QUICK REFERENCE CHART : G20 [ ] 1991

ENGINE TUNE-UP DATA

Engine model			SR20DE		
Firing order			1-3-4-2		
Idle speed rpm	M/T		800±50		
	A/T (in "N" position)				
Ignition timing (B.T.D.C. at idle speed)			15°±2°		
CO% at idle			Idle mixture screw is preset and sealed at factory.		
Drive belt deflection (Cold) 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 N (kg, lb)			98 (10, 22)		
Radiator cap relief pressure kPa (kg/cm², psi)			78 - 98 (0.8 - 1.0, 11 - 14)		
Cooling system leakage testing pressure kPa (kg/cm², psi)			157 (1.6, 23)		
Compression pressure kPa (kg/cm², psi)/rpm	Standard		1,226 (12.5, 178)/300		
	Minimum		1,030 (10.5, 149)/300		
Spark plug	Type (Standard)		PFR6B-11, BKR6E		

FRONT WHEEL ALIGNMENT (Unladen*)

Camber	degree	−0°45′ to 0°45′
Caster	degree	1°05′ - 2°35′
Kingpin inclination	degree	13°45′ - 15°15′
Total toe-in	mm (in)	0 - 2 (0 - 0.08)
	degree	0′ - 12′ (Total toe-in angle)
Wheel turning angle (Full turn) Inside	degree	33° - 37°
Outside		28° - 32°

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

REAR WHEEL ALIGNMENT (Unladen*)

Camber	degree	−1°45′ to −0°15′
Total toe-in	mm (in)	−2 to 2 (−0.08 to 0.08)
	degree	−12′ to 12′ (Total toe-in angle)

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

BRAKE

Unit: mm (in)

Front brake Pad wear limit		2.0 (0.079)
Rotor repair limit		20 (0.79)
Rear brake Pad wear limit		2.0 (0.079)
Rotor repair limit		8.0 (0.315)
Pedal free height	M/T	151 - 161 (5.94 - 6.34)
	A/T	159 - 169 (6.26 - 6.65)
Pedal depressed height*	M/T	80 (3.15) or more
	A/T	85 (3.35) or more

* Under force of 490 N (50 kg, 110 lb) with engine running

REFILL CAPACITIES

Unit		Liter	US measure
Fuel tank		60	15-7/8 gal
Coolant (With reservoir tank)	M/T	6.1	6-1/2 qt
	A/T	6.5	6-7/8 qt
Engine	With oil filter	3.4	3-5/8 qt
	Without oil filter	3.2	3-3/8 qt
Transaxle	M/T	3.5 - 3.7	3-3/4 - 3-7/8 qt
	A/T	7.0	7-3/8 qt
Power steering system		0.9	1 qt
Air conditioning system	Compressor oil	0.2	6.8 fl oz
	Refrigerant	0.70 - 0.80 kg	1.54 - 1.76 lb

INFINITI®

G20

MODEL P10 SERIES

QUICK REFERENCE INDEX

GENERAL INFORMATION	GI
MAINTENANCE	MA
ENGINE MECHANICAL	EM
ENGINE LUBRICATION & COOLING SYSTEMS	LC
ENGINE FUEL & EMISSION CONTROL SYSTEM	EF & EC
ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEMS	FE
CLUTCH	CL
MANUAL TRANSAXLE	MT
AUTOMATIC TRANSAXLE	AT
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

INFINITI®

© 1990 NISSAN MOTOR CO., LTD. Printed in Japan

Not to be reproduced in whole or in part without the prior written permission of Nissan Motor Company Ltd., Tokyo, Japan.

FOREWORD

This manual contains maintenance and repair procedures for the 1991 INFINITI G20.

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 INFINITI must first completely satisfy himself that neither his safety nor the vehicle's safety will be jeopardized by the service method selected.

I N F I N I T I ®

NISSAN MOTOR CO., LTD.
Overseas Service Department
Tokyo, Japan

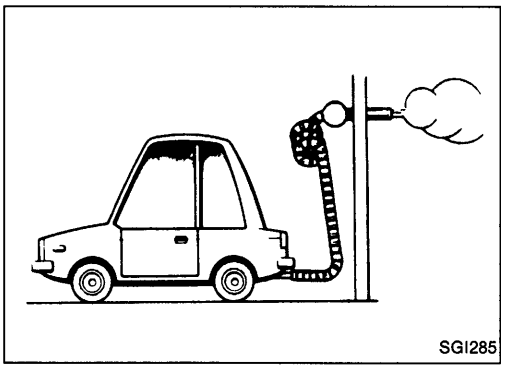
GENERAL INFORMATION

SECTION GI

CONTENTS

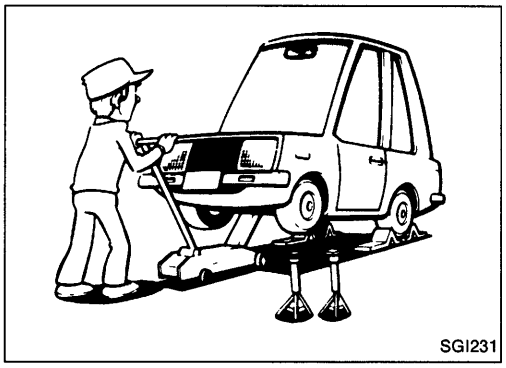
PRECAUTIONS ..... GI- 2
HOW TO USE THIS MANUAL ..... GI- 5
HOW TO READ WIRING DIAGRAMS ..... GI- 7
HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES GI-11
CONSULT CHECKING SYSTEM GI-15
IDENTIFICATION INFORMATION GI-17
LIFTING POINTS AND TOW TRUCK TOWING GI-21
TIGHTENING TORQUE OF STANDARD BOLTS GI-26

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

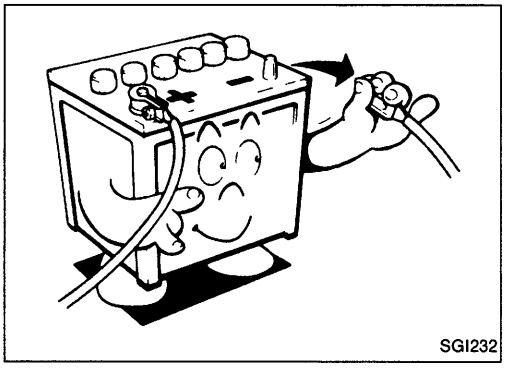

SGI285

General Precautions

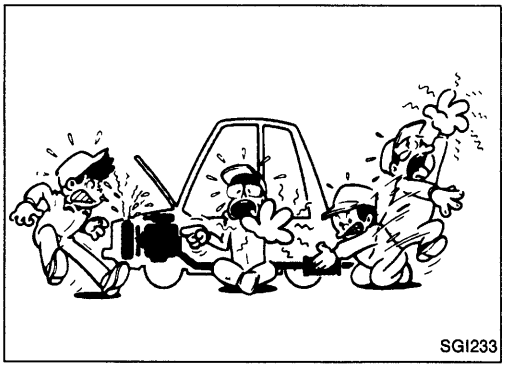
1. Do not operate the engine for an extended period of time without proper exhaust ventilation.
   Keep the work area well ventilated and free of any inflammable materials. Special care should be taken when handling any inflammable or poisonous materials, such as gasoline, refrigerant gas, etc. When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

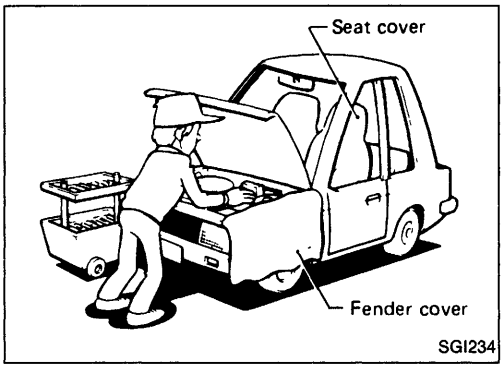

SGI232

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.

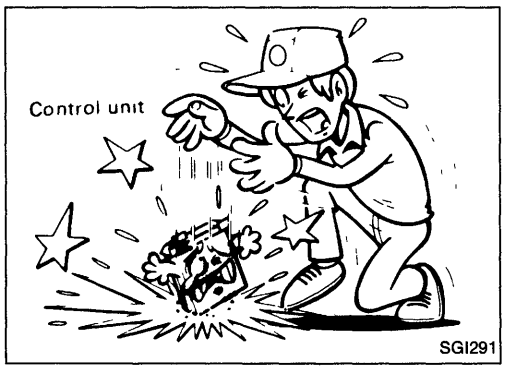

SGI233

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.

General Precautions (Cont'd)

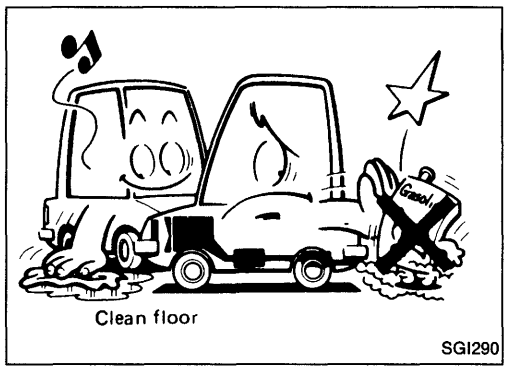


6. Before servicing the vehicle, protect fenders, upholstery and carpeting with appropriate covers.
   Take caution that keys, buckles or buttons on your person do not scratch the paint.
7. Clean all disassembled parts in the designated liquid or solvent prior to inspection or assembly.
8. Replace oil 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 Fuel

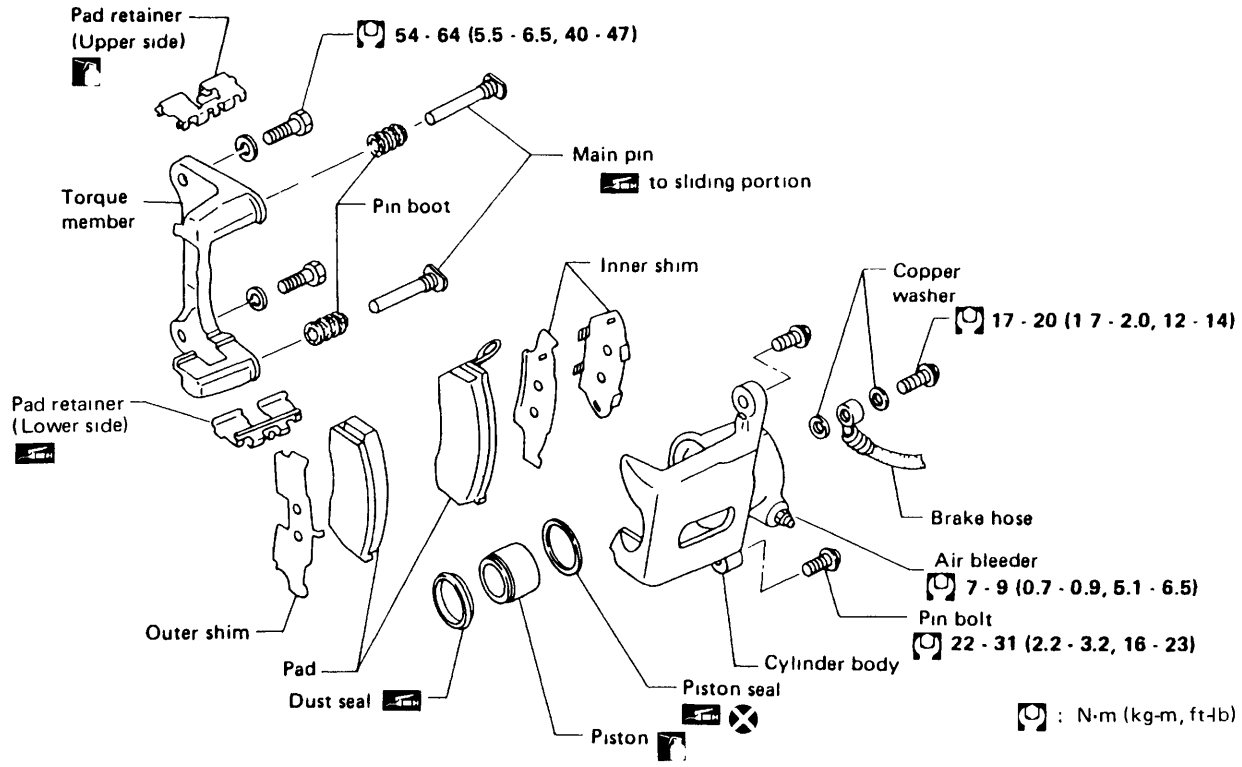
Use unleaded gasoline with an octane rating of at least 87 AKI (Anti-Knock Index) number (research octane number 91).

CAUTION:

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

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 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.
Ⓟ :	Apply petroleum jelly.
ATF :	Apply A.T.F.
★ :	Select with proper thickness.
☆ :	Adjustment is required.

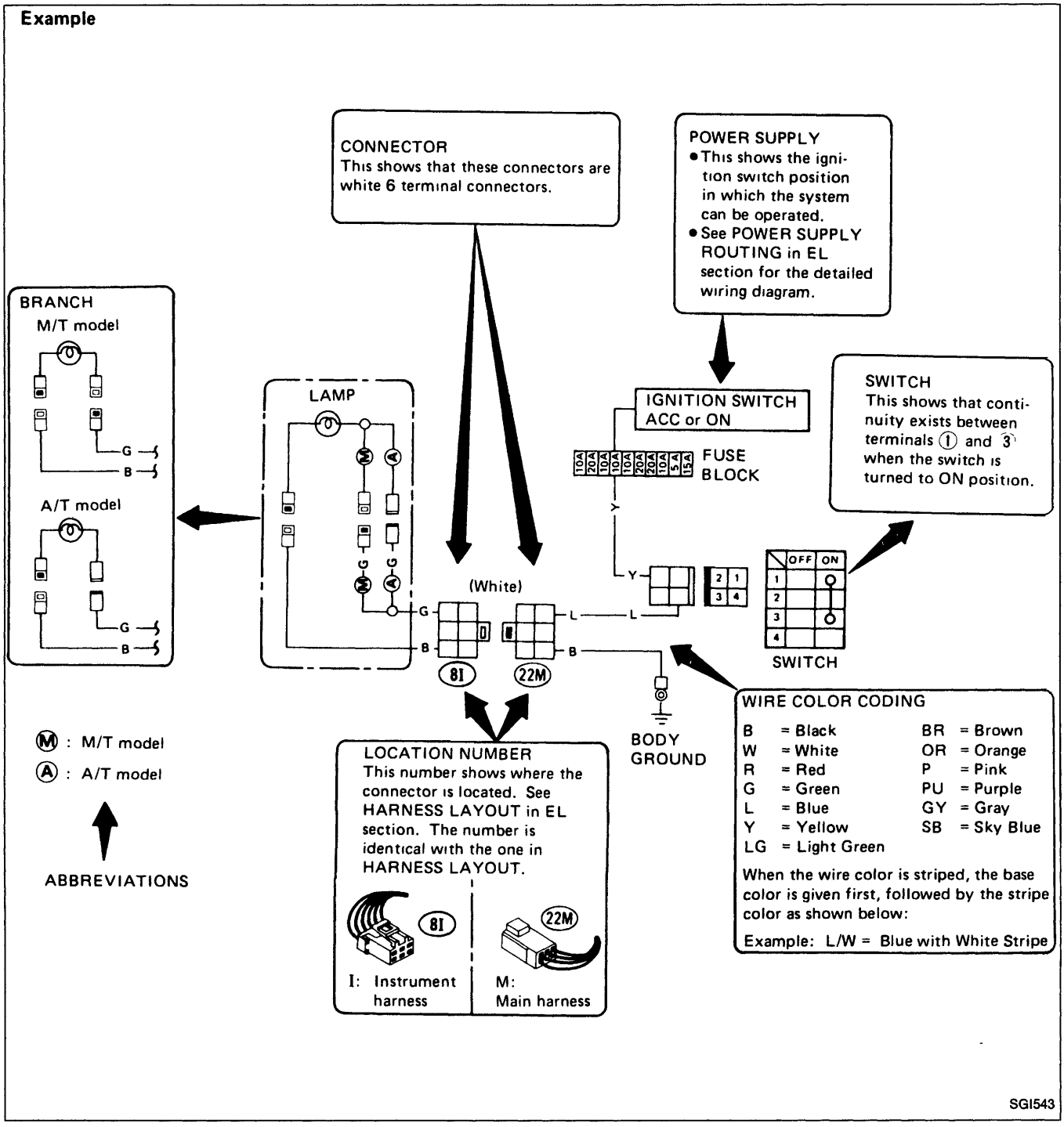
S.D.S.	: Service Data and Specifications
L.H.	: Left-Hand
A/T	: Automatic Transaxle/Transmission
Tool	: Special Service Tools
A.T.F.	: Automatic Transmission Fluid
D_1	: Drive range 1st gear
D_2	: Drive range 2nd gear
D_3	: Drive range 3rd gear
D_4	: Drive range 4th gear
O.D.	: Overdrive

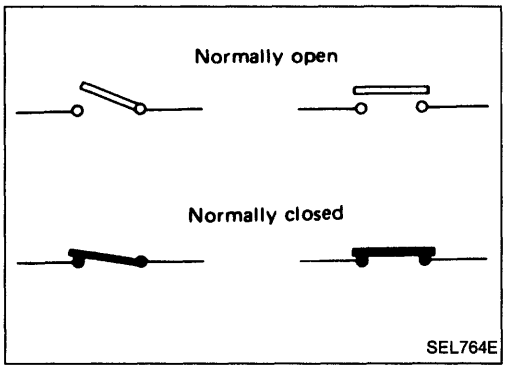
8. The **UNITS** given in this manual are primarily expressed as SI UNITS (International System of Unit), and alternately expressed in the metric system and in the yard/pound system.
   "Example"
   Tightening torque:
   59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)
9. **TROUBLE DIAGNOSES** are included 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:

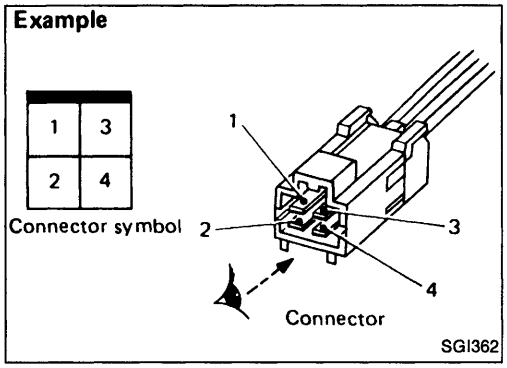




SWITCH POSITIONS

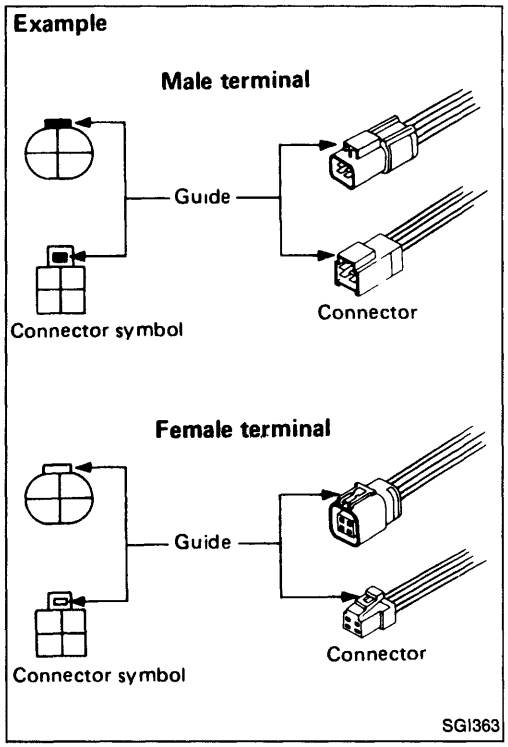
Wiring diagram switches are shown with the vehicle in the following condition.

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



CONNECTOR SYMBOLS

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

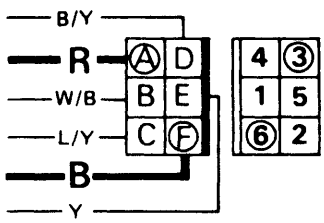


- Male and female terminals
  Connector guides for male terminals are shown in black and female terminals in white in wiring diagrams.

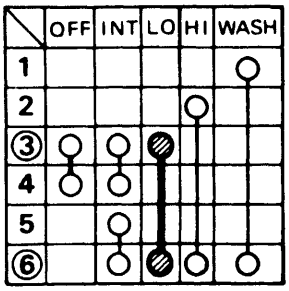
MULTIPLE SWITCH

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

Example



WIPER SWITCH



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

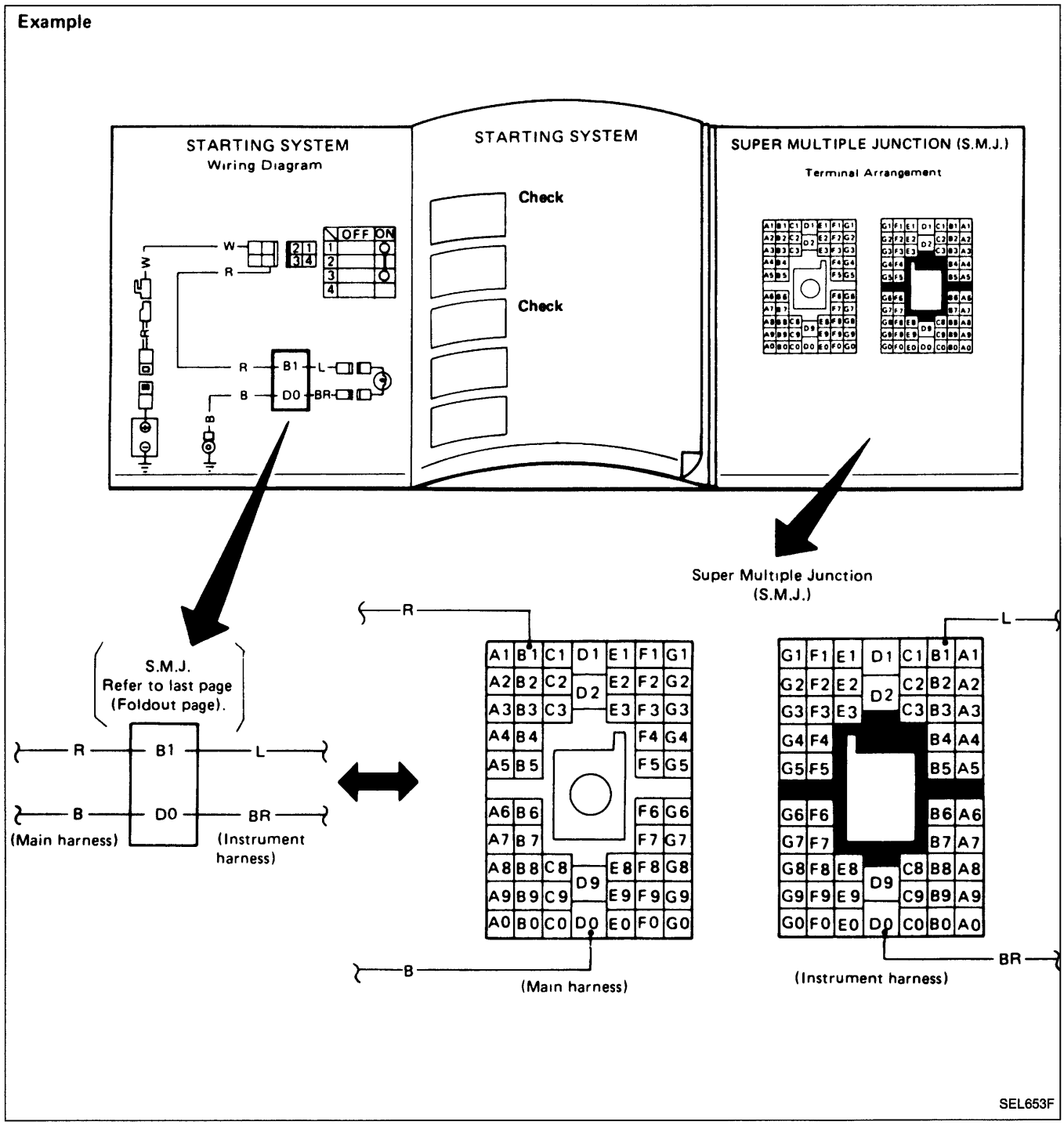
Continuity circuit: Red wire – Ⓐ terminal – ③ terminal – Wiper switch (● – ●: LO) – ⑥ terminal – Ⓕ terminal – Black wire

SGI365

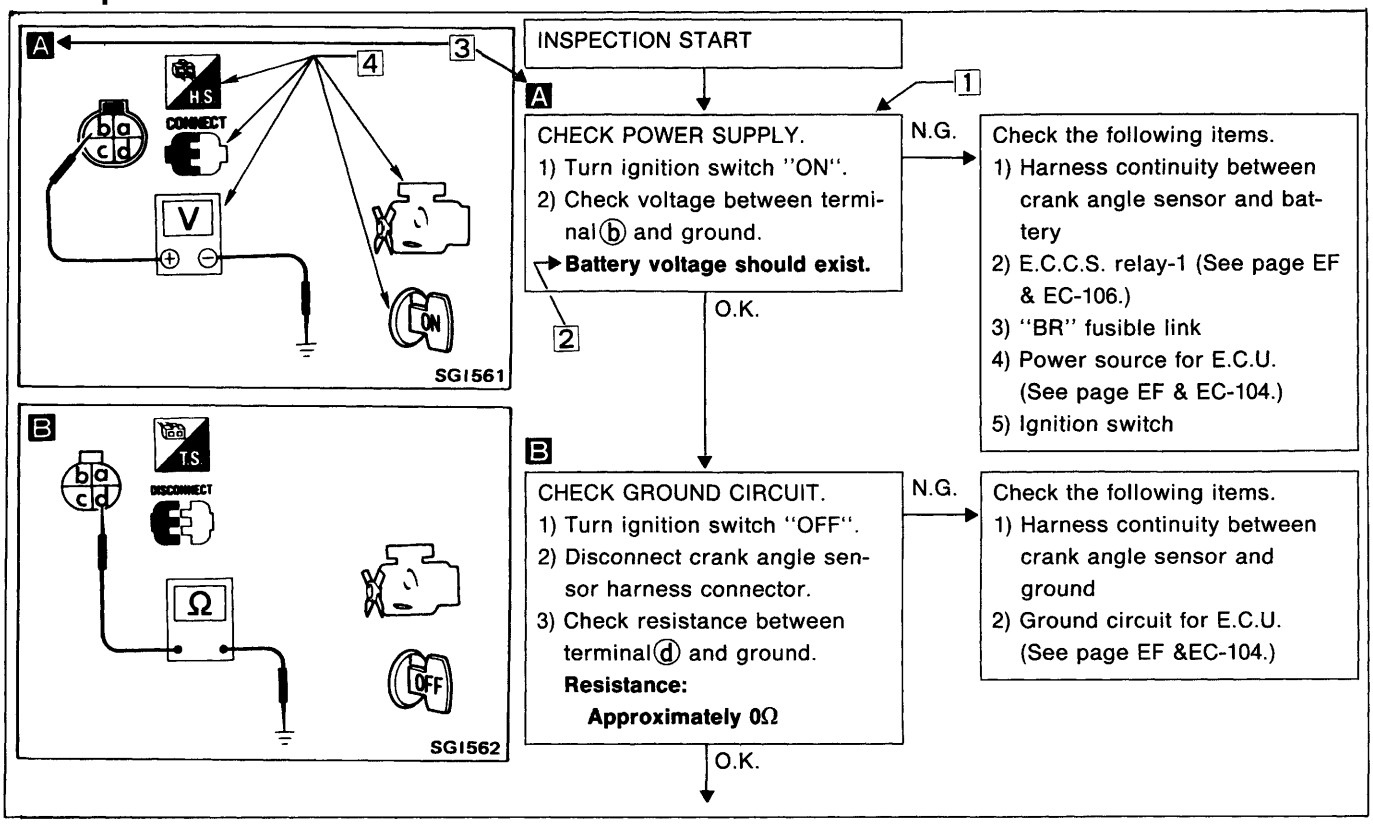
SUPER MULTIPLE JUNCTION (S.M.J.)

- 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



Example



NOTICE

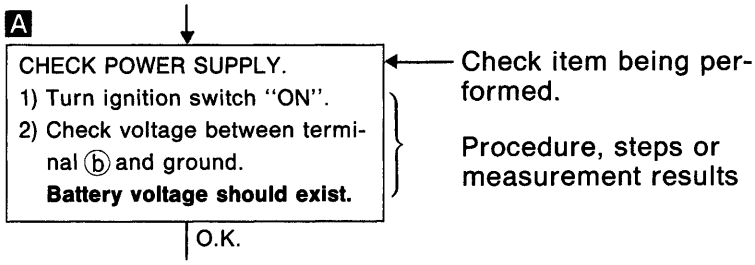
The flow chart indicates work procedures required to diagnose problems effectively. Observe the following instructions before diagnosing.

1) **Use the flow chart after locating probable causes of a problem following the "Preliminary Check" or the "Symptom Chart".**
2) **After repairs, re-check 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:

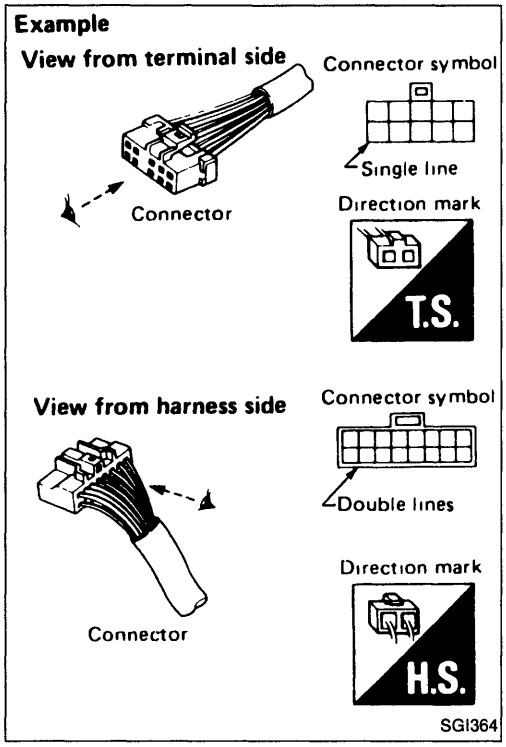
Battery voltage → 11 - 14V or approximately 12V
Voltage: Approximately 0V → Less than 1V

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 flow chart for easy identification. More precisely, the procedure under the "CHECK POWER SUPPLY" outlined previously is indicated by an illustration A.

4 Symbols used in illustrations

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



Direction mark

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.

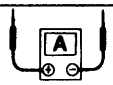
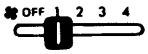
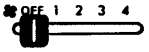
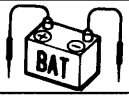
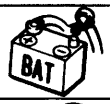
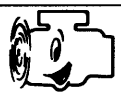
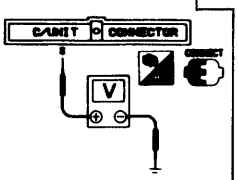
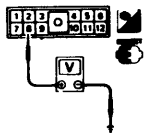
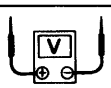
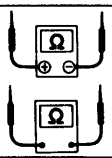
- **All connector symbols shown from the terminal side are enclosed by a single line.**



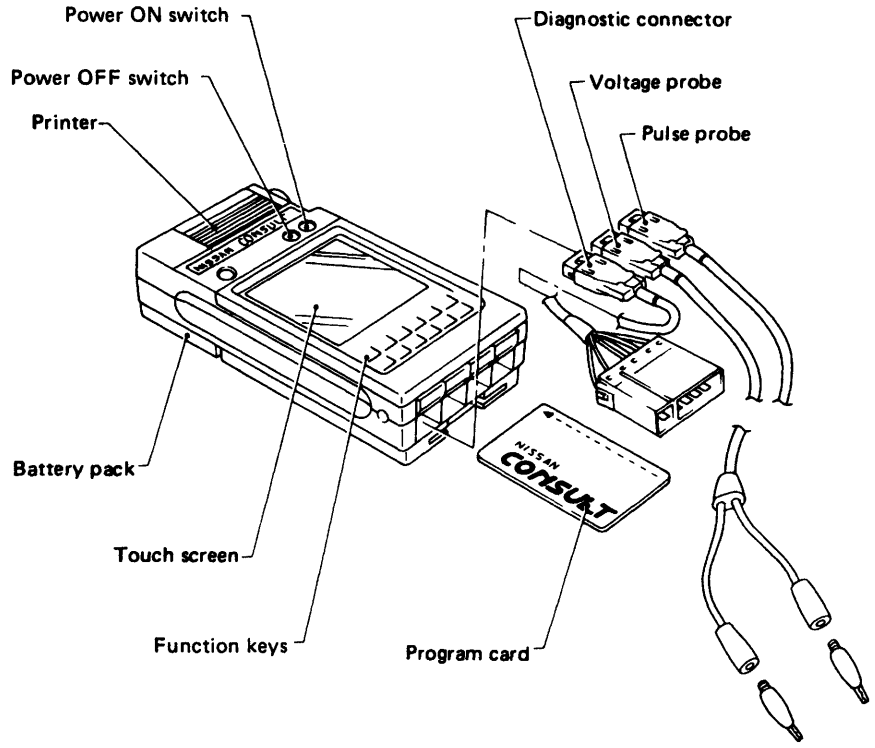
: View from harness side ... H.S.

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

Outside View



SGI619

System Application

Diagnostic mode \ System	E.C.C.S.
Work support	×
Self-diagnostic results	×
Data monitor	×
Active test	×
E.C.U. part number	×
Function test	×

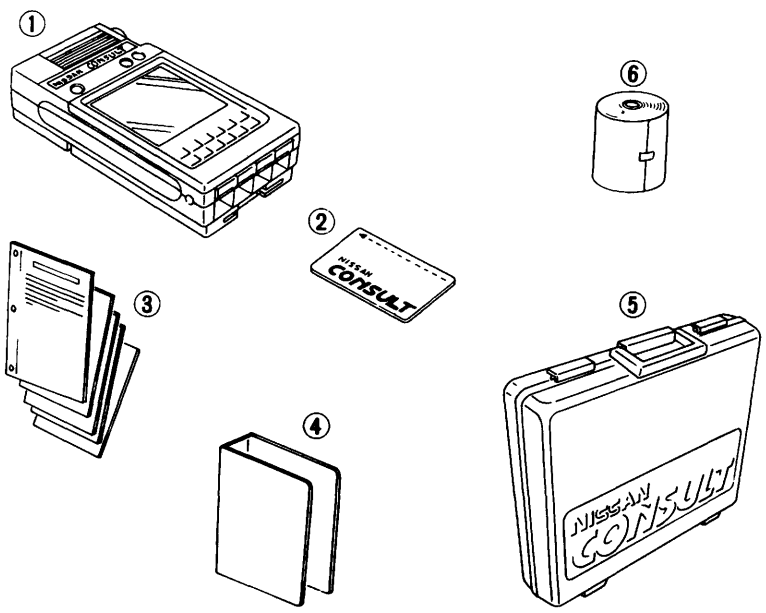
×: Applicable

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

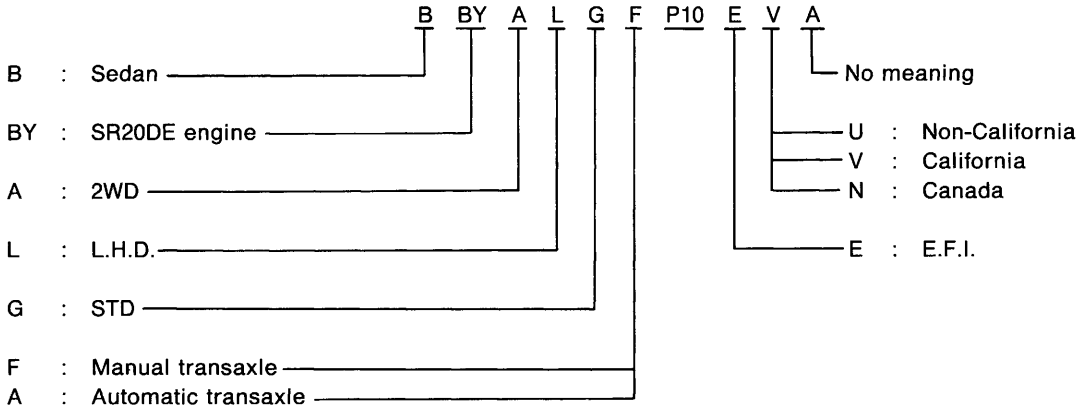
When ordering the below equipment, contact your INFINITI distributor.

Tool name	Description
NISSAN CONSULT kit ① CONSULT unit and accessories ② Program card (UE900) ③ Operation manuals ④ Binder ⑤ Carrying case ⑥ Thermal paper (Rolls)	

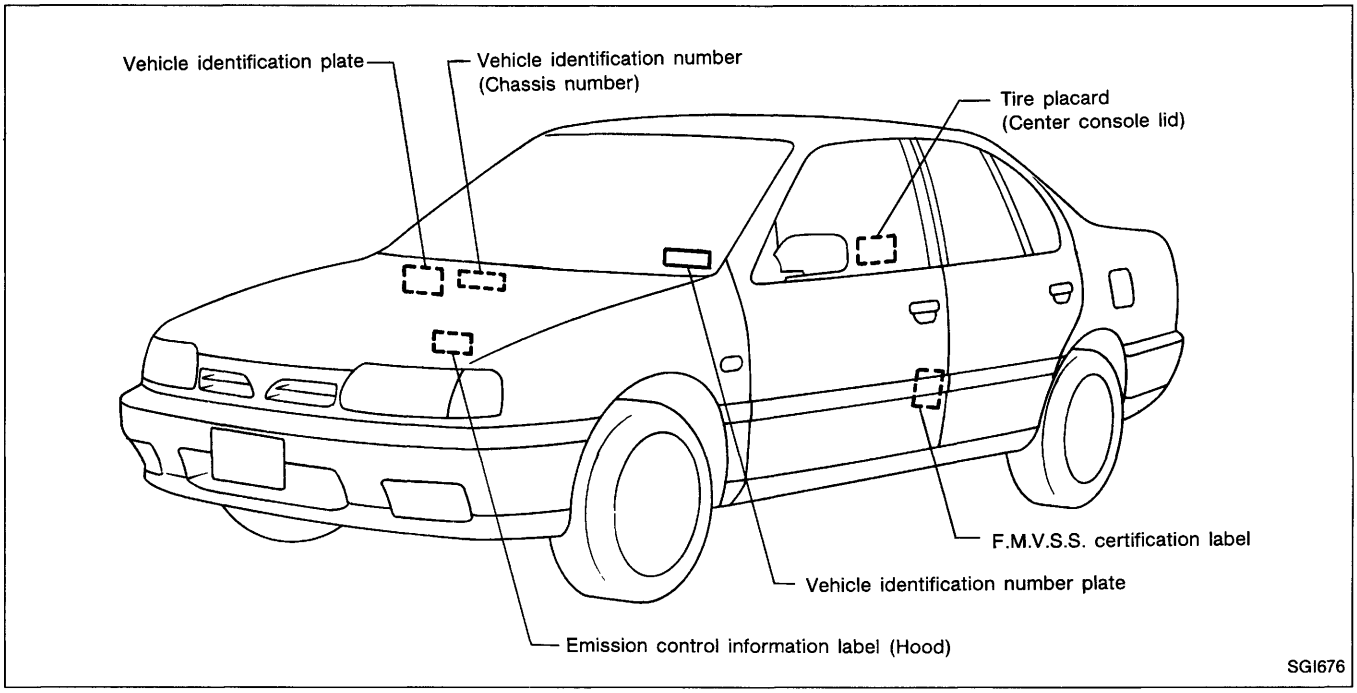
Model Variation

Body	Destination	Grade	Model	Engine	Transaxle
Sedan	Non-California	STD	BBYALGFP10EUA	SR20DE	RS5F32A
			BBYALGAP10EUA		RL4F03A
	California		BBYALGFP10EVA		RS5F32A
			BBYALGAP10EVA		RL4F03A
	Canada		BBYALGFP10ENA		RS5F32A
			BBYALGAP10ENA		RL4F03A

Prefix and suffix designations:



Identification Number



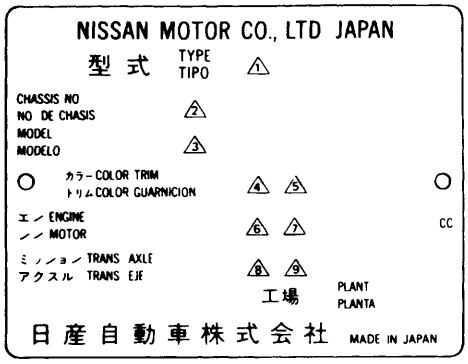
VEHICLE IDENTIFICATION NUMBER ARRANGEMENT

JNK C P 0 1 P * M T 000001

- Manufacturer
  - JNK : Nissan, Passenger vehicle
- Engine type
  - C : SR20DE engine
- Vehicle line
  - P : INFINITI G20
- Model change (0 to 9)
- Body type
  - 1 : 4-door Sedan
- Restraint system
  - S : Standard
  - P : Automatic seat belt (Electrical)
- Check digit (0 to 9 or x)
  - The code for the check digit is determined by mathematical computation.
- Model year
  - M : 1991 year model
- Manufacturing plant
  - T : Oppama
- Vehicle serial number (Chassis number)

Identification Number (Cont'd)

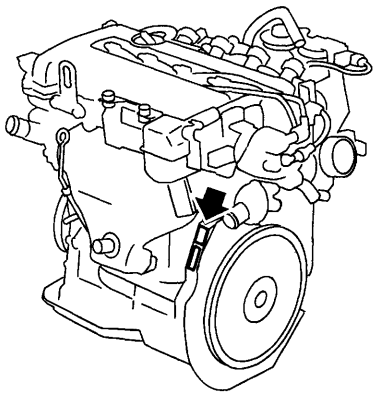
IDENTIFICATION PLATE



1 Type
2 Vehicle identification number (Chassis number)
3 Model
4 Body color code
5 Trim color code
6 Engine model
7 Engine displacement
8 Transaxle model
9 Axle model

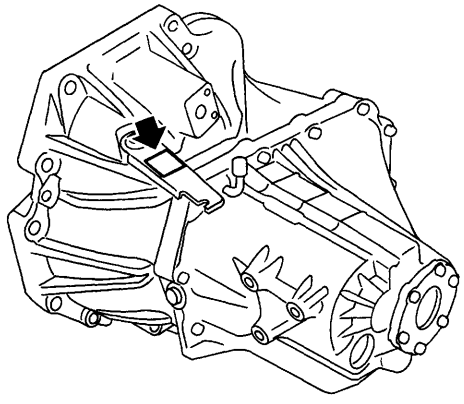
SGI315

ENGINE SERIAL NUMBER



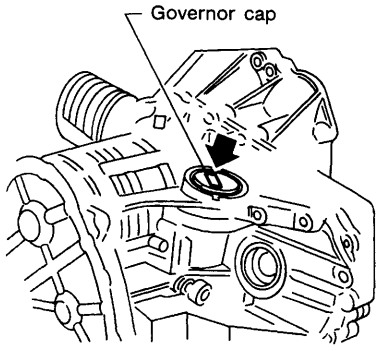
SGI677

MANUAL TRANSAXLE NUMBER



SGI678

AUTOMATIC TRANSAXLE NUMBER



SGI656

Dimensions

Unit: mm (in)

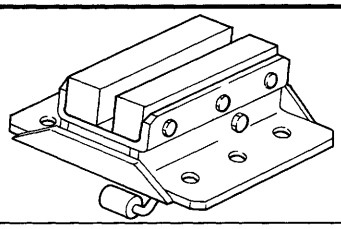
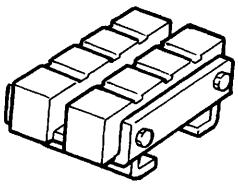
Item \ Model		Sedan
Overall length		4,440 (174.8)
Overall width		1,694 (66.7)
Overall height		1,389 (54.7)
Wheel base		2,550 (100.4)
Tread	Front	1,471 (57.9)
	Rear	1,461 (57.5)

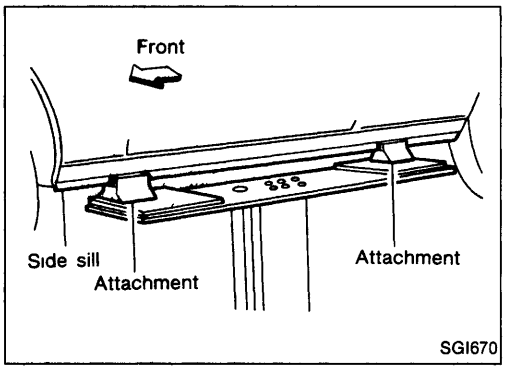
Wheels and Tires

Road wheel	Aluminum	6-JJ x 14
	Offset mm (in)	45 (1.77)
Tire size	Conventional	195/60HR14
	Spare	T125/70D15

Preparation

SPECIAL SERVICE TOOLS

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



Board-on Lift

Models without sill spoiler

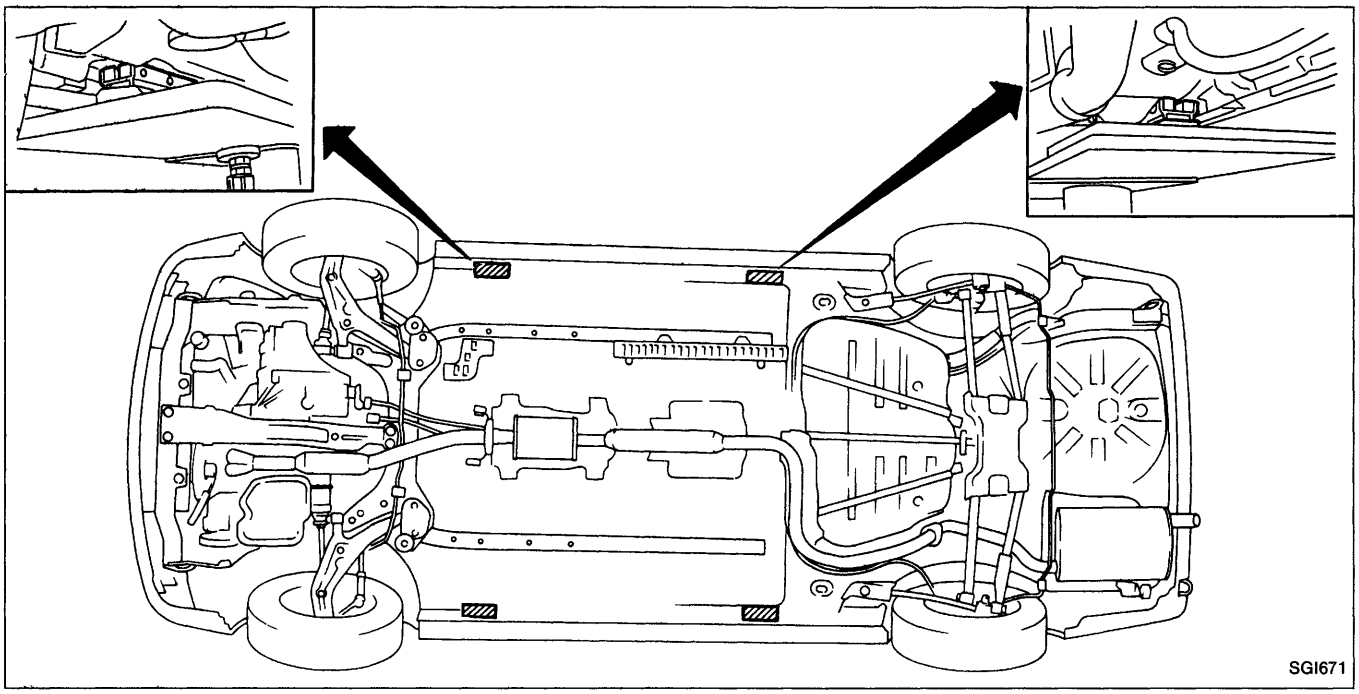
CAUTION:

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

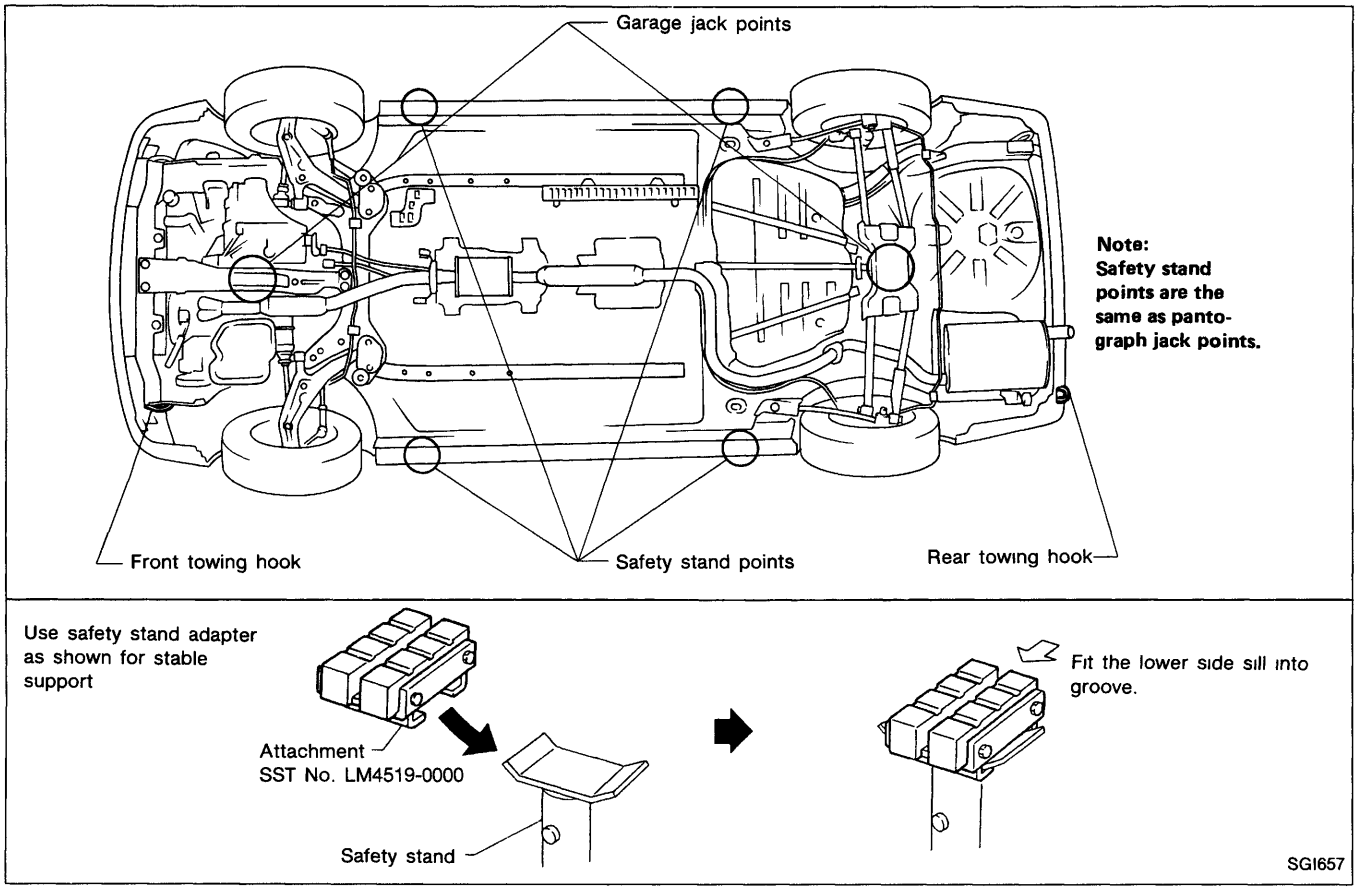
Fix board-on lift attachments to inner side of sill.



Garage Jack and Safety Stand

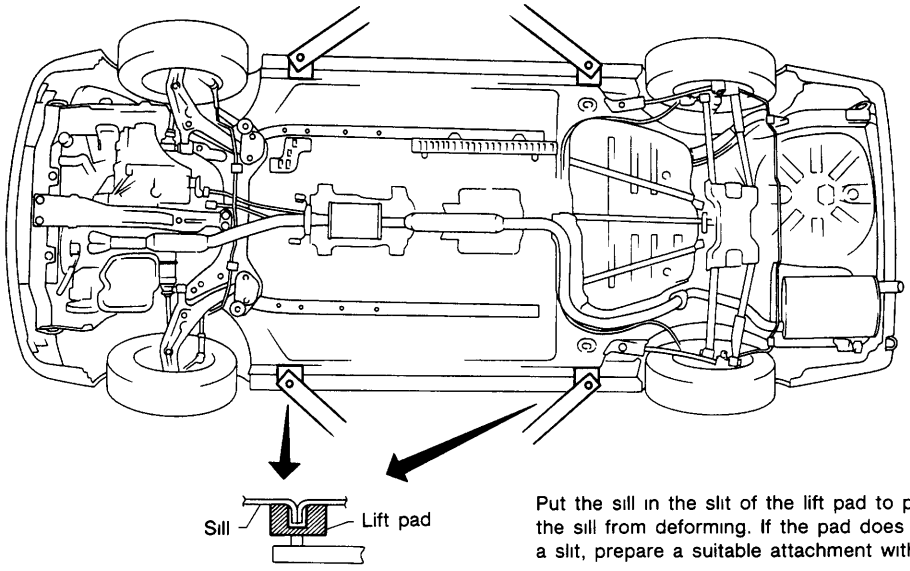
WARNING:

- **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-pole Lift

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



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

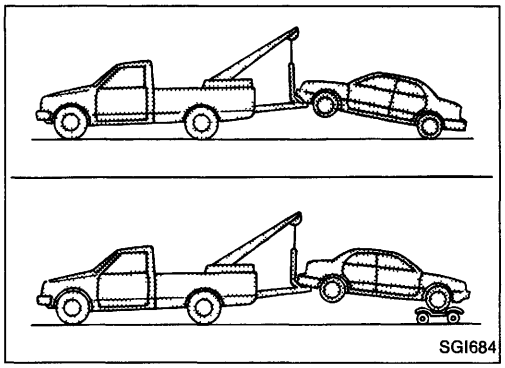
Put the sill in the slit of the lift pad to prevent the sill from deforming. If the pad does not have a slit, prepare a suitable attachment with one.

SGI658

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).**


SGI684

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

TOWING AN AUTOMATIC TRANSAXLE MODEL WITH FOUR WHEELS ON GROUND

Observe the following restricted towing speeds and distances.

Speed:

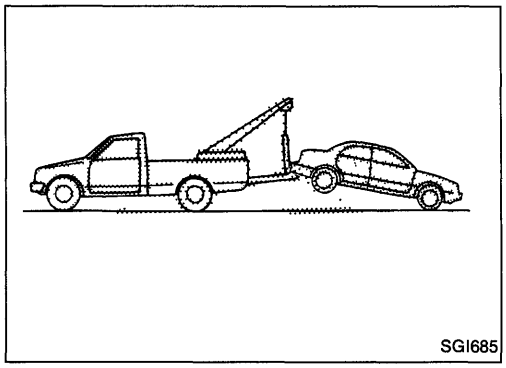
Below 50 km/h (30 MPH)

Distance:

Less than 65 km (40 miles)

CAUTION:

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


SGI685

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.

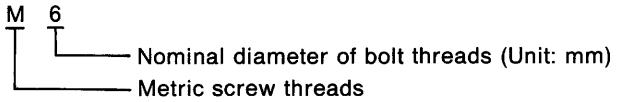
TIGHTENING TORQUE OF STANDARD BOLTS

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



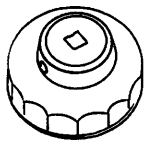
MAINTENANCE

SECTION MA

CONTENTS

PREPARATION ..... MA- 2
GENERAL MAINTENANCE ..... MA- 3
PERIODIC MAINTENANCE ..... MA- 5
RECOMMENDED FLUIDS AND LUBRICANTS ..... MA- 8
ENGINE MAINTENANCE MA-10
CHASSIS AND BODY MAINTENANCE MA-17
SERVICE DATA AND SPECIFICATIONS (S.D.S.) MA-24

SPECIAL SERVICE TOOL

Tool number (Kent-Moore No.) Tool name	Description
KV10115800 (J38956) Oil filter cap wrench 65 mm (2.56 in) dia.	 SMA327C

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 INFINITI dealers do them for a nominal charge.

Item	Reference page
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.	—
Wheel nuts When checking the tires, make sure no nuts are missing, and check for any loose nuts. Tighten if necessary.	—
Tire rotation Tires should be rotated every 12,000 km (7,500 miles).	MA-21
Wheel alignment and balance If the vehicle should pull to either side while driving on a straight and level road, or if you detect uneven or abnormal tire wear, there may be a need for wheel alignment. If the steering wheel or seat vibrates at normal highway speeds, wheel balancing may be needed.	MA-21 FA-5
Windshield wiper blades Check for cracks or wear if they do not wipe properly.	—
Doors and engine hood Check that all doors and the engine hood operate smoothly as well as the trunk lid and back hatch. 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 lubrication frequently.	MA-23
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.	—
Windshield wiper and washer Check that the wipers and washer operate properly and that the wipers do not streak.	—
Windshield defroster Check that the air comes out of the defroster outlets properly and in sufficient quantity when operating the heater or air conditioner.	—
Steering wheel Check that it has the specified free play. Be sure to check for changes in the steering condition, such as excessive free play, hard steering or strange noises. **Free play: Less than 35 mm (1.38 in)**	—
Seats Check seat position controls such as seat adjusters, seatback recliner, etc. to ensure they operate smoothly and that all latches lock securely in every position. Check that the head restrains move up and down smoothly and that the locks (if so equipped) hold securely in all latched positions. Check that the latches lock securely for folding-down rear seatbacks.	—
Seat belts Check that all parts of the seat belt system (e.g. buckles, anchors, adjusters and retractors) operate properly and smoothly, and are installed securely. Check the belt webbing for cuts, fraying, wear or damage.	MA-23
Clutch pedal Make sure the pedal operates smoothly and check that it has the proper free travel.	CL-4
Brakes Check that the brake does not pull the vehicle to one side when applied.	—
Brake pedal Check the pedal for smooth operation and make sure it has the proper distance under it when depressed fully. Check the brake booster function.	BR-8

Item	Reference page
Parking brake Check that the lever has the proper travel and confirm that your vehicle is held securely on a fairly steep hill with only the parking brake applied.	BR-27
Automatic transaxle "Park" mechanism Check that the lock release button on the selector lever operates properly and smoothly. On a fairly steep hill check that your vehicle is held securely with the selector lever in the "P" position without applying any brakes.	—
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-12
Radiator and hoses Check the front of the radiator and clean off any dirt, insects, leaves, etc., that may have accumulated. Make sure the hoses have no cracks, deformation, rot or loose connections.	—
Brake fluid level Make sure that the brake fluid level is between the "MAX" and "MIN" lines on the reservoir.	MA-19
Battery Check the fluid level in each cell. It should be between the "MAX" and "MIN" lines.	—
Engine drive belts Make sure that no belt is frayed, worn, cracked or oily.	MA-10
Engine oil level Check the level on the dipstick after parking the vehicle on a level spot and turning off the engine.	MA-14
Power steering fluid level and lines Check the level when the fluid is cold and the engine is turned off. Check the lines for proper attachment, leaks, cracks, etc.	MA-21
Automatic transaxle fluid level Check the level on the dipstick after putting the selector lever in "P" with the engine idling.	MA-18
Exhaust system Make sure there are no loose supports, cracks or holes. If the sound of the exhaust seems unusual or there is a smell of exhaust fumes, immediately locate the trouble and correct it.	MA-17
Underbody The underbody is frequently exposed to corrosive substances such as those used on icy roads or to control dust. It is very important to remove these substances, otherwise rust will form on the floor pan, frame, fuel lines and around the exhaust system. At the end of winter, the underbody should be thoroughly flushed with plain water, being careful to clean those areas where mud and dirt can easily accumulate.	—
Fluid leaks Check under the vehicle for fuel, oil, water or other fluid leaks after the vehicle has been parked for a while. Water dripping from the air conditioner after use is normal. If you should notice any leaks or gasoline fumes are evident, check for the cause and correct it immediately.	—

Two different maintenance schedules are provided, and should be used, depending upon the conditions in which the vehicle is mainly operated. **After 60,000 miles (96,000 km) or 48 months, continue the periodic maintenance at the same mileage/time intervals.**

SCHEDULE 1

Follow Periodic Maintenance Schedule 1 if your driving habits frequently includes one or more of the following driving conditions:

- Repeated short trips of less than 5 miles (8 km).
- Repeated short trips of less than 10 miles (16 km) with outside temperatures remaining below freezing.
- Operating in hot weather in stop-and-go "rush hour" traffic.
- Extensive idling and/or low speed driving for long distances, such as police, taxi or door-to-door delivery use.
- Driving in dusty conditions.
- Driving on rough, muddy, or salt spread roads.
- Towing a trailer, using a camper or a car-top carrier.

SCHEDULE 2

Follow Periodic Maintenance Schedule 2 if none of the driving conditions shown in Schedule 1 apply to your driving habits.

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

[ ]: Perform service at the mileage intervals only

MAINTENANCE OPERATION		MAINTENANCE INTERVAL																
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000	3.75	7 5	11.25	15	18 75	22 5	26.25	30	33 75	37 5	41.25	45	48 75	52.5	56.25	60	Reference page
	(km x 1,000)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	(54)	(60)	(66)	(72)	(78)	(84)	(90)	(96)	
	Months	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	
EMISSION CONTROL SYSTEM MAINTENANCE																		
Service "A"																		
Engine oil		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MA-14
Engine oil filter		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MA-14
Service "E"																		
Air cleaner filter	See NOTE (1)								[R]								[R]	MA-13
Service "F"																		
Vapor lines									I*								I*	MA-16
Fuel lines									I*								I*	MA-12
Fuel filter	See NOTE (2)*																	MA-13
Service "G"																		
Drive belts	See NOTE (3)																I*	MA-10
Service "J"																		
Engine coolant	See NOTE (4)																R*	MA-11
Service "H"																		
Spark plugs (PLATINUM-TIPPED type)	See NOTE (5)																[R]	MA-15
CHASSIS AND BODY MAINTENANCE																		
Service "B"																		
Brake pads & discs			I		I		I		I		I		I		I		I	MA-20
Steering gear & linkage, axle & suspension parts			I		I		I		I		I		I		I		I	MA-21, FA-4, RA-5
Steering linkage ball joints & front suspension ball joints			I		I		I		I		I		I		I		I	MA-21, FA-4
Exhaust system & drive shaft boots			I		I		I		I		I		I		I		I	MA-17, FA-7
Service "D"																		
Brake lines & cables					I				I				I				I	MA-19
Automatic & manual transmission oil	See NOTE (6)				I				I				I				I	MA-17, 18

NOTE:

(1) If operating mainly in dusty conditions, more frequent maintenance may be required.

(2) If vehicle is operated under extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the filters might become clogged. In such an event, replace them immediately.

(3) After 60,000 miles (96,000 km) or 48 months, inspect every 15,000 miles (24,000 km) or 12 months.

(4) After 60,000 miles (96,000 km) or 48 months, replace every 30,000 miles (48,000 km) or 24 months.

(5) Original equipment platinum-tipped plugs should be replaced at 60,000 miles (96,000 km). Conventional spark plugs can be used but should be replaced at 30,000 miles (48,000 km) intervals.

(6) If towing a trailer, using a camper or a car-top carrier, or driving on rough or muddy roads, change (not just inspect) oil at every 30,000 miles (48,000 km) or 24 months.

(7) Maintenance items and intervals with "*" are recommended by INFINITI for reliable vehicle operation. The owner need not perform such maintenance in order to maintain the emission warranty or manufacturer recall liability. Other maintenance items and intervals are required.

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

[ ]: Perform service at the mileage intervals only

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000	7 5	15	22.5	30	37.5	45	52 5	60	Reference page
	(km x 1,000)	(12)	(24)	(36)	(48)	(60)	(72)	(84)	(96)	
	Months	6	12	18	24	30	36	42	48	
EMISSION CONTROL SYSTEM MAINTENANCE										
Service "A"										
Engine oil		R	R	R	R	R	R	R	R	MA-14
Service "C"										
Engine oil filter		R		R		R		R		MA-14
Service "E"										
Air cleaner filter					[R]				[R]	MA-13
Service "F"										
Vapor lines					I*				I*	MA-16
Fuel lines					I*				I*	MA-12
Fuel filter	See NOTE (1)*									MA-13
Service "G"										
Drive belts	See NOTE (2)								I*	MA-10
Service"J"										
Engine coolant	See NOTE (3)								R*	MA-11
Service "H"										
Spark plugs (PLATINUM-TIPPED Type)	See NOTE (4)								[R]	MA-15
CHASSIS AND BODY MAINTENANCE										
Service "D"										
Brake lines & cables			I		I		I		I	MA-19
Brake pads & discs			I		I		I		I	MA-20
Automatic & manual transmission oil			I		I		I		I	MA-17, 18
Exhaust system, drive shaft boots			I		I		I		I	MA-17, FA-7
Service "F"										
Steering gear linkage axle & suspension parts					I				I	MA-21, FA-4, RA-4

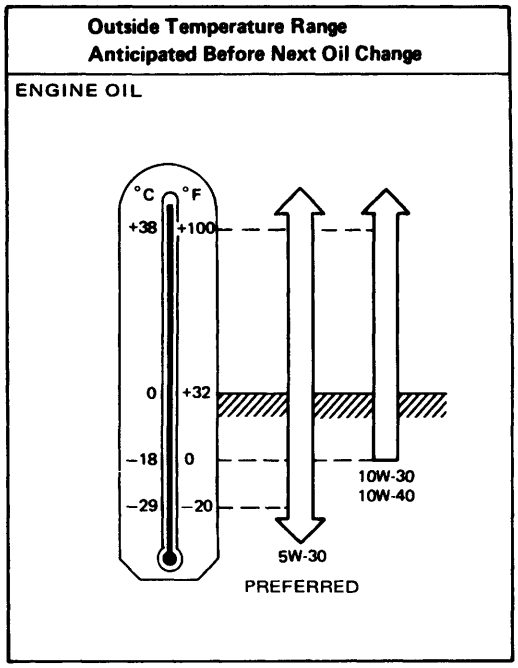
NOTE:
(1) If vehicle is operated under extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the filters might become clogged. In such an event, replace them immediately.
(2) After 60,000 miles (96,000 km) or 48 months, inspect every 15,000 miles (24,000 km) or 12 months.
(3) After 60,000 miles (96,000 km) or 48 months, replace every 30,000 miles (48,000 km) or 24 months.
(4) Original equipment platinum-tipped plugs should be replaced at 60,000 miles (96,000 km). Conventional spark plugs can be used but should be replaced at 30,000 miles (48,000 km) intervals.
(5) Maintenance items and intervals with "*" are recommended by INFINITI for reliable vehicle operation. The owner need not perform such maintenance in order to maintain the emission warranty or manufacturer recall liability. Other maintenance items and intervals are required.

Fluids and Lubricants

		Capacity (Approximate)			Recommended fluids and lubricants
		US measure	Imp measure	Liter	
Engine oil (Refill)					
With oil filter		3-5/8 qt	3 qt	3.4	Energy Conserving Oils of API SG *2, *3
Without oil filter		3-3/8 qt	2-7/8 qt	3.2	
Cooling system (With reservoir tank)	M/T	6-1/2 qt	5-3/8 qt	6.1	Anti-freeze coolant (Ethylene glycol base)
	A/T	6-7/8 qt	5-3/4 qt	6.5	
Manual transaxle gear oil		7-3/8 - 7-7/8 pt	6-1/8 - 6-1/2 pt	3.5 - 3.7	API GL-4*2
Automatic transaxle fluid		7-3/8 qt	6-1/8 qt	7.0	Genuine ATF*1 or equivalent Type DEXRON™
Power steering fluid		—	—	—	Type DEXRON™
Brake fluid		—	—	—	Genuine Brake Fluid*1 or equivalent DOT 3 (US FMVSS No. 116)
Multi-purpose grease		—	—	—	NLGI No. 2 (Lithium soap base)

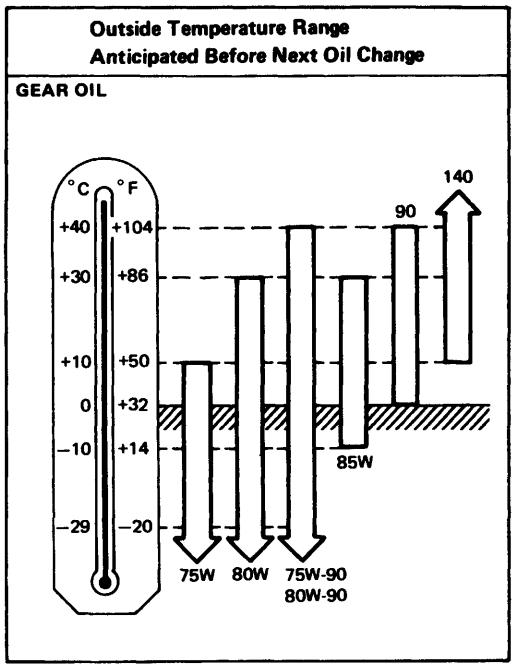
*1: Available in mainland U.S.A. through your INFINITI dealer.
*2: For further details, see "Recommended SAE viscosity number".
*3: Energy conserving oils
These oils can be identified by such labels as EC-I, EC-II energy conserving, energy saving, improved fuel economy, etc.

SAE Viscosity Number



TI0008

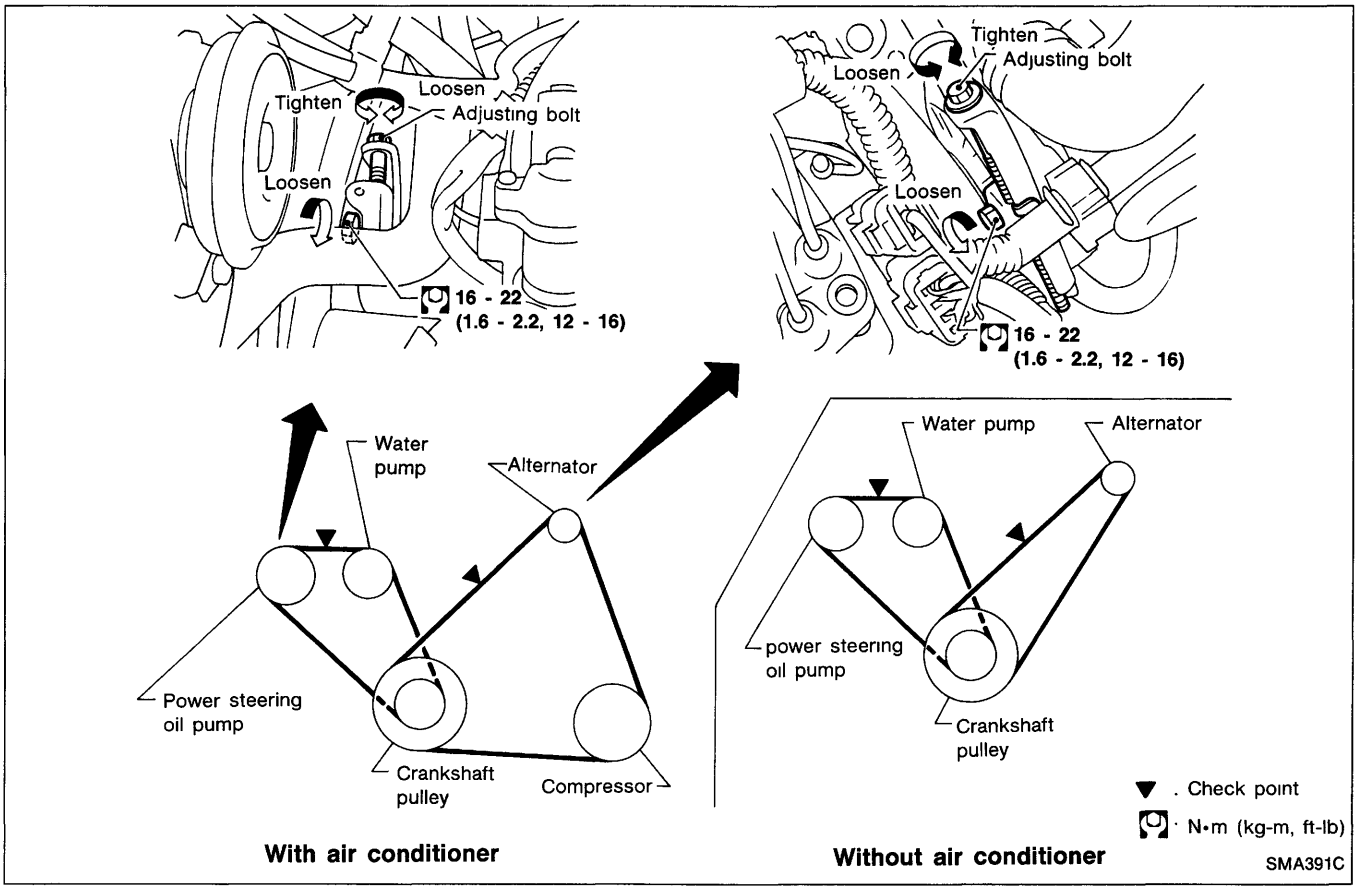
5W-30 is preferable for all ambient temperatures. 20W - 40 and 20W - 50 are usable for ambient temperatures above 10°C (50°F) for all seasons.



TI0003

80W-90 is preferable for ambient temperatures below 40°C (104°F).

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.

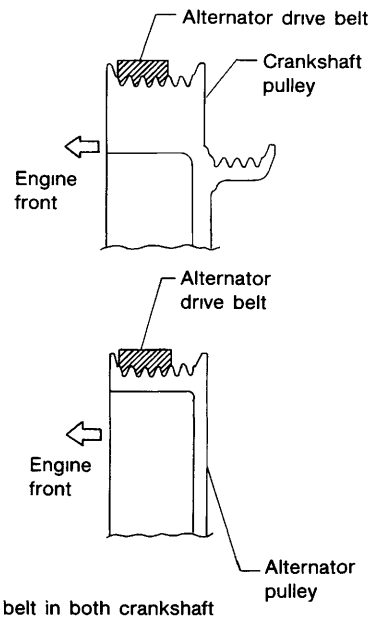
Belt deflection:

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)		

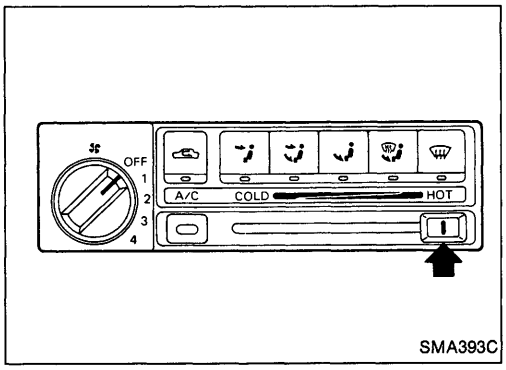
Inspect drive belt deflections when engine is cold.

Alternator drive belt fitting place (Models without air conditioner)



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

SMA328C

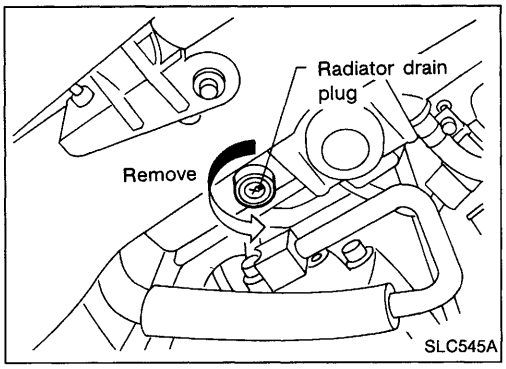


Changing Engine Coolant

WARNING:

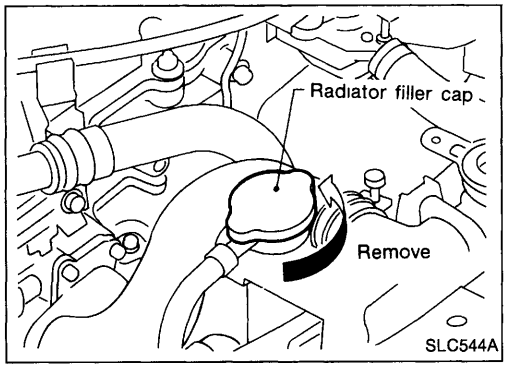
To avoid being scalded, never change the coolant when the engine is hot.

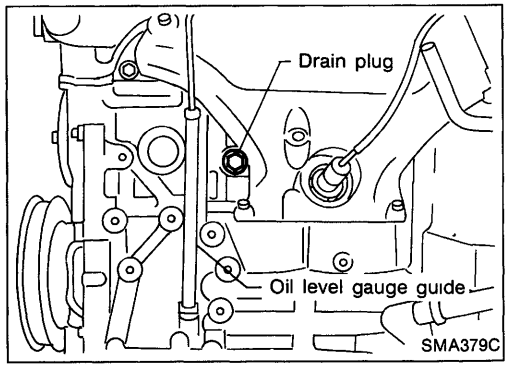
1. Move heater "TEMP" control lever all the way to "HOT".



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.**





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 filler cap and air bleeder cap.
8. Warm up engine until radiator fan operates, then race engine 2 or 3 times under no-load.

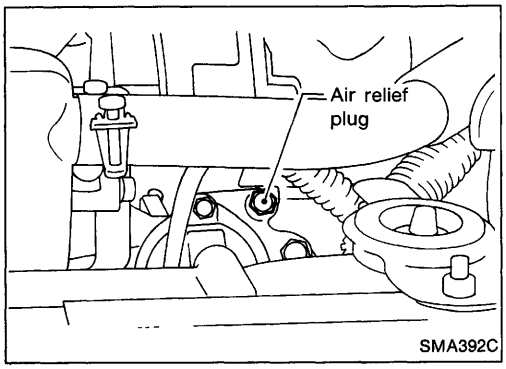
- **Make sure that air conditioner switch is "OFF".**

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.

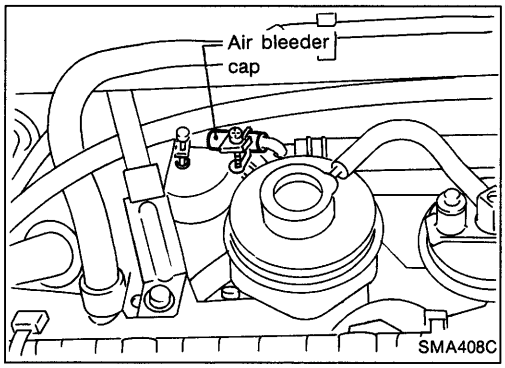
- **Apply sealant to thread of drain plug.**

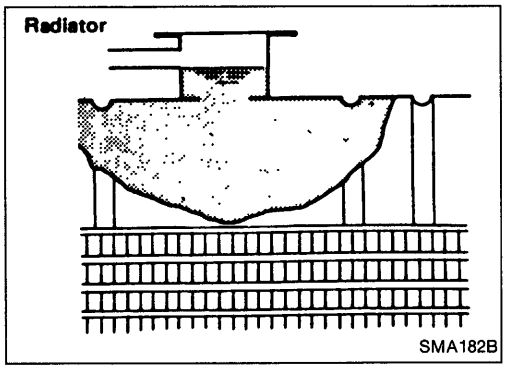
   : 8 - 12 N·m (0.8 - 1.2 kg-m, 5.8 - 8.7 ft-lb)

12. Reinstall reservoir tank.



Changing Engine Coolant (Cont'd)



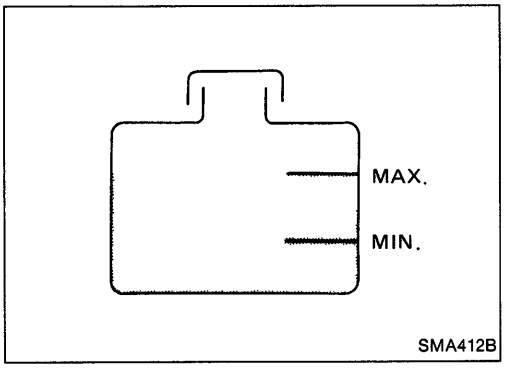


13. Fill radiator and reservoir tank with coolant up to specified level following step 6 through step 9.
    Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.

Coolant capacity (With reservoir tank):

Unit: ℓ (US qt, Imp qt)

M/T	6.1 (6-1/2, 5-3/8)
A/T	6.5 (6-7/8, 5-3/4)

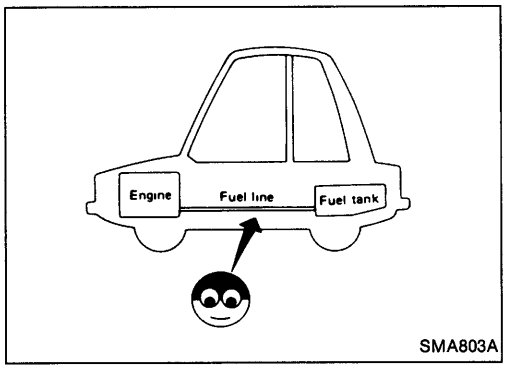


[Reservoir tank capacity for "H" level is 0.6 ℓ (5/8 US qt, 1/2 Imp qt).]

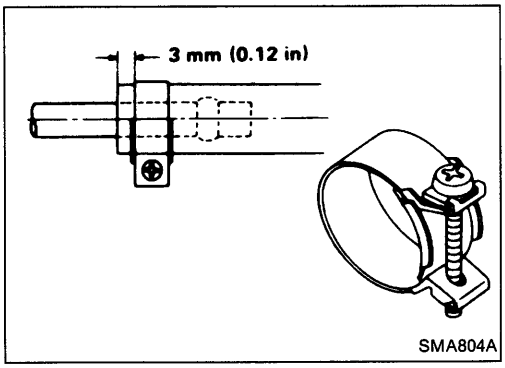
Pour coolant through coolant filler neck slowly to allow air in system to escape.

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

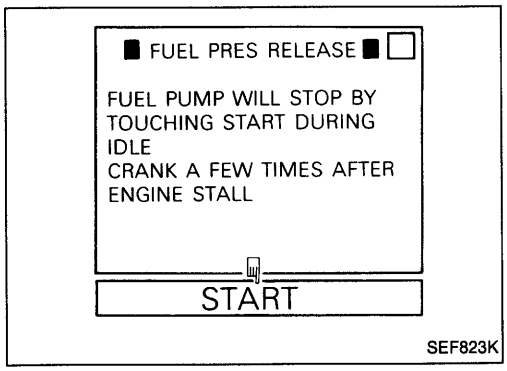
Checking Fuel Lines



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



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

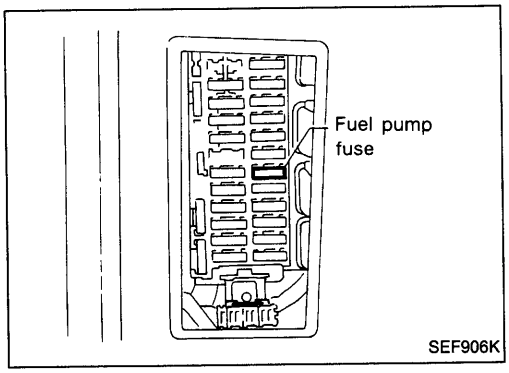


Changing Fuel Filter

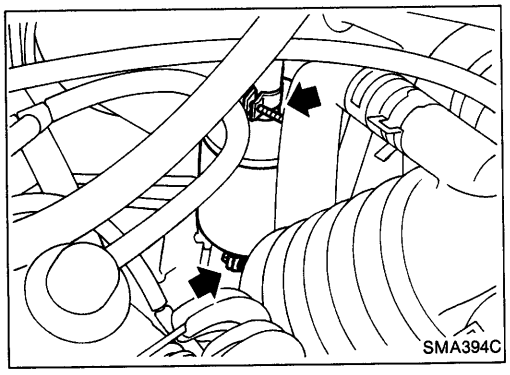
WARNING:

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

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



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



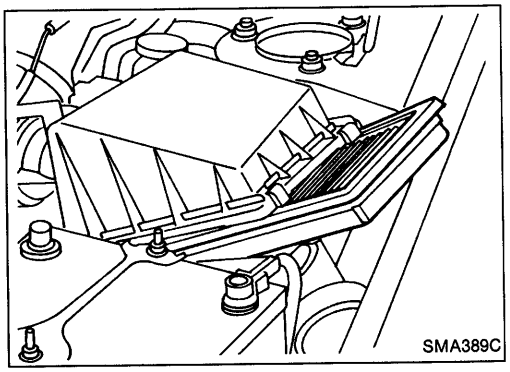
5. Loosen fuel hose clamps.
6. Replace fuel filter.

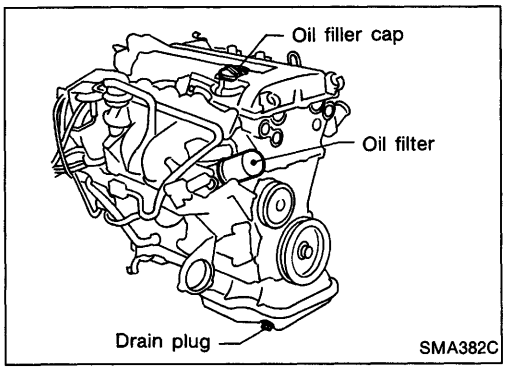
- **Be careful not to spill fuel over engine compartment. Place a shop towel to absorb fuel.**
- **Use a high-pressure type fuel filter. Do not use a synthetic resinous fuel filter.**
- **When tightening fuel hose clamps, refer to "Checking Fuel Lines".**

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):

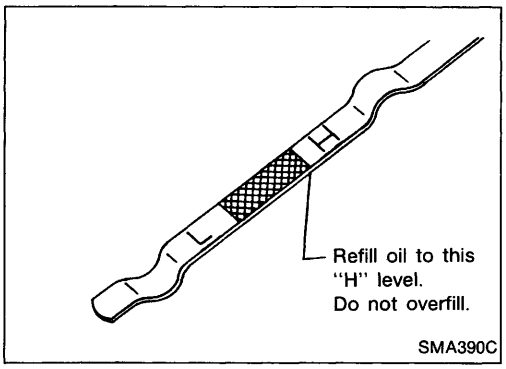
Unit: ℓ (US qt, Imp qt)

With oil filter change	3.4 (3-5/8, 3)
Without oil filter change	3.2 (3-3/8, 2-7/8)

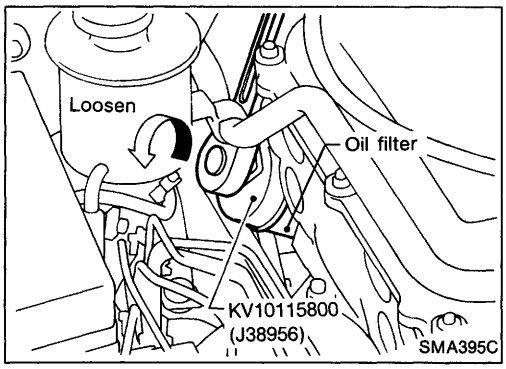
CAUTION:

- **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.

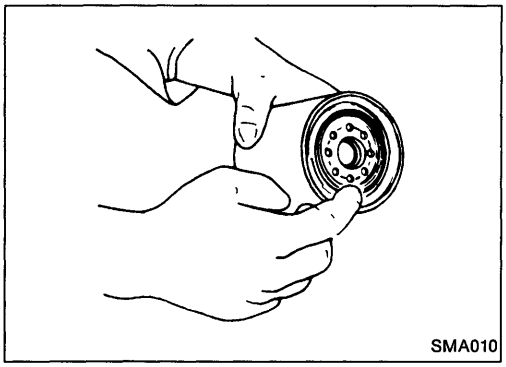


Changing Oil Filter

1. Remove oil filter with Tool.

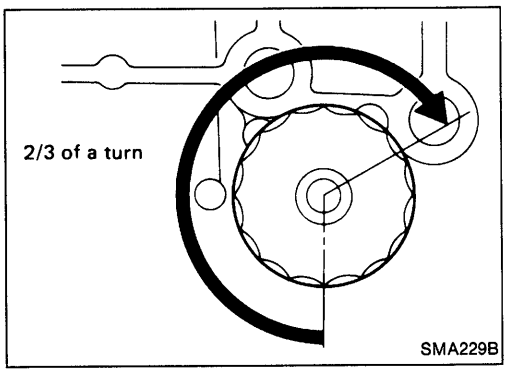
WARNING:

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



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

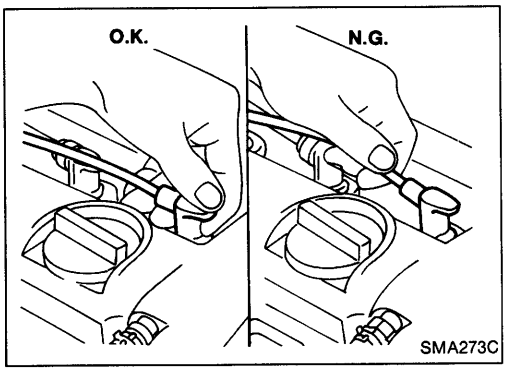
Changing Oil Filter (Cont'd)



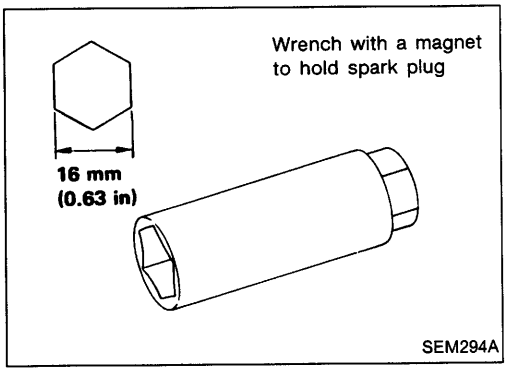
3. Screw in the oil filter until a slight resistance is felt, then tighten additionally more than 2/3 turn.
4. Add engine oil.

Refer to Changing Engine Oil.

Changing Spark Plugs (Platinum-tipped type)



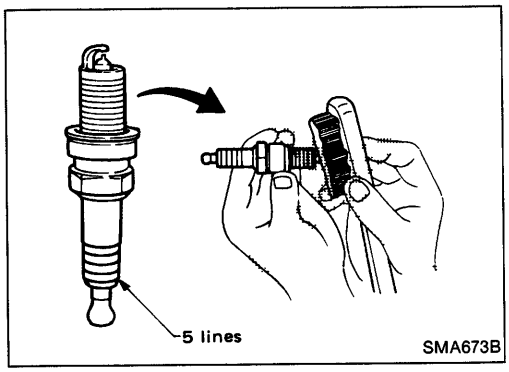
1. Disconnect ignition wires from spark plugs at boot. Do not pull on the wire.



2. Remove spark plugs with spark plug wrench.

Spark plug:

Standard type	**PFR6B-11**
Hot type	**PFR5B-11**
Cold type	**PFR7B-11**



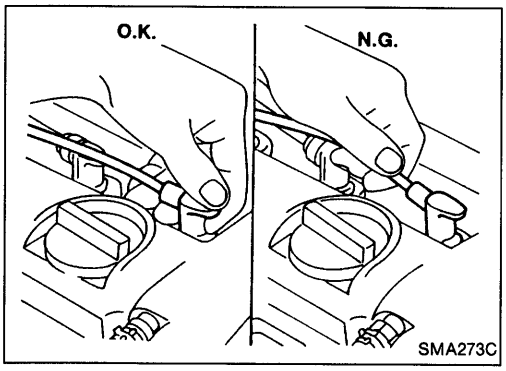
- **Checking and adjusting plug gap are not required between renewals.**
- **Do not use a wire brush for cleaning.**
- **If plug tip is covered with carbon, spark plug cleaner may be used.**

Cleaner air pressure:
Less than 588 kPa (6 kg/cm^2, 85 psi)

Cleaning time:
Less than 20 seconds

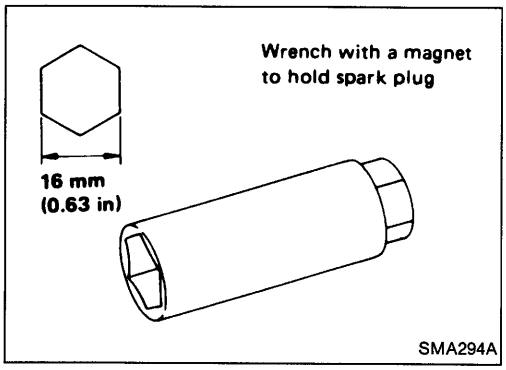
3. Install spark plugs. Reconnect ignition wires according to nos. indicated on them.

Spark plug:
: 20 - 29 N·m
(2.0 - 3.0 kg-m, 14 - 22 ft-lb)



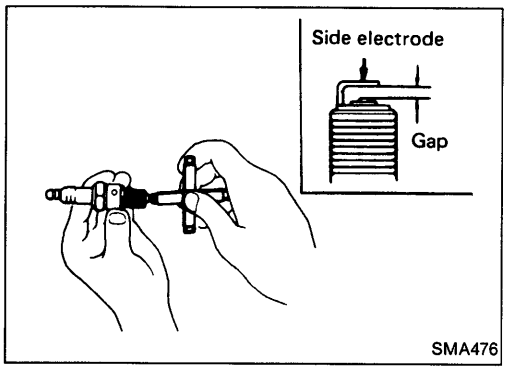
Changing Spark Plugs (Conventional type)

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

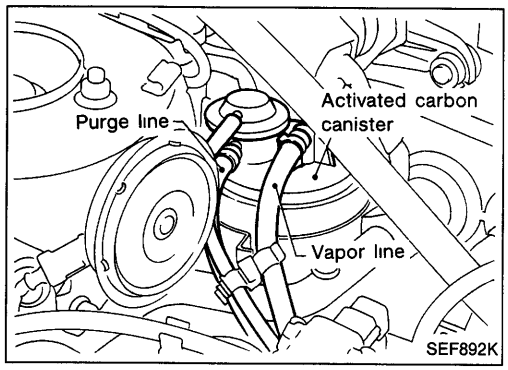


2. Remove spark plugs with spark plug wrench.
   Spark plug:

Standard type	**BKR6E**
Hot type	**BKR5E**
Cold type	**BKR7E**



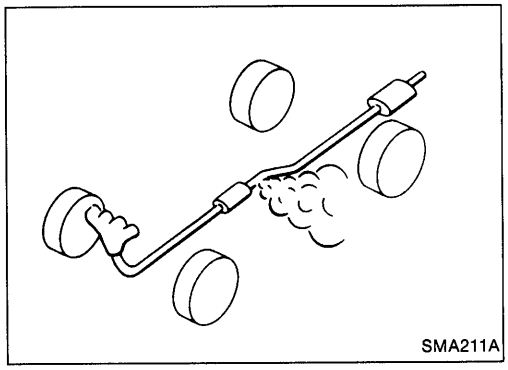
3. Check gap of each new spark plug.
   Gap: 0.8 - 0.9 mm (0.031 - 0.035 in)
4. Install spark plugs. Reconnect ignition wires according to nos. indicated on them.
   Spark plug:
   [O]: 20 - 29 N·m (2 - 3 kg-m, 14 - 22 ft-lb)



Checking Vapor Lines

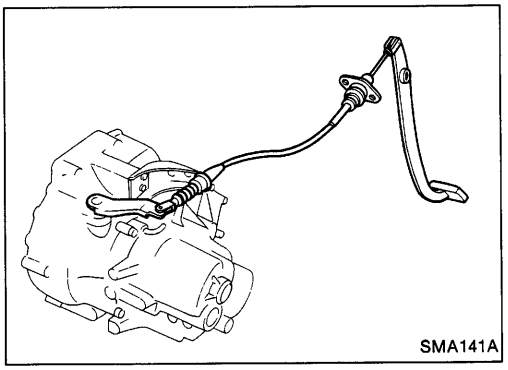
1. Visually inspect vapor lines for improper attachment and for cracks, damage, loose connections, chafing and deterioration.
2. Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc.

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


SMA211A

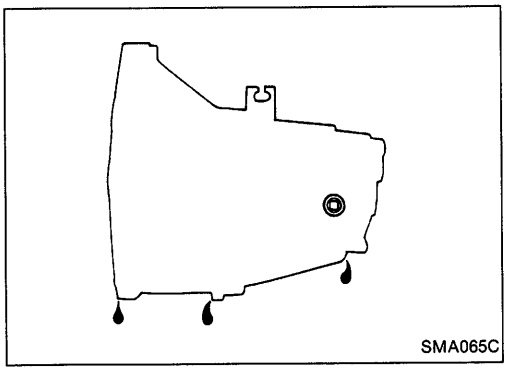
Checking Exhaust System

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


SMA141A

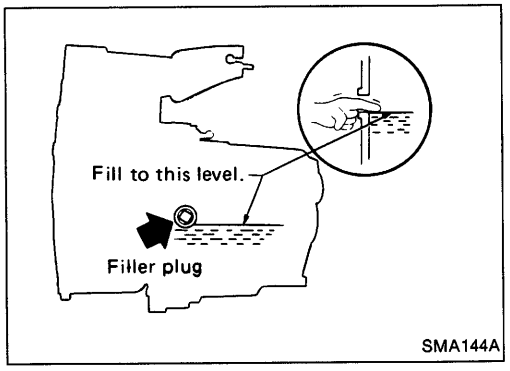
Checking Clutch System

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


SMA065C

Checking M/T Oil

1. Check for oil leaks.



SMA144A

2. Check oil level.

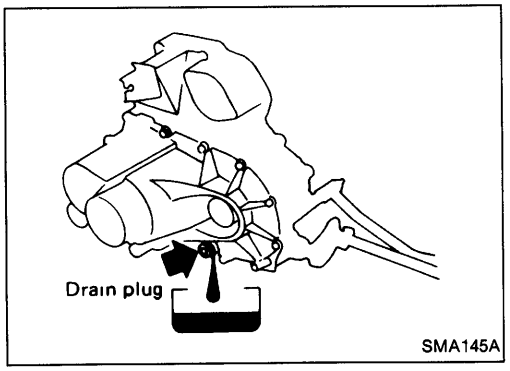
Never start engine while checking oil level.

Filler plug:

RS5F32A and RS5F32V

: 10 - 20 N·m (1.0 - 2.0 kg-m, 7 - 14 ft-lb)

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



SMA145A

Changing M/T Oil

Oil capacity:

RS5F32A

3.5 - 3.7 ℓ

(7-3/8 - 7-7/8 US pt, 6-1/8 - 6-1/2 Imp pt)

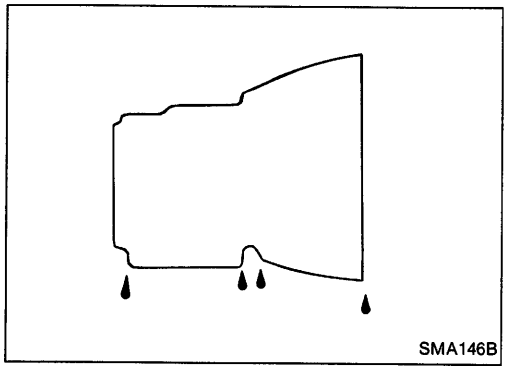
RS5F32V

3.5 - 3.7 ℓ

(7-3/8 - 7-7/8 US pt, 6-1/8 - 6-1/2 Imp pt)

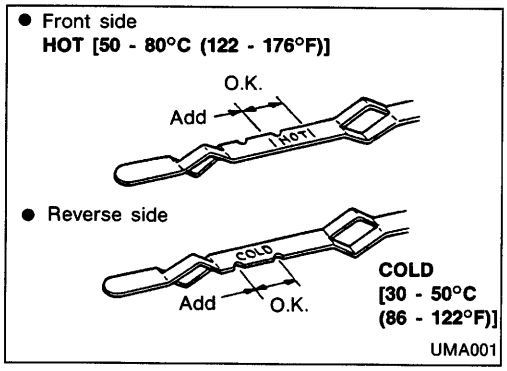
Drain plug:

: 25 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)


SMA146B

Checking A/T Fluid Level

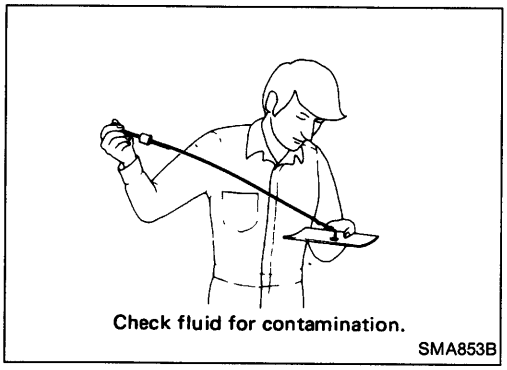
1. Check for fluid leakage.



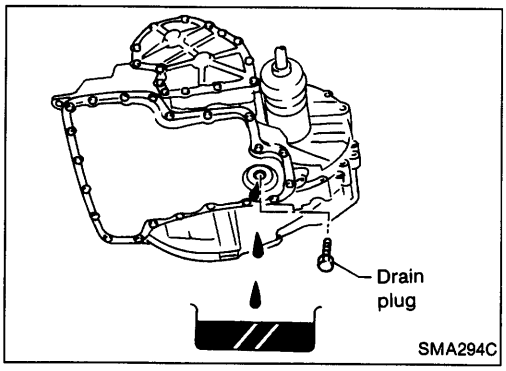
UMA001

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.
   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.


Check fluid for contamination.
SMA853B

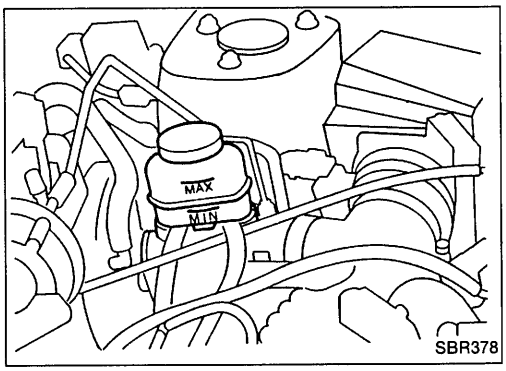
3. Check fluid condition.
   Check fluid for contamination. If fluid is very dark or smells burned, or contains frictional material (clutches, band, etc.), check operation of A/T.
   Refer to section AT for checking operation of A/T.



SMA294C

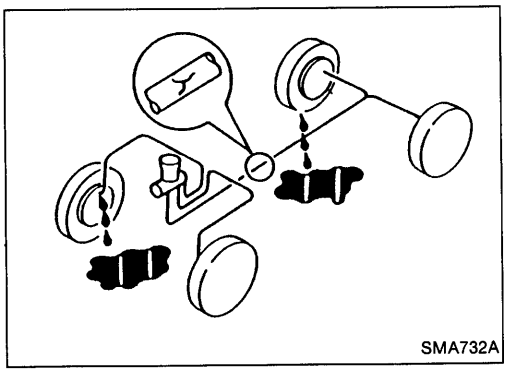
Changing A/T Fluid

Oil capacity (With torque converter):
7.0 ℓ (7-3/8 US qt, 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™" type.



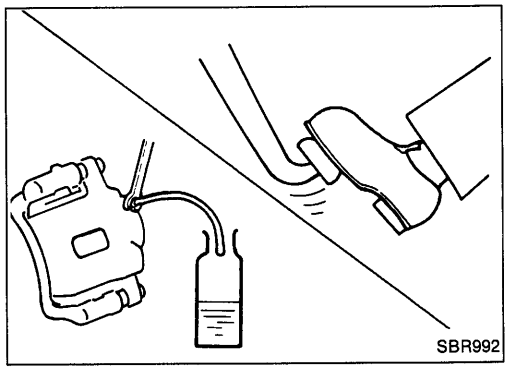
Checking Brake Fluid Level and Leaks

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



Checking Brake Lines and Cables

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

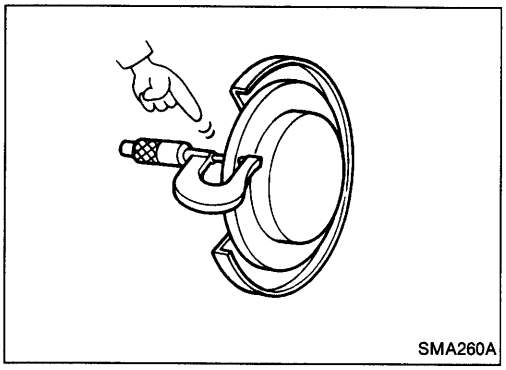


Changing Brake Fluid

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.**


SMA260A

Checking Disc Brake

Check condition of disc brake components.

ROTOR

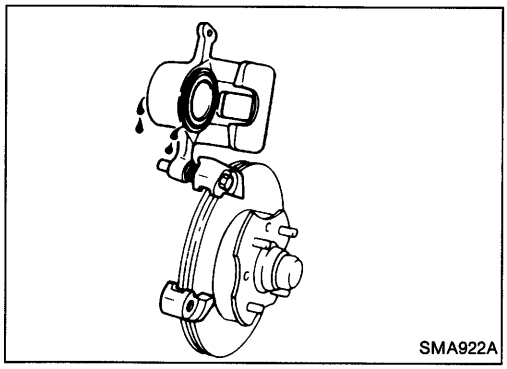
Check condition and thickness.

CL25VA:

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

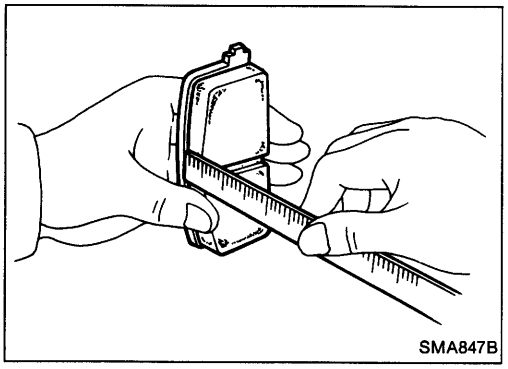
CL9HA:

Standard thickness
9.0 mm (0.354 in)
Minimum thickness
8.0 mm (0.315 in)


SMA922A

CALIPER

Check operation and for leakage.


SMA847B

PAD

Check for wear or damage.

CL25VA:

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

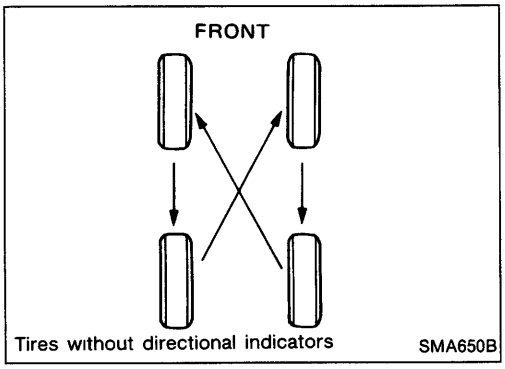
CL9HA:

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

Balancing Wheels

- Adjust wheel balance using road wheel center.

Refer to S.D.S.



Tire Rotation

Wheel nuts:

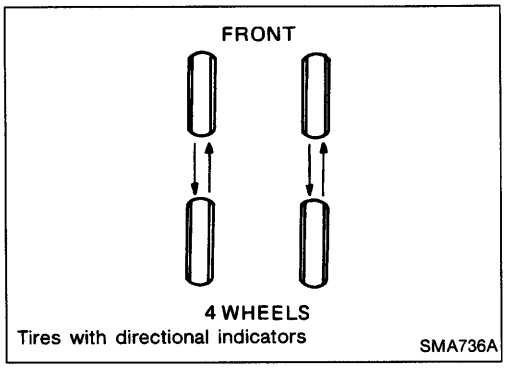
: 98 - 118 N·m (10 - 12 kg-m, 72 - 87 ft-lb)

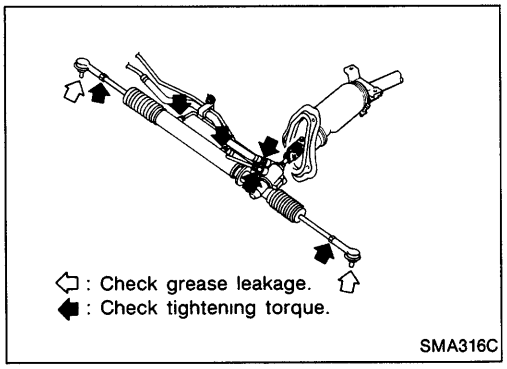
T-TYPE SPARE TIRE

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

Wheel nuts:

: 98 - 118 N·m
(10 - 12 kg-m, 72 - 87 ft-lb)





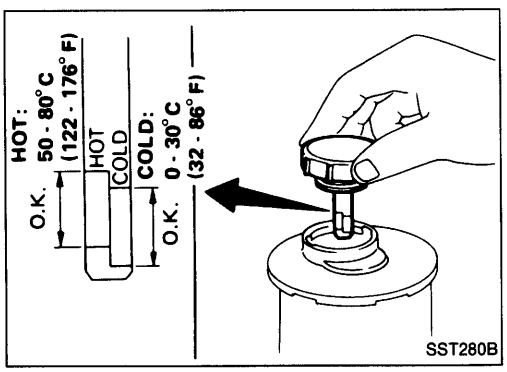
Checking Steering Gear and Linkage

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

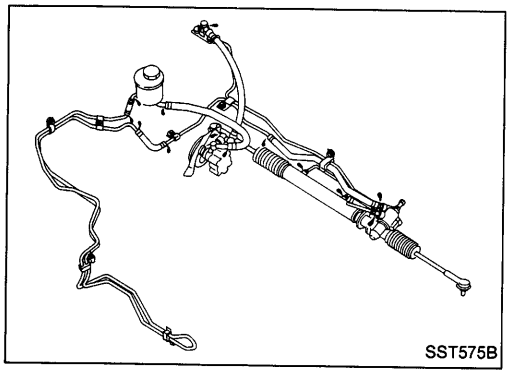
Check fluid level.

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:

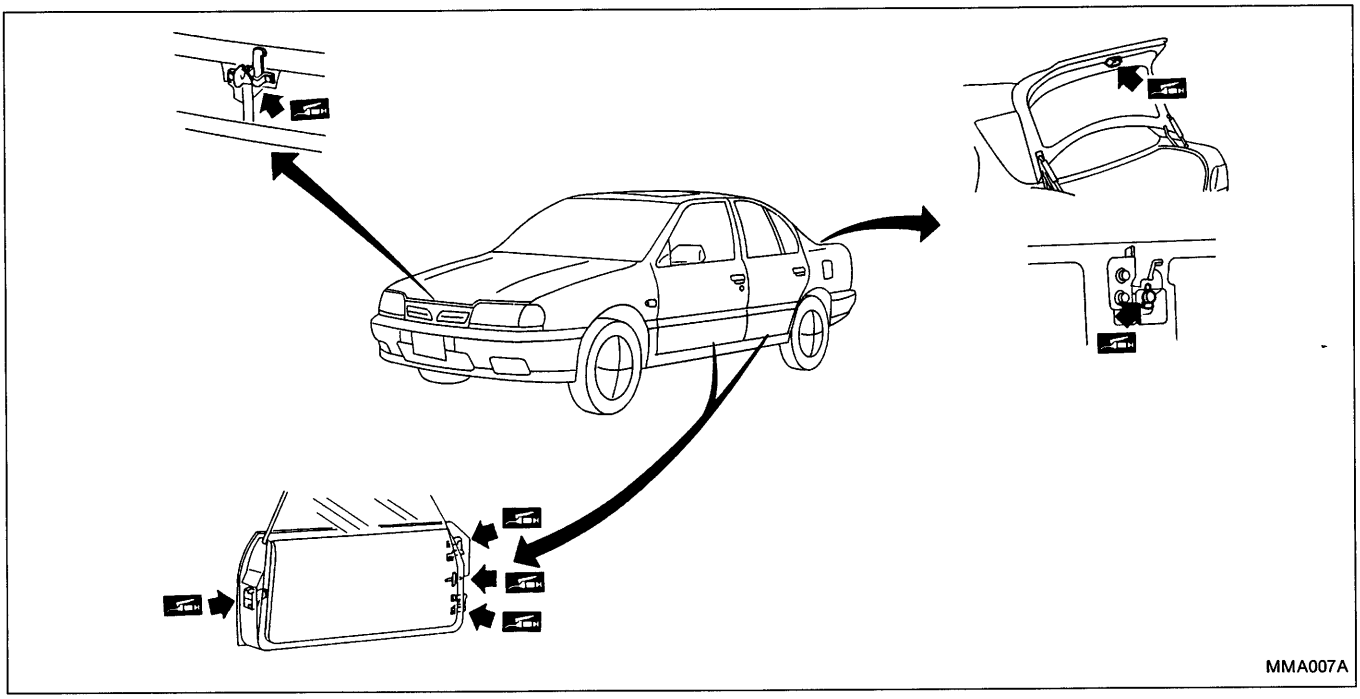
- **Do not overfill.**
- **Recommended fluid is Automatic Transmission Fluid "DEXRON™" type.**

Checking Power Steering Fluid and Lines (Cont'd)



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

Lubricating Hood Latches, Locks and Hinges



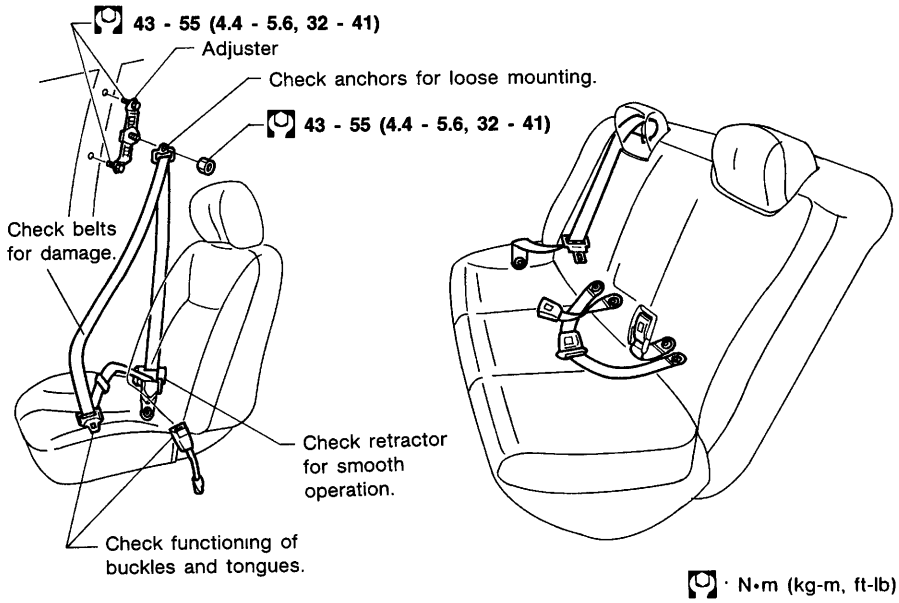
Checking Seat Belts, Buckles, Retractors, Anchors and Adjusters

CAUTION:

1. **All seat belt assembles, including retractors and attaching hardwares such as guide rail set, etc., should be inspected after any collision.**
   Nissan recommends that all seat belt assemblies in use during a collision be replaced unless the collision was minor and the belts show no damage and continue to operate properly.
   Seat belt assemblies not in use during a collision should also be inspected and replaced if either damage or improper operation is noted.
2. **If the condition of any component of seat belt assembly is questionable, do not have it repaired, but replaced as seat 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 genuine seat belt assembly.**

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

For 2-point motorized automatic seat belts, refer to BF section.



Engine Maintenance

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 (US qt, Imp qt)

With oil filter change	3.4 (3-5/8, 3)
Without oil filter change	3.2 (3-3/8, 2-7/8)

Coolant capacity (Refill capacity)

Unit: ℓ (US qt, Imp qt)

With reservoir tank	M/T	6.1 (6-1/2, 5-3/8)
	A/T	6.5 (6-7/8, 5-3/4)
Reservoir tank		0.6 (5/8, 1/2)

Spark plug

	Platinum-tipped type	Conventional type
Type		
Standard	PFR6B-11	BKR6E
Hot	PFR5B-11	BKR5E
Cold	PFR7B-11	BKR7E
Plug gap mm (in)	1.0 - 1.1 (0.039 - 0.043)	0.8 - 0.9 (0.031 - 0.035)

Chassis and Body Maintenance

INSPECTION AND ADJUSTMENT

Clutch

Unit: mm (in)

Pedal free height	159.5 - 169.5 (6.28 - 6.67)
Pedal free play	10.8 - 15.1 (0.425 - 0.594)

Front axle and front suspension (Unladen)*

Camber	degree	–0°45′ to 0°45′
Caster	degree	1°05′ - 2°35′
Kingpin inclination	degree	13°45′ - 15°15′
Toe-in	mm (in)	0 - 2 (0 - 0.08)
(Total toe-in)	degree	0′ - 12′
Front wheel turning angle Full turn Inside/outside	degree	33° - 37°/28° - 32°

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

Rear axle and rear suspension (Unladen)*

Camber	degree	–1°45′ to –0°15′
Toe-out	mm (in)	–2 to 2 (–0.08 to 0.08)
(Total toe-out)	degree	–12′ to 12′

*: 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	
CL25VA	11.0 (0.433)
CL9HA*	10.0 (0.394)
Minimum thickness	
CL25VA	2.0 (0.079)
CL9HA*	2.0 (0.079)
Rotor	
Standard thickness	
CL25VA	22.0 (0.866)
CL9HA*	9.0 (0.354)
Minimum thickness	
CL25VA	20.0 (0.787)
CL9HA*	8 (0.31)
Pedal mm (in)	
Free height	
M/T	151 - 161 (5.94 - 6.34)
A/T	159 - 169 (6.26 - 6.65)
Free play	1 - 3 (0.04 - 0.12)
Depressed height [Under force of 490 N (50 kg, 110 lb) with engine running]	
M/T	80 (3.15) or more
A/T	85 (3.35) or more
Parking brake Number of notches [at pulling force 196 N (20 kg, 44 lb)]	7 - 9
Number of notches when warning switch comes on	1 or 0

*: Rear disc brake

Wheel balance

Maximum allowable unbalance g (oz)	Dynamic (at rim flange)	10 (0.35) (one side)
	Static	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)	235 - 314 (24 - 32, 174 - 231)	186 - 255 (19 - 26, 137 - 188)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Clutch			
Pedal stopper lock nut	16 - 22	1.6 - 2.2	12 - 16
A.S.C.D. cancel switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Manual transaxle			
Filler plug	10 - 20	1.0 - 2.0	7 - 14
Drain plug	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	78 - 98	8.0 - 10.0	58 - 72
Rear axle and rear suspension			
Toe adjusting lock nut	108 - 127	11 - 13	80 - 94
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

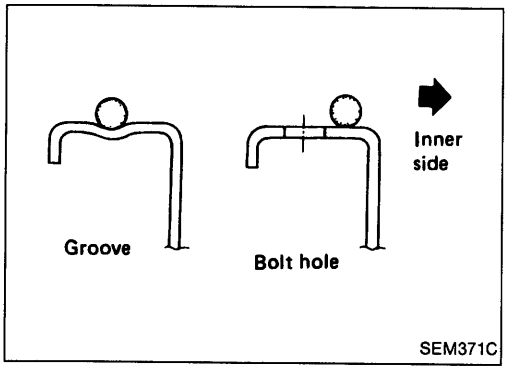
SECTION EM

CONTENTS

PRECAUTIONS ..... EM- 2
PREPARATION ..... EM- 3
OUTER COMPONENT PARTS ..... EM- 7
COMPRESSION PRESSURE EM-10
OIL PAN EM-11
TIMING CHAIN EM-17
OIL SEAL REPLACEMENT EM-32
ACCEL-DRUM UNIT EM-35
CYLINDER HEAD EM-37
ENGINE REMOVAL EM-51
CYLINDER BLOCK EM-55
SERVICE DATA AND SPECIFICATIONS (S.D.S.) EM-67

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
  (2) Main bearing cap bolts
  (3) Connecting rod cap nuts.



Liquid Gasket Application Procedure

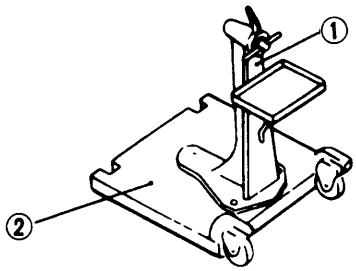
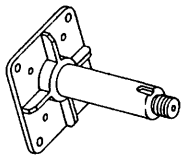
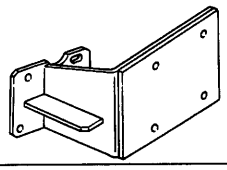
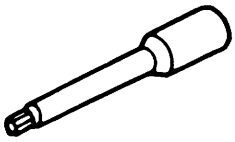
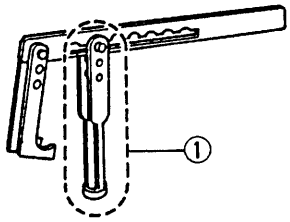
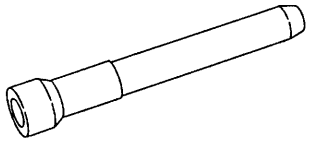
a. Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surface.

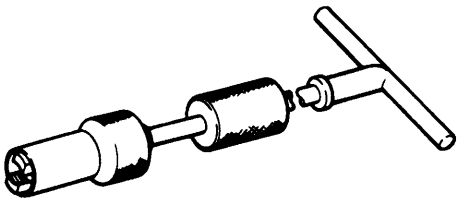
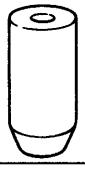
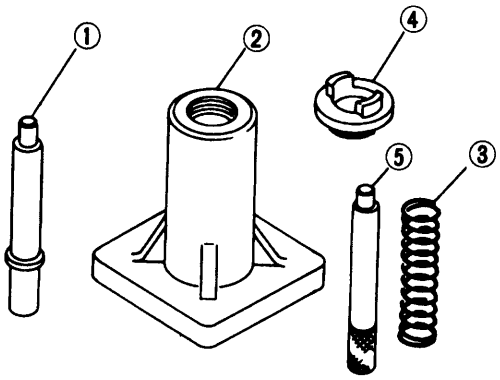
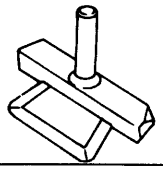
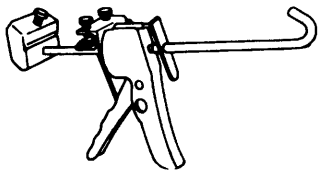
b. Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
- **Be sure liquid gasket is 4.0 to 5.0 mm (0.157 to 0.197 in) wide (for oil pan).**
- **Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide (in areas except oil pan).**

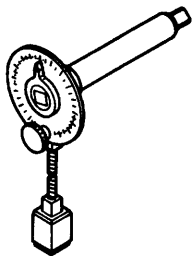
c. Apply liquid gasket to inner surface around hole perimeter area.
(Assembly should be done within 5 minutes after coating.)

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

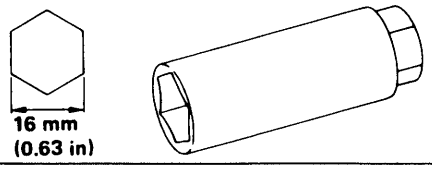
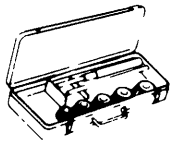
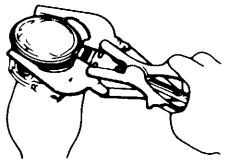
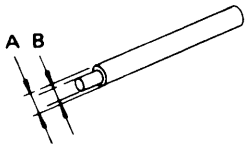
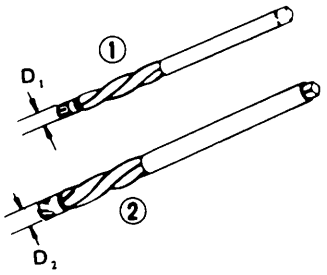
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description
ST0501S000 (—) Engine stand assembly ① ST05011000 (—) Engine stand ② ST05012000 (—) Base	Disassembling and assembling 
KV10106500 (—) Engine stand shaft	
KV10115300 (—) Engine sub-attachment	
ST10120000 (J24239-01) Cylinder head bolt wrench	Loosening and tightening cylinder head bolt 
KV10116200 (J26336-A) Valve spring compressor ① KV10115900 (J26336-20) Attachment	Disassembling valve mechanism 
(J38958) Valve oil seal drift (Intake side) (J38971) Valve oil seal drift (Exhaust side)	Installing valve oil seal 

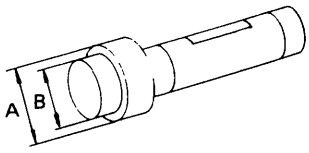
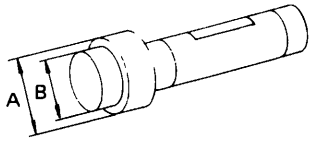
Tool number (Kent-Moore No.) Tool name	Description	
KV10107902 (J38959) Valve oil seal puller		Displacement valve lip seal
KV10115700 (J38957) Dial gauge stand		Adjusting shims
EM03470000 (J8037) Piston ring compressor		Installing piston assembly into cylinder bore
KV10107400 (J26365-12, J26365) Piston pin press stand ① KV10107310 (—) Center shaft ② ST13040020 (—) Stand ③ ST13040030 (—) Spring ④ KV10107320 (—) Cap ⑤ ST13040050 (—) Drift		Disassembling and assembling piston pin
KV10111100 (—) Seal cutter		Removing oil pan
WS39930000 (—) Tube presser		Pressing the tube of liquid gasket

Tool number (Kent-Moore No.) Tool name	Description	
KV10112100 (—) Angle wrench		Tightening bolts for bearing cap, cylinder head, etc.

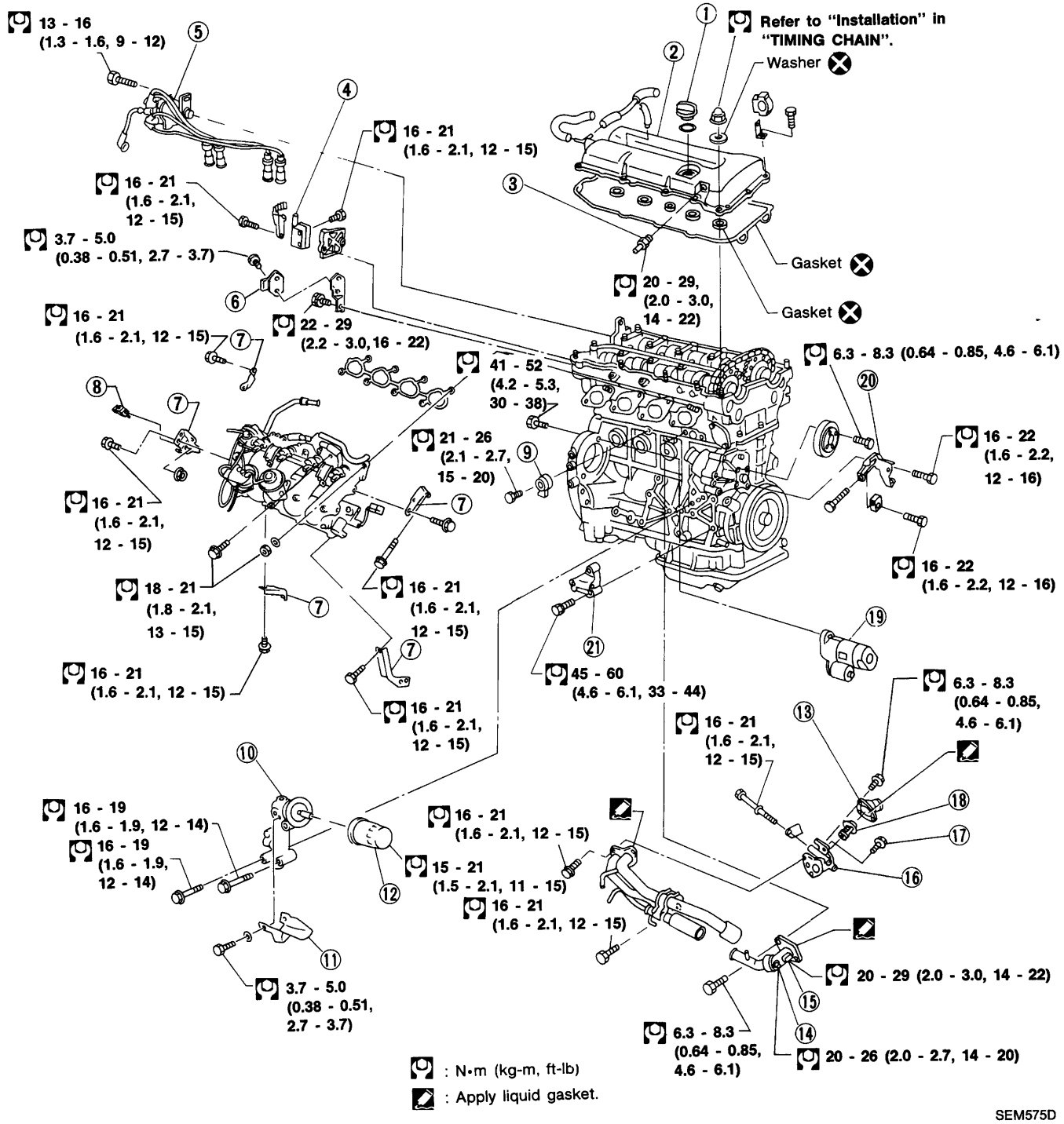
COMMERCIAL SERVICE TOOLS

Tool name	Description
Spark plug wrench	Removing and installing spark plug 
Valve seat cutter set	Finishing valve seat dimensions 
Piston ring expander	Removing and installing piston ring 
Valve guide drift	Removing and installing valve guide  Intake & Exhaust **A = 9.5 mm (0.374 in) dia.** **B = 5.0 mm (0.197 in) dia.**
Valve guide reamer	Reaming valve guide ① or hole for oversize valve guide ②  Unit: mm (in) dia.

	D_1	D_2
Intake & Exhaust	6.0 (0.236)	10.175 (0.4006)

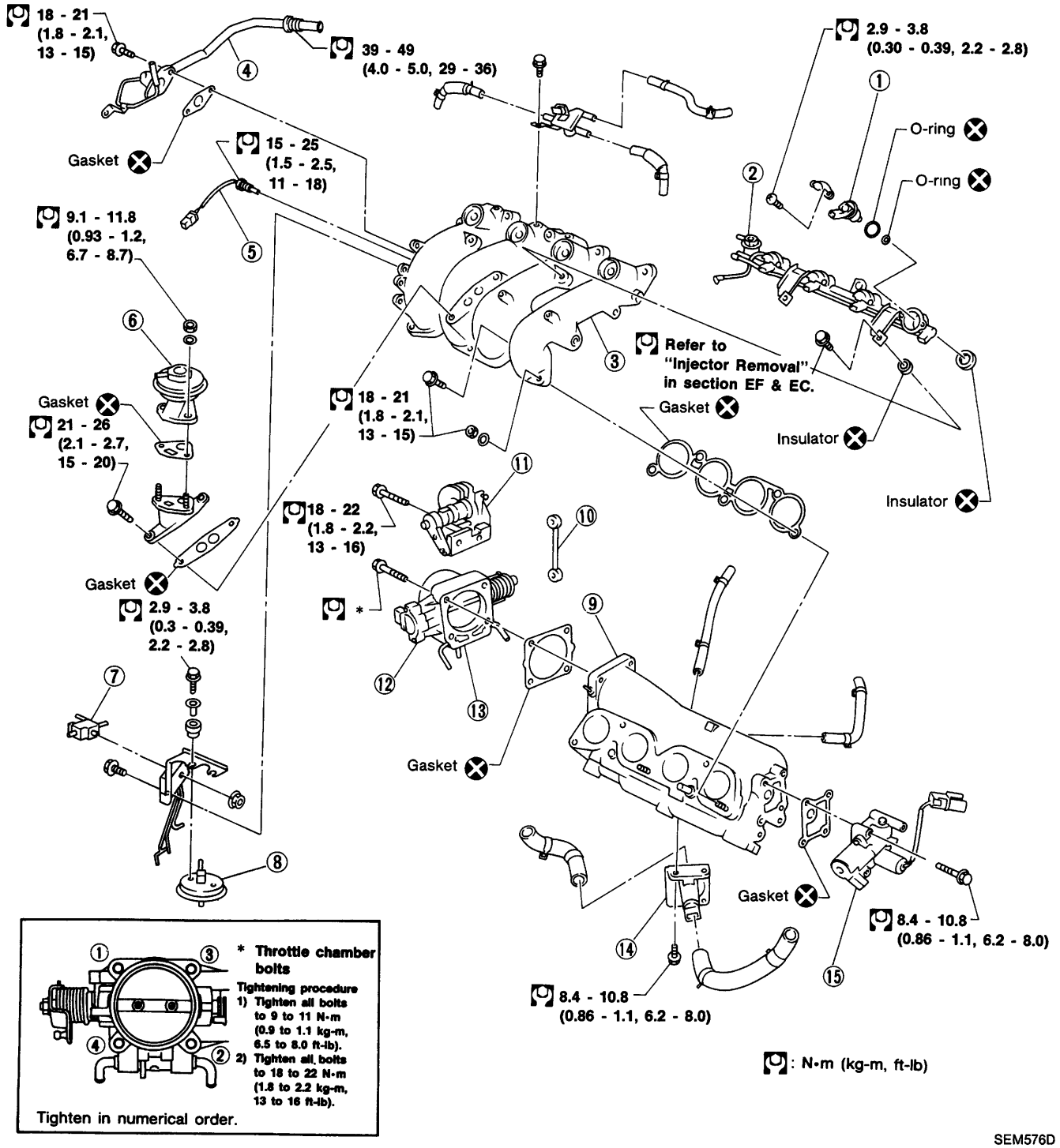
Front oil seal drift	Installing front oil seal  **A = 75 mm (2.95 in) dia.** **B = 45 mm (1.77 in) dia.**
Rear oil seal drift	Installing rear oil seal  **A = 110 mm (4.33 in) dia.** **B = 80 mm (3.15 in) dia.**

OUTER COMPONENT PARTS



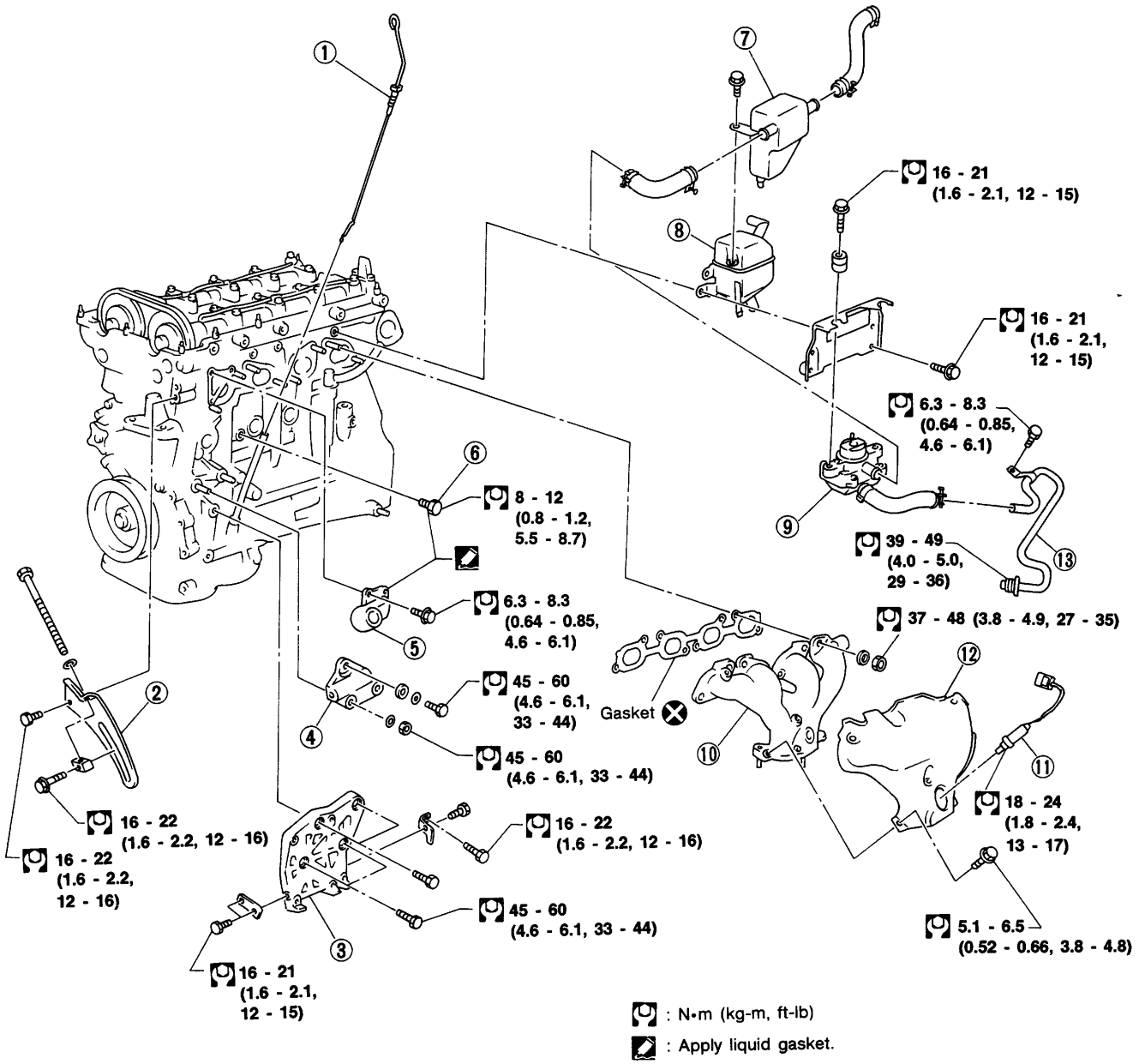
① Oil filler cap
② Rocker cover
③ P.C.V. valve
④ Ignition coil
⑤ Crank angle sensor built into distributor
⑥ Power transistor
⑦ Intake manifold supports
⑧ E.G.R. & canister control solenoid valve
⑨ Detonation sensor
⑩ Oil filter bracket
⑪ Oil catcher
⑫ Oil filter
⑬ Water inlet
⑭ Thermal transmitter
⑮ Engine temperature sensor
⑯ Thermostat housing
⑰ Air relief plug
⑱ Thermostat
⑲ Starter motor
⑳ Power steering oil pump adjusting bar
㉑ Power steering oil pump bracket

OUTER COMPONENT PARTS



SEM576D

① Injector
② Pressure regulator
③ Intake manifold
④ E.G.R. tube
⑤ Exhaust gas temperature sensor
⑥ E.G.R. control valve
⑦ A.I.V. control solenoid valve
⑧ B.P.T. valve
⑨ Intake manifold collector
⑩ Rod
⑪ Accel-drum unit
⑫ Throttle sensor
⑬ Throttle chamber
⑭ Air regulator
⑮ A.A.C. valve

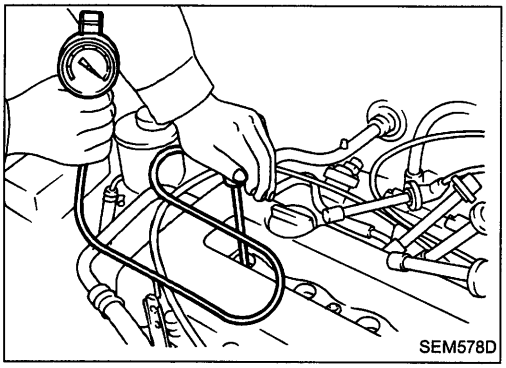


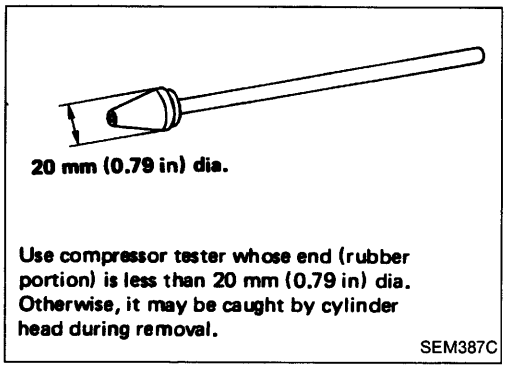
SEM577D

① Oil level gauge
② Alternator adjusting bar
③ Compressor bracket
④ Alternator bracket
⑤ Water outlet
⑥ Drain plug
⑦ Resonator
⑧ Oil separator
⑨ A.I.V.
⑩ Exhaust manifold
⑪ Exhaust gas sensor
⑫ Exhaust manifold cover
⑬ A.I.V. tube

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


20 mm (0.79 in) dia.

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

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

Standard

1,226 (12.5, 178)

Minimum

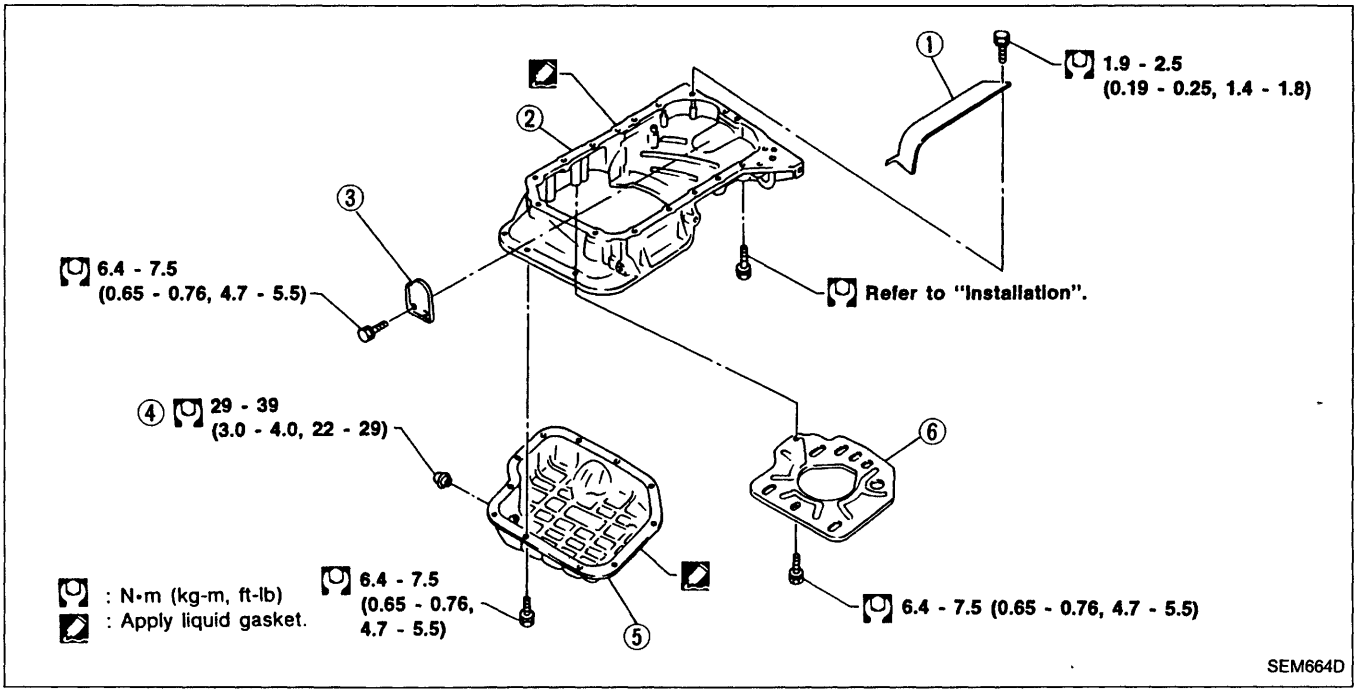
1,030 (10.5, 149)

Difference limit between cylinders

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.

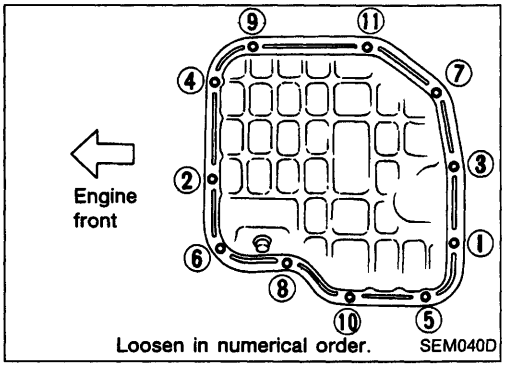
- **If adding oil helps compression, piston rings may be worn or damaged. If so, replace piston rings after checking piston.**
- **If pressure stays low, a valve may be sticking or seating improperly. Inspect and repair valve and valve seat. (Refer to S.D.S.) If valve or valve seat is damaged excessively, 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.**



① Side gallery baffle plate
② Aluminum oil pan
③ Rear cover plate
④ Drain plug
⑤ Steel oil pan
⑥ Baffle plate

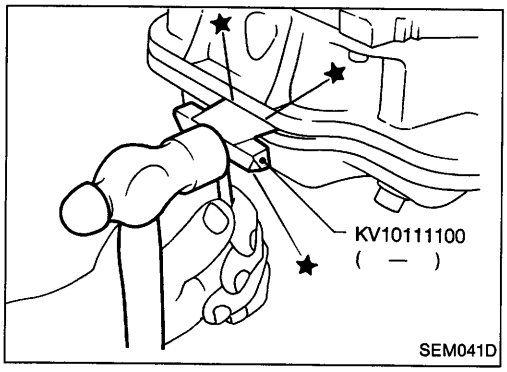
Removal

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



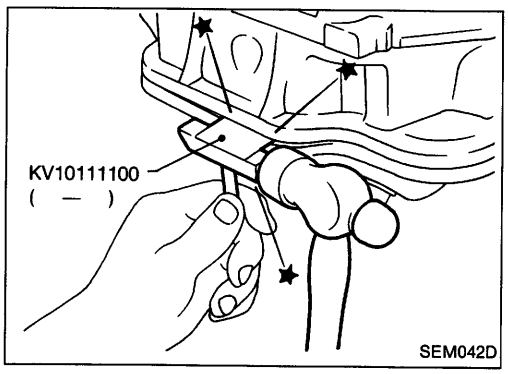
3. Remove steel oil pan bolts.

Removal (Cont'd)

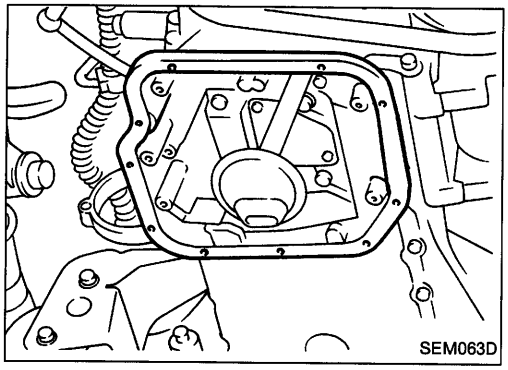


4. Remove steel oil pan.
(1) Insert Tool between aluminum oil pan and steel oil pan.

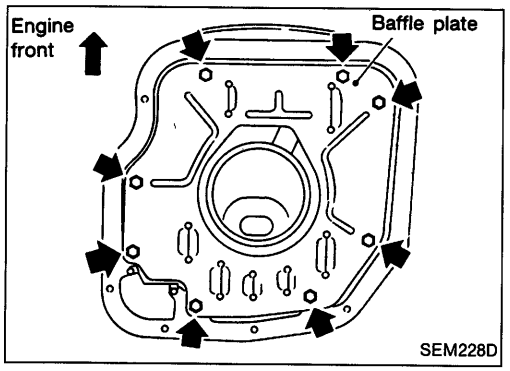
- **Be careful not to damage aluminum mating surface.**
- **Do not insert screwdriver, or oil pan flange will be deformed.**



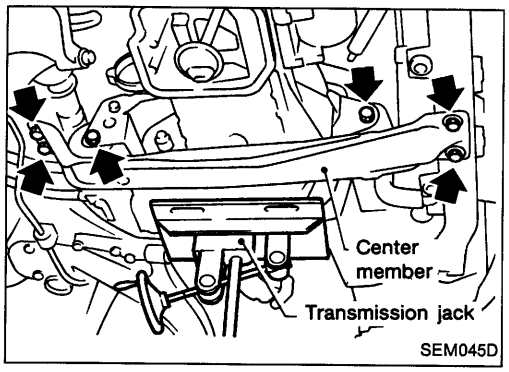
(2) Slide Tool by tapping on the side of the Tool with a hammer.



(3) Remove steel oil pan.

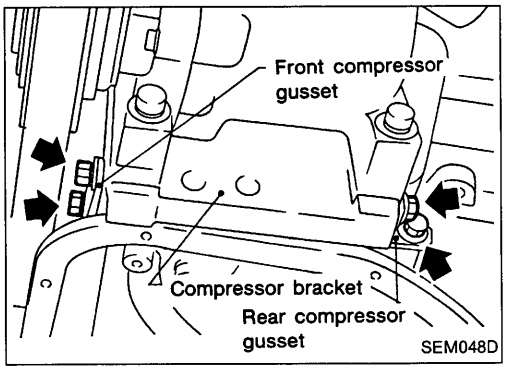


5. Remove baffle plate.

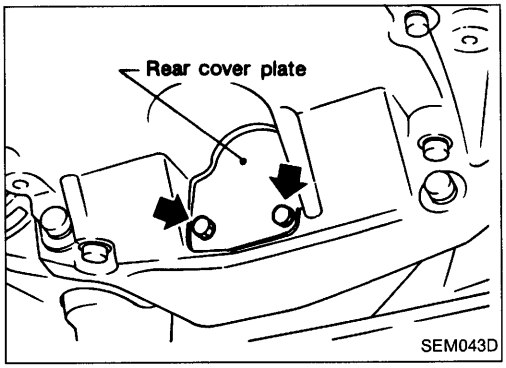


6. Remove front tube.
7. Set a suitable transmission jack under transaxle and hoist engine with engine slinger.
8. Remove center member.
9. Remove A/T shift control cable. (A/T only)

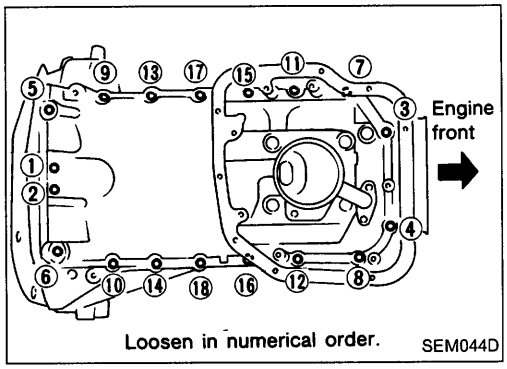
Removal (Cont'd)



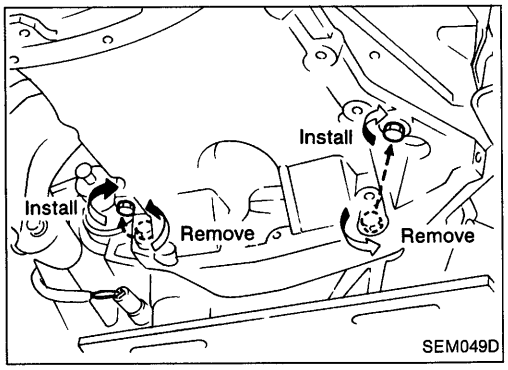
10. Remove compressor gussets.



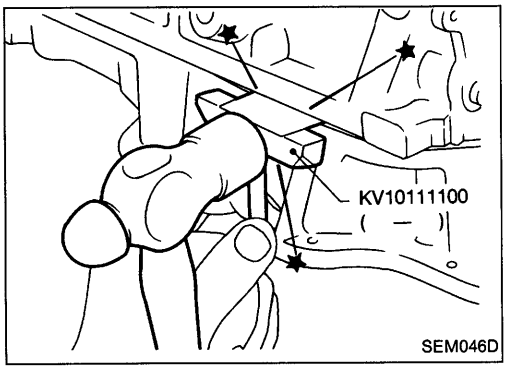
11. Remove rear cover plate.



12. Remove aluminum oil pan bolts.



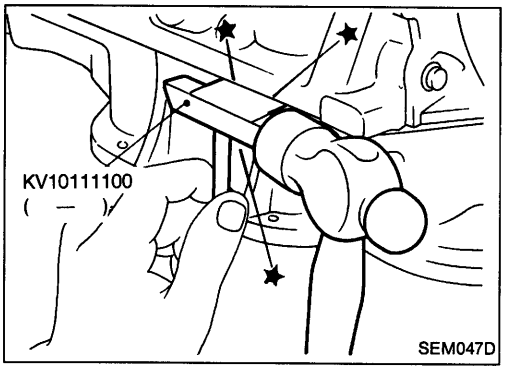
13. Remove the two engine to transaxle bolts and refit them into vacant holes as indicated. Tighten bolts to release aluminum oil pan from cylinder block.



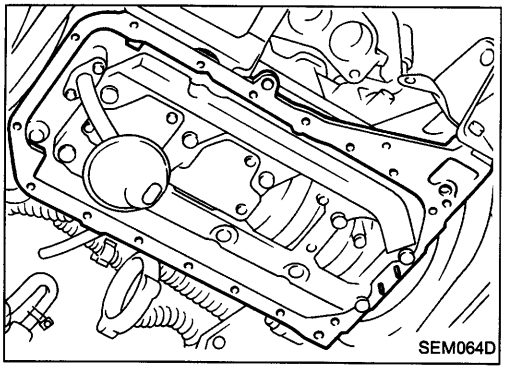
14. Remove aluminum oil pan.
(1) Insert Tool between cylinder block and aluminum oil pan.

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

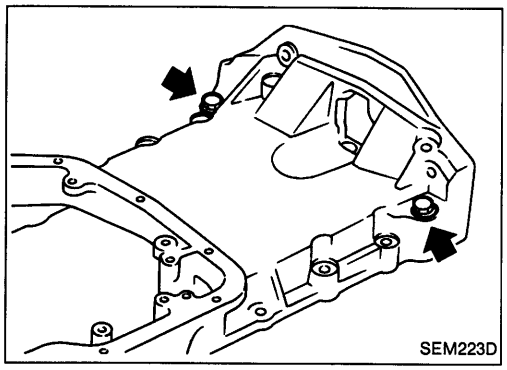
Removal (Cont'd)



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

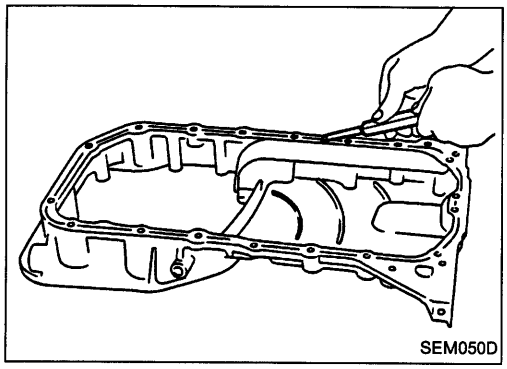


(3) Remove aluminum oil pan.



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

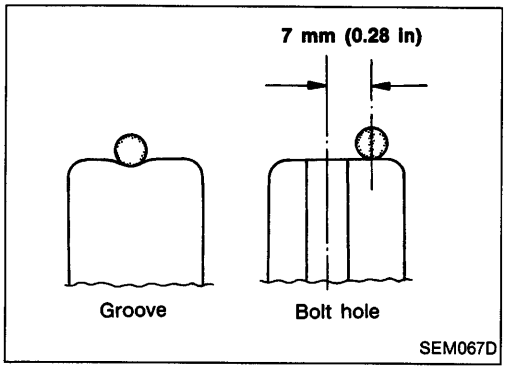
Installation



1. Install aluminum oil pan.

(1) Before installing aluminum oil pan, remove all traces of liquid gasket from mating surfaces using a scraper.

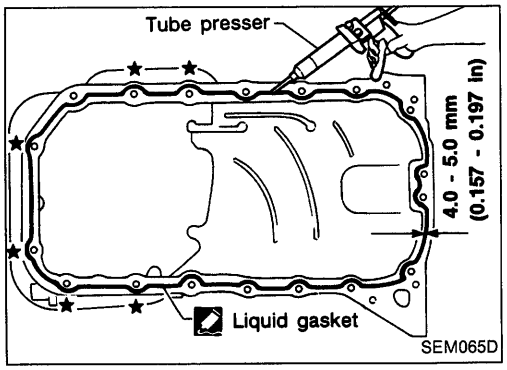
- Also remove traces of liquid gasket from mating surface of cylinder block and front cover.



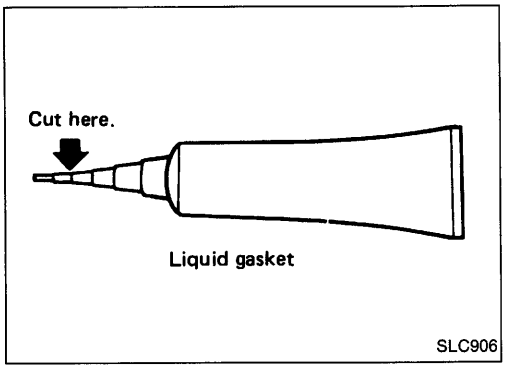
(2) Apply a continuous bead of liquid gasket to mating surface of aluminum oil pan.

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

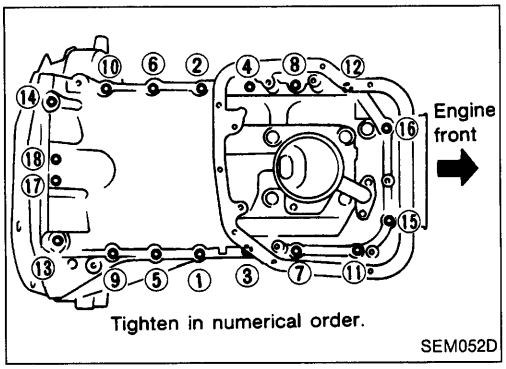
Installation (Cont'd)



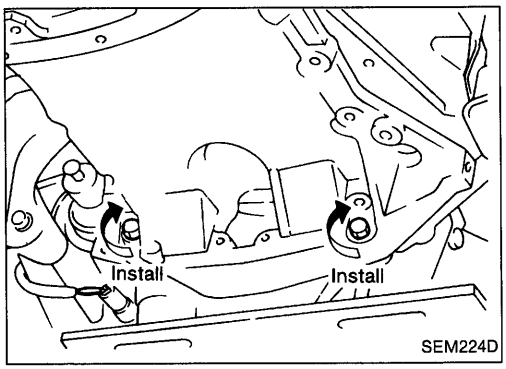
- **For areas marked with "★", apply liquid gasket to the outer side of the bolt hole.**



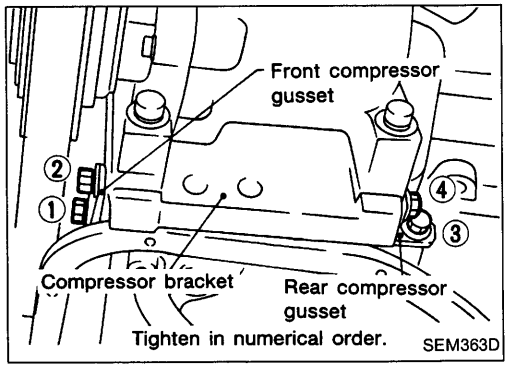
- **Be sure liquid gasket is 4.0 to 5.0 mm (0.157 to 0.197 in) wide.**
- **Attaching should be done within 5 minutes after coating.**



(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)

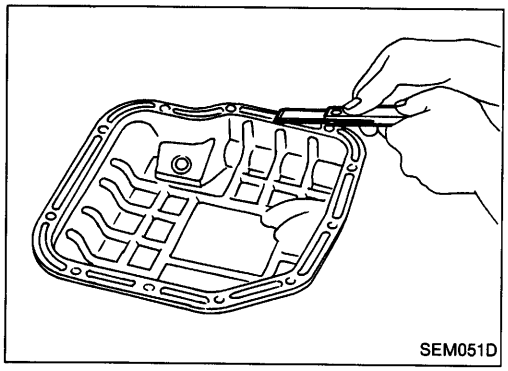


2. Install the two engine to transaxle bolts.
3. Install rear cover plate.

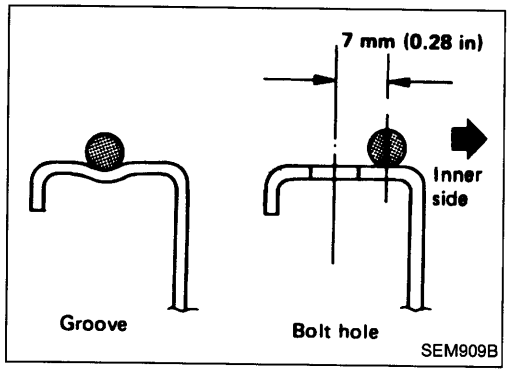


4. Install compressor gussets.
5. Install A/T shift control cable. (A/T only)
6. Install center member.
7. Install front tube.
8. Install baffle plate.

Installation (Cont'd)

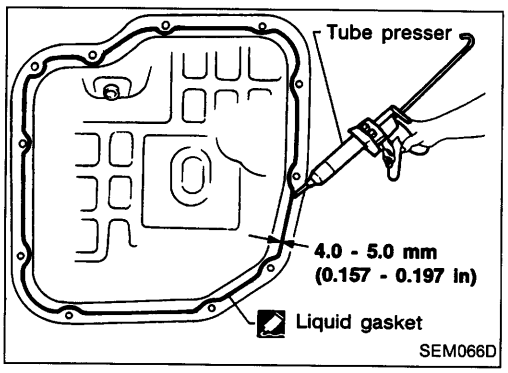

SEM051D

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.



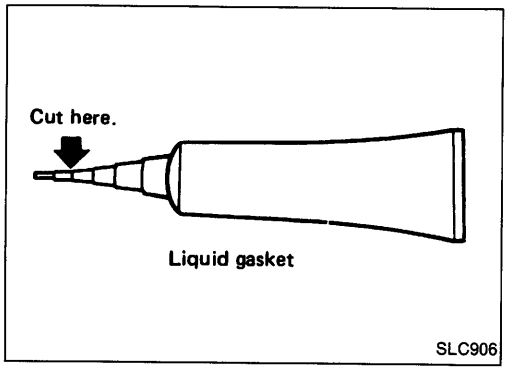
SEM909B

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

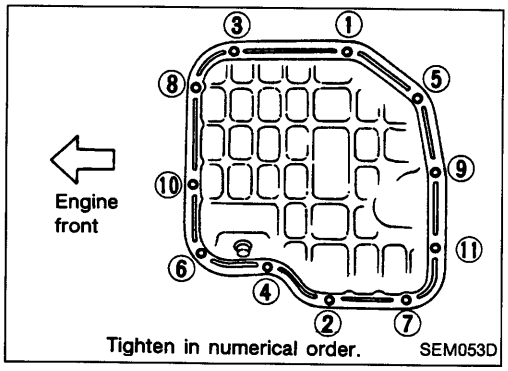


SEM066D

- **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.**

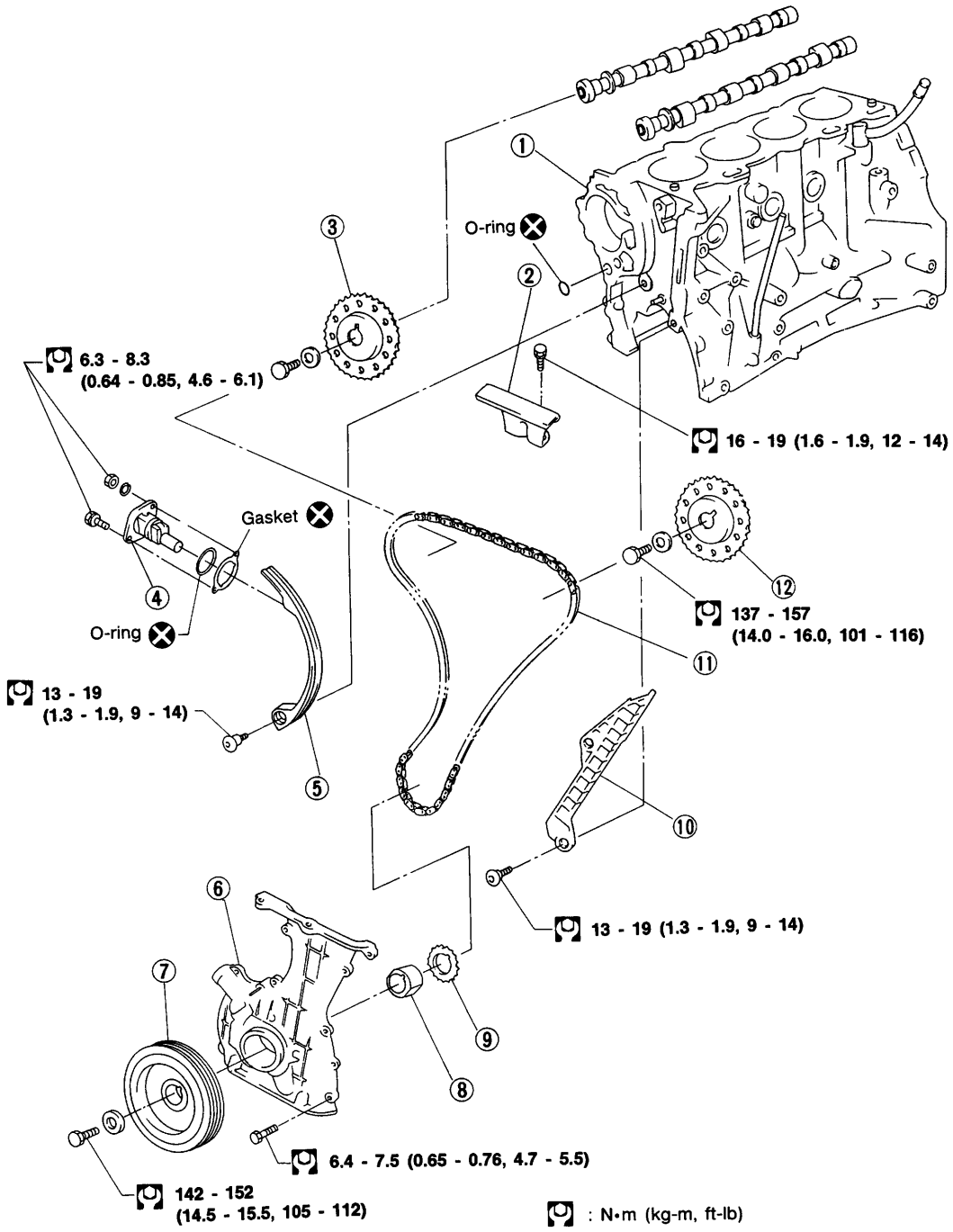


SLC906



SEM053D

(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.



SEM604D

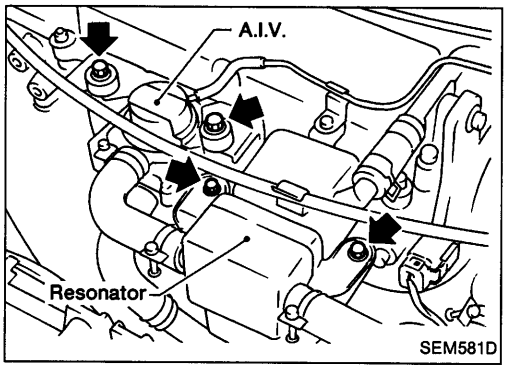
① Cylinder block
② Chain guide
③ R.H. camshaft sprocket
④ Chain tensioner
⑤ Chain guide
⑥ Front cover
⑦ Crank pulley
⑧ Oil pump spacer
⑨ Crankshaft sprocket
⑩ Chain guide
⑪ Timing chain
⑫ L.H. camshaft sprocket

CAUTION:

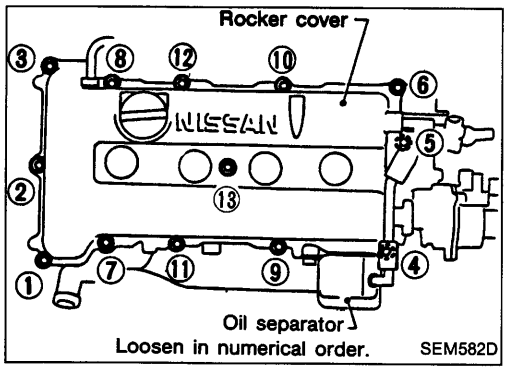
- **After removing timing chain, do not turn crankshaft and camshaft separately, or valves will strike piston heads.**
- **When installing sliding parts such as rocker arms, camshafts, chain tensioner and oil seal, be sure to apply new engine oil on their sliding surfaces.**
- **When tightening cylinder 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 drive belts and water pump pulley.
8. Remove alternator.
9. Remove power steering oil pump.
10. Remove vacuum hoses, fuel hoses, wires, harness, connectors and so on.
11. Remove all spark plugs.

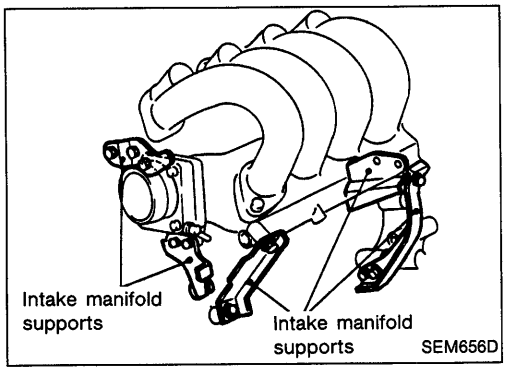


12. Remove A.I.V. and resonator.

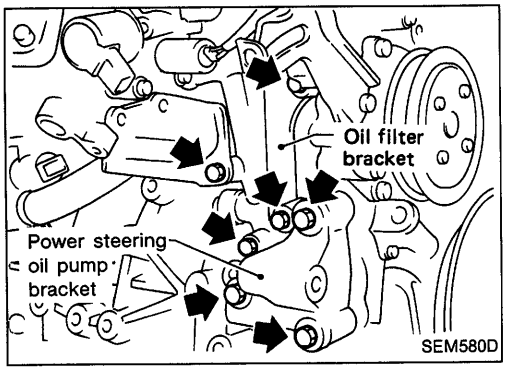


13. Remove rocker cover and oil separator.

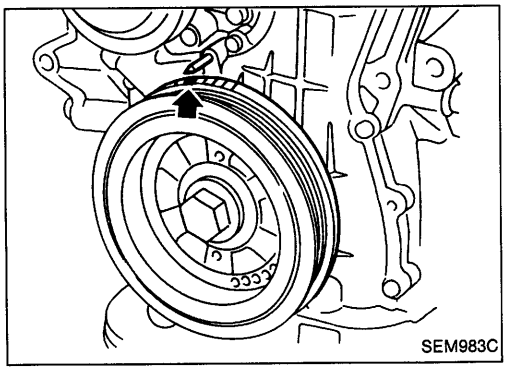
Removal (Cont'd)



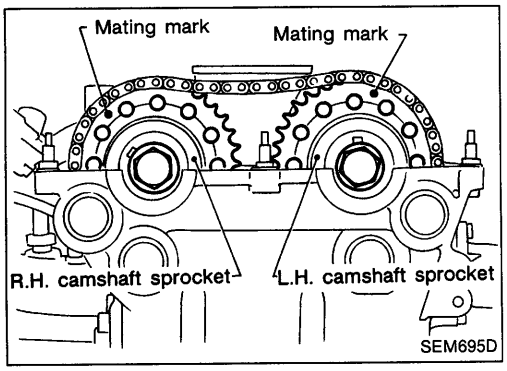
14. Remove intake manifold supports.



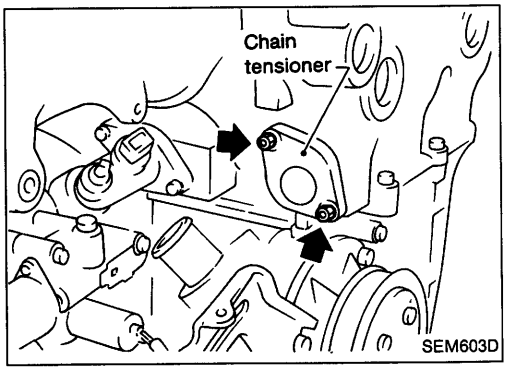
15. Remove oil filter bracket and power steering oil pump bracket.



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

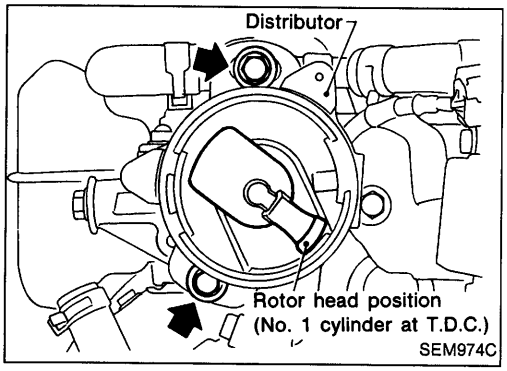


- **Rotate crankshaft until mating mark on camshaft sprocket is set at position indicated in figure at left.**



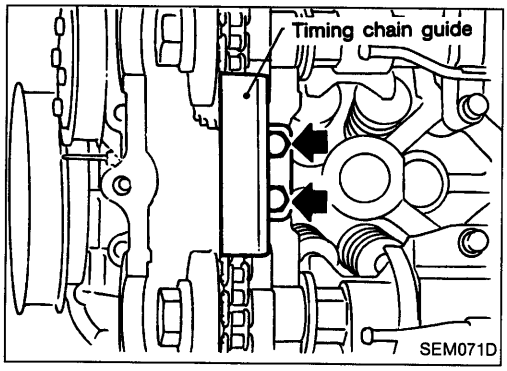
17. Remove chain tensioner.

Removal (Cont'd)

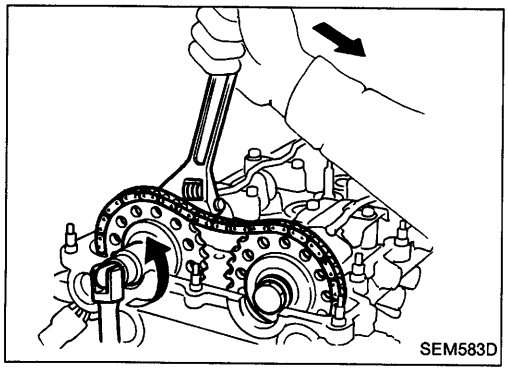


18. Remove distributor.

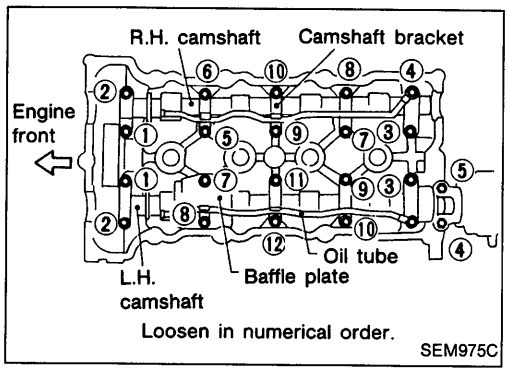
Do not turn rotor with distributor removed.



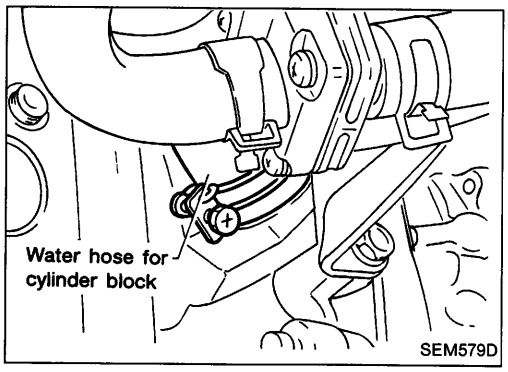
19. Remove timing chain guide.



20. Remove camshaft sprockets.

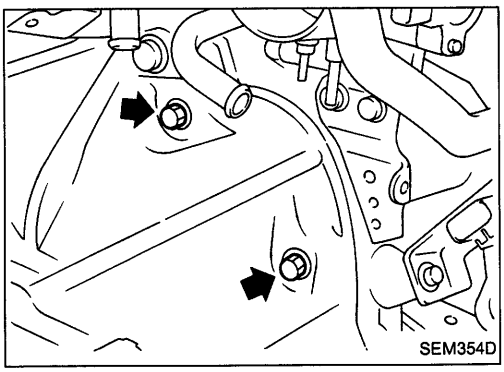


21. Remove camshafts, camshaft brackets, oil tubes and baffle plate.

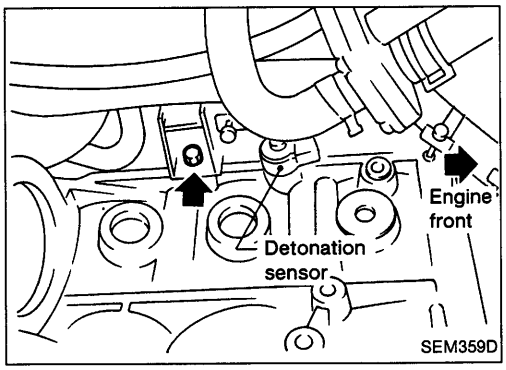


22. Remove the following water hoses.
- Water hose for cylinder block.
- Water hoses from heater.

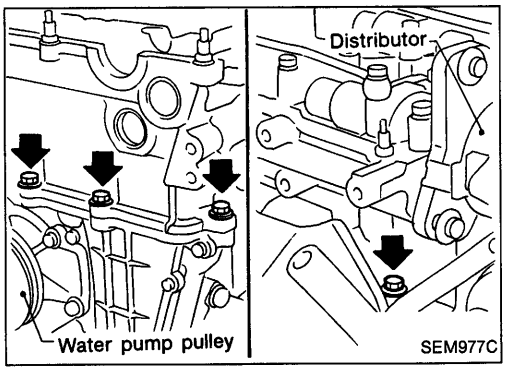
Removal (Cont'd)



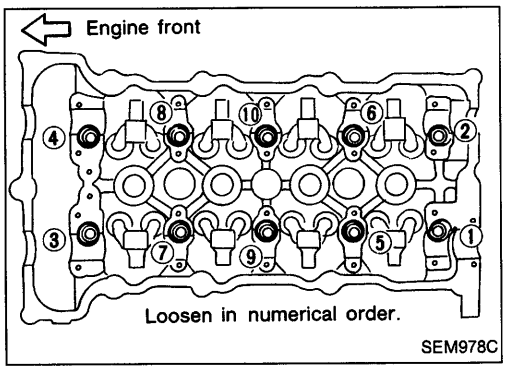
23. Remove starter motor.



24. Remove water pipe bolt.



25. Remove cylinder head outside bolts.

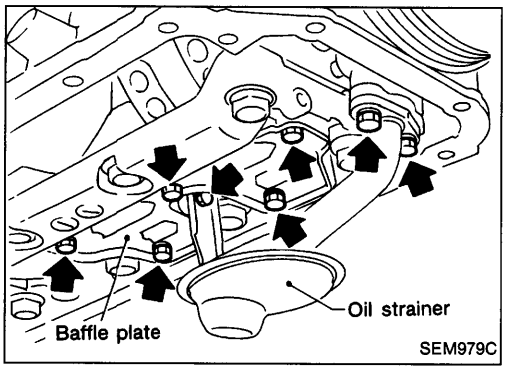


26. Remove cylinder head bolts.
- **Bolts should be loosened in two or three steps.**

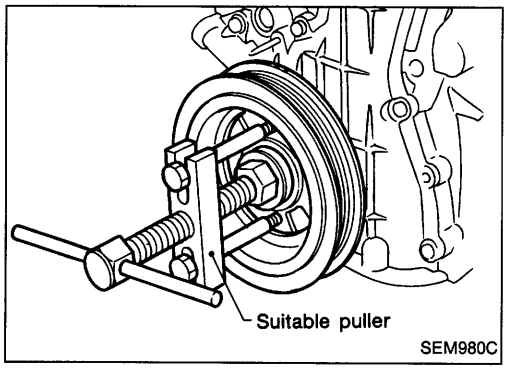
27. Remove cylinder head completely with intake and exhaust manifolds.

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

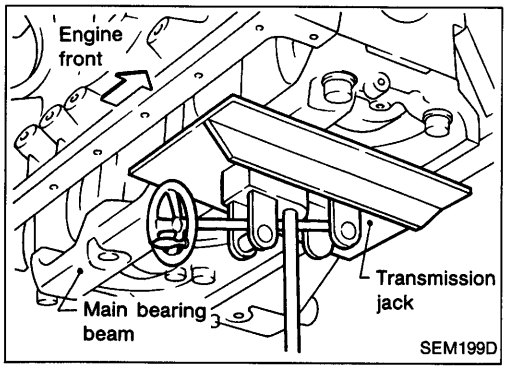
Removal (Cont'd)



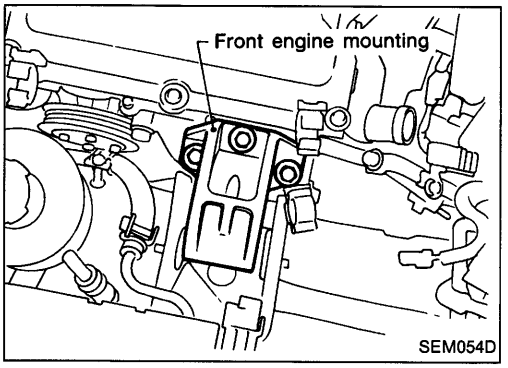
29. Remove oil strainer and baffle plate.



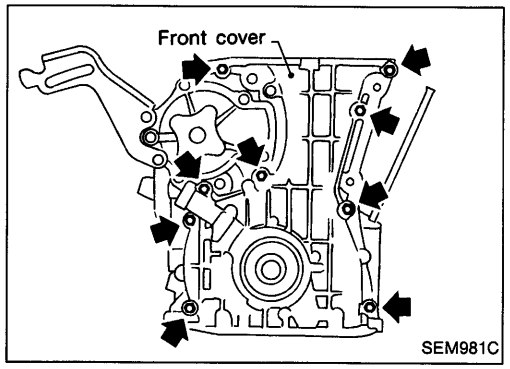
30. Remove crankshaft pulley.



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

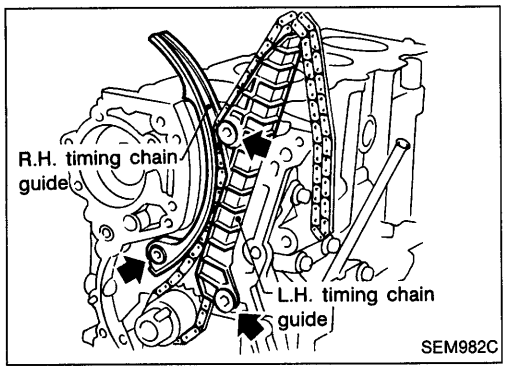


32. Remove front engine mounting.

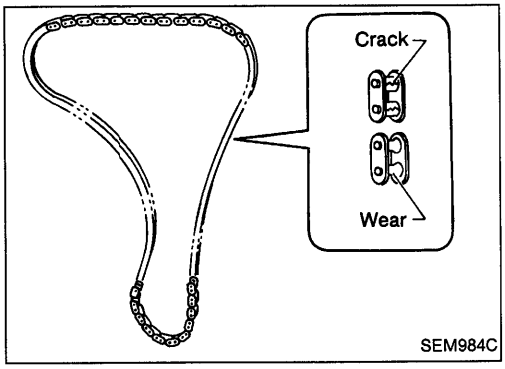


33. Remove front cover.

Removal (Cont'd)

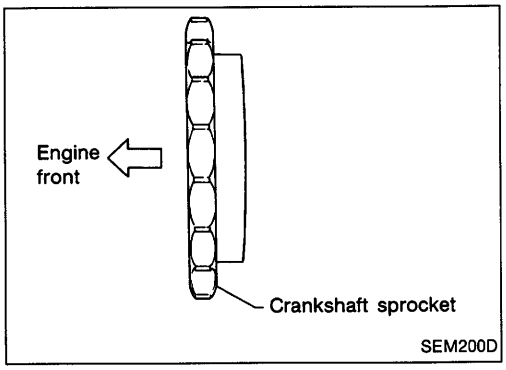


34. Remove timing chain guides and timing chain.



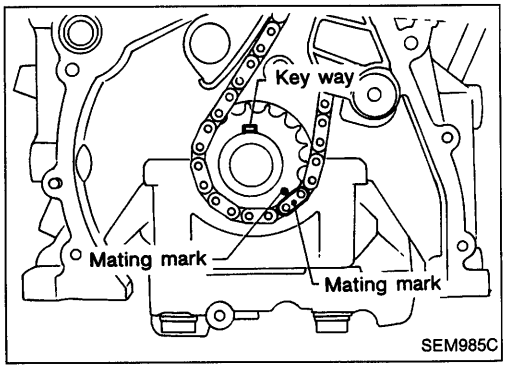
Inspection

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

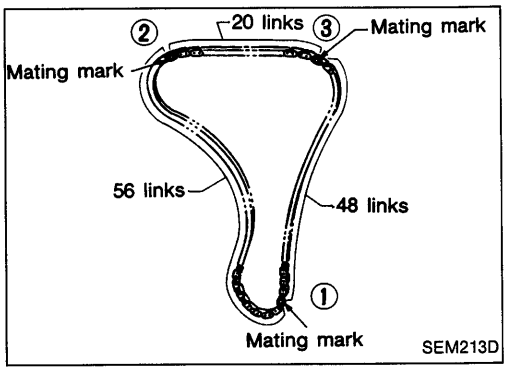


Installation

1. Install crankshaft sprocket on crankshaft.

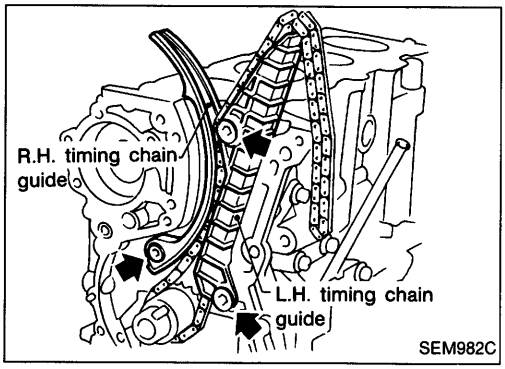


2. Position crankshaft so that No. 1 piston is set at T.D.C. (Keyway at 12 o'clock-mating mark at 4 o'clock approx.) fit timing chain to crankshaft sprocket so that mating mark is in line with mating mark on crankshaft sprocket.

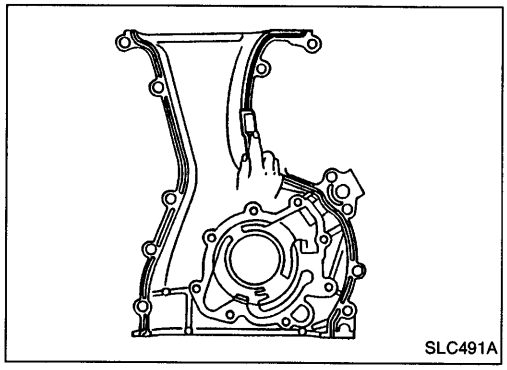


- Mating mark color on timing chain.
  ① : **Gold**
  ②, ③ : **Silver**

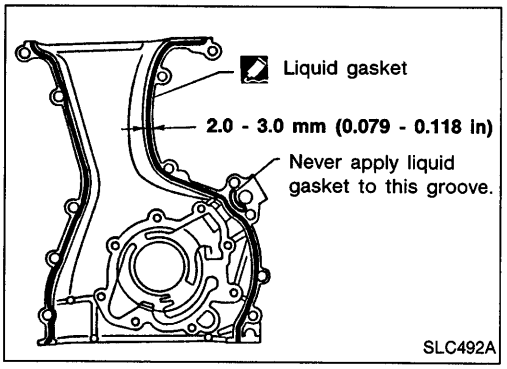
Installation (Cont'd)



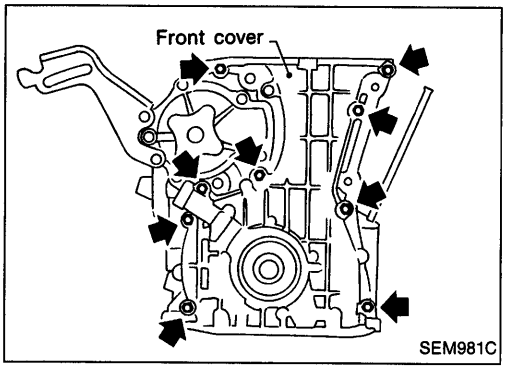
3. Install timing chain and timing chain guides.



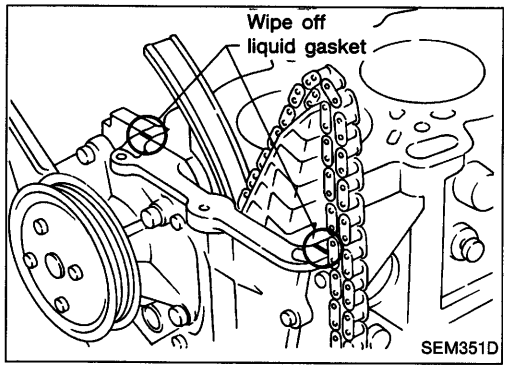
4. Before installing front cover, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.



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

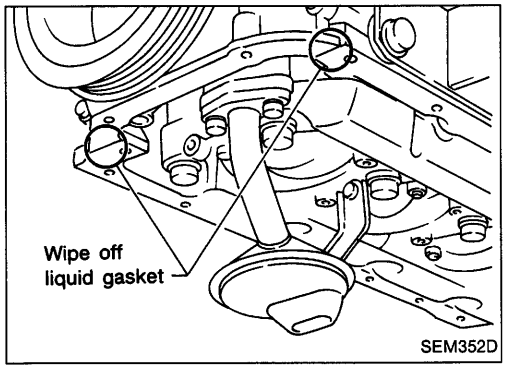


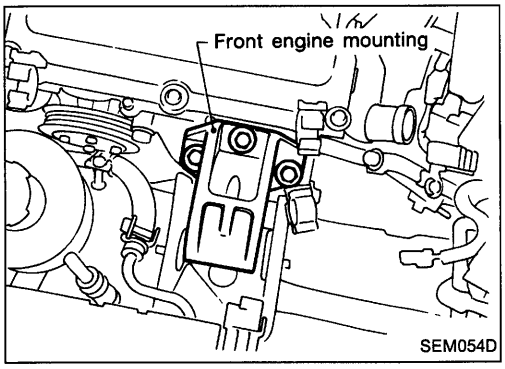
6. Install oil pump drive spacer and front cover.



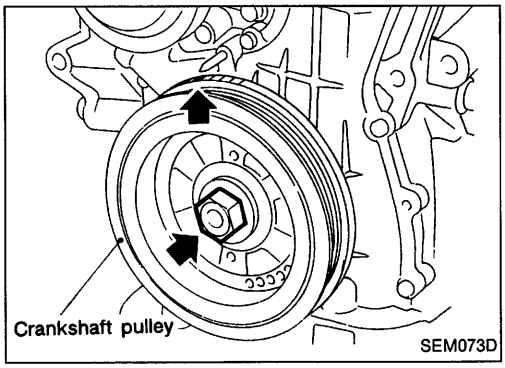
- Wipe off excessive liquid gasket.

Installation (Cont'd)

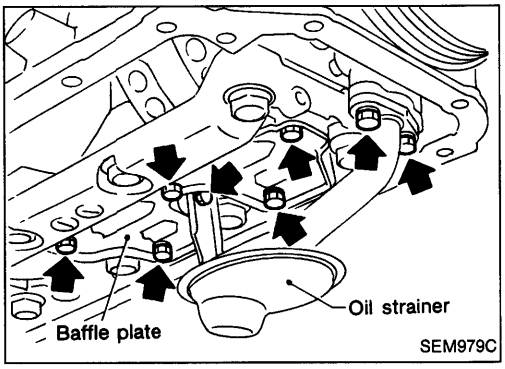




7. Install front engine mounting.



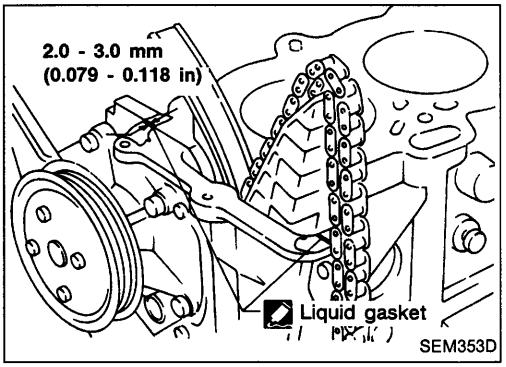
8. Install crankshaft pulley.
9. Set No. 1 piston at T.D.C. on its compression stroke.



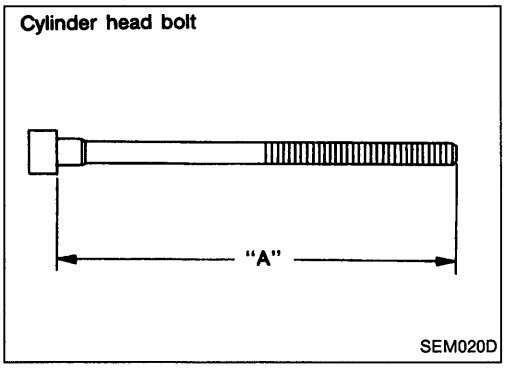
10. Install oil strainer and baffle plate.

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

Installation (Cont'd)



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

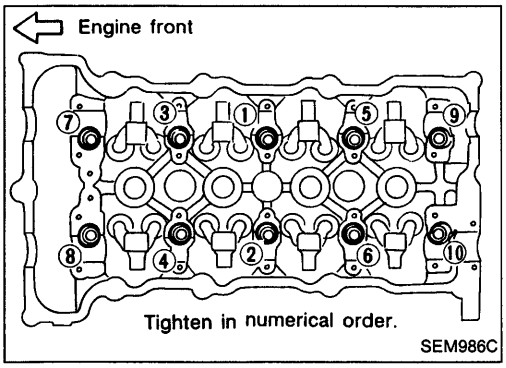


13. Install cylinder head completely with intake and exhaust manifolds.

CAUTION:

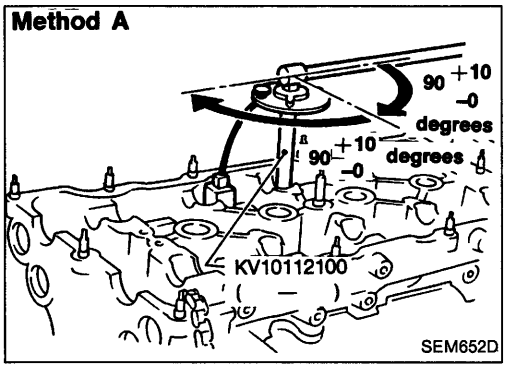
The cylinder head bolts can be reused providing dimension "A" is not exceeded.

Dimension "A":
158.2 mm (6.228 in)



- **Tightening procedure:**

ⓐ **Tighten all bolts to 39 N·m (4.0 kg-m, 29 ft-lb).**
ⓑ **Tighten all bolts to 78 N·m (8.0 kg-m, 58 ft-lb).**
ⓒ **Loosen all bolts completely.**
ⓓ **Tighten all bolts to 34 to 44 N·m (3.5 to 4.5 kg-m, 25 to 33 ft-lb).**

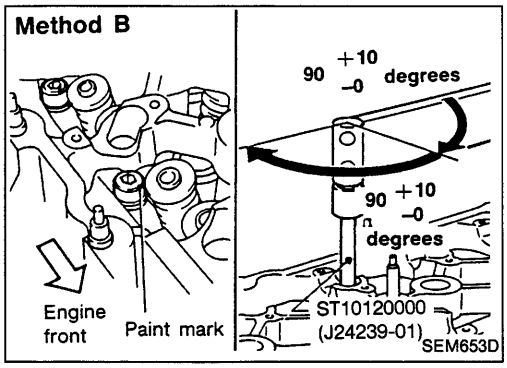


ⓔ **Method A: Turn all bolts 90 to 100 degrees clockwise with Tool or suitable angle wrench.**

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.

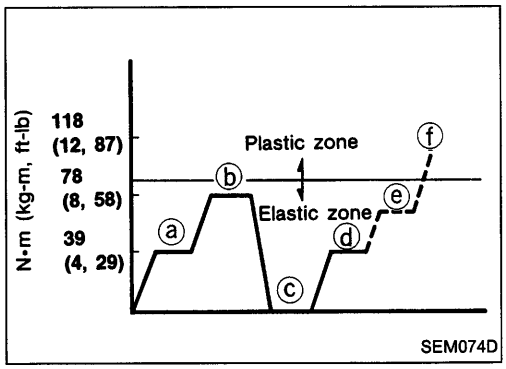
ⓕ **Turn all bolts 90 to 100 degrees clockwise.**
ⓖ **Ensure that paint mark on each bolt faces the rear of the engine. (Method B only)**

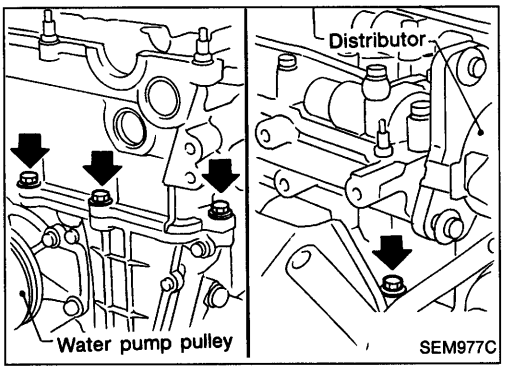
Do not turn any bolt 180 to 200 degrees clockwise all at once.



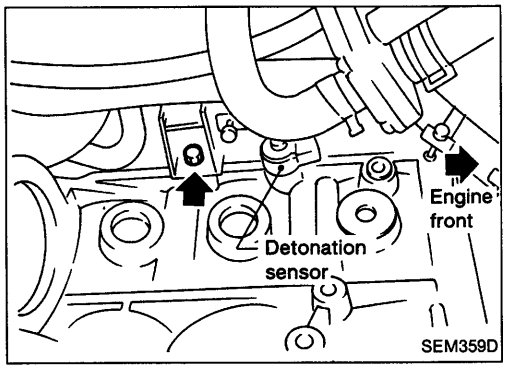
	Tightening torque N·m (kg-m, ft-lb)
ⓐ	39 (4.0, 29)
ⓑ	78 (8.0, 58)
ⓒ	0 (0, 0)
ⓓ	39 ± 5 (4.0 ± 0.5, 28.9 ± 3.6)
ⓔ	90^{+10}_{-0} degrees
ⓕ	90^{+10}_{-0} degrees

Installation (Cont'd)

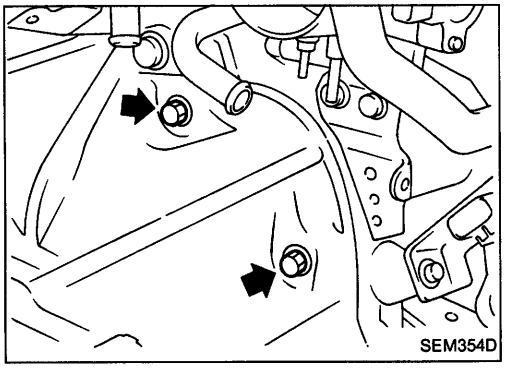




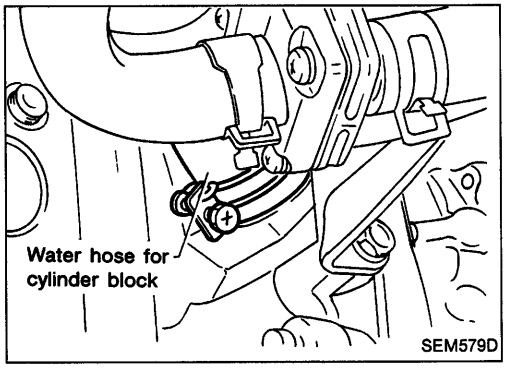
14. Install cylinder head outside bolts.



15. Install water pipe bolt.

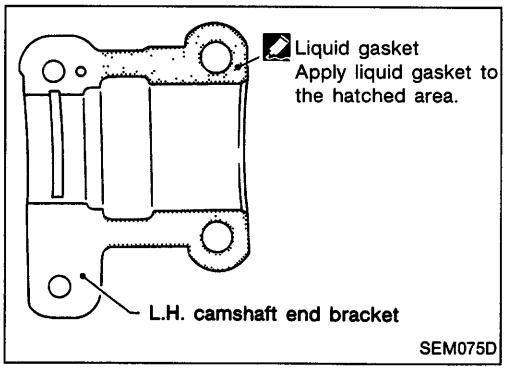


16. Install starter motor.



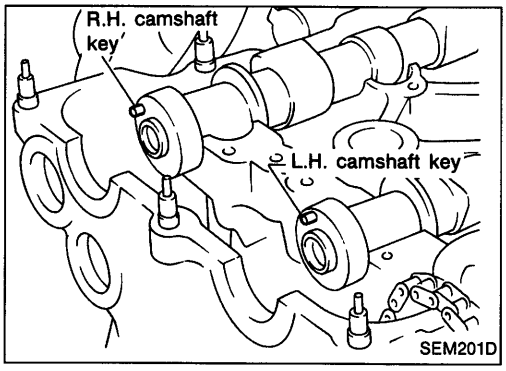
17. Install the following water hoses.
- Water hose for cylinder block.
- Water hoses for heater.

Installation (Cont'd)

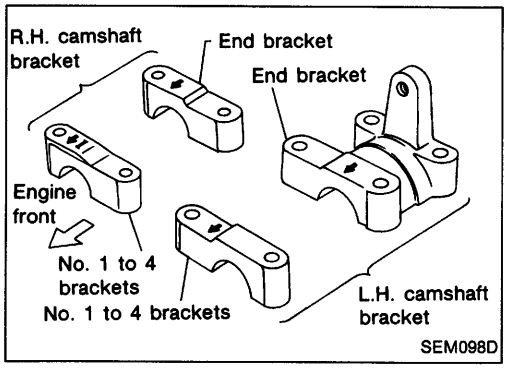


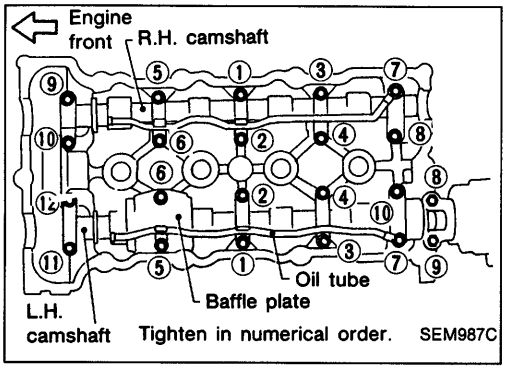
18. Before installing L.H. camshaft end bracket, remove all traces of liquid gasket from mating surface.
- Also remove traces of liquid gasket from mating surface of cylinder head.

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



20. 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





- **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:

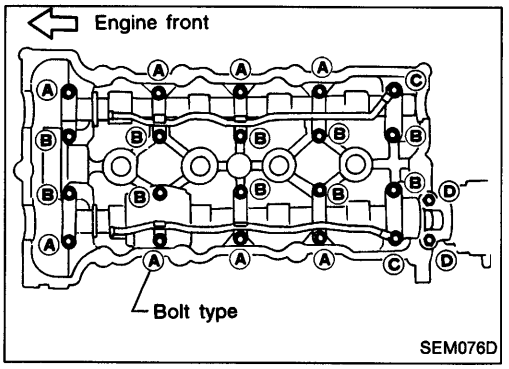
Tighten bolts in the specified order.

: 9.0 - 11.8 N·m (0.92 - 1.2 kg-m, 6.7 - 8.7 ft-lb)

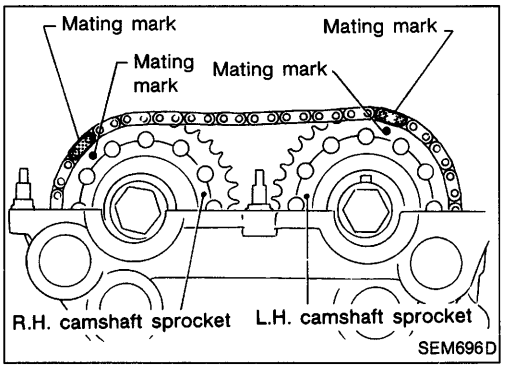
... Bolt type Ⓐ Ⓑ Ⓒ

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

... Bolt type Ⓓ

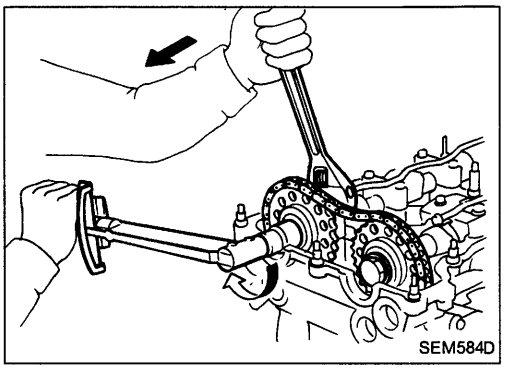


Installation (Cont'd)



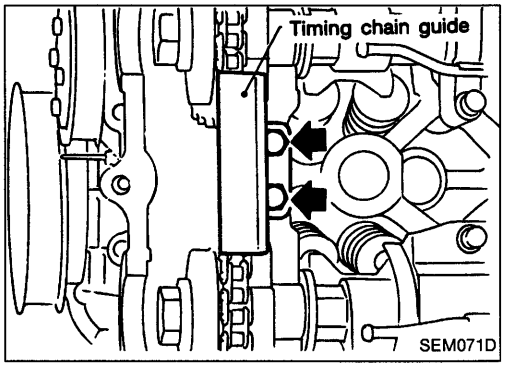
21. Install camshaft sprockets.

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

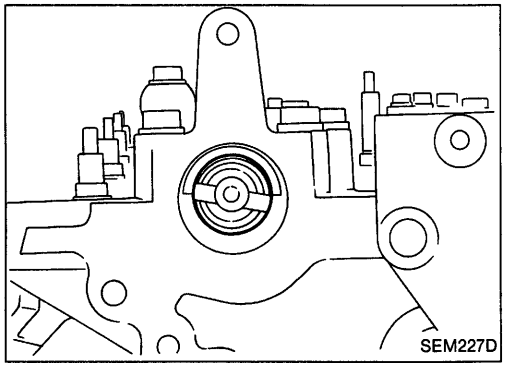


- Lock camshafts as shown in figure and tighten to specified torque.

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

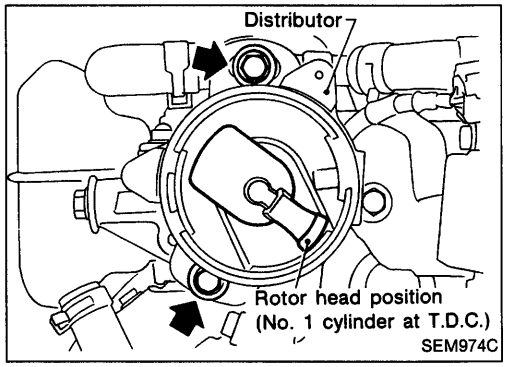


22. Install timing chain guide.



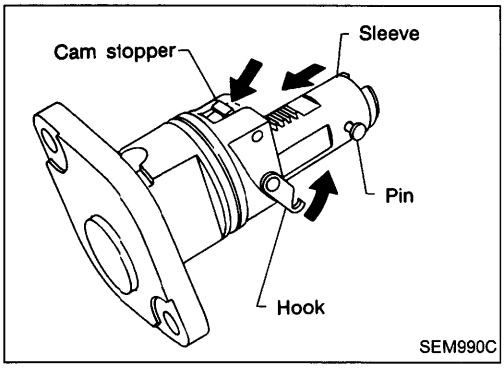
23. Install distributor.

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



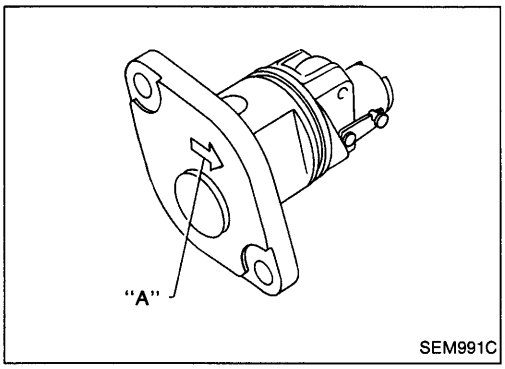
- **After installing, confirm that distributor rotor head is set as shown in figure.**

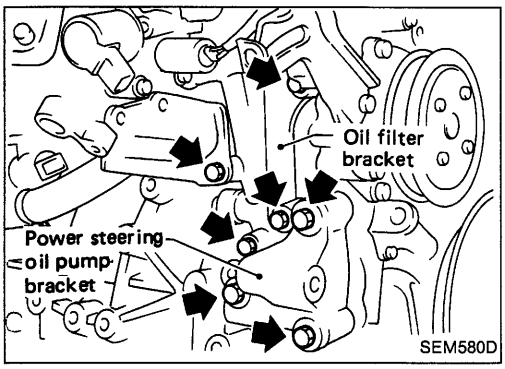
Installation (Cont'd)



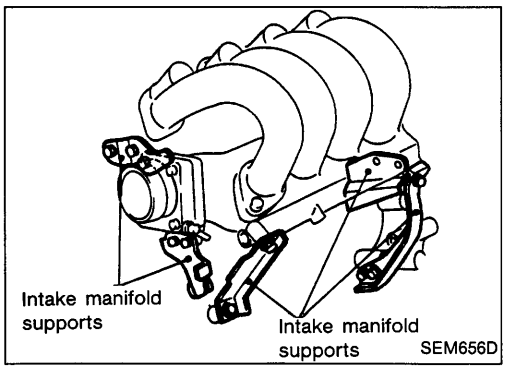
24. Install chain tensioner.

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.

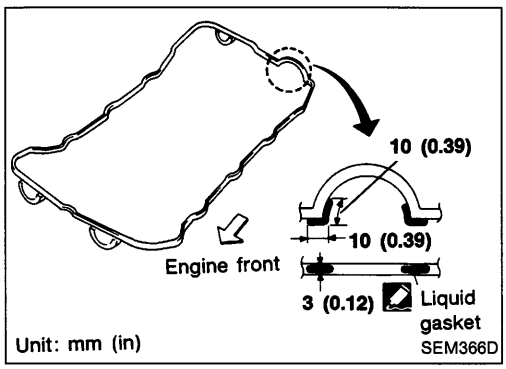




25. Install oil filter bracket and power steering oil pump bracket.



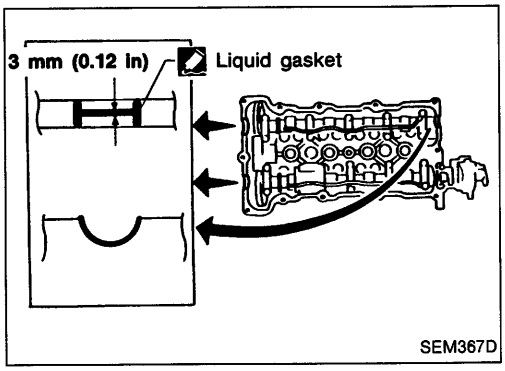
26. Install intake manifold supports.

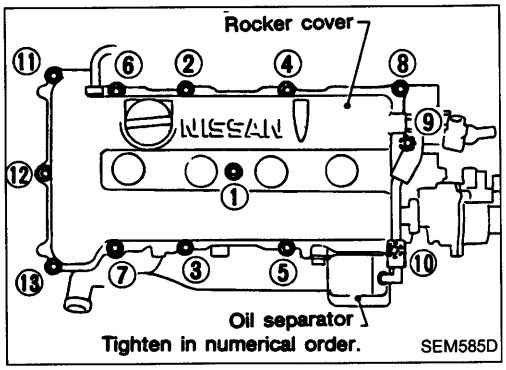


27. Before installing rocker cover, remove all traces of liquid gasket from mating surface of rocker cover gasket to cylinder head.
28. Apply a continuous bead of liquid gasket to mating surface of rocker cover gasket and cylinder head.

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

Installation (Cont'd)



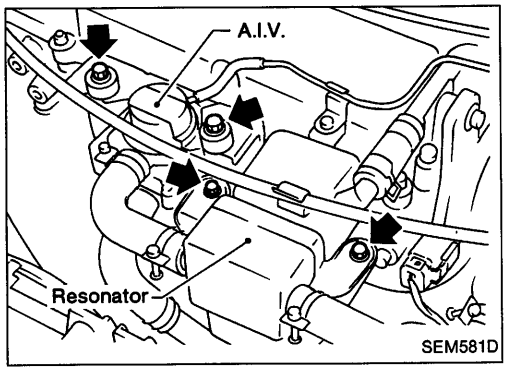


29. Install rocker cover and oil separator.

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).

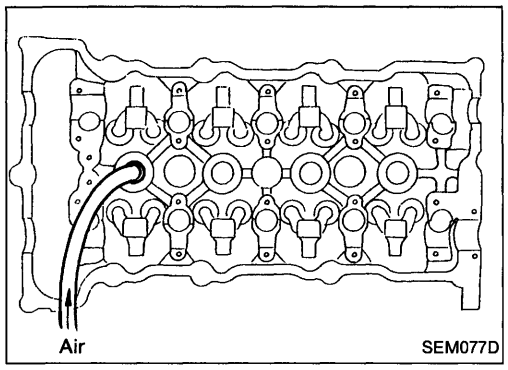


30. Install A.I.V. and resonator.

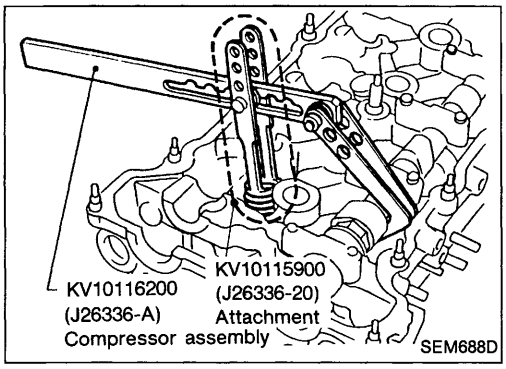
31. Refit spark plugs and leads.
32. Install vacuum hoses, fuel hoses, wires, harness, connectors and so on.
33. Install power steering oil pump.
34. Install alternator.
35. Install water pump pulley and drive belts.
36. Refit air duct to intake manifold.
37. Install radiator.
38. Refit hoses and refill with coolant.
    Refer to MA section.
39. Install engine side cover and front R.H. wheel.
40. 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.

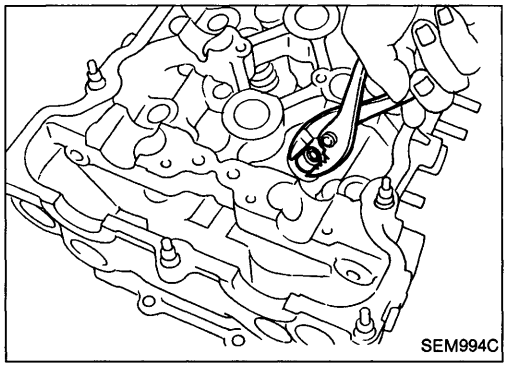


5. Install air hose adapter into spark plug hole and apply air pressure to hold valves in place. Apply a pressure of 490 kPa (5 kg/cm^2, 71 psi).
6. Remove rocker arm, rocker arm guide and shim.

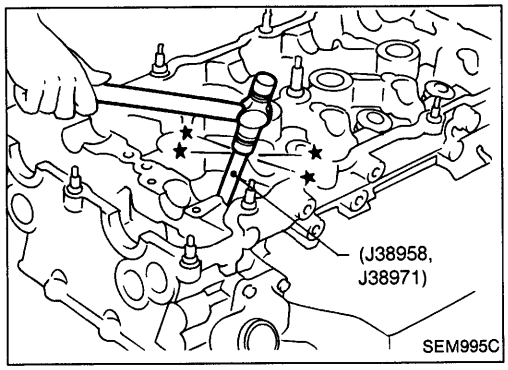


7. Remove valve spring with Tool.

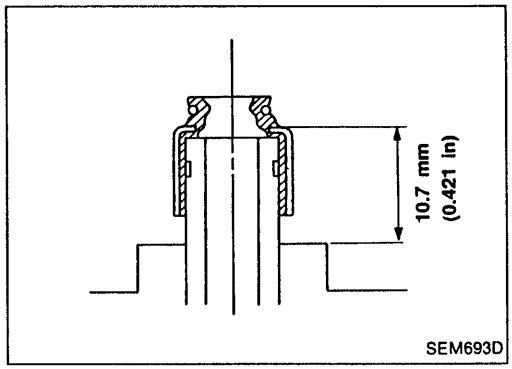
Piston concerned should be set at T.D.C. to prevent valve from falling.



8. Remove valve oil seal.

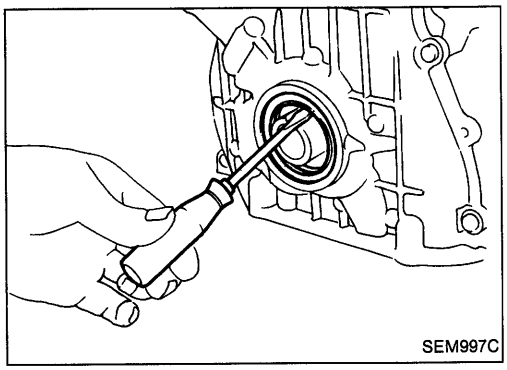


9. Apply engine oil to new valve oil seal and install it with Tool.



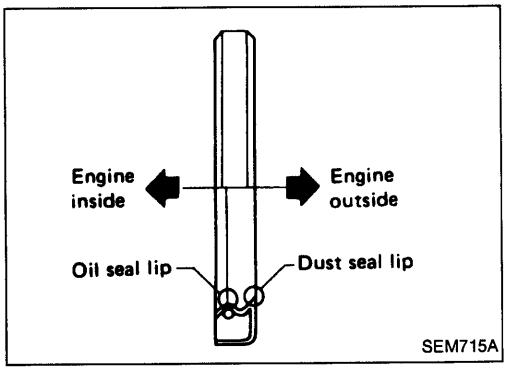
FRONT OIL SEAL

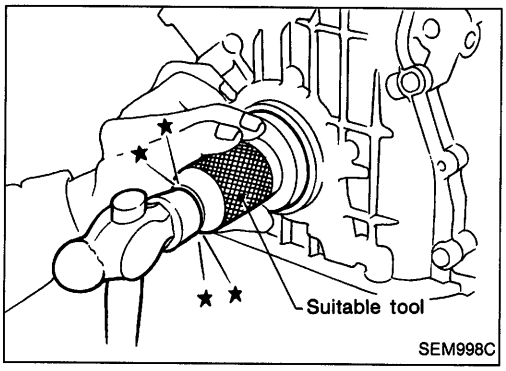
1. Remove the following parts:
- Engine under cover
- Front R.H. wheel and engine side cover
- Drive belts
- Crankshaft pulley



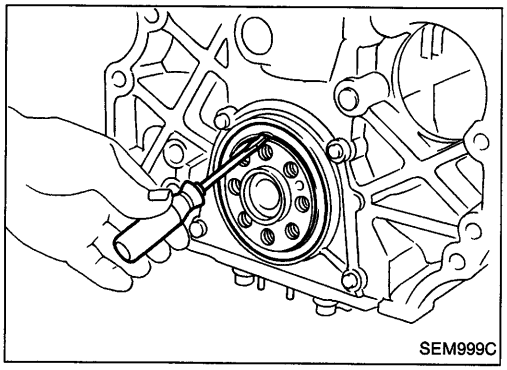
2. Remove front oil seal.

Be careful not to scratch front cover.





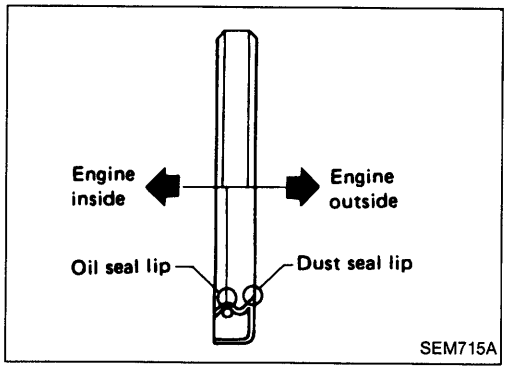
3. Apply engine oil to new oil seal and install it using a suitable tool.

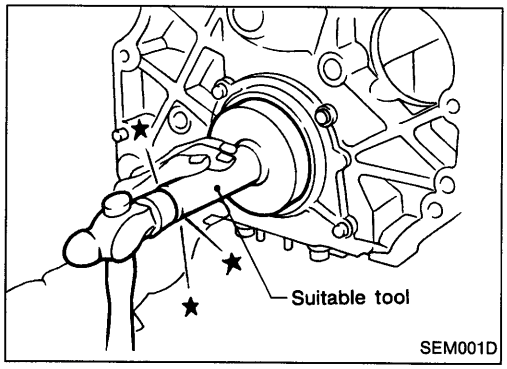


REAR OIL SEAL

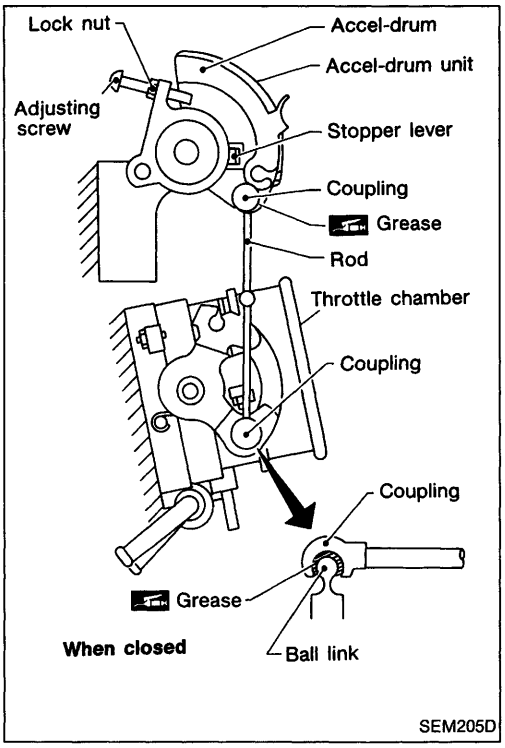
1. Remove transaxle. (Refer to MT or AT section.)
2. Remove flywheel or drive plate.
3. Remove rear oil seal.

Be careful not to scratch rear oil seal retainer.





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



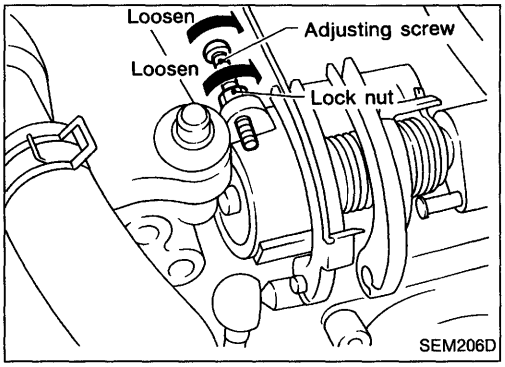
Adjust accel-drum unit whenever any of the following parts (new or old) are installed:

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

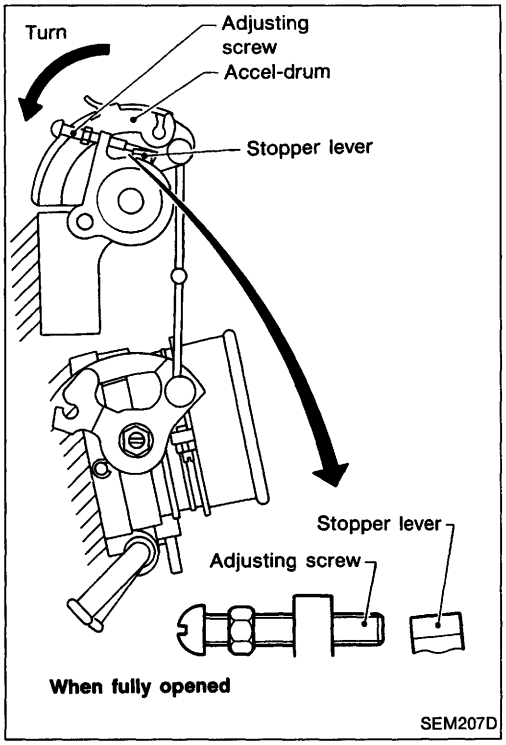
1. Install accel-drum unit and throttle chamber.
2. Apply grease all over the inside of the rod couplings.

Use genuine Nissan grease or equivalent.

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

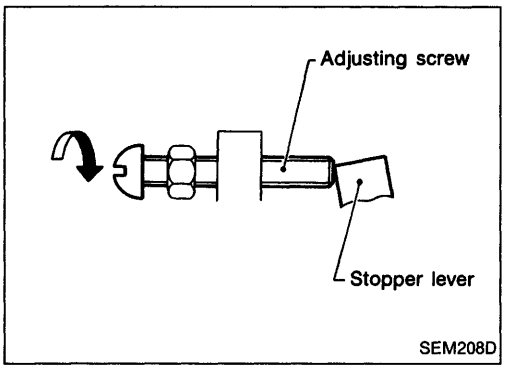


4. Loosen lock nut.
5. Loosen adjusting screw enough.

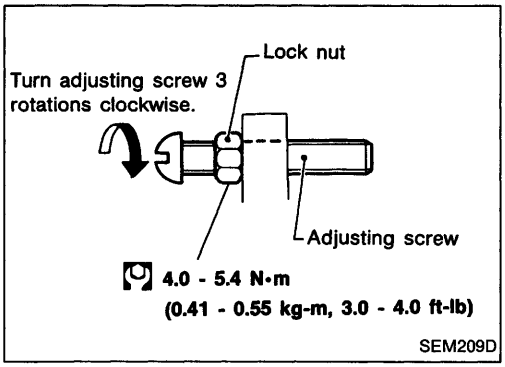


6. Manually turn accel-drum until throttle valve is fully open.

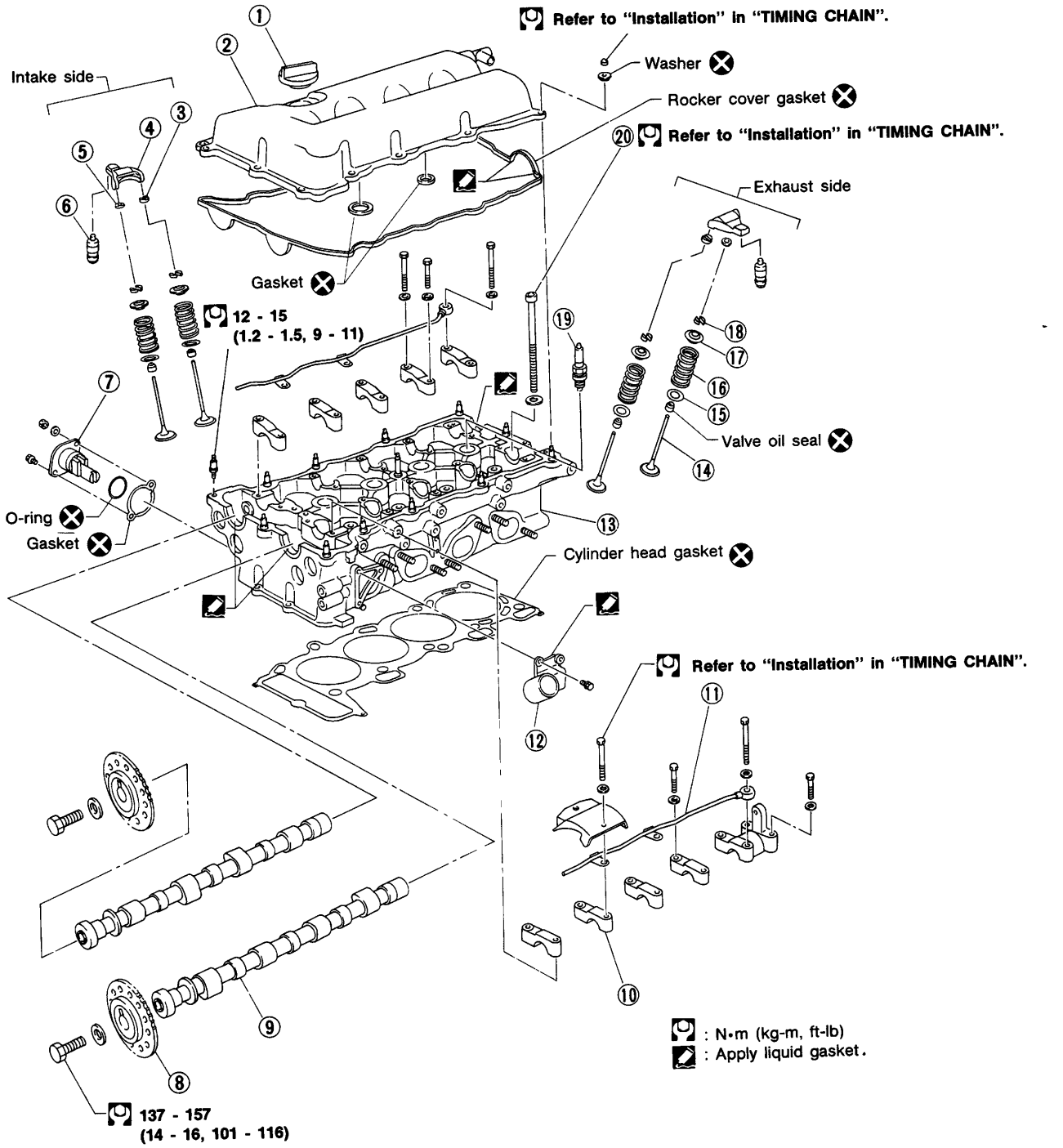
- Check that stopper lever is not touching adjusting screw. If it is, loosen adjusting screw to maintain clearance between the two.



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.

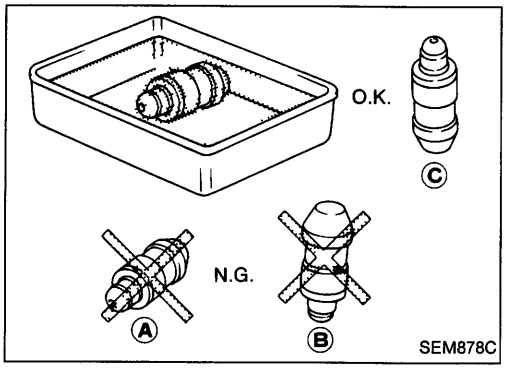


SEM605D

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

CAUTION:

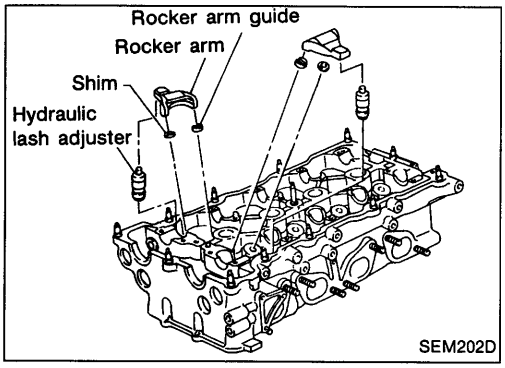
- **When installing sliding parts such as rocker arms, camshaft and oil seal, be sure to apply new engine oil on their sliding surfaces.**
- **When tightening cylinder head bolts, camshaft sprocket bolts and camshaft bracket bolts, apply new engine oil to thread portions and seat surfaces of bolts.**



- **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

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

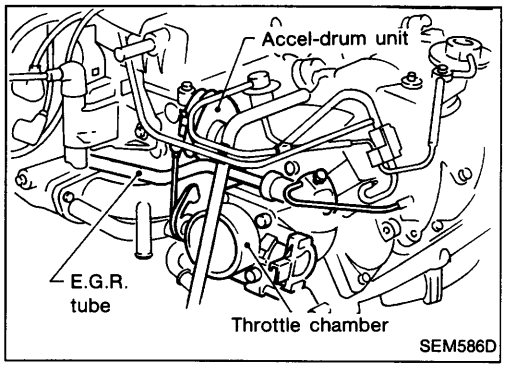


Disassembly

1. Remove rocker arms, shims, rocker arm guides and hydraulic lash adjusters from cylinder head.

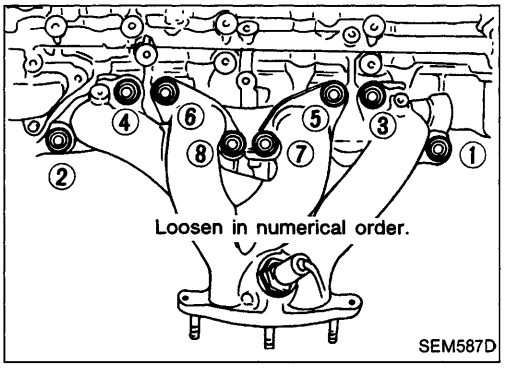
CAUTION:

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

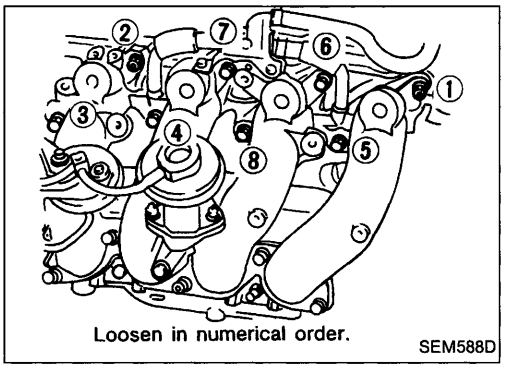


2. Remove throttle chamber with accel-drum unit.
3. Remove E.G.R. tube.

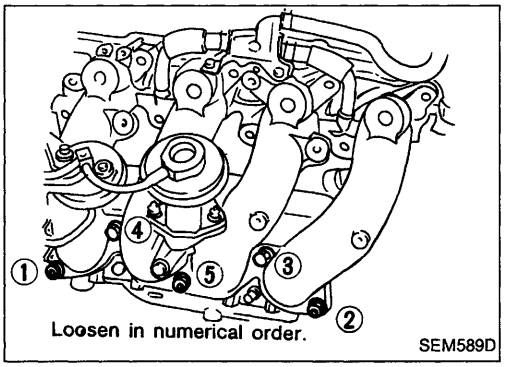
Disassembly (Cont'd)



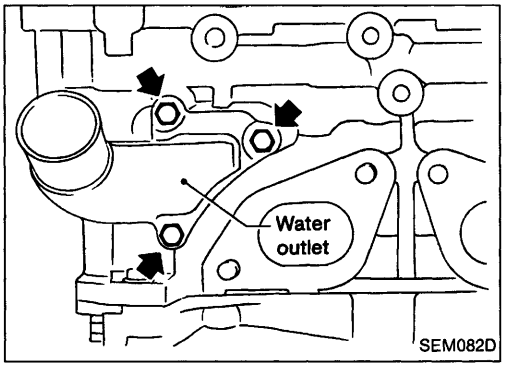
4. Remove exhaust manifold cover.
5. Remove exhaust manifold.



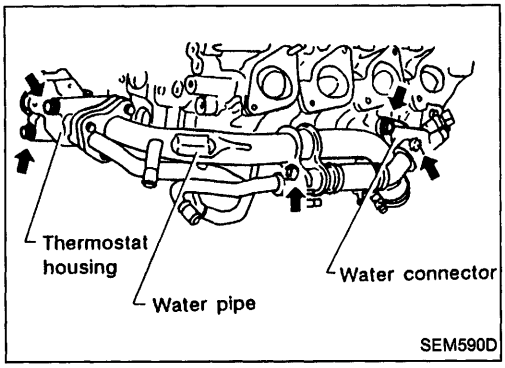
6. Remove fuel tube assembly.
   Refer to "Injector Removal and Installation" in EF & EC section.
7. Remove intake manifold.



8. Remove intake manifold collector from intake manifold.

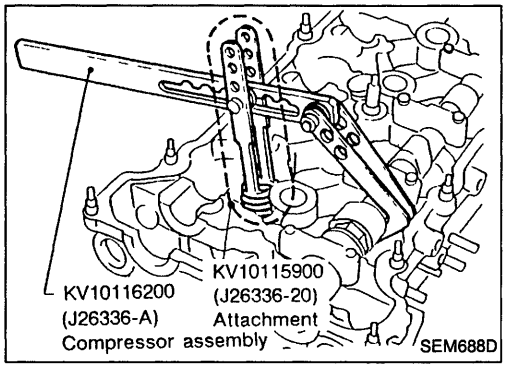


9. Remove water outlet.

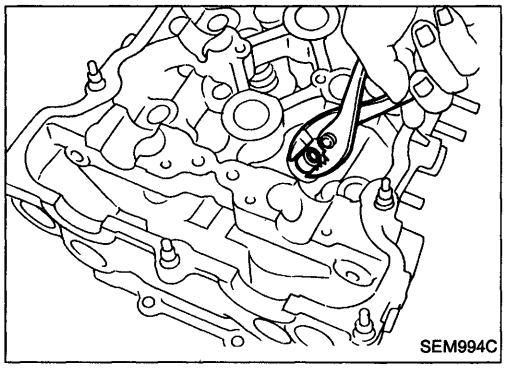


10. Remove water connector.
11. Remove thermostat housing with water pipe.

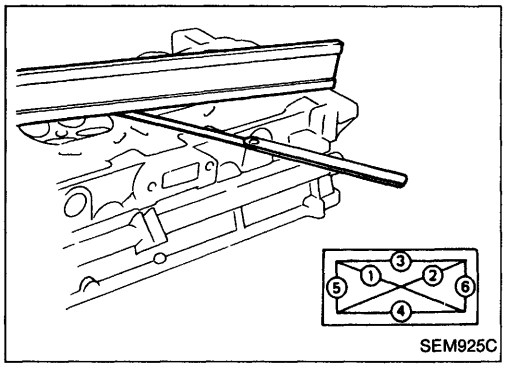
Disassembly (Cont'd)



12. Remove valve components with Tool.



13. 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.

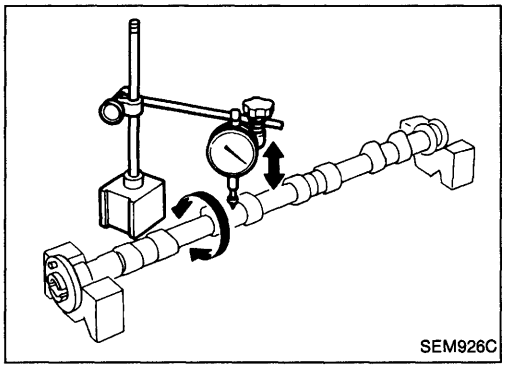
Nominal cylinder head height:

136.9 - 137.1 mm (5.390 - 5.398 in)

CAMSHAFT VISUAL CHECK

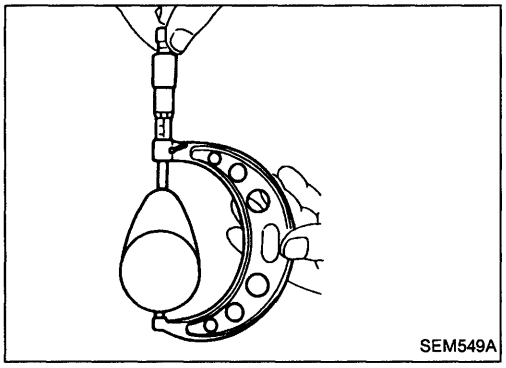
Check camshaft for scratches, seizure and wear.

Inspection (Cont'd)


SEM926C

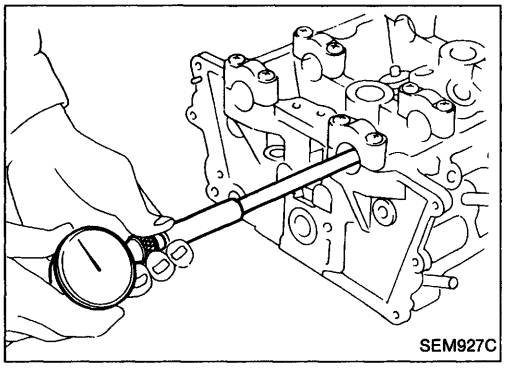
CAMSHAFT RUNOUT

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.


SEM549A

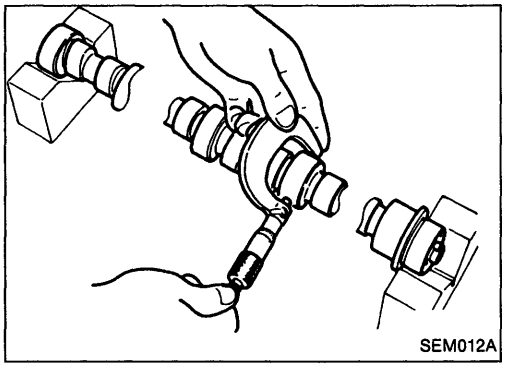
CAMSHAFT CAM HEIGHT

1. Measure camshaft cam height.
   Standard cam height:
   Intake
   38.408 - 38.598 mm (1.5121 - 1.5196 in)
   Exhaust
   37.920 - 38.110 mm (1.4929 - 1.5004 in)
   Cam wear limit:
   Intake & Exhaust
   0.2 mm (0.008 in)
2. If wear is beyond the limit, replace camshaft.

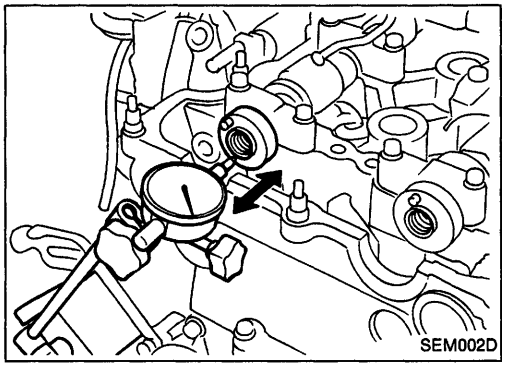

SEM927C

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

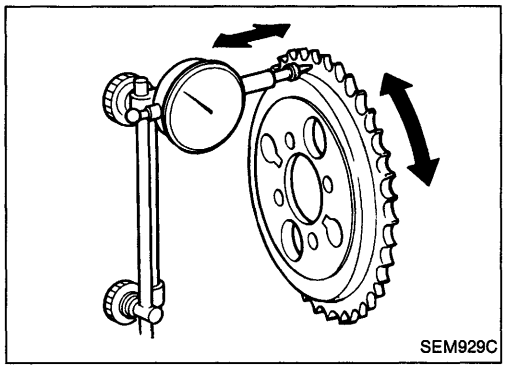
3. Measure outer diameter of camshaft journal.
   Standard outer diameter:
   27.935 - 27.955 mm (1.0998 - 1.1006 in)
4. If clearance exceeds the limit, replace camshaft and/or cylinder head.
   Camshaft journal clearance:
   Standard
   0.045 - 0.086 mm (0.0018 - 0.0034 in)
   Limit
   0.12 mm (0.0047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


SEM002D

CAMSHAFT END PLAY

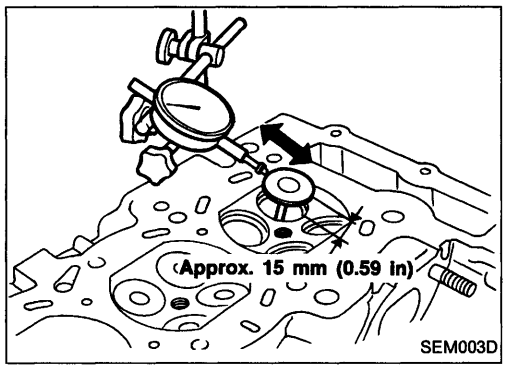
1. Install camshaft in cylinder head.
2. Measure camshaft end play.
   Camshaft end play:
   Standard
   0.055 - 0.139 mm (0.0022 - 0.0055 in)
   Limit
   0.20 mm (0.0079 in)

Inspection (Cont'd)



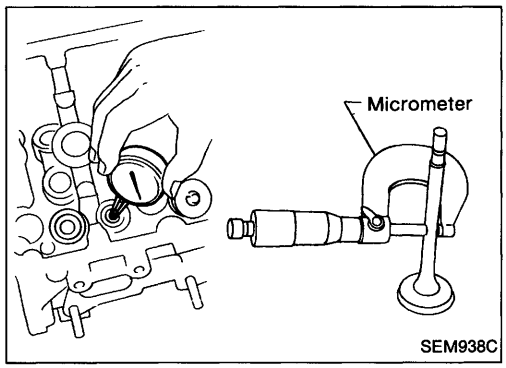
CAMSHAFT SPROCKET RUNOUT

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)



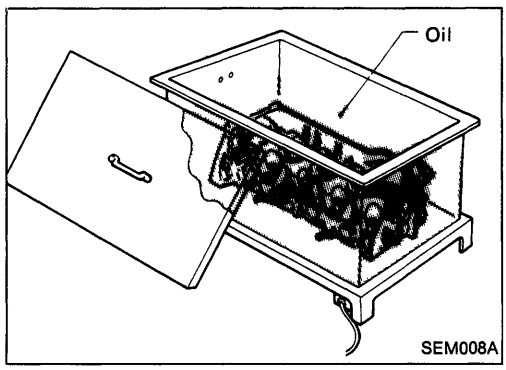
2. If it exceeds the limit, check valve to valve guide clearance.
a. Measure valve stem diameter and valve guide inner diameter.
b. Check that clearance is within specification.

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)

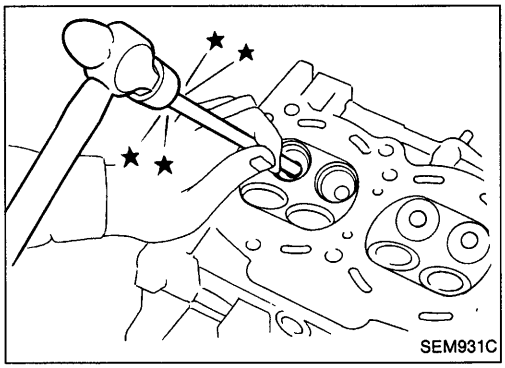
c. If it exceeds the limit, replace valve or valve guide.



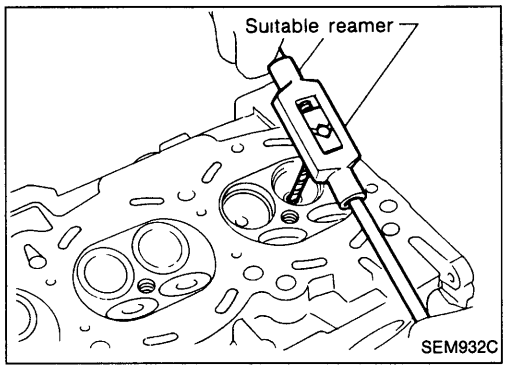
VALVE GUIDE REPLACEMENT

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

Inspection (Cont'd)

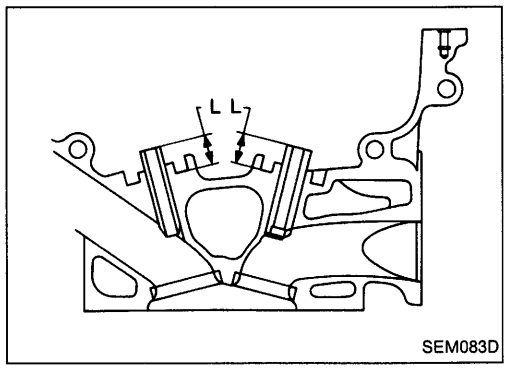

SEM931C

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



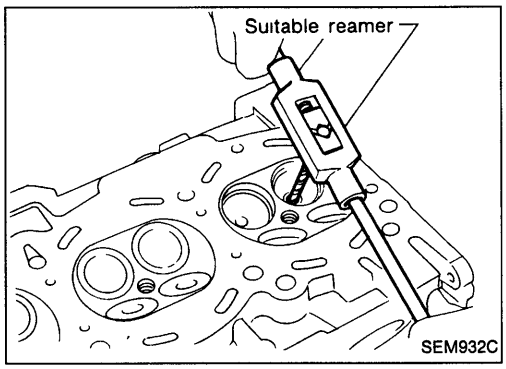
SEM932C

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



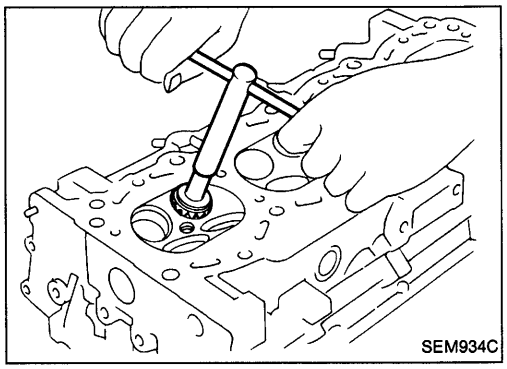
SEM083D

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)



SEM932C

5. Ream valve guide.
   Valve guide inner diameter:
   Intake & Exhaust
   6.000 - 6.018 mm (0.2362 - 0.2369 in)

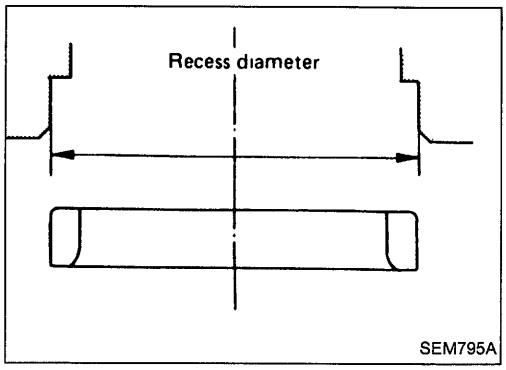

SEM934C

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)

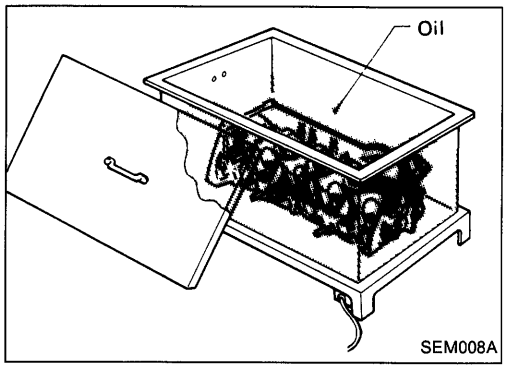


REPLACING VALVE SEAT FOR SERVICE PARTS

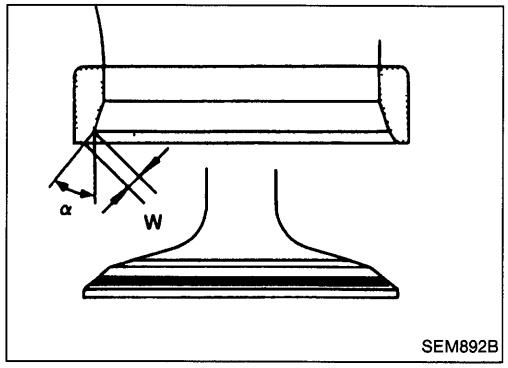
1. Bore out old seat until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the seat recess in cylinder head.
2. Ream cylinder head recess.

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.

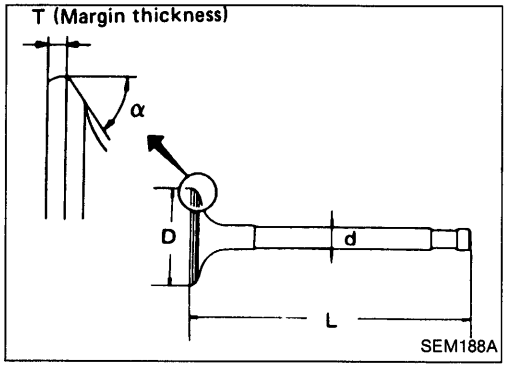


3. Heat cylinder head to 110 to 130°C (230 to 266°F).
4. Press fit valve seat until it seats on the bottom.



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)

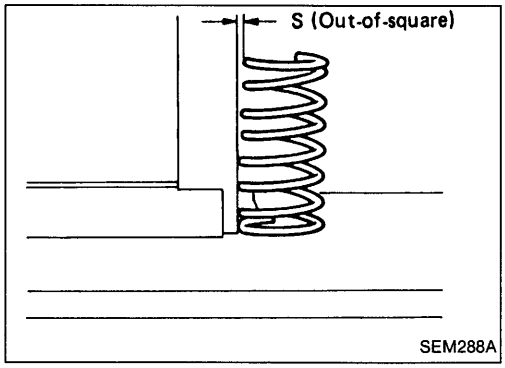


VALVE DIMENSIONS

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.

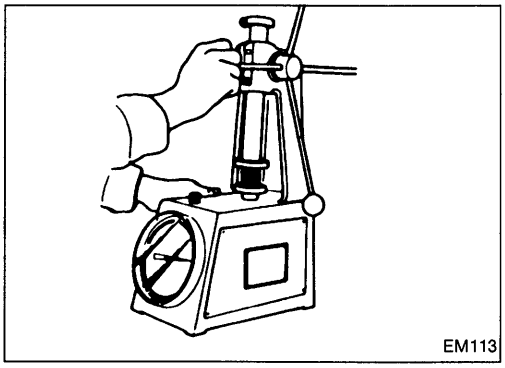
Inspection (Cont'd)



VALVE SPRING

Squareness

1. Measure "S" dimension.
   Out-of-square:
   Less than 2.2 mm (0.087 in)
2. If it exceeds the limit, replace spring.

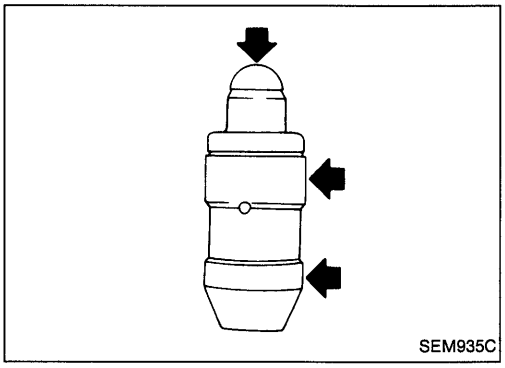


Pressure

Check valve spring pressure.

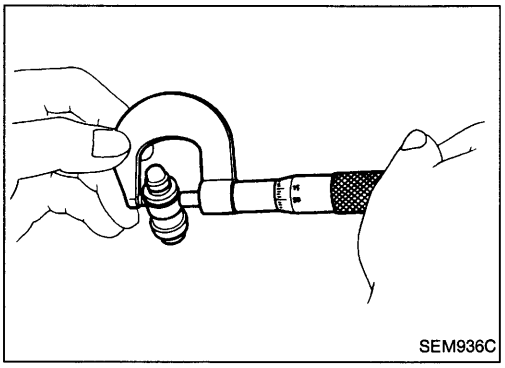
Pressure: N (kg, lb) at height mm (in)
Standard
569.00 - 641.57 (58.02 - 65.42, 127.93 - 144.25) at 30.0 (1.181)
Limit
More than 549.2 (56.0, 123.5) at 30.0 (1.181)

If it exceeds the limit, replace spring.

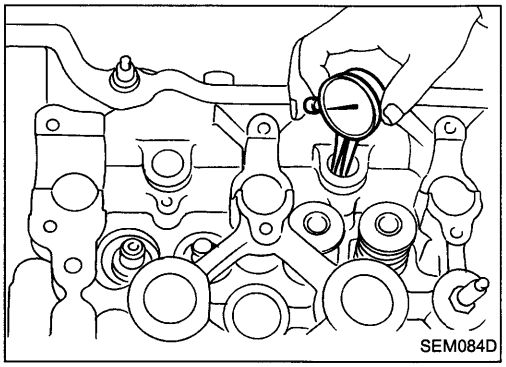


HYDRAULIC LASH ADJUSTER

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)

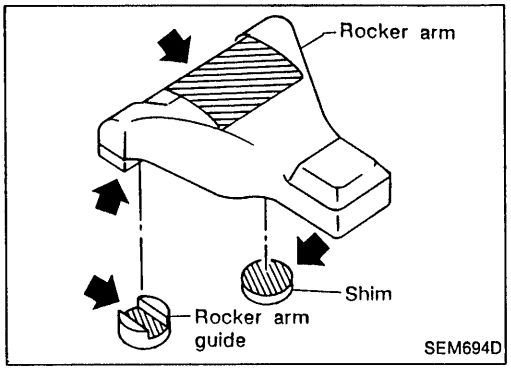


3. Check lash adjuster guide inner diameter.
   Inner diameter:
   17.000 - 17.020 mm (0.6693 - 0.6701 in)
   Standard clearance between lash adjuster and adjuster guide:
   0.007 - 0.040 mm (0.0003 - 0.0016 in)

Inspection (Cont'd)

ROCKER ARM, SHIM AND ROCKER ARM GUIDE

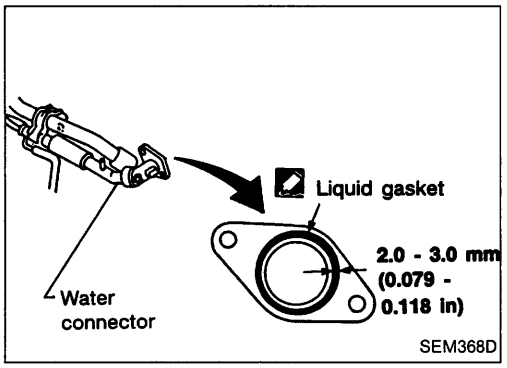
Check contact and sliding surfaces of rocker arms, shims and rocker arm guides for wear or scratches.



Assembly

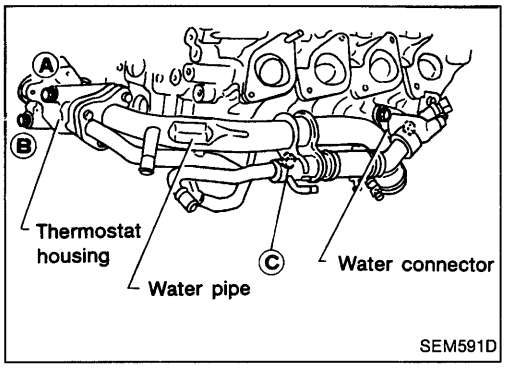
1. Install water connector.
(1) Before installing water connector, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder head.

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



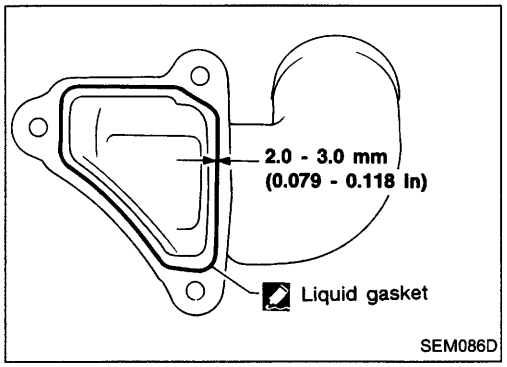
2. Install thermostat housing with water pipe.
- Tightening procedure:

(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.**

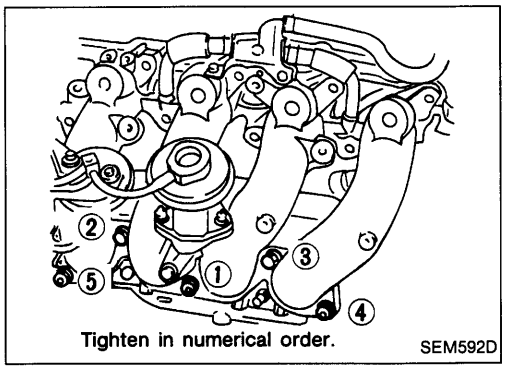


3. Install water outlet.
(1) Before installing water outlet, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder head.

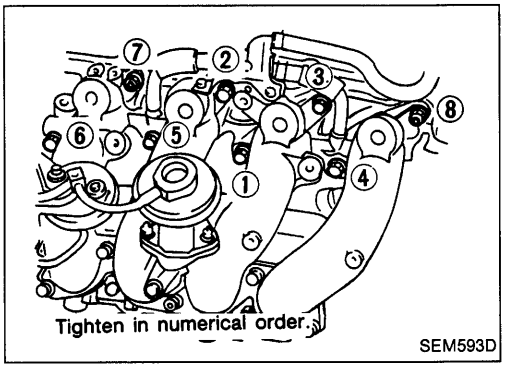
(2) Apply a continuous bead of liquid gasket to mating surface of water outlet.
- **Use Genuine Liquid Gasket or equivalent.**



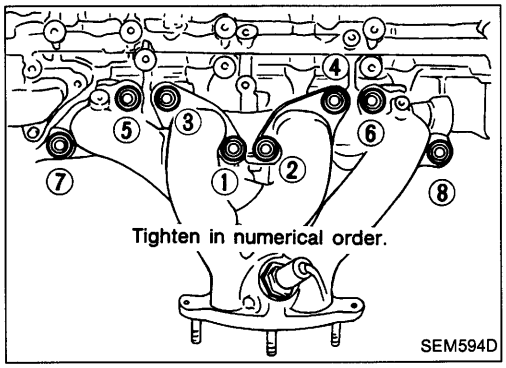
Assembly (Cont'd)



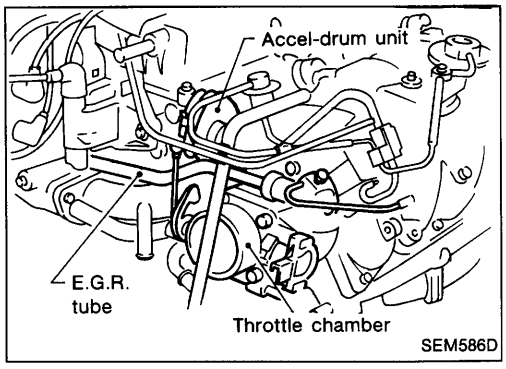
4. Install intake manifold collector to intake manifold.



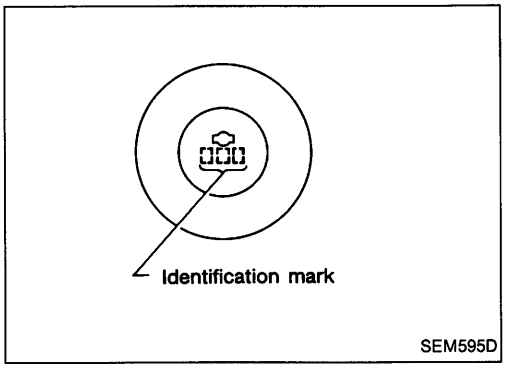
5. Install intake manifold.
6. Install fuel tube assembly.
   Refer to "Injector Removal and Installation" in EF & EC section.



7. Install exhaust manifold.
8. Install exhaust manifold cover.



9. Install E.G.R. tube.
10. Install throttle chamber with accel-drum unit.
11. Adjust accel-drum unit.
    Refer to "ACCEL-DRUM UNIT".

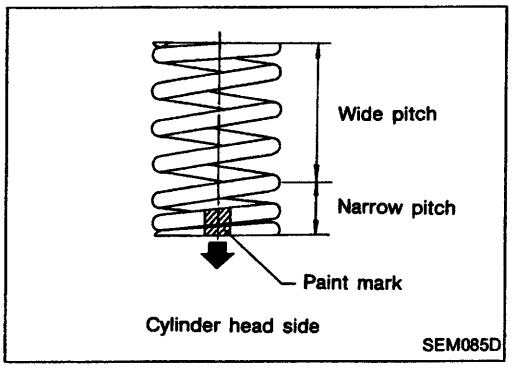


12. Install valve component parts.

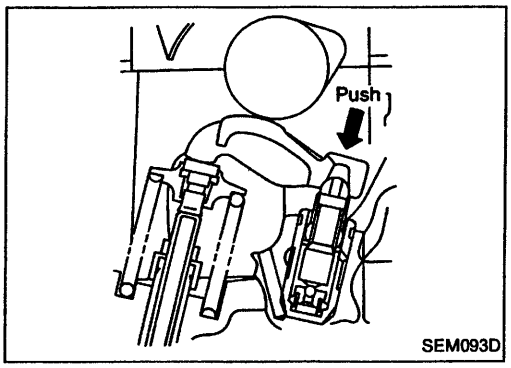
- **Install valves, noting their identification marks as indicated in the table below.**

	Identification mark
Intake valve	53J
Exhaust valve	64Y

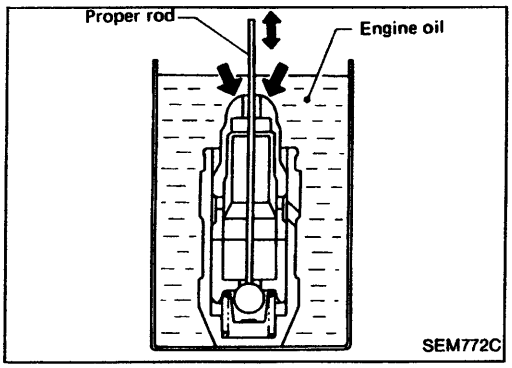
Assembly (Cont'd)



- **Always use new valve oil seal.**
  Refer to OIL SEAL REPLACEMENT.
- **Before installing valve oil seal, install valve spring seat.**
- **Install valve spring (uneven pitch type) with its narrow pitched side toward cylinder head side (paint mark).**
- **After installing valve component parts, use plastic hammer to lightly tap valve stem tip to assure a proper fit.**

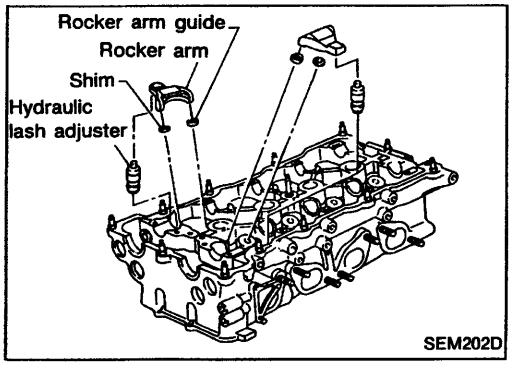


13. Check hydraulic lash adjusters.
(1) When rocker arm can be moved at least 1 mm (0.04 in) by pushing at hydraulic lash adjuster location, it indicates that there is air in the high pressure chamber.
Noise will be emitted from hydraulic lash adjuster if engine is started without bleeding air.

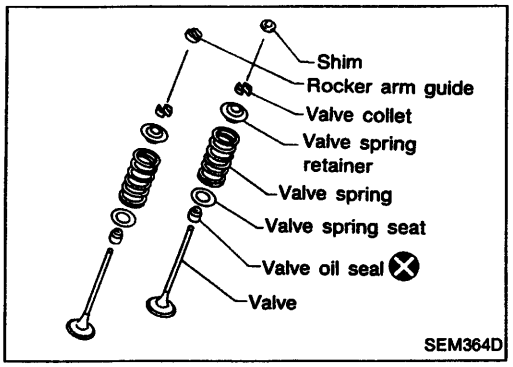


(2) Remove hydraulic lash adjuster and dip in a container filled with engine oil. While pushing plunger as shown in figure, lightly push check ball using a thin rod. Air is completely bled when plunger no longer moves.

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

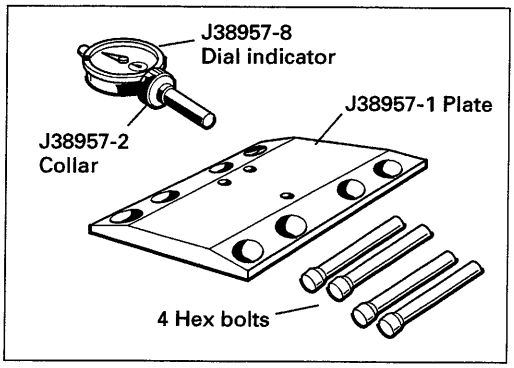


14. Remove camshafts, rocker arms and shims. For future reference, identify each shim with the cylinder it was removed from. Since the shims are reusable, it may not be necessary to replace all of the existing shims.



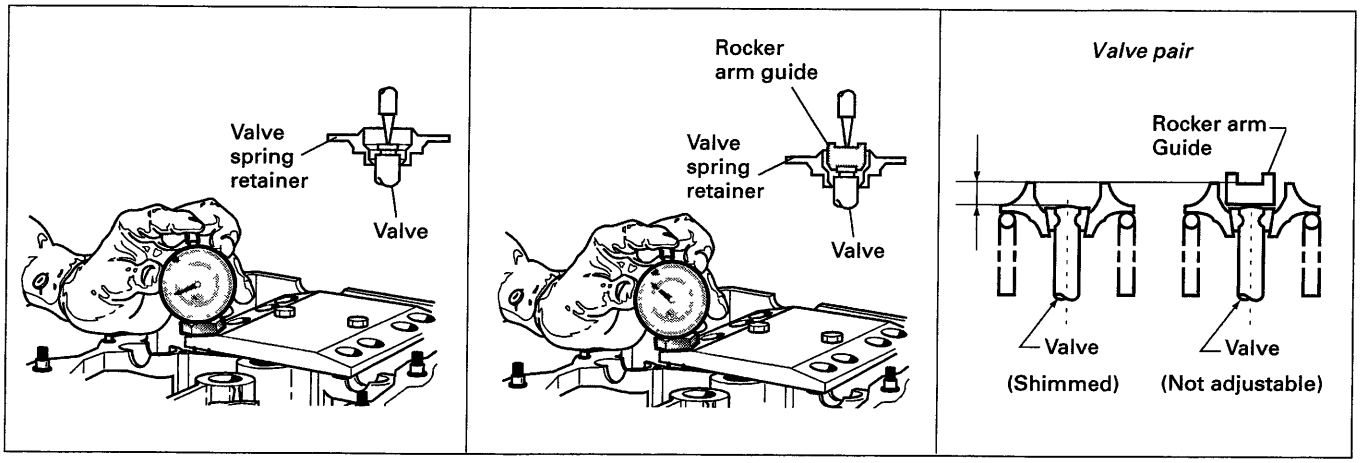
15. Before attempting any measurement, make sure the valve, valve spring, collet, retainer and rocker arm guide are properly installed in the head.
- **Always replace rocker arm guide with a new one.**

CAUTION: Install parts in their original positions.



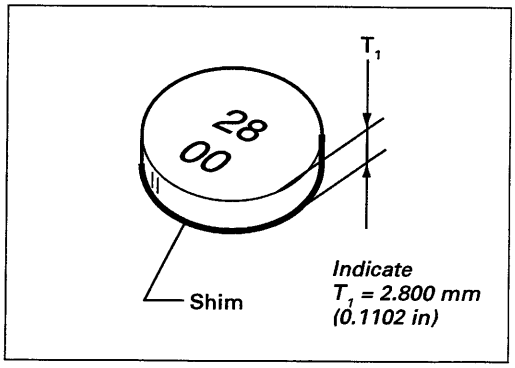
16. Install the J38957-1 gauge plate into the tapped holes at the cam journals and secure it to the head using two of the hex bolts supplied with the kit. (The two remaining bolts are spares).

17. Place the J38957-2 collar on the J38957-8 dial indicator. Make sure the dished side of the collar is facing 'up' (toward the dial indicator). Secure the collar to the dial indicator by tightening the set screw in the collar



18. Place the indicator and collar over #1 cylinder intake valve, shim side. Slide the tip of the dial indicator through the access hole and place it on the end of the valve stem. While resting the dial indicator collar on the gauge plate, 'zero' the dial indicator.

19. Move the dial indicator and collar to the adjacent hole in the gauge plate and place the tip of the indicator in the center of the rocker arm guide. Write down the dial indicator reading. This measured distance between the valve stem end and the contact surface of the rocker arm guide is the 'T_1' dimension.

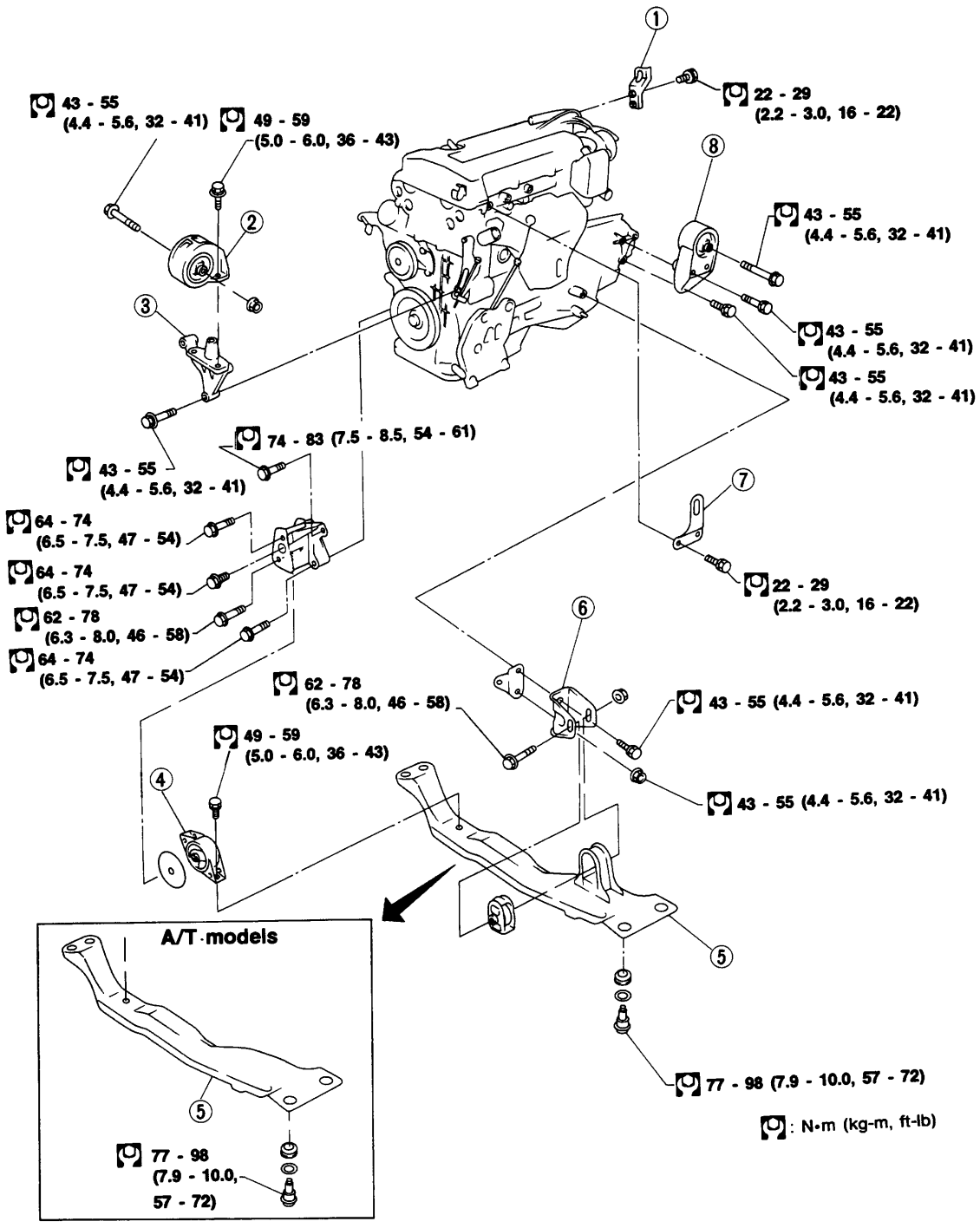


20. Match the measured 'T_1' dimension (in inches) to the available shim chart (in millimeters) located in the S.D.S. section of the appropriate service manual. (The 'T_1' dimension is equivalent to the thickness and size designation of the valve shim). Select the closest size shim to the measured 'T_1' dimension. For example, if the measured 'T_1' dimension is 0.1154 in. use a 2.925 mm shim. Shims are available in 17 different thicknesses ranging from 2.800 mm (0.110 in.) to 3.200 mm (0.126 in.) and increase in increments of 0.025 mm (0.001 in.). Refer to the NMC parts fiche for appropriate part numbers.

21. Repeat this procedure on the remaining cylinders.

Installation

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



SEM687D

① Rear engine slinger
② Front engine mounting (Fluid type)
③ Mounting bracket
④ Rear insulator
⑤ Center member
⑥ Mounting bracket
⑦ Front engine slinger
⑧ Rear engine mounting (Fluid type)

WARNING:

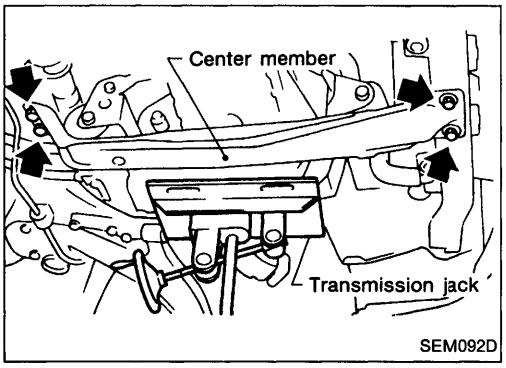
a. Situate vehicle on a flat and solid surface.
b. Place chocks at front and back of rear wheels.
c. Do not remove engine until exhaust system has completely cooled off.
Otherwise, you may burn yourself and/or fire may break out in fuel line.
d. For safety during subsequent steps, the tension of wires 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:

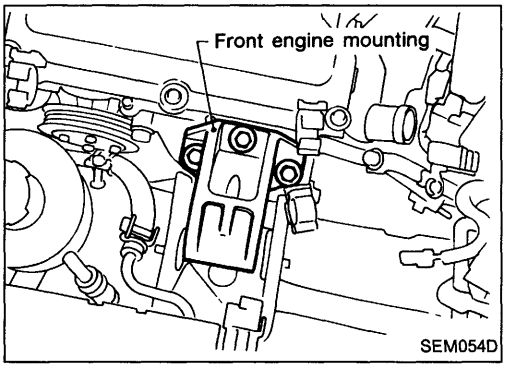
- **When lifting engine, be careful not to strike adjacent parts, especially accelerator wire casing, brake lines, and brake master cylinder.**
- **In hoisting the engine, always use engine slingers in a safe manner.**

Removal

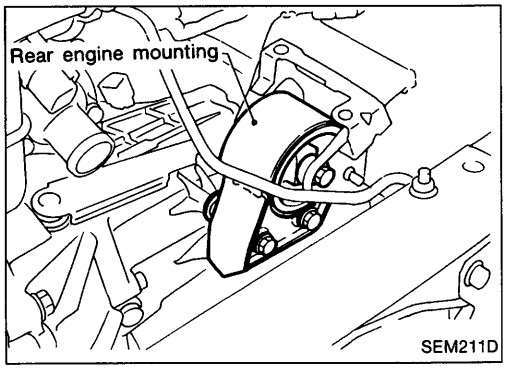
1. Remove engine under cover and hood.
2. Drain coolant from both cylinder block, and radiator.
3. Drain engine oil from drain plug of oil pan.
4. Remove vacuum hoses, fuel hoses, wires, harness and connectors and so on.
5. Remove exhaust tubes, ball joints and drive shafts.
6. Remove radiator and fans.
7. Remove drive belts.
8. Remove alternator, compressor and power steering oil pump from engine.
9. Set a suitable transmission jack under transaxle. Hoist engine with engine slinger.
10. Remove center member.



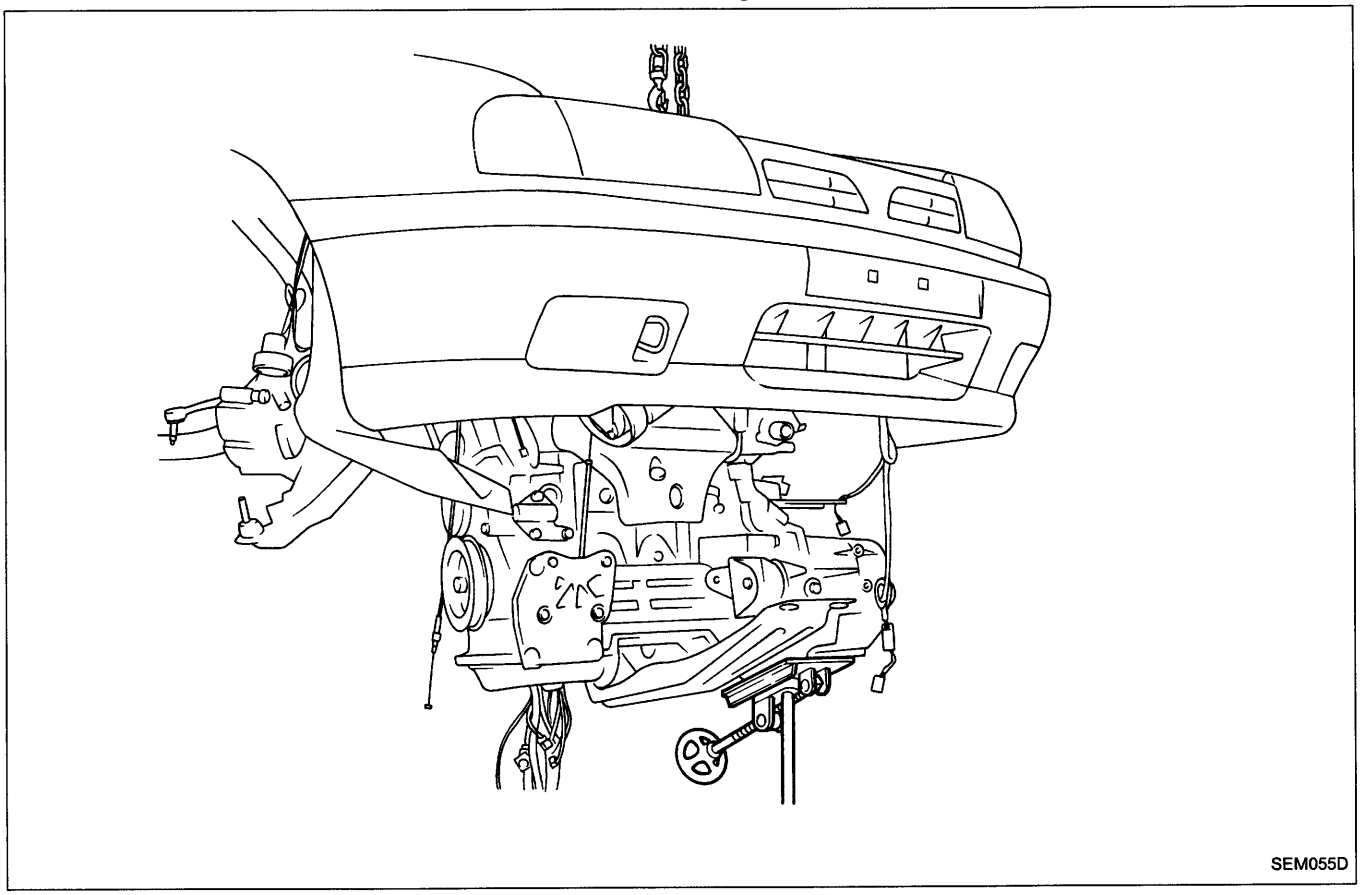
11. Remove engine mounting bolts from both sides and then slowly lower transmission jack.

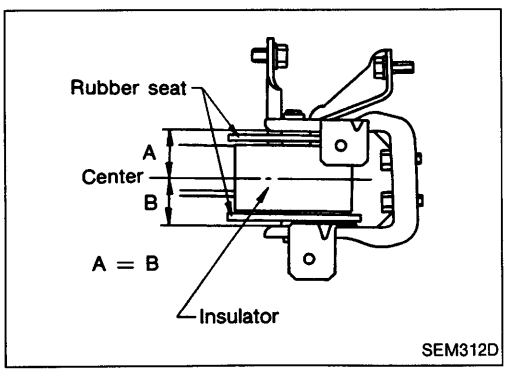


Removal (Cont'd)



12. Remove engine with transaxle as shown.





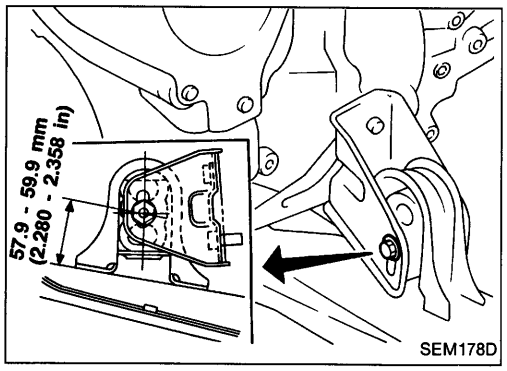
Installation

1. Install engine mounting bracket and fixing bolts.

Be sure that insulators are correctly positioned on the brackets.

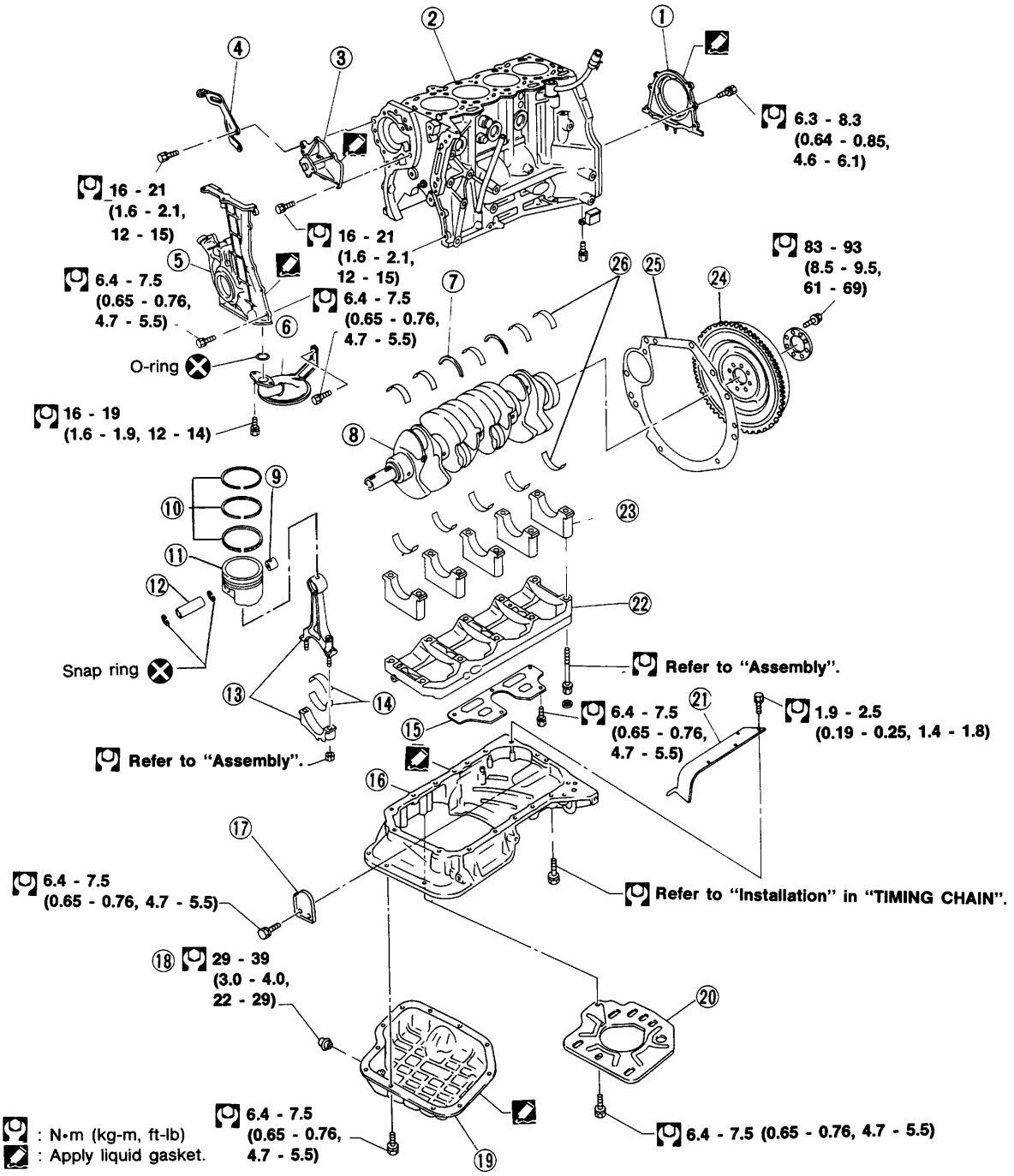
2. Carefully lower the engine onto engine mounting insulators.

Installation (Cont'd)



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

3. Installation is in the reverse order of removal.



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

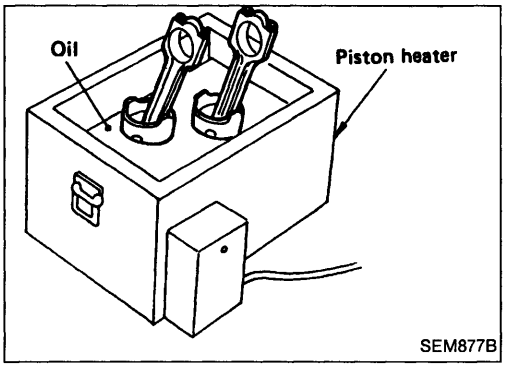
CAUTION:

- **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.**

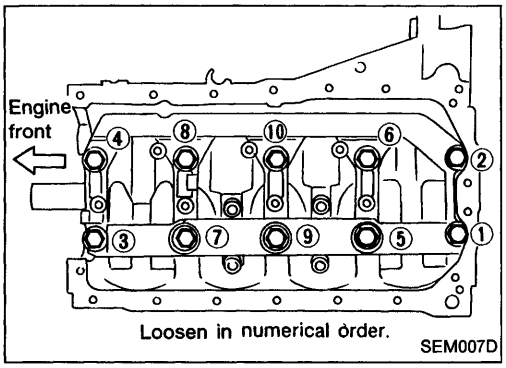
Disassembly

PISTON AND CRANKSHAFT

1. Remove engine.
   Refer to "ENGINE REMOVAL".
2. Remove cylinder head.
   Refer to "Removal" in "TIMING CHAIN".
3. Remove oil pan.
   Refer to "Removal" in "OIL PAN".
4. Remove timing chain.
   Refer to "Removal" in "TIMING CHAIN".



5. 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.
6. Remove rear oil seal retainer.

