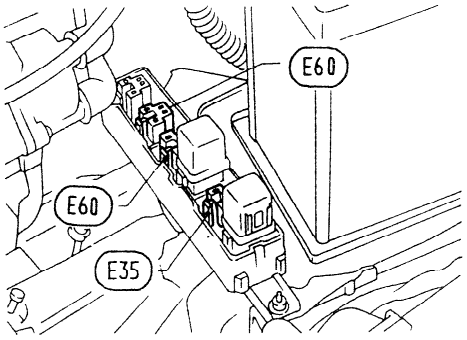
RHA916B

Harness Layout for A/C System

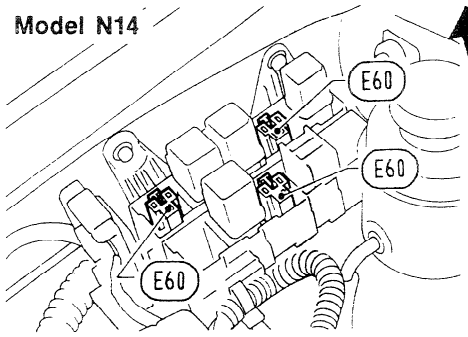
Model B13

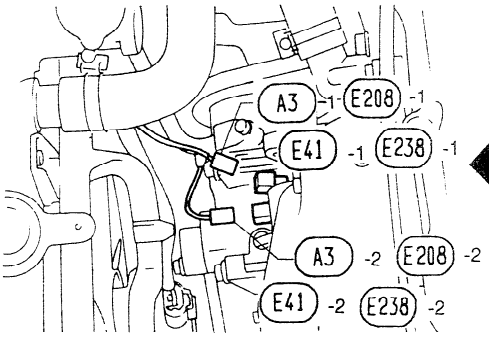


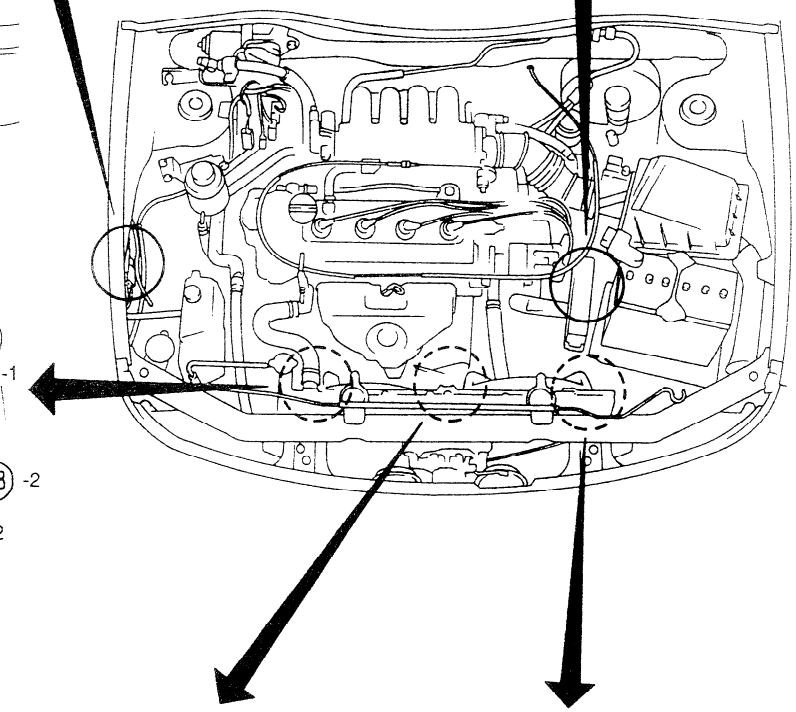
Model B13

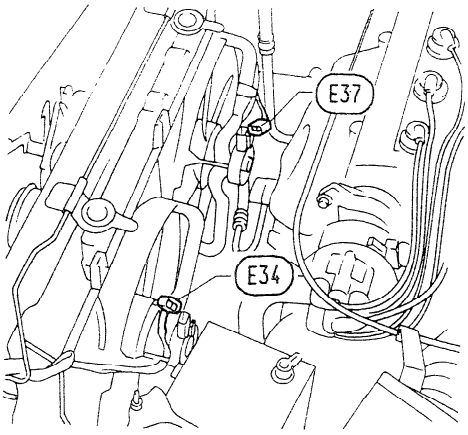


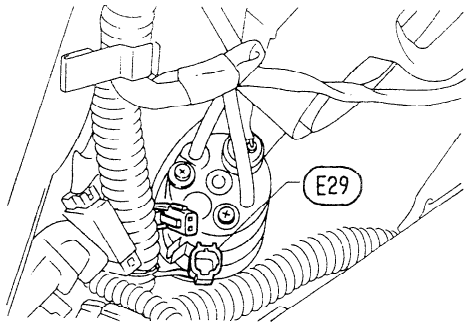
Model N14





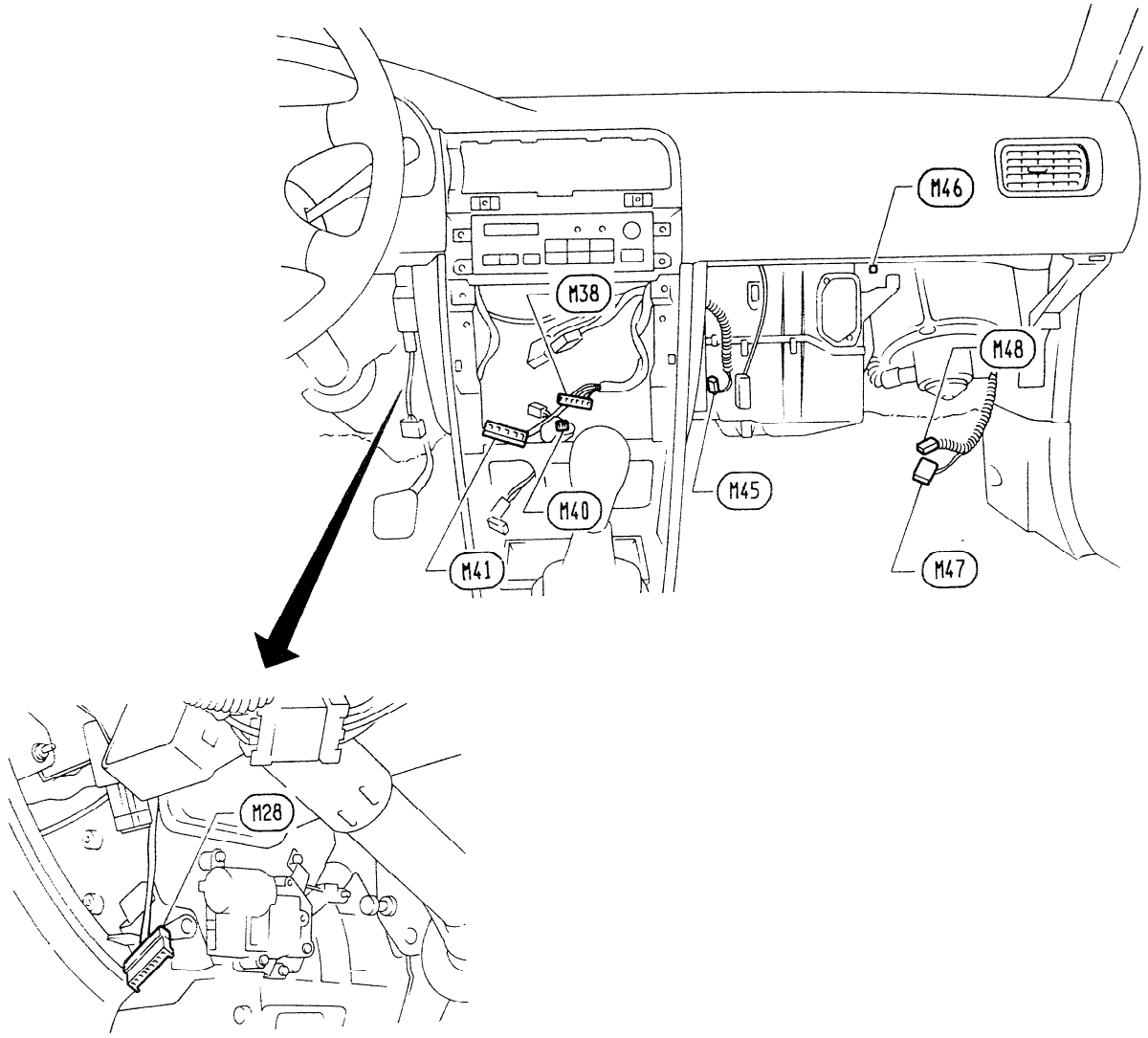






RHA921B

Harness Layout for A/C System (Cont'd)



RHA922B

Main harness

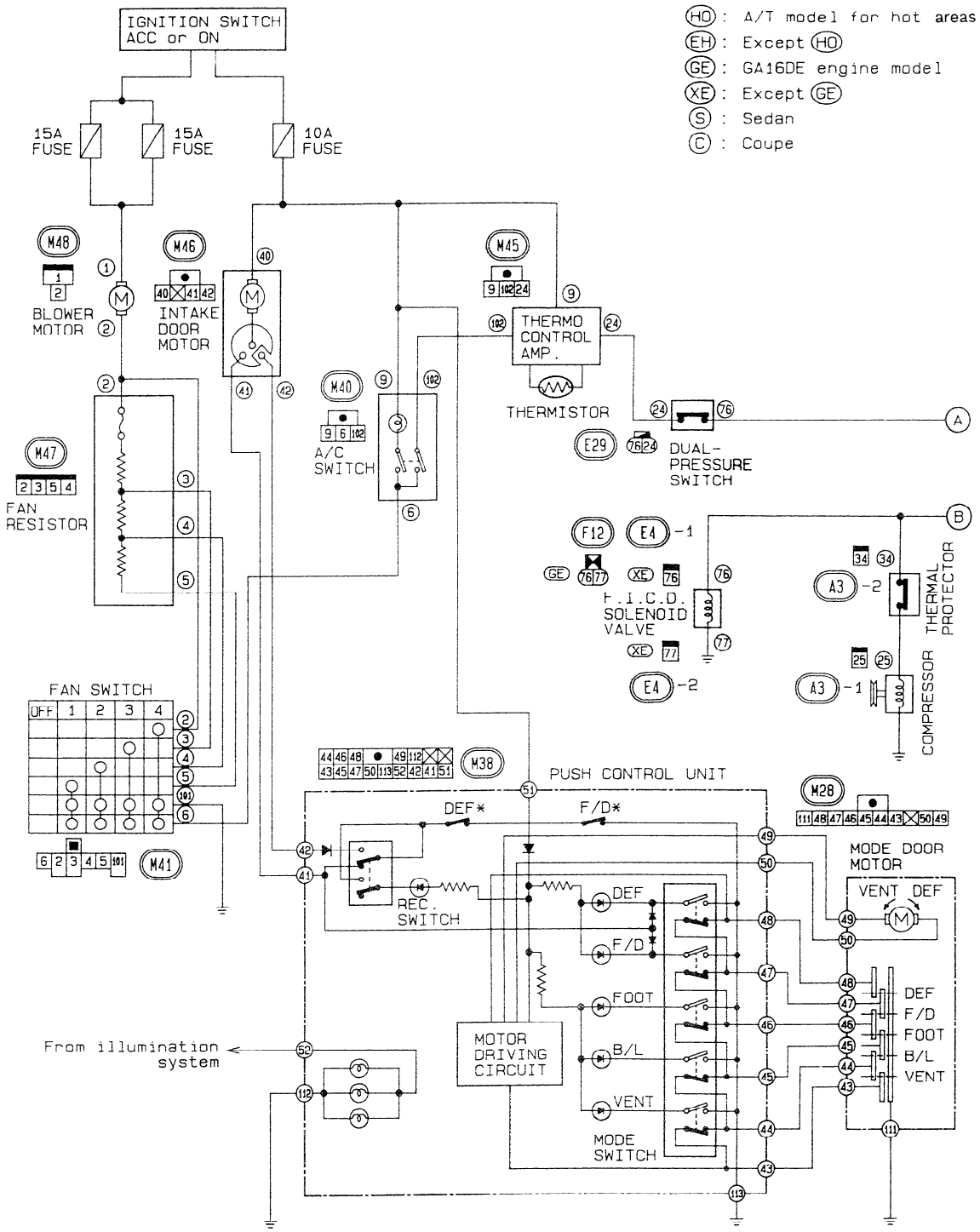
- M28 : Mode door motor
- M38 : Push control unit
- M40 : A/C switch
- M41 : Fan switch
- M45 : Thermo control amp.
- M46 : Intake door motor
- M47 : Fan resistor
- M48 : Blower motor

Engine room harness

- E29 : Dual-pressure switch
- E34 : Radiator fan motor-1
- E35 : A/C relay (B13 L.H.D. models)
- E37 : Radiator fan motor-2
- E60 : Radiator fan relay-1 and -2, A/C relay (Except for B13 L.H.D. models)
- E41-1 : Compressor (E10S engine)
- E208-1 : Compressor (SR20DET engine)
- E238-1 : Compressor (GA engine with catalyzer without E.G.R.)
- A3-1 : Compressor (Other engine models)
- E41-2 : Thermal protector (E10S engine)
- E208-2 : Thermal protector (SR20DET engine)
- E238-2 : Thermal protector (GA engine with catalyzer without E.G.R.)
- A3-2 : Thermal protector (Other engine models)

Circuit Diagram for Quick Pinpoint Check

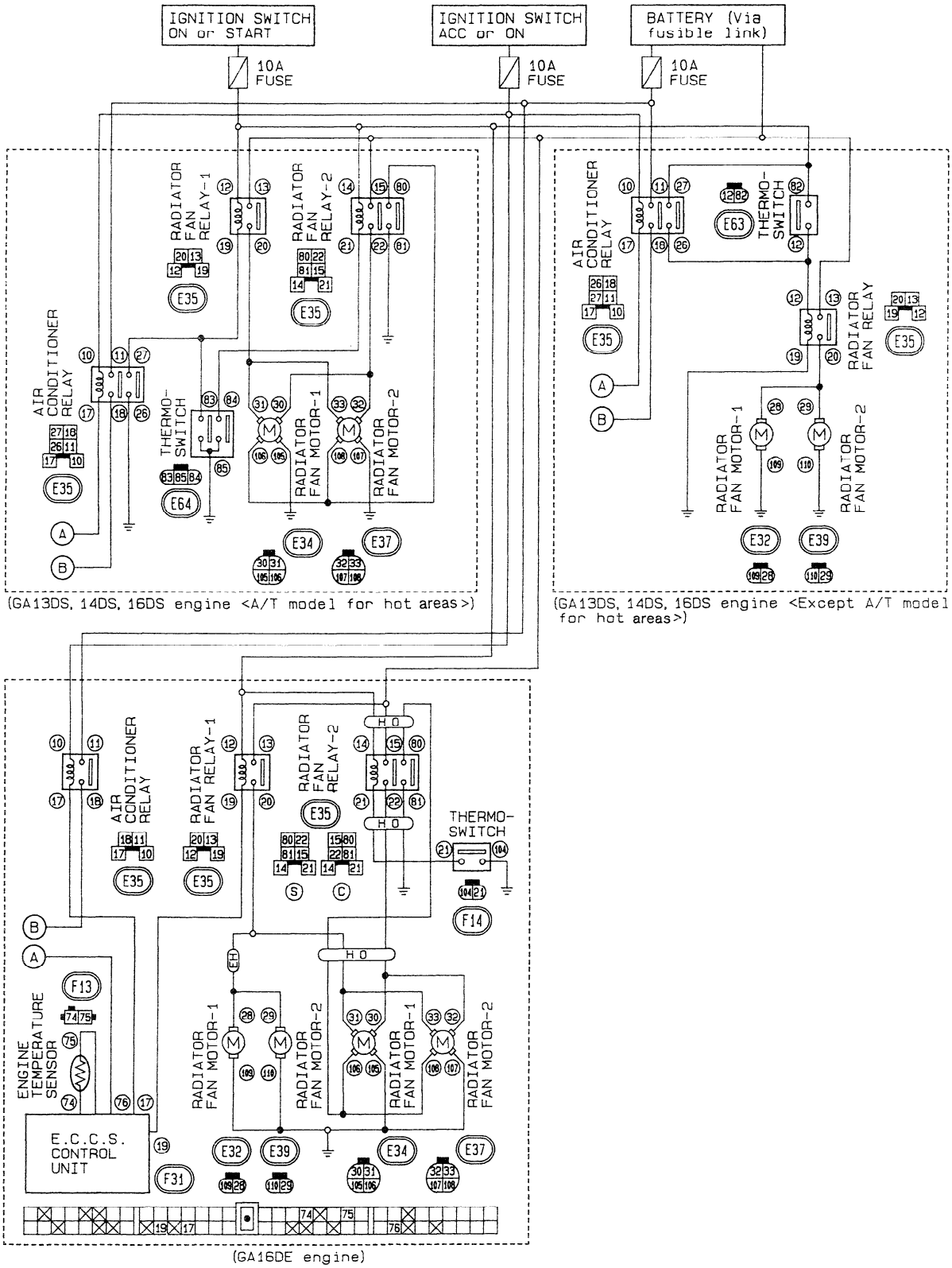
L.H.D. MODELS (Push control type)



- All connectors shown in this illustration are unit side connectors.
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle "○".
- The unit side connectors with a **double** circle "⊜" are connected to the harness side connectors shown in the "Harness Layout for A/C System". (See pages HA-70, HA-71.)

*: These switches are built into push control unit and mechanically linked to corresponding switches.

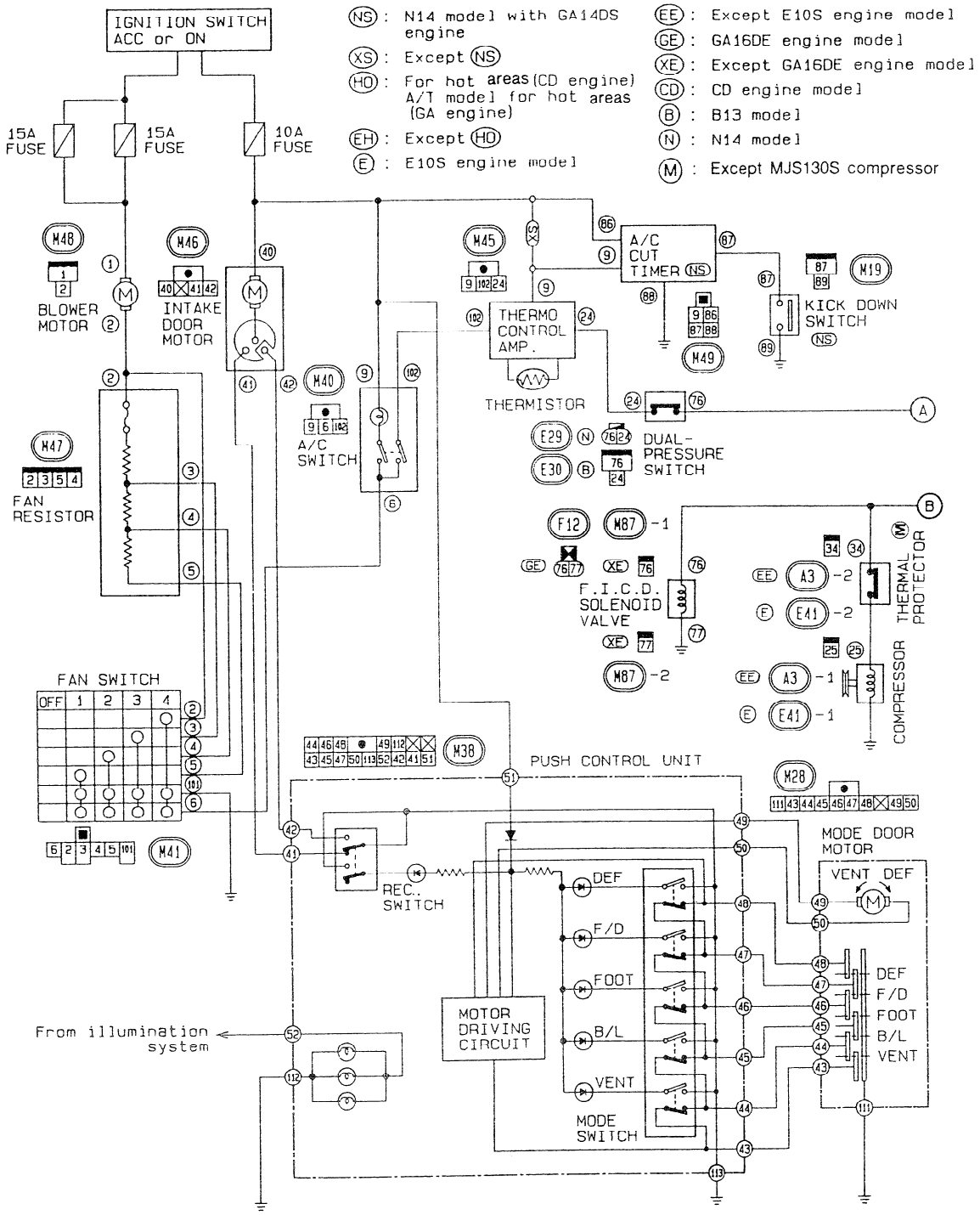
Circuit Diagram for Quick Pinpoint Check (Cont'd)



RHA951B

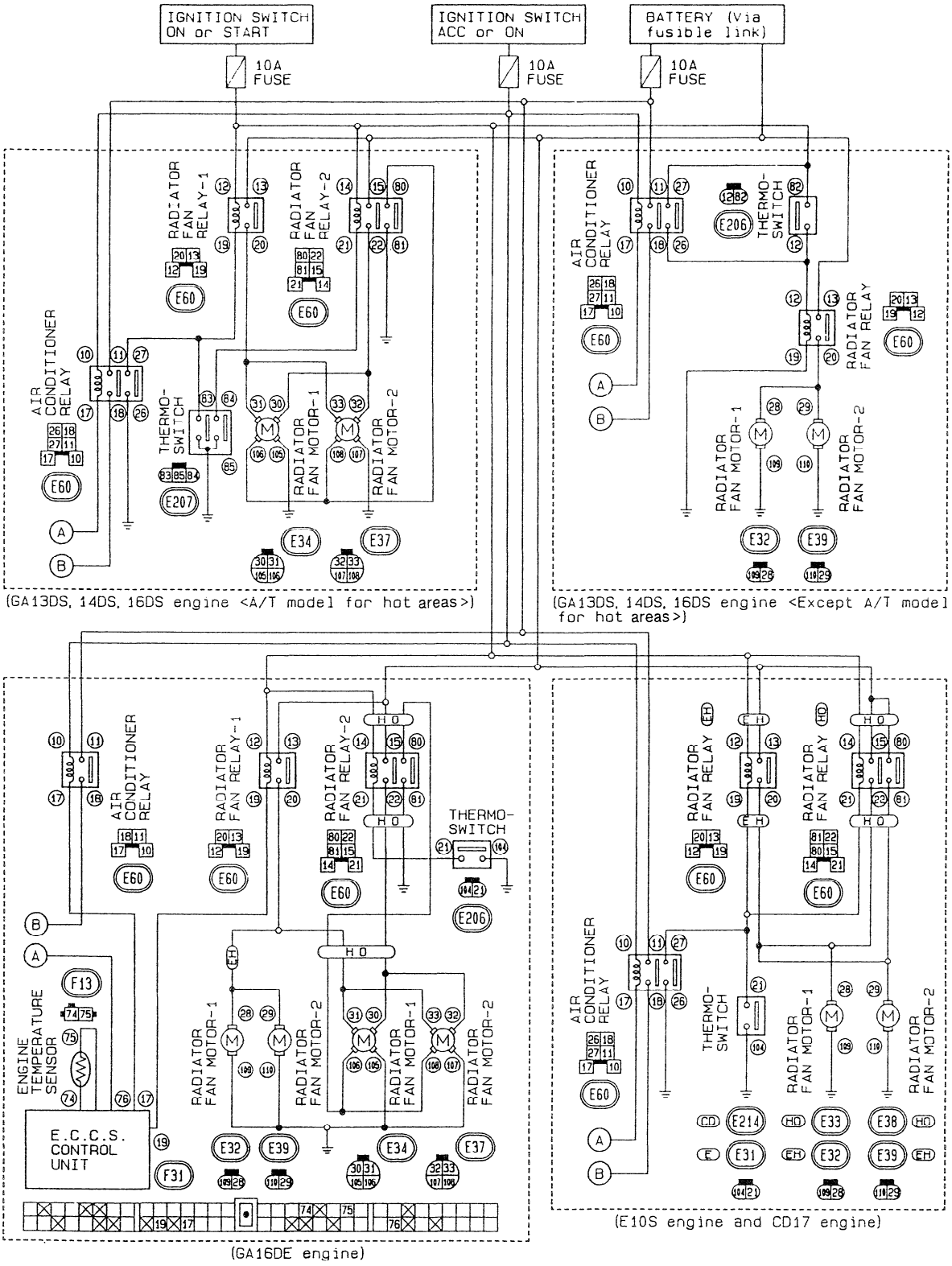
Circuit Diagram for Quick Pinpoint Check (Cont'd)

R.H.D. MODELS (Push control type)



- All connectors shown in this illustration are unit side connectors.
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle "○".
- The unit side connectors with a double circle "⊜" are connected to the harness side connectors shown in the "Harness Layout for A/C System". (See pages HA-70, HA-71.)

Circuit Diagram for Quick Pinpoint Check (Cont'd)

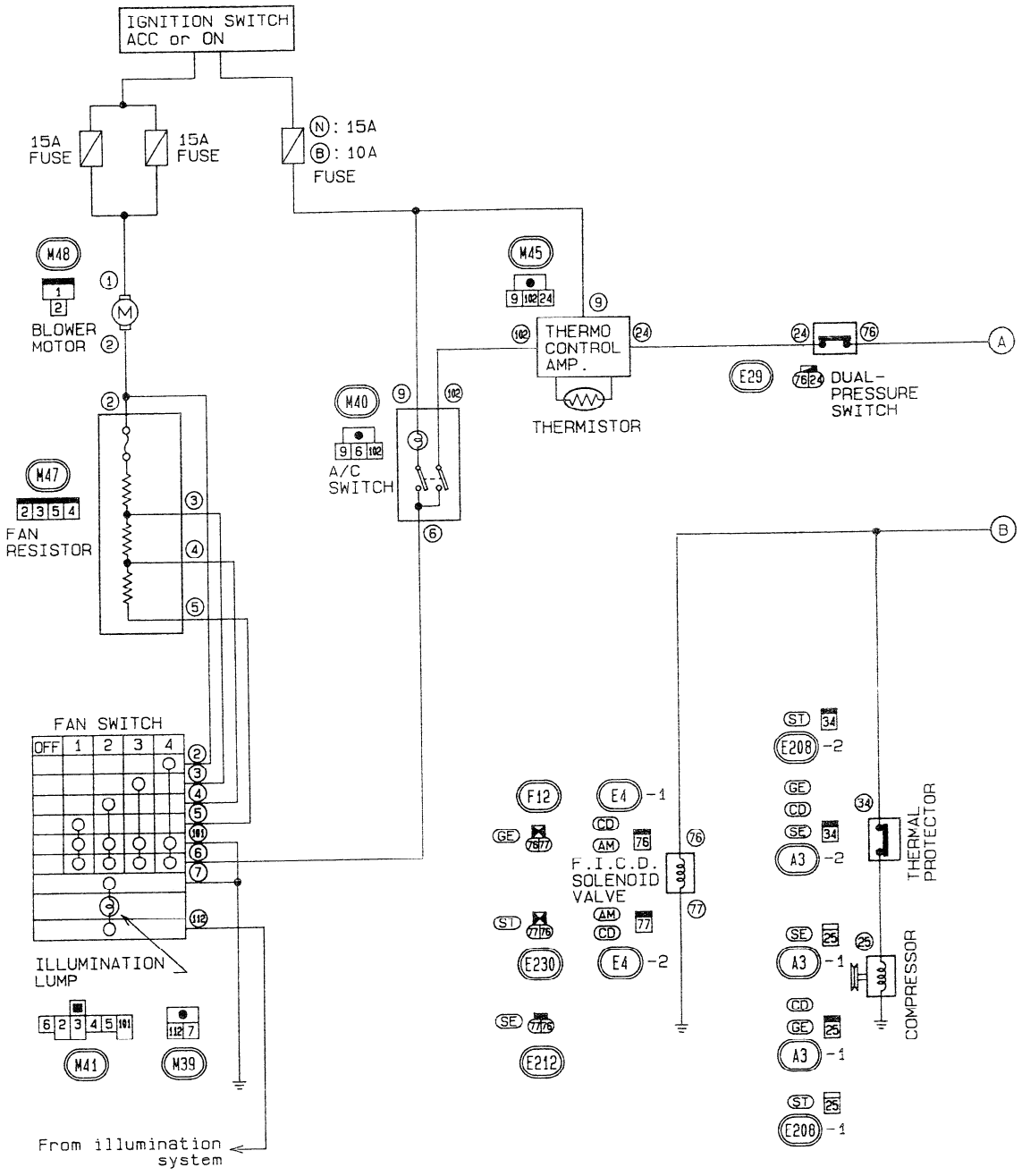


RHA954B

Circuit Diagram for Quick Pinpoint Check (Cont'd)

L.H.D. MODELS (Lever control type)

GA engine A/T models for Middle East, and non-GA-S engine models

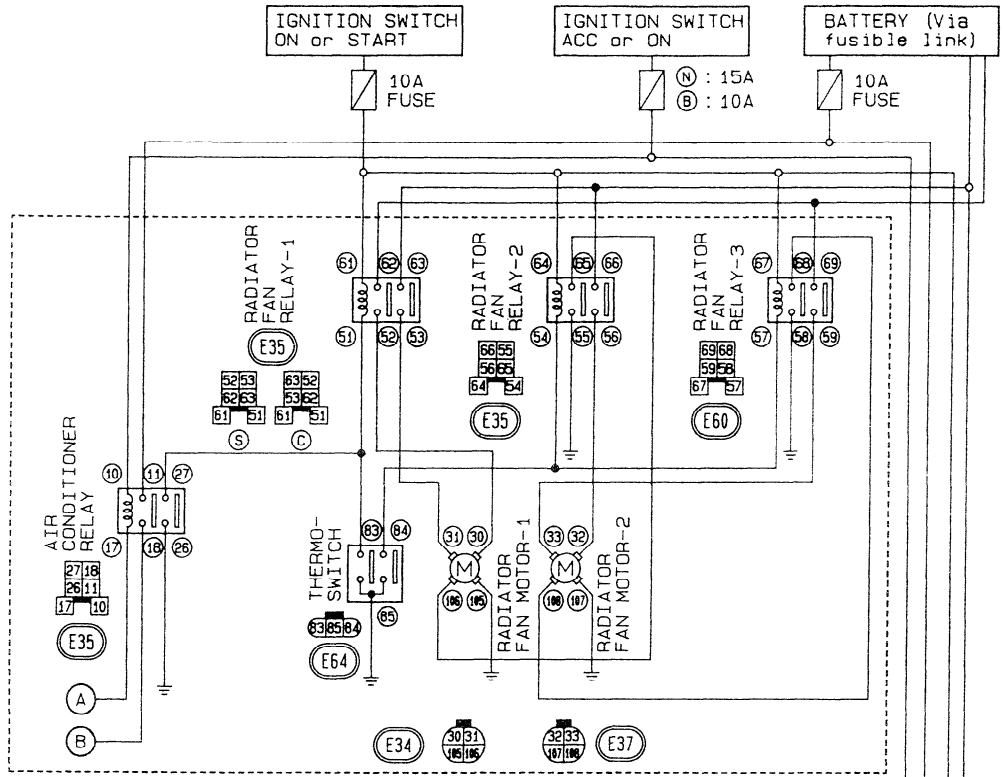


Ⓑ : B13 model
Ⓝ : N14 model
Ⓒ : Sedan
Ⓒ : Coupe

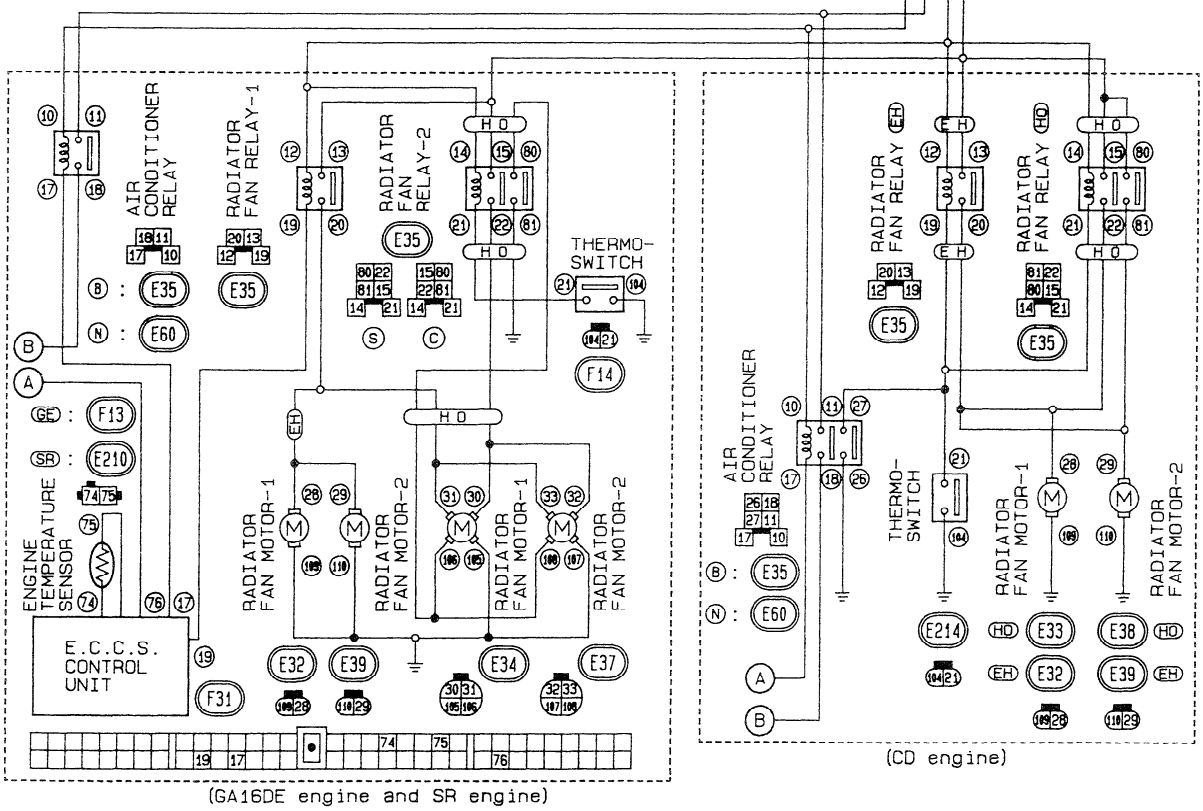
(GE) : GA16DE engine model
(HO) : CD17 engine for hot areas and CD20 engine (CD engine) A/T model for hot areas (GA engine)
(EH) : Except (HO)
(SE) : SR20DE engine model
(ST) : SR20DET engine model
(AM) : A/T model for Middle East

- All connectors shown in this illustration are unit side connectors.
- The unit side connectors with a double circle " ◎ " are connected to the harness side connectors shown in the "Harness Layout for A/C System". (See pages HA-70, HA-71.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle " ○ ".

Circuit Diagram for Quick Pinpoint Check (Cont'd)



(GA14DS, 16DS engine <A/T model for Middle East>)



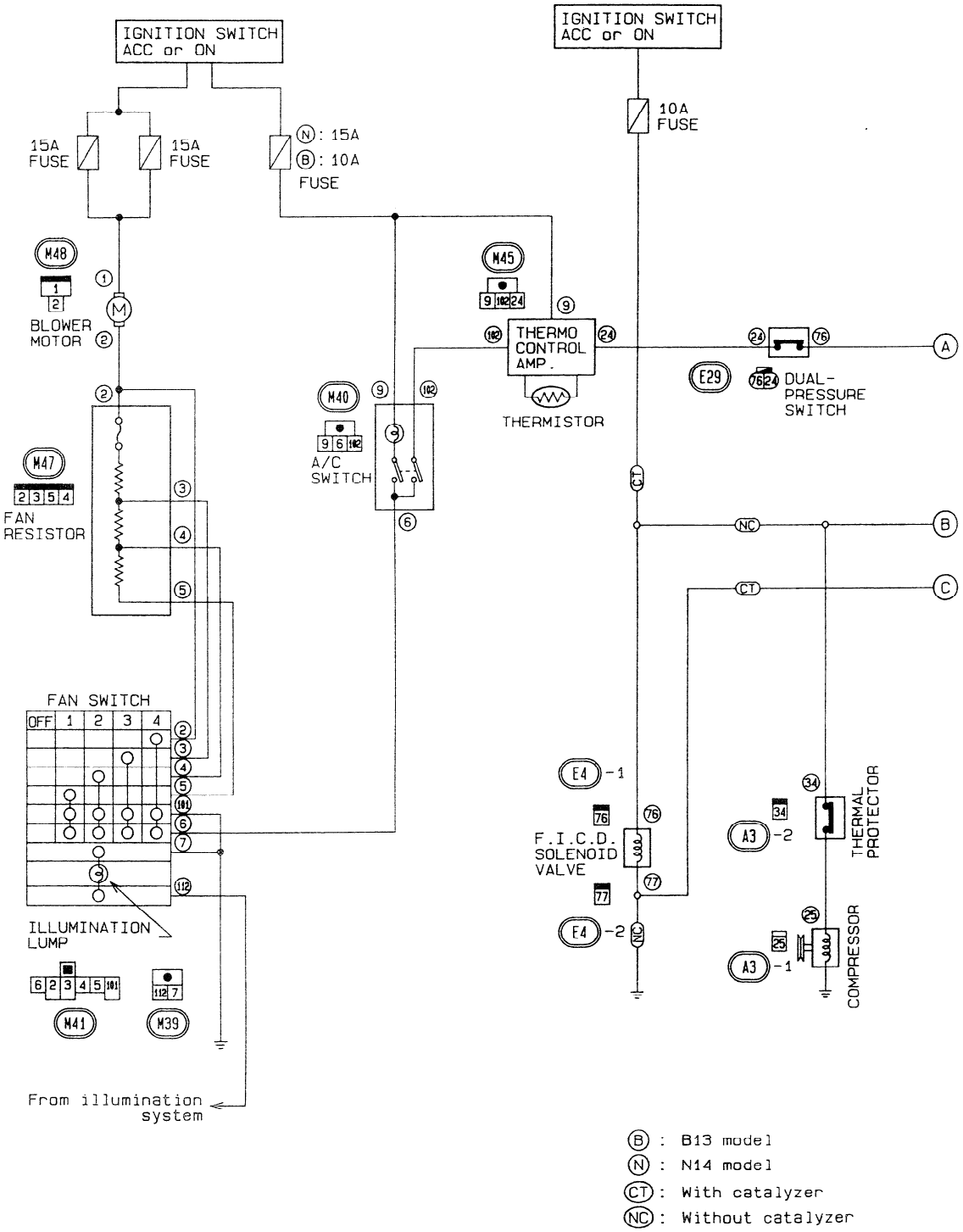
(GA16DE engine and SR engine)

(CD engine)

SHA879C

Circuit Diagram for Quick Pinpoint Check (Cont'd)

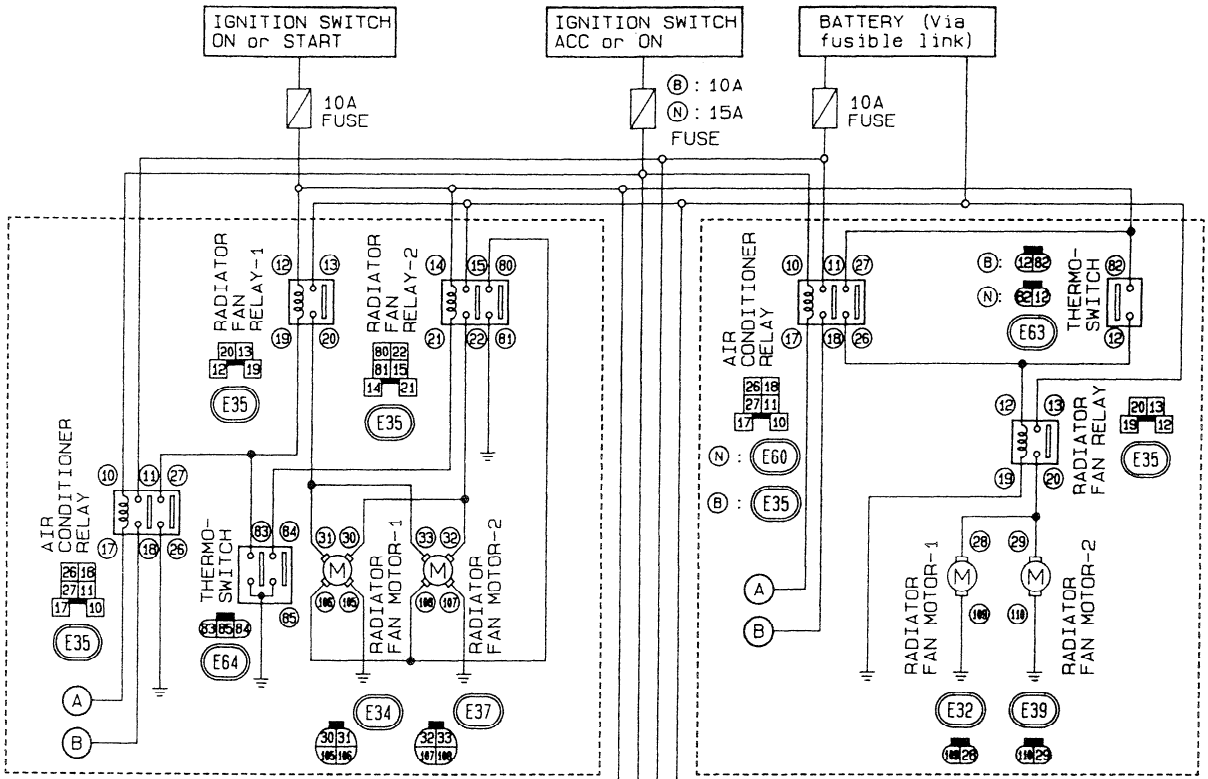
GA-S engine models



Ⓑ : B13 model
Ⓝ : N14 model
CT : With catalyzer
NC : Without catalyzer

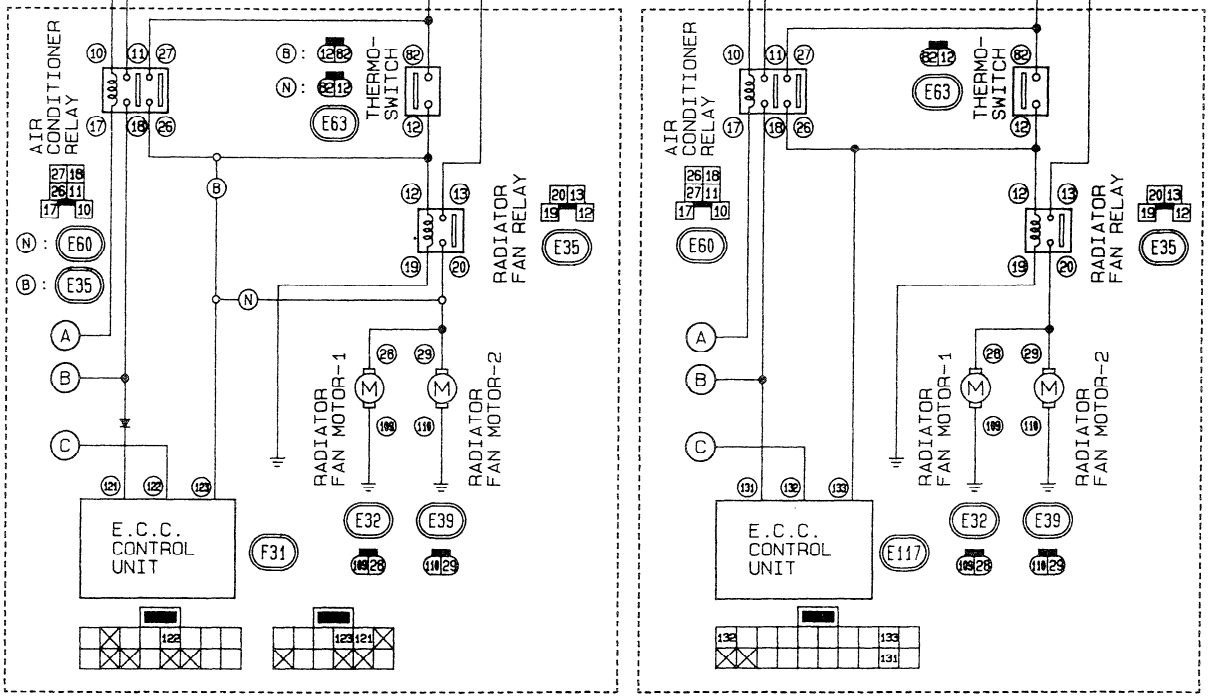
- All connectors shown in this illustration are unit side connectors.
- The unit side connectors with a double circle " ◯◯ " are connected to the harness side connectors shown in the "Harness Layout for A/C System". (See pages HA-70, HA-71.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle " ○ ".

Circuit Diagram for Quick Pinpoint Check (Cont'd)



(GA13DS, 14DS, 16DS engine <A/T model for hot areas except Middle East>)

(GA13DS, 14DS, 16DS engine <Except A/T model for hot areas>)



(GA14DS, 16DS engine with catalyzer and E.G.R.)

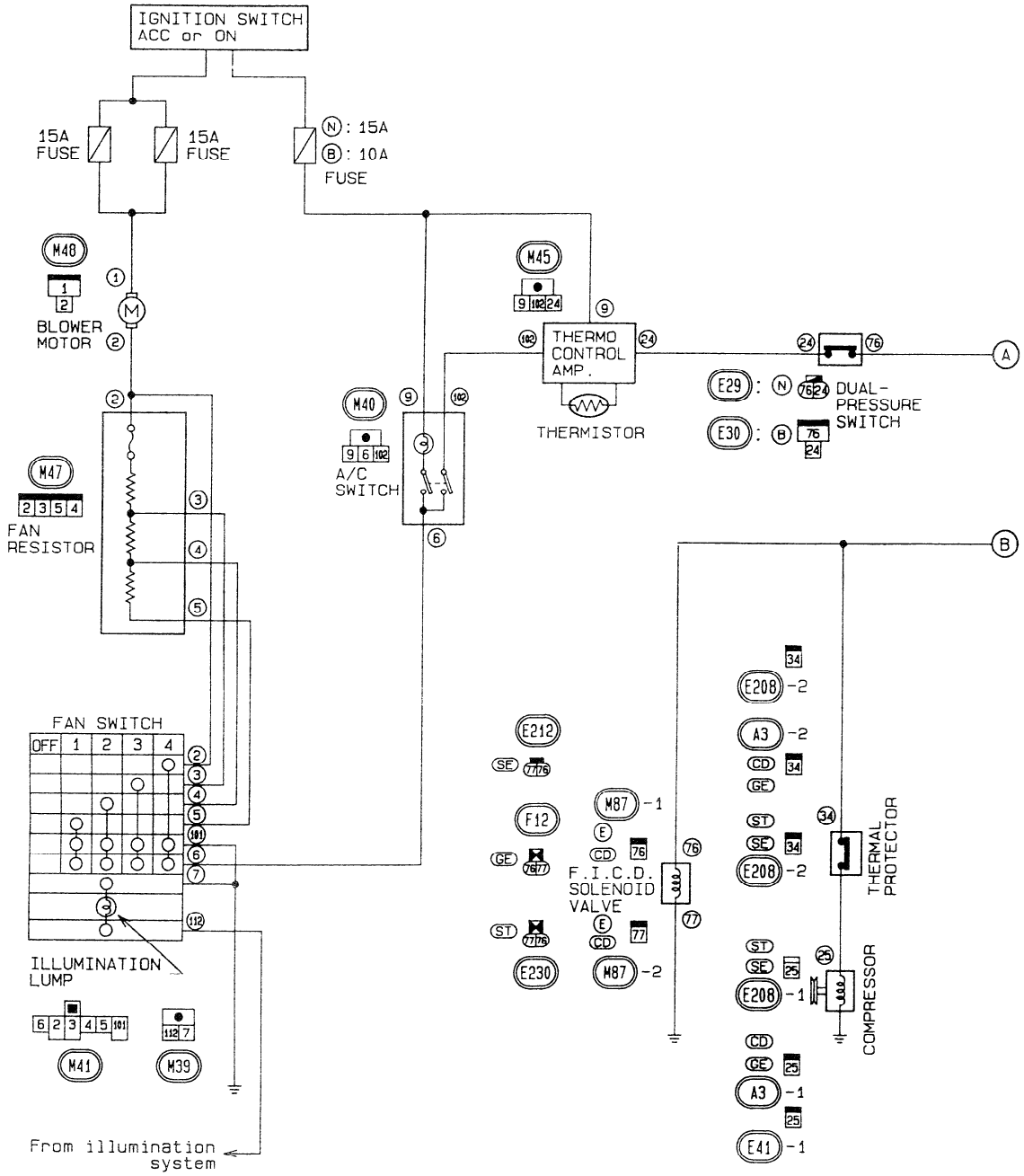
(GA14DS egine with catalyzer without E.G.R.)

SHA880C

Circuit Diagram for Quick Pinpoint Check (Cont'd)

R.H.D. MODELS (Lever control type)

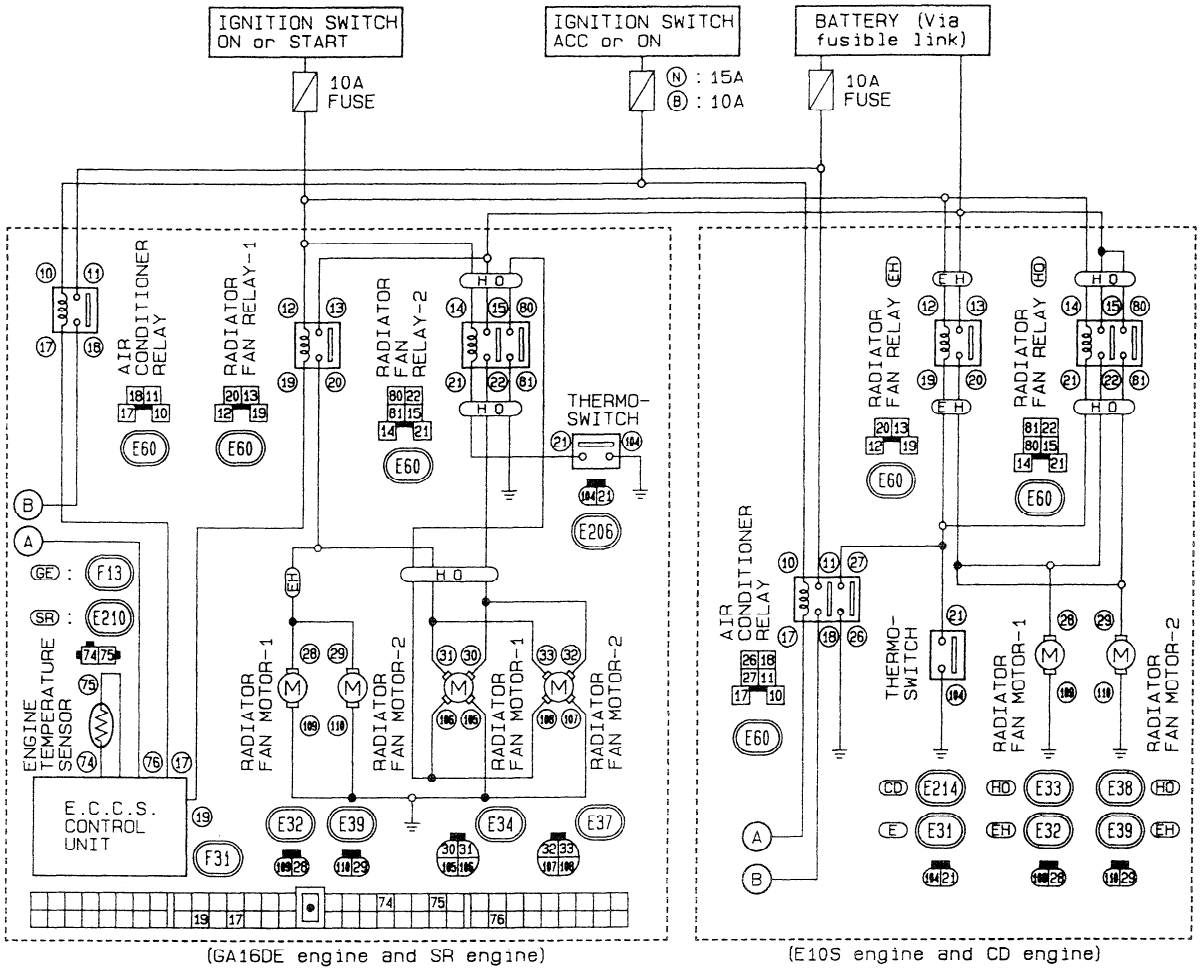
GA engine A/T models for Middle East, and non-GA-S engine models



Ⓑ : B13 model
Ⓝ : N14 model
Ⓔ : E10S engine
GE : GA16DE engine model
HO : CD17 engine for hot areas and CD20 engine (CD engine) A/T model for hot areas (GA engine)
EH : Except HO
SE : SR20DE engine model
ST : SR20DET engine model

- All connectors shown in this illustration are unit side connectors.
- The unit side connectors with a double circle " ◎ " are connected to the harness side connectors shown in the "Harness Layout for A/C System". **(See pages HA-70, HA-71.)**
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle " ○ ".

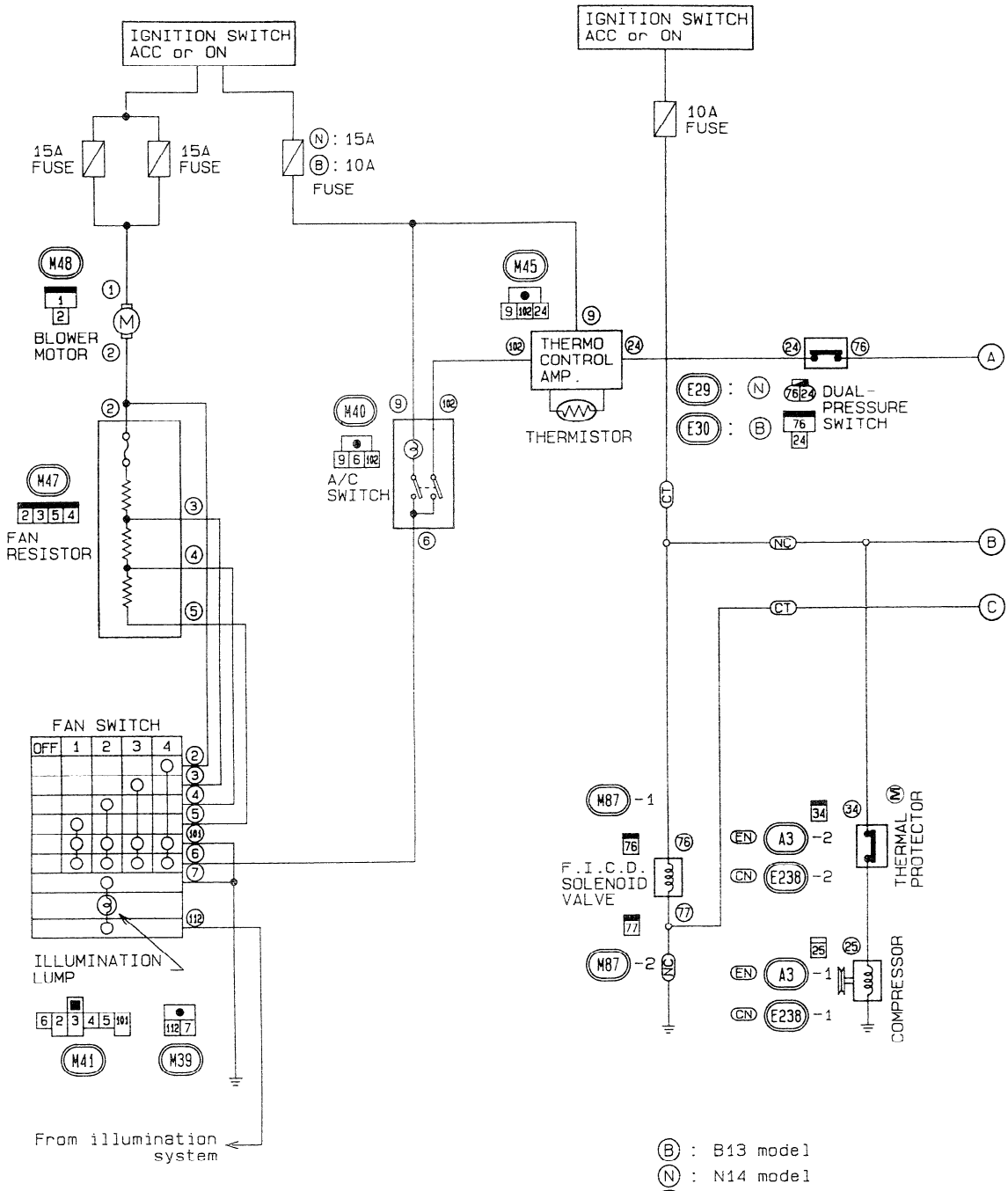
Circuit Diagram for Quick Pinpoint Check (Cont'd)



SHA881C

Circuit Diagram for Quick Pinpoint Check (Cont'd)

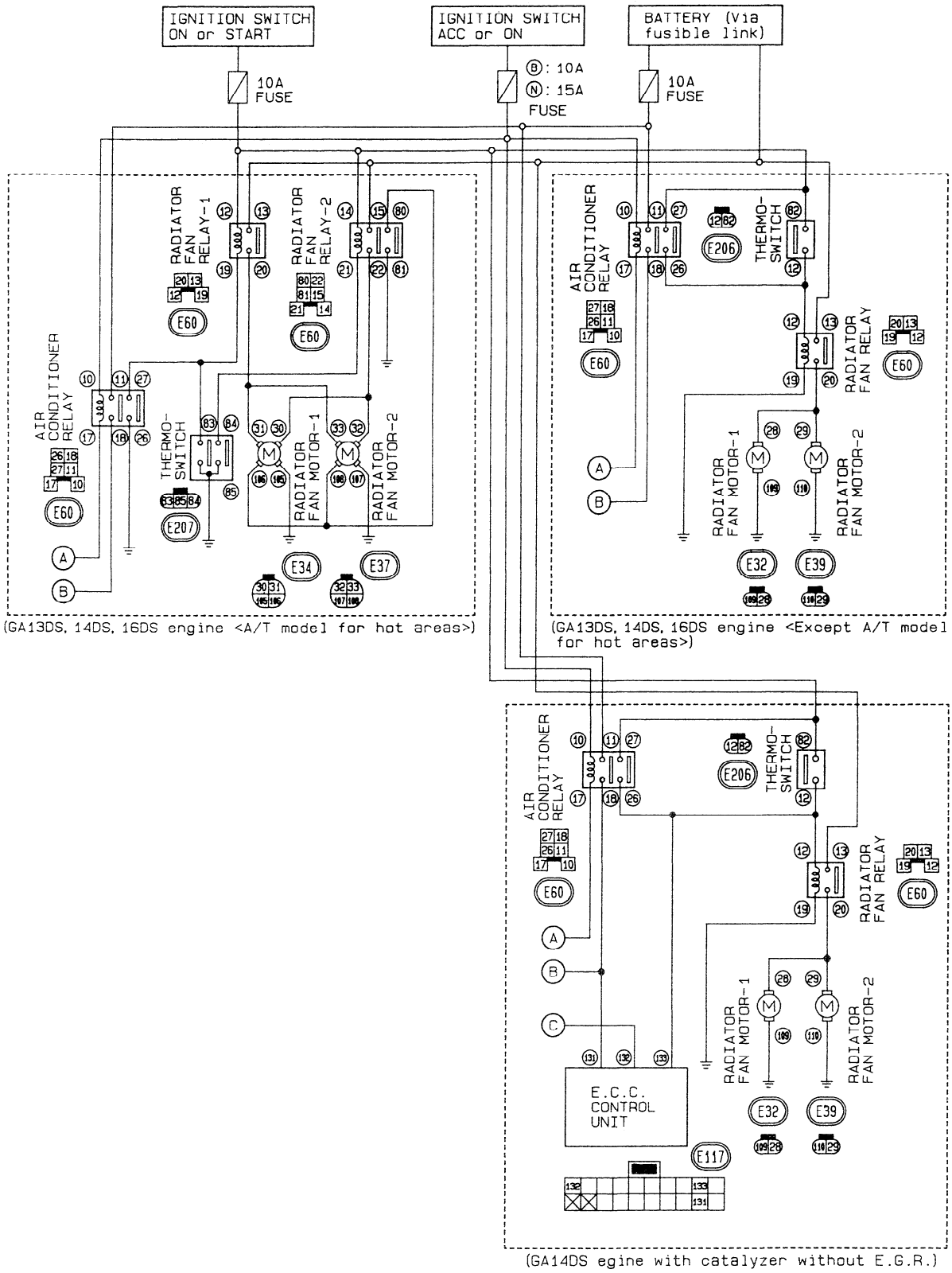
GA-S engine models



Ⓑ : B13 model
Ⓝ : N14 model
CT : With catalyzer
NC : Without catalyzer
CN : GA engine with catalyzer without E.G.R.
EN : Except CN
Ⓜ : Except MJS130S compressor

- All connectors shown in this illustration are unit side connectors.
- The unit side connectors with a double circle " ◎ " are connected to the harness side connectors shown in the "Harness Layout for A/C System". (See pages HA-70 - HA-71.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle " ○ ".

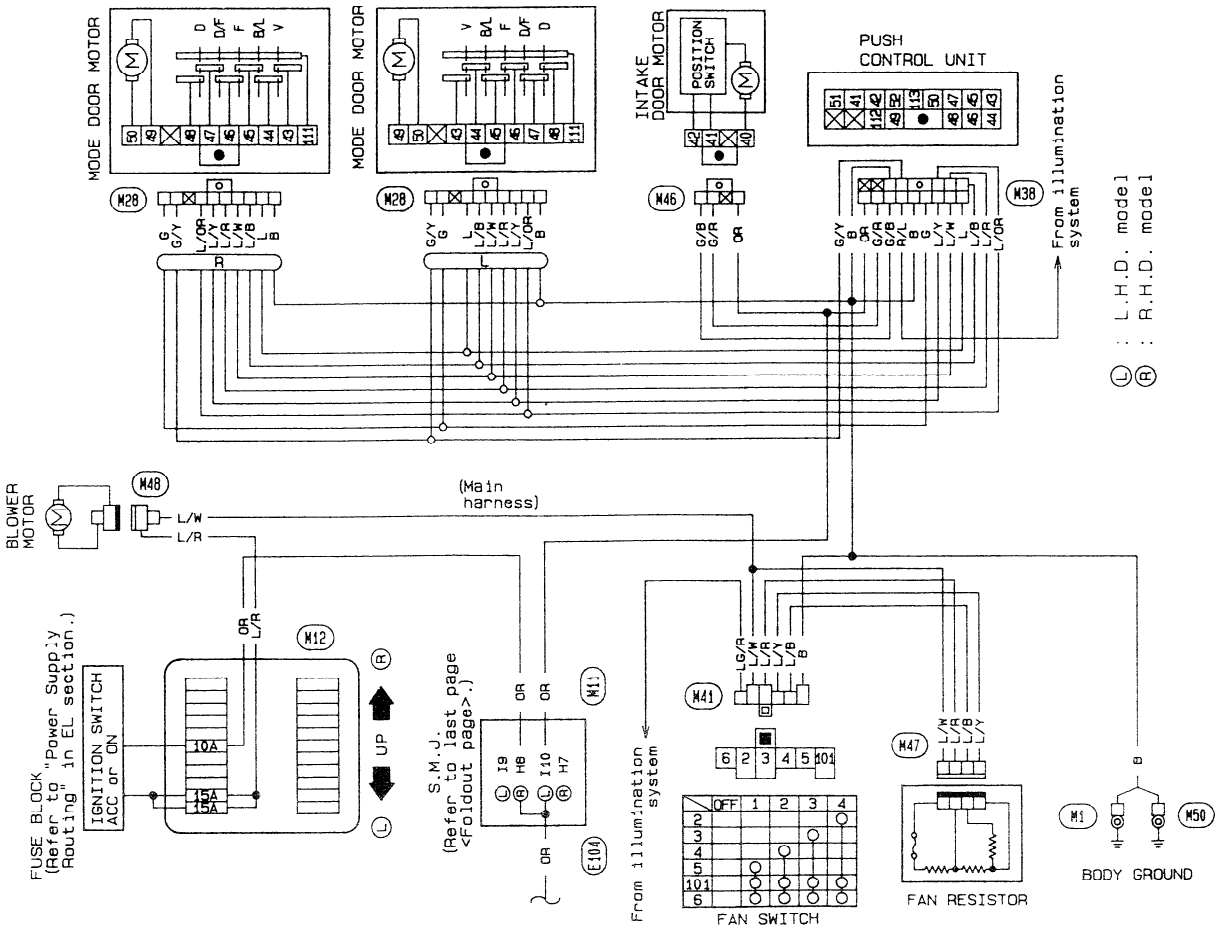
Circuit Diagram for Quick Pinpoint Check (Cont'd)



SHA882C

Wiring Diagram — Heater

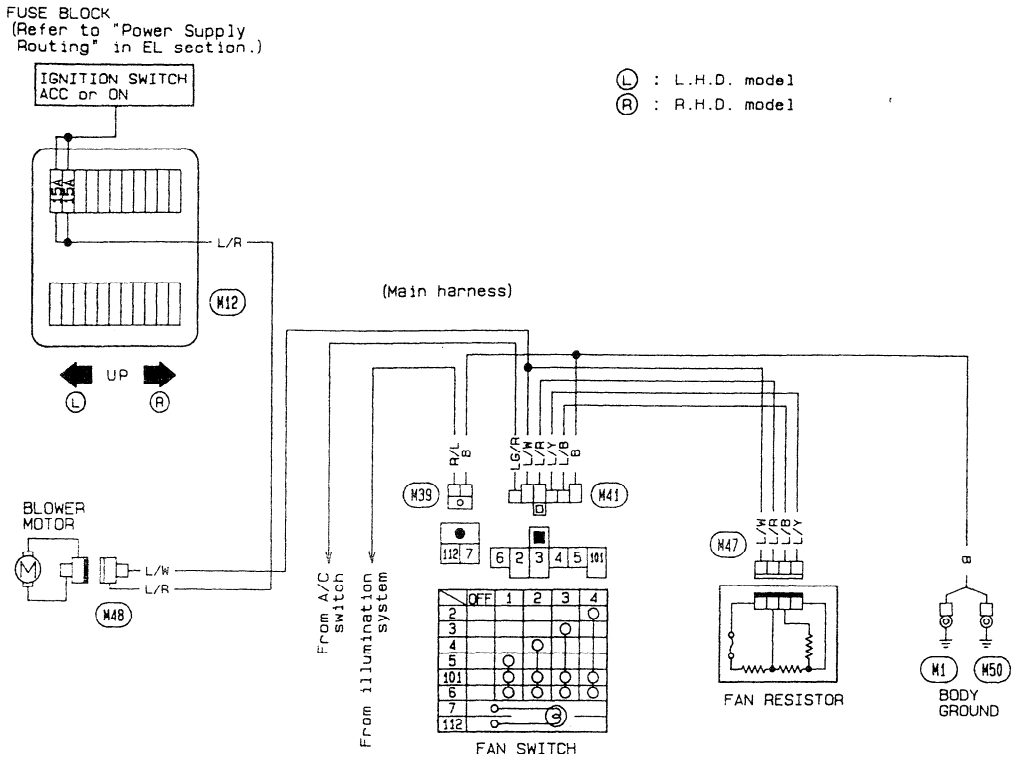
PUSH CONTROL TYPE



SHA739C

Wiring Diagram — Heater (Cont'd)

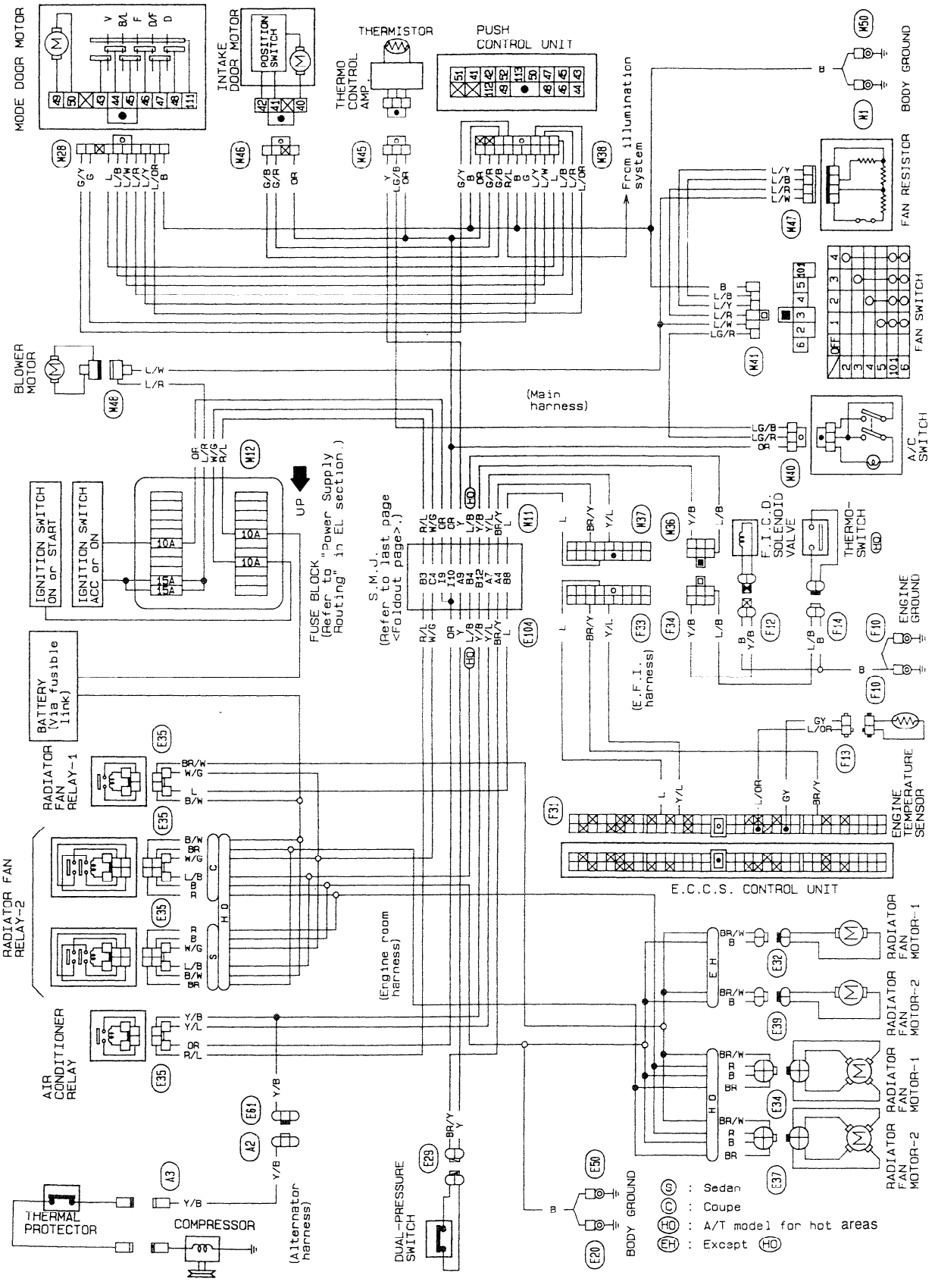
LEVER CONTROL TYPE



SHA738C

Wiring Diagram — Air conditioner

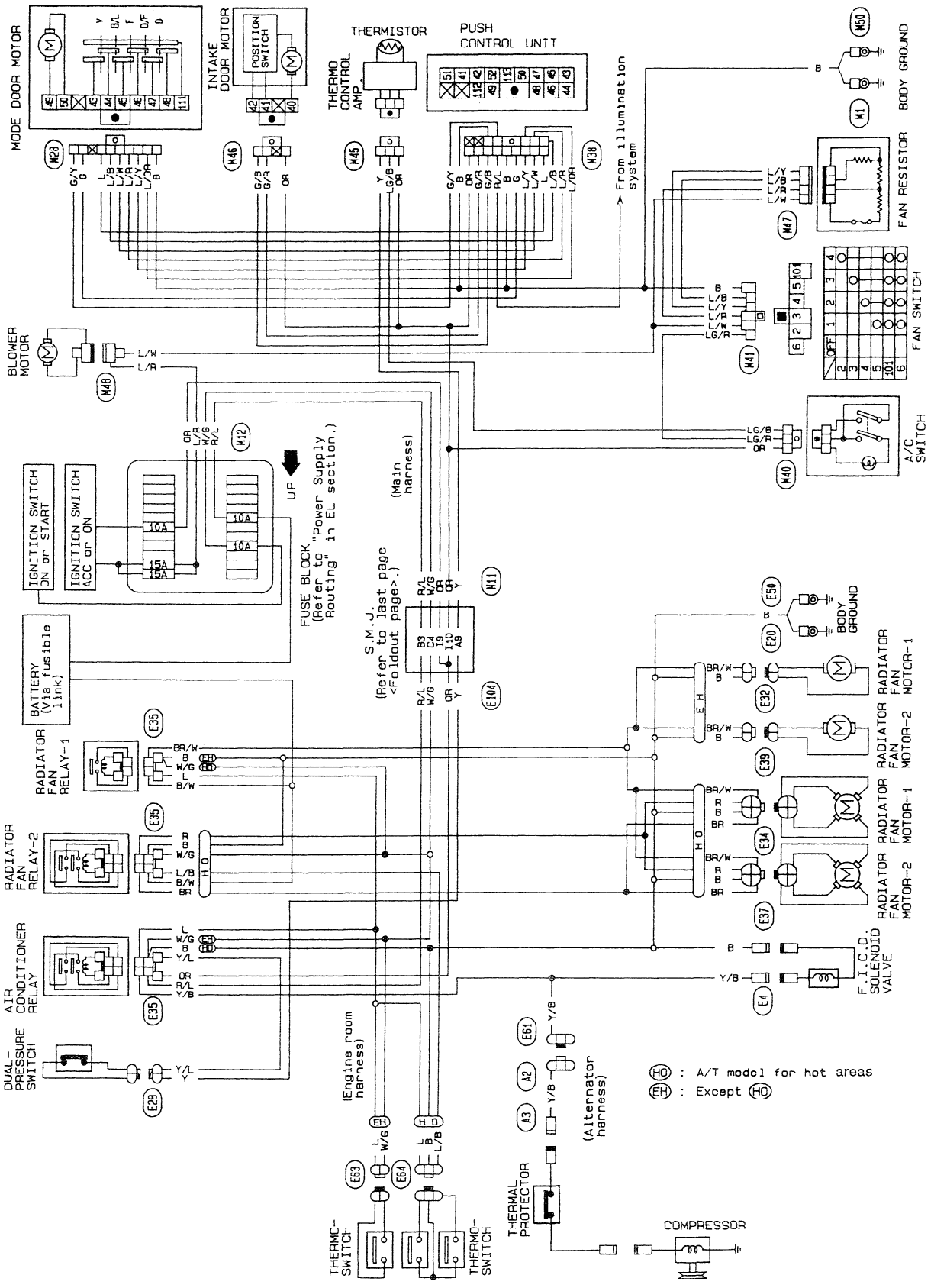
PUSH CONTROL TYPE (L.H.D.) — GA16DE engine models



SHA744C

Wiring Diagram — Air conditioner (Cont'd)

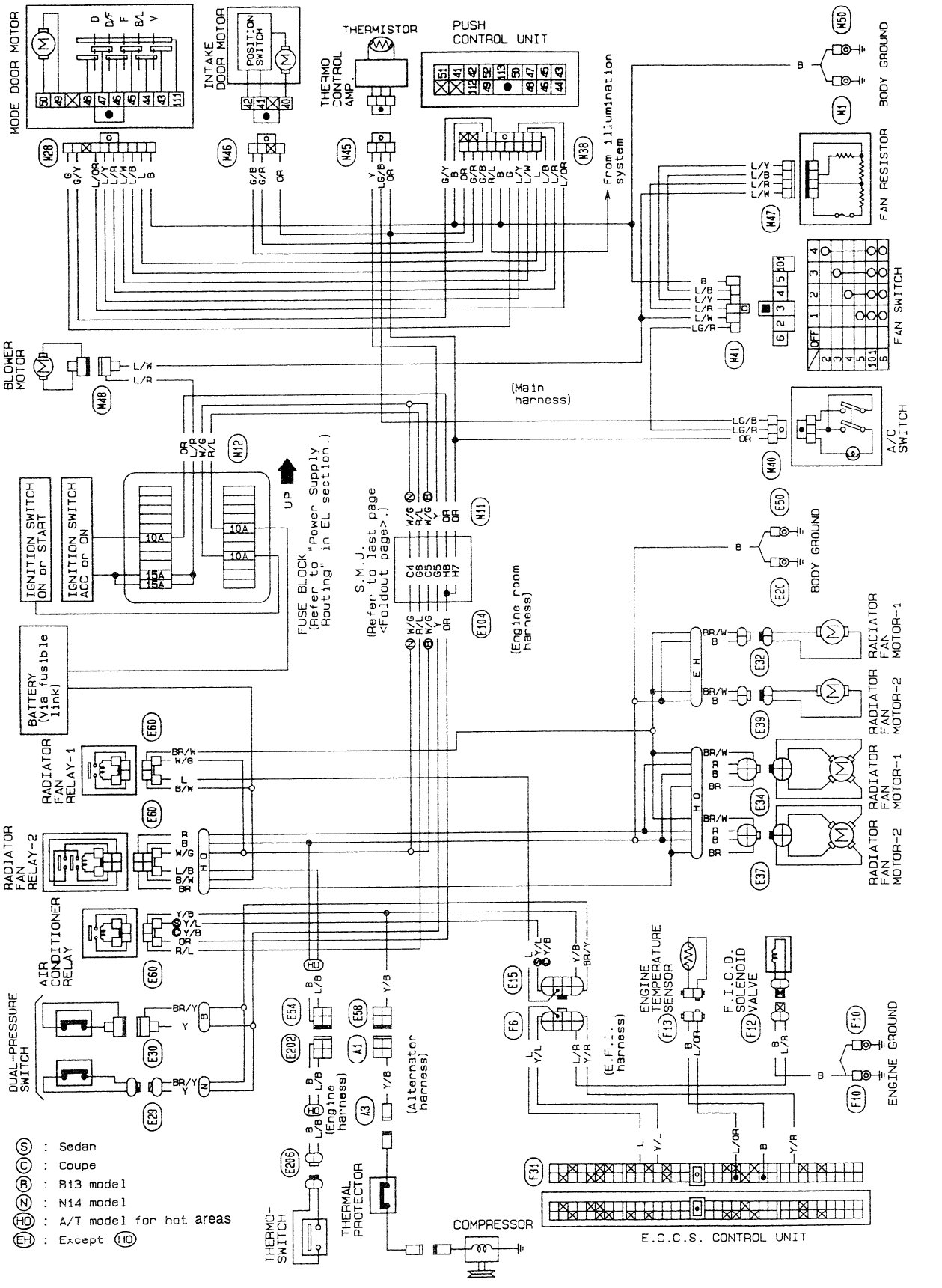
PUSH CONTROL TYPE (L.H.D.) — GA-S engine models



SHA745C

Wiring Diagram — Air conditioner (Cont'd)

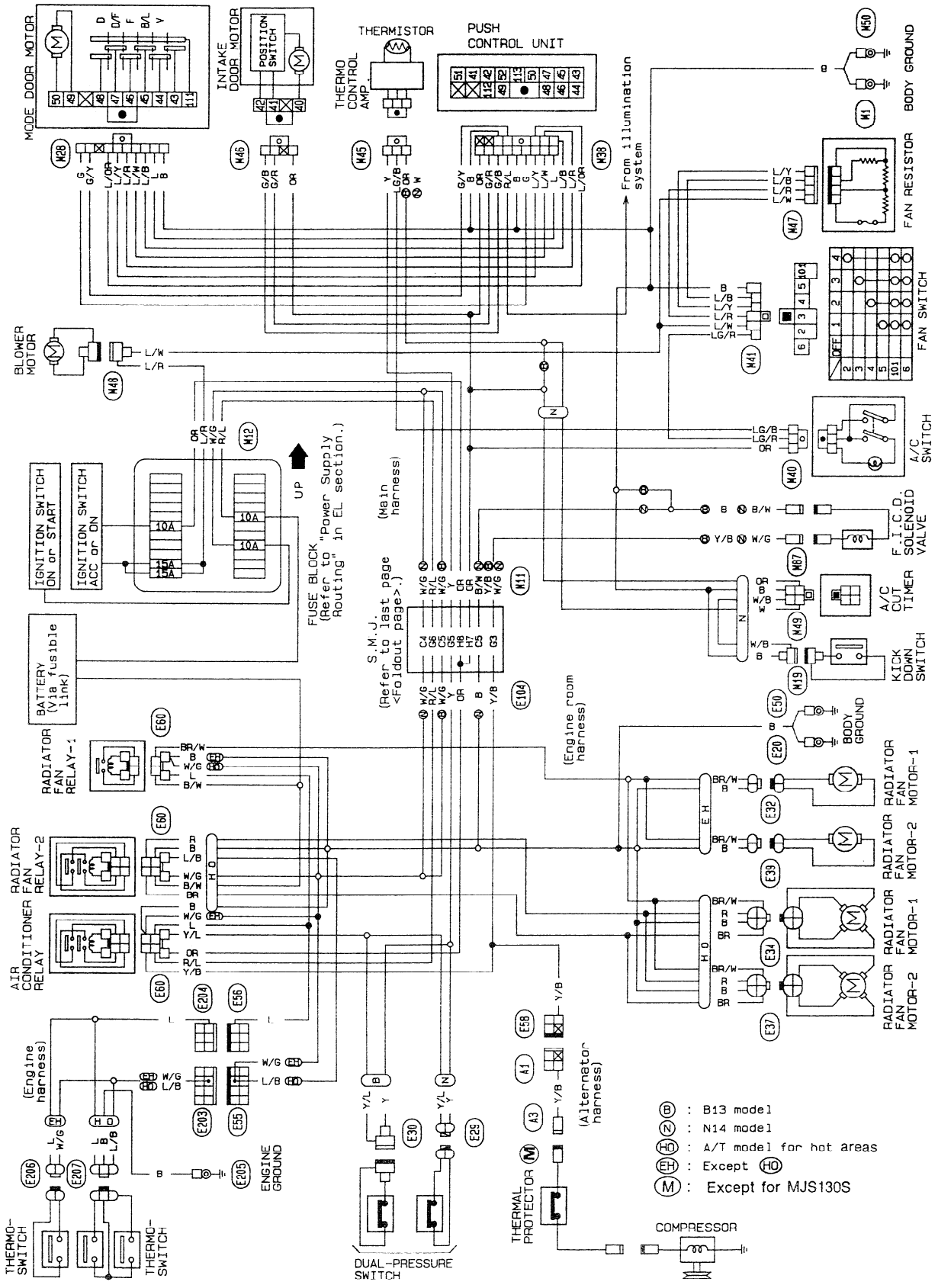
PUSH CONTROL TYPE (R.H.D.) — GA16DE engine models



SHA746C

Wiring Diagram — Air conditioner (Cont'd)

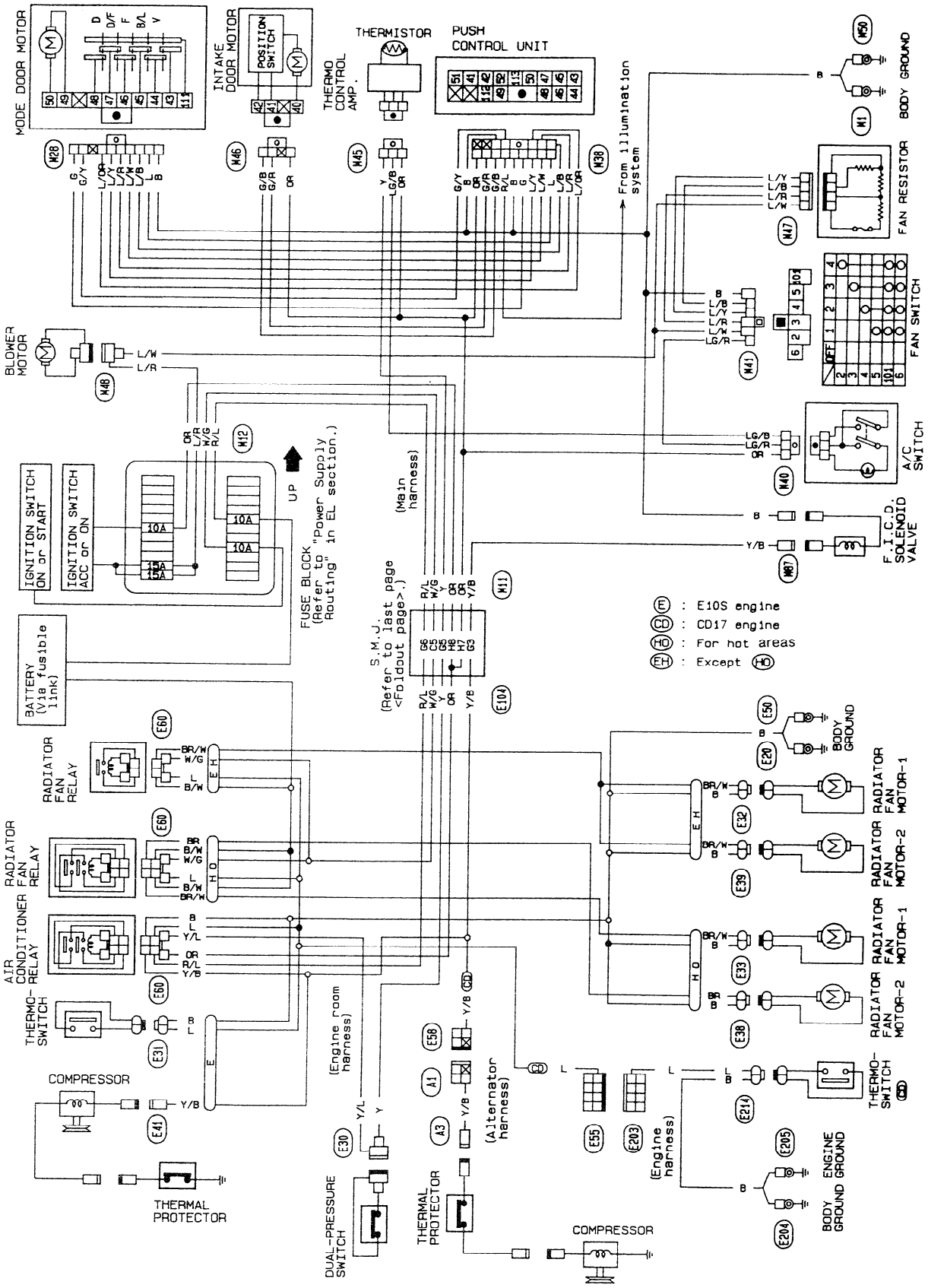
PUSH CONTROL TYPE (R.H.D.) — GA-S engine models



SHA747C

Wiring Diagram — Air conditioner (Cont'd)

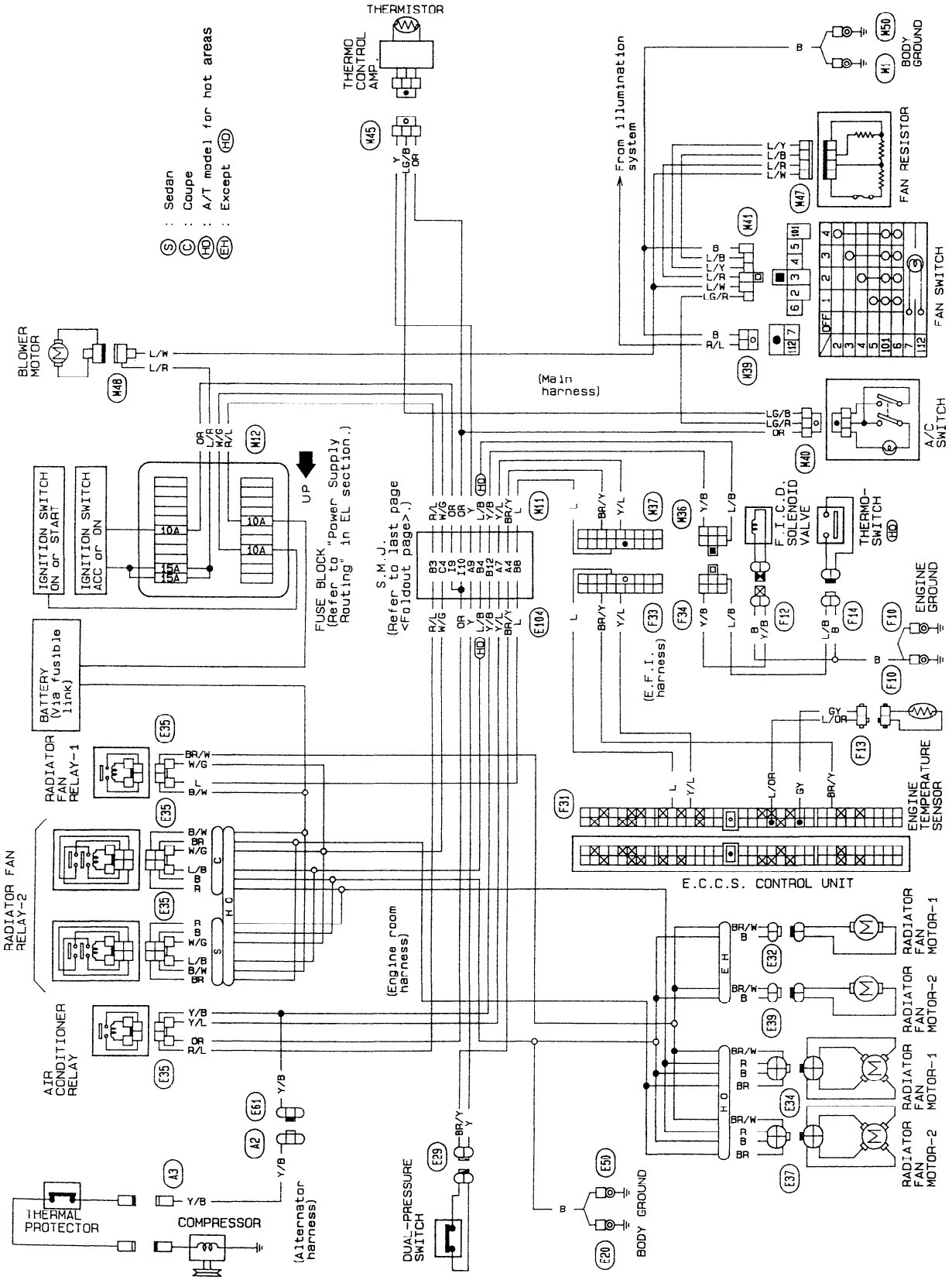
PUSH CONTROL TYPE (R.H.D.) — E10S and CD17 engine models



SHA748C

Wiring Diagram — Air conditioner (Cont'd)

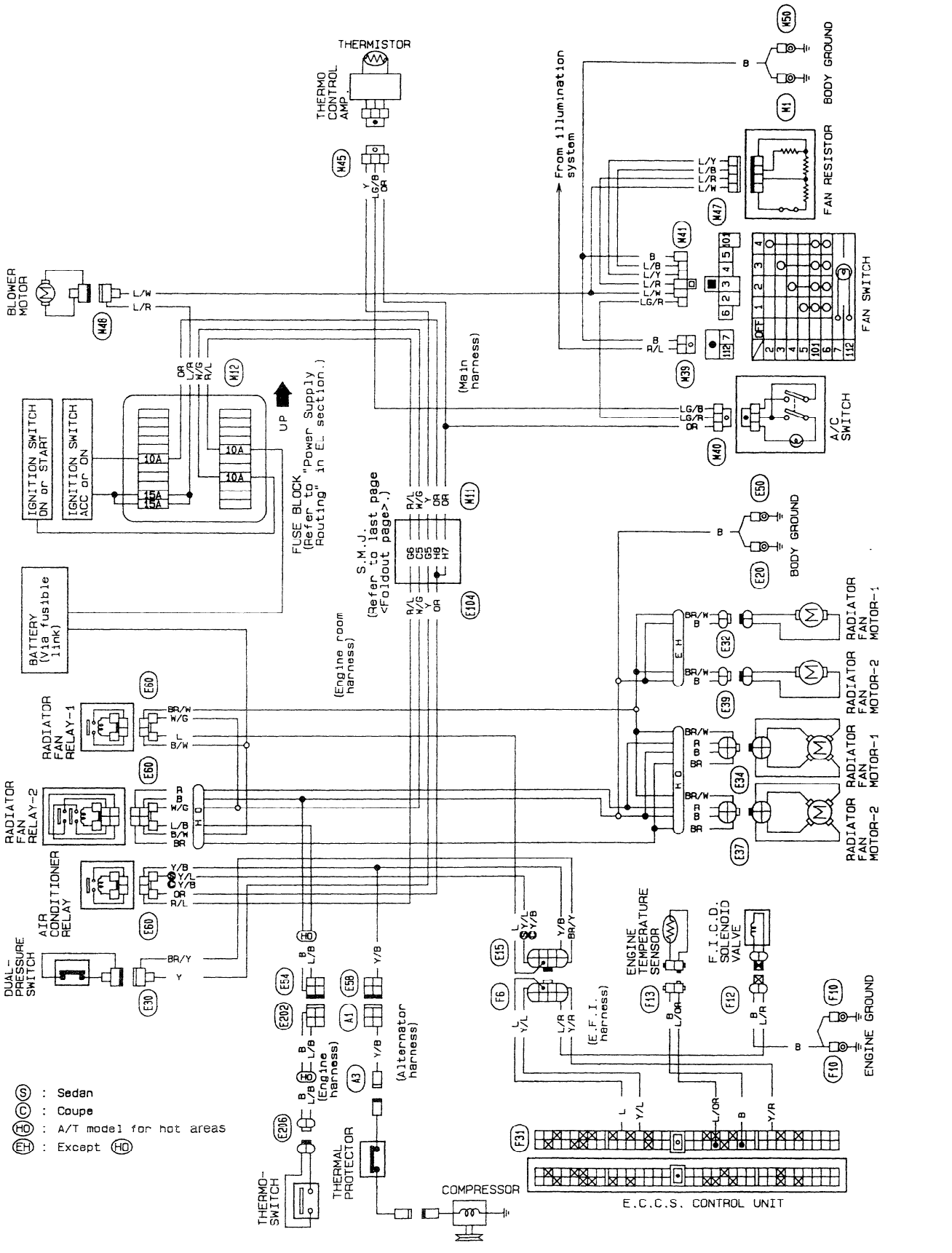
LEVER CONTROL TYPE (L.H.D.) — GA16DE engine models



SHA749C

Wiring Diagram — Air conditioner (Cont'd)

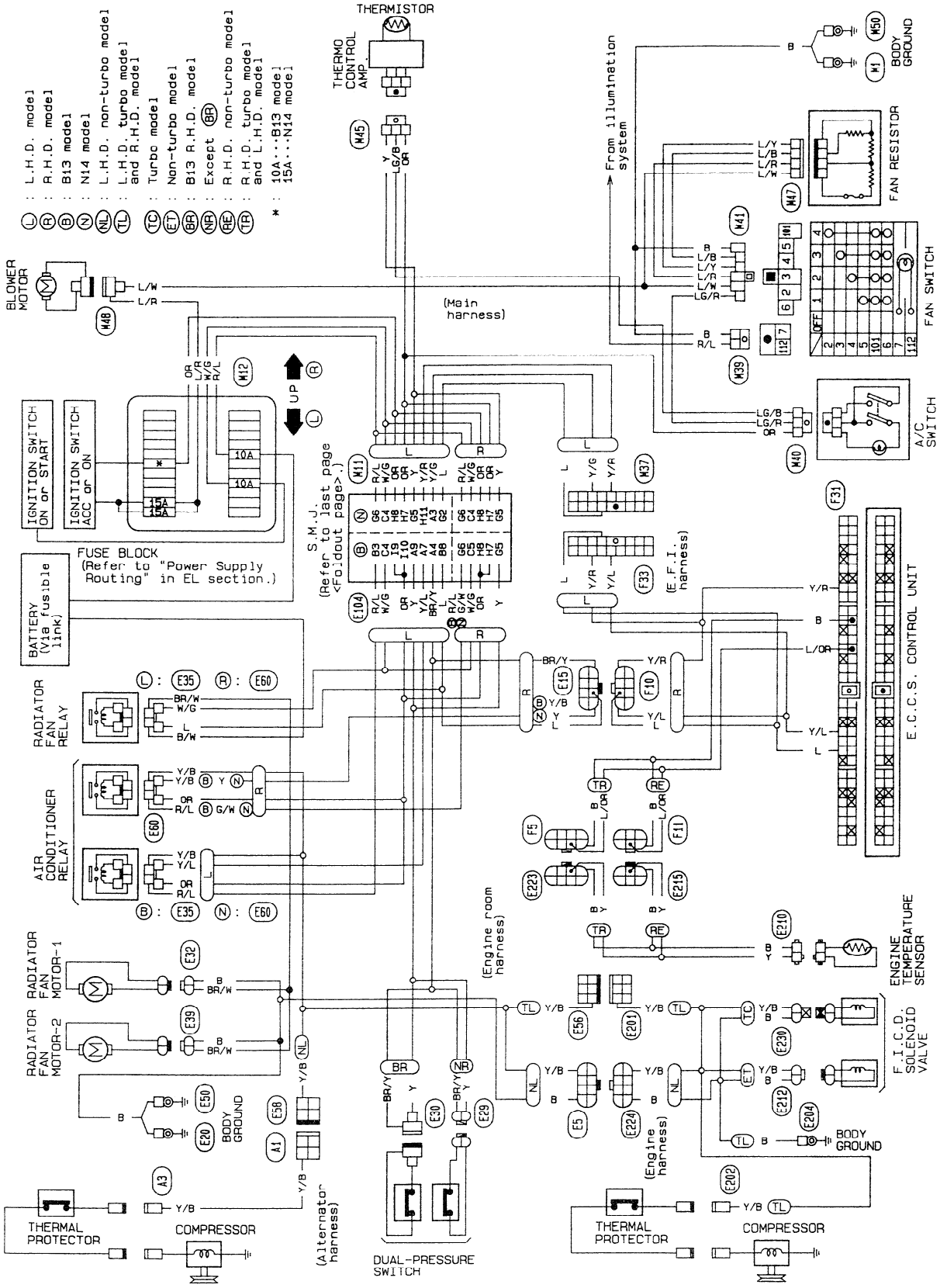
LEVER CONTROL TYPE (R.H.D.) — GA16DE engine models



SHA750C

Wiring Diagram — Air conditioner (Cont'd)

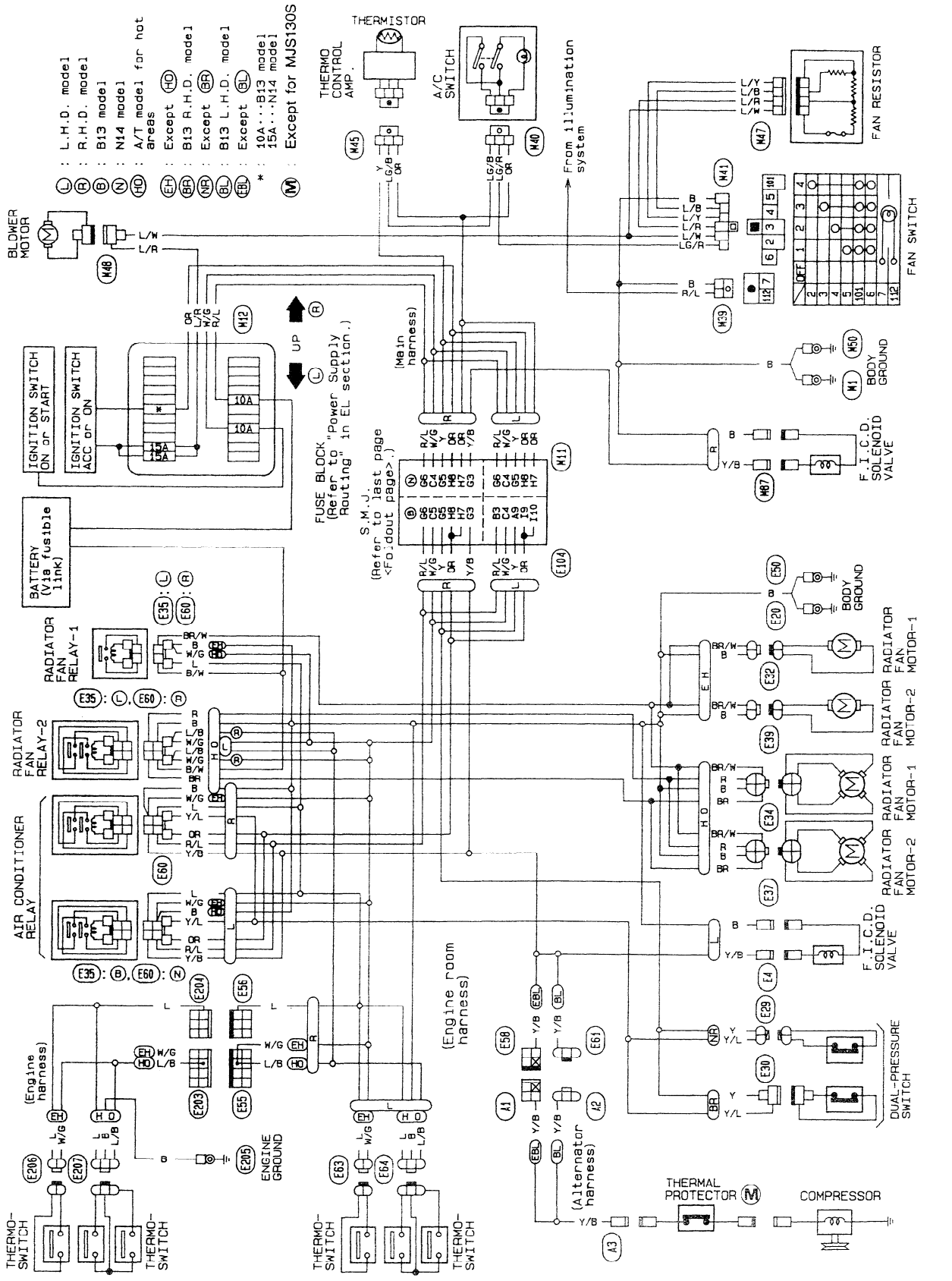
LEVER CONTROL TYPE — SR engine models



SHA883C

Wiring Diagram — Air conditioner (Cont'd)

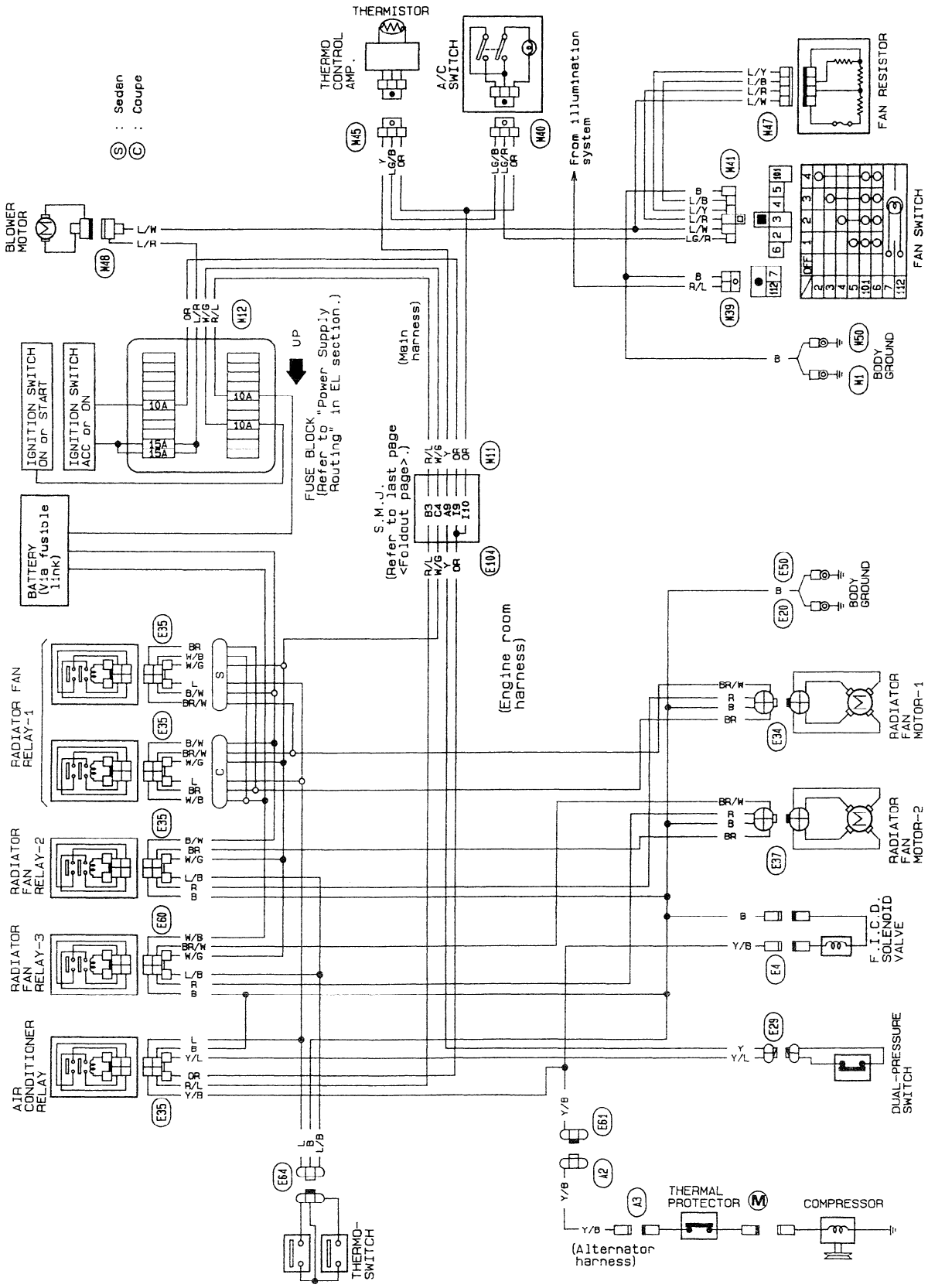
LEVER CONTROL TYPE — GA engine models without catalyzer except A/T models for Middle East



SHA884C

Wiring Diagram — Air conditioner (Cont'd)

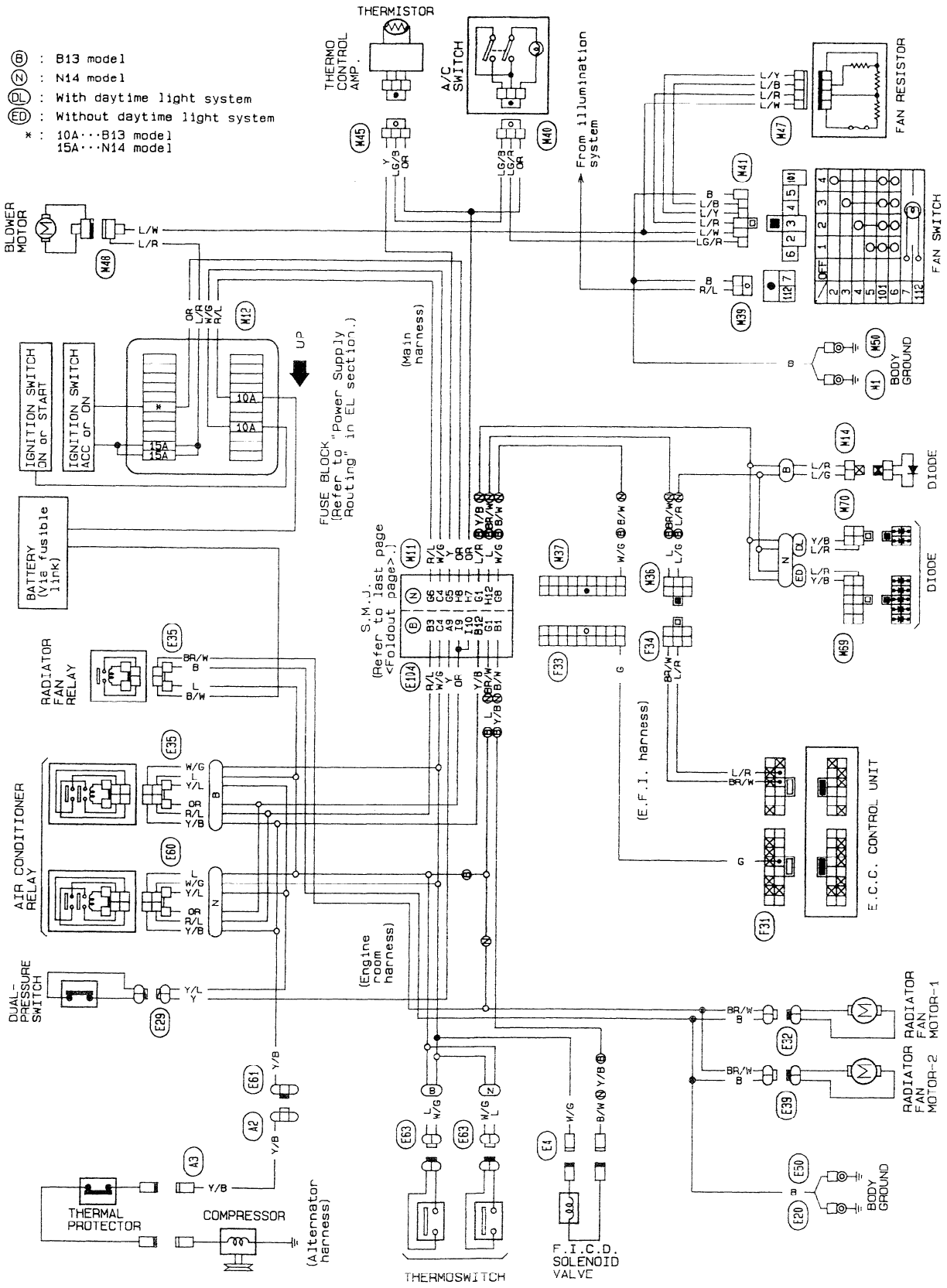
LEVER CONTROL TYPE — GA engine A/T models for Middle East



SHA885C

Wiring Diagram — Air conditioner (Cont'd)

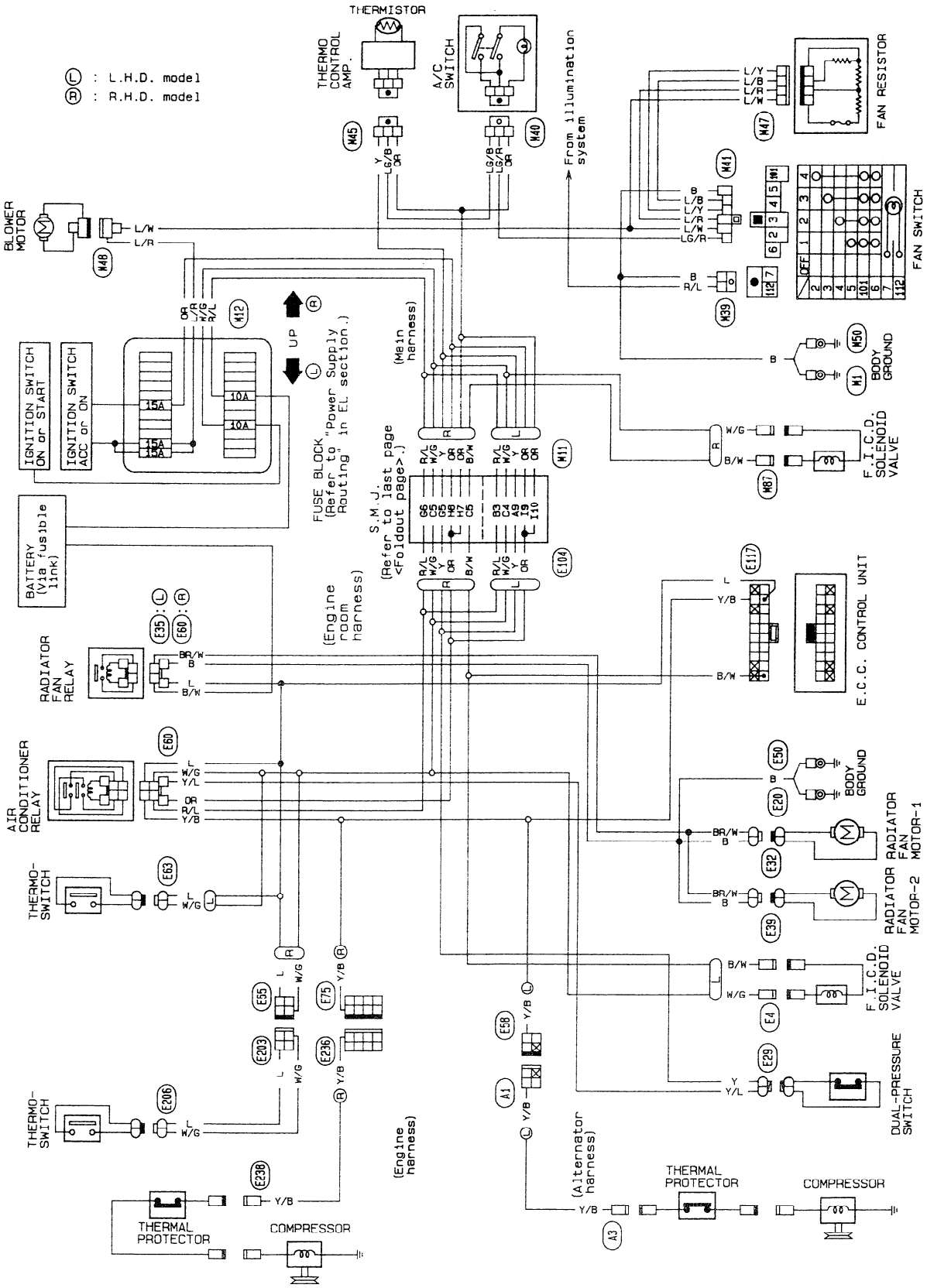
LEVER CONTROL TYPE — L.H.D. GA engine models with catalyzer and E.G.R.



SHA886C

Wiring Diagram — Air conditioner (Cont'd)

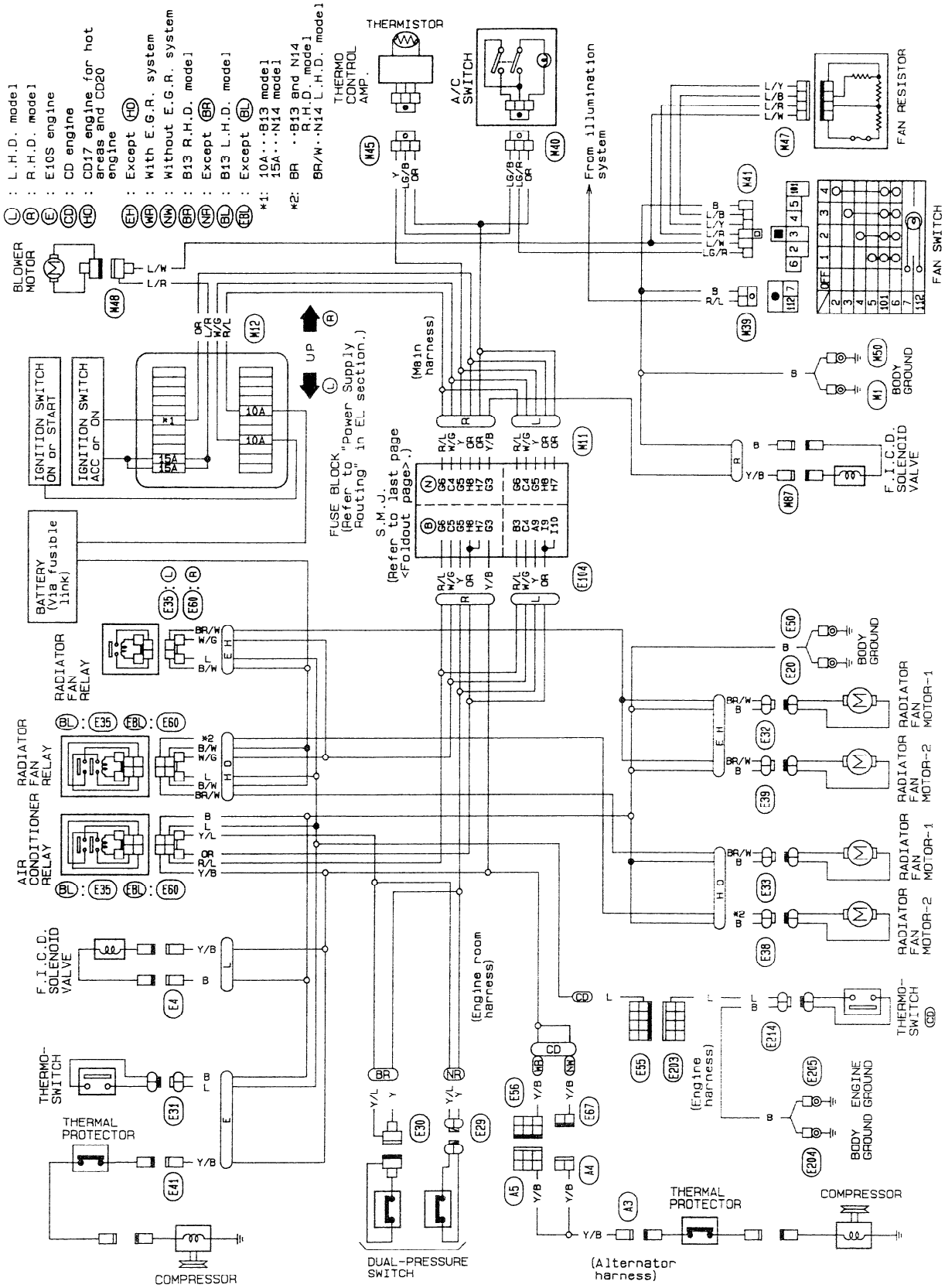
LEVER CONTROL TYPE — GA14DS engine models with catalyzer without E.G.R.



SHA887C

Wiring Diagram — Air conditioner (Cont'd)

LEVER CONTROL TYPE — E10S and CD engine models



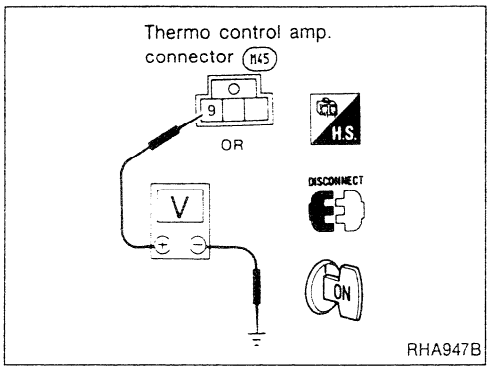
SHA888C

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 A/C ELECTRICAL CIRCUIT.

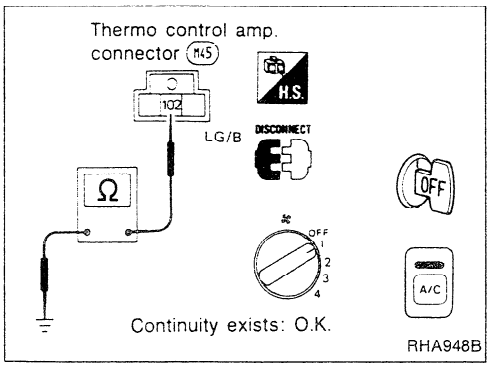


THERMO CONTROL AMP. CHECK

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. ⑨ and body ground.

Voltmeter terminal		Voltage
⊕	⊖	
⑨	Body ground	Approx. 12V

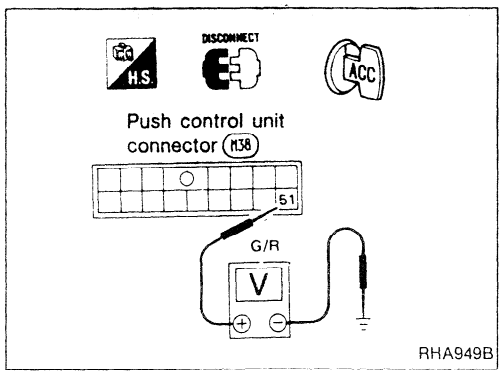


Check body ground circuit for thermo control amp. with ignition switch OFF, A/C switch ON and fan switch ON.

1. Disconnect thermo control amp. harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between terminal No. ⑩② and body ground.

Ohmmeter terminal		Continuity
⊕	⊖	
⑩②	Body ground	Yes

Main Power Supply and Ground Circuit Check (Cont'd)

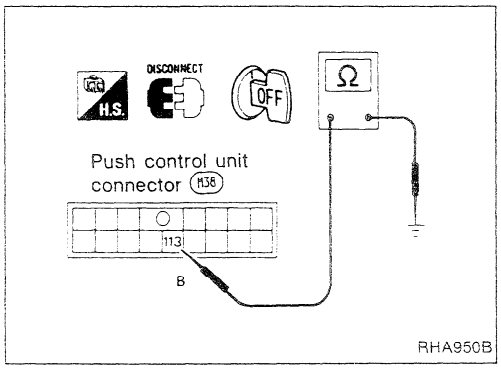


PUSH CONTROL UNIT CHECK

Check power supply circuit for push control unit with ignition switch at ACC.

1. Disconnect push control unit harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. (51) and body ground.

Voltmeter terminal		Voltage
⊕	⊖	
(51)	Body ground	Approx. 12V



Check body ground circuit for push control unit with ignition switch OFF.

1. Disconnect push control unit harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between terminal No. (113) and body ground.

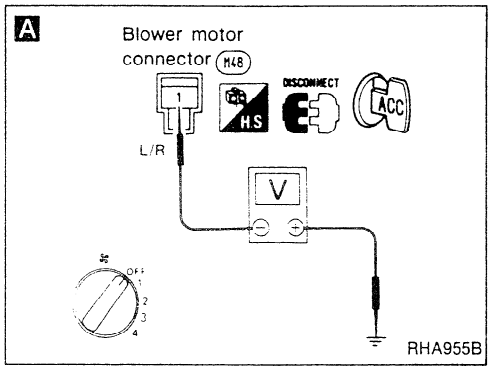
Ohmmeter terminal		Continuity
⊕	⊖	
(113)	Body ground	Yes

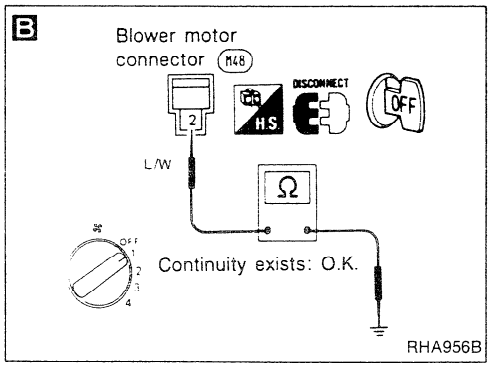
	INCIDENT	Flow chart No.
1	Fan fails to rotate.	1
2	Fan does not rotate at 1-speed.	2
3	Fan does not rotate at 2-speed.	3
4	Fan does not rotate at 3-speed.	4
5	Fan does not rotate at 4-speed.	5

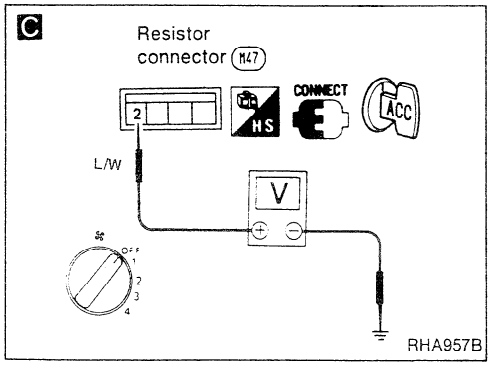
Diagnostic Procedure 1

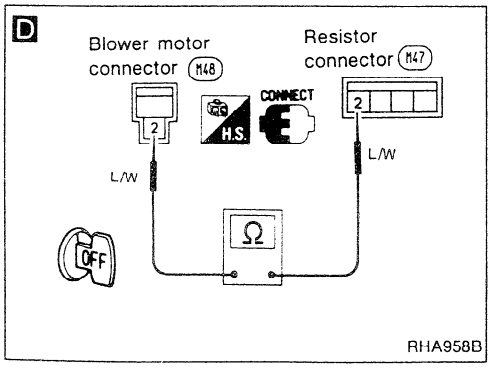
SYMPTOM: Blower motor does not rotate.

- **Perform PRELIMINARY CHECK 2 before referring to the following flow chart.**









Check if blower motor rotates properly at each fan speed.
Conduct check as per flow chart at left.

1 → A

A
CHECK POWER SUPPLY FOR BLOWER MOTOR.
Disconnect blower motor harness connector.
Do approx. 12 volts exist between blower motor harness terminal No. ① and body ground?

N.G. → Check 20A fuses or 15A fuses at fuse block.
(Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

O.K. ↓

B
Check circuit continuity between blower motor harness terminal No. ② and body ground.

N.G. → Reconnect blower motor harness connector.

O.K. ↓

CHECK BLOWER MOTOR.
(Refer to Electrical Components Inspection.)

Replace blower motor.

C
CHECK BLOWER MOTOR CIRCUIT BETWEEN BLOWER MOTOR AND RESISTOR.
Do approx. 12 volts exist between resistor harness terminal No. ② and body ground?

N.G. → Disconnect blower motor and resistor harness connectors.

D Note
Check circuit continuity between blower motor harness terminal No. ② and resistor harness terminal No. ②.

O.K. ↓

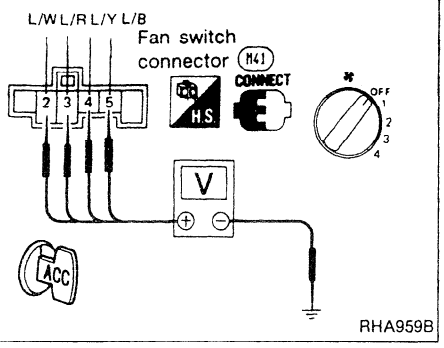
Ⓐ
(Go to next page.)

2 3 → Ⓑ Ⓒ
4 5 → Ⓓ Ⓔ

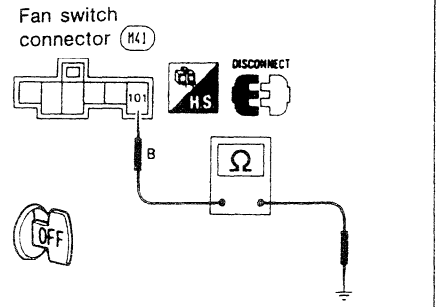
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 1 (Cont'd)

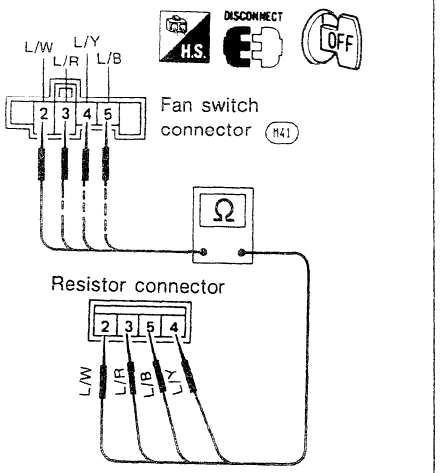
E



F



G



Ⓐ 1

CHECK RESISTOR AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

Ⓑ 2 Ⓒ 3 Ⓓ 4 Ⓔ 5

O.K. ↓

N.G. → Replace resistor.

Reconnect resistor harness connector.