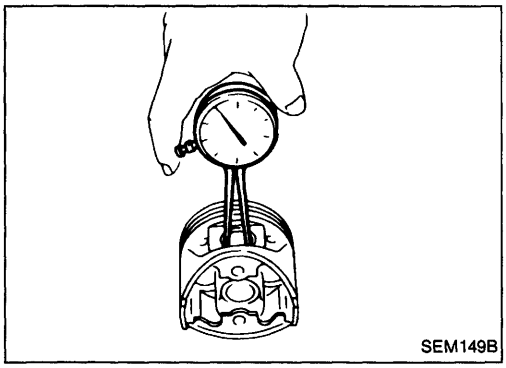


7. Remove bearing beam, bearing cap and crankshaft.
   - **Before removing bearing cap, measure crankshaft end play.**
   - **Bolts should be loosened in two or three steps.**

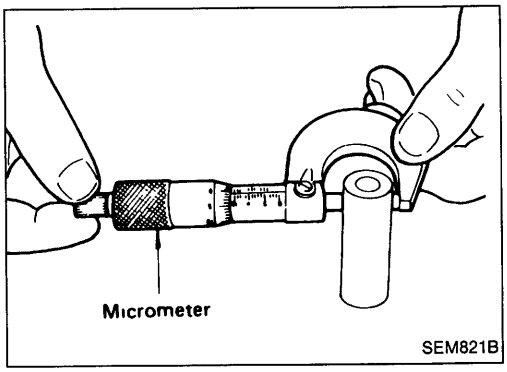
Inspection

PISTON AND PISTON PIN CLEARANCE

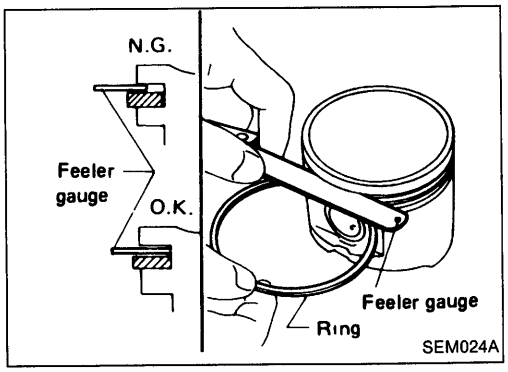
1. Measure inner diameter of piston pin hole "dp".
   Standard diameter "dp":
   21.987 - 21.999 mm (0.8656 - 0.8661 in)



Inspection (Cont'd)



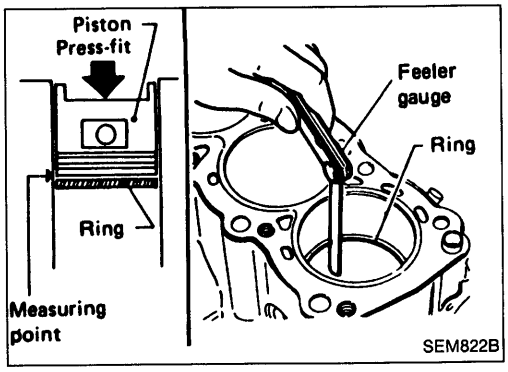
2. Measure outer diameter of piston pin "Dp".
   Standard diameter "Dp":
   21.989 - 22.001 mm (0.8657 - 0.8662 in)
3. Calculate piston pin clearance.
   dp – Dp = –0.004 to 0 mm (–0.0002 to 0 in)
   If it exceeds the above value, replace piston assembly with pin.



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.

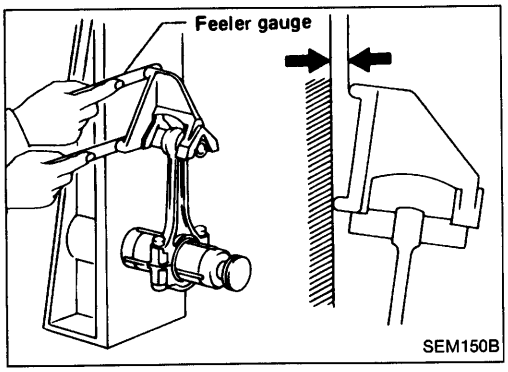


PISTON RING END GAP

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.

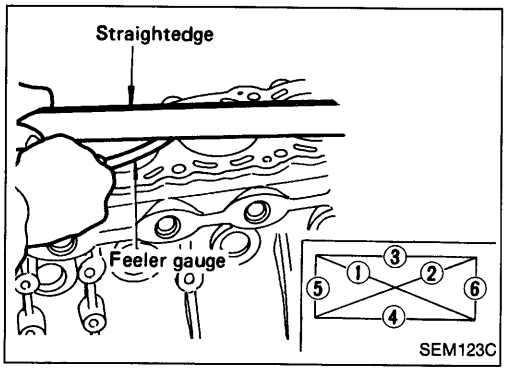


CONNECTING ROD BEND AND TORSION

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.

Inspection (Cont'd)

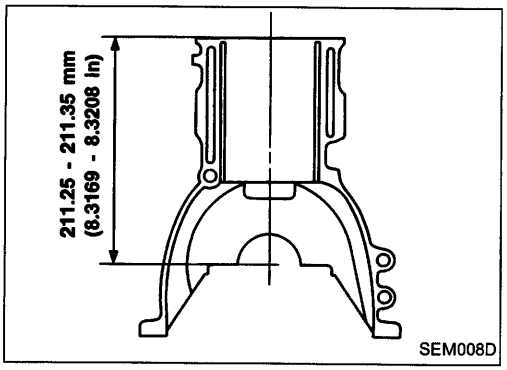


CYLINDER BLOCK DISTORTION AND WEAR

1. Clean upper face of cylinder block and measure the distortion.
   Standard:
   Less than 0.03 mm (0.0012 in)
   Limit:
   0.10 mm (0.0039 in)
2. If out of specification, resurface it.
   The resurfacing limit is determined by cylinder head resurfacing in engine.

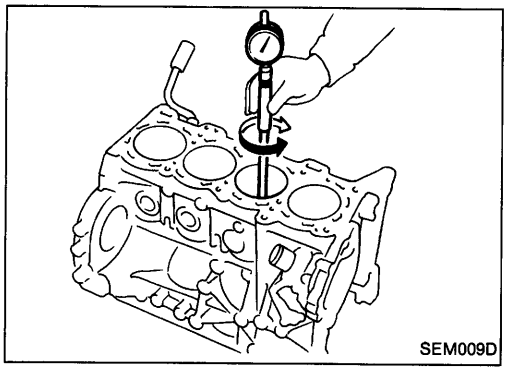
Amount of cylinder head resurfacing is "A".
Amount of cylinder block resurfacing is "B".
The maximum limit is as follows:
A + B = 0.2 mm (0.008 in)
Nominal cylinder block height from crankshaft center:
211.25 - 211.35 mm (8.3169 - 8.3208 in)

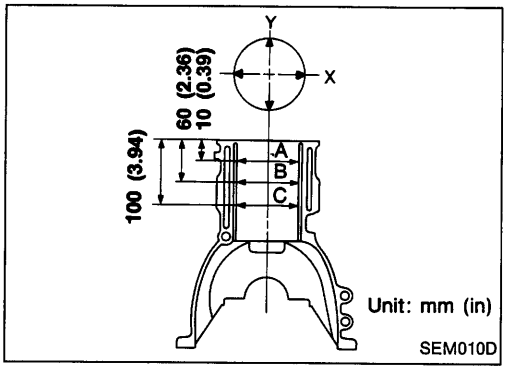
3. If necessary, replace cylinder block.



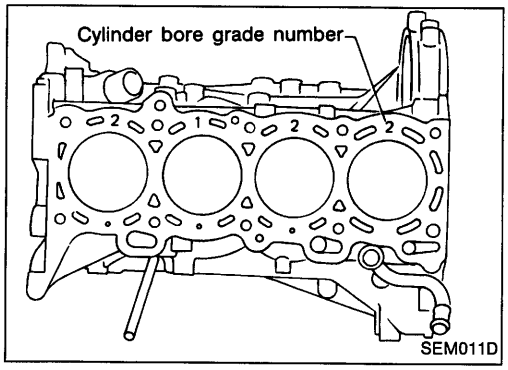
PISTON-TO-BORE CLEARANCE

1. Using a bore gauge, measure cylinder bore for wear, out-of-round and taper.
   Standard inner diameter:
   86.000 - 86.030 mm (3.3858 - 3.3870 in)
   Wear limit:
   0.20 mm (0.0079 in)
   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.

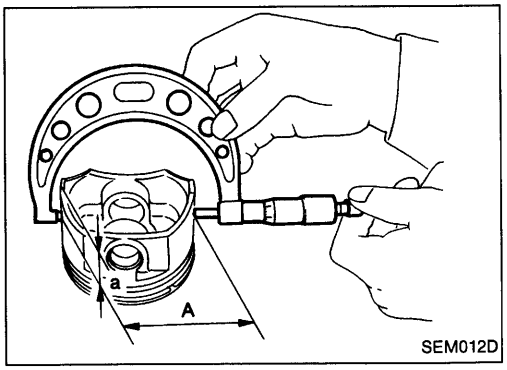




- **If both cylinder block and piston are replaced with new ones, select piston of the same grade number punched on cylinder block upper surface.**



Inspection (Cont'd)



3. Measure piston skirt diameter.
   Piston diameter "A":
   Refer to S.D.S.
   Measuring point "a" (Distance from the bottom):
   11.0 mm (0.433 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.

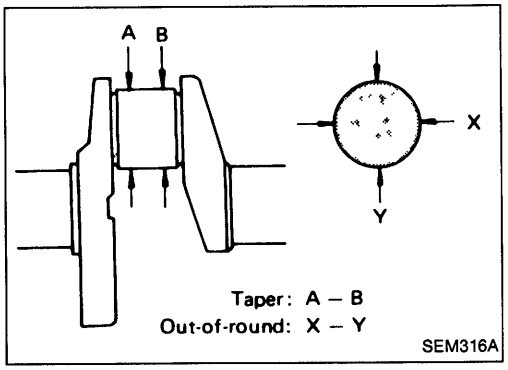
Oversize pistons are available for service. Refer to S.D.S.

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.
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.**

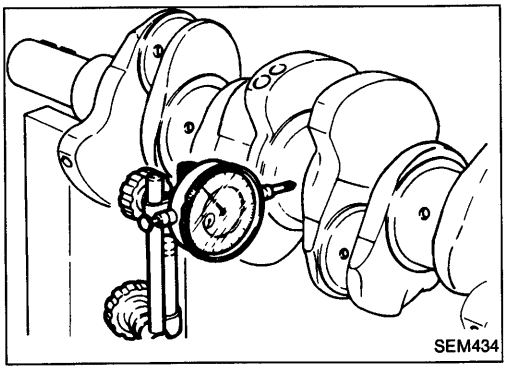
9. Hone cylinders to obtain specified piston-to-bore clearance.
10. Measure finished cylinder bore for out-of-round and taper.

- **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 0.005 mm (0.0002 in)



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

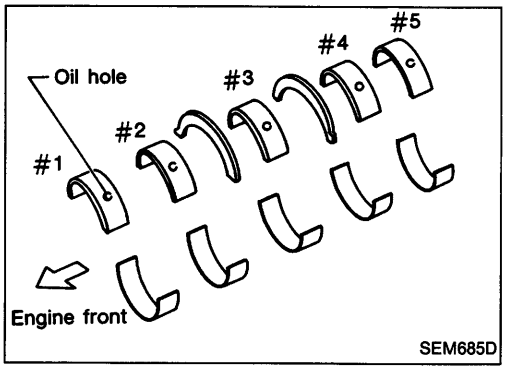
Inspection (Cont'd)

BEARING CLEARANCE

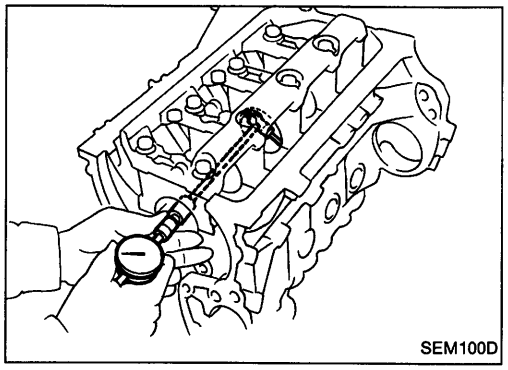
- Either of the following two methods may be used, however, method "A" gives more reliable results and is preferable.

Method A (Using bore gauge & micrometer)

Main bearing



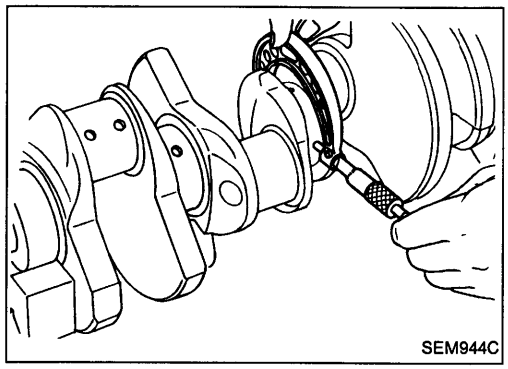
1. Set main bearings in their proper positions on cylinder block and main bearing cap.



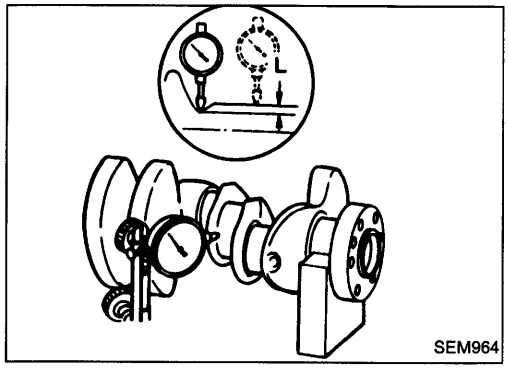
2. Install main bearing cap and main bearing beam to cylinder block.

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

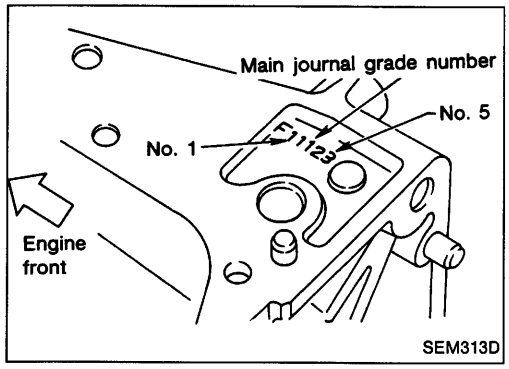
3. Measure inner diameter "A" of each main bearing.



4. Measure outer diameter "Dm" of each crankshaft main journal.
5. Calculate main bearing clearance.
   Main bearing clearance = A – Dm
   Standard: 0.004 - 0.022 mm (0.0002 - 0.0009 in)
   Limit: 0.050 mm (0.0020 in)
6. If it exceeds the limit, replace bearing.
7. If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing.

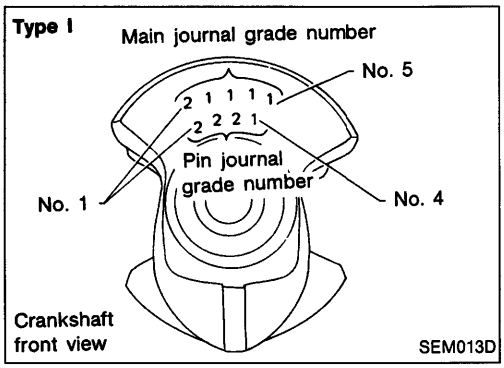


a. When grinding crankshaft journal, confirm that "L" dimension in fillet roll is more than the specified limit.
   "L": 0.1 mm (0.004 in)
b. Refer to S.D.S. for grinding crankshaft and available service parts.

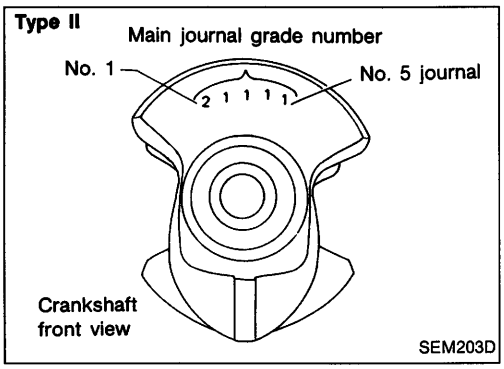


8. If crankshaft is reused, measure main bearing clearances and select thickness of main bearings.
   If crankshaft is replaced with a new one, it is necessary to select thickness of main bearings as follows:
a. Grade number of each cylinder block main journal is punched on the respective cylinder block.

Inspection (Cont'd)



b. Grade number of each crankshaft main journal is punched on the respective crankshaft.

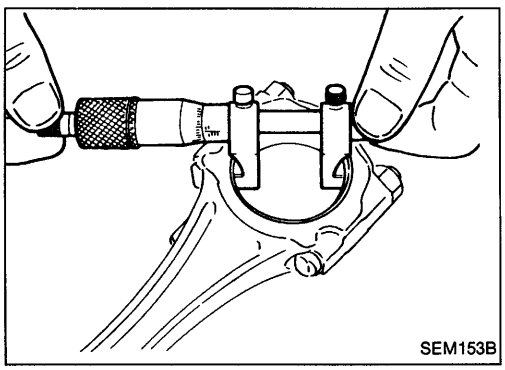


c. Select main bearing with suitable thickness according to the following table.

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)



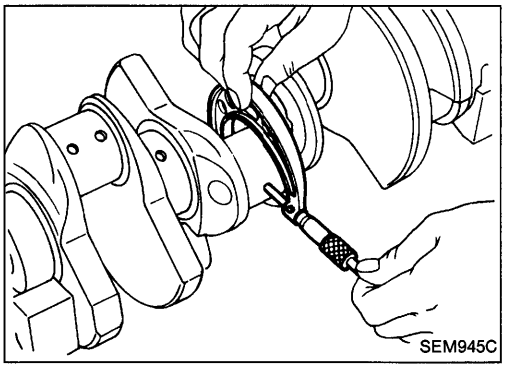
Connecting rod bearing (Big end)

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

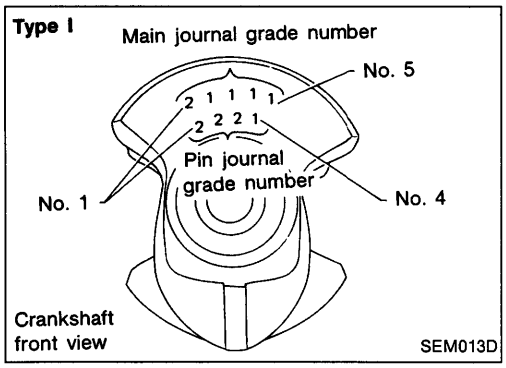
Tighten bolts to the specified torque.

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

Inspection (Cont'd)



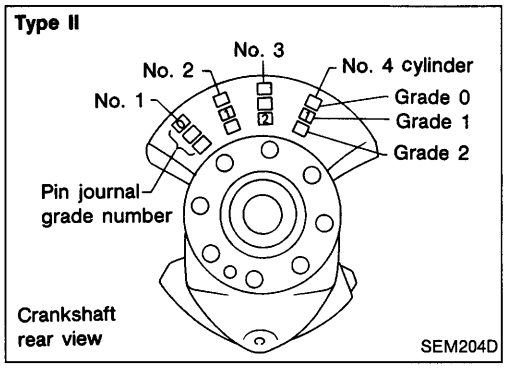
4. Measure outer diameter "Dp" of each crankshaft pin journal.
5. Calculate connecting rod bearing clearance.
   Connecting rod bearing clearance = C – Dp
   Standard:
   0.020 - 0.045 mm (0.0008 - 0.0018 in)
   Limit:
   0.090 mm (0.0035 in)
6. If it exceeds the limit, replace bearing.
7. If clearance 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".



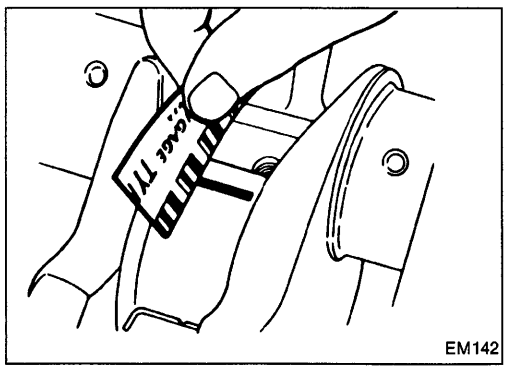
8. If crankshaft is replaced with a new one, select connecting rod bearing according to the following table.

Connecting rod bearing grade number:

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



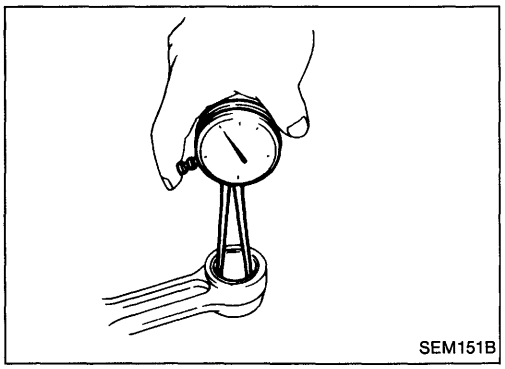
Method B (Using plastigage)

CAUTION:

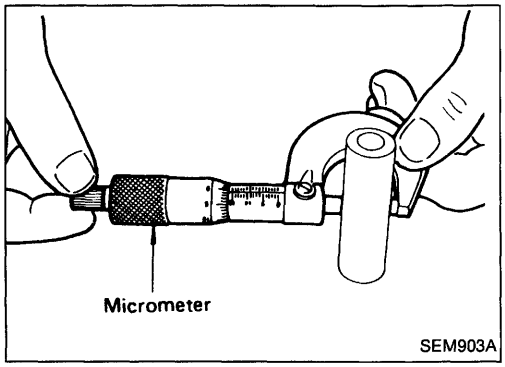
- **Do not turn crankshaft or connecting rod while plastigage is being inserted.**
- **When bearing clearance exceeds the specified limit, ensure that the proper bearing has been installed. Then if excessive bearing clearance exists, use a thicker main bearing or undersized bearing so that the specified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

Inspection (Cont'd)

CONNECTING ROD BUSHING CLEARANCE (Small end)


SEM151B

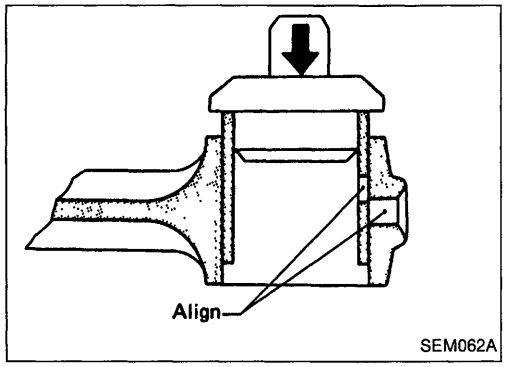
1. Measure inner diameter "C" of bushing.



SEM903A

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)

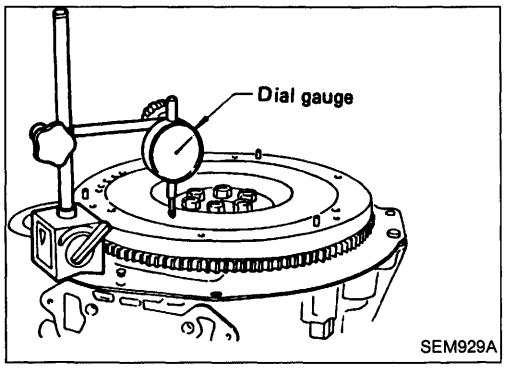


SEM062A

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

Be sure to align the oil holes.

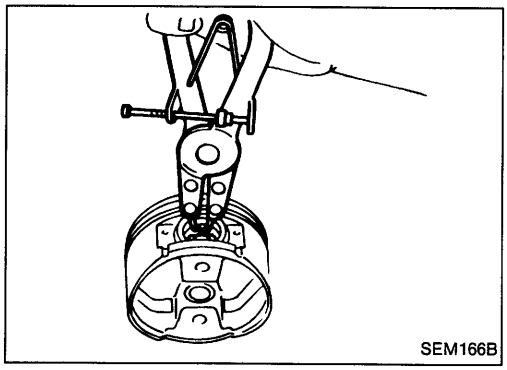
2. After driving in small end bushing, ream the bushing so that clearance between connecting rod bushing and piston pin is the specified value.
   Clearance between connecting rod bushing and piston pin:
   0.005 - 0.017 mm (0.0002 - 0.0007 in)



SEM929A

FLYWHEEL/DRIVE PLATE RUNOUT

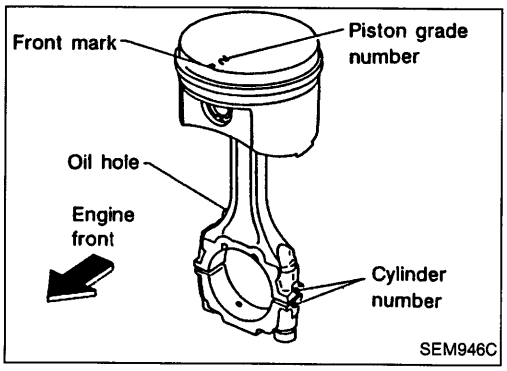
Runout (Total indicator reading):
Flywheel (M/T model)
Less than 0.10 mm (0.0039 in)
Drive plate (A/T model)
Less than 0.20 mm (0.0079 in)


SEM166B

Assembly

PISTON

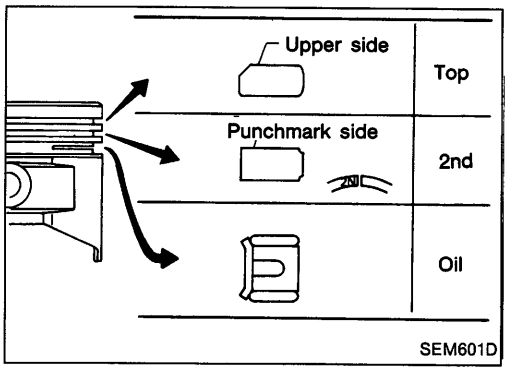
1. Install new snap ring on one side of piston pin hole.



SEM946C

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.**

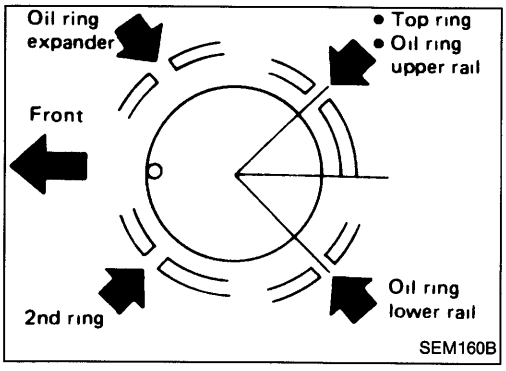


SEM601D

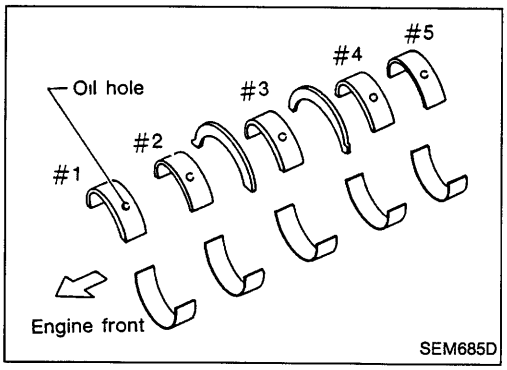
3. Set piston rings as shown.

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.**



SEM160B



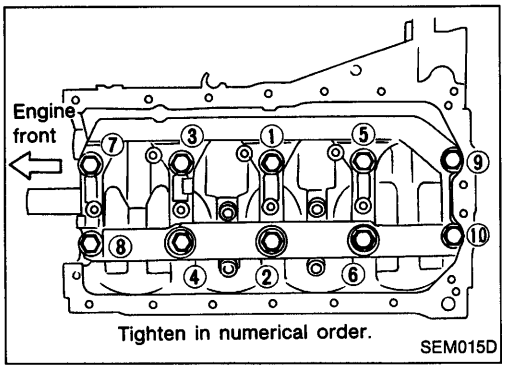
SEM685D

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.**

Assembly (Cont'd)

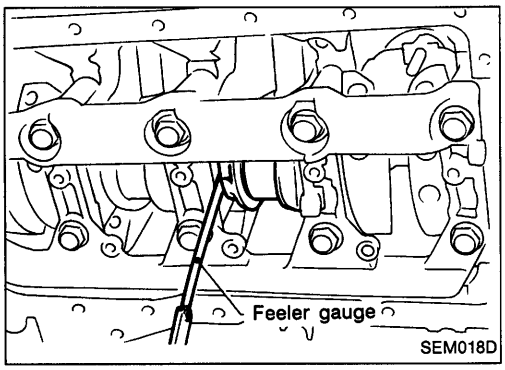


2. Install crankshaft, main bearing caps and beam and tighten bolts to the specified torque.

- **Prior to tightening bearing cap bolts, place bearing cap in its proper position by shifting crankshaft in the axial direction.**
- **Tightening procedure**

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).**

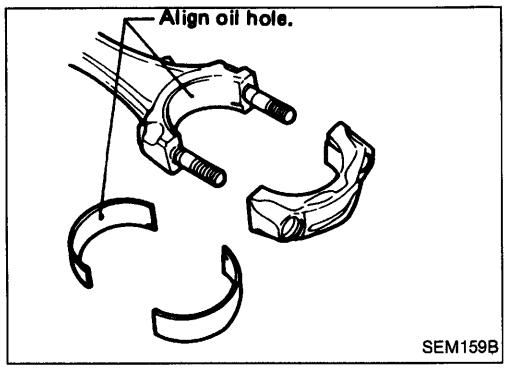
- **After securing bearing cap bolts, make sure crankshaft turns smoothly by hand.**



3. Measure crankshaft end play.

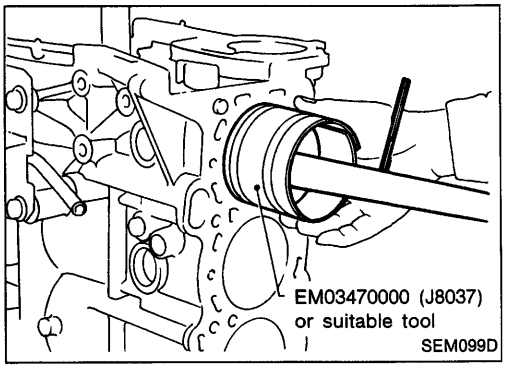
Crankshaft end play:
Standard
0.10 - 0.26 mm (0.0039 - 0.0102 in)
Limit
0.30 mm (0.0118 in)

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.**

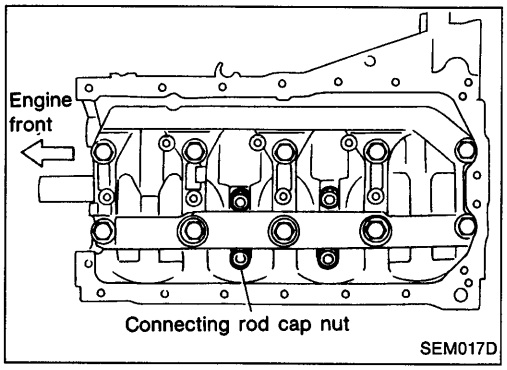


5. Install pistons with connecting rods.

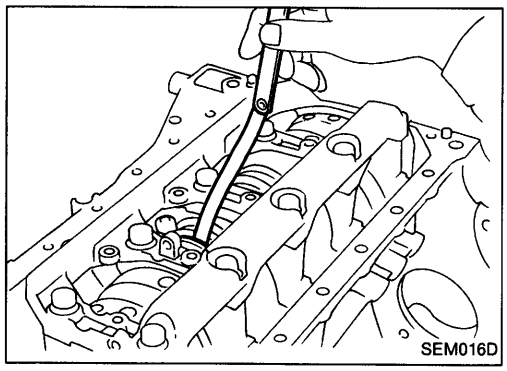
a. Install them into corresponding cylinders with Tool.

- **Be careful not to scratch cylinder wall by connecting rod.**
- **Arrange so that front mark on piston head faces toward front of engine.**

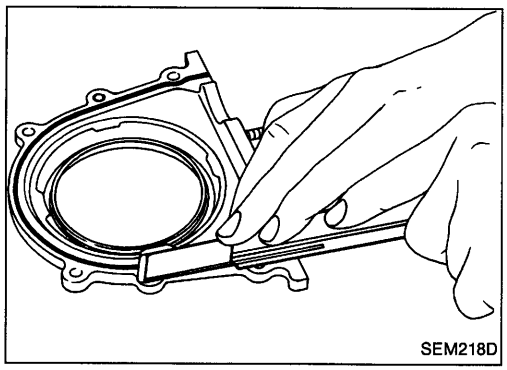
Assembly (Cont'd)



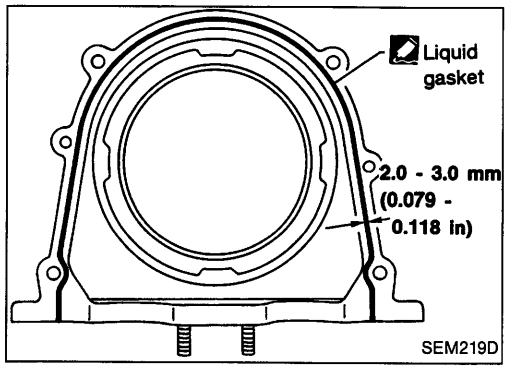
b. Install connecting rod caps.
Tighten connecting rod cap nuts to the specified torque.
Tightening procedure:
1) Tighten nuts to 14 to 16 N·m (1.4 to 1.6 kg-m, 10 to 12 ft-lb).
2) Turn nuts 60 to 65 degrees clockwise or if angle wrench is not available, tighten nuts to 38 to 44 N·m (3.9 to 4.5 kg-m, 28 to 33 ft-lb).



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.



(2) Apply a continuous bead of liquid gasket to mating surface of rear oil seal retainer.
- Use Genuine Liquid Gasket or equivalent.

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		9.5

COMPRESSION PRESSURE

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

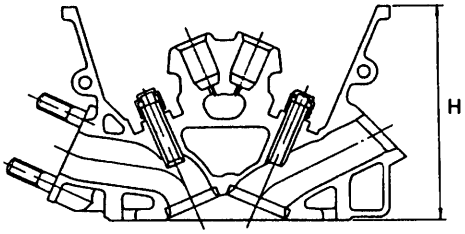
Compression pressure	
Standard	1,226 (12.5, 178)
Minimum	1,030 (10.5, 149)
Differential limit between cylinders	98 (1.0, 14)

Inspection and Adjustment

CYLINDER HEAD

Unit: mm (in)

	Standard	Limit
Head surface distortion	Less than 0.03 (0.0012)	0.1 (0.004)

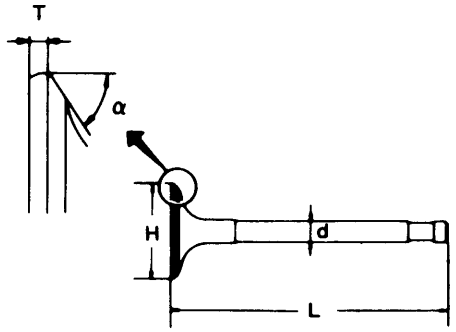


Nominal cylinder head height:
H = 136.9 - 137.1 (5.390 - 5.398)

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	101.19 - 101.61 (3.9839 - 4.0004)
Exhaust	102.11 - 102.53 (4.0201 - 4.0366)
Valve stem diameter "d"	
Intake	5.965 - 5.980 (0.2348 - 0.2354)
Exhaust	5.945 - 5.960 (0.2341 - 0.2346)
Valve seat angle "α"	
Intake	45°15' - 45°45'
Exhaust	
Valve margin "T"	
Intake	1.1 (0.043)
Exhaust	1.3 (0.051)
Valve margin "T" limit	More than 0.5 (0.020)
Valve stem end surface grinding limit	Less than 0.2 (0.008)
Valve clearance	
Intake	0 (0)
Exhaust	0 (0)

Inspection and Adjustment (Cont'd)

Valve spring

Free height	mm (in)	49.36 (1.9433)
Pressure N (kg, lb) at height mm (in)		
Standard		569.00 - 641.57 (58.02 - 65.42, 127.93 - 144.25) at 30.0 (1.181)
Limit		549.2 (56.0, 123.5) at 30.0 (1.181)
Out-of-square	mm (in)	Less than 2.2 (0.087)

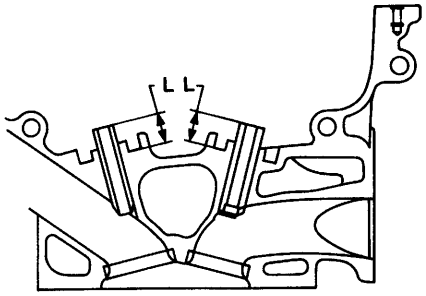
Hydraulic lash adjuster (H.L.A.)

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)



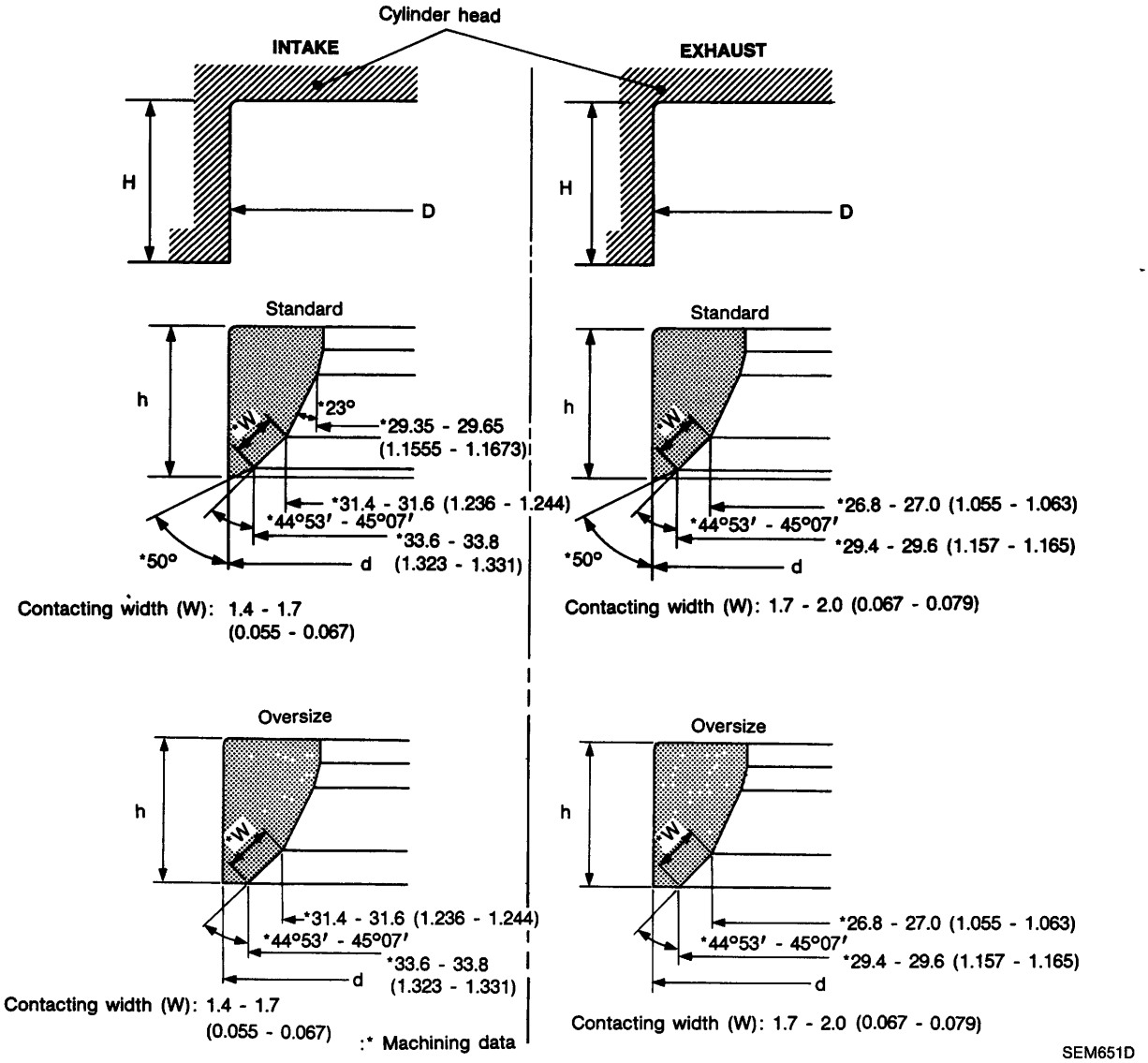
SEM083D

		Standard	Service
Valve guide Outer diameter	Intake	10.023 - 10.034 (0.3946 - 0.3950)	10.223 - 10.234 (0.4025 - 0.4029)
	Exhaust	10.023 - 10.034 (0.3946 - 0.3950)	10.223 - 10.234 (0.4025 - 0.4029)
Valve guide Inner diameter (Finished size)	Intake	6.000 - 6.018 (0.2362 - 0.2369)	
	Exhaust	6.000 - 6.018 (0.2362 - 0.2369)	
Cylinder head valve guide hole diameter	Intake	9.975 - 9.996 (0.3927 - 0.3935)	10.175 - 10.196 (0.4006 - 0.4014)
	Exhaust	9.975 - 9.996 (0.3927 - 0.3935)	10.175 - 10.196 (0.4006 - 0.4014)
Interference fit of valve guide		0.027 - 0.059 (0.0011 - 0.0023)	
		Standard	Limit
Stem to guide clearance	Intake	0.020 - 0.053 (0.0008 - 0.0021)	0.1 (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)



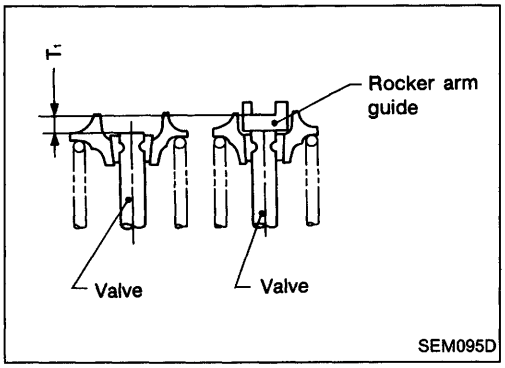
		Standard	Service
Cylinder head seat recess diameter (D)	In.	35.000 - 35.016 (1.3780 - 1.3786)	35.500 - 35.516 (1.3976 - 1.3983)
	Ex.	31.000 - 31.016 (1.2205 - 1.2211)	31.500 - 31.516 (1.2402 - 1.2408)
Valve seat interference fit	In.	0.064 - 0.096 (0.0025 - 0.0038)	
	Ex.	0.064 - 0.096 (0.0025 - 0.0038)	
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)

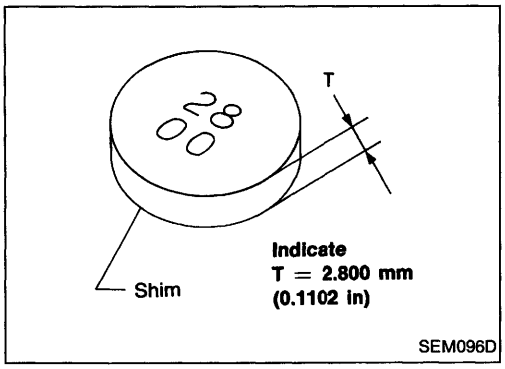
Valve clearance adjustment

Unit: mm (in)

Valve clearance	
Intake	0 (0)
Exhaust	0 (0)
Valve clearance	
Adjustment valve limit $(T) - (T_1) =$	−0.025 (−0.0010) ≦ $[(T) - (T_1)]$ ≦ 0.025 (0.0010)



SEM095D



SEM096D

Available shim

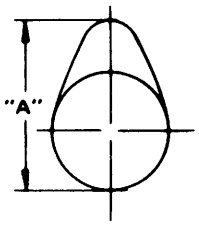
Thickness mm (in)	Identification mark
2.800 (0.1102)	28 00
2.825 (0.1112)	28 25
2.850 (0.1122)	28 50
2.875 (0.1132)	28 75
2.900 (0.1142)	29 00
2.925 (0.1152)	29 25
2.950 (0.1161)	29 50
2.975 (0.1171)	29 75
3.000 (0.1181)	30 00
3.025 (0.1191)	30 25
3.050 (0.1201)	30 50
3.075 (0.1211)	30 75
3.100 (0.1220)	31 00
3.125 (0.1230)	31 25
3.150 (0.1240)	31 50
3.175 (0.1250)	31 75
3.200 (0.1260)	32 00

Inspection and Adjustment (Cont'd)

CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

	Standard	Limit
Camshaft journal to bearing clearance	0.045 - 0.086 (0.0018 - 0.0034)	0.12 (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)

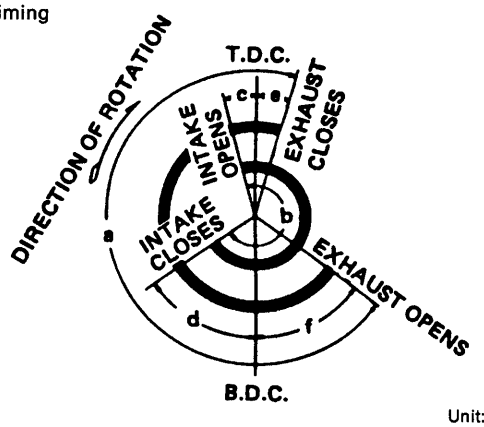


EM671

Cam height "A"	
Intake	38.408 - 38.598 (1.5121 - 1.5196)
Exhaust	37.920 - 38.110 (1.4929 - 1.5004)
Wear limit of cam height	0.2 (0.008)
Valve lift	
Intake	10.0 (0.394)
Exhaust	9.2 (0.362)

*Total indicator reading

Valve timing

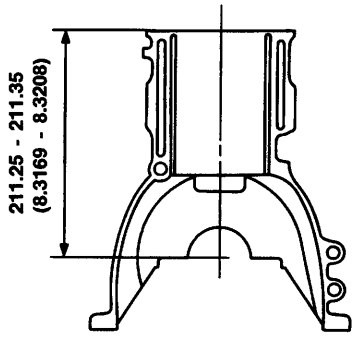


EM120
Unit: degree

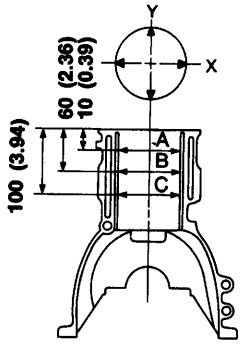
a	b	c	d	e	f
240°	248°	13°	55°	3°	57°

CYLINDER BLOCK

Unit: mm (in)



SEM008D



SEM686D

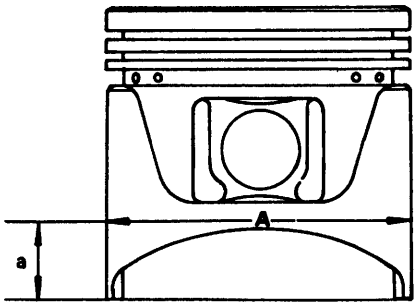
Surface flatness	
Standard	Less than 0.03 (0.0012)
Limit	0.10 (0.0039)
Cylinder bore	
Inner diameter	
Standard	
Grade No. 1	86.000 - 86.010 (3.3858 - 3.3862)
Grade No. 2	86.010 - 86.020 (3.3862 - 3.3866)
Grade No. 3	86.020 - 86.030 (3.3866 - 3.3870)
Wear limit	0.20 (0.0079)
Out-of-round (X – Y)	Less 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)

Inspection and Adjustment (Cont'd)

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	11.0 (0.433)
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)

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)

Inspection and Adjustment (Cont'd)

CONNECTING ROD

Unit: mm (in)

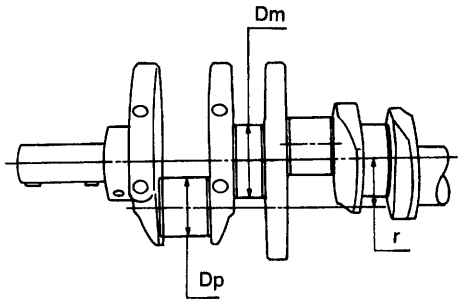
Center distance	136.30 (5.3661)
Bend, torsion [per 100 (3.94)]	
Limit	0.15 (0.0059)
Torsion [per 100 (3.94)]	
Limit	0.3 (0.0012)
Connecting rod small end inner diameter	24.980 - 25.000 (0.9835 - 0.9843)
Piston pin bushing inner diameter*	22.000 - 22.012 (0.8661 - 0.8666)
Connecting rod big end inner 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

CRANKSHAFT

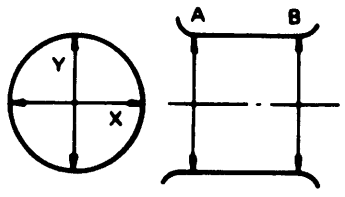
Unit: mm (in)

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"	47.2 (1.858)
Out-of-round (X – Y)	
Standard	Less than 0.005 (0.0002)
Taper (A – B)	
Standard	Less than 0.005 (0.0002)
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

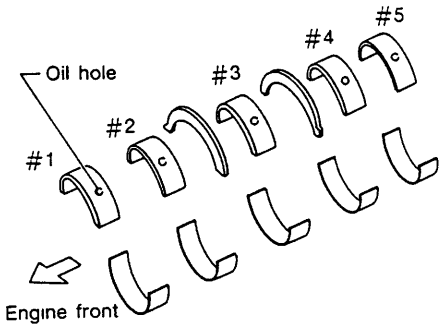
Out-of-round X – Y
Taper A – B



EM715

Inspection and Adjustment (Cont'd)

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.

AVAILABLE CONNECTING ROD BEARING

Connecting rod bearing

Standard size

Unit: mm (in)

Grade number	Thickness "T"	Width "W"	Identification color (mark)
0	1.500 - 1.503 (0.0591 - 0.0592)	16.9 - 17.1 (0.665 - 0.673)	No color (A)
1	1.503 - 1.506 (0.0592 - 0.0593)		Black (B)
2	1.506 - 1.509 (0.0593 - 0.0594)		Brown (C)

Undersize

Unit: mm (in)

Undersize	Thickness "T"	Crank pin journal diameter "Dp"
0.08 (0.0031)	1.541 - 1.549 (0.0607 - 0.0610)	Grind so that bearing clearance is the specified value.
0.12 (0.0047)	1.561 - 1.569 (0.0615 - 0.0618)	
0.25 (0.0098)	1.626 - 1.634 (0.0640 - 0.0643)	

Bearing clearance

Unit: mm (in)

Main bearing clearance	
Standard	0.004 - 0.022 (0.0002 - 0.0009)
Limit	0.05 (0.0020)
Connecting rod bearing clearance	
Standard	0.020 - 0.045 (0.0008 - 0.0018)
Limit	0.09 (0.0035)

MISCELLANEOUS COMPONENTS

Unit: mm (in)

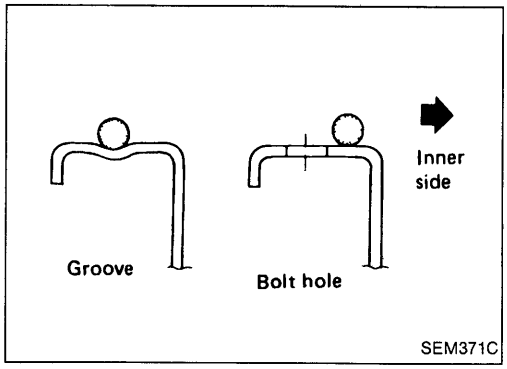
Camshaft sprocket runout limit [T.I.R.]	0.25 (0.0098)
Flywheel runout limit [T.I.R.]	0.1 (0.004)
Drive plate runout limit [T.I.R.]	0.2 (0.008)

ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

CONTENTS

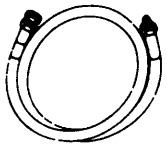
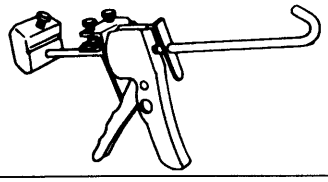
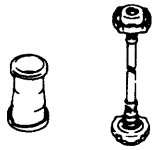
PRECAUTION ..... LC- 2
PREPARATION ..... LC- 3
ENGINE LUBRICATION SYSTEM ..... LC- 4
ENGINE COOLING SYSTEM ..... LC- 9
SERVICE DATA AND SPECIFICATIONS (S.D.S.) LC-17



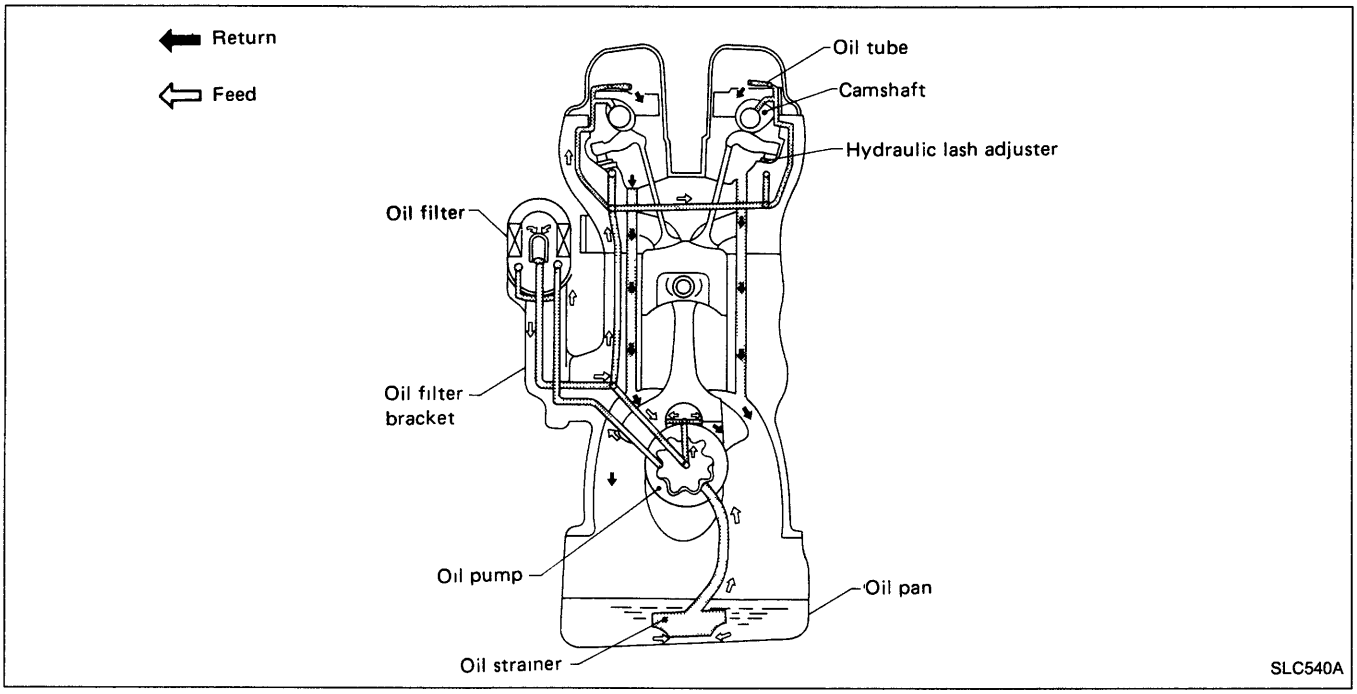
LIQUID GASKET APPLICATION PROCEDURE

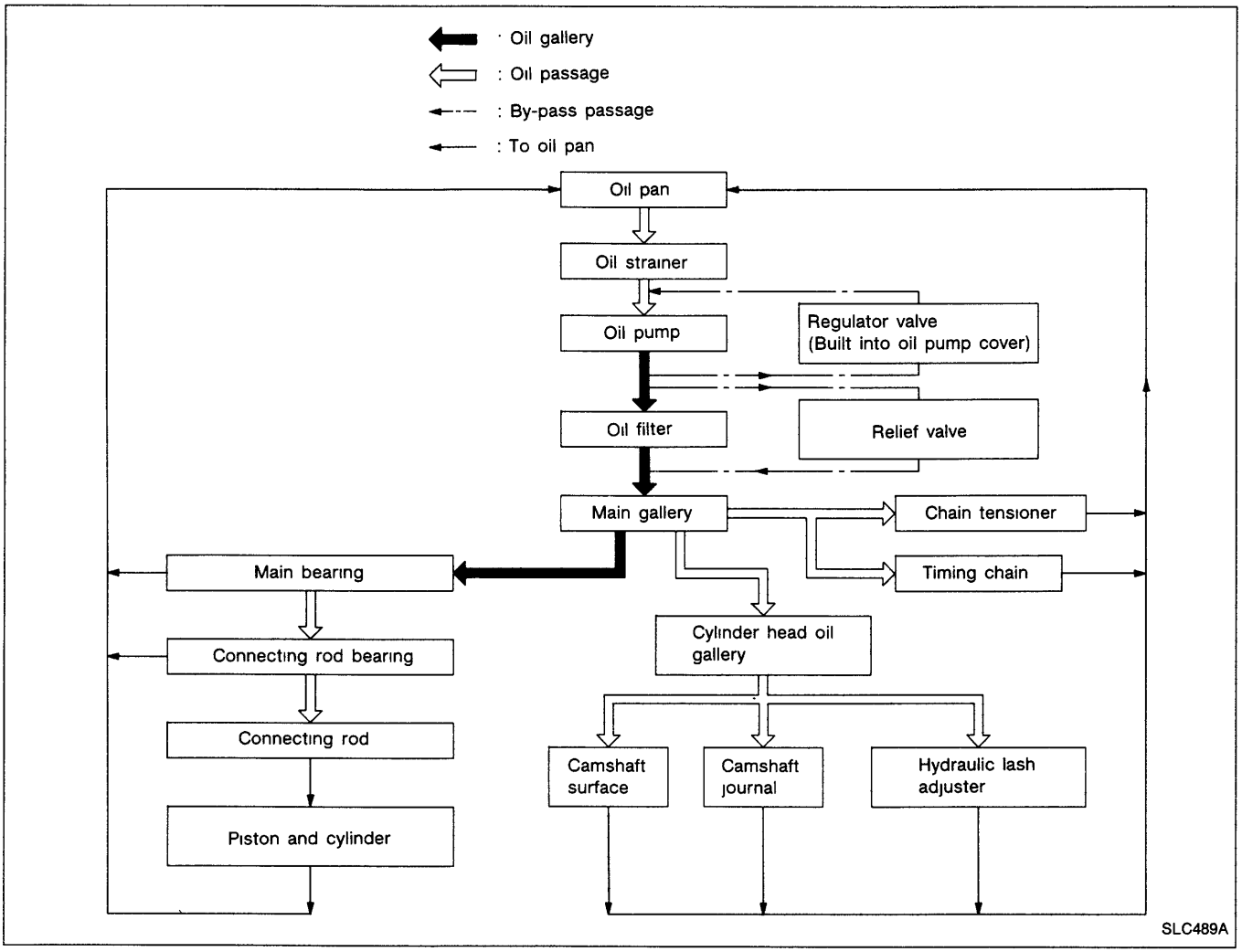
a. Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surface.
b. Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
   - Be sure liquid gasket is 4.0 to 5.0 mm (0.157 to 0.197 in) wide (for oil pan).
   - Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide (in areas except oil pan).
c. Apply liquid gasket to inner 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

Tool number (Kent-Moore No.) Tool name	Description	
ST25051001 (J25695-1) Oil pressure gauge		
ST25052000 (J25695-2) Hose		Adapting oil pressure gauge to cylinder block
WS39930000 (—) Tube presser		Pressing the tube of liquid gasket
EG17650301 (—) Radiator cap tester adapter		Adapting radiator cap tester to radiator filler neck

Lubrication Circuit

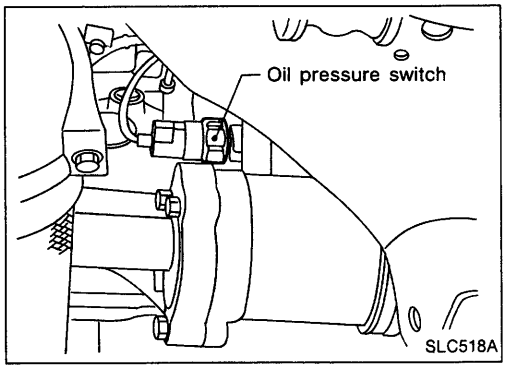




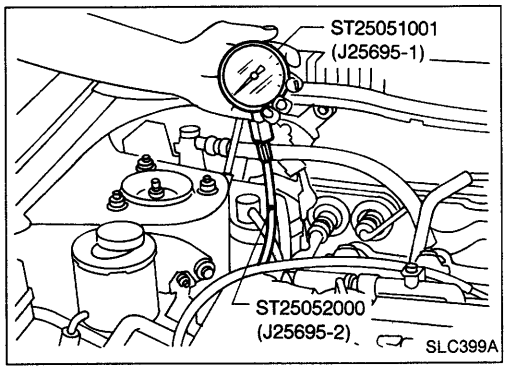
Oil Pressure Check

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.



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 (kg/cm^2, psi)
Idle speed	More than 78 (0.8, 11)
3,200	314 - 392 (3.2 - 4.0, 46 - 57)

If difference is extreme, check oil passage and oil pump for oil leaks.

6. Install oil pressure switch with sealant.

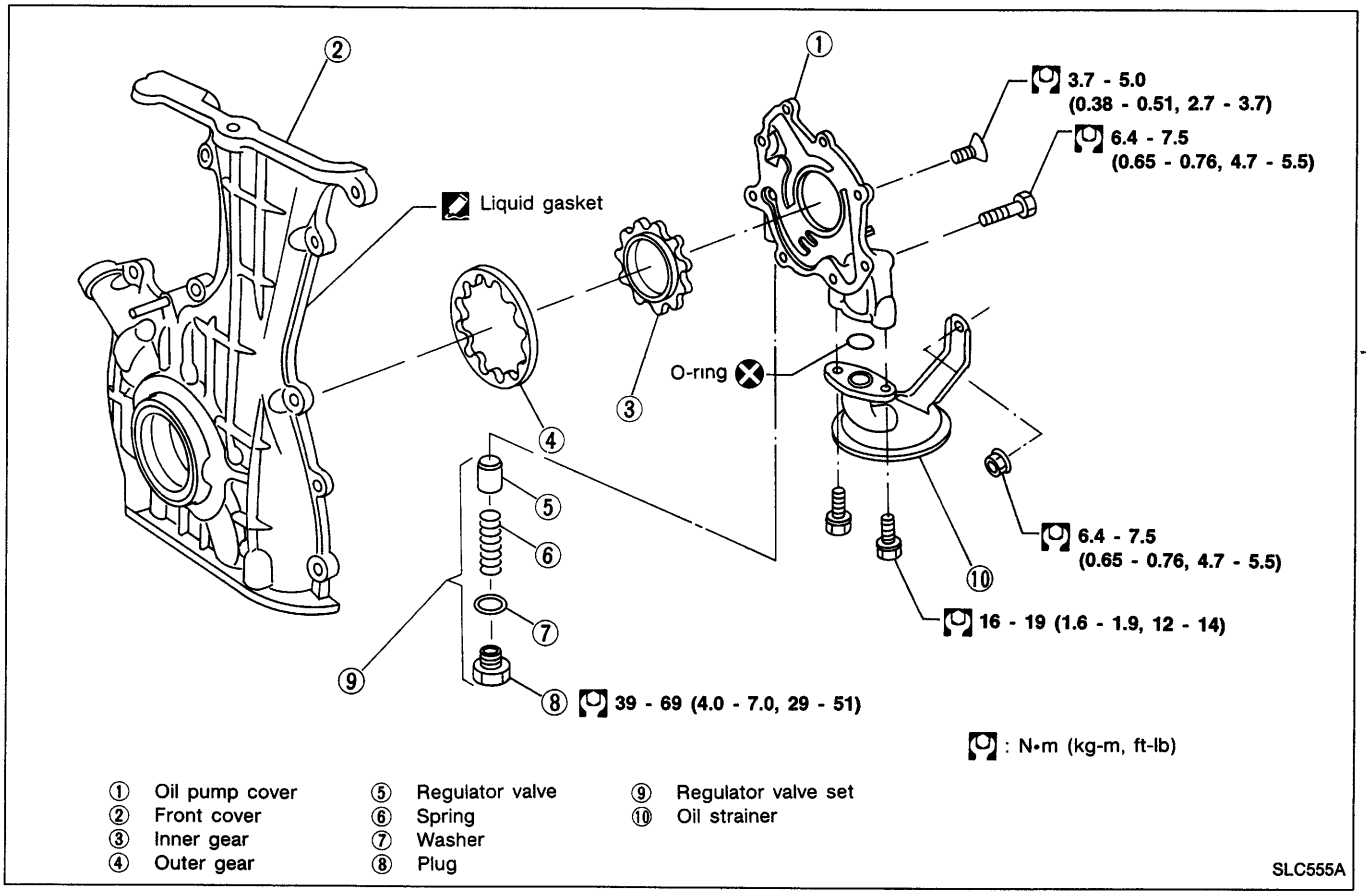
Oil Pump

REMOVAL

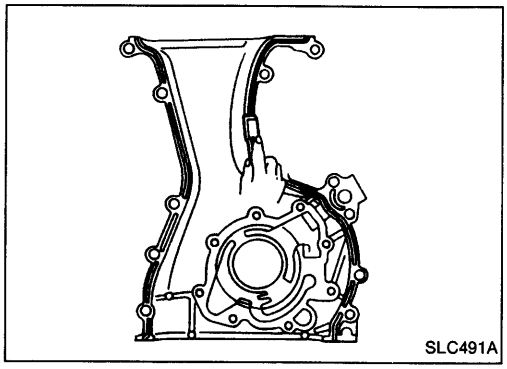
1. Remove drive belts.
2. Remove cylinder head. (Refer to EM section.)
3. Remove oil pans. (Refer to EM section.)
4. Remove oil strainer and baffle plate.
5. Remove front cover assembly.

Oil Pump (Cont'd)

DISASSEMBLY AND ASSEMBLY

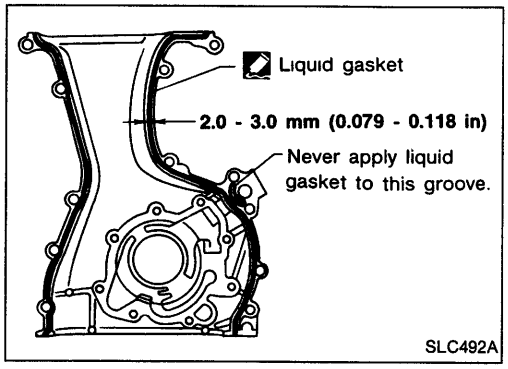


- **Always replace oil seal and O-ring with new ones.**
- **When installing oil pump, apply engine oil to inner and outer gears.**
- **Be sure that O-rings are properly fitted.**



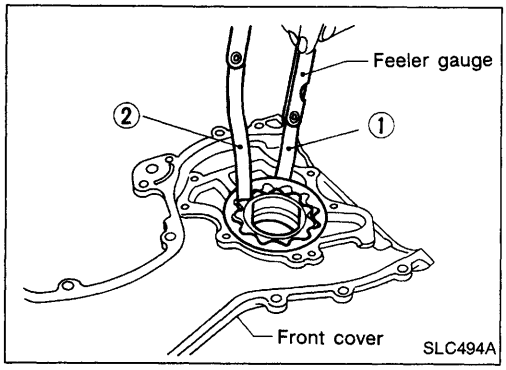
INSTALLATION

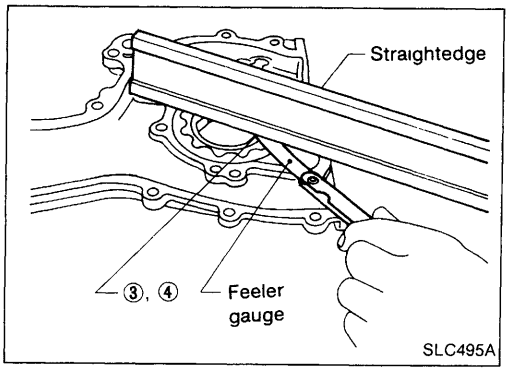
- Before installing front cover assembly, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.

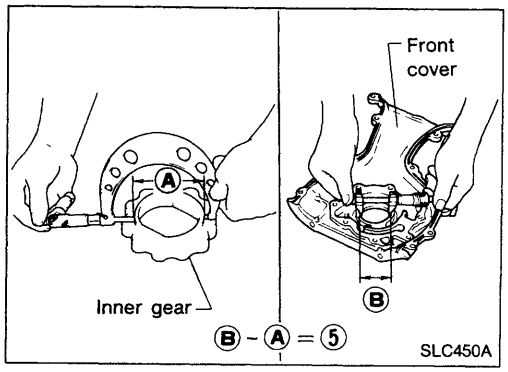


1. Apply a continuous bead of liquid gasket to mating surface of front cover assembly.
   - Use Genuine Liquid Gasket or equivalent.
2. Installation is the reverse order of removal.

Oil Pump (Cont'd)







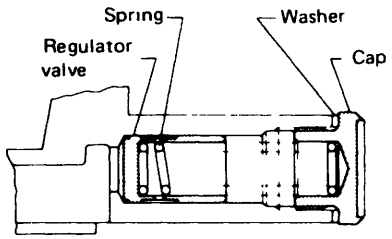
INSPECTION

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.**

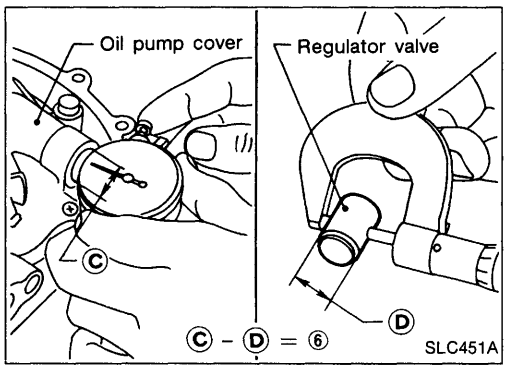


REGULATOR VALVE INSPECTION

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 oil pump cover.

Oil Pump (Cont'd)

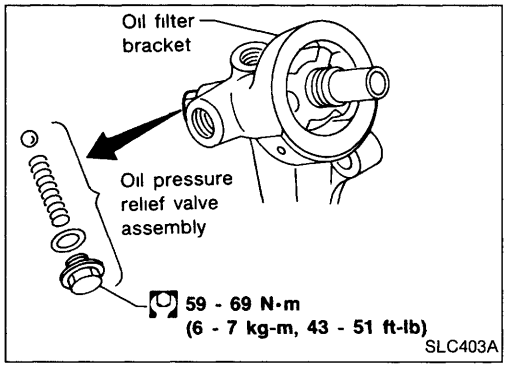


4. Check regulator valve to oil pump cover clearance.

Clearance:

⑥ : 0.040 - 0.097 mm (0.0016 - 0.0038 in)

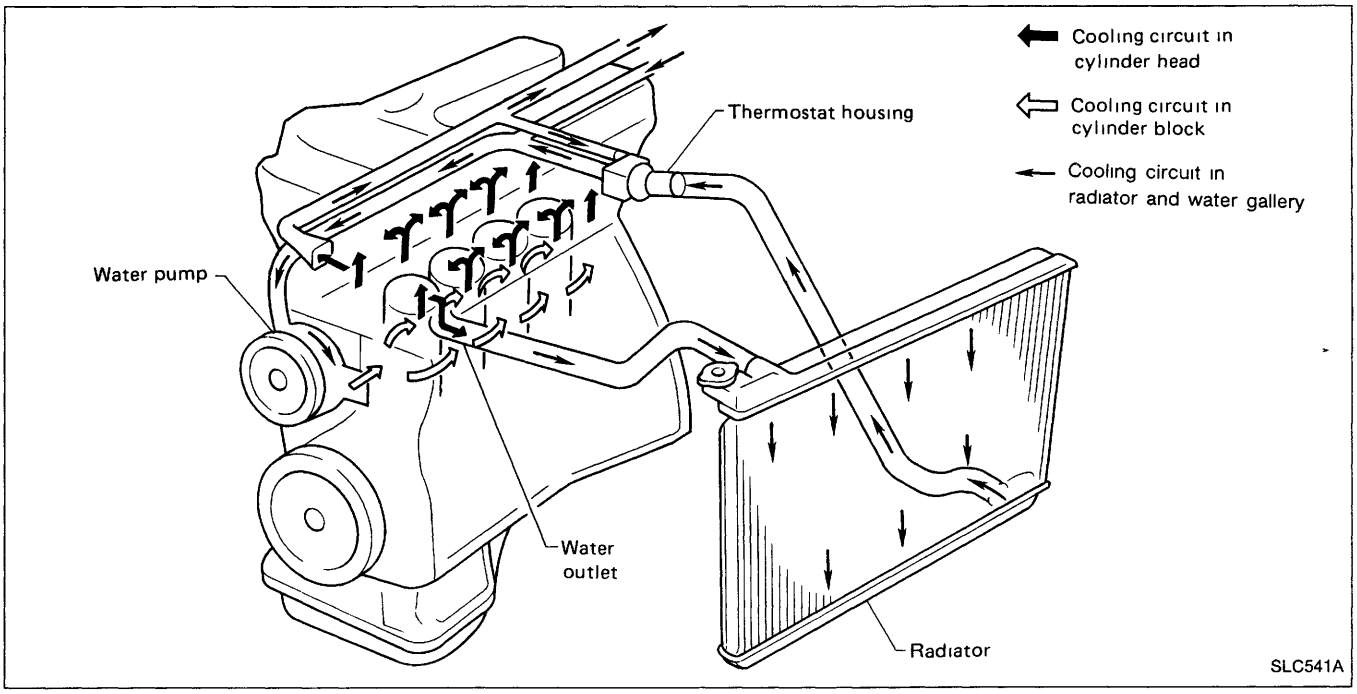
If it exceeds the limit, replace oil pump cover.

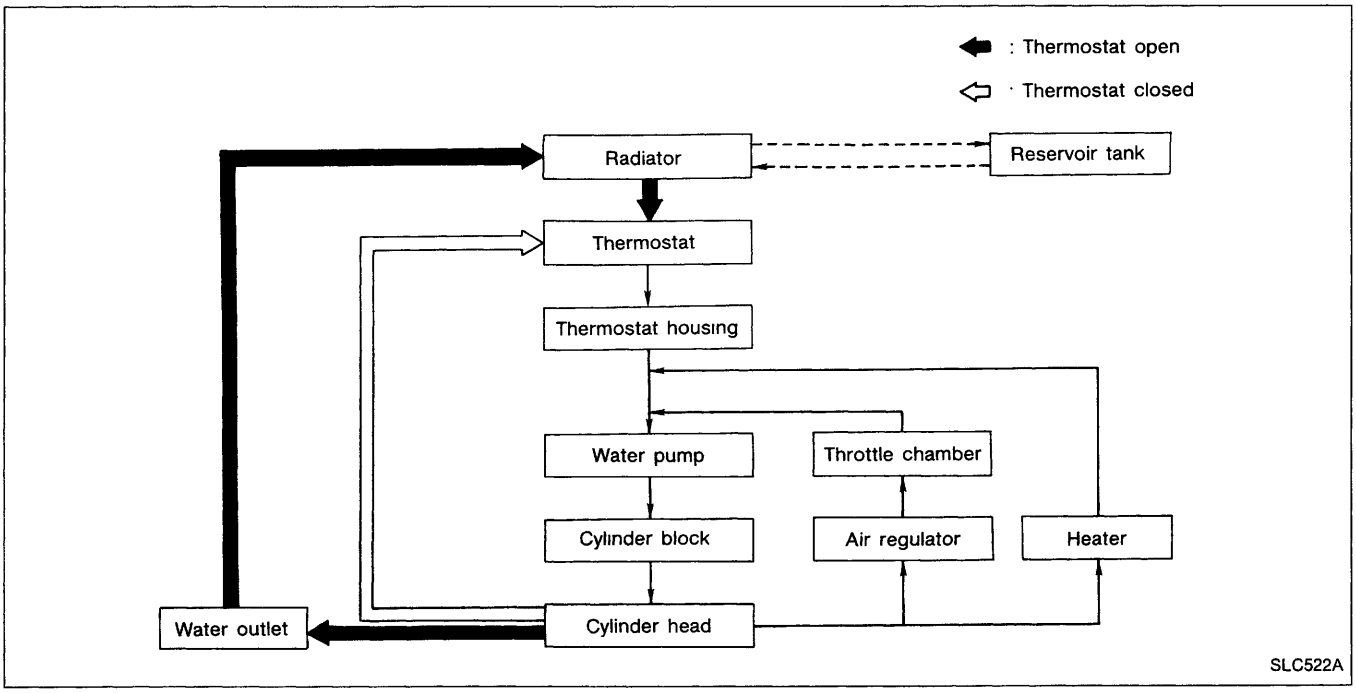


OIL PRESSURE RELIEF VALVE INSPECTION

Inspect oil pressure relief valve for movement, cracks and breaks. If damaged, replace oil filter bracket assembly.

Cooling Circuit





System Check

WARNING:

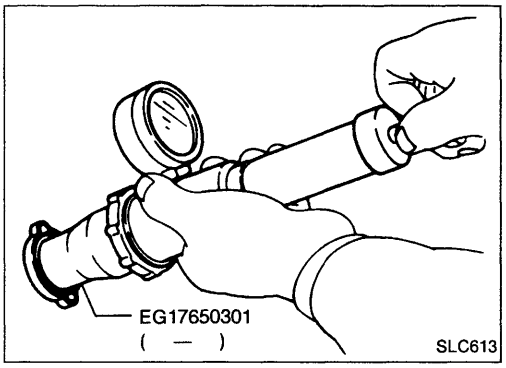
Never remove the radiator cap when the engine is hot; serious burns could be caused by high pressure fluid escaping from the radiator.

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

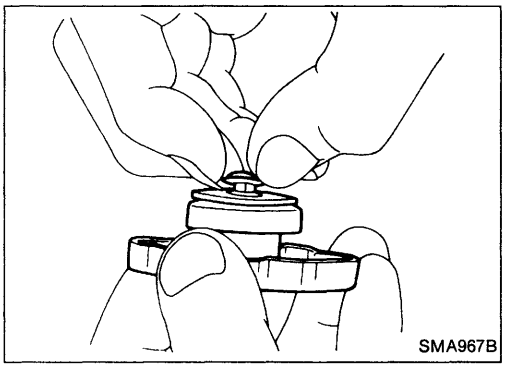
Check water hoses for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



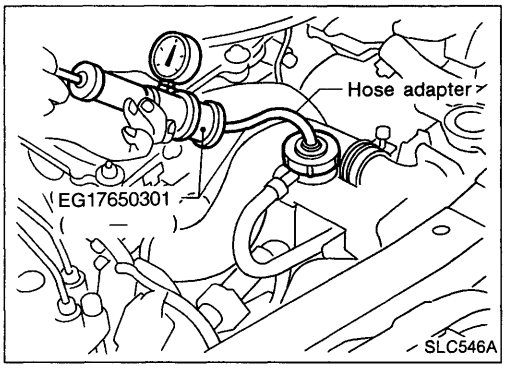
CHECKING RADIATOR CAP

To check radiator cap, apply pressure to cap with a tester.

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



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

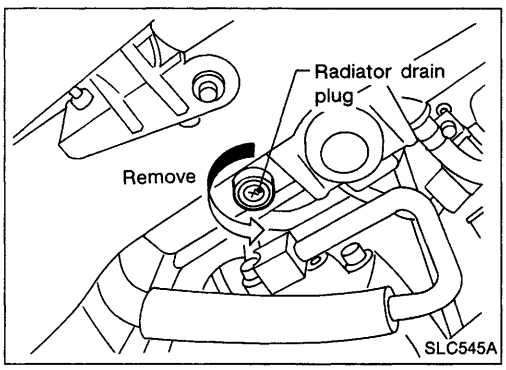


CHECKING COOLING SYSTEM FOR LEAKS

To check for leakage, apply pressure to the cooling system with a tester.

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

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

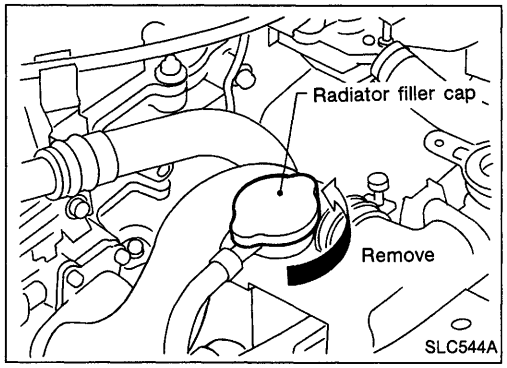


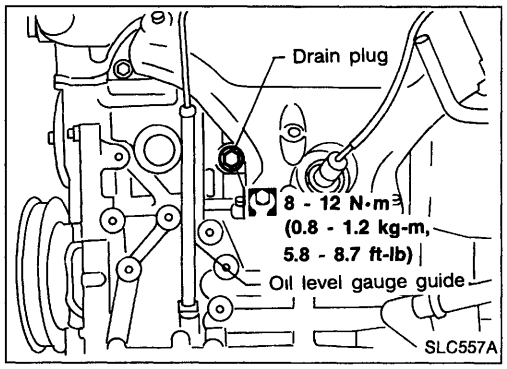
Water Pump

REMOVAL

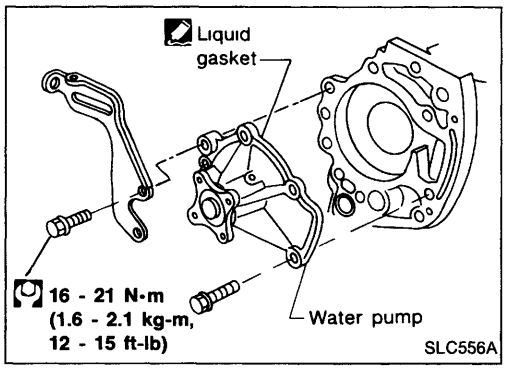
1. Drain coolant from radiator.

Water Pump (Cont'd)





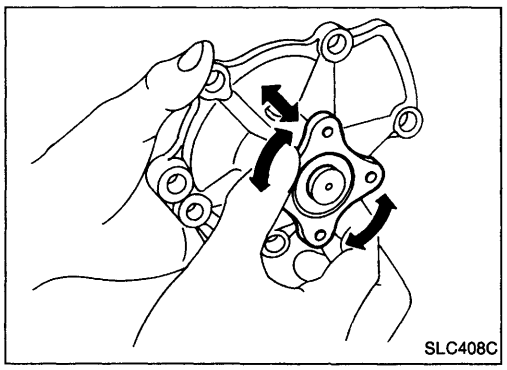
2. Remove cylinder block drain plug located at left front of cylinder block and drain coolant.



3. Remove drive belts.
4. Remove water pump.

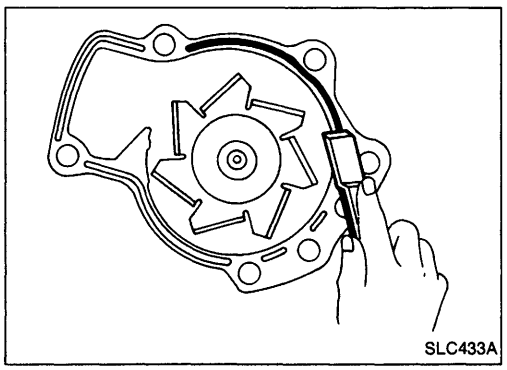
CAUTION:

- **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

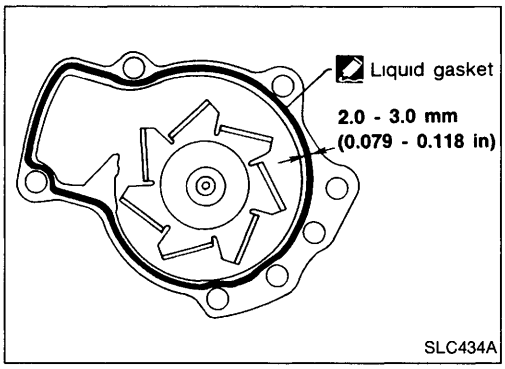
1. Check for badly rusted or corroded body assembly.
2. Check for rough operation due to excessive end play.



INSTALLATION

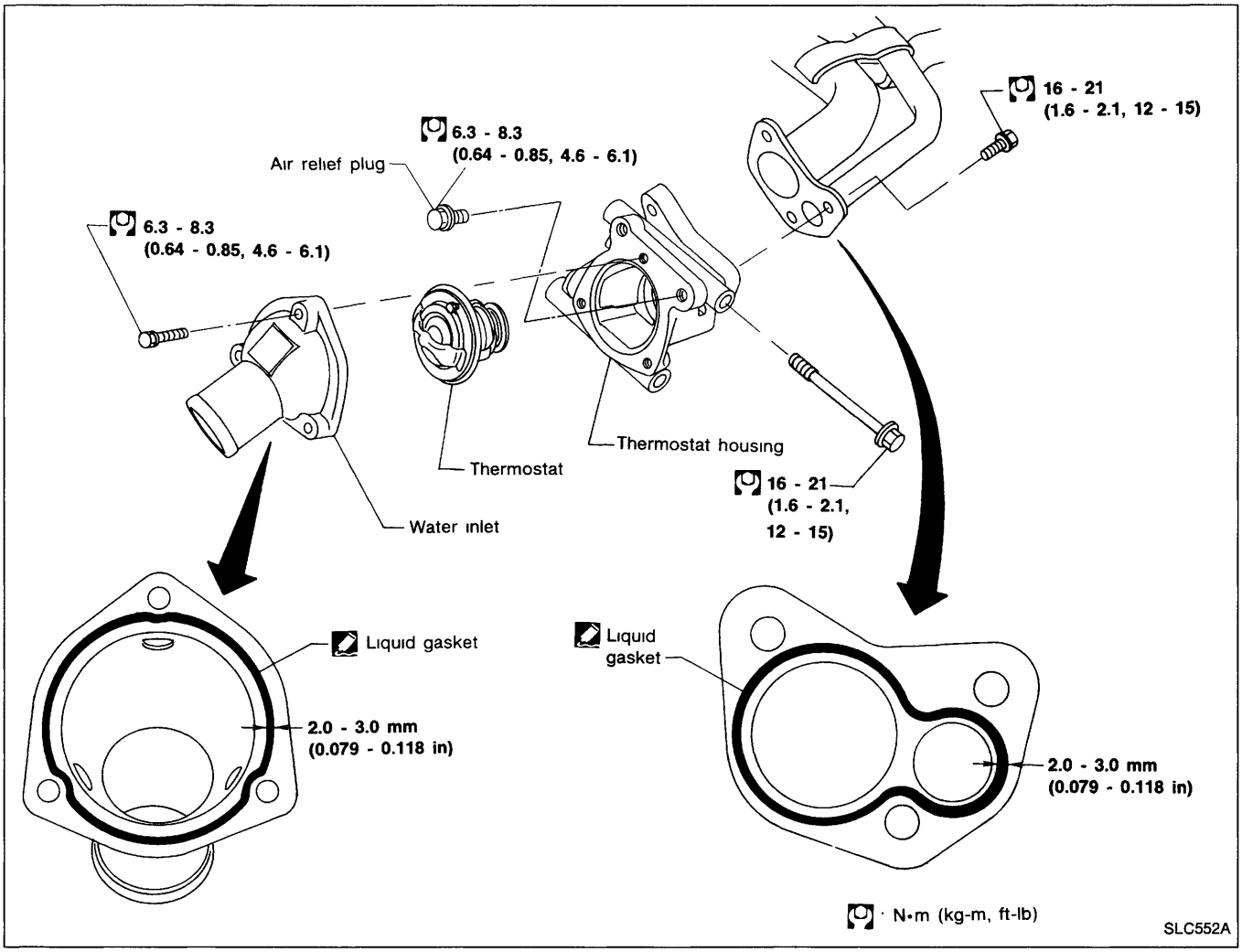
1. Before installing water pump, remove all traces of liquid gasket from mating surface of water pump using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block .

Water Pump (Cont'd)



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

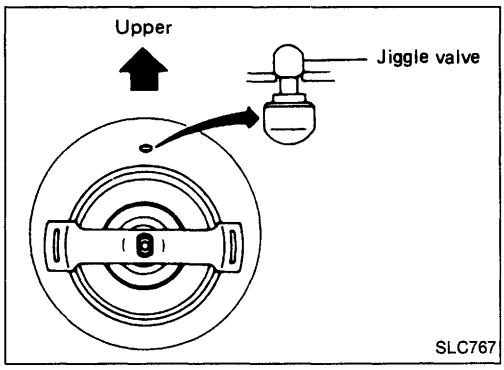
Thermostat



REMOVAL AND INSTALLATION

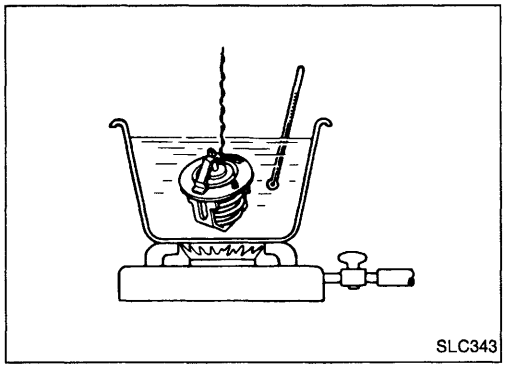
1. Drain engine coolant.
2. Remove lower radiator hose.
3. Remove water inlet, then take out thermostat.

Thermostat (Cont'd)



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.**

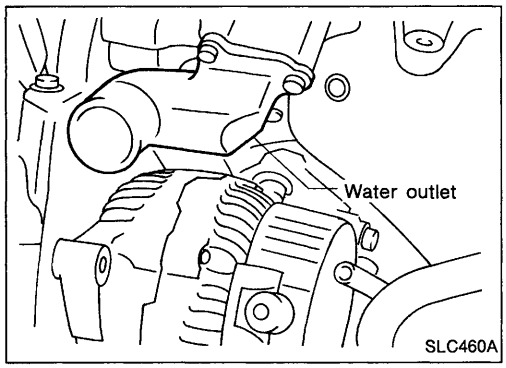


INSPECTION

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)

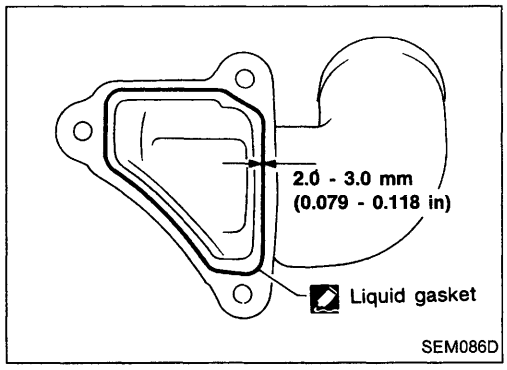
3. Then check if valve closes at 5°C (9°F) below valve opening temperature.



Water outlet

INSPECTION

Visually inspect for water leaks. If there is leakage, apply liquid gasket.



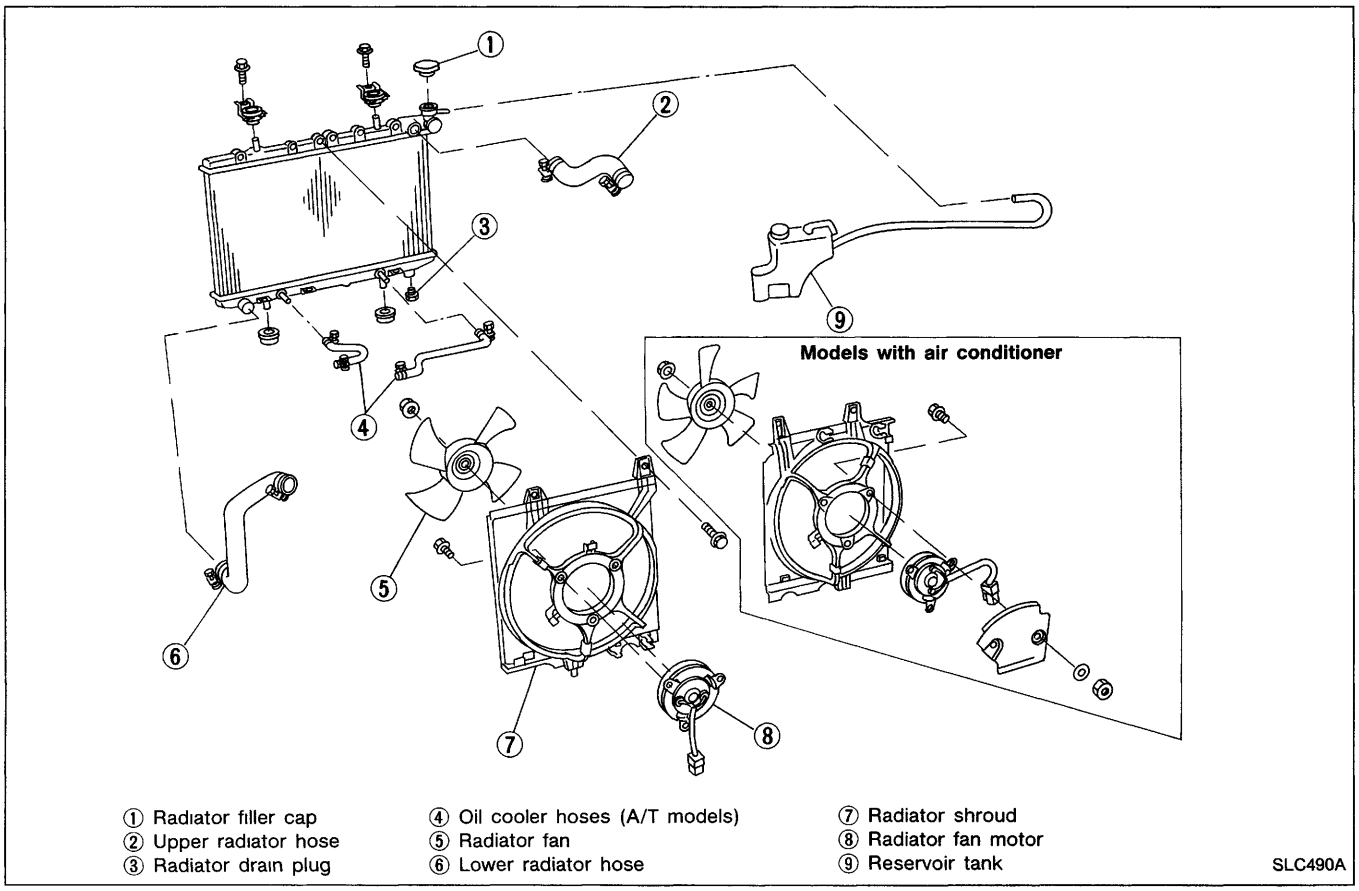
INSTALLATION

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.

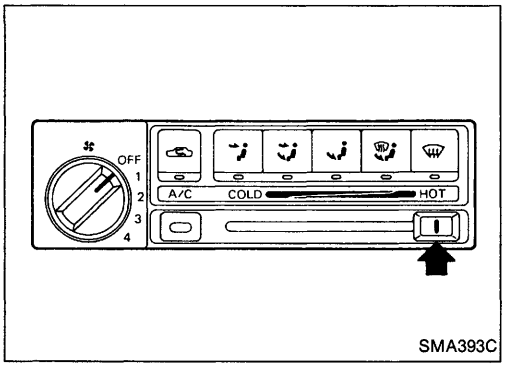
Radiator

DISASSEMBLY AND ASSEMBLY



① Radiator filler cap
② Upper radiator hose
③ Radiator drain plug
④ Oil cooler hoses (A/T models)
⑤ Radiator fan
⑥ Lower radiator hose
⑦ Radiator shroud
⑧ Radiator fan motor
⑨ Reservoir tank

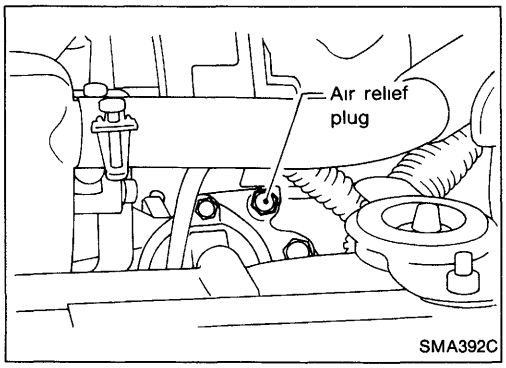
SLC490A



SMA393C

Refilling Engine Coolant

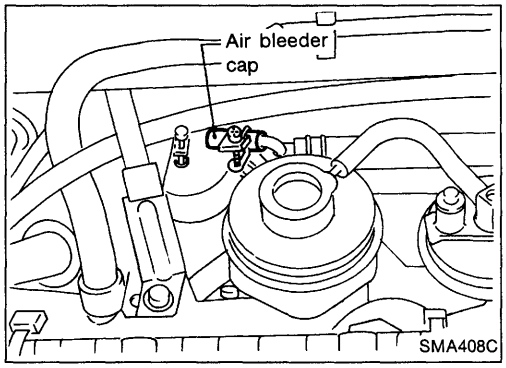
1. Set heater temperature control lever to Maximum Hot position.

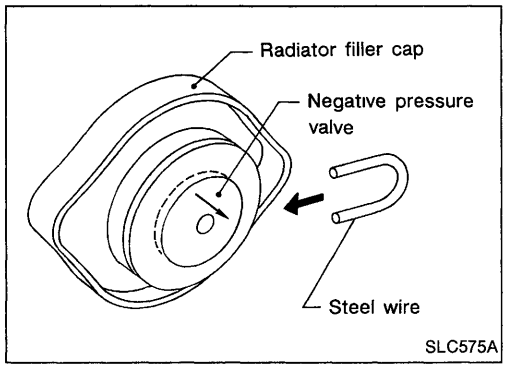


SMA392C

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.

Refilling Engine Coolant (Cont'd)

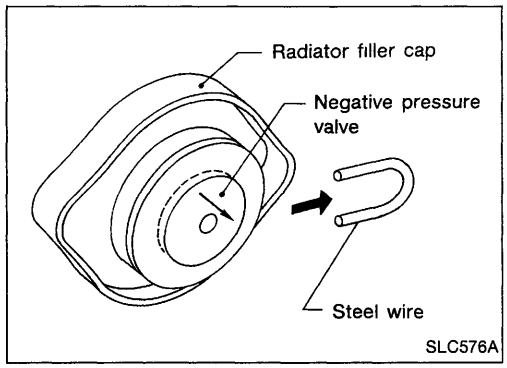




5. Install a temporary radiator filler cap which allows air and coolant in cooling system to be directed into reservoir tank regardless of pressure.
- Install a suitable steel wire between negative pressure valve and its seat as shown in the picture.
6. Warm up engine to normal operating temperature.
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.

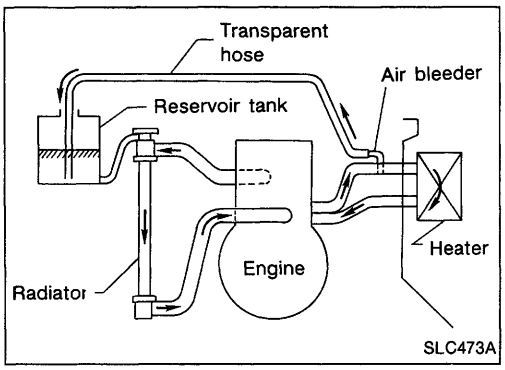
8. Stop engine and cool it down.
- Cool down using a fan to reduce the time.
9. Remove the temporary radiator filler cap and check coolant level.
- If necessary, refill radiator up to filler neck with coolant.
10. Refill reservoir tank to Max line with coolant.
11. Repeat step 7 through step 10 two or more times.



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. 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.

Refilling Engine Coolant (Cont'd)



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 filler 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 filler cap. (Original radiator filler cap)
17. Remove the transparent hose and install air bleeder cap.
18. Check any removed parts for secure reinstallation.

Engine Lubrication System

Oil pressure check

Engine rpm	Approximate discharge pressure kPa (kg/cm^2, psi)
Idle speed	More than 78 (0.8, 11)
3,200	314 - 392 (3.2 - 4.0, 46 - 57)

Regulator valve inspection

Unit: mm (in)

Regulator valve to oil pump cover clearance	0.040 - 0.097 (0.0016 - 0.0038)

Oil pump inspection

Unit: mm (in)

Body to outer gear clearance	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)

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 FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

CONTENTS

PRECAUTIONS ..... EF & EC- 2
PREPARATION ..... EF & EC- 3
ENGINE AND EMISSION CONTROL OVERALL SYSTEM ..... EF & EC- 4
ENGINE AND EMISSION CONTROL PARTS DESCRIPTION ..... EF & EC- 11
ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION ..... EF & EC- 18
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION ..... EF & EC- 30
TROUBLE DIAGNOSES ..... EF & EC- 38
FUEL INJECTION CONTROL SYSTEM INSPECTION ..... EF & EC-193
EVAPORATIVE EMISSION CONTROL SYSTEM ..... EF & EC-196
CRANKCASE EMISSION CONTROL SYSTEM ..... EF & EC-198
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... EF & EC-200

Note: Refer to Foldout page for "E.C.C.S. WIRING DIAGRAM".

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

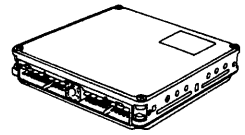
When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

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.

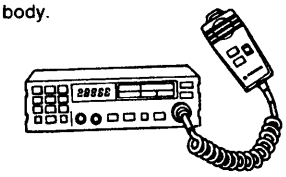
INJECTOR
- Do not disconnect injector harness connectors with engine running.
- Do not apply battery power directly to injectors

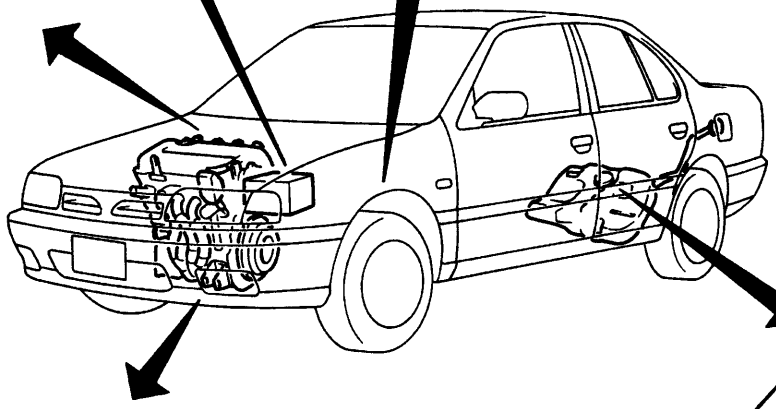
E.C.U.
- Do not disassemble E.C.C.S. control unit (E.C.U.).
- Do not turn diagnosis mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ROM value. The E.C.C.S. will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.



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

1) Keep the antenna as far as possible away from the 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.

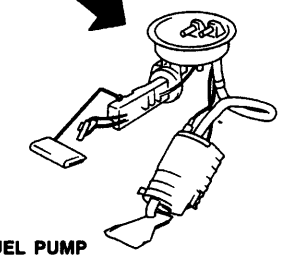




E.C.C.S. PARTS HANDLING
- Handle air flow meter carefully to avoid damage.
- Do not disassemble air flow meter.
- Do not clean air flow meter with any type of detergent.
- Do not disassemble auxiliary air control valve.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the crank angle sensor.



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

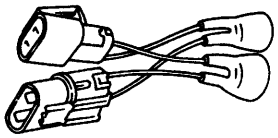


FUEL PUMP
- Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.

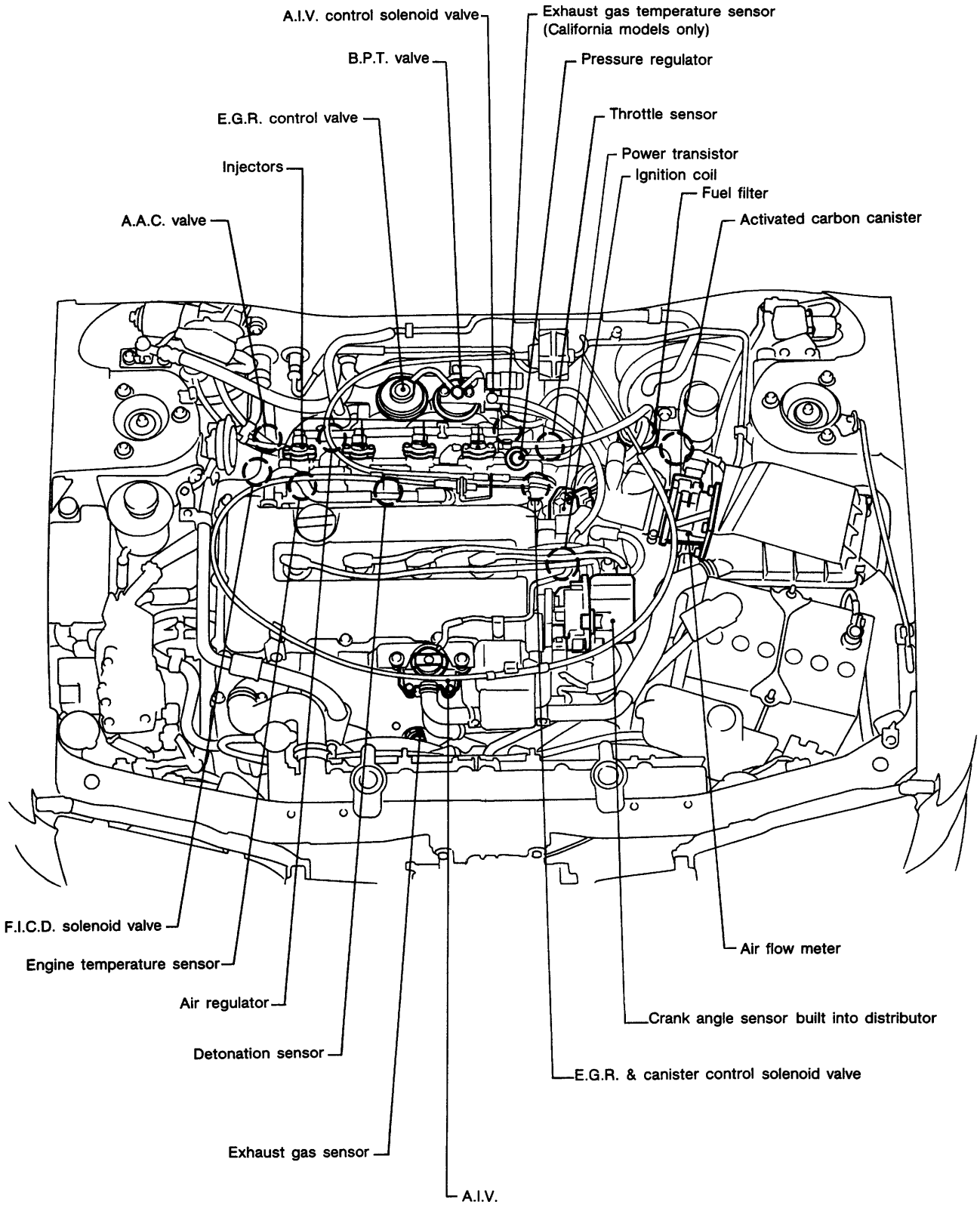
E.C.C.S. HARNESS HANDLING
- Securely connect E.C.C.S. harness connectors.
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep E.C.C.S. harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an E.C.C.S. 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.

SEF308K

SPECIAL SERVICE TOOL

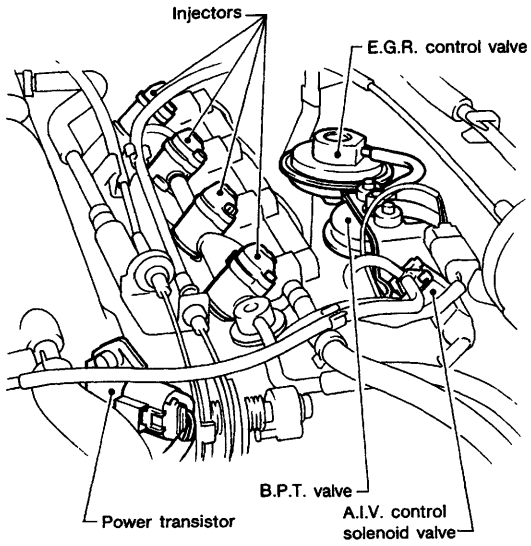
Tool number (Kent-Moore No.) Tool name	Description
EG11160000 (—) Adapter harness	 Measuring engine speed

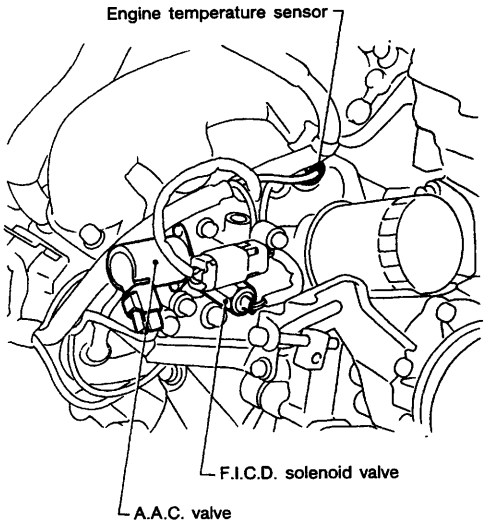
E.C.C.S. Component Parts Location

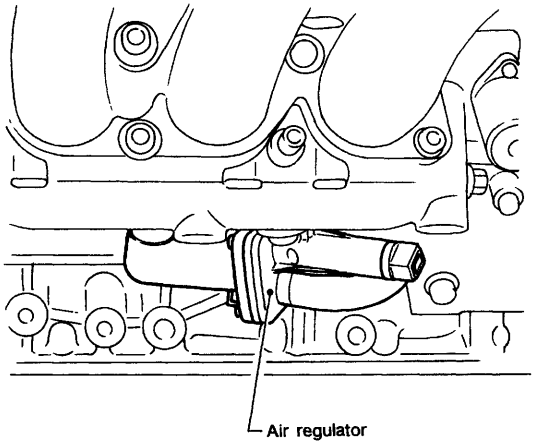


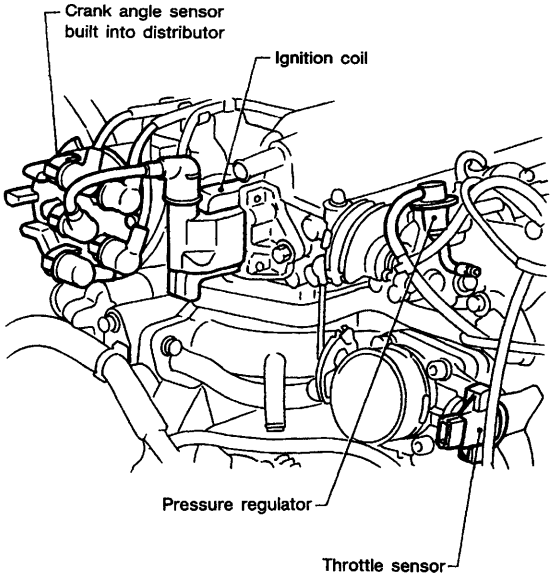
SEF889K

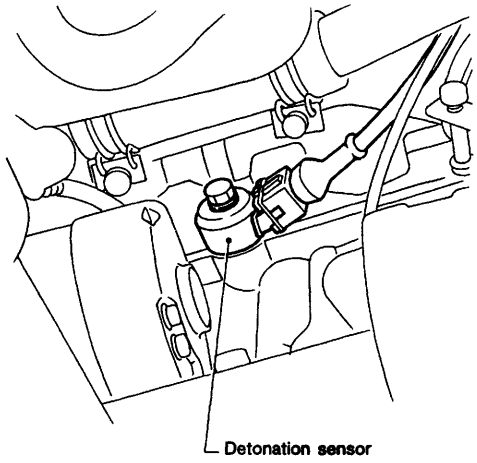
E.C.C.S. Component Parts Location (Cont'd)

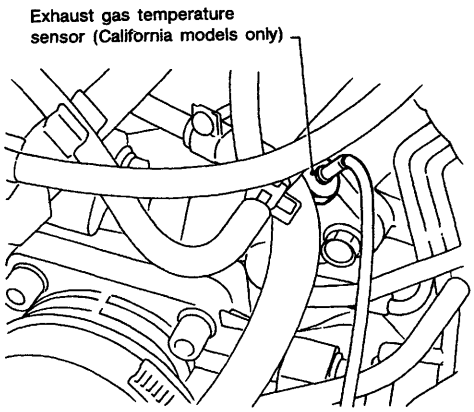






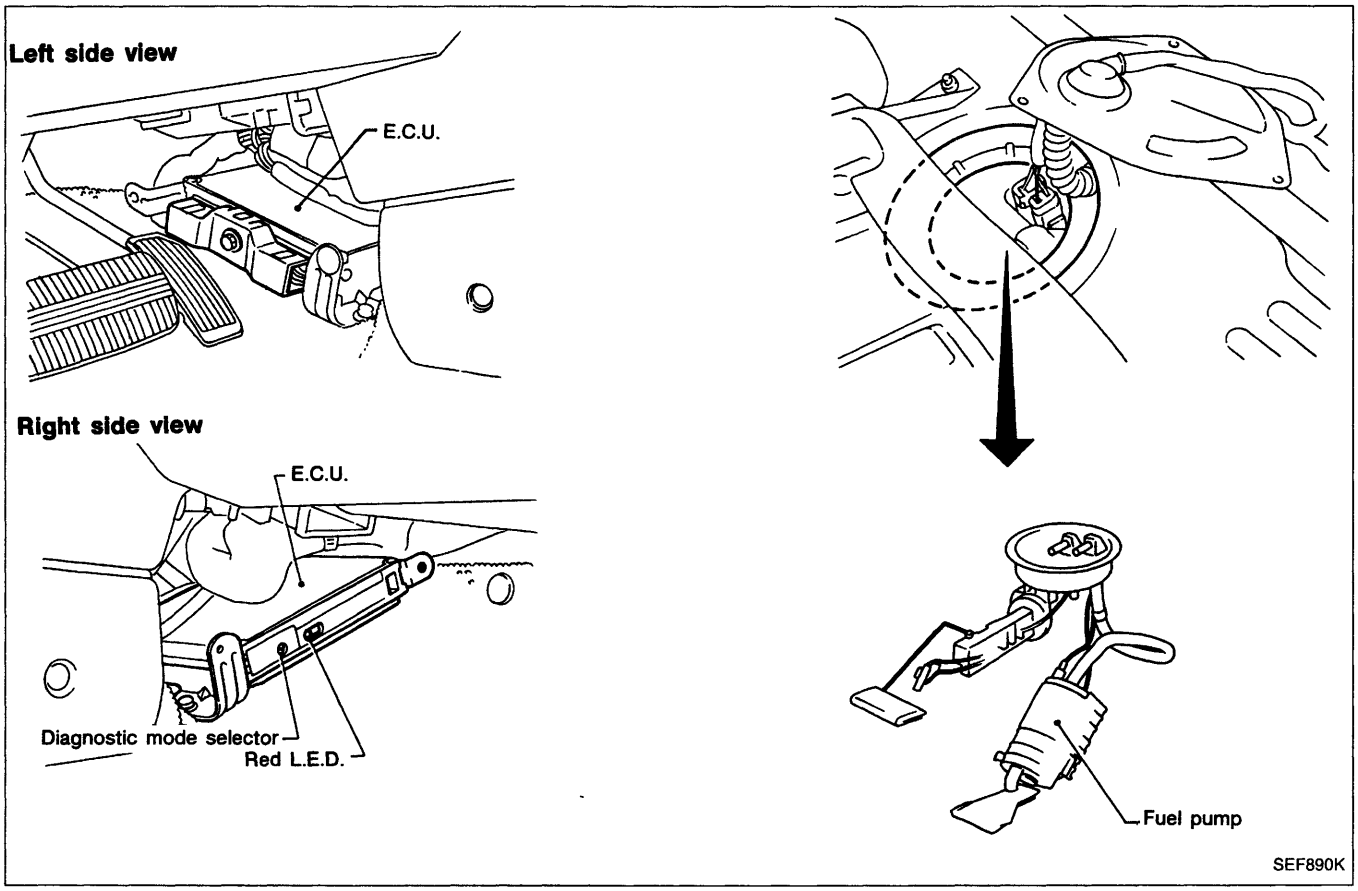




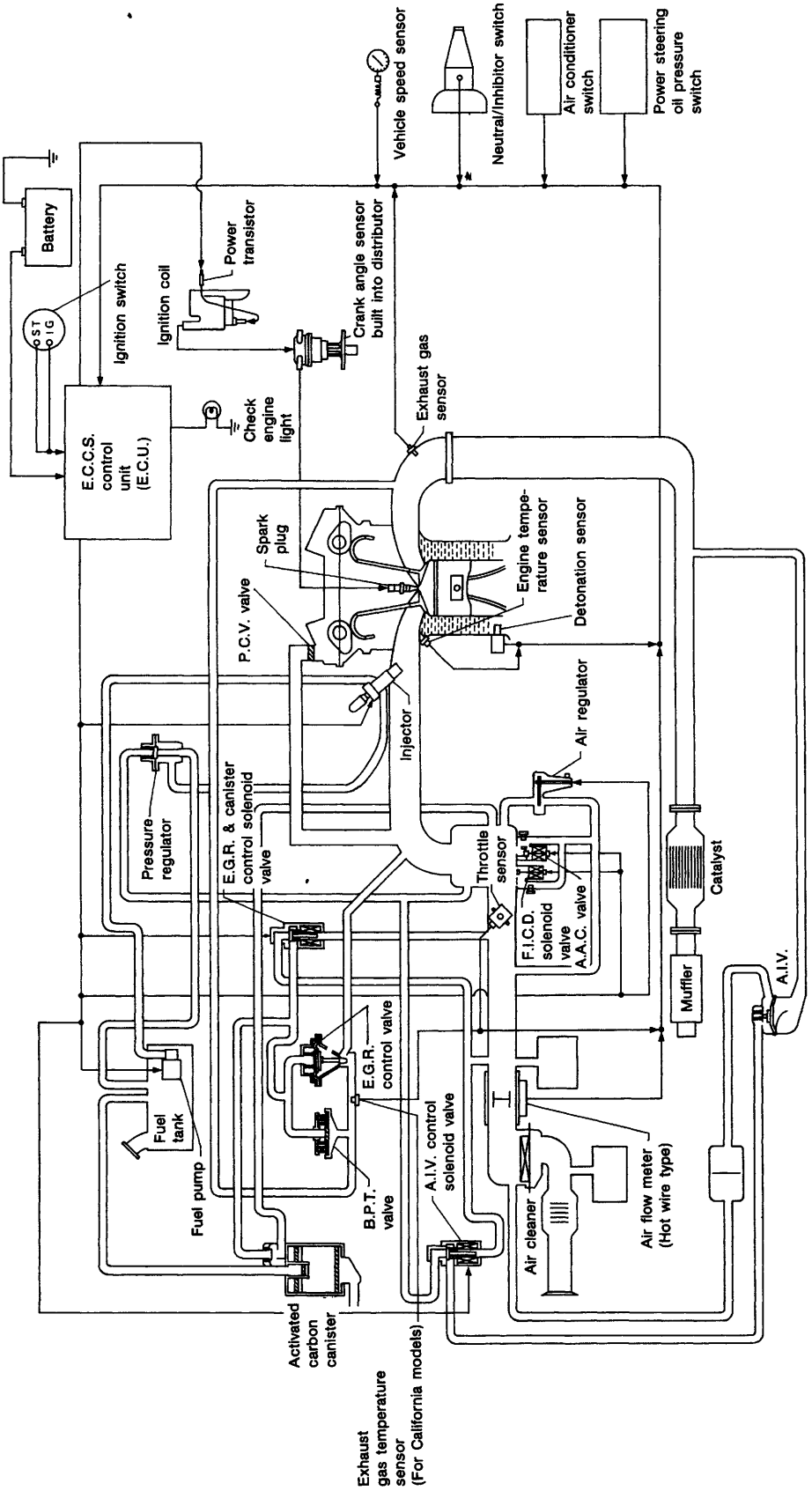


SEF979K

E.C.C.S. Component Parts Location (Cont'd)

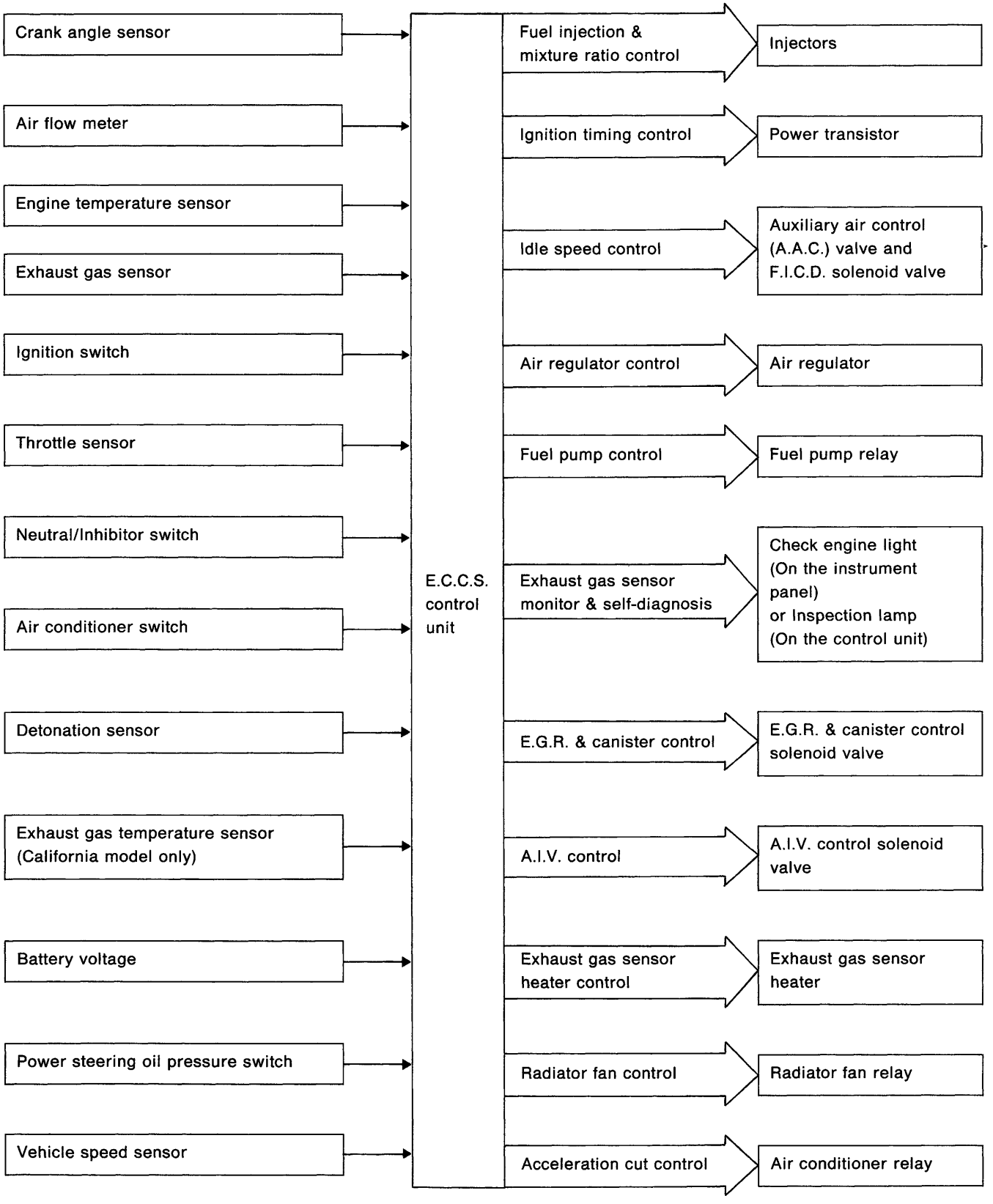


System Diagram

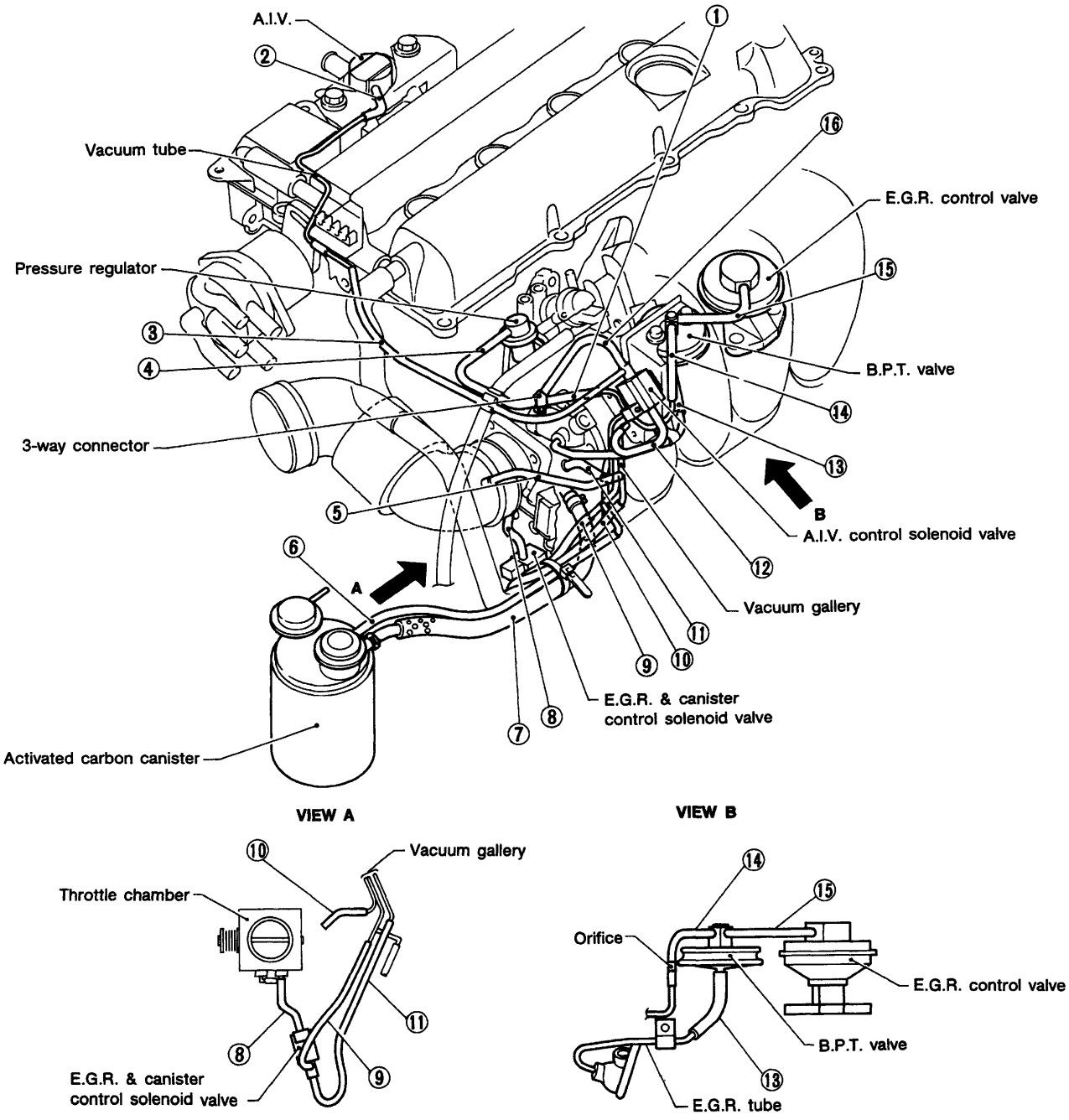


SEF774K

System Chart



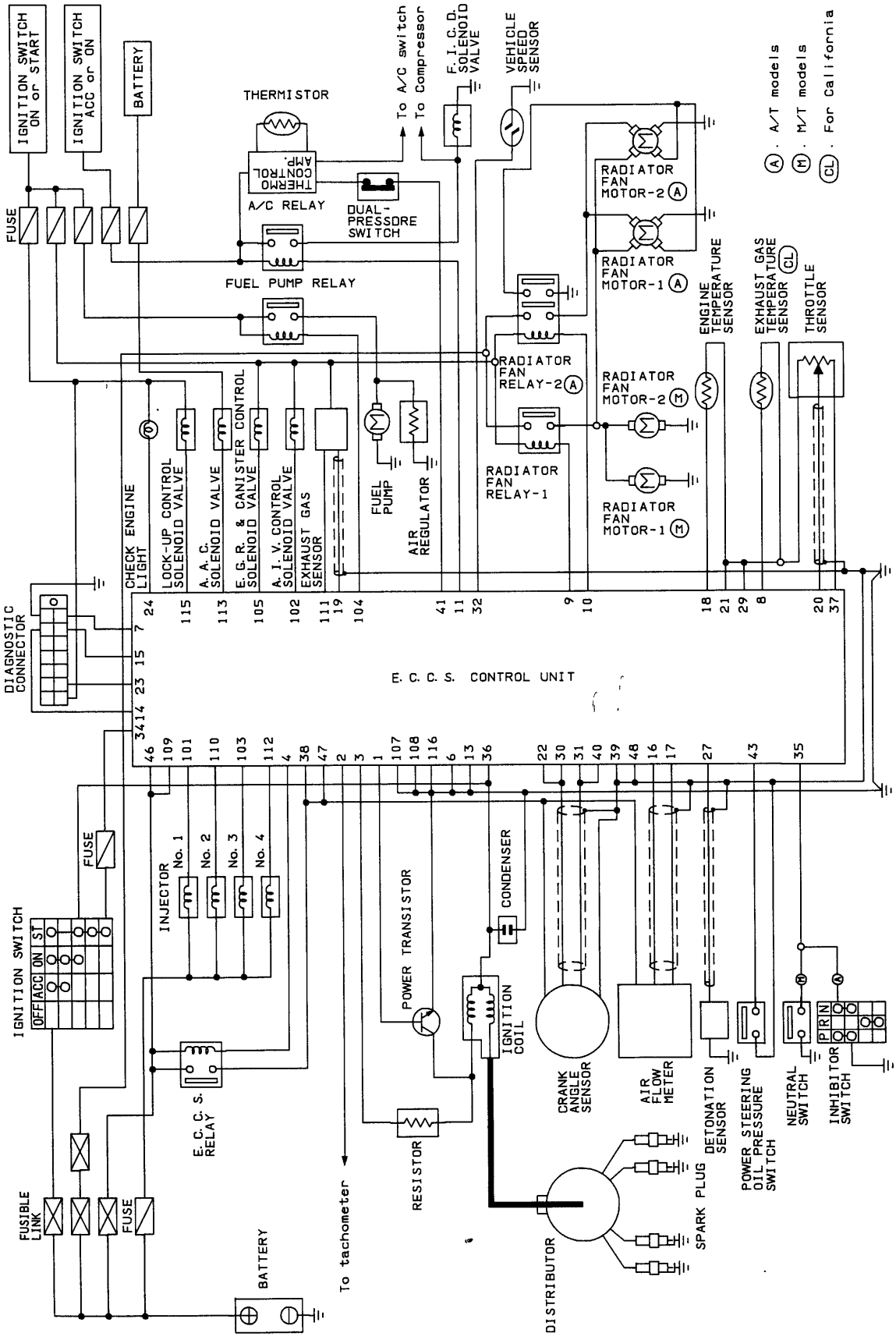
Vacuum Hose Drawing



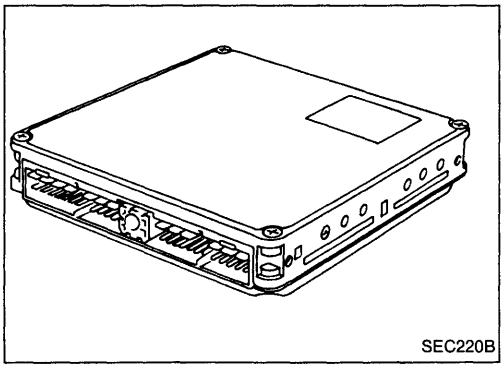
SEF879K

① 3-way connector to vacuum gallery
② A.I.V. to vacuum tube
③ Vacuum tube to A.I.V. control solenoid valve
④ Pressure regulator to 3-way connector
⑤ Air duct to vacuum gallery
⑥ Actuated carbon canister (vacuum line) to vacuum gallery
⑦ Activated carbon canister (purge line) to intake manifold collector
⑧ Throttle chamber to E.G.R. & canister control solenoid valve
⑨ E.G.R. & canister control solenoid valve to vacuum gallery
⑩ E.G.R. & canister control solenoid valve to vacuum gallery
⑪ Intake manifold collector to vacuum gallery
⑫ A.I.V. control solenoid valve to vacuum gallery
⑬ B.P.T. valve to E.G.R. tube
⑭ B.P.T. valve to vacuum gallery
⑮ E.G.R. control valve to B.P.T. valve
⑯ A.I.V. control solenoid valve to 3-way connector

Circuit Diagram

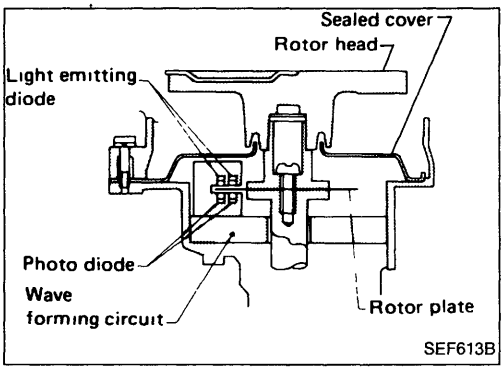


MEF486A


SEC220B

E.C.C.S. Control Unit (E.C.U.)

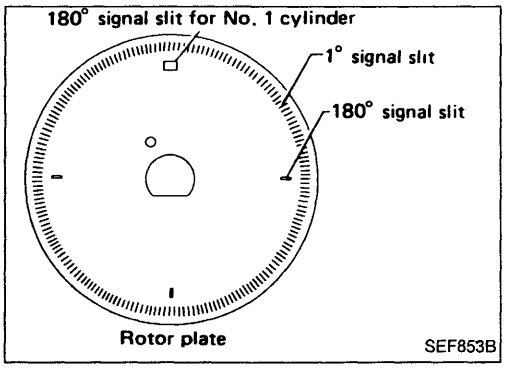
The E.C.U. consists of a microcomputer, inspection lamp, a diagnostic mode selector, and connectors for signal input and output and for power supply. The unit controls the engine.



SEF613B

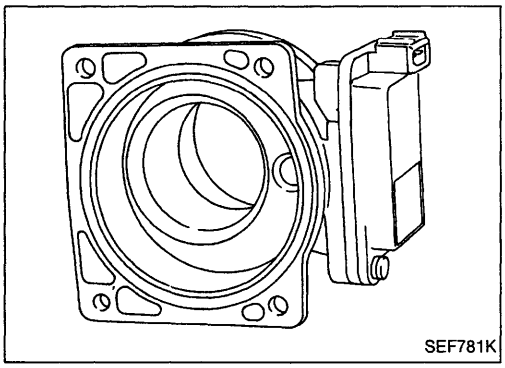
Crank Angle Sensor

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.



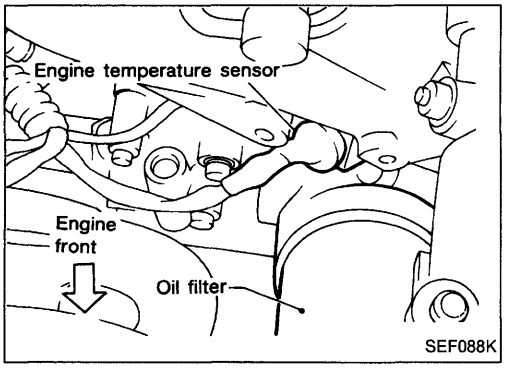
SEF853B

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.


SEF781K

Air Flow Meter

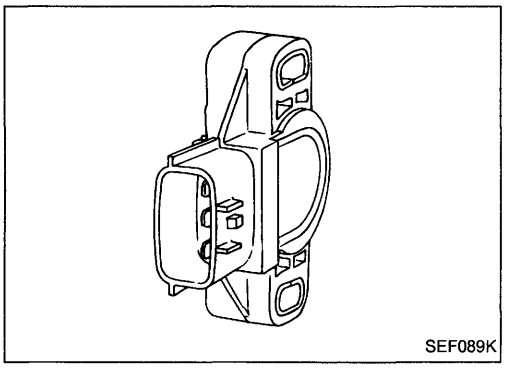
The air flow meter measures the intake air flow rate by taking a part of the entire flow. Measurements are made in such a manner that the E.C.U. receives electrical output signals varied by the amount of heat emitting from the hot wire placed in the stream of the intake air.
When intake air flows into 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 behind the oil filter, detects engine coolant temperature and transmits a signal to the E.C.U.

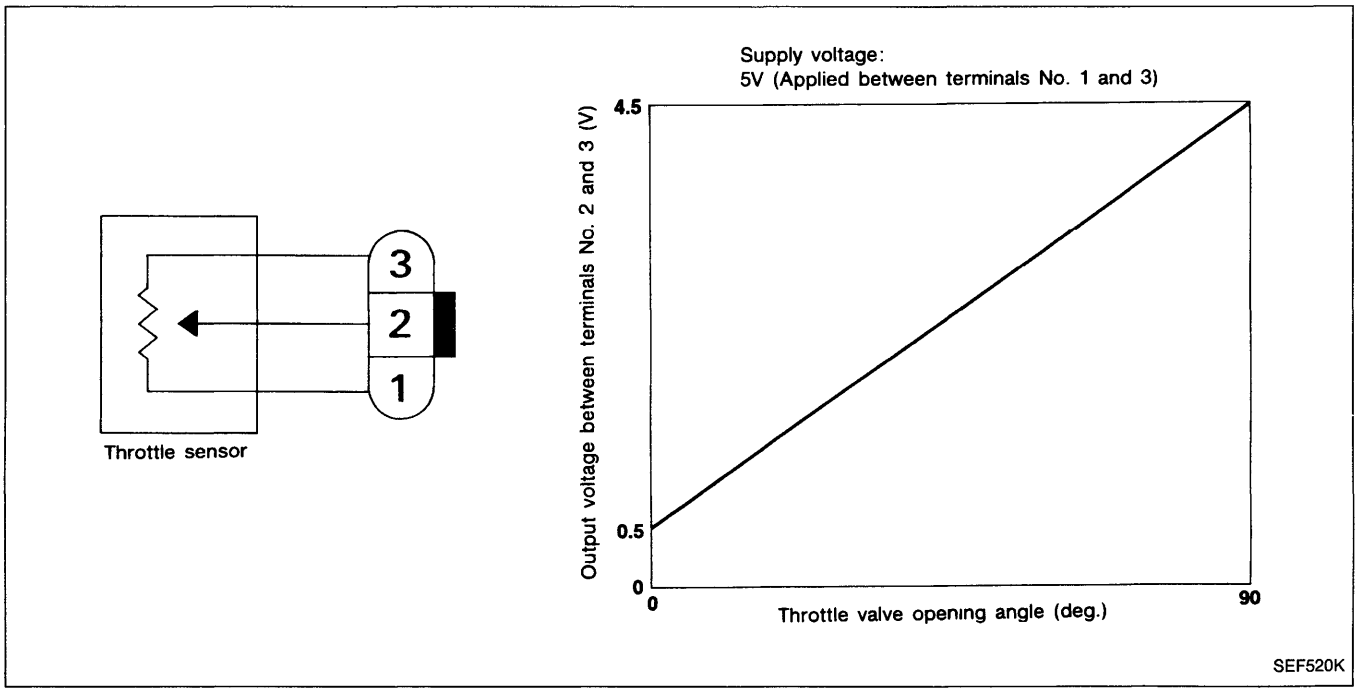
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

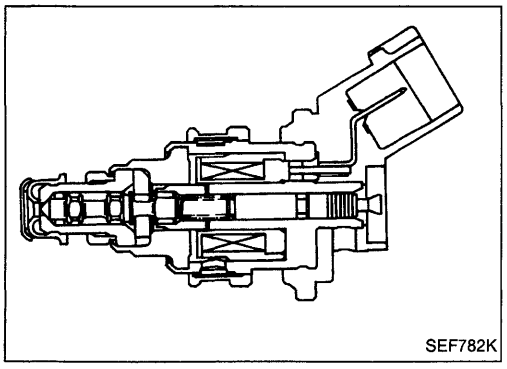


Throttle Sensor & Soft Idle Switch

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.

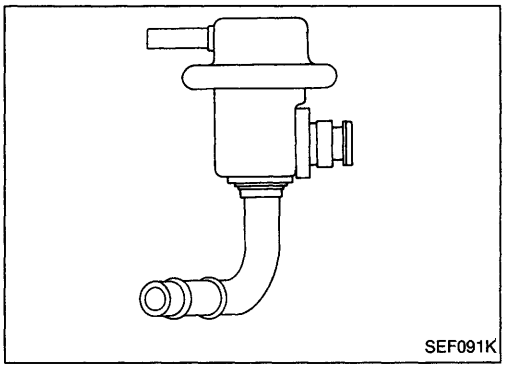
Idle position of the throttle valve is determined by the E.C.U. receiving the signal from the throttle sensor. This system is called "soft idle switch". This one controls engine operation such as fuel cut.





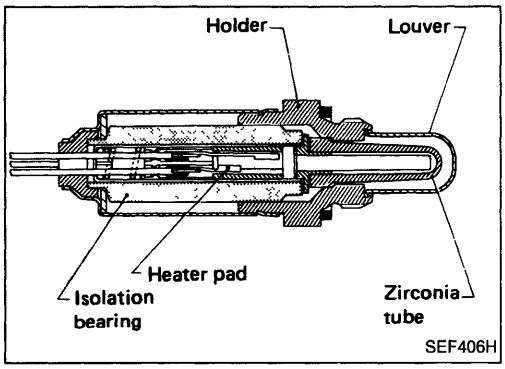
Fuel Injector

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.


SEF091K

Pressure Regulator

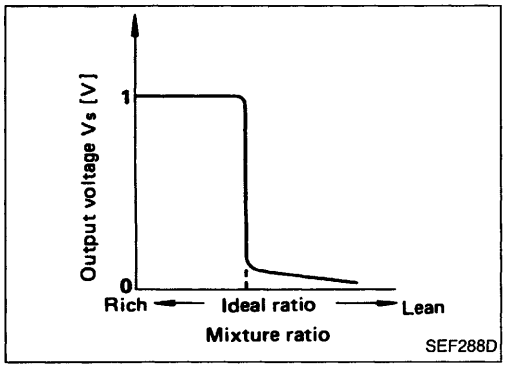
The pressure regulator maintains the fuel pressure at 299.1 kPa (3.05 kg/cm^2, 43.4 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pressure at the above value.



SEF406H

Exhaust Gas Sensor

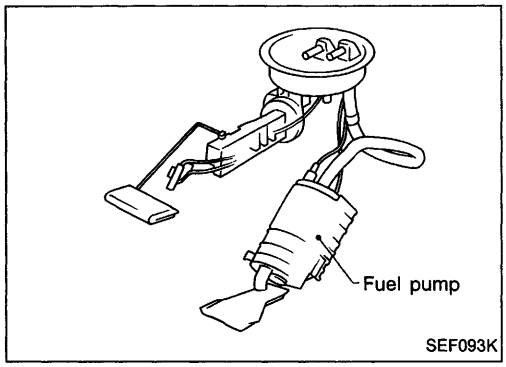
The exhaust gas sensor, which is placed into the exhaust manifold, monitors the amount of oxygen in the exhaust gas. The sensor has a closed-end tube made of ceramic zirconia. The outer surface of the tube is exposed to exhaust gas, and the inner surface to atmosphere. The zirconia of the tube compares the oxygen density of exhaust gas with that of atmosphere, and generates electricity. In order to improve generating power of the zirconia, its tube is coated with platinum. The voltage is approximately 1V in a richer condition of the mixture ratio than the ideal air-fuel ratio, while approximately 0V in leaner conditions. The radical change from 1V to 0V occurs at around the ideal mixture ratio. In this way, the exhaust gas sensor detects the amount of oxygen in the exhaust gas and sends the signal of approximately 1V or 0V to the E.C.U. A heater is used to activate the sensor.



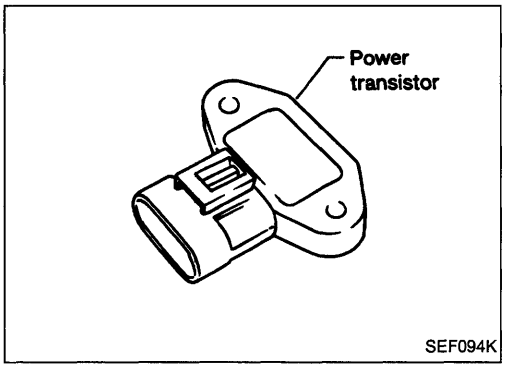
SEF288D

Fuel Pump

A turbine type design fuel pump is used and is situated in the fuel tank.

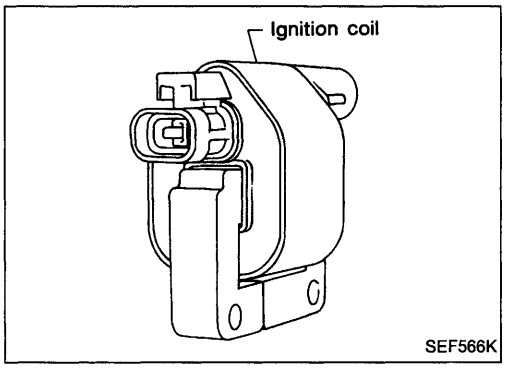


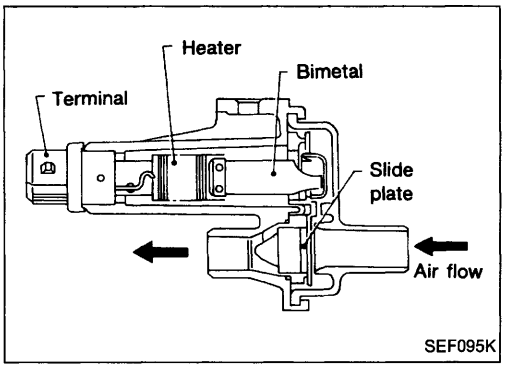
SEF093K



Power Transistor & Ignition Coil

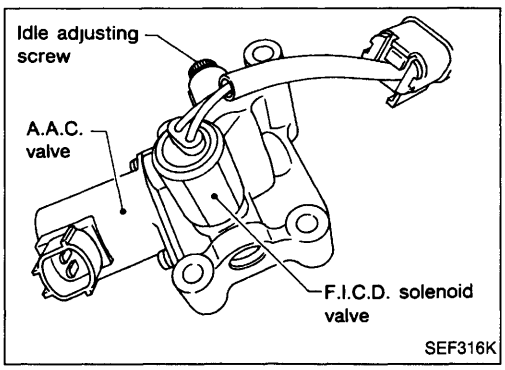
The ignition signal from the E.C.U. is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit. The ignition coil is a small, molded type.





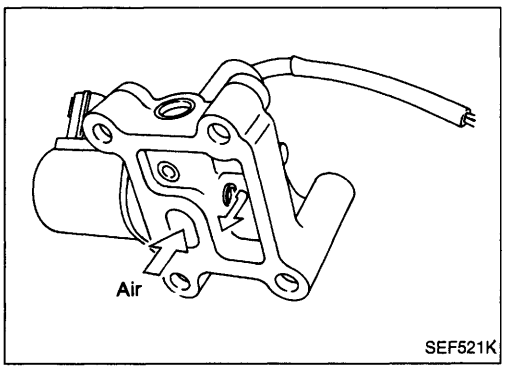
Air Regulator

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.



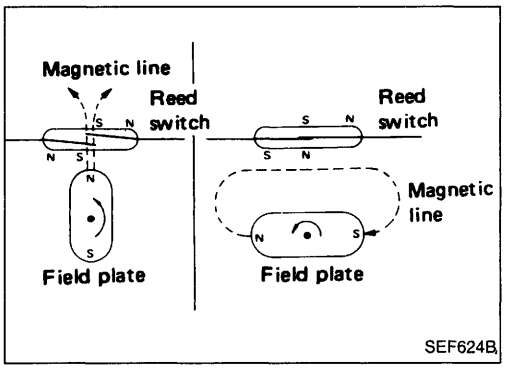
Idle Air Adjusting (I.A.A.) Unit

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.



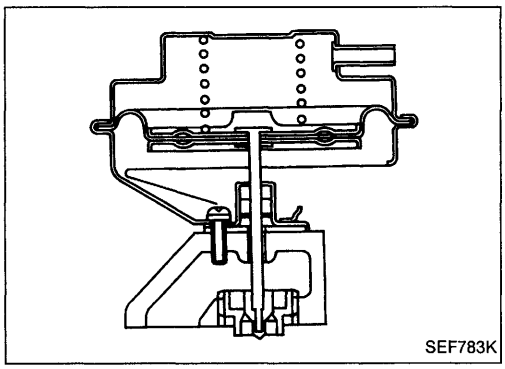
Auxiliary Air Control (A.A.C.) Valve

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.



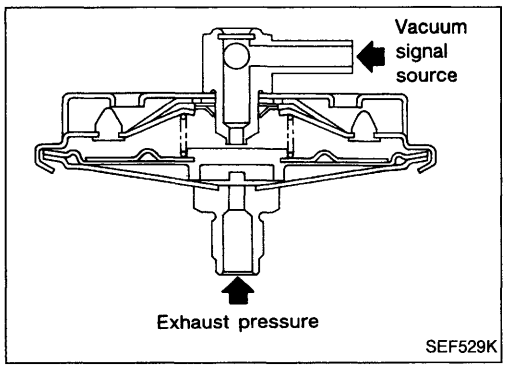
Vehicle Speed Sensor

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.



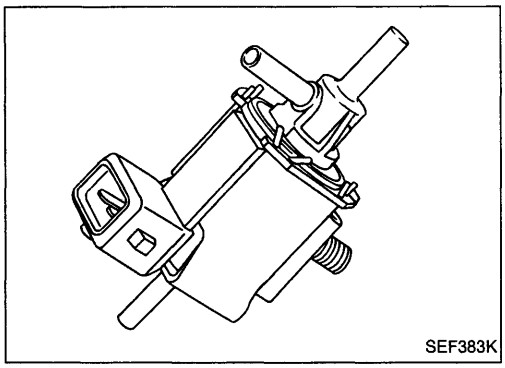
E.G.R. Control Valve

The E.G.R. control valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the taper valve connected to the diaphragm, to which vacuum is applied in response to the opening of the throttle valve.



B.P.T. Valve

The B.P.T. valve monitors exhaust pressure to activate the diaphragm, controlling throttle chamber vacuum applied to the E.G.R. control valve. In other words, recirculated exhaust gas is controlled in response to positioning of the E.G.R. control valve or to engine operation.

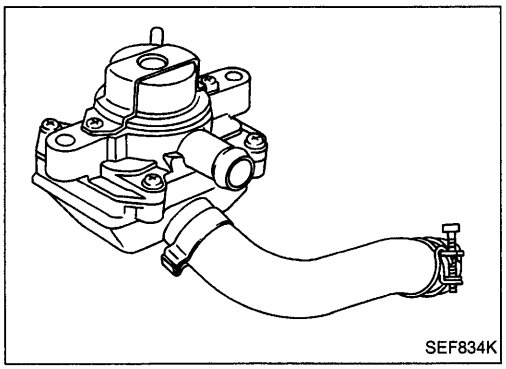


E.G.R. & Canister Control Solenoid Valve

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.

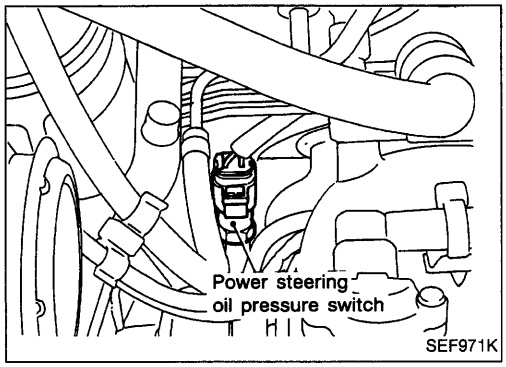
A.I.V. Control Solenoid Valve

The A.I.V. control solenoid valve cuts the intake manifold vacuum signal for A.I.V. control. It responses to the ON/OFF signal from the E.C.U. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the control unit sends an ON signal, the coil pulls the plunger downward and feeds the vacuum signal to the A.I.V. control valve.


SEF834K

Air Induction Valve (A.I.V.)

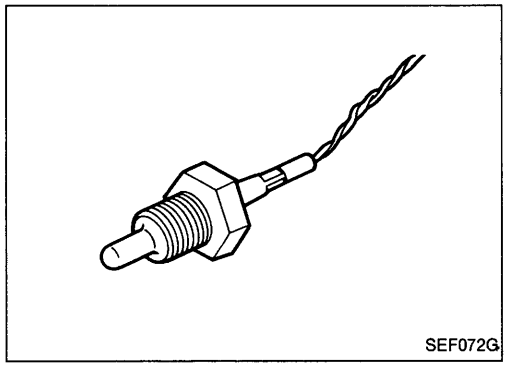
The air induction valve sends secondary air to the exhaust manifold, using a vacuum created by exhaust pulsation in the exhaust manifold. When the exhaust pressure is below atmospheric pressure (negative pressure), secondary air is sent to the exhaust manifold. When the exhaust pressure is above atmospheric pressure, the reed valves prevent secondary air from being sent back to the air cleaner.



SEF971K

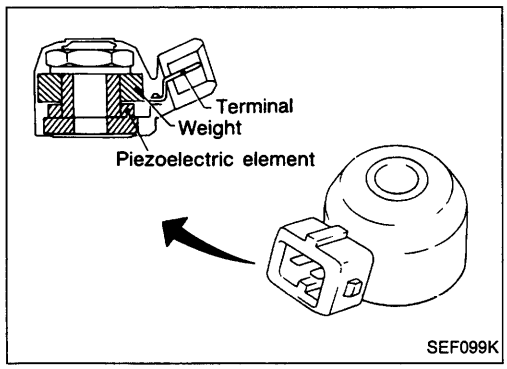
Power Steering Oil Pressure Switch

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.


SEF072G

Exhaust Gas Temperature Sensor (California models only)

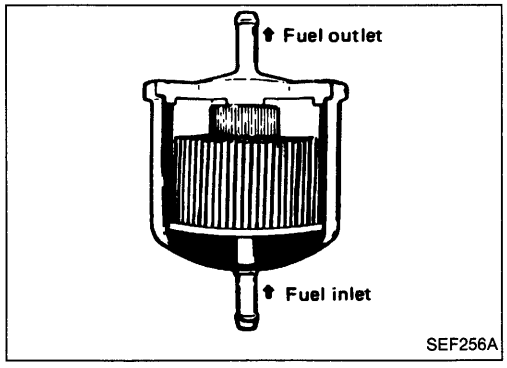
The exhaust gas temperature sensor monitors in exhaust gas temperature and transmits a signal to the E.C.U. The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electric resistance of the thermistor decreases in response to the temperature rise.



SEF099K

Detonation Sensor

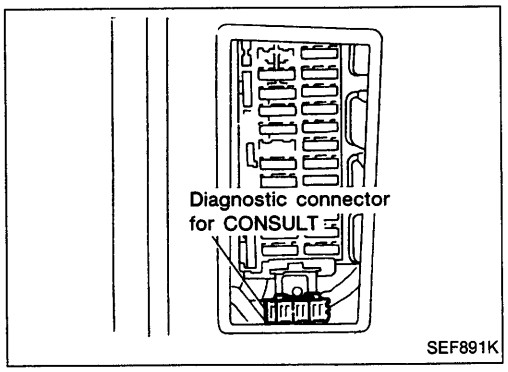
The detonation sensor is attached to the cylinder block and senses engine knocking conditions.
A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. This vibrational pressure is then converted into a voltage signal which is delivered as output.



SEF256A

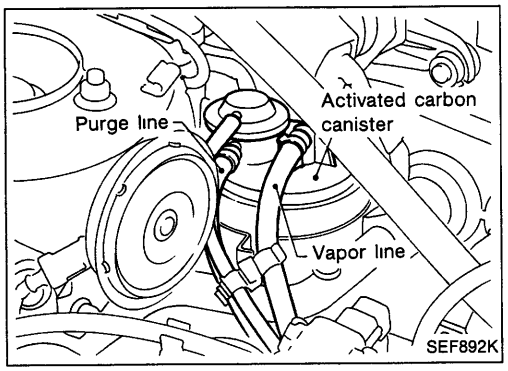
Fuel Filter

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.

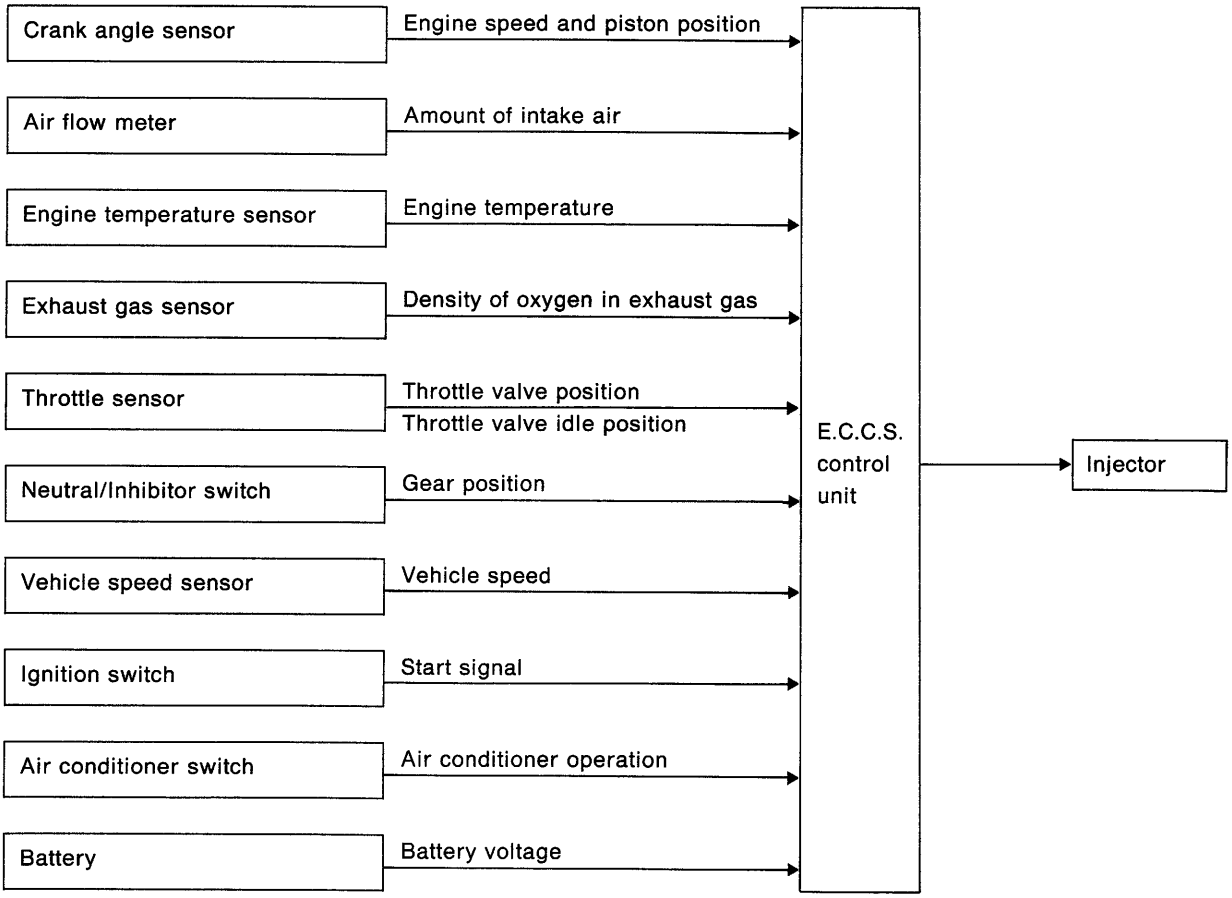


Activated Carbon Canister

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.

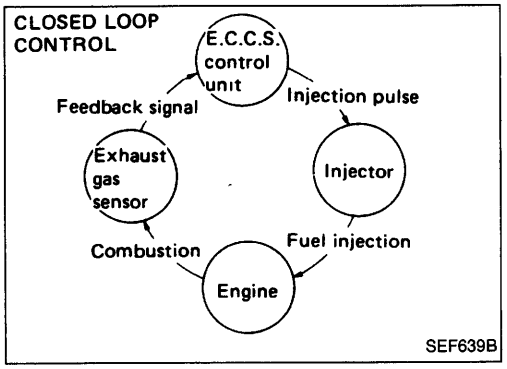
<Fuel increase>

1) During warm-up
2) When starting the engine
3) During acceleration
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)



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) Hot-engine operation
8) When all of the following conditions are met:

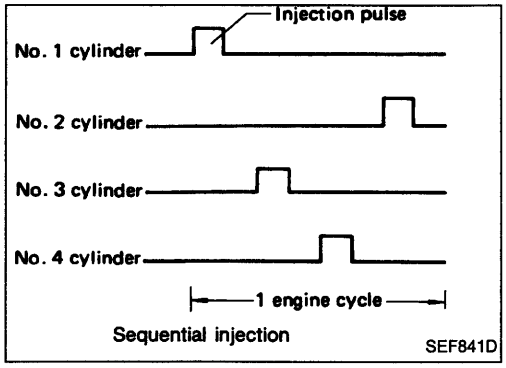
- Ignition switch "ON"
- Soft idle switch "ON"
- Neutral switch "OFF"
- Engine running at idle speed
- Vehicle running at slow speed

MIXTURE RATIO SELF-LEARNING CONTROL

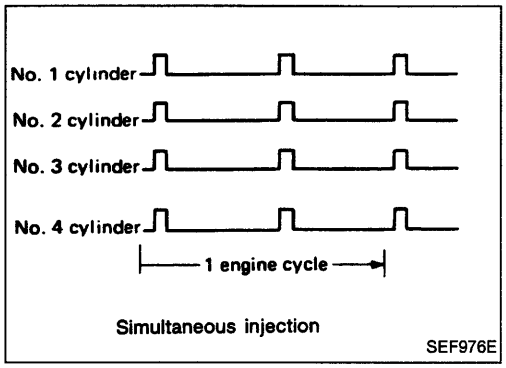
The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the exhaust gas sensor. This feedback signal is then sent to the E.C.U. to control the amount of fuel injection to provide a basic mixture ratio as close to the theoretical mixture ratio as possible. However, 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)



Sequential injection
SEF841D



Simultaneous injection
SEF976E

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.

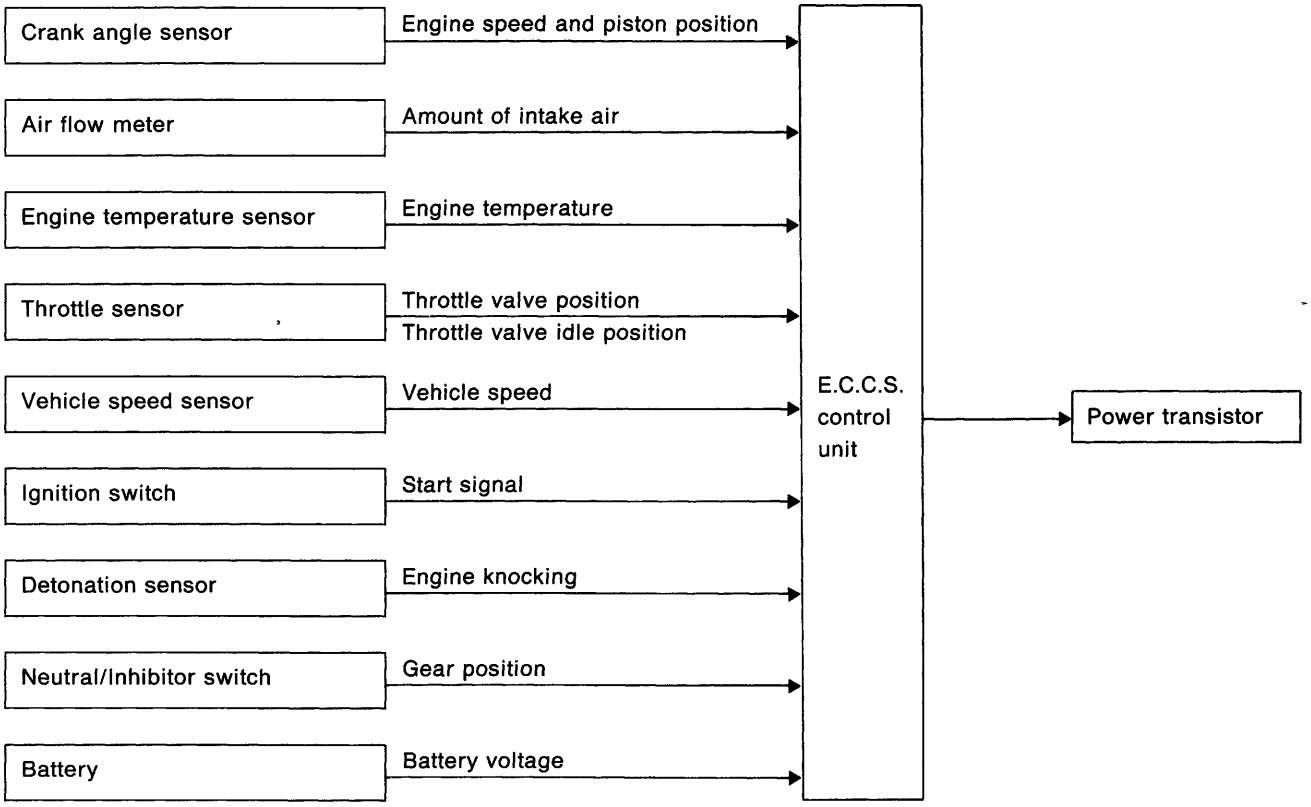
When the engine is running sequential fuel injection is used.

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.

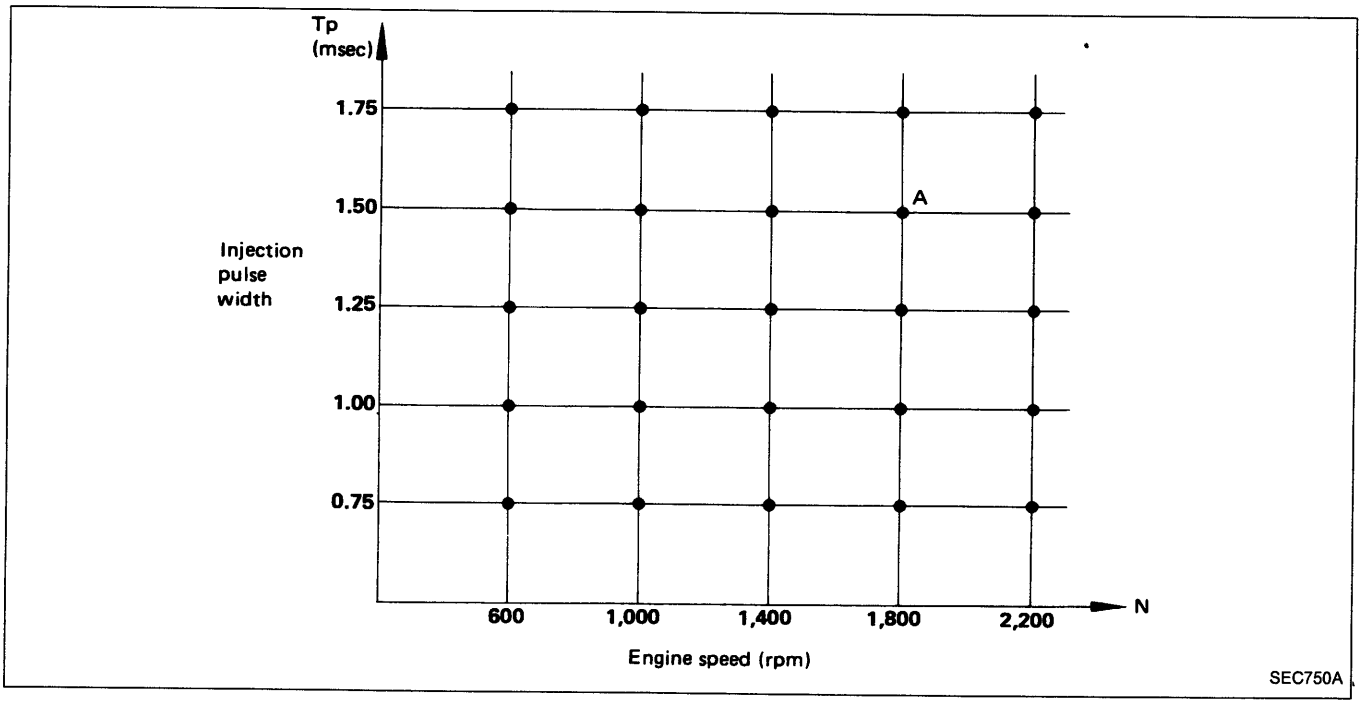
The E.C.U. detects information such as the injection pulse width and crank angle sensor signal which varies every moment. Then responding to this information, ignition signals are transmitted to the power transistor.

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
5) Hot-engine operation

the ignition timing is revised by the E.C.U. according to the other data stored in the ROM.

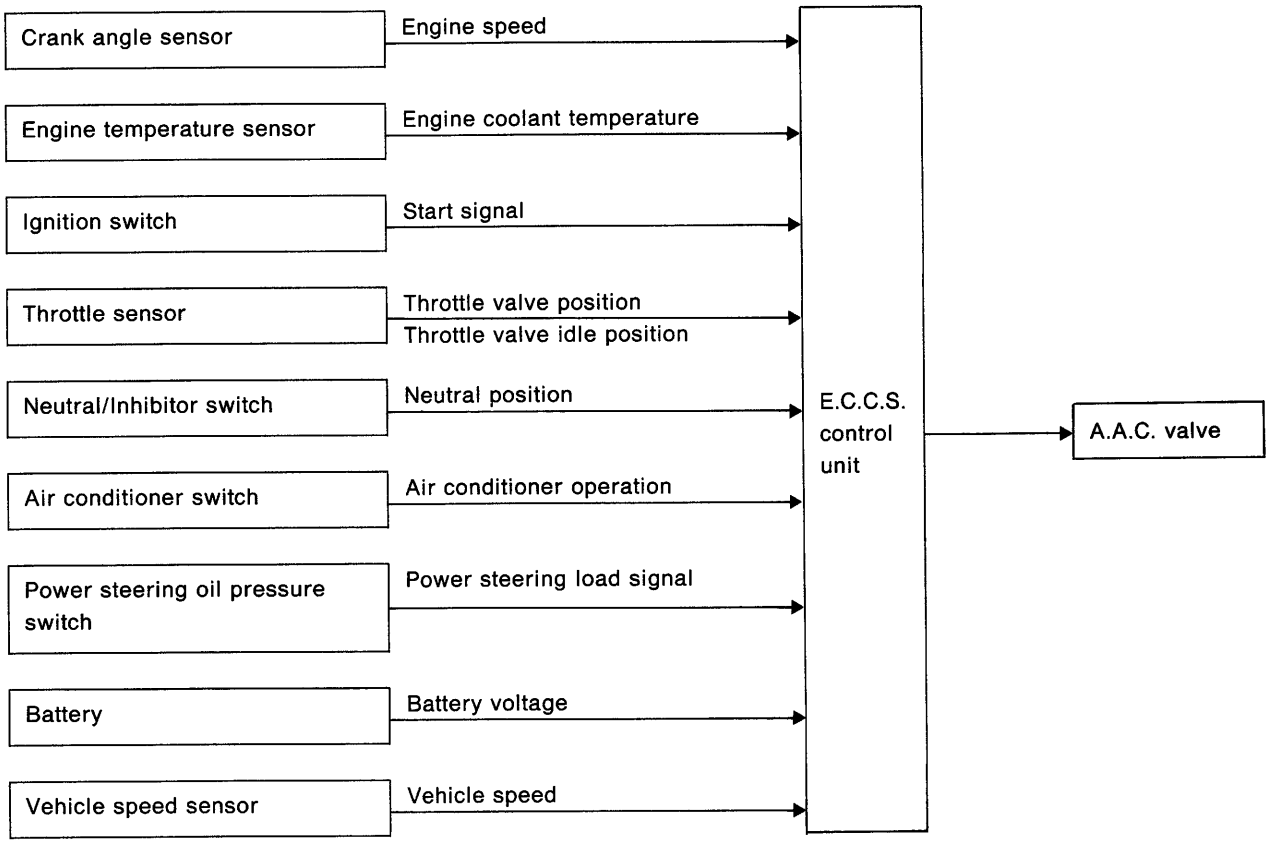


The retard system by detonation sensor is designed only for emergencies. The basic ignition timing is pre-programmed within the anti- knocking zone, even if recommended fuel is used under dry conditions. Consequently, the retard system does not operate under normal driving conditions.

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

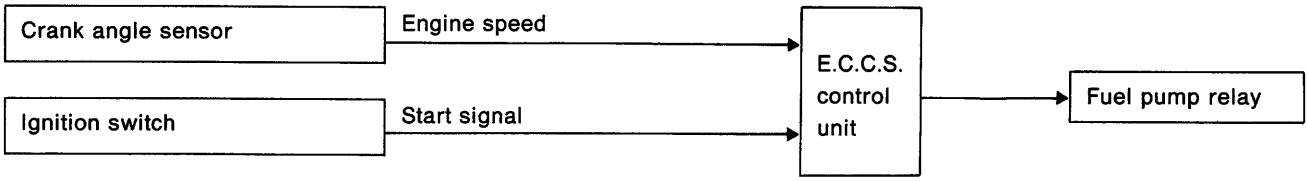


SYSTEM DESCRIPTION

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



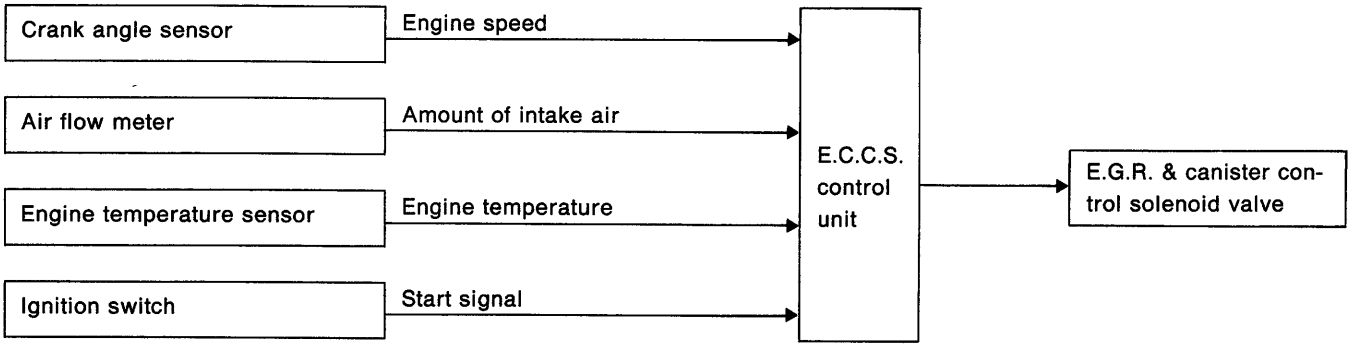
SYSTEM DESCRIPTION

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.	Operates for 5 seconds
Engine running and cranking	Operates
When engine is stopped	Stops in 1 second
Except as shown above	Stops

E.G.R. (Exhaust Gas Recirculation) & Canister Control

INPUT/OUTPUT SIGNAL LINE



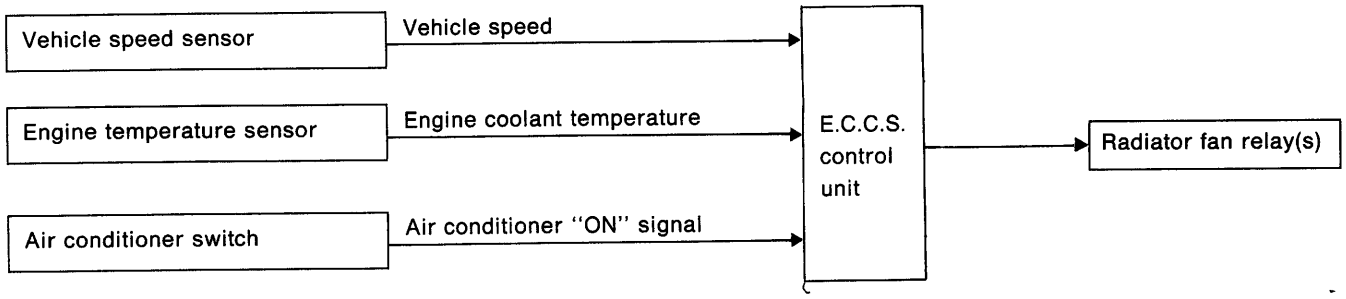
SYSTEM DESCRIPTION

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) Low engine temperature
2) Engine starting
3) High-speed engine operation
4) Engine idling
5) Excessively high engine temperature
6) Air flow meter malfunction

Radiator Fan Control

INPUT/OUTPUT SIGNAL LINE



FOR M/T MODELS

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

Air conditioner switch is "OFF"

Engine coolant temperature °C (°F)	Radiator fans	Remarks
94 (201) or less	OFF	
Between 95 (203) and 99 (210)	OFF	Vehicle speed is 19 km/h (12 MPH) or less
	ON	Vehicle speed is 20 km/h (12 MPH) or more
100 (212) or more	ON	

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
	ON	Vehicle speed is 79 km/h (49 MPH) or less
95 (203) or more	ON	

FOR A/T MODELS

The E.C.U. performs ON/OFF control and LOW/HIGH speed control of the radiator fan corresponding to the vehicle speed, engine temperature, and air conditioner ON signal.

Operation

Air conditioner switch is "OFF"

Engine coolant temperature °C (°F)	Radiator fans	Remarks
94 (201) or less	OFF	
Between 95 (203) and 99 (210)	LOW	
Between 100 (212) and 104 (219)	LOW	Vehicle speed is 19 km/h (12 MPH) or less
	HIGH	Vehicle speed is 20 km/h (12 MPH) or more
105 (221) or more	HIGH	

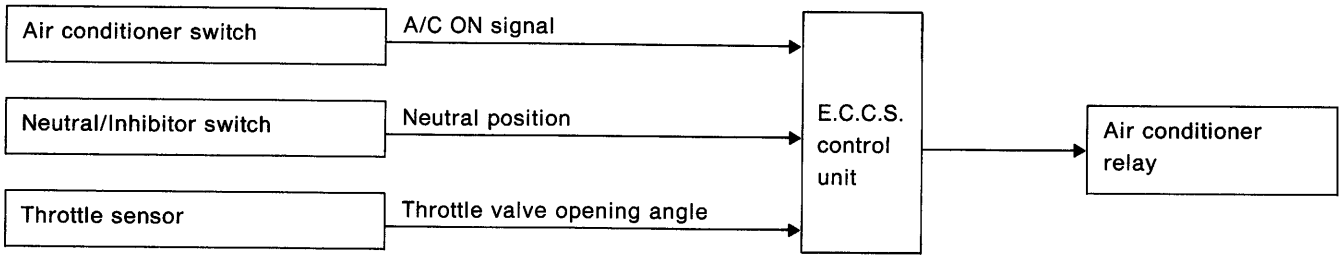
Air conditioner switch is "ON"

Engine coolant temperature °C (°F)	Radiator fans	Remarks
94 (201) or less	OFF	Vehicle speed is 80 km/h (50 MPH) or more
	LOW	Vehicle speed is 79 km/h (49 MPH) or less
Between 95 (203) and 99 (210)	LOW	
Between 100 (212) and 104 (219)	LOW	Vehicle speed is 19 km/h (12 MPH) or less
	HIGH	Vehicle speed is 20 km/h (12 MPH) or more
105 (221) or more	HIGH	

The radiator fan operates at HIGH if the self-diagnosing engine temperature sensor system results in "N.G.".

Acceleration Cut Control

INPUT/OUTPUT SIGNAL LINE

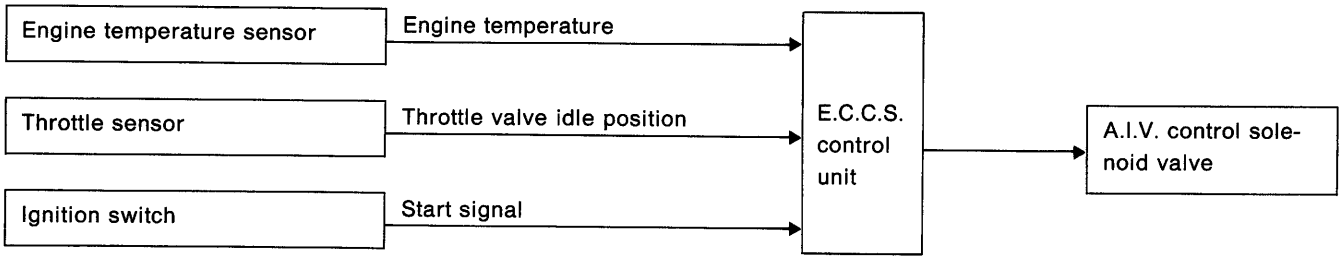


SYSTEM DESCRIPTION

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.

Air Induction Valve (A.I.V.) Control

INPUT/OUTPUT SIGNAL LINE



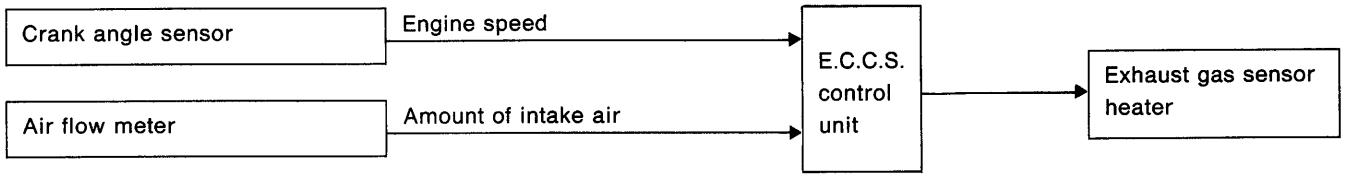
SYSTEM DESCRIPTION

The air induction system is designed to send secondary air to the exhaust manifold, utilizing the vacuum caused by exhaust pulsation in the exhaust manifold.
The exhaust pressure in the exhaust manifold usually pulsates in response to the opening and closing of the exhaust valve and decreases below atmospheric pressure periodically.
If a secondary air intake pipe is opened to the atmosphere under vacuum conditions, secondary air can be drawn into the exhaust manifold in proportion to the vacuum.
The air induction valve is controlled by the E.C.C.S. control unit, corresponding to the engine temperature. When the engine is cold, the A.I.V. control system operates to reduce HC and CO.
In extremely cold conditions, A.I.V. control system does not operate to reduce after-burning.
This system also operates during deceleration for the purpose of blowing off water around the air induction valve.

Engine condition	Water temperature °C (°F)	A.I.V. control solenoid valve	A.I.V. control system
Idle or deceleration	Between 28 (82) and 105 (221)	ON	Operates

Exhaust Gas Sensor Heater Control

INPUT/OUTPUT SIGNAL LINE



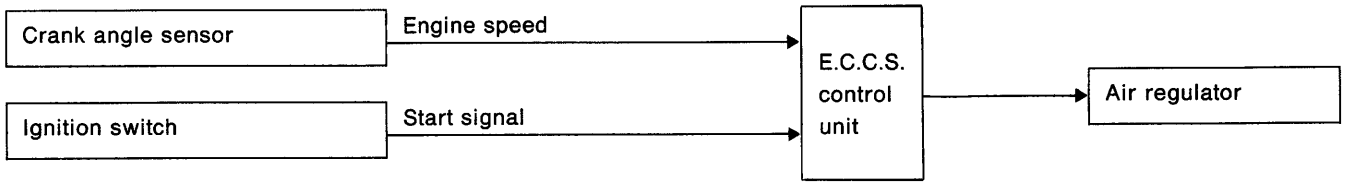
The E.C.U. performs ON/OFF control of the exhaust gas sensor heater corresponding to the engine speed and engine load.

OPERATION

Engine speed rpm	Engine load	Exhaust gas sensor heater
Above 3,200	—	OFF
Below 3,200	Heavy load	OFF
	Middle or light load	ON

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.

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	30°C (86°F)
More than 6 minutes after ignition ON or Start	80°C (176°F)
Except as shown above	30 - 80°C (86 - 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

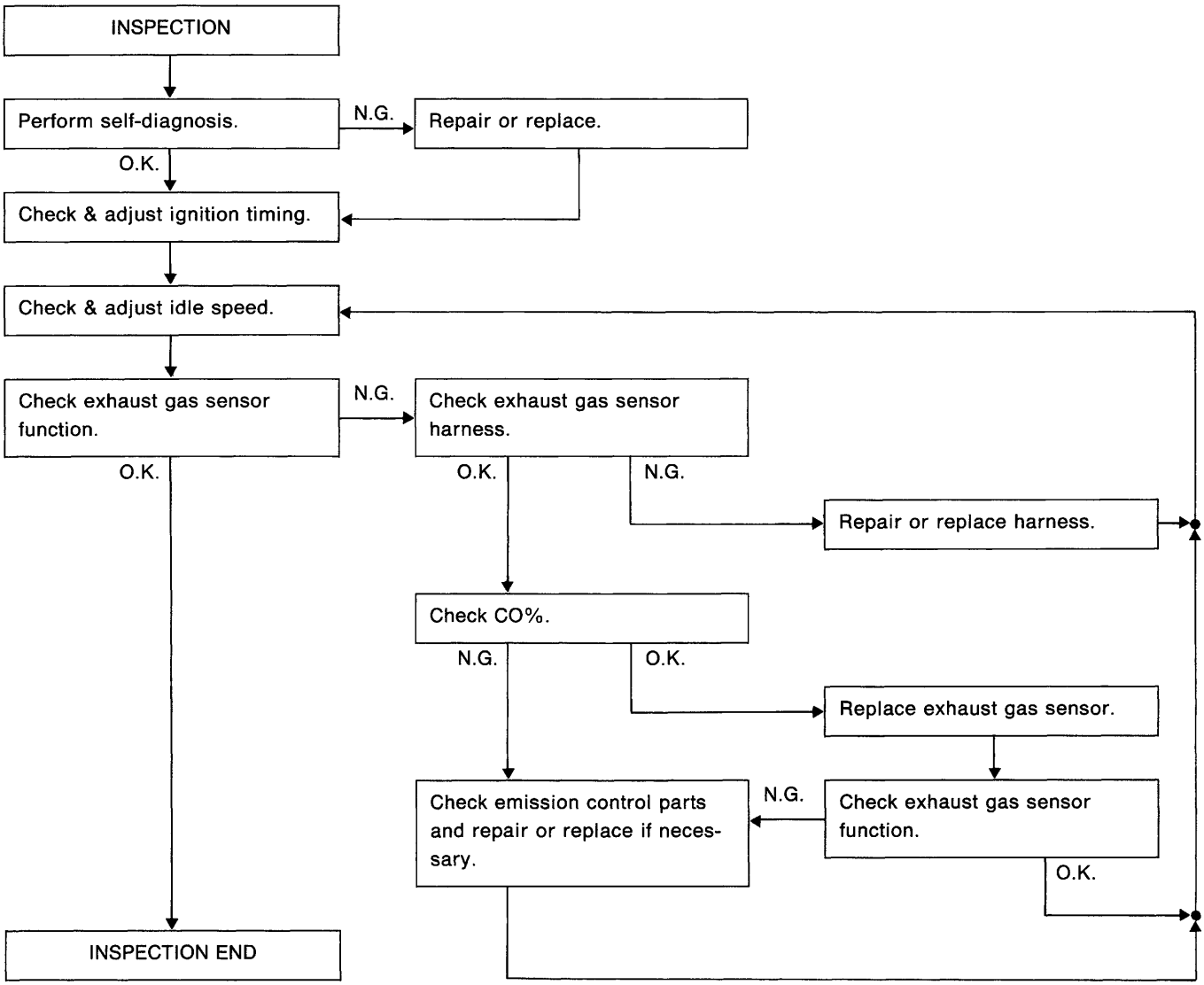
PREPARATION

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**

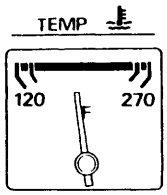
2. **On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".**
3. **On automatic transaxle equipped models, when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in "N" position.**
4. **When measuring "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.**

Overall inspection sequence



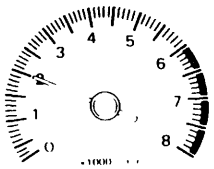
START

Visually check the following:
- Air cleaner clogging
- Hoses and ducts for leaks
- E.G.R valve operation
- Electrical connectors
- Gasket
- Throttle valve and throttle sensor operation



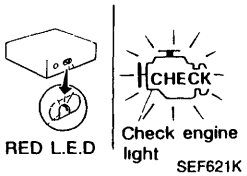
SEF246F

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).

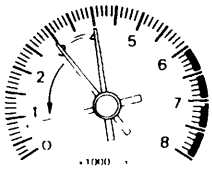


RED L.E.D
Check engine light
SEF621K

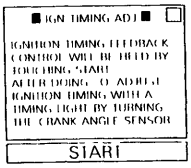
O K

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 at idle speed

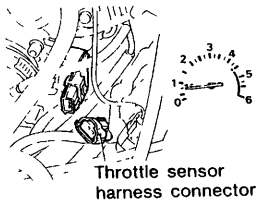


SEF816K

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

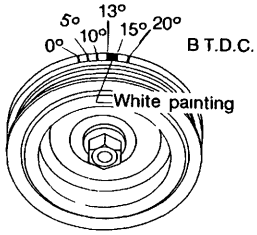
OR

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


Throttle sensor harness connector
SEF785K

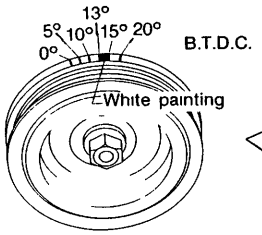
Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and then run engine at idle speed.

Check ignition timing with a timing light.
M/T: 15° ± 2° B.T.D.C.
A/T: 15° ± 2° B.T.D.C. (in "N" position)



O.K. → Ⓐ

N.G. → Ⓘ



Ⓐ

Ⓘ

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

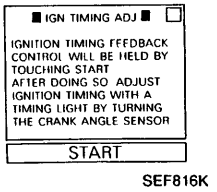
M/T: 15° ± 2° B.T.D.C.
A/T: 15° ± 2° B.T.D.C. (in "N" position)

Ⓔ

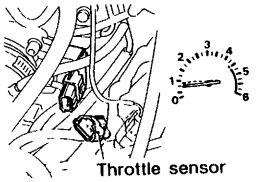
1) Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2) Touching "START".

OR

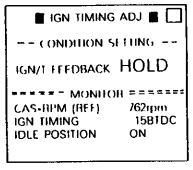
1) Turn off engine and disconnect throttle sensor harness connector.
2) Start engine.



SEF816K



SEF785K



SEF786K

Check idle speed.

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

OR

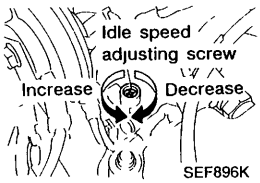
- Check idle speed.

M/T: 750 ± 50 rpm
A/T: 750 ± 50 rpm (in "N" position)

O.K.

N.G.

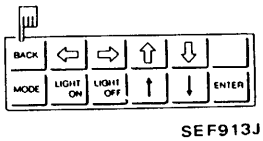
Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.



SEF896K

Adjust idle speed by turning idle speed adjusting screw.

M/T: 750 ± 50 rpm
A/T: 750 ± 50 rpm (in "N" position)



SEF913J

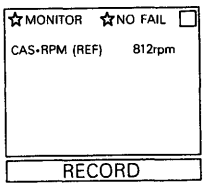
1) Touch "BACK".

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.

Ⓙ



SEF817K

Ⓙ

Check idle speed.

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

OR

- Check idle speed.

M/T: 800 ± 50 rpm
A/T: 800 ± 50 rpm (in "N" position)

O.K. / N.G.

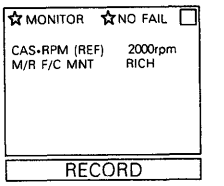
Check A.A.C. valve and replace if necessary.

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.

Ⓑ



SEF818K

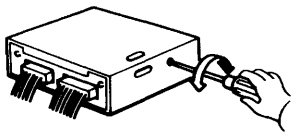
Ⓑ

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.

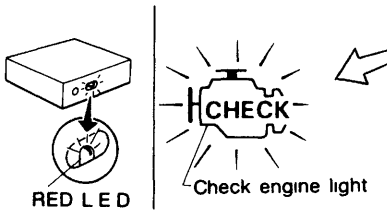
RICH → LEAN → RICH →
1 time **2 times**
LEAN → RICH .....

N.G. → Ⓒ

OR


SEF957D

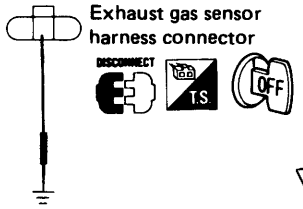
1. Set "Exhaust gas sensor monitor" in the self-diagnostic mode II.
(See page EF & EC-45.)
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. Maintaining engine at 2,000 rpm under no-load, check to make sure that the RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.



SEF621K

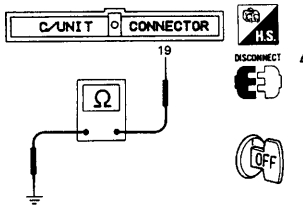
O.K.

END



As for the location of exhaust gas sensor harness connector, refer to page EF & EC-128.

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.

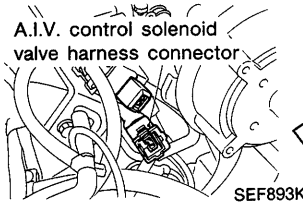
Continuity exists.....O.K.
Continuity does not exist.....N.G.

O.K.

N.G.

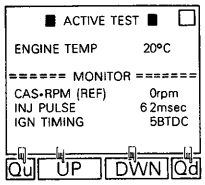
Repair or replace harness. → Ⓔ

Connect E.C.U. S.M.J. harness connector to control unit.



SEF893K

Disconnect A.I.V. control solenoid valve harness connector.

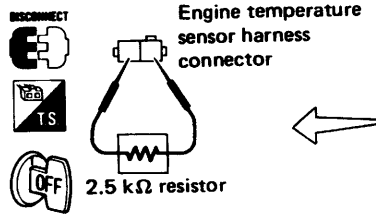


SEF788K

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

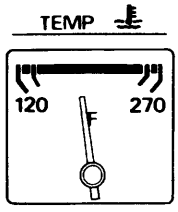
OR

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



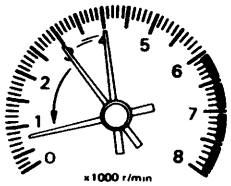
SEC242B

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



SEF246F

Ⓓ



SEF248F

Ⓓ

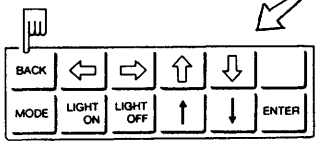
Race engine two or three times under no-load, then run engine at idle speed.

Check "CO"%.

Idle CO: Less than 10%

After checking CO%,

1) Touch "BACK".
2) Connect A.I.V. control solenoid valve harness connector.

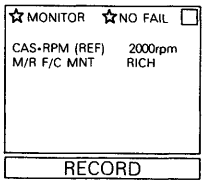


SEF913J

1) Disconnect the resistor from terminals of engine temperature sensor harness connector.
2) Connect engine temperature sensor harness connector to engine temperature sensor.
3) Connect A.I.V. control solenoid valve harness connector.

N.G. O.K.

Replace exhaust gas sensor.

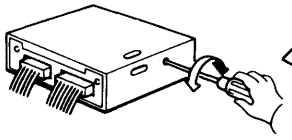


SEF818K

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.

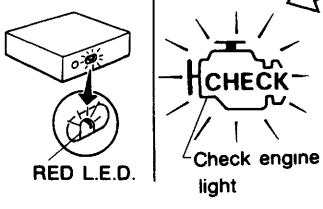
RICH → LEAN → RICH → LEAN → RICH .....
(1 time, 2 times)

OR


SEF957D

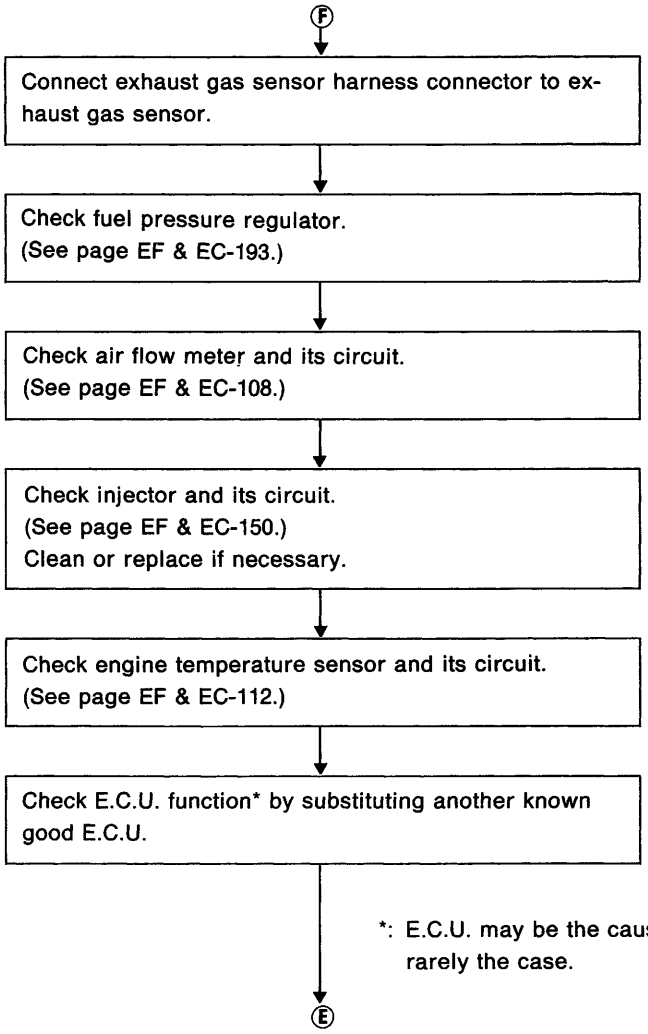
1. Set "Exhaust gas sensor monitor" in the self-diagnostic mode II. (See page EF & EC-45.)
2. Maintaining engine at 2,000 rpm under no-load, check to make sure that the RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

N.G. O.K.



SEF621K

Ⓕ Ⓔ



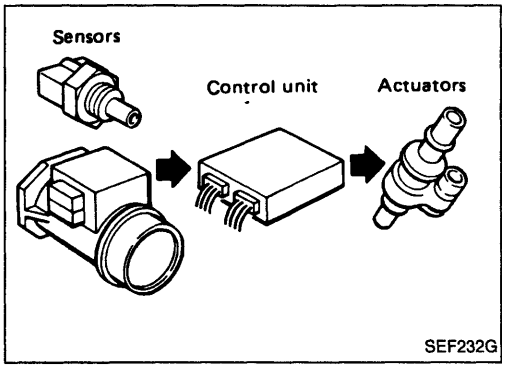
*: E.C.U. may be the cause of a problem, but this is rarely the case.

Contents

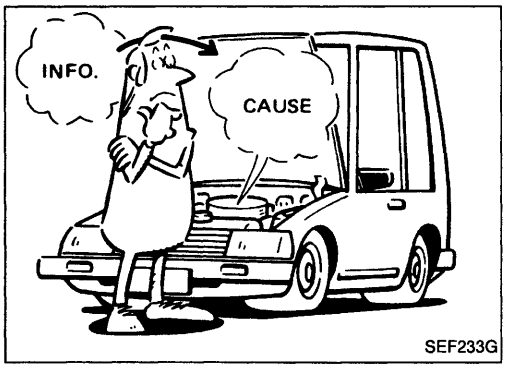
How to Perform Trouble Diagnoses for Quick and Accurate Repair ..... EF & EC- 40
Self-diagnosis ..... EF & EC- 44
Self-diagnosis — Mode I ..... EF & EC- 46
Self-diagnosis — Mode II (Self-diagnostic results) ..... EF & EC- 47
Self-diagnosis — Mode II (Exhaust gas sensor monitor) ..... EF & EC- 50
Consult ..... EF & EC- 51
Diagnostic Procedure ..... EF & EC- 58
Basic Inspection ..... EF & EC- 60
Diagnostic Procedure 1 — High Idling after Warm-up ..... EF & EC- 63
Diagnostic Procedure 2 — Hunting ..... EF & EC- 64
Diagnostic Procedure 3 — Unstable Idle ..... EF & EC- 66
Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold ..... EF & EC- 69
Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot ..... EF & EC- 71
Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions ..... EF & EC- 73
Diagnostic Procedure 7 — Hesitation when the Engine is Hot ..... EF & EC- 75
Diagnostic Procedure 8 — Hesitation when the Engine is Cold ..... EF & EC- 76
Diagnostic Procedure 9 — Hesitation under Normal Conditions ..... EF & EC- 77
Diagnostic Procedure 10 — Engine Stalls when turning ..... EF & EC- 78
Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot ..... EF & EC- 80
Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold ..... EF & EC- 82
Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily ..... EF & EC- 84
Diagnostic Procedure 14 — Engine Stalls after Decelerating ..... EF & EC- 86
Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed ..... EF & EC- 90
Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy ..... EF & EC- 92
Diagnostic Procedure 17 — Lack of Power and Stumble ..... EF & EC- 94
Diagnostic Procedure 18 — Detonation ..... EF & EC- 95
Diagnostic Procedure 19 — Surge ..... EF & EC- 97
Diagnostic Procedure 20 — Backfire through the Intake ..... EF & EC- 98
Diagnostic Procedure 21 — Backfire through the Exhaust ..... EF & EC- 98
Diagnostic Procedure 22
MAIN POWER SUPPLY AND GROUND CIRCUIT ..... EF & EC-100
Diagnostic Procedure 23
CRANK ANGLE SENSOR ..... EF & EC-104
Diagnostic Procedure 24
AIR FLOW METER ..... EF & EC-108
Diagnostic Procedure 25
ENGINE TEMPERATURE SENSOR ..... EF & EC-112
Diagnostic Procedure 26
VEHICLE SPEED SENSOR ..... EF & EC-116
Diagnostic Procedure 27
IGNITION SIGNAL ..... EF & EC-118
Diagnostic Procedure 28
E.C.C.S. CONTROL UNIT ..... EF & EC-121
Diagnostic Procedure 29
E.G.R. FUNCTION, E.G.R. CONTROL ..... EF & EC-122
Diagnostic Procedure 30
EXHAUST GAS SENSOR ..... EF & EC-128
Diagnostic Procedure 31
DETONATION SENSOR ..... EF & EC-132
Diagnostic Procedure 32
EXHAUST GAS TEMPERATURE SENSOR ..... EF & EC-134

Contents (Cont'd)

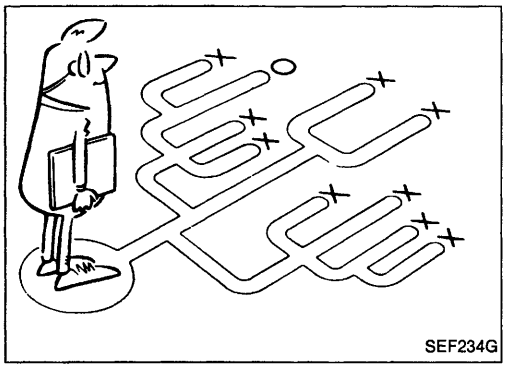
Diagnostic Procedure 33
THROTTLE SENSOR ..... EF & EC-138
Diagnostic Procedure 34
INJECTOR LEAK ..... EF & EC-142
Diagnostic Procedure 35
START SIGNAL ..... EF & EC-144
Diagnostic Procedure 36
A.I.V. CONTROL ..... EF & EC-146
Diagnostic Procedure 37
INJECTOR ..... EF & EC-150
Diagnostic Procedure 38
FUEL PUMP ..... EF & EC-152
Diagnostic Procedure 39
AIR REGULATOR ..... EF & EC-156
Diagnostic Procedure 40
A.A.C. VALVE ..... EF & EC-158
Diagnostic Procedure 41
RADIATOR FAN CONTROL ..... EF & EC-160
Diagnostic Procedure 42
POWER STEERING OIL PRESSURE SWITCH ..... EF & EC-170
Diagnostic Procedure 43
NEUTRAL SWITCH/INHIBITOR SWITCH ..... EF & EC-174
Electrical Components Inspection ..... EF & EC-179



SEF232G



SEF233G


SEF234G

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.

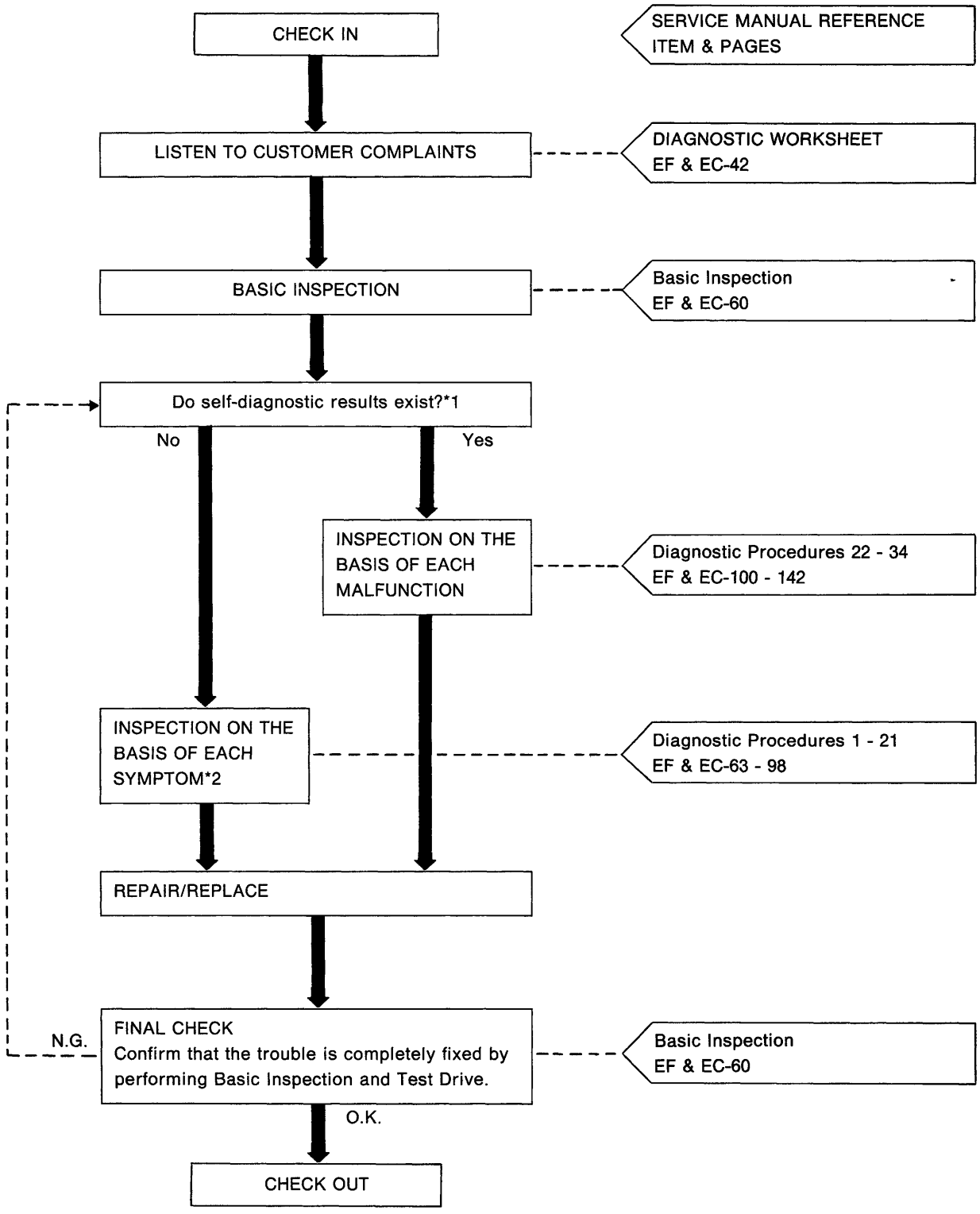
A visual check only may not find the cause of the problems, so a road test with a circuit tester connected to a suspected circuit should be performed.

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-43).

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

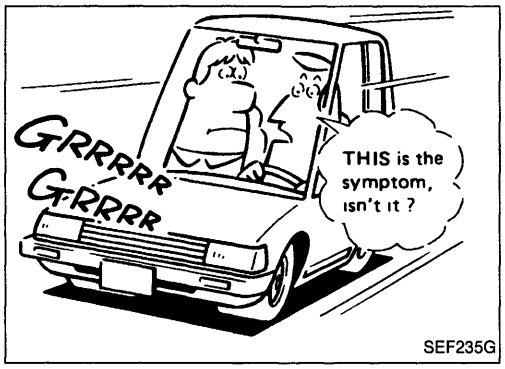
DIAGNOSTIC WORKSHEET

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	

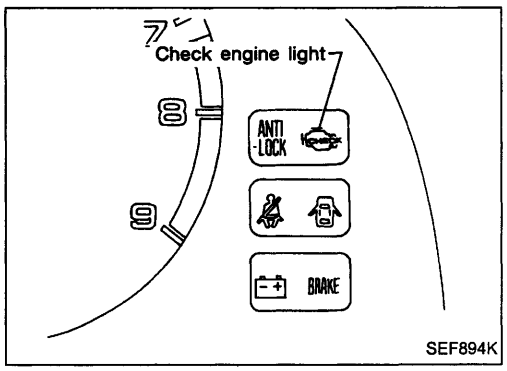
How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

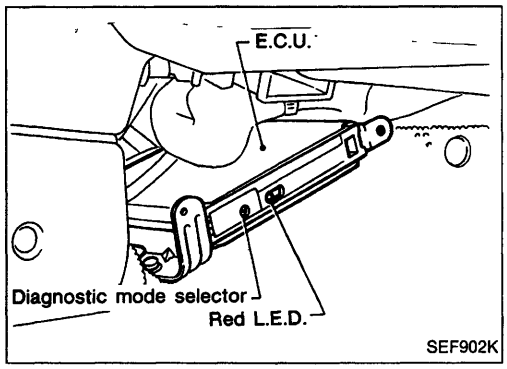


INTERMITTENT PROBLEM SIMULATION

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.).





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.

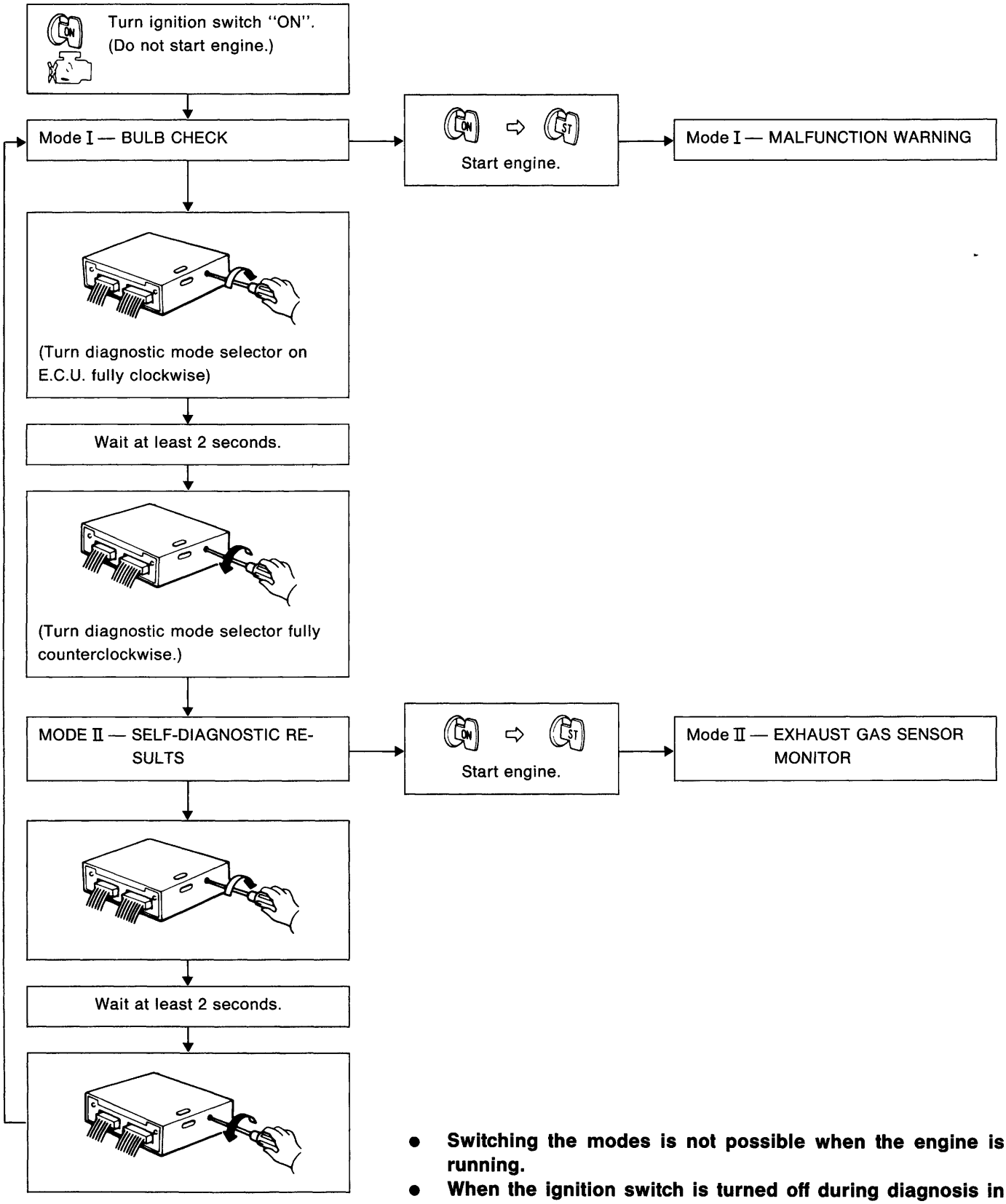
The E.C.U. has only one RED L.E.D.

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

Self-diagnosis (Cont'd)

HOW TO SWITCH MODES



- **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.**
- **Turn back diagnostic mode selector to the fully counterclockwise position whenever vehicle is in use.**

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

FOR CALIFORNIA MODELS

CHECK ENGINE LIGHT and RED L.E.D.	Condition
ON	When the following malfunctions (check engine light item) are detected or the E.C.U.'s C.P.U. is malfunctioning.
OFF	O.K.

Code No.	Malfunction
12	Air flow meter circuit
13	Engine temperature sensor circuit
14	Vehicle speed sensor circuit
31	E.C.U. (E.C.C.S. control unit)
32	E.G.R. function
33	Exhaust gas sensor circuit
35	Exhaust gas temperature sensor circuit
43	Throttle sensor circuit
45	Injector leak

- **These Code Numbers are clarified in Mode II — SELF-DIAGNOSTIC RESULTS.**
- **The RED L.E.D. and the CHECK ENGINE LIGHT will turn off when normal condition is detected. At this time, the Mode II — SELF-DIAGNOSTIC RESULTS memory must be cleared as the contents remain stored.**

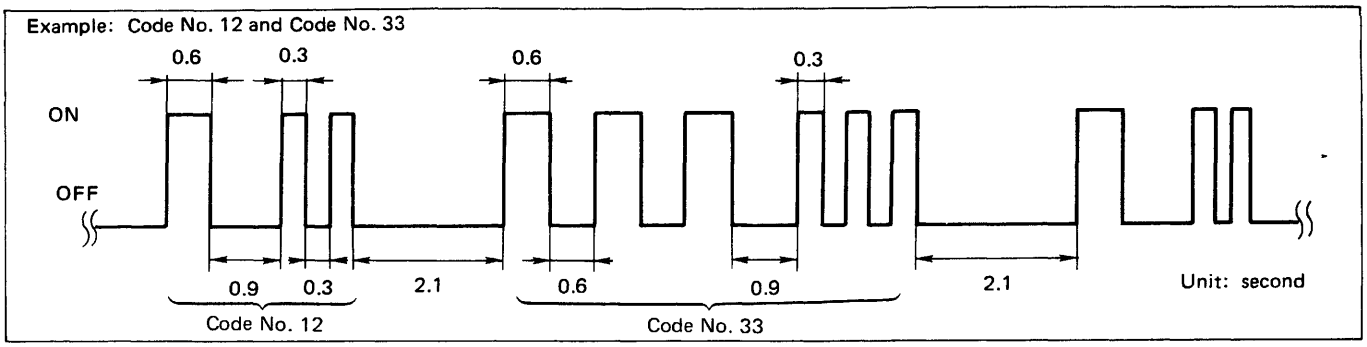
FOR NON-CALIFORNIA MODELS

CHECK ENGINE LIGHT and RED L.E.D.	Condition
ON	When the E.C.U.'s C.P.U. is malfunctioning.
OFF	O.K.

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.

Display code table

Code No.	Detected items	California models	Non-California models
11*	Crank angle sensor circuit	X	X
12 CHECK	Air flow meter circuit	X	X
13 CHECK	Engine temperature sensor circuit	X	X
14 CHECK	Vehicle speed sensor circuit	X	X
21*	Ignition signal circuit	X	X
31 CHECK	E.C.U.	X	X
32 CHECK	E.G.R. function	X	—
33 CHECK	Exhaust gas sensor circuit	X	X
34	Detonation sensor circuit	X	X
35 CHECK	Exhaust gas temperature sensor circuit	X	—
43 CHECK	Throttle sensor circuit	X	X
45 CHECK	Injector leak	X	—
55	No malfunction in the above circuits	X	X

X: Available

—: Not available

CHECK : Check engine light item

*: 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
31	E.C.U.	• E.C.U. calculation function is malfunctioning.	(Replace E.C.C.S. control unit.)
32	E.G.R. function	• E.G.R. control valve does not operate. (E.G.R. control valve spring does not lift.)	• E.G.R. control valve • E.G.R. & canister control solenoid valve
33	Exhaust gas sensor circuit	• The exhaust gas sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Exhaust gas sensor • Fuel pressure • Injectors • Intake air leaks
34	Detonation sensor circuit	• The detonation circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Detonation sensor
35	Exhaust gas temperature sensor circuit	• The exhaust gas temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Exhaust gas temperature sensor
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
45	Injector leak	• Fuel leaks from injector.	• Injector

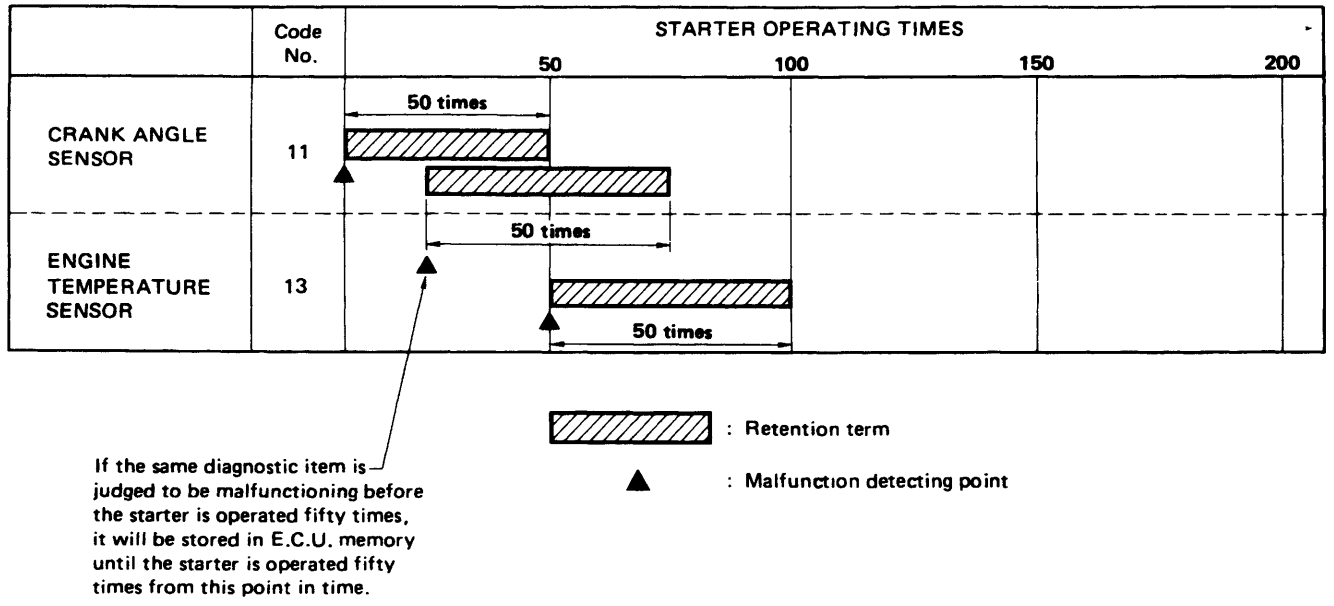
*: Check items causing a malfunction of crank angle sensor circuit first, if both code No. 11 and 21 come out at the same time.

Self-diagnosis — Mode II (Self-diagnostic results)(Cont'd)

RETENTION OF DIAGNOSTIC RESULTS

The diagnostic results will remain in E.C.U. memory until the starter is operated fifty times after a diagnostic item has been judged to be malfunctioning. The diagnostic result will then be canceled automatically. If a diagnostic item which has been judged to be malfunctioning and stored in memory is again judged to be malfunctioning before the starter is operated fifty times, the second result will replace the previous one. It will be stored in E.C.U. memory until the starter is operated fifty times more.

RETENTION TERM CHART (Example)



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.**

Self-diagnosis — Mode II (Exhaust gas sensor monitor)

DESCRIPTION

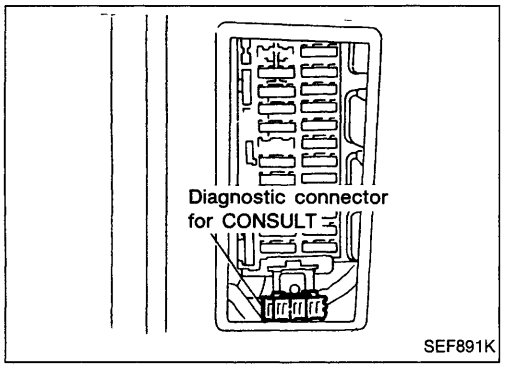
In this mode, the CHECK ENGINE LIGHT and RED L.E.D. display the condition of the fuel mixture (lean or rich) which is monitored by the exhaust gas sensor.

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

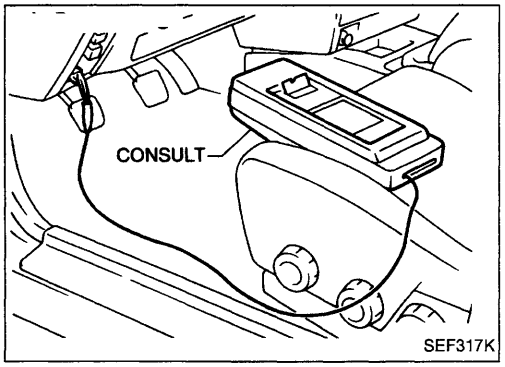
1. Set Mode II. (Refer to "HOW TO SWITCH MODES".)
2. Start engine and warm it up until engine coolant temperature indicator points to the middle of the gauge.
3. Run engine at about 2,000 rpm for about 2 minutes under no-load conditions.
4. Make sure RED L.E.D. or CHECK ENGINE LIGHT goes ON and OFF more than 5 times every 10 seconds; measured at 2,000 rpm under no-load.

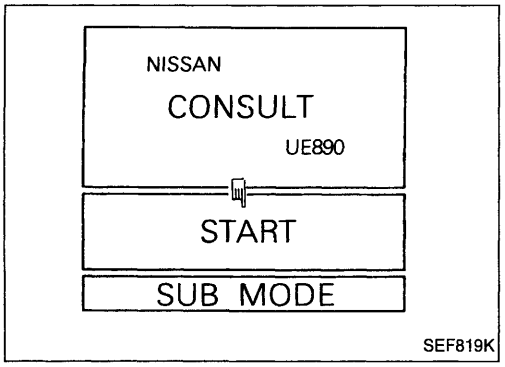


Consult

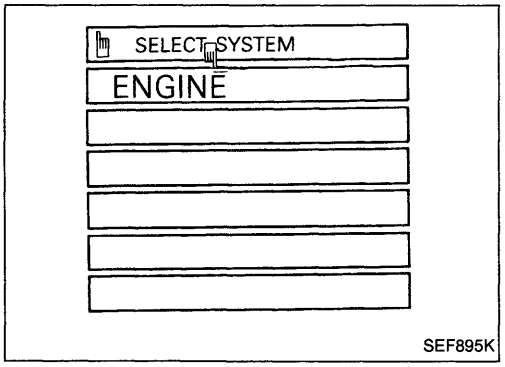
CONSULT INSPECTION PROCEDURE

1. Turn off ignition switch.
2. Connect "CONSULT" to diagnostic connector.
   (Diagnostic connector is located behind the fuse box cover.)

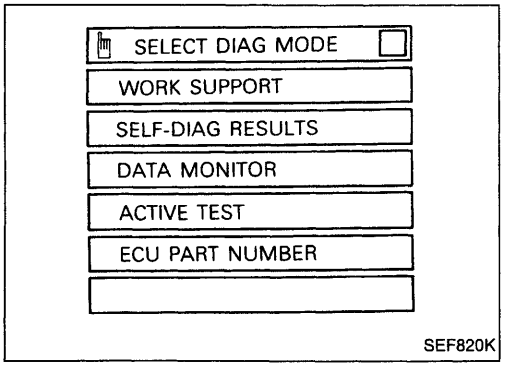




3. Turn on ignition switch.
4. Touch "START".



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 sensors		X	X	
	Vehicle speed sensors		X	X	
	Throttle sensor	X	X	X	
	Exhaust gas temperature sensor*		X	X	
	Detonation sensor		X		
	Ignition switch (start signal)			X	
	Air conditioner switch			X	
	Neutral switch			X	
	Power steering oil pump switch			X	
	Battery			X	
OUTPUT	Injectors		X	X	X
	Power transistor (ignition signal)	X (Ignition timing)	X	X (Ignition timing)	X
	A.A.C. valve	X		X	X
	E.G.R. & canister control solenoid valve			X	X
	Air conditioner relay			X	
	Fuel pump relay	X		X	X
	Radiator fan			X	X
	A.I.V. control solenoid valve			X	X

: The E.C.C.S. component part marked "" is applicable to vehicles for California only.

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
CAR SPEED SENSOR	• The vehicle speed sensor circuit is open or shorted.	• Harness and connector • Vehicle speed sensor (reed switch)
IGN SIGNAL-PRIMARY*	• The ignition signal in primary circuit is not entered during engine cranking or running.	• Harness and connector • Power transistor unit
CONTROL UNIT	• E.C.U. calculation function is malfunctioning.	(Replace E.C.C.S. control unit.)
EGR SYSTEM**	• E.G.R. control valve does not operate. (E.G.R. control valve spring does not lift.)	• E.G.R. control valve • E.G.R. & canister control solenoid valve
EXH GAS SENSOR	• The exhaust gas sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Exhaust gas sensor • Fuel pressure • Injectors • Intake air leaks
DETONATION SENSOR	• The detonation circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Detonation sensor
EXH GAS TEMP SENSOR**	• The exhaust gas temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Exhaust gas temperature sensor
THROTTLE SENSOR	• The throttle sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Throttle sensor
INJECTOR LEAK**	• Fuel leaks from injector.	• Injector

*: 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.

:The diagnostic item marked "" is applicable to vehicles for California only.

DATA MONITOR MODE

Remarks:

- The monitor item marked "**" is applicable to vehicles for California 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	1.3 - 1.7V	• Harness and connector • Air flow meter
		2,000 rpm	1.7 - 2.1V	
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	
EGR TEMP SEN**	• Engine: After warming up		Less than 4.5V	• Harness and connector • Exhaust gas temperature sensor
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	

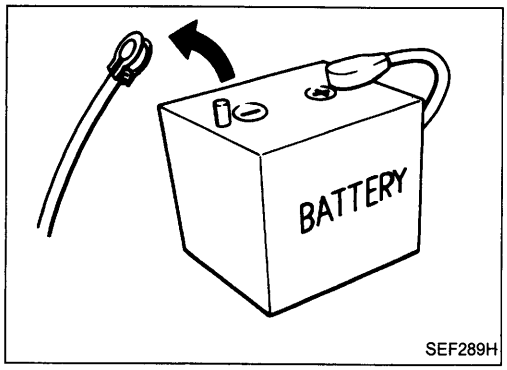
Consult (Cont'd)

MONITOR ITEM	CONDITION			SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
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	• After warming up engine, idle the engine. • A/C switch "OFF"	M/T	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	
		A/T	Engine temperature is 94°C (201°F) or less	OFF	
			Engine temperature is between 95°C (203°F) and 104°C (219°F)	LOW	
			Engine temperature is 105°C (221°F) or more	HIGH	
INJ PULSE	• Engine: After warming up • A/C switch "OFF" • Shift lever "N" • No-load		Idle	2.4 - 3.2 msec.	• Harness and connector • Injector • Air flow meter • Intake air system
			2,000 rpm	1.9 - 2.8 msec.	
IGN TIMING	ditto		Idle	15° B.T.D.C.	• Harness and connector • Crank angle sensor
			2,000 rpm	More than 25° 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 • Injectors • 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
EGR CONT S/V	• Engine: After warming up • A/C switch "OFF" • Shift lever "N" • No-load		2,000 rpm	OFF	• Harness and connector • E.G.R. & canister control solenoid valve
			4,000 rpm	ON	
AIV CONT S/V	• Engine: After warming up • Shift lever "N" • No-load		Idle	ON	• Harness and connector • A.I.V. control solenoid valve
			2,000 rpm	OFF	

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
EGR CONT SOL/V TEST AIV CONT SOL/V TEST	• Ignition switch: ON • Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound.	Each solenoid valve makes an operating sound.	• Harness and connector • Solenoid valve
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.		

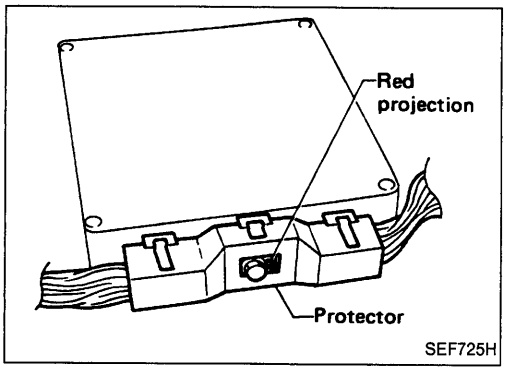


SEF289H

Diagnostic Procedure

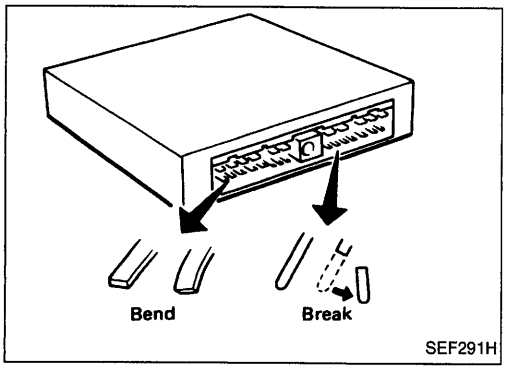
CAUTION:

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.**



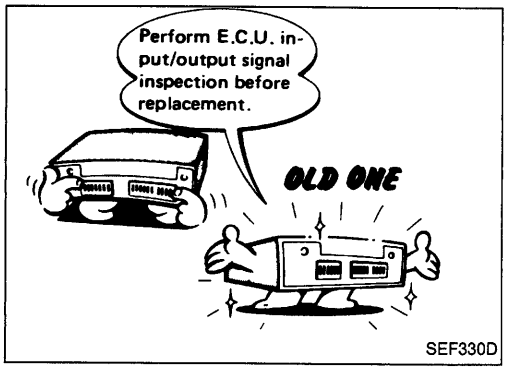
SEF725H

2. **When connecting E.C.U. harness connector, tighten securing bolt until red projection is in line with connector face.**



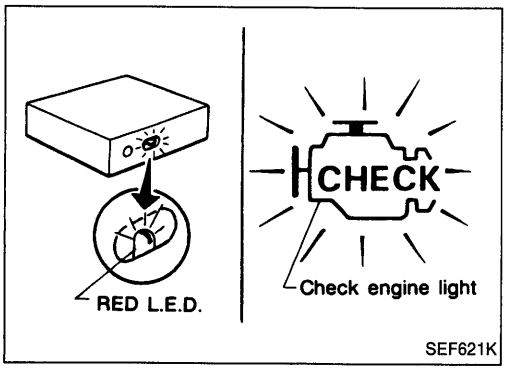
SEF291H

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

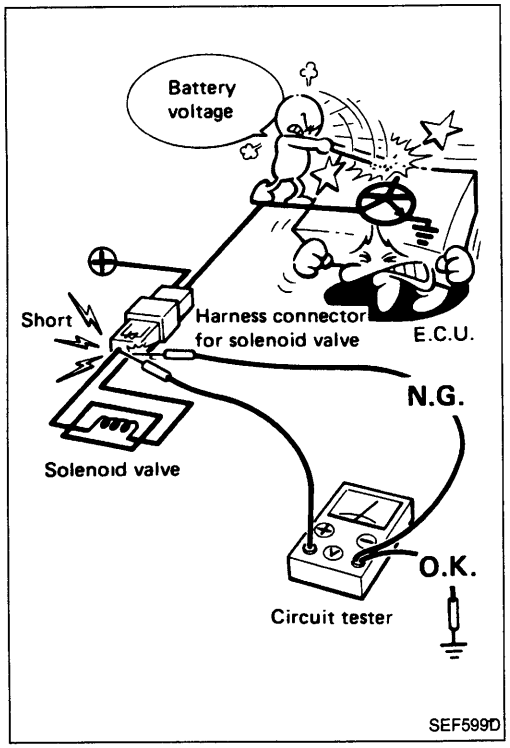
5. **Before replacing E.C.U., perform E.C.U. input/output signal inspection and make sure whether E.C.U. functions properly or not. (See page EF & EC-179.)**



SEF621K

6. **After performing this "Diagnostic Procedure", perform E.C.C.S. self-diagnosis and driving test.**

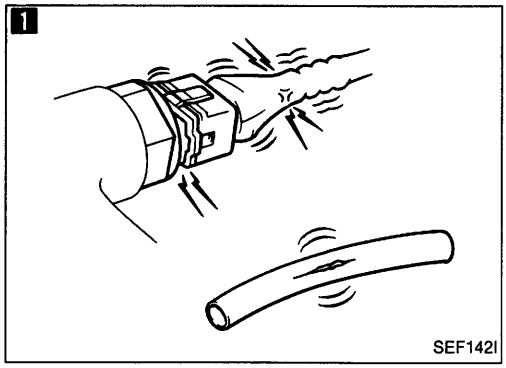
Diagnostic Procedure (Cont'd)



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

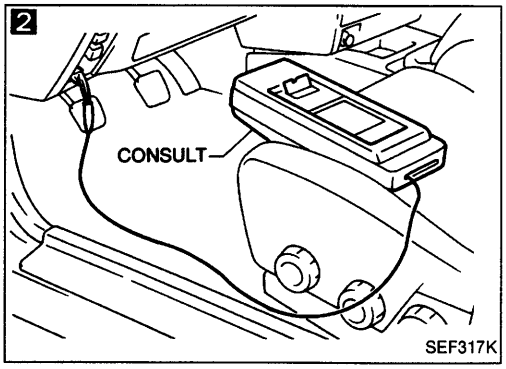

SEF142I

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

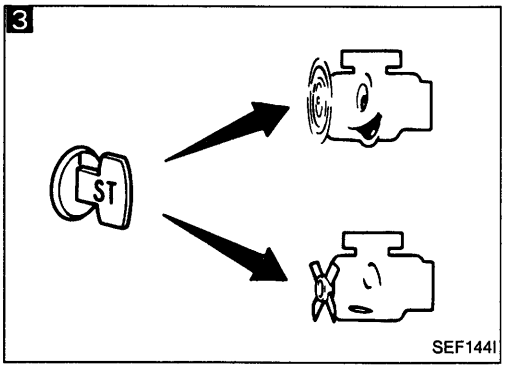


SEF317K

CONNECT CONSULT TO THE VEHICLE

Connect "CONSULT" to the diagnostic connector and select "ENGINE" from the menu. (Refer to page EF & EC-51.)

3



SEF144I

DOES ENGINE START?

No → Go to 6.

Yes

4

CHECK IGNITION TIMING.

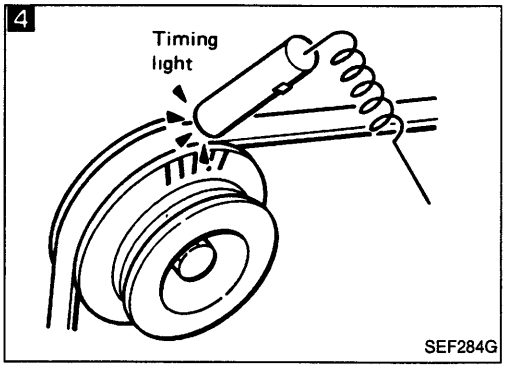
Warm up engine sufficiently and check ignition timing at idle using timing light. (Refer to page EF & EC-30.)

Ignition timing:

15° ± 2° B.T.D.C.

N.G. → Adjust ignition timing by turning crank angle sensor.

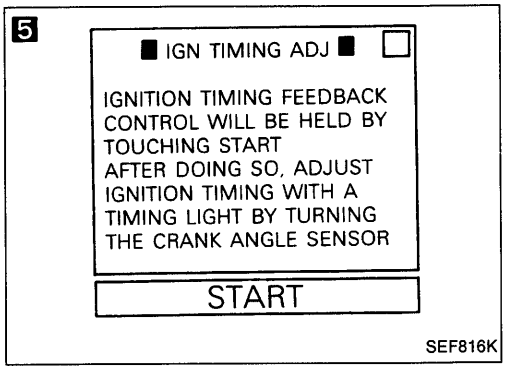
O.K.

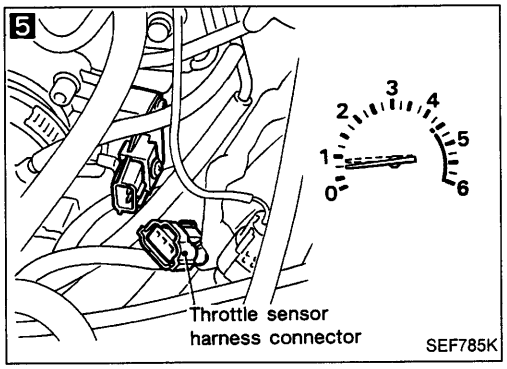


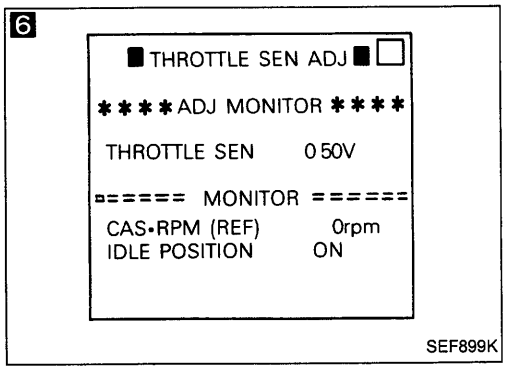
SEF284G

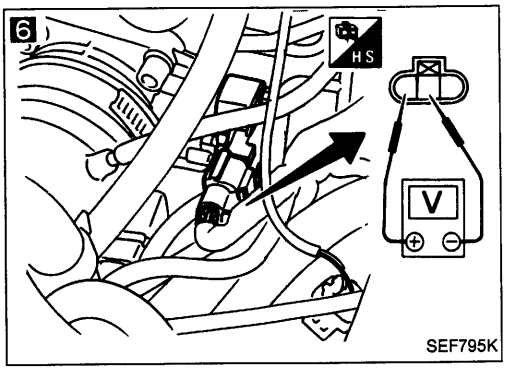
(Go to Ⓐ on next page.)

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 750±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 750±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

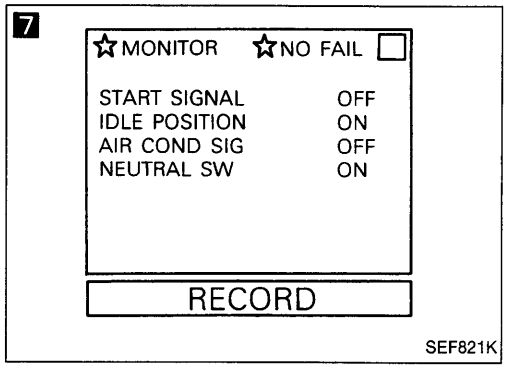
Measure output voltage of throttle sensor using voltmeter, and check that it is 0.45 to 0.55V. (Throttle valve fully closed.)

O.K.

(Go to Ⓑ on next page.)

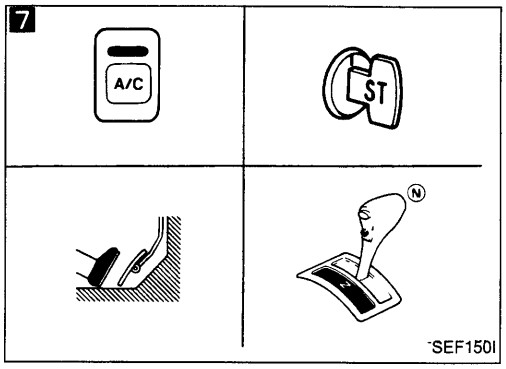
Basic Inspection (Cont'd)

7



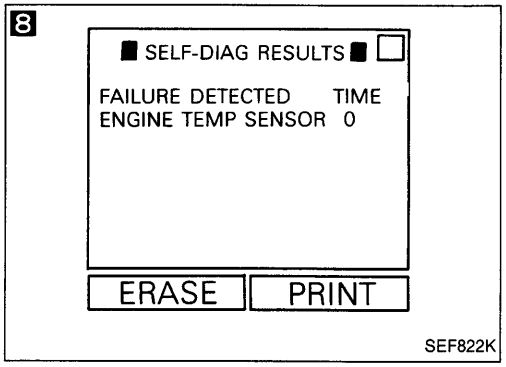
SEF821K

7



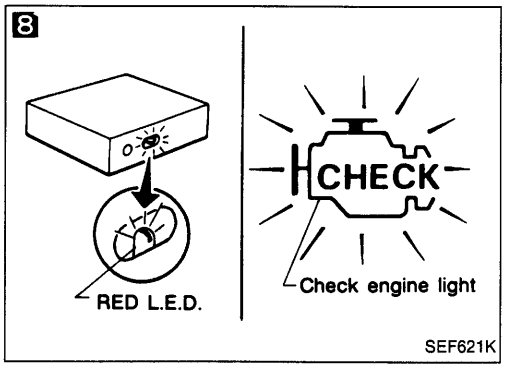
SEF150I

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 → 0
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?

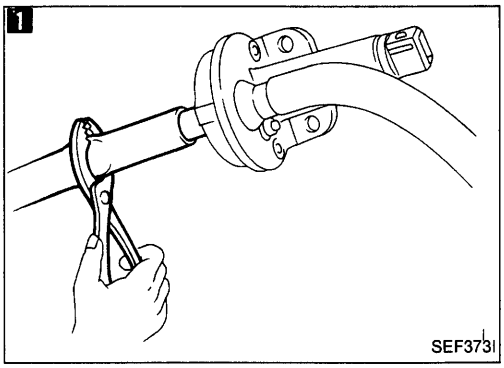
Yes → Go to the relevant inspection procedure.

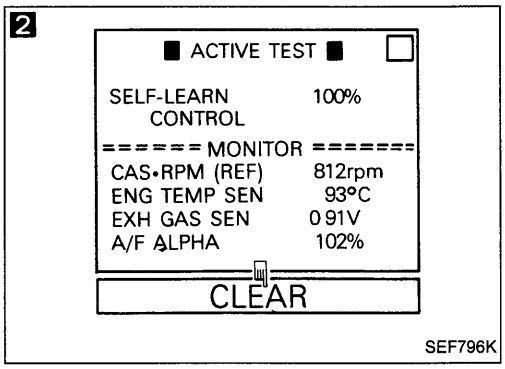
OR

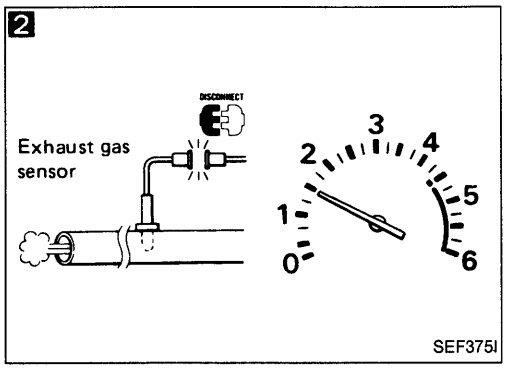
1. Set "Self-diagnostic results mode" in Mode II. (Refer to page EF & EC-45.)
2. Count the number of RED L.E.D. or check engine light flashes and read out the codes.
3. Are the codes shown?

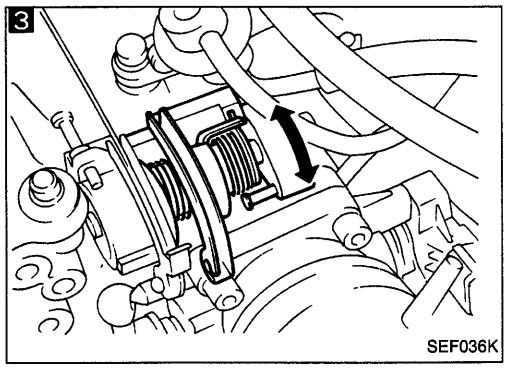
No

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-156.)

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.

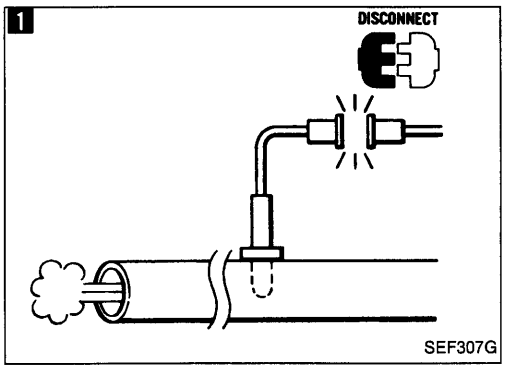
N.G. → Repair throttle linkage or sticking of throttle valve.

O.K. ↓

INSPECTION END

Diagnostic Procedure 2 — Hunting

1

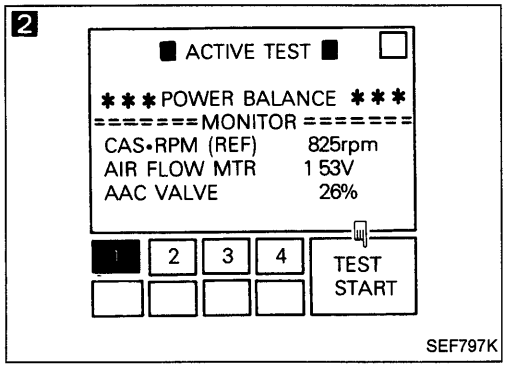


CHECK EXHAUST GAS SENSOR.
When disconnecting exhaust gas sensor harness connector, is the hunting fixed?

Yes → Check exhaust gas sensor. (See page EF & EC-128.)

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?

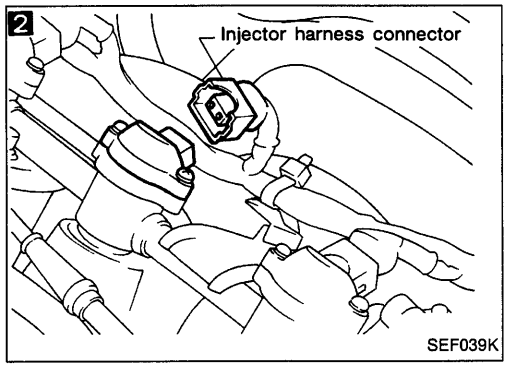
No → Go to 4.

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 ↓

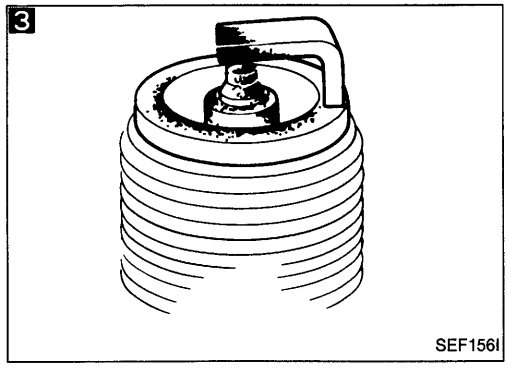
3



CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

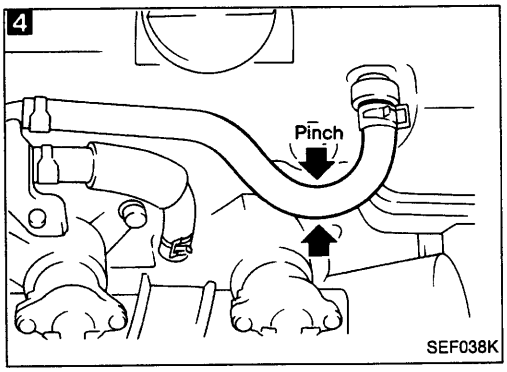
O.K. ↓



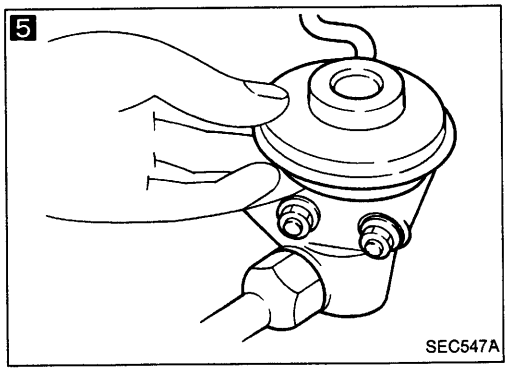
(Go to Ⓐ on next page.)

Diagnostic Procedure 2 — Hunting (Cont'd)

4



5



Ⓐ

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

5

CHECK E.G.R. CONTROL VALVE
Check E.G.R. control valve for sticking

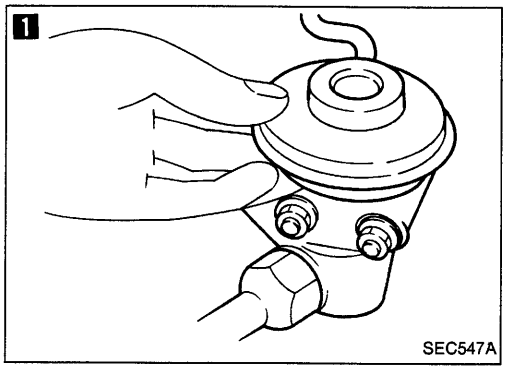
N.G. → Repair or replace

O.K.

INSPECTION END

Diagnostic Procedure 3 — Unstable Idle

1

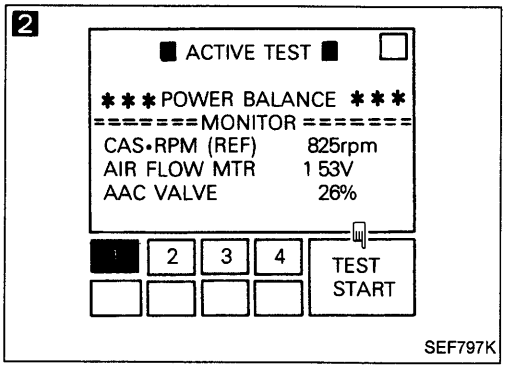

SEC547A

CHECK E.G.R. CONTROL VALVE.
Check E.G.R. control valve for sticking.

N.G. → Repair or replace.

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?

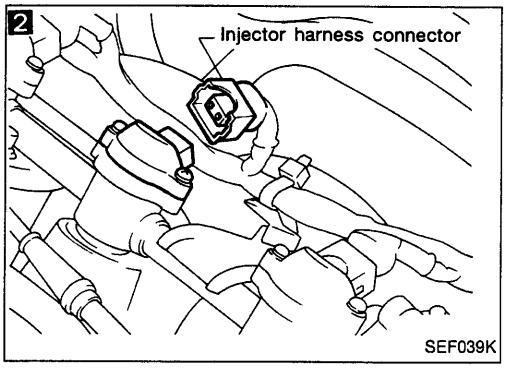
No → Go to 6 .

—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 ↓

3



SEF039K

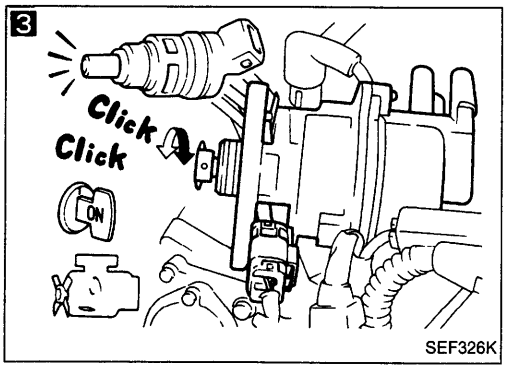
CHECK INJECTOR.

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



SEF326K

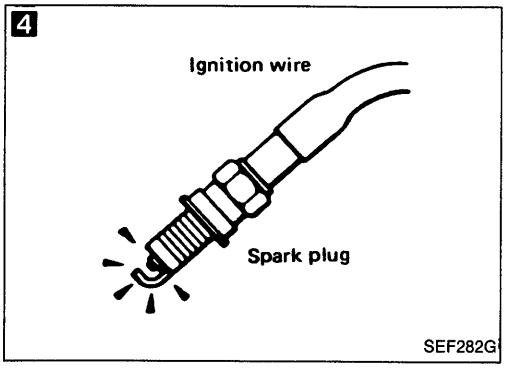
CHECK IGNITION SPARK.

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-118.)

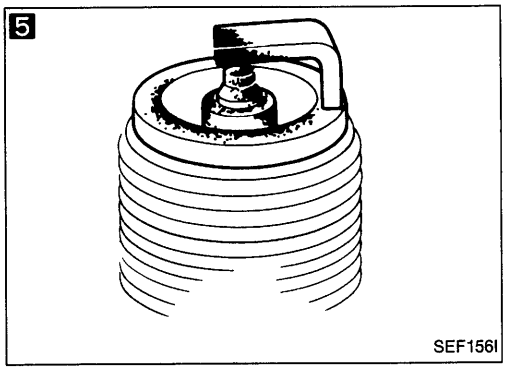
O.K. ↓

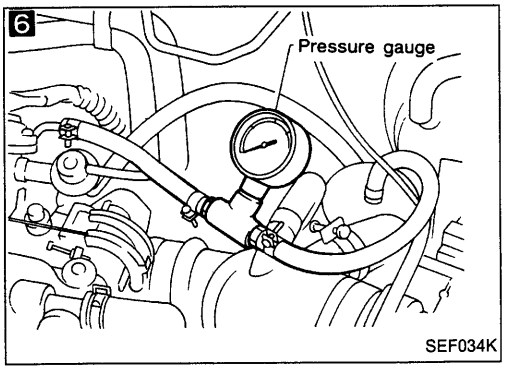
(Go to Ⓐ on next page.)



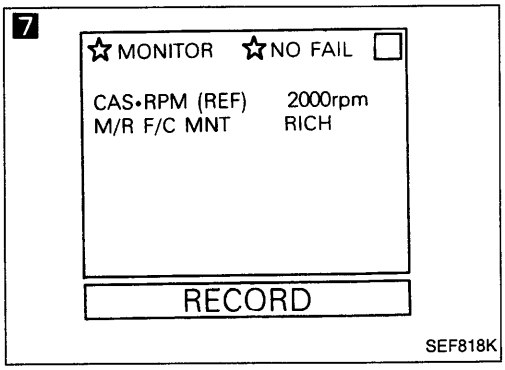
SEF282G

Diagnostic Procedure 3 — Unstable Idle (Cont'd)

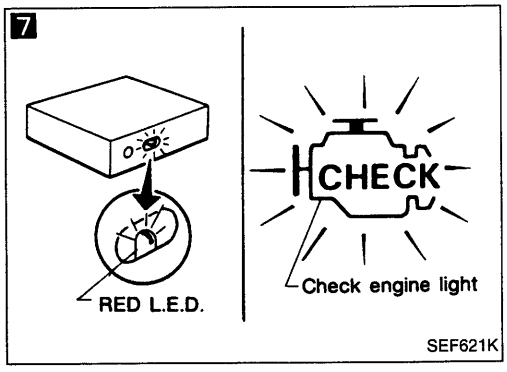

SEF156I



SEF034K



SEF818K



SEF621K

Ⓐ

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-193.)
2. Install fuel pressure gauge and check fuel pressure.
   At idle:
   Approx. 245 kPa
   (2.5 kg/cm², 36 psi)

N.G. → Check fuel pump and circuit.
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 (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.

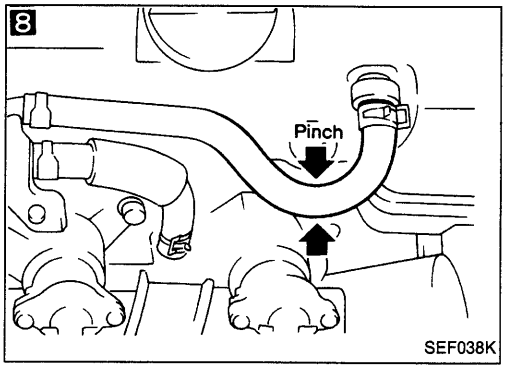
— OR —

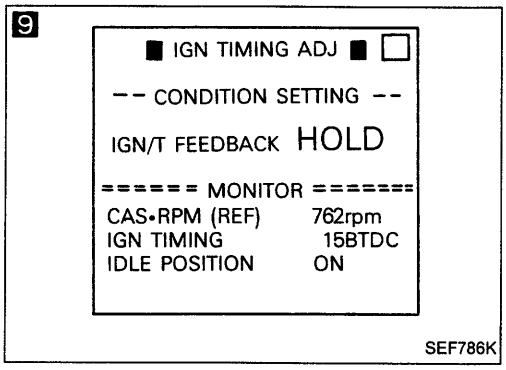
1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-45.)
2. Maintaining engine at 2,000 rpm under no-load, check to make sure that the RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

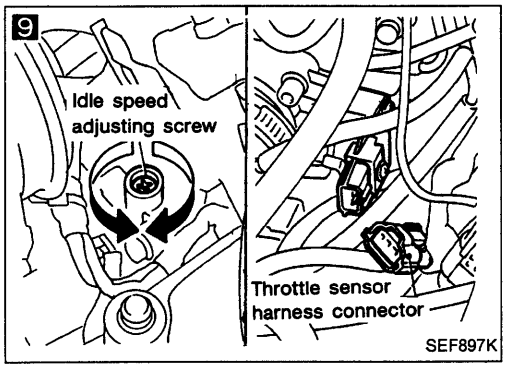
O.K. ↓

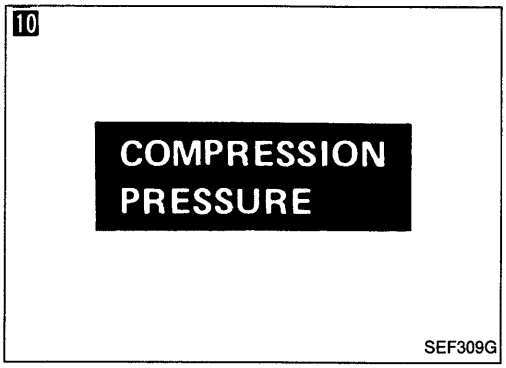
(Go to Ⓑ on next page.)

Diagnostic Procedure 3 — Unstable Idle (Cont'd)









Ⓑ

8 **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 ↓

9 **CHECK IDLE ADJ. SCREW CLOGGING.**
1. Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. Can you set engine rpm at 750±50 rpm (in "N" position) by turning idle speed adjusting screw?

OR

1. Disconnect throttle sensor harness connector.
2. Can you set engine rpm at 750±50 rpm (in "N" position) by turning idle speed adjusting screw?

- No → Check for IAS clogging or throttle valve clogging.
- Yes ↓

10 **CHECK COMPRESSION PRESSURE.**
- Check compression pressure.

Standard:
kPa (kg/cm², psi)/300 rpm
1,226 (12.5, 178)
Minimum:
kPa (kg/cm², psi)/300 rpm
1,030 (10.5, 149)
Difference between each cylinder:
kPa (kg/cm², psi)/300 rpm
98 (1.0, 14)

- N.G. → Check pistons, piston rings, valves, valve seats and cylinder head gaskets.
- O.K. ↓

11 **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. ↓

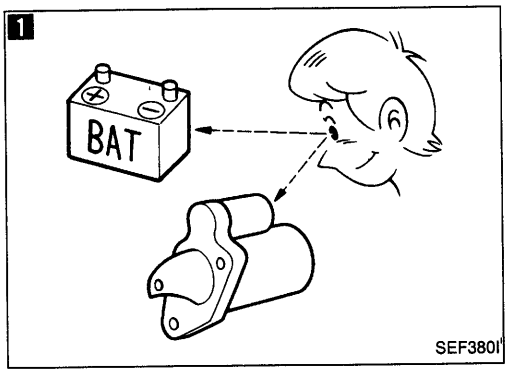
12 **TRY A KNOWN GOOD E.C.U.***

↓

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

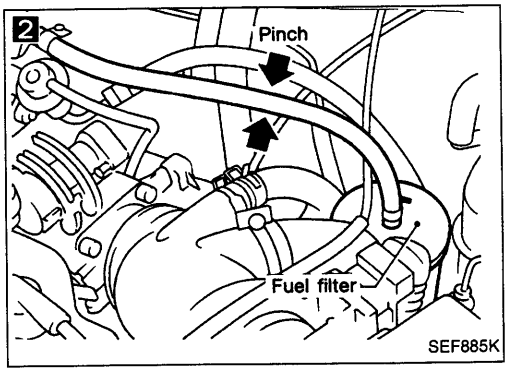


1

CHECK BATTERY AND STARTER.
Check battery and starter condition.
(Refer to EL section.)

N.G. → Repair or replace.

O.K. ↓

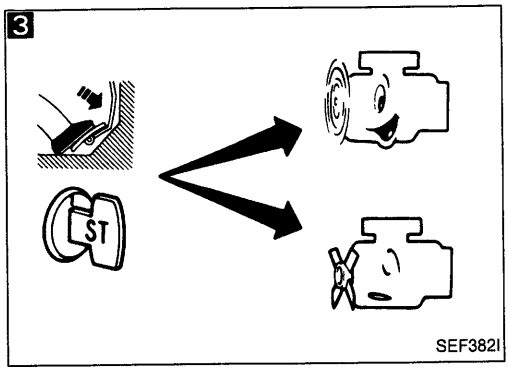


2

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-152.)

Yes ↓

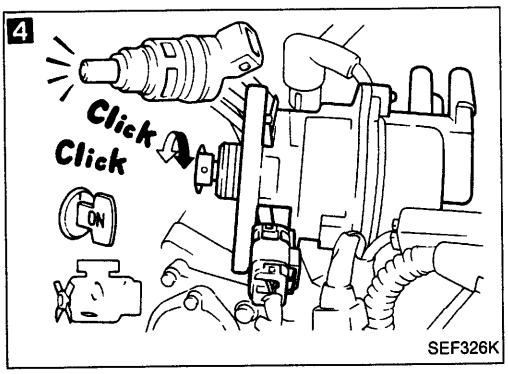


3

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-156, 158.)

No ↓

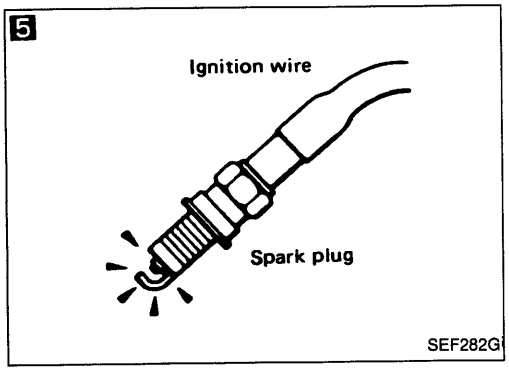


4

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.

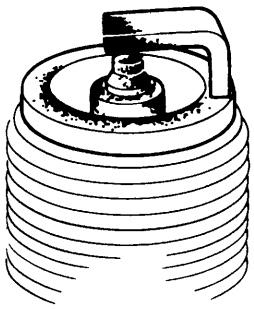
N.G. → Check ignition coil, power transistor and their circuits. (See page EF & EC-118.)

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. ↓

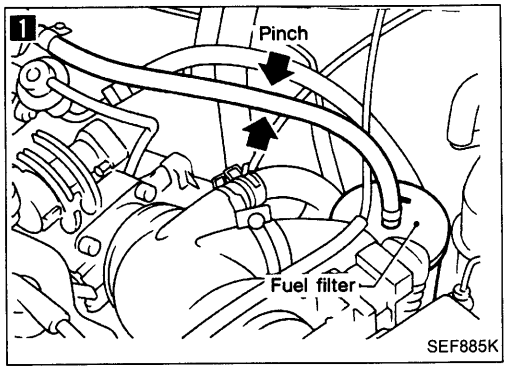
7 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.
N.G. → Repair or replace.
O.K. ↓

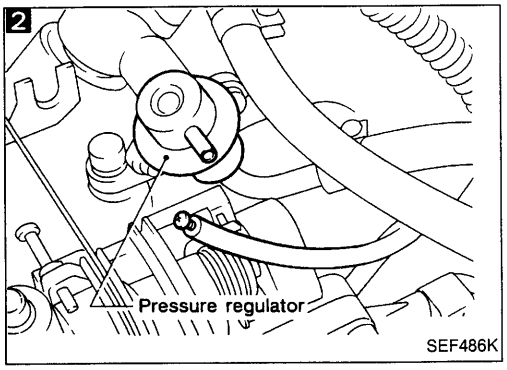
8 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-100.
N.G. → Repair or replace.
O.K. ↓

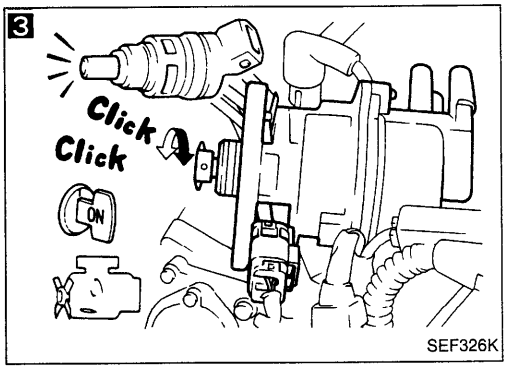
9 **TRY A KNOWN GOOD E.C.U.***
↓

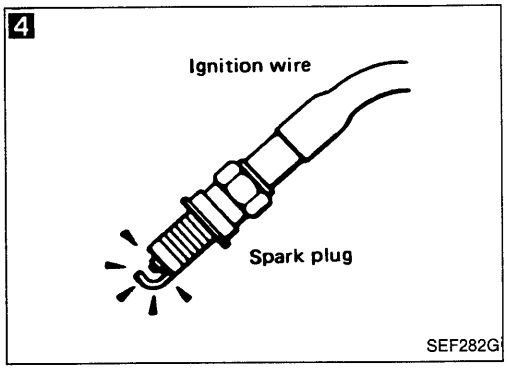
INSPECTION END

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









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-152.)

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

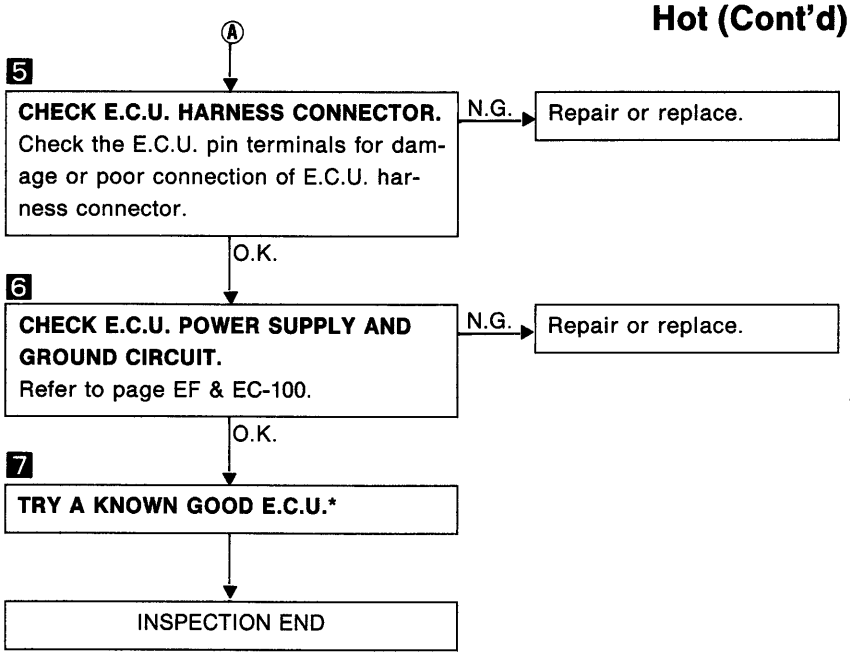
CHECK IGNITION SPARK.
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor and circuits. (See page EF & EC-118.)

O.K. ↓

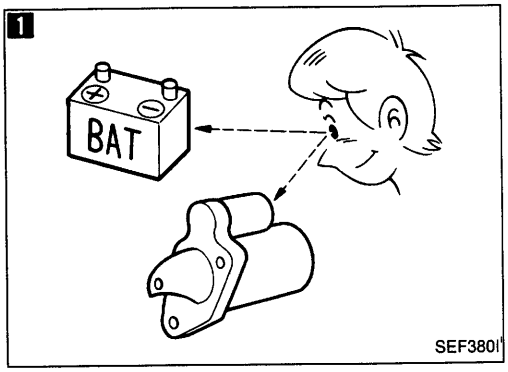
(Go to Ⓐ on next page.)

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

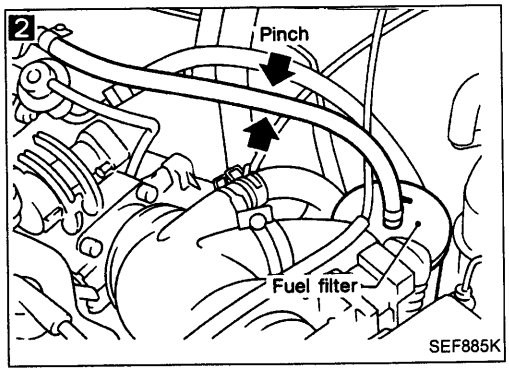


1

CHECK BATTERY AND STARTER.
Check battery and starter operation.
(Refer to EL section.)

N.G. → Repair or replace.

O.K. ↓

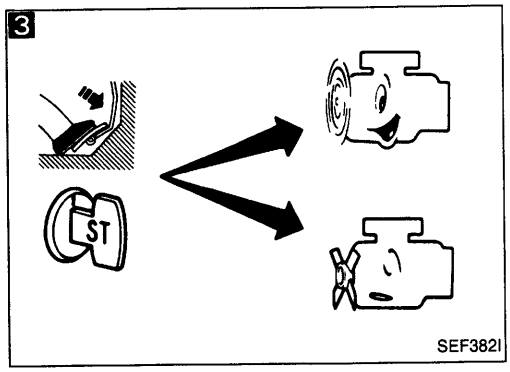


2

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-152.)

Yes ↓

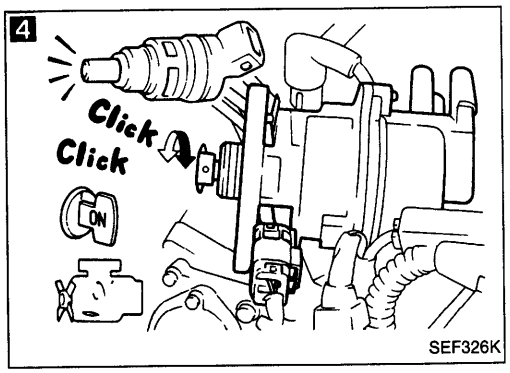


3

CHECK INJECTOR FOR LEAKAGE.
When pressing accelerator pedal fully, can you start the engine.

Yes → Check injector(s) for leakage.

No ↓

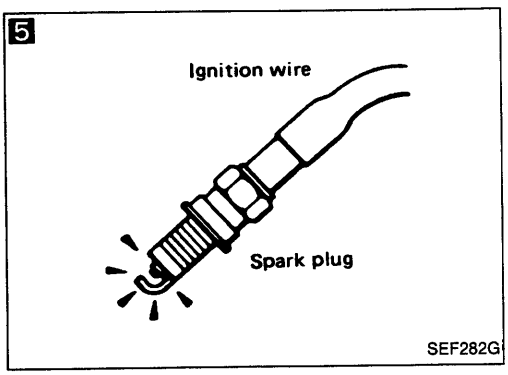


4

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

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.

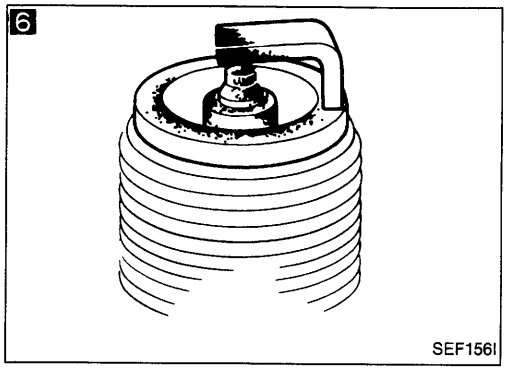
N.G. → Check ignition coil, power transistor and circuits. (See page EF & EC-118.)

O.K. ↓

(Go to Ⓐ on next page.)

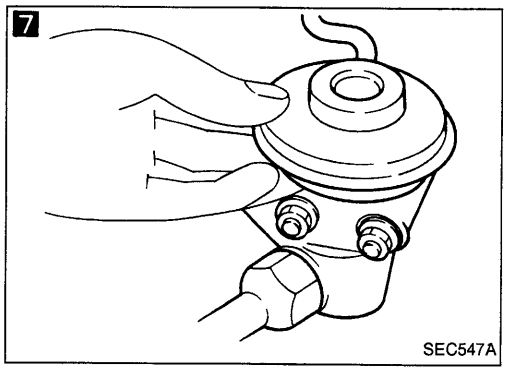
Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions (Cont'd)

6



SEF156I

7



SEC547A

Ⓐ

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.G.R. CONTROL VALVE.**
Check E.G.R. control valve for sticking.

N.G. → Repair or replace.

O.K. ↓

8 **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. ↓

9 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-100.

N.G. → Repair or replace.

O.K. ↓

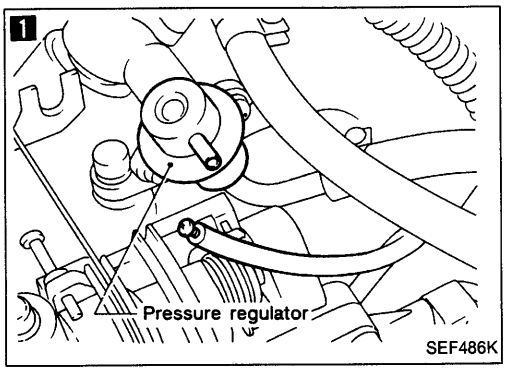
10 **TRY A KNOWN GOOD E.C.U.***

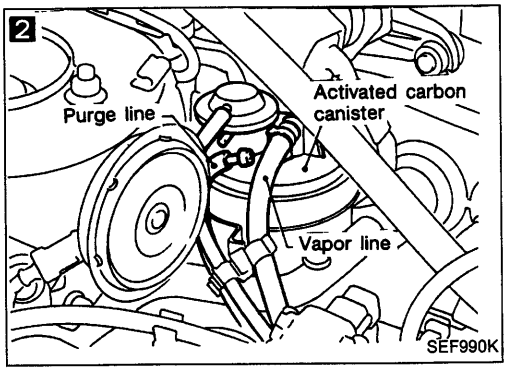
Trouble is fixed. → Replace E.C.U.

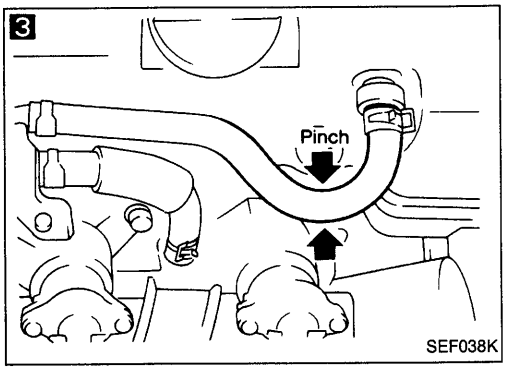
Trouble is not fixed. ↓

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 CANISTER PURGE.
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 ↓

3

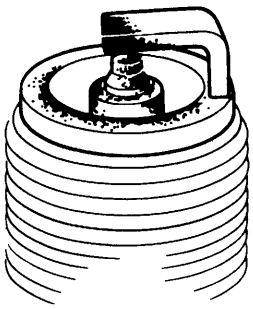
CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

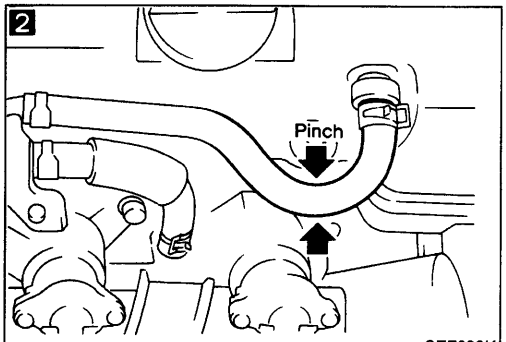
INSPECTION END

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

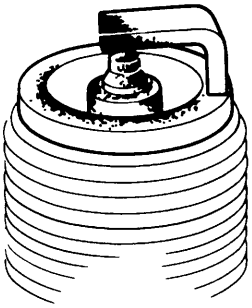
CHECK FOR INTAKE VALVE DEPOSITS.
If there are deposits on intake valves, clean them.

↓

INSPECTION END

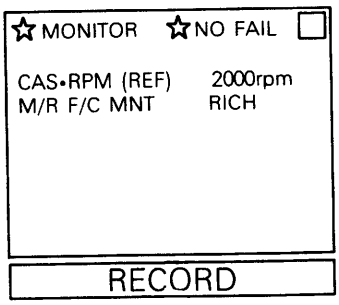
Diagnostic Procedure 9 — Hesitation under Normal Conditions

1



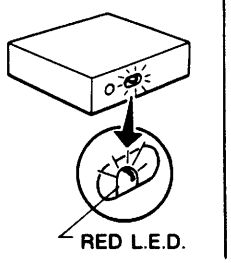
SEF156I

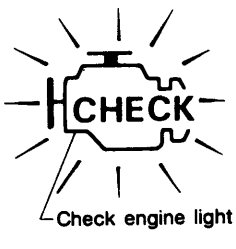
2



SEF818K

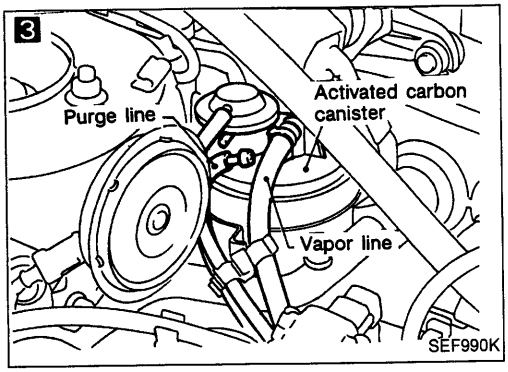
2





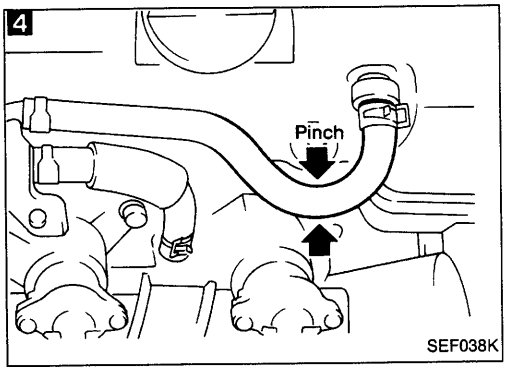
SEF621K

3



SEF990K

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.

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-45.)
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.

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

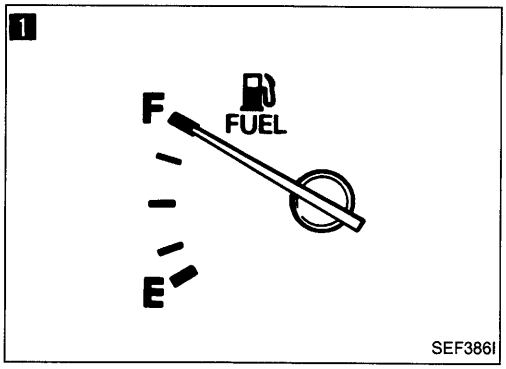
CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No

INSPECTION END

Diagnostic Procedure 10 — Engine Stalls when Turning



SEF386I

1

CHECK FUEL LEVEL.
Check to see that there is enough fuel in tank.

N.G. → Fill fuel tank with fuel.

O.K. ↓

2

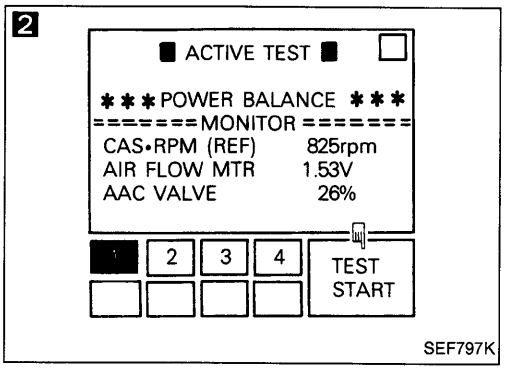
PERFORM POWER BALANCE TEST.
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

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 ↓



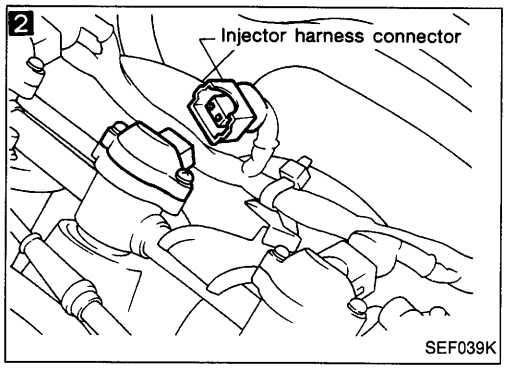
SEF797K

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 ↓



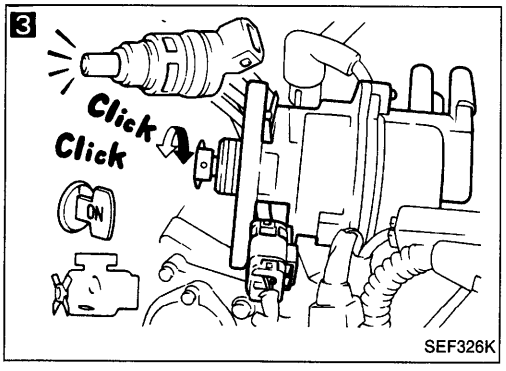
SEF039K

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.

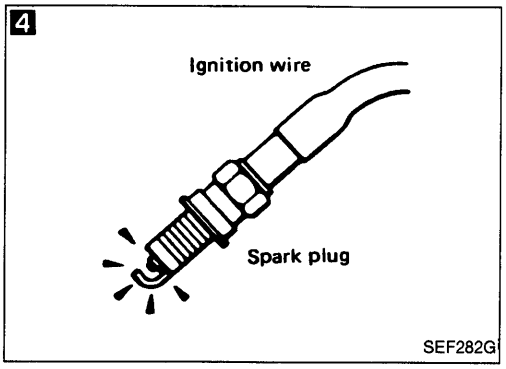
N.G. → Check ignition coil, power transistor and circuits. (See page EF & EC-118.)

O.K. ↓



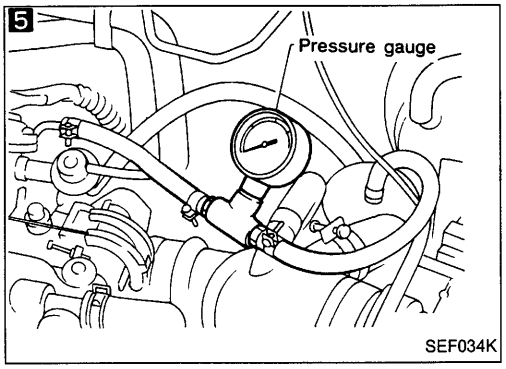
SEF326K

(Go to Ⓐ on next page.)



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-193.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:

Approx. 245 kPa
(2.5 kg/cm², 36 psi)

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

Approx. 294 kPa
(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-100.

N.G. → Repair or replace.

O.K. ↓

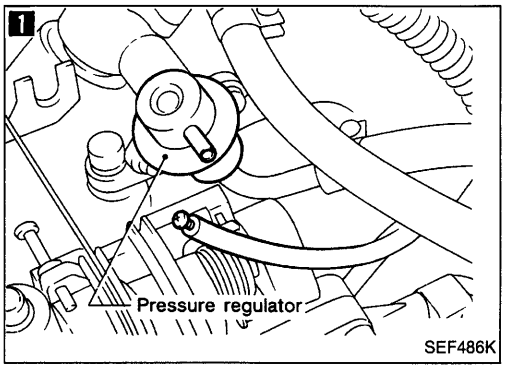
8

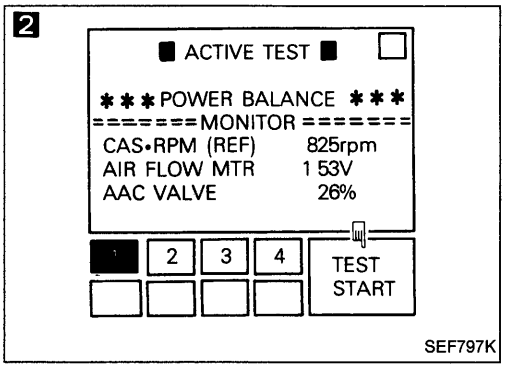
TRY A KNOWN GOOD E.C.U.*

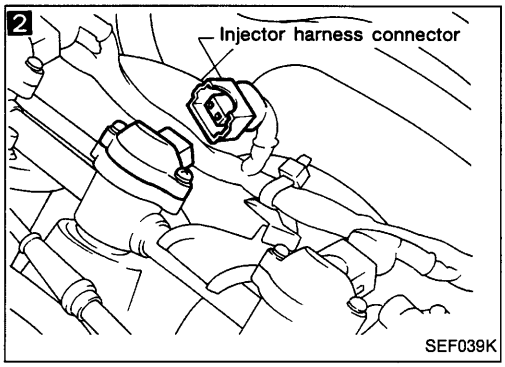
↓

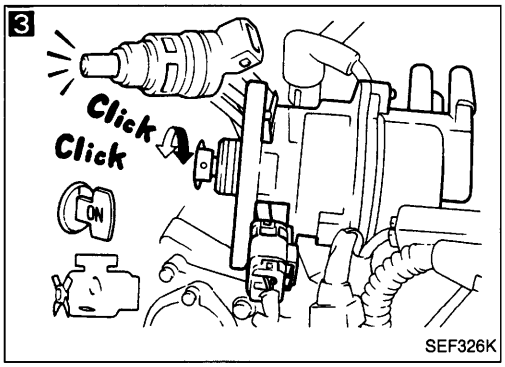
INSPECTION END

*: 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 ↓

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?

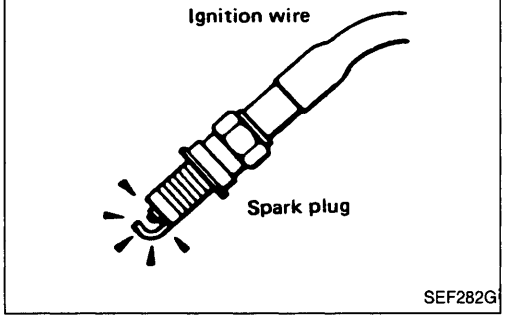
No → Check injector(s) and circuit(s).

Yes ↓

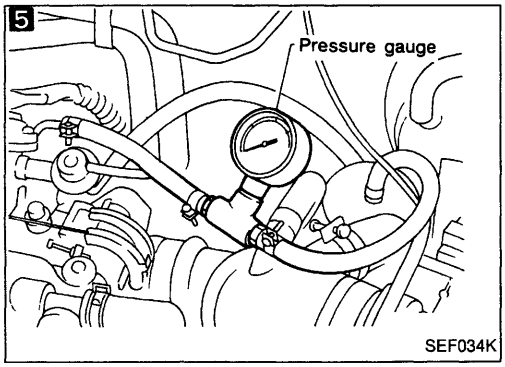
(Go to Ⓐ on next page.)

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-118.)

O.K. ↓

5 **CHECK FUEL PRESSURE.**

1. Release fuel pressure to zero. (Refer to page EF & EC-193.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.5 kg/cm^2, 36 psi)
A few seconds after ignition switch is turned OFF to ON:
Approx. 294 kPa
(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-100.

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

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-156, 158.)

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?

— OR —

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

N.G. → Go to **6**.

O.K. ↓

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. ↓

4

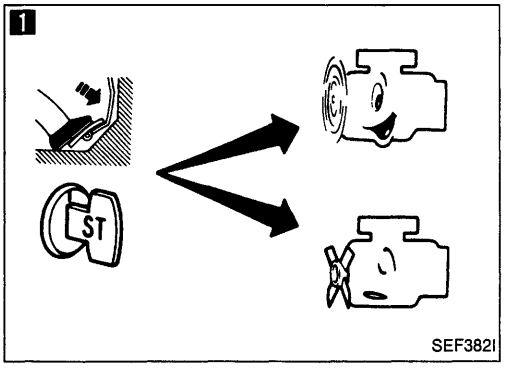
CHECK IGNITION SPARK.

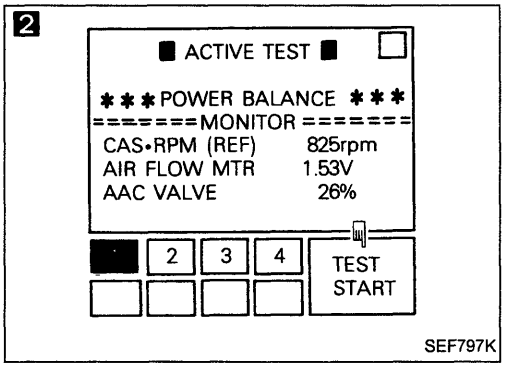
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

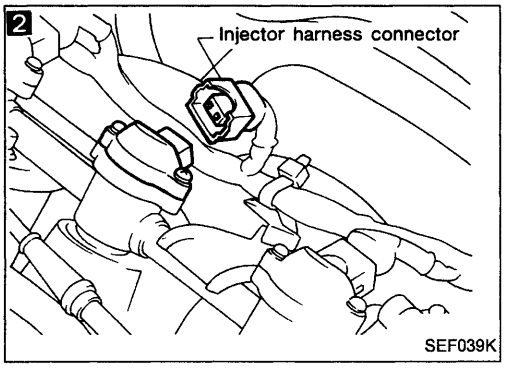
N.G. → Check ignition coil, power transistor and circuits. (See page EF & EC-118.)

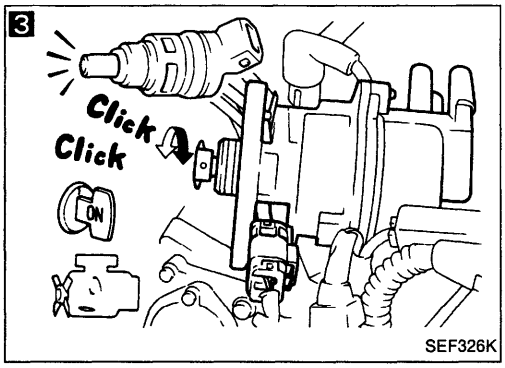
O.K. ↓

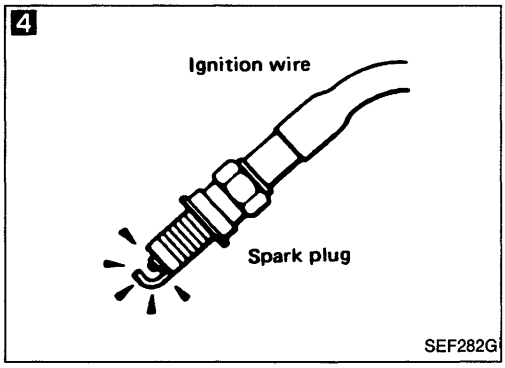
(Go to Ⓐ on next page.)





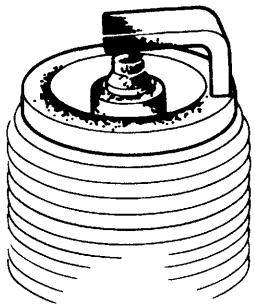






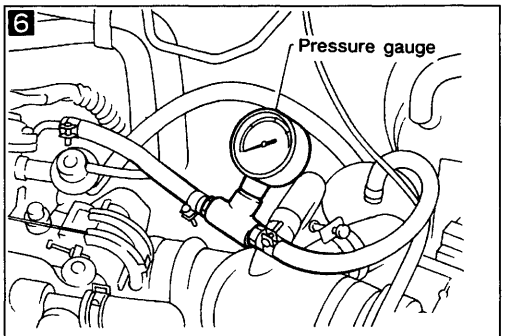
Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold (Cont'd)

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-193.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.5 kg/cm², 36 psi)
A few seconds after ignition switch is turned OFF to ON:
Approx. 294 kPa
(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-100.

N.G. → Repair or replace.

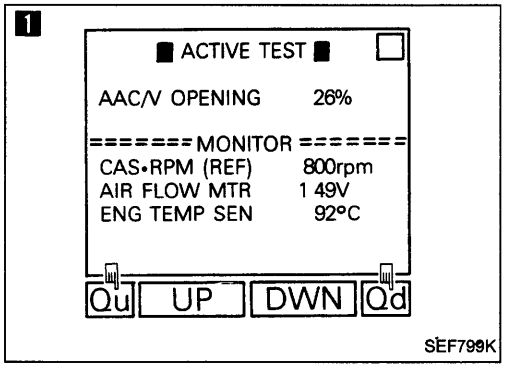
O.K.

9 **TRY A KNOWN GOOD E.C.U.***

INSPECTION END

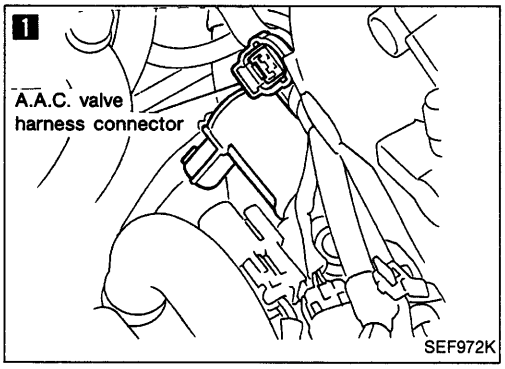
*: E.C.U. may be the cause of a problem, but this is rarely the case.

1



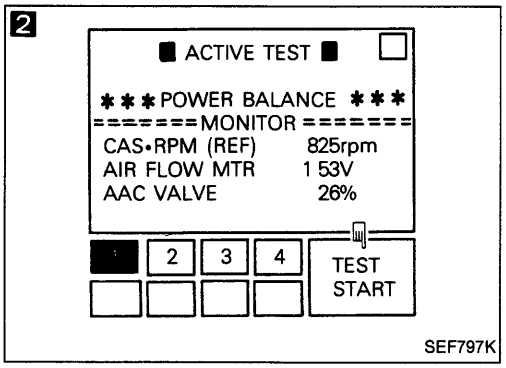
SEF799K

1



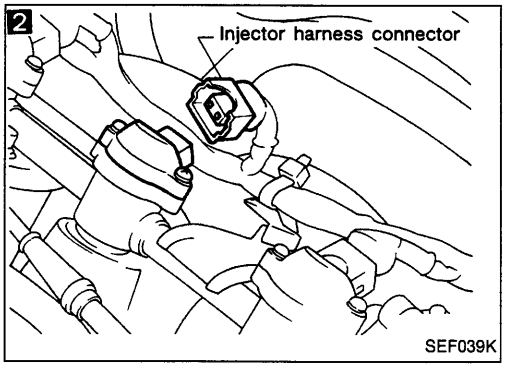
SEF972K

2



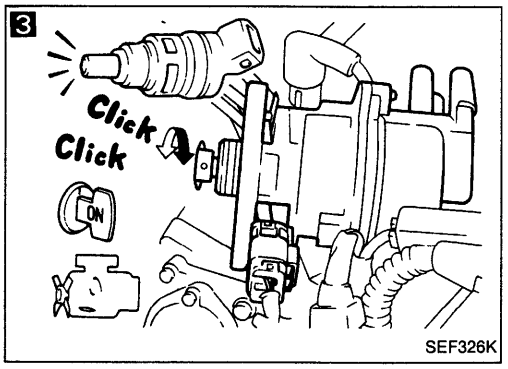
SEF797K

2



SEF039K

3



SEF326K

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-158.)

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?

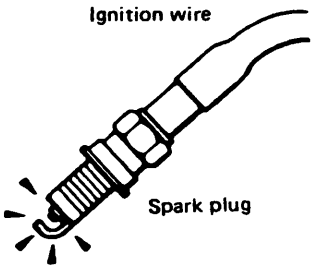
No → Check injector(s) and their circuit(s).

Yes ↓

(Go to Ⓐ on next page.)

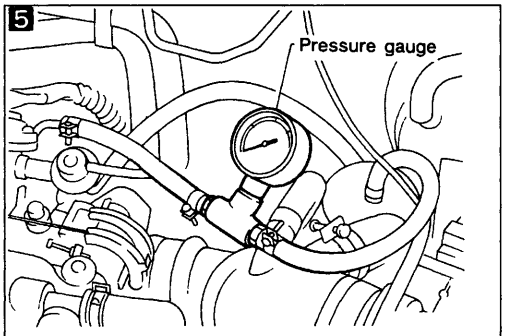
Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily (Cont'd)

4



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 an earth point with engine cranking.
4. Check for spark.

N.G. → Check ignition coil, power transistor and their circuits. (See page EF & EC-118.)

O.K. ↓

5

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero. (Refer to page EF & EC-193.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:

Approx. 245 kPa (2.5 kg/cm², 36 psi)

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

Approx. 294 kPa (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-100.

N.G. → Repair or replace.

O.K. ↓

8

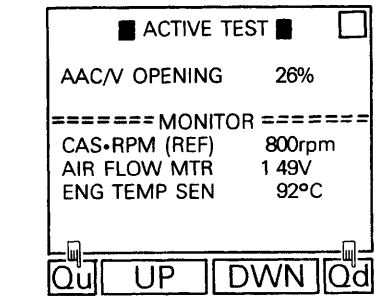
TRY A KNOWN GOOD E.C.U.*

↓

INSPECTION END

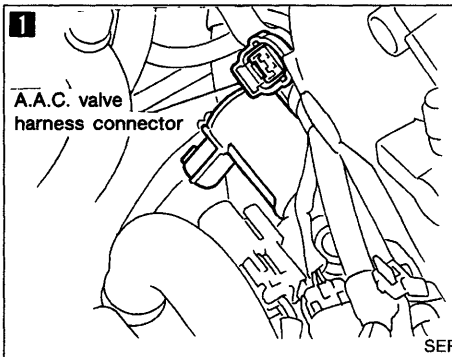
*: E.C.U. may be the cause of a problem, but this is rarely the case.

1



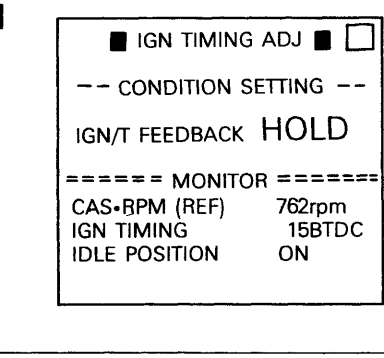
SEF799K

1



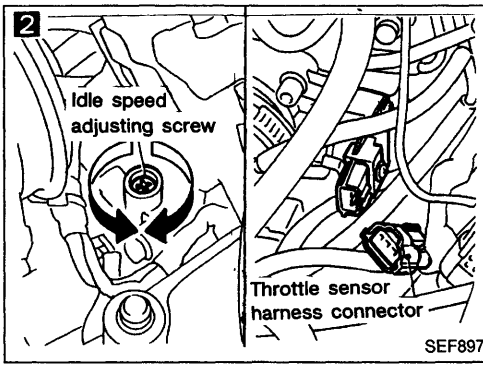
SEF972K

2



SEF786K

2



SEF897K

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-158.)

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 750±50 rpm (in "N" position) by turning idle adjusting screw?

No → Check for IAS clogging or throttle chamber clogging.

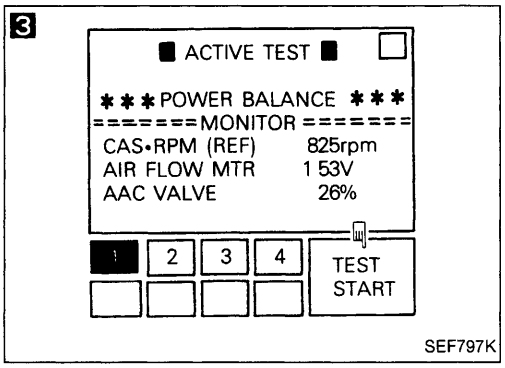
OR

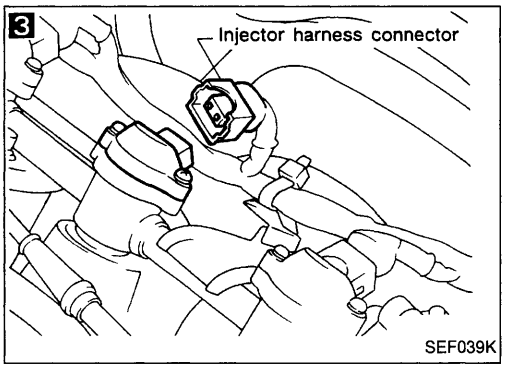
1. Disconnect throttle sensor harness connector.
2. Can you set engine rpm at 750±50 rpm (in "N" position) by turning idle adjusting screw?

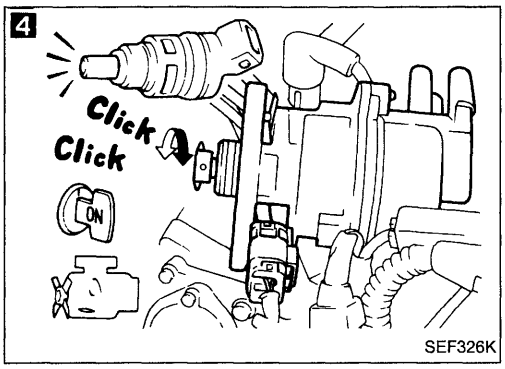
Yes ↓

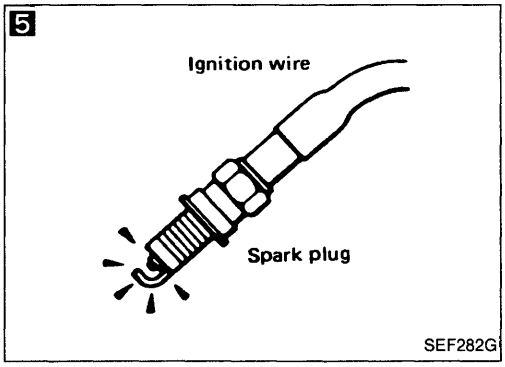
(Go to Ⓐ on next page.)

Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)









Ⓐ

3 **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. 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.

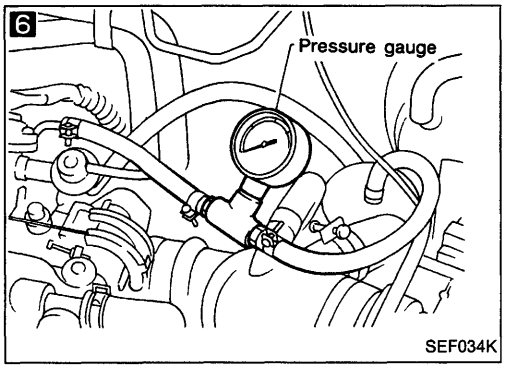
No → Check ignition coil, power transistor and circuits. (See page EF & EC-118.)

Yes ↓

(Go to Ⓑ on next page.)

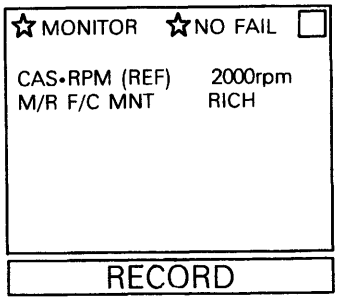
Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

6



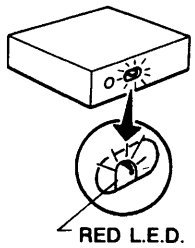
SEF034K

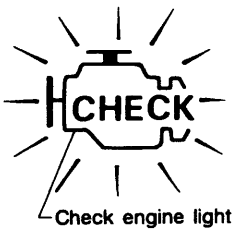
7



SEF818K

7





SEF621K

Ⓑ

6

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero. (Refer to page EF & EC-193.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:

Approx. 245 kPa
(2.5 kg/cm², 36 psi)

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

Approx. 294 kPa
(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→ LEAN→RICH.....
1 time 2 times

N.G. → Replace exhaust gas sensor.

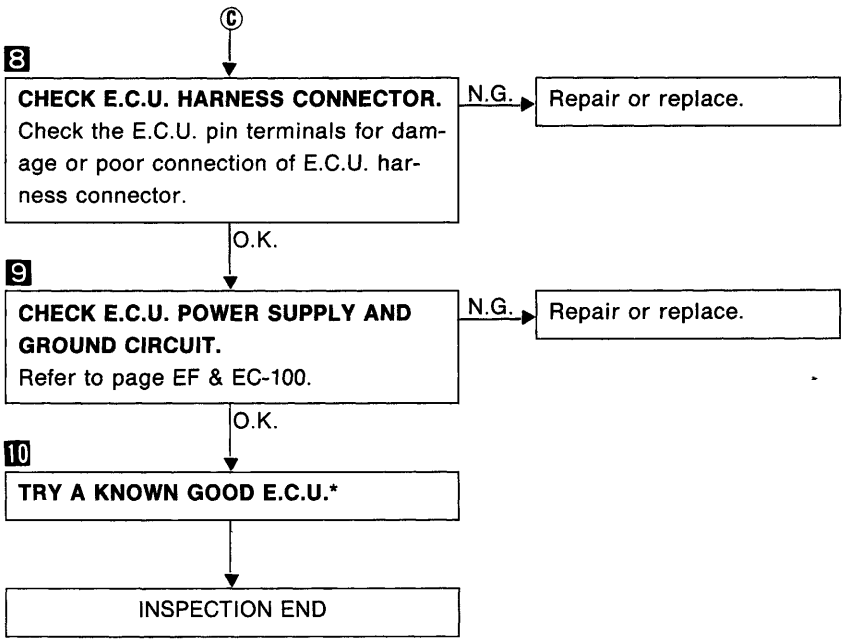
OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-45.)
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.

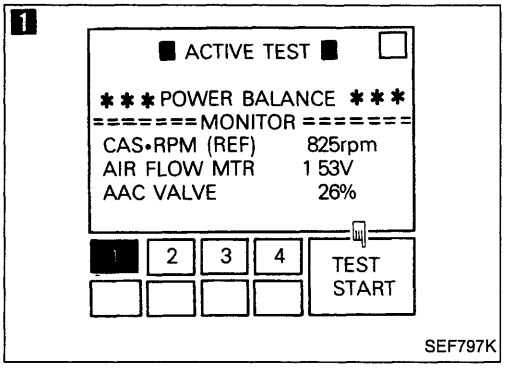
(Go to Ⓒ on next page.)

Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

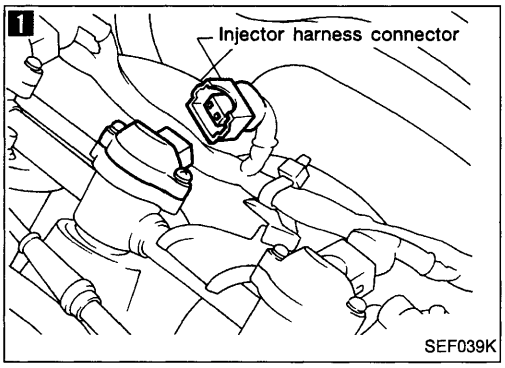


*: E.C.U. may be the cause of a problem, but this is rarely the case.

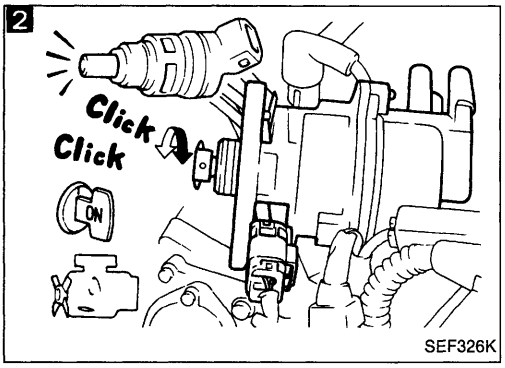
1



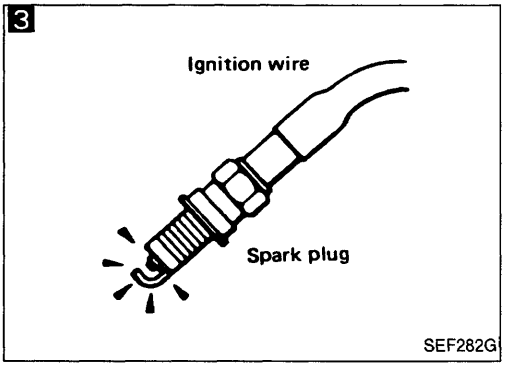
1



2



3



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.

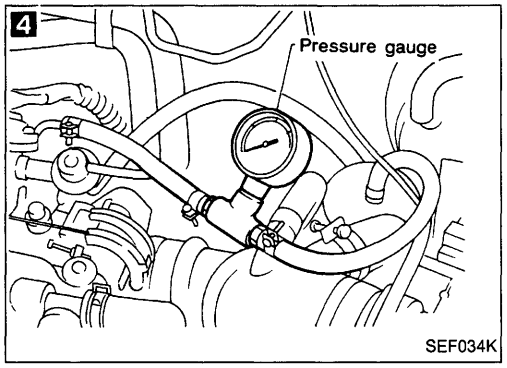
No → Check ignition coil, power transistor and circuits. (See page EF & EC-118.)

Yes ↓

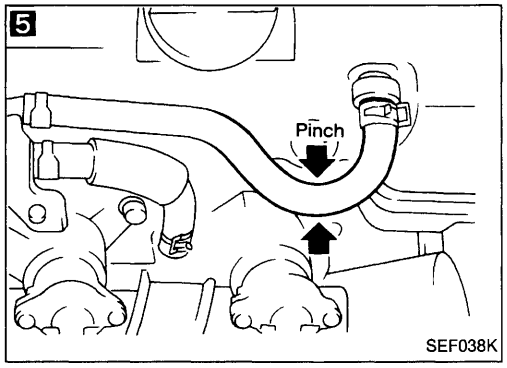
(Go to Ⓐ on next page.)

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-193.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 245 kPa
(2.5 kg/cm², 36 psi)
A few seconds after ignition switch is turned OFF to ON:
Approx. 294 kPa
(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-100.

Yes → Repair or replace.

No ↓

8 **TRY A KNOWN GOOD E.C.U.***

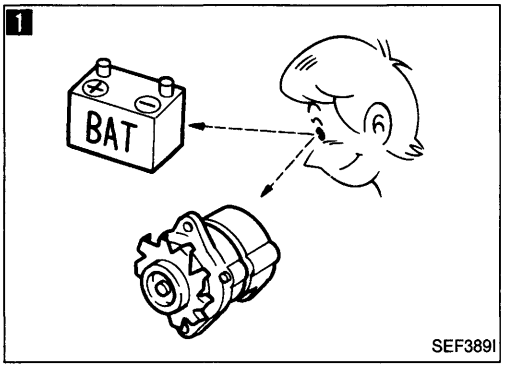
↓

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?

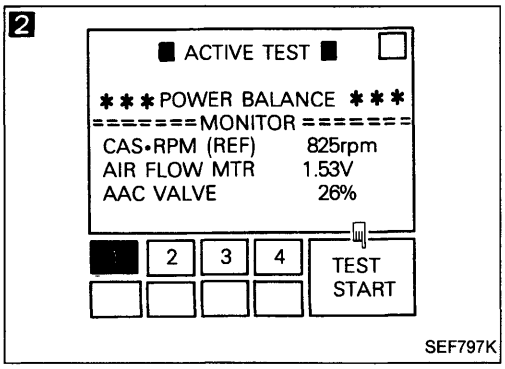
No → Go to 5.

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



SEF797K

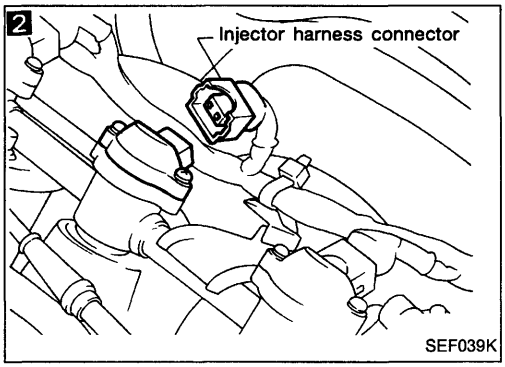
3

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).

2



SEF039K

Yes ↓

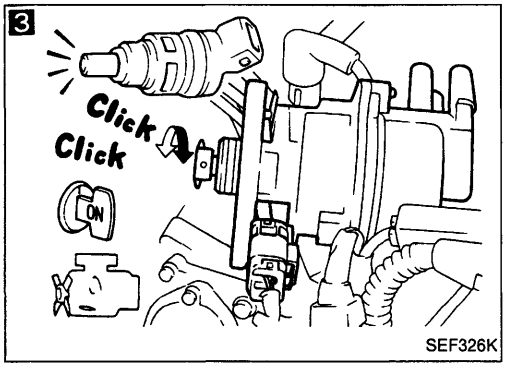
4

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-118.)

3

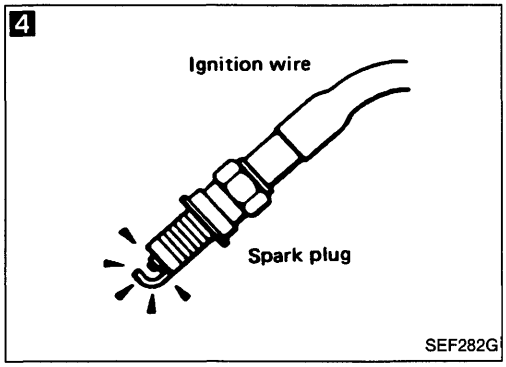


SEF326K

O.K. ↓

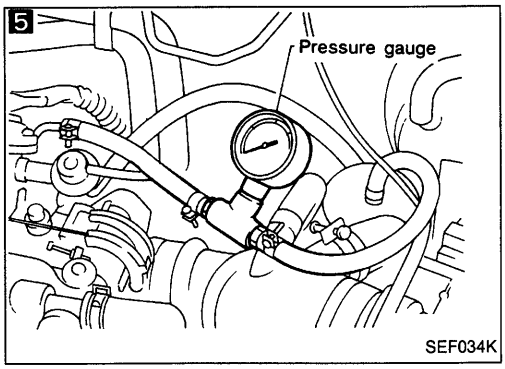
(Go to Ⓐ on next page.)

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-193.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:

Approx. 245 kPa

(2.5 kg/cm^2, 36 psi)

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

Approx. 294 kPa

(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-100.

N.G. → Repair or replace.

O.K. ↓

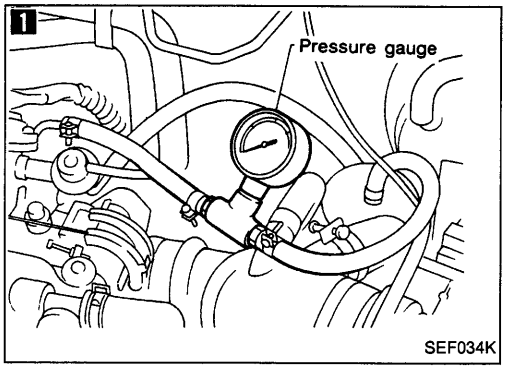
8

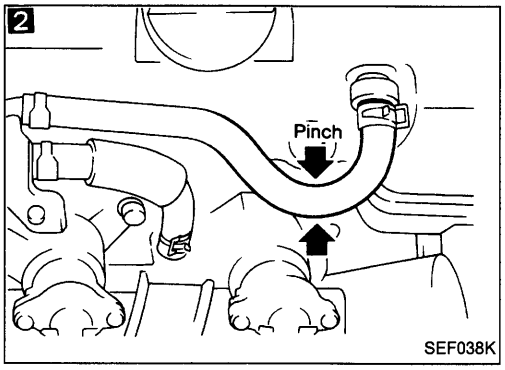
TRY A KNOWN GOOD E.C.U.*

↓

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-193.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:

Approx. 245 kPa
(2.5 kg/cm², 36 psi)

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

Approx. 294 kPa
(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?

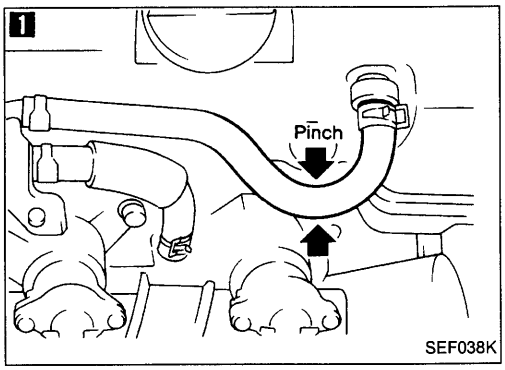
Yes → Discover air leak location and repair.

No ↓

INSPECTION END

Diagnostic Procedure 18 — Detonation

1

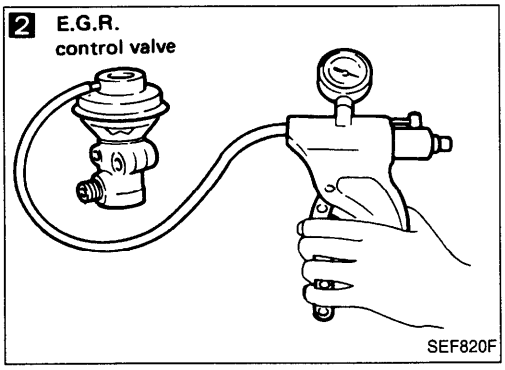


CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine rpm rise?

Yes → Discover air leak location and repair.

No ↓

2

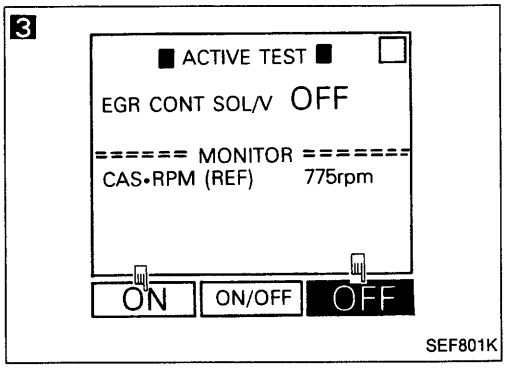


CHECK E.G.R. OPERATION.
1. Apply vacuum directly to the E.G.R. valve using a handy vacuum pump.
2. Check to see that the engine runs rough or dies.

No → Check E.G.R. valve for sticking.

Yes ↓

3



CHECK E.G.R. & CANISTER CONTROL SOLENOID VALVE.

1. Select "E.G.R. CONT SOL VALVE" in "ACTIVE TEST" mode.
2. Turn E.G.R. & canister control solenoid valve ON and OFF.
3. Check operating sound.

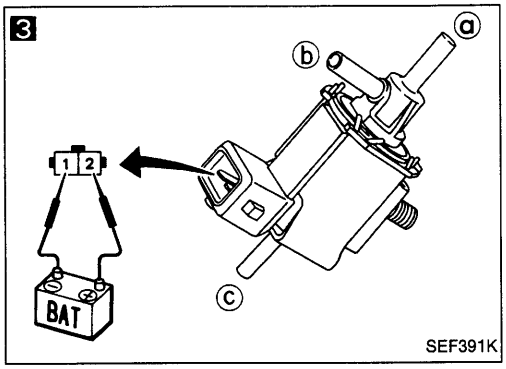
N.G. → Check solenoid valve and circuit.

—OR—

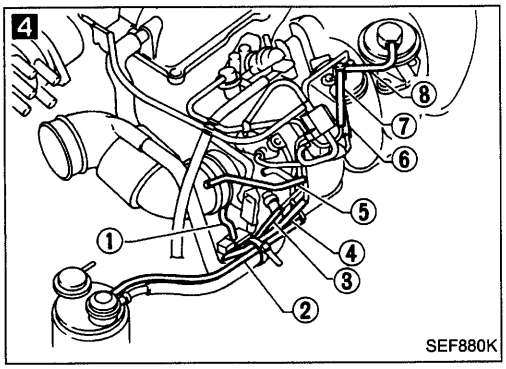
1. Disconnect E.G.R. & canister control solenoid valve harness connector.
2. Supply E.G.R. & canister control solenoid valve terminals with battery current and check operating sound.

O.K. ↓

3



4



CHECK VACUUM HOSES.
Check the following vacuum hoses for clogging, cracks and poor connection.

① Throttle chamber to E.G.R. & canister control solenoid valve
② Activated carbon canister to vacuum gallery
③ E.G.R. & canister control solenoid valve to vacuum gallery
④ E.G.R. & canister control solenoid valve to vacuum gallery
⑤ Air duct to vacuum gallery
⑥ B.P.T. valve to E.G.R. tube
⑦ B.P.T. valve to vacuum gallery
⑧ E.G.R. control valve to B.P.T. valve

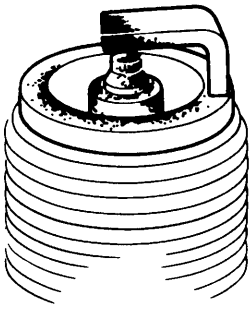
N.G. → Repair or replace.

O.K. ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 18 — Detonation (Cont'd)

5



SEF156I

Ⓐ

5

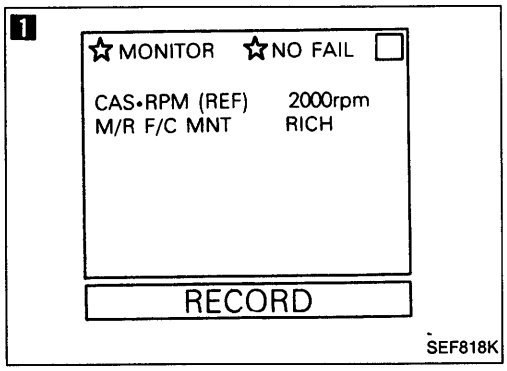
CHECK FOR OIL LEAK TO COMBUSTION CHAMBER.
Remove spark plugs and check for fouling with oil.

Yes → Check pistons, piston rings, valves, valve seats, valve oil seal, engine oil level, etc.

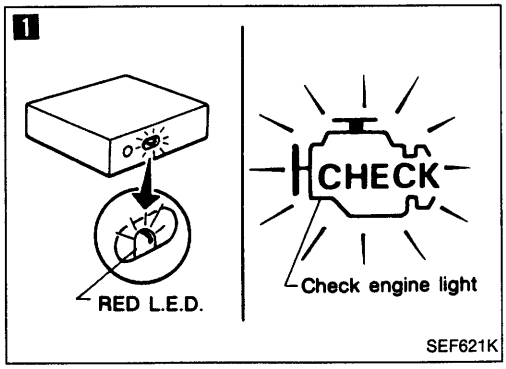
No ↓

INSPECTION END

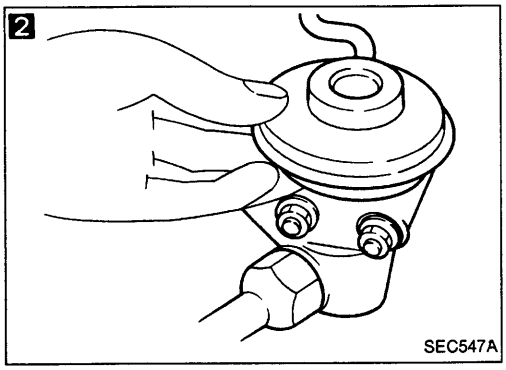
1



1



2



Diagnostic Procedure 19 — Surge

1

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-45.)
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.

2

CHECK E.G.R. CONTROL VALVE.
Check E.G.R. control valve for sticking.

N.G. → Repair or replace.

O.K.

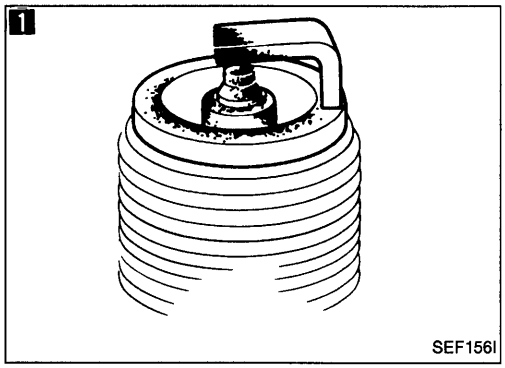
3

TRY A KNOWN GOOD E.C.U.*

INSPECTION END

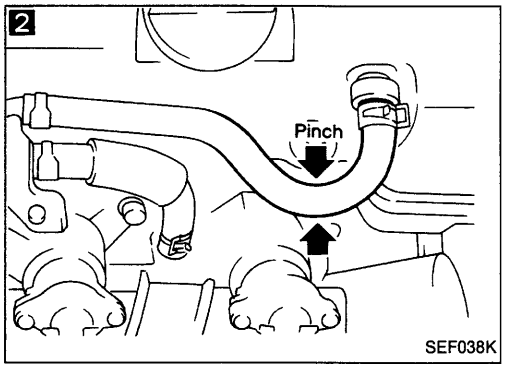
*: E.C.U. may be the cause of a problem, but this is rarely the case.

1



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

CHECK ENGINE TEMPERATURE SENSOR.
Check engine temperature sensor and its circuit. (See page EF & EC-112.)

N.G. → Replace or repair.

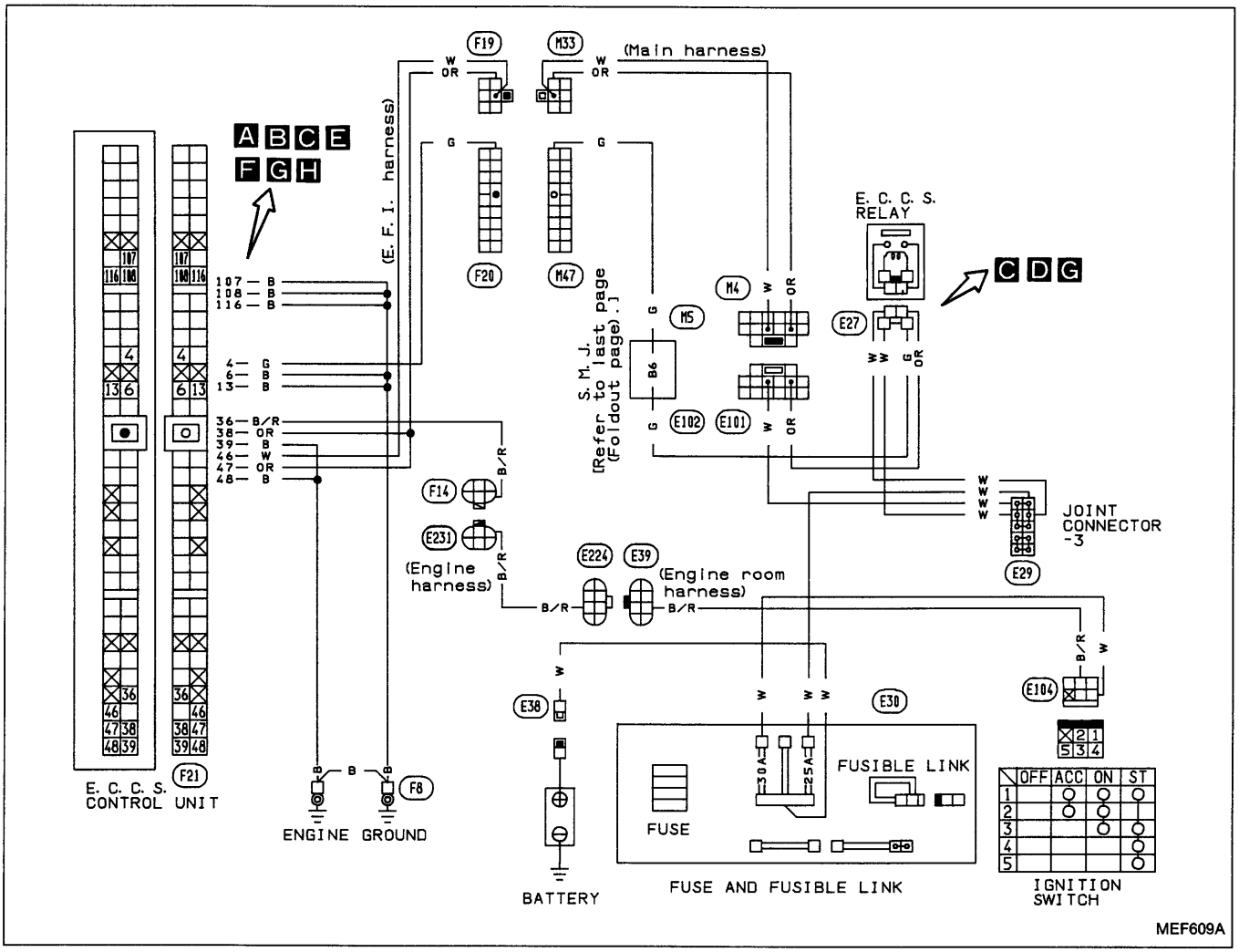
O.K. ↓

INSPECTION END

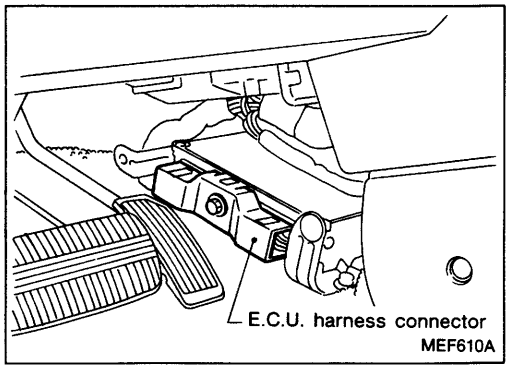
NOTE

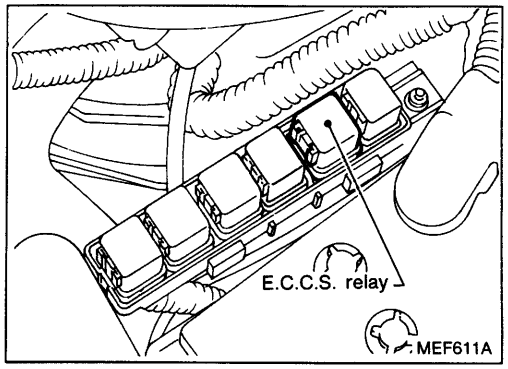
Diagnostic Procedure 22

MAIN POWER SUPPLY AND GROUND CIRCUIT (Not self-diagnostic item)



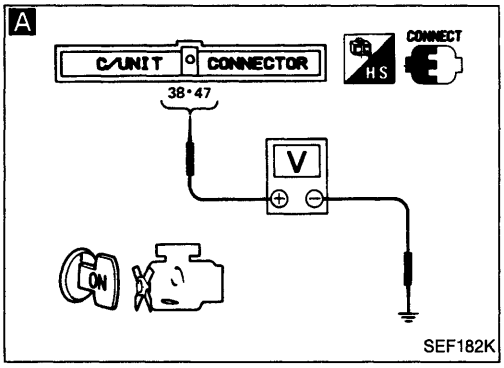
Harness layout





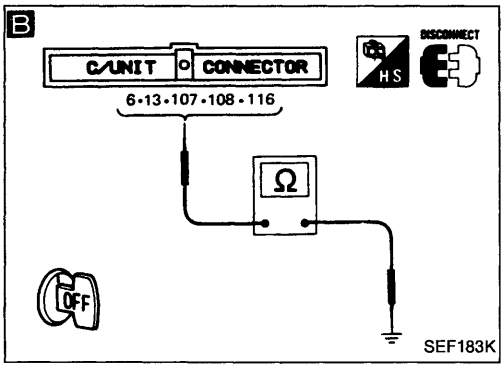
Diagnostic Procedure 22 (Cont'd)

A



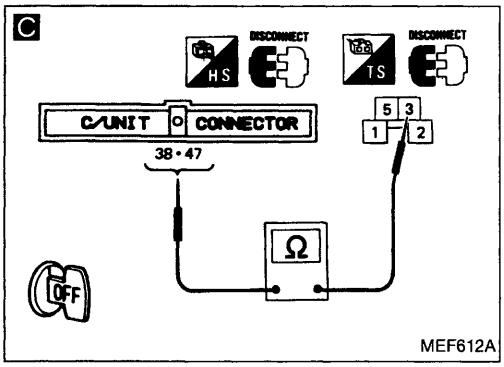
SEF182K

B



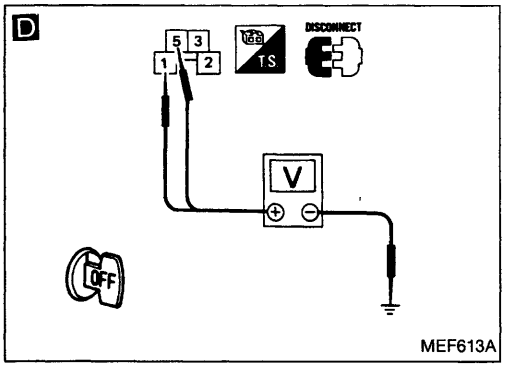
SEF183K

C



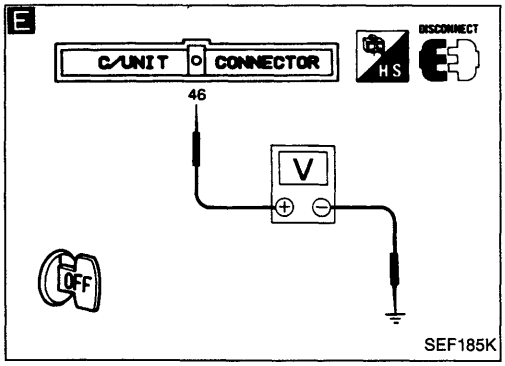
MEF612A

D



MEF613A

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, ㉗, ㉘, ㉟ 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 ③ .
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F19) , (M33)
- Harness connectors (M4) , (E101)
- Harness continuity between E.C.U. and E.C.C.S. relay

If 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 , ⑤ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- 25A fusible link
- Joint connector-3
- Harness continuity between E.C.C.S. relay and battery

If N.G., repair harness or connectors.

O.K. ↓

E

CHECK VOLTAGE BETWEEN E.C.U. AND GROUND.
1) Check voltage between E.C.U. terminal ㊻ and ground.
Voltage: Battery voltage

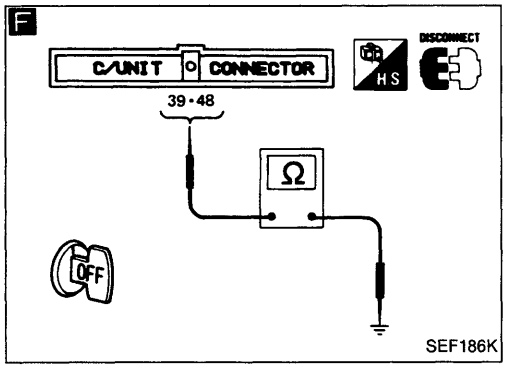
N.G. → Check the following.
- Harness connectors (F19) , (M33)
- Harness connectors (M4) , (E101)
- 25A fuse
- Joint connector-3
- Harness continuity between E.C.U. and battery

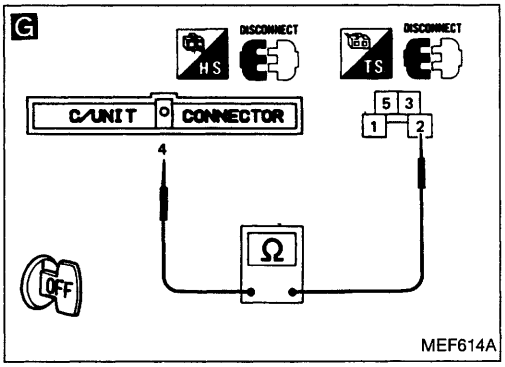
If N.G., repair harness or connectors.

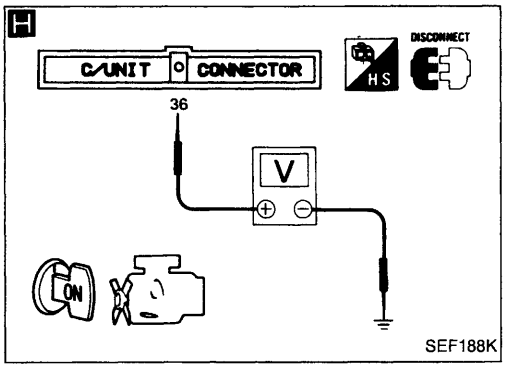
O.K. ↓

Ⓐ

Diagnostic Procedure 22 (Cont'd)







F (A)

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. → Check the following.
- Harness connectors (F20), (M47)
- Harness connectors (M5), (E102)
- Harness continuity between E.C.U. and E.C.C.S. relay

If 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 (F14), (E231)
- Harness connectors (E39), (E224)
- Harness connector (E104)
- 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-191.)

N.G. → Replace E.C.C.S. relay.

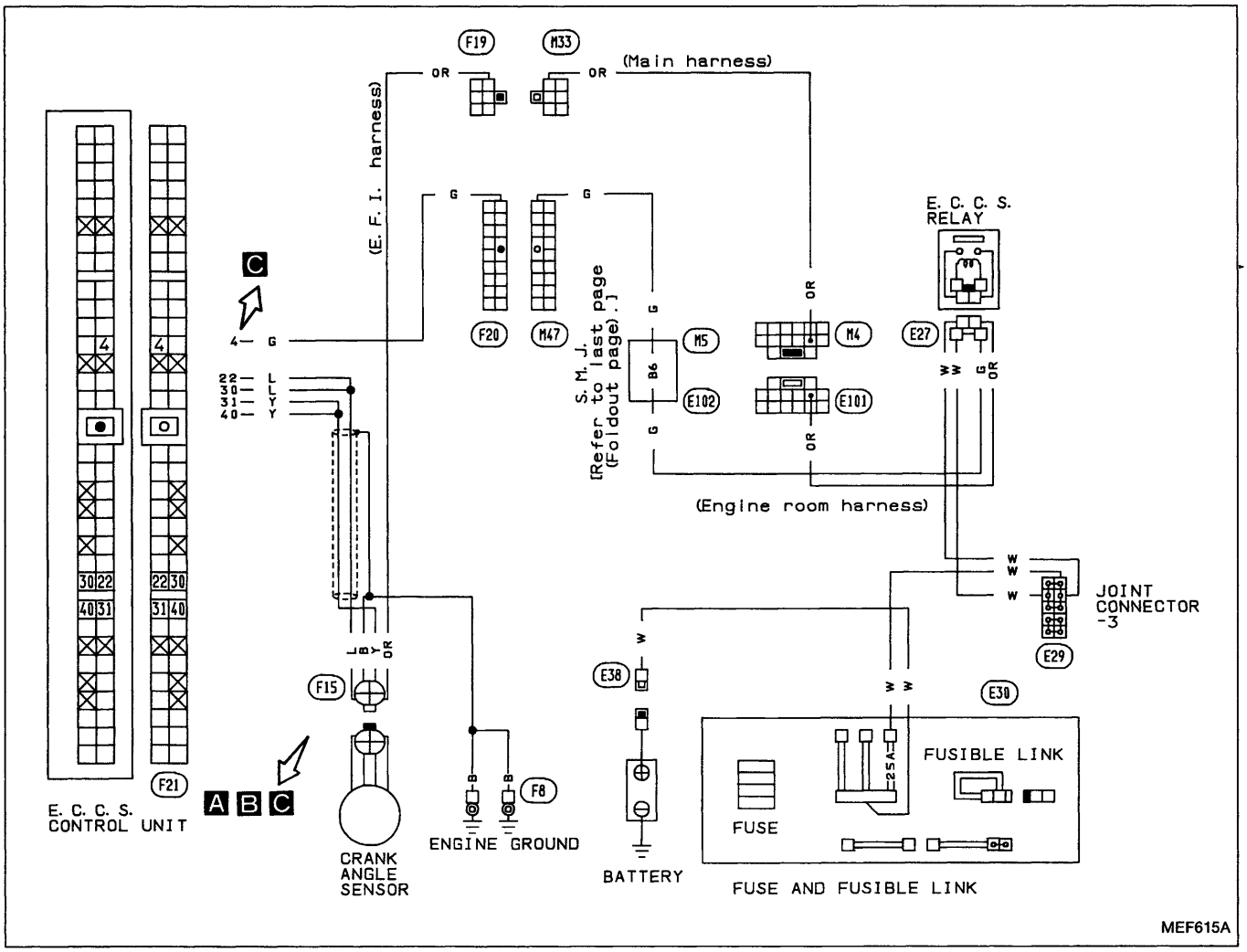
O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

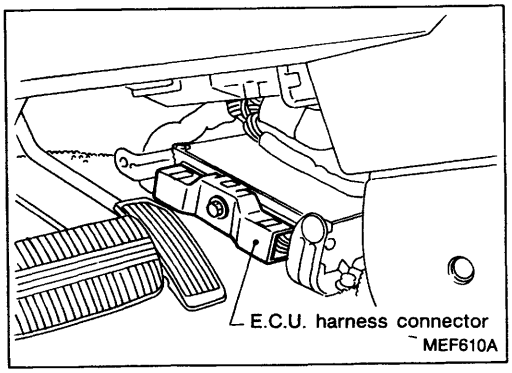
NOTE

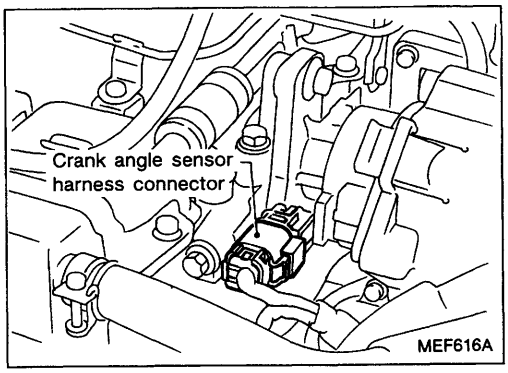
Diagnostic Procedure 23

CRANK ANGLE SENSOR (Code No. 11)

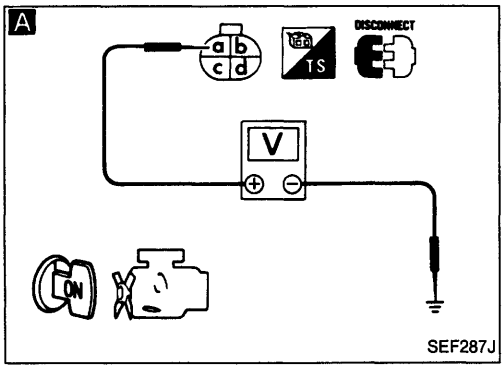


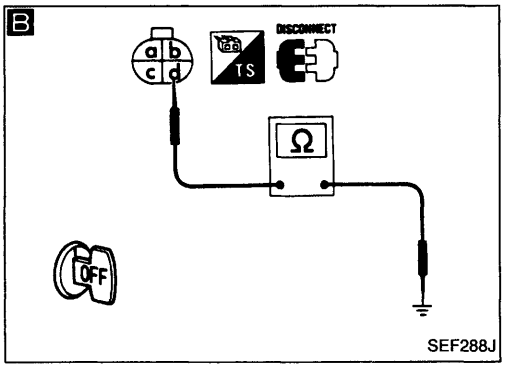
Harness layout

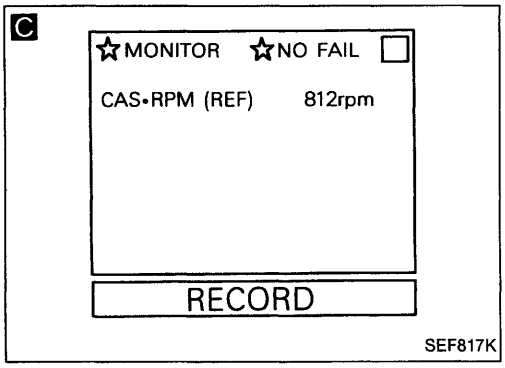


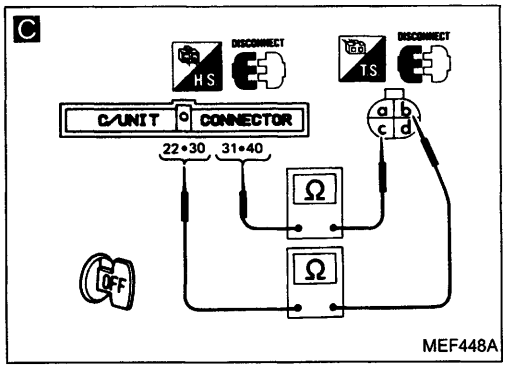


Diagnostic Procedure 23 (Cont'd)









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 connectors (F19), (M33)
- Harness connectors (M4), (E101)
- 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: 800 ± 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-184.)

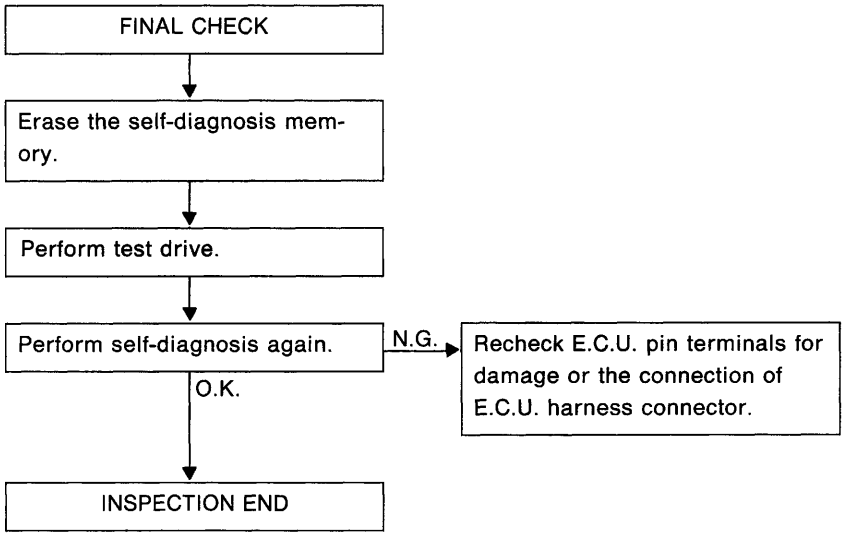
N.G. → Replace crank angle sensor.

O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 23 (Cont'd)

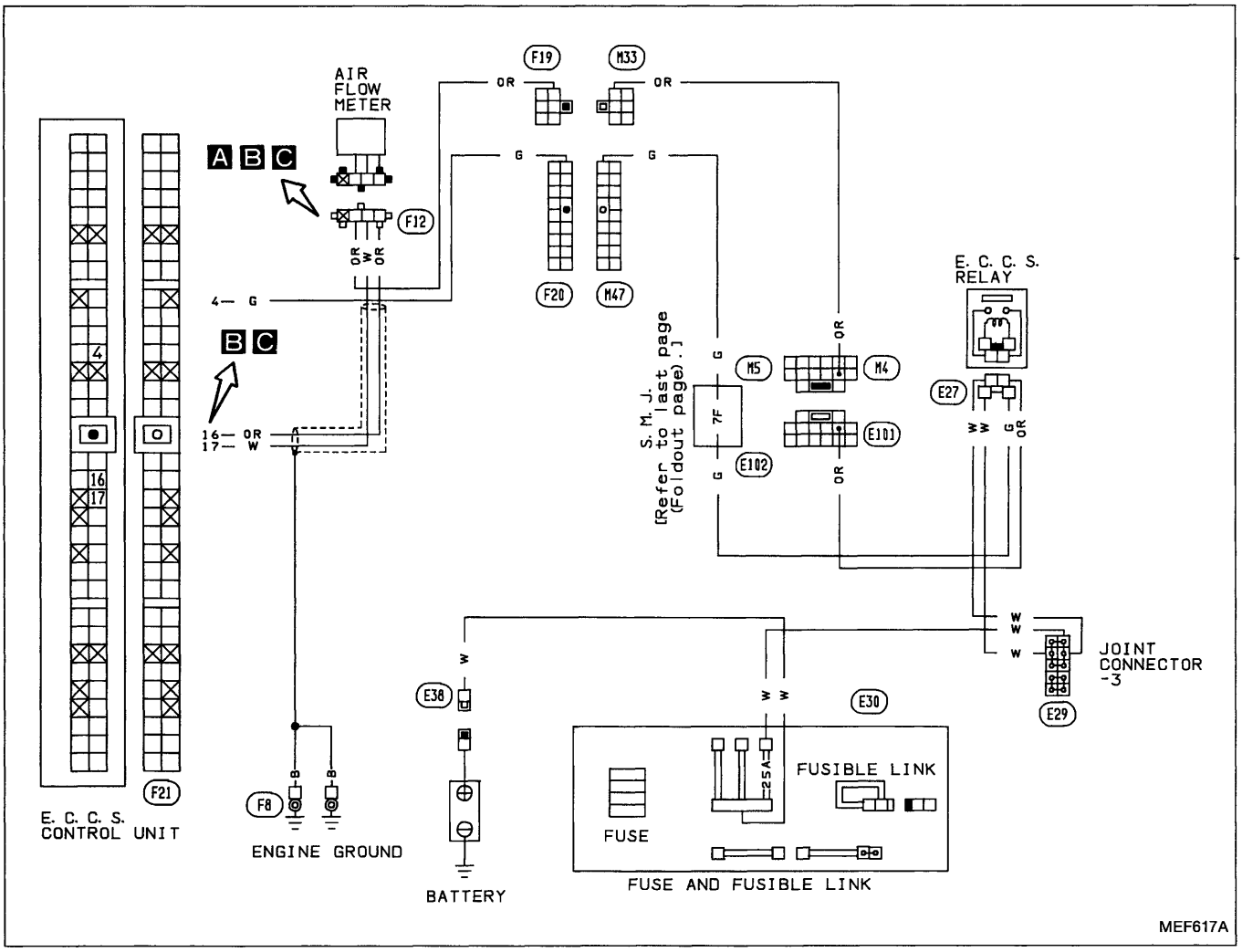
Perform FINAL CHECK by the following procedure after repair is completed.



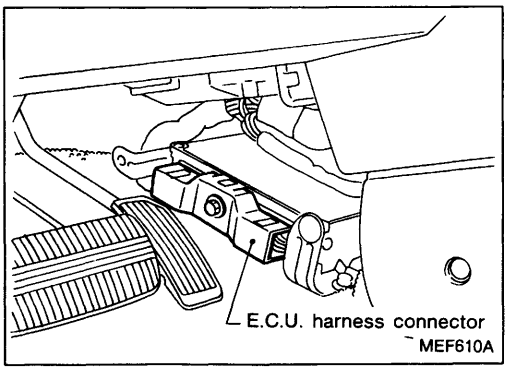
NOTE

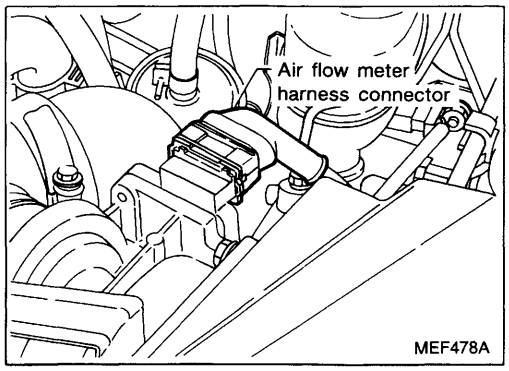
Diagnostic Procedure 24

AIR FLOW METER (Code No. 12) (CHECK ENGINE LIGHT ITEM)



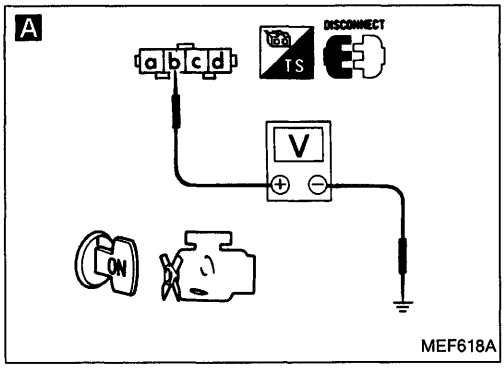
Harness layout





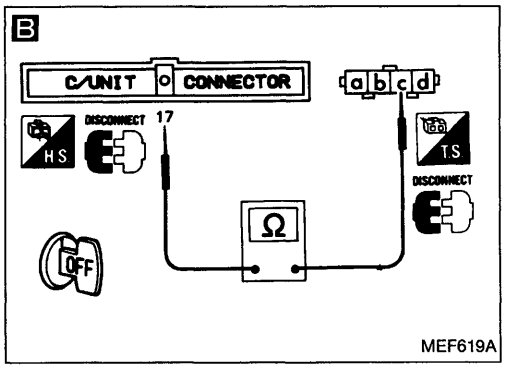
Diagnostic Procedure 24 (Cont'd)

A



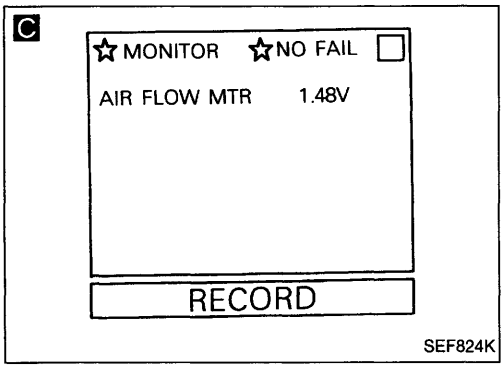
MEF618A

B



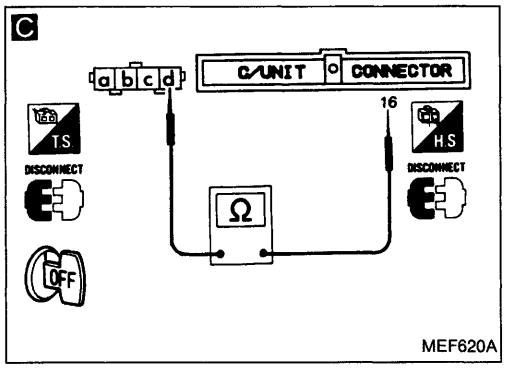
MEF619A

C



SEF824K

C



MEF620A

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 connectors (F19), (M33)
- Harness connectors (M4), (E101)
- 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 - 1.7V
(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-184.)

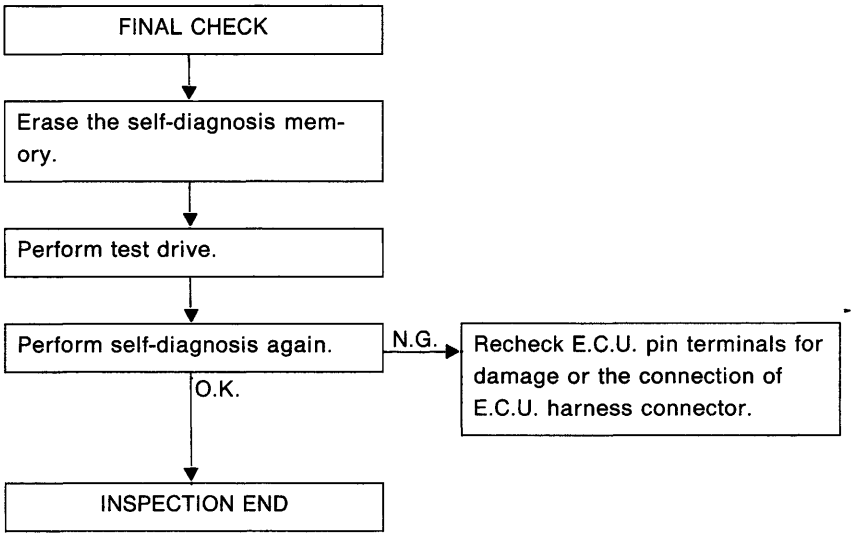
N.G. → Replace air flow meter.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 24 (Cont'd)

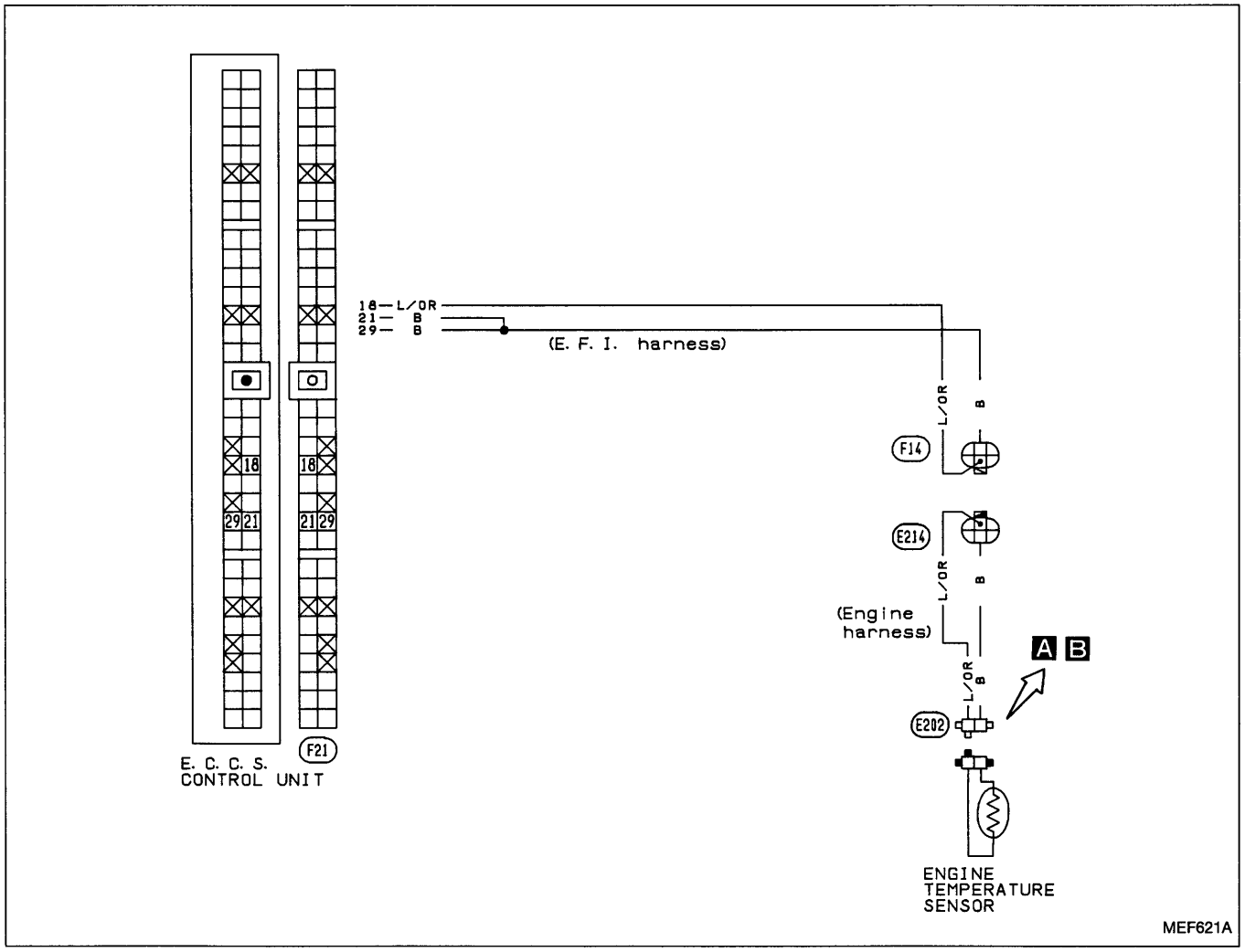
Perform FINAL CHECK by the following procedure after repair is completed.



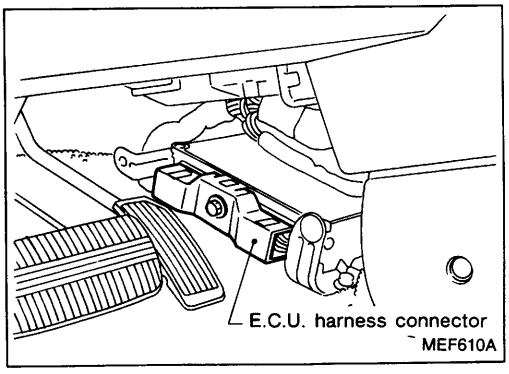
NOTE

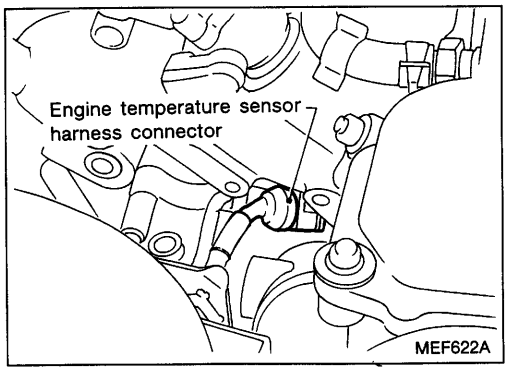
Diagnostic Procedure 25

ENGINE TEMPERATURE SENSOR (Code No. 13) (CHECK ENGINE LIGHT ITEM)



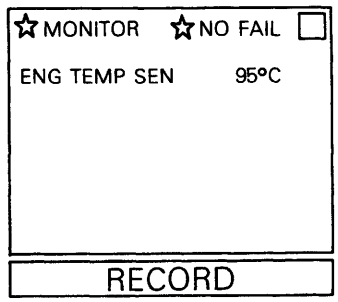
Harness layout





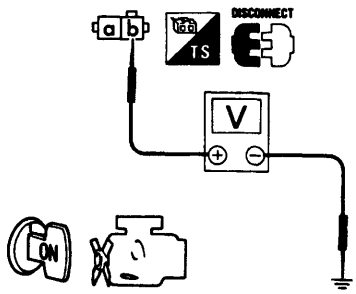
Diagnostic Procedure 25 (Cont'd)

A



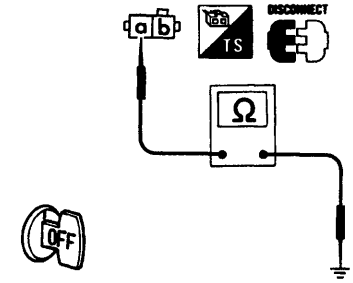
SEF825K

A



MEF623A

B



MEF624A

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.

N.G. → Check the following.
- Harness connectors (F14), (E214)
- Harness continuity between E.C.U. and engine temperature sensor.

If 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. → Check the following.
- Harness connectors (F14), (E214)
- 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-185.)

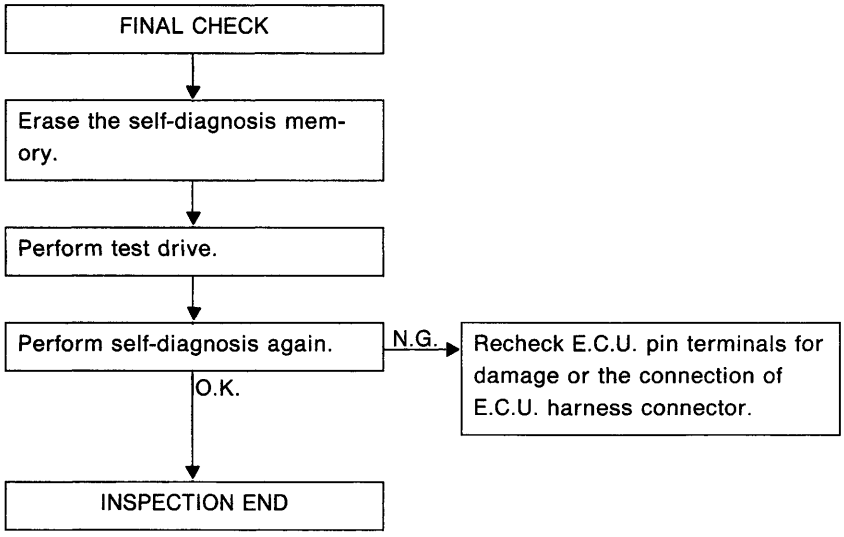
N.G. → Replace engine temperature sensor.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 25 (Cont'd)

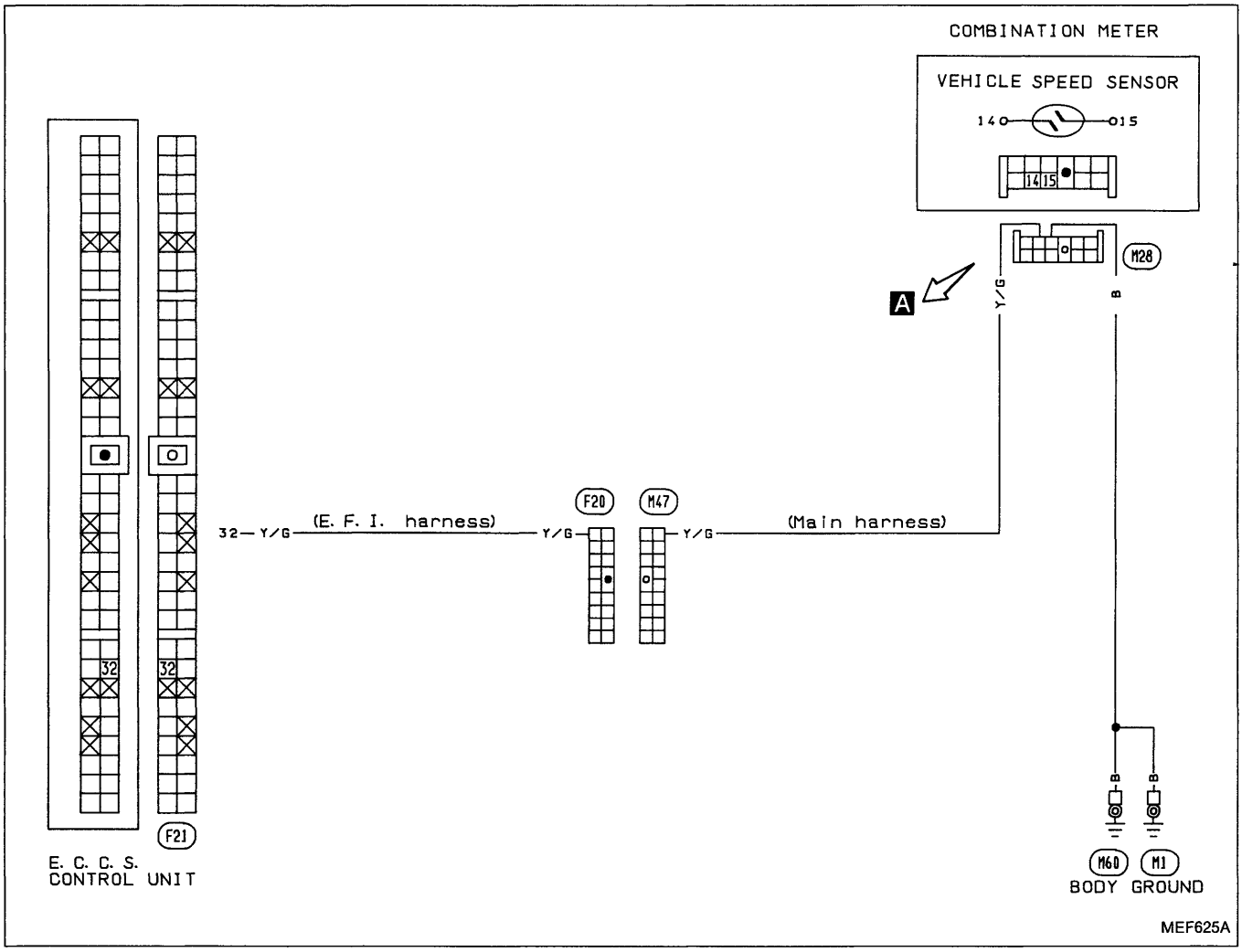
Perform FINAL CHECK by the following procedure after repair is completed.



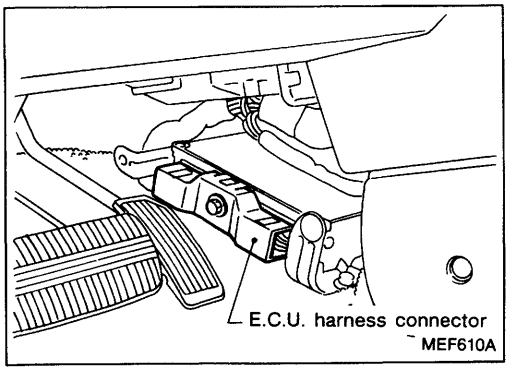
NOTE

Diagnostic Procedure 26

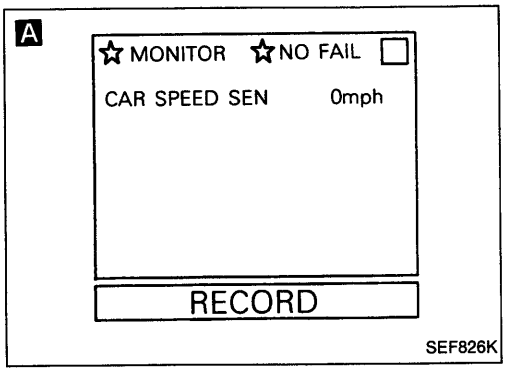
VEHICLE SPEED SENSOR (Code No. 14) (CHECK ENGINE LIGHT ITEM)

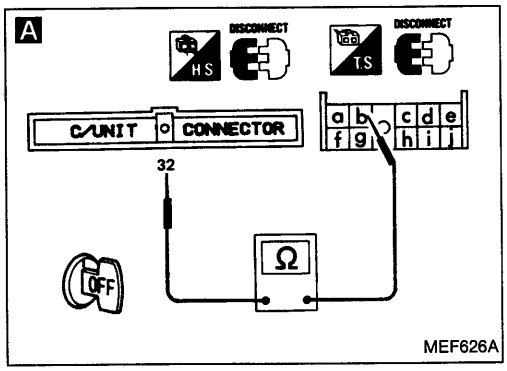


Harness layout



Diagnostic Procedure 26 (Cont'd)





INSPECTION START

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

N.G. → Check vehicle speed sensor and its 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 (F20), (M47)
- 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 (b). **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).

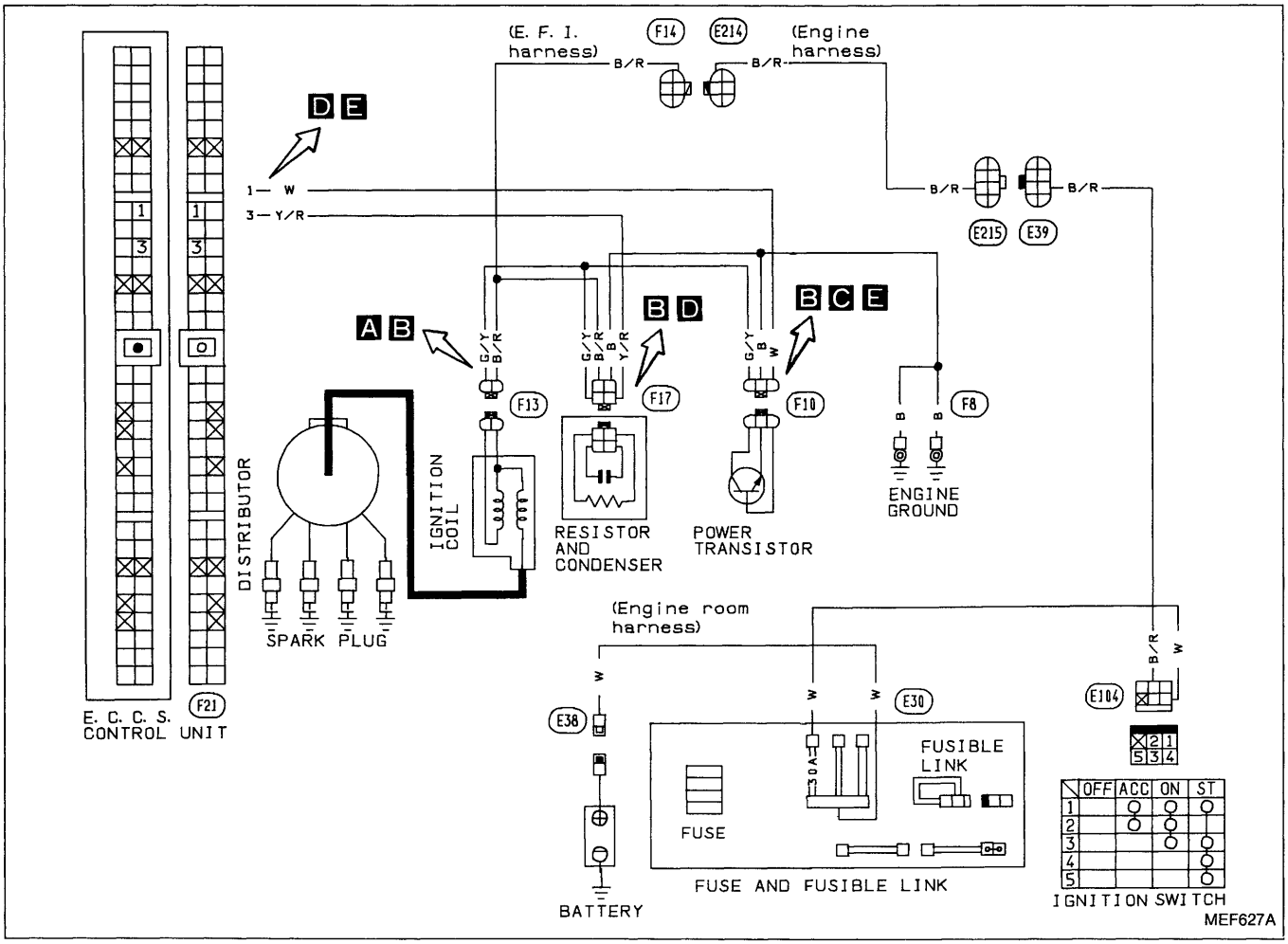
N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K.

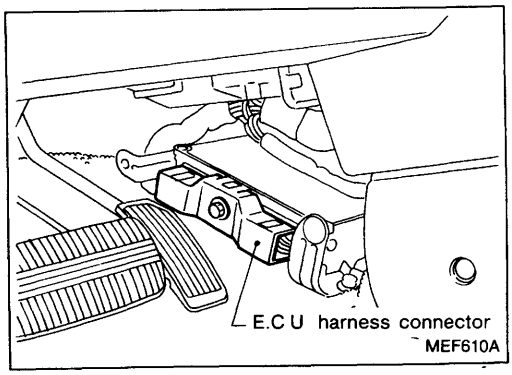
INSPECTION END

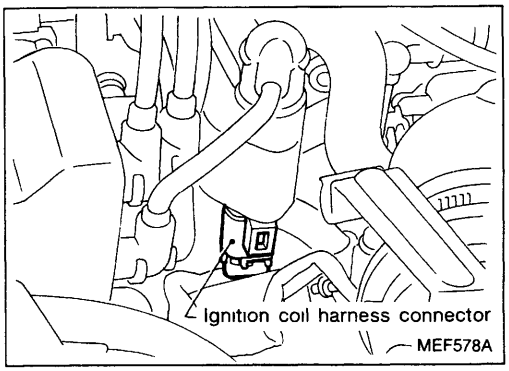
Diagnostic Procedure 27

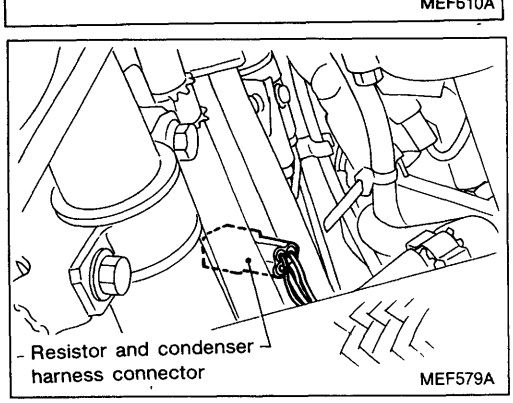
IGNITION SIGNAL (Code No. 21)

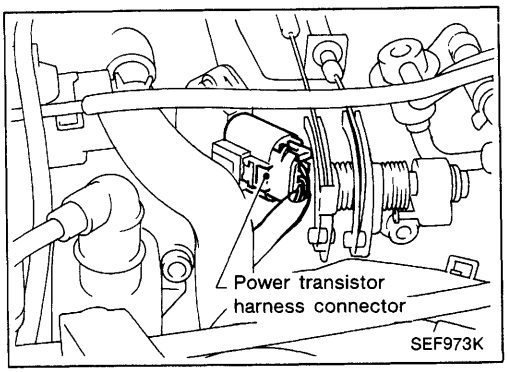


Harness layout

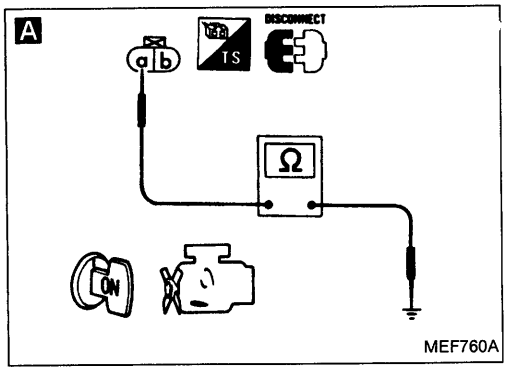


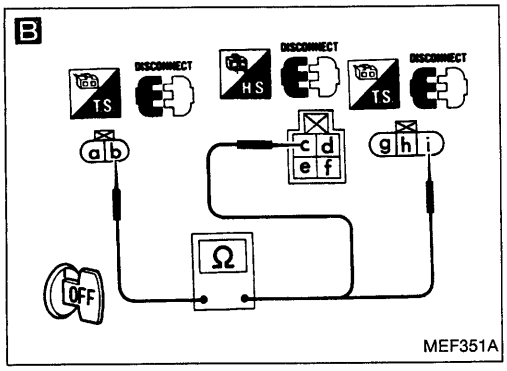


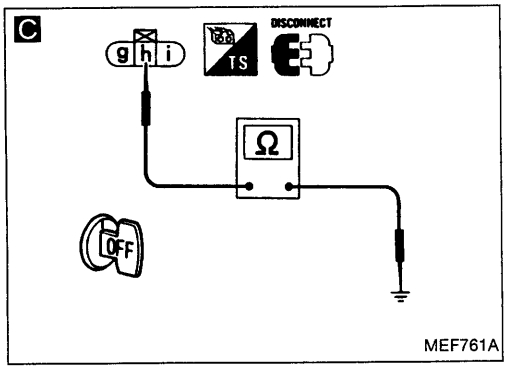


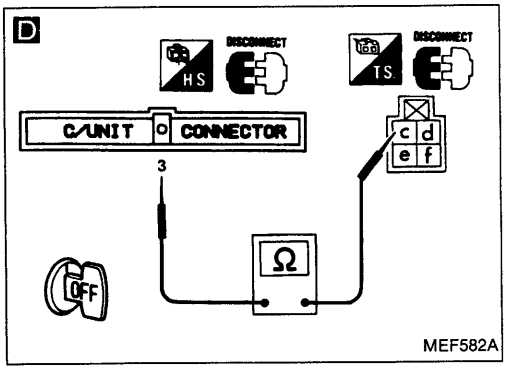


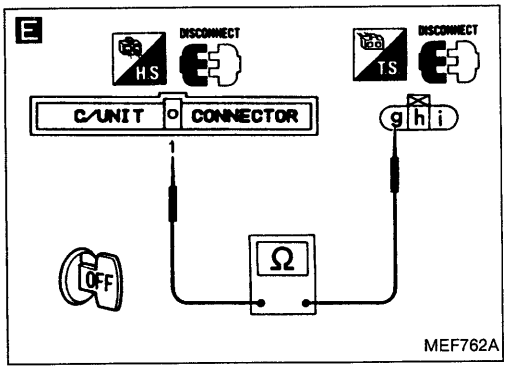
Diagnostic Procedure 27 (Cont'd)











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 F14 , E214
- Harness connectors E39 , E215
- 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 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.

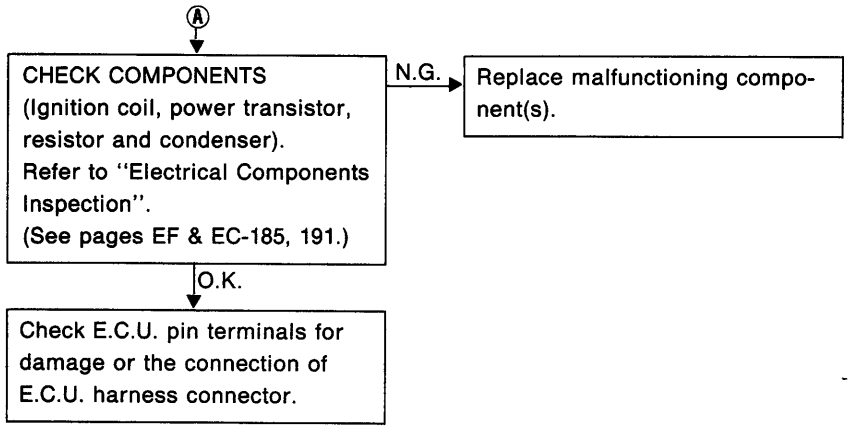
E

CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between terminal ⓖ and E.C.U. terminal ① .
Continuity should exist.

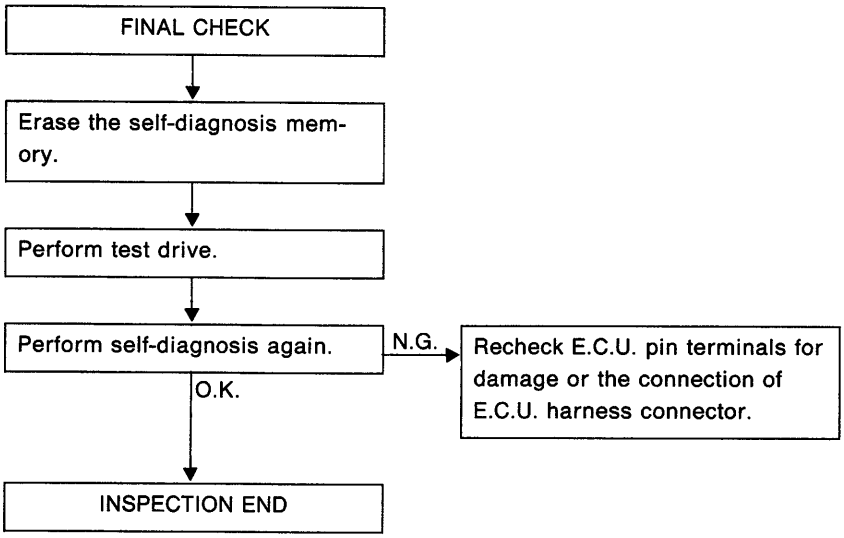
N.G. → Repair harness or connectors.

O.K. → Ⓐ

Diagnostic Procedure 27 (Cont'd)

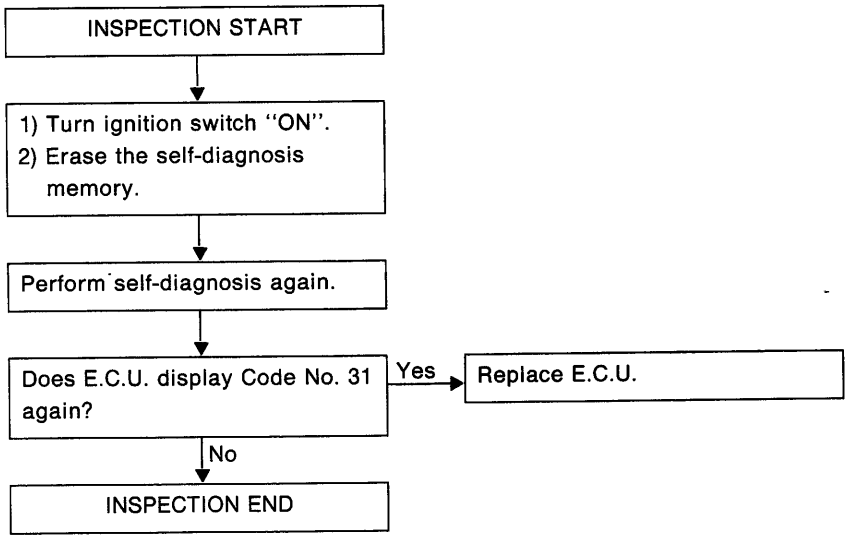


Perform FINAL CHECK by the following procedure after repair is completed.



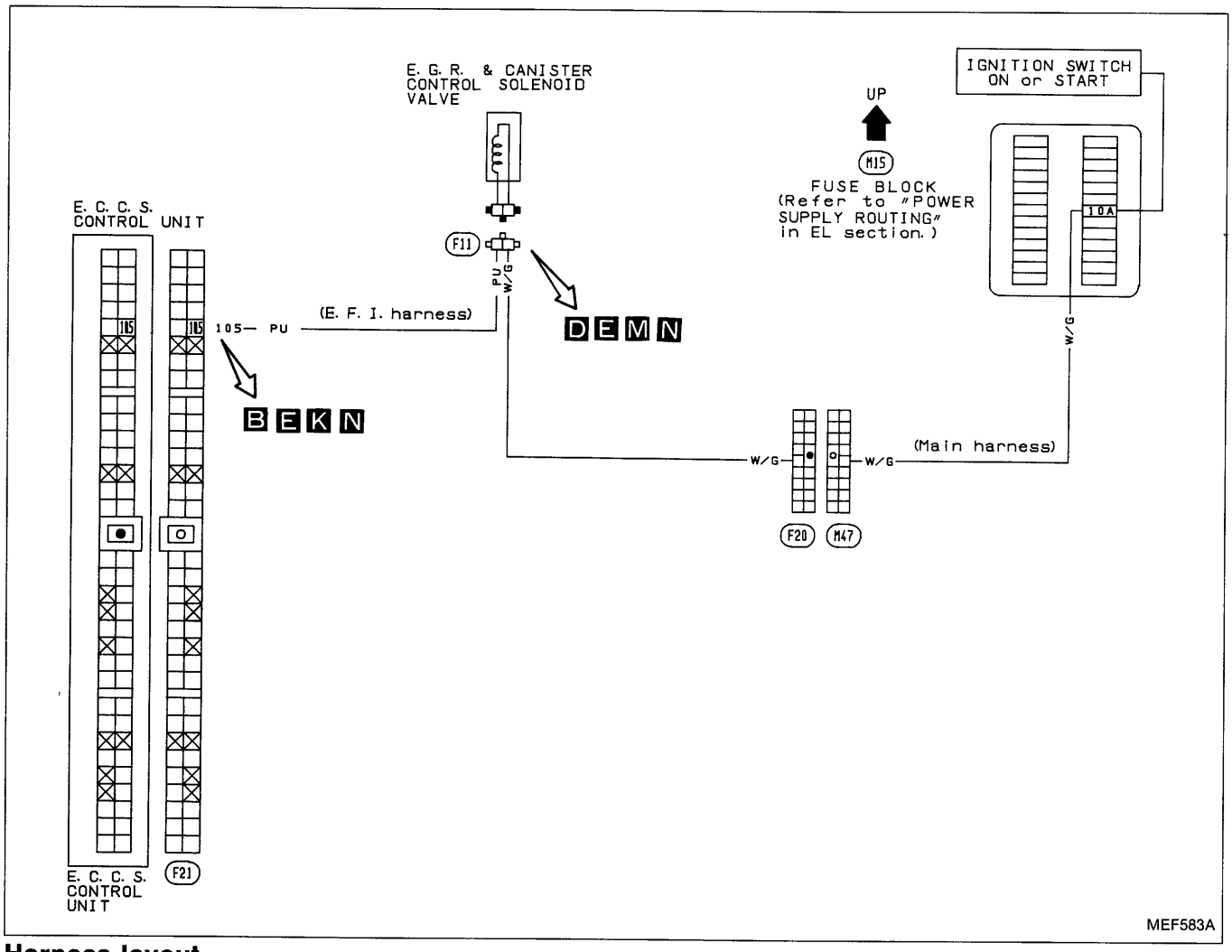
Diagnostic Procedure 28

E.C.C.S. CONTROL UNIT (Code No. 31) (CHECK ENGINE LIGHT ITEM)

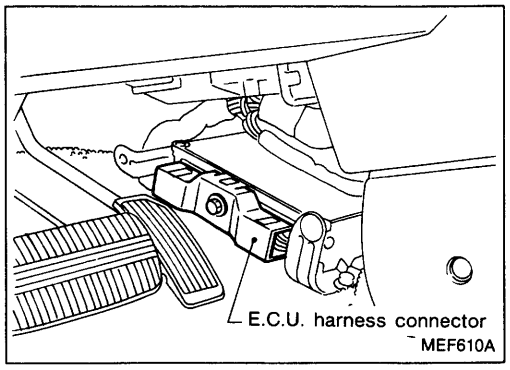


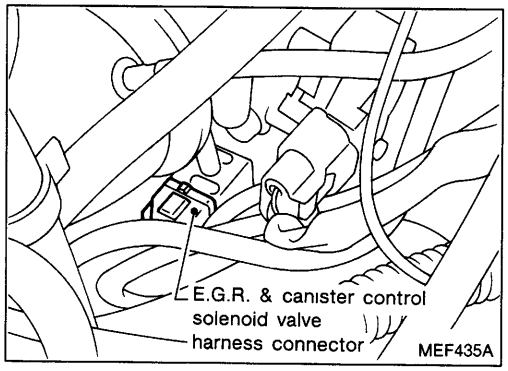
Diagnostic Procedure 29

E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM): CALIFORNIA MODELS
E.G.R. CONTROL (Not self-diagnostic item): NON-CALIFORNIA MODELS

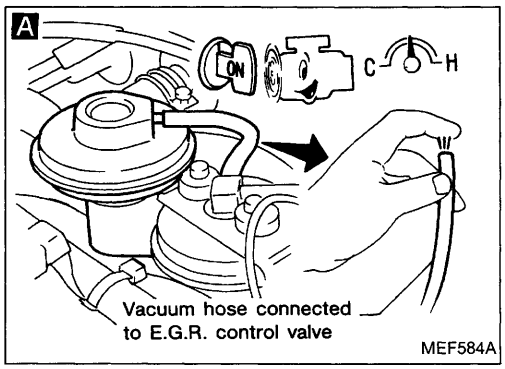


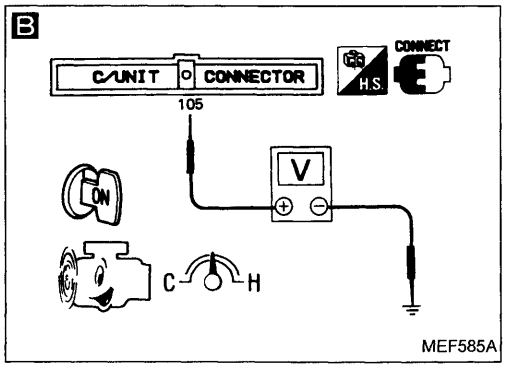
Harness layout

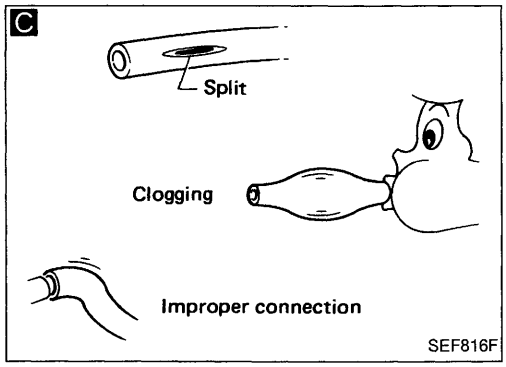


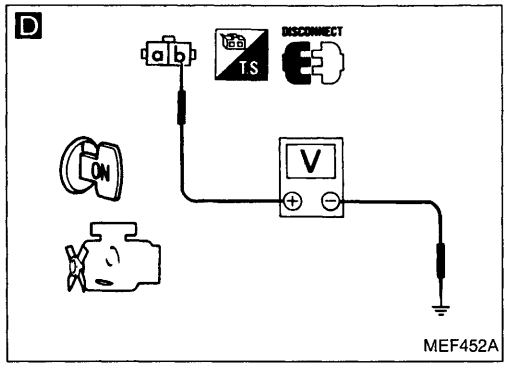


Diagnostic Procedure 29 (Cont'd)









California models

INSPECTION START

A

CHECK VACUUM SOURCE TO E.G.R. CONTROL VALVE.
1) Start engine and warm it up sufficiently.
2) Perform self-diagnosis.
   Make sure that code No. 12 is not displayed.
   Make sure that both air flow meter and E.C.U.'s C.P.U. are not in "fail-safe" state.
3) Keep engine speed at about 2,000 rpm.
4) Disconnect vacuum hose to E.G.R. control valve.
5) Make sure that vacuum exists under the following conditions.
   Engine speed is 4,000 rpm:
   Vacuum should not exist.
   Engine speed is 2,000 rpm:
   Vacuum should exist.

O.K. → CHECK COMPONENTS (E.G.R. control valve, B.P.T. valve and exhaust gas temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-189.)

N.G. → Replace malfunctioning component(s).

N.G.

B

CHECK CONTROL FUNCTION.
1) Check voltage between E.C.U. terminal (105) and ground under the following conditions.
   Voltage:
   Engine speed is 4,000 rpm
   0.6 - 0.8V
   Engine speed is 2,000 rpm
   Battery voltage

O.K. → C

C

CHECK VACUUM HOSE.
1) Check vacuum hose for clogging, cracks and proper connection.

N.G.

D

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 (b) and ground.
   Voltage: Battery voltage

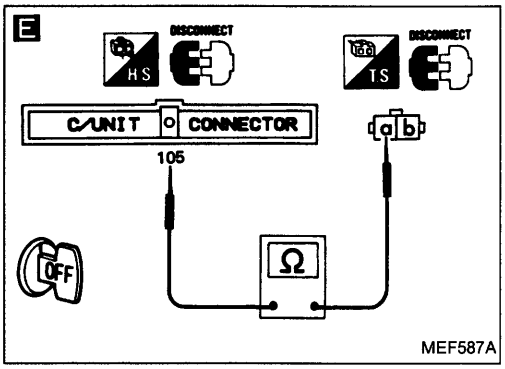
N.G. → Check the following.
- Harness connectors (F20), (M47)
- 10A fuse
- Harness continuity between E.G.R. & canister control solenoid valve and fuse

If N.G., repair harness or connectors.

O.K.

(A)

Diagnostic Procedure 29 (Cont'd)



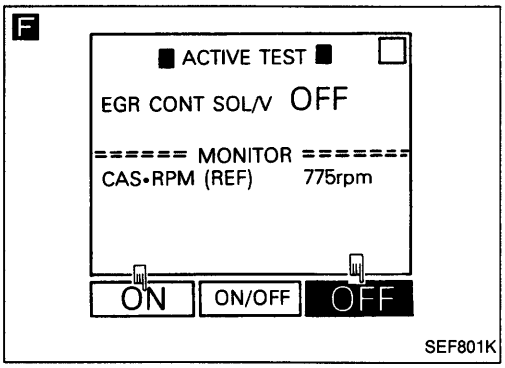
E

Ⓐ

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 ⓐ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓



F

CHECK COMPONENT
(E.G.R. & canister control solenoid valve).

1) Reconnect E.G.R. & canister control solenoid valve harness connector and E.C.U. harness connector.
2) Start engine.
3) Turn E.G.R. & canister control solenoid valve "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

N.G. → Replace E.G.R. & canister control solenoid valve.

OR

Refer to "Electrical Components Inspection". (See page EF & EC-189.)

O.K. ↓

Check resistance of exhaust gas temperature sensor. (See page EF & EC-190.)

↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 29 (Cont'd)

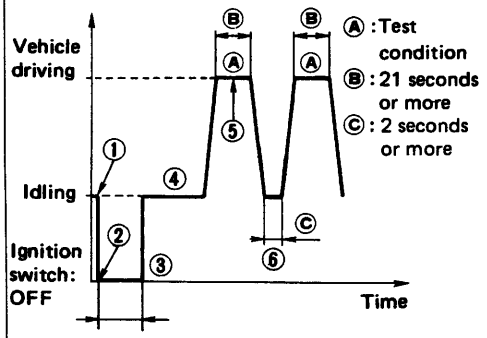
G ROAD TEST

Test condition

Drive vehicle under the following conditions with a suitable shift position.

(1) Engine speed:
2,400±200 rpm
(2) Intake manifold vacuum:
−33.3±6.7 kPa
(−250±50 mmHg, −9.84±1.97 inHg)

Driving mode

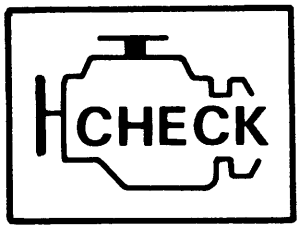


Until red L.E.D. goes off.

① Start engine and warm it up sufficiently.
② Turn off ignition switch and keep it off until red L.E.D. goes off.
③ Start engine and make sure that air conditioner switch and rear defogger are turned "OFF" during test drive.
④ Keep engine running for at least 210 seconds.
⑤ Shift to suitable gear position and drive in "Test condition" for at least 21 seconds.
⑥ Decrease engine revolutions to less than 1,500 rpm for at least 2 seconds.
⑦ Repeat steps ⑤ through ⑥ at lest 1 more time.

SEF969K

H



CHECK ENGINE LIGHT

SEF924F

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

FINAL CHECK

↓

Erase the self-diagnosis memory.

↓ G

Perform test drive under the following conditions.
1) Warm up engine sufficiently.
2) Use test driving modes indicated in figure G.

↓ H

Make sure that check engine light does not come on during test drive.

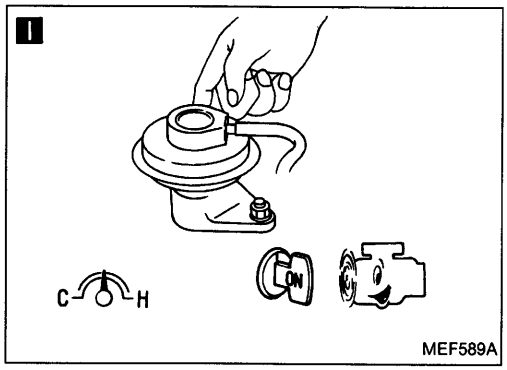
Comes on. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Does not come on. ↓

INSPECTION END

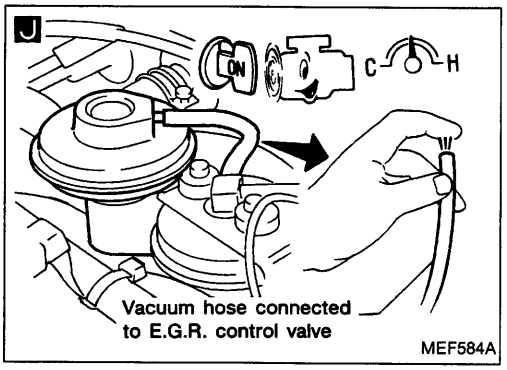
Diagnostic Procedure 29 (Cont'd)

I



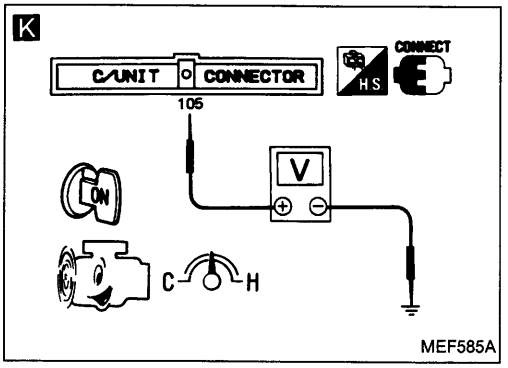
MEF589A

J



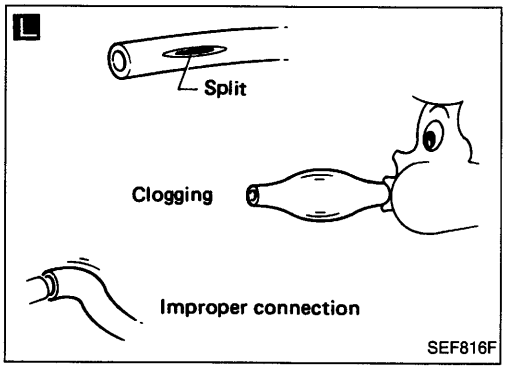
MEF584A

K



MEF585A

L



SEF816F

Non-California models

INSPECTION START

I

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Perform self-diagnosis.
Make sure that code No. 12 is not displayed.
Make sure that both air flow meter and E.C.U.'s C.P.U. are not in "fail-safe" state.
3) Make sure that E.G.R. control valve spring is lifted up and down when racing engine (2,000 rpm).
(Use your finger.)

Is lifted up and down. → INSPECTION END

Is not lifted up and down.

J

CHECK VACUUM SOURCE TO E.G.R. CONTROL VALVE.
1) Disconnect vacuum hose to E.G.R. control valve.
2) Make sure that vacuum exists under the following conditions.
Engine speed is 4,000 rpm:
Vacuum should not exist.
Engine speed is 2,000 rpm:
Vacuum should exist.

O.K. → CHECK COMPONENTS (E.G.R. control valve and B.P.T. valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-189.)

N.G. → Replace malfunctioning component(s).

N.G.

K

CHECK CONTROL FUNCTION.
1) Check voltage between E.C.U. terminal (105) and ground under the following conditions.
Voltage:
Engine speed is 4,000 rpm
0.6 - 0.8V
Engine speed is 2,000 rpm
Battery voltage

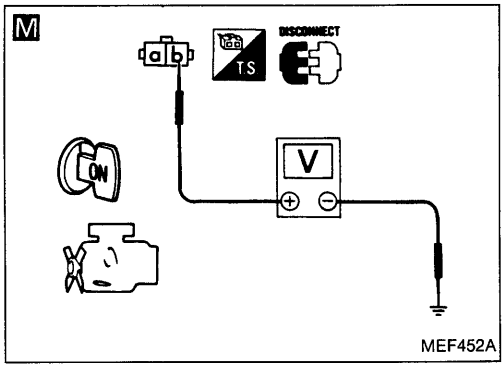
O.K. → L

CHECK VACUUM HOSE.
1) Check vacuum hose for clogging, cracks and proper connection.

N.G.

Ⓐ

Diagnostic Procedure 29 (Cont'd)



M

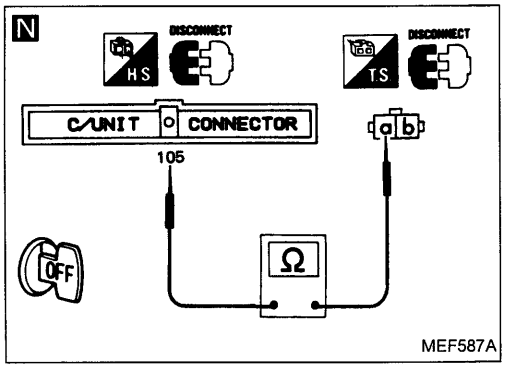
Ⓐ

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 F20, M47
- 10A fuse
- Harness continuity between E.G.R. & canister control solenoid valve and fuse

If N.G., repair harness or connectors.

O.K. ↓

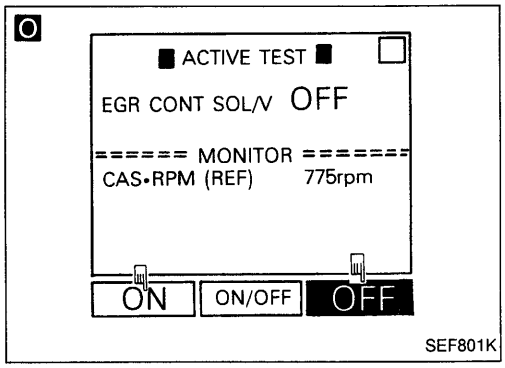


N

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 ⓐ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓



O

CHECK COMPONENT
(E.G.R. & canister control solenoid valve).

1) Reconnect E.G.R. & canister control solenoid valve harness connector and E.C.U. harness connector.
2) Start engine.
3) Turn E.G.R. & canister control solenoid valve "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

N.G. → Replace E.G.R. & canister control solenoid valve.

— OR —

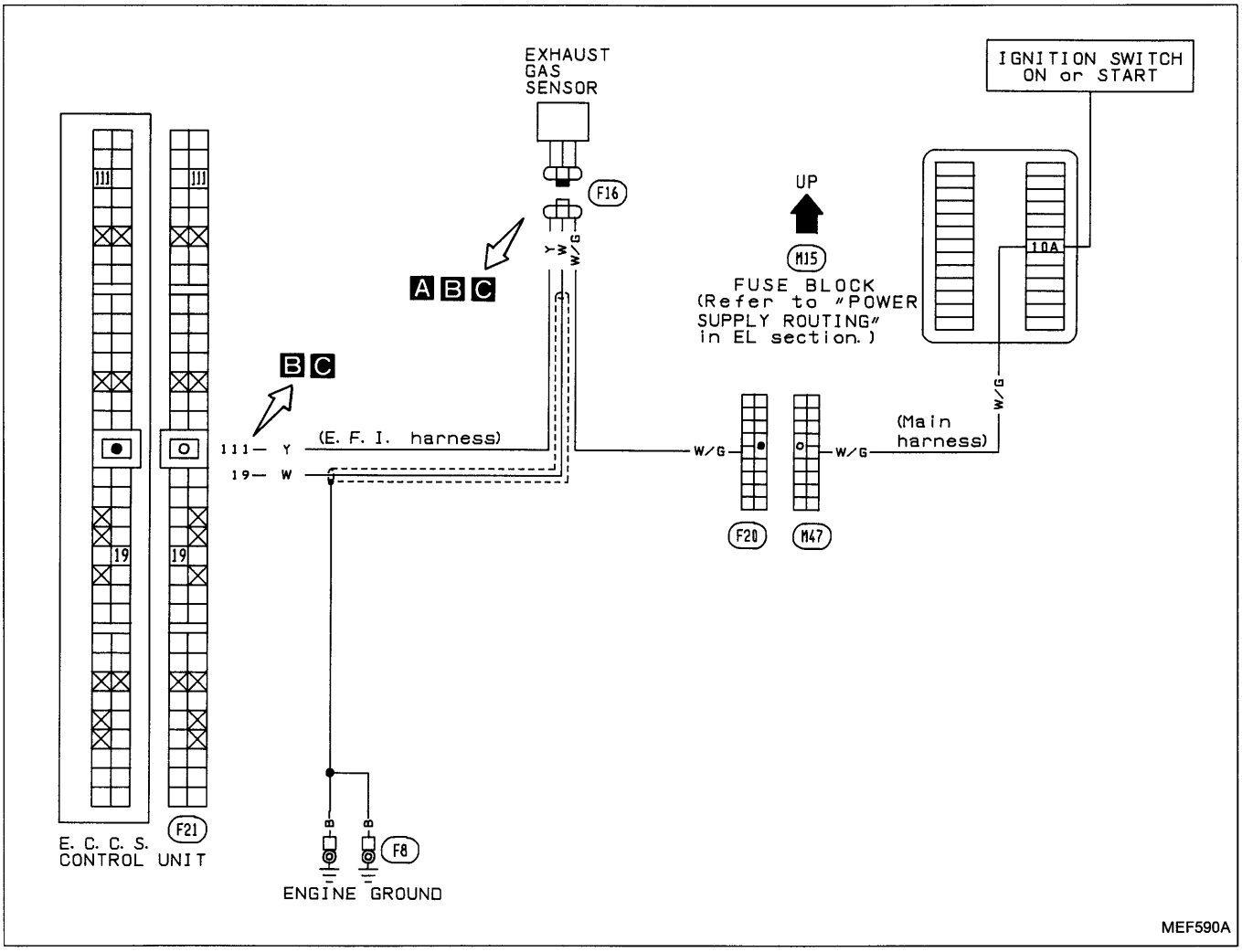
Refer to "Electrical Components Inspection". (See page EF & EC-189.)

O.K. ↓

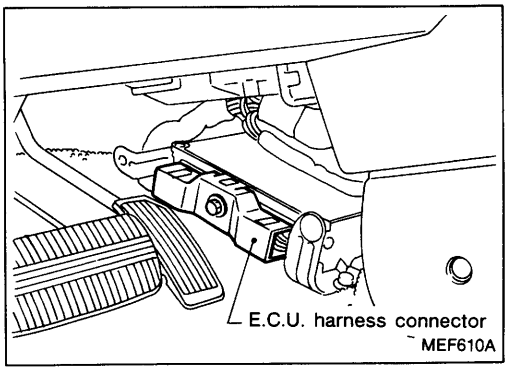
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

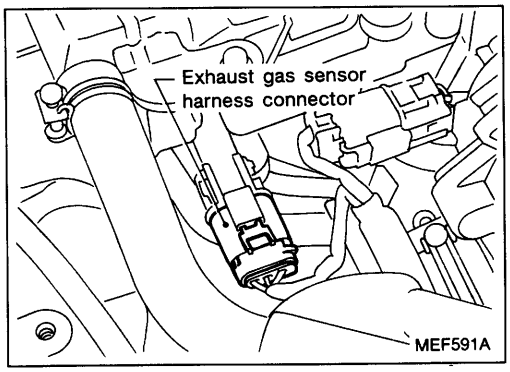
Diagnostic Procedure 30

EXHAUST GAS SENSOR (Code No. 33) (CHECK ENGINE LIGHT ITEM): CALIFORNIA MODELS ONLY

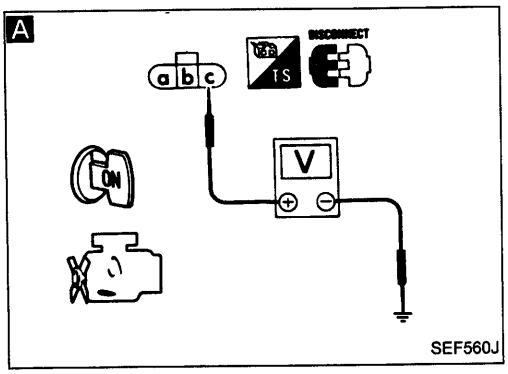


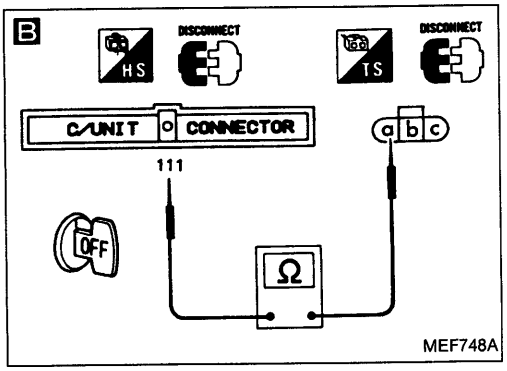
Harness layout

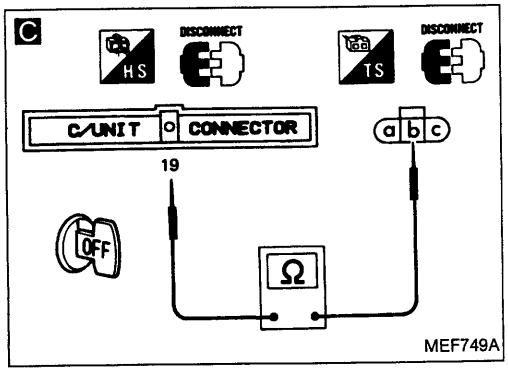


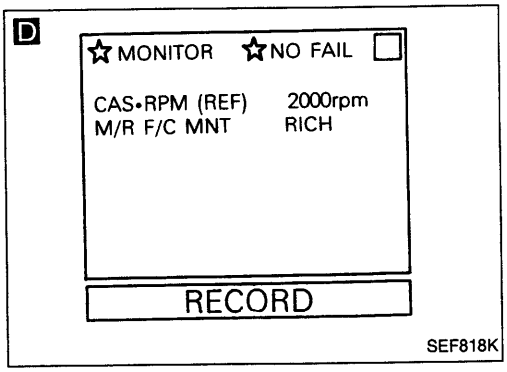


Diagnostic Procedure 30 (Cont'd)









INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect exhaust gas sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓒ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F20), (M47)
- 10A fuse
- Harness continuity between exhaust gas sensor and fuse

If N.G., repair harness or connectors.

O.K. ↓

B

CHECK OUTPUT CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between terminal ⓐ and E.C.U. terminal (111).
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1) Check harness continuity between E.C.U. terminals ⑲ and terminal ⓑ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

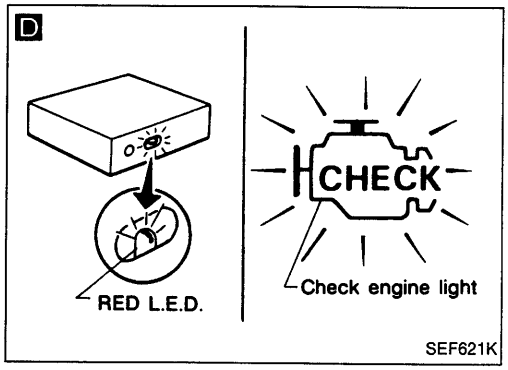
CHECK COMPONENT
(Exhaust gas sensor heater).
Refer to "Electrical Components Inspection".
(See page EF & EC-186.)

N.G. → Replace exhaust gas sensor.

O.K. ↓

Ⓐ

Diagnostic Procedure 30 (Cont'd)



D

Ⓐ

CHECK COMPONENT
(Exhaust gas sensor).
1) Reconnect exhaust gas sensor harness connector and E.C.U. harness connector.
2) Start engine and warm it up sufficiently.
3) 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.

N.G. → Replace exhaust gas sensor.

3) 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 periodically more than 5 times during 10 seconds at 2,000 rpm in self-diagnosis Mode II.

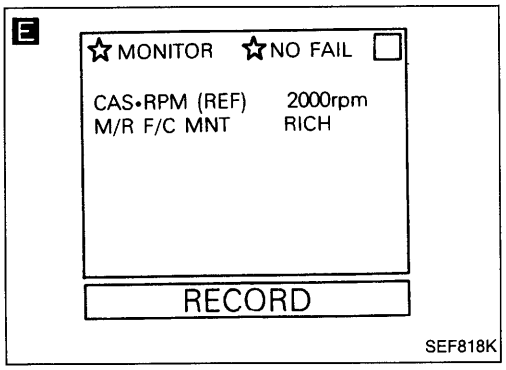
O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

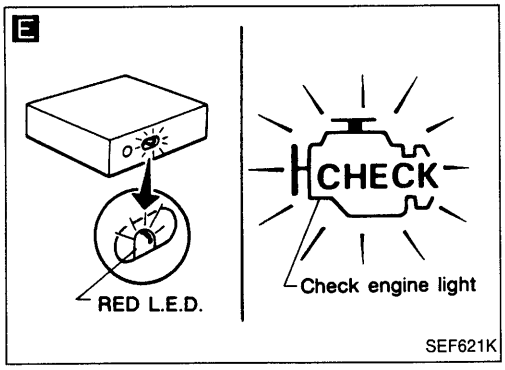
Diagnostic Procedure 30 (Cont'd)

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

E



E



FINAL CHECK

↓

Erase the self-diagnosis memory.

↓

E

Perform test drive under the following conditions.

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.

2) Make sure that the red L.E.D. on the E.C.U. goes on and off periodically more than 5 times during 10 seconds at 2,000 rpm in self-diagnosis Mode II.

↓

Perform self-diagnosis again.

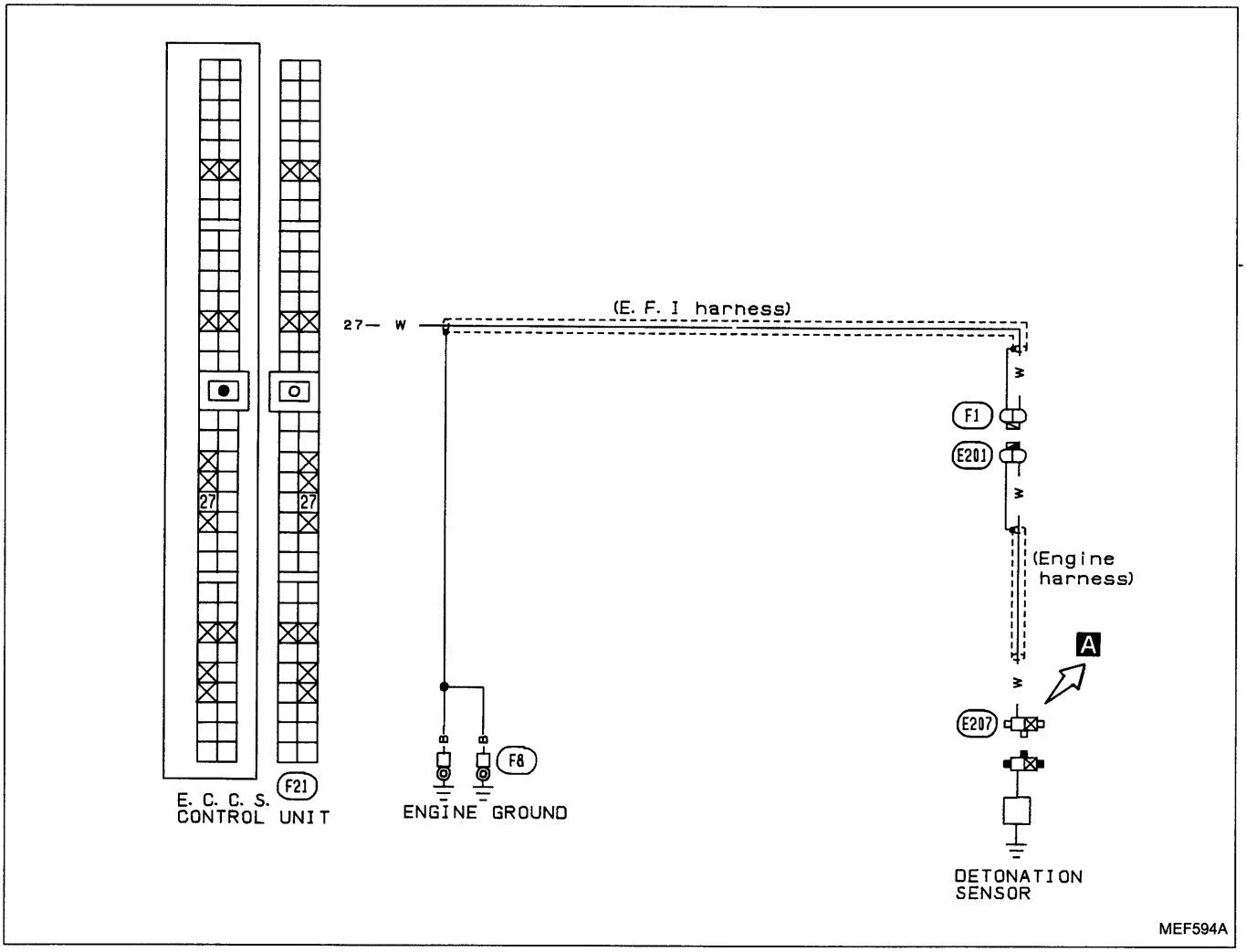
N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K. ↓

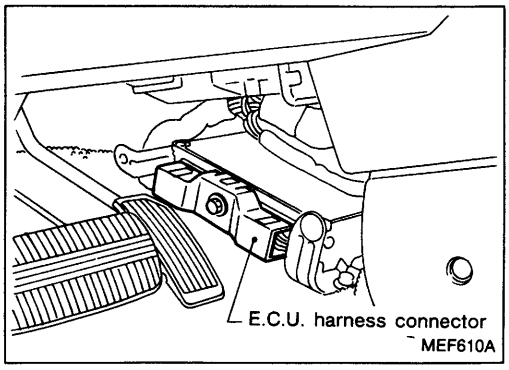
INSPECTION END

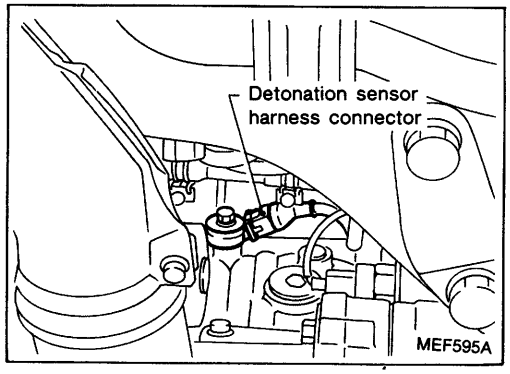
Diagnostic Procedure 31

DETONATION SENSOR (Code No. 34)

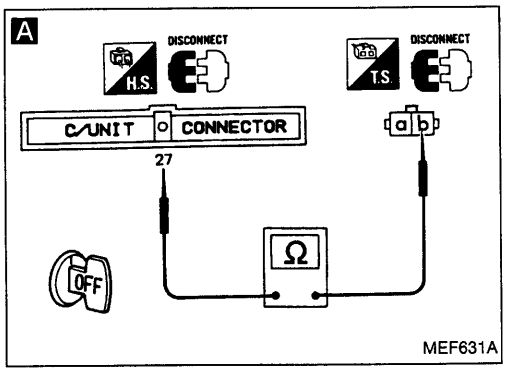


Harness layout





Diagnostic Procedure 31 (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 ⓑ and E.C.U. terminal ㉗ .
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F1), (E201)
- 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-188.)

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.

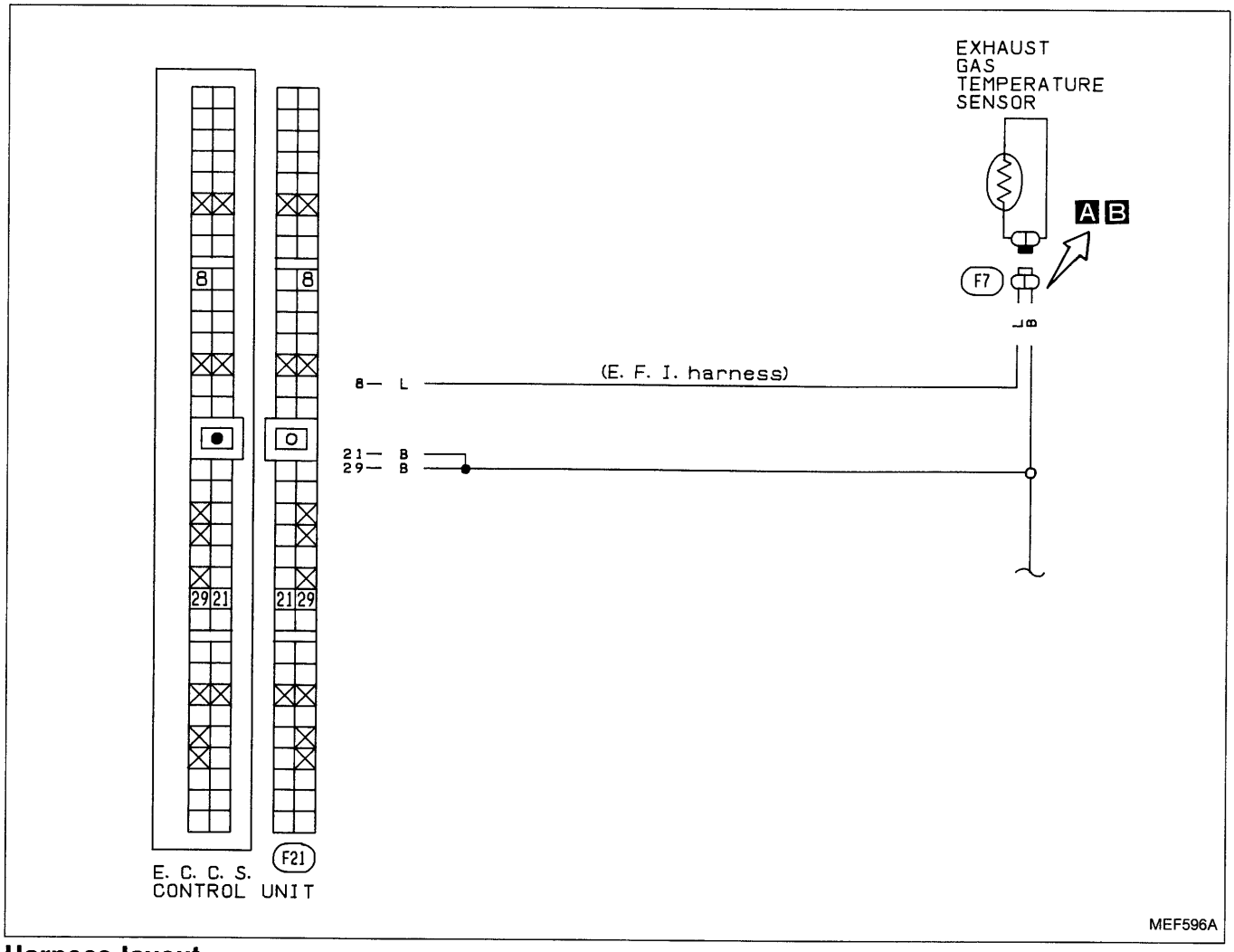
N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K. ↓

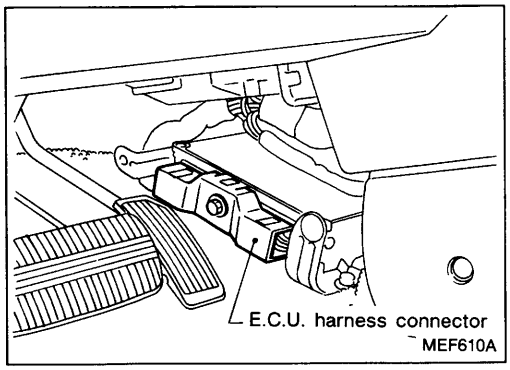
INSPECTION END

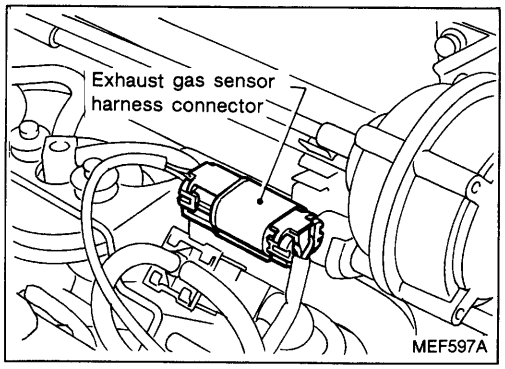
Diagnostic Procedure 32

EXHAUST GAS TEMPERATURE SENSOR (Code No. 35) (CHECK ENGINE LIGHT ITEM): CALIFORNIA MODELS ONLY

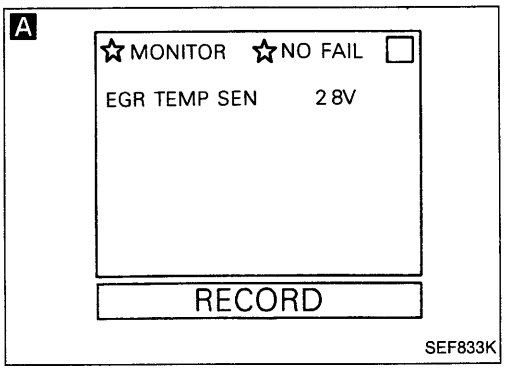


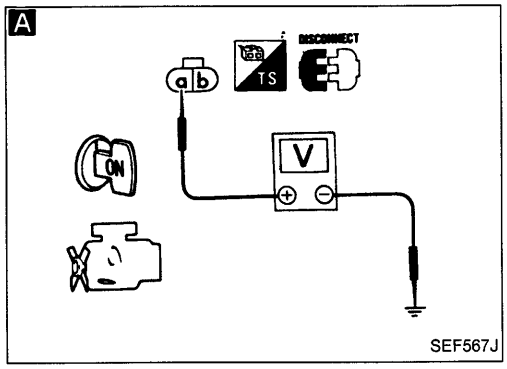
Harness layout

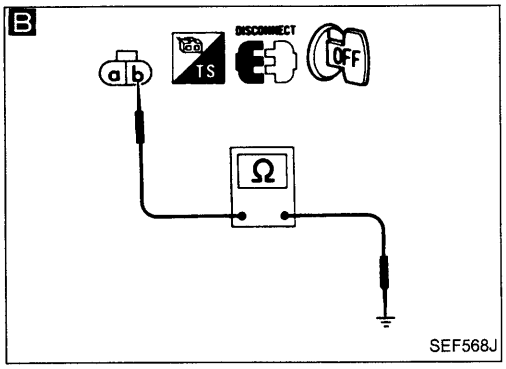




Diagnostic Procedure 32 (Cont'd)







INSPECTION START

A

CHECK POWER SUPPLY.
1) Start engine and warm it up sufficiently.
2) Read exhaust gas temperature sensor signal in "DATA MONITOR" mode with CONSULT.
Voltage:
Less than 4.5V

N.G. → Repair harness or connectors.

OR

2) Stop engine.
3) Disconnect exhaust gas temperature sensor harness connector.
4) Turn ignition switch "ON".
5) Check voltage between terminal ⓐ and ground.
Voltage: Less than 4.5V

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.
(Exhaust gas temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-190.)

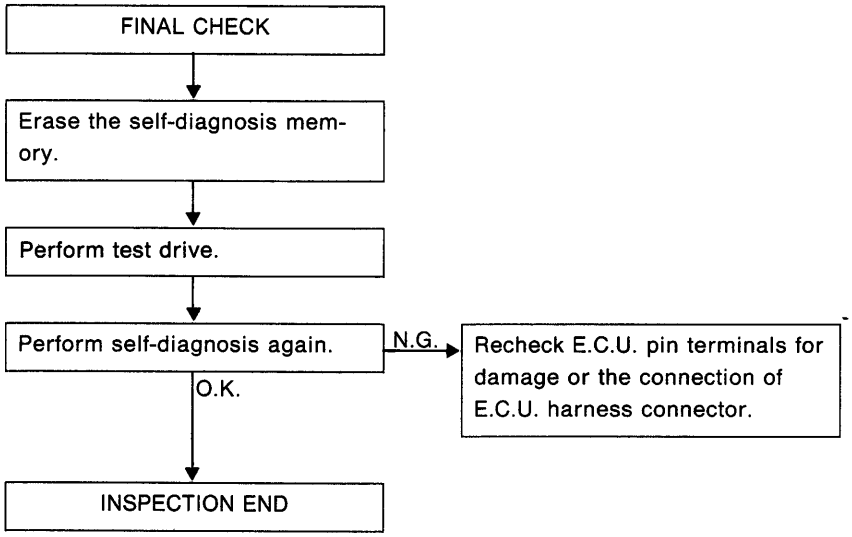
N.G. → Replace exhaust gas temperature sensor.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 32 (Cont'd)

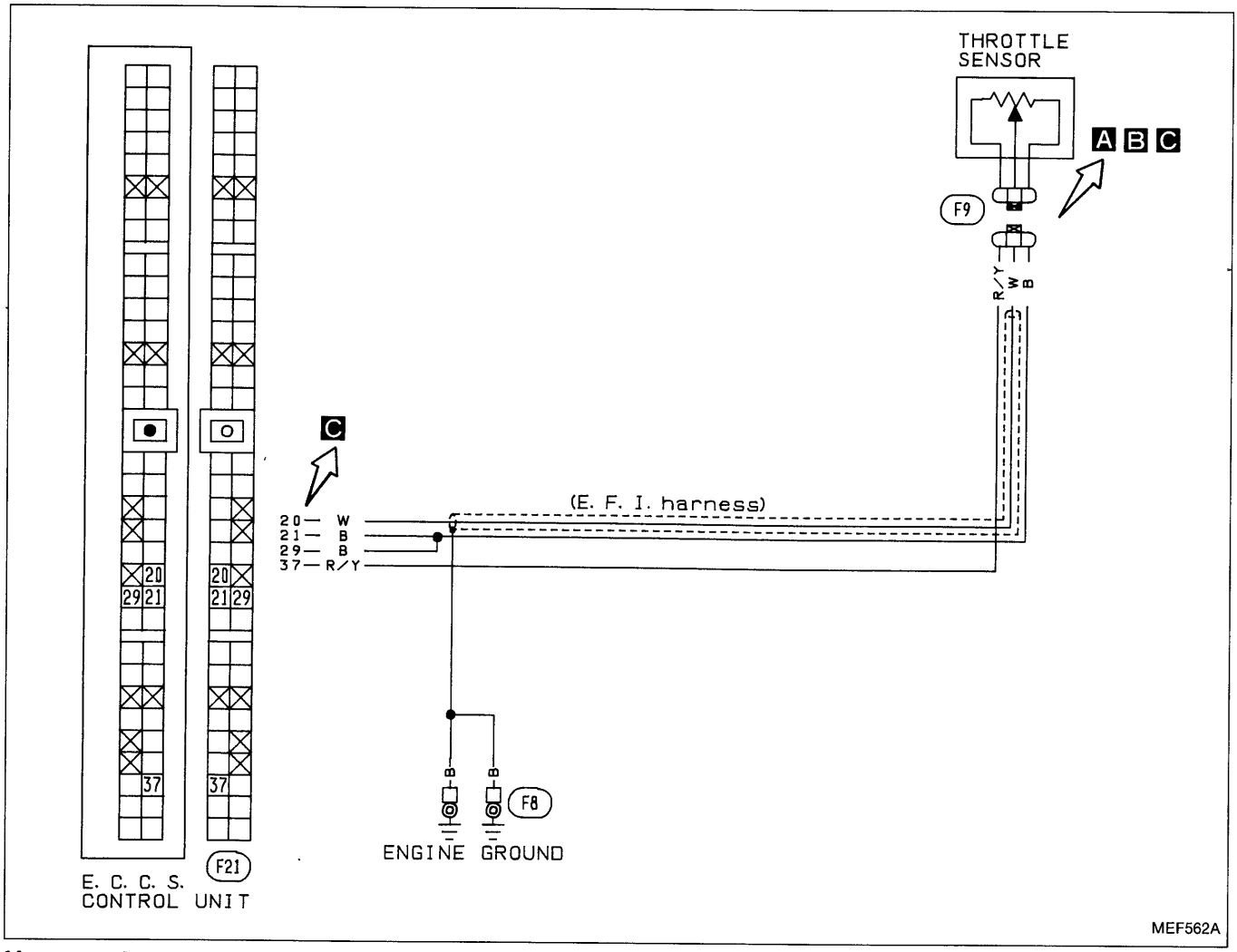
Perform FINAL CHECK by the following procedure after repair is completed.



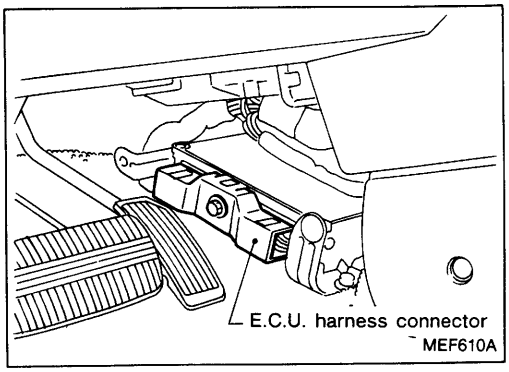
NOTE

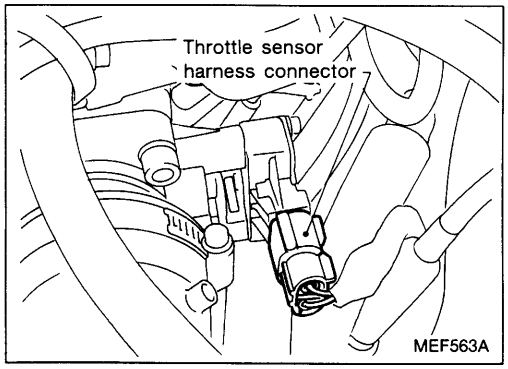
Diagnostic Procedure 33

THROTTLE SENSOR (Code No. 43) (CHECK ENGINE LIGHT ITEM)

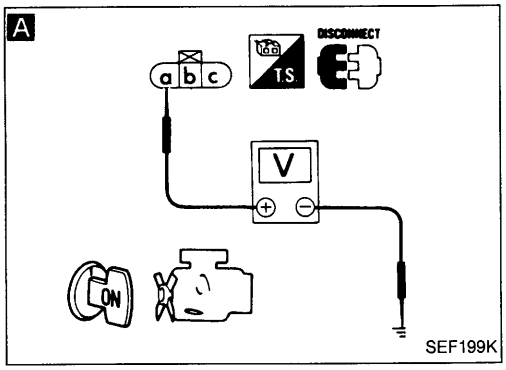


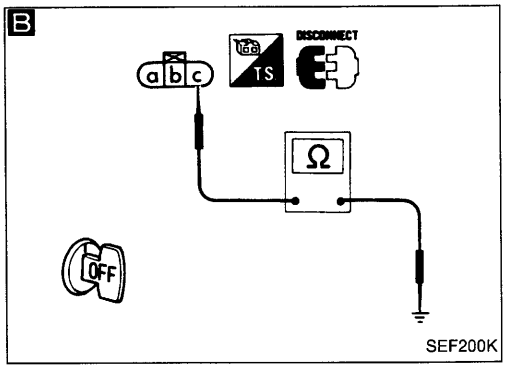
Harness layout

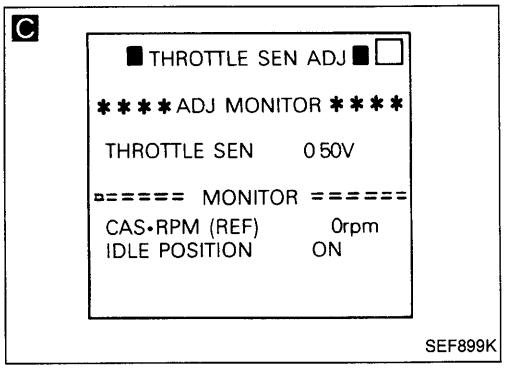


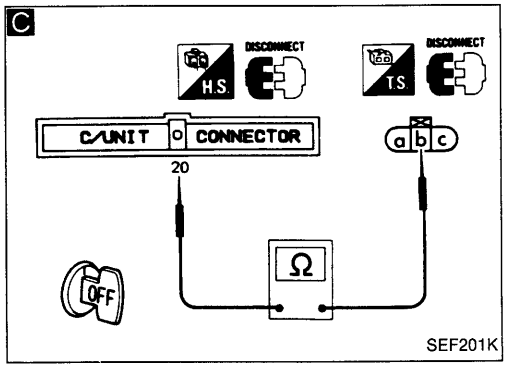


Diagnostic Procedure 33 (Cont'd)









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. 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-186.)

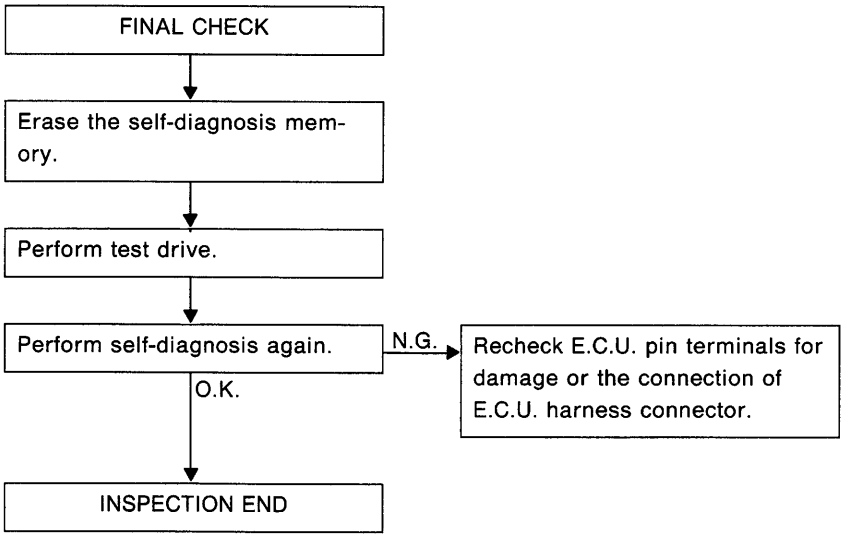
N.G. → Replace throttle sensor.

O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

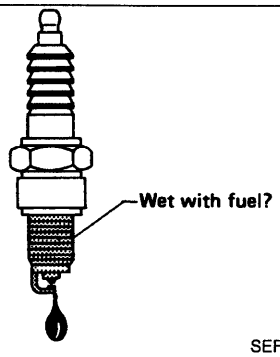
Diagnostic Procedure 33 (Cont'd)

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



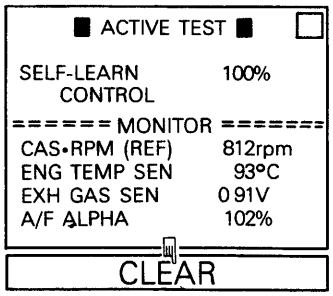
NOTE

A



SEF832F

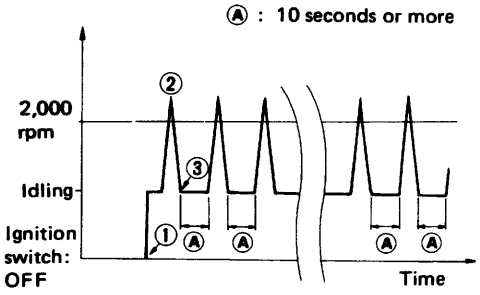
B



SEF796K

C

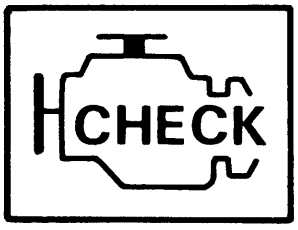
Engine racing mode



① Start engine and warm it up sufficiently.
② Race engine revolution higher than 2,000 rpm under no-load.
③ Keep engine at idle speed for at least 10 seconds.
④ Repeat steps ② through ③ at least 10 times.

SEF329G

D



CHECK ENGINE LIGHT

SEF924F

Diagnostic Procedure 34

INJECTOR LEAK (Code No. 45) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODELS ONLY

INSPECTION START

Start engine and warm it up sufficiently.

Make sure engine runs smoothly at idle after warming.

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

Does not run smoothly.

Set the diagnostic mode selector of E.C.U. to Mode II.

Check if the red L.E.D. on E.C.U. stays off for 10 seconds with engine at idle speed.

Stays off.

Does not stay off. → Check mixture ratio feedback system. (See page EF & EC-30.)

Set diagnosis to Mode II and check that red L.E.D. on E.C.U. blinks with engine at 2,000 rpm under no-load.

Does not blink. → Check idle CO%. (See page EF & EC-30.)

Blinks. → INSPECTION END

A

Remove all spark plugs from cylinder head. Is any plug wet with fuel?

Yes → Replace injector which supply cylinders having wet spark plugs.

No

Remove injector assembly. (See page EF & EC-194.) Keep fuel hose and all injectors connected to injector gallery.

Turn ignition switch "ON". Make sure fuel does not drip from injector.

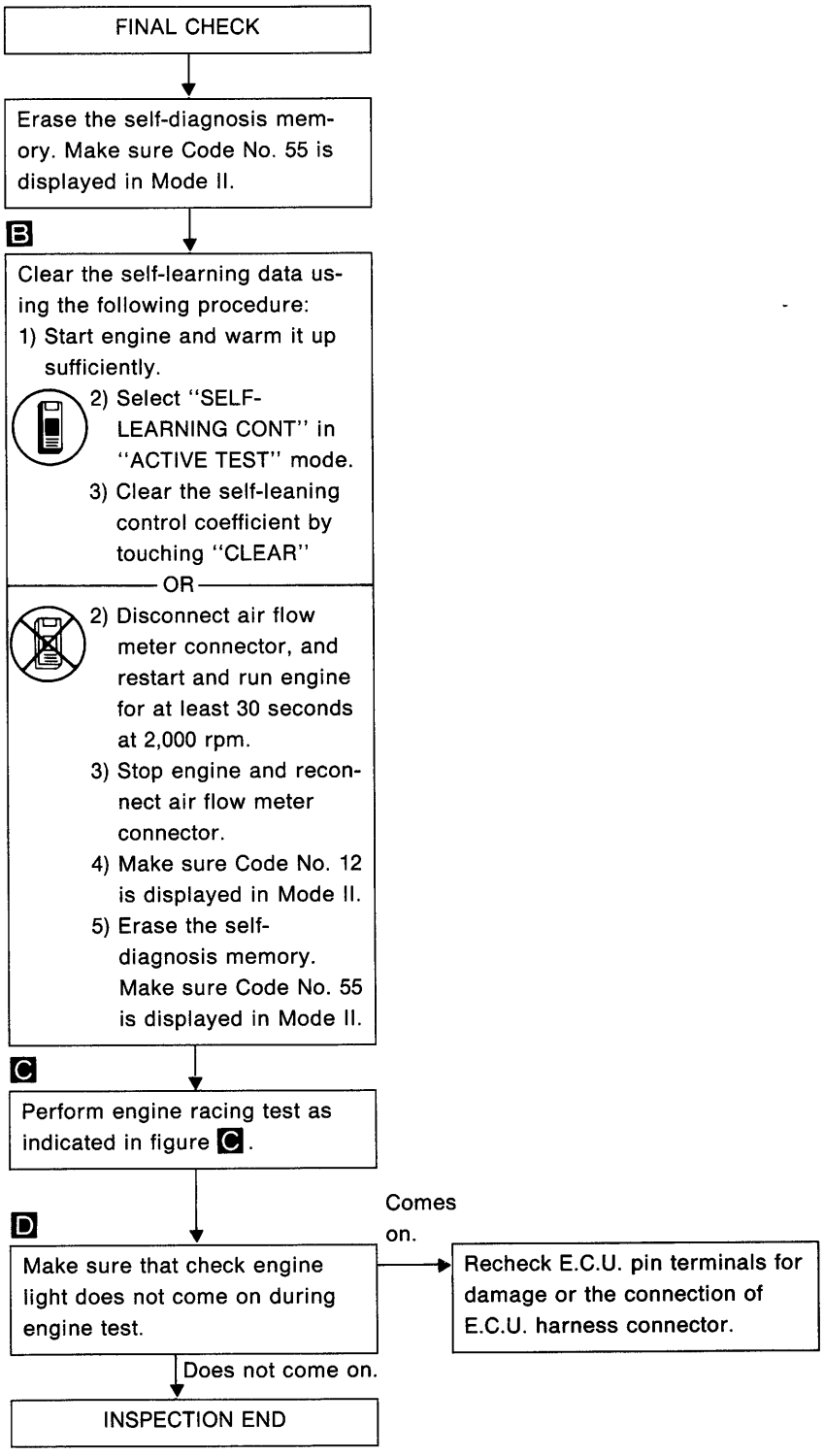
Drips → Replace the injectors from which fuel is dripping.

Does not drip.

Go to FINAL CHECK.

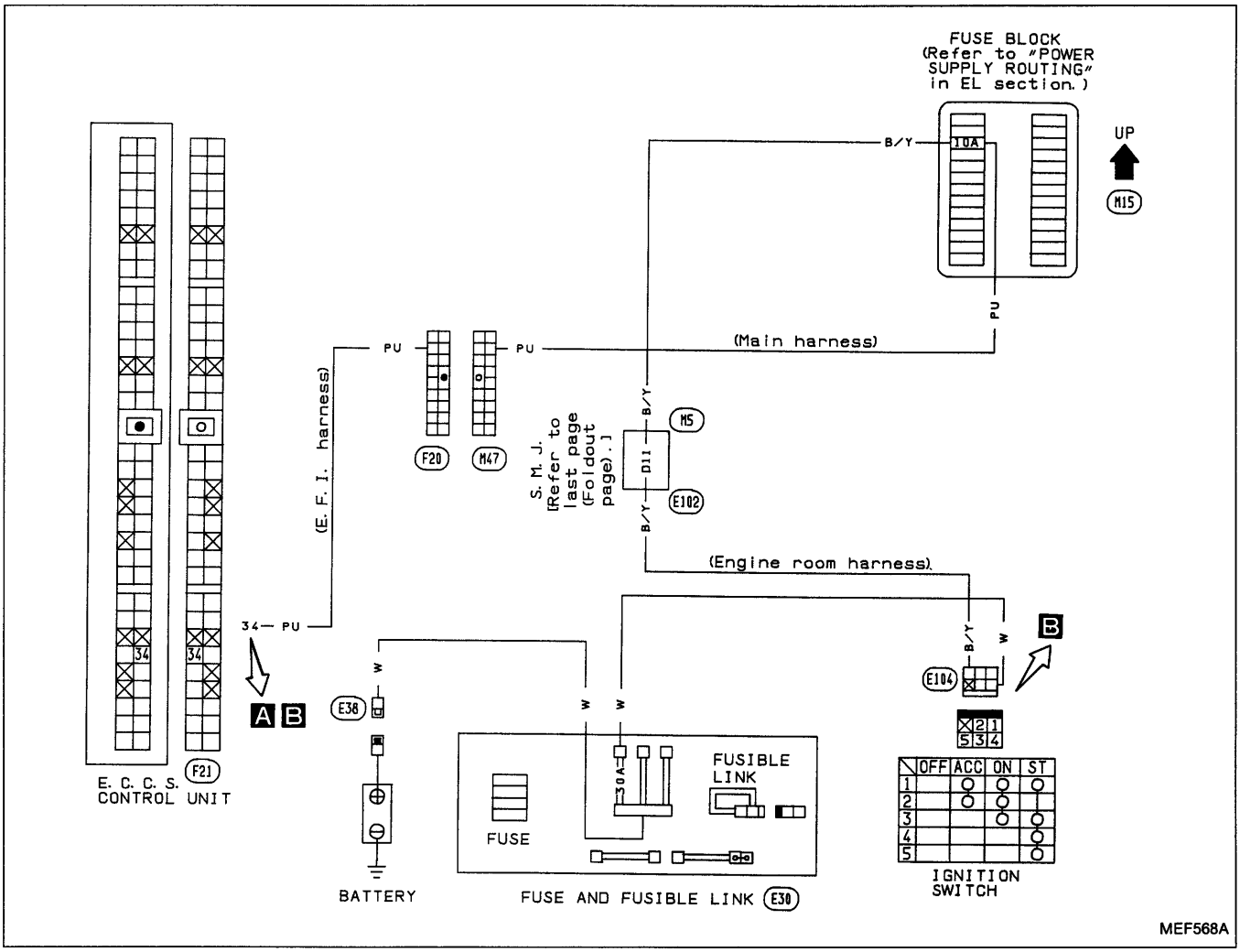
Diagnostic Procedure 34 (Cont'd)

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

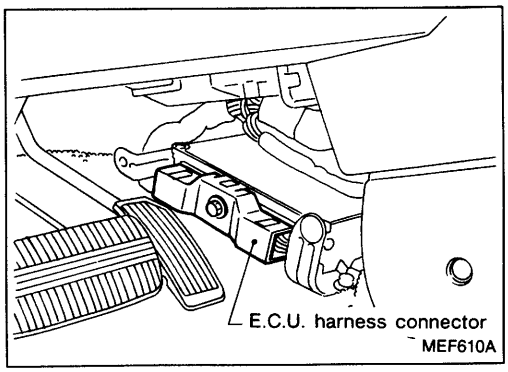


Diagnostic Procedure 35

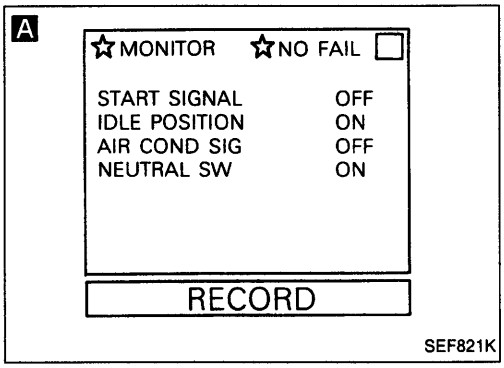
START SIGNAL (Not self-diagnostic item)

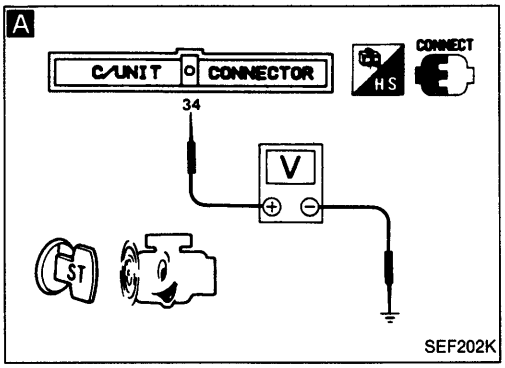


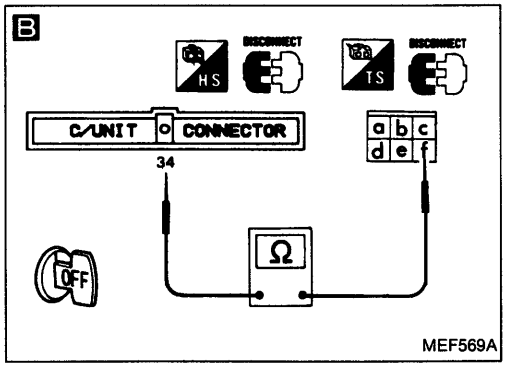
Harness layout



Diagnostic Procedure 35 (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 (F20), (M47)
- Harness connectors (M5), (E102)
- 10A fuse
- Harness continuity between E.C.U. and ignition switch

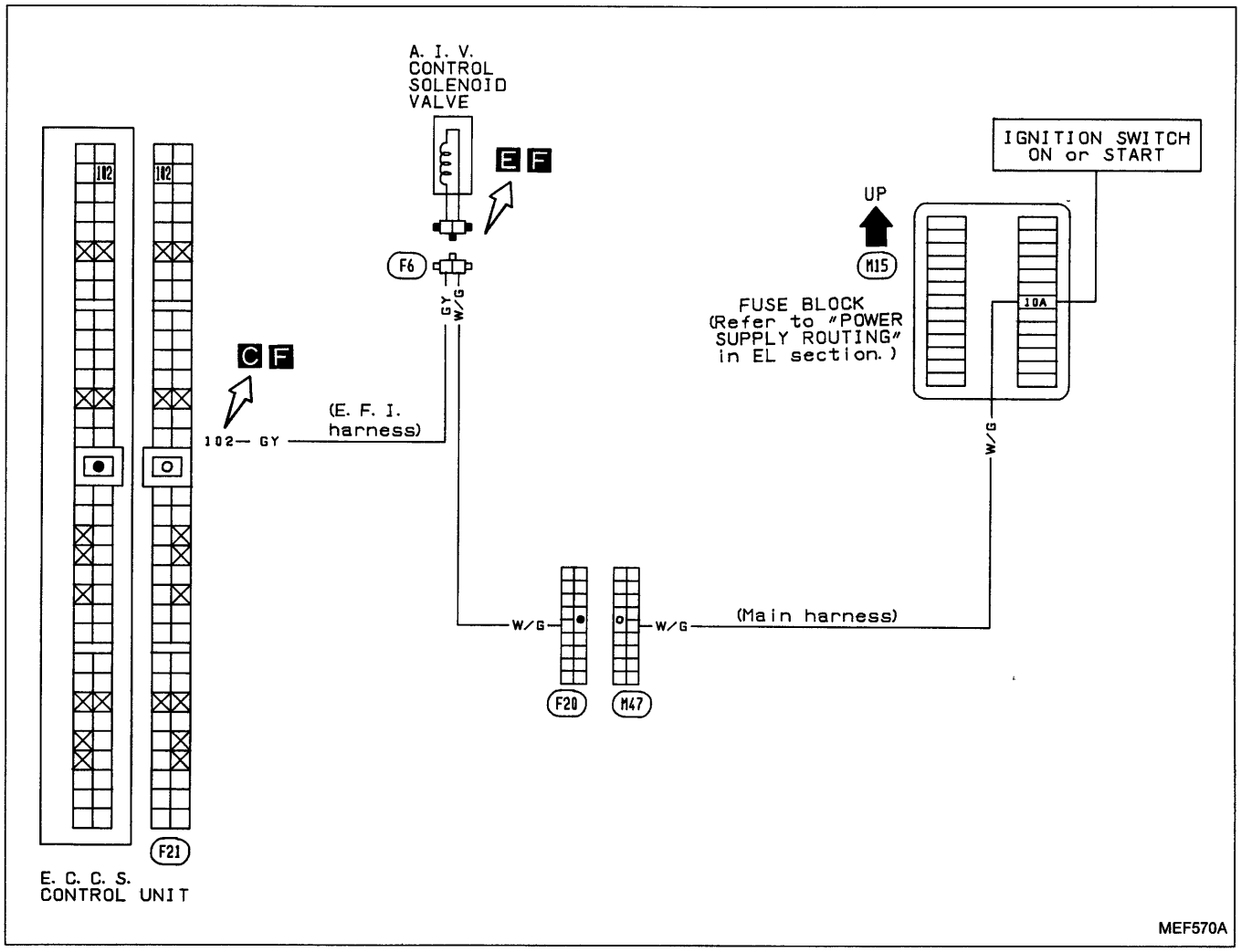
If N.G., repair harness or connectors.

O.K. ↓

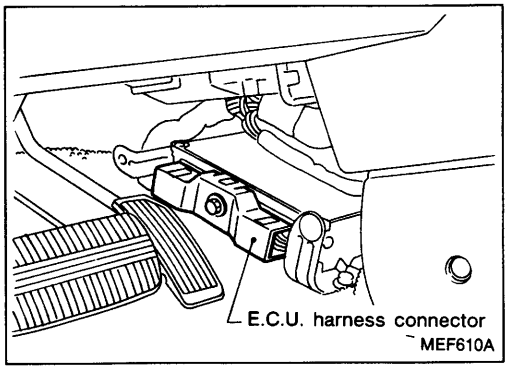
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

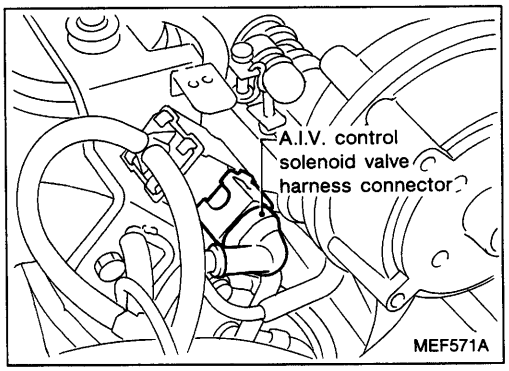
Diagnostic Procedure 36

A.I.V. CONTROL (Not self-diagnostic item)

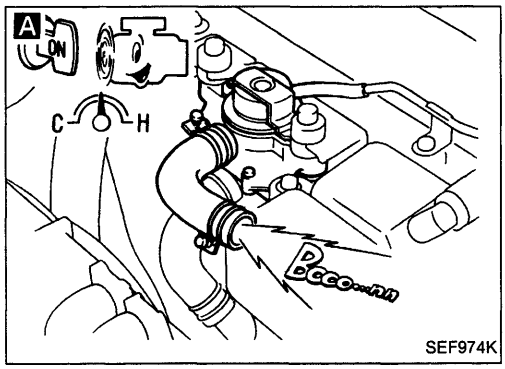


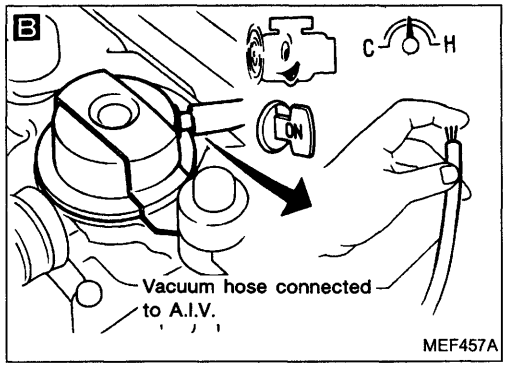
Harness layout

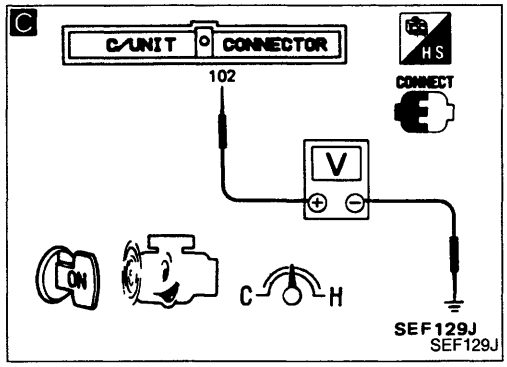


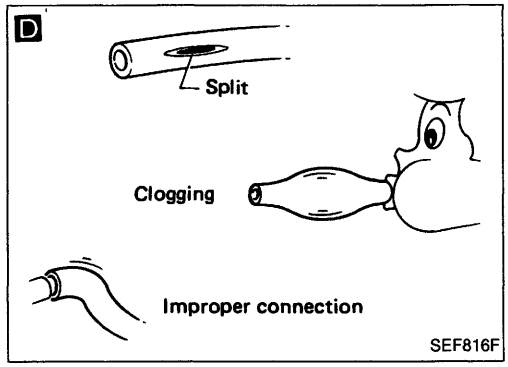


Diagnostic Procedure 36 (Cont'd)









INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Run engine at about 2,000 rpm for about 2 minutes under no-load.
3) 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 periodically more than 5 times during 10 seconds at 2,000 rpm under no-load.
4) Release accelerator pedal fully, and run engine at idle.
5) Listen to A.I.V. operating sound.

At idle and during deceleration:
A.I.V. should operate.
Accelerator pedal is depressed:
A.I.V. should not operate.

O.K. → INSPECTION END

N.G. ↓

B

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 and during deceleration:
Vacuum should exist.
Accelerator pedal is depressed:
Vacuum should not exist.

O.K. → CHECK COMPONENT (A.I.V.).
Refer to "Electrical Components Inspection".
(See page EF & EC-189.)

N.G. ↓

C

CHECK CONTROL FUNCTION.
1) Check voltage between E.C.U. terminal (102) and ground.

Voltage:
At idle and during deceleration
0.6 - 0.8V
Accelerator pedal is depressed
Battery voltage

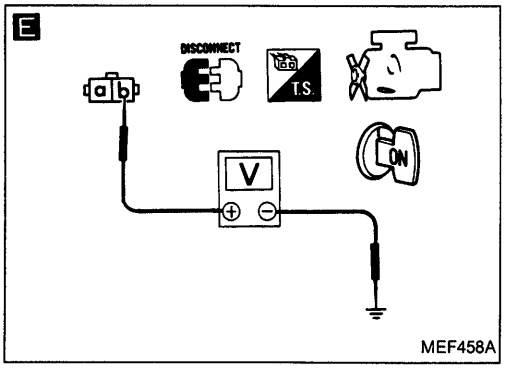
O.K. → D

CHECK VACUUM HOSE.
Check vacuum hose for clogging, cracks and proper connections.

N.G. ↓
Ⓐ

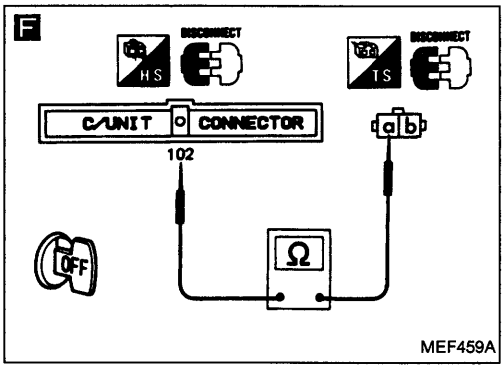
Diagnostic Procedure 36 (Cont'd)

E



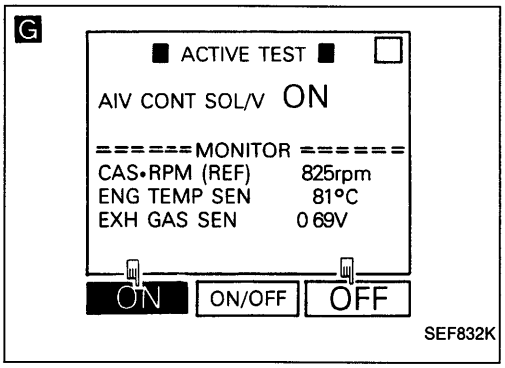
MEF458A

F



MEF459A

G



SEF832K

Ⓐ

E

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 (F28), (M47)
- 10A fuse
- Harness continuity between fuse and A.I.V. control solenoid valve

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 (102) and terminal ⓐ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

G

CHECK COMPONENT (A.I.V. control solenoid valve).

1) Reconnect E.C.U. harness connector and A.I.V. control solenoid valve harness connector.
2) Start engine.
3) Perform "A.I.V. CONTROL SOLENOID VALVE TEST" in "ACTIVE TEST" mode with CONSULT.

OR

Refer to "Electrical Components Inspection". (See page EF & EC-189.)

N.G. → Replace A.I.V. control solenoid valve.

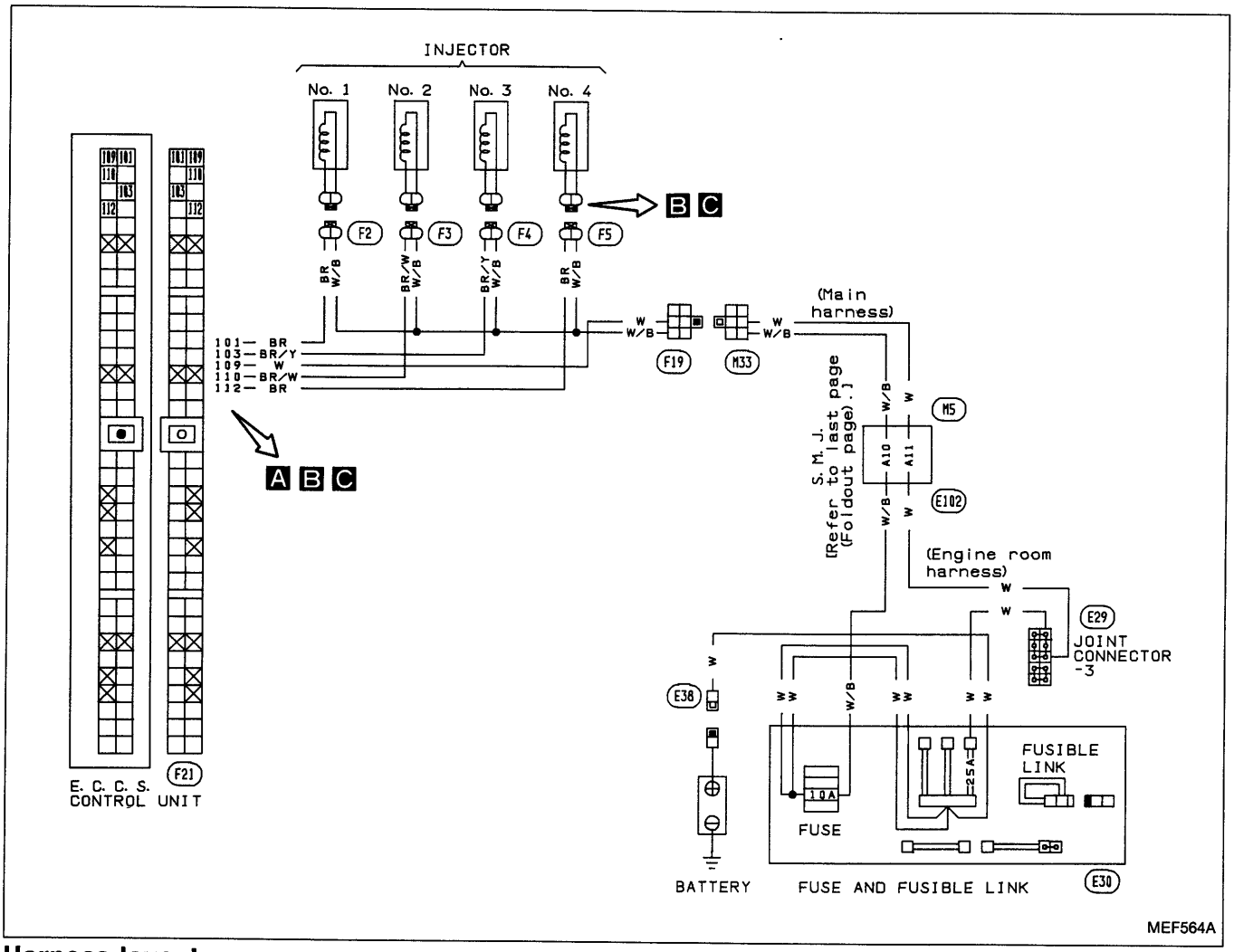
O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

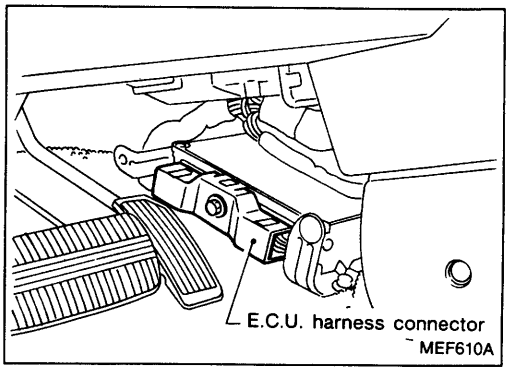
NOTE

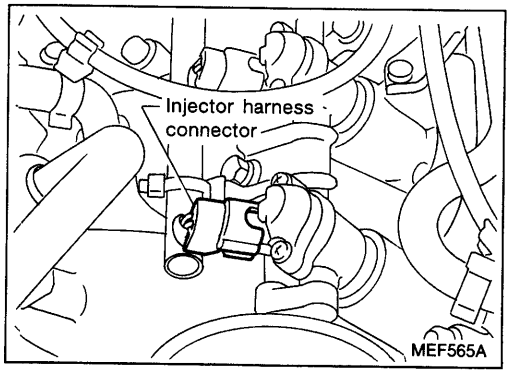
Diagnostic Procedure 37

INJECTOR (Not self-diagnostic item)



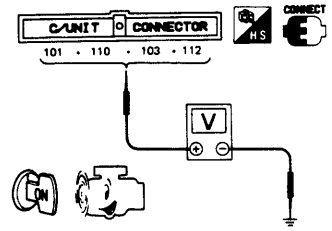
Harness layout





Diagnostic Procedure 37 (Cont'd)

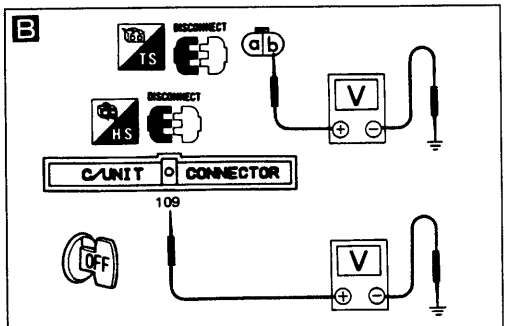
A



(101) : No. 1 cylinder (103) : No. 3 cylinder
(110) : No 2 cylinder (112) : No. 4 cylinder

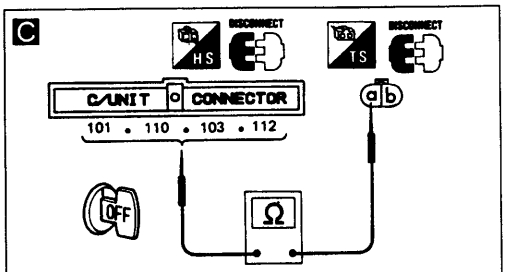
SEF974I

B



MEF566A

C



(101): No. 1 cylinder (103): No. 3 cylinder
(110): No. 2 cylinder (112): No. 4 cylinder

MEF567A

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 (F19), (M33)
- Harness connectors (M5), (E102)
- Joint connector-3
- 25A fusible link
- 10A fuse
- 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-188.)

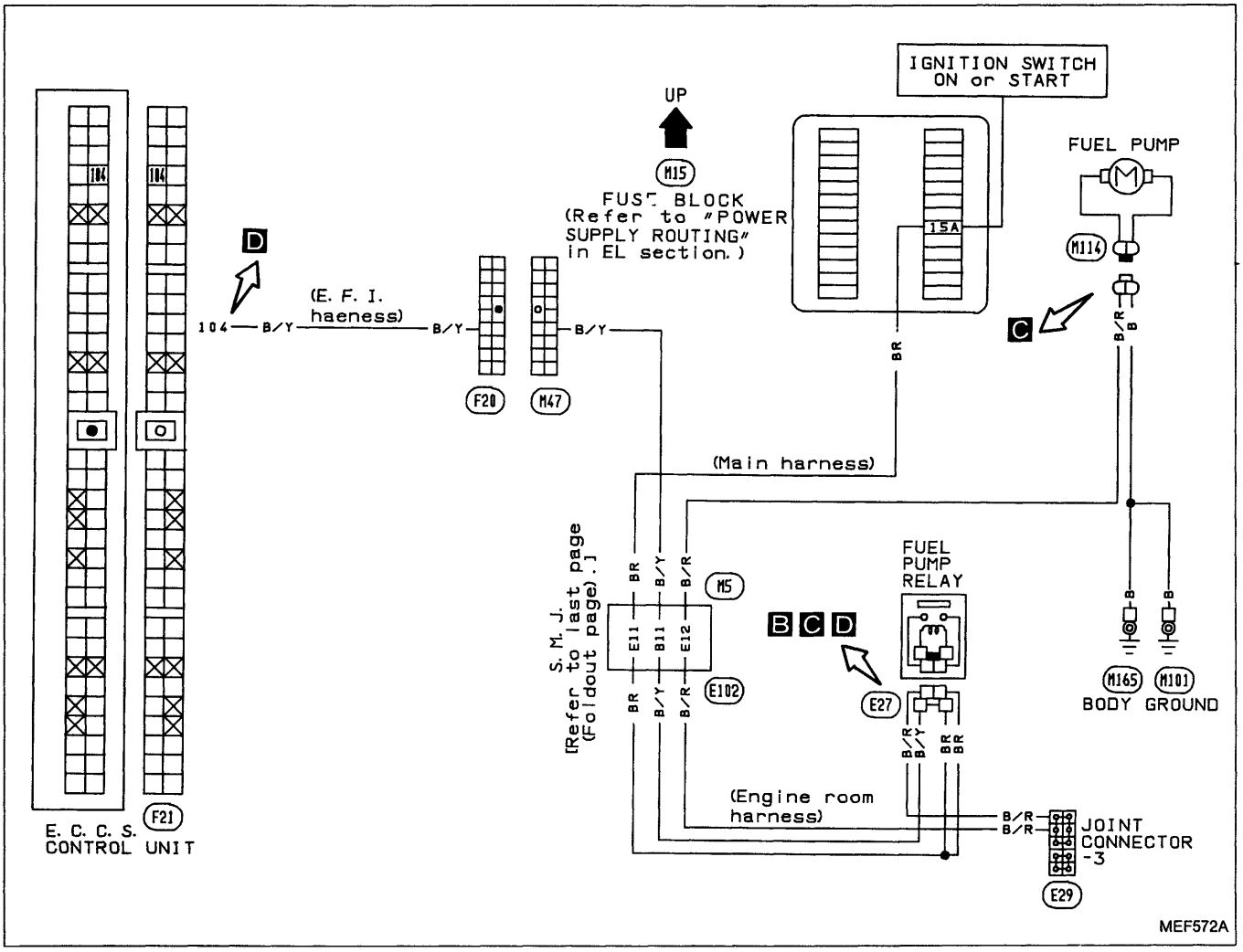
N.G. → Replace injector.

O.K.

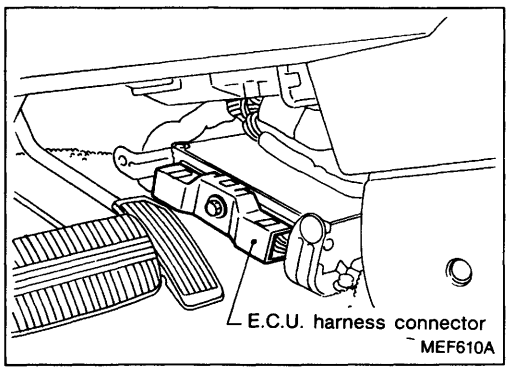
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

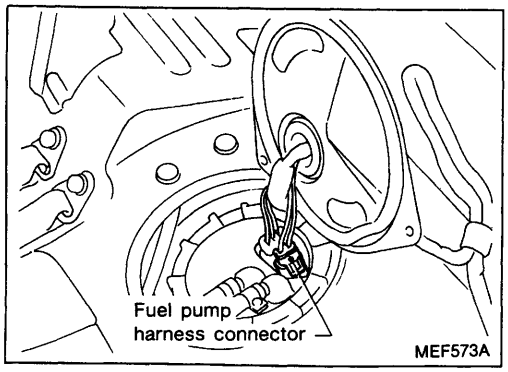
Diagnostic Procedure 38

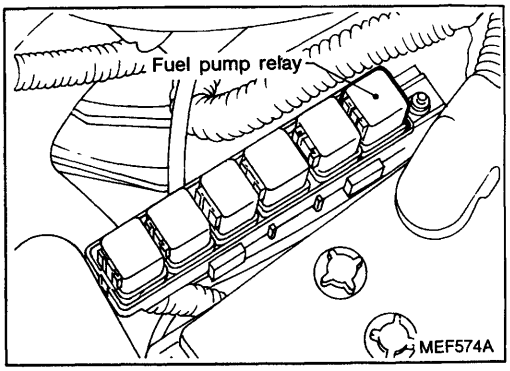
FUEL PUMP (Not self-diagnostic item)



Harness layout

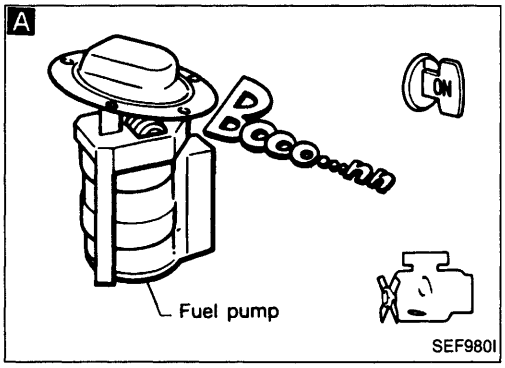






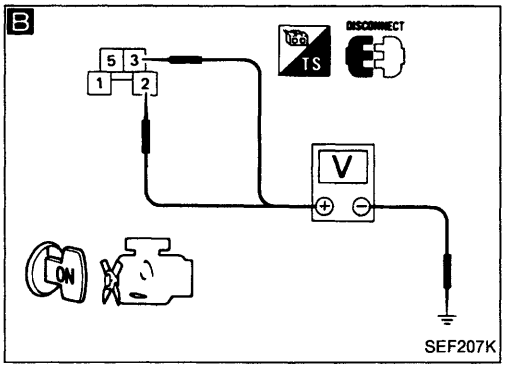
Diagnostic Procedure 38 (Cont'd)

A



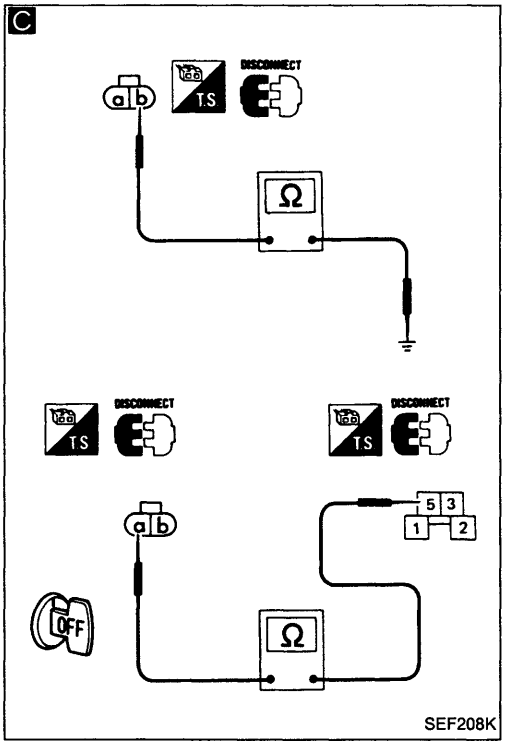
SEF980I

B



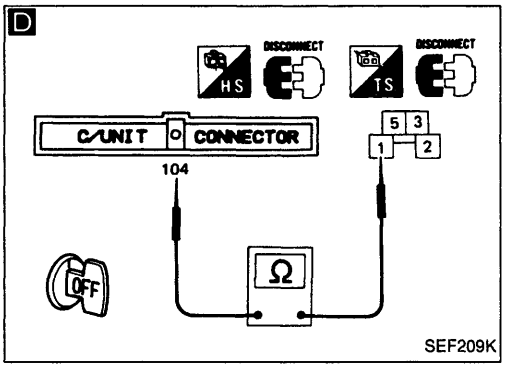
SEF207K

C



SEF208K

D



SEF209K

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 (M5), (E102)
- 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 (M5), (E102)
- Joint connector-3
- 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.

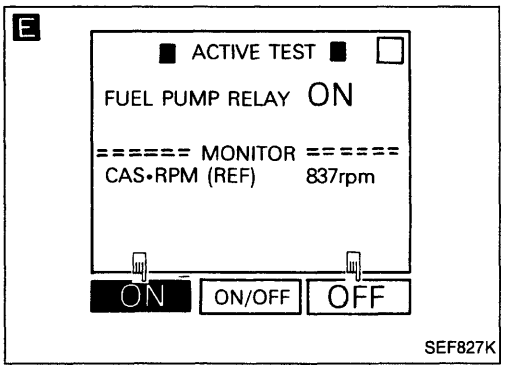
N.G. → Check the following:
- Harness connectors (F20), (M47)
- Harness connectors (M5), (E102)
- Harness continuity between E.C.U. and fuel pump relay

If N.G., repair harness or connectors.

O.K.

Ⓐ

Diagnostic Procedure 38 (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-191.)

O.K.

CHECK COMPONENT
(Fuel pump).
Refer to "Electrical Components Inspection".
(See page EF & EC-186.)

N.G. → Replace fuel pump.

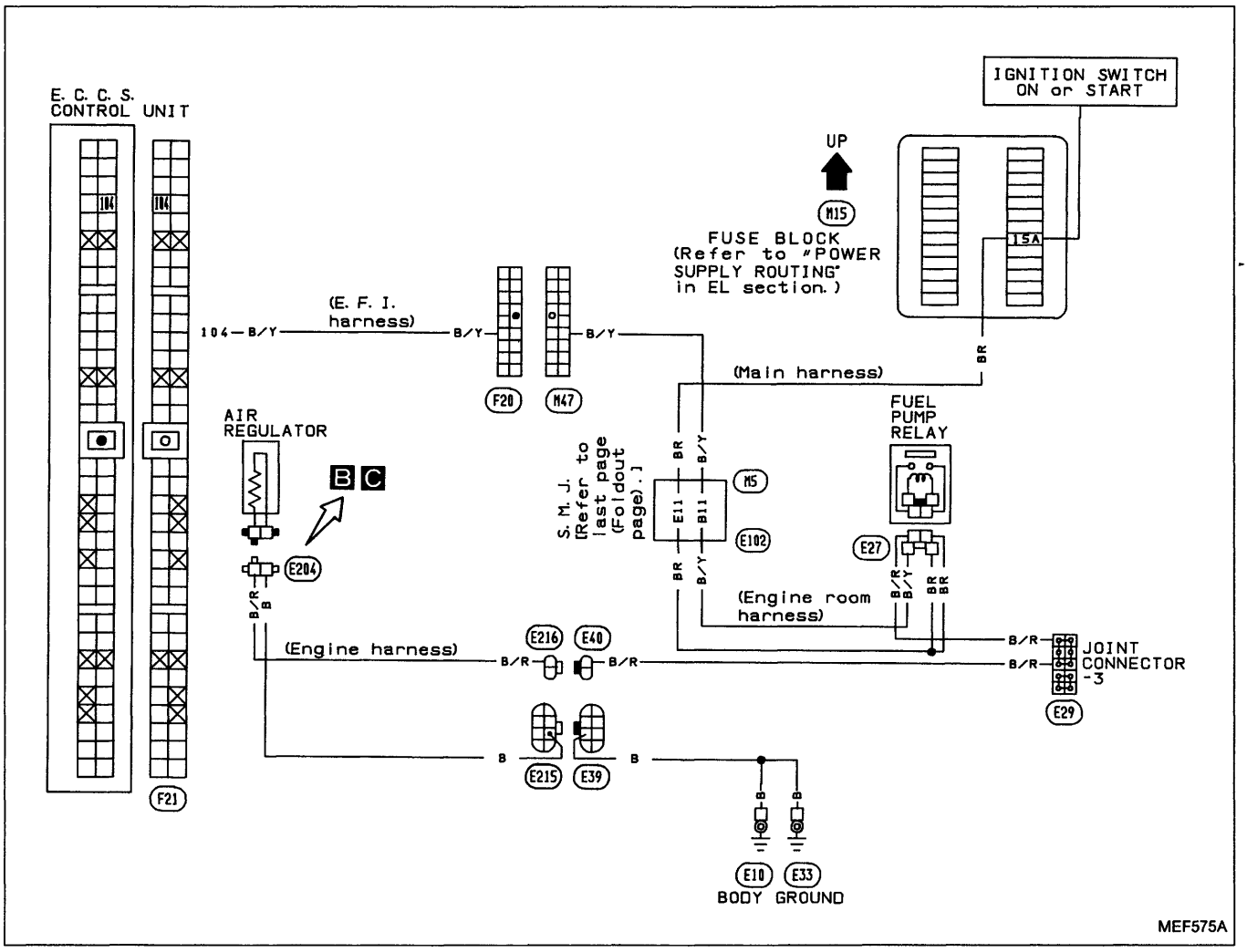
O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

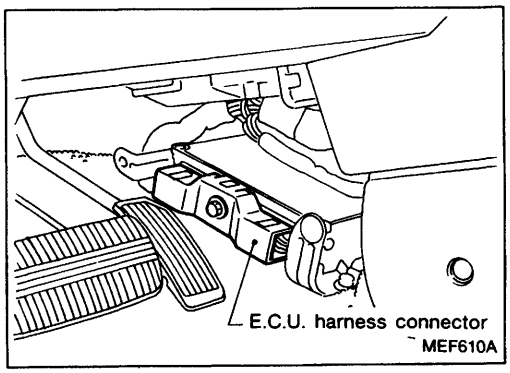
NOTE

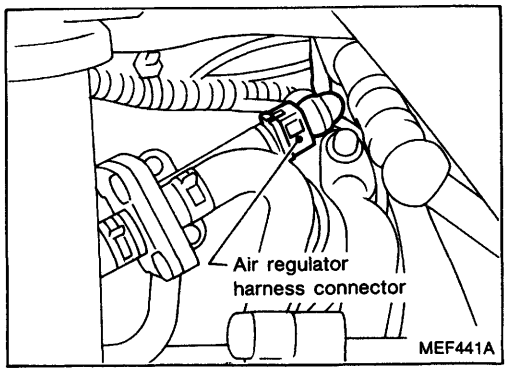
Diagnostic Procedure 39

AIR REGULATOR (Not self-diagnostic item)



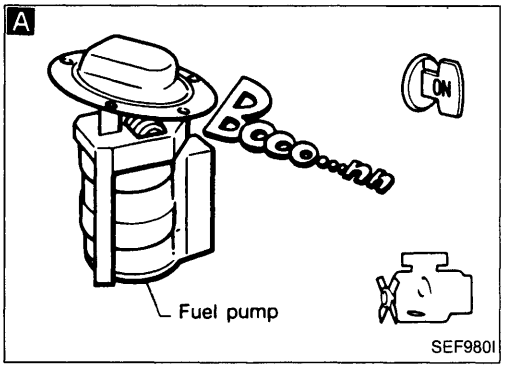
Harness layout





Diagnostic Procedure 39 (Cont'd)

A



INSPECTION START

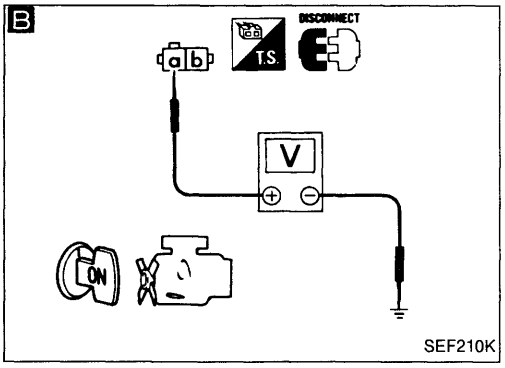
A

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-152.)

O.K. ↓

B



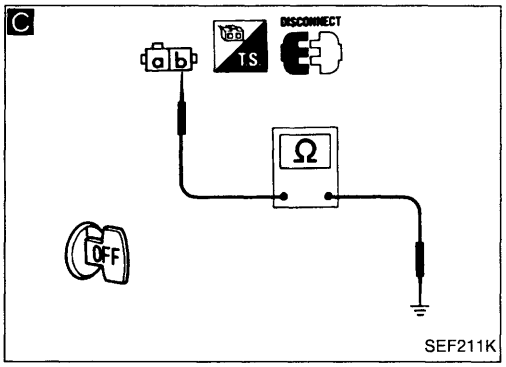
CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect air regulator harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ and ground.
Battery voltage should exist for 5 seconds after ignition switch is turned "ON".

N.G. → Check the following.
- Harness connectors (E40), (E216)
- Joint connector-3
- 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.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (E39), (E215)
- 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-188.)

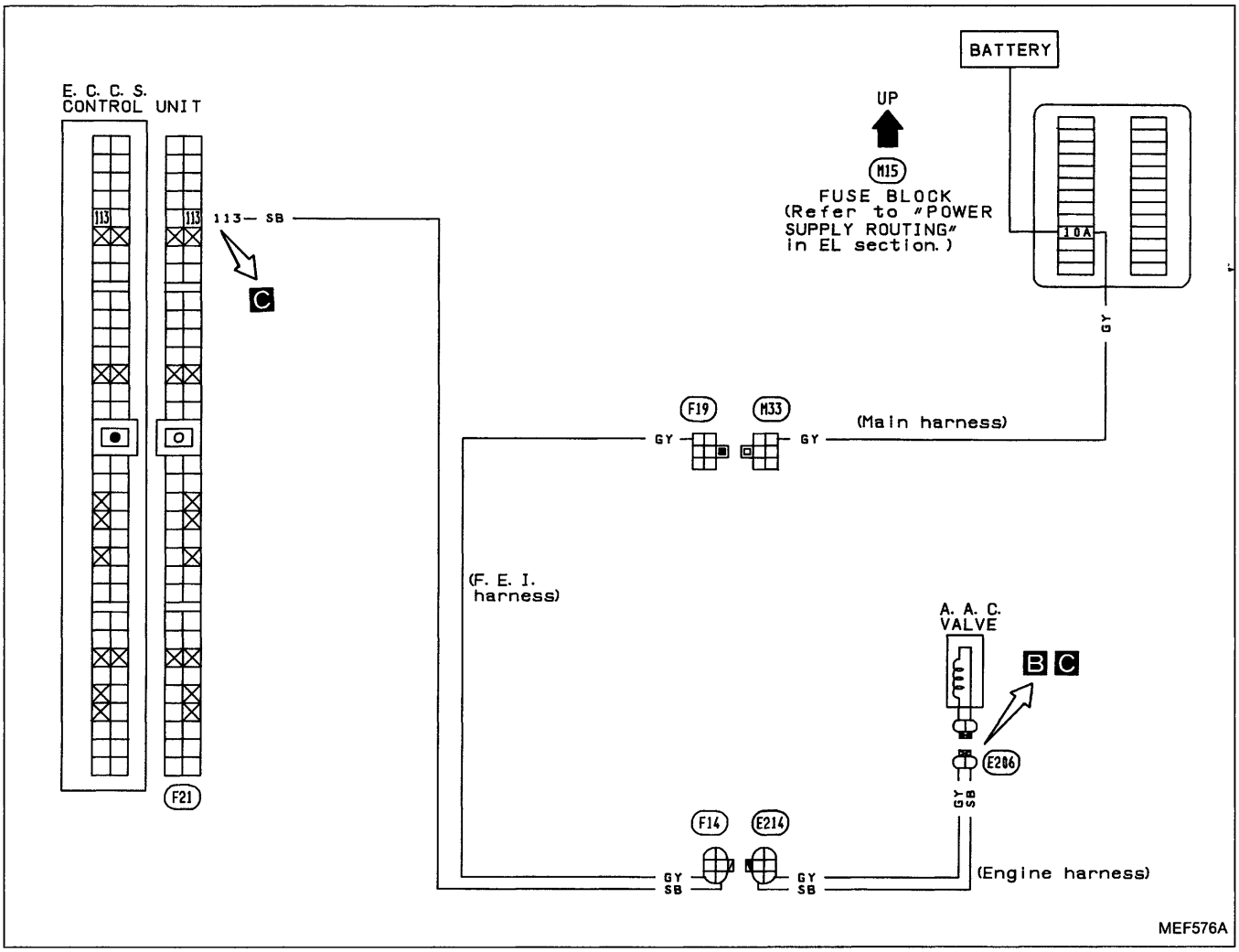
N.G. → Replace air regulator.

O.K. ↓

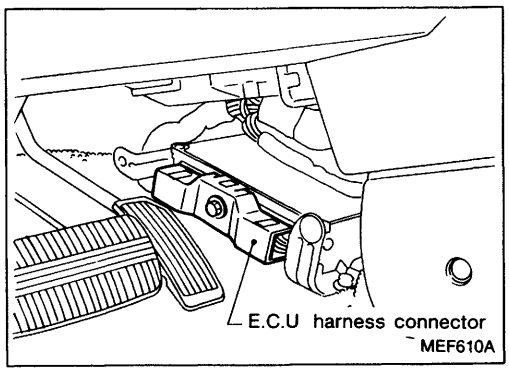
INSPECTION END

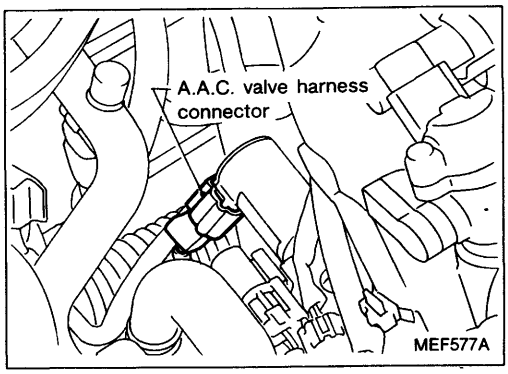
Diagnostic Procedure 40

A.A.C. VALVE (Not self-diagnostic item)



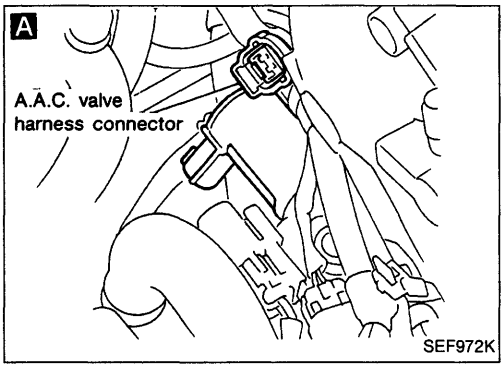
Harness layout





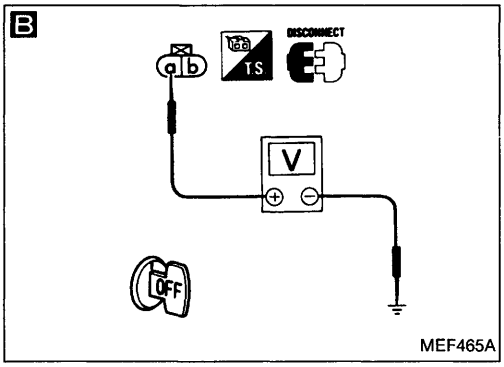
Diagnostic Procedure 40 (Cont'd)

A



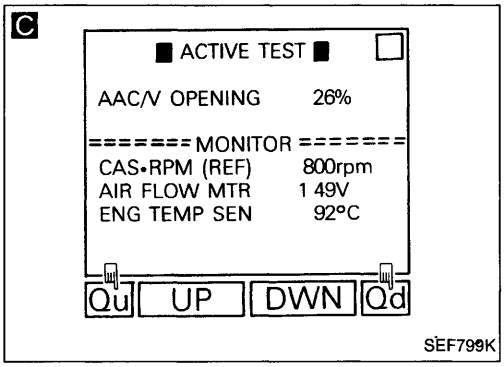
SEF972K

B



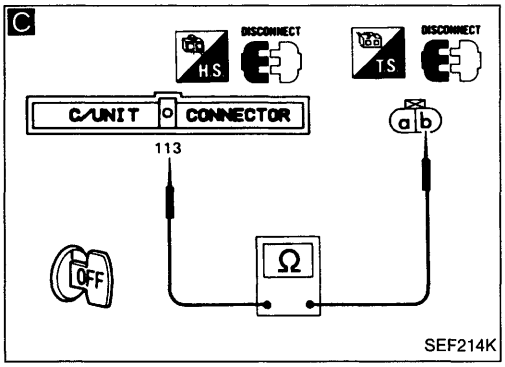
MEF465A

C



SEF799K

C



SEF214K

INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check idle speed.
800 ± 50 rpm
If N.G., adjust idle speed.
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) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F14), (E214)
- Harness connectors (F19), (M33)
- 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. → Check the following.
- Harness connectors (F14), (E214)
- Harness continuity between E.C.U. and A.A.C. valve

If N.G., repair harness or connectors.

OR

1) Disconnect E.C.U. harness connector.
2) 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-187.)

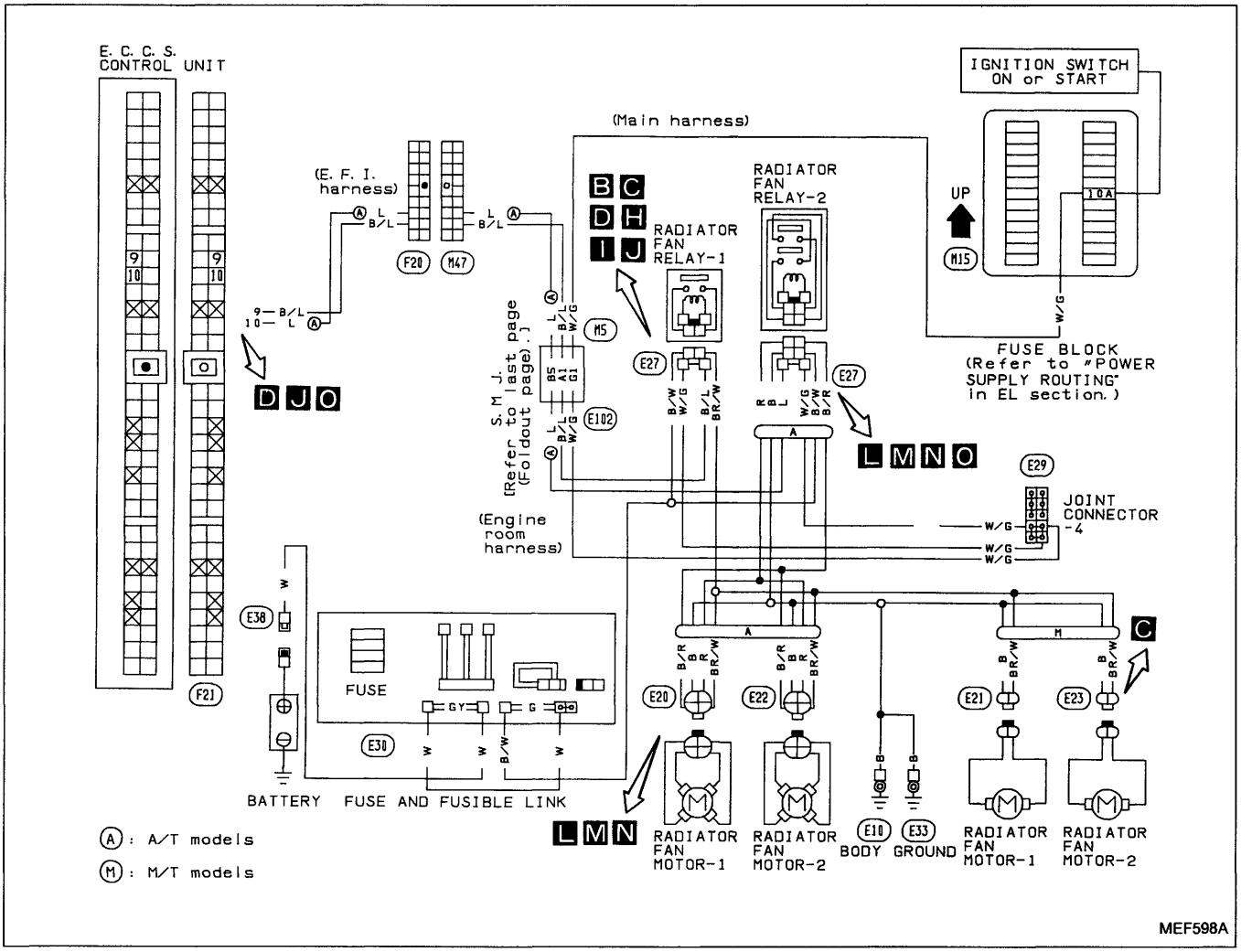
N.G. → Replace A.A.C. valve.

O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

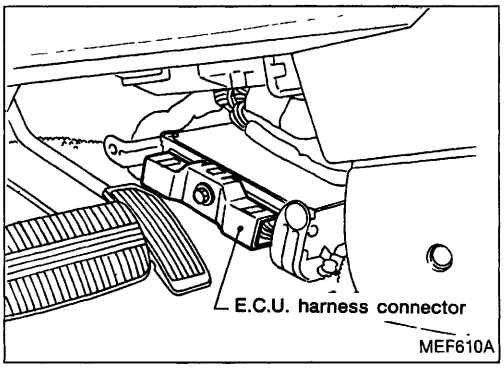
Diagnostic Procedure 41

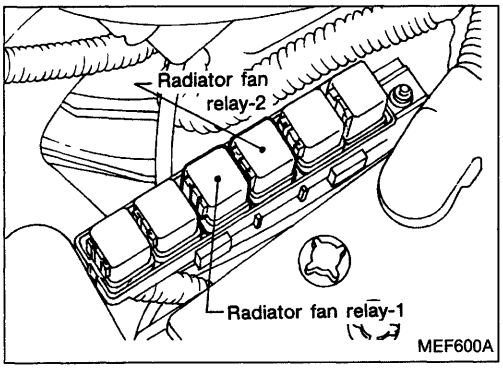
RADIATOR FAN CONTROL (Not self-diagnostic item)

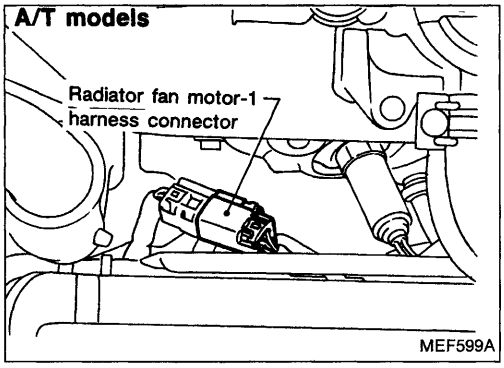


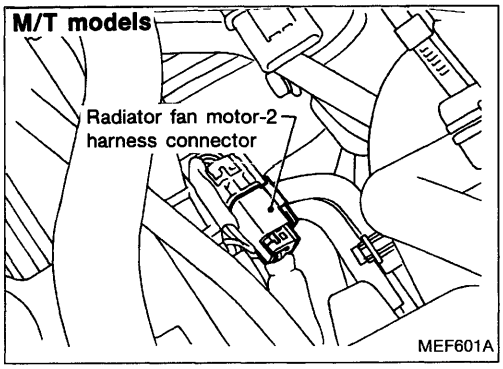
Diagnostic Procedure 41 (Cont'd)

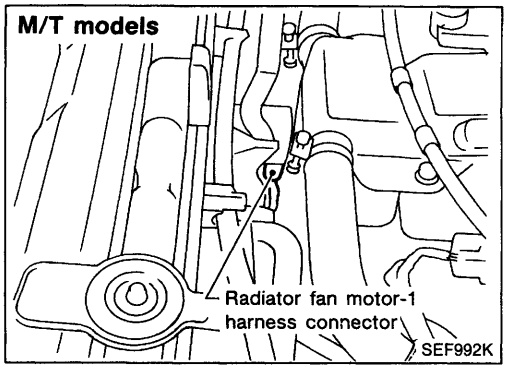
Harness layout

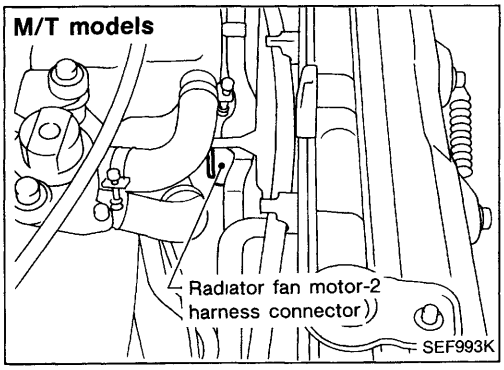






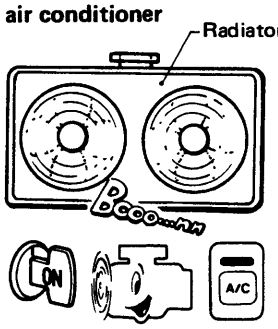




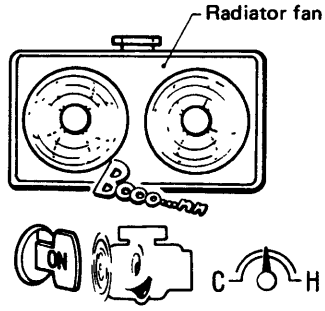


Diagnostic Procedure 41 (Cont'd)

A **With air conditioner**

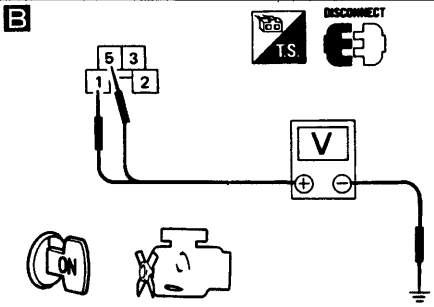


Without air conditioner



SEF997I

B



MEF602A

M/T models

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".
   (Steps 1) and 2) are only performed for models with air conditioner.)
3) Stop engine.
4) Disconnect radiator fan relay-1.
5) Turn ignition switch "ON".
6) Check voltage between terminals ①, ⑤ and ground.
   Voltage: Battery voltage

N.G. →

Check the following.

- Harness connectors (M5), (E102)
- "GY" fusible link
- "G" fusible link
- 10A fuse
- Joint connector-4
- Harness continuity between battery and radiator fan relay-1
- Harness continuity between fuse and radiator fan relay-1

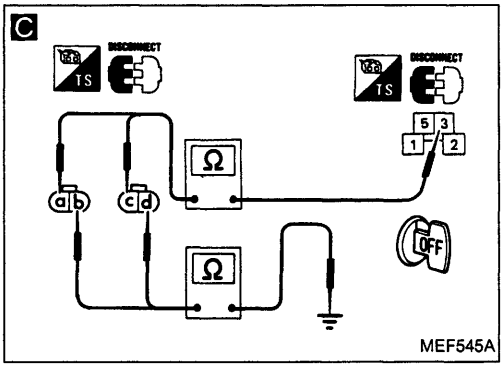
If N.G., repair harness or connectors.

O.K.

Ⓐ

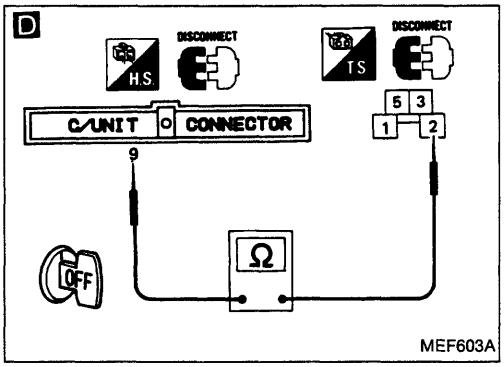
Diagnostic Procedure 41 (Cont'd)

C



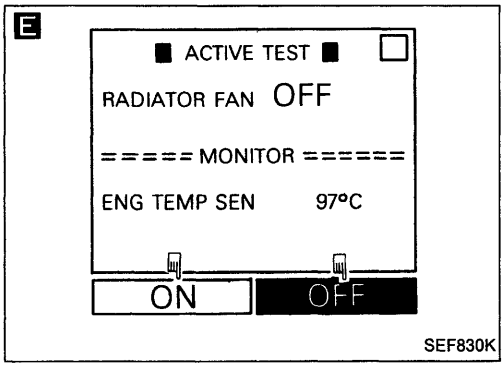
MEF545A

D



MEF603A

E



SEF830K

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 terminals ⓐ, ⓒ and terminal ③, terminals ⓑ, ⓓ 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 ②.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F20), (M47)
- Harness connectors (M5), (E102)
- Harness continuity between E.C.U. and radiator fan relay-1

If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(Radiator fan relay-1).
Refer to "Electrical Components Inspection".
(See page EF & EC-191.)

N.G. → Replace radiator fan relay.

O.K. ↓

E

CHECK COMPONENTS
(Radiator fan motors).

1) Reconnect radiator fan relay-1, 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.

OR

Refer to "Electrical Components Inspection".
(See page EF & EC-190.)

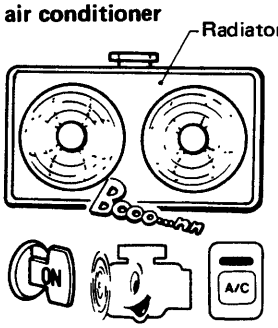
N.G. → Replace radiator fan motors.

O.K. ↓

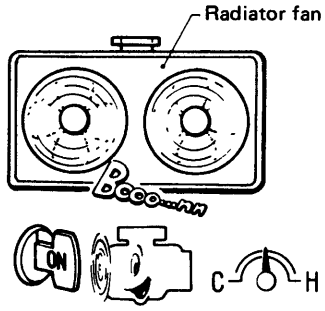
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 41 (Cont'd)

F With air conditioner

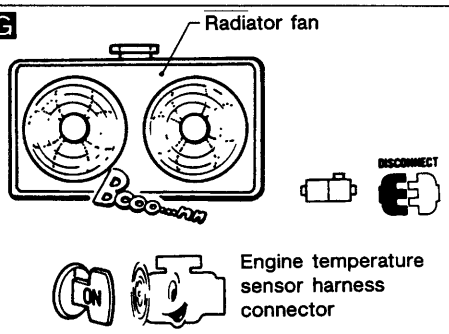


Without air conditioner



SEF997I

G



MEF468A

A/T models

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.

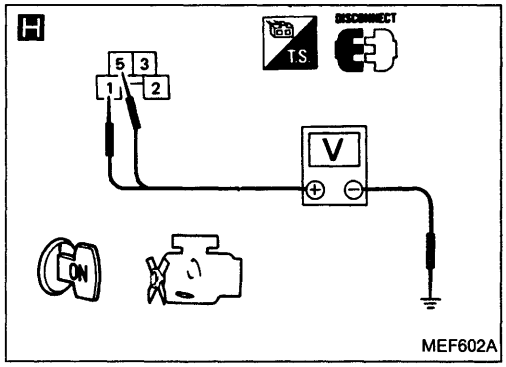
1) Turn air conditioner switch "OFF".
2) Turn blower fan switch "OFF".
   (Steps 1) and 2) are only performed for models with air conditioner.)
3) Stop engine.
4) Disconnect engine temperature sensor harness connector.
5) Restart engine and make sure that radiator fan operates at high speed.

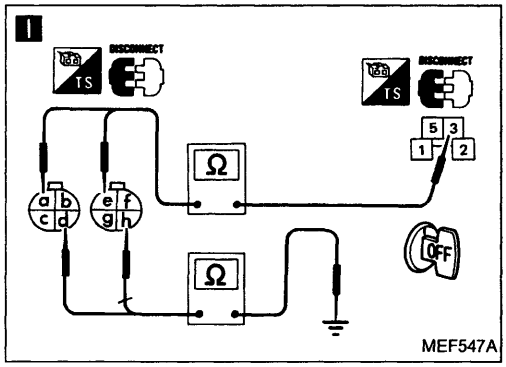
N.G. → Check radiator fan high speed control circuit. (Go to PROCEDURE B .)

O.K.

INSPECTION END

Diagnostic Procedure 41 (Cont'd)





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 ①, ⑤ and ground.
Voltage: Battery voltage

N.G. →
Check the following.
- Harness connectors (M5), (E102)
- 10A fuse
- "G" fusible link
- "GY" fusible link
- Joint connector-4
- 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

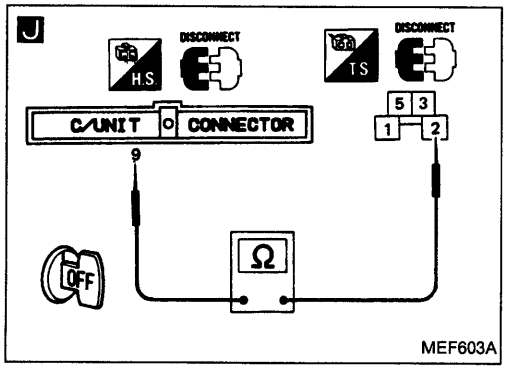
CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect radiator fan motor-1 harness connector and radiator fan motor-2 harness connector.
3) Check harness continuity between terminals ⓐ, ⓔ and terminal ③, terminals ⓓ, ⓗ and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

Ⓐ

Diagnostic Procedure 41 (Cont'd)



J

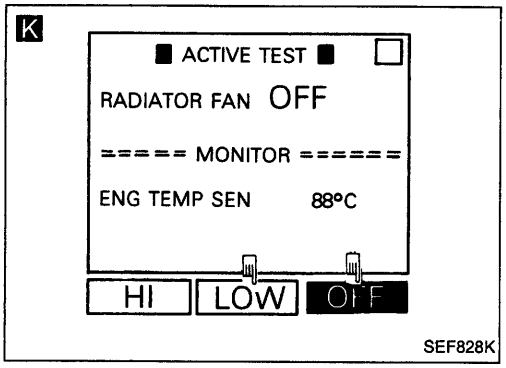
(A)

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ⑨ and terminal ②.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F20), (M47)
- Harness connectors (M5), (E102)
- 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-191.)

N.G. → Replace radiator fan relay.

O.K. ↓

K

CHECK COMPONENT
(Radiator fan motor-1).

1) Reconnect radiator fan relay-1, radiator fan motor harness connector and E.C.U. harness connector.
2) Start engine.
3) Perform "RADIATOR FAN TEST" in "ACTIVE TEST" mode with CONSULT.

OR

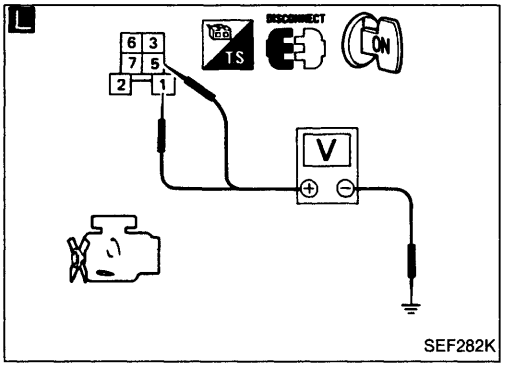
Refer to "Electrical Components Inspection".
(See page EF & EC-190.)

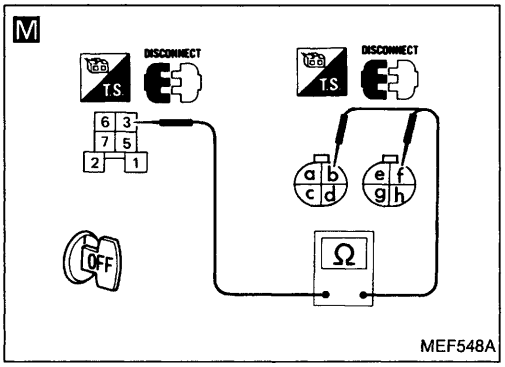
N.G. → Replace radiator fan motors.

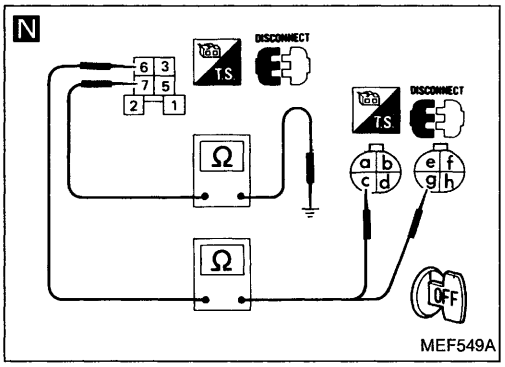
O.K. ↓

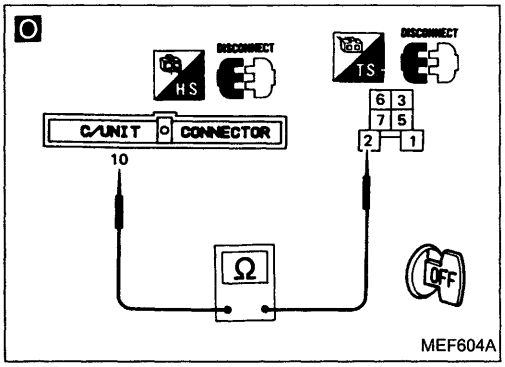
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 41 (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, ⑤ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M5), (E102)
- 10A fuse
- "G" fusible link
- "GY" fusible link
- Joint connector-4
- 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 harness connector.
M 3) Check harness continuity between terminal ③ and terminals ⓑ, ⓕ.
Continuity should exist.
N 4) Check harness continuity between terminal ⑥ and terminals ⓒ, ⓖ, terminal ⑦ and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

O

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ⑩ and terminal ②.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F20), (M47)
- Harness connectors (M5), (E102)
- Harness continuity between E.C.U. and radiator fan relay-2

If N.G., repair harness or connectors.

O.K. ↓

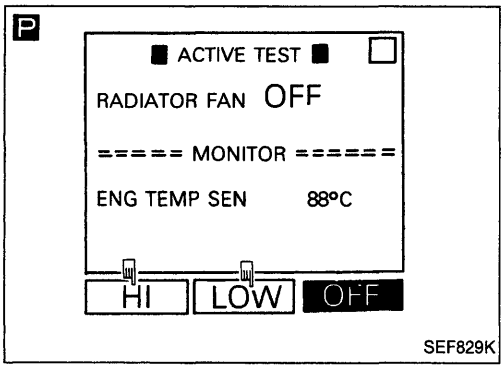
CHECK COMPONENT
(Radiator fan relay-2).
Refer to "Electrical Components Inspection".
(See page EF & EC-192.)

N.G. → Replace radiator fan relay.

O.K. ↓

Ⓐ

Diagnostic Procedure 41 (Cont'd)



P

Ⓐ

CHECK COMPONENTS
(Radiator fan motor-2).

1) Reconnect radiator fan relay-2, radiator fan motor harness connector, engine temperature sensor harness connector 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-190).

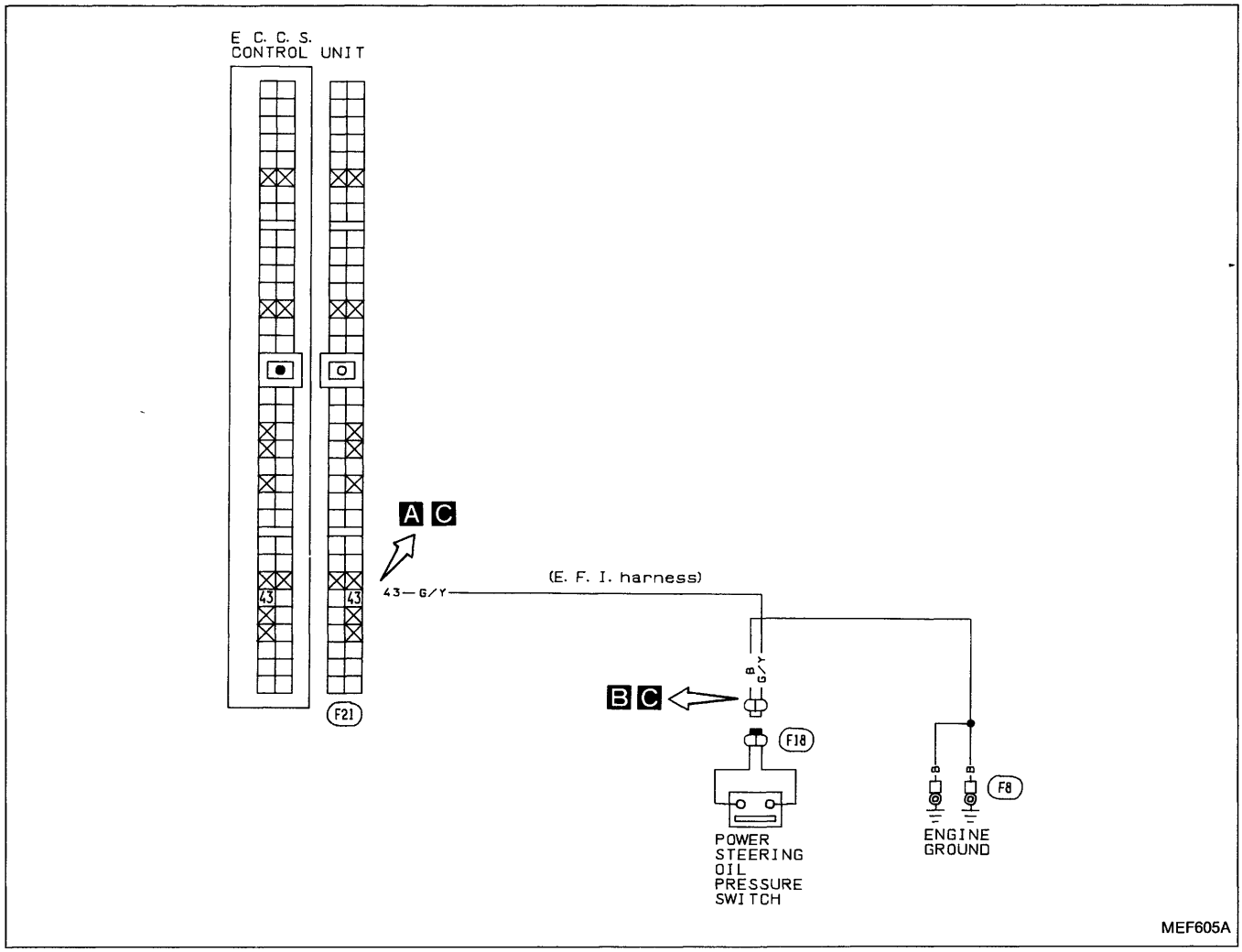
O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

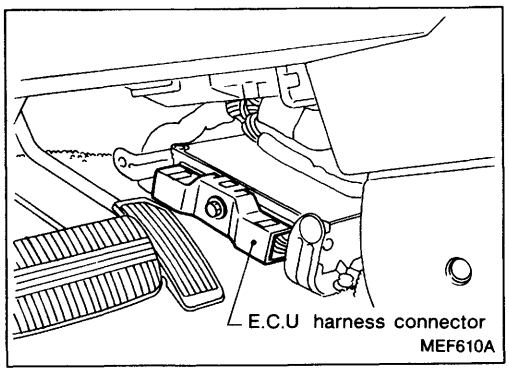
NOTE

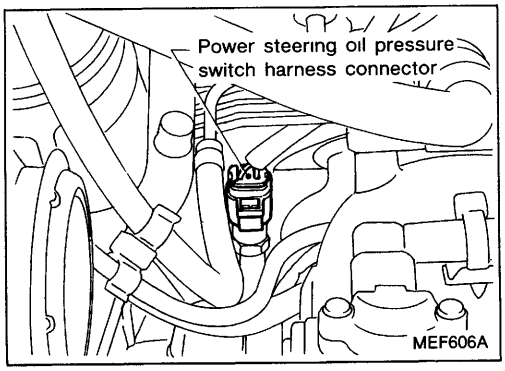
Diagnostic Procedure 42

POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)

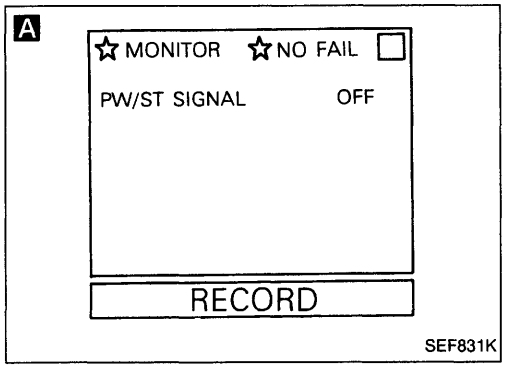


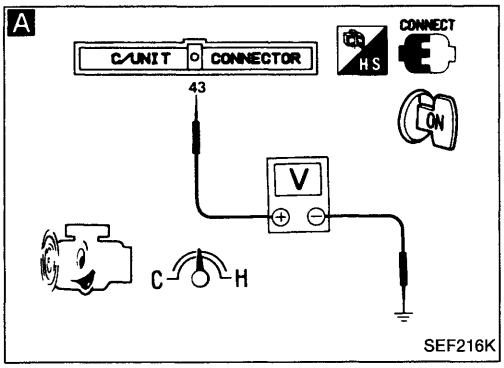
Harness layout

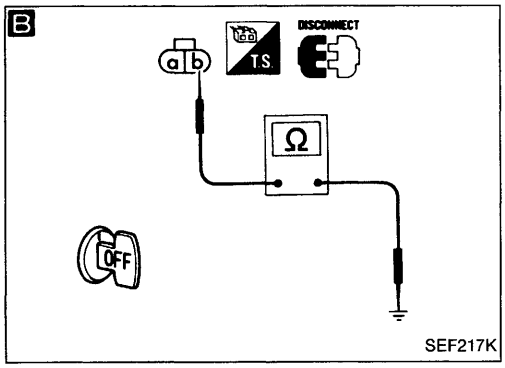


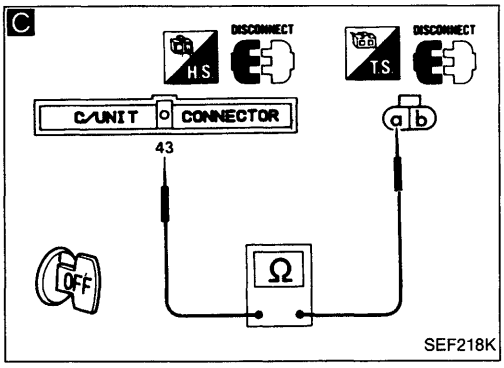


Diagnostic Procedure 42 (Cont'd)









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
7 - 10V

O.K. → INSPECTION END

N.G.

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.

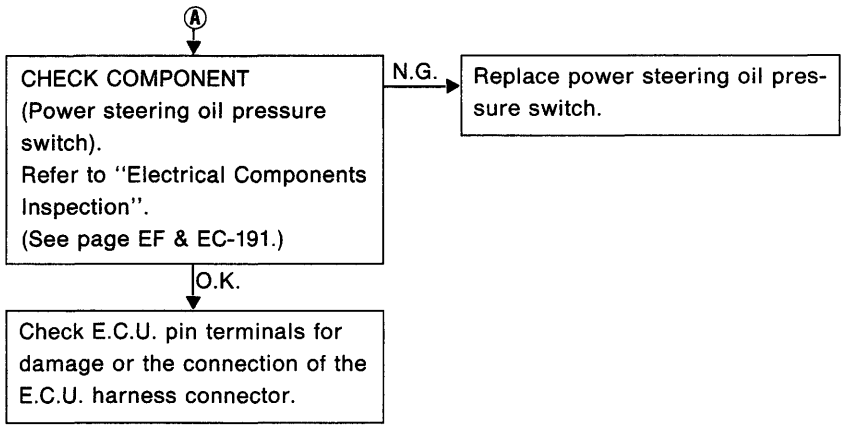
CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ㊸ and terminal ⓐ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

Ⓐ

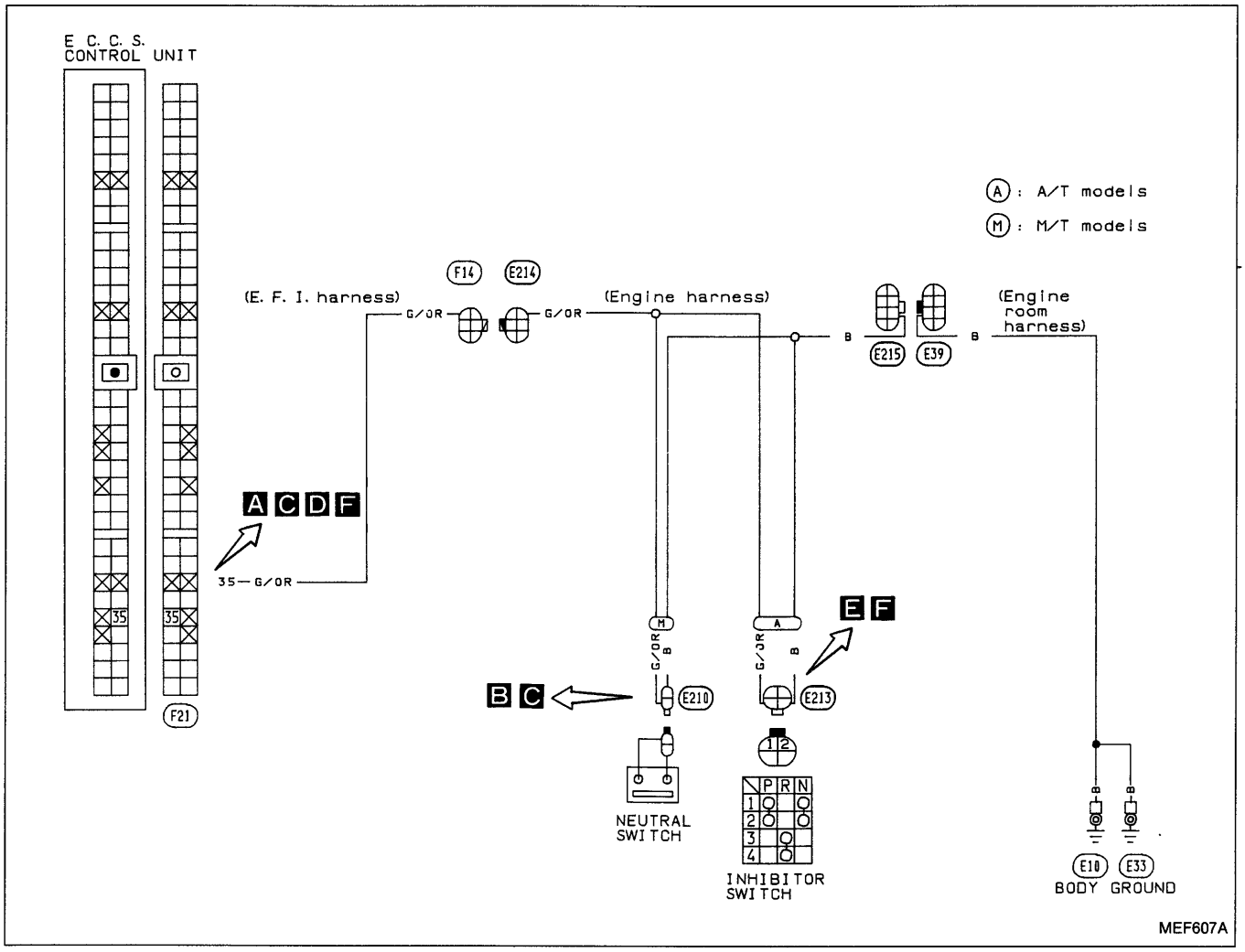
Diagnostic Procedure 42 (Cont'd)



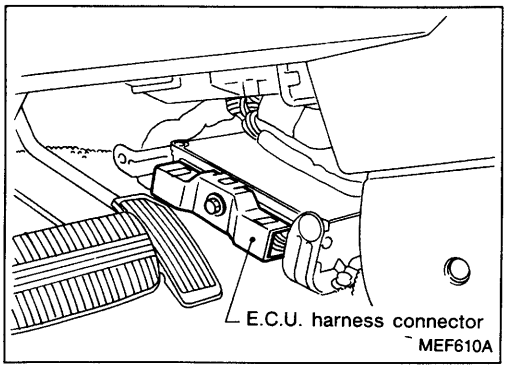
NOTE

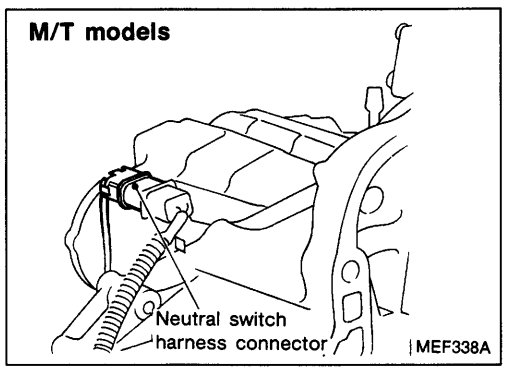
Diagnostic Procedure 43

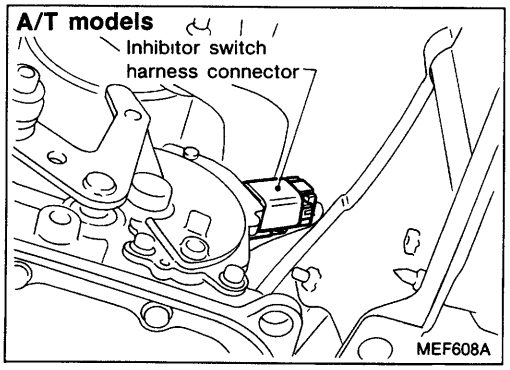
NEUTRAL SWITCH/INHIBITOR SWITCH (Not self-diagnostic item)



Harness layout

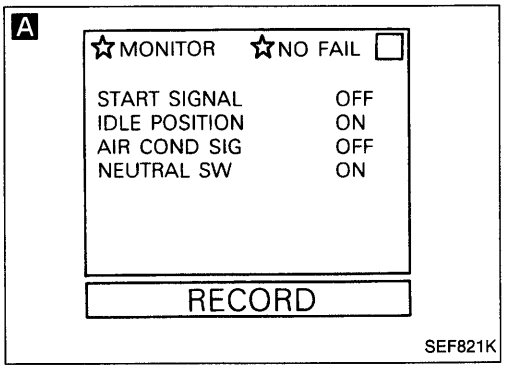




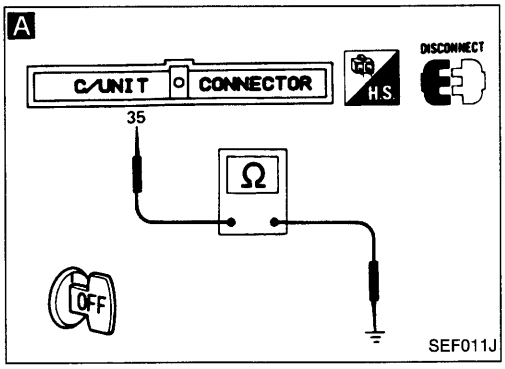


Diagnostic Procedure 43 (Cont'd)

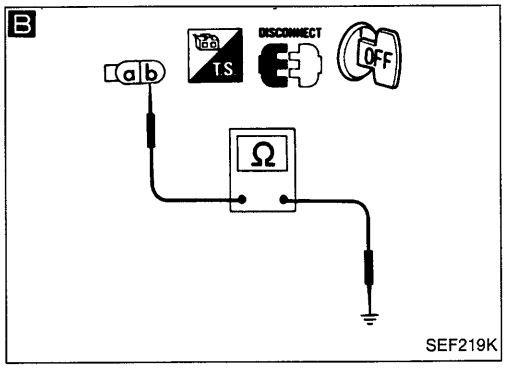
A



A



B



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 E39, E215
- Harness continuity between neutral switch and body ground

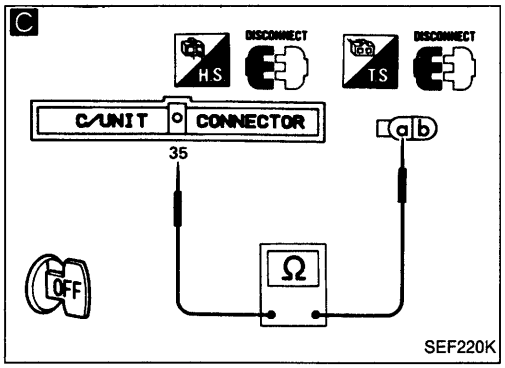
If N.G., repair harness or connectors.

O.K.

Disconnect E.C.U. harness connector.

Ⓐ

Diagnostic Procedure 43 (Cont'd)



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 (F14), (E214)
- 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-191.)

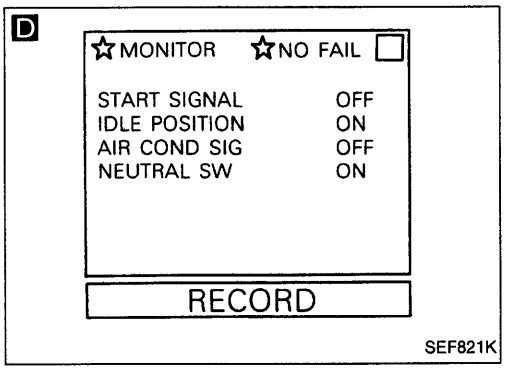
N.G. → Replace neutral switch.

O.K. ↓

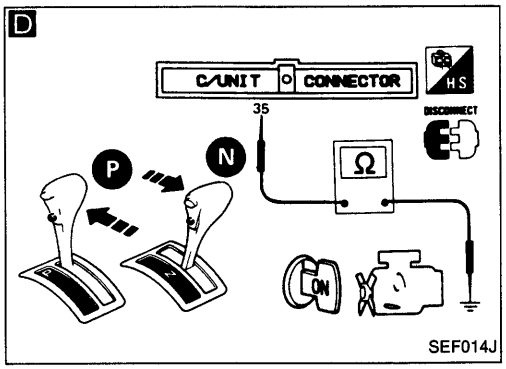
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 43 (Cont'd)

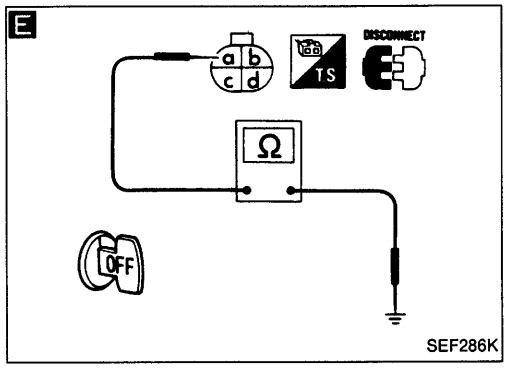
D



D



E



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) Check harness continuity between E.C.U. terminal ㉟ and body ground.
4) Shift selector lever to "N" range.
5) Check harness continuity between E.C.U. terminal ㉟ and body ground.
   Continuity should exist.

N.G.

Turn ignition switch "OFF".

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 E39, E215
- Harness continuity between inhibitor switch and body ground

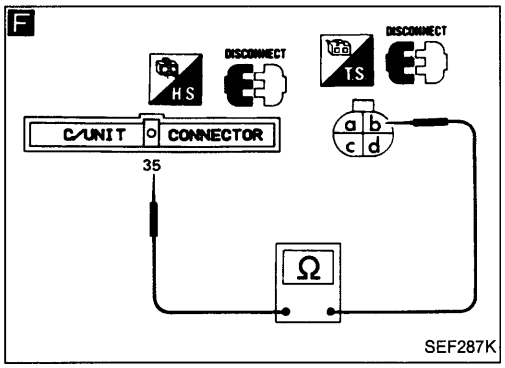
If N.G., repair harness or connectors.

O.K.

Disconnect E.C.U. harness connector.

Ⓐ

Diagnostic Procedure 43 (Cont'd)



F

Ⓐ

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 (F14), (E214)
- Harness continuity between E.C.U. and inhibitor switch

If N.G., repair harness or connectors.

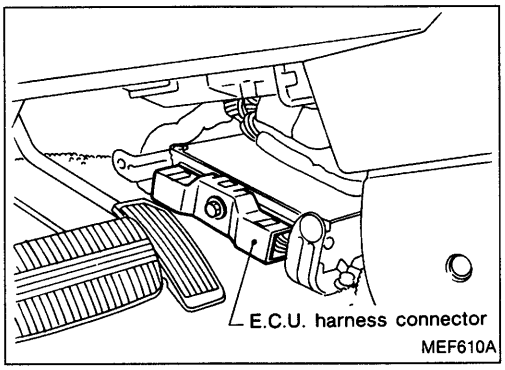
O.K. ↓

CHECK COMPONENT
(Inhibitor switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-190.)

N.G. → Replace inhibitor relay.

O.K. ↓

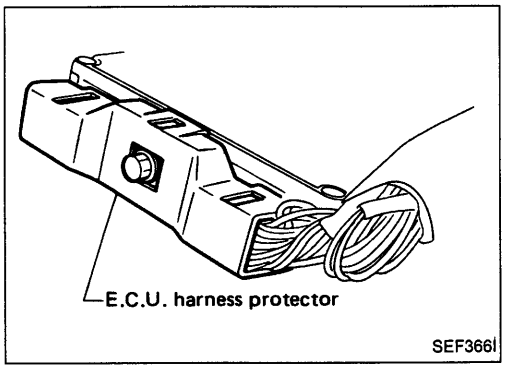
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.



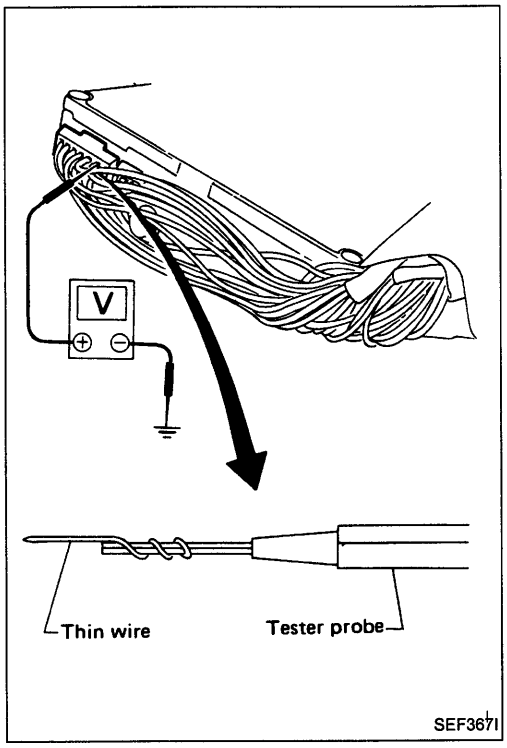
Electrical Components Inspection

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.

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	Approximately 0.7V
3	Ignition check	Engine is running. └Idle speed	Approximately 12V
4	E.C.C.S. relay (Self-shutoff)	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)
8	Exhaust gas temperature sensor	Engine is running. (Warm-up condition) └Idle speed	Less than 4.5V
		Engine is running. (Warm-up condition) └E.G.R. system is operating.	0 - 1.0V
9 10	Radiator fan relay (Low) Radiator fan relay (High)	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".	0.6 - 0.8V
		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 - 1.7V
		Engine is running. (Warm-up condition) └Engine speed is 2,000 rpm.	1.7 - 2.1V

Electrical Components Inspection (Cont'd)

*Date are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
18	Engine temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with engine coolant temperature.
19	Exhaust gas sensor	Engine is running. └After warming up sufficiently and engine speed is 2,000 rpm.	0 - Approximately 1.0V
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 (M/T models) Inhibitor switch (A/T models)	Ignition switch "ON" ├Gear position is "Neutral" (M/T models) └Gear position is "N" or "P" (A/T models)	0V
		Ignition switch "ON" └Except the above gear position	BATTERY VOLTAGE (11 - 14V)
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)

Electrical Components Inspection (Cont'd)

*Date are reference values.

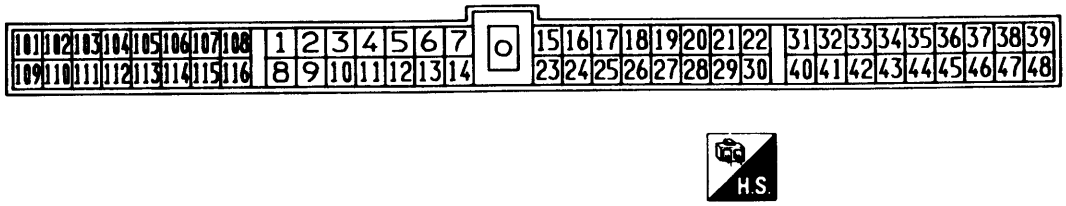
TER-MINAL NO.	ITEM	CONDITION	*DATA
41	Air conditioner switch	Engine is running. └Both air conditioner switch and blower switch are "ON".	Approximately 0V
		Engine is running. └Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
43	Power steering oil pressure switch	Engine is running. └Steering wheel is being turned.	0V
		Engine is running. └Steering wheel is not being turned.	7 - 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		
102	A.I.V. control solenoid valve	Engine is running. (Warm-up condition) └Idle speed.	0.6 - 0.8V
		Engine is running. (Warm-up condition) └Accelerator pedal is depressed.	BATTERY VOLTAGE
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)
105	E.G.R. & canister control solenoid valve	Engine is running. (Warm-up condition) └Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. (Warm-up condition) └Engine speed is 4,000 rpm.	0.6 - 0.8V

Electrical Components Inspection (Cont'd)

*Date are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
111	Exhaust gas sensor heater	Engine is running. └Engine speed is below 3,200 rpm.	0V
		Engine is running. └Engine speed is above 3,200 rpm.	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

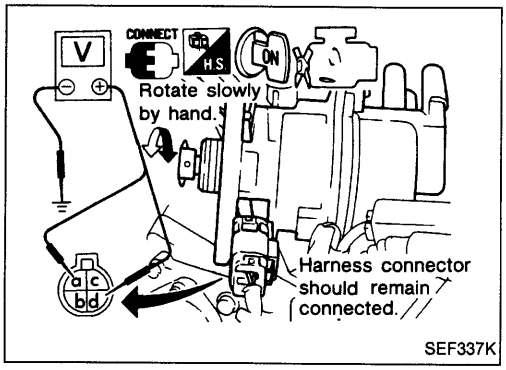
E.C.U. HARNESS CONNECTOR TERMINAL LAYOUT



SEF877K

Electrical Components Inspection (Cont'd)

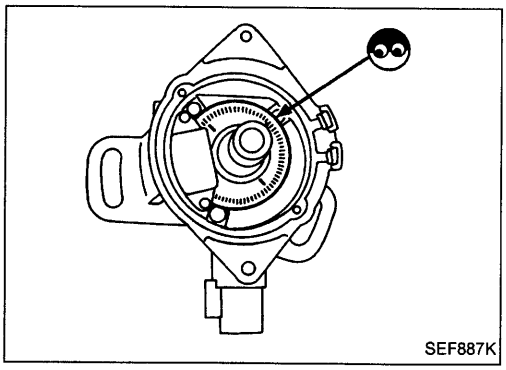
CRANK ANGLE SENSOR



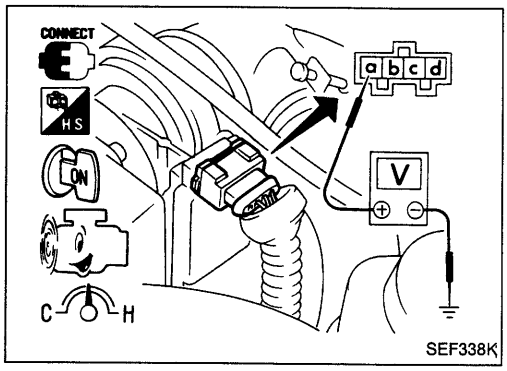
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch "ON".
4. Rotate distributor shaft slowly by hand and check voltage between terminals ⓐ, ⓓ and ground.

Terminal	Voltage
ⓐ (180° signal)	Tester's pointer fluctuates between 5V and 0V.
ⓓ (1° signal)	

If N.G., replace distributor assembly with crank angle sensor.



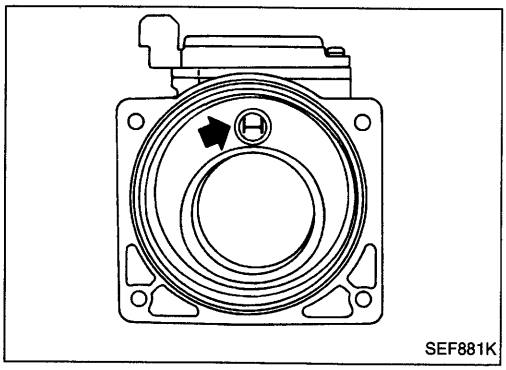
4. Visually check signal plate for damage or dust.



AIR FLOW METER

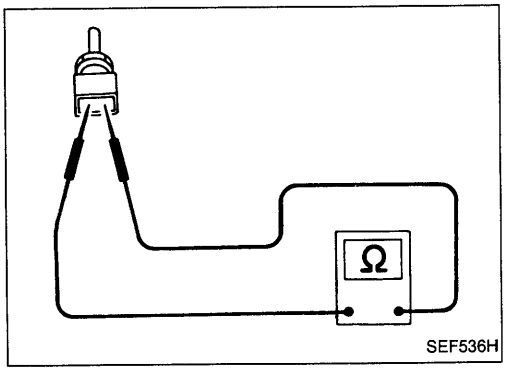
1. Peel air flow meter harness connector rubber as shown in the figure if the harness connector is connected.
2. Turn ignition switch "ON".
3. Start engine and warm it up sufficiently.
4. Check voltage between terminal ⓐ and ground.

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



5. If N.G., remove air flow meter from air duct. Check hot wire for damage or dust.

Electrical Components Inspection (Cont'd)

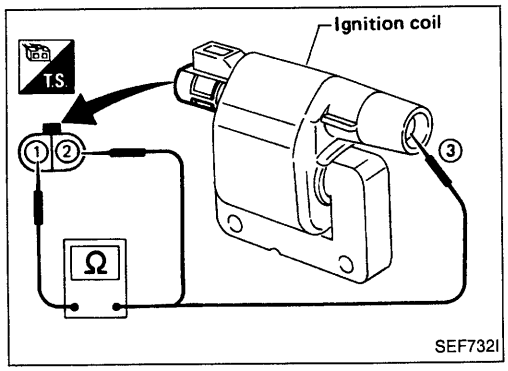


ENGINE TEMPERATURE SENSOR

1. Disconnect engine temperature sensor harness connector.
2. Check resistance as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.0
80 (176)	0.30 - 0.33

If N.G., replace engine temperature sensor.

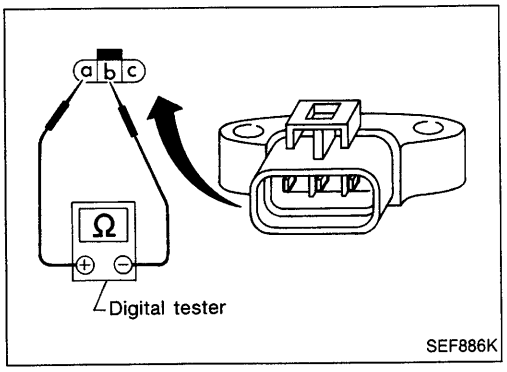


IGNITION COIL

1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.

Terminal	Resistance
① - ②	Approximately 1.0Ω
① - ③	Approximately 10 kΩ

If N.G., replace ignition coil.



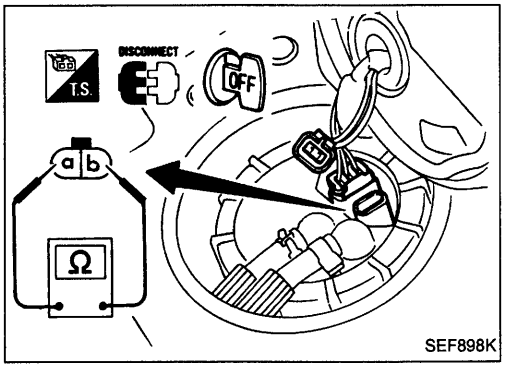
POWER TRANSISTOR

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.	—	—

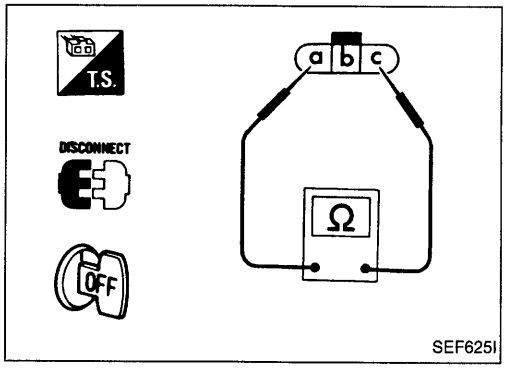
If N.G., replace power transistor.

Electrical Components Inspection (Cont'd)



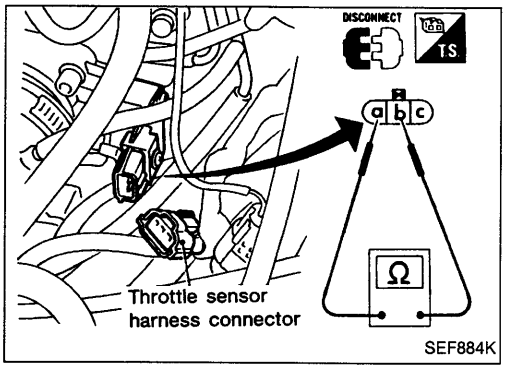
FUEL PUMP

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ⓐ and ⓑ.
   Resistance: Approximately 0.7Ω
   If N.G., replace fuel pump.



EXHAUST GAS SENSOR HEATER

Check resistance between terminals ⓐ and ⓒ.
Resistance: 3 - 1,000Ω
If N.G., replace exhaust gas sensor.



THROTTLE SENSOR

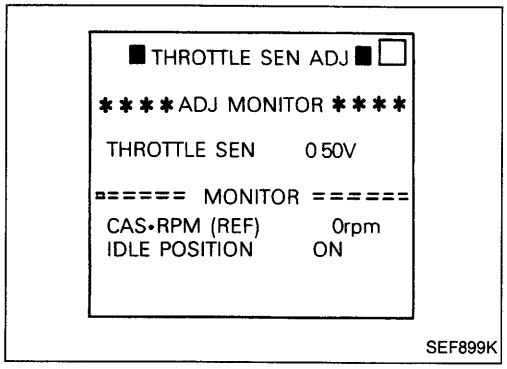
1. Disconnect throttle sensor harness connector.
2. Make sure that resistance between terminals ⓐ and ⓑ changes when opening throttle valve manually.

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 2
Partially released	2 - 10
Completely depressed	Approximately 10

If N.G., replace throttle sensor.

Adjustment

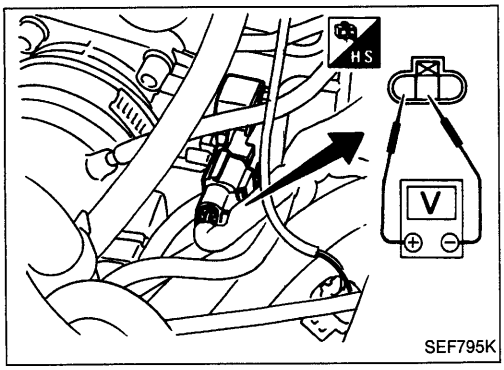
If throttle sensor is replaced or removed, it is necessary to install in proper position, by following the procedure as shown below:



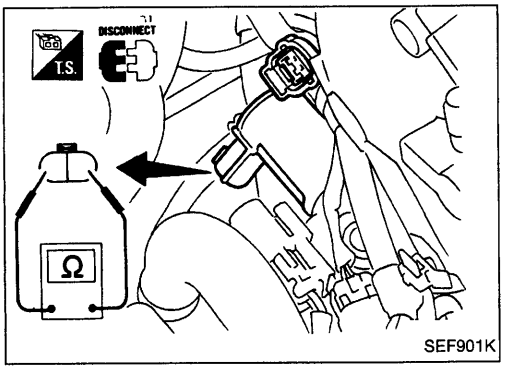
1. Install throttle sensor body in throttle chamber. Do not tighten bolts. Leave bolts loose.
2. Connect throttle sensor harness connector.
3. Start engine and warm it up sufficiently.
4. Perform "THROTTLE SEN ADJ" in "WORK SUPPORT" mode.

   Measure output voltage of throttle sensor using voltmeter.

Electrical Components Inspection (Cont'd)



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.



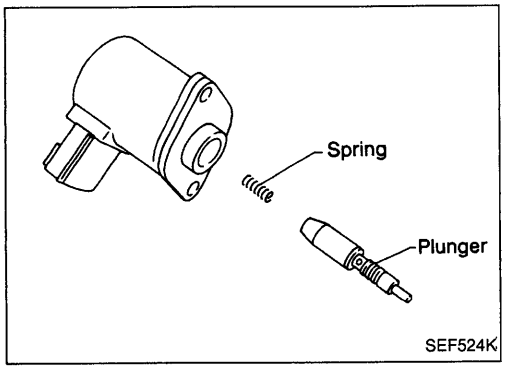
A.A.C. VALVE

Disconnect A.A.C. valve harness connector.

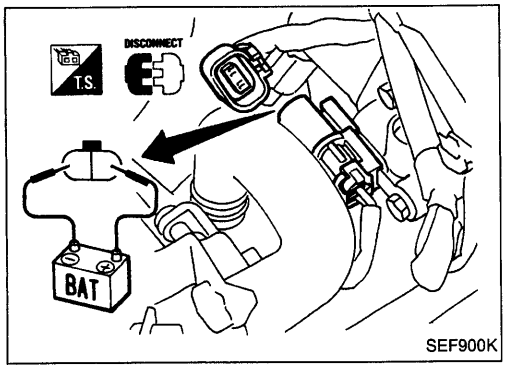
- Check A.A.C. valve resistance.

  Resistance:

  Approximately 10Ω



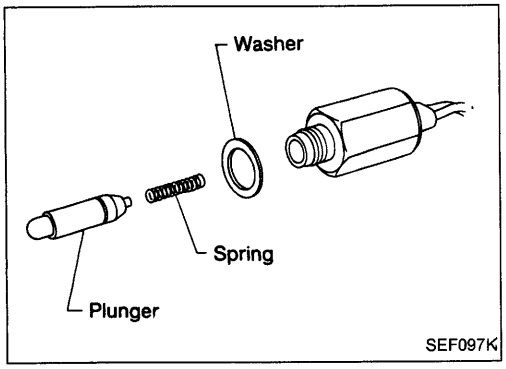
- Check plunger for seizing or sticking.
- Check for broken spring.



F.I.C.D. SOLENOID VALVE

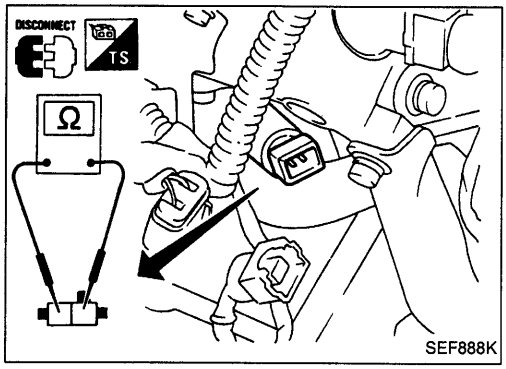
Disconnect F.I.C.D. solenoid valve harness connector.

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



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

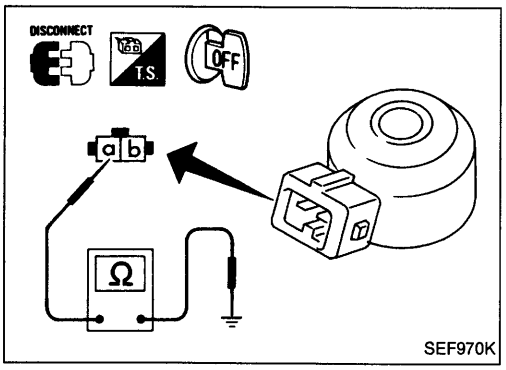
Electrical Components Inspection (Cont'd)



AIR REGULATOR

Disconnect air regulator harness connector.

- Check air regulator resistance.
  Resistance:
  Approximately 70 - 80Ω
- Check air regulator for clogging.



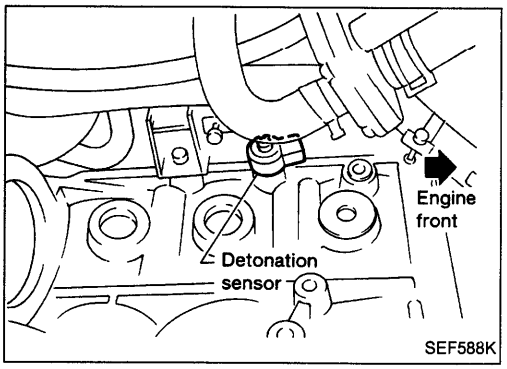
DETONATION SENSOR

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.

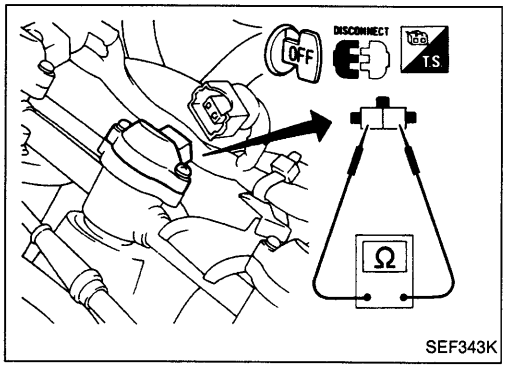
CAUTION:
Discard any detonation sensor which has been dropped or undergone shocks; use a new one.



Installation

Install detonation sensor with connector side facing engine front.

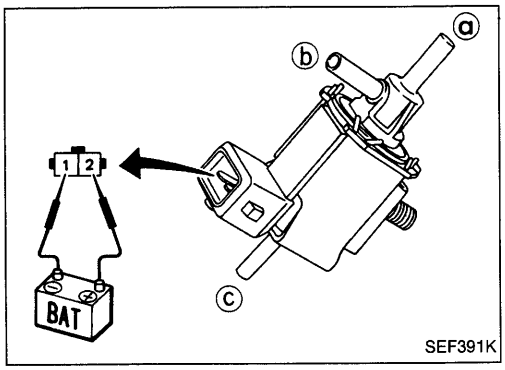
- When installing detonation sensor, ensure both upper and lower sides of detonation sensor and cylinder block mating surface are clean and free from foreign particles.
- When tightening detonation sensor, be careful not to apply excessive force to connector.
- Make sure detonation sensor is not in contact with any adjacent part after installing.



INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.
   Resistance: 10 - 14Ω
   If N.G., replace injector.

Electrical Components Inspection (Cont'd)

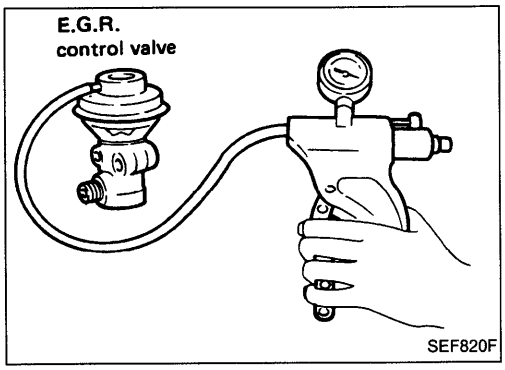


E.G.R. & CANISTER CONTROL SOLENOID VALVE AND A.I.V. CONTROL SOLENOID VALVE

Check solenoid valve, following the table as shown below:

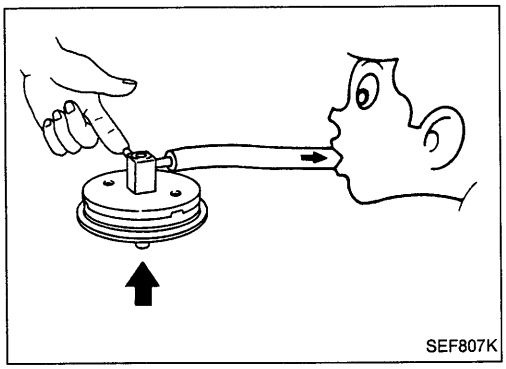
Conditions	Air passage continuity between ⓐ and ⓑ	Air passage continuity between ⓑ and ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

If N.G., replace E.G.R. & canister control solenoid valve.



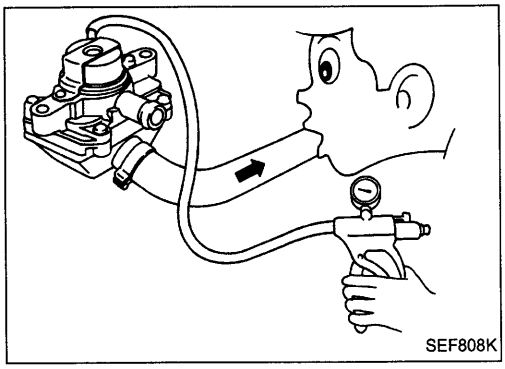
E.G.R. CONTROL VALVE

Apply vacuum to E.G.R. vacuum port with a hand vacuum pump.
E.G.R. control valve spring should lift.
If N.G., replace E.G.R. control valve.



B.P.T. VALVE

Plug one of two ports of B.P.T. valve.
Apply a pressure above 0.490 kPa (50 mmH_2O, 1.97 inH_2O) to check for leakage. If a leak is noted, replace valve.

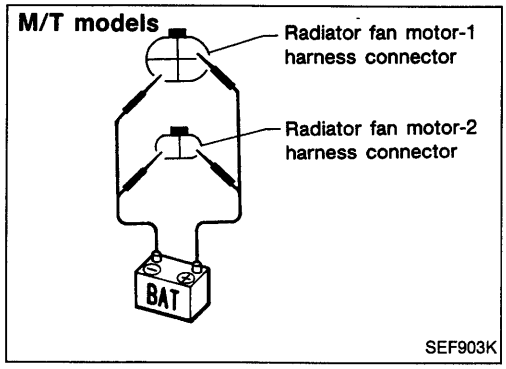


AIR INDUCTION VALVE (A.I.V.)

Apply vacuum to vacuum motor, suck or blow hose to make sure that air flows only towards the air induction side.

Electrical Components Inspection (Cont'd)

RADIATOR FAN MOTORS-1 AND -2

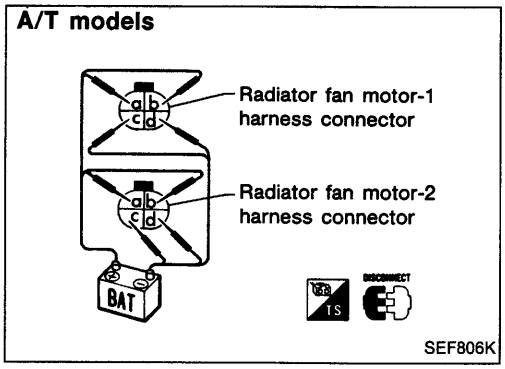


M/T models:

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.



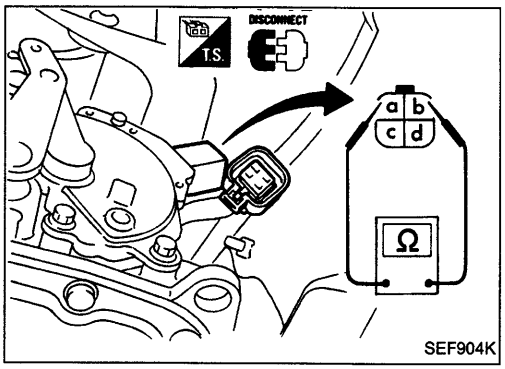
A/T models:

1. Disconnect radiator fan motor harness connectors.
2. Supply radiator fan motor terminals with battery voltage and check operation.

	Speed	Terminals	
		(⊕)	(⊖)
Radiator fan motor-1	Low	ⓑ	ⓒ
	High	ⓐ, ⓑ	ⓒ, ⓓ
Radiator fan motor-2	Low	ⓑ	ⓒ
	High	ⓐ, ⓑ	ⓒ, ⓓ

Radiator fan motor should operate.

If N.G., replace radiator fan motor.

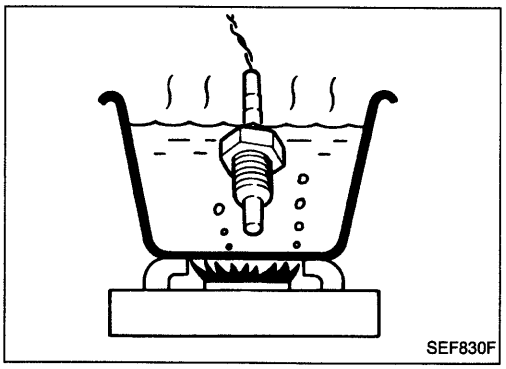


INHIBITOR SWITCH

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.



EXHAUST GAS TEMPERATURE SENSOR

Check resistance change and resistance value at 100°C (212°F).

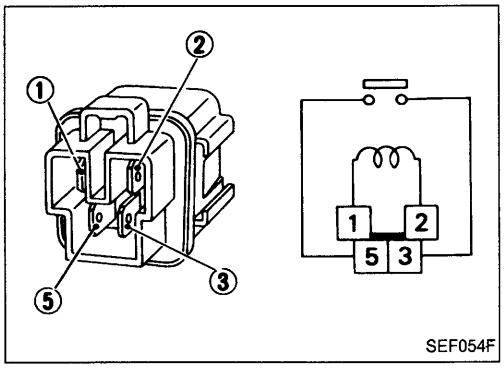
- **Resistance should decrease in response to temperature increase.**

  Resistance: 100°C (212°F)

  85.3 ± 8.53 kΩ

If N.G., replace exhaust gas temperature sensor.

Electrical Components Inspection (Cont'd)



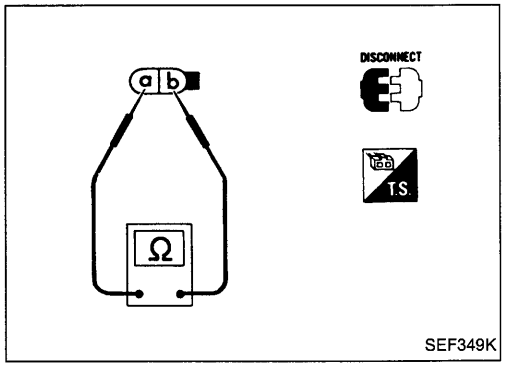
SEF054F

E.C.C.S. RELAY, RADIATOR FAN RELAY FOR M/T MODELS 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.



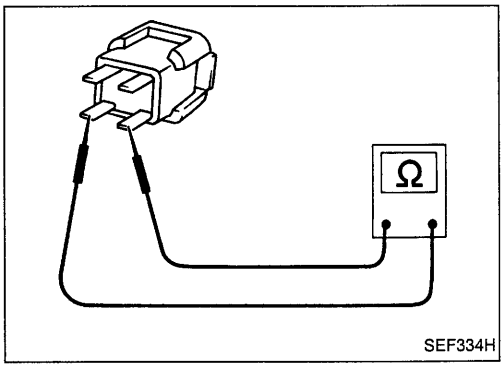
SEF349K

NEUTRAL SWITCH

Check continuity between terminals ⓐ and ⓑ.

Conditions	Continuity
Shift to Neutral	Yes
Shift to other position	No

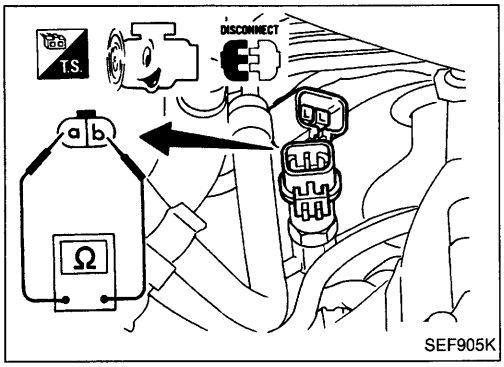
If N.G., replace relay.



SEF334H

RESISTOR

1. Disconnect resistor harness connector.
2. Check resistance between terminals ⓐ and ⓑ.
   Resistance: Approximately 2.2 kΩ
   If N.G., replace resistor.



SEF905K

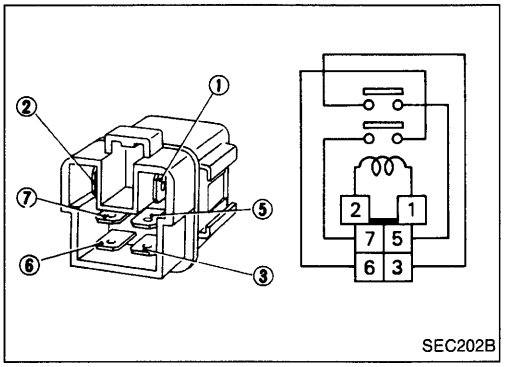
POWER STEERING OIL PRESSURE SWITCH

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.

Electrical Components Inspection (Cont'd)

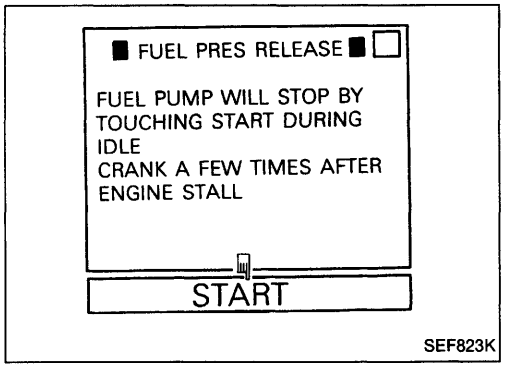


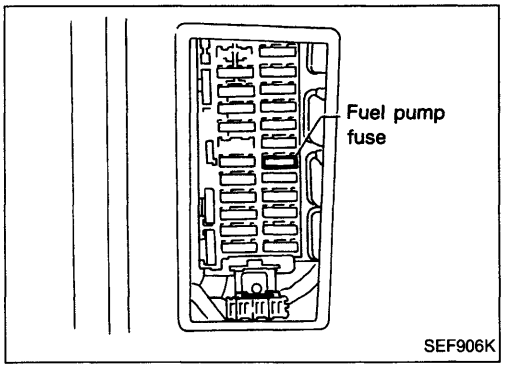
RADIATOR FAN RELAYS-1, -2 AND -3 FOR A/T MODELS

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.





Releasing Fuel Pressure

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

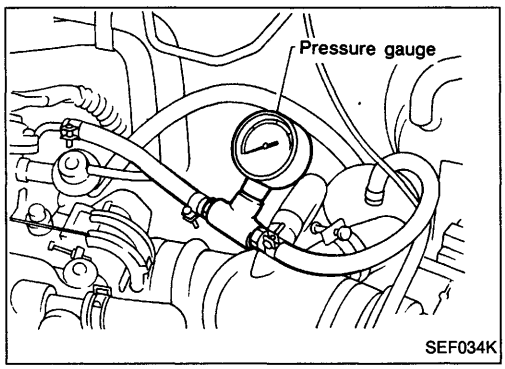
1. Turn ignition switch "ON".
2. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch off.

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 fuse.

Fuel Pressure Check

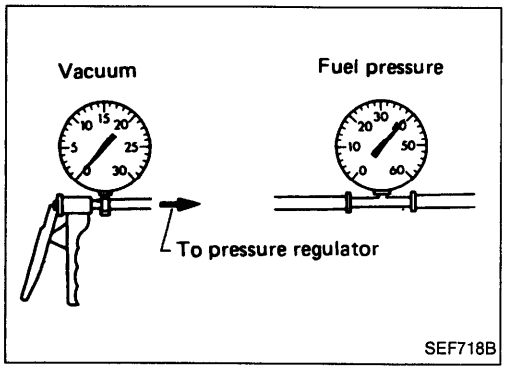
a. When reconnecting fuel line, always use new clamps.
b. Make sure that clamp screw does not contact adjacent parts.
c. Use a torque driver to tighten clamps.
d. Use Pressure Gauge to check fuel pressure.
e. Do not perform fuel pressure check while fuel pressure regulator control system is operating; 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.



5. Read the indication of fuel pressure gauge.
   At idling:
   Approximately 245 kPa (2.5 kg/cm^2, 36 psi)
   A few seconds after ignition switch is turned OFF to ON:
   Approximately 294 kPa (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.

Fuel Pressure Check (Cont'd)

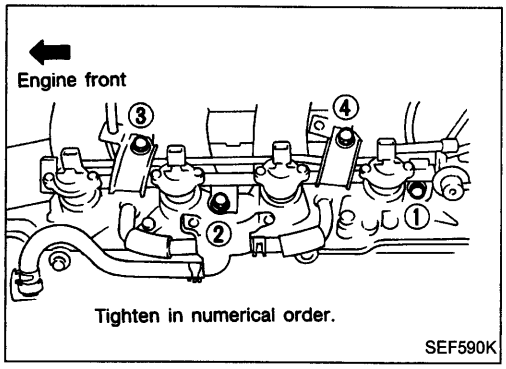


9. Start engine and read indication of fuel pressure gauge as vacuum is changed.

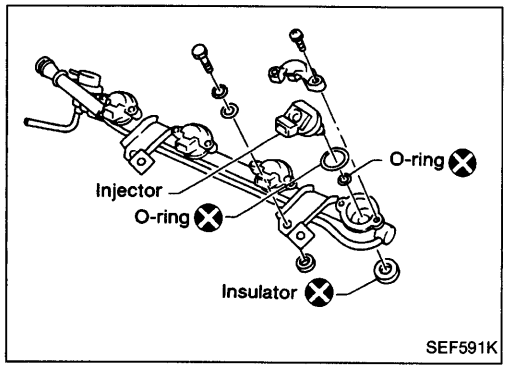
Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.

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.



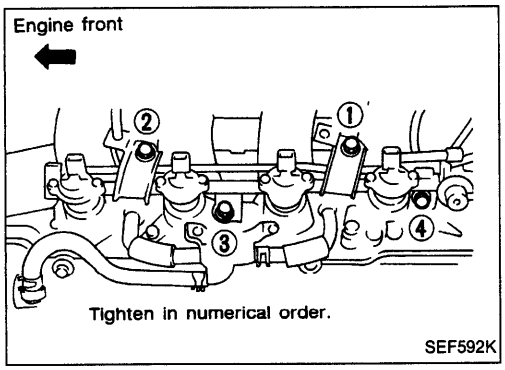
6. Push out any malfunctioning injector from fuel tube assembly.

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.

Injector Removal and Installation (Cont'd)



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 21 to 26 N·m (2.1 to 2.7 kg-m, 15 to 20 ft-lb).**
10. Install fuel hoses to fuel tube assembly.