1 2 3 4 5

E

CHECK FAN SWITCH CIRCUIT.
Do approx. 12 volts exist between each fan switch harness terminal and body ground?

Flow chart No.	Terminal No. ⊕	Terminal No. ⊖	Voltage
2	⑤	Body ground	Approx. 12V
3	④		
4	③		
5	②		

O.K. ↓

2 3 4 5

N.G. → G Note: Check circuit continuity between fan switch and resistor.

CHECK FAN SWITCH AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

N.G. → Replace fan switch.

O.K. ↓

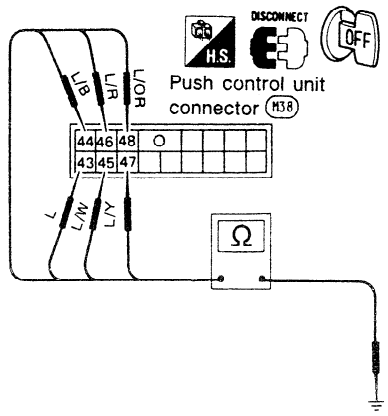
F Note: Check circuit continuity between fan switch harness terminal No. (101) and body ground.

O.K. ↓

Replace blower motor.

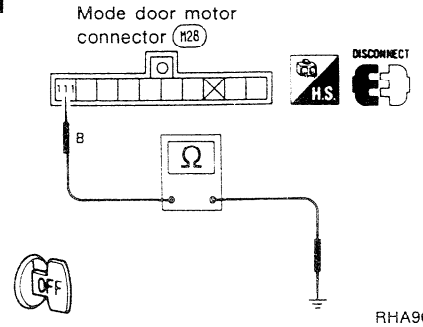
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

A



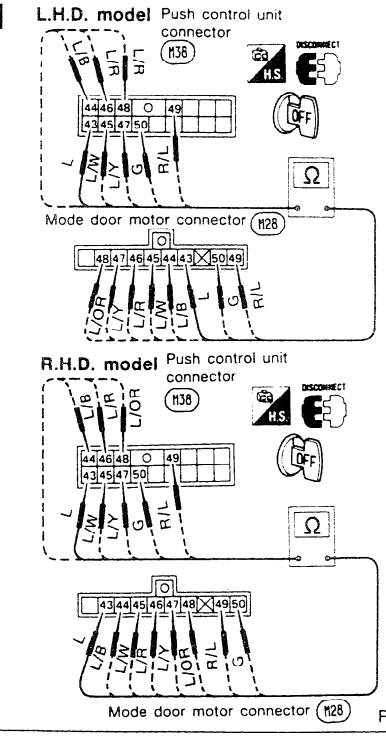
RHA962B

B



RHA963B

C



RHA964B

Diagnostic Procedure 2

SYMPTOM: Air outlet does not change. — For push control type

- **Perform PRELIMINARY CHECK 4 and Main Power Supply and Ground Circuit Check before referring to the following flow chart.**

A

CHECK MODE DOOR MOTOR POSITION SWITCH.

1. Turn VENT switch ON with ignition switch at ACC position.
2. Turn ignition switch OFF. Disconnect push control unit connector.
3. Check if continuity exists between terminal No. (43) or (44) of push control unit harness connector and body ground.
4. Using above procedures, check for continuity in any other mode, as indicated in chart.

Mode switch	Terminal No. ⊕	Terminal No. ⊖	Continuity
VENT	(43) or (44)	Body ground	Yes
B/L	(44) or (45)		
FOOT	(45) or (46)		
F/D	(46) or (47)		
DEF	(47) or (48)		

N.G. → Disconnect mode door motor harness connector.

O.K. ↓

B Note

CHECK BODY GROUND CIRCUIT FOR MODE DOOR MOTOR. Does continuity exist between mode door motor harness terminal No. (111) and body ground?

O.K. ↓

C Note

Check circuit continuity between each terminal on push control unit and on mode door motor.

Terminal No. ⊕ Push control unit	Terminal No. ⊖ Mode door motor	Continuity
(43)	(43)	Yes
(44)	(44)	
(45)	(45)	
(46)	(46)	
(47)	(47)	
(48)	(48)	
(49)	(49)	
(50)	(50)	

O.K. ↓

CHECK SIDE LINK. Refer to DOOR CONTROL.

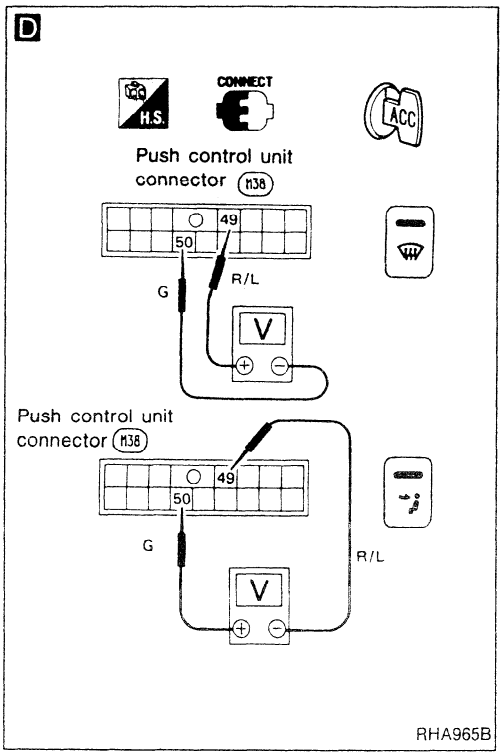
Ⓐ

(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 2 (Cont'd)

D



Ⓐ

Reconnect push control unit and mode door motor harness connectors.

D

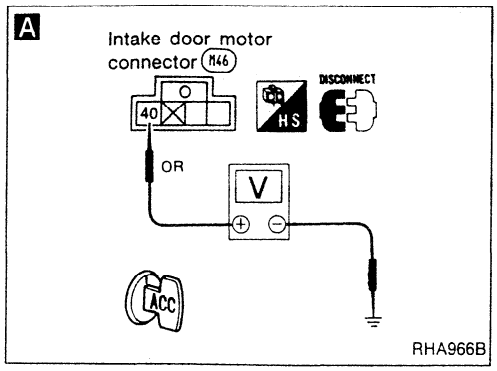
CHECK FOR OUTPUT OF PUSH CONTROL UNIT.
Do approx. 12 volts exist between push control unit harness terminal No. ⑤⓪ and ④⑨ when mode is switched from "VENT" to "DEF" or when mode is switched from "DEF" to "VENT"?

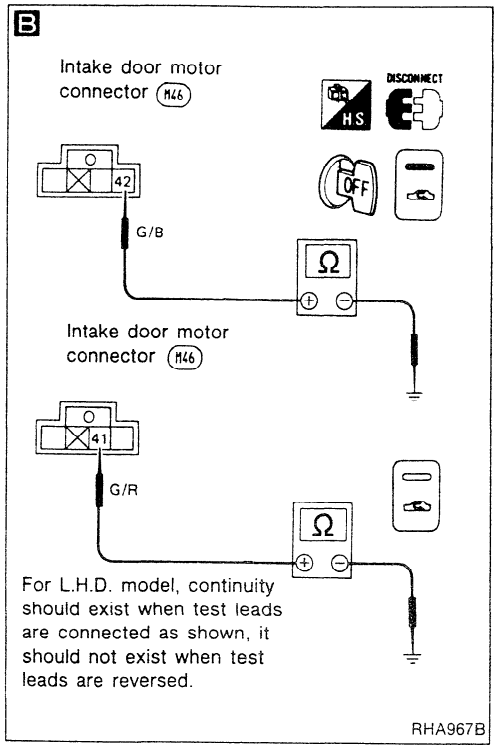
N.G. → Replace control amp. built-in push control unit.

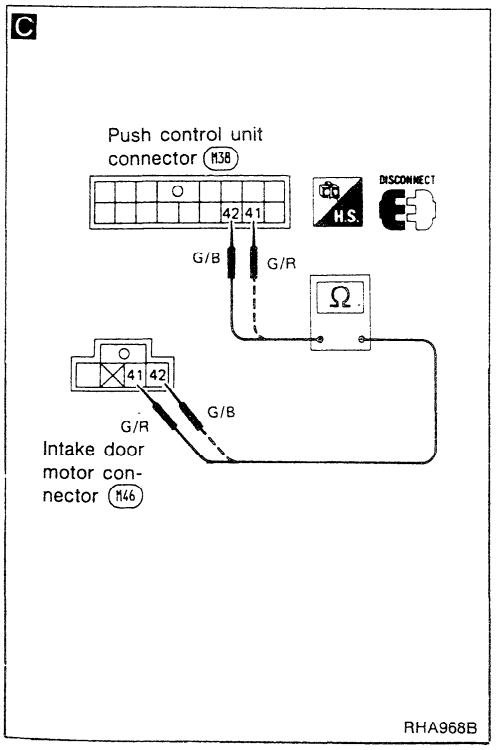
Terminal No.		Mode door motor	
⑤⓪	④⑨	Mode door operation	Direction of linkage rotation
⊖	⊖	Stop	Stop
⊖	⊕	VENT → DEF	L.H.D. model: Clockwise R.H.D. model: Counterclockwise
⊕	⊖	DEF → VENT	L.H.D. model: Counterclockwise R.H.D. model: Clockwise

O.K.

Replace mode door motor.







Diagnostic Procedure 3

SYMPTOM: Intake door does not change. — For push control type

- **Perform PRELIMINARY CHECK 1 (FOR L.H.D. MODEL ONLY) and Main Power Supply and Ground Circuit Check before referring to the following flow chart.**

A

CHECK POWER SUPPLY FOR INTAKE DOOR MOTOR.
Disconnect intake door motor harness connector.
Do approx. 12 volts exist between intake door motor harness terminal No. (40) and body ground?

N.G. → Check 10A fuses at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

O.K. ↓

B

CHECK BODY GROUND CIRCUIT FOR INTAKE DOOR MOTOR.
Does continuity exist between intake door motor harness terminal No. (42) and body ground when REC switch is ON?
Does continuity exist between intake door motor harness terminal No. (41) and body ground when REC switch is OFF?

N.G. → Disconnect push control unit harness connector.

C

Note

Check circuit continuity between push control unit harness terminal No. (42) ((41)) and intake door motor harness terminal No. (42) ((41))?

O.K. ↓

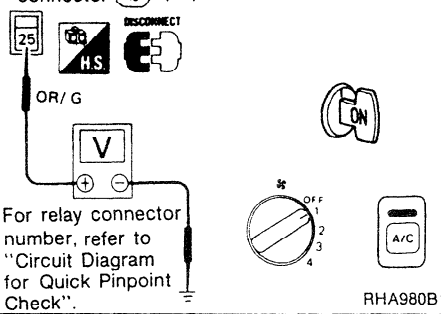
Replace control amp. built-in push control unit.

O.K. ↓

Replace intake door motor.

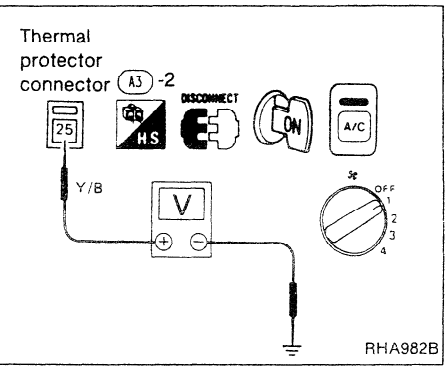
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

A

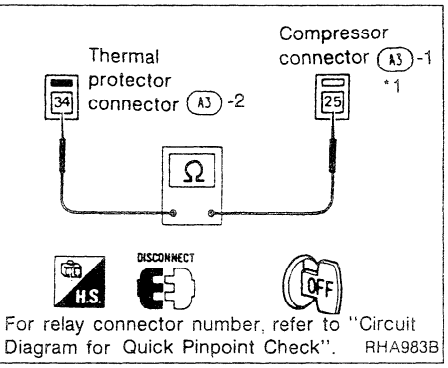


*1: For relay connector number, refer to "Circuit Diagram for Quick Pinpoint Check".

B



C



*1: For relay connector number, refer to "Circuit Diagram for Quick Pinpoint Check".

Diagnostic Procedure 4

SYMPTOM: Magnet clutch does not operate when A/C switch and fan switch are ON. — GA16DE and SR20DE engine models

- **Perform PRELIMINARY CHECK 2 before referring to the following flow chart.**

A

R.H.D. models
CHECK POWER SUPPLY FOR COMPRESSOR.
Disconnect compressor harness connector.
Do approx. 12 volts exist between compressor harness terminal No. (25) and body ground?

N.G. → B

O.K. ↓

Check magnet clutch coil.

O.K. ↓

Replace magnet clutch.
Refer to COMPRESSOR.

B

CHECK POWER SUPPLY FOR THERMAL PROTECTOR.
Disconnect thermal protector harness connector.
Do approx. 12V exist between thermal protector harness terminal No. (34) and body ground?

N.G. → (A)

O.K. ↓

C

Note

CHECK THERMAL PROTECTOR.
Check circuit continuity between thermal protector harness terminal No. (34) and compressor harness terminal No. (25).

O.K. ↓

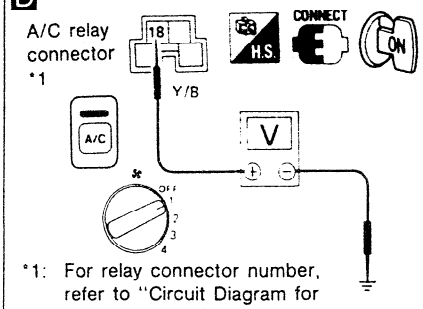
Replace thermal protector.

(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 4 (Cont'd)

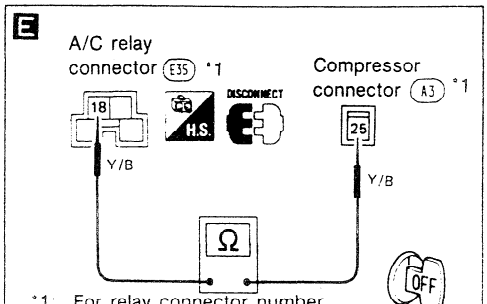
D



*1: For relay connector number, refer to "Circuit Diagram for Quick Pinpoint Check".

RHA984B

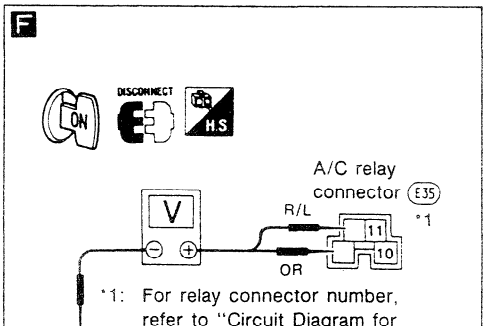
E



*1: For relay connector number, refer to "Circuit Diagram for Quick Pinpoint Check".

RHA985B

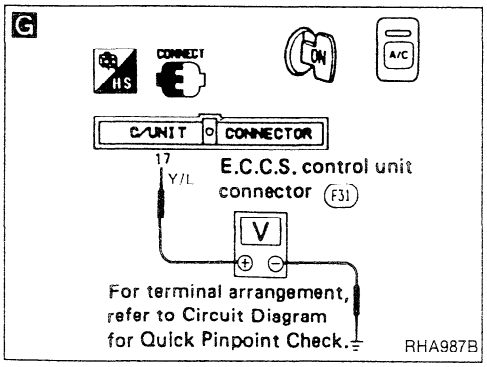
F



*1: For relay connector number, refer to "Circuit Diagram for Quick Pinpoint Check".

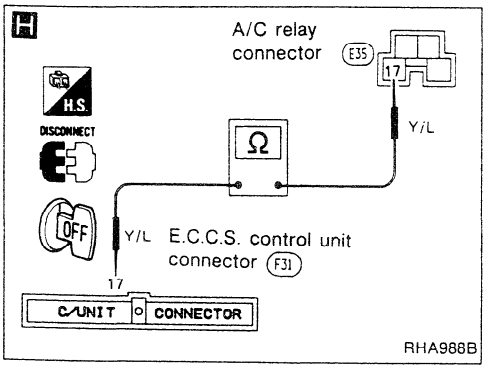
RHA986B

G



RHA987B

H



RHA988B

D (A)

CHECK A/C RELAY OPERATION.
Do approx. 12 volts exist between A/C relay harness terminal No. (18) and body ground?

N.G. → **F**

CHECK POWER SUPPLY FOR A/C RELAY.
Disconnect A/C relay.
Do approx. 12 volts exist between A/C relay harness terminal No. (10), (11) and body ground?

O.K. → Disconnect A/C relay harness connector.

N.G. → CHECK POWER SUPPLY CIRCUIT AND 10A FUSE AT FUSE BLOCK.
(Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

E Note

Check circuit continuity between A/C relay harness terminal No. (18) and compressor harness terminal No. (25).

CHECK A/C RELAY AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

N.G. → Replace A/C relay.

O.K. → Reconnect A/C relay.

G

CHECK COIL SIDE CIRCUIT OF A/C RELAY.
Do approx. 12 volts exist between E.C.C.S. control unit harness terminal No. (17) and body ground?

N.G. → **H**

Check circuit continuity between A/C relay harness terminal No. (17) and E.C.C.S. control unit harness terminal No. (17).

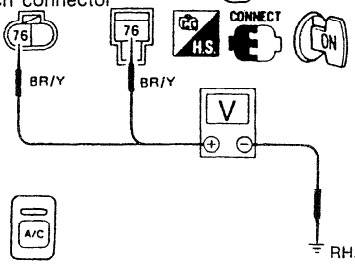
O.K. → (B)

(Go to next page.)

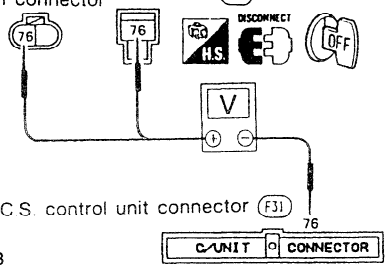
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 4 (Cont'd)

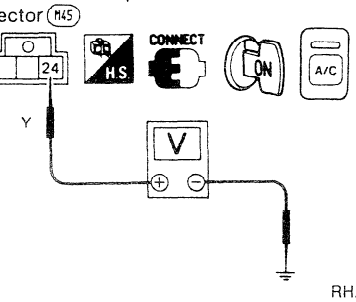
I **Except for B13 R.H.D. models** Dual-pressure switch connector (E29)
B13 R.H.D. models Dual-pressure switch connector (E30)



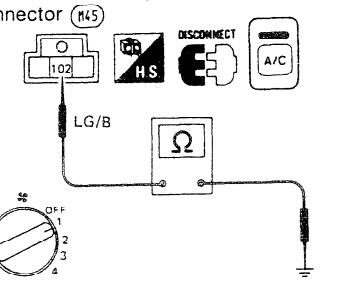
Except for B13 R.H.D. models Dual-pressure switch connector (E29)
B13 R.H.D. models Dual-pressure switch connector (E30) **J**



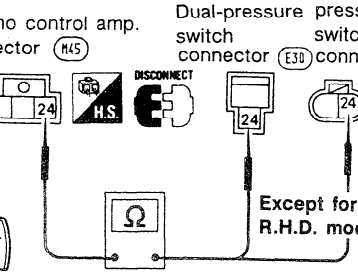
K Thermo control amp. connector (M45)



L Thermo control amp. connector (M45)



M **B13 R.H.D. models** Thermo control amp. connector (M45) Dual-pressure switch connector (E30) Dual-pressure switch connector (E29)



I (B)

CHECK A/C RELAY COIL SIDE CIRCUIT
Do approx. 8 to 9 volts exist between dual-pressure switch harness terminal No. (76) and body ground?

N.G. → Disconnect E.C.C.S. control unit and dual-pressure switch harness connectors.

O.K. ↓

J Note

Check circuit continuity between E.C.C.S. control unit harness terminal No. (102) and dual-pressure switch harness terminal No. (76).

O.K. ↓

CHECK E.C.C.S. CONTROL UNIT.
(Refer to EF & EC section.)

K

CHECK VOLTAGE FOR THERMO CONTROL AMP.
Do approx. 12 volts exist between thermo control amp. harness terminal No. (24) and body ground?

N.G. → **M** Note: Check circuit continuity between dual-pressure switch harness terminal No. (24) and thermo control amp. harness terminal No. (24).

O.K. ↓

CHECK POWER SUPPLY FOR THERMO CONTROL AMP.
Go to Main Power Supply and Ground Circuit Check.

O.K. ↓

L

CHECK BODY GROUND CIRCUIT FOR THERMO CONTROL AMP.
Disconnect thermo control amp. harness connector.
Does continuity exist between thermo control amp. harness terminal No. (102) and body ground?

N.G. → Disconnect A/C switch harness connector.

O.K. ↓

Replace thermo control amp.

M: CHECK DUAL-PRESSURE SWITCH.
(Refer to Electrical Components Inspection.)

N.G. ↓

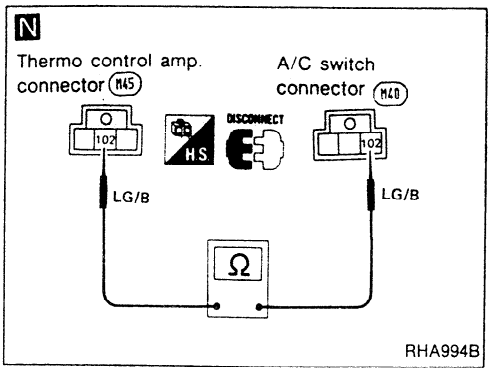
Replace dual-pressure switch.

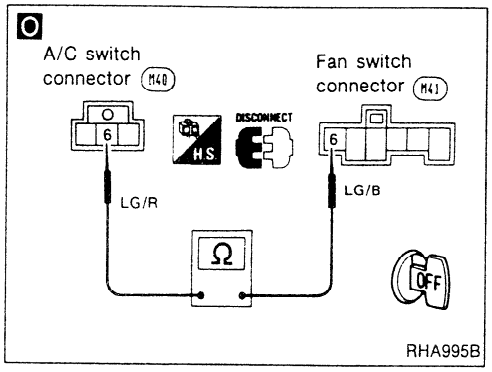
Disconnect A/C switch harness connector. → (C)

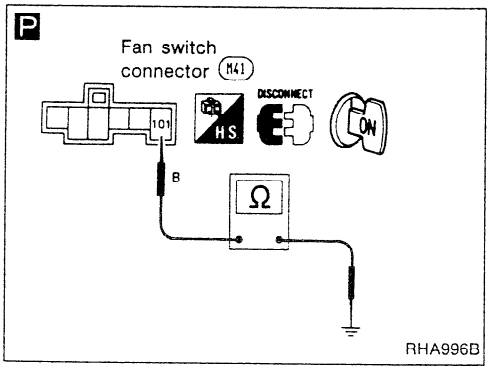
(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 4 (Cont'd)







Ⓒ

N Note

Check circuit continuity between thermo control amp. harness terminal No. (102) and A/C switch harness terminal No. (102).

O.K.

CHECK A/C SWITCH.
(Refer to Electrical Components Inspection.)

N.G. → Replace A/C switch.

O.K.

Disconnect fan switch harness connector.

O Note

Check circuit continuity between A/C switch harness terminal No. (6) and fan switch harness terminal No. (6).

O.K.

P Note

CHECK BODY GROUND CIRCUIT FOR FAN SWITCH.
Does continuity exist between fan switch harness terminal No. (101) and body ground?

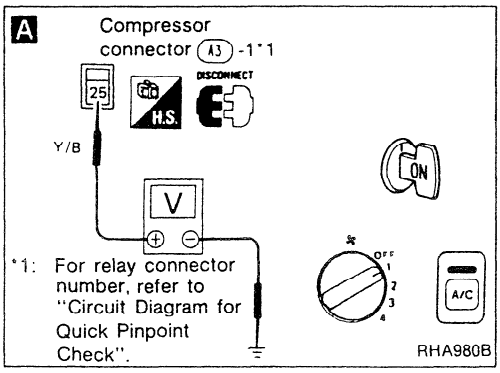
O.K.

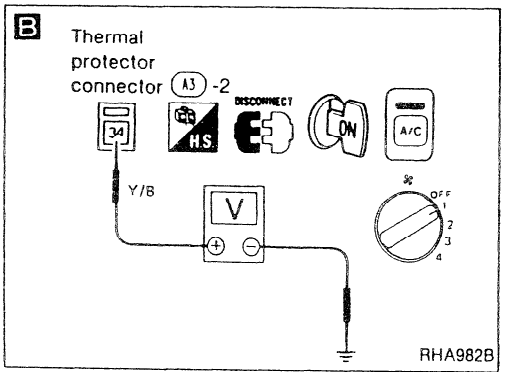
CHECK FAN SWITCH.
(Refer to Electrical Components Inspection.)

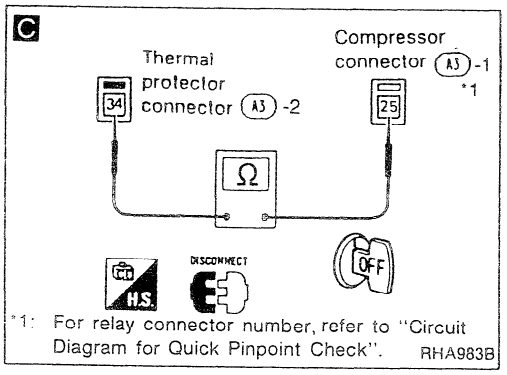
N.G.

Replace fan switch.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.







Diagnostic Procedure 5

SYMPTOM: Magnet clutch does not operate when A/C switch and fan switch are ON. — Except for GA16DE and SR20DE engine models

- **Perform PRELIMINARY CHECK 2 before referring to the following flow chart.**

A

CHECK POWER SUPPLY FOR COMPRESSOR.
Disconnect compressor harness connector.
Do approx. 12 volts exist between compressor harness terminal No. 25 and body ground?

N.G. → Is the MJS130S compressor used?

No → B

Yes → A (Go to next page.)

O.K. → Check magnet clutch coil.

O.K. → Replace magnet clutch.
Refer to COMPRESSOR.

B

CHECK POWER SUPPLY FOR THERMAL PROTECTOR.
Disconnect thermal protector harness connector.
Do approx. 12V exist between thermal protector harness terminal No. 34 and body ground?

N.G. → A (Go to next page.)

O.K. → C

C

CHECK THERMAL PROTECTOR.
Check circuit continuity between thermal protector harness terminal No. 34 and compressor harness terminal No. 25.

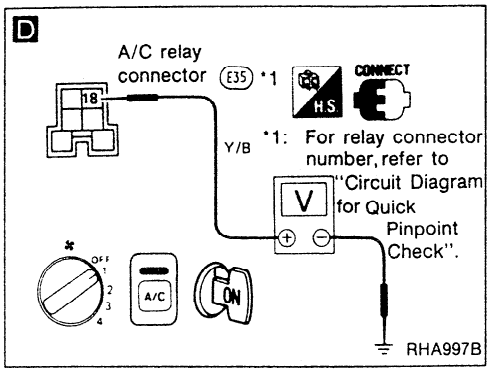
Note

O.K. → Replace thermal protector.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

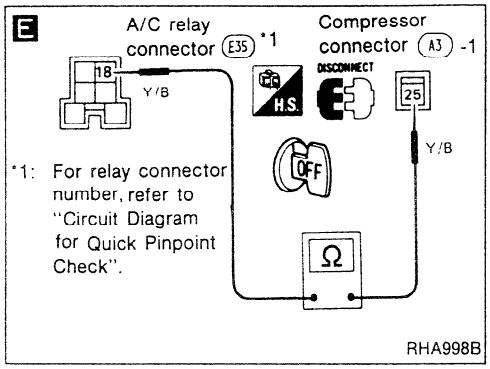
Diagnostic Procedure 5 (Cont'd)

D



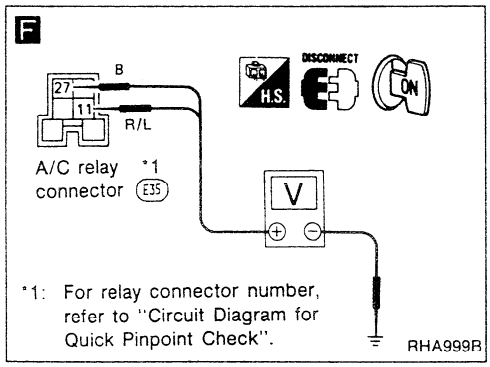
*1: For relay connector number, refer to "Circuit Diagram for Quick Pinpoint Check".

E



*1: For relay connector number, refer to "Circuit Diagram for Quick Pinpoint Check".

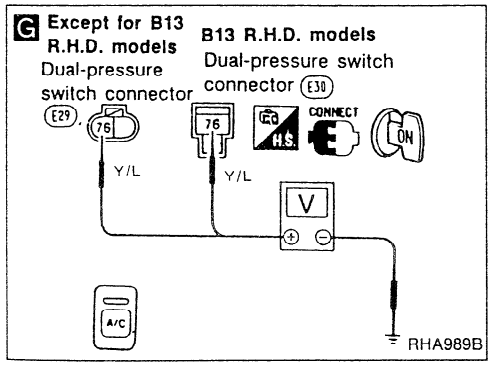
F



*1: For relay connector number, refer to "Circuit Diagram for Quick Pinpoint Check".

G **Except for B13 R.H.D. models** Dual-pressure switch connector E29

B13 R.H.D. models Dual-pressure switch connector E30

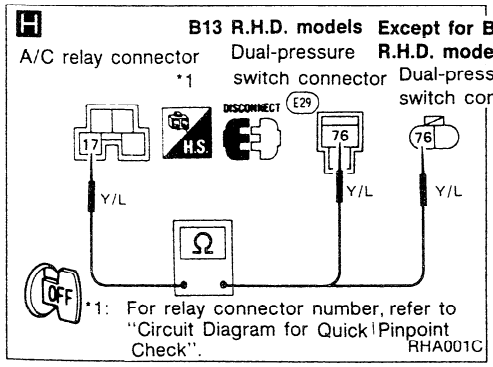


H

A/C relay connector *1

B13 R.H.D. models Dual-pressure switch connector E29

Except for B13 R.H.D. models Dual-pressure switch connector E30



*1: For relay connector number, refer to "Circuit Diagram for Quick Pinpoint Check".

Ⓐ

D CHECK A/C RELAY OPERATION.
Do approx. 12 volts exist between A/C relay harness terminal No. ⑱ and body ground?

N.G. → **F** CHECK POWER SUPPLY FOR A/C RELAY.
Disconnect A/C relay.
Do approx. 12 volts exist between A/C relay harness terminals No. ㉗, ⑪ and body ground?

O.K. → Disconnect A/C relay harness connector.

O.K. → **E** Note: Check circuit continuity between A/C relay harness terminal No. ⑱ and compressor harness terminal No. ㉕.

N.G. → CHECK POWER SUPPLY CIRCUIT AND10A FUSE AT FUSE BLOCK.
(Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

CHECK A/C RELAY AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

N.G. → Replace A/C relay.

O.K. → Reconnect A/C relay.

G CHECK COIL SIDE CIRCUIT OF A/C RELAY.
Do approx. 12 volts exist between dual-pressure switch harness terminal No. ⑯ and body ground?

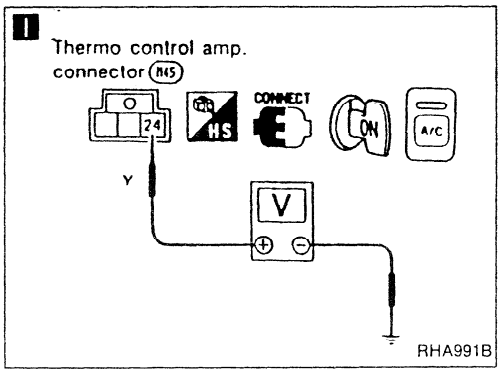
N.G. → **H** Note: Check circuit continuity between A/C relay harness terminal No. ⑰ and dual-pressure switch harness terminal No. ⑯.

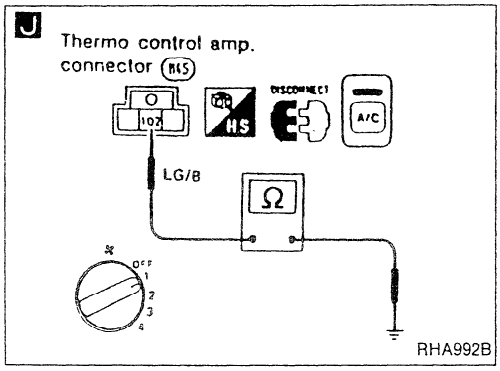
O.K. → Ⓑ

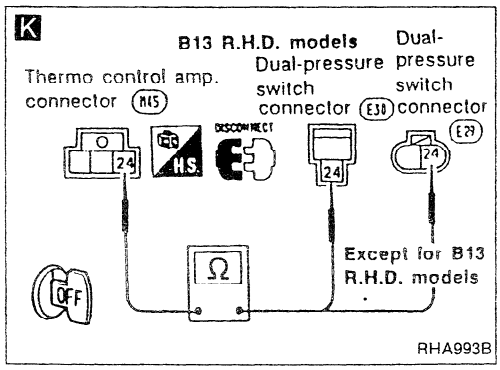
(Go to next page.)

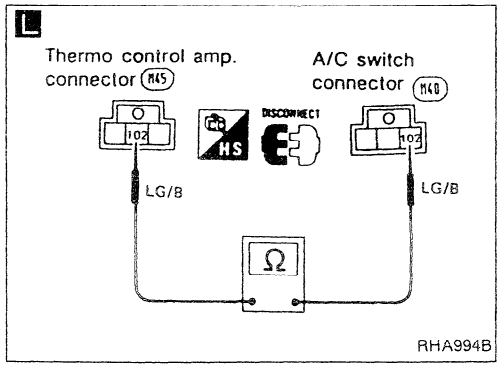
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

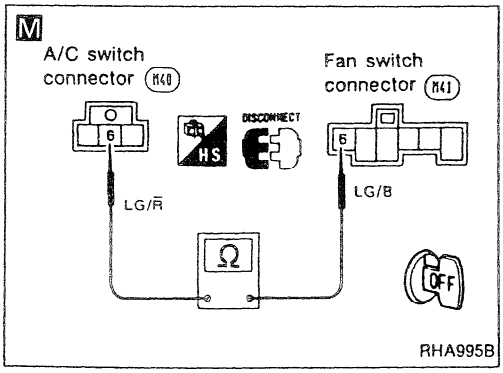
Diagnostic Procedure 5 (Cont'd)











(B)

I CHECK VOLTAGE FOR THERMO CONTROL AMP.
Do approx. 12 volts exist between thermo control amp. harness terminal No. (24) and body ground?

N.G. → **K** Note: Check circuit continuity between dual-pressure switch harness terminal No. (24) and thermo control amp. harness terminal No. (24).

O.K. → CHECK POWER SUPPLY FOR THERMO CONTROL AMP.
Go to Main Power Supply and Ground Circuit Check.

O.K. → **J** CHECK BODY GROUND CIRCUIT FOR THERMO CONTROL AMP.
Disconnect thermo control amp. harness connector.
Does continuity exist between thermo control amp. harness terminal No. (102) and body ground?

N.G. → Disconnect A/C switch harness connector. → **L** Note: Check circuit continuity between thermo control amp. harness terminal No. (102) and A/C switch harness terminal No. (102).

O.K. → Replace thermo control amp.

CHECK A/C SWITCH.
(Refer to Electrical Components Inspection.)

N.G. → Replace A/C switch.

O.K. → Disconnect fan switch harness connector.

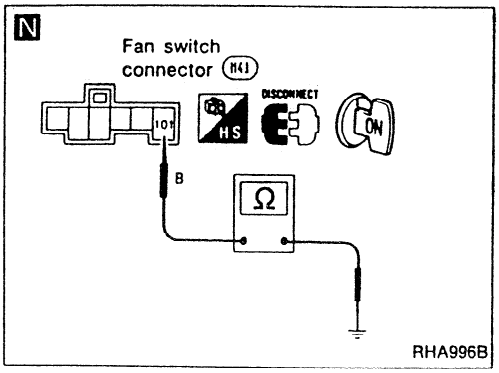
M Note: Check circuit continuity between A/C switch harness terminal No. (6) and fan switch harness terminal No. (6).

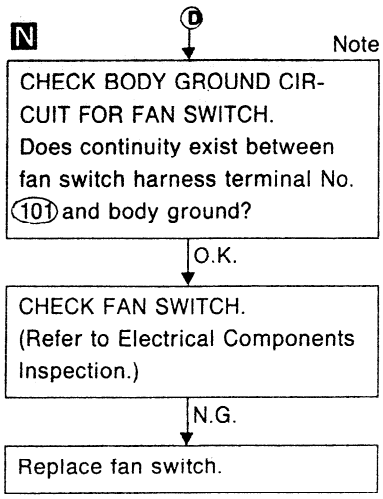
O.K. → (D)

(Go to next page.)

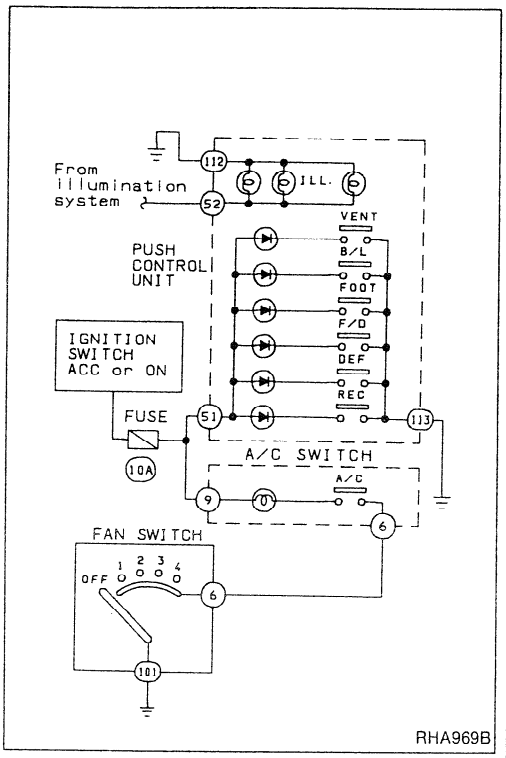
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 5 (Cont'd)



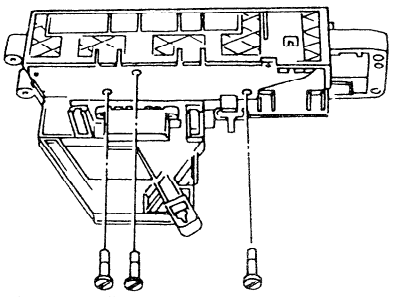


Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.



RHA969B

A



RHA164B

Diagnostic Procedure 6

SYMPTOM: Illumination or indicators of push control unit do not come on. — For push control type

- **Perform Main Power Supply and Ground Circuit Check before referring to the following flow chart.**

Turn ignition switch and lighting switch ON.

↓

CHECK ILLUMINATION AND INDICATORS.
- Turn A/C, REC and fan switches ON.
- Push VENT, B/L, FOOT, F/D and DEF switches in order.
- Check for incidents and follow the repairing methods as shown:

INCIDENTS								"How to repair"
ILL.	VENT	B/L	FOOT	F/D	DEF	REC	A/C	
X	○	○	○	○	○	○		Go to DIAGNOSTIC PROCEDURE 6-1.
	○	○	○	○	○	○	X	Go to DIAGNOSTIC PROCEDURE 6-2.
○	X	X	X	X	X	X		Go to DIAGNOSTIC PROCEDURE 6-3.
				△				Replace control amp. built-in push control unit.
○	X	X	X	X	X	X	○	Replace control amp. built-in push control nit.

○ : Illumination or indicator comes on.
X : Illumination or indicator does not come on.
△ : Some indicators for VENT, B/L,FOOT, F/D, DEF or REC come on.

DIAGNOSTIC PROCEDURE 6-1

CHECK OTHER ILLUMINATION SYSTEMS EXCEPT FOR A/C SYSTEM.
Does other illumination come on with ignition switch and lighting switch ON?

N.G. → CHECK ILLUMINATION SYSTEM. Refer to illumination/Wiring Diagram in EL section.

O.K. ↓

Turn ignition switch and lighting switch OFF.

A ↓

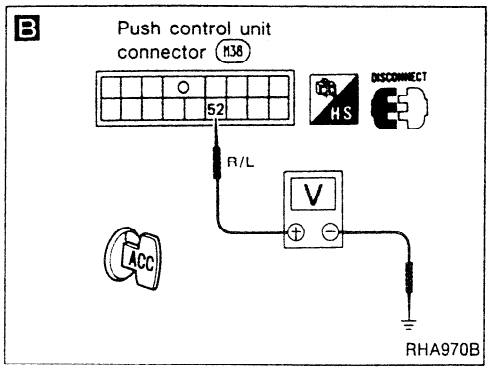
CHECK ILLUMINATION BULB.
Remove push control unit and disconnect harness connectors.
Remove illumination bulb(s) and check them.

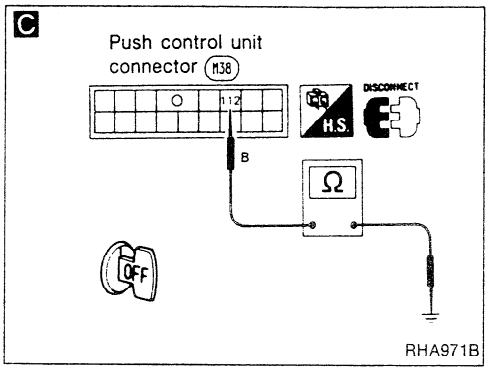
N.G. → Replace illumination bulb(s).

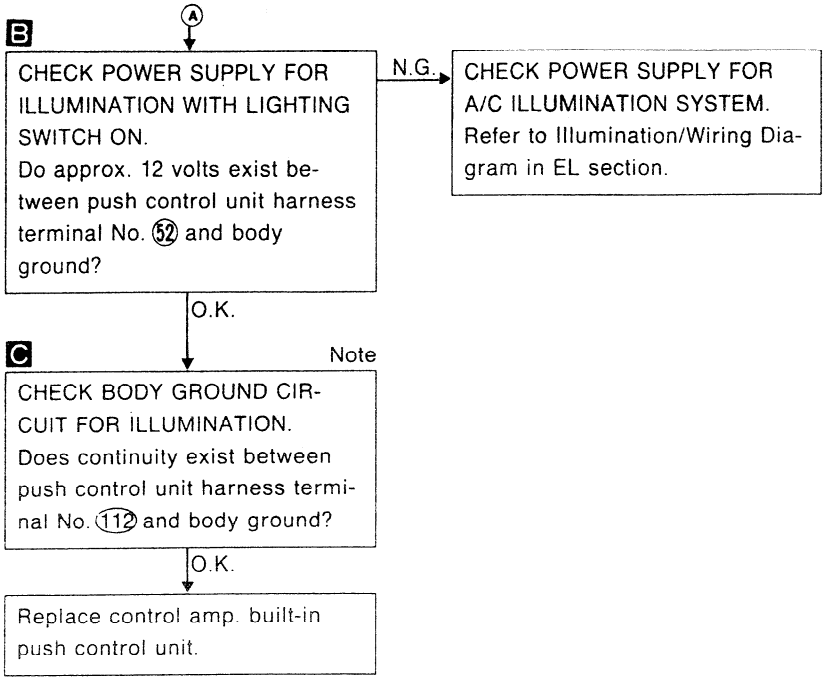
O.K. → Ⓐ

(Go to next page.)

Diagnostic Procedure 6 (Cont'd)



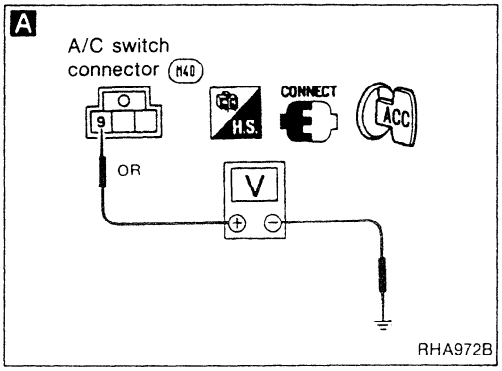


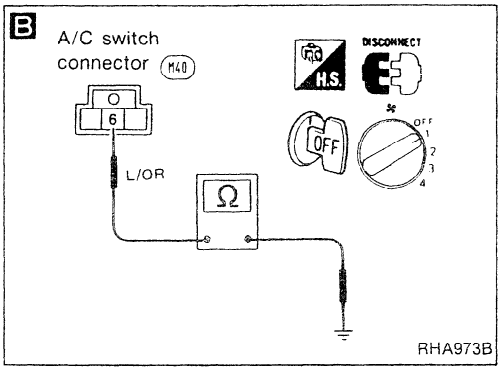


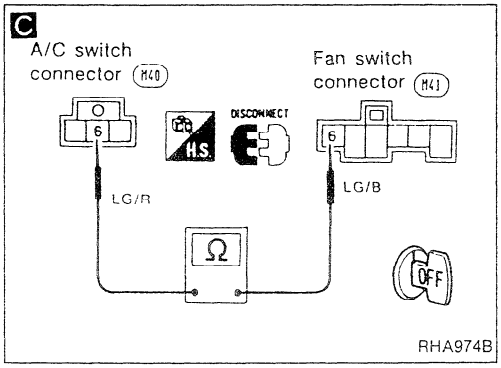
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

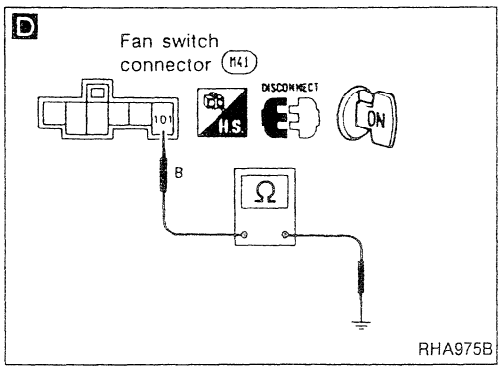
Diagnostic Procedure 6 (Cont'd)

DIAGNOSTIC PROCEDURE 6-2









A

CHECK POWER SUPPLY FOR A/C SWITCH.
Do approx. 12 volts exist between A/C switch harness terminal No. (9) and body ground?

N.G. → Check 10A fuse at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

O.K. ↓

B

CHECK BODY GROUND CIRCUIT FOR A/C SWITCH.
Disconnect A/C switch harness connector.
Does continuity exist between A/C switch harness terminal No. (6) and body ground?

N.G. → **C** Note: Check circuit continuity between A/C switch harness terminal No. (6) and fan switch harness terminal No. (6).

O.K. ↓

D Note: CHECK BODY GROUND CIRCUIT FOR FAN SWITCH.
Does continuity exist between fan switch harness terminal No. (101) and body ground?

O.K. ↓

CHECK A/C SWITCH.
(Refer to Electrical Components Inspection.)

N.G. ↓

Replace A/C switch.

CHECK FAN SWITCH.
(Refer to Electrical Components Inspection.)

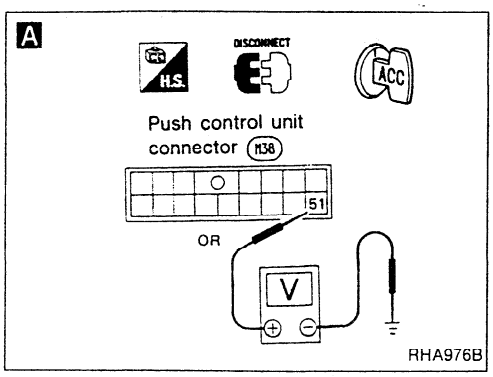
N.G. ↓

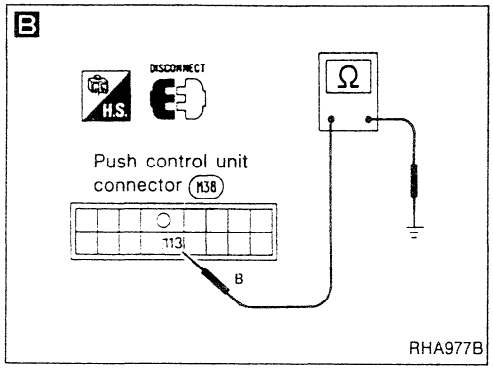
Replace fan switch.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 6 (Cont'd)

DIAGNOSTIC PROCEDURE 6-3





Turn ignition switch and lighting switch OFF.

↓

Disconnect push control unit harness connector.

↓

A

CHECK POWER SUPPLY FOR PUSH CONTROL UNIT.
Do approx. 12 volts exist between push control unit harness terminal No. (51) and body ground?

N.G. → Check 10A fuse at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

O.K.

↓

B

Note

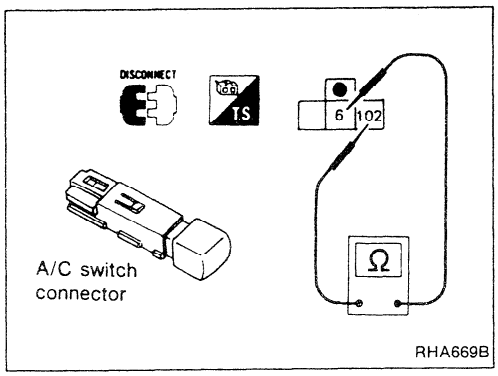
CHECK BODY GROUND CIRCUIT FOR PUSH CONTROL UNIT.
Does continuity exist between push control unit harness terminal No. (113) and body ground?

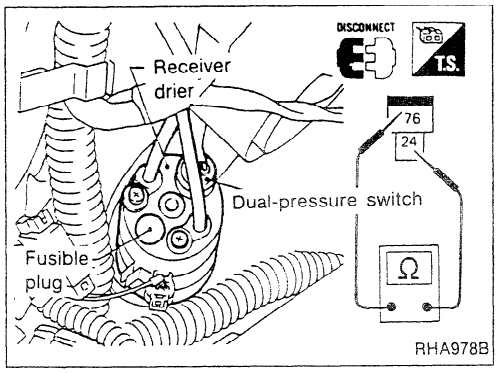
O.K.

↓

Replace control amp. built-in push control unit.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.





Electrical Components Inspection

A/C SWITCH

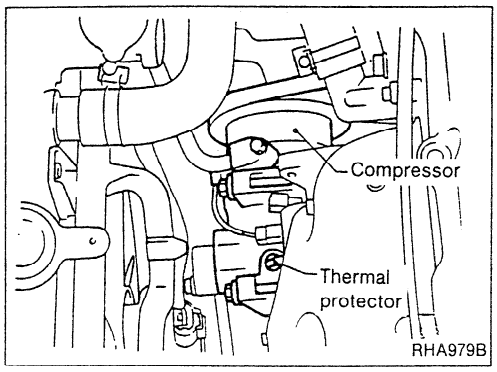
Check continuity between terminals at each switch position.

Switch condition	Terminal No.		Continuity
A/C	⊕	⊖	
ON	(102)	(6)	Yes
OFF			ON

DUAL-PRESSURE SWITCH

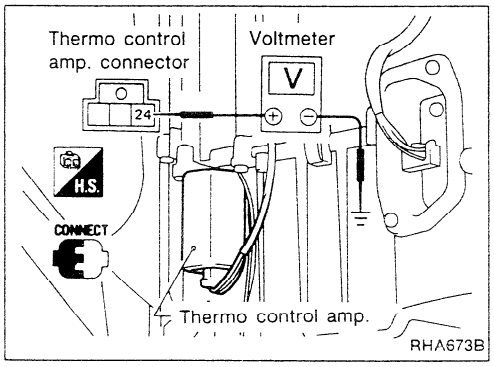
High-pressure side line pressure kPa (bar, kg/cm^2,psi)	Operation	Continuity
Decreasing to 177 - 216 (1.77- 2.16, 1.8 - 2.2, 26 - 31) Increasing to 2,452 - 2,844 (24.5 -28.4, 25 - 29, 356 - 412)	Turn OFF	Does not exist
Increasing to 177 - 235 (1.77 - 2.35, 1.8 - 2.4, 26 - 34) Decreasing to 1,863 - 2,256 (18.6 - 22.6, 19 - 23, 270 - 327)	Turn ON	Exists

Electrical Components Inspection (Cont'd)



THERMAL PROTECTOR

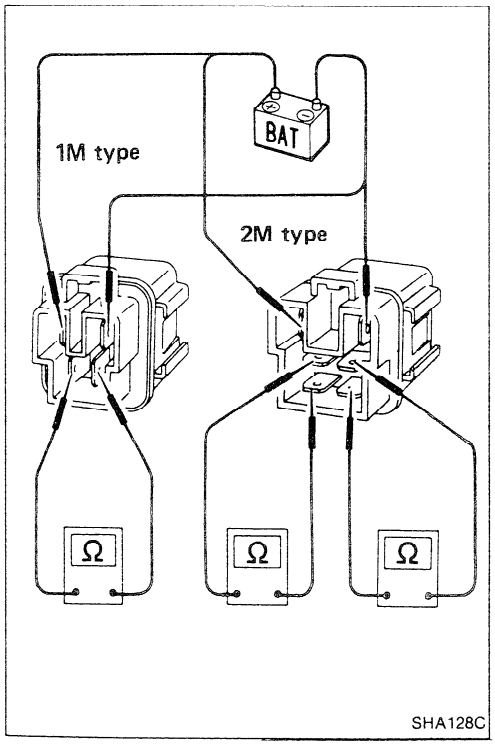
Temperature of compressor °C (°F)		Operation
NVR 140S	Increasing to approx. 135 - 145 (275 - 293)	Turn OFF
	Decreasing to approx. 120 - 130 (248 - 266)	Turn ON
DKV-14C & DKV-14D	Increasing to approx. 145 - 155 (293 - 311)	Turn OFF
	Decreasing to approx. 130 - 140 (266 - 284)	Turn ON



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



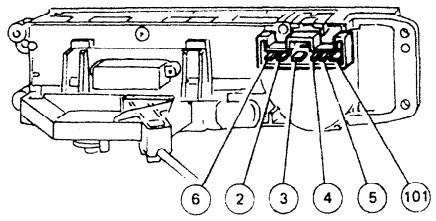
A/C RELAY

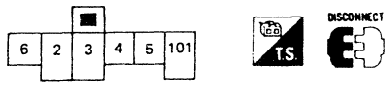
Check circuit continuity between terminals by supplying 12 volts to coil side terminal of A/C relay.

Electrical Components Inspection (Cont'd)

FAN SWITCH

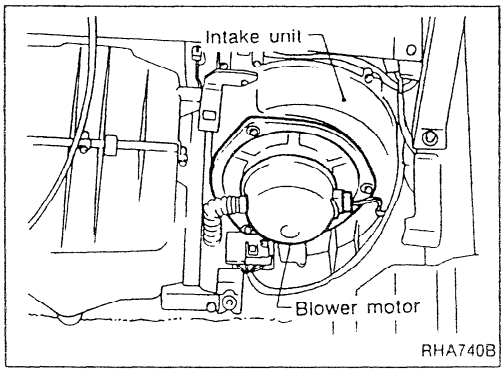
Check continuity between terminals as each switch position.





LEVER POSITION / TERMINAL	OFF	1	2	3	4
2					○
3				○	
4			○		
5		○			
101		○	○	○	○
6		○	○	○	○

RHA668B

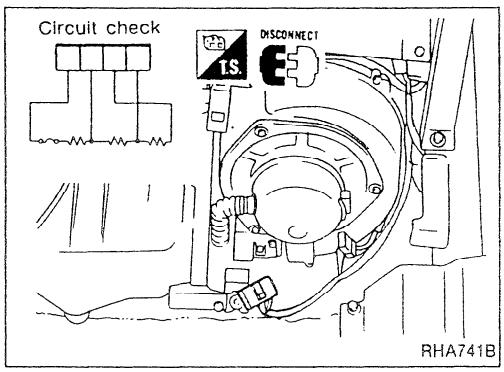


RHA740B

BLOWER MOTOR

Confirm smooth rotation of the blower motor.

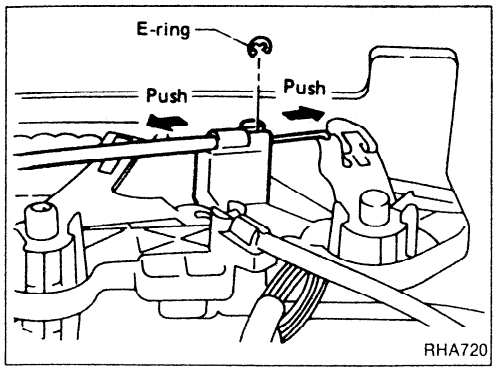
- Ensure that there are no foreign particles inside the intake unit.



RHA741B

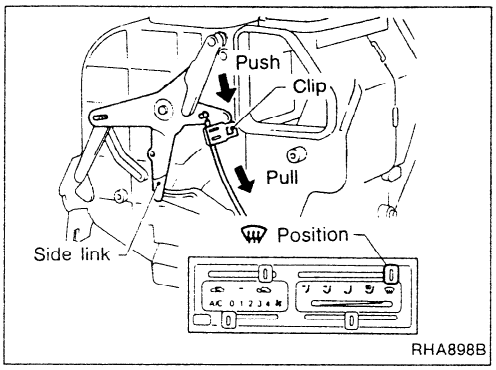
BLOWER RESISTOR

Check continuity between terminals.



Control Cable and Rod Adjustment — Lever control type

- **When disconnecting the control cable, remove the E-ring and take off the cable while pushing the cable outer in the direction of the arrow.**



AIR CONTROL CABLE

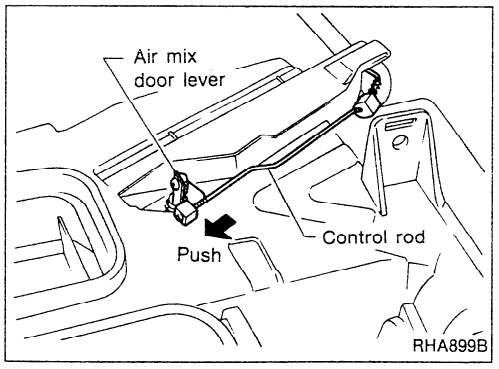
- Clamp the cable while pushing cable outer and side link in DEF mode.

After positioning control cable, check it operates properly.

- For R.H.D. models, set side link in VENT mode.

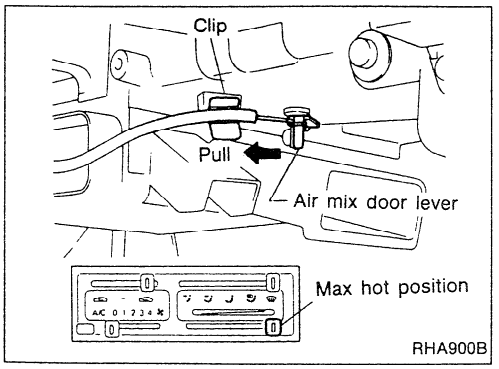
WATER COCK CONTROL ROD

- **When adjusting water cock control rod, first disconnect temperature control cable from air mix door lever. Reconnect and readjust 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 properly.



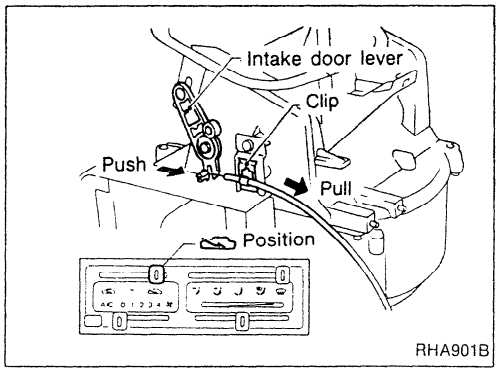
TEMPERATURE CONTROL CABLE

- Clamp the cable while pushing cable outer and air mix door lever in full hot position.

After positioning control cable, check it operates properly.

- For R.H.D. models, set air mix door lever in full cold position.

Control Cable and Rod Adjustment — Lever control type (Cont'd)

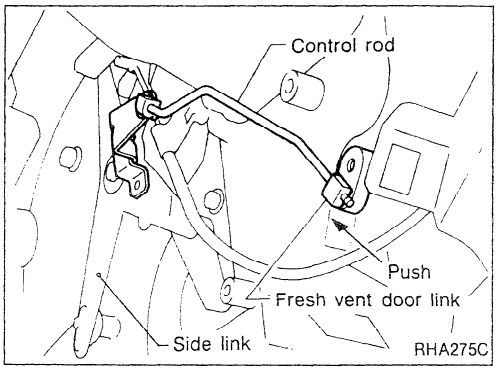


INTAKE DOOR CONTROL CABLE

- Clamp the cable while pushing cable outer and intake door lever at FRE position.

After positioning control cable, check it operates properly.

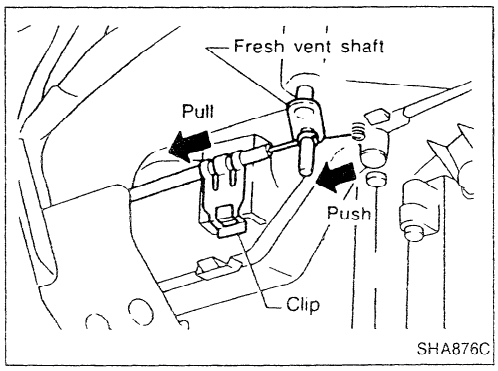
- For R.H.D. models, set intake door lever at REC position.



FRESH VENT DOOR — For Europe models

1. Set air control cable at VENT.
2. Push fresh vent door link in direction of arrow.
3. Clamp fresh vent door control rod.

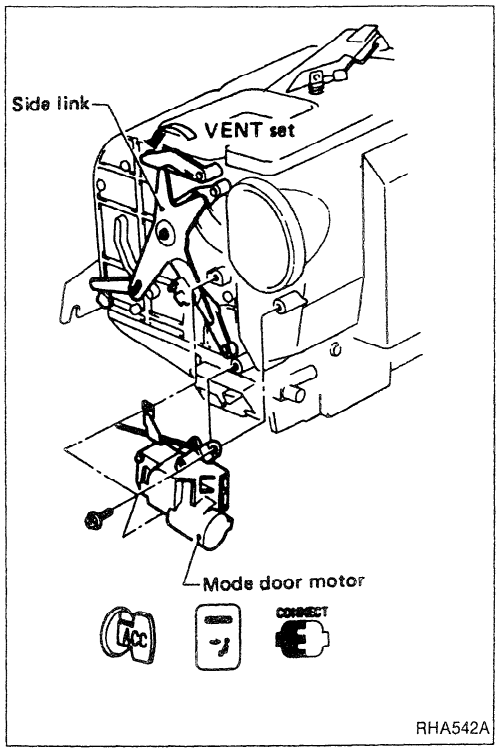
After connecting control rod, check fresh vent door is shut tightly in both VENT mode and DEF mode.



FRESH VENT DOOR — Except Europe models

1. Set fresh vent lever at position.
2. Set fresh vent shaft in direction of arrow. Pull on outer cable and then clamp it.

After positioning control cable, check it operates properly.



Control Cable and Rod Adjustment — Push control type

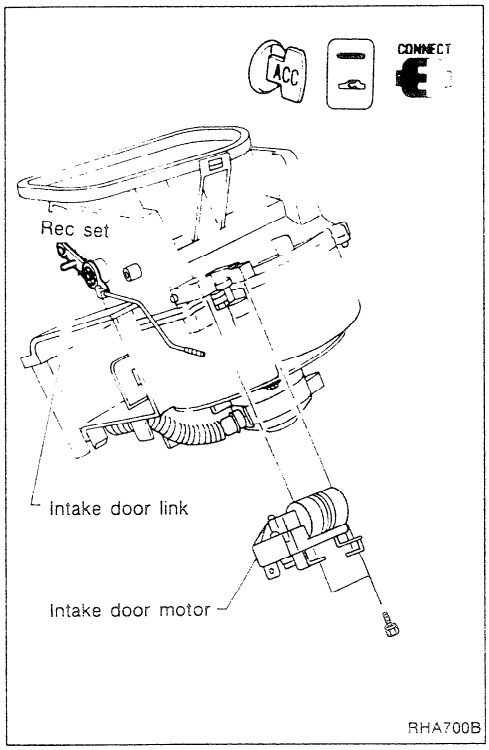
MODE DOOR

1. Move side link with hand and hold mode door in VENT mode.
2. Install mode door motor on heater unit and connect it to body harness.
3. Turn ignition switch to ACC.
4. Turn VENT switch ON.
5. Attach mode door motor rod to side link rod holder.
6. Turn DEF switch ON. Check that side link operates at the fully-open position. Also turn VENT switch ON to check that side link operates at the fully-open position.

Control Cable and Rod Adjustment — Push control type (Cont'd)

TEMPERATURE CONTROL CABLE

Refer to "TEMPERATURE CONTROL CABLE" section in "Control Cable and Rod Adjustment — Lever control type" on page HA-121.



INTAKE DOOR

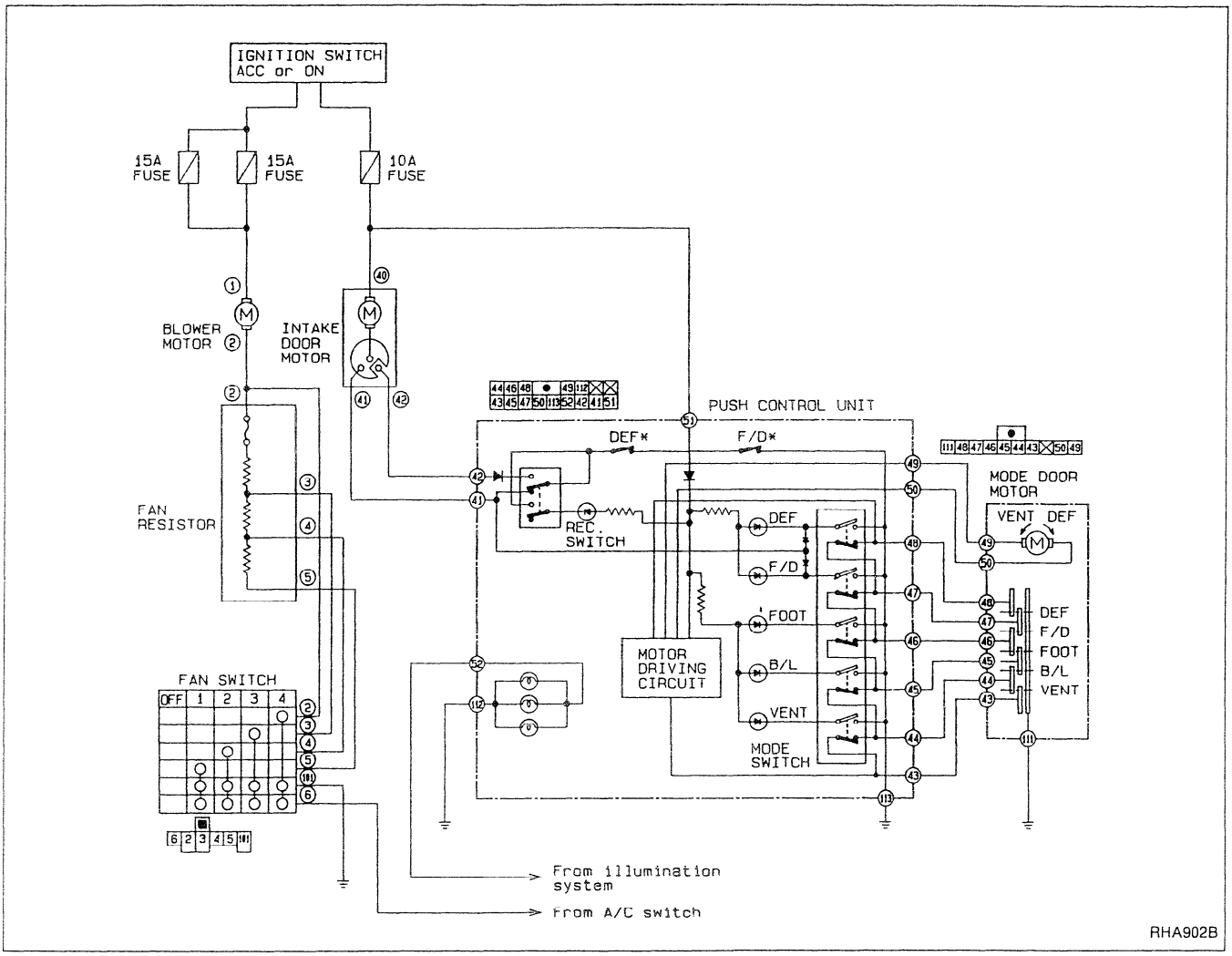
1. Connect the intake door motor harness connector before installing to the intake door motor.
2. Turn ignition switch to ACC.
3. Turn REC switch ON.
4. Install intake door motor on intake unit.
5. Install intake door lever.
6. Set intake door rod in REC position and fasten door rod to holder on intake door lever.
7. Check that intake door operates properly when REC switch is turned ON and OFF.

FRESH VENT DOOR

Refer to "FRESH VENT DOOR" section in "Control Cable and Rod Adjustment — Lever control type" on page HA-122.

Push Control System

L.H.D. MODELS



This push control system operates the intake and mode door motors to activate their corresponding doors.

Switches and their control functions

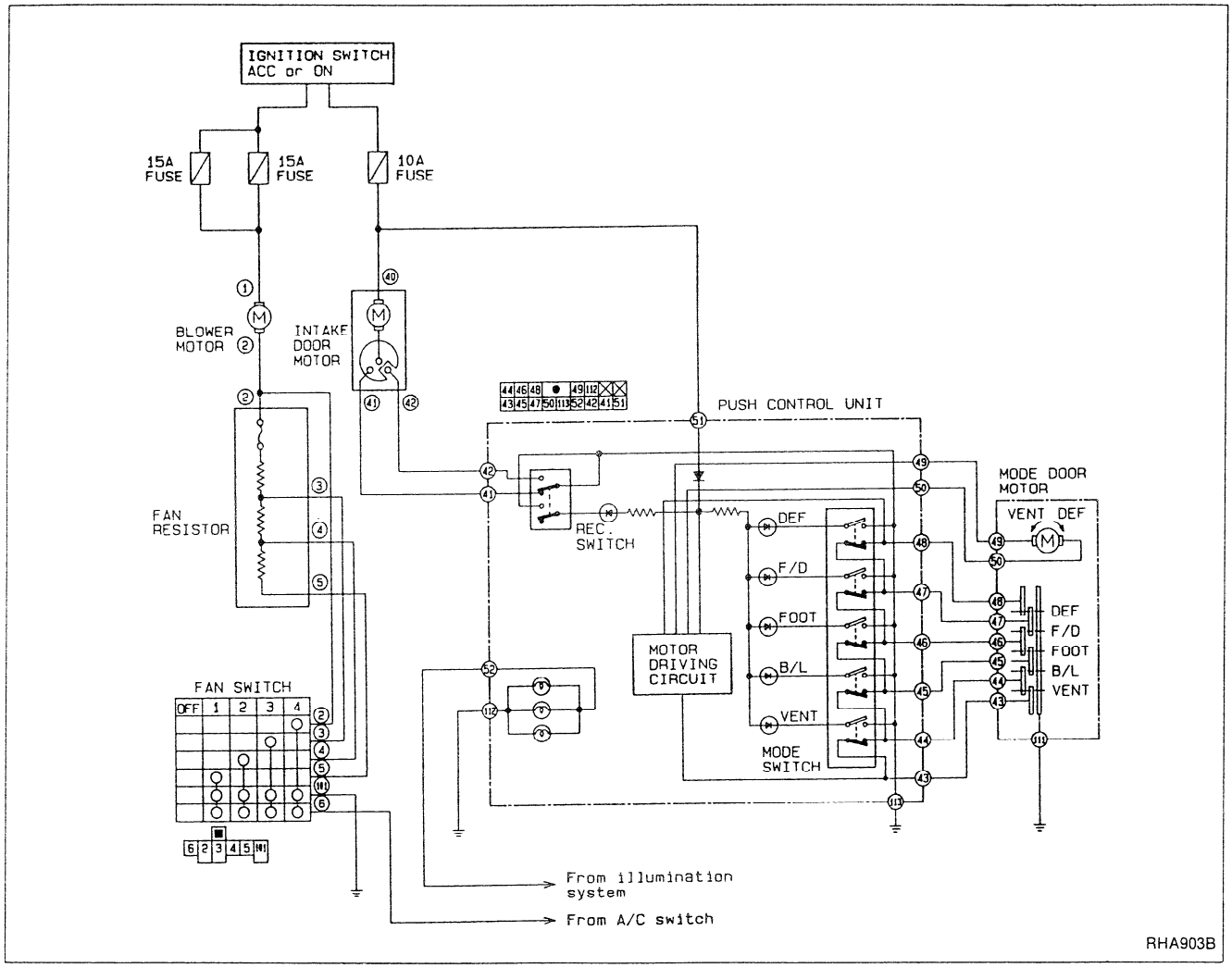
Switch		Indicator illuminates							Air outlet	Intake air	Compressor
		A/C									
A/C		○									ON*1
Mode			○						VENT		
				○					B/L		
					○				FOOT		
						○			F/D	FRE	
							○		DEF	FRE	
								○*2		REC*2	

*1: Compressor is operated by thermo control amp.

*2: Depending on mode switch position

Push Control System (Cont'd)

R.H.D. MODELS

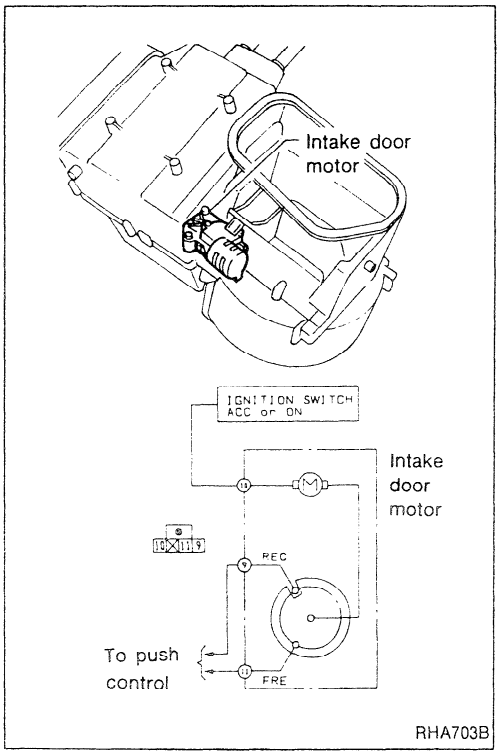


This push control system operates the intake and mode door motors to activate their corresponding doors.

Switches and their control functions

Switch		Indicator illuminates							Air outlet	Intake air	Compressor
		A/C									
A/C		○									ON*
Mode			○						VENT		
				○					B/L		
					○				FOOT		
						○			F/D		
							○		DEF		
								○		REC	

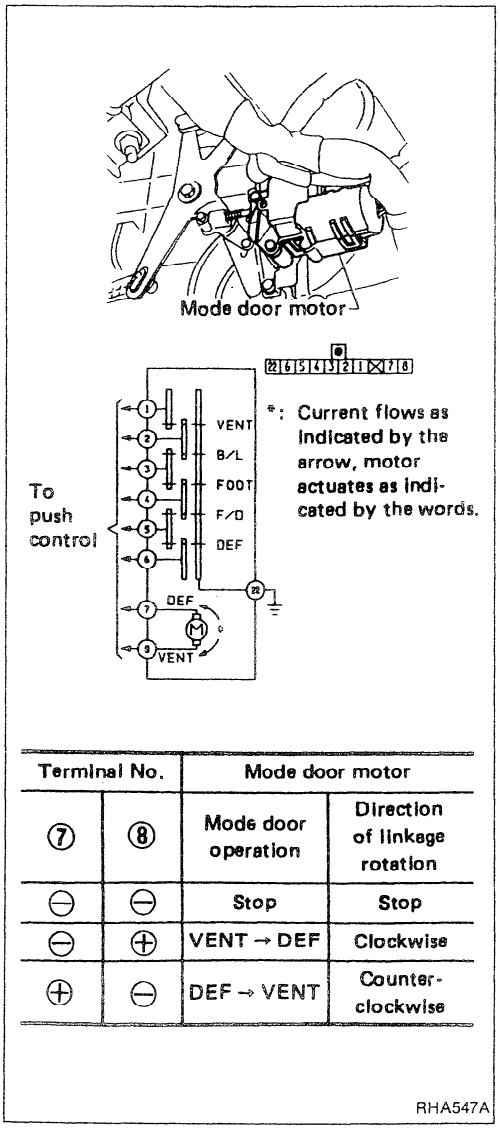
*: Compressor is operated by thermo control amp.



Intake Door Motor

The intake door motor is installed on the front portion of the intake unit. Using a rod and link it opens and closes the intake door.

When the REC switch is ON (OFF), the ground line of the intake door motor is switched from terminal ⑪ to ⑨ (⑨ to ⑪). This causes the motor to start because the position switch contacts built into it are set to the current flow position. The contacts turn along with the motor. When they reach the non-current flow position, the motor will stop. The motor always turns in the same direction.



Terminal No.		Mode door motor	
⑦	⑧	Mode door operation	Direction of linkage rotation
⊖	⊖	Stop	Stop
⊖	⊕	VENT → DEF	Clockwise
⊕	⊖	DEF → VENT	Counter-clockwise

RHA547A

Mode Door Motor

L.H.D. MODELS

The mode door motor is located on the left side of the heater unit. Through the side link it opens and closes the vent, foot and defroster door.

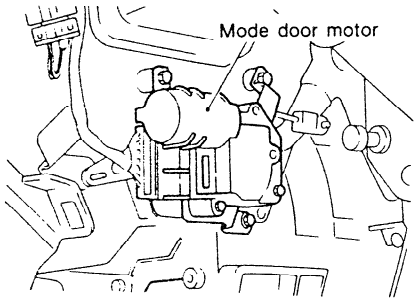
When one mode switch is pushed, the position switch built into it reads the corresponding mode to determine the direction of the motor rotation. As soon as the desired mode is set, the position switch stops the motor.

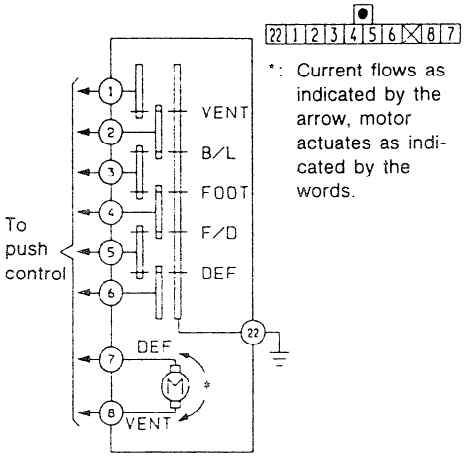
Mode Door Motor (Cont'd)

R.H.D. MODELS

The mode door motor is located on the right side of the heater unit. Through the side link it opens and closes the vent, foot and defroster door.

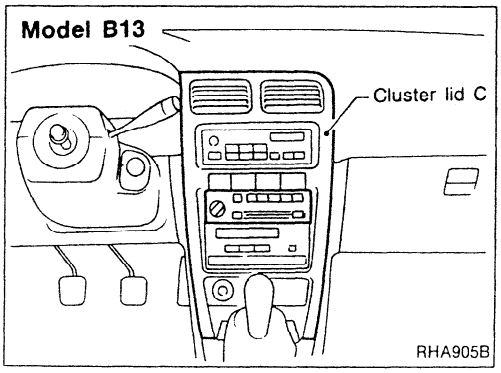
When one mode switch is pushed, the position switch built into it reads the corresponding mode to determine the direction of the motor rotation. As soon as the desired mode is set, the position switch stops the motor.





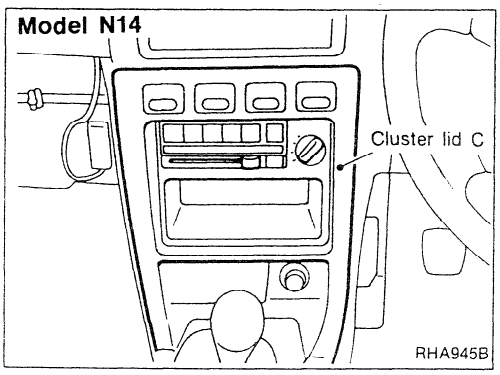
Terminal No.		Mode door motor	
⑦	⑧	Mode door operation	Direction of linkage rotation
⊖	⊖	Stop	Stop
⊖	⊕	VENT → DEF	Counter-clockwise
⊕	⊖	DEF → VENT	Clockwise

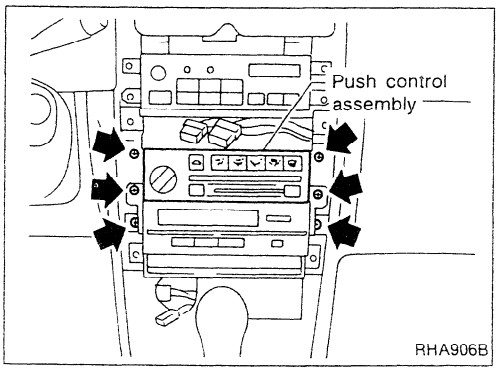
RHA904B



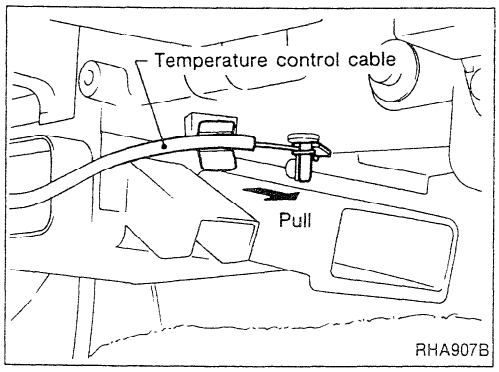
Removal and Installation

1. Remove cluster lid C.





2. Remove the 6 bracket screws.

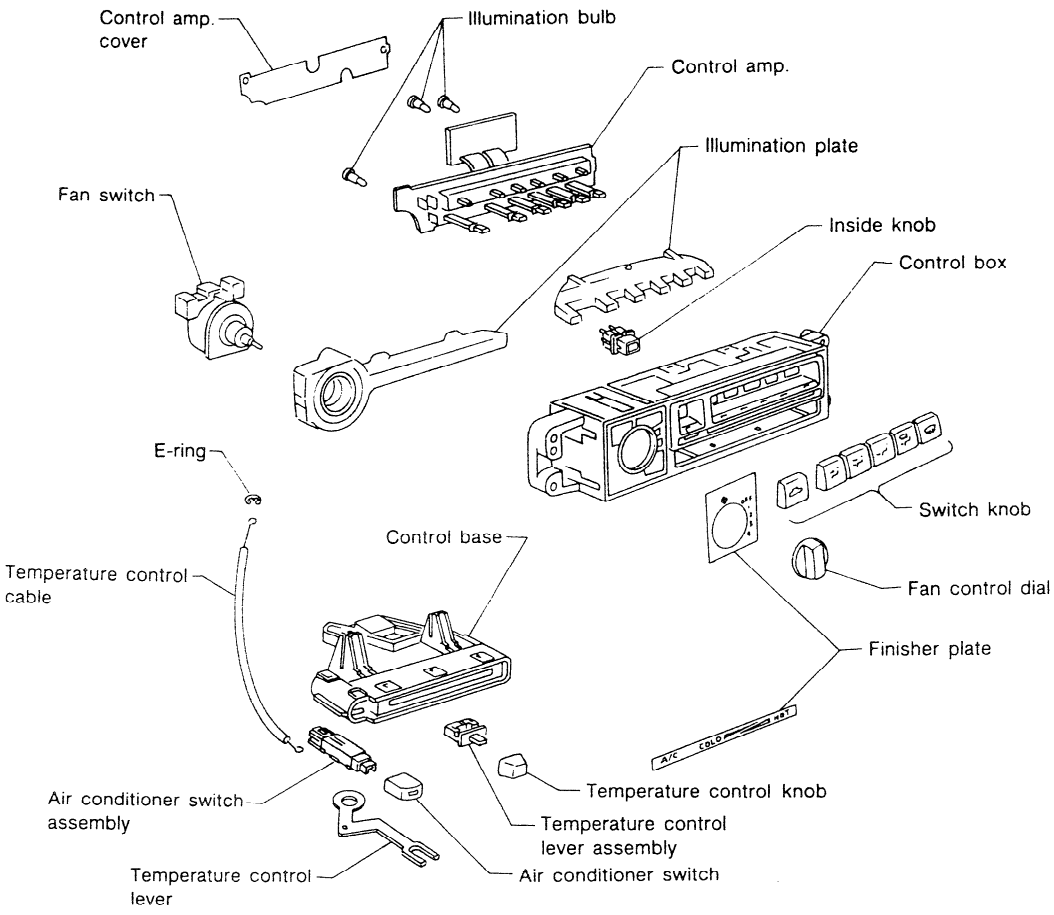


3. Disconnect temperature control cable at heater unit side.

4. Remove cassette deck.
5. Disconnect push control unit harness connectors.
6. Remove lower instrument panel with push control unit.
7. Remove push control unit.
8. Installation is in the reverse order of removal.

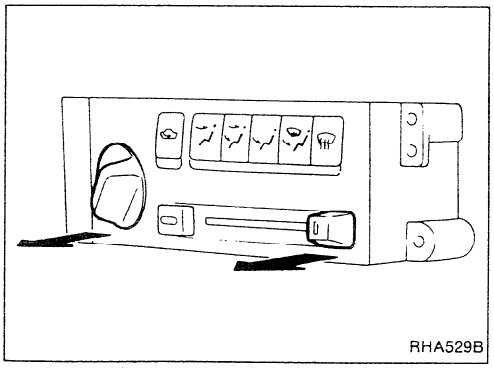
Refer to "Control Cable and Rod Adjustment" for temperature control cable.

Removal and Installation (Cont'd)



This illustration is for L.H. drive models.
R.H. drive models are basically the same.

RHA707B

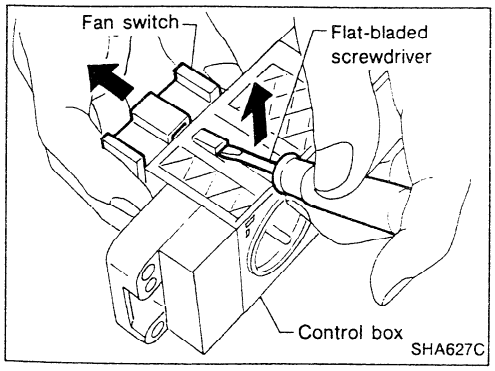


RHA529B

Disassembly

1. Remove temperature control knob & fan control dial.

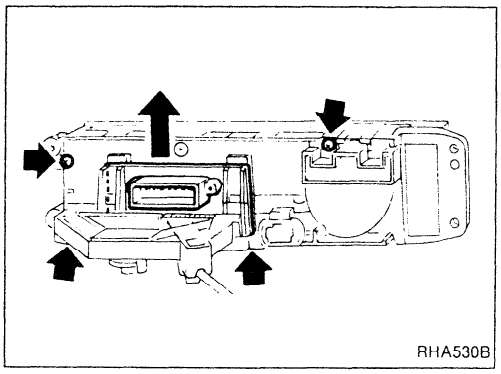
Wrap temperature knob & fan control dial with a cloth and pull in direction indicated by arrow as shown in figure at left. Be careful not to scratch knobs during removal.



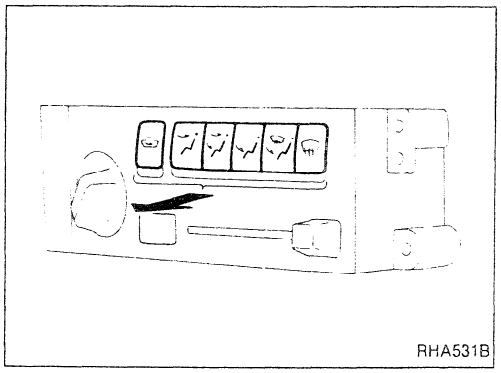
SHA627C

2. Remove fan switch.

Disassembly (Cont'd)

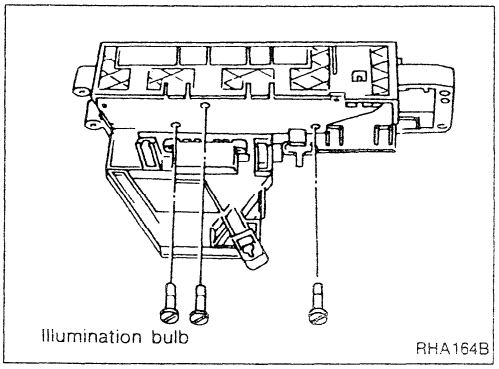

RHA530B

3. Remove control base & control amp. cover.


RHA531B

4. Remove control knobs.

Wrap finisher with a cloth and remove knobs using flat-bladed screwdriver or similar tool. Be careful not to scratch finisher surface.



RHA164B

5. Remove illumination bulbs.

6. Remove control amp.

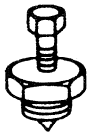
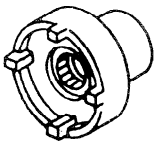
Be careful not to damage substrate when removing.

7. Remove illumination plate.
8. Remove finisher plate.
9. Disconnect temperature control cable.
10. Assembly is in reverse order of disassembly.

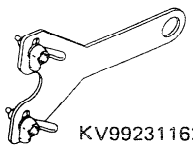
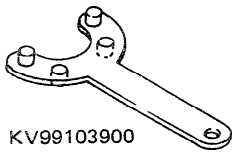
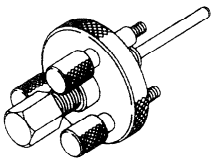
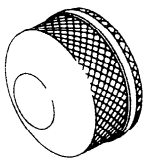
SPECIAL SERVICE TOOLS

NVR 140S model

*: Special tool or commercial equivalent

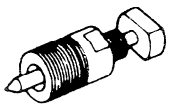
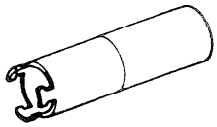
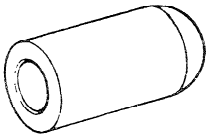
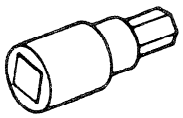
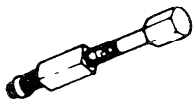
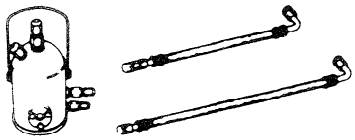
Tool number Tool name	Description	
KV998VR001 Clutch disc puller		Removing clutch disc
KV99231010* Clutch disc wrench		Removing shaft nut and clutch disc
KV99235160* Nut wrench		Removing lock nut

DKV 14C model

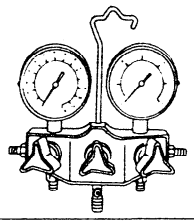
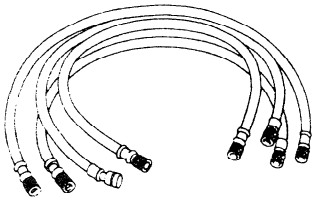
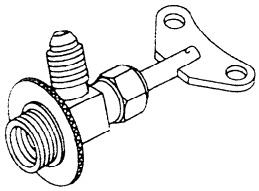
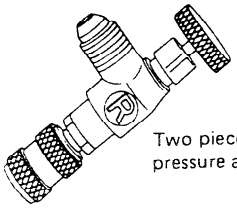
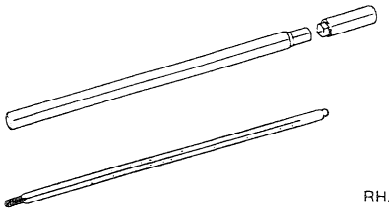
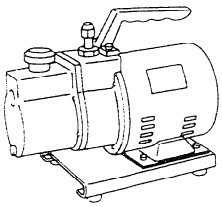
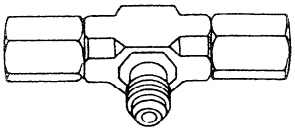
Tool number Tool name	Description	
KV99231162 or KV99103900	 KV99231162  KV99103900	Removing shaft nut and clutch disc
KV99232340 Clutch disc puller		Removing clutch disc
KV99234330 Pulley installer		Installing pulley

MJS130 model

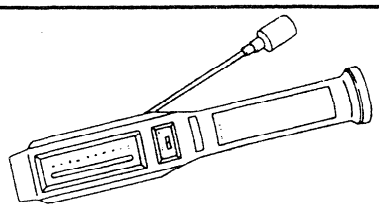
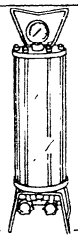
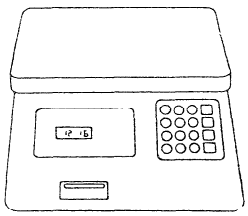
*: Special tool or commercial equivalent

Tool number Tool name	Description	
KV99412302* Clutch disc wrench		Removing shaft nut and clutch disc
KV994C5780 Clutch disc puller		Removing clutch disc
KV994C1143 Shaft seal remover and installer		Removing and installing shaft seal
KV994C5784* Shaft seal pilot		Installing shaft seal
KV99412330* Allen socket		Removing rear cover
KV994C5785* Cylinder head remover		Removing rear cylinder head
KV994A9690 Oil separator kit		Separating oil from refrigerant

Service Tools

Tool name	Description	
Manifold gauge (3-valve type)	 RHA570B	Discharging, evacuating and charging refrigerant
Charging hose (Four)	 RHA571B	Discharging, evacuating and checking refrigerant
Charge valve	 RHA572B	Charging refrigerant
Adapter valve	 Two pieces on each high pressure and low pressure line RHA573B	Evacuating and charging
Thermometer	 RHA574B	Checking temperature
Vacuum pump	 RHA575B	Evacuating refrigerant
Joint adapter (T-type)	 RHA576B	Charging refrigerant

Service Tools (Cont'd)

Tool name	Description	
Gas leak detector	 RHA577B	Checking refrigerant leaks
Charging cylinder	 RHA578B	Checking amount of refrigerant and charging refrigerant
Weight scale	 RHA579B	Checking amount of refrigerant

For details of such handling methods, refer to the Instruction Manual attached to each of the service tools.

Service Tools (Cont'd)

HANDLING METHOD AND STRUCTURE

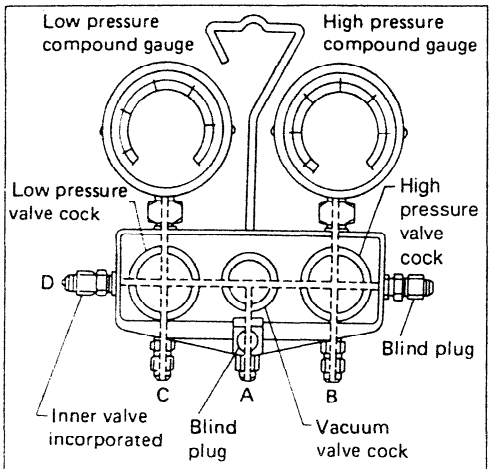
Manifold gauge

The manifold gauge is used to measure the operating pressure accurately in the high pressure and low pressure lines of the refrigerating system.

The high pressure gauge measures from –101.3 kPa (–1,013 mbar, –760 mmHg, –29.92 inHg) to 2,942 kPa (29.4 bar, 30 kg/cm^2, 427 psi), and the low pressure gauge measures generally from –101.3 kPa (–1,013 mbar, –760 mmHg, –29.92 inHg) to 1,471 kPa (14.7 bar, 15 kg/cm^2, 213 psi).

CAUTION:

- **When installing the gauge to the refrigerating system, use utmost care not to mistake high pressure and low pressure line connections. (Wrong connections will lead to a damaged gauge.)**
- **Before evacuating, confirm that the gauge has a negative pressure scale. (If not, the gauge will be damaged.)**



Center joint (A):
Use for evacuating.
High pressure side joint (B):
Connect to high pressure side service valve of refrigerating system.
Low pressure side joint (C):
Connect to low pressure side service valve of refrigerating system.
Refrigerant joint (D):
Use for charging refrigerant.

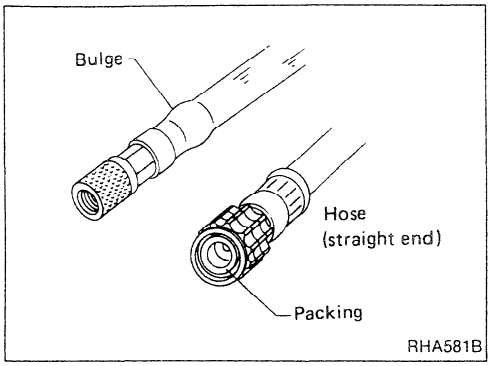
RHA580B

Charging hose

1. Completely tighten the high pressure valve, low pressure valve and vacuum pump valve cocks of the gauge manifold.
2. Connect the charging hoses to the high and low pressure lines.
3. Connect the charging hose fitted with a valve core to the refrigerant canister.
4. Connect the charging hose to the vacuum pump.

The high and low pressure hoses are color coded to prevent wrong connection.

High pressure line hose	Red
Low pressure line hose	Yellow
Refrigerant canister hose	Blue or green (with valve core)
Vacuum pump hose	Blue or green

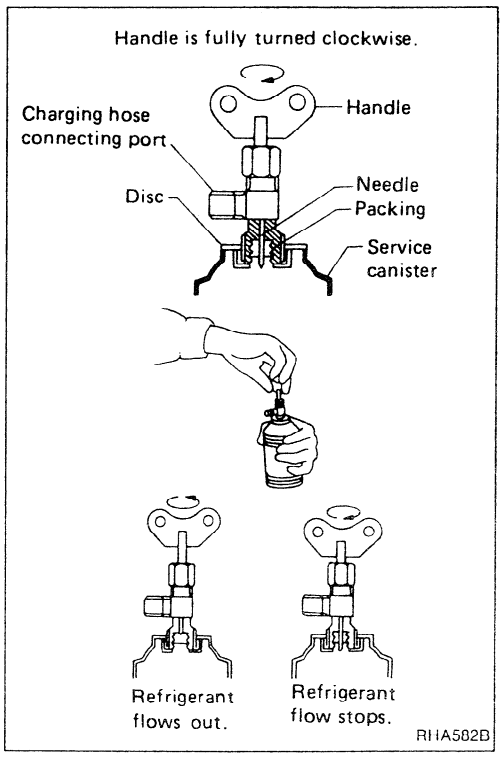


RHA581B

CAUTION:

- **Check each hose for cracks. If found, discard the hose.**
- **Do not use any hose if bulges are found.**
- **Check the rubber packing. If any deterioration or cracks are found, replace it with a new one.**

Service Tools (Cont'd)



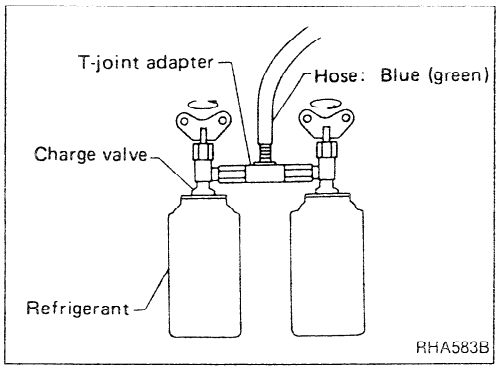
Charge valve

The charge valve is used to charge the refrigerant into the system from the service canister through the gauge manifold. Attach this valve to the head of a service canister by screwing it on. Then turn the handle clockwise to pierce the canister to allow the refrigerant to flow into the refrigerating system.

CAUTION:

Check the packing for any sign of deterioration or cracks. If any abnormalities are found, replace it with a new one.

1. Turn the charge valve handle counterclockwise to fully retract the needle, and then attach the charge valve to the service canister. Note that leakage will occur if the charge valve is attached to the canister without retracting the needle.
2. Securely fit the charge valve to the head of the service canister by turning it. Then turn the handle slowly clockwise to make a hole in the canister with the needle.
3. Turn the handle counterclockwise to retract the needle, and the refrigerant will flow into the gauge manifold through the hole. To stop the flow of the refrigerant, turn the handle clockwise to close the hole with the needle.

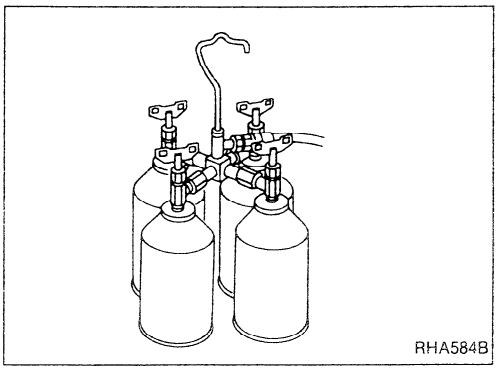


Connecting T-joint adapter

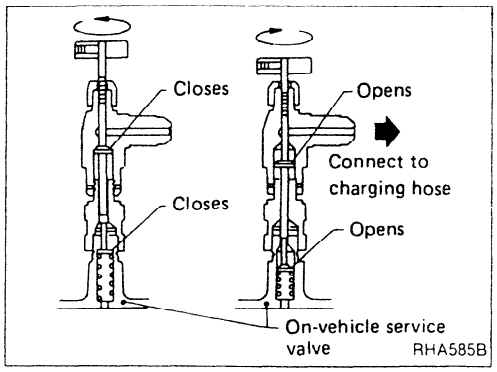
The T-joint adapter is used to connect two refrigerant canisters so that air purging and the accompanying discharge of refrigerant into the atmosphere can be eliminated when recharging the refrigerant. If only one service canister is sufficient to charge the refrigeration system, do not use this T-joint adapter.

1. Turn the handle of each charge valve fully counterclockwise, and attach the valve to a refrigerant canister.
2. Connect the T-joint adapter to both charge valves so that two refrigerant canisters are connected as shown.
3. Connect the charging hose with valve core to the T-joint adapter. Connect the valve core end of the charging hose to the manifold gauge.

If more than three service canisters are needed for charging, use a cross joint adapter to connect four service canisters.



Service Tools (Cont'd)



Installing the adapter valve

Install the adapter valve to each of the high pressure and low pressure service valves so that air purging from the charging hose can be omitted. This also ensures that refrigerant leakage upon disconnection of the hose can be prevented.

1. Before connecting the adapter valve to the on-vehicle service valve, turn the adapter valve handle fully counterclockwise to retract the pin.

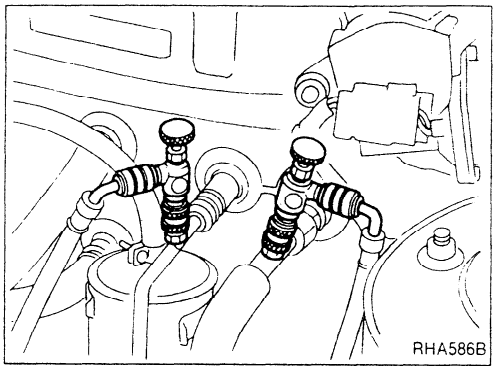
CAUTION:

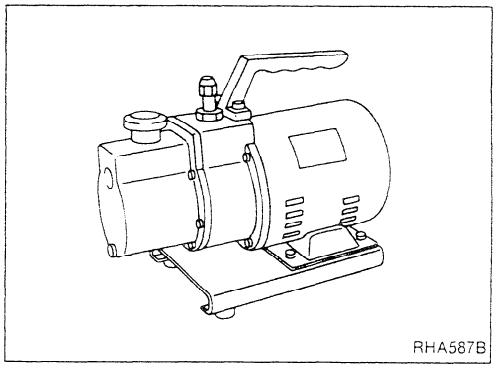
Check the packing for any sign of deterioration or cracks. If any abnormality is found, replace it with a new one.

2. Connect the charging hose to the adapter valve.

Turning the handle clockwise will cause the on-vehicle service valve pin to be pushed open by the adapter valve pin, thus opening the refrigerant passage.

Turning the handle counterclockwise will close the passage. Before removing the adapter valve from the on-vehicle service valve, be sure to fully turn the handle counterclockwise to shut off the refrigerant passage.

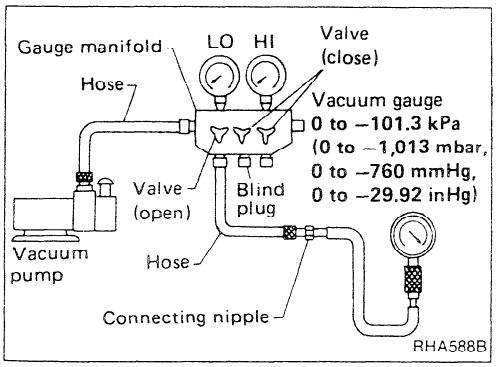




Vacuum pump

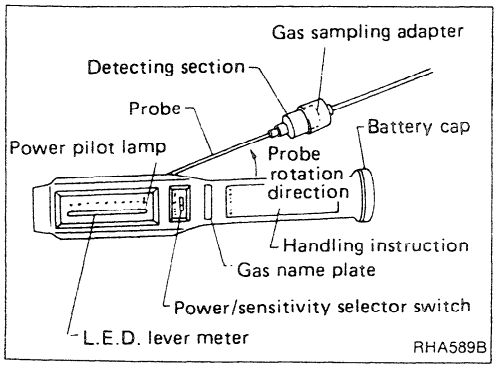
The vacuum pump is used to purge air and moisture from the inside of the refrigeration system by evacuation, thereby ensuring proper functioning of the air conditioner system.

Check the vacuum pump to see that the vacuum pump capacity is greater than –100.0 kPa (–1,000 mbar, –750 mmHg, –29.53 inHg).



Vacuum pump performance check procedure

1. Connect the vacuum gauge to the system.
2. Run the vacuum pump, and check to see that the needle pointers of the gauge manifold and vacuum gauge move smoothly, indicating a similar value.
3. After running the vacuum pump for two or three minutes, read the vacuum gauge. The measured value indicates the capacity of the vacuum pump.



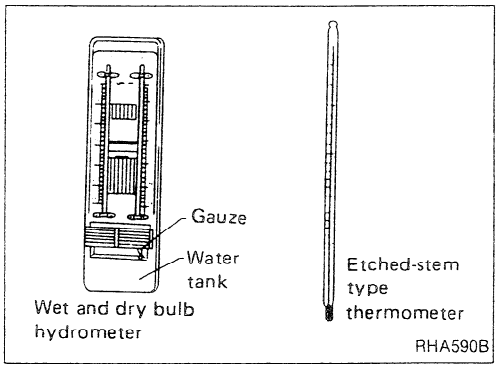
Gas leak detector

The gas leak detector is used to check whether the refrigeration system is leaking. The detector is available in two types; halide torch or electrical. The features of these gas leak detectors are listed on the next page.

Service Tools (Cont'd)

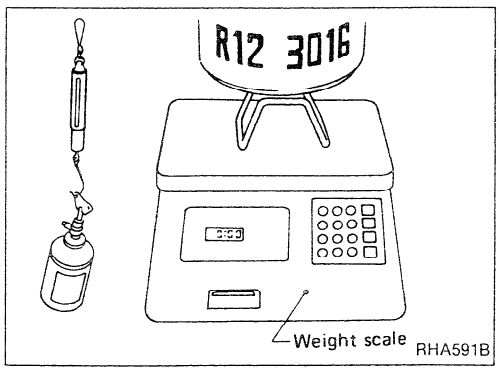
Type		Detection ability	Features
Halide torch		200 g (7.05 oz)/year (thin green)	• Low price • Low sensitivity • Less safe because of the use of flame for detection
Electrical	Discharge type (Suction type)	3 - 50 g (0.11 - 1.76 oz)/year	• Easy handling • Medium sensitivity • Each point needs tow or more seconds for detection.
	Positive ion emission type (Suction type)	2 g (0.07 oz)/year	• High sensitivity • High price • Warm-up time is needed because a heater is incorporated.
Other simple checking method: Change in vacuum when evacuating		1 kg (2 lb)/month; if 13.3 kPa (133 mbar, 100 mmHg, 3.94 inHg) change in vacuum is detected in 10 minutes.	• Can be used easily in refrigerant charging operation. • Detection ability is very low with vacuum gauge in gauge manifold.

- **Leakage inspection of a refrigeration system needs a sensitivity greater than 20 g (0.71 oz)/year.**
- **The actual amount of leak is estimated at 5 to 10 times the detected amount.**
- **Insufficient cooling may be felt if leakage exceeds 150 to 200 g (5.29 to 7.05 oz).**



Temperature gauge

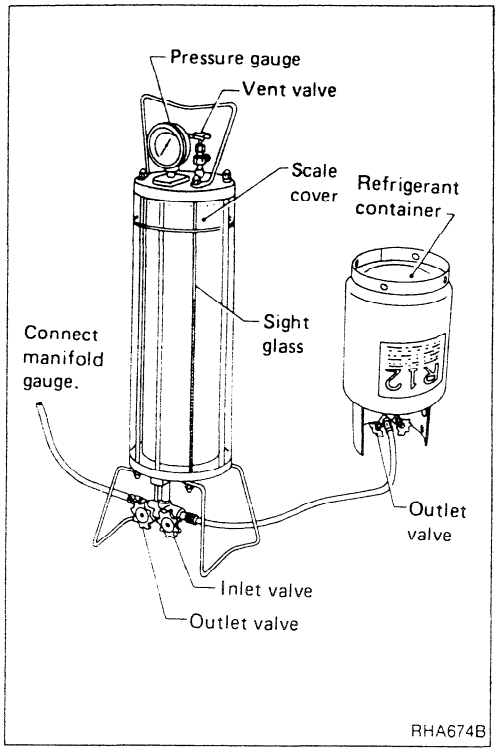
Use to check the air conditioner performance. An etched stem type thermometer may be used. A hygrometer must also be used because the air conditioner performance depends on the humidity.



Scale

Measure the weight of the refrigerant to determine how much the refrigerant is charged.

Service Tools (Cont'd)



Charging cylinder

The charging cylinder is used to correctly measure the amount of refrigerant to be charged.

Features

- With the charging cylinder, the operator can measure correctly the amount of refrigerant to be charged into the system.
- Change in the refrigerant volume due to a change in temperature and pressure can be supplemented, and this ensures correct charging of refrigerant.

CAUTION:

- **Never attempt to carry the charging cylinder containing refrigerant.**
- **Do not put the charging cylinder in a hot place. If the temperature and pressure of the refrigerant in the cylinder increase, the safety valve will be pushed open and the refrigerant will be released into the atmosphere.**
- **Do not expose the cylinder to the direct sunlight.**
- **Do not over-charge the refrigerant so that it exceeds the maximum limit of the cylinder.**
- **Do not charge the cylinder with more refrigerant than is needed.**

General Specifications

COMPRESSOR

Model	L.H.D. model	R.H.D. model			
		For Singapore		Except Singapore	
		GA16DE	GA14DS	CD17 and E10S	Except for CD17 and E10S
	ATSUGI make NVR140S		HITACHI make MJS130	ZEXEL make DKV-14C	ZEXEL make DKV-14D
Type	Vane rotary		Swash plate	Vane rotary	
Displacement cm^3 (cu in)/Rev.	140 (8.54)		130 (7.93)	142 (8.66)	140 (8.54)
Cylinder bore × stroke mm (in)	—		32.7 × 19.9 (1.287 × 0.783)	—	
Direction of rotation	Clockwise (Viewed from drive end)				
Drive belt	Poly V				

LUBRICATION OIL

Model	ATSUGI make NVR 140S	ZEXEL make DKV-14D	ZEXEL make DKV-14C	HITACHI make MJS130
Type	SUNISO 5GS or equivalent			
Capacity mℓ (Imp fl oz)				
Total in system	200 (7.0)			150 (5.1)
Compressor (Service part) charging amount	200 (7.0)			150 (5.1)

REFRIGERANT (Except Europe and Middle East models)

Type	R12
Capacity kg (lb)	
Model B13	
L.H.D.	0.65 - 0.75 (1.43 - 1.65)
R.H.D.	0.55 - 0.65 (1.21 - 1.43)
Model N14	0.60 - 0.70 (1.32 - 1.54)

REFRIGERANT (Europe and Middle East models)

Type	R12
Capacity kg (lb)	
L.H.D.	0.65 - 0.75 (1.43 - 1.65)
R.H.D.	0.60 - 0.70 (1.32 - 1.54)

Inspection and Adjustment

ENGINE IDLING SPEED (When A/C is ON.)

- **Refer to EF & EC section.**

BELT TENSION

- **Refer to Checking Drive Belts (MA section).**

COMPRESSOR

Model	NVR 140S/DKV-14D/DKV-14C	MJS130
Clutch disc-pulley clearance mm (in)	0.3 - 0.6 (0.012 - 0.024)	0.5 - 0.8 (0.020 - 0.031)

ELECTRICAL SYSTEM

SECTION EL

When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS" and EL-5, "How to Identify Type I and Type II Vehicles".**

CONTENTS

HARNESS CONNECTOR ..... EL- 2
STANDARDIZED RELAY ..... EL- 3
POWER SUPPLY ROUTING ..... EL- 5
BATTERY ..... EL- 11
STARTING SYSTEM ..... EL- 20
STARTING SYSTEM — Starter — ..... EL- 23
CHARGING SYSTEM ..... EL- 46
CHARGING SYSTEM — Alternator — ..... EL- 49
COMBINATION SWITCH ..... EL- 62
HEADLAMP — Without Daytime Light System and Dim-dip Lamp System — ..... EL- 64
HEADLAMP — Daytime Light System — ..... EL- 66
HEADLAMP — Dim-dip Lamp System — ..... EL- 70
HEADLAMP — Headlamp Aiming Control — ..... EL- 75
HEADLAMP ..... EL- 81
EXTERIOR LAMP ..... EL- 83
INTERIOR LAMP EL-103
METER AND GAUGES — Needle Type — EL-109
METER AND GAUGES — Digital Type — EL-125
WARNING LAMPS AND BUZZER EL-137
WIPER AND WASHER EL-151
HORN AND CIGARETTE LIGHTER EL-162
CLOCK EL-163
REAR WINDOW DEFOGGER EL-164
AUDIO AND POWER ANTENNA EL-167
LOCATION OF ELECTRICAL UNITS EL-176
HARNESS LAYOUT EL-180
SUPER MULTIPLE JUNCTION (S.M.J.) EL-217

WIRING DIAGRAM REFERENCE CHART

RADIATOR FAN ..... LC SECTION
ENGINE CONTROL SYSTEM, IGNITION SYSTEM ..... EF & EC SECTION
O/D CONTROL SYSTEM, SHIFT LOCK SYSTEM ..... AT SECTION
ANTI-LOCK BRAKING SYSTEM ..... BR SECTION
POWER WINDOW AND POWER DOOR LOCK, SEAT BELT, HEATING SEAT, SUN ROOF, DOOR MIRROR ..... BF SECTION
HEATER AND AIR CONDITIONER ..... HA SECTION

Description

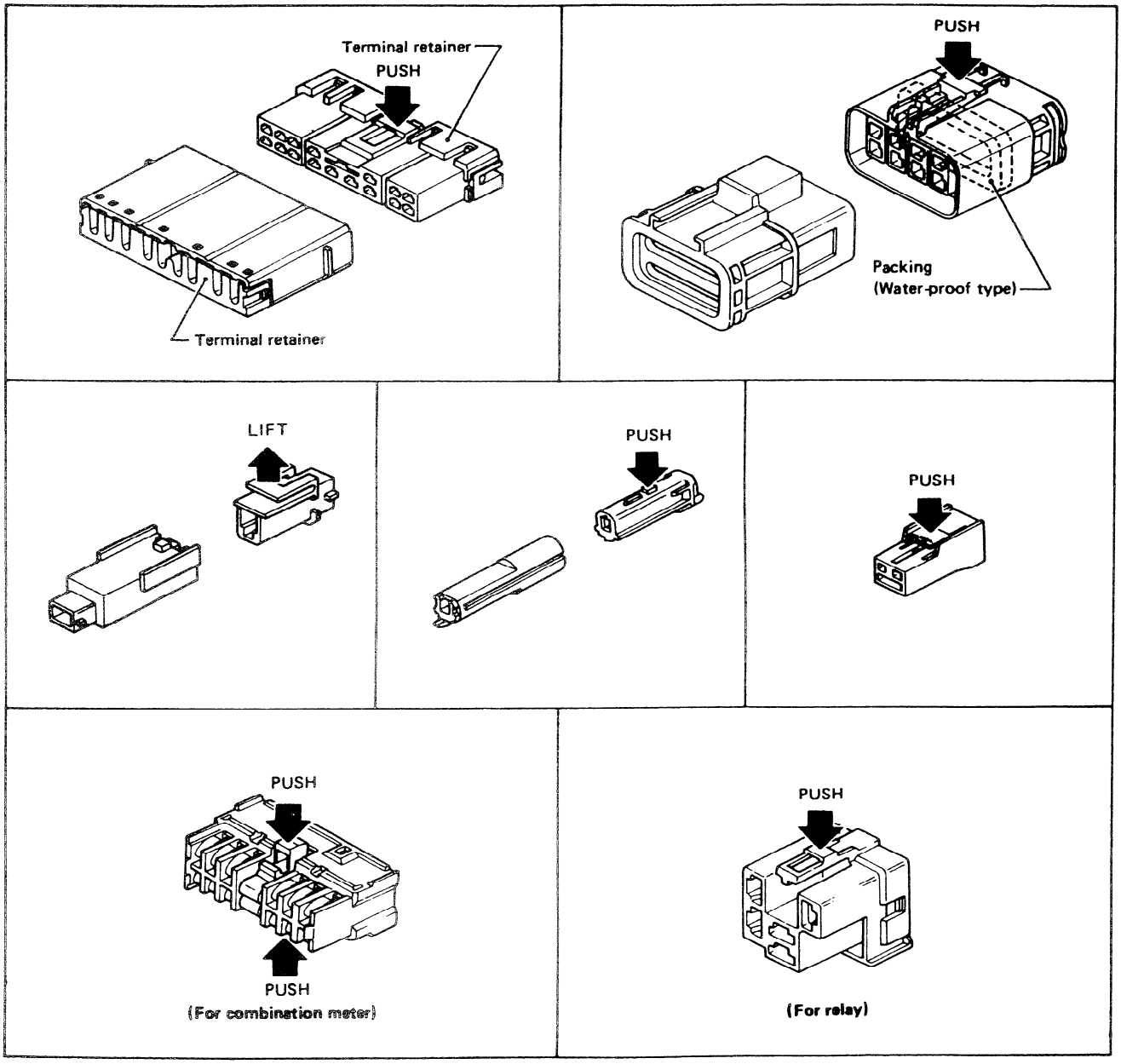
HARNESS CONNECTOR

- 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]

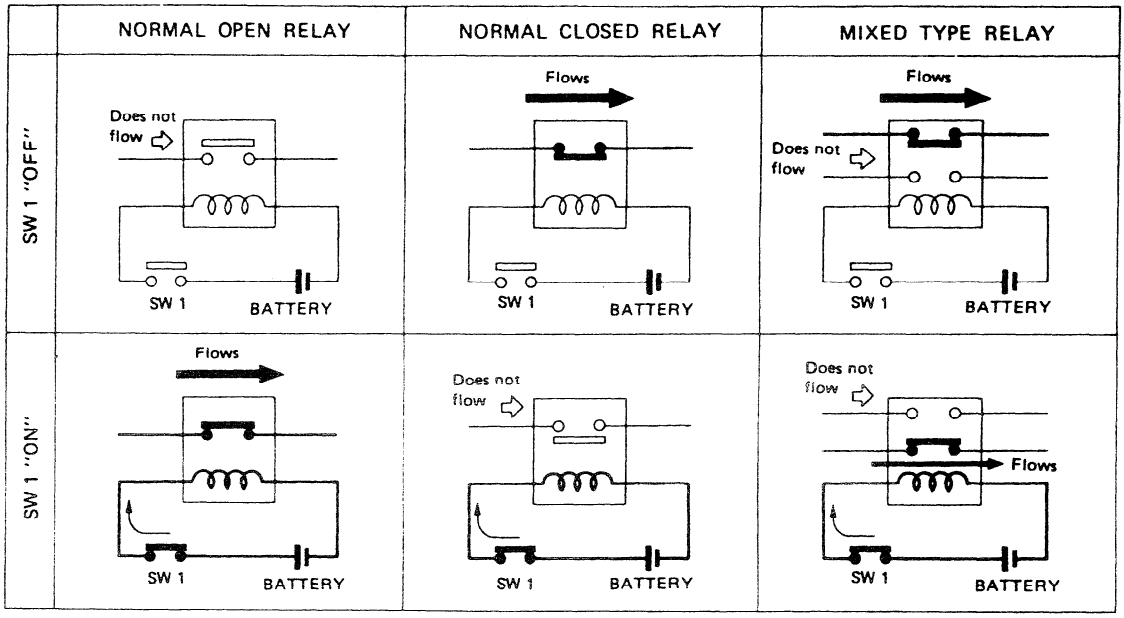


SEL769D

Description

NORMAL OPEN, NORMAL CLOSED AND MIXED TYPE RELAYS

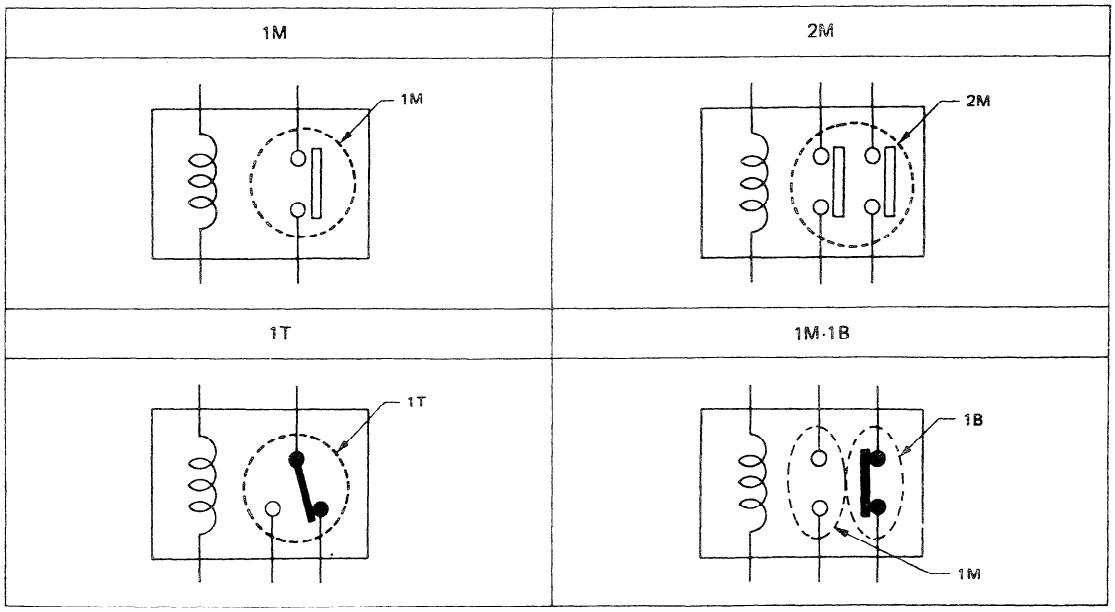
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



SEL881H

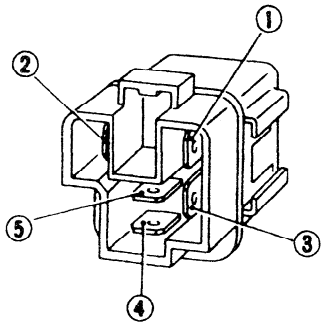
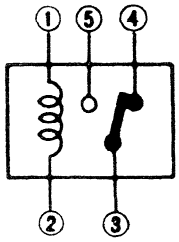
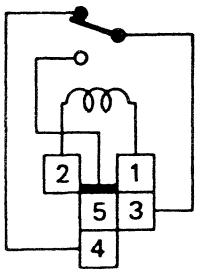
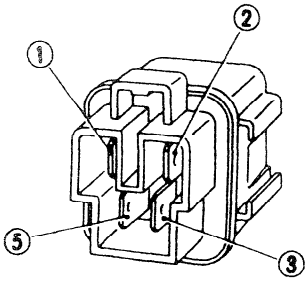
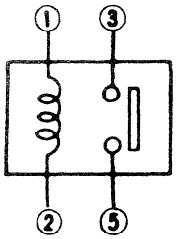
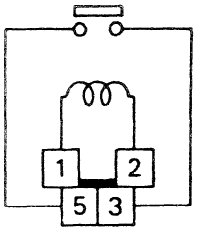
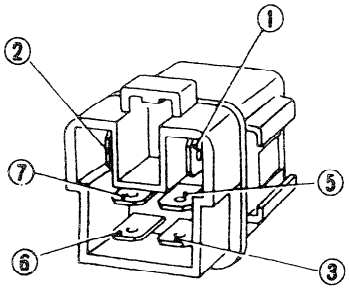
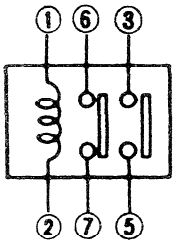
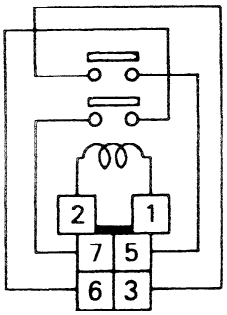
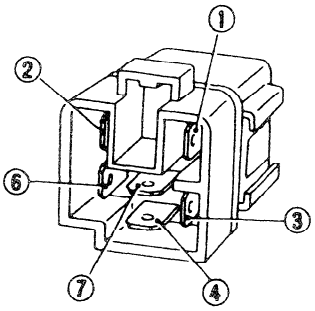
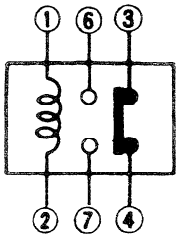
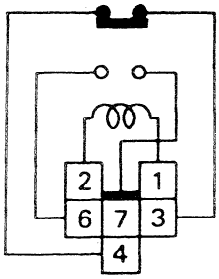
TYPE OF STANDARDIZED RELAYS

1M	..... 1 Make	2M	..... 2 Make
1T	..... 1 Transfer	1M·1B	..... 1 Make 1 Break



SEL882H

Description (Cont'd)

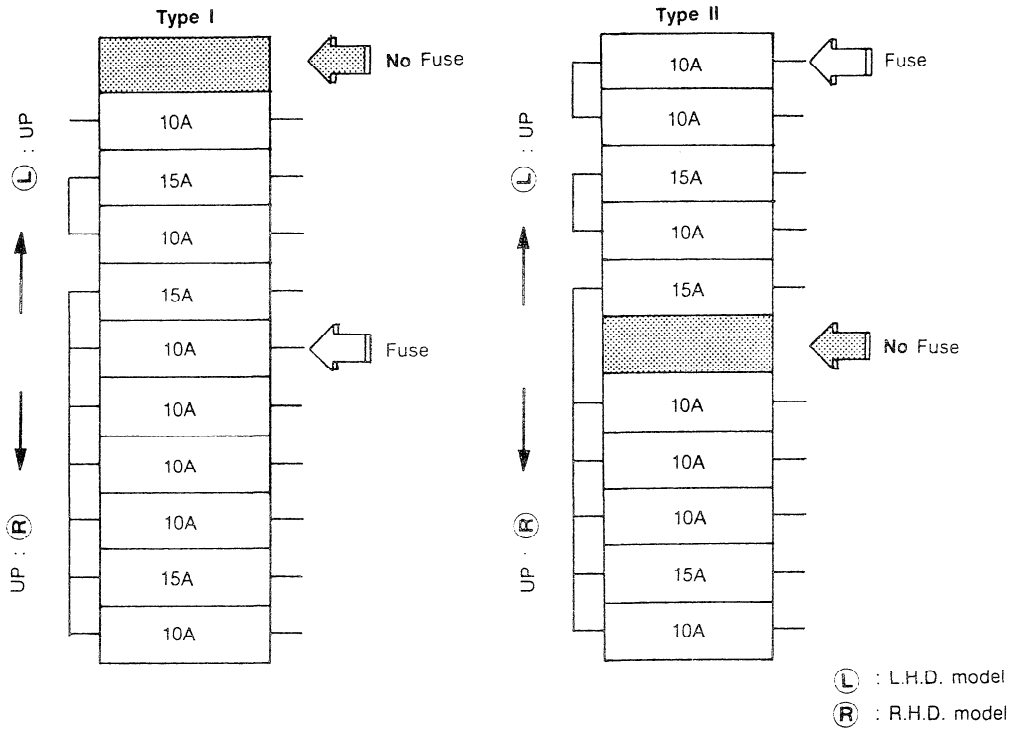
Type	Outer view	Circuit	Connector symbol and connection	Case color
1T				BLACK
1M				BLUE or GREEN
2M				BROWN
1M-1B				GRAY

SEL883H

How to Identify Type I and Type II Vehicles

The vehicles are classified into two types (Type I and Type II) according to the difference in the electrical system. Before starting any trouble diagnoses, be sure to identify whether a Type I or Type II wiring diagram matches the vehicle by comparing the vehicle's fuse block with the diagram below.

Fuse block



SEL748Q

Wiring Diagram

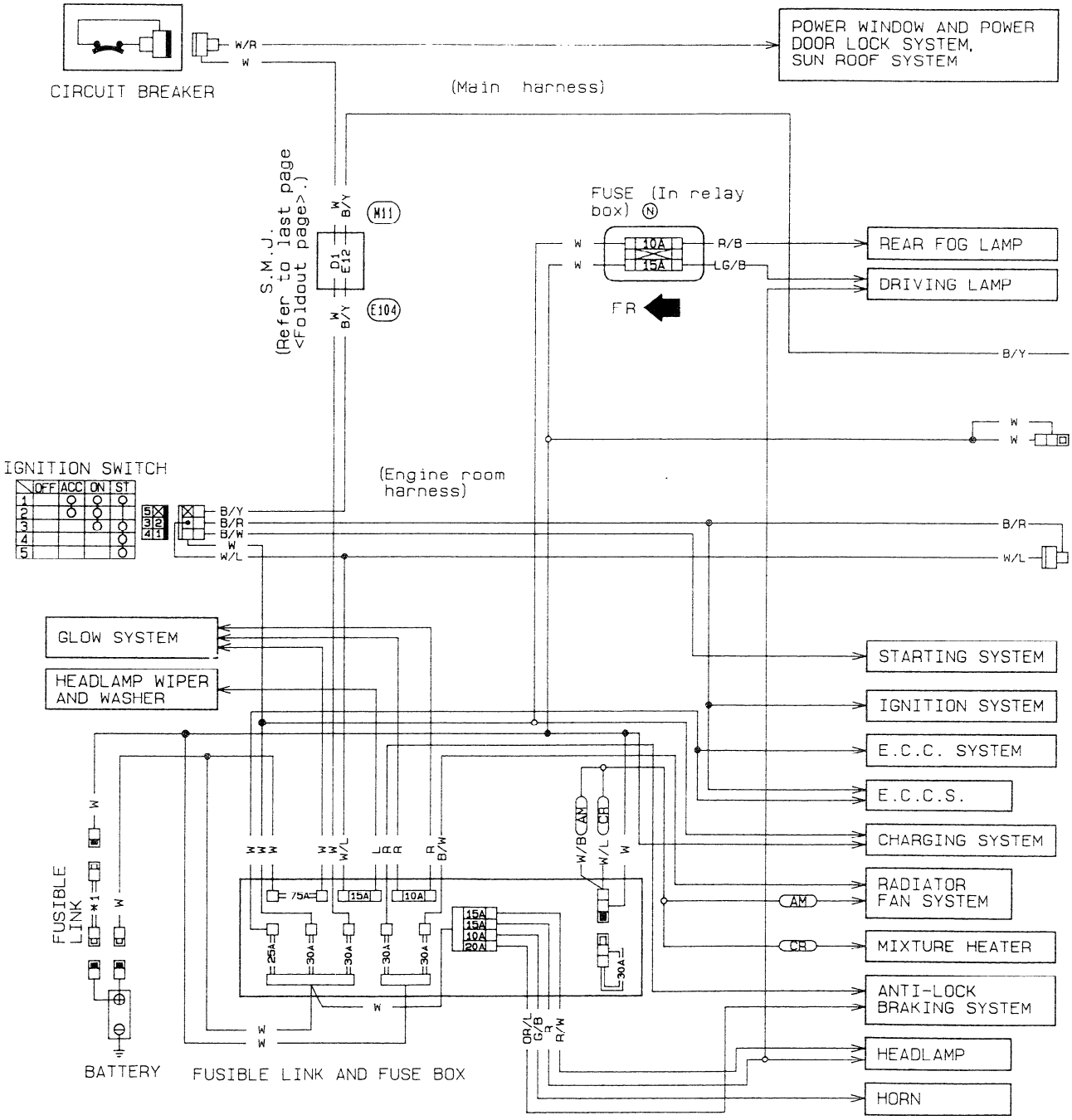
TYPE-I

*1: B·····E10S engine GA13DS, 14DS, 16DS engine except for Europe and N14 model with GA engine for Europe

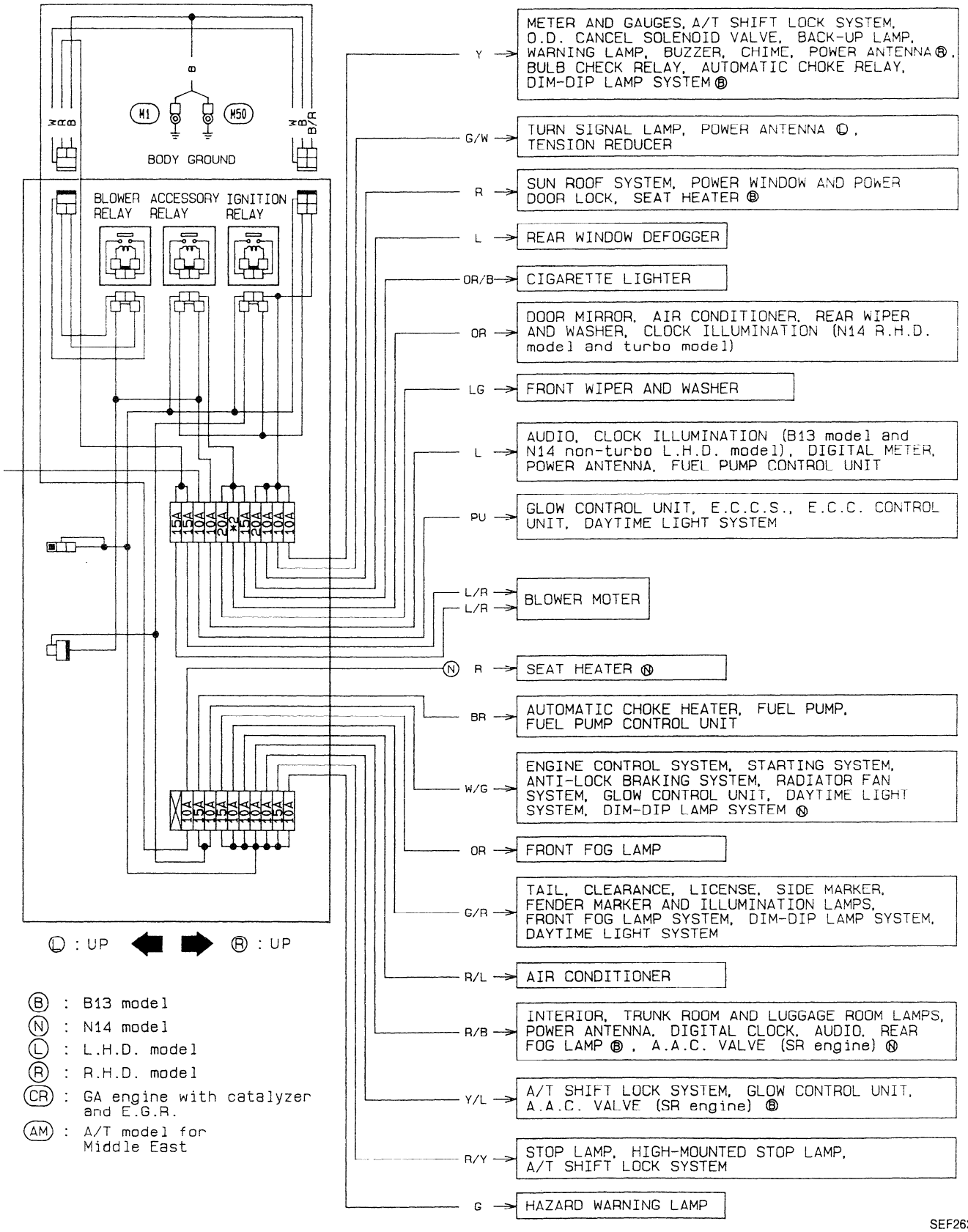
GY····B13 model with GA engine for Europe and Middle East, N14 model with GA16DE engine, CD20 engine and R.H.D. model with CD17 engine

L·····SR engine and L.H.D. model with CD17 engine

*2: 10A···B13 model
15A···N14 model



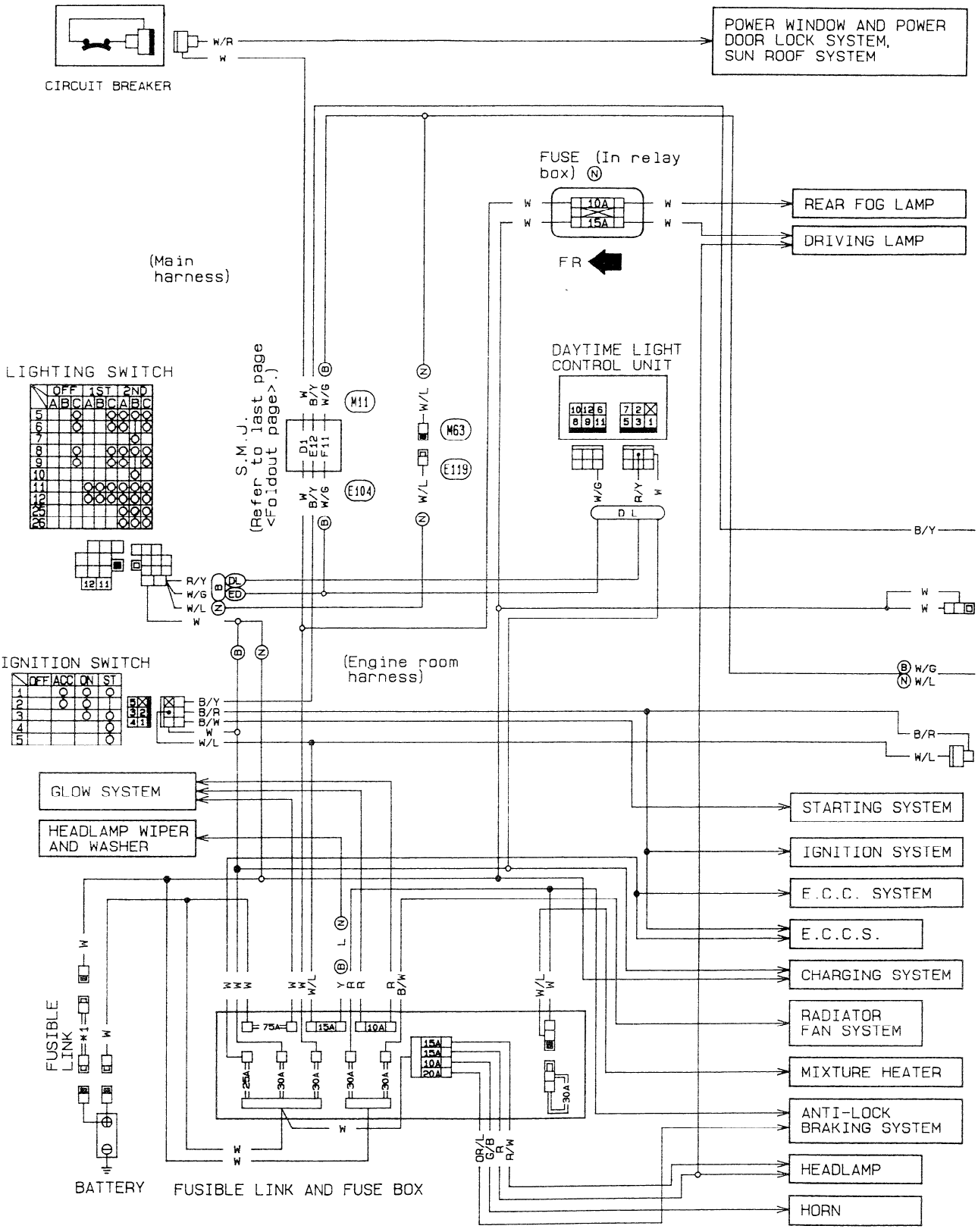
Wiring Diagram (Cont'd)



SEF262Q

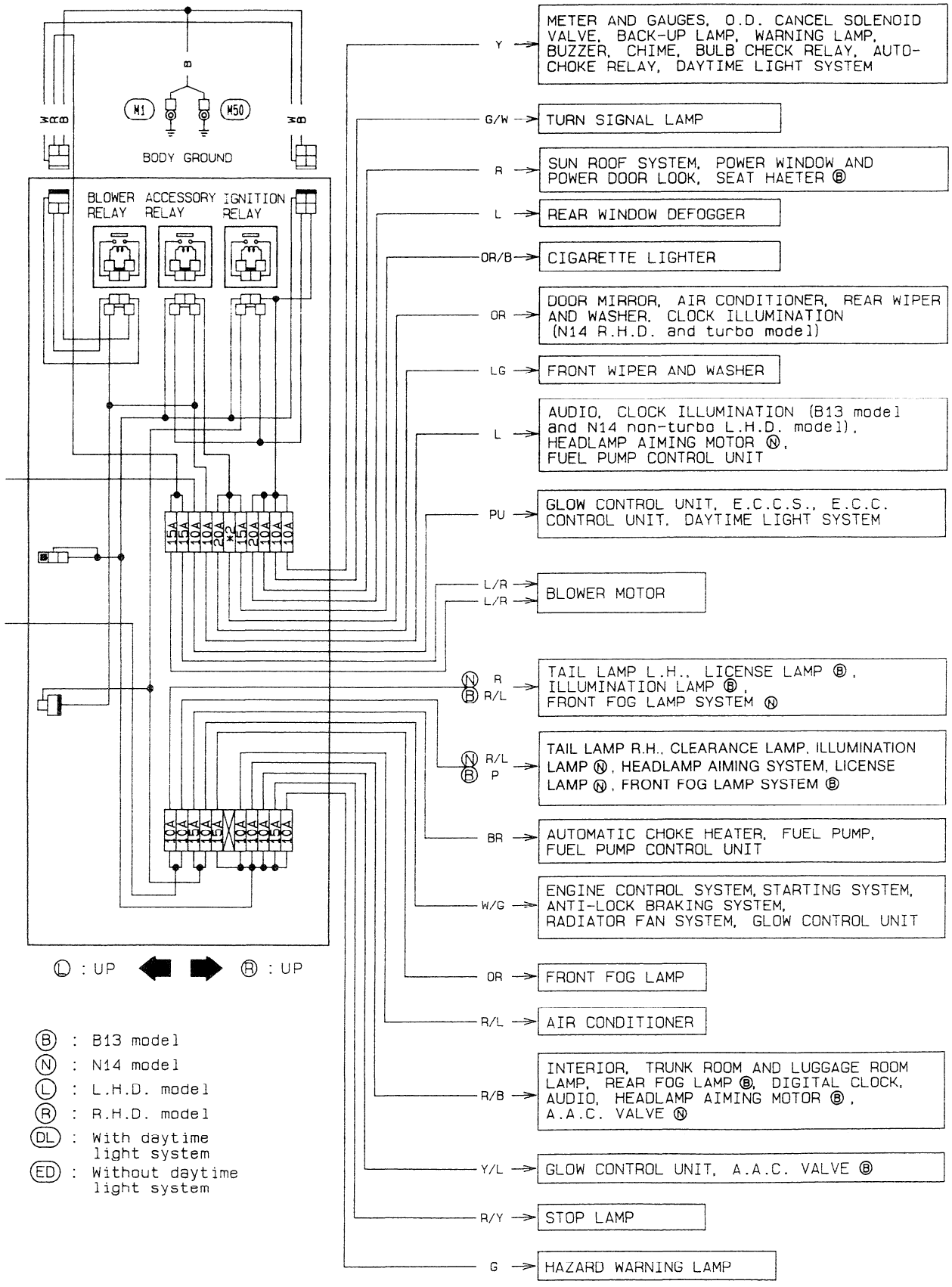
Wiring Diagram (Cont'd)

TYPE-II

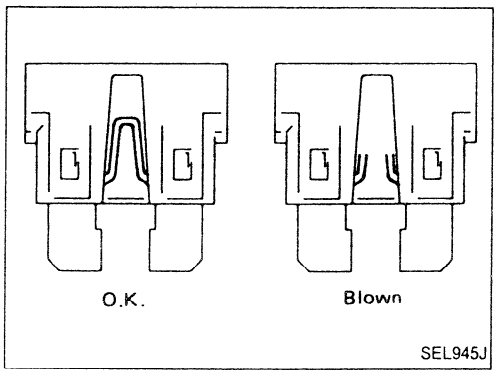


*1: B.....N14 model with GA engine
GY....CD engine and B13 model with GA engine
L.....SR engine
*2: 10A...B13 model
15A...N14 model

Wiring Diagram (Cont'd)

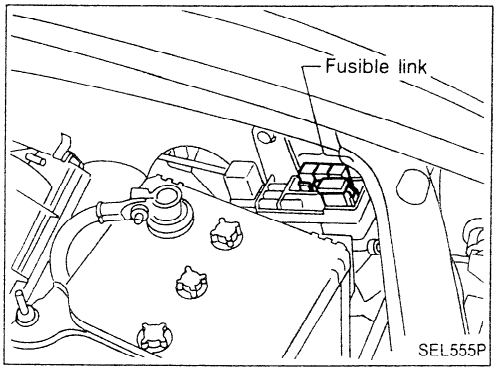


SEL263Q



Fuse

a. If fuse is blown, be sure to eliminate cause of problem before installing new fuse.
b. Use fuse of specified rating. Never use fuse of more than specified rating.
c. Do not install fuse in oblique direction; always insert it into fuse holder properly.
d. Remove fuse for clock if vehicle is not used for a long period of time.



Fusible Link

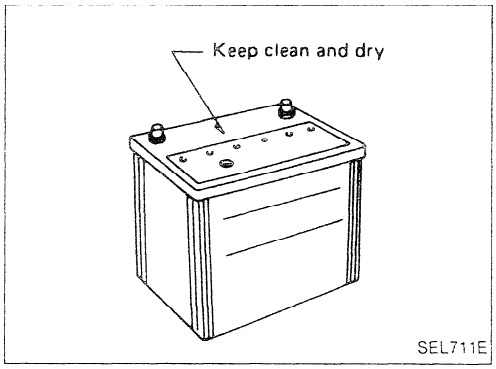
A melted fusible link can be detected by visual inspection. If its condition is questionable, use circuit tester or test lamp.

CAUTION:

a. **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.**
b. **Never wrap periphery of fusible link with vinyl tape. Extreme care should be taken with this link to ensure that it does not come into contact with any other wiring harness or vinyl or rubber parts.**

CAUTION:

a. **If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.**
b. **After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.**
c. **Never add distilled water through the hole used to check specific gravity.**

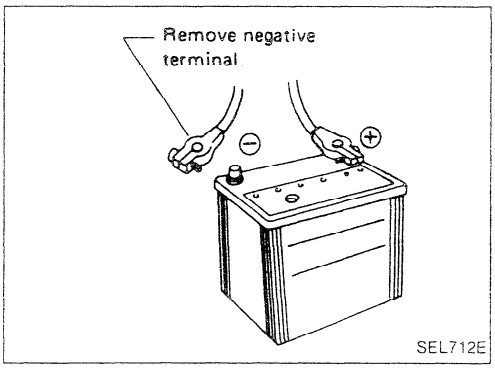


How to Handle Battery

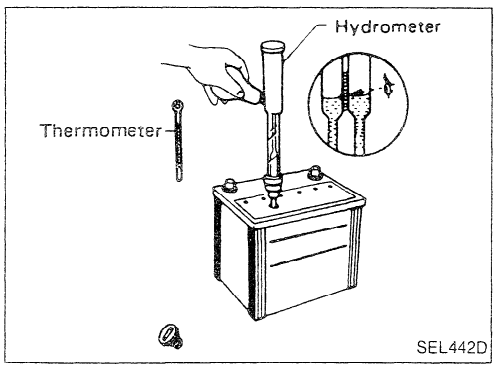
METHODS OF PREVENTING OVER-DISCHARGE

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.
  If the top surface of a battery is wet with electrolyte or water, leakage current will cause the battery to discharge. Always keep the battery clean and dry.



- 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 over-discharge.

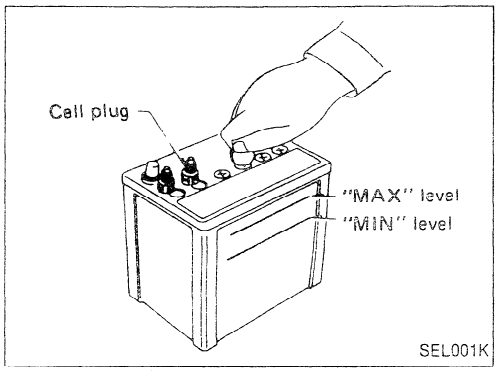
How to Handle Battery (Cont'd)

CHECKING ELECTROLYTE LEVEL

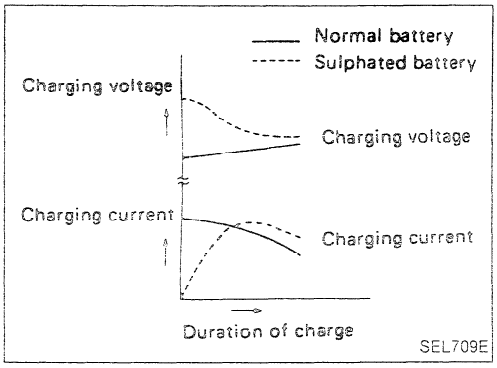
WARNING:

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.

Normally the battery does not require additional water. However, when the battery is used under severe conditions, adding distilled water may be necessary during the battery life.



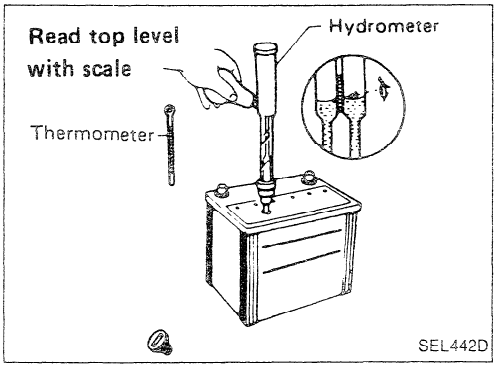
- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



SULPHATION

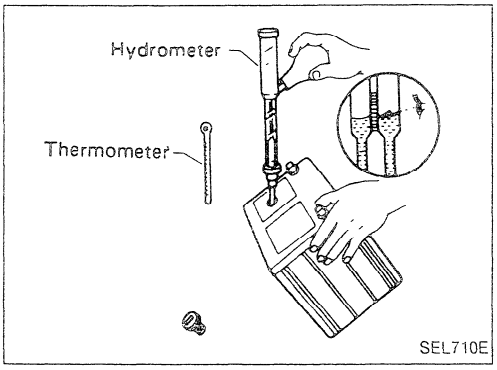
When a battery has been left unattended for a long period of time and has a specific gravity of less than 1.100, it will be completely discharged, resulting in sulphation on the cell plates.

Compared with a battery discharged under normal conditions, the current flow in a "sulphated" battery is not as smooth although its voltage is high during the initial stage of charging, as shown in the figure at the left.



SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.



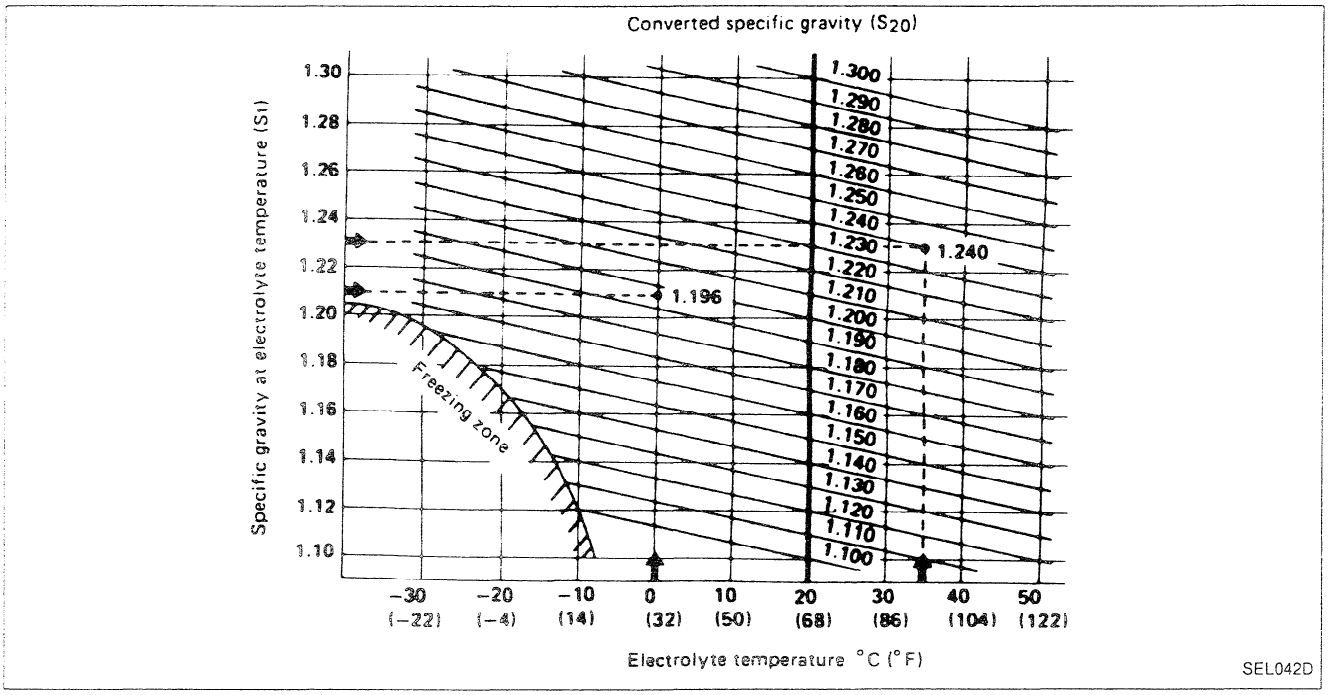
- When electrolyte level is too low, tilt battery case to raise it for easy measurement.

How to Handle Battery (Cont'd)

2. Convert into specific gravity at 20°C (68°F).

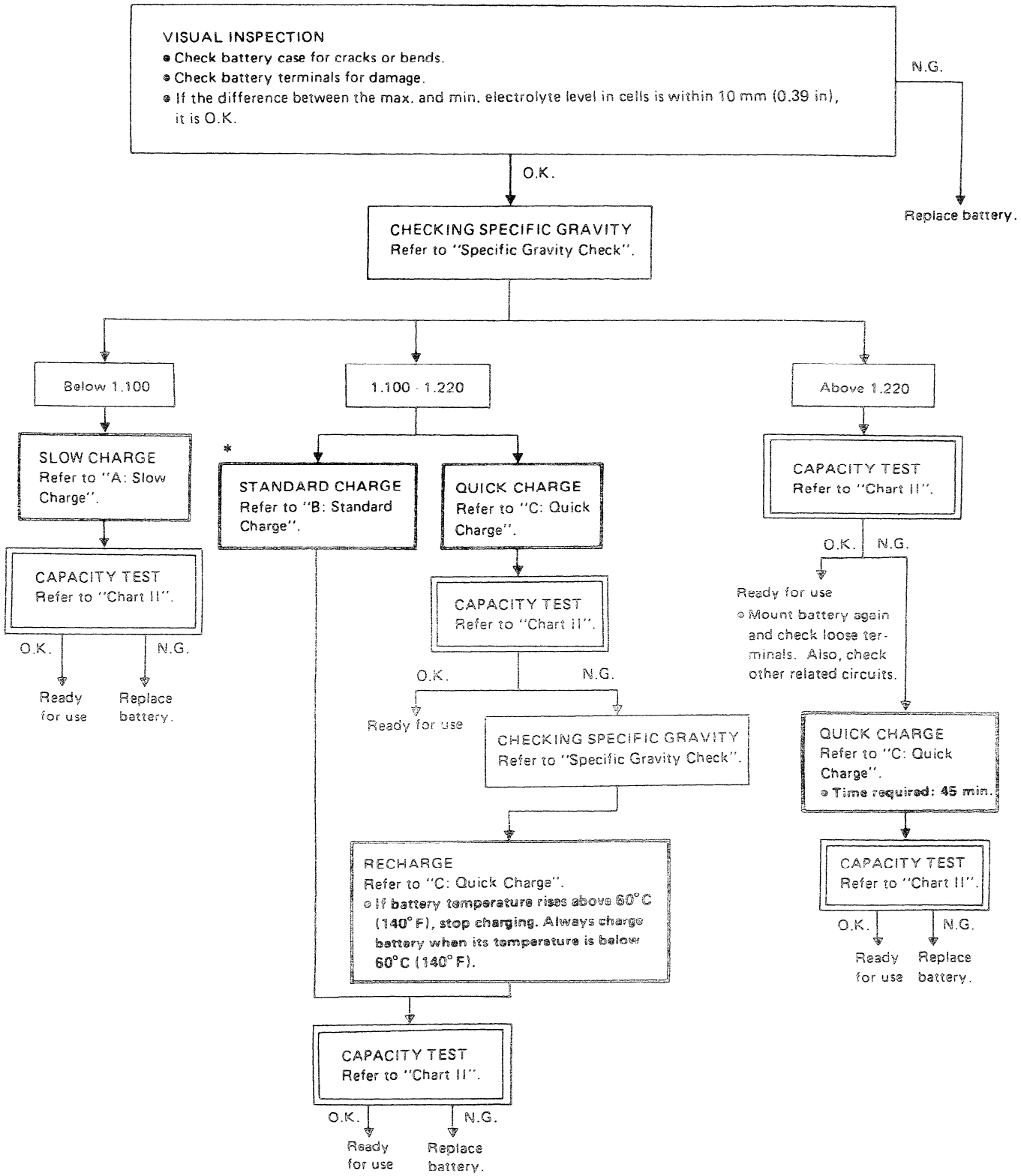
Example:

- 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

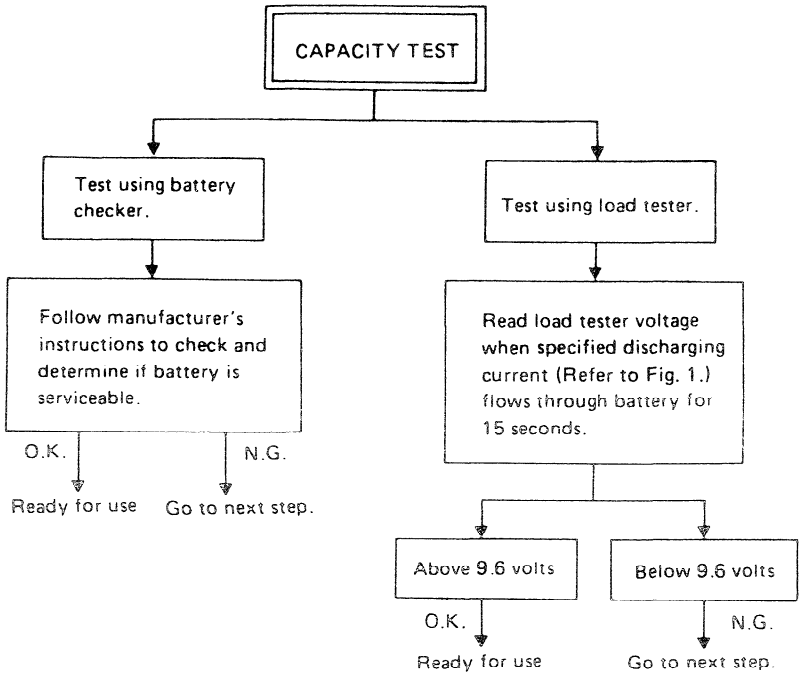
Chart I



* "STANDARD CHARGE" is recommended in case that the vehicle is in storage after charging.

Battery Test and Charging Chart (Cont'd)

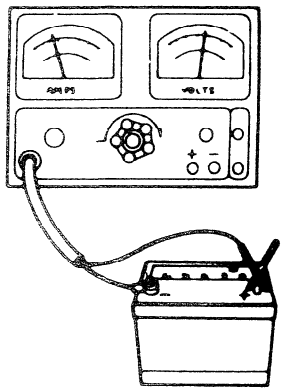
Chart II



- Check battery type and determine the specified current using the following table.

Fig. 1 DISCHARGING CURRENT (Load tester)

Type	Current (A)
28B19R(L)	90
34B19R(L)	99
46B24R(L)	135
55B24R(L)	135
50D23R(L)	150
55D23R(L)	180
65D26R(L)	195
80D26R(L)	195
75D31R(L)	210
95D31R(L)	240
95E41R(L)	300
130E41R(L)	330



SEL697B

Battery Test and Charging Chart (Cont'd)

A: SLOW CHARGE

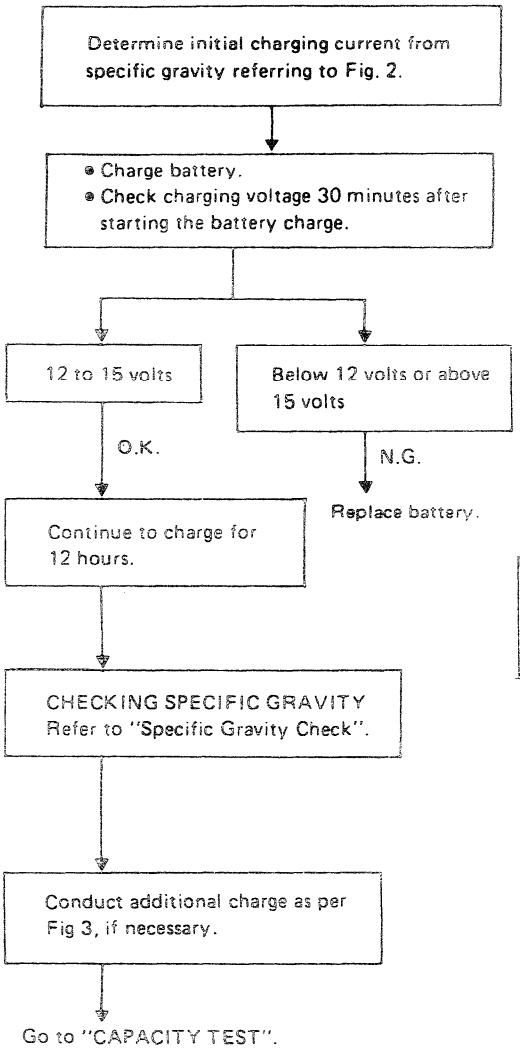
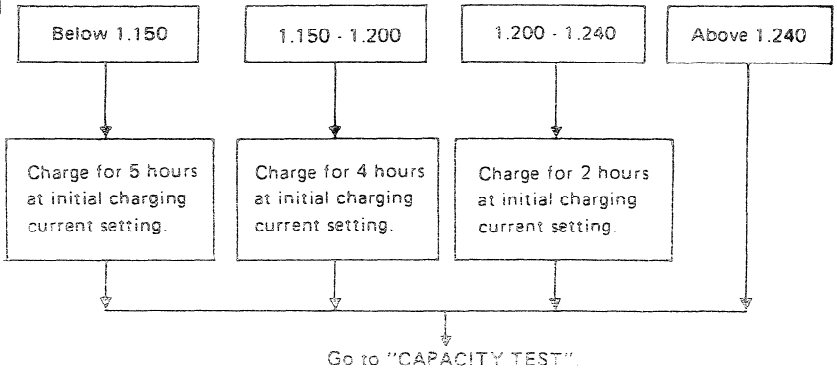


Fig. 2 INITIAL CHARGING CURRENT SETTING (Slow charge)

BATTERY TYPE / CONVERTED SPECIFIC GRAVITY	28B19R(L) 34B19R(L)	46B24R(L) 55B24R(L)	50D23R(L) 55D23R(L)	65D26R(L) 80D26R(L)	75D31R(L)	95D31R(L) 95E41R(L)	130E41R(L)
Below 1.100	4.0 (A)	5.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)	10.0 (A)	14.0 (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:

a. 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.
b. Keep battery away from open flame while it is being charged.
c. When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.
d. If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).

Battery Test and Charging Chart (Cont'd)

B: STANDARD CHARGE

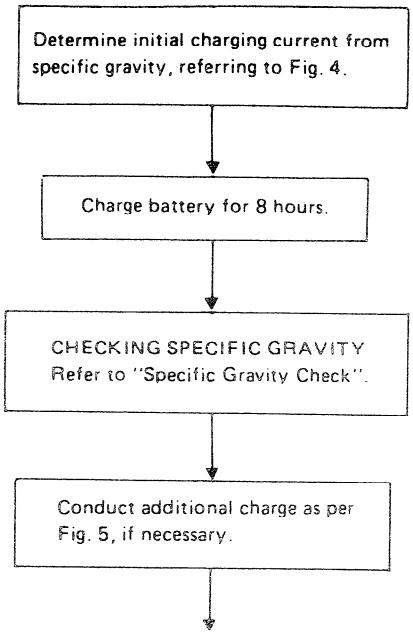
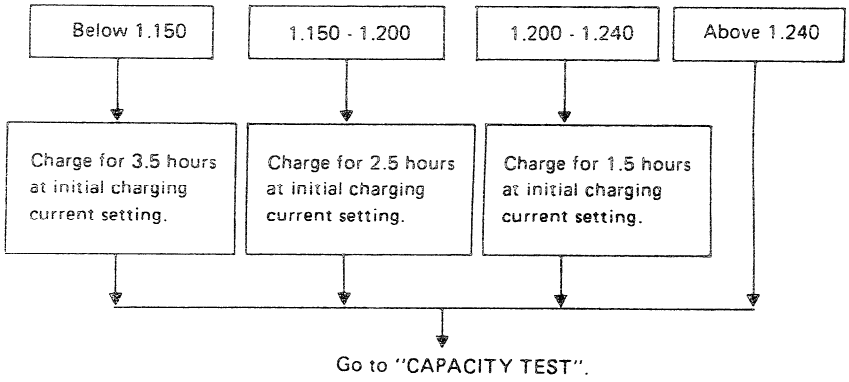


Fig. 4 INITIAL CHARGING CURRENT SETTING
(Standard charge)

BATTERY TYPE / CONVERTED SPECIFIC GRAVITY	28B19R(L) 34B19R(L)	46B24R(L) 55B24R(L)	50D23R(L) 55D23R(L)	65D26R(L) 80D26R(L)	75D31R(L)	95D31R(L) 95E41R(L)	130E41R(L)
1.100 - 1.130	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)	13.0 (A)
1.130 - 1.160	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	11.0 (A)
1.160 - 1.190	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	9.0 (A)
1.190 - 1.220	2.0 (A)	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	5.0 (A)	7.0 (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:

a. **Do not use standard charge method on a battery whose specific gravity is less than 1.100.**
b. **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.**
c. **Keep battery away from open flame while it is being charged.**
d. **When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.**
e. **If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).**

Battery Test and Charging Chart (Cont'd)

C: QUICK CHARGE

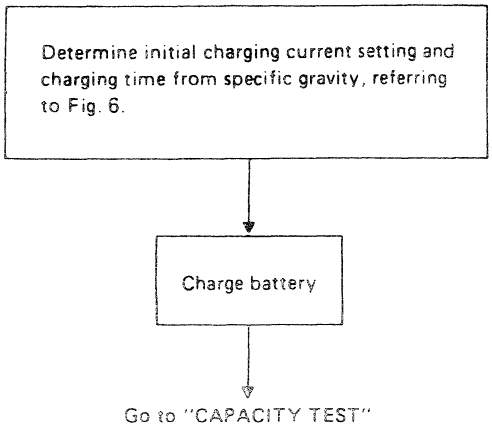


Fig. 6 INITIAL CHARGING CURRENT SETTING AND CHARGING TIME (Quick charge)

CONVERTED SPECIFIC GRAVITY \ BATTERY TYPE / CURRENT [A]	28B19R(L) 34B19R(L)	46B24R(L) 55B24R(L) 50D23R(L)	55D23R(L) 65D26R(L) 80D26R(L)	75D31R(L) 95D31R(L) 95E41R(L)	130E41R(L)
	10 (A)	15 (A)	20 (A)	30 (A)	40 (A)
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:

a. Do not use quick charge method on a battery whose specific gravity is less than 1.100.
b. 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.
c. Keep battery away from open flame while it is being charged.
d. When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.
e. 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).
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 (S.D.S.)

N14

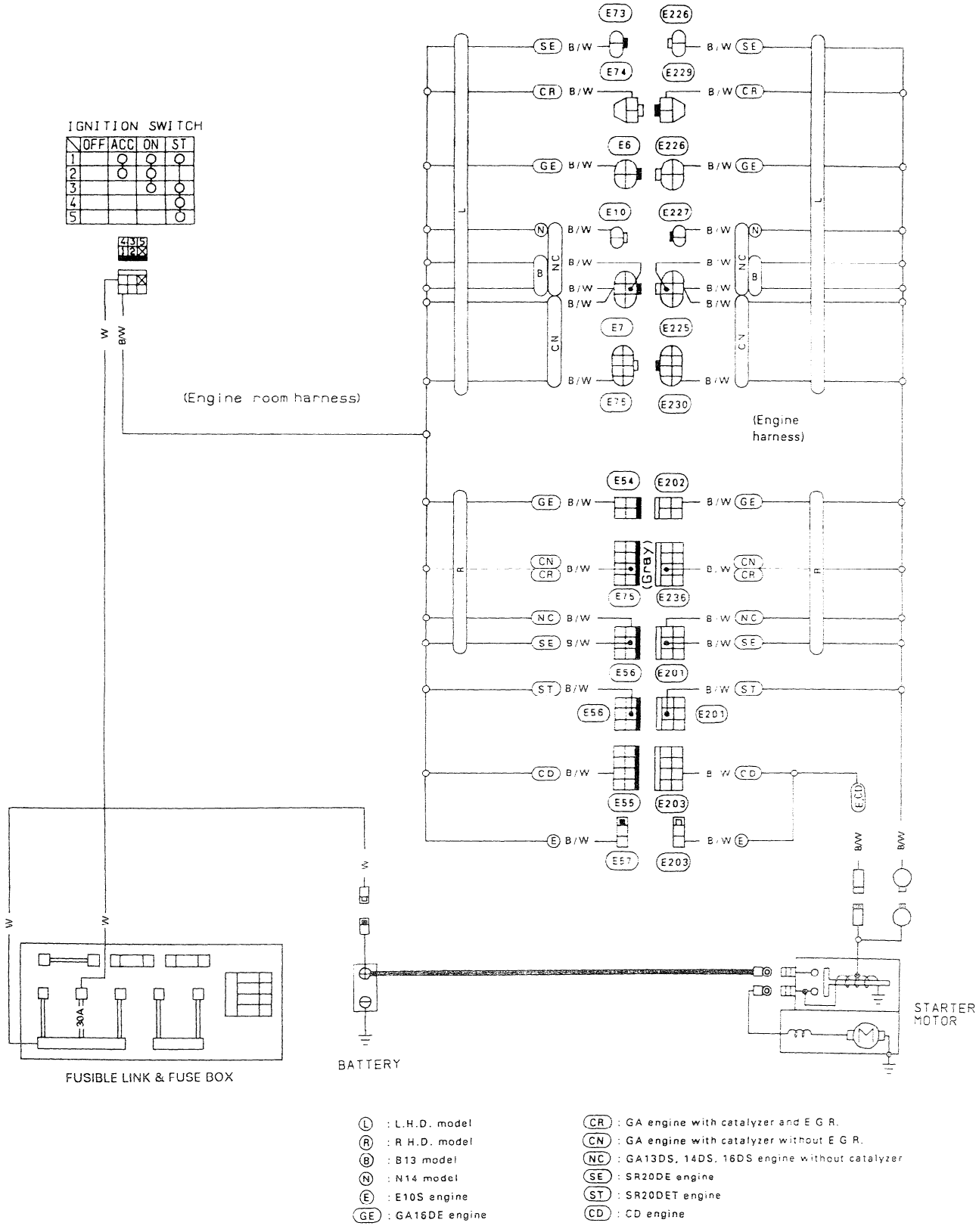
Model	Except Europe			Europe				
				—	North	Except North	—	
	GA14D	GA16D		CD20	SR20D		GA16D and GA14D	
	—	M/T	A/T	—	—	—	Standard	Option
Type	55D23L		65D26L	95D31L	80D26L	55D23L		80D26L
Capacity V-AH	12-60		12-65	12-80	12-65	12-60		12-65

B13

Model	Except Middle East and Europe					Middle East	Europe		
							North		Except North
	CD17		Except CD17			—	GA16D	SR20D	—
	Standard	Option	Standard	Option for M/T	Option for A/T	—	—	—	—
Type	75D31L	95D31L	46B24L	55D23L	65D26L	46B24L	65D26L	80D26L	55D23L
Capacity V-AH	12-70	12-80	12-45	12-60	12-65	12-45	12-65	12-65	12-60

Wiring Diagram

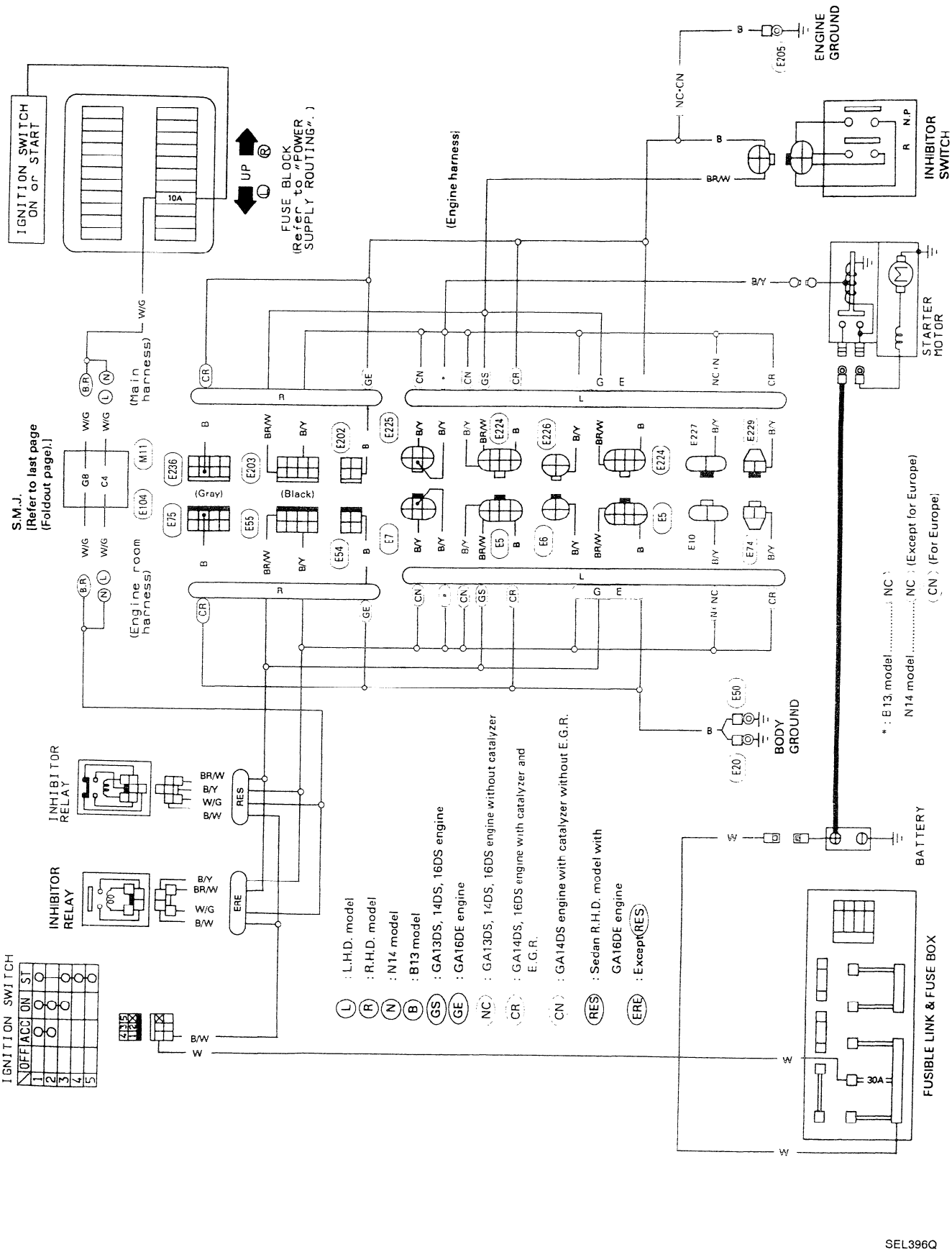
M/T MODELS



SEL395Q

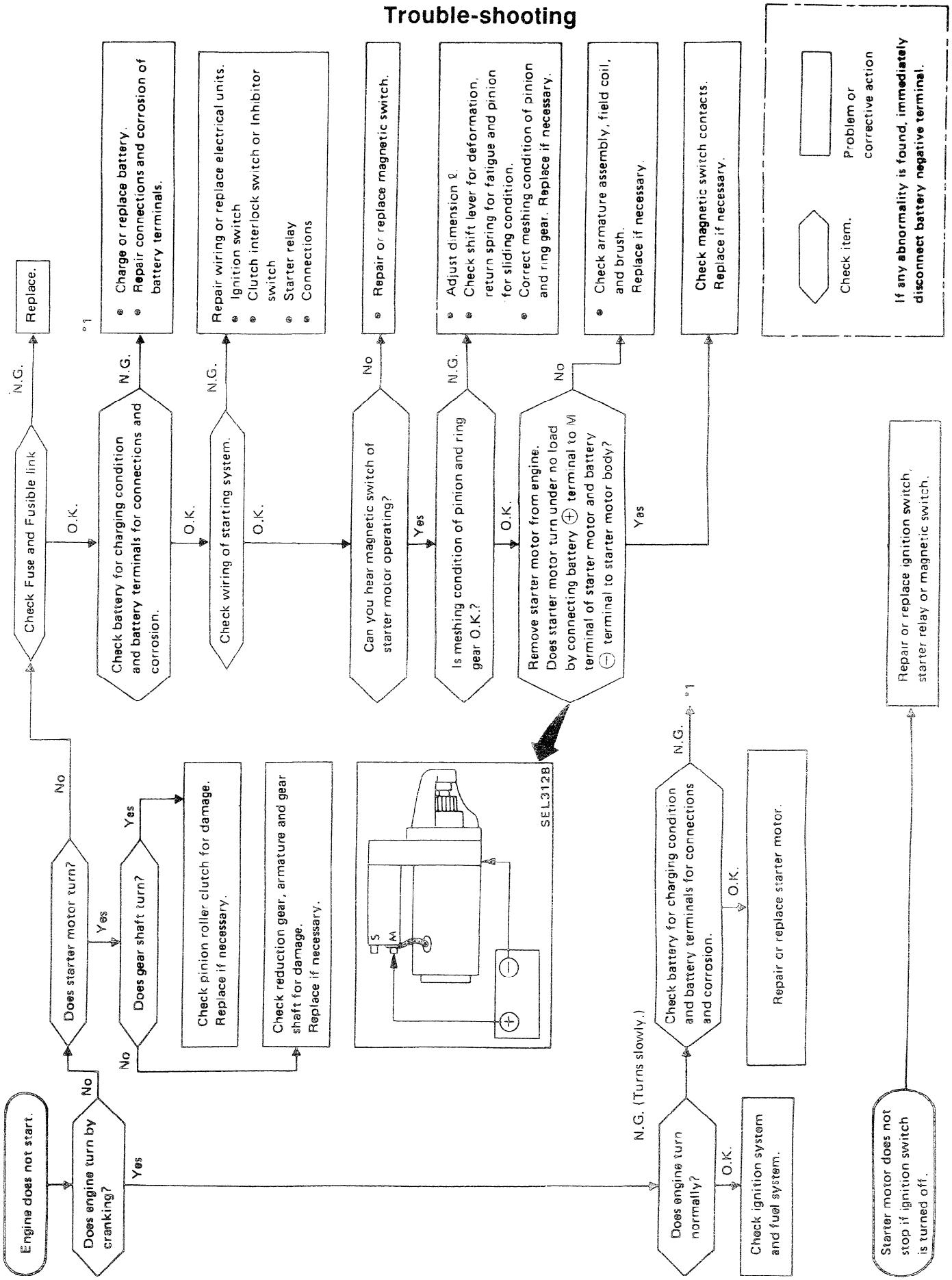
Wiring Diagram (Cont'd)

A/T MODELS

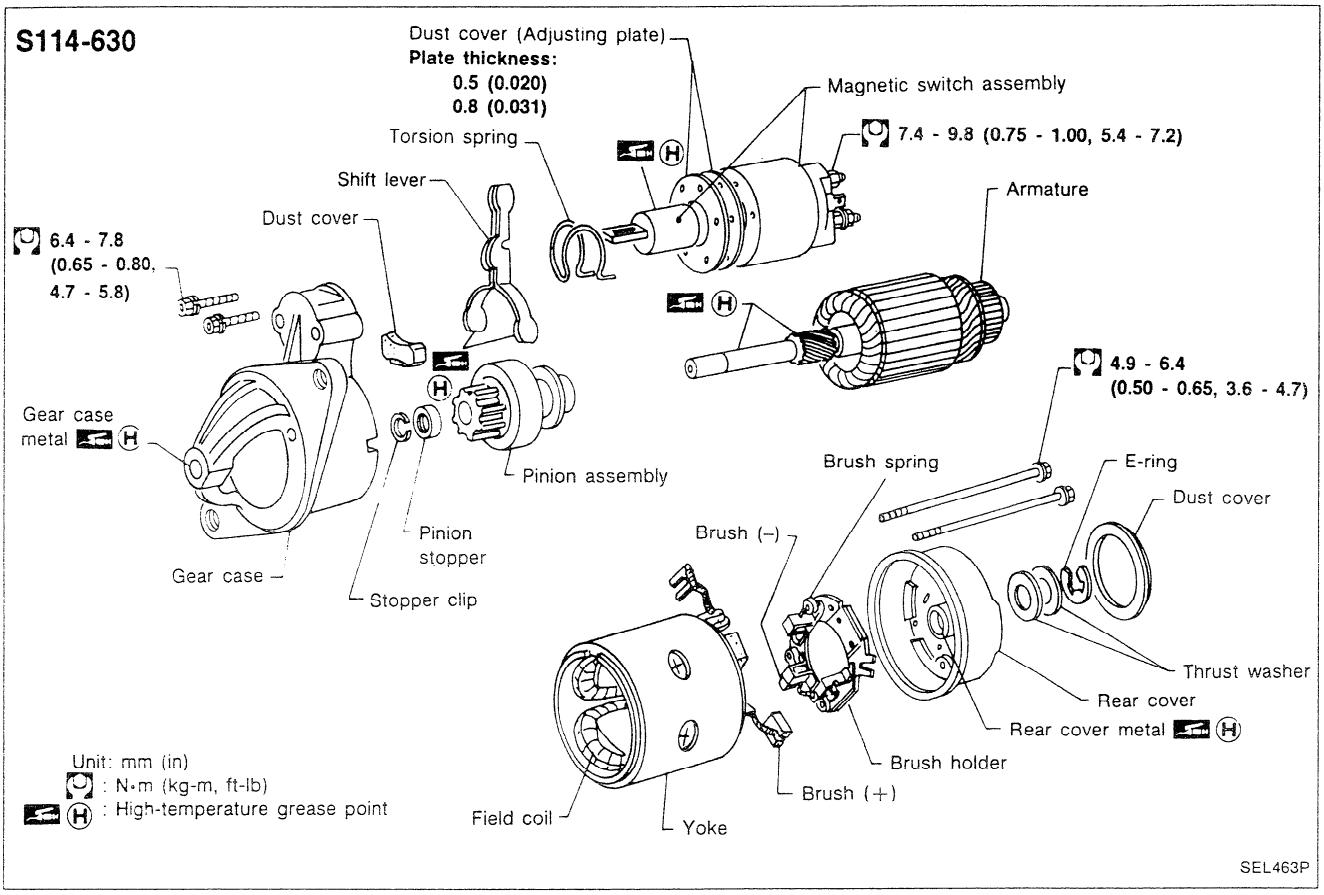


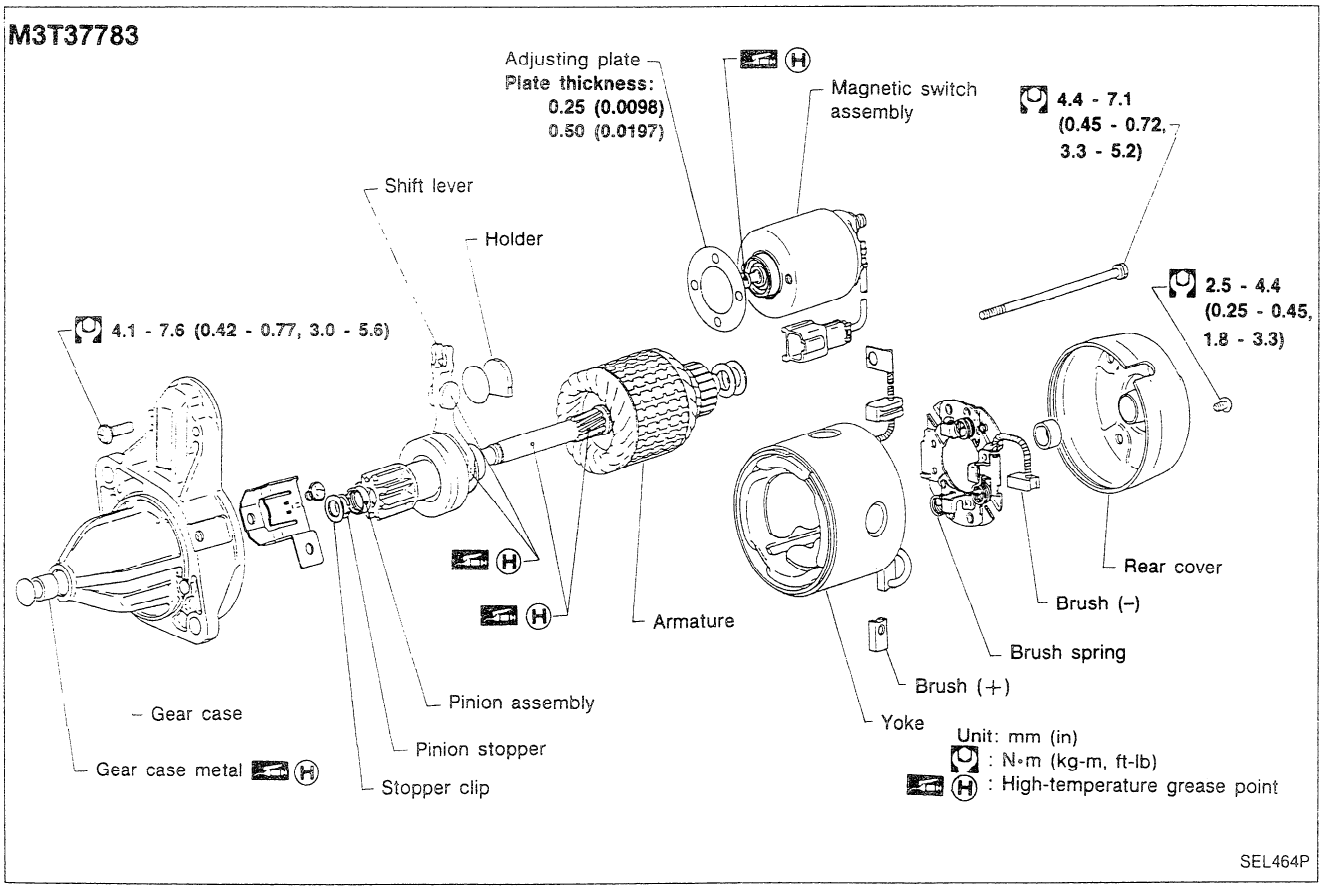
SEL396Q

Trouble-shooting

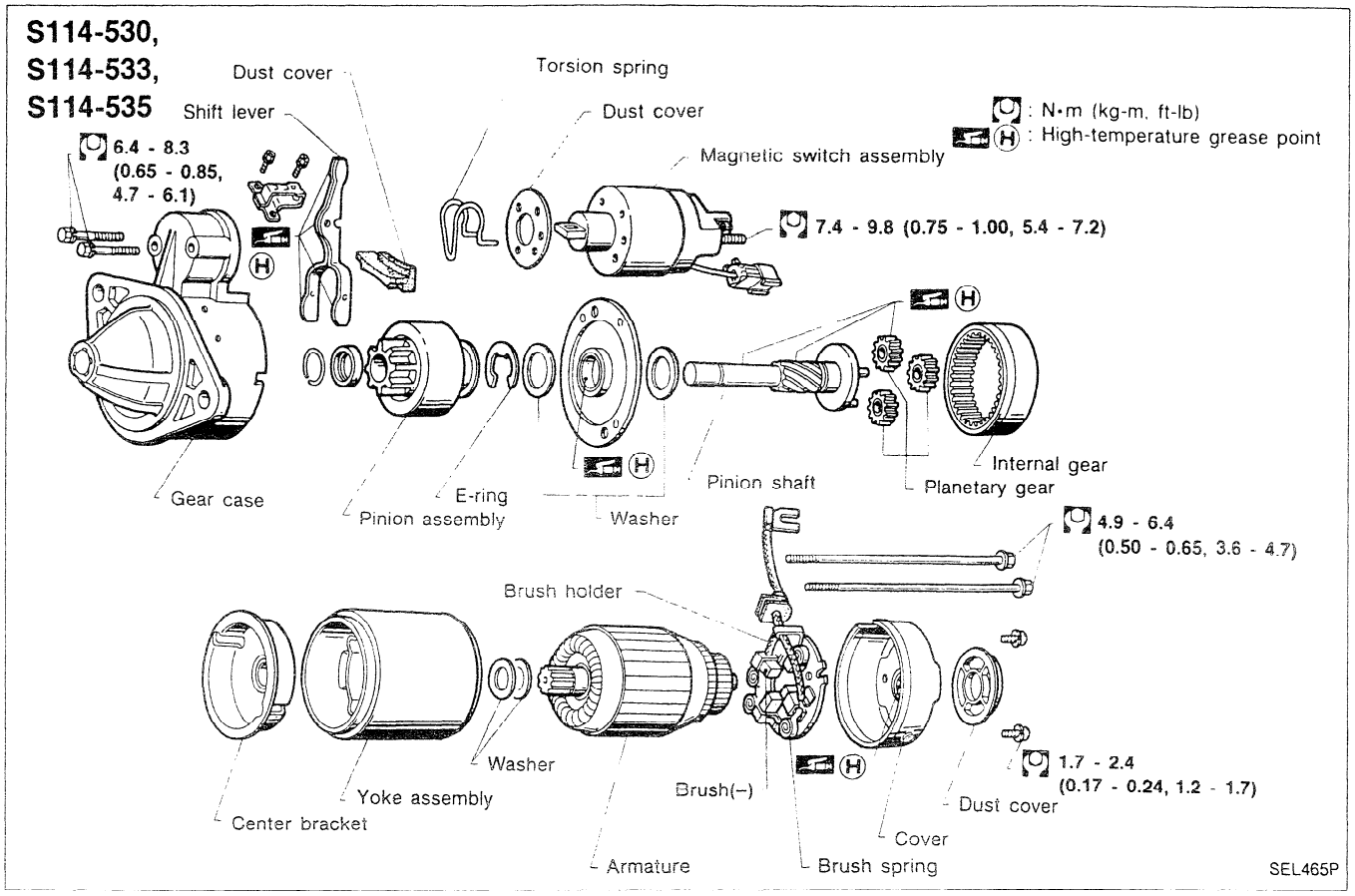


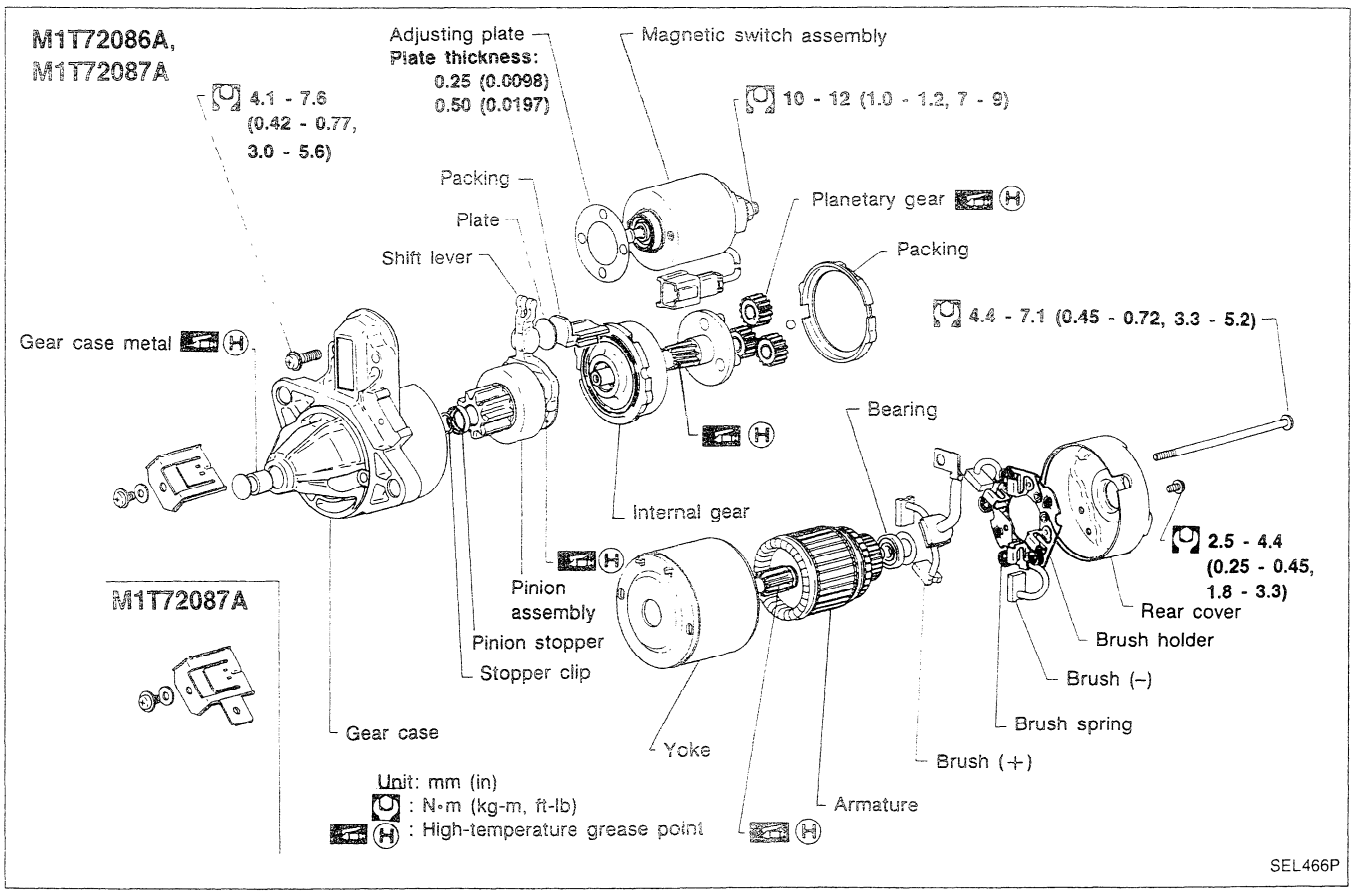
Construction





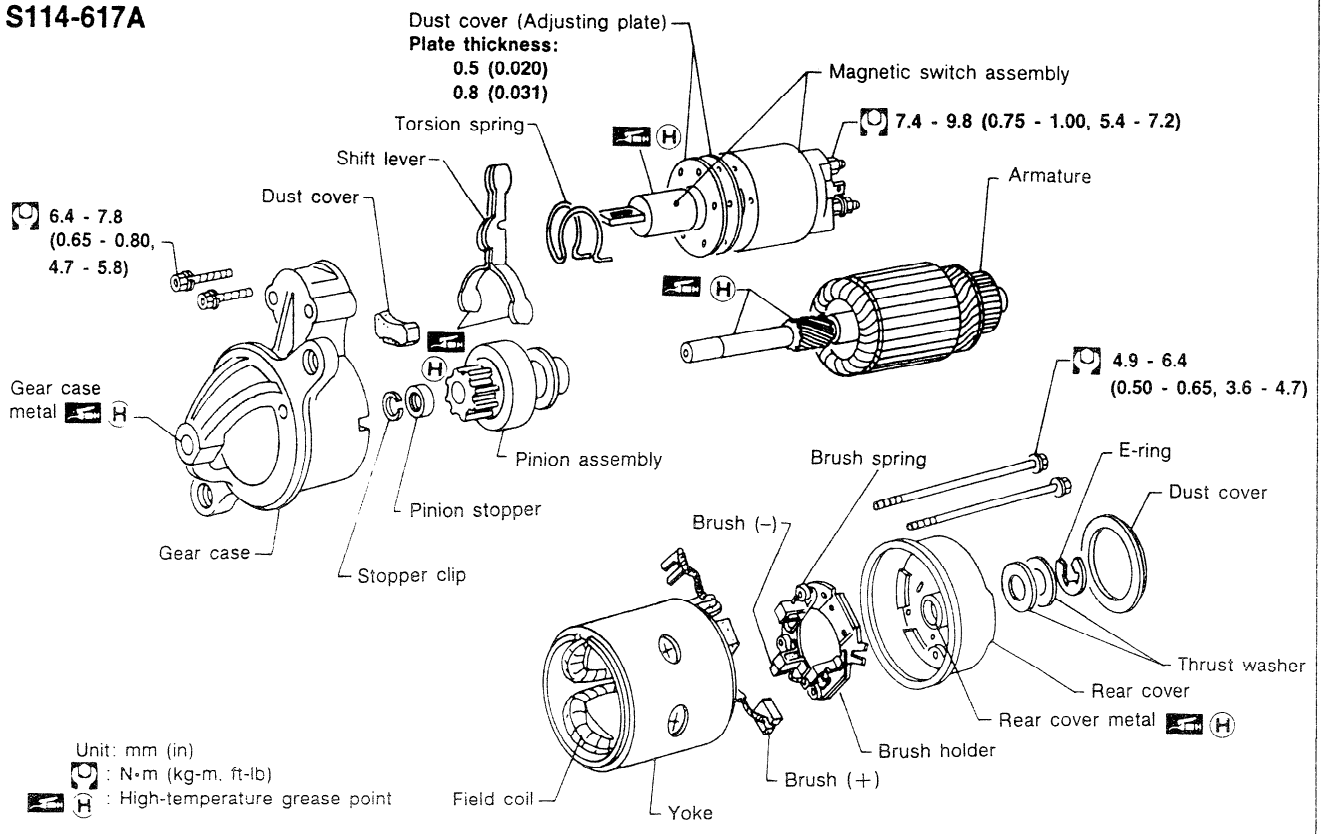
Construction (Cont'd)





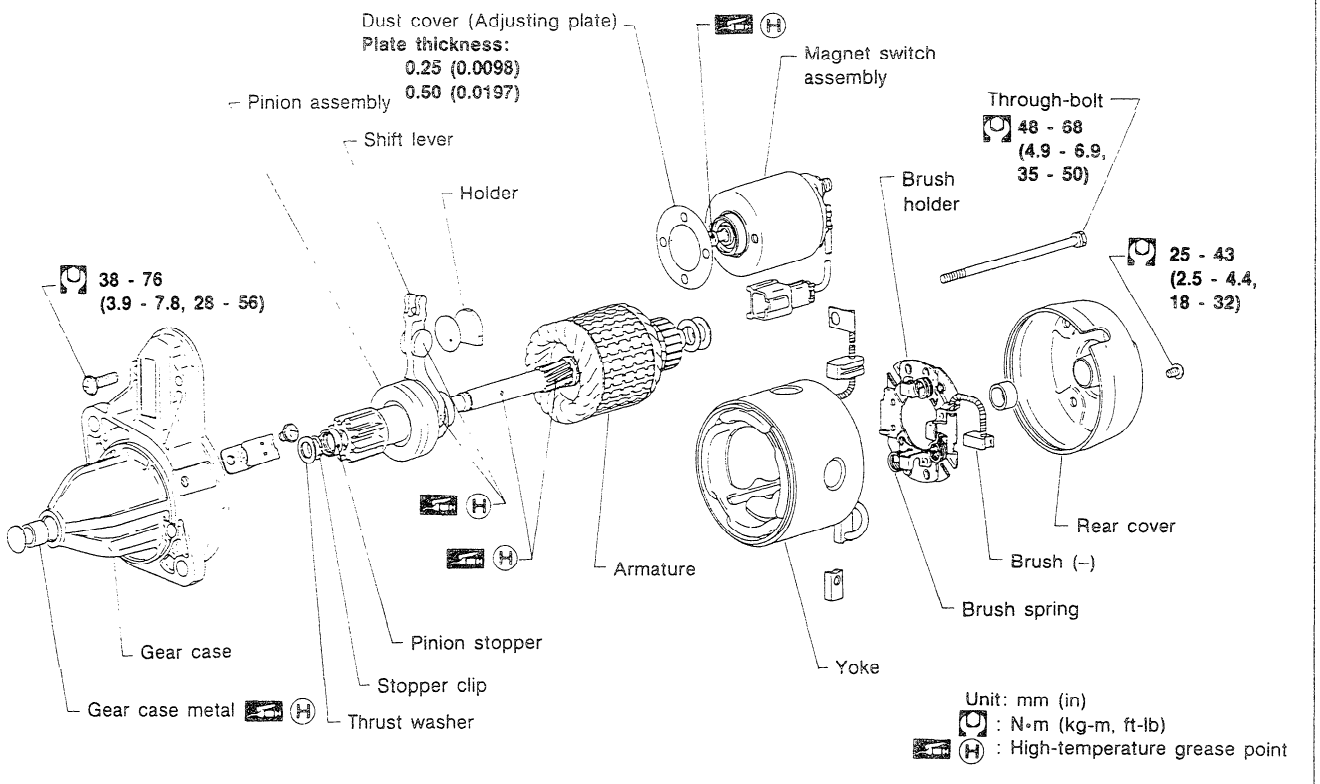
Construction (Cont'd)

S114-617A



SEL467P

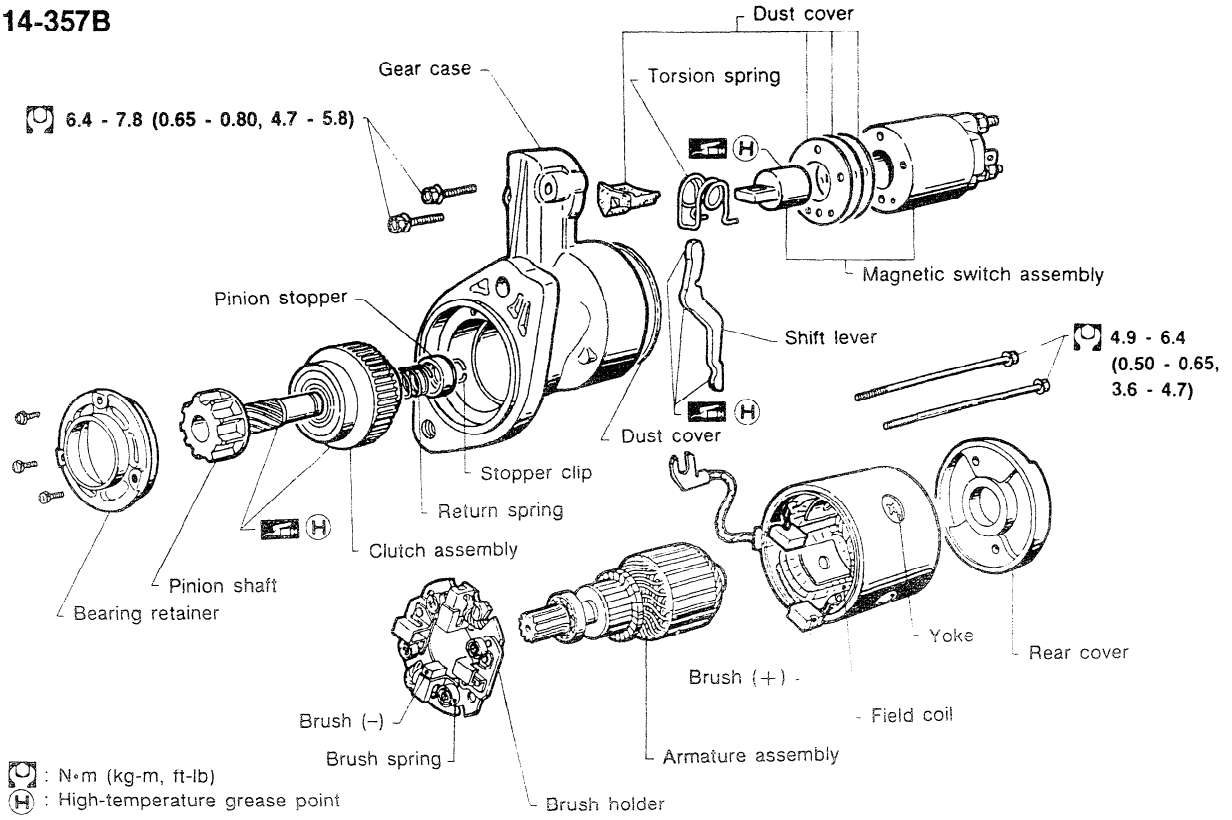
M3T37782



SEL468P

Construction (Cont'd)

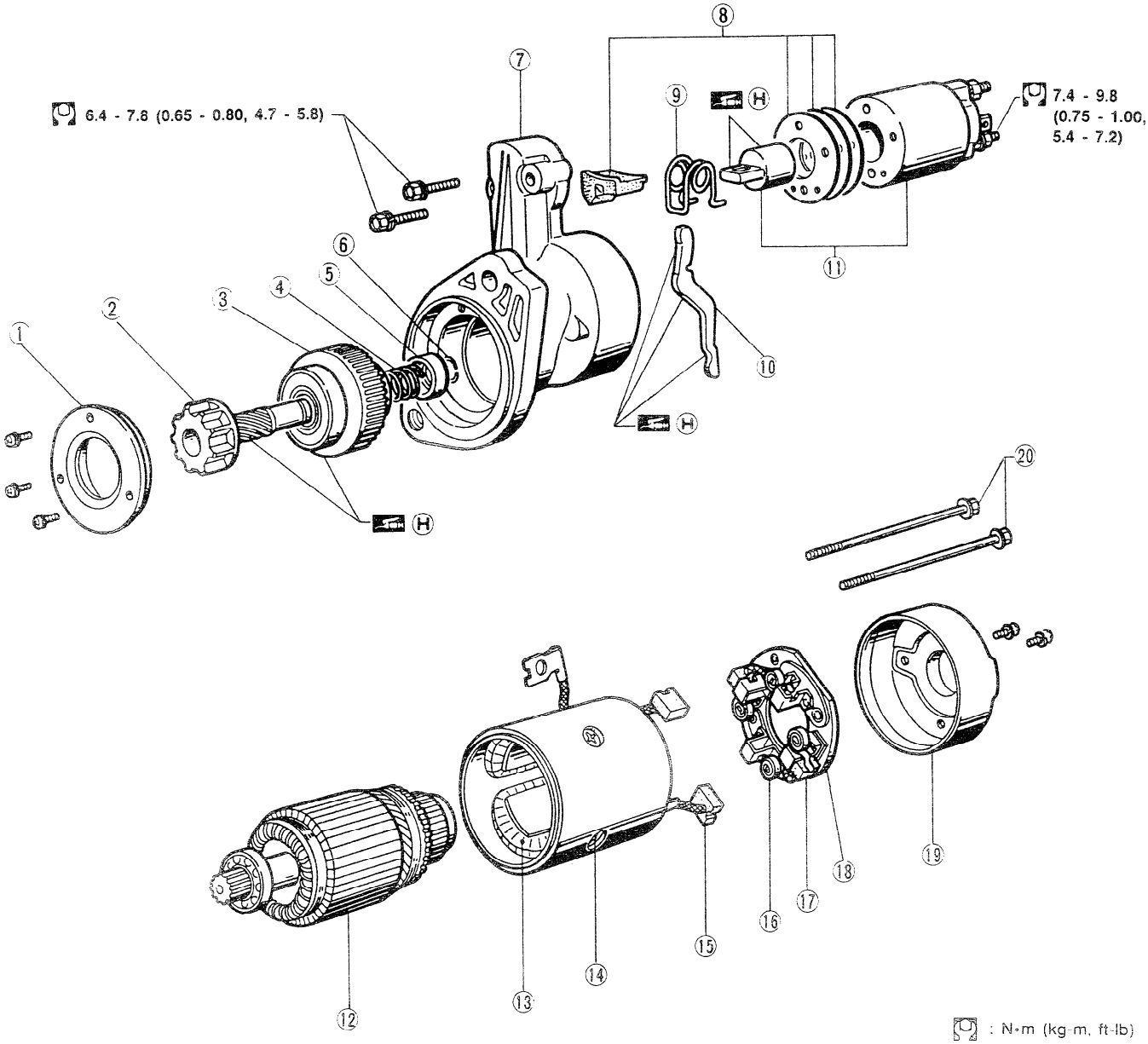
S114-357B



SEL469P

Construction (Cont'd)

S13-131, S13-105A

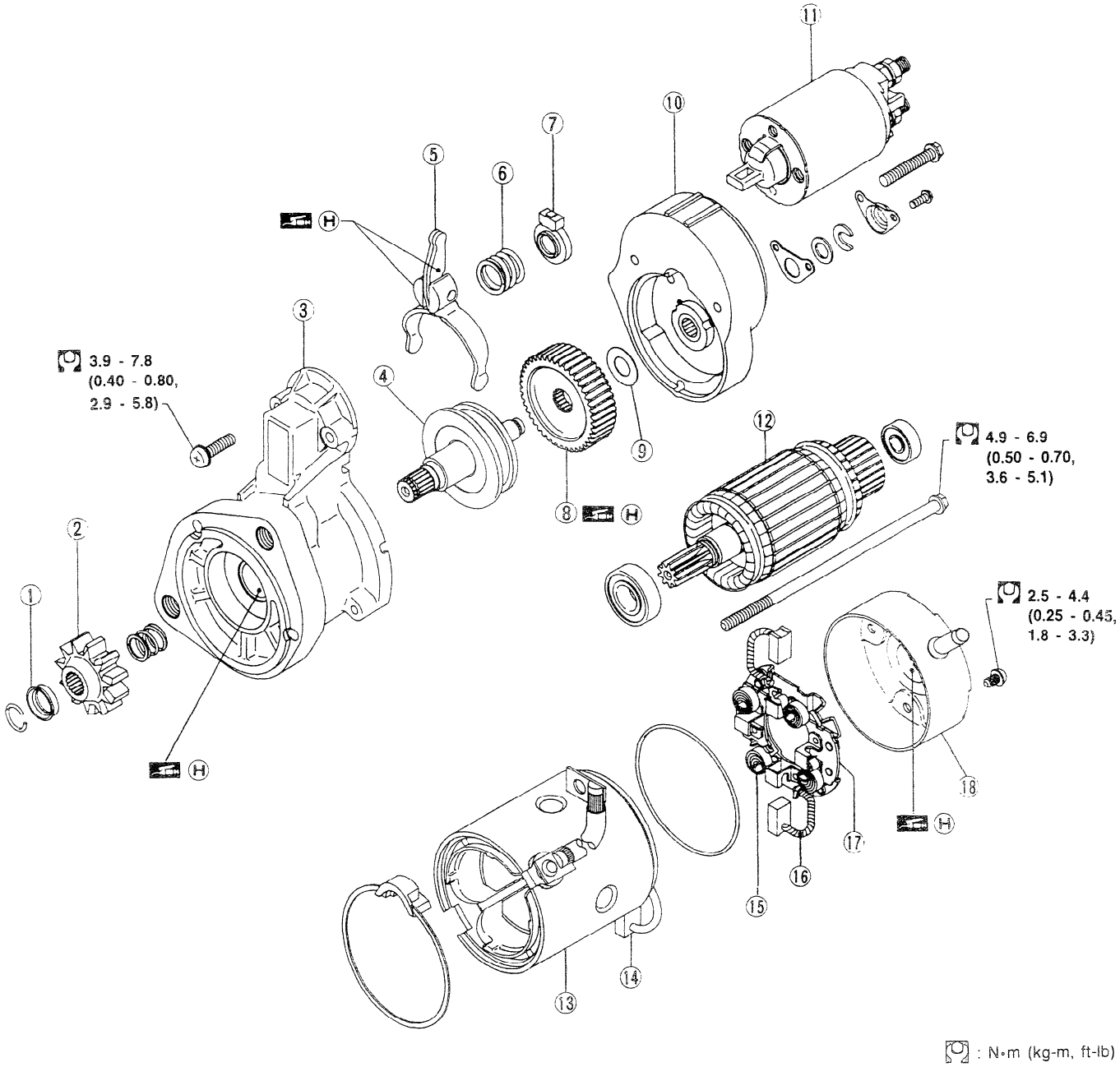


SEL553P

① Bearing retainer
② Pinion shaft
③ Clutch assembly
④ Return spring
⑤ Pinion stopper
⑥ Stopper clip
⑦ Gear case
⑧ Dust cover
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)

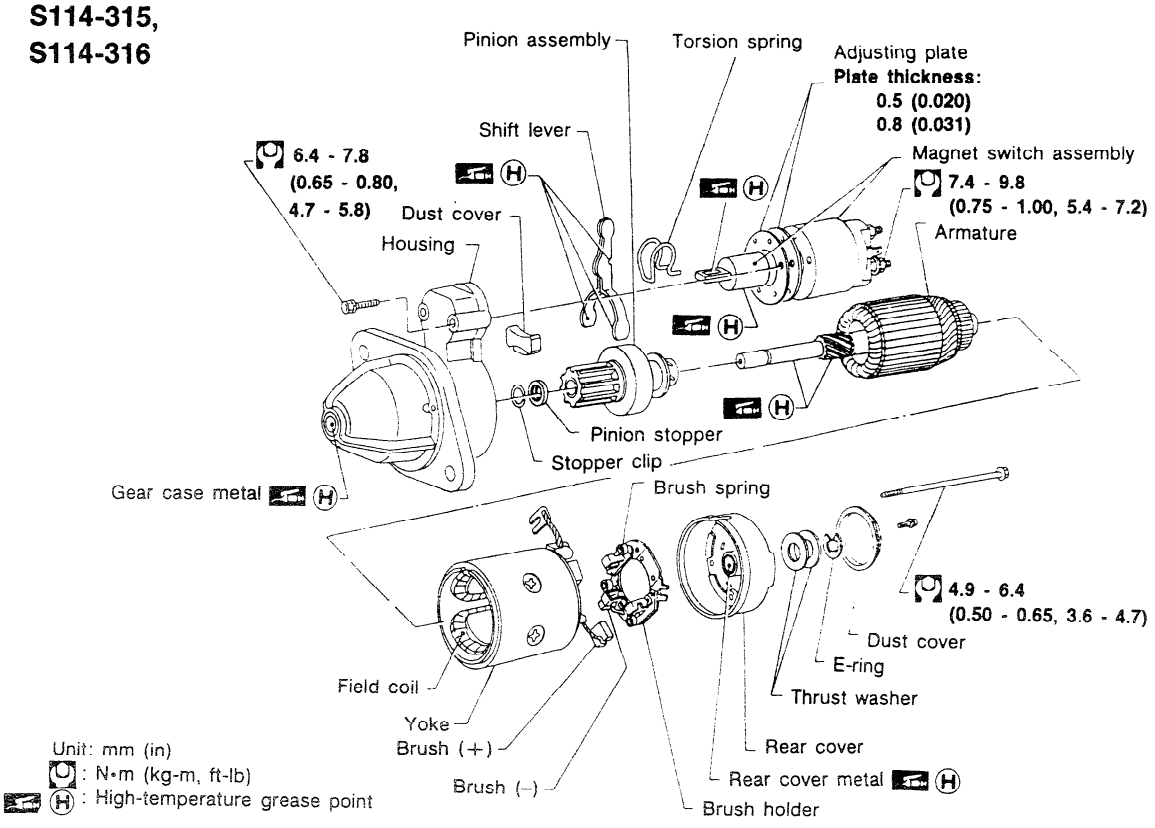
M2T61871A



① Pinion stopper
② Pinion assembly
③ Gear case
④ Pinion shaft assembly
⑤ Shift lever
⑥ Spring
⑦ Holder
⑧ Reduction gear
⑨ Washer
⑩ Center bracket
⑪ Magnetic switch assembly
⑫ Armature
⑬ Yoke
⑭ Brush (+)
⑮ Brush spring
⑯ Brush (–)
⑰ Brush holder
⑱ Rear cover

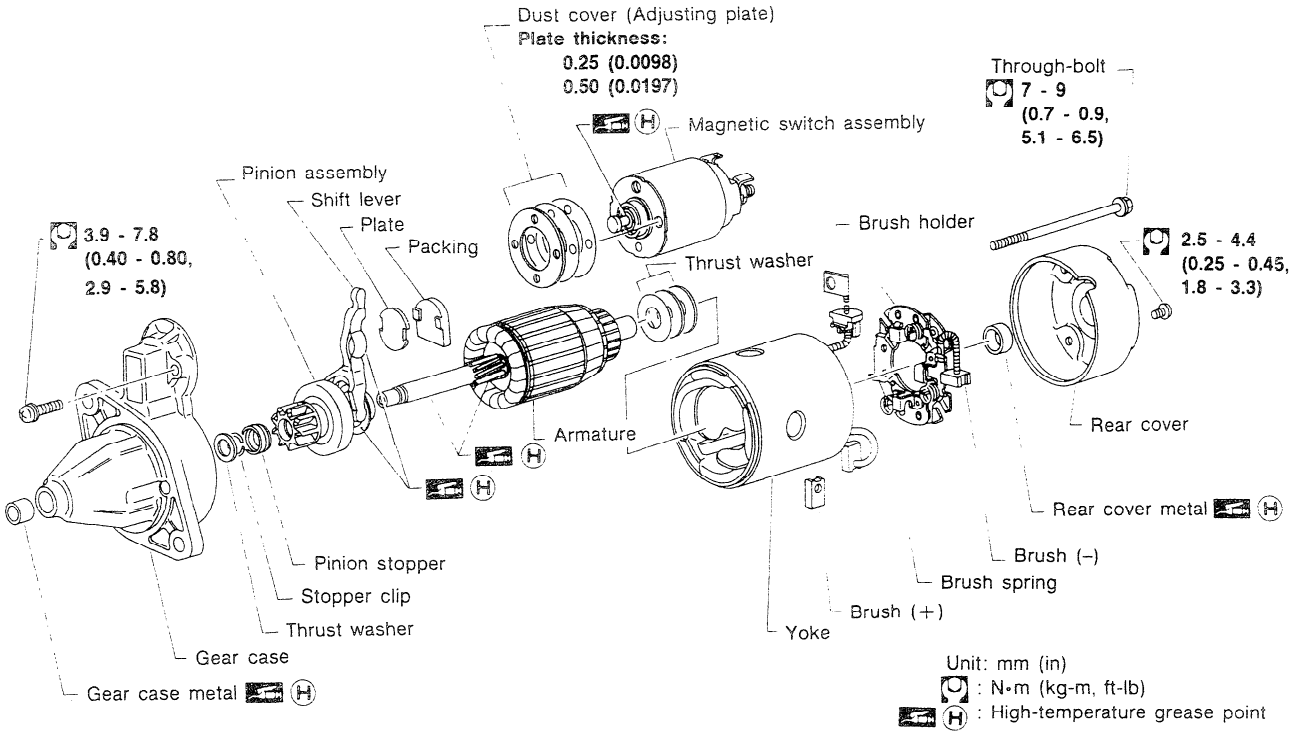
Construction (Cont'd)

S114-315,
S114-316



SEL470P

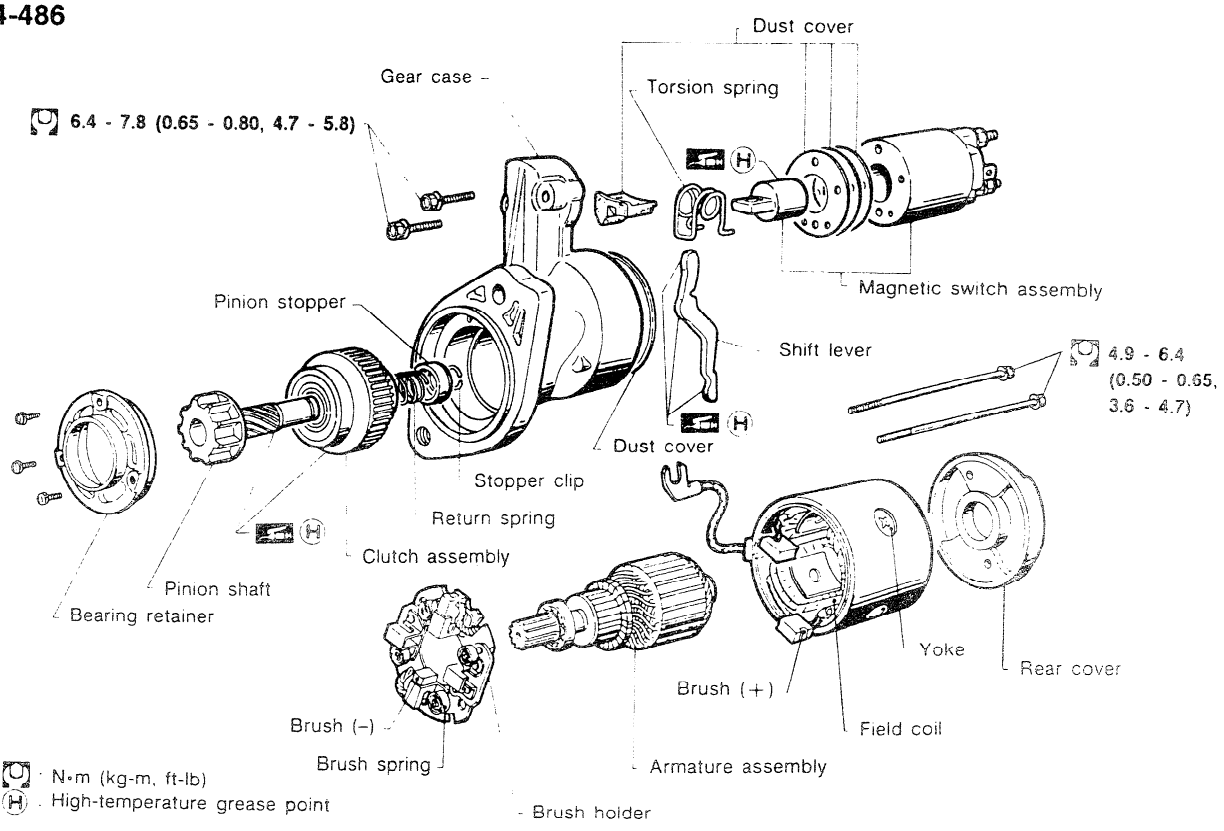
M2T37081



SEL471P

Construction (Cont'd)

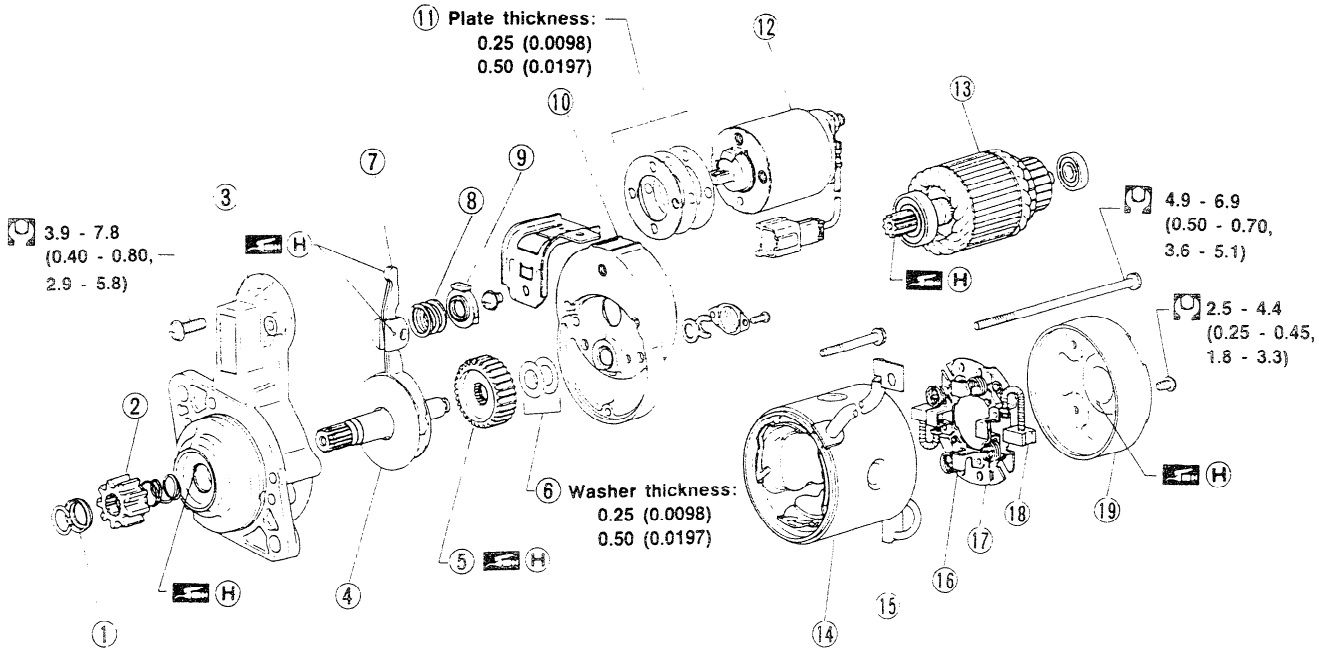
S114-486



SEL469P

Construction (Cont'd)

M2T53883



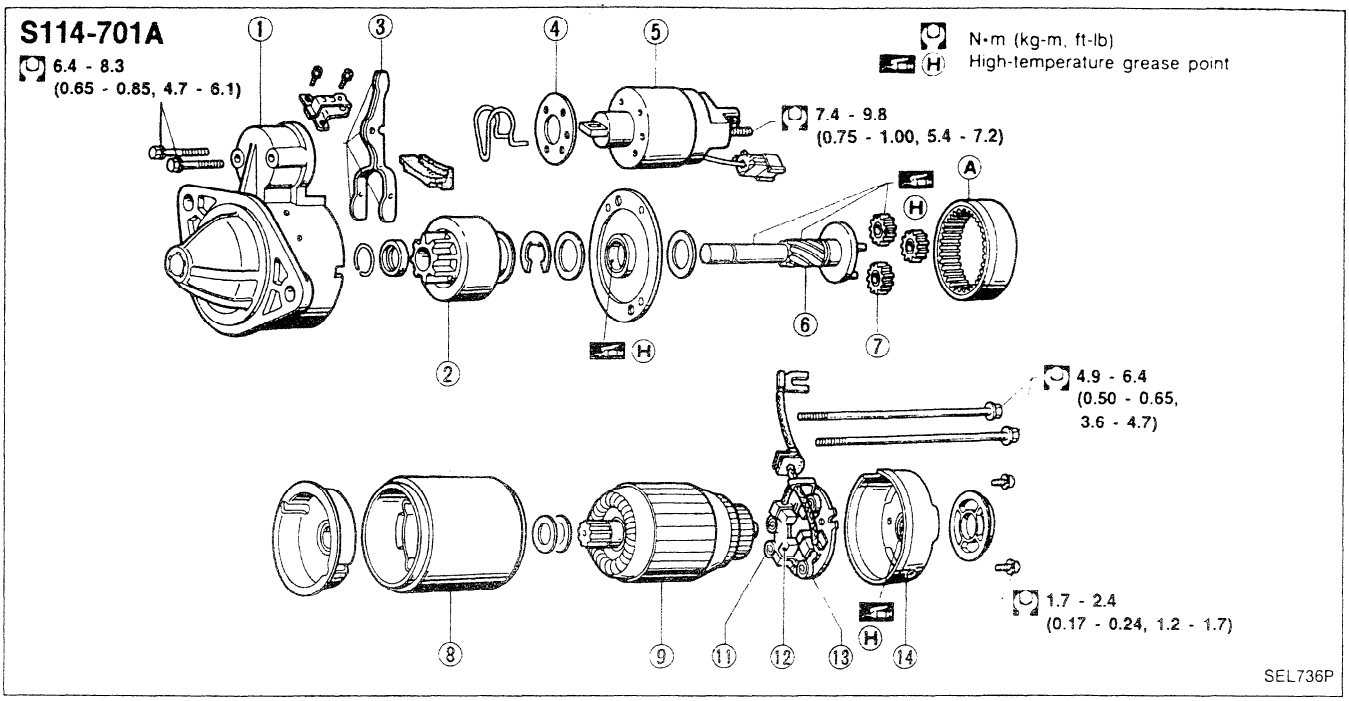
Unit: mm (in)
: N·m (kg-m, ft-lb)
Ⓗ: High-temperature grease point

SEL484P

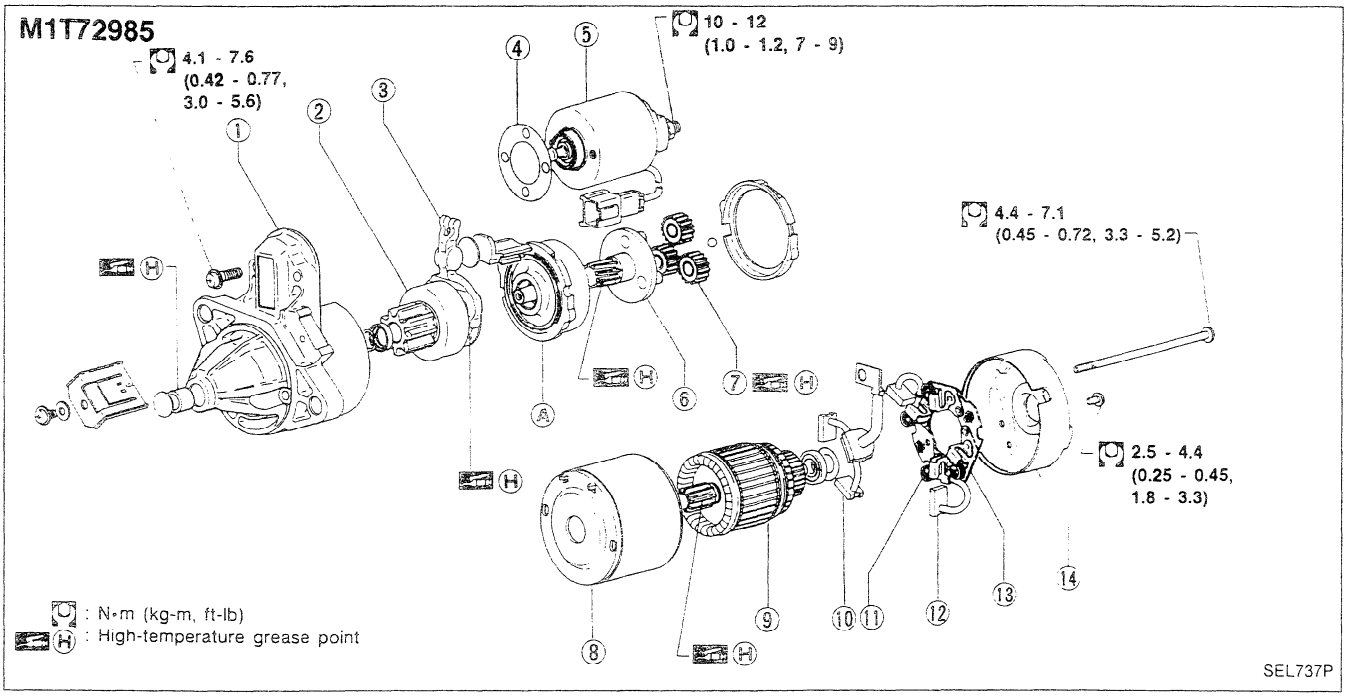
① Pinion stopper
② Pinion assembly
③ Gear case
④ Pinion shaft assembly
⑤ Reduction gear
⑥ Washer
⑦ Shift lever
⑧ Spring
⑨ Holder
⑩ Center bracket
⑪ Adjusting plate
⑫ Magnetic switch assembly
⑬ Armature
⑭ Yoke
⑮ Brush (–)
⑯ Brush spring
⑰ Brush holder
⑱ Brush (–)
⑲ Rear cover

Construction (Cont'd)

S114-701A



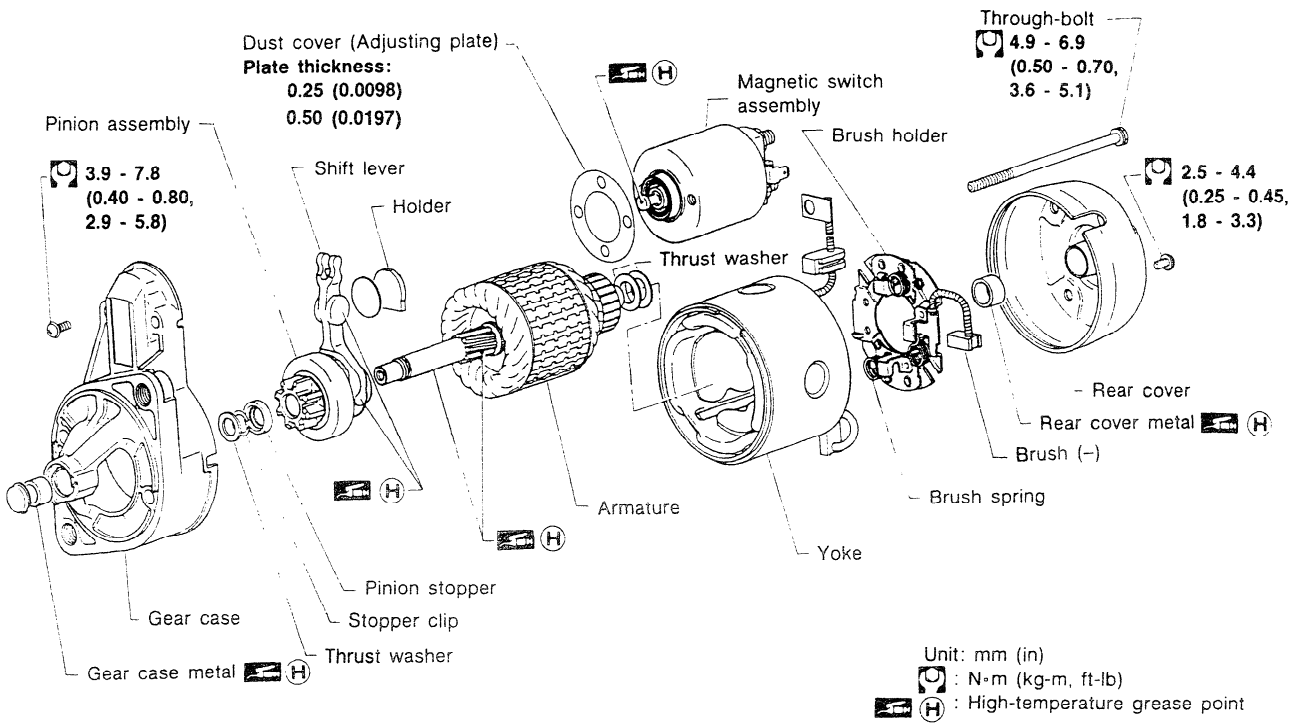
M1T72985



① Gear case
② Pinion assembly
③ Shift lever
④ Adjusting plate
⑤ Magnetic switch assembly
⑥ Pinion shaft
Ⓐ Internal gear
⑦ Planetary gear
⑧ Yoke
⑨ Armature
⑩ Brush (+)
⑪ Brush spring
⑫ Brush (–)
⑬ Brush holder
⑭ Rear cover

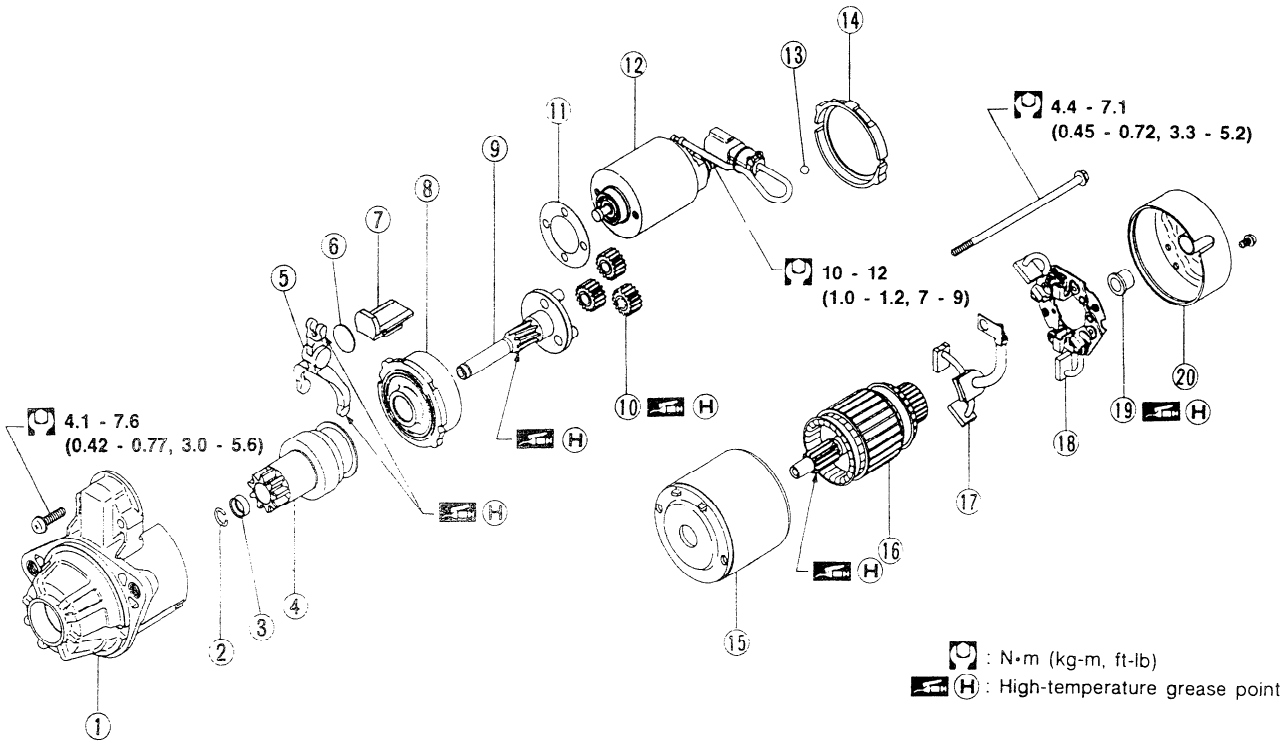
Construction (Cont'd)

M3T27781D



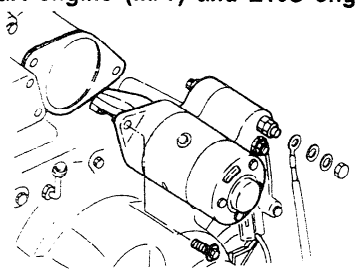
Construction (Cont'd)

M1T60185



① Gear case
② Stopper clip
③ Pinion stopper
④ Pinion assembly
⑤ Shift lever
⑥ Plate
⑦ Packing
⑧ Internal gear
⑨ Shaft
⑩ Planetary gear
⑪ Adjusting plate
⑫ Magnetic switch assembly
⑬ Ball
⑭ Packing
⑮ Yoke
⑯ Armature
⑰ Brush (+)
⑱ Brush (–)
⑲ Rear cover metal
⑳ Rear cover

2WD GA engine (M/T) and E10S engine



SEL478P

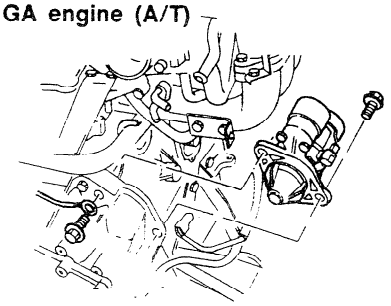
Removal and Installation

REMOVAL

2WD with GA (M/T) and E10S engines

- Remove starter from transaxle side (from engine compartment upper side.)

GA engine (A/T)

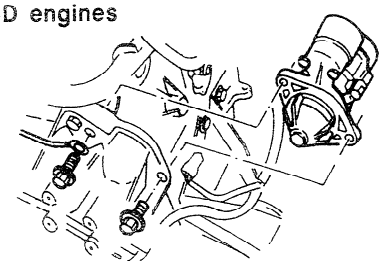


SEL479P

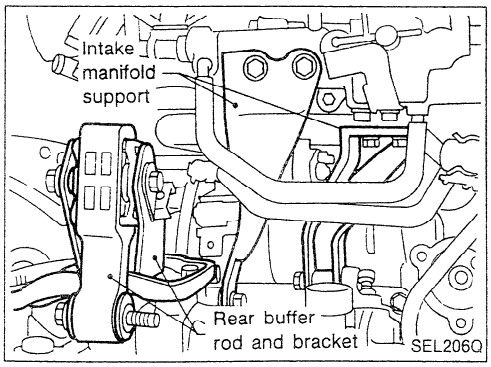
GA (A/T) and CD engines

- Remove starter from engine side (from engine compartment underside.)

CD engines



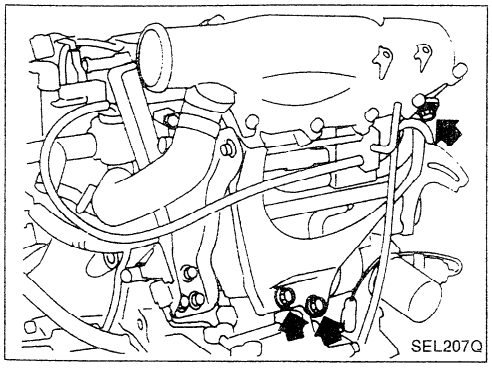
SEL480P



SEL206Q

4WD with GA engines

1. Remove battery, air cleaner, intake air duct, EFI harness, vacuum hoses and speedometer cable from transfer.
2. Remove rear buffer rod, buffer rod bracket and intake manifold supports.
3. Remove starter from transaxle side (from engine compartment upper side).

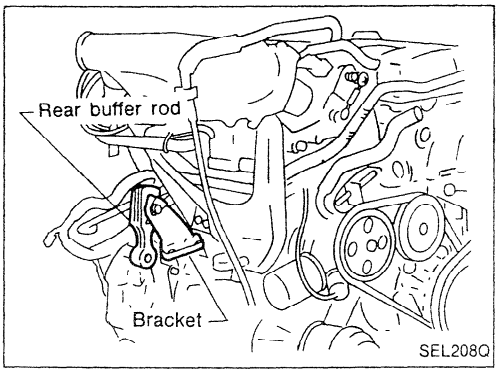


SEL207Q

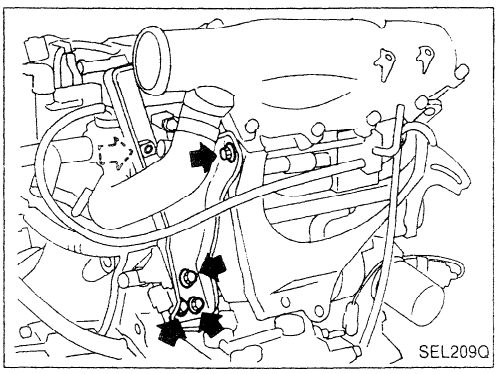
4WD with SR20DET engine

1. Remove battery, air cleaner and intercooler.
2. Remove power steering hose mounting bracket from intake collector.
3. Remove vacuum hose from brake booster (R.H.D. only).
4. Remove front exhaust tube.
5. Remove intake manifold support mounting bolts.

Removal and Installation (Cont'd)



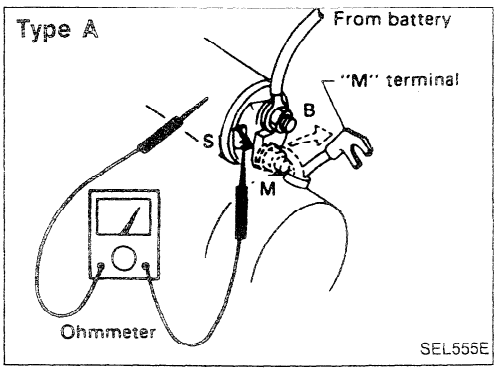
6. Remove vacuum hoses and EFI harness.
7. Remove rear buffer rod and bracket.

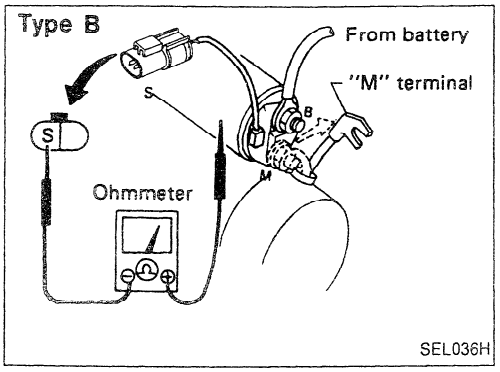


8. Remove intercooler support and rear intake manifold support.
9. Move intake manifold support to engine compartment rear side as much as possible, then remove starter from transaxle side (from engine compartment upper side).

INSTALLATION

Installation procedure is the reverse order of removal.





Magnetic Switch Check

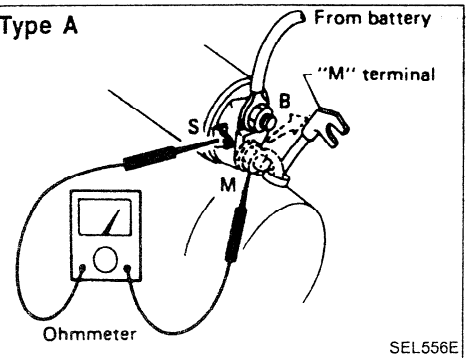
- Before starting to check, disconnect battery ground cable.
- Disconnect "M" terminal of starter motor.

1. Continuity test (between "S" terminal and switch body).

- No continuity ... Replace.

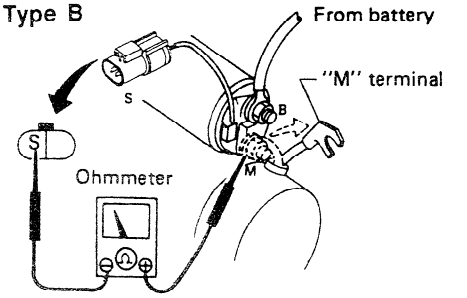
Magnetic Switch Check (Cont'd)

Type A



SEL556E

Type B

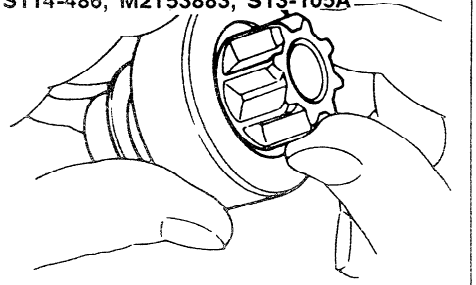


SEL038H

2. Continuity test (between "S" terminal and "M" terminal).
- No continuity ... Replace.

Pinion/Clutch Check

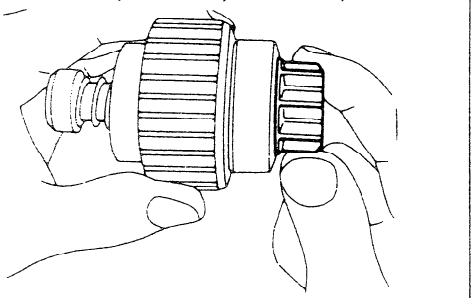
Except S114-357B, S13-131, M2T61871A, S114-486, M2T53883, S13-105A



SEL630E

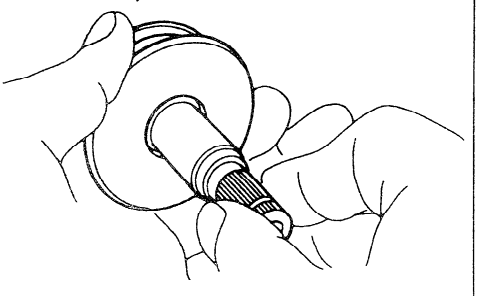
1. Inspect pinion teeth.
- Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
2. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
- If it does not lock (or locks) in either direction or unusual resistance is evident. ... Replace.

S114-357B, S13-131, S114-486, S13-105A



SEL569B

M2T61871A, M2T53883

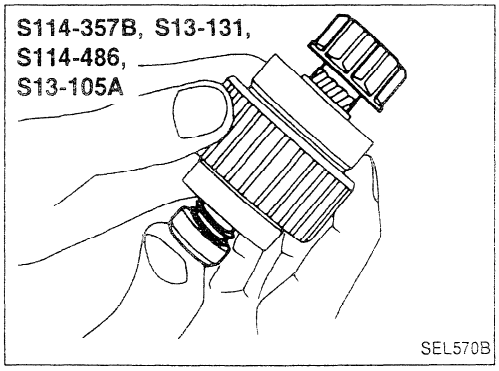


SEL557E

Pinion/Clutch Check (Cont'd)

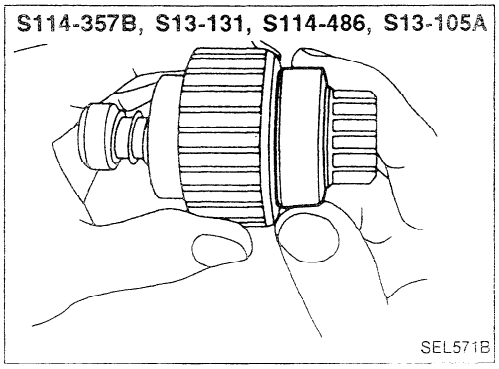
REDUCTION GEAR TYPE

3. Inspect reduction gear teeth.
- Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)



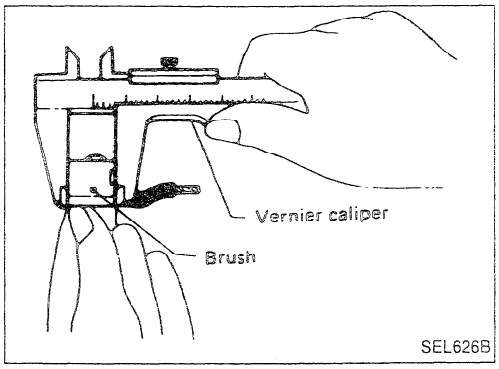
[S114-357B, S13-131, S114-486, S13-105A]

4. Check pinion movement.
- If it is hard to move, apply high-temperature grease or, if necessary, replace.



[S114-357B, S13-131, S114-486, S13-105A]

5. Check ball bearing.
   Spin outer race of ball bearing to ensure that it turns smoothly without binding.
- Abnormal resistance ... Replace.



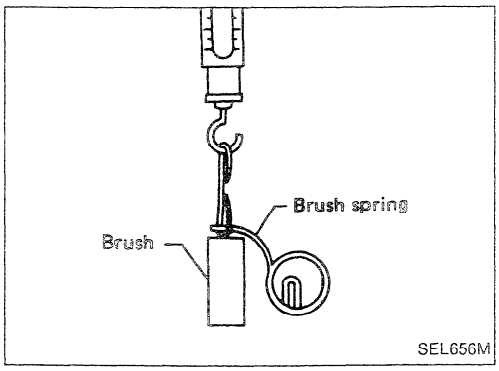
Brush Check

BRUSH

Check wear of brush.

Wear limit length:
Refer to S.D.S.

- Excessive wear ... Replace.



BRUSH SPRING PRESSURE

Check brush spring pressure with brush spring detached from brush.

Spring pressure (with new brush):
Refer to S.D.S.

- Not within the specified values ... Replace.

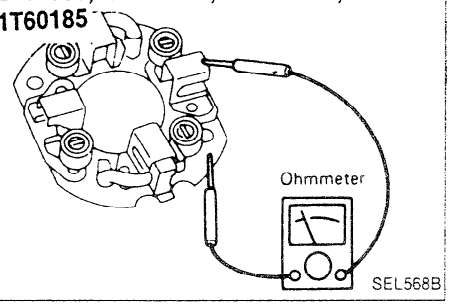
Brush Check (Cont'd)

BRUSH HOLDER

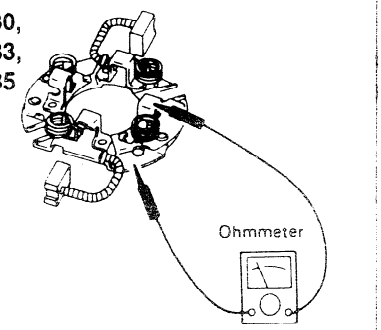
1. Perform insulation test between brush holder (positive side) and its base (negative side).
- Continuity exists. ... Replace.

2. Check brush to see if it moves smoothly.
- If brush holder is bent, replace it; if sliding surface is dirty, clean.

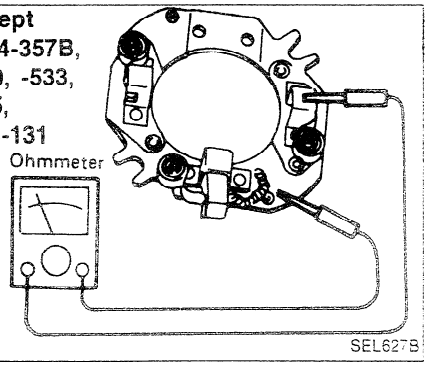
S114-357B, S13-131, S114-486, M2T53883, S13-105A, M1T72985, M1T60185

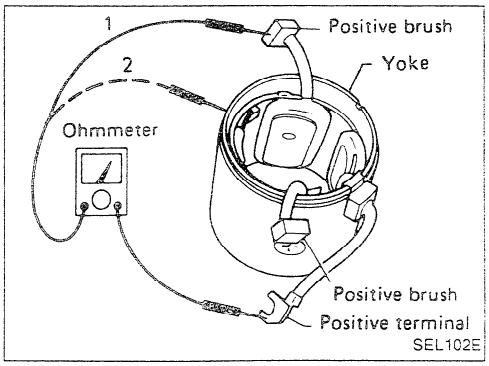


S114-530, S114-533, S114-535



Except S114-357B, -530, -533, -535, S13-131

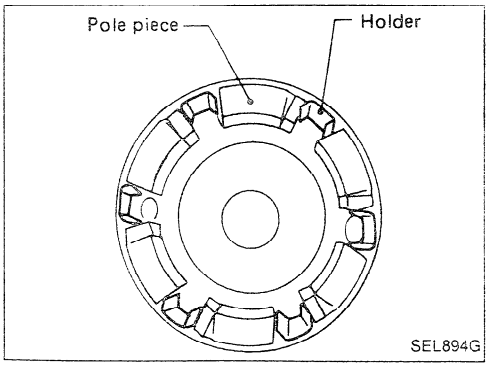




Field Coil Check [Non-reduction gear type, S114-357B, S13-131, M2T61871A, S13-105A, S114-486, M2T53883]

1. Continuity test (between field coil positive terminal and positive brushes).
- No continuity ... Replace field coil.

2. Insulation test (between field coil positive terminal and yoke).
- Continuity exists. ... Replace field coil.



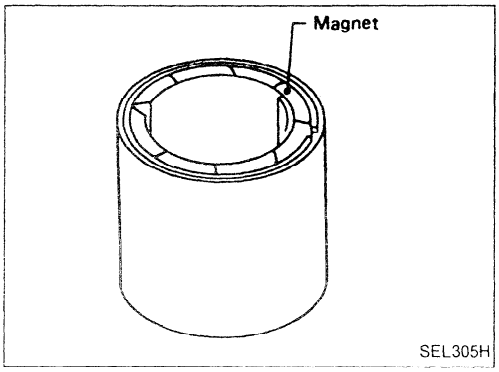
Pole Piece Check [M1T72086A, M1T72087A, M1T72985, M1T60185]

Pole piece is secured to yoke by bonding agent. Check pole piece 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.