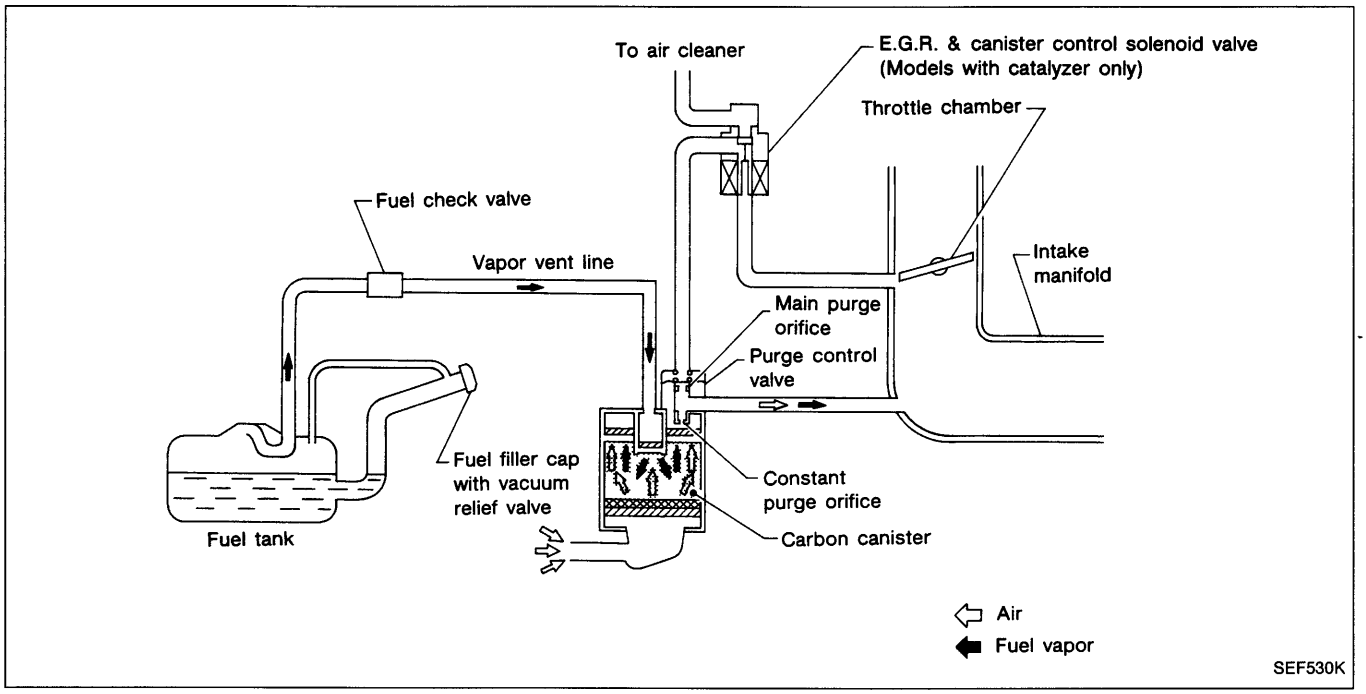
Lubricate fuel hoses with a smear of silicone oil.

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

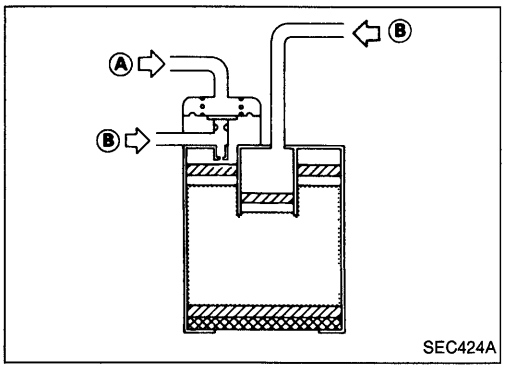


The evaporative emission control system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

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

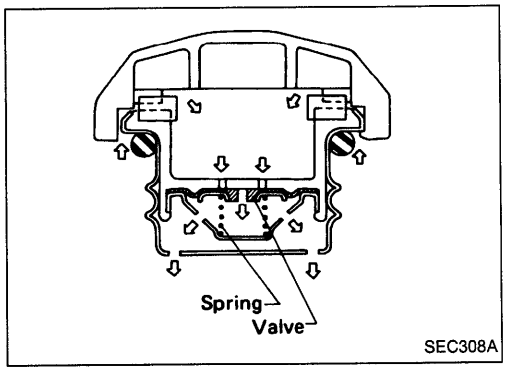
CARBON CANISTER

Check carbon canister as follows:

Ⓐ : Blow air and ensure that there is no leakage.

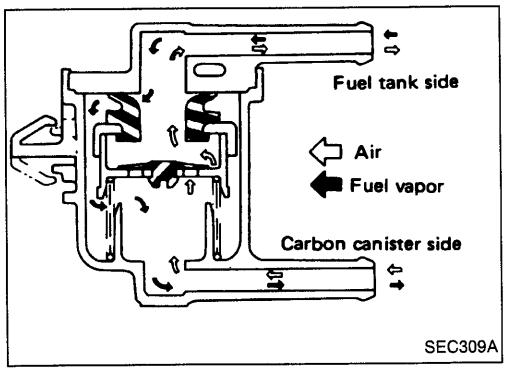
Ⓑ : Blow air and ensure that there is leakage.

Inspection (Cont'd)



FUEL TANK VACUUM RELIEF VALVE

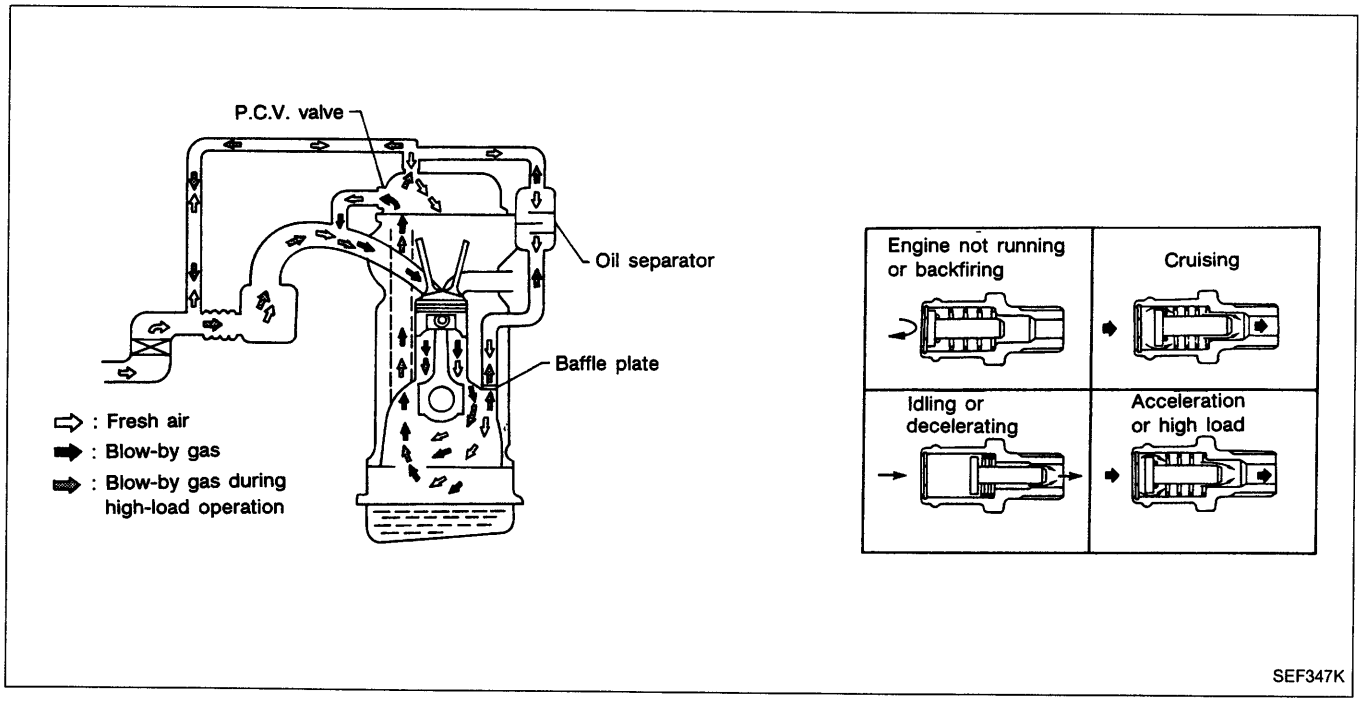
1. Wipe clean valve housing.
2. Suck air through the cap. A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition. Note also that, by further sucking air, the resistance should disappear with valve clicks.
3. If valve is clogged or if no resistance is felt, replace cap as an assembly.



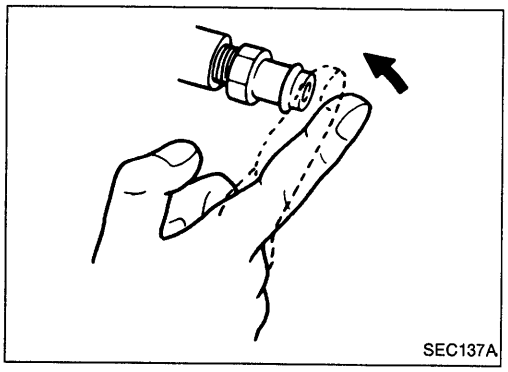
FUEL CHECK VALVE

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.

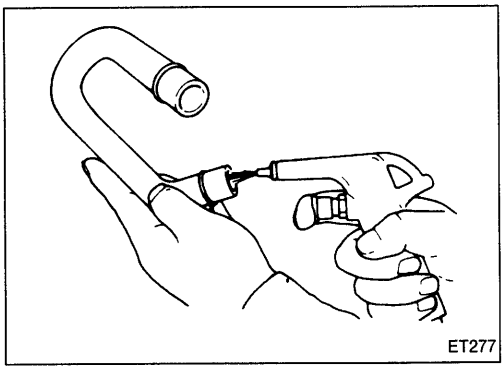


Inspection

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.

General Specifications

PRESSURE REGULATOR Fuel pressure at idling kPa (kg/cm^2, psi)	
Vacuum hose is connected	Approximately 245 (2.5, 36)
Vacuum hose is disconnected	Approximately 294 (3.0, 43)

Inspection and Adjustment

Idle speed*1 rpm No-load*2 (in "N" position)	800 ± 50
Air conditioner: ON (in "N" position)	850 ± 50
Ignition timing	15° ± 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	1.3 - 1.7*

*: 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

EXHAUST GAS TEMPERATURE SENSOR

Resistance [at 100°C (212°F)] kΩ	85.3 ± 8.53

EXHAUST GAS SENSOR HEATER

Resistance Ω	3 - 1,000

FUEL PUMP

Resistance Ω	Approximately 0.7

A.A.C. VALVE

Resistance Ω	Approximately 10.0

INJECTOR

Resistance Ω	10 - 14

RESISTOR

Resistance kΩ	Approximately 2.2

THROTTLE SENSOR

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 2
Partially released	2 - 10
Completely depressed	Approximately 10

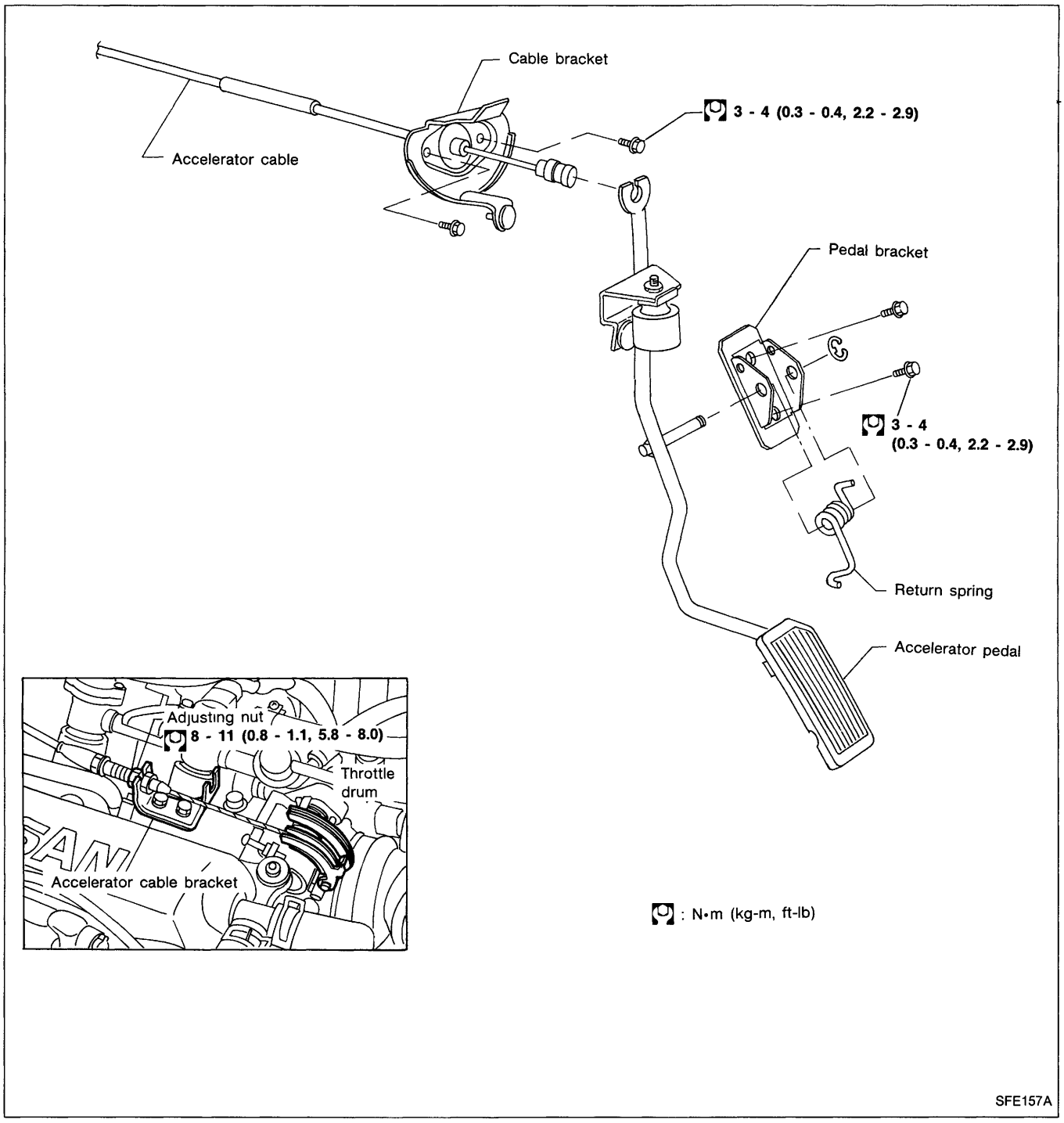
ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEMS

SECTION FE

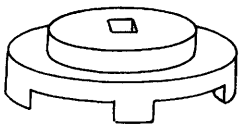
CONTENTS

ACCELERATOR CONTROL SYSTEM FE-2
FUEL SYSTEM FE-3
EXHAUST SYSTEM FE-8

- When removing accelerator wire, make a mark to indicate lock nut's initial position.
- Check that throttle valve fully opens when accelerator pedal is fully depressed and that it returns to idle position when pedal is released.
- Adjust accelerator wire according to the following procedure.
  Tighten "adjusting nut" until "throttle drum" starts to move.
  From that position turn back "adjusting nut" 1.5 to 2 turns, and fasten it with a lock nut.
- Check accelerator control parts for improper contact with any adjacent parts.
- When connecting accelerator wire, be careful not to twist or scratch its inner wire.

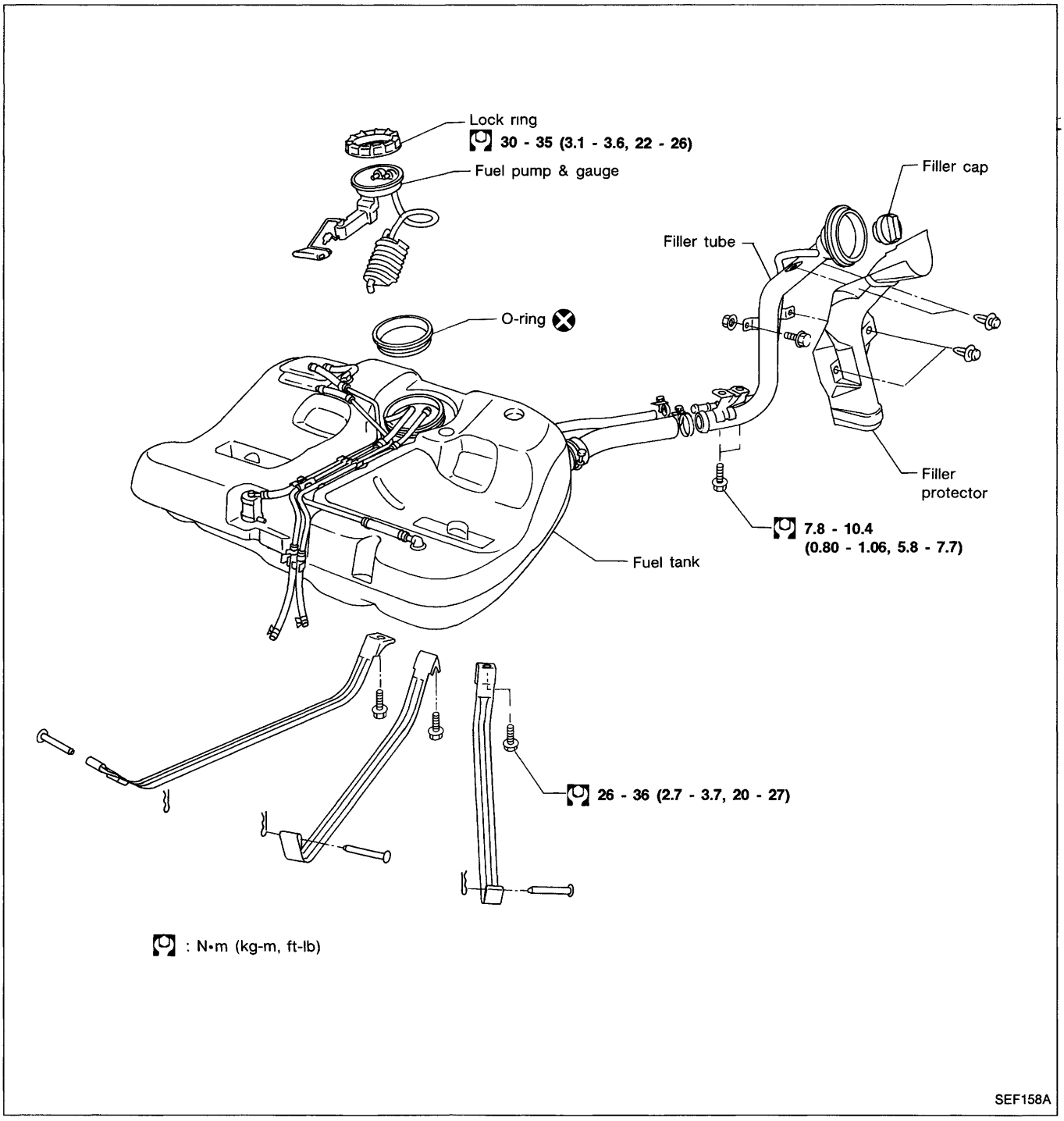


SPECIAL SERVICE TOOL

Tool number (Kent-Moore No.) Tool name	Description
KV999G0010 (X38879) Fuel tank lock ring socket	

WARNING:
When replacing fuel line parts, be sure to observe the following:

- **Put a "CAUTION: INFLAMMABLE" sign in workshop.**
- **Be sure to furnish workshop with a CO_2 fire extinguisher.**
- **Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.**
- **Be sure to disconnect battery ground cable before conducting operations.**
- **Put drained fuel in an explosion-proof container and put lid on securely.**

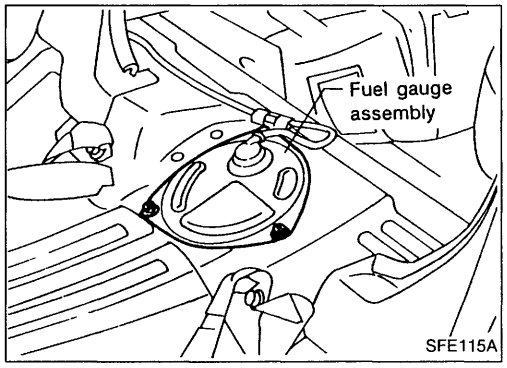


Fuel Tank

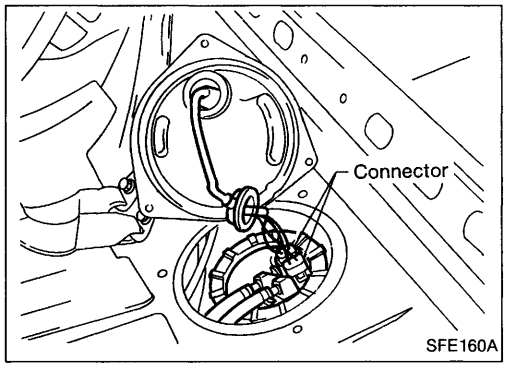
REMOVAL

CAUTION:

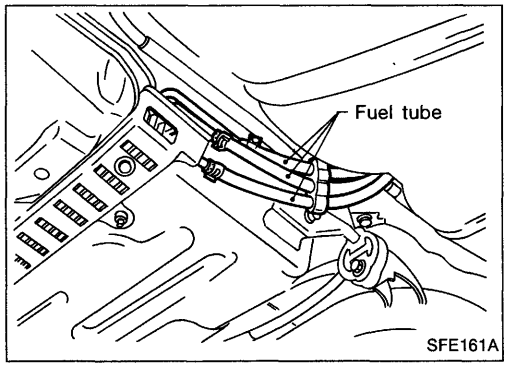
- **Do not disconnect any fuel line unless absolutely necessary.**
- **Plug hose and pipe openings to prevent entry of dust or dirt.**



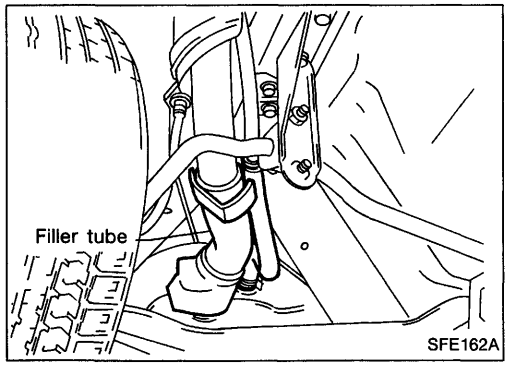
1. Release fuel pressure from fuel line. Refer to "Fuel Filter Replacement" in MA section.
2. Remove inspection hose cover located beneath rear seat.



3. Disconnect connectors.

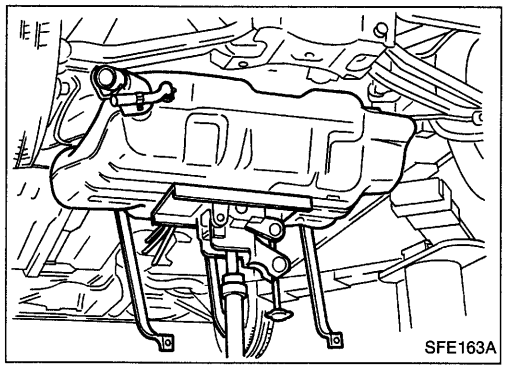


4. Disconnect tubes.



5. Disconnect filler protector.
6. Disconnect filler tube.

Fuel Tank (Cont'd)


SFE163A

7. Remove fuel tank mounting bolts (three), and remove fuel tank as shown in the figure.

INSTALLATION

- **Installation procedure is basically the reverse order of removal.**

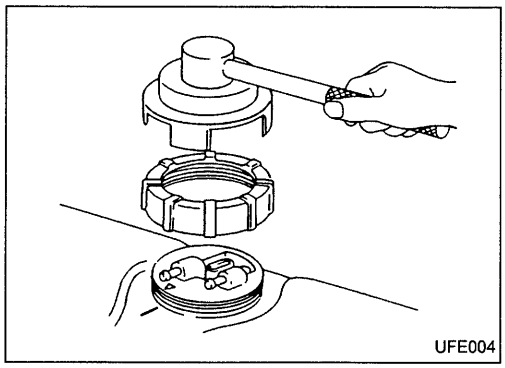
CAUTION:

- **Do not kink or twist hose and tube when they are installed.**
- **Do not tighten hose clamps excessively to avoid damaging hoses.**
- **Tighten bolts to specified torque.**
- **After assembly, run engine and check for leaks at connections.**

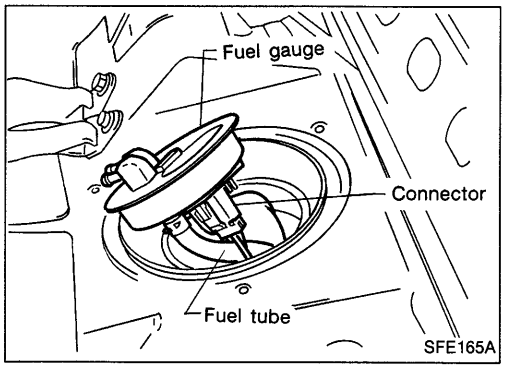
Fuel Pump and Gauge

REMOVAL

1. Release fuel pressure from fuel line.
   Refer to "Fuel Filter Replacement" in MA section.
2. Remove inspection hole cover located beneath rear seat.
3. Disconnect connectors and fuel tubes.
4. Remove lock ring (Use S.S.T. X38879).

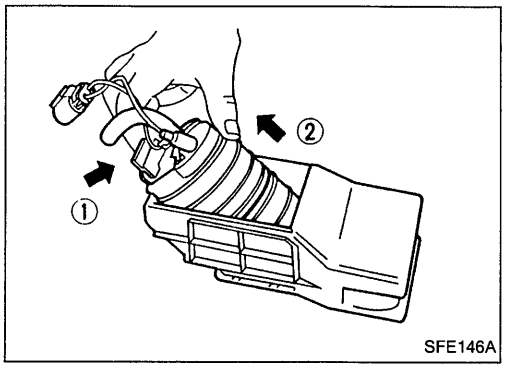

UFE004

5. Remove fuel gauge assembly and disconnect tubes and connector.



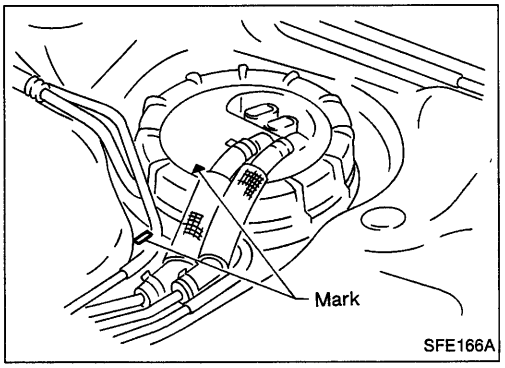
SFE165A

6. Remove fuel pump as shown in the figure.



SFE146A

Fuel Pump and Gauge (Cont'd)

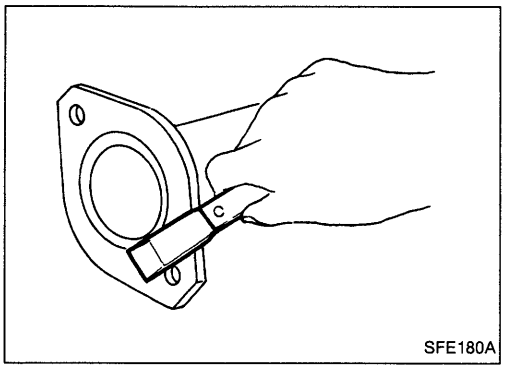


INSTALLATION

- **Installation procedure is basically the reverse order of removal.**

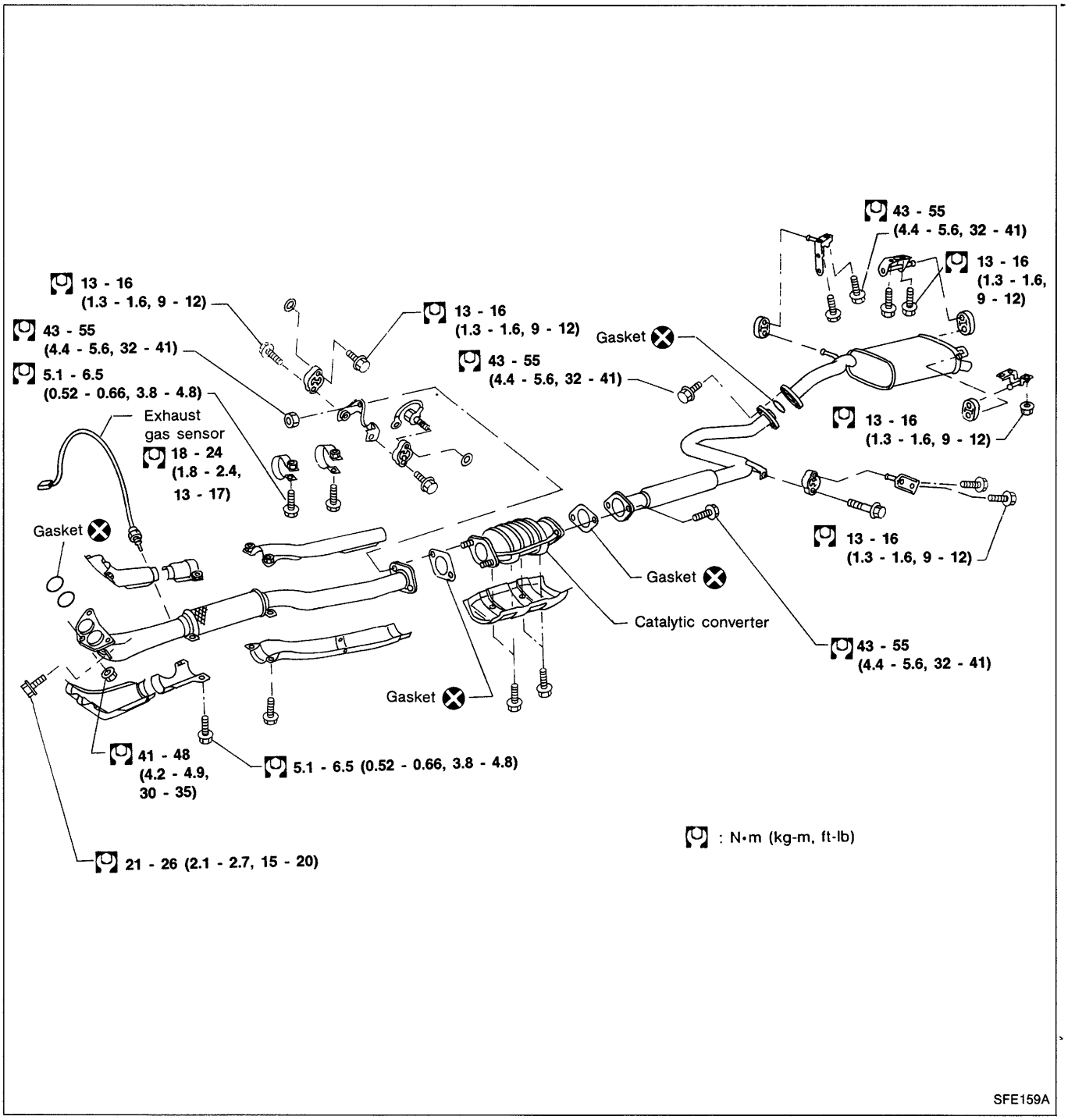
CAUTION:

- **Always replace O-ring with a new one.**
- **Align parts with alignment marks.**
- **Tighten lock ring to specified torque.**



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.**



SECTION CL

CONTENTS

PRECAUTION AND PREPARATION CL-2
CLUTCH SYSTEM CL-3
INSPECTION AND ADJUSTMENT CL-4
CLUTCH RELEASE MECHANISM CL-5
CLUTCH DISC AND CLUTCH COVER CL-7
SERVICE DATA AND SPECIFICATIONS (S.D.S.) CL-9

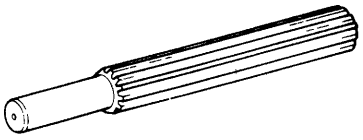
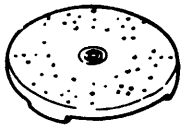
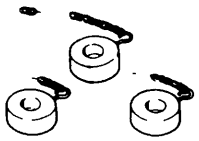
Precaution

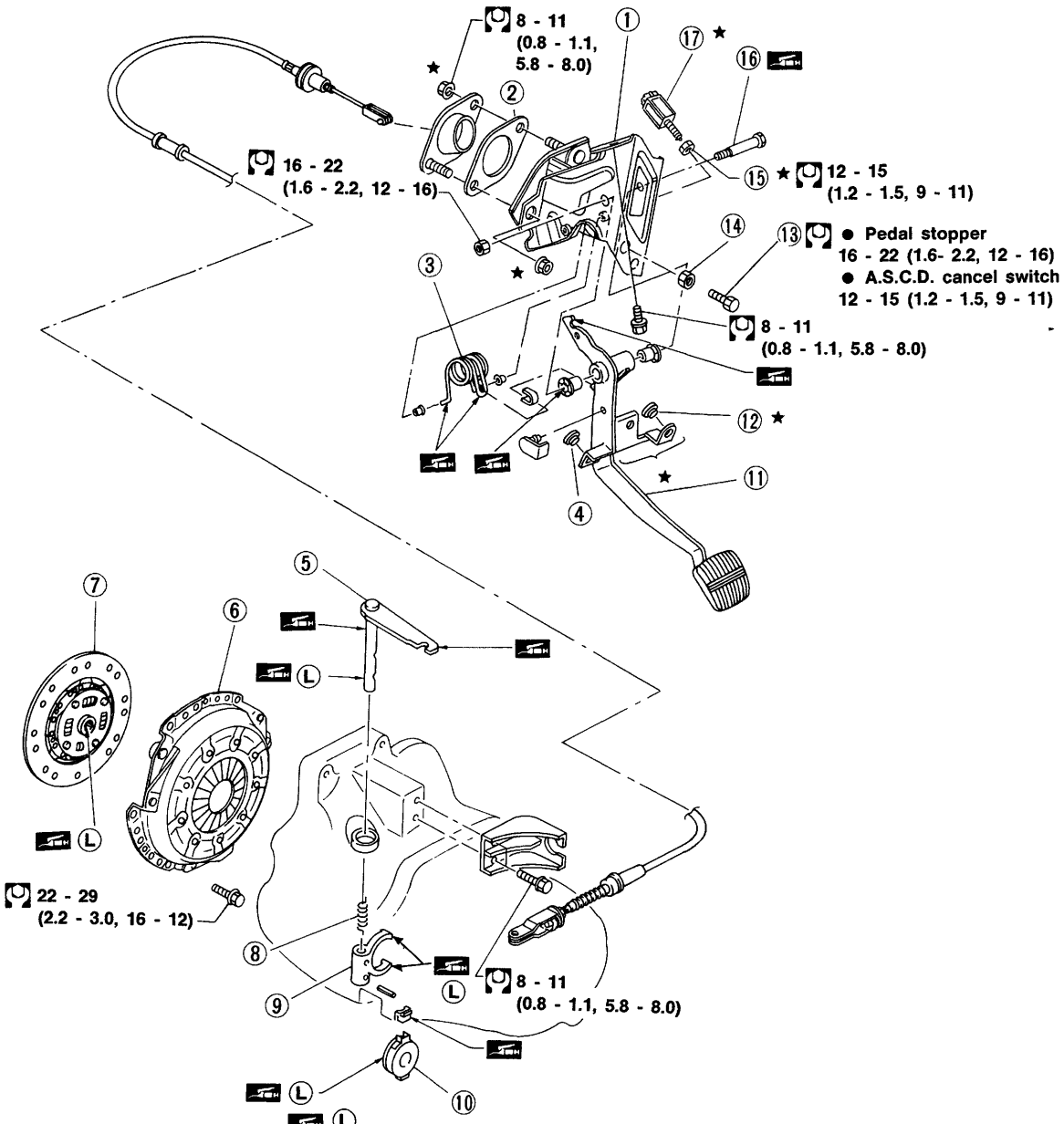
WARNING:
After cleaning the clutch disc, wipe it with a dust collector. Do not use compressed air.

Preparation

SPECIAL SERVICE TOOLS

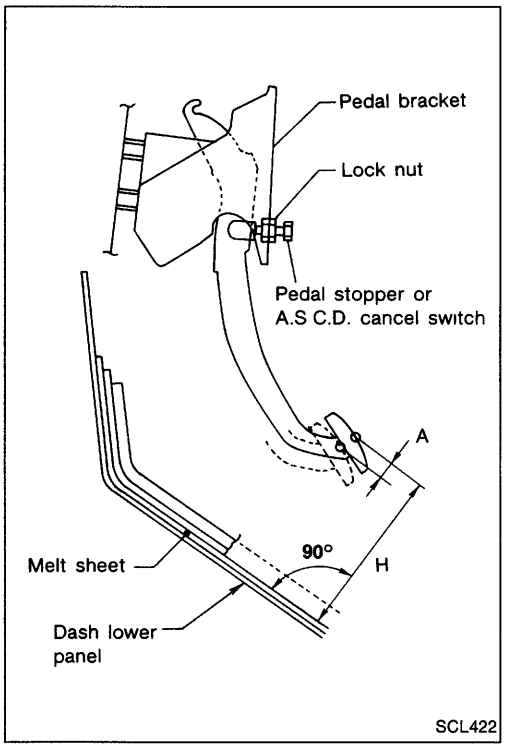
*: Special tool or commercial equivalent

Tool number (Kent-Moore No.) Tool name	Description	
KV30101000* (J33213) 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	



SCL428

① Clutch pedal bracket
② Insulator
③ Assist spring
④ Stopper rubber
⑤ Withdrawal lever
⑥ Clutch cover
⑦ Clutch disc
⑧ Return spring
⑨ Clutch lever
⑩ Release bearing
⑪ Clutch pedal
⑫ Stopper rubber
⑬ Pedal stopper or A.S.C.D. cancel switch
⑭ Lock nut
⑮ Lock nut
⑯ Fulcrum pin
⑰ Clutch interlock switch

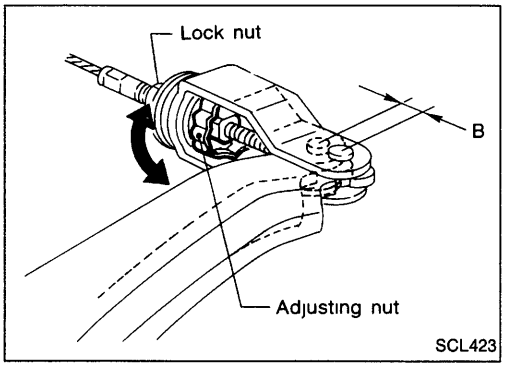


Adjusting Clutch Pedal

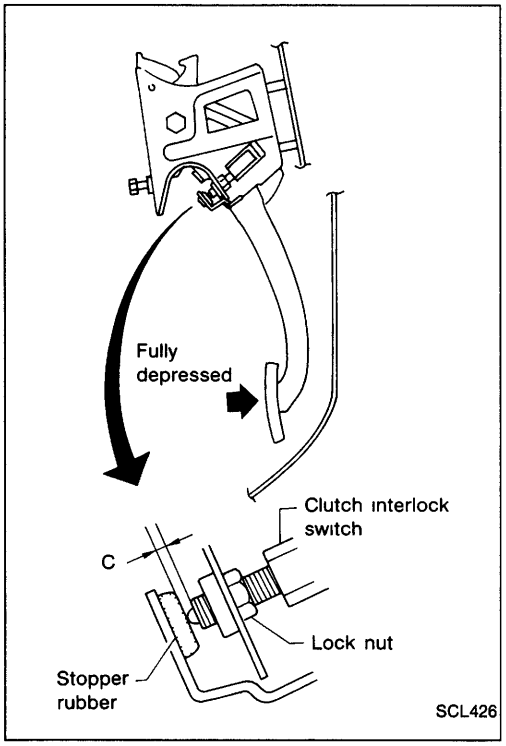
1. Adjust pedal height with pedal stopper or A.S.C.D. cancel switch.
   Pedal height "H":
   159.5 - 169.5 mm (6.28 - 6.67 in)
2. Adjust withdrawal lever play "B" according to the following procedure.

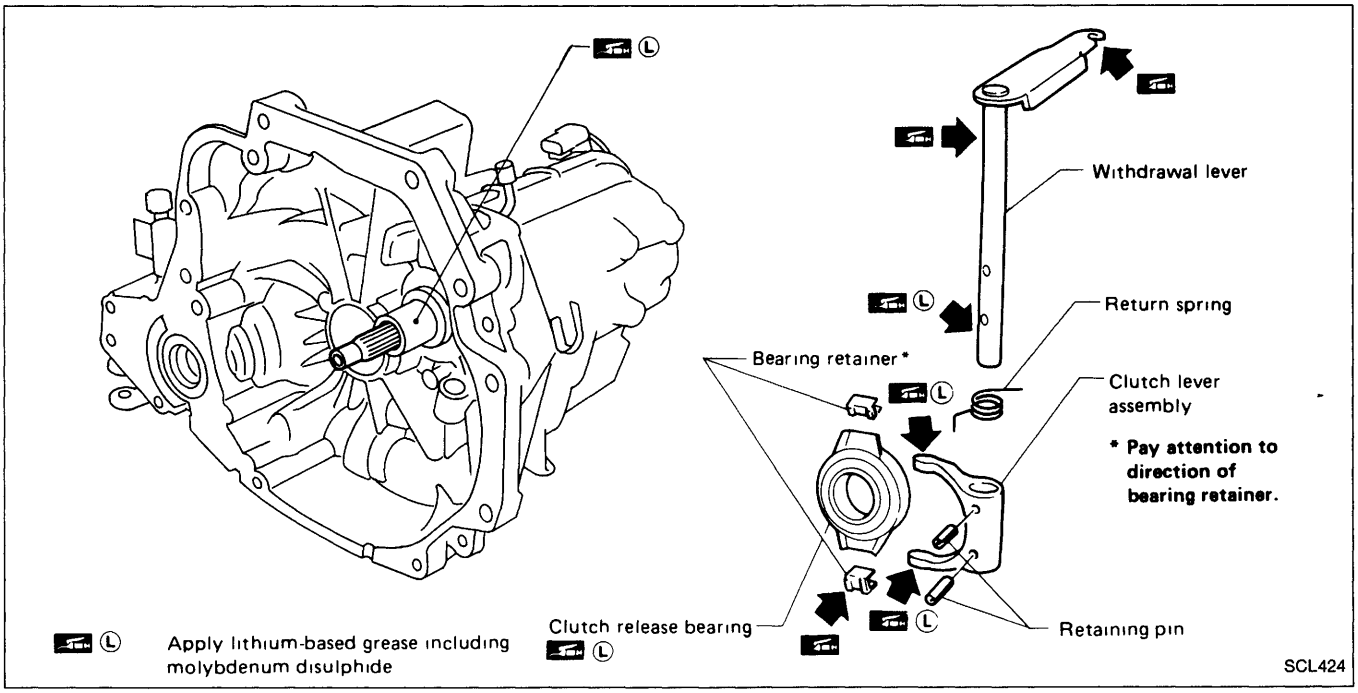
(1) Push withdrawal lever by hand until resistance is felt, and then tighten adjusting nut.
(2) Turn back adjusting nut 2.5 to 3.5 turns, and then tighten lock nut.
   Withdrawal lever play "B":
   2.5 - 3.5 mm (0.098 - 0.138 in)
   Lock nut:
   : 3 - 4 N·m (0.3 - 0.4 kg-m, 2.2 - 2.9 ft-lb)

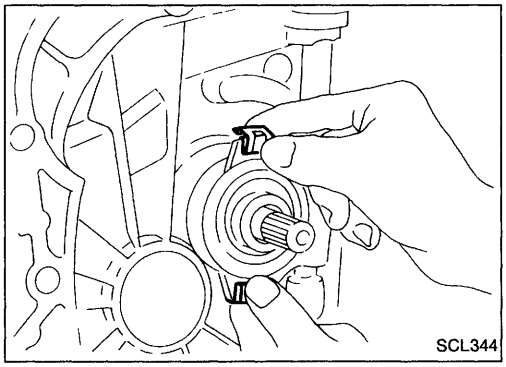
3. As a final check, measure pedal free travel at center of pedal pad.
   Pedal free travel "A":
   10.8 - 15.1 mm (0.425 - 0.594 in)



4. U.S.A. models only
   Adjust clearance "C" between stopper rubber and threaded end of clutch interlock switch while depressing clutch pedal fully.
   Clearance "C":
   0.1 - 1.0 mm (0.004 - 0.039 in)

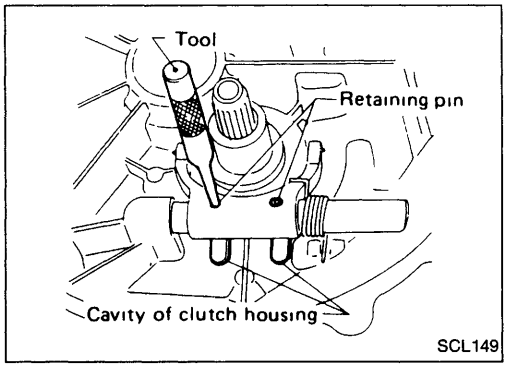






REMOVAL AND INSTALLATION

- Remove release bearing by pulling bearing retainers outward.

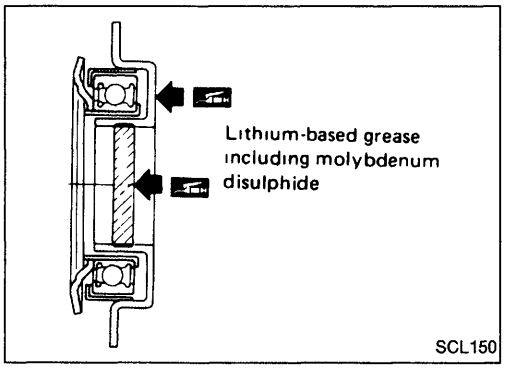


- Align retaining pin with cavity of clutch housing and tap out retaining pin.

INSPECTION

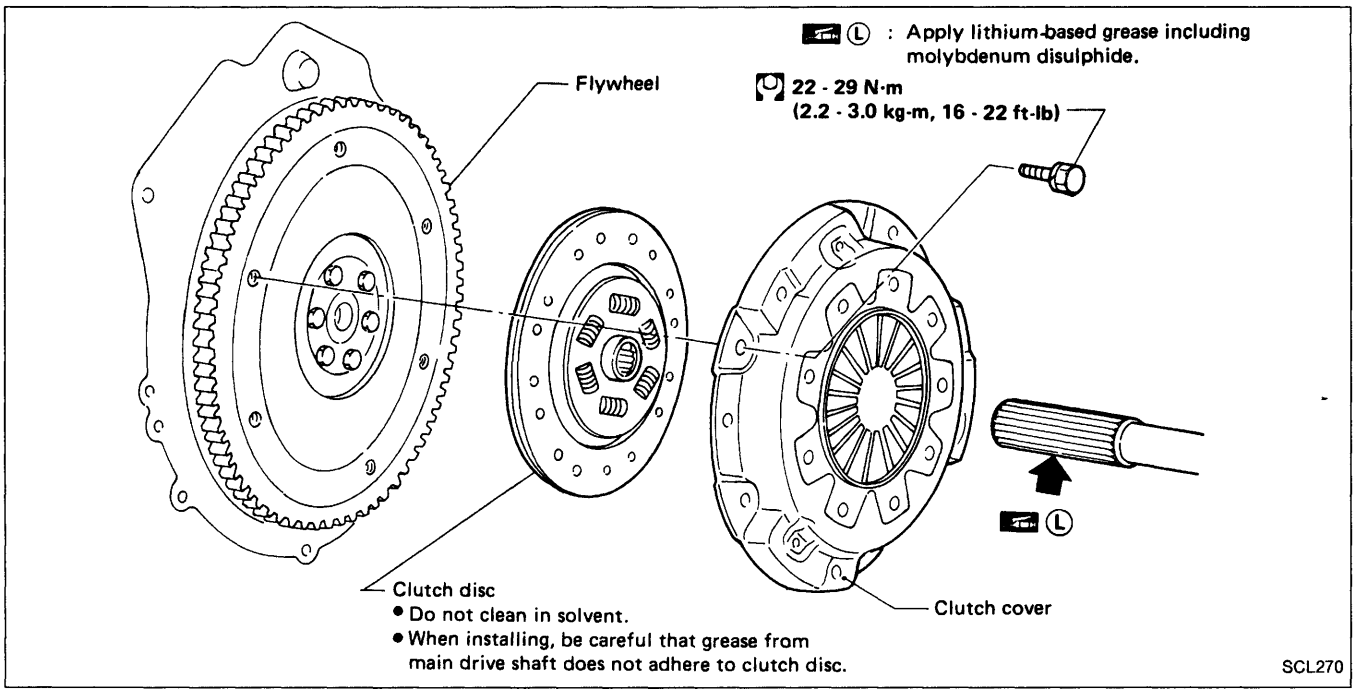
Check the following items, and replace if necessary.

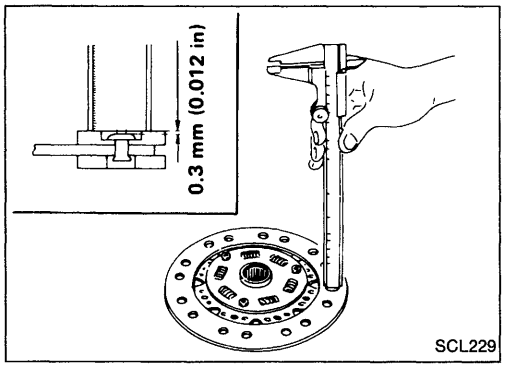
- Release bearing, to see that it rolls freely and is free from noise, cracks, pitting or wear
- Release sleeve and withdrawal lever rubbing surface, for wear, rust or damage



LUBRICATION

- Apply recommended grease to contact surface and rubbing surface.
- **Too much lubricant might damage clutch disc facing.**



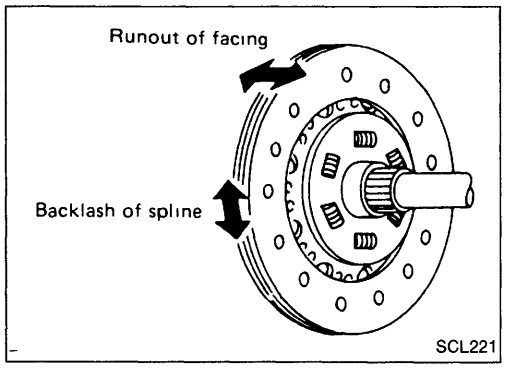


Clutch Disc

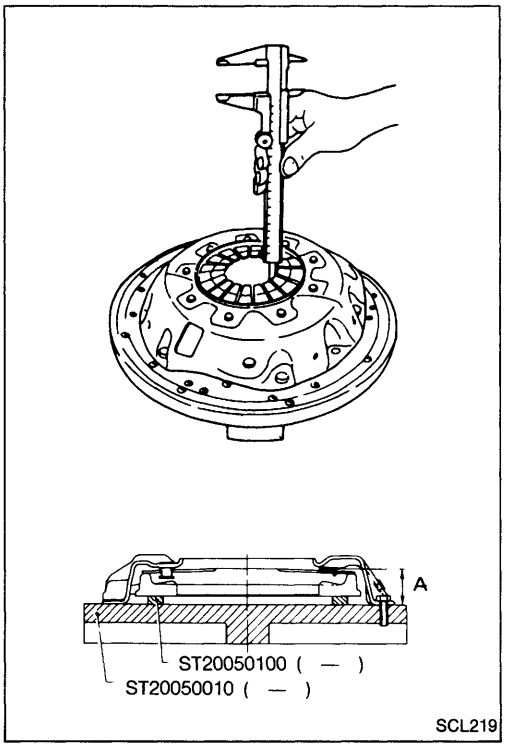
INSPECTION

Check clutch disc for wear of facing.

Wear limit of facing surface to rivet head:
0.3 mm (0.012 in)



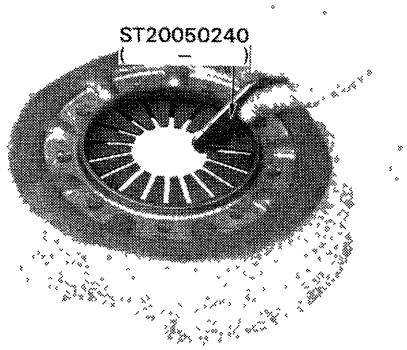
- Check clutch disc for backlash of spline and runout of facing.
  Maximum backlash of spline (at outer edge of disc):
  215TBL 0.9 mm (0.035 in)
  Runout limit:
  1.0 mm (0.039 in)
  Distance of runout check point (from hub center):
  215TBL 102.5 mm (4.04 in)
- Check clutch disc for burns, discoloration or oil or grease leakage. Replace if necessary.



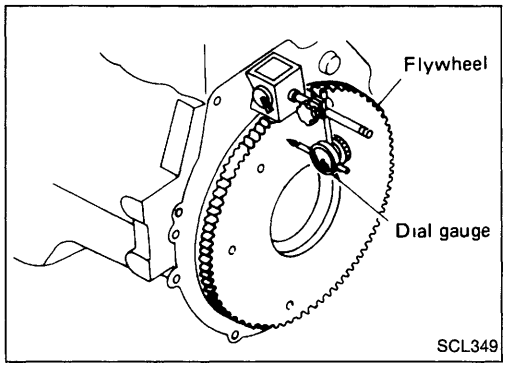
Clutch Cover and Flywheel

INSPECTION AND ADJUSTMENT

- Set Tool and check height and unevenness of diaphragm spring.
  Diaphragm spring height "A":
  C215S 30.5 - 32.5 mm (1.201 - 1.280 in)
- Check thrust rings for wear or damage by shaking cover assembly and listening for chattering noise, or lightly hammering on rivets for a slightly cracked noise. Replace clutch cover assembly if necessary.
- Check pressure plate and clutch disc contact surface for slight burns or discoloration. Repair pressure plate with emery paper.
- Check pressure plate and clutch disc contact surface for deformation or damage. Replace if necessary.

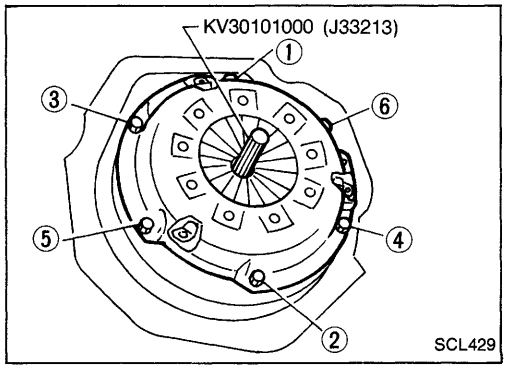


- Adjust unevenness of diaphragm spring with Tool.
  Uneven limit:
  0.7 mm (0.028 in)



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)



INSTALLATION

- Insert Tool into clutch disc hub when installing clutch cover and disc.
- Tighten bolts in numerical order.
- **Be careful that grease does not contaminate clutch facing.**

General Specifications

CLUTCH CONTROL SYSTEM

Type of clutch control	Mechanical type

CLUTCH COVER

Engine	SR20DE
Model	C215S
Full-load N (kg, lb)	4,413 (450, 992)

CLUTCH DISC

Unit: mm (in)

Engine	SR20DE
Model	215TBL
Facing size (Outer dia. x inner dia. x thickness)	215 x 140 x 3.5 (8.46 x 5.51 x 0.138)
Thickness of disc assembly with load	7.6 - 8.0 (0.299 - 0.315) with 3,923 N (400 kg, 882 lb)

Inspection and Adjustment

CLUTCH PEDAL

Unit: mm (in)

Pedal height*	159.5 - 169.5 (6.28 - 6.67)
Pedal free travel	10.8 - 15.1 (0.425 - 0.594)
Withdrawal lever play	2.5 - 3.5 (0.098 - 0.138)

*: Measured from surface of melt sheet to surface of pedal pad.

CLUTCH COVER

Unit: mm (in)

Cover model	C215S
Diaphragm spring height	30.5 - 32.5 (1.201 - 1.280)
Uneven limit of diaphragm spring toe height "A"	0.7 (0.028)

CLUTCH DISC

Unit: mm (in)

Disc model	215TBL
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)	102.5 (4.04)
Maximum backlash of spline (at outer edge of disc)	0.9 (0.035)

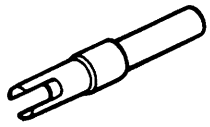
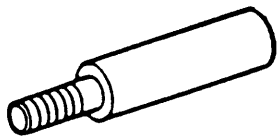
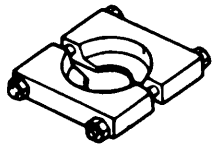
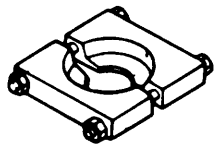
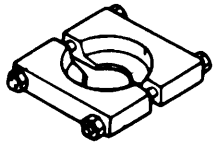
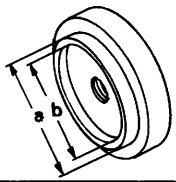
MANUAL TRANSMISSION

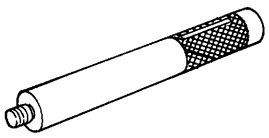
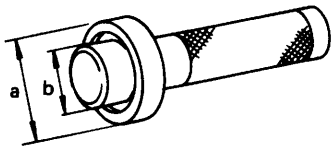
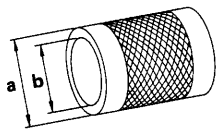
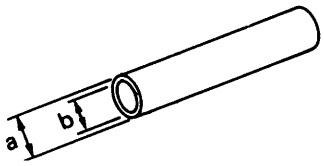
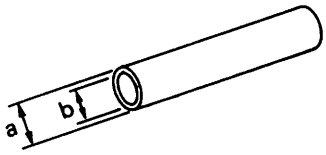
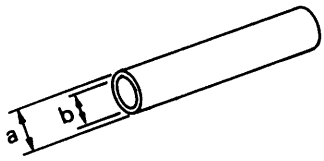
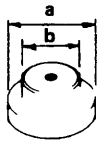
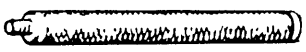
SECTION MT

CONTENTS

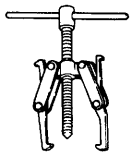
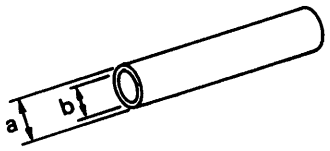
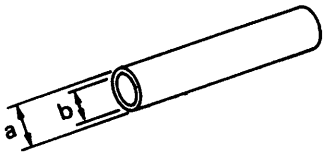
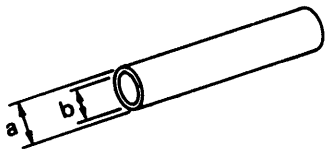
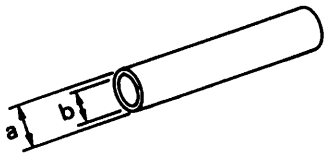
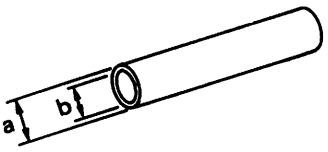
PREPARATION ..... MT- 2
ON-VEHICLE SERVICE ..... MT- 5
REMOVAL AND INSTALLATION ..... MT- 7
TRANSAXLE GEAR CONTROL MT-10
MAJOR OVERHAUL MT-11
DISASSEMBLY MT-14
REPAIR FOR COMPONENT PARTS MT-17
ADJUSTMENT MT-40
ASSEMBLY MT-42
SERVICE DATA AND SPECIFICATIONS (S.D.S.) MT-46

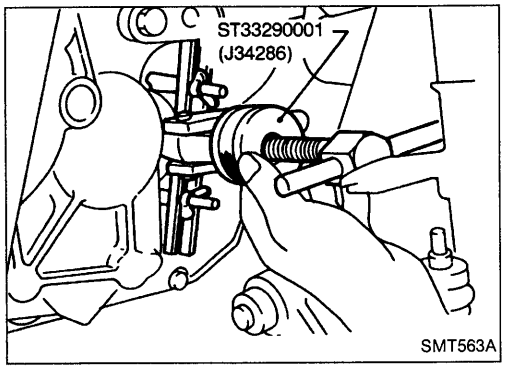
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description	
KV38107700 (—) Preload adapter		Measuring turning torque of final drive assembly 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 or KV38107700.)
KV32101000 (J25689-A) Pin punch		Removing and installing retaining pin
ST22730000 (J25681) Puller		Removing 5th main gear
ST30031000 (J22912-01) Puller		Removing differential side bearing inner race (F32A) Removing 3rd and 4th synchronizer Measuring wear of 2nd & 3rd baulk ring
ST30021000 (J22912-01) Puller		Removing 5th synchronizer
ST33290001 (J34286) Puller		Removing differential oil seal Removing differential side bearing outer race
KV31103000 (—) Drift	 a: 59 mm (2.32 in) dia. b: 49 mm (1.93 in) dia.	Installing differential oil seal (Use with ST35325000.) (Except for F32V left side)

Tool number (Kent-Moore No.) Tool name	Description	
ST35325000 (—) Drift handle		Installing differential oil seal (Use with KV31103000.)
KV38102100 (J25803-01) Drift		Installing input shaft rear bearing **a: 44 mm (1.73 in) dia.** **b: 24.5 mm (0.965 in) dia.**
ST33200000 (J26082) Drift		Installing mainshaft front bearing **a: 60 mm (2.36 in) dia.** **b: 44.5 mm (1.752 in) dia.**
ST22350000 (J25678-01) Drift		Installing input shaft front bearing **a: 34 mm (1.34 in) dia.** **b: 28 mm (1.10 in) dia.**
ST22452000 (—) Drift		Installing 1st & 2nd synchronizer Installing 3rd & 4th synchronizer **a: 45 mm (1.77 in) dia.** **b: 36 mm (1.42 in) dia.**
ST37750000 (J25863-01) Drift		Installing 5th main gear Installing input shaft oil seal Installing 5th synchronizer **a: 40 mm (1.57 in) dia.** **b: 31 mm (1.22 in) dia.**
ST30621000 (J25742-5) Drift		Installing differential side bearing outer race (F32A and right side of F32V) (Use with ST30611000.) **a: 79 mm (3.11 in) dia.** **b: 59 mm (2.32 in) dia.**
ST30611000 (J25742-1) Drift handle		(Use with ST30621000.)

COMMERCIAL SERVICE TOOLS

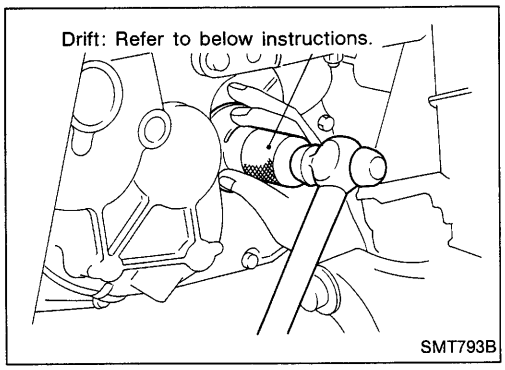
Tool name	Description	
Puller		Removing input shaft front bearing Removing mainshaft rear bearing
Drift		Installing differential side bearing inner race (F32V right side and F32A) **a: 56 mm (2.20 in) dia.** **b: 50.5 mm (1.988 in) dia.**
Drift		Installing striking rod oil seal **a: 38 mm (1.50 in) dia.** **b: 32 mm (1.26 in) dia.**
Drift		Installing differential oil seal (F32V left side) **a: 88 mm (3.46 in) dia.** **b: 72 mm (2.83 in) dia.**
Drift		Installing differential side bearing outer race (F32V left side) **a: 104 mm (4.09 in) dia.** **b: 98 mm (3.86 in) dia.**
Drift		Installing differential side bearing inner race (F32V left side) **a: 91 mm (3.58 in) dia.** **b: 81 mm (3.19 in) dia.**



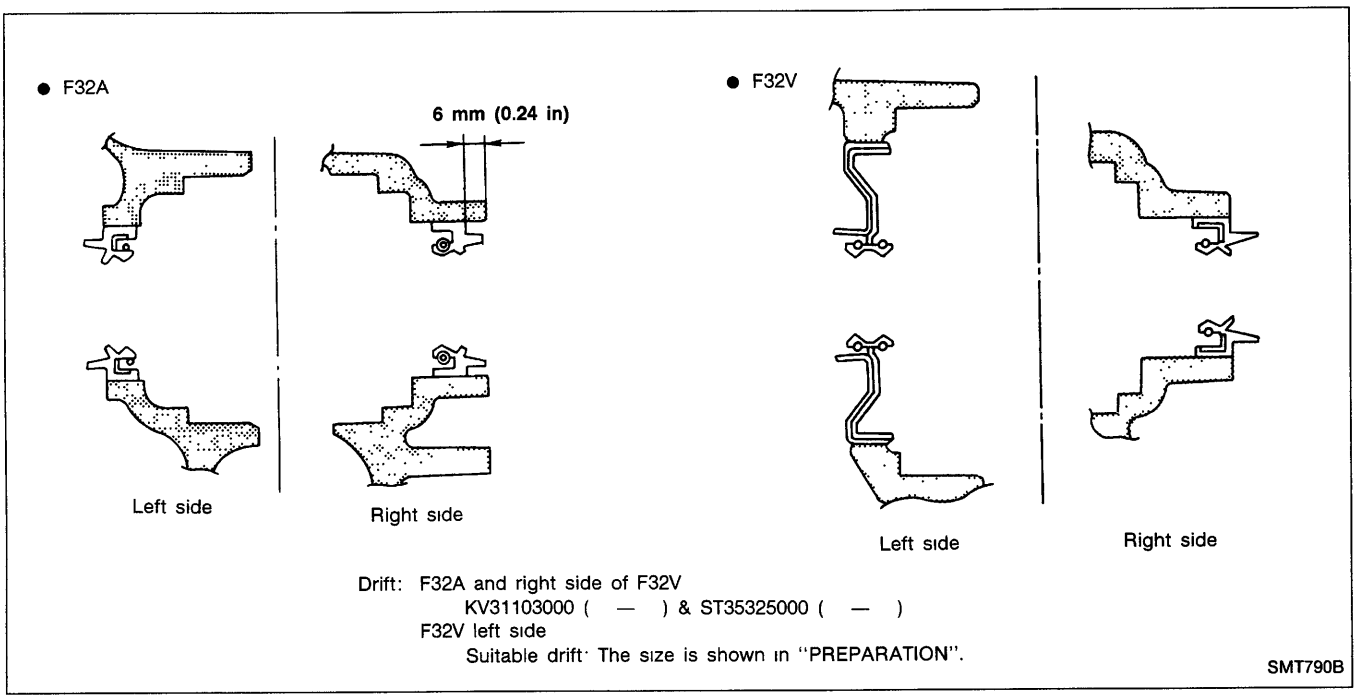
Replacing Oil Seal

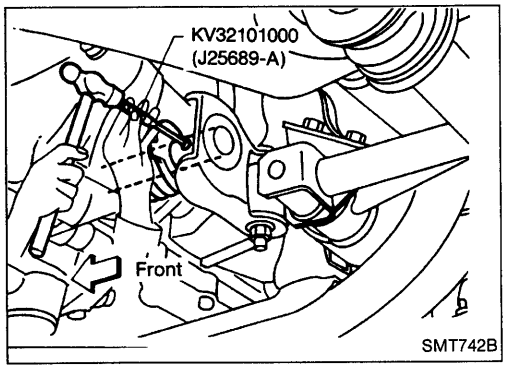
DIFFERENTIAL OIL SEAL

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.

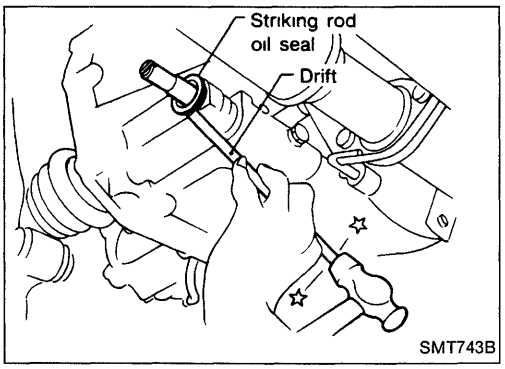




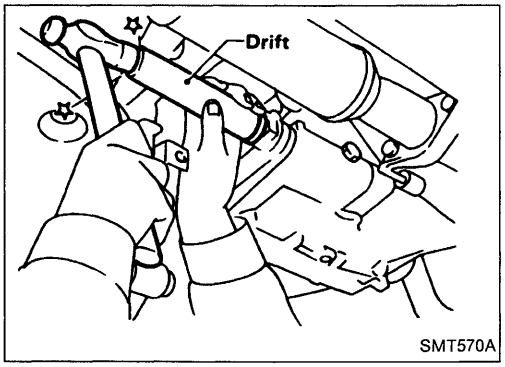
STRIKING ROD OIL SEAL

1. Remove transaxle control rod from yoke.
2. Remove retaining pin of yoke.
- **Be careful not to damage boot.**

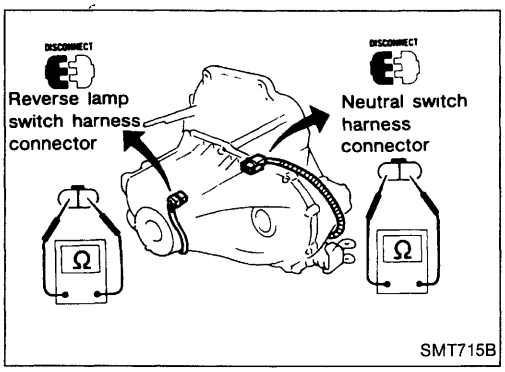
Replacing Oil Seal (Cont'd)



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

BACK-UP LAMP SWITCH

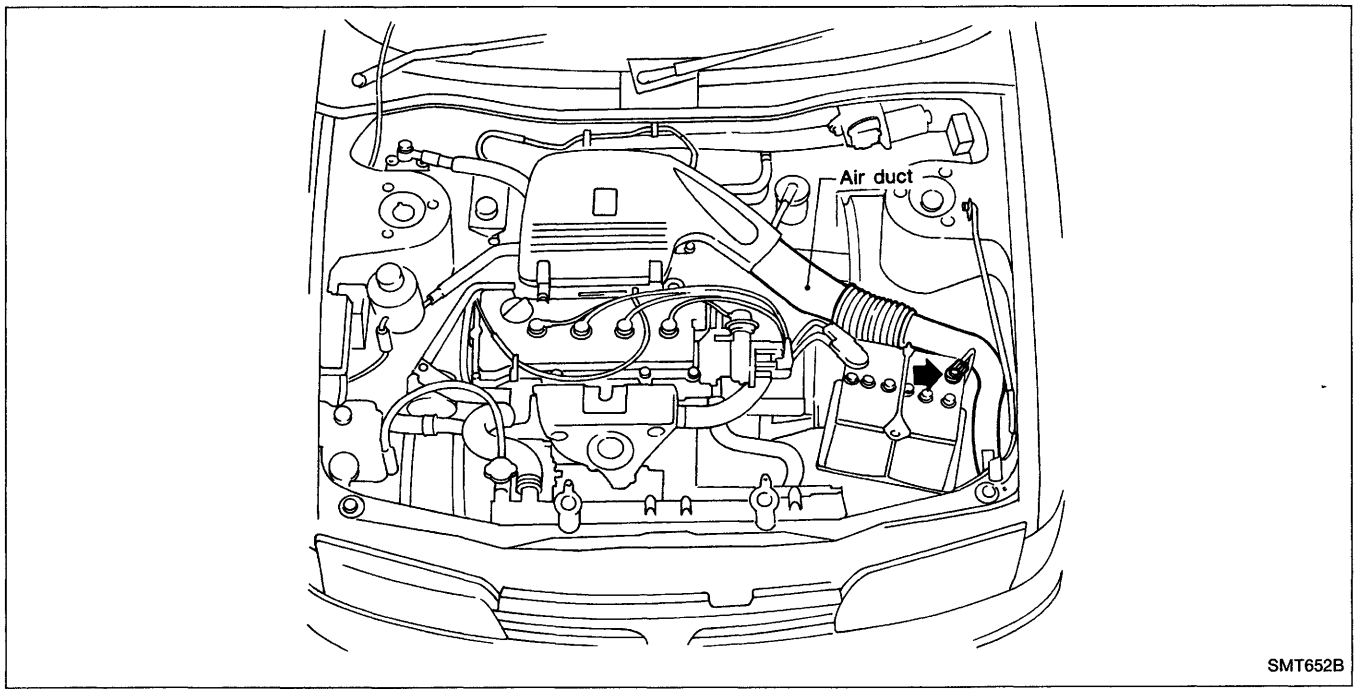
- Check continuity.

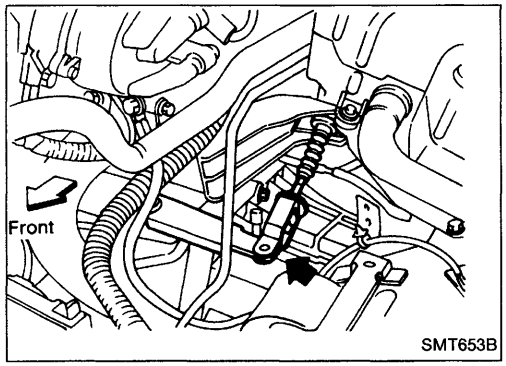
Gear position	Continuity
Reverse	Yes
Except reverse	No

NEUTRAL SWITCH

- Check continuity.

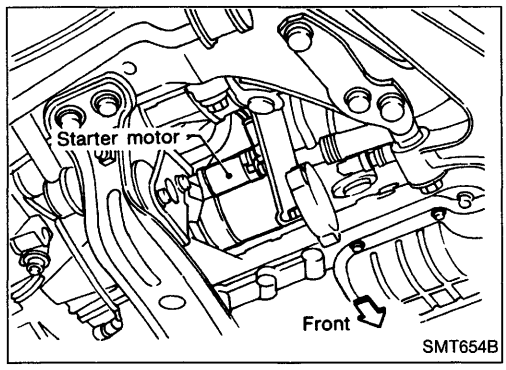
Gear position	Continuity
Neutral	Yes
Except neutral	No



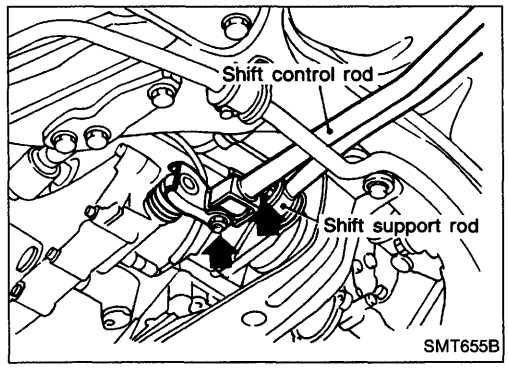


Removal

1. Remove battery negative terminal.
2. Remove air duct.
3. Disconnect clutch control cable from transaxle.
4. Disconnect speedometer cable from transaxle.
5. Disconnect back-up lamp switch, neutral switch and ground harness connectors.

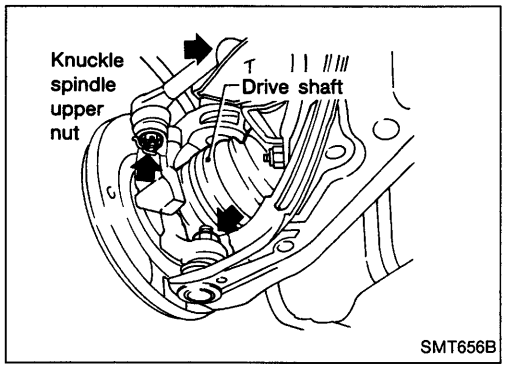


6. Remove starter motor from transaxle.

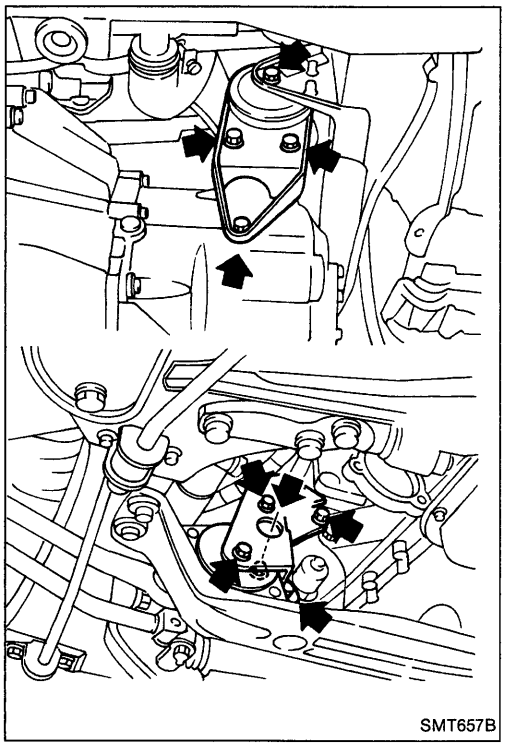


7. Remove shift control rod and support rod from transaxle.
8. Drain gear oil from transaxle.
9. Remove exhaust front tube.

Removal (Cont'd)



10. Draw out drive shafts from transaxle — Refer to section FA.

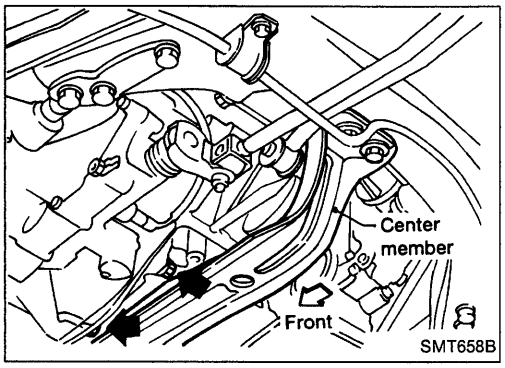


11. Support engine by placing a jack under oil pan.

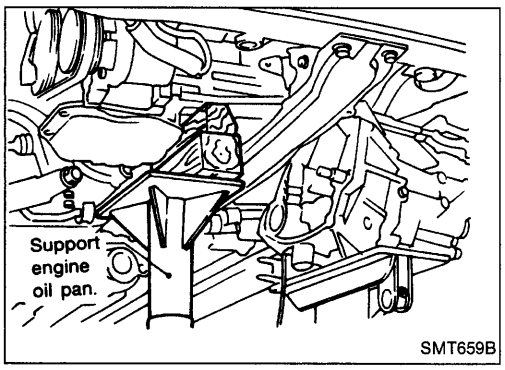
CAUTION:

Do not place jack under oil pan drain plug.

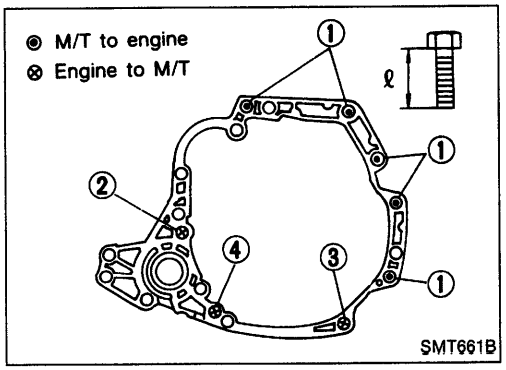
12. Remove rear and L.H. mounts.



13. Raise jack for access to lower housing bolts. Remove bolts. Lower jack.



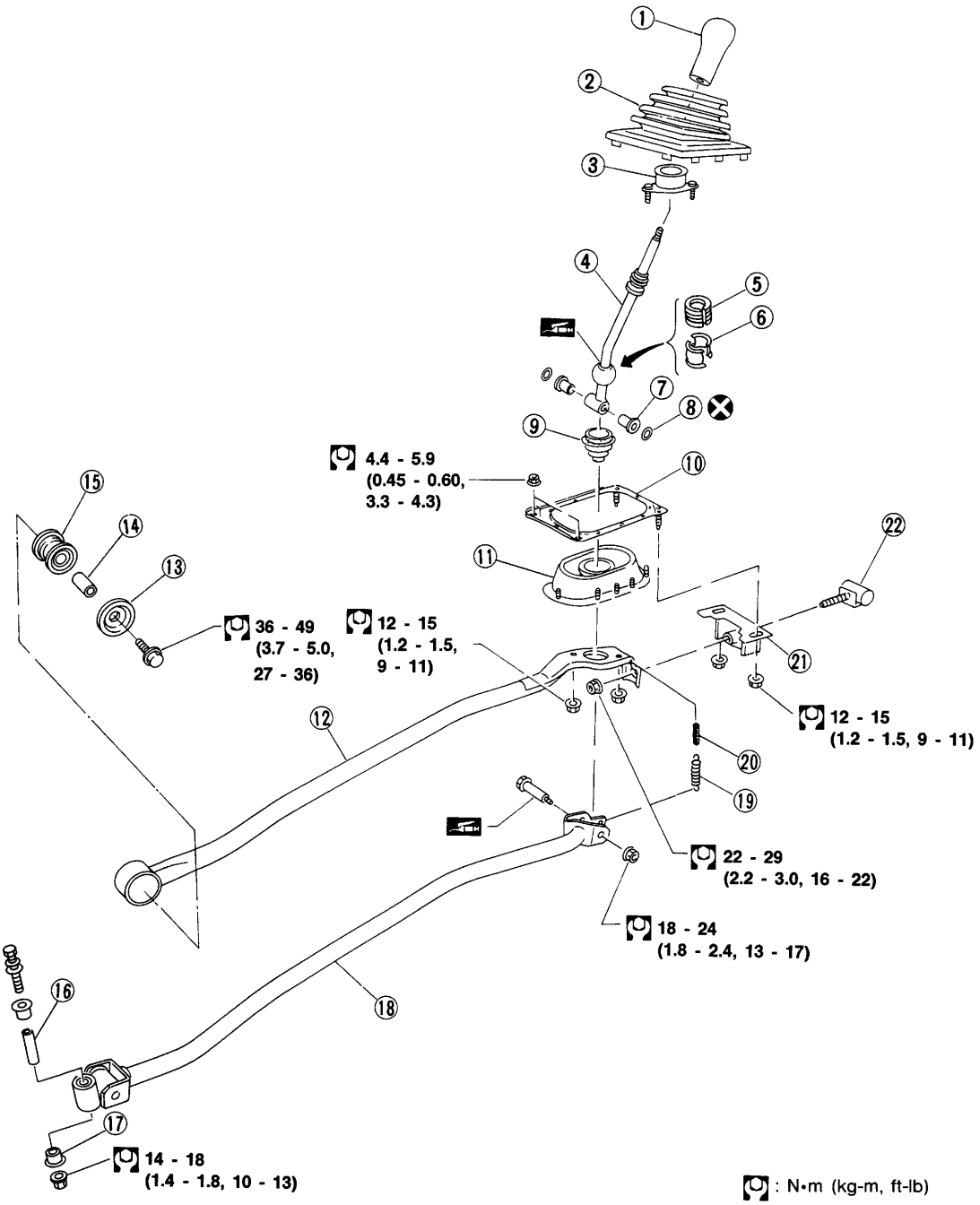
14. Remove bolts securing transaxle.
15. Lower transaxle while supporting it with a jack.



Installation

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)

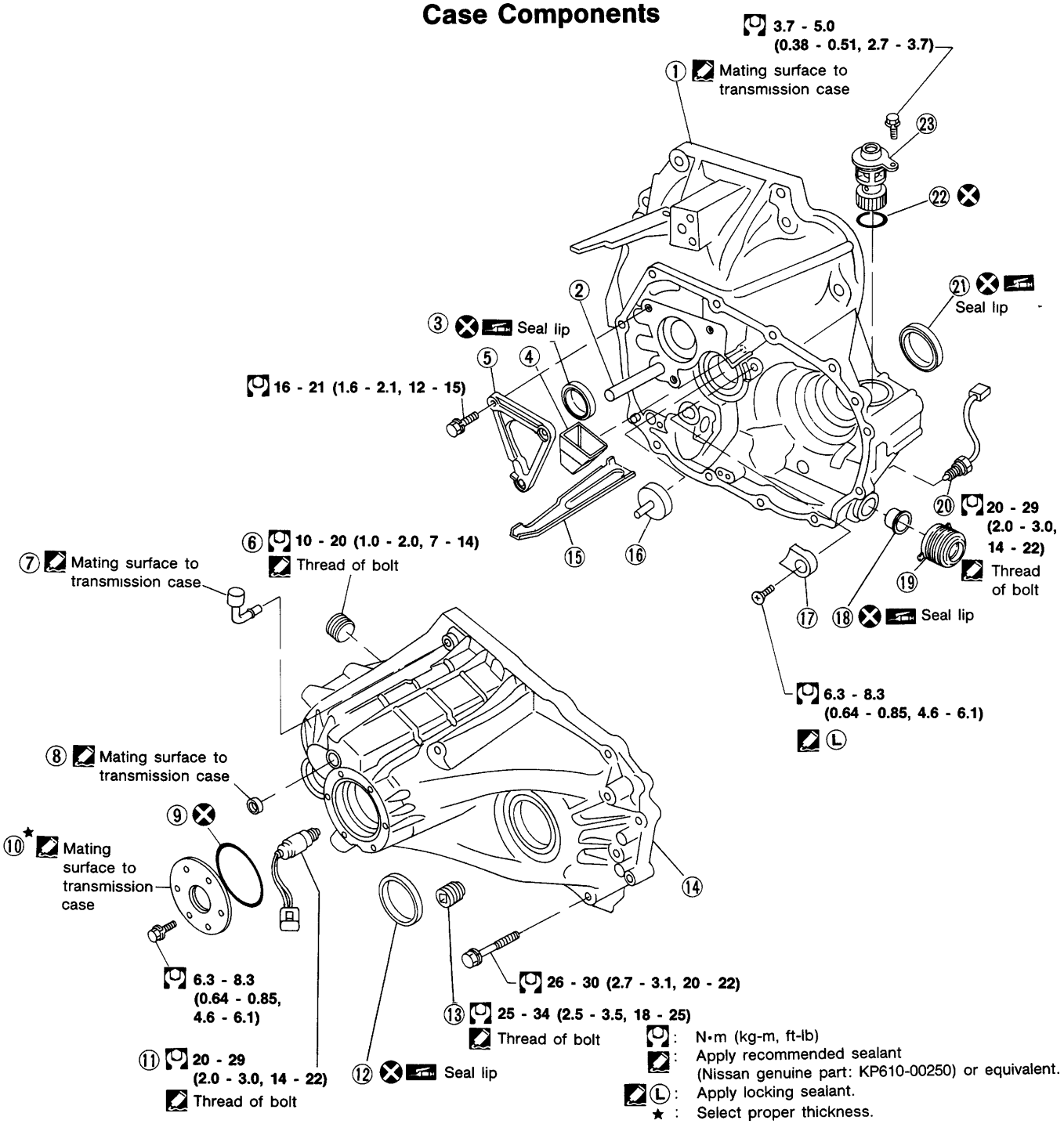
- Reinstall any part removed.



SMT791B

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 Collar
⑰ Bushing
⑱ Control rod
⑲ Return spring
⑳ Return spring rubber
㉑ Holder bracket
㉒ Mass damper

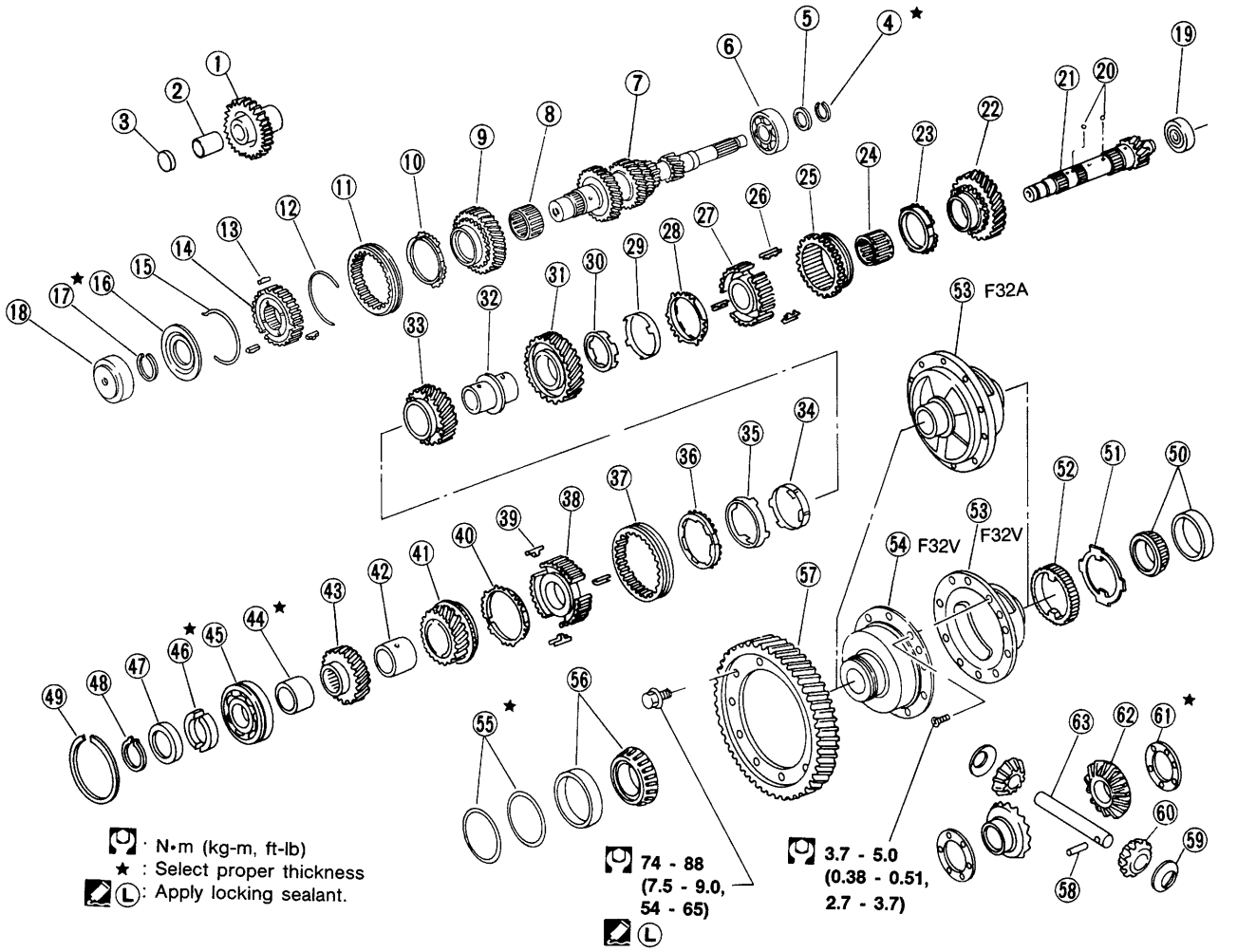
Case Components



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

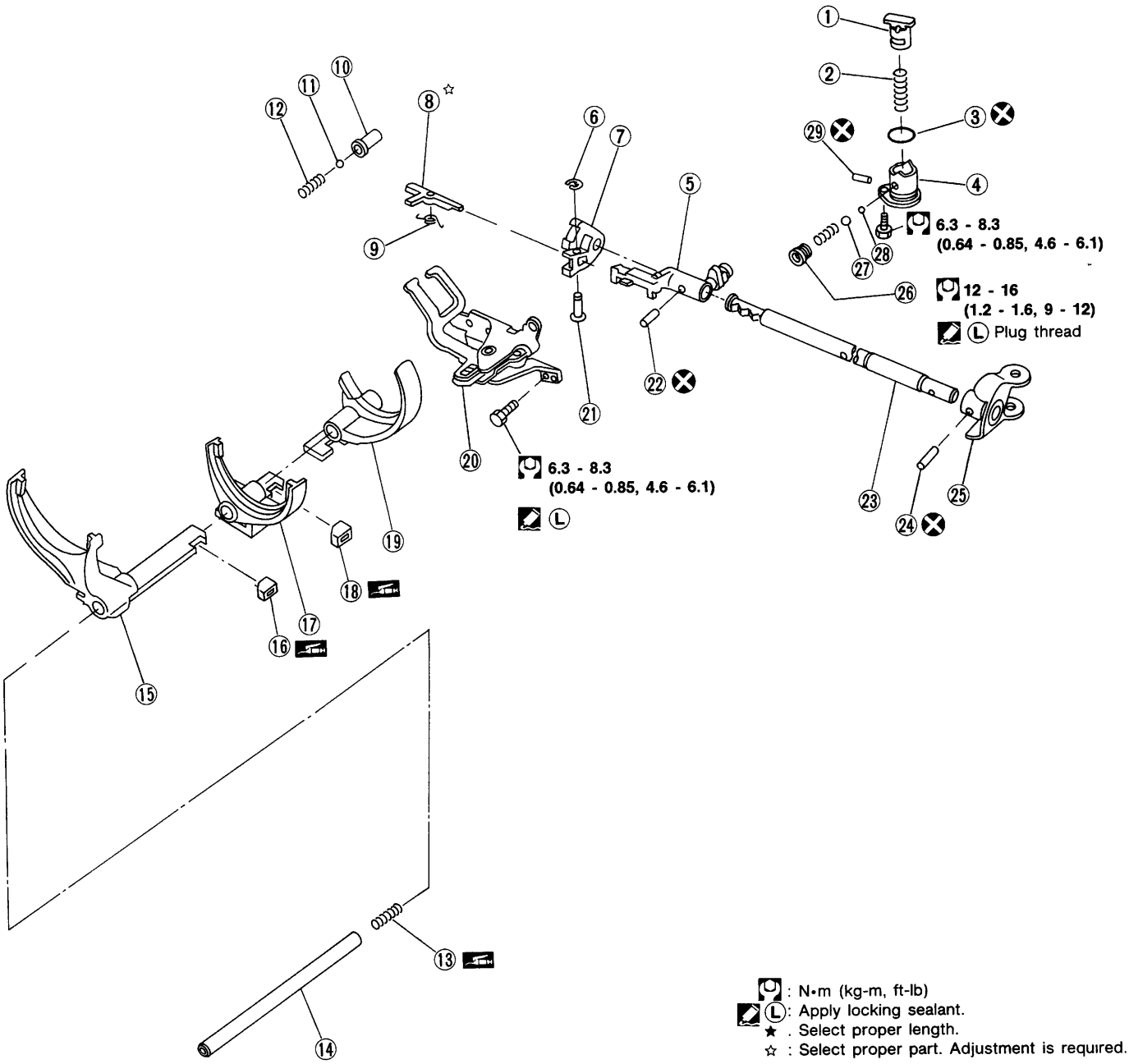
Gear Components



SMT792B

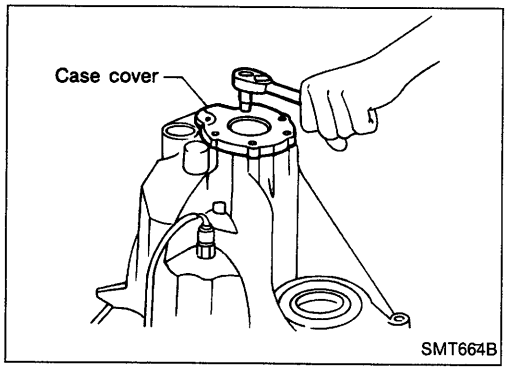
① Reverse idler gear
② Reverse idler bushing
③ Reverse idler spacer
④ Snap ring
⑤ Spacer
⑥ Input shaft front bearing
⑦ Input shaft
⑧ 5th gear needle bearing
⑨ 5th input gear
⑩ Baulk ring
⑪ Coupling sleeve
⑫ Spread ring
⑬ Insert spring
⑭ 5th gear synchronizer hub
⑮ Spread ring
⑯ 5th stopper
⑰ Snap ring
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) Viscous coupling
(55) Differential side bearing adjusting shim
(56) Differential side bearing
(57) Final gear
(58) Retaining pin
(59) Thrust washer
(60) Pinion mate gear
(61) Thrust washer
(62) Side gear
(63) Pinion mate shaft

Shift Control Components

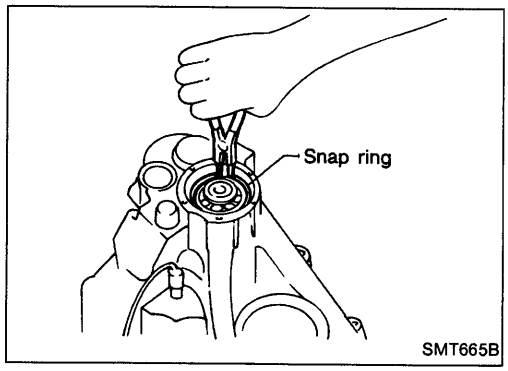


SMT716B

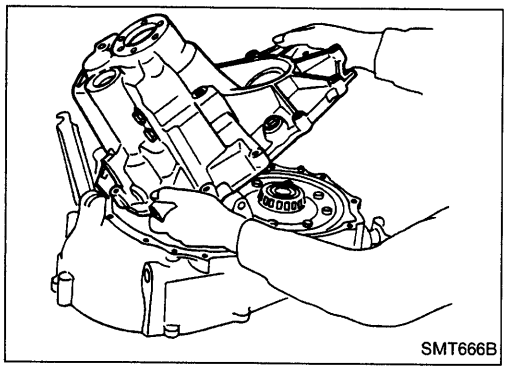
① Check plunger
② Select return spring
③ O-ring
④ Check sleeve
⑤ Striking lever
⑥ Snap ring
⑦ Striking interlock
⑧ Reverse brake cam
⑨ Reverse check cam spring
⑩ Check ball plug
⑪ Shift check ball
⑫ Check spring
⑬ Fork shaft supporting spring
⑭ Fork shaft
⑮ 5th shift fork
⑯ Shift cap
⑰ 3rd & 4th shift fork
⑱ Shift cap
⑲ 1st & 2nd shift fork
⑳ Control bracket
㉑ Control bracket pin
㉒ Retaining pin
㉓ Striking rod
㉔ Retaining pin
㉕ Yoke
㉖ Reverse check plug
㉗ Check ball (Large)
㉘ Check ball (Small)
㉙ Stopper pin



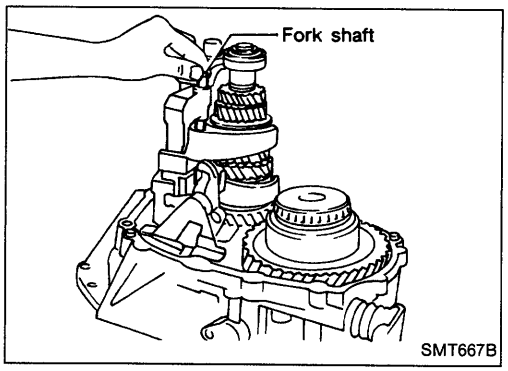
1. Remove case cover.



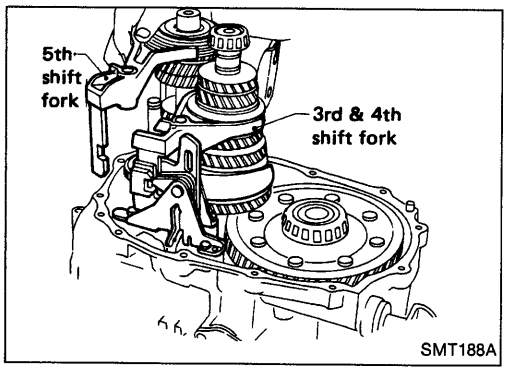
2. Remove mainshaft bearing snap ring.



3. Remove transmission case while slightly tilting it to prevent 5th shift fork from interfering with case.

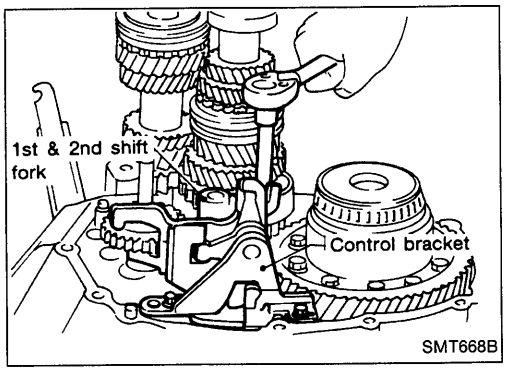


4. Draw out reverse idler spacer and fork shaft.

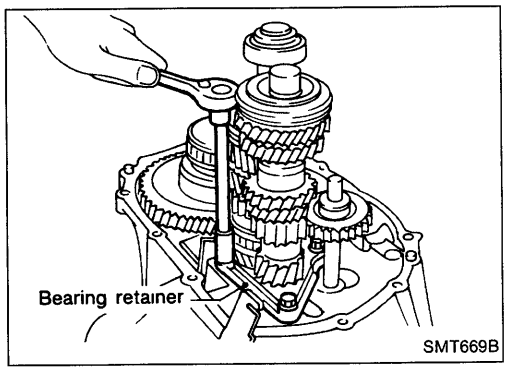


5. Remove 5th and 3rd & 4th shift forks.

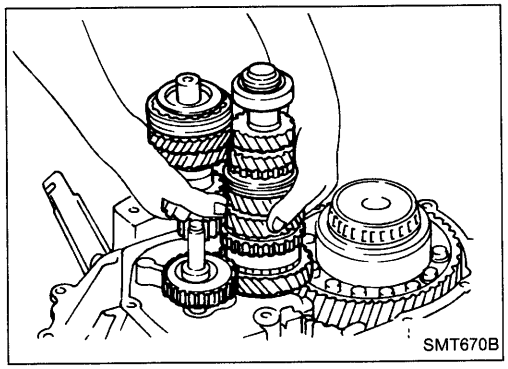
- **Be careful not to lose shifter cap.**



6. Remove control bracket with 1st & 2nd shift fork.

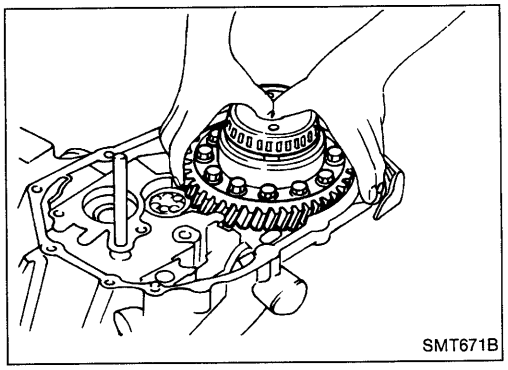


7. Remove gear components from clutch housing.
a. Remove input shaft front bearing retainer securing bolts.

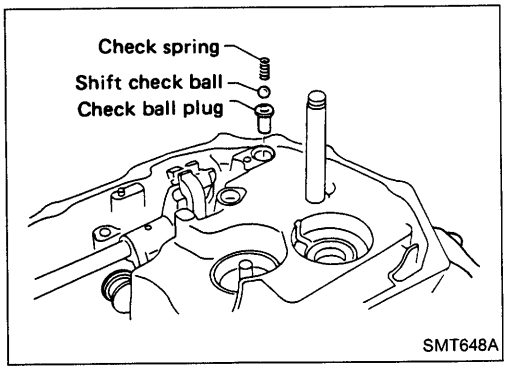


b. Remove input shaft with bearing retainer, mainshaft assembly and reverse idler gear.

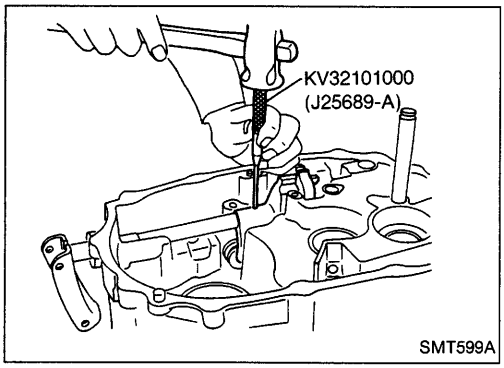
- **Always withdraw mainshaft straight out. Failure to do so can damage resin oil channel on clutch housing side.**
- **Do not draw out reverse idler shaft from clutch housing because these fittings will be loose.**
  When removing input shaft, be careful not to scratch oil seal lip with shaft spline.



c. Remove final drive assembly.

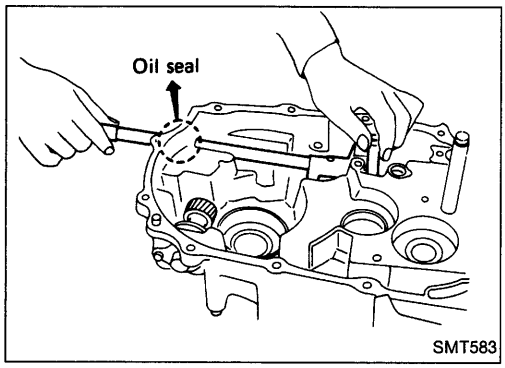


8. Remove oil pocket, shift check ball, check spring and check ball plug.

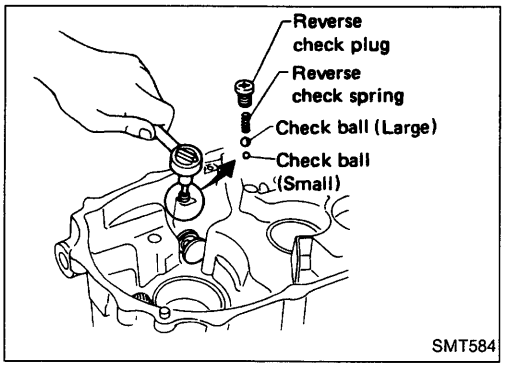


9. Drive retaining pin out of striking lever, then remove striking rod, striking lever and striking interlock.

- **Select a position where retaining pin does not interfere with clutch housing when removing retaining pin.**

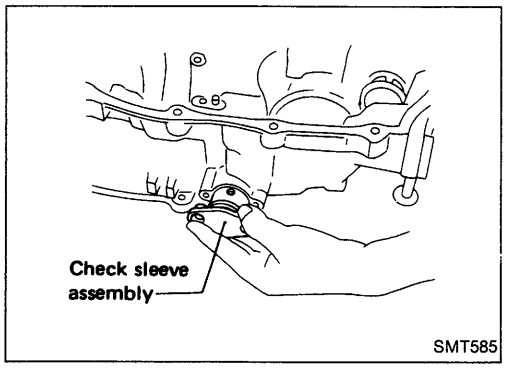


- **Be careful not to damage oil seal lip, when removing striking rod. If necessary, tape edges of striking rod.**

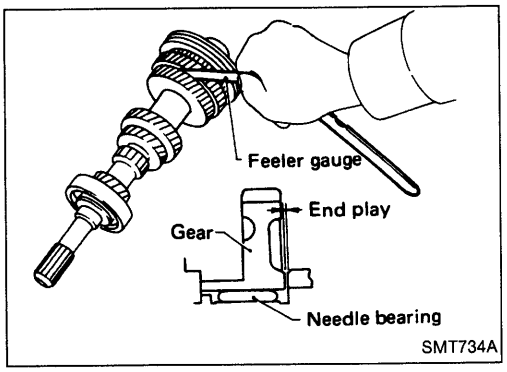


10. Remove reverse check plug, then detach reverse check spring and check balls.

- If the smaller ball does not come out, remove it together with check sleeve assembly.



11. Remove check sleeve assembly.



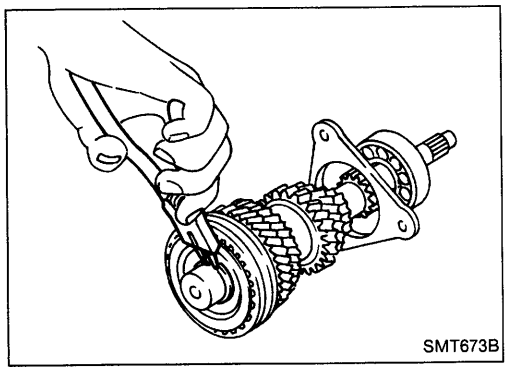
Input Shaft and Gears

DISASSEMBLY

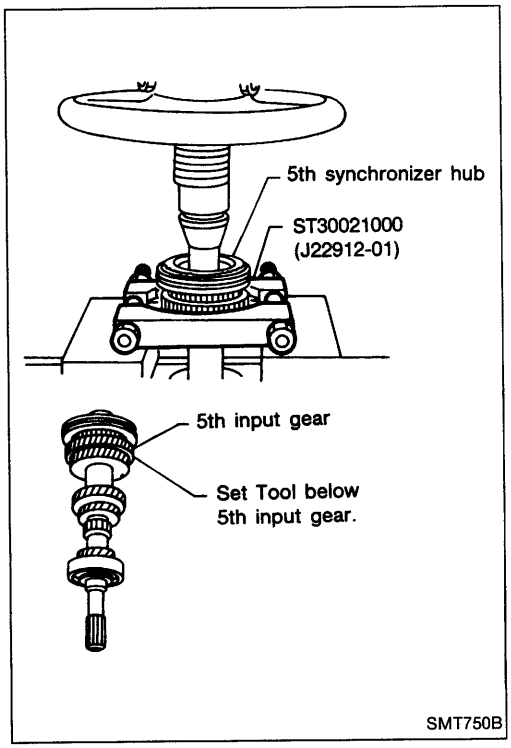
1. Before disassembly, check 5th input gear end play.

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".

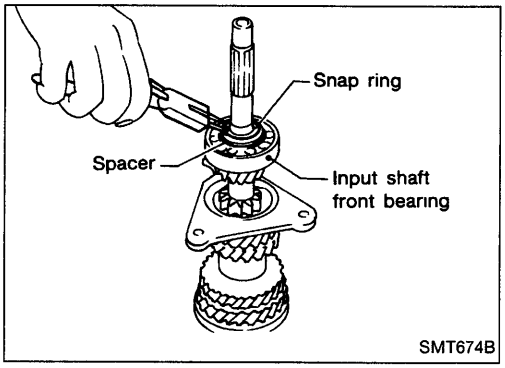


2. Remove snap ring and 5th stopper.

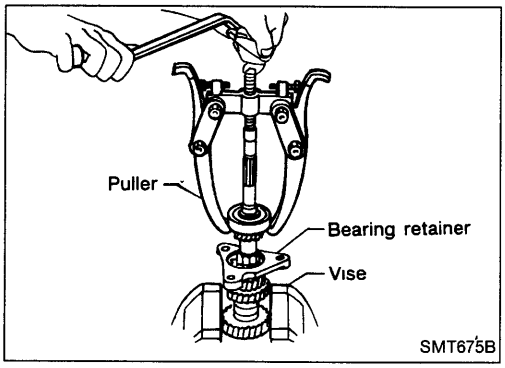


3. Remove 5th synchronizer, 5th input gear and 5th gear needle bearing.

Input Shaft and Gears (Cont'd)



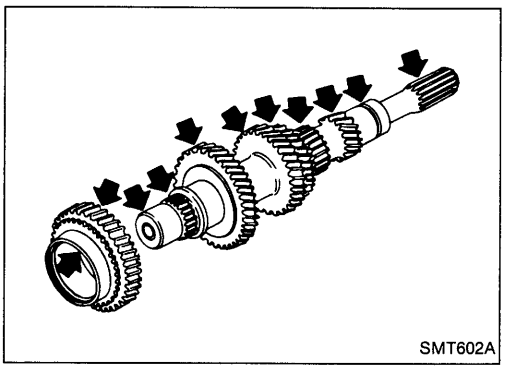
4. Remove snap ring of input shaft front bearing and input gear spacer.



5. Pull out input shaft front bearing.
6. Remove bearing retainer.

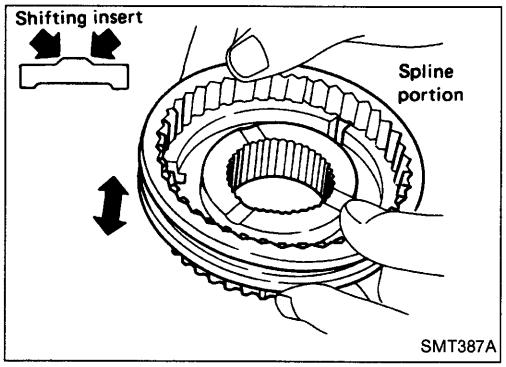
INSPECTION

Gear and shaft

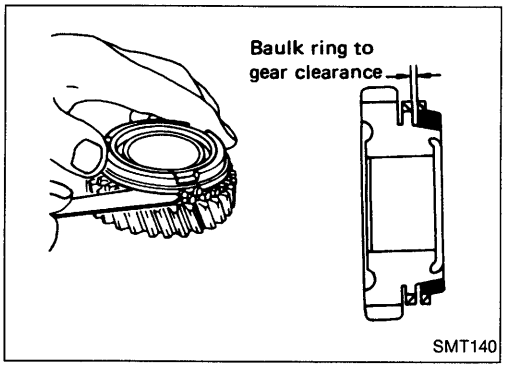


- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.

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:

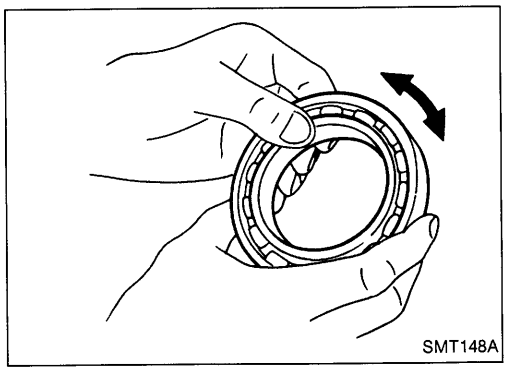
  Standard

  1.0 - 1.35 mm (0.0394 - 0.0531 in)

  Wear limit

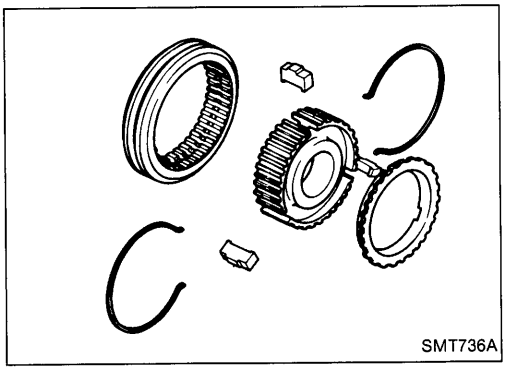
  0.7 mm (0.028 in)

Input Shaft and Gears (Cont'd)



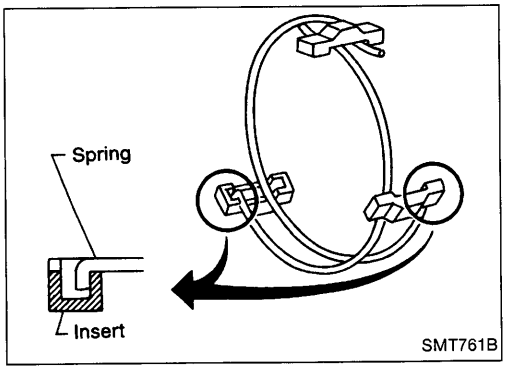
Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

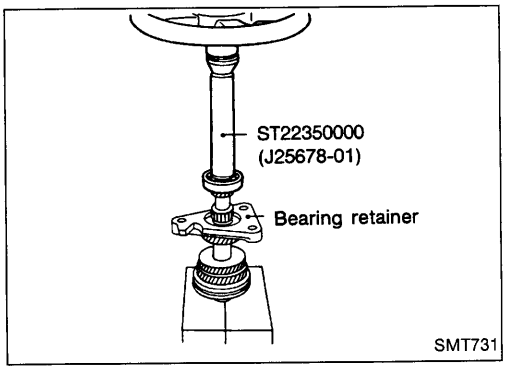


ASSEMBLY

1. Assemble 5th synchronizer.

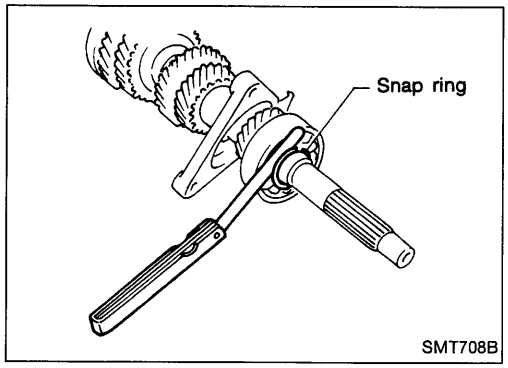


- **Be careful not to hook front and rear ends of spread spring to the same insert.**



2. Install bearing retainer.
3. Press on input shaft front bearing.
4. Install input gear spacer.

Input Shaft and Gears (Cont'd)

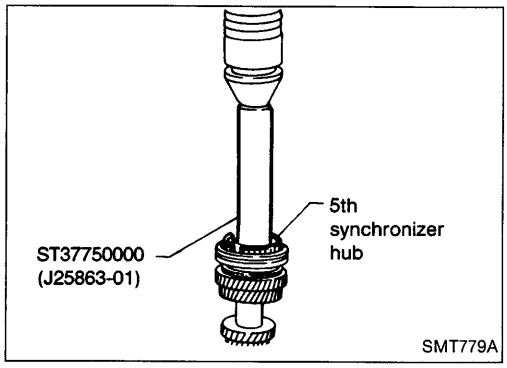


5. Select proper snap ring of input shaft front bearing to minimize clearance of groove in input shaft and then install it.

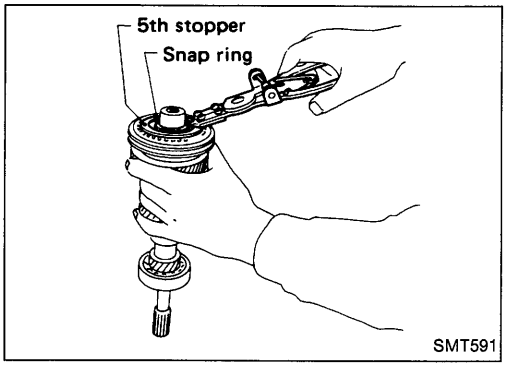
Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)

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



6. Install 5th gear needle bearing, 5th input gear, 5th synchronizer and 5th stopper.
7. Measure gear end play as a final check — Refer to "Disassembly — Input Shaft and Gears".

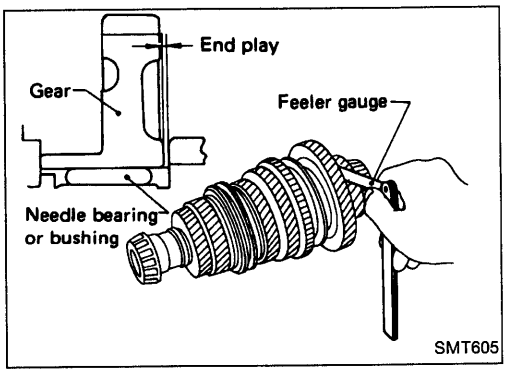


8. Select proper snap ring of 5th synchronizer hub to minimize clearance of groove in input shaft and install it.

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

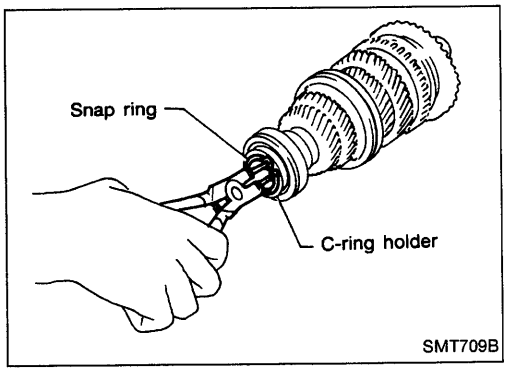
DISASSEMBLY

1. Before disassembly, measure gear end play.

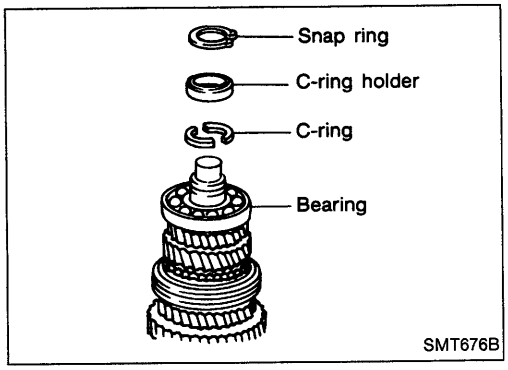
Gear end play:

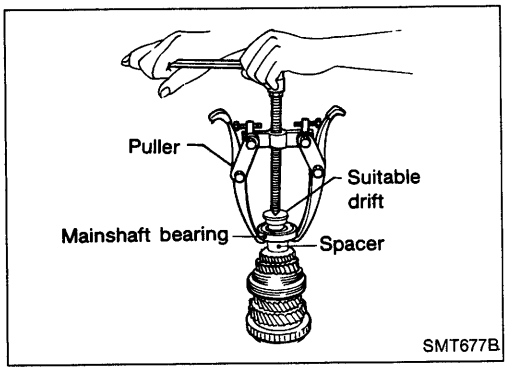
Gears	End play mm (in)
1st main gear	0.18 - 0.31 (0.0071 - 0.0122)
2nd-4th main gear	0.20 - 0.30 (0.0079 - 0.0118)

- If end play is not within the specified limit, disassemble and check the parts.



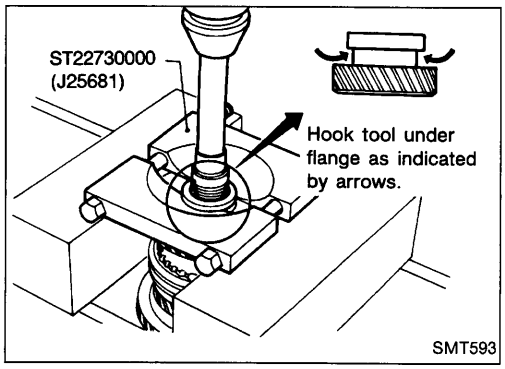
2. Remove mainshaft rear bearing snap ring, C-ring holder and C-rings.



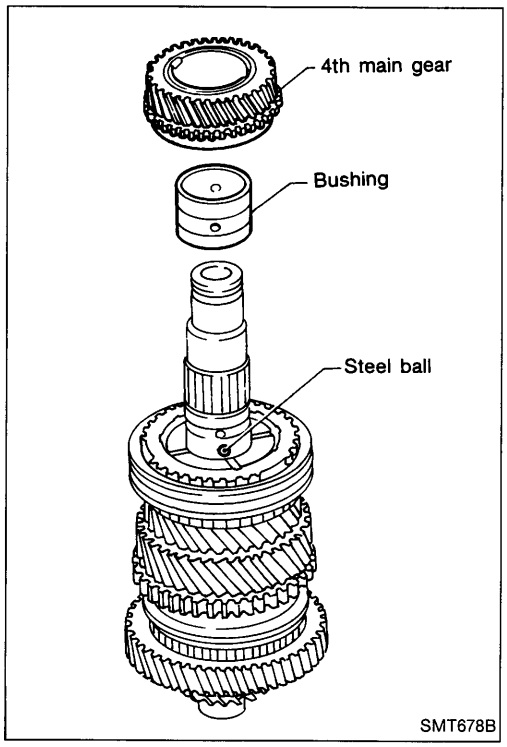


3. Remove mainshaft bearing and spacer.

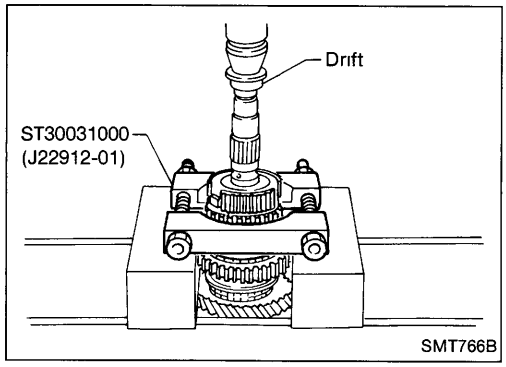
Mainshaft and Gears (Cont'd)



4. Remove 5th main gear.

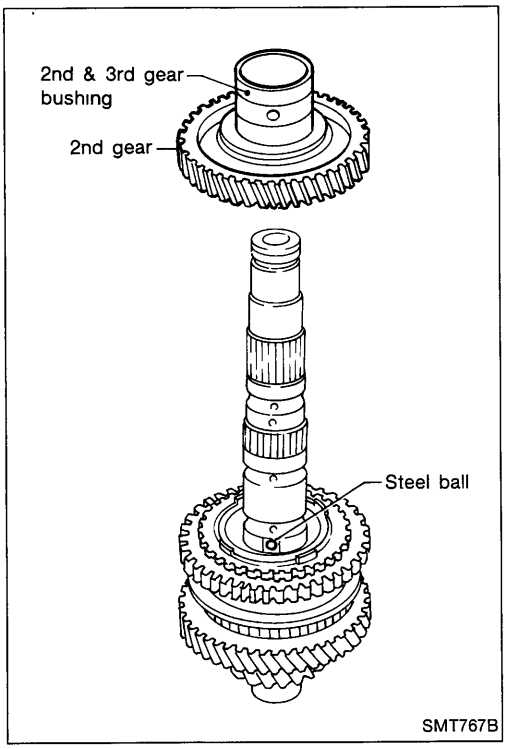


5. Remove 4th main gear, 4th gear bushing and steel ball.
- **Take care not to lose steel ball.**

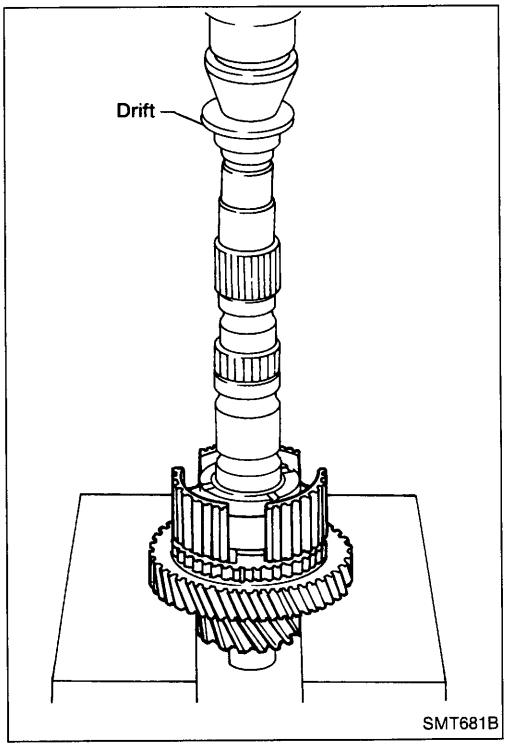


6. Remove 3rd & 4th synchronizer and 3rd main gear.

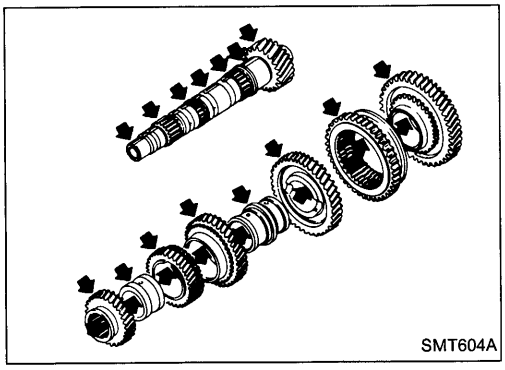
Mainshaft and Gears (Cont'd)



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.

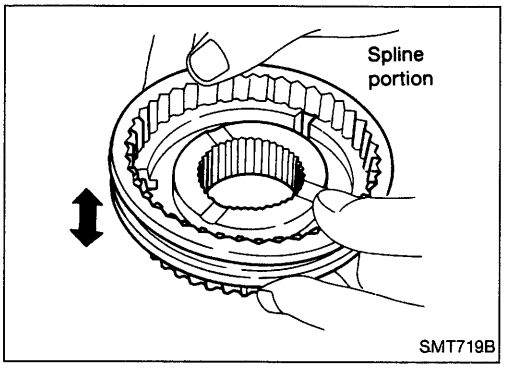


INSPECTION

Gear and shaft

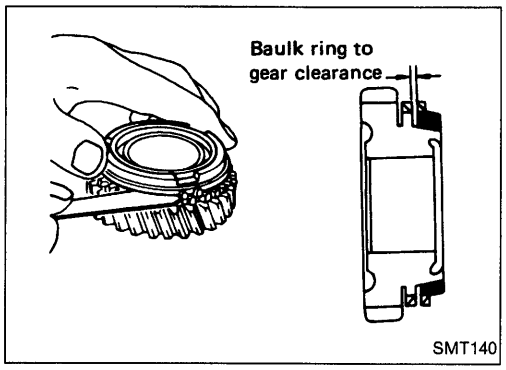
- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.

Mainshaft and Gears (Cont'd)

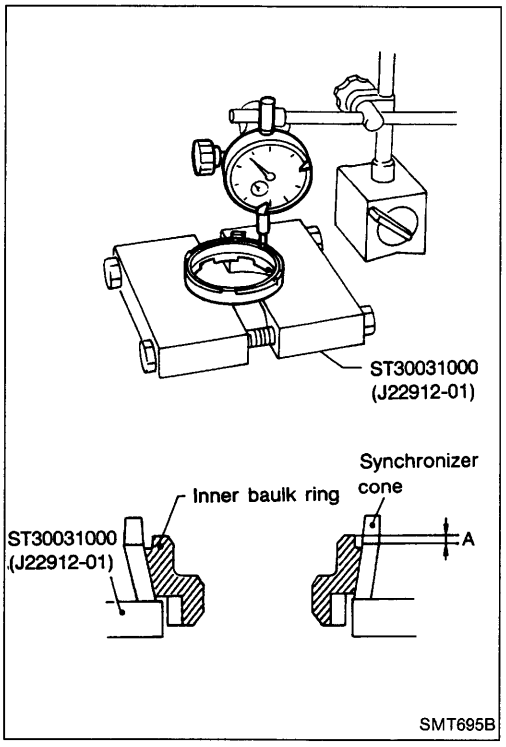


Synchronizer

- 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.



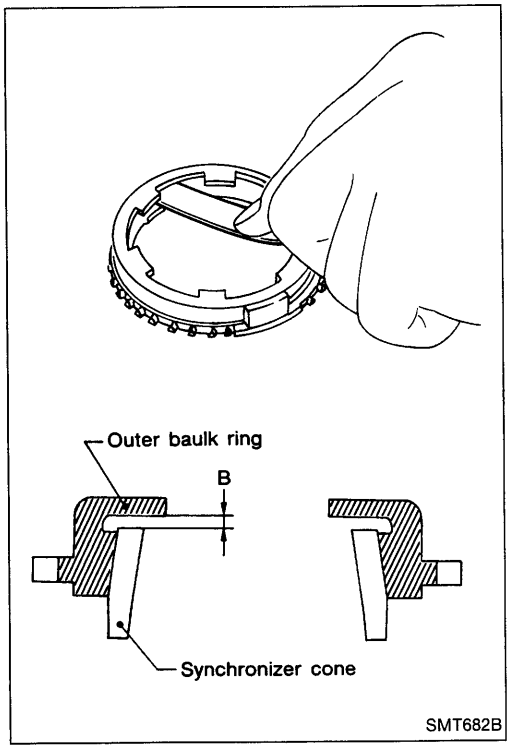
- Measure clearance between baulk ring and gear.
  Clearance between baulk rings and gears, for 1st and 4th gear only:
  Standard
  1.0 - 1.35 mm (0.0394 - 0.0531 in)
  Wear limit
  0.7 mm (0.028 in)
- **2nd and 3rd gears have inner and outer baulk rings and so have different measurements.**

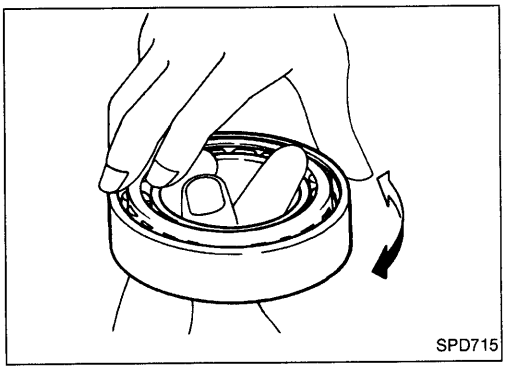


- Measure wear of 2nd and 3rd baulk ring.

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.

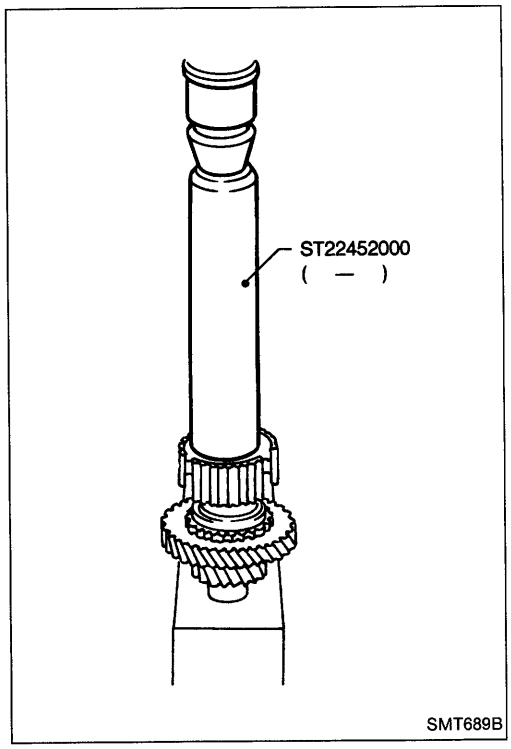
Mainshaft and Gears (Cont'd)





Bearing

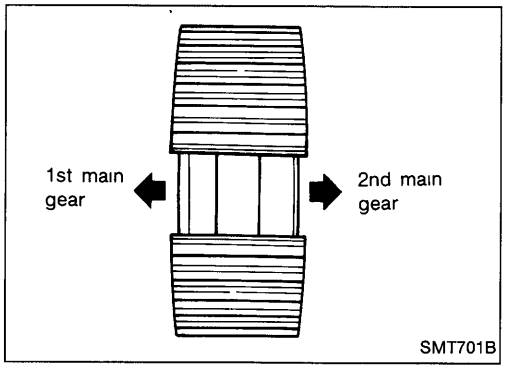
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **The mainshaft front bearing cannot be re-used. It must be replaced once removed.**



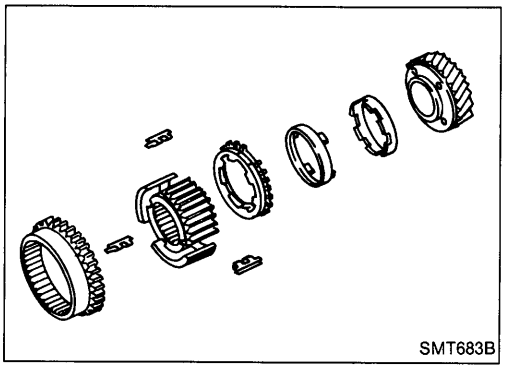
ASSEMBLY

1. Install 1st gear needle bearing, 1st main gear and baulk ring.
2. Press on 1st & 2nd synchronizer hub.

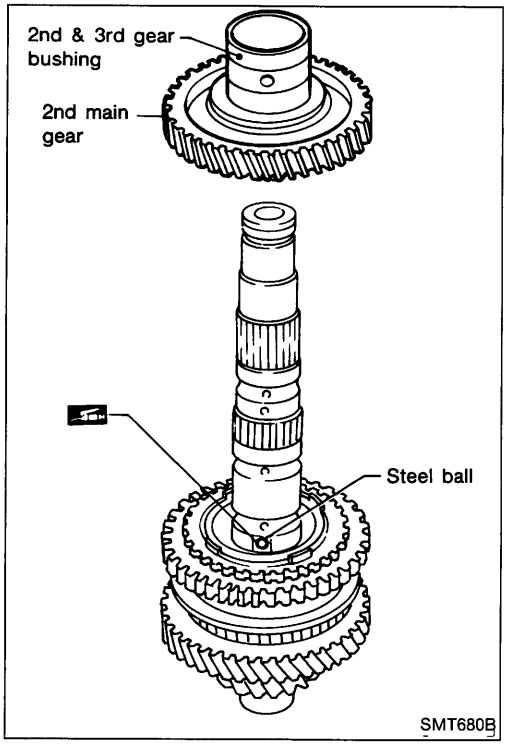
Mainshaft and Gears (Cont'd)



- **Ensure correct fitting of 1st & 2nd synchronizer hub.**



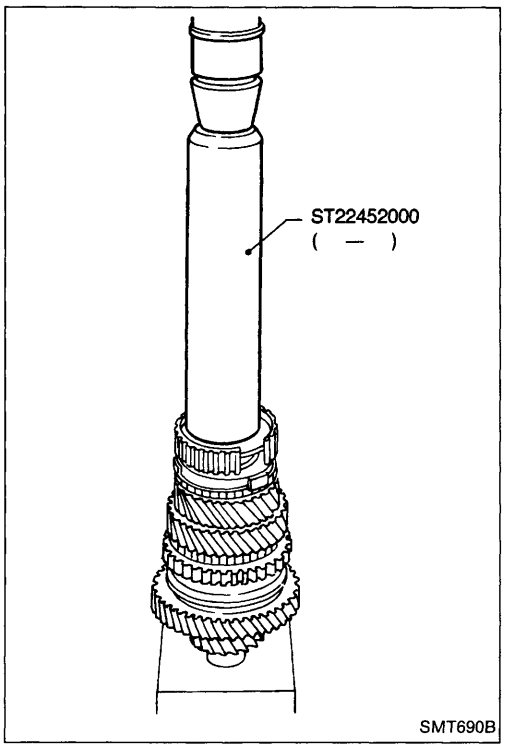
3. Install 2nd synchronizer cone, outer & inner baulk ring and 1st & 2nd coupling sleeve.



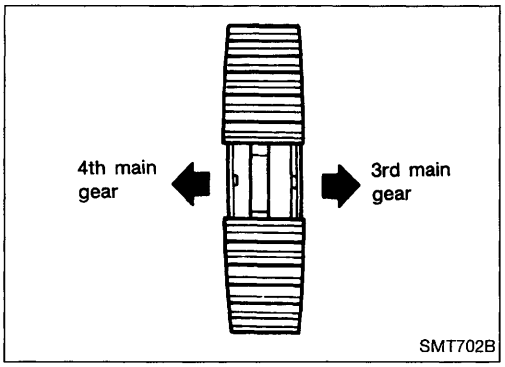
4. Install steel ball, 2nd main gear, 2nd & 3rd bushing.

- **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.**

Mainshaft and Gears (Cont'd)

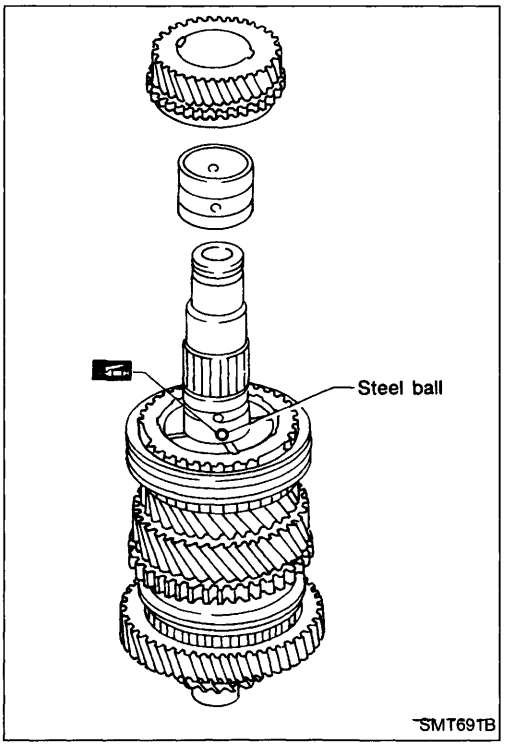


5. Install 3rd main gear, synchronizer cone, outer & inner baulk ring.
6. Press on 3rd & 4th synchronizer hub.



- **Ensure correct fitting of 3rd & 4th synchronizer hub.**

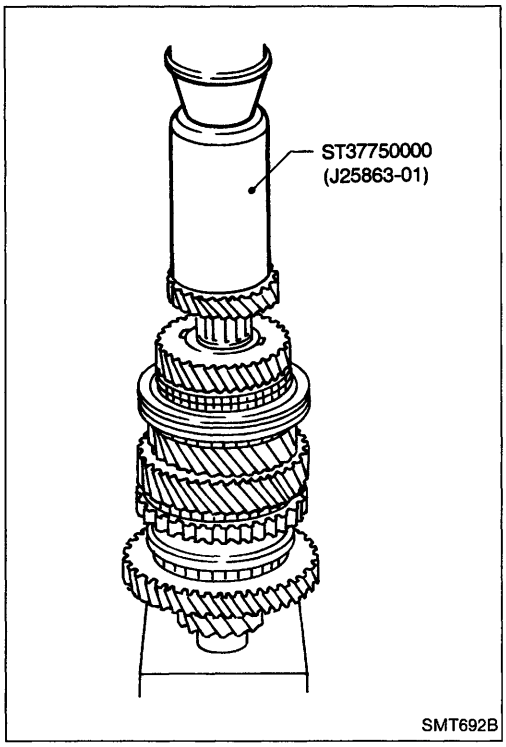
7. Install 3rd & 4th coupling sleeve and 4th baulk ring.



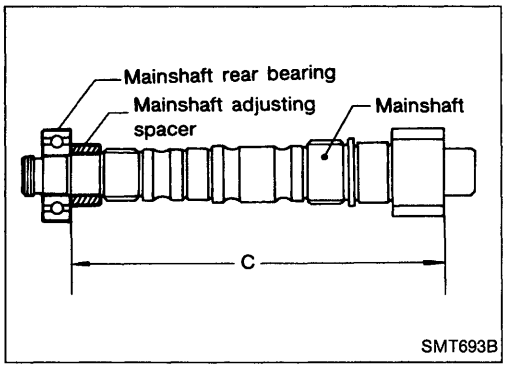
8. Install steel ball, 4th bushing and 4th main gear.

- **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)



9. Press on 5th main gear.



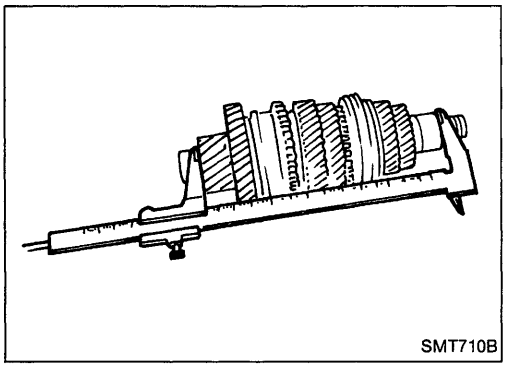
10. Select proper mainshaft bearing spacer to give correct bearing distance.

Bearing distance "C":

230.15 - 230.25 mm (9.0610 - 9.0649 in)

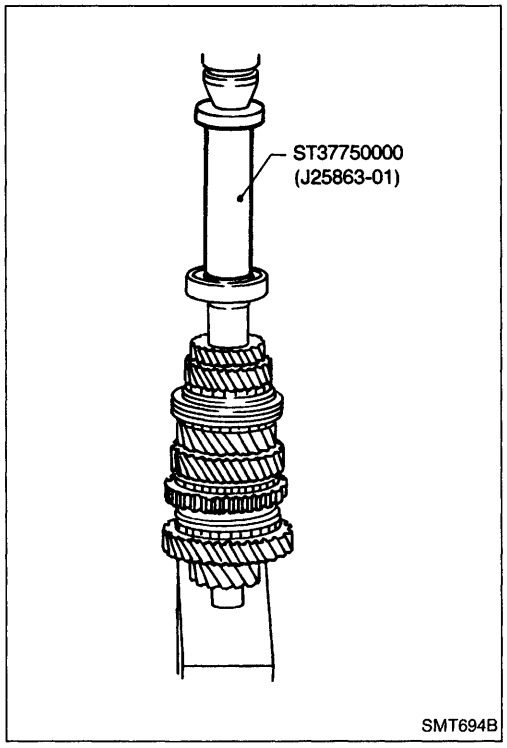
Spacers available:

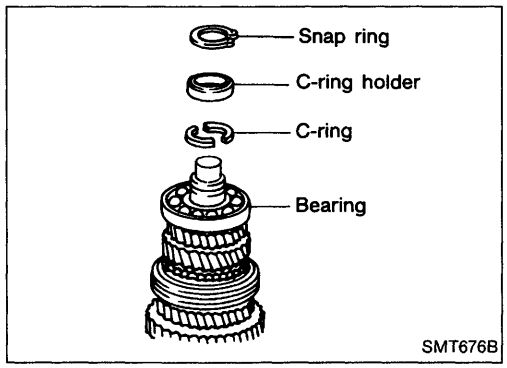
Thickness mm (in)	Part number
18.91 (0.7445)	32347-50J00
18.98 (0.7472)	32347-50J01
19.05 (0.7500)	32347-50J02
19.12 (0.7528)	32347-50J03
19.19 (0.7555)	32347-50J04
19.26 (0.7583)	32347-50J05
19.33 (0.7610)	32347-50J06
19.40 (0.7638)	32347-50J07
19.47 (0.7665)	32347-50J08



Mainshaft and Gears (Cont'd)

11. Press on mainshaft rear bearing.

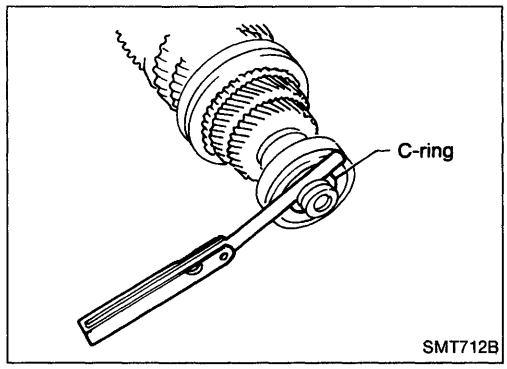




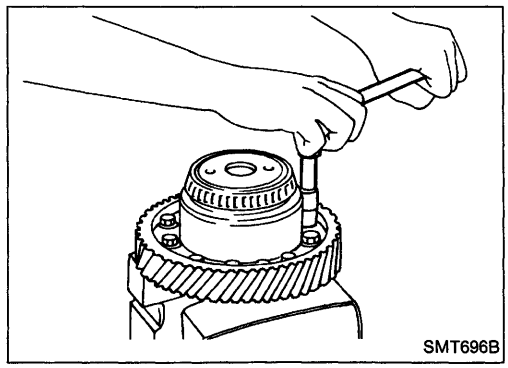
12. Select proper C-ring to minimize clearance of groove in mainshaft and install it.
    Allowable clearance of groove:
    0 - 0.1 mm (0 - 0.004 in)

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".

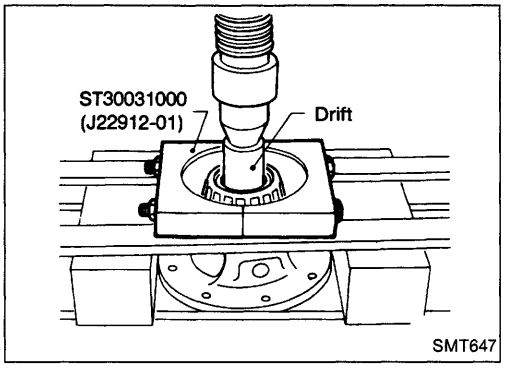


Final Drive

DISASSEMBLY

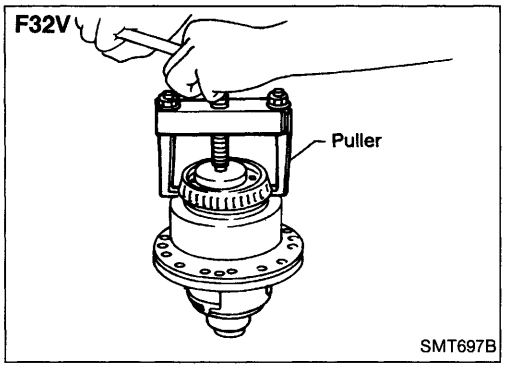
1. Remove final gear.
2. Remove speedometer drive gear by cutting it.

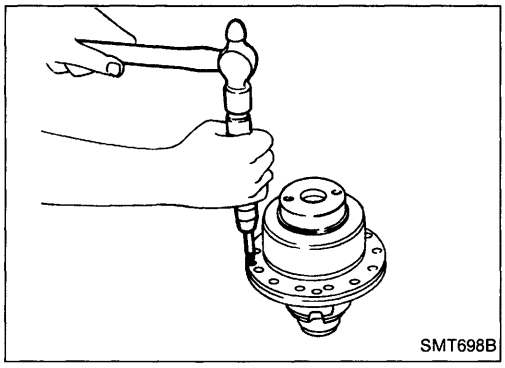
Final Drive (Cont'd)



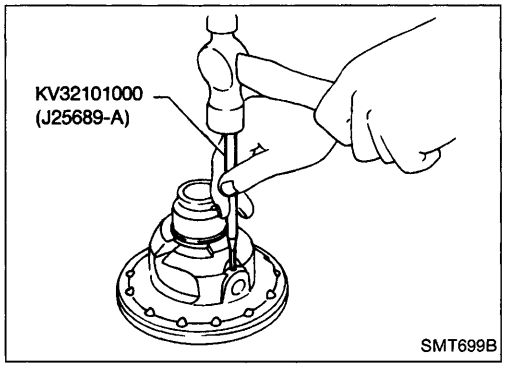
3. Pull out differential side bearings.

- Be careful not to mix up the right and left bearings — RS5F32A



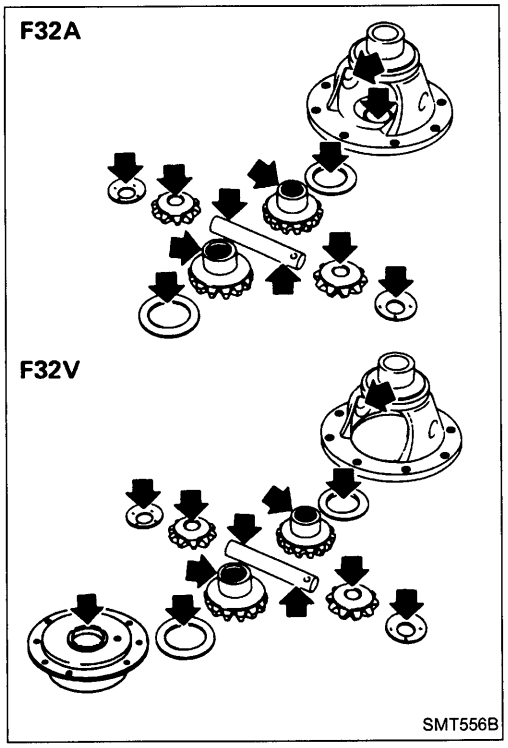


4. Remove viscous coupling.



5. Drive out retaining pin and draw out pinion mate shaft.
6. Remove pinion mate gears and side gears.

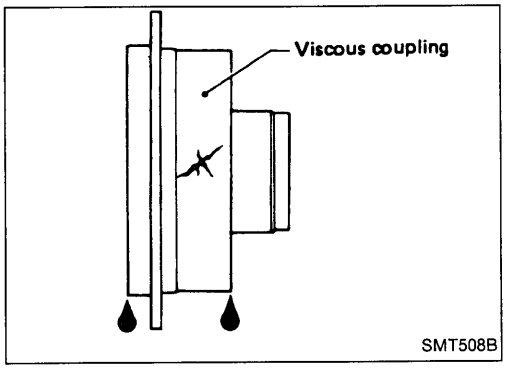
Final Drive (Cont'd)



INSPECTION

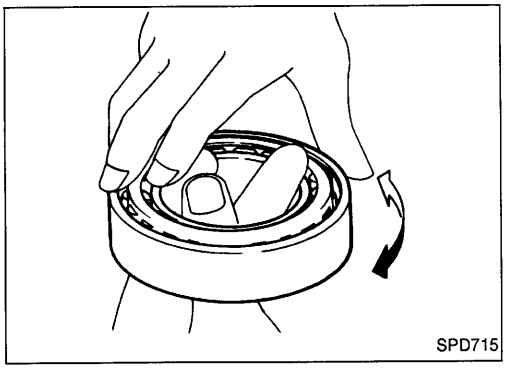
Gear, washer, shaft and case

- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.



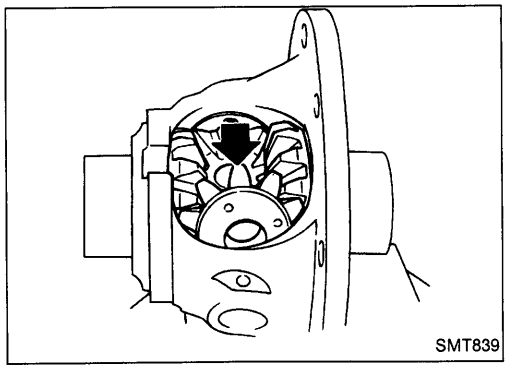
Viscous coupling — RS5F32V

- Check case for cracks.
- Check silicone oil for leakage.



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.**

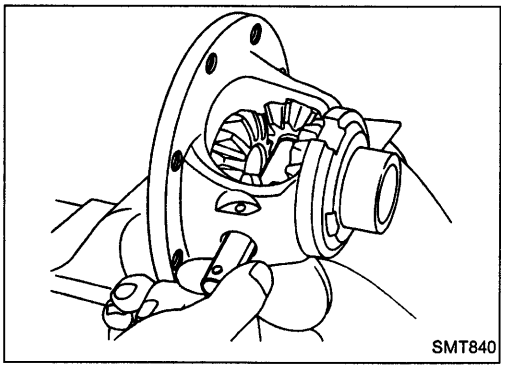


ASSEMBLY

— RS5F32A —

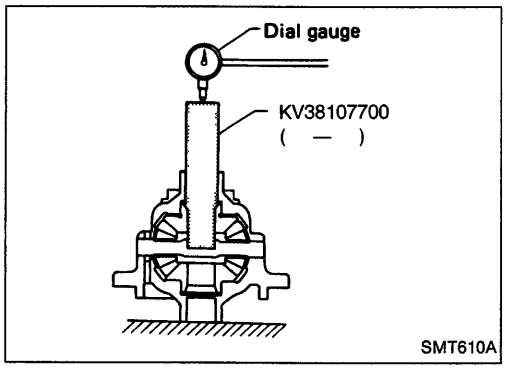
1. Attach side gear thrust washers to side gears, then install pinion mate washers and pinion mate gears in place.

Final Drive (Cont'd)


SMT840

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 using the following procedure:
   Set Tool and dial indicator on side gear.

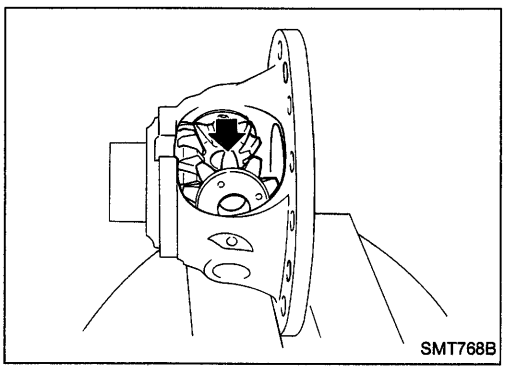
b. Move side gear up and down to measure dial indicator deflection. Always measure indicator deflection on both side gears.

Clearance between side gear and differential case with washers:
0.1 - 0.2 mm (0.004 - 0.008 in)

c. If not within specification, adjust clearance by changing thickness of side gear thrust washers.

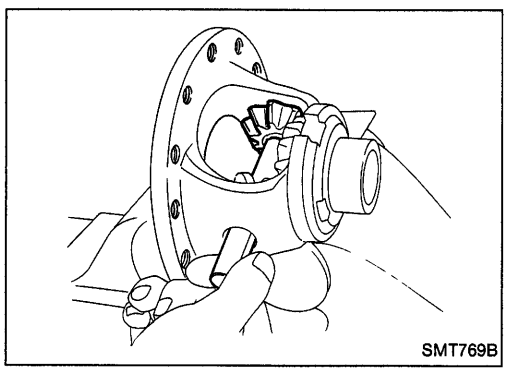
Side gear thrust washers:

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


SMT768B

— RS5F32V —

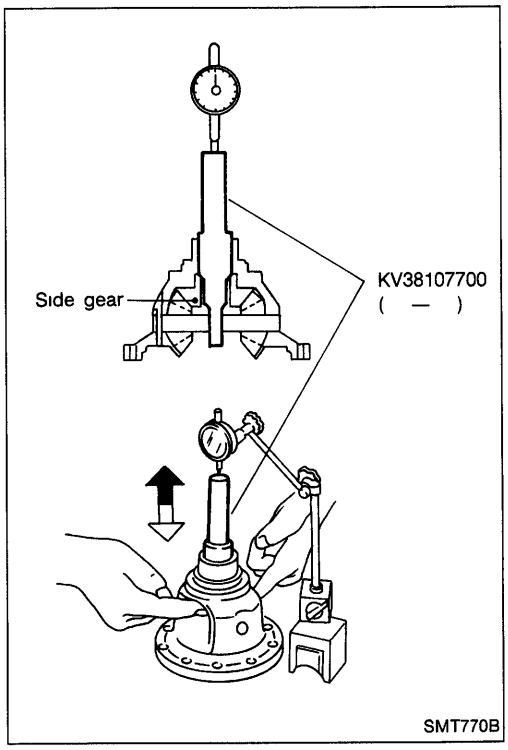
1. Attach side gear thrust washer to side gear and install them in differential case.
   Then install pinion mate washers and pinion mate gears in place.


SMT769B

2. Insert pinion mate shaft.

- **When inserting, be careful not to damage pinion mate thrust washers.**

Final Drive (Cont'd)



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.

Clearance between side gear and differential case with washers:

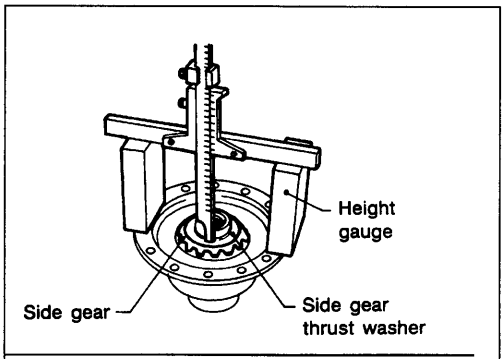
0.1 - 0.2 mm (0.004 - 0.008 in)

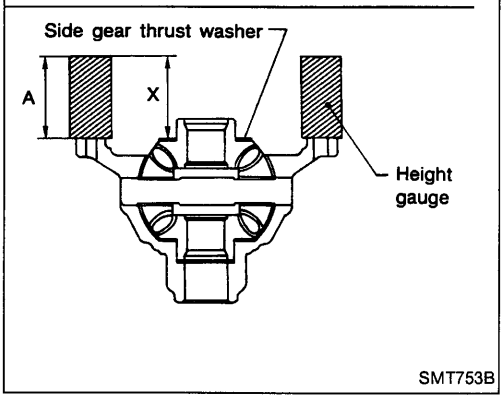
c. If not within specification, adjust clearance by changing thickness of side gear thrust washers.

Side gear thrust washers for differential case side:

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

Final Drive (Cont'd)





4. Measure clearance between side gear and viscous coupling with washers following the procedure below.

a. Set remaining side gear with washer on pinion mate gears.

b. Measure distance "X".

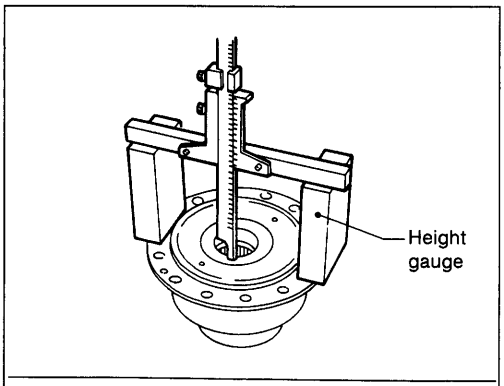
- **Side gear might be uneven, so measure it in at least 4 places along the circumference and take an average reading.**

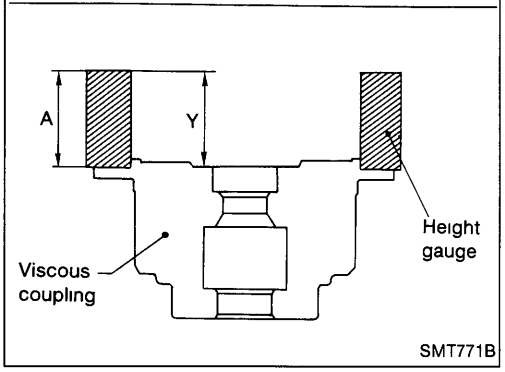
c. Measure dimension "Y".
Clearance between side gear and viscous coupling with washers can be obtained by "X + Y – 2A".
Specification: 0.1 - 0.2 mm (0.004 - 0.008 in)

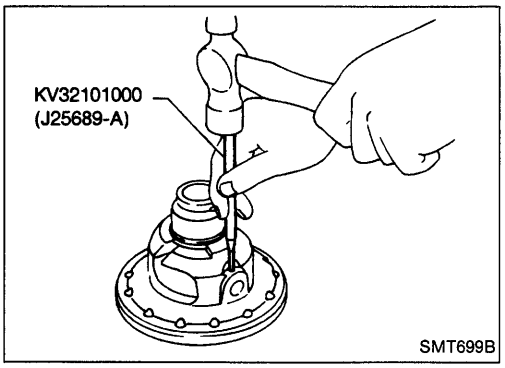
d. If not within specification, adjust clearance by changing thickness of side gear thrust washer.

Side gear thrust washers for viscous coupling side:

Thickness mm (in)	Part number
0.70 - 0.75 (0.0276 - 0.0295)	38424-D2110
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
1.00 - 1.05 (0.0394 - 0.0413)	38424-D2116
1.05 - 1.10 (0.0413 - 0.0433)	38424-D2117
1.10 - 1.15 (0.0433 - 0.0453)	38424-D2118
1.15 - 1.20 (0.0453 - 0.0472)	38424-D2119
1.20 - 1.25 (0.0472 - 0.0492)	38424-D2120
1.25 - 1.30 (0.0492 - 0.0512)	38424-D2121
1.30 - 1.35 (0.0512 - 0.0531)	38424-D2122





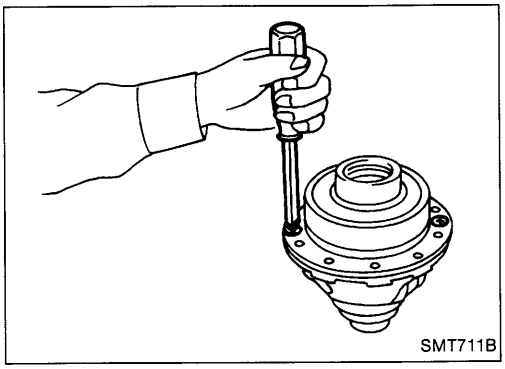


— RS5F32A & RS5F32V —

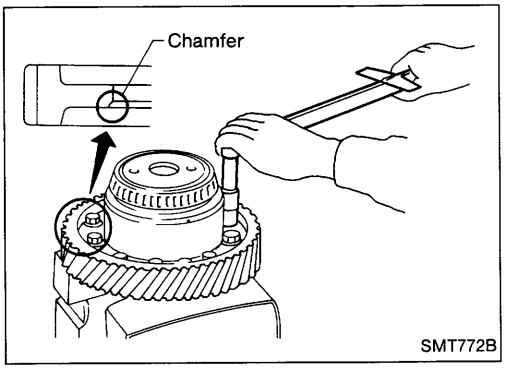
5. Install retaining pin.

- **Make sure that retaining pin is flush with case.**

Final Drive (Cont'd)

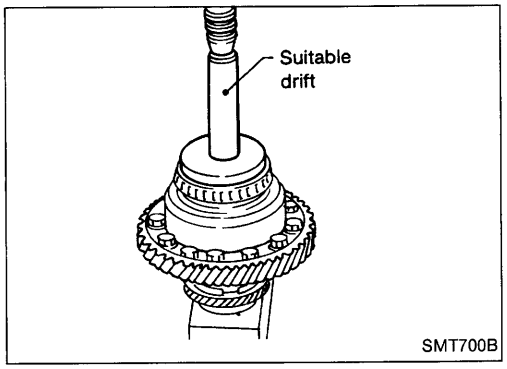

SMT711B

6. Install viscous coupling — RS5F32V.



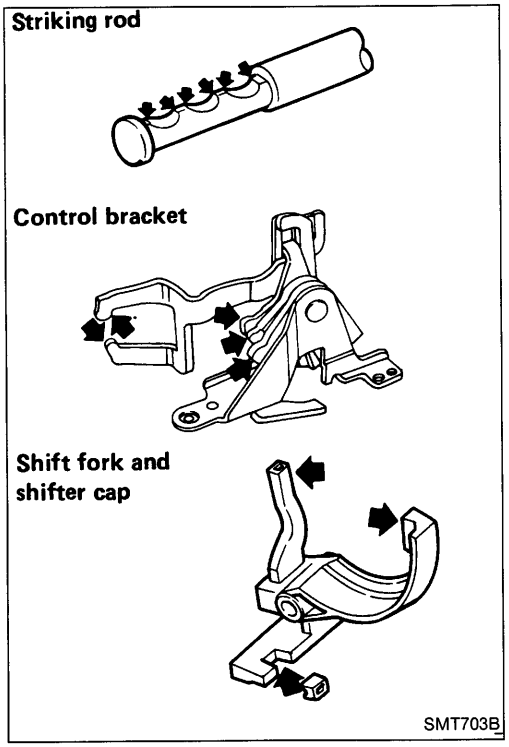
SMT772B

7. Install final gear.
- **Apply locking sealant to final gear fixing bolts before installing them.**
8. Install speedometer drive gear.



SMT700B

9. Press on differential side bearings.



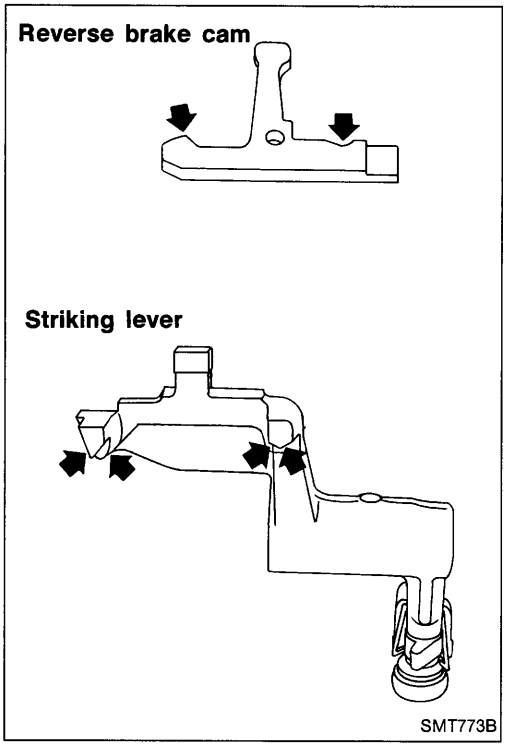
SMT703B

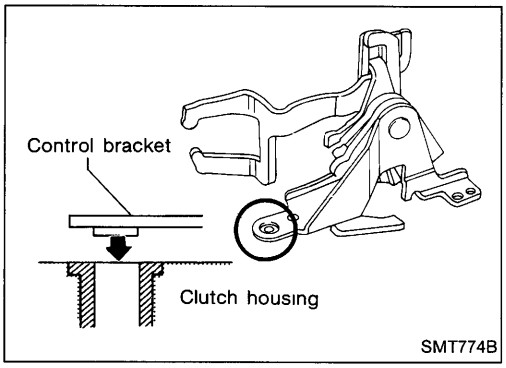
Shift Control Components

INSPECTION

- Check contact surface and sliding surface for wear, scratches, projections or other damage.

Shift Control Components (Cont'd)

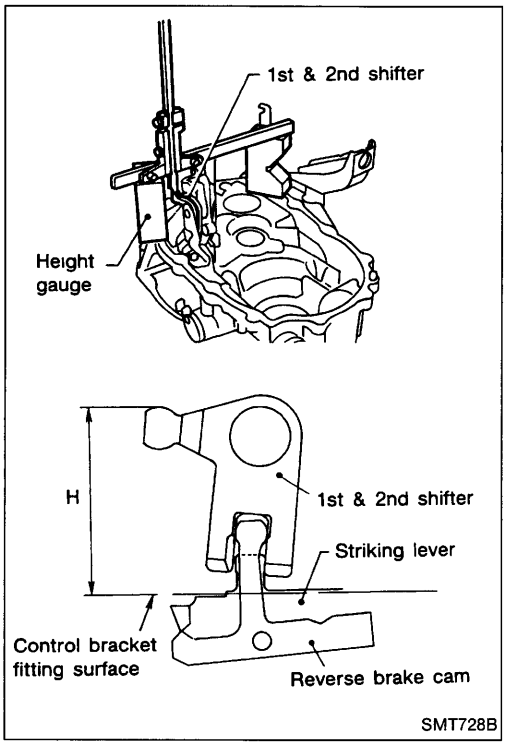




ADJUSTMENT OF INPUT SHAFT BRAKING MECHANISM

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.**

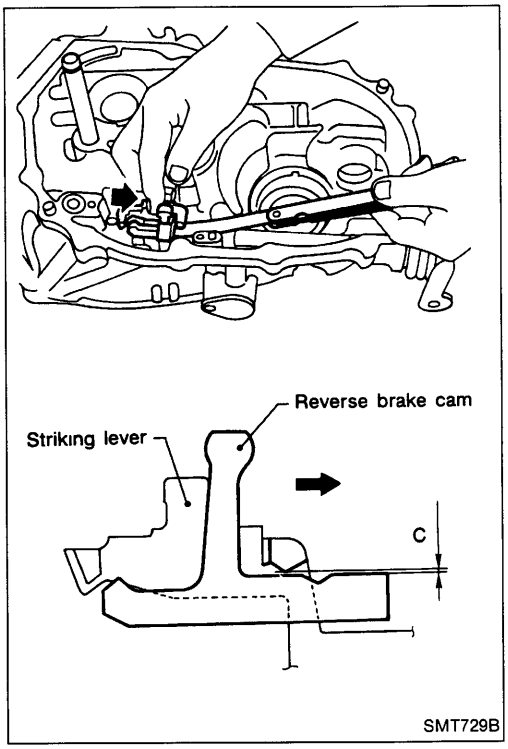


2. Measure maximum height "H" while shifting from neutral to reverse position.

   Maximum height "H":

   67.38 - 67.86 mm (2.6528 - 2.6716 in)

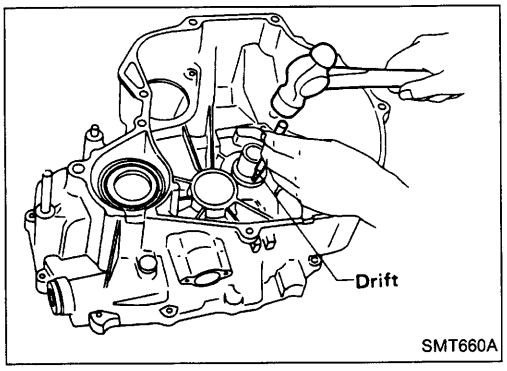
Shift Control Components (Cont'd)



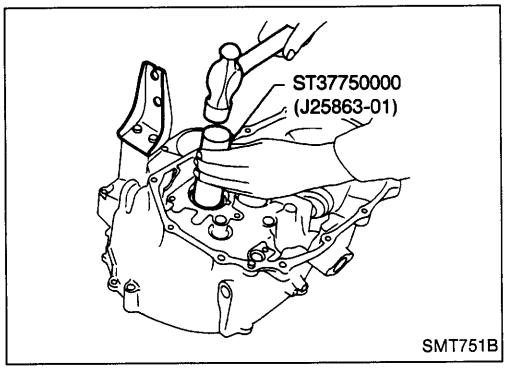
3. Measure clearance "C" between reverse brake cam and striking lever while shifting to reverse position.
   Clearance "C":
   0.05 - 0.20 mm (0.0020 - 0.0079 in)
   If "H" or "C" is not within specification, replace the following parts as a set.
   - **Striking lever assembly**
   - **Striking interlock assembly (This includes reverse brake cam.)**
   - **Control bracket assembly**

Case Components

Input shaft oil seal

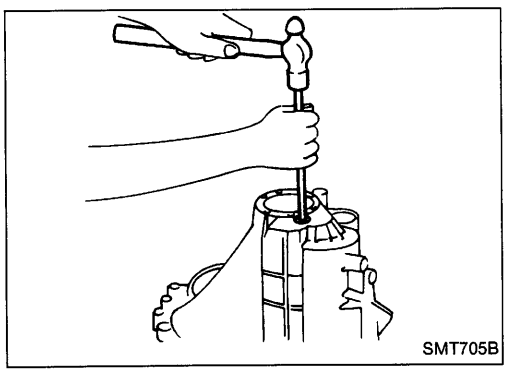


1. Drive out input shaft oil seal.



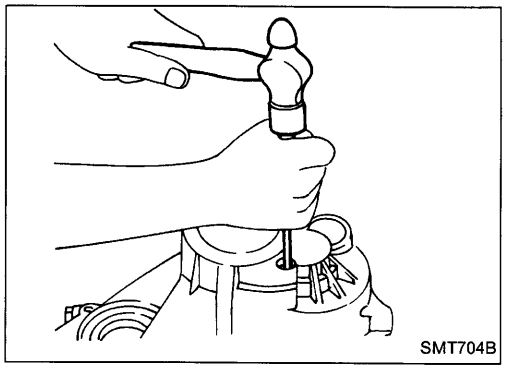
2. Install input shaft oil seal.
   - **Apply multi-purpose grease to seal lip of oil seal before installing.**

Input shaft rear bearing

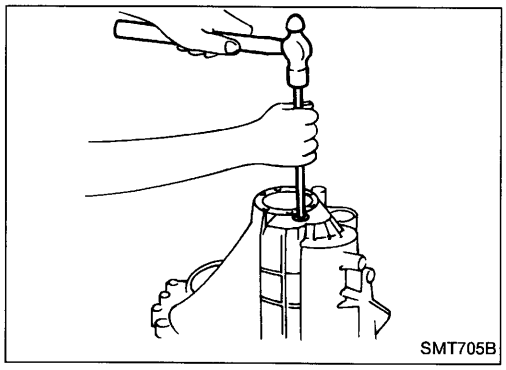


1. Remove welch plug from transmission case.

Case Components (Cont'd)

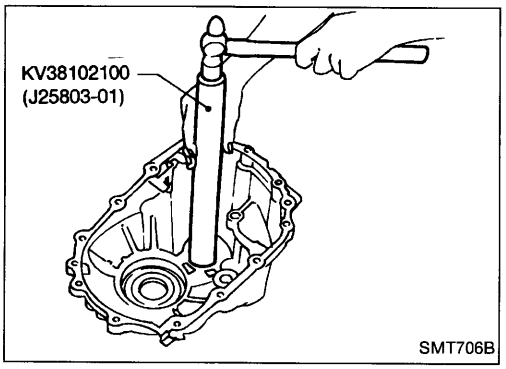

SMT704B

2. Remove input shaft rear bearing by tapping it from welch plug hole.


SMT705B

3. Install welch plug.

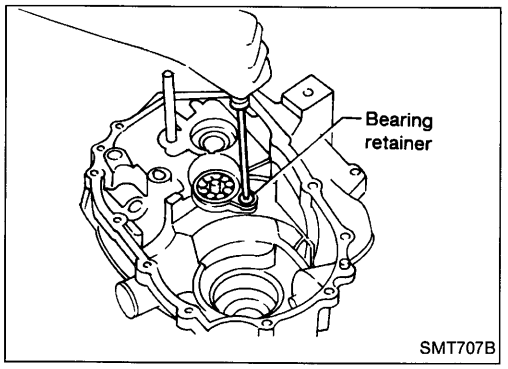
- **Apply recommended sealant to mating surface of transmission case.**



SMT706B

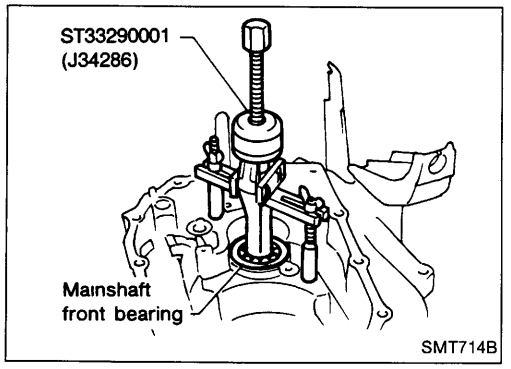
4. Install input shaft rear bearing.

Mainshaft front bearing and oil channel



SMT707B

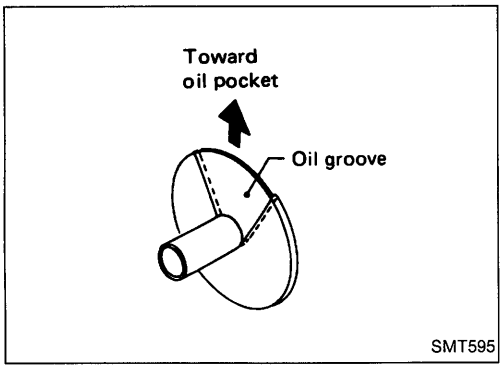
1. Remove mainshaft front bearing retainer.



SMT714B

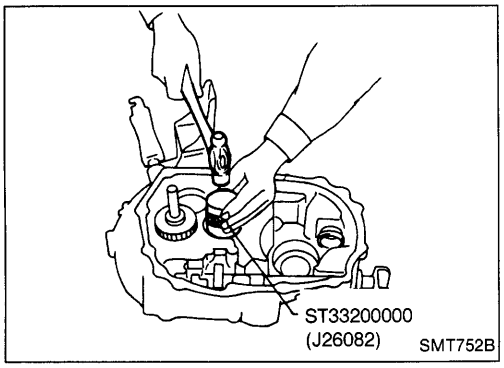
2. Remove mainshaft front bearing.
3. Remove oil channel.

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.**



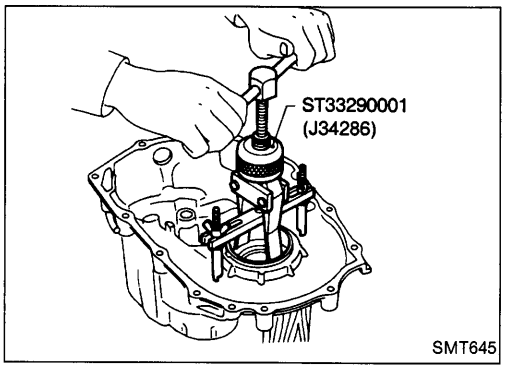
5. Install mainshaft front bearing.
6. Install mainshaft front bearing retainer.

Apply locking sealant to thread of screw before installation.

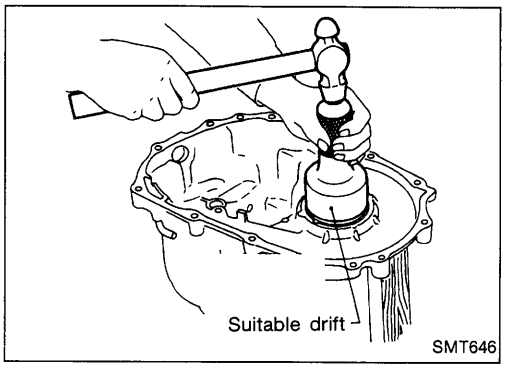
Differential Side Bearing Preload

If any of the following parts are replaced, adjust differential side bearing preload.

- **Differential case**
- **Differential side bearing**
- **Clutch housing**
- **Transmission case**

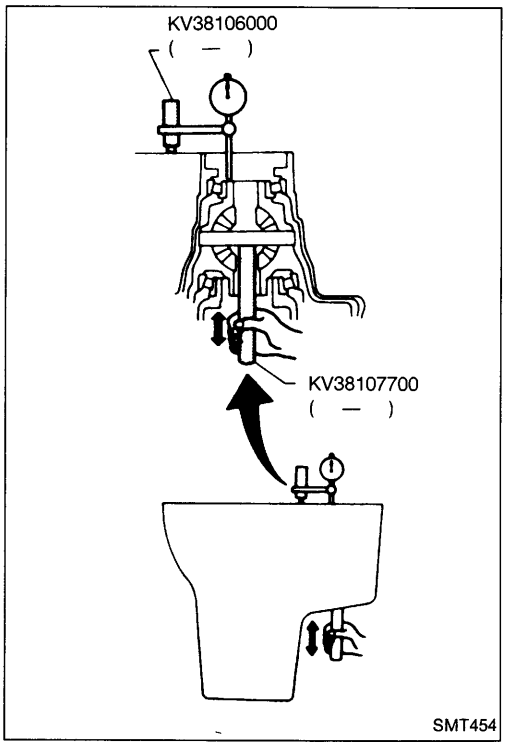


1. Remove differential side bearing outer race (transmission case side) and shim.



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:
Refer to S.D.S.

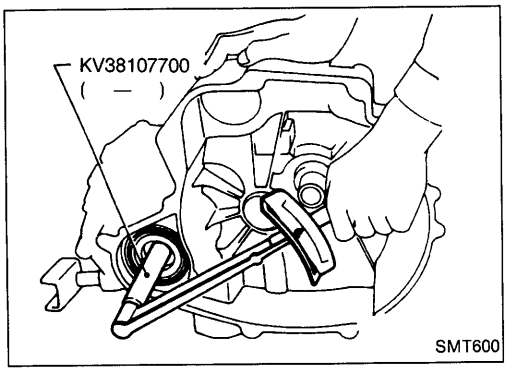
Bearing preload:
0.25 - 0.30 mm (0.0098 - 0.0118 in)

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)

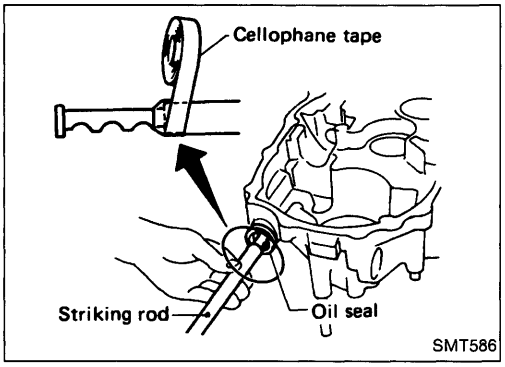


c. Measure turning torque of final drive assembly.

Turning torque of final drive assembly (New bearing):

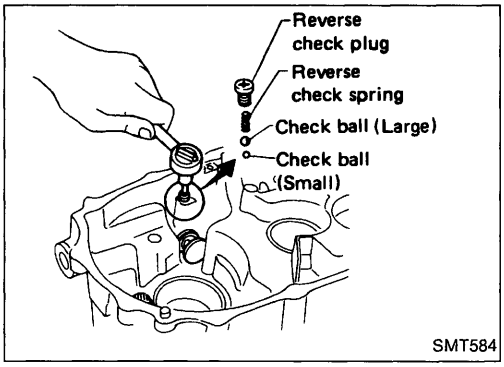
2.9 - 6.9 N·m (30 - 70 kg-cm, 26 - 61 in-lb)

- **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.**

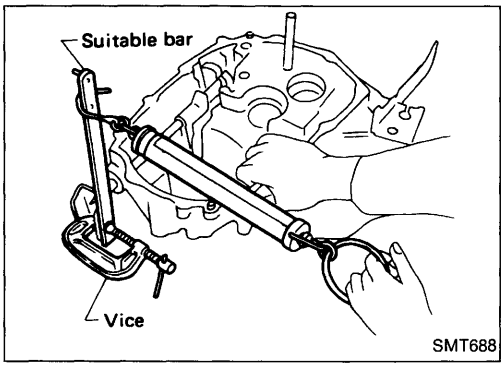


1. Install striking rod, lever and interlock.

- **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.

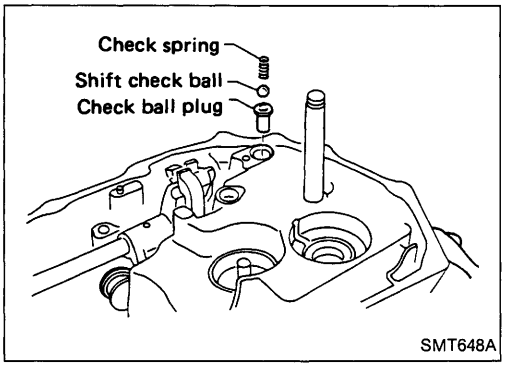
Available reverse check plugs:

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

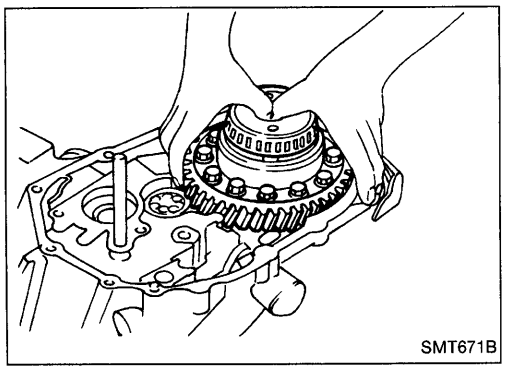
*Standard size check plug.

5. Install selected reverse check plug.

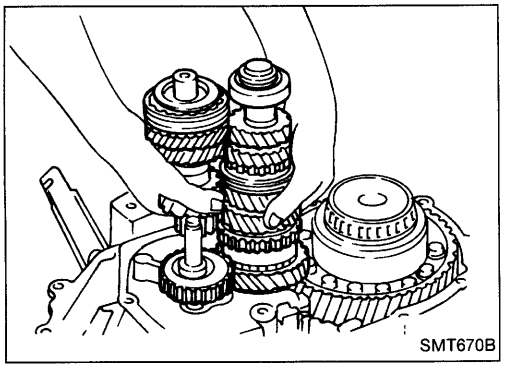
Apply locking sealant to thread of plug before installing it.



6. Install check ball plug, shift check ball and check spring.
7. Install oil pocket.

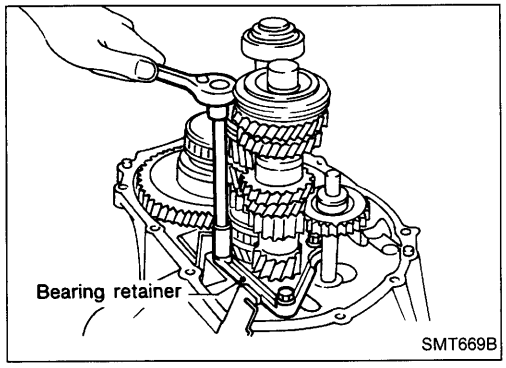

SMT671B

8. Install gear components onto clutch housing.
a. Install final drive assembly.


SMT670B

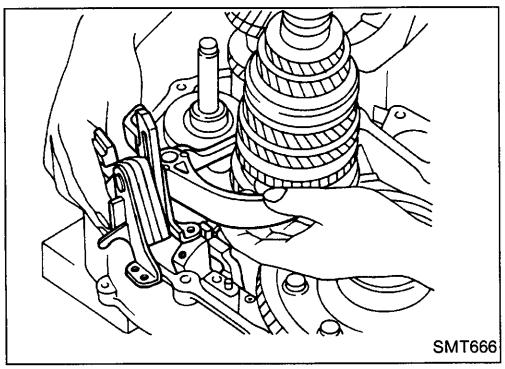
b. Install input shaft assembly with bearing retainer, mainshaft assembly and reverse idler gear.

- **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.**

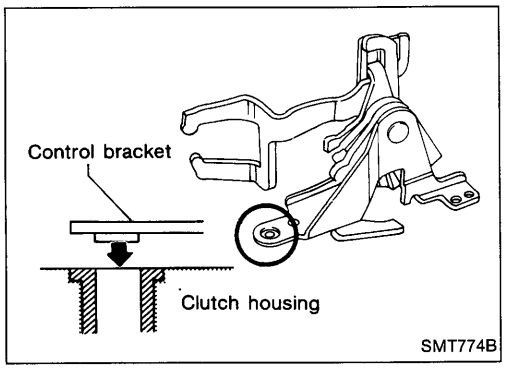


SMT669B

c. Install input shaft front bearing retainer.


SMT666

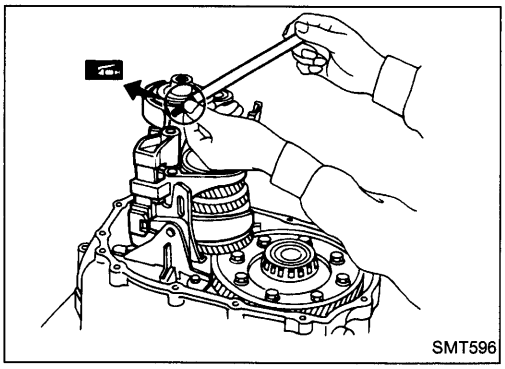
9. Apply grease to shifter caps, then install it to control bracket. Install control bracket with 1st & 2nd shift fork.



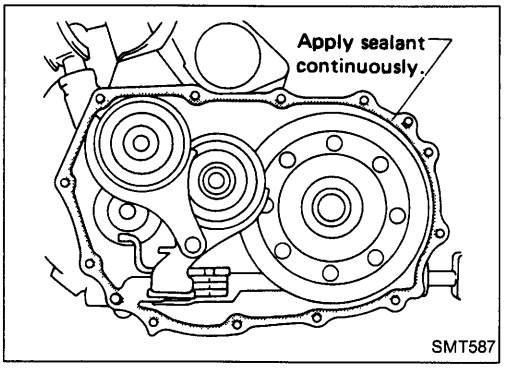
SMT774B

- When installing control bracket on clutch housing, ensure protrusion beneath bracket is correctly seated.

10. Install 3rd & 4th and 5th shift forks.

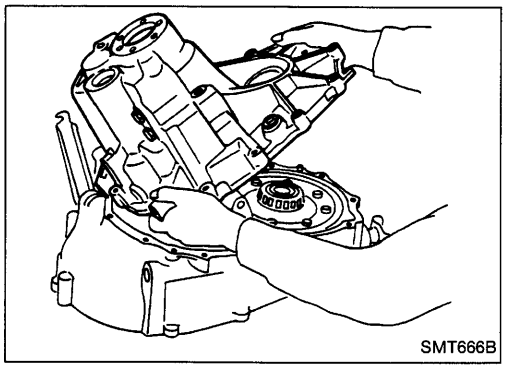

SMT596

11. Insert fork shaft.
- **Apply multi-purpose grease to support spring before installing.**
12. Install reverse idler spacer.

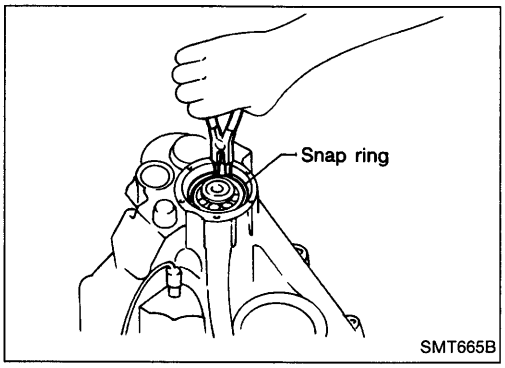


SMT587

13. Apply recommended sealant to mating surface of clutch housing.

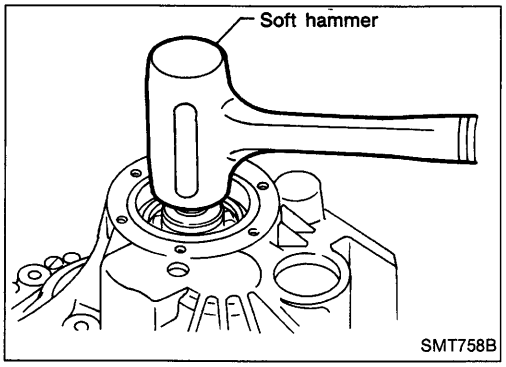

SMT666B

14. Install transmission case on clutch housing.



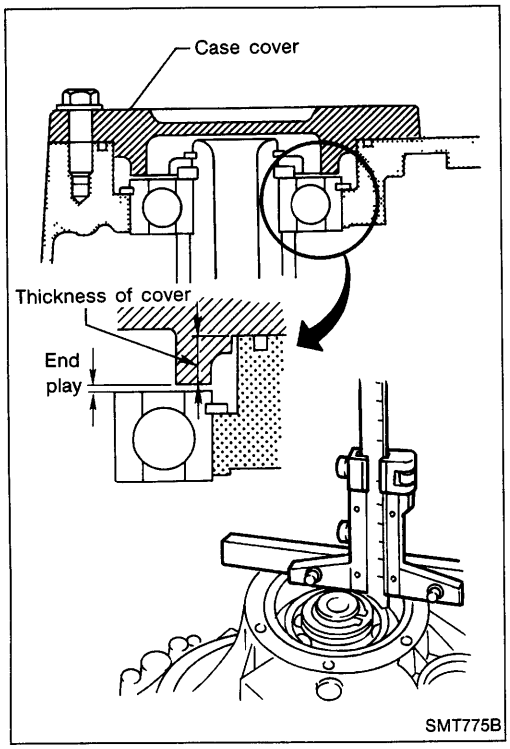
SMT665B

15. Install mainshaft front bearing snap ring.

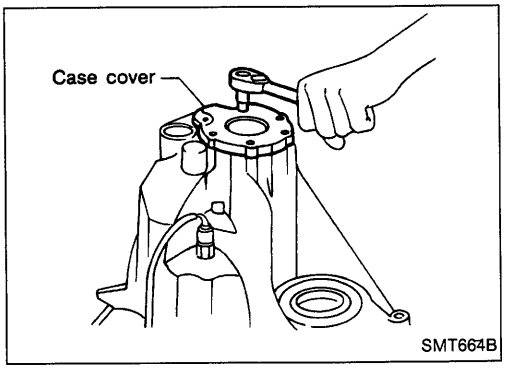


SMT758B

16. Tap mainshaft with a rubber hammer to ensure mainshaft rear bearing is properly seated.



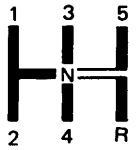
17. Check mainshaft bearing end play.
    Mainshaft bearing end play:
    0 - 0.1 mm (0 - 0.004 in)
- If not within specification, select another case cover having a different thickness.
    Available case covers:
    Refer to S.D.S.



18. Install O-ring and case cover on transmission case.
Apply recommended sealant to mating surface of transmission case.

General Specifications

TRANSAXLE

Engine			SR20DE	
Transaxle model			RS5F32A	RS5F32V
Number of speeds			5	
Synchromesh type			Warner	
Shift pattern				
Gear ratio	1st		3.063	
	2nd		1.826	
	3rd		1.207	
	4th		0.926	
	5th		0.733	
	Reverse		3.153	
Number of teeth	Input gear	1	16	
		2	23	
		3	29	
		4	41	
		5	45	
		Rev.	13	
	Main gear	1	49	
		2	42	
		3	35	
		4	38	
		5	33	
		Rev.	41	
	Reverse idler gear		31	
Oil capacity		ℓ (US pt, Imp pt)	3.5 - 3.7 (7-3/8 - 7-7/8, 6-1/8 - 6-1/2)	

FINAL GEAR

Engine		SR20DE
Final gear ratio		4.058
Number of teeth	Final gear/Pinion	69/17
	Side gear/Pinion mate gear	14/10

Inspection and Adjustment

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

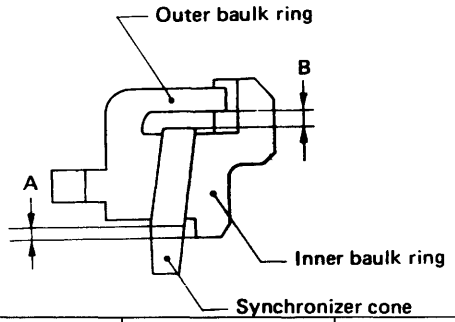
1st, 4th, 5th baulk ring

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)



Dimension	Standard	Wear limit
A	0.7 - 0.9 (0.028 - 0.035)	0.2 (0.008)
B	0.6 - 1.1 (0.024 - 0.043)	

AVAILABLE CHECK PLUGS 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

Main shaft 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

AVAILABLE SNAP RINGS

Input shaft front bearing

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
1.27 (0.0500)	32204-M8004
1.33 (0.0524)	32204-M8005
1.39 (0.0547)	32204-M8006
1.45 (0.0571)	32204-M8007

Input shaft 5th synchronizer hub

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
2.00 (0.0787)	32311-M8812
2.05 (0.0807)	32311-M8813
2.10 (0.0827)	32311-M8814
2.15 (0.0846)	32311-M8815
2.20 (0.0866)	32311-M8816
2.25 (0.0886)	32311-M8817
2.30 (0.0906)	32311-M8818

AVAILABLE C-RINGS

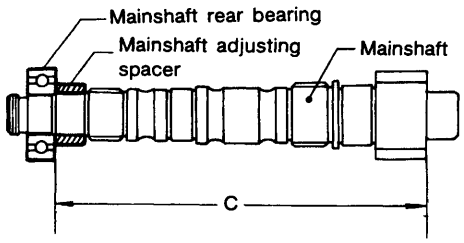
Mainshaft C-ring

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
4.45 (0.1752)	32348-50J00
4.52 (0.1780)	32348-50J01
4.59 (0.1807)	32348-50J02
4.66 (0.1835)	32348-50J03
4.73 (0.1862)	32348-50J04
4.80 (0.1890)	32348-50J05
4.87 (0.1917)	32348-50J06
4.94 (0.1945)	32348-50J07

Inspection and Adjustment (Cont'd)

AVAILABLE SPACERS

Mainshaft bearing adjusting spacer



SMT693B

Bearing distance: C	230.15 - 230.25 mm (9.0610 - 9.0649 in)
Thickness mm (in)	Part number
18.91 (0.7445)	32347-50J00
18.98 (0.7472)	32347-50J01
19.05 (0.7500)	32347-50J02
19.12 (0.7528)	32347-50J03
19.19 (0.7555)	32347-50J04
19 26 (0.7583)	32347-50J05
19.33 (0.7610)	32347-50J06
19.40 (0.7638)	32347-50J07
19 47 (0.7665)	32347-50J08

AVAILABLE WASHERS

Differential side gear thrust washer

Allowable clearance between side gear and differential case or viscous coupling with washer		0.1 - 0.2 mm (0.004 - 0.008 in)	
		Thickness mm (in)	Part number
F32A		0.75 - 0.80 (0.0295 - 0.0315)	38424-D2111
		0.80 - 0.85 (0.0315 - 0.0335)	38424-D2112
		0.85 - 0.90 (0.0335 - 0.0354)	38424-D2113
		0.90 - 0.95 (0.0354 - 0.0374)	38424-D2114
		0.95 - 1.00 (0.0374 - 0.0394)	38424-D2115
F32V	Viscous coupling side	0.70 - 0.75 (0.0276 - 0.0295)	38424-D2110
		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
		1.00 - 1.05 (0.0394 - 0.0413)	38424-D2116
		1.05 - 1.10 (0.0413 - 0.0433)	38424-D2117
		1.10 - 1.15 (0.0433 - 0.0453)	38424-D2118
		1.15 - 1.20 (0.0453 - 0.0472)	38424-D2119
		1.20 - 1.25 (0.0472 - 0.0492)	38424-D2120
		1.25 - 1.30 (0.0492 - 0.0512)	38424-D2121
		1.30 - 1.35 (0.0512 - 0.0531)	38424-D2122
	Differential case side	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)

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)

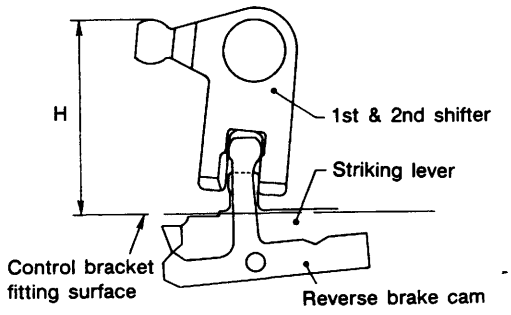
Final drive	2.9 - 6.9 (30 - 70, 26 - 61)

Differential side bearing adjusting shims

Thickness mm (in)		Part number
RS5F32A	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
RS5F32V	0.28 (0.0110)	31439-31X00
	0.32 (0.0126)	31439-31X01
	0.36 (0.0142)	31439-31X02
	0.40 (0.0157)	31439-31X03
	0.44 (0.0173)	31439-31X04
	0.48 (0.0189)	31439-31X05
	0.52 (0.0205)	31439-31X06
	0.56 (0.0220)	31439-31X07
	0.60 (0.0236)	31439-31X08
	0.64 (0.0252)	31439-31X09
	0.68 (0.0268)	31439-31X10
	0.72 (0.0283)	31439-31X11
	0.76 (0.0299)	31439-31X12
	0.80 (0.0315)	31439-31X13
	0.84 (0.0331)	31439-31X14
	0.88 (0.0346)	31439-31X15
	0.92 (0.0362)	31439-31X16
	0.96 (0.0378)	31439-31X17
	1.44 (0.0567)	31439-31X18

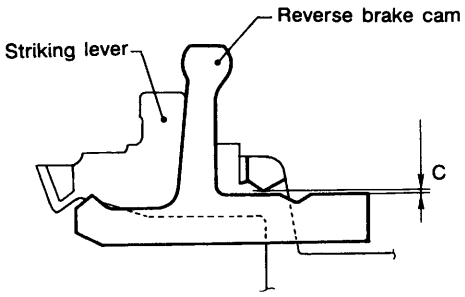
INPUT SHAFT BRAKING MECHANISM

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)

AUTOMATIC TRANSAXLE

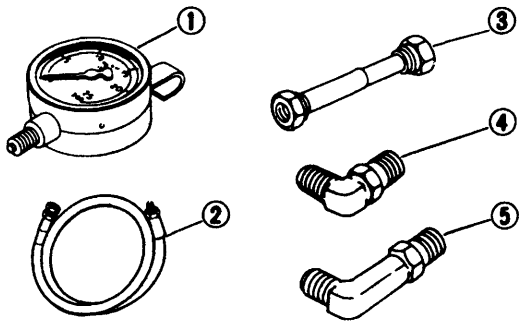
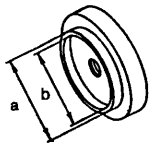
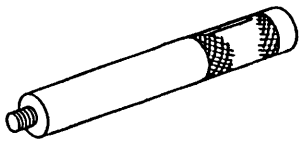
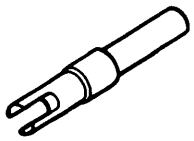
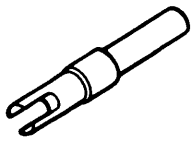
SECTION AT

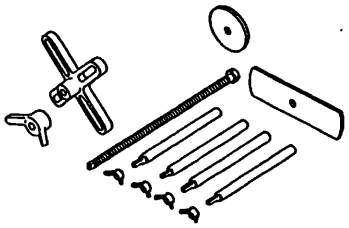
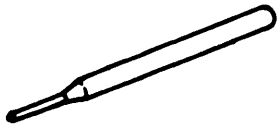
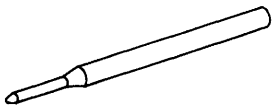
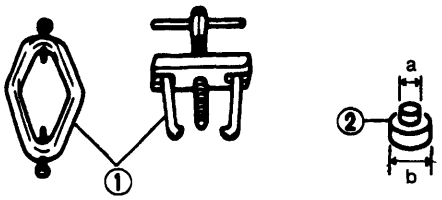
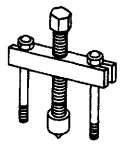
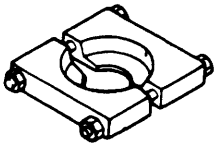
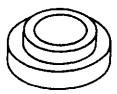
CONTENTS

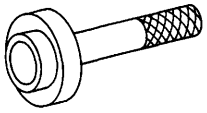
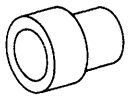
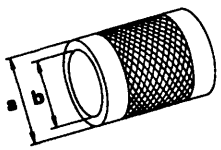
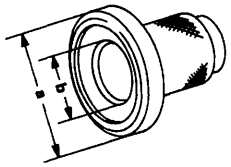
PREPARATION ..... AT- 2
PRECAUTIONS ..... AT- 5
ON-VEHICLE SERVICE ..... AT- 6
TROUBLE DIAGNOSES ..... AT- 12
ELECTRICAL SYSTEM ..... AT- 25
REMOVAL AND INSTALLATION ..... AT- 28
MAJOR OVERHAUL ..... AT- 31
DISASSEMBLY ..... AT- 40
REPAIR FOR COMPONENT PARTS ..... AT- 55
ASSEMBLY AT-124
SHIFT CONTROL AND SHIFT LOCK SYSTEM AT-147
SERVICE DATA AND SPECIFICATIONS (S.D.S.) AT-163

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

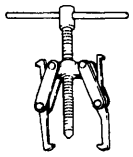
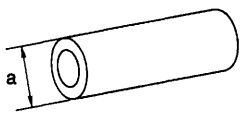
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description	
ST2505S001 (J25695-A) Oil pressure gauge set ① ST25051001 (J25695-1) Oil pressure gauge ② ST25052000 (J25695-2) Hose ③ ST25053000 (J25695-3) Joint pipe ④ ST25054000 (J25695-4) Adapter ⑤ ST25055000 (J25695-5) Adapter		Measuring line pressure and governor pressure
ST33290001 (J34286) Puller		Removing differential side oil seals
KV31103000 (—) Drift		Installing R.H. side differential oil seal (Use with ST35325000.) **a: 76 mm (2.99 in) dia.** **b: 67 mm (2.64 in) dia.**
ST35325000 (—) Drift		Installing R.H. side differential oil seal (Use with KV31103000.)
KV38105710 (—) Preload adapter		**RL4F03A** • Measuring turning torque of final drive assembly • Measuring clearance between side gear and differential case with washer • Selecting differential side bearing adjusting shim
KV38107700 (—) Preload adapter		**RL4F03V** • Measuring turning torque of final drive assembly • Measuring clearance between side gear and differential case with washer • Selecting differential side bearing adjusting shim

Tool number (Kent-Moore No.) Tool name	Description	
KV31103200 (—) Clutch spring compressor		Removing and installing clutch return spring & spring retainer
ST23540000 (—) Pin punch		Removing and installing parking rod plate and manual plate pins.
KV32101000 (J25689-A) Pin punch		• Installing throttle lever and manual shaft retaining pins • Removing and installing differential pinion mate shaft retaining pin.
ST3306S001 (—) Differential side bearing puller set ① ST33051001 (—) Puller ② ST33061000 (J8107-2) 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 differential side bearing outer race • Removing idler gear bearing outer race • Removing needle bearing from bearing retainer
ST27180001 (—) Puller		Removing idler gear
ST30037000 (—) Puller		Removing reduction gear bearing inner race
ST35272000 (—) Drift		• Installing reduction gear bearing inner race • Installing idler gear bearing inner race

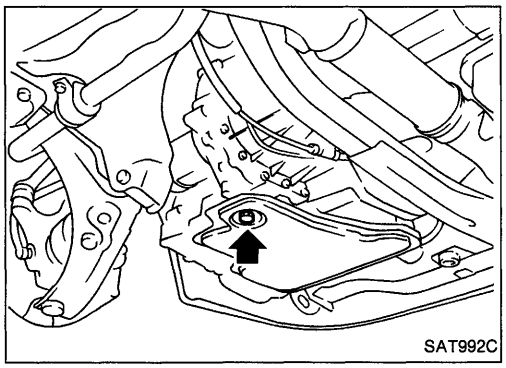
Tool number (Kent-Moore No.) Tool name	Description	
ST37830000 (—) Drift		Installing idler gear bearing outer race
ST35321000 (—) Drift		Installing output shaft bearing
ST33200000 (J37067) Drift		Installing differential side bearing inner race **a: 60 mm (2.36 in) dia.** **b: 44.5 mm (1.752 in) dia.**
ST30633000 (—) Drift		Installing differential side bearing outer race
ST35271000 (—) Drift		Installing idler gear **a: 76 mm (2.99 in) dia.** **b: 67 mm (2.64 in) dia.**

COMMERCIAL SERVICE TOOLS

Tool name	Description	
Puller		• Removing idler gear bearing inner race • Removing and installing band servo piston snap ring
Drift		Removing idler gear bearing inner race **a: 34 mm (1.34 in) dia.**
Drift		Installing needle bearing onto bearing retainer **a: 36 mm (1.42 in) dia.**

Service Notice

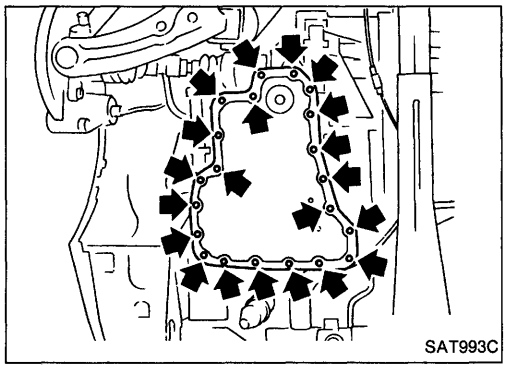
- Before proceeding with disassembly, thoroughly clean the outside of the transaxle. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common shop rags can leave fibers that could interfere with the operation of the transaxle.
- When disassembling parts, place them in order in a parts rack so that they can be put back into the unit in their proper positions.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Gaskets, seals and O-rings should be replaced any time the transaxle is disassembled.
- 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.



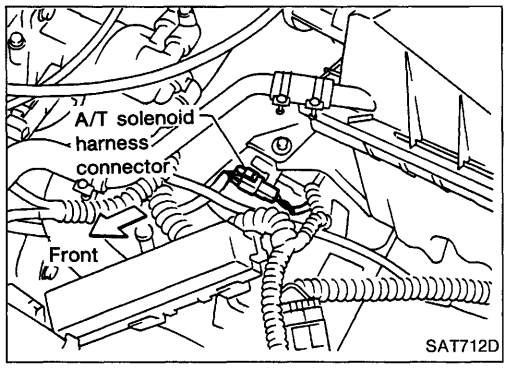
Control Valve Assembly and Accumulator

REMOVAL

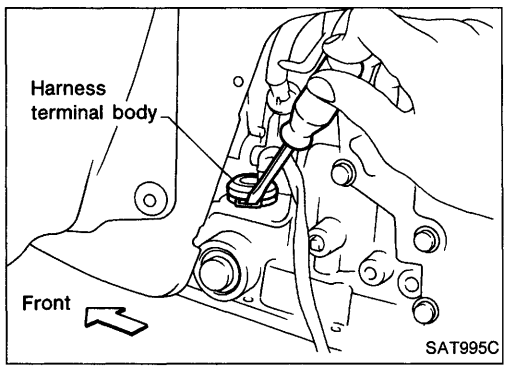
1. Drain A.T.F. from transaxle.



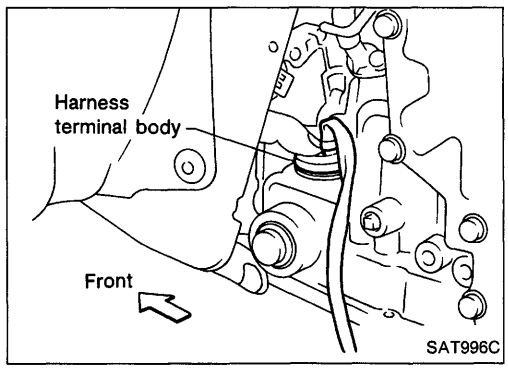
2. Remove oil pan and gasket.



3. Disconnect A/T solenoid harness connector.

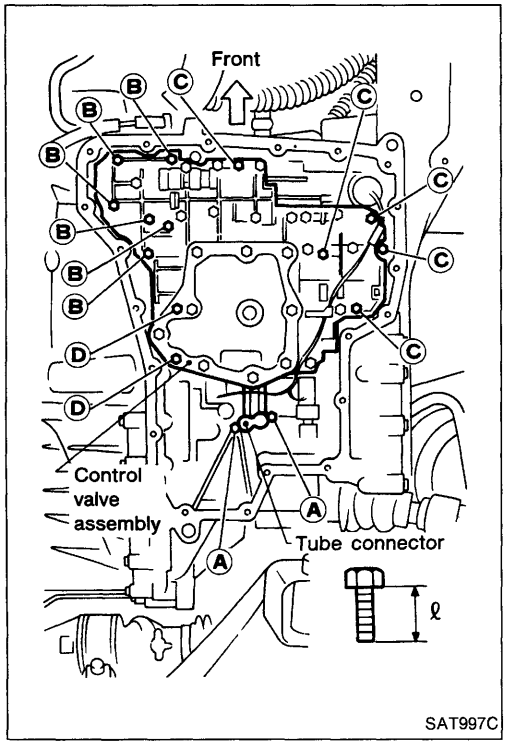


4. Remove stopper ring from A/T solenoid harness terminal body.



5. Remove A/T solenoid harness from transmission case by pushing on terminal body.

Control Valve Assembly and Accumulator (Cont'd)



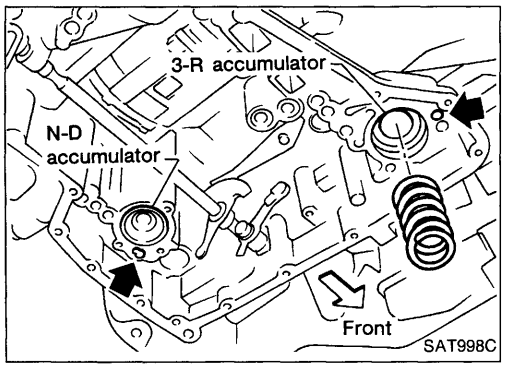
6. Remove control valve assembly by removing fixing bolts.

Bolt length, number and location:

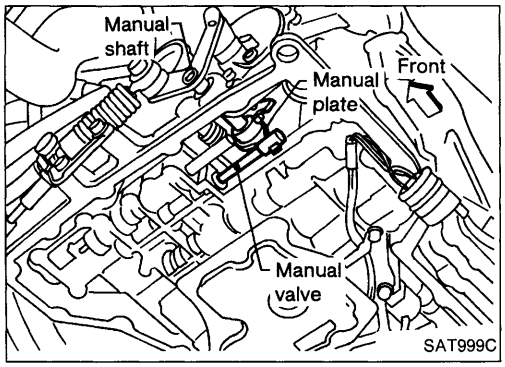
Bolt symbol	A	B	C	D
Bolt length "ℓ" mm (in)	25.0 (0.984)	33.0 (1.299)	40.0 (1.575)	43.5 (1.713)
Number of bolts	2	6	5	2

- **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".

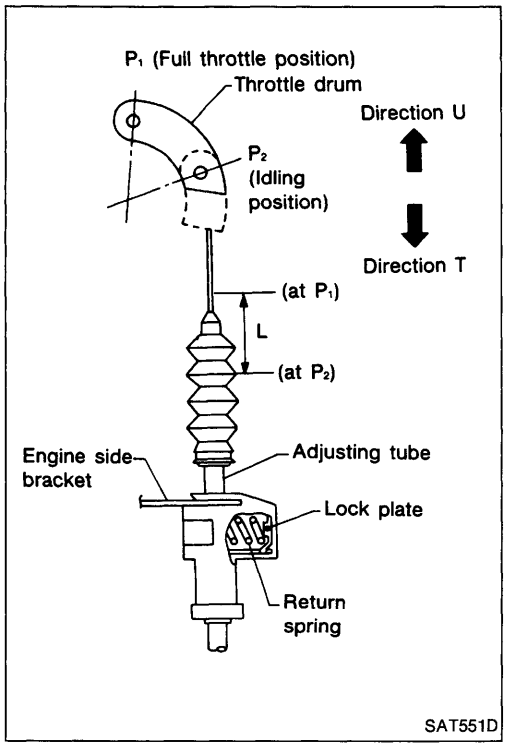


8. Remove 3-R and N-D accumulators by applying compressed air if necessary.
- **Hold each piston with a rag.**



INSTALLATION

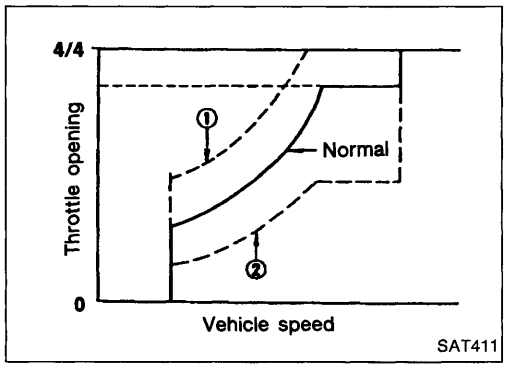
- **Set manual shaft in Neutral, then align manual plate with groove in manual valve.**
- **After installing control valve to transmission case, make sure that selector lever can be moved to all positions.**



Throttle Wire Adjustment

1. Turn ignition switch to OFF.
2. Move adjusting tube in direction "T" (Transaxle side) while pressing lock plate.
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 the direction "U" (Engine side) depressing the lock plate.]
   Ensure that throttle wire stroke "L" is within the specified range between full throttle and idle.
   Throttle wire stroke "L":
   39 - 43 mm (1.54 - 1.69 in)

- **Adjust throttle wire stroke after throttle wire/accelerator wire has been installed and adjusted.**
- **Put mark on throttle wire to facilitate measuring wire stroke.**



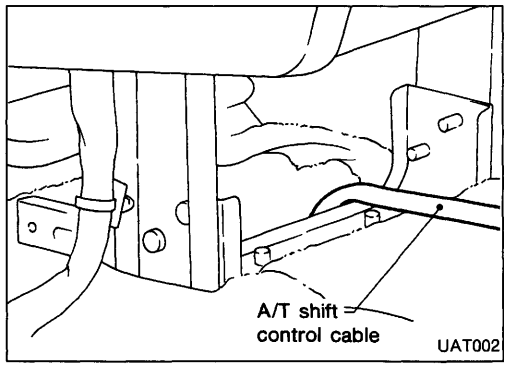
If throttle wire stroke is improperly adjusted, the following problems may arise.

- When full-open position "P_1" of throttle drum is too far in direction "T", shift schedule will be as shown by ② in figure, and kickdown range will greatly increase.
- When full-open position "P_1" of throttle drum is too far in direction "U", shift schedule will be as shown by ① in figure, and kickdown will not occur.

5. After properly adjusting throttle wire, ensure the parting line is as straight as possible.

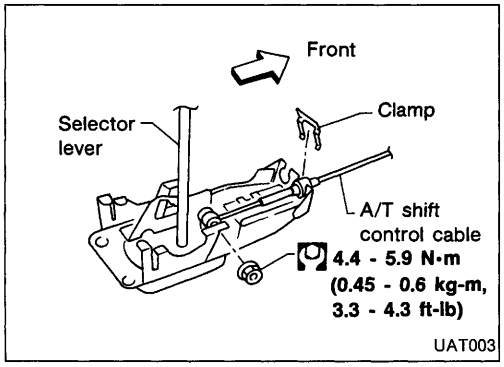
Control Cable Installation and Adjustment

Move selector lever from the "P" range to "1" range. You should be able to feel the detents in each range. If the detents cannot be felt or the pointer indicating range is improperly aligned, the control cable needs adjustment.

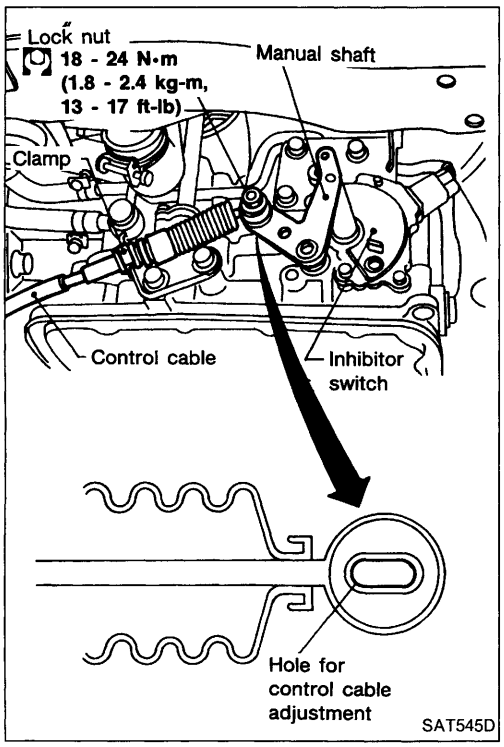


1. Remove center console.
2. Loosen heater duct.
3. Locate control cable by sliding it through body and under heater duct.

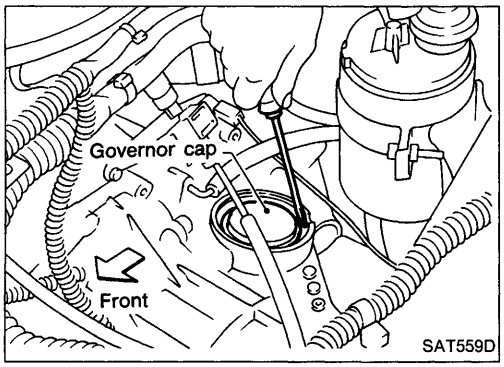
Control Cable Installation and Adjustment (Cont'd)



4. Place selector lever and manual shaft at position "P".
5. Install control cable to selector lever and tighten lock nut. Clamp control cable to selector lever bracket.

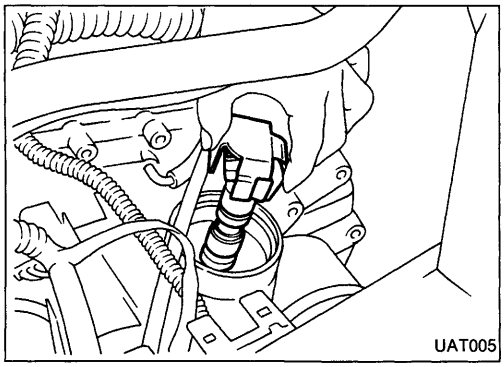


6. Install control cable to manual shaft and clamp control cable to bracket at transaxle.
- **Adjust by sliding manual shaft in long hole of control cable end at transaxle side.**
7. Tighten lock nut.
8. Move selector lever from "P" range to "1" range and make sure that selector lever moves smoothly without any sliding noise.
9. Apply grease to contacting areas of selector lever and control cable.
   Install any part removed.

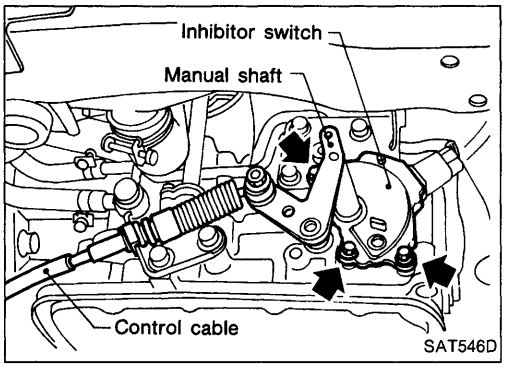


Governor Valve

1. Remove governor cap snap ring and spacer.
2. Remove governor cap and O-ring.

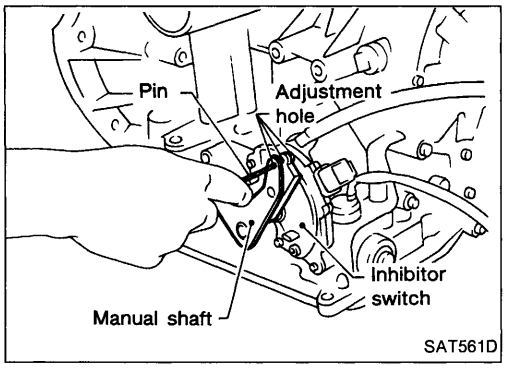


3. Remove governor valve assembly from transaxle.
4. Check governor valve assembly if necessary — Refer to "DISASSEMBLY".



Inhibitor Switch Adjustment

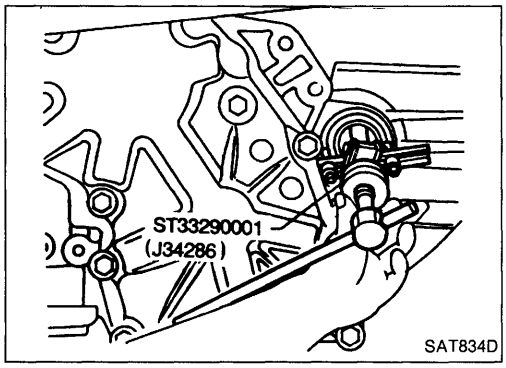
1. Remove control cable end from manual shaft.
2. Set manual shaft in "N" range.
3. Loosen inhibitor switch fixing bolts.



4. Insert 4.0 mm (0.157 in) dia. pin into adjustment holes in both inhibitor switch and manual shaft as near vertically as possible.
5. Tighten inhibitor switch fixing bolts.
6. Remove pin from adjustment holes 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".

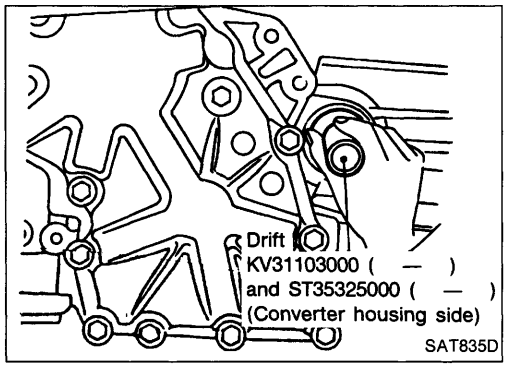
Differential Side Oil Seal Replacement

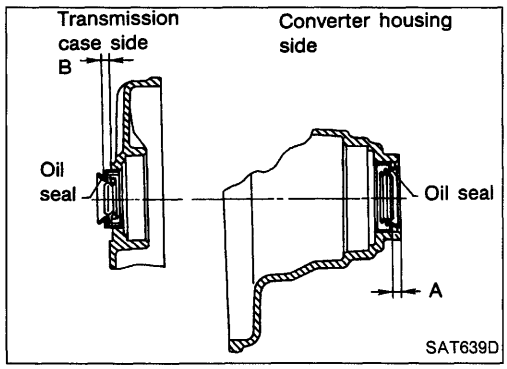
1. Remove drive shaft assembly. — Refer to section FA.
2. Remove oil seal.



3. Install oil seal.

- **Apply A.T.F. to oil seal surface before installing.**



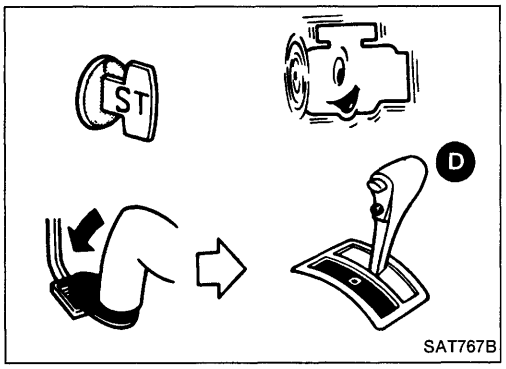


- **Install oil seal so that dimensions "A" and "B" are within specifications.**

Unit: mm (in)

Dimension A	Dimension B
5.5 - 6.5 (0.217 - 0.256)	0.5 (0.020) or less

NOTE



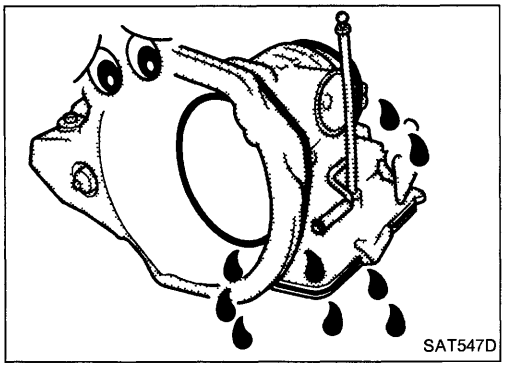
SAT767B

Preliminary Check (Prior to road testing)

A/T FLUID CHECK

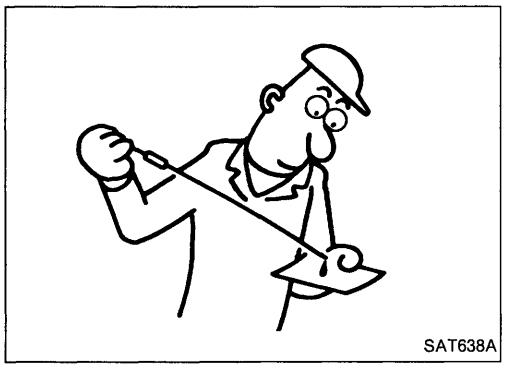
Fluid leakage check

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.

Fluid condition check


SAT638A

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-16.

"P" RANGE

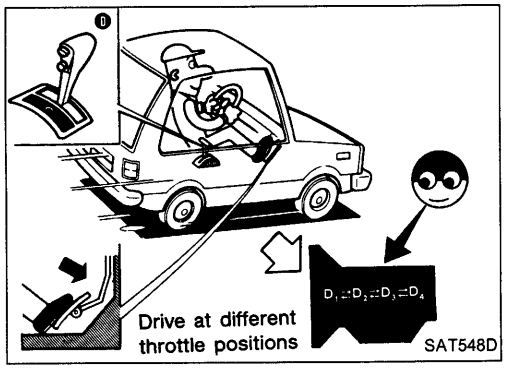
1. Place selector lever in "P" range and start the engine. Stop the engine and repeat the procedure in all ranges, including neutral.
2. Stop vehicle on a slight upgrade and place selector lever in "P" range. Release parking brake to make sure vehicle remains locked.

"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

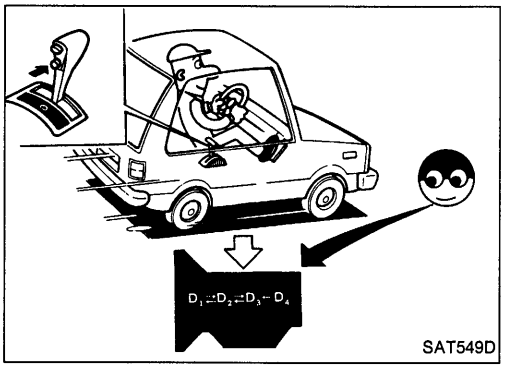
1. Manually move selector lever from "R" and "D" to "N" and note quality.
2. Release parking brake with selector lever in "N" range. Lightly depress accelerator pedal to make sure vehicle does not move. (When vehicle is new or soon after clutches have been replaced, vehicle may move slightly. This is 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.

Road Testing (Cont'd)



4. Check to determine if shifting to overdrive gear cannot be made while O.D. control switch is "OFF".

5. When vehicle is being driven 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 it downshifts from 3rd to 2nd gear.
6. When vehicle is being driven in the 30 to 40 km/h (19 to 25 MPH) ("D_2" range) at half to light throttle position, fully depress accelerator pedal to make sure it 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 it upshifts from 1st to 2nd gear.
3. Further increase vehicle speed. Make sure it 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 it downshifts from 2nd to 1st gear.
5. Allow vehicle to run idle while in "2" range to make sure that it downshifts to 1st gear.
6. Move selector lever to "D" range and allow vehicle to operate at 40 to 50 km/h (25 to 31 MPH). Then, shift to "2" range to make sure it downshifts to 2nd gear.

"1" RANGE

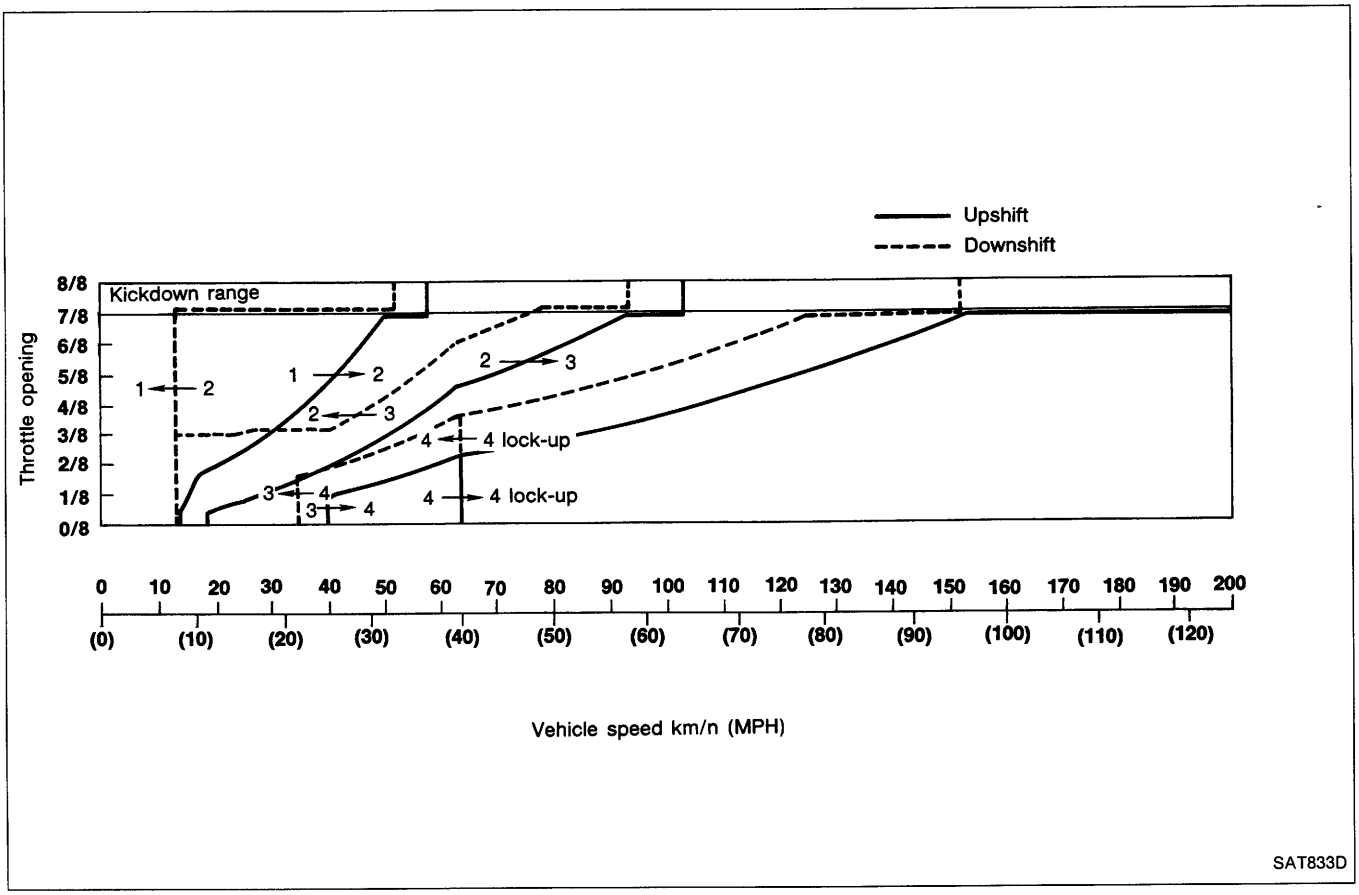
1. Place selector lever in "1" range and accelerate vehicle. Make sure it does not shift from 1st to 2nd gear although vehicle speed increases.
2. While vehicle is being to driven in "1" range, release accelerator pedal to make sure that engine compression acts as a brake.
3. Place selector lever in "D" or "2" range and allow vehicle to run at 20 to 30 km/h (12 to 19 MPH). Then move selector lever to "1" range to make sure it downshifts to 1st gear.

Road Testing (Cont'd)

VEHICLE SPEED WHEN 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



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	Lock-up 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
									.	.	.	.	.	6				9	8	.	.	.	.	.	.		.
										.			5				.	8	.		.	.		.	.	7	
									.	.	.	.	.		.	.	.	8	.	.			7	.	.	6	.
									.	.	.	.	.			.		.	.	8		.	7	.	.	6	.
									.									7	.	.	.	.	.		6		
									.		.	.		.		.	.	7		.					.	6	
									.	.	.	.	5					9	.	8	.		.	.		7	.
									.	.	.	.			.	.	.	8		7	.					6	.
									4	7	.				.		8	9	10	11	13	14	15	16	17	12	.
										.	.	.	5		.			7	.	8			10	.	11	9	.
									4	7						.	.	11	.	8	.	10	.	.		9	.
									.			.	.	5	.	.	.	9	.	7	8	.	.	.	.	.	
									5	6			.	.	.	.	.	9		.	8	.	.	.		.	
											.							.	.	.			6	.		.	.
											6		.	.		5	.						8		.	.	
															.			.	.	.			6	.	7	.	.
									4	5	.		.				.	.	.	.				.	.	.	.
									4	5	.									.							
									4	5			.		.			.			.			.	.	.	.
									4	5	.	.			.	.		.		.				.	.	.	.

Road Testing (Cont'd)

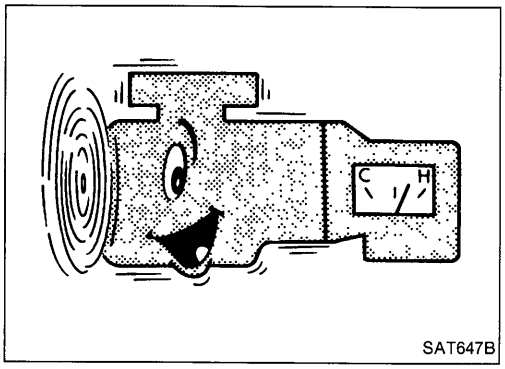
Numbers are arranged in order of probability.
Perform inspections starting with number one and work up.
Circled numbers indicate that the transaxle must be removed from the vehicle.

[ ] : 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	7								
	Lock-up is not released when accelerator pedal is released	1			.			2								
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	Lock-up 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
									4	5			.	.			.		.	.	.	.	.	.	.	.	.
									4	5									.	.	.	.	.		.	.	.
									4	5								.	.	.	.	.	.			.	.
									4	5									.	.		.			.		
									4	5	7					8		.		.			.	.	.	.	.
									4	5									.	.	.	.		.	.	.	
									4	5	.	.				.	.		.		.						.
									4	5			.		.			.		.	.	.	.			.	.
									4	5	.	6				.	8	.	.	.	.	.	.	.	.	.	.
												3					4	.	.	.	.	.	.	.	.		
									.	.	.	.	.	.	1			.	.		.		.				.
																	.	.	.	.	.	.	.	.	.		2



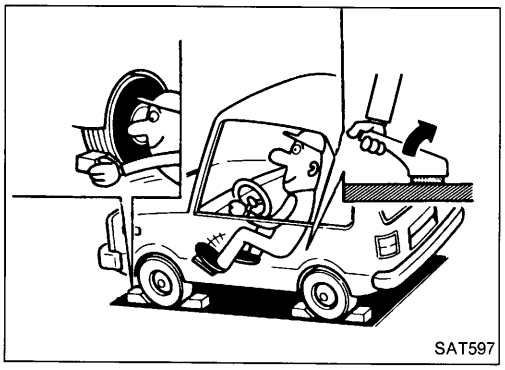
SAT647B

Stall Testing

STALL TEST PROCEDURE

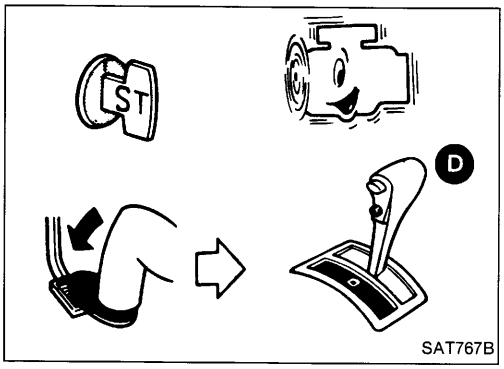
1. Check A/T and engine fluid levels. If necessary, add fluid.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

A.T.F. operating temperature:
50 - 80°C (122 - 176°F)


SAT597

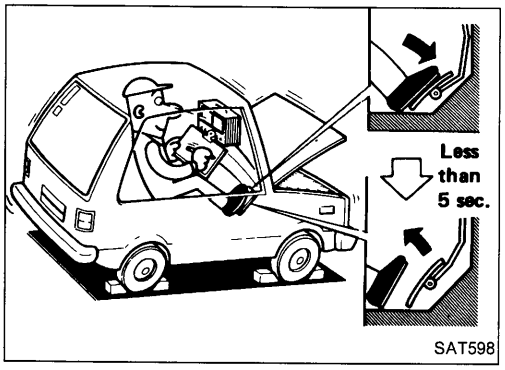
3. Set parking brake and block wheels.
4. Install a tachometer where it can be seen by driver during test.

- **It is good practice to put a mark at point of specified engine rpm on indicator.**



SAT767B

5. Start engine, apply foot brake, and place selector lever in "D" range.

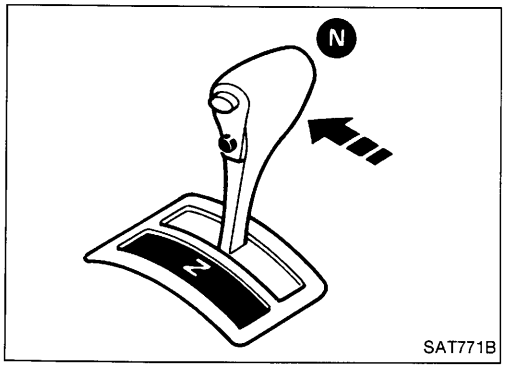


SAT598

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:
1,900 - 2,200 rpm



SAT771B

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.

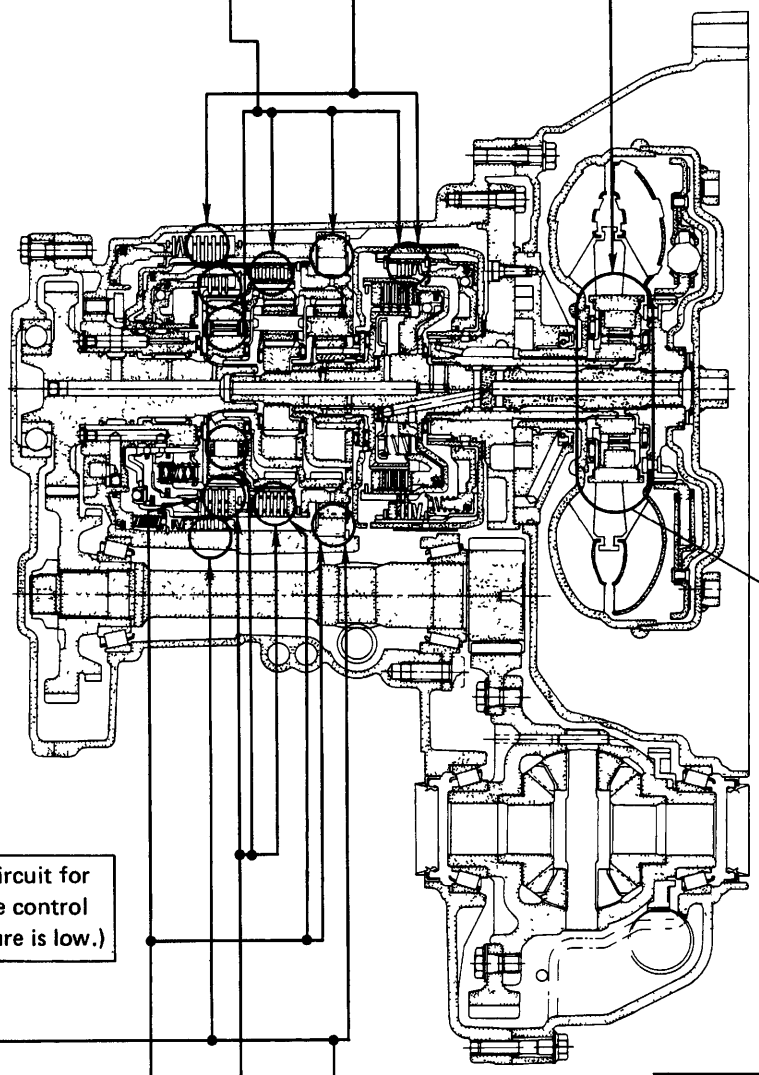
Stall Testing (Cont'd)

JUDGMENT OF STALL TEST

Selector lever position	Judgement		
D	H	O	L
2	H	O	L
1	O	O	L
R	H	H	L

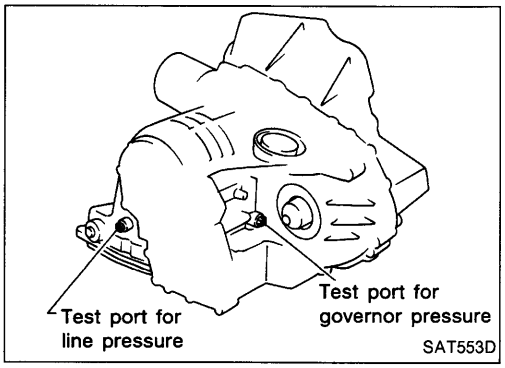
O : Stall revolution is normal.
H : Stall revolution is higher than specified.
L : Stall revolution is lower than specified.

Damaged components



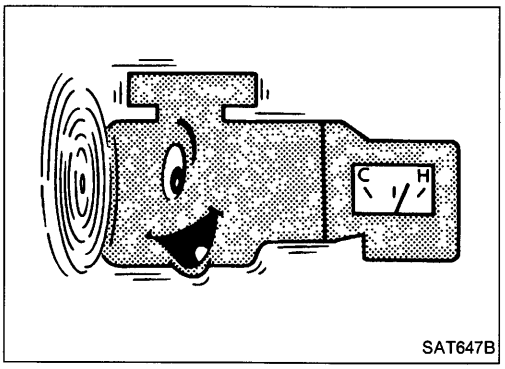
D	H	H	H	O
2	H	H	H	O
1	O	H	H	O
R	O	O	H	O
Selector lever position	Judgement			

SAT552D



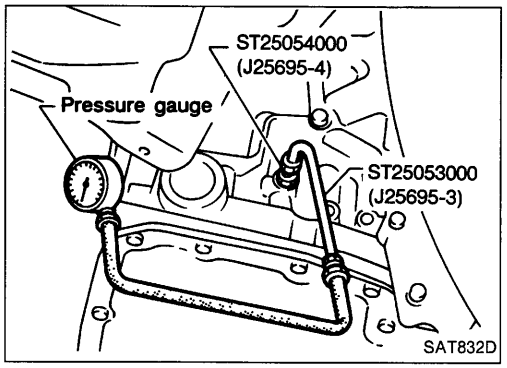
Pressure Testing

- Location of pressure test port.
- **Always replace pressure plugs as they are self-sealing bolts.**

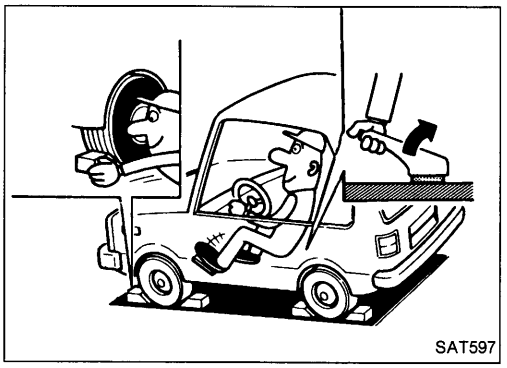


LINE PRESSURE TEST PROCEDURE

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)

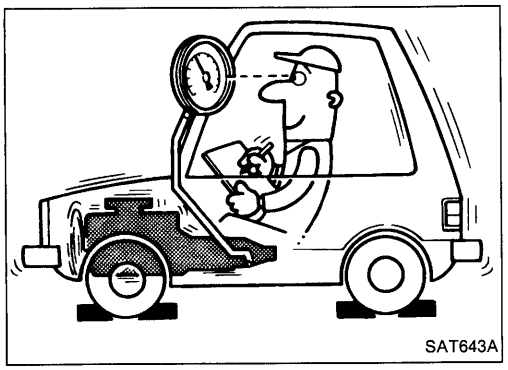


3. Install pressure gauge to line pressure port.



4. Set parking brake and block wheels.
- **Continue to depress brake pedal fully while line pressure test is being performed 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 (kg/cm^2, psi)			
	R range	D range	2 range	1 range
Idle	88.3 (9.0, 128)	637 (6.58, 92)	441 (4.5, 64)	1,138 (11.6, 165)
Stall	1,765 (18.0, 256)	1,295 (13.0, 185)	883 (9.0, 128)	1,275 (13.0, 185)

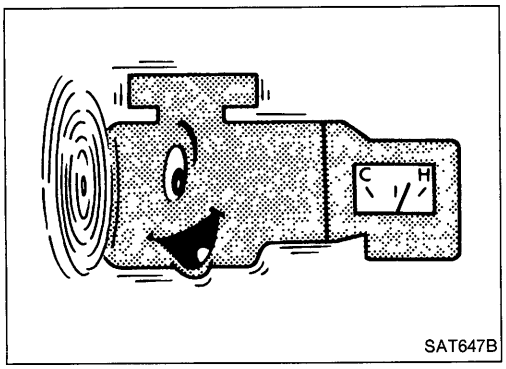
JUDGMENT OF LINE PRESSURE TEST

- **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 and 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.

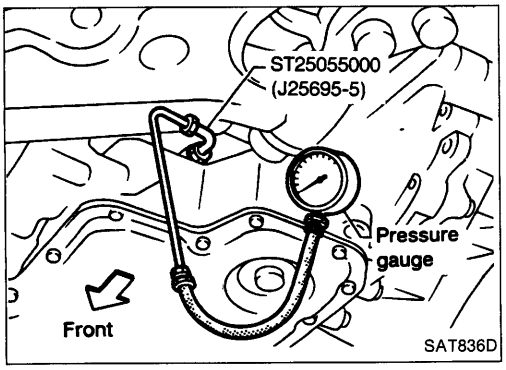


SAT647B

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.

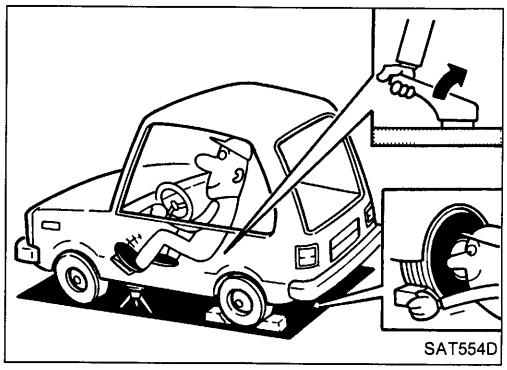
A.T.F. operating temperature:
50 - 80°C (122 - 176°F)



SAT836D

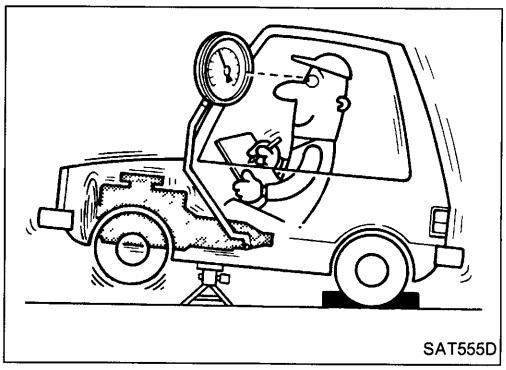
3. Install pressure gauge to governor pressure port.

Pressure Testing (Cont'd)


SAT554D

4. Set parking brake and block rear wheels.
5. Jack up front wheels.
6. Set selector lever in D range and drive vehicle.

- **Be careful of rotating wheels.**

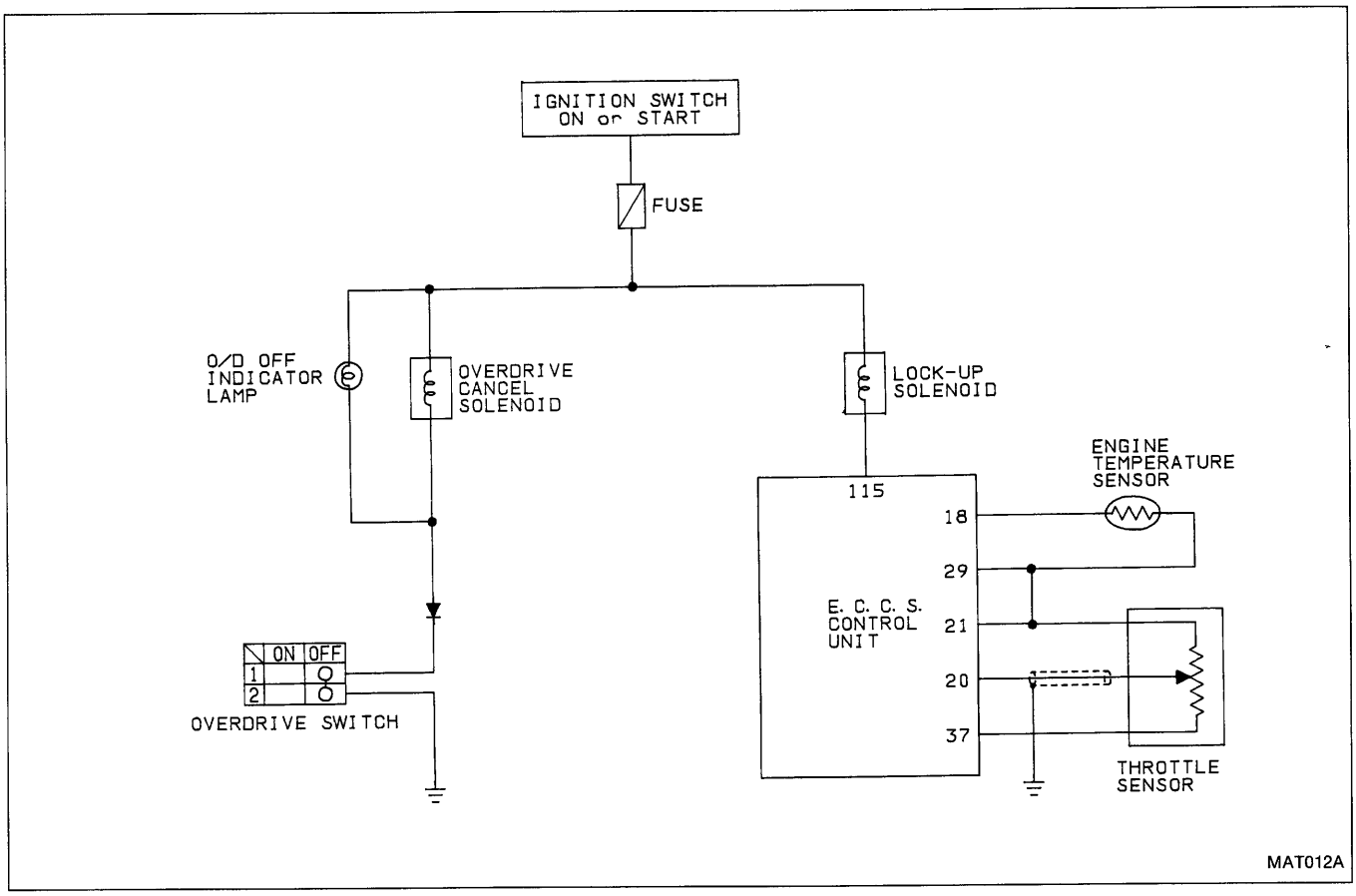

SAT555D

Governor pressure:

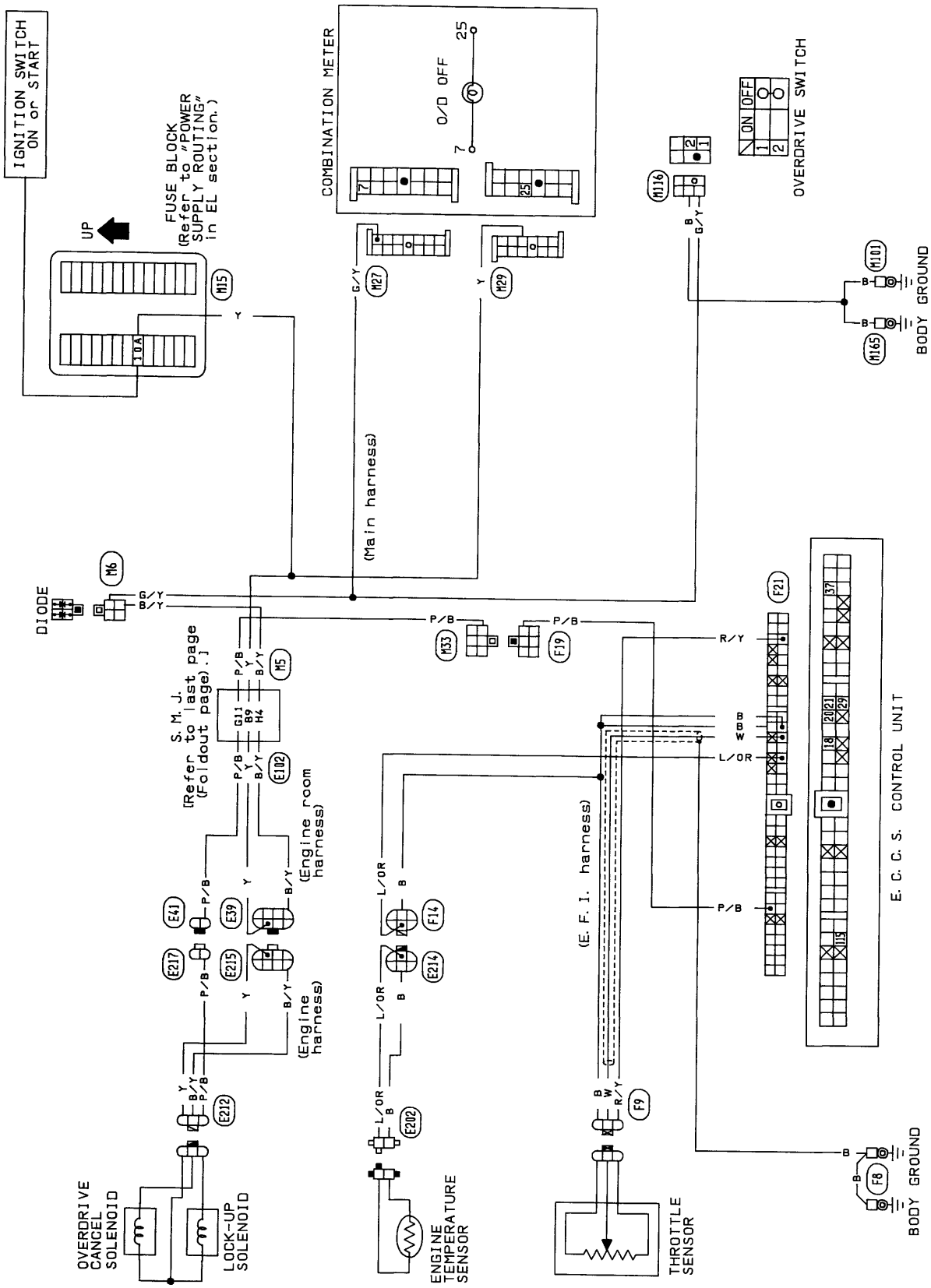
- Governor pressure is not generated when vehicle is stopped, (front wheels are not rotating).
- Governor pressure rises gradually in response to vehicle speed, (front wheel r.p.m.).

If not, check governor valve assembly. Refer to "REPAIR FOR COMPONENT PARTS".

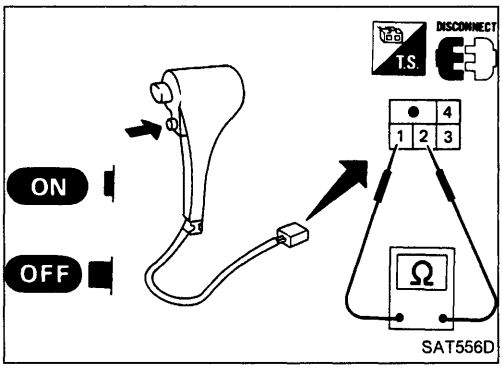
Circuit Diagram



Wiring Diagram



MAT011A

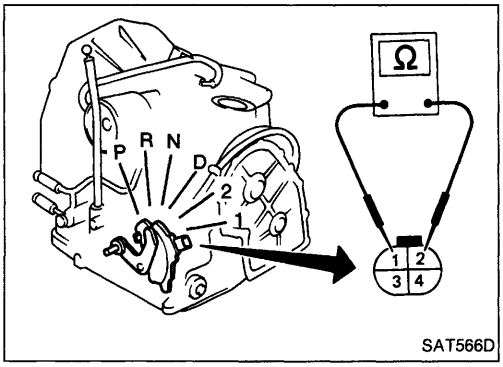


Component Check

OVERDRIVE CONTROL SWITCH

- Check continuity between two terminals.

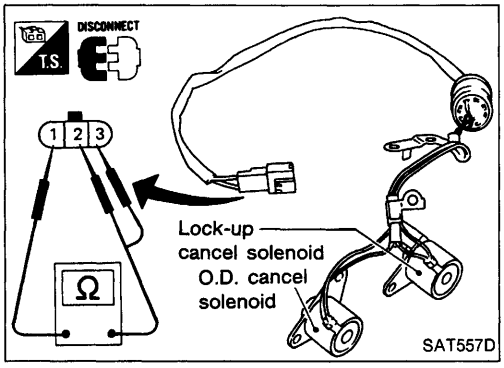
O.D. switch position	Continuity
ON	No
OFF	Yes



INHIBITOR SWITCH

- Check continuity at "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.

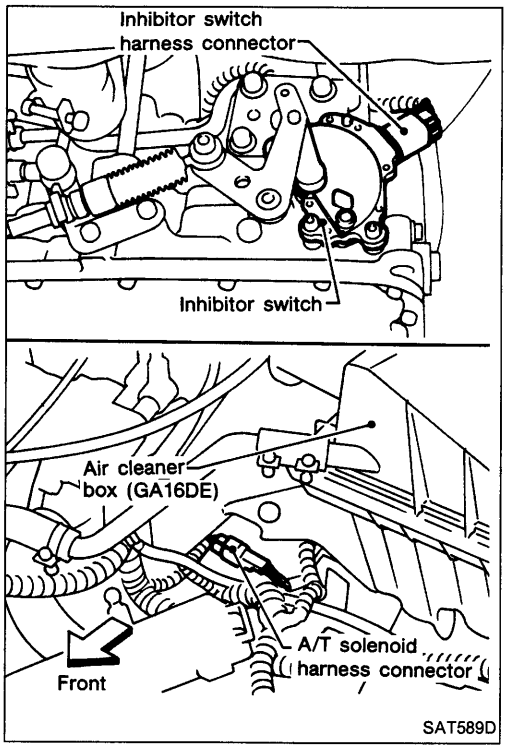
Range \ Terminal No.	①	②	③	④
P,N	○——	——○		
R			○——	——○



O.D. CANCEL SOLENOID AND LOCK-UP CANCEL SOLENOID

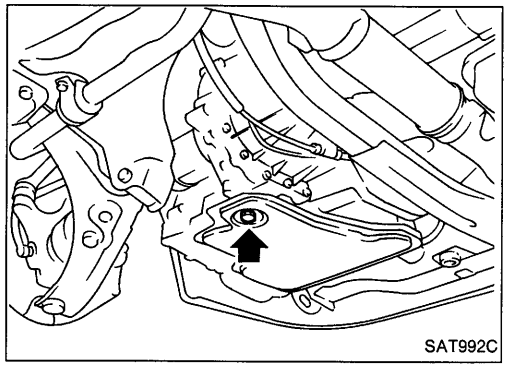
- Check resistance between terminals of each solenoid.

Solenoid	Terminal No.	Resistance
O.D. cancel solenoid	① — ②	Approximately 25 Ω
Lock-up cancel solenoid	① — ③	

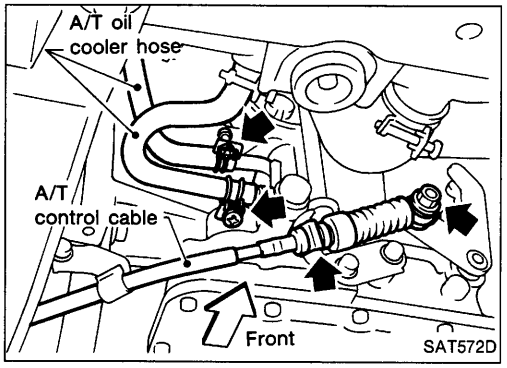


Removal

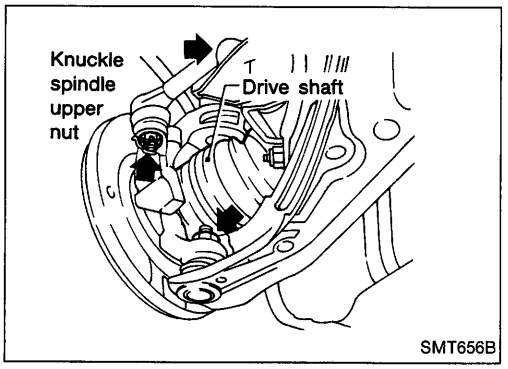
- Remove battery and bracket.
- Remove air duct.
- Disconnect A/T solenoid harness connector and inhibitor switch harness connector.
- Disconnect throttle wire at engine side.



- Drain A.T.F.

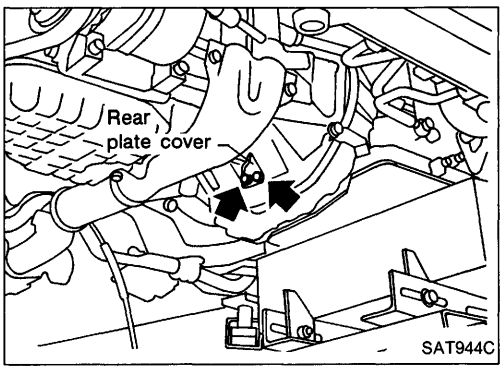


- Disconnect control cable from transaxle.
- Disconnect oil cooler hoses.

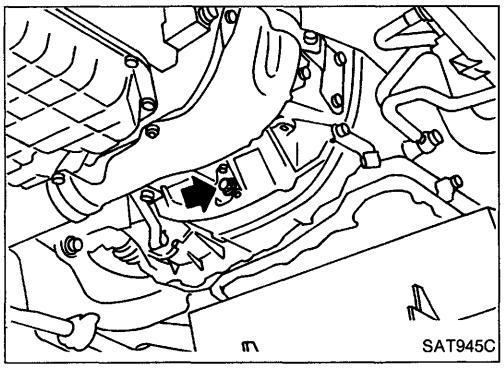


- Remove drive shafts — Refer to "Section FA".
- Remove exhaust front tube.
- Remove starter motor from transaxle.

Removal (Cont'd)



- Remove rear plate cover.

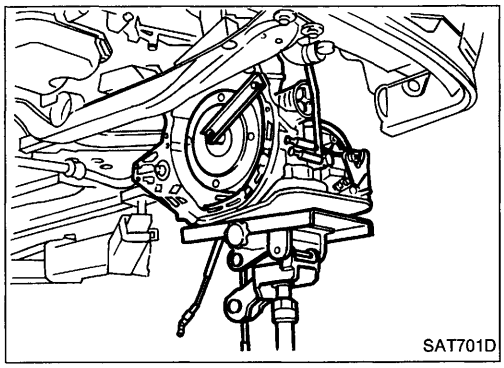


- Remove bolts securing torque converter to drive plate.

Rotate crankshaft for access to securing bolts.

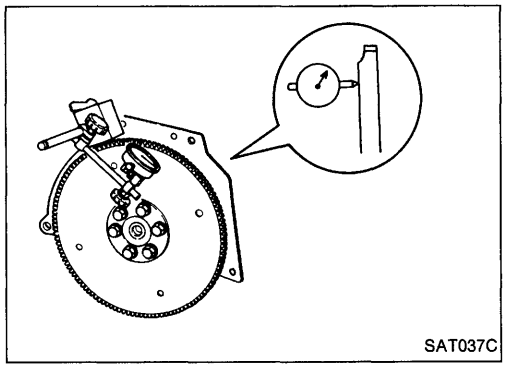
- Support engine by placing a jack under oil pan.

Do not place jack under oil pan drain plug.



- 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

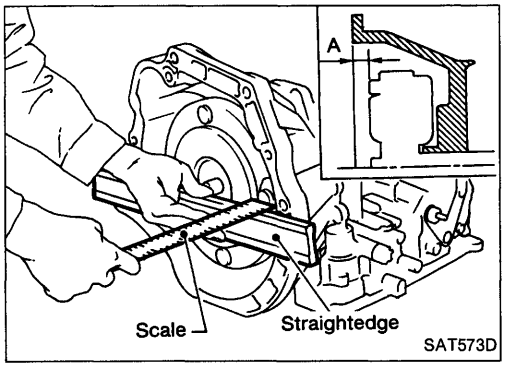


- Drive plate runout

  Maximum allowable runout:

  0.2 mm (0.008 in)

  If this runout is out of specification, replace drive plate with ring gear.

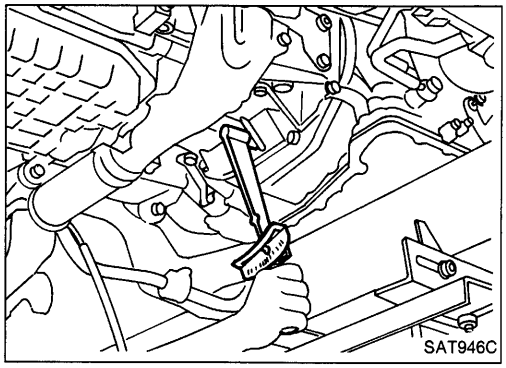


- When connecting torque converter to transaxle, measure distance "A" to be certain that they are correctly assembled.

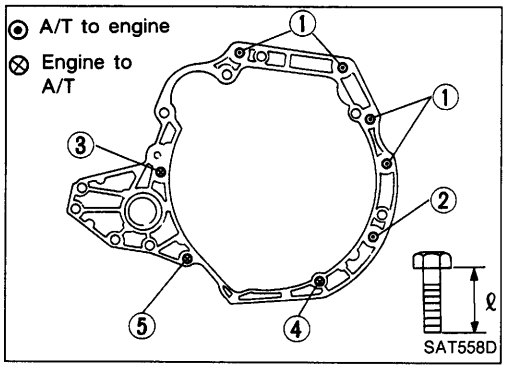
  Distance "A":

  15.9 mm (0.626 in) or more

Installation (Cont'd)

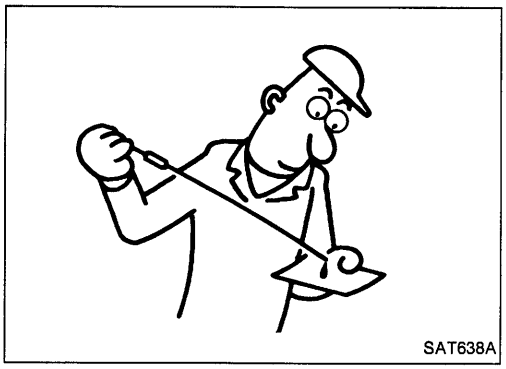


- Install converter to drive plate.
- **After converter is installed to drive plate, rotate crankshaft several turns and check to be sure that transaxle rotates freely without binding.**



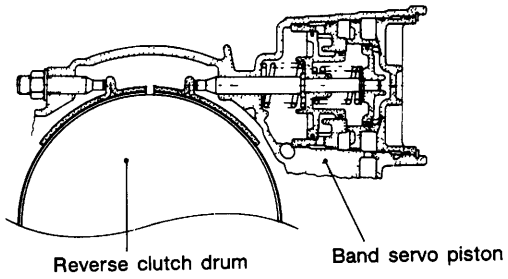
- Tighten bolts fixing transaxle

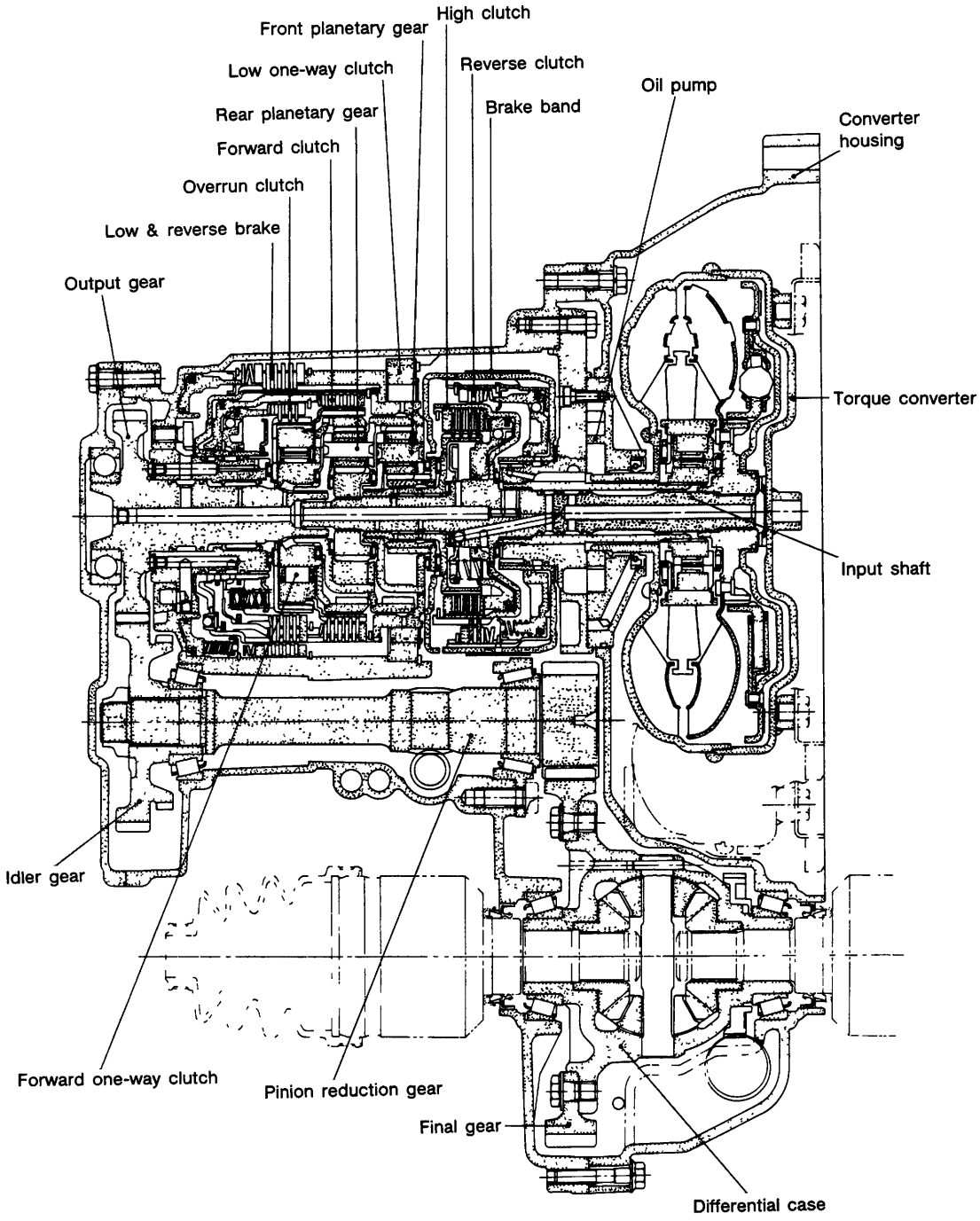
Bolt No.	Tightening torque N·m (kg-m, ft-lb)	Bolt length "ℓ" mm (in)
①	70 - 79 (7.1 - 8.1, 51 - 59)	55 (2.17)
②	70 - 79 (7.1 - 8.1, 51 - 59)	50 (1.97)
③	70 - 79 (7.1 - 8.1, 51 - 59)	65 (2.56)
④	16 - 21 (1.6 - 2.1, 12 - 15)	35 (1.38)
⑤	16 - 21 (1.6 - 2.1, 12 - 15)	45 (1.77)



- Reinstall any part removed.
- Refill transaxle with A.T.F. and check fluid level.
- Adjust control cable and throttle wire. Refer to "ON-VEHICLE SERVICE".
- Check inhibitor switch for operation.
- 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".

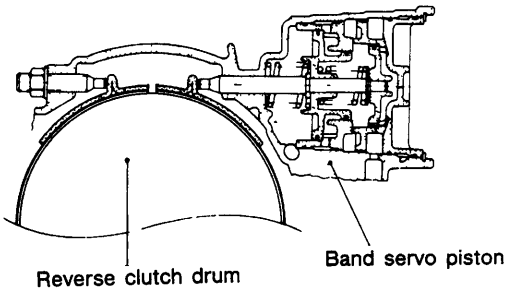
RL4F03A

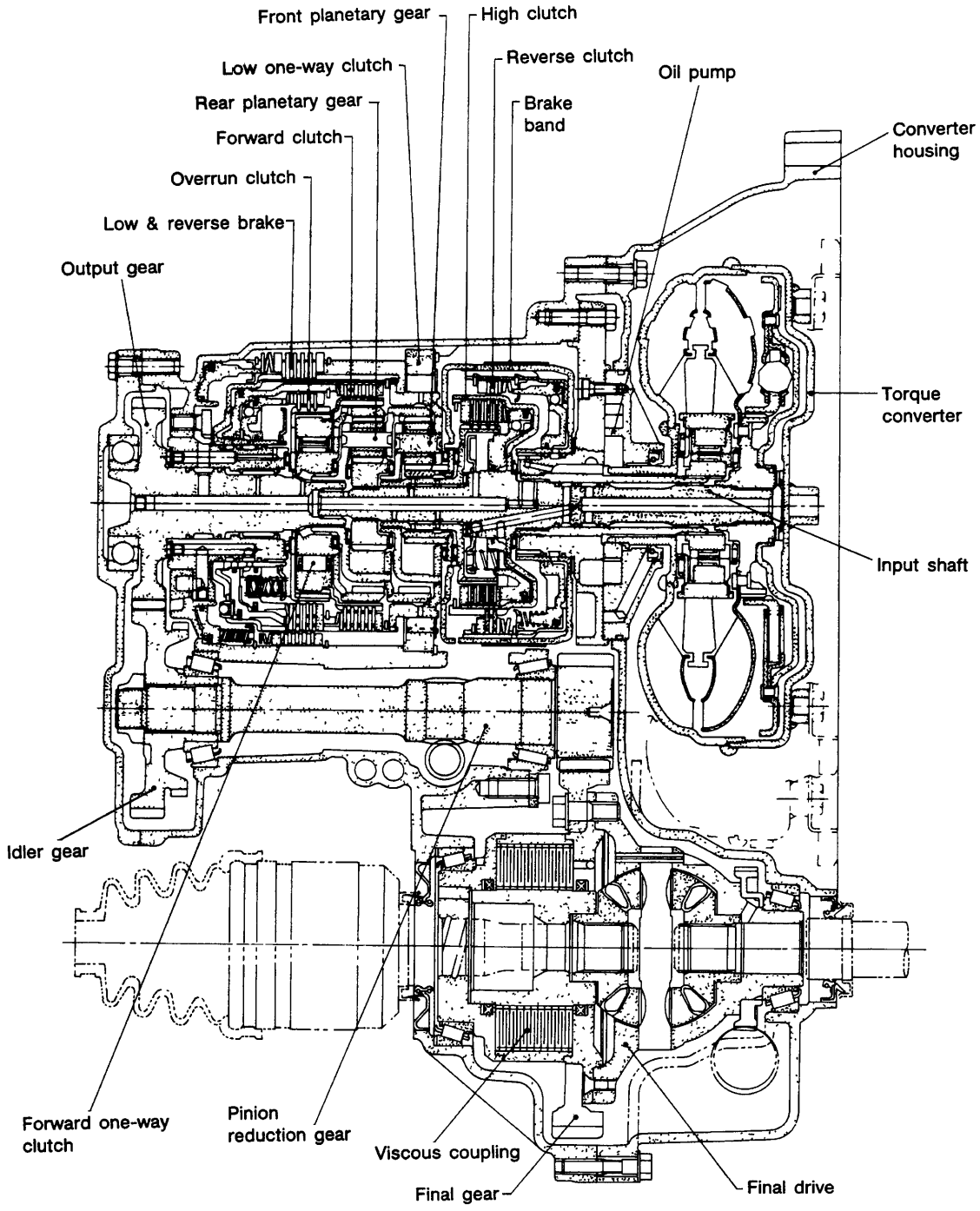




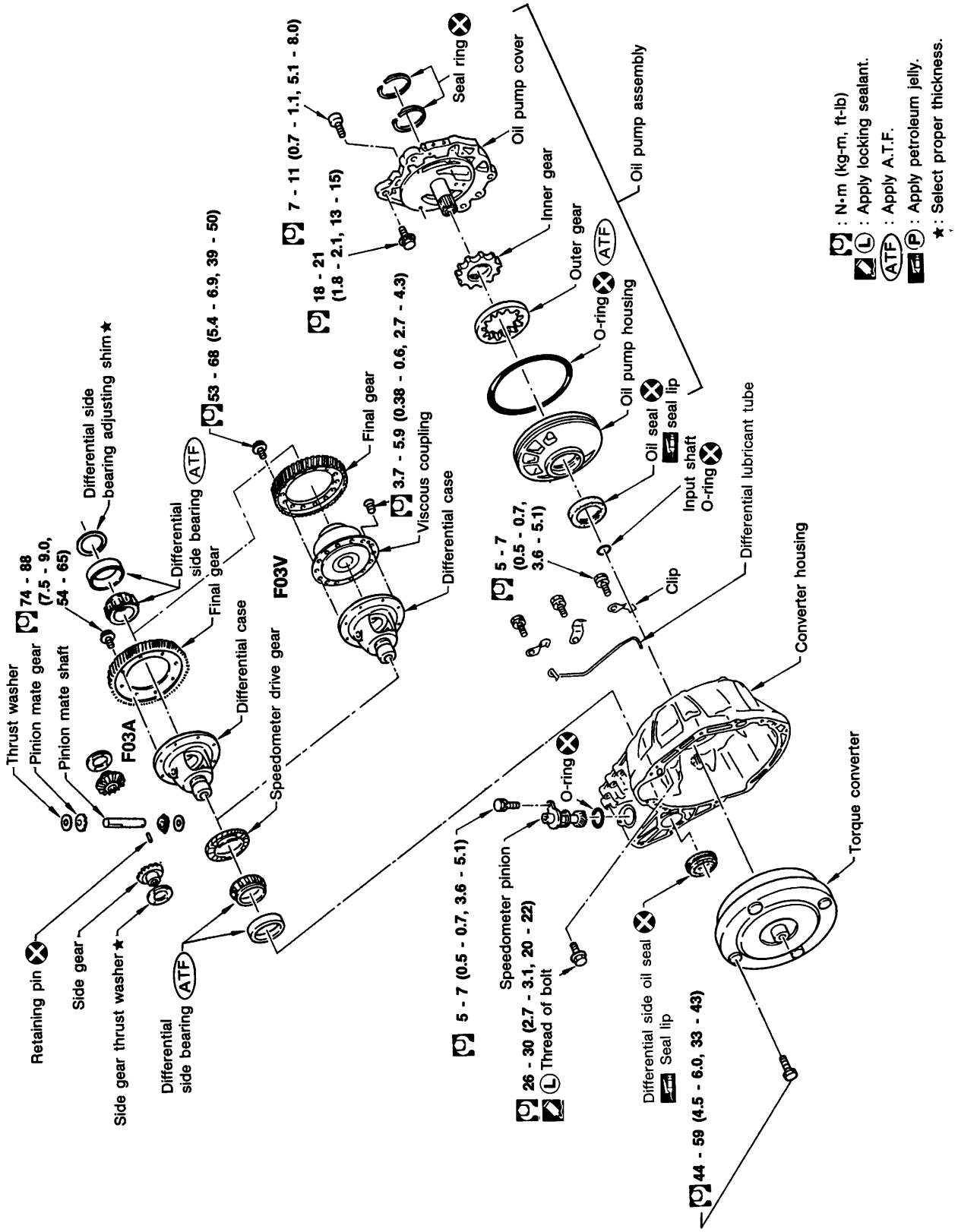
SAT001D

RL4F03V

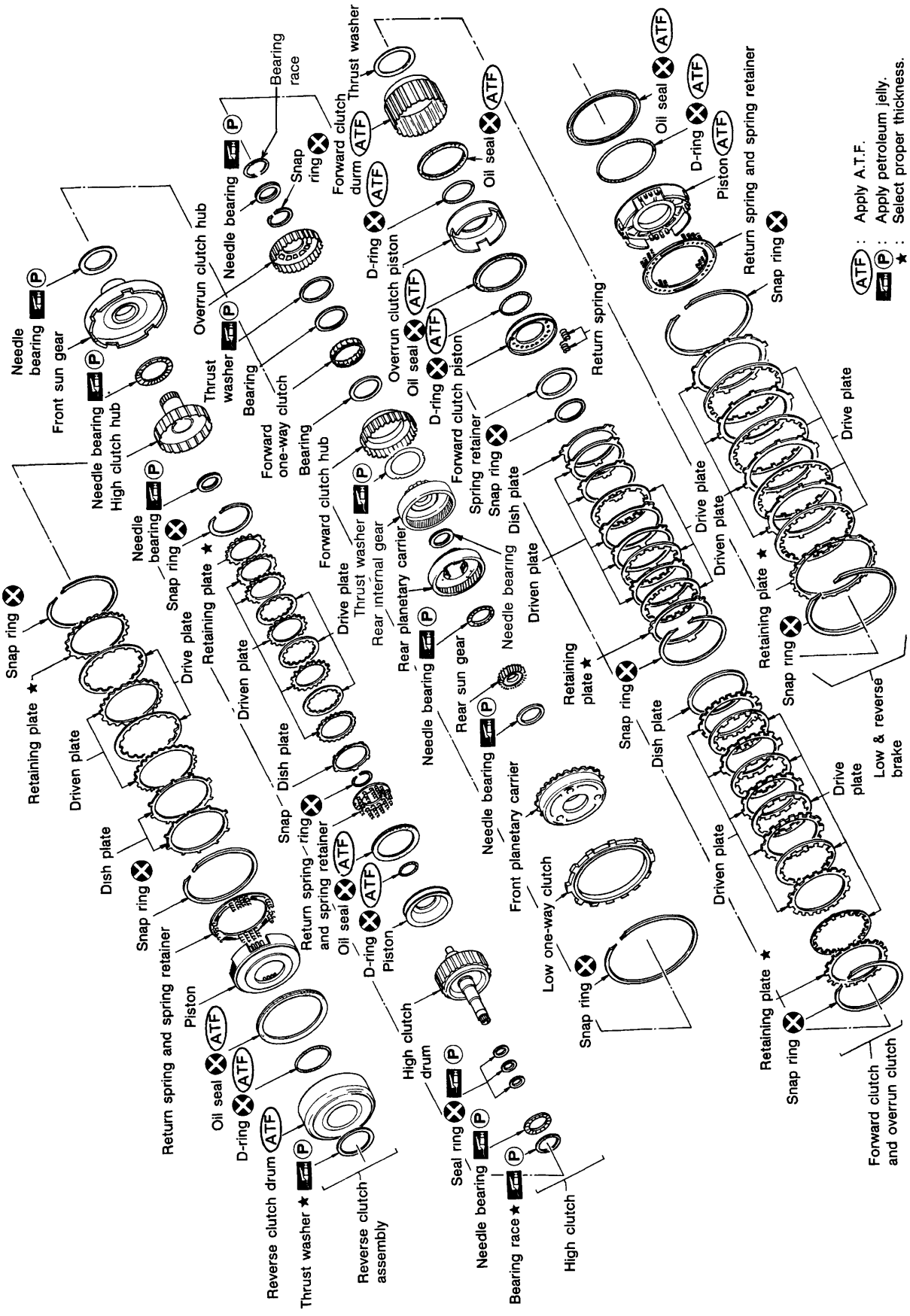




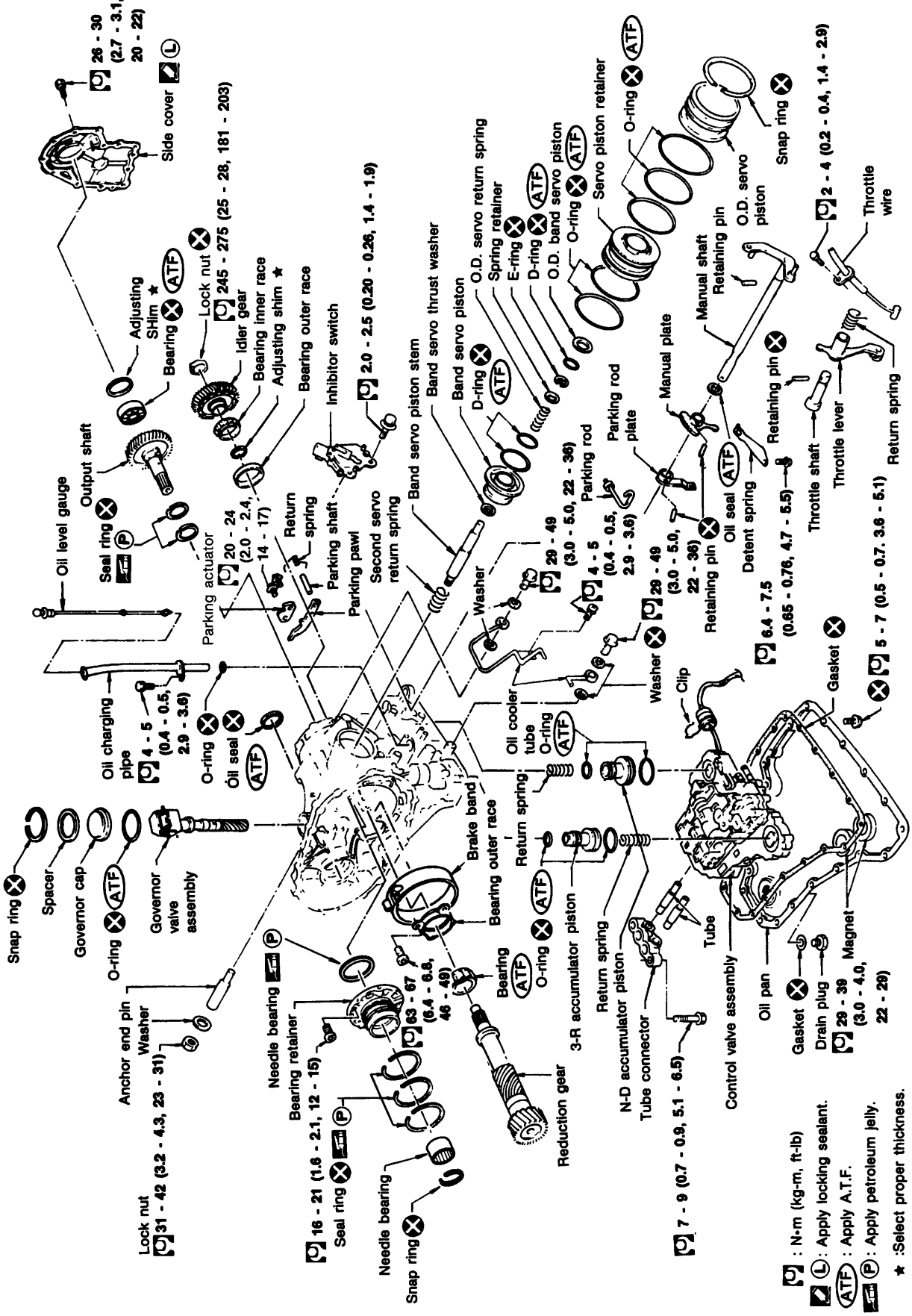
SAT794D


Thrust washer
Pinion mate gear
Pinion mate shaft
74 - 88 (7.5 - 9.0, 54 - 65)
Differential side bearing adjusting shim ★
Differential side bearing (ATF)
Final gear
Differential case
F03A
Speedometer drive gear
Retaining pin
Side gear
Side gear thrust washer ★
Differential side bearing (ATF)
53 - 68 (5.4 - 6.9, 39 - 50)
F03V
Final gear
3.7 - 5.9 (0.38 - 0.6, 2.7 - 4.3)
Viscous coupling
Differential case
7 - 11 (0.7 - 1.1, 5.1 - 8.0)
18 - 21 (1.8 - 2.1, 13 - 15)
Seal ring
Oil pump cover
Inner gear
Outer gear
O-ring (ATF)
Oil pump housing
Oil pump assembly
Oil seal
seal lip
Input shaft
O-ring
5 - 7 (0.5 - 0.7, 3.6 - 5.1)
Clip
Differential lubricant tube
Converter housing
5 - 7 (0.5 - 0.7, 3.6 - 5.1)
Speedometer pinion
O-ring
26 - 30 (2.7 - 3.1, 20 - 22)
Thread of bolt
Differential side oil seal
Seal lip
Torque converter
44 - 59 (4.5 - 6.0, 33 - 43)
: N·m (kg-m, ft-lb)
: Apply locking sealant.
(ATF) : Apply A.T.F.
(P) : Apply petroleum jelly.
★: Select proper thickness.