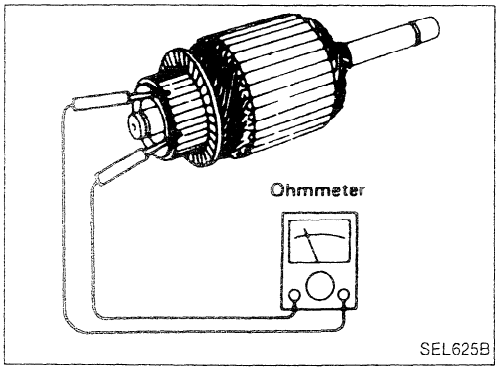
CAUTION:

Do not clamp yoke in a vice or strike it with a hammer.



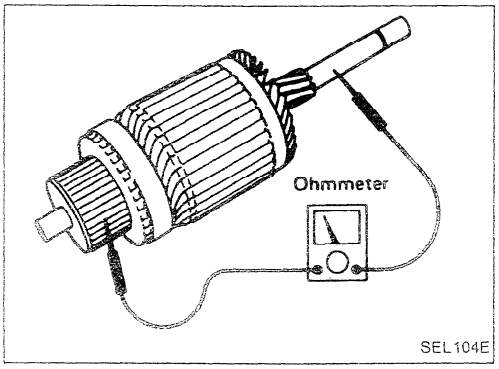
Yoke Assembly Check [S114-530, -533, -535, -701A]

Check magnet for cracks. If there is any crack, replace malfunctioning parts as an assembly.

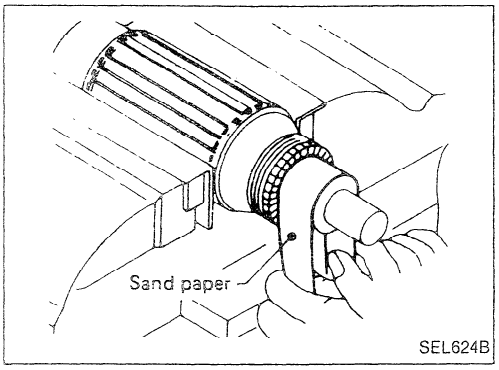


Armature Check

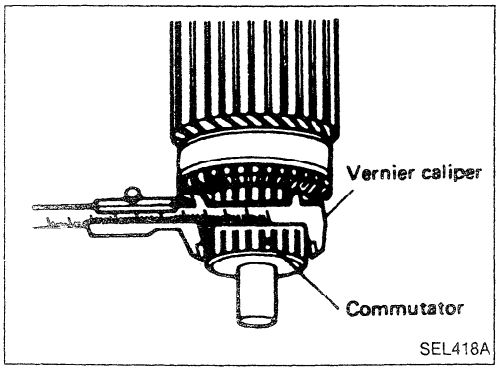
1. Continuity test (between two segments side by side).
   - No continuity ... Replace.



2. Insulation test (between each commutator bar and shaft).
   - Continuity exists. ... Replace.

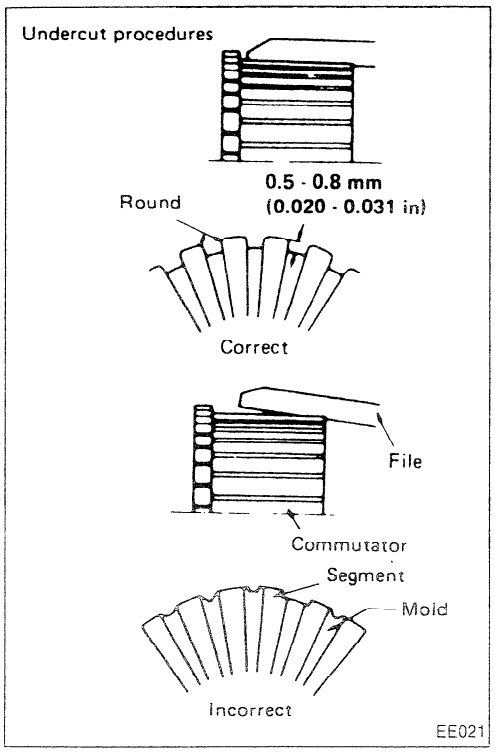


3. Check commutator surface.
   - Rough ... Sand lightly with No. 500 - 600 sandpaper.



4. Check diameter of commutator.
   Commutator minimum diameter:
   Refer to S.D.S.
   - Less than specified value ... Replace.

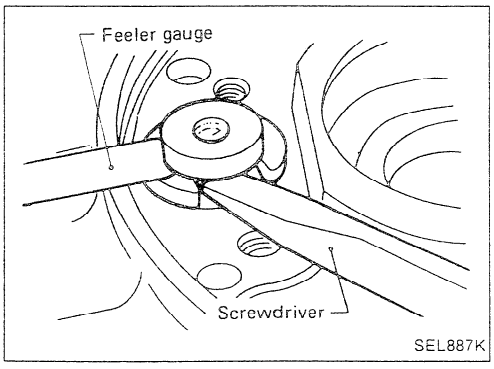
Armature Check (Cont'd)



5. 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

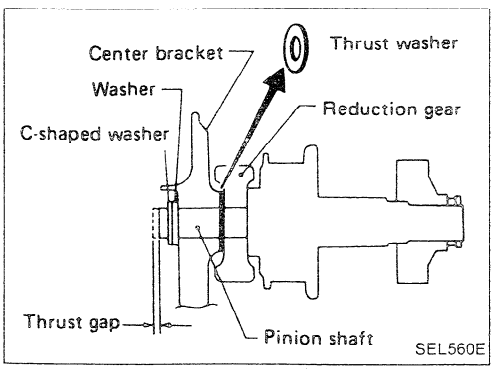
Apply high-temperature grease to lubricate the bearing, gears and frictional surface when assembling the starter.
Carefully observe the following instructions.



PINION SHAFT THRUST GAP ADJUSTMENT [M2T61871A]

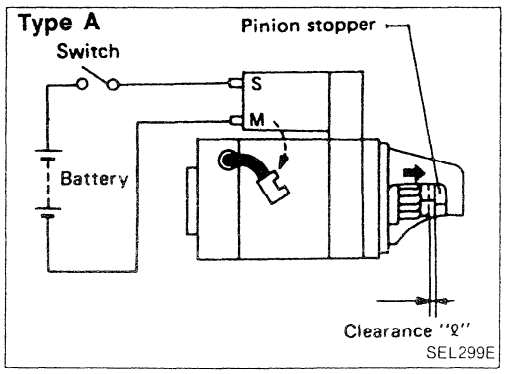
Check thrust gap with a gap gauge by pulling pinion shaft in the axial direction with a screwdriver.

Maximum of thrust gap:
0.5 mm (0.020 in)



- If thrust gap is over the specified value, adjust it with adjusting plate.

Assembly (Cont'd)

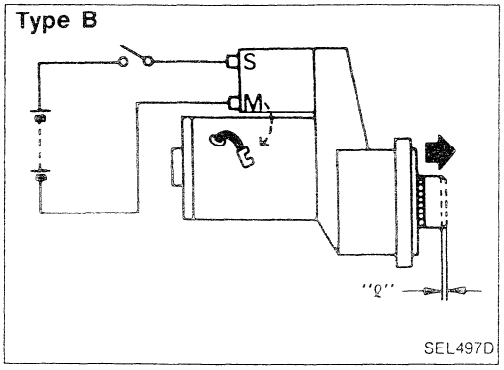


PINION PROTRUSION LENGTH ADJUSTMENT

[Except S114-357B, S13-131, M2T61871A, S114-486, M2T53883, S13-105A, M1T60185]

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.

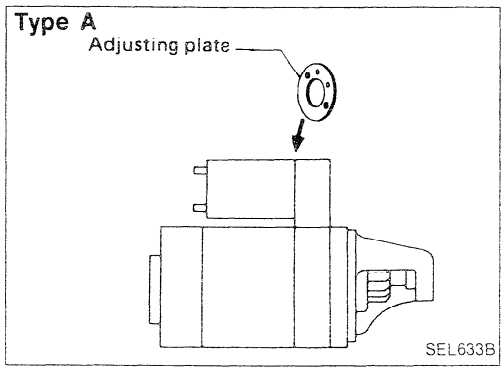
Clearance "ℓ":
Refer to S.D.S.



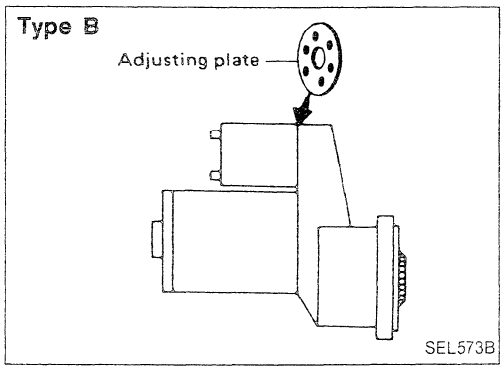
[S114-357B, S13-131, M2T61871A, S114-486, M2T53883, S13-105A, M1T60185]

Compare movement "ℓ" in height of pinion when it is pushed out with magnetic switch energized and when it is pulled out by hand until it touches stopper.

Movement "ℓ":
Refer to S.D.S.



- Not in the specified value ... Adjust by adjusting plate.



STARTER

Type	S114-630	M3T37783	S114-533	M1T72087A	S114-617A	M3T37782	S114-530	M1T72086A	S114-357B	S13-131	M2T61871A
	Non-reduction gear type		Reduction gear type		Non-reduction gear type		Reduction gear type		Reduction gear type		
	HITACHI	MITSUBISHI	HITACHI	MITSUBISHI	HITACHI	MITSUBISHI	HITACHI	MITSUBISHI	HITACHI		MITSUBISHI
Applied model	A		B		C		D		E	F	
System voltage V	12										
No-load											
Terminal voltage V	11.5		11.0		11.5		11.0		11.0		
Current A	Less than 60		Less than 90	50 - 75	Less than 60		Less than 90	50 - 75	Less than 100	Less than 140	Less than 100
Revolution rpm	More than 7,000	More than 6,500	More than 2,950	3,000 - 4,000	More than 7,000	More than 7,500	More than 2,950	3,000 - 4,000	More than 3,900	More than 3,900	More than 4,100
Minimum diameter of commutator mm (in)	39.0 (1.535)	31.4 (1.236)	32.0 (1.260)	28.8 (1.134)	39.0 (1.535)	38.1 (1.500)	32.0 (1.260)	28.8 (1.134)	29.0 (1.142)	35.5 (1.398)	31.4 (1.236)
Minimum length of brush mm (in)	11.0 (0.433)	11.5 (0.453)	11.0 (0.433)	12.0 (0.472)	11.0 (0.433)	11.5 (0.453)	11.0 (0.433)	12.0 (0.472)	11.0 (0.433)	10.5 (0.413)	11.5 (0.453)
Brush spring tension N (kg, lb)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)	15.7 - 19.6 (1.6 - 2.0, 3.5 - 4.4)	26.5 - 32.3 (2.70 - 3.29, 5.96 - 7.26)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)
Clearance between bearing metal and armature shaft mm (in)	Less than 0.2 (0.008)	—	0.2 (0.008)	—	0.2 (0.008)	—	0.2 (0.008)	—	—	—	—
Clearance "ℓ" between pinion front edge and pinion stopper mm (in)	0.3 - 2.5 (0.012 - 0.098)	0.5 - 2.0 (0.020 - 0.079)	0.3 - 1.5 (0.012 - 0.059)	0.5 - 2.0 (0.020 - 0.079)	0.3 - 2.5 (0.012 - 0.098)	0.5 - 2.0 (0.020 - 0.079)	0.3 - 1.5 (0.012 - 0.059)	0.5 - 2.0 (0.020 - 0.079)	—	—	—
Movement "ℓ" in height of pinion assembly mm (in)	—	—	—	—	—	—	—	—	0.3 - 1.5 (0.012 - 0.059)		

Type	S114-315	M2T37081	S114-316	M3T27781D	S114-701A	S114-535	M1T72985	S114-486	M2T53883	S13-105A	MIT60185
	Non-reduction gear type				Reduction type						
	HITACHI	MITSUBISHI	HITACHI	MITSUBISHI	HITACHI		MITSUBISHI	HITACHI	MITSUBISHI	HITACHI	MITSUBISHI
Applied model	G		H		I			J		K	L
System voltage V	12										
No-load											
Terminal voltage V	11.5				11.0						
Current A	Less than 60	Less than 55	Less than 60		Less than 90	Less than 85	50 - 75	Less than 100		Less than 140	50 - 75
Revolution rpm	More than 7,000			More than 6,500	More than 2,950		3,000 - 4,000	More than 3,900	More than 2,900	More than 3,900	3,000 - 4,000
Minimum diameter of commutator mm (in)	32 (1.26)	31 (1.22)	39 (1.54)	31.4 (1.236)	32.0 (1.260)		28.8 (1.134)	29.0 (1.142)	31.4 (1.236)	35.5 (1.398)	28.8 (1.134)
Minimum length of brush mm (in)	11.0 (0.433)	11.5 (0.453)	11.0 (0.433)	11.5 (0.453)	11.0 (0.433)		12.0 (0.472)	11.0 (0.433)	11.5 (0.453)	10.5 (0.413)	12.0 (0.472)
Brush spring tension N (kg, lb)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)		13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)	15.7 - 19.6 (1.6 - 2.0, 3.5 - 4.4)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)	26.5 - 32.4 (2.7 - 3.3, 6.0 - 7.3)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)
Clearance between bearing metal and armature shaft mm (in)	Less than 0.2 (0.008)	—	Less than 0.2 (0.008)	—	0.03 - 0.3 (0.0012 - 0.0118)	0.2 (0.008)	—	—	—	—	—
Clearance "ℓ" between pinion front edge and pinion stopper mm (in)	0.3 - 2.5 (0.012 - 0.098)	0.5 - 2.0 (0.020 - 0.079)	0.3 - 2.5 (0.012 - 0.098)	0.5 - 2.0 (0.020 - 0.079)	0.05 - 1.5 (0.0020 - 0.0591)	0.3 - 1.5 (0.012 - 0.059)	0.5 - 2.0 (0.020 - 0.079)	—	—	—	—
Movement "ℓ" in height of pinion assembly mm (in)	—	—	—	—	—		—	0.3 - 1.5 (0.012 - 0.059)	0.5 - 2.0 (0.020 - 0.079)	0.3 - 1.5 (0.012 - 0.059)	0.5 - 2.0 (0.020 - 0.079)

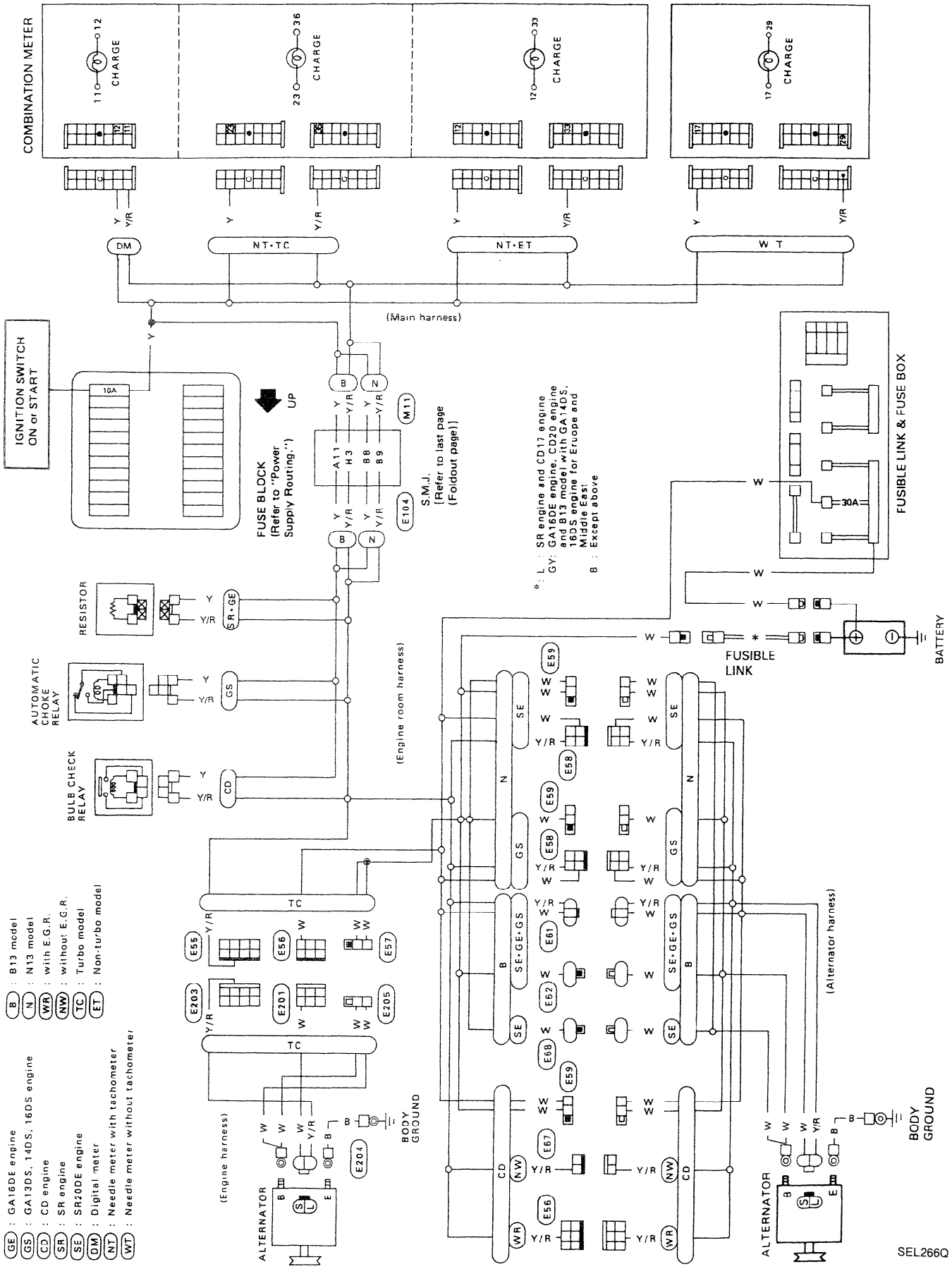
Applied model table for Starter Motor

Model series	N14												B13		
Traction system	2WD										4WD		2WD		
Destination	Except Europe				Europe								Except Europe		
					R.H.D. and South		Central and North								
					Stan-dard	Option				Except North	North		Stan-dard	Option	
Engine	GA14DS		GA16DE		GA14DS and GA16DS			SR20DE	CD20			GA16DS	SR20DET	E10S	GA13DS
Transaxle	M/T	A/T	M/T	A/T	M/T		A/T	M/T	M/T			M/T	M/T	M/T	M/T
	A	B	A	D	A	I	B	J	K	F		B	L	G	H	A

Model series	B13												
Traction system	2WD												
Destination	Except Europe									Europe			
								Standard	Option	R.H.D. and South	Central and North		
Engine	GA14DS		GA16DS		GA16DE		SR20DE	CD17		GA16DS			SR20DE
Transaxle	M/T	A/T	M/T	A/T	M/T	A/T	M/T	M/T		M/T		A/T	M/T
	A	B	A	B	C	D	J	E	F	A	I	B	J

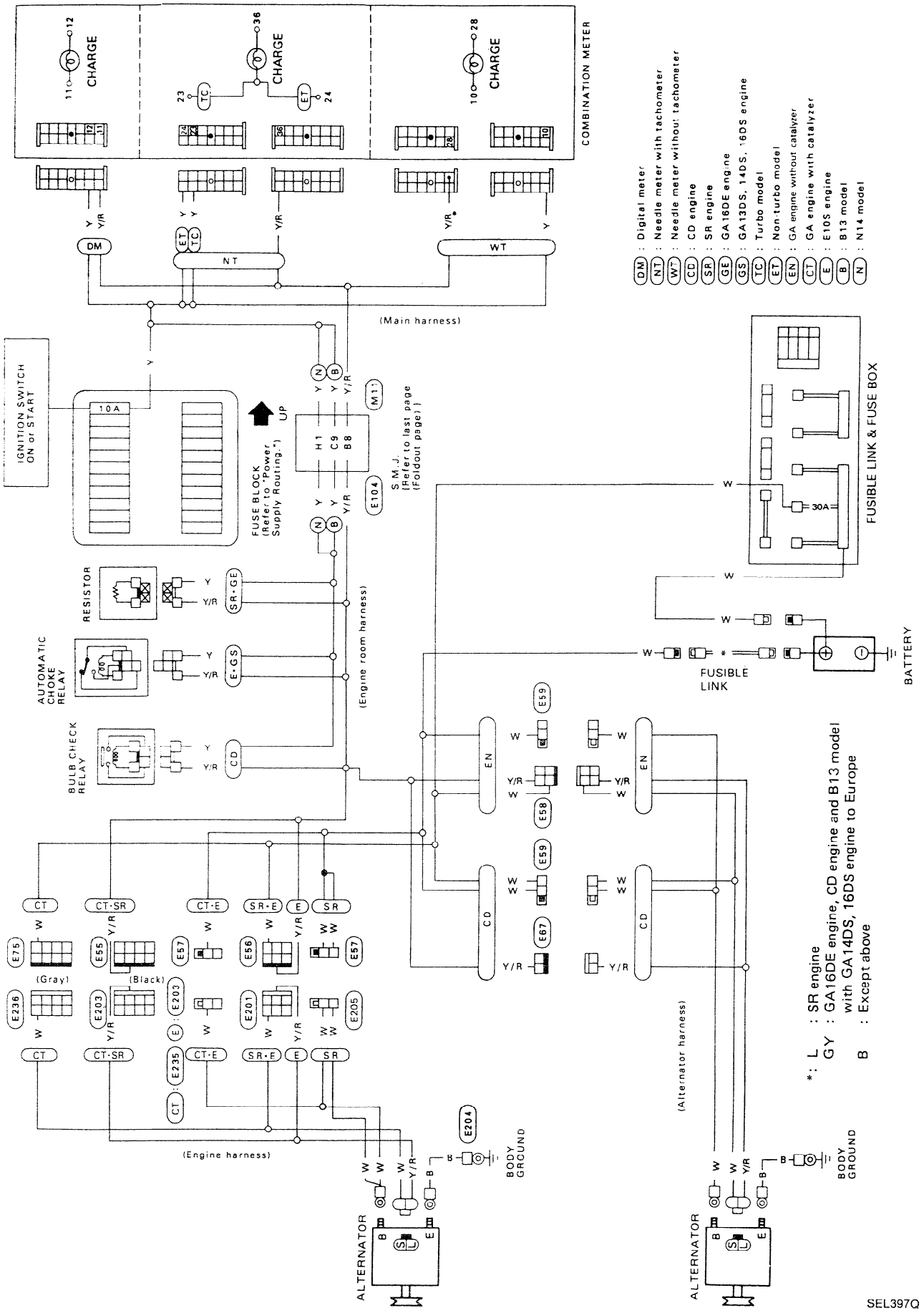
Wiring Diagram

L.H.D. MODELS



Wiring Diagram (Cont'd)

R.H.D. MODELS

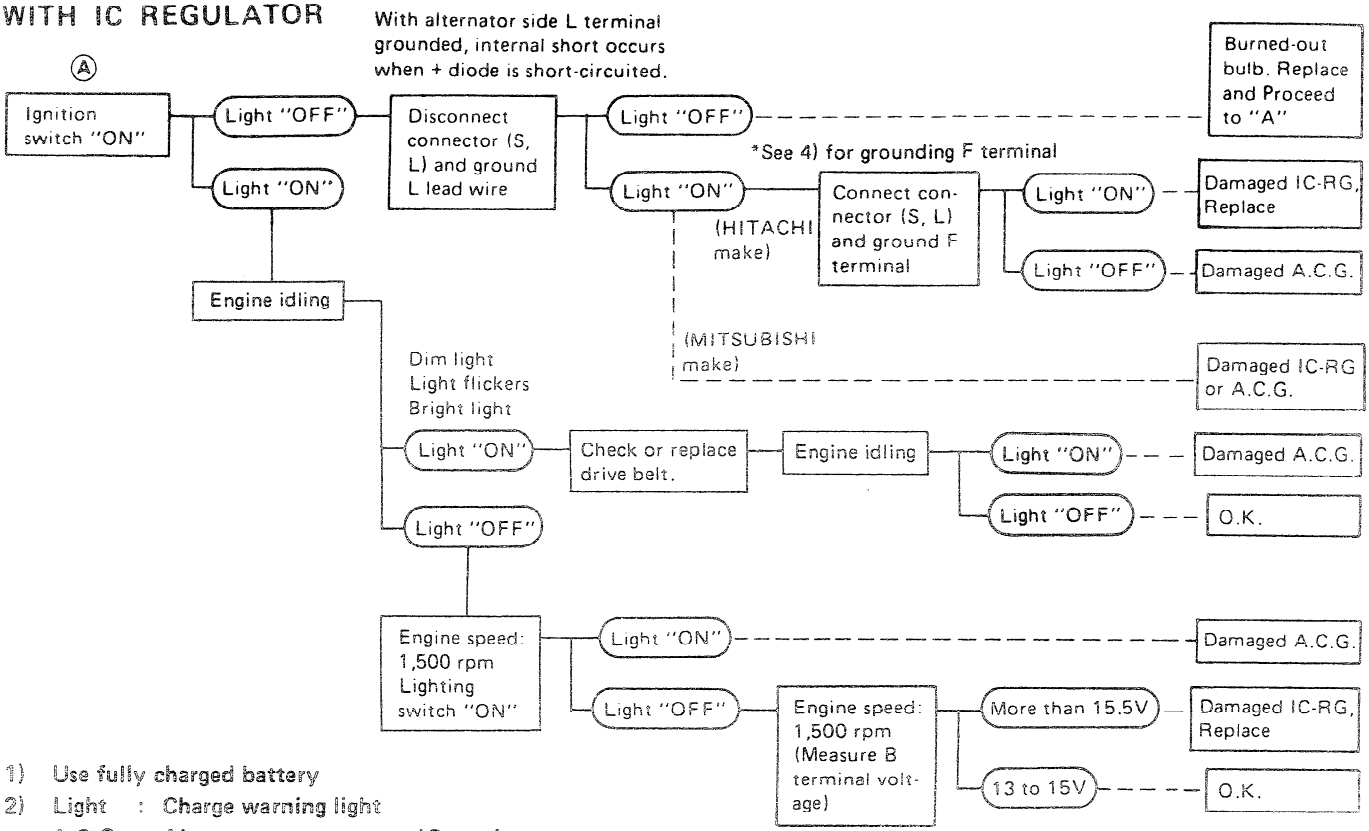


Trouble-shooting

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 trouble-shooting, inspect the fusible link.

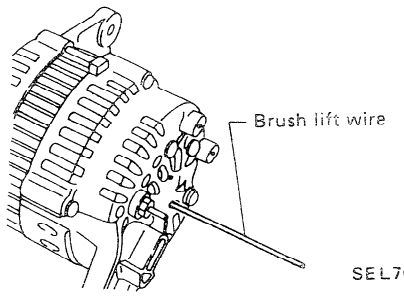
WITH IC REGULATOR



1) Use fully charged battery
2) Light : Charge warning light
   A.C.G. : Alternator parts except IC regulator
   IC-RG : IC regulator
   O.K. : IC-alternator is in good condition
3) When reaching "Damaged A.C.G.", remove alternator from vehicle and disassemble, inspect and correct or replace faulty parts
4) *Method of grounding F terminal (HITACHI make only)

Gasoline engine model

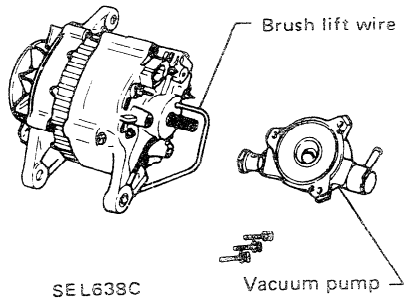
Connect tip of wire to brush and attach wire to alternator body.



SEL766D

Diesel engine model

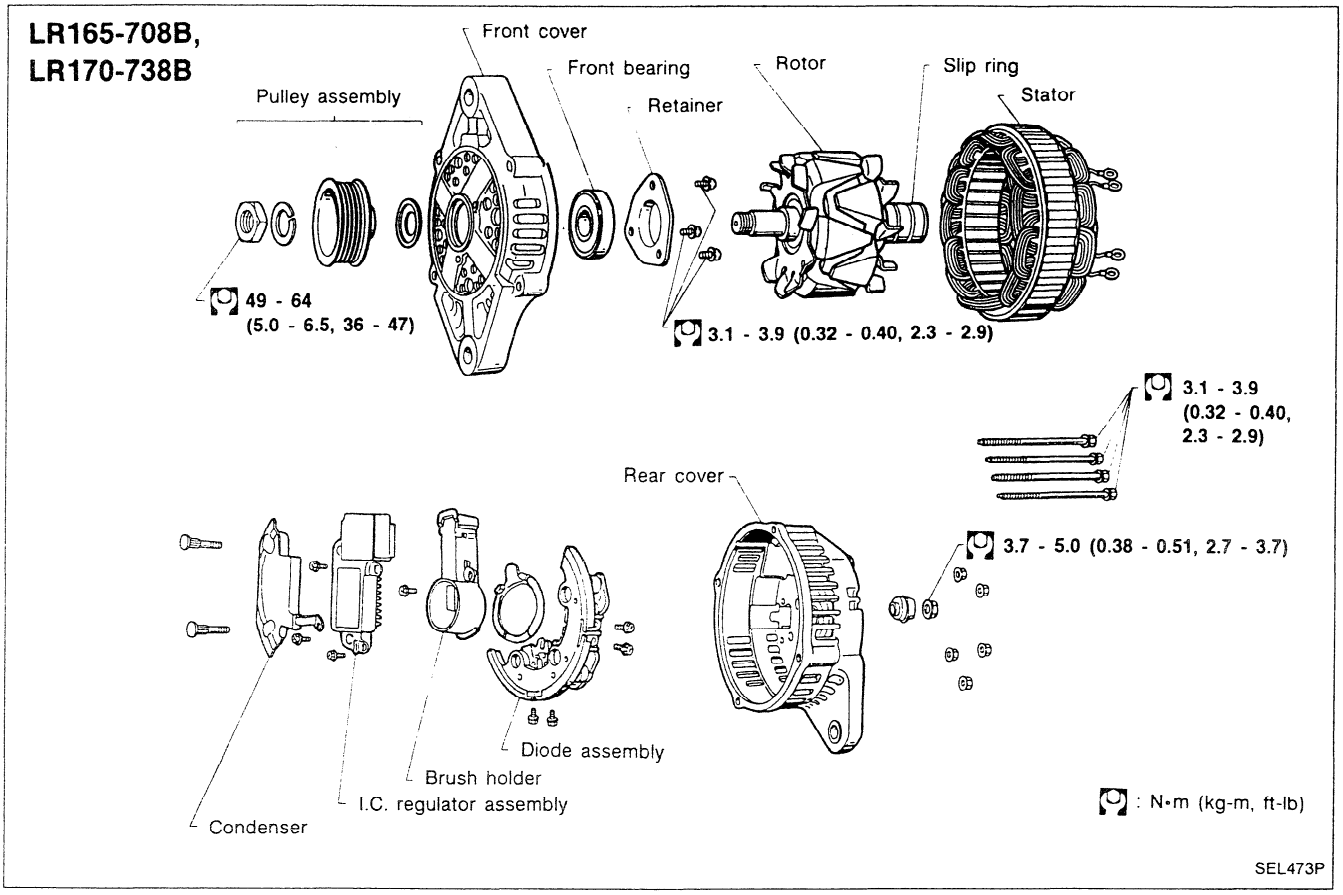
Remove vacuum pump and connect tip of wire to brush and attach wire to alternator body.

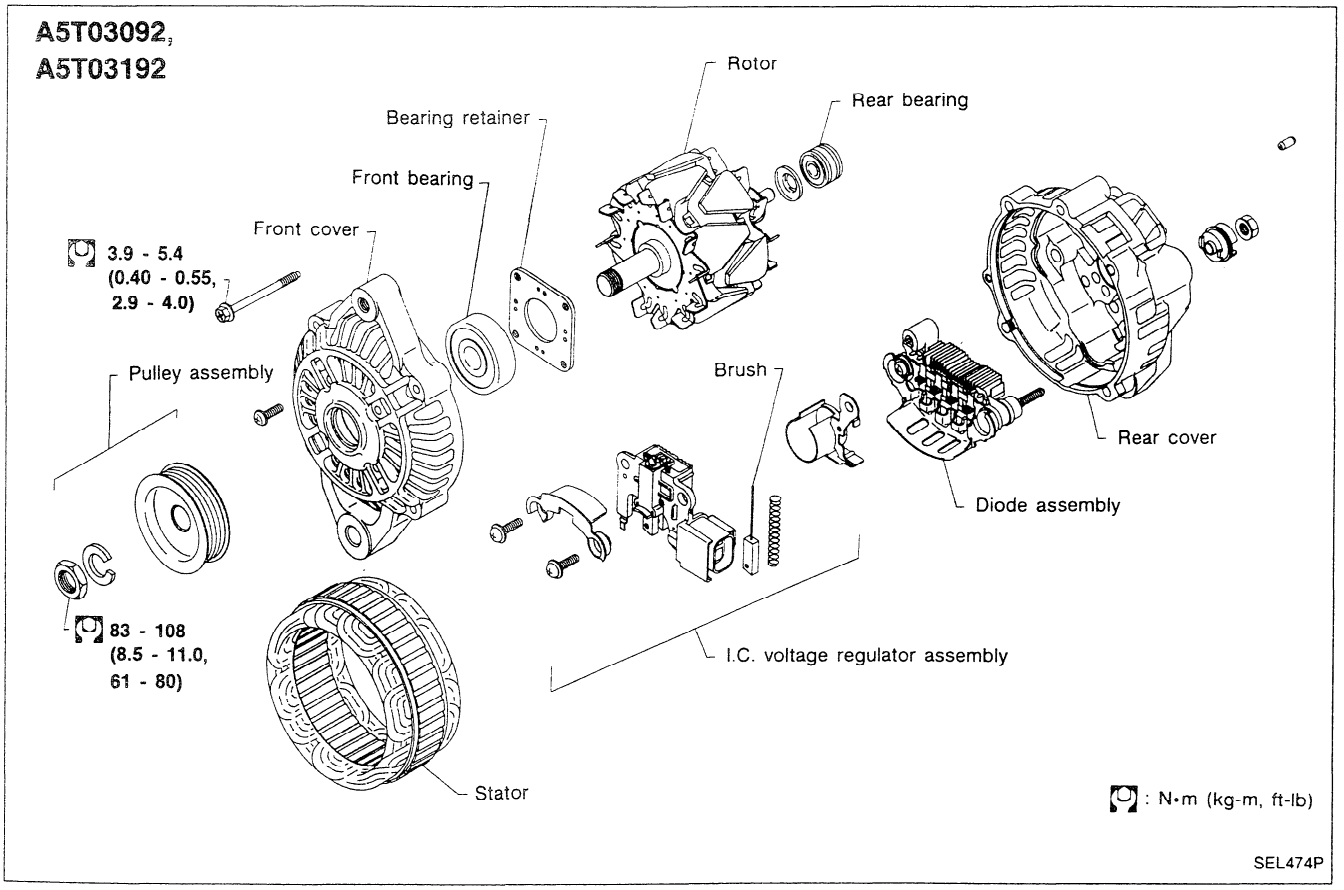


SEL638C

5) Terminals "S", "L", "B" and "E" are marked on rear cover of alternator.

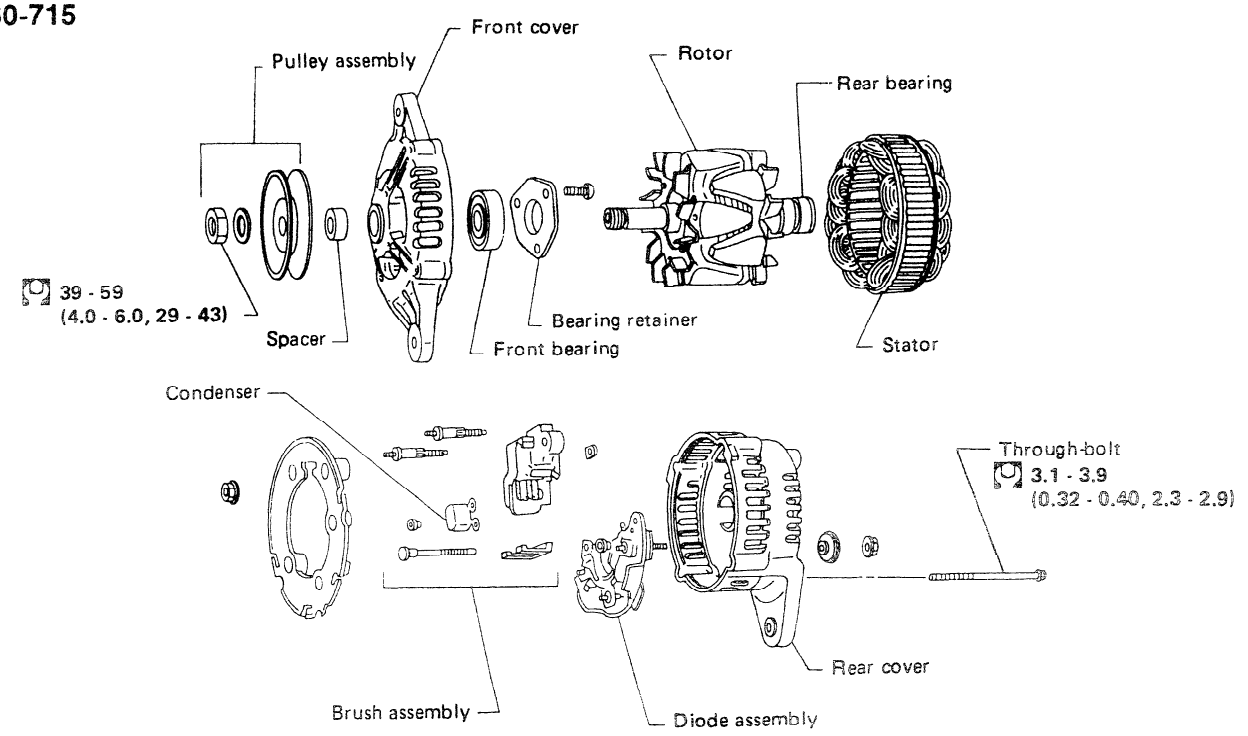
Construction





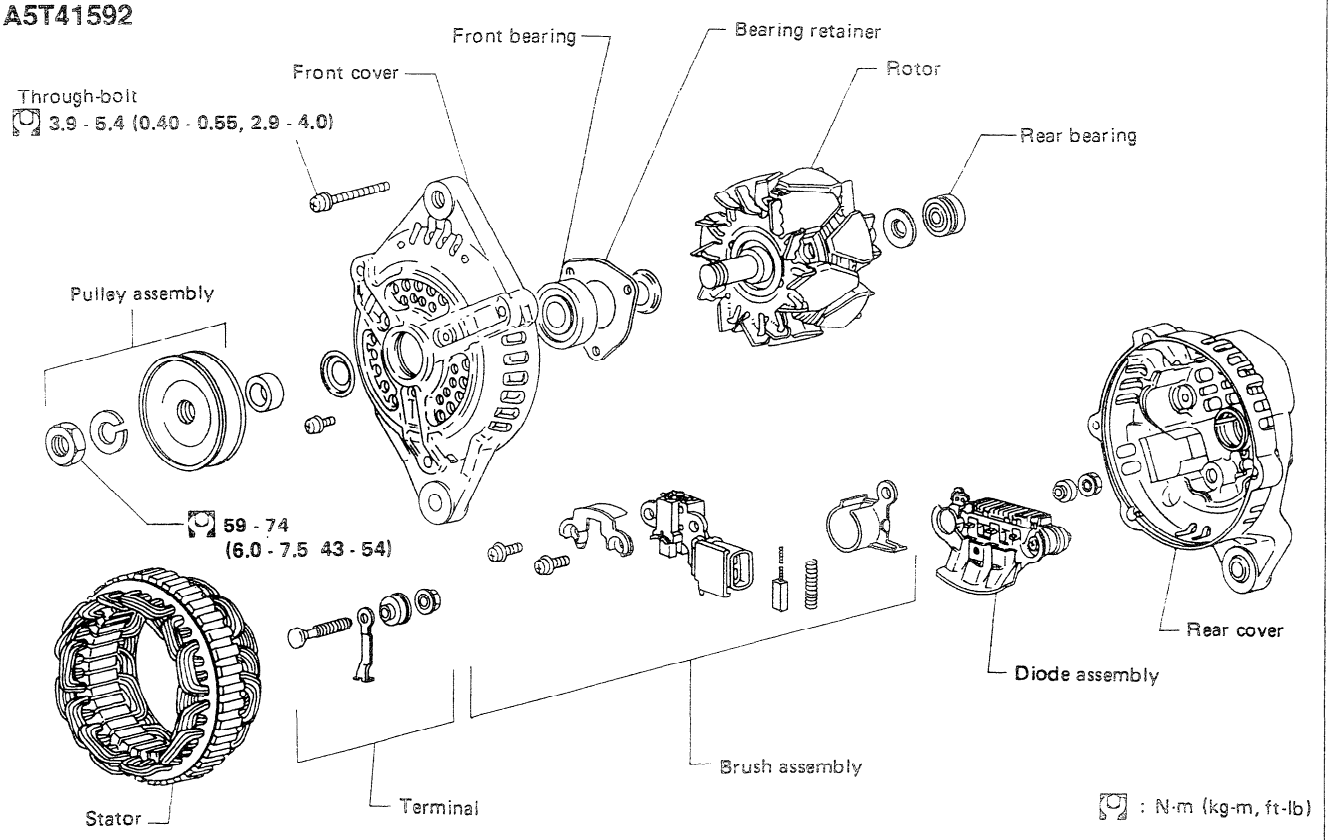
Construction (Cont'd)

LR160-715



SEL834H

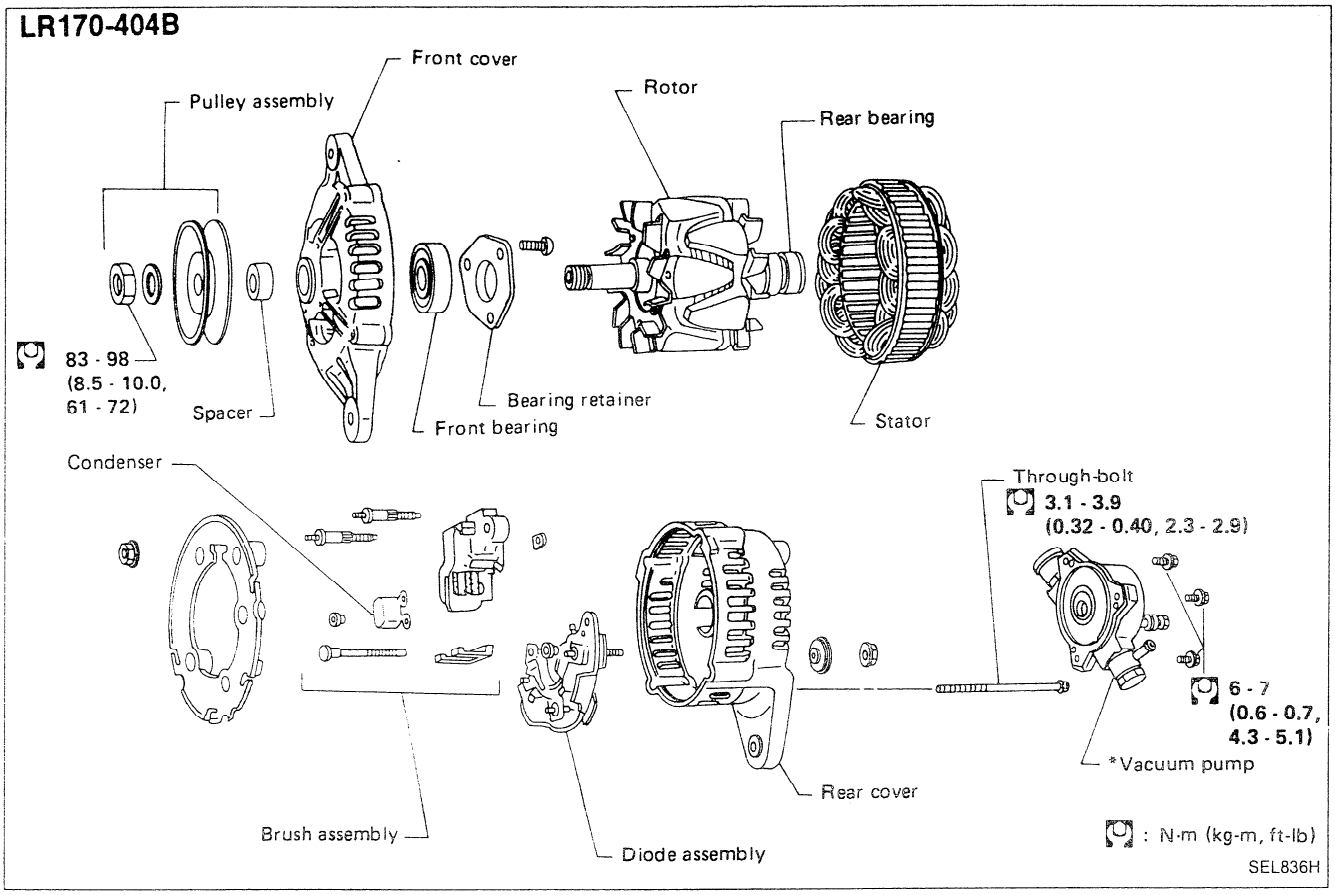
A5T41592



SEL835H

Construction (Cont'd)

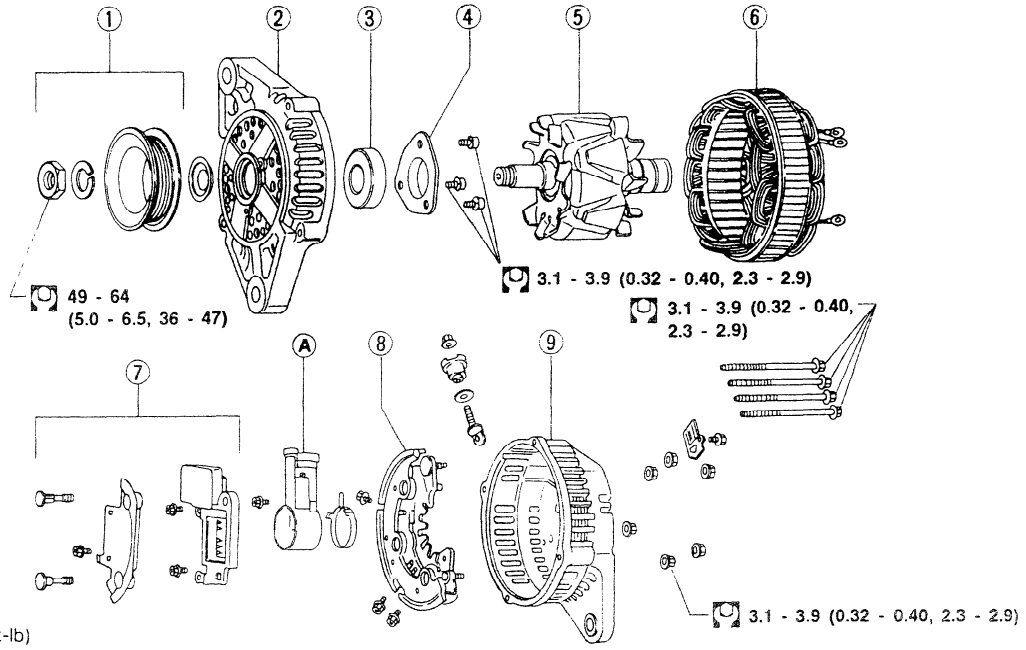
LR170-404B



* Refer to **BR section** for vacuum pump service information.

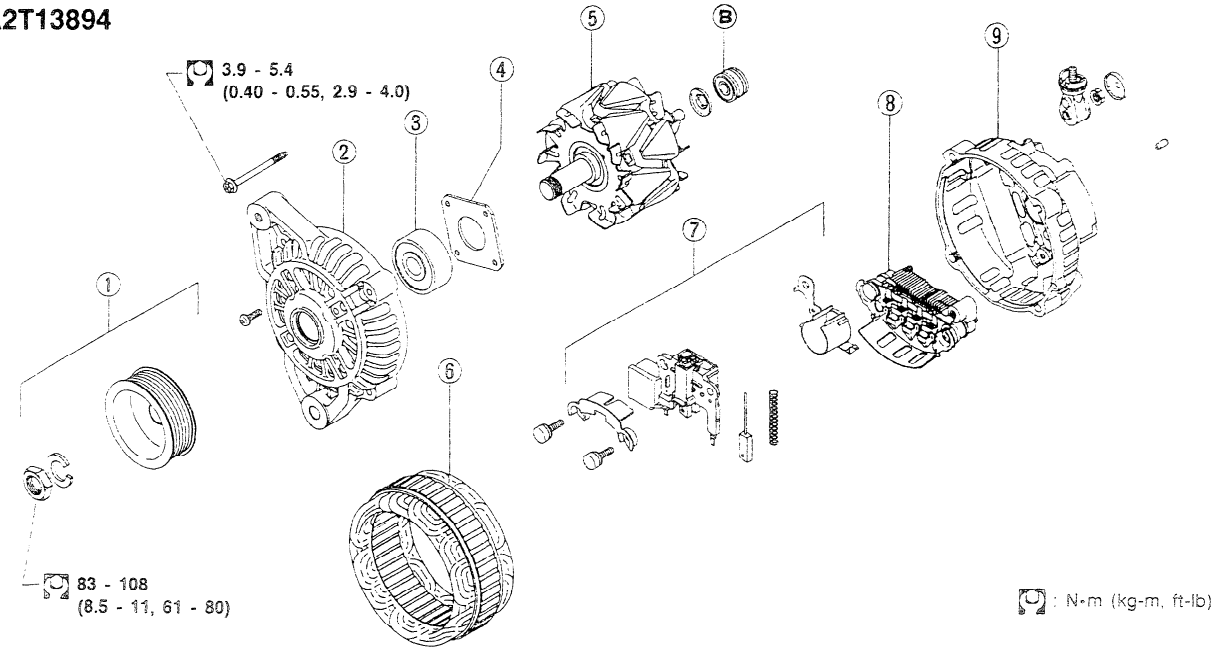
Construction (Cont'd)

LR180-725



SEL739P

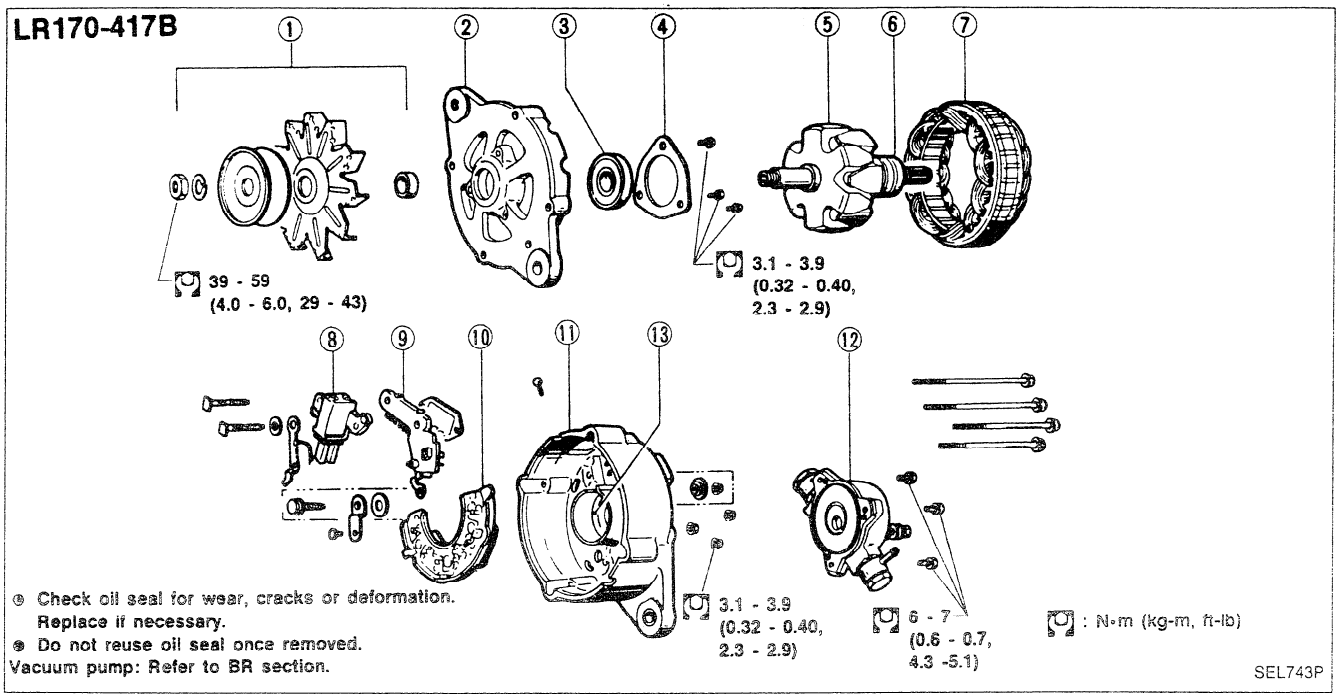
A2T13894



SEL740P

① Pulley assembly
② Front cover
③ Bearing
④ Bearing retainer
⑤ Rotor
⑥ Stator
⑦ I.C. regulator assembly
⑧ Diode assembly
⑨ Rear cover
Ⓐ Brush holder
Ⓑ Rear bearing

Construction (Cont'd)

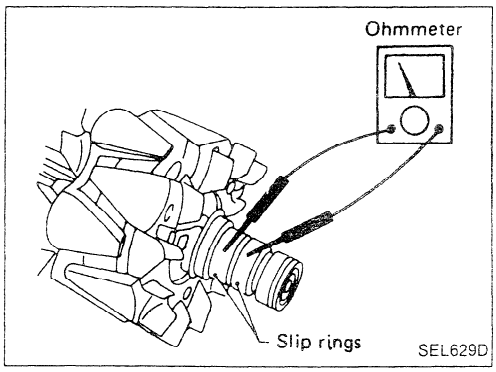


① Pulley assembly
② Front cover
③ Front bearing
④ Bearing retainer
⑤ Rotor
⑥ Rear bearing
⑦ Stator
⑧ Brush holder assembly
⑨ I.C. regulator assembly
⑩ Diode assembly
⑪ Rear cover
⑫ Vacuum pump
⑬ Oil seal

Rear Bearing

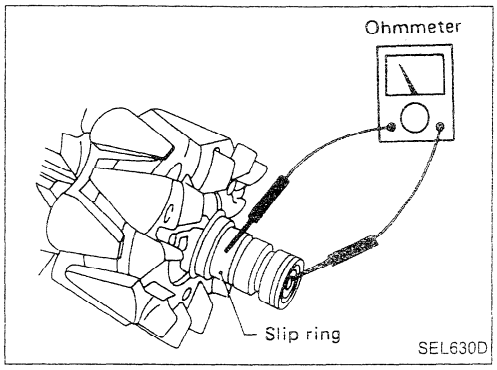
CAUTION:

- **Do not reuse rear bearing after removal. Replace with a new one.**
- **Do not lubricate rear bearing outer race.**

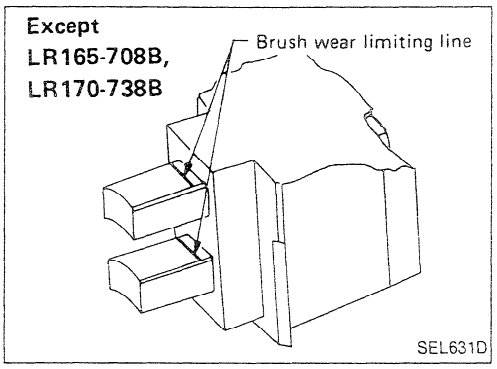


Rotor Slip Ring Check

1. Continuity test
   - No continuity ... Replace rotor.

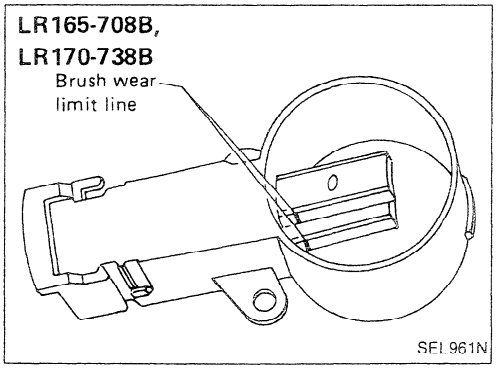


2. Insulator test
   - Continuity exists ... Replace rotor.
3. Check slip ring for wear.
   Slip ring minimum outer diameter:
   Refer to S.D.S.

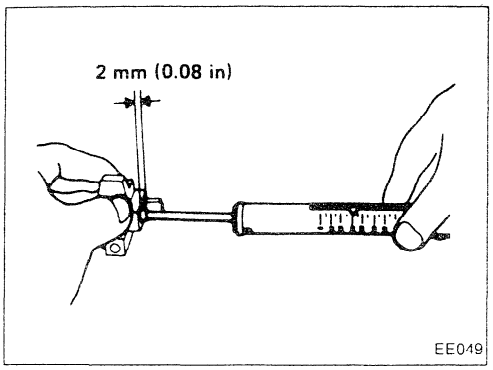


Brush Check

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.



Brush Check (Cont'd)

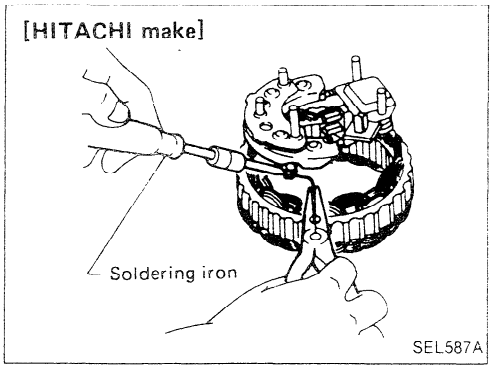


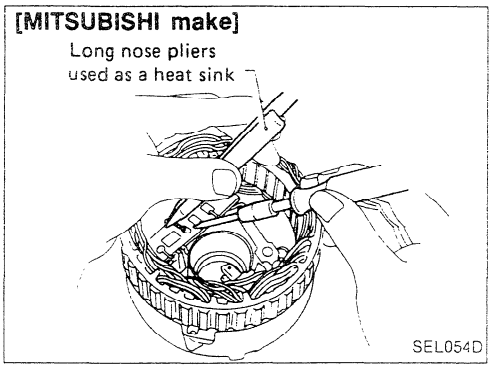
3. Check brush lead wire for damage.
   - Damaged ... Replace.
4. Check brush spring pressure.
   Measure brush spring pressure with brush projected approximately 2 mm (0.08 in) from brush holder.
   Spring pressure:
   Refer to S.D.S.
   - Not within the specified values ... Replace.

Stator Check (Except LR165-708B, LR170-738B)

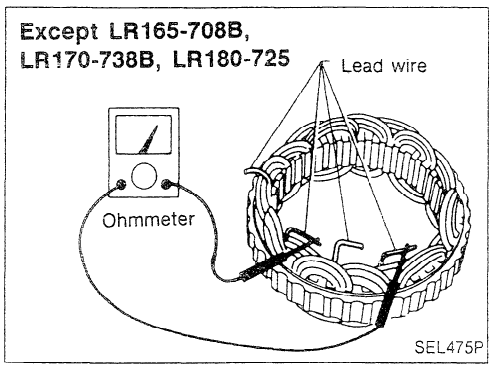
To test the stator or diode, separate them by unsoldering the connecting wires.

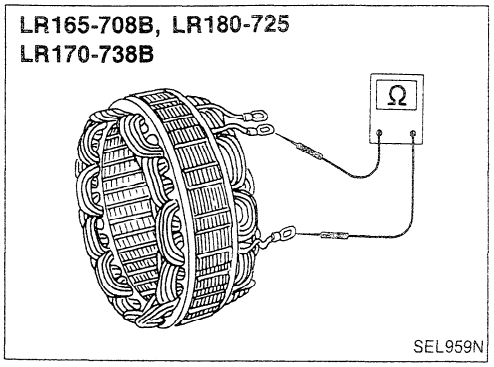
CAUTION:
Use only as much heat as required to melt solder. Otherwise, diodes will be damaged by excessive heat.





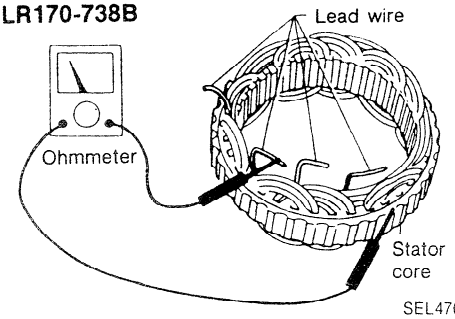
1. Continuity test
   - No continuity ... Replace stator.





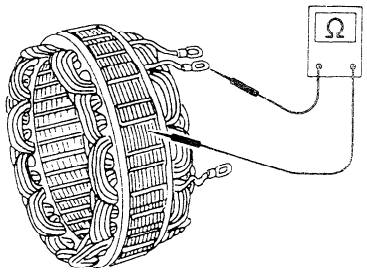
Stator Check (Except LR165-708B, LR170-738B) (Cont'd)

Except LR165-708B, LR180-725, LR170-738B



SEL476P

LR165-708B, LR180-725, LR170-738B



SEL956N

2. Ground test
   - Continuity exists ... Replace stator.

Diode Check

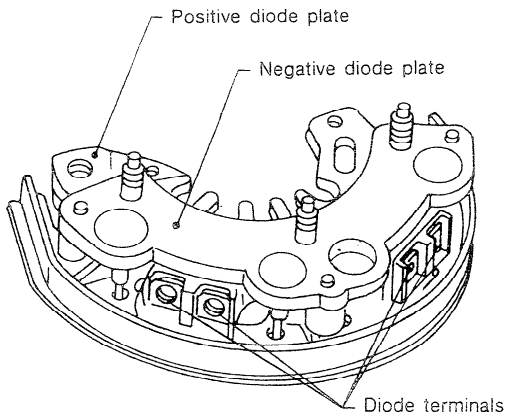
MAIN DIODES

- 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		Continuity
	Positive ⊕	Negative ⊖	
Diodes check (Positive side)	Positive diode plate	Diode terminals	Yes
	Diode terminals	Positive diode plate	No
Diodes check (Negative side)	Negative diode plate	Diode terminals	No
	Diode terminals	Negative diode plate	Yes

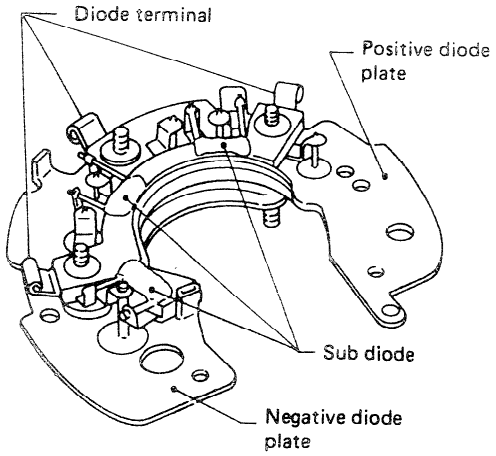
[HITACHI make]

LR165-768B, LR170-738B, LR180-725



SEL477P

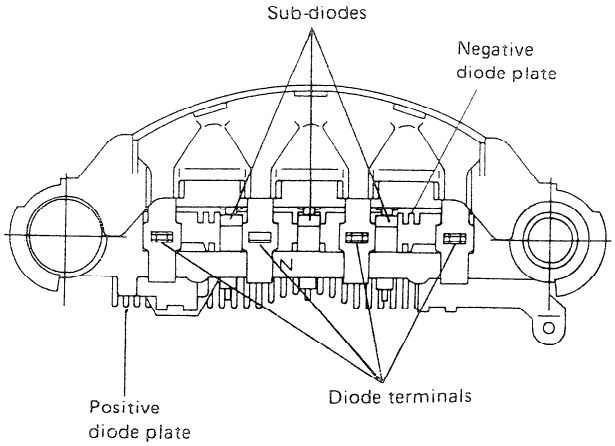
LR160-715, LR170-404B



SEL768D

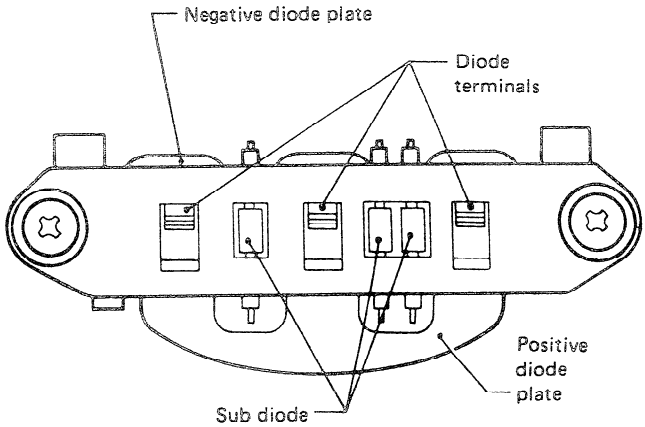
[MITSUBISHI make]

A5T03092, A5T03192



SEL385L

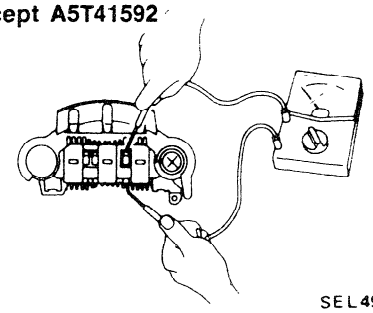
A5T41592



SEL767D

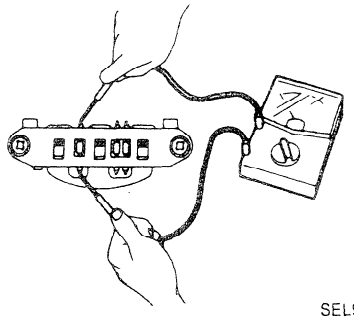
Diode Check (Cont'd)

[MITSUBISHI make]
Except A5T41592



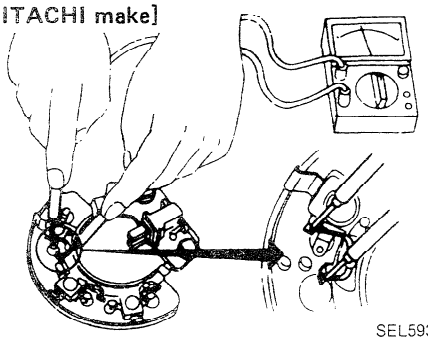
SEL494H

A5T41592



SEL910A

[HITACHI make]



SEL593A

SUB-DIODES
(Except LR165-768B, LR170-738B, LR180-725)

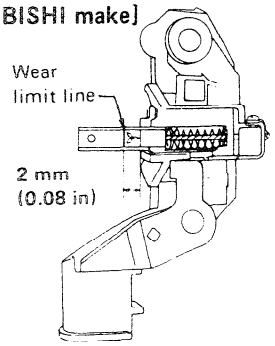
- Attach ohmmeter's probe to each end of diode to check for continuity.
- Continuity is N.G. ... Replace diode assembly.

Assembly

Carefully observe the following instructions.

- When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.

[MITSUBISHI make]



SEL386L

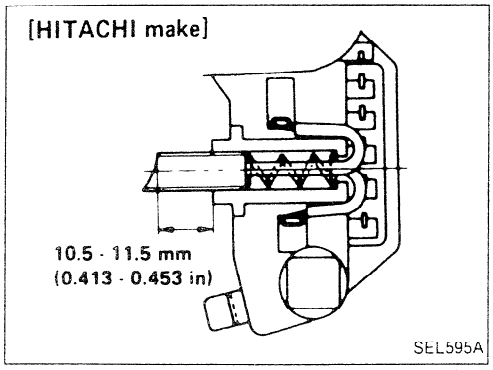
WHEN SOLDERING BRUSH LEAD WIRE

[MITSUBISHI make]

- Position brush so that its wear limit line protrudes 2 mm (0.08 in) beyond end face of brush holder.

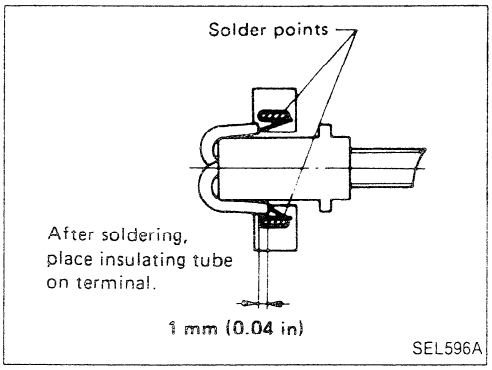
Assembly (Cont'd)

[HITACHI make]



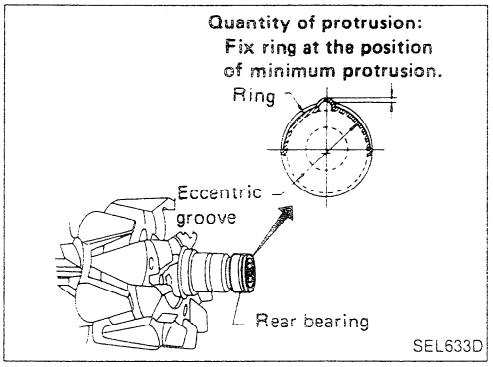
[HITACHI make]

(1) Position brush so that it extends 10.5 - 11.5 mm (0.413 - 0.453 in) from brush holder.



(2) Coil lead wire 1.5 times around terminal groove. Solder outside of terminal.

When soldering, be careful not to let solder adhere to insulating tube as it will weaken the tube and cause it to break.

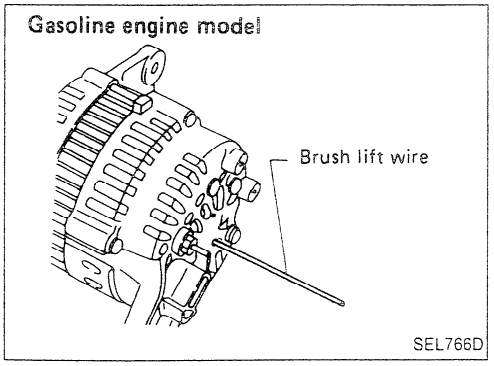


RING FITTING IN REAR BEARING

- Fix ring into groove in rear bearing so that it is as close to the adjacent area as possible.

CAUTION:

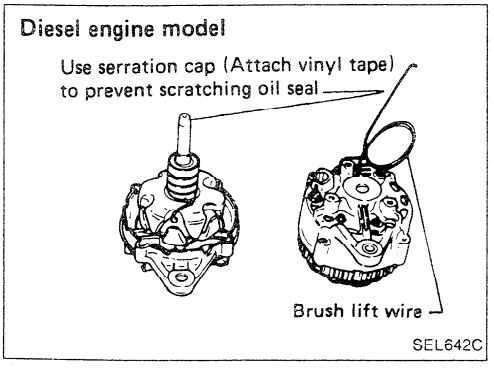
Do not reuse rear bearing after removal.



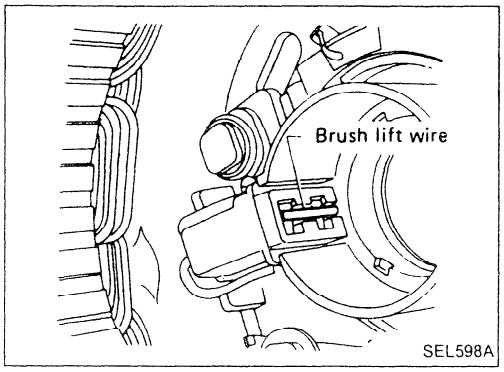
REAR COVER INSTALLATION (Except LR165-708B, LR170-738B, LR180-725)

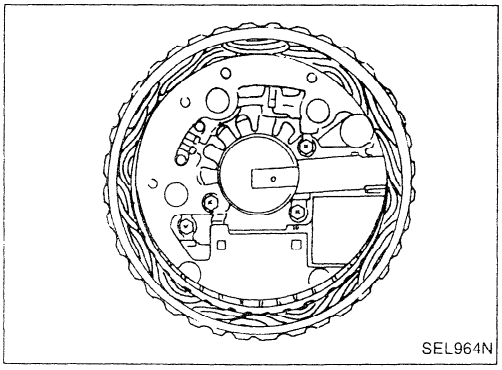
(1) Before installing front cover with pulley and rotor with rear cover, push brush up with fingers and retain brush by inserting brush lift wire into brush lift hole from outside.

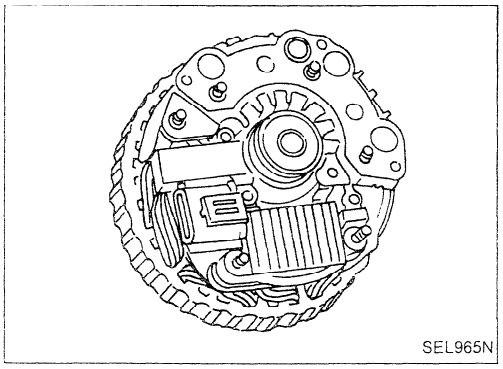
(2) After installing front and rear sides of alternator, pull out brush lift wire.



Assembly (Cont'd)







REAR COVER INSTALLATION (LR165-708B, LR170-738B, LR180-725)

(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 (S.D.S.)

ALTERNATOR

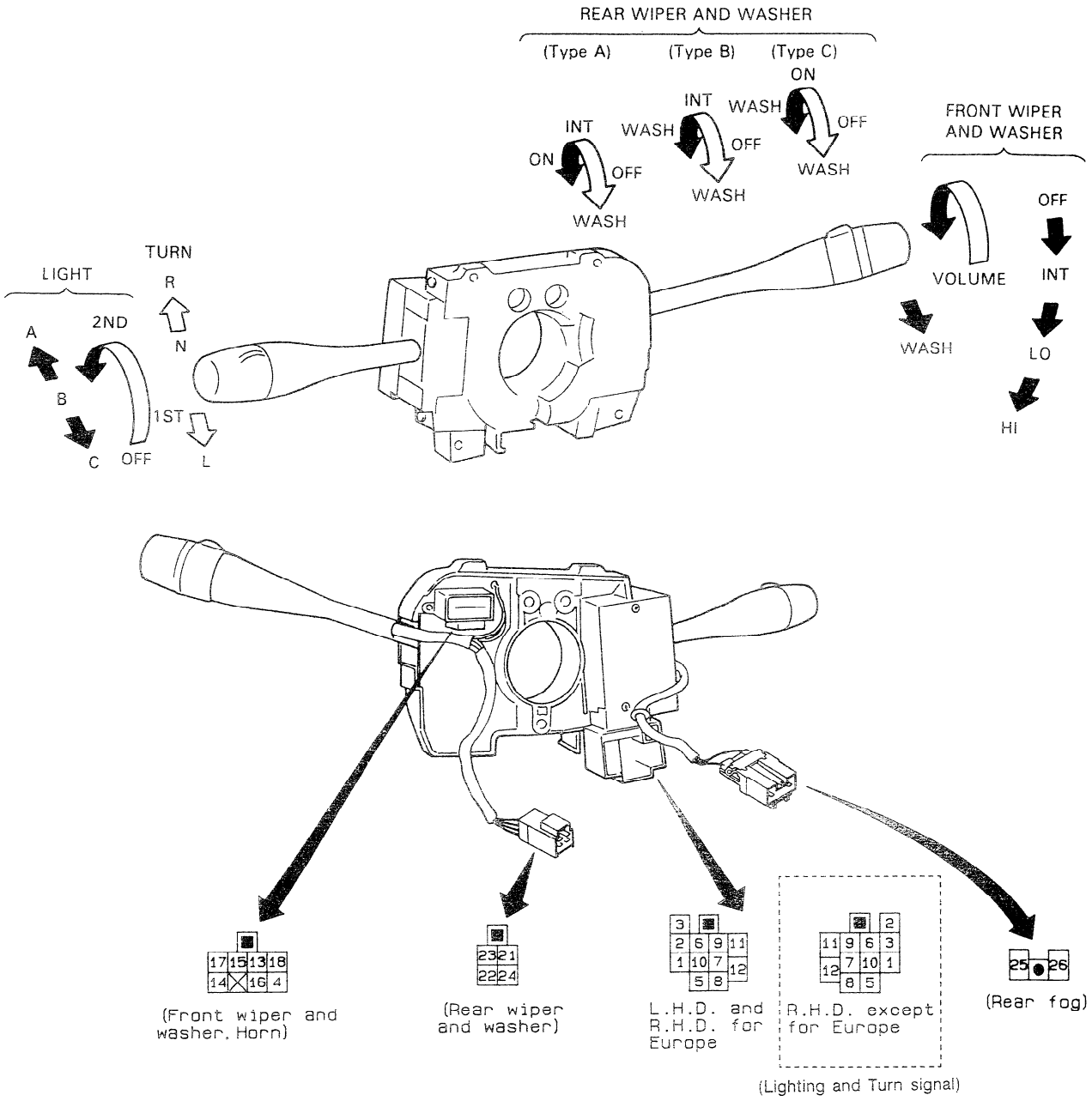
Type		LR165-708B	A5T03092	LR170-738B	A5T03192	LR170-404B	LR160-715	A5T41592
		HITACHI	MITSUBISHI	HITACHI	MITSUBISHI	HITACHI	HITACHI	MITSUBISHI
Applied model		A		B		C	D	
Nominal rating	V-A	12-65		12-70		12-70	12-60	
Ground polarity		Negative						
Minimum revolutions under no-load (when 13.5 volts is applied)	rpm	Less than 950	Less than 1,300	Less than 950	Less than 1,300	Less than 900	Less than 950	Less than 1,100
Hot output current (when 13.5 volts is applied)	A/rpm	More than 17/1,300 More than 48/2,500 More than 62/5,000	More than 16/1,300 More than 50/2,500	More than 22/1,300 More than 50/2,500 More than 67/5,000	More than 21/1,300 More than 50/2,500	More than 26/1,300 More than 56/2,500 More than 66/5,500	More than 17/1,300 More than 48/2,500 More than 57/5,000	More than 16/1,300 More than 50/2,500 More than 60/5,000 (when 14 volts is applied)
Regulated output voltage	V	14.1 - 14.7						
Minimum length of brush	mm (in)	6.0 (0.236)	8.0 (0.315)	6.0 (0.236)	8.0 (0.315)	6.0 (0.236)	7.0 (0.276)	8.0 (0.315)
Brush spring pressure	N (g, oz)	1.079 - 3.432 (110 - 350, 3.88 - 12.34)	3.138 - 4.315 (320 - 440, 11.29 - 15.52)	1.079 - 3.432 (110 - 350, 3.88 - 12.34)	3.138 - 4.315 (320 - 440, 11.29 - 15.52)	1.765 - 3.531 (180 - 360, 6.35 - 12.70)	2.746 - 3.923 (280 - 400, 9.88 - 14.11)	3.040 - 4.217 (310 - 430, 10.93 - 15.17)
Slip ring minimum diameter	mm (in)	26.0 (1.024)	22.1 (0.870)	26.0 (1.024)	22.1 (0.870)	30.6 (1.205)	30.6 (1.205)	22.2 (0.874)

Type		LR180-725	A2T13894	LR170-417B
		HITACHI	MITSUBISHI	HITACHI
Applied model		F	E	G
Nominal rating	V-A	12 - 80		12 - 70
Ground polarity		Negative		
Minimum revolution under no-load (When 13.5 volts is applied)	rpm	950	1,300	1,000 (at 14 volts)
Hot output current (When 13.5 volts is applied)	A/rpm	More than 23/1,300 More than 63/2,500 More than 77/5,000	More than 22/1,300 More than 65/2,500	More than 26/1,300 More than 56/2,500 More than 66/5,000
Regulated output voltage	V	14.1 - 14.7		
Minimum length of brush	mm (in)	6.0 (0.236)	8.0 (0.315)	6.0 (0.236)
Brush spring pressure	N (g, oz)	1.000 - 3.432 (102 - 350, 3.60 - 12.34)	3.138 - 4.315 (320 - 440, 11.29 - 15.52)	1.569 - 3.334 (160 - 340, 5.64 - 11.99)
Slip ring minimum outer diameter	mm (in)	26.0 (1.024)	22.1 (0.870)	33.6 (1.323)

Applied model

Engine	E10	CD17	CD20	GA13D, GA14D and GA16D			SR20D	
Traction system	2WD	2WD	2WD	2WD	2WD option	4WD	2WD	4WD
	D	C	G	A	B		E	F

Combination Switch/Check



LIGHTING SWITCH

	OFF			1ST			2ND		
	A	B	C	A	B	C	A	B	C
5		○					○	○	○
6		○					○	○	
7									○
8		○					○	○	○
9		○					○	○	
10									○
11			○	○	○	○	○	○	○
12			○	○	○	○	○	○	○
25							○	○	○
26							○	○	○

TURN SIGNAL SWITCH

	R	N	L
1	○		○
2	○		
3			○

WIPER SWITCH

	OFF	INT	LO	HI	WASH
13					○
14	○	○	○		
	○	○			
		○			
15					○
16				○	
17	○		○	○	○
18					○

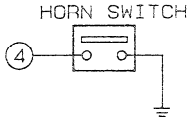
WIPER AMPLIFIER (In combination switch)
INTERMITTENT WIPER VOLUME

(With intermittent)

	OFF	LO	HI	WASH
13	○			
14	○	○		
15				
16			○	
17		○	○	○
18				○

(Without intermittent)

HORN SWITCH



REAR WIPER SWITCH

	WASH	OFF	INT	ON
21			○	
22				○
23	○			
24	○		○	○

(TYPE A)

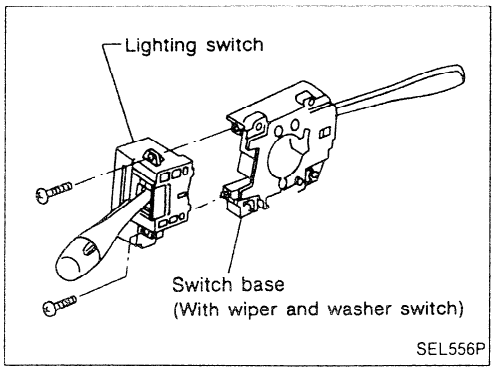
	WASH	OFF	INT	WASH
21			○	○
22				
23	○			○
24	○		○	○

(TYPE B)

	WASH	OFF	ON	WASH
21	○	○	○	○
22		○		
23	○			○
24	○		○	○

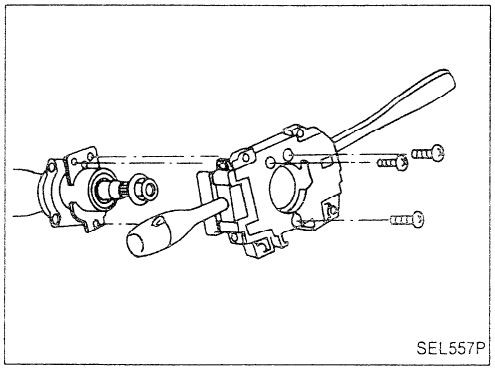
(TYPE C)

SEL268Q



Replacement

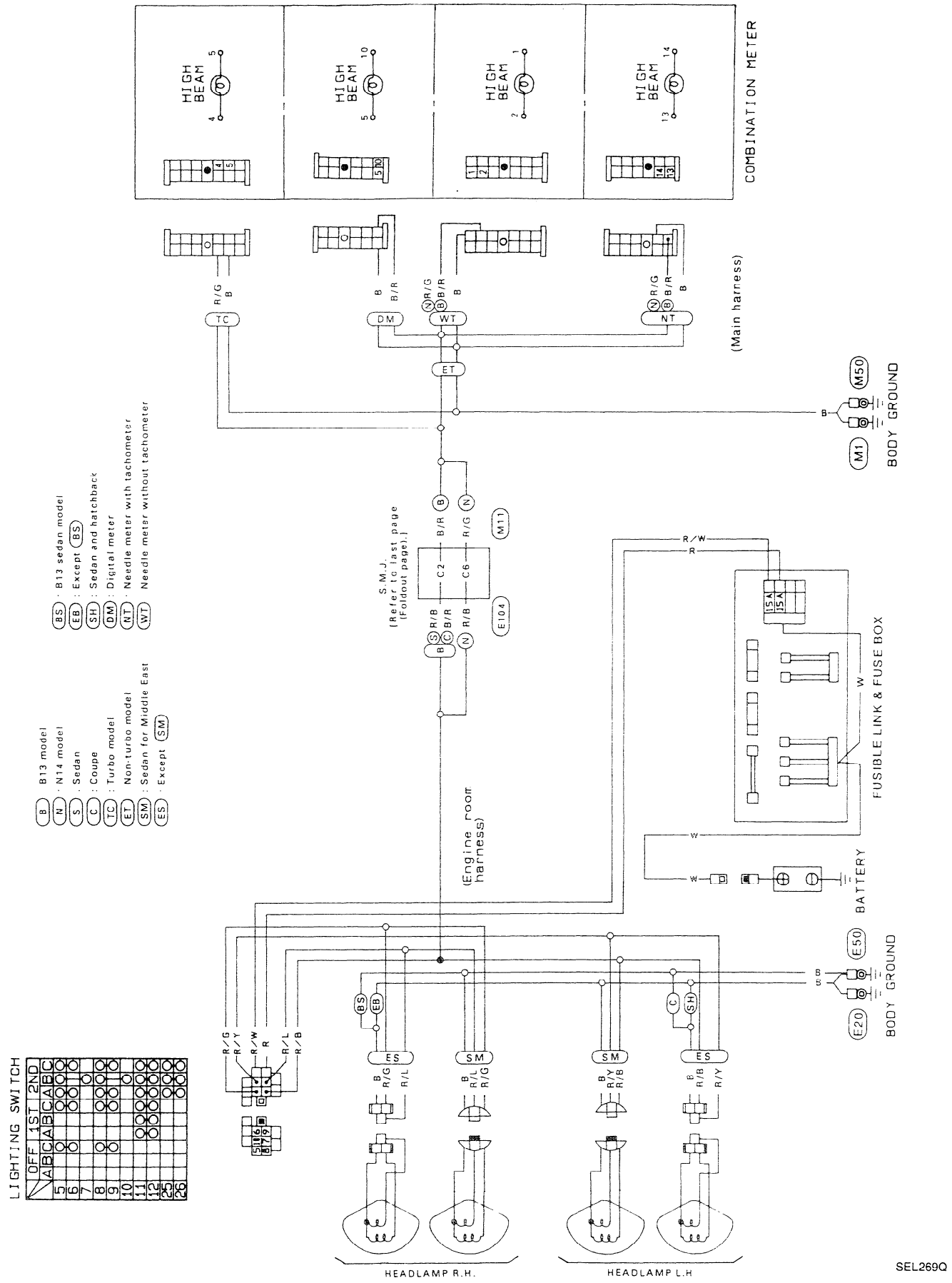
- Lighting switch can be replaced without removing combination switch base.



- To remove combination switch base, remove base attaching screw.

Wiring Diagram

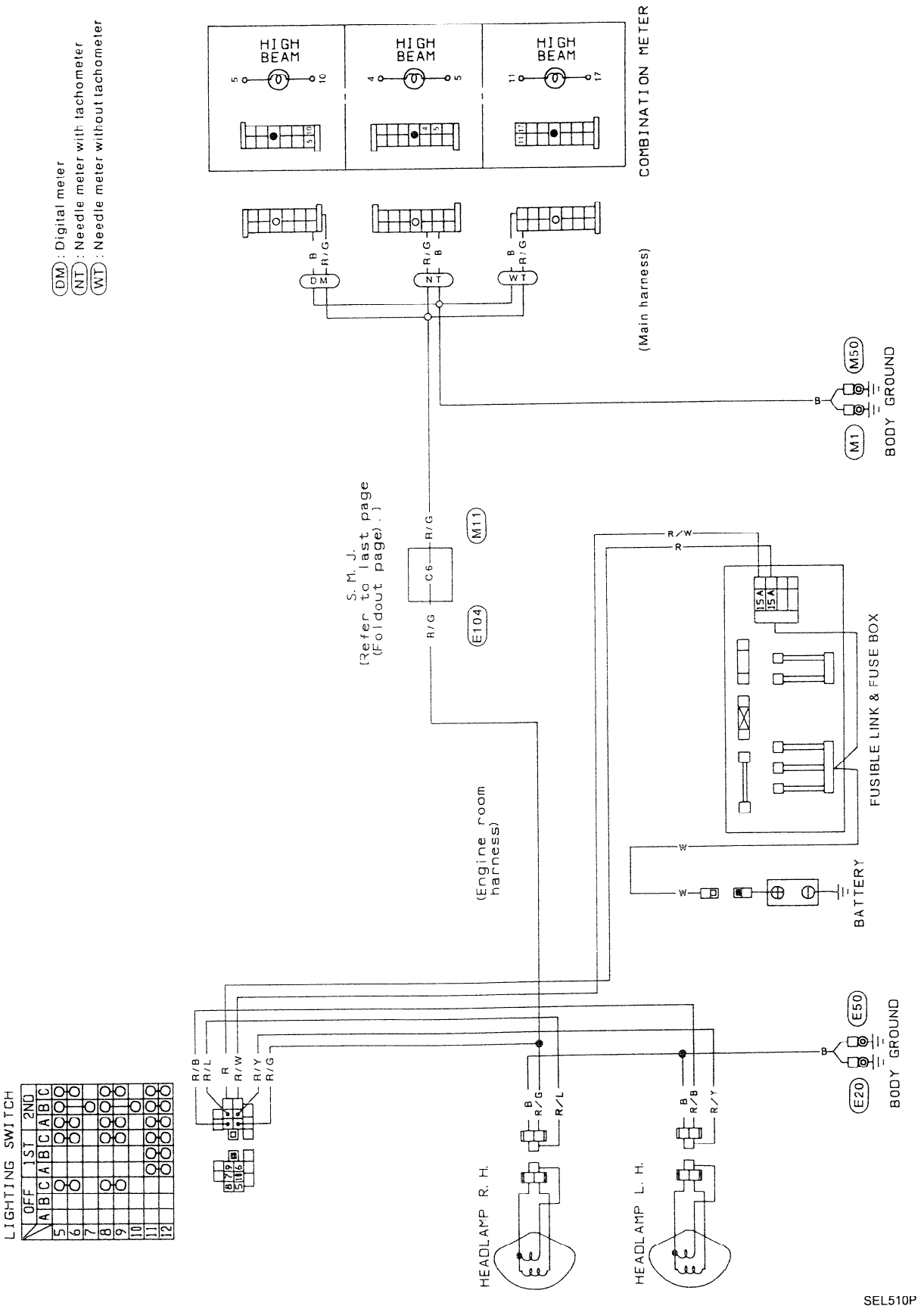
L.H.D. MODELS



SEL269Q

Wiring Diagram (Cont'd)

R.H.D. MODELS



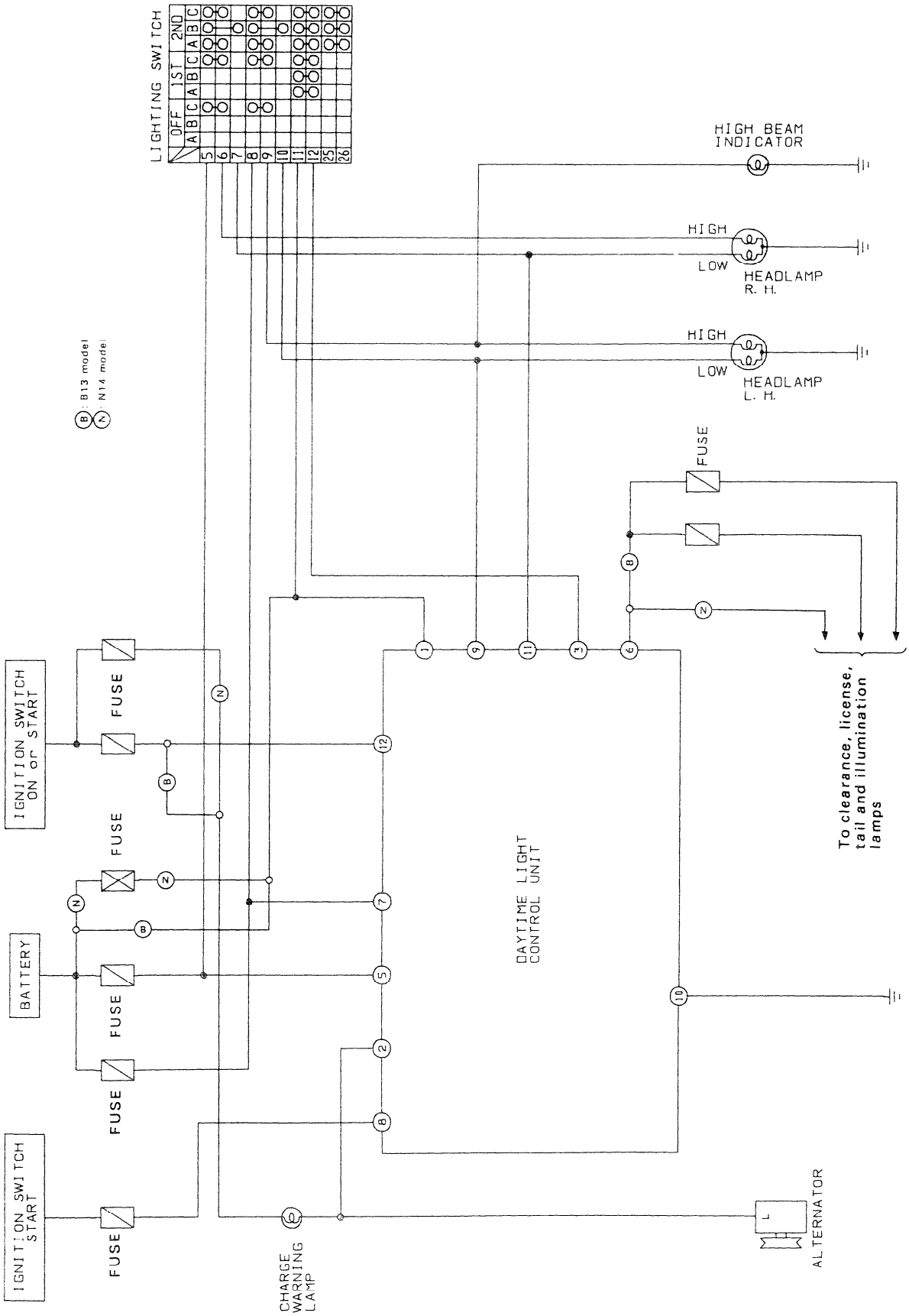
Operation

After starting the engine with the lighting switch in the "OFF" position, the headlamp low beam and clearance, tail, license and instrument illumination lamps automatically turn on. 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	O	X	X	O	O	X	O	X	X	O	X	X	O	O	X	O
	Low beam	X	X	X	X	X	X	X	O	X	O	O	O	X	X	X	X	O	X
Clearance and tail lamp		X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
License and instrument illumination lamp		X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

O : Lamp "ON"
X : Lamp "OFF"
□ : Added functions

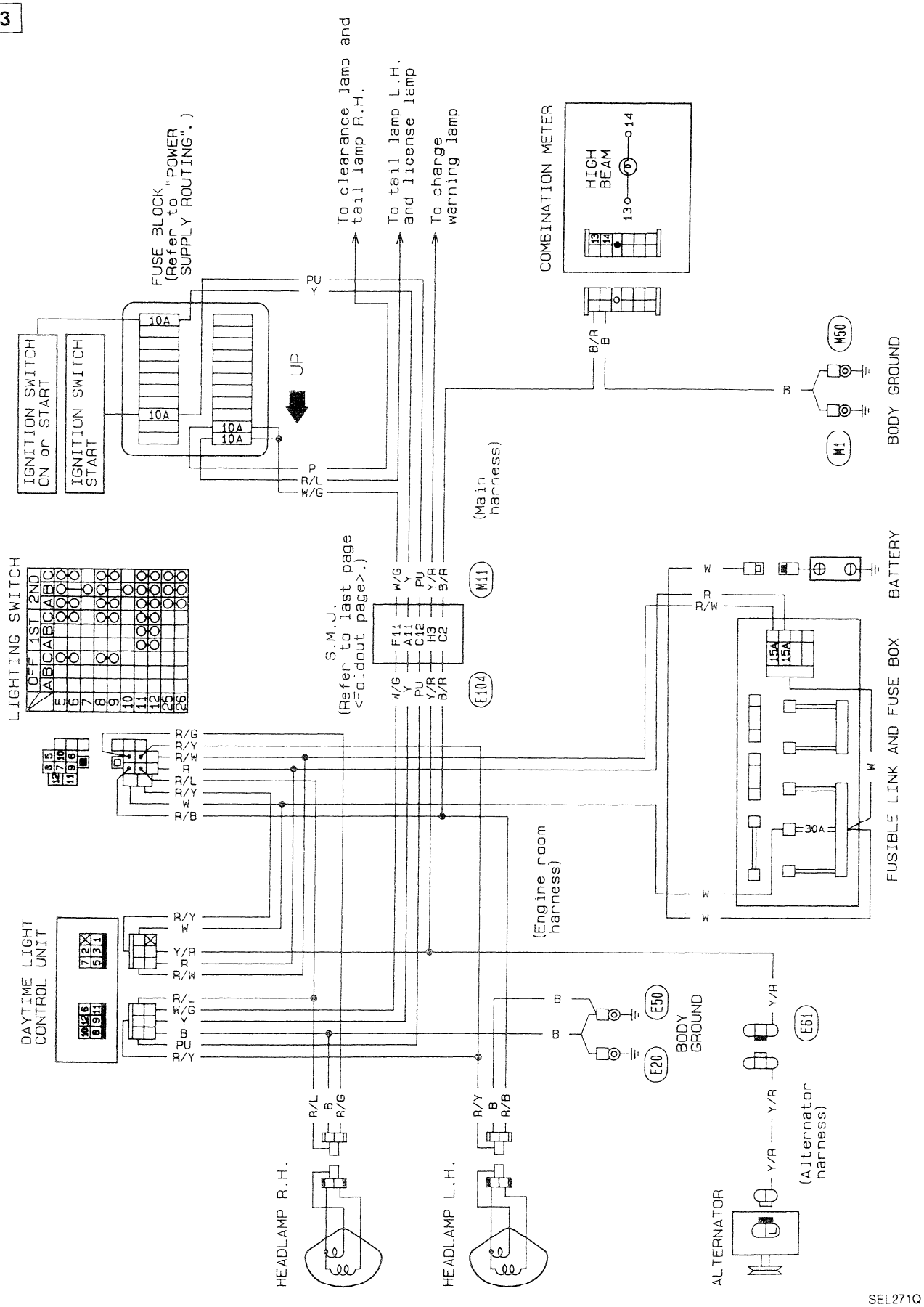
Schematic



SEL270Q

Wiring Diagram

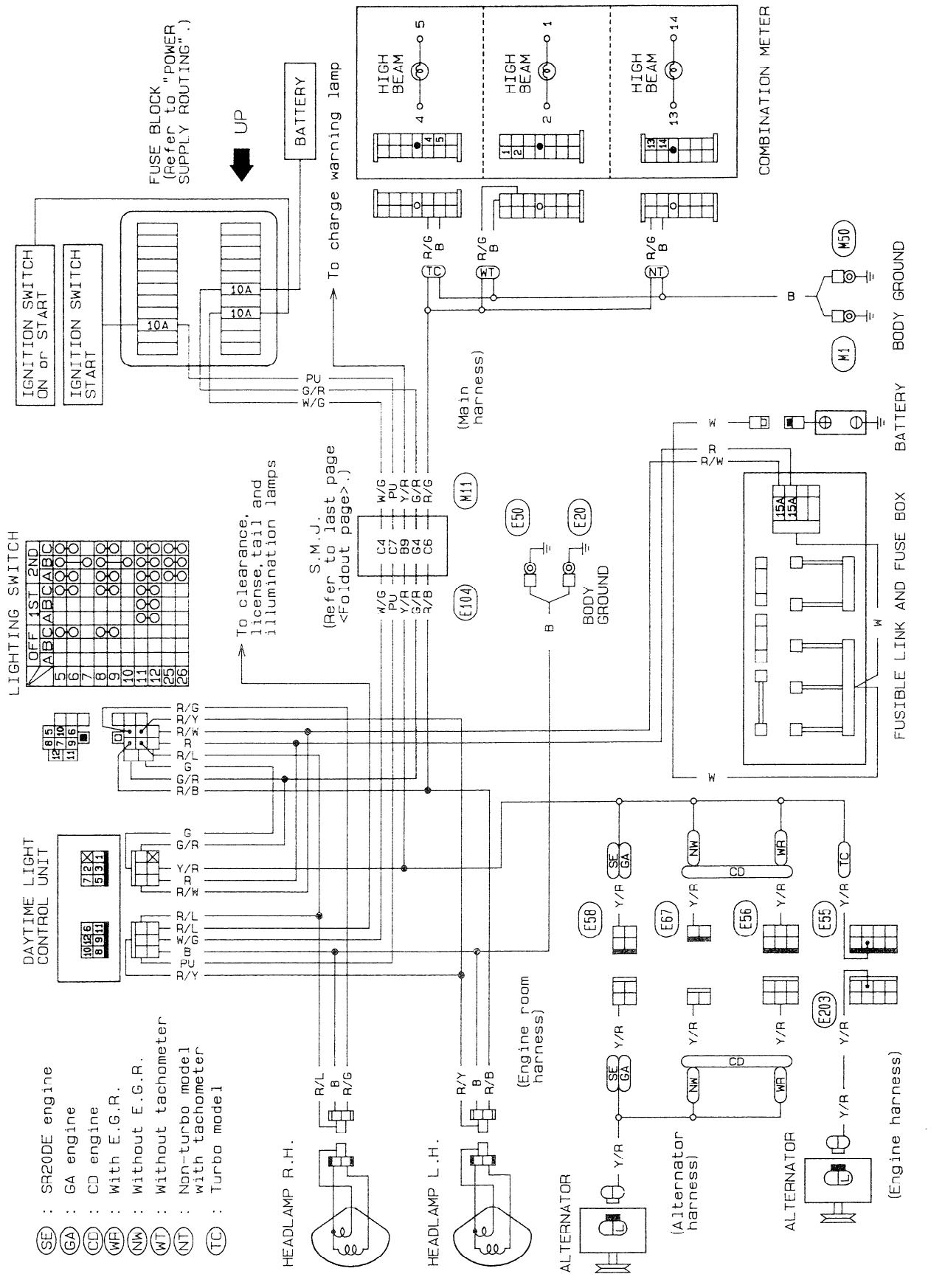
B13



SEL271Q

Wiring Diagram (Cont'd)

N14



SEL272Q

Operation

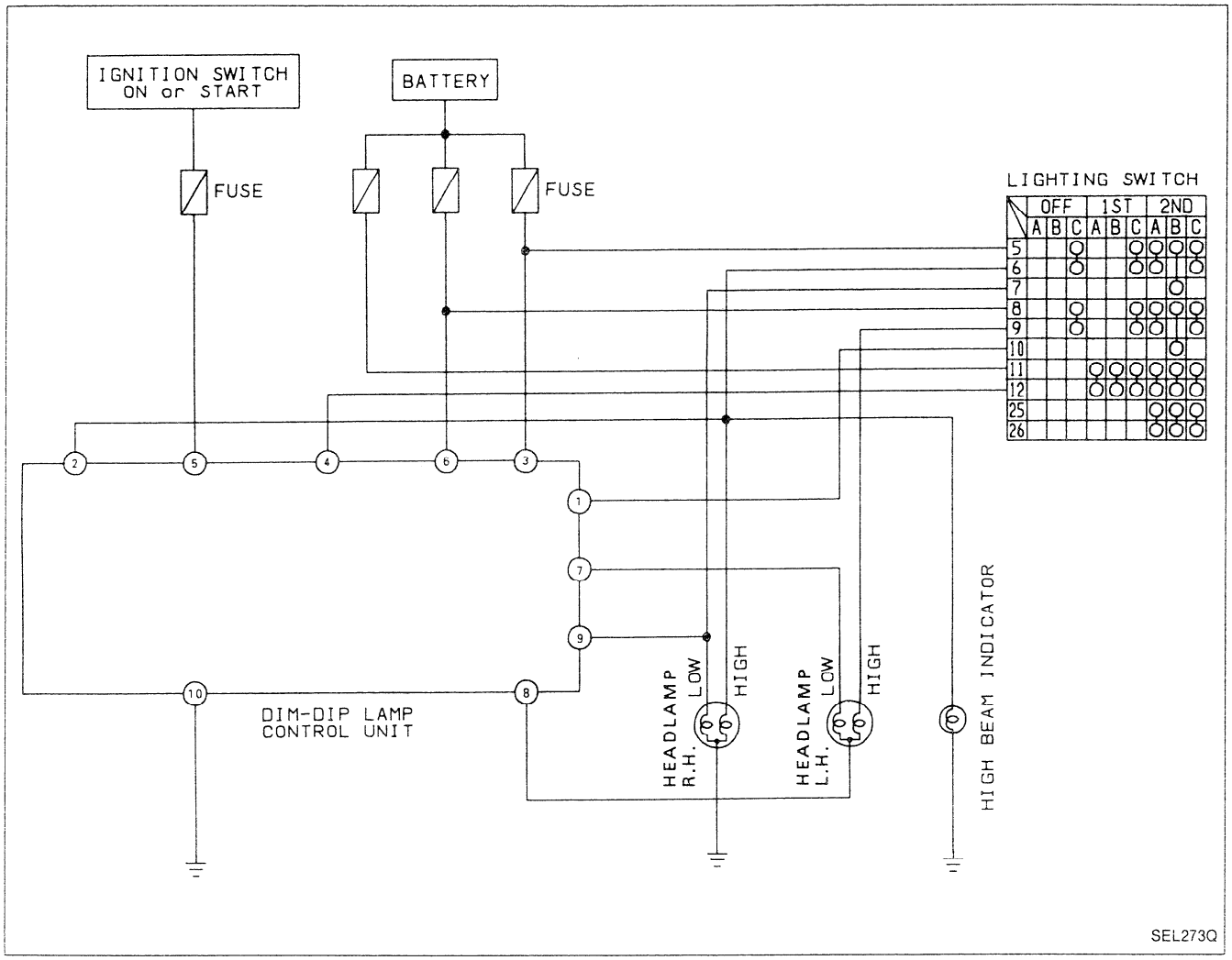
When ignition switch is in the "ON" position with the lighting switch in the "1ST" position, the headlamp low beam comes on dimly to function as a clearance lamp. Lighting switch operations other than the above are the same as conventional light systems.

Ignition switch		OFF or ACC									ON								
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	O	X	X	O	O	X	O	X	X	O	X	X	O	O	X	O
	Low beam	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	O	X
	Dim-dip (Low beam)	X	X	X	X	X	X	X	X	X	X	X	X	O	O	X	X	X	X
Clearance, tail, license and illumination lamps		X	X	X	O	O	O	O	O	O	X	X	X	O	O	O	O	O	O

O : Lamp "ON"
X : Lamp "OFF"
□ : Added functions

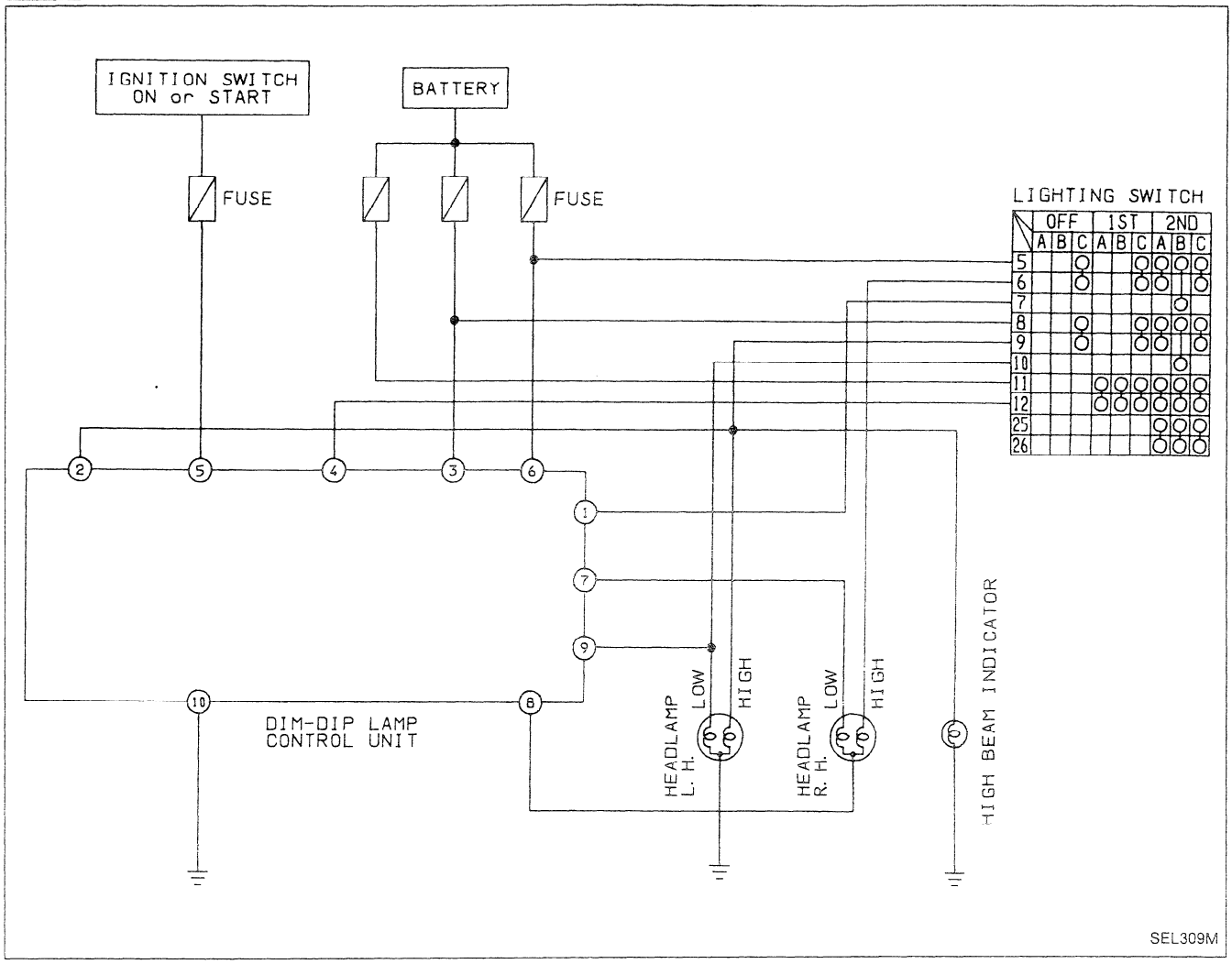
B13

Schematic



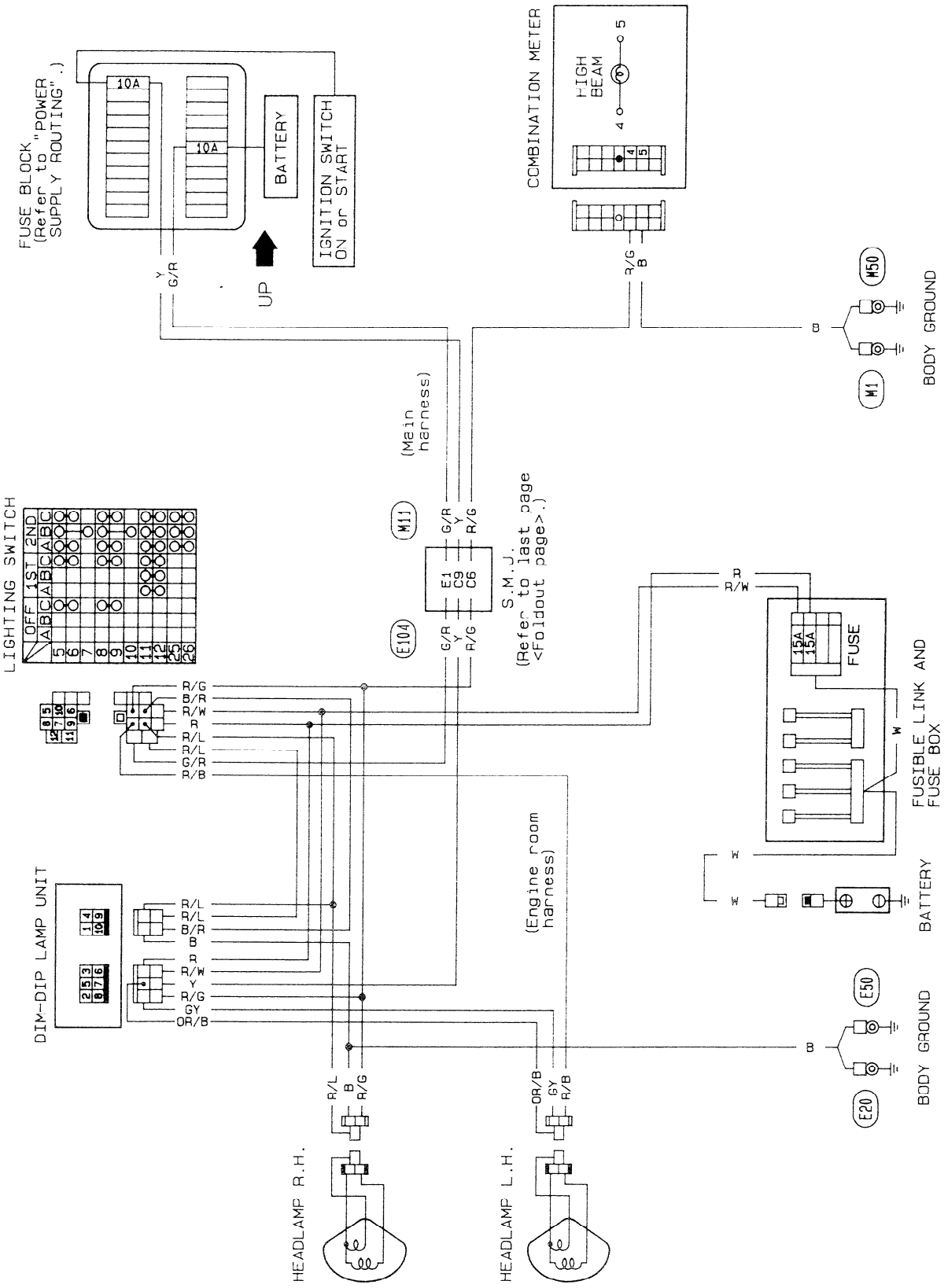
N14

Schematic (Cont'd)



Wiring Diagram

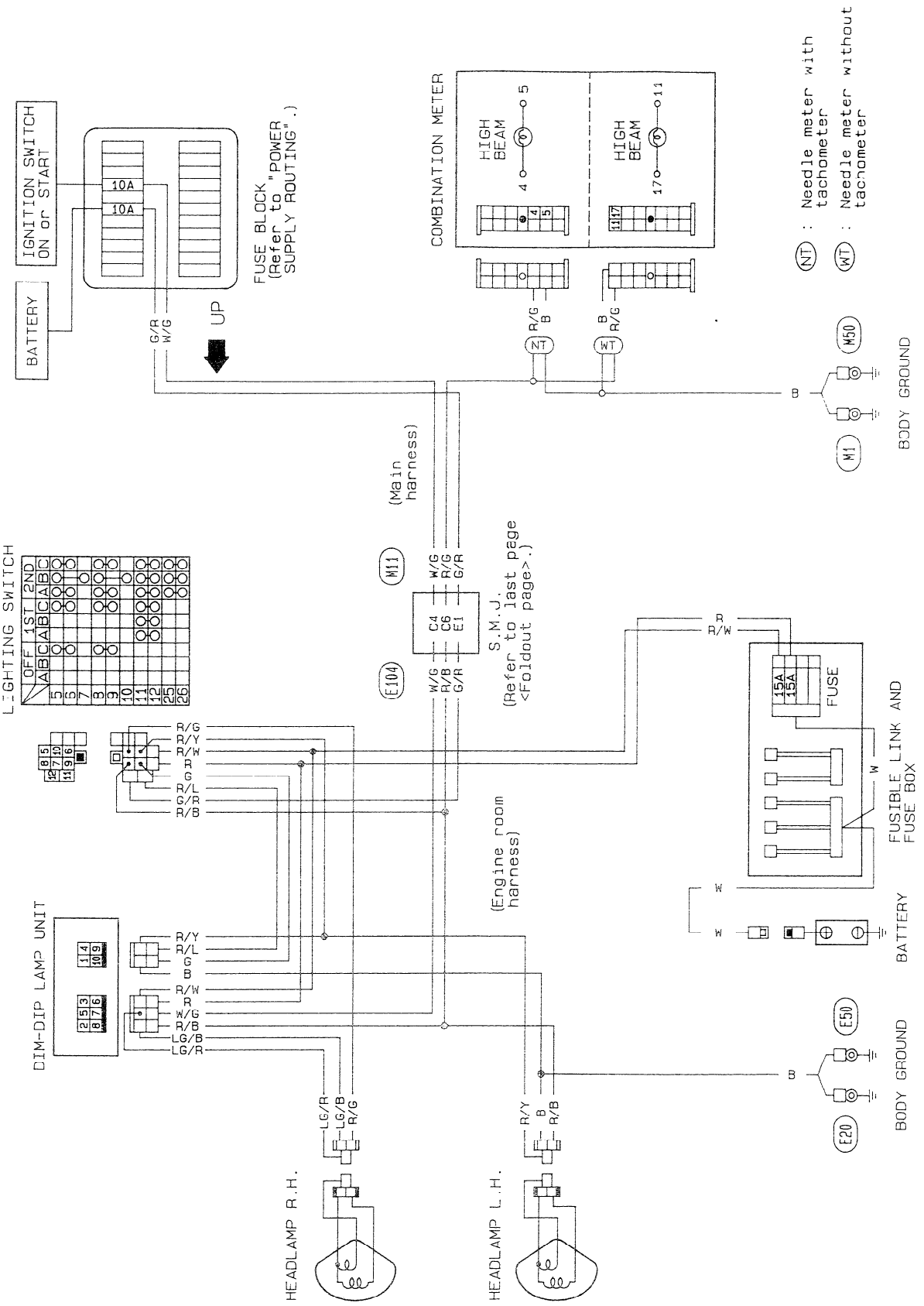
B13



SEL274Q

Wiring Diagram (Cont'd)

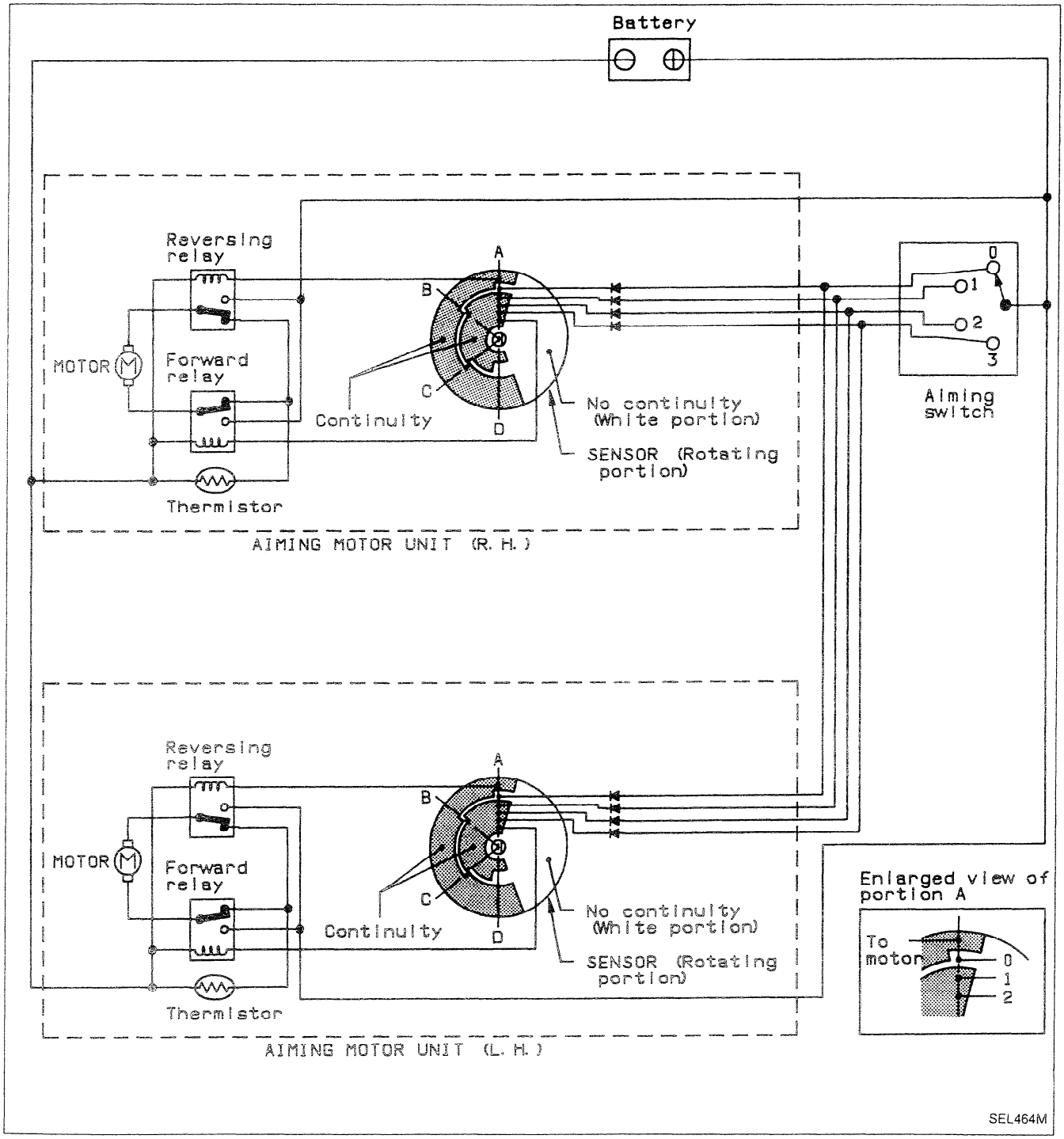
N14



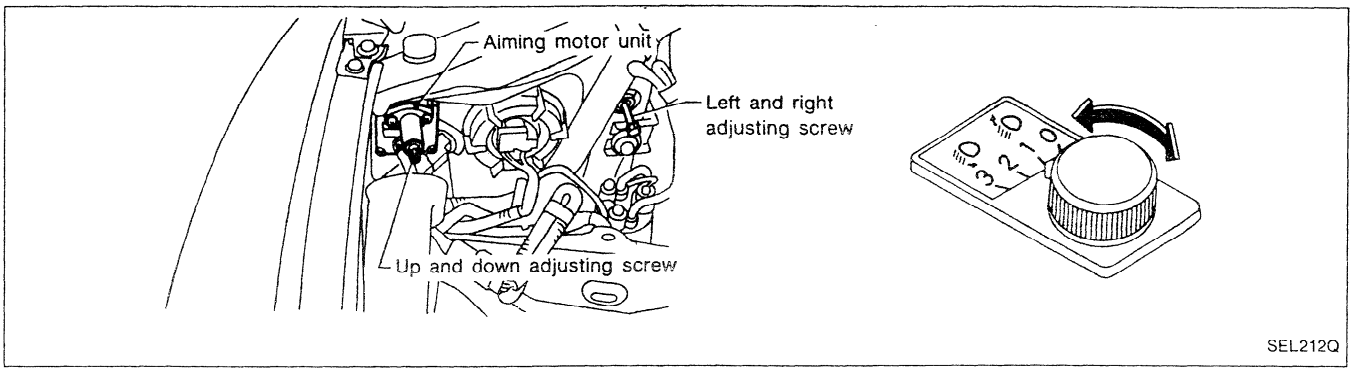
SEL407Q

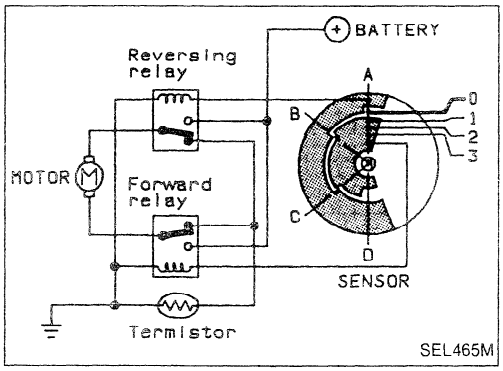
Description

- The vertical direction of the headlamp projection can be adjusted from inside the vehicle to prevent the headlight beam axis from facing upward due to a change in the number of occupants and load conditions in the vehicle.



Description (Cont'd)



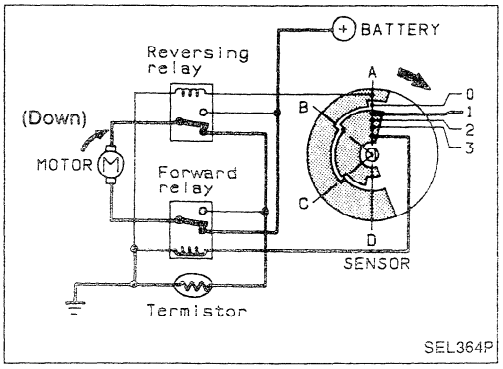


CIRCUIT OPERATION

[Example]

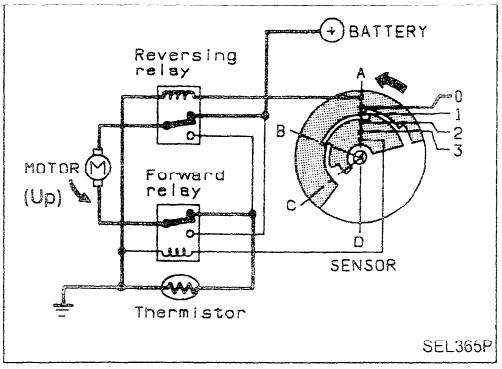
Aiming switch "0"

- When the aiming switch is set to "0", the motor will not start because the power terminals are positioned at the nonconductive section of the sensor's rotary unit.



Aiming switch "0" → "1"

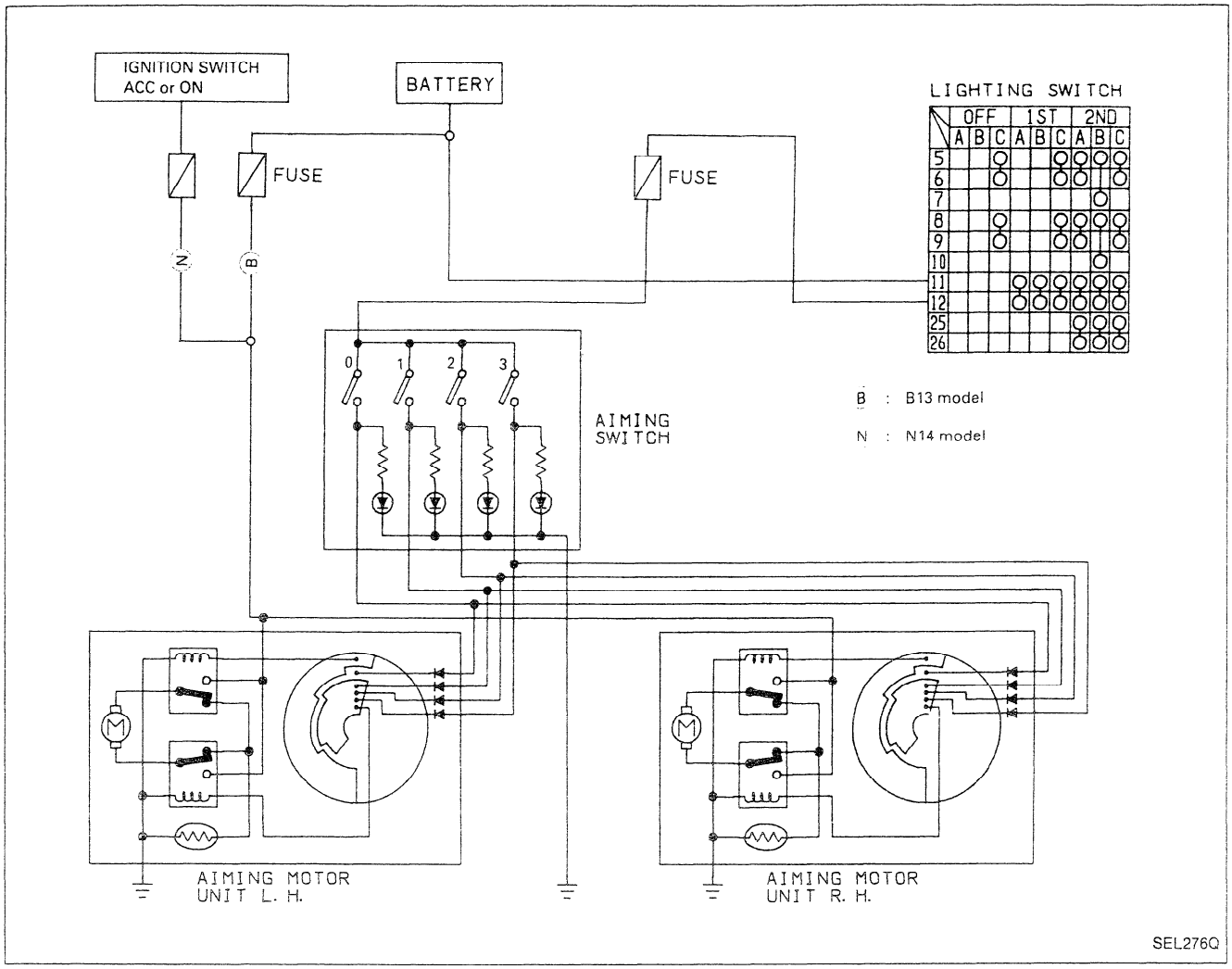
- When the aiming switch is moved from "0" to "1", power is applied to the motor through the relay operated by the sensor's conductive section. The headlamps will then move in the "DOWN" direction.
- The motor continues to rotate while the rotary unit of the sensor moves from point A to point B.
- The power terminals will then be positioned at the nonconductive section, disconnecting the power to the motor. Then motor then stops.



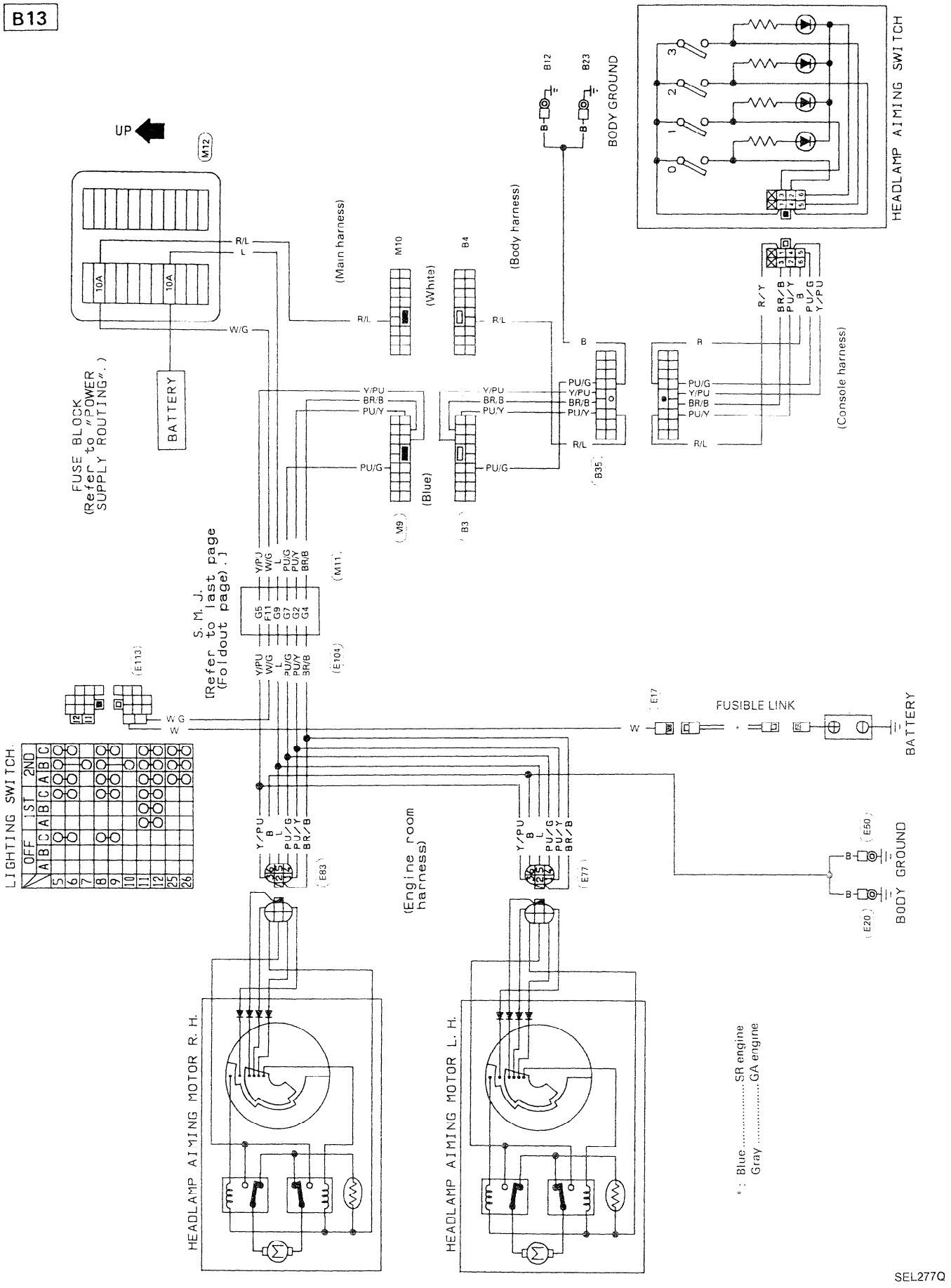
Aiming switch "1" → "0"

- When the aiming switch is moved from "1" to "0", power is applied to the motor through the relay operated by the conductive section of the sensor. 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.

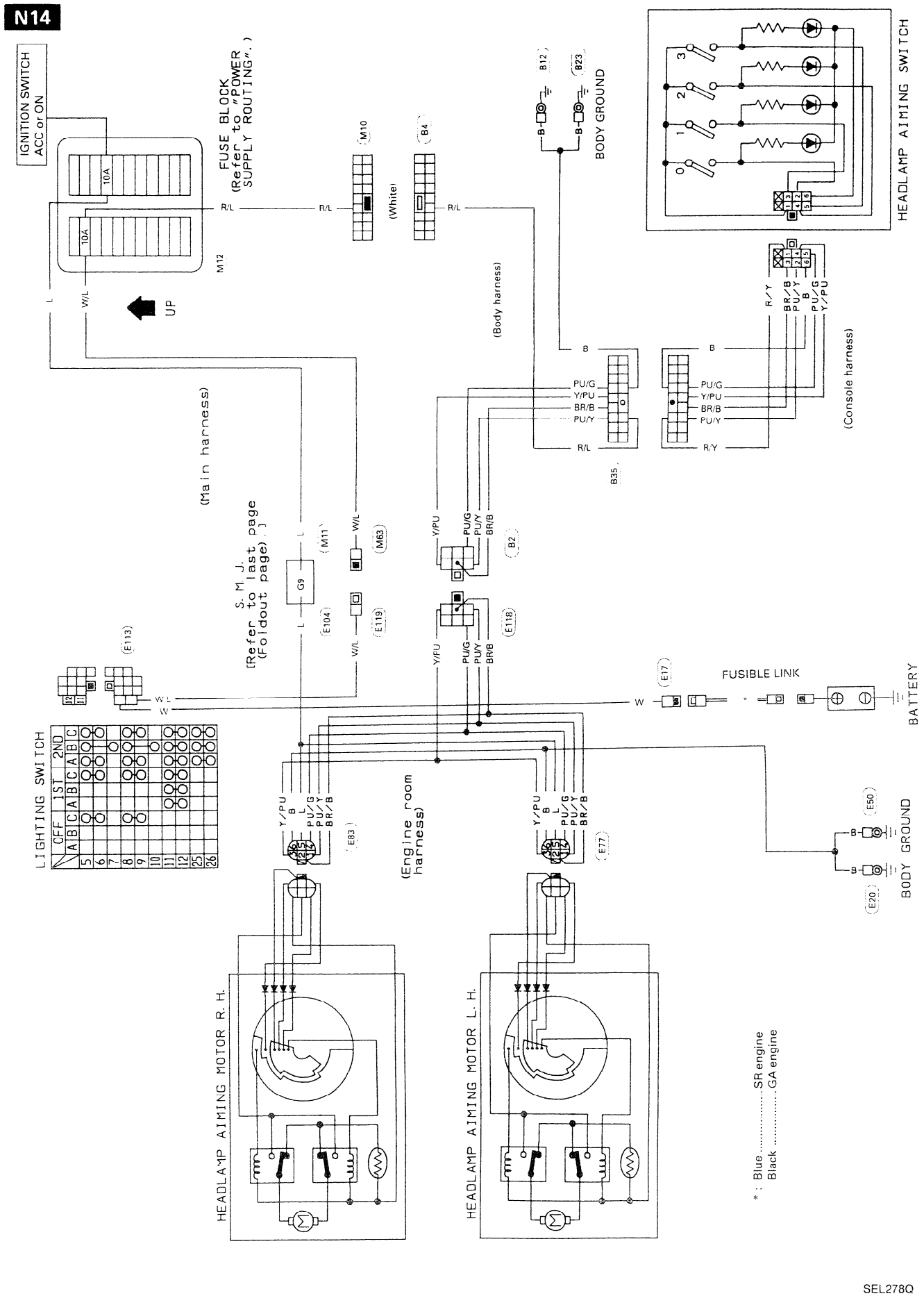
Schematic


IGNITION SWITCH
ACC or ON
BATTERY
FUSE
FUSE
N
B
LIGHTING SWITCH
OFF
1ST
2ND
A B C A B C A B C
5
6
7
8
9
10
11
12
25
26
0 1 2 3
AIMING
SWITCH
B : B13 model
N : N14 model
AIMING MOTOR
UNIT L. H.
AIMING MOTOR
UNIT R. H.
SEL276Q

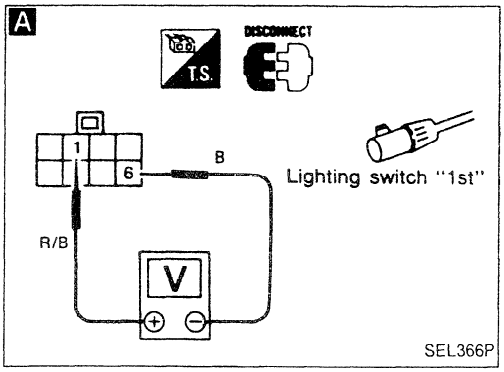
Wiring Diagram

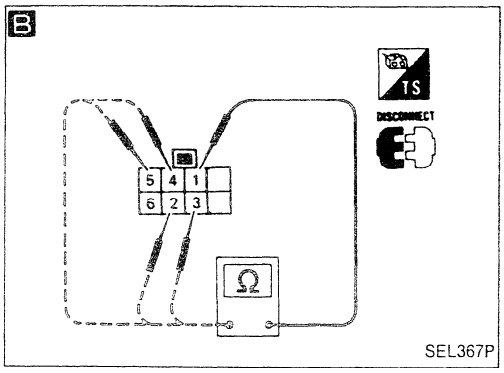


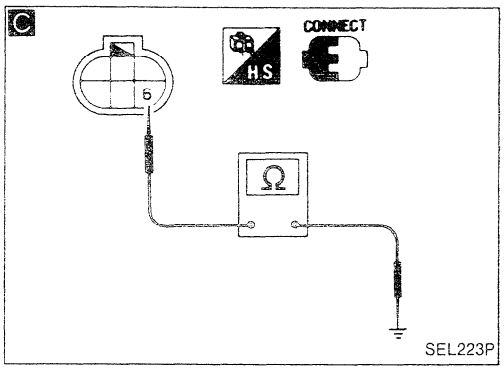
Wiring Diagram (Cont'd)

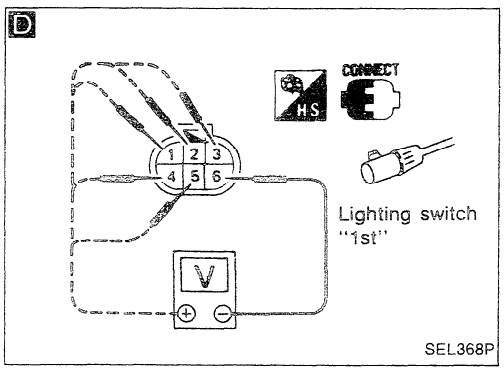


SEL278Q









Trouble-diagnosis

SYMPTOM: Headlamp aiming does not operate.

A

POWER SUPPLY CIRCUIT CHECK (For aiming switch)
Check if 12 volts exist between terminals ① and ⑥.

Voltmeter terminals (+)	Voltmeter terminals (−)	Voltage [V]
①	⑥	Approx. 12

N.G. → Check 10A fuse at fuse block. (Refer to "POWER SUPPLY ROUTING".)

O.K. ↓

B

AIMING SWITCH CHECK
Check continuity between terminals at each switch position

Switch position \ Terminal	①	②	③	④	⑤
0	○—○				
1	○—	—○			
2	○—	—	—○		
3	○—	—	—	—○	

N.G. → Replace aiming switch.

O.K. ↓

C

GROUND CIRCUIT CHECK FOR AIMING MOTOR
Check continuity between terminals ⑥ and body ground.
Continuity exists ... O.K.

N.G. → Repair harness between aiming motor and body ground.

O.K. ↓

D

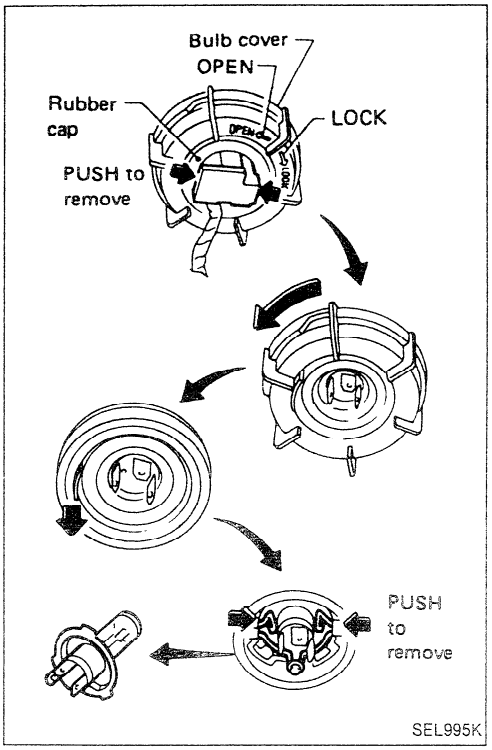
POWER SUPPLY CIRCUIT CHECK (For aiming motor unit)
Check if 12 volts exist between terminals ①, ②, ③, ④, ⑤ and ⑥.

Voltmeter terminals (+)	Voltmeter terminals (−)	Voltage [V]	Aiming switch position
①	⑥	Approx. 12	"0"
		0	Except "0"
②		Approx. 12	"1"
		0	Except "1"
③		Approx. 12	"2"
		0	Except "2"
④		Approx. 12	"3"
		0	Except "3"
⑤		Approx. 12	—

N.G. → Check harness between aiming switch and aiming motor unit

O.K. ↓

Replace aiming motor unit.



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. Disconnect the harness connector from the back side of the bulb.
3. Turn the bulb retaining ring counterclockwise until it is free from the headlamp reflector, and then remove it.
4. Pull off the rubber cap.
5. Remove the headlamp bulb carefully. Do not shake or rotate the bulb when removing it.
6. Install in the reverse order of removal.

CAUTION:

- **Do not leave the bulb out of the headlamp reflector for a long period of time as dust, moisture, smoke, etc. may enter the headlamp body and affect the performance of the headlamp. Thus, the headlamp bulb should not be removed from the headlamp reflector until just before a replacement bulb is to be installed.**

Aiming Adjustment

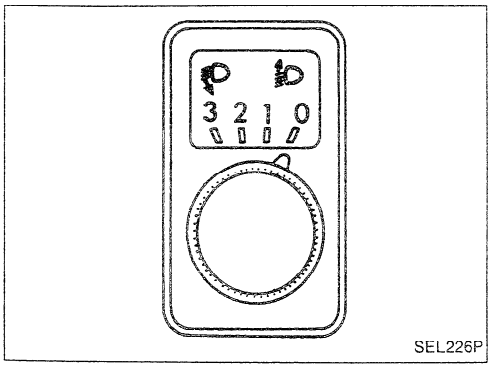
When performing headlamp aiming adjustment, use an aiming machine, aiming wall screen or headlamp tester. For operating instructions of any aimer, it should be in good repair, calibrated and used according to respective operation manuals supplied with the unit.

If any aimer is not available, aiming adjustment can be done as follows:

For details, refer to the regulations in your own country.

CAUTION:

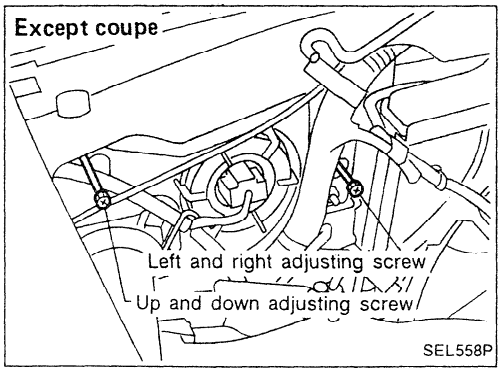
a. **Keep all tires inflated to correct pressures.**
b. **Place vehicle and tester on one and same flat surface.**
c. **See that there is no-load in vehicle (coolant, engine oil filled up to correct level and full fuel tank) other than the driver (or equivalent weight placed in driver's position).**

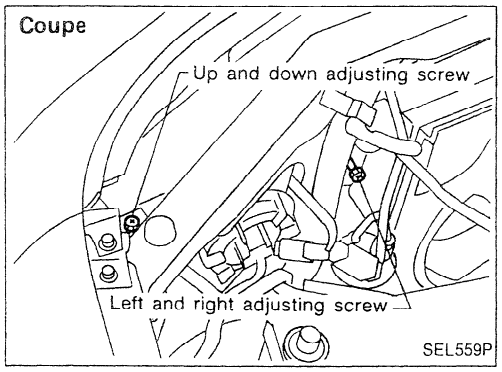


CAUTION:

Be sure aiming switch is set to "0" when performing aiming adjustment on vehicles equipped with headlamp aiming control.

Aiming Adjustment (Cont'd)

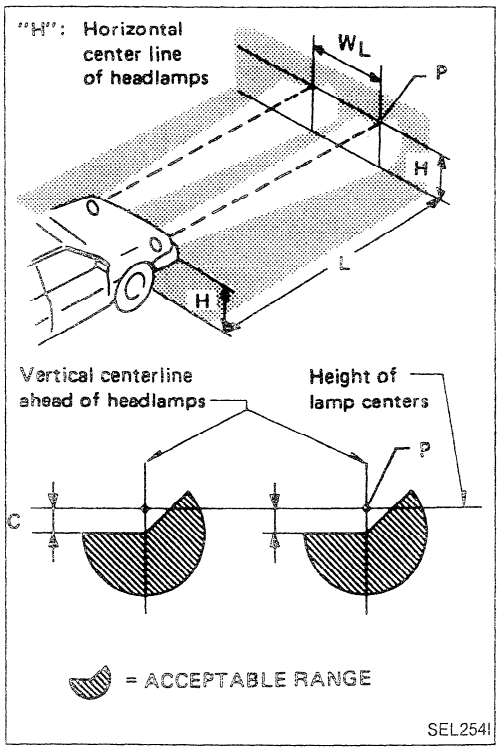




LOW BEAM

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.**

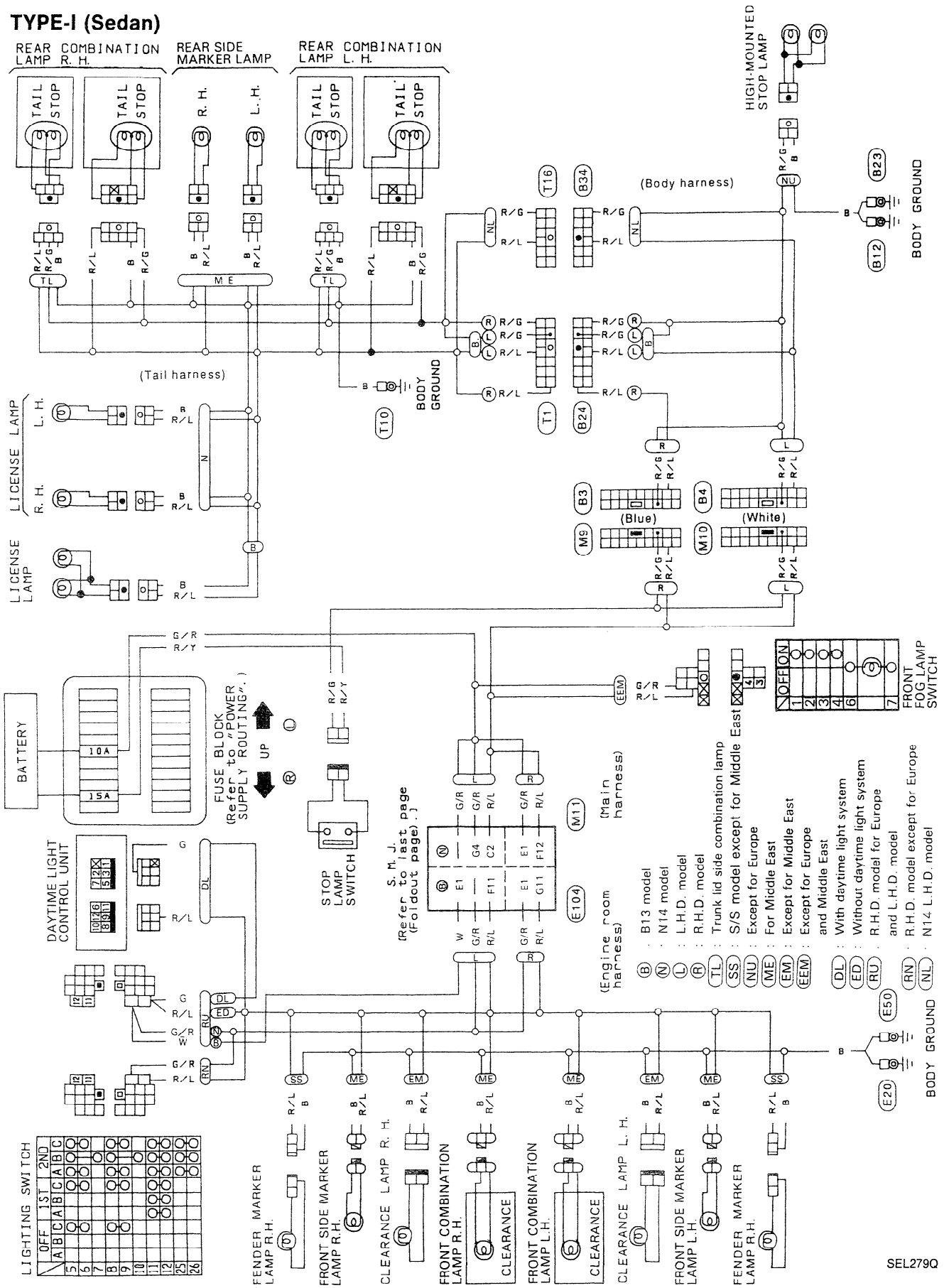


a. **Adjust headlamps so that main axis of light is parallel to center line of body and is aligned with point P shown in illustration.**
b. **Figure to the left shows headlamp aiming pattern for driving on right side of road; for driving on left side of road, aiming pattern is reversed.**
c. **Dotted 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)**

Clearance, License, Tail and Stop Lamps/Wiring Diagram

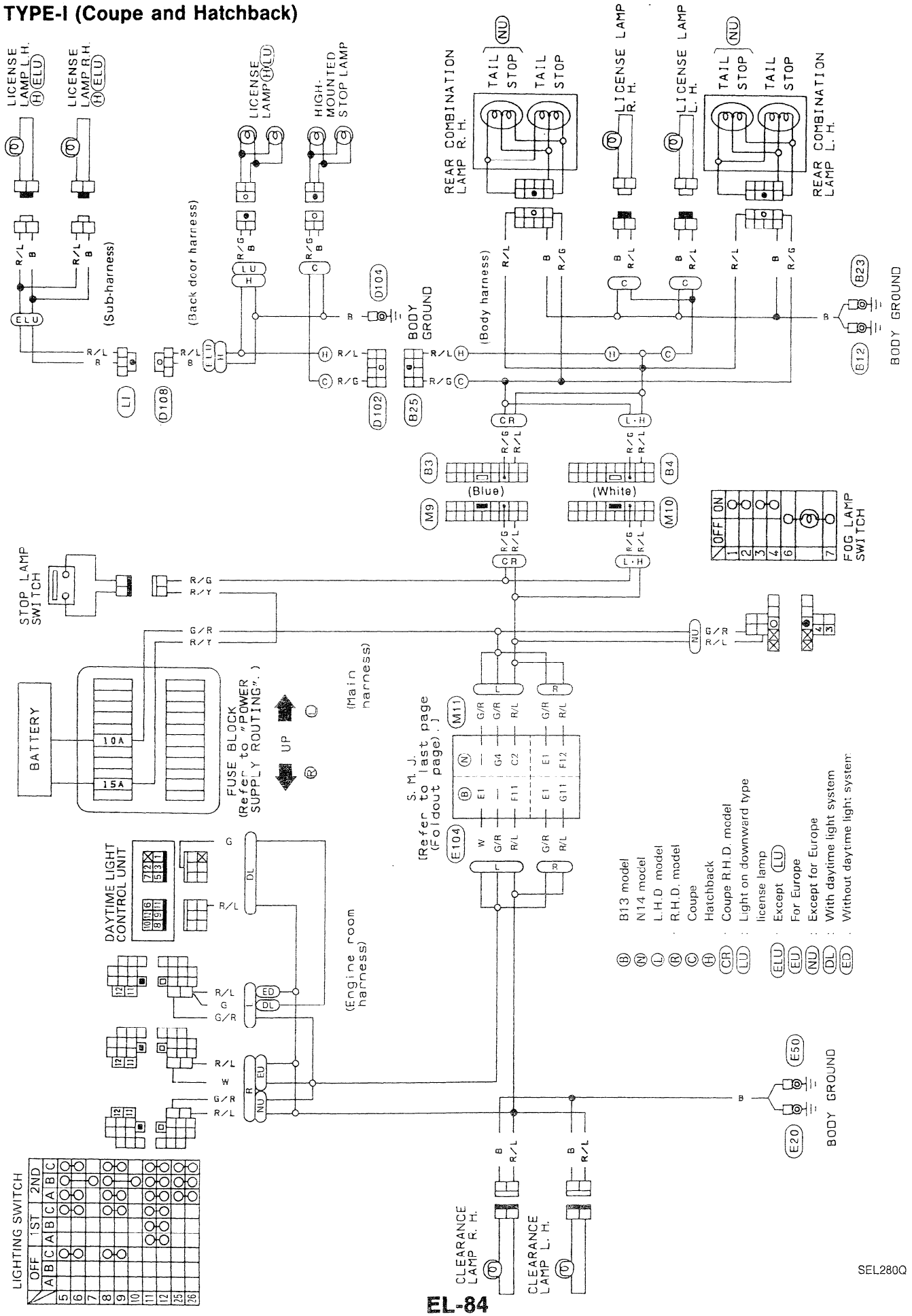
TYPE-I (Sedan)



SEL279Q

Clearance, License, Tail and Stop Lamps/Wiring Diagram (Cont'd)

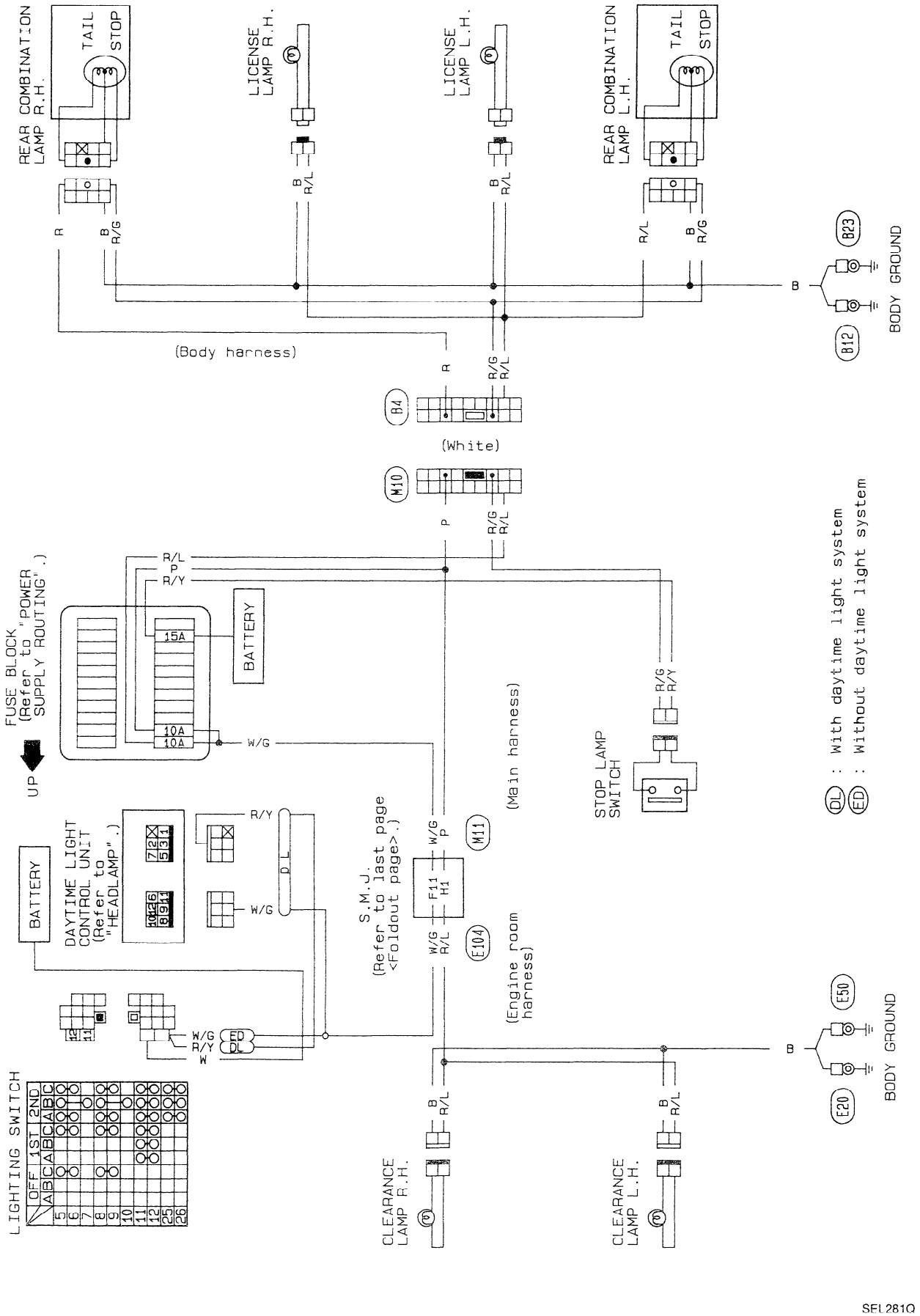
TYPE-I (Coupe and Hatchback)



SEL280Q

Clearance, License, Tail and Stop Lamps/Wiring Diagram (Cont'd)

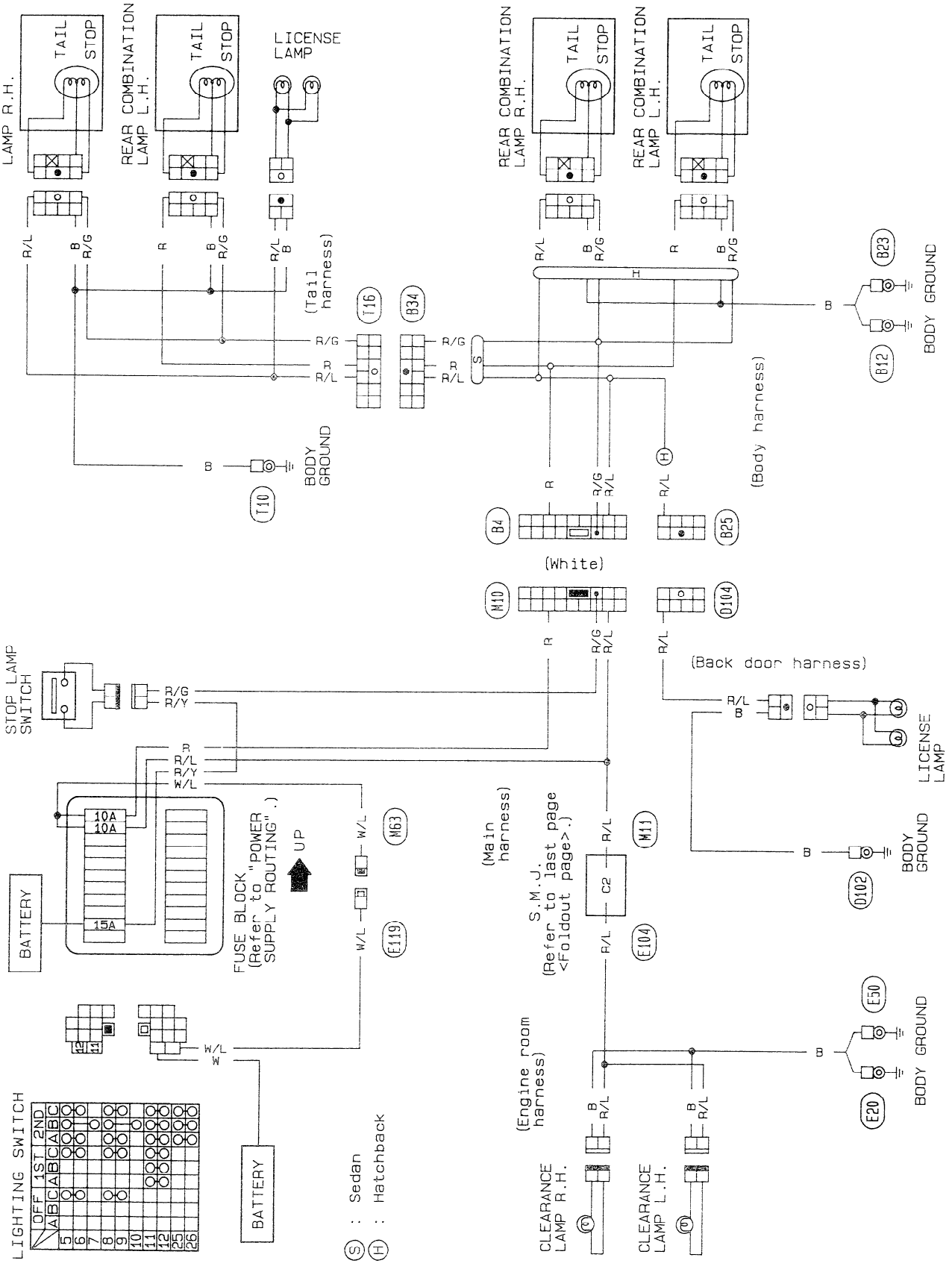
TYPE-II (B13 models)



SEL281Q

Clearance, License, Tail and Stop Lamps/Wiring Diagram (Cont'd)

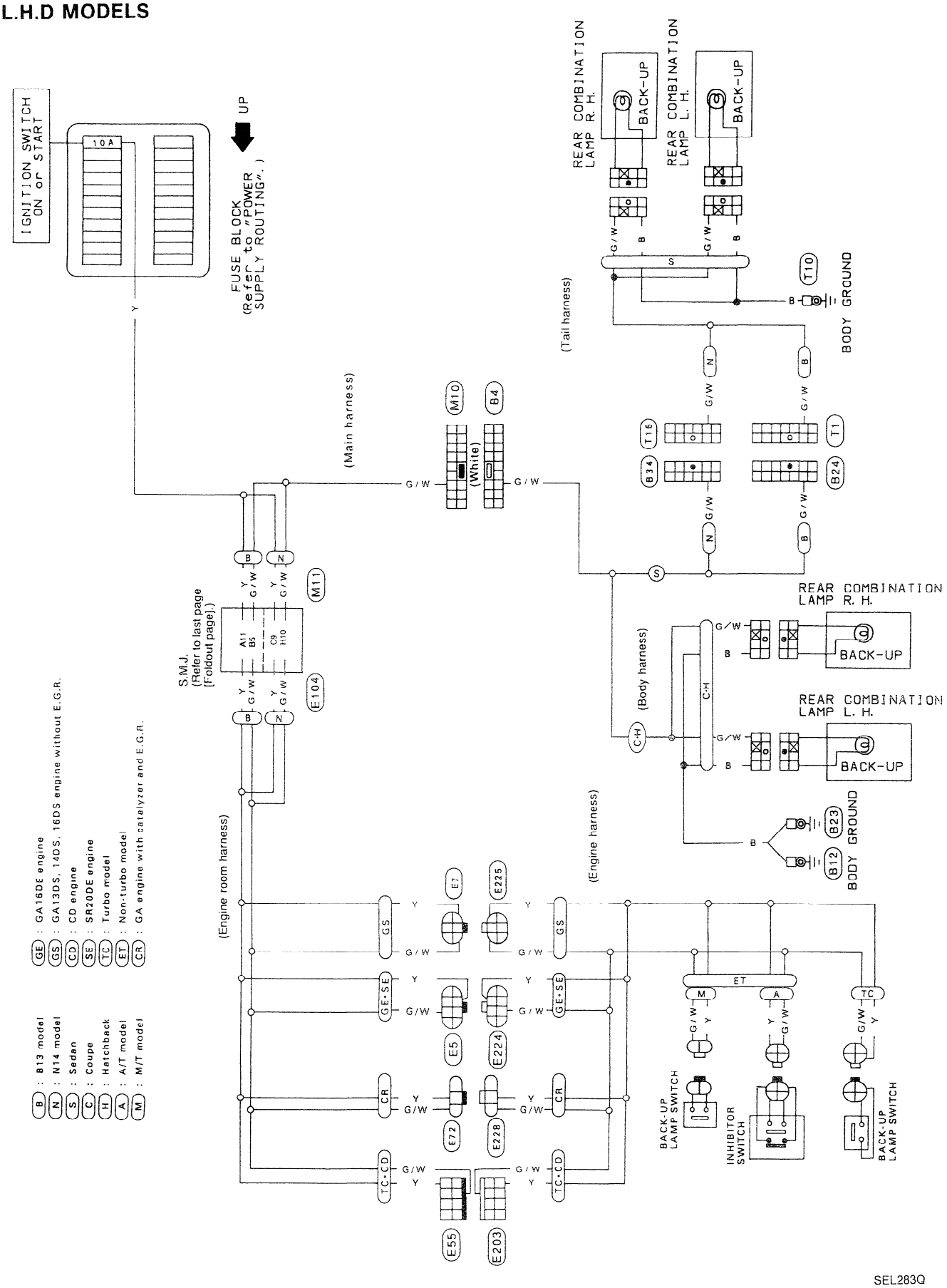
TYPE-II (N14 models)



SEL282Q

Back-up Lamp/Wiring Diagram

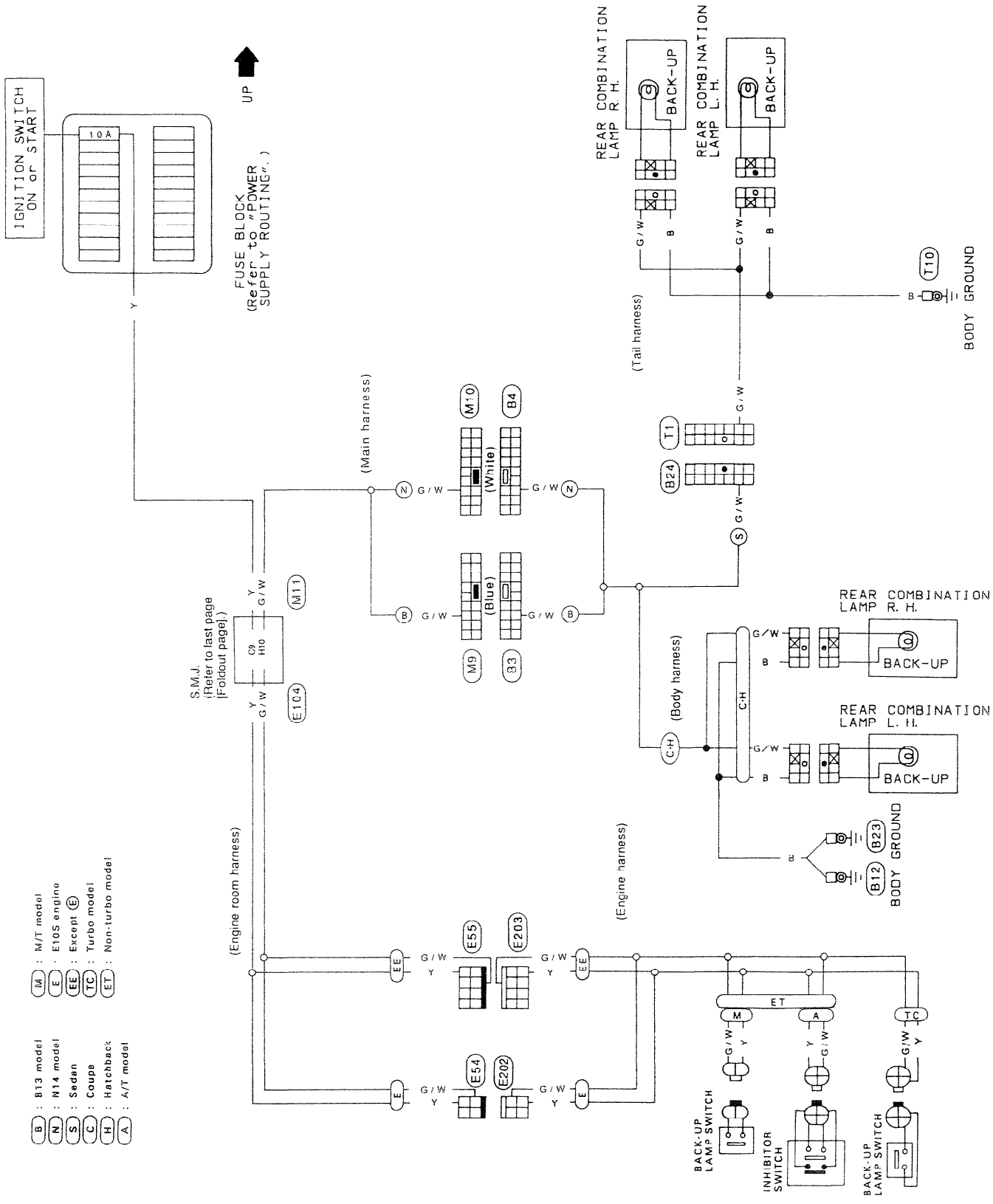
L.H.D MODELS



SEL283Q

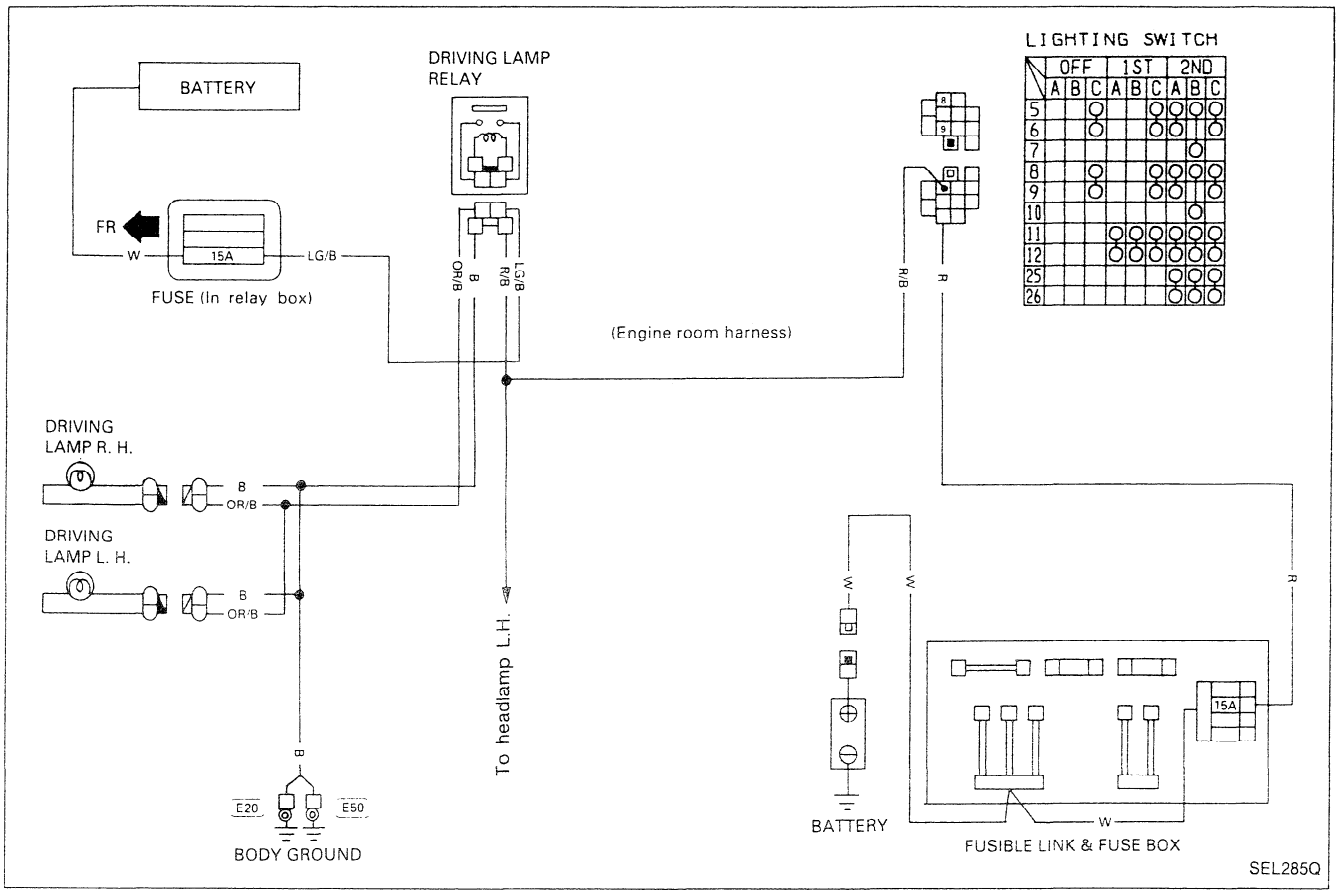
Back-up Lamp/Wiring Diagram (Cont'd)

R.H.D MODELS



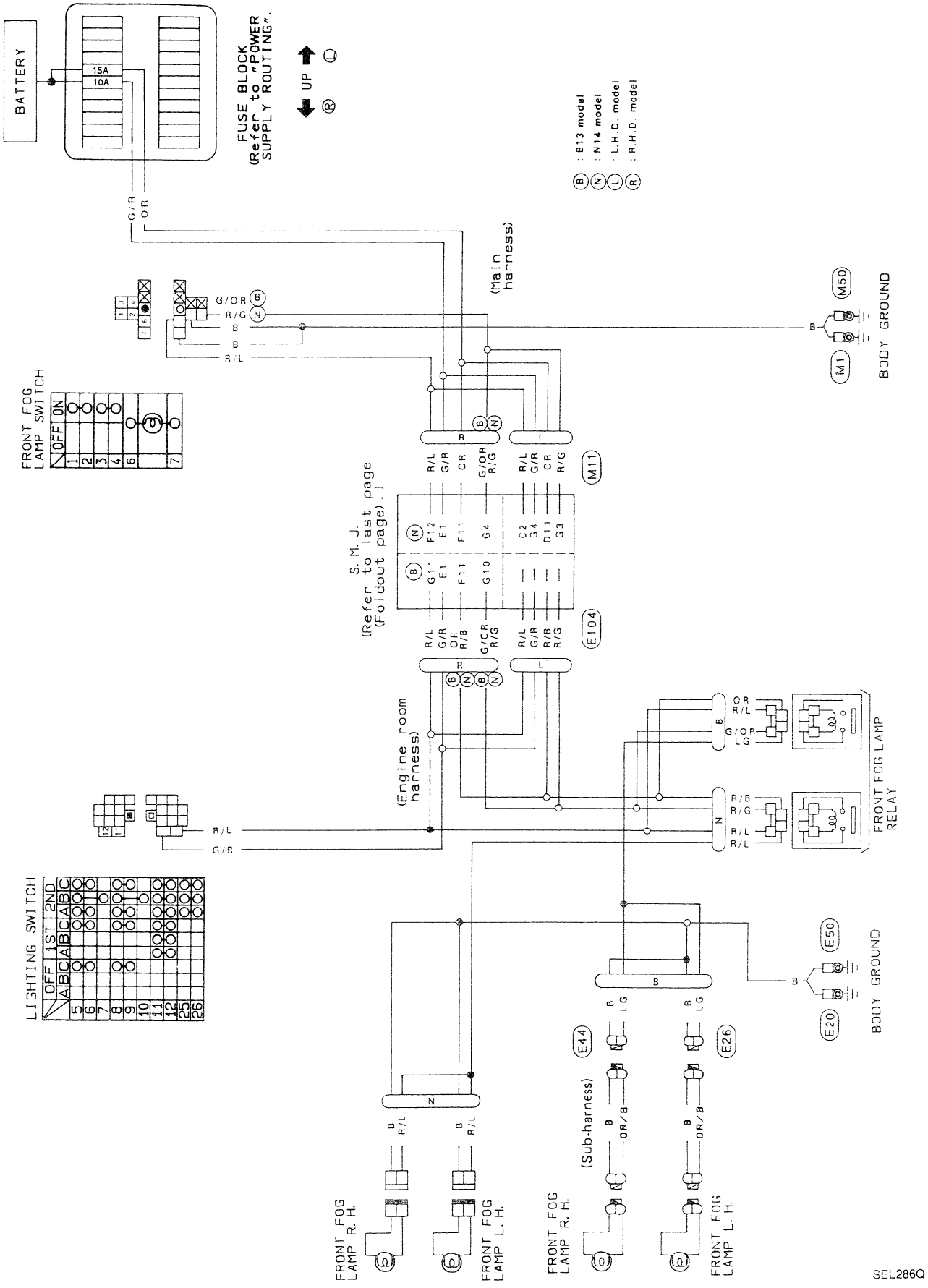
SEL284Q

Driving Lamp/Wiring Diagram



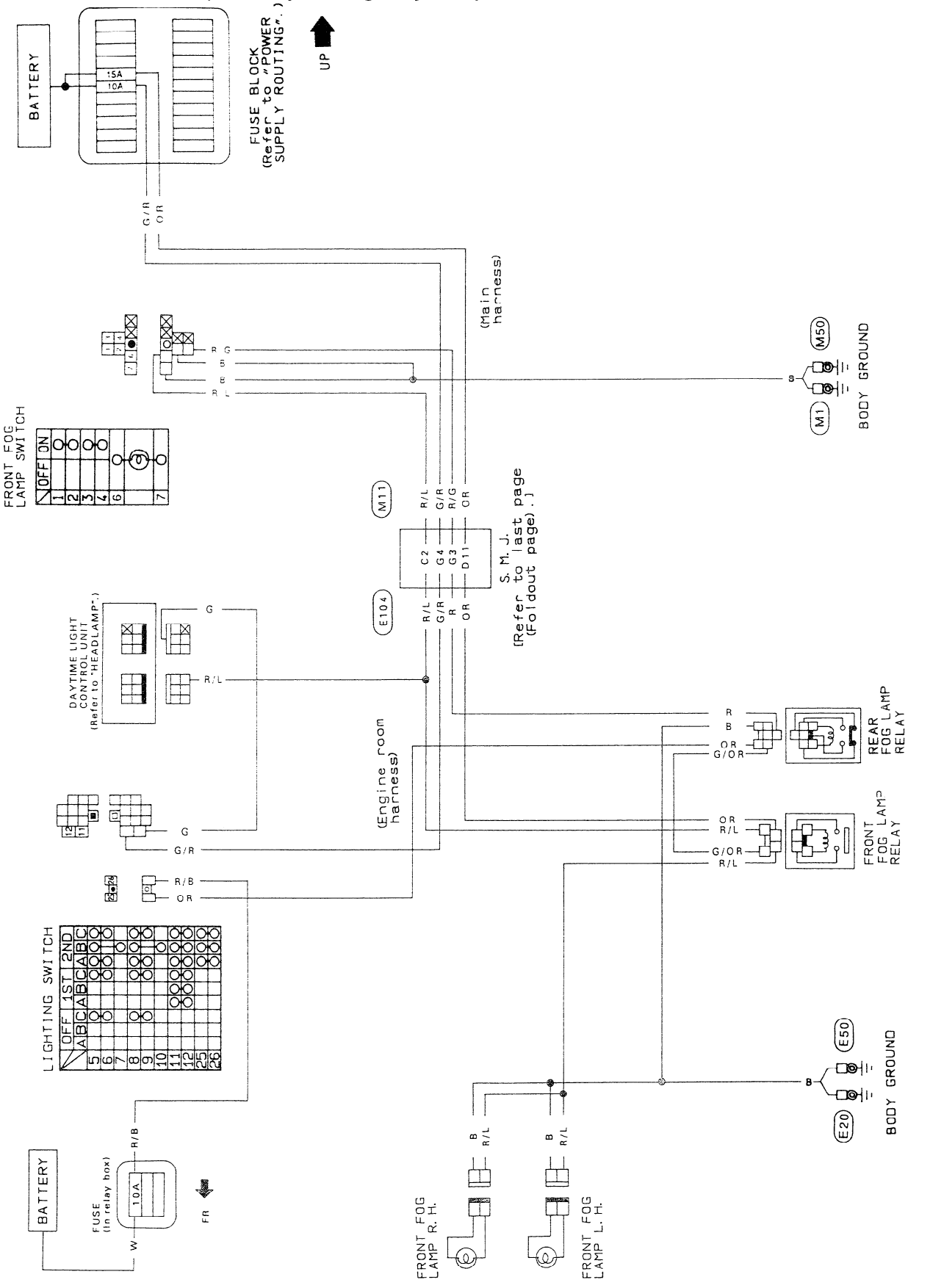
Front Fog Lamp/Wiring Diagram

TYPE-I FOR EUROPE (Without daytime light system)



Front Fog Lamp/Wiring Diagram (Cont'd)

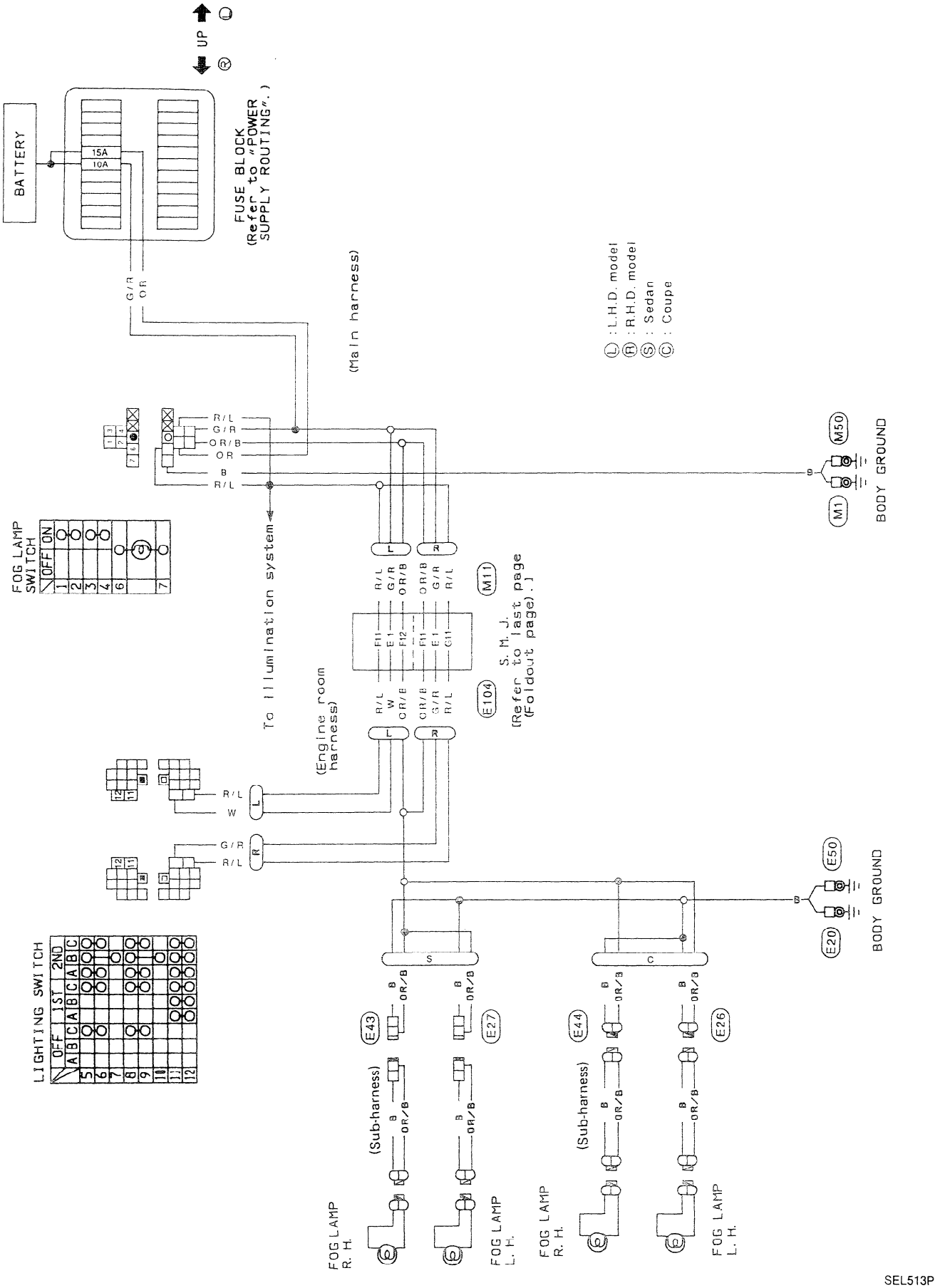
TYPE-I FOR EUROPE (With daytime light system)



SEL287Q

Front Fog Lamp/Wiring Diagram (Cont'd)

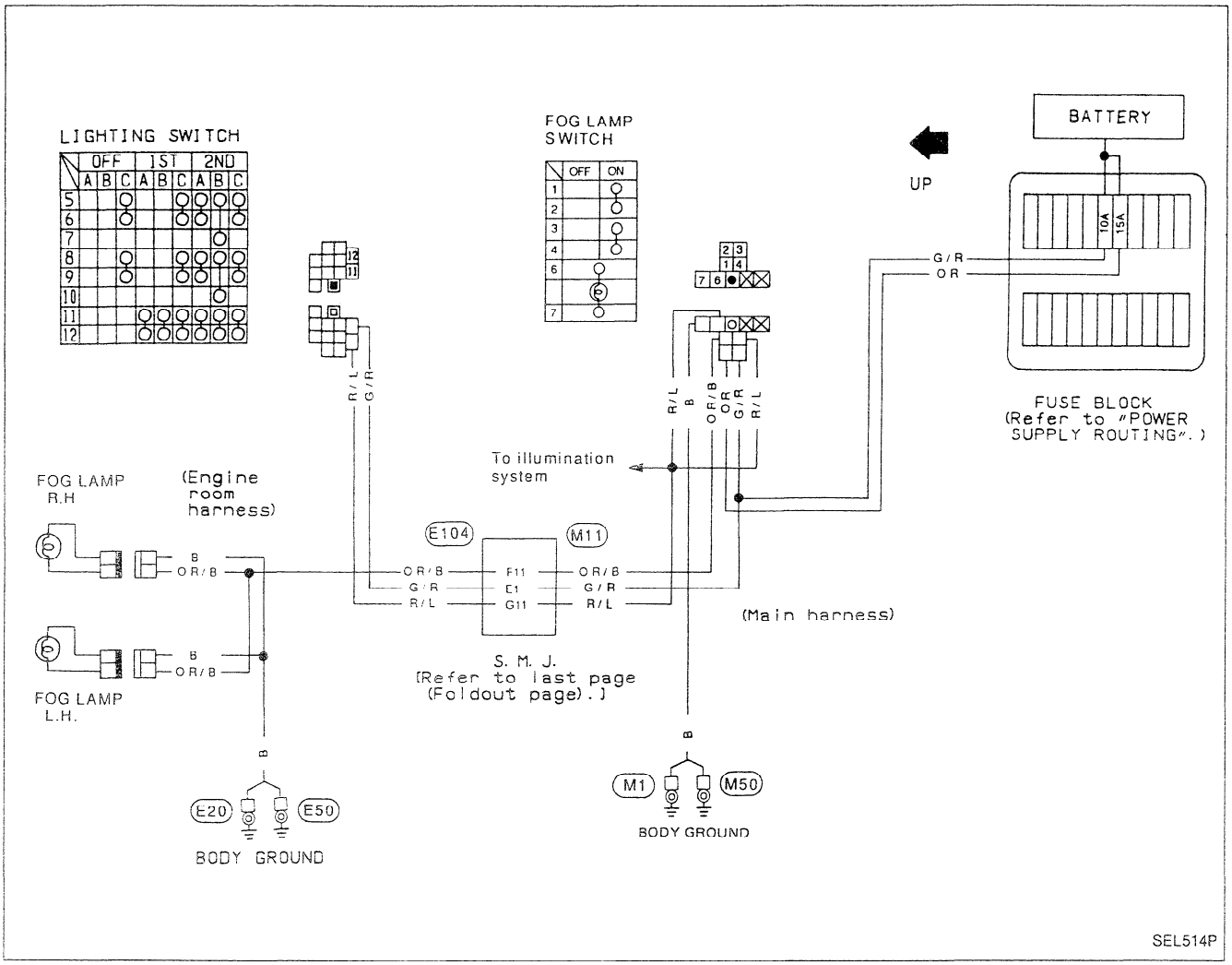
TYPE-I EXCEPT FOR EUROPE (B13 models)



SEL513P

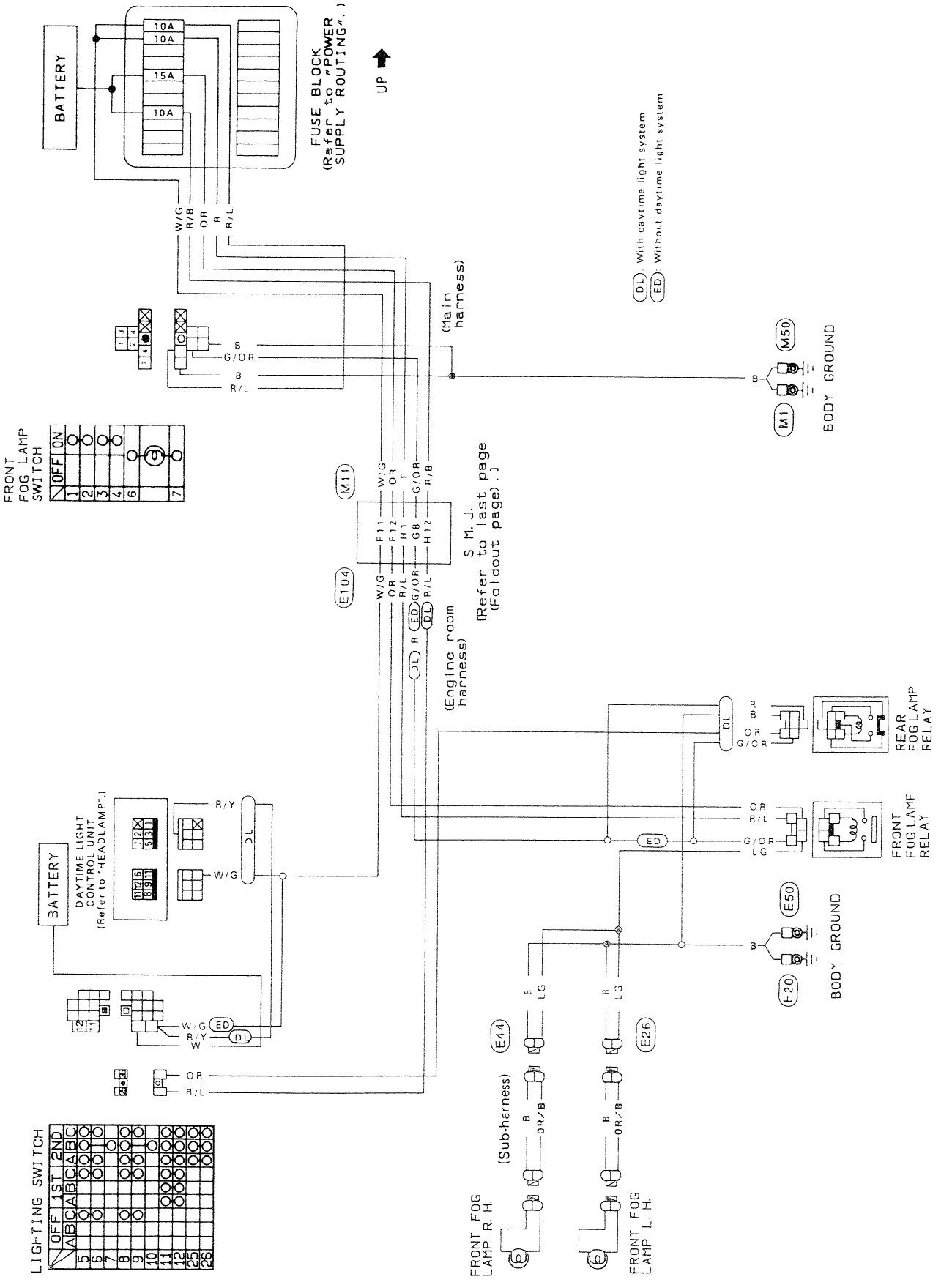
Front Fog Lamp/Wiring Diagram (Cont'd)

TYPE-I EXCEPT FOR EUROPE (N14 models)



Front Fog Lamp/Wiring Diagram (Cont'd)

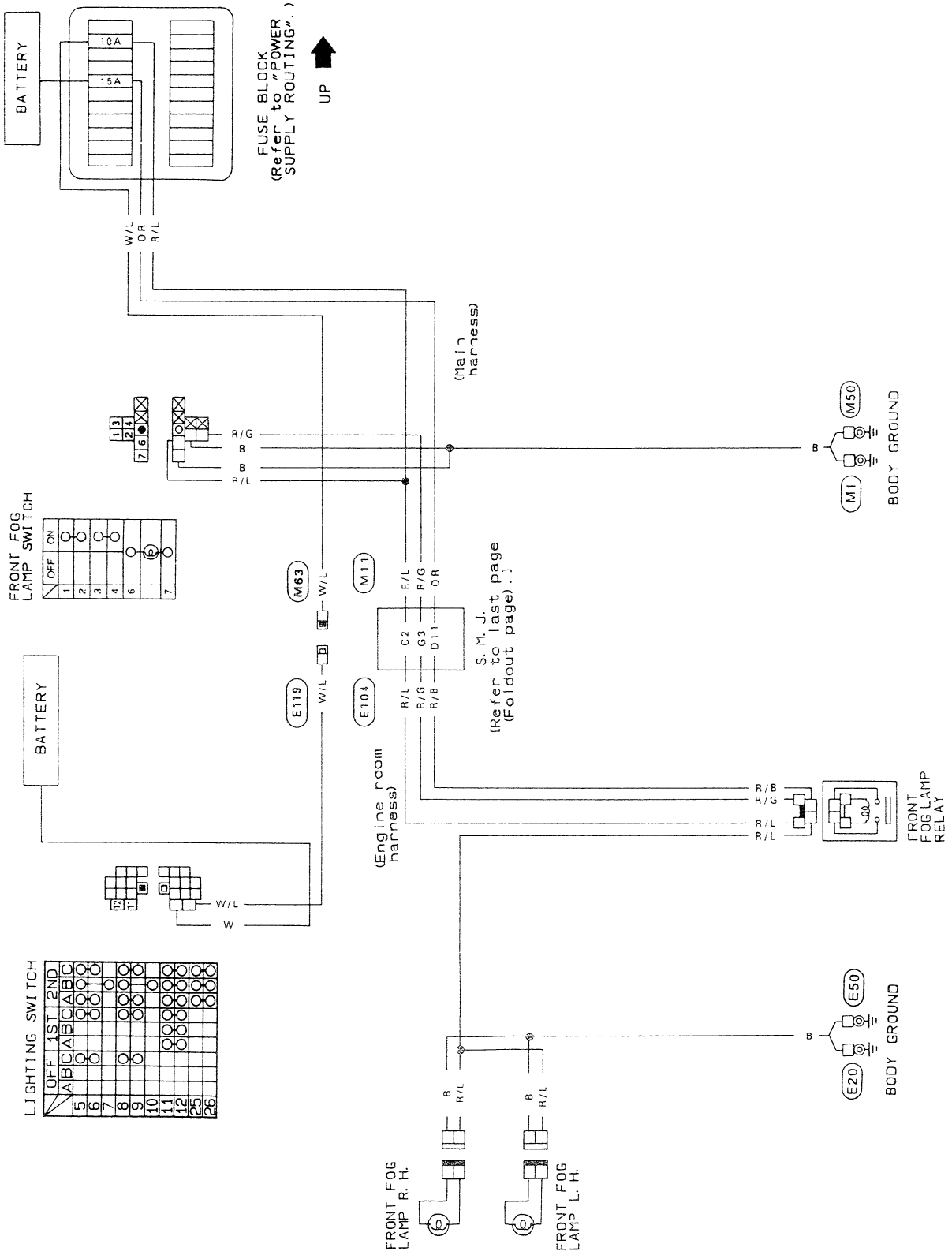
TYPE-II (B13 models)



SEL288Q

Front Fog Lamp/Wiring Diagram (Cont'd)

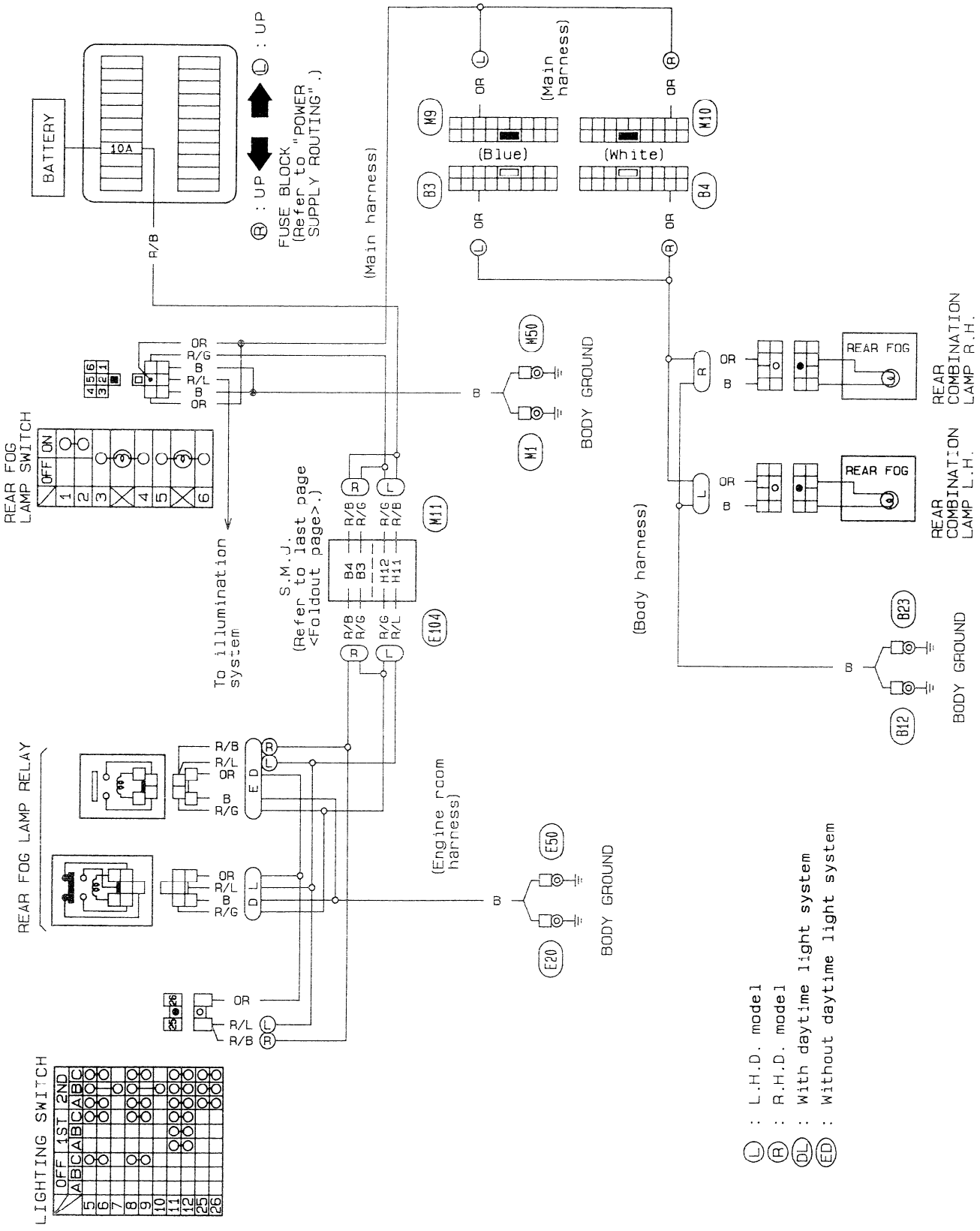
TYPE-II (N14 models)



SEL289Q

Rear Fog Lamp/Wiring Diagram

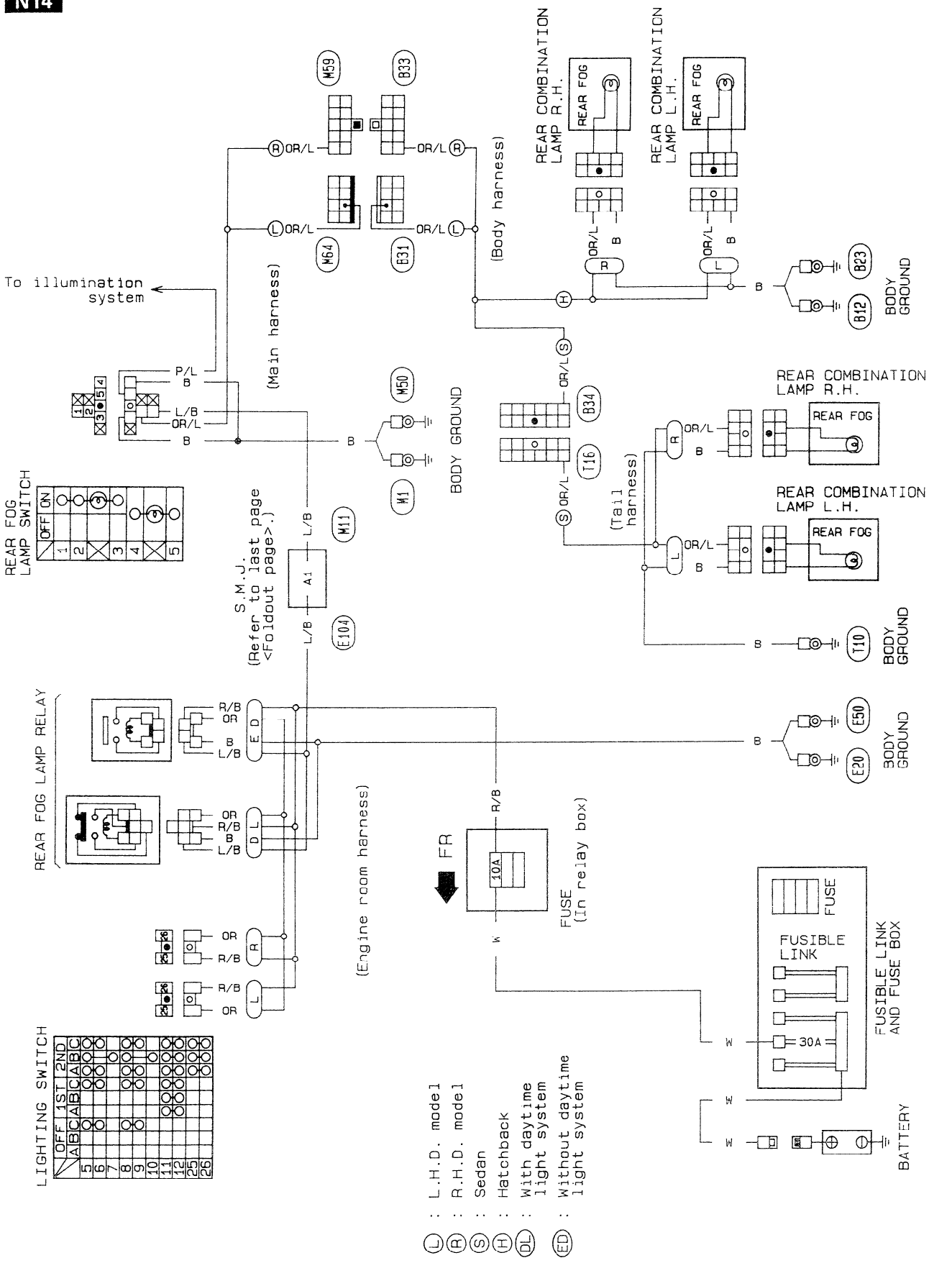
B13



SEL290Q

Rear Fog Lamp/Wiring Diagram (Cont'd)

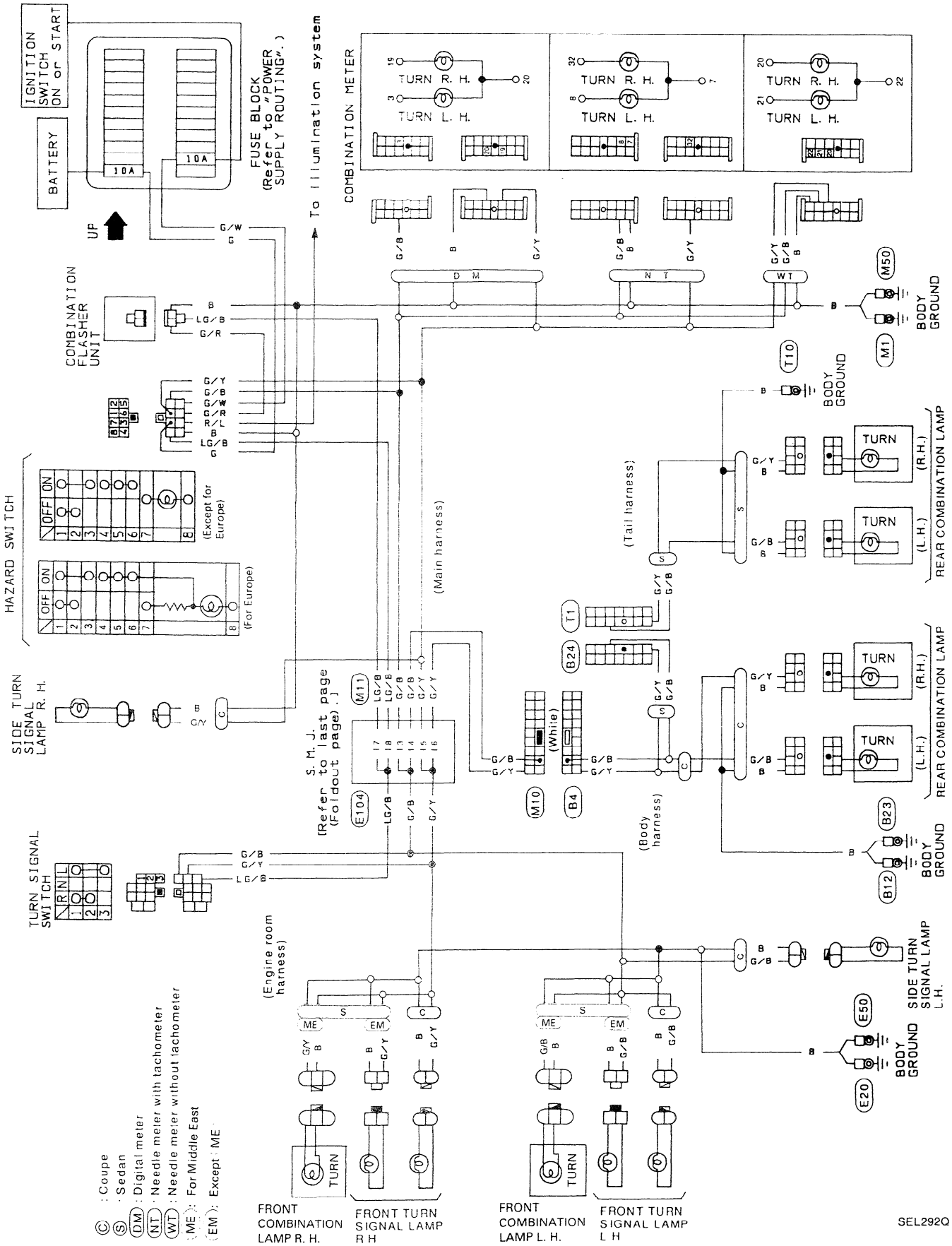
N14



SEL291Q

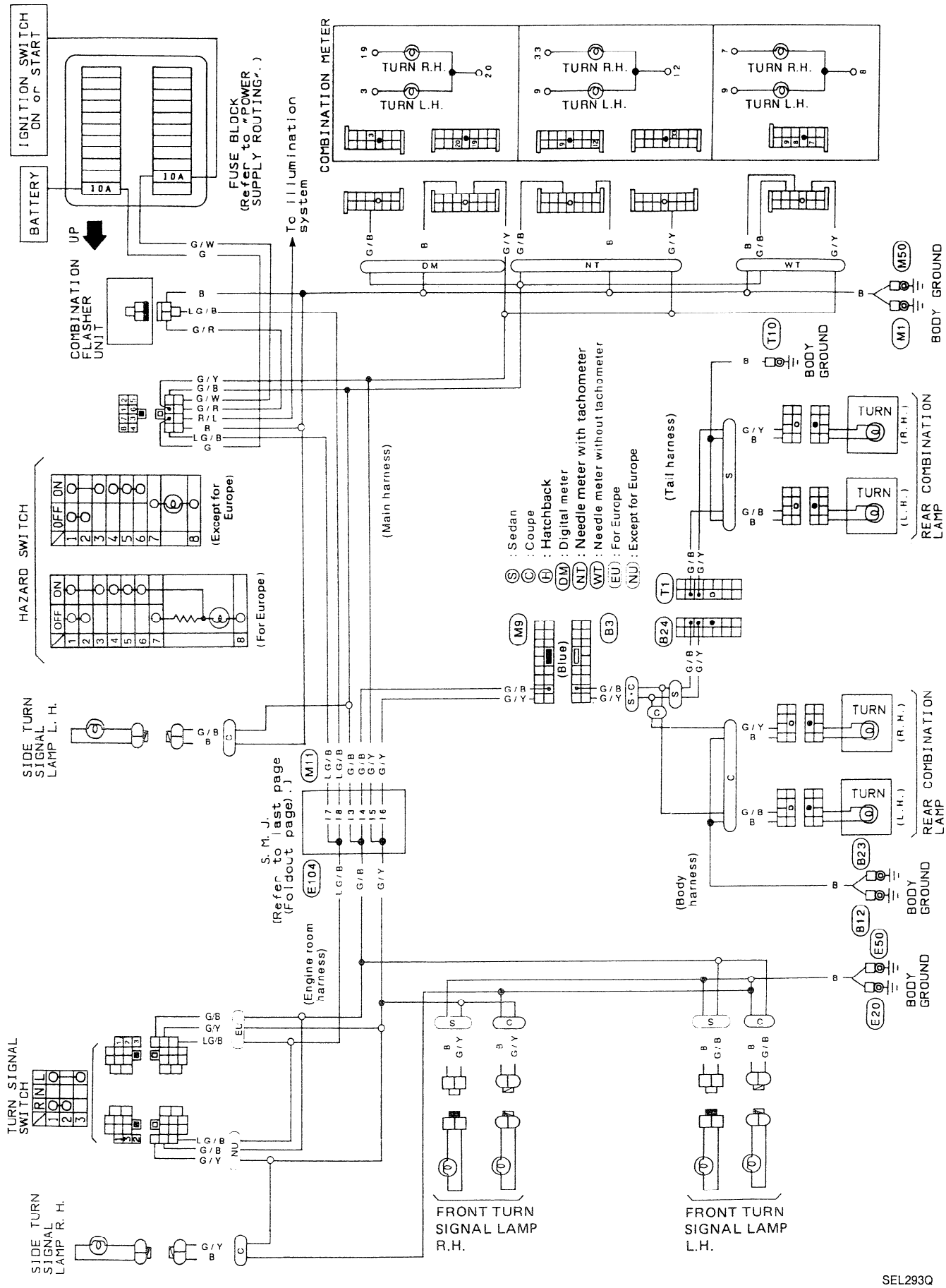
Turn Signal and Hazard Warning Lamps/Wiring Diagram

B13 L.H.D. MODELS



Turn Signal and Hazard Warning Lamps/Wiring Diagram (Cont'd)

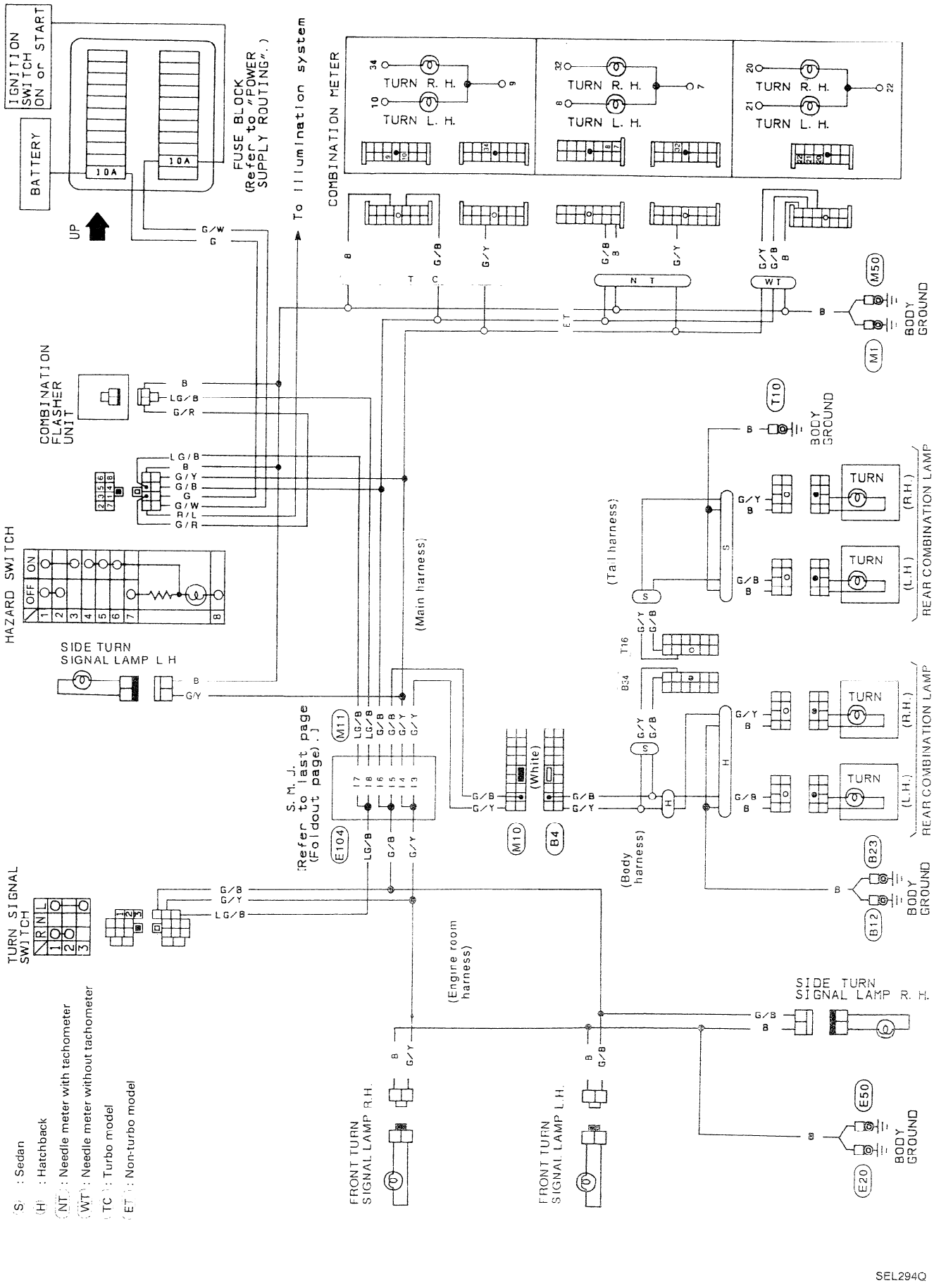
B13 R.H.D. MODELS



SEL293Q

Turn Signal and Hazard Warning Lamps/Wiring Diagram (Cont'd)

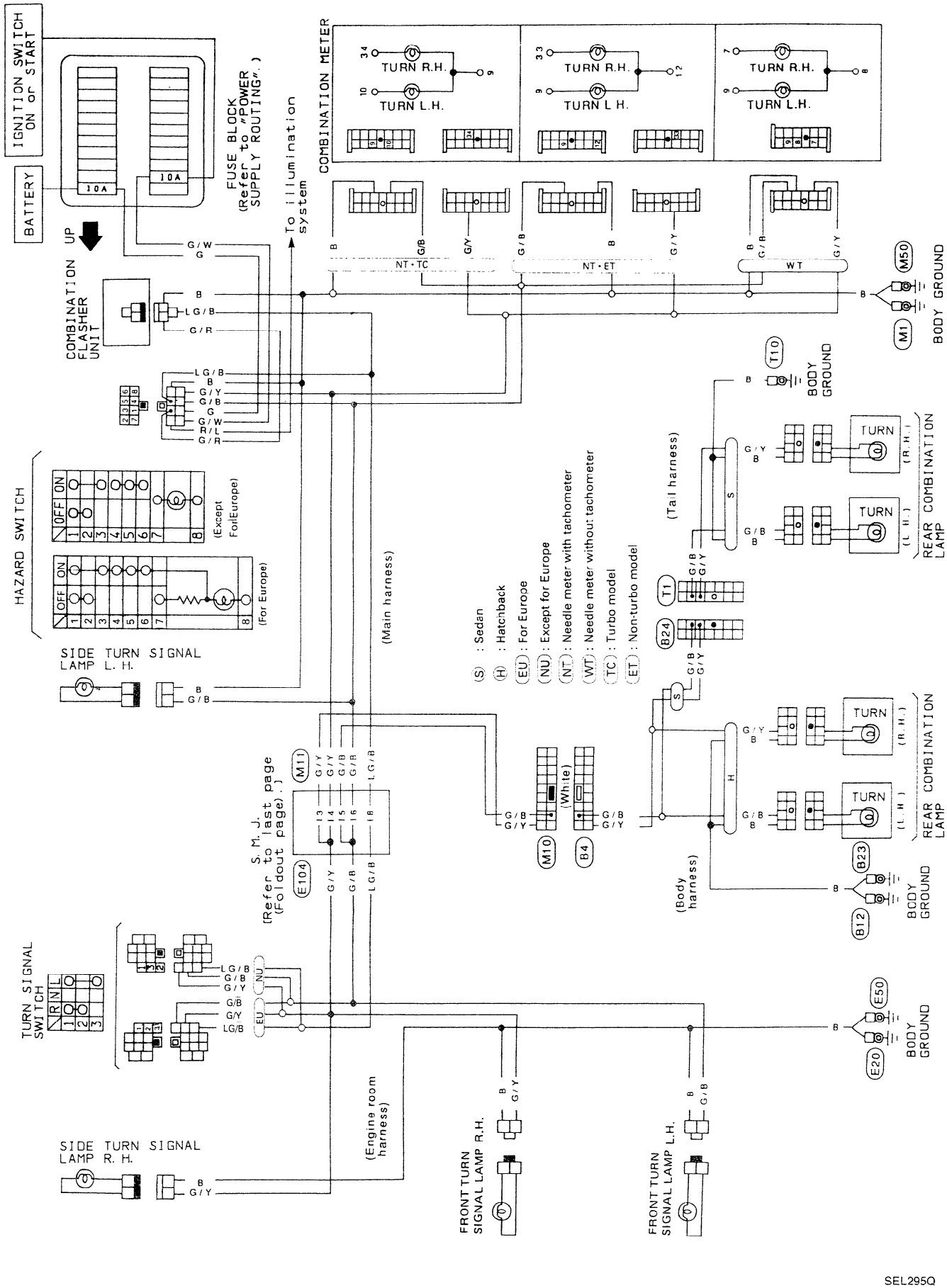
N14 L.H.D. MODELS



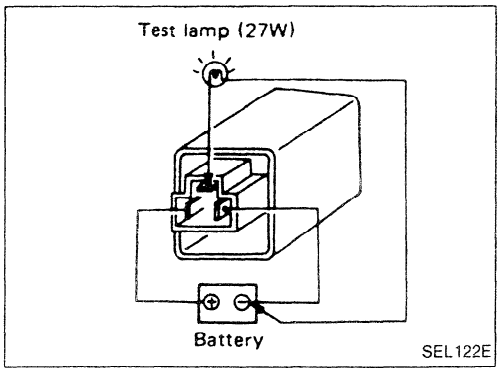
SEL294Q

Turn Signal and Hazard Warning Lamps/Wiring Diagram (Cont'd)

N14 R.H.D. MODELS



SEL295Q



Combination Flasher Unit Check

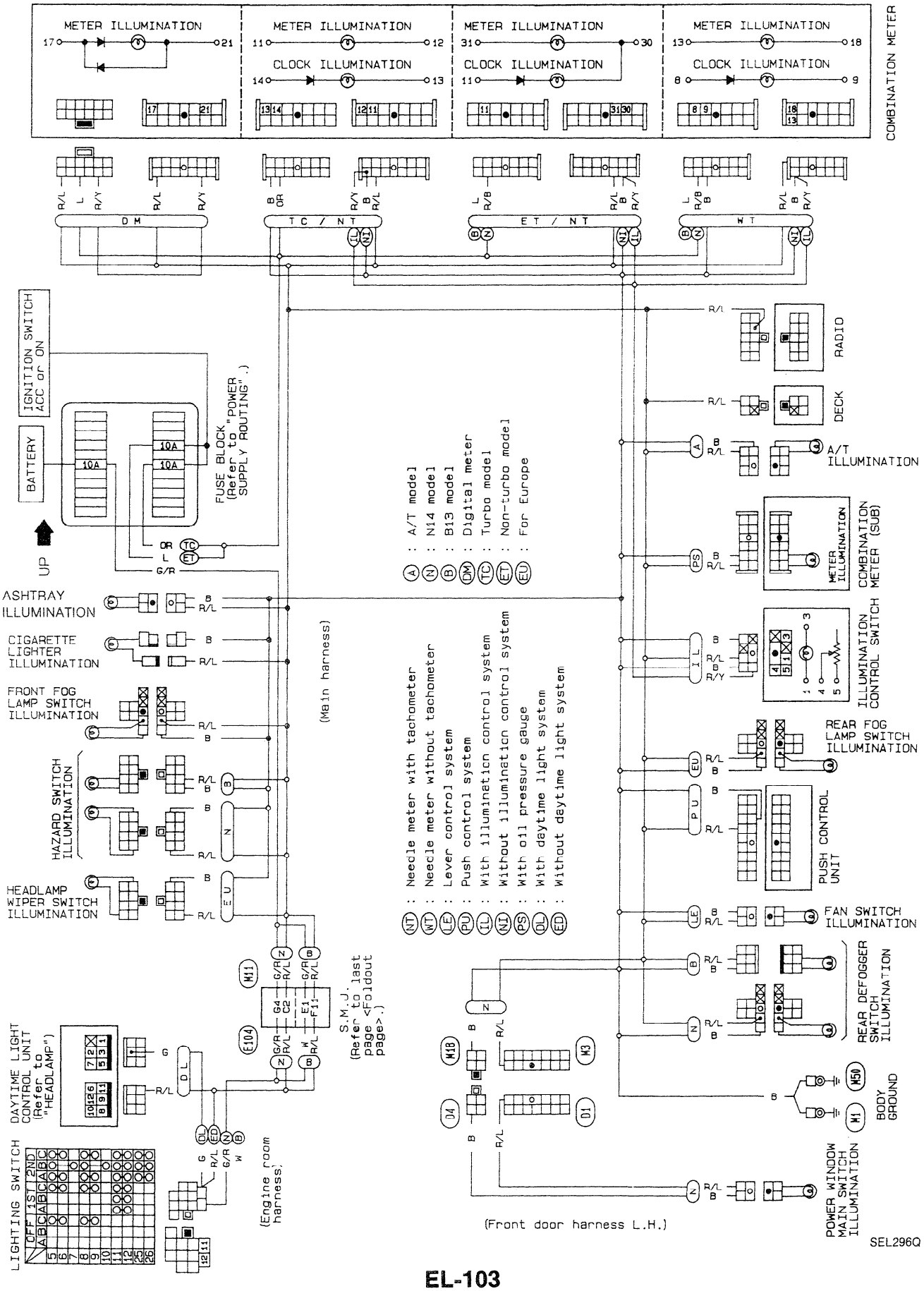
- Before checking, ensure that bulbs meet specifications.
- Connect a battery and test lamp to the combination flasher unit, as shown. Combination flasher unit is properly functioning if it blinks when power is supplied to the circuit.

Bulb Specifications

	Wattage (12 volt)	
	Except Sedan for Middle East	Sedan for Middle East
Headlamp (Semi-sealed beam)		
High/Low	60/55	65/45
Driving lamp	55	—
Front fog lamp		
Sedan	35	—
Coupe and Hatchback	55	55
Front turn signal lamp	21	—
Front clearance lamp	5	—
Front combination lamp		
Turn/Clearance	—	27/8
Front side marker lamp	—	3.8
Side turn signal lamp	5	—
Rear combination lamp		
Turn signal	21	27
Stop/Tail	21/5	27/8
Back-up	21	27
Rear fog	21	—
License plate lamp		
B13 model for Europe	10	—
B13 model for Middle East	7.5	5
B13 model except for above	5	—
N14 model	5	—
Rear side marker lamp	—	3.8
High-mounted stop lamp		
Sedan	12	12
Coupe	18	—
Interior lamp	10	10
Trunk room lamp (Sedan)	3.4	3.4
Luggage room lamp		
Coupe and 5-door Hatchback	5	—
3-door Hatchback	3.4	—

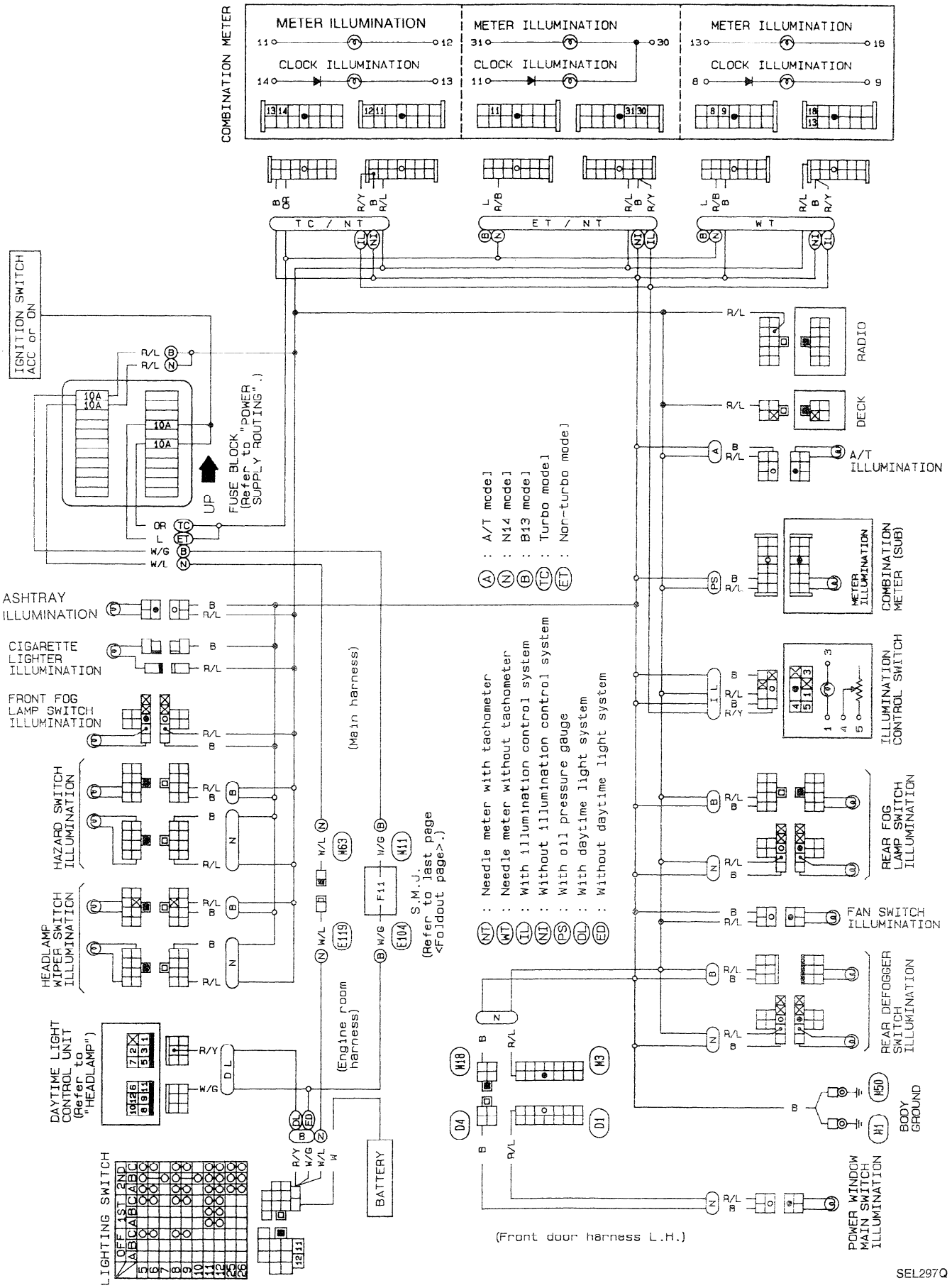
Illumination/Wiring Diagram

L.H.D. MODELS (Type-I)



Illumination/Wiring Diagram (Cont'd)

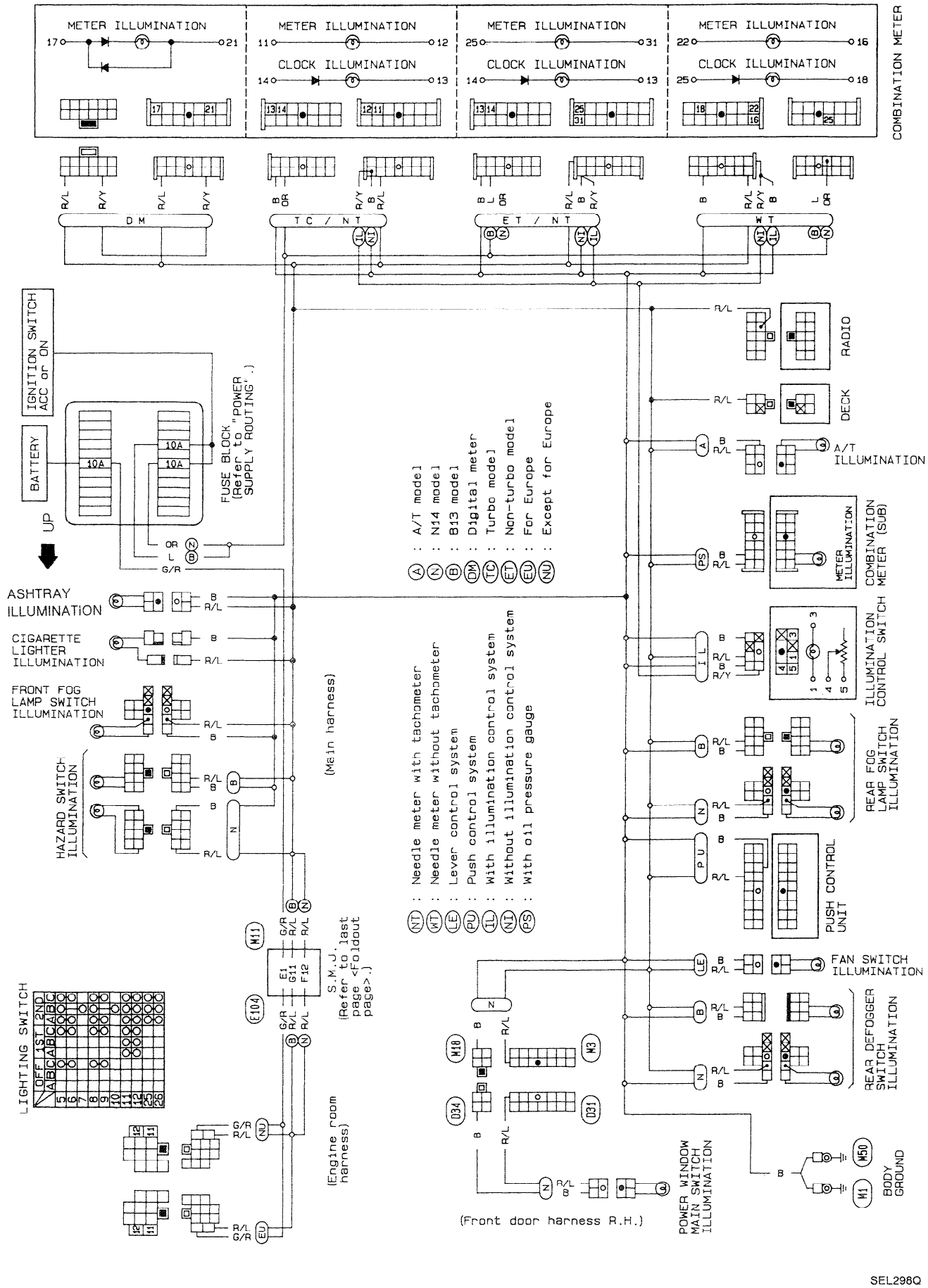
L.H.D. MODELS (Type-II)



SEL297Q

Illumination/Wiring Diagram (Cont'd)

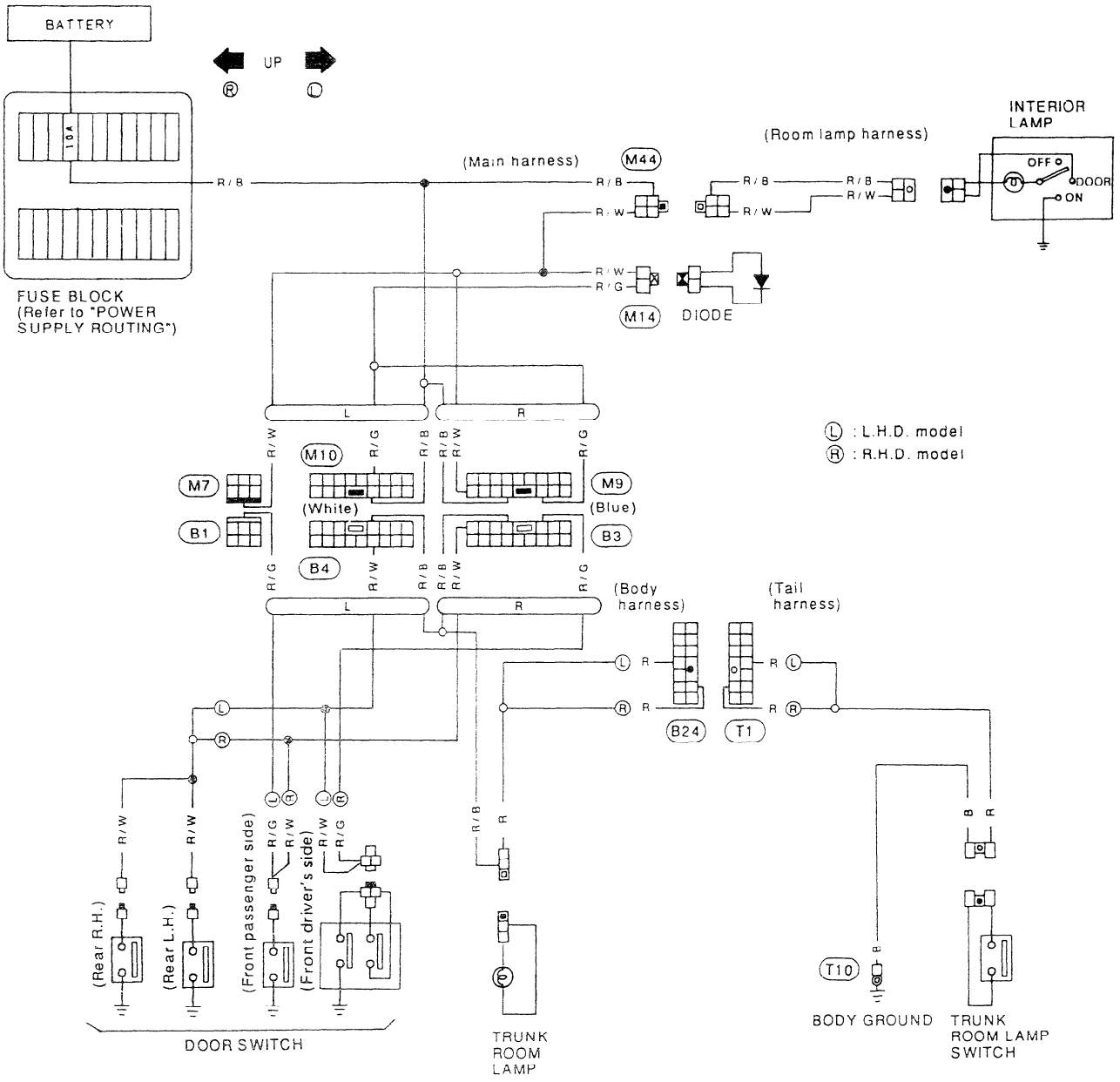
R.H.D. MODELS



SEL296Q

Interior, Trunk Room and Luggage Room Lamps/Wiring Diagram

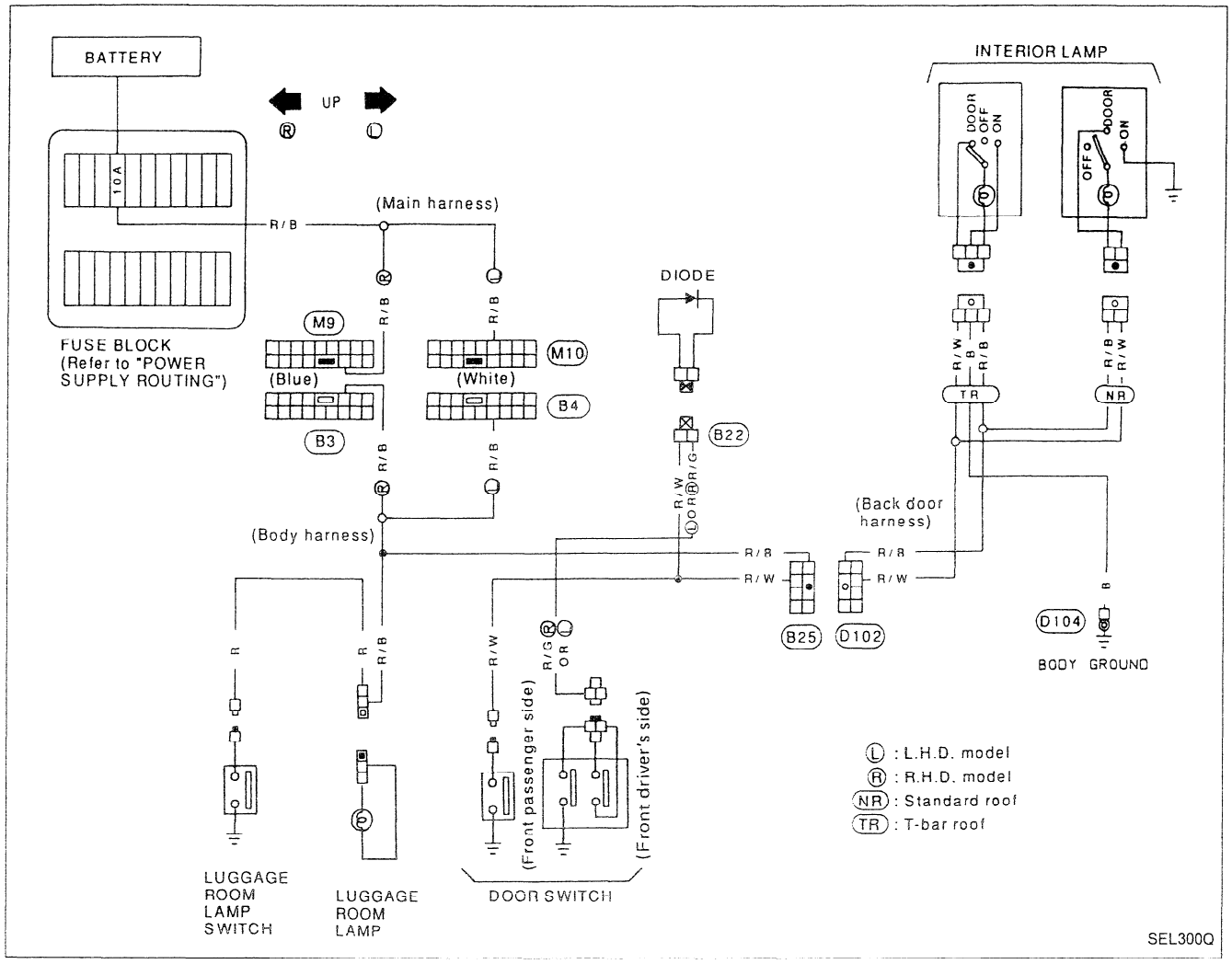
B13 SEDAN



SEL299Q

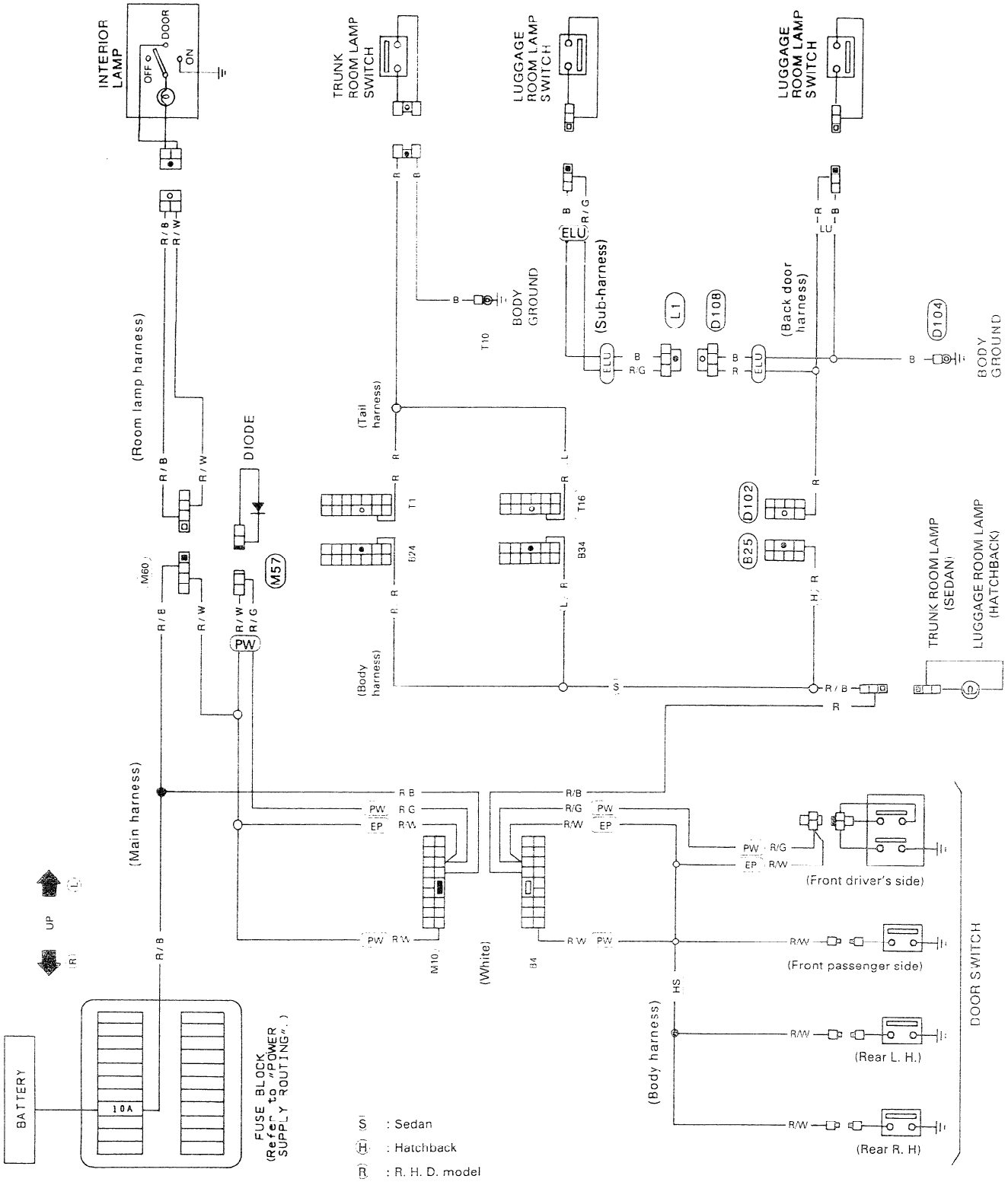
Interior, Trunk Room and Luggage Room Lamps/Wiring Diagram (Cont'd)

B13 COUPE



Interior, Trunk Room and Luggage Room Lamps/Wiring Diagram (Cont'd)

N14 HATCHBACK

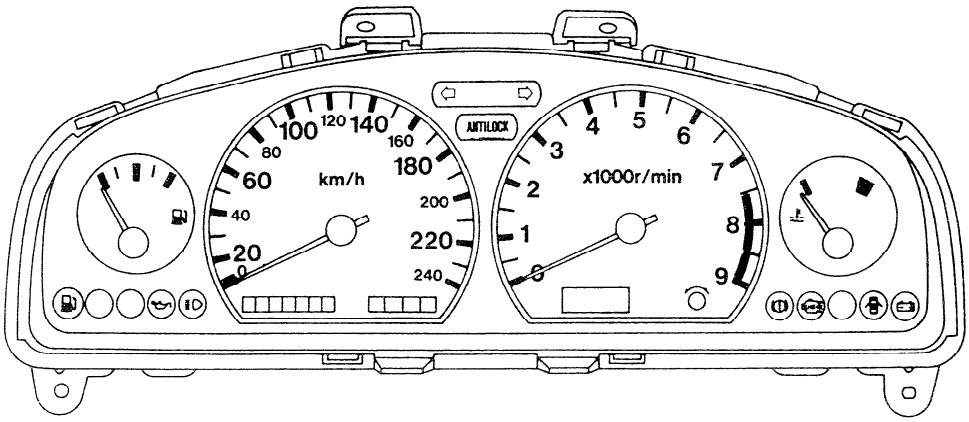


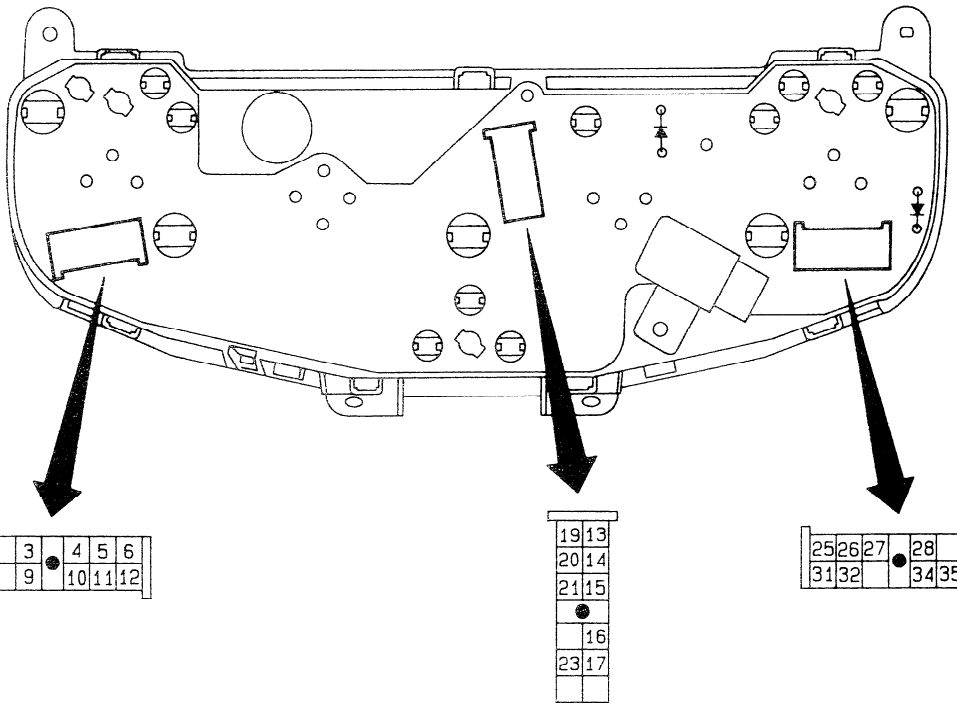
S : Sedan
H : Hatchback
R : R. H. D. model
L : L. H. D. model
LU : Light on downward type license lamp
ELU : Except LU
PW : With power window
EP : Except PW
HS : 5-door hatchback and sedan

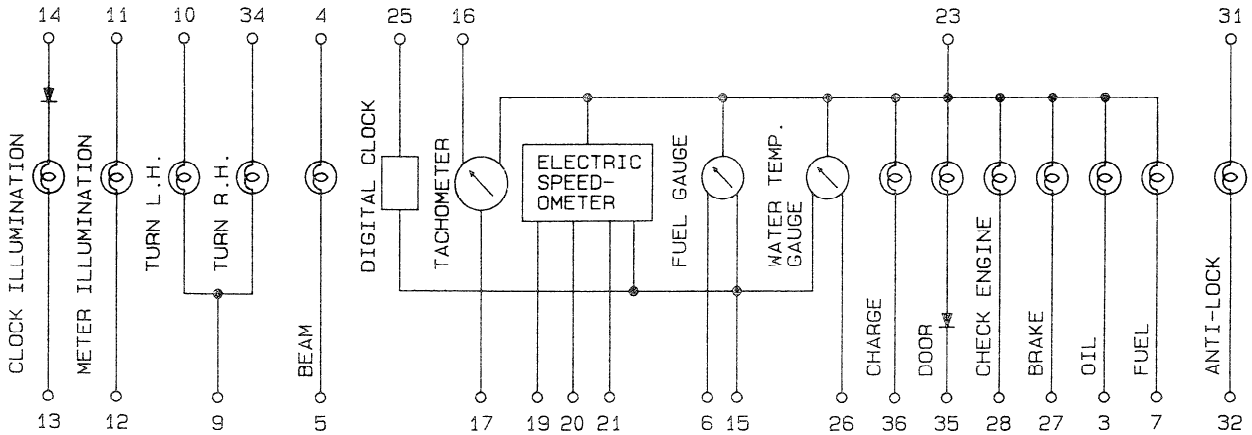
SEL301Q

Combination Meter

WITH TACHOMETER (Turbo models)



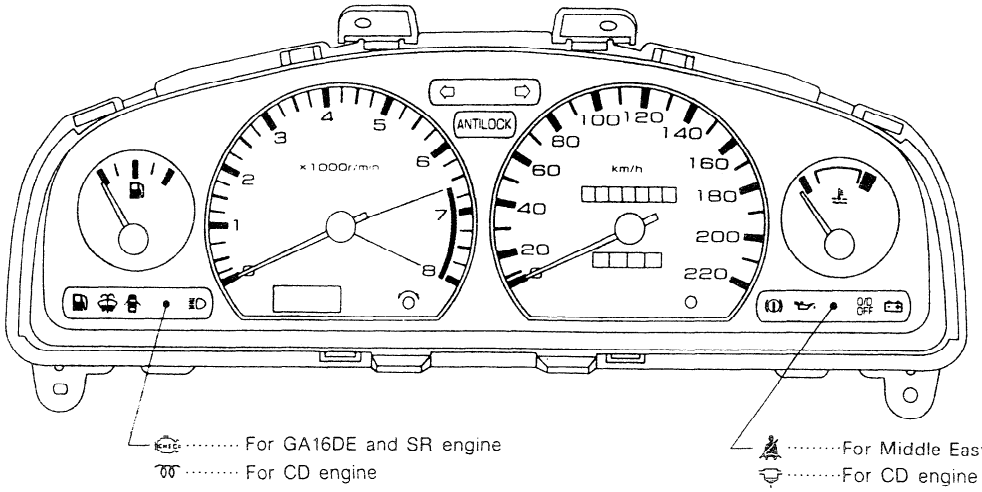


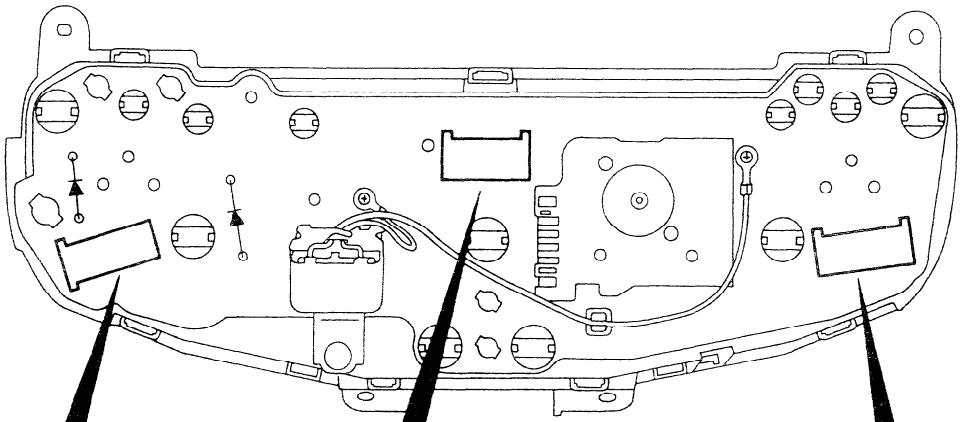


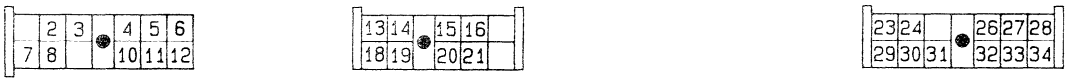
SEL302Q

Combination Meter (Cont'd)

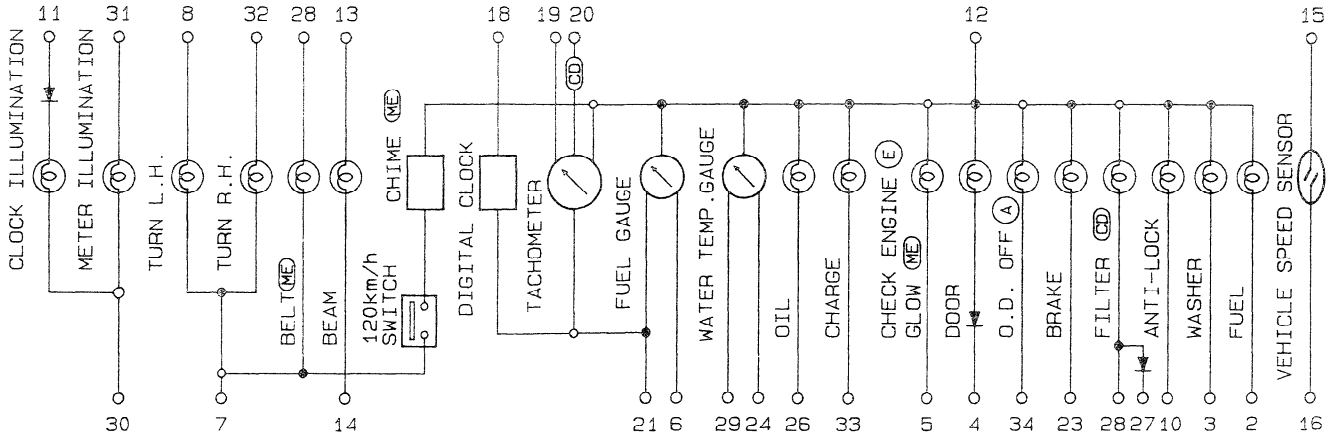
WITH TACHOMETER (L.H.D. non-turbo models)







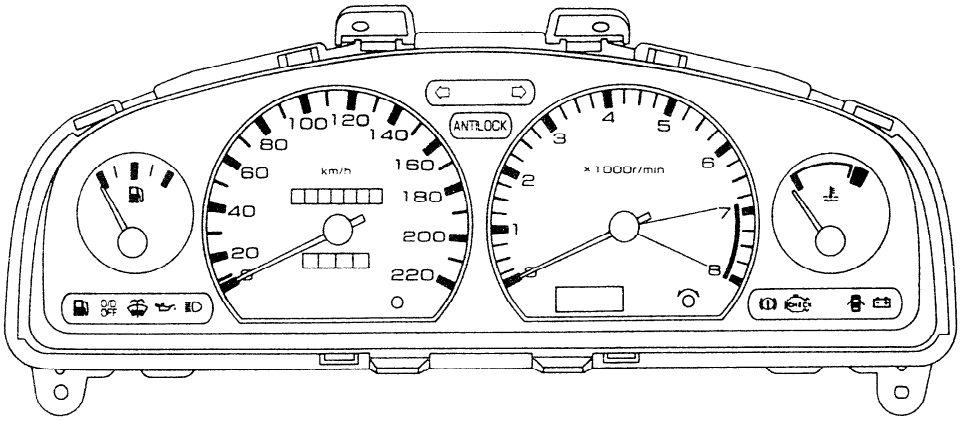
Ⓐ : A/T model
Ⓔ : With E.C.C.S.
ME : For Middle East
CD : CD engine

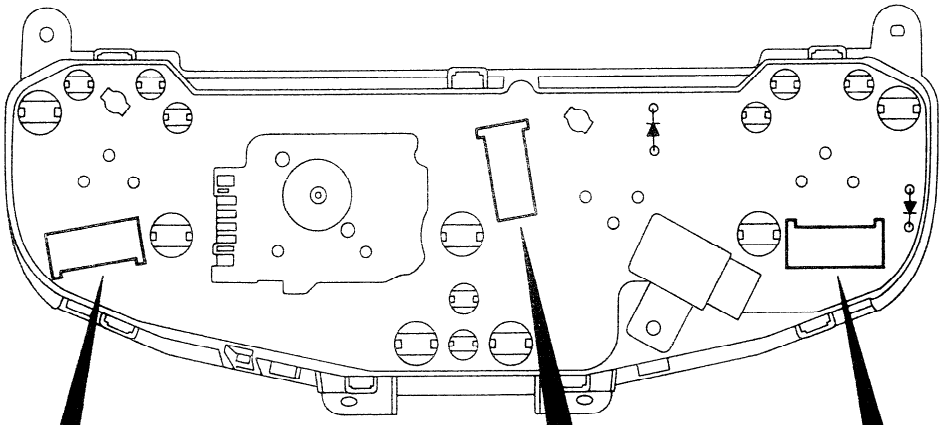


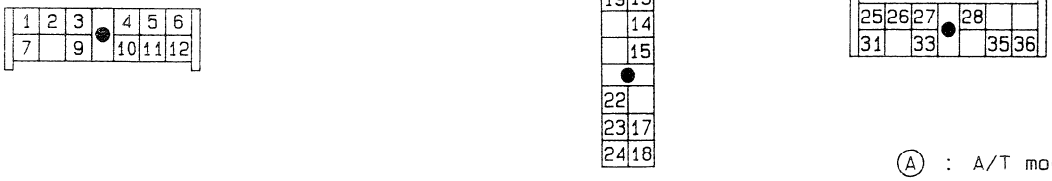
SEL303Q

Combination Meter (Cont'd)

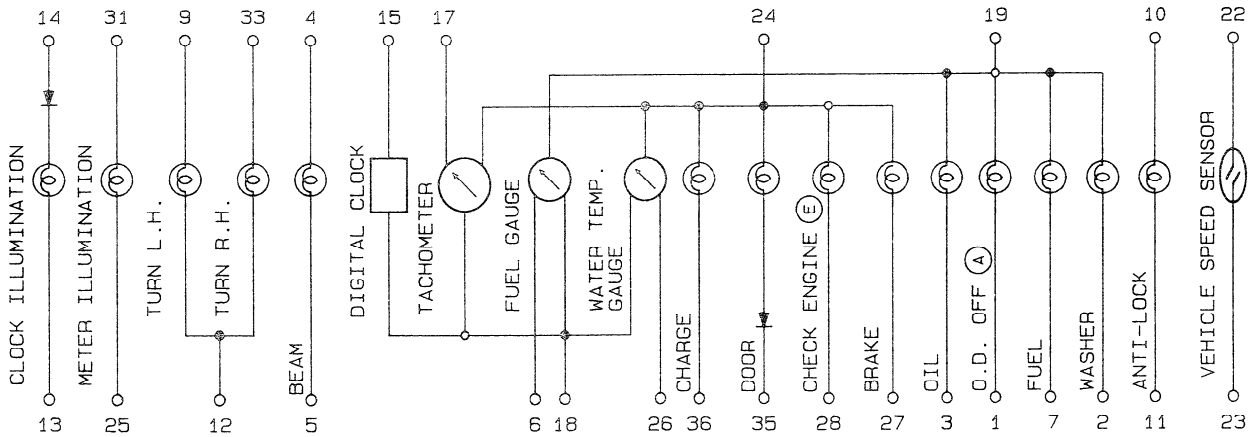
WITH TACHOMETER (R.H.D. non-turbo models)







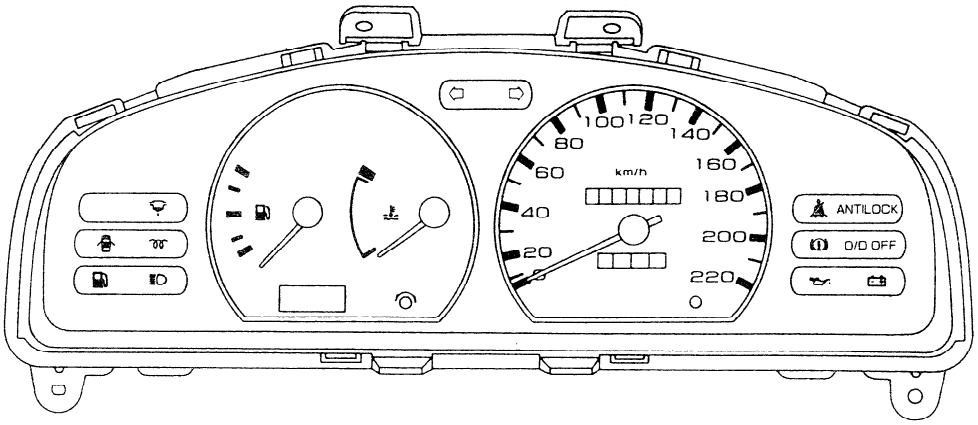
Ⓐ : A/T model
Ⓔ : With E.C.C.S.