SAT837D

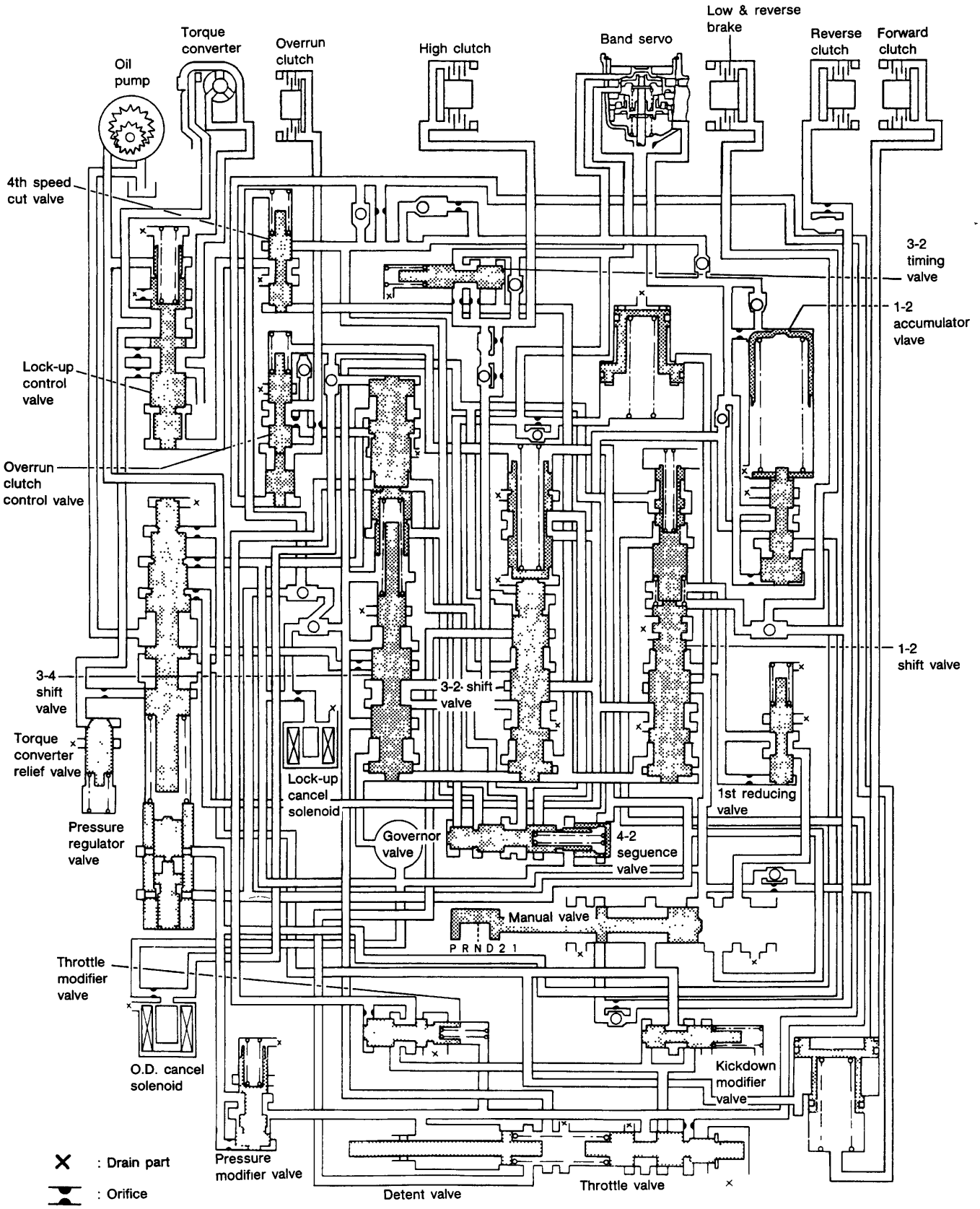

Needle bearing
Front sun gear
Needle bearing
High clutch hub
Thrust washer
Overrun clutch hub
Needle bearing
Bearing race
Snap ring
Forward clutch drum
Thrust washer
Bearing
Forward one-way clutch
Bearing
D-ring
Overrun clutch piston
Oil seal
Oil seal
D-ring
Forward clutch piston
Needle bearing
Snap ring
Retaining plate
Drive plate
Forward clutch hub
Thrust washer
Rear internal gear
Rear planetary carrier
Spring retainer
Snap ring
Dish plate
Return spring
Oil seal
D-ring
Piston
Return spring and spring retainer
Retaining plate
Drive plate
Driven plate
Drive plate
Driven plate
Snap ring
Retaining plate
Driven plate
Dish plate
Snap ring
Return spring and spring retainer
Piston
Oil seal
D-ring
Reverse clutch drum
Thrust washer
Reverse clutch assembly
Snap ring
Dish plate
Return spring and spring retainer
Oil seal
D-ring
Piston
High clutch drum
Seal ring
Needle bearing
Bearing race
High clutch
Needle bearing
Rear sun gear
Needle bearing
Front planetary carrier
Low one-way clutch
Snap ring
Retaining plate
Snap ring
Dish plate
Driven plate
Drive plate
Low & reverse brake
Retaining plate
Snap ring
Forward clutch and overrun clutch
Oil seal
D-ring
Piston
Return spring and spring retainer
Snap ring
Drive plate
Driven plate
Retaining plate
Snap ring
Drive plate
ATF : Apply A.T.F.
P : Apply petroleum jelly.
★ : Select proper thickness.

SAT003E


Snap ring
Spacer
Governor cap
O-ring
Governor valve assembly
Anchor end pin
Washer
Lock nut
31 - 42 (3.2 - 4.3, 23 - 31)
Needle bearing
Bearing retainer
16 - 21 (1.6 - 2.1, 12 - 15)
Seal ring
Needle bearing
Snap ring
Oil level gauge
Seal ring
Output shaft
Adjusting SHim ★
Bearing
Oil charging pipe
4 - 5 (0.4 - 0.5, 2.9 - 3.6)
O-ring
Oil seal
Parking actuator
20 - 24 (2.0 - 2.4, 14 - 17)
Return spring
Parking shaft
Parking pawl
Second servo return spring
Inhibitor switch
2.0 - 2.5 (0.20 - 0.26, 1.4 - 1.9)
Band servo piston stem
Band servo thrust washer
Band servo piston
D-ring
Washer
Brake band
Bearing outer race
Return spring
Bearing
O-ring
3-R accumulator piston
Return spring
N-D accumulator piston
Tube connector
7 - 9 (0.7 - 0.9, 5.1 - 6.5)
Reduction gear
63 - 67 (6.4 - 6.8, 46 - 49)
Lock nut
245 - 275 (25 - 28, 181 - 203)
Idler gear
Bearing inner race
Adjusting shim ★
Bearing outer race
26 - 30 (2.7 - 3.1, 20 - 22)
Side cover
O.D. servo return spring
Spring retainer
E-ring
D-ring
O.D. band servo piston
O-ring
Servo piston retainer
O-ring
Parking rod
Parking rod plate
29 - 49 (3.0 - 5.0, 22 - 36)
4 - 5 (0.4 - 0.5, 2.9 - 3.6)
Oil cooler tube
O-ring
Washer
Clip
Gasket
Oil pan
Gasket
Drain plug
29 - 39 (3.0 - 4.0, 22 - 29)
Magnet
Control valve assembly
Tube
Manual plate
Manual shaft
Retaining pin
Oil seal
Detent spring
6.4 - 7.5 (0.65 - 0.76, 4.7 - 5.5)
Retaining pin
O.D. servo piston
Snap ring
Throttle shaft
Throttle lever
2 - 4 (0.2 - 0.4, 1.4 - 2.9)
Throttle wire
Return spring
5 - 7 (0.5 - 0.7, 3.6 - 5.1)
: N·m (kg-m, ft-lb)
Ⓛ: Apply locking sealant.
ATF: Apply A.T.F.
Ⓟ: Apply petroleum jelly.
★ :Select proper thickness.

SAT004E

Hydraulic Control Circuit



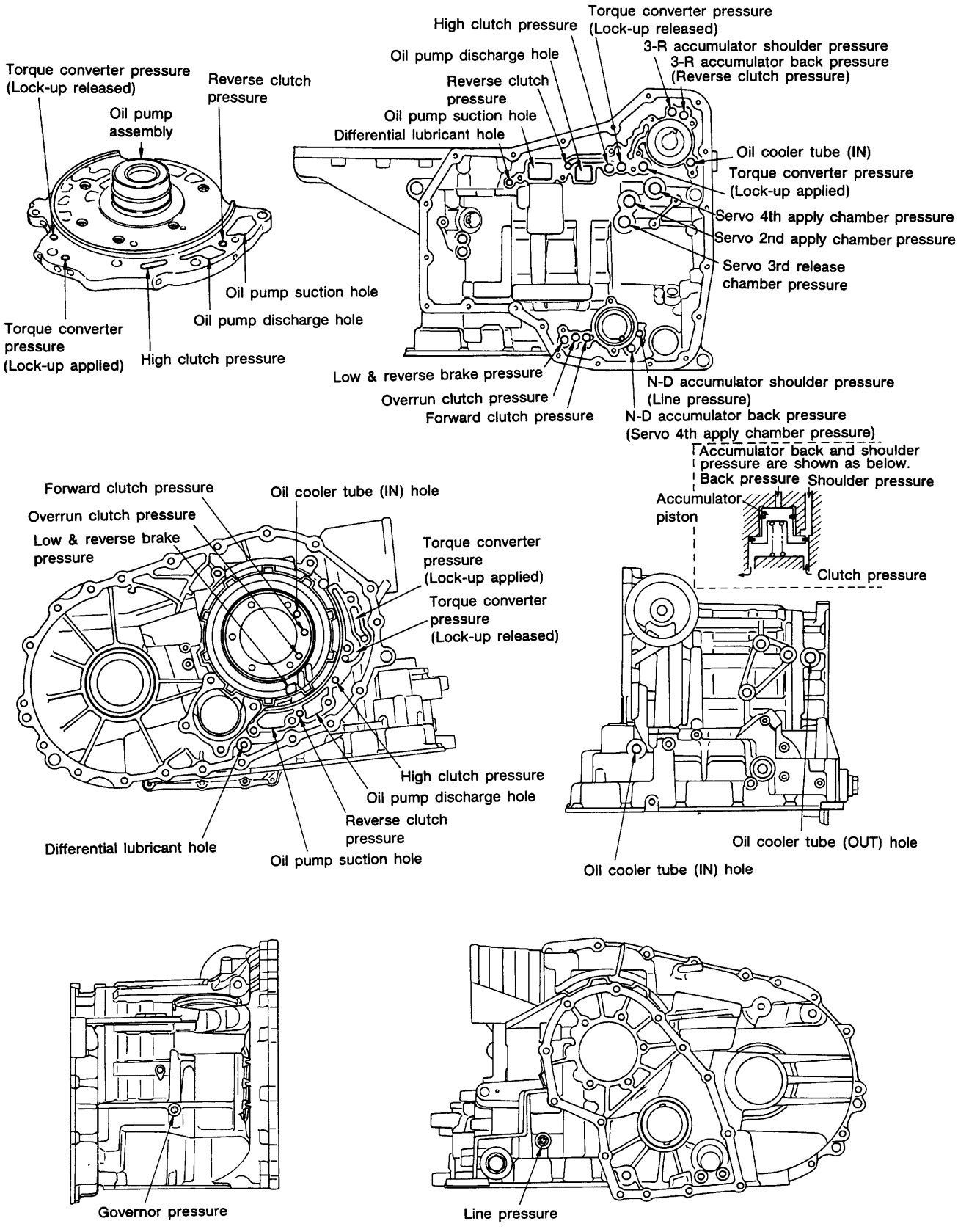
SAT450D

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 being set in "OFF" position.
*2 : Oil pressure is applied to both 2nd "apply" side and 3rd "release" side of band servo piston. However, brake band does not contract because oil pressure area on the "release" side is greater than that on the "apply" side.
*3 : Oil pressure is applied to 4th "apply" side in condition *2 above, and brake band contracts.
*4 : A/T will not shift to 4th when overdrive switch is set in "OFF" position.
○ : Operates
◎ : Operates when throttle opening is less than 1/16.
● : Operates during "progressive" acceleration.
⊗ : Operates but does not affect power transmission.

Oil Channel



SAT586D

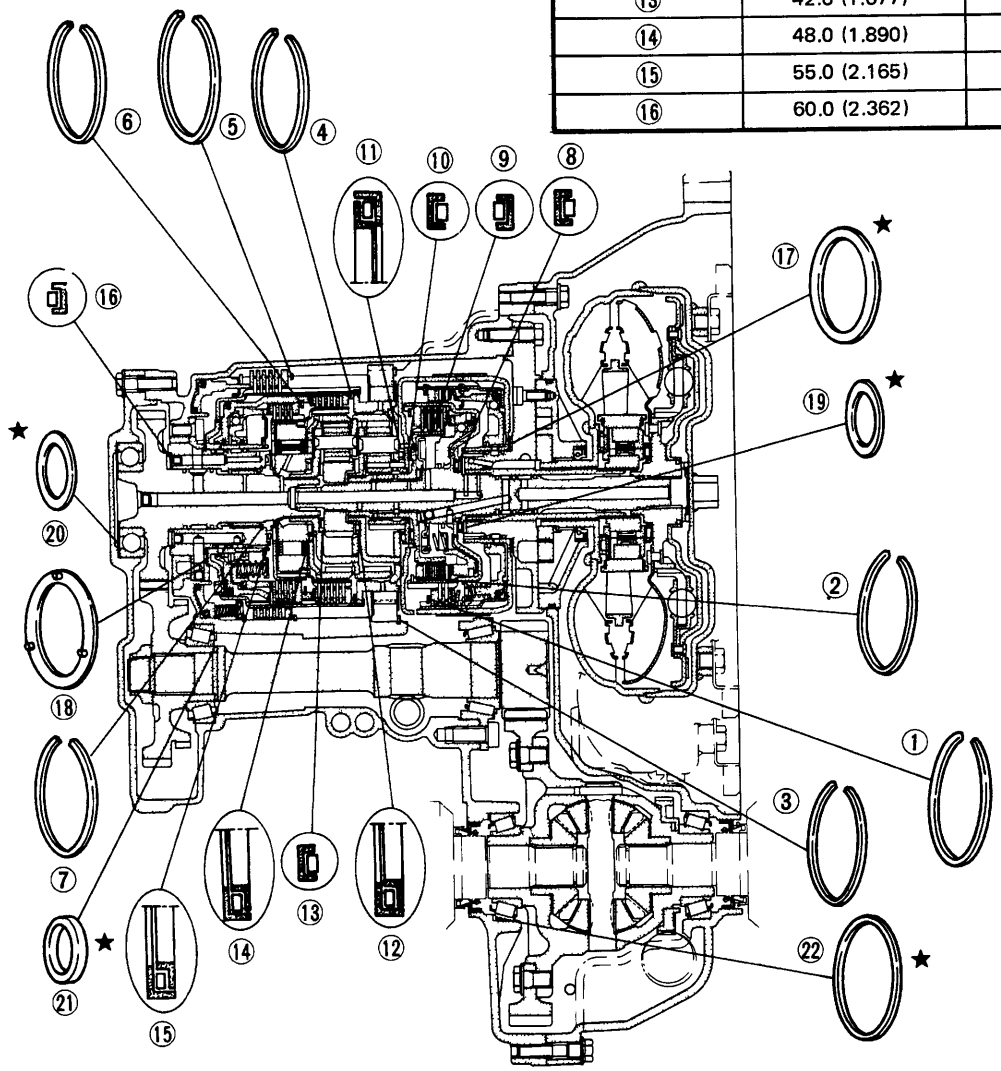
Locations of Bearings, Thrust Washers and Snap Rings

Outer diameter and color of thrust washers

Item number	Outer diameter mm (in)	Color
⑰	72.0 (2.835)	Black
⑱	78.5 (3.091)	

Outer & inner diameter of needle bearings

Item number	Outer diameter mm (in)	Inner diameter mm (in)
⑧	47.0 (1.850)	32.0 (1.260)
⑨	35.0 (1.378)	20.0 (0.787)
⑩	60.0 (2.362)	42.0 (1.654)
⑪	60.0 (2.362)	45.0 (1.772)
⑫	47.0 (1.850)	30.0 (1.181)
⑬	42.6 (1.677)	26.0 (1.024)
⑭	48.0 (1.890)	33.5 (1.319)
⑮	55.0 (2.165)	40.5 (1.594)
⑯	60.0 (2.362)	40.0 (1.575)



★: Select proper thickness.

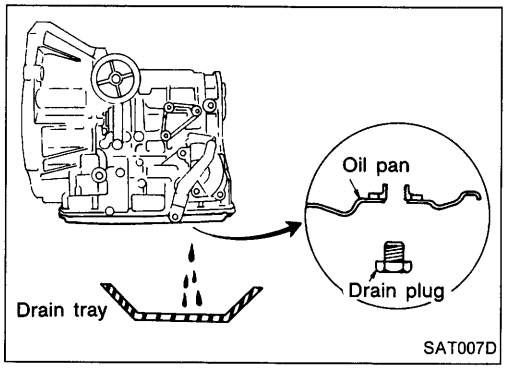
Outer & inner diameter of bearing race and adjusting shims

Item number		Outer diameter mm (in)	Inner diameter mm (in)
⑲		48.0 (1.890)	33.0 (1.299)
⑳		72.0 (2.835)	61.0 (2.402)
㉑		34.5 (1.358)	26.1 (1.028)
㉒	RL4F03A	68.0 (2.677)	60.0 (2.362)
	RL4F03V	105.0 (4.13)	96.0 (3.780)

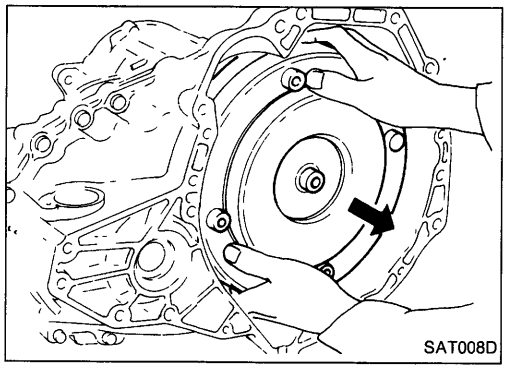
Outer diameter of snap rings

Item number	Out diameter mm (in)
①	142.0 (5.59)
②	113.0 (4.45)
③	162.4 (6.39)
④	135.4 (5.33)
⑤	159.0 (6.26)
⑥	126.0 (4.96)
⑦	40.5 (1.594)

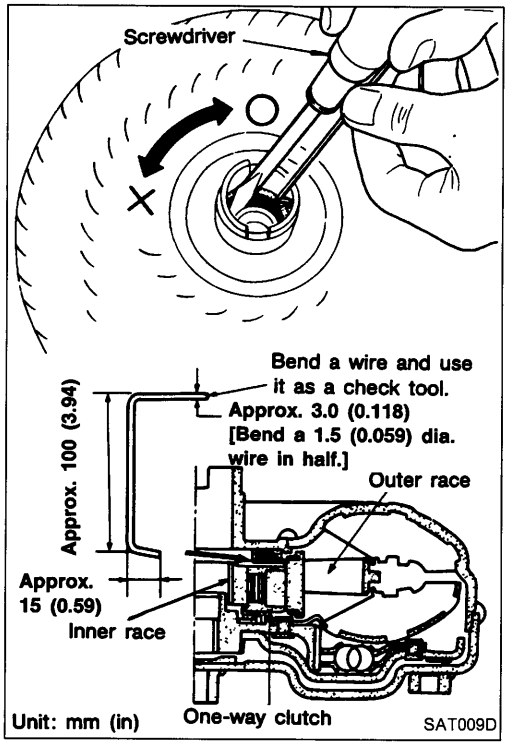
SAT838D



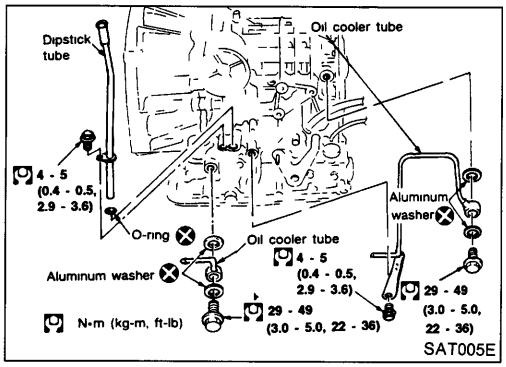
1. Drain A.T.F. through drain plug.



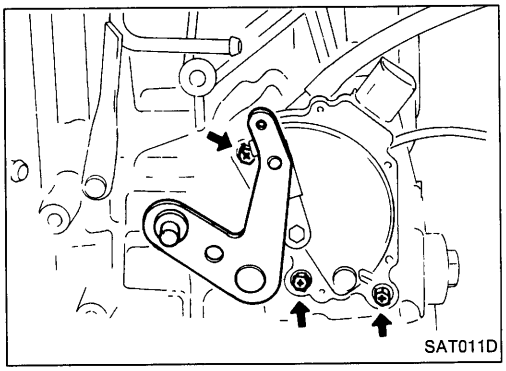
2. Remove torque converter.



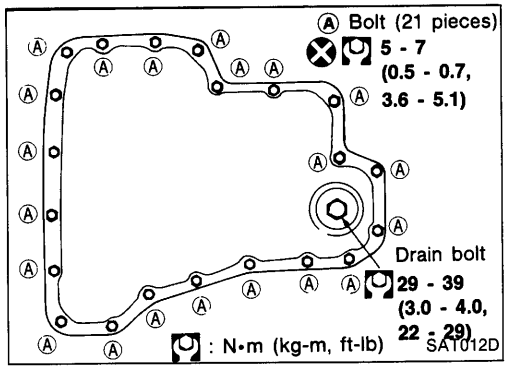
3. Check torque converter one-way clutch using check tool as shown at left.
a. Insert check tool into the groove of bearing support built into one-way clutch outer race.
b. When fixing bearing support with check tool, rotate one-way clutch spline using screwdriver.
c. Check that inner race rotates clockwise only. If not, replace torque converter assembly.



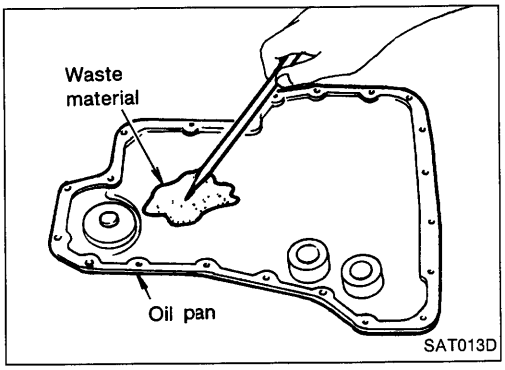
4. Remove oil charging pipe and oil cooler tube.



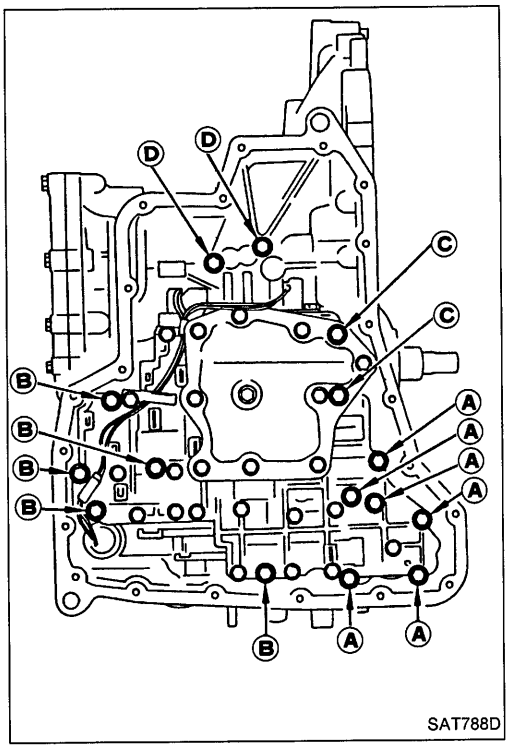
5. Set manual lever to position "P".
6. Remove inhibitor switch.



7. Remove oil pan and oil pan gasket.
- **Do not reuse oil pan bolts.**

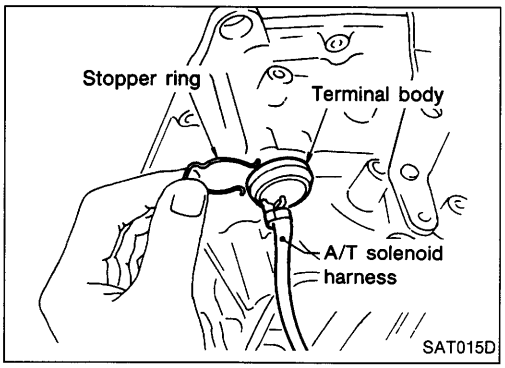


8. Analyze foreign materials in oil pan to trace possible causes of malfunction. If the fluid is very dark, smells burned, or contains foreign particles, the frictional material (clutches, band) may need replacement. A tacky film that will not wipe clean indicates varnish build up which can cause valves, servo, and clutches to stick and may inhibit pump pressure.

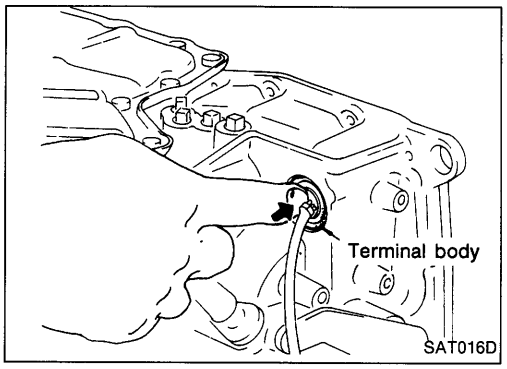


9. Remove control valve assembly according to the following procedures.

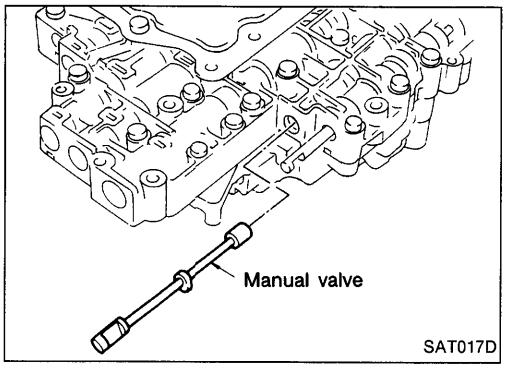
a. Remove control valve assembly mounting bolts Ⓐ, Ⓑ, Ⓒ and Ⓓ.



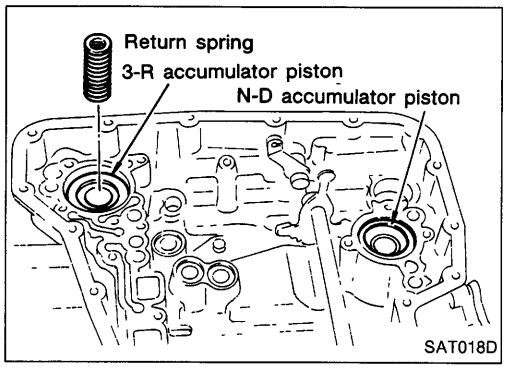
b. Remove stopper ring from terminal body.



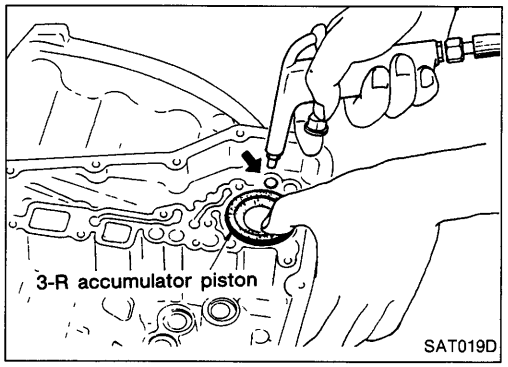
c. Push terminal body into transmission case and draw out solenoid harness.



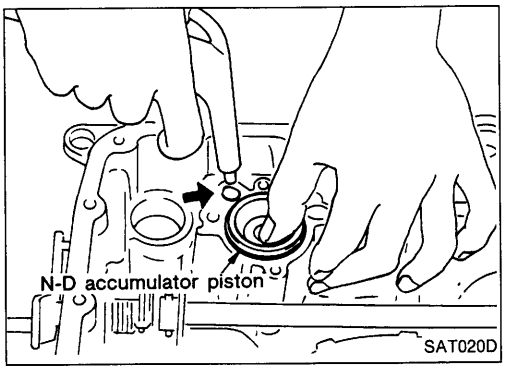
10. Remove manual valve from control valve assembly.



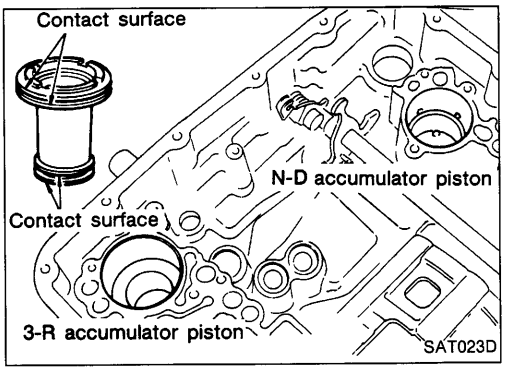
11. Remove return spring from 3-R accumulator piston.



12. Remove 3-R accumulator piston with compressed air.
13. Remove O-rings from 3-R accumulator piston.



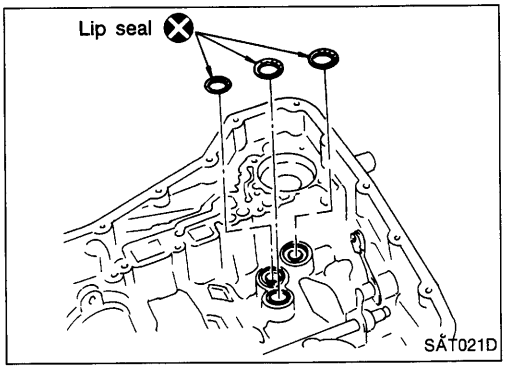
14. Remove N-D accumulator piston and return spring with compressed air.
15. Remove O-rings from N-D accumulator piston.



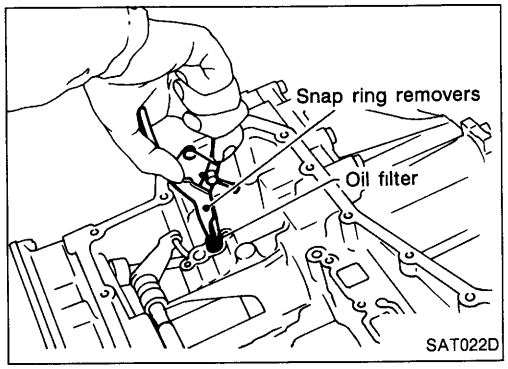
16. Check accumulator pistons and contact surface of transmission case for damage.
17. Check accumulator return springs for damage and free length.

Unit: mm (in)

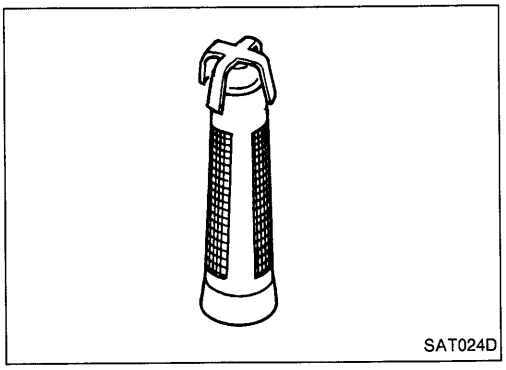
Spring	Free length	Outer diameter
3-R accumulator spring	56.4 (2.220)	21.0 (0.827)
N-D accumulator spring	43.5 (1.713)	28.0 (1.102)



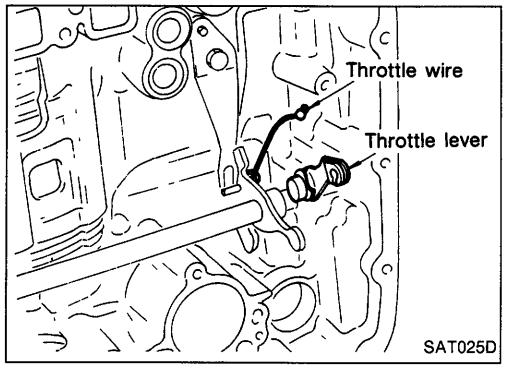
18. Remove lip seals from band servo oil port.



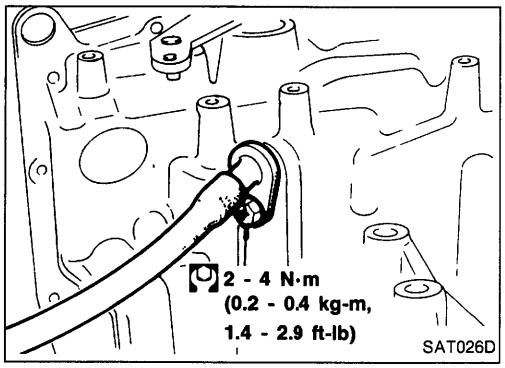
19. Remove governor oil filter.



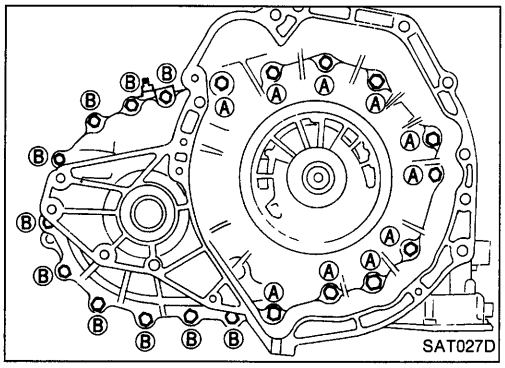
20. Check governor oil filter for damage or clogging.



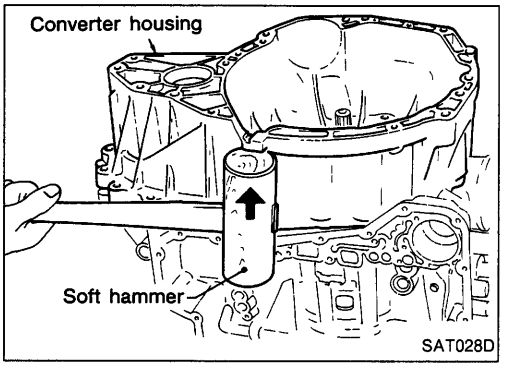
21. Remove throttle wire from throttle lever.



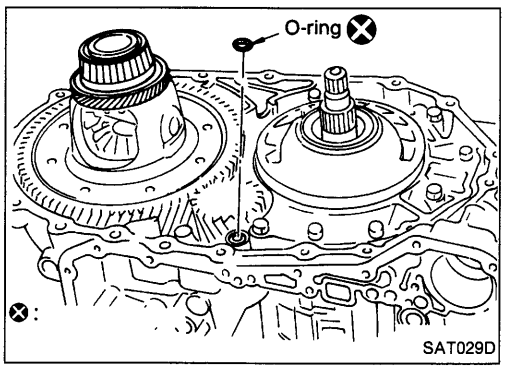
22. Remove throttle wire mounting bolt.
23. Draw out throttle wire from transmission case.



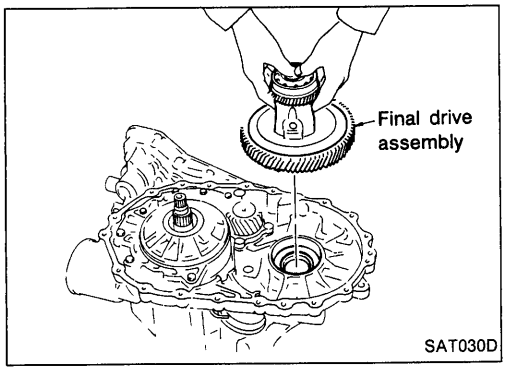
24. Remove converter housing according to the following procedures.
a. Remove converter housing mounting bolts Ⓐ and Ⓑ.



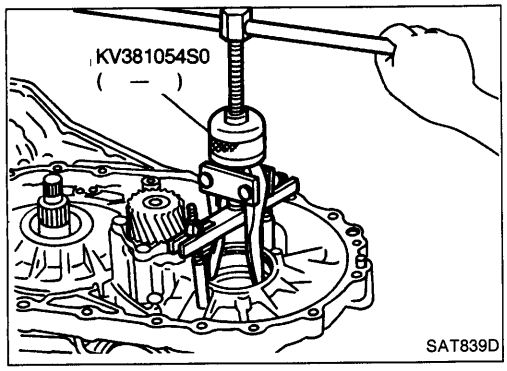
b. Remove converter housing by tapping it lightly.



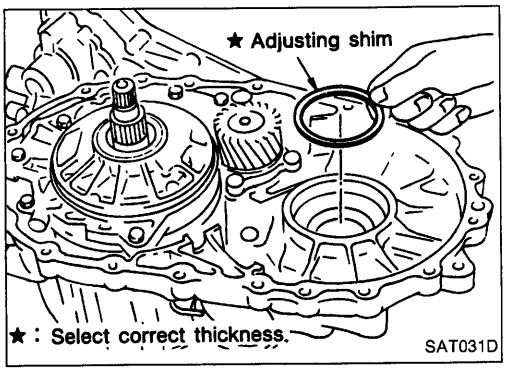
c. Remove O-ring from differential oil port.



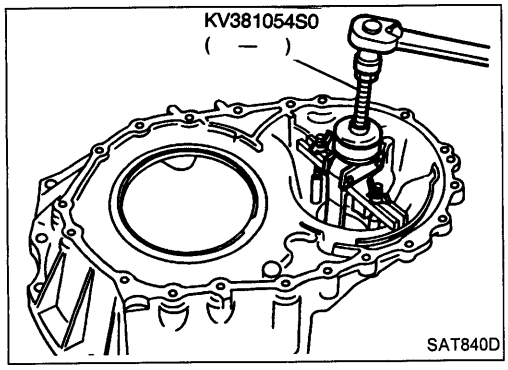
25. Remove final drive assembly from transmission case.



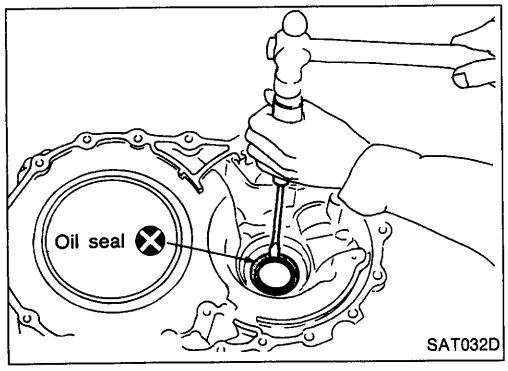
26. Remove differential side bearing outer race from transmission case.



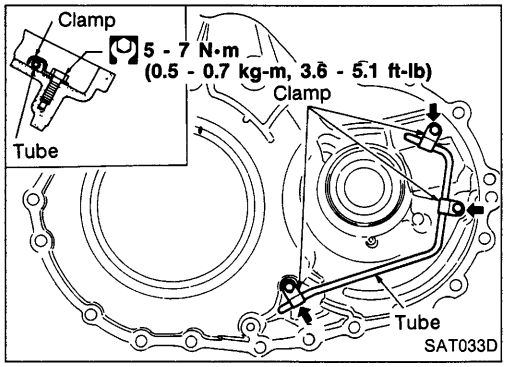
27. Remove differential side bearing adjusting shim from transmission case.



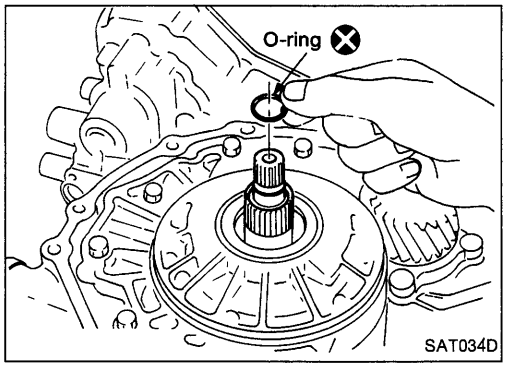
28. Remove differential side bearing outer race from converter housing.



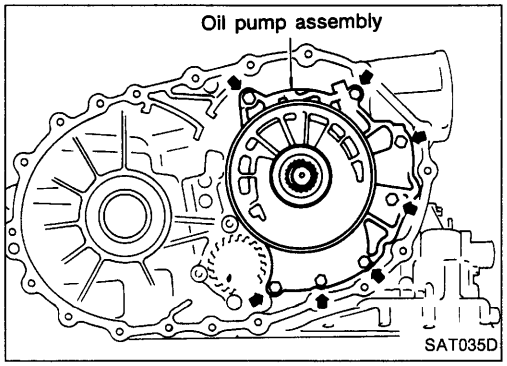
29. Remove oil seal with screwdriver from converter housing.
- **Be careful not to damage case.**



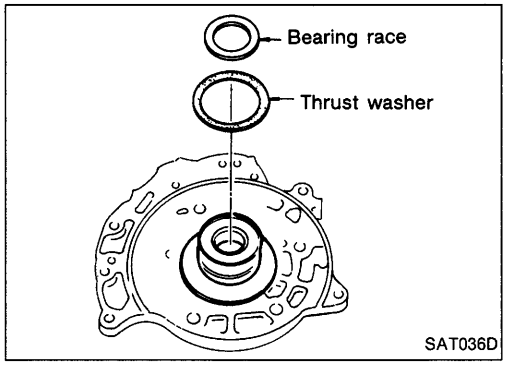
30. Remove oil tube from converter housing.



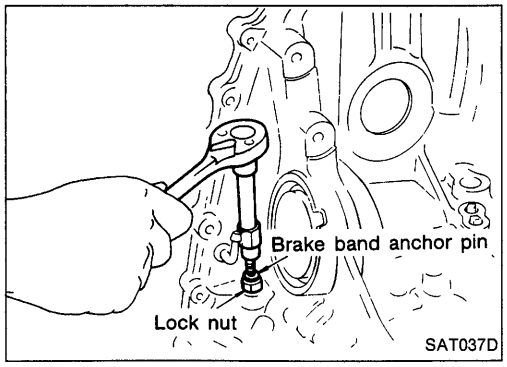
31. Remove oil pump according to the following procedures.
a. Remove O-ring from input shaft.



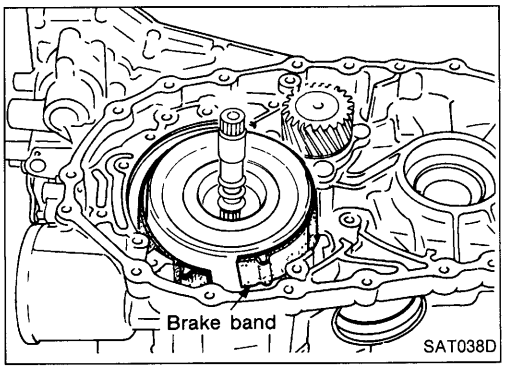
b. Remove oil pump assembly from transmission case.



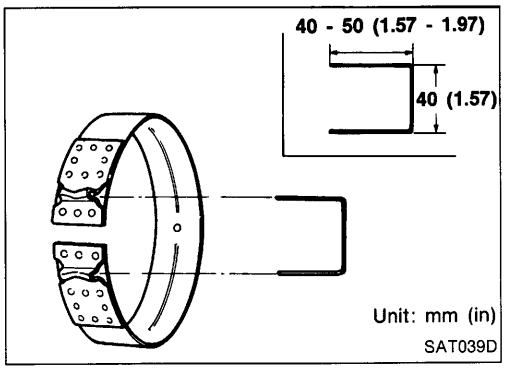
c. Remove thrust washer and bearing race from oil pump assembly.



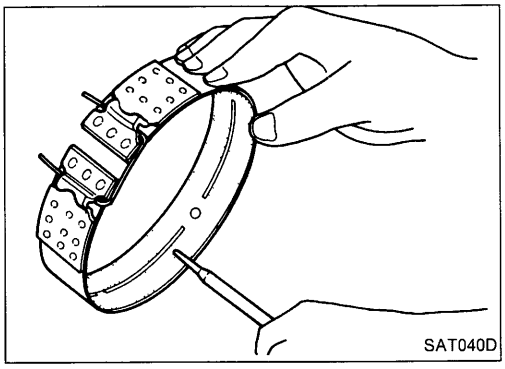
32. Remove brake band according to the following procedures.
a. Loosen lock nut, then back off band servo anchor end pin.



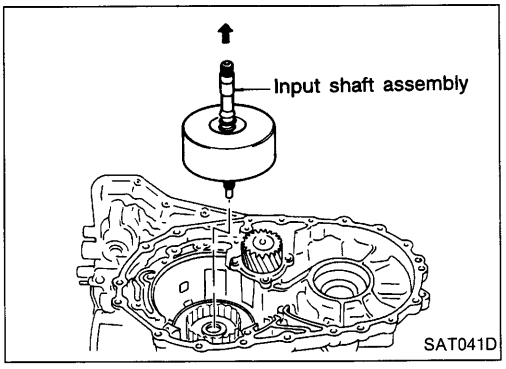
b. Remove brake band from transmission case.



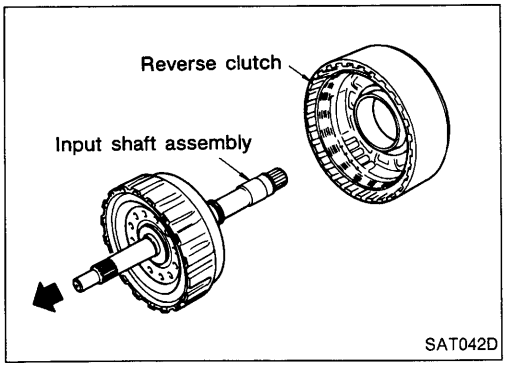
- **To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. When removing the brake band, always secure it with a clip as shown in the figure at left.**
  Leave the clip in position after removing the brake band.



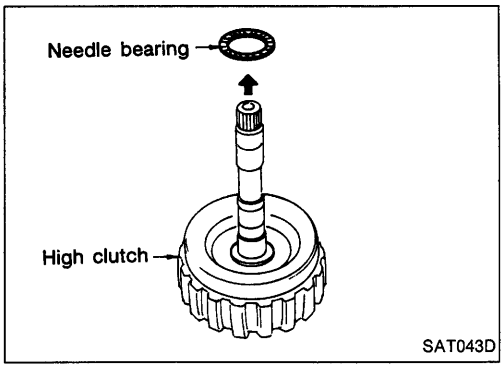
c. Check brake band facing for damage, cracks, wear or burns.



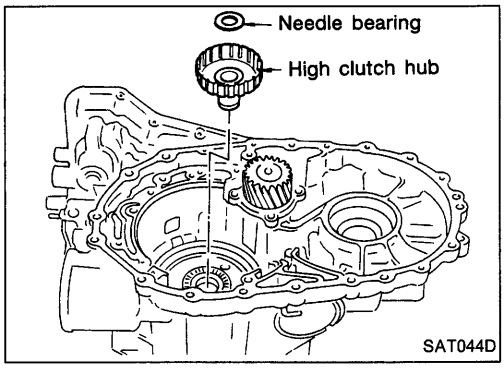
33. Remove input shaft assembly (high clutch) and reverse clutch according to the following procedures.
a. Remove input shaft assembly (high clutch) with reverse clutch.



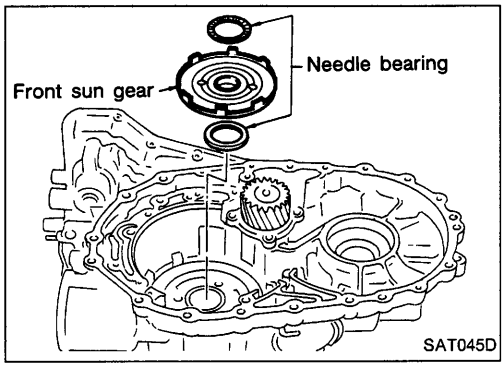
b. Remove input shaft assembly (high clutch) from reverse clutch.



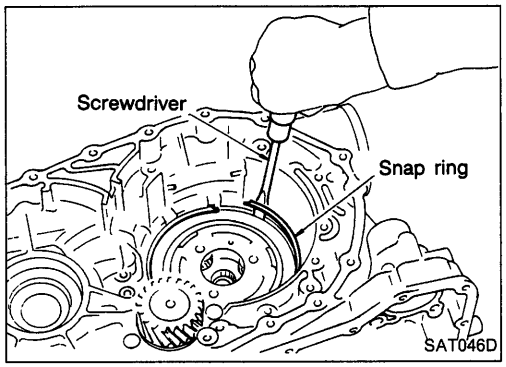
c. Remove needle bearing from high clutch drum.
d. Check input shaft assembly and needle bearing for damage or wear.



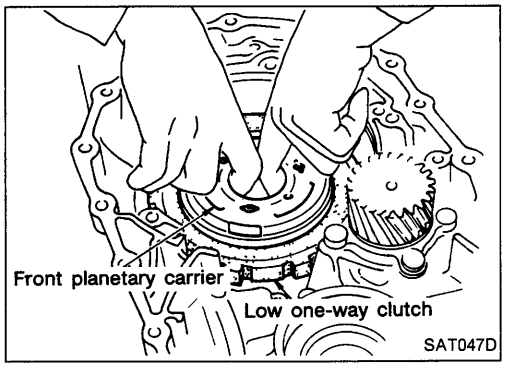
34. Remove high clutch hub and needle bearing from transmission case.
35. Check high clutch hub and needle bearing for damage or wear.



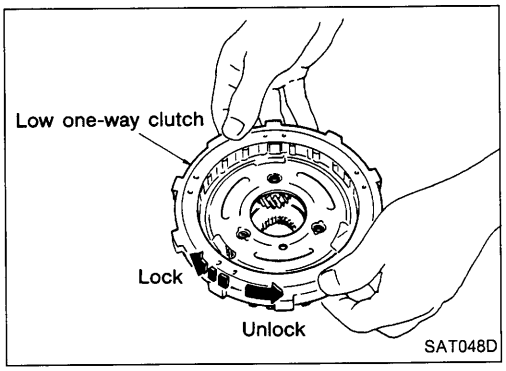
36. Remove front sun gear and needle bearings from transmission case.
37. Check front sun gear and needle bearings for damage or wear.



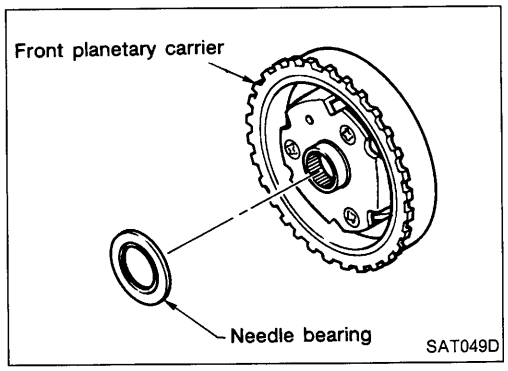
38. Remove front planetary carrier assembly and low one-way clutch according to the following procedures.
a. Remove snap ring with flat-bladed screwdriver.



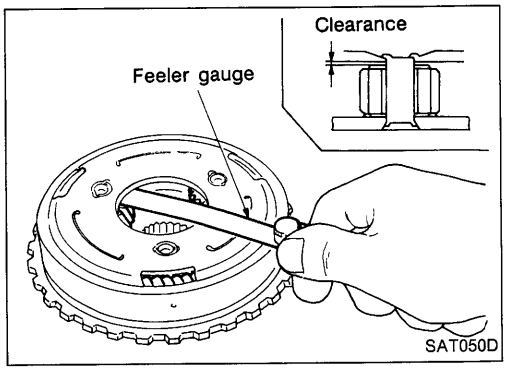
b. Remove front planetary carrier with low one-way clutch.



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 while rotating it toward unlock.



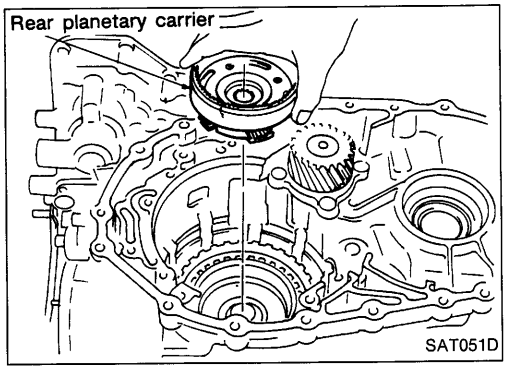
e. Remove needle bearing from front planetary carrier.



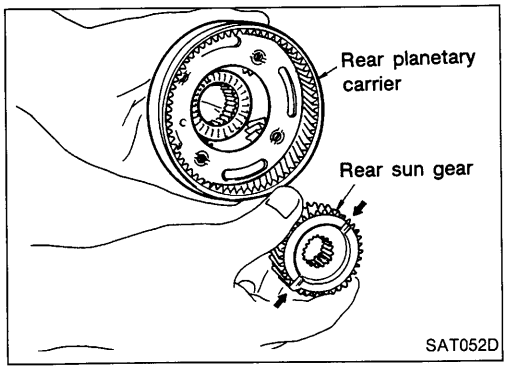
f. Check front planetary carrier, low one-way clutch and needle bearing for damage or wear.
g. Check clearance between pinion washer and planetary carrier with feeler gauge.

Standard clearance:
0.15 - 0.70 mm (0.0059 - 0.0276 in)
Allowable limit:
0.80 mm (0.0315 in)

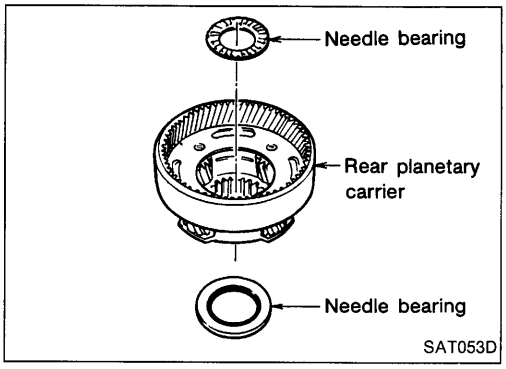
Replace front planetary carrier if the clearance exceeds allowable limit.



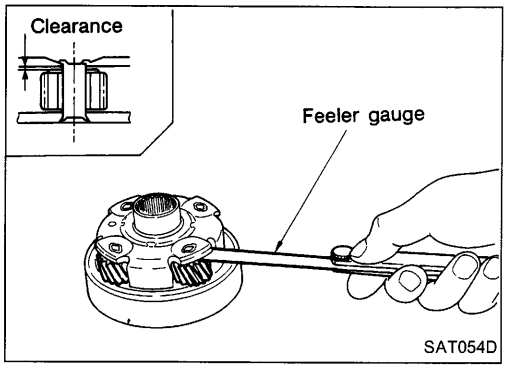
39. Remove rear planetary carrier assembly and rear sun gear according to the following procedures.
a. Remove rear planetary carrier assembly from transmission case.



b. Remove rear sun gear from rear planetary carrier.



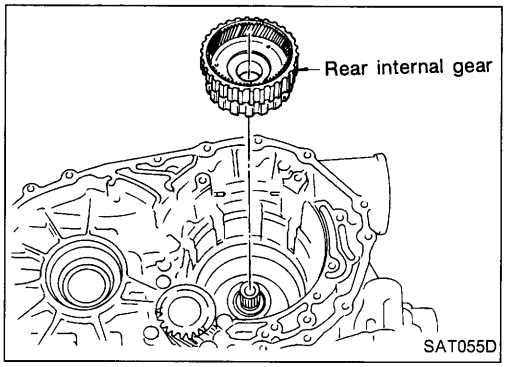
c. Remove needle bearings from rear planetary carrier assembly.



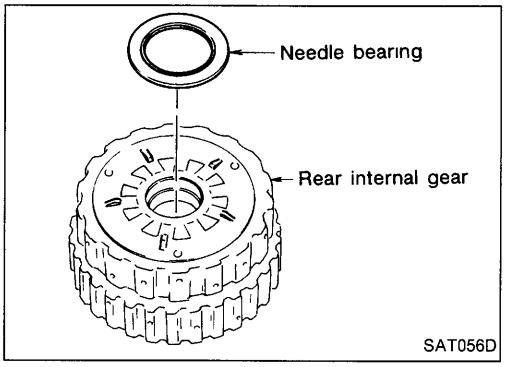
d. Check rear planetary carrier, rear sun gear and needle bearings for damage or wear.
e. Check clearance between pinion washer and rear planetary carrier with feeler gauge.

Standard clearance:
0.15 - 0.70 mm (0.0059 - 0.0276 in)
Allowable limit:
0.80 mm (0.0315 in)

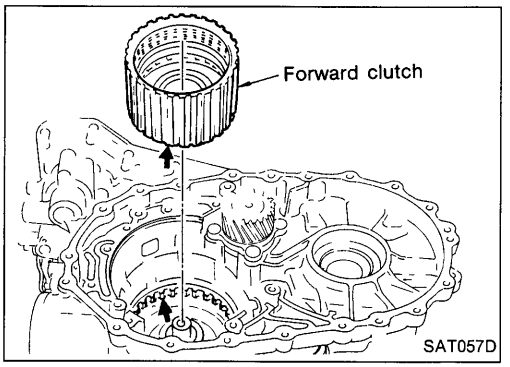
Replace rear planetary carrier if the clearance exceeds allowable limit.



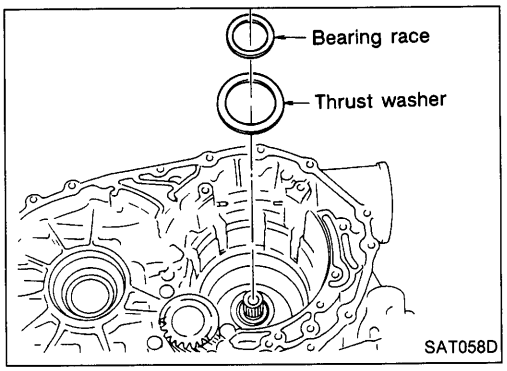
40. Remove rear internal gear from transmission case.



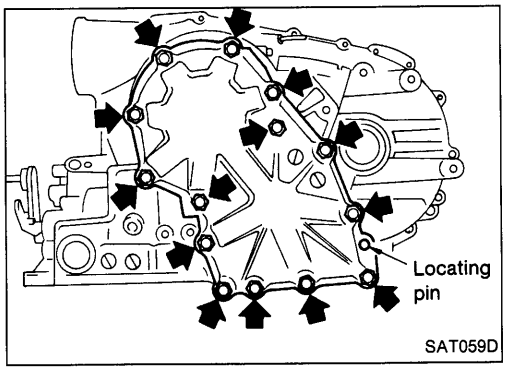
41. Remove needle bearing from rear internal gear.
42. Check needle bearing for damage or wear.



43. Remove forward clutch assembly from transmission case.

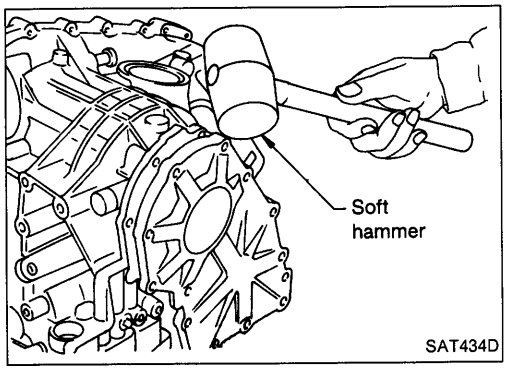


44. Remove needle bearing from transmission case.



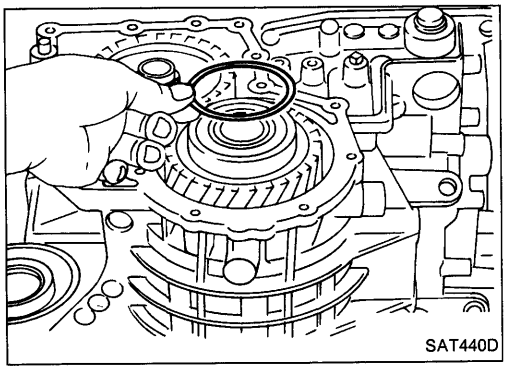
45. Remove output shaft assembly according to the following procedures.

a. Remove side cover bolts.

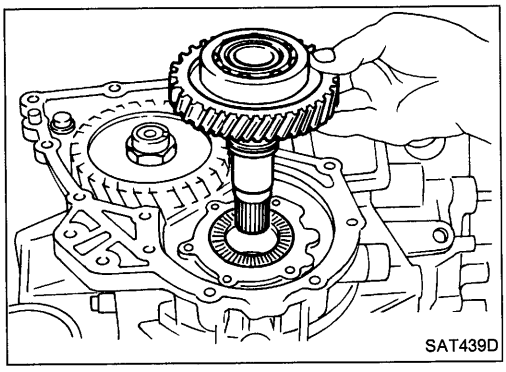


b. Remove side cover by lightly tapping it with a soft hammer.

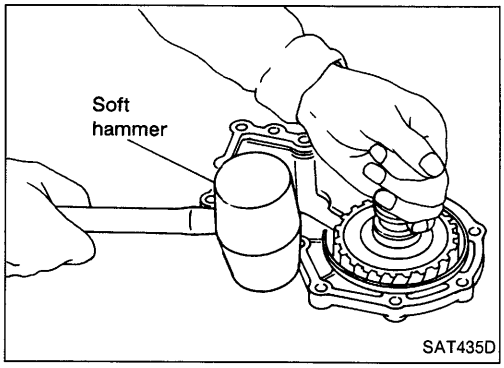
- **Be careful not to drop output shaft assembly as output shaft assembly may be removed together with side cover.**



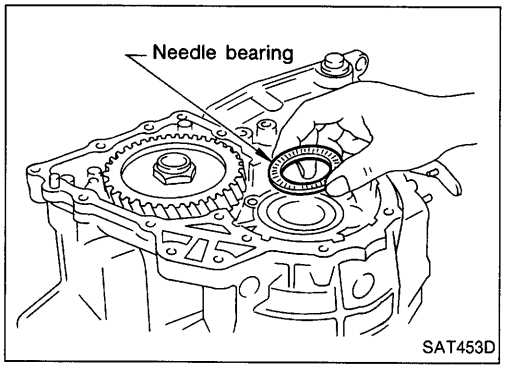
c. Remove adjusting shim.



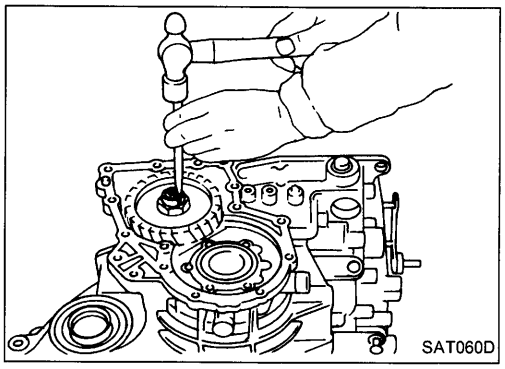
d. Remove output shaft assembly.



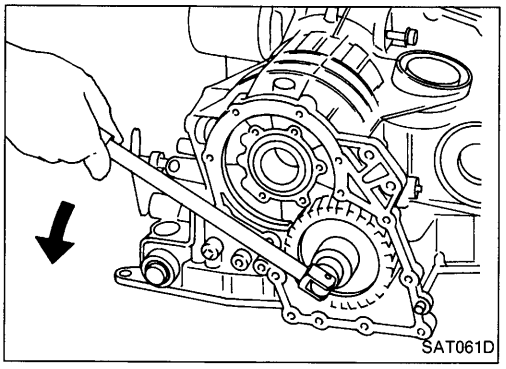
- If output shaft assembly was removed together with side cover, remove side cover by tapping it lightly with a soft hammer.



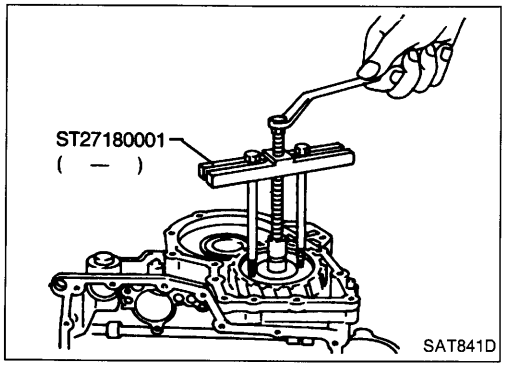
e. Remove needle bearing.



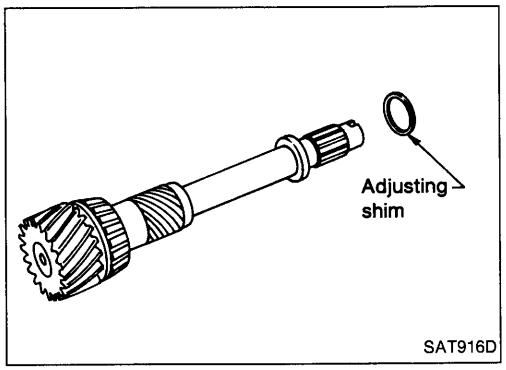
46. Disassemble reduction gear according to the following procedures.
a. Set manual lever to position "P" to fix idler gear.
b. Unlock idler gear lock nut using a pin punch.



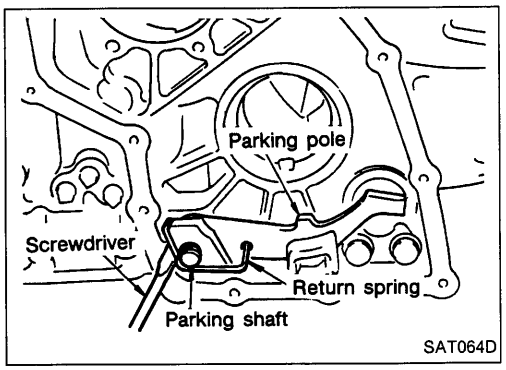
c. Remove idler gear lock nut.
- **Do not reuse idler gear lock nut.**



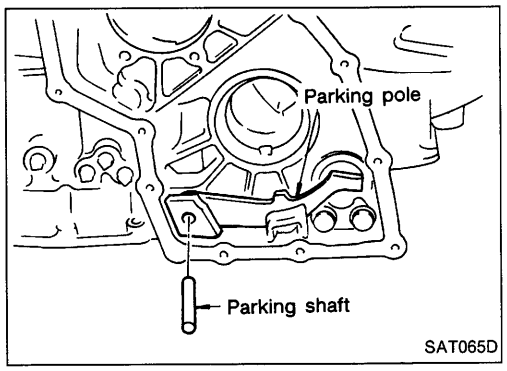
d. Remove idler gear with puller.



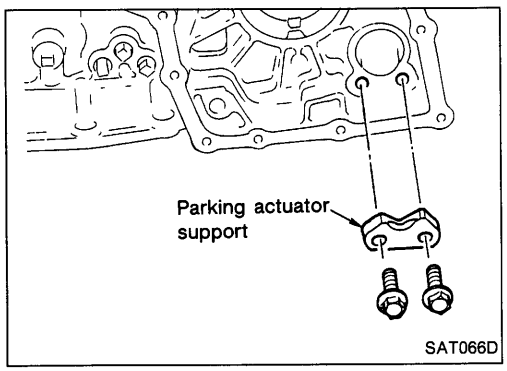
e. Remove reduction gear.
f. Remove adjusting shim from reduction gear.



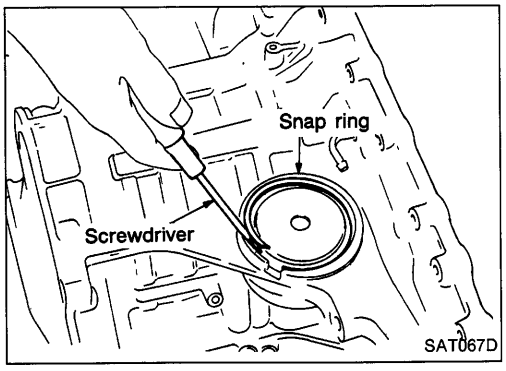
47. Remove return spring from parking shaft with screwdriver.



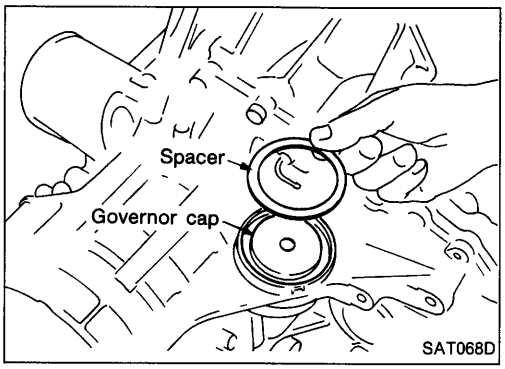
48. Draw out parking shaft and remove parking pole from transmission case.
49. Check parking pole and shaft for damage or wear.



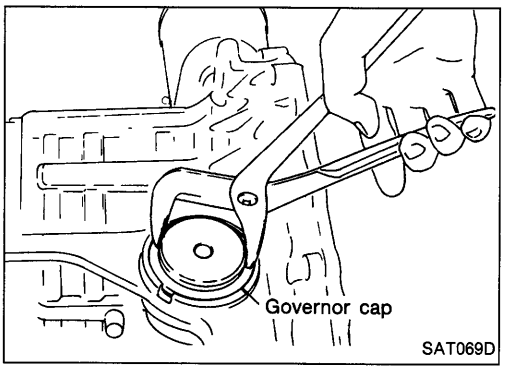
50. Remove parking actuator support from transmission case.
51. Check parking actuator support for damage or wear.



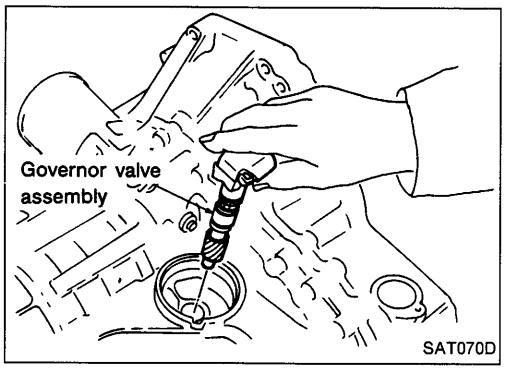
52. Remove governor valve assembly according to the following procedures.
a. Remove snap ring with screwdriver.



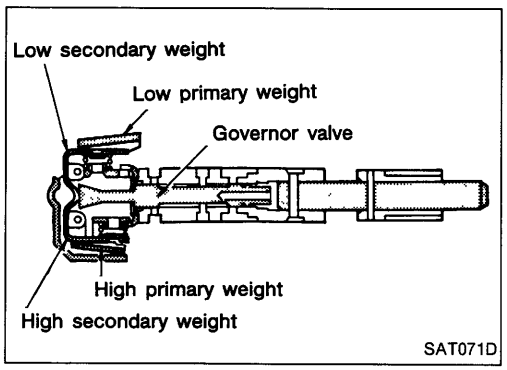
b. Remove spacer from governor cap.



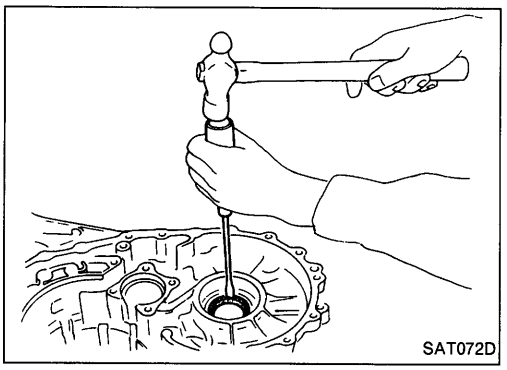
c. Remove governor cap with water pump pliers.
d. Remove O-ring from governor cap.



e. Remove governor valve assembly.

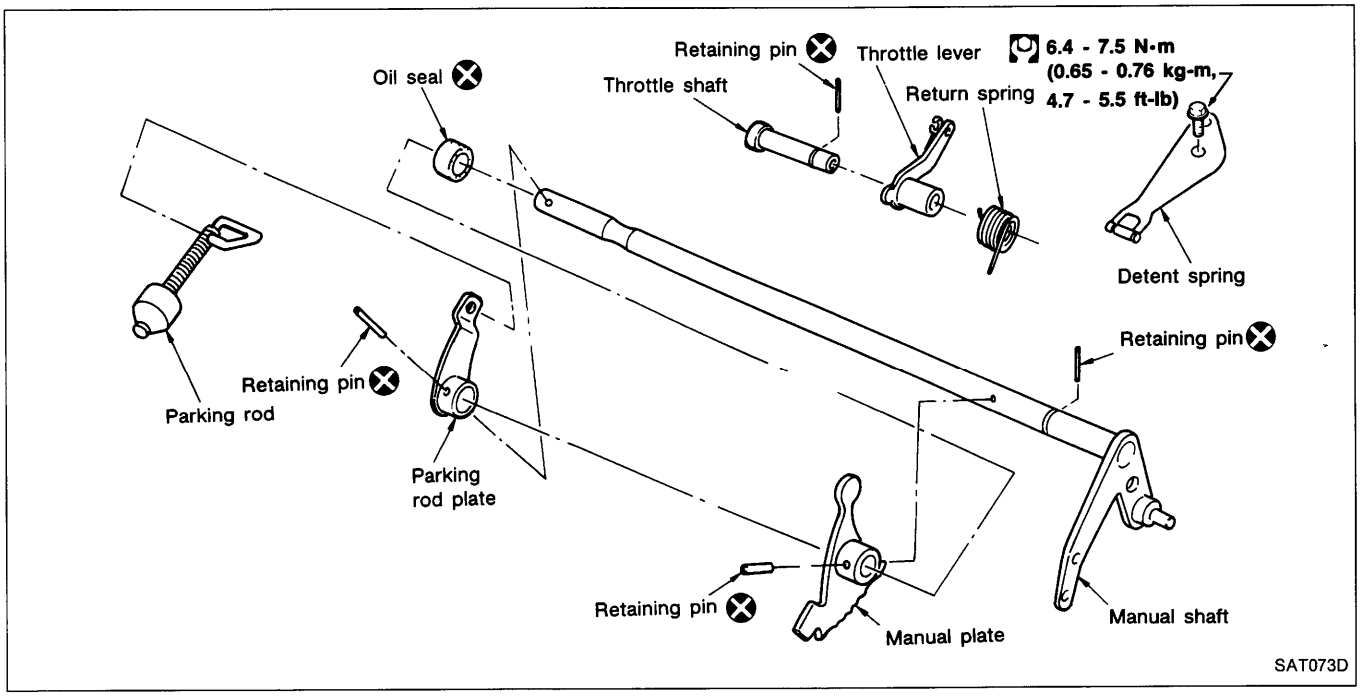


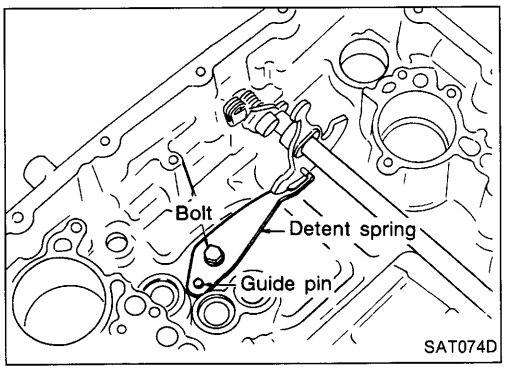
f. Close low primary weight. Make sure governor valve smoothly lowers under its own weight with topside of governor assembly down.
g. With topside of governor assembly down, operate both low and high secondary weights to ensure governor valve is functioning properly.



53. Remove side oil seal with screwdriver.

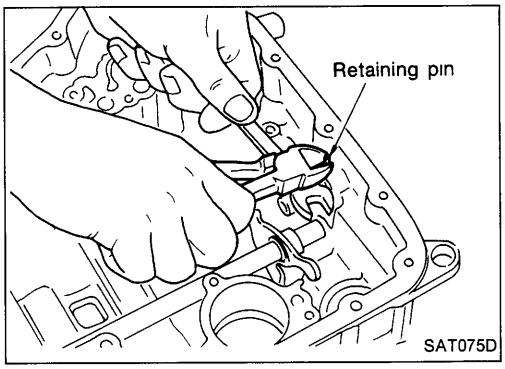
Manual Shaft and Throttle Lever



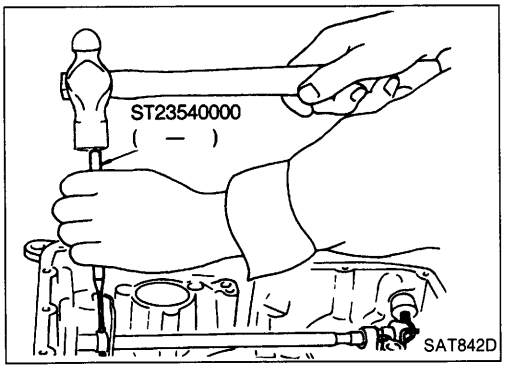


REMOVAL

1. Remove detent spring from transmission case.

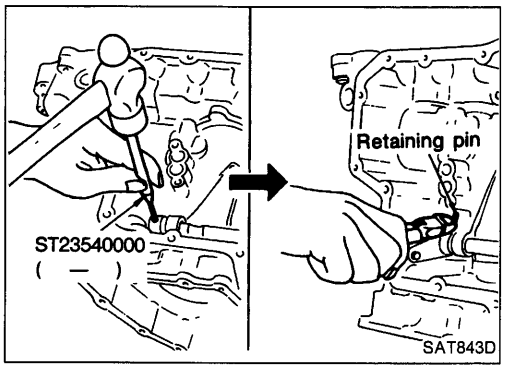


2. Pull out throttle shaft retaining pin.
3. Draw out throttle shaft from transmission case.

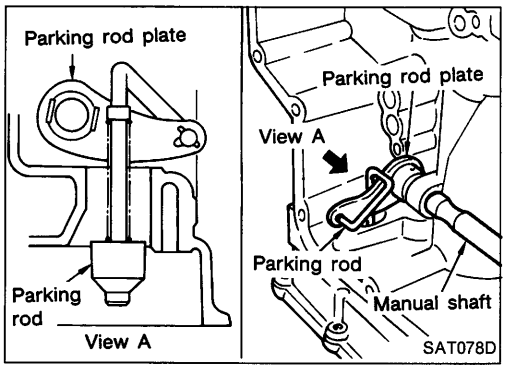


4. Drive out manual plate retaining pin.

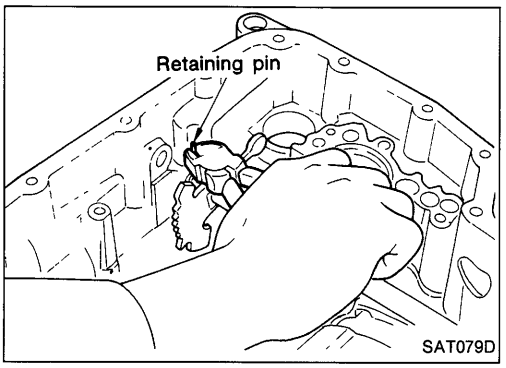
Manual Shaft and Throttle Lever (Cont'd)



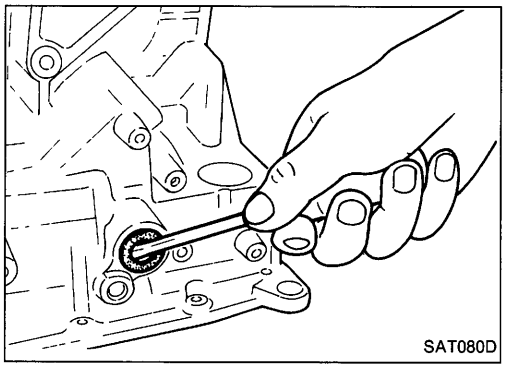
5. Drive and pull out parking rod plate retaining pin.



6. Remove parking rod plate from manual shaft.
7. Draw out parking rod from transmission case.



8. Pull out manual shaft retaining pin.
9. Remove manual shaft and manual plate from transmission case.



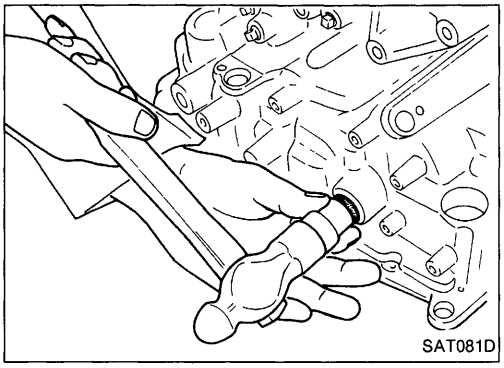
10. Remove manual shaft oil seal.

INSPECTION

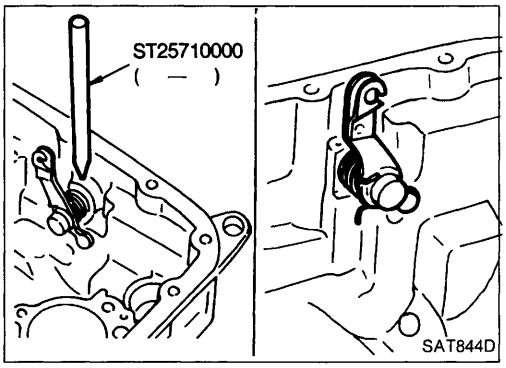
- Check component parts for wear or damage. Replace if necessary.

Manual Shaft and Throttle Lever (Cont'd)

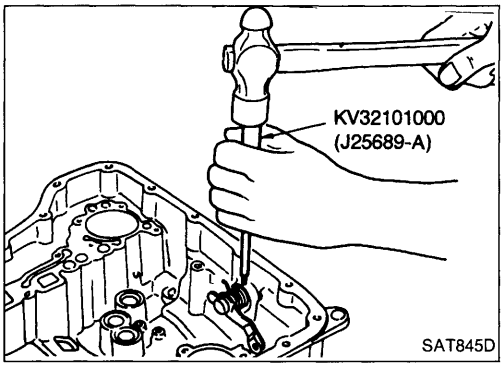
INSTALLATION



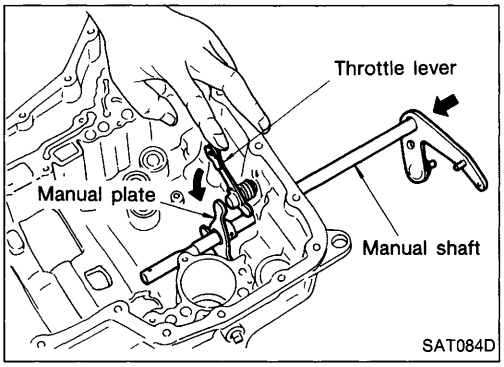
1. Install manual shaft oil seal.
- **Apply A.T.F. to outer surface of oil seal.**



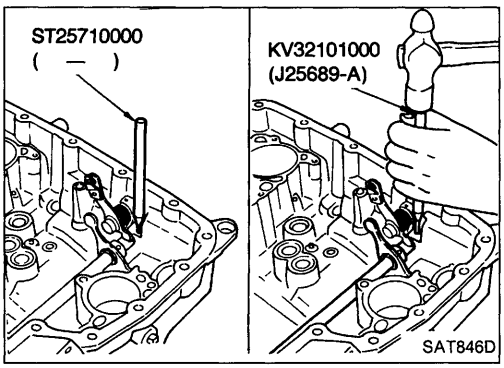
2. Install throttle lever and return spring on throttle shaft.
3. Install throttle lever assembly on transmission case.



4. Align groove of throttle shaft and hole of transmission case.
5. Install a new throttle shaft retaining pin.

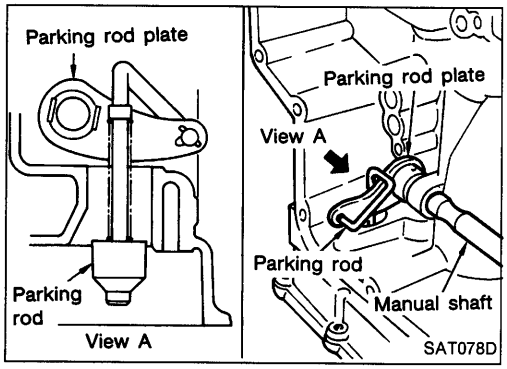


6. Move throttle lever in the direction of the arrow.
7. Install manual shaft and manual plate.

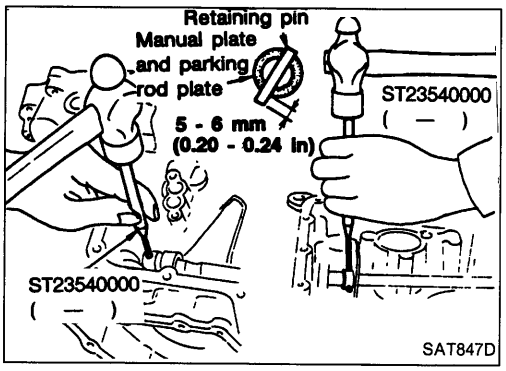


8. Align groove of manual shaft and hole of transmission case.
9. Install manual shaft retaining pin.

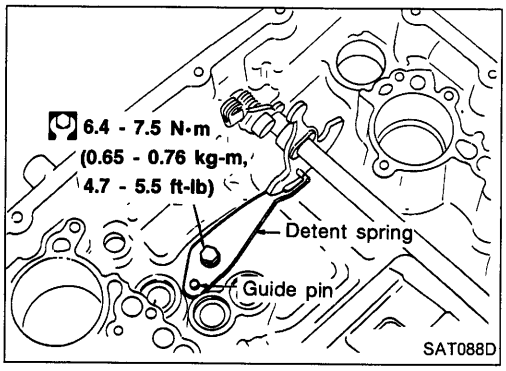
Manual Shaft and Throttle Lever (Cont'd)



10. Install parking rod to parking rod plate.
11. Install parking rod assembly to manual shaft.

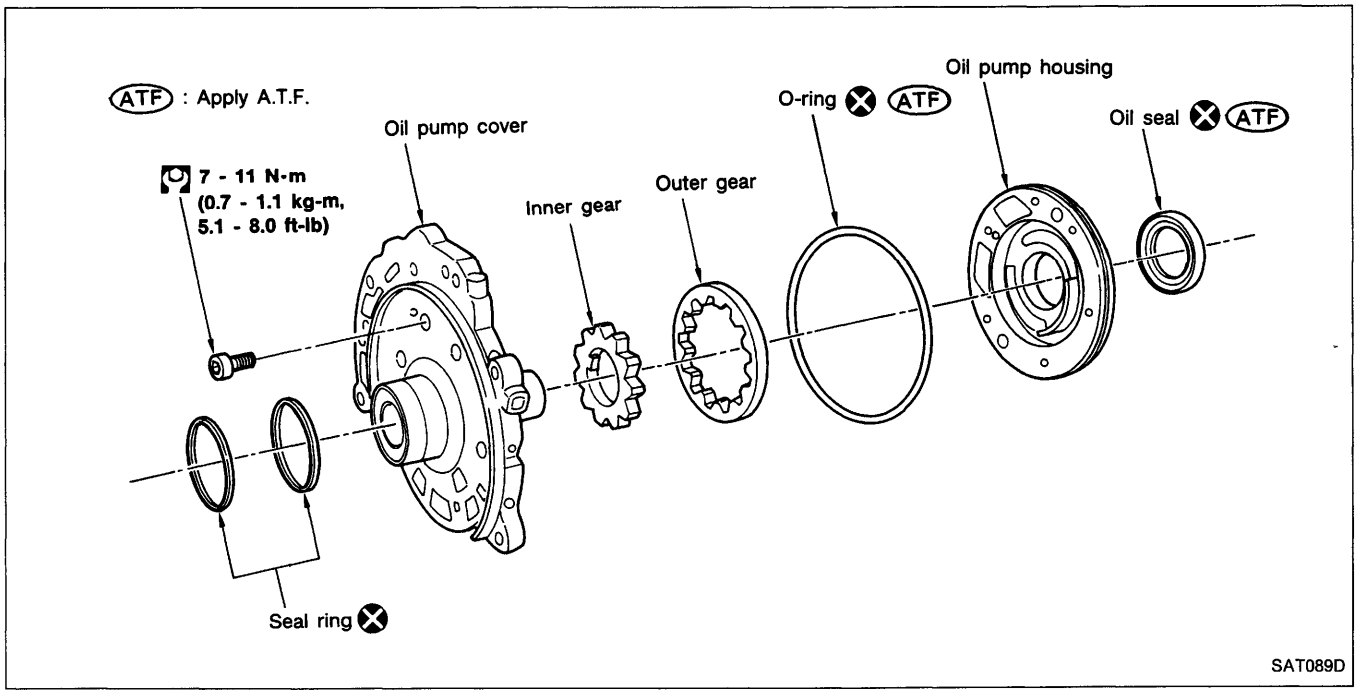


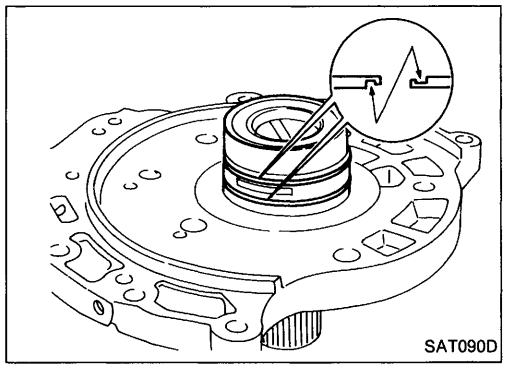
12. Install manual plate retaining pin and parking rod plate retaining pin.



13. Install detent spring.

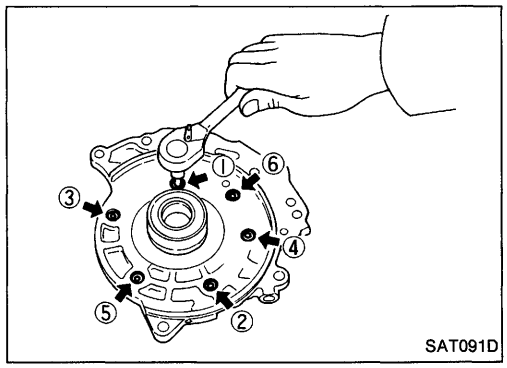
Oil Pump



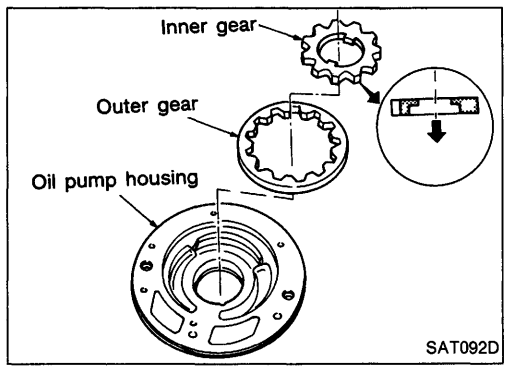


DISASSEMBLY

1. Remove seal rings by undoing hooks.

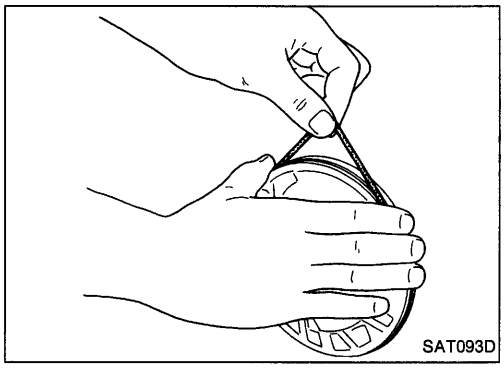


2. Loosen bolts in numerical order and remove oil pump cover.

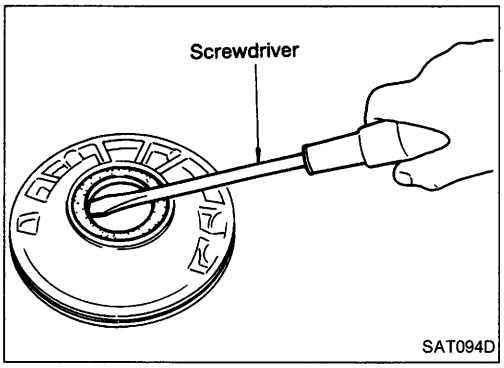


3. Remove inner and outer gear from oil pump housing.

Oil Pump (Cont'd)



4. Remove O-ring from oil pump housing.

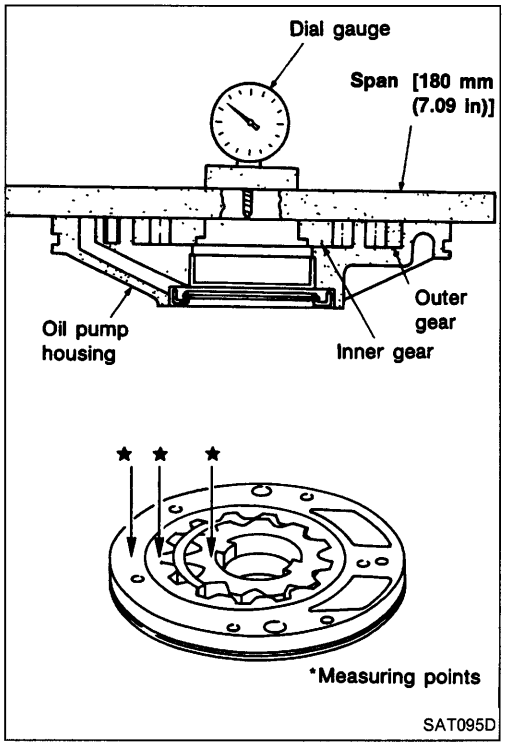


5. Remove oil pump housing oil seal.

INSPECTION

Oil pump housing, oil pump cover, inner gear and outer gear

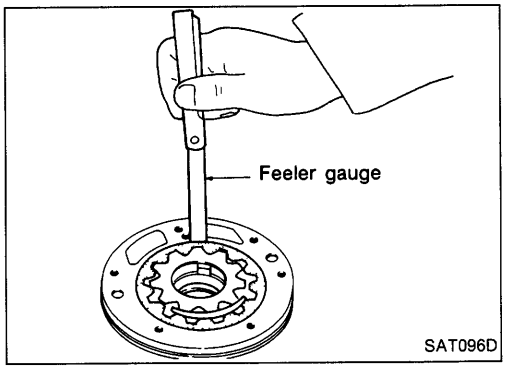
- Check for wear or damage.



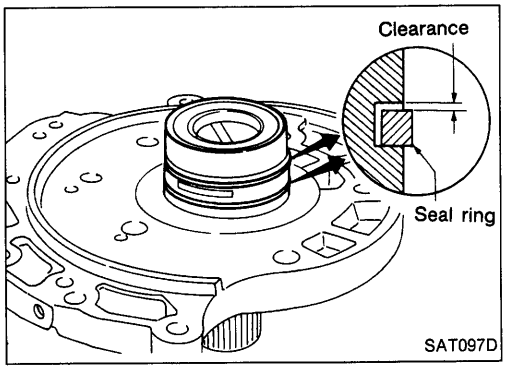
Side clearance

- 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)
  Allowable limit:
  0.15 mm (0.0059 in)
- If not within allowable limit, replace whole oil pump assembly except oil pump cover.

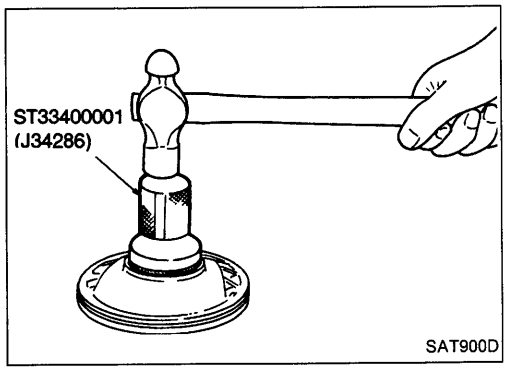


Seal ring clearance

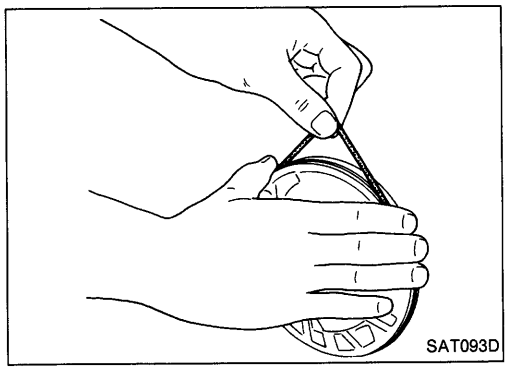
- Measure clearance between seal ring and ring groove.
  Standard clearance:
  0.07 - 0.19 mm (0.0028 - 0.0075 in)
  Allowable limit:
  0.19 mm (0.0075 in)
- If not within allowable limit, replace oil pump cover assembly.

ASSEMBLY

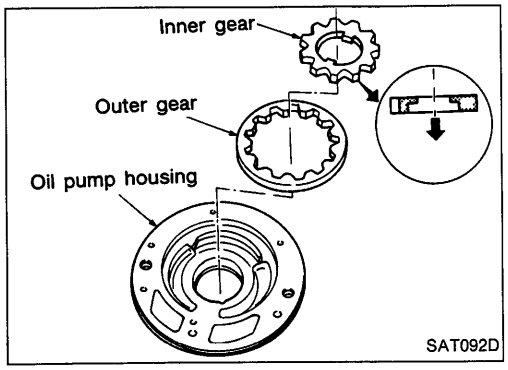
1. Install oil seal on oil pump housing.



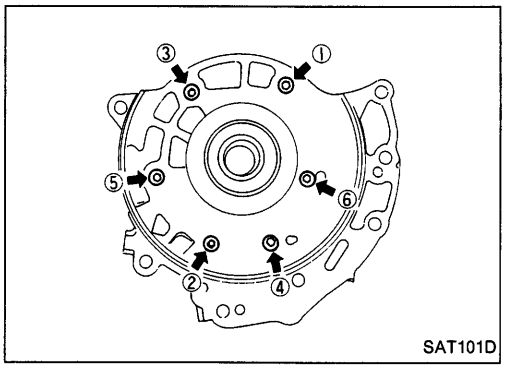
2. Install O-ring on oil pump housing.
- **Apply A.T.F. to O-ring.**



3. Install inner and outer gears on oil pump housing.
- **Be careful of direction of inner gear.**

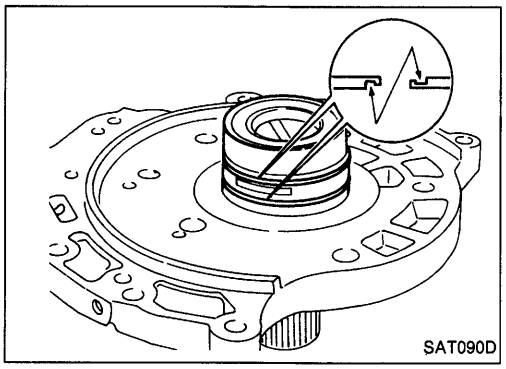


Oil Pump (Cont'd)



SAT101D

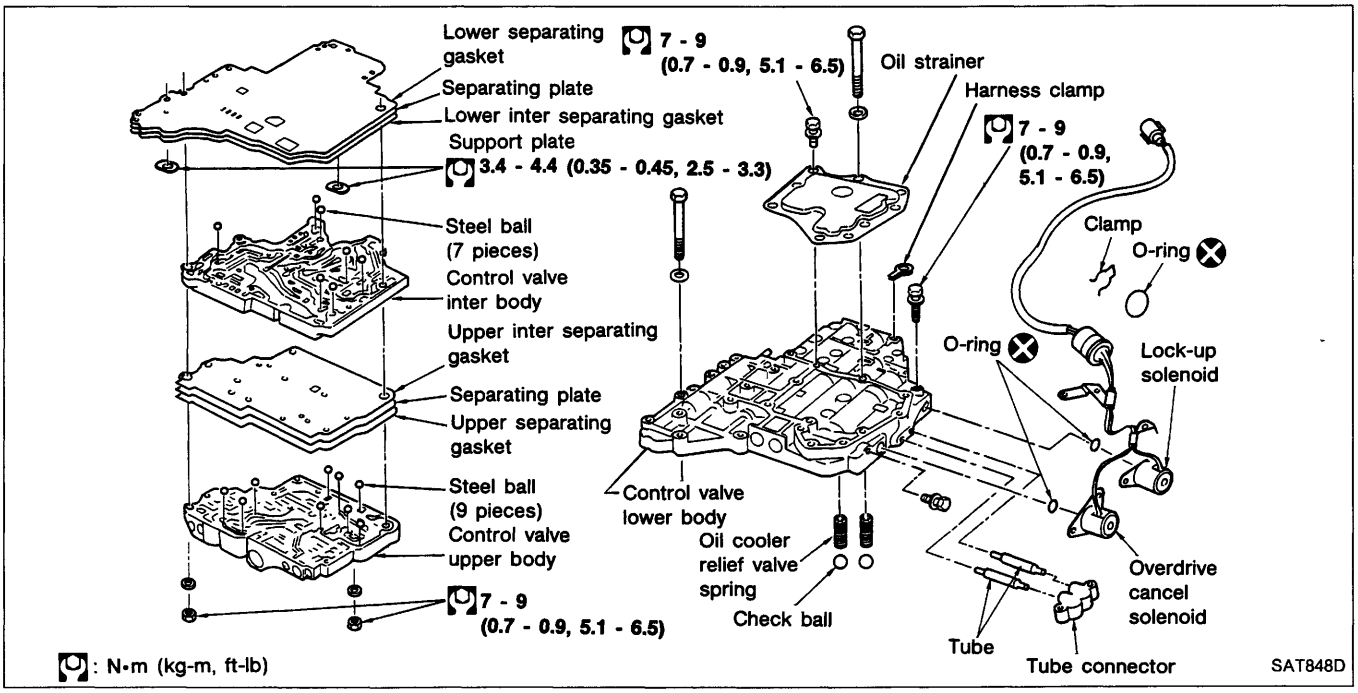
4. Install oil pump cover on oil pump housing.
a. Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly on oil pump housing assembly, then remove masking tape.
b. Tighten bolts in a criss-cross pattern.

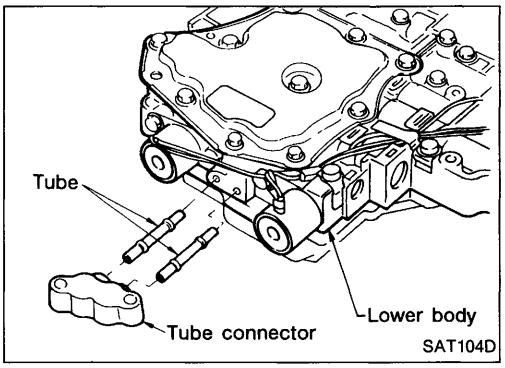

SAT090D

5. Install new seal rings carefully after packing ring groove with petroleum jelly and attach hooks.

- **Do not spread gap of seal ring excessively while installing. The ring may be deformed.**

Control Valve Assembly





DISASSEMBLY

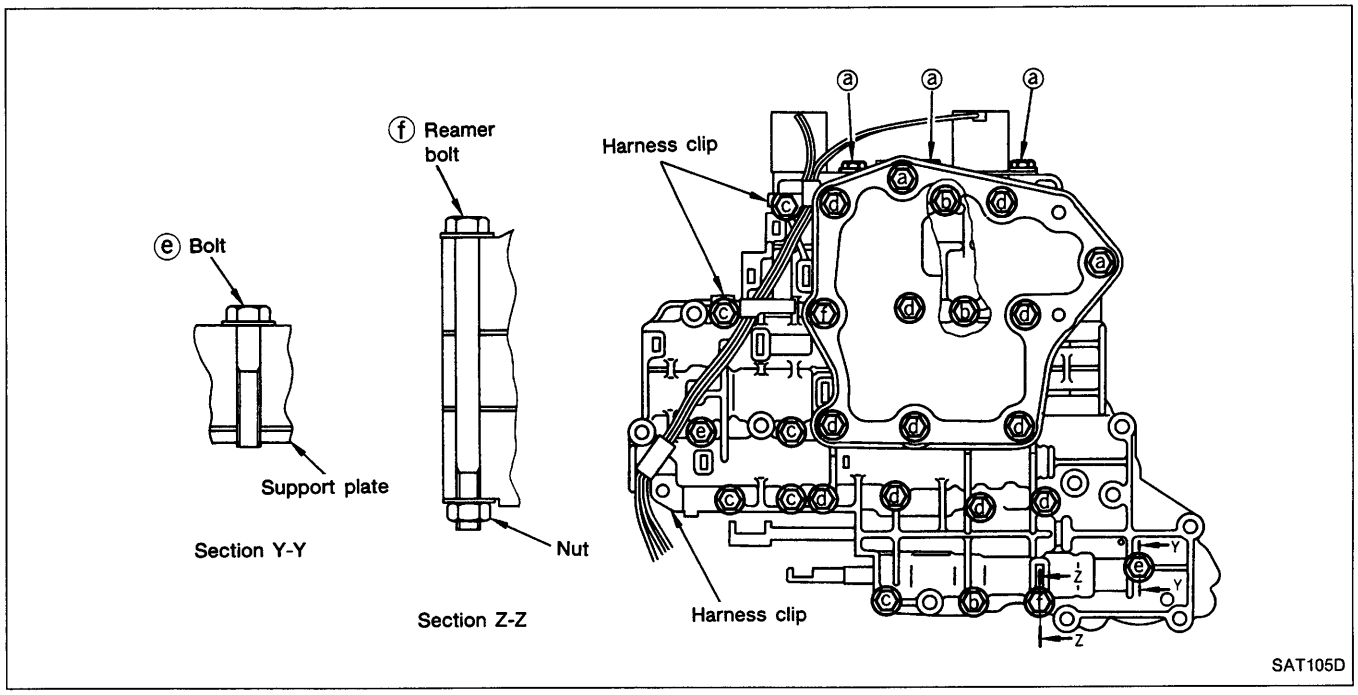
1. Remove tube connector and tube from control valve lower body.

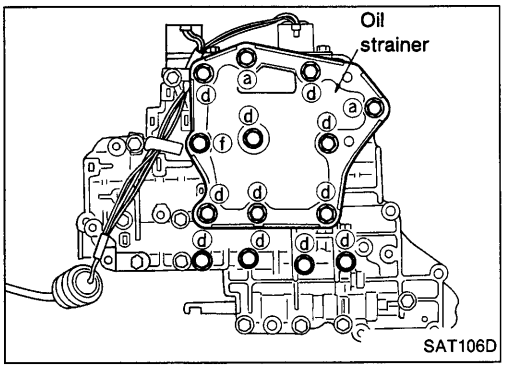
Control Valve Assembly (Cont'd)

2. Disassemble upper, inter and lower bodies.

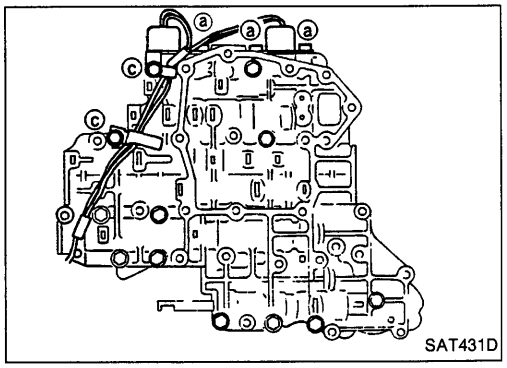
Bolt length, number and location:

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	5	3	6	11	2	2



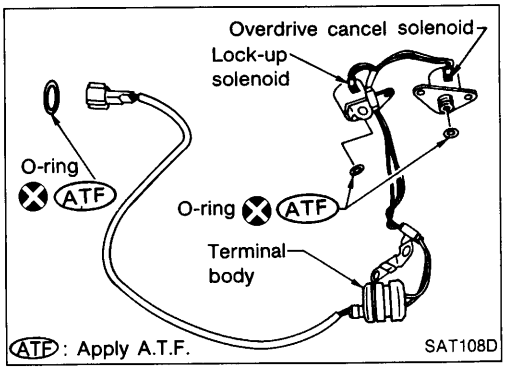


a. Remove bolts ⓐ, ⓓ and ⓕ and remove oil strainer from control valve assembly.

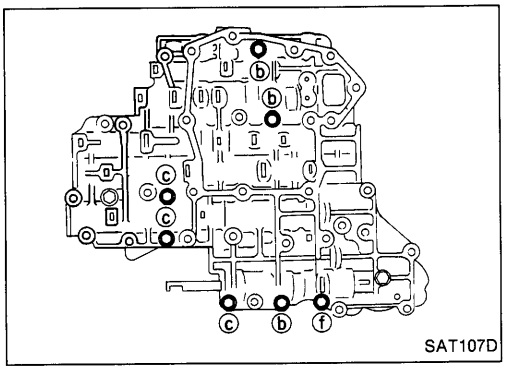


b. Remove O.D. cancel solenoid and lock-up cancel solenoid from control valve assembly.

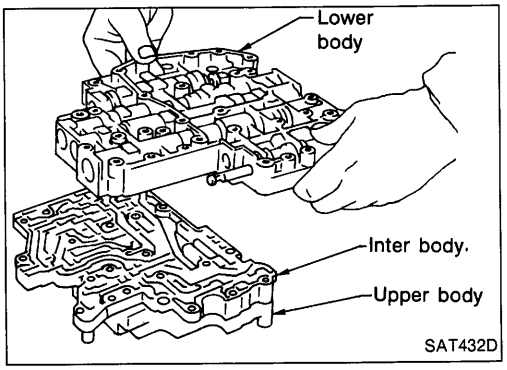
Control Valve Assembly (Cont'd)



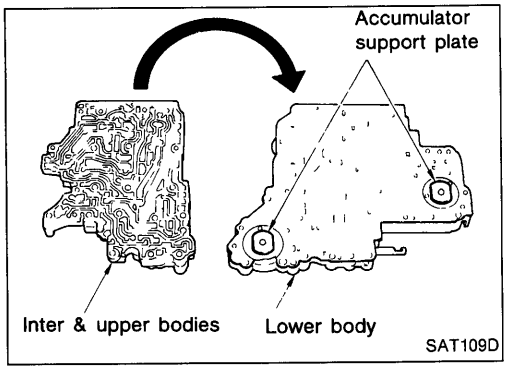
c. Remove O-rings from O.D. cancel solenoid, lock-up cancel solenoid and harness terminal body.



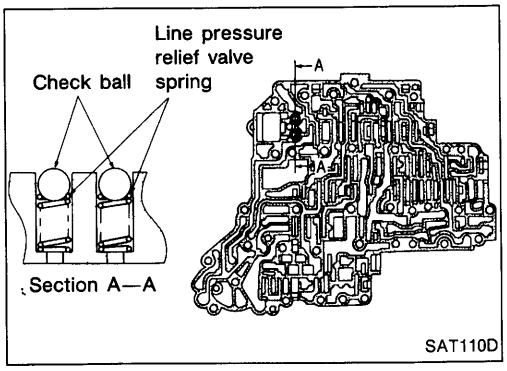
d. Place upper body facedown, and remove bolts ⓑ, ⓒ and ⓕ.



e. Remove inter body from lower body.



f. Turn over lower body, and remove accumulator support plate.

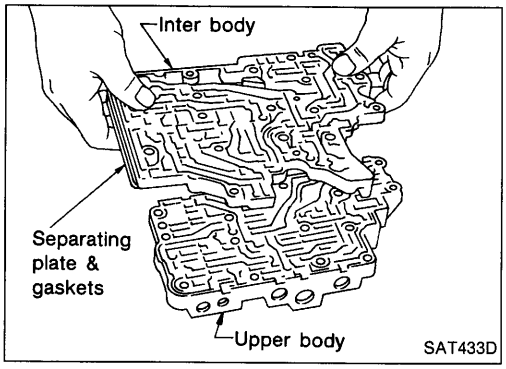


g. Remove separating plate and separating gasket from lower body.

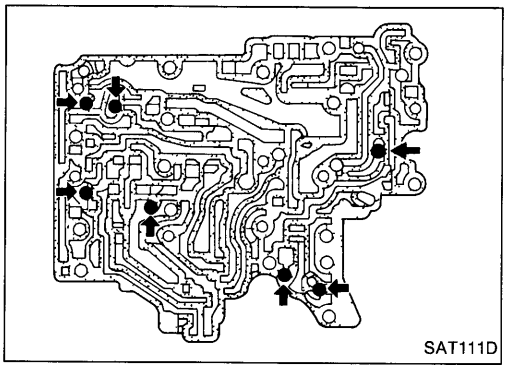
h. Remove steel balls and relief valve springs from lower body.

- **Be careful not to lose steel balls and relief valve springs.**

Control Valve Assembly (Cont'd)

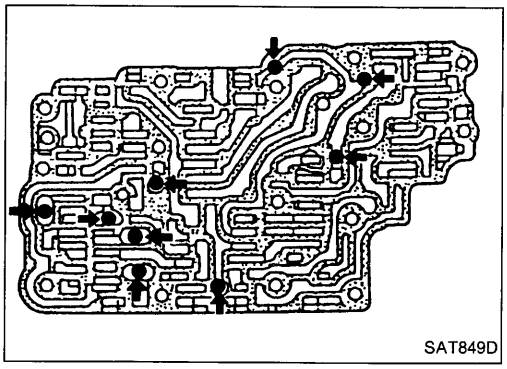


i. Remove inter body with separating plate and separating gasket from upper body.



j. 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.**

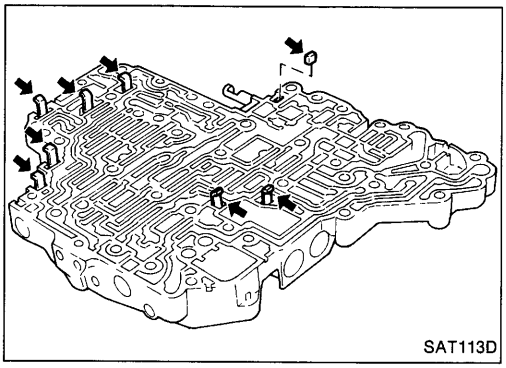


k. Check to see that steel balls are properly positioned in upper body and then remove them from upper body.

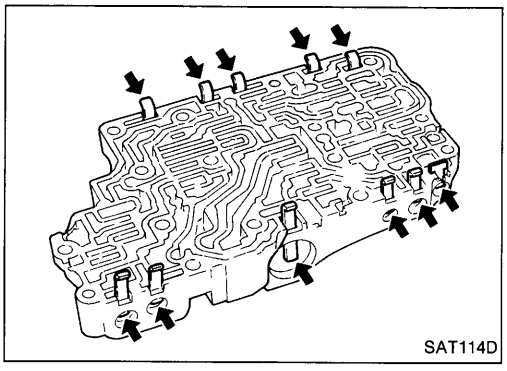
- **Be careful not to lose steel balls.**

INSPECTION

Lower and upper bodies

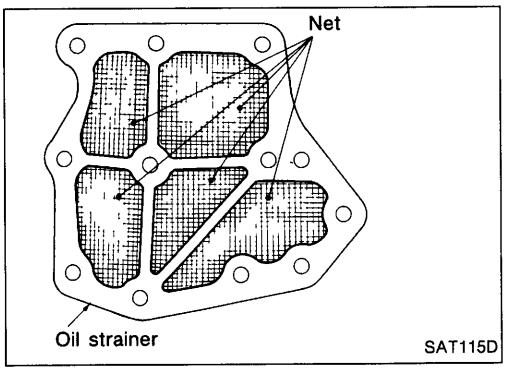


- Check to see that retainer plates are properly positioned in lower body.



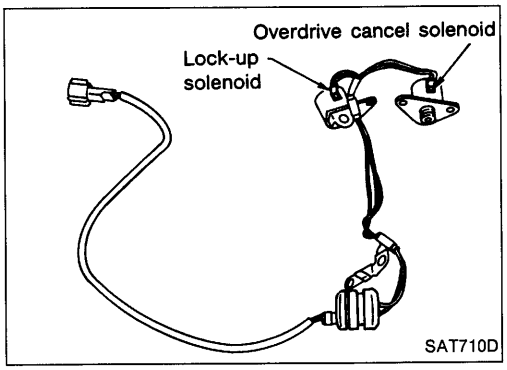
- Check to see that retainer plates are properly positioned in upper body.
- **Be careful not to lose these parts.**

Control Valve Assembly (Cont'd)



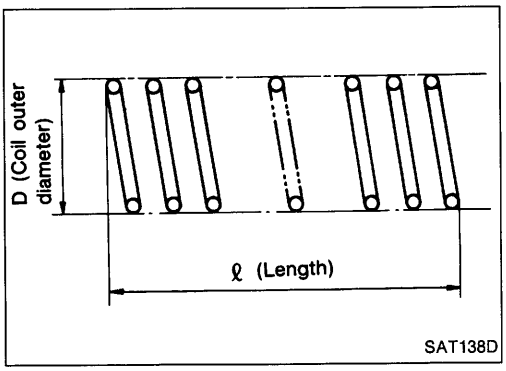
Oil strainer

- Check wire netting of oil strainer for damage.



O.D. cancel solenoid and lock-up cancel solenoid

- Measure resistance — Refer to "ELECTRICAL SYSTEM".



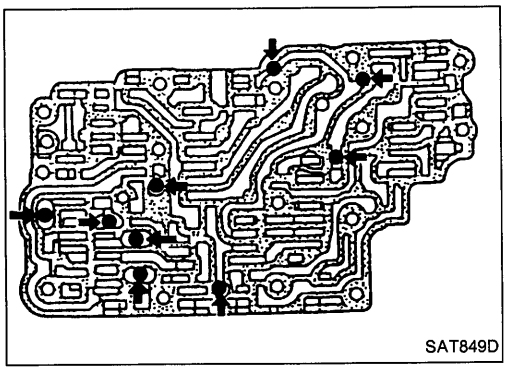
Oil cooler relief valve spring.

- Check springs for damage or deformation.
- Measure free length and outer diameter

Inspection standard:

Unit: mm (in)

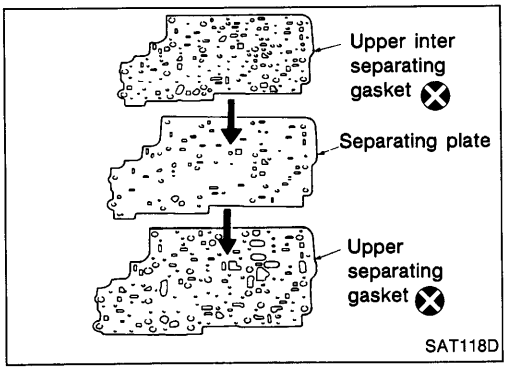
Part No.	ℓ	D
31872-31X00	17.02 (0.6701)	8.0 (0.315)



ASSEMBLY

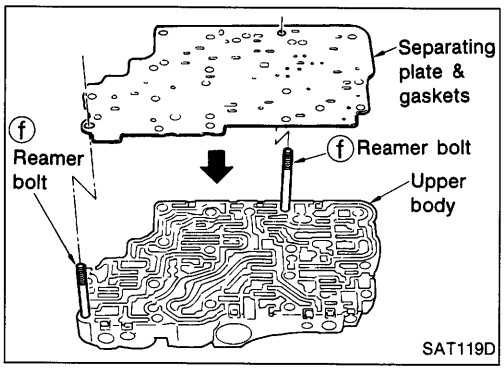
1. Install upper, inter and lower body.

a. Place oil circuit of upper body face up. Install steel balls in their proper positions.

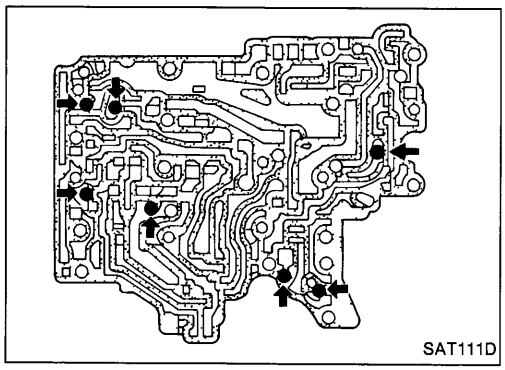


b. Install upper separating gasket, upper inter separating gasket and upper separating plate in order shown in illustration.

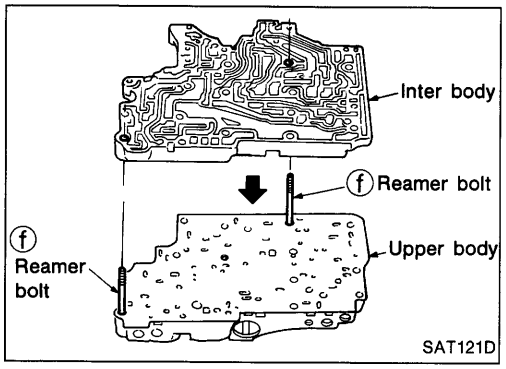
Control Valve Assembly (Cont'd)



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.

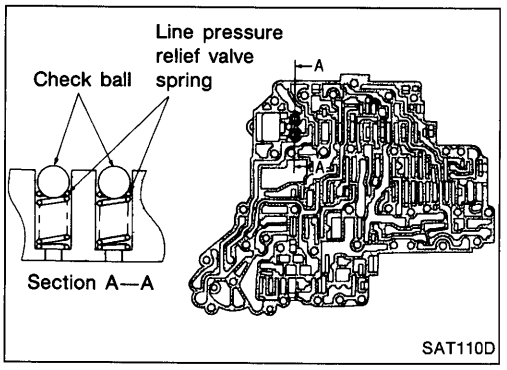


d. Place lower body side of inter body face up. Install steel balls in their proper positions.

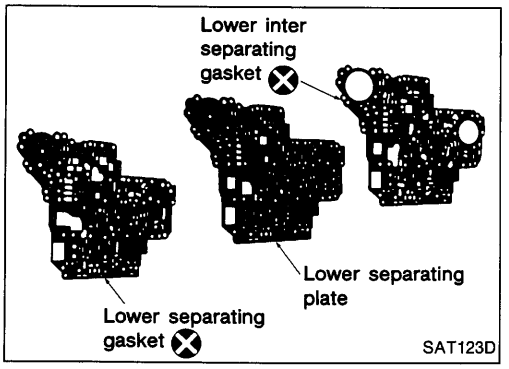


e. Install inter body on upper body using reamer bolts Ⓕ as guides.

- **Be careful not to dislocate or drop steel balls.**

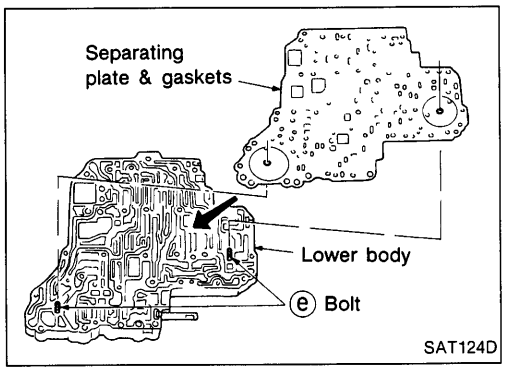


f. Install steel balls and relief valve springs in their proper positions in lower body.

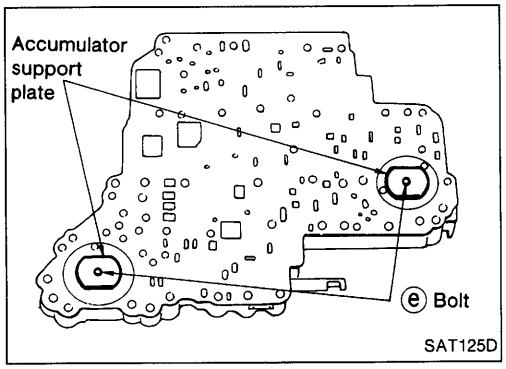


g. Install lower separating gasket, inter separating gasket and lower separating plate in order shown in illustration.

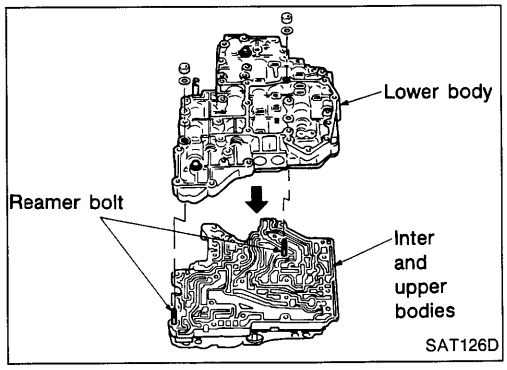
Control Valve Assembly (Cont'd)



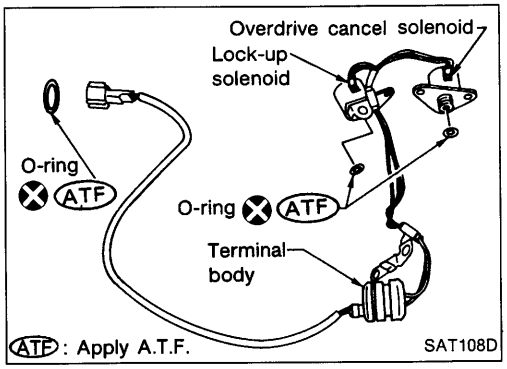
h. Install support plate fixing bolts ⓔ from bottom of lower body and install separating gaskets and separating plate as a set on lower body using bolts ⓔ as guides.



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, lock-up cancel solenoid and harness connector.

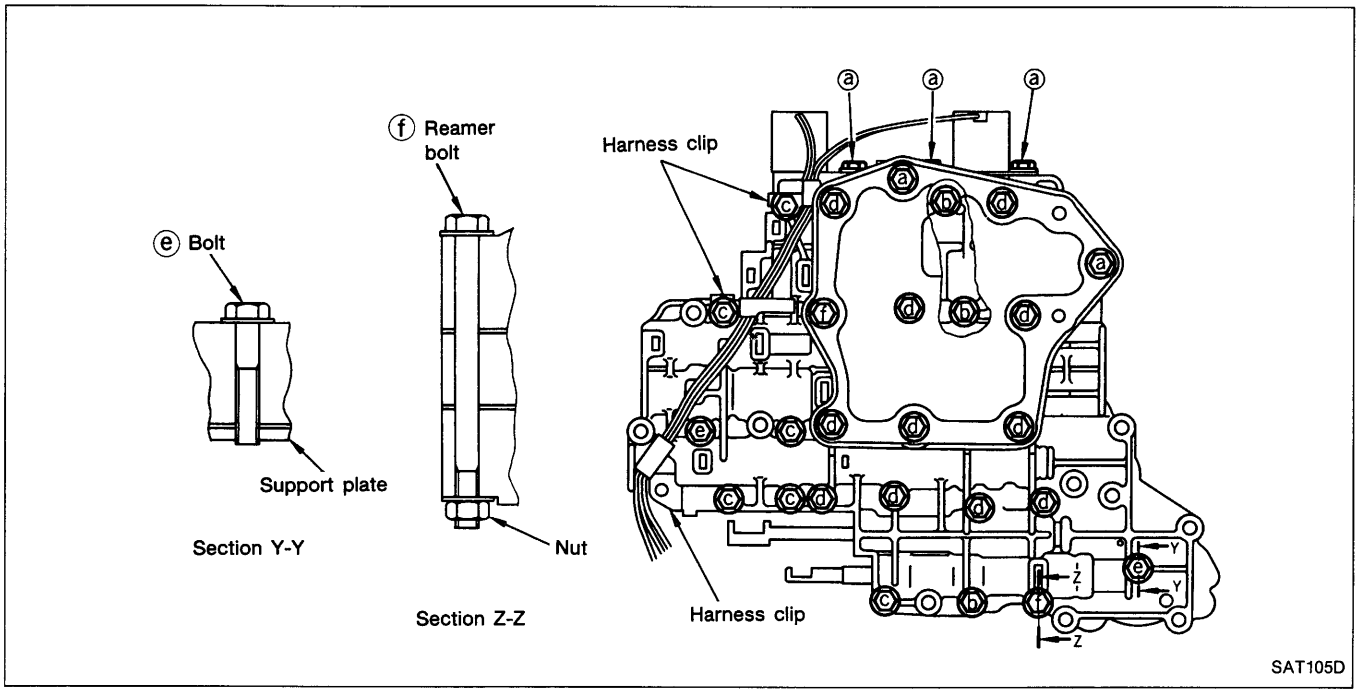
- **Apply A.T.F. to O-rings.**

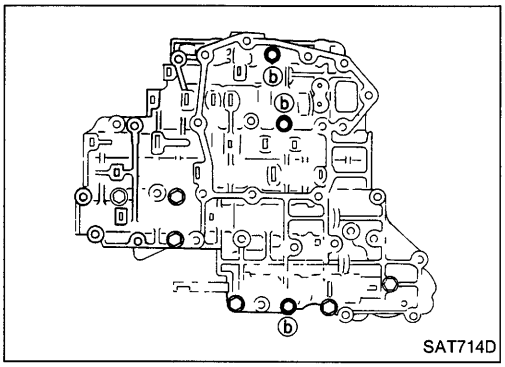
Control Valve Assembly (Cont'd)

3. Install and tighten bolts.

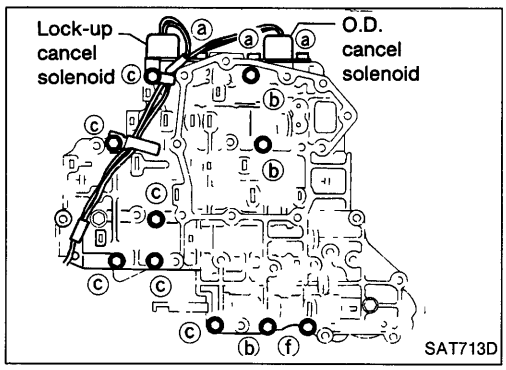
Bolt length, number and location:

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	5	3	6	11	2	2



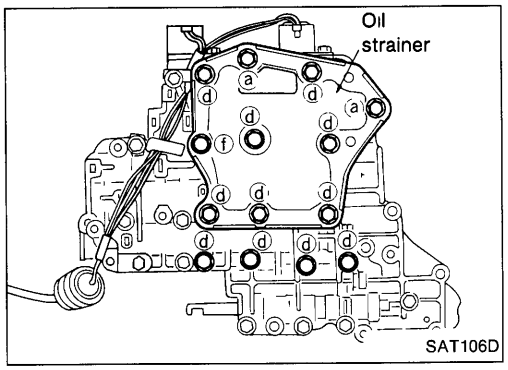


a. Install and tighten bolts ⓑ slightly.

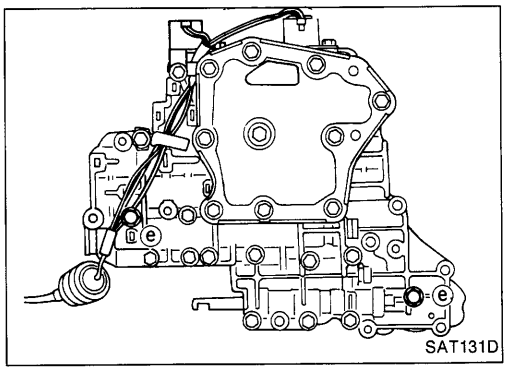


b. Install O.D. cancel solenoid and lock-up cancel solenoid to lower body.
c. Install and tighten bolts ⓐ and ⓒ slightly.
d. Remove both reamer bolts ⓕ previously installed as guides. Install one reamer bolt ⓕ (marked in illustration) from lower body side.
e. Tighten bolts ⓐ, ⓑ, ⓒ and ⓕ to specified torque.

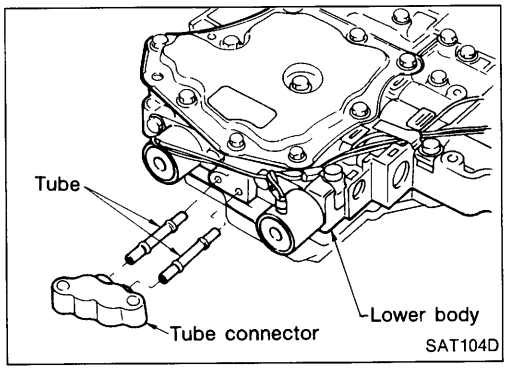
Control Valve Assembly (Cont'd)



f. Install oil strainer and the other reamer bolt ⓕ (marked in illustration), then tighten bolts ⓐ, ⓓ and ⓕ to specified torque.



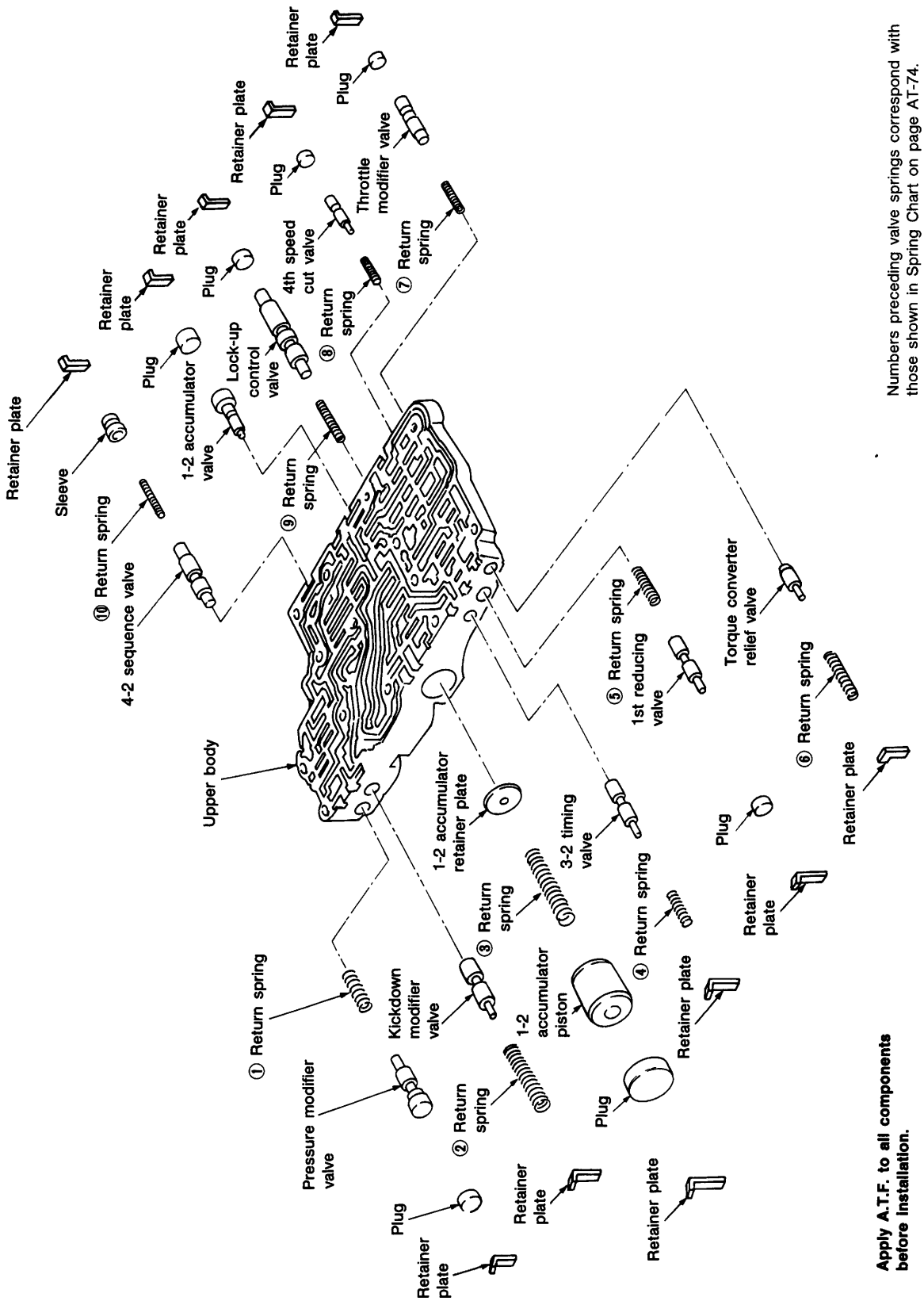
g. Install support plates and tighten bolts ⓔ to specified torque.



h. Install tube connector and tubes to lower body.

- **Install oil circuit side of tube connector face up.**

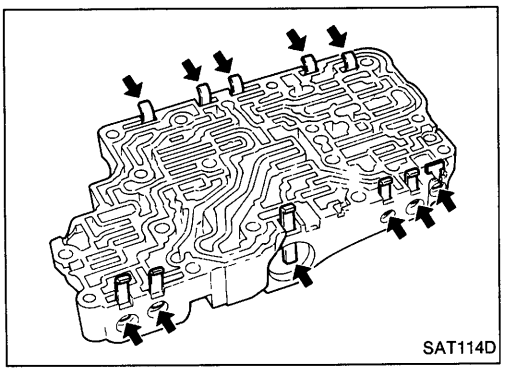
Control Valve Upper Body



SAT133D

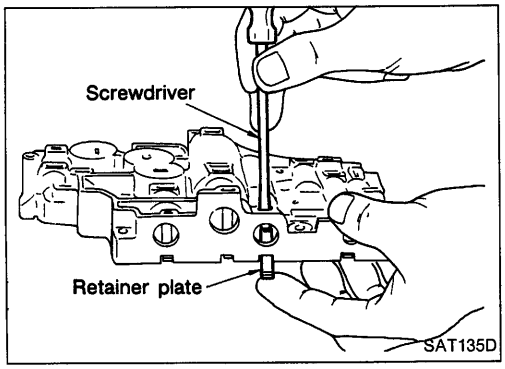
Control Valve Upper Body (Cont'd)

DISASSEMBLY


SAT114D

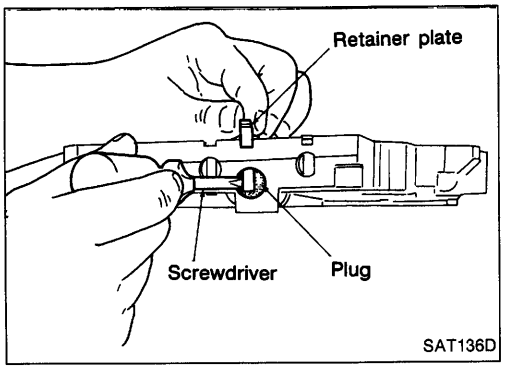
1. Remove valves at retainer plates.

- **Do not use a magnetic "hand".**



SAT135D

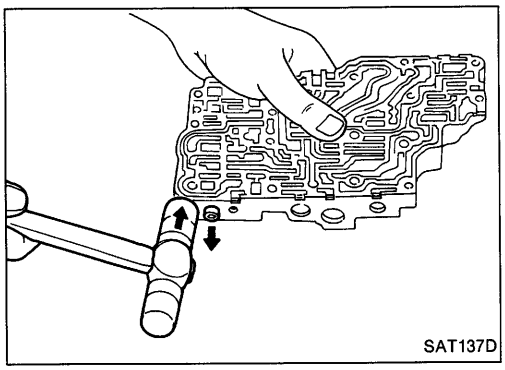
a. Use a screwdriver to pry out retainer plates.



SAT136D

b. Remove retainer plates while holding spring, plugs or sleeves.

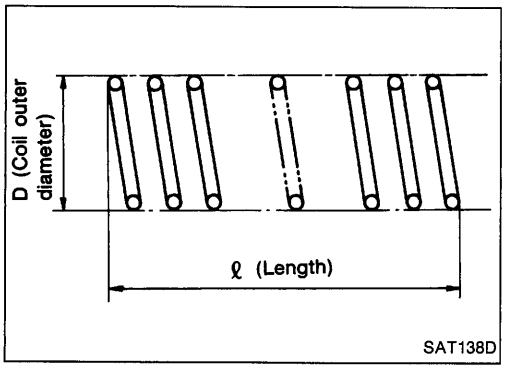
- **Remove plugs slowly to prevent internal parts from jumping out.**


SAT137D

c. Place mating surface of valve body face down, and remove internal parts.

- **If a valve is hard to remove, place valve body face down and lightly tap it with a soft hammer.**
- **Be careful not to drop or damage valves and sleeves.**

Control Valve Upper Body (Cont'd)



INSPECTION

Valve spring

- 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-72.

Inspection standard

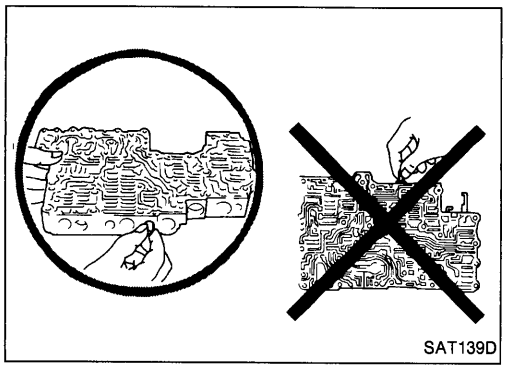
Unit: mm (in)

Parts \ Item	Part No.	ℓ	D
① Pressure modifier valve spring	31742-31X64	25.0 (0.984)	7.9 (0.311)
② Kickdown modifier valve spring	31742-31X03	40.5 (1.594)	9.0 (0.354)
③ 1-2 accumulator valve spring	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 modifier valve spring	31742-31X07	29.5 (1.161)	5.5 (0.217)
⑧ 4th speed cut valve spring	31835-21X02	23.2 (0.913)	6.2 (0.244)
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.

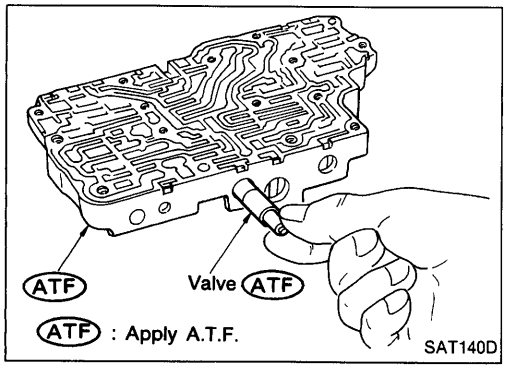
Control valves

- Check sliding surfaces of valves, sleeves and plugs.



ASSEMBLY

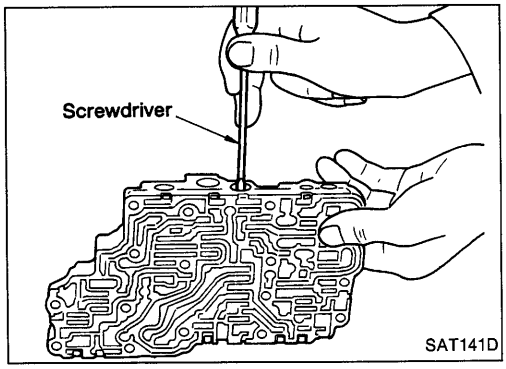
- **Lay control valve body down when installing valves. Do not stand the control valve body upright.**



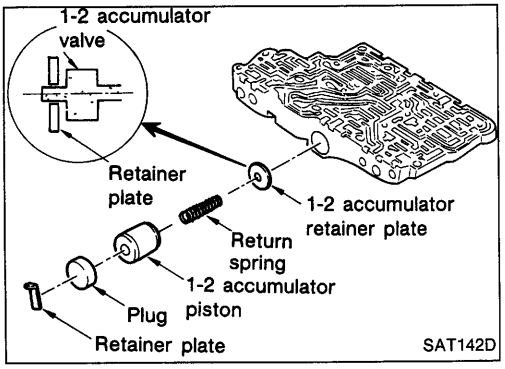
1. Lubricate the control valve body and all valves with A.T.F. Install control valves by sliding them carefully into their bores.

- **Be careful not to scratch or damage valve body.**

Control Valve Upper Body (Cont'd)

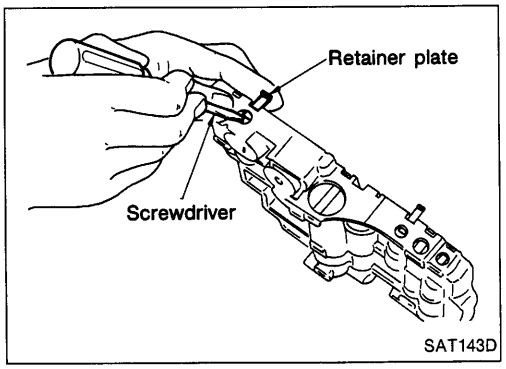


- Wrap a small screwdriver with vinyl tape and use it to insert the valves into their proper positions.

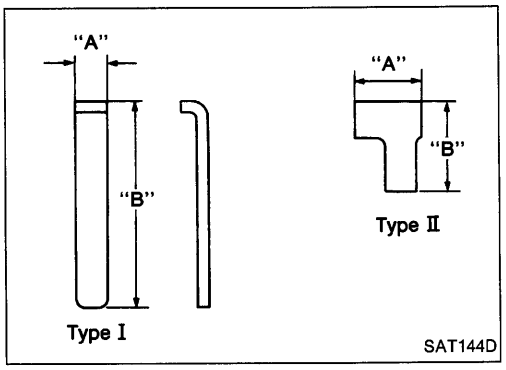


1-2 accumulator valve

- 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, 1-2 accumulator piston and plug.



2. Install retainer plates
- Install retainer plate while pushing plug or return spring.



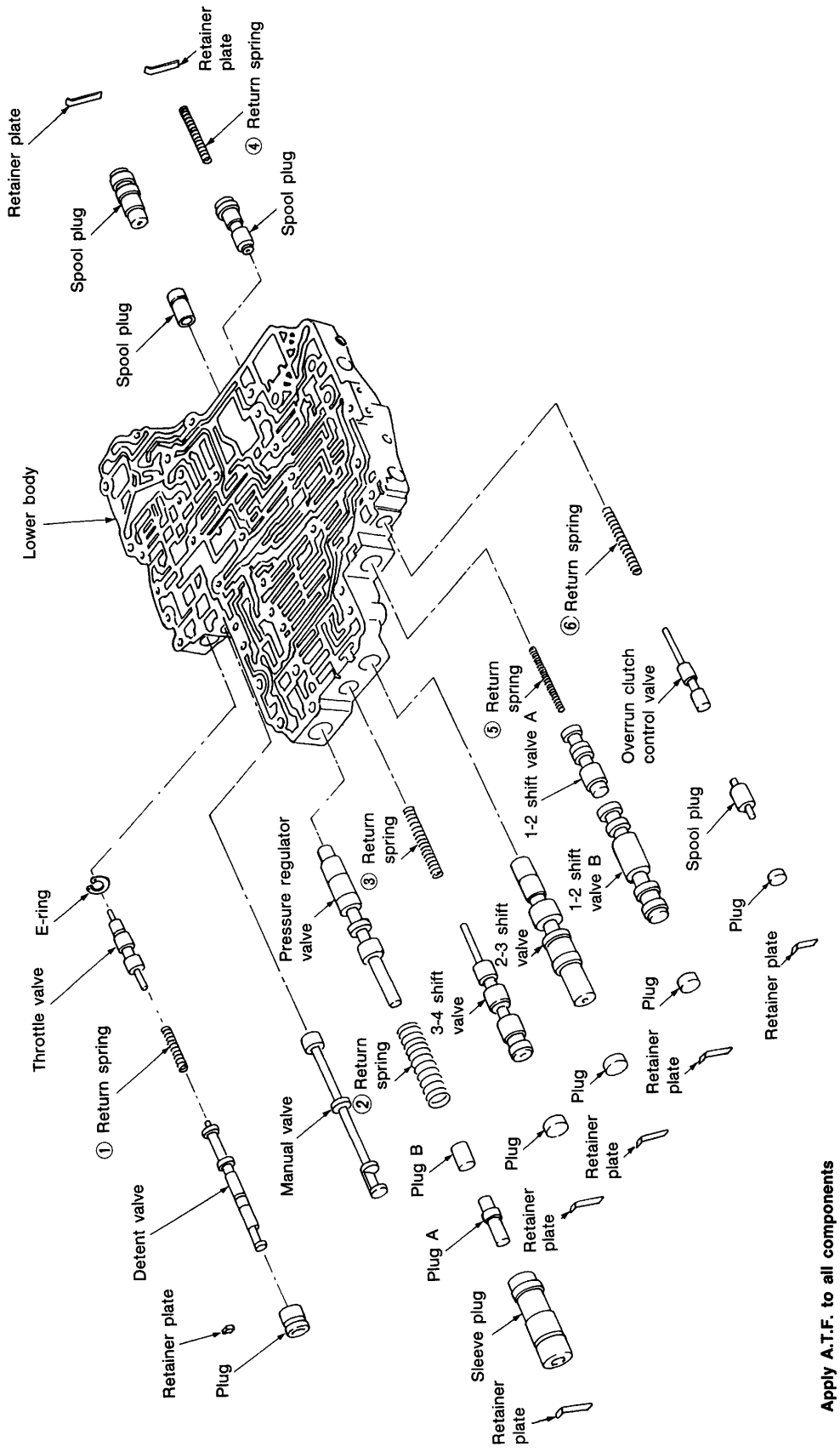
Retainer plate

Unit: mm (in)

Name of control valve	Length A	Length B	Type
Pressure modifier valve	6.0 (0.236)	28.0 (1.102)	I
Lock-up control valve			
4-2 sequence valve			
Kickdown modifier valve	6.0 (0.236)	21.5 (0.846)	
3-2 timing valve			
1st reducing valve			
Throttle modifier 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)	II

- Install proper retainer plates.

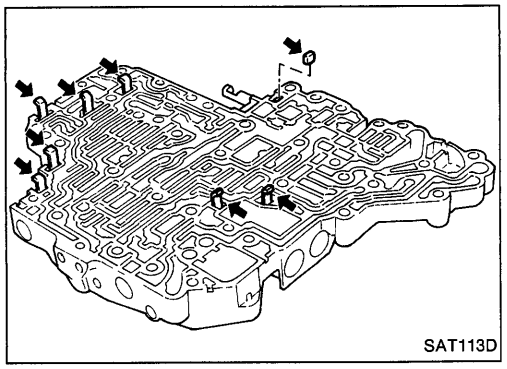
Control Valve Lower Body



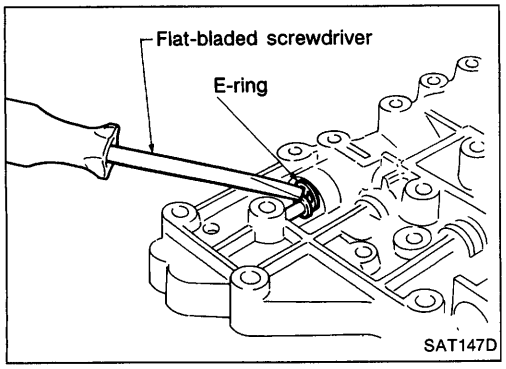
SAT850D

Control Valve Lower Body (Cont'd)

DISASSEMBLY


SAT113D

1. Remove valves at retainer plate.
   For removal procedures, refer to "DISASSEMBLY" of Control Valve Upper Body.



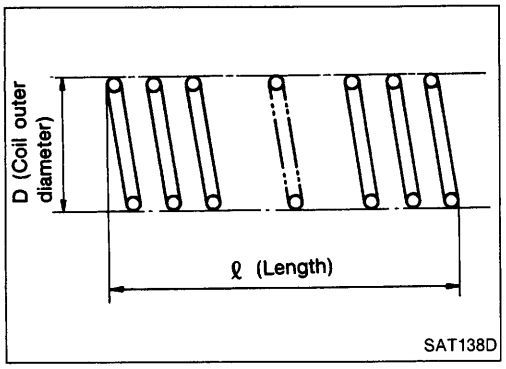
SAT147D

Throttle valve

- Remove throttle valve at E-ring.

INSPECTION

Valve springs



SAT138D

- 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-76.

Inspection standard

Unit: mm (in)

Parts / Item		Part No.	ℓ	D
①	Throttle valve & detent valve spring	31802-31X06	* 32.0 (1.260)	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	31762-31X11	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	31762-31X09	44.5 (1.752)	5.3 (0.209)
⑥	Overrun clutch control valve spring	31742-31X60	48.9 (1.925)	7.0 (0.276)

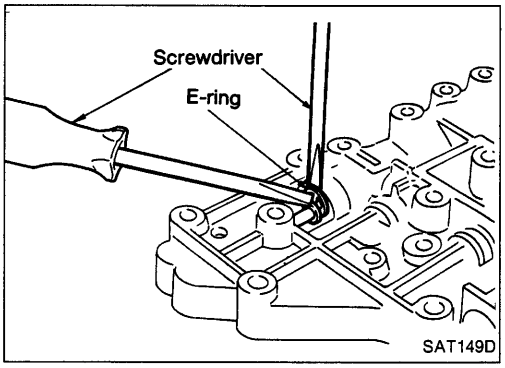
- Replace valve springs if deformed or fatigued.

Control valves

- Check sliding surfaces of control valves, sleeves and plugs for damage.

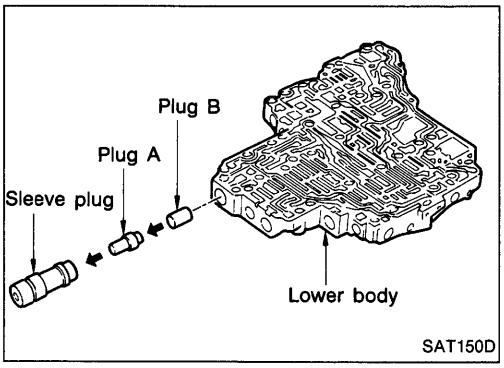
Control Valve Lower Body (Cont'd)

ASSEMBLY



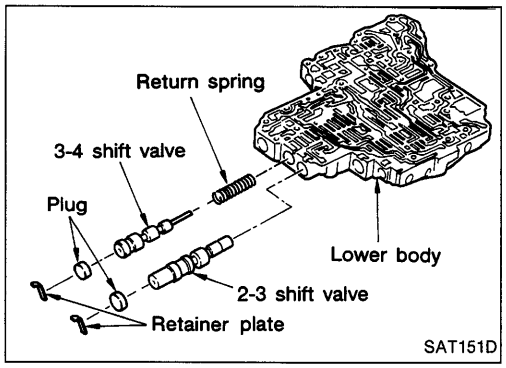
Throttle valve

- Insert throttle valve to control valve body and then install E-ring to throttle valve.



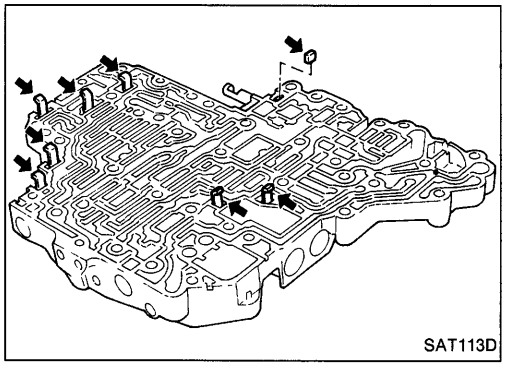
Pressure regulator valve

- Install pressure regulator valve after assembling sleeve plug, plug A and plug B.



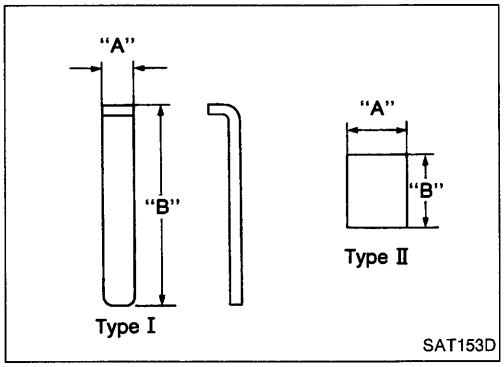
3-4 shift valve and 2-2 shift valve

- Install 3-4 shift valve and 2-3 shift valve after fixing plugs with retainer plates on the opposite side.



- Install control valves.
  For installation procedures, refer to "ASSEMBLY" of Control Valve Upper Body.

Control Valve Lower Body (Cont'd)



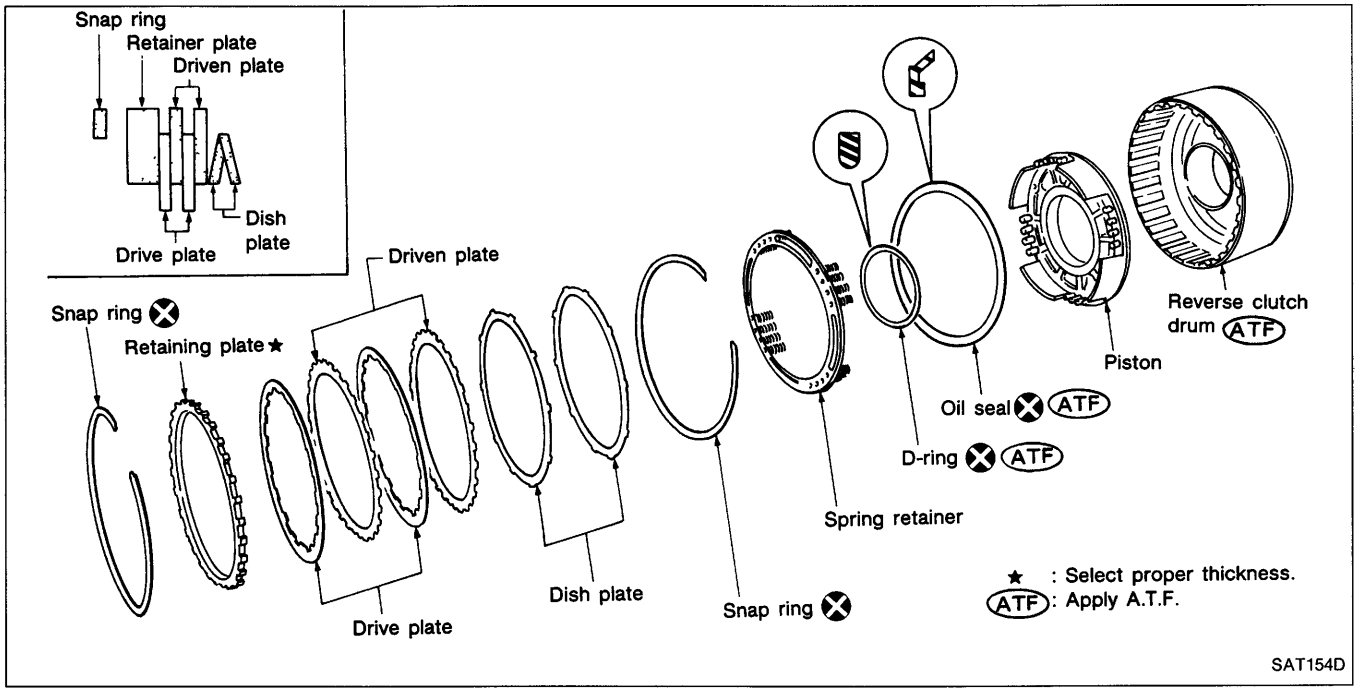
Retainer plate

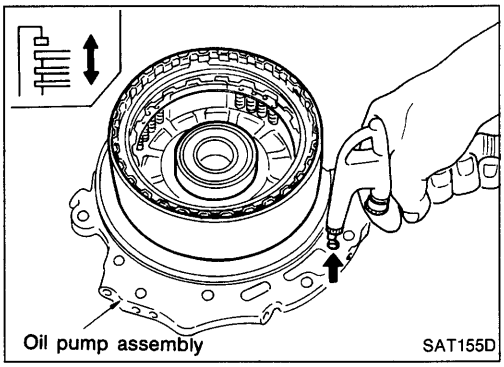
Unit: mm (in)

Name of control valve	Length A	Length B	Type
Throttle valve & detent valve	6.0 (0.236)	7.2 (0.283)	I
Pressure regulator valve	6.0 (0.236)	28.0 (1.102)	II
3-4 shift valve			
2-3 shift valve			
1-2 shift valve			
Overrun clutch control valve			

- Install proper retainer plates

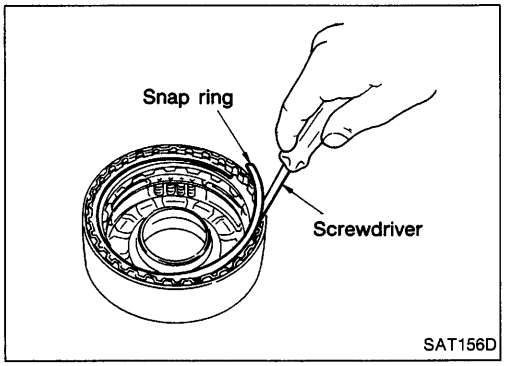
Reverse Clutch



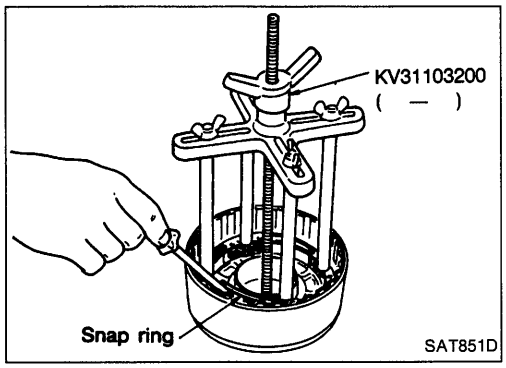


DISASSEMBLY

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.

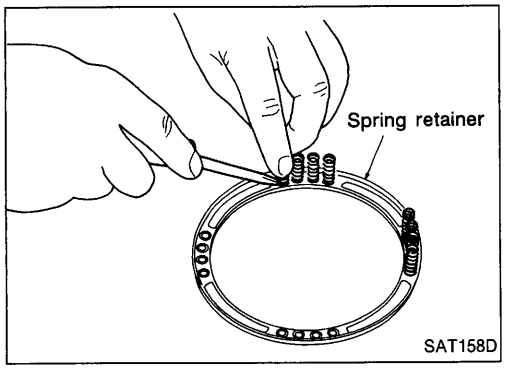


2. Remove snap ring.
3. Remove drive plates, driven plates, retaining plate, and dish plates.

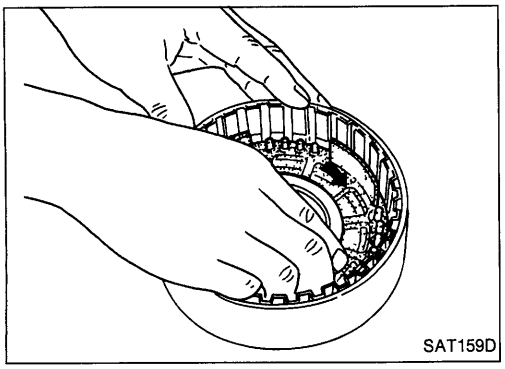


4. Set Tool on spring retainer and remove snap ring from reverse clutch drum while compressing return springs.
- **Set Tool directly over springs.**
- **Do not expand snap ring excessively.**
5. Remove spring retainer and return springs.

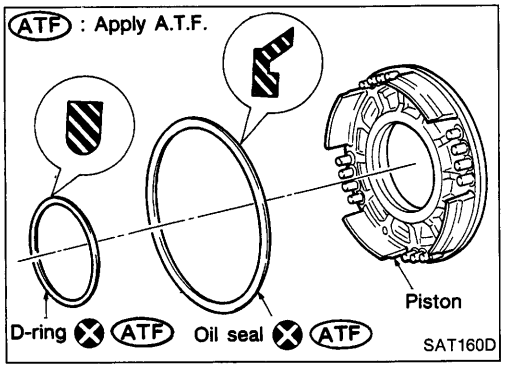
Reverse Clutch (Cont'd)



- **Do not remove return springs from spring retainer.**



6. Remove piston from reverse clutch drum by turning it.

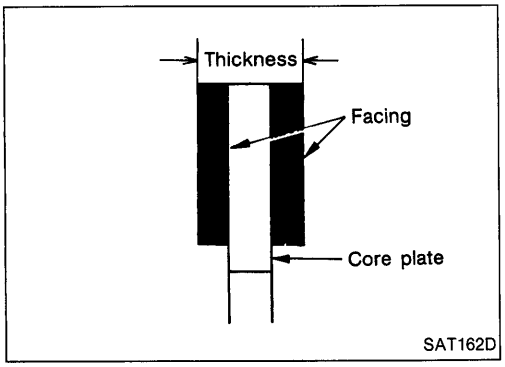


7. Remove D-ring and oil seal from piston.

INSPECTION

Reverse clutch snap ring, spring retainer and return springs

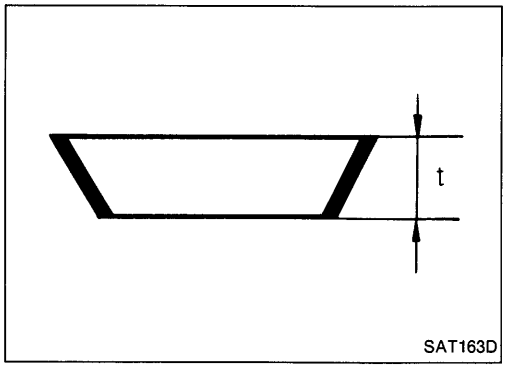
- Check for deformation, fatigue or damage.
  If necessary, replace.
- **When replacing spring retainer and return springs, replace them as a set.**



Reverse clutch drive plates

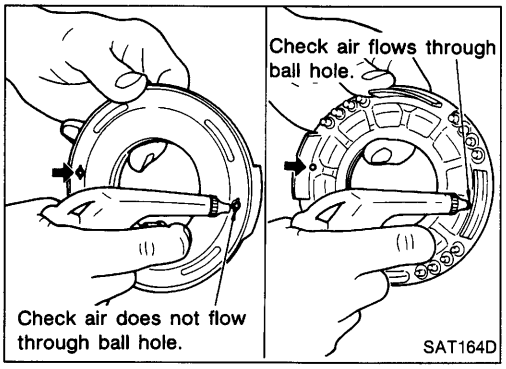
- Check facing for burns, cracks or damage.
- Measure thickness of facing.
  Thickness of drive plate:
  Standard value: 2.0 mm (0.079 in)
  Wear limit: 1.8 mm (0.071 in)
- If not within wear limit, replace.

Reverse Clutch (Cont'd)



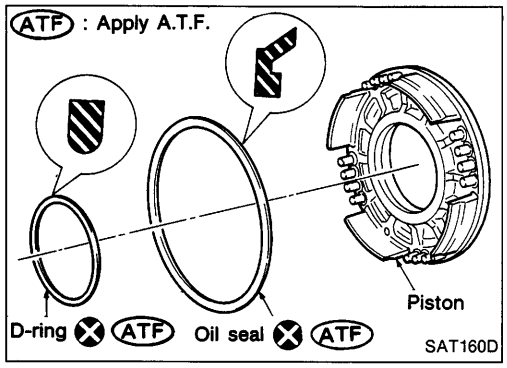
Reverse clutch dish plates

- Check for deformation or damage.
- Measure thickness of dish plate.
  Thickness of dish plate: 2.8 mm (0.110 in)
- If deformed or fatigued, replace.



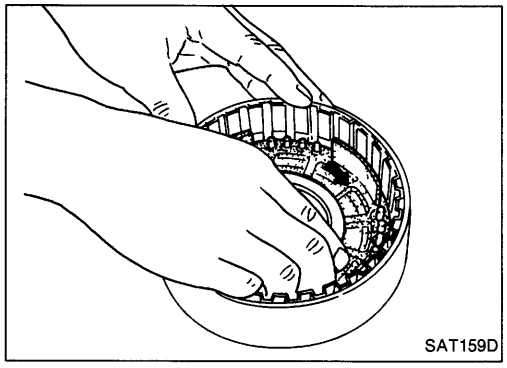
Reverse clutch piston

- Make sure that 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 that air leaks past ball.

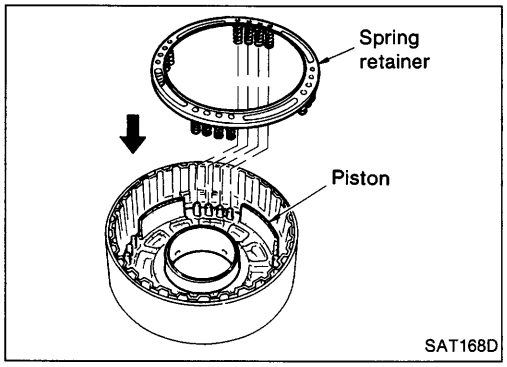


ASSEMBLY

1. Install D-ring and oil seal on piston.
- **Take care with the direction of oil seal.**
- **Apply A.T.F. to both parts.**

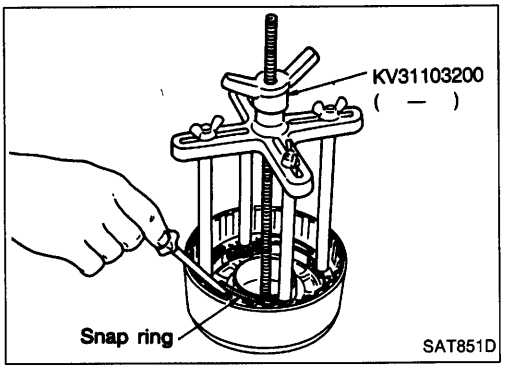


2. Install piston assembly by turning it slowly.
- **Apply A.T.F. to inner surface of drum.**



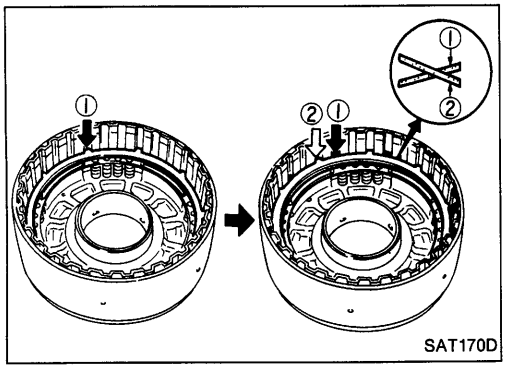
3. Install return springs and spring retainer on piston.

Reverse Clutch (Cont'd)



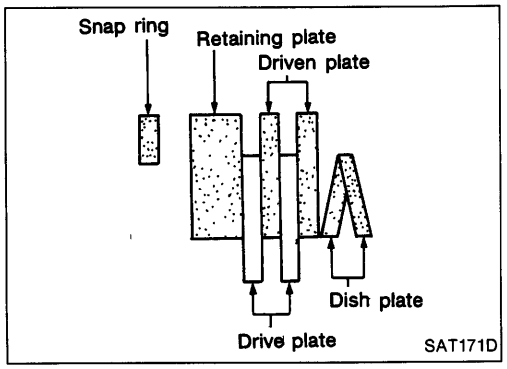
4. Set Tool on spring retainer and install snap ring while compressing return springs.

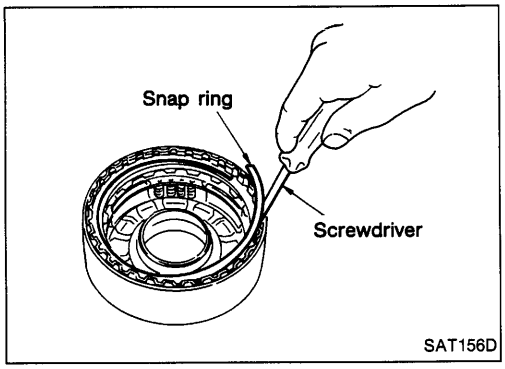
- **Set Tool directly over return springs.**



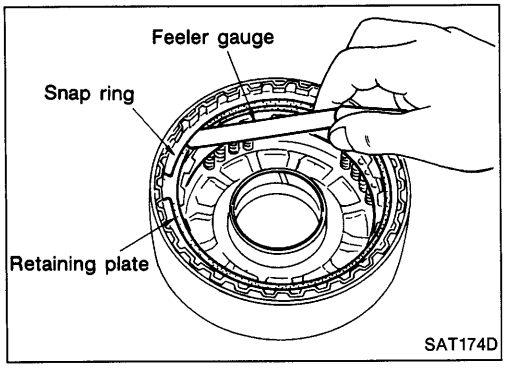
5. Install drive plates, driven plates, retaining plate and dish plates.

- **Do not align the projections on the two dish plates.**





6. Install snap ring.



7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

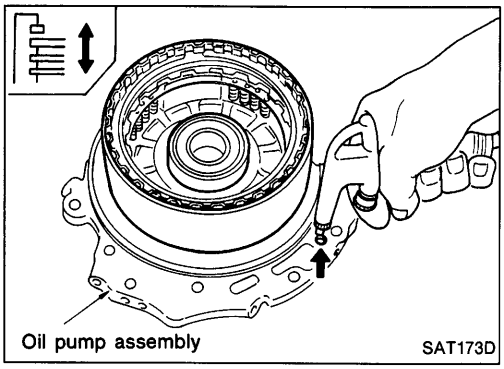
Specified clearance:

Standard 0.5 - 0.8 mm (0.020 - 0.031 in)

Allowable limit 1.2 mm (0.047 in)

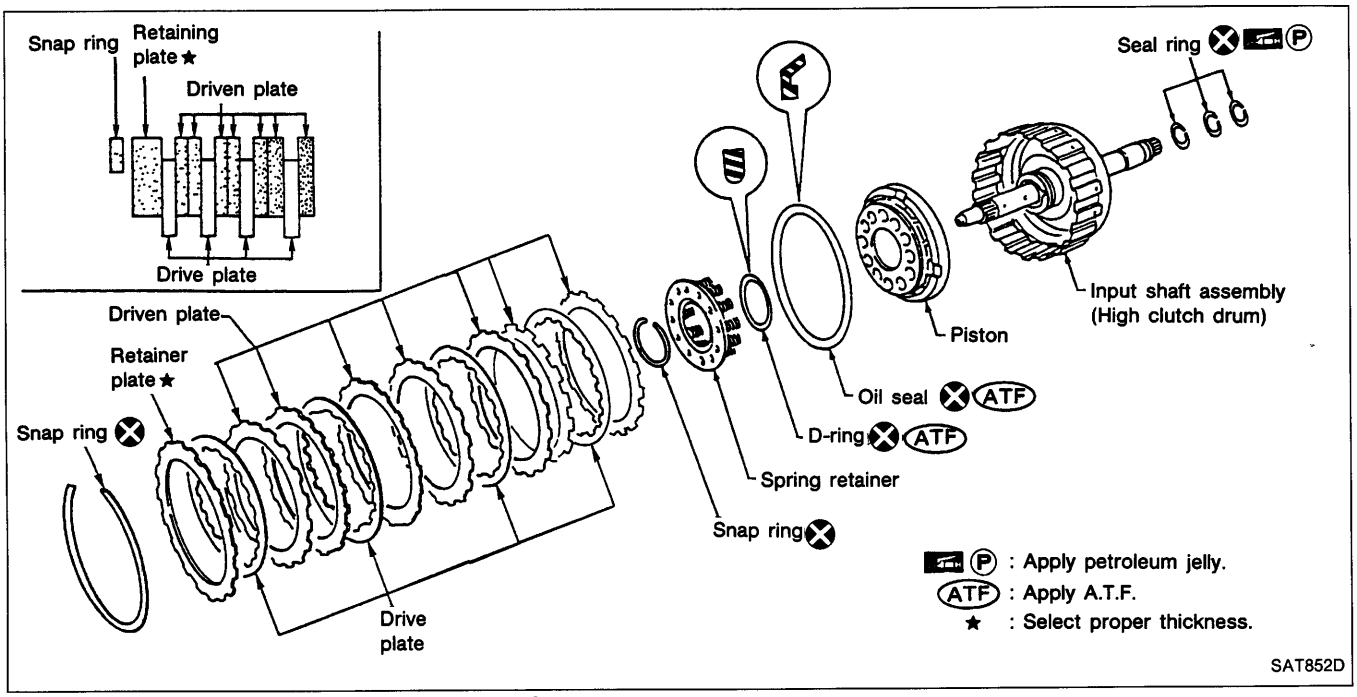
Retaining plate: Refer to S.D.S.

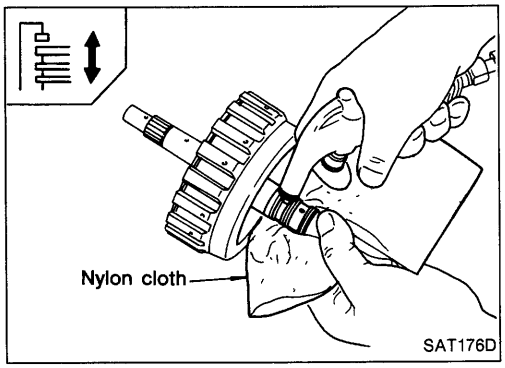
Reverse Clutch (Cont'd)



8. Check operation of reverse clutch.
   Refer to "DISASSEMBLY" of Reverse Clutch.

High Clutch

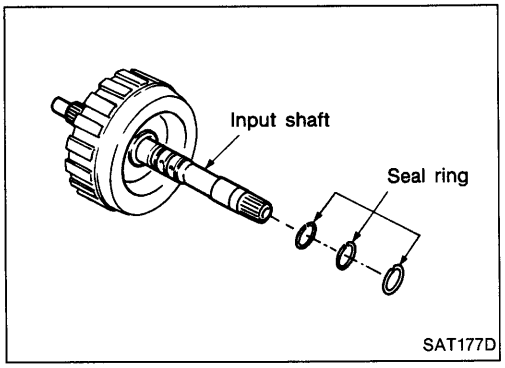




1. Check operation of high clutch.
a. Apply compressed air to oil hole of input shaft with nylon cloth.

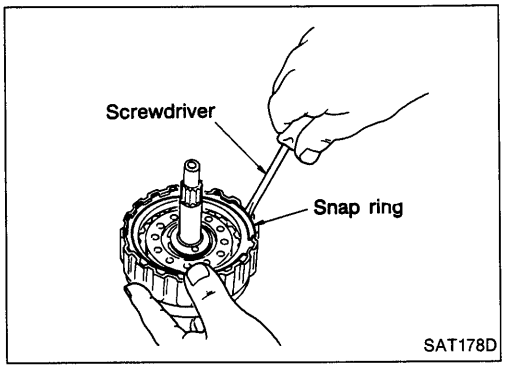
- **Stop up hole on opposite side of input shaft with nylon cloth.**

b. Check to see that retaining plate moves to snap ring.
c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.



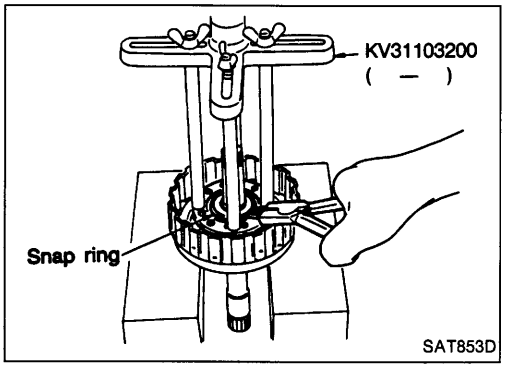
2. Remove seal rings from input shaft.

- **Always replace when removed.**

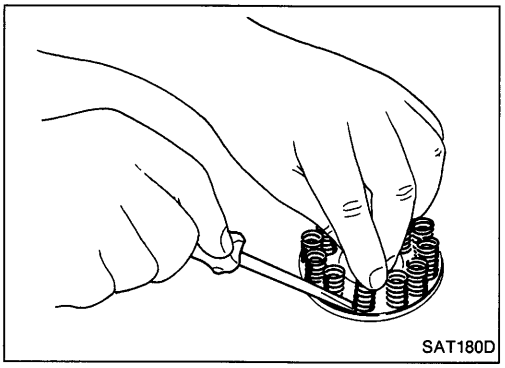


3. Remove snap ring.
4. Remove drive plates, driven plates, retaining plate and dish plate.

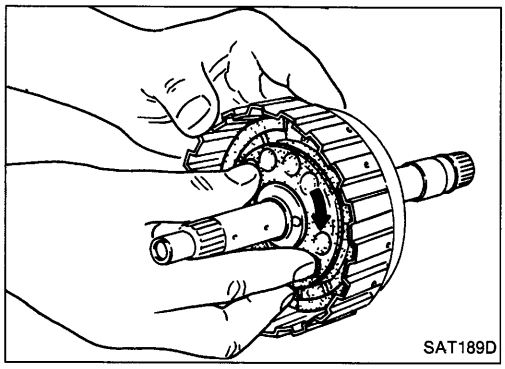
High Clutch (Cont'd)



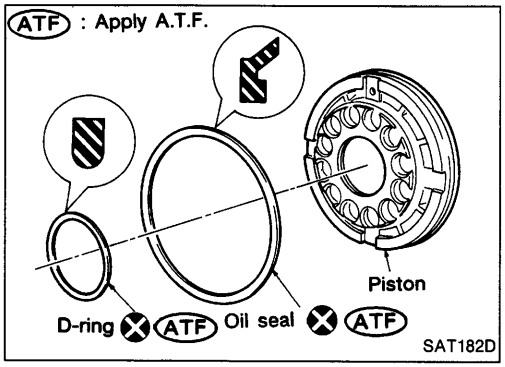
5. Set Tool on spring retainer and remove snap ring from high clutch drum while compressing return springs.
- **Set Tool directly over springs.**
- **Do not expand snap ring excessively.**
6. Remove spring retainer and return springs.



- **Do not remove return springs from spring retainer.**



7. Remove piston from high clutch drum by turning it.



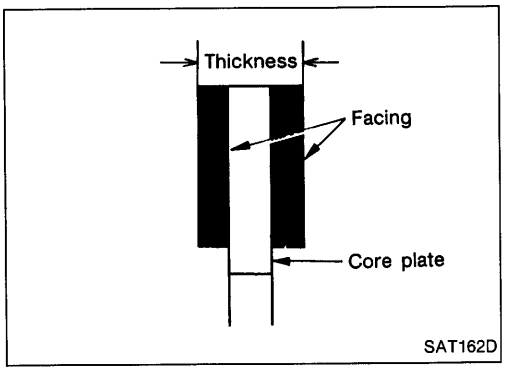
8. Remove D-ring and oil seal from piston.

INSPECTION

High clutch snap ring, spring retainer and return springs.

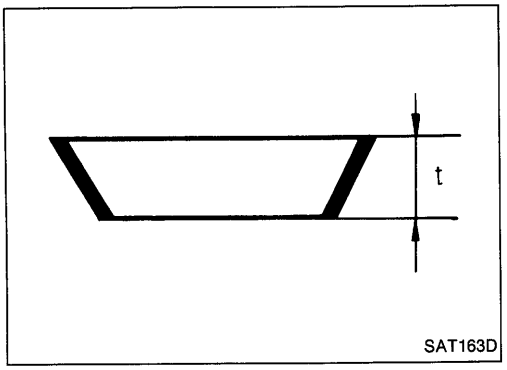
- Check for deformation, fatigue or damage.
  If necessary, replace.
- **When replacing spring retainer and return springs, replace them as a set.**

High Clutch (Cont'd)



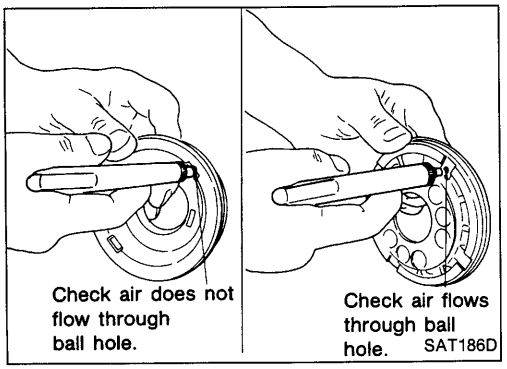
High clutch drive plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.
  Thickness of drive plate:
  Standard value 1.6 mm (0.063 in)
  Wear limit 1.4 mm (0.055 in)
- If not within wear limit, replace.



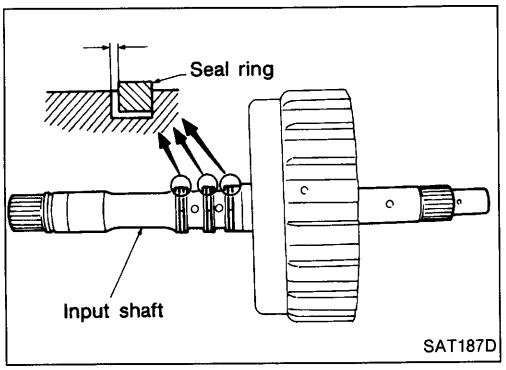
High clutch dish plate

- Check for deformation or damage.
- Measure thickness of dish plate.
  Thickness of dish plate: 2.7 mm (0.106 in)
- If deformed or fatigued, replace.



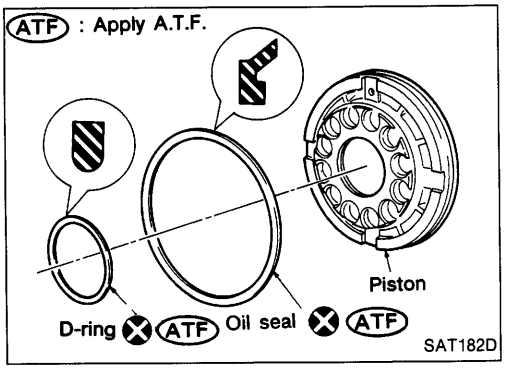
High clutch piston

- Make sure that 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 that air leaks past ball.



Seal ring clearance

- 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 allowable limit, replace input shaft assembly.

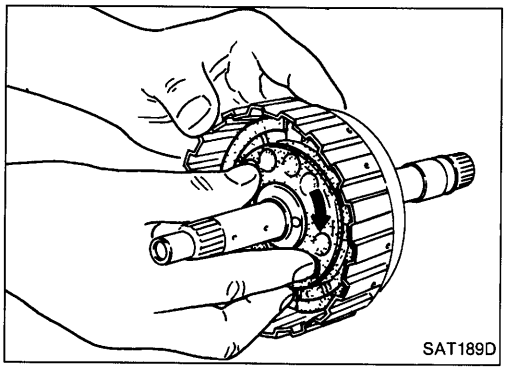


ASSEMBLY

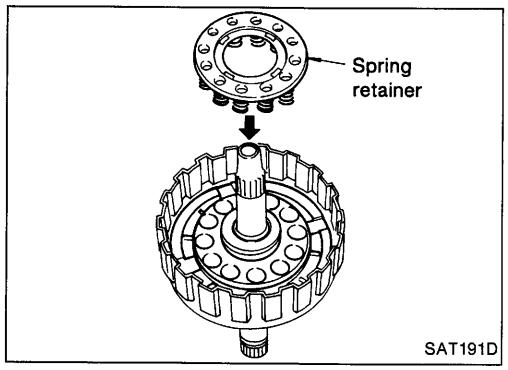
1. Install D-ring and oil seal on piston.

- **Take care with the direction of oil seal.**
- **Apply A.T.F. to both parts.**

High Clutch (Cont'd)

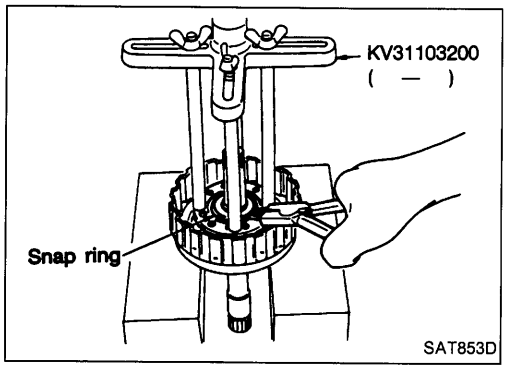

SAT189D

2. Install piston assembly by turning it slowly.
- **Apply A.T.F. to inner surface of drum.**



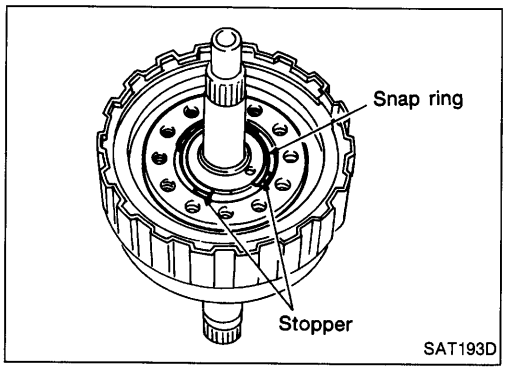
SAT191D

3. Install return springs and spring retainer on piston.



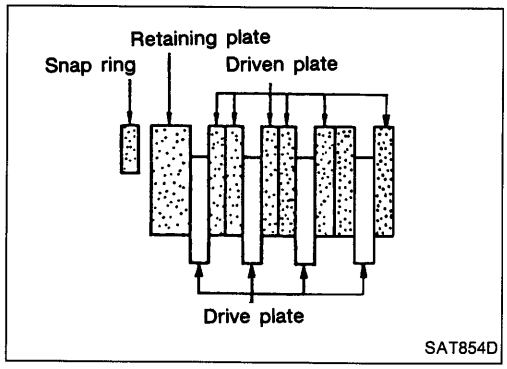
SAT853D

4. Set Tool on spring retainer and install snap ring while compressing return springs.
- **Set Tool directly over return springs.**



SAT193D

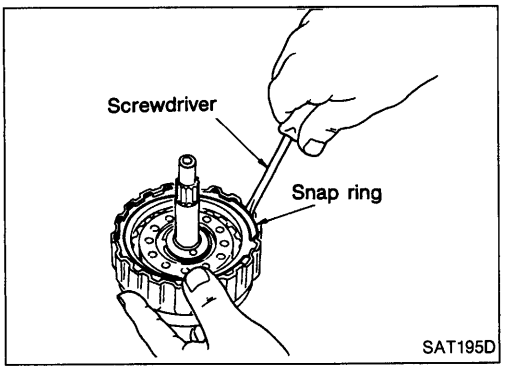
- **Do not align snap ring gap with spring retainer stopper.**



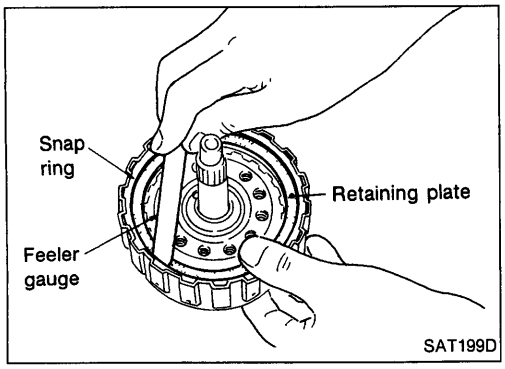
SAT854D

5. Install drive plates, driven plates, retaining plate and dish plate.

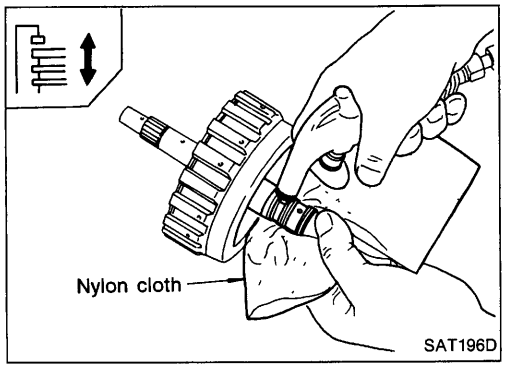
High Clutch (Cont'd)



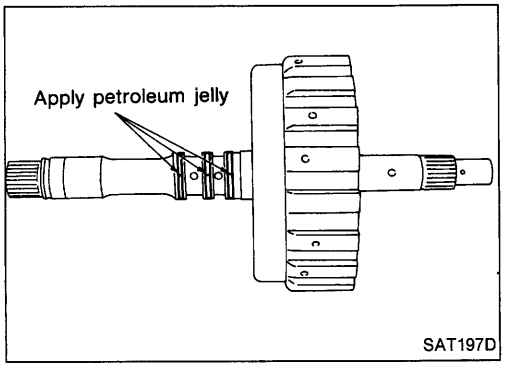
6. Install snap ring.



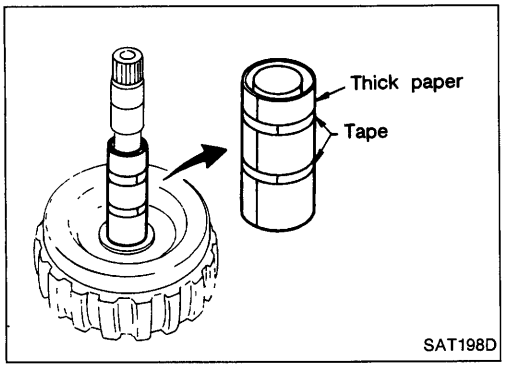
7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.
   Specified clearance:
   Standard 1.4 - 1.8 mm (0.055 - 0.071 in)
   Allowable limit 2.6 mm (0.102 in)
   Retaining plate: Refer to S.D.S.



8. Check operation of high clutch.
   Refer to "DISASSEMBLY" of High Clutch.

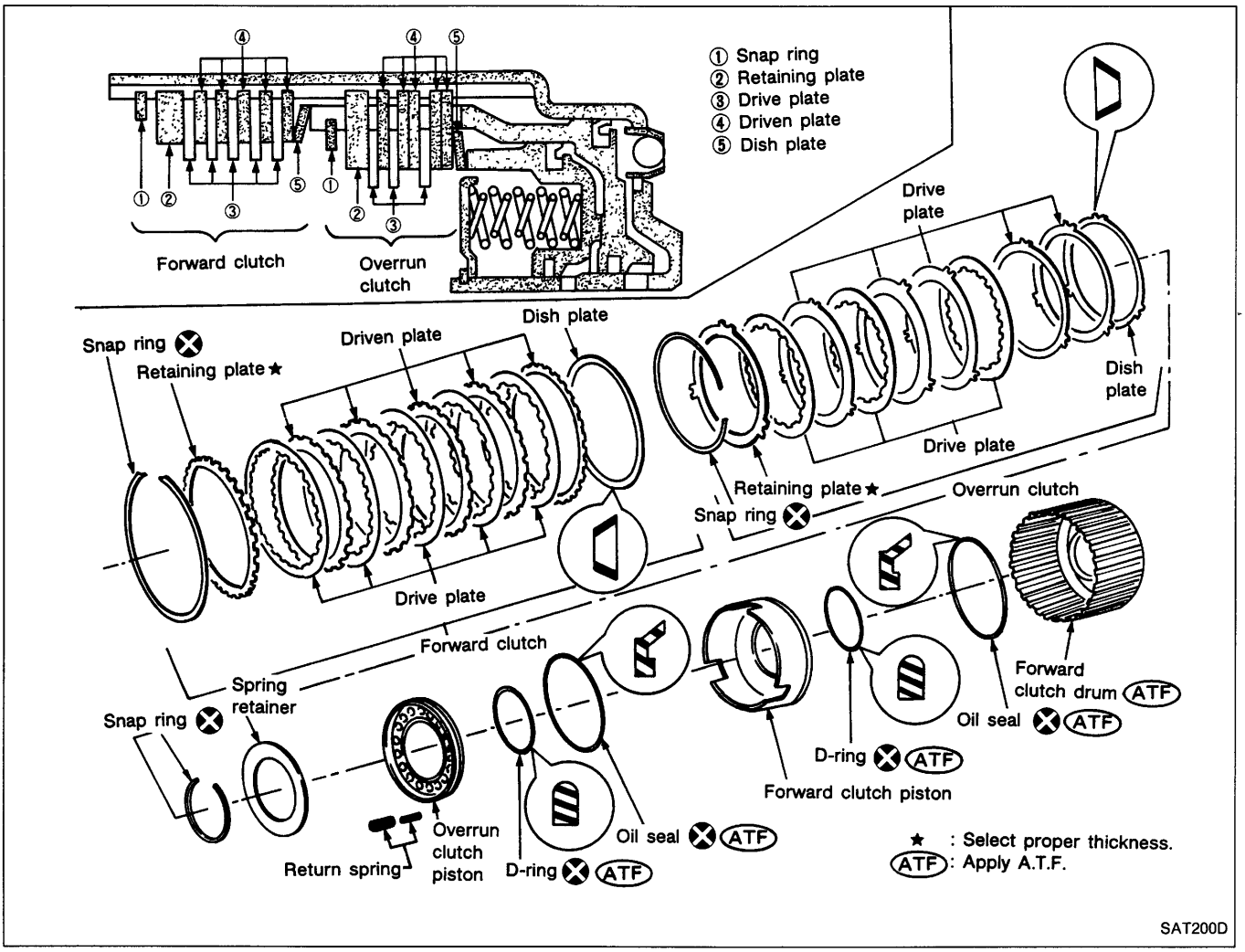


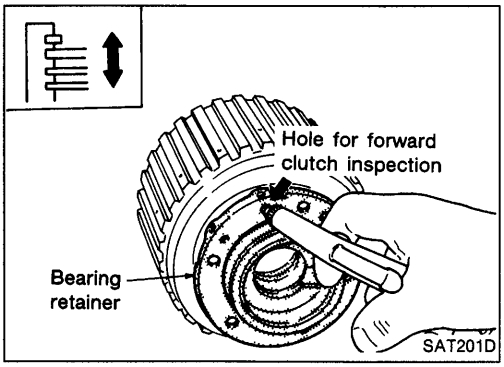
9. Install seal rings to input shaft.
- **Apply petroleum jelly to seal rings.**
- **Always replace when removed.**



- **Roll paper around seal rings to prevent seal rings from spreading.**

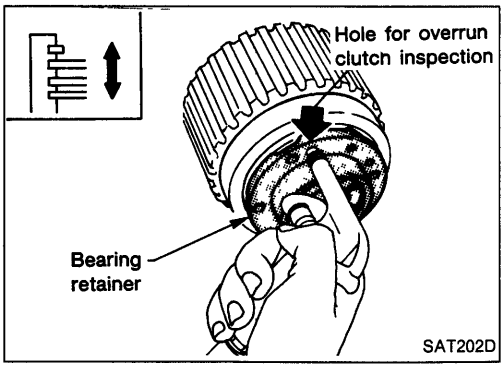
Forward Clutch and Overrun Clutch





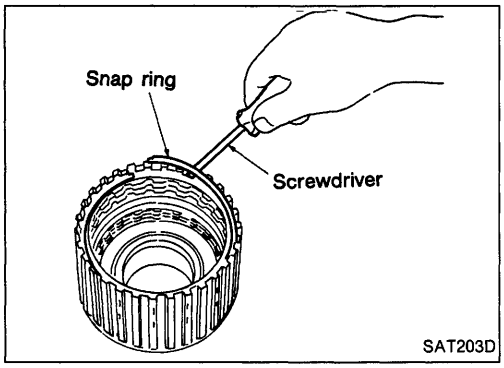
DISASSEMBLY

1. Check operation of forward clutch and overrun clutch.
a. Install bearing retainer on forward clutch drum.
b. Apply compressed air to oil hole of forward clutch drum.
c. Check to see that retaining plate moves to snap ring.

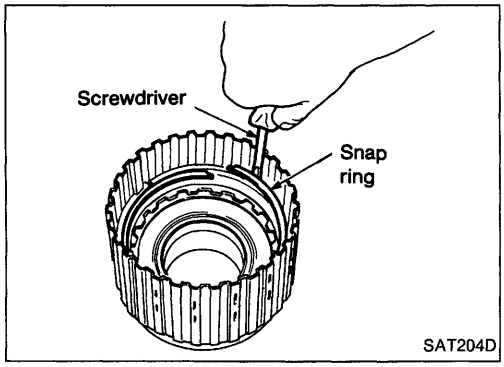


d. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.

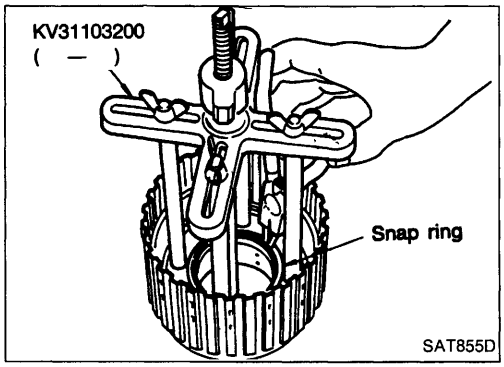
Forward Clutch and Overrun Clutch (Cont'd)



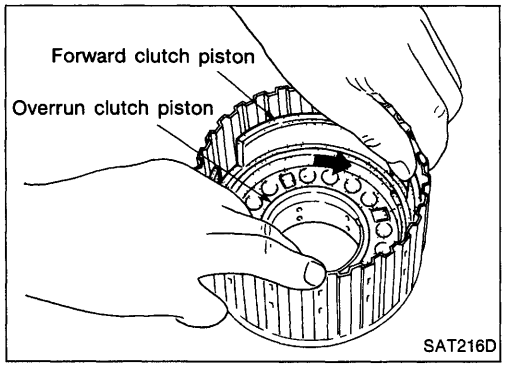
2. Remove snap ring for forward clutch.
3. Remove drive plates, driven plates, retaining plate and dish plate for forward clutch.



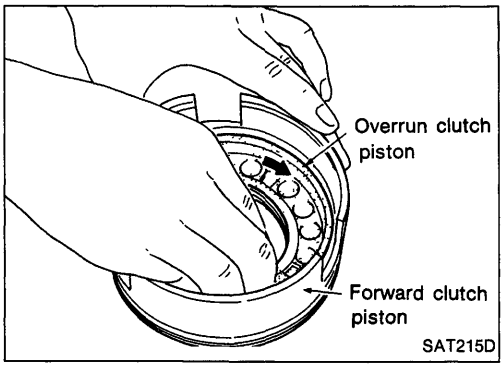
4. Remove snap ring for overrun clutch.
5. Remove drive plates, driven plates, retaining plate and dish plate for overrun clutch.



6. Set Tool on spring retainer and remove snap ring from forward clutch drum while compressing return springs.
- **Set Tool directly over return springs.**
- **Do not expand snap ring excessively.**
7. Remove spring retainer and return springs.

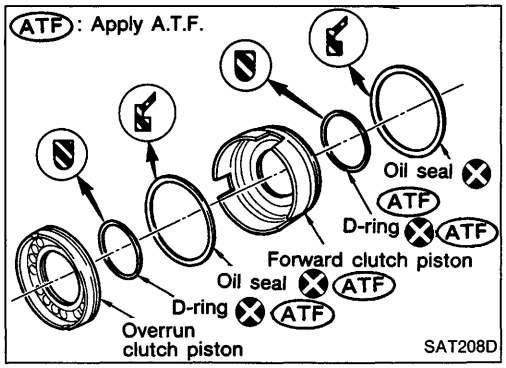


8. Remove forward clutch piston with overrun clutch piston from forward clutch drum by turning it.



9. Remove overrun clutch piston from forward clutch piston by turning it.

Forward Clutch and Overrun Clutch (Cont'd)

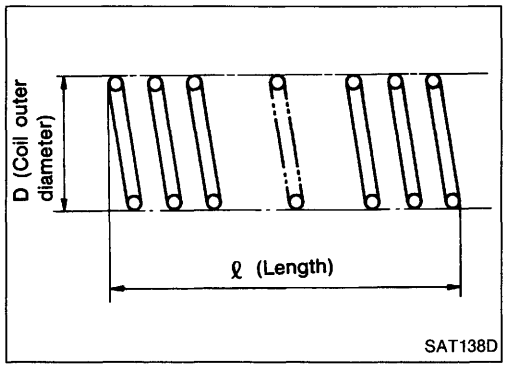


10. Remove D-rings and oil seals from forward clutch piston and overrun clutch piston.

INSPECTION

Snap rings and spring retainer

- Check for deformation, fatigue or damage.



Forward clutch and overrun clutch return springs

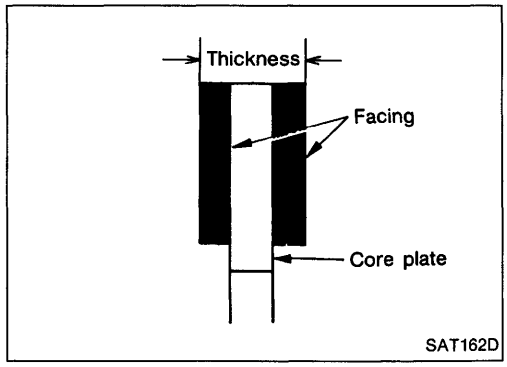
- Check for deformation or damage.
- Measure free length and outer diameter.

Inspection standard:

Unit: mm (in)

Parts		Part No.	ℓ	D
Return spring	inner	31505-31X02	26.3 (1.035)	7.7 (0.303)
	outer	31505-31X03	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)

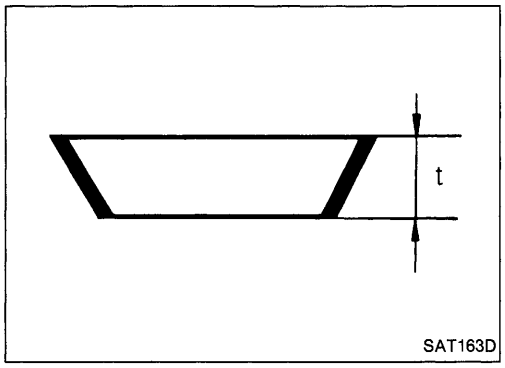
  Overrun clutch

  Standard value: 1.6 mm (0.063 in)

  Wear limit: 1.4 mm (0.055 in)

- If not within wear limit, replace.

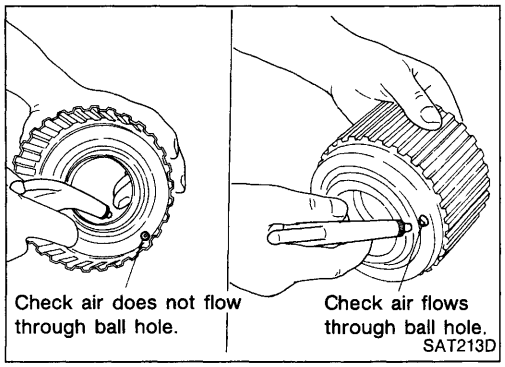
Forward Clutch and Overrun Clutch (Cont'd)



Forward clutch and overrun clutch dish plates

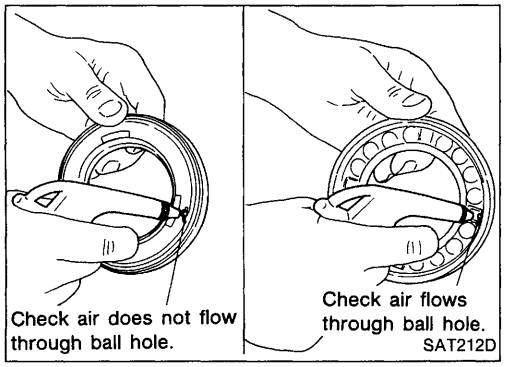
- Check for deformation or damage.
- Measure thickness of dish plate.

  Thickness of dish plate:
  Forward clutch 2.5 mm (0.098 in)
  Overrun clutch 2.15 mm (0.0846 in)
- If deformed or fatigued, replace.



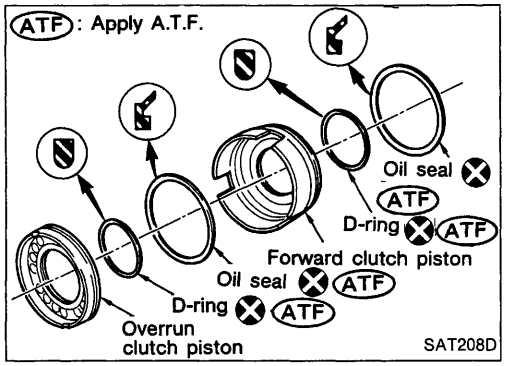
Forward clutch drum

- Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole from outside of forward clutch drum to make sure that air leaks past ball.
- Apply compressed air to oil hole from inside of forward clutch drum to make sure that there is no air leakage.



Overrun clutch piston

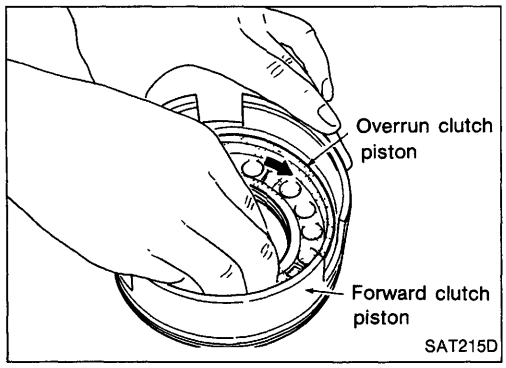
- Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring to make sure that there is no air leakage.
- Apply compressed air to oil hole on return spring side to make sure that air leaks past ball.



ASSEMBLY

1. Install D-rings and oil seals on forward clutch piston and overrun clutch piston.

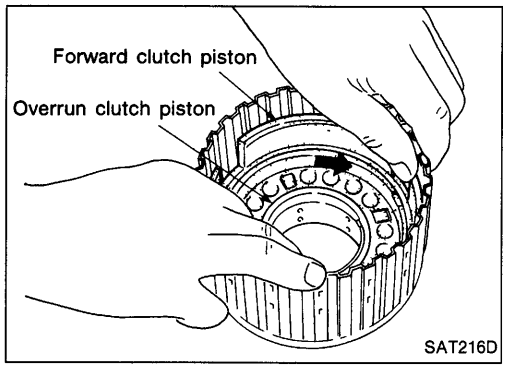
- **Take care with direction of oil seal.**
- **Apply A.T.F. to both parts.**



2. Install overrun clutch piston assembly on forward clutch piston by turning it slowly.

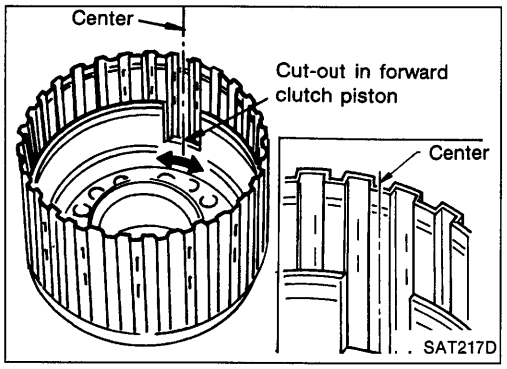
- **Apply A.T.F. to inner surface of forward clutch piston.**

Forward Clutch and Overrun Clutch (Cont'd)

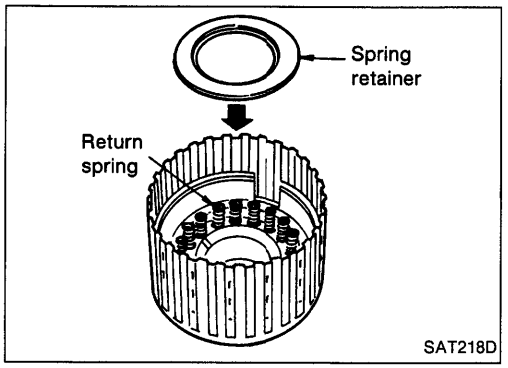


3. Install forward clutch piston assembly on forward clutch drum by turning it slowly.

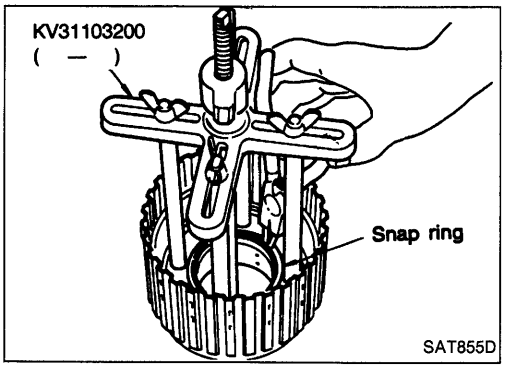
- **Apply A.T.F. to inner surface of drum.**



4. Align cut-out in forward clutch piston with groove in forward clutch drum.

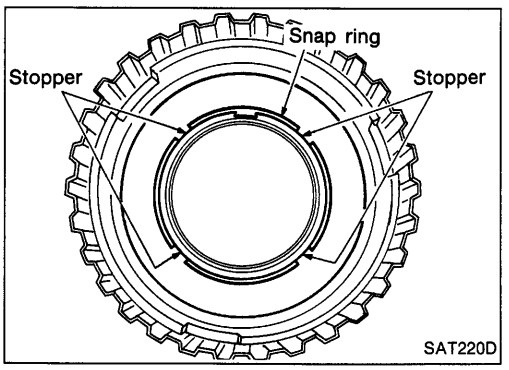


5. Install return spring on overrun clutch piston.
6. Install spring retainer on return springs.



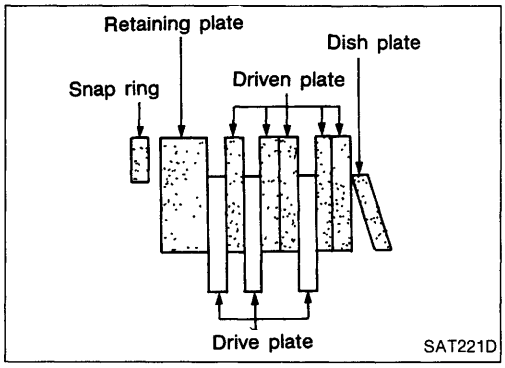
7. Set Tool on spring retainer and install snap ring while compressing return springs.

- **Set Tool directly over return springs.**

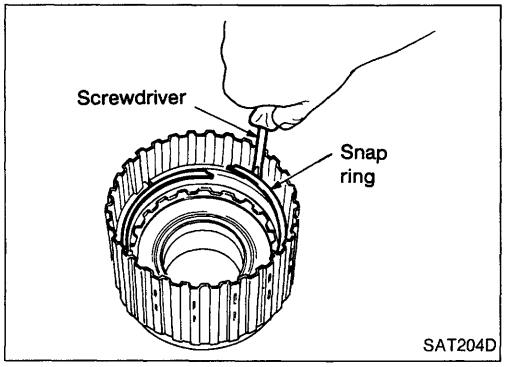


- **Do not align snap ring gap with spring retainer stopper.**

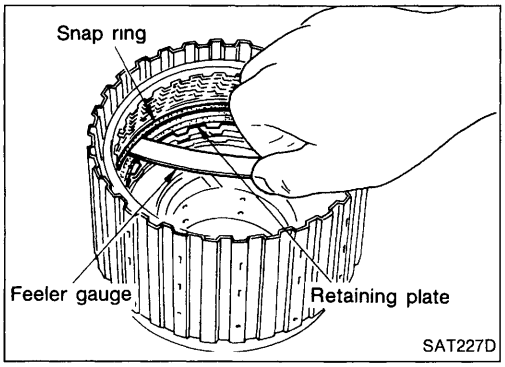
Forward Clutch and Overrun Clutch (Cont'd)



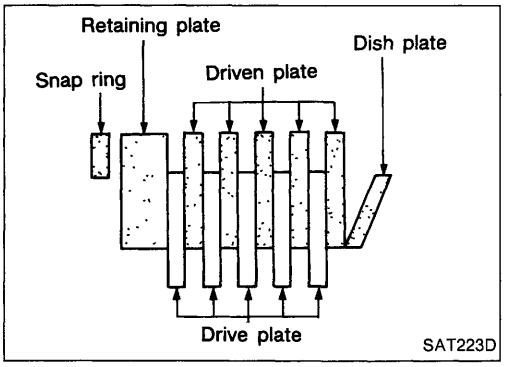
8. Install drive plates, driven plates, retaining plate and dish plate for overrun clutch.



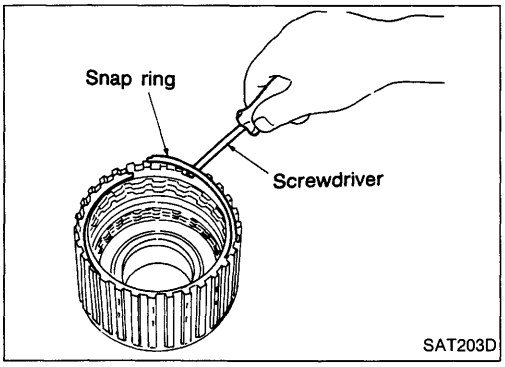
9. Install snap ring for overrun clutch.



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.

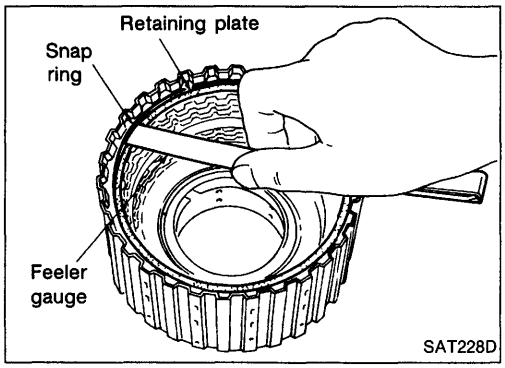


11. Install drive plates, driven plates, retaining plate and dish plate for forward clutch.

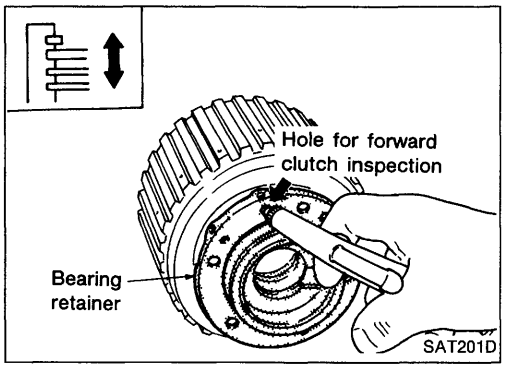


12. Install snap ring for forward clutch.

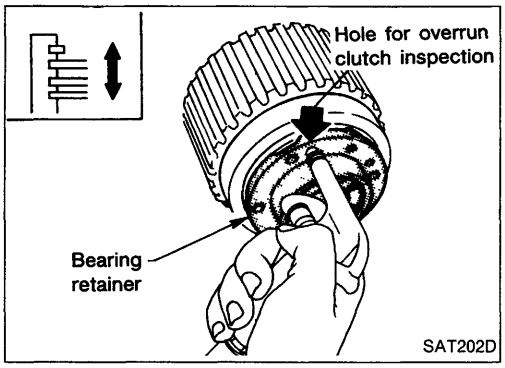
Forward Clutch and Overrun Clutch (Cont'd)



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.

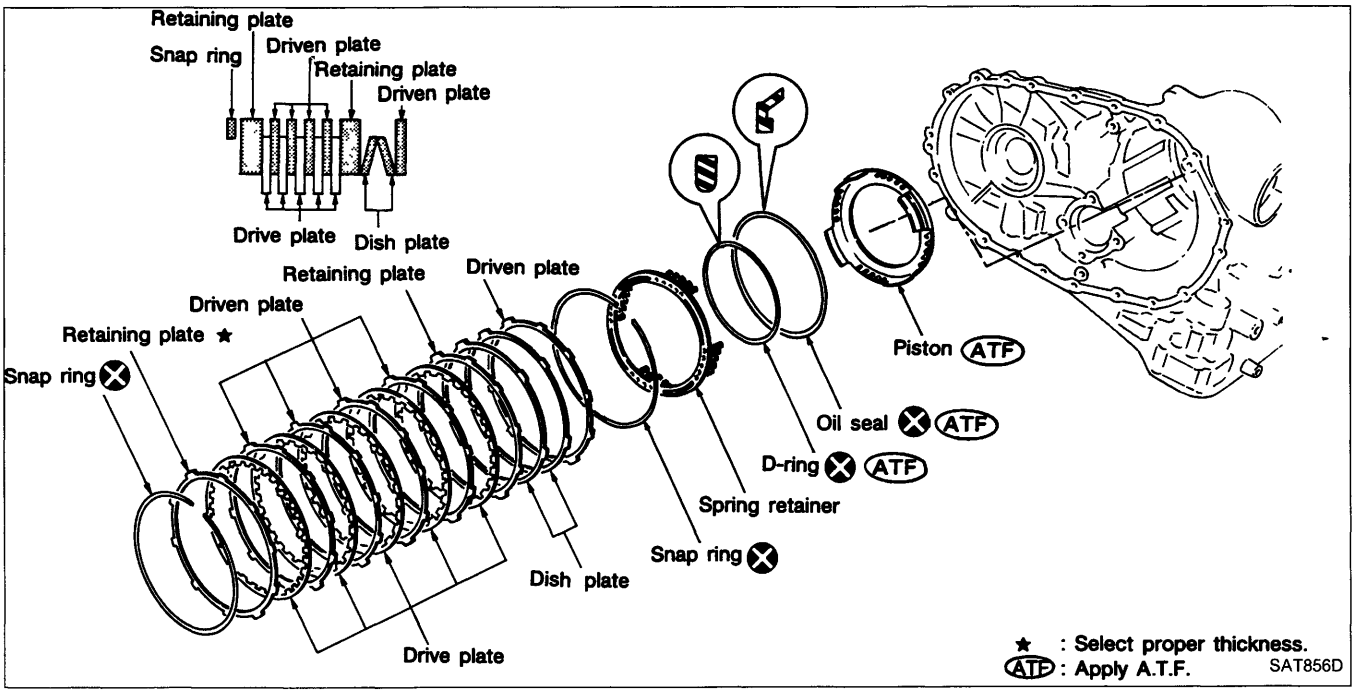


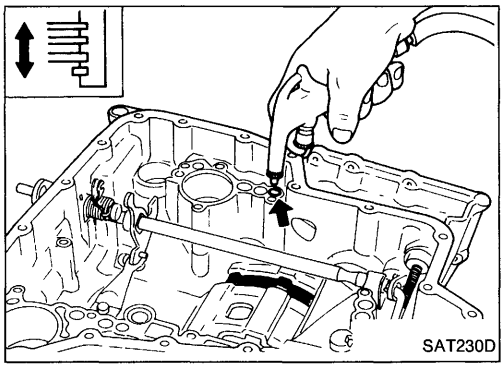
14. Check operation of forward clutch.
    Refer to "DISASSEMBLY" of Forward Clutch and Overrun Clutch.



15. Check operation of overrun clutch.
    Refer to "DISASSEMBLY" of Forward Clutch and Overrun Clutch.

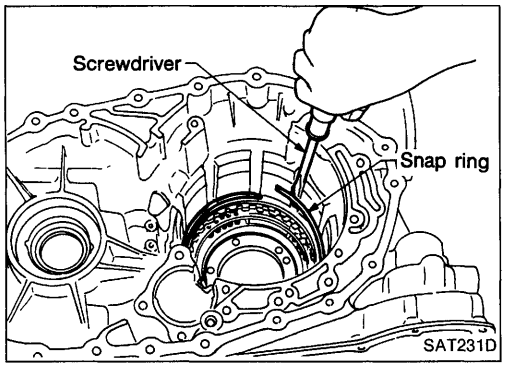
Low & Reverse Brake



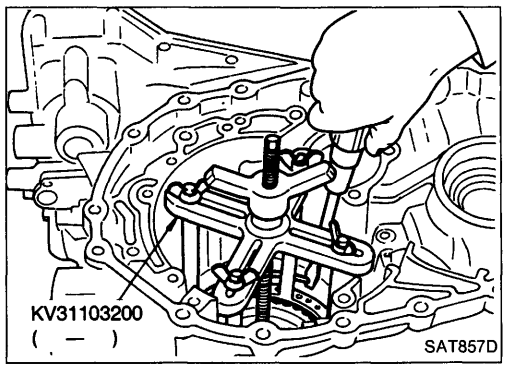


DISASSEMBLY

1. Check operation of low & reverse brake.
a. Apply compressed air to oil hole of transmission case.
b. Check to see that retaining plate moves to snap ring.
c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.

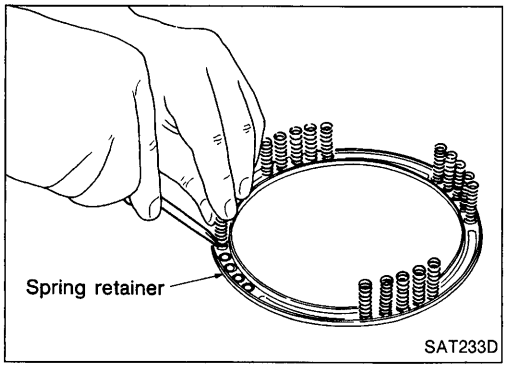


2. Stand transmission case.
3. Remove snap ring.
4. Remove drive plates, driven plates, retaining plate from transmission case.

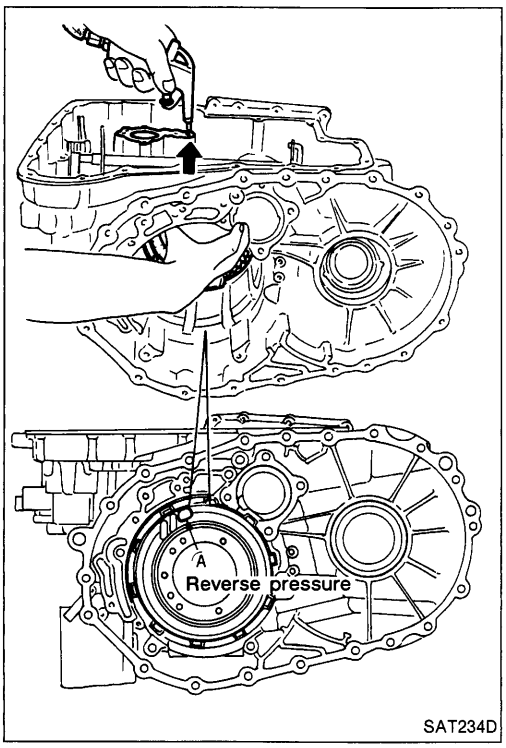


5. Set Tool on spring retainer and remove snap ring while compressing return springs.
- **Set Tool directly over return springs.**
- **Do not expand snap ring excessively.**
6. Remove spring retainer and return springs.

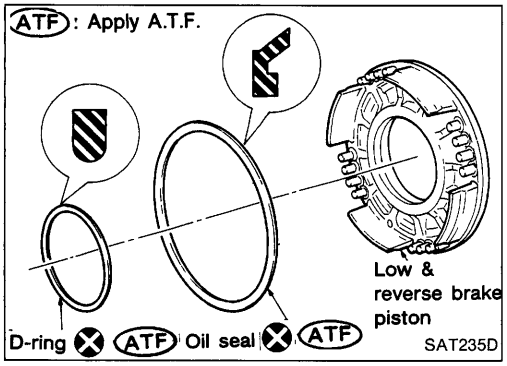
Low & Reverse Brake (Cont'd)



- **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.



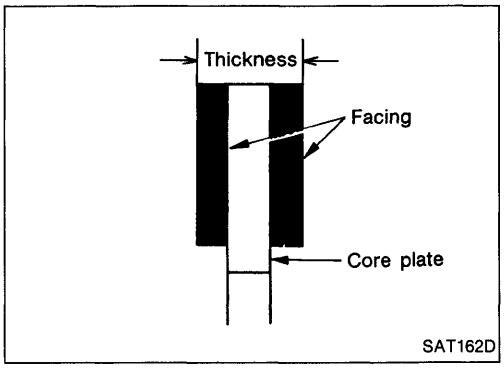
9. Remove D-ring and oil seal from piston.

INSPECTION

Low & reverse clutch snap ring, spring retainer and return springs

- Check for deformation, fatigue or damage.
  If necessary, replace.
- **When replacing spring retainer and return springs, replace them as a set.**

Low & Reverse Brake (Cont'd)



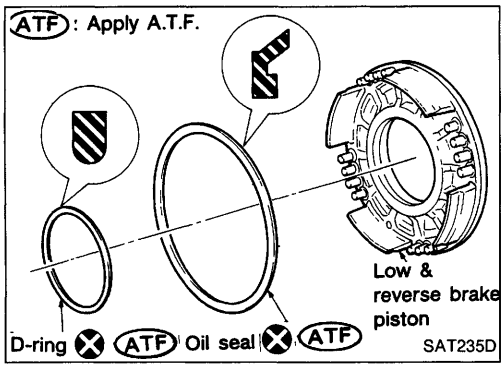
Low & reverse brake drive plate

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

  Thickness of drive plate:

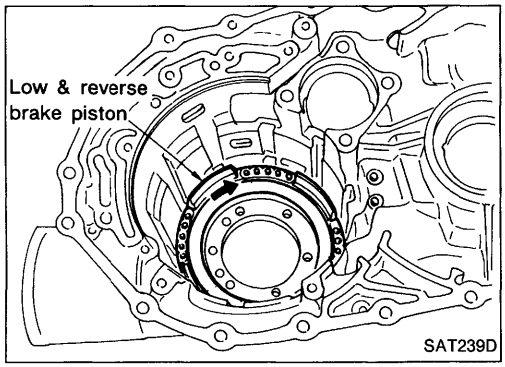
  Standard value 2.0 mm (0.079 in)

  Wear limit 1.8 mm (0.071 in)
- If not within wear limit, replace.

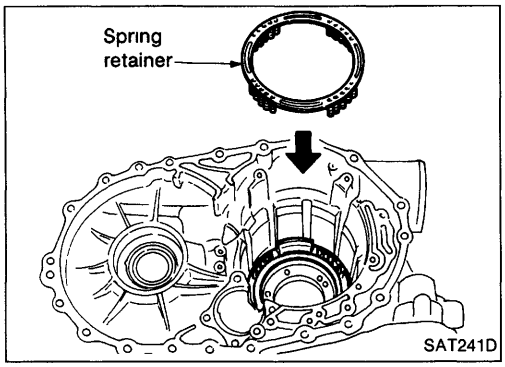


ASSEMBLY

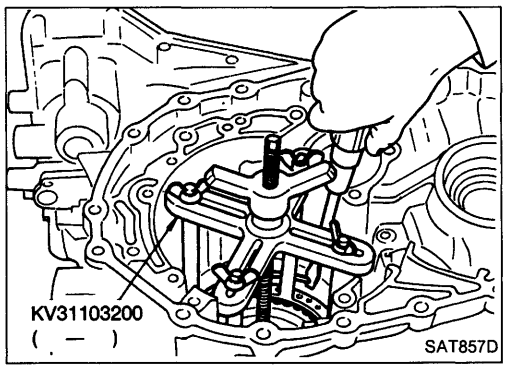
1. Install D-ring and oil seal on piston.
- **Take care with the direction of oil seal.**
- **Apply A.T.F. to both parts.**



2. Stand transmission case.
3. Install piston assembly on transmission case by turning it slowly.
- **Apply A.T.F. to inner surface of transmission case.**

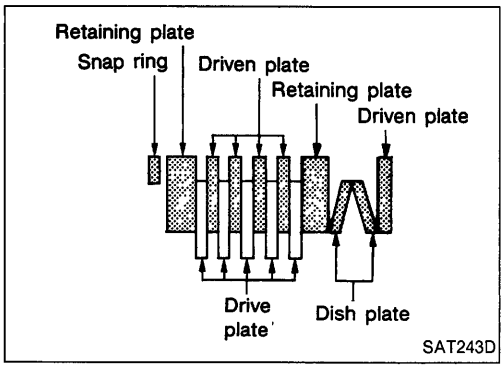


4. Install return springs and spring retainer on piston.

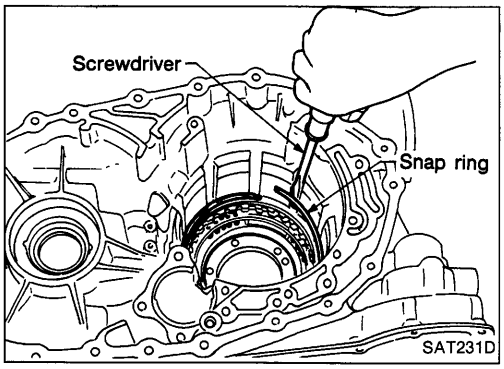


5. Install snap ring while compressing return springs.
- **Set Tool directly over return springs.**

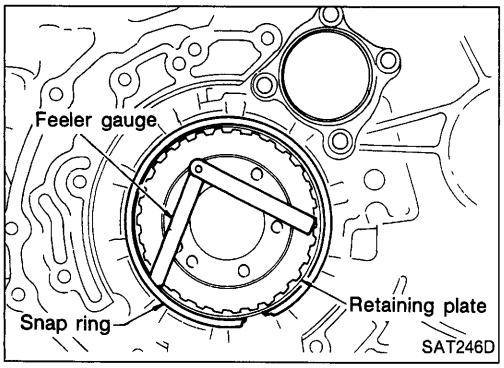
Low & Reverse Brake (Cont'd)



6. Install drive plates, driven plates and retaining plate.



7. Install snap ring.



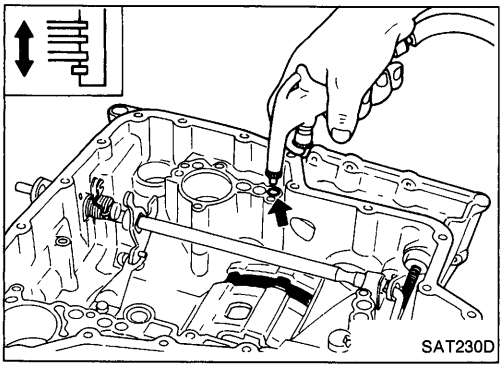
8. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate. (front side)

   Specified clearance:

   Standard 1.4 - 1.8 mm (0.055 - 0.071 in)

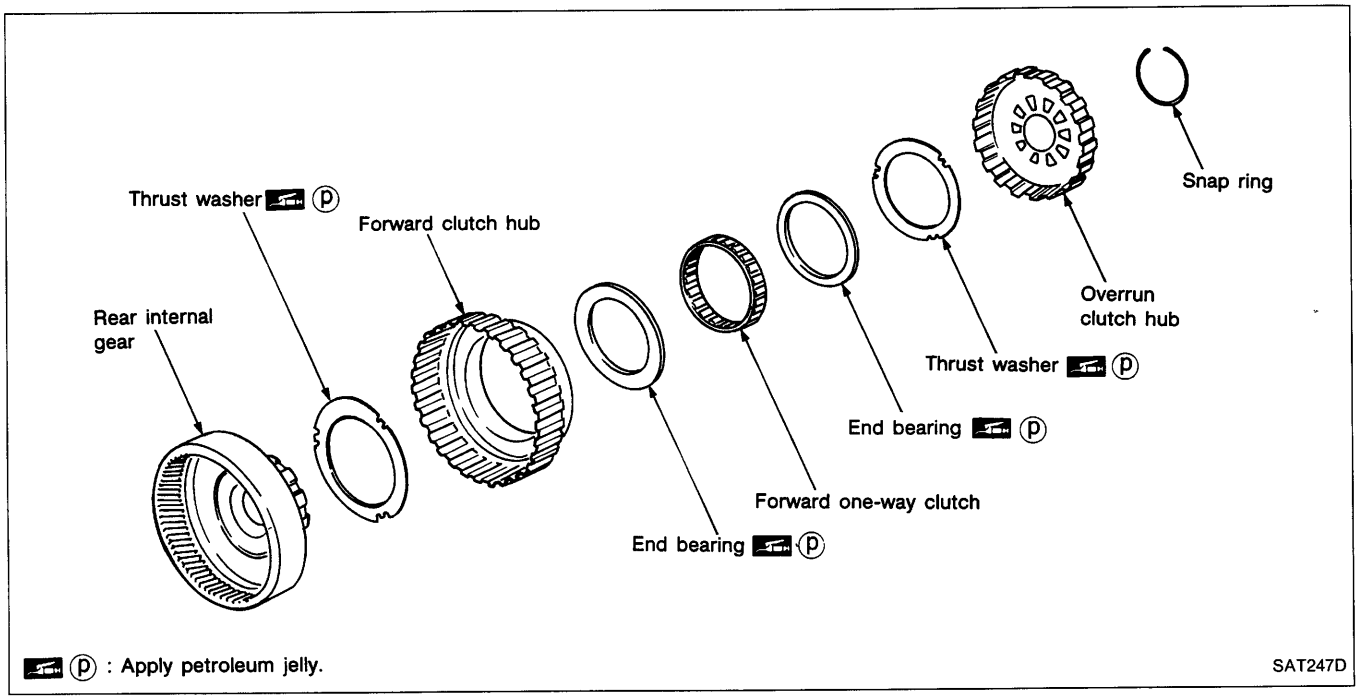
   Allowable limit 2.8 mm (0.110 in)

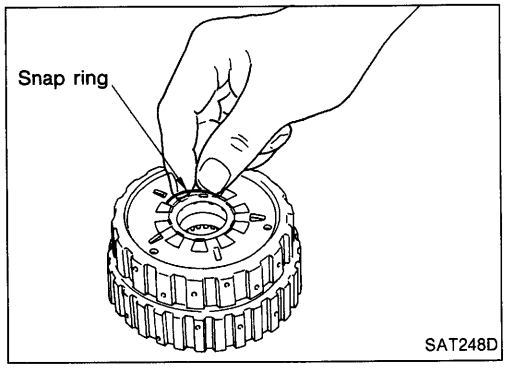
   Retaining plate: Refer to S.D.S.



9. Check operation of low & reverse brake.
   Refer to "DISASSEMBLY" of low & reverse brake.

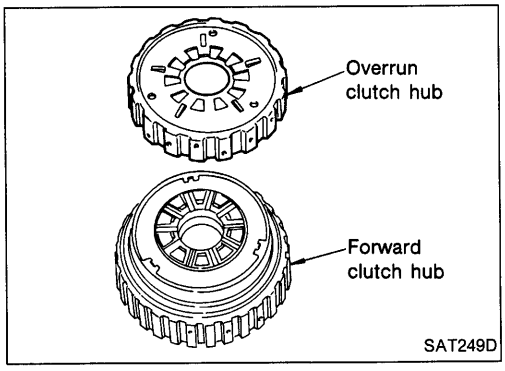
Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub





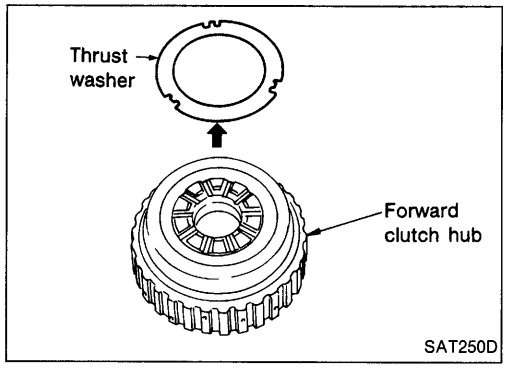
DISASSEMBLY

1. Remove snap ring from overrun clutch hub.

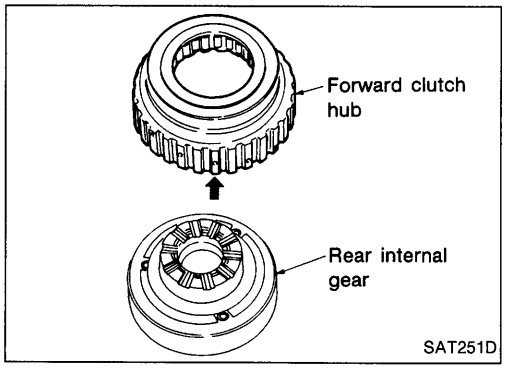


2. Remove overrun clutch hub from forward clutch hub.

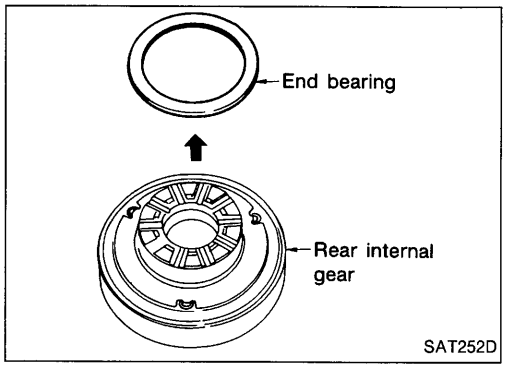
Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd)



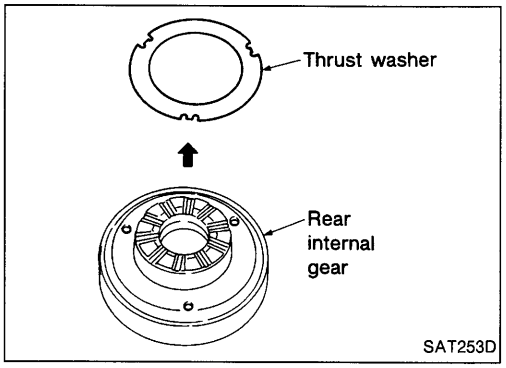
3. Remove thrust washer from forward clutch hub.



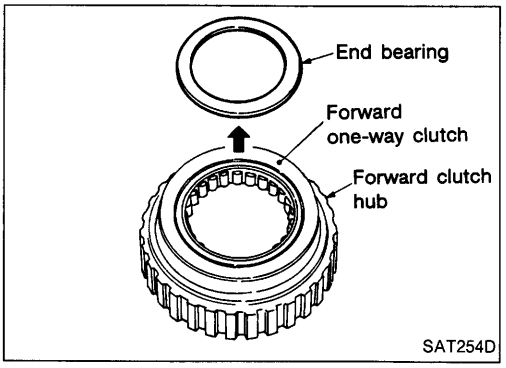
4. Remove forward clutch hub from rear internal gear.



5. Remove end bearing from rear internal gear.

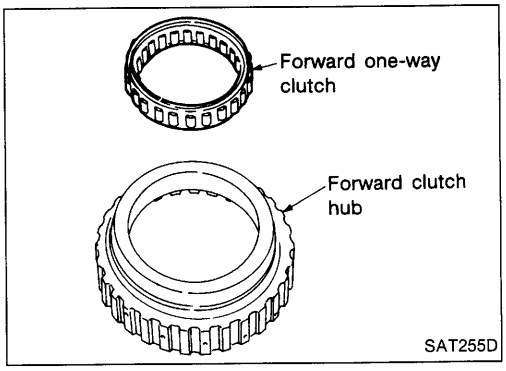


6. Remove thrust washer from rear internal gear.

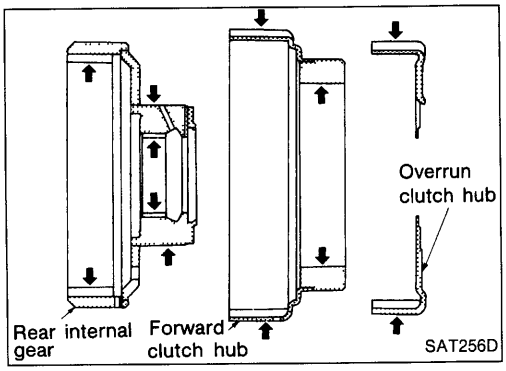


7. Remove end bearing from forward one-way clutch.

Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd)



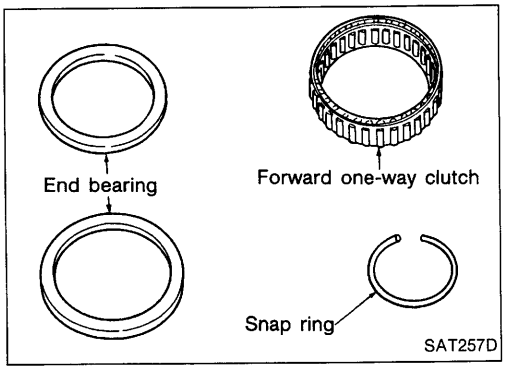
8. Remove forward one-way clutch from forward clutch hub.



INSPECTION

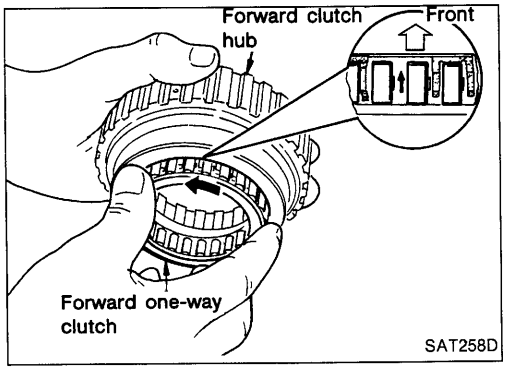
Rear internal gear, forward clutch hub and overrun clutch hub

- Check rubbing surfaces for wear or damage.



Snap ring, end bearings and forward one-way clutch

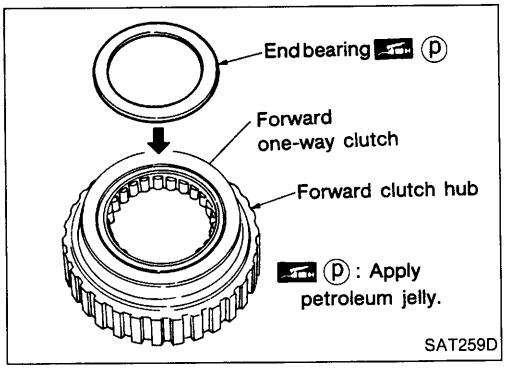
- Check snap ring and end bearings for deformation and damage.
- Check forward one-way clutch for wear and damage.



ASSEMBLY

1. Install forward one-way clutch on forward clutch.

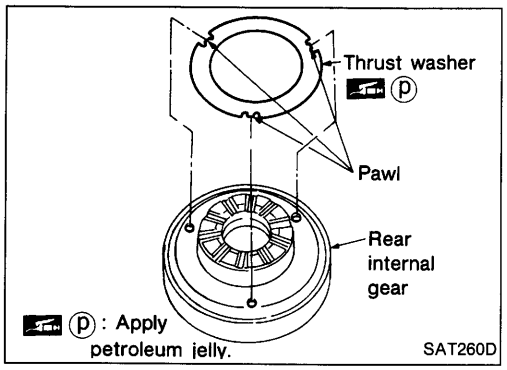
- **Take care with the direction of forward one-way clutch.**



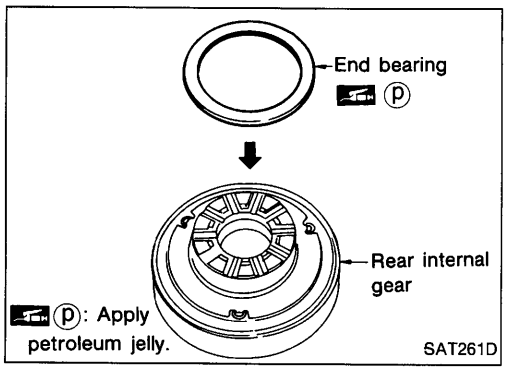
2. Install end bearing on forward one-way clutch.

- **Apply petroleum jelly to end bearing.**

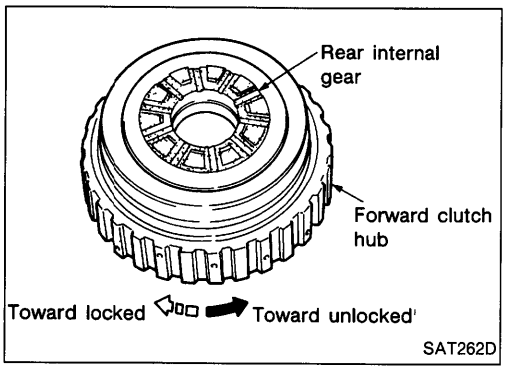
Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd)



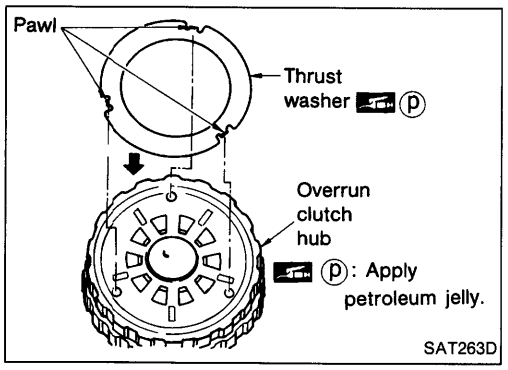
3. Install thrust washer on rear internal gear.
- **Apply petroleum jelly to thrust washer.**
- **Align hooks of thrust washer with holes of rear internal gear.**



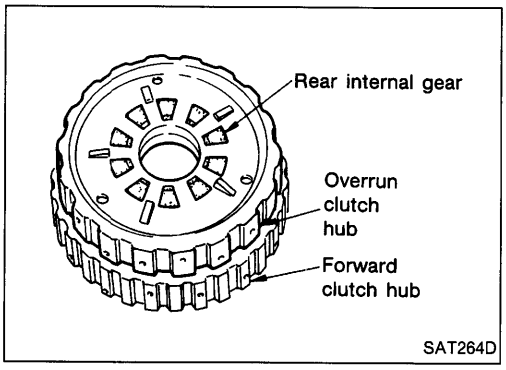
4. Install end bearing on rear internal gear.
- **Apply petroleum jelly to end bearing.**



5. Install forward clutch hub on rear internal gear.
- **Check operation of forward one-way clutch.**

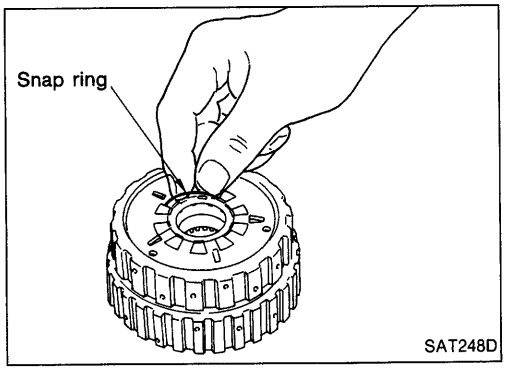


6. Install thrust washer on overrun clutch hub.
- **Apply petroleum jelly to thrust washer.**
- **Align hooks of thrust washer with holes of overrun clutch hub.**



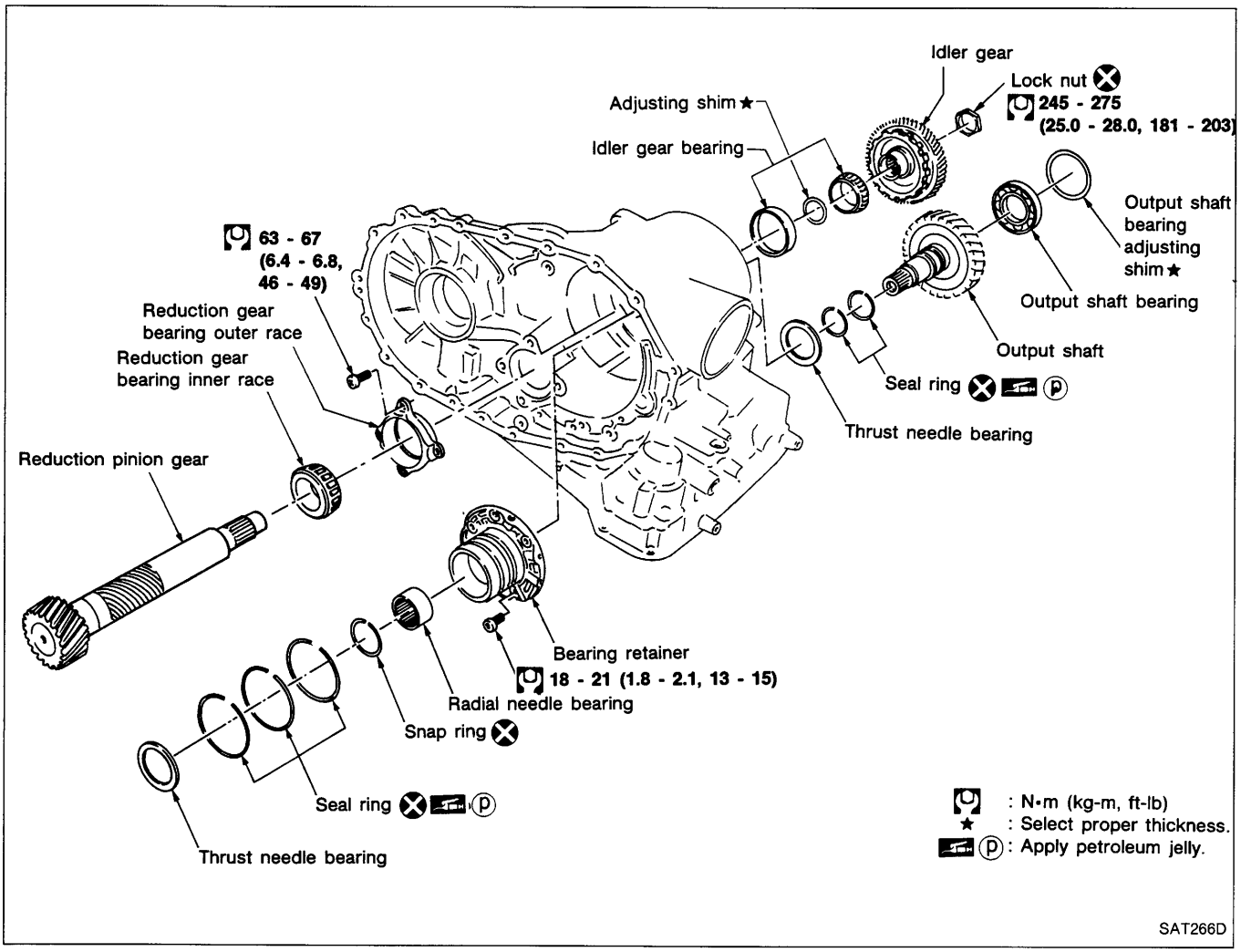
7. Install overrun clutch hub on rear internal gear.
- **Align projections of rear internal gear with holes of overrun clutch hub.**

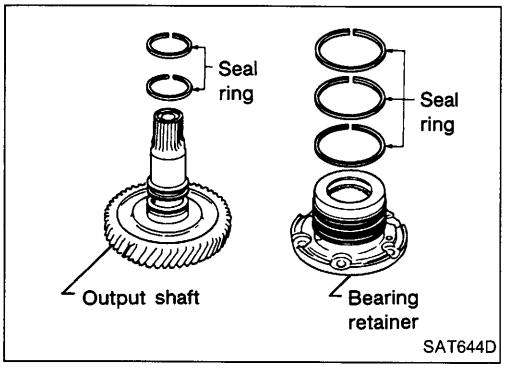
Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd)



8. Install snap ring to groove of rear internal gear.

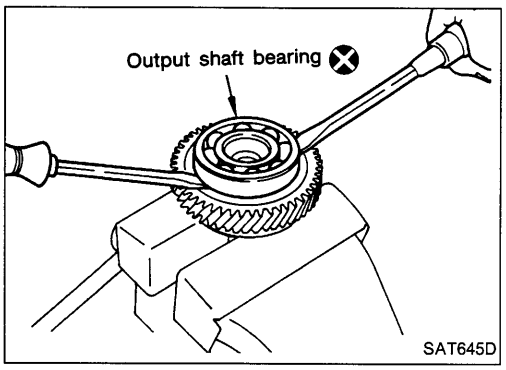
Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer





DISASSEMBLY

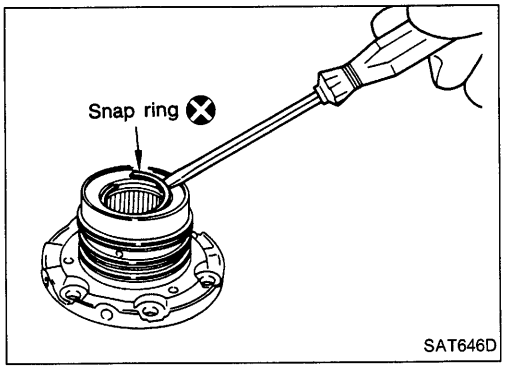
1. Remove seal rings from output shaft and bearing retainer.



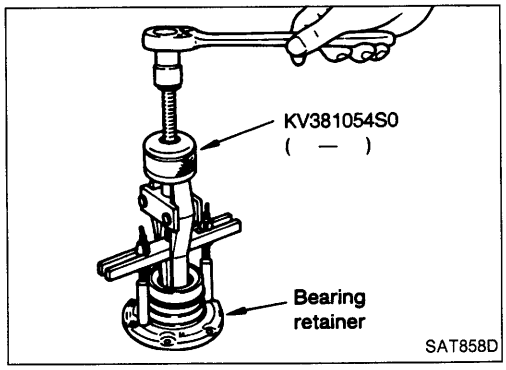
2. Remove output shaft bearing with screwdrivers.

- **Always replace bearing with a new one when removed.**
- **Do not damage output shaft.**

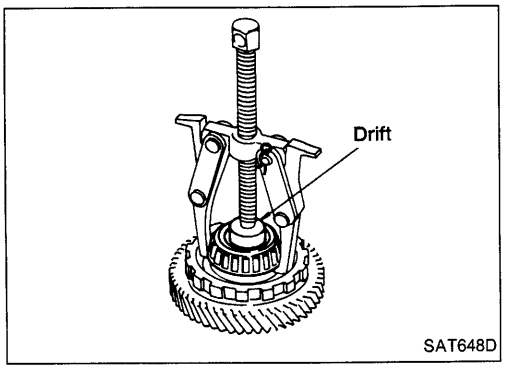
Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer (Cont'd)



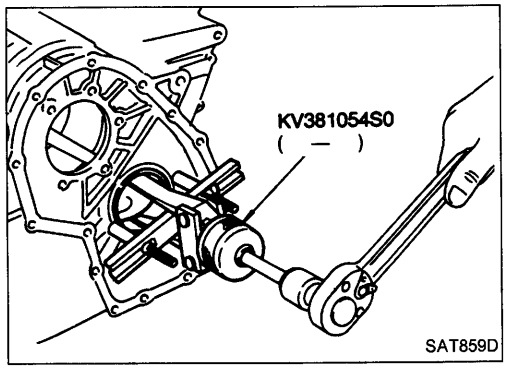
3. Remove snap ring from bearing retainer.



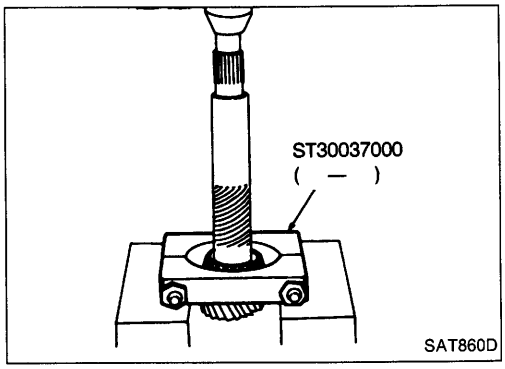
4. Remove needle bearing from bearing retainer.



5. Remove idler gear bearing inner race from idler gear.

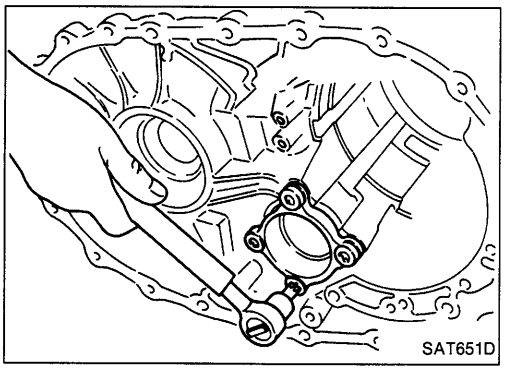


6. Remove idler gear bearing outer race from transmission case.



7. Press out reduction gear bearing inner race from reduction gear.

Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer (Cont'd)

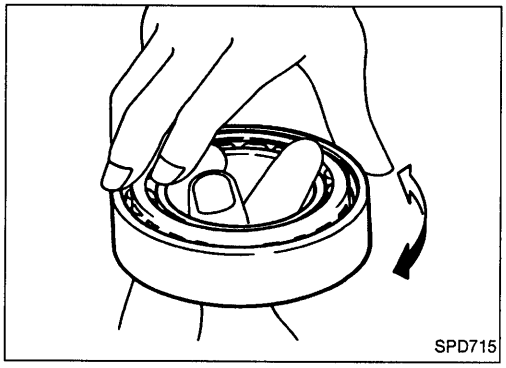

SAT651D

8. Remove reduction gear bearing outer race from transmission case.

INSPECTION

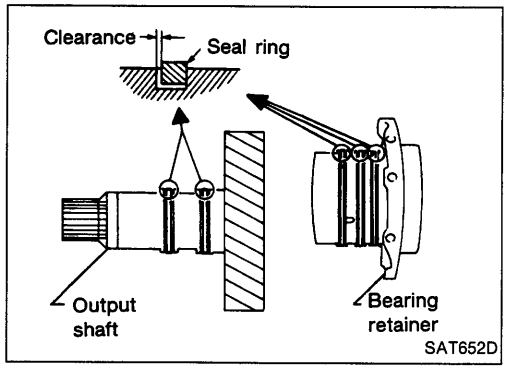
Output shaft, idler gear and reduction gear

- Check shafts for cracks, wear or bending.
- Check gears for wear, chips and cracks.


SPD715

Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing taper roller bearing, replace outer and inner race as a set.**



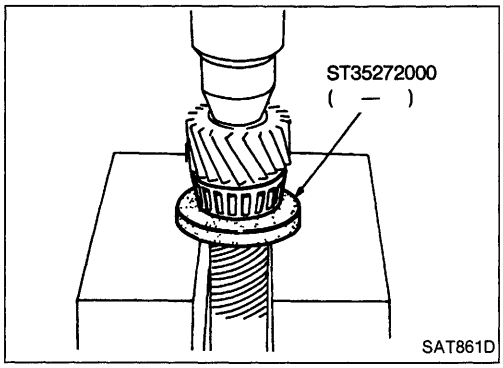
SAT652D

Seal ring clearance

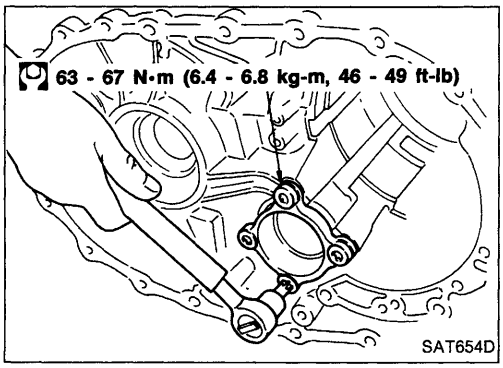
- Install new seal rings to output shaft.
- Measure clearance between seal ring and ring groove of output shaft.
  Standard clearance:
  0.10 - 0.25 mm (0.0039 - 0.0098 in)
  Allowable limit:
  0.25 mm (0.0098 in)
- If not within allowable limit, replace output shaft.
- Install new seal rings to bearing retainer.
- Measure clearance between seal ring and ring groove of bearing retainer.
  Standard clearance:
  0.10 - 0.25 mm (0.0039 - 0.0098 in)
  Allowable limit:
  0.25 mm (0.0098 in)
- If not within allowable limit, replace bearing retainer.

Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer (Cont'd)

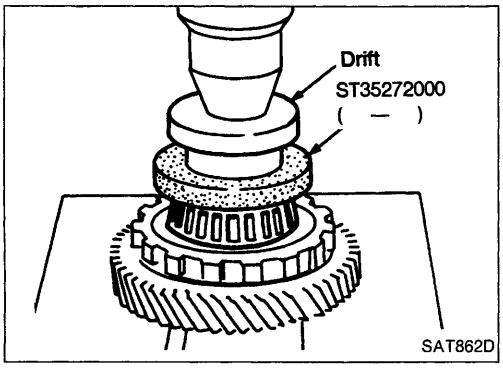
ASSEMBLY



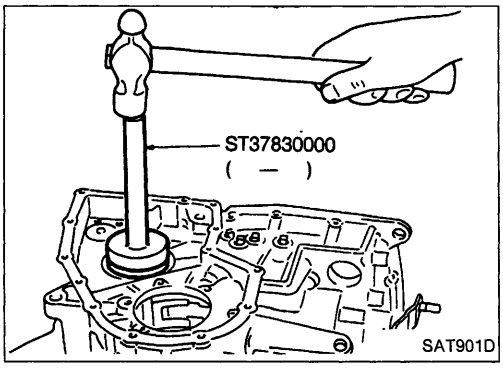
1. Press reduction gear bearing inner race on reduction gear.



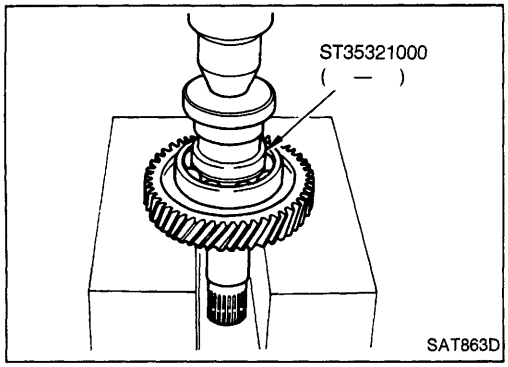
2. Install reduction gear bearing outer race on transmission case.



3. Press idler gear bearing inner race on idler gear.

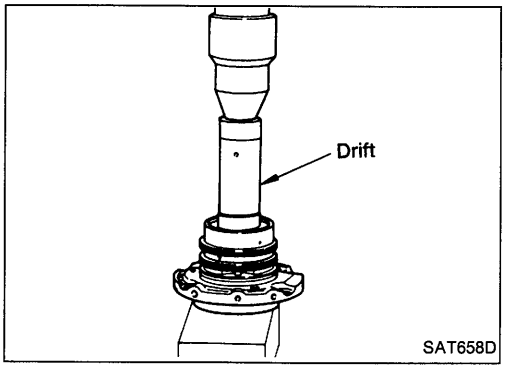


4. Install idler gear bearing outer race on transmission case.

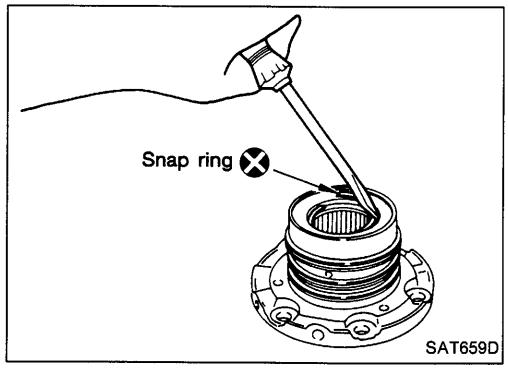


5. Press output shaft bearing on output shaft.

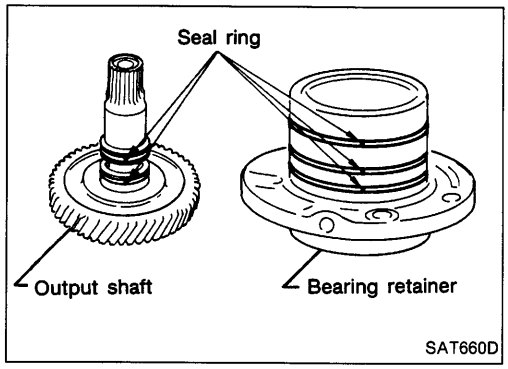
Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer (Cont'd)



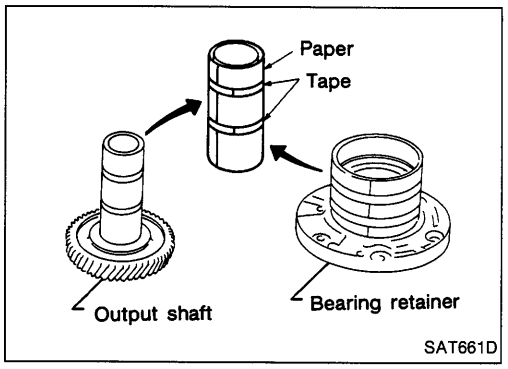
6. Press needle bearing on bearing retainer.



7. Install snap ring to bearing retainer.

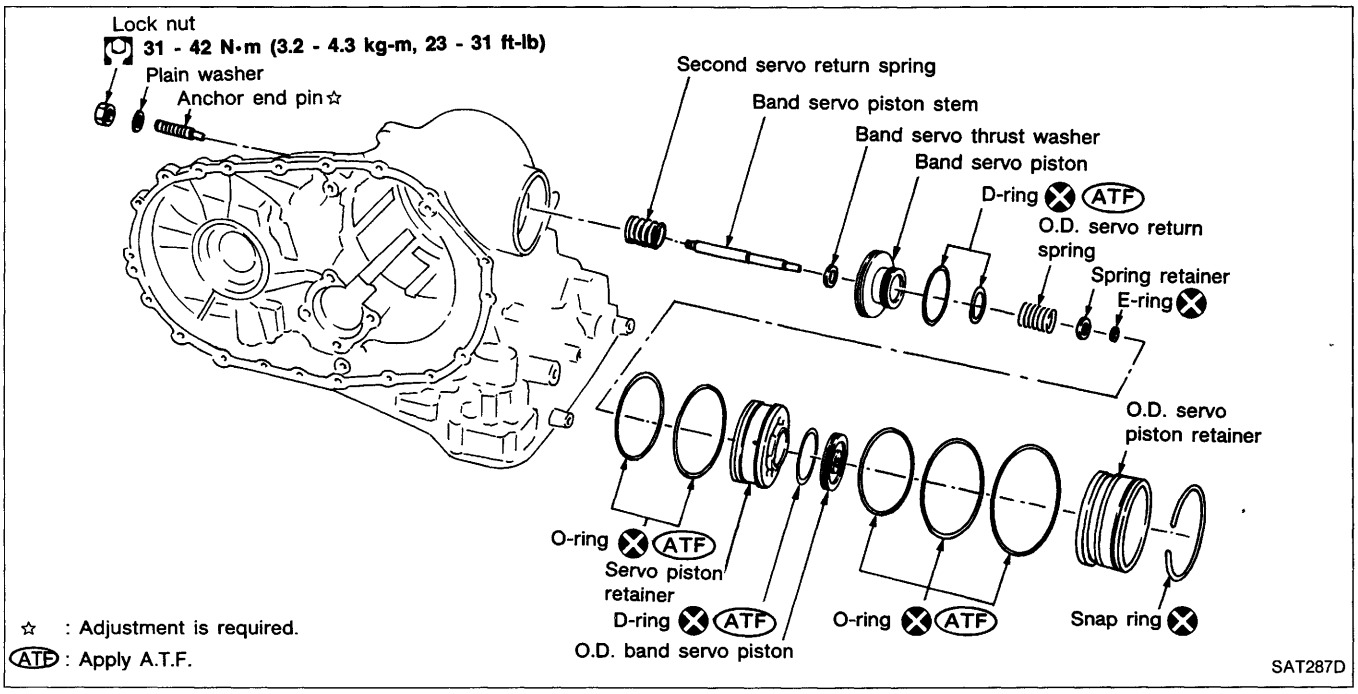


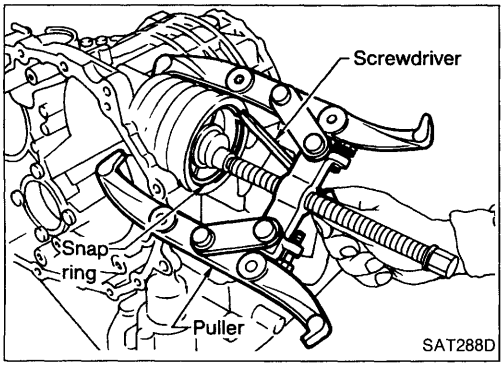
8. Install new seal rings to output shaft and bearing retainer carefully after packing ring grooves with petroleum jelly.



- **Roll paper around seal rings to prevent seal rings from spreading.**

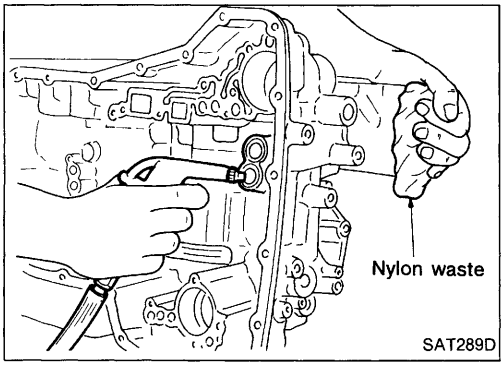
Band Servo Piston Assembly



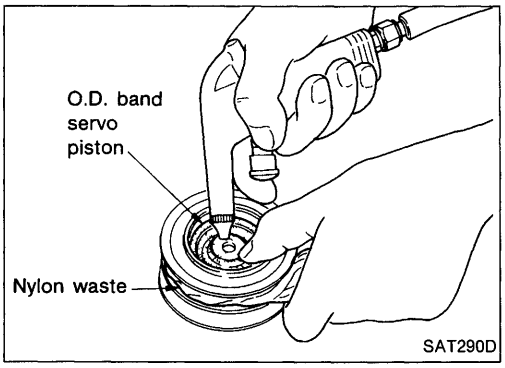


DISASSEMBLY

1. Remove band servo piston snap ring.

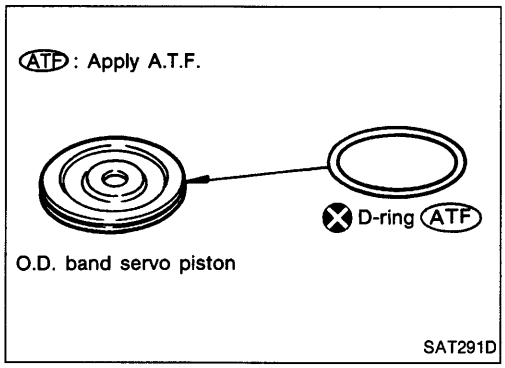


2. Apply compressed air to oil hole in transmission case to remove O.D. servo piston retainer and band servo piston assembly.
   - **Hold band servo piston assembly with a rag.**

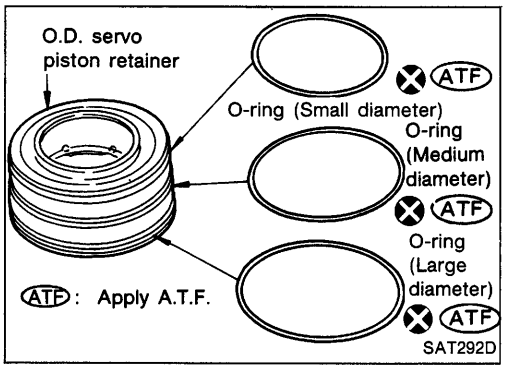


3. Apply compressed air to oil hole in O.D. servo piston retainer to remove O.D. band servo piston from retainer.
   - **Hold O.D. band servo piston while applying compressed air.**

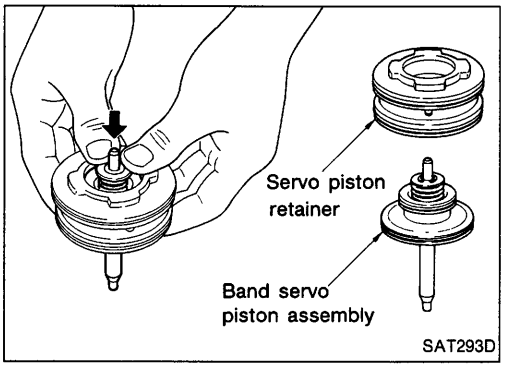
Band Servo Piston Assembly (Cont'd)



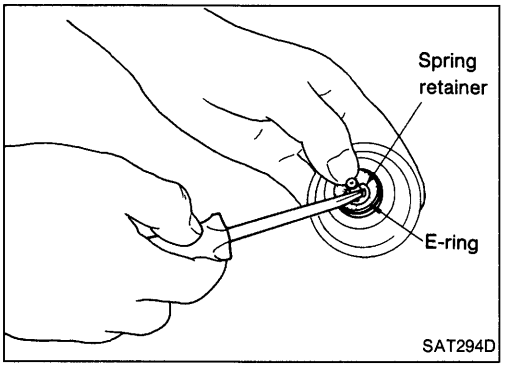
4. Remove D-ring from O.D. band servo piston.



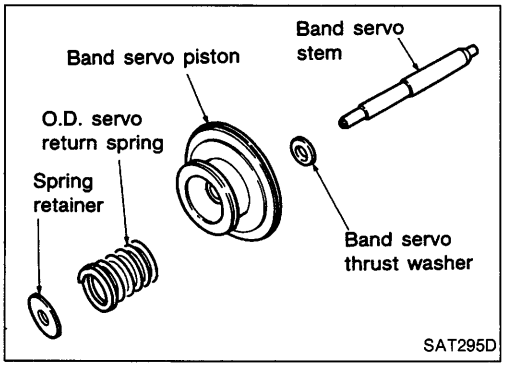
5. Remove O-rings from O.D. servo piston retainer.



6. Remove band servo piston assembly from servo piston retainer by pushing it forward.

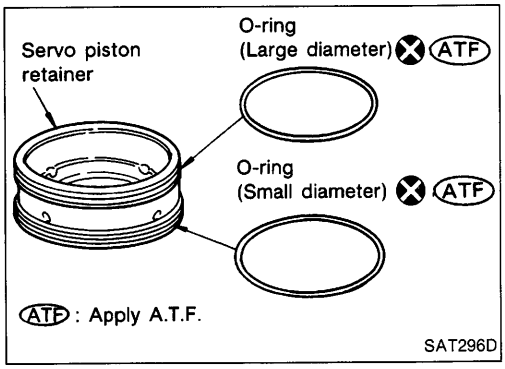


7. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.

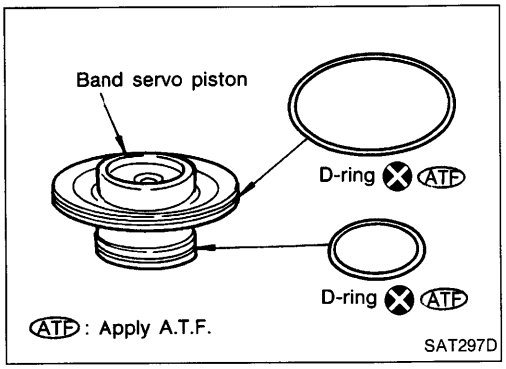


8. Remove O.D. servo return spring, band servo thrust washer and band servo piston stem from band servo piston.

Band Servo Piston Assembly (Cont'd)



9. Remove O-rings from servo piston retainer.

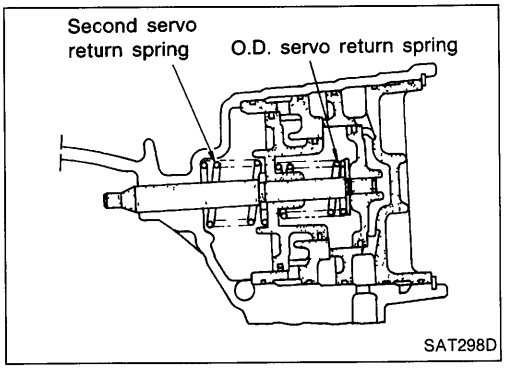


10. Remove D-rings from band servo piston.

INSPECTION

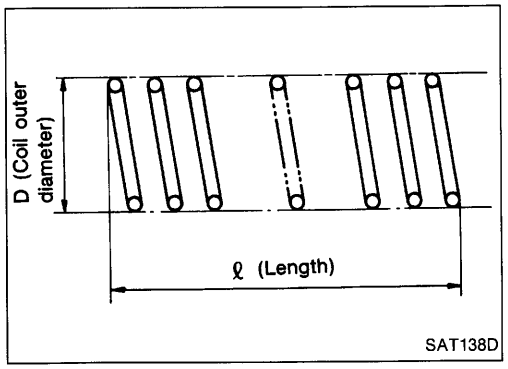
Pistons, retainers and piston stem

- Check frictional surfaces for abnormal wear or damage.



Return springs

- Check for deformation or damage.
- Measure free length and outer diameter.



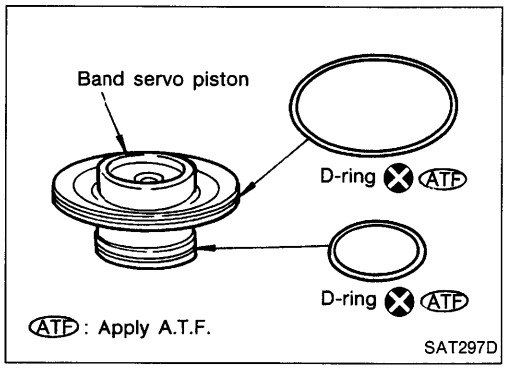
Inspection standard

Unit: mm (in)

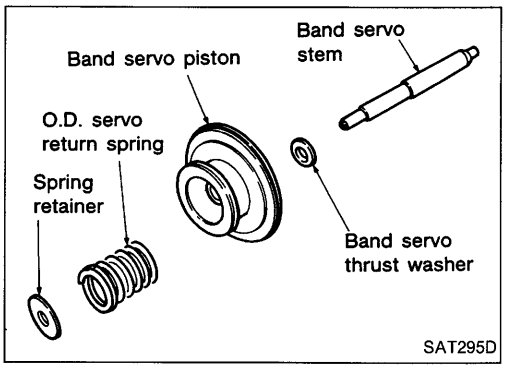
Parts	Free length	Outer diameter
2nd servo return spring	32.5 (1.280)	25.9 (1.020)
O.D. servo return spring	31.0 (1.220)	21.7 (0.854)

Band Servo Piston Assembly (Cont'd)

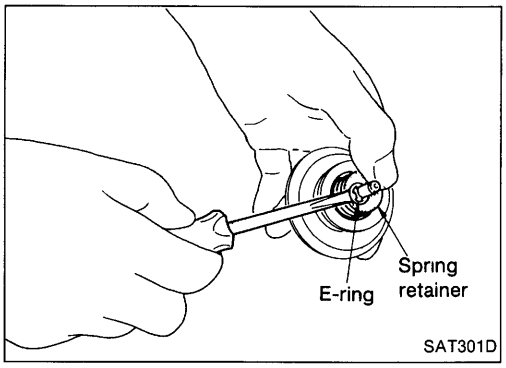
ASSEMBLY



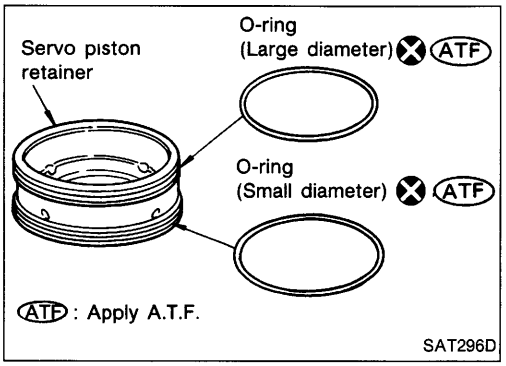
1. Install D-rings to servo piston retainer.
- **Apply A.T.F. to D-rings.**
- **Pay attention to position of each O-ring.**



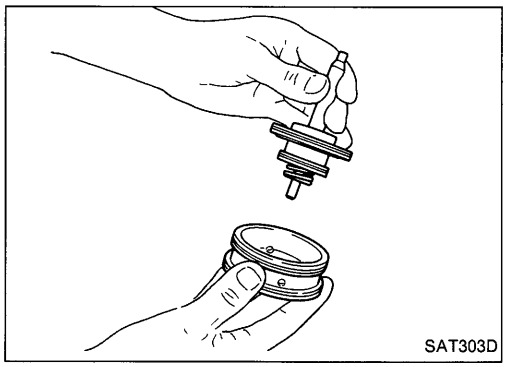
2. Install band servo piston stem, band servo thrust washer, O.D. servo return spring and spring retainer to band servo piston.



3. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.

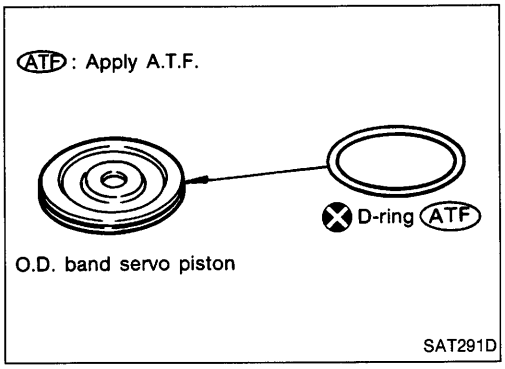


4. Install O-rings to servo piston retainer.
- **Apply A.T.F. to O-rings.**
- **Pay attention to position of each O-ring.**

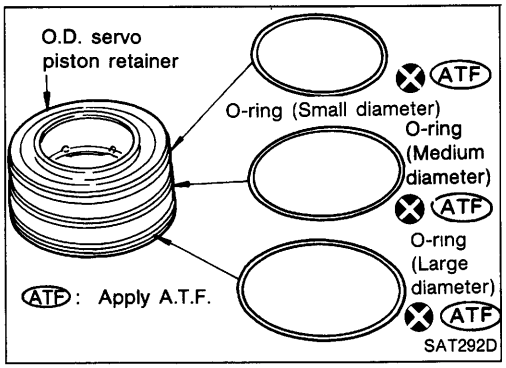


5. Install band servo piston assembly to servo piston retainer by pushing it inward.

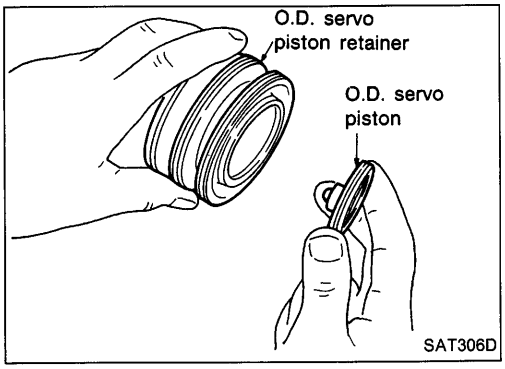
Band Servo Piston Assembly (Cont'd)



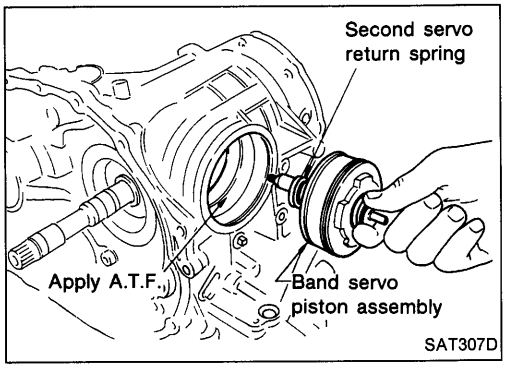
6. Install D-ring to O.D. band servo piston.
- **Apply A.T.F. to D-ring.**



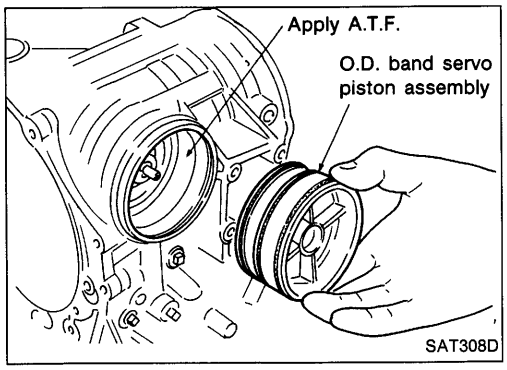
7. Install O-rings to O.D. servo piston retainer.
- **Apply A.T.F. to O-rings.**
- **Pay attention to position of each O-ring.**



8. Install O.D. band servo piston to O.D. servo piston retainer.

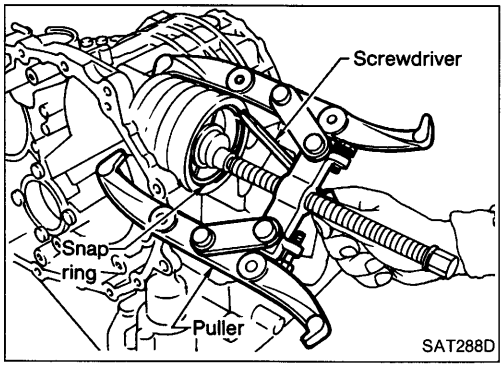


9. Install band servo piston assembly and 2nd servo return spring to transmission case.
- **Apply A.T.F. to O-ring of band servo piston and transmission case.**



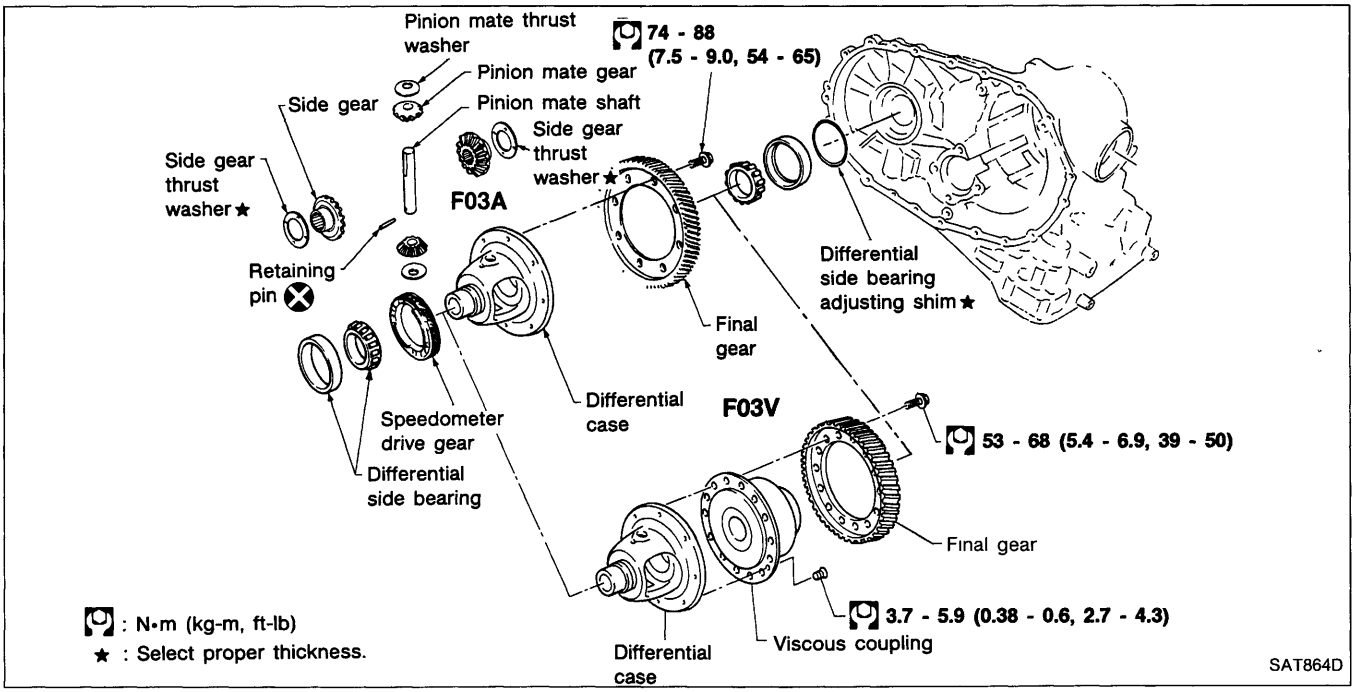
10. Install O.D. band servo piston assembly to transmission case.
- **Apply A.T.F. to O-ring of band servo piston and transmission case.**

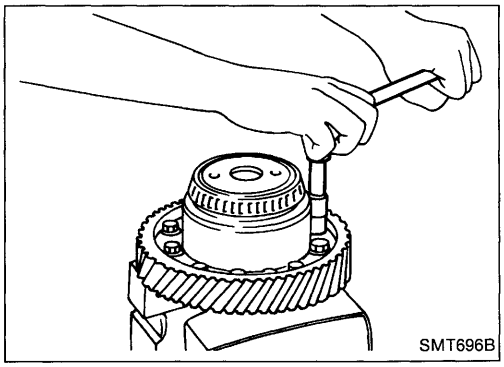
Band Servo Piston Assembly (Cont'd)



11. Install band servo piston snap ring to transmission case.

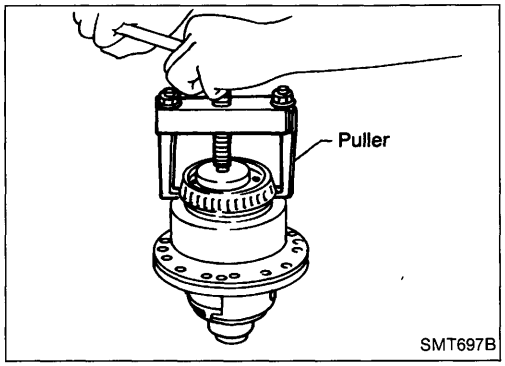
Final Drive



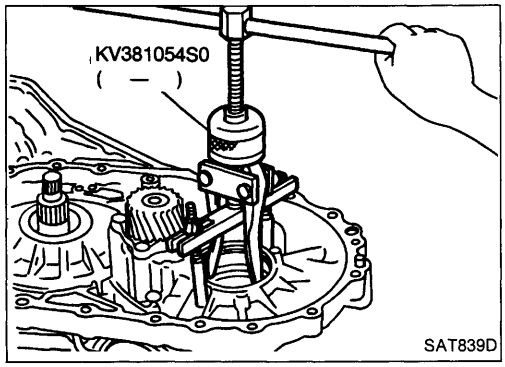


DISASSEMBLY

1. Remove final gear.

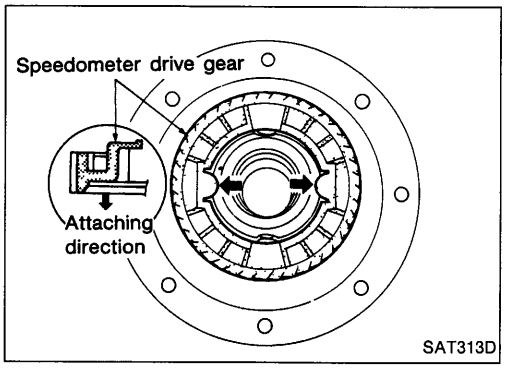


2. Press out differential side bearings.

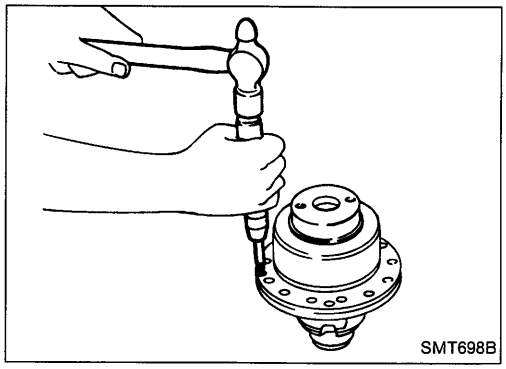


3. Remove differential side bearing outer race, and side bearing adjusting shim from transmission case.

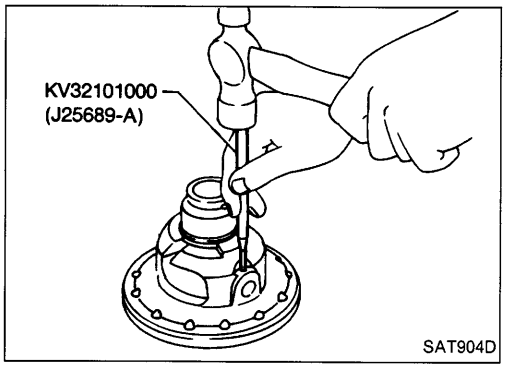
Final Drive (Cont'd)



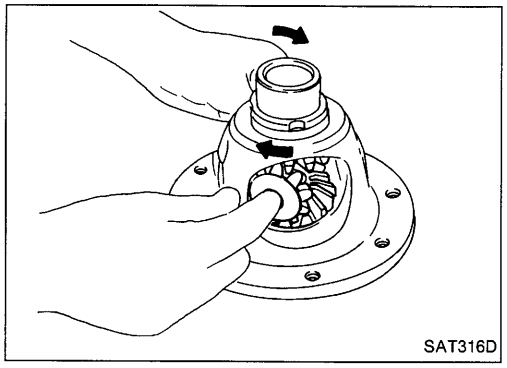
4. Remove speedometer drive gear.