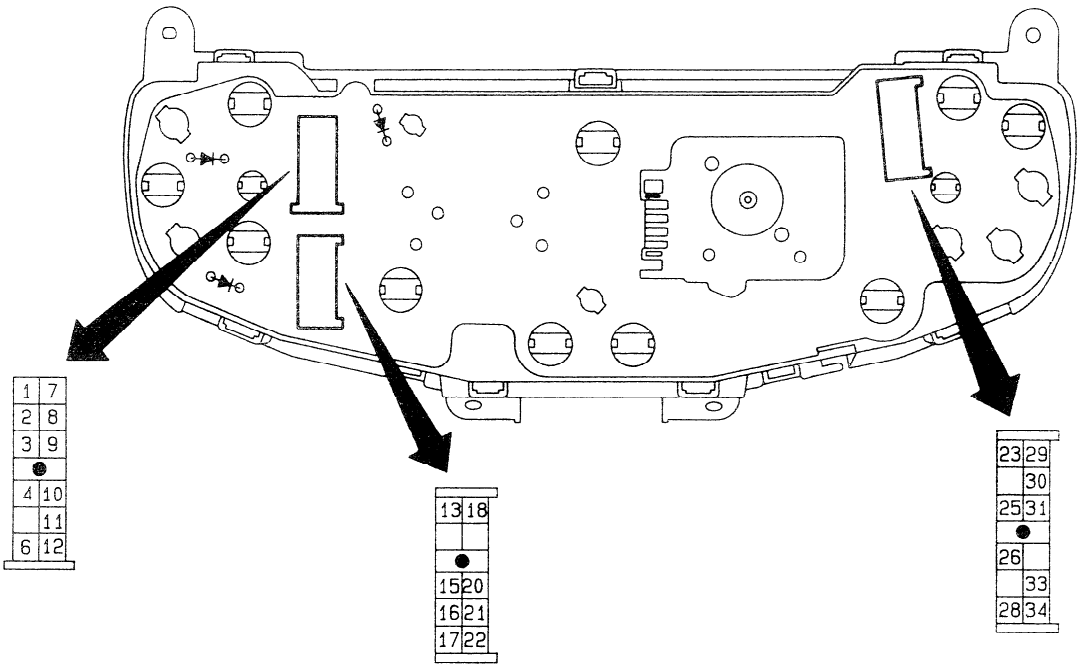


SEL304Q

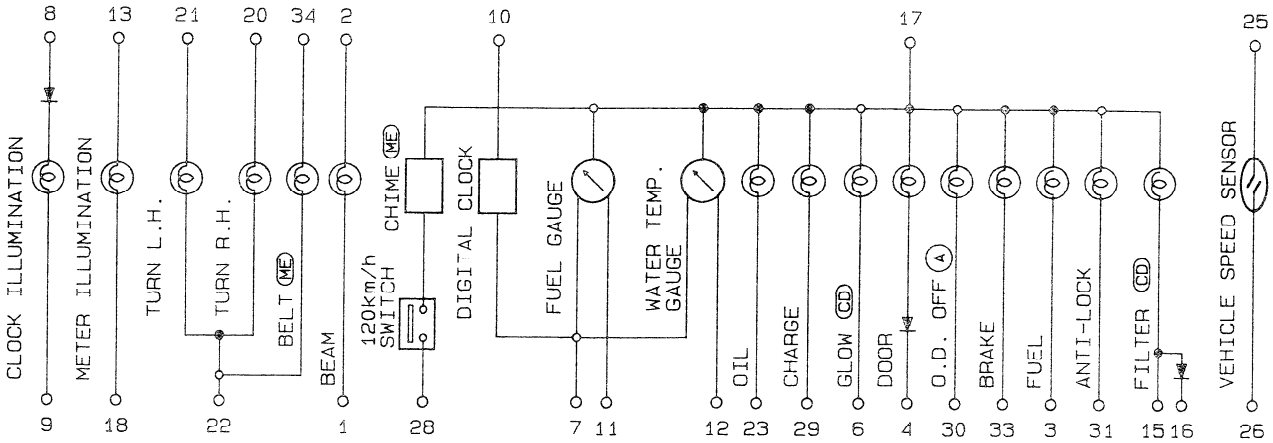
Combination Meter (Cont'd)

WITHOUT TACHOMETER (L.H.D. models)





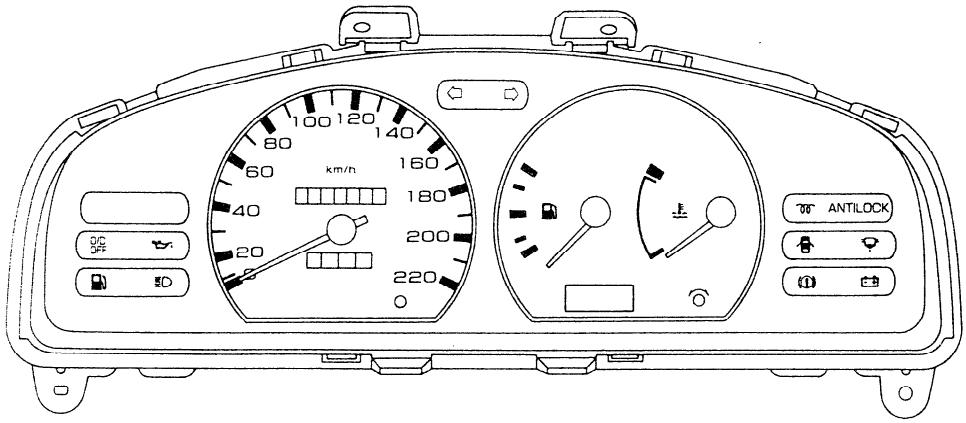
Ⓐ : A/T model (ME) : For Middle East
(CD) : CD engine

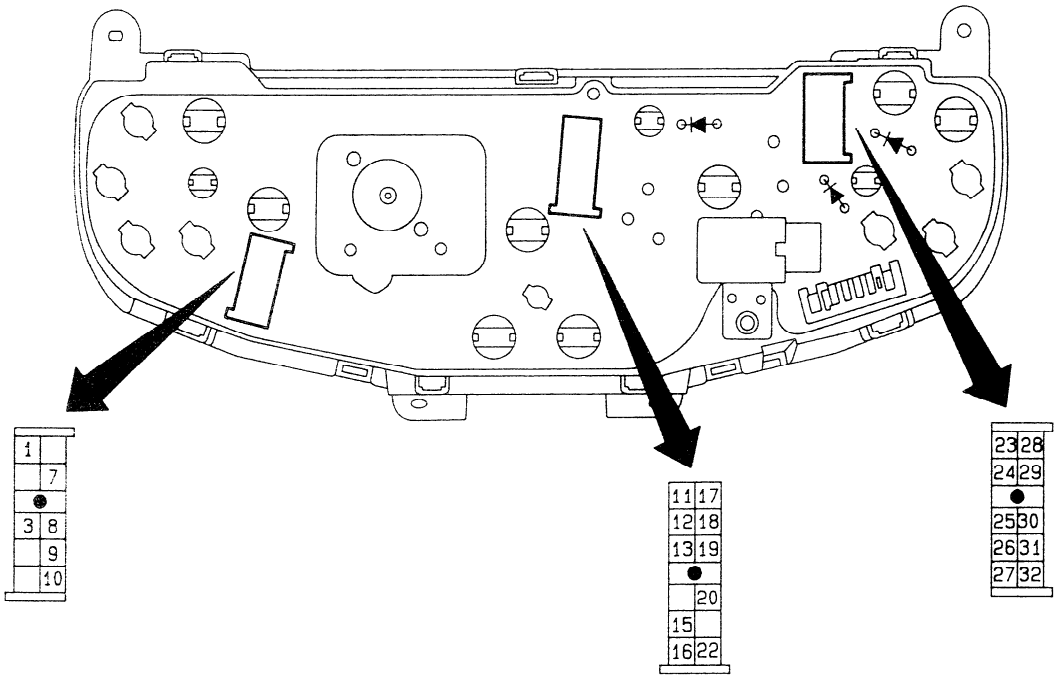


SEL305Q

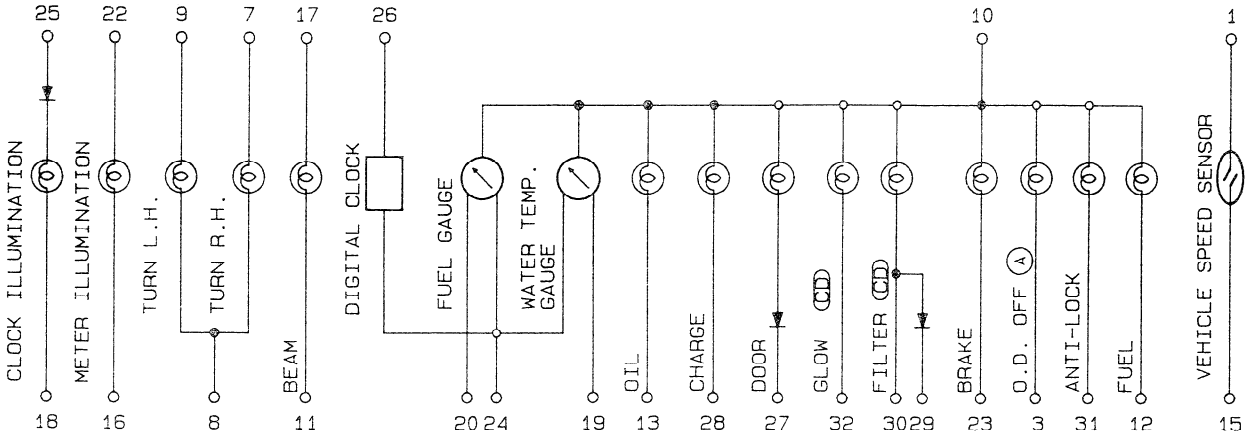
Combination Meter (Cont'd)

WITHOUT TACHOMETER (R.H.D. models)





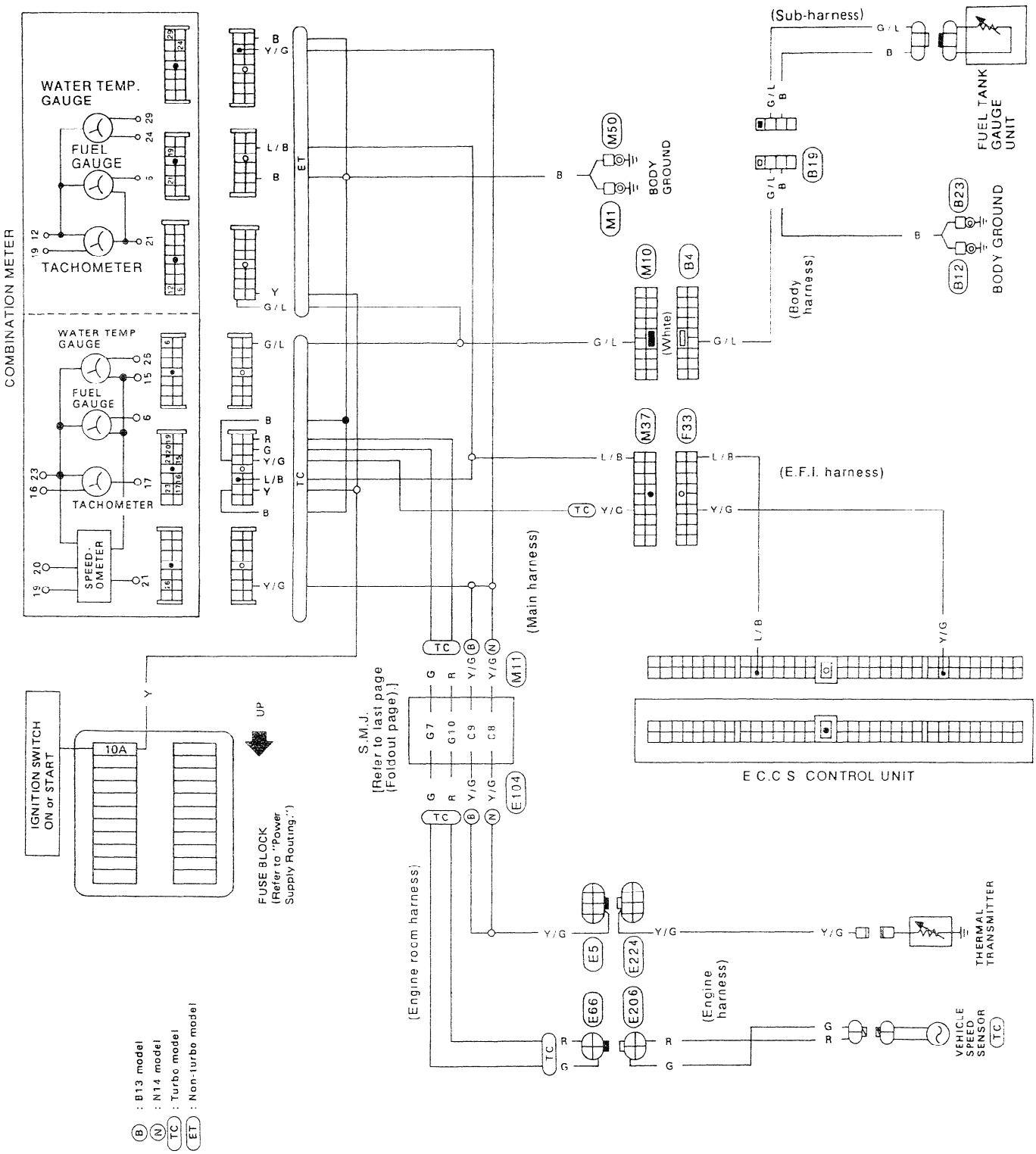
Ⓐ : A/T model
CD : CD engine



SEL306Q

Tachometer, Temp., and Fuel Gauges/Wiring Diagram

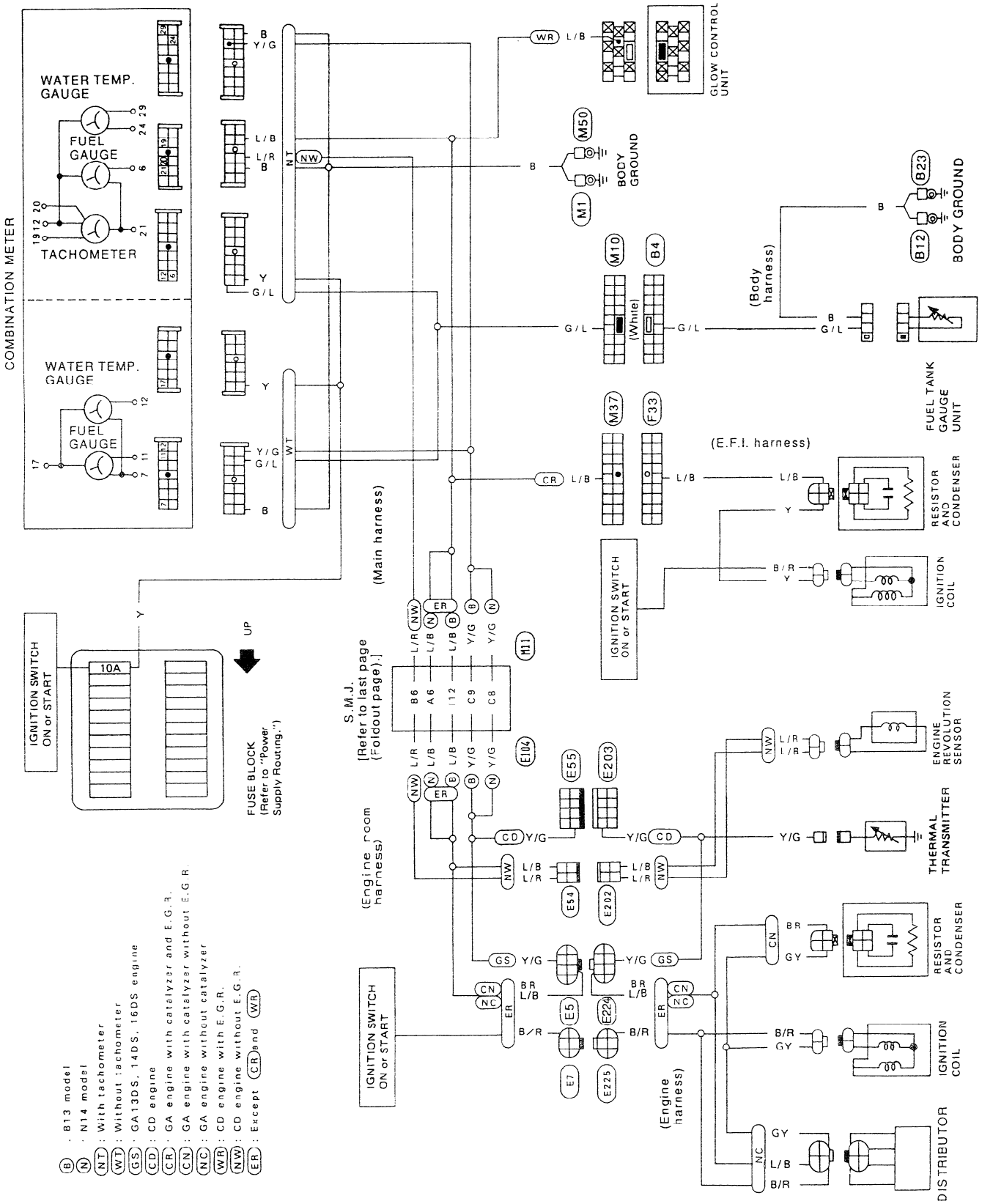
L.H.D. MODELS (With E.C.C.S)



SEL307Q

Tachometer, Temp., and Fuel Gauges/Wiring Diagram (Cont'd)

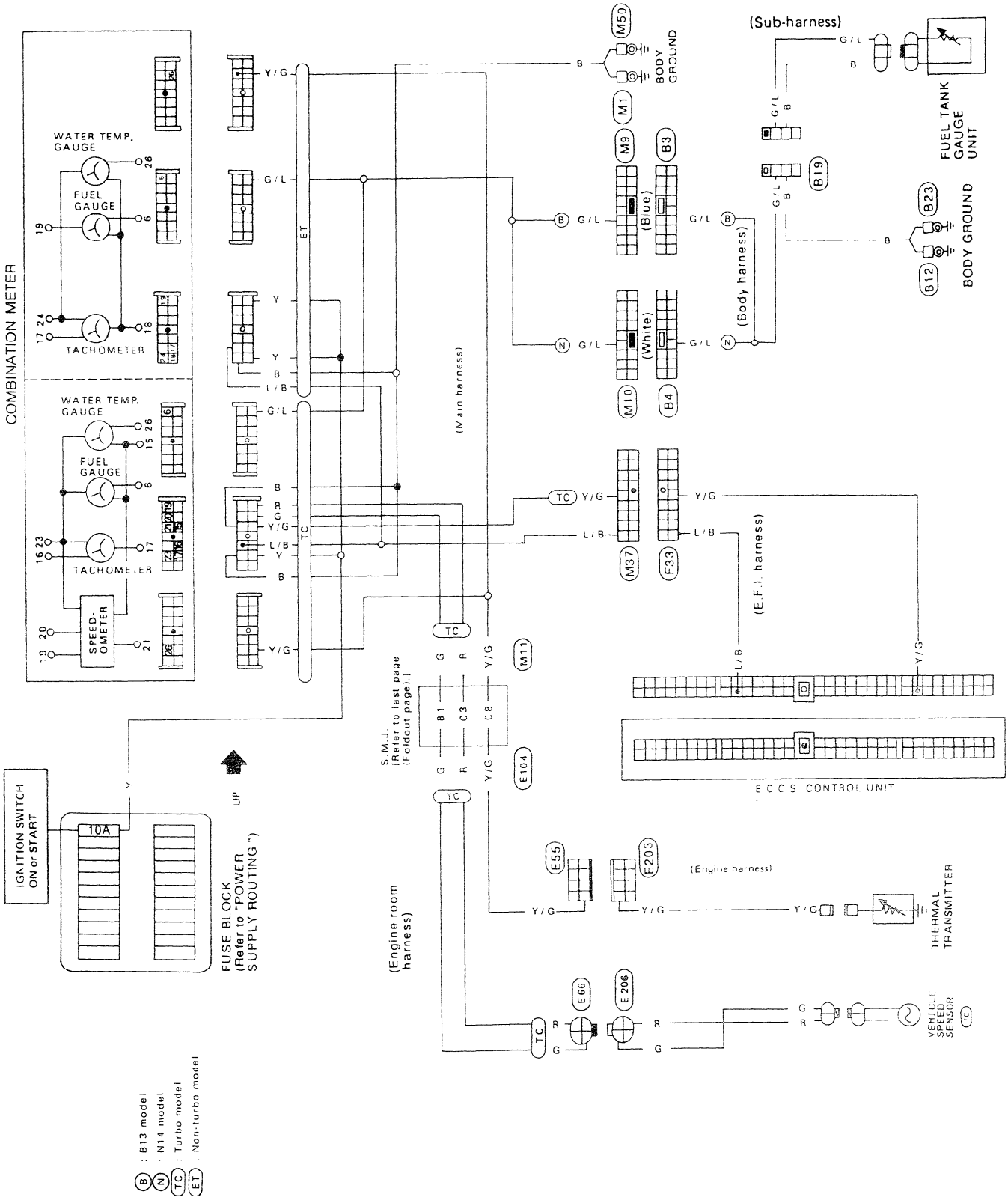
L.H.D. MODELS (Without E.C.C.S)



SEL308Q

Tachometer, Temp., and Fuel Gauges/Wiring Diagram (Cont'd)

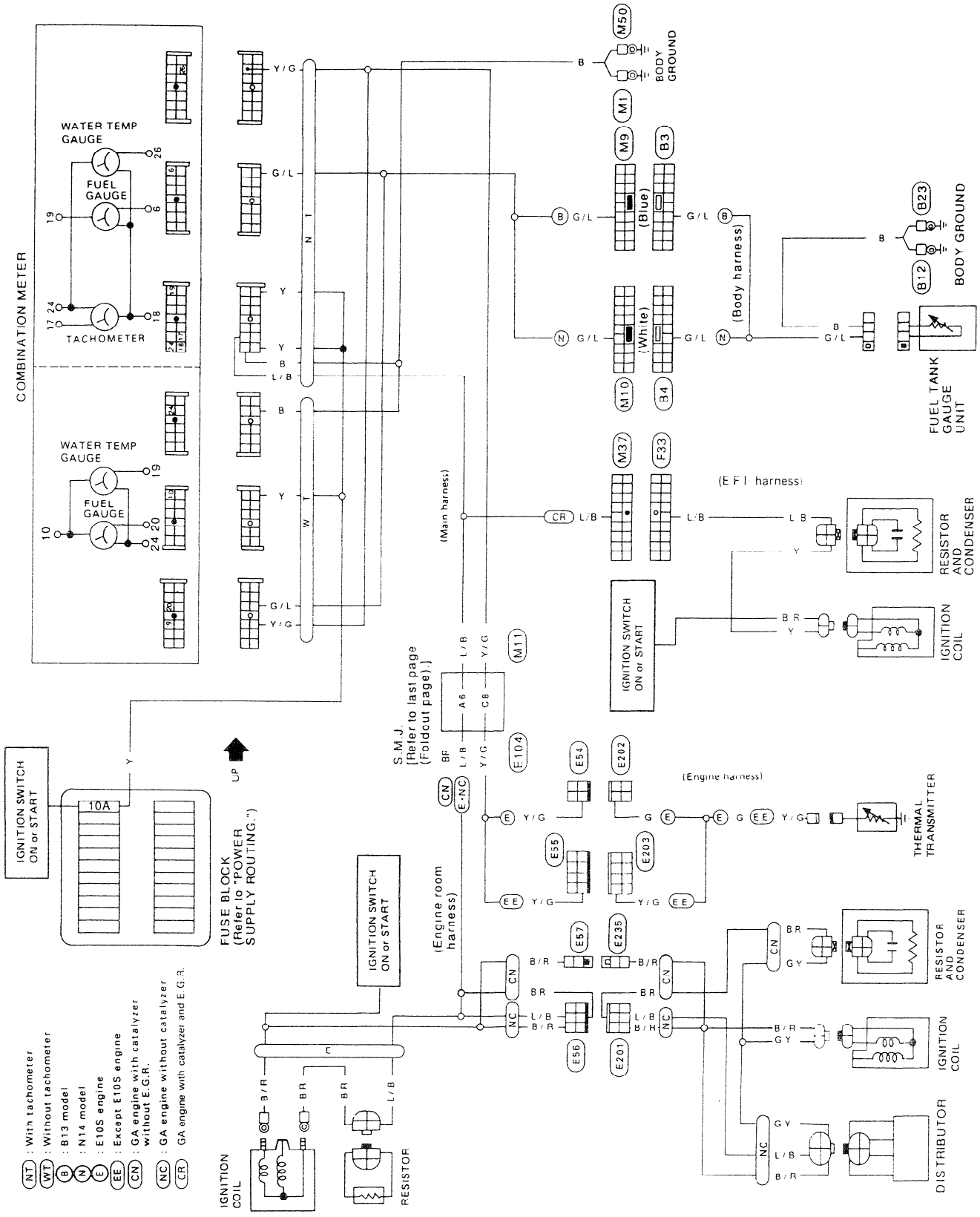
R.H.D. MODELS (With E.C.C.S)



SEL309Q

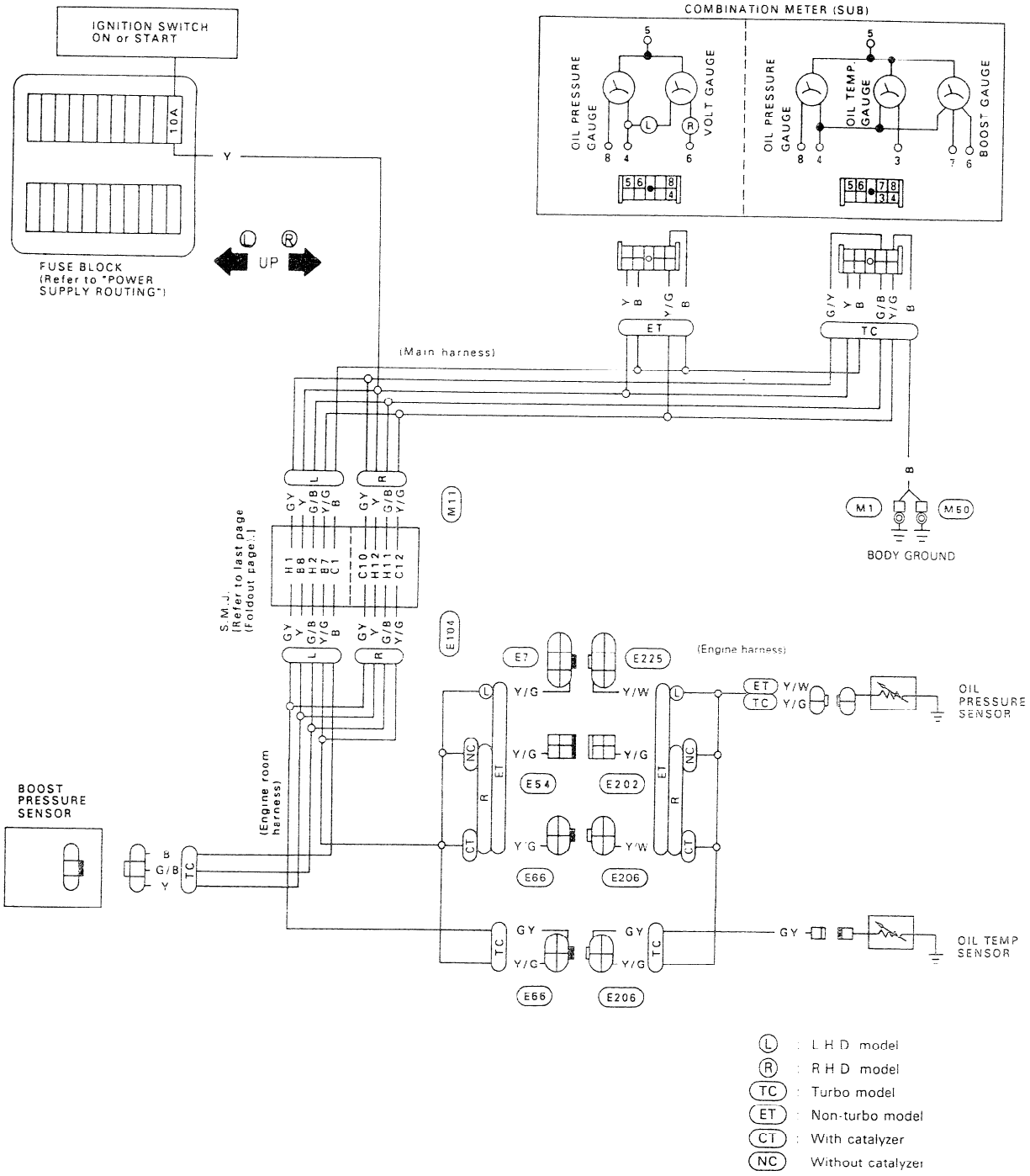
Tachometer, Temp., and Fuel Gauges/Wiring Diagram (Cont'd)

R.H.D. MODELS (Without E.C.C.S)



SEL398Q

Oil Pressure, Oil Temp., Boost and Volt Gauges/Wiring Diagram



SEL399Q

Inspection/Fuel Gauge and Water Temperature Gauge

INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal Ⓐ and ground.
Battery voltage should exist.

N.G. → Check the following items.
1) Harness continuity between battery terminal and combination meter
2) Ignition relay
3) Fusible link and fuse
4) Ignition switch

O.K. ↓

B

CHECK GAUGE OPERATION.
1) Turn ignition switch "ON".
2) Connect terminal Ⓑ and ground with wire through 3.4W test bulb.
3) Check operation of gauge.
Gauge should move smoothly to full scale.

N.G. → Repair or replace gauge.

O.K. ↓

C

Check harness continuity between component and combination meter Ⓒ.

N.G. → Repair or replace.

O.K. ↓

CHECK COMPONENT.
Check gauge units and harness.
Refer to "Fuel Tank Gauge Unit Check" and "Thermal Transmitter Check".

N.G. → Repair or replace.
Refer to FE section. (Fuel tank gauge unit)

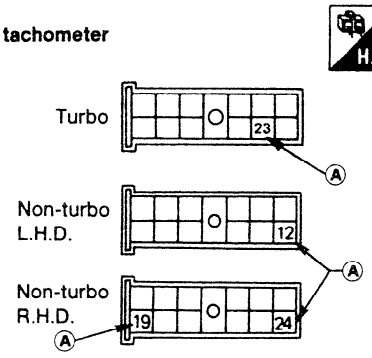
O.K. ↓

Reinstall any part removed.

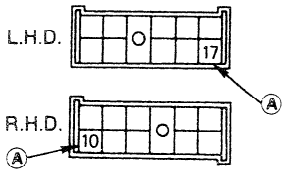
INSPECTION END

A

With tachometer

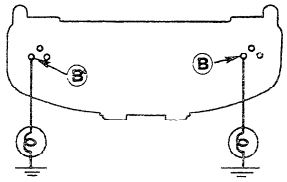


Without tachometer

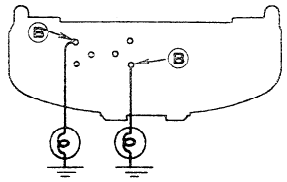


SEL213Q

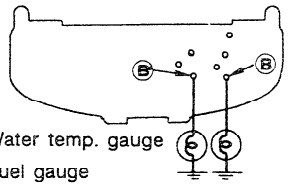
B **With tachometer**



Without tachometer (L.H.D.)



Without tachometer (R.H.D.)

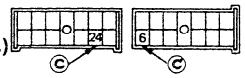


Ⓑ : Water temp. gauge
Ⓑ : Fuel gauge

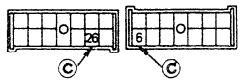
SEL561P

C

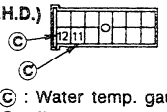
With tachometer (Non-turbo L.H.D.)



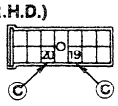
With tachometer (Non-turbo R.H.D. and turbo)



Without tachometer (L.H.D.)

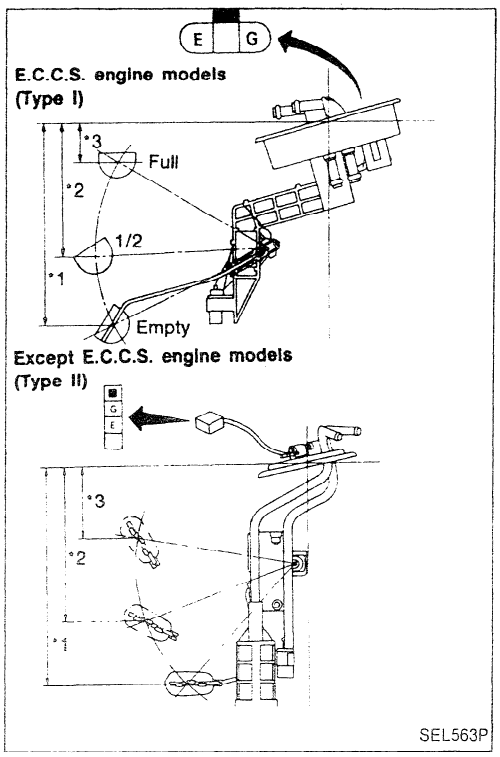


Without tachometer (R.H.D.)



Ⓒ : Water temp. gauge
Ⓒ : Fuel gauge

SEL214Q



Fuel Tank Gauge Unit Check (2WD)

- For removal, refer to FE section.

Check the resistance between terminals (G) and (E).

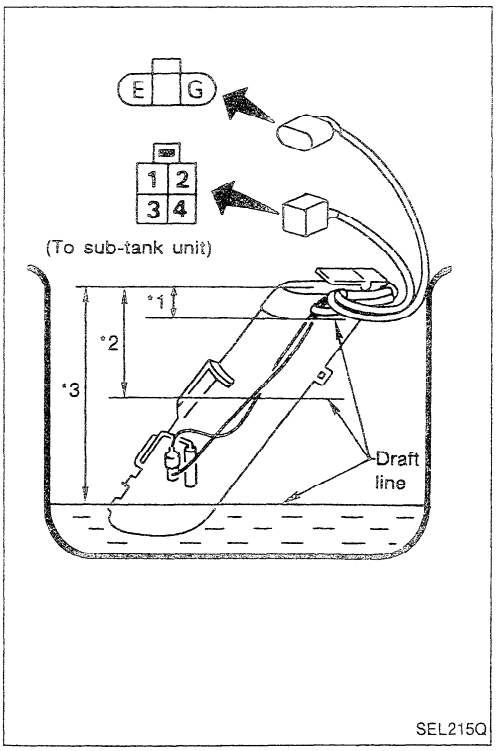
Ohmmeter		Float position mm (in)				Resistance value (Ω)
(+)	(−)			Type-I	Type-II	
G	E	*3	Full	59 (2.32)	58 (2.28)	Approx. 4 - 6
		*2	1/2	110 (4.33)	108 (4.25)	27 - 35
		*1	Empty	166 (6.54)	161 (6.34)	78 - 85

*1 and *3: When float rod is in contaact with stopper.

Fuel Tank Gauge Unit Check (4WD)

- For removal, refer to FE section.

Check the resistance between terminals Ⓖ and Ⓔ.

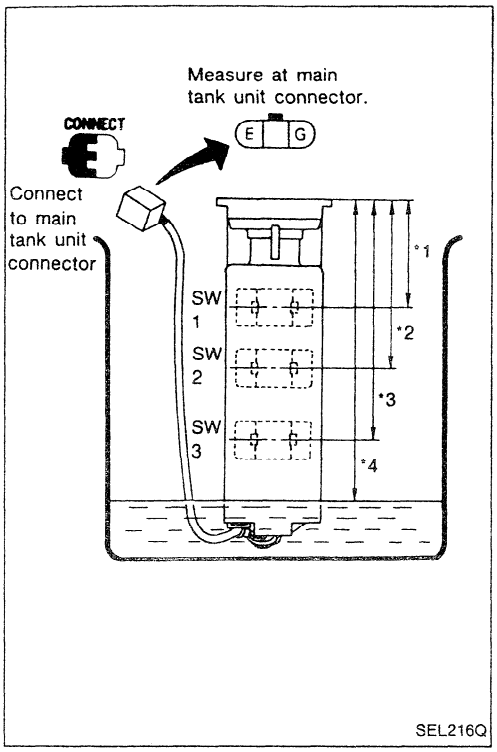


Main tank

Ohmmeter		Draft line mm (in)			Resistance value (Ω)
(+)	(−)				
G	E	*1	Full	13 (0.51)	Approx. 5 - 8
		*2	1/2	81 (3.19)	29 - 33
		*3	Empty	172 (6.77)	92 - 96

Fuel Tank Gauge Unit Check (4WD) (Cont'd)

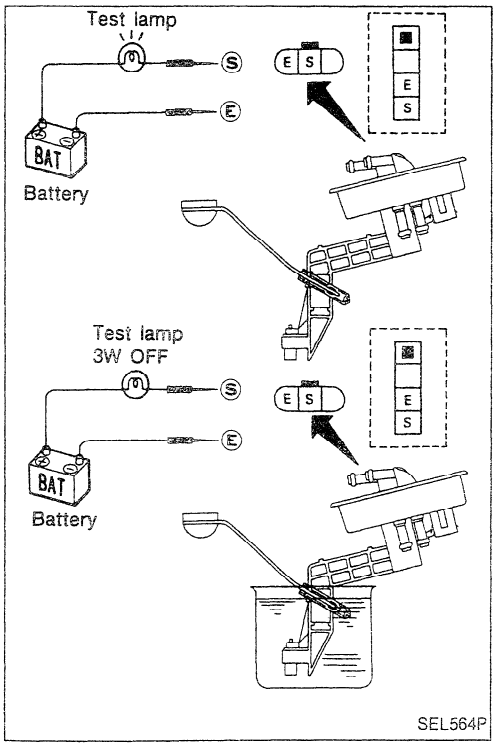
Sub-tank



SEL216Q

Ohmmeter		Built-in switch			Draft line mm (in)		Resistance value (Ω)
(+)	(−)	SW 1	SW 2	SW 3			
G	E	○	○	○	*1	37 (1.46)	Approx. 3 - 4
		—	○	○	*2	60 (2.36)	8 - 9
		—	—	○	*3	87 (3.43)	12 - 13
		—	—	—	*4	126 (4.96)	12 - 13

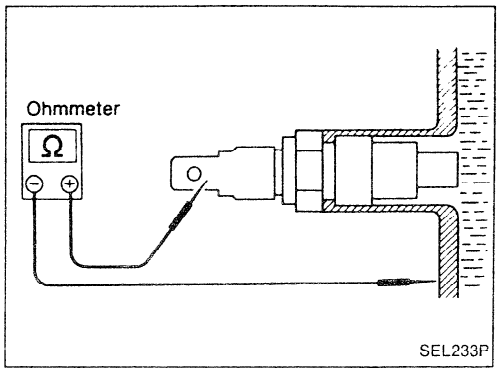
○: ON, —: OFF



SEL564P

Fuel Warning Lamp Sensor Check

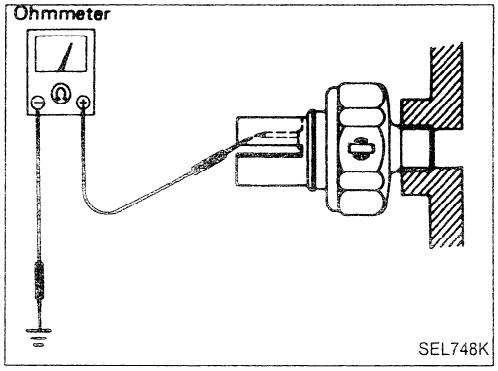
- It will take a short time for the bulb to light.



Thermal Transmitter Check

Check the resistance between the terminals of thermal transmitter and body ground.

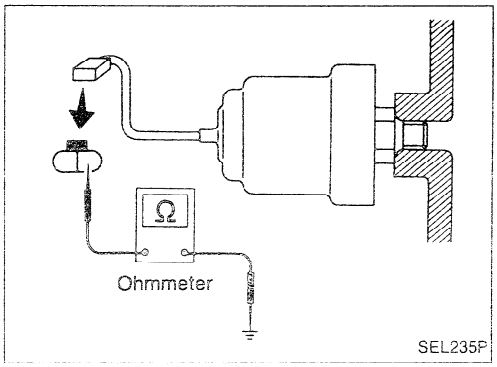
Water temperature	Resistance
60°C (140°F)	Approx. 70 - 90Ω
100°C (212°F)	Approx. 21 - 24Ω



Oil Pressure Switch Check

Check the continuity between the terminals of oil pressure switch and body ground.

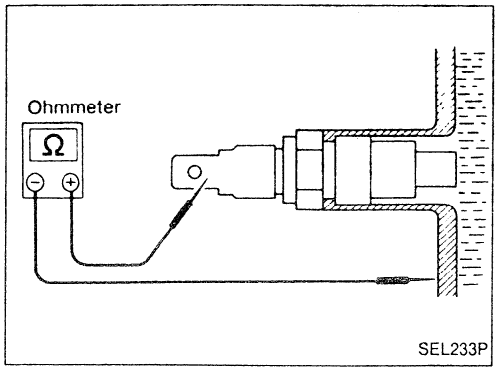
	Oil pressure kPa (bar, kg/cm², psi)	Continuity
Engine start	More than 10 - 20 (0.10 - 0.20, 0.1 - 0.2, 1.4 - 2.8)	NO
Engine stop	Less than 10 - 20 (0.10 - 0.20, 0.1 - 0.2, 1.4 - 2.8)	YES



Oil Pressure Sending Unit Check

Check the resistance between the terminals of oil pressure sending unit and body ground.

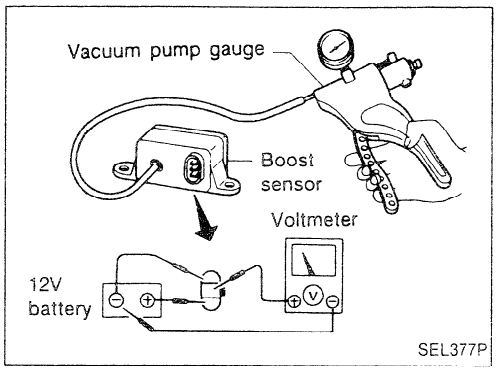
Oil pressure kPa (bar, kg/cm², psi)	Resistance value
0 (0, 0, 0) (Engine is stopped)	∞
392 (3.9, 4, 57)	Approx. 27 - 37Ω
588 (5.9, 6, 85)	Approx. 17 - 27Ω



Oil Temperature Sensor Check

Check the resistance between the terminals of oil temperature sensor and body ground.

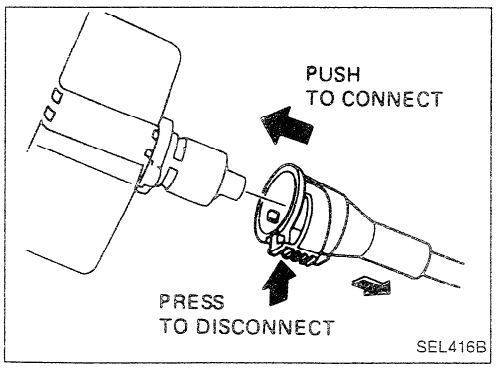
Water temperature	Resistance
70°C (158°F)	Approx. 87 - 97Ω
110°C (230°F)	Approx. 26 - 29Ω



Boost Pressure Sensor Check

1. Connect vacuum pump gauge to boost pressure sensor vacuum hose.
2. Disconnect harness connector from boost pressure sensor and connect battery and voltmeter as shown.
3. Apply vacuum pressure to boost pressure sensor by vacuum pump gauge and measure voltages.

Vacuum pressure kPa (mbar, mmHg, inHg)	Voltage (V)
0 (0, 0, 0)	Approx. 2.2
–53.3 (–533, –400, –5.75)	Approx. 1.3



Speedometer Cable Removal and Installation

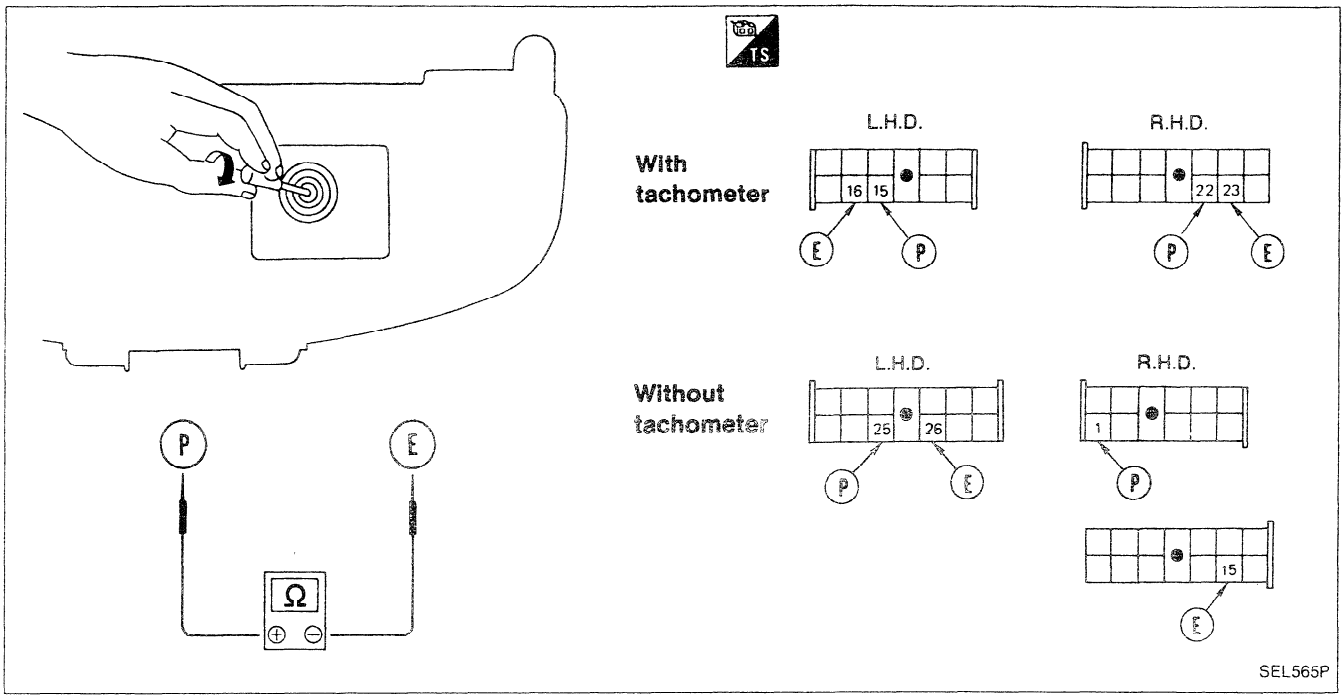
After disconnecting speedometer cable end from transaxle, push speedometer cable so that combination meter is pushed into passenger compartment. Disconnect speedometer cable end from combination meter as shown in the figure at left.

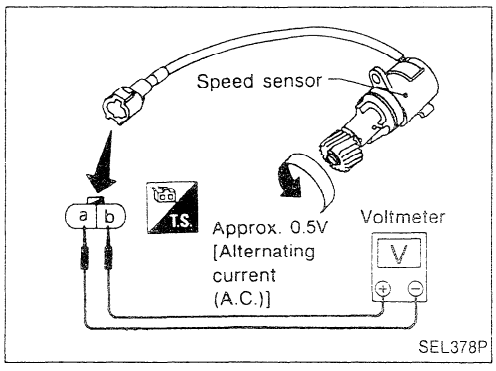
Speed Sensor Signal Check (Non-turbo models)

- A speed sensor is built into the speedometer.

1. Turn speedometer slowly using a small screwdriver.
2. Check continuity of speed sensor circuit.

Continuity exists two times for each turn ... O.K.

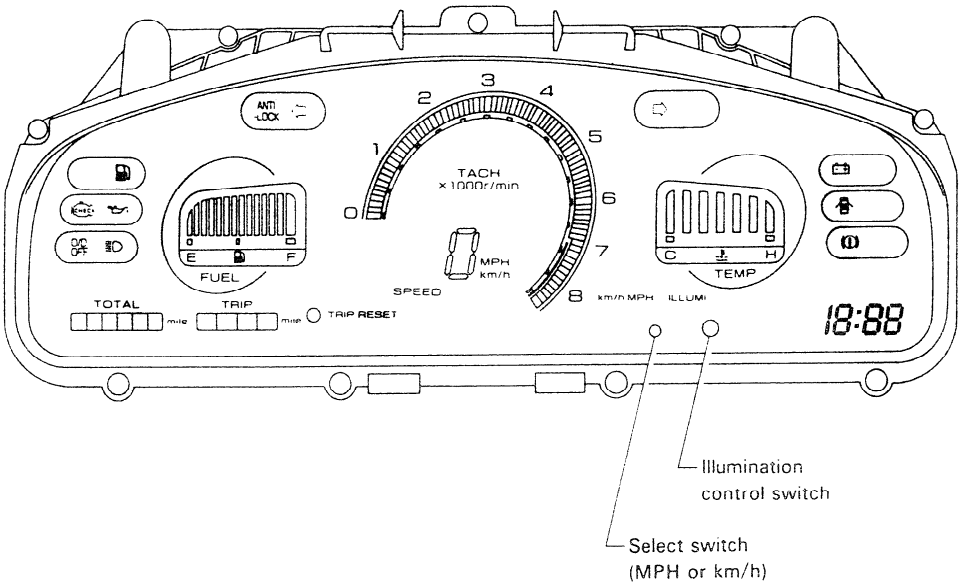




Speed Sensor Signal Check (Turbo models)

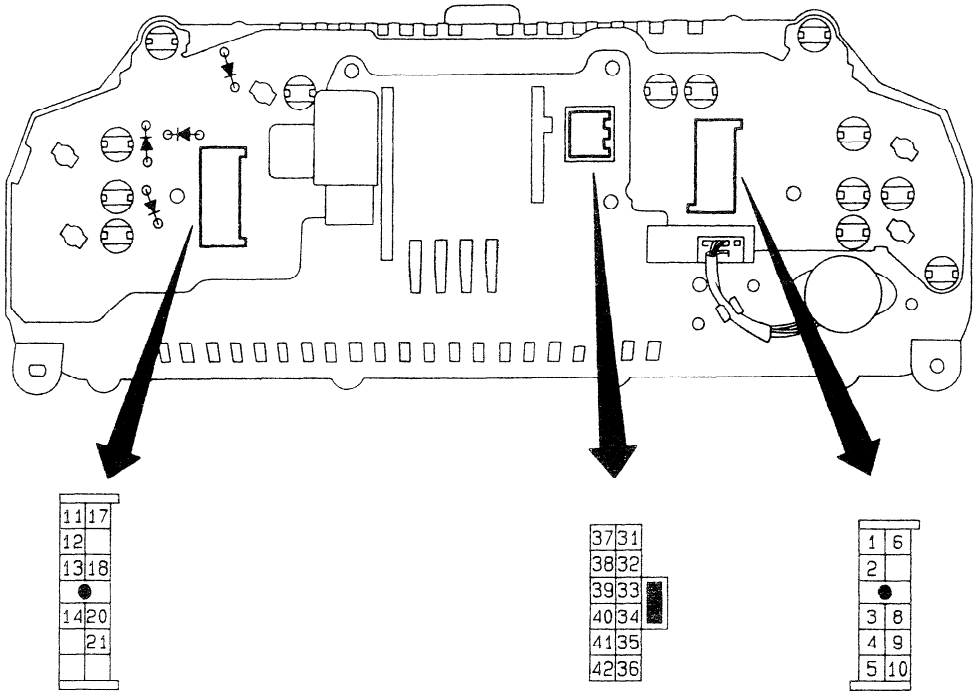
1. Remove speed sensor from transaxle.
2. Turn speedometer pinion quickly and measure voltage across ⓐ and ⓑ.

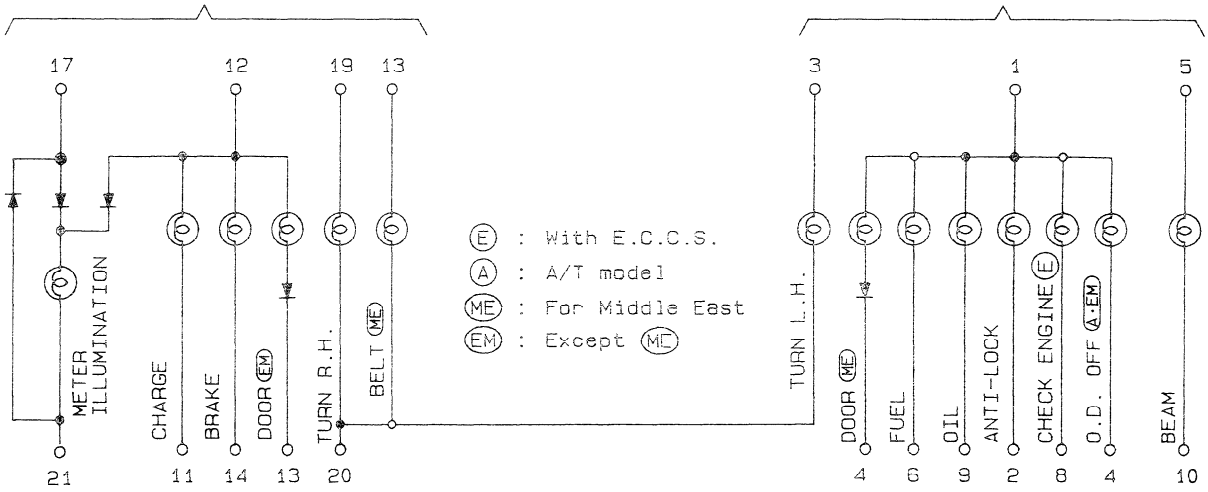
Combination Meter

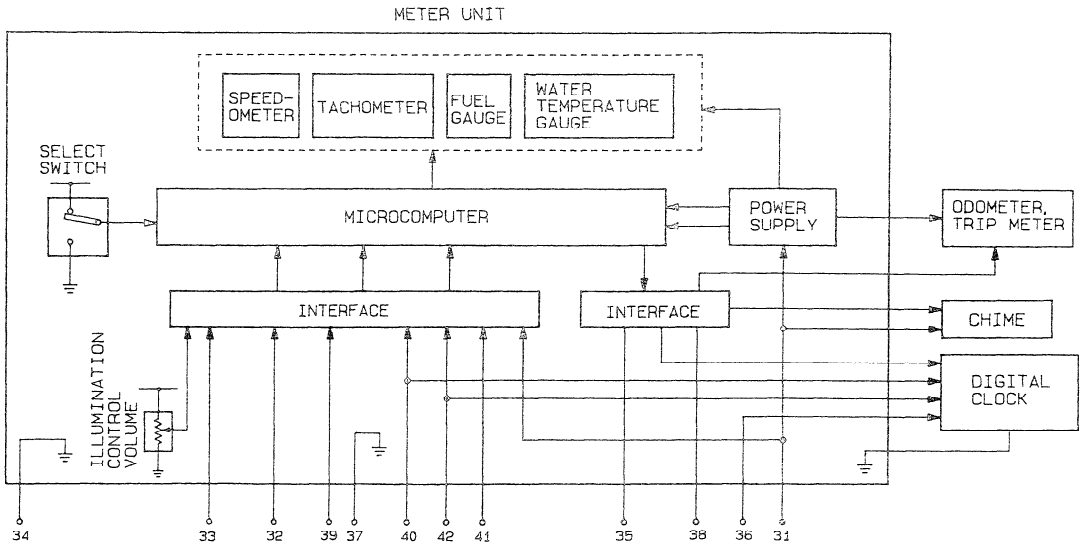


SEL312Q

Combination Meter (Cont'd)

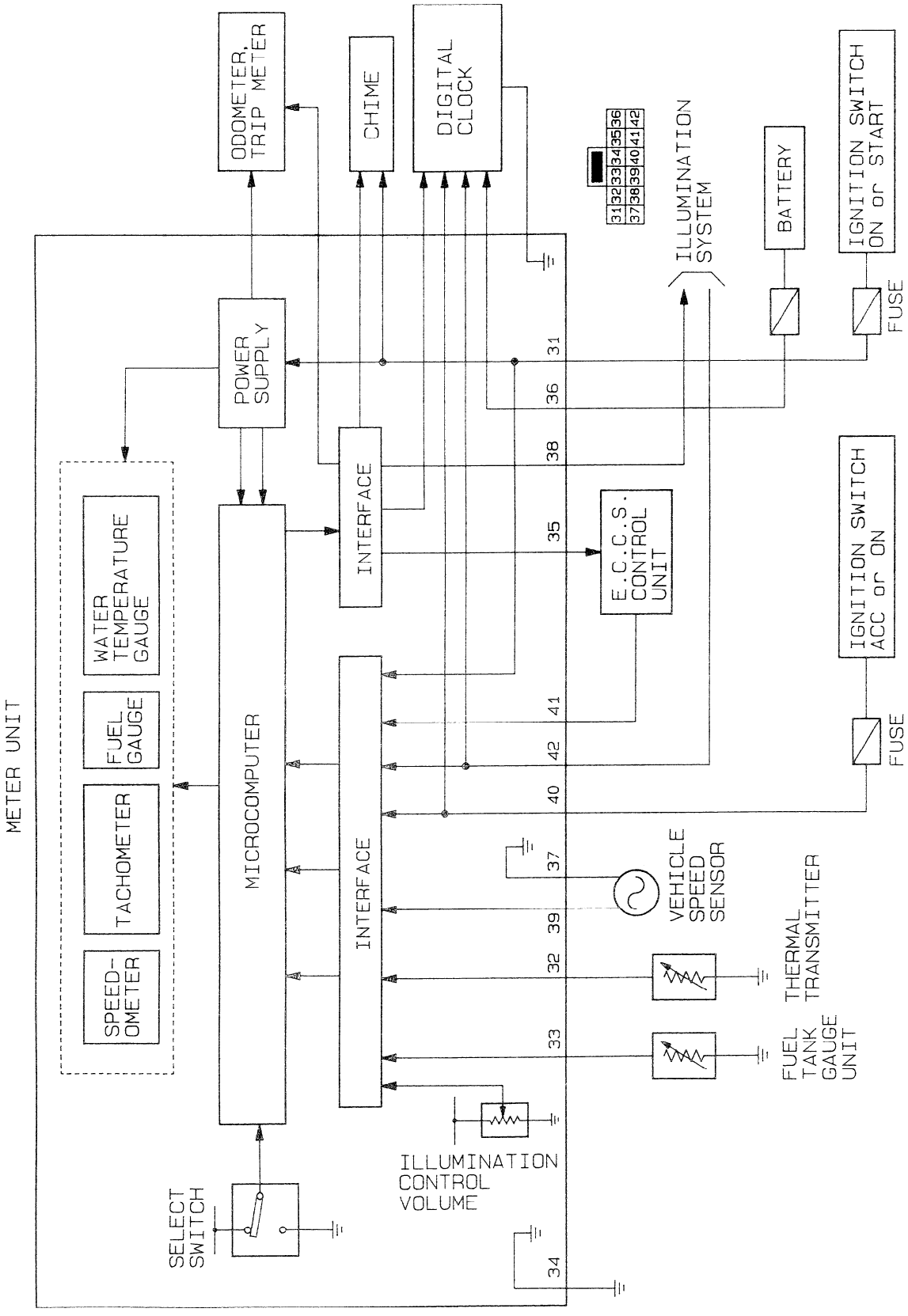






SEL313Q

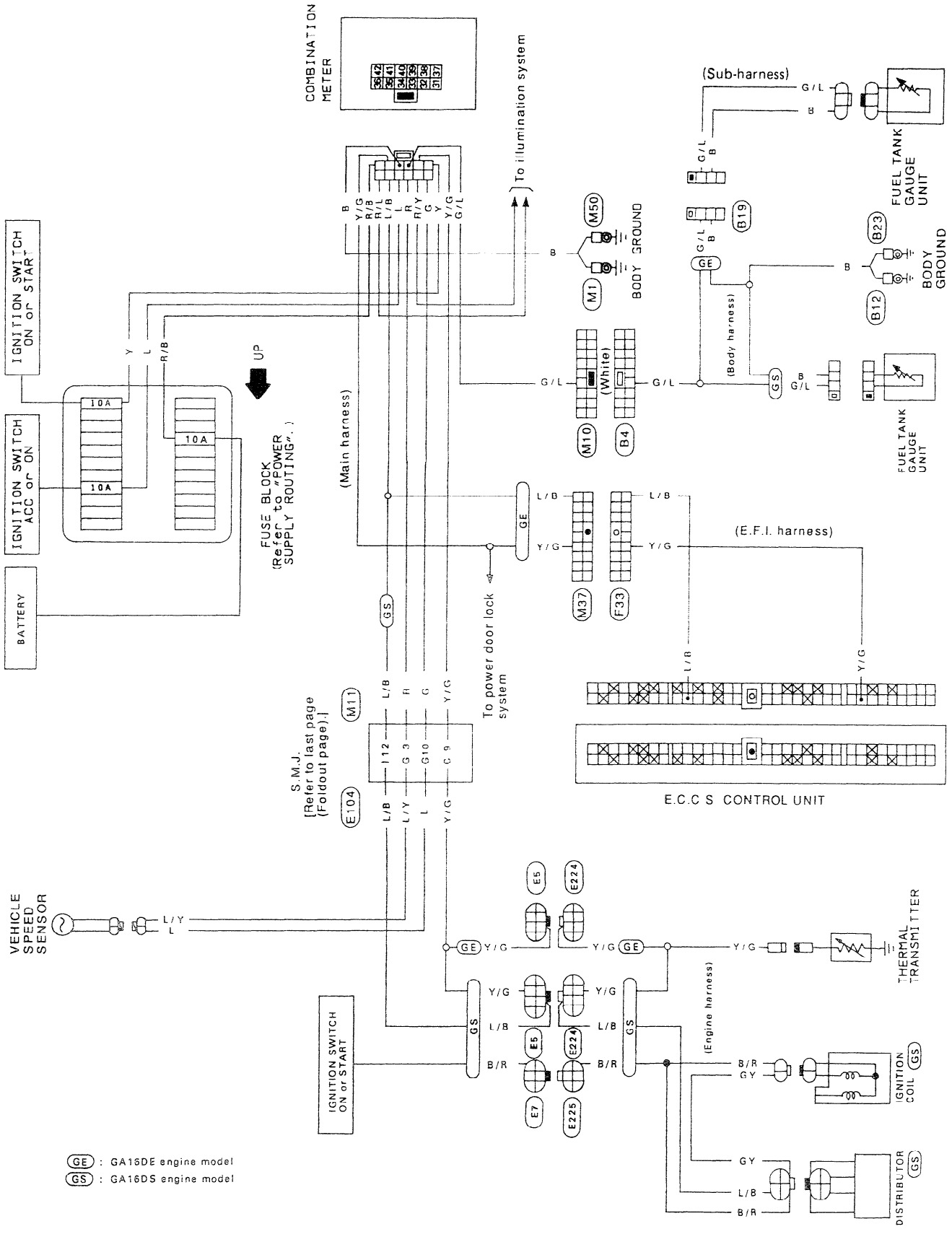
Schematic



SEL314Q

Wiring Diagram

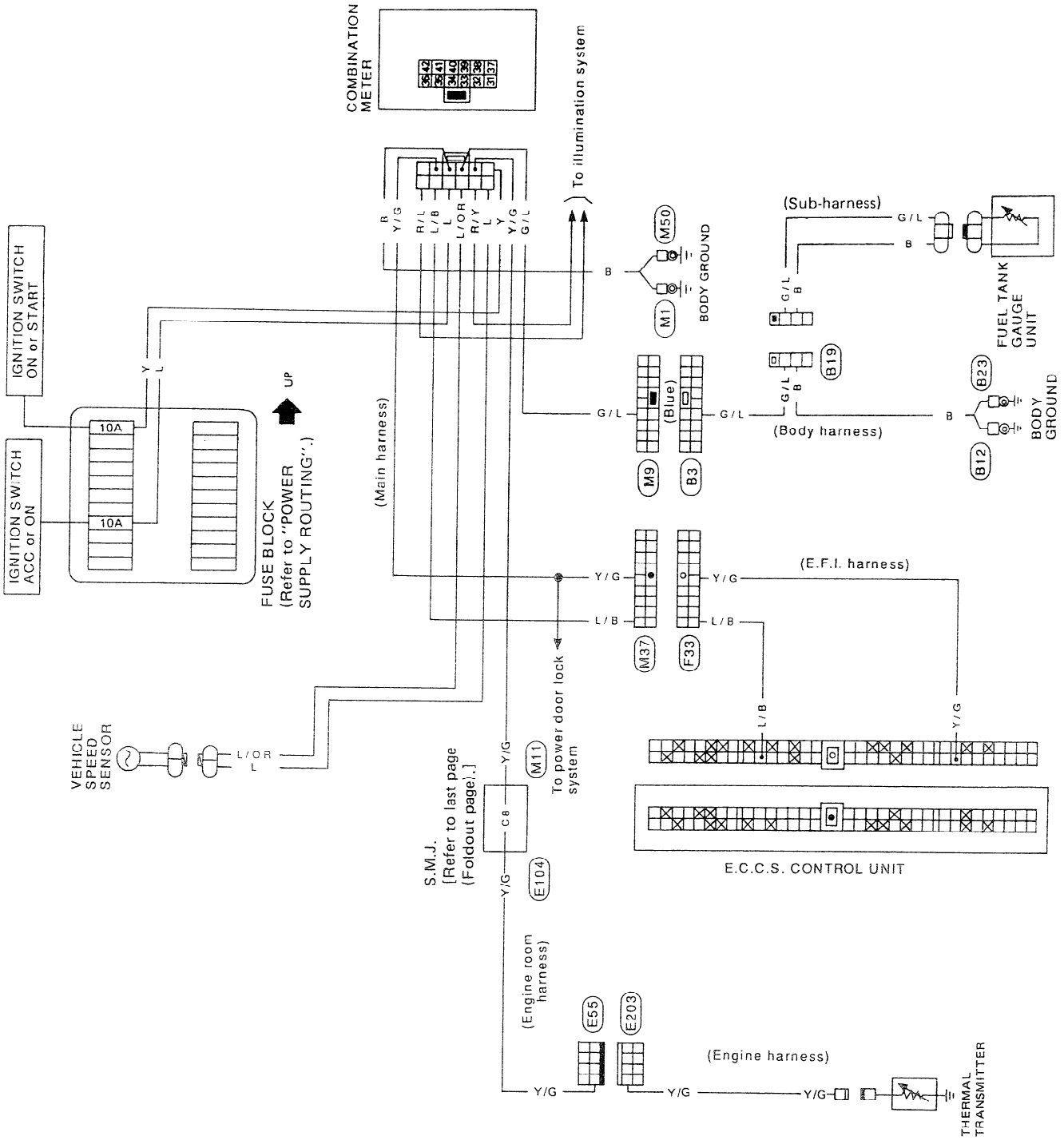
L.H.D. MODELS



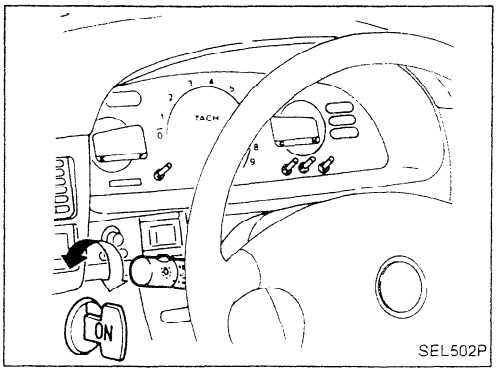
SEL315Q

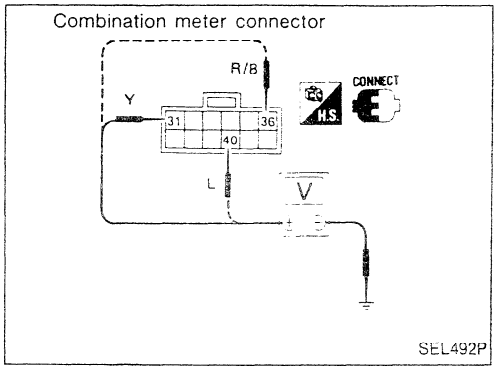
Wiring Diagram (Cont'd)

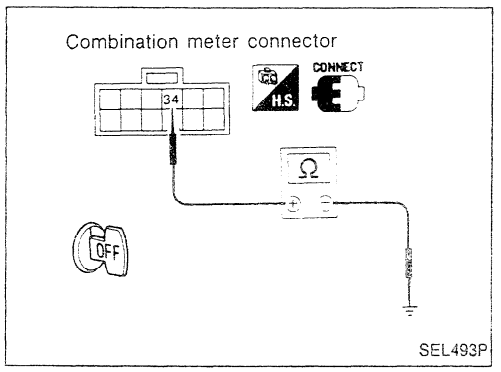
R.H.D. MODELS



SEL533P







Trouble Diagnoses

SELF-CHECK (SEGMENT CHECK)

1. Turn light switch from "OFF" to "ON" more than 10 times, within 15 seconds after ignition switch is turned from "OFF" to "ON".
2. The display starts self-check automatically. This function operates on speedometer, tachometer, temperature gauge and fuel gauge at the same time.
   To stop this function, run engine or turn ignition switch to "OFF".

MAIN POWER SUPPLY AND GROUND CIRCUIT CHECK

Main power supply

Terminal No.		Ignition switch		
(+)	(–)	OFF	ACC	ON
31	Ground	0V	0V	Battery voltage
36	Ground	Battery voltage	Battery voltage	Battery voltage
40	Ground	0V	Battery voltage	Battery voltage

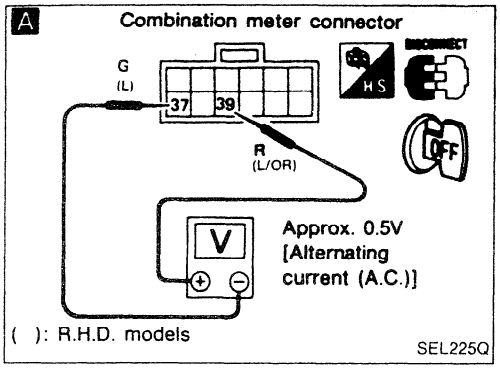
Ground circuit

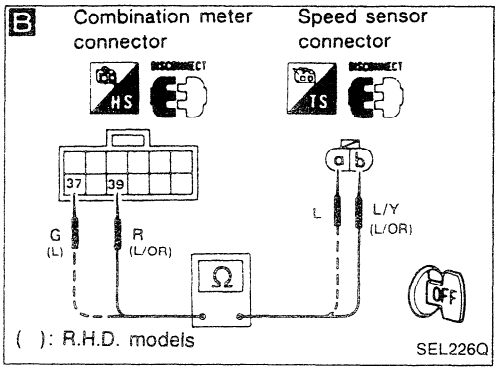
Terminal No.	Continuity
34	Yes

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE ①

SYMPTOM: Speedometer always indicates zero ("0") when driving.





A

SPEED SENSOR INPUT SIGNAL CHECK
1. Apply wheel chocks and jack up front of vehicle.
2. Connect voltmeter between harness terminals No. 37 and No. 39.
3. Turn front wheel slowly.
4. Check deflection of voltmeter pointer.

O.K. → Replace digital meter.

N.G.

SPEED SENSOR CHECK
Refer to "Speed sensor signal check".

N.G. → Replace speed sensor.

O.K.

B

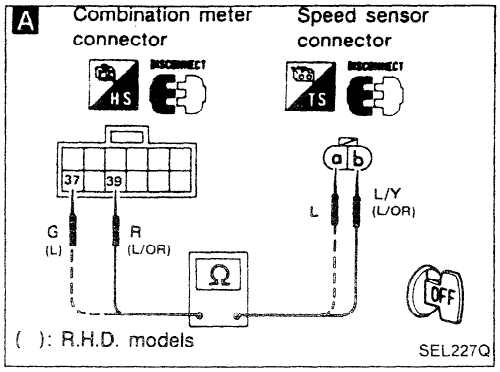
SPEED SENSOR CIRCUIT CHECK
Check continuity between digital meter harness terminals and speed sensor terminals.

Terminal No.		Continuity
Digital meter	Speed sensor	
37	a	Yes
39	b	

N.G.

Repair harness or connector.

Trouble Diagnoses (Cont'd)



DIAGNOSTIC PROCEDURE ②

SYMPTOM: Indicated value of speedometer changes irregularly or is incorrect.

SPEED SENSOR CHECK
Refer to "Speed sensor signal check".

O.K. → Replace speed sensor.

N.G. ↓

A

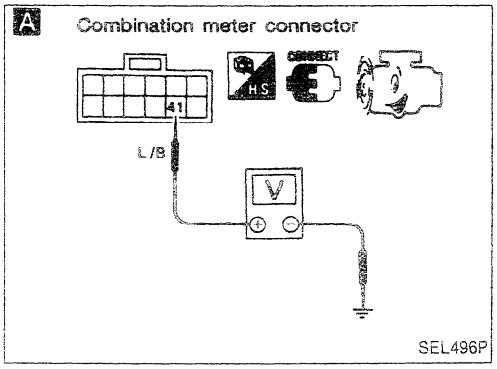
SPEED SENSOR CIRCUIT CHECK
Check continuity between digital meter harness terminals and speed sensor terminals.

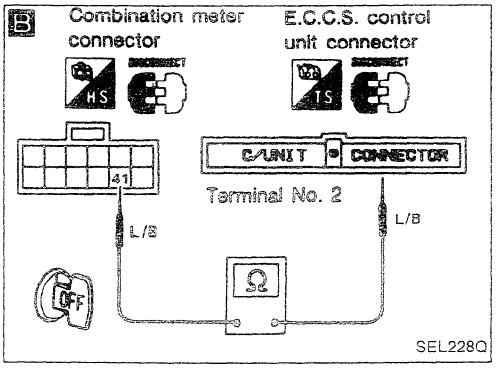
Terminal No.		Continuity
Digital meter	Speed sensor	
37	a	Yes
39	b	

N.G. → Repair harness or connector.

O.K. ↓

Replace digital meter.





DIAGNOSTIC PROCEDURE ③

SYMPTOM: Indicated value of tachometer is incorrect.

A

TACHOMETER INPUT SIGNAL CHECK
Check voltage between digital meter harness terminal No. 41 and body ground.

Terminal No.		Voltage (V)
(+)	(−)	
41	Ground	Approx. 1 - 5

O.K. → Replace digital meter.

N.G. ↓

B

TACHOMETER CIRCUIT CHECK
Check continuity between digital meter terminal No. 41 and E.C.C.S. control unit harness terminal No. 2.

N.G. → Repair harness or connector.

O.K. ↓

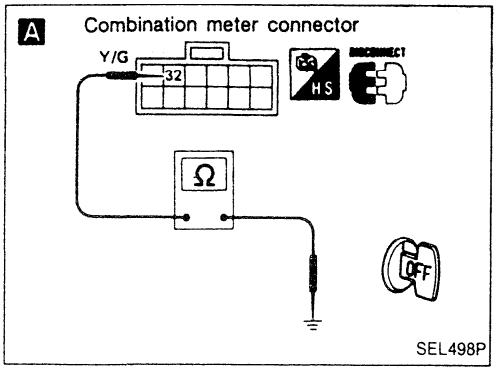
Check E.C.C.S. control unit. Refer to EF & EC section.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE ④

SYMPTOM: Indicated value of water temperature gauge is incorrect.

A



WATER TEMPERATURE SENSOR INPUT SIGNAL CHECK
Check resistance between digital meter harness terminal No. 32 and body ground.
Compare measured resistance with indication of gauge segment (before disconnecting connector).
Gauge indication is changed by the water temperature.

Segment	Resistance (Ω)
7	Approx. 14
≀	≀
4	Approx. 64
≀	≀
1	Approx. 203

O.K. → Replace digital meter.

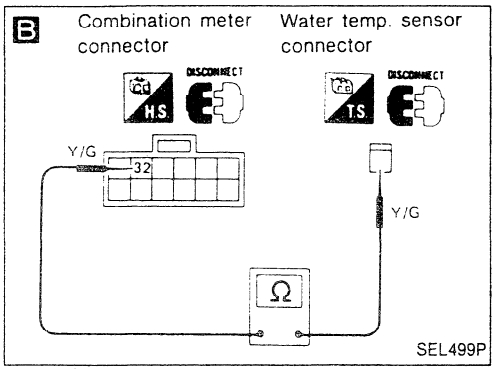
N.G.

THERMAL TRANSMITTER CHECK
Refer to "Thermal Transmitter Check".

N.G. → Replace thermal transmitter.

O.K.

B



WATER TEMPERATURE SENSOR CIRCUIT CHECK.
Check continuity between digital meter harness terminal No. 32 and thermal transmitter harness terminal.

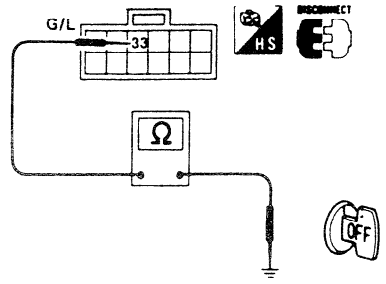
Repair harness or connector.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE ⑤

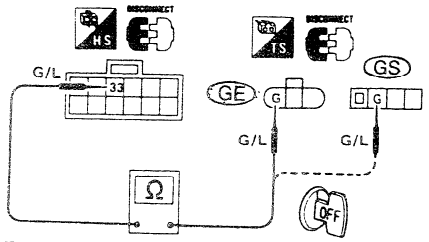
SYMPTOM: Indicated value of fuel gauge is incorrect.

A Combination meter connector



SEL500P

B Combination meter connector — Fuel gauge sensor connector



GE : GA16DE engine models
GS : GA16DS engine models

SEL229Q

A

FUEL GAUGE SENSOR INPUT SIGNAL CHECK
Check resistance between digital meter harness terminal No. 33 and body ground.
Compare measured resistance with indication of gauge segment (before disconnecting connector).
Gauge indication is changed by the amount of fuel.

Segment	Resistance (Ω)
14	Approx. 12
≀	≀
8	Approx. 33
≀	≀
1	Approx. 76

O.K. → Replace digital meter.

N.G. ↓

FUEL GAUGE SENSOR CHECK
Refer to "Fuel Tank Gauge Unit Check".

N.G. → Replace fuel tank gauge unit.

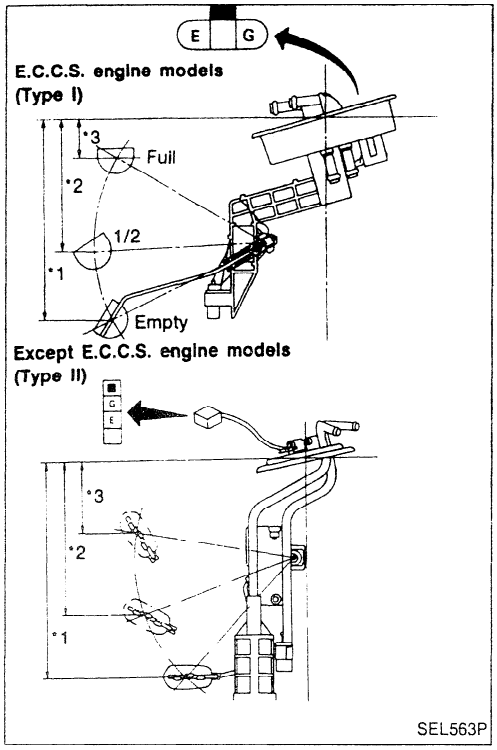
O.K. ↓

B

FUEL GAUGE SENSOR CIRCUIT CHECK
Check continuity between digital meter harness terminal No. 33 and fuel gauge sensor harness terminal Ⓖ.

N.G. ↓

Repair harness or connector.

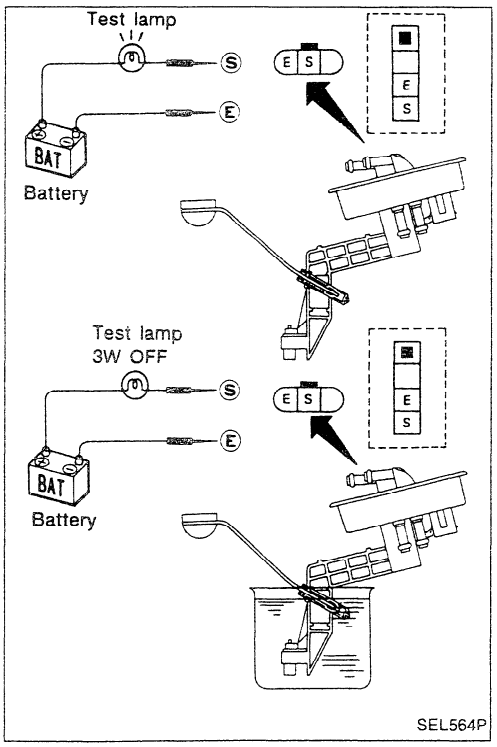


Fuel Tank Gauge Unit Check

- For removal, refer to FE section.

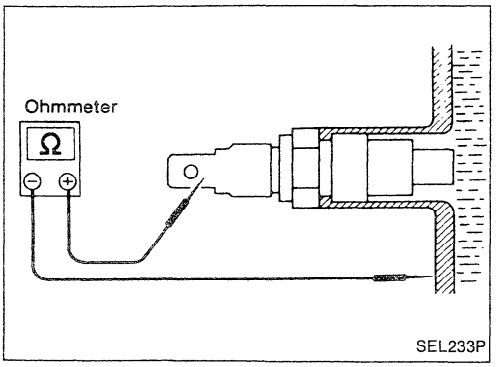
Check the resistance between terminals (G) and (E).

Ohmmeter		Float position mm (in)				Resistance value (Ω)
(+)	(−)			Type-I	Type-II	
G	E	*3	Full	59 (2.32)	58 (2.28)	Approx. 4 - 6
		*2	1/2	110 (4.33)	108 (4.25)	27 - 35
		*1	Empty	166 (6.54)	161 (6.34)	78 - 85



Fuel Warning Lamp Sensor Check

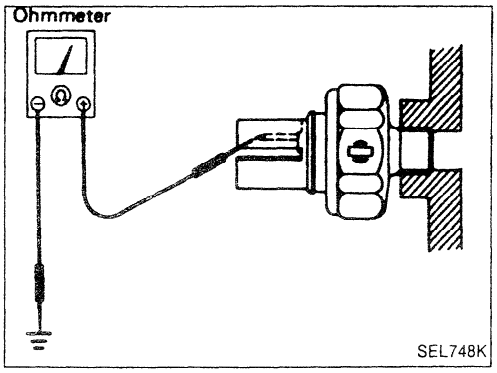
- It will take a short time for the bulb to light.

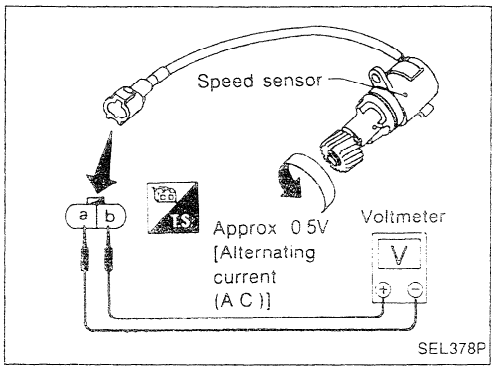


Thermal Transmitter Check

Check the resistance between the terminals of thermal transmitter and body ground.

Water temperature	Resistance
60°C (140°F)	Approx. 70 - 90Ω
100°C (212°F)	Approx. 21 - 24Ω





Oil Pressure Switch Check

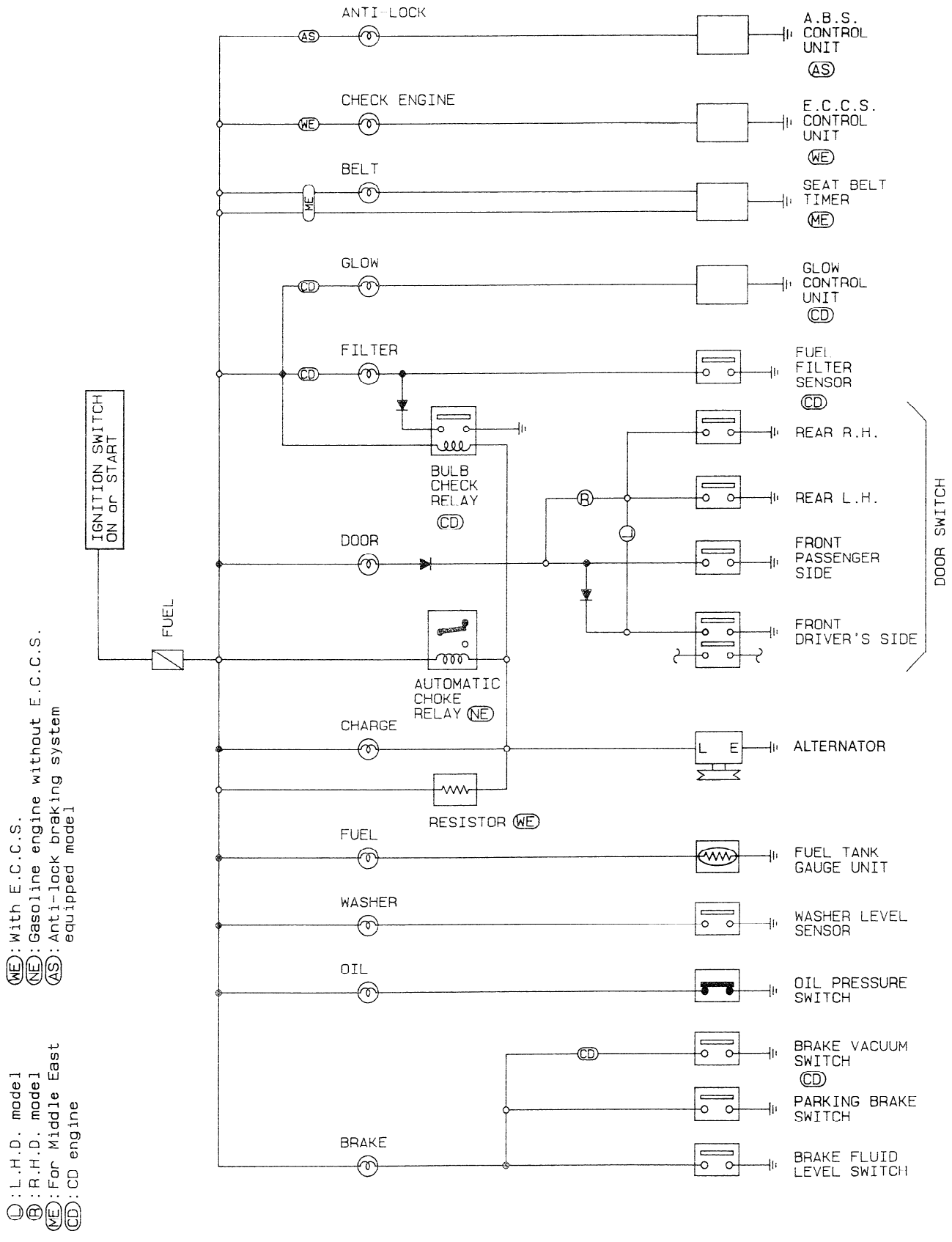
	Oil pressure kPa (bar, kg/cm^2, psi)	Continuity
Engine start	More than 10 - 20 (0.10 - 0.20, 0.1 - 0.2, 1.4 - 2.8)	NO
Engine stop	Less than 10 - 20 (0.10 - 0.20, 0.1 - 0.2, 1.4 - 2.8)	YES

Check the continuity between the terminals of oil pressure switch and body ground.

Speed Sensor Signal Check

1. Remove speed sensor from transaxle.
2. Turn speedometer pinion quickly and measure voltage across ⓐ and ⓑ.

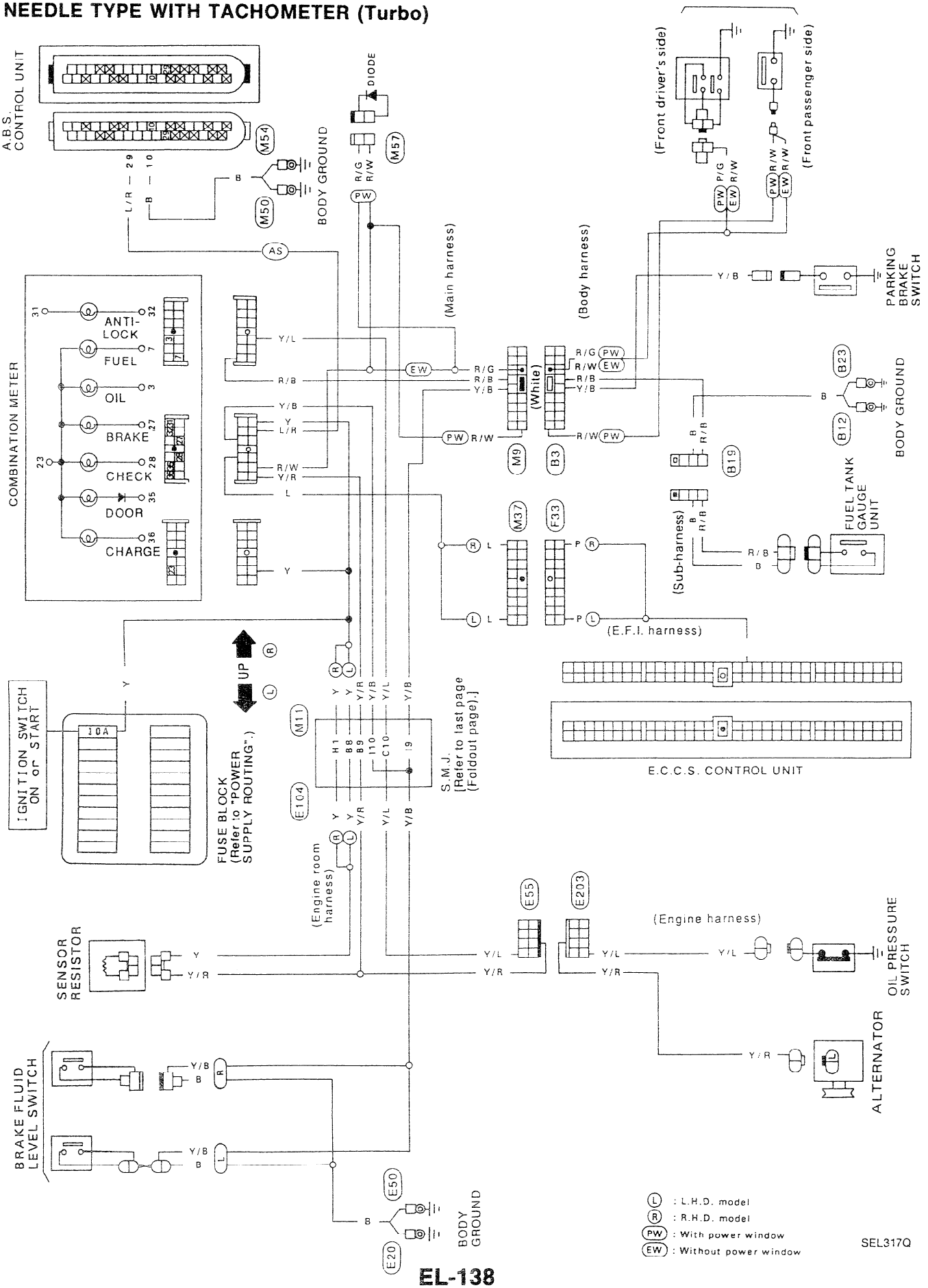
Warning Lamps/Schematic



SEL316Q

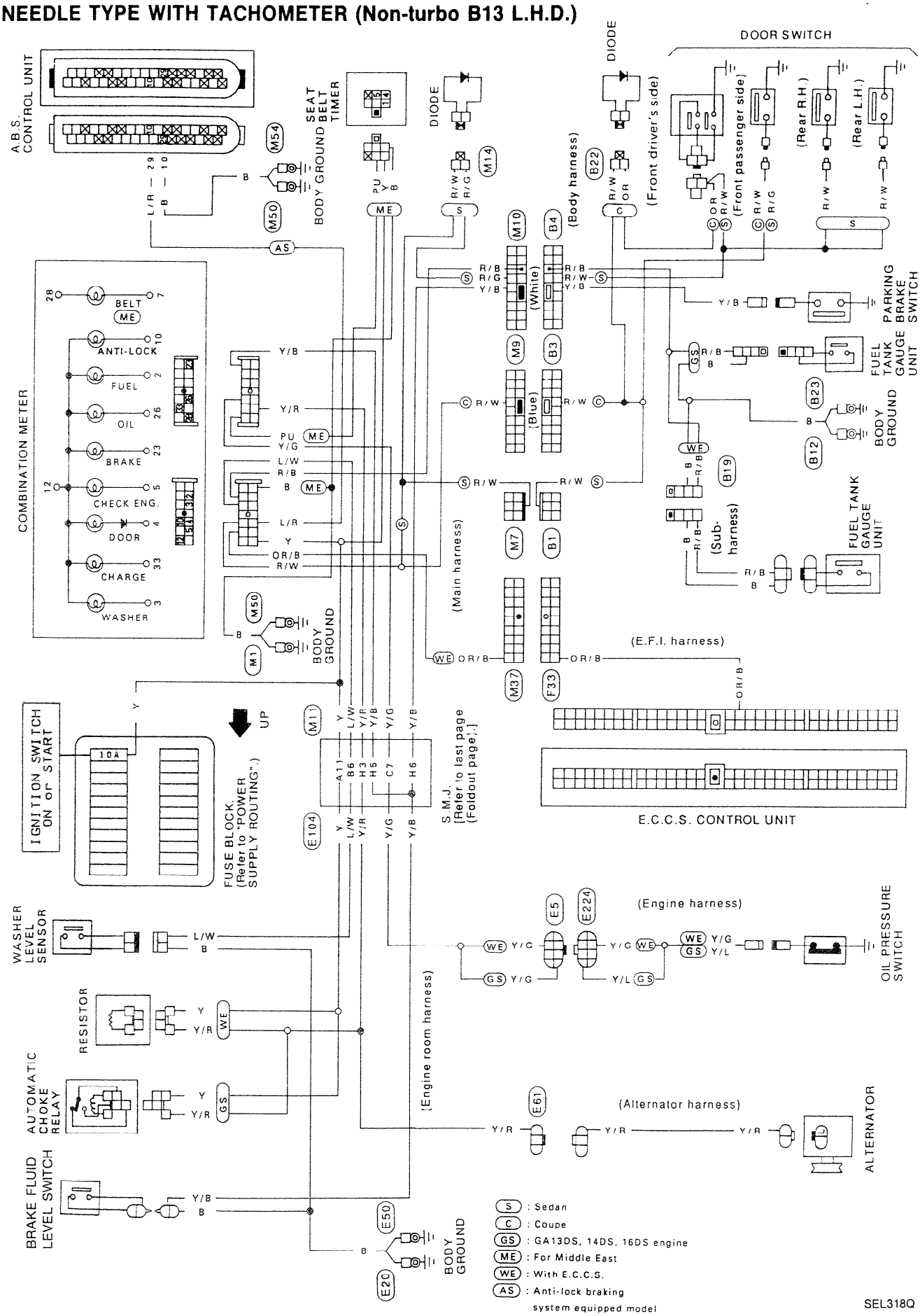
Warning Lamps/Wiring Diagram

NEEDLE TYPE WITH TACHOMETER (Turbo)



Warning Lamps/Wiring Diagram (Cont'd)

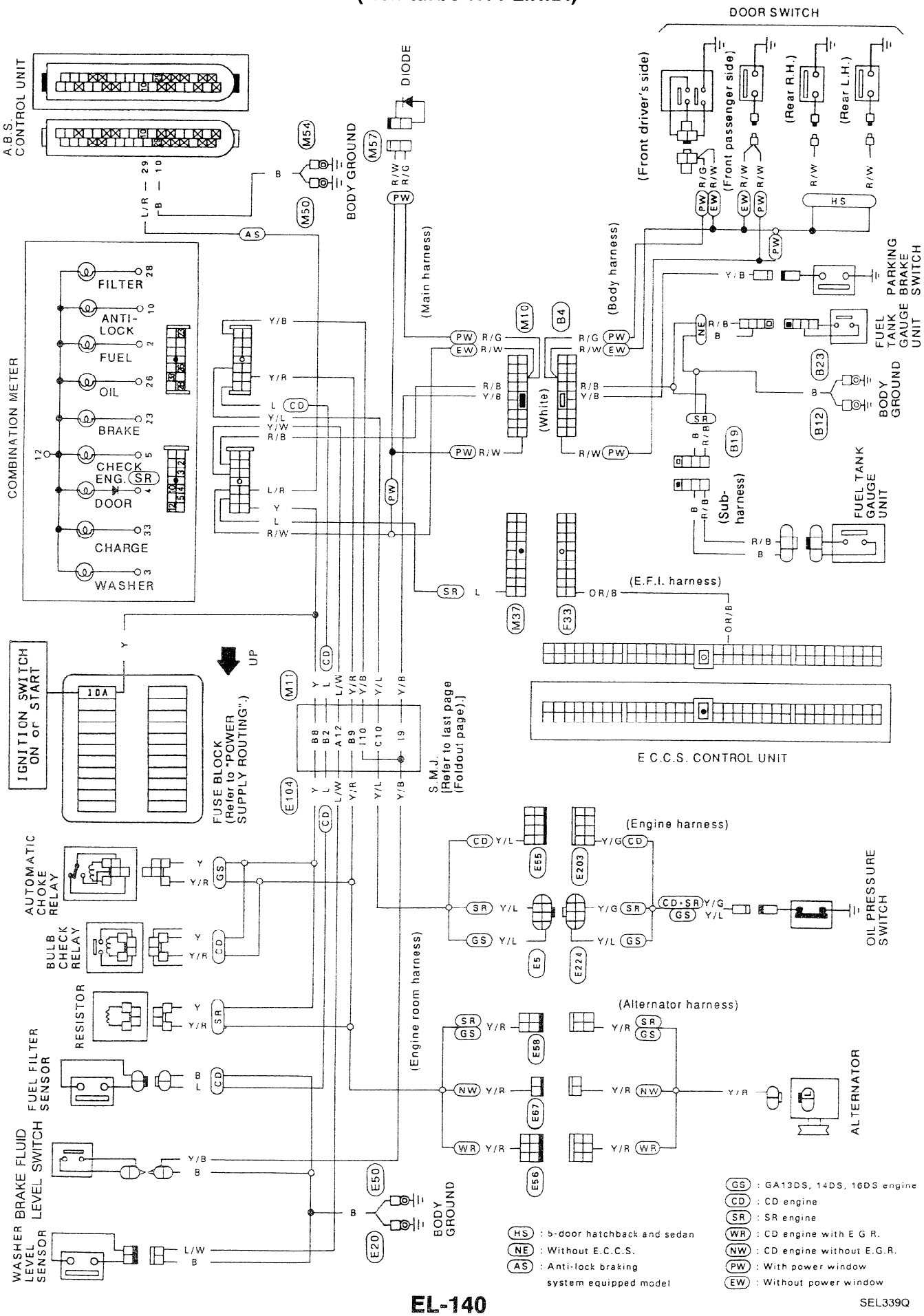
NEEDLE TYPE WITH TACHOMETER (Non-turbo B13 L.H.D.)



SEL318Q

Warning Lamps/Wiring Diagram (Cont'd)

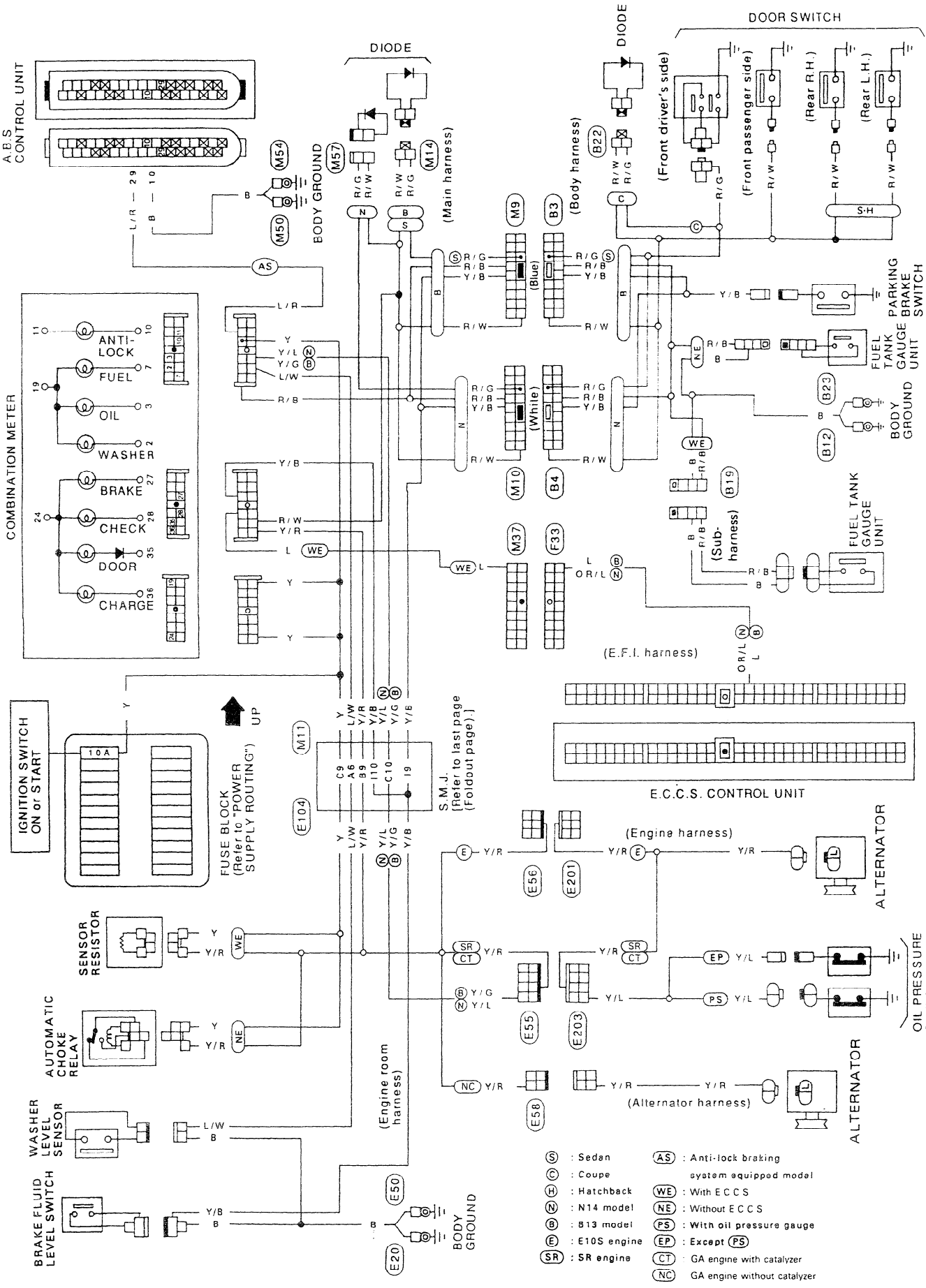
NEEDLE TYPE WITH TACHOMETER (Non-turbo N14 L.H.D.)



SEL339Q

Warning Lamps/Wiring Diagram (Cont'd)

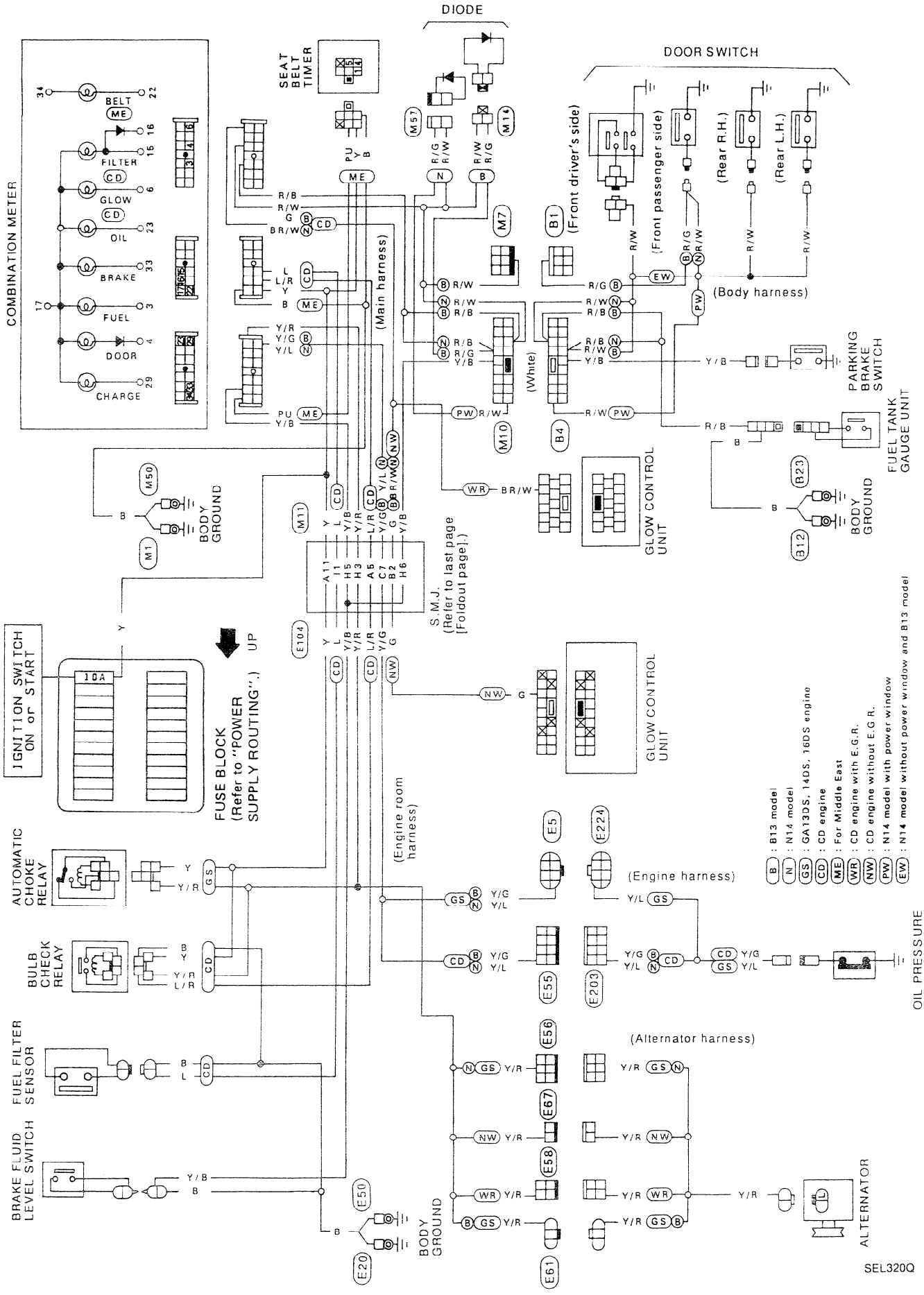
NEEDLE TYPE WITH TACHOMETER (Non-turbo R.H.D.)



SEL400Q

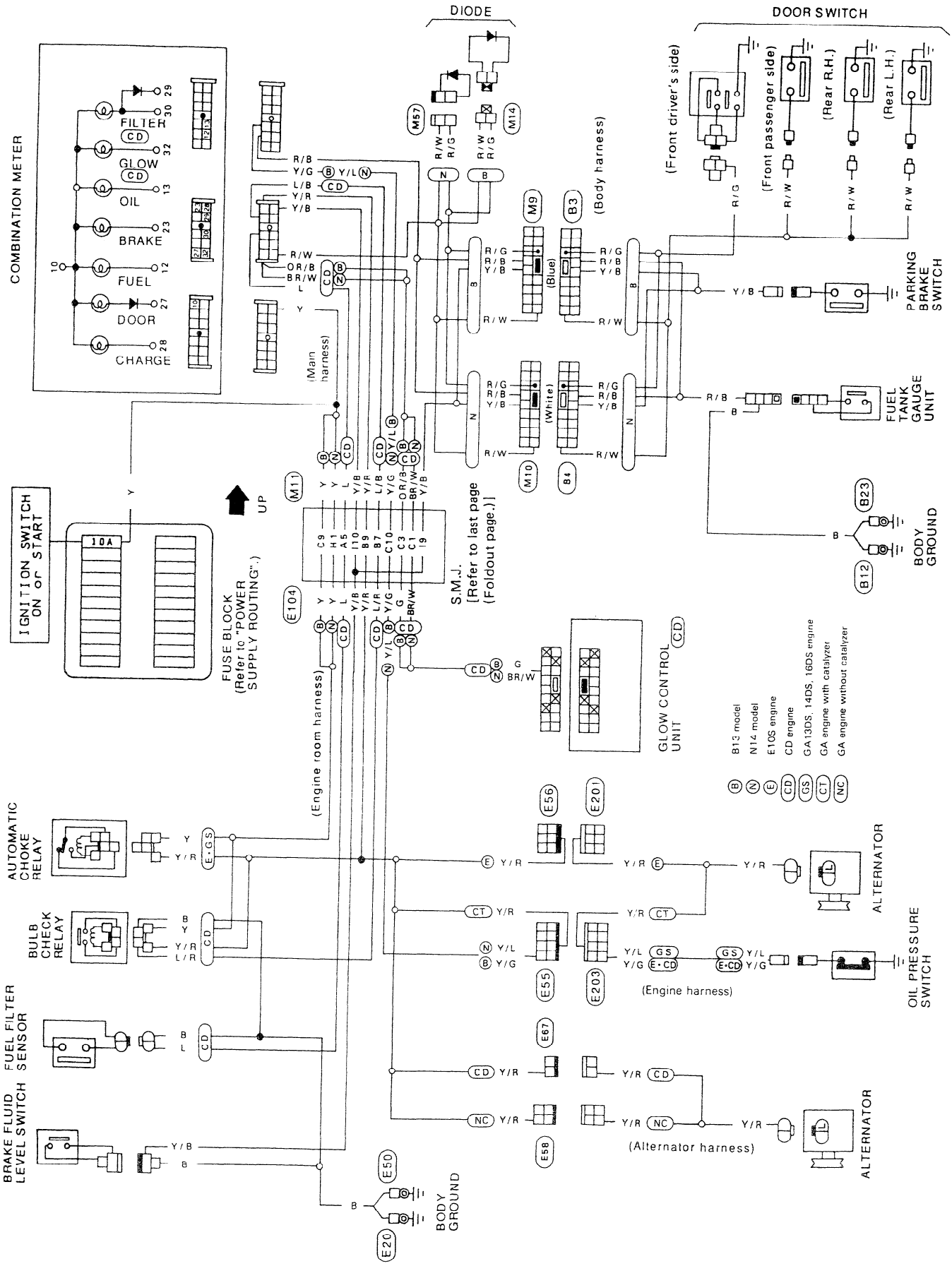
Warning Lamps/Wiring Diagram (Cont'd)

NEEDLE TYPE WITHOUT TACHOMETER (L.H.D.)



Warning Lamps/Wiring Diagram (Cont'd)

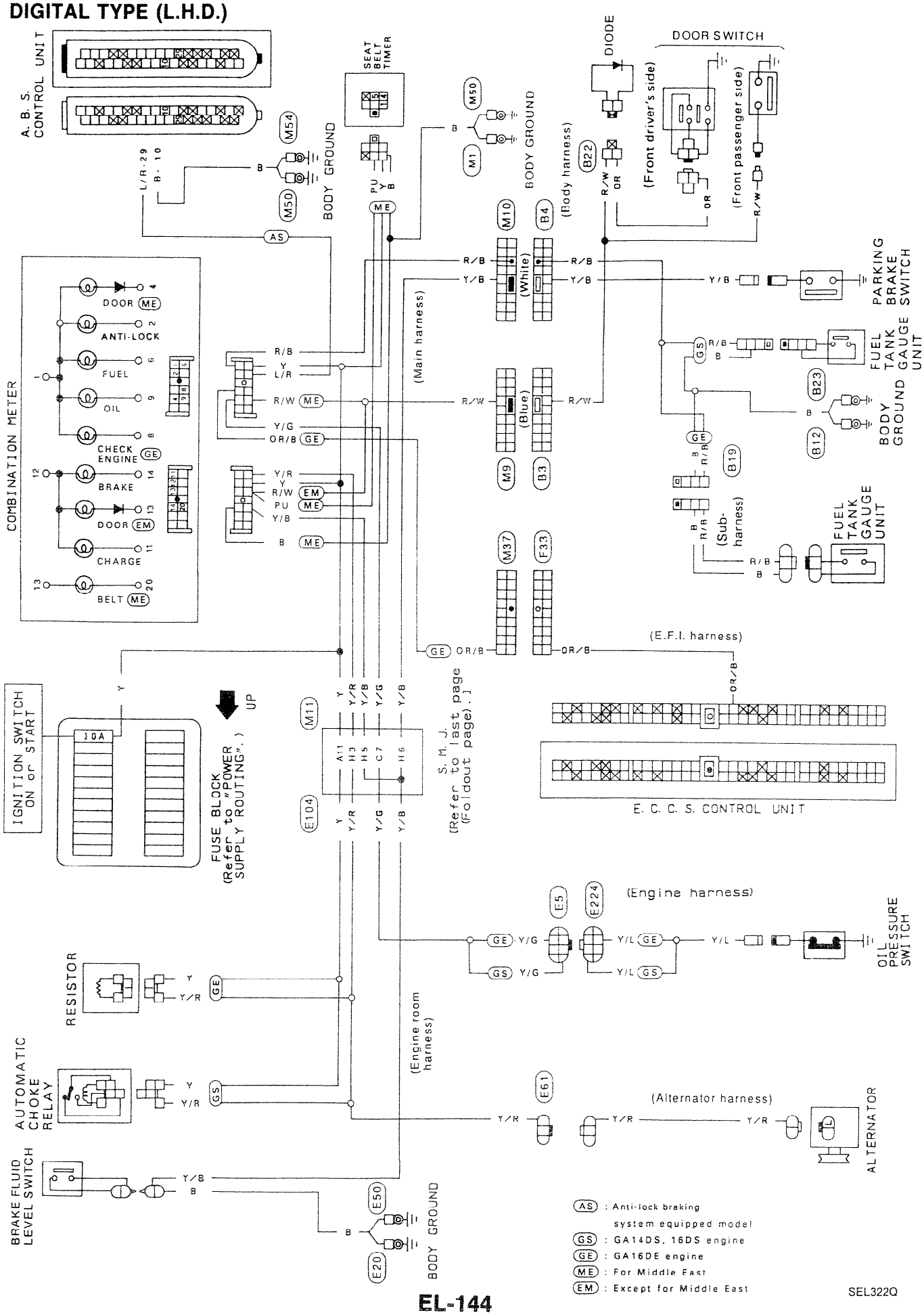
NEEDLE TYPE WITHOUT TACHOMETER (R.H.D.)



SEL401Q

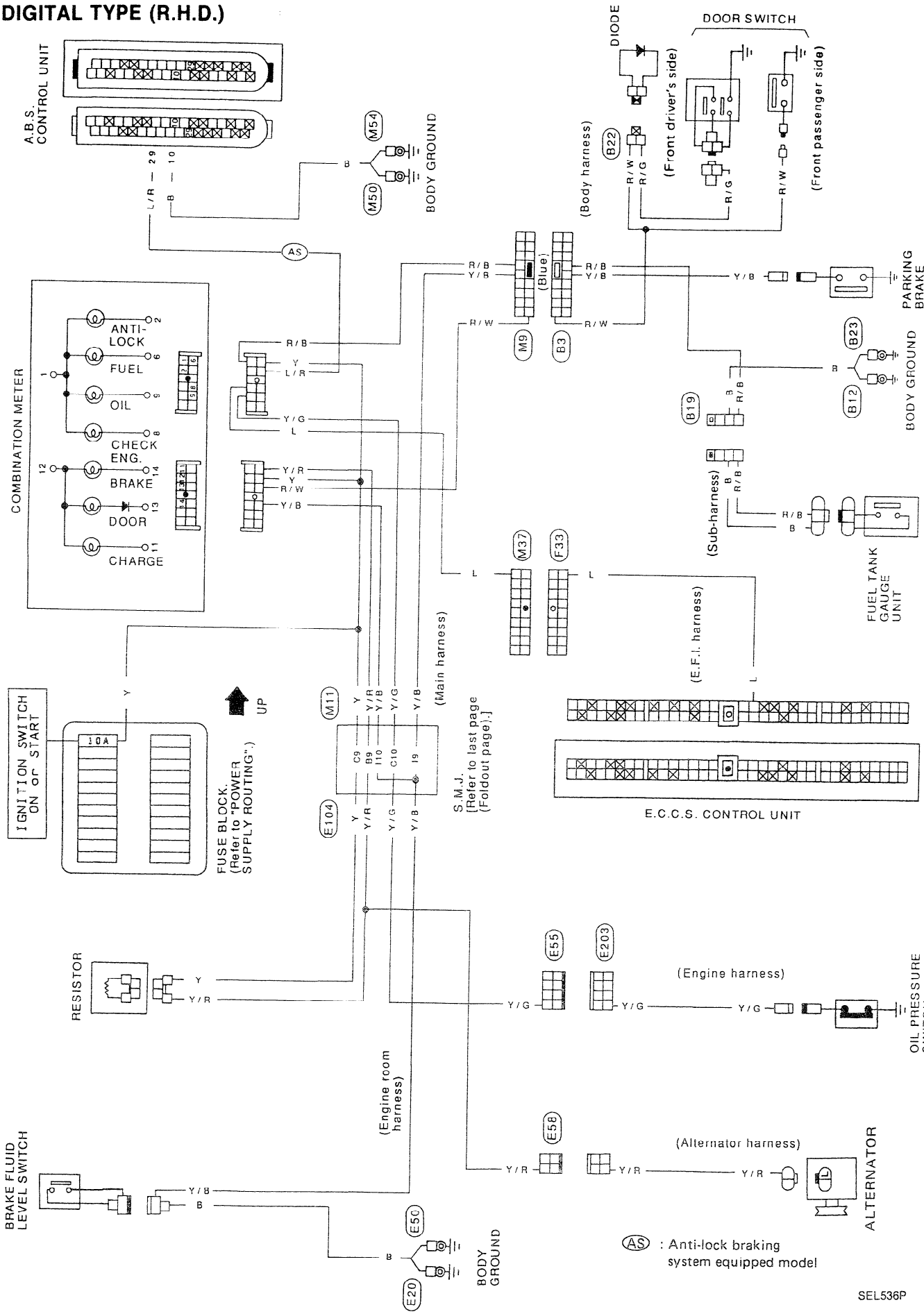
Warning Lamps/Wiring Diagram (Cont'd)

DIGITAL TYPE (L.H.D.)



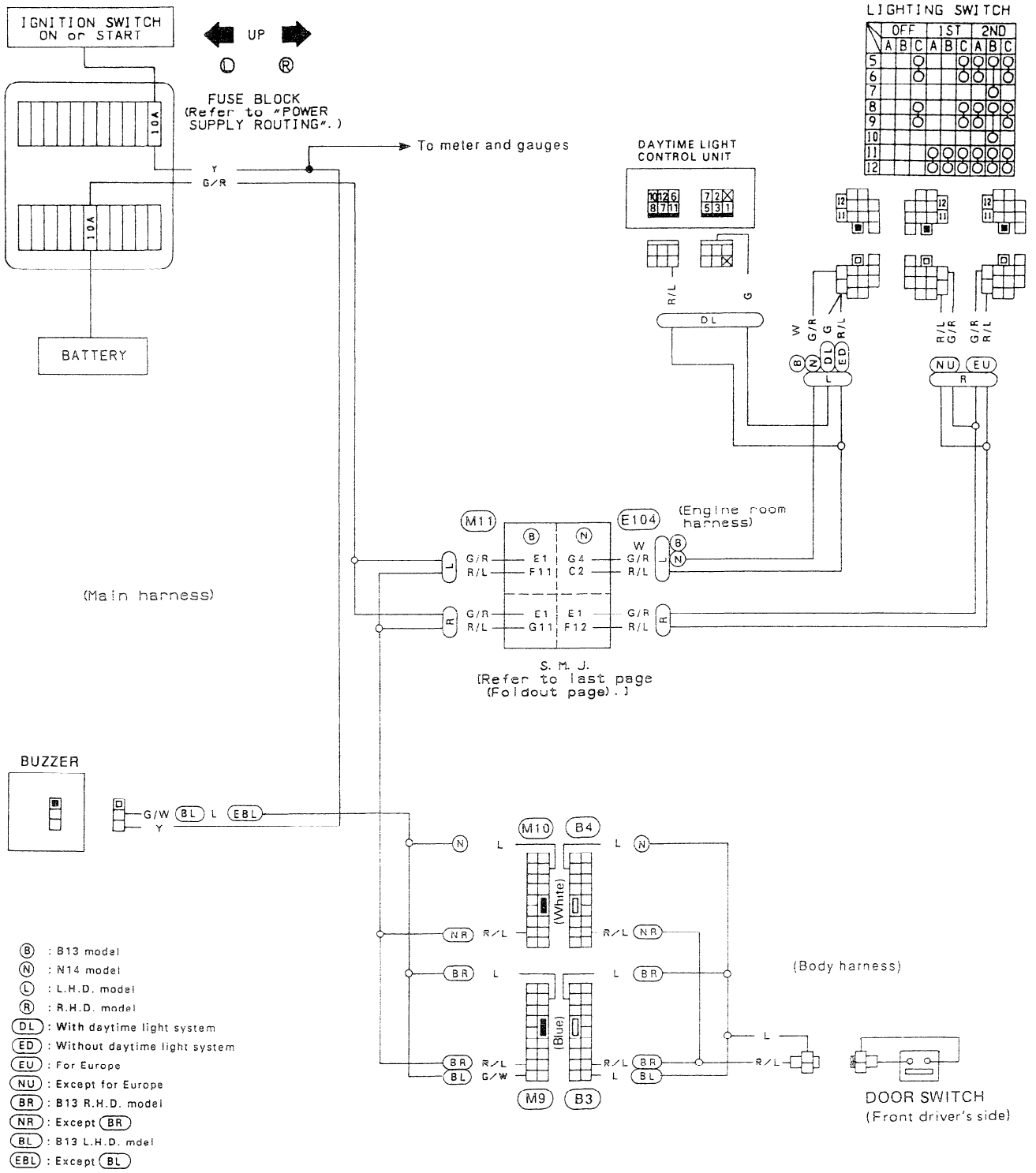
Warning Lamps/Wiring Diagram (Cont'd)

DIGITAL TYPE (R.H.D.)