5. Remove viscous coupling — RL4F03V.

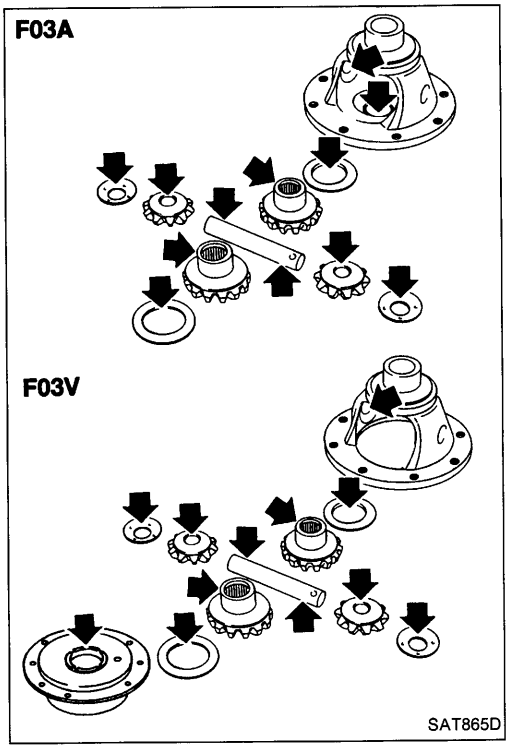


6. Drive out pinion mate shaft retaining pin.



7. Draw out pinion mate shaft from differential case.
8. Remove pinion mate gears and side gears.

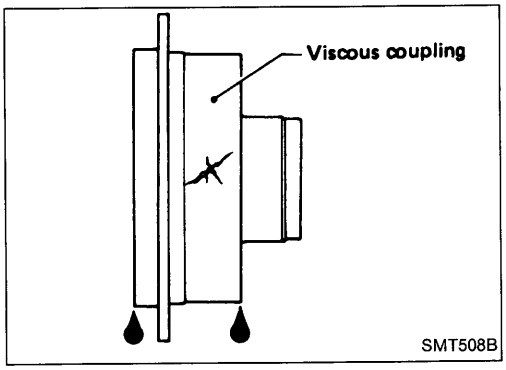
Final Drive (Cont'd)



INSPECTION

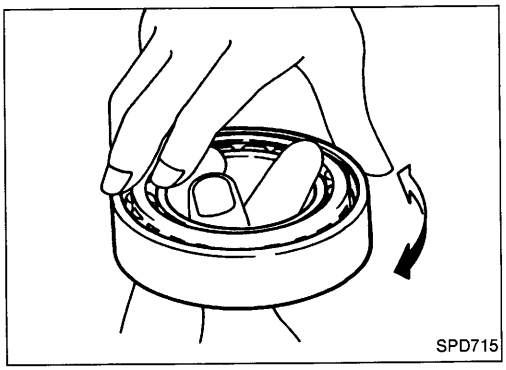
Gear, washer, shaft and case

- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.



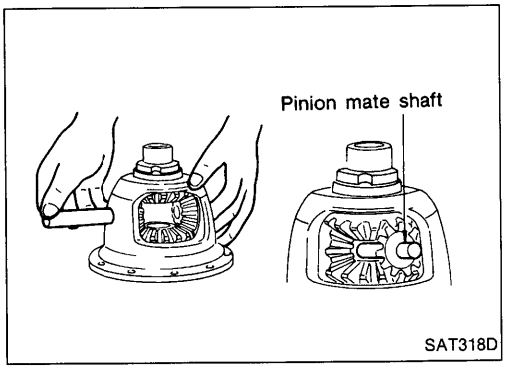
Viscous coupling — RL4F03V

- Check case for cracks.
- Check silicone oil for leakage



Bearings

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing taper roller bearing, replace outer and inner race as a set.**

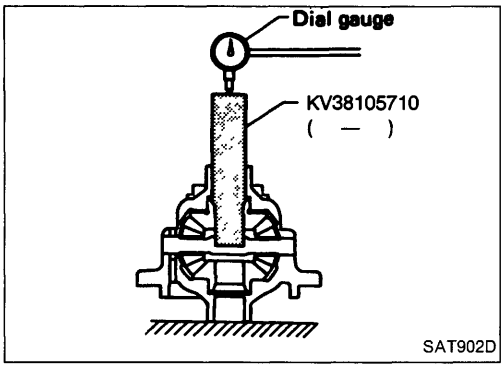


ASSEMBLY

1. Install side gears and thrust washers in differential case.
2. Install pinion mate gears and thrust washers in differential case while rotating them.

- **Apply A.T.F. to any parts.**

Final Drive (Cont'd)



— RL4F03A —

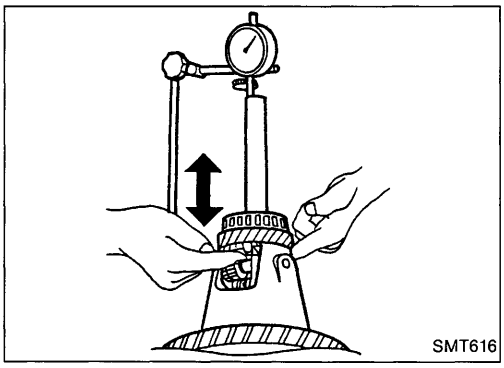
3. Measure clearance between side gear and differential case with washers using the following procedure.

a. Set Tool and dial indicator on side gear.

b. Move side gear up and down to measure dial indicator deflection. Always measure indicator deflection on both side gears.

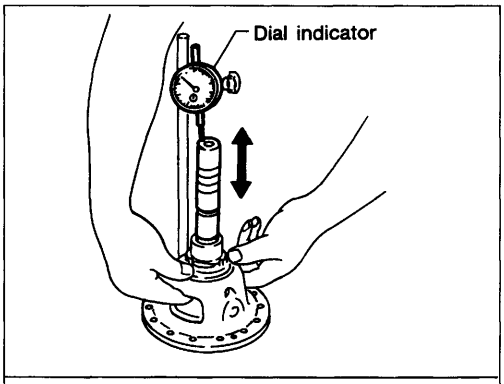
Clearance between side gear and differential case with washers:

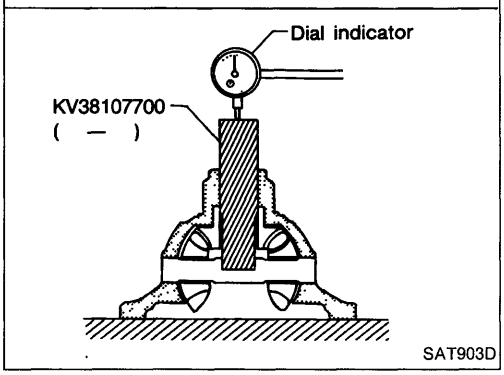
0.1 - 0.2 mm (0.004 - 0.008 in)



c. If not within specifications, adjust clearance by changing thickness of side gear thrust washers.

Side gear thrust washer: Refer to S.D.S.





— RL4F03V —

3. Measure clearance between side gear and differential case & viscous coupling with washers using the following procedure:

Differential case side

a. Set Tool and dial indicator on side gear.

b. Move side gear up and down to measure dial indicator deflection.

Clearance between side gear and differential case with washers:

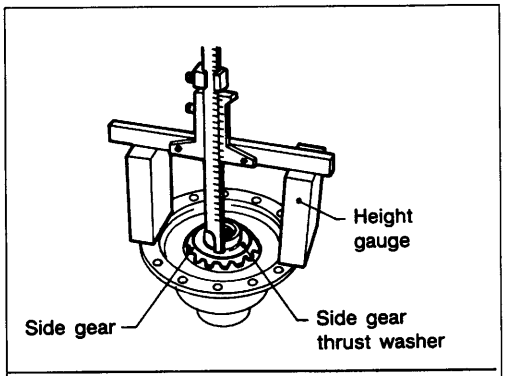
0.1 - 0.2 mm (0.004 - 0.008 in)

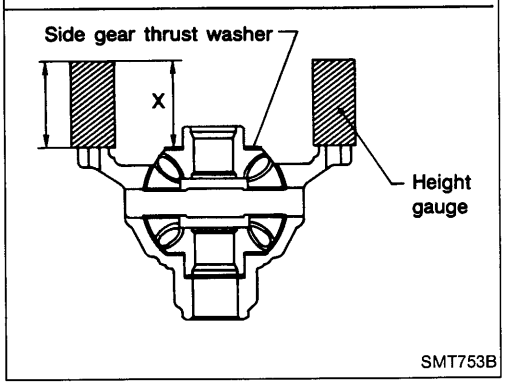
c. If not within specification adjust clearance by changing thickness of side gear thrust washer.

Side gear thrust washers for differential case side:

Refer to S.D.S.

Final Drive (Cont'd)

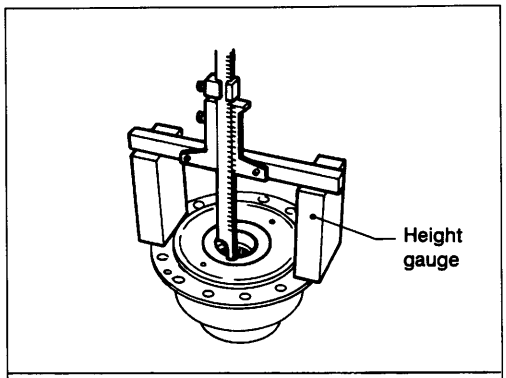


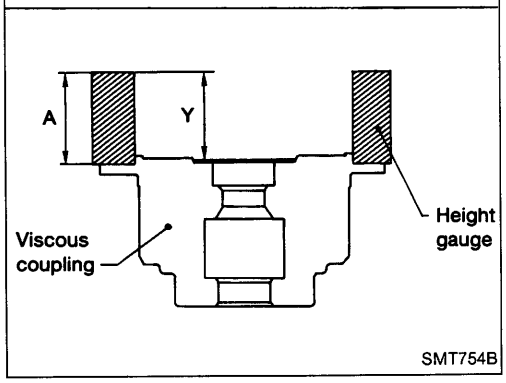


Viscous coupling side

a. Place side gear and thrust washer on pinion mate gears installed on differential case.
b. Measure dimension X.

- **Measure dimension X in at least four places.**

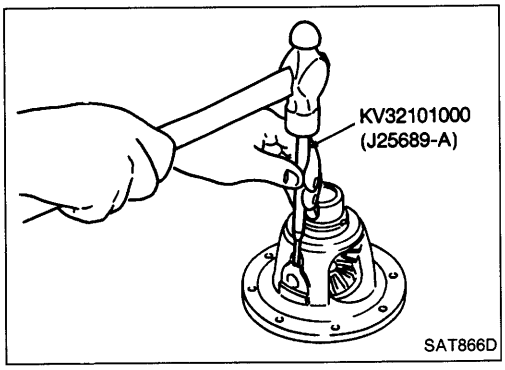




c. Measure dimension Y.

- **Measure dimension Y in at least four places.**
  Clearance between side gear and viscous coupling = X + Y − 2A: 0.1 - 0.2 mm (0.004 - 0.008 in)
  A: Height of gauge

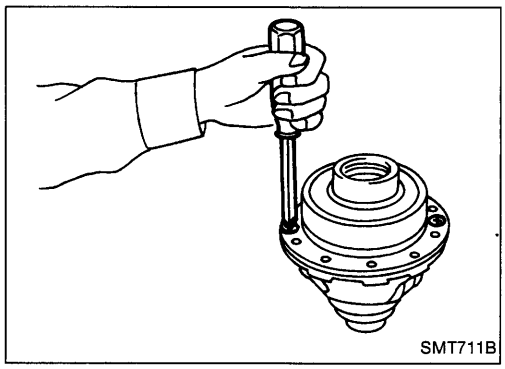
d. If not within specification, adjust clearance by changing thickness of side gear thrust washer.
   Side gear thrust washers for viscous coupling side: Refer to S.D.S.



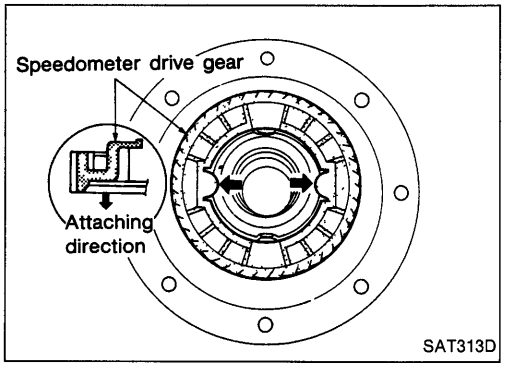
4. Install retaining pin.

- **Make sure that retaining pin is flush with case.**

Final Drive (Cont'd)

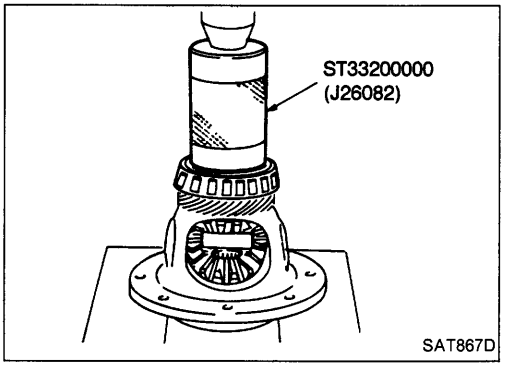

SMT711B

5. Install viscous coupling — RL4F03V.



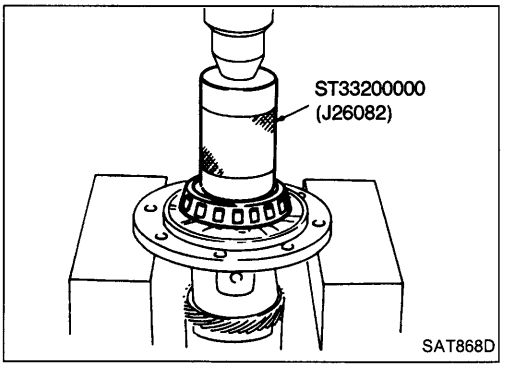
SAT313D

6. Install speedometer drive gear on differential case.
- **Align the projection of speedometer drive gear with the groove of differential case.**

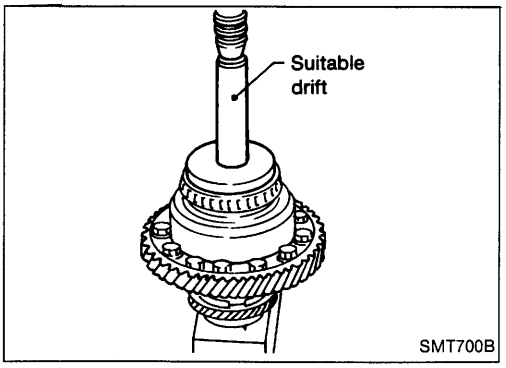


SAT867D

7. Press differential side bearings on differential case.

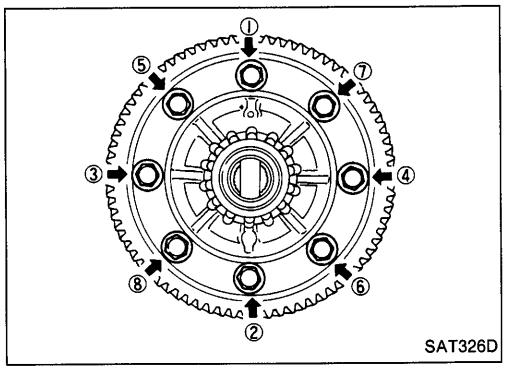


SAT868D

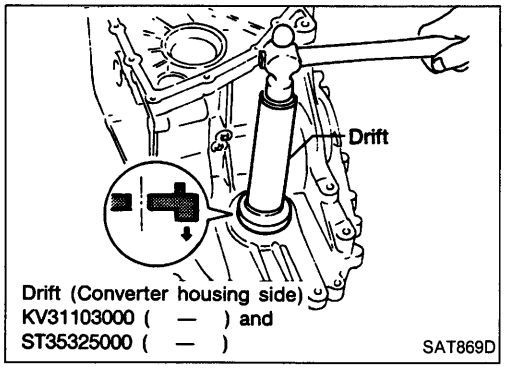


SMT700B

Final Drive (Cont'd)

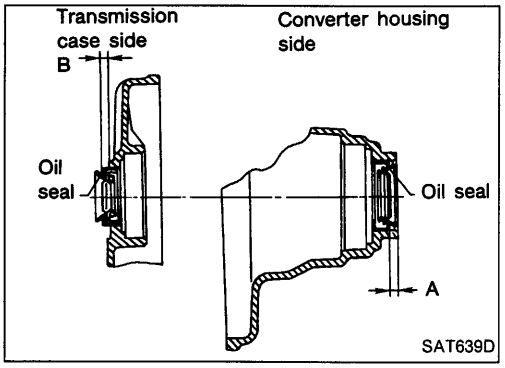


8. Install final gear and tighten fixing bolts in numerical order.



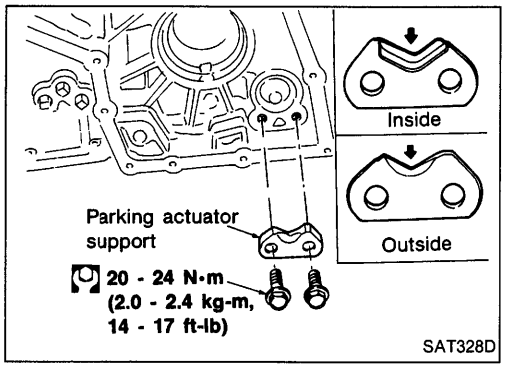
Assembly

1. Install differential side oil seals on transmission case and converter housing so that "A" and "B" are within specifications.

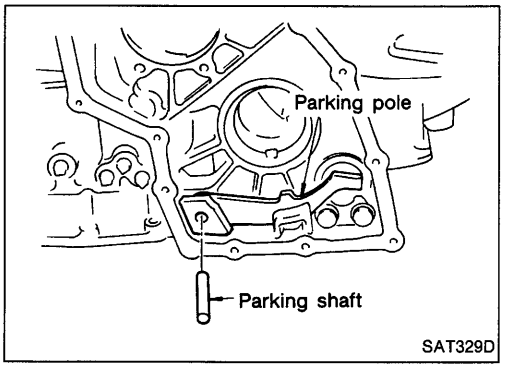


Unit: mm (in)

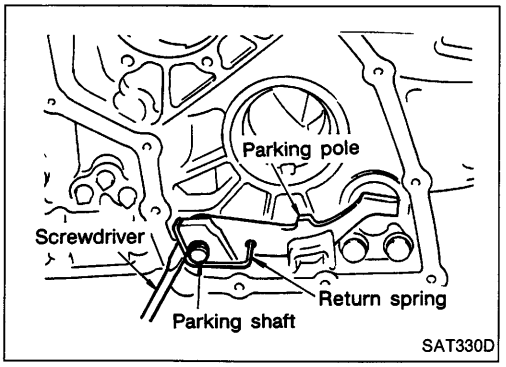
A	B
5.5 - 6.5 (0.217 - 0.256)	0.5 (0.020) or less



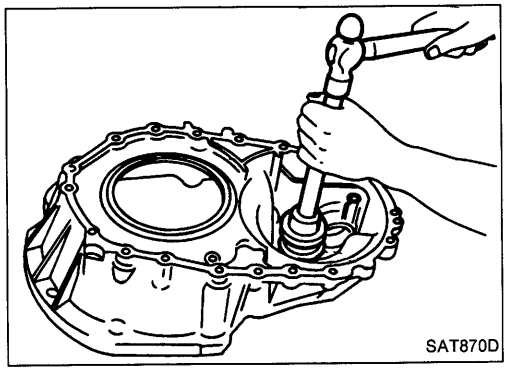
2. Install parking actuator support to transmission case.
- **Pay attention to direction of parking actuator support.**



3. Install parking pawl on transmission case and fix it with parking shaft.



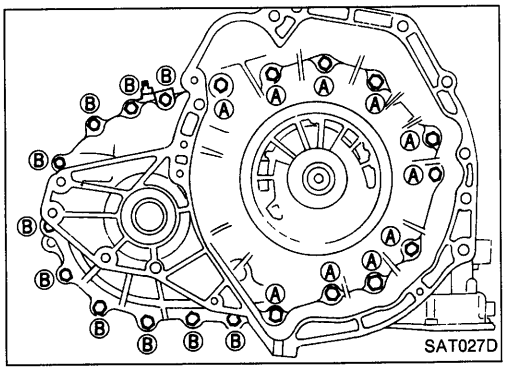
4. Install return spring.


SAT870D

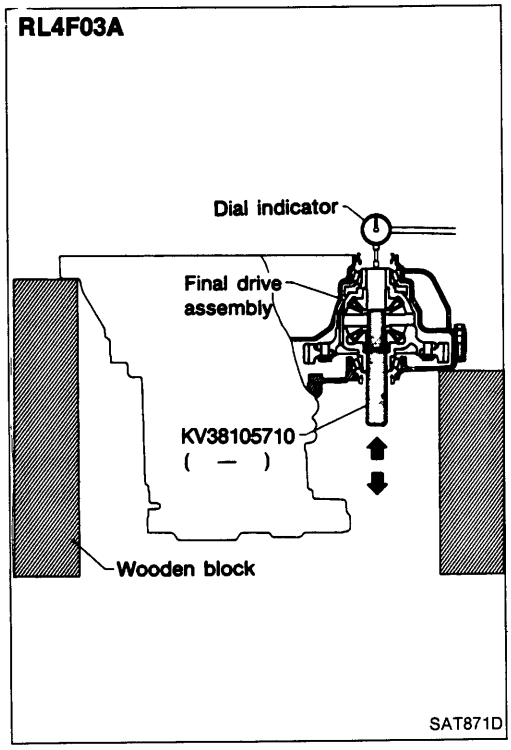
Adjustment

DIFFERENTIAL SIDE BEARING PRELOAD

1. Install differential side bearing outer race without adjusting shim on transmission case.
2. Install differential side bearing outer race on converter housing.


SAT027D

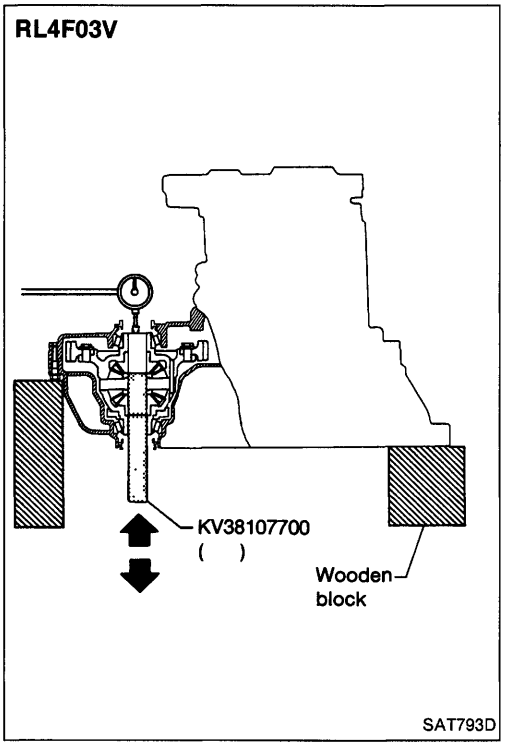
3. Place final drive assembly on transmission case.
4. Install transmission case on converter housing and tighten transmission case fixing bolts Ⓐ and Ⓑ to the specified torque.

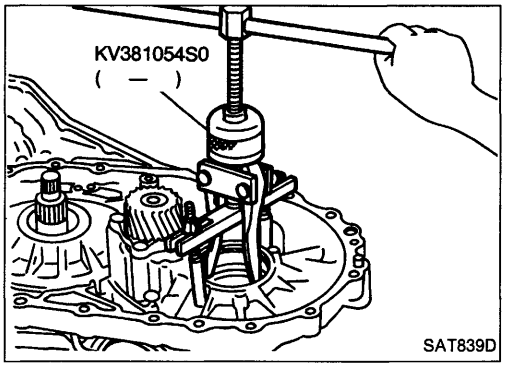


5. Attach dial indicator on differential case at converter housing side.
6. Insert Tool into differential side gear from transmission case. — RL4F03A
   Insert Tool into differential side gear from converter housing side. — RL4F03V
7. Move Tool up and down and measure dial indicator deflection.
8. Select proper thickness of differential side bearing adjusting shim(s) using S.D.S. table as a guide.

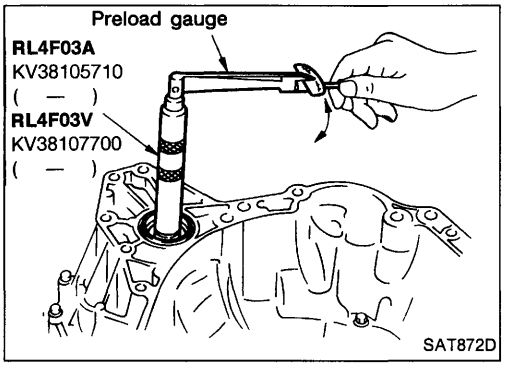
Differential side bearing adjusting shim: Refer to S.D.S.

Adjustment (Cont'd)





9. Remove converter housing from transmission case.
10. Remove final drive assembly from transmission case.
11. Remove differential side bearing outer race from transmission case.
12. Reinstall differential side bearing outer race and shim(s) selected from S.D.S. table on transmission case.
13. Reinstall converter housing on transmission case and tighten transmission case fixing bolts to the specified torque.



14. Insert Tool into differential case and measure turning torque of final drive assembly.

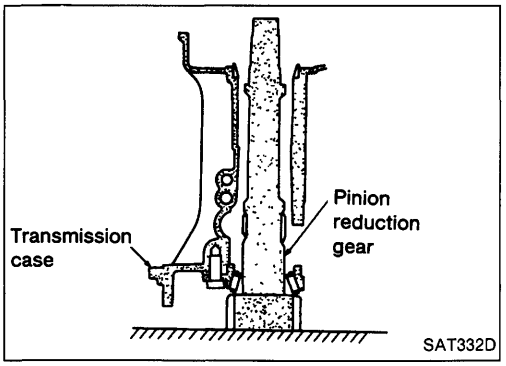
- **When measuring turning torque, turn final drive assembly in both directions several times to seat bearing rollers correctly.**

  Turning torque of final drive assembly (New bearing):
  0.49 - 1.08 N·m (5.0 - 11.0 kg-cm, 4.3 - 9.5 in-lb)
- **When old bearing is used again, turning torque will be slightly less than the above.**
- **Make sure torque is close to the specified range.**

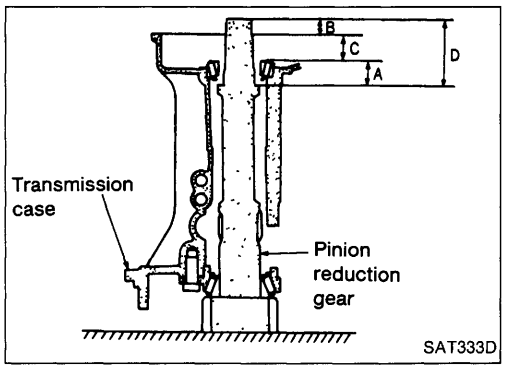
REDUCTION GEAR BEARING PRELOAD

1. Remove transmission case and final drive assembly from converter housing.
2. Select proper thickness of reduction gear bearing adjusting shim using the following procedures.

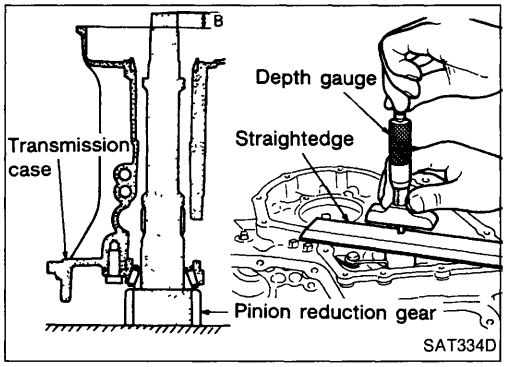
a. Place reduction gear on transmission case as shown.



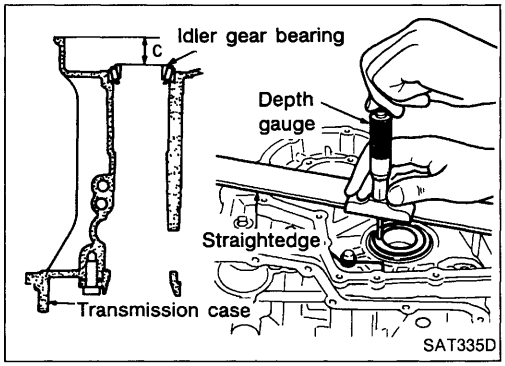
Adjustment (Cont'd)



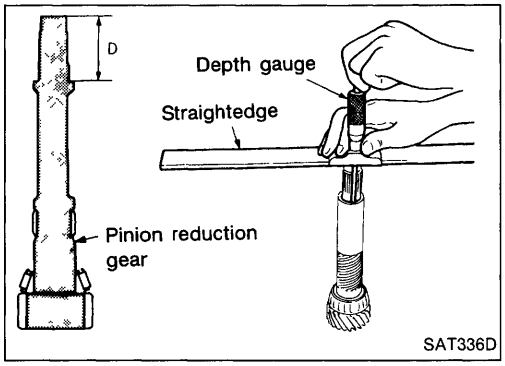
b. Place idler gear bearing on transmission case.
c. Measure dimensions "B" "C" and "D" and calculate dimension "A".
   A = D – (B + C)
   "A": Distance between the surface of idler gear bearing inner race and the adjusting shim mating surface of reduction gear.



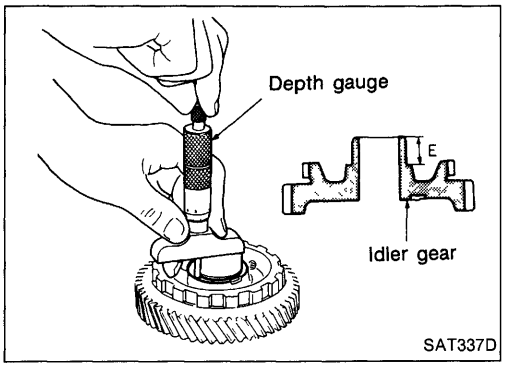
- Measure dimension "B" between the end of reduction gear and the surface of transmission case.
- **Measure dimension "B" in at least two places.**



- Measure dimension "C" between the surface of idler gear bearing inner race and the surface of transmission case.
- **Measure dimension "C" in at least two places.**



- Measure dimension "D" between the end of reduction gear and the adjusting shim mating surface of reduction gear.
- **Measure dimension "D" in at least two places.**
- Calculate dimension "A"
  A = D – (B + C)



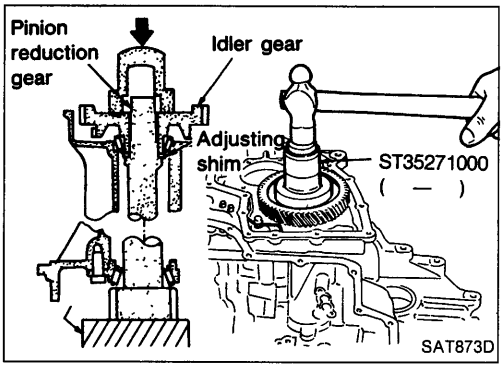
d. Measure dimension "E" between the end of idler gear and the idler gear bearing inner race mating surface of idler gear.
- **Measure dimension "E" in at least two places.**

Adjustment (Cont'd)

e. Calculate "T" and select proper thickness of reduction gear bearing adjusting shim using S.D.S. table as a guide.

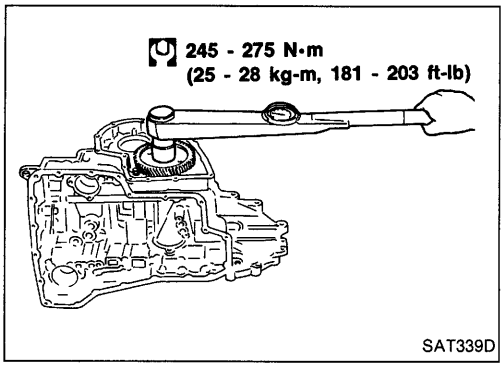
T = A – E

Reduction gear bearing adjusting shim: Refer to S.D.S.



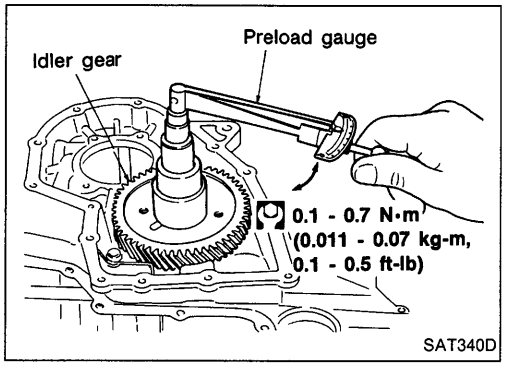
3. Install reduction gear and reduction gear bearing adjusting shim selected in step 2-e on transmission case.
4. Press idler gear bearing inner race on idler gear.
5. Press idler gear on reduction gear.

- **Press idler gear so that idler gear can be locked by parking pawl.**



6. Tighten idler gear lock nut to the specified torque.

- **Lock idler gear with parking pawl when tightening lock nut.**

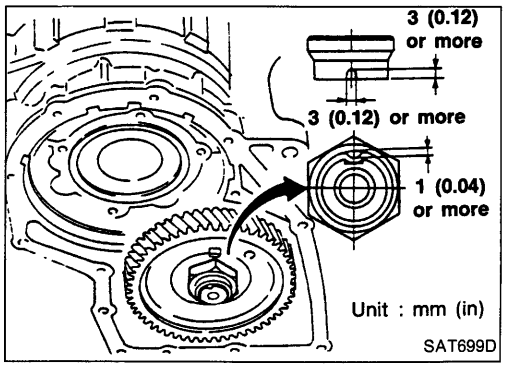


7. Measure turning torque of reduction gear.

- **When measuring turning torque, turn reduction gear in both directions several times to seat bearing rollers correctly.**

  Turning torque of reduction gear:

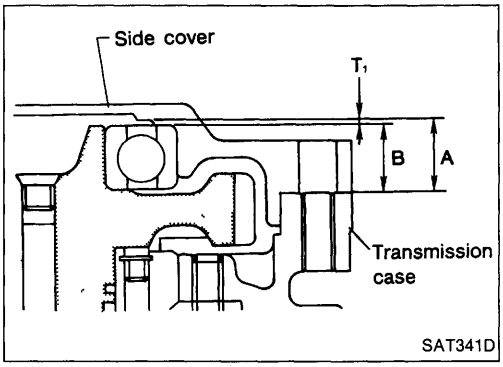
  0.11 - 0.69 N·m (1.1 - 7.0 kg-cm, 0.95 - 6.08 in-lb)



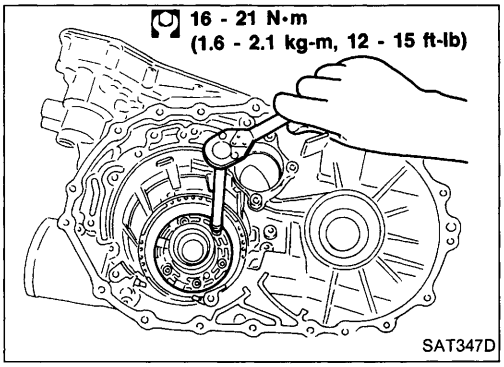
8. After properly adjusting turning torque, clinch idler gear lock nut as shown.

Adjustment (Cont'd)

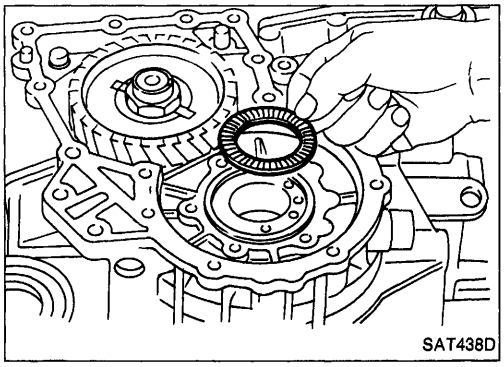
OUTPUT SHAFT END PLAY



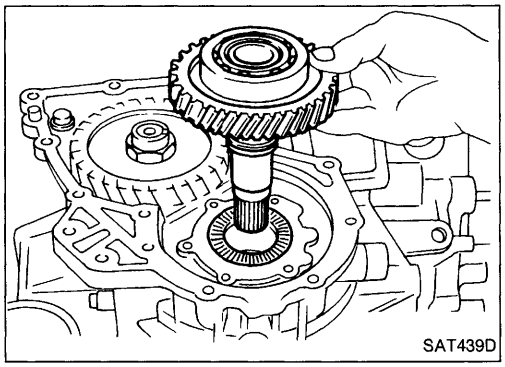
- Measure clearance between side cover and the end of the output shaft bearing.
- Select proper thickness of adjusting shim so that clearance is within specifications.



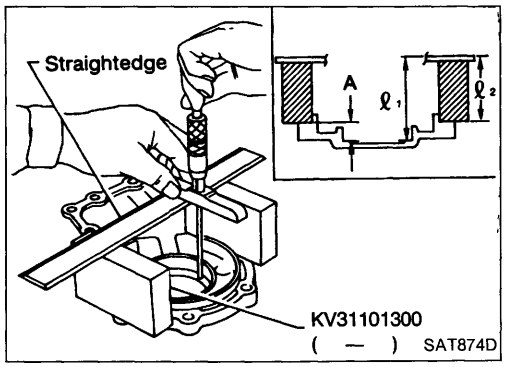
1. Install bearing retainer for output shaft.



2. Install output shaft thrust needle bearing on bearing retainer.



3. Install output shaft on transmission case.



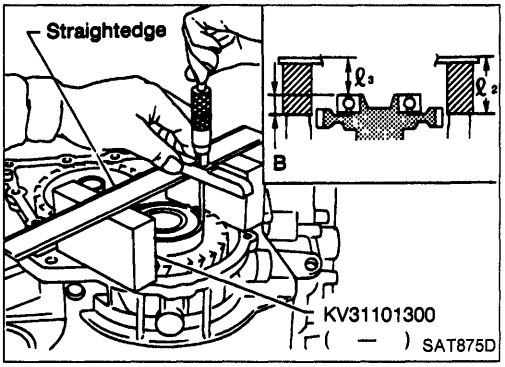
4. Measure dimensions "ℓ_1" and "ℓ_2" at side cover and then calculate dimension "A".

- **Measure dimension "ℓ_1" and "ℓ_2" in at least two places.**

"A": Distance between transmission case fitting surface and adjusting shim mating surface.

A = $\ell_1 - \ell_2$ ℓ_2: Height of gauge

Adjustment (Cont'd)

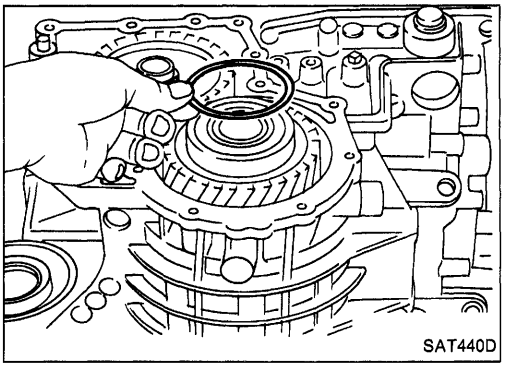


5. Measure dimensions "ℓ_2" and "ℓ_3" and then calculate dimension "B".

Measure "ℓ_2" and "ℓ_3" in at least two places.

"B": Distance between the end of output shaft bearing outer race and the side cover fitting surface of transmission case.

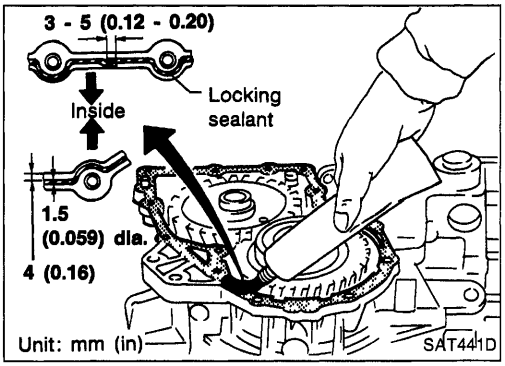
B = $\ell_2 - \ell_3$ ℓ_2: Height of gauge



6. Select proper thickness of adjusting shim so that output shaft end play (clearance between side cover and output shaft bearing) is within specifications.

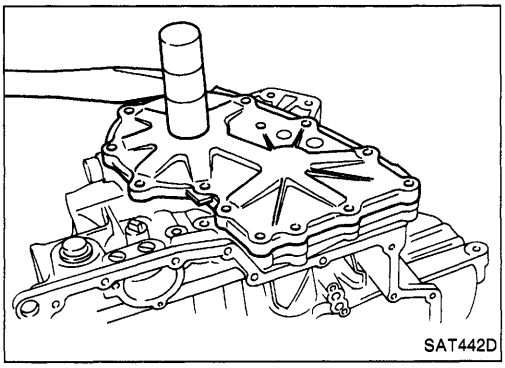
Output shaft end play (A – B):
0 - 0.5 mm (0 - 0.020 in)
Output shaft end play adjusting shim:
Refer to S.D.S.

7. Install adjusting shim on output shaft bearing.

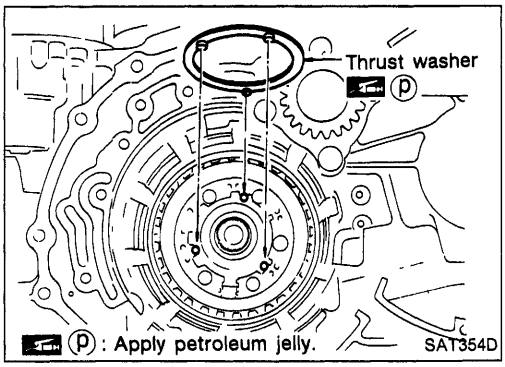


Assembly

1. Apply locking sealant to transmission case as shown in illustration.



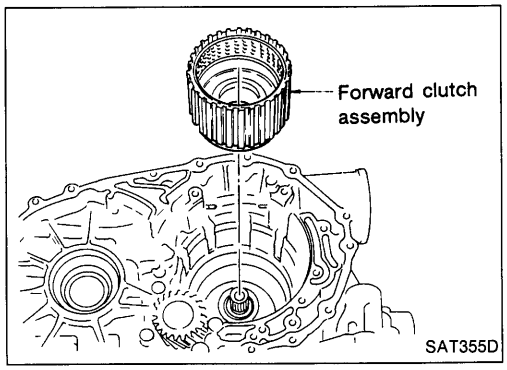
2. Install side cover on transmission case and tighten fixing bolt to the specified torque.



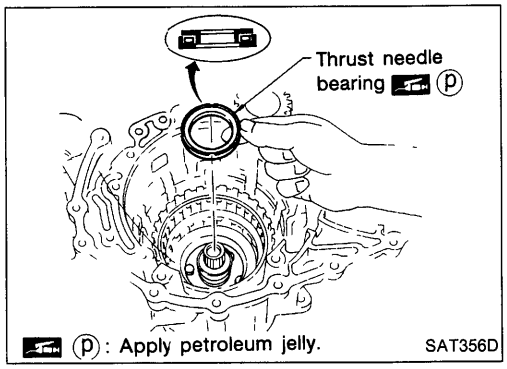
3. Remove paper rolled around bearing retainer.
4. Install thrust washer on bearing retainer.

- **Apply petroleum jelly to thrust washer.**

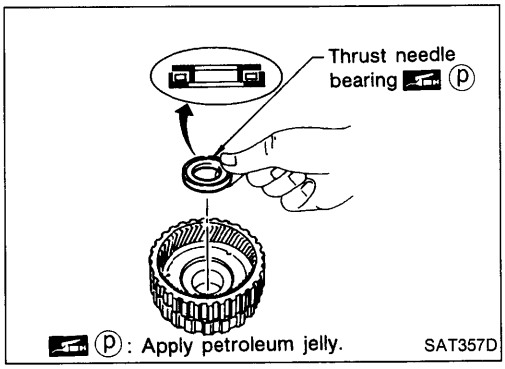
Assembly (Cont'd)



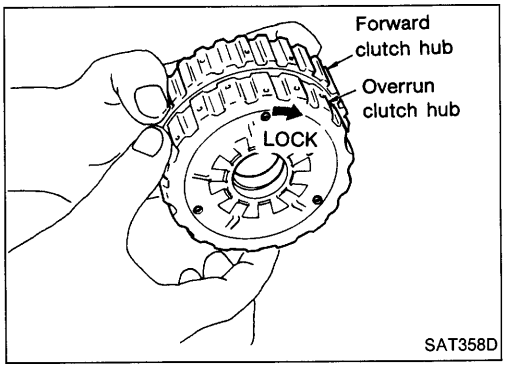
5. Install forward clutch assembly.
- **Align teeth of low & reverse brake drive plates before installing.**
- **Make sure that bearing retainer seal rings are not spread.**



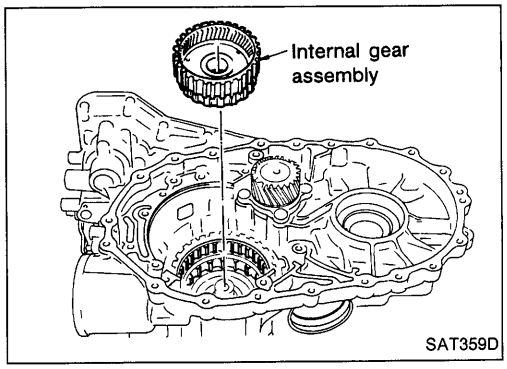
6. Install thrust needle bearing on bearing retainer.
- **Apply petroleum jelly to thrust needle bearing.**
- **Pay attention to direction of thrust needle bearing.**



7. Install thrust needle bearing on rear internal gear.
- **Apply petroleum jelly to thrust needle bearing.**
- **Pay attention to direction of thrust needle bearing.**

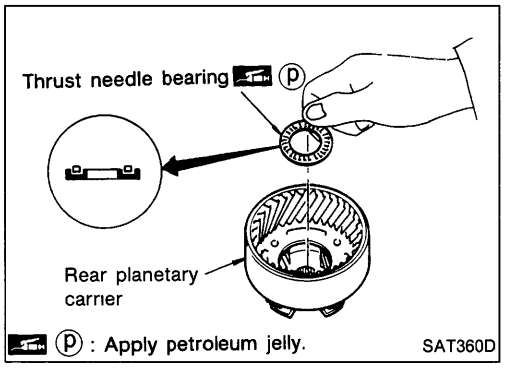


8. Hold forward clutch hub and turn overrun clutch hub. Check overrun clutch hub for correct directions of lock and unlock.
- If not shown as illustration, check installed direction of forward one-way clutch.

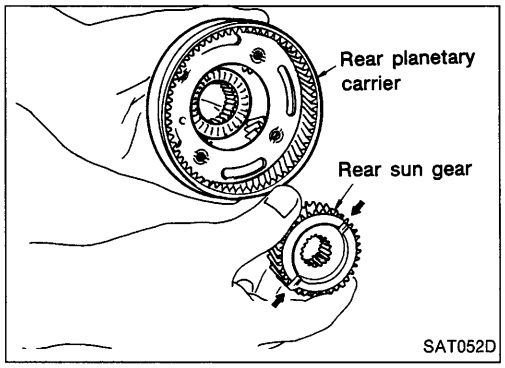


9. Install rear internal gear assembly.
- **Align teeth of forward clutch and overrun clutch drive plates before installing.**

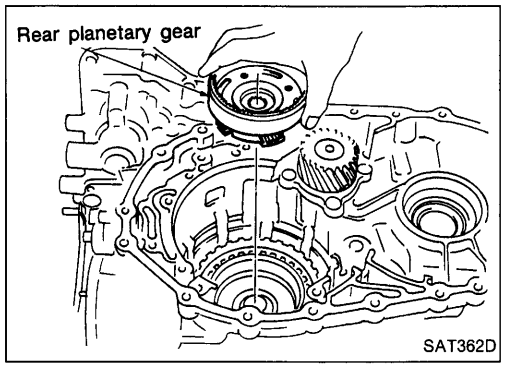
Assembly (Cont'd)



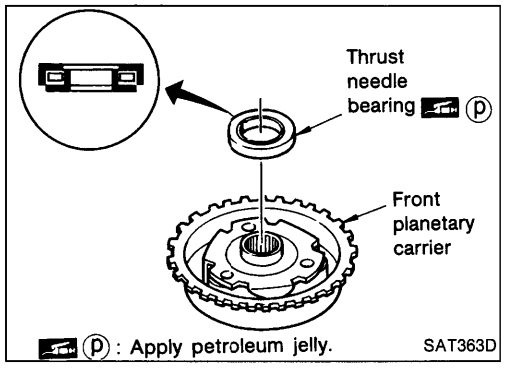
10. Install needle bearing on rear planetary carrier.
- **Apply petroleum jelly to needle bearing.**
- **Pay attention to direction of needle bearing.**



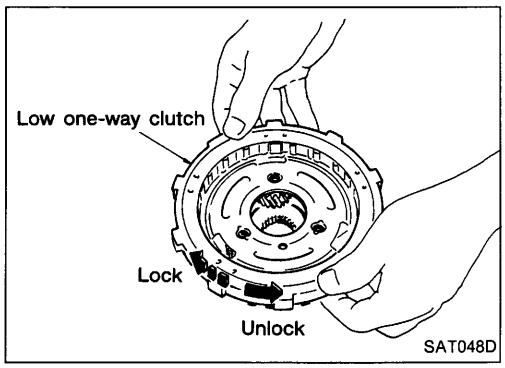
11. Install rear sun gear on rear planetary carrier.
- **Pay attention to direction of rear sun gear.**



12. Install rear planetary carrier on transmission case.

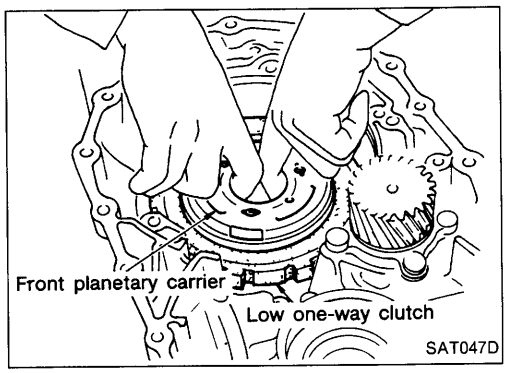


13. Install thrust needle bearing on front planetary carrier.
- **Apply petroleum jelly to thrust needle bearing.**
- **Pay attention to direction of thrust needle bearing.**

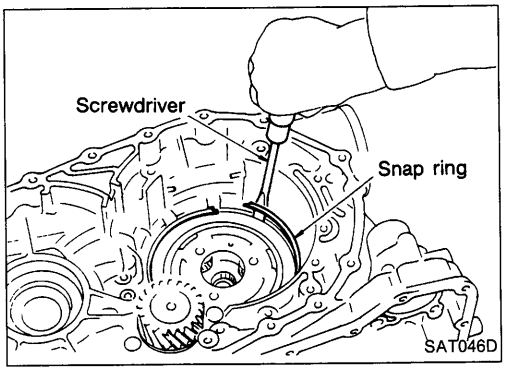


14. Install low one-way clutch to front planetary carrier by turning it in the direction of the arrow shown.
15. While holding front planetary carrier, turn low one-way clutch.
    Check low one-way clutch for correct directions of lock and unlock.

Assembly (Cont'd)

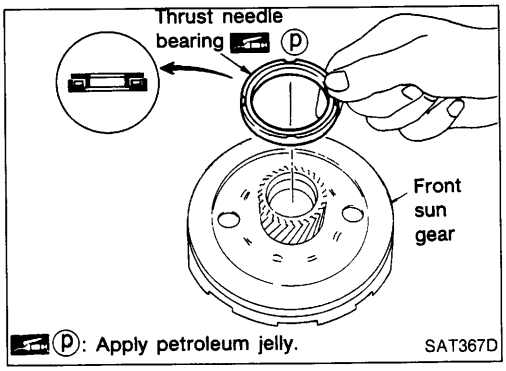


16. Install front planetary carrier assembly with low one-way clutch on transmission case.



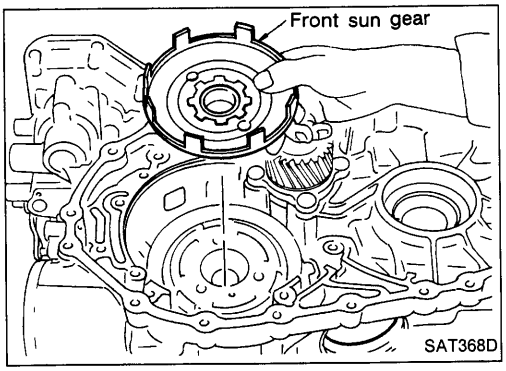
17. Install snap ring with screwdriver.

- **If forward clutch, overrun clutch and all bearings are not installed correctly, snap ring will not fit in groove of transmission case.**

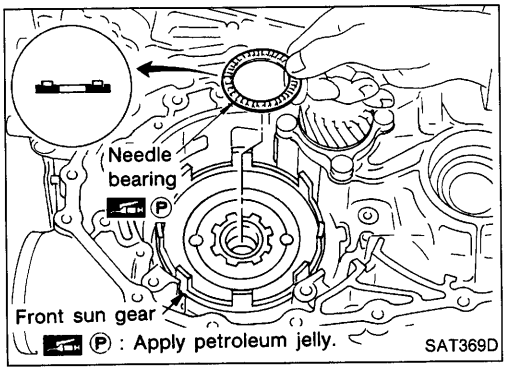


18. Install needle bearing on front sun gear.

- **Apply petroleum jelly to needle bearing.**
- **Pay attention to direction of needle bearing.**



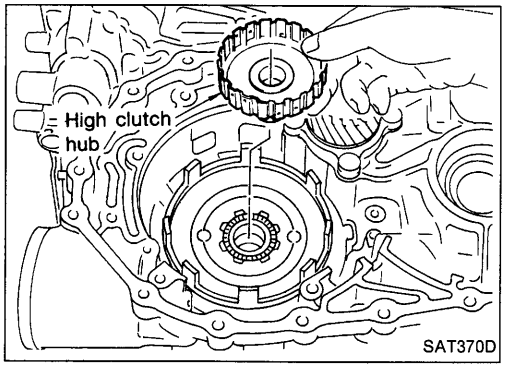
19. Install front sun gear on front planetary carrier.



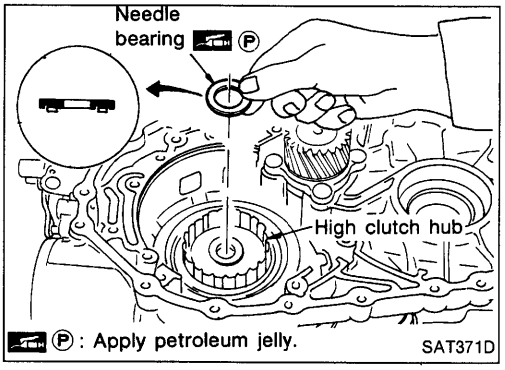
20. Install needle bearing on front sun gear.

- **Apply petroleum jelly to needle bearing.**
- **Pay attention to direction of needle bearing.**

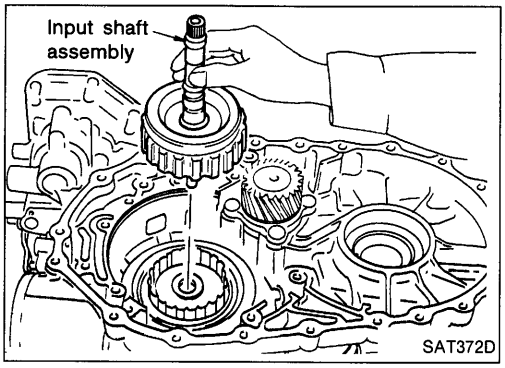
Assembly (Cont'd)



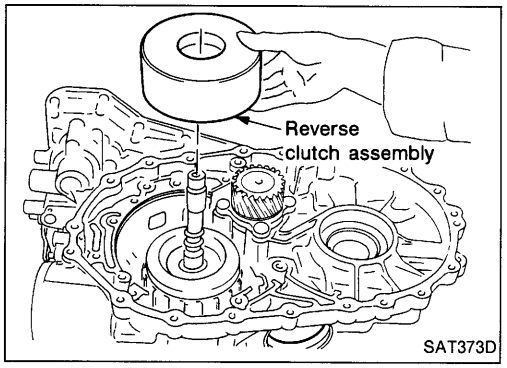
21. Install high clutch hub on front sun gear.



22. Install needle bearing on high clutch hub.
- **Apply petroleum jelly to needle bearing.**
- **Pay attention to direction of needle bearing.**



23. Remove paper rolled around input shaft.
24. Install input shaft assembly.
- **Align teeth of high clutch drive plates before installing.**

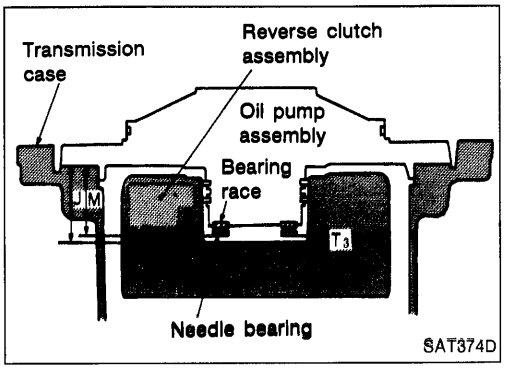


25. Install reverse clutch assembly.
- **Align teeth of reverse clutch drive plates before installing.**

Adjustment

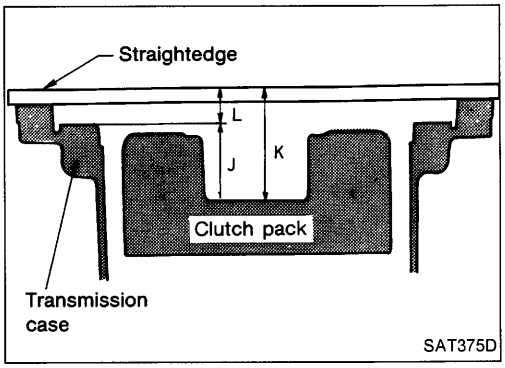
When any parts listed in the following table are replaced, total end play or reverse clutch end play must be adjusted.

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	●	●

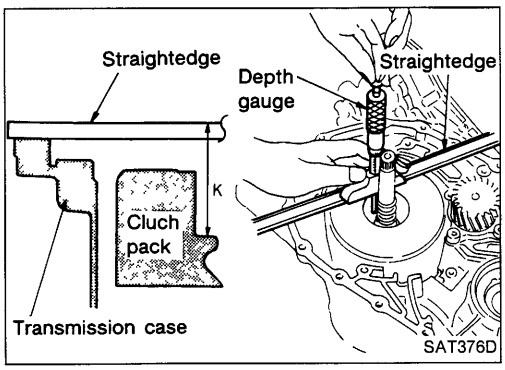


TOTAL END PLAY

- 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.

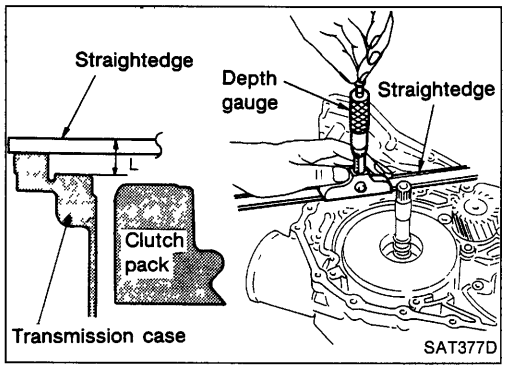


1. Measure dimensions "K" and "L" and then calculate dimension "J".



a. Measure dimension "K".

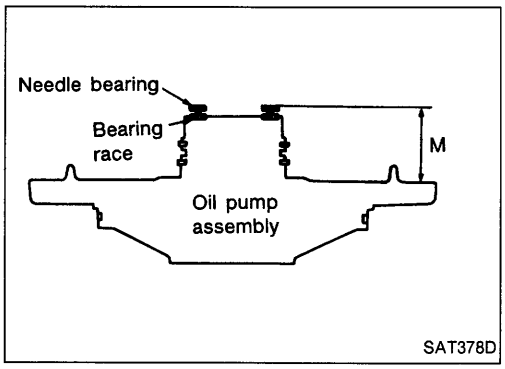
Adjustment (Cont'd)



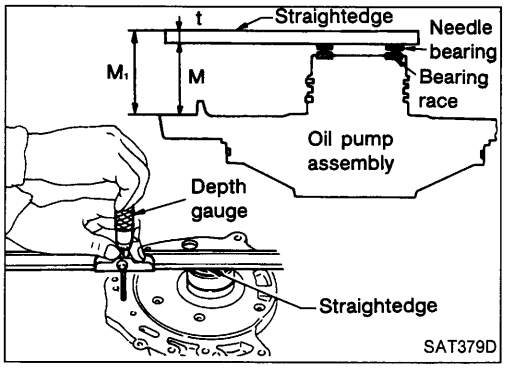
b. Measure dimension "L".
c. Calculate dimension "J".

"J": Distance between oil pump fitting surface of transmission case and needle bearing mating surface of high clutch drum.

J = K – L



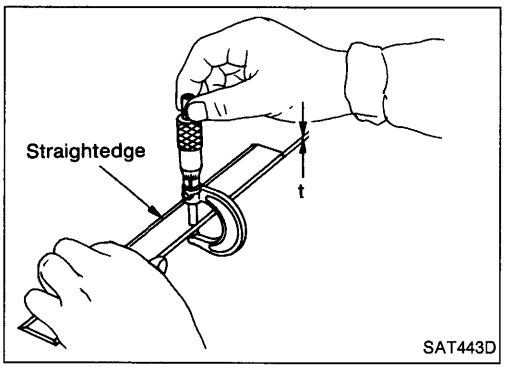
2. Measure dimension "M".
a. Place bearing race and needle bearing on oil pump assembly.



b. Measure dimension "M".

"M": Distance between transmission case fitting surface of oil pump cover 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":

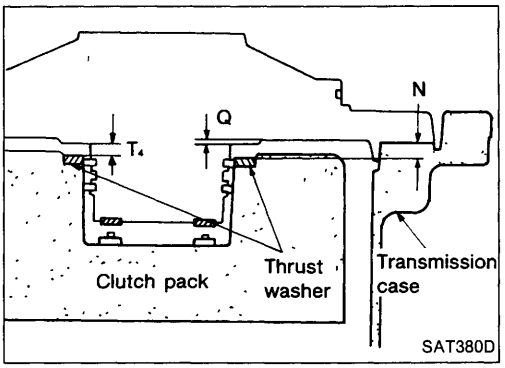
0.25 - 0.55 mm (0.0098 - 0.0217 in)

- Select proper thickness of bearing race so that total end play is within specifications.

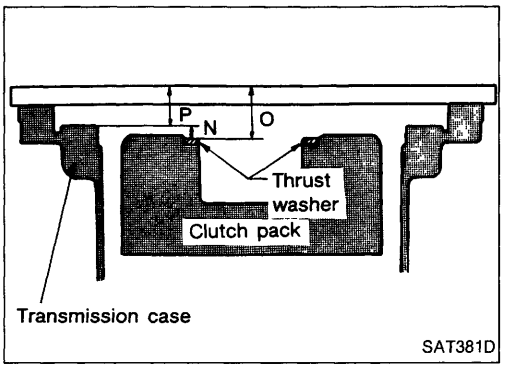
Bearing races: Refer to S.D.S.

Adjustment (Cont'd)

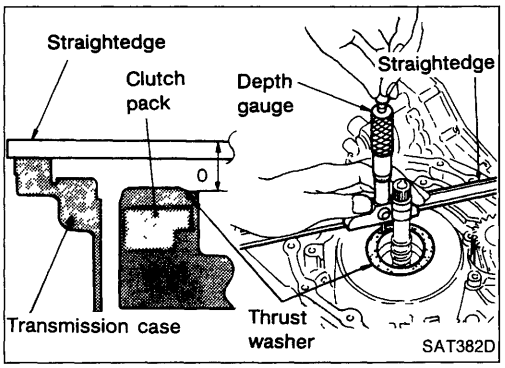
REVERSE CLUTCH END PLAY



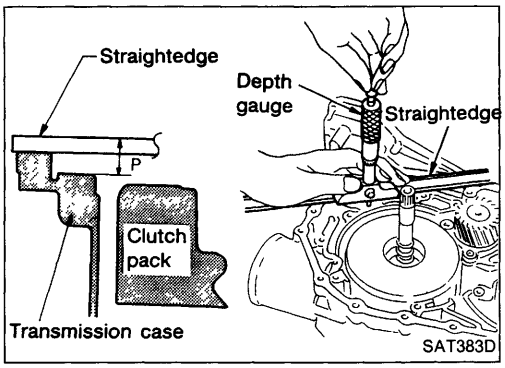
- Measure clearance between oil pump cover and thrust washer for reverse clutch drum.
- Select proper thickness of thrust washer so that end play is within specification.



1. Measure dimensions "O" and "P" and then calculate dimension "N".



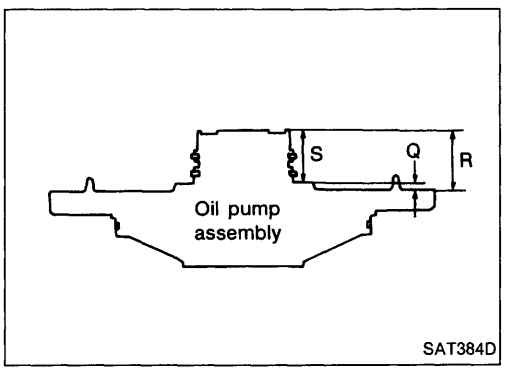
a. Place thrust washer on reverse clutch drum.
b. Measure dimension "O".



c. Measure dimension "P".
d. Calculate dimension "N".

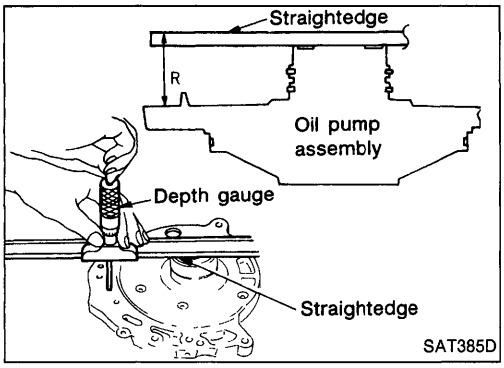
"N": Distance between oil pump fitting surface of transmission case and thrust washer on reverse clutch drum.

N = O – P

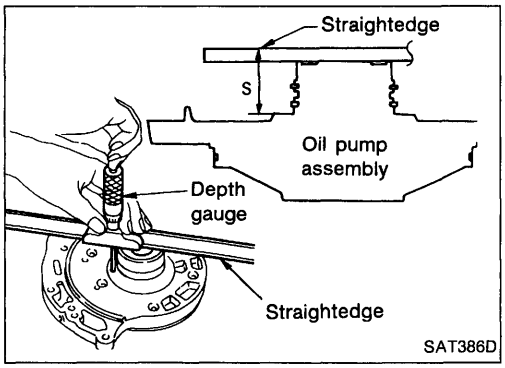


2. Measure dimensions "R" and "S" and then calculate dimension "Q".

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".

$T_4 = N - Q$

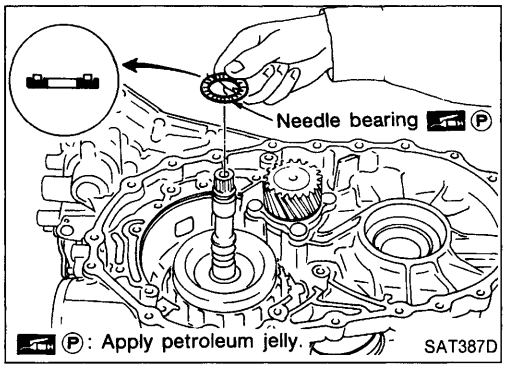
Reverse clutch end play:

0.65 - 1.0 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.

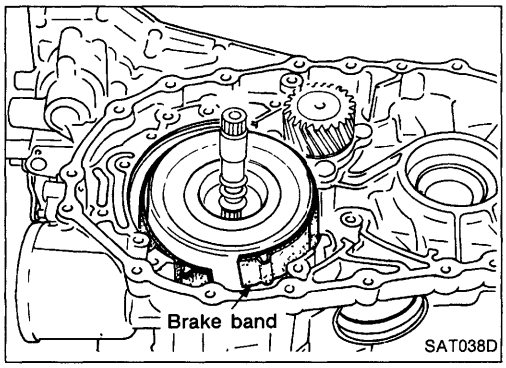
Assembly



1. Remove reverse clutch assembly and install needle bearing on high clutch assembly.

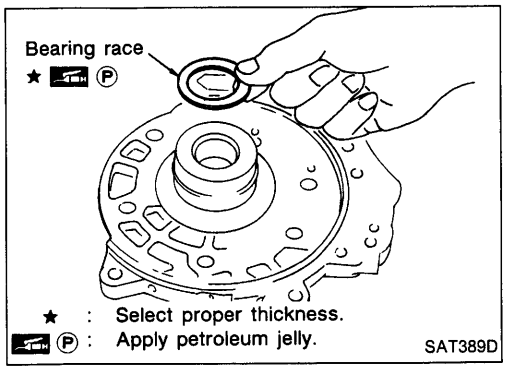
- **Pay attention to direction of needle bearing.**

2. Install reverse clutch assembly.

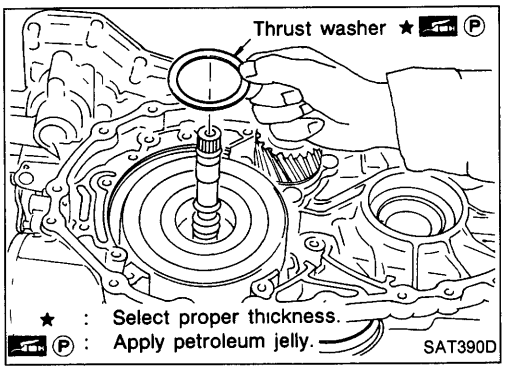


3. Install anchor end pin, washer and lock nut on transmission case.
4. Place brake band on periphery of reverse clutch drum. Then, tighten anchor end pin just enough so that brake band is fitted on periphery of reverse clutch drum uniformly.

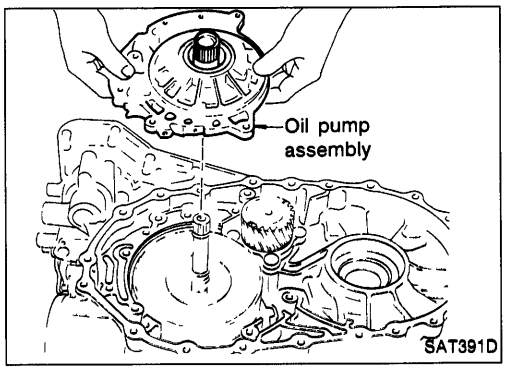
Assembly (Cont'd)



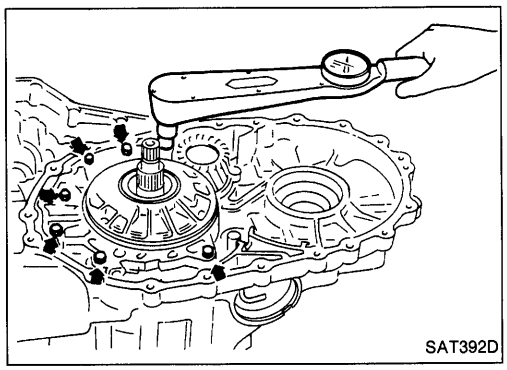
5. Place bearing race selected in total end play adjustment step on oil pump cover.
- **Apply petroleum jelly to bearing race.**



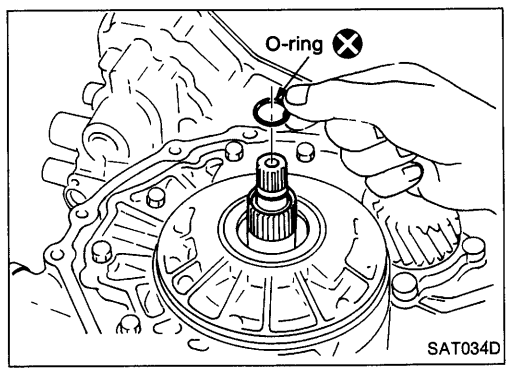
6. Place thrust washer selected in reverse clutch end play step on reverse clutch drum.
- **Apply petroleum jelly to thrust washer.**



7. Install oil pump assembly on transmission case.

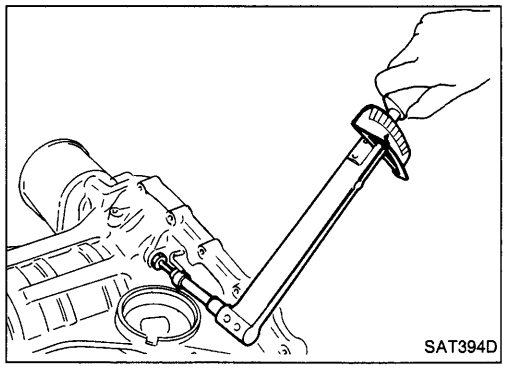


8. Tighten oil pump fixing bolts to the specified torque.

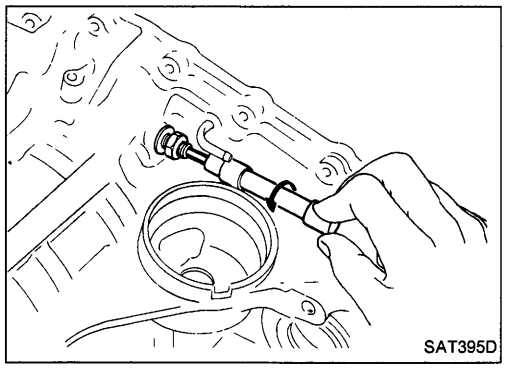


9. Install O-ring to input shaft.
- **Apply A.T.F. to O-ring.**

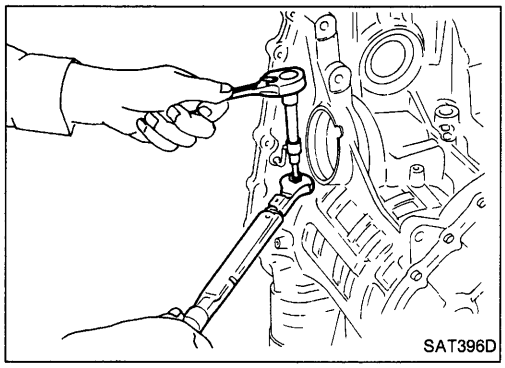
Assembly (Cont'd)


SAT394D

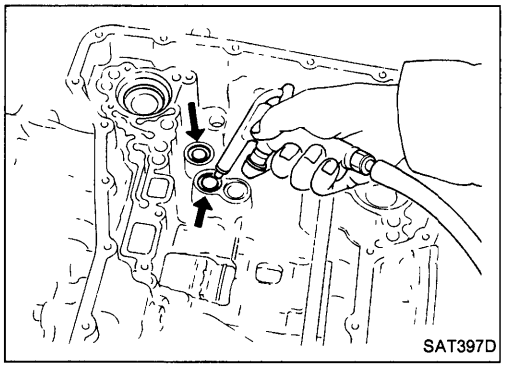
10. Adjust brake band.
a. Tighten anchor end pin to the specified torque.
Anchor end pin:
: 4 - 6 N·m (0.4 - 0.6 kg-m, 2.9 - 4.3 ft-lb)


SAT395D

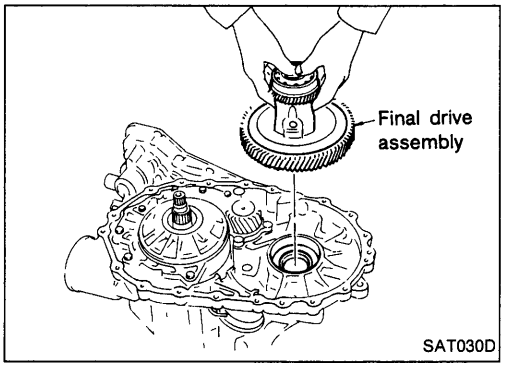
b. Back off anchor end pin two and a half turns.


SAT396D

c. While holding anchor end pin, tighten lock nut.


SAT397D

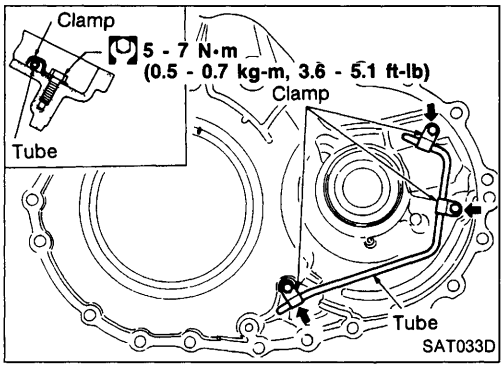
11. Apply compressed air to oil holes of transmission case and check operation of brake band.



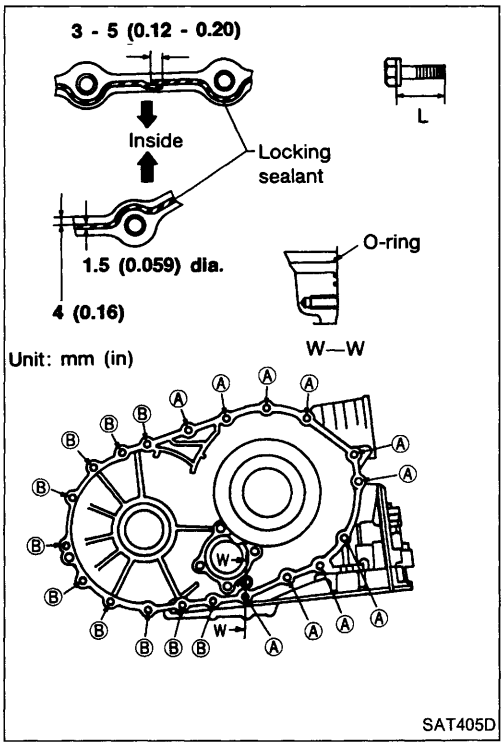
SAT030D

12. Install final drive assembly on transmission case.

Assembly (Cont'd)



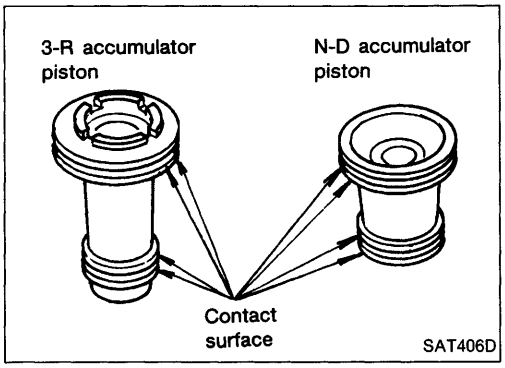
13. Install oil tube on converter housing.



14. Install O-ring on differential oil port of transmission case.
15. Install converter housing on transmission case.

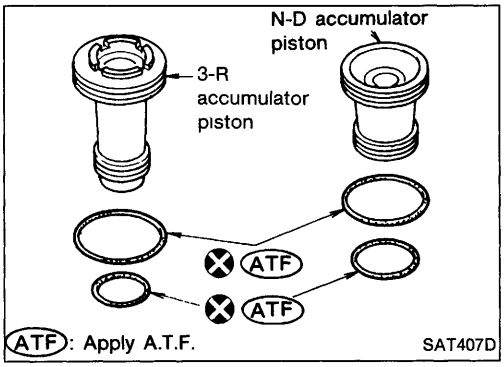
- **Apply locking sealant to mating surface of converter housing.**

Bolt	Length mm (in)
Ⓐ	30 (1.18)
Ⓑ	40 (1.57)



16. Install accumulator piston.

a. Check contact surface of accumulator piston for damage.



b. Install O-rings on accumulator piston.

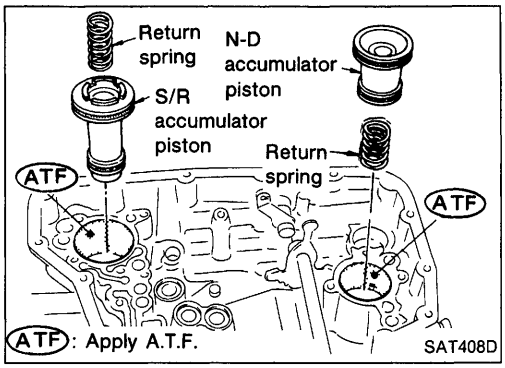
- Apply A.T.F. to O-rings.

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)

Assembly (Cont'd)



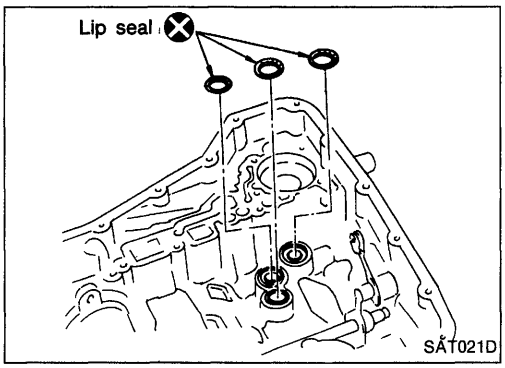
c. Install accumulator pistons and return springs on transmission case.

- **Apply A.T.F. to inner surface of transmission case.**

Return springs:

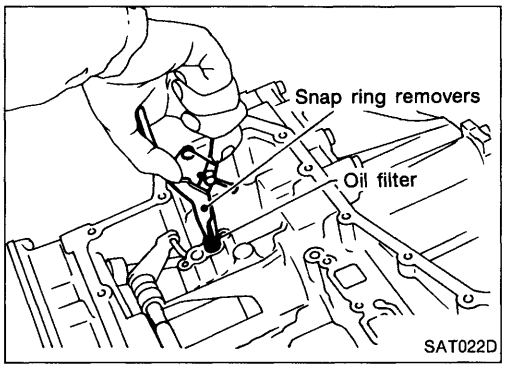
Unit: mm (in)

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)



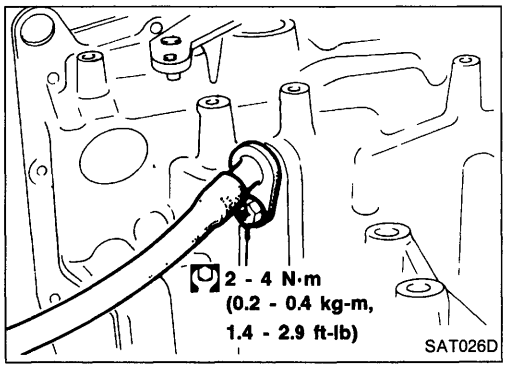
17. Install lip seals for band servo oil holes on transmission case.

- **Apply petroleum jelly to lip seals.**

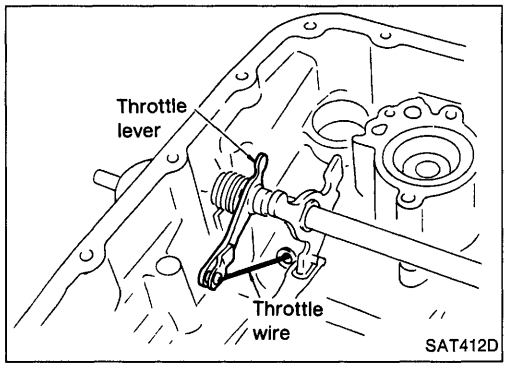


18. Install oil filter for governor valve.

- **Pay attention to direction of oil filter.**

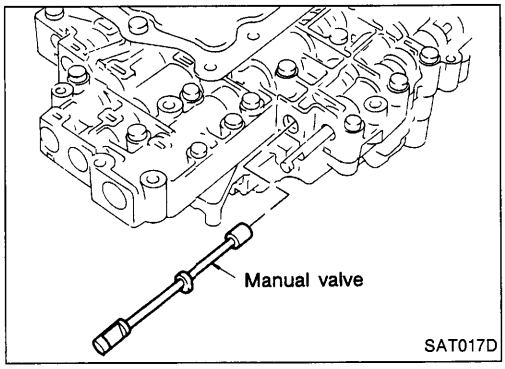


19. Install throttle wire to transmission case.

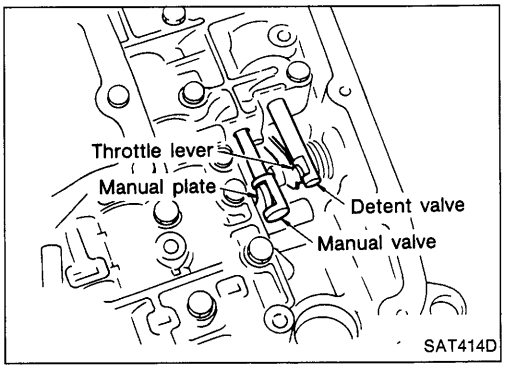


20. Install throttle wire to throttle lever.

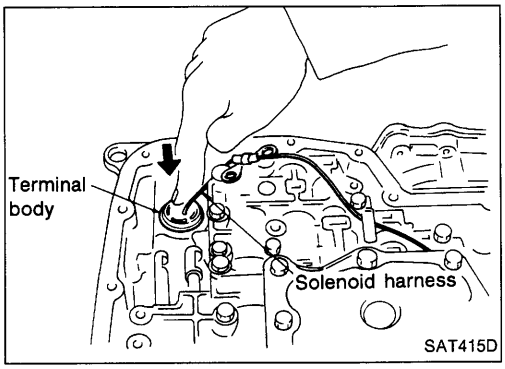
Assembly (Cont'd)



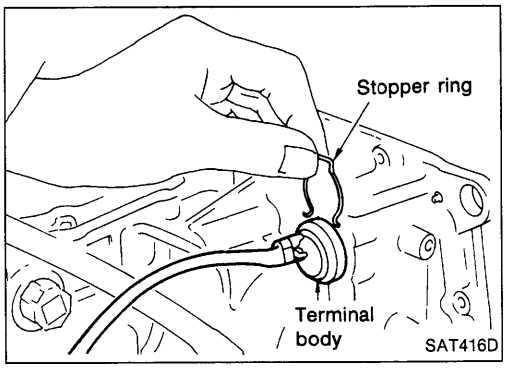
21. Install control valve assembly.
a. Insert manual valve into control valve assembly.
- **Apply A.T.F. to manual valve.**



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.

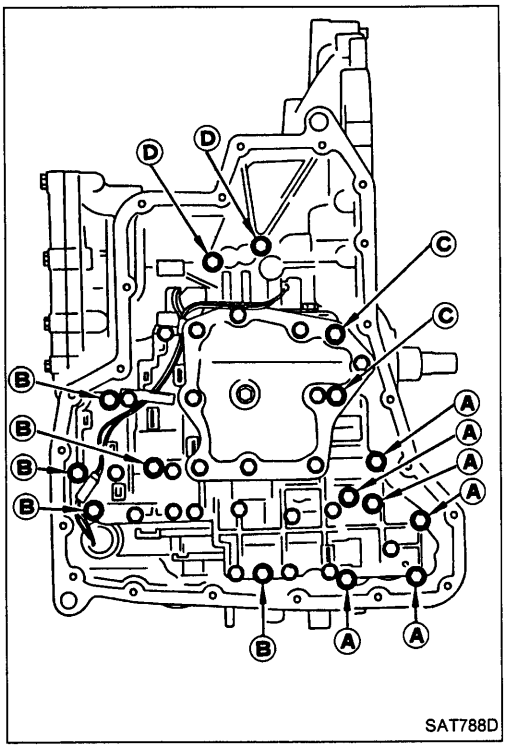


d. Pass solenoid harness through transmission case and install terminal body on transmission case by pushing it.



e. Install stopper ring to terminal body.

Assembly (Cont'd)

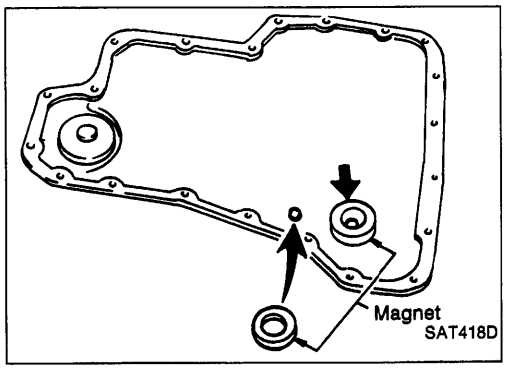


SAT788D

f. Tighten bolts Ⓐ, Ⓑ, Ⓒ and Ⓓ.

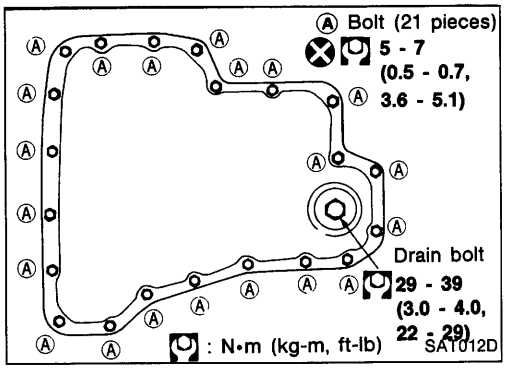
Bolt length, number and location:

Bolt	Ⓐ	Ⓑ	Ⓒ	Ⓓ
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



SAT418D

22. Install oil pan.
a. Attach a magnet to oil pan.

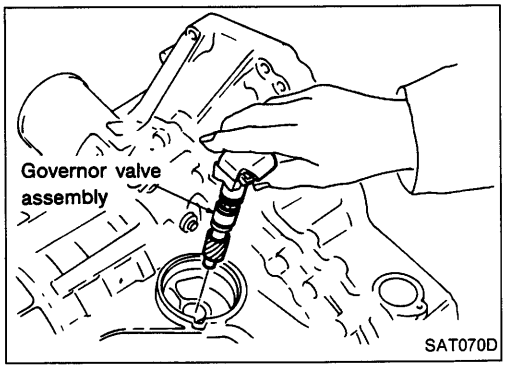


SAT012D

b. Install new oil pan gasket on transmission case.
c. Install oil pan on transmission case.

- **Always replace oil pan bolts as they are self-sealing bolts.**
- **Tighten four bolts in a criss-cross pattern to prevent dislocation of gasket.**

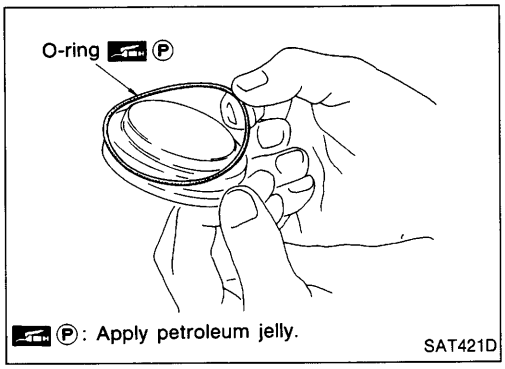
d. Tighten drain plug to the specified torque.



SAT070D

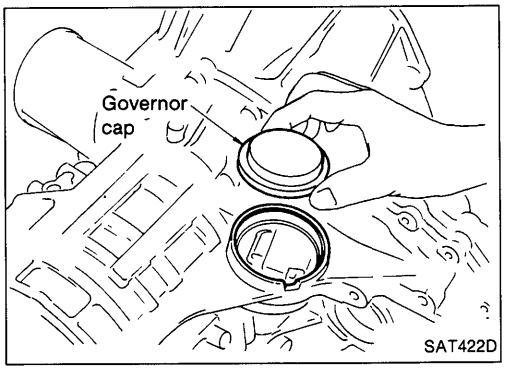
23. Install governor valve.
a. Install governor valve assembly into transmission case.

Assembly (Cont'd)

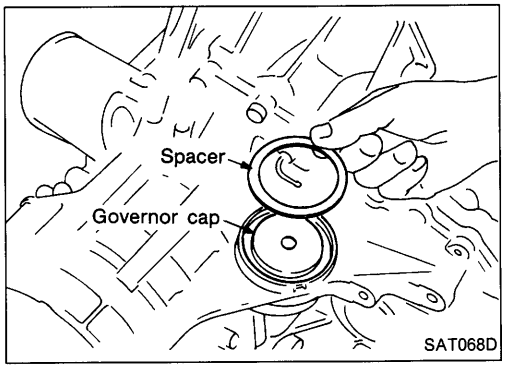


b. Install O-ring to governor cap.

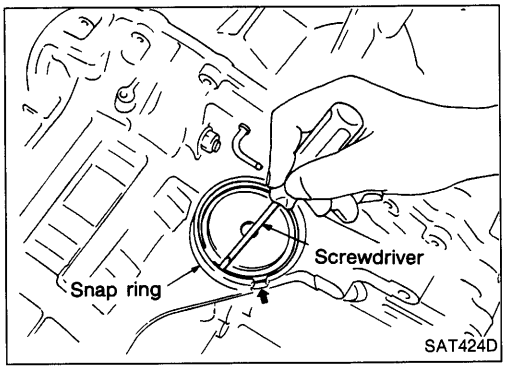
- **Apply A.T.F. to O-ring.**



c. Install governor cap onto transmission case.

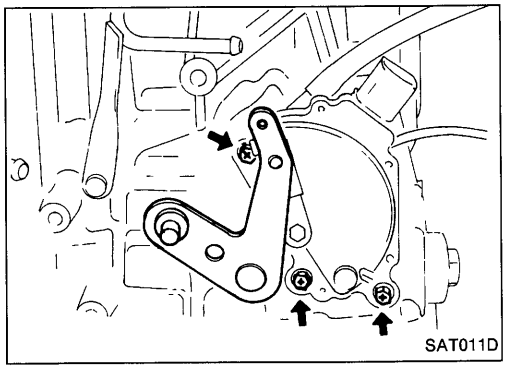


d. Place spacer on governor cap.



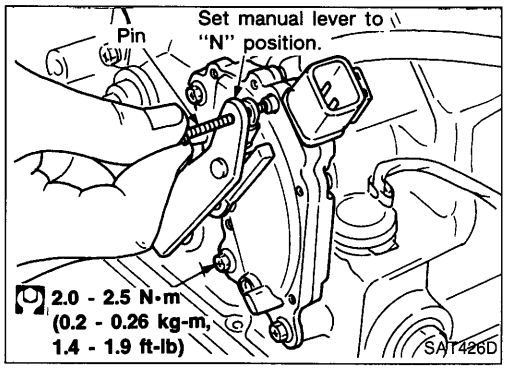
e. Install snap ring onto transmission case with screwdriver.

- **Align snap ring gap with the notch of transmission case.**

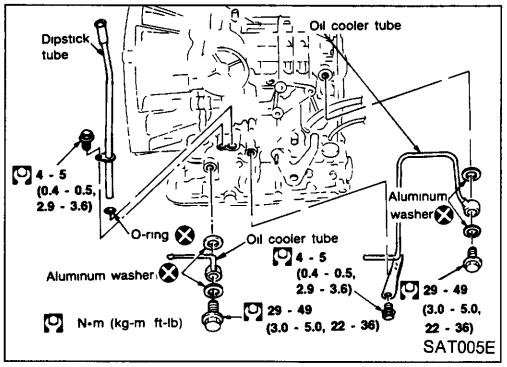


24. Install inhibitor switch.
a. Set manual lever in "P" position.
b. Temporarily install inhibitor switch on manual shaft.
c. Move selector lever to "N" position.

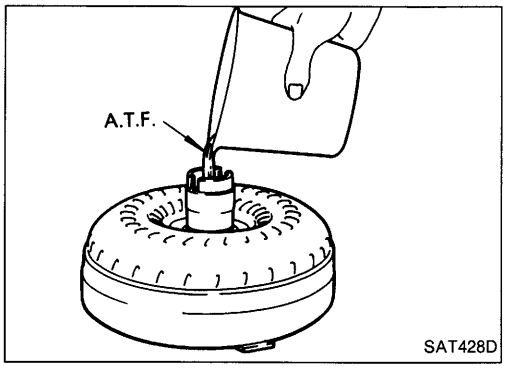
Assembly (Cont'd)



d. Insert 4.0 mm (0.157 in) dia. pin into adjustment hole in both inhibitor switch and manual shaft as near vertically as possible.
e. Tighten inhibitor switch fixing bolts.
f. Remove pin from adjustment hole after adjusting inhibitor switch.

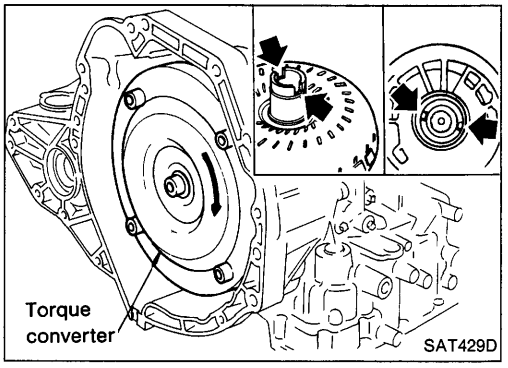


25. Install oil charging pipe and oil cooler tube to transmission case.

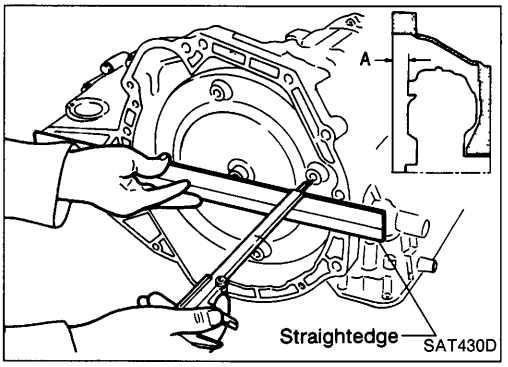


26. Install torque converter.
a. Pour A.T.F. into torque converter.

- **Approximately 1 liters (1-1/8 US qt, 7/8 Imp qt) of fluid are required for a new torque converter.**
- **When reusing old torque converter, add the same amount of fluid as was drained.**

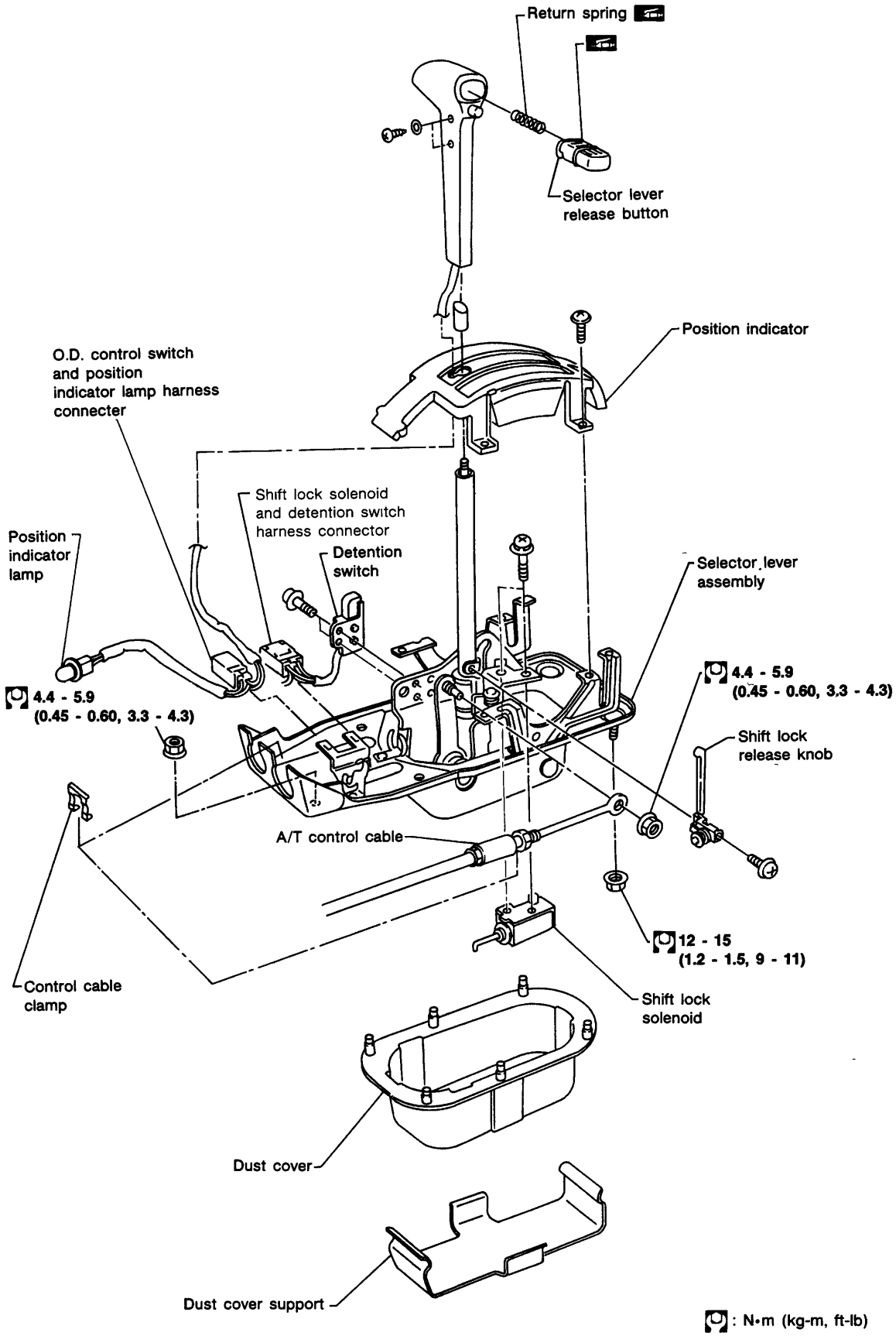


b. Install torque converter while aligning notches of torque converter with notches of oil pump.



c. Measure distance "A" to check that torque converter is in proper position.
Distance "A": 15.9 mm (0.626 in) or more

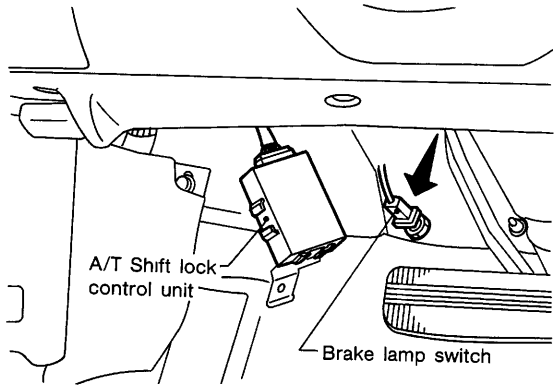
Shift Control Components



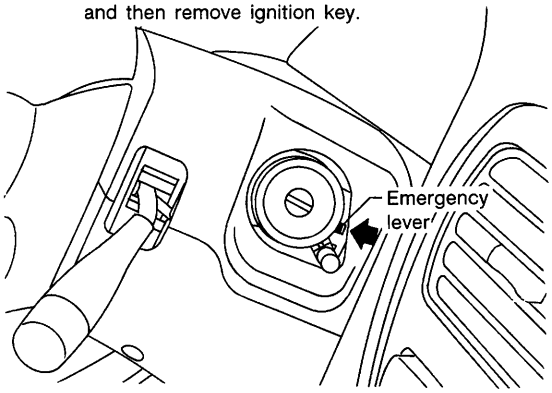
SAT876D

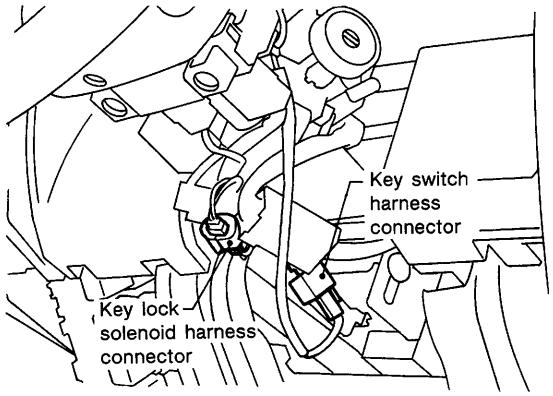
Shift Lock System

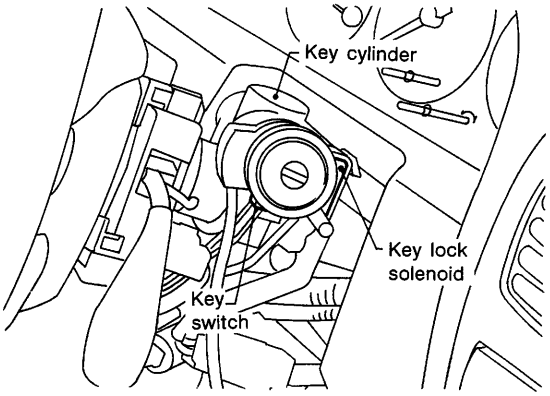
SHIFT LOCK SYSTEM PART LOCATIONS

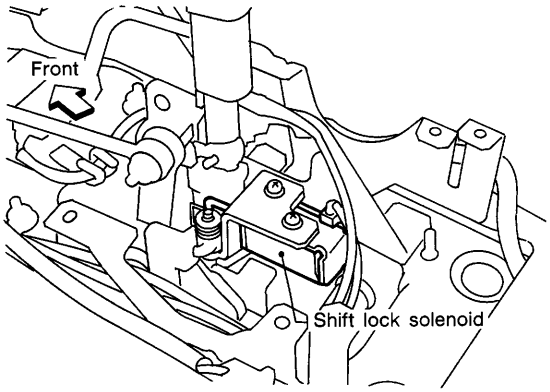


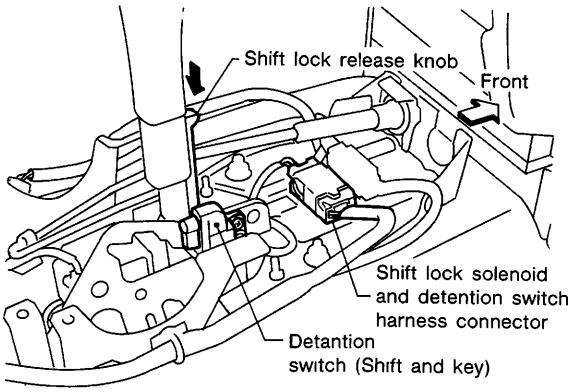
Emergency lever
When ignition key cannot be removed, even if selector lever is in "P" position, push emergency lever and then remove ignition key.









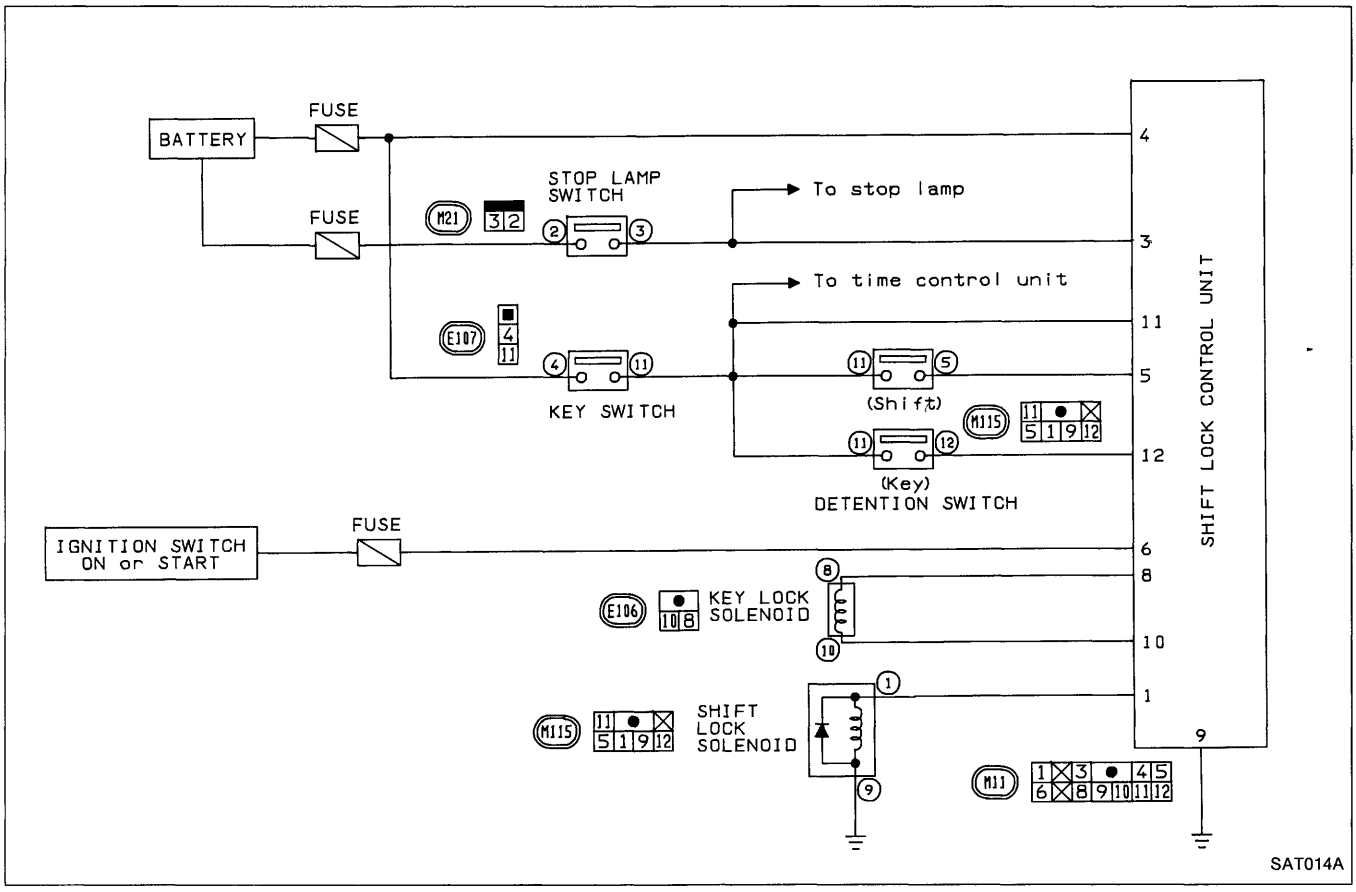


Shift lock release knob
When selector lever cannot be moved from "P" range even if ignition switch is in "ON" position and brake pedal is depressed, move selector lever from "P" range while pushing shift lock release knob.

SAT877D

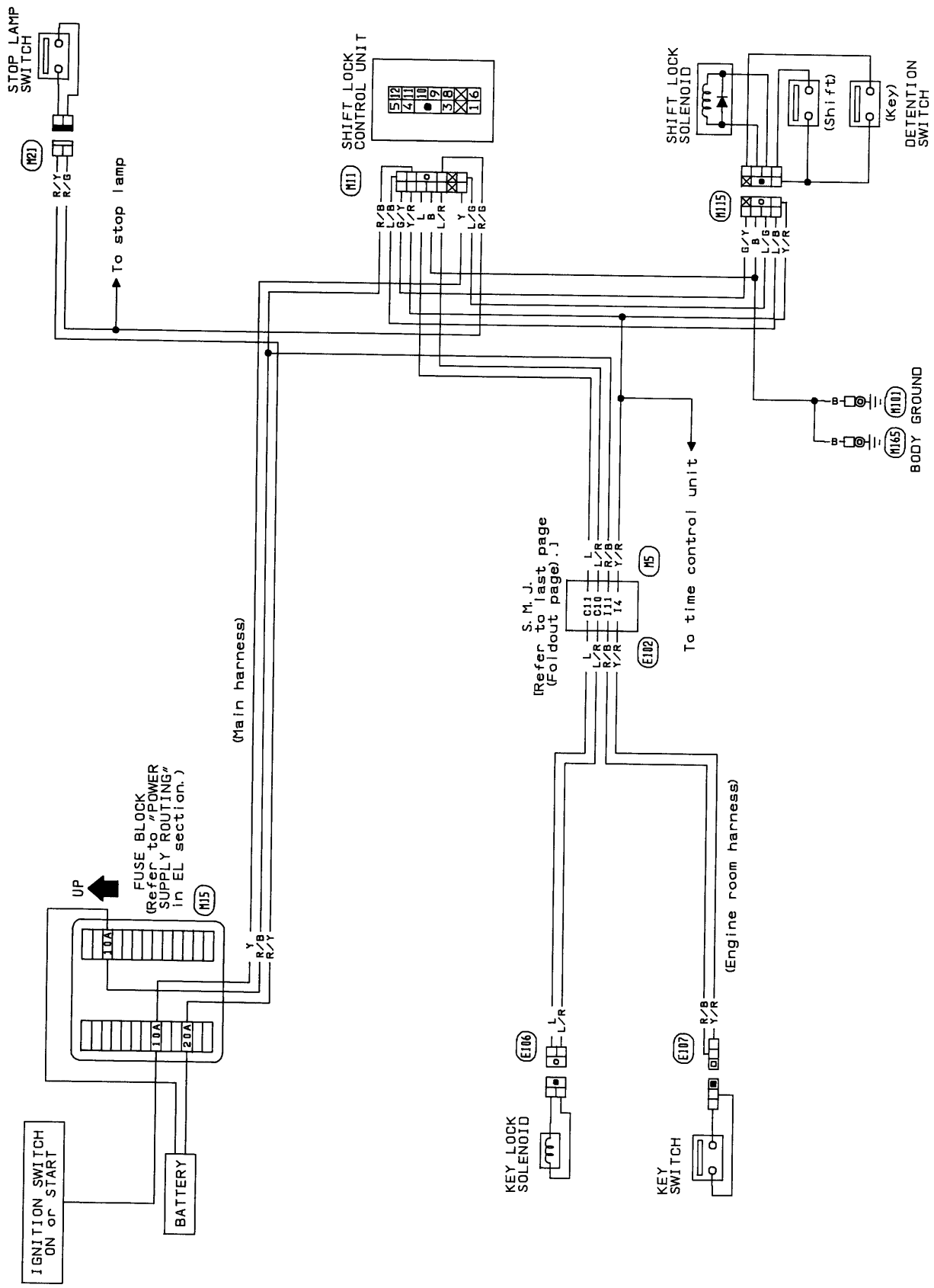
Shift Lock System (Cont'd)

CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK



Shift Lock System (Cont'd)

WIRING DIAGRAM



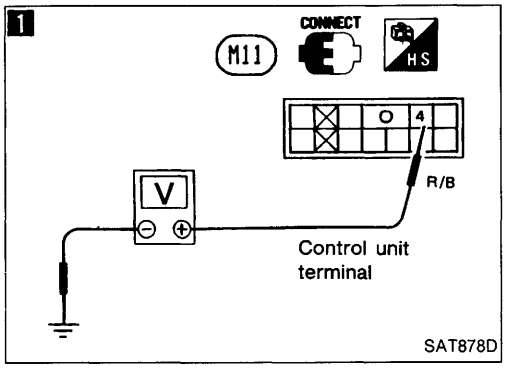
SAT013A

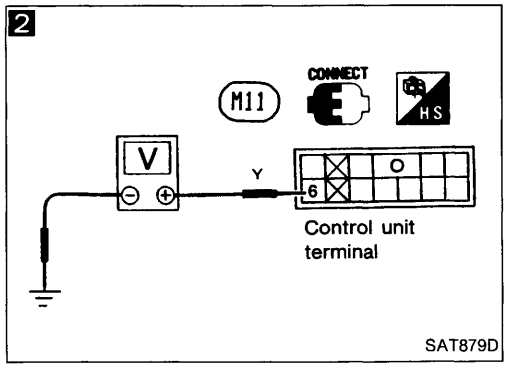
Shift Lock System (Cont'd)

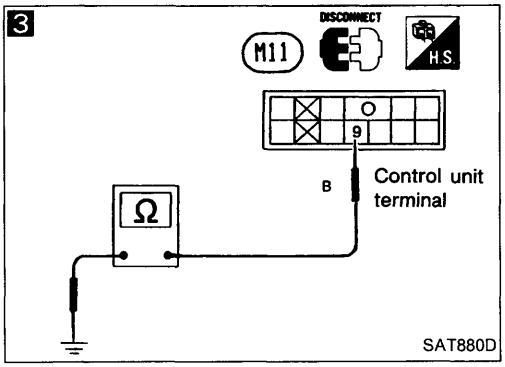
DIAGNOSTIC PROCEDURE 1

SYMPTOM:

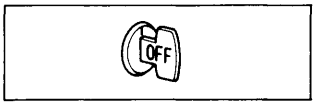
Selector lever cannot be moved from "P" range when ignition switch is set in "ON" position and brake pedal is applied, or can be moved when brake pedal is released.
Selector lever can be moved from "P" range when key is removed from key cylinder.







1 **CHECK POWER SOURCE.**

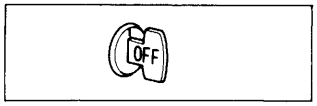
1. 

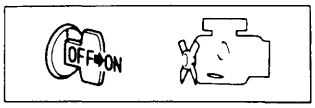
2. Check voltage between control unit harness terminal ④ and ground.
Battery voltage should exist.

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. 

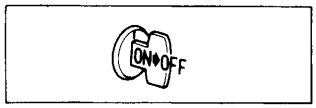
2. Check voltage between control unit harness terminal ⑥ and ground.
0V
3. 

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.

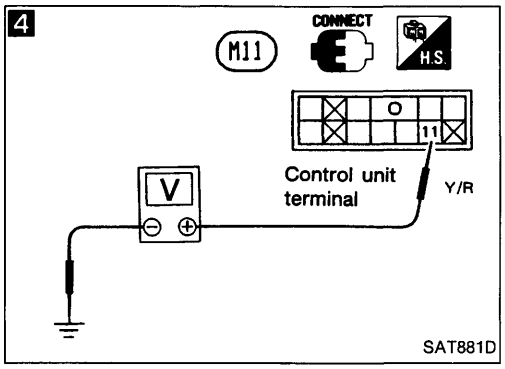
N.G. → Repair harness or connector.

O.K. ↓

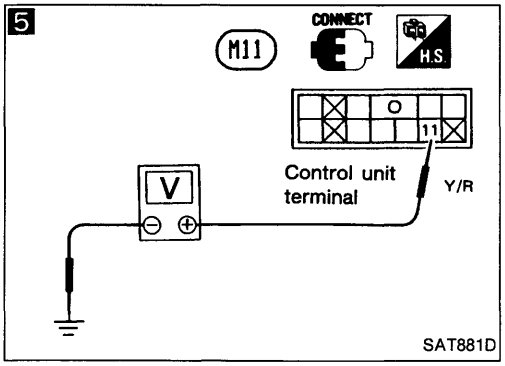
Ⓐ

Shift Lock System (Cont'd)

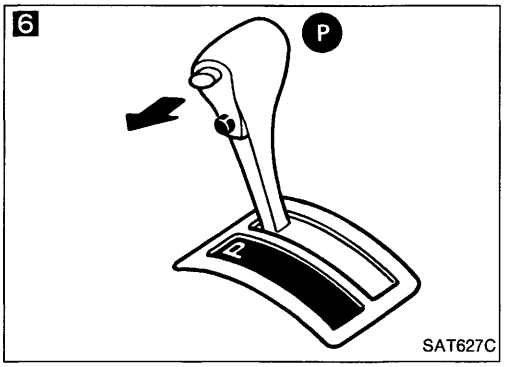
4



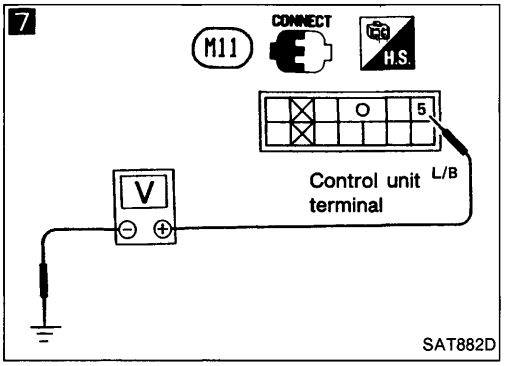
5



6

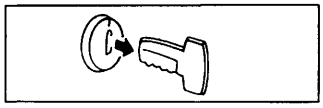


7



Ⓐ

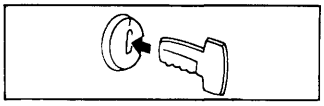
4 **CHECK INPUT SIGNAL (KEY SWITCH).**

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. ↓

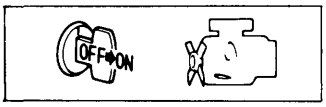
5

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 in "P" position and release selector lever button.

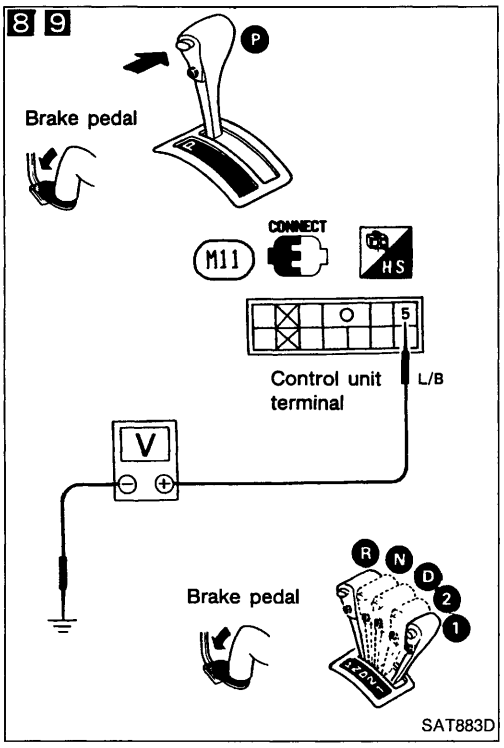
7 3. Check voltage between control unit harness terminal ⑤ and ground.
0V

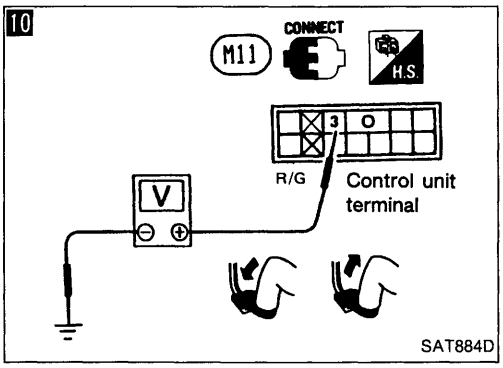
N.G. → Check detention switch—shift. (Refer to "COMPONENT CHECK".)

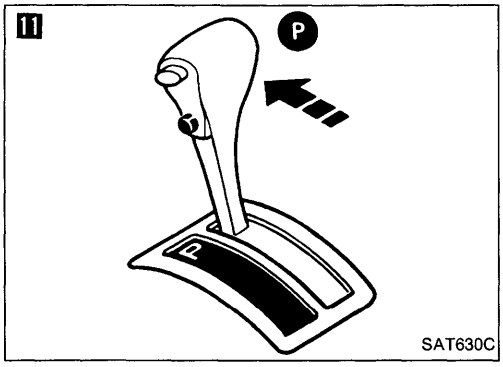
O.K. ↓

Ⓑ

Shift Lock System (Cont'd)



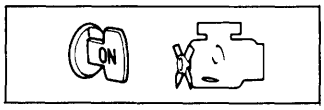




Ⓑ

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.

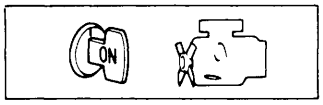
9 3. Check voltage between control unit harness terminal ⑤ and ground with selector lever set in any position except "P".
When selector lever cannot be moved from "P" position with brake pedal depressed, push shift lock release knob.
Battery voltage should exist.

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".)

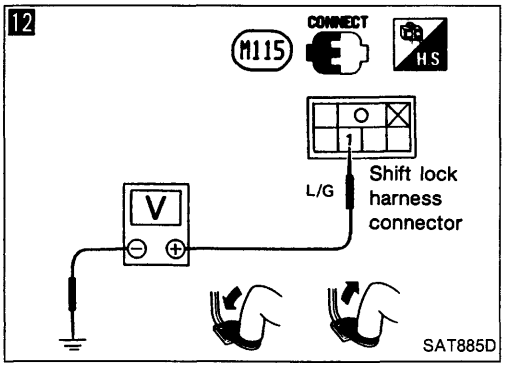
O.K. ↓

Set selector lever in "P" position.

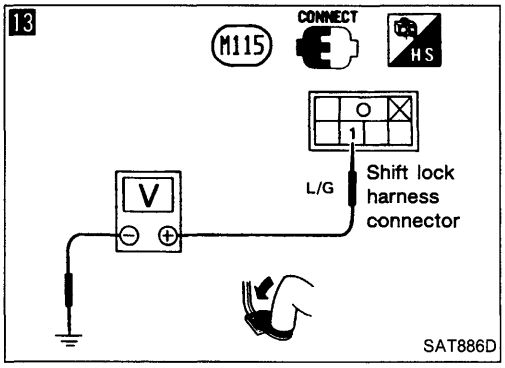
Ⓒ

Shift Lock System (Cont'd)

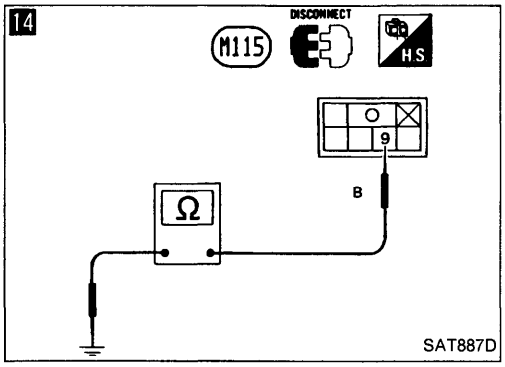
12



13



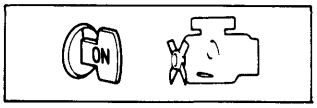
14



Ⓒ

CHECK OUTPUT SIGNAL (SHIFT LOCK SOLENOID).

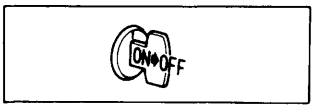
1.



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. ↓

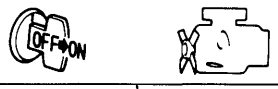
Check shift lock solenoid. (Refer to "COMPONENT CHECK".)

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. ↓

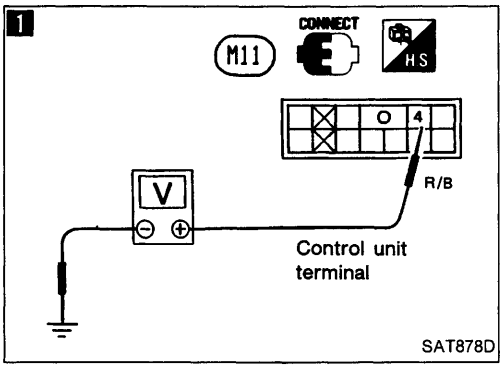
INSPECTION END

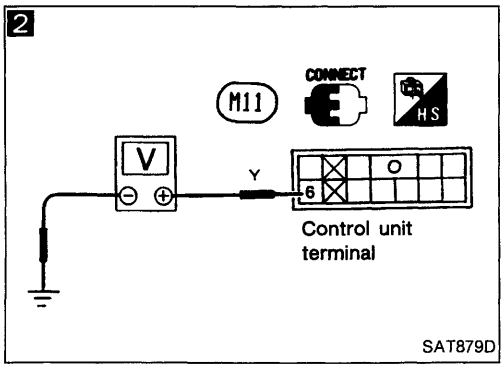
Shift Lock System (Cont'd)

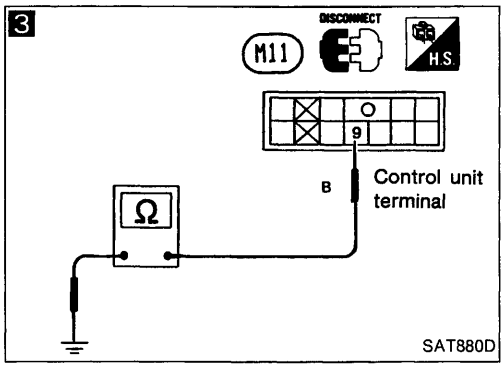
DIAGNOSTIC PROCEDURE 2

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".

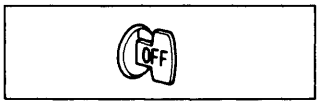






1

CHECK POWER SOURCE.

1. 

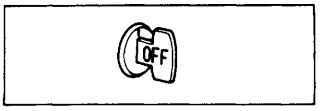
2. Check voltage between control unit harness terminals ②, ④ and ground.
   Battery voltage should exist.

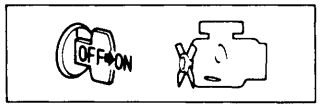
N.G. → Check the following items:
1. Harness continuity between battery and control unit harness terminals ②, ④
2. Fuse

O.K. ↓

2

CHECK IGNITION SIGNAL.

1. 

2. Check voltage between control unit harness terminal ⑥ and ground.
   0V
3. 

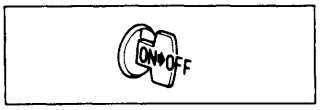
4. Check voltage between control unit harness terminal ⑥ and ground.
   Battery voltage should exist.

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.

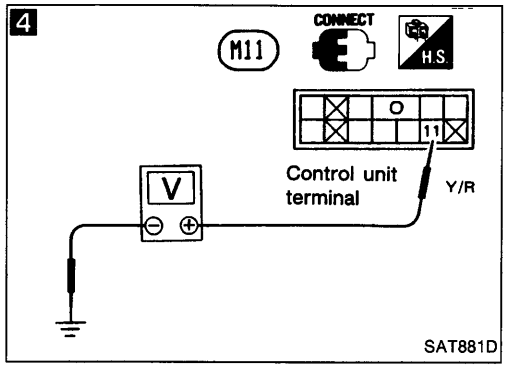
N.G. → Repair harness or connector.

O.K. ↓

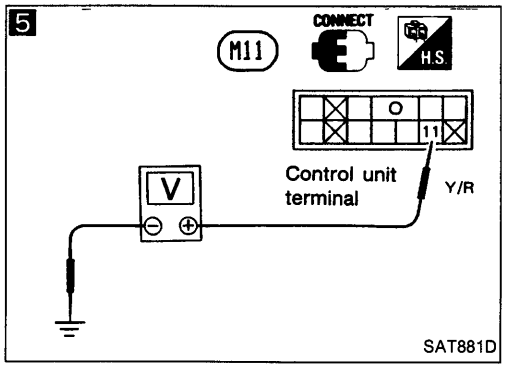
Ⓐ

Shift Lock System (Cont'd)

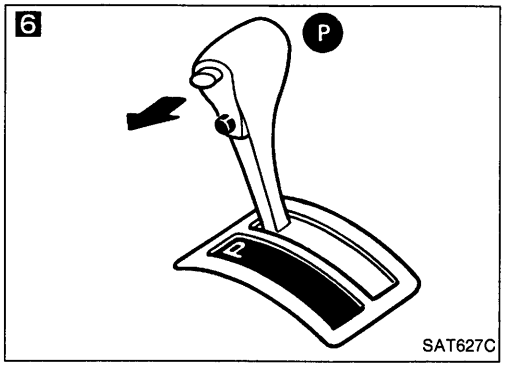
4



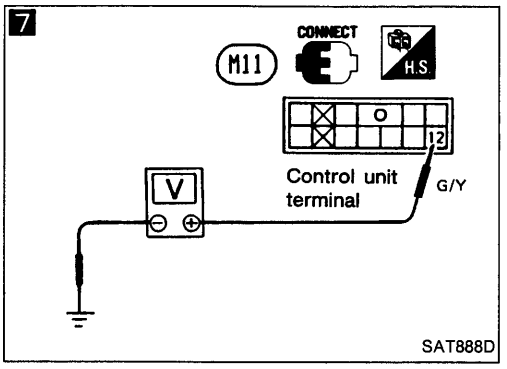
5



6

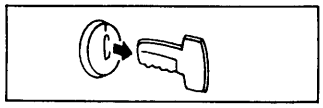


7



Ⓐ

4 **CHECK INPUT SIGNAL (KEY SWITCH).**

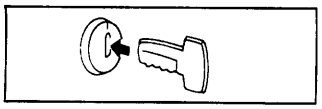
1. Reconnect control unit harness connector.
2. 

   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. ↓

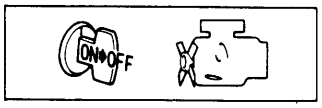
5

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 in "P" position and release selector lever button.

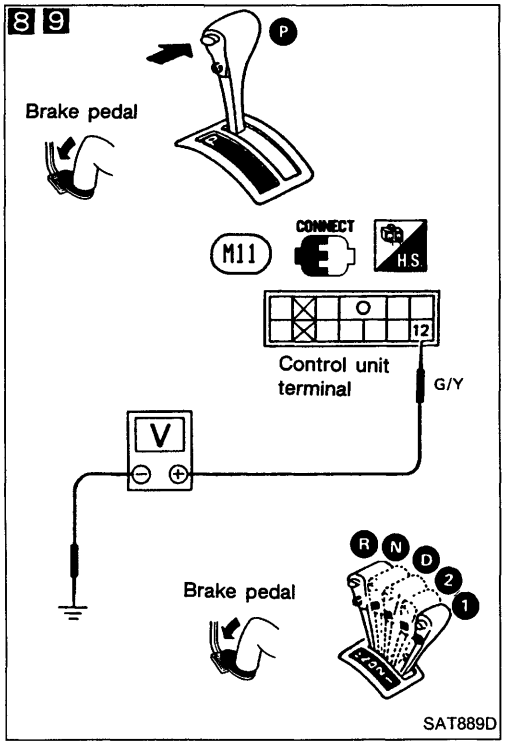
7 3. Check voltage between control unit harness terminal 12 and ground.
0V

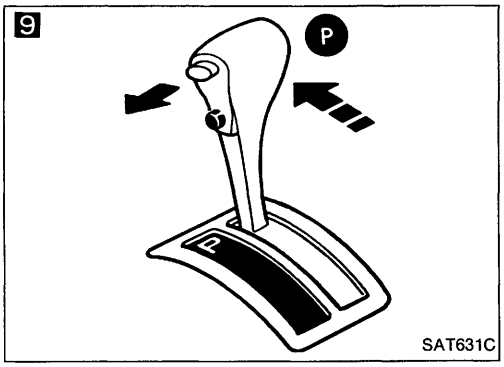
N.G. → Check detention switch—key. (Refer to "COMPONENT CHECK".)

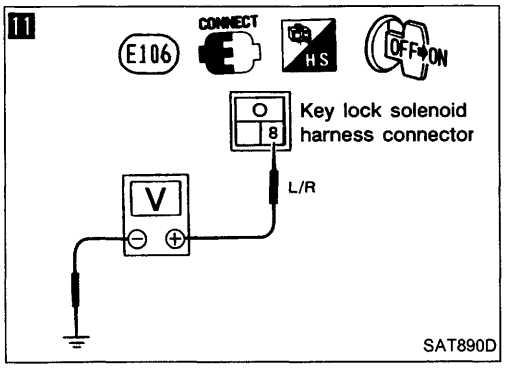
O.K. ↓

Ⓑ

Shift Lock System (Cont'd)

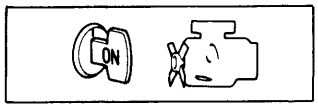






Ⓑ

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.

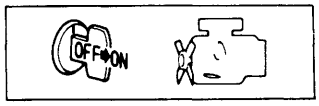
N.G. →
Check the following items:
1. Harness continuity between control unit harness terminal ⑫ and detention switch harness terminal ⑫
2. Harness continuity between detention switch harness terminal ⑪ and key switch harness terminal ⑪
3. Detention switch—key (Refer to "COMPONENT CHECK".)

O.K. ↓

10
Set selector lever in "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.

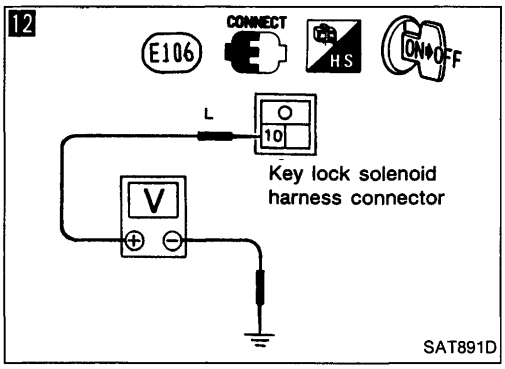
Replace control unit.

O.K. ↓

Ⓒ

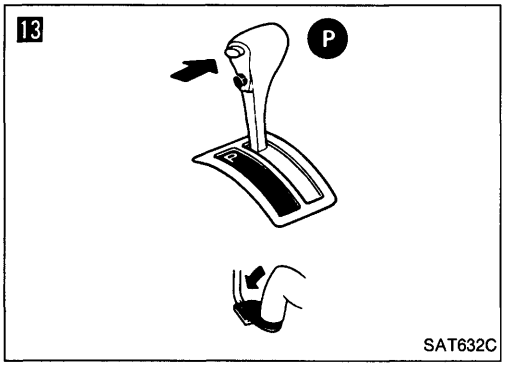
Shift Lock System (Cont'd)

12



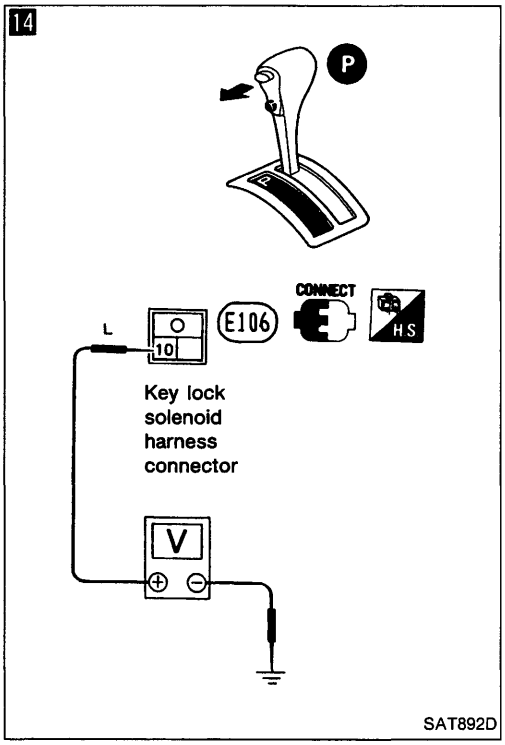
SAT891D

13



SAT632C

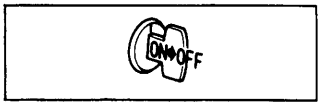
14



SAT892D

Ⓒ

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.

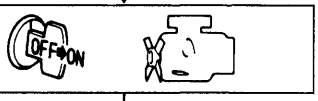
Battery voltage should exist for approximately 0.1 seconds.

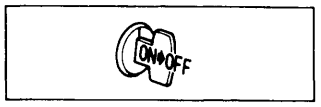
N.G. → Check harness continuity between shift lock solenoid harness terminal ⑩ and control unit harness terminal ⑩.

- O.K. → Replace control unit.
- N.G. → Repair harness or connector.

O.K.

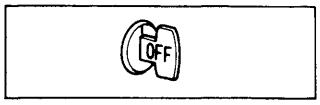
13



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.

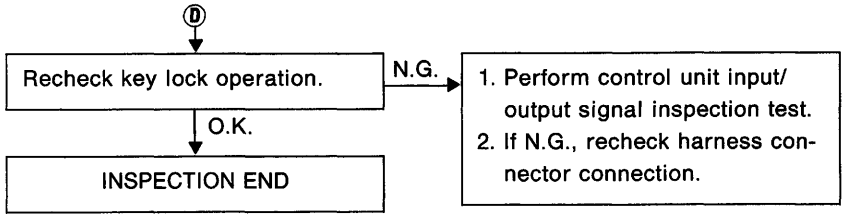
Check key lock solenoid. (Refer to "COMPONENT CHECK".)

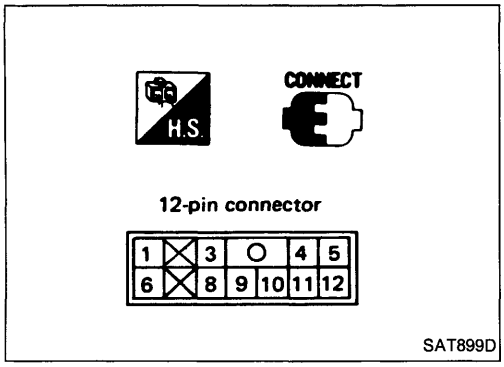
N.G. → Replace key lock solenoid.

O.K.

Ⓓ

Shift Lock System (Cont'd)





SHIFT LOCK CONTROL UNIT INSPECTION

- Measure voltage between each terminal by following "Shift lock control unit inspection table".
- Pin connector terminal layout.

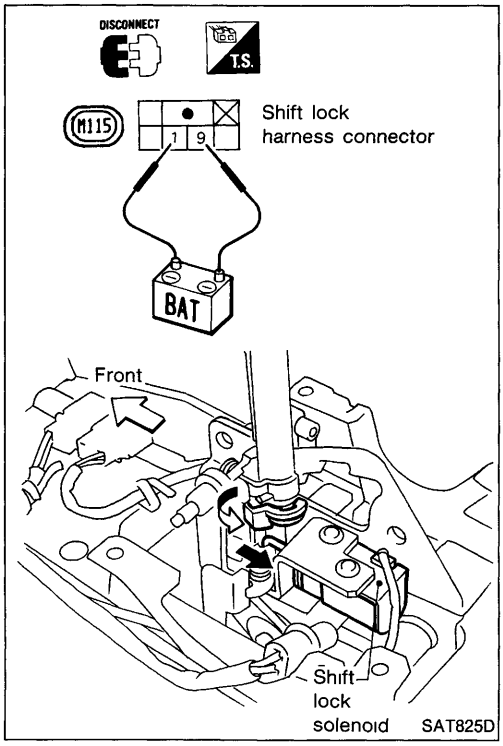
Shift Lock System (Cont'd)

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	9	Power source	Any condition	Battery voltage
3	9	Stop lamp switch	When brake pedal is depressed	Battery voltage
			When brake pedal is released	0V
4	9	Power source		Battery voltage
5	9	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	9	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	9	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

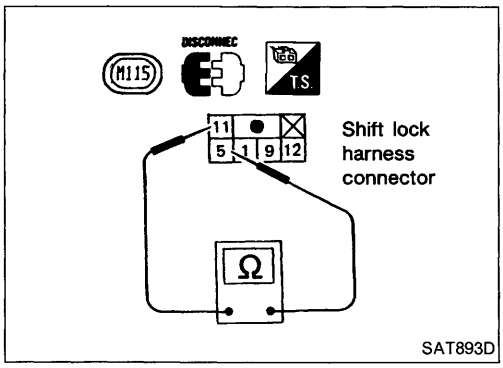
Shift Lock System (Cont'd)

COMPONENT CHECK



Shift lock solenoid

- Check operation by applying battery voltage to shift lock harness connector.

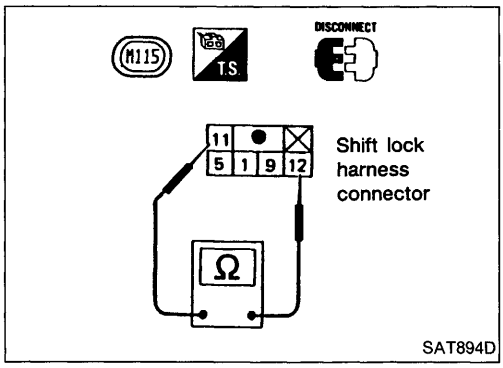


Detention switch

— Shift detention switch —

- Check continuity between terminals ⑤ and ⑪ of shift lock harness connector.

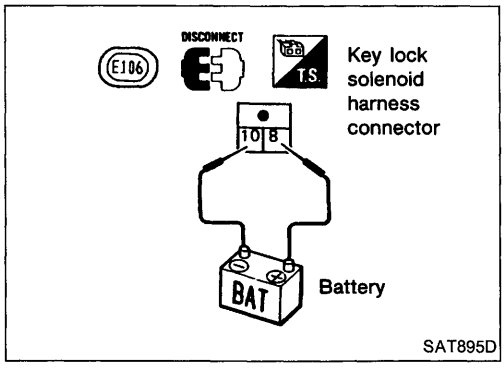
Condition	Continuity
When selector lever is set in "P" position with selector lever button pushed or selector lever is set in any position except "P".	Yes
Except the above	No



— 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



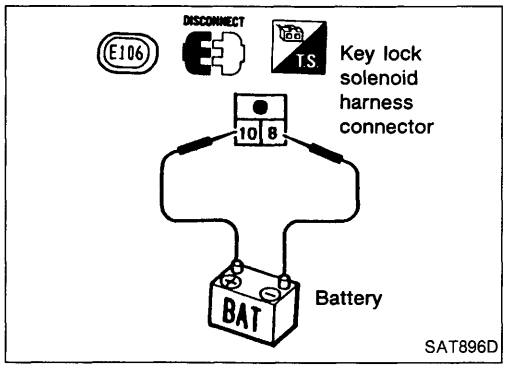
Key lock solenoid

— Operation of locking mechanism —

- Check operation by applying battery voltage to key lock solenoid harness connector.

Operating sound must be emitted.

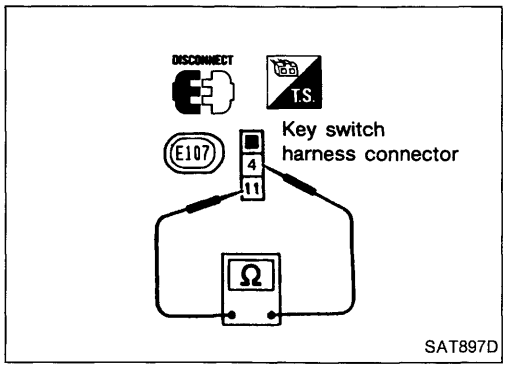
Shift Lock System (Cont'd)



— Operation of unlocking mechanism —

- Check operation by applying battery voltage to key lock solenoid harness connector.

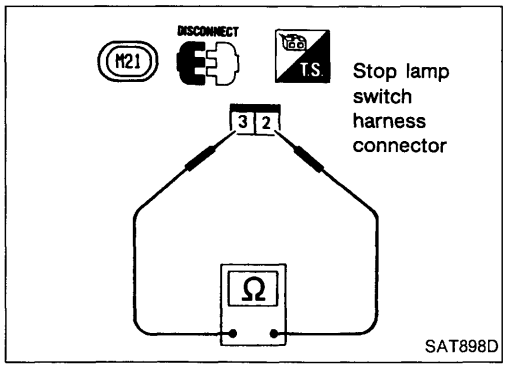
Operating sound must be emitted.



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

Engine	SR20DE	
Automatic transaxle model	RL4F03A	RL4F03V
Automatic transaxle assembly Model code number	31X71	31X72
Transaxle gear ratio		
1st	2.861	
2nd	1.562	
3rd	1.000	
4th	0.697	
Reverse	2.310	
Final drive	4.072	
Recommended oil	Automatic transmission fluid Type DEXRON™	
Oil capacity ℓ (US qt, Imp qt)	7.0 (7-3/8, 6-1/8)	

Specifications and Adjustments

VEHICLE SPEED WHEN SHIFTING GEARS

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	53 - 61 (33 - 38)	99 - 107 (62 - 66)	—	148 - 156 (92 - 97)	89 - 97 (55 - 60)	47 - 55 (29 - 34)	50 - 58 (31 - 36)
Half throttle	29 - 37 (18 - 23)	52 - 60 (32 - 37)	104 - 112 (65 - 70)	63 - 71 (39 - 44)	41 - 49 (25 - 30)	9 - 17 (6 - 11)	50 - 58 (31 - 36)

VEHICLE SPEED WHEN PERFORMING AND RELEASING LOCK-UP

Throttle opening	Gear position	Vehicle speed km/h (MPH)	
		Lock-up "ON"	Lock-up "OFF"
2/8	D_4	59 - 67 (37 - 42)	55 - 63 (34 - 39)

STALL REVOLUTION

Stall revolution	rpm	1,900 - 2,200

THROTTLE WIRE ADJUSTMENT

Unit: mm (in)

Throttle wire stroke	39 - 43 (1.54 - 1.69)

LINE PRESSURE

Engine speed rpm	Line pressure kPa (kg/cm², psi)			
	R range	D range	2 range	1 range
Idle	883 (9.0, 128)	637 (6.5, 92)	441 (4.5, 64)	1,138 (11.6, 165)
Stall	1,765 (18.0, 256)	1,275 (13.0, 185)	883 (9.0, 128)	1,275 (13.0, 185)

Specifications and Adjustments (Cont'd)

CONTROL VALVES

Control valve return springs

Unit: mm (in)

Parts		Part No.	Free length	Outer diameter
Upper body	Pressure modifier valve spring	31742-31X64	25.0 (0.984)	7.9 (0.311)
	Kickdown modifier valve spring	31742-31X03	40.5 (1.594)	9.0 (0.354)
	1-2 accumulator valve spring	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 modifier valve spring	31742-31X07	29.5 (1.161)	5.5 (0.217)
	4th speed cut valve spring	31835-21X02	23.2 (0.913)	6.2 (0.244)
	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	31802-31X06	32.0 (1.260)	10.0 (0.394)
	Pressure regulator valve spring	31742-31X00	52.24 (2.0567)	15.0 (0.591)
	3-4 shift valve spring	31762-31X11	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	31762-31X09	44.5 (1.752)	5.3 (0.209)
	Overrun clutch control valve spring	31742-31X60	48.9 (1.925)	7.0 (0.276)

Specifications and Adjustments (Cont'd)

CLUTCHES AND BRAKES

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 plate	Thickness mm (in)	Part number
	4.4 (0.173)	31537-31X00
	4.6 (0.181)	31537-31X01
	4.8 (0.189)	31537-31X02
	5.0 (0.197)	31537-31X03
	5.2 (0.205)	31537-31X04

High clutch		
Number of drive plates	4	
Number of driven plates	7	
Drive plate thickness mm (in)		
Standard	1.6 (0.063)	
Wear limit	1.4 (0.055)	
Clearance mm (in)		
Standard	1.4 - 1.8 (0.055 - 0.071)	
Allowable limit	2.6 (0.102)	
Thickness of retaining plate	Thickness mm (in)	Part number
	3.6 (0.142)	31537-31X10
	3.8 (0.150)	31537-31X11
	4.0 (0.157)	31537-31X12
	4.2 (0.165)	31537-31X13
	4.4 (0.173)	31537-31X14
	4.6 (0.181)	31537-31X15
	4.8 (0.189)	31537-31X16
	5.0 (0.197)	31537-31X17

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)

Low & reverse brake		
Number of drive plates	5	
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	2.8 (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)	

Clutches and brakes return spring

Unit: mm (in)

Parts		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		
Oil pump side clearance mm (in)	0.02 - 0.04 (0.0008 - 0.0016)	
Thickness of inner gear and outer gear	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)

Specifications and Adjustments (Cont'd)

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 F03A

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 side gear thrust washers for F03V

Thickness mm (in)		Part number
Viscous coupling side	0.70 - 0.75 (0.0276 - 0.0295)	38424-D2110
	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
	1.00 - 1.05 (0.0394 - 0.0413)	38424-D2116
	1.05 - 1.10 (0.0413 - 0.0433)	38424-D2117
	1.10 - 1.15 (0.0433 - 0.0453)	38424-D2118
	1.15 - 1.20 (0.0453 - 0.0472)	38424-D2119
	1.20 - 1.25 (0.0472 - 0.0492)	38424-D2120
	1.25 - 1.30 (0.0492 - 0.0512)	38424-D2121
	1.30 - 1.35 (0.0512 - 0.0531)	38424-D2122
Differential case side	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

Specifications and Adjustments (Cont'd)

Bearing preload

Differential side bearing preload "T" mm (in)	0.04 - 0.09 (0.0016 - 0.0035)

Turning torque

Turning torque of final drive assembly N·m (kg-cm, in-lb)	0.49 - 1.08 (5.0 - 11.0, 4.3 - 9.5)

Differential side bearing adjusting shims for F03A

Thickness mm (in)	Part number
0.40 (0.0157)	31499-21X07
0.44 (0.0173)	31499-21X08
0.48 (0.0189)	31499-21X09
0.52 (0.0205)	31499-21X10
0.56 (0.0220)	31499-21X11
0.60 (0.0236)	31499-21X12
0.64 (0.0252)	31499-21X13
0.68 (0.0268)	31499-21X14
0.72 (0.0283)	31499-21X15
0.76 (0.0299)	31499-21X16
0.80 (0.0315)	31499-21X17
0.84 (0.0331)	31499-21X18
0.88 (0.0346)	31499-21X19
0.92 (0.0362)	31499-21X20
1.44 (0.0567)	31499-21X21

Differential side bearing adjusting shims for F03V

Thickness mm (in)	Part number
0.28 (0.0110)	31439-31X00
0.32 (0.0126)	31439-31X01
0.36 (0.0142)	31439-31X02
0.40 (0.0157)	31439-31X03
0.44 (0.0173)	31439-31X04
0.48 (0.0189)	31439-31X05
0.52 (0.0205)	31439-31X06
0.56 (0.0220)	31439-31X07
0.60 (0.0236)	31439-31X08
0.64 (0.0252)	31439-31X09
0.68 (0.0268)	31439-31X10
0.72 (0.0283)	31439-31X11
0.76 (0.0299)	31439-31X12
0.80 (0.0315)	31439-31X13
0.84 (0.0331)	31439-31X14
0.88 (0.0346)	31439-31X15
0.92 (0.0362)	31439-31X16
0.96 (0.0378)	31439-31X17
1.44 (0.0567)	31439-31X18

Specifications and Adjustments (Cont'd)

Table for selecting differential side bearing adjusting shim(s) for F03A

Unit: mm (in)

Dial indicator deflection	Suitable shim(s)
0.31 - 0.35 (0.0122 - 0.0138)	0.40 (0.0157)
0.35 - 0.39 (0.0138 - 0.0154)	0.44 (0.0173)
0.39 - 0.43 (0.0154 - 0.0169)	0.48 (0.0189)
0.43 - 0.47 (0.0169 - 0.0185)	0.52 (0.0205)
0.47 - 0.51 (0.0185 - 0.0201)	0.56 (0.0220)
0.51 - 0.55 (0.0201 - 0.0217)	0.60 (0.0236)
0.55 - 0.59 (0.0217 - 0.0232)	0.64 (0.0252)
0.59 - 0.63 (0.0232 - 0.0248)	0.68 (0.0268)
0.63 - 0.67 (0.0248 - 0.0264)	0.72 (0.0283)
0.67 - 0.71 (0.0264 - 0.0280)	0.76 (0.0299)
0.71 - 0.75 (0.0280 - 0.0295)	0.80 (0.0315)
0.75 - 0.79 (0.0295 - 0.0311)	0.84 (0.0331)
0.79 - 0.83 (0.0311 - 0.0327)	0.88 (0.0346)
0.83 - 0.87 (0.0327 - 0.0343)	0.92 (0.0362)
0.87 - 0.91 (0.0343 - 0.0358)	0.48 (0.0189) + 0.48 (0.0189)
0.91 - 0.95 (0.0358 - 0.0374)	0.48 (0.0189) + 0.52 (0.0205)
0.95 - 0.99 (0.0374 - 0.0390)	0.52 (0.0205) + 0.52 (0.0205)
0.99 - 1.03 (0.0390 - 0.0406)	0.52 (0.0205) + 0.56 (0.0220)
1.03 - 1.07 (0.0406 - 0.0421)	0.56 (0.0220) + 0.56 (0.0220)
1.07 - 1.11 (0.0421 - 0.0437)	0.56 (0.0220) + 0.60 (0.0236)
1.11 - 1.15 (0.0437 - 0.0453)	0.60 (0.0236) + 0.60 (0.0236)
1.15 - 1.19 (0.0453 - 0.0469)	0.60 (0.0236) + 0.64 (0.0252)
1.19 - 1.23 (0.0469 - 0.0484)	0.64 (0.0252) + 0.64 (0.0252)
1.23 - 1.27 (0.0484 - 0.0500)	0.64 (0.0252) + 0.68 (0.0268)
1.27 - 1.31 (0.0500 - 0.0516)	0.68 (0.0268) + 0.68 (0.0268)
1.31 - 1.35 (0.0516 - 0.0531)	0.68 (0.0268) + 0.72 (0.0283)
1.35 - 1.39 (0.0531 - 0.0547)	1.44 (0.0567)
1.39 - 1.43 (0.0547 - 0.0563)	0.72 (0.0283) + 0.76 (0.0299)
1.43 - 1.47 (0.0563 - 0.0579)	0.76 (0.0299) + 0.76 (0.0299)
1.47 - 1.51 (0.0579 - 0.0594)	0.76 (0.0299) + 0.80 (0.0315)
1.51 - 1.55 (0.0594 - 0.0610)	0.80 (0.0315) + 0.80 (0.0315)
1.55 - 1.59 (0.0610 - 0.0626)	0.80 (0.0315) + 0.84 (0.0331)
1.59 - 1.63 (0.0626 - 0.0642)	0.84 (0.0331) + 0.84 (0.0331)
1.63 - 1.67 (0.0642 - 0.0657)	0.84 (0.0331) + 0.88 (0.0346)
1.67 - 1.71 (0.0657 - 0.0673)	0.88 (0.0346) + 0.88 (0.0346)
1.71 - 1.75 (0.0673 - 0.0689)	0.88 (0.0346) + 0.92 (0.0362)
1.75 - 1.79 (0.0689 - 0.0705)	0.92 (0.0362) + 0.92 (0.0362)
1.79 - 1.83 (0.0705 - 0.0720)	0.44 (0.0173) + 1.44 (0.0567)
1.83 - 1.87 (0.0720 - 0.0736)	0.48 (0.0189) + 1.44 (0.0567)
1.87 - 1.91 (0.0736 - 0.0752)	0.52 (0.0205) + 1.44 (0.0567)
1.91 - 1.95 (0.0752 - 0.0768)	0.56 (0.0220) + 1.44 (0.0567)

Table for selecting differential side bearing adjusting shim(s) for F03V

Unit: mm (in)

Dial indicator deflection	Suitable shim(s)
0.19 - 0.23 (0.0075 - 0.0091)	0.28 (0.0110)
0.23 - 0.27 (0.0091 - 0.0106)	0.32 (0.0126)
0.27 - 0.31 (0.0106 - 0.0122)	0.36 (0.0142)
0.31 - 0.35 (0.0122 - 0.0138)	0.40 (0.0157)
0.35 - 0.39 (0.0138 - 0.0154)	0.44 (0.0173)
0.39 - 0.43 (0.0154 - 0.0169)	0.48 (0.0189)
0.43 - 0.47 (0.0169 - 0.0185)	0.52 (0.0205)
0.47 - 0.51 (0.0185 - 0.0201)	0.56 (0.0220)
0.51 - 0.55 (0.0201 - 0.0217)	0.60 (0.0236)
0.55 - 0.59 (0.0217 - 0.0232)	0.64 (0.0252)
0.59 - 0.63 (0.0232 - 0.0248)	0.68 (0.0268)
0.63 - 0.67 (0.0248 - 0.0264)	0.72 (0.0283)
0.67 - 0.71 (0.0264 - 0.0280)	0.76 (0.0299)
0.71 - 0.75 (0.0280 - 0.0295)	0.80 (0.0315)
0.75 - 0.79 (0.0295 - 0.0311)	0.84 (0.0331)
0.79 - 0.83 (0.0311 - 0.0327)	0.88 (0.0346)
0.83 - 0.87 (0.0327 - 0.0343)	0.92 (0.0362)
0.87 - 0.91 (0.0343 - 0.0358)	0.48 (0.0189) + 0.48 (0.0189)
0.91 - 0.95 (0.0358 - 0.0374)	0.48 (0.0189) + 0.52 (0.0205)
0.95 - 0.99 (0.0374 - 0.0390)	0.52 (0.0205) + 0.52 (0.0205)
0.99 - 1.03 (0.0390 - 0.0406)	0.52 (0.0205) + 0.56 (0.0220)
1.03 - 1.07 (0.0406 - 0.0421)	0.56 (0.0220) + 0.56 (0.0220)
1.07 - 1.11 (0.0421 - 0.0437)	0.56 (0.0220) + 0.60 (0.0236)
1.11 - 1.15 (0.0437 - 0.0453)	0.60 (0.0236) + 0.60 (0.0236)
1.15 - 1.19 (0.0453 - 0.0469)	0.60 (0.0236) + 0.64 (0.0252)
1.19 - 1.23 (0.0469 - 0.0484)	0.64 (0.0252) + 0.64 (0.0252)
1.23 - 1.27 (0.0484 - 0.0500)	0.64 (0.0252) + 0.68 (0.0268)
1.27 - 1.31 (0.0500 - 0.0516)	0.68 (0.0268) + 0.68 (0.0268)
1.31 - 1.35 (0.0516 - 0.0531)	0.68 (0.0268) + 0.72 (0.0283)
1.35 - 1.39 (0.0531 - 0.0547)	1.44 (0.0567)
1.39 - 1.43 (0.0547 - 0.0563)	0.72 (0.0283) + 0.76 (0.0299)
1.43 - 1.47 (0.0563 - 0.0579)	0.76 (0.0299) + 0.76 (0.0299)
1.47 - 1.51 (0.0579 - 0.0594)	0.76 (0.0299) + 0.80 (0.0315)
1.51 - 1.55 (0.0594 - 0.0610)	0.80 (0.0315) + 0.80 (0.0315)
1.55 - 1.59 (0.0610 - 0.0626)	0.80 (0.0315) + 0.84 (0.0331)
1.59 - 1.63 (0.0626 - 0.0642)	0.84 (0.0331) + 0.84 (0.0331)
1.63 - 1.67 (0.0642 - 0.0657)	0.84 (0.0331) + 0.88 (0.0346)
1.67 - 1.71 (0.0657 - 0.0673)	0.88 (0.0346) + 0.88 (0.0346)
1.71 - 1.75 (0.0673 - 0.0689)	0.88 (0.0346) + 0.92 (0.0362)
1.75 - 1.79 (0.0689 - 0.0705)	0.92 (0.0362) + 0.92 (0.0362)
1.79 - 1.83 (0.0705 - 0.0720)	0.92 (0.0362) + 0.96 (0.0378)
1.83 - 1.87 (0.0720 - 0.0736)	0.96 (0.0378) + 0.96 (0.0378)
1.87 - 1.91 (0.0736 - 0.0752)	0.52 (0.0205) + 1.44 (0.0567)
1.91 - 1.95 (0.0752 - 0.0768)	0.56 (0.0220) + 1.44 (0.0567)

Specifications and Adjustments (Cont'd)

REDUCTION GEAR

Bearing preload

Reduction gear bearing preload mm (in)	0.05 (0.0020)

Turning torque

Turning torque of reduction gear N·m (kg-cm, in-lb)	0.11 - 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 - 0.0161)	1.34 (0.0528)
1.41 - 1.45 (0.0161 - 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)

End play

Output shaft end play	mm (in)	0 - 0.5 (0 - 0.020)

Output shaft adjusting shims

Thickness mm (in)	Part number
0.56 (0.0220)	31438-31X46
0.96 (0.0378)	31438-31X47
1.36 (0.0535)	31438-31X48

BEARING RETAINER

Seal ring clearance

Bearing retainer seal ring clearance mm (in)	
Standard	0.10 - 0.25 (0.0039 - 0.0098)
Allowable limit	0.25 (0.0098)

TOTAL END PLAY

Total end play	mm (in)	0.25 - 0.55 (0.0098 - 0.0217)

Bearing race for adjusting total end play

Thickness mm (in)	Part number
0.6 (0.024)	31435-31X01
0.8 (0.031)	31435-31X02
1.0 (0.039)	31435-31X03
1.2 (0.047)	31435-31X04
1.4 (0.055)	31435-31X05
1.6 (0.063)	31435-31X06
1.8 (0.071)	31435-31X07
2.0 (0.079)	31435-31X08
2.2 (0.087)	31435-31X09

Specifications and Adjustments (Cont'd)

REVERSE CLUTCH END PLAY

Reverse clutch end play mm (in)	0.65 - 1.0 (0.0256 - 0.0394)

Thrust washer 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	56.4 (2.220)	21.0 (0.827)
N-D accumulator	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

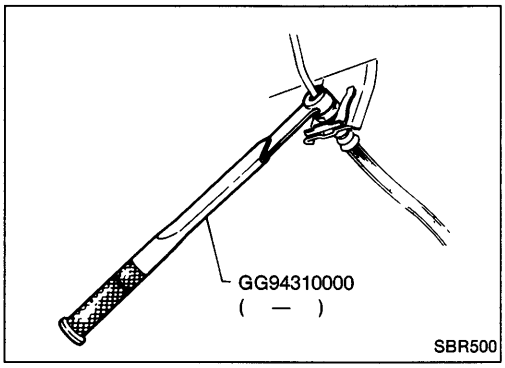
Distance between end of converter housing and torque converter	15.9 mm (0.626 in) or more
Drive plate runout limit	0.2 mm (0.008 in)

FRONT AXLE & FRONT SUSPENSION

SECTION FA

CONTENTS

PRECAUTIONS AND PREPARATION ..... FA- 2
FRONT AXLE AND FRONT SUSPENSION ..... FA- 3
CHECK AND ADJUSTMENT ..... FA- 4
FRONT AXLE ..... FA- 9
FRONT AXLE — Wheel Hub and Knuckle FA-10
FRONT AXLE — Drive Shaft FA-15
FRONT SUSPENSION FA-23
FRONT SUSPENSION — Coil Spring and Shock Absorber FA-24
FRONT SUSPENSION — Third Link and Upper Link FA-26
FRONT SUSPENSION — Stabilizer Bar FA-29
FRONT SUSPENSION — Transverse Link and Lower Ball Joint FA-30
SERVICE DATA AND SPECIFICATIONS (S.D.S.) FA-31

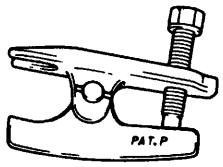
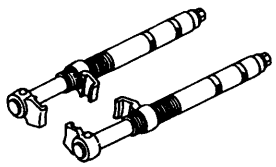
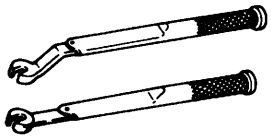
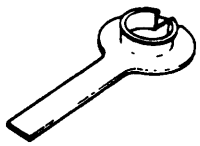
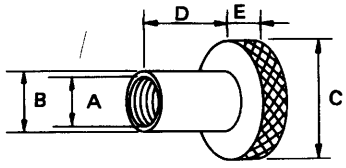


Precautions

- **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.**

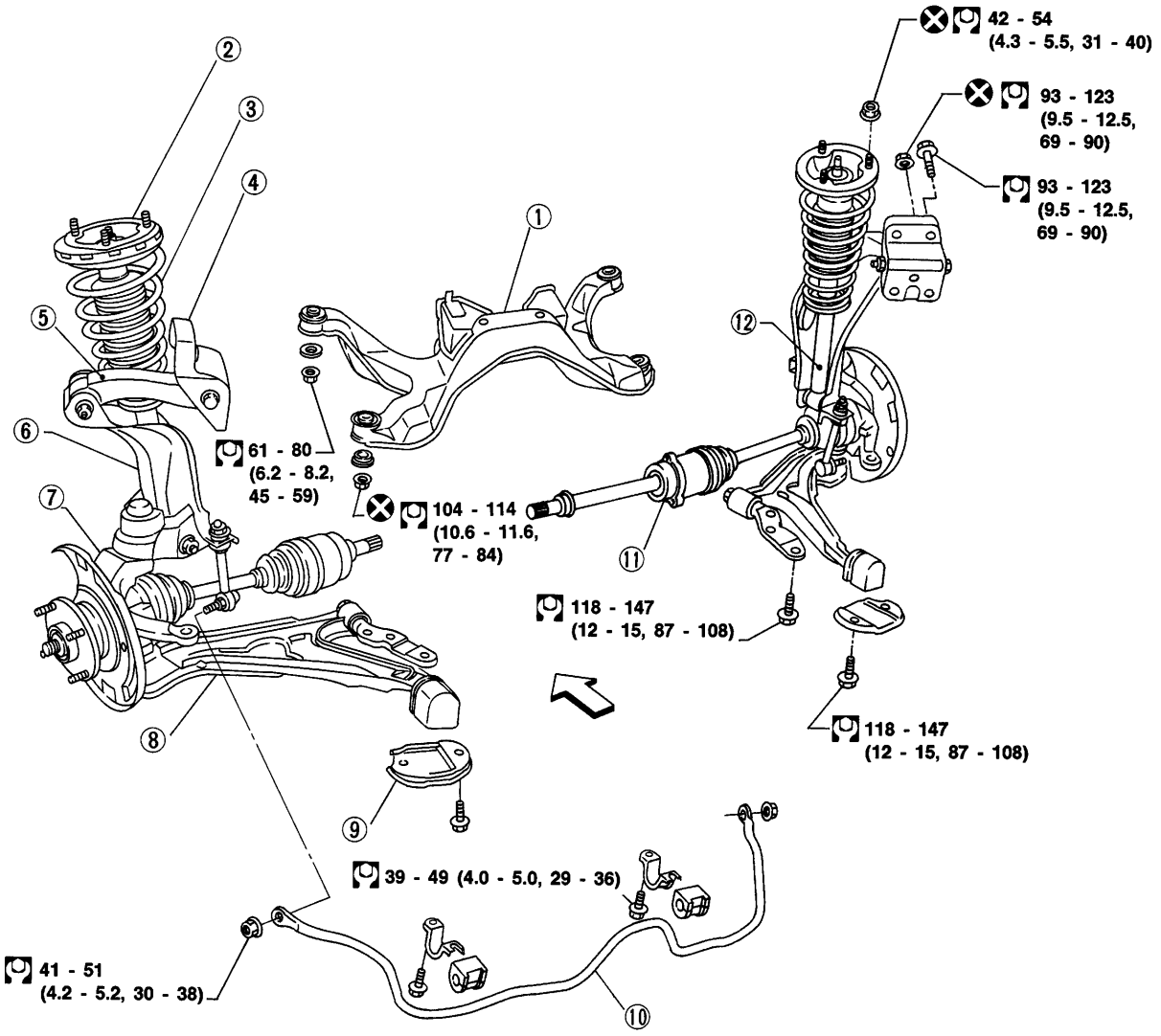
Preparation

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description	
HT72520000 (J25730-A) Ball joint remover		Removing tie-rod outer end and lower ball joint
HT71780000 (—) Spring compressor		Removing and installing coil spring
GG94310000 (—) Flare nut torque wrench		Removing and installing brake piping
KV38106700 (J34296) KV38106800 (J34297) Differential side oil seal protector	 L.H.: KV38106700 R.H.: KV38106800	Installing drive shaft
IM23600800 (—) Attachment Wheel alignment		Measure wheel alignment **A: Screw M24 x 1.5** **B: 35 (1.38) dia.** **C: 65 (2.56) dia.** **D: 56 (2.20)** **E: 12 (0.47)** Unit: mm (in)

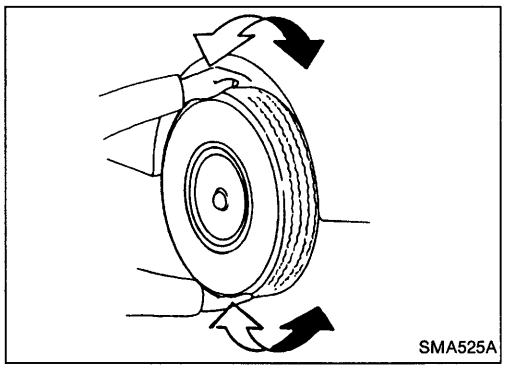
When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.

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



SFA908A

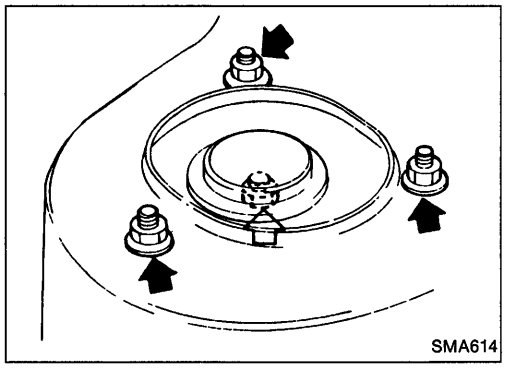
① Front suspension member
② Shock absorber mounting insulator
③ Coil spring
④ Upper link bracket
⑤ Upper link
⑥ Third link
⑦ Knuckle
⑧ Transverse link
⑨ Clamp
⑩ Stabilizer bar
⑪ Drive shaft
⑫ Shock absorber


SMA525A

Front Axle and Front Suspension Parts

Check front axle and front suspension parts for looseness, cracks, wear or other damage.

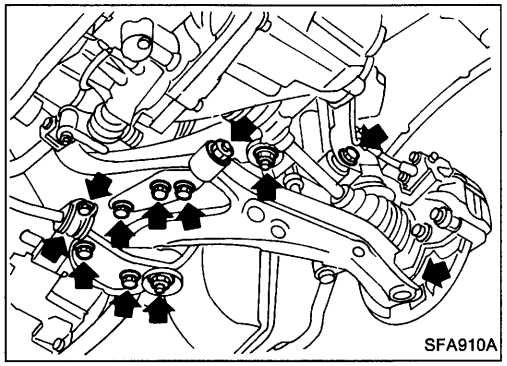
- Shake each front wheel to check for excessive play.

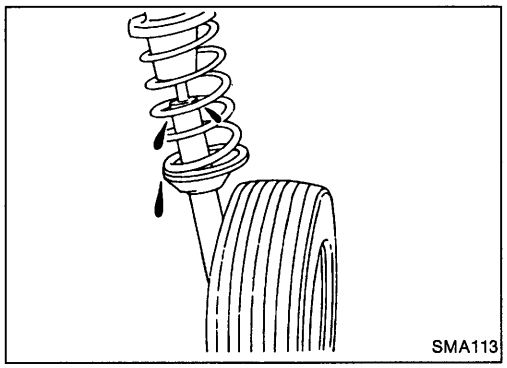

SMA614

- Make sure that cotter pin is inserted.
- Retighten all nuts and bolts to the specified torque.

  Tightening torque:

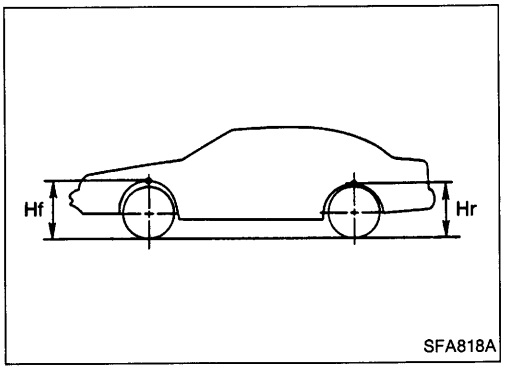
  Refer to FRONT SUSPENSION.


SFA910A


SMA113

- Check strut (shock absorber) for oil leakage or other damage.

Front Axle and Front Suspension Parts (Cont'd)



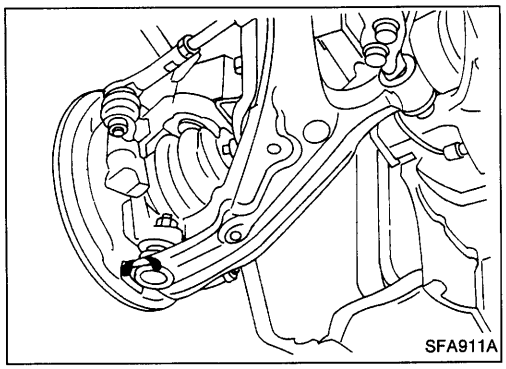
- Check spring height from the top of the wheelarch to the ground.

(1) Vehicle must be unladen*, parked on a level surface, and tires checked for proper inflation and wear (tread wear indicator must not be showing).
*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

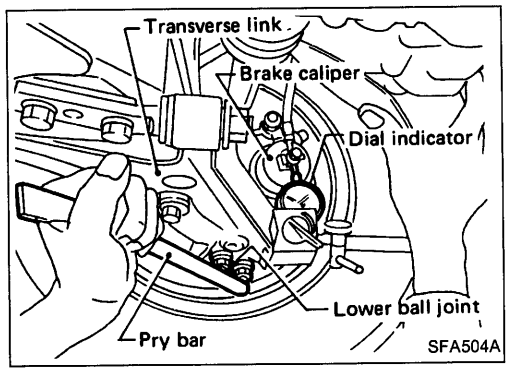
(2) Bounce the vehicle up and down several times before measuring.

Standard height:
Front (Hf): 653.5 mm (25.73 in)
Rear (Hr): 644.5 mm (25.37 in)

(3) Spring height is not adjustable. If out of specification, check for worn springs or suspension parts.



- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.

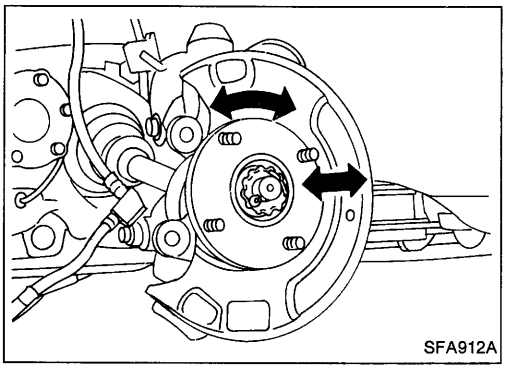


- Check suspension ball joint end play.

(1) Jack up front of vehicle and set the stands.
(2) Clamp dial indicator onto transverse link and place indicator tip on lower edge of brake caliper.
(3) Make sure front wheels are straight and brake pedal is depressed.
(4) Place a pry bar between transverse link and inner rim of road wheel.
(5) While raising and releasing pry bar, observe maximum dial indicator value.

Vertical end play:
0 mm (0 in)

(6) If ball joint movement is beyond specifications, remove and recheck it.

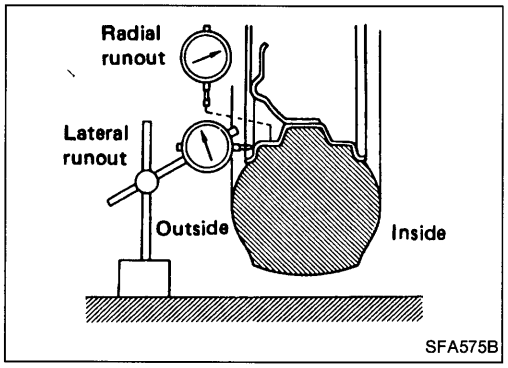

SFA912A

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.



SFA575B

Front Wheel Alignment

Before checking front wheel alignment, be sure to make a preliminary inspection (Unladen*).

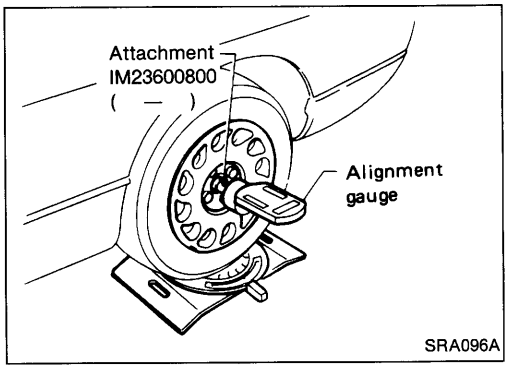
*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

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).



SRA096A

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:

   –0°45′ to 0°45′

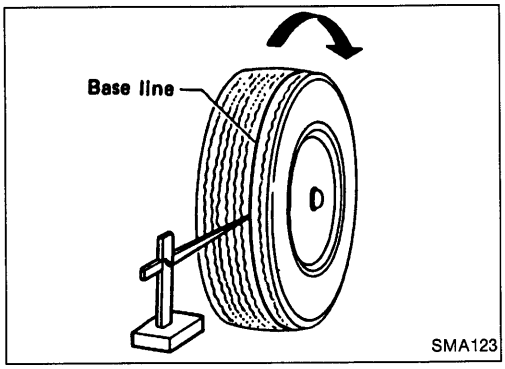
   Caster:

   1°05′ - 2°35′

   Kingpin inclination:

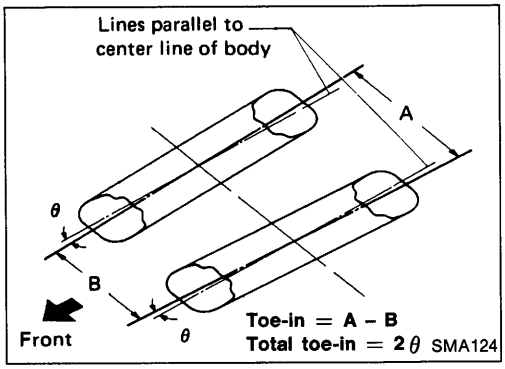
   13°45′ - 15°15′
2. If camber, caster and kingpin inclination are not within specification, inspect and replace any damaged or worn front suspension parts.

Front Wheel Alignment (Cont'd)



TOE-IN

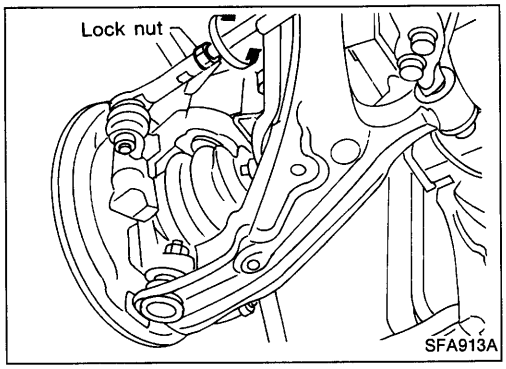
1. Draw a base line across the tread.
- After lowering front of vehicle, move it up and down to eliminate friction, and set steering wheel in straight-ahead position.



2. Measure toe-in.
- Measure distance "A" and "B" at the same height as hub center.

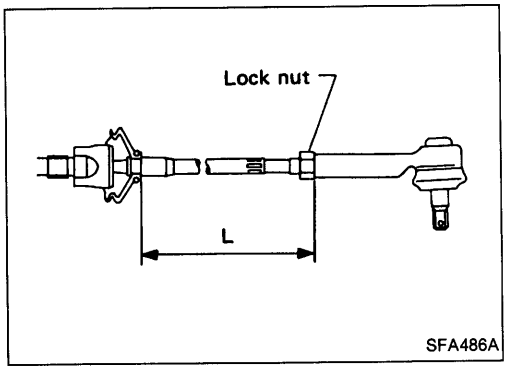
Total toe-in (Unladen):

A – B	**0 - 2 mm (0 - 0.08 in)**
2θ	**0′ - 12′**



3. Adjust toe-in by varying the length of steering tie-rods.

(1) Loosen lock nuts.

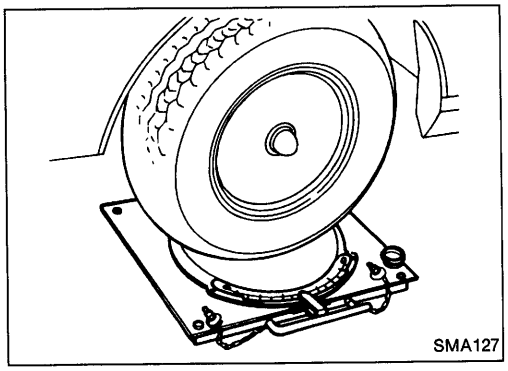


(2) Adjust toe-in by screwing tie-rods in and out.

Standard length "L":
Refer to ST section.

(3) Tighten lock nuts to specified torque.

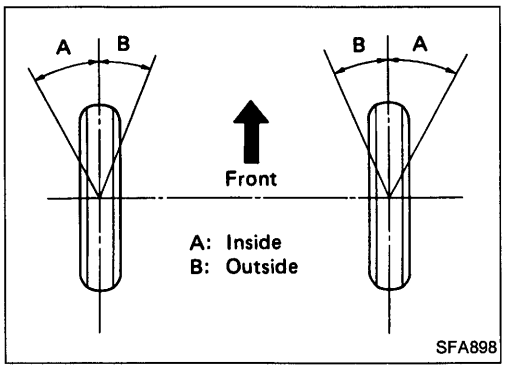
Lock nut tightening torque:
Refer to ST section.



FRONT WHEEL TURNING ANGLE

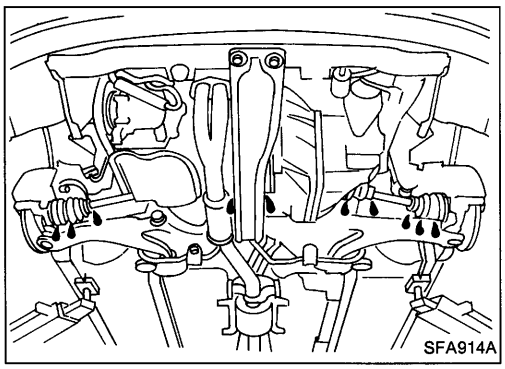
1. Set wheels in straight-ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.

Front Wheel Alignment (Cont'd)



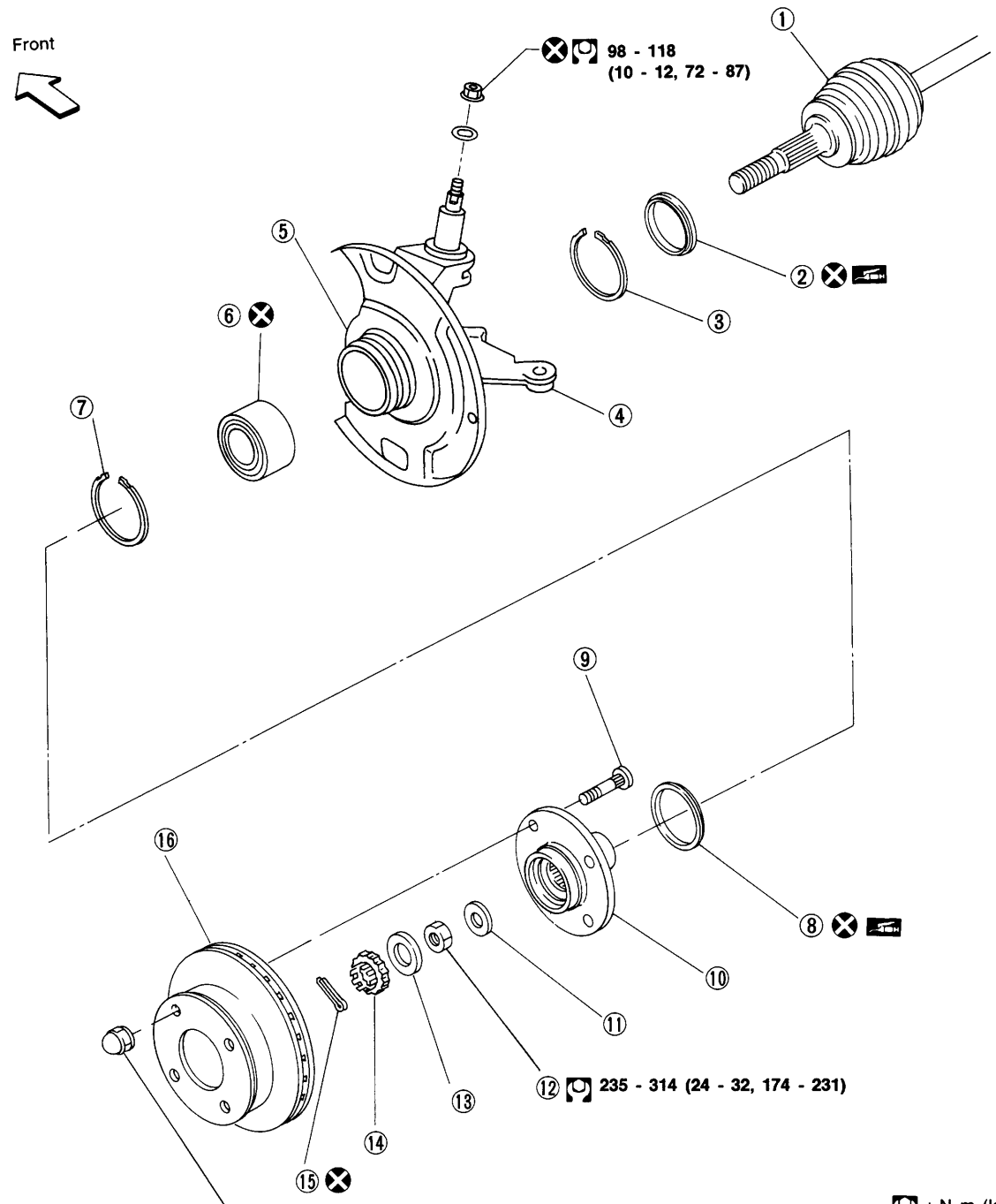
2. Rotate steering wheel all the way right and left; measure turning angle.

Wheel turning angle (Full turn):
Inside wheel/Outside wheel
33° - 37°/28° - 32°



Drive Shaft

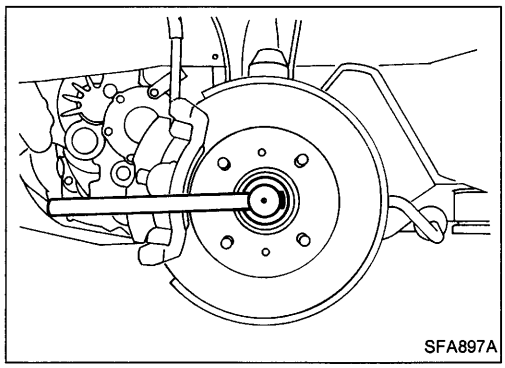
Check for grease leakage or other damage.



: N•m (kg-m, ft-lb)

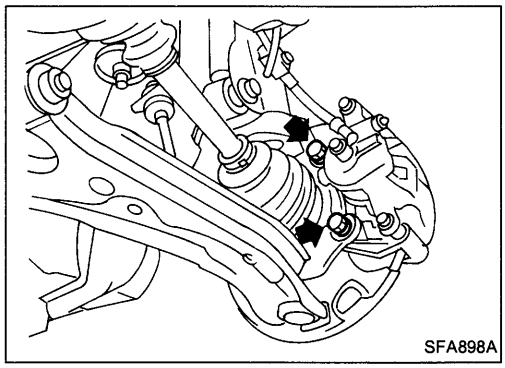
SFA896A

① Drive shaft
② Inner grease seal
③ Snap ring
④ Knuckle
⑤ Baffle plate
⑥ Wheel bearing assembly
⑦ Snap ring
⑧ Outer grease seal
⑨ Wheel bolt
⑩ Wheel hub
⑪ Plain washer
⑫ Wheel bearing lock nut
⑬ Insulator
⑭ Adjusting cap
⑮ Cotter pin
⑯ Disc rotor
⑰ Wheel nut


SFA897A

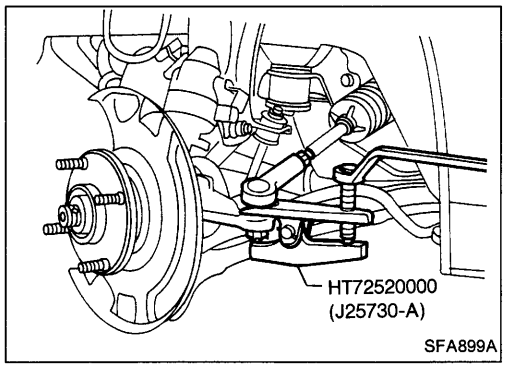
Removal

- Remove wheel bearing lock nut.


SFA898A

- Remove brake caliper assembly and rotor.

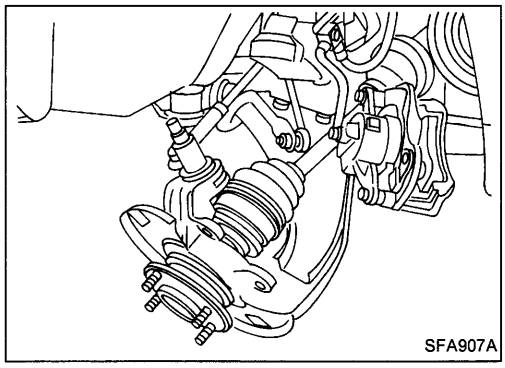
Brake hose need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out. Make sure brake hose is not twisted.



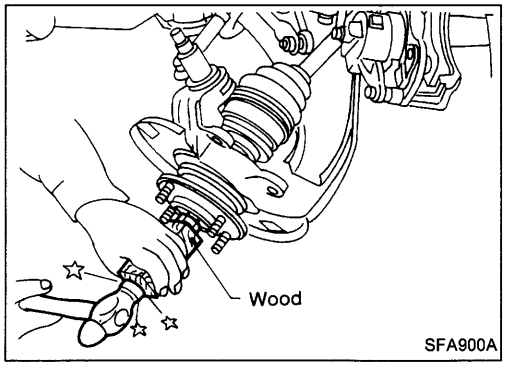
SFA899A

- Separate tie-rod from knuckle with Tool.

Install stud nut inverted on stud bolt to prevent damage to stud bolt.


SFA907A

- Remove kingpin cap and securing nut. Separate kingpin from knuckle.

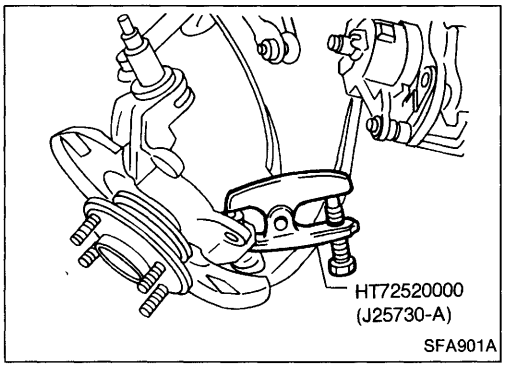


SFA900A

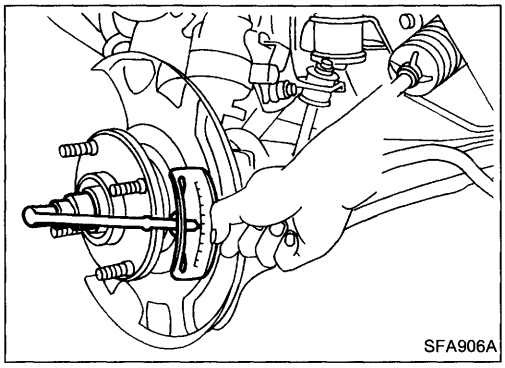
- Separate drive shaft from knuckle with drift.

When removing drive shaft, cover boots with waste cloth to prevent damage to them.

Removal (Cont'd)

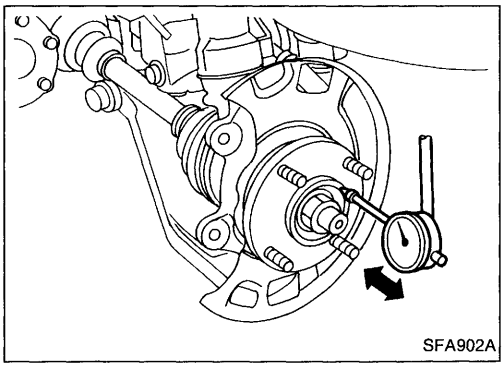


- Remove ball joint securing nut. Separate from knuckle using Tool (as for tie-rod).

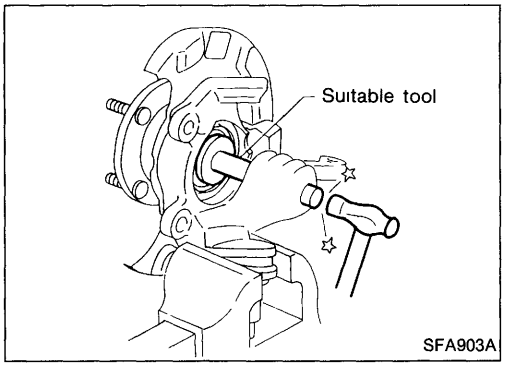


Installation

- Install knuckle with wheel hub.
- Tighten wheel bearing lock nut.
  : 235 - 314 N·m
  (24 - 32 kg-m, 174 - 231 ft-lb)
- Check that wheel bearings operate smoothly.



- Check wheel bearing axial end play.
  Axial end play:
  0.05 mm (0.0020 in) or less.

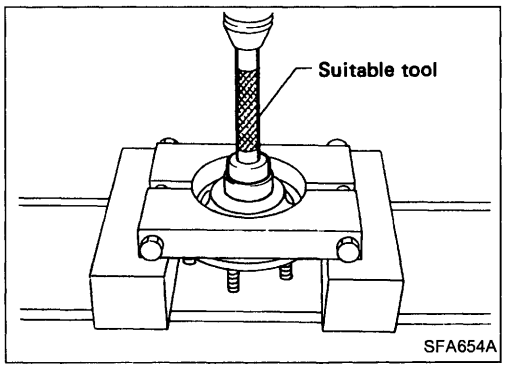


Disassembly

CAUTION:
When removing wheel hub or wheel bearing from knuckle, replace wheel bearing assembly (outer race, inner races and grease seals) with a new one.

WHEEL HUB

Drive out hub with inner race (outside) from knuckle with a suitable tool.

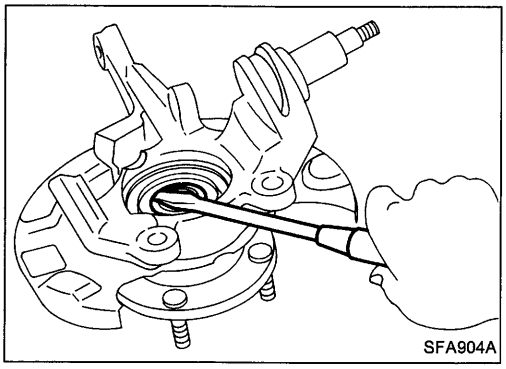


WHEEL BEARING

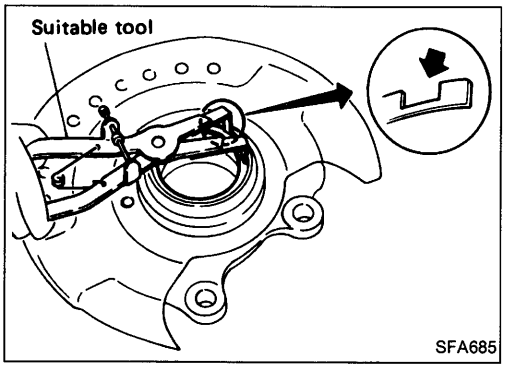
When replacing wheel bearing, replace complete wheel bearing assembly (including inner and outer races).

- Remove bearing inner race (outside), then remove outer grease seal.

Disassembly (Cont'd)

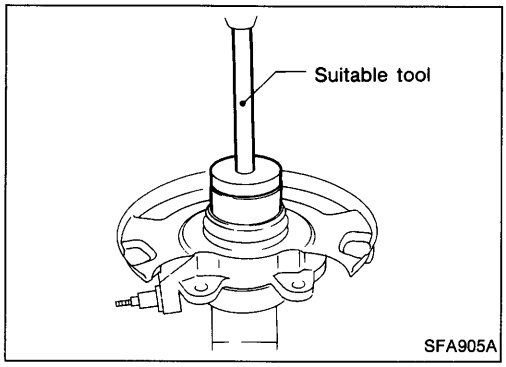

SFA904A

- Remove inner grease seal from knuckle.



SFA685

- Remove inner and outer snap rings.



SFA905A

- Press out bearing outer race.

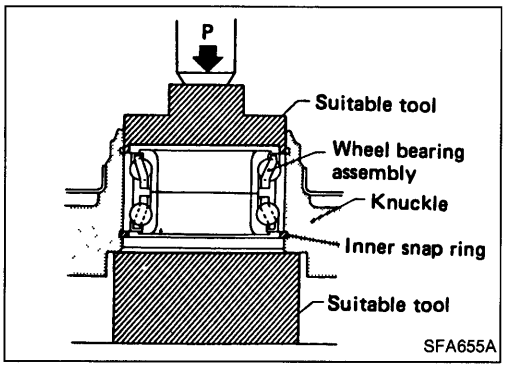
Inspection

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.



SFA655A

Assembly

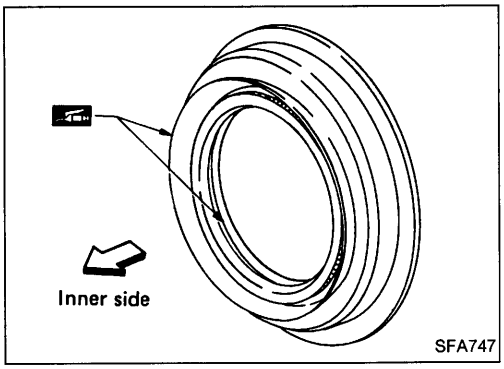
1. Install inner snap ring into groove of knuckle.
2. Press new wheel bearing assembly into knuckle until it contacts snap ring.
   Maximum load P:
   49 kN (5 t, 5.5 US ton, 4.9 Imp ton)

CAUTION:

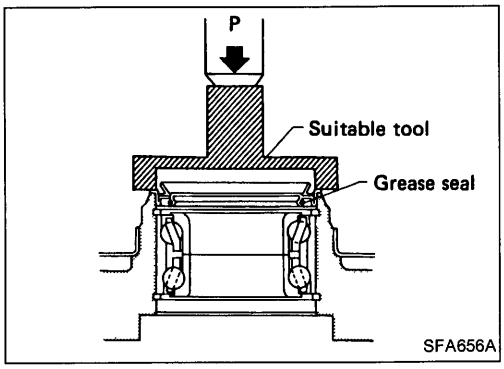
- **Do not press inner race of wheel bearing assembly.**
- **Do not apply oil or grease to mating surfaces of wheel bearing outer race and knuckle.**

3. Install outer snap ring into groove of knuckle.

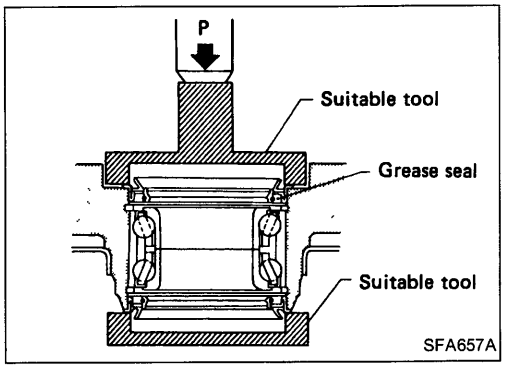
Assembly (Cont'd)



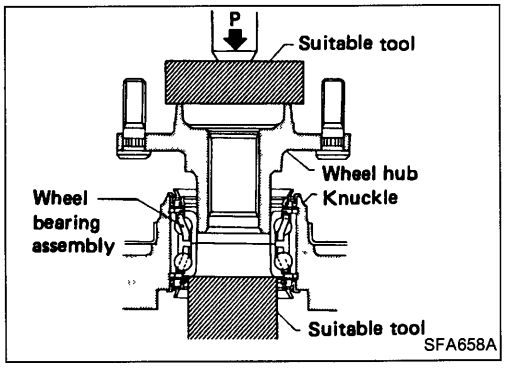
4. Pack grease seal lip with multi-purpose grease.



5. Install outer grease seal.

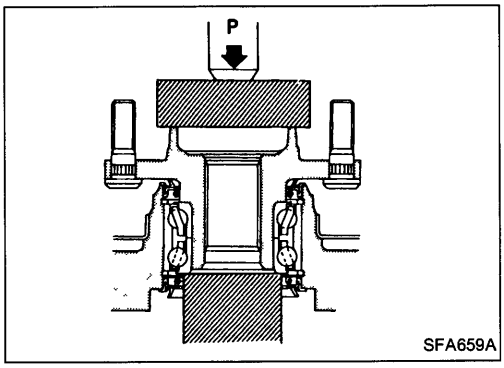


6. Install inner grease seal.



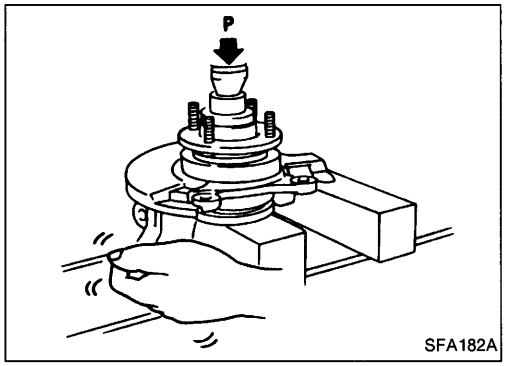
7. Press wheel hub into knuckle.
   Maximum load P:
   29 kN (3 ton, 3.3 US ton, 3.0 Imp ton)

Be careful not to damage grease seal.

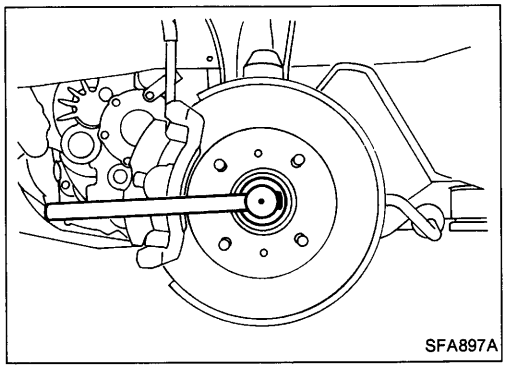


8. Check bearing operation.
(1) Add load P with press.
   Load P:
   34.3 - 49.0 kN
   (3.5 - 5.0 ton, 3.9 - 5.5 US ton, 3.44 - 4.92 Imp ton)

Assembly (Cont'd)



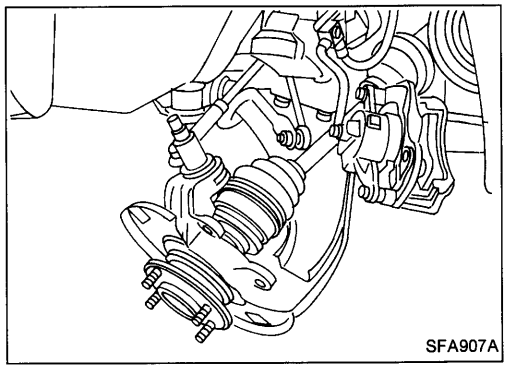
(2) Spin knuckle several turns in both directions.
(3) Make sure that wheel bearings operate smoothly.


SFA897A

Removal

- Remove wheel bearing lock nut.
- Remove brake caliper assembly and rotor.

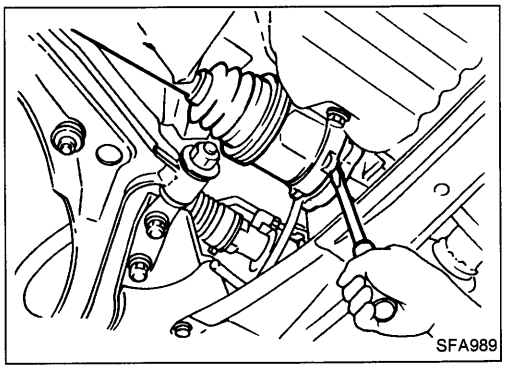
Brake hose need not be disconnected from brake caliper.
Be careful not to depress brake pedal, or piston will pop out.
Do not pull or twist brake hose.


SFA907A

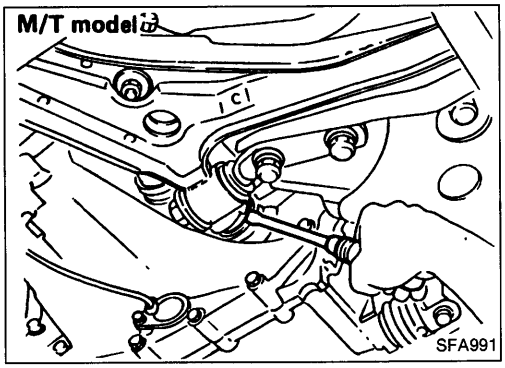
- Remove tie-rod ball joint.
- Remove upper knuckle nut.
- Separate drive shaft from knuckle by lightly tapping it. If it is hard to remove, use a puller.

When removing drive shaft, cover boots with waste cloth to prevent damage to them.

Refer to FRONT AXLE — Wheel Hub and Knuckle.


SFA989

1. Remove right drive shaft from transaxle.



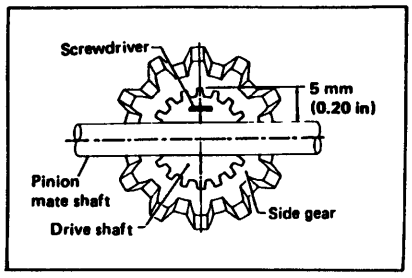
SFA991

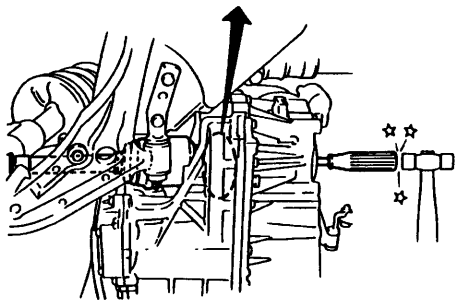
2. Remove left drive shaft from transaxle.

— For M/T models —

Removal (Cont'd)

A/T model





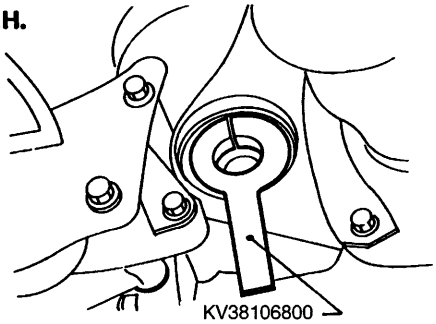
SFA730

— For A/T models —

- Remove left drive shaft with a suitable tool.

Be careful not to damage pinion mate shaft and side gear.

R.H.



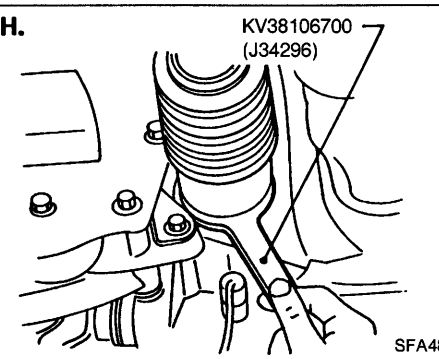
SFA482

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.

L.H.



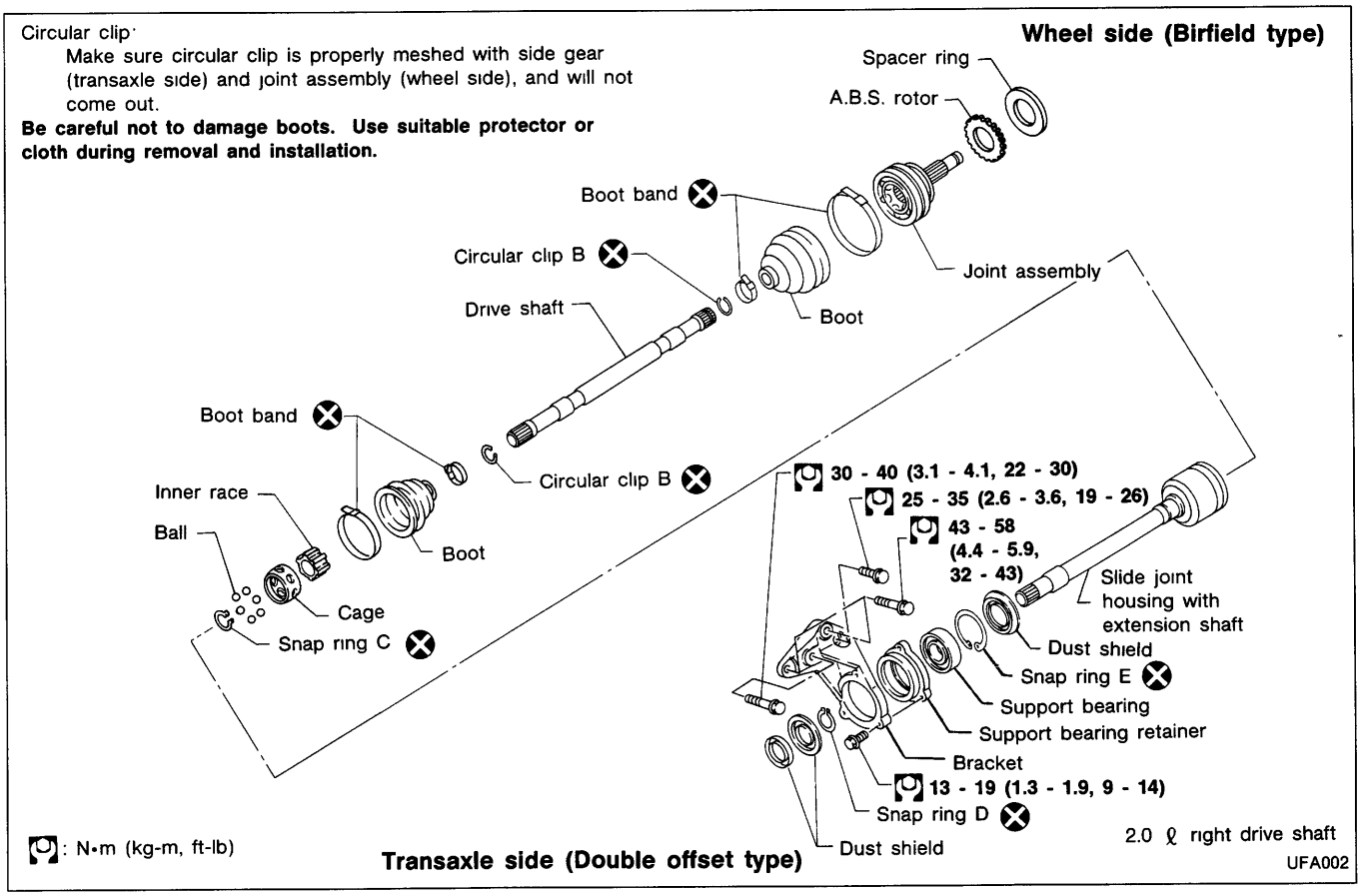
SFA483

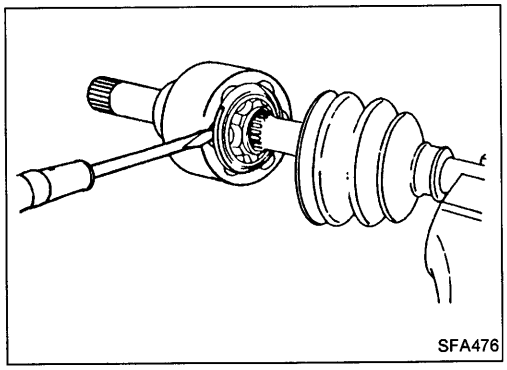
3. Insert drive shaft into transaxle. Be sure to properly align the serrations and then withdraw Tool.
4. Push drive shaft, then press-fit circular clip on the drive shaft into circular clip groove of side gear.
5. After its insertion, try to pull the flange out of the slide joint by hand. If it pulls out, the circular clip is not properly meshed with the side gear.

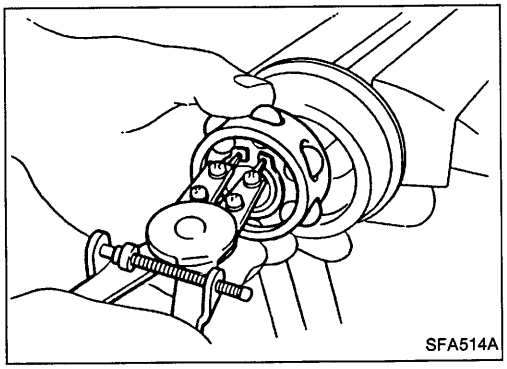
WHEEL SIDE

- Install drive shaft into knuckle.
- Tighten upper knuckle nut and wheel bearing lock nut. Refer to section Installation in FRONT AXLE — Wheel Hub and Knuckle.

Components







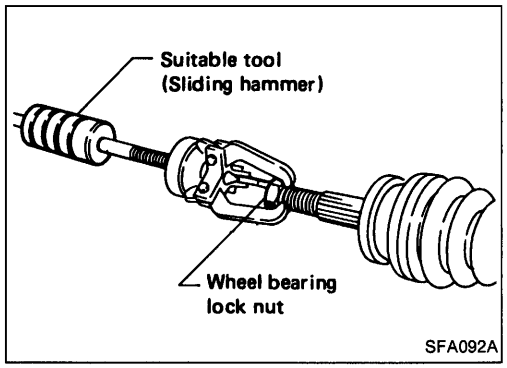
Disassembly

TRANSAXLE SIDE

1. Remove boot bands.
2. Put matching marks 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 matching marks 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.

Disassembly (Cont'd)



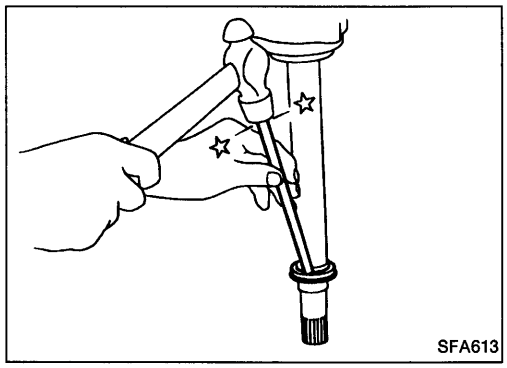
WHEEL SIDE (Birfield type)

CAUTION:
The joint on the wheel side cannot be disassembled.

- Before separating joint assembly, put matching marks on drive shaft and joint assembly.
- Separate joint assembly with a suitable tool.

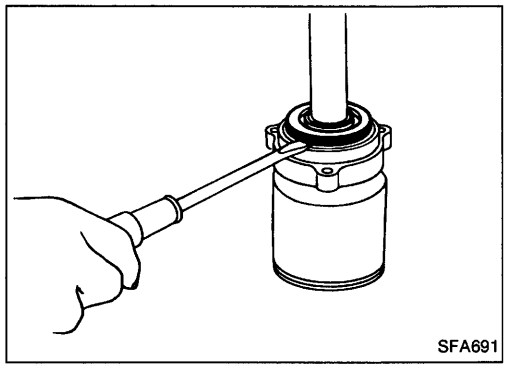
Be careful not to damage threads on drive shaft.

- Draw out boot.

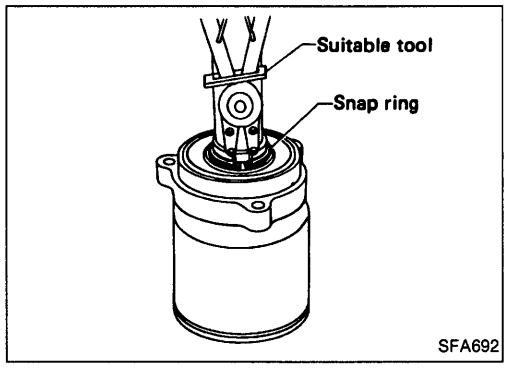


SUPPORT BEARING

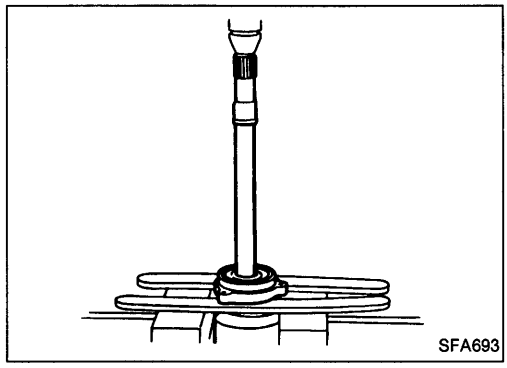
- Remove outer dust shield.



- Remove inner dust shield.

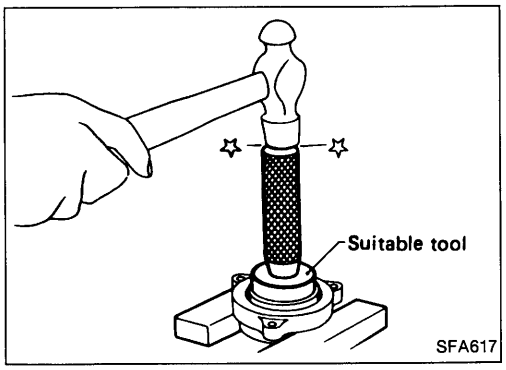


- Pry off snap ring.



- Press support bearing assembly out of drive shaft.

Disassembly (Cont'd)



- 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)

- Replace any parts of double offset joint which show signs of scorching, rust, wear or excessive play.
- Check serration for deformation. Replace if necessary.
- Check slide joint housing for any damage. Replace if necessary.

JOINT ASSEMBLY (Wheel side)

Replace joint assembly if it is deformed or damaged.

SUPPORT BEARING

Make sure wheel bearing rolls freely and is free from noise, cracks, pitting or wear.

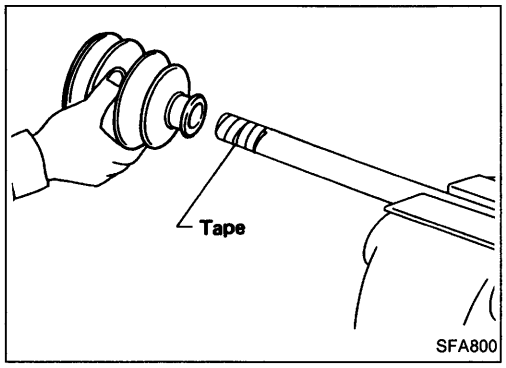
SUPPORT BEARING BRACKET

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.**

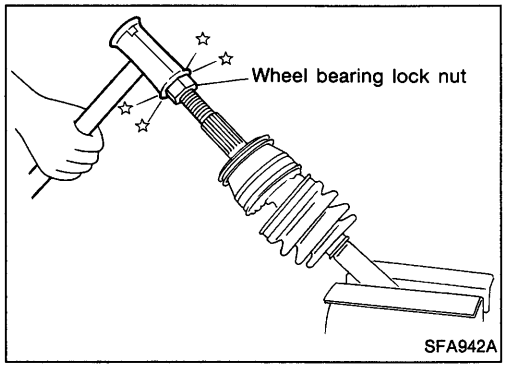
Assembly (Cont'd)



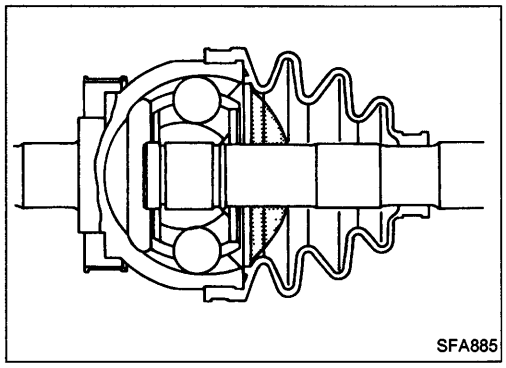
WHEEL SIDE (Birfield type)

1. Install boot and new small boot band on drive shaft.

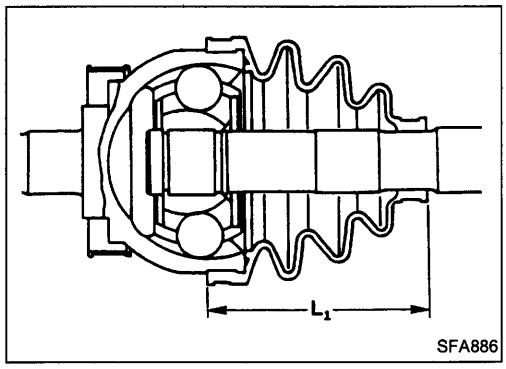
Cover drive shaft serration with tape so as not to damage boot during installation.



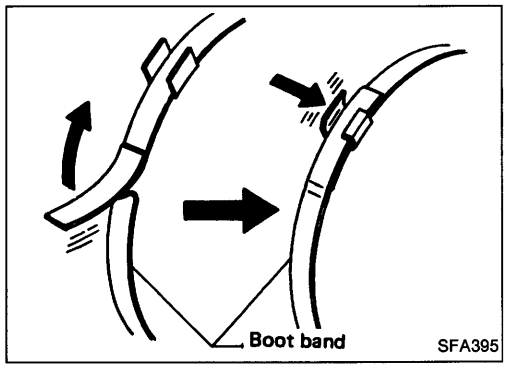
2. Set joint assembly onto drive shaft by lightly tapping it. Install joint assembly securely, ensuring marks which were made during disassembly are properly aligned.



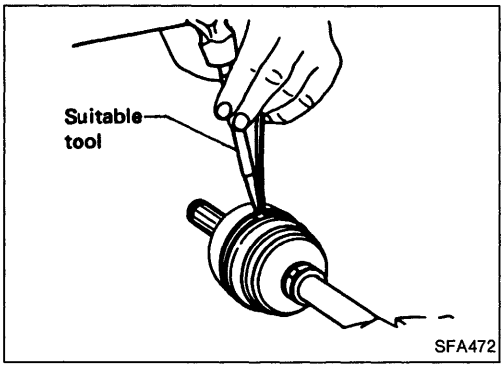
3. Pack drive shaft with specified amount of grease.
   Specified amount of grease:
   105 - 125 mℓ (3.6 - 4.2 US fl oz, 3.7 - 4.4 Imp fl oz)

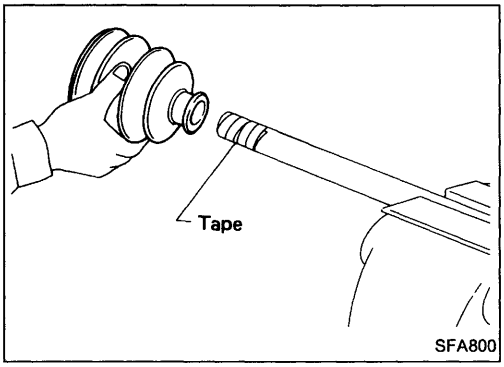


4. Make sure that boot is properly installed on the drive shaft groove.
   Set boot so that it does not swell and deform when its length is "L_1".
   Length "L_1":
   100.5 mm (3.96 in)



5. Lock new larger and smaller boot bands securely with a suitable tool.



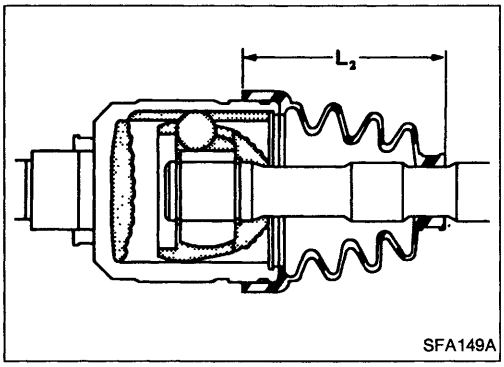


TRANSAXLE SIDE

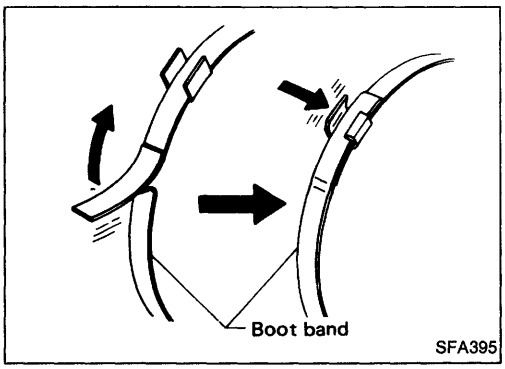
(Double offset type)

1. Install boot and new small boot band on drive shaft.

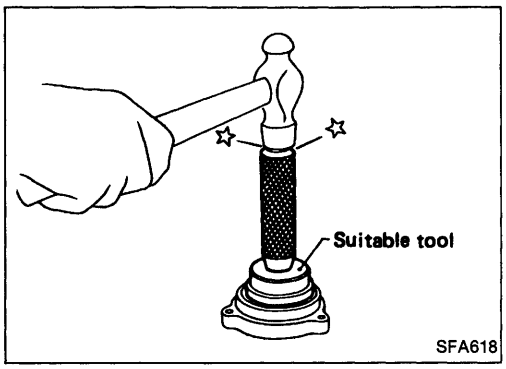
Cover drive shaft serration with tape so as not to damage boot during installation.



2. Pack drive shaft with specified amount of grease.
   Specified amount of grease:
   140 - 160 mℓ (4.7 - 5.4 US fl oz, 4.9 - 5.6 Imp fl oz)
3. Install slide joint housing.
4. Make sure that boot is properly installed on the drive shaft groove.
   Set boot so that it does not swell and deform when its length is "L_2".
   Length "L_2":
   98 mm (3.86 in)



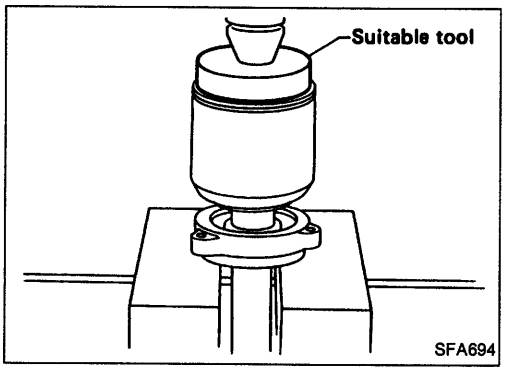
5. Lock new larger and smaller boot bands securely with a suitable tool.



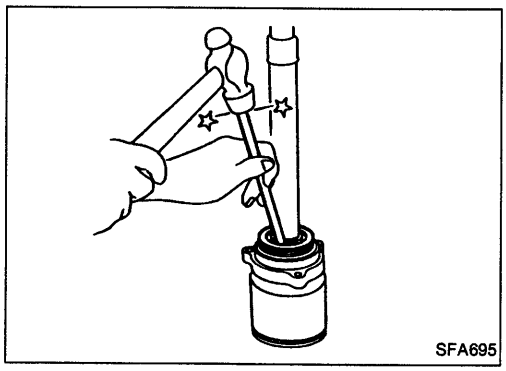
SUPPORT BEARING

- Press bearing into retainer.

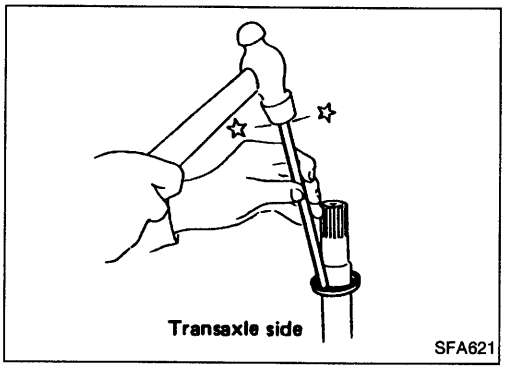
Assembly (Cont'd)



- Press drive shaft into bearing.

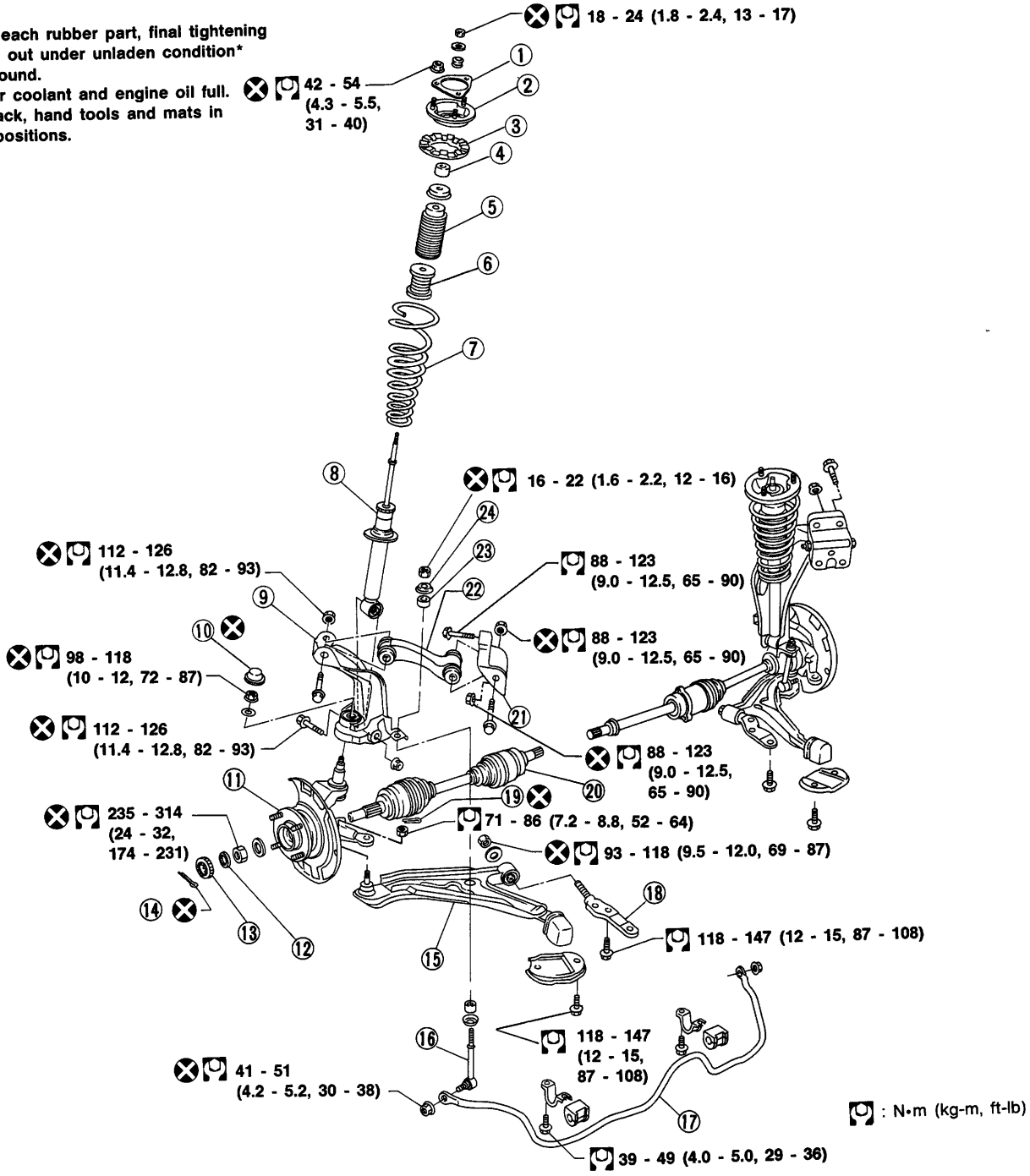


- Install snap ring.
- Install new dust shield.



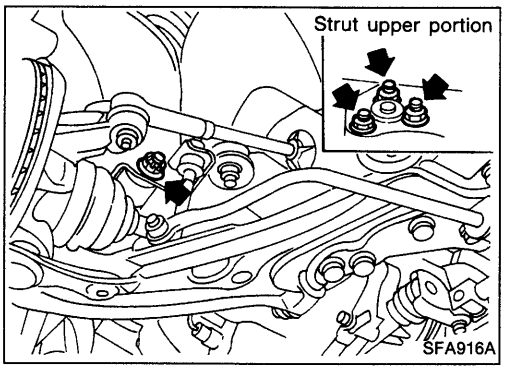
When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.

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



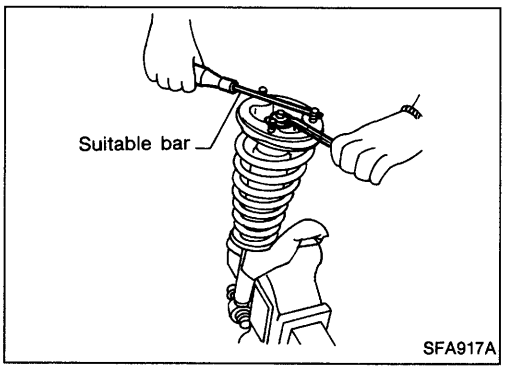
SFA909A

① Gasket
② Upper mounting
③ Upper rubber seat
④ Bound bumper rubber
⑤ Dust cover
⑥ Bound bumper rubber
⑦ Coil spring
⑧ Shock absorber
⑨ Third link
⑩ Cap
⑪ Wheel hub and steering knuckle assembly
⑫ Insulator
⑬ Adjusting cap
⑭ Cotter pin
⑮ Transverse link
⑯ Connecting rod
⑰ Stabilizer
⑱ Gusset pin
⑲ Cotter pin
⑳ Drive shaft
㉑ Upper link bracket
㉒ Upper link
㉓ Bushing
㉔ Washer



Removal

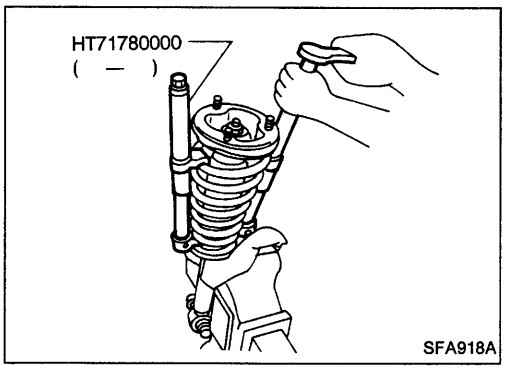
- Remove shock absorber fixing bolt and nut (to hoodledge).
- **Do not remove piston rod lock nut.**



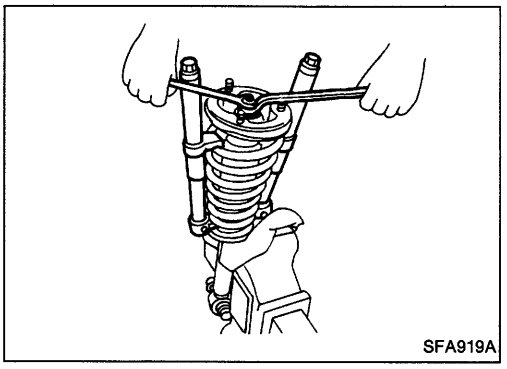
Disassembly

1. Set shock absorber on vise, then loosen piston rod lock nut.

- **Do not remove piston rod lock nut.**



2. Compress spring with Tool so that shock absorber mounting insulator can be turned by hand.



3. Remove piston rod lock nut.

Inspection

SHOCK ABSORBER ASSEMBLY

- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occurring on welded or gland packing portions.
- Check piston rod for cracks, deformation or other damage. Replace if necessary.

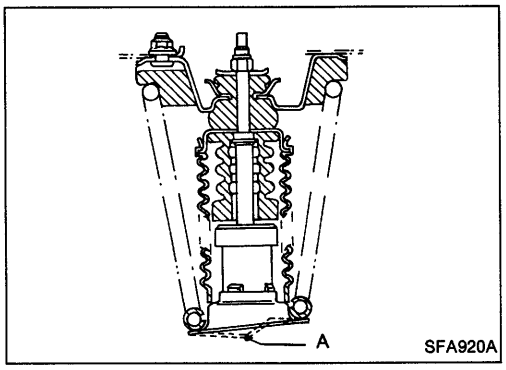
Inspection (Cont'd)

MOUNTING INSULATOR AND RUBBER PARTS

- Check cemented rubber-to-metal portion for separation or cracks. Check rubber parts for deterioration. Replace if necessary.

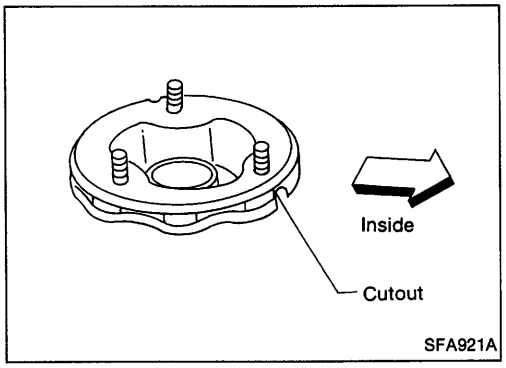
COIL SPRING

- Check for cracks, deformation or other damage. Replace if necessary.



Assembly

- When shock absorber is installed, it must be positioned so that arrow point A faces rearward on L.H. side, and forward on R.H. side.



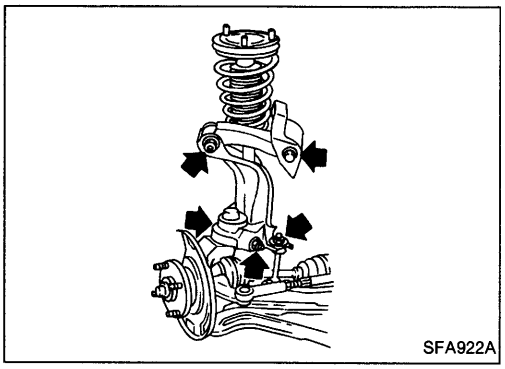
- Install upper spring seat with its cutout facing the inside of the vehicle.

Removal

CAUTION:

Kingpin bearing usually does not require maintenance. If any of the following symptoms are noted, replace kingpin bearing assembly.

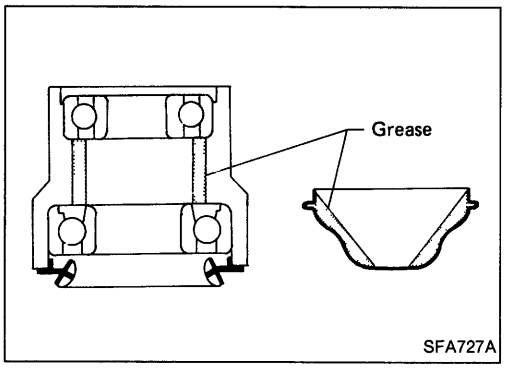
- **Growling noise is emitted from kingpin bearing during operation.**
- **Kingpin bearing drags or turns roughly when steering knuckle is turned by hand.**


SFA922A

1. Remove cap and kingpin nut.
2. Remove shock absorber fixing nut and upper link fixing bolts.
3. Remove stabilizer connecting rod.
4. Remove third link and upper link.

Installation

THIRD LINK

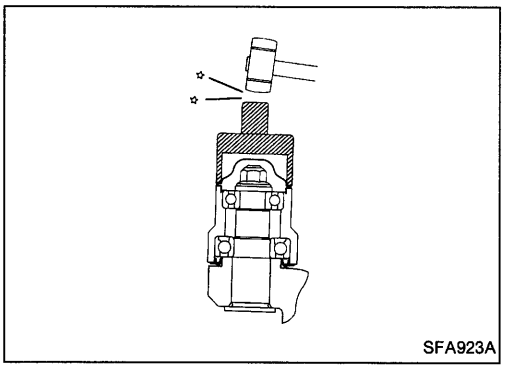


SFA727A

- Pack kingpin housing and cap with multi-purpose grease.

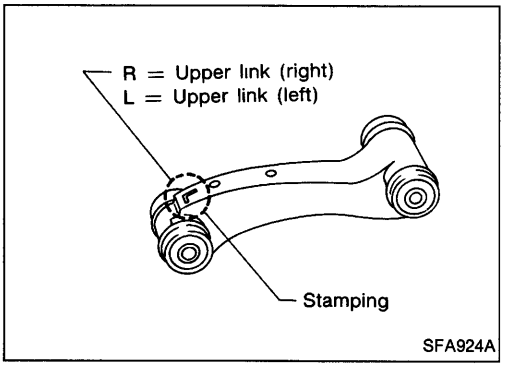
  Grease capacity:

Kingpin housing	**4 g (0.14 oz)**
Cap	**10 g (0.35 oz)**


SFA923A

- Install third link and cap.

UPPER LINK

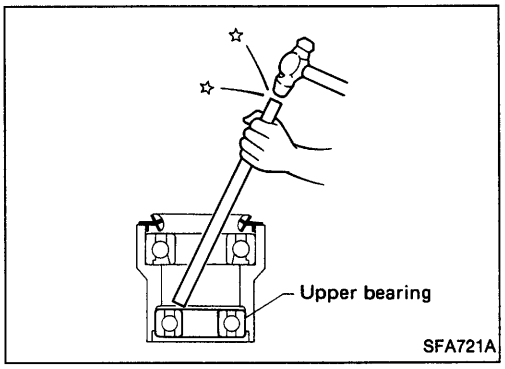


SFA924A

- Upper link has "L" or "R" stamped on it as shown.

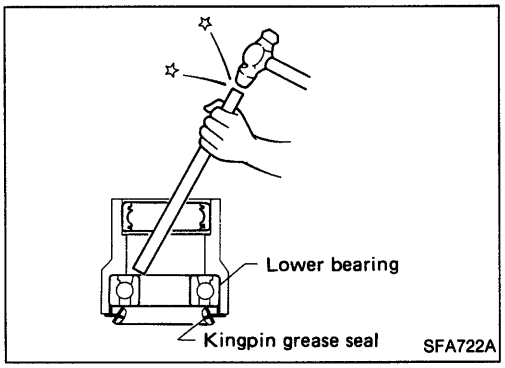
Upper link bushings cannot be disassembled.

- When installing upper link, make sure that parts are in their correct positions.

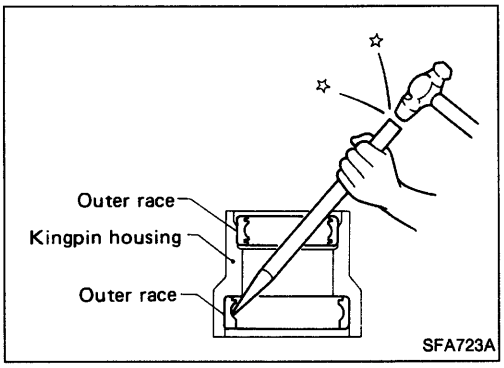


Disassembly

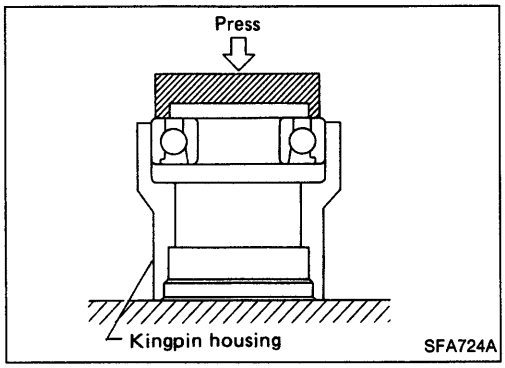
- Remove upper bearing (inner race and ball).



- Remove kingpin grease seal.
- Remove lower bearing (inner race and ball).

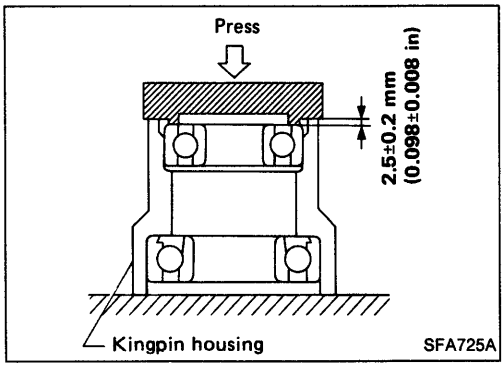


- Remove upper and lower outer race.
- **Be careful not to damage kingpin housing.**



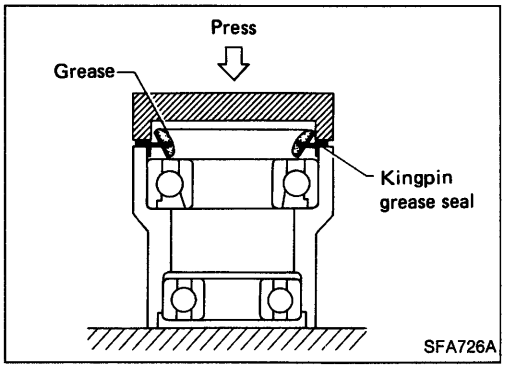
Assembly

- Install lower bearing.

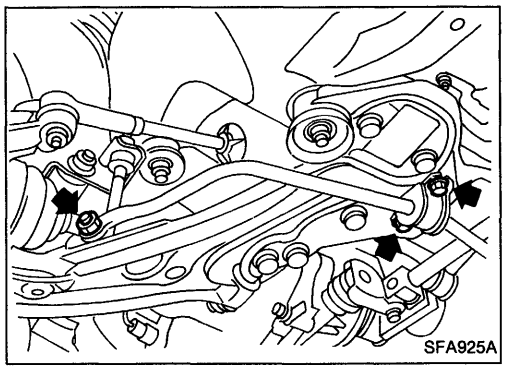


- Install upper bearing.

Assembly (Cont'd)

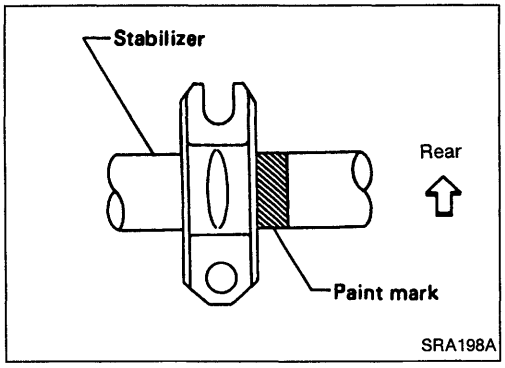


- Install lower oil seal.
- Apply multi-purpose grease to oil seal lip.


SFA925A

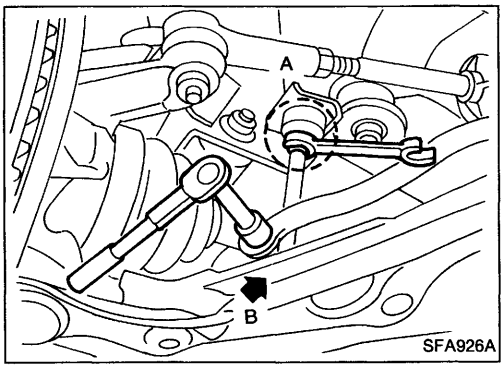
Removal and Installation

- Remove stabilizer bar.



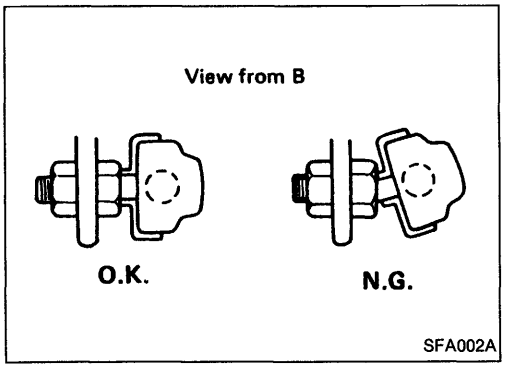
SRA198A

- When installing stabilizer, make sure that paint mark and clamp face in their correct directions.



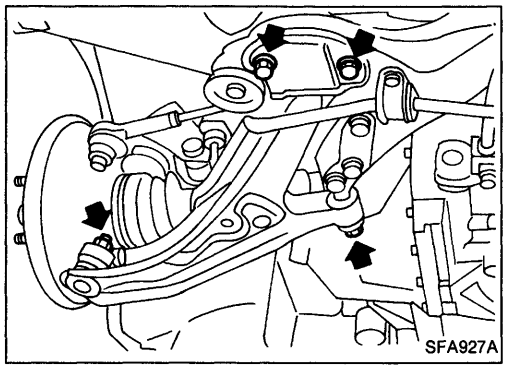
SFA926A

- When removing and installing stabilizer bar, fix portion A.



SFA002A

- Install stabilizer bar with ball joint socket properly placed.



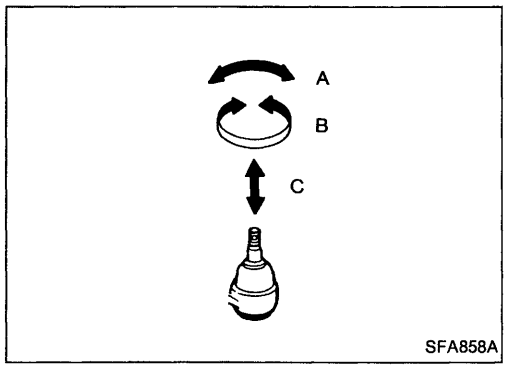
Removal and Installation

- Remove tension rod, ball joint and transverse link assembly.
- During installation, final tightening must be done at curb weight with tires on ground.
- After installation, check wheel alignment.
  Refer to "Front Wheel Alignment" of CHECK AND ADJUSTMENT — On-vehicle.

Inspection

TRANSVERSE LINK

- Check transverse link for damage, cracks or deformation. Replace it if necessary.
- Check rubber bushing for damage, cracks and deformation. Replace transverse link if necessary.



LOWER BALL JOINT

- Check ball joint for play. If ball stud is worn, play in axial direction is excessive or joint is hard to swing, replace transverse link assembly.

Swing force and turning torque

Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.

Swing force "A":
(measuring point: cotter pin hole of ball stud)
7.8 - 54.9 N (0.8 - 5.6 kg, 1.8 - 12.3 lb)
Turning torque "B":
0.5 - 3.4 N·m (5 - 35 kg-cm, 4.3 - 30.4 in-lb)
Vertical end play "C":
0 mm (0 in)

General Specifications

COIL SPRING

Applied model	M/T	A/T
Wire diameter mm (in)		
minor/major	10.2 (0.402)/ 12.1 (0.476)	10.3 (0.406)/ 12.2 (0.480)
Coil center diameter mm (in)		
minor/major	78.2 (3.079)/ 140.1 (5.52)	78.3 (3.083)/ 140.2 (5.52)
Free length mm (in)	411.0 (16.18)	417.0 (16.42)
Spring constant N/mm (kg/mm, lb/in)	17.7 (1.8, 101)	
Identification color	Orange x 2, Light green x 1	Light green x 2, Red x 1

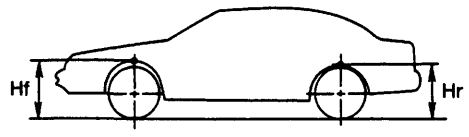
SHOCK ABSORBER

Applied model	M/T	A/T
Damping force [at 0.3 m (1.0 ft)/sec.] N (kg, lb)		
Expansion	1,000 - 1,353 (102 - 138, 225 - 304)	794 - 1,089 (81 - 111, 179 - 245)
Compression	353 - 530 (36 - 54, 79 - 119)	314 - 471 (32 - 48, 71 - 106)
Piston rod diameter mm (in)	12.5 (0.492)	

STABILIZER BAR

Stabilizer bar diameter mm (in)	19 (0.75)

WHEELARCH HEIGHT (Unladen*)



SFA818A

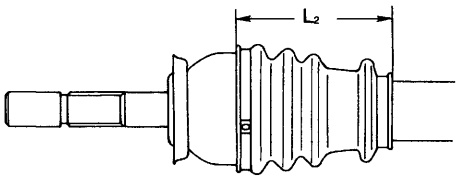
Applied model		All
Front (Hf)	mm (in)	653.5 (25.73)
Rear (Hr)	mm (in)	644.5 (25.37)

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

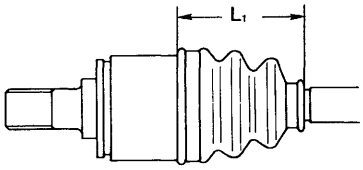
DRIVE SHAFT

Joint type	
Transaxle side	DS86
Wheel side	BF86
Grease	
Quality	Nissan genuine grease or equivalent
Capacity mℓ (US fl oz, Imp fl oz)	
Transaxle side	140 - 160 (4.7 - 5.4, 4.9 - 5.6)
Wheel side	105 - 125 (3.6 - 4.2, 3.7 - 4.4)
Boot length mm (in)	
Transaxle side "L_1"	98 (3.86)
Wheel side "L_2"	100.5 (3.96)

Wheel side



Transaxle side



SFA705B

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*1)

Camber	degree	–0°45′ to 0°45′
Caster	degree	1°05′ - 2°35′
Kingpin inclination	degree	13°45′ - 15°15′
Total toe-in		
	mm (in)	0 - 2 (0 - 0.08)
	degree	0′ - 12′
Front wheel turning angle		
Full turn*2	degree	
Inside		33° - 37°
Outside		28° - 32°

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

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

WHEEL BEARING

Wheel bearing axial end play limit mm (in)	0.05 (0.0020) or less
Wheel bearing lock nut tightening torque N·m (kg-m, ft-lb)	235 - 314 (24 - 32, 174 - 231)

LOWER BALL JOINT

Ball stud swinging force at cotter pin hole N (kg, lb)	7.8 - 54.9 (0.8 - 5.6, 1.8 - 12.3)
Ball stud rotating torque N·m (kg-cm, in-lb)	0.5 - 3.4 (5 - 35, 4.3 - 30.4)
Ball stud axial end play limit mm (in)	0 (0)

WHEEL RUNOUT

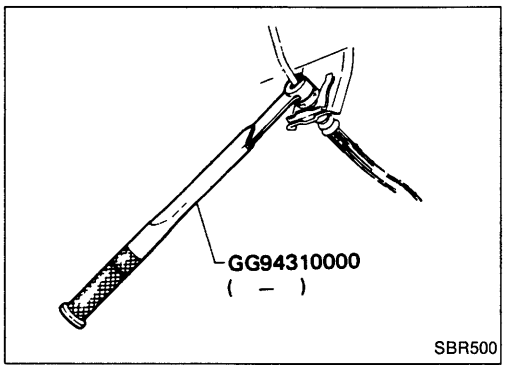
Wheel type	Aluminum	Steel
Radial runout limit mm (in)	0.3 (0.012)	0.5 (0.020)
Lateral runout limit mm (in)	0.3 (0.012)	0.8 (0.031)

REAR AXLE & REAR SUSPENSION

SECTION RA

CONTENTS

PRECAUTIONS AND PREPARATION ..... RA- 2
REAR AXLE AND REAR SUSPENSION ..... RA- 3
CHECK AND ADJUSTMENT — On-vehicle ..... RA- 4
REAR AXLE — Wheel Hub ..... RA- 6
REAR SUSPENSION ..... RA- 8
REAR SUSPENSION — Coil Spring and Strut Assembly RA-10
REAR SUSPENSION — Stabilizer Bar RA-12
SERVICE DATA AND SPECIFICATIONS (S.D.S.) RA-13

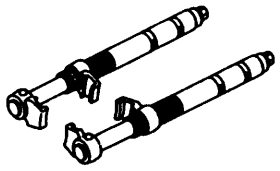
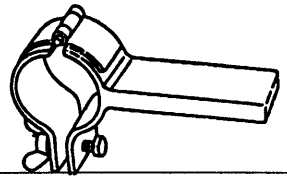
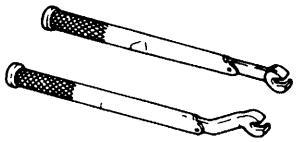


Precautions

- **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.**

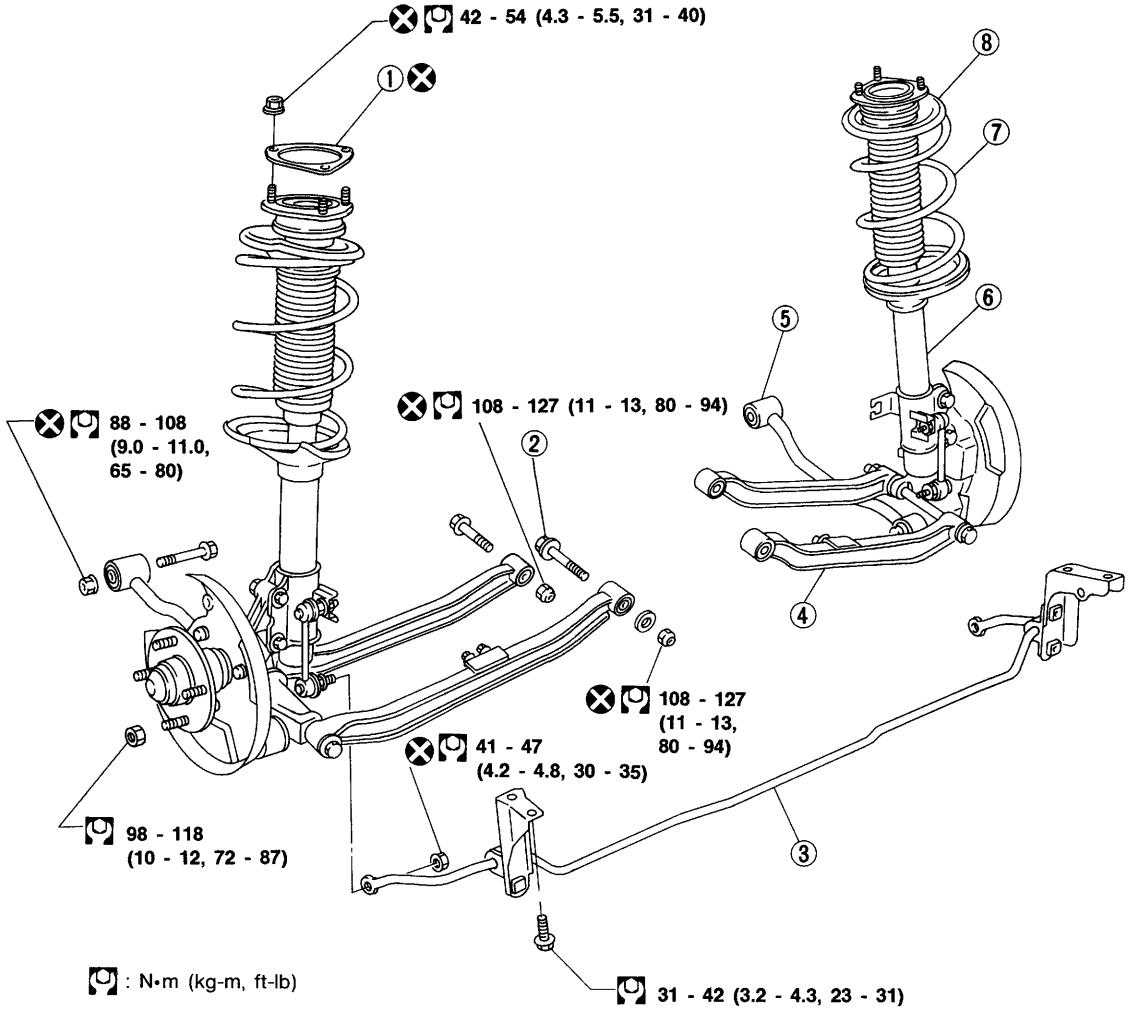
Preparation

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) 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

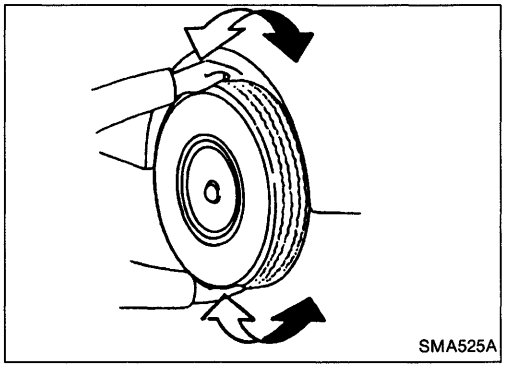
When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.

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



SRA361A

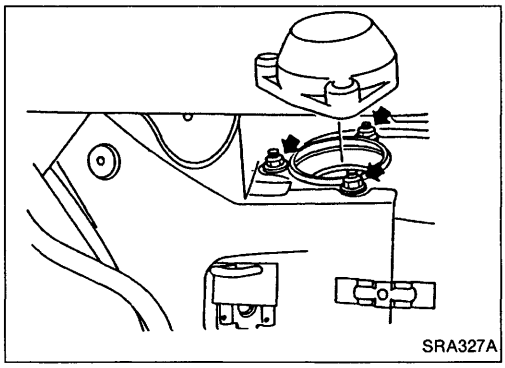
① Gasket
② Adjusting bolt
③ Stabilizer bar
④ Parallel link
⑤ Radius rod
⑥ Strut assembly
⑦ Coil spring
⑧ Strut mounting insulator assembly


SMA525A

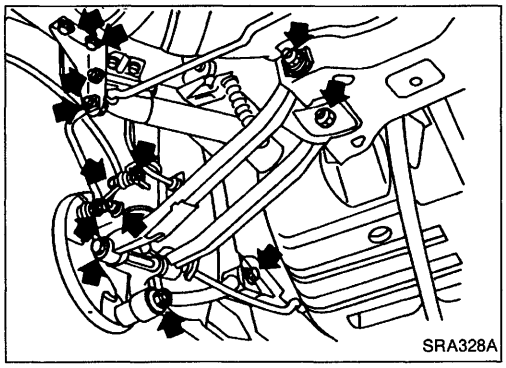
Rear Axle and Rear Suspension Parts

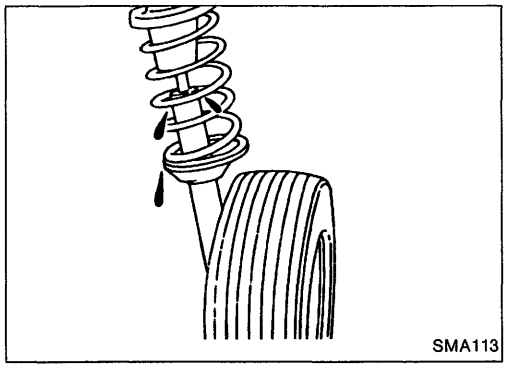
Check axle and suspension parts for looseness, wear or damage.

- Shake each rear wheel to see excessive play.

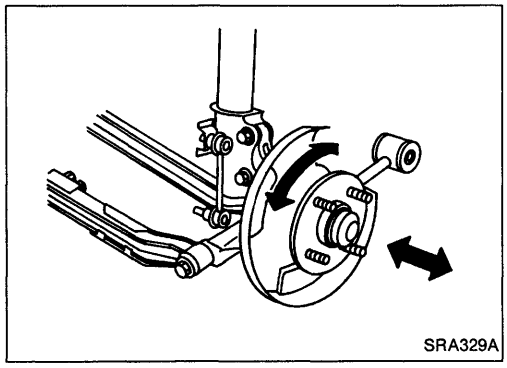

SRA327A

- Retighten all nuts and bolts to the specified torque.
  Tightening torque: Refer to REAR SUSPENSION.


SRA328A

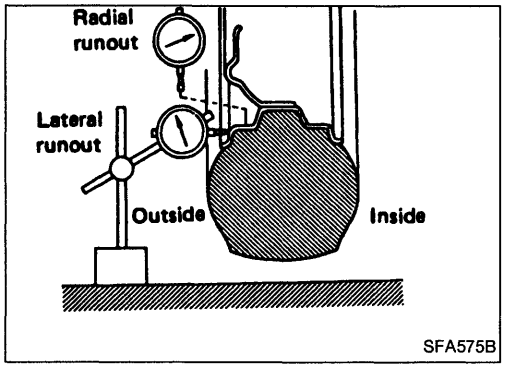

SMA113

- Check strut (shock absorber) for oil leakage or other damage.
- Check wheelarch height. Refer to CHECK AND ADJUSTMENT — On-vehicle in section FA.


SRA329A

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.

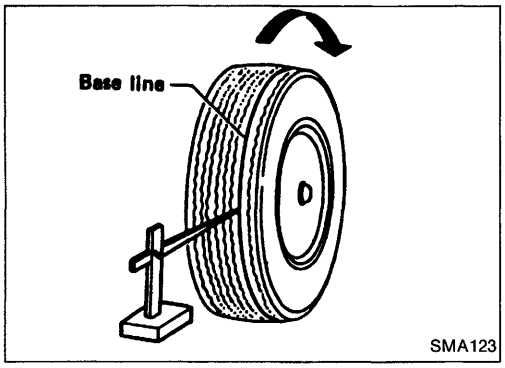
CAMBER

Camber is preset at factory and cannot be adjusted.

Camber:

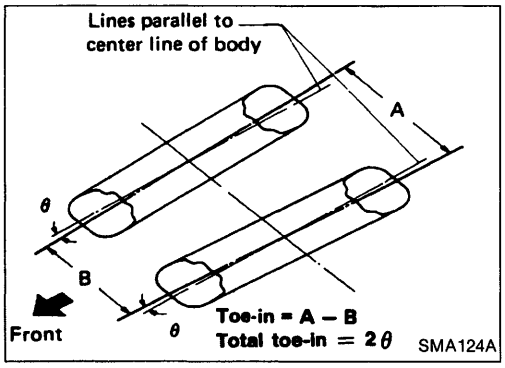
–1°45′ to –0°15′

- If the camber is not within specification, inspect and replace any damaged or worn rear suspension parts.



TOE-IN

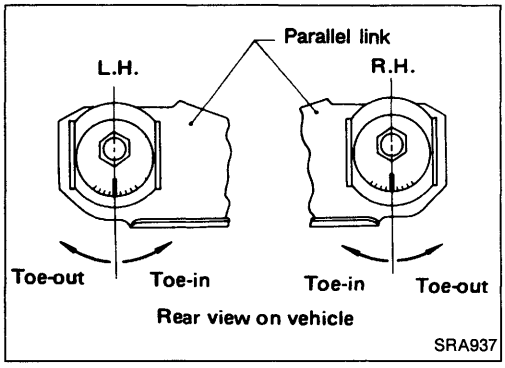
1. Draw a base line across the tread.
- After lowering rear of vehicle, move it up and down to eliminate friction.



2. Measure toe-in.
- Measure distance "A" and "B" at the same height as hub center.

Total toe-in:

A – B	**–2 to 2 mm (–0.08 to 0.08 in)**
2θ	**–12′ to 12′**

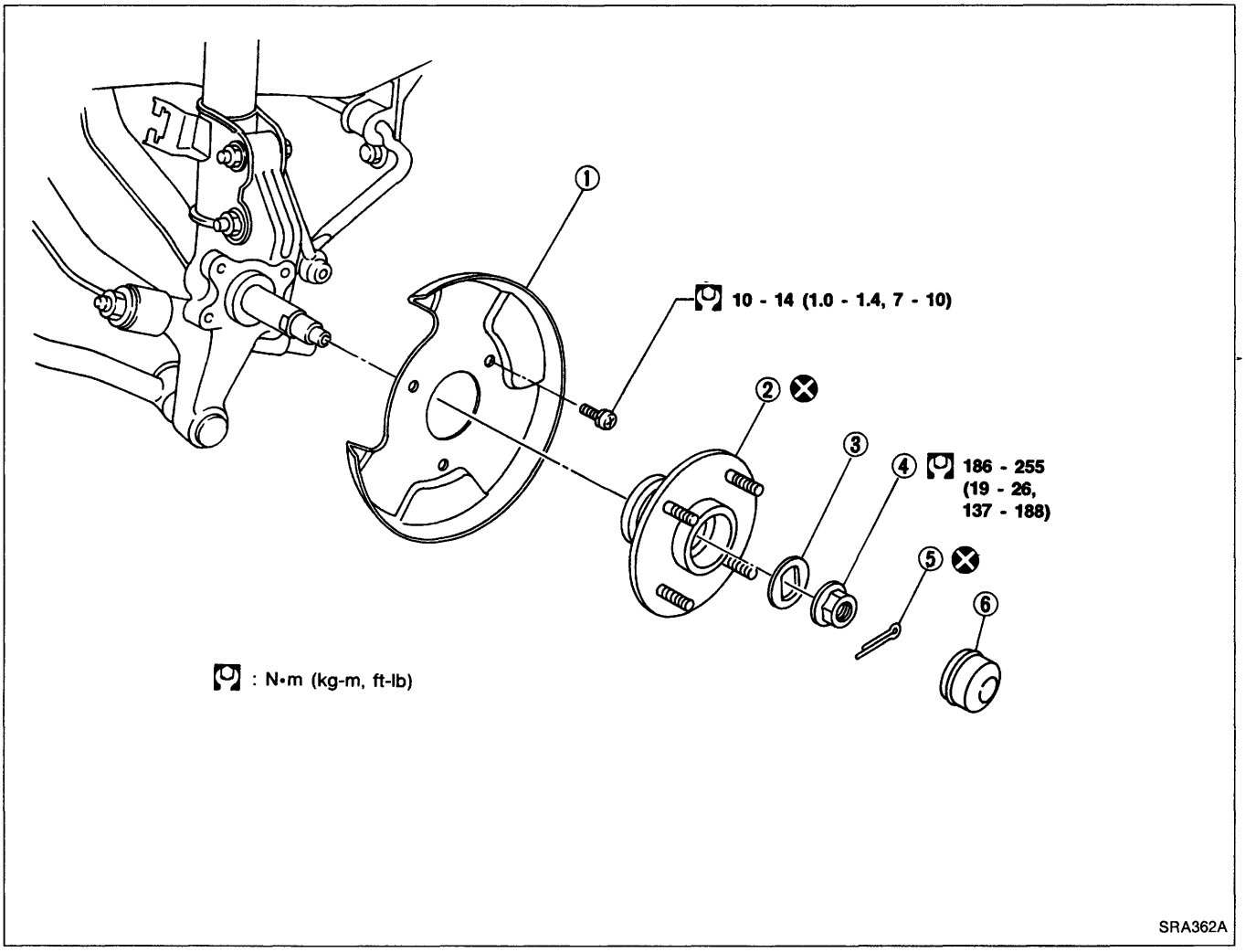


3. Loosen adjusting pin fixing nuts.
4. Adjust toe-in by turning adjusting pins.

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.

: 108 - 127 N·m
(11 - 13 kg-m, 80 - 94 ft-lb)

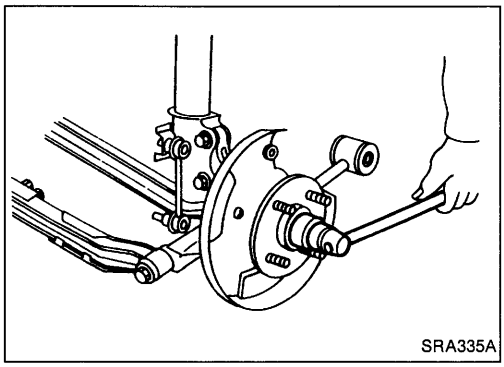


① Baffle plate
② Wheel hub bearing
③ Washer
④ Wheel bearing lock nut
⑤ Cotter pin
⑥ Hub cap

Removal

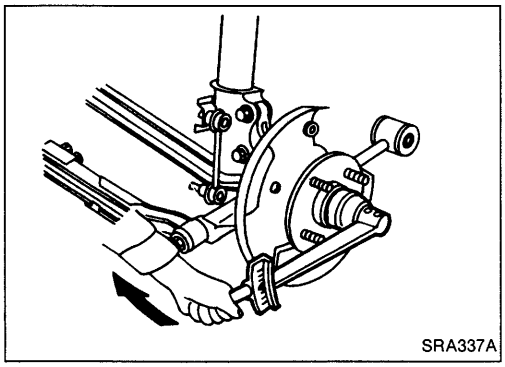
CAUTION:
Wheel hub bearing usually does not require maintenance. If any of the following symptoms are noted, replace wheel hub bearing assembly.

- 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.


SRA335A

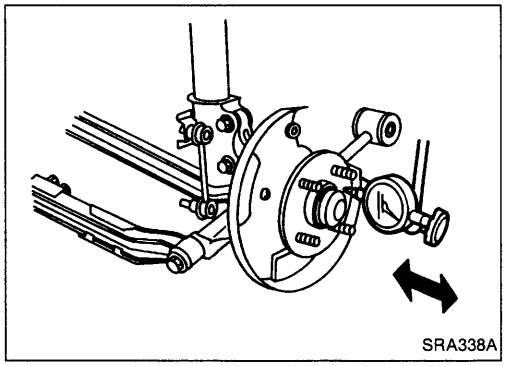
1) Remove brake caliper assembly and rotor.
2) Remove wheel bearing lock nut.

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.


SRA337A

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.


SRA338A

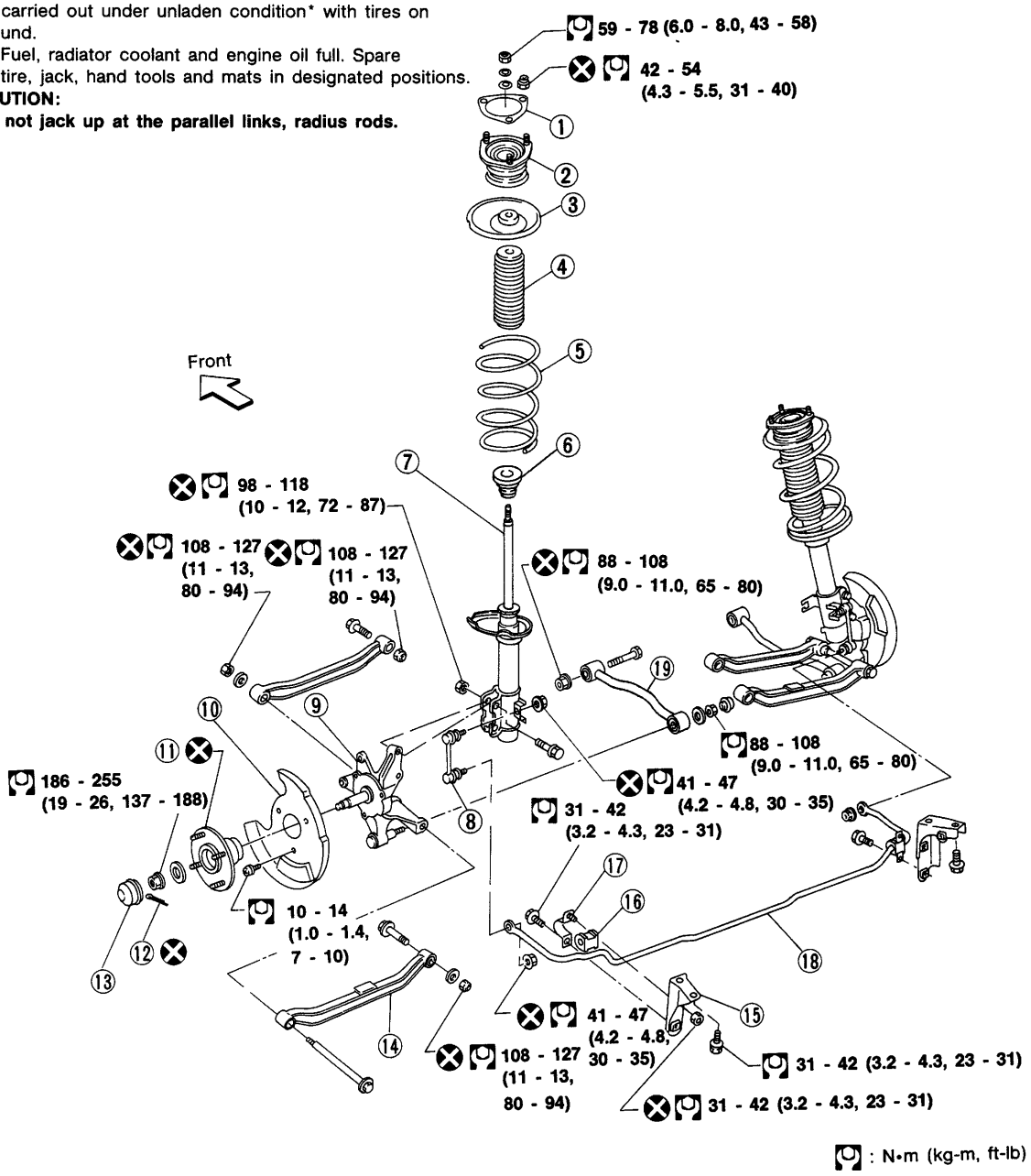
- Check wheel bearing axial end play.
  Axial end play:
  0.05 mm (0.0020 in) or less

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.

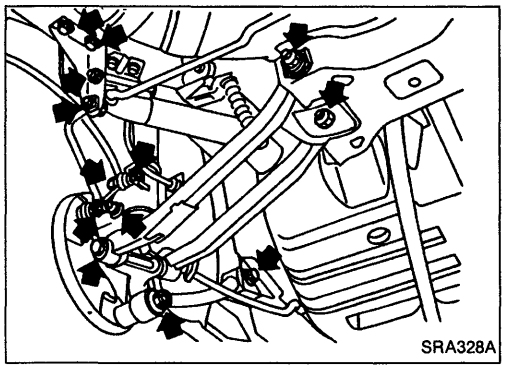
CAUTION:

Do not jack up at the parallel links, radius rods.



URA002

① Gasket
② Strut mounting insulator
③ Upper spring seat
④ Dust cover
⑤ Coil spring
⑥ Bound bumper
⑦ Strut assembly
⑧ Connecting rod
⑨ Knuckle assembly
⑩ Baffle plate
⑪ Wheel hub bearing
⑫ Cotter pin
⑬ Cap
⑭ Parallel link
⑮ Mounting bracket
⑯ Bushing
⑰ Clamp
⑱ Stabilizer bar
⑲ Radius rod


SRA328A

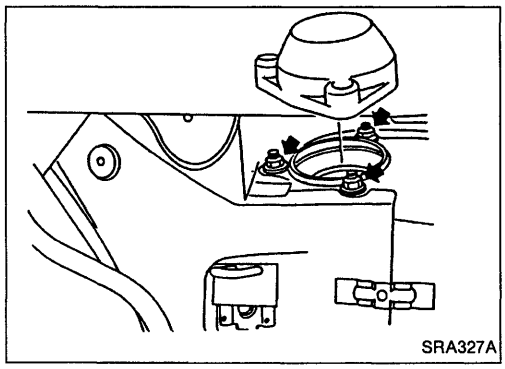
Removal and Installation

CAUTION:

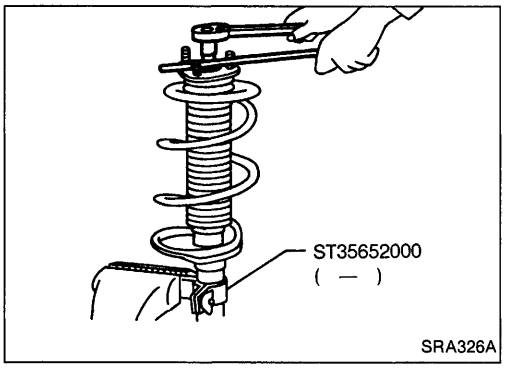
Do not jack up at the parallel links or radius rods.

- 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.


SRA327A

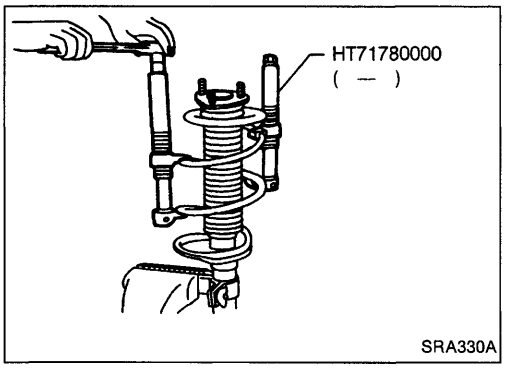
3) Remove rear seat and finisher. Refer to section BF.
4) Remove strut securing nuts (Upper side). Then pull out strut assembly.



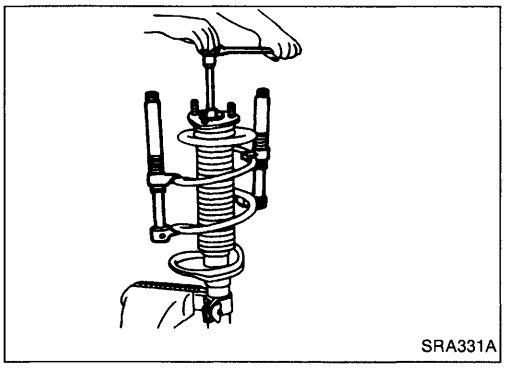
Disassembly

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.

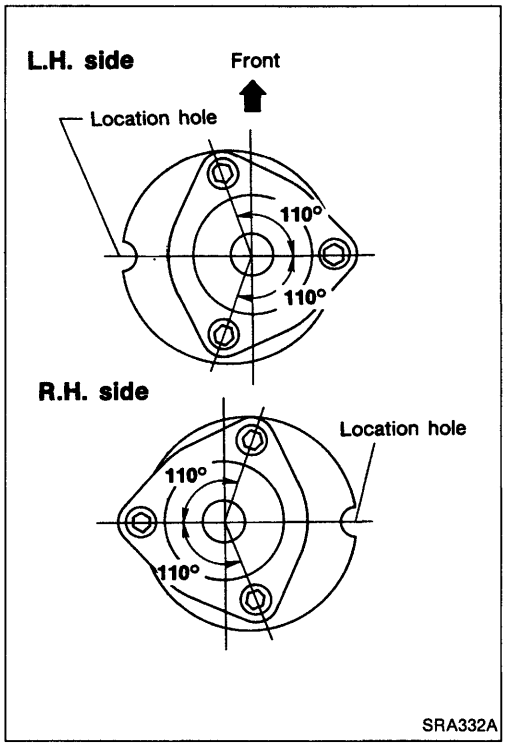
STRUT MOUNTING INSULATOR

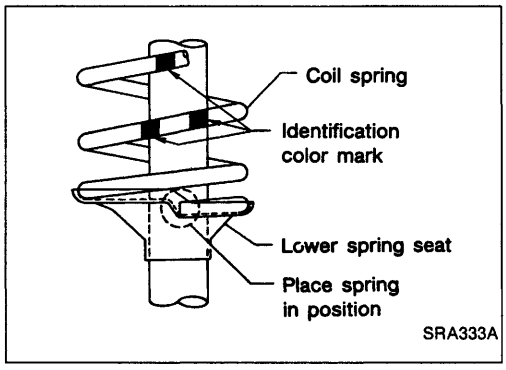
- Check cemented rubber-to-metal portion for melting or cracks.
- Check rubber parts for deterioration.

Inspection (Cont'd)

COIL SPRING

Check for cracks, deformation or other damage.
Replace if necessary.

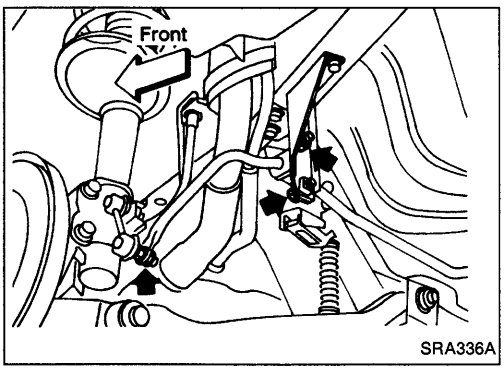




Assembly

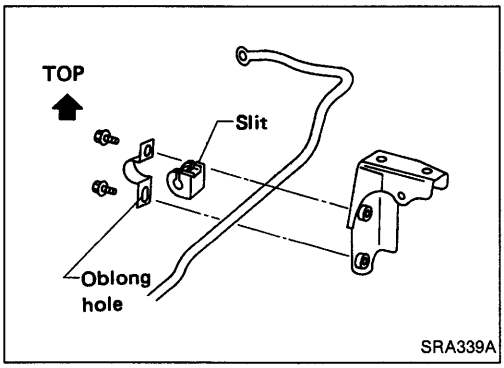
CAUTION:
In GA16D models, there are two struts with different piston rod diameters [18 mm (0.71 in) and 20 mm (0.79 in)].
Therefore the bound rubber bumpers are not interchangeable and should be replaced with the strut assembly.

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.

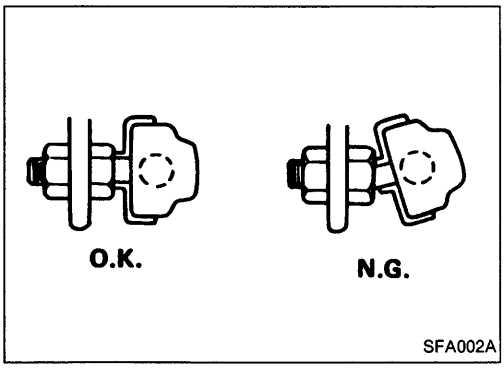


Removal and Installation

- Remove stabilizer bar.



- When installing stabilizer bar, it must be positioned as shown.



- Install stabilizer bar with ball joint socket properly placed.

General Specifications

COIL SPRING

Wire diameter	mm (in)	12.3 (0.484)
Coil diameter (average)	mm (in)	150 (5.91)
Free length	mm (in)	317.5 (12.50)
Spring constant	N/mm (kg/mm, lb/in)	19.6 (2.0, 112)
Identification color		Yellow x 2, Red x 1

SHOCK ABSORBER

Damping force [at 0.3 m (1.0 ft)/sec.]	N (kg, lb)	
Expansion		667 - 902 (68 - 92, 150 - 203)
Compression		235 - 373 (24 - 38, 53 - 84)
Piston rod diameter	mm (in)	22 (0.87)

REAR STABILIZER BAR

Applied model	M/T	A/T
Stabilizer bar diameter mm (in)	18 (0.71)	17 (0.67)
Identification color	Orange	Light green

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*)

Applied model		All
Camber	degree	−1°45′ to −0°15′
Toe-in	mm (in)	−2 to 2 (−0.08 to 0.08)
(Total toe-in)	degree	−12′ to 12′

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

WHEEL BEARING

Applied model	All
Wheel bearing axial end play mm (in)	0.05 (0.0020) or less
Wheel bearing lock nut tightening torque N·m (kg-m, ft-lb)	186 - 255 (19 - 26, 137 - 188)

BRAKE SYSTEM

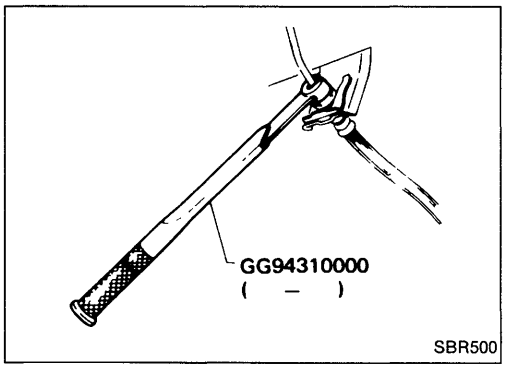
SECTION BR

CONTENTS

PRECAUTIONS AND PREPARATION ..... BR- 2
CHECK AND ADJUSTMENT ..... BR- 3
AIR BLEEDING ..... BR- 4
BRAKE HYDRAULIC LINE ..... BR- 5
CONTROL VALVE ..... BR- 7
BRAKE PEDAL AND BRACKET ..... BR- 8
MASTER CYLINDER BR-10
BRAKE BOOSTER BR-13
VACUUM HOSE BR-15
FRONT DISC BRAKE BR-16
REAR DISC BRAKE BR-20
PARKING BRAKE CONTROL BR-26
ANTI-LOCK BRAKING SYSTEM BR-28
TROUBLE DIAGNOSES BR-43
SERVICE DATA AND SPECIFICATIONS (S.D.S.) BR-66

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.**



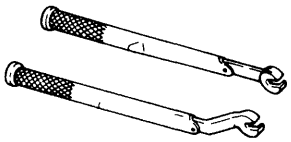
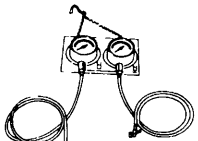
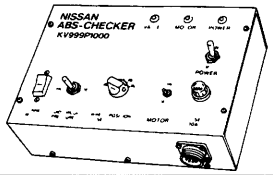
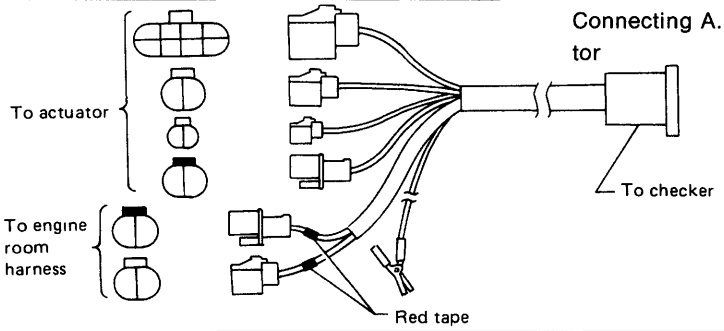
- **Use Tool when removing and installing brake tube.**

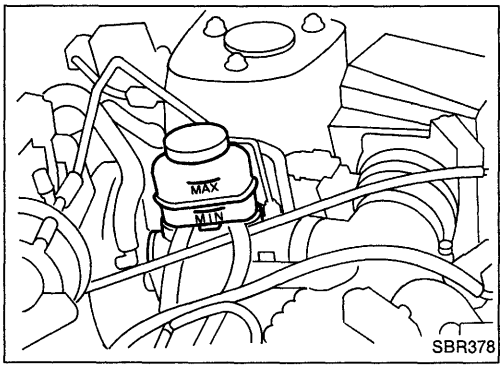
WARNING:

- **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 (Kent-Moore No.) Tool name	Description	
GG94310000 (—) Flare nut torque wrench		Removing and installing each brake piping
KV991V0010 (—) Brake fluid pressure gauge		Measuring brake fluid pressure
KV999P1000 (—) A.B.S. checker		Checking A.B.S. actuator operation
KV999P1010 (—) A.B.S. checker adapter harness		Connecting A.B.S. checker with actuator



Checking Brake Fluid Level

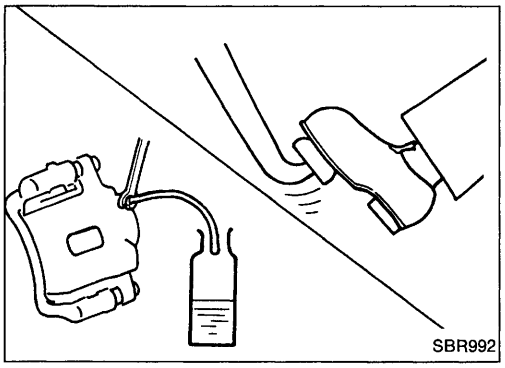
- Check fluid level in reservoir tank. It should be between Max. and Min. lines on reservoir tank.
- If fluid level is extremely low, check brake system for leaks.
- When brake warning lamp comes on even when parking brake lever is released, check brake system for leaks.

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.

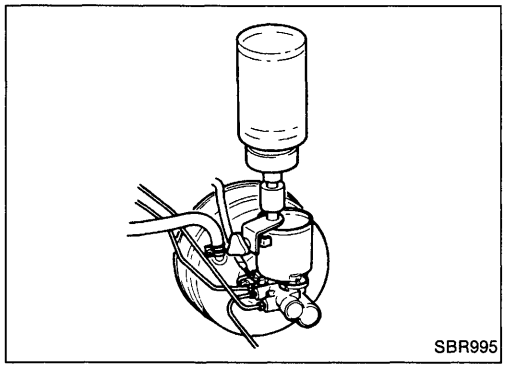


Changing Brake Fluid

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.**

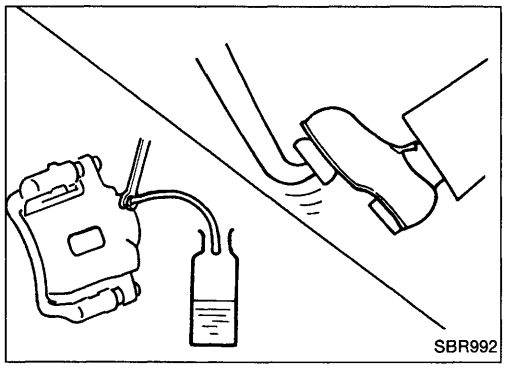
1. Connect a vinyl tube to each air bleeder valve.
2. Drain brake fluid from each air bleeder valve by depressing brake pedal.
3. Refill until new brake fluid comes out of each air bleeder valve.
   Use same procedure as in bleeding hydraulic system to refill brake fluid.
   Refer to "Bleeding Procedure" in "AIR BLEEDING".


SBR995

Bleeding Procedure

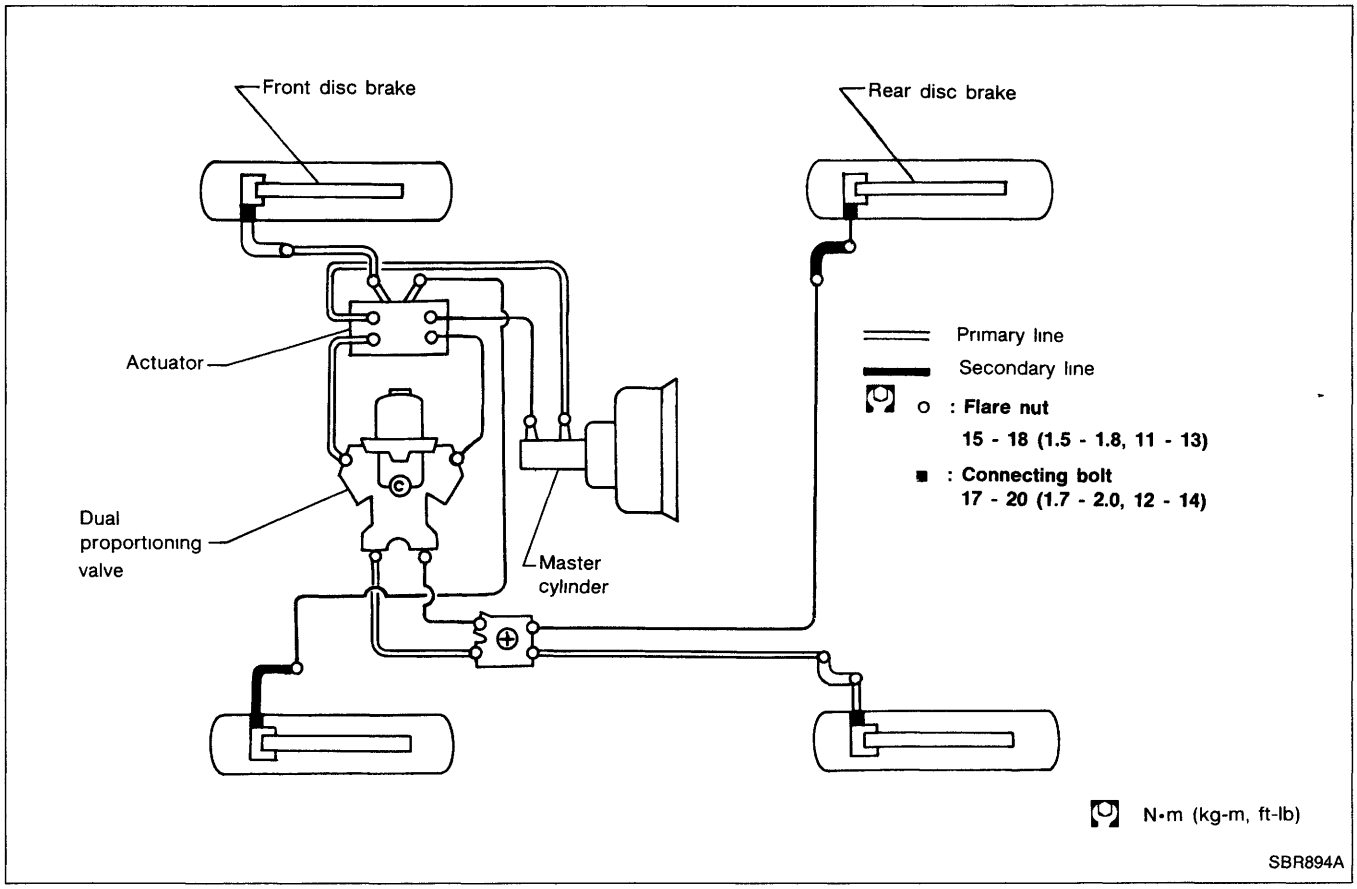
CAUTION:

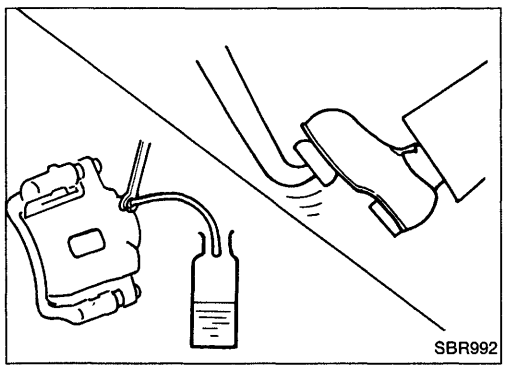
- **Carefully monitor brake fluid level at master cylinder during bleeding operation.**
- **Fill reservoir with new brake fluid "DOT 3". Make sure it is full at all times while bleeding air out of system.**
- **Place a container under master cylinder to avoid spillage of brake fluid.**


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 caliper (or wheel cylinder)
  ↓
  Right front caliper
  ↓
  Right rear caliper (or wheel cylinder)
  ↓
  Left front caliper





Removal

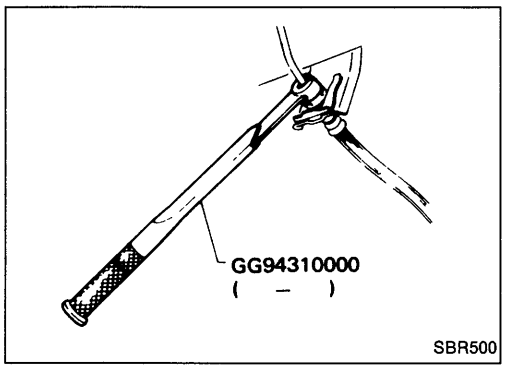
CAUTION:

- **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.

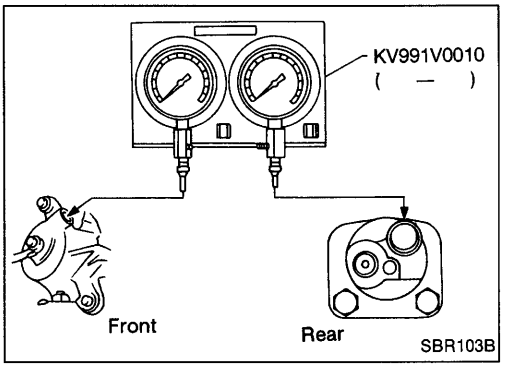


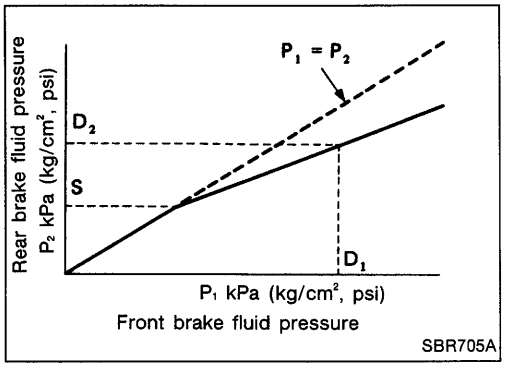
Installation

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".





Dual 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.**

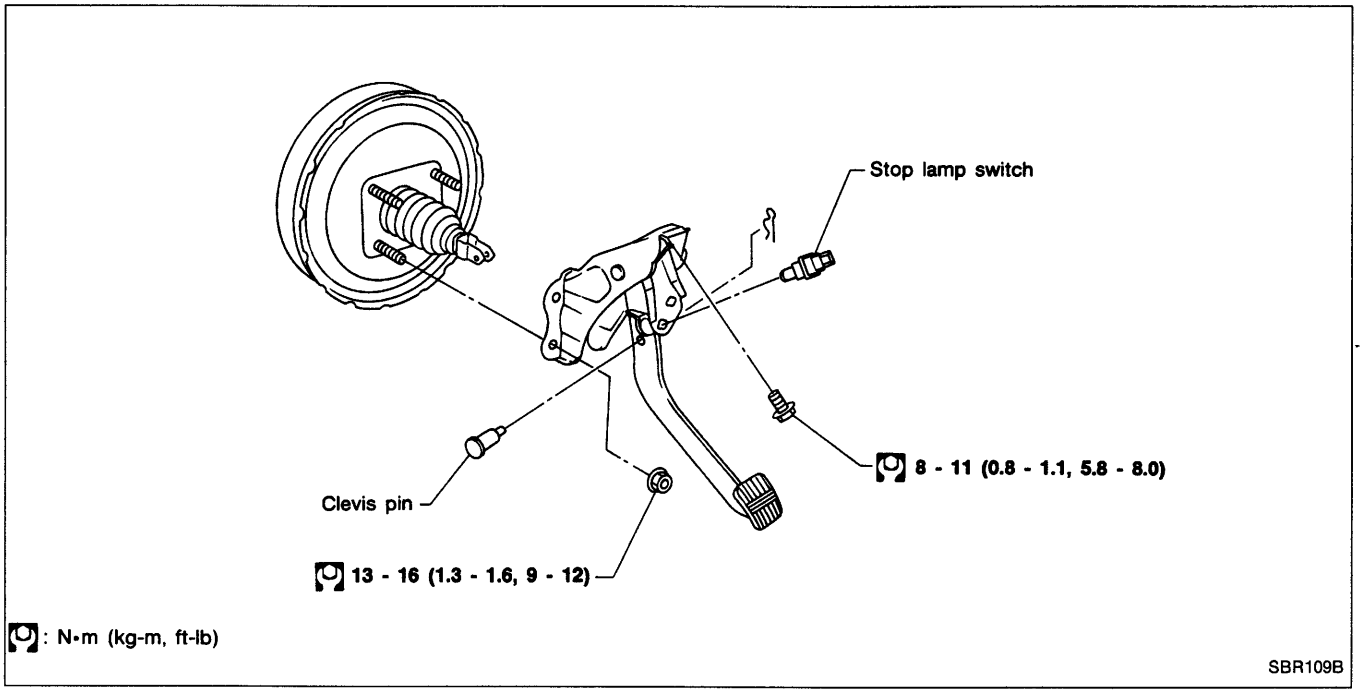
1. Connect Tool to air bleeders of front and rear brakes on either L.H. and R.H. side.
2. Bleed air from the Tool.
3. Check fluid pressure by depressing brake pedal.

Unit: kPa (kg/cm², psi)

Applied pressure (Front brake)	5,884 (60, 853)
Output pressure (Rear brake)	3,629 - 4,021 (37 - 41, 526 - 583)

4. Bleed air after disconnecting the Tool. Refer to "Bleeding Procedure" in "AIR BLEEDING".

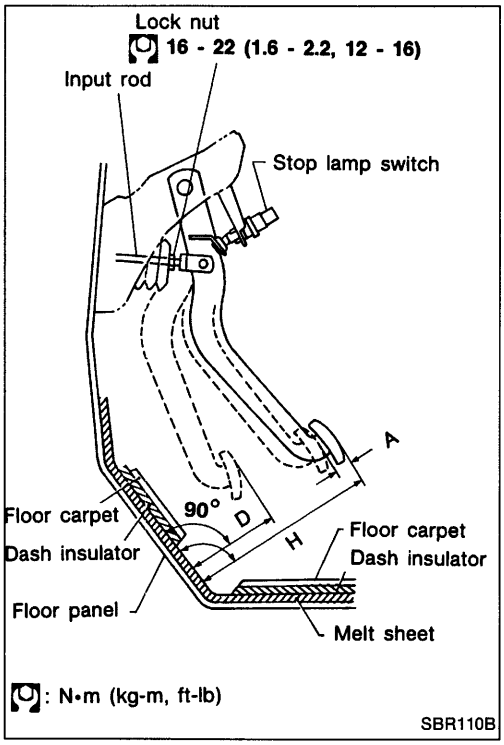
Removal and Installation



Inspection

Check brake pedal for following items.

- Brake pedal bend
- Clevis pin deformation
- Crack of any welded portion



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

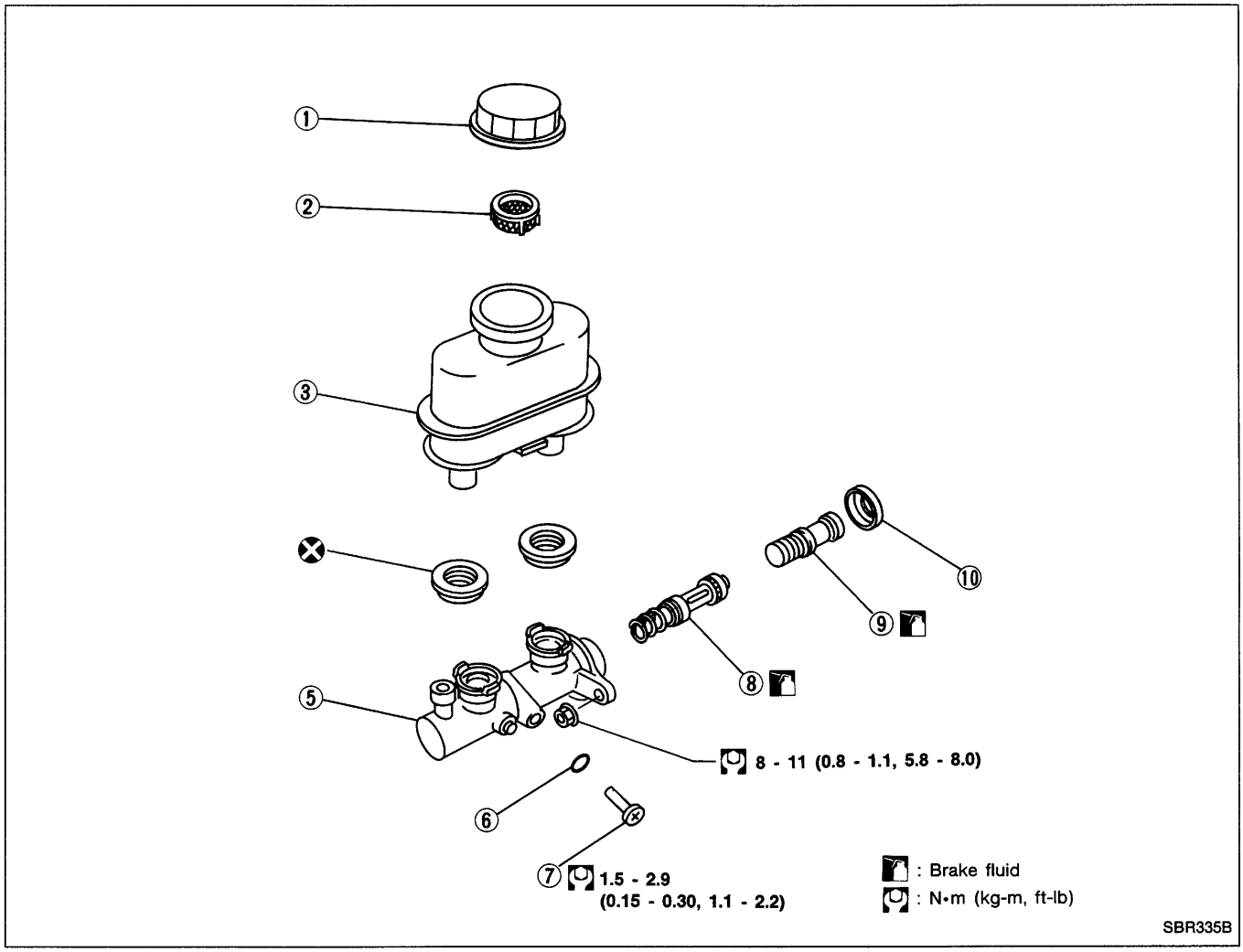
A: **Pedal free play**
Refer to S.D.S.

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.

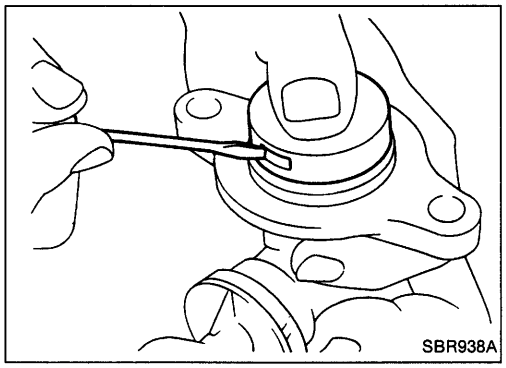


① Reservoir cap
② Oil filter
③ Reservoir tank
④ Seal
⑤ Cylinder body
⑥ O-ring
⑦ Piston stopper
⑧ Secondary piston assembly
⑨ Primary piston assembly
⑩ Stopper cap

Removal

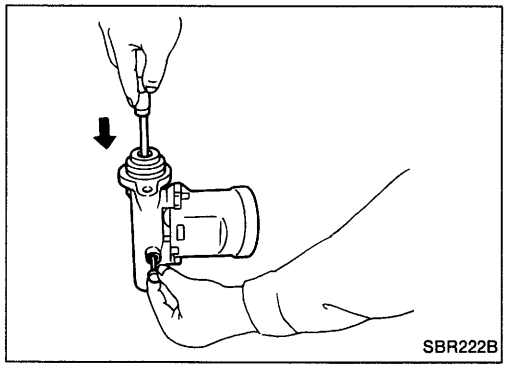
CAUTION:
Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.

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.

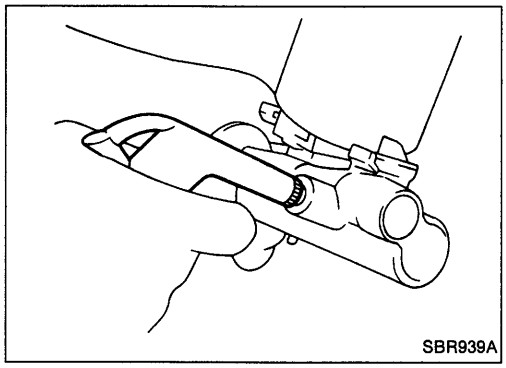

SBR938A

Disassembly

1. Bend claws of stopper cap outward.


SBR222B

2. Remove valve stopper while piston is pushed into cylinder.


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:

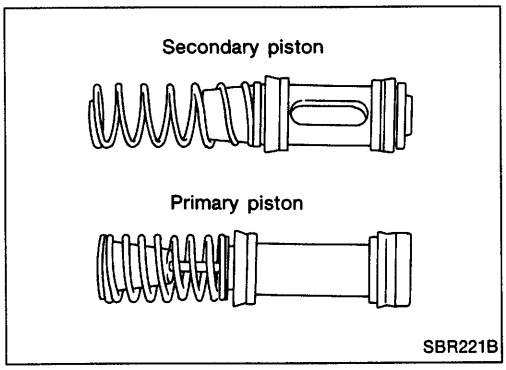
- Pin holes or scratches on inner wall.

Piston:

- Deformation of or scratches on piston cups.

Stopper cap:

- Damage or excessive deformation of claws.



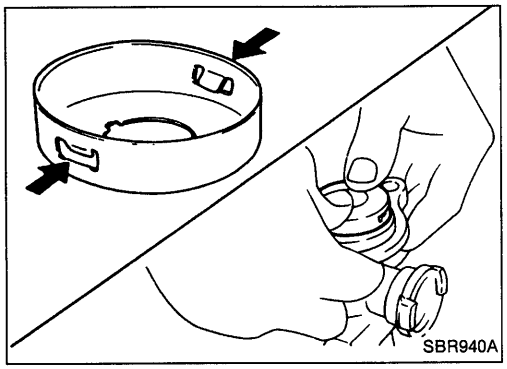
SBR221B

Assembly

1. Insert secondary piston assembly. Then insert primary piston assembly.

- **Pay attention to alignment of secondary piston slit with valve stopper mounting hole of cylinder body.**

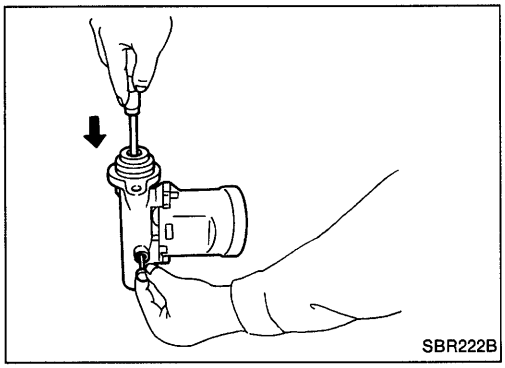
Assembly (Cont'd)



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.



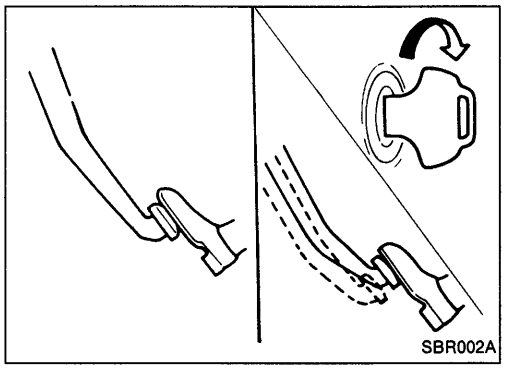
5. Install valve stopper while piston is pushed into cylinder.

Installation

CAUTION:

- **Refill with new brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**

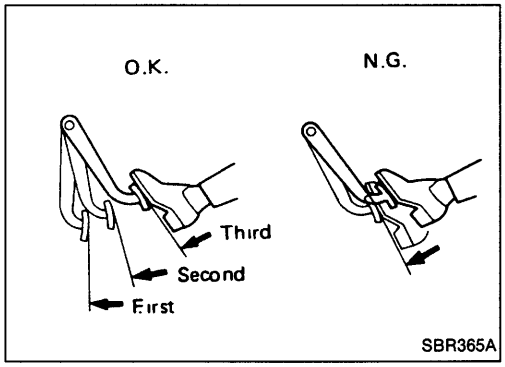
1. Place master cylinder onto brake booster and secure mounting nuts lightly.
2. Fit flare nuts to master cylinder.
3. Tighten mounting nuts.
   Specification:
   8 - 11 N·m
   (0.8 - 1.1 kg-m, 5.8 - 8.0 ft-lb)
4. Tighten flare nuts.
   Specification:
   15 - 18 N·m
   (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
5. Bleed air. Refer to "Bleeding Procedure" in "AIR BLEEDING".



On-vehicle Service

OPERATING CHECK

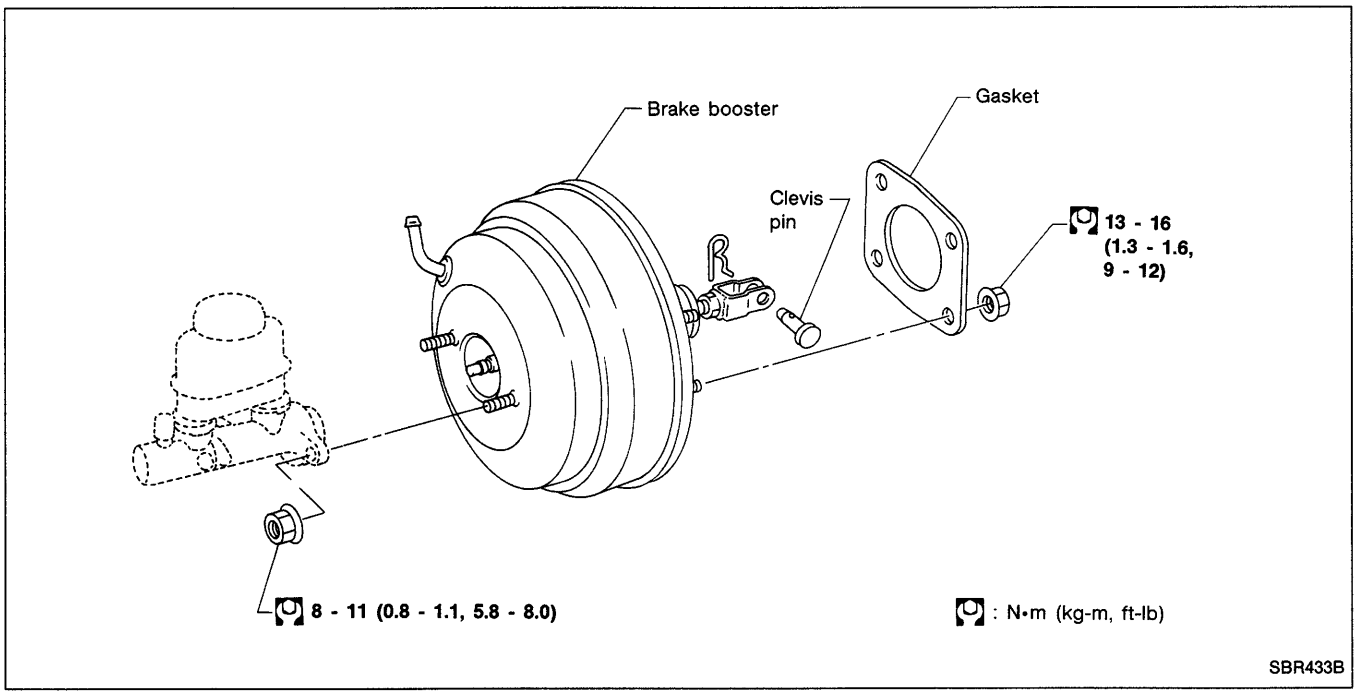
- Depress brake pedal several times with engine off, and check that there is no change in pedal stroke.
- Depress brake pedal, then start engine. If pedal goes down slightly, operation is normal.



AIRTIGHT CHECK

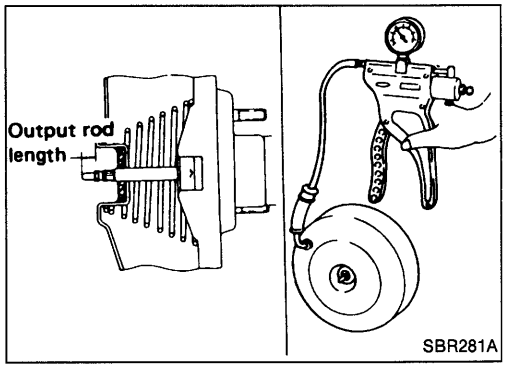
- Start engine, and stop it after one or two minutes. Depress brake pedal several times slowly. If pedal goes further down the first time and gradually rises after second or third time, booster is airtight.
- Depress brake pedal while engine is running, and stop engine with pedal depressed. If there is no change in pedal stroke after holding pedal down **30 seconds**, brake booster is airtight.

Removal



CAUTION:

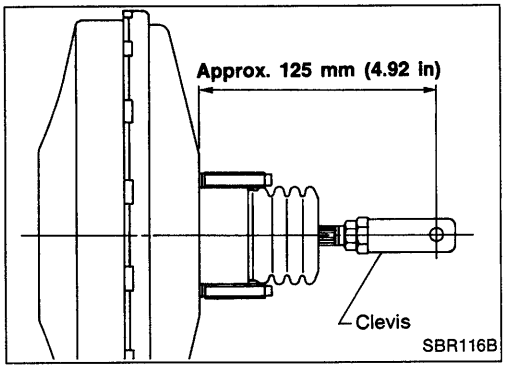
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **Be careful not to deform or bend brake pipes, during removal of booster.**
- **Pay attention to brake booster mounting bolt thread when installing. Due to the acute angle of installation, the threads can be damaged on the metal surrounding the bulkhead holes.**



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:
   10.275 - 10.525 mm (0.4045 - 0.4144 in)

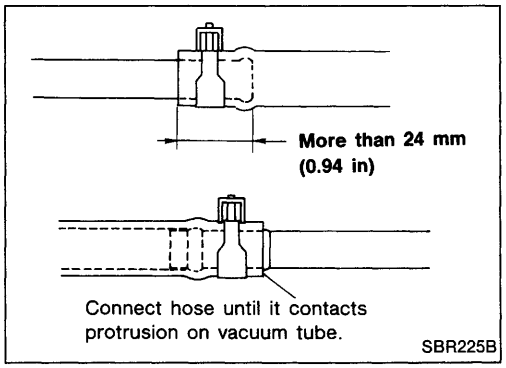


Installation

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".

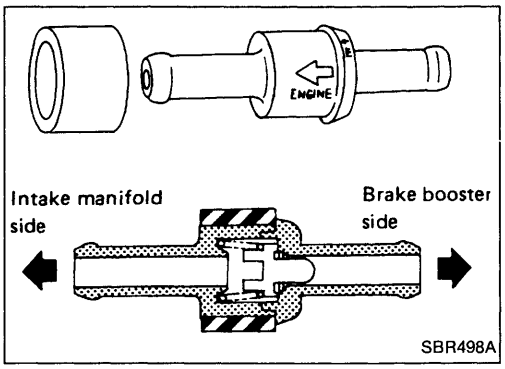


Removal and Installation

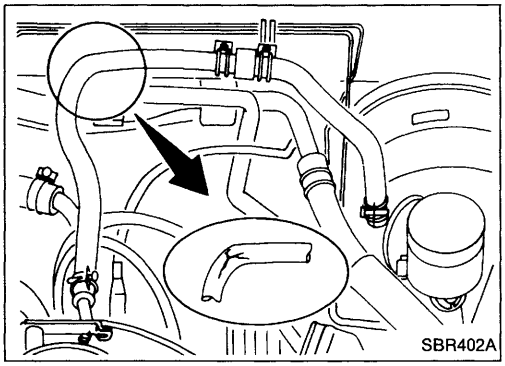
CAUTION:

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 more than 24 mm (0.94 in).**



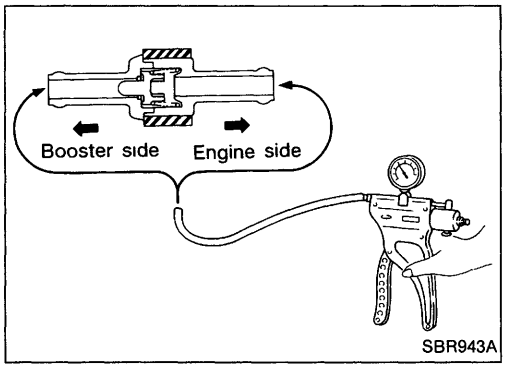
- **Install check valve, paying attention to its direction.**



Inspection

HOSES AND CONNECTORS

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



CHECK VALVE

Check vacuum with a vacuum pump.

Connect to booster side	Vacuum should exist.
Connect to engine side	Vacuum should not exist.

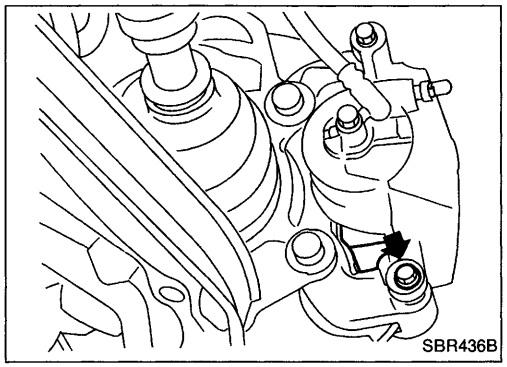
Pad Replacement

WARNING:

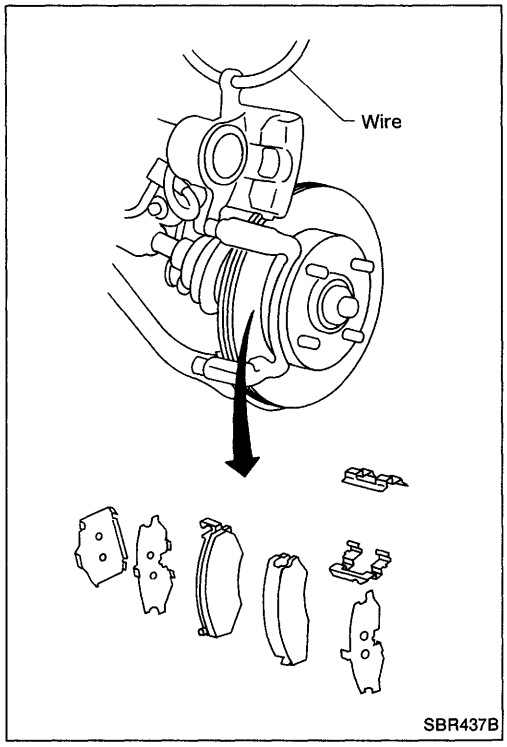
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.

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.**


SBR436B

1. Remove master cylinder reservoir cap.
2. Remove pin bolt.



SBR437B

3. Open cylinder body upward. Then remove pad retainers, and inner and outer shims.

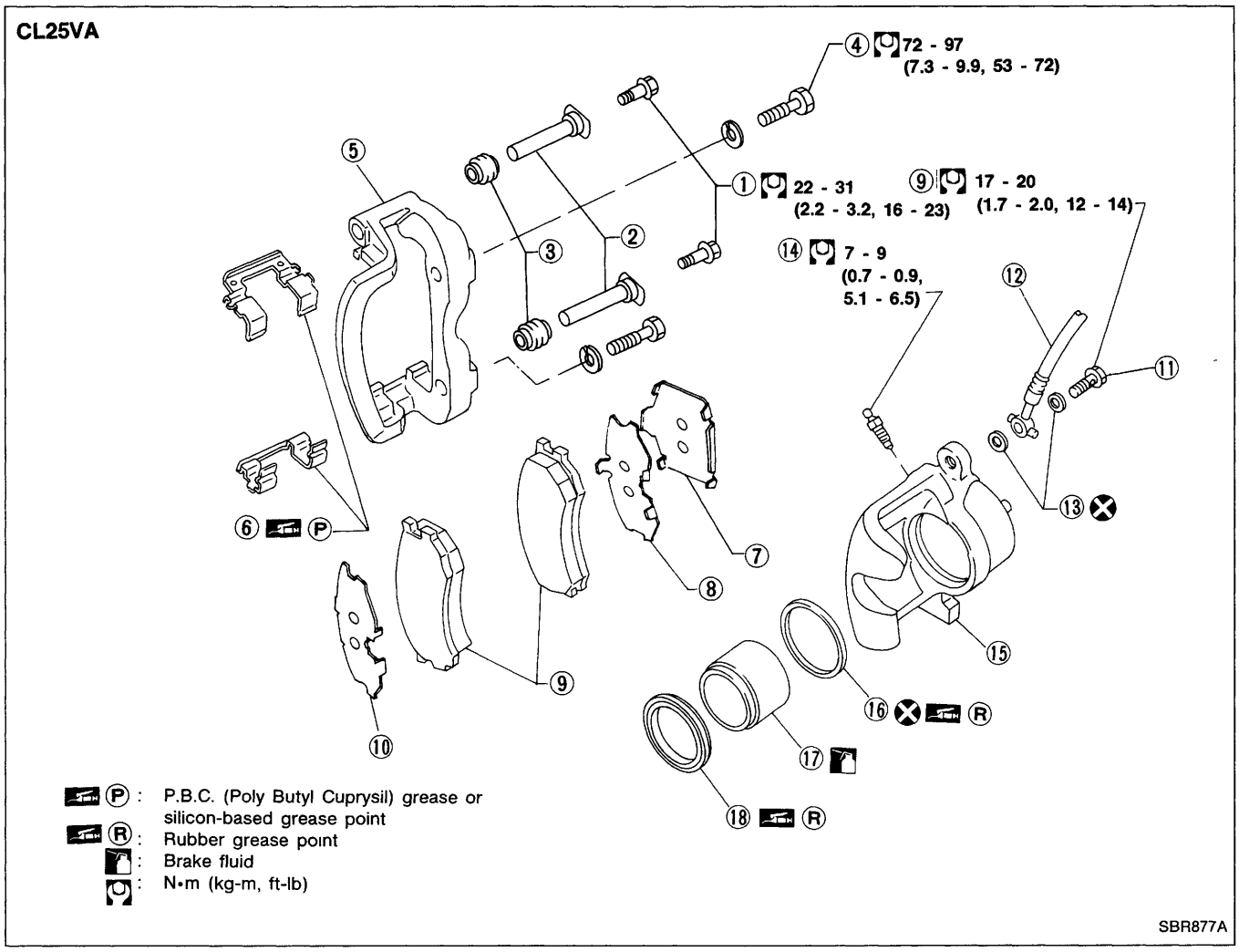
   Standard pad thickness:

   11 mm (0.43 in)

   Pad wear limit:

   2.0 mm (0.079 in)

Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.



① Main pin bolt
② Pin
③ Pin boot
④ Torque member fixing bolt
⑤ Torque member
⑥ Pad retainer
⑦ Shim cover
⑧ Inner shim
⑨ Pad
⑩ Outer shim
⑪ Connecting bolt
⑫ Brake hose
⑬ Copper washer
⑭ Air bleeder
⑮ Cylinder body
⑯ Piston seal
⑰ Piston
⑱ Dust seal

Removal

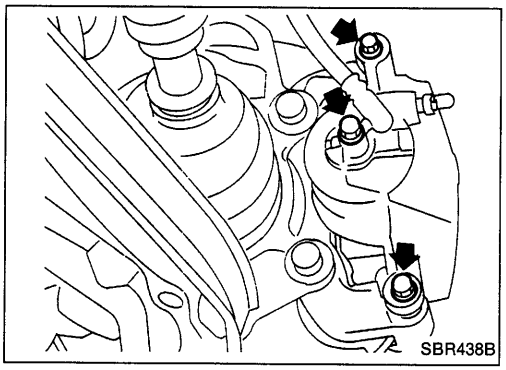
WARNING:

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.

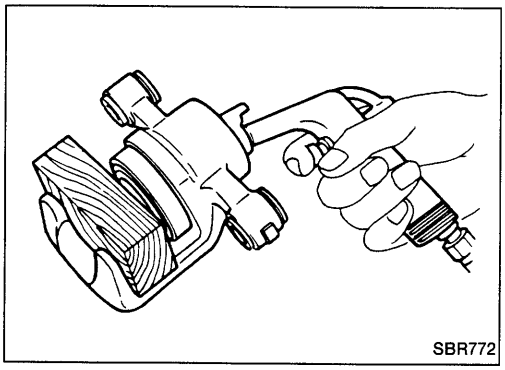
Removal (Cont'd)


SBR438B

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


SBR772

WARNING:

Do not place your fingers in front of piston.

CAUTION:

Do not scratch or score cylinder wall.

1. Push out piston with dust seal with compressed air.
2. Remove piston seal with a suitable tool.

Inspection — Caliper

CYLINDER BODY

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign materials. If any of the above conditions are observed, replace cylinder body.
- Minor damage from rust or foreign materials may be eliminated by polishing surface with a fine emery paper. Replace cylinder body if necessary.

CAUTION:

Use brake fluid to clean. Never use mineral oil.

PISTON

Check piston for score, rust, wear, damage or presence of foreign materials. Replace if any of the above conditions are observed.

CAUTION:

Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

SLIDE PIN, PIN BOLT AND PIN COVER

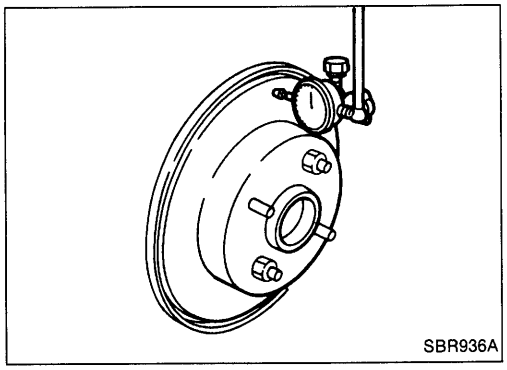
Check for wear, cracks or other damage. Replace if any of the above conditions are observed.

Inspection — Rotor

RUBBING SURFACE

Check rotor for roughness, cracks or chips.

Inspection — Rotor (Cont'd)


SBR936A

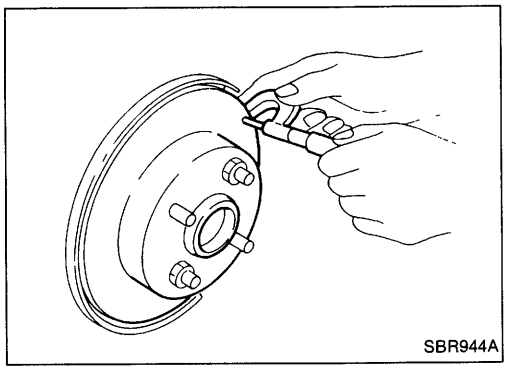
RUNOUT

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.

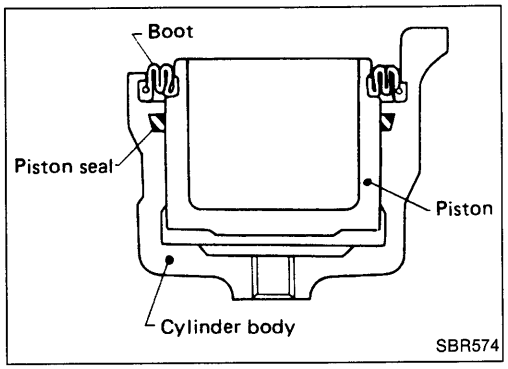
3. Change relative positions of rotor and wheel hub so that runout is minimized.

Maximum runout:
0.07 mm (0.0028 in)


SBR944A

THICKNESS

Rotor repair limit:
Standard thickness
22 mm (0.87 in)
Minimum thickness
20.0 mm (0.787 in)
Thickness variation (At least 8 positions)
Maximum 0.02 mm (0.0008 in)

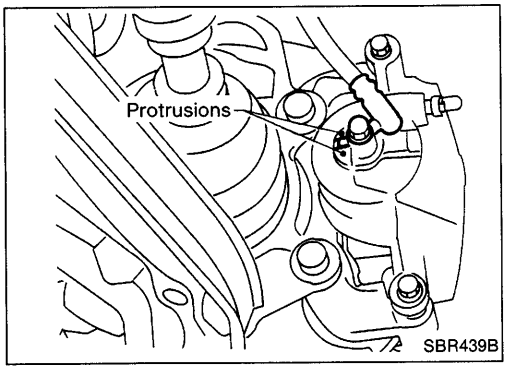


SBR574

Assembly

CAUTION:
Pay attention to piston seal direction.

1. With dust seal fitted to piston, insert dust seal into groove on cylinder body and install piston.
2. Properly secure dust seal.



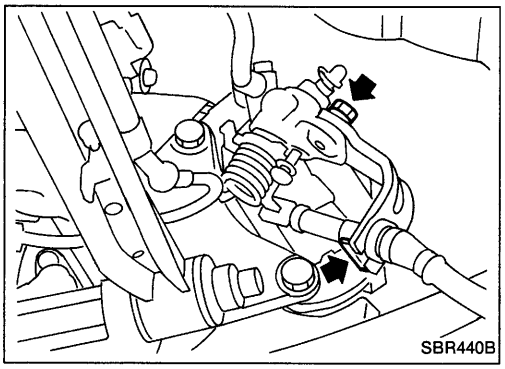
SBR439B

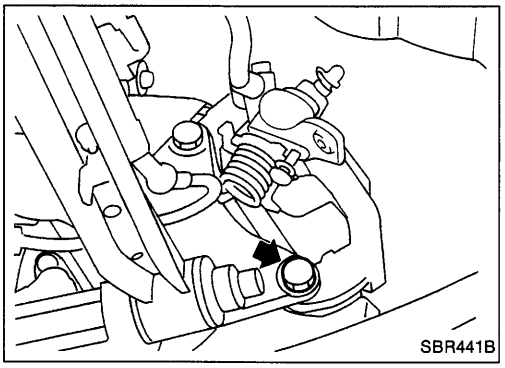
Installation

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".


SBR440B


SBR441B

Pad Replacement

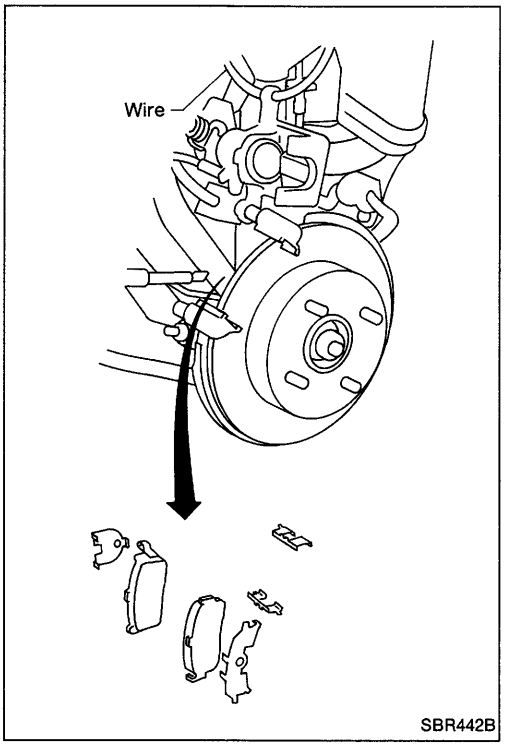
WARNING:

Clean brake pads with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.

CAUTION:

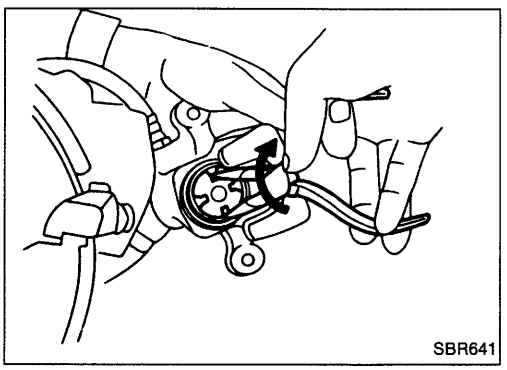
- **When cylinder body is open, do not depress brake pedal because piston will pop out.**
- **Be careful not to damage piston boot or get oil on rotor. Always replace shims in replacing pads.**
- **If shims are rusted or show peeling of rubber coat, replace them with new shims.**
- **It is not necessary 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 mounting bracket bolt and lock spring.
3. Disconnect cable.
4. Remove pin bolt.



SBR442B

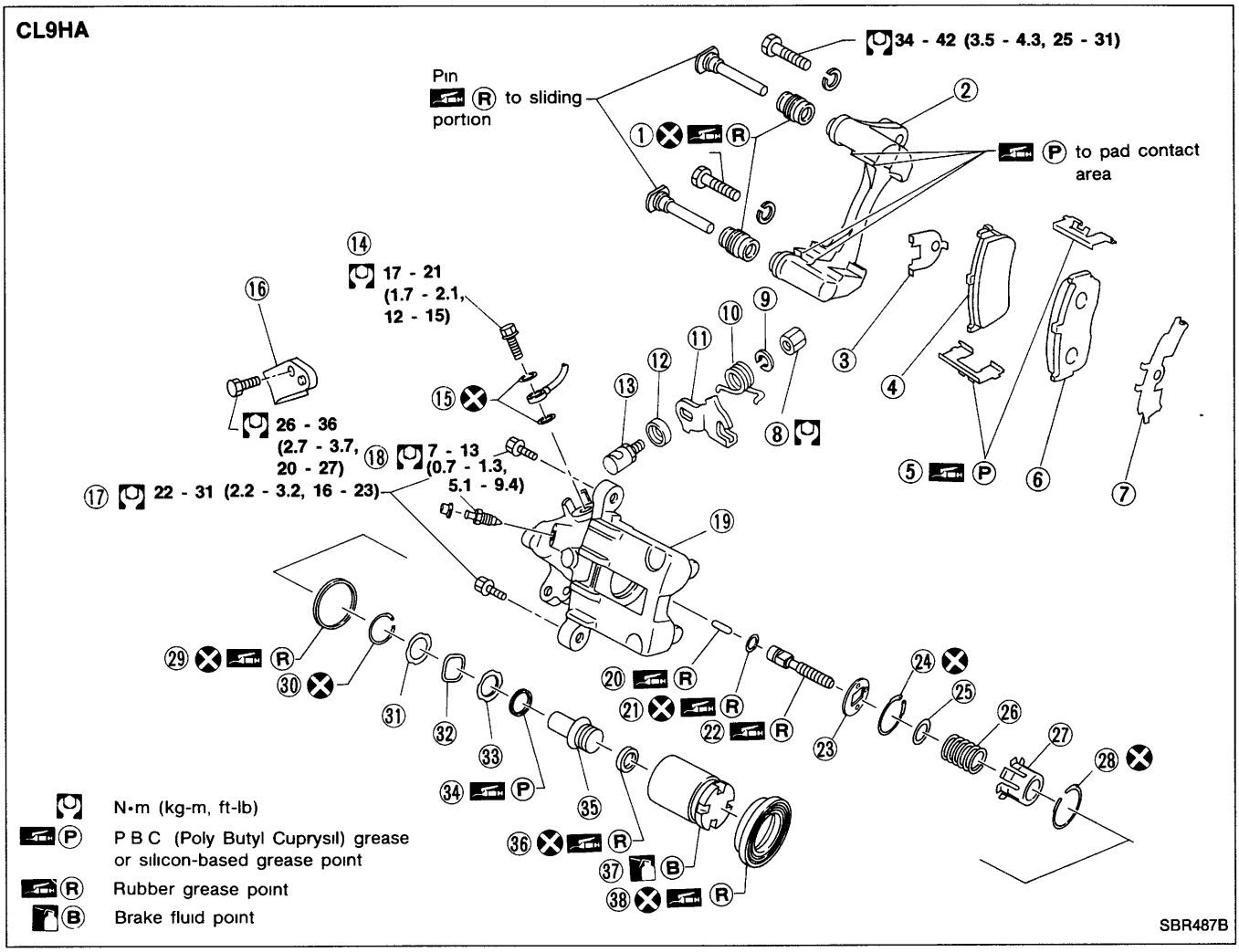
5. Open cylinder body upward. Then remove pad retainers, and inner and outer shims.
   Standard pad thickness:
   10 mm (0.39 in)
   Pad wear limit:
   2.0 mm (0.079 in)


SBR641

6. When installing new pads, push piston into cylinder body by gently turning piston clockwise, as shown.

Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.

CL9HA

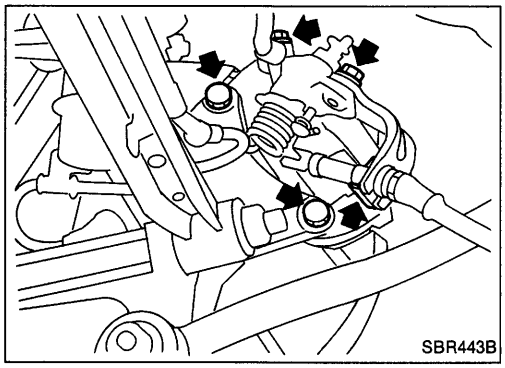


① Pin boot
② Torque member
③ Outer shim
④ Pad
⑤ Pad retainer
⑥ Pad
⑦ Inner shim
⑧ Nut
⑨ Spring washer
⑩ Return spring
⑪ Lever
⑫ Cam boot
⑬ Adjusting cam
⑭ Connecting bolt
⑮ Copper washer
⑯ Cable mounting bracket
⑰ Pin bolt
⑱ Bleed screw
⑲ Cylinder
⑳ Rod
㉑ O-ring
㉒ Push rod
㉓ Key plate
㉔ Ring C
㉕ Seat
㉖ Spring
㉗ Spring cover
㉘ Ring B
㉙ Piston seal
㉚ Ring A
㉛ Spacer
㉜ Wave washer
㉝ Spacer
㉞ Ball bearing
㉟ Adjusting nut
㊱ Cup
㊲ Piston
㊳ Dust seal

Removal

WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.

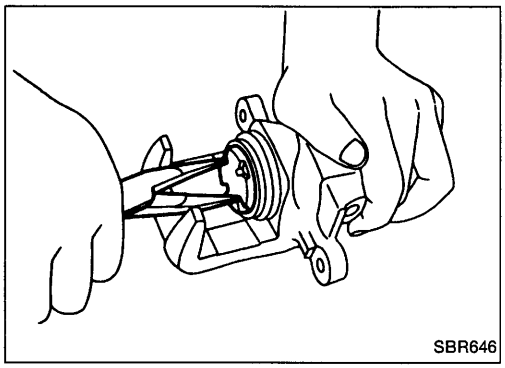
CAUTION:
Suspend caliper assembly with wire so as not to stretch brake hose.


SBR443B

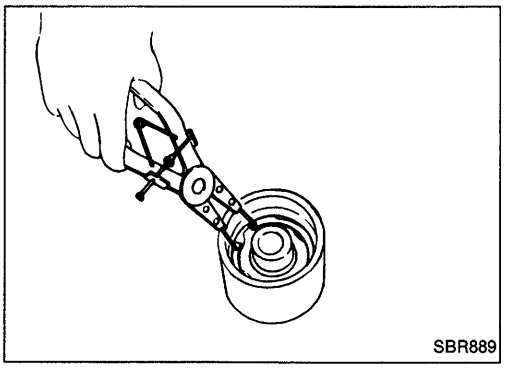
1. Remove brake cable mounting bracket bolt and lock spring.
2. Remove torque member fixing bolts and connecting bolt.

It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly.

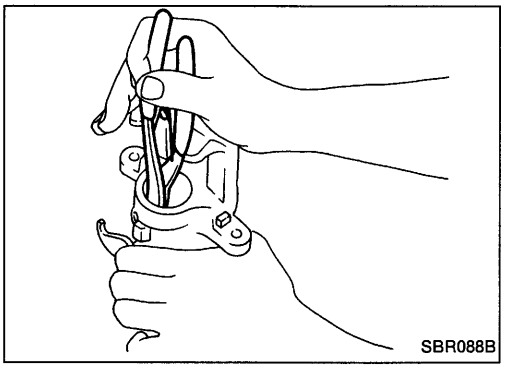
Disassembly


SBR646

1. Remove piston by turning it counterclockwise with suitable long nose pliers.


SBR889

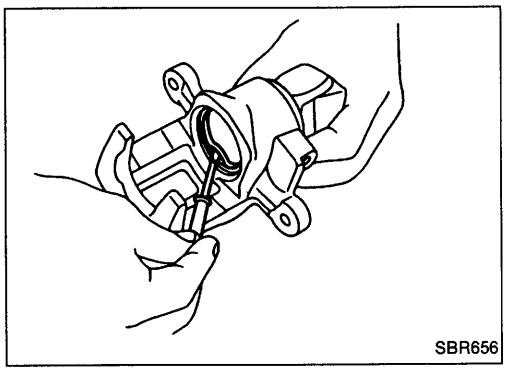
2. Pry off ring A from piston with suitable pliers and remove adjusting nut.


SBR088B

3. Disassemble cylinder body.

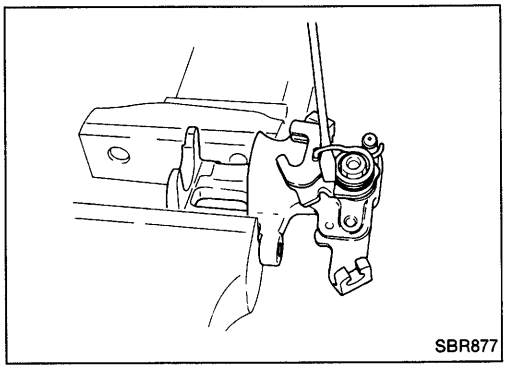
a. Pry off ring B with suitable pliers, then remove spring cover, spring and seat.
b. Pry off ring C, then remove key plate, push rod and rod.

Disassembly (Cont'd)


SBR656

c. Remove piston seal.

Be careful not to damage cylinder body.


SBR877

4. Remove return spring, stopper bolt and lever.

Inspection — Caliper

CAUTION:
Use brake fluid to clean cylinder. Never use mineral oil.

CYLINDER BODY

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign materials. If any of the above conditions are observed, replace cylinder body.
- Minor damage from rust or foreign materials may be eliminated by polishing surface with a fine emery paper. Replace cylinder body if necessary.

TORQUE MEMBER

Check for wear, cracks or other damage. Replace if necessary.

PISTON

Check piston for score, rust, wear, damage or presence of foreign materials.
Replace if any of the above conditions are observed.

CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is stuck to sliding surface.

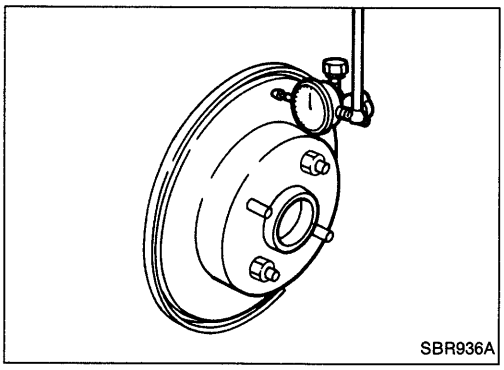
PIN AND PIN BOOT

Check for wear, cracks or other damage.
Replace if any of the above conditions are observed.

Inspection — Rotor

RUBBING SURFACE

Check rotor for roughness, cracks or chips.


SBR936A

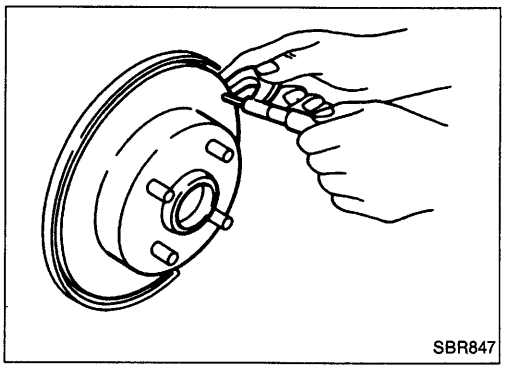
RUNOUT

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)

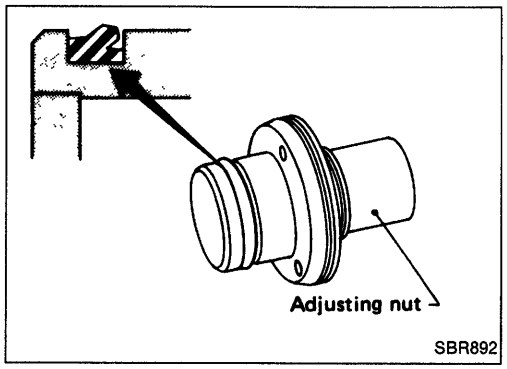

SBR847

THICKNESS

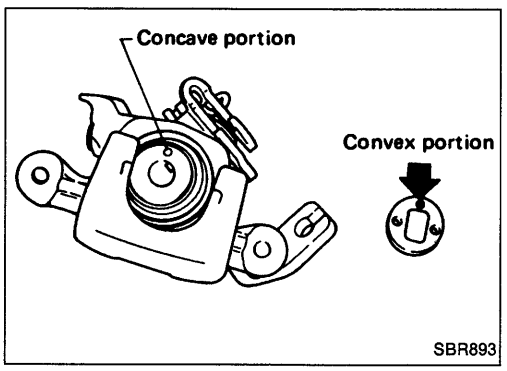
Rotor repair limit:
Standard thickness
9 mm (0.35 in)
Minimum thickness
8 mm (0.31 in)
Thickness variation (At least 8 portions)
Maximum 0.02 mm (0.0008 in)

Assembly

1. Install cup in the specified direction.



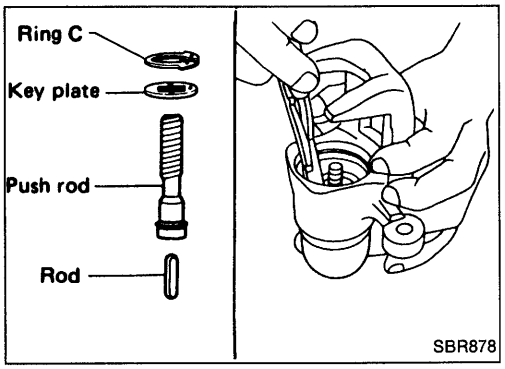
SBR892



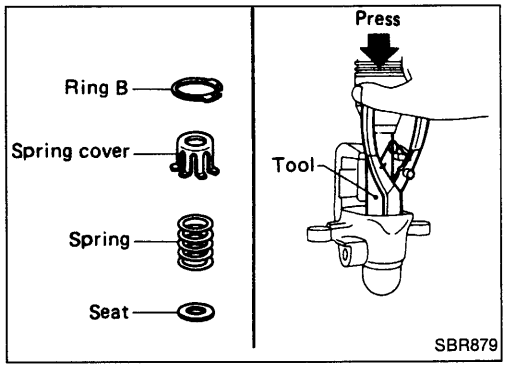
SBR893

2. Fit push rod into square hole in key plate. Also match convex portion of key plate with concave portion of cylinder.

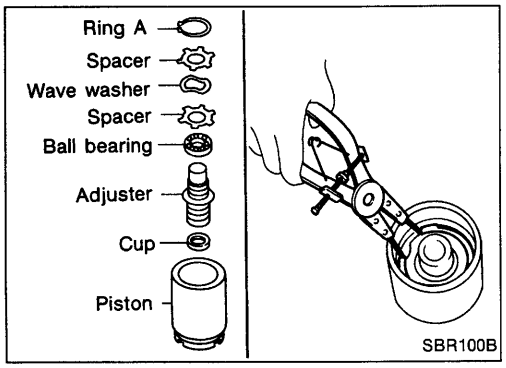
Assembly (Cont'd)



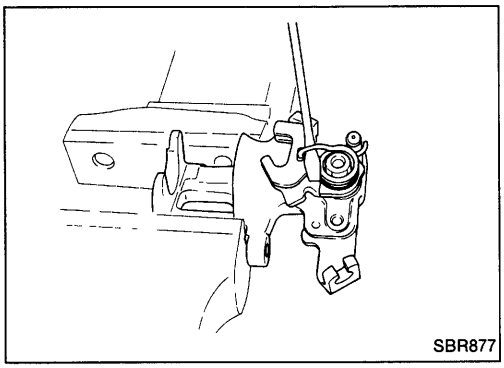
3. Install ring C with a suitable tool.



4. Install seat, spring, spring cover and ring B with suitable press and drift.



5. Install cup, adjuster, bearing, spacers, washers and ring A with a suitable tool.



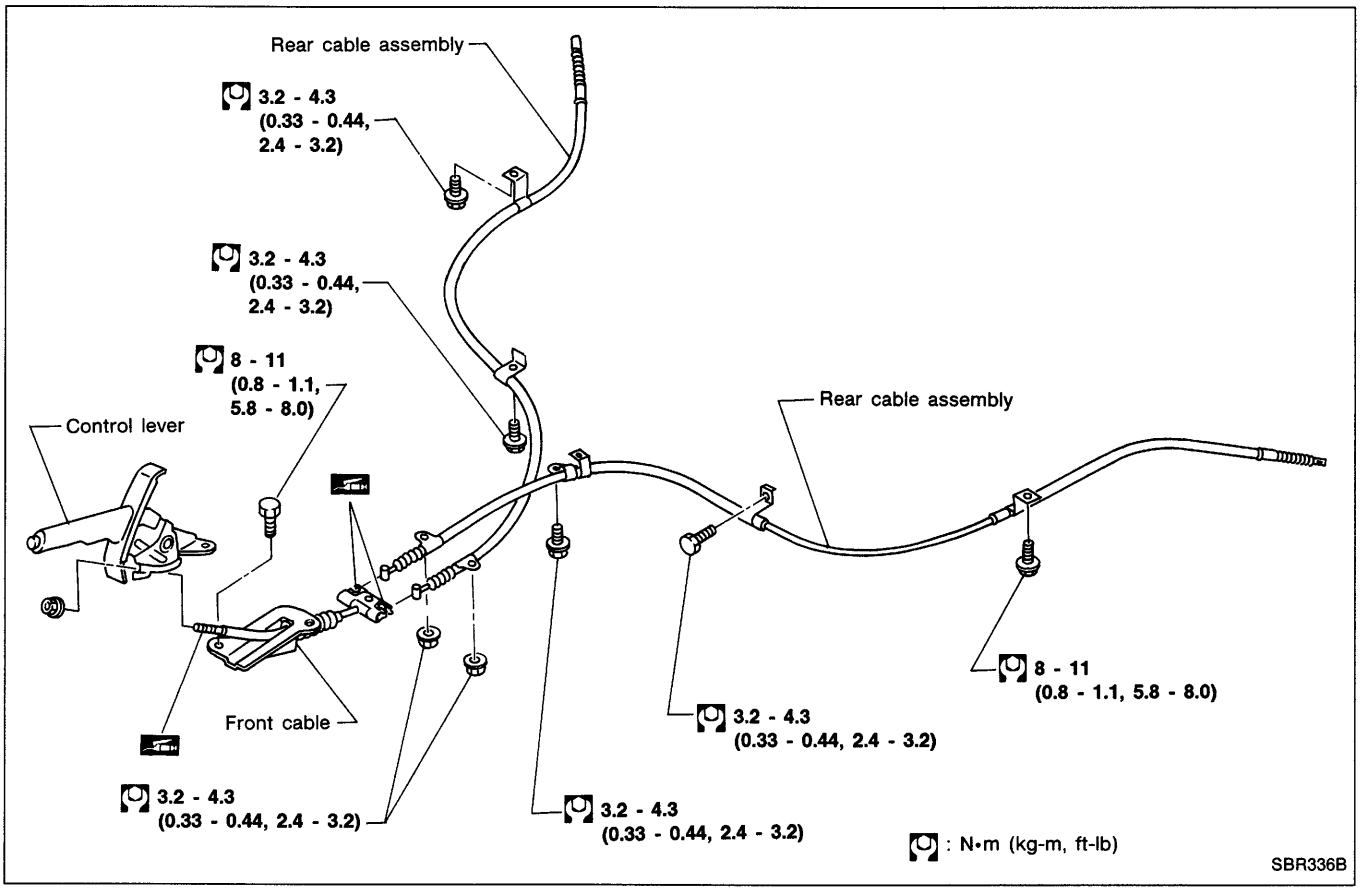
6. Fit lever and tighten stopper bolt.
7. Fit return spring in the order shown.

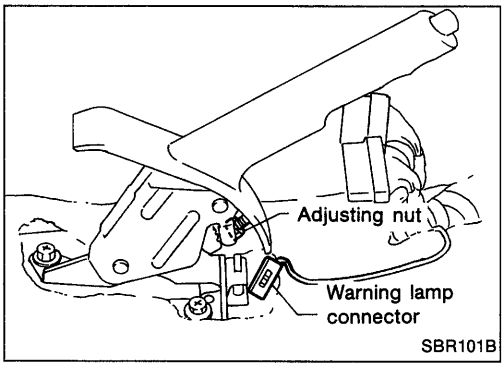
Installation

CAUTION:

- **Refill with new brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**

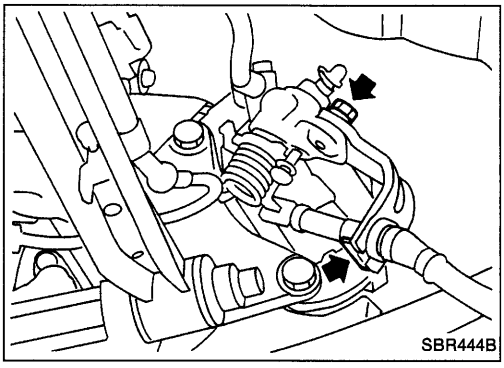
1. Install brake hose to caliper securely.
2. Install all parts and secure all bolts.
3. Bleed air. Refer to "Bleeding Procedure" in "AIR BLEEDING".





Removal and Installation

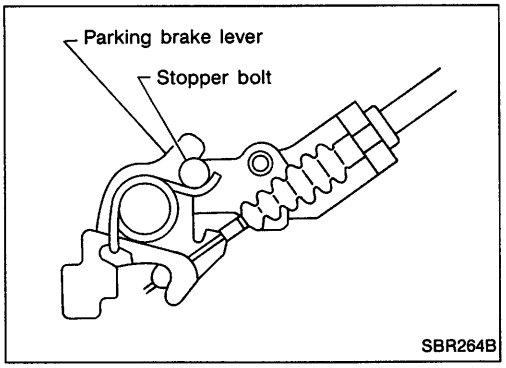
1. To remove parking brake cable, first remove center console.
2. Disconnect warning lamp connector.
3. Remove bolts, slacken off and remove adjusting nut.



4. Remove cable mounting bracket and lock plate.

Inspection

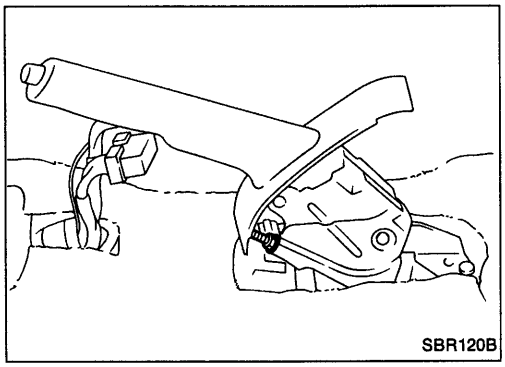
1. Check control lever for wear or other damage. Replace if necessary.
2. Check wires for discontinuity or deterioration. Replace if necessary.
3. Check warning lamp and switch. Replace if necessary.
4. Check parts at each connecting portion and, if found deformed or damaged, replace.



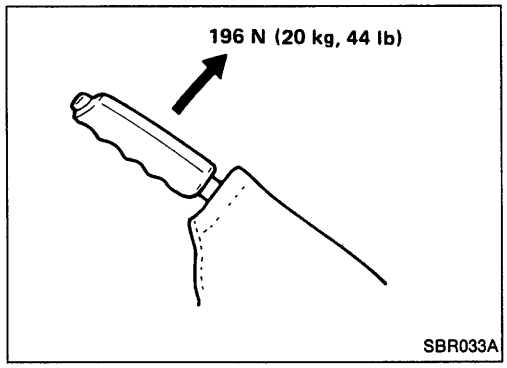
Adjustment

Pay attention to the following points after adjustment.

a. There is no drag when control lever is being released.
b. Parking brake lever returns to stopper bolt when control lever for rear disc brake models is released.



1. Loosen parking brake cable.
2. Depress brake pedal fully more than 5 times.
3. Adjust control lever by turning adjusting nut.



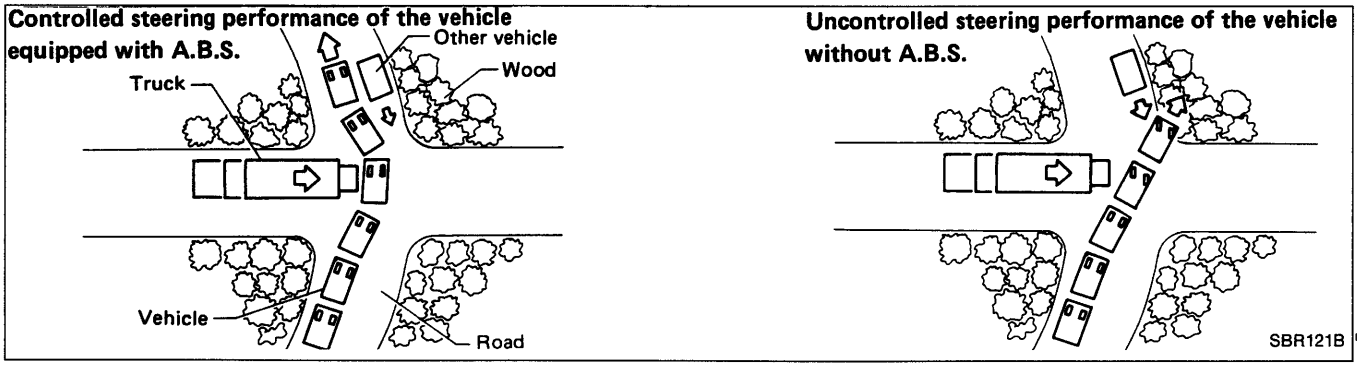
4. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.
   Number of notches : 7 - 9

5. Bend parking brake warning lamp switchplate so that brake warning lamp comes on when ratchet at parking brake lever is pulled "A" notches and goes out when fully released.
   Number of "A" notches : 1 or 0

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.

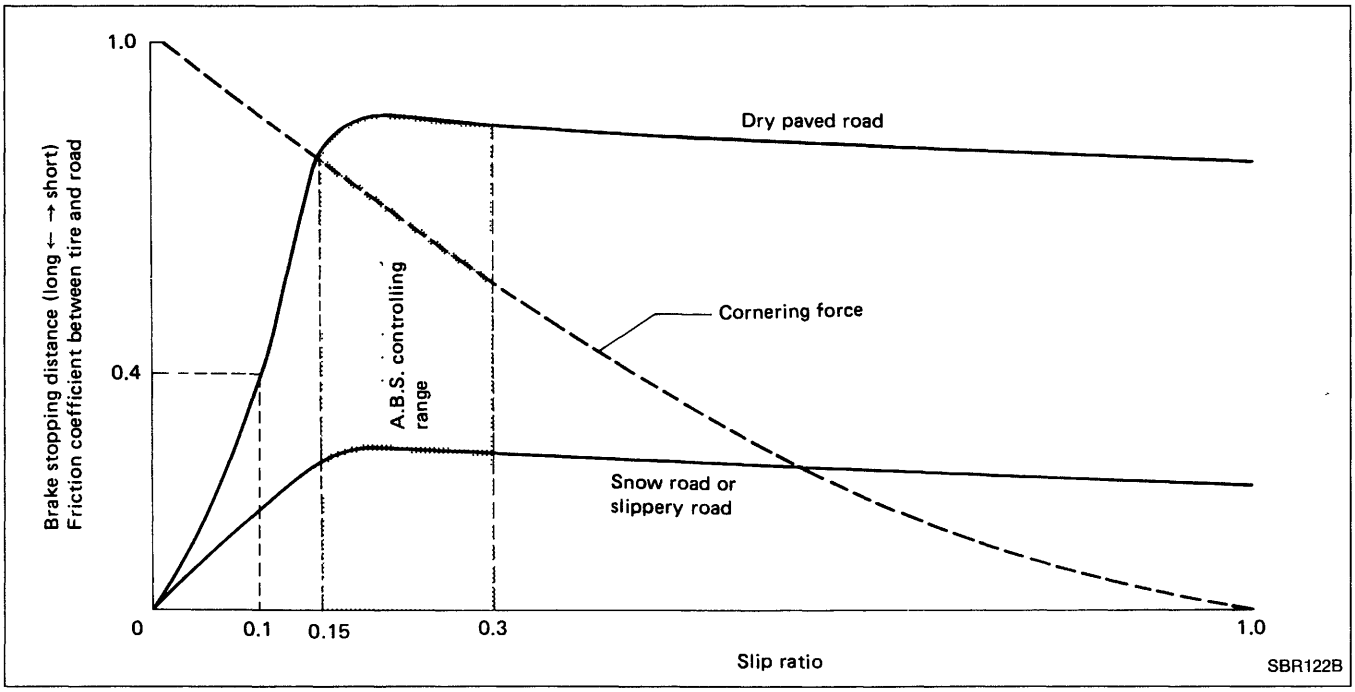
The A.B.S., by the use of electronic and hydraulic components, allows for control of braking force so that locking of the wheels can be avoided in the circumstances described above.
The A.B.S.:
1) Ensures proper tracking performance through steering wheel operation.
2) Enables obstacles to be avoided 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, accumulator and 4 solenoids (one per wheel). 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.

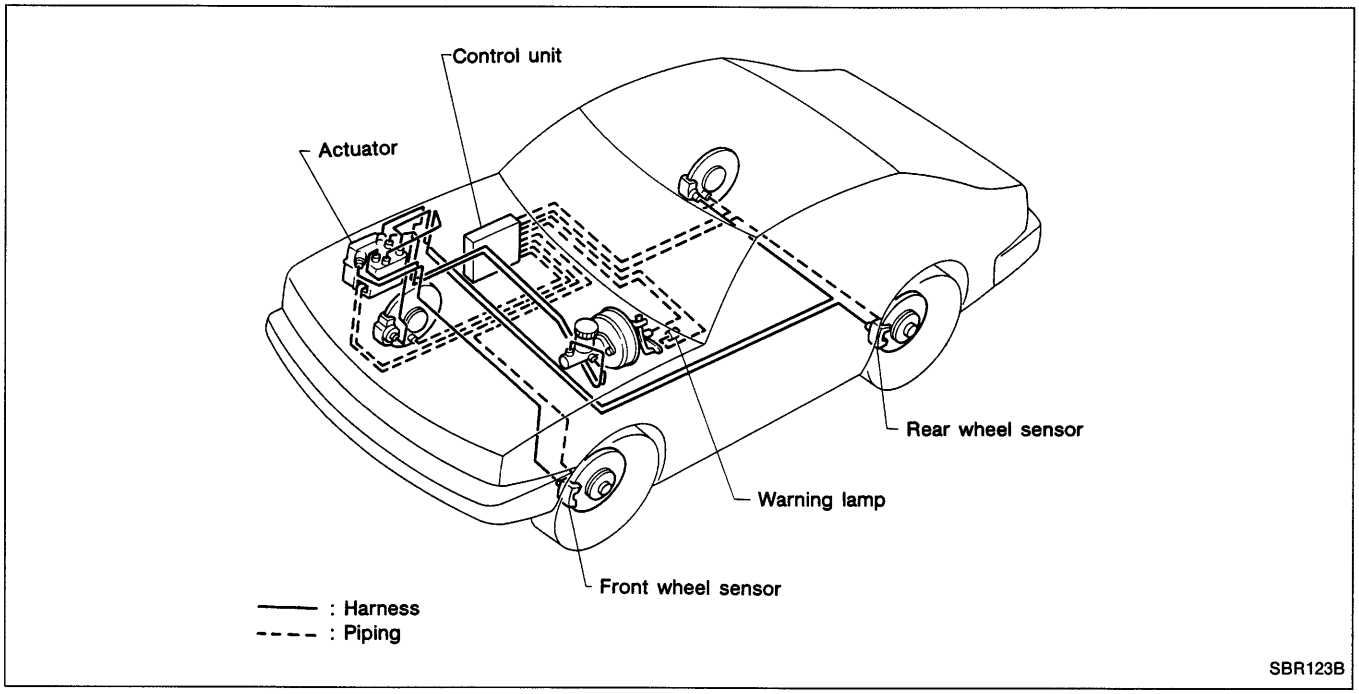
Operation (Cont'd)

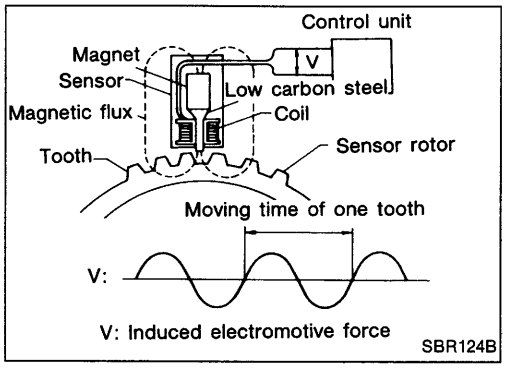


$$\text{SLIP RATIO} = \frac{\text{VEHICLE SPEED} - \text{WHEEL SPEED}}{\text{VEHICLE SPEED}}$$

- 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

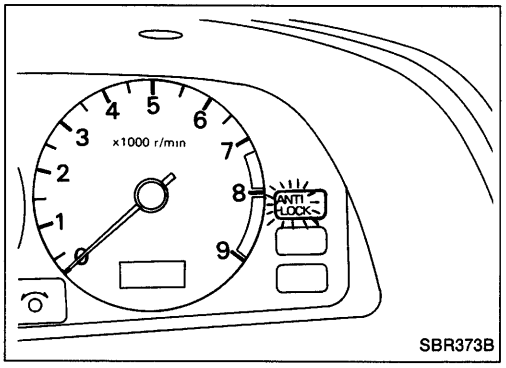




System Description

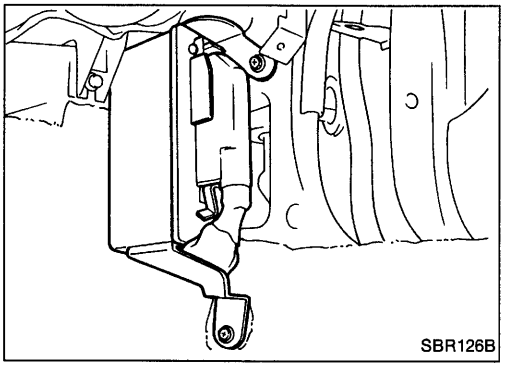
SENSOR

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.



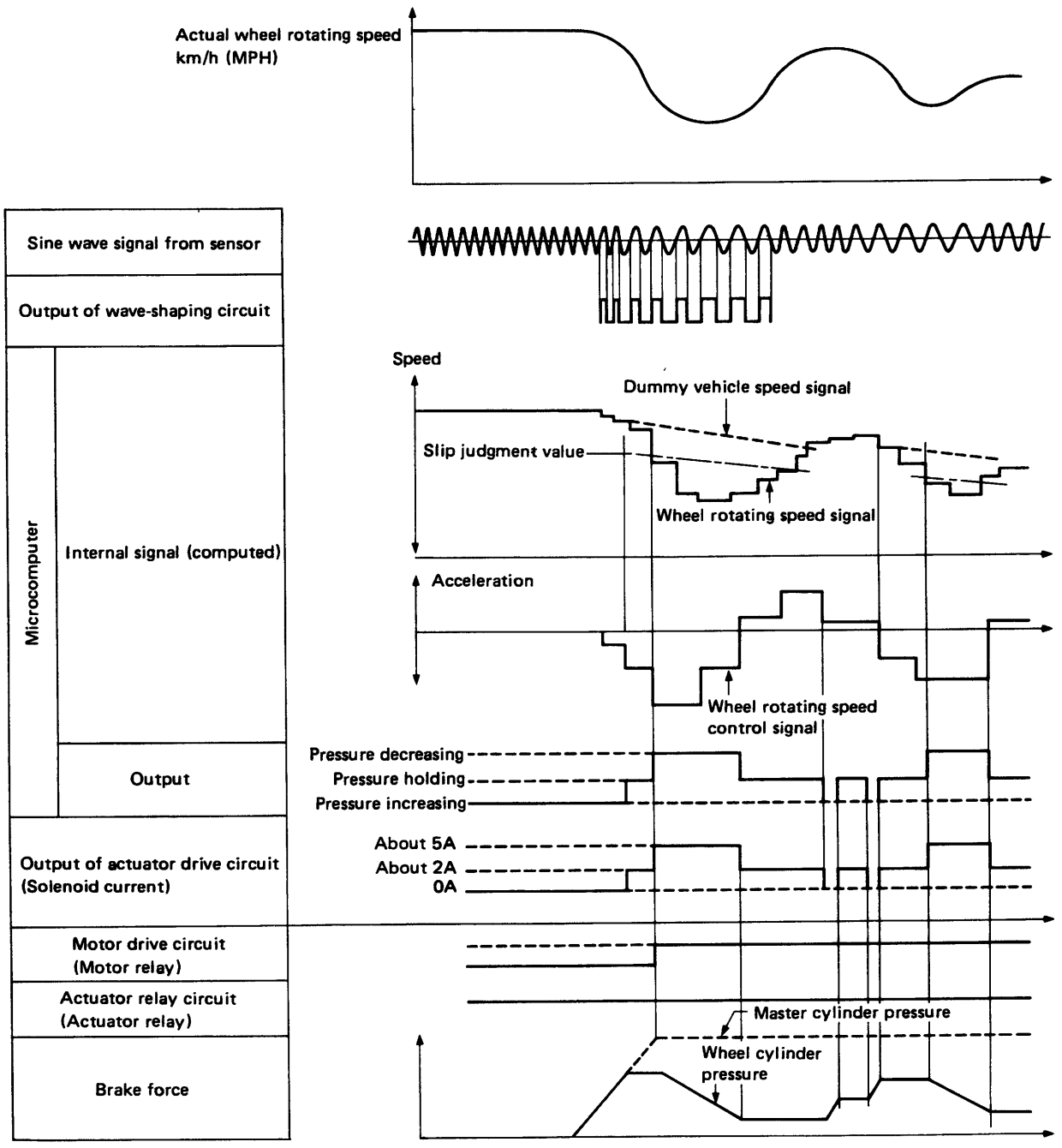
CONTROL UNIT

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. 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)

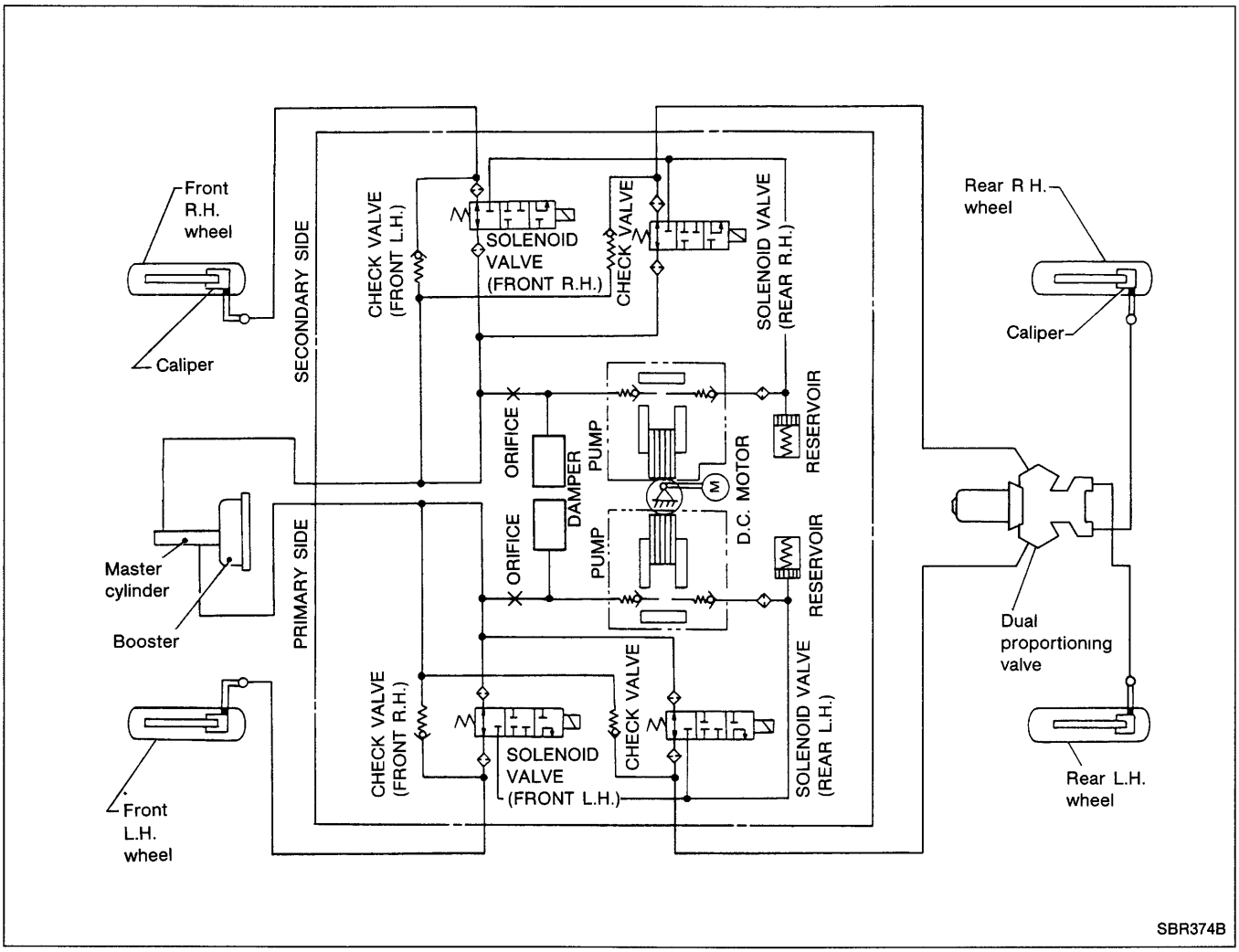
CONTROL UNIT CONTROL CHART



SBR127B

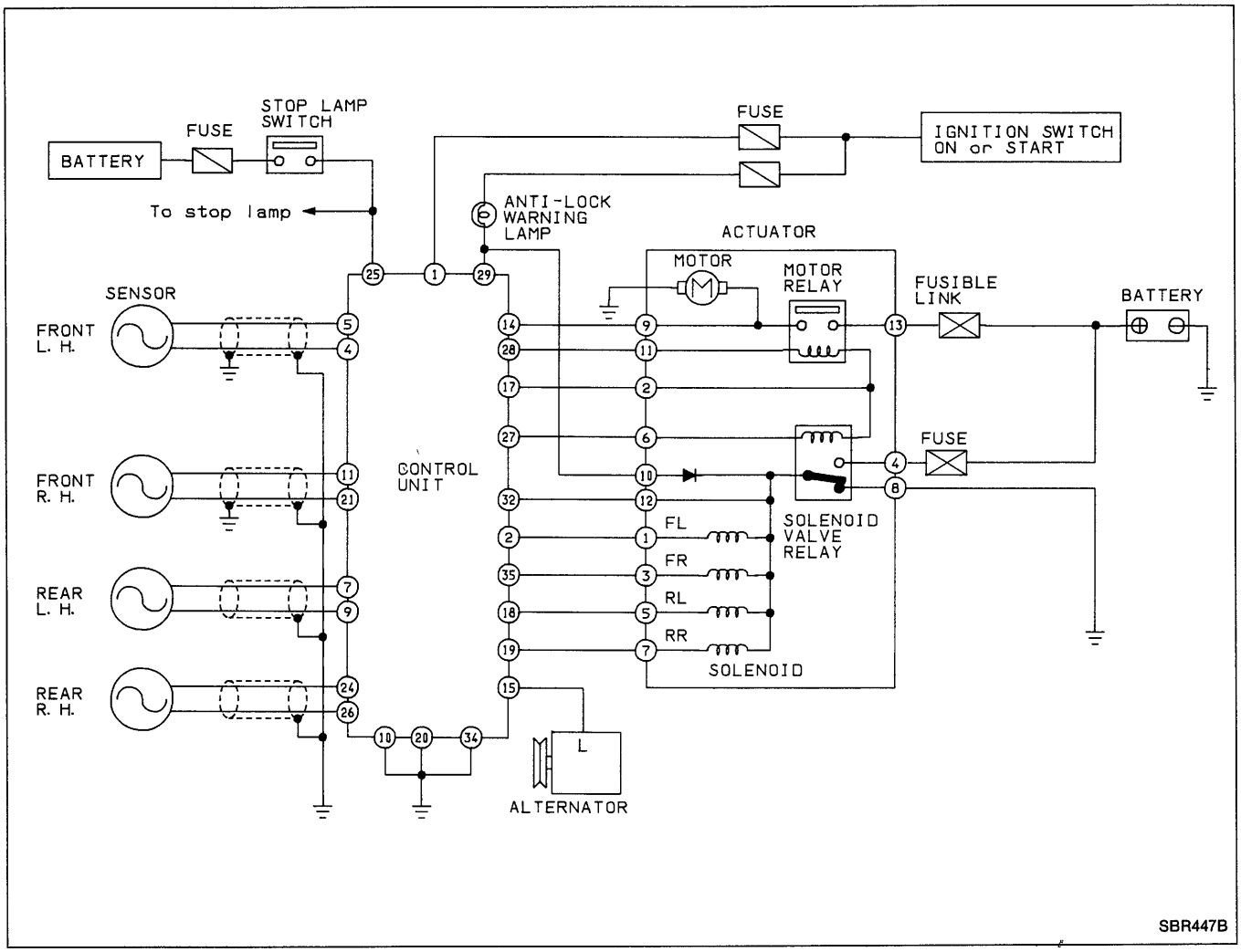
System Description (Cont'd)

ACTUATOR

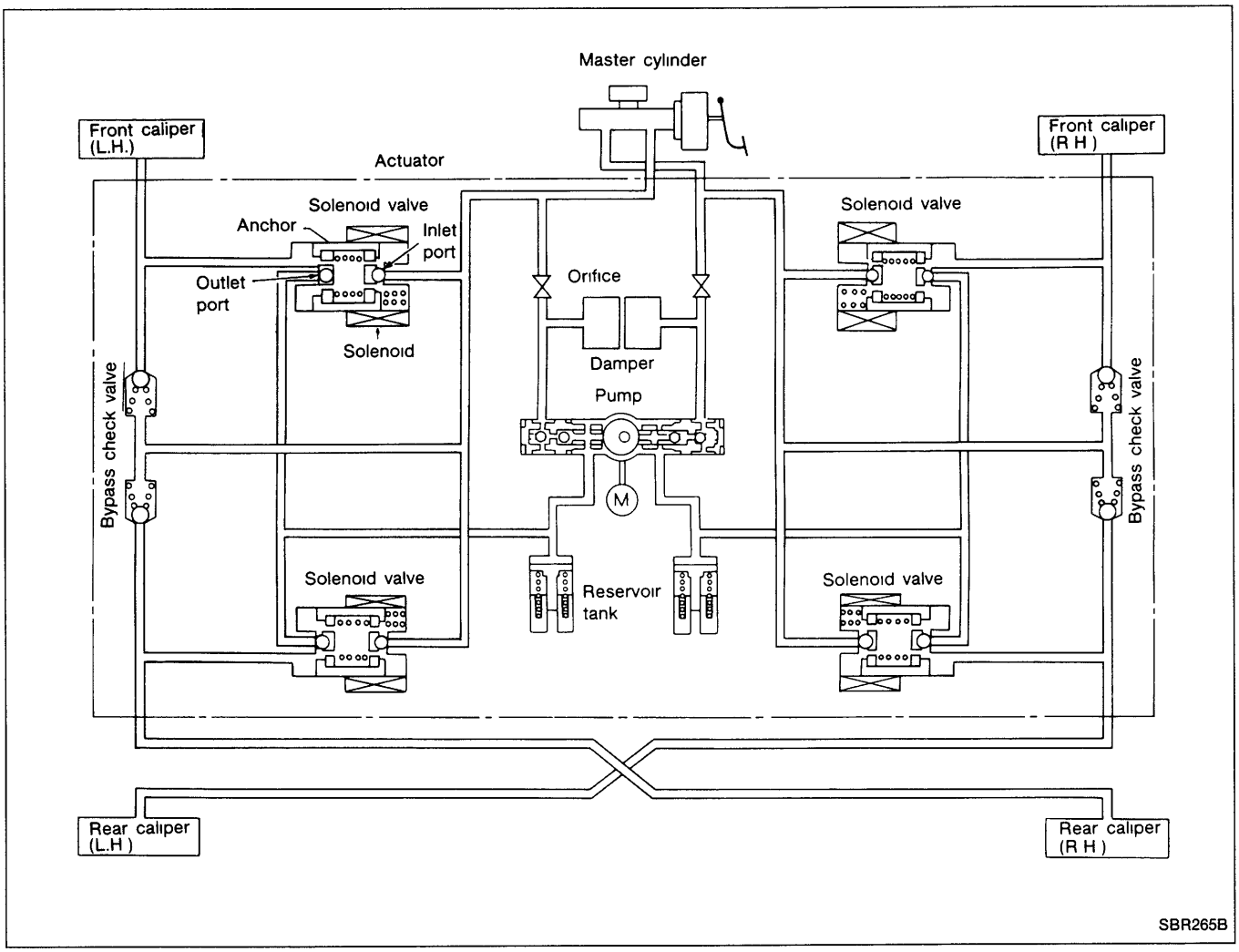


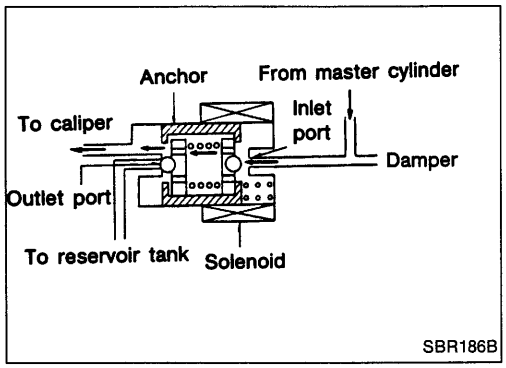
The actuator consists of solenoid valves, a pump, a reservoir (for pressure decreasing), and a damper and orifice (to prevent high pressure fluid produced by the pump from being applied to the master cylinder). The solenoid valve changes its spool position corresponding to the control unit output amperage: 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 damper and the orifice to reduce fluid pressure, before its return 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 kept constant.

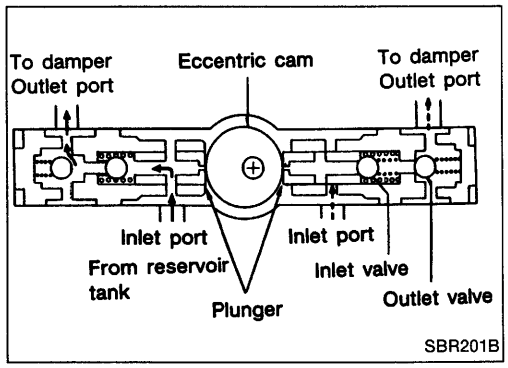
Circuit Diagram



Operation of Actuator Hydraulic Circuit







COMPONENT PARTS AND THEIR FUNCTIONS

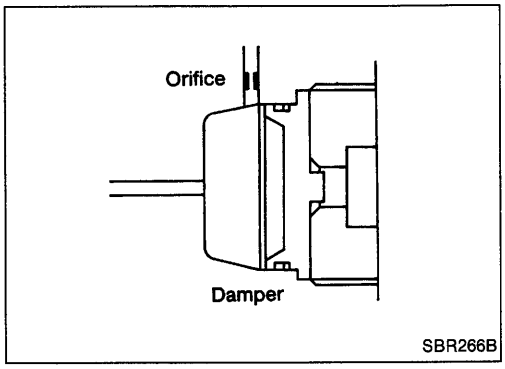
Solenoid valve

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

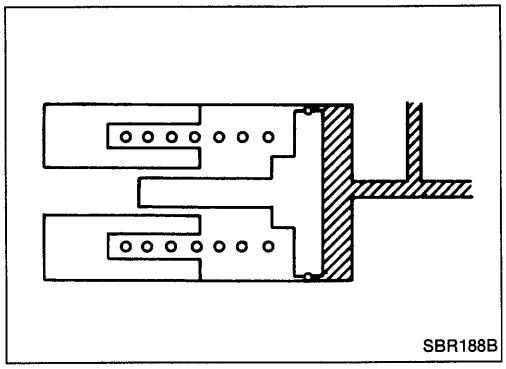
The pump delivers **brake fluid to the damper and the orifice to decrease fluid pressure in the caliper.** When the pump shaft's eccentric cam pushes the plunger to the left (as shown in the figure), oil from the reservoir tank is delivered to the damper and the orifice via the inlet and outlet ports 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)



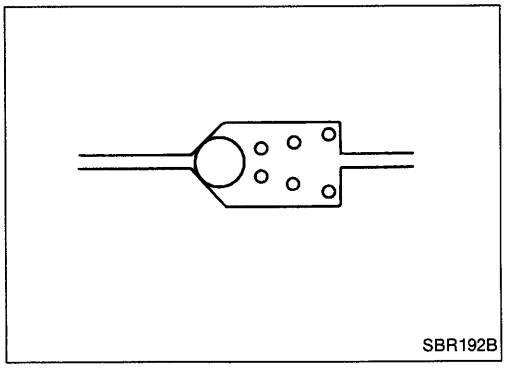
Damper and Orifice

The damper temporarily stores high pressure brake fluid (pulsation fluid) delivered from the pump and the orifice allows the brake fluid to return to the master cylinder smoothly.



Reservoir tank

The reservoir tank temporarily stores brake fluid returning from the calipers as required in order to provide a smooth pressure decrease in the calipers.

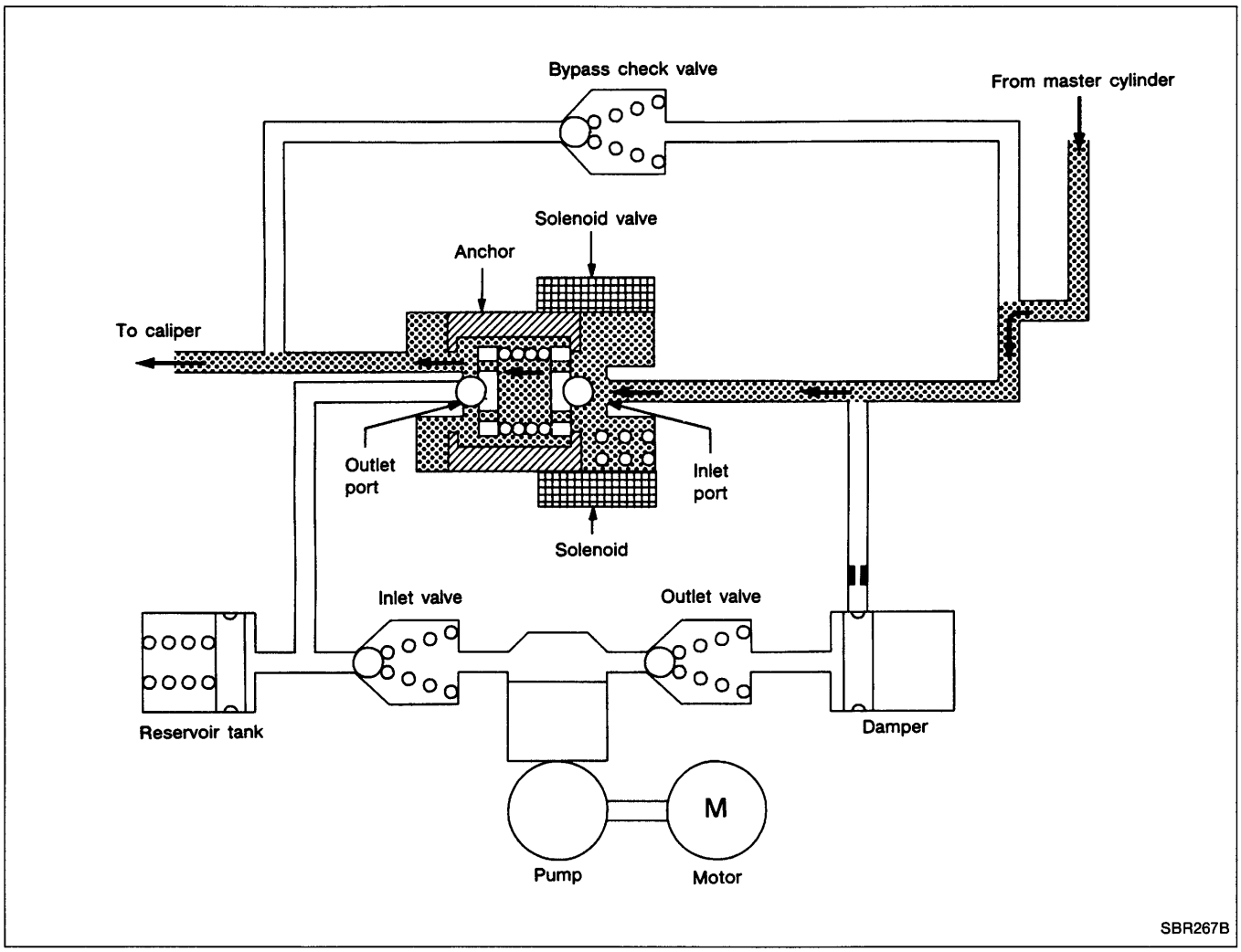


Bypass check valve

During brake release, brake fluid returns from the caliper to the master cylinder through this valve without entering the solenoid valve and feeling valve.

Operation of Actuator Hydraulic Circuit (Cont'd)

NORMAL BRAKE OPERATION (A.B.S. is not operating)



Description

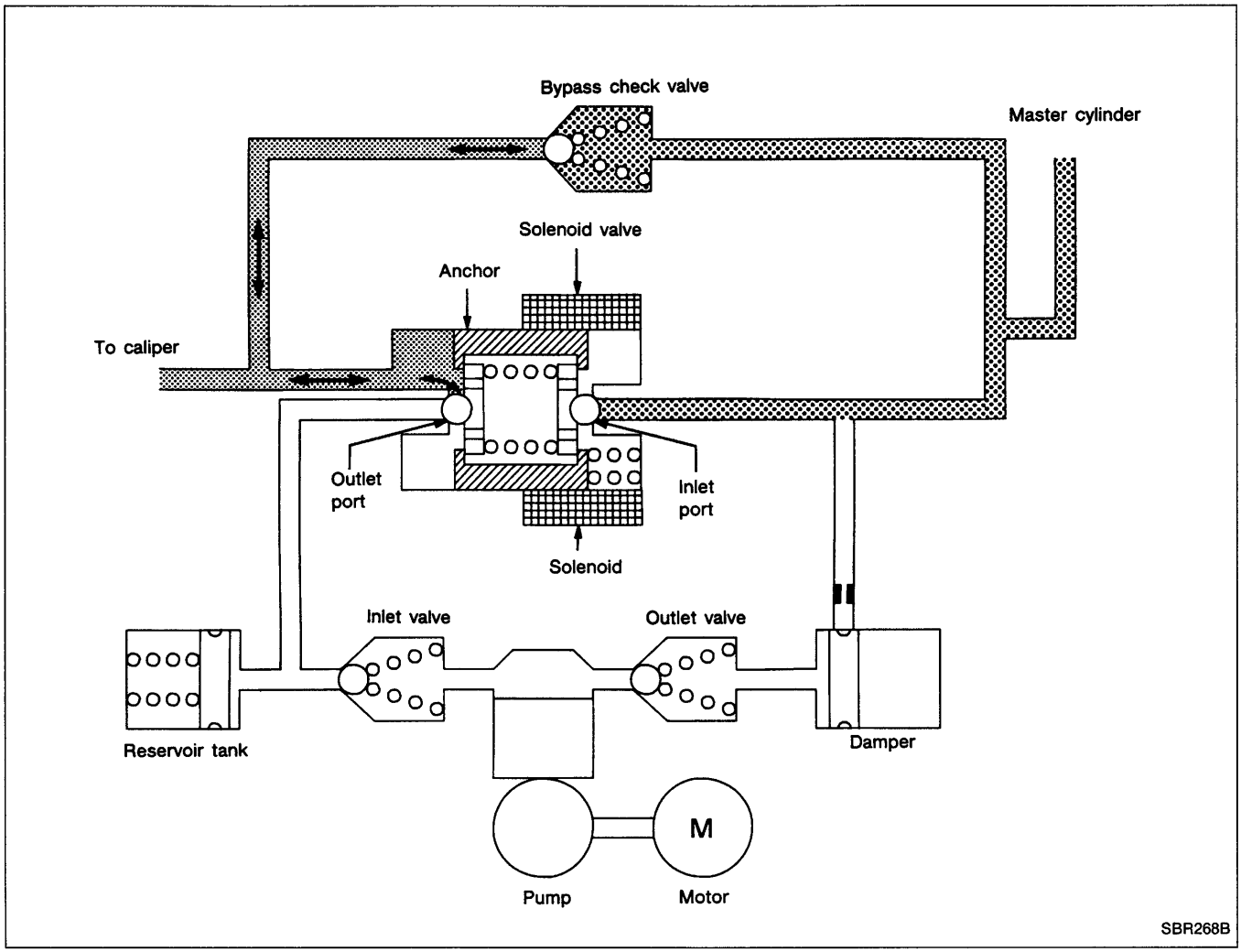
Electric current to the solenoid ... 0 [A]

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.
   Since the outlet port of the solenoid valve is closed, brake fluid pressure is not delivered to the reservoir tank.
3. Master cylinder brake fluid pressure is directly transmitted to the caliper (= disc brake) via the inlet port of the solenoid valve.

Operation of Actuator Hydraulic Circuit (Cont'd)

ANTI-LOCK OPERATION

Operation during pressure "Hold" (Wheels begin to slip)



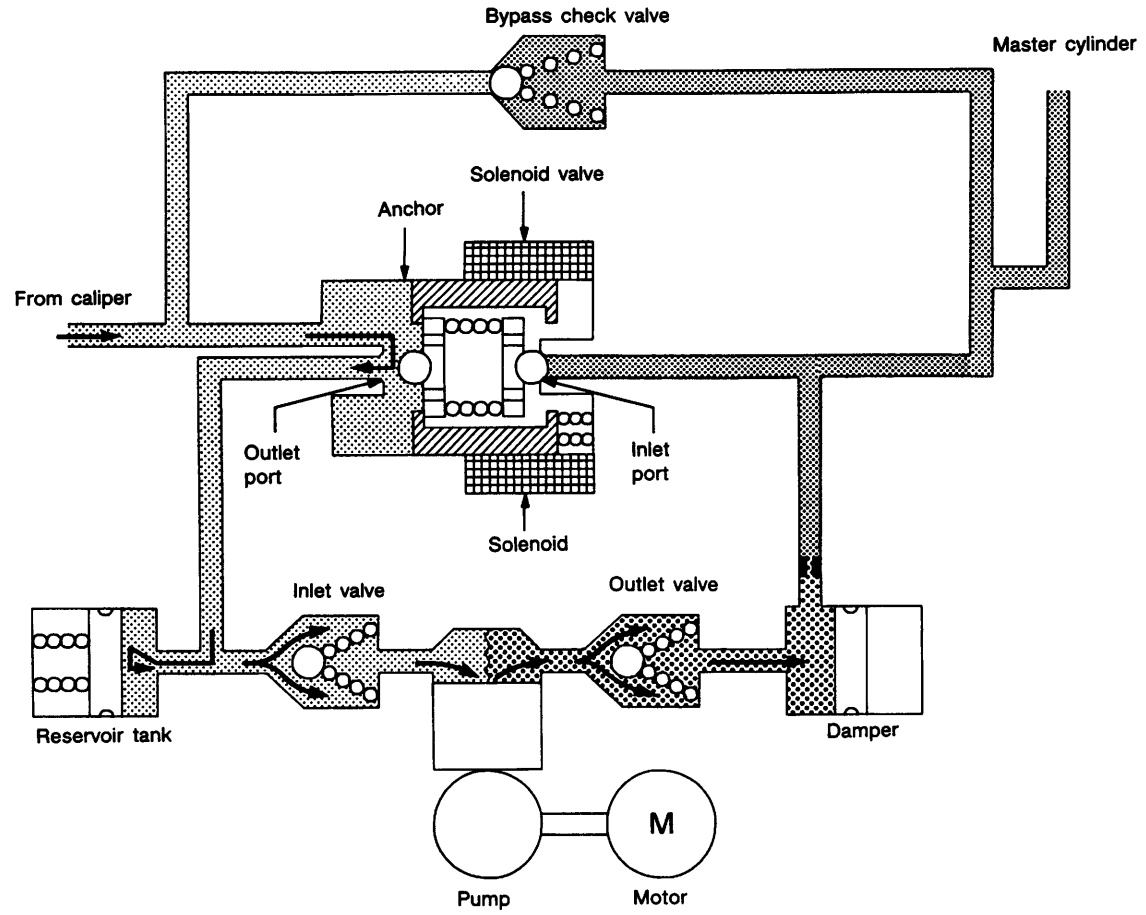
Description

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.
   Caliper fluid pressure is not delivered to the reservoir tank since the outlet port of the solenoid valve is closed. The bypass check valve is closed due to high master cylinder fluid pressure.
3. Master cylinder fluid pressure is not delivered to the solenoid valve so that caliper pressure is held.

Operation of Actuator Hydraulic Circuit (Cont'd)

Operation during pressure "Decrease" (Wheels slip excessively)



Description

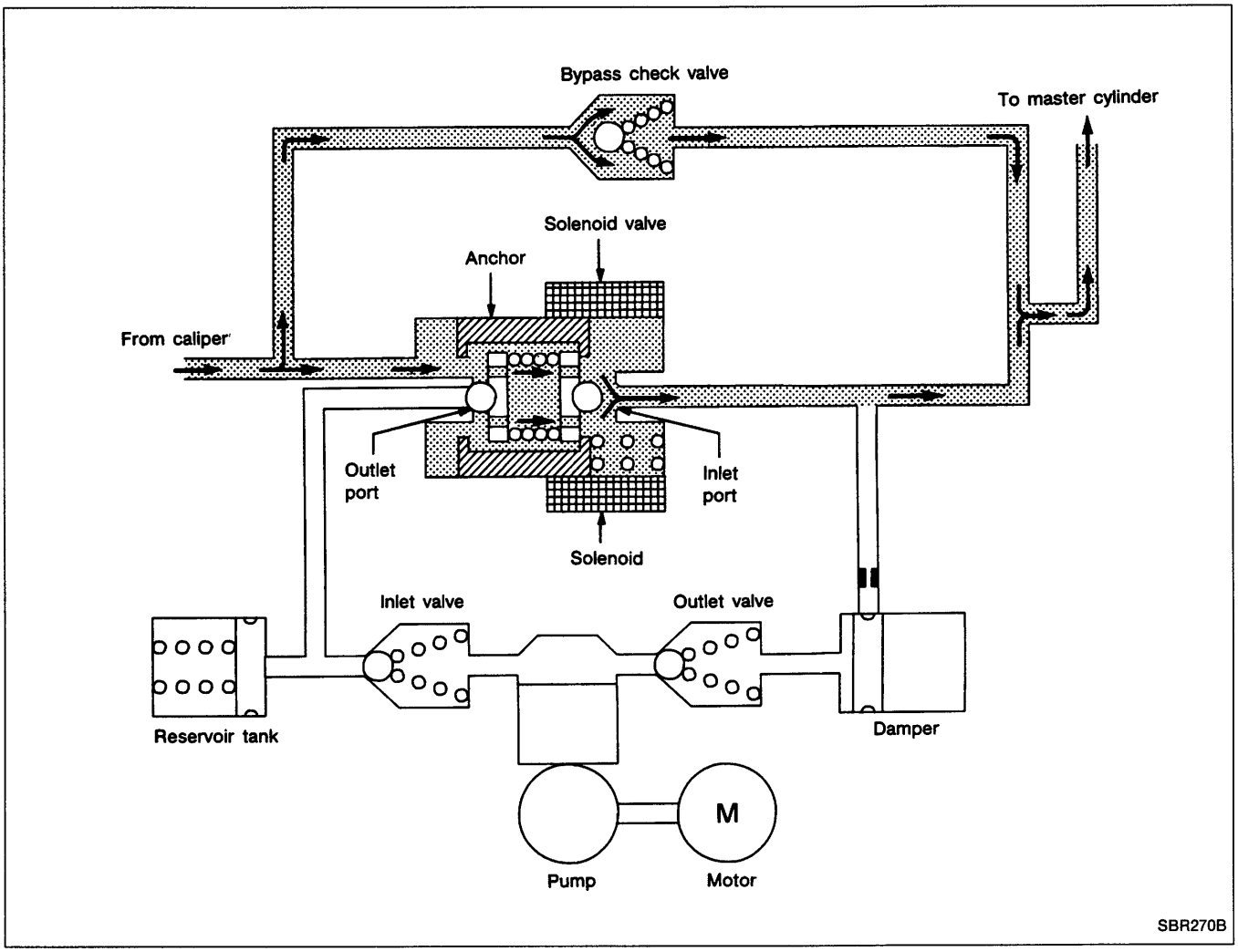
Electric current to the solenoid ... 5 [A]

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 tank 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 operation returns brake fluid (which eventually returns to the reservoir) through the damper and the orifice so that the high pressure brake fluid does not apply to the master cylinder directly.

[The above operation is repeated in a very short period of time. As a result, each wheel is prevented from locking up.]

Operation of Actuator Hydraulic Circuit (Cont'd)

OPERATION DURING BRAKE RELEASE

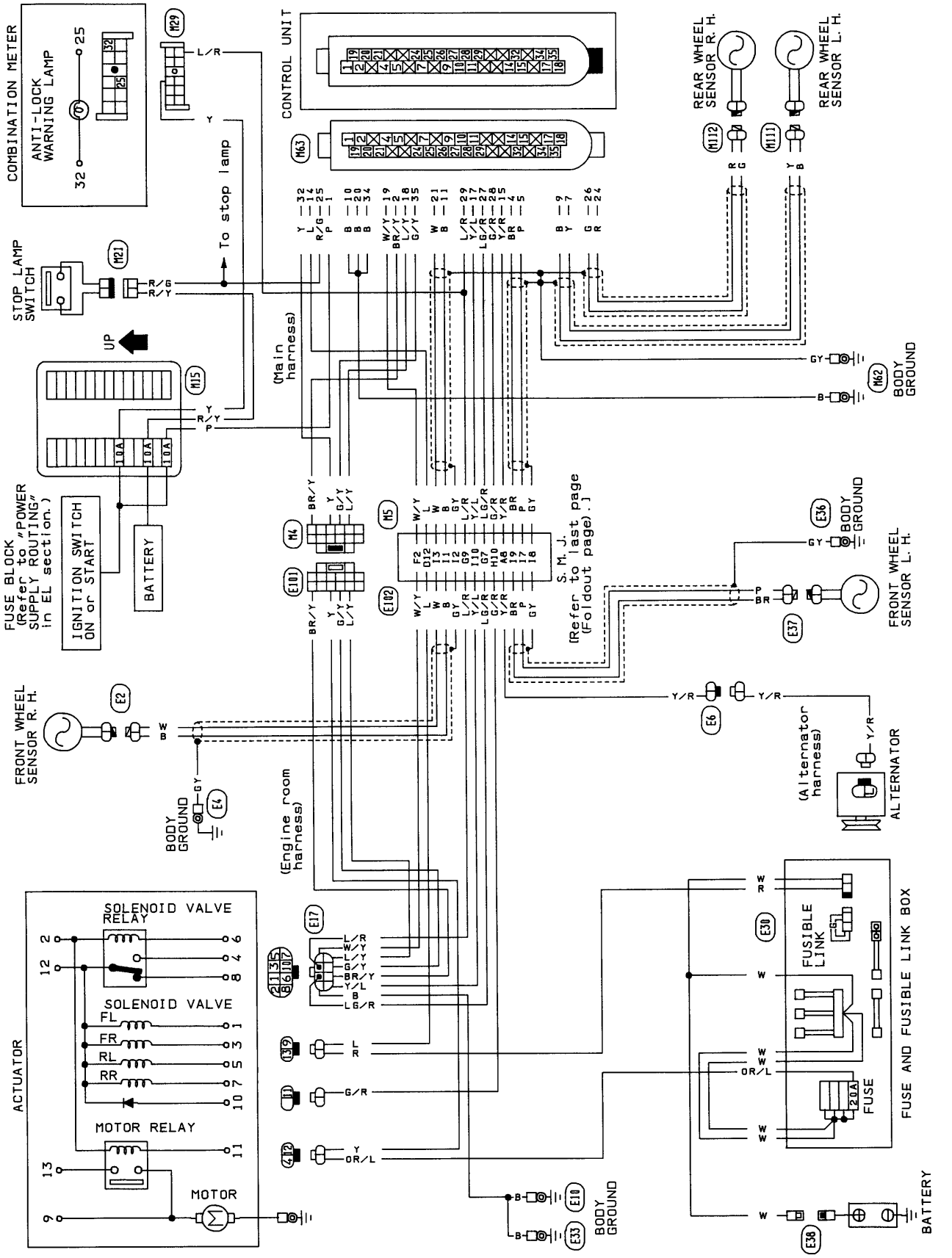


Description

Electric current to the solenoid ... 0 [A]

1. Master cylinder fluid pressure decreases so that the bypass valve opens. This allows caliper fluid pressure to return to the master cylinder.
2. The bypass check valve is set to open at low pressure to return the caliper fluid to the master cylinder quickly.

Wiring Diagram

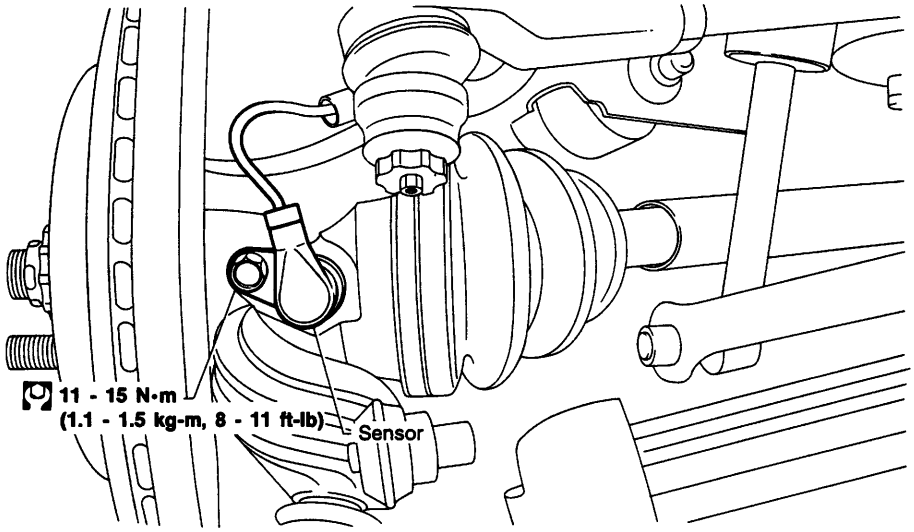


SBR375B

Removal and Installation

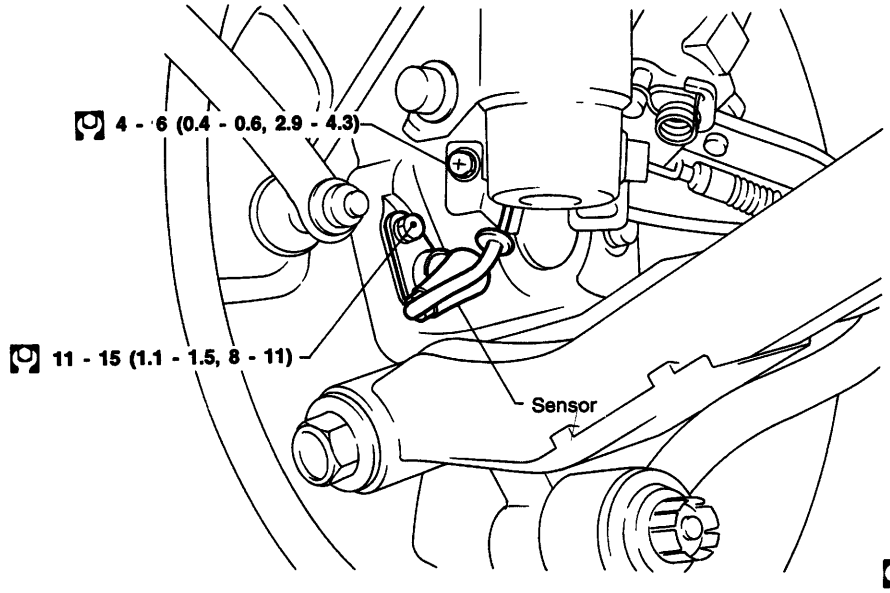
CAUTION:
Be careful not to damage sensor edge and sensor rotor teeth.

FRONT WHEEL SENSOR



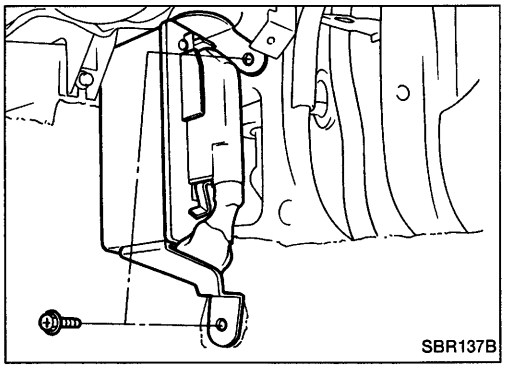
UBR007

REAR SENSOR



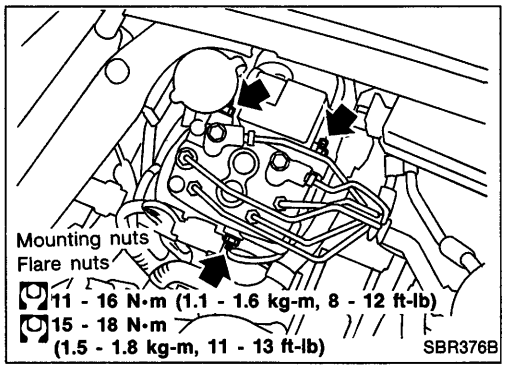
SBR134B

Removal and Installation (Cont'd)



CONTROL UNIT

Location: Front passenger side dash side lower.



Removal

ACTUATOR

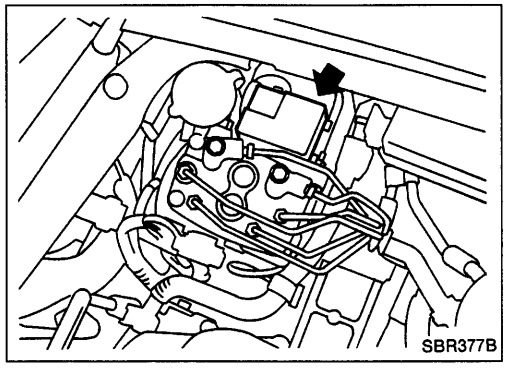
1. Disconnect battery cable.
2. Drain brake fluid. Refer to "Changing Brake Fluid" in "CHECK AND ADJUSTMENT".
3. Apply different colored paint to each pipe connector and actuator to prevent incorrect connection.
4. Disconnect connector, brake pipes and remove fixing nuts and actuator ground cable.

Installation

CAUTION:

After installation, refill brake fluid. Then bleed air. Refer to "CHECK AND ADJUSTMENT" and "AIR BLEEDING" respectively.

1. Tighten actuator ground cable.
2. Connect brake pipes temporarily.
3. Tighten fixing nuts.
4. Tighten brake pipes.
5. Connect connector and battery cable.



Removal and Installation

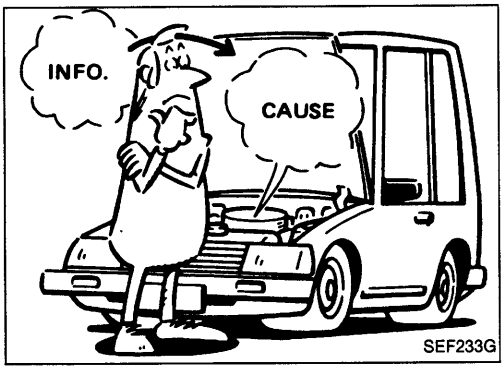
ACTUATOR RELAYS

BLACK: Motor Relay
SILVER: Solenoid Valve Relay

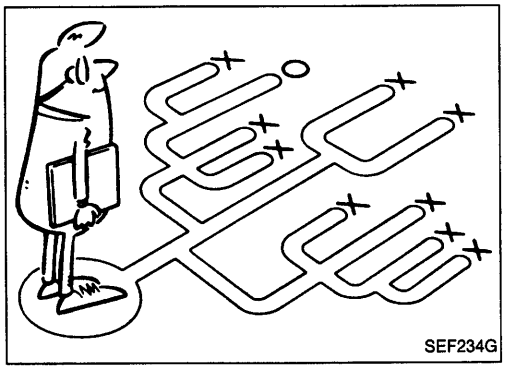
1. Disconnect battery cable.
2. Remove actuator relay cover.
3. Pull out relays.

Contents

How to Perform Trouble Diagnoses for Quick and Accurate Repair BR-44
Symptom Chart BR-47
Preliminary Check 1 ..... BR-48
Preliminary Check 2 ..... BR-49
Preliminary Check 3, 4 ..... BR-50
Self-diagnosis BR-51
Component Parts and Harness Connector Location BR-52
Ground Circuit Check BR-53
Circuit Diagram for Quick Pinpoint Check BR-54
Diagnostic Procedure 1 ..... BR-55
Diagnostic Procedure 2 ..... BR-56
Diagnostic Procedure 3 ..... BR-57
Diagnostic Procedure 4 ..... BR-57
Diagnostic Procedure 5 ..... BR-58
Diagnostic Procedure 6 ..... BR-58
Diagnostic Procedure 7 ..... BR-59
Diagnostic Procedure 8 ..... BR-60
Diagnostic Procedure 9 ..... BR-61
Diagnostic Procedure 10 ..... BR-62
Diagnostic Procedure 11 ..... BR-63
Diagnostic Procedure 12 ..... BR-63
Electrical Components Inspection BR-64



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.

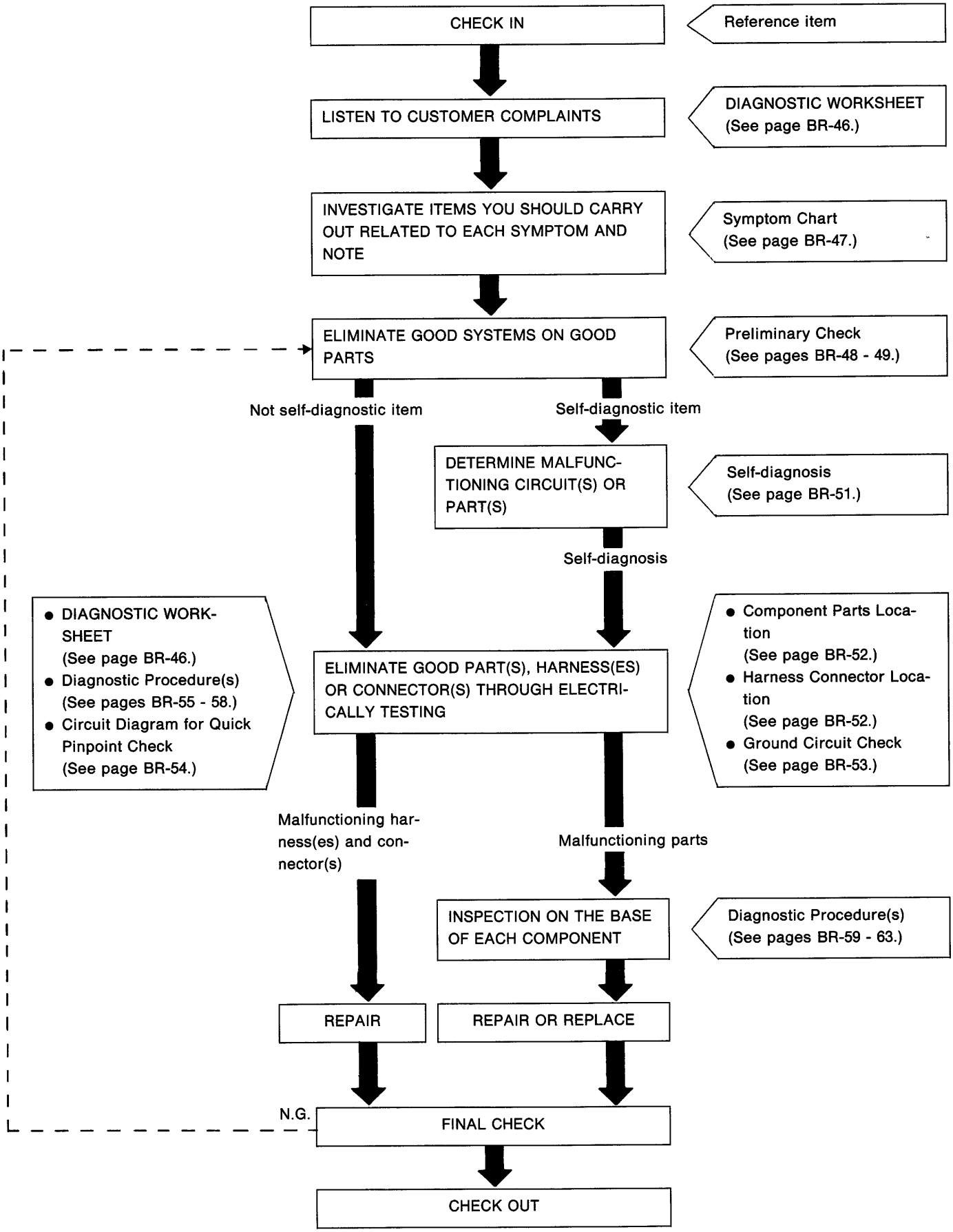
A visual check only may not find the cause of the problems, so a road test should be carried out.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with an 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

BR-SURF1

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

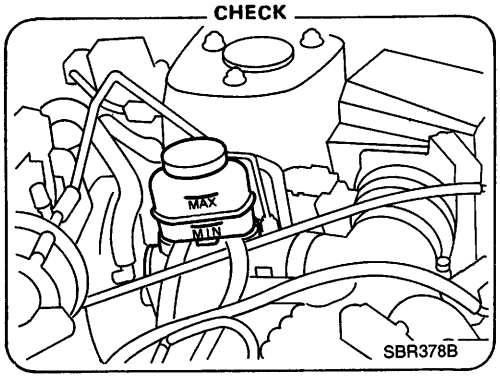
Customer name MR/MS		Model & Year			VIN		
Engine #		Trans.			Mileage		
Incident Date		Manuf. Date			In Service Date		
Symptoms	☐ Pedal vibration and noise	☐ Warning activates	☐ Long stopping distance	☐ Abnormal pedal action	☐ A.B.S. doesn't work	☐ A.B.S. works but warning activates	☐ A.B.S. works frequently
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	Abnormal pedal action	A.B.S. doesn't work	A.B.S. works but warning activates	A.B.S. works frequently
Electrical Components Inspection	BR-64	Actuator inspection					○		
Ground Circuit Check	BR-53	Motor ground					○		
	BR-53	Sensor shield	○						○
Diagnostic Procedure (Select inspection with L.E.D. flashing No.)	BR-63	L.E.D. goes off	○	○	○	○	○	○	
	BR-63	L.E.D. flashing 16	○	○	○	○	○	○	
	BR-62	L.E.D. flashing 10	○	○	○	○	○	○	
	BR-61	L.E.D. flashing 9	○	○	○	○	○	○	
	BR-60	L.E.D. flashing 5 - 8	○	○	○	○	○	○	
	BR-59	L.E.D. flashing 1 - 4	○	○	○	○	○	○	
Diagnostic Procedure	BR-58	Diagnostic Procedure 6							○
	BR-58	Diagnostic Procedure 5						○	
	BR-57	Diagnostic Procedure 4					○		
	BR-57	Diagnostic Procedure 3				○			
	BR-56	Diagnostic Procedure 2			○				
	BR-55	Diagnostic Procedure 1	○						
Preliminary Check	BR-51	Preliminary Check 4	○	○	○	○	○	○	
	BR-50	Preliminary Check 3	○	○					
	BR-49	Preliminary Check 2		○			○		○
	BR-48	Preliminary Check 1			○	○			○

Preliminary Check 1

CHECK

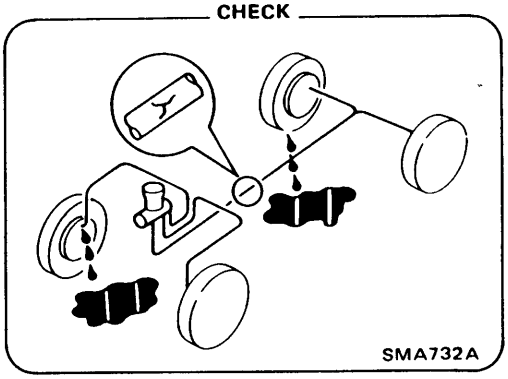


N.G. → Fill up brake fluid.

Check brake fluid level in reservoir tank.

O.K. →

CHECK

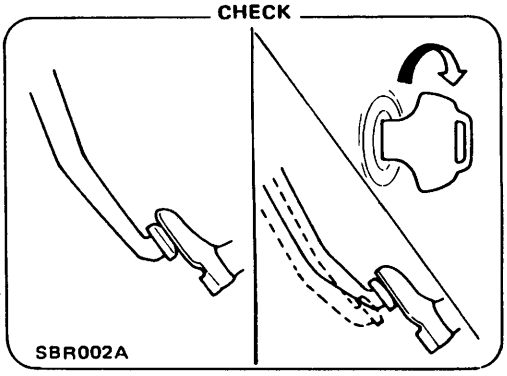


N.G. ← Repair brake system.

Check brake system.
Refer to CHECK AND ADJUSTMENT.

O.K. ↓

CHECK

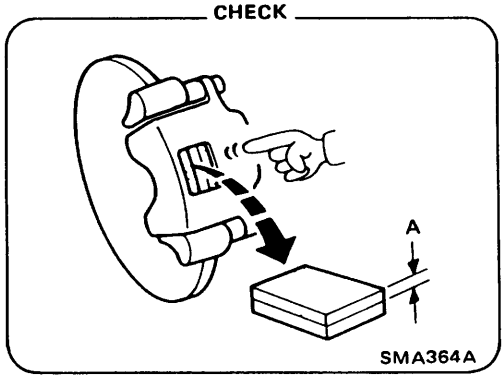


N.G. ← Repair or replace booster system.

Check brake booster operation and airtightness.
Refer to "Inspection" of BRAKE BOOSTER.

O.K. ←

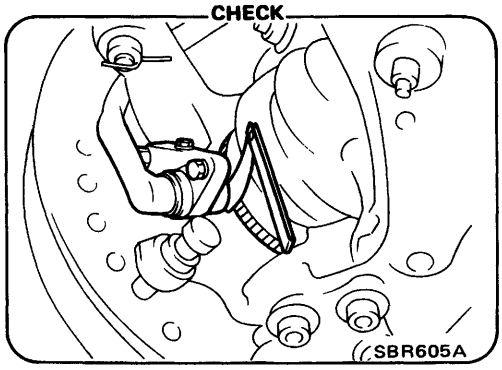
CHECK



N.G. → Replace malfunctioning parts.

Check brake pads and rotor.
Refer to "Inspection" of FRONT and REAR DISC BRAKE.

Preliminary Check 2



Check sensor clearance.

Clearance:

0.2 - 1.0 mm

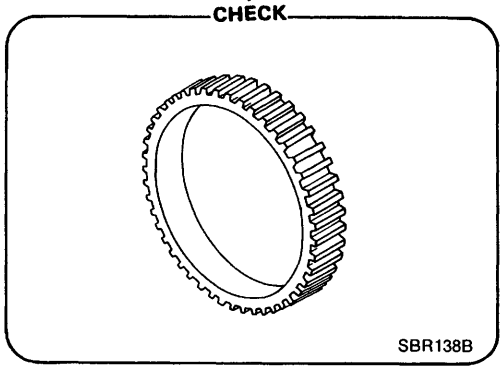
(0.008 - 0.039 in)

N.G. → Check sensor for the following items:

- Dust, foreign materials, etc., at fastening portion
- Improper installation
- Breakage

O.K. → CHECK

N.G. → Repair or replace malfunctioning sensor.



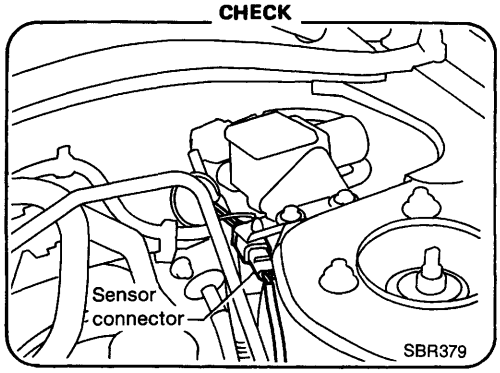
Check sensor rotor for teeth damage.

N.G. → Replace sensor rotor with wheel hub or companion flange as a set..

Preliminary Check 3, 4

Preliminary Check 3

CHECK



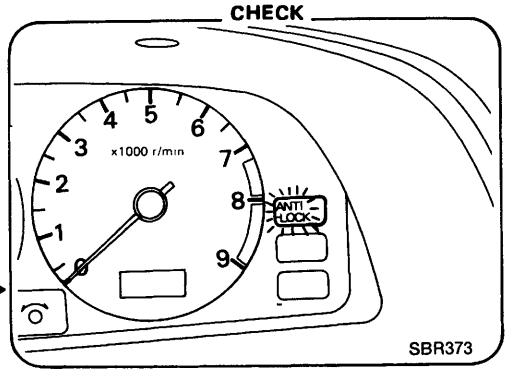
N.G. → Replace.

O.K.

Measure each sensor resistance.
0.8 - 1.2 kΩ

Preliminary Check 4

CHECK



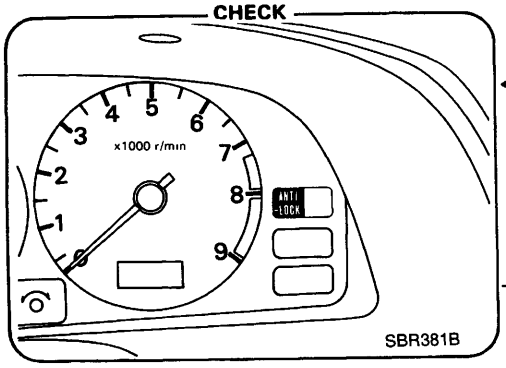
Check warning lamp activation.
When ignition switch is turned on, warning lamp turns on.

O.K. ↓

N.G. ↓

Check fuse.
Check bulb condition and remedy.

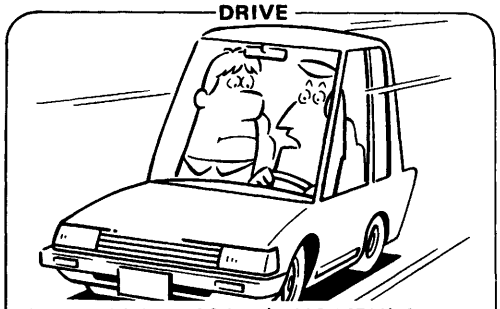
CHECK



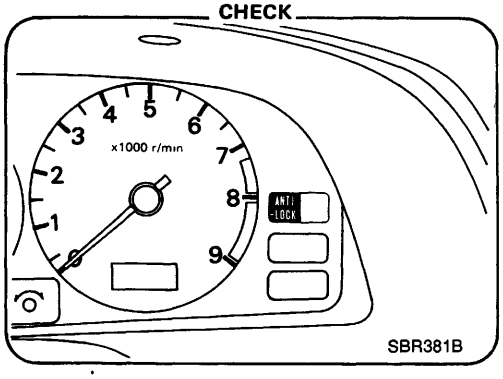
Check warning lamp for deactivation.
When engine starts, warning lamp deactivates.

O.K. ↓

DRIVE

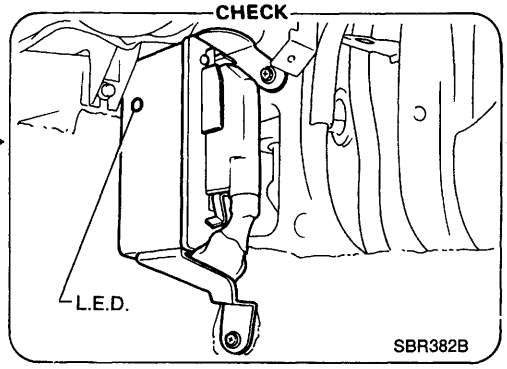


CHECK



Ensure warning lamp remains off while driving.

N.G. → CHECK



- Keep engine on and running.
- Count the number of L.E.D. flashes during 5 to 10 second "OFF" period.

↓

Go to Self-diagnosis.
(See page BR-51.)

N.G. → CHECK

O.K. → If Preliminary Check 2 is not performed and there is abnormal A.B.S. operation, perform Preliminary Check 2.

Self-diagnosis

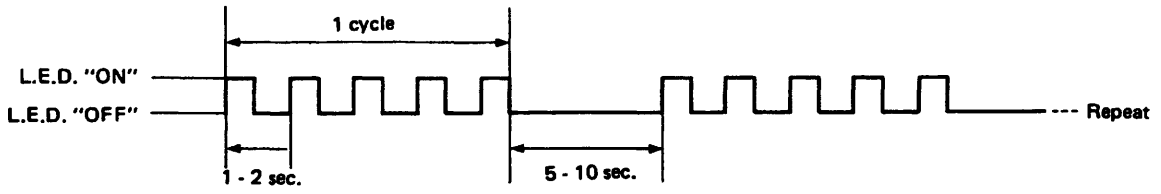
CHECKING THE NUMBER OF L.E.D. FLASHES

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 part or unit
1	Left front actuator solenoid circuit
2	Right front actuator solenoid circuit
3	Right rear actuator solenoid circuit
4	Left rear actuator solenoid circuit
5	Left front wheel sensor circuit
6	Right front wheel sensor circuit
7	Right rear wheel sensor circuit
8	Left rear wheel sensor circuit
9	Motor and motor relay
10	Solenoid valve relay
16	Control unit
Warning activates and L.E.D. "OFF"	Power supply or ground circuit for control unit

Example

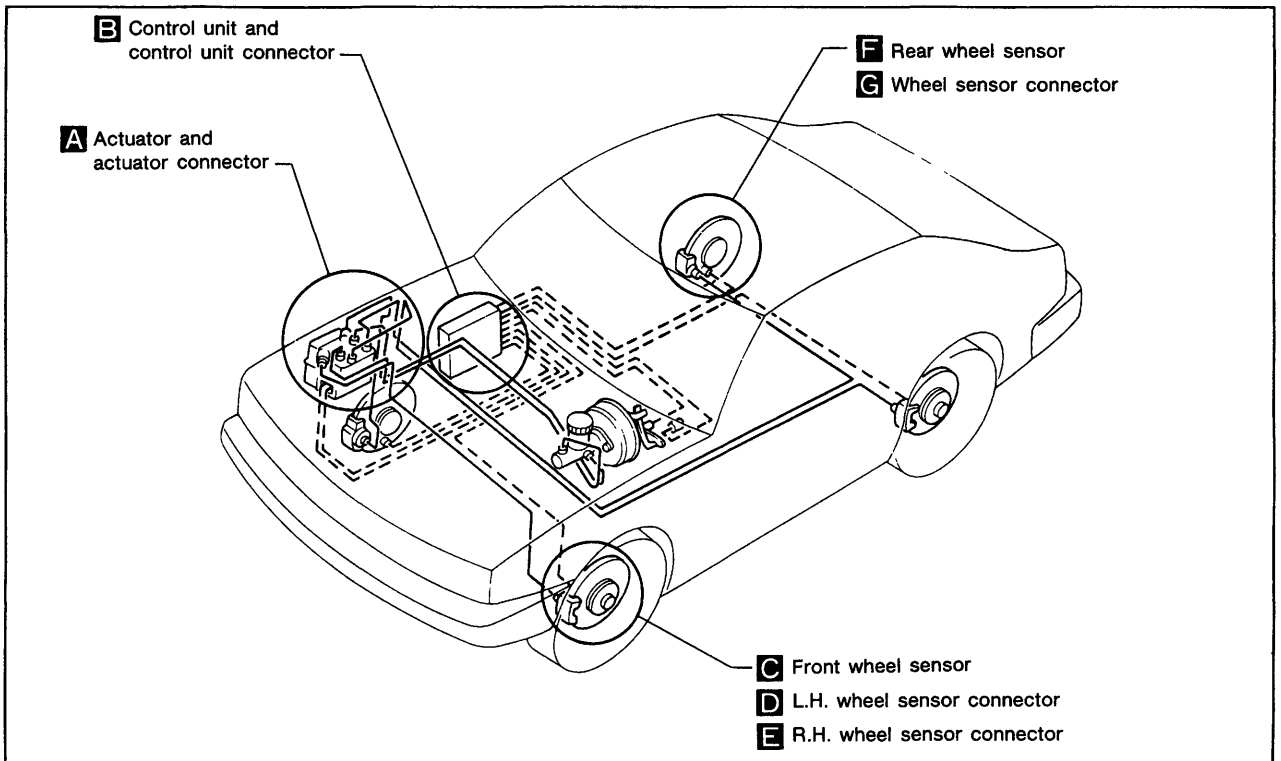
Improper operation of left front rotor sensor circuit

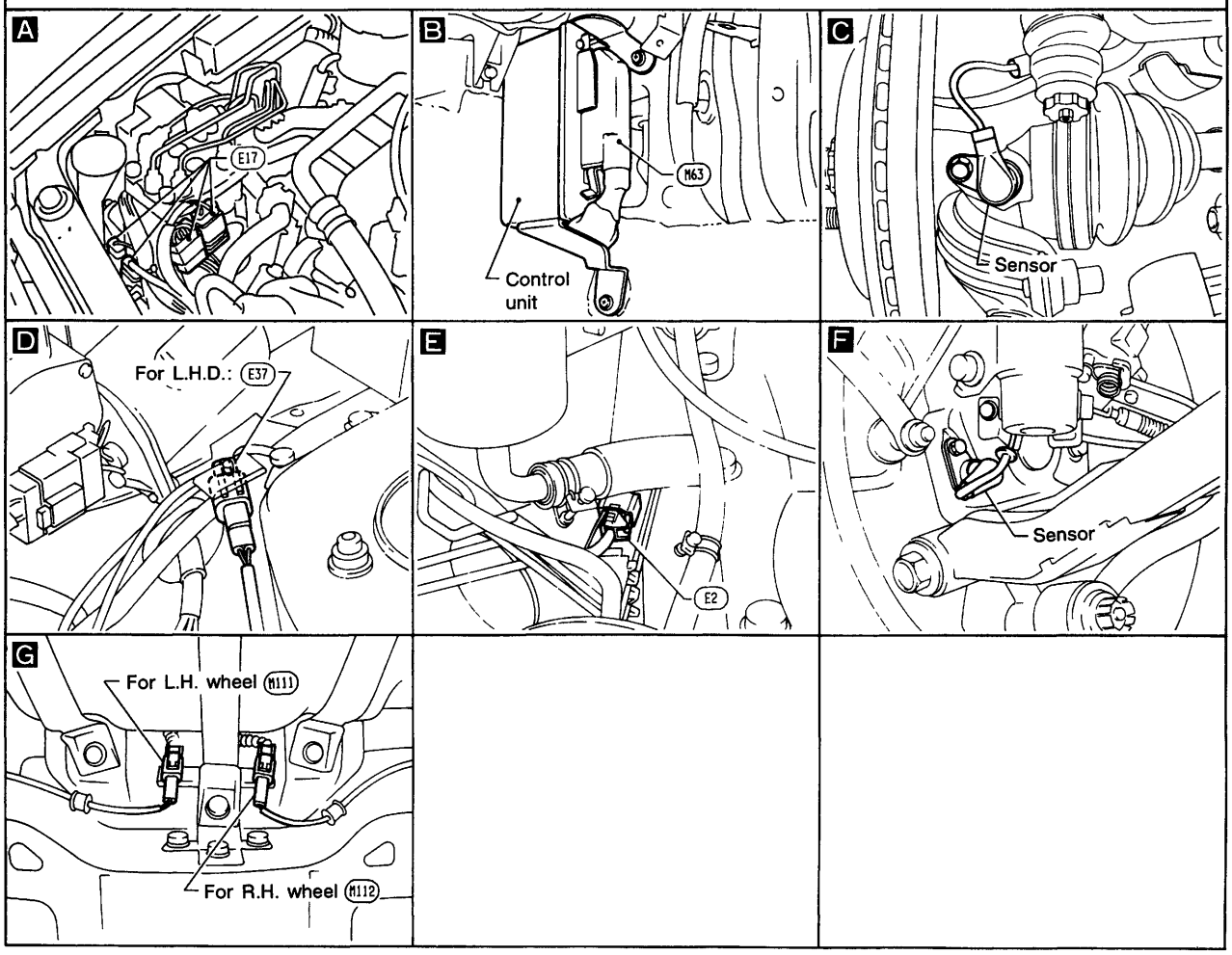


SBR531A

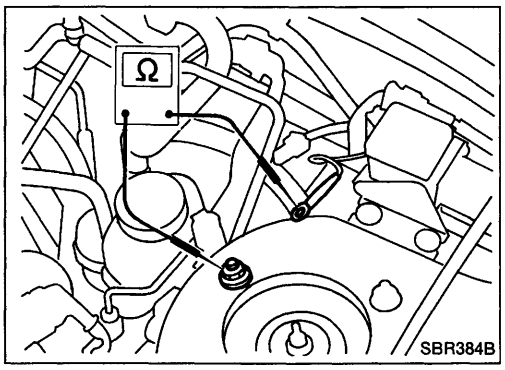
Go to Diagnostic Procedures 7-12, where malfunction portion is concerned.

Component Parts and Harness Connector Location





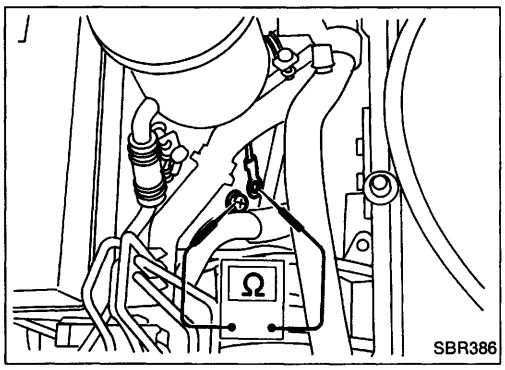
SBR383B



Ground Circuit Check

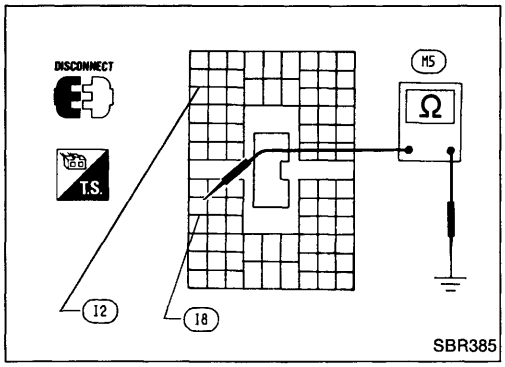
FRONT WHEEL SENSOR L.H. AND SHIELDED WIRE GROUND

- Check resistance between both terminals.
  Resistance: 0Ω

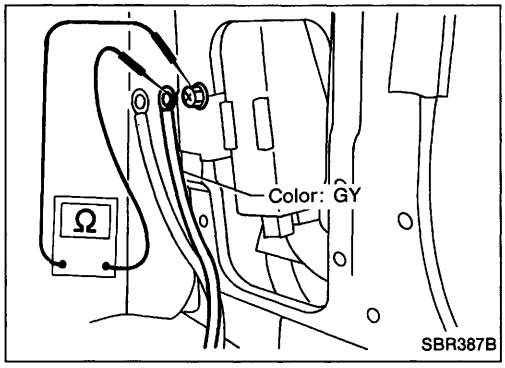


REAR WHEEL SENSOR SHIELDED WIRE GROUND

- Check resistance between terminal and body ground.
  Resistance: 0Ω

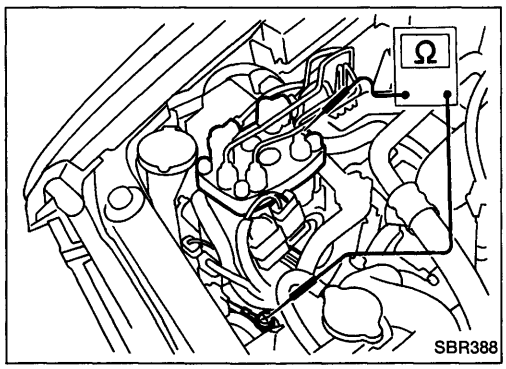


1. Connect front wheel sensor ground and S.M.J.
2. Check resistance between terminal and body ground.
   Resistance: 0Ω

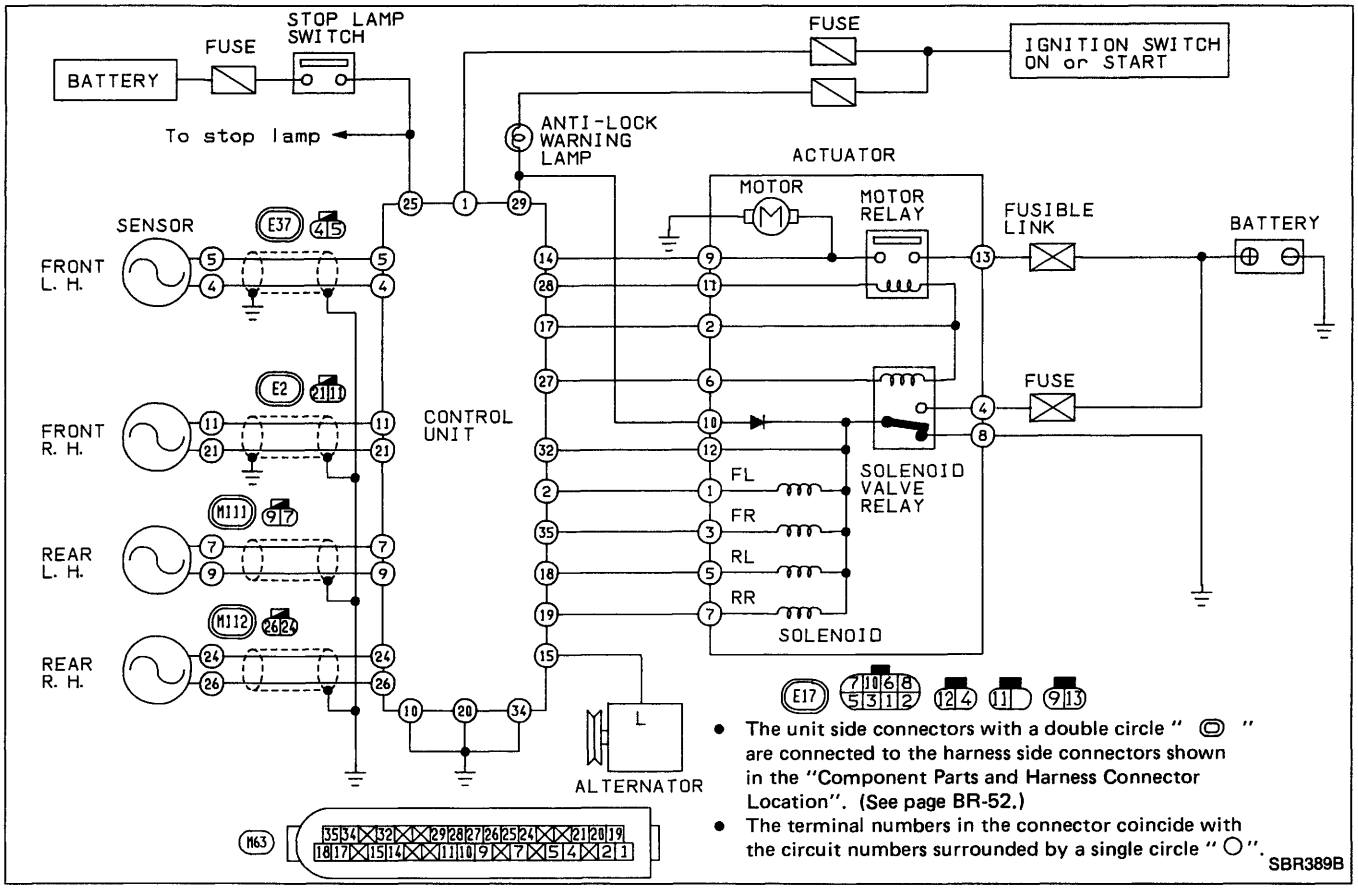


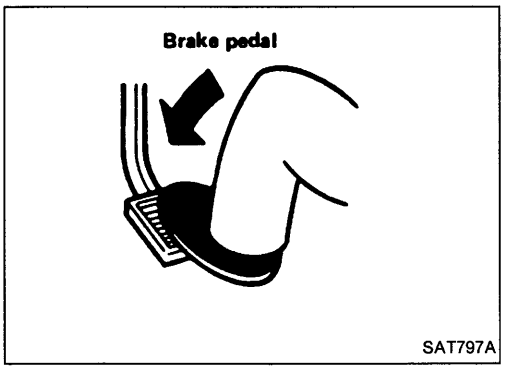
ACTUATOR MOTOR GROUND

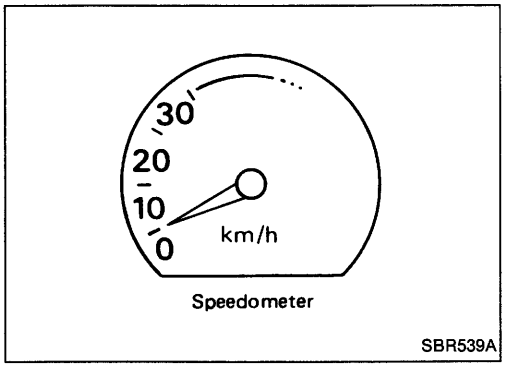
- Check resistance between both terminals.
  Resistance: 0Ω

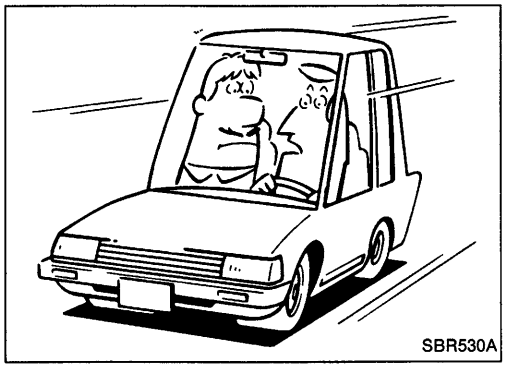


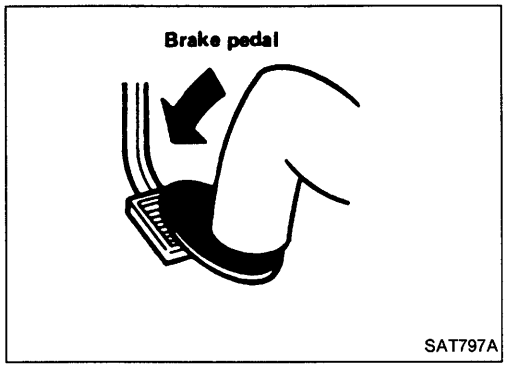
Circuit Diagram for Quick Pinpoint Check











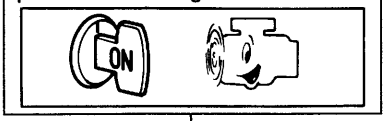
Diagnostic Procedure 1

SYMPTOM: Pedal vibration and noise

Refer to worksheet results.

Check whether brake is applied suddenly in normal driving conditions.
- Yes → When brake is normally applied, A.B.S. works and produces pedal vibration or noise.
- No ↓

Check whether the symptom appeared when engine is started.



- Yes → Refer to Preliminary Check 4 result.
- No ↓

Check whether the symptom appeared when the vehicle speed is within 10 km/h (6 MPH) after starting engine.
- Yes → Check whether the symptom disappeared 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 appeared while the vehicle was driven.
- No → Ⓐ
- Yes ↓

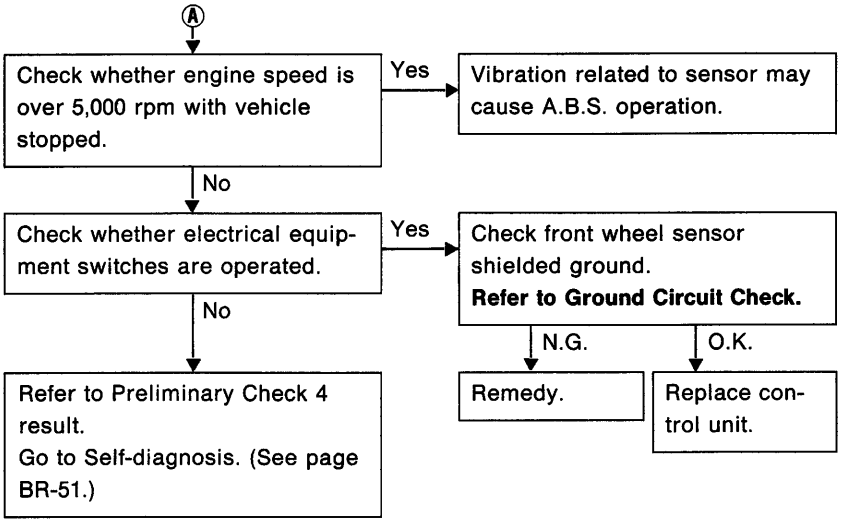
Check whether brake is applied gradually.
- No → Check if there were any conditions, among those listed below, when symptom appeared.
  - ● Shifting
  - ● Operating clutch
  - ● Passing over bumps/potholes
  - No → Ⓐ
  - Yes → For such condition, if there is considerable wheel speed variation and, A.B.S. will work normally.
- Yes ↓

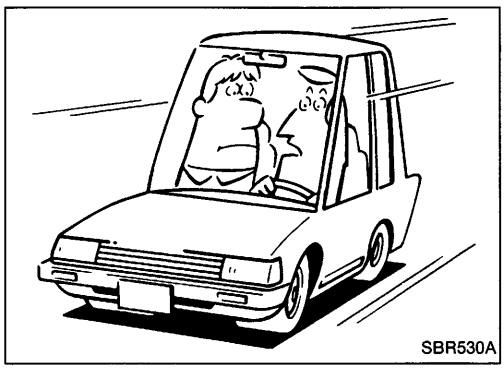
Check if there were any conditions, among those listed below, when symptom appeared.
- ● Low friction road
- ● High speed cornering
- ● Passing over bumps/potholes

Yes → For such conditions, if wheel speed is considerably different between front and rear or left and right, A.B.S. will work normally.

No ↓ Ⓐ

Diagnostic Procedure 1 (Cont'd)

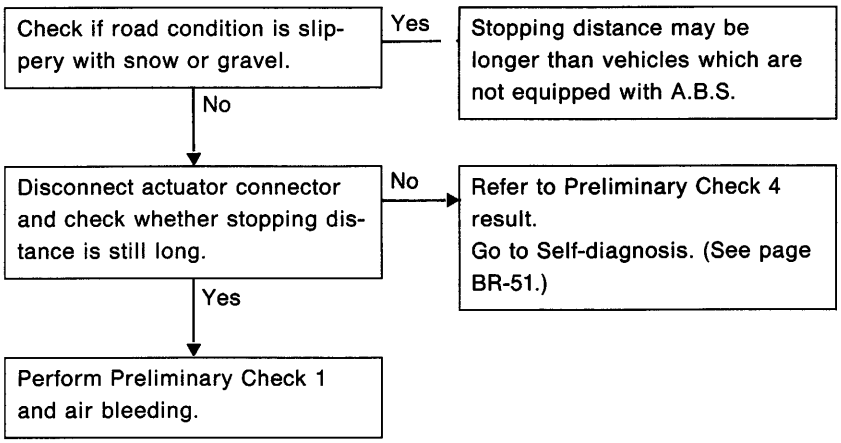


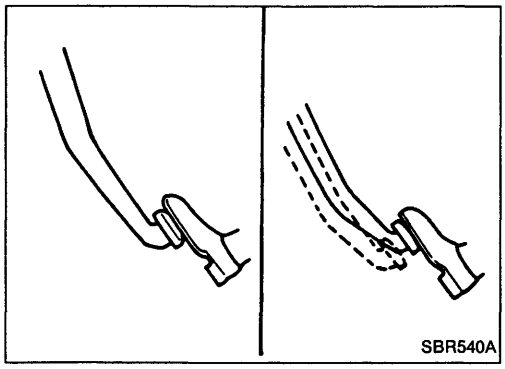


Diagnostic Procedure 2

SYMPTOM: Long stopping distance

Refer to worksheet results.




SBR540A

Diagnostic Procedure 3

SYMPTOM: Abnormal pedal action

Refer to worksheet results.

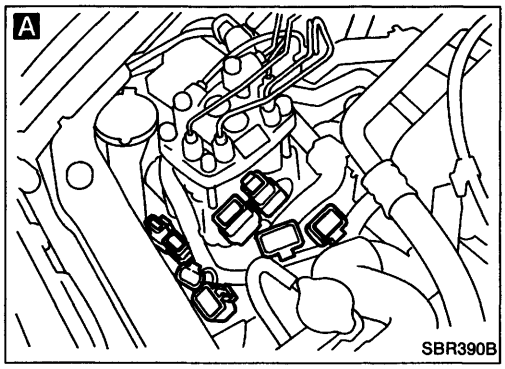
Check whether brake pedal stroke is abnormally large.
- Yes → Vehicle equipped with A.B.S. may have a tendency for large pedal strokes.
- No ↓

Check that brake pedal force is firm but brake is effective.
- Yes → Normal condition.
- No ↓

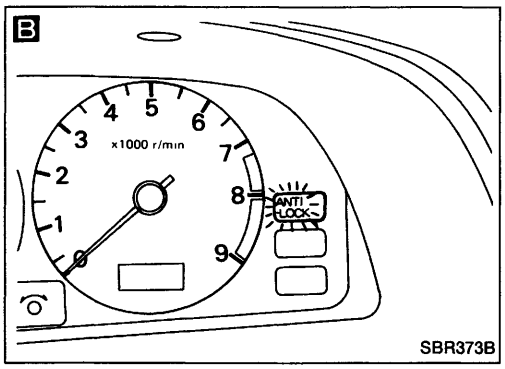
A

Disconnect actuator connector and check whether brake is effective.
- Yes → Refer to Preliminary Check 4 result. Go to Self-diagnosis. (See page BR-51.)
- No ↓

Perform Preliminary Check 1.



SBR390B



SBR373B

Diagnostic Procedure 4

SYMPTOM: A.B.S. doesn't work.

Refer to worksheet results.

B

Check whether warning activates.
- Yes → Refer to Preliminary Check 4 result. Go to Self-diagnosis. (See page BR-51.)
- No ↓

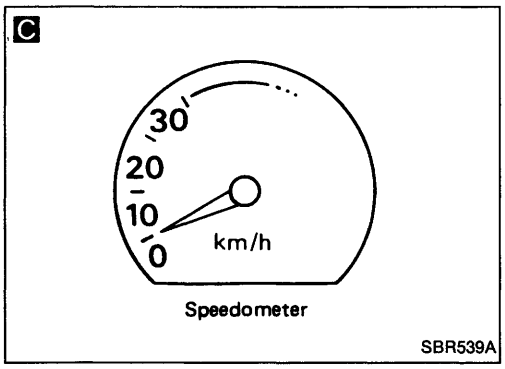
C

Check whether vehicle speed is under 10 km/h (6 MPH).
- Yes → A.B.S. doesn't work in this condition.
- No ↓

Refer to Preliminary Check 3 result.

↓ O.K. but A.B.S. still doesn't work.

Check actuator by referring to Electrical Components Inspection — ACTUATOR. (See page BR-57.)



Speedometer
SBR539A

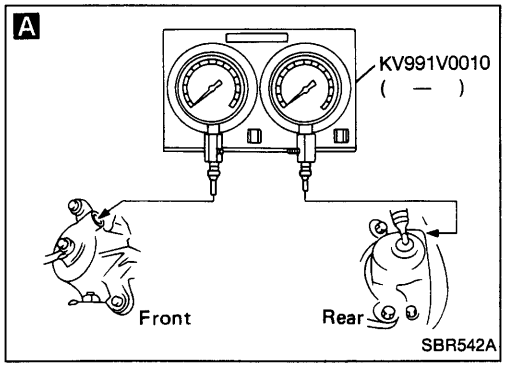
Diagnostic Procedure 5

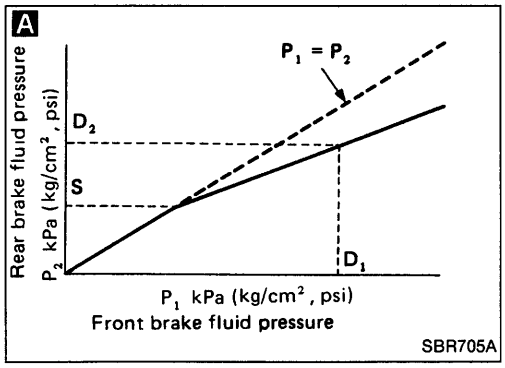
SYMPTOM: A.B.S. works but warning activates.

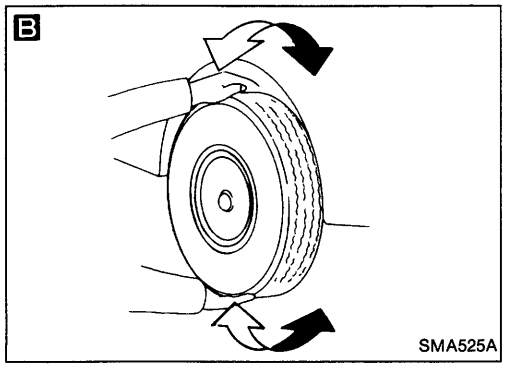
Check whether alternator produces proper output.
Refer to EL section.
→ No → Remedy.
↓ Yes

Check whether battery has enough voltage.
Refer to EL section.
→ No → Remedy.
↓ Yes

Refer to Preliminary Check 4 result.
Go to Self-diagnosis. (See page BR-51.)







Diagnostic Procedure 6

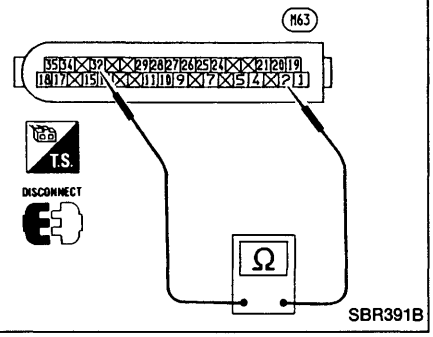
SYMPTOM: A.B.S. works frequently.

A
CHECK BRAKE FLUID PRESSURE.
Check whether brake fluid pressure distribution is normal.
D2/D1: 37 - 41/60
→ No → Perform Preliminary Check 1.
↓ Yes

B
Check whether front axles have excessive looseness.
→ Yes → Remedy.
↓ No

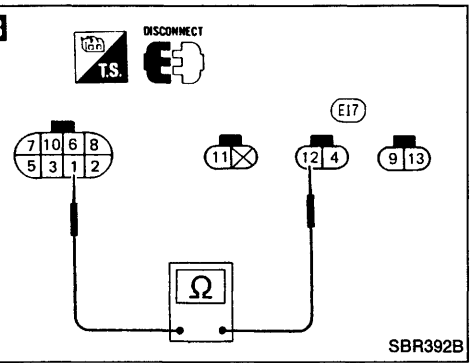
Perform Preliminary Check 2 and Ground Circuit Check.

A



SBR391B

B



SBR392B

Diagnostic Procedure 7

ACTUATOR SOLENOID (L.E.D. flashing number 1 - 4)

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 ㉜ and ②
Flashing number 2:
Terminals ㉜ and ㉟
Flashing number 3:
Terminals ㉜ and ⑱
Flashing number 4:
Terminals ㉜ and ⑲
Resistance: 0.7 - 1.6Ω

O.K. → Replace control unit.

N.G. ↓

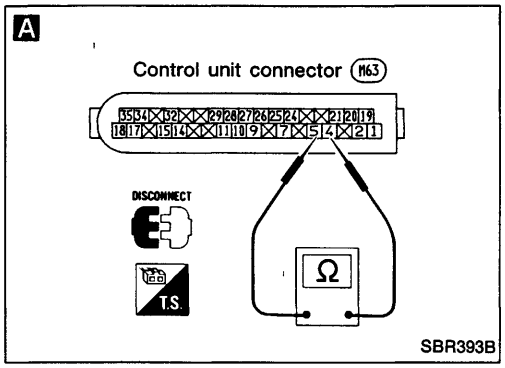
B

Check resistance between actuator connector (actuator side) terminals.
Flashing number 1:
Terminals ⑫ and ①
Flashing number 2:
Terminals ⑫ and ③
Flashing number 3:
Terminals ⑫ and ⑤
Flashing number 4:
Terminals ⑫ and ⑦
Resistance: 0.7 - 1.6Ω

O.K. → Repair harness between actuator connector and control unit connector.

N.G. ↓

Replace actuator.



Diagnostic Procedure 8

WHEEL SPEED SENSOR (L.E.D. 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.
Flashing number 5 (Fr. L.H.):
Terminals ④ and ⑤
Flashing number 6 (Fr. R.H.):
Terminals ⑪ and ㉑
Flashing number 7 (Rr. R.H.):
Terminals ㉔ and ㉖
Flashing number 8 (Rr. L.H.):
Terminals ⑦ and ⑨
Resistance: 0.8 - 1.2kΩ

O.K. → Replace control unit.

N.G.

Refer to Preliminary Check 3 result. Check whether sensor has 0.8 to 1.2 kΩ resistance.

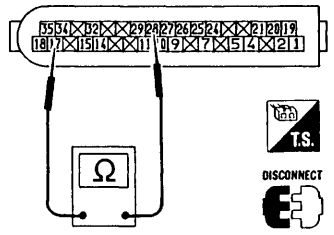
N.G. → Replace sensor.

O.K.

Repair harness between sensor connector and control unit connector.

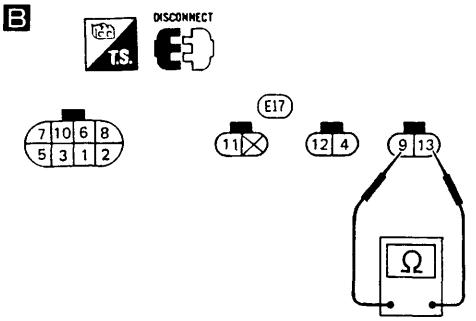
A

Control unit connector (M63)



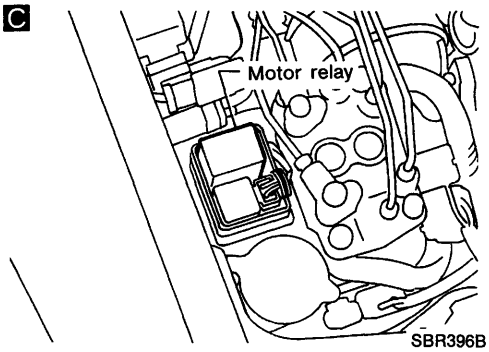
SBR394B

B



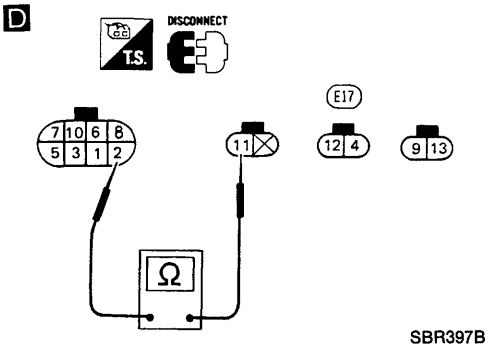
SBR395B

C



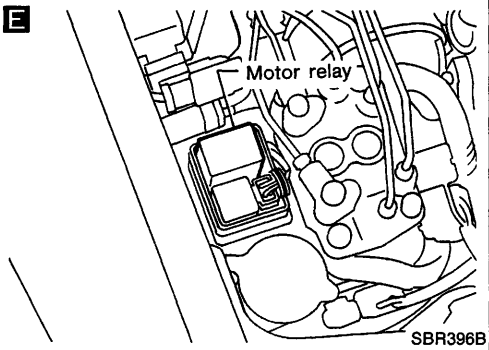
SBR396B

D



SBR397B

E



SBR396B

Diagnostic Procedure 9

ACTUATOR MOTOR RELAY (L.E.D. flashing number 9)

INSPECTION START
Remove battery negative terminal connector.

A

CHECK MOTOR RELAY SOLENOID RESISTANCE.
Check resistance between control unit connector (vehicle side) terminals ⑰ and ㉘.
Resistance: 33 - 60Ω

N.G. → D

D

Check resistance between actuator connector (actuator side) terminals ② and ⑪.
Resistance: 33 - 60Ω

O.K. → Repair harness between actuator and control unit.

E N.G. → Replace motor relay.

O.K. ↓

B

CHECK MOTOR RELAY DEACTIVATION.
Check continuity between actuator connector (actuator side) terminals ⑬ and ⑨.

Yes → C

C

Replace motor relay.

No ↓

Check if motor fusible link is blown.

Yes → Replace fusible link.

No ↓

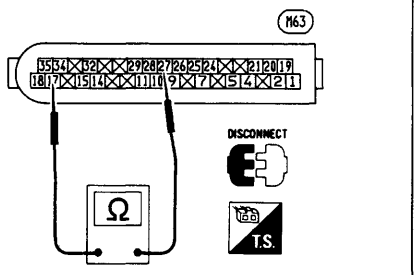
Perform Electrical Components Inspection — ACTUATOR.
(See page BR-64.)

N.G. → Replace actuator.

O.K. ↓

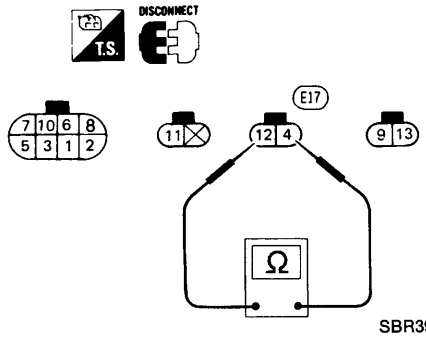
Replace control unit.

A



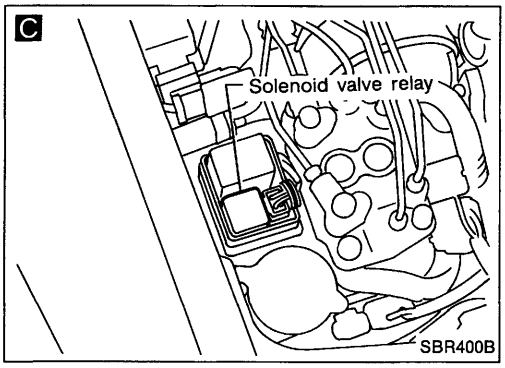
SBR398B

B



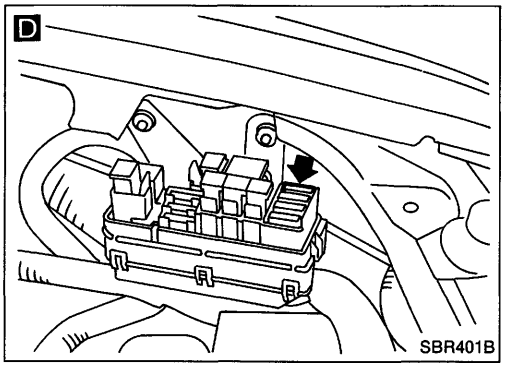
SBR399B

C



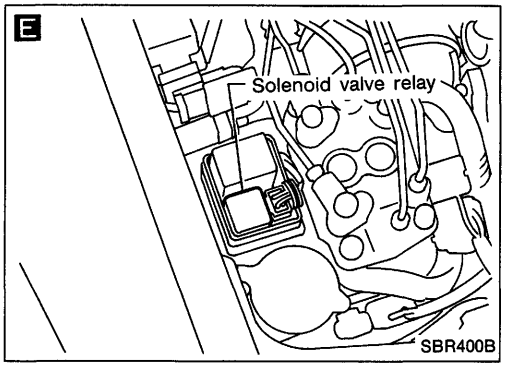
SBR400B

D



SBR401B

E



SBR400B

Diagnostic Procedure 10

ACTUATOR SOLENOID VALVE RELAY (L.E.D. flashing number 10)

INSPECTION START
Remove battery negative terminal connector.

A

CHECK SOLENOID VALVE RELAY RESISTANCE.
Check resistance between control unit connector (vehicle side) terminals ㉗ and ⑰.
Resistance: 75 - 95Ω

N.G. → D

D

Check resistance between actuator connector (actuator side) terminals ⑥ and ②.
Resistance: 75 - 95Ω

O.K. → Repair harness between actuator and control unit.

E N.G. → Replace solenoid valve relay.

O.K. ↓

B

CHECK SOLENOID VALVE RELAY MOVEMENT.
Disconnect actuator connector.
Check continuity between actuator connector (actuator side) terminals ④ and ⑫.

Yes → C

C

Replace solenoid valve relay.

No ↓

Check if solenoid valve relay 20A fuse is blown.

Yes → Replace fuse.

No ↓

Perform Electrical Components Inspection — ACTUATOR.
(See page BR-64.)

N.G. → Replace actuator.

O.K. ↓

Replace control unit.

Diagnostic Procedure 11

CONTROL UNIT (L.E.D. flashing number 16)

INSPECTION START

↓

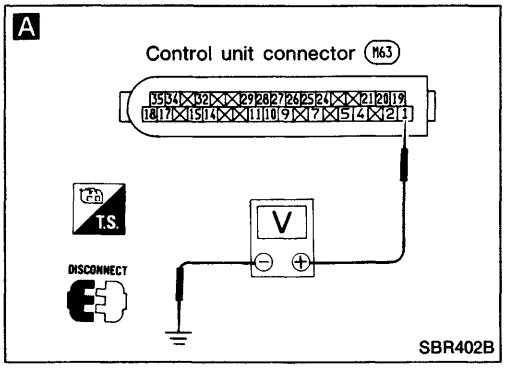
Control unit malfunction.

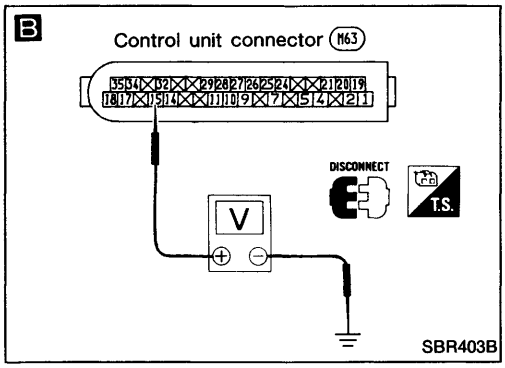
↓

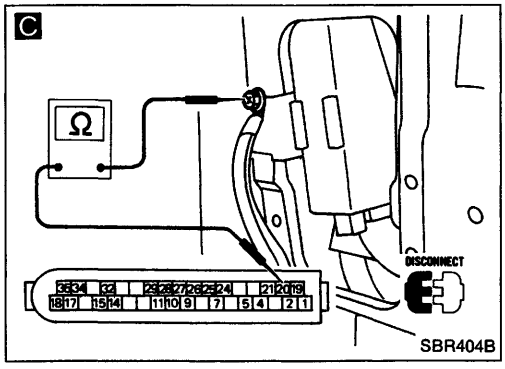
Replace control unit.

Diagnostic Procedure 12

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.
Voltage: 10V or more

N.G. → Check if control unit 10A fuse is blown.

- Yes → Replace fuse.
- No → Repair power supply harness.

↓ 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 warnings activate.

- Yes → Repair harness between alternator and control unit.
- No → Malfunctioning alternator.

↓ O.K.

C

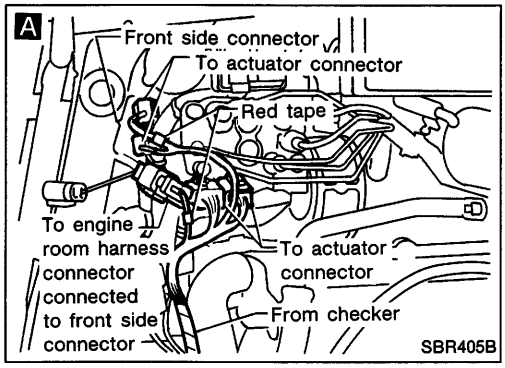
Check continuity between control unit connector (vehicle side) terminal ⑳ and body ground with ignition switch "OFF".

N.G. → Repair ground harness.

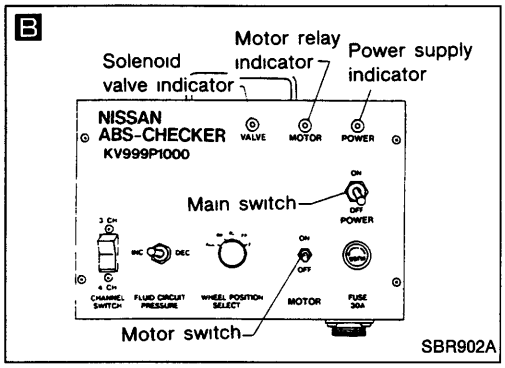
↓ O.K.

Replace control unit.

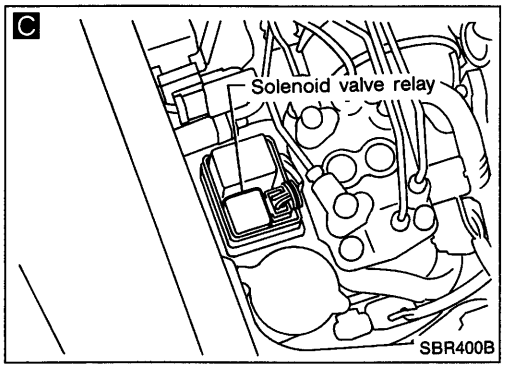
A



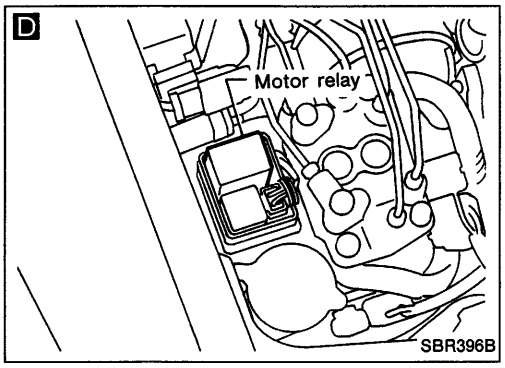
B



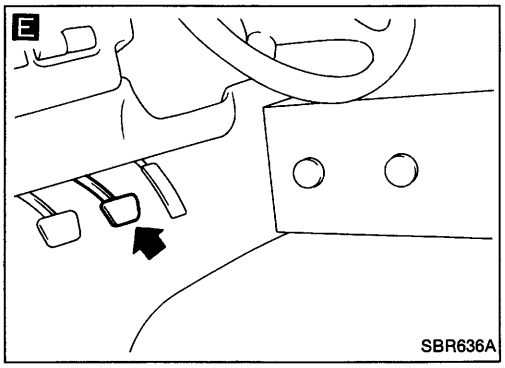
C



D



E



Electrical Components Inspection

ACTUATOR (Not self-diagnostic item)

INSPECTION START

A

Connect A.B.S. checker to actuator connector and vehicle harness with battery terminal connected and all checker switch turning off.
Use harness for 4 channel.
Set channel select switch to 4 channel.

B

Turn checker main switch on. Check power supply indicator for coming on.
- No → Replace battery with fully charged new one, if checker connection is correct.
- Yes ↓

C

Check checker valve relay indicator for coming on.
- No → Replace solenoid valve relay, if checker connection s correct.
- Yes ↓

Select one valve — FL, FR, RL or RR. (valves corresponding to each wheel position.)
Select brake circuit pressure decreasing position by switch then turn motor switch on.
Select pressure increasing position.

A

Yes ↓

Repeat so that all valve will be performed.

B

Check motor relay indicator for coming on while motor switch is turned on.
- No → D Replace motor relay, if checker connection is correct.
- Yes ↓

Check motor for operational sound beside the actuator in a quiet place.
- No → Replace actuator as assembly, if Diagnostic Procedures 7 - 12 are already performed and checker connection is correct.
- Yes ↓

E

Bring checker in the vehicle and depress the brake pedal.
Perform step A again.

Ⓐ

Electrical Components Inspection (Cont'd)

Ⓐ

Check brake pedal for vibration when motor switch is turned on or while operating solenoid valve selecting switch with motor switch turned on.
N.G.: No vibration
O.K.: Vibration

N.G.

O.K.

Check brake pedal for depression when select pressure increases.

O.K.

Actuator works normally.

Connect pressure gauge (KV991V0010) to the caliper connected to the malfunctioning valve. (See page BR-7.)

Set checker's select valve switch to malfunctioning valve and circuit pressure switch to "INCREASE".

F

Depress brake pedal to see if pressure gauge registers fluid pressure.

No → Replace actuator assembly.

Drawing shows pressure gauge connected to front side caliper.

Yes

G

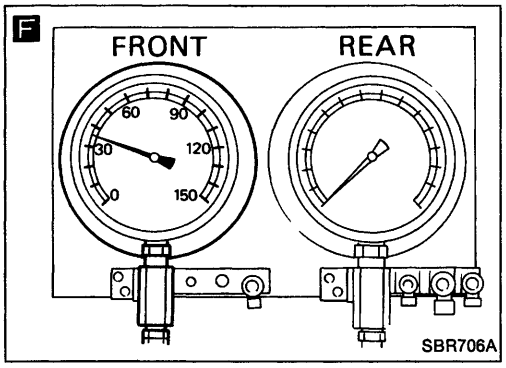
Turn motor switch on.
Set circuit pressure switch to "DECREASE" to see if caliper brake fluid pressure decreases to zero.

No → Replace actuator assembly.

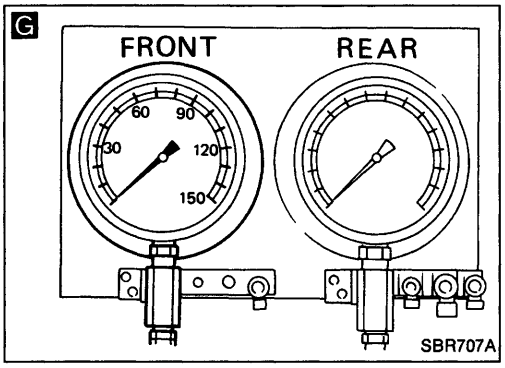
Yes

Actuator works normally.

F



G



General Specifications

Front brake	
Brake model	CL25VA disc brake
Cylinder bore diameter mm (in)	57.2 (2.252)
Pad mm (in) Length x width x thickness	125.6 x 45.3 x 11 (4.94 x 1.783 x 0.43)
Rotor outer diameter x thickness mm (in)	257 x 22 (10.12 x 0.87)
Rear brake	
Brake model	CL9HA disc brake
Cylinder bore diameter mm (in)	33.96 (1.3370)
Pad mm (in) Length x width x thickness	89.1 x 39.5 x 10 (3.508 x 1.555 x 0.39)
Rotor outer diameter x thickness mm (in)	258 x 9 (10.16 x 0.35)
Master cylinder	
Cylinder bore diameter mm (in)	23.81 (15/16)
Control valve	
Valve model	Dual proportioning valve
Split point kPa (kg/cm^2, psi) x reducing ratio	2,452 (25, 356) x 0.4
Brake booster	
Booster model	M195T
Diaphragm diameter mm (in)	Primary: 205 (8.07) Secondary: 180 (7.09)
Recommended brake fluid	DOT 3

Inspection and Adjustment

DISC BRAKE

Brake model	CL25VA	CL9HA
Pad wear limit mm (in)		
Minimum thickness	2.0 (0.079)	
Rotor repair limit mm (in)		
Minimum thickness	20.0 (0.787)	8 (0.31)
Maximum thickness variation	0.02 (0.0008)	

PARKING BRAKE

Type	Center lever
Number of notches [under force of 196 N (20 kg, 44 lb)]	7 - 9
Number of notches when warning lamp switch comes on	1 or 0

BRAKE PEDAL

Free height "H" mm (in)	
M/T	151 - 161 (5.94 - 6.34)
A/T	159 - 169 (6.26 - 6.65)
Depressed height "D" mm (in) [under force of 490 N (50 kg, 110 lb) with engine running]	M/T : 80 (3.15) A/T: 85 (3.35)
Pedal free play "A" mm (in)	1 - 3 (0.04 - 0.12)

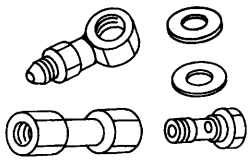
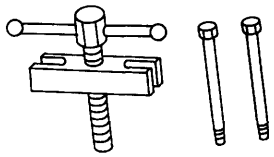
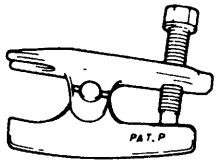
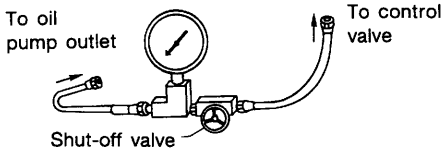
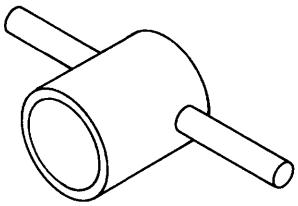
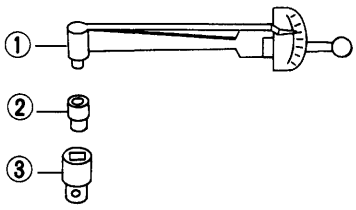
STEERING SYSTEM

SECTION ST

CONTENTS

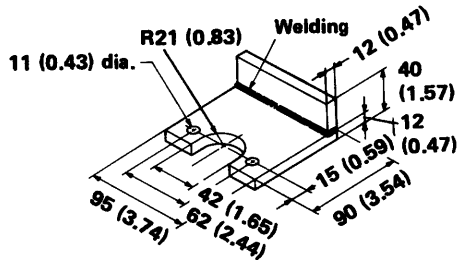
PREPARATION ..... ST- 2
PRECAUTIONS ..... ST- 4
ON-VEHICLE INSPECTION ..... ST- 5
ON-VEHICLE INSPECTION (Power steering) ..... ST- 6
STEERING WHEEL AND STEERING COLUMN ..... ST- 9
POWER STEERING GEAR AND LINKAGE (Model PR26SC) ST-14
POWER STEERING OIL PUMP ST-27
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ST-31

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description	
KV48100700 (J26364) Torque adapter		Measuring pinion rotating torque
KV48102500 (—) Pressure gauge adapter		Measuring oil pressure
ST27180001 (J25726-A) Steering wheel puller		Removing and installing steering wheel
HT72520000 (J25730-A) Ball joint remover		Removing ball joint
ST27091000 (J26357) Pressure gauge		Measuring oil pressure
KV48104400 (—) Rack seal ring reformer		Reforming teflon ring
ST3127S000 (See J25765-A) ① GG91030000 (J25765-A) Torque wrench ② HT62940000 (—) Socket adapter ③ HT62900000 (—) Socket adapter		Measuring turning torque

COMMERCIAL SERVICE TOOL

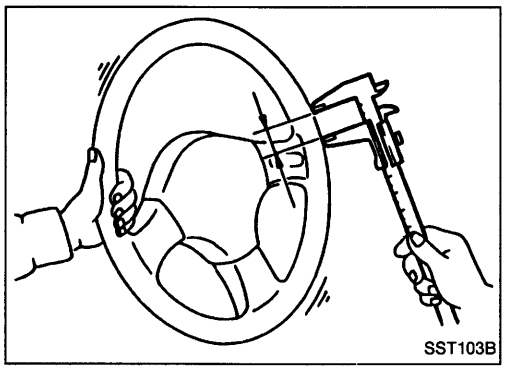
Tool name	Description
Oil pump attachment	Disassembling and assembling oil pump



Unit: mm (in)

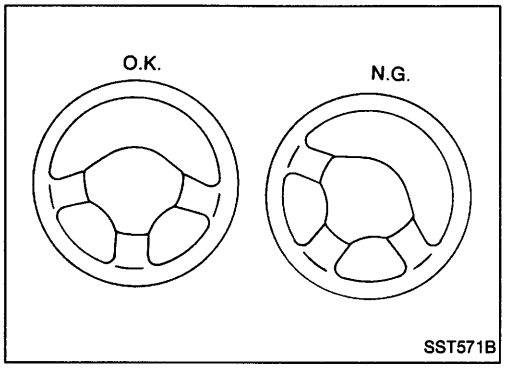
- Before disassembly, thoroughly clean the outside of the unit.
- Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- When disassembling parts, be sure to place them in order on a part rack so they can be reinstalled in their proper positions.
- Use nylon cloths or paper towels to clean the parts; common shop rags can leave lint that might interfere with their operation.
- Before inspection or reassembly, carefully clean all parts with a general purpose, non-flammable solvent.
- 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.
- Replace all gaskets, seals and O-rings. Avoid damaging O-rings, seals and gaskets during installation. Perform functional tests whenever designated.

  *: Automatic transmission fluid


SST103B

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.



SST571B

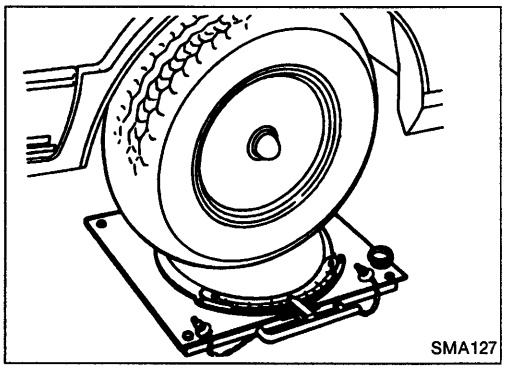
Checking Neutral Position on Steering Wheel

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.

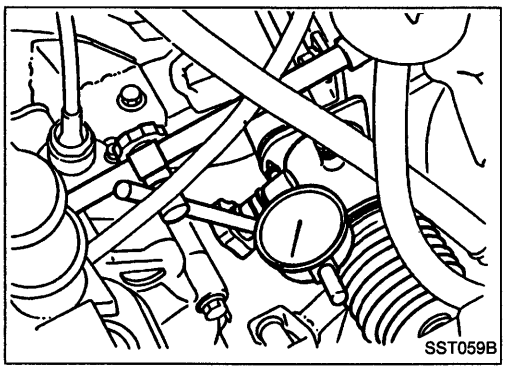
Checking

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.

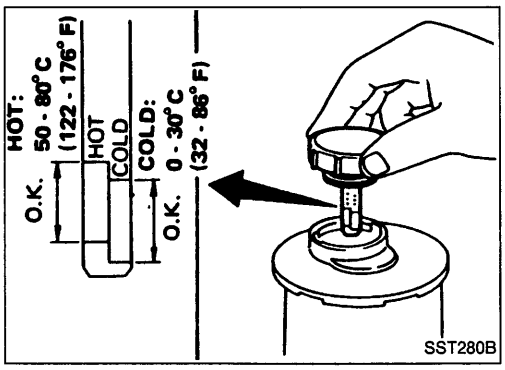

SST059B

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.

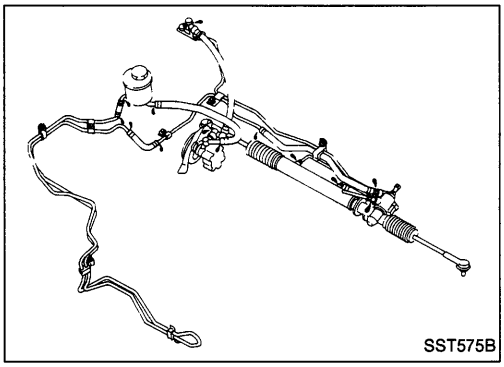


Checking Fluid Level

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

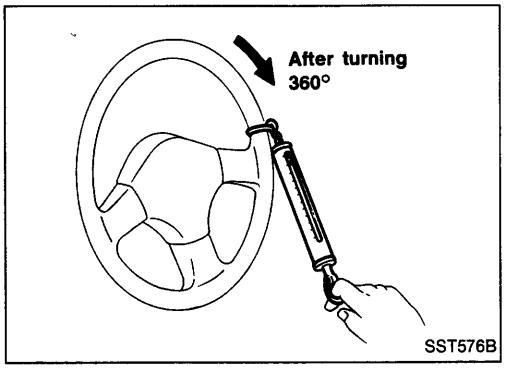
1. Raise front end of vehicle until wheels are clear of the ground.
2. Add fluid into oil tank to specified level. Meanwhile quickly turn steering wheel fully to right and left and lightly touch steering stoppers.
   Repeat steering wheel operation until fluid level no longer decreases.
3. Start engine.
   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.



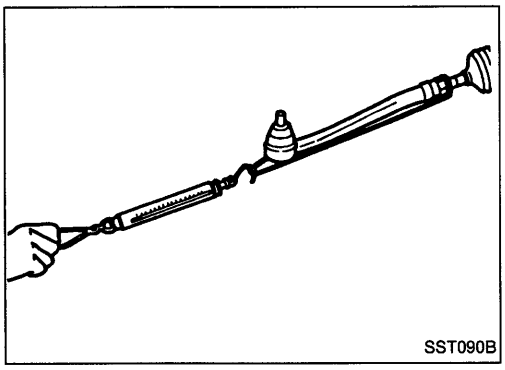
Checking Steering Wheel Turning Force

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 neutral position.

Steering wheel turning force:
39 N (4 kg, 9 lb) or less

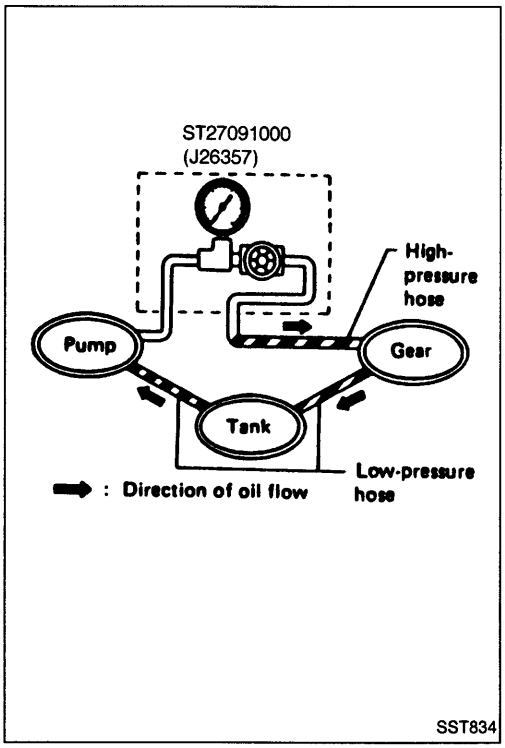


5. If steering wheel turning force is out of specifications, check rack sliding force to detect condition of steering gear assembly.

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 from the neutral position, make sure rack sliding force is within specification.

Rack sliding force:
284 N (29 kg, 64 lb) or less

6. If rack sliding force is not within specification, replace steering gear assembly.



Checking Hydraulic System

Before starting, check belt tension, driving pulley and tire pressure.

1. Set Tool. Open shut-off valve. Then bleed air. (See "Bleeding Hydraulic System".)
2. Run engine.

Make sure temperature of fluid in tank rises to 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:
7,649 - 8,238 kPa (78 - 84 kg/cm^2,
1,109 - 1,194 psi)

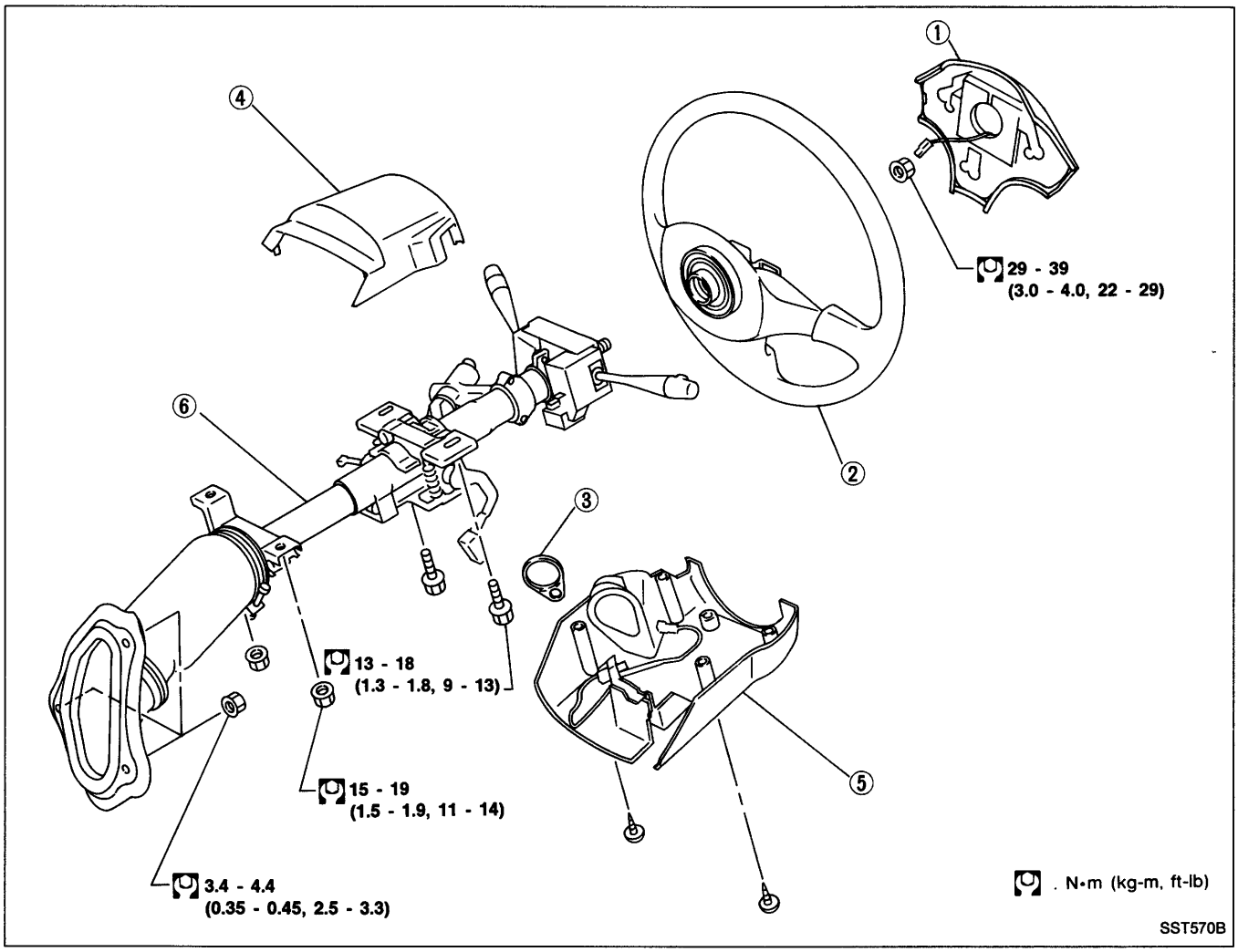
4. If oil pressure is below the standard pressure, slowly close shut-off valve and check pressure.

- When pressure reaches standard pressure, gear is damaged.
- When pressure remains below standard pressure, pump is damaged.

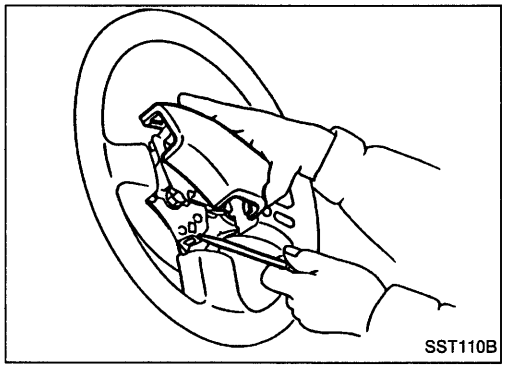
CAUTION:

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.



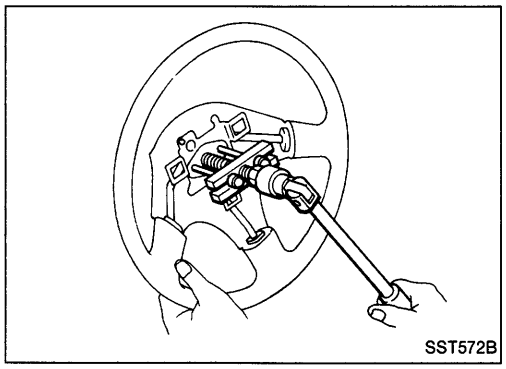
① Horn pad
② Steering wheel
③ Ignition switch grommet
④ Upper column cover
⑤ Lower column cover
⑥ Steering column assembly


SST110B

Removal

STEERING WHEEL

1. Pull out horn pad.

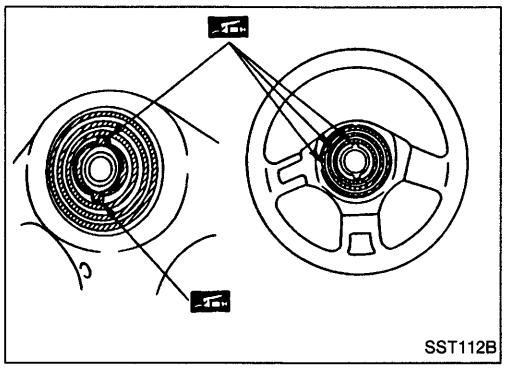

SST572B

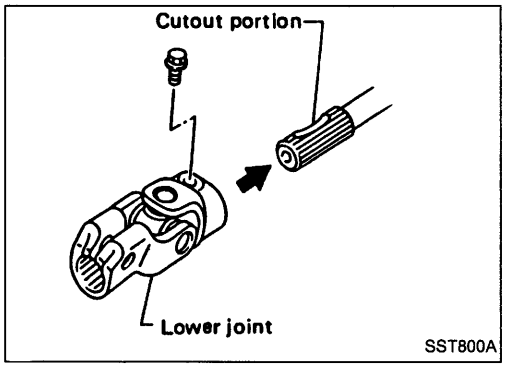
2. Remove steering wheel with Tool.

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.

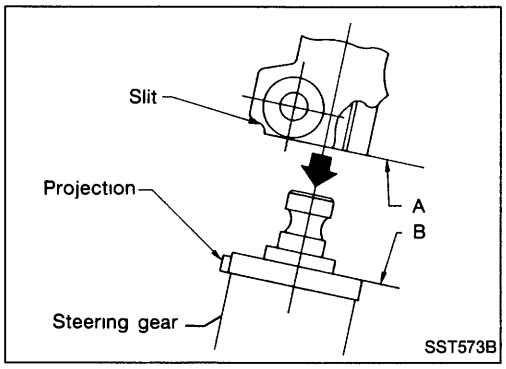

SST112B



SST800A

STEERING COLUMN

- When installing steering column, fingertighten all lower bracket and clamp retaining bolts; then tighten them securely. Do not apply undue stress to steering column.
- When attaching lower joint, be sure tightening bolt faces cutout portion.



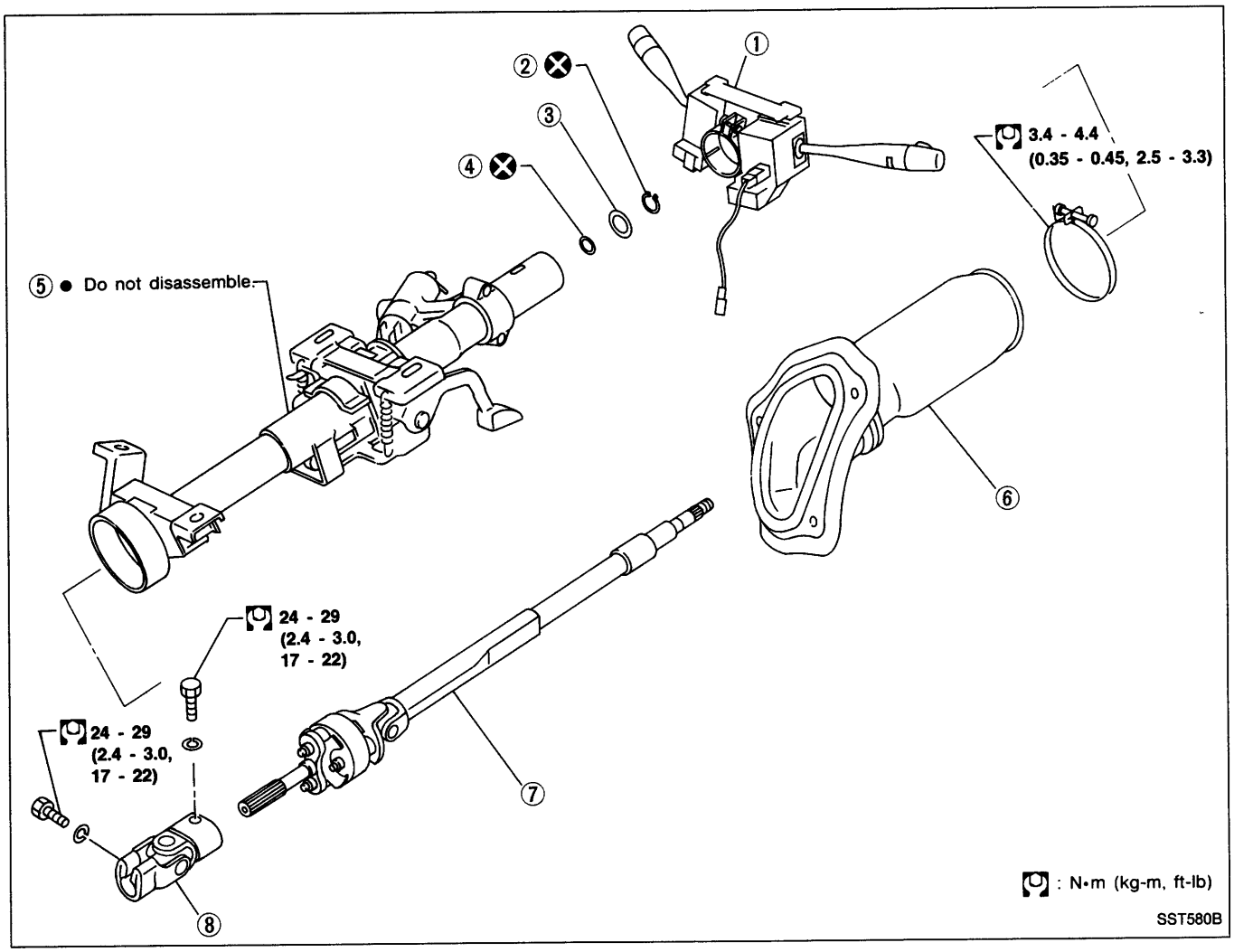
SST573B

- Align slit of lower joint with projection on dust cover. Insert joint until surface A contacts surface B.

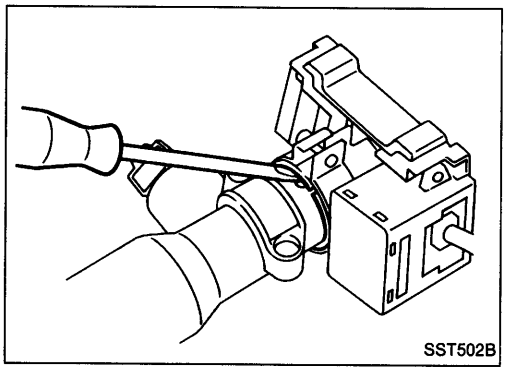
CAUTION:

After installing steering column, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight forward position to left and right locks are equal. Be sure that the steering wheel is in a neutral position when driving straight ahead.

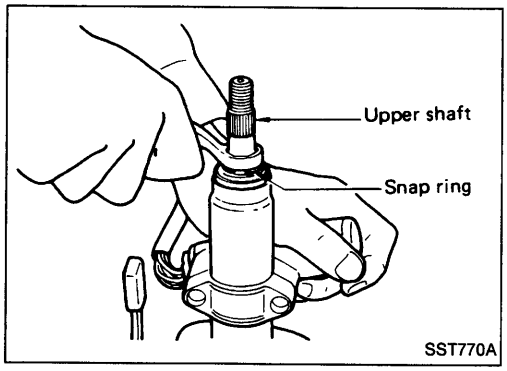
Disassembly and Assembly



Disassembly and Assembly (Cont'd)

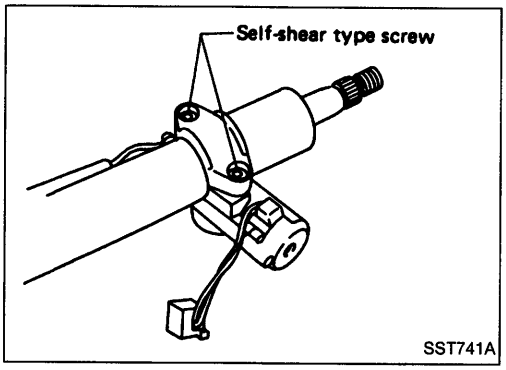

SST502B

- To remove combination switch, insert a suitable tool between mating portion. Lift switch bracket and pull it out.
- When disassembling and assembling, unlock steering lock with key.



SST770A

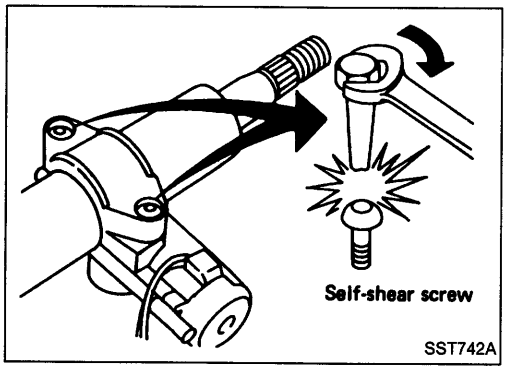
- Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.
- Install snap ring on upper shaft with a suitable tool.



SST741A

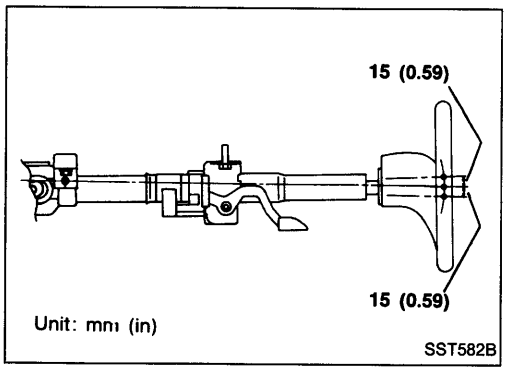
- Steering lock

a. Break self-shear type screws with a drill or other appropriate tool.



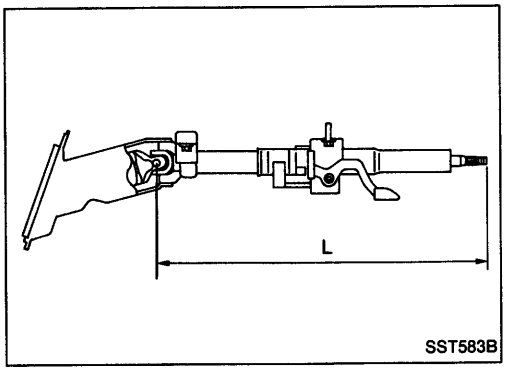
SST742A

b. Install self-shear type screws and then cut off self-shear type screw heads.



SST582B

- After installing steering column, check tilt mechanism operation. (Vehicles with tilt system)



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.

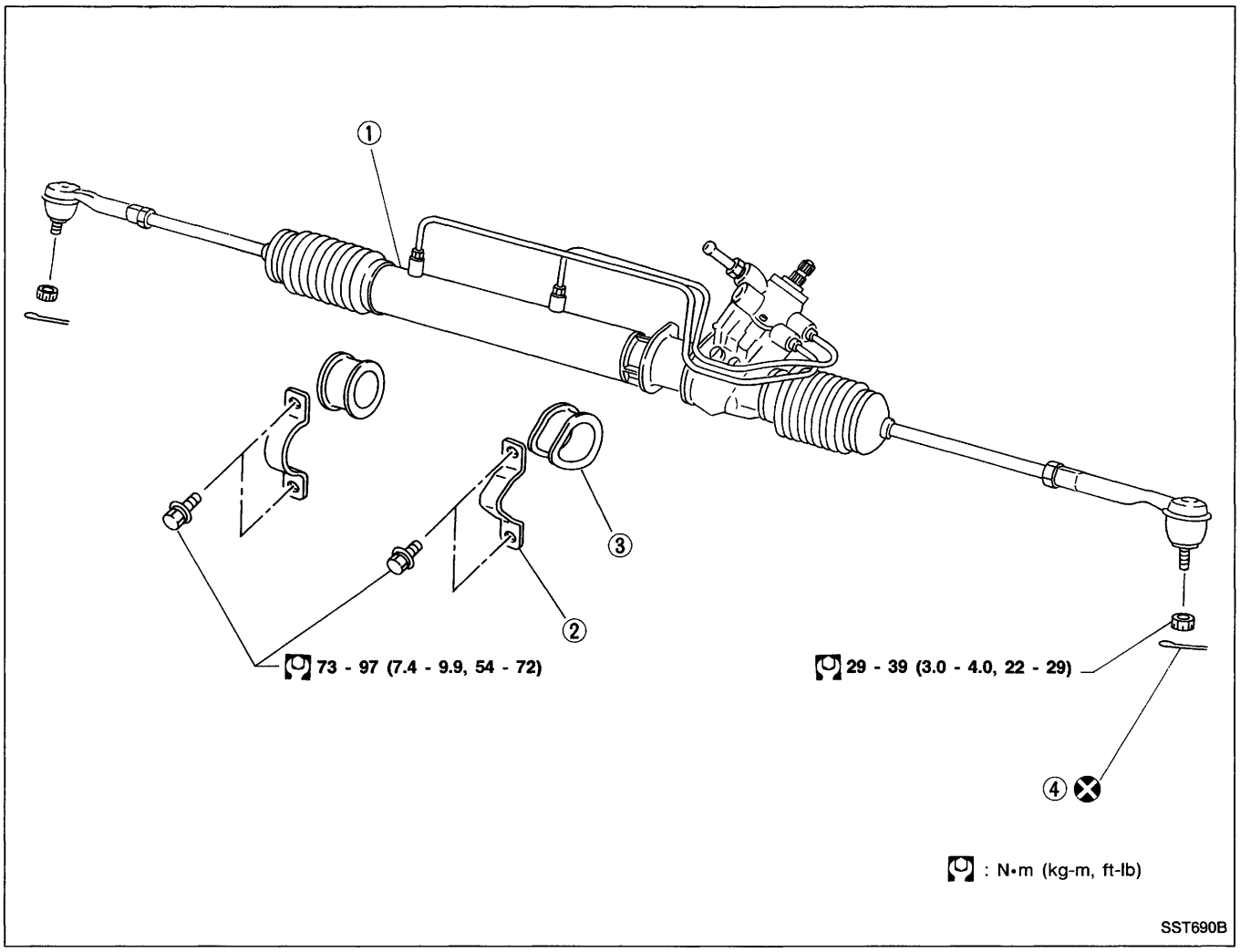
b. Check jacket tube for deformation or breakage. Replace if necessary.

- 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.

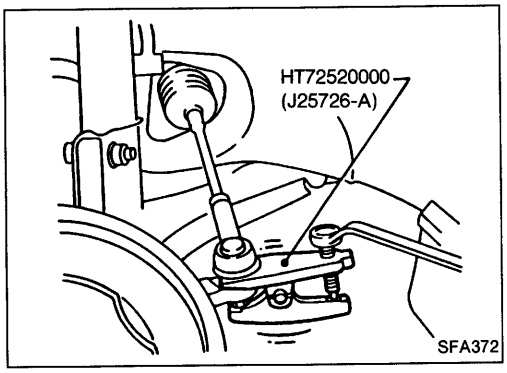
Column length "L":

556.2 - 557.8 mm (21.90 - 21.96 in)

Removal and Installation

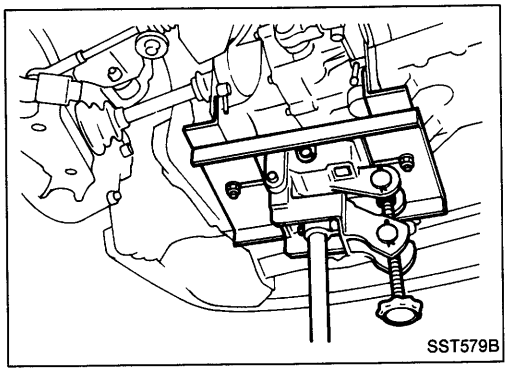


① Gear and linkage assembly
② Gear housing mounting bracket
③ Rack mounting insulator
④ Cotter pin

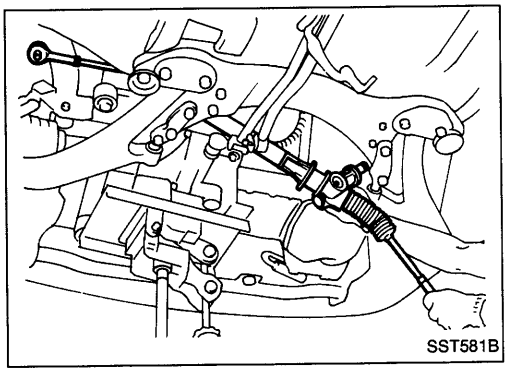


Removal

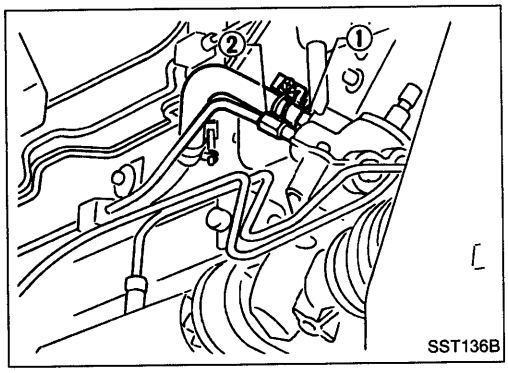
- Detach tie-rod outer sockets from knuckle arms with Tool.
- Remove high and low pressure connectors.
- Remove exhaust front tube.
- Remove steering lower joint.
- Remove gear housing brackets.



- Support transmission housing with engine jack.
- Remove center member with engine mounting rear bracket.



- Remove steering gear assembly.



Installation

- 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:

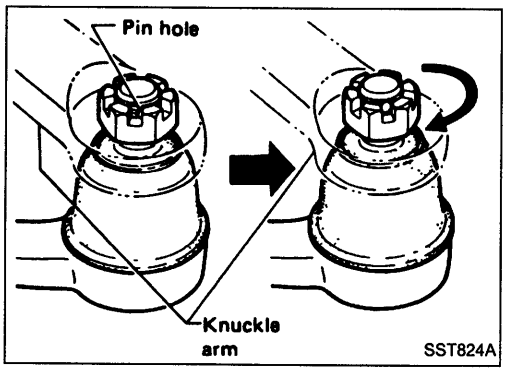
Low-pressure side "1"

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)

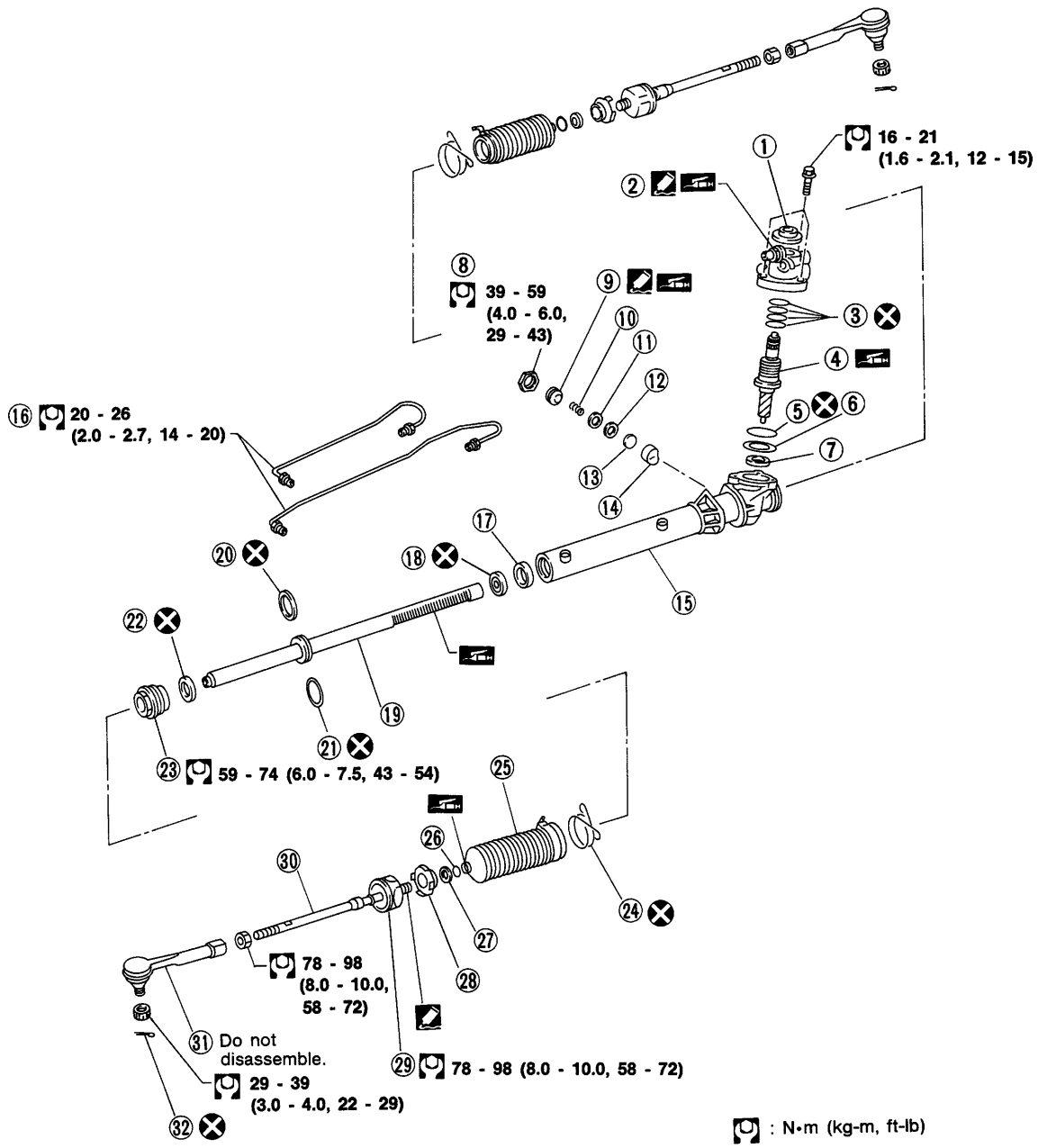
Installation (Cont'd)



- 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). Then tighten further to align nut groove with first pin hole so that cotter pin can be installed.

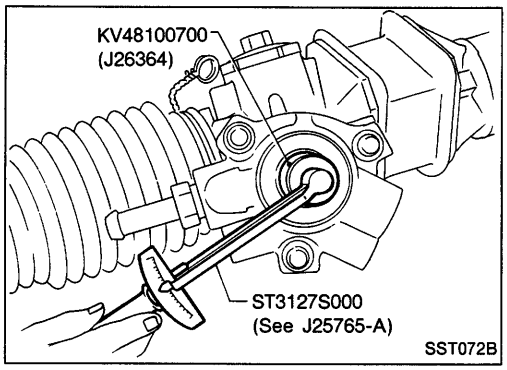
CAUTION:

Tightening torque must not exceed 49 N·m (5 kg-m, 36 ft-lb).



SST691B

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 Lock nut
⑨ Adjusting screw
⑩ Spring
⑪ Spring disc
⑫ Washer
⑬ Spring seat
⑭ Retainer
⑮ Gear housing
⑯ Gear housing tube
⑰ Center bushing
⑱ Rack oil seal
⑲ Rack assembly
⑳ Rack seal ring
㉑ O-ring
㉒ Rack oil seal
㉓ End cover assembly
㉔ Boot clamp
㉕ Dust boot
㉖ Boot band
㉗ Rack spacer
㉘ Lock plate
㉙ Tie-rod inner socket
㉚ Tie-rod
㉛ Tie-rod outer
㉜ Cotter pin



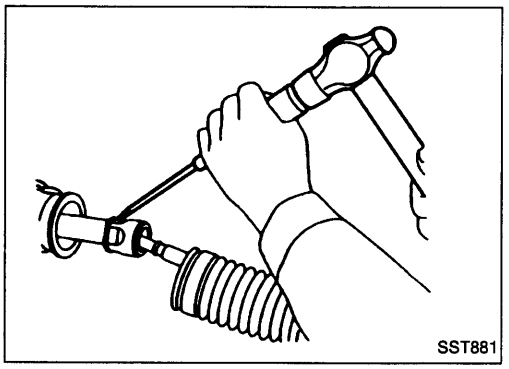
Disassembly

1. Prior to disassembling, measure pinion rotating torque. Record the pinion rotating torque as a reference.

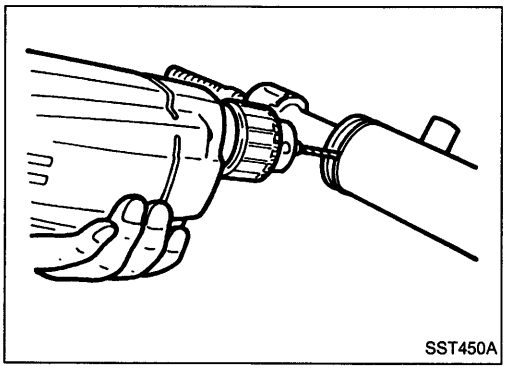
- **Before measuring, disconnect gear housing tube and drain fluid.**
- **Use soft jaws when holding steering gear housing. Handle gear housing carefully, as it is made of aluminum. Do not grip cylinder in a vise.**

2. Remove pinion gear.

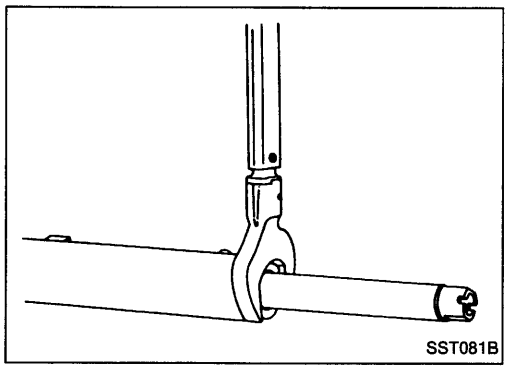
Be careful not to damage pinion gear when removing pinion seal ring.



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.

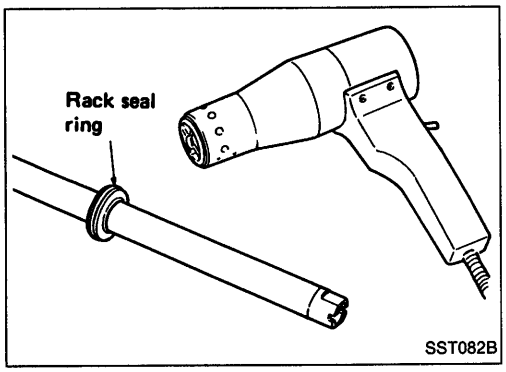


7. Drill staked portion of gear housing end with drill of 2 to 2.5 mm (0.079 to 0.098 in) diameter, until the staking is eliminated.



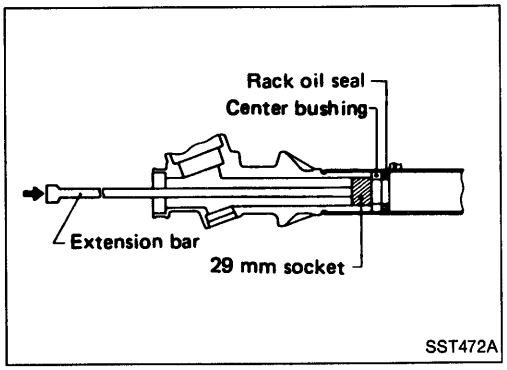
8. Remove end cover assembly with a suitable tool.
9. Draw out rack assembly.

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

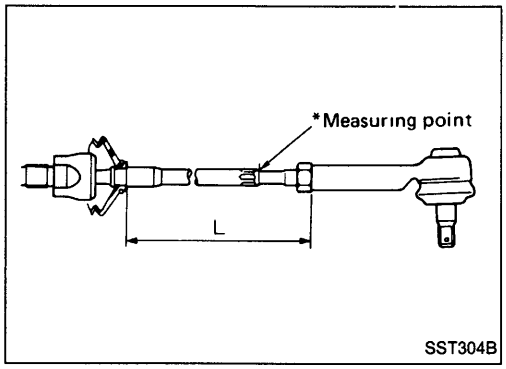
- Thoroughly examine pinion gear. If pinion gear is damaged, cracked or worn, replace it.
- Inspect bearings to see that they roll freely and are free from cracked, pitted, or worn balls, rollers and races. Replace if necessary.

GEAR HOUSING CYLINDER

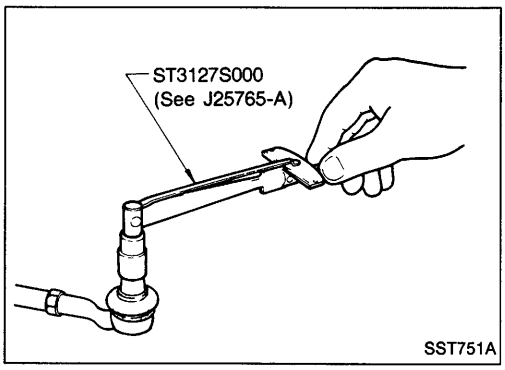
Check gear housing cylinder bore for scratches or other damage. Replace if necessary.

Inspection (Cont'd)

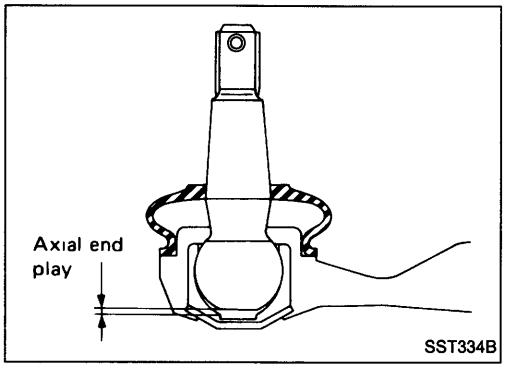
TIE-ROD OUTER AND INNER SOCKET



- Check ball joint for swinging force.
  Tie-rod outer ball joint:
  At cotter pin hole
  6.9 - 63.7 N
  (0.7 - 6.5 kg, 1.5 - 14.3 lb)
  Tie-rod inner ball joint:
  5.69 - 51.29 N
  (0.58 - 5.23 kg, 1.28 - 11.53 lb)



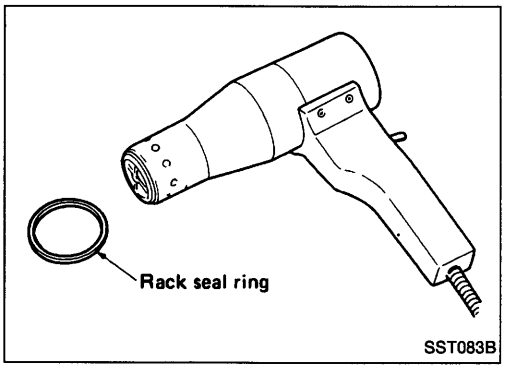
- Check ball joint for rotating torque.
  Tie-rod outer ball joint:
  0.3 - 2.9 N·m
  (3 - 30 kg-cm, 2.6 - 26.0 in-lb)



- Check ball joint for axial end play.
  Tie-rod outer ball joint:
  0.5 mm (0.020 in) or Less
  Tie-rod inner ball joint:
  0 mm (0 in)
- Check condition of dust cover. If cracked excessively, replace it.

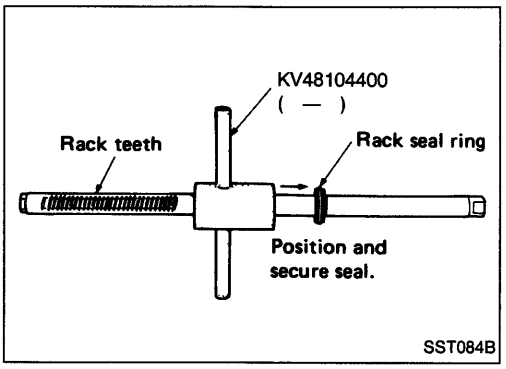
Assembly

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.

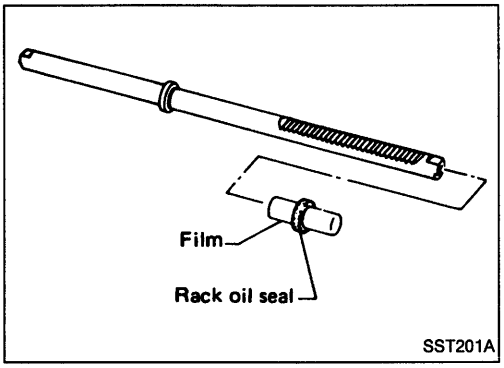


2. Using Tool, compress periphery of rack seal ring to position and secure it on rack.

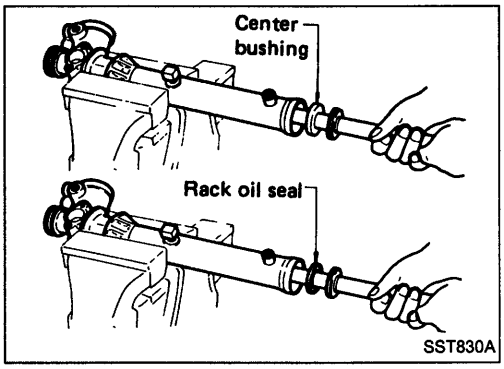
Always insert Tool from the rack gear side.



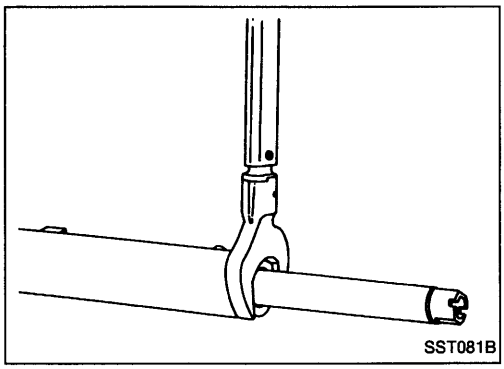
Assembly (Cont'd)



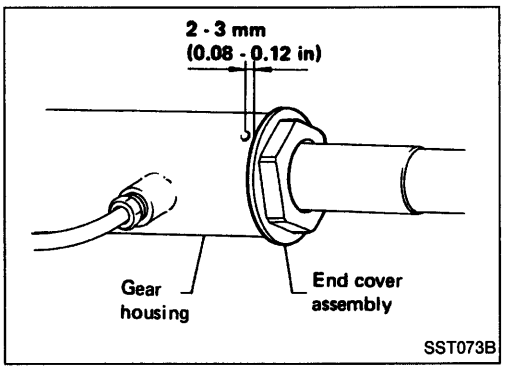
3. Insert new rack oil seal.
- **Place plastic film into rack oil seal to prevent damage by rack teeth.**
- **Do not forget to remove plastic film after rack oil seal is positioned properly.**
- **Make sure lips of rack oil seal face each other.**



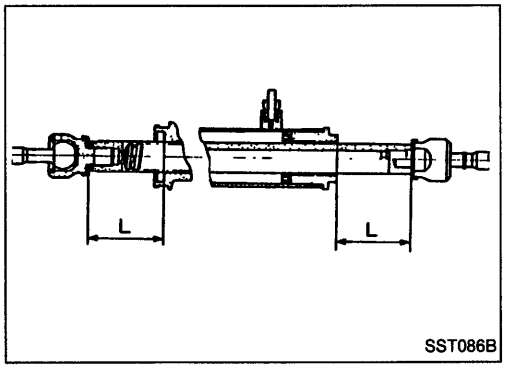
4. Install center bushing and rack oil seal with rack assembly.



5. Tighten end cover assembly with a suitable tool.

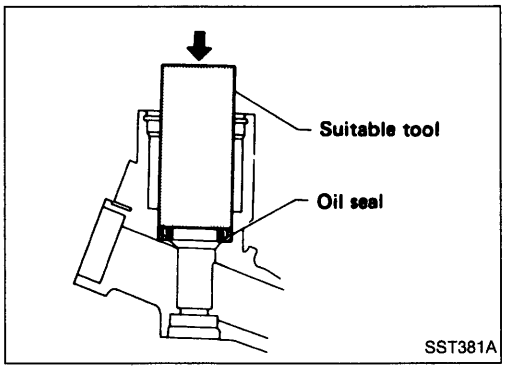


6. Fasten end cover assembly to gear housing by staking.



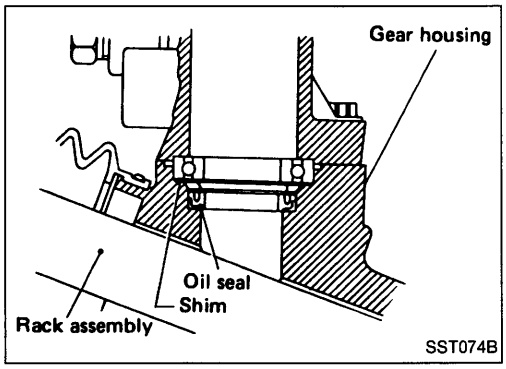
7. Set rack gear in neutral position.
   Rack stroke "L":
   Refer to S.D.S.

Assembly (Cont'd)

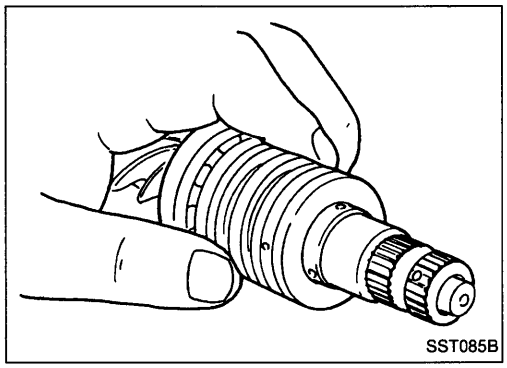


8. Coat seal lip of new pinion oil seal with multi-purpose grease and install it to pinion housing of gear housing with a suitable tool.

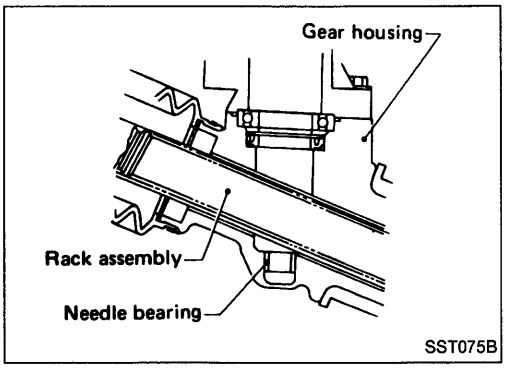
Make sure lip of oil seal faces up when installed.



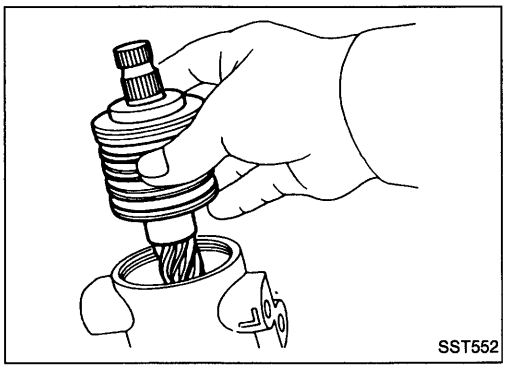
9. Install pinion bearing adjusting shim(s).
- Whenever pinion assembly, gear housing and rear housing are disassembled, replace shim(s) with new ones. Always use the same number of shim(s) when replacing.



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.



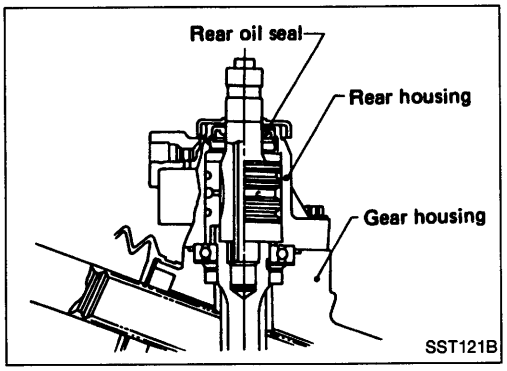
11. Apply a coat of multi-purpose grease to needle bearing roller and oil seal lip before installing pinion assembly in gear housing.



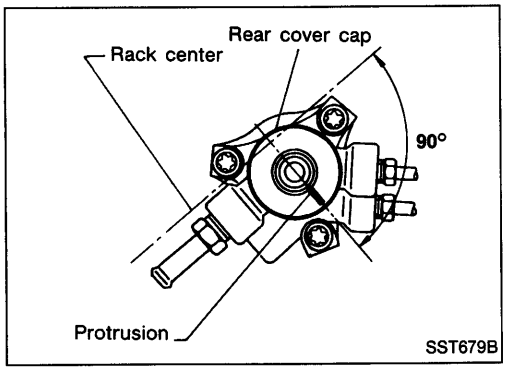
12. Install pinion assembly to pinion housing.

Be careful not to damage pinion oil seal.

Assembly (Cont'd)

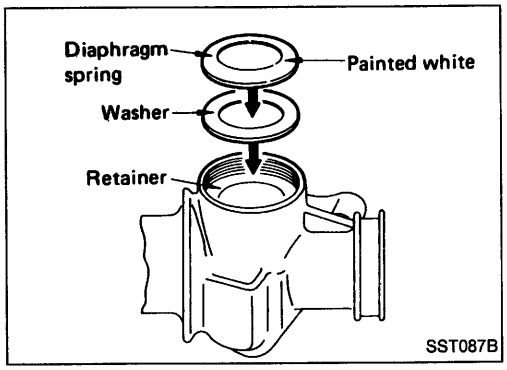


13. Apply a coat of multi-purpose grease to new rear oil seal lip before installing rear housing.



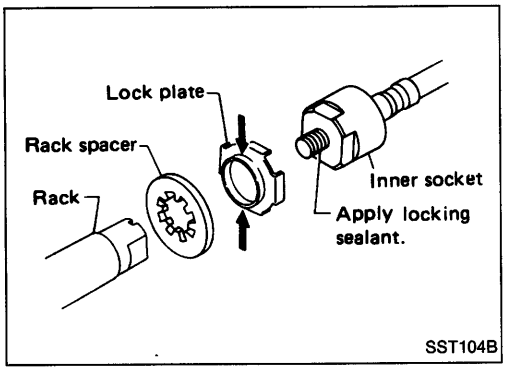
14. Install rear cover cap so that protrusion of rear housing cover is positioned as shown in figure at left when rack is centralized.

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.

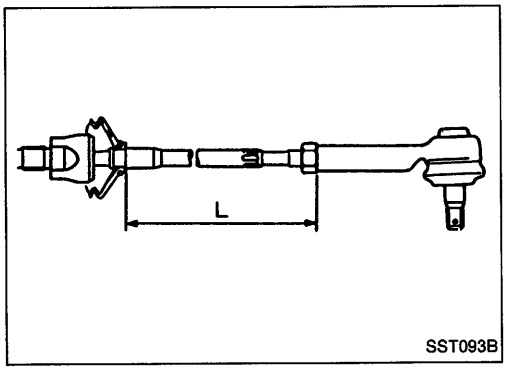
16. Install retainer spring and adjusting screw temporarily.



17. Install new lock plate.
- Attach lock plate to side rod inner socket .
- Apply locking sealant to inner socket threads . Screw inner socket into rack and tighten to specified torque.
- Clinch two places of lock plate at rack's groove.

CAUTION:

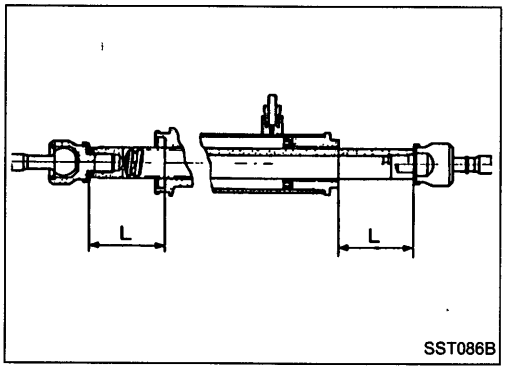
To prevent scratching the boot, remove burrs from lock plate.



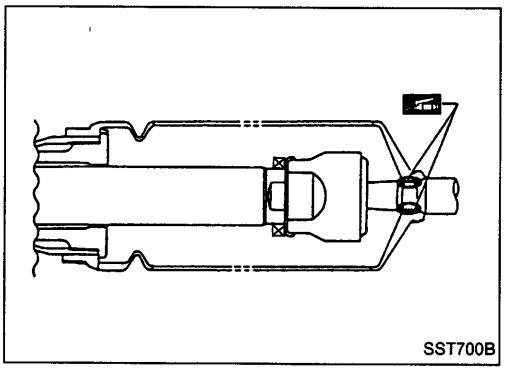
18. Tighten outer socket lock nut.

Tie-rod length "L":
Refer to S.D.S.

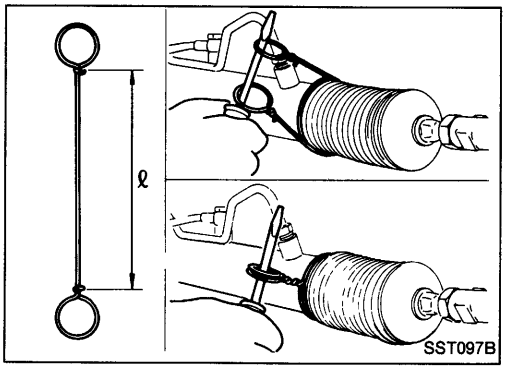
Assembly (Cont'd)



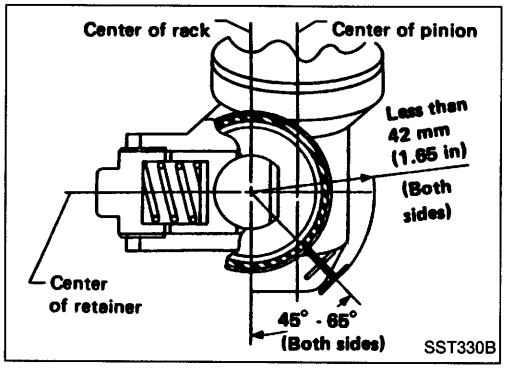
19. Measure rack stroke.
    Rack stroke "L":
    Refer to S.D.S.



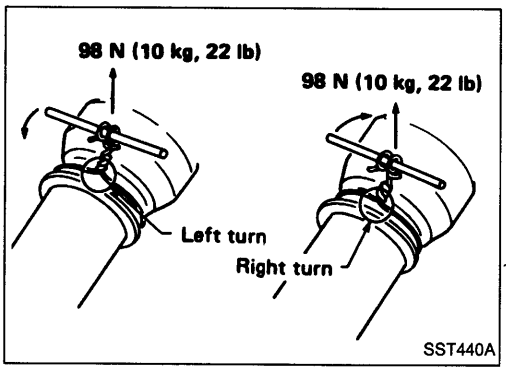
20. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.



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).

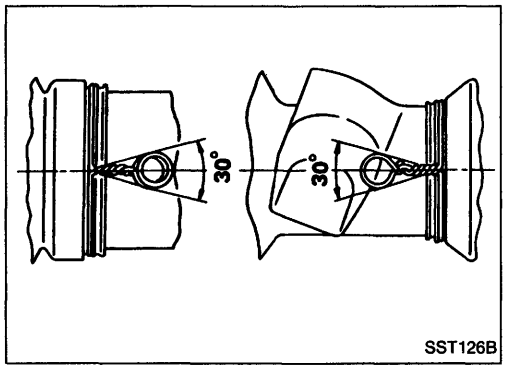


- Install boot clamps so they are behind the gear housing when it is attached to the vehicle. (This will prevent interference with other parts.)

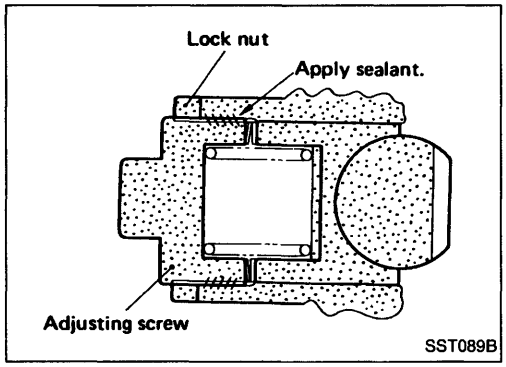


- Twist boot clamp in the direction shown in figure at left.

Assembly (Cont'd)



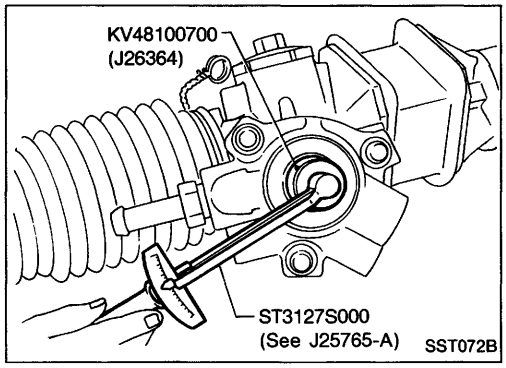
- After twisting boot clamp, bend twisted and diagonally so it does not contact boot.



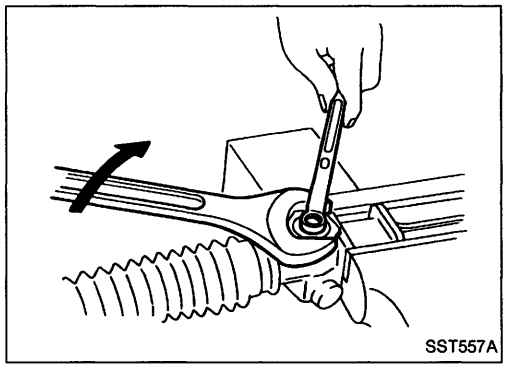
Adjustment

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).

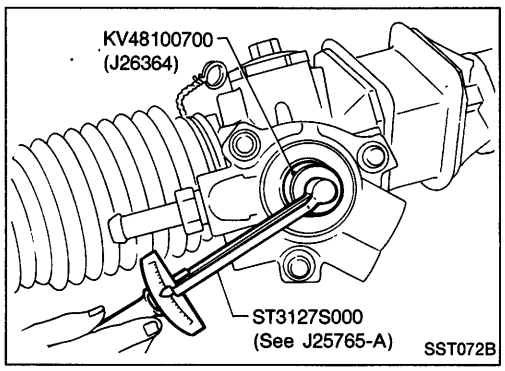


6. Move rack over its entire stroke several times.
7. Measure pinion rotating torque within the range of 180° from neutral position.
   Stop the gear at the point of maximum torque.
8. Loosen adjusting screw, then retighten it to 4.9 N·m (50 kg-cm, 43 in-lb).
9. Loosen adjusting screw by 40° to 60°.



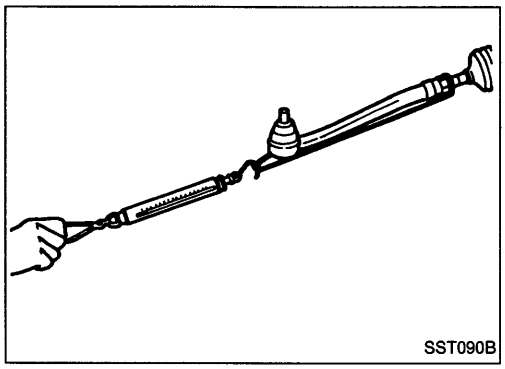
10. Prevent adjusting screw from turning, and tighten lock nut to specified torque.

Adjustment (Cont'd)



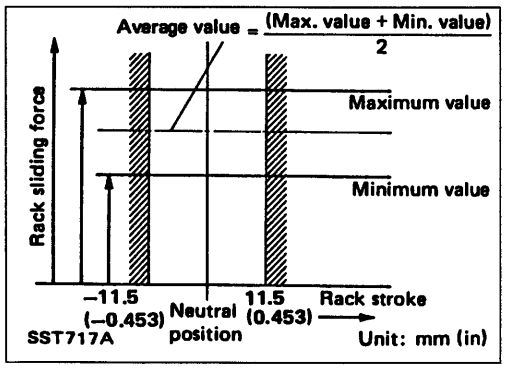
11. Measure pinion rotating torque.
    Within ±100° from the neutral position:
    Average rotating torque
    0.8 - 1.3 N·m (8 - 13 kg-cm, 6.9 - 11.3 in-lb)
    Maximum torque deviation
    0.4 N·m (4 kg-cm, 3.5 in-lb)
    Except for above measuring range:
    Maximum rotating torque
    1.9 N·m (19 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.

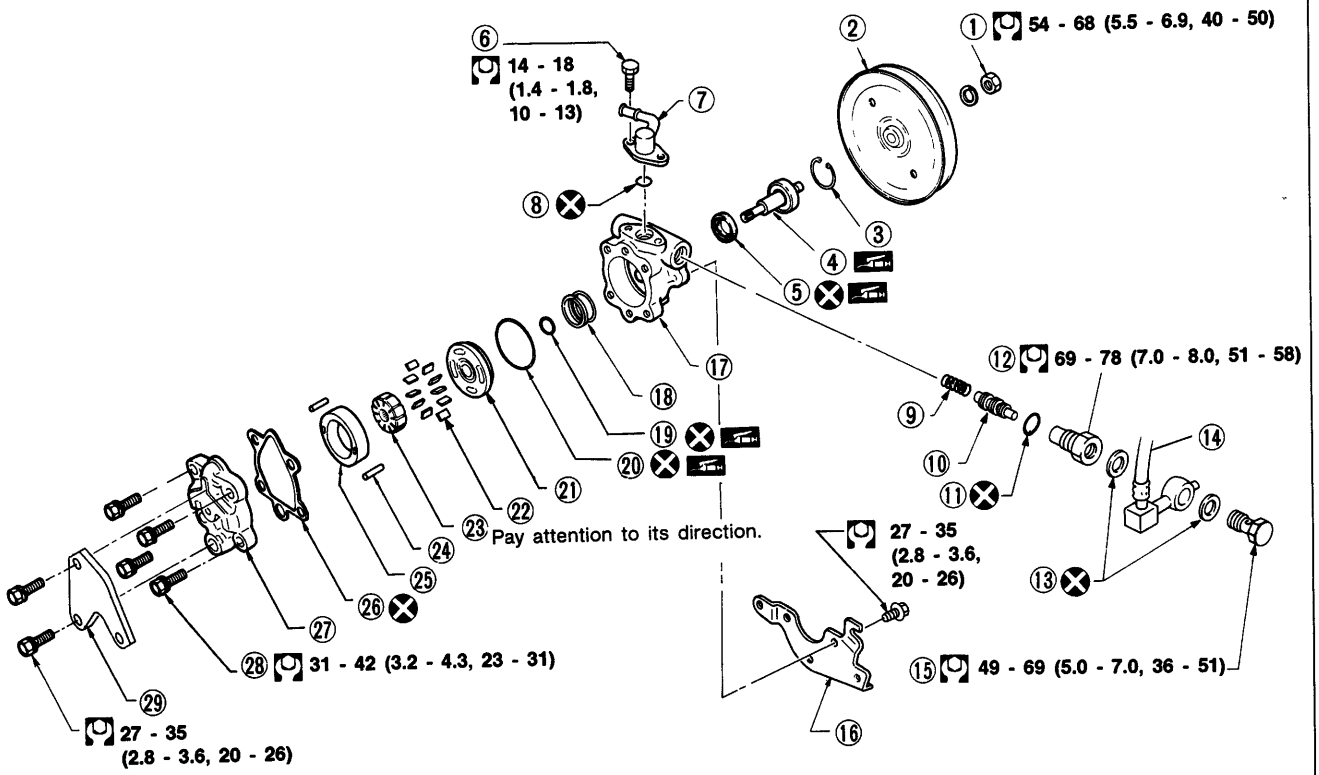
    Average rack sliding force:
    284 N (29 kg, 64 lb)
g. Check sliding force outside above range.
    Maximum rack sliding force:
    Not more than 39 N (4 kg, 9 lb) beyond above value



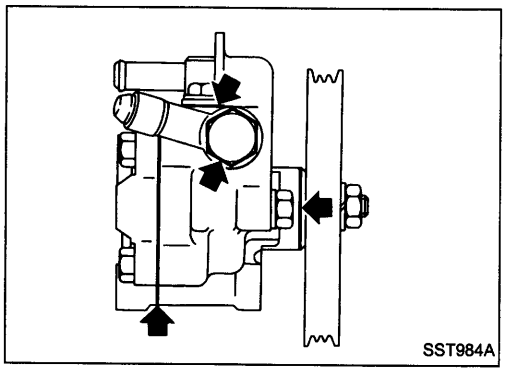
- If rack sliding force is not within specification, readjust by repeating adjustment procedure from the beginning.
- If rack sliding force is still out of specification after readjustment, gear assembly needs to be replaced.

Disassembly and Assembly

For 2.0 ℓ engine



① Nut
② Pulley
③ Snap ring
④ Drive shaft
⑤ Oil seal
⑥ Bolt
⑦ Suction pipe
⑧ O-ring
⑨ Spring
⑩ Flow control valve
⑪ O-ring
⑫ Connector
⑬ Washer
⑭ Hose
⑮ Connector bolt
⑯ Bracket
⑰ Front housing
⑱ Spring
⑲ O-ring
⑳ O-ring
㉑ Front side plate
㉒ Vane
㉓ Rotor
㉔ Pin
㉕ Cam ring
㉖ Gasket
㉗ Rear housing
㉘ Bolt
㉙ Bracket


SST984A

Pre-disassembly Inspection

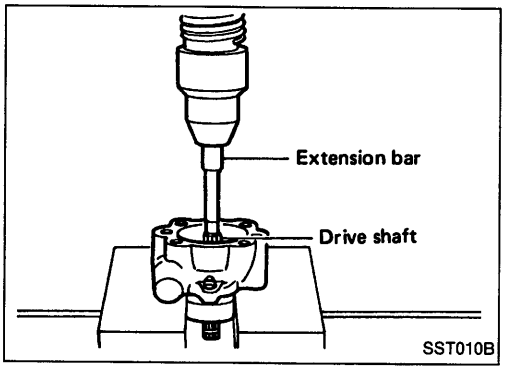
Disassemble the power steering oil pump only if the following items are found.

- Oil leak from any point shown in the figure.
- Deformed or damaged pulley.
- Poor performance.

Disassembly

CAUTION:

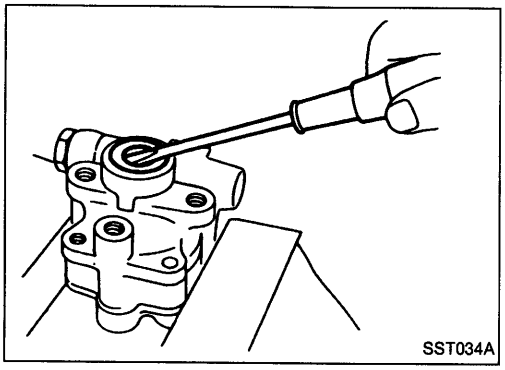
- **Parts which can be disassembled are strictly limited. Never disassemble parts other than those specified.**
- **Disassemble in as clean a place as possible.**
- **Clean your hands before disassembly.**
- **Do not use rags; use nylon cloths or paper towels.**
- **Follow the procedures and cautions in the Service Manual.**
- **When disassembling and reassembling, do not let foreign matter enter or contact the parts.**



SST010B

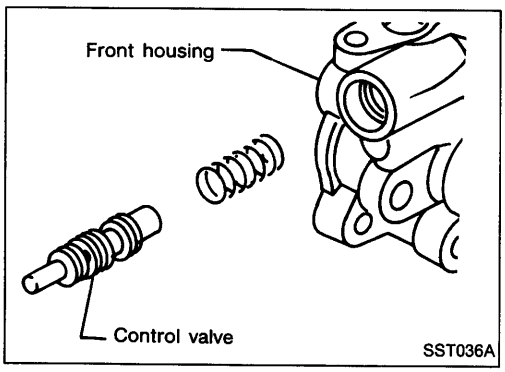
- Remove snap ring, then draw drive shaft out.

Be careful not to drop drive shaft.


SST034A

- Remove oil seal.

Be careful not to damage front housing.



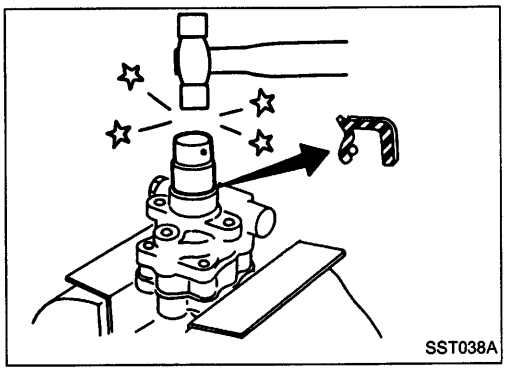
SST036A

- Remove connector.

Be careful not to drop flow control valve.

Inspection

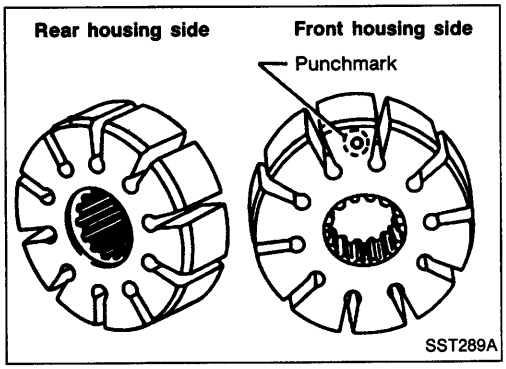
Inspect each component part for wear, deformation, scratches and cracks. If damage is found, replace the part.



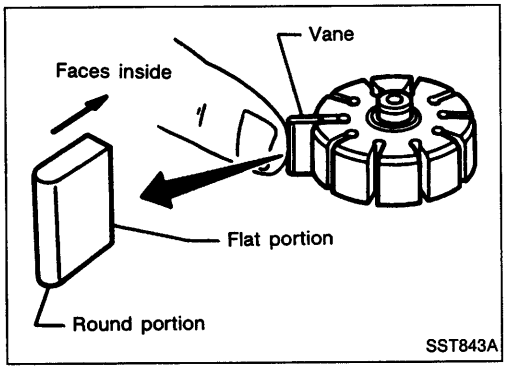
Assembly

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.

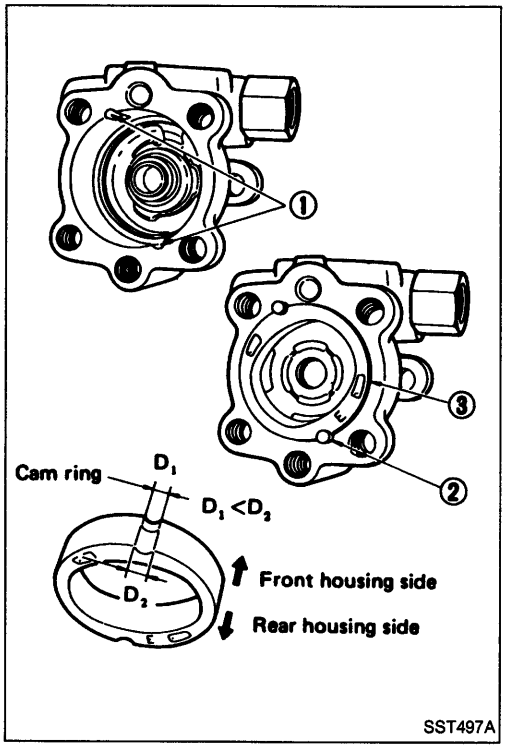


- Pay attention to the direction of rotor.



- When assembling vanes to rotor, rounded surfaces of vanes must face cam ring side.

Assembly (Cont'd)



- 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	All
Steering model	Power steering
Steering gear type	PR26SC
Steering overall gear ratio	17.7
Turns of steering wheel (Lock to lock)	2.9
Steering column type	Collapsible, tilt

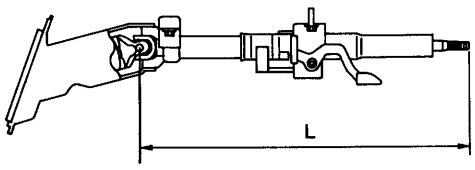
Inspection and Adjustment

GENERAL

Steering wheel axial play mm (in)	0 (0)
Steering wheel play mm (in)	35 (1.38) or less
Movement of gear housing mm (in)	±2 (±0.08) or less

STEERING COLUMN

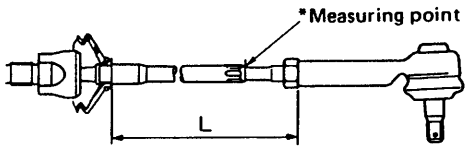
Steering column length "L" mm (in)	556.2 - 557.8 (21.90 - 21.96)



SST583B

STEERING GEAR AND LINKAGE

Steering gear type		PR26SC
Side rod outer ball joint		
Swinging force at cotter pin hole	N (kg, lb)	6.9 - 63.7 (0.7 - 6.5, 1.5 - 14.3)
Rotating torque	N·m (kg-cm, in-lb)	0.3 - 2.9 (3 - 30, 2.6 - 26.0)
Axial end play	mm (in)	0.5 (0.020) or less
Side rod inner ball joint		
Swinging force*	N (kg, lb)	5.69 - 51.29 (0.58 - 5.23, 1.28 - 11.53)
Axial end play	mm (in)	0 (0)
Side rod standard length "L"	mm (in)	176.6 (6.95)

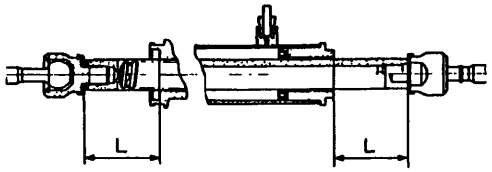


SST371B

Inspection and Adjustment (Cont'd)

STEERING GEAR AND LINKAGE

Steering gear type	PR26SC
Rack stroke "L" mm (in)	69.5 (2.736)



SST086B

Pinion gear preload without gear oil N·m (kg-cm, in-lb)	
Within ±100° from the neutral position	
Average rotating torque	0.78 - 1.27 (8.0 - 13.0, 6.9 - 11.3)
Maximum torque deviation	0.4 (4, 3.5)
Except above range	
Maximum rotating torque	1.9 (19, 16)
Maximum torque deviation	0.6 (6, 5.2)

POWER STEERING

Rack sliding force N (kg, lb)	
Under normal operating oil pressure	
Range within ±11.5 mm (±0.453 in) from the neutral position	284 (29, 64)
Maximum force deviation	39 (4, 9)
Except above range	Not more than 39 (4, 9) beyond above value
Retainer adjustment	
Adjusting screw	
Initial tightening torque N·m (kg-cm, in-lb)	4.9 - 5.9 (50 - 60, 43 - 52)
Retightening torque after loosening	0.2 (2, 1.7)
Tightening torque after gear has settled	4.9 (50, 43)
Returning angle degree	40° - 60°
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 (US qt, Imp qt)	0.9 (1, 3/4)
Oil pump maximum pressure kPa (kg/cm^2, psi)	7,649 - 8,238 (78 - 84, 1,109 - 1,194)

SECTION BF

CONTENTS

GENERAL SERVICING
(Including "Clip and Fastener") ..... BF- 2
BODY END ..... BF- 6
DOOR
(Including "Power Window" and "Power Door Lock") BF-11
INSTRUMENT PANEL BF-20
INTERIOR AND EXTERIOR
(In EXTERIOR, including "Weatherstrips") BF-23
SEAT
(Including "Heating seat") BF-34
2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM BF-36
2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses BF-43
SUN ROOF BF-72
WINDSHIELD AND WINDOWS BF-75
MIRROR BF-79
REAR AIR SPOILER BF-81
BODY ALIGNMENT BF-82

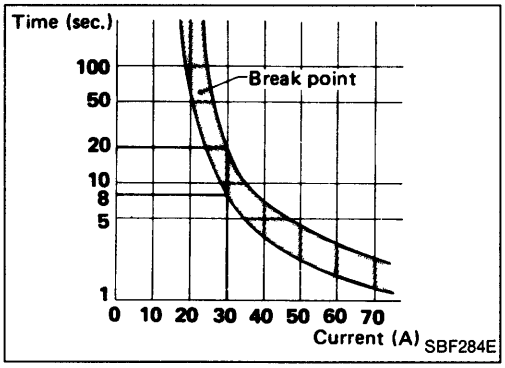
When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

★ **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

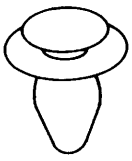
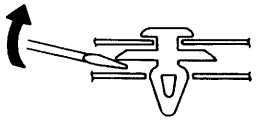
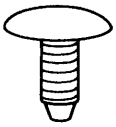
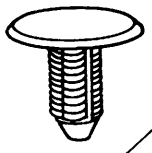
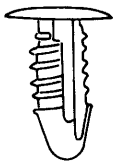
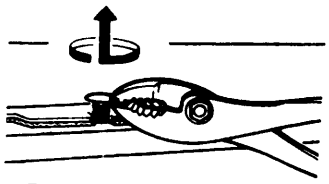
For example, when current is 30A, the circuit is broken within 8 to 20 seconds.

Circuit breakers are used in the following systems.

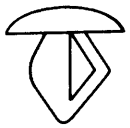
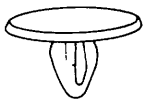
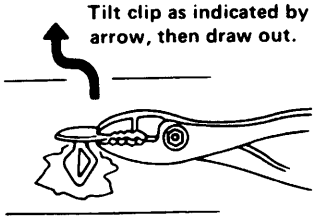
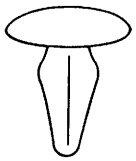
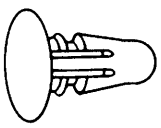
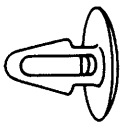
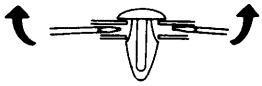
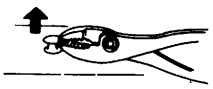
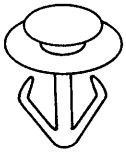
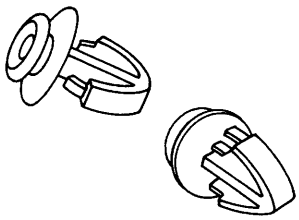
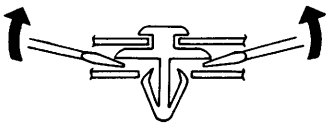
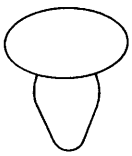
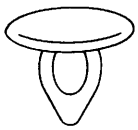
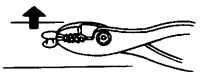
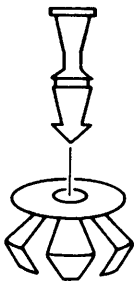
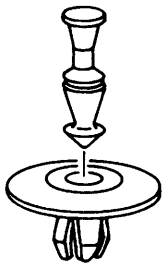
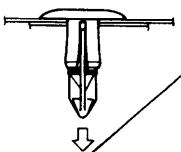
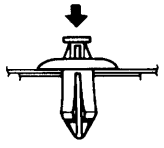
- Power window & power door lock
- Power sun roof
- Trunk lid and fuel filler lid opener
- 2-point motorized automatic seat belt system

Clip and Fastener

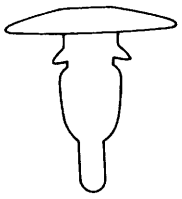
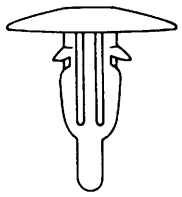
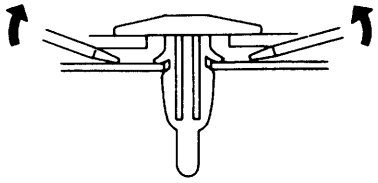
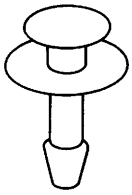
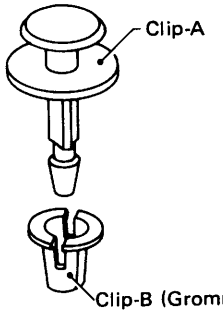
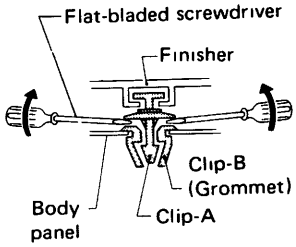
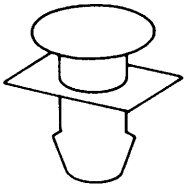
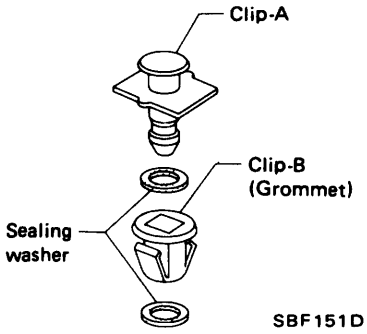
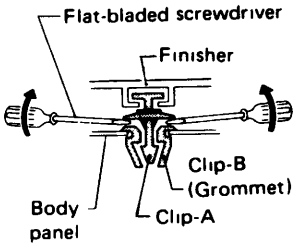
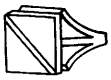
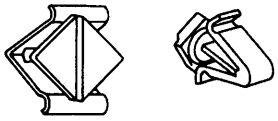
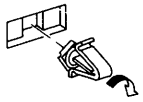
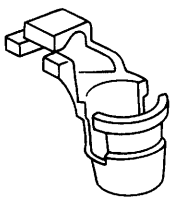
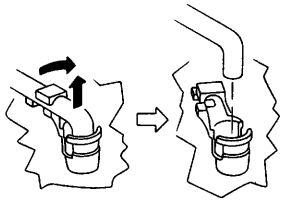
- Clips and fasteners in BF section correspond to the following numbers and symbols.
- Replace any clips and/or fasteners which are damaged during removal or installation.