Warning Buzzer/Wiring Diagram

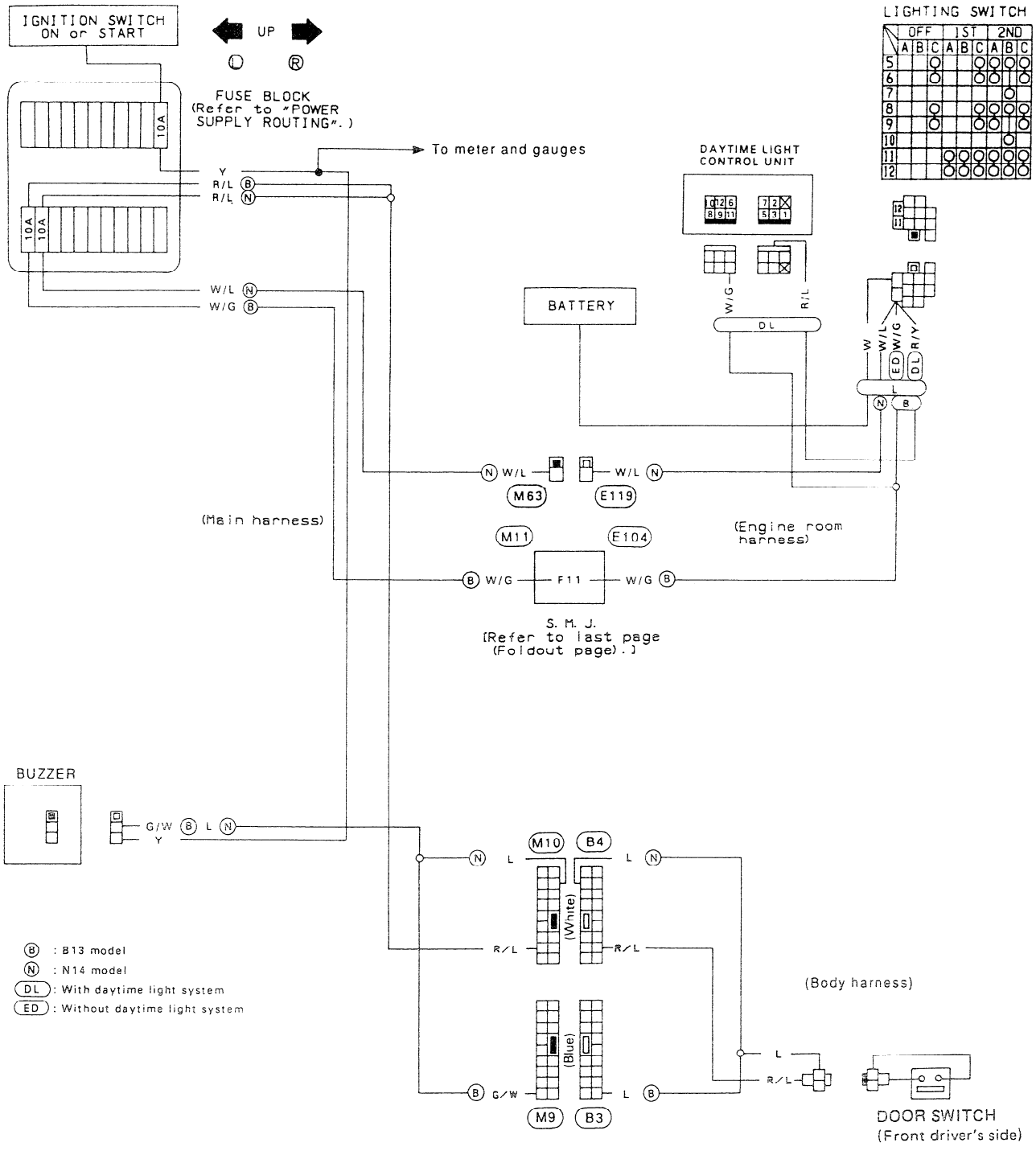
LIGHT WARNING (Type-I)



SEL323Q

Warning Buzzer/Wiring Diagram (Cont'd)

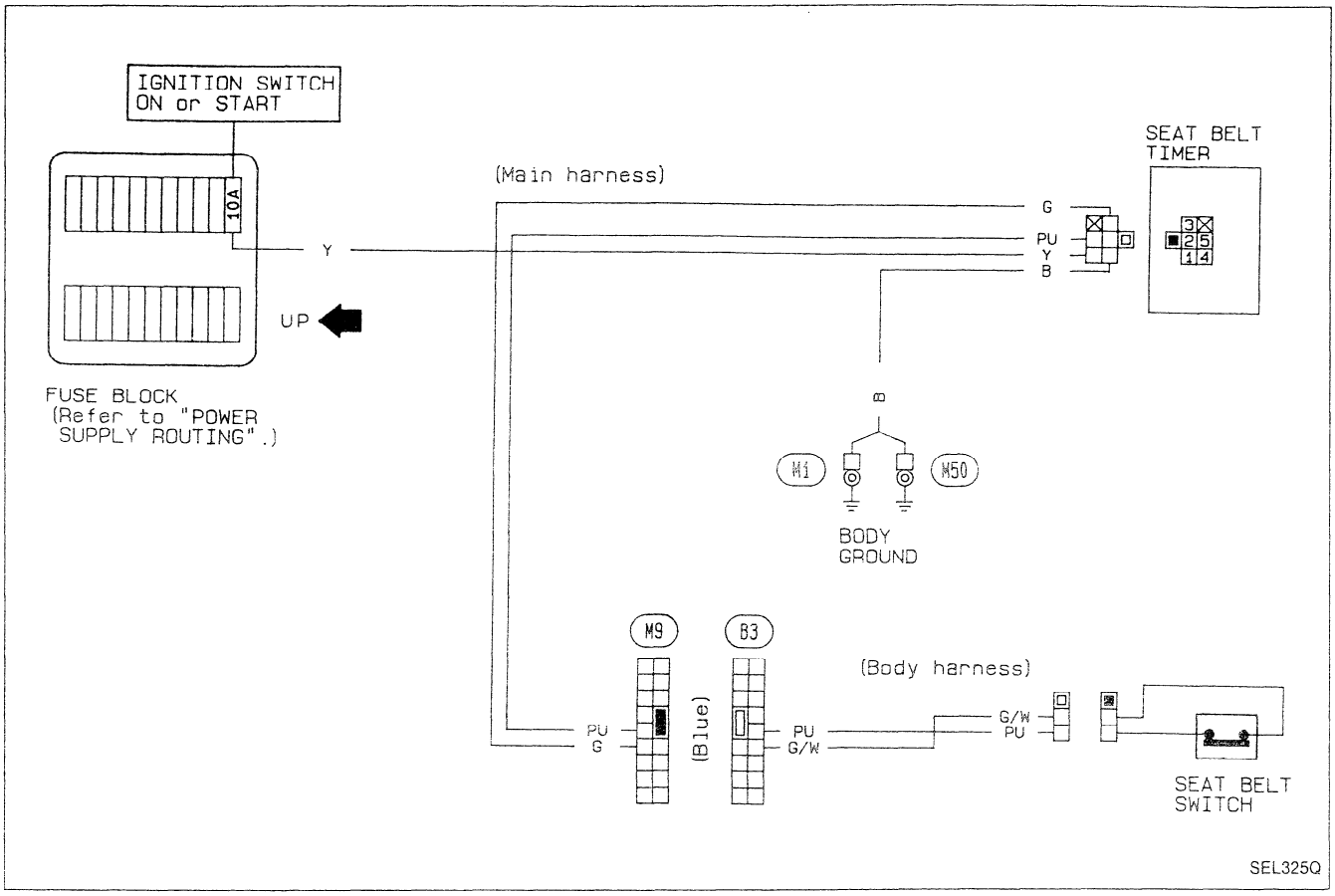
LIGHT WARNING (Type-II)



SEL324Q

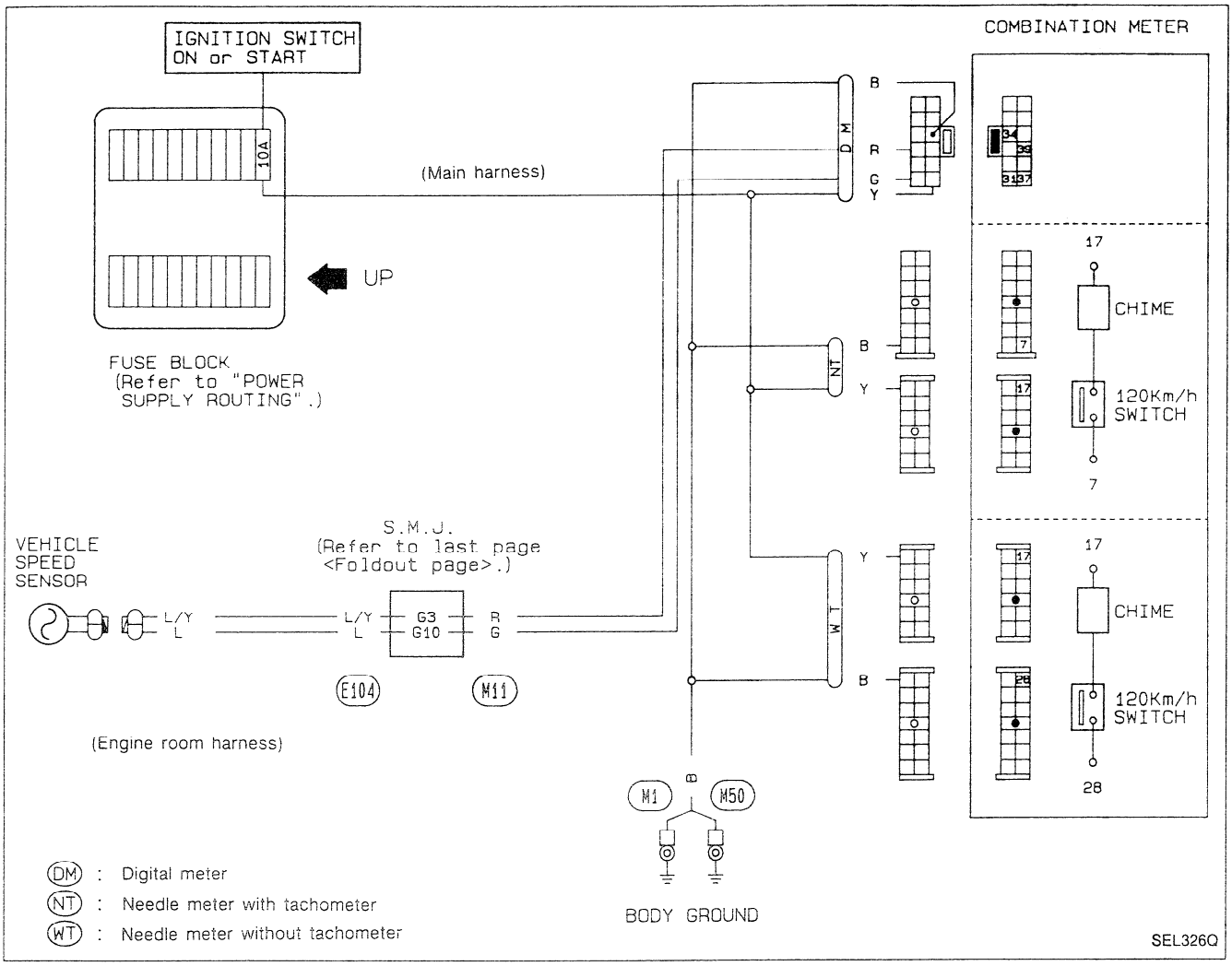
Warning Chime/Wiring Diagram

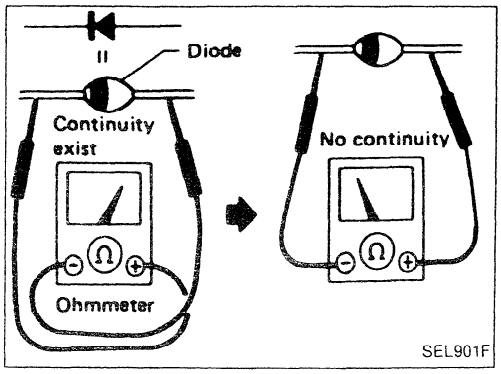
SEAT BELT WARNING



Warning Chime/Wiring Diagram (Cont'd)

SPEED WARNING



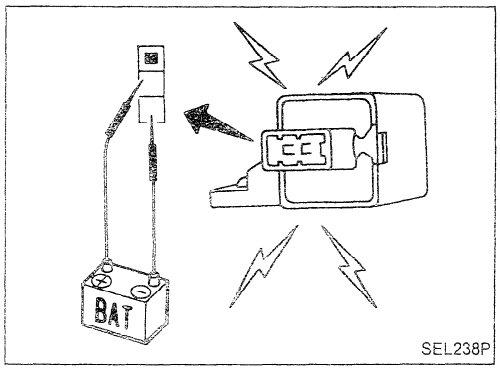


Diode Check

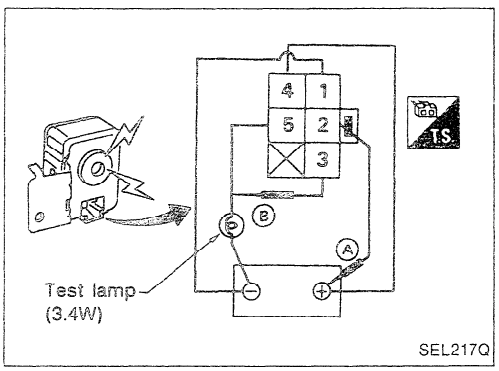
- Check continuity using an ohmmeter.
- Diode is functioning properly if test results are as shown in the figure at left.

- Diodes for warning lamps are built into the combination meter printed circuit.

Refer to "Combination Meter".



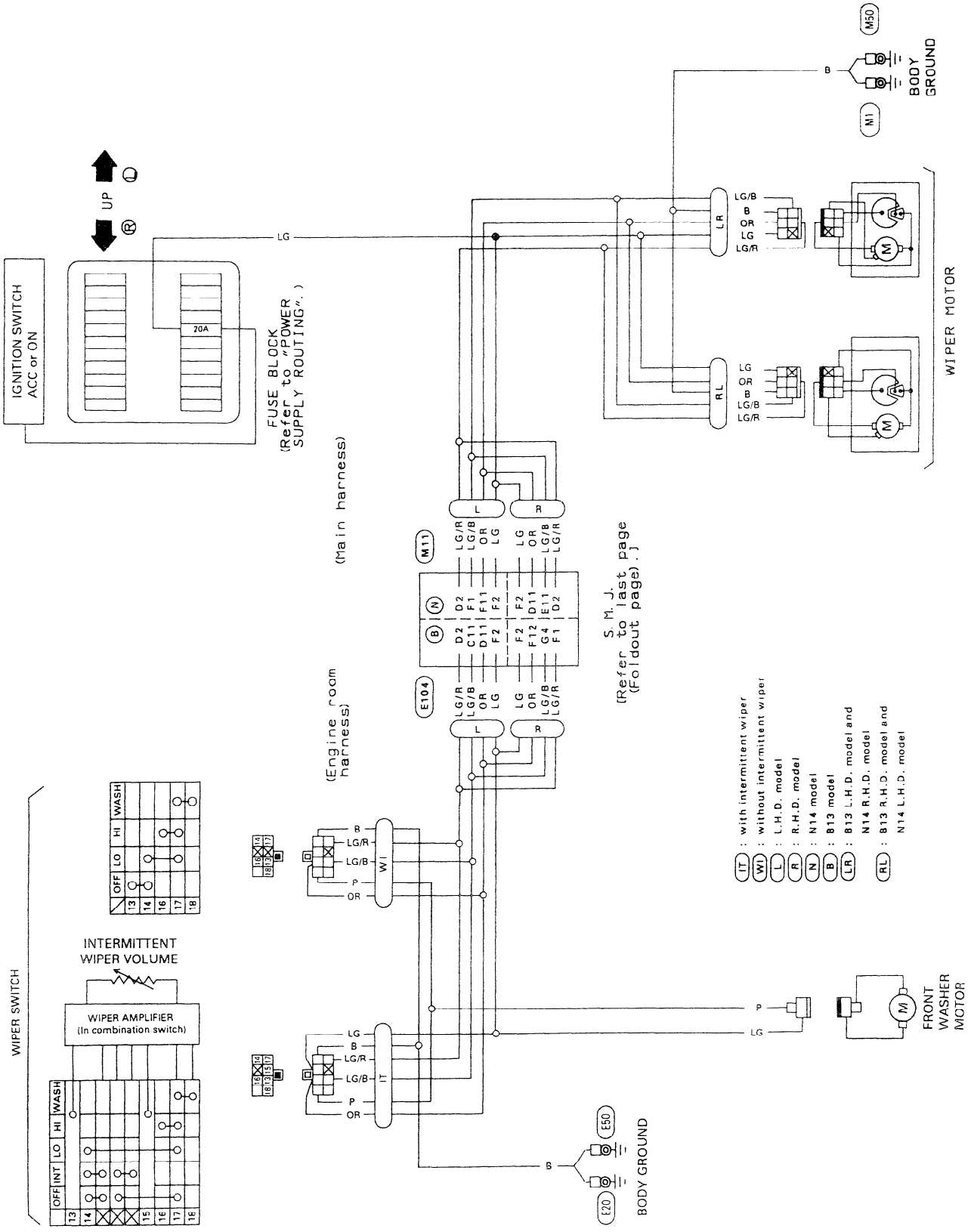
Warning Buzzer Check



Seat Belt Timer Check

Connect as shown in the figure.
Ⓐ ... Test lamp comes on about 6 seconds.
Ⓐ and Ⓑ ... Test lamp comes on about 6 seconds and chime rings.

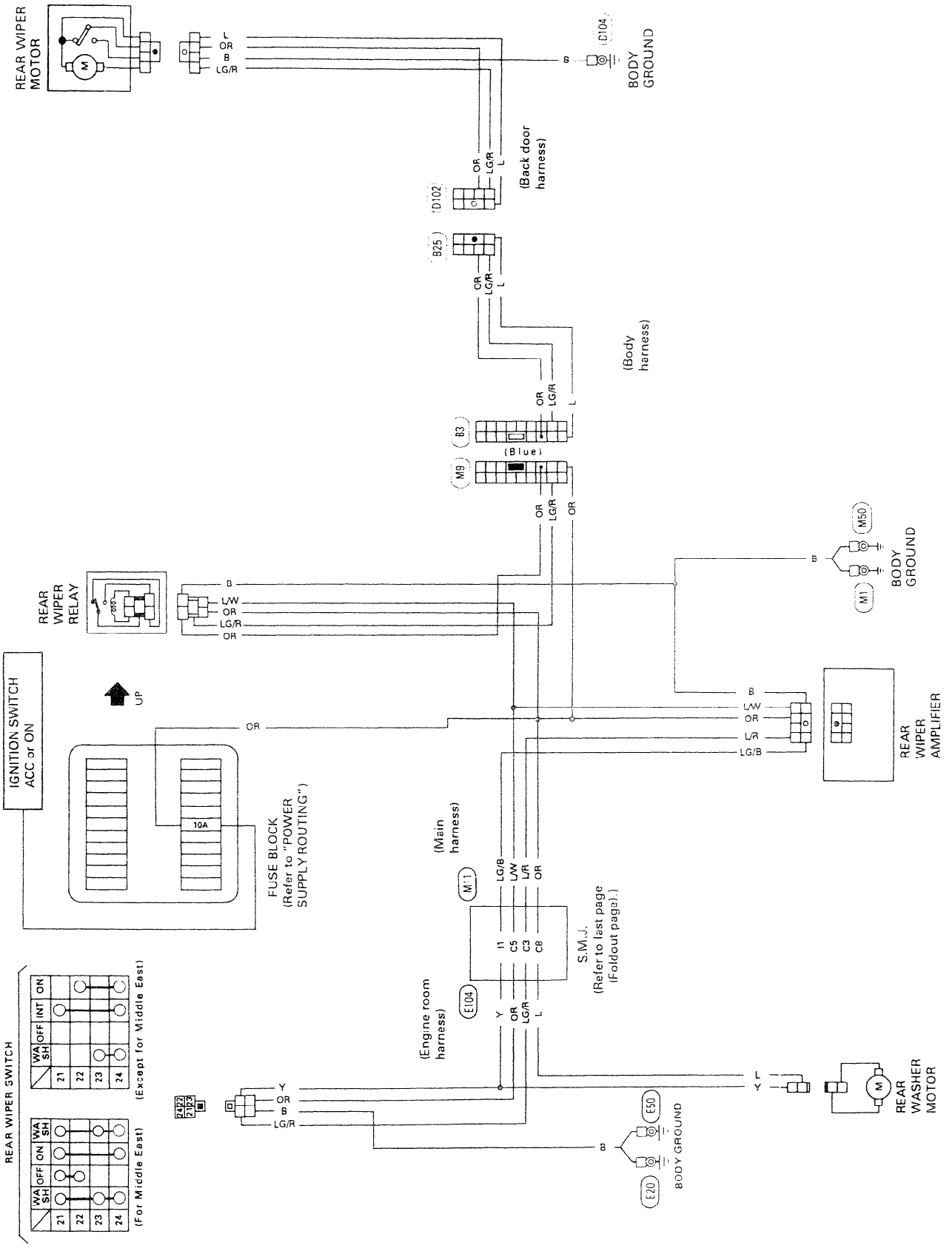
Front Wiper and Washer/Wiring Diagram



SEL327Q

Rear Wiper and Washer/Wiring Diagram

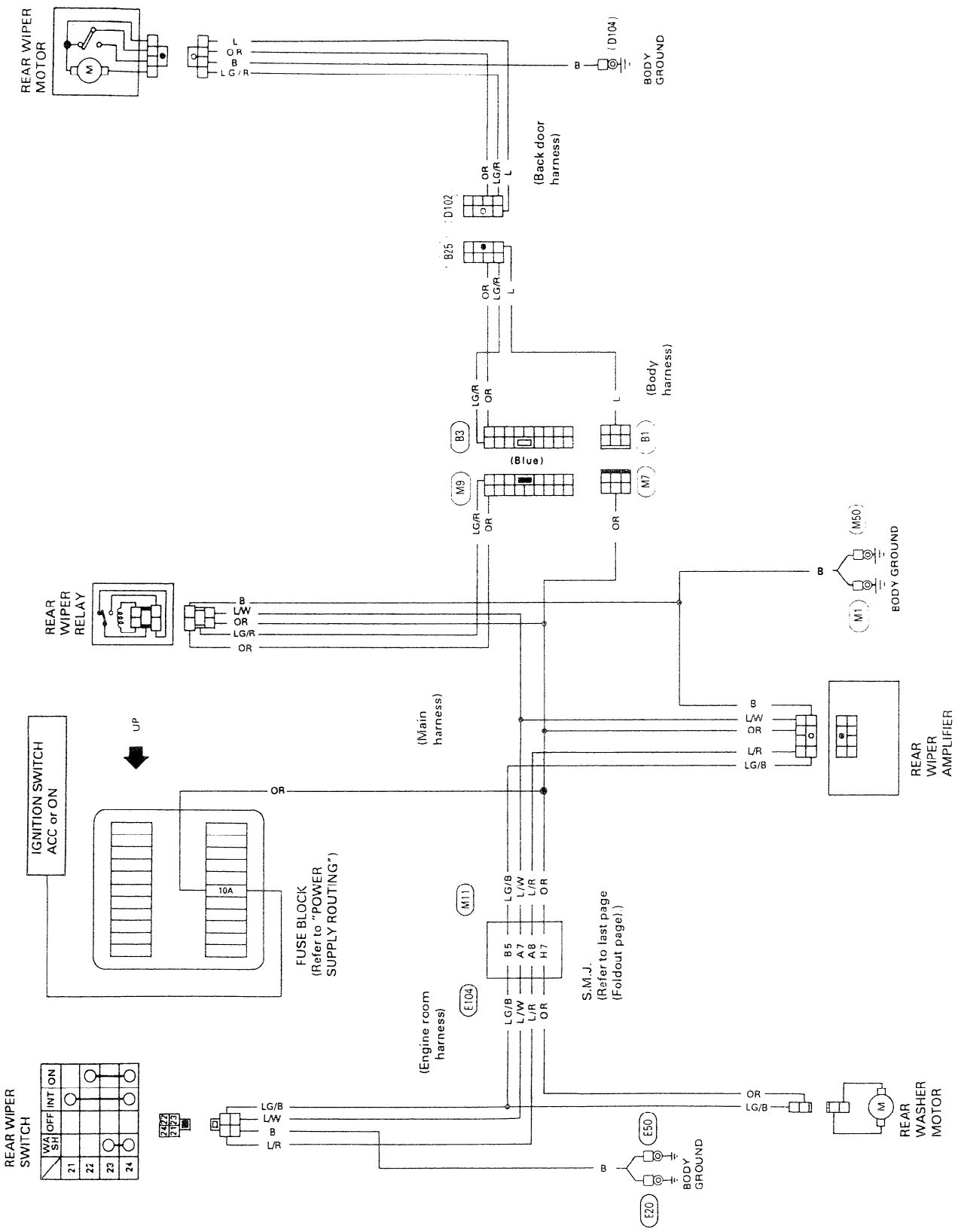
B13 **L.H.D. MODELS**



SEL328Q

Rear Wiper and Washer/Wiring Diagram (Cont'd)

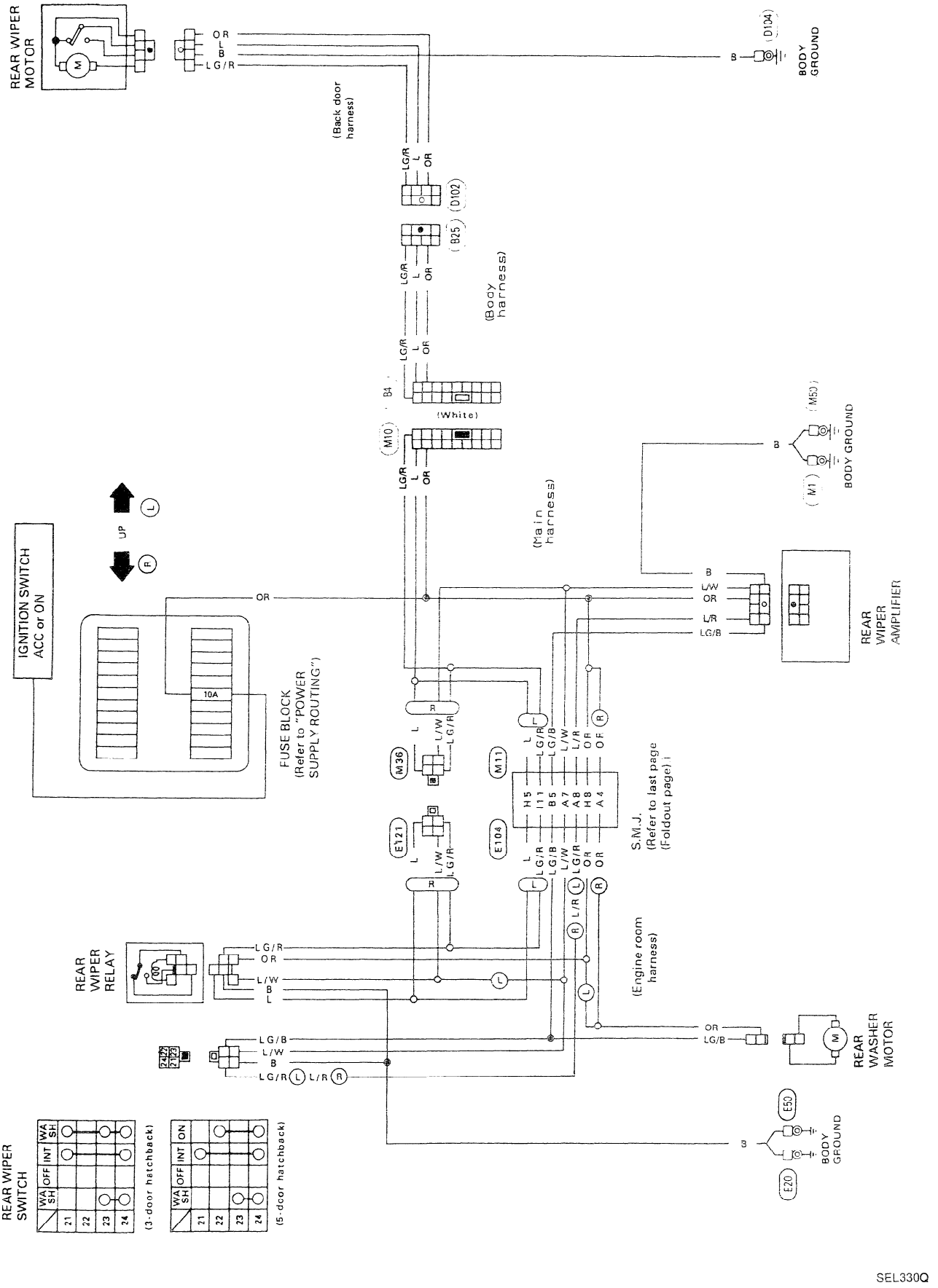
B13 **R.H.D. MODELS**



SEL329Q

Rear Wiper and Washer/Wiring Diagram (Cont'd)

N14



SEL330Q

Installation

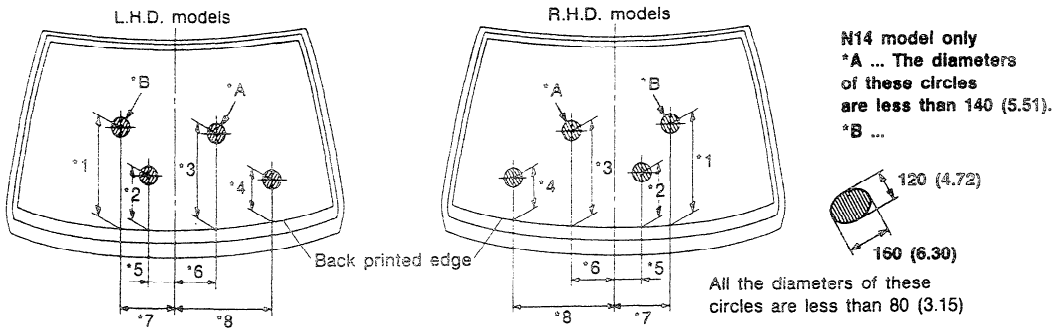
1. Prior to wiper arm installation, turn on wiper switch to operate wiper motor and then turn it "OFF" (Auto Stop).
2. Lift the blade up and then set it down onto glass surface to set the blade center to clearance "C", "D", "E", or "F" immediately before tightening nut.
3. Eject washer fluid. Turn on wiper switch to operate wiper motor and then turn it "OFF".
4. Ensure that wiper blades stop within clearance "C", "D", "E", or "F".

	C	D	E	F
B13 mm (in)	25 - 35 (0.98 - 1.38)	20 - 30 (0.79 - 1.18)	105 - 115 (4.13 - 4.53)	—
N14 mm (in)	22 - 37 (0.87 - 1.46)	18 - 33 (0.71 - 1.30)	—	20 (0.79)

- Tighten windshield wiper arm nuts to specified torque.

Front wiper:
17 - 23 N·m (1.7 - 2.3 kg-m, 12 - 17 ft-lb)
Rear wiper:
Coupe 13 - 18 N·m (1.3 - 1.8 kg-m, 9 - 13 ft-lb)
Hatchback 10 - 14 N·m (1.0 - 1.4 kg-m, 7 - 10 ft-lb)

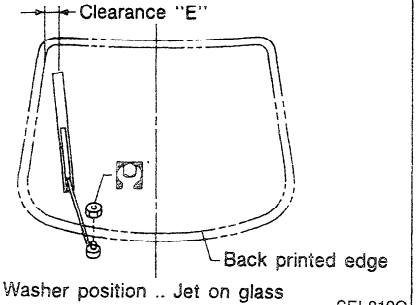
Front wiper and washer



B13 Sedan	B13 Coupe	N14
*1: 340 (13.39)	*1: 270 (10.63)	*1: 492 (19.37)
*2: 155 (6.10)	*2: 130 (5.12)	*2: 255 (8.86)
*3: 300 (11.81)	*3: 260 (10.24)	*3: 280 (11.02)
*4: 115 (4.53)	*4: 140 (5.51)	*4: 175 (6.89)
*5: 130 (5.12)	*5: 200 (7.87)	*5: 98 (3.86)
*6: 160 (6.30)	*6: 225 (8.86)	*6: 160 (6.30)
*7: 310 (12.20)	*7: 370 (14.57)	*7: 241 (9.49)
*8: 400 (15.75)	*8: 430 (16.93)	*8: 395 (15.55)

SEL218Q

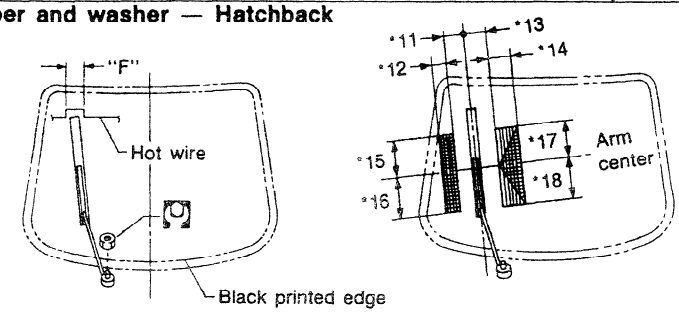
Rear wiper and washer — Coupe



SEL219Q

Installation (Cont'd)

Rear wiper and washer — Hatchback

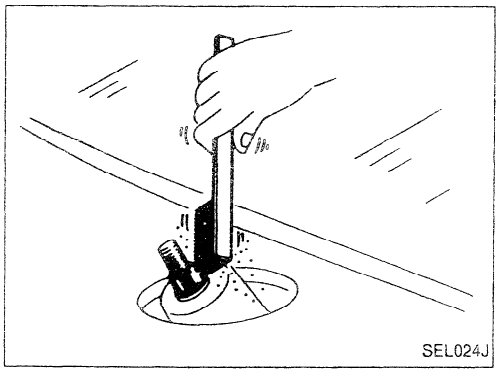


	3-door	5-door
*11	80 (3.15)	30 (1.18)
*12	20 (0.79)	20 (0.79)
*13	20 (0.79)	20 (0.79)
*14	50 (1.97)	80 (3.15)
*15	40 (1.57)	170 (6.69)
*16	35 (1.38)	50 (1.97)
*17	40 (1.57)	30 (1.18)
*18	35 (1.38)	30 (1.18)

: 3-door : 5-door

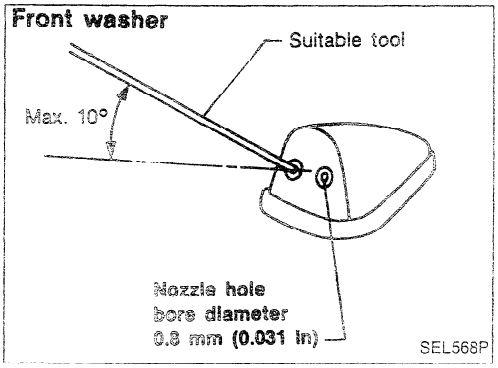
Unit mm (in)

SEL220Q



SEL024J

- **Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.**

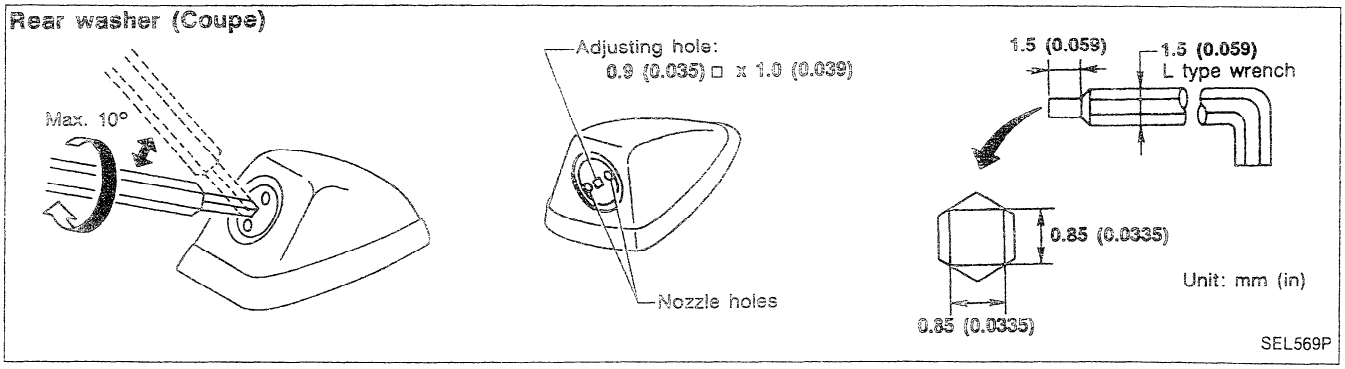


SEL568P

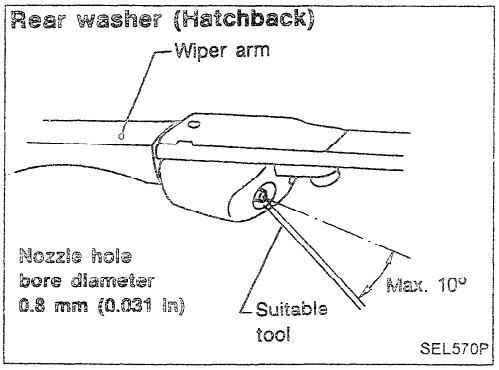
Washer Nozzle Adjustment

- Adjust washer nozzle with suitable tool as shown in the figure at left.

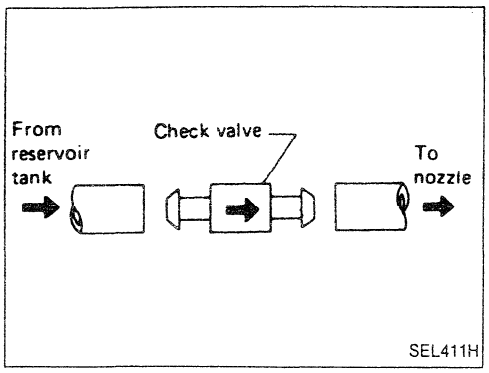
  Adjustable range: ±10°



SEL569P

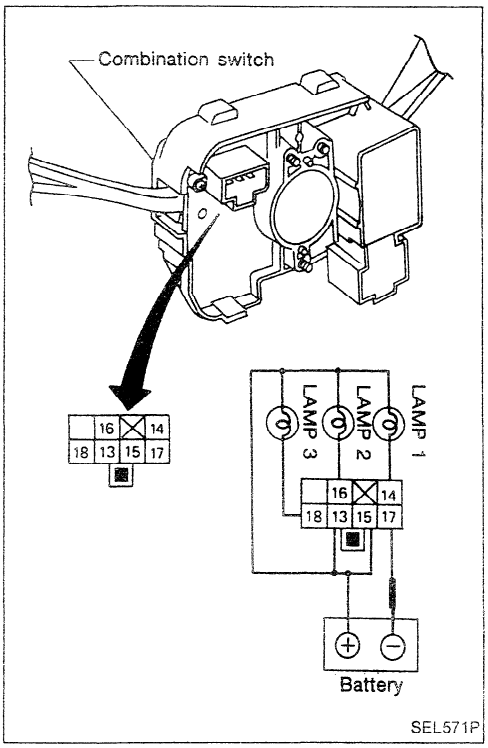


SEL570P



Check Valve (For rear washer)

- A check valve is provided in the rear washer fluid line. Be careful not to connect check valve to washer tube in the wrong direction.



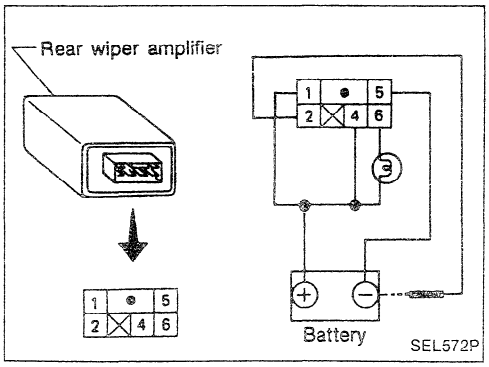
Wiper Amplifier Check

FRONT WIPER SWITCH AND AMPLIFIER

1. Connect as shown in the figure at left.
2. If test lamp comes on when connected to terminal ⑰ and battery ground, wiper switch and amplifier is normal.

Wiper switch position	Test lamp		
	1	2	3
OFF	—	—	—
INT or LO	○	—	—
HI	—	○	—
WASH	○	—	○

○: Lamp "ON". —: Lamp "OFF"

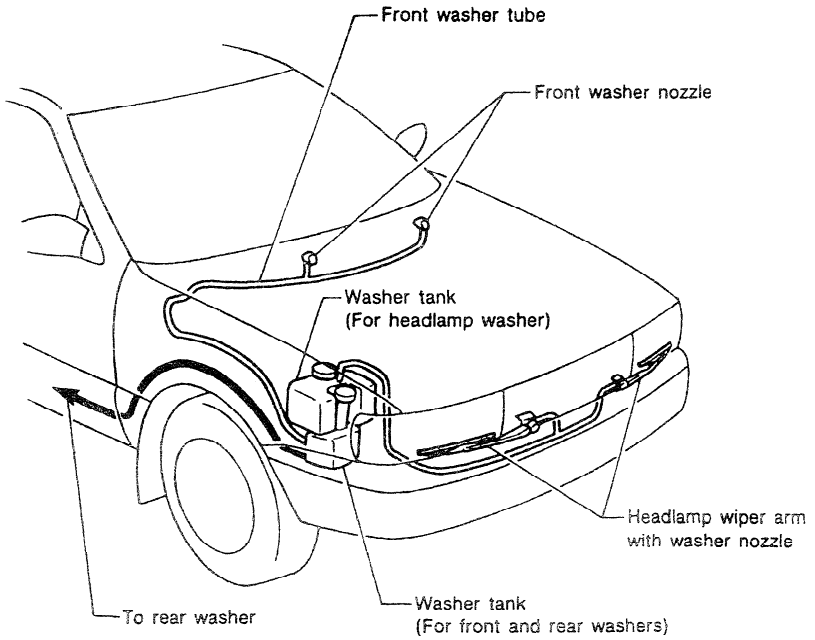


REAR WIPER AMPLIFIER

1. Connect as shown in the figure at left.
2. If test lamp comes on when connected to terminal ② and battery ground, wiper amplifier is normal.

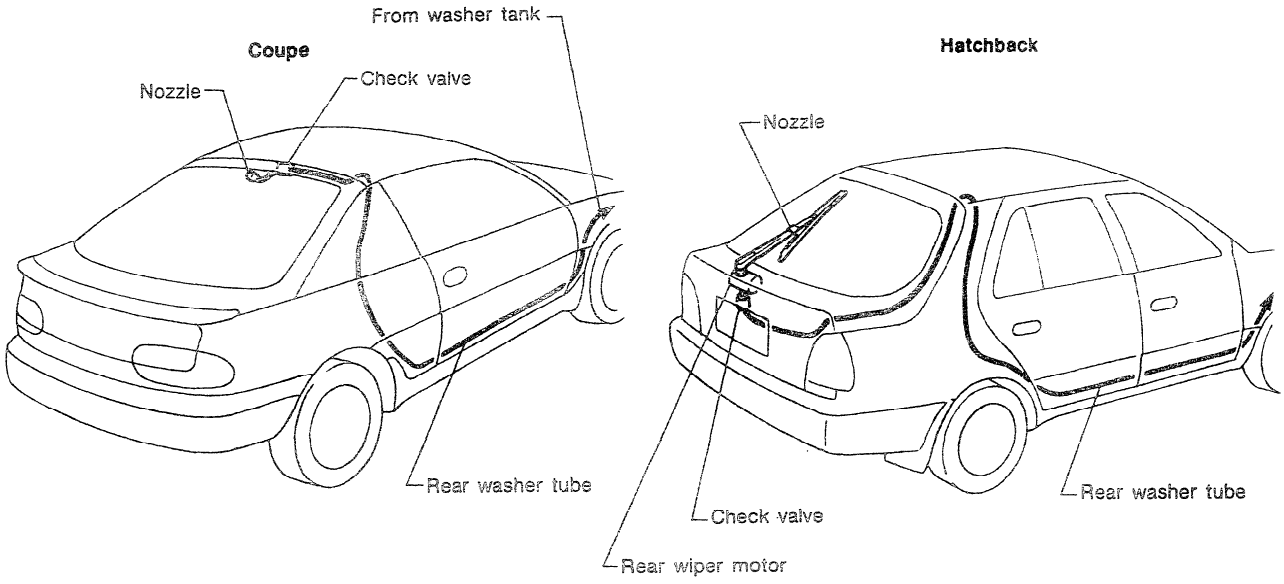
Washer Tube Layout

Front washer



SEL221Q

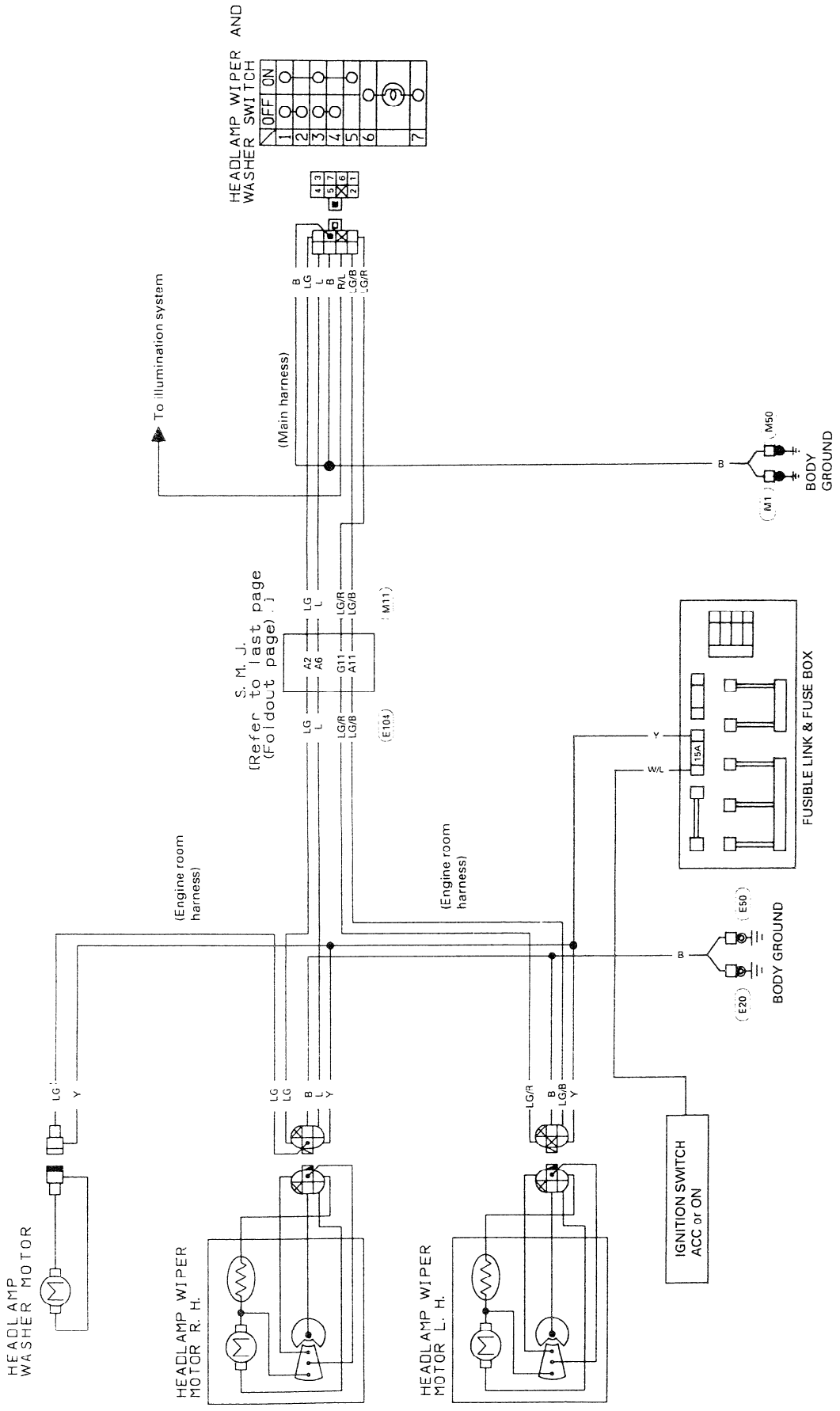
Rear washer



SEL574P

Headlamp Wiper and Washer/Wiring Diagram

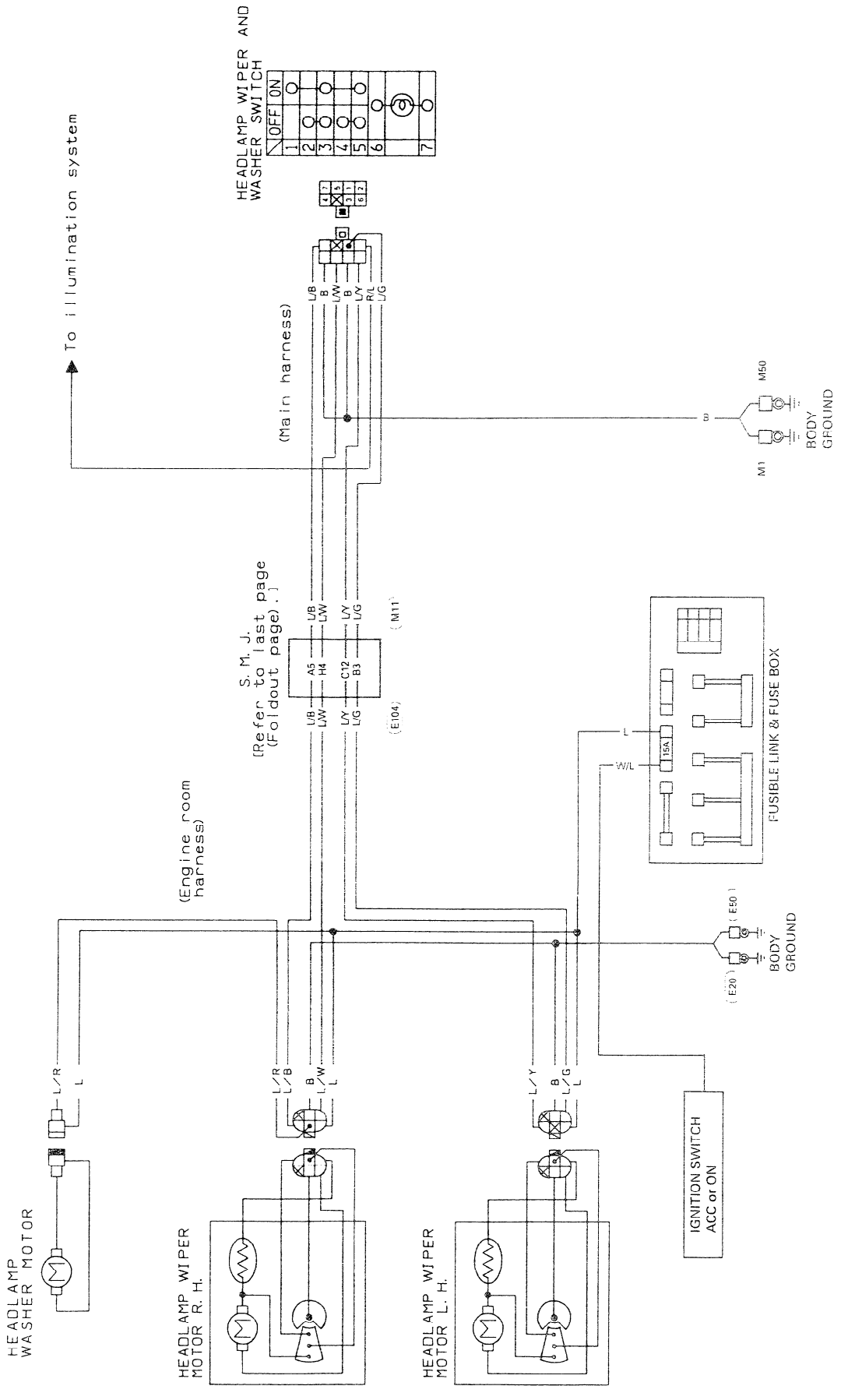
B13



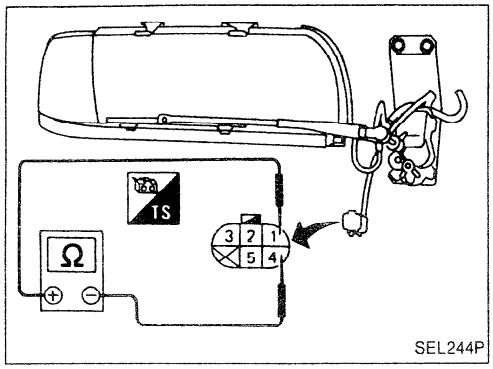
SEL331Q

Headlamp Wiper and Washer/Wiring Diagram (Cont'd)

N14



SEL332Q

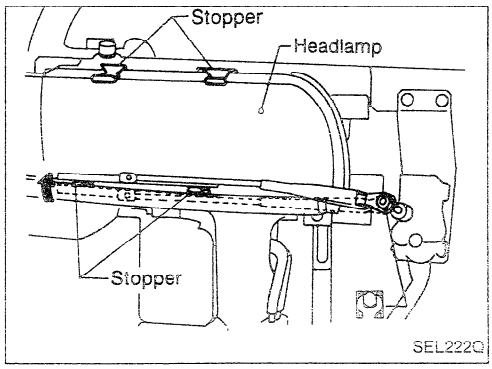


Headlamp Wiper Motor Check

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 OFF and leave it off for approx. 1 to 3 minutes.

1. Turn headlamp wiper switch OFF.
2. Connect ohmmeter and check continuity.

Headlamp wiper motor	Ohmmeter probe		Continuity
	(+)	(–)	
Stop position	①	④	Yes
	①	②	Yes
	①	③	Yes
	③	⑤	No



Headlamp Wiper Installation

Tighten nut to secure wiper arm with wiper blade held below lower stopper.

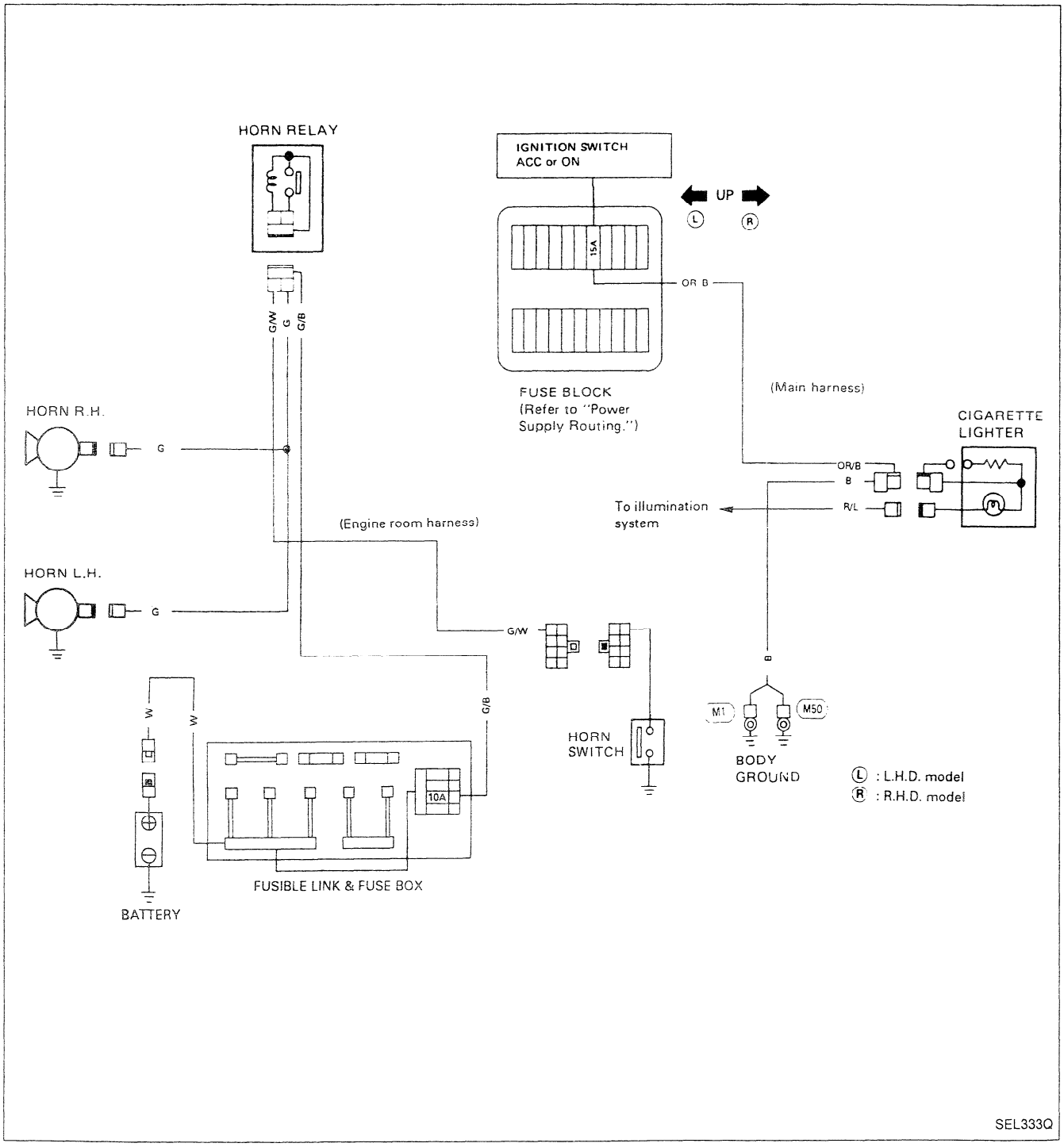
After installing wiper arm, position wiper blade on stopper upper surface.

- Tighten headlamp wiper arm nut to the specified torque.

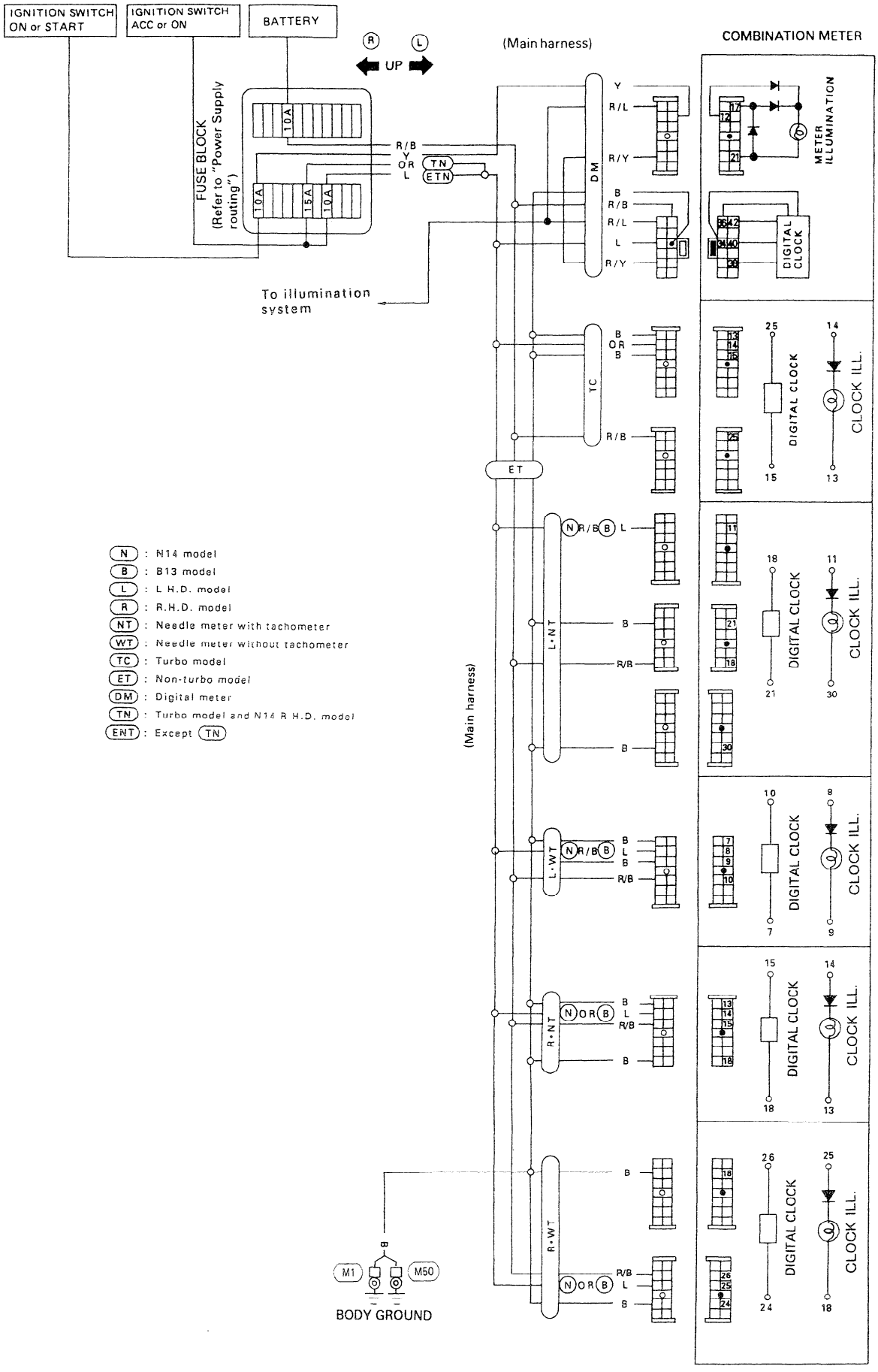
  B13
  2.5 - 3.8 N·m
  (0.25 - 0.39 kg-m, 1.8 - 2.8 ft-lb)

  N14
  2.3 - 3.0 N·m
  (0.23 - 0.31 kg-m, 1.7 - 2.2 ft-lb)

Wiring Diagram

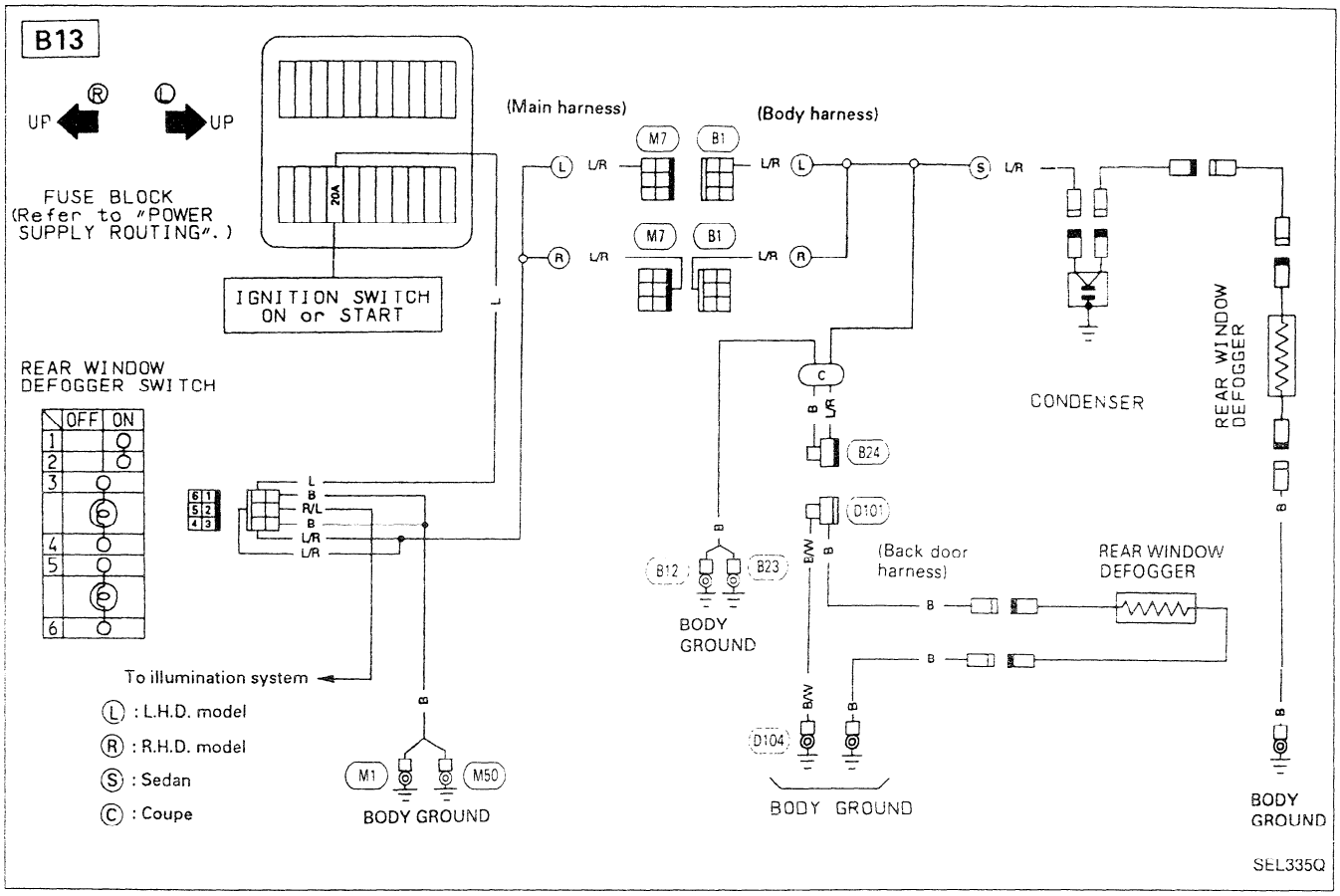


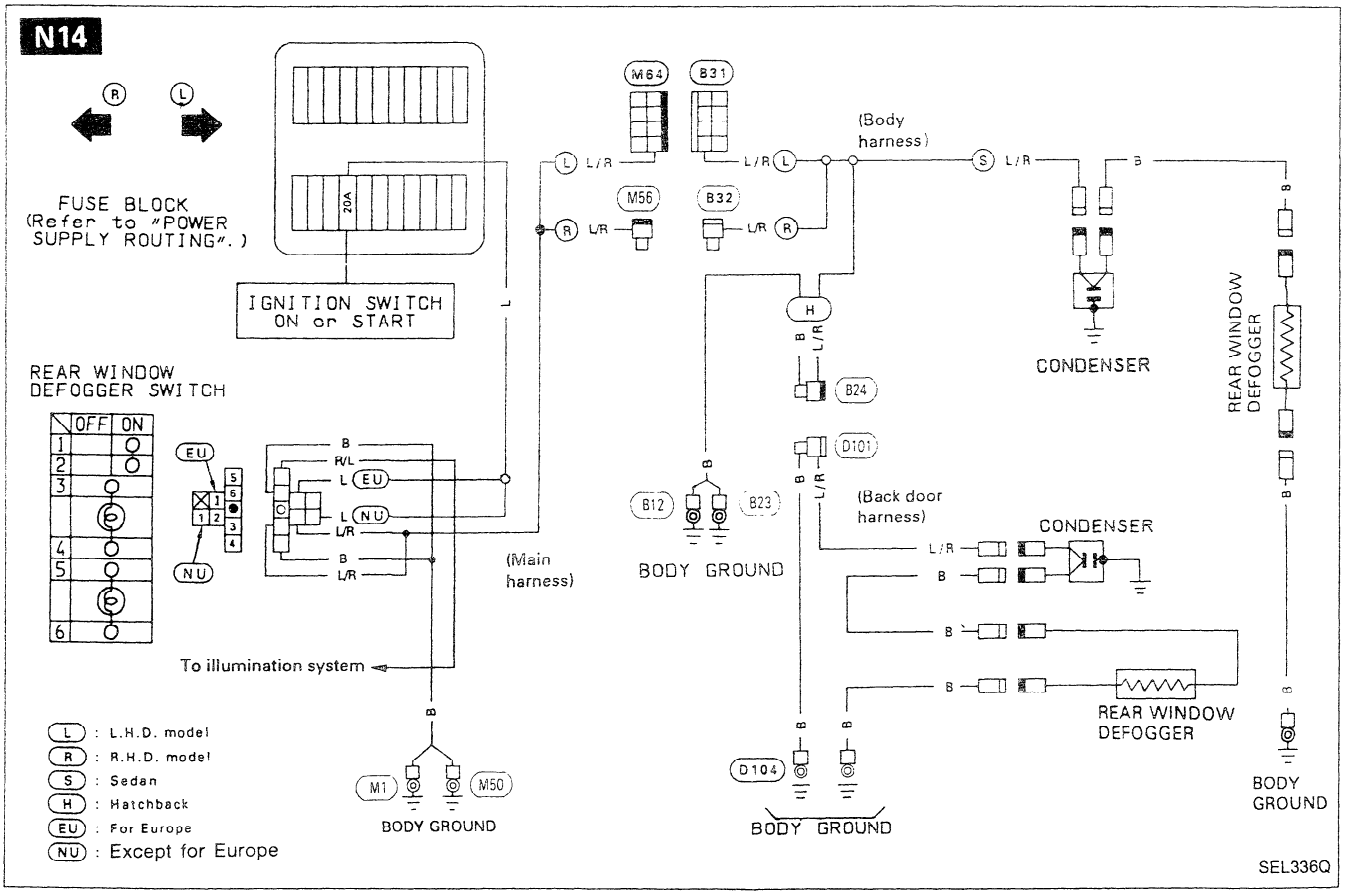
Wiring Diagram

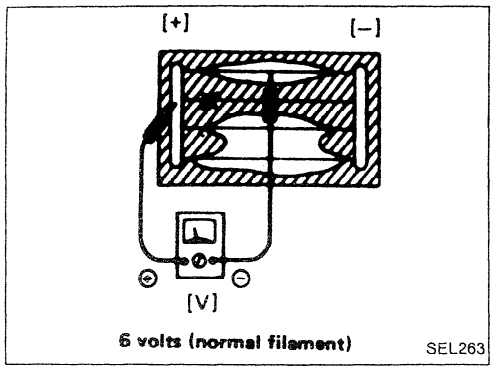


SEL334Q

Wiring Diagram

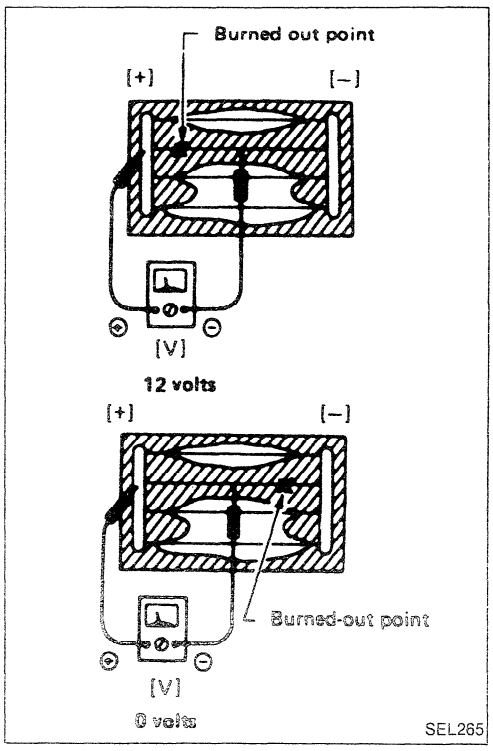




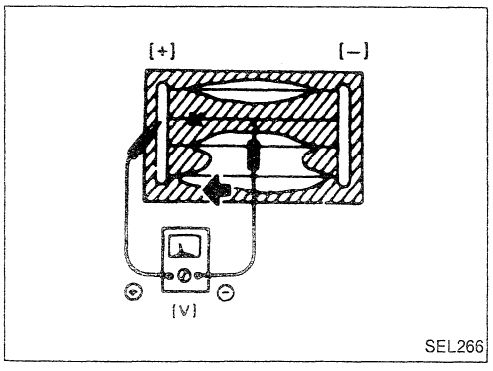


Filament Check

1. Attach probe circuit tester (in volt range) to middle portion of each filament.



2. If a filament is burned out, circuit tester registers 0 or 12 volts.

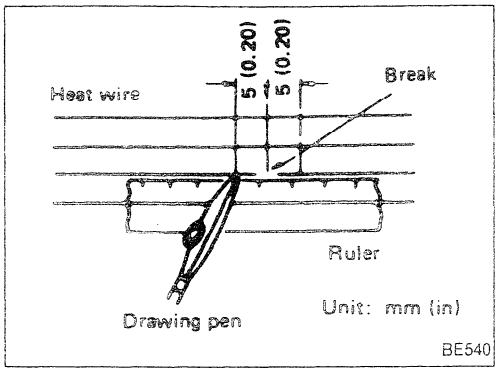


3. To locate burned out point, move probe to left and right along filament to determine point where tester needle swings abruptly.

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

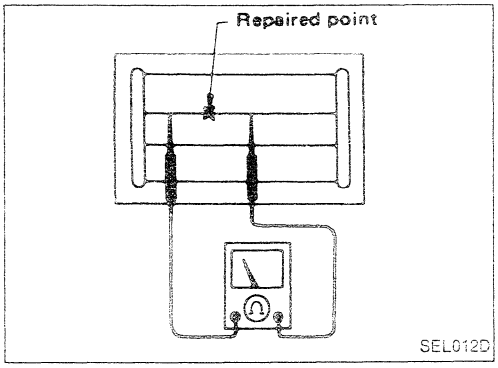


REPAIRING PROCEDURE

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.

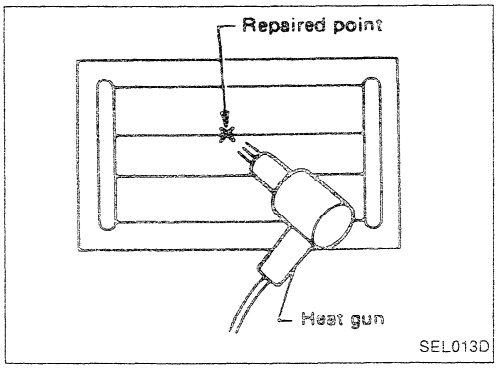
Shake silver composition container before use.

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.

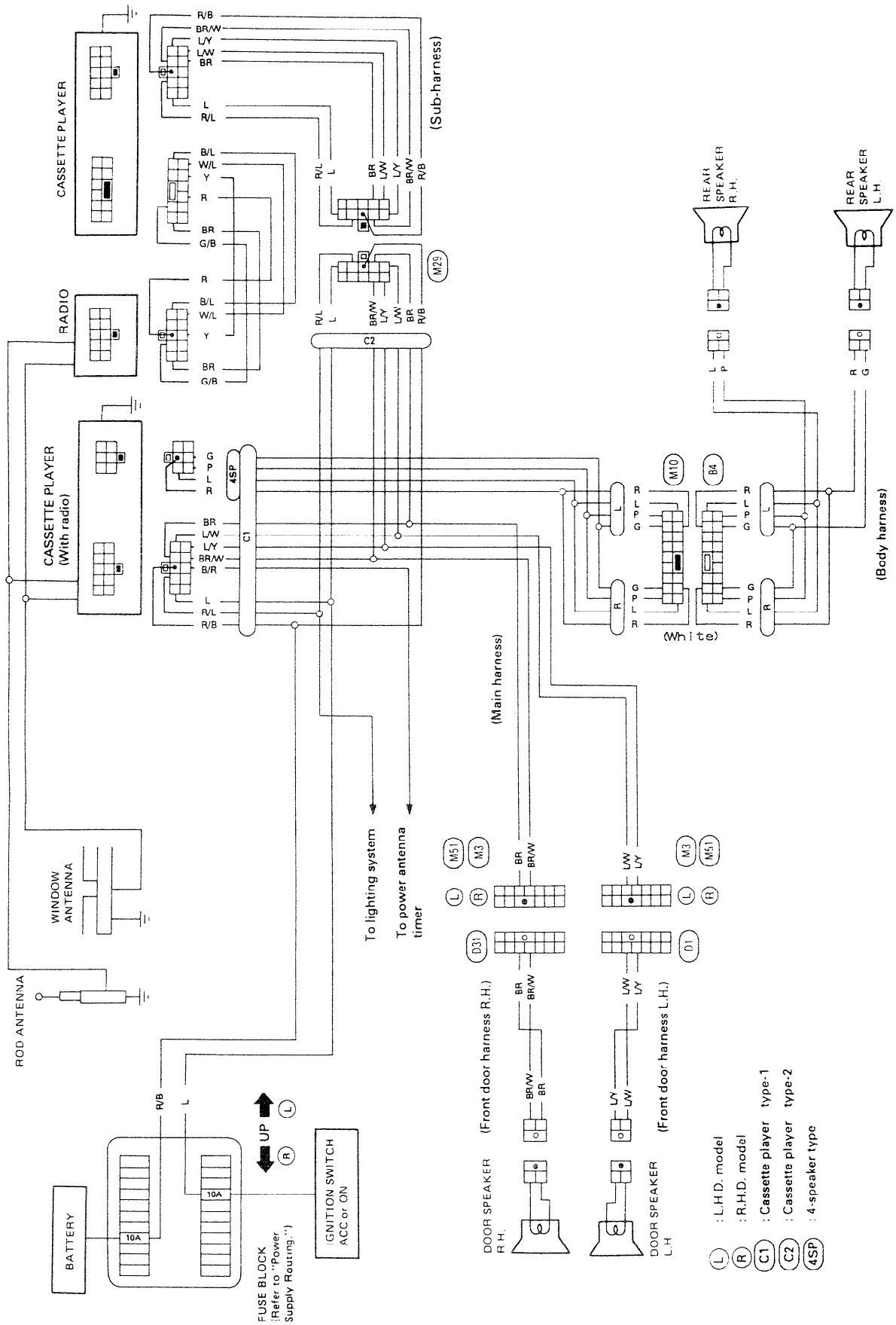
Do not touch repaired area while test is being conducted.



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.

Audio/Wiring Diagram

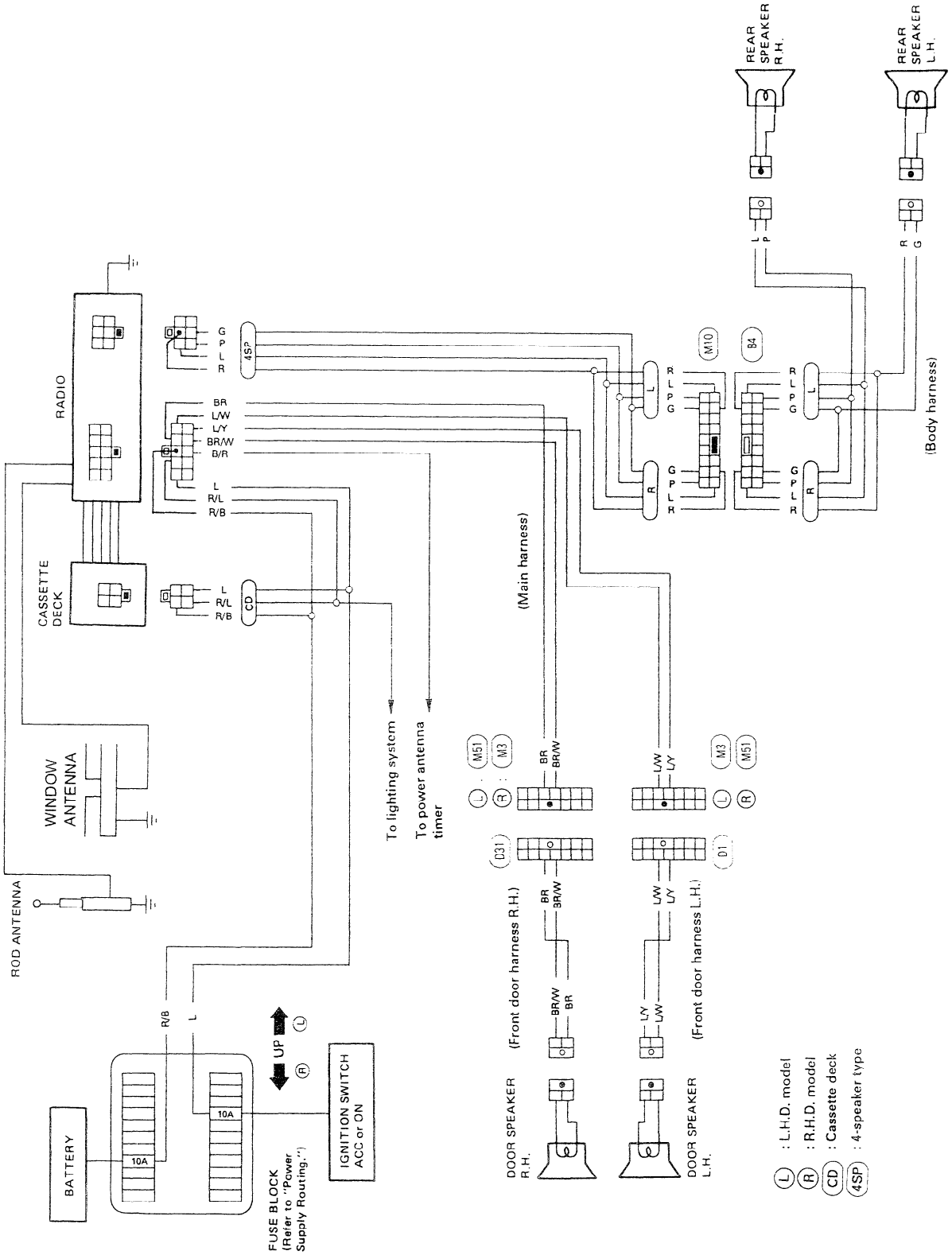
B13 RADIO AND CASSETTE PLAYER



SEL337Q

Audio/Wiring Diagram (Cont'd)

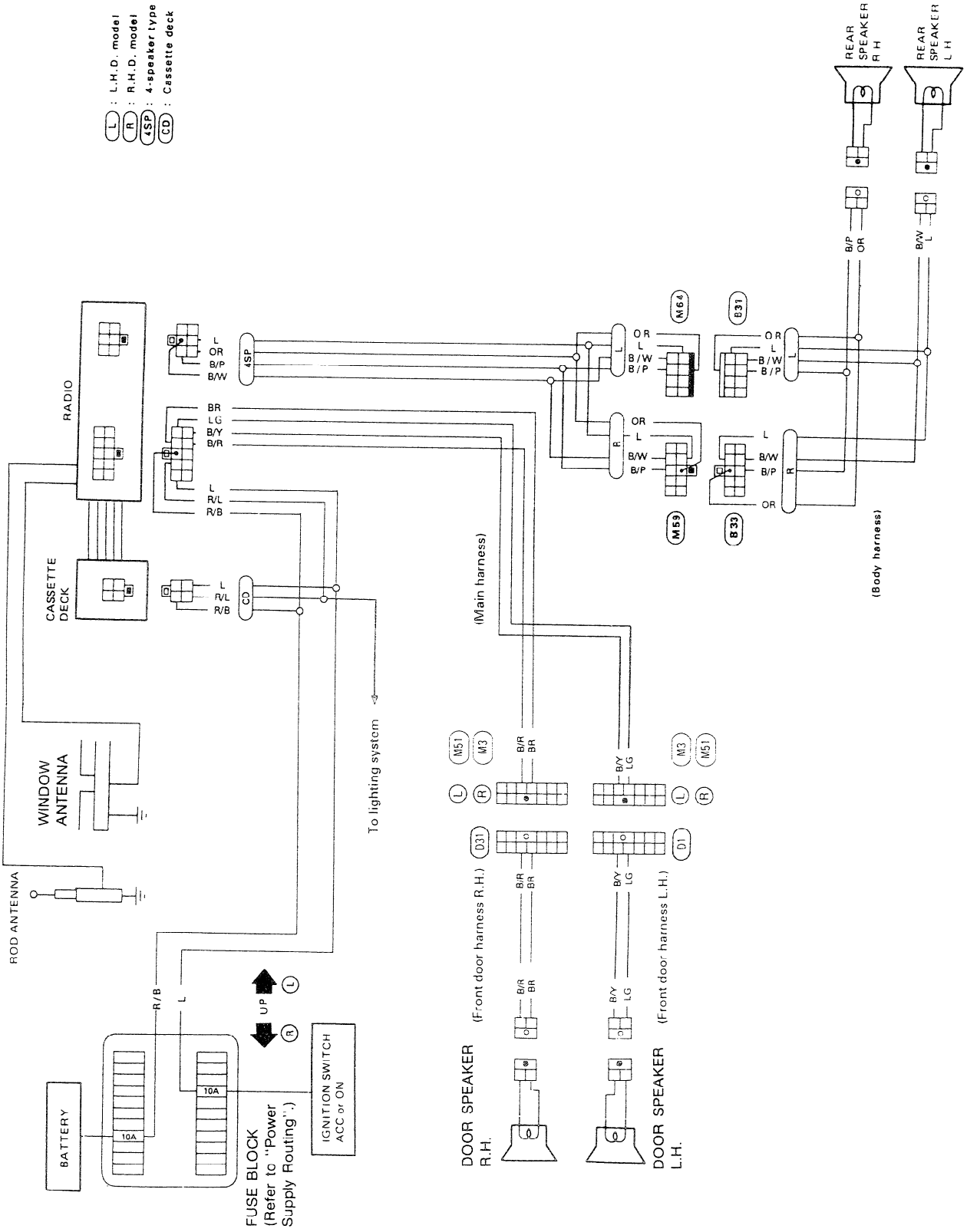
B13 RADIO AND CASSETTE DECK



SEL550P

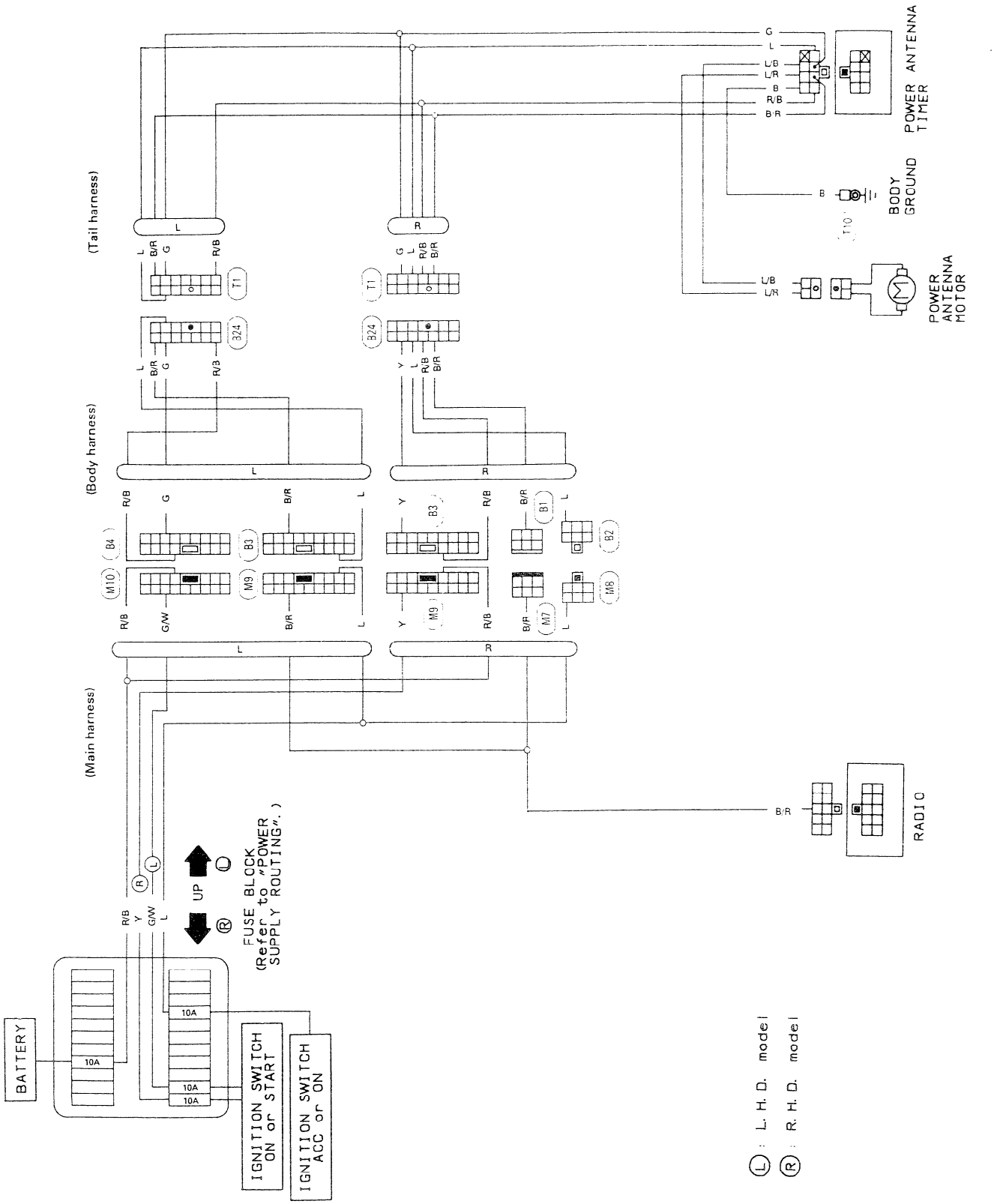
Audio/Wiring Diagram (Cont'd)

N14

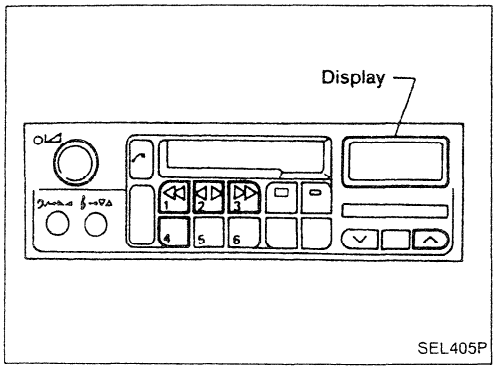


SEL338Q

Power Antenna/Wiring Diagram



SEL608P



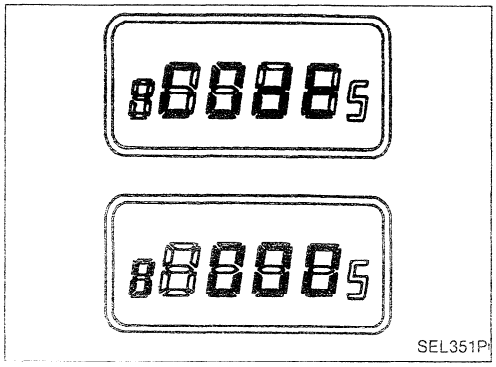
SEL405P

Radio

ANTI-THEFT SYSTEM

By using a personal 4-digit code known only to the vehicle owner, the possibility of the audio unit being stolen is effectively reduced, because without the code the unit can not be activated. When in normal use, the unit is unlocked and accessible in the usual way.

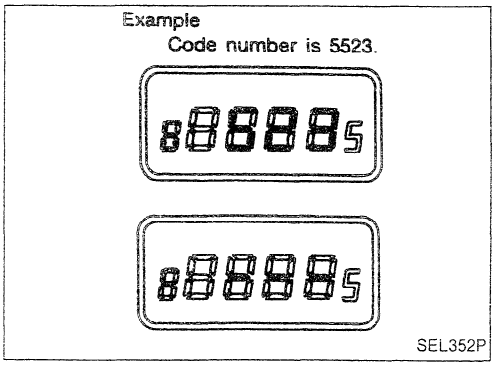
If however, someone attempts to remove the unit or the ground cable is disconnected from the battery, the Anti-theft system activates and the unit "locks". The only way it can be unlocked is by entering a personal code number known only by the owner.


SEL351P

UNLOCKING THE UNIT (How to enter a personal code number)

Use the following procedures to enter a personal code number into the radio.

1. Turn ignition switch to "ACC" or "ON".
2. Turn SW. VOL knob to "ON" and "CODE" will appear on the display.
3. Press any button (except "eject") and "0000" will appear on the display.

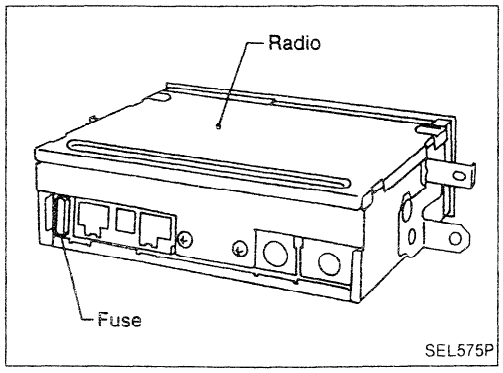


SEL352P

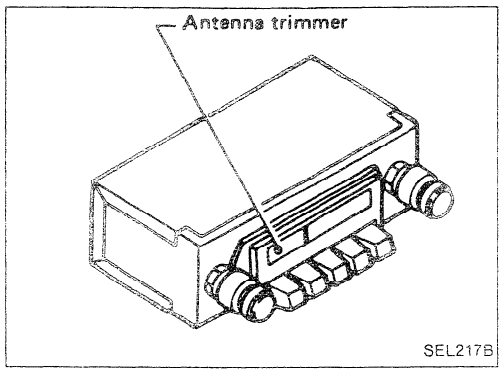
4. Enter a personal code number by pressing station select buttons 1, 2, 3,4 the required number of times to display the code.
5. Press [∧] to enter the code.
   Unit is unlocked and the radio/cassette will operate.
   If the wrong code number is entered, the display shows "- --- ". Wait ten seconds then enter the correct code.

CAUTION:

There is a theft prevention mechanism restricting the number of times a wrong code number can be entered into the radio unit. If a wrong code number is entered 1 to 2 times, you will have to wait for 10 seconds before the radio will receive further input. If a wrong code number is entered 3 to 20 times, you will have to wait a duration of 15 minutes. The radio unit will lock permanently if any further attempts are made.



Radio Fuse Check



Antenna Trimmer Adjustment (Mechanical tuning type)

The antenna trimmer should be adjusted in the following cases.

- Fading and weak MW (AM) reception.
- After installation of new antenna, feeder cable or radio receiver.

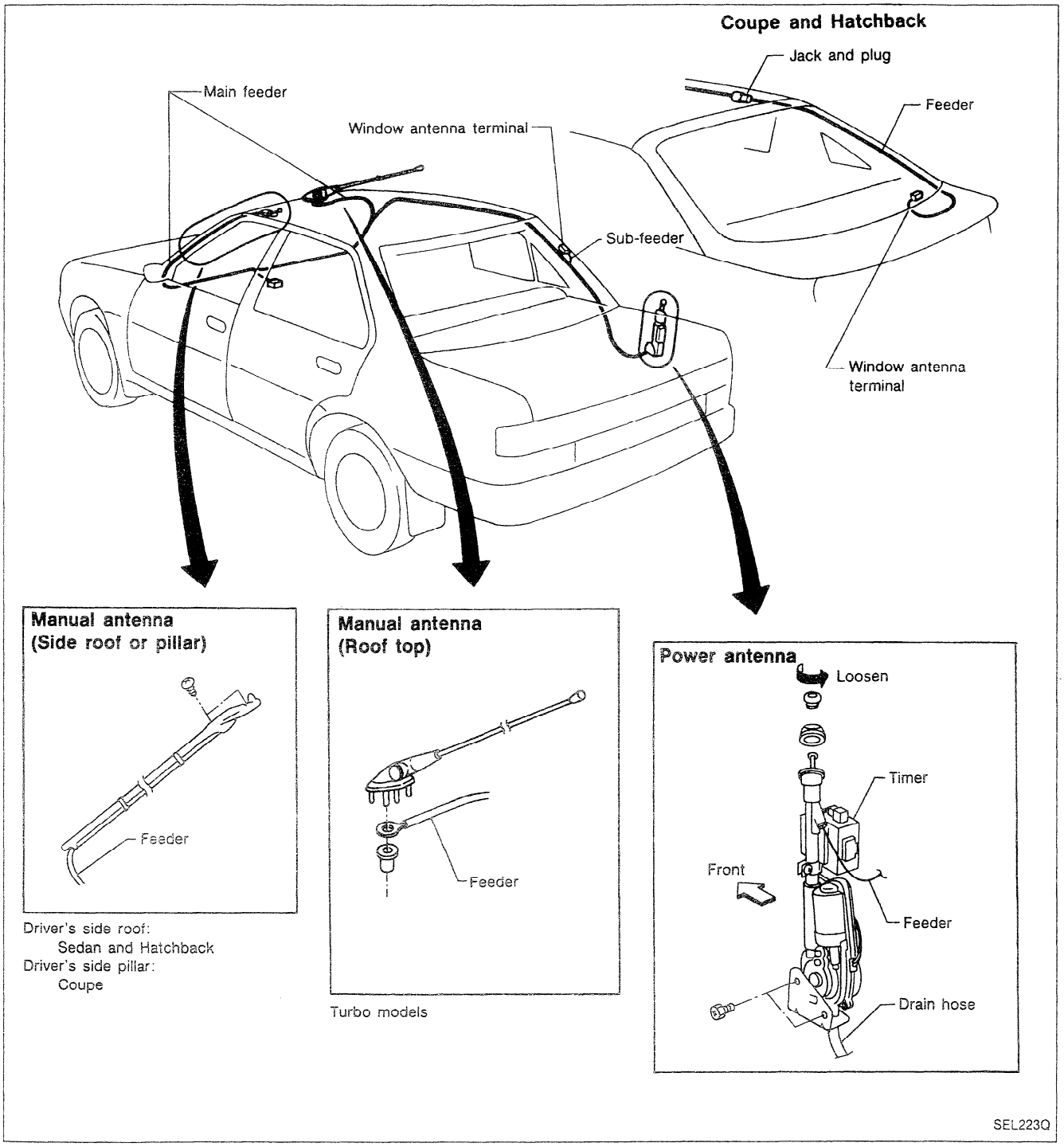
Before adjusting, be sure to check harness and antenna feeder cable connectors for proper connection.

1. Extend antenna completely.
2. Turn radio on, and turn volume control to increase speaker volume.
3. Tune in the weakest station (barely audible) on dial at the range around 14 (1,400 kHz).
4. Turn antenna trimmer to left or right slowly, and set it in the position where reception is strongest.

CAUTION:

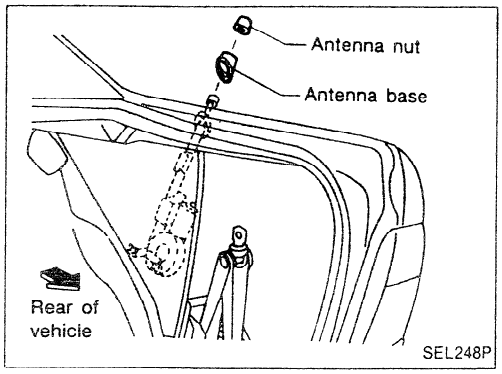
Do not turn antenna trimmer more than one-half turn.

Location of Antenna



Driver's side roof:
Sedan and Hatchback
Driver's side pillar:
Coupe

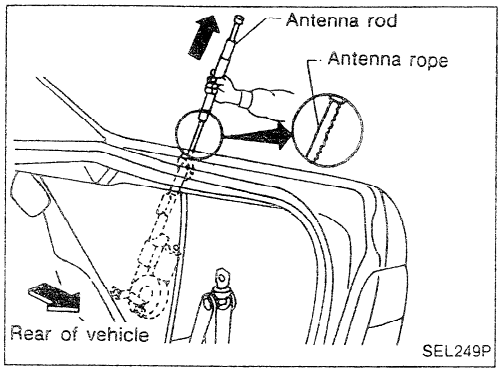
Turbo models



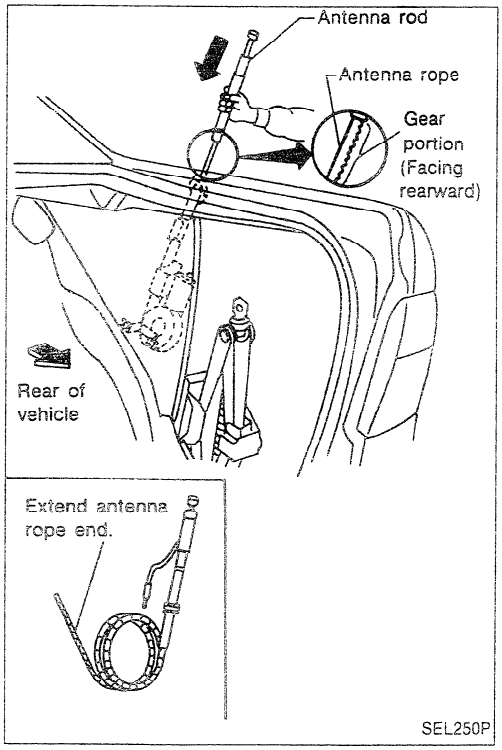
Antenna Rod Replacement

REMOVAL

1. Remove antenna nut and antenna base.

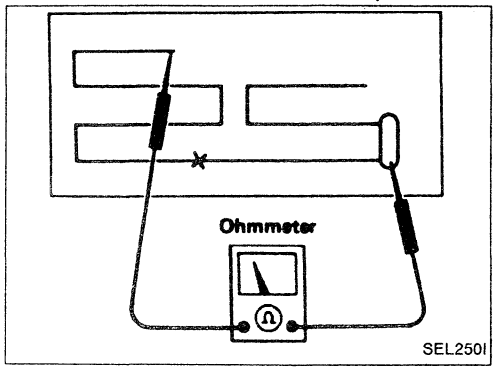


2. Withdraw antenna rod while raising it by operating antenna motor. (Radio switch: OFF → ON)



INSTALLATION

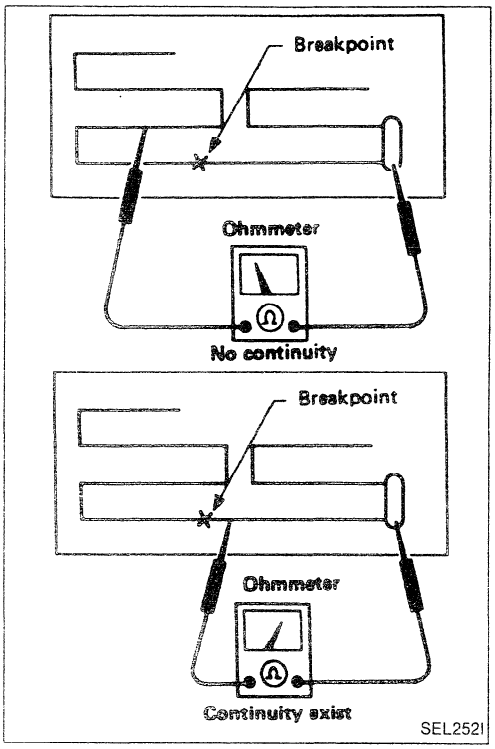
1. Lower antenna rod by operating antenna motor. (Radio switch: OFF → ON)
2. Insert gear section of antenna rope into place with it facing toward antenna motor.
3. As soon as antenna rope is wound on antenna motor, stop antenna motor. Insert antenna rod lower end into antenna motor pipe.
4. Retract antenna rod completely by operating antenna motor.
5. Install antenna nut and base.



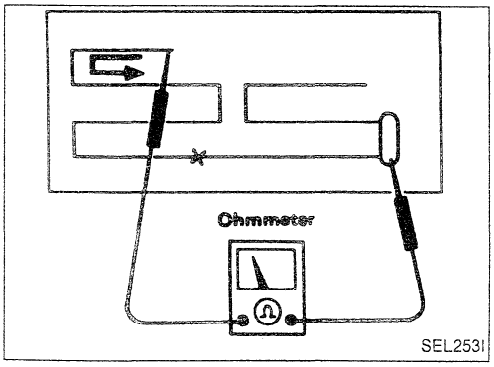
Window Antenna Repair

ELEMENT CHECK

1. Attach probe circuit tester (in ohm range) to antenna terminal on each side.



2. If an element is broken, no continuity will exist.

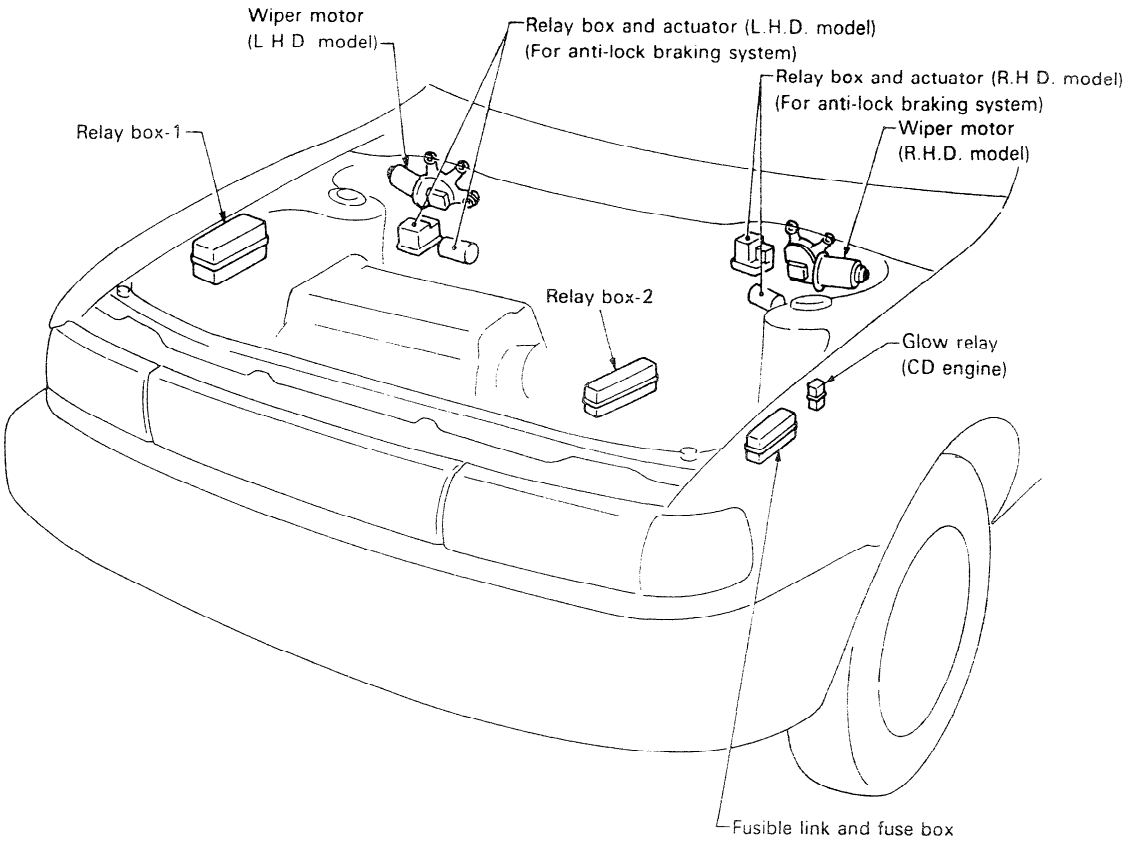


3. To locate broken point, move probe to left and right along element to determine point where tester needle swings abruptly.

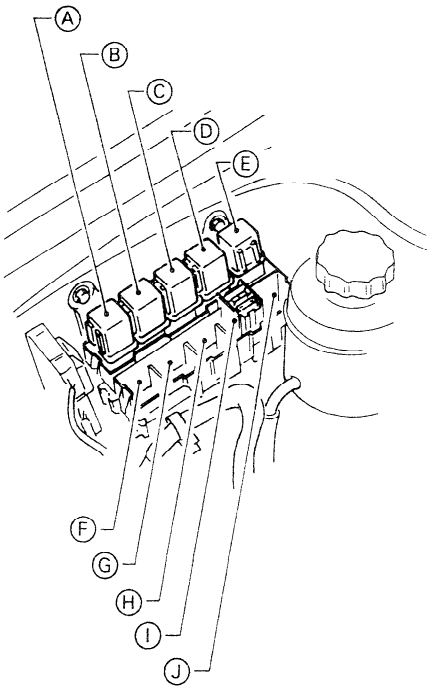
ELEMENT REPAIR

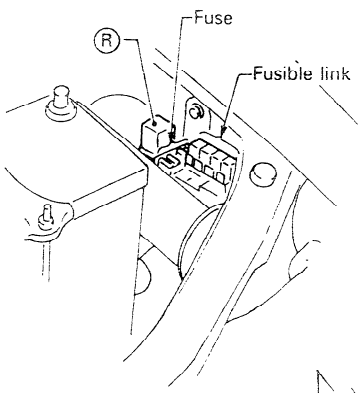
Refer to REAR WINDOW DEFOGGER "Filament Repair".

Engine Compartment

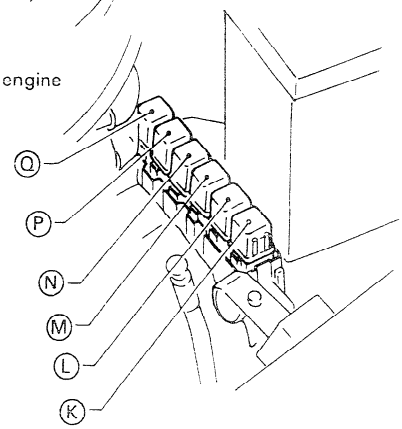


Relay box-1
(For Europe·····All models
Except for Europe·····L.H.D. model with CD engine and R.H.D. model)





Relay box-2
(L.H D. model with GA engine and SR engine)



Engine Compartment (Cont'd)

L.H.D. MODELS

Model	B13 model							N14 model				
Destination	Europe			Middle East	Except Europe and Middle East			Europe				
Engine / Relay	SR	GA16DS (NC)	GA16DS (CR)	GA14DS GA16DS	GA16DE	GA13DS GA14DS GA16DS	CD	SR	GA14DS, GA16DS (NC)	GA14DS, GA16DS (CR)	GA14DS, GA16DS (CN)	CD
Air conditioner relay	K	K	K	K	K	K	A	B	B	B	B	B
Resistor	M	—	—	—	M	—	—	Q	—	—	—	—
Automatic choke relay	—	M	M	M	—	M	—	—	Q	Q	Q	—
Bulb check relay	—	—	—	—	—	—	B	—	—	—	—	J
Fuel pump relay	L	—	—	—	L	—	—	N	—	—	—	—
Idle-up relay	—	L	—	L	—	L	—	—	M	—	—	—
E.C.C. relay	—	—	L	—	—	—	—	—	—	N	N	—
Mixture heater relay	—	—	N	—	—	—	—	—	—	M	—	—
Radiator fan relay-1	P	P	P	P	P	P	D	P	P	P	P	I
Radiator fan relay-2	—	—	—	N (A/T)	N (*1)	N (*1)	—	—	—	—	—	—
Radiator fan relay-3	—	—	—	B (A/T)	—	—	—	—	—	—	—	—
Inhibitor relay (A/T)	—	Q	Q	Q	Q	Q	—	—	C	C	C	—
Horn relay	A	A	A	A(A/T) R(M/T)	R	R	R	L	L	L	L	G
Rear wiper relay	—	—	—	—	—	—	—	A (H/B)	A (H/B)	A (H/B)	A (H/B)	A (H/B)
Front fog lamp relay	C	C	C	—	—	—	—	K	K	K	K	F
Rear fog lamp relay	B	B	B	—	—	—	—	E	E	E	E	E
Driving lamp relay	—	—	—	—	—	—	—	C (2ODE)	—	—	—	—
Fuse	—	—	—	—	—	—	—	D	D	D	D	D

R.H.D. MODELS

Model	B13 model							N14 model						
Destination	Europe			Except Europe				Europe					Except Europe	
Engine / Relay	SR	GA16DS (NC)	GA16DS (CR)	GA16DE	GA13DS GA14DS GA16DS	E	CD	SR	GA14DS, GA16DS (NC)	GA14DS, GA16DS (CR)	GA14DS, GA16DS (CN)	CD	GA16DE	GA14DS
Air conditioner relay	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Resistor	B	—	—	B	—	—	—	B	—	—	—	—	B	—
Automatic choke relay	—	B	B	—	B	B	—	—	B	B	B	—	—	B
Bulb check relay	—	—	—	—	—	—	B	—	—	—	—	B	—	—
Fuel pump relay	C	—	—	—	—	—	—	C	—	—	—	—	C	—
Idle-up relay	—	C	—	—	—	—	—	—	C	—	—	—	—	C
E.C.C. relay	—	—	C	—	—	—	—	—	—	C	C	—	—	—
Mixture heater relay	—	—	H	—	—	—	—	—	—	H	—	—	—	—
Radiator fan relay-1	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Radiator fan relay-2	—	—	—	C (*1)	C (*1)	—	—	—	—	—	—	—	—	—
Inhibitor relay (A/T)	—	E	E	E	E	—	—	—	E	E	E	—	E	E
Horn relay	R	R	I	R	R	R	R	R	R	I	R	R	R	R
Rear wiper relay	—	—	—	—	—	—	—	G (H/B)	G (H/B)	G (H/B)	G (H/B)	G (H/B)	G (H/B)	G (H/B)
Front fog lamp relay	G	G	G	—	—	—	—	J	J	J	J	J	—	—
Rear fog lamp relay	F	F	F	—	—	—	—	F	F	F	F	F	—	—
Driving lamp relay	—	—	—	—	—	—	—	H (2ODE)	—	—	—	—	—	—
Fuse	—	—	—	—	—	—	—	I	I	—	I	I	I	I

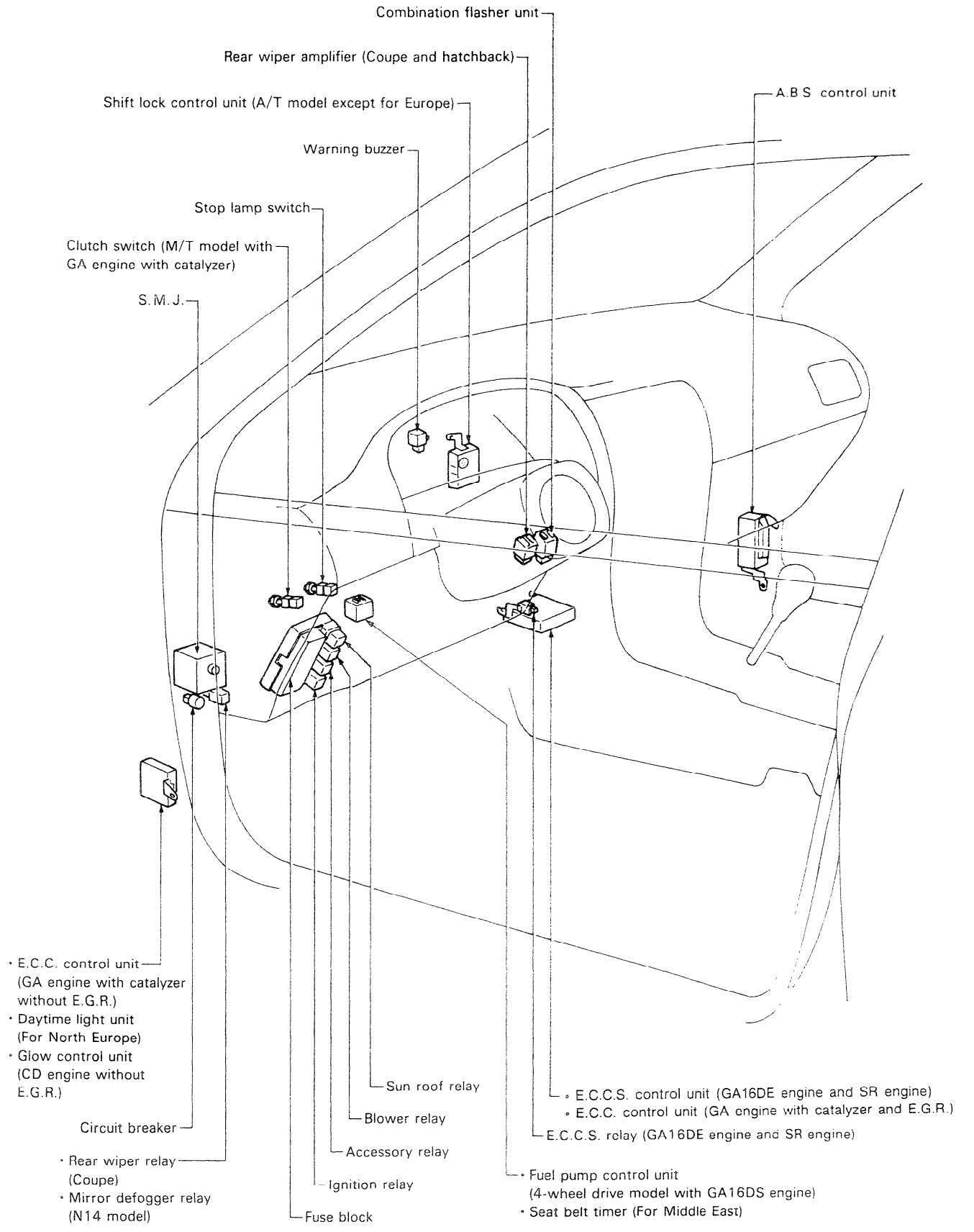
(NC) : Without catalyzer
(CR) : With catalyzer and E.G.R.
(CN) : With catalyzer without E.G.R.

*1: A/T model for hot areas

SEL402Q

Passenger Compartment

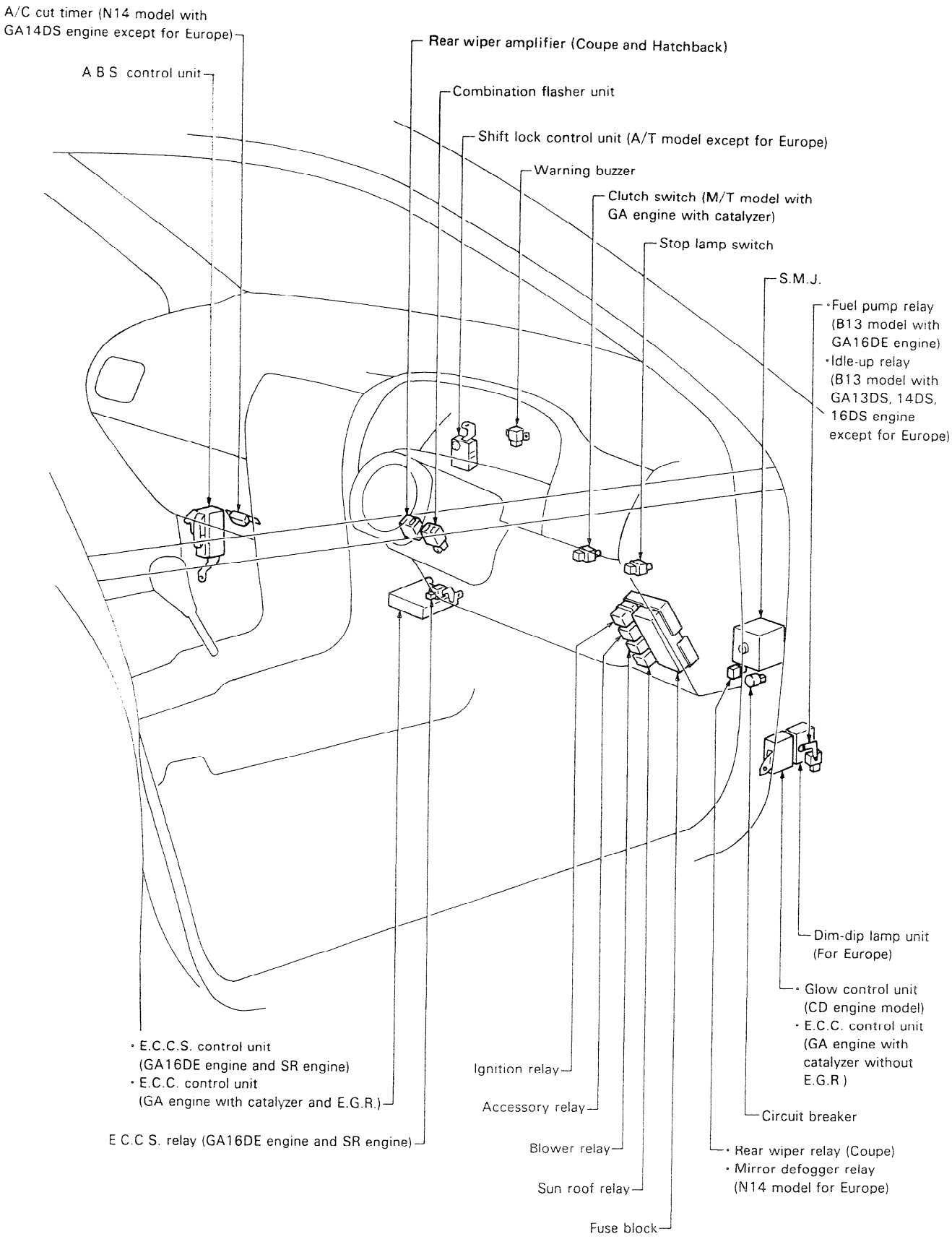
L.H.D. MODELS



SEL232Q

Passenger Compartment (Cont'd)

R.H.D. MODELS

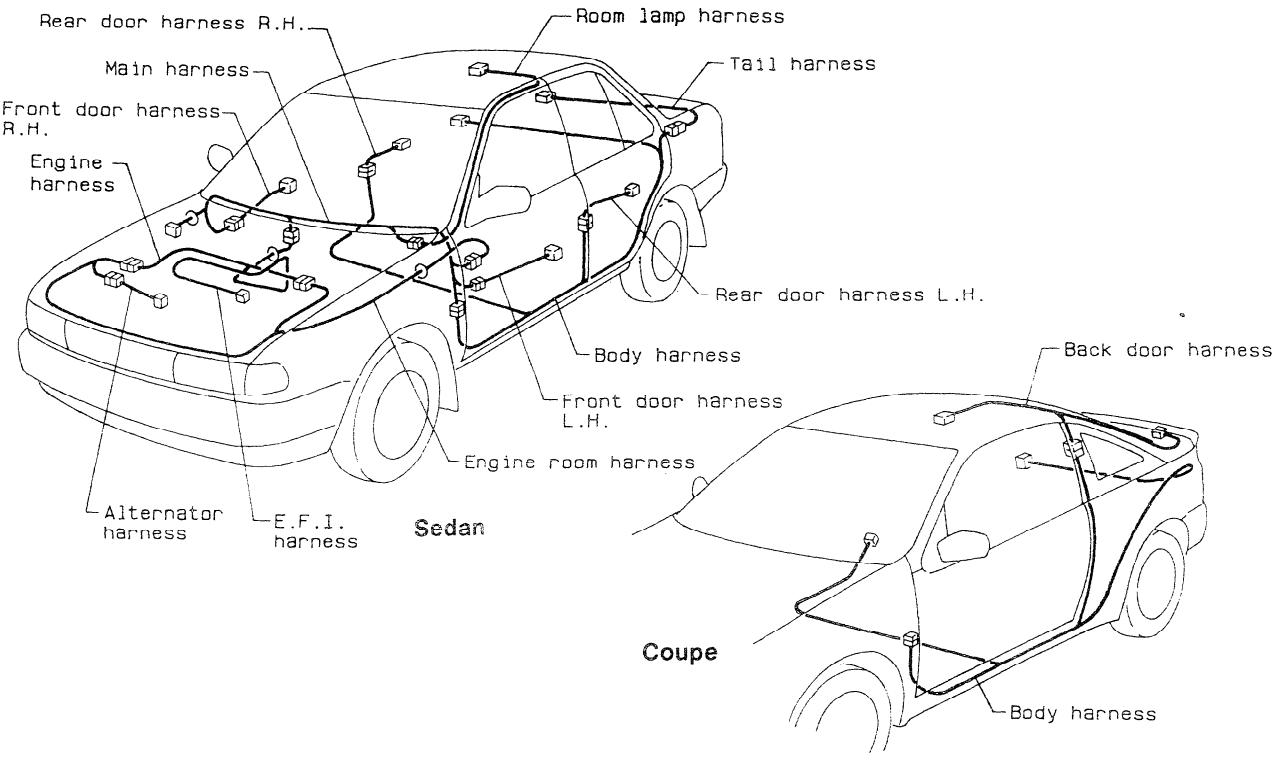


SEL403Q

Outline

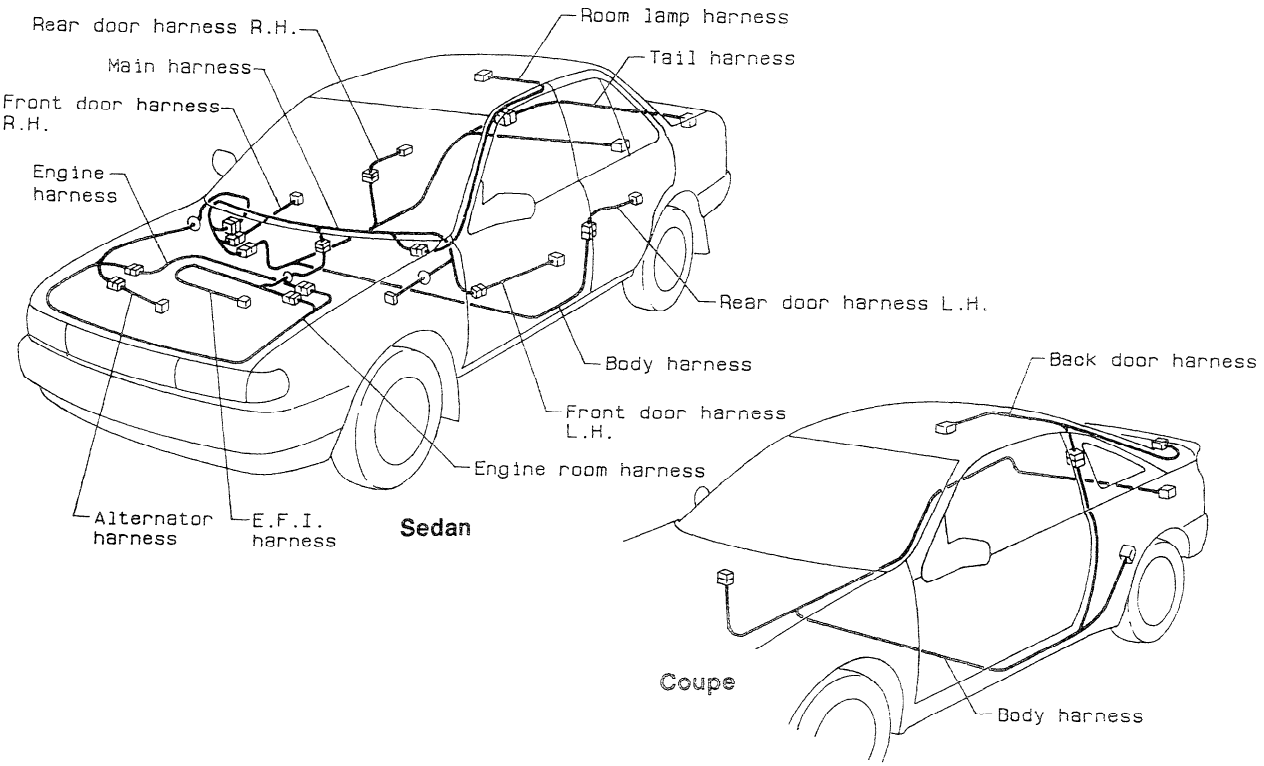
B13

L.H.D. MODELS



SEL612P

R.H.D. MODELS

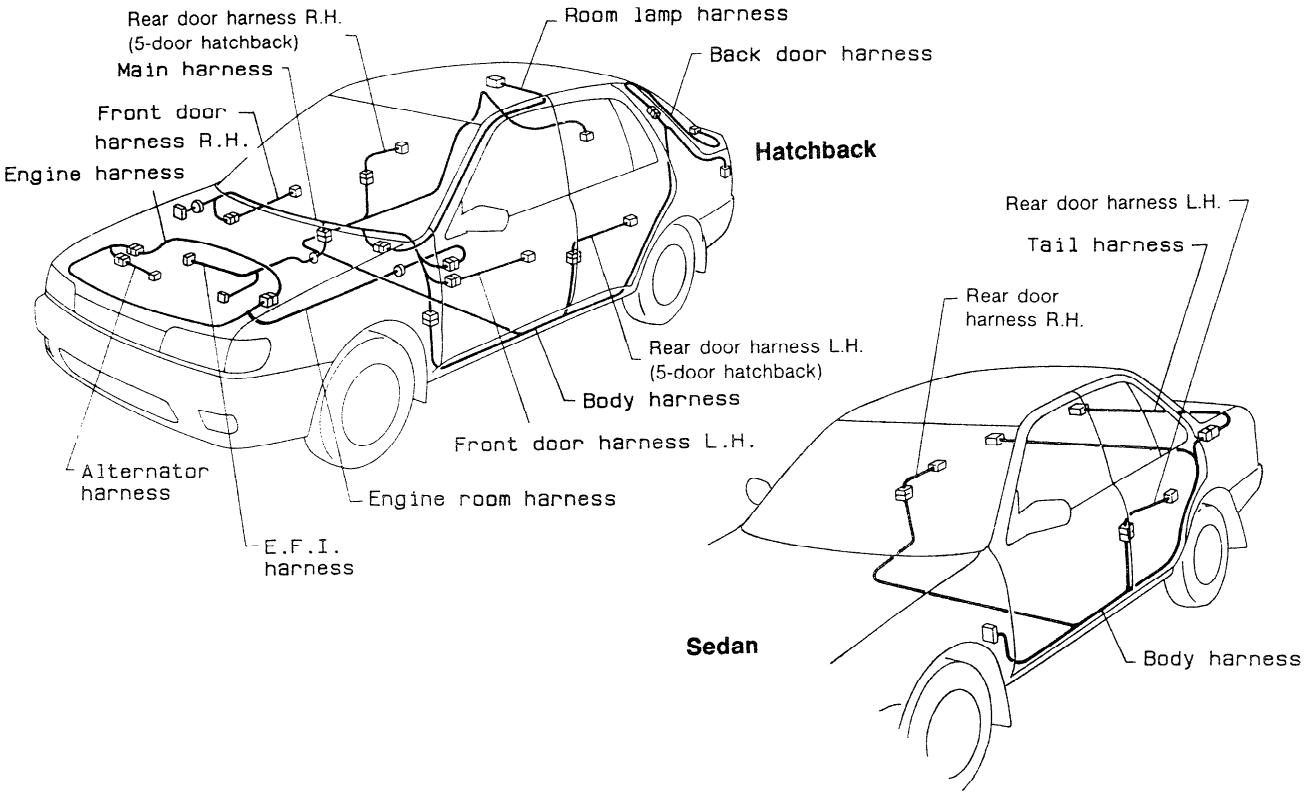


SEL613P

Outline (Cont'd)

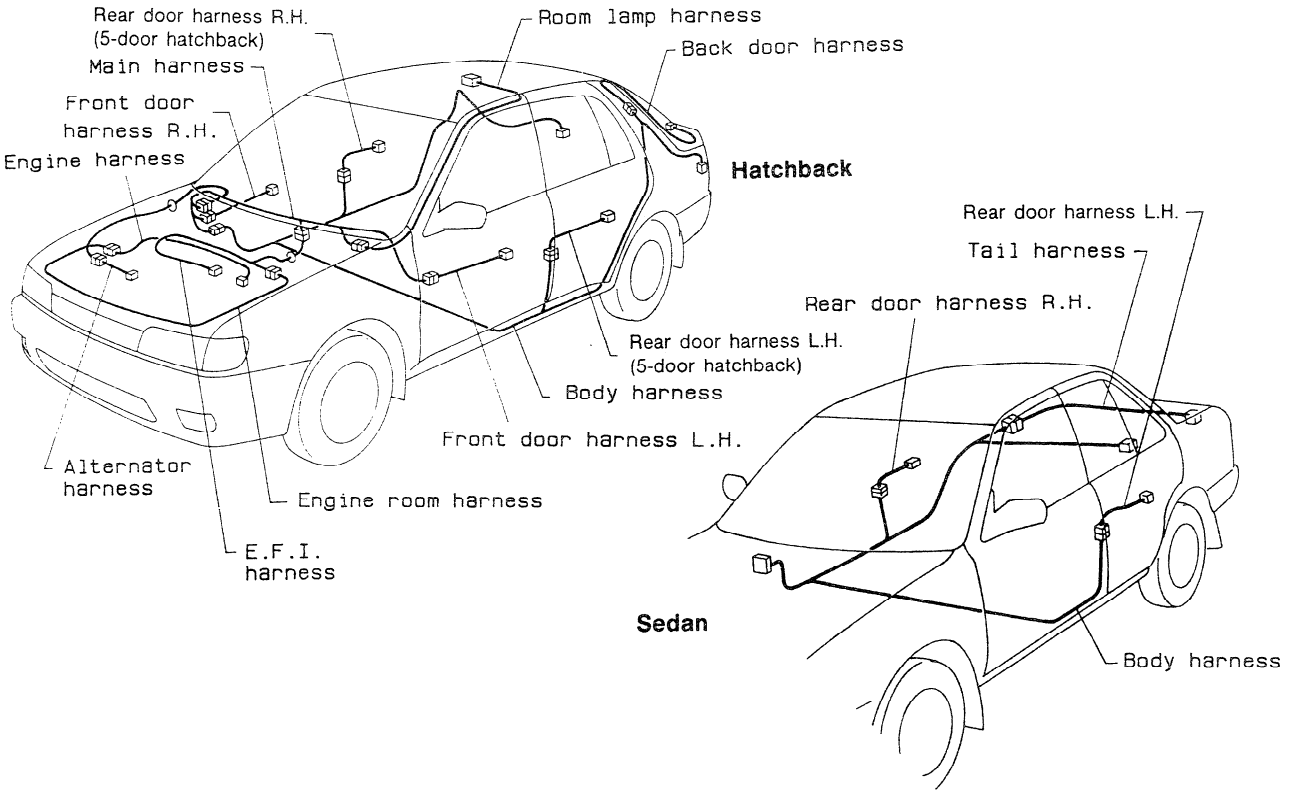
N14

L.H.D. MODELS



SEL236Q

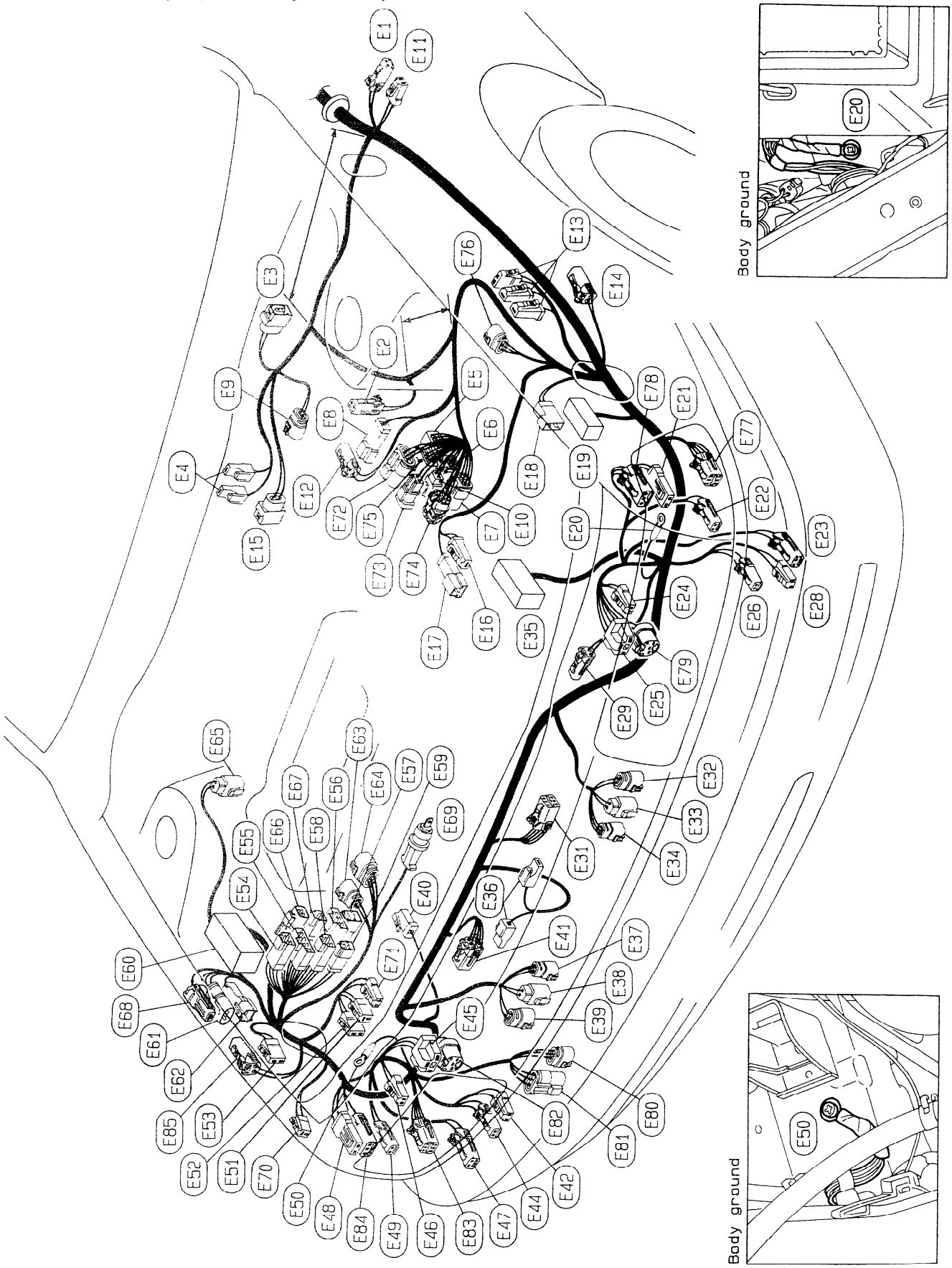
R.H.D. MODELS



SEL237Q

Engine Room Harness

L.H.D. MODELS (Engine compartment)



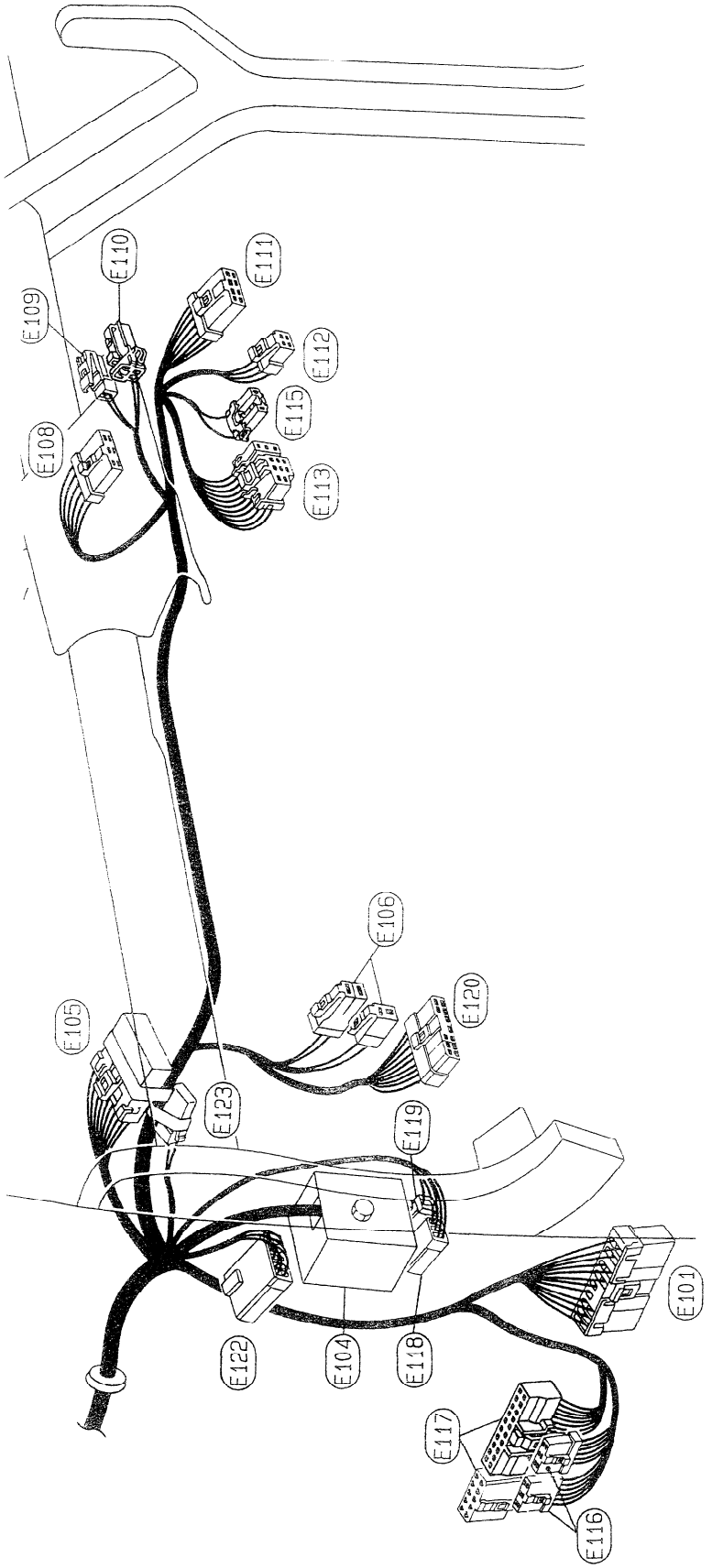
(E1) : Side turn signal lamp L.H. (Coupe)
(E2) : Front sensor L.H. (For anti-lock braking system)
(E3) : Brake fluid level switch
(E4) : F.I.C.D. solenoid valve (Without E.C.C.S. engine)
(E5) : To (E224) (Non-turbo model except CD engine without E.G.R)
(E6) : To (E226) (GA16DE engine)
(E7) : To (E225) (GA13DS, 14DS, 16DS engine without catalyzer, and SR20DE engine)
(E8) : To (E216) (CD engine)
(E9) : Fuel filter sensor (CD engine)
(E10) : To (E227) (N14 model GA engine without catalyzer)
(E11) : Side turn signal lamp L.H. (N14 model)
(E12) : Vehicle speed sensor (Digital meter)
(E13) : Glow relay (CD engine)
(E14) : Front side marker lamp L.H. (Sedan for Middle East)
(E15) : Vacuum switch (GA engine with catalyzer without E.G.R.)
(E16) : Battery
(E17) : Fusible link
(E18) : Fender marker lamp L.H. (Sedan except for Europe and Middle East)
(E19) : Fusible link and fuse box
(E20) : Body ground
(E21) : Front turn signal lamp L.H. (Sedan and hatchback except for Middle East)
(E22) : Front turn signal lamp L.H. (Coupe)
(E23) : Driving lamp L.H. (GTI model)
(E24) : Clearance lamp L.H. (Except Sedan for Middle East)
(E25) : Headlamp L.H. (Except Sedan for Middle East)
(E26) : To front fog lamp harness L.H. (Coupe)
(E28) : Front fog lamp L.H. (N14 model)
(E29) : Dual-pressure switch
(E31) : Headlamp wiper motor L.H. (For Europe)
(E32) : Radiator fan motor-1 (Except for hot areas and CD20 engine)
(E33) : Radiator fan motor-1 (CD17 engine model for hot areas and CD20 engine)
(E34) : Radiator fan motor-1 (GA engine A/T model for hot areas)
(E35) : Relay box (Refer to "LOCATION OF ELECTRICAL UNITS".)
(E36) : Horn
(E37) : Radiator fan motor-2 (GA engine A/T model for hot areas)
(E38) : Radiator fan motor-2 (CD17 engine model for hot areas and CD20 engine)
(E39) : Radiator fan motor-2 (Except for hot areas and CD20 engine)
(E40) : Brake vacuum switch (CD engine)
(E41) : Headlamp wiper motor R.H. (For Europe)
(E42) : Front fog lamp R.H. (N14 model)
(E44) : To front fog lamp harness R.H. (Coupe)
(E45) : Headlamp R.H. (Except secan for Middle East)
(E46) : Clearance lamp R.H. (Except sedan for Middle East)
(E47) : Driving lamp R.H. (GTI model)
(E48) : Front turn signal lamp R.H. (Sedan and hatchback except for Middle East)
(E49) : Front turn signal lamp R.H. (Coupe)
(E50) : Body ground
(E51) : Front washer motor
(E52) : Rear washer motor (Coupe and hatchback)
(E53) : Fender marker lamp R.H. (Sedan except for Europe and Middle East)
(E54) : To (E202) (CD engine without E.G.R.)
(E55) : To (E203) (CD engine and SR20DET engine)
(E56) : To alternator harness (CD engine with E.G.R.)
To (E201) (Turbo model)
(E57) : To (E205) (Turbo model)
(E58) : To alternator harness (N14 model GA engine and SR engine for Europe)
(E59) : To alternator harness (B13 model with CD engine and N14 non-turbo model)
(E60) : Relay box (Refer to "LOCATION OF ELECTRICAL UNITS".)
(E61) : To alternator harness (B13 model with GA engine)
(E62) : To alternator harness (B13 model with GA engine and SR engine)
(E63) : Thermoswitch (GA13DS, 14DS, 16DS engine except A/T model for hot areas)
(E64) : Thermoswitch (GA13DS, 14DS, 16DS engine A/T model for hot areas)
(E65) : Actuator (For anti-lock braking system)
(E66) : To (E206) (Turbo model)
(E67) : To alternator harness (CD engine without E.G.R.)
(E68) : To alternator harness (B13 model with SR engine for Europe and GA engine coupe for Middle East)
(E69) : Exhaust gas sensor (GA engine with catalyzer and E.G.R.)
(E70) : Headlamp washer motor (With headlamp wiper)
(E71) : Washer level switch (For Europe)
(E72) : To (E228) (GA engine with catalyzer and E.G.R.)
(E73) : To (E226) (SR20DE engine)
(E74) : To (E229) (GA engine with catalyzer and E.G.R.)
(E75) : To (E230) (GA engine with catalyzer without E.G.R.)
(E76) : Boost pressure sensor (Turbo model)
(E77) : Aiming motor unit L.H. (For Europe)
(E78) : Front combination lamp L.H. (For Middle East)
(E79) : Headlamp L.H. (For Middle East)
(E80) : Exhaust gas sensor (SR20DE engine with catalyzer)
(E81) : Exhaust gas sensor (Turbo model)
(E82) : Headlamp R.H. (For Middle East)
(E83) : Aiming motor unit R.H. (For Europe)
(E84) : Front combination lamp R.H. (For Middle East)
(E85) : Front side marker lamp R.H. (Sedan for Middle East)

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Engine Room Harness (Cont'd)

L.H.D. MODELS (Passenger compartment)

E101 : Glow control unit (CD engine without E.G.R.)
E104 : To M11 (S.M.J.)
E105 : Diode (GA13DS, 14DS, 16DS engine except N14 model with catalyzer)
E106 : Fuse block
E108 : Ignition switch
E109 : Key switch (Except for Europe and CD engine)
E110 : Key lock solenoid (A/T model)
E111 : Front wiper switch
E112 : Rear wiper switch (Coupe and hatchback)
E113 : Lighting switch
E115 : Lighting switch (For Europe)
E116 : Daytime light cotrol unit
E117 : E.C.C. control unit (GA engine with catalyzer without E.G.R.)
E118 : To B2 (N14 model with headlamp aiming system)
E119 : To M63 (N14 model with small lamps type-II)
E120 : Check connector (GA engine with catalyzer without E.G.R.)
E122 : To M62 (CD engine with E.G.R.)
E123 : Diode (N14 model with GA engine with catalyzer and E.G.R.)

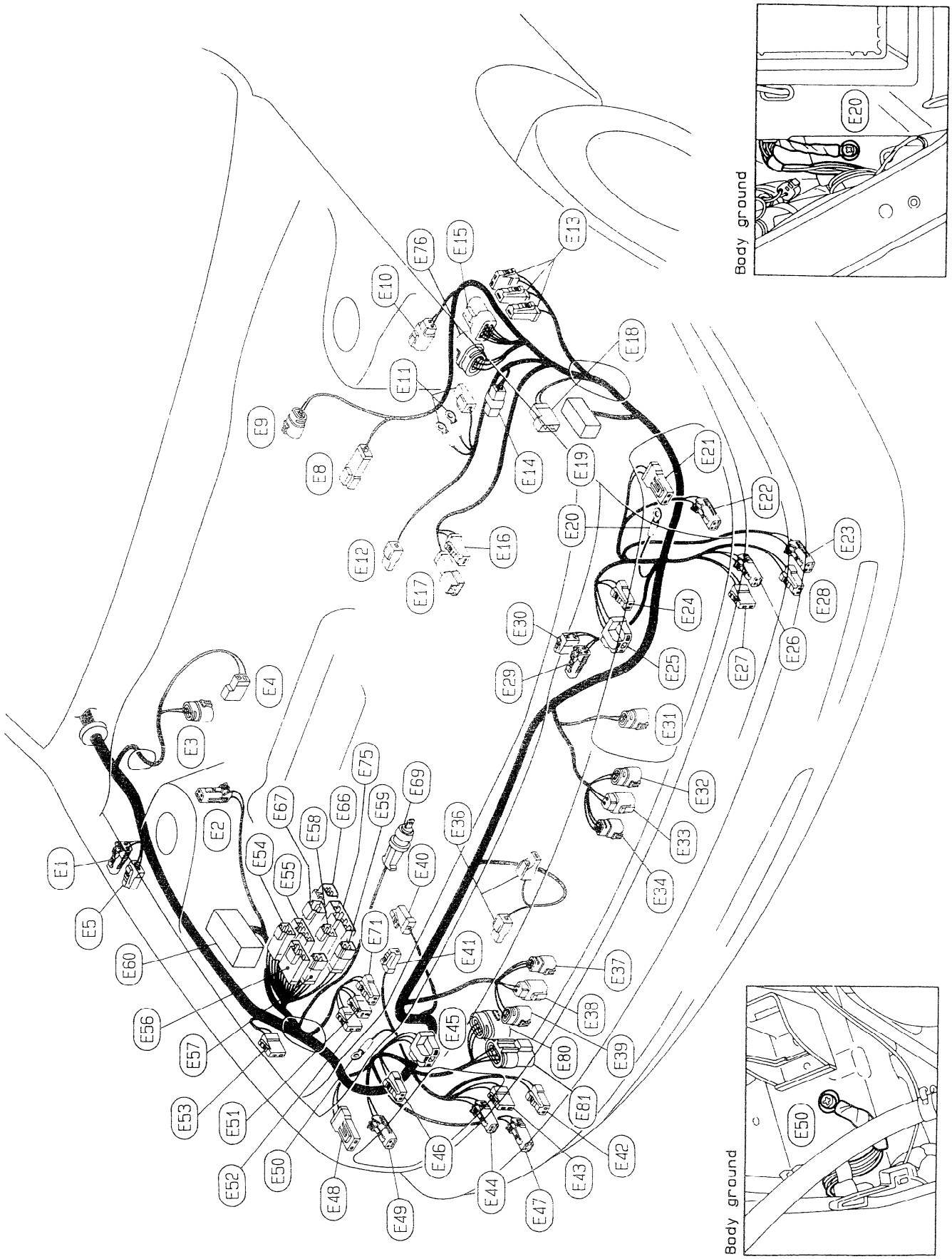


SEL239Q

NOTE

Engine Room Harness (Cont'd)

R.H.D. MODELS (Engine compartment)



(E1) : Side turn signal lamp R.H. (Coupe)
(E2) : Front sensor R.H. (For anti-lock braking system)
(E3) : Power steering oil pressure switch (GA engine and SR engine)
(E4) : Brake fluid level switch
(E5) : Side turn signal lamp R.H. (Hatchback)
(E8) : To (E216) (CD engine)
(E9) : Fuel filter sensor (CD engine)
(E10) : To (M82) (For anti-lock braking system)
(E11) : Ignition coil (E10S engine)
(E12) : Distributor (E10S engine)
(E13) : Glow relay (CD engine)
(E14) : Resistor and condenser (E10S engine)
(E15) : To (F6) (GA16DE engine)
To (F10) (SR engine)
To (F11) (GA engine with catalyzer and E.G.R.)
(E16) : Battery
(E17) : Fusible link
(E18) : Fender marker lamp L.H. (Sedan except for Europe)
(E19) : Fusible link and fuse box
(E20) : Body ground
(E21) : Front turn signal lamp L.H. (Sedan and Hatchback)
(E22) : Front turn signal lamp L.H. (Coupe)
(E23) : Driving lamp L.H. (GTI model)
(E24) : Clearance lamp L.H.
(E25) : Headlamp L.H.
(E26) : To front fog lamp harness L.H. (Coupe)
(E27) : To front fog lamp harness L.H. (Sedan with GA engine except for Europe)
(E28) : Front fog lamp L.H. (N14 model)
(E29) : Dual-pressure switch (B13 model for Europe and N14 model)
(E30) : Dual-pressure switch (B13 model except for Europe)
(E31) : Thermoswitch (E10S engine)
(E32) : Radiator fan motor-1 (Except for hot areas and CD20 engine)
(E33) : Radiator fan motor-1 (CD17 engine model for hot areas and CD20 engine)
(E34) : Radiator fan motor-1 (GA engine A/T model for hot areas)
(E36) : Horn
(E37) : Radiator fan motor-2 (GA engine A/T model for hot areas)
(E38) : Radiator fan motor-2 (CD17 engine model for hot areas and CD20 engine)
(E39) : Radiator fan motor-2 (Except for hot areas and CD20 engine)
(E40) : Brake vacuum switch (CD engine)
(E41) : Compressor (E10S engine)
(E42) : Front fog lamp R.H. (N14 model)
(E43) : To front fog lamp harness R.H. (Sedan with GA engine except for Europe)
(E44) : To front fog lamp harness R.H. (Coupe)
(E45) : Headlamp R.H.
(E46) : Clearance lamp R.H.
(E47) : Driving lamp R.H. (GTI model)
(E48) : Front turn signal lamp R.H. (Sedan and Hatchback)
(E49) : Front turn signal lamp R.H. (Coupe)
(E50) : Body ground
(E51) : Front washer motor
(E52) : Rear washer motor (Coupe and Hatchback)
(E53) : Fender marker lamp R.H. (Sedan except for Europe)
(E54) : To (E202) (N14 model with SR engine without catalyzer, GA16DE engine, GA engine with catalyzer without E.G.R., E10S engine and CD engine)
(E55) : To (E203) (Except E10S engine)
(E56) : To (E201) (Except GA16DE engine, GA engine with E.G.R. and CD engine)
(E57) : To (E203) (E10S engine)
To (E205) (SR engine)
To (E235) (GA engine with catalyzer)
(E58) : To alternator harness (GA engine without catalyzer and CD17 engine)
(E59) : To alternator harness (GA engine without catalyzer and CD engine)
(E60) : Relay box (Refer to "LOCATION OF ELECTRICAL UNITS".)
(E66) : To (E206) (SR engine with catalyzer)
(E67) : To alternator harness (CD20 engine without E.G.R.)
(E69) : Exhaust gas sensor (GA engine with catalyzer)
(E71) : Washer level switch (For Europe)
(E75) : To (E236) (GA engine with catalyzer)
(E76) : Boost pressure sensor (Turbo model)
(E80) : Exhaust gas sensor (SR20DE engine with catalyzer)
(E81) : Exhaust gas sensor (Turbo model)

Engine Room Harness (Cont'd)

R.H.D. MODELS (Passenger compartment)

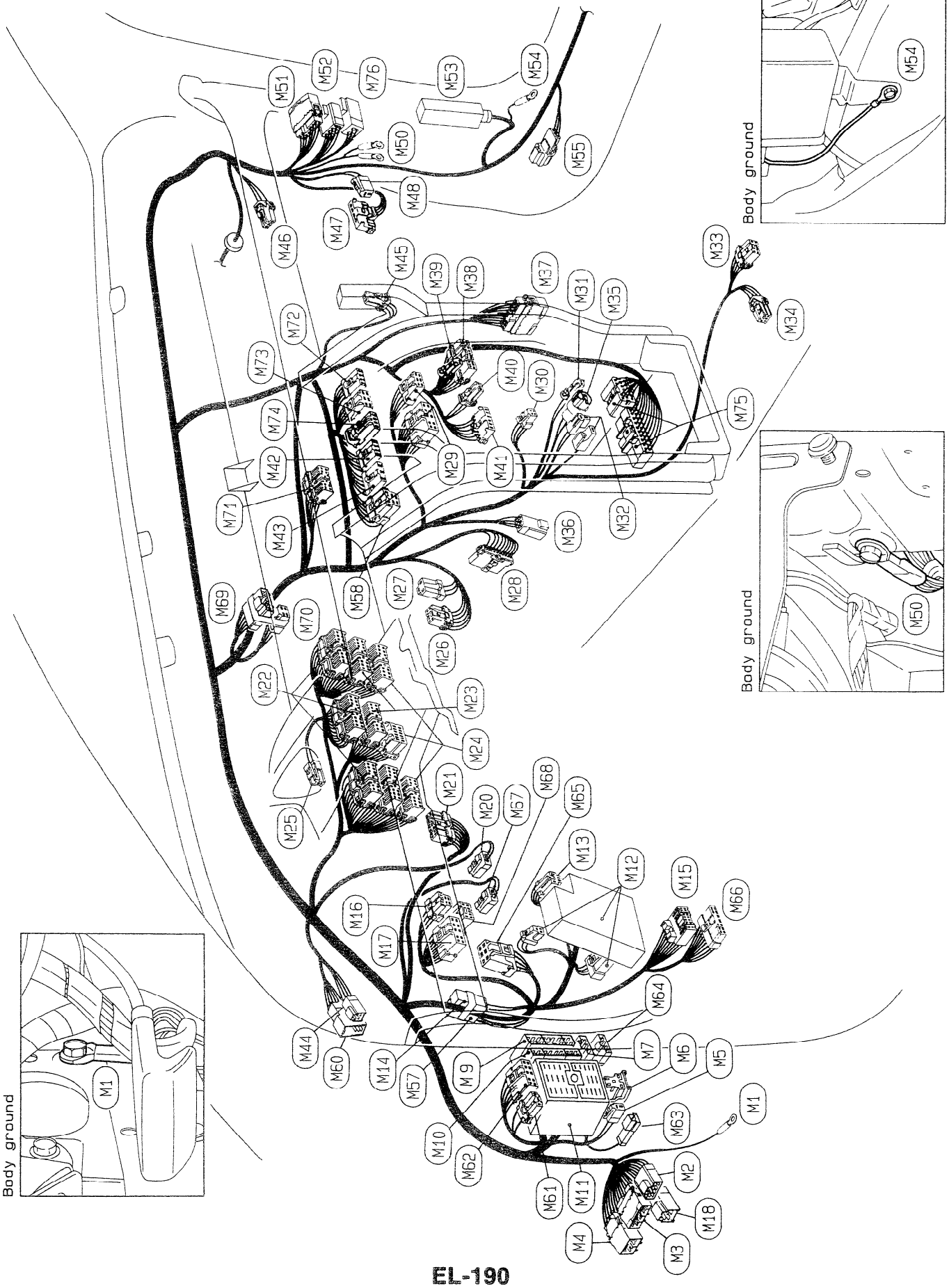


SEL405Q

NOTE

Main Harness

L.H.D. MODELS



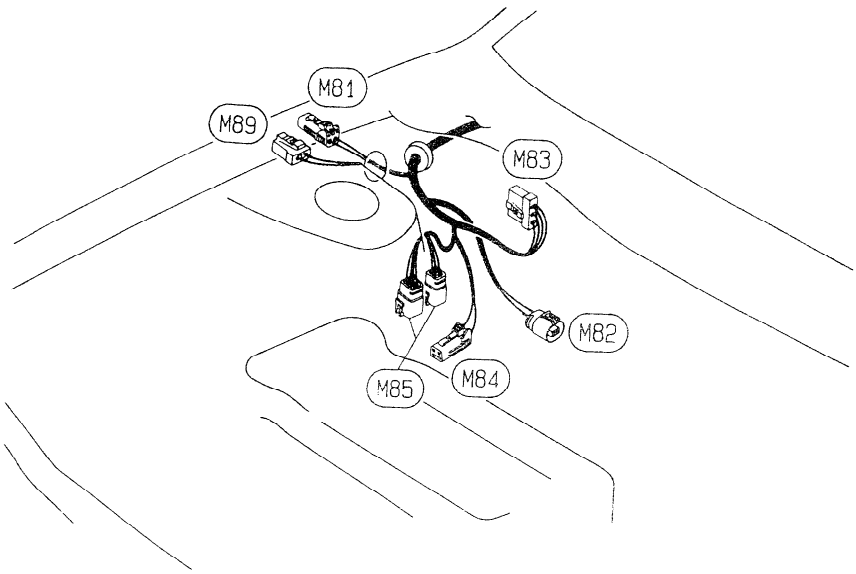
Main Harness (Cont'd)

(M1) : Body ground
(M2) : To (02) (B13 model)
(M3) : To (01)
(M4) : To (03) (N14 model)
(M5) : Circuit breaker
(M6) : Rear wiper relay (Coupe)
(M7) : To (E1) (B13 model)
(M9) : To (E3) (Blue)
(M10) : To (B4) (White)
(M11) : To (E104) (S.M.J.)
(M12) : Fuse block
(M13) : Sun roof relay
(M14) : Diode (B13 model)
(M15) : Diagnostic connector for CONSULT (With E.C.C.S. engine)
(M16) : Front fog lamp switch
(M17) : Door mirror switch
(M18) : To (D4) (N14 model)
(M20) : Stop lamp switch
(M21) : Shift lock control unit (Except for Europe)
(M22) : Combination meter (Needle type without tachometer)
(M23) : Combination meter (Needle type with tachometer)
(M24) : Combination meter (Digital type)
(M25) : Buzzer
(M26) : Rear wiper amplifier (Coupe and hatchback)
(M27) : Combination flasher unit
(M28) : Mode door motor (Push control type)
(M29) : Radio
(M30) : Cassette deck
(M31) : Ashtray illumination
(M32) : Cigarette lighter
(M33) : Shift lock solenoid · Detent switch (Except for Europe)
(M34) : O.D. cancel switch · A/T illumination
(M35) : G sensor (4-wheel drive model) (For anti-lock braking system)
(M36) : To (F34)
(M37) : To (F33)
(M38) : Push control unit (Push control type)
(M39) : Fan switch illumination (Lever control type)
(M40) : Air conditioner switch
(M41) : Fan switch
(M42) : Hazard switch
(M43) : Rear window defogger switch (B13 model)
(M44) : To room lamp harness (B13 model)
(M45) : Thermo control amplifier
(M46) : Intake door motor (Push control type)
(M47) : Fan resistor
(M48) : Blower motor
(M50) : Body ground
(M51) : To (D31)
(M52) : To (D35) (B13 model)
(M53) : A.B.S. control unit (For anti-lock braking system)
(M54) : Body ground (For anti-lock braking system)
(M55) : Joint connector (N14 model) (For anti-lock braking system)
(M57) : Diode (N14 model with power window)
(M58) : Rear window defogger switch (N14 model)
(M60) : To room lamp harness (N14 model)
(M61) : Door mirror defogger relay (N14 model for Europe)
(M62) : To (E122) (CD engine model with E.G.R.)
(M63) : To (E119) (N14 model with small lamps type-II)
(M64) : To (B31) (N14 model)
(M65) : Seat belt timer (For Middle East) Fuel pump control unit (4-wheel drive model)
(M66) : Check connector (GA14DS, 16DS engine with catalyzer and E.G.R.)
(M67) : Clutch switch (GA14DS, 16DS engine M/T model with catalyzer)
(M68) : Illumination control switch (For Europe)
(M69) : Diode (N14 model GA14DS, 16DS engine with catalyzer and small lamps type-II)
(M70) : Diode (N14 model GA14DS, 16DS engine with catalyzer and small lamps type-I)
(M71) : Combination meter (sub) (N14 model with SR engine)
(M72) : Headlamp wiper and washer switch (For Europe)
(M73) : Rear fog lamp switch (B13 model)
(M74) : Rear fog lamp switch (N14 model)
(M75) : Glow control unit (CD engine model with E.G.R.)
(M76) : To (D34) (N14 model for Europe)

SEL242Q

Main Harness (Cont'd)

L.H.D. MODELS

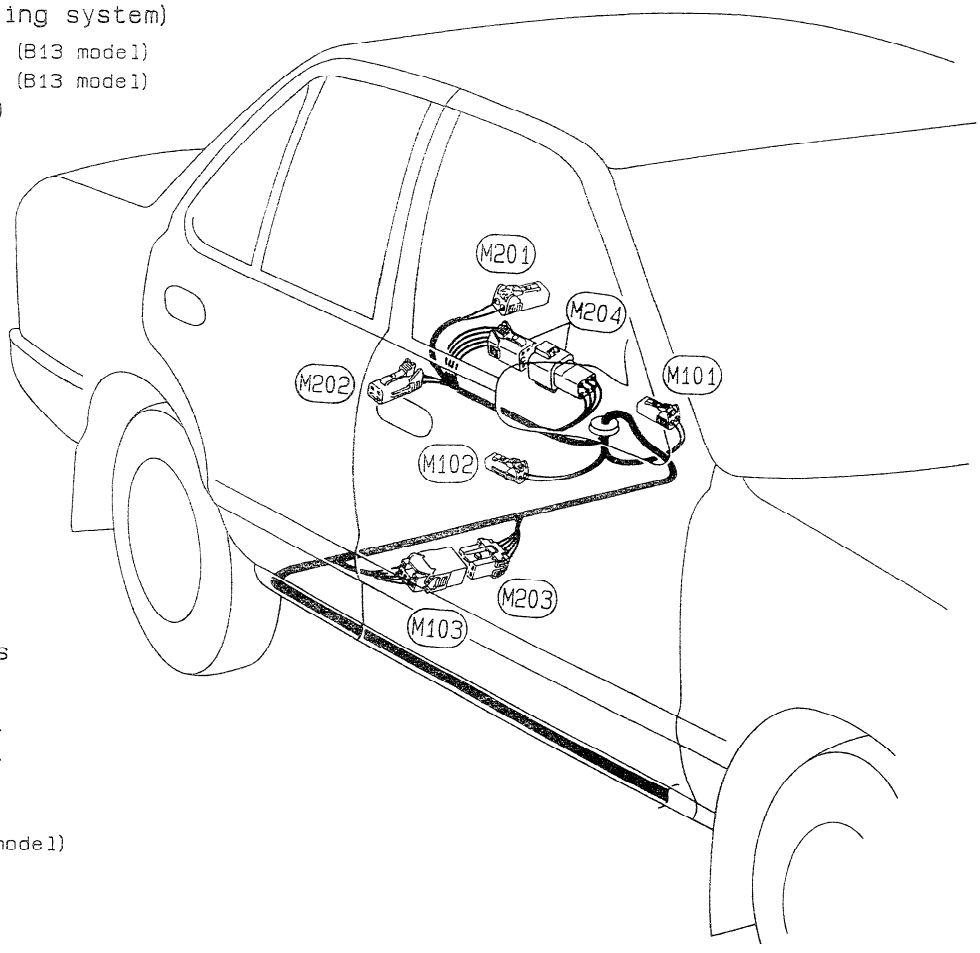


Engine compartment

(M81) : Side turn signal lamp R.H. (Coupe)
(M82) : Power steering oil pressure switch (GA13DS, 14DS, 16DS engine without catalyzer)
(M83) : Wiper motor
(M84) : Front sensor R.H. (For anti-lock braking system)
(M85) : Actuator (For anti-lock braking system)
(M89) : Side turn signal lamp R.H. (N14 model)

Rear body
(For anti-lock braking system)

(M101) : Rear sensor L.H. (B13 model)
(M102) : Rear sensor R.H. (B13 model)
(M103) : To (M203) (N14 model)



Rear sensor harness
(N14 model)

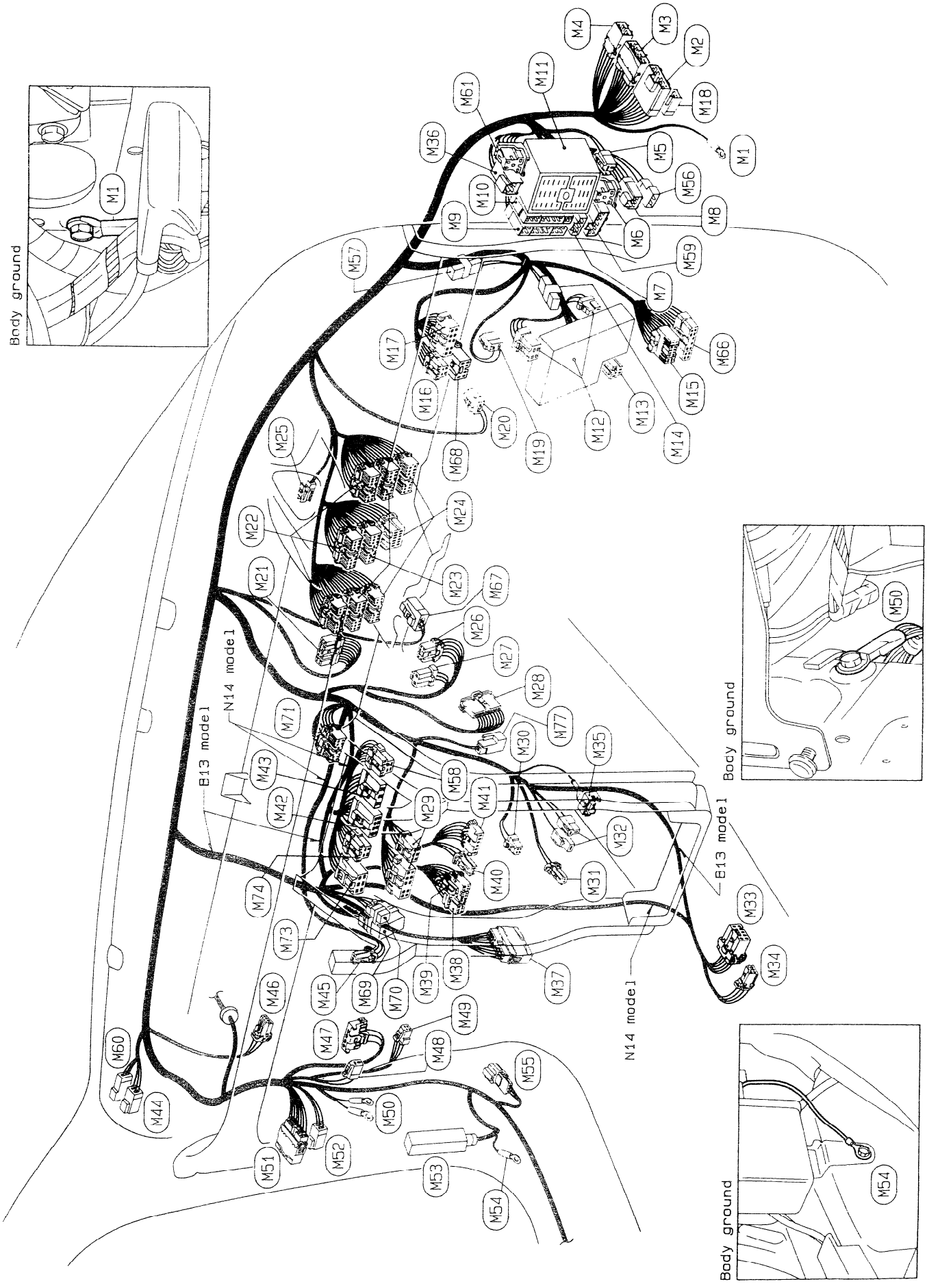
(M201) : Rear sensor L.H.
(M202) : Rear sensor R.H.
(M203) : To (M103)
(M204) : Joint connector (4-wheel drive model)

SEL243Q

NOTE

Main Harness (Cont'd)

R.H.D. MODELS



Main Harness (Cont'd)

(M1) : Body ground
(M2) : To (D32) (B13 model)
(M3) : To (D31)
(M4) : To (D33) (N14 model)
(M5) : Circuit breaker
(M6) : Rear wiper relay (Coupe)
(M7) : To (B1) (B13 model)
(M8) : To (B2) (B13 Sedan mocel)
(M9) : To (B3) (Blue)
(M10) : To (B4) (White)
(M11) : To (E104) (S.M.J.)
(M12) : Fuse block
(M13) : Sun roof relay
(M14) : **Diode (B13 model with power window for Sedan or with catalyzer and E.G.R.)**
(M15) : Diagnostic connector for CONSULT (N14 model with E.C.C.S. engine)
(M16) : Front fog lamp switch
(M17) : Door mirror switch
(M18) : To (D34) (N14 model)
(M19) : Kickdown switch (N14 model with GA14DS engine except for Europe)
(M20) : Stop lamp switch
(M21) : Shift lock control unit (Except for Europe)
(M22) : Combination meter (Needle type without tachometer)
(M23) : Combination meter (Needle type with tachometer)
(M24) : Combination meter (Digital type)
(M25) : Buzzer
(M26) : **Rear wiper amplifier (Coupe and Hatchback)**
(M27) : Combination flasher unit
(M28) : Mode door motor (Push control type)
(M29) : Radio
(M30) : Cassette deck
(M31) : Ashtray illumination
(M32) : Cigarette lighter
(M33) : Shift lock solenoid · Detent switch (Except for Europe)
(M34) : O.D. cancel switch · A/T illumination
(M35) : G sensor (4-wheel drive model) (For anti-lock braking system)
(M36) : To (E121) (N14 model)
(M37) : To (F33)
(M38) : Push control unit (Push control type)
(M39) : Fan switch illumination (Lever control type)
(M40) : Air conditioner switch
(M41) : Fan switch
(M42) : Hazard switch
(M43) : Rear window defogger switch (B13 model)
(M44) : To room lamp harness (B13 model)
(M45) : Thermo control amplifier
(M46) : Intake door motor (Push control type)
(M47) : Fan resistor
(M48) : Blower motor
(M49) : A/C cut timer (N14 model with GA14DS engine except for Europe)
(M50) : Body ground
(M51) : To (D1)
(M52) : To (D4)
(M53) : A.B.S. control unit (For anti-lock braking system)
(M54) : Body ground (For anti-lock braking system)
(M55) : Joint connector (N14 model) (For anti-lock braking system)
(M56) : To (B2) (N14 model)
(M57) : Diode (N14 model with power window or with catalyzer and E.G.R.)
(M58) : Rear window defogger switch (N14 model)
(M59) : To (B1) (N14 model)
(M60) : To room lamp harness (N14 model)
(M61) : Door mirror defogger relay (N14 model for Europe)
(M66) : Check connector (N14 model with GA engine with catalyzer and E.G.R.)
(M67) : Clutch switch (GA14DS, 16DS engine M/T model with catalyzer)
(M68) : Illumination control switch (For Europe)
(M69) : Diode (N14 model with GA engine with catalyzer and E.G.R.)
(M70) : Diode (B13 model with GA engine with catalyzer and E.G.R.)
(M71) : Combination meter (Sub) (N14 model with SR engine)
(M73) : Rear fog lamp switch (B13 model for Europe)
(M74) : Rear fog lamp switch (N14 model for Europe)
(M77) : To (F35) (N14 model with GA engine with catalyzer and E.G.R.)

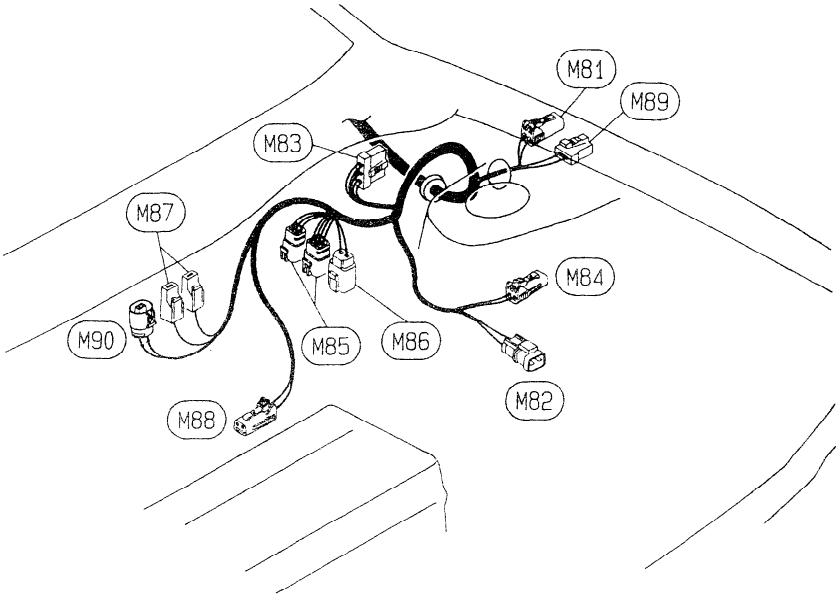
SEL406Q

Main Harness (Cont'd)

R.H.D. MODELS

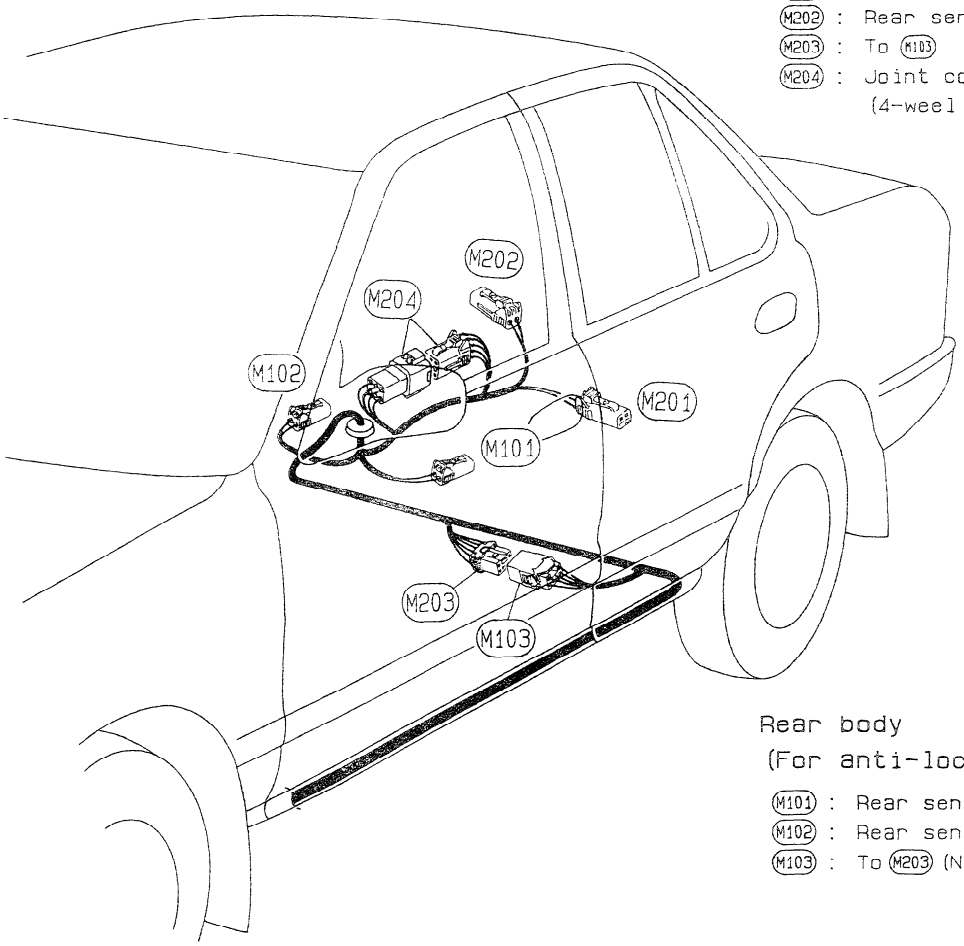
Engine compartment

(M81) : Side turn signal lamp L.H. (Coupe)
(M82) : To (E10)
(M83) : Wiper motor
(M84) : Front sensor L.H. (For anti-lock braking system)
(M85) : Actuator (For anti-lock braking system)
(M86) : Actuator (For anti-lock braking system)
(M87) : F.I.C.D. solenoid valve (Without E.C.C.S. engine)
(M88) : Vehicle speed sensor (Digital meter)
(M89) : Side turn signal lamp L.H. (N14 model)
(M90) : Vacuum switch (GA engine with catalyzer without E.G.R.)



Rear sensor harness. (N14 model)

(M201) : Rear sensor L.H.
(M202) : Rear sensor R.H.
(M203) : To (M103)
(M204) : Joint connector (4-weel drive model)



Rear body
(For anti-lock braking system)

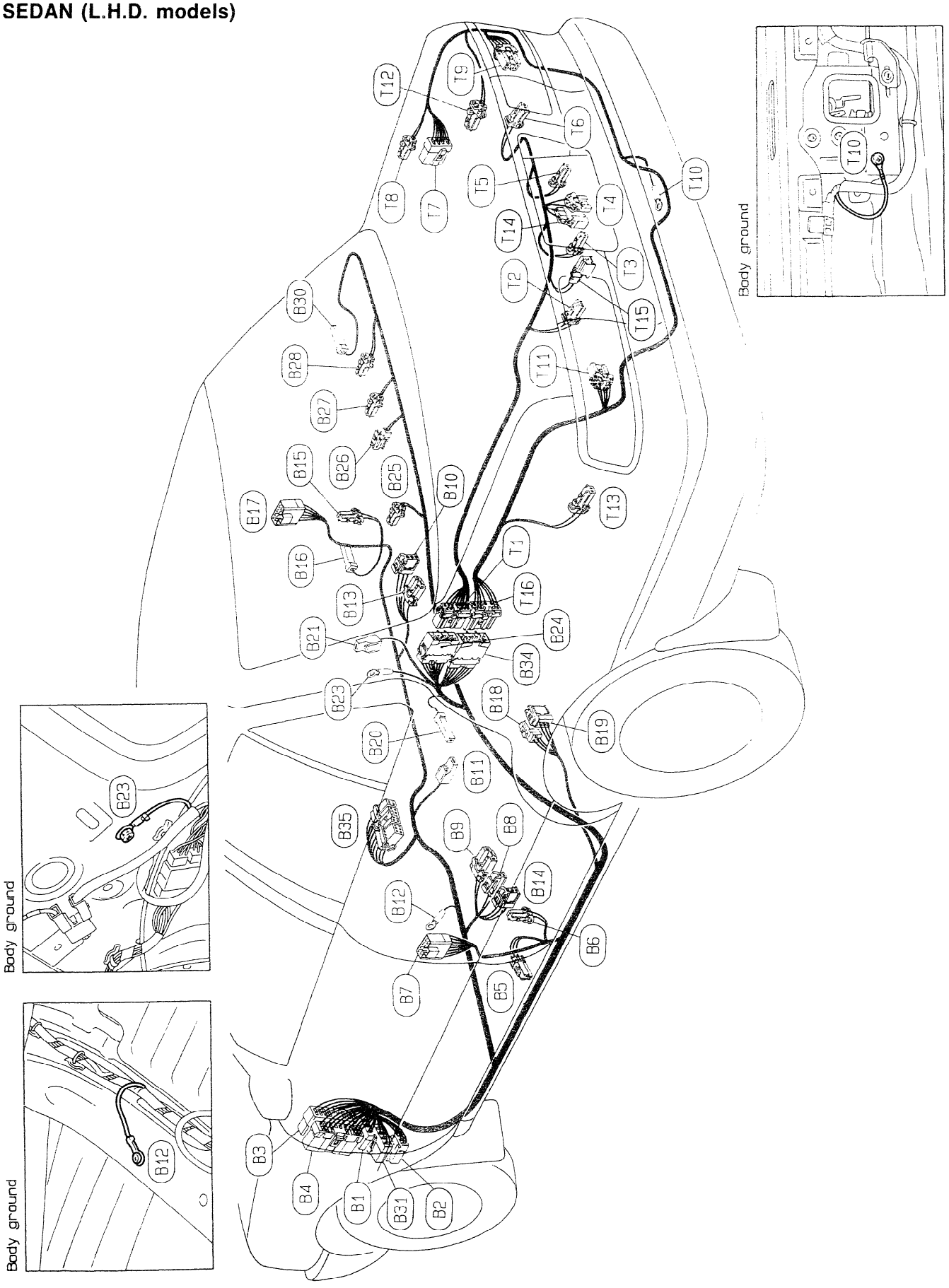
(M101) : Rear sensor L.H. (B13 model)
(M102) : Rear sensor R.H. (B13 model)
(M103) : To (M203) (N14 model)

SEL245Q

NOTE

Body Harness

SEDAN (L.H.D. models)



Body Harness (Cont'd)

Body harness

(B1) : To (M7) (B13 model)
(B2) : To (E118) (N14 model with headlamp aiming system)
(B3) : To (M9) (Blue)
(B4) : To (M10) (White)
(B5) : Front door switch driver's side
(B6) : Tension reducer L.H. (Except for Europe)
(B7) : To (D61)
(B8) : Seat belt switch (For Middle East)
(B9) : Seat belt buckle switch L.H. (Except for Europe)
(B10) : Seat heater R.H. (For Europe)
(B11) : Parking brake switch
(B12) : Body ground
(B13) : Seat belt buckle switch R.H. (Except for Europe)
(B14) : Seat heater L.H. (For Europe)
(B15) : Tension reducer R.H. (Except for Europe)
(B16) : Front door switch passenger side
(B17) : To (D71)
(B18) : To fuel pump sub-harness
(B19) : Fuel tank gauge unit
(B20) : Rear door switch L.H.
(B21) : Condenser
(B23) : Body ground
(B24) : To (T1) (B13 model)
(B25) : Rear speaker L.H.
(B26) : Trunk room lamp
(B27) : High-mounted stop lamp (Except for Europe)
(B28) : Rear speaker R.H.
(B30) : Rear door switch R.H.
(B31) : To (M67) (N14 model)
(B34) : To (T16) (N14 model)
(B35) : To console harness (For Europe)

Tail harness

(T1) : To (B24) (B13 model)
(T2) : Rear combination lamp L.H. (Trunk lid side)
(T3) : License lamp L.H. (B13 model)
(T4) : Trunk room lamp switch (B13 model)
(T5) : License lamp R.H. (B13 model)
(T6) : Rear combination lamp R.H. (Trunk lid side)
(T7) : Power antenna timer
(T8) : Power antenna motor
(T9) : Rear combination lamp R.H.
(T10) : Body ground
(T11) : Rear combination lamp L.H.
(T12) : Rear side marker lamp L.H. (For Middle East)
(T13) : Rear side marker lamp R.H. (For Middle East)
(T14) : Trunk room lamp switch (N14 model)
(T15) : License lamp (N14 model)
(T16) : To (B34) (N14 model)

SEL246Q

Body Harness (Cont'd)

SEDAN (R.H.D. models)



Body Harness (Cont'd)

Body harness

(B1) : To (W7) (B13 model)
(B2) : To (W8) (B13 model)
(B3) : To (W9) (Blue)
(B4) : To (M10) (White)
(B5) : Front door switch driver's side
(B6) : Tension reducer R.H. (Except for Europe)
(B7) : To (D71)
(B8) : Not used
(B9) : Seat belt buckle switch R.H. (Except for Europe)
(B10) : Not used
(B11) : Parking brake switch
(B12) : Body ground
(B13) : Seat belt buckle switch L.H. (Except for Europe)
(B14) : Not used
(B15) : Tension reducer L.H. (Except for Europe)
(B16) : Front door switch passenger side
(B17) : To (D61)
(B18) : To fuel pump sub-harness
(B19) : Fuel tank gauge unit
(B20) : Rear door switch R.H.
(B21) : Condenser
(B22) : Not used
(B23) : Body ground
(B24) : To (T1)
(B25) : Rear speaker R.H.
(B26) : Trunk room lamp
(B27) : High-mounted stop lamp (Except for Europe)
(B28) : Rear speaker L.H.
(B29) : Not used
(B30) : Rear door switch L.H.
(B32) : To (M56) (N14 model)
(B33) : To (M59) (N14 model)

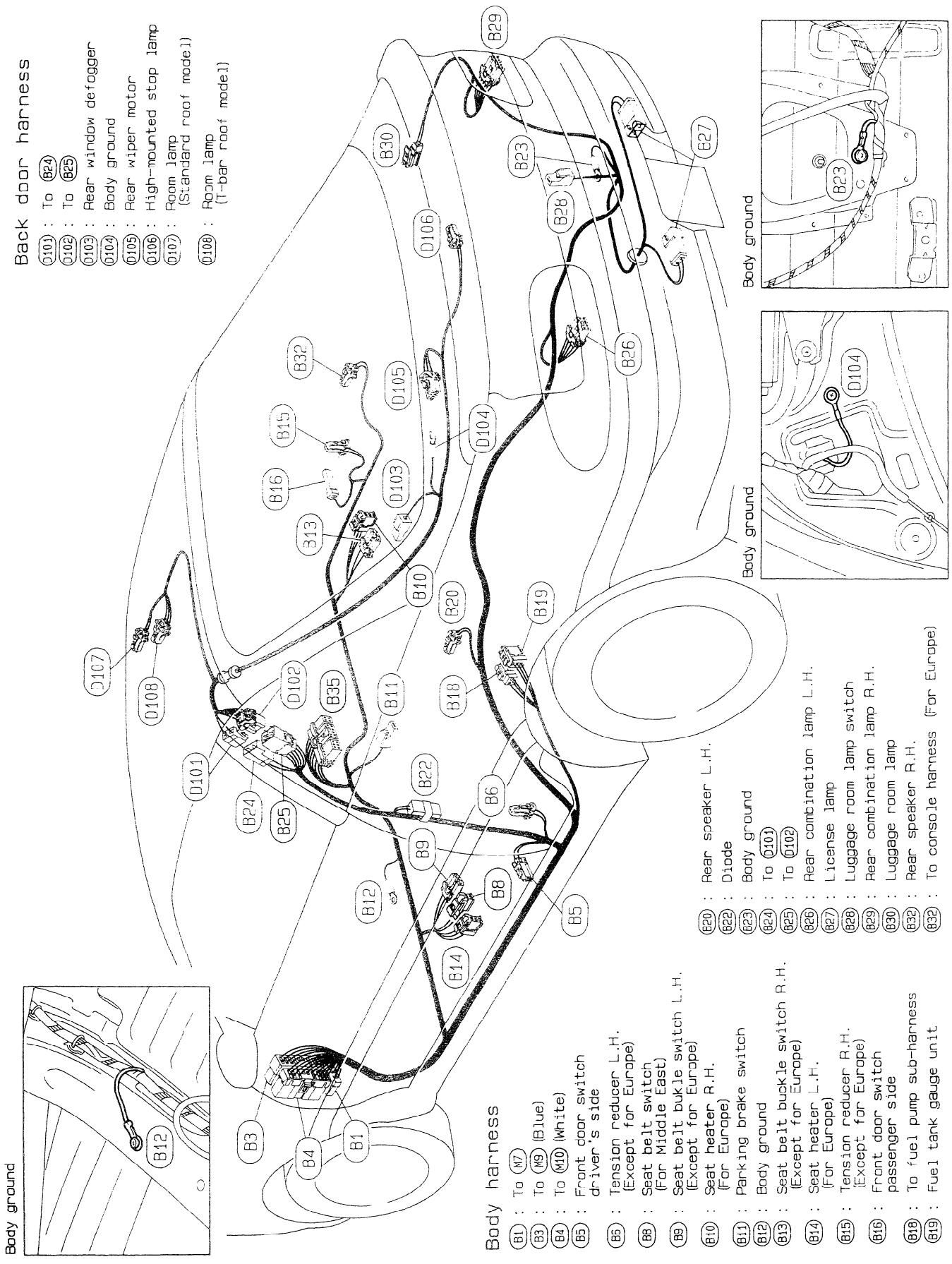
Tail harness

(T1) : To (B24)
(T2) : Rear combination lamp R.H. (Trunk lid side)
(T3) : License lamp R.H. (B13 model)
(T4) : Trunk room lamp switch (B13 model)
(T5) : License lamp L.H. (B13 model)
(T6) : Rear combination lamp L.H. (Trunk lid side)
(T7) : Power antenna timer
(T8) : Power antenna motor
(T9) : Rear combination lamp R.H.
(T10) : Body ground
(T11) : Rear combination lamp L.H.
(T14) : Trunk room lamp switch (N14 model)
(T15) : License lamp (N14 model)

SEL247Q

Body Harness (Cont'd)

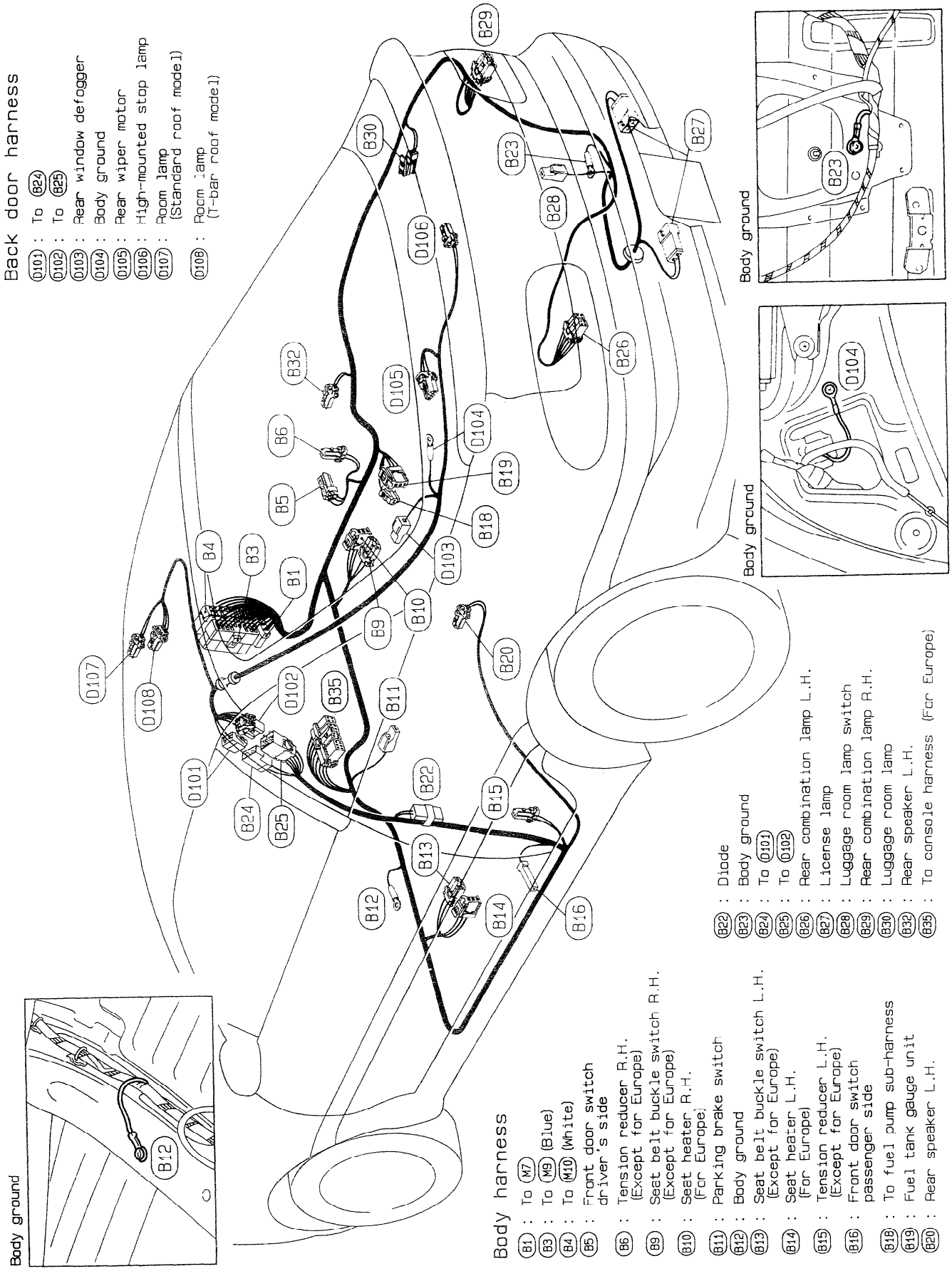
COUPE (L.H.D. models)



SEL248Q

Body Harness (Cont'd)

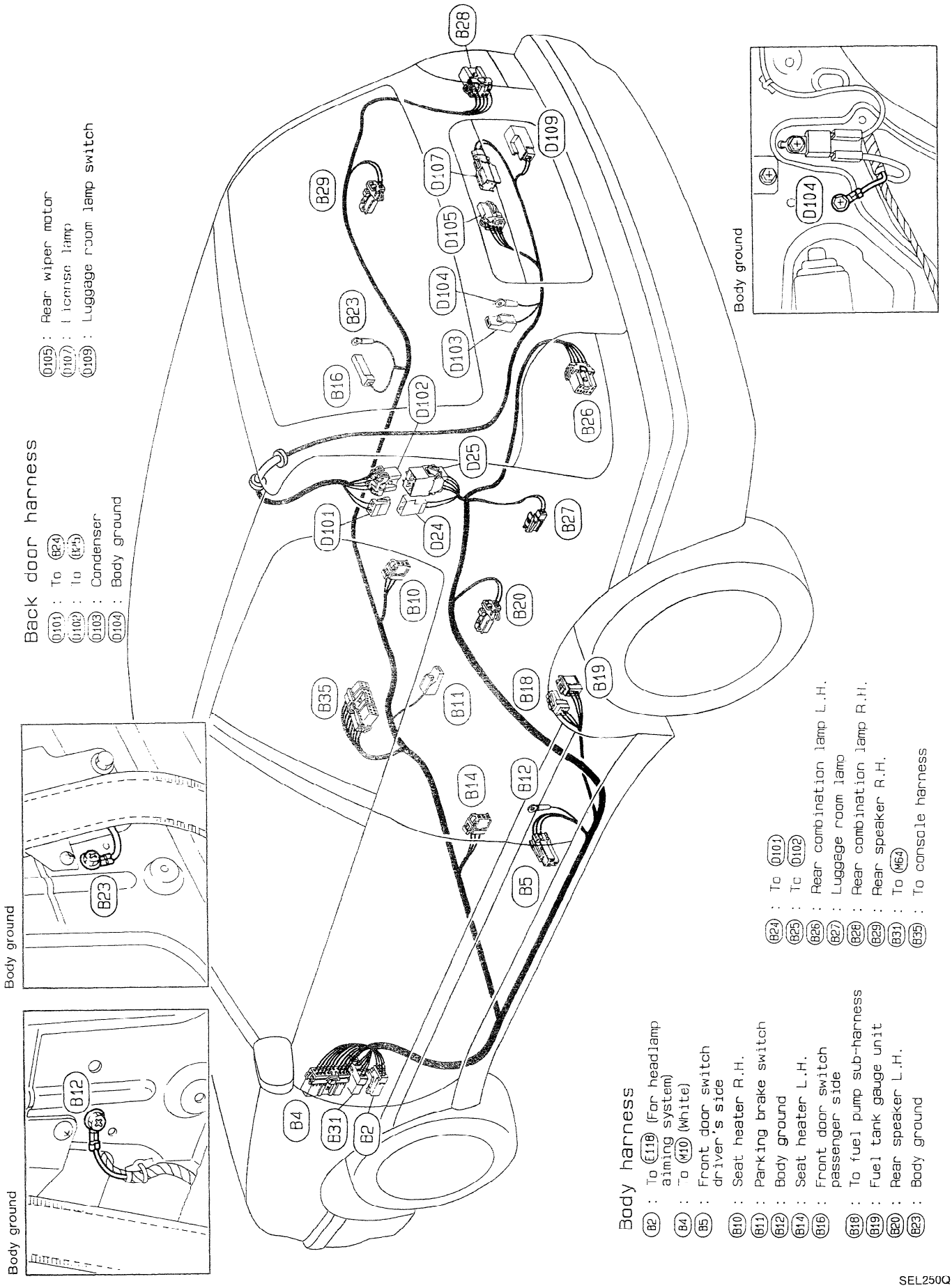
COUPE (R.H.D. models)



SEL249Q

Body Harness (Cont'd)

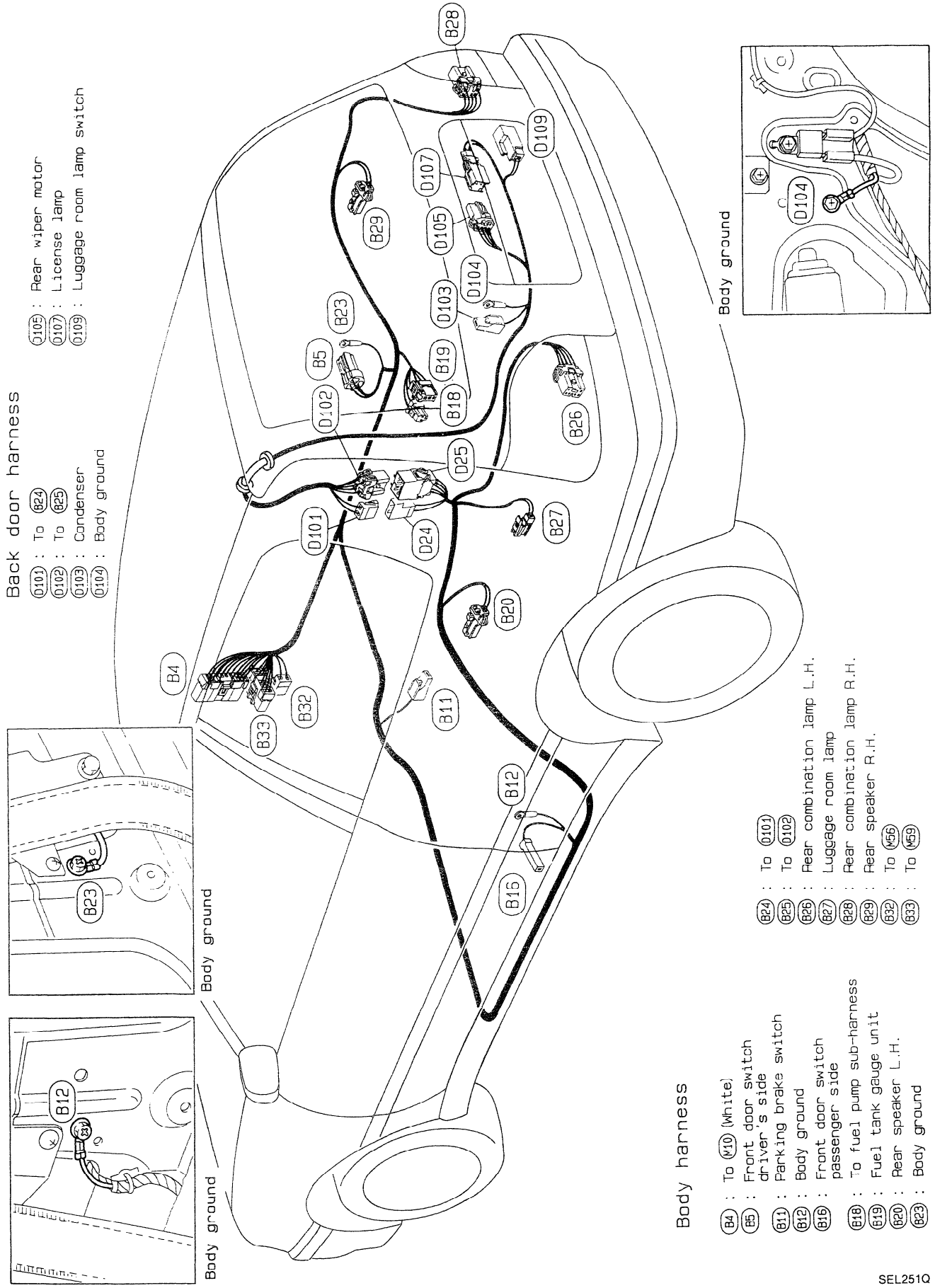
3-DOOR HATCHBACK (L.H.D. models)



SEL250Q

Body Harness (Cont'd)

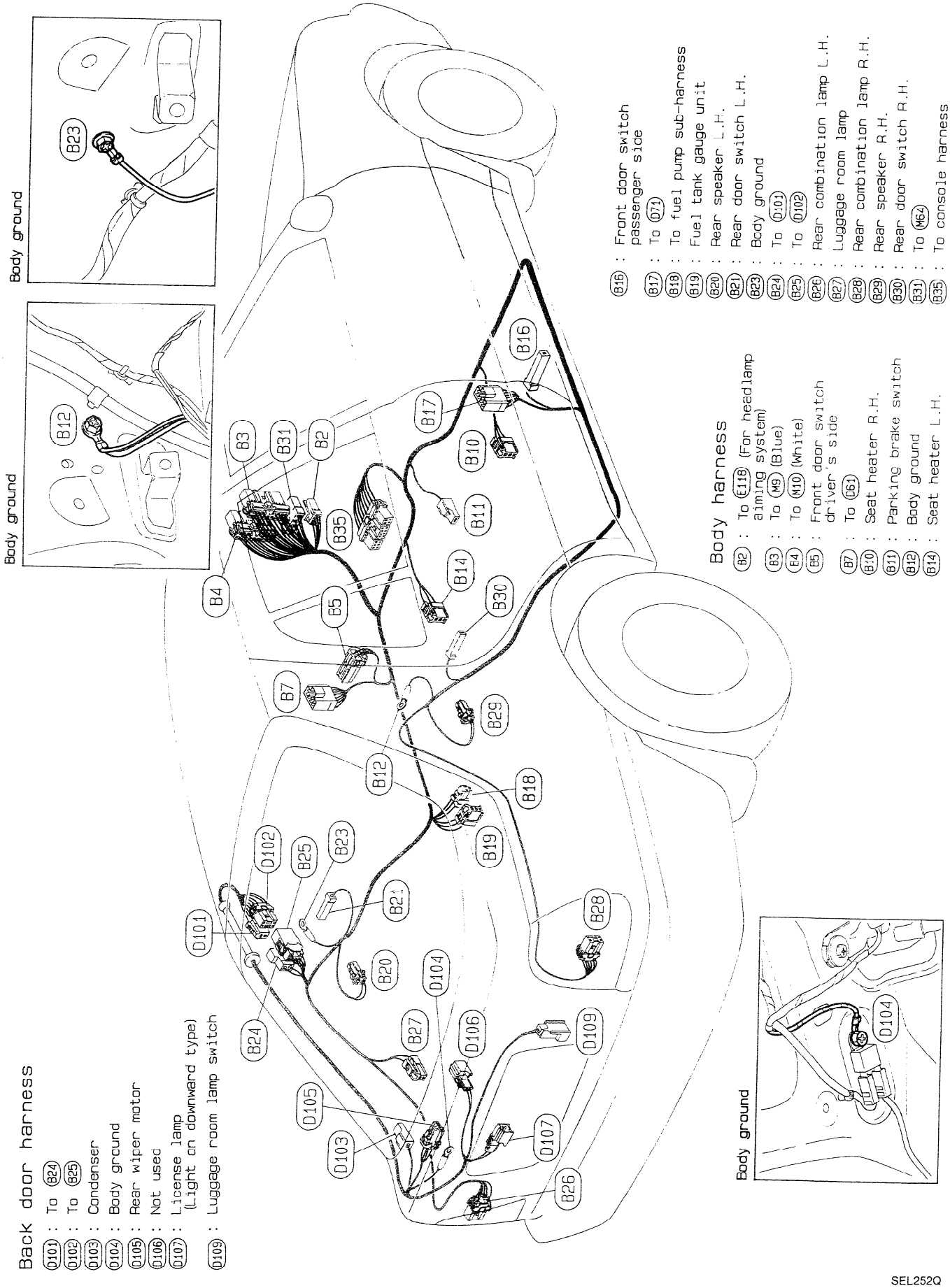
3-DOOR HATCHBACK (R.H.D. models)



SEL251Q

Body Harness (Cont'd)

5-DOOR HATCHBACK (L.H.D. models)



Back door harness

- D101 : To B24
- D102 : To B25
- D103 : Condenser
- D104 : Body ground
- D105 : Rear wiper motor
- D106 : Not used
- D107 : License lamp (Light on downward type)
- D109 : Luggage room lamp switch

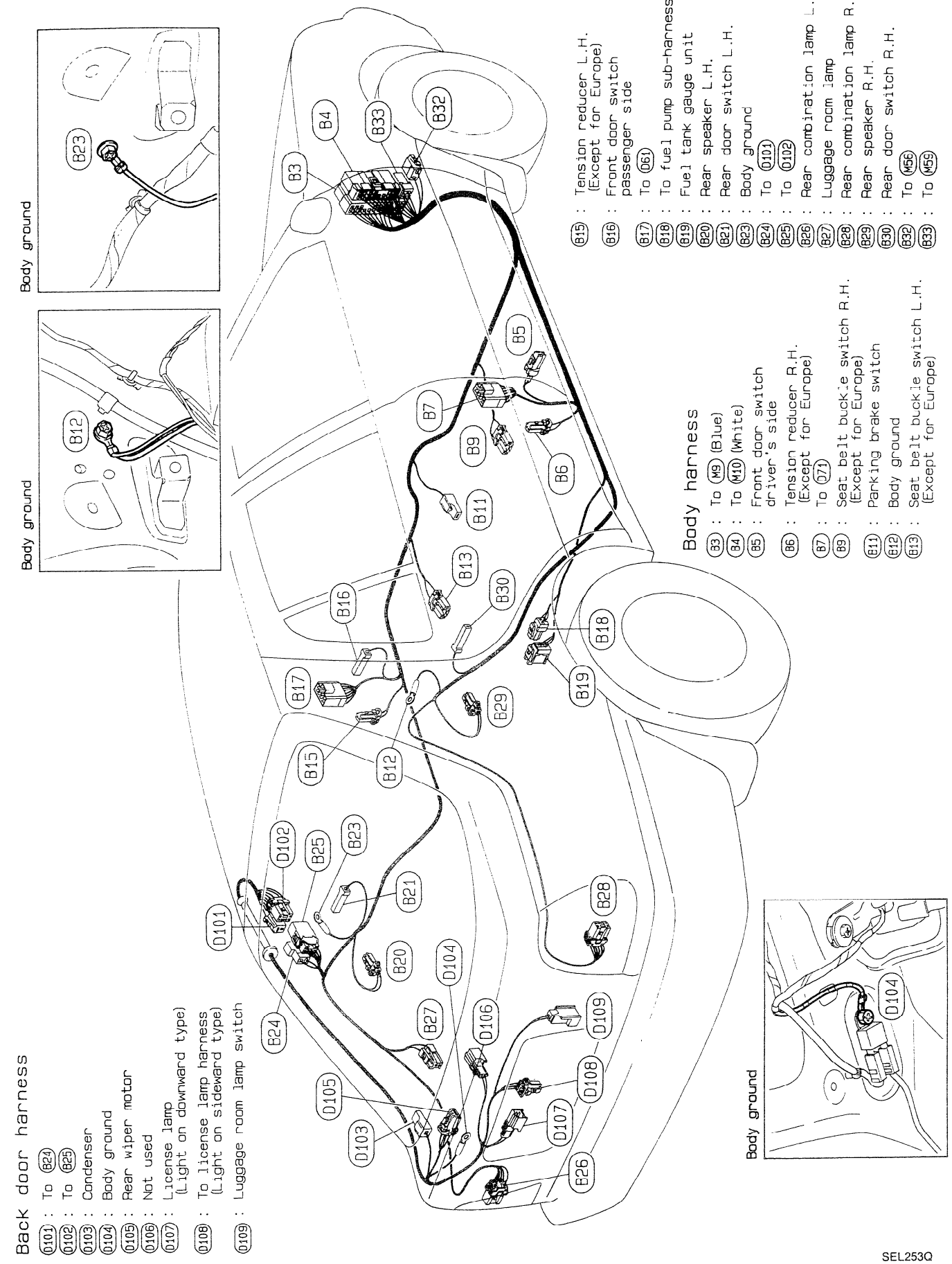
Body harness

- B2 : To E118 (For headlamp aiming system)
- B3 : To M9 (Blue)
- B4 : To M10 (White)
- B5 : Front door switch driver's side
- B7 : To D61
- B10 : Seat heater R.H.
- B11 : Parking brake switch
- B12 : Body ground
- B14 : Seat heater L.H.
- B16 : Front door switch passenger side
- B17 : To D71
- B18 : To fuel pump sub-harness
- B19 : Fuel tank gauge unit
- B20 : Rear speaker L.H.
- B21 : Rear door switch L.H.
- B23 : Body ground
- B24 : To D101
- B25 : To D102
- B26 : Rear combination lamp L.H.
- B27 : Luggage room lamp
- B28 : Rear combination lamp R.H.
- B29 : Rear speaker R.H.
- B30 : Rear door switch R.H.
- B31 : To M64
- B35 : To console harness

SEL252Q

Body Harness (Cont'd)

5-DOOR HATCHBACK (R.H.D. models)



Back door harness

- (D101) : To (B24)
- (D102) : To (B25)
- (D103) : Condenser
- (D104) : Body ground
- (D105) : Rear wiper motor
- (D106) : Not used
- (D107) : License lamp (Light on downward type)
- (D108) : To license lamp harness (Light on sideward type)
- (D109) : Luggage room lamp switch

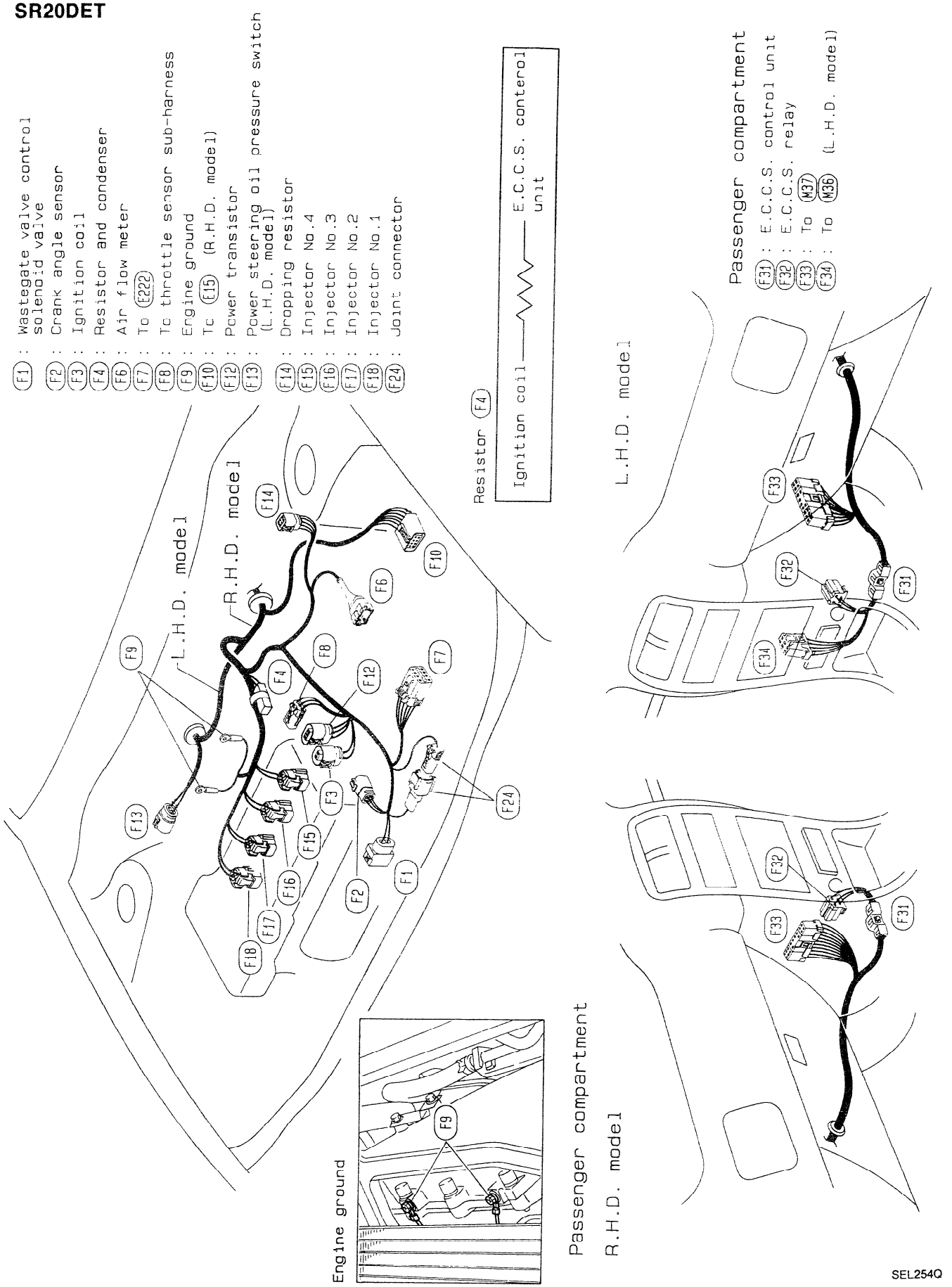
Body harness

- (B3) : To (M9) (Blue)
- (B4) : To (M10) (White)
- (B5) : Front door switch driver's side
- (B6) : Tension reducer R.H. (Except for Europe)
- (B7) : To (D71)
- (B9) : Seat belt buckle switch R.H. (Except for Europe)
- (B11) : Parking brake switch
- (B12) : Body ground
- (B13) : Seat belt buckle switch L.H. (Except for Europe)
- (B15) : Tension reducer L.H. (Except for Europe)
- (B16) : Front door switch passenger side
- (B17) : To (D61)
- (B18) : To fuel pump sub-harness
- (B19) : Fuel tank gauge unit
- (B20) : Rear speaker L.H.
- (B21) : Rear door switch L.H.
- (B23) : Body ground
- (B24) : To (D101)
- (B25) : To (D102)
- (B26) : Rear combination lamp L.H.
- (B27) : Luggage room lamp
- (B28) : Rear combination lamp R.H.
- (B29) : Rear speaker R.H.
- (B30) : Rear door switch R.H.
- (B32) : To (M56)
- (B33) : To (M55)

SEL253Q

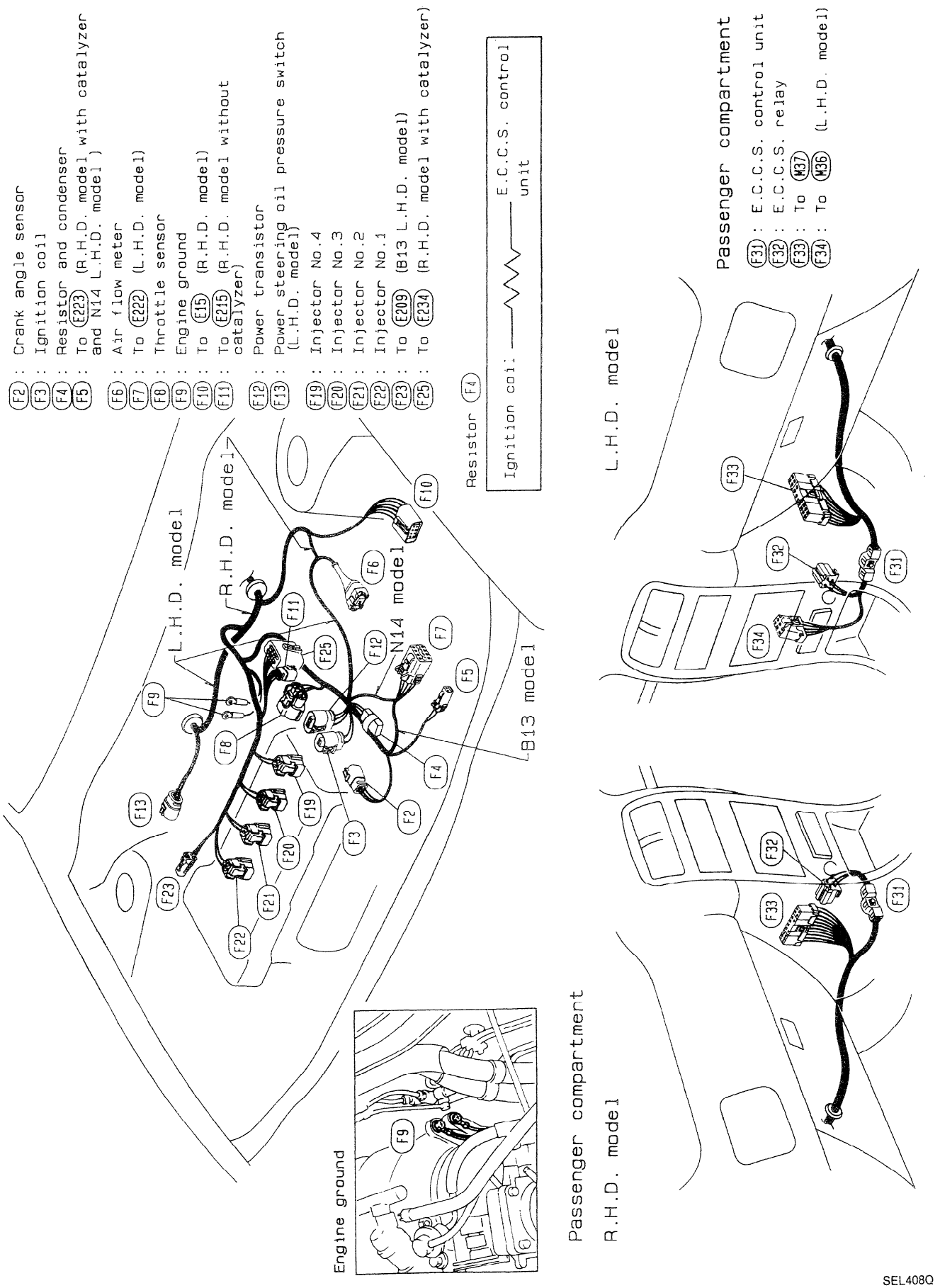
E.F.I. Harness

SR20DET



E.F.I. Harness (Cont'd)

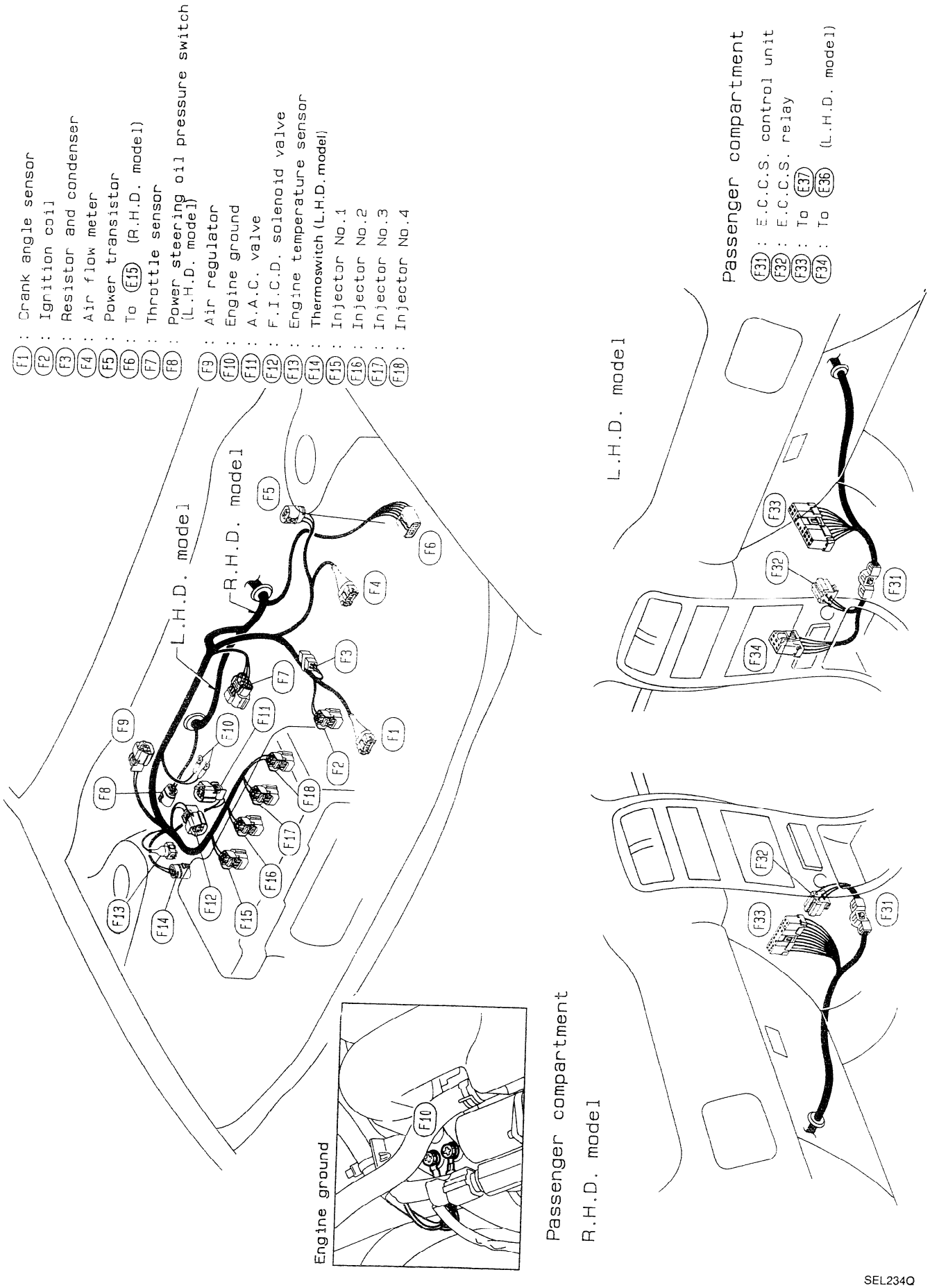
SR20DE



SEL408Q

E.F.I. Harness (Cont'd)

GA16DE



SEL234Q

E.F.I. Harness (Cont'd)

GA14 AND GA16DS WITH CATALYZER AND E.G.R.

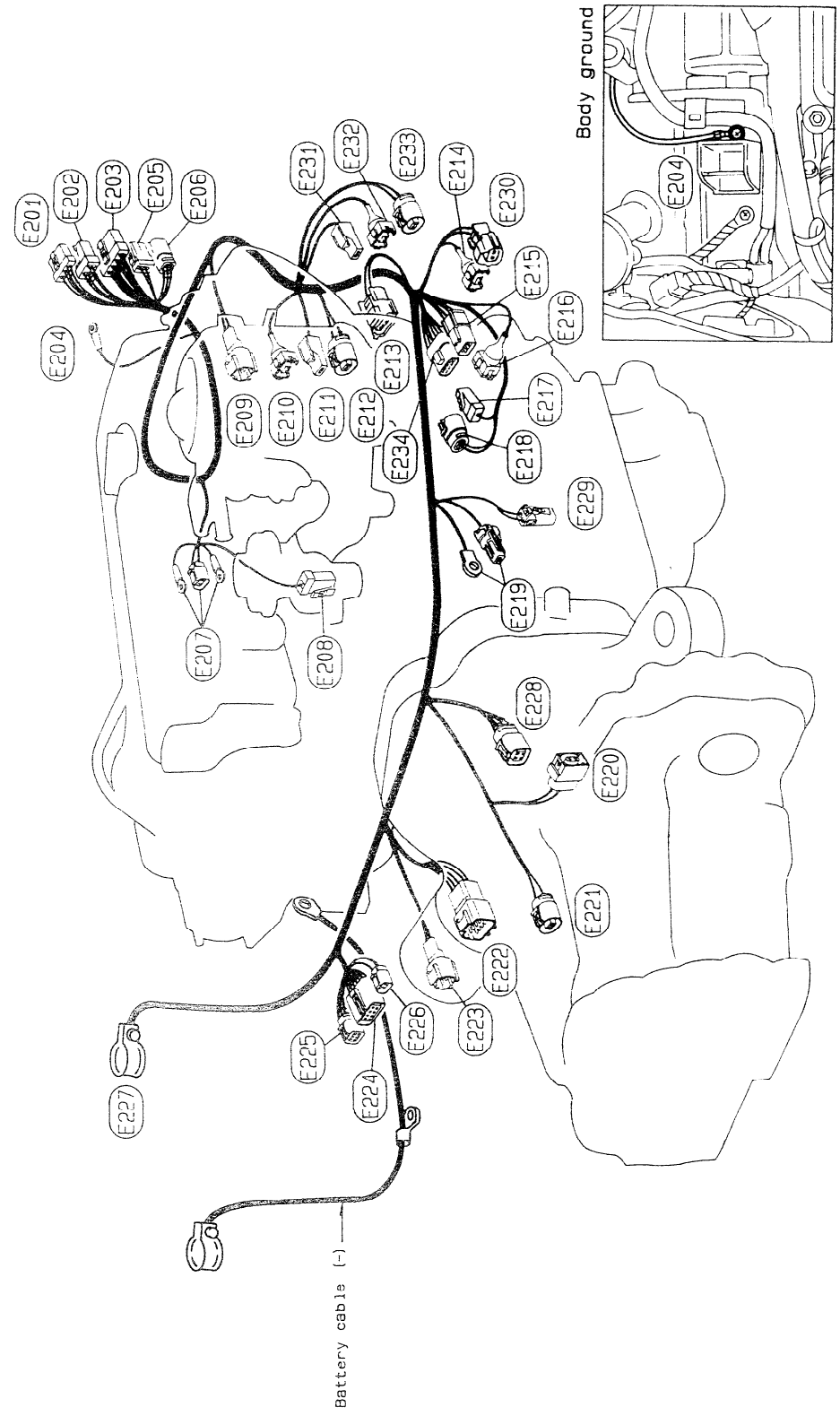
(F2) : Crank angle sensor
(F3) : Ignition coil
(F4) : To boost pressure sensor sub-harness
(F5) : **Power transistor**
(F6) : A.I.V. control solenoid valve
(F7) : Carburetor-1
(F8) : Carburetor-2
(F9) : Resistor and condenser
(F10) : Engine ground (L.H.D. model)
(F11) : To (E15) (R.H.D. model)
(F12) : Power steering oil pressure switch (L.H.D. model)
(F13) : E.G.R. & canister control solenoid valve (L.H.D. model)
(F14) : Engine temperature sensor (L.H.D. model)
(F16) : To (E239) (R.H.D. model)
(F17) : Engine ground (R.H.D. model)

Passenger compartment
(F31) : E.C.C. control unit
(F33) : To (M37)
(F34) : To (M36) (L.H.D. model)
(F35) : To (M77) (R.H.D. model)

SEL409Q

Engine Harness

SR ENGINE



E201 : To E56 (R.H.D. model and turbo model)
E202 : To E54 (R.H.D. non-turbo model without catalyzer)
E203 : To E55 (R.H.D. model and turbo model)
E204 : Body ground (R.H.D. model and turbo model)
E205 : To E57 (R.H.D. model and turbo model)
E206 : To E86 (R.H.D. model with catalyzer and turbo model)
E207 : Alternator (R.H.D. model and turbo model)
E208 : Compressor (R.H.D. model and turbo model)
E209 : To F23 (B13 L.H.D. non-turbo model)
E210 : Engine temperature sensor
E211 : Thermal transmitter
E212 : F.I.C.D. solenoid valve (Non-turbo model)
E213 : A.A.C. valve
E214 : Air regulator (Non-turbo model)
E215 : To F11 (R.H.D. non-turbo model without catalyzer)
E216 : Detonation sensor
E217 : Oil pressure switch (Without oil pressure gauge)
E218 : Oil pressure sensor (Non-turbo model with oil pressure gauge)
E219 : Starter motor
E220 : Neutral switch
E221 : Back-up lamp switch
E222 : To F7 (L.H.D. model and turbo model)
E223 : To F5 (N14 L.H.D. non-turbo model and R.H.D. non-turbo model with catalyzer)
E224 : To E5 (L.H.D. non-turbo model)
E225 : To E7 (L.H.D. non-turbo model)
E226 : To E73 (L.H.D. non-turbo model)
E227 : Battery
E228 : Neutral switch and back-up lamp switch (Turbo model)
E229 : Vehicle speed sensor (Turbo model)
E230 : F.I.C.D. solenoid valve (Turbo model)
E231 : Oil temperature sensor (Turbo model)
E232 : Air regulator (Turbo model)
E233 : Oil pressure sensor (Turbo model)
E234 : To F25 (R.H.D. non-turbo model with catalyzer)

SEL410Q

Engine Harness (Cont'd)

GA ENGINE

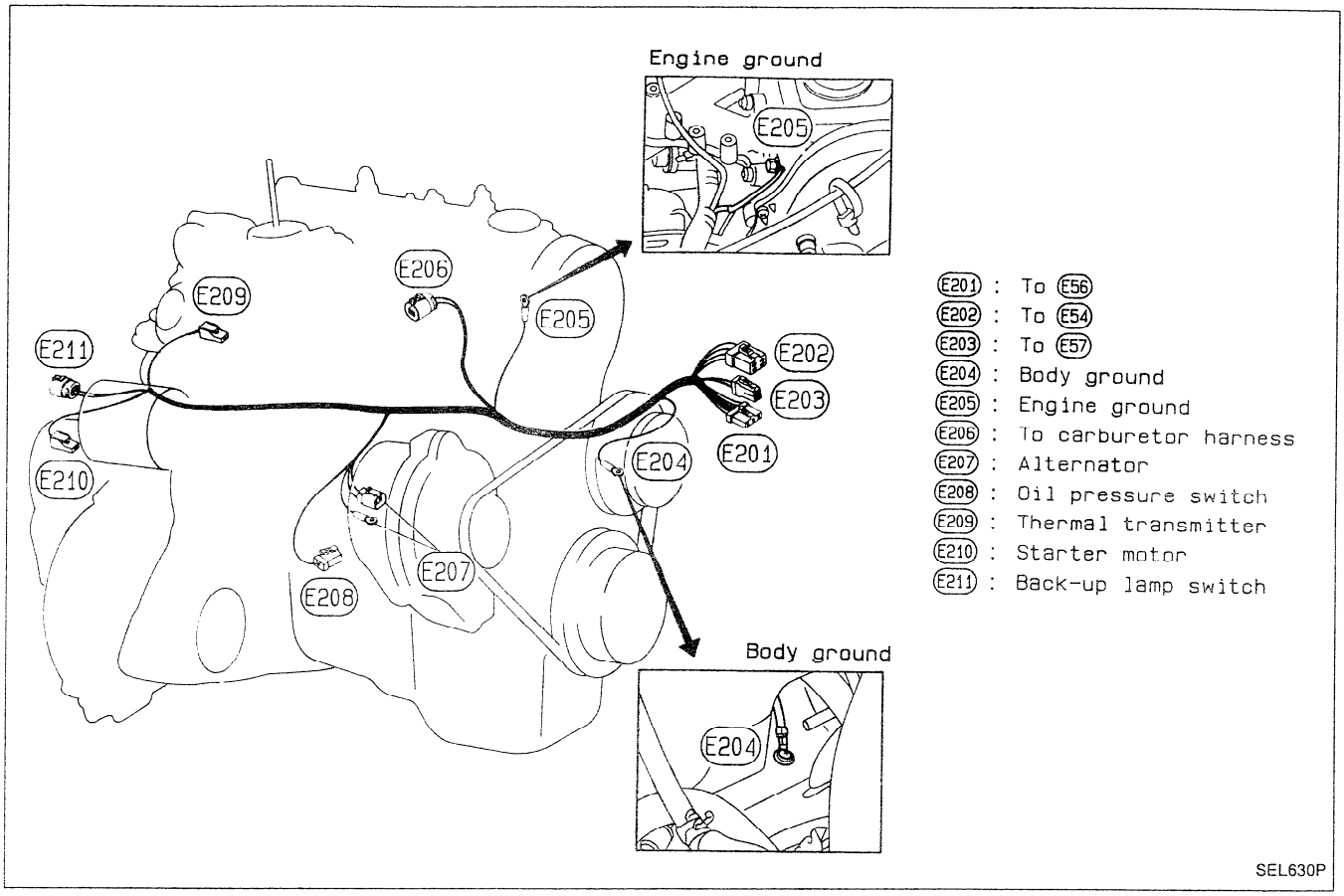
(CR) : GA14DS, 16DS engine with catalyzer and E.G.R.
(CN) : GA14DS engine with catalyzer without E.G.R.
(NC) : GA13DS, 14DS, 16DS engine without catalyzer
(S) : GA13DS, 14DS, 16DS engine
(E) : GA16DE engine

E201 : To E56 (R.H.D. model with CN and NC)
E202 : To E54 (R.H.D. model with E and CN)
E203 : To E55 (R.H.D. model)
E204 : Body ground (R.H.D. model with CR and CN)
E205 : Engine ground (S)
E206 : Thermoswitch (R.H.D. with S except A/T model for hot areas, R.H.D. A/T model for hot areas with E)
E207 : Thermoswitch (R.H.D. A/T model for hot areas with S)
E208 : Water temperature switch (NC)
E209 : Oil pressure switch
E210 : Carburetor (CN)
E211 : Carburetor (CN and NC)
E212 : Thermal transmitter (Except A/T model with E)
E213 : Distributor (NC)
E214 : Condenser (NC)
E215 : Starter motor (A/T model and L.H.D. M/T model with E)
E216 : Ignition coil (CN and NC)
E217 : Thermal transmitter (A/T model with E)
E218 : Starter motor (M/T model with S and B13 R.H.D. M/T model with E)
E219 : Starter motor (N14 M/T model with E)
E220 : Neutral switch (M/T model except NC)
E221 : Back-up lamp switch (M/T model)
E222 : Inhibitor switch (A/T model)
E223 : O.D. cancel solenoid valve (A/T model)
E224 : To E5 (L.H.D. model)
E225 : To E7 (L.H.D. model with CN and NC)
E226 : To E6 (L.H.D. model with E)
E227 : To E10 (N14 L.H.D. model with NC)
E228 : To E72 (L.H.D. model with CR)
E229 : To E74 (L.H.D. model with CR)
E230 : To E75 (L.H.D. model with CN)
E231 : Mixture heater (CR)
E232 : Engine temperature sensor (CN)
E233 : Distributor (CN)
E234 : Resistor and condenser (CN)
E235 : To E57 (R.H.D. model with CR and CN)
E236 : To E75 (R.H.D. model with CR and CN)
E237 : Alternator (R.H.D. model with CR and CN)
E238 : Compressor (R.H.D. model with CR and CN)
E239 : To E16 (R.H.D. model with CR)
E240 : Engine temperature sensor (R.H.D. model with CR)
E241 : E.G.R.& canister control solenoid valve (R.H.D. model with CR)

SEL411Q

Engine Harness (Cont'd)

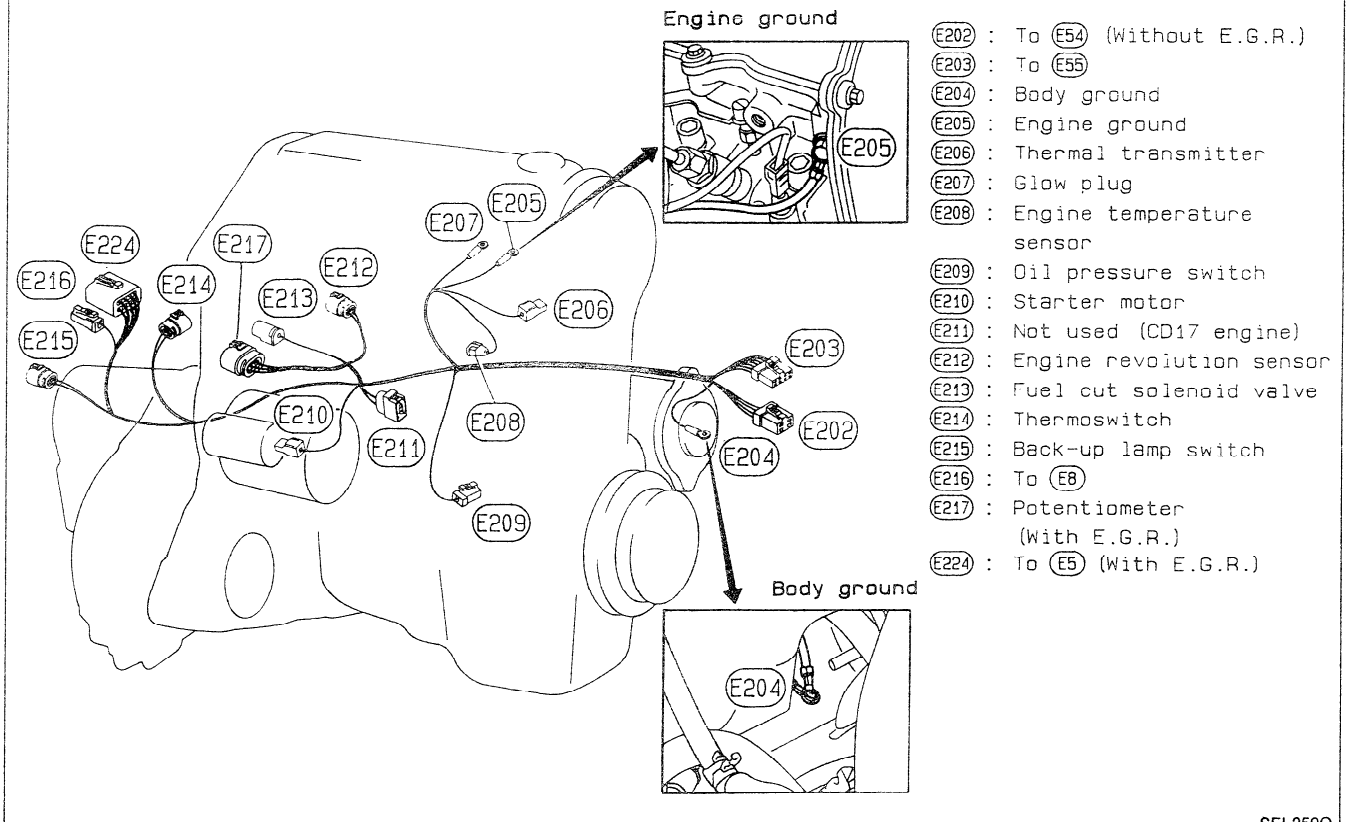
E10S ENGINE



E201 : To E56
E202 : To E54
E203 : To E57
E204 : Body ground
E205 : Engine ground
E206 : To carburetor harness
E207 : Alternator
E208 : Oil pressure switch
E209 : Thermal transmitter
E210 : Starter motor
E211 : Back-up lamp switch

SEL630P

CD17 ENGINE

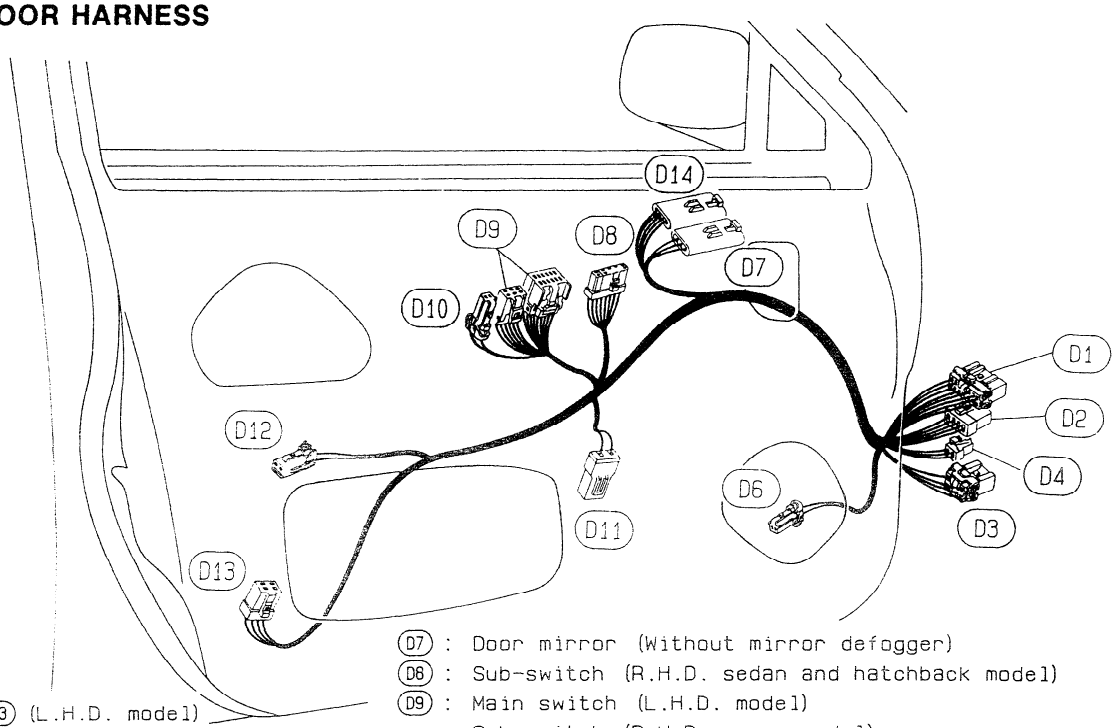


E202 : To E54 (Without E.G.R.)
E203 : To E55
E204 : Body ground
E205 : Engine ground
E206 : Thermal transmitter
E207 : Glow plug
E208 : Engine temperature sensor
E209 : Oil pressure switch
E210 : Starter motor
E211 : Not used (CD17 engine)
E212 : Engine revolution sensor
E213 : Fuel cut solenoid valve
E214 : Thermoswitch
E215 : Back-up lamp switch
E216 : To E8
E217 : Potentiometer (With E.G.R.)
E224 : To E5 (With E.G.R.)

SEL259Q

Door Harness (L.H. side)

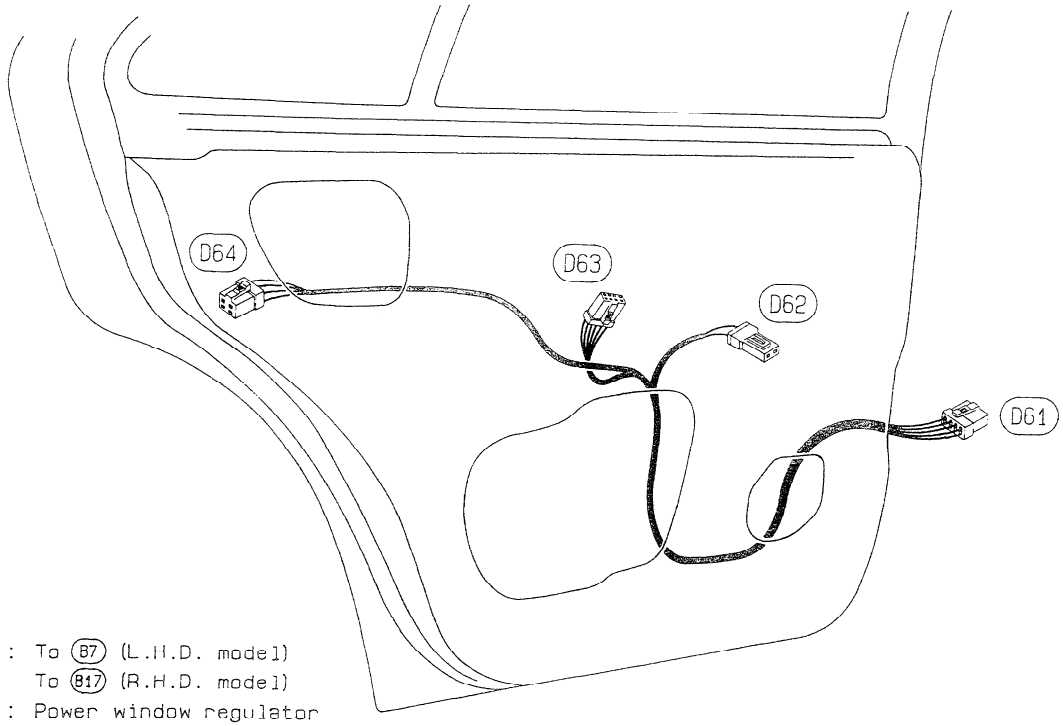
FRONT DOOR HARNESS



(D1) : To (M3) (L.H.D. model)
To (M51) (R.H.D. model)
(D2) : To (M2) (B13 L.H.D. model)
(D3) : To (M4) (N14 L.H.D. model)
(D4) : To (M18) (N14 L.H.D. model)
To (M52) (R.H.D. model)
(D6) : Door speaker
(D7) : Door mirror (Without mirror defogger)
(D8) : Sub-switch (R.H.D. sedan and hatchback model)
(D9) : Main switch (L.H.D. model)
Sub-switch (R.H.D. coupe model)
(D10) : Main switch illumination (N14 L.H.D. model)
(D11) : Power window regulator
(D12) : Lock knob switch (L.H.D. model)
(D13) : Door lock actuator (R.H.D. model)
(D14) : Door mirror (With mirror defogger)

SEL260Q

REAR DOOR HARNESS

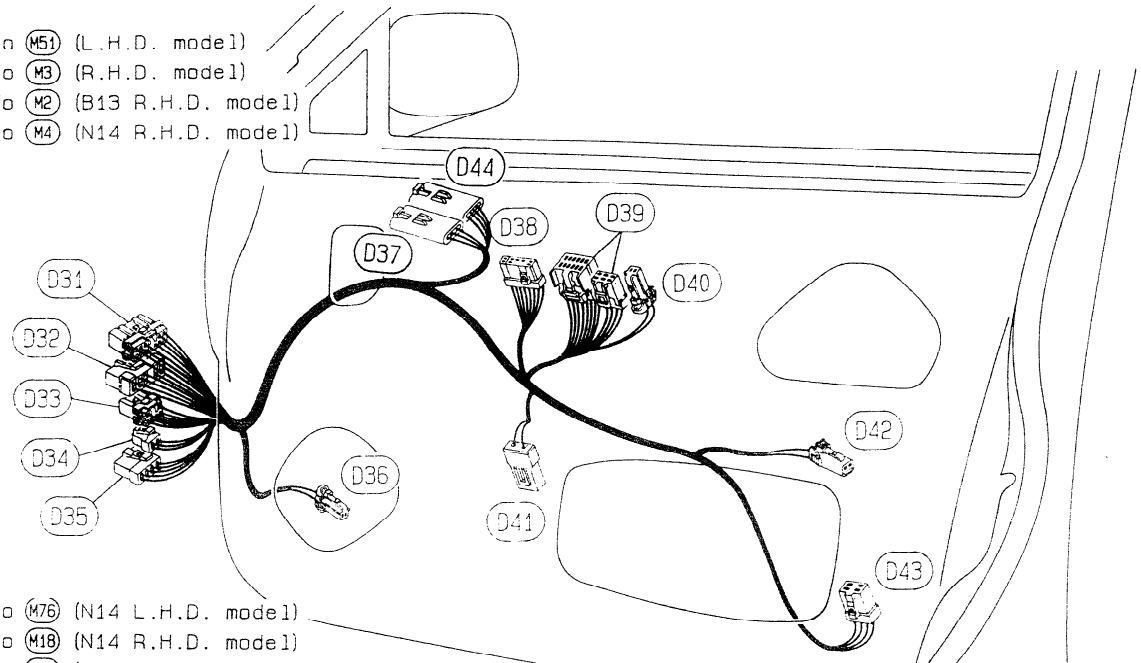


(D61) : To (B7) (L.H.D. model)
To (B17) (R.H.D. model)
(D62) : Power window regulator
(D63) : Sub-switch
(D64) : Door lock actuator

SEL632P

Door Harness (R.H. side)

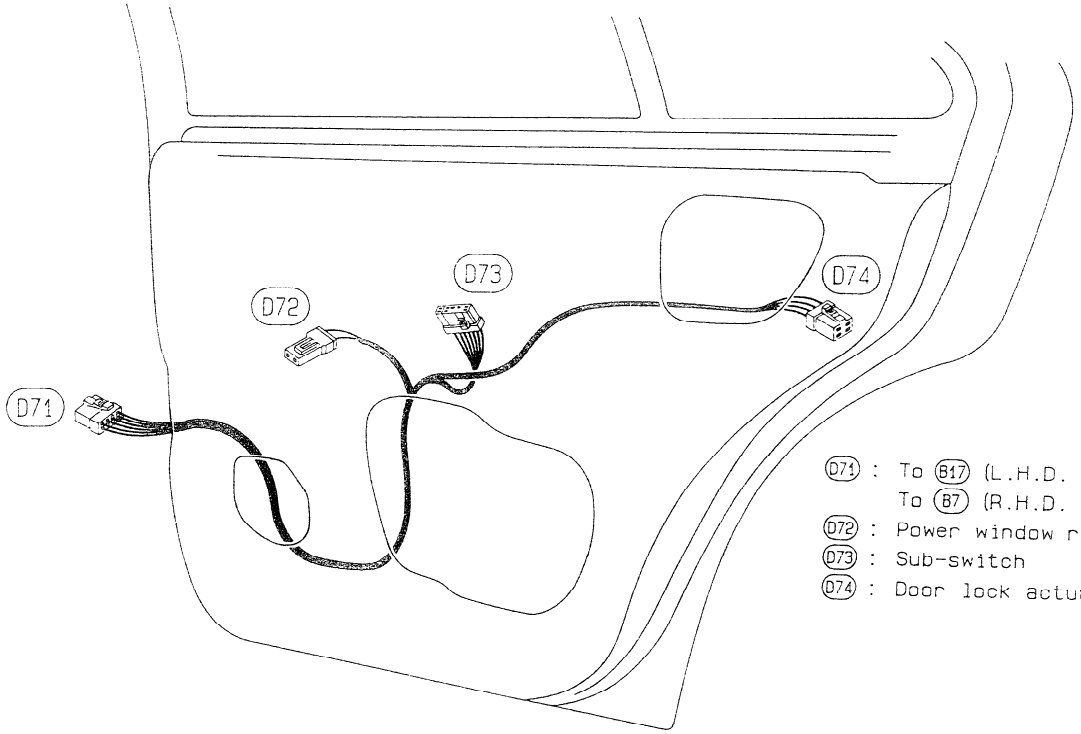
FRONT DOOR HARNESS



D31 : To M51 (L.H.D. model)
To M3 (R.H.D. model)
D32 : To M2 (B13 R.H.D. model)
D33 : To M4 (N14 R.H.D. model)
D34 : To M76 (N14 L.H.D. model)
To M18 (N14 R.H.D. model)
D35 : To M52 (B13 L.H.D. model)
D36 : Door speaker
D37 : Door mirror (Without mirror defogger)
D38 : Sub-switch (L.H.D. sedan and hatchback model)
D39 : Main switch (R.H.D. model)
Sub-switch (L.H.D. coupe model)
D40 : Main switch illumination (N14 R.H.D. model)
D41 : Power window regulator
D42 : Lock knob switch (R.H.D. model)
D43 : Door lock actuator (L.H.D. model)
D44 : Door mirror (With mirror defogger)

SEL261Q

REAR DOOR HARNESS



D71 : To B17 (L.H.D. model)
To B7 (R.H.D. model)
D72 : Power window regulator
D73 : Sub-switch
D74 : Door lock actuator

SEL633P

NISSAN B13/N14 Series
CIRCUIT DIAGRAM