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 by rotating.** SBF115B

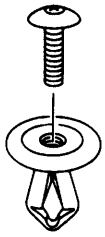
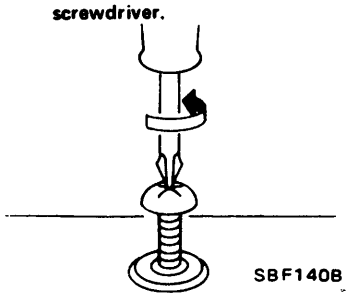
Clip and Fastener (Cont'd)

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 a flat-bladed screwdrivers or plier.   SBF091B
C107	 SBF365B	 SBF366B	Removal: Remove by bending up with flat-bladed screwdrivers.  SBF367B
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

Clip and Fastener (Cont'd)

No.	Symbol	Shape	Removal & Installation
CE117	 SBF173D	 SBF174D	**Removal:** **Remove with a flat-bladed screwdriver or pliers.**  SBF175D
CF113	 SBF035C	 SBF036C	**Removal:**  SBF652B
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)

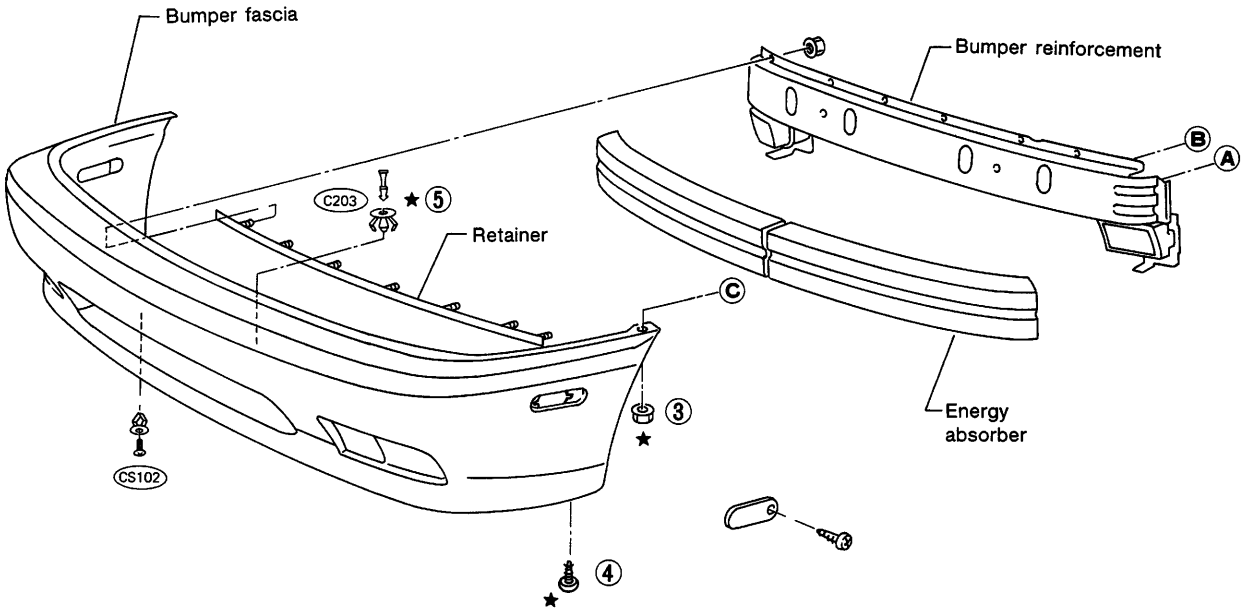
No.	Symbol	Shape	Removal & Installation
CS102	 SBF138B	 SBF139B	**Removal:** **Screw out with a Phillips screwdriver.**  SBF140B

Body Front End

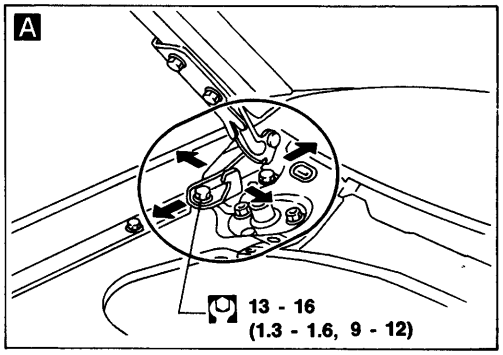
- Hood adjustment: Adjust at hinge portion.
- Hood lock adjustment: After adjusting, check hood lock control operation. Apply a coat of grease to hood locks engaging mechanism.
- Hood opener: Do not attempt to bend cable forcibly. Doing so increases effort required to unlock hood.

REMOVAL — Front bumper assembly

① Remove clearance lamps.
② Remove headlamps.
③ Remove left and right nuts securing bumper fascia to fender.
④ Remove left and right screws securing bumper fascia to fender protector.
⑤ Remove left and right clips (CS203) securing bumper fascia to radiator core lower support.
⑥ Remove left and right pins.
⑦ Remove left and right bolts securing bumper stay to side member.



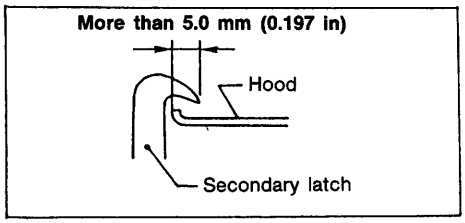
Body Front End (Cont'd)



Hood lock adjustment

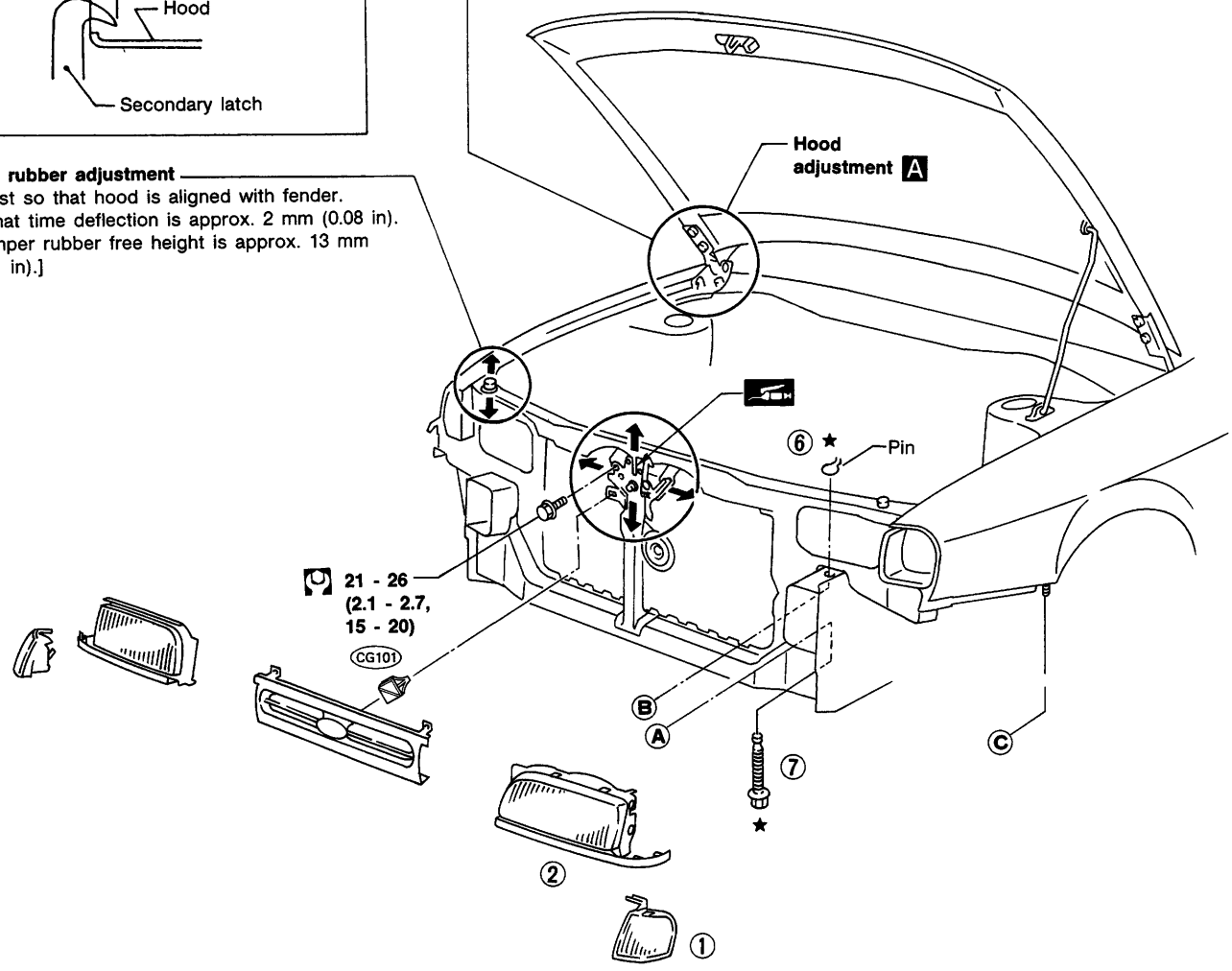
- Adjust hood so that hood primary lock meshes at a position 1 to 1.5 mm (0.039 to 0.059 in) lower than fender.
- After hood lock adjustment, adjust bumper rubber.
- When securing hood lock, ensure it does not tilt. Striker must be positioned at the center of hood primary lock.
- After adjustment, ensure that hood primary and secondary lock operate properly.

Hood lock secondary latch hooking length



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 clips, bolts & nuts
: N•m (kg-m, ft-lb)

MBF186A

Body Rear End and Opener

- Trunk door adjustment: Adjust at hinge portion for proper fit.
- Trunk door lock system adjustment: Adjust striker so that it is in the center of the lock. After adjustment, check lock operation.
- 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.

SEDAN

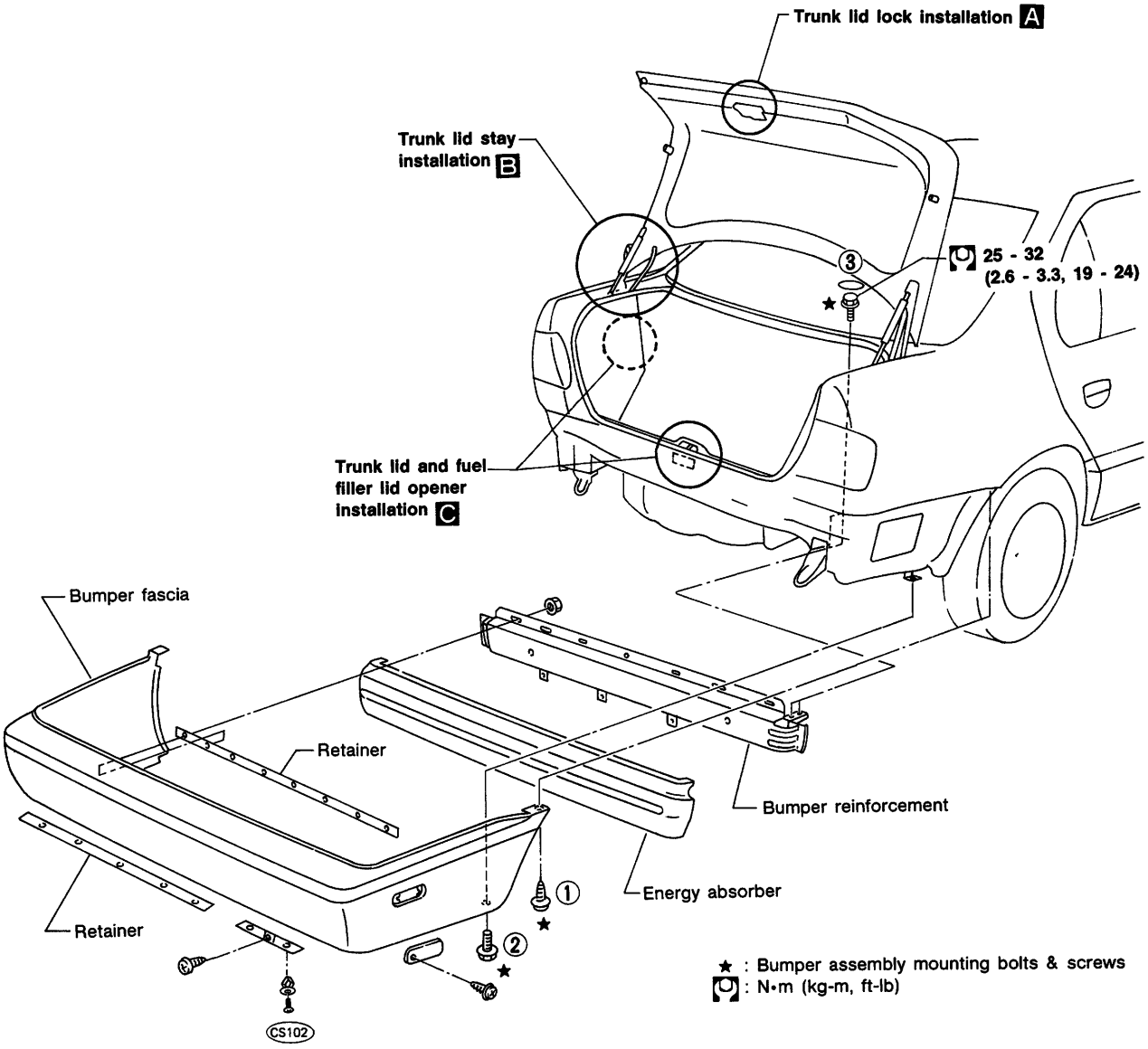
WARNING:

a. Be careful not to scratch trunk lid stay when installing back door. A scratched stay may cause gas leakage.

b. The contents of the trunk lid stay are under pressure. Do not take apart, puncture, apply heat or allow fire near it.

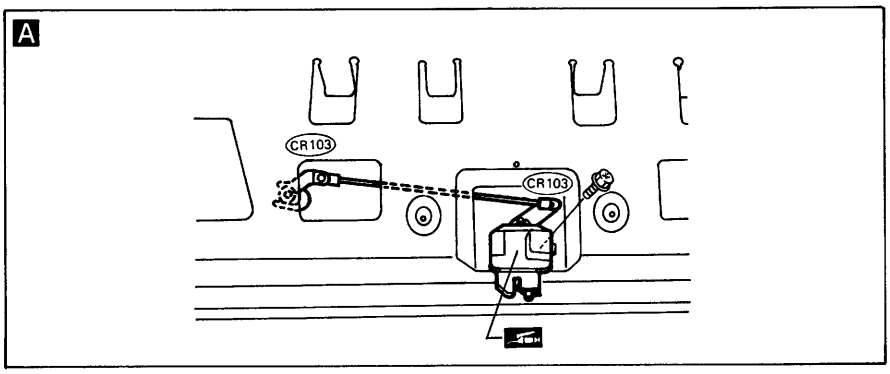
Removal — Rear bumper assembly

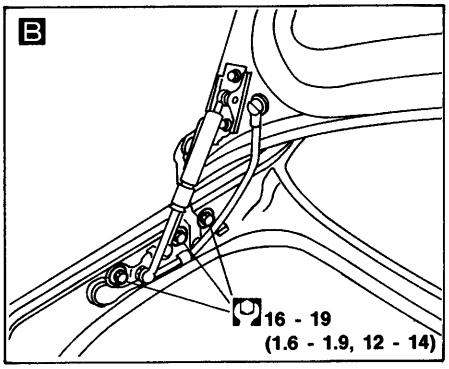
① Remove left and right screws securing bumper fascia to wheelarch.
② Remove left and right bolts securing bumper fascia to bracket.
③ Remove the four left and right bolts securing bumper stay to rear side member.

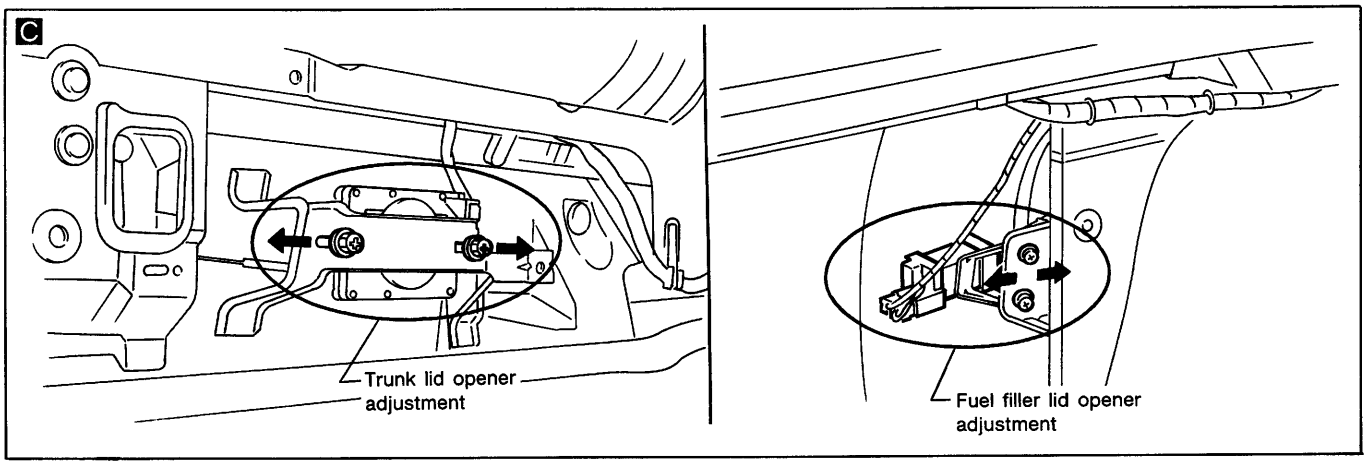


Body Rear End and Opener (Cont'd)

Installation (Refer to figures below.)



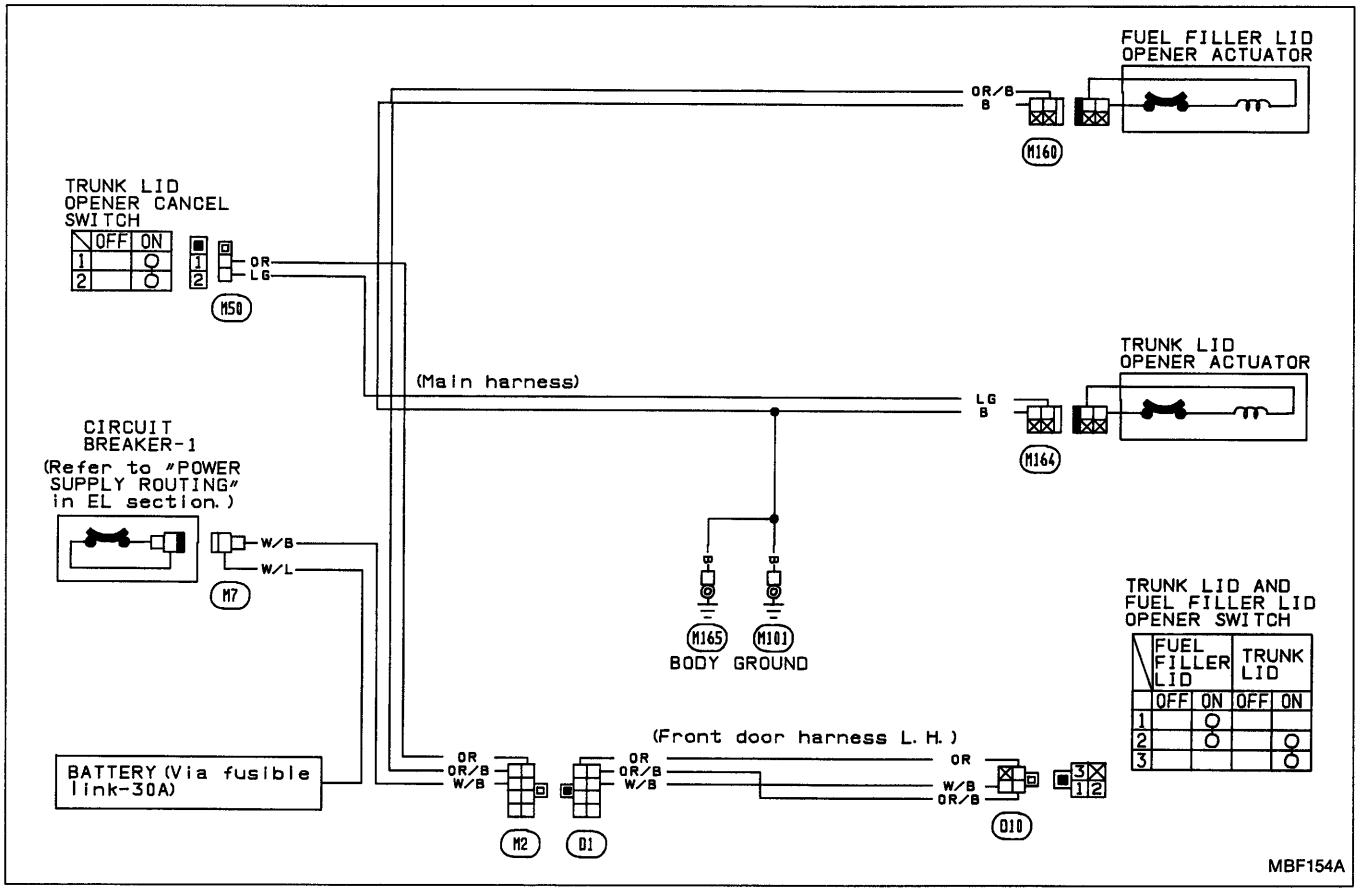




MBF187A

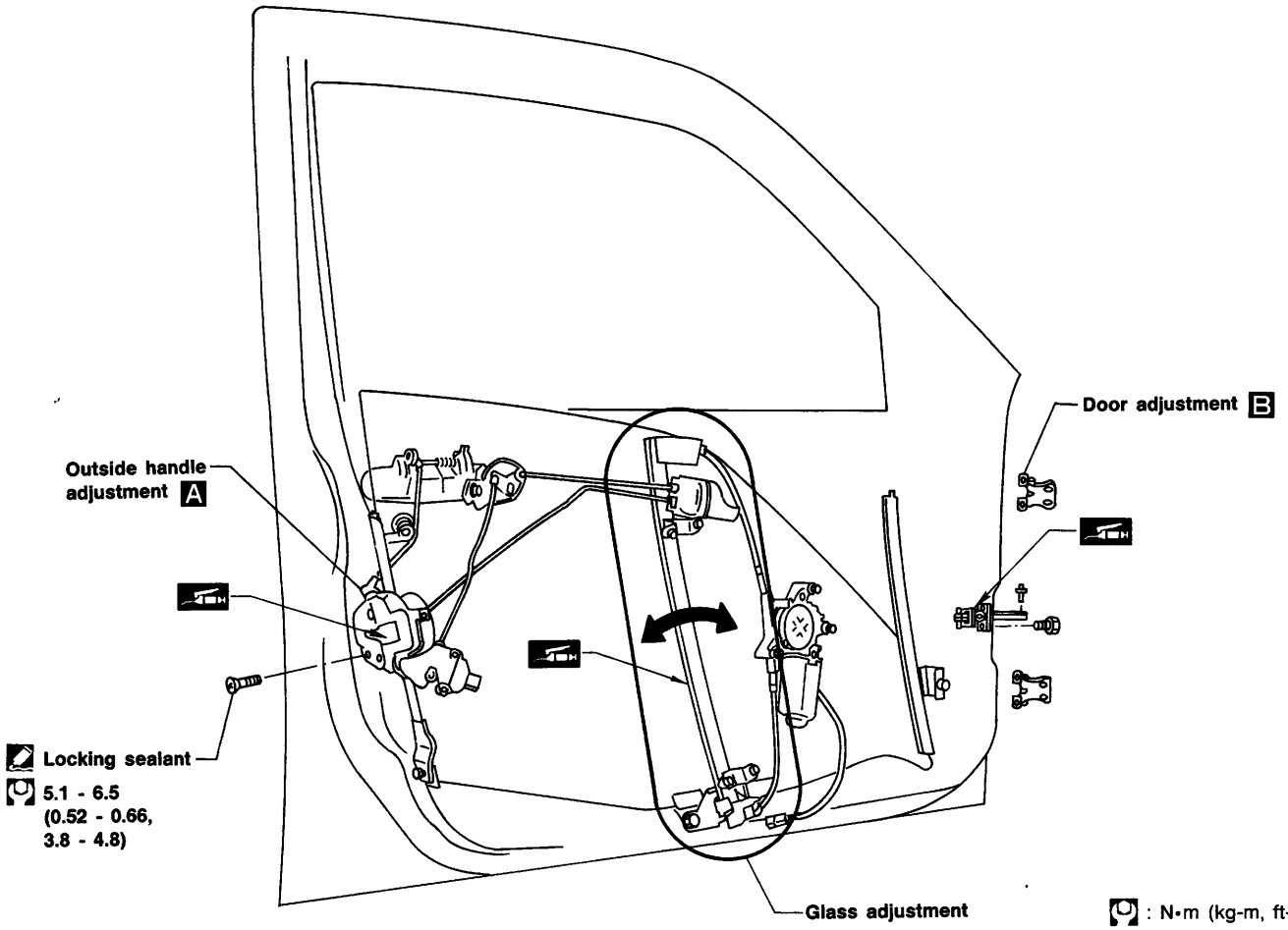
Body Rear End and Opener (Cont'd)

TRUNK LID AND FUEL FILLER LID OPENER/WIRING DIAGRAM

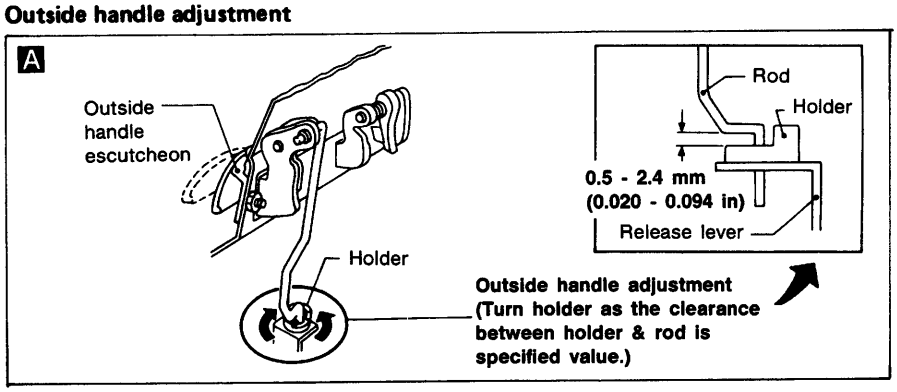


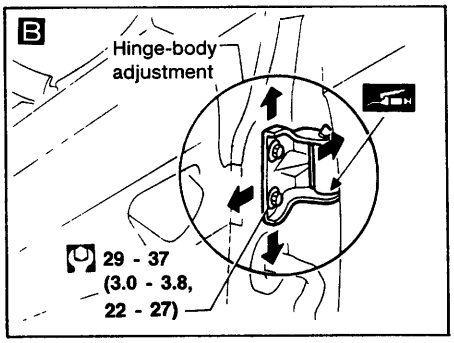
Front Door

- After adjusting door or door lock, check door lock operation.

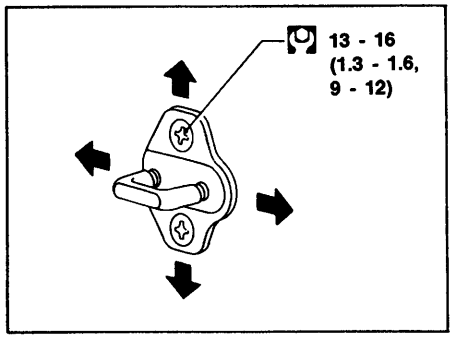


Outside handle adjustment



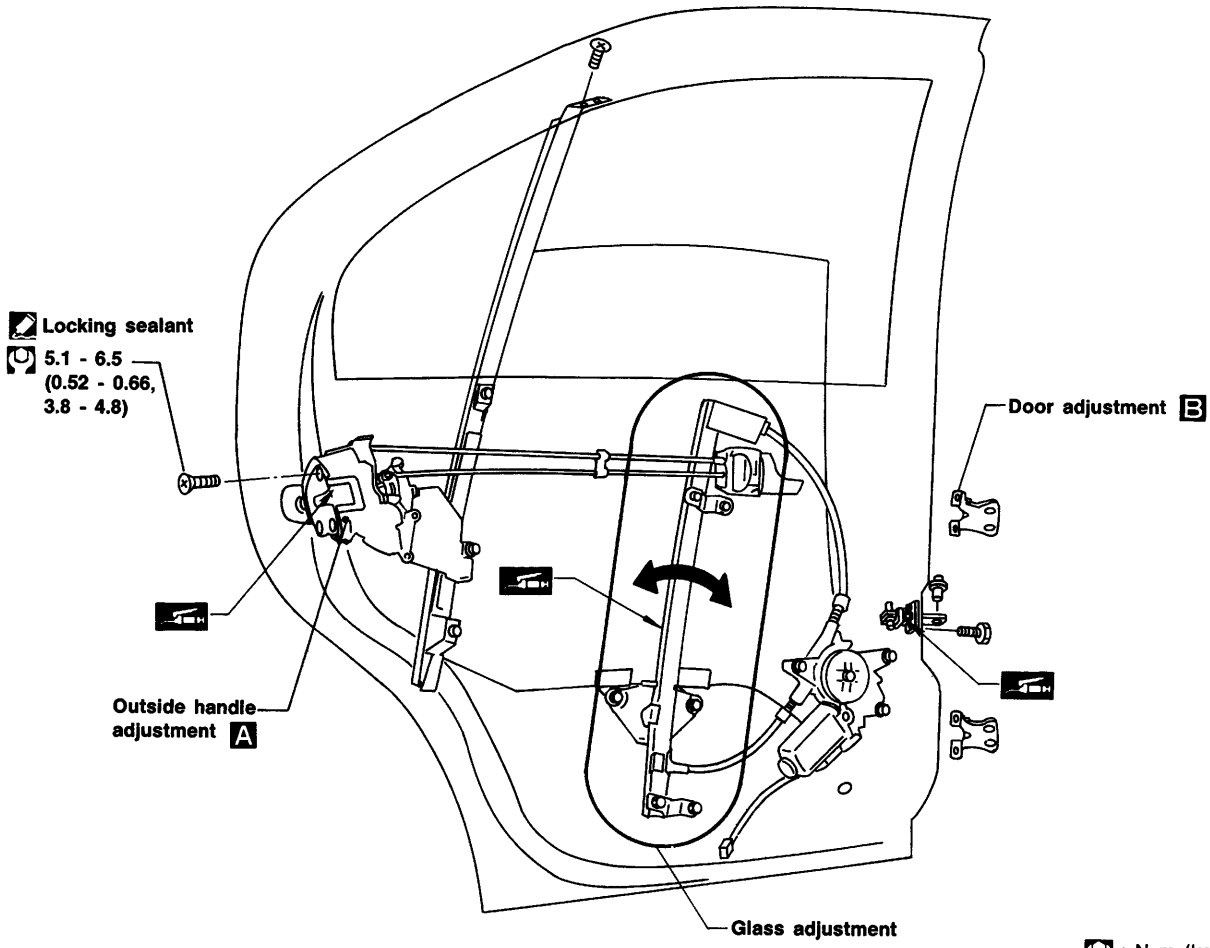


Striker adjustment



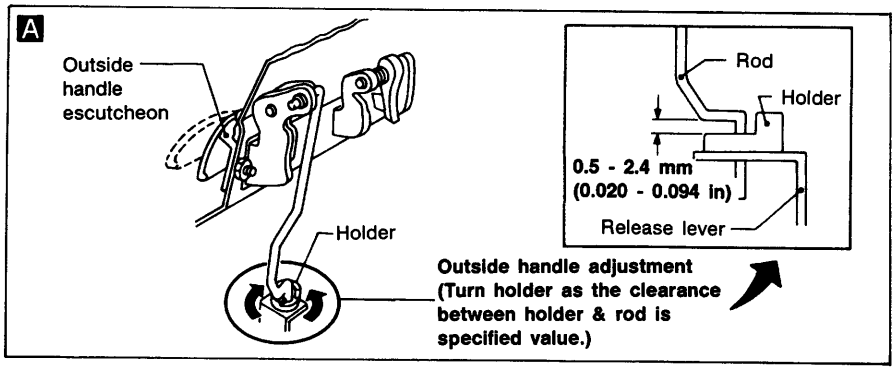
MBF188A

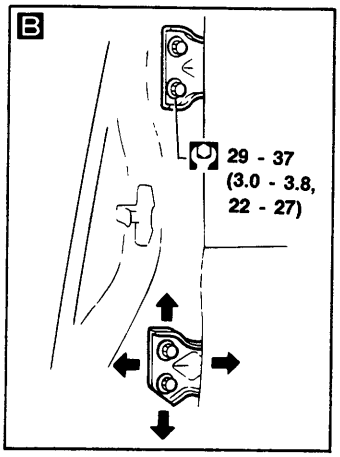
Rear Door



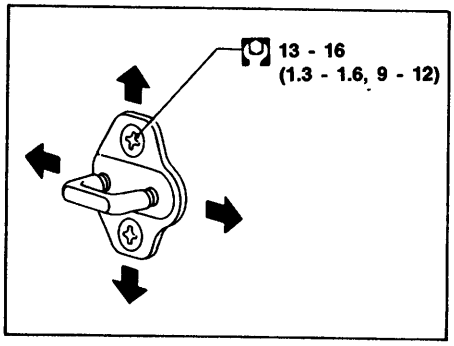
: N•m (kg-m, ft-lb)

Outside handle adjustment





Striker adjustment



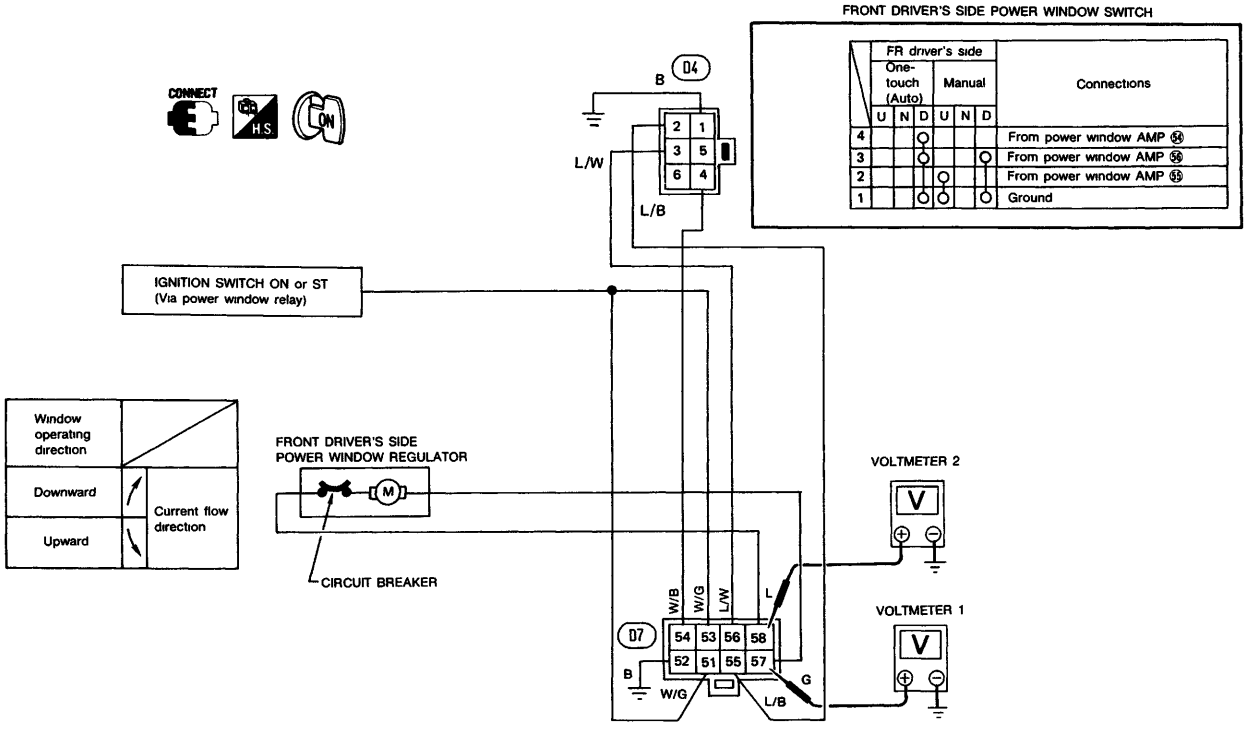
MBF189A

Power Window

POWER WINDOW AMP. INSPECTION

Carry out the inspections below.

(1) Power source and ground: Battery voltage should exist between terminals ㊶ and ㊷.
(2) Input signals: Battery voltage should exist between terminal ㊸ and ground (IGN "ON" or "ST"). Continuity should exist between terminal ㊹, ㊺ or ㊻ and ground in "ON" condition, and should not exist in "OFF" condition.
(3) Output signals: Battery voltage shown in the chart should exist.



AMP OPERATION

		Connections	Operations					
			Manual operation			One-touch (Auto) operation		
			N	UP	Down	N	Down →	N
51		Power source (IGN)	12V	12V	12V	12V	12V	12V
52		Ground	Ground	Ground	Ground	Ground	Ground	Ground
53	Input signal	From ignition SW (ON or ST)	12V	12V	12V	12V	12V	12V
54	Input signal	To FR driver s side power window SW (AUTO) ④	OFF	OFF	OFF	OFF	ON	OFF
55	Input signal	To FR driver's side power window SW (UP) ②	OFF	ON	OFF	OFF	OFF	OFF
56	Input signal	To FR driver's side power window SW (DOWN) ③	OFF	OFF	ON	OFF	ON	OFF
57	Output signal	FR driver's side regulator (Upward power source) VOLTMETER 1	Approx 0V	Approx over 9V	Approx 0V	Approx 0V	Approx 0V	Approx 0V
58	Output signal	FR driver's side regulator (Downward power source) VOLTMETER 2	Approx 0V	Approx 0V	Approx over 9V	Approx 0V	Approx over 9V	Approx over 9V

Regulator Operating Condition	Stop	Upward operation	Downward operation	Stop	Starting	Keeping operation until fully open, then stops automatically
					Downward operation	

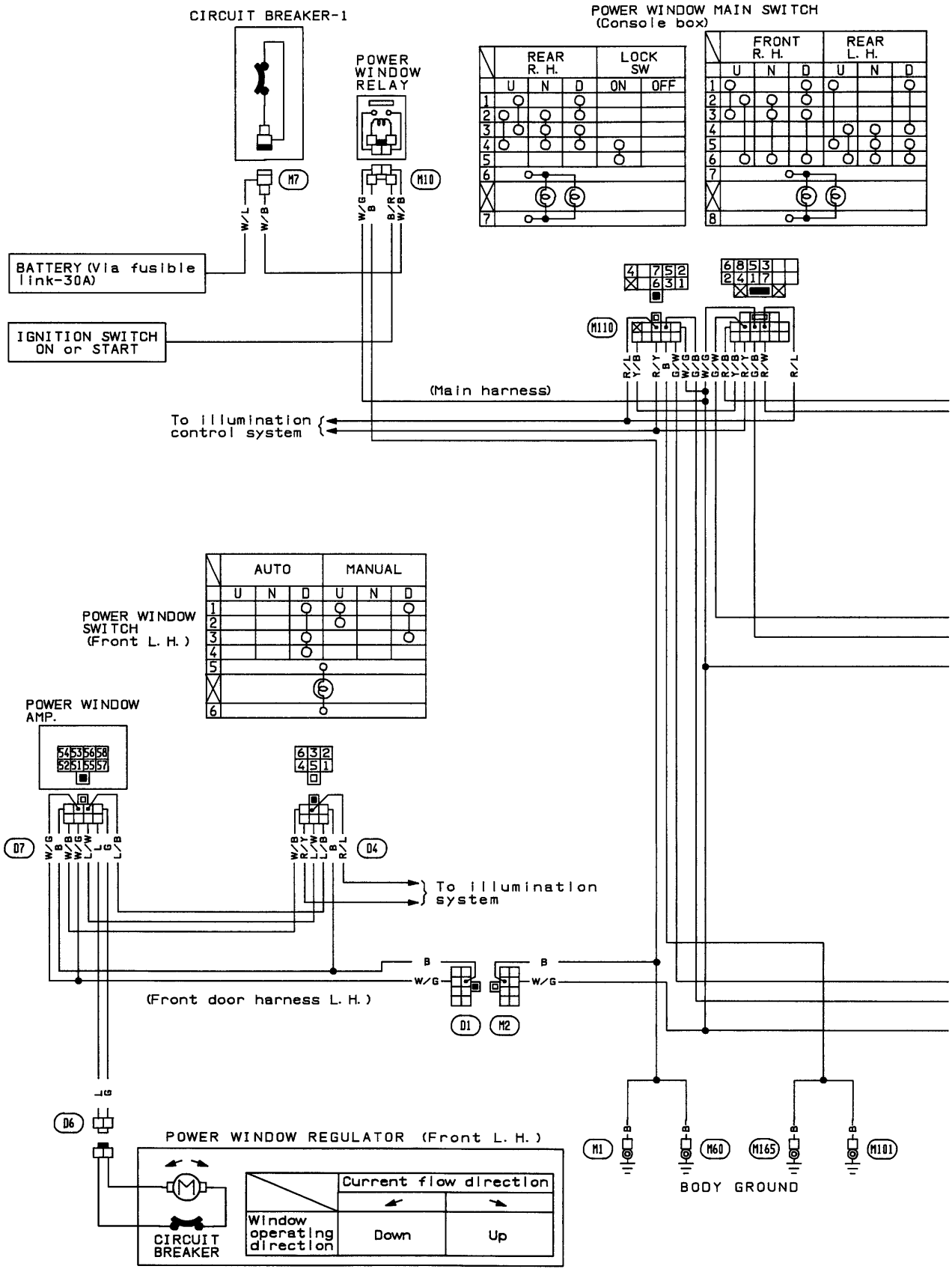
Carry out the operation check in this chart from left to right continuously

POWER WINDOW AMP — Driver's side door

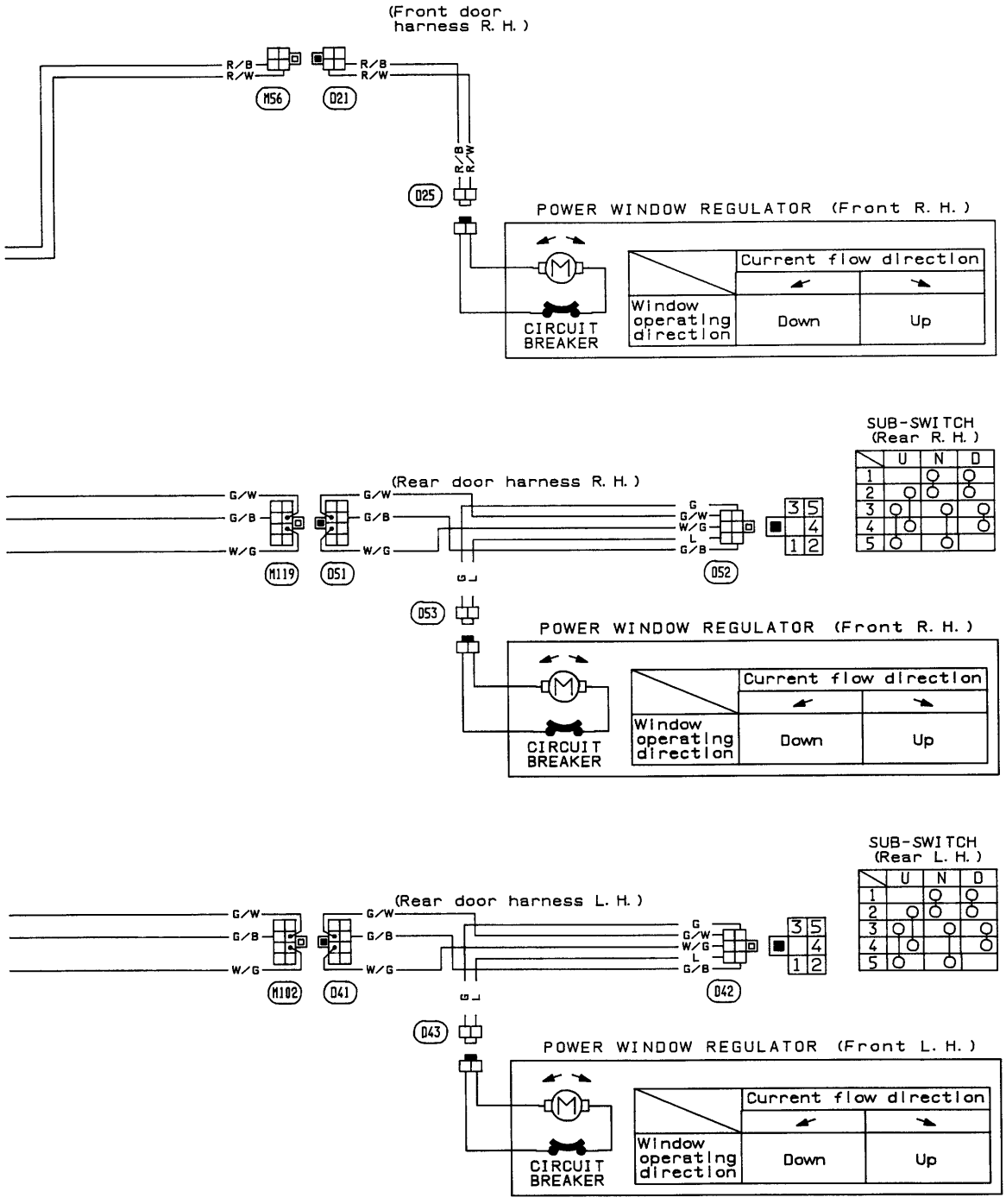
SBF942F

Power Window (Cont'd)

WIRING DIAGRAM



Power Window (Cont'd)



MBF155A

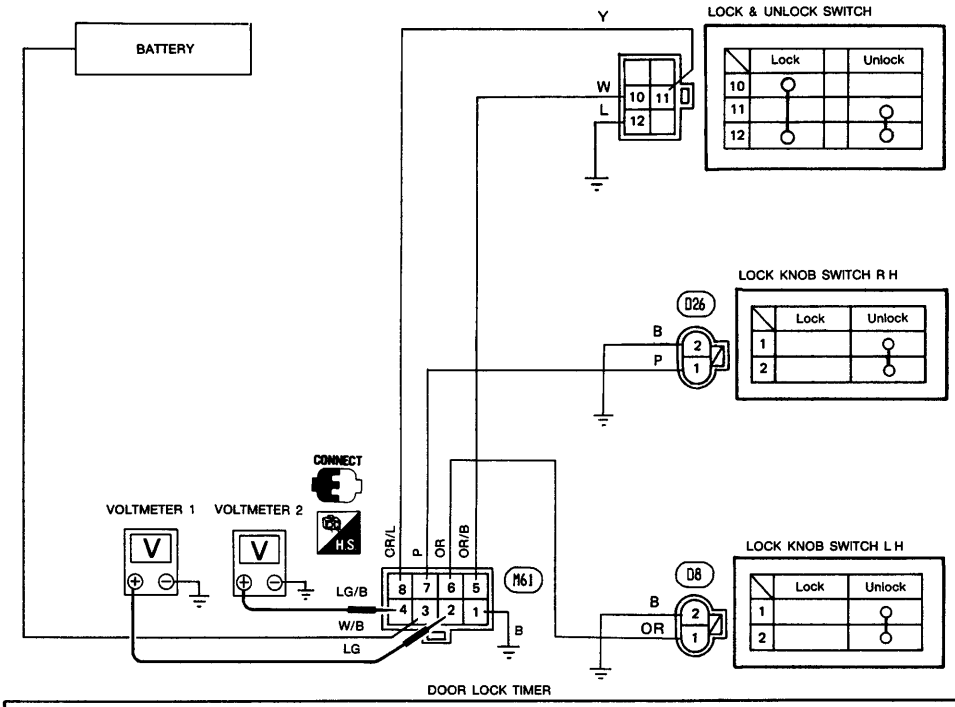
Power Door Lock

DOOR LOCK TIMER INSPECTION

Door lock timer 1

- Carry out the inspections below.

(1) Power source and ground: Battery voltage should exist between terminals ③ and ①.
(2) Input signals: Continuity should exist between terminals ⑤, ⑥, ⑦, ⑧ and ground in "ON" condition, and should not exist in "OFF" condition.
(3) Output signals: Voltage shown in the chart should exist.



		Connections	Operations							
			Lock & unlock switch			Lock knob switch L H			Lock knob switch R H	
			N	Unlock	Lock	Lock → Unlock → Lock			Lock → Unlock	
3		Power source	12V	12V	12V	12V	12V	12V	12V	12V
1		Ground	Ground	Ground	Ground	Ground	Ground	Ground	Ground	Ground
5	Input signal	Lock & unlock switch ⑪ (Input signal for lock)	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
6	Input signal	Lock knob switch ① L H	—	—	—	OFF	ON	OFF	—	—
7	Input signal	Lock knob switch ① R H	—	—	—	—	—	—	OFF	ON
8	Input signal	Lock & unlock switch ⑫ (Input signal for unlock)	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
2	Output signal	Door lock actuator (Lock power source) VOLTMETER 1	0V	0V	12V (Approx 10 sec) → 0V	0V	0V	12V (Approx 10 sec) → 0V	0V	0V
4	Output signal	Door lock actuator (Unlock power source) VOLTMETER 2	0V	12V (Approx 10 sec) → 0V	0V	0V	12V (Approx 10 sec) → 0V	0V	0V	12V (Approx 10 sec) → 0V

● Carry out the complete inspection in the chart from left to right

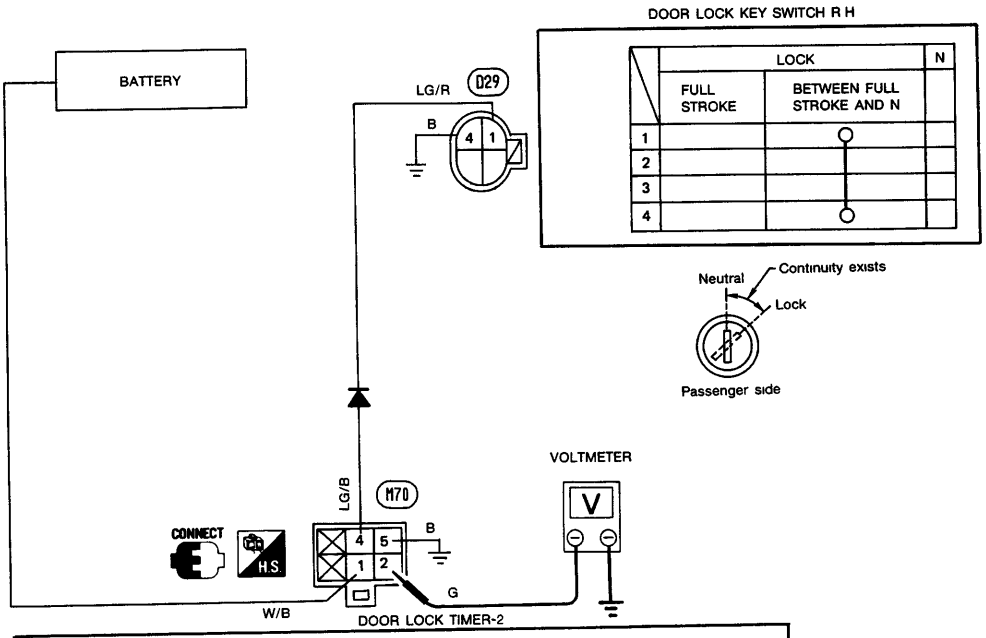
SBF943F

Power Door Lock (Cont'd)

Door lock timer 2

- Carry out the inspections below.

(1) Power source and ground: Battery voltage should exist between terminals ① and ⑤.
(2) Input signals: Continuity should exist between terminal ④ and ground in "ON" condition, and should not exist in "OFF" condition.
(3) Output signals: Battery voltage shown in the chart should exist between terminal ② and ground.



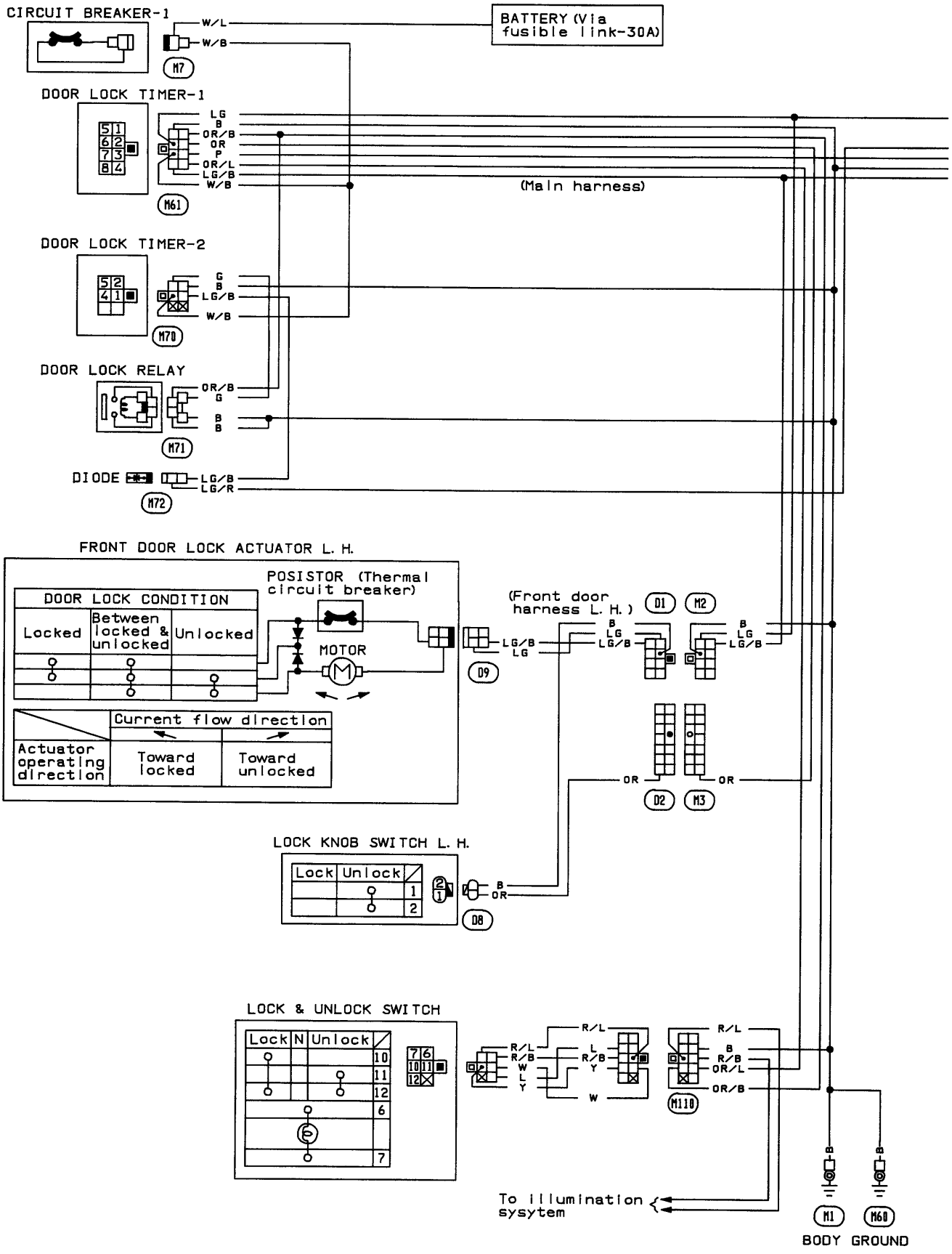
	Connections		Operations		
			Door lock key switch R H		
			Neutral	Between neutral and lock	Lock
1	Power source		12V	12V	12V
5	Ground		Ground	Ground	Ground
4	Input signal	Door lock Key switch R H ①	OFF	ON	OFF
2	Output signal	Door lock relay VOLTMETER	0V	12V (Approx 10 sec) → 0V	0V

- Carry out the complete inspection in the chart from left to right

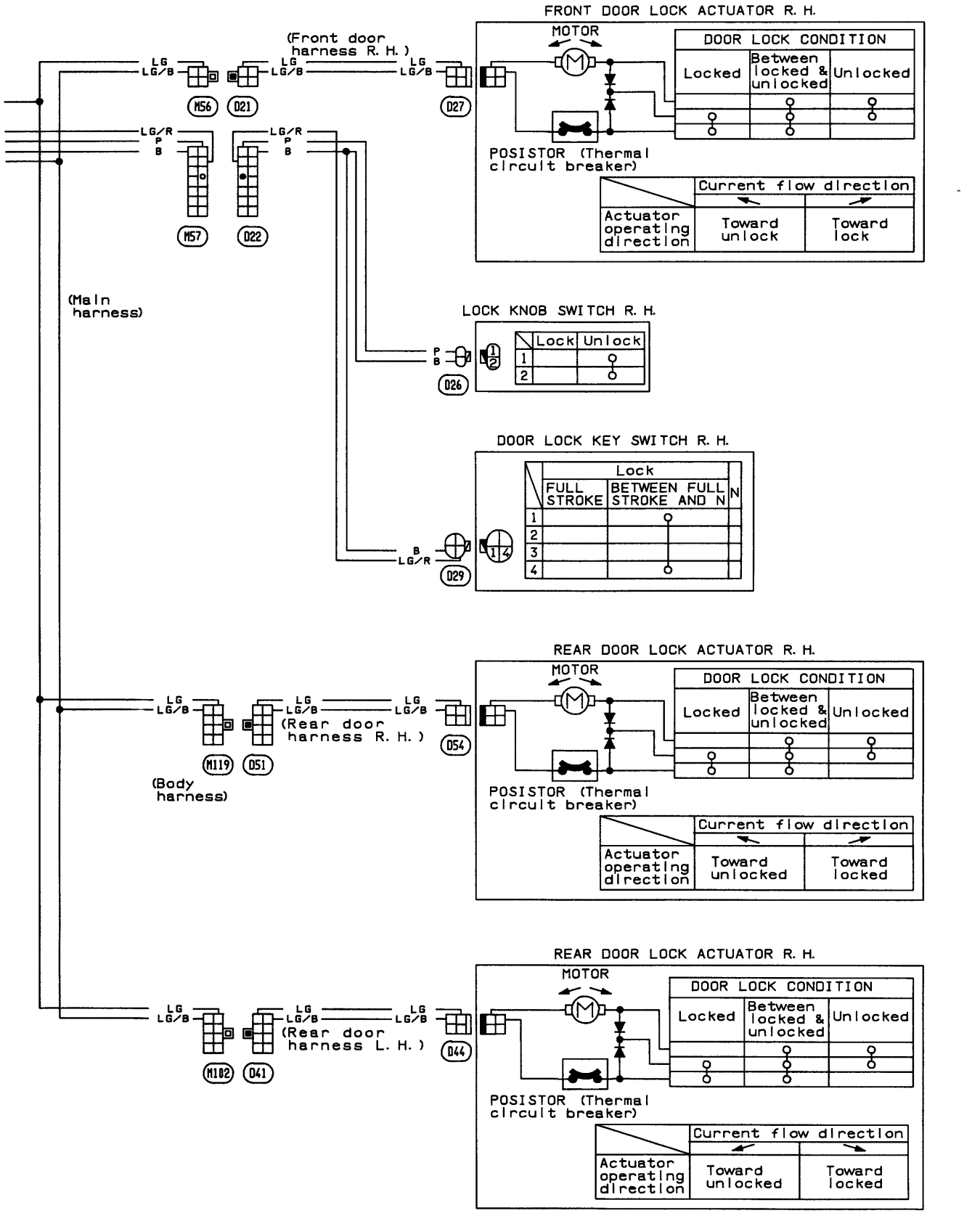
SBF944F

Power Door Lock (Cont'd)

WIRING DIAGRAM



Power Door Lock (Cont'd)



MBF156A

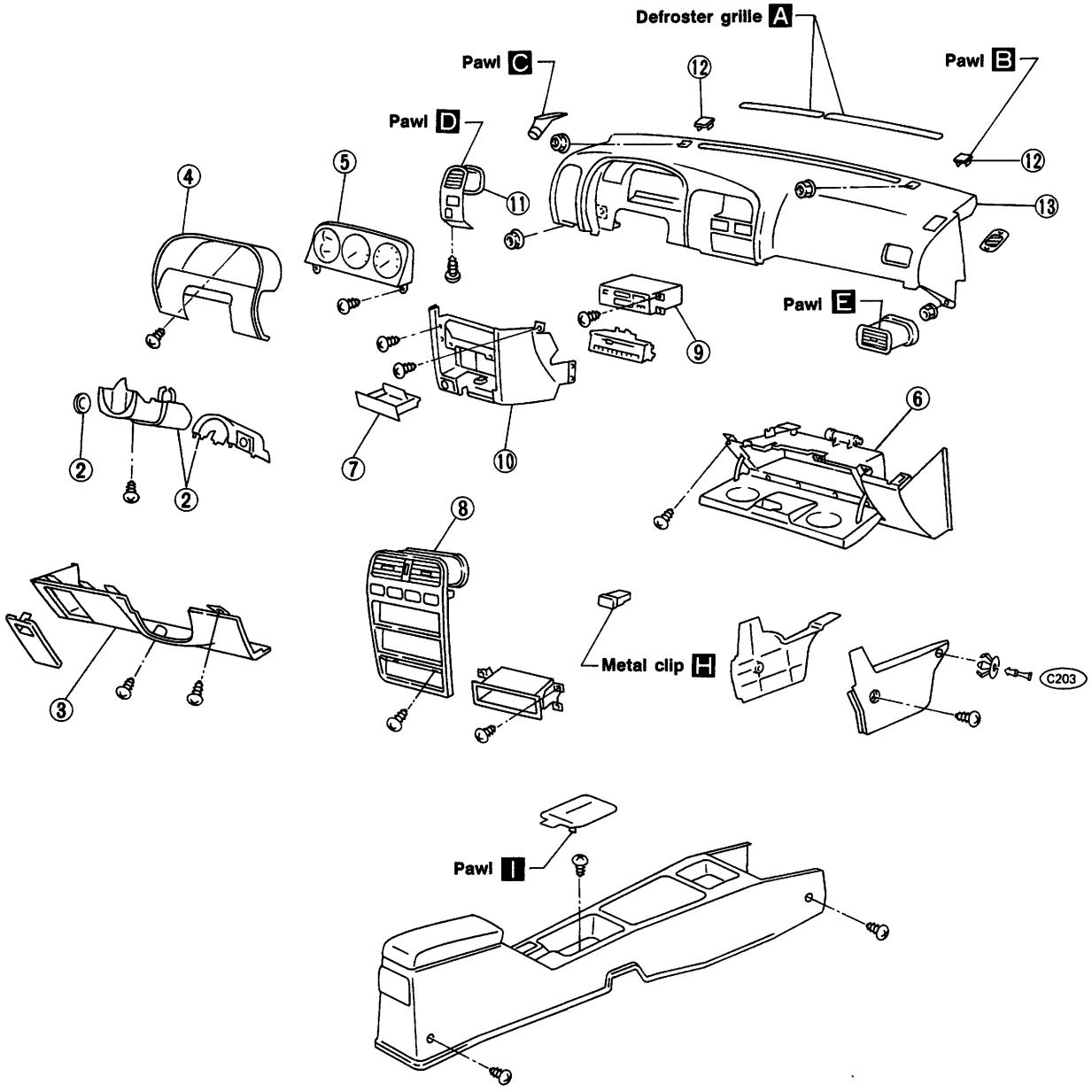
REMOVAL — Instrument panel assembly

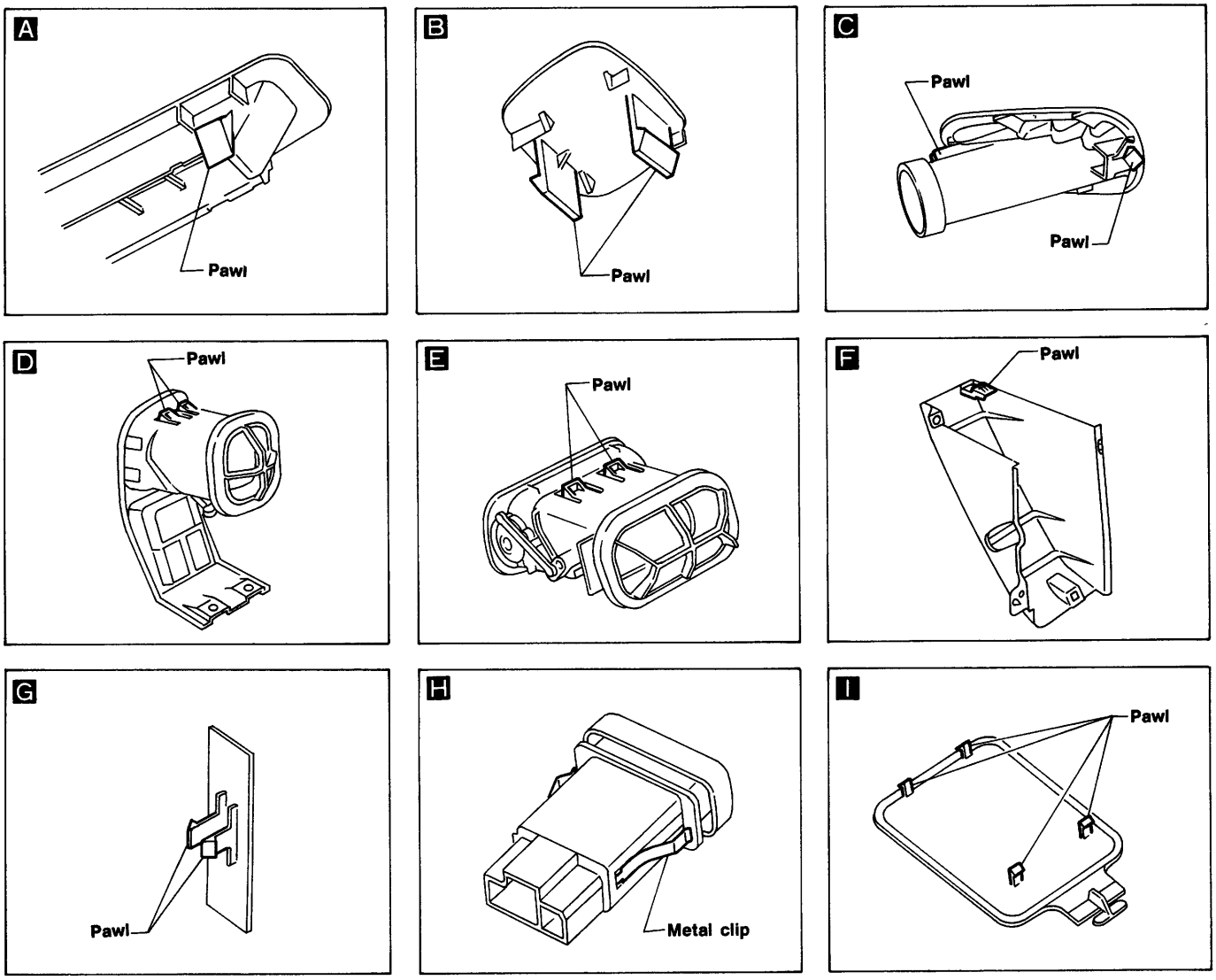
① Remove steering wheel. Refer to ST section "STEERING WHEEL AND STEERING COLUMN".
② Remove lower and upper column covers and key escutcheon.
③ Remove driver's side lower instrument panel.
④ Remove cluster A.
⑤ Remove meters.
Remove meter harness connector.
⑥ Remove glove box.
Remove clip if a damper is attached.
Remove glove box lamp harness connector.
⑦ Remove lower instrument panel.
⑧ Remove reinforced panel.
⑨ Remove ashtray inner case.
⑩ Remove cluster C.
Remove switch harness.
⑪ Remove audio system parts.
Remove setting screw on audio bracket to instrument stay.
Remove audio harness.
Remove antenna feeder.
Remove pocket deck.
⑫ Remove center lower instrument panel.
Remove heater control unit.
Remove cigarette lighter harness.
⑬ Remove ventilator on the driver's side.
Remove switch harness.
⑭ Remove mask instrument R.H./L.H.
⑮ Remove instrument panel.

INSTALLATION

Reverse the procedures described above.

Pay attention so as not to scratch the parts (plastic). During installation, fit the ducting parts precisely.


Defroster grille A
Pawl C
Pawl D
Pawl B
Pawl E
Pawl I
Metal clip H
C203


A
Pawl
B
Pawl
C
Pawl
Pawl
D
Pawl
E
Pawl
F
Pawl
G
Pawl
H
Metal clip
I
Pawl

MBF190A

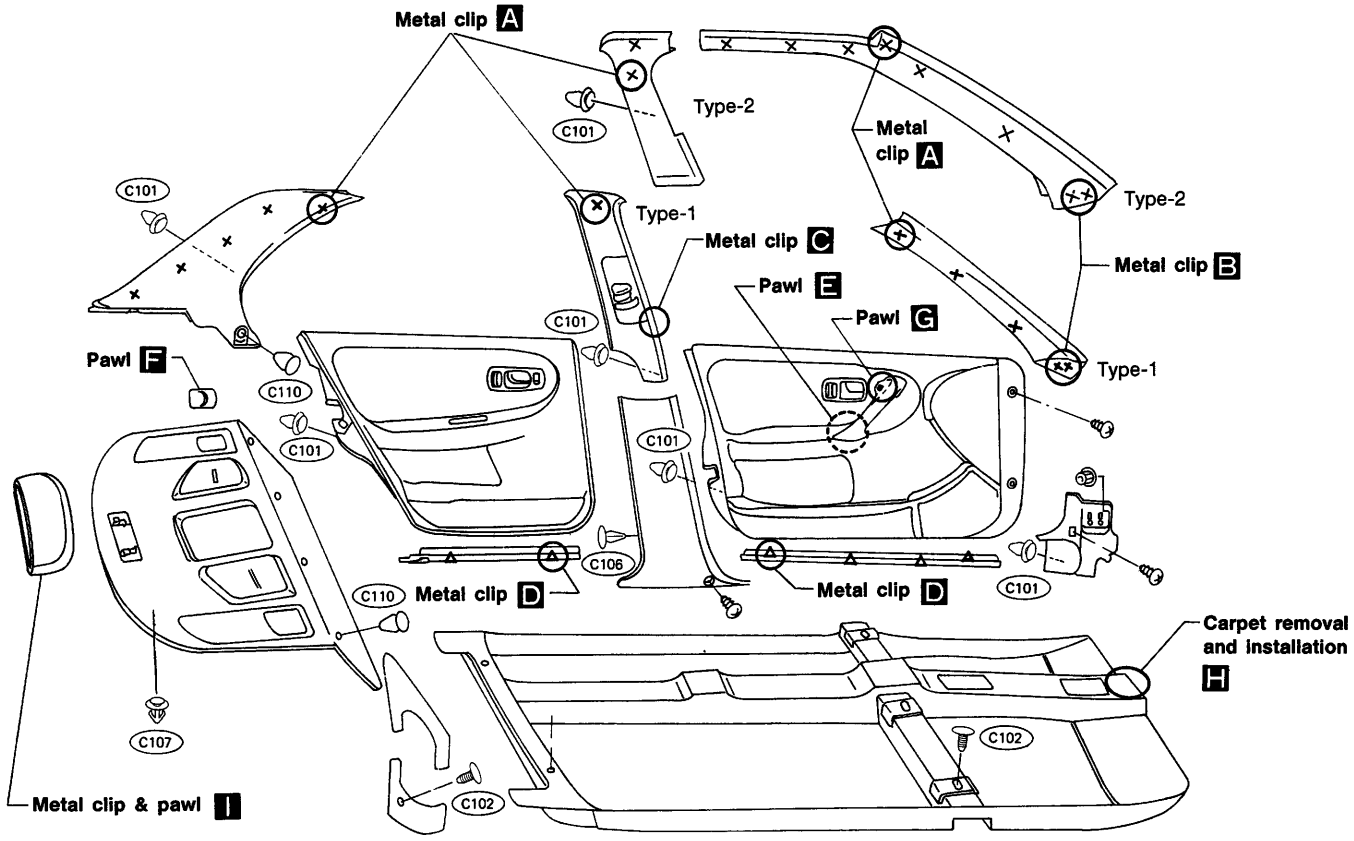
Interior

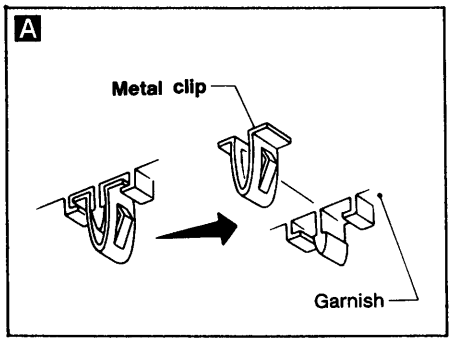
SIDE AND FLOOR TRIM — Passenger room

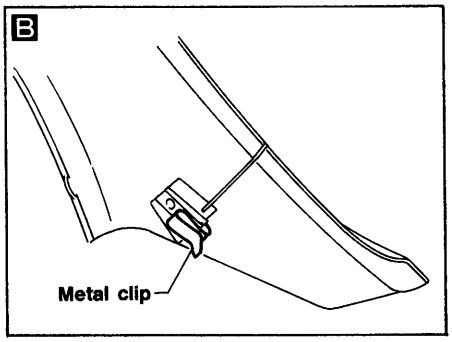
CAUTION:

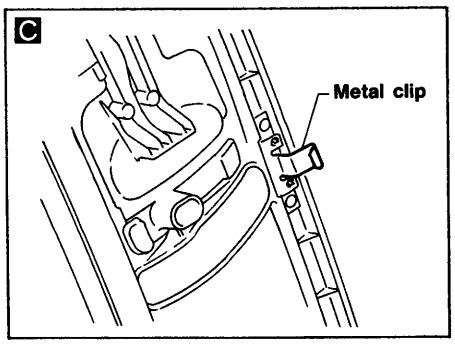
a. **Be sure to remove front, center and rear pillar garnishes by pulling them straight out. Use a long flat-bladed screwdriver when removing metal clips from rear pillar garnish Ⓐ.**

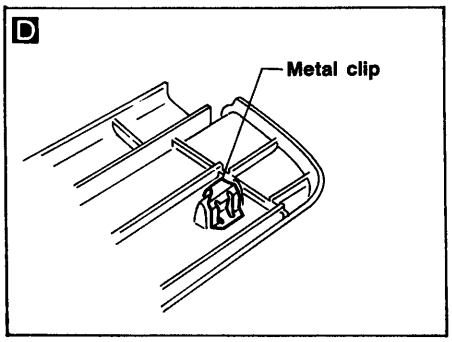
b. **Wrap the tip of flat-bladed screwdriver with a cloth when removing metal clips from garnishes.**

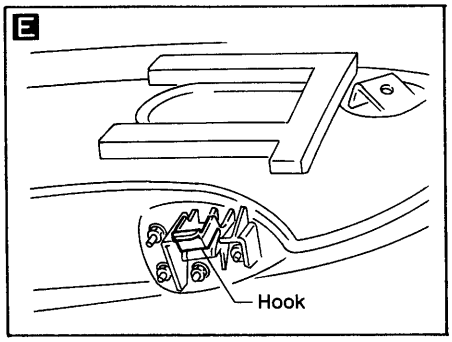


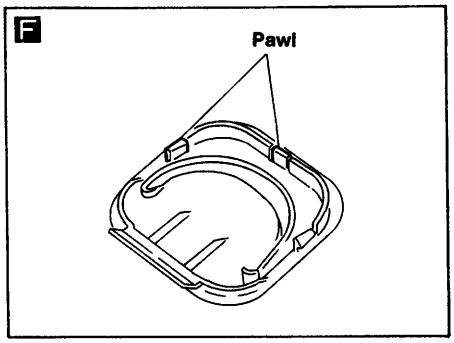




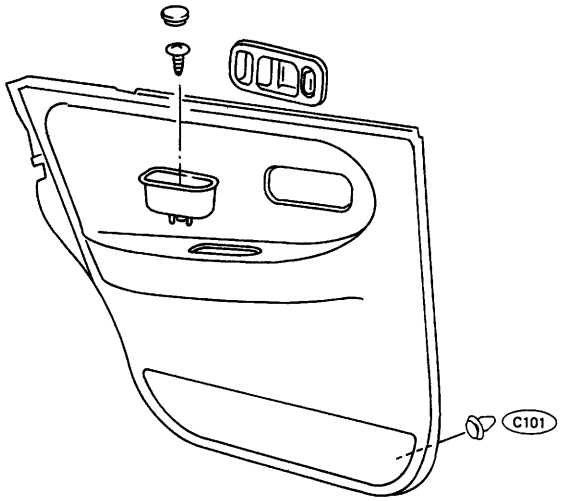


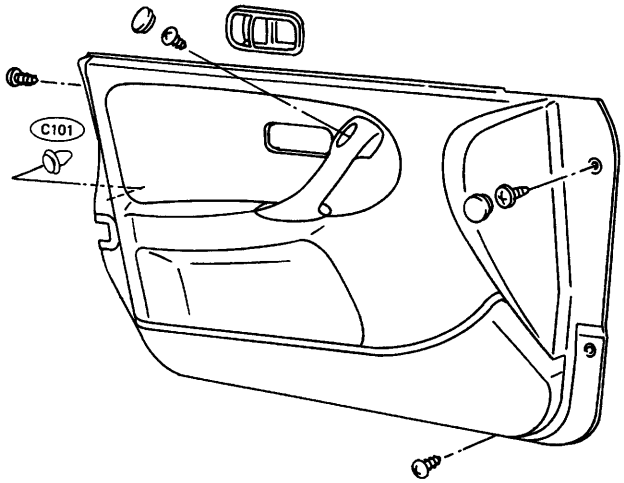




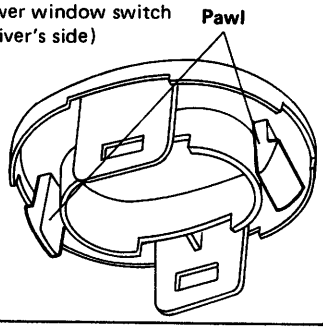


Interior (Cont'd)

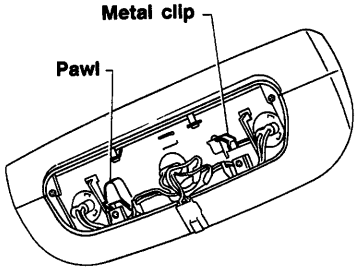




G Power window switch (Driver's side)

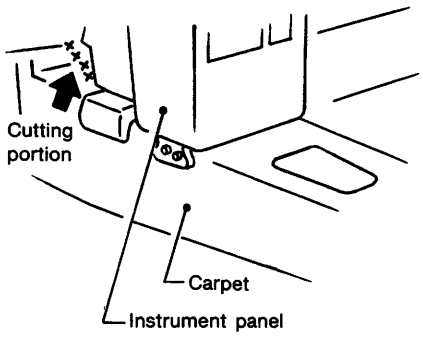


I



H

When removing or installing carpet, instrument panel has to be removed or carpet has to be cut at the portion shown by arrow, as carpet is a one-piece design.



MBF191A

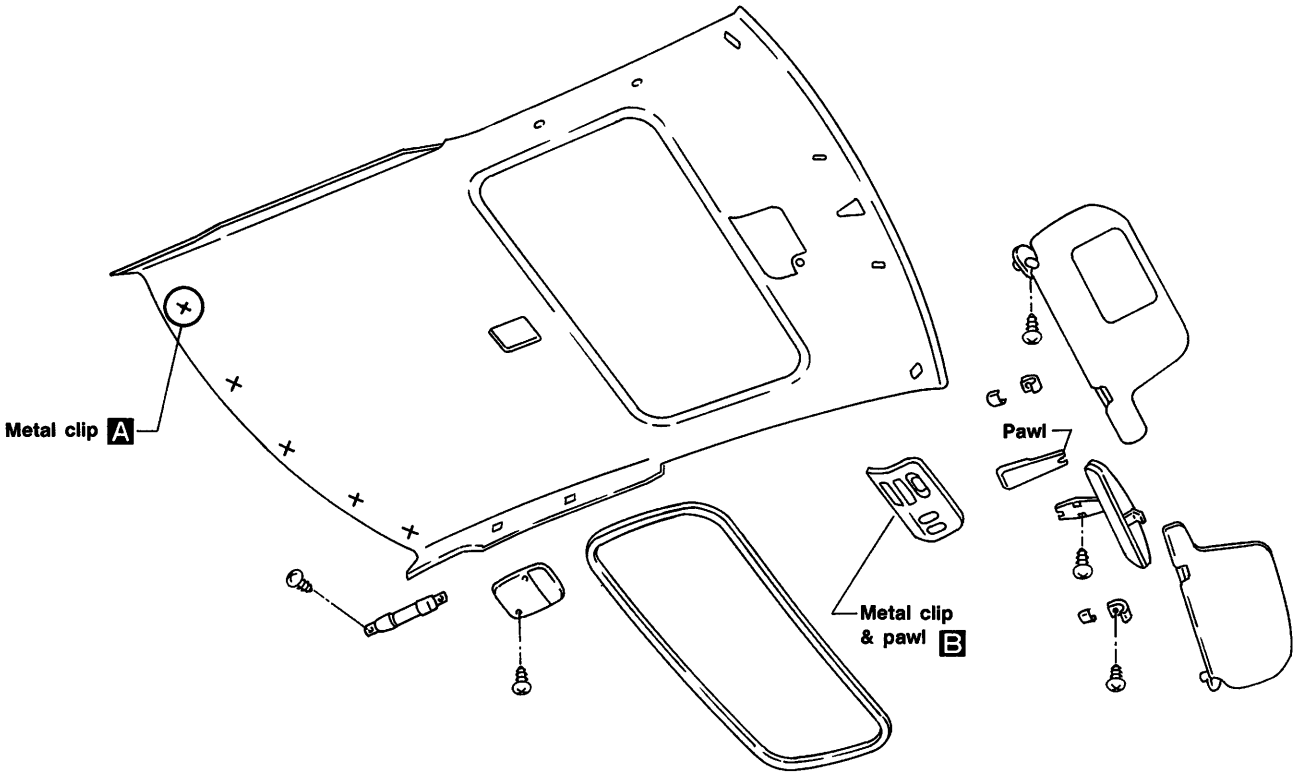
Interior (Cont'd)

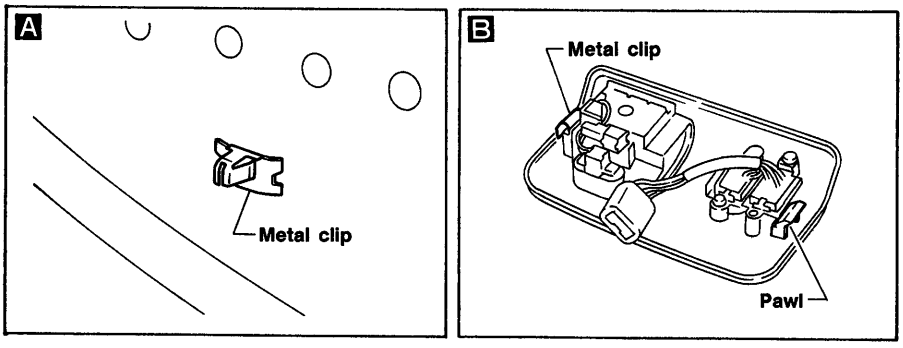
ROOF TRIM

Removal — headlining cloth

- Fully recline both front seats for easy access. Remove headlining through front passenger door.

1. Remove sunvisor, assist straps, room lamps and inside mirror.
2. Remove body side welts.
3. Remove front pillar garnishes, center pillar garnishes, rear quarter garnishes and roof finishers.
4. Remove clips and headlining cloth.

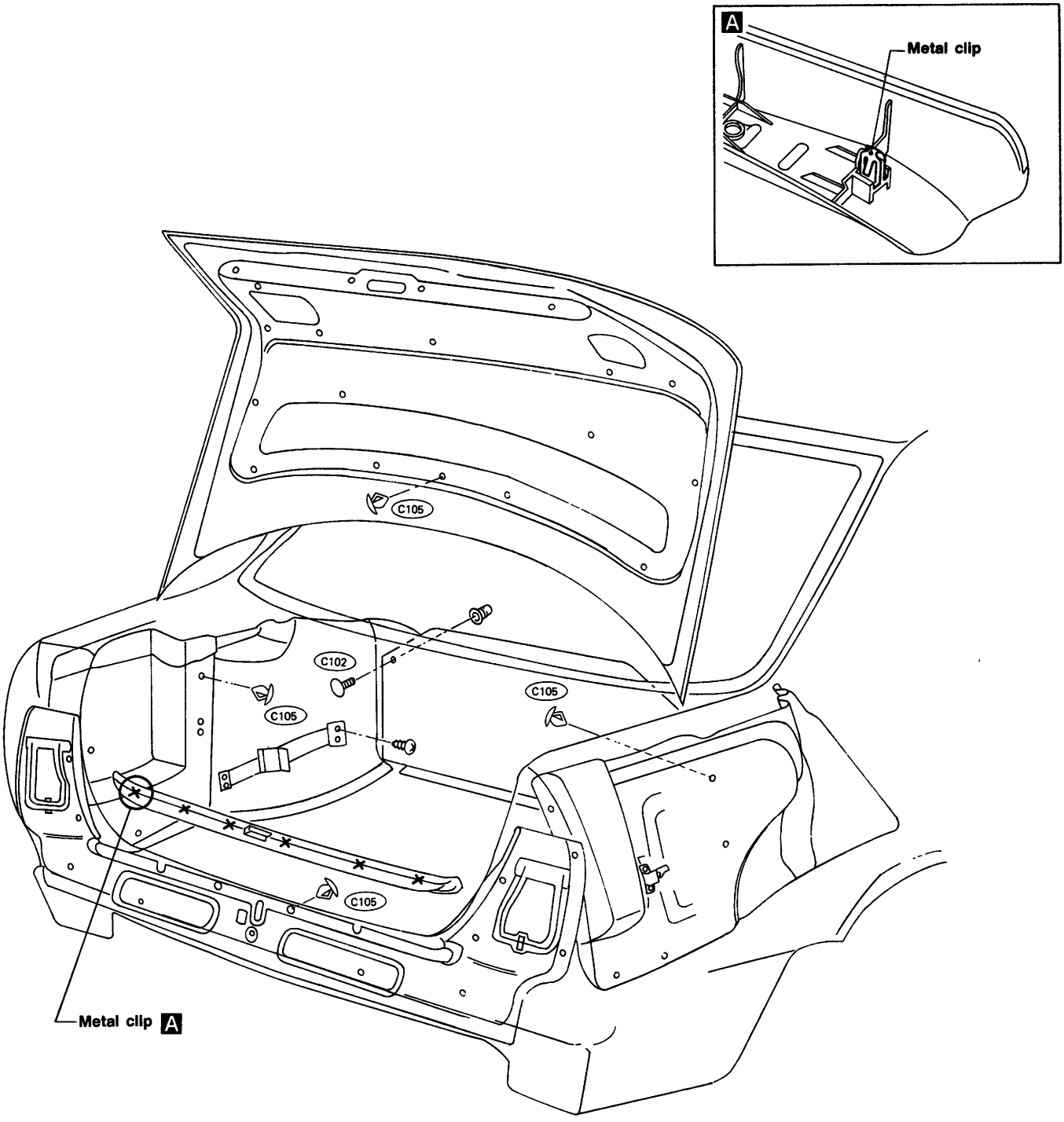




MBF192A

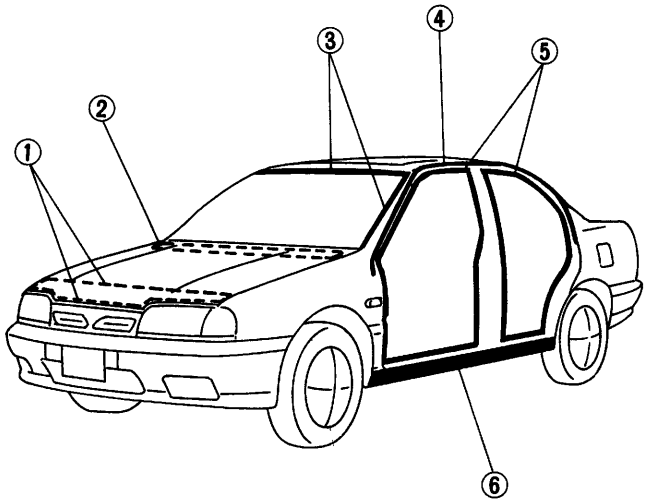
Interior (Cont'd)

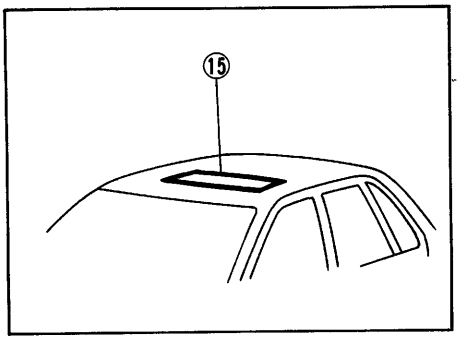
LUGGAGE COMPARTMENT TRIM

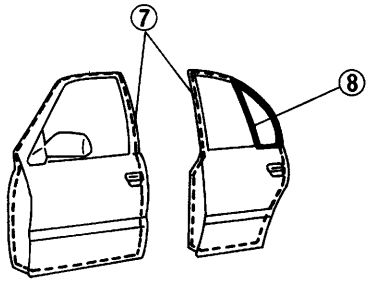


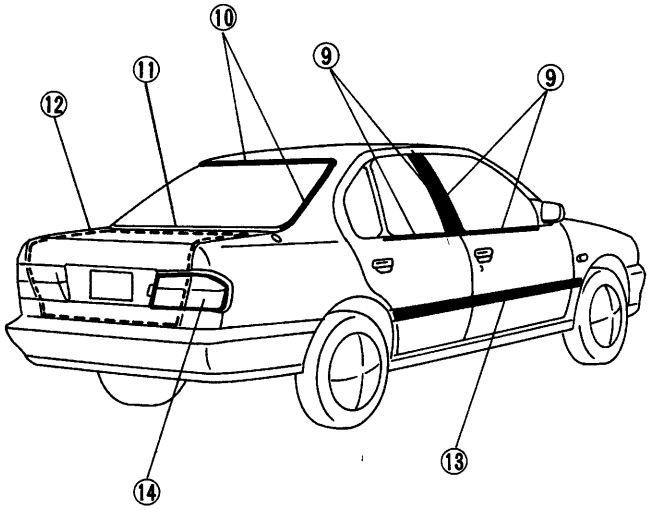
MBF193A

Exterior





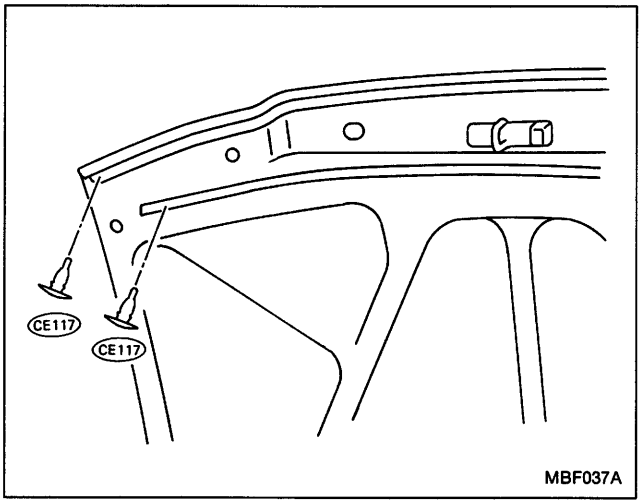




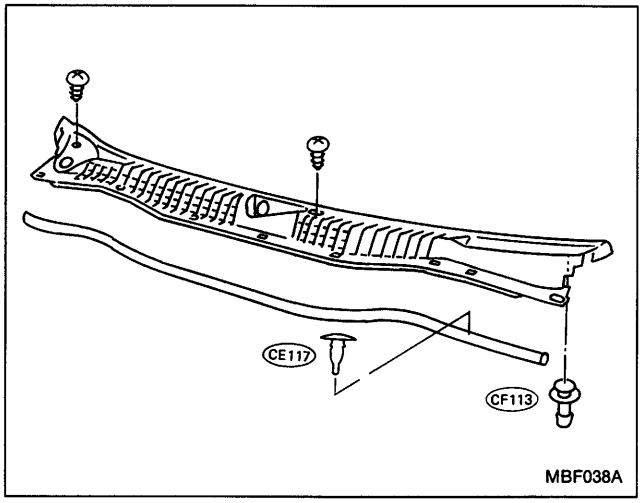
MBF194A

Exterior (Cont'd)

① Hood front seal



② Cowl top seal and cowl top grille

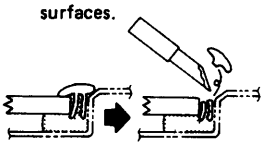


③ Windshield upper molding and side molding

- **Upper molding**

Method 1

Cut off top portion of molding and clean glass and panel surfaces.



Apply sealant to top portion of molding.



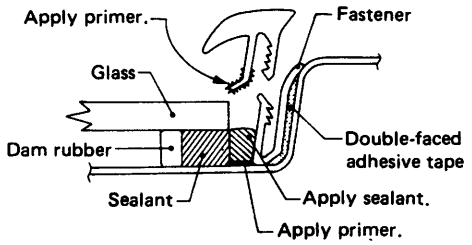
Cut off lower portion of new molding.



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.



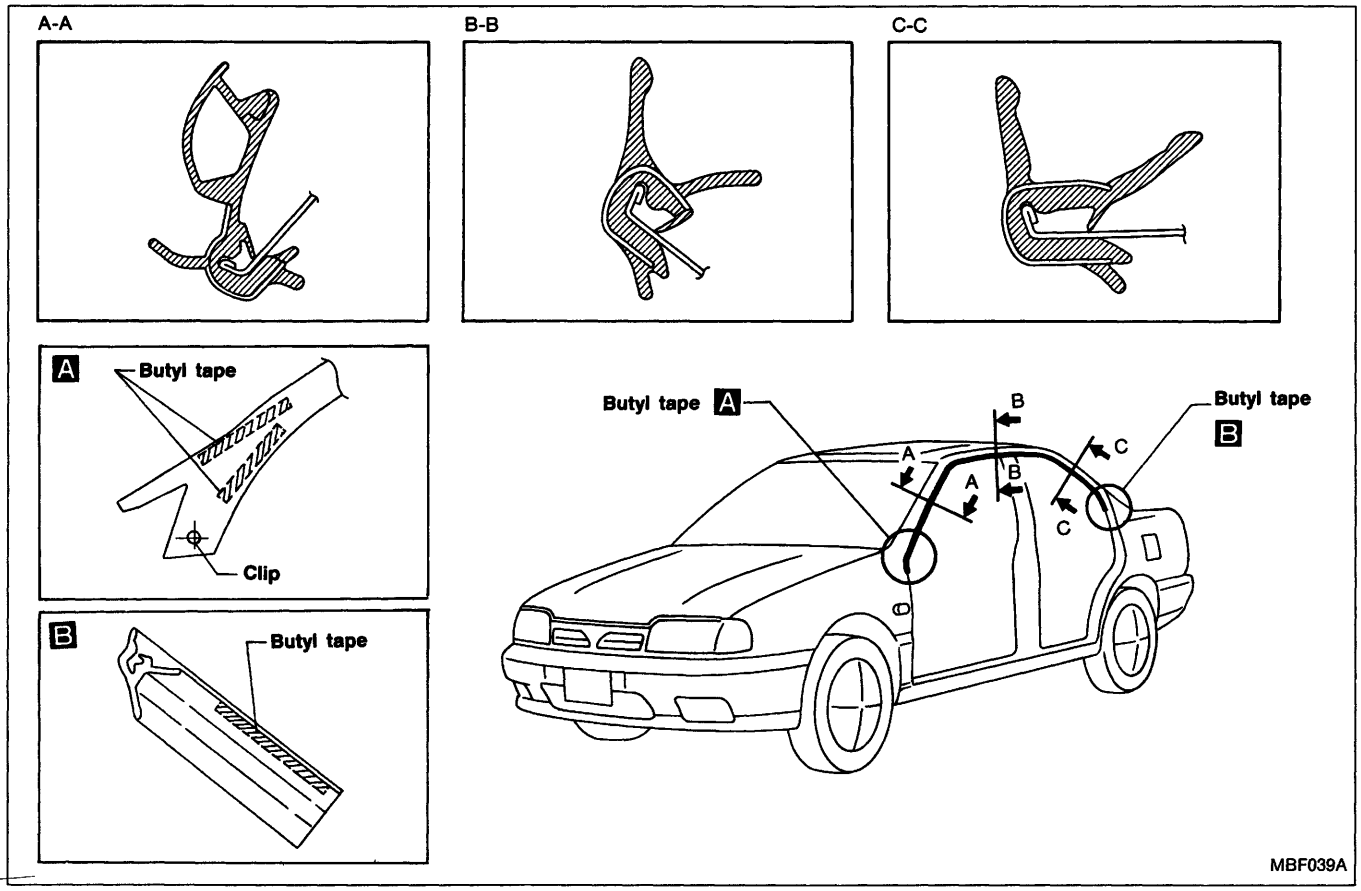
4. Install molding by aligning the molding mark located on center with vehicle center.
   Be sure to install tightly so that there is no gap around the corner.

SBF161E

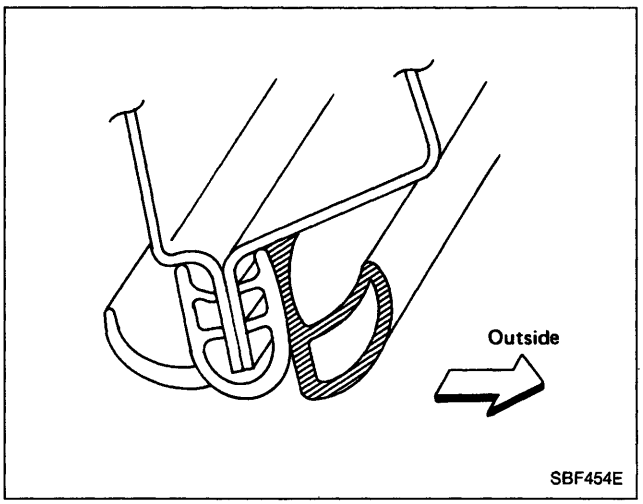
- **Side molding**
  Mounted with screws

Exterior (Cont'd)

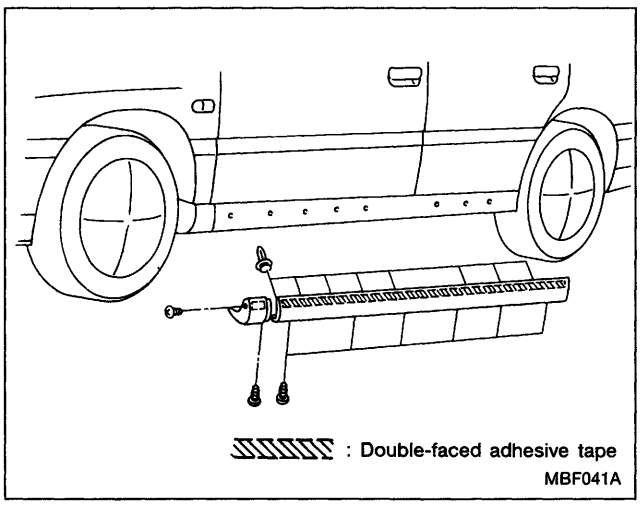
④ Drip molding and opera window lower molding



⑤ Body side welt

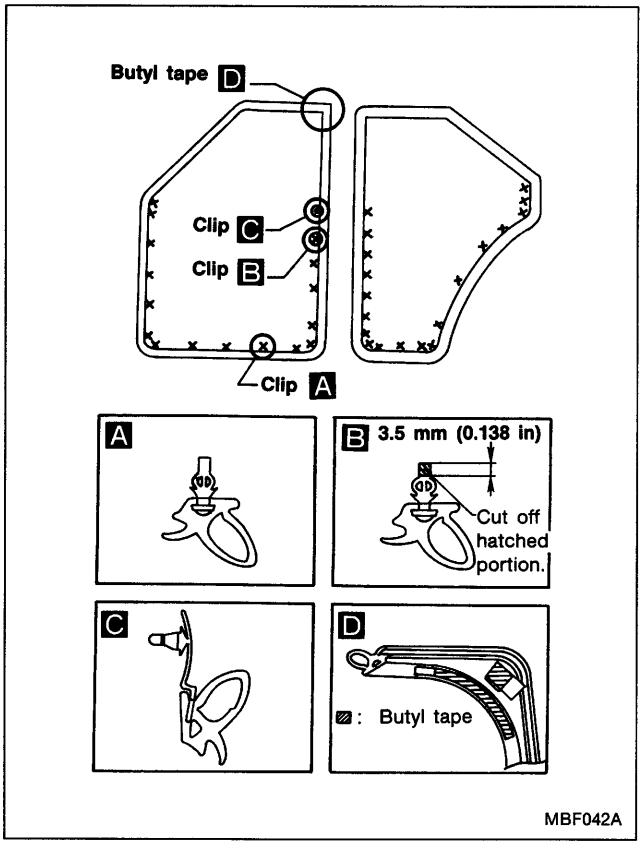


⑥ Center mudguard

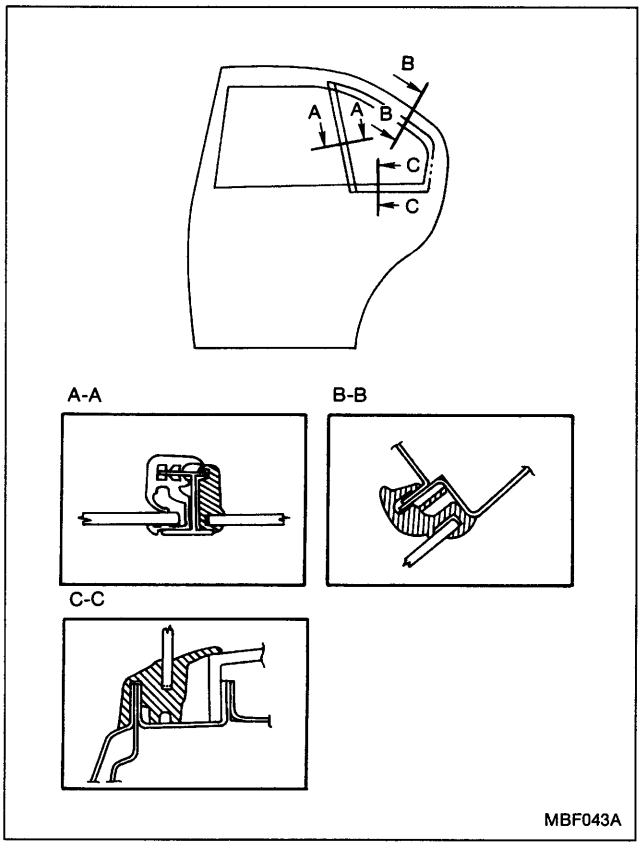


Exterior (Cont'd)

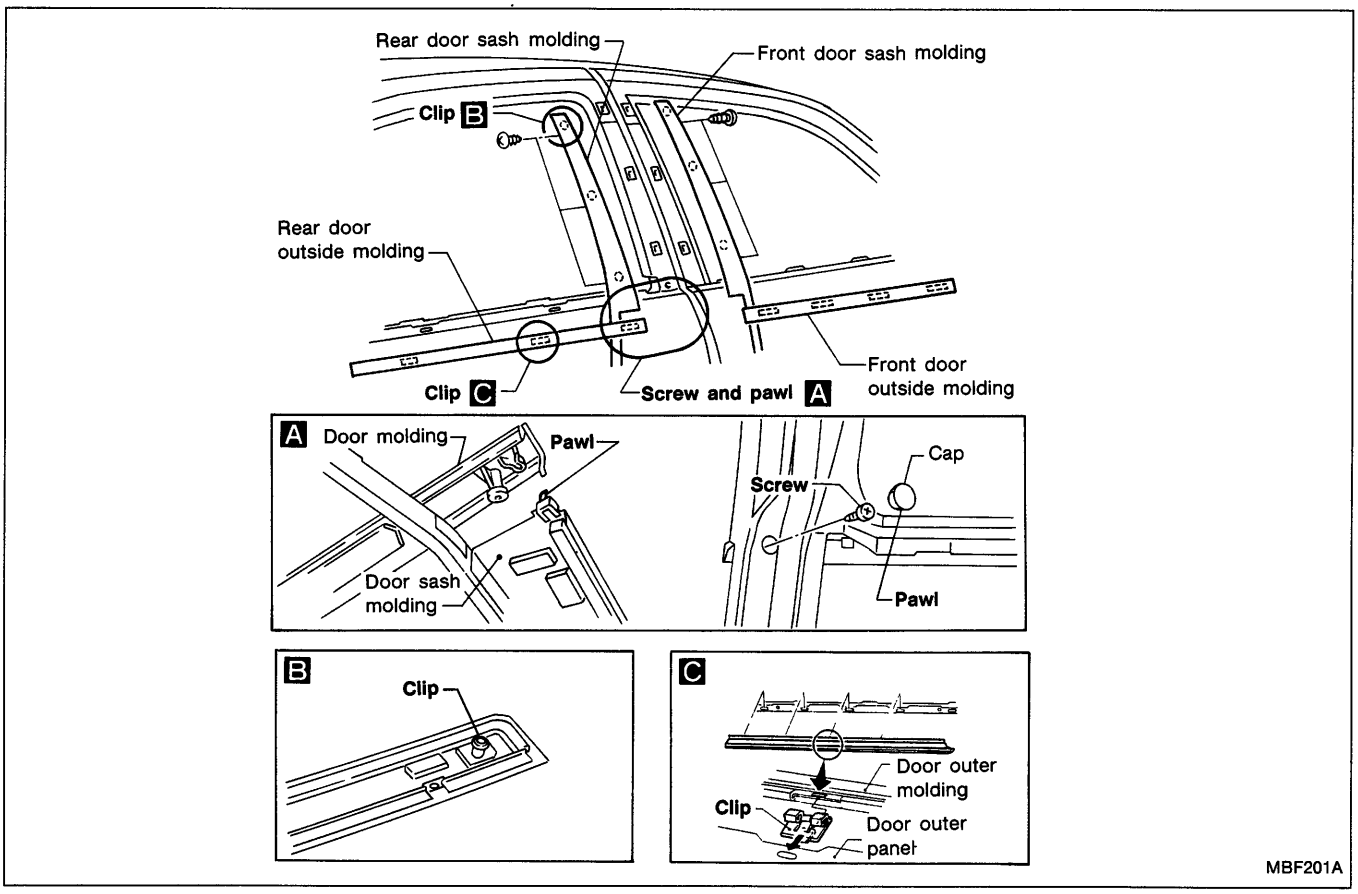
⑦ Door weatherstrip



⑧ Rear door partition weatherstrip



⑨ Door outside molding and door sash molding



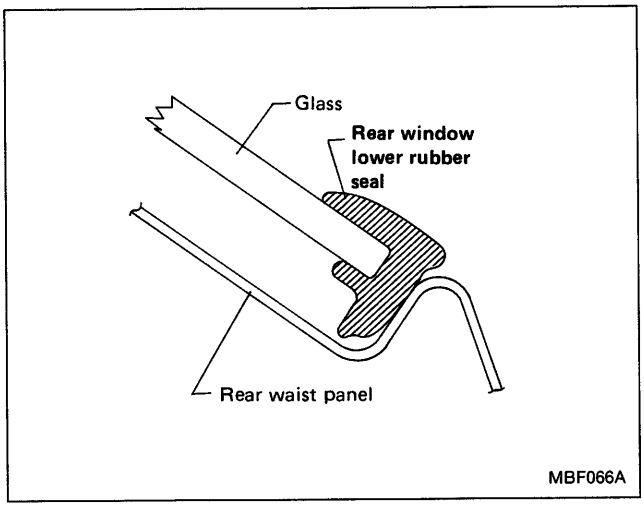
Exterior (Cont'd)

⑩ Rear window upper molding and side molding (Sedan)

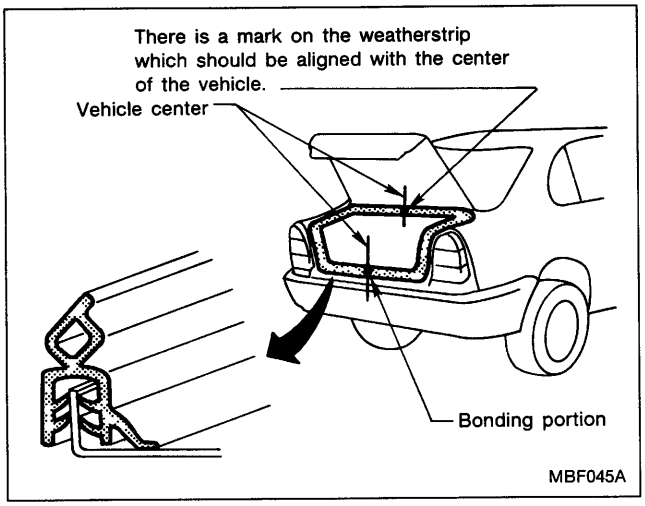
Basically the same as windshield upper molding and side molding.

Refer to ③ Windshield upper molding and side molding.

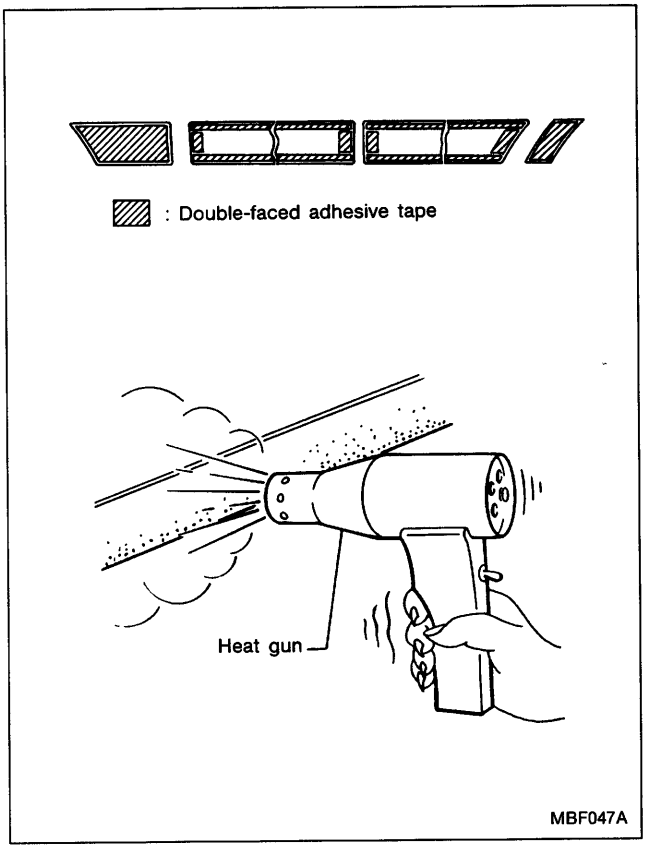
⑪ Rear window lower rubber seal (Sedan)



⑫ Trunk lid weatherstrip (Sedan)



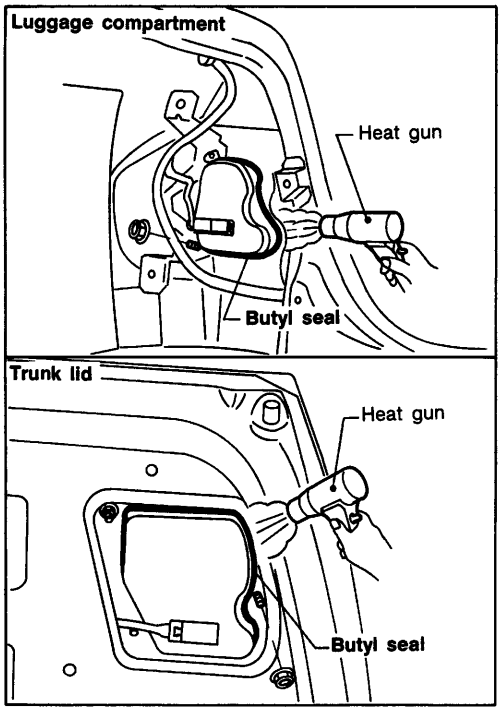
⑬ Side guard molding



Exterior (Cont'd)

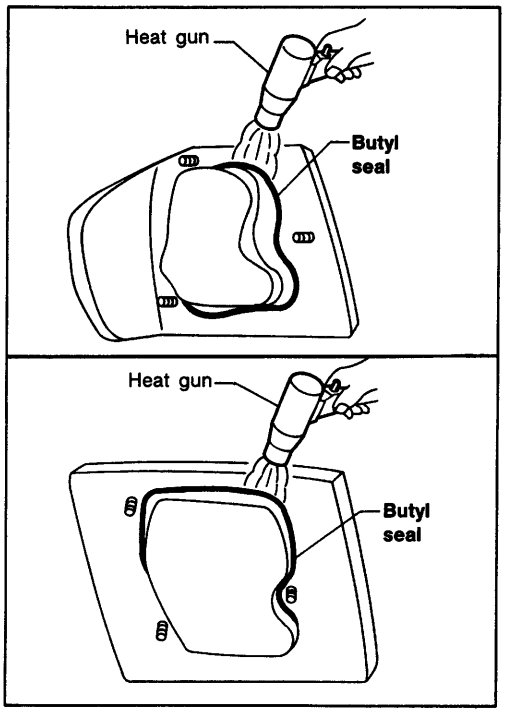
⑭ Rear combination lamp (Sedan)

Removal



- **Warm up lamp assembly area to temperature of a little below 60°C (140°F).**

Installation

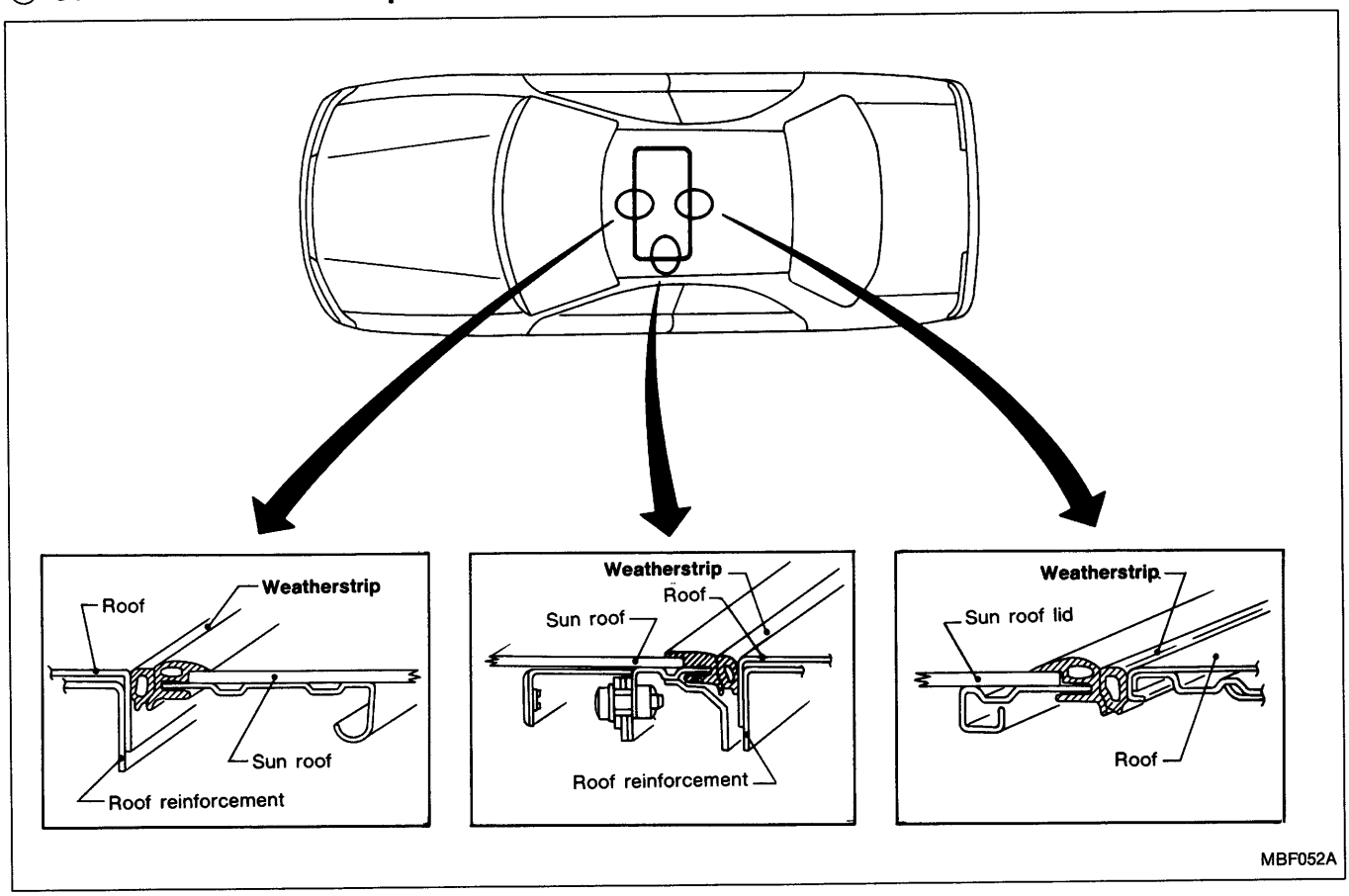


- **Apply butyl seal evenly as it tends to become thin in the corners.**
- **Warm up lamp assembly area to temperature of a little below 60°C (140°F).**

MBF050A

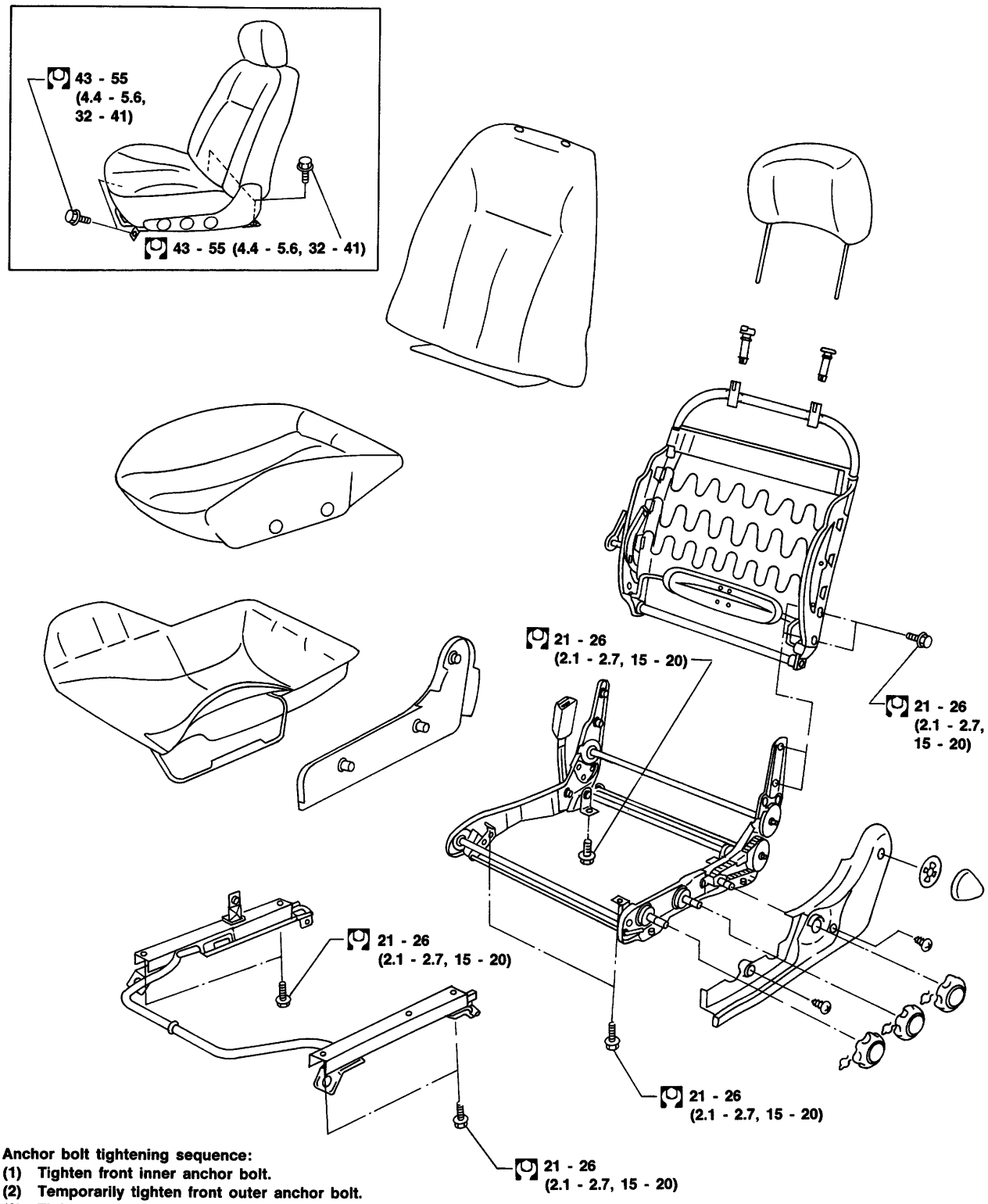
Exterior (Cont'd)

⑮ Sun roof lid weatherstrip



- When removing or installing the seat trim, carefully handle it to keep dirt out and avoid damage.

Front Seat

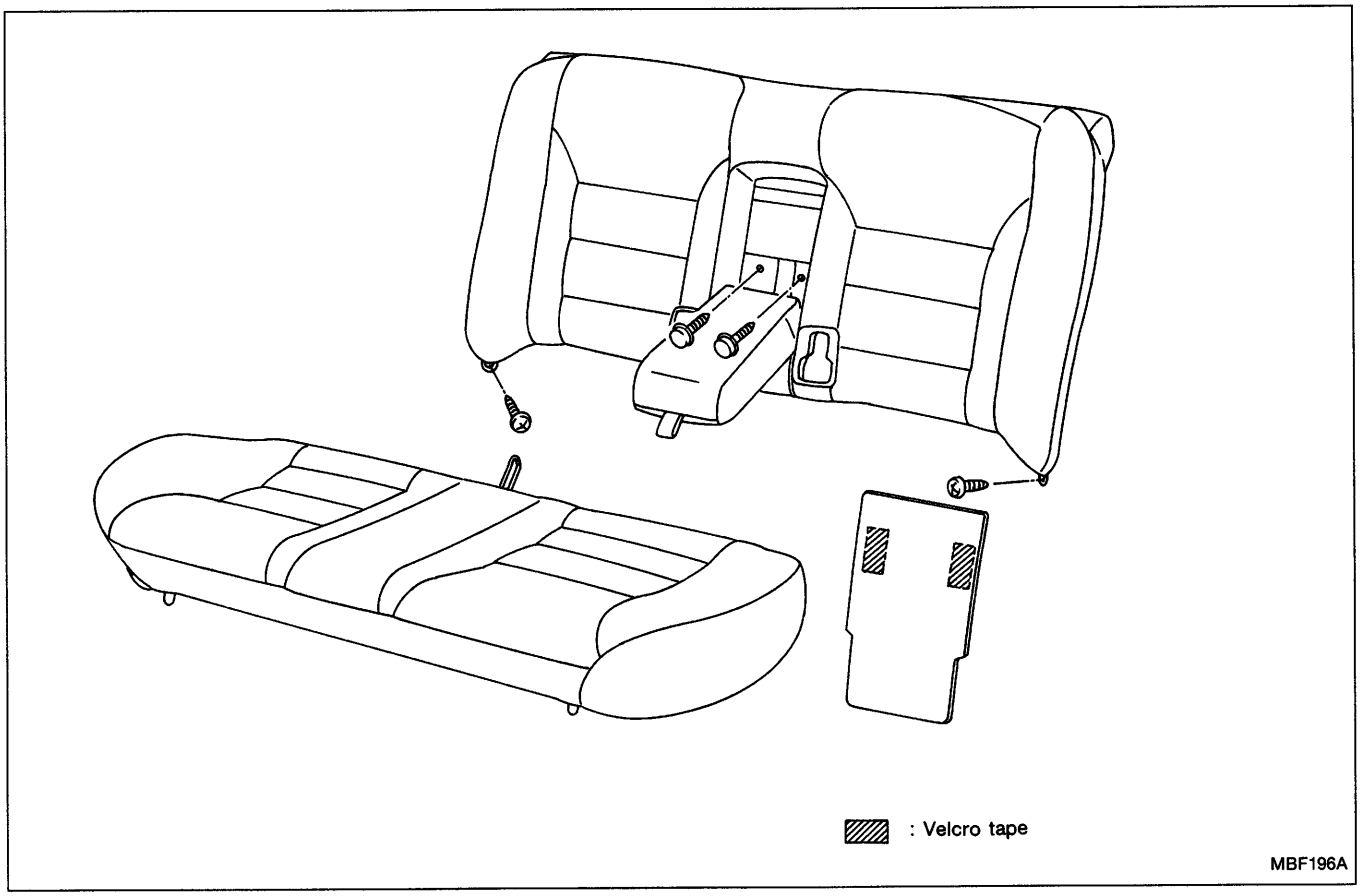


Anchor bolt tightening sequence:
(1) Tighten front inner anchor bolt.
(2) Temporarily tighten front outer anchor bolt.
(3) Tighten rear inner anchor bolt.
(4) Tighten rear outer anchor bolt.
(5) Tighten front outer anchor bolt.

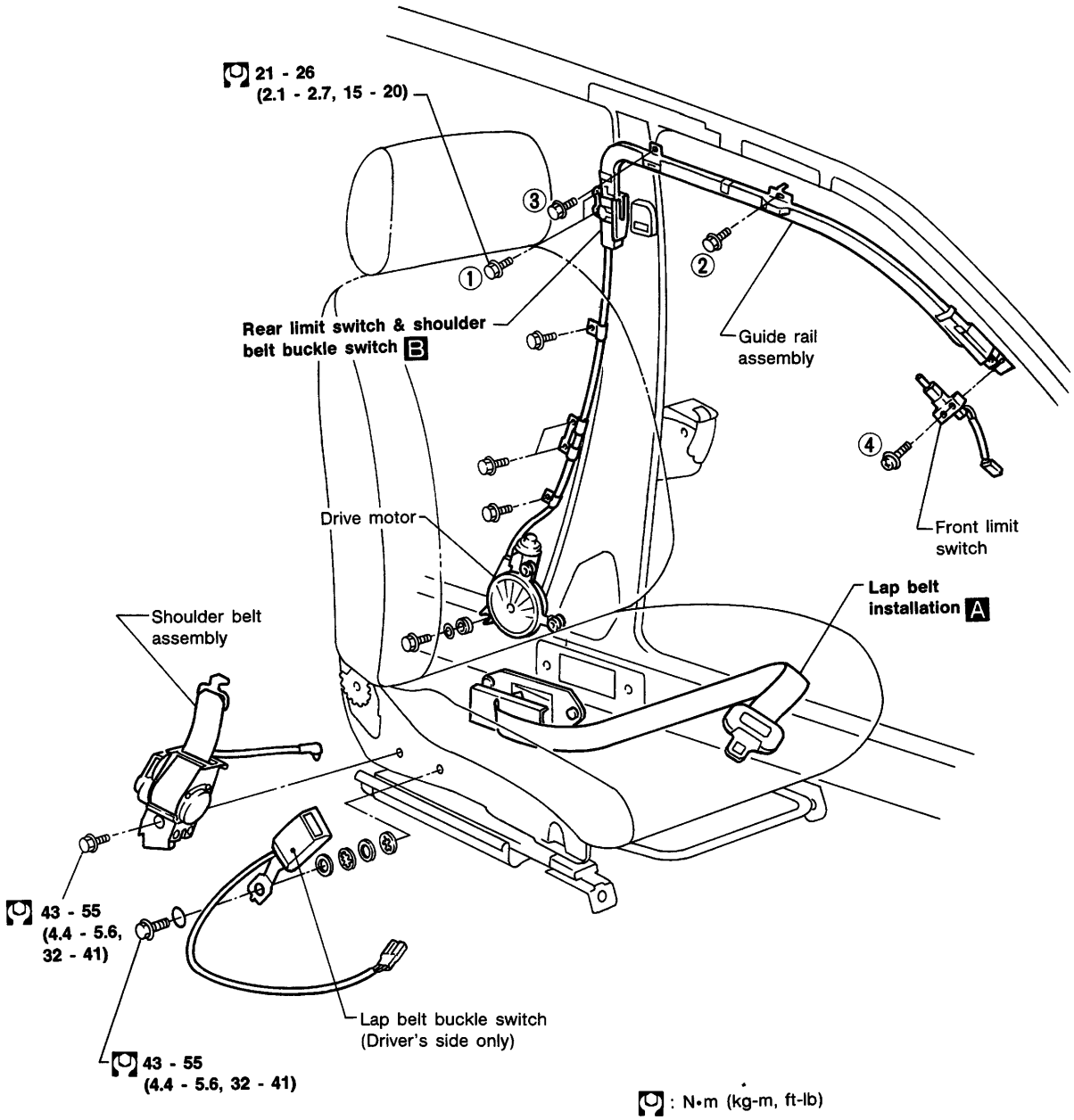
: N•m (kg-m, ft-lb)

MBF195A

Rear Seat



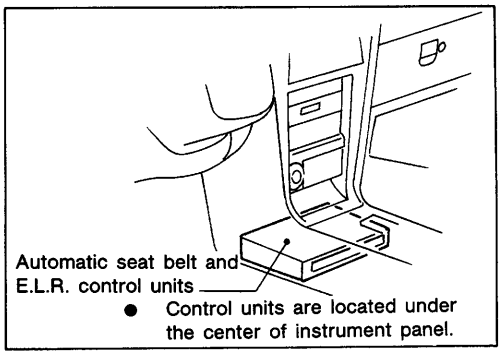
Unit Location



: N•m (kg-m, ft-lb)

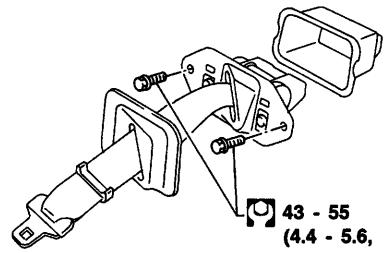
Tighten bolts in numerical order when installing guide rail.

Control unit

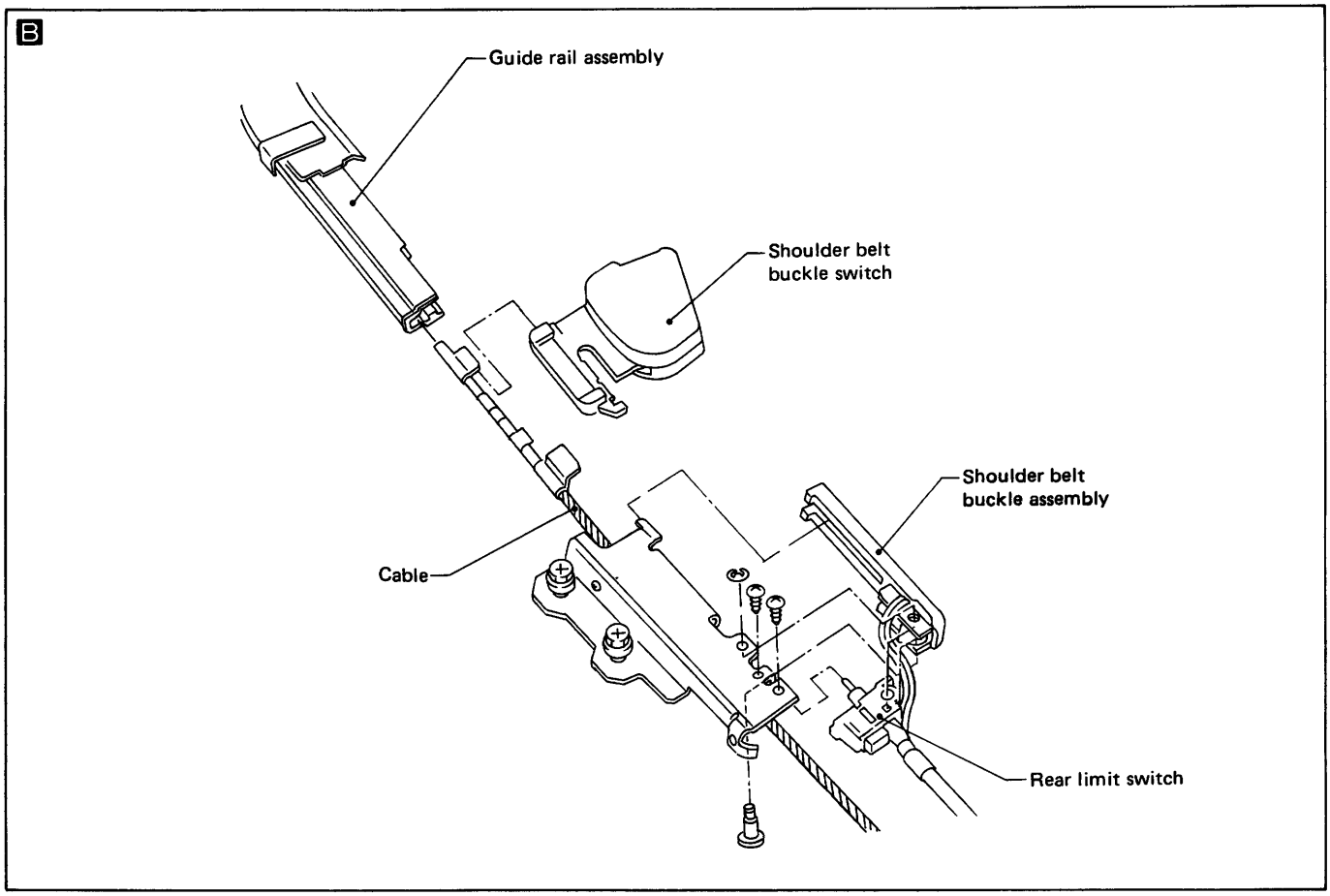


Unit Location (Cont'd)

A

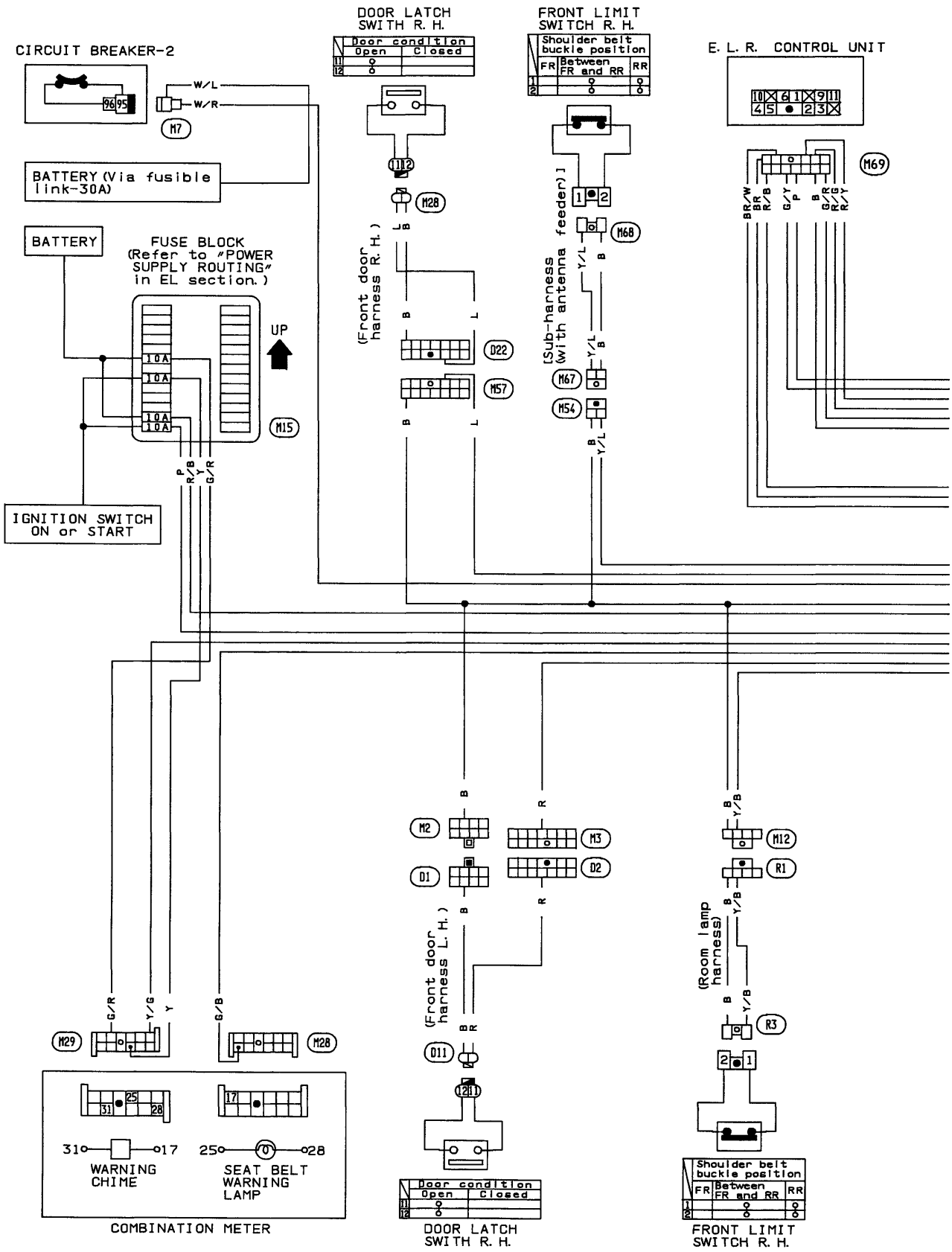


B

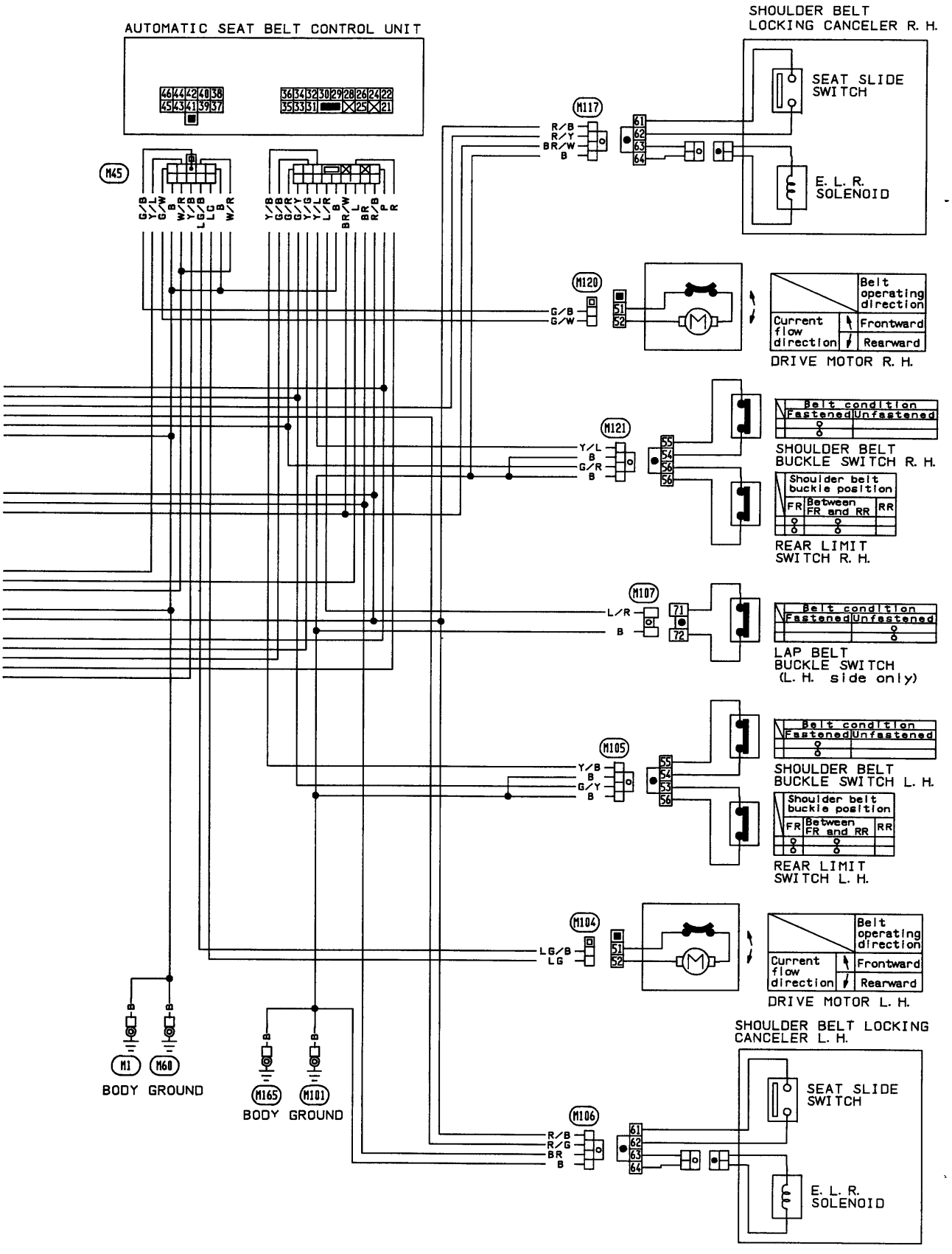


MBF197A

Wiring Diagram



Wiring Diagram (Cont'd)



MBF157A

Description

FUNCTION

Shoulder belt buckle is mainly operated while ignition switch is "ON".

Condition (A): Ignition switch is "ON".

When door is opened, shoulder belt buckle is moved frontward and when door is closed, buckle is moved rearward.

Condition (B): Ignition switch is "OFF".

When door is opened, shoulder belt buckle is moved frontward. When the door is closed, buckle will remain in this position.

(Voltage of output signal is approximate value.)

Input signal	Ignition switch	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
	Door latch switch	OFF	ON	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF
	Front limit switch	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF	
	Rear limit switch	ON	ON	ON	ON	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	ON	ON	ON	
Output signal	Drive motor power source for frontward operation	0V	0V	0V	0V	0V	12V	12V	0V	0V	0V	0V	0V	12V	12V	0V	0V	
	Drive motor power source for rearward operation	0V	0V	12V	12V	0V	0V	0V	0V	12V	12V	0V	0V	0V	0V	0V	0V	
Shoulder belt buckle	Function	Stop	Stop	Start to move	Moving	Stop	Start to move	Moving	Stop	Start to move	Moving	Stop	Stop	Start to move	Moving	Stop	Stop	
	Position	Front	Front	Front	Between Front & Rear	Rear	Rear	Between Front & Rear	Front	Front	Between Front & Rear	Rear	Rear	Rear	Between Front & Rear	Front	Front	

TIMER (Ignition switch either "ON" or "OFF")

If limit switch does not operate (when accomplishing frontward operation, front limit switch can not be turned "OFF" or when accomplishing rearward operation, rear limit switch can not be turned "OFF"), control unit will continue to supply power to drive motor for 15 seconds.

QUICK WARNING (Ignition switch "ON")

If front limit switch is not turned "OFF" after accomplishing frontward operation, control unit will stop supplying power 15 seconds later and warning lamp will flash and chime will operate rapidly for approximately 6 seconds.

REAR LOCK (Fail safe operation)

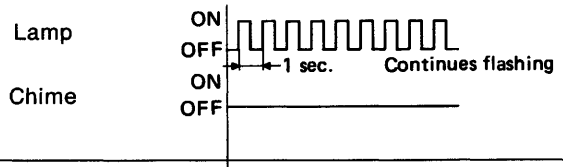
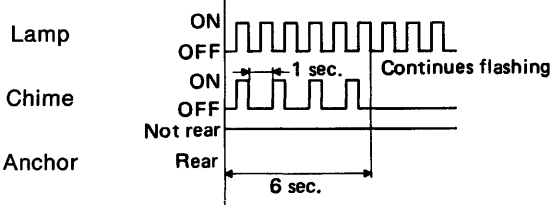
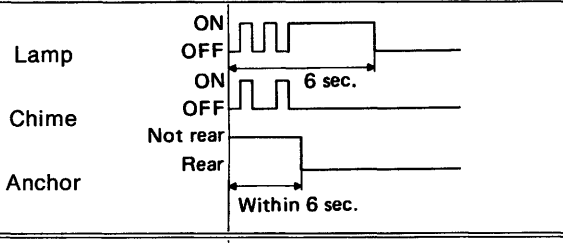
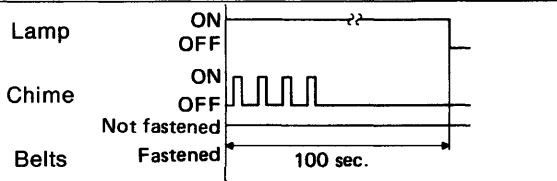
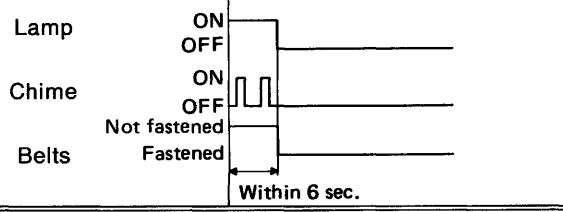
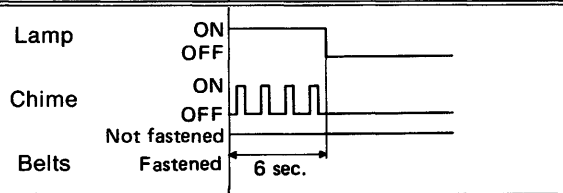
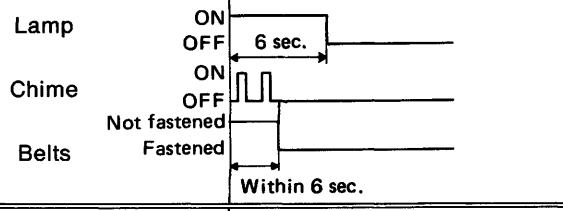
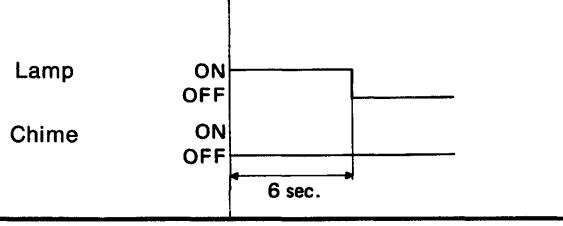
If quick warning functions twice successively while ignition switch is "ON", shoulder belt buckle will move to rear position and will remain in the rear position. This function is canceled when the ignition switch is "OFF".

SHOULDER BELT LOCKING CANCELER (Ignition switch "ON" or "OFF")

The shoulder belt retractor does not lock belt length for 5 seconds after moving the seat position front-rear adjusting lever (turning on seat slide switch). While ignition switch is "ON", the system warning lamp also glows for 5 seconds. This system can be operated independently of "Automatic Seat Belt System".

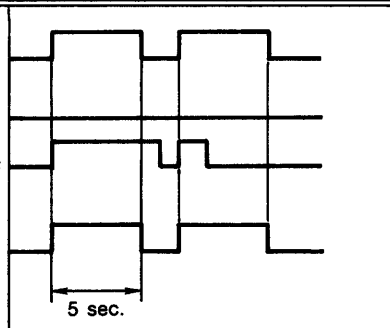
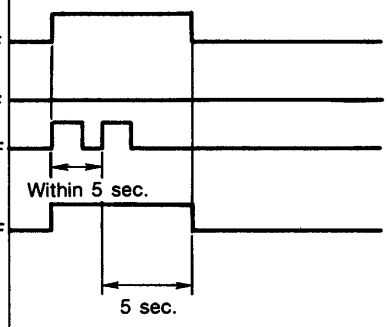
Description (Cont'd)

WARNING

Priority	Warning item	Ignition switch	Indication of warning (Indicating time is approximate value.)
1	Shoulder anchors are not at rear lock position.	ON	
		OFF → ON	
			
2	Shoulder belts are not fastened.	ON	
			
3	Driver's side lap belt is not fastened.	OFF → ON	
			
4	Normal (All belts are fastened and shoulder anchors are in rear lock position.)	OFF → ON	

Description (Cont'd)

WARNING

Priority	Warning item	Ignition switch	Indication of warning (Indicating time is approximate value.)
1	Move seat front-rear adjusting lever. (Seat slide switch is turned on.)	ON	
			

Contents

Symptom Chart BF-44
Preliminary Check BF-45
Main Power Supply and Ground Circuit Check BF-49
Harness Layout BF-50
Circuit Diagram for Quick Pinpoint Check BF-52
Diagnostic Procedure 1
(Check motor circuit and stop signals.) BF-53
Diagnostic Procedure 2
(Check door latch switch circuit.) BF-56
Diagnostic Procedure 3
(Check front limit switch circuit.) BF-58
Diagnostic Procedure 4
(Check rear limit switch circuit.) BF-60
Diagnostic Procedure 5
(Check shoulder belt buckle switch circuit.) BF-62
Diagnostic Procedure 6
(Check lap belt switch circuit.) BF-64
Diagnostic Procedure 7
(Check warning chime circuit.) BF-66
Diagnostic Procedure 8
(Check warning lamp circuit.) BF-67
Diagnostic Procedure 9
(Check shoulder belt locking canceler circuit.) BF-68
Electrical Components Inspection BF-70

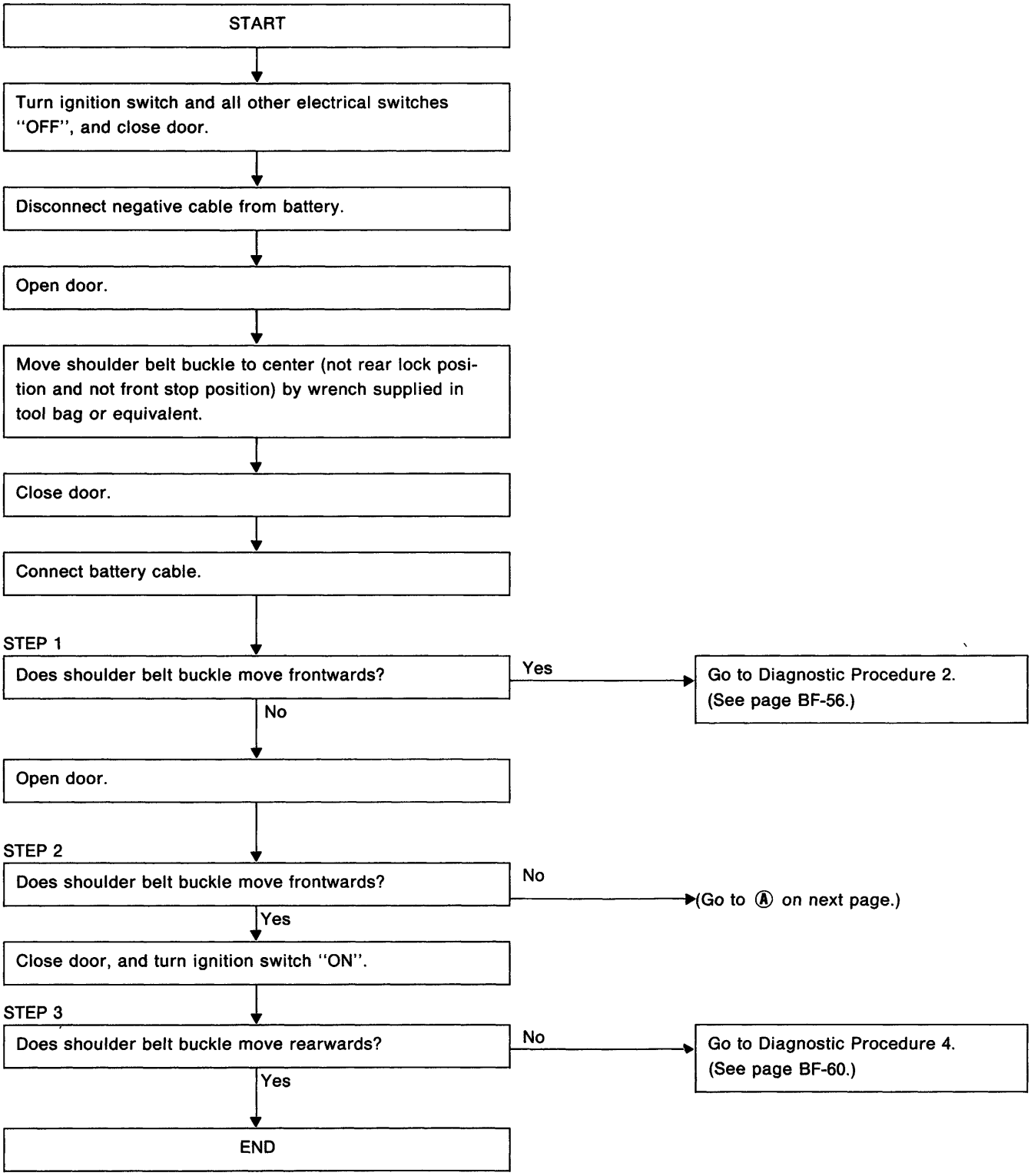
Since left and right component parts are basically the same, harness layout and methods for electrical components inspection are shown for one side only.
Although methods for checking component parts on both sides are described in the flow chart, making it easier to troubleshoot, apply checking procedures to either side that have malfunction during trouble diagnoses.

Symptom Chart

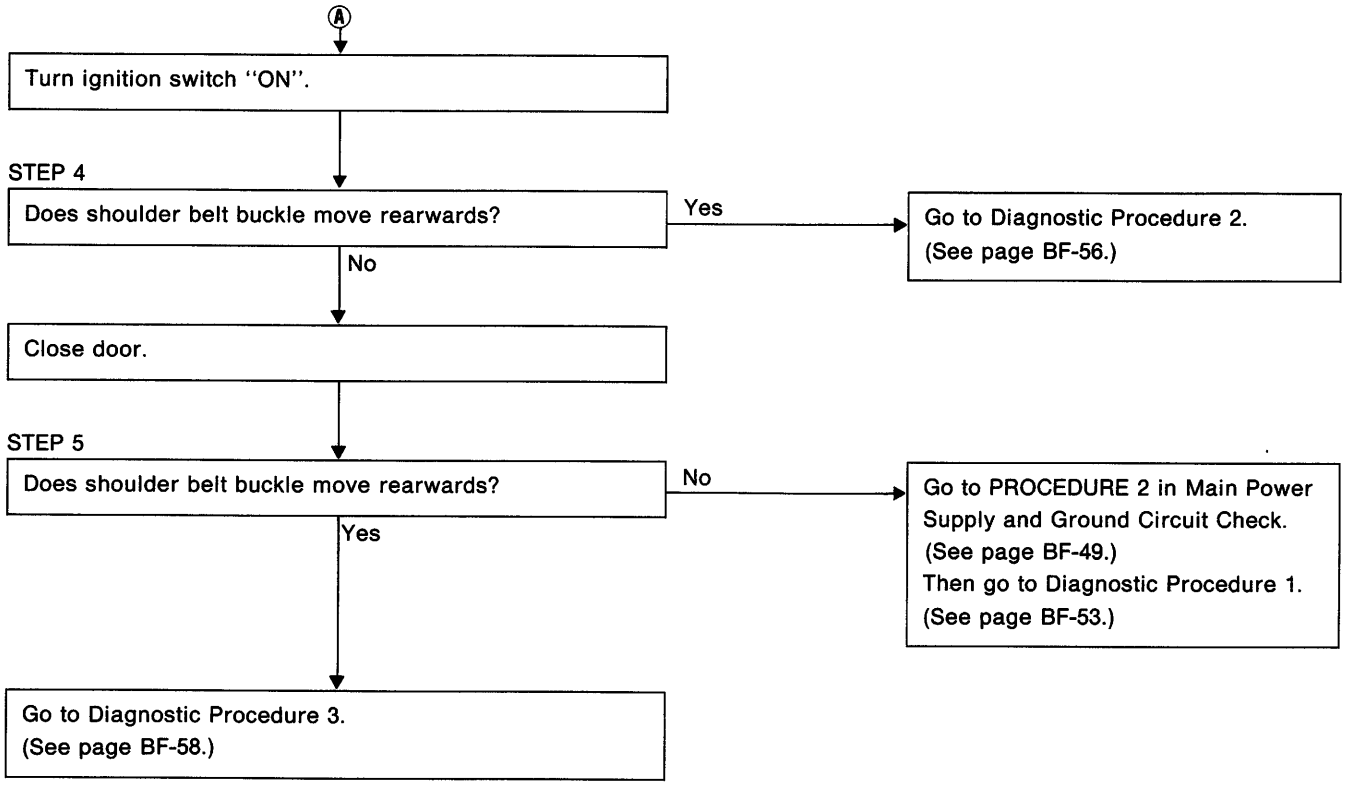
Procedure	Reference page			SYMPTOM: No operation has made. (No warning indicated and no buckles movement performed)	SYMPTOM: Shoulder belt buckle in L.H. or R.H. side does not move	SYMPTOM: Shoulder belt buckle moves frontwards only. (not rearwards)	SYMPTOM: Shoulder belt buckle moves rearwards only. (not frontwards)	SYMPTOM: Warnings indicate incorrectly or do not function.	SYMPTOM: Quick warning operates.	SYMPTOM: Shoulder belt locks when adjusting front-rear seat position.
Electrical Components Inspection	BF-71	R.H. side	Seat slide switch					○		○
	BF-71		Motor	○	○					
	BF-70		Shoulder belt buckle switch	○				○		
	BF-70		Door latch switch	○		○	○			
	BF-70		Rear limit switch	○	○	○		○		
	BF-70		Front limit switch	○	○		○		○	
	BF-71	L.H. side	Seat slide switch					○		○
	BF-71		Lap belt switch	○				○		
	BF-70		Motor	○	○					
	BF-70		Shoulder belt buckle switch	○				○		
	BF-70		Door latch switch	○		○	○			
	BF-70		Rear limit switch	○	○	○		○		
	BF-70		Front limit switch	○	○		○		○	
	—		E.L.R. control unit					○		○
	—		Warning chime	○				○		
	—		Warning lamp	○				○		
Diagnostic Procedure	BF-68		Procedure 9					○		○
	BF-67		Procedure 8					○		
	BF-66		Procedure 7					○		
	BF-64		Procedure 6					○		
	BF-62		Procedure 5					○		
	BF-60		Procedure 4	○	○	○		○		
	BF-58		Procedure 3	○	○		○		○	
	BF-56		Procedure 2			○	○			
	BF-53		Procedure 1	○	○					
Main Power Supply and Ground Circuit Check	BF-49		Procedure 2		○					
	BF-49		Procedure 1	○						
Preliminary Check	BF-47		Procedure 2					○		
	BF-45		Procedure 1		○	○	○			

Preliminary Check

PROCEDURE 1

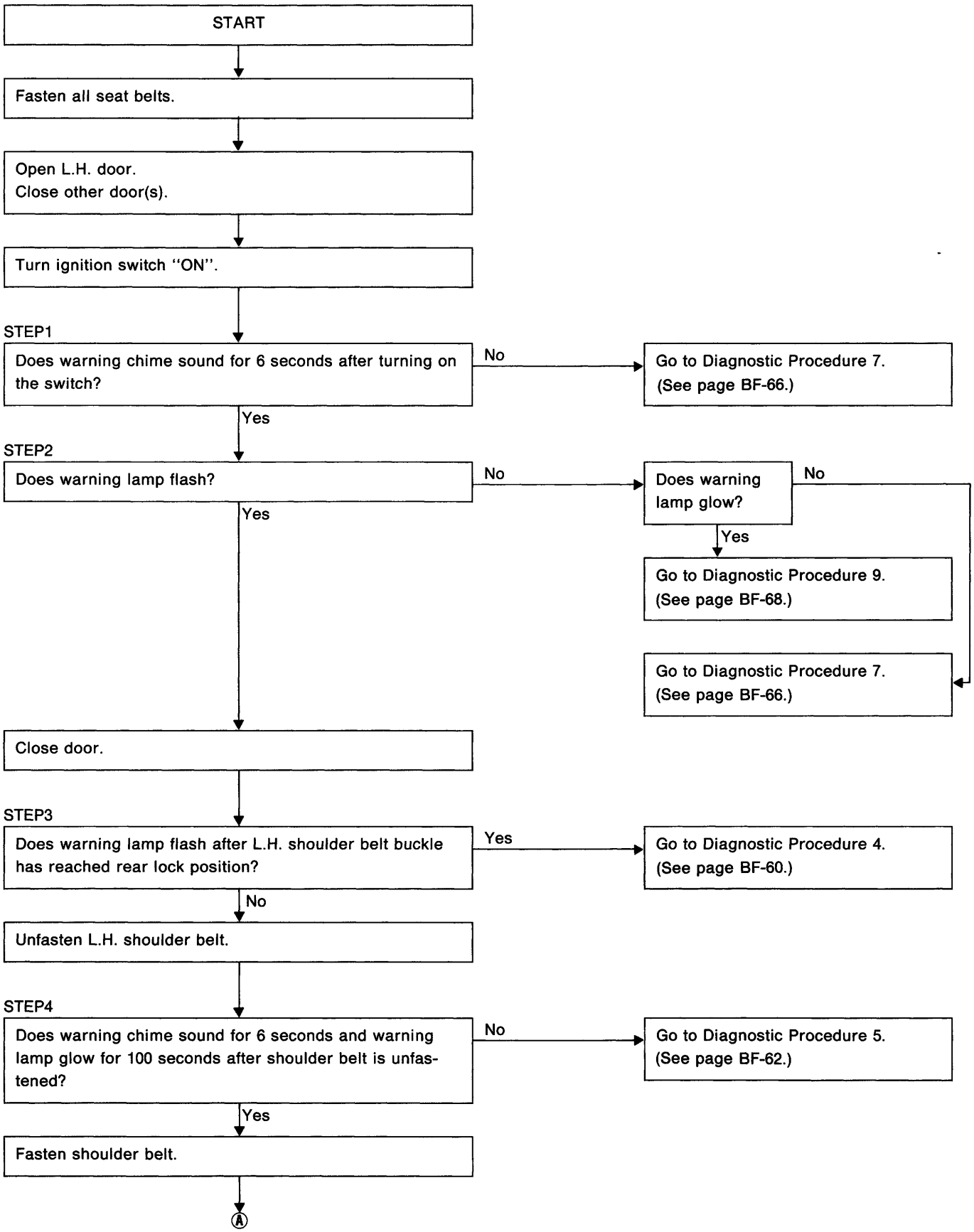


Preliminary Check (Cont'd)

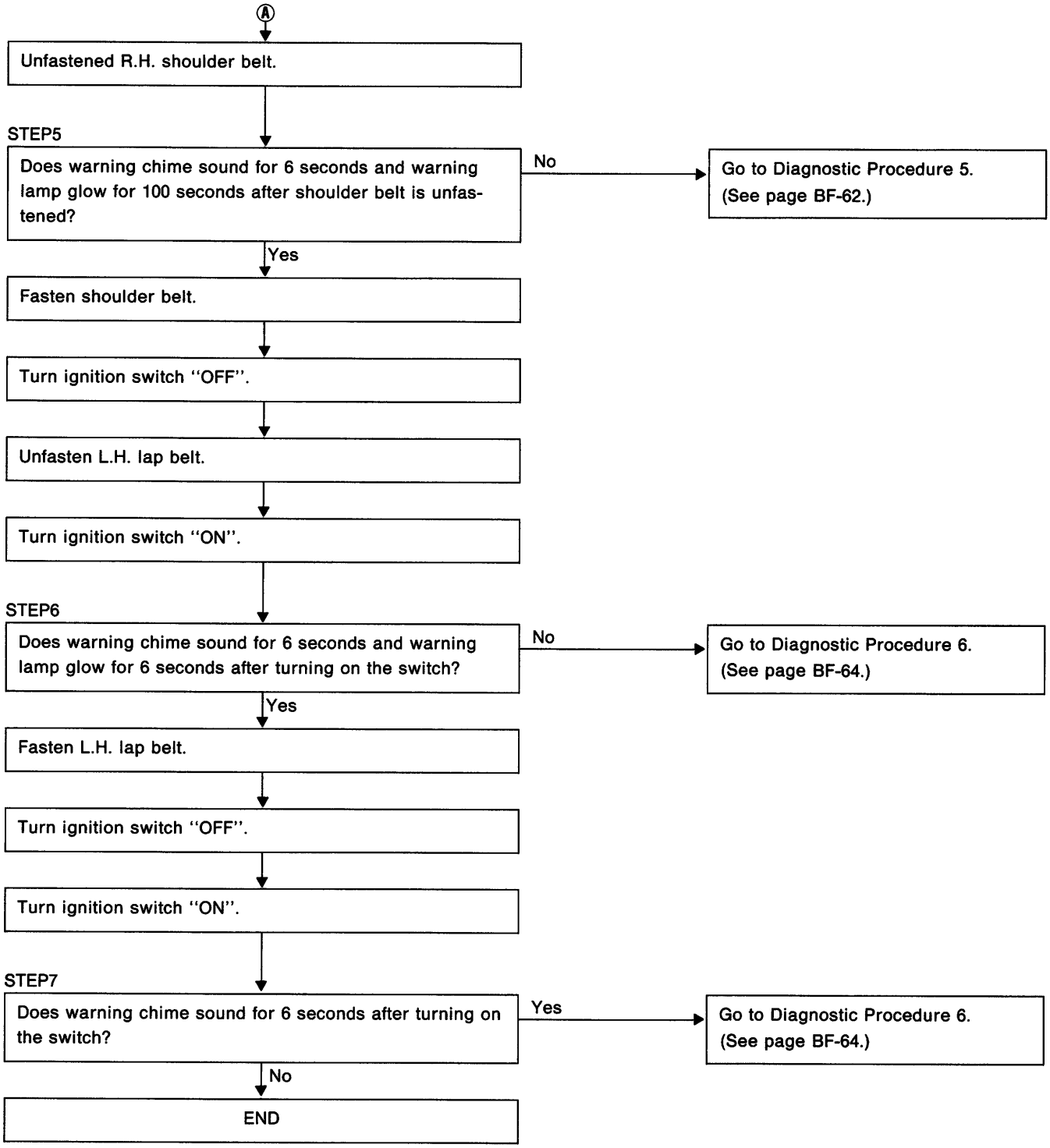


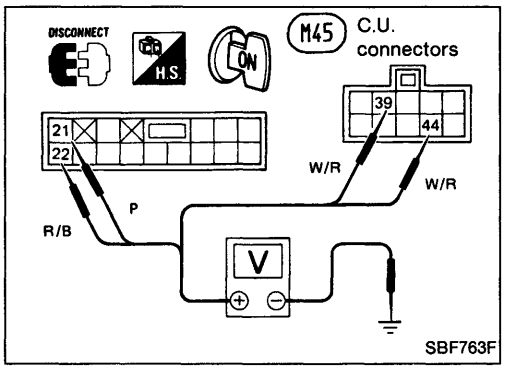
Preliminary Check (Cont'd)

PROCEDURE 2



Preliminary Check (Cont'd)



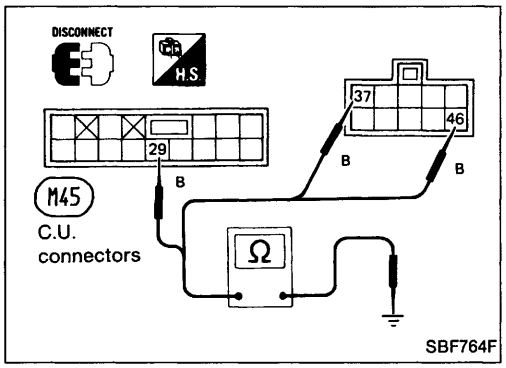


Main Power Supply and Ground Circuit Check

PROCEDURE 1

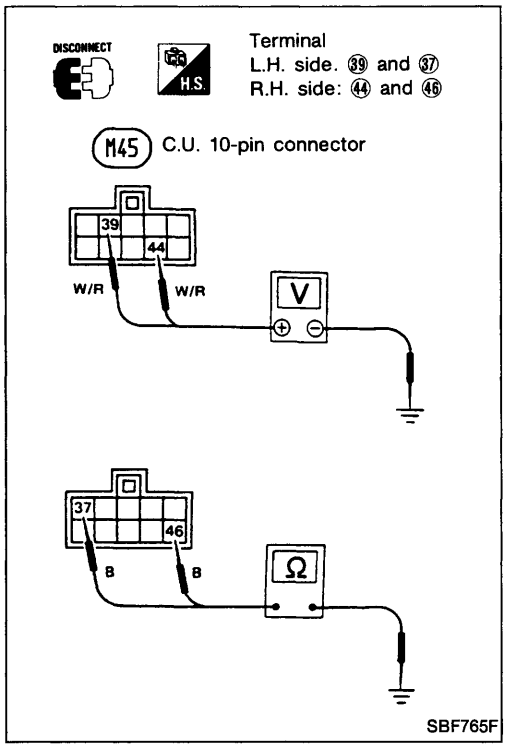
Main power supply

Terminals	Battery voltage existence condition	
	Ignition switch "ON"	Other than ignition switch "ON"
㉑ - Ground	Yes	No
㉒ - Ground	Yes	Yes
㊴ - Ground	Yes	Yes
㊹ - Ground	Yes	Yes



Ground circuit

Terminals	Continuity
㉙ - Ground	Yes
㊲ - Ground	Yes
㊻ - Ground	Yes



PROCEDURE 2

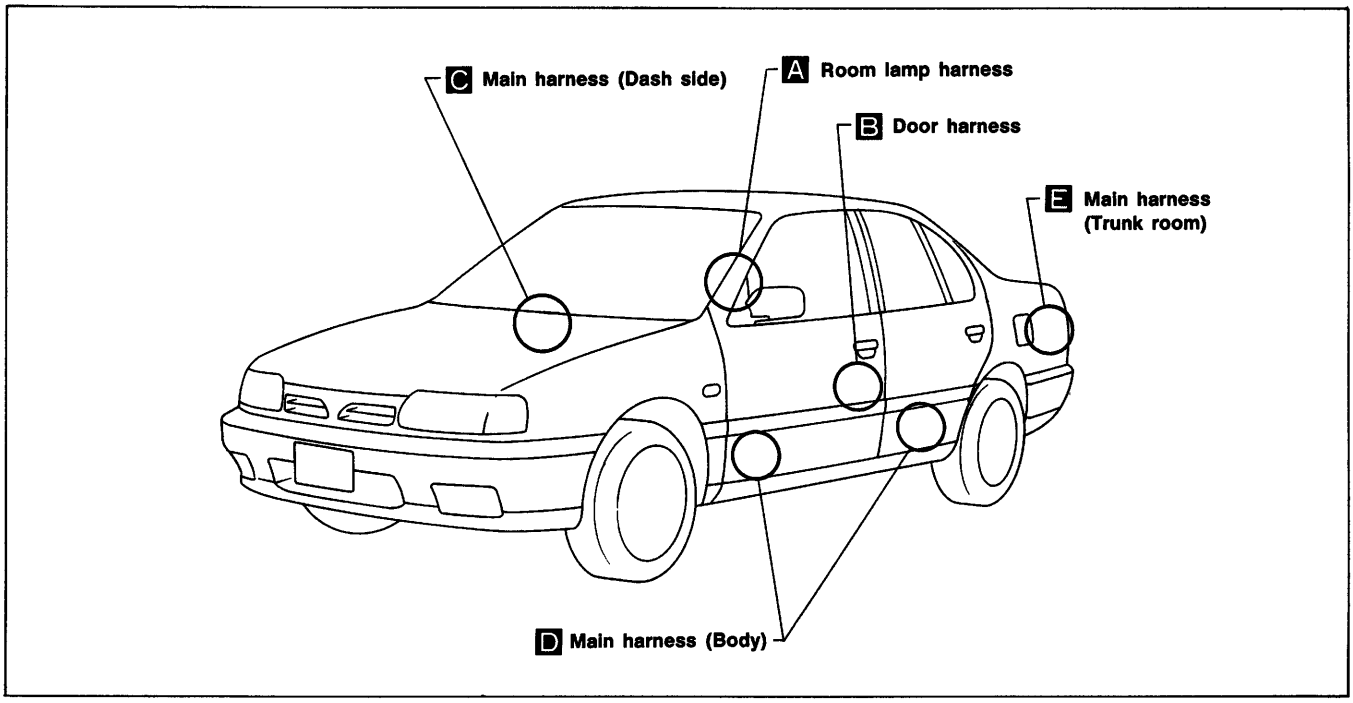
Power supply for motor drive

	Terminals	Battery voltage existence
L.H. side	㊴ - Ground	Yes
R.H. side	㊹ - Ground	Yes

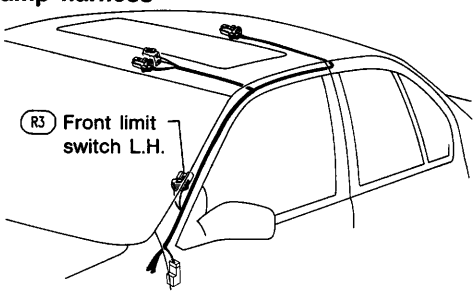
Ground circuit for motor drive

	Terminals	Continuity
L.H. side	㊲ - Ground	Yes
R.H. side	㊻ - Ground	Yes

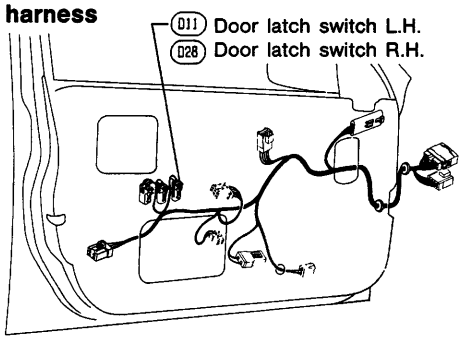
Harness Layout



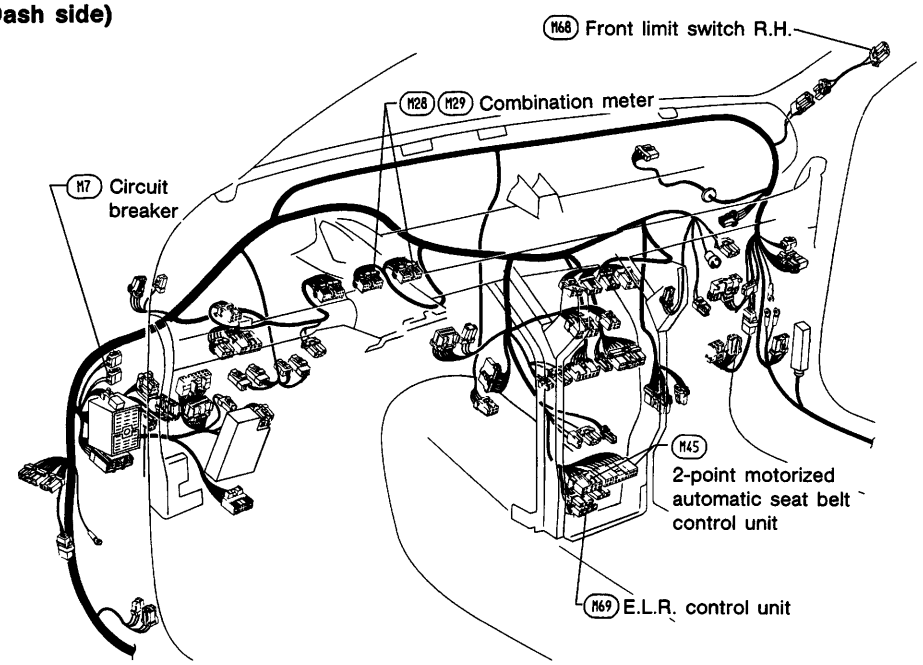
A Room lamp harness



B Door harness

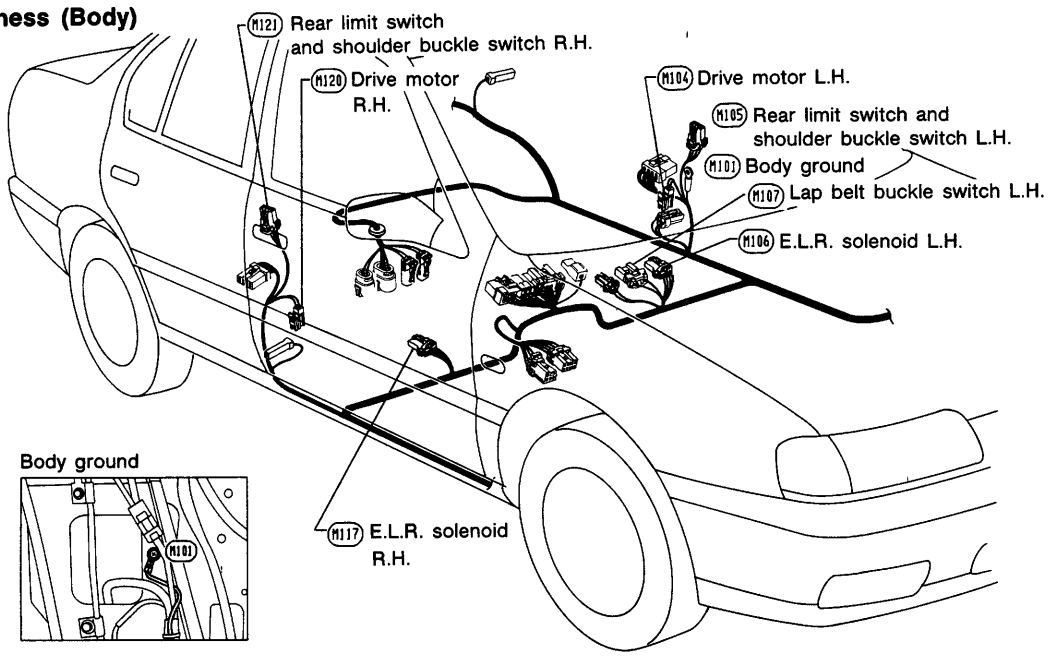


C Main harness (Dash side)

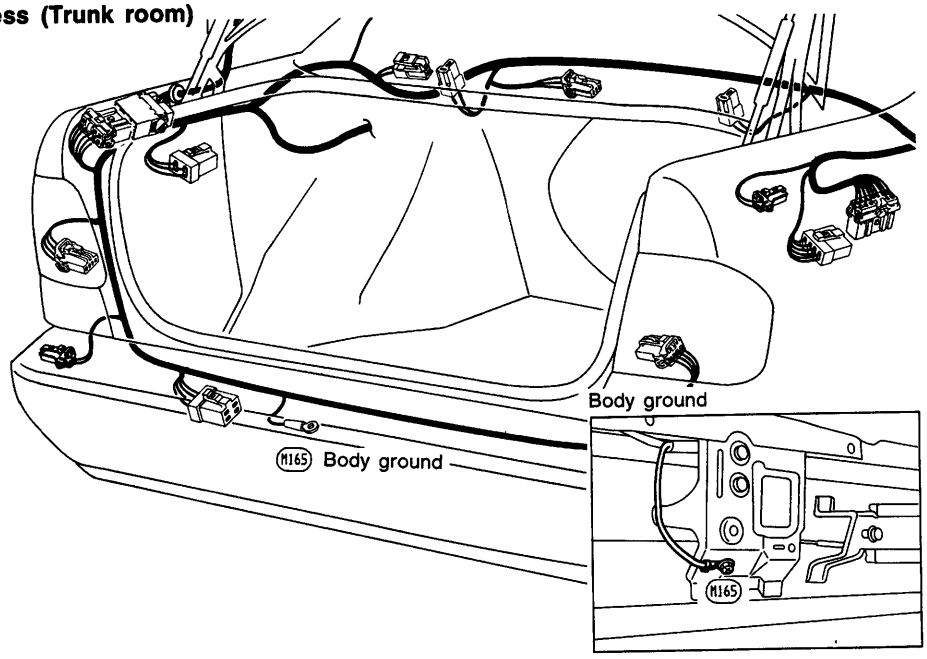


Harness Layout (Cont'd)

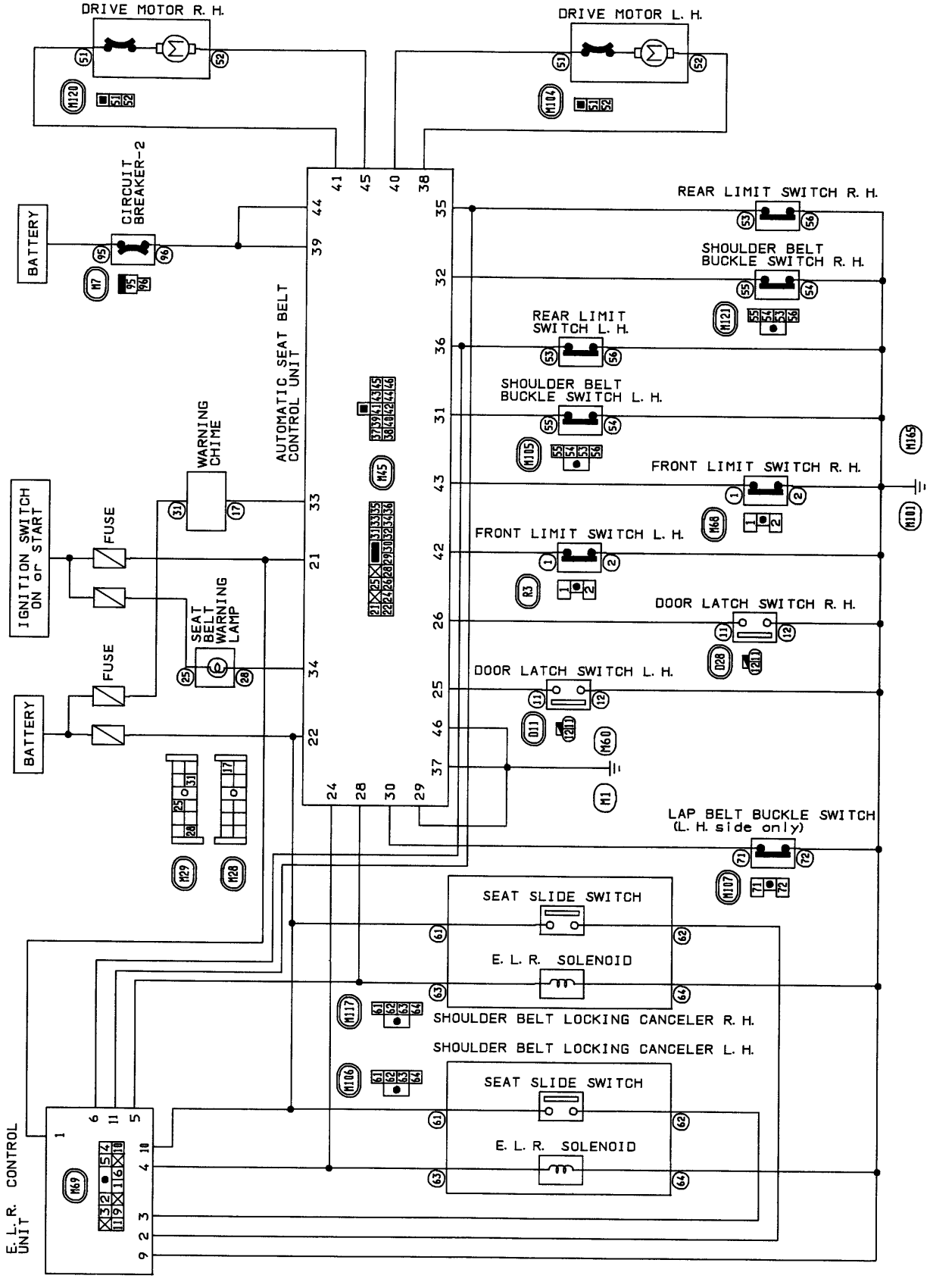
D Main harness (Body)



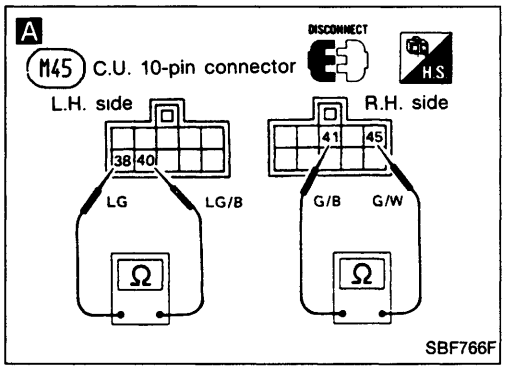
E Main harness (Trunk room)

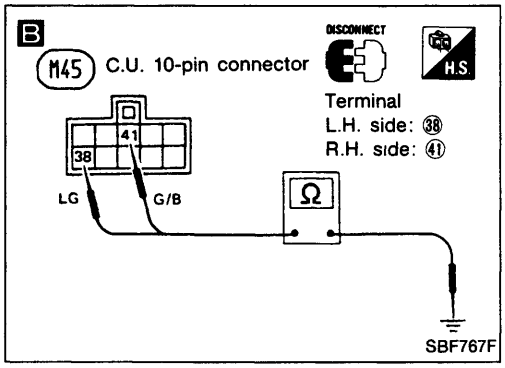


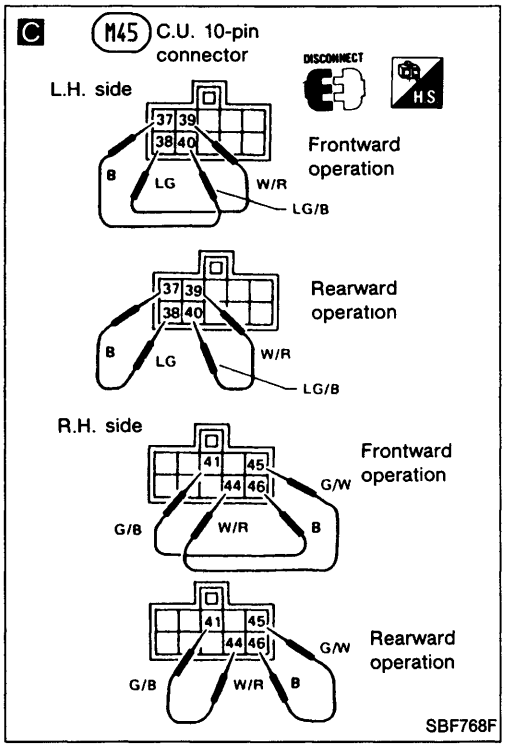
Circuit Diagram for Quick Pinpoint Check



MBF158A







Diagnostic Procedure 1

START

A

CHECK MOTOR CIRCUIT.
1) Disconnect 10-pin connector from control unit.
2) Check continuity.

	Terminals
L.H. side	38 - 40
R.H. side	41 - 45

Continuity should exist.

N.G. → (Go to Ⓐ on next page.)

O.K.

B

Does continuity exist?

	Terminals
L.H. side	38 - Ground
R.H. side	41 - Ground

Yes → (Go to Ⓑ on next page.)

No

C

CHECK MOTOR OPERATION.
Check shoulder belt buckle movement.

O.K. → (Go to Ⓒ on page BF-55.)

N.G.

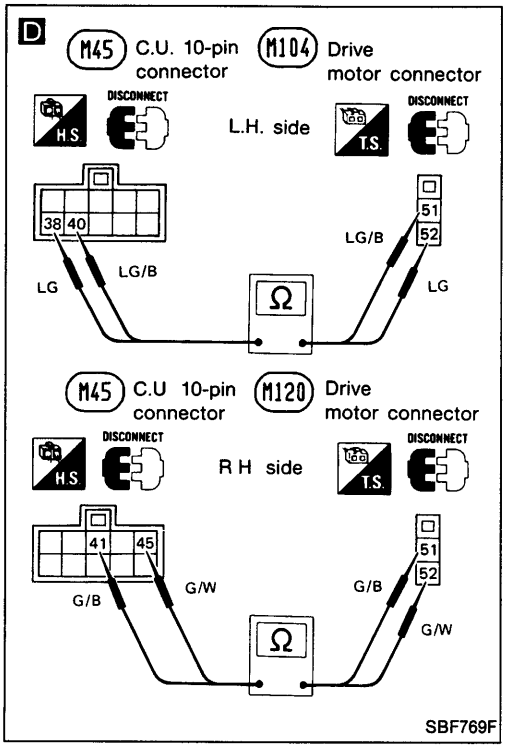
Go to DRIVE MOTOR ASSEMBLY in Electrical Components Inspection. (See page BF-71.)

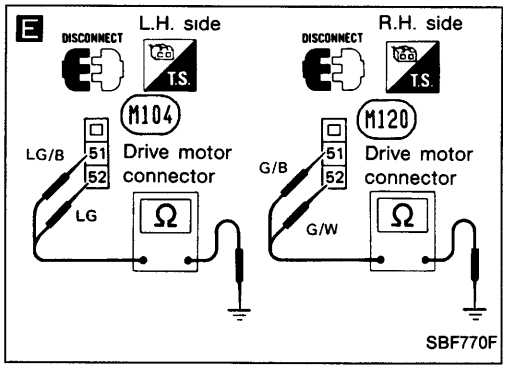
N.G. → Replace drive motor assembly.

O.K.

Replace guide rail assembly.

Diagnostic Procedure 1 (Cont'd)





D

(A)

1) Disconnect connector from drive motor assembly.
2) Check continuity.

N.G. → Repair harness.

	Terminals
L.H. side	(38) - (52)
	(40) - (51)
R.H. side	(41) - (51)
	(45) - (52)

Continuity should exist.

O.K.

Check drive motor harness for open circuit.

N.G. → Repair drive motor harness.

O.K.

Replace drive motor.

E

(B)

1) Disconnect connector from drive motor assembly.
2) Does continuity exist in at least one point?

Yes → Repair harness. There will be incorrect grounding.

	Terminals
L.H. side	(51) - Ground
	(52) - Ground
R.H. side	(51) - Ground
	(52) - Ground

No

Check drive motor harness for incorrect grounding.

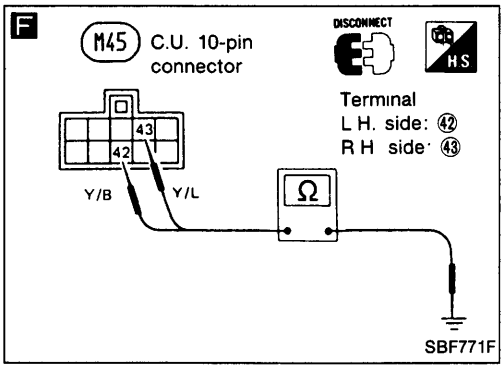
N.G. → Repair drive motor harness.

O.K.

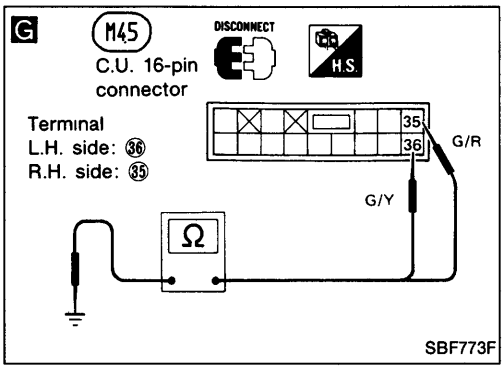
Replace drive motor assembly.

Diagnostic Procedure 1 (Cont'd)

F



G



Ⓒ

F

CHECK STOP SIGNAL.
1) Move shoulder belt buckle to center (not rear lock position and not front).
2) Check continuity.

	Terminals
L.H. side	42 - Ground
R.H. side	43 - Ground

Continuity should exist.

N.G. → Go to Diagnostic Procedure 3 (See page BF-58.) and return to next step.

O.K.

G

1) Disconnect 16-pin connector from control unit.
2) Check continuity.

	Terminals
L.H. side	36 - Ground
R.H. side	35 - Ground

Continuity should exist.

N.G. → Go to Diagnostic Procedure 4 (See page BF-60.) and return to next step.

O.K.

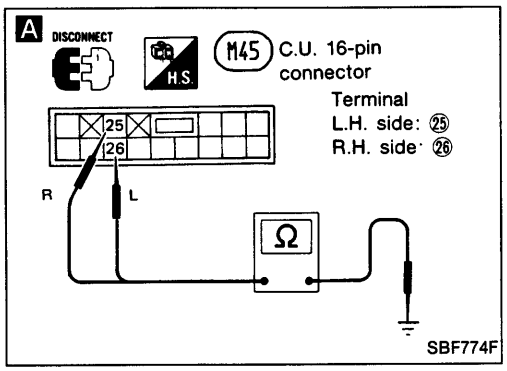
Is this the second time?

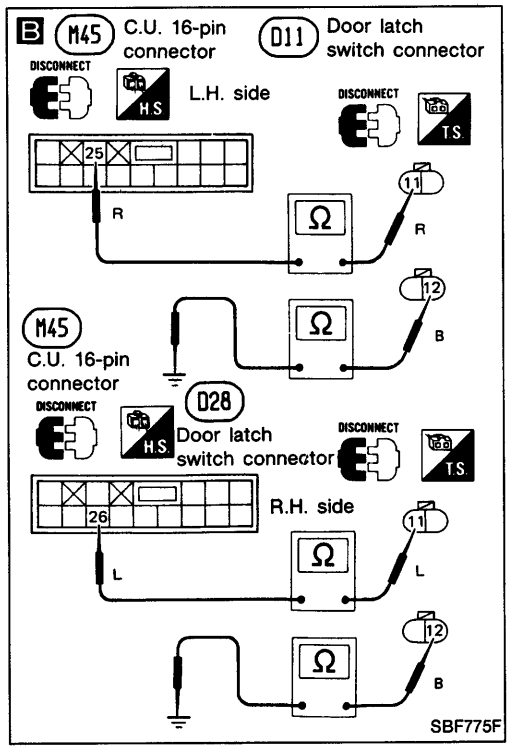
Yes → Replace control unit.

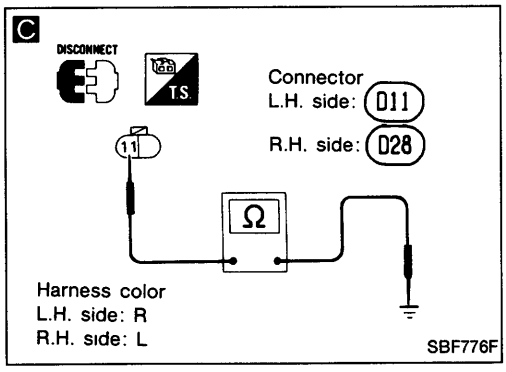
No

Reinstall any part removed.

Go to PROCEDURE 1 (START) in Preliminary Check. (See page BF-45.)







Diagnostic Procedure 2

START

A CHECK DOOR LATCH SWITCH CIRCUIT.
1) Disconnect 16-pin connector from control unit.
2) Check continuity.

	Terminals	Door condition	Continuity
L.H. side	25 - Ground	Open	Yes
		Close	No
R.H. side	26 - Ground	Open	Yes
		Close	No

O.K. → (Go to Ⓐ on next page.)

N.G. ↓

B
1) Disconnect door latch switch connector.
2) Check continuity.

	Terminals
L.H. side	25 - 11 12 - Ground (M101), (M165)
R.H. side	26 - 11 12 - Ground (M101), (M165)

Continuity should exist.

N.G. → Repair harness.

O.K. ↓

C Does continuity exist?

	Connector	Terminals
L.H. side	D11	11 - Ground
R.H. side	D28	11 - Ground

Yes → Repair harness.
There will be incorrect grounding between terminals 25 and 11 or 26 and 11.

No ↓

Go to DOOR LATCH SWITCH in Electrical Components Inspection. (See page BF-70.)

O.K. → Reinstall any part removed. → Go to PROCEDURE 1 (START) in Preliminary Check. (See page BF-45.)

N.G. ↓

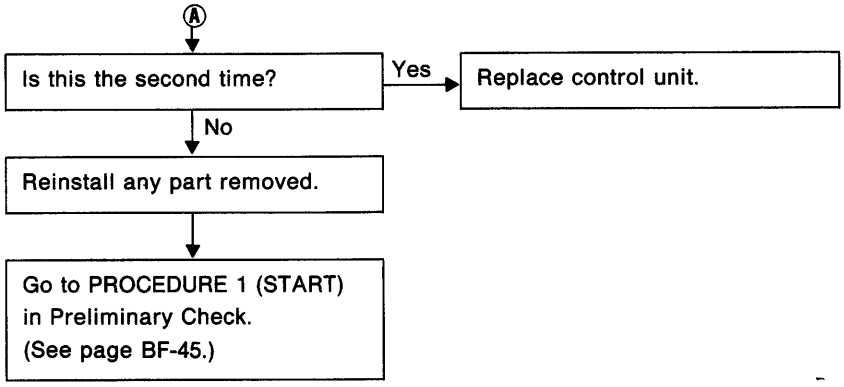
Check door latch switch harness for open and short circuit.

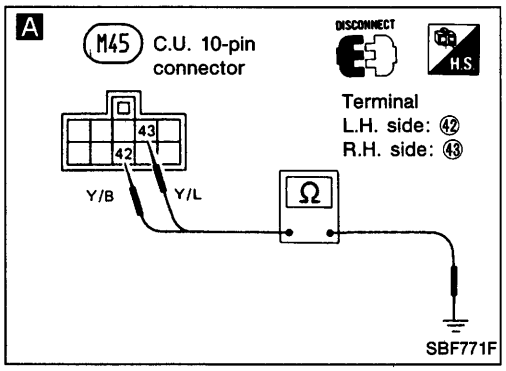
N.G. → Repair door latch switch harness.

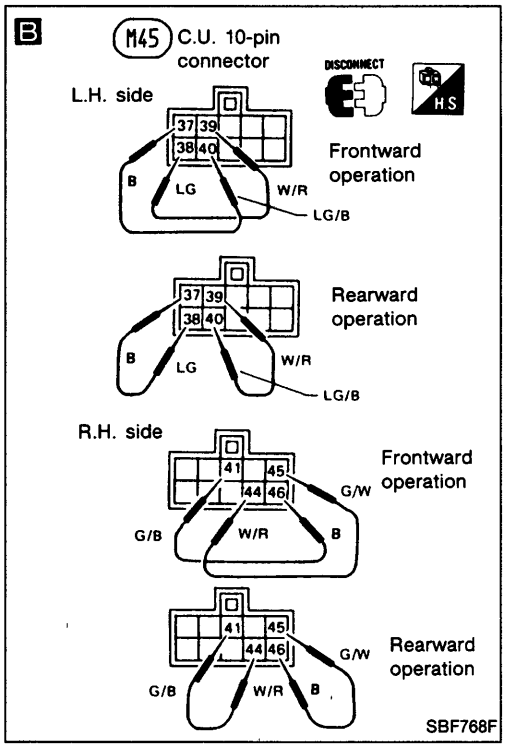
O.K. ↓

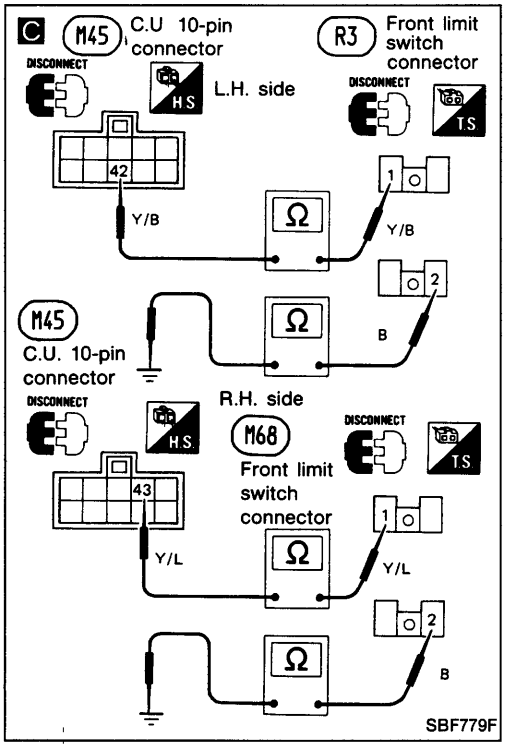
Replace door lock assembly.

Diagnostic Procedure 2 (Cont'd)









Diagnostic Procedure 3

START

A

CHECK FRONT LIMIT SWITCH CIRCUIT.
1) Disconnect 10-pin connector from control unit.
2) Check continuity.

	Terminals	Shoulder belt buckle position	Continuity
L.H. side	㊷ - Ground	At front	No
		Not at front	Yes
R.H. side	㊸ - Ground	At front	No
		Not at front	Yes

O.K. → (Go to Ⓑ on next page.)

B Check drive motor for operation.

N.G.

C

1) Disconnect connector from front limit switch.
2) Check continuity.

	Terminals
L.H. side	㊷ - ① ② - Ground (M101, M165)
R.H. side	㊸ - ① ② - Ground (M101, M165)

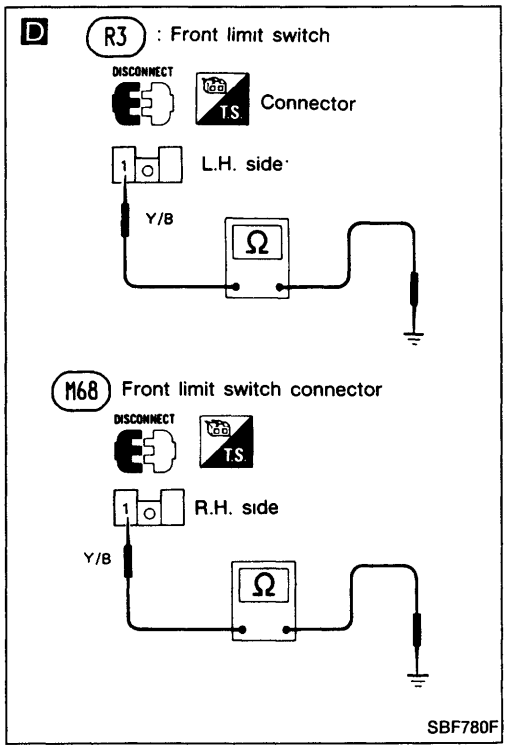
Continuity should exist.

N.G. → Repair harness.

O.K.

(Go to Ⓐ on next page.)

Diagnostic Procedure 3 (Cont'd)



D

Ⓐ

Does continuity exist?

	Connector	Terminals
L.H. side	R3	① - Ground
R.H. side	M68	① - Ground

Yes → Repair harness.
There will be incorrect grounding between terminals ㊷ and ① or ㊸ and ①.

No ↓

Go to FRONT LIMIT SWITCH in Electrical Components Inspection. (See page BF-70.)

O.K. → Replace guide rail assembly.

N.G. ↓

Check front limit switch harness for open and short circuit.

N.G. → Repair front limit switch harness.

O.K. ↓

Replace front limit switch.

Ⓑ

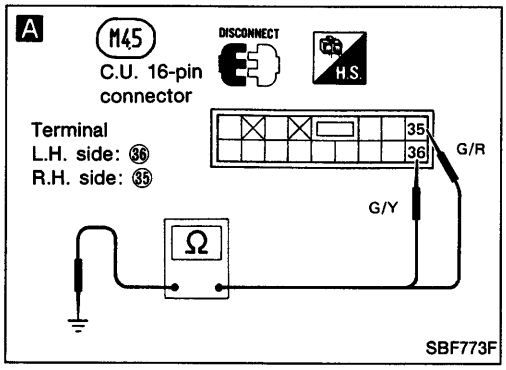
Is this the second time?

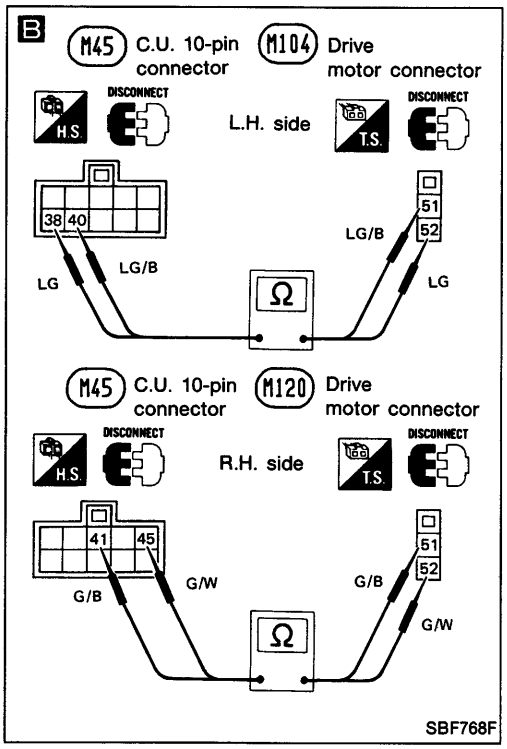
Yes → Replace control unit.

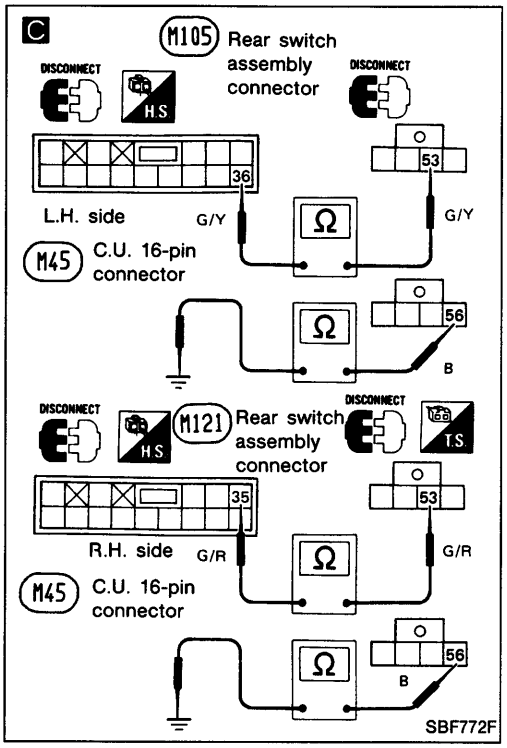
No ↓

Reinstall any part removed.

Go to PROCEDURE 1 (START) in Preliminary Check.
(See page BF-45.)







Diagnostic Procedure 4

START

A

CHECK REAR LIMIT SWITCH CIRCUIT.
1) Disconnect 16-pin connector from control unit.
2) Check continuity.

	Terminals	Shoulder belt buckle position	Continuity
L.H. side	36 - Ground	At rear	No
		Not at rear	Yes
R.H. side	35 - Ground	At rear	No
		Not at rear	Yes

O.K. → (Go to Ⓑ on next page.)

B Check drive motor for operation.

N.G.

C

1) Disconnect connector from rear switch assembly.
2) Check continuity.

	Terminals
L.H. side	36 - 53 56 - Ground (M101), (M165)
R.H. side	35 - 53 56 - Ground (M101), (M165)

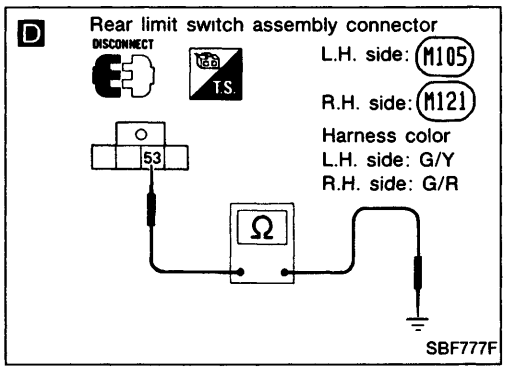
Continuity should exist.

N.G. → Repair harness.

O.K.

(Go to Ⓐ on next page.)

Diagnostic Procedure 4 (Cont'd)



D

Ⓐ

Does continuity exist?

	Connector	Terminals
L.H. side	M116	㊸ - Ground
R.H. side	M121	㊸ - Ground

Yes → Repair harness.
There will be incorrect grounding between terminals ㊱ and ㊸ or ㉟ and ㊸.

No ↓

Go to REAR LIMIT SWITCH in Electrical Components Inspection. (See page BF-70.)

O.K. → (Go to Ⓑ below.)

N.G. ↓

Check rear limit switch harness for open or short circuit.

N.G. → Repair rear limit switch harness.

O.K. ↓

Replace rear switch assembly.

Ⓑ

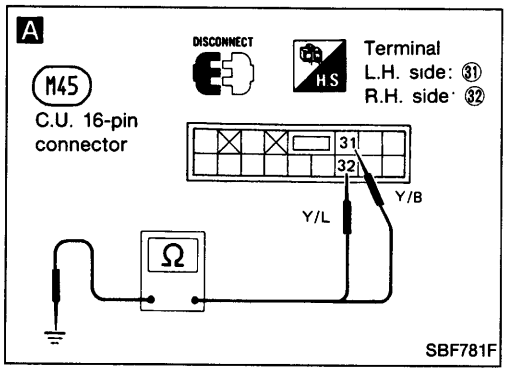
Is this the second time?

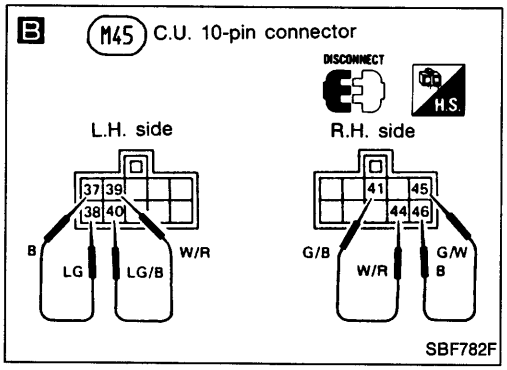
Yes → Replace control unit.

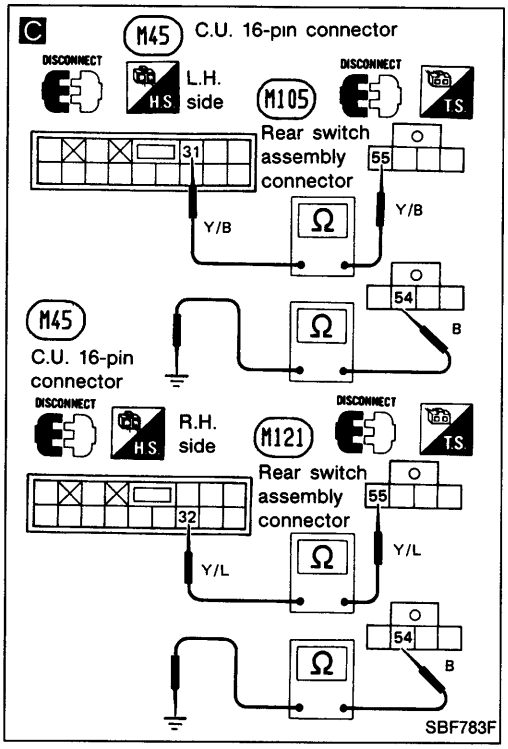
No ↓

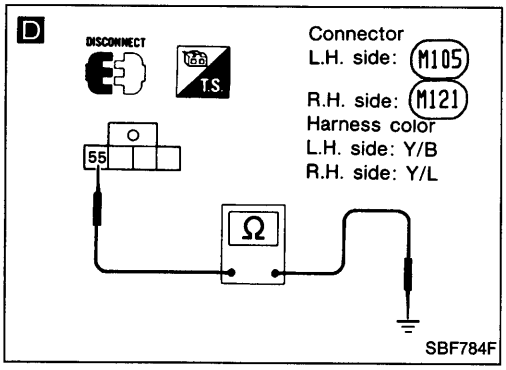
Reinstall any part removed.

Go to PROCEDURE 1 (STEP 3) (See page BF-45.) or PROCEDURE 2 (STEP 3) (See page BF-47.) in Preliminary Check.









Diagnostic Procedure 5

START

A

CHECK SHOULDER BELT BUCKLE SWITCH CIRCUIT.
1) Disconnect 16-pin connector from control unit.
2) Check continuity when shoulder belt buckle is at rear lock position.

	Terminals	Shoulder belt	Continuity
L.H. side	31 - Ground	Fasten	Yes
		Unfasten	No
R.H. side	32 - Ground	Fasten	Yes
		Unfasten	No

B If shoulder belt buckle is not at rear lock position, set it to rear lock position.

O.K. → (Go to Ⓑ on next page.)

N.G. ↓

C

1) Disconnect connector from rear switch assembly.
2) Check continuity.

	Terminals
L.H. side	31 - 55 54 - Ground (M101, M165)
R.H. side	32 - 55 54 - Ground (M101, M165)

Continuity should exist.

N.G. → Repair harness.

O.K. ↓

D

Does continuity exist.?

	Connector	Terminals
L.H. side	M105	55 - Ground
R.H. side	M121	55 - Ground

Yes → Repair harness.
There will be incorrect grounding between terminals 31 and 55 or 32 and 55.

No ↓

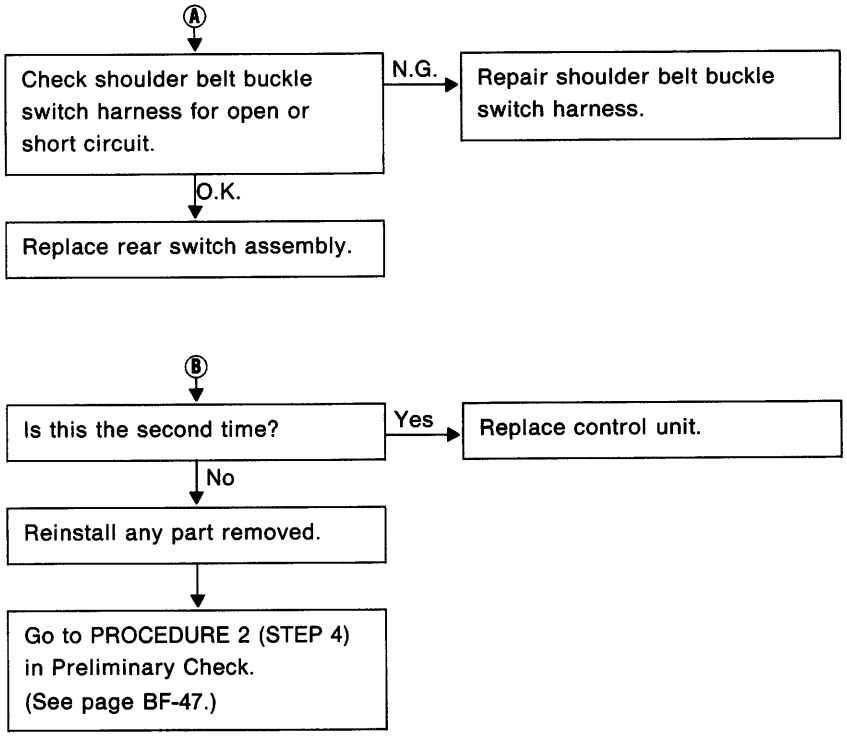
Go to SHOULDER BELT BUCKLE SWITCH in Electrical Components Inspection. (See page BF-70.)

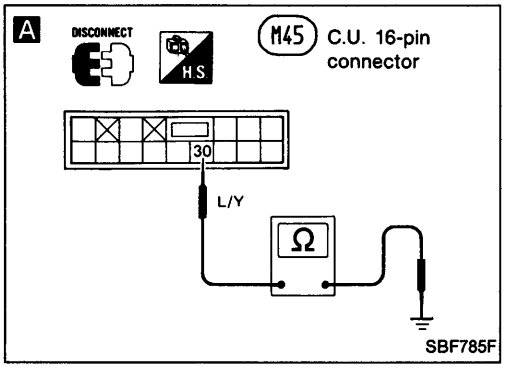
O.K. → (Go to Ⓑ on next page.)

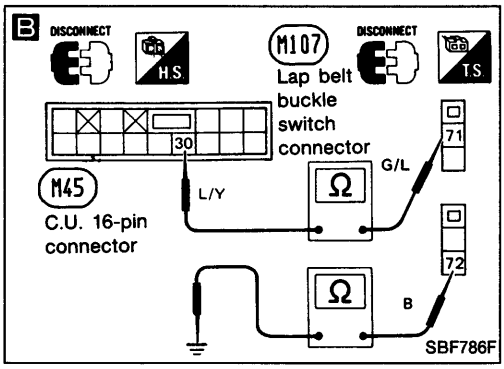
N.G. ↓

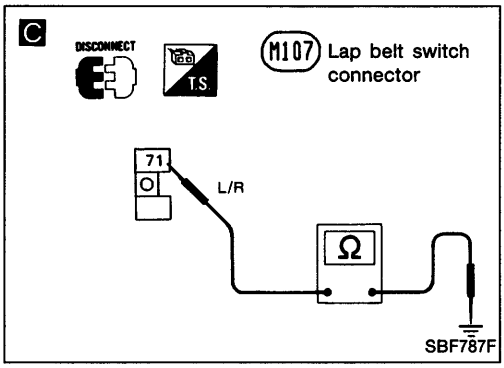
(Go to Ⓐ on next page.)

Diagnostic Procedure 5 (Cont'd)









Diagnostic Procedure 6

START

A

CHECK LAP BELT BUCKLE SWITCH CIRCUIT (L.H. only).
1) Disconnect 16-pin connector from control unit.
2) Check continuity.

Terminals	Lap belt	Continuity
㉚ - Ground	Fasten	No
	Unfasten	Yes

O.K. → (Go to Ⓐ on next page.)

N.G.

B

1) Disconnect lap belt switch connector.
2) Check continuity.

Terminals
㉚ - ㉛
㉜ - Ground (M101, M165)
Continuity should exist.

N.G. → Repair harness.

O.K.

C

Does continuity exist?

Terminals
㉛ - Ground

Yes → Repair harness. There will be incorrect grounding.

No

Go to LAP BELT BUCKLE SWITCH in Electrical Components Inspection. (See page BF-71.)

O.K. → (Go to Ⓐ on next page.)

N.G.

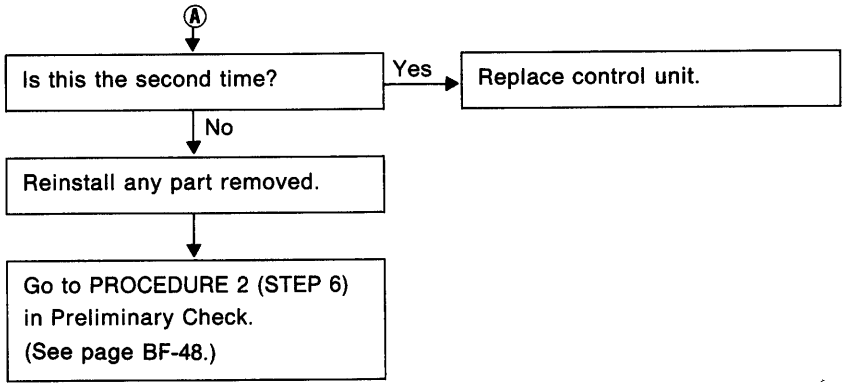
Check lap belt buckle switch harness for open and short circuit.

N.G. → Repair lap belt buckle switch harness.

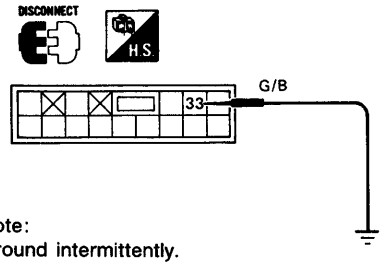
O.K.

Replace shoulder belt buckle assembly.

Diagnostic Procedure 6 (Cont'd)



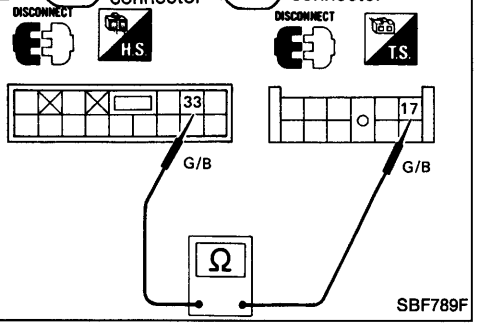
A (M45) C.U. 16-pin connector



Note:
Ground intermittently.

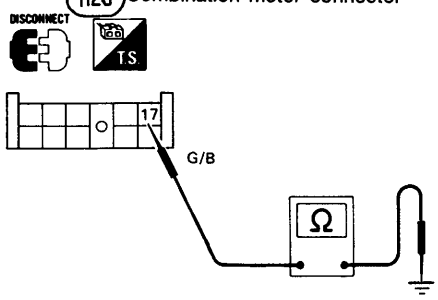
SBF788F

B (M45) C.U. 16-pin connector (M28) Combination meter connector



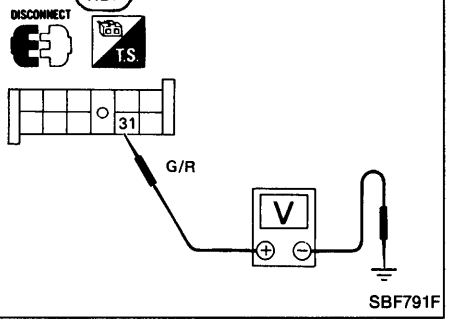
SBF789F

C (M28) Combination meter connector



SBF790F

D (M29) Combination meter connector



SBF791F

Diagnostic Procedure 7

START

A

CHECK WARNING CHIME CIRCUIT.
1) Disconnect 16-pin connector from control unit.
2) Check warning chime.

Terminals	Method	Result
(33) - Ground	Ground intermittently.	Sound

O.K. → (Go to Ⓐ below.)

N.G.

B

1) Disconnect connector(s) from combination meter.
2) Check continuity.

Terminals
(33) - (17)
Continuity should exist.

N.G. → Repair harness.

O.K.

C

Does continuity exist?

Terminals
(17) - Ground

Yes → Repair harness. There will be incorrect grounding.

No

D

Check battery voltage existence.

Terminals
(31) - Ground
Battery voltage should exist.

N.G. → Repair harness. For details, refer to POWER SUPPLY ROUTING in EL section.

O.K.

Is this the first time? Yes → Replace warning chime.

No

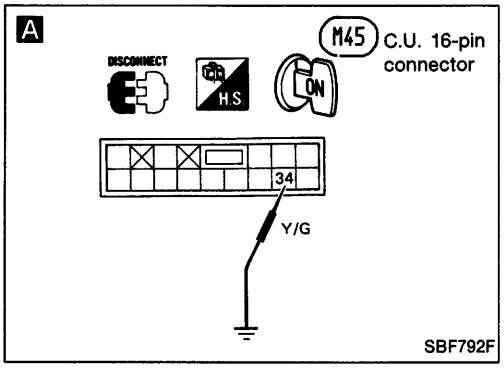
Ⓐ

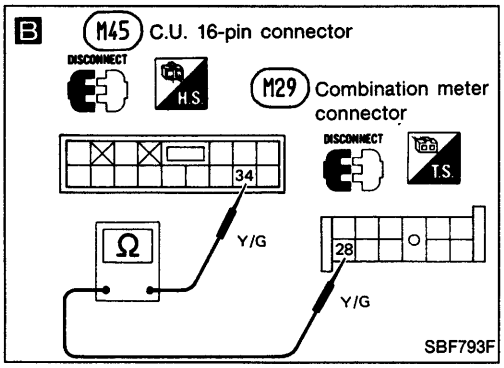
Is this the second time? Yes → Replace control unit.

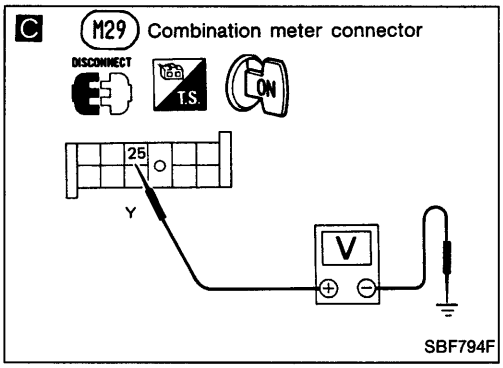
No

Reinstall any part removed.

Go to PROCEDURE 2 (START) in Preliminary Check. (See page BF-47.)







Diagnostic Procedure 8

START

A

CHECK WARNING LAMP CIRCUIT.
1) Disconnect 16-pin connector from control unit.
2) Check warning lamp.

Terminals	Result
㉞ - Ground	Glow

O.K. → (Go to Ⓐ below.)

N.G.

B

1) Disconnect connector from combination meter.
2) Check continuity.

Terminals
㉞ - ㉘

Continuity should exist.

N.G. → Repair harness.

O.K.

B

Does continuity exist?

Terminals
㉘ - Ground

Yes → Repair harness. There will be incorrect grounding.

No

C

Check battery voltage existence.

Terminals
㉕ - Ground

Battery voltage should exist.

N.G. → Repair harness. For details, refer to POWER SUPPLY ROUTING in EL section.

O.K.

Is warning lamp bulb burn out? Yes → Replace bulb.

No

Ⓐ

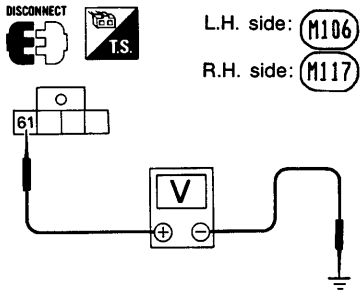
Is this the second time? Yes → Replace control unit.

No

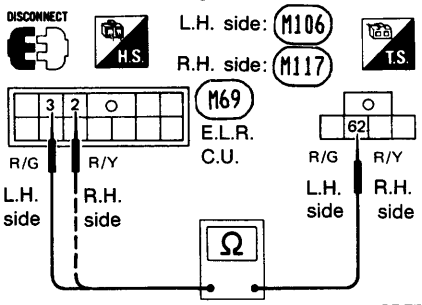
Reinstall any part removed.

Go to PROCEDURE 2 (START) in Preliminary Check. (See page BF-47.)

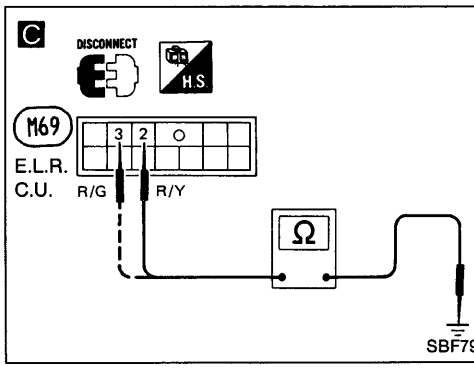
A Shoulder belt locking canceler connector



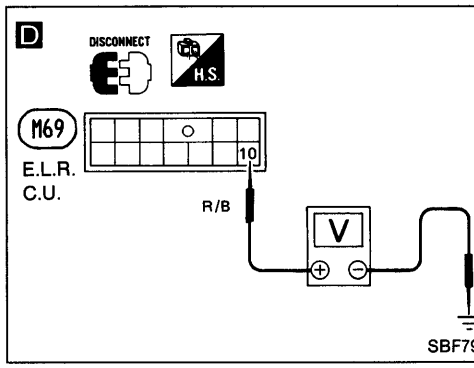
B Shoulder belt locking canceler connector



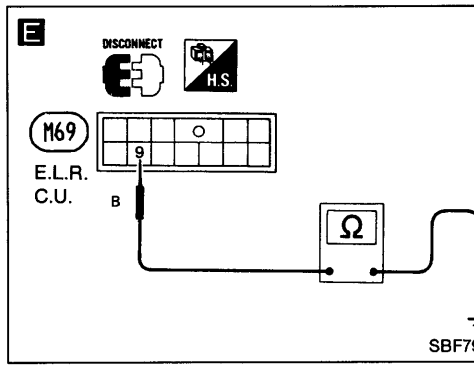
C



D



E



Diagnostic Procedure 9

START

A Does battery voltage exist between terminal ⑥① and ground?

- No → Repair harness, harness connector and fuse between battery and terminal ⑥①.
- Yes ↓

Go to SEAT SLIDE SWITCH in Electrical Components Inspection. (See page BF-71).

- N.G. → Replace seat slide switch.
- O.K. ↓

B Does continuity exist?

	Connector	Terminals
L.H. side	M106	③ - ⑥②
R.H. side	M117	② - ⑥②

- No → Repair harness and harness connector.
- Yes ↓

C Does continuity exist between terminals ② and ground, and ③ and ground?

- Yes → Repair harness. There will be incorrect grounding.
- No ↓

D Does battery voltage exist between terminal ⑩ and ground?

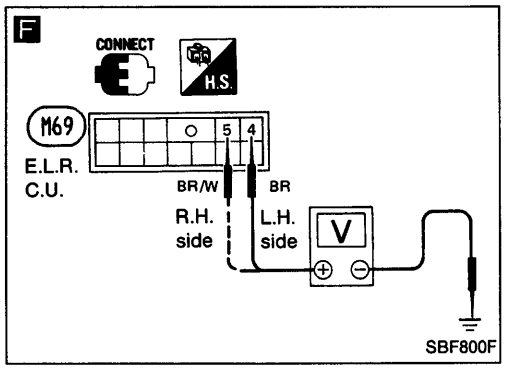
- No → Repair harness, harness connector and fuse between battery and terminal ⑩.
- Yes ↓

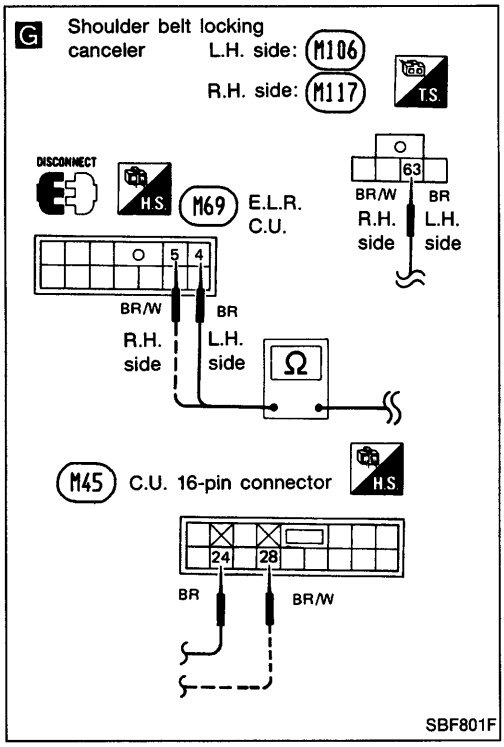
E Does continuity exist between terminal ⑨ and ground?

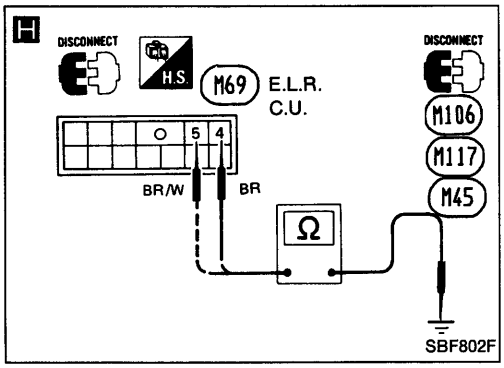
- No → Repair harness, harness connector between terminal ⑨ and ground.
- Yes ↓

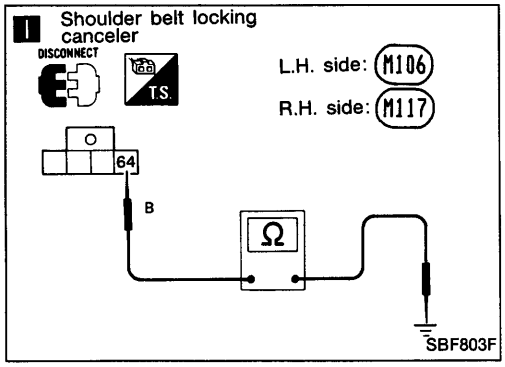
(Go to Ⓐ on next page.)

Diagnostic Procedure 9 (Cont'd)









Ⓐ

F Does battery voltage exist for 5 seconds and then go off when moving seat front-rear adjusting lever?

	Terminals
L.H. side	④ - Ground
R.H. side	⑤ - Ground

No → Replace E.L.R. control unit.

Yes ↓

G Does continuity exist?

	Connector	Terminals
L.H. side	M106	④ - ⑬
R.H. side	M117	⑤ - ⑬
—		④ - ㉔
—		⑤ - ㉘

No → Repair harness and harness connector.

Yes ↓

H Does continuity exist between terminals ④ and ground, and ⑤ and ground?
- Disconnect connectors M106, M117 and M45.

Yes → Repair harness. There will be incorrect grounding.

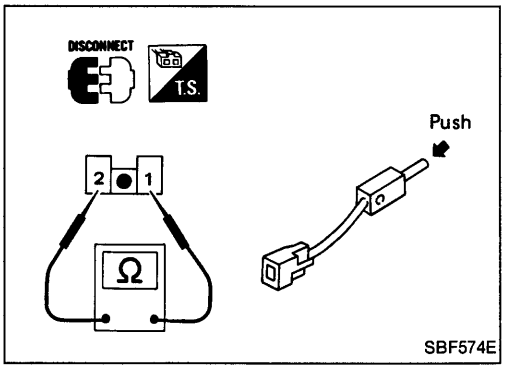
No ↓

I Does continuity exist between terminal ㊹ and ground?

No → Repair harness and harness connector between ㊹ and ground.

Yes ↓

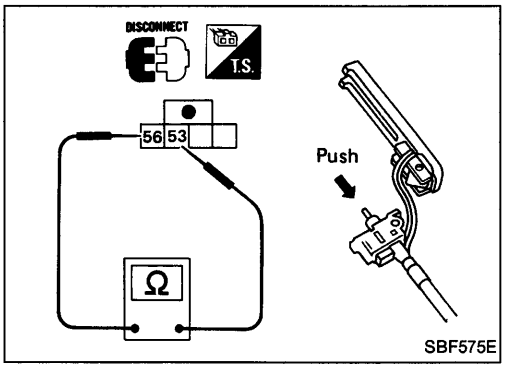
Replace shoulder belt locking canceler (shoulder belt retractor assembly).



Electrical Components Inspection

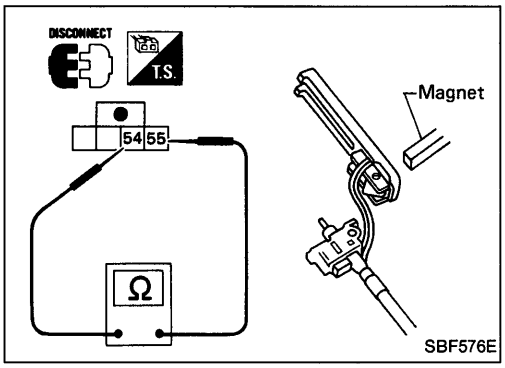
FRONT LIMIT SWITCH

Condition	Continuity
Pushed	No
Released	Yes



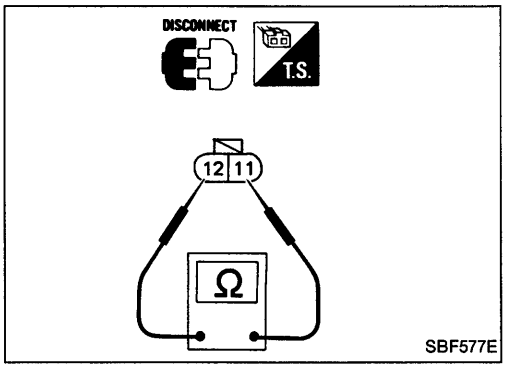
REAR LIMIT SWITCH

Condition	Continuity
Pushed	No
Released	Yes



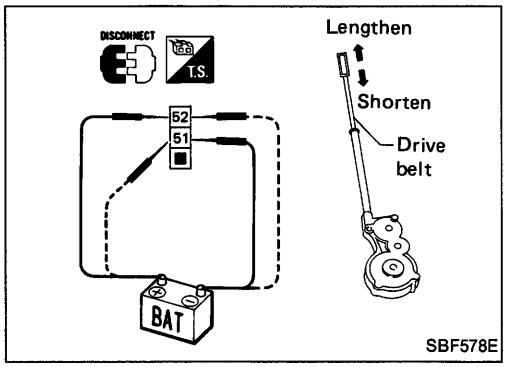
SHOULDER BELT BUCKLE SWITCH

Condition	Continuity
Move magnet toward buckle switch.	Yes
Move magnet away buckle switch.	No



DOOR LATCH SWITCH (Built-in door lock assembly)

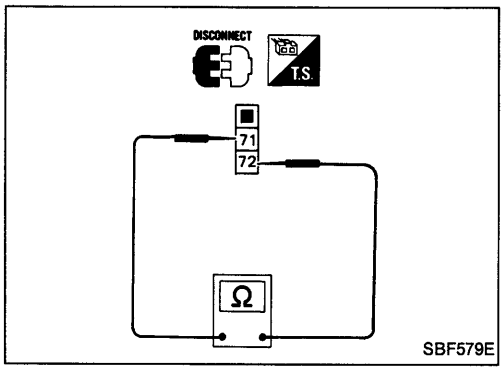
Door condition	Continuity
Open	Yes
Closed	No



DRIVE MOTOR ASSEMBLY

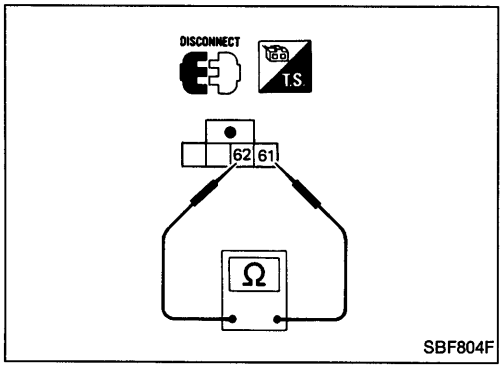
Terminals		Drive belt operation
⊕	⊖	
⑫	⑪	Lengthen
⑪	⑫	Shorten

Electrical Components Inspection (Cont'd)



LAP BELT BUCKLE SWITCH
(Built-in lap belt buckle for L.H. side)

Condition	Continuity
Fastened	No
Unfastened	Yes



SEAT SLIDE SWITCH
(Seat slide inside rail)

Condition	Continuity
Move seat front-rear adjusting lever	Yes
Release seat front-rear adjusting lever	No

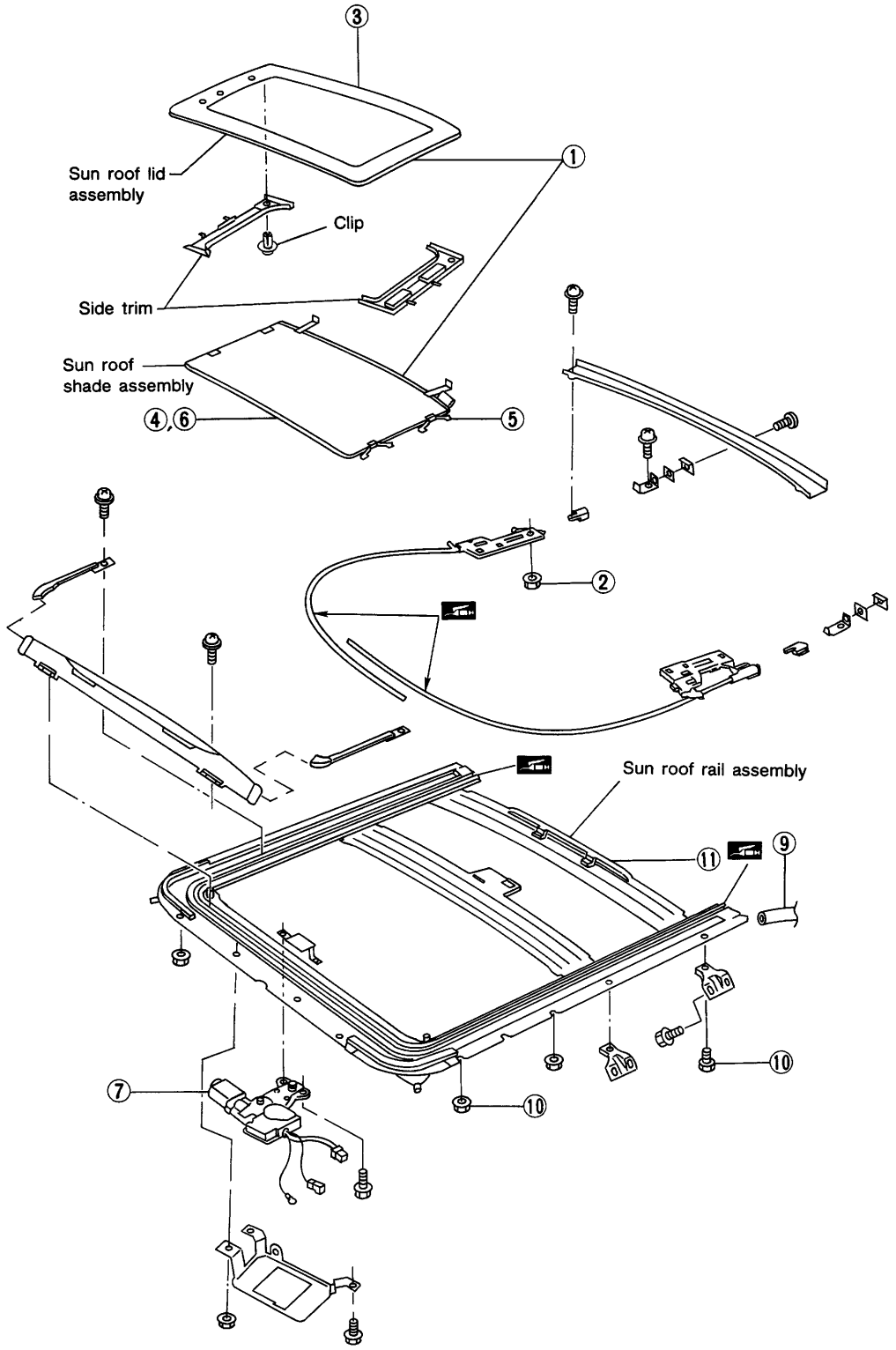
Electric Sun Roof

- After any adjustment, check sun roof 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.

REMOVAL — Sun roof assembly

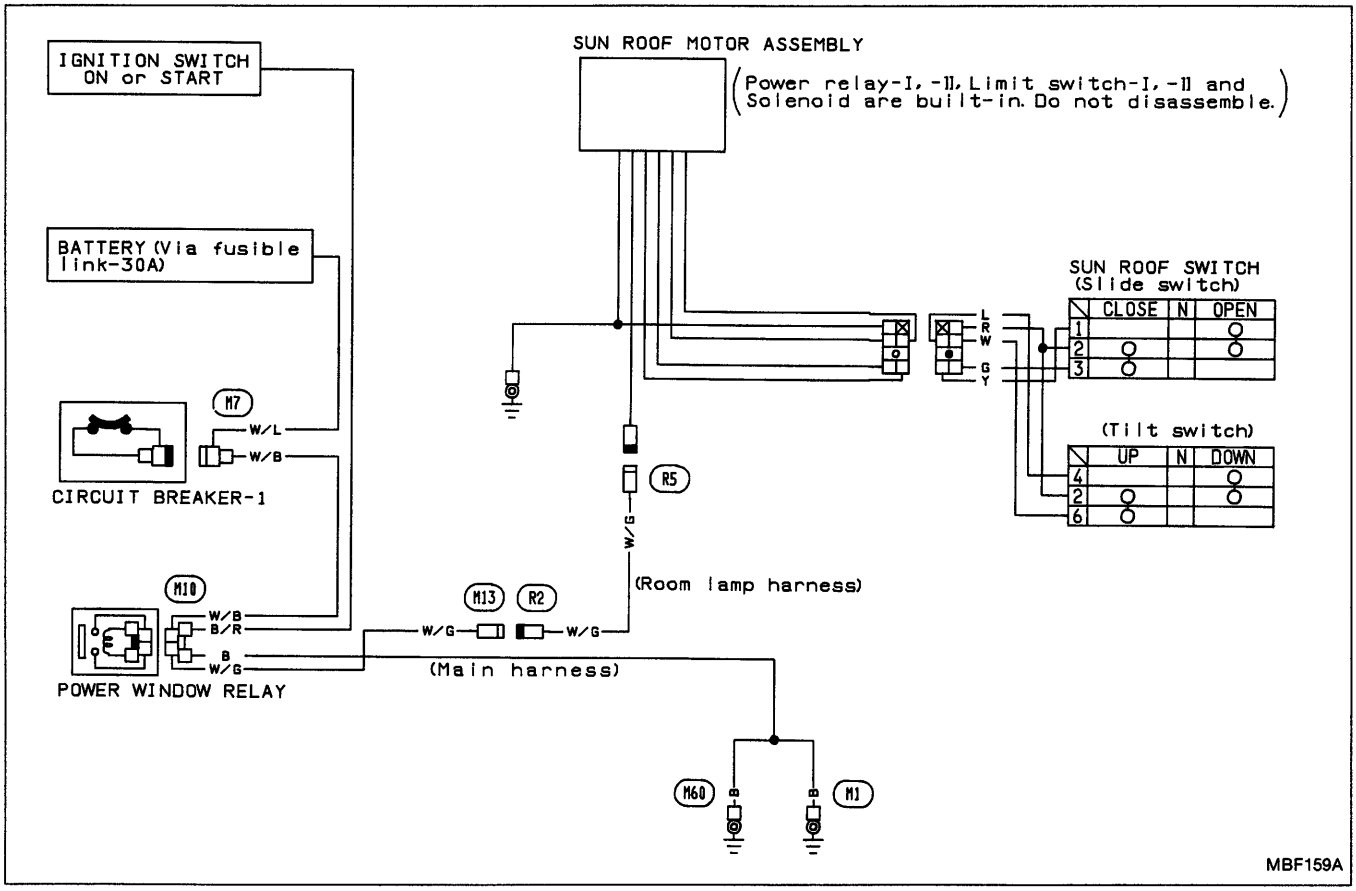
① Fully close or tilt up sun roof lid assembly. Fully open sun roof shade assembly. Remove clips and side trim.
② Close sun roof lid, and remove the six nuts from the back of the sun roof lid.
③ Lift out sun roof away from roof.
④ Pull sun roof shade forward.
⑤ Remove the four shade locks located beside sun roof shade.
⑥ Remove sun roof shade.
⑦ Remove sun roof motor assembly.
⑧ Disconnect interior lamp harness.
⑨ Disconnect front and rear drain hoses.
⑩ Remove nuts and bolts securing sun roof rails.
⑪ Remove sun roof rail assembly.

Electric Sun Roof (Cont'd)



MBF125A

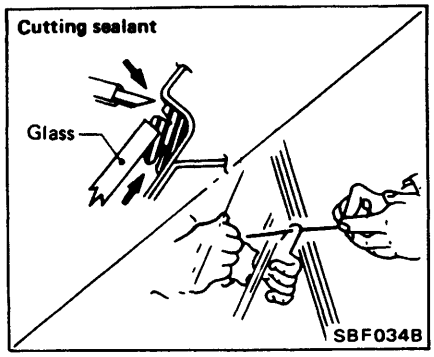
Wiring Diagram



Windshield and Rear Window

REMOVAL

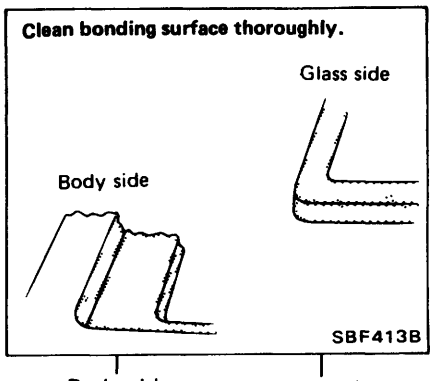
After removing moldings, remove glass.



CAUTION:
Be careful not to scratch glass when removing.

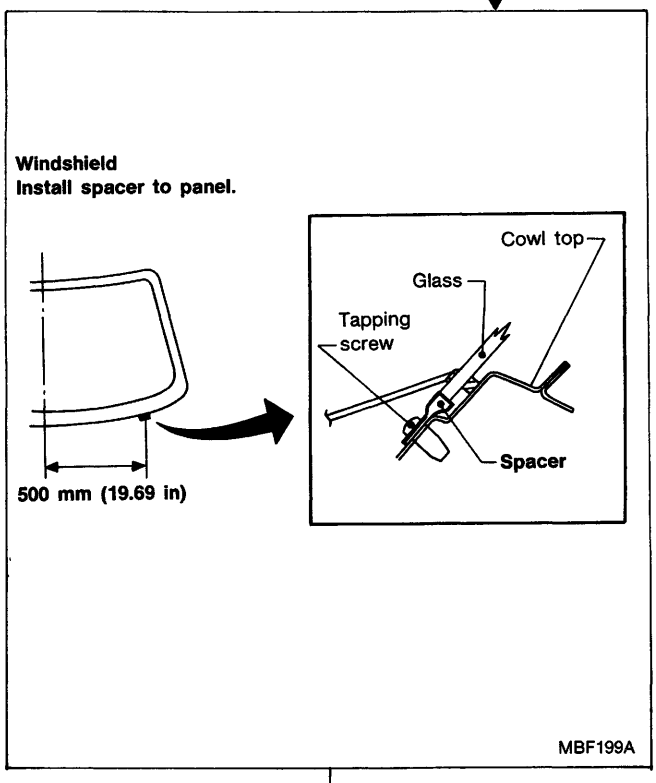
INSTALLATION

- **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.**

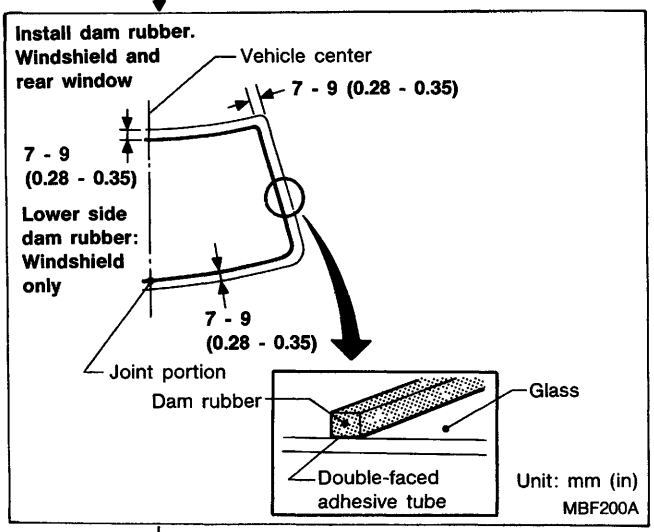


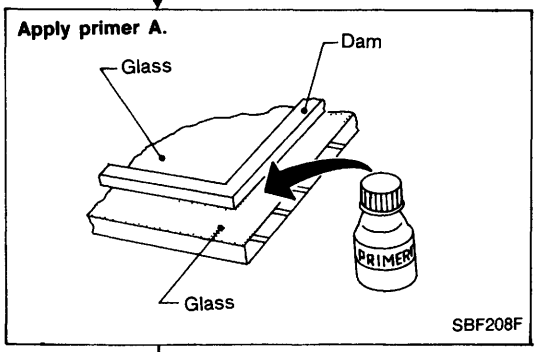
WARNING:
Keep heat or open flames away as primers are flammable.

Body side



Glass side





CAUTION:
Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

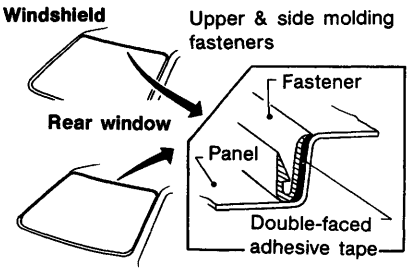
Ⓐ Ⓑ

Windshield and Rear Window (Cont'd)

Ⓐ

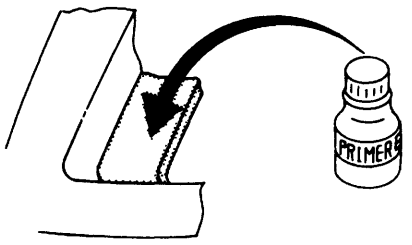
Install molding fastener.

When installing it, heat body panel and fastener to approx. 30 to 40°C (86 to 104°F).



SBF017A

Apply primer E.

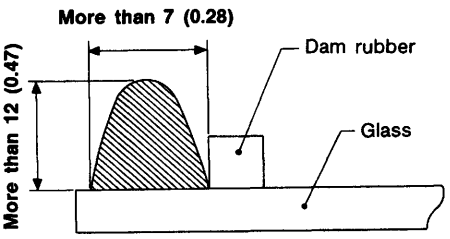


SBF038B

CAUTION:
Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

Ⓑ

Apply sealant evenly.



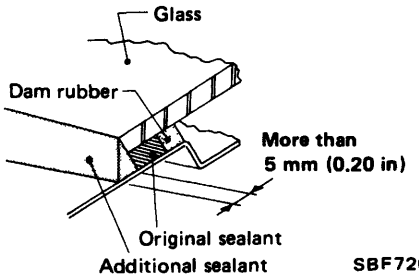
Unit: mm (in)

SBF018A

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.

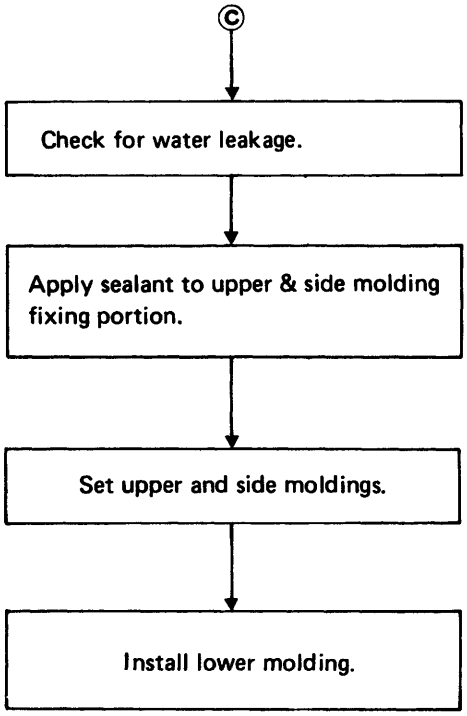
Apply additional sealant uniformly to the lower portion of glass, as shown below:



SBF720C

Ⓒ

Windshield and Rear Window (Cont'd)



CAUTION:
For sealant drying period, refer to "Drying Time for Sealant".

CAUTION:
Molding must be installed securely so that it is in position and leaves no gap.

For details of moldings, refer to "Exterior".

Drying Time for Sealant

Reference: Time required for sealant to dry to desired hardness.

Unit: days

Relative humidity % / Temperature °C (°F)	Windshield and Rear window		
	90	50	25
40 (104)	1.5	2.5	5.0
25 (77)	2.5	4.0	7.5
5 (41)	5.0	13.0	20.5

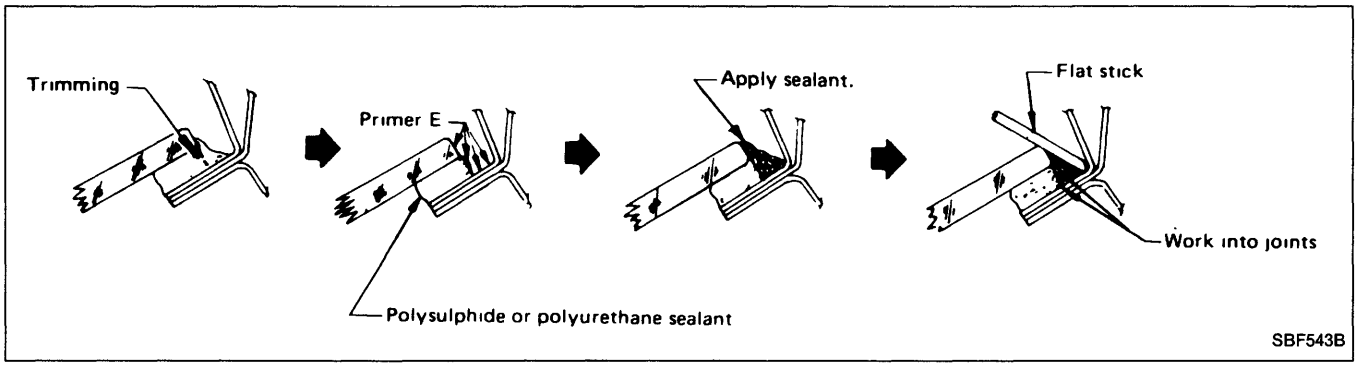
CAUTION:
Advise the user of the fact that vehicle should not be driven on rough roads or surfaces until sealant has properly vulcanized.

Repair 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.



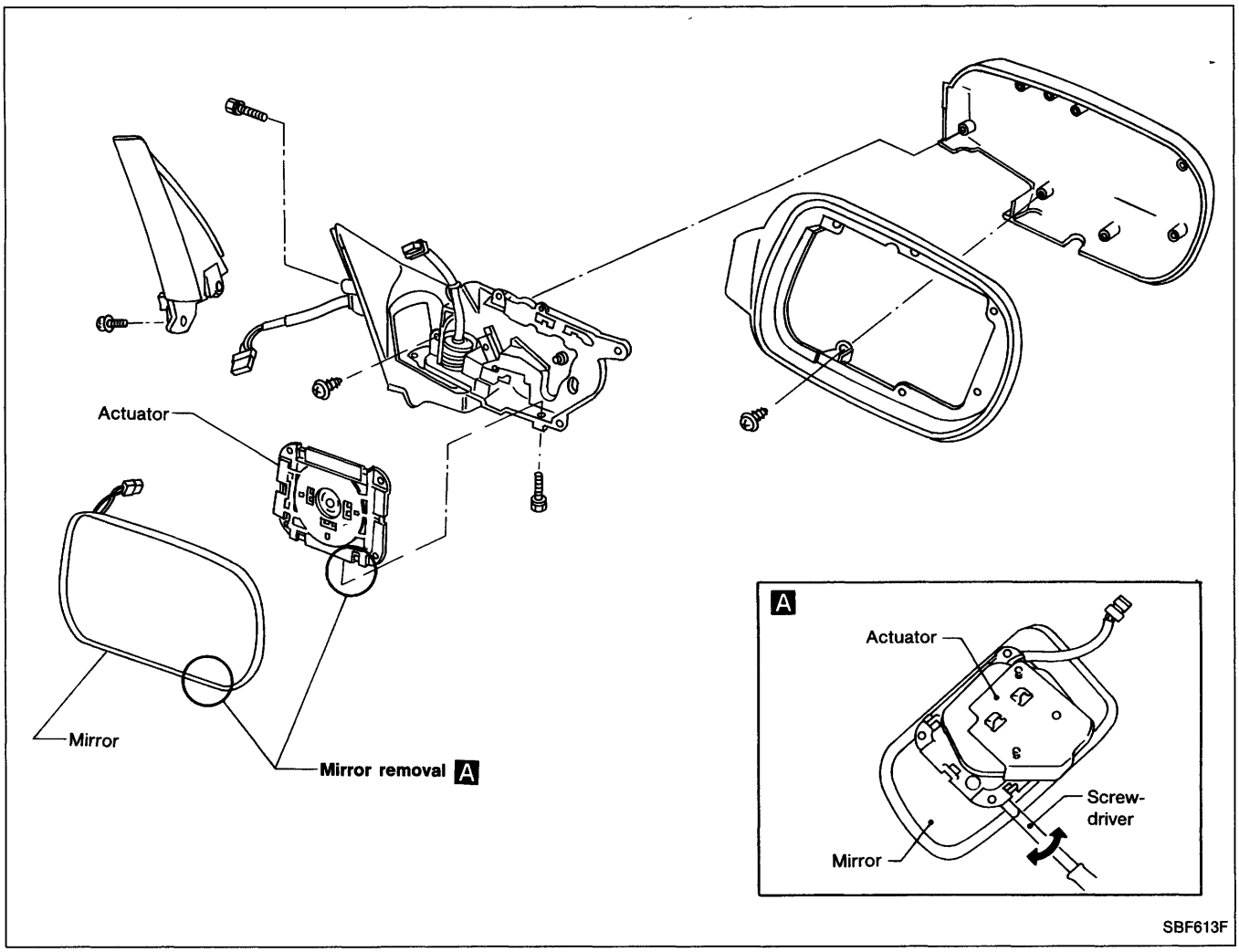
Afterwards, install molding securely.

Door Mirror

CAUTION:
Be careful not to scratch door rearview mirror body.

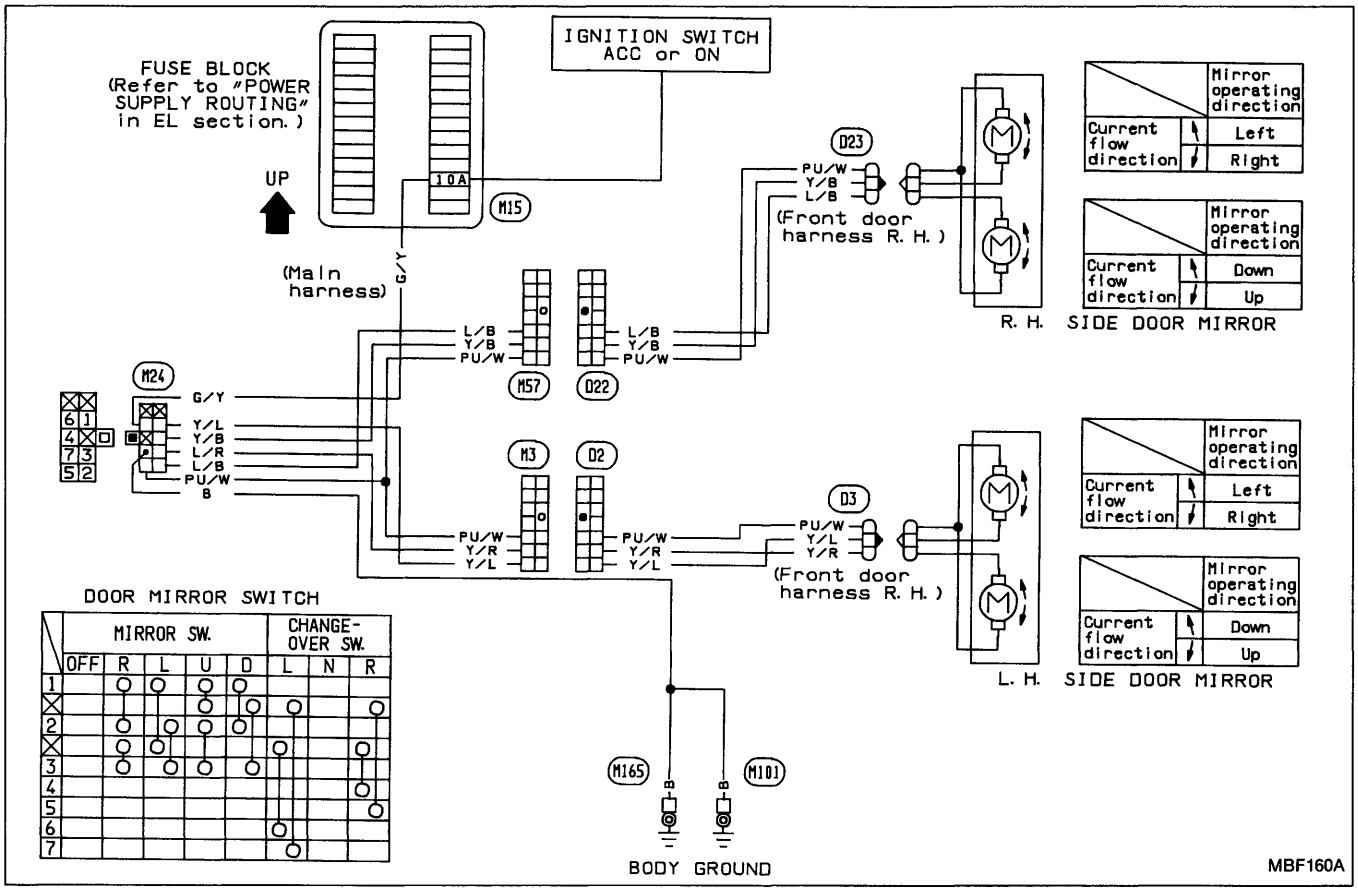
REMOVAL — Door mirror

1. Remove door trim. Refer to "Removal — Door trim" in "Interior" for details.
2. Remove inner cover front corner of door.
3. Disconnect door mirror harness connector.
4. Remove harness clips.
5. Remove three bolts securing door mirror.



Door Mirror (Cont'd)

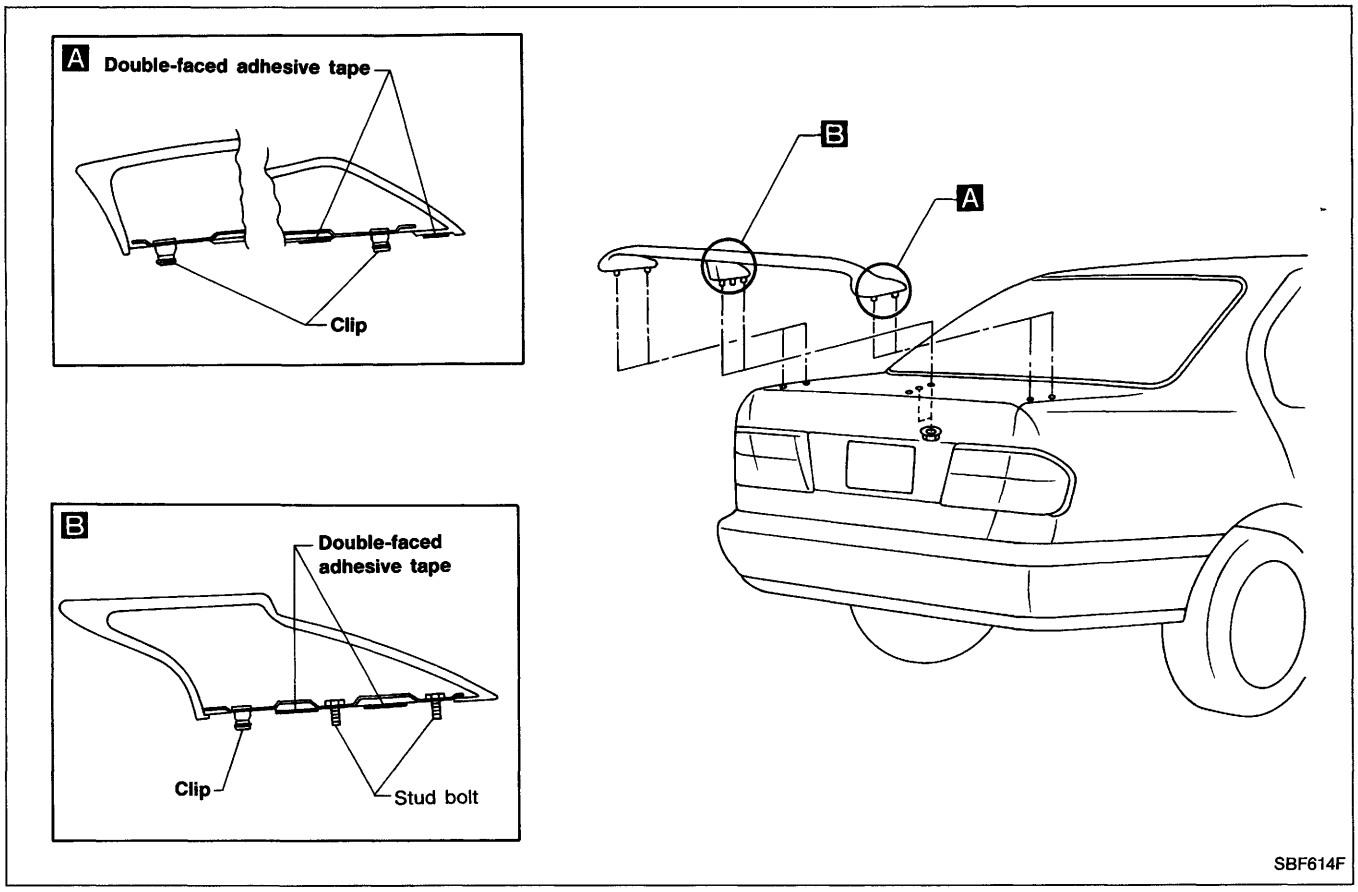
WIRING DIAGRAM



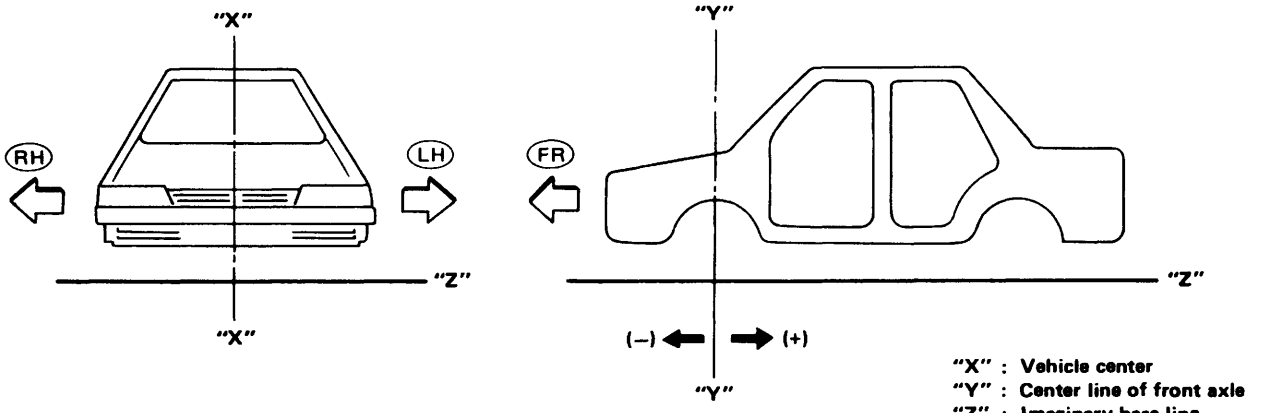
- When installing, make sure that there are not gaps or waves at ends of air spoiler.
- Before installing spoiler, clean and remove oil from surface where spoiler will be mounted.

REAR AIR SPOILER

Sedan



- 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".

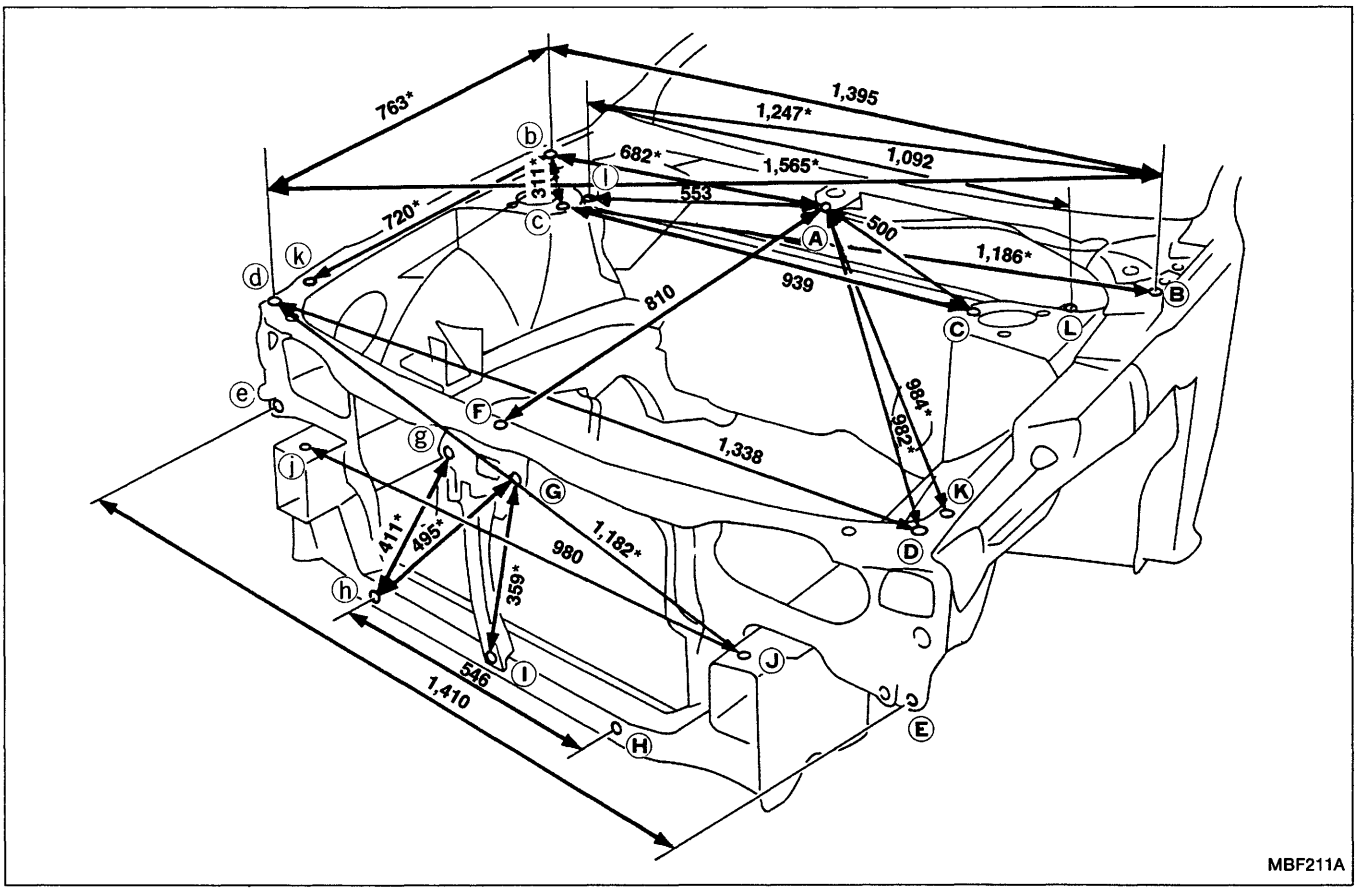


"X" : Vehicle center
"Y" : Center line of front axle
"Z" : Imaginary base line [200 mm below datum line ("OZ" at design plan)]

(LH) : L.H. side
(RH) : R.H. side

Engine Compartment

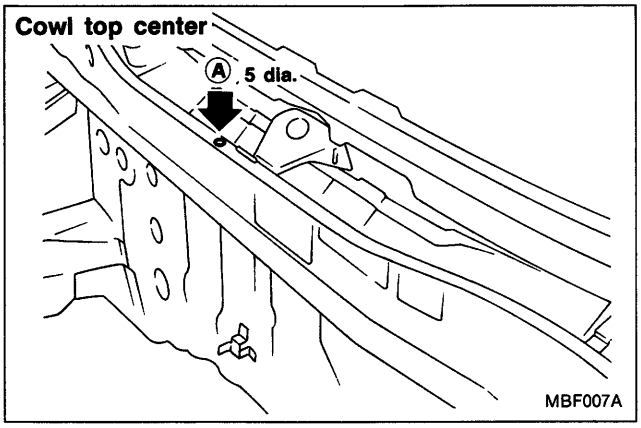
MEASUREMENT

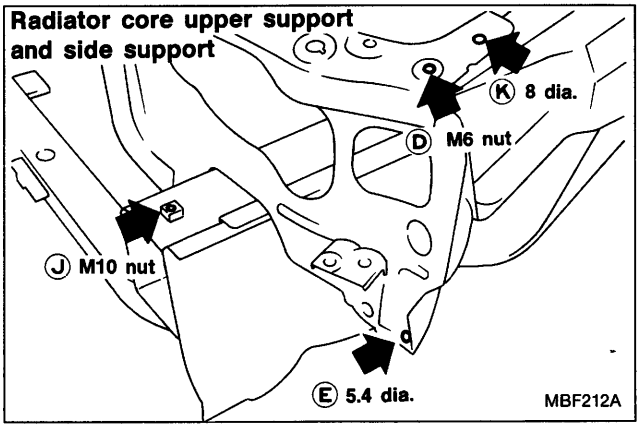


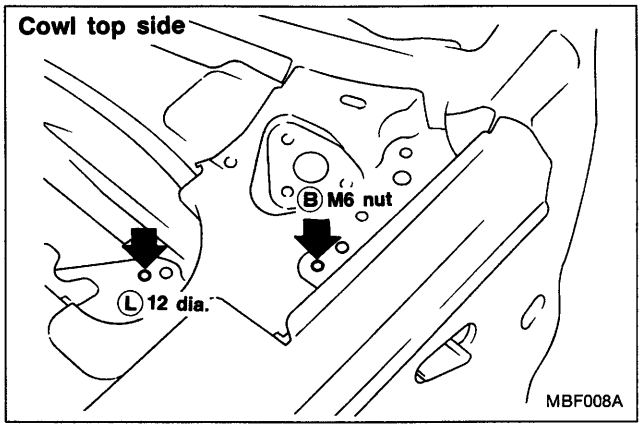
Engine Compartment (Cont'd)

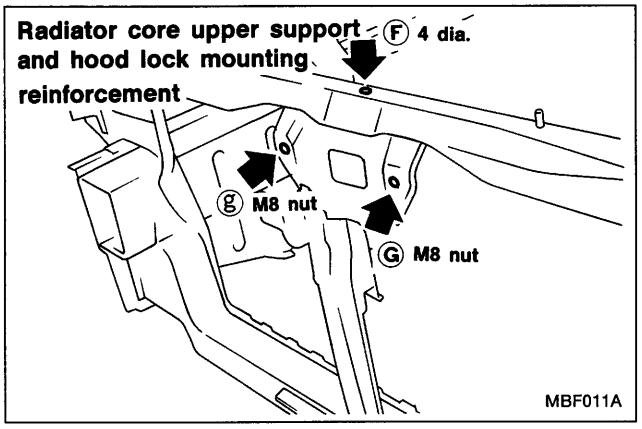
MEASUREMENT POINTS

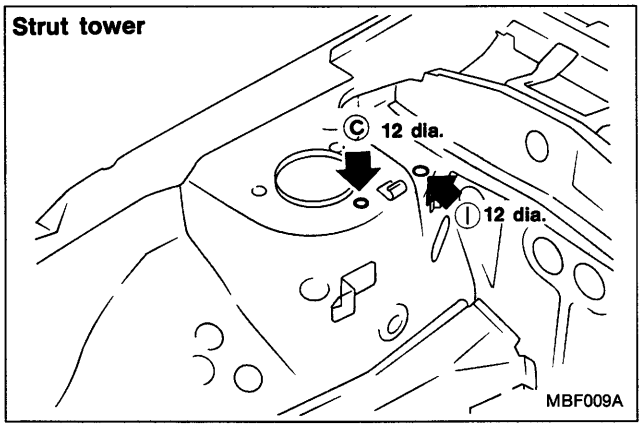
Unit: mm

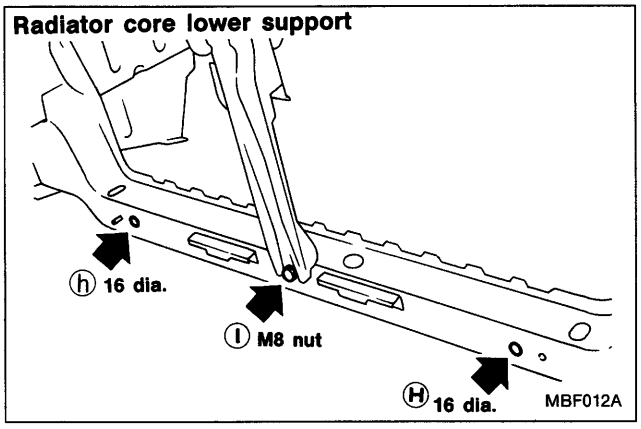






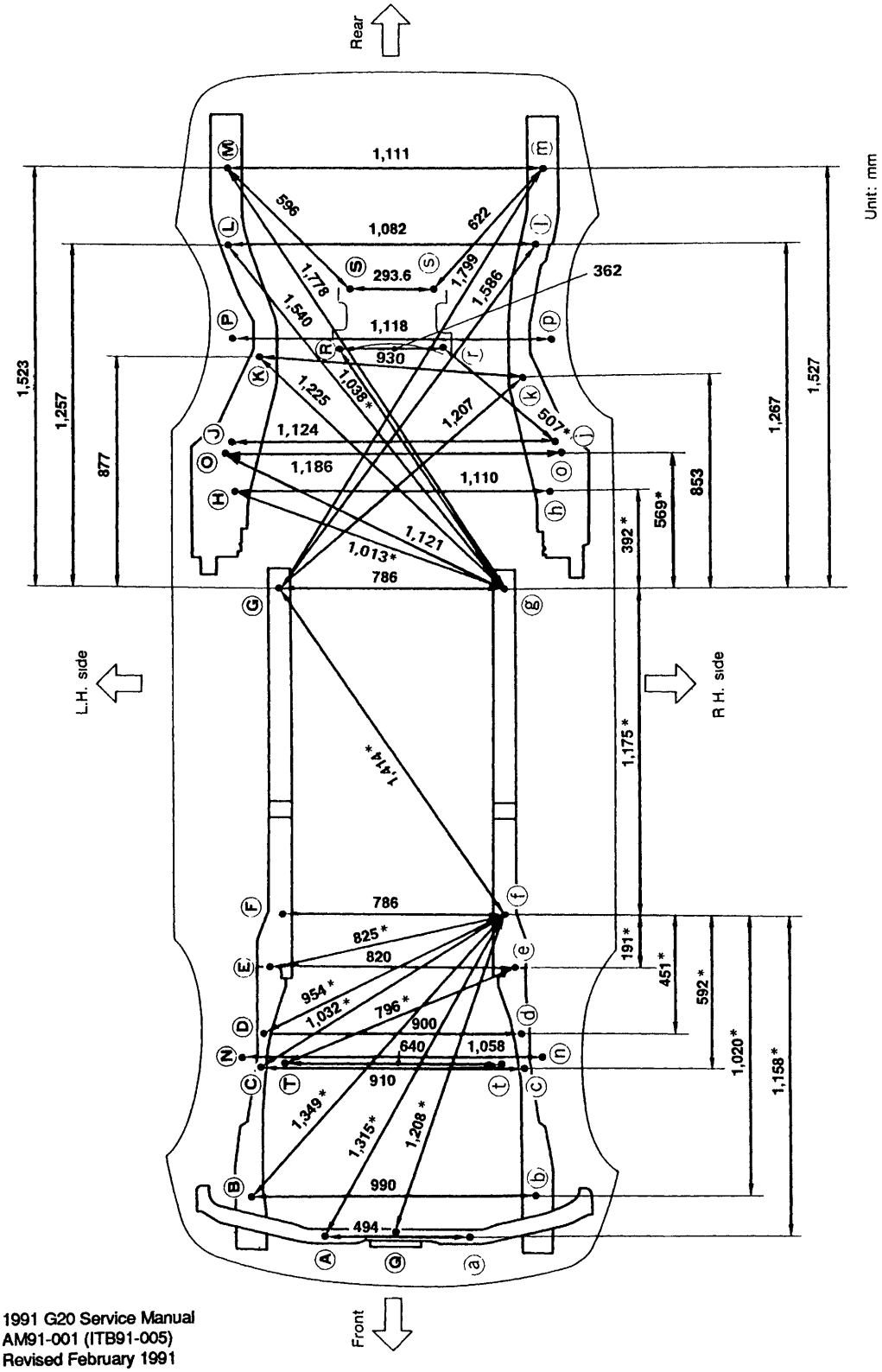






UNDERBODY

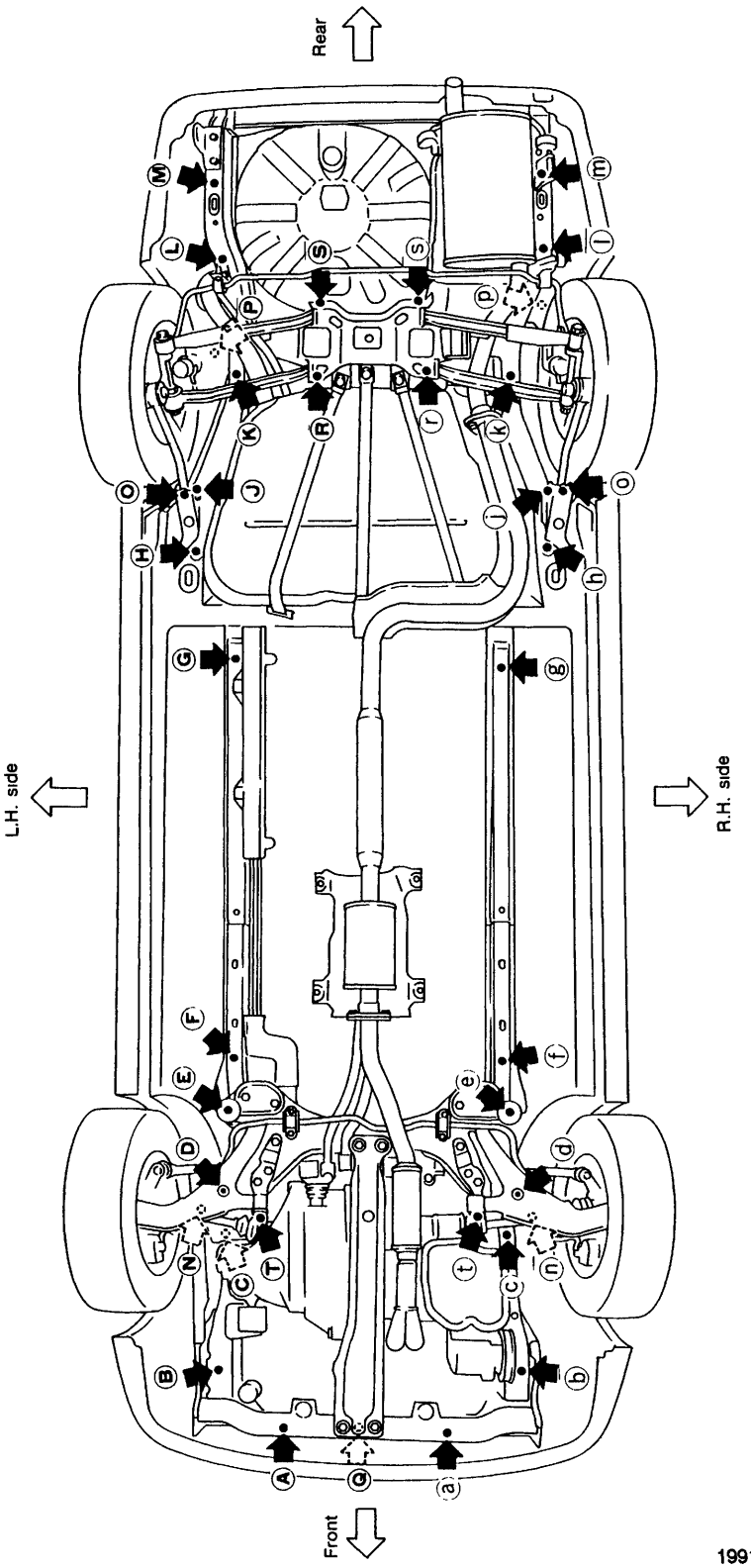
MEASUREMENT



All dimensions indicated in this figure are actual ones.
(There are no projected dimensions.)

UNDERBODY

MEASUREMENT POINTS



MBF001A

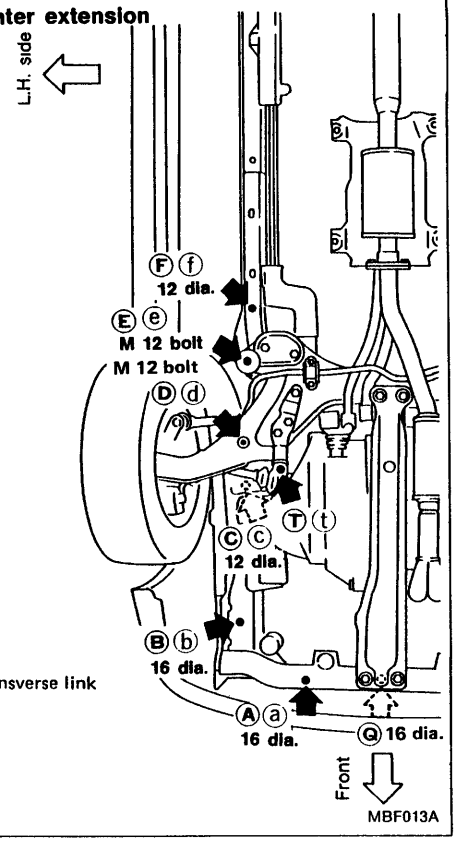
1991 G20 Service Manual
AM91-001 (ITB91-005)
Revised February 1991

UNDERBODY

Unit mm

Radiator core support, front side member, front suspention mounting lower member and front side member center extension

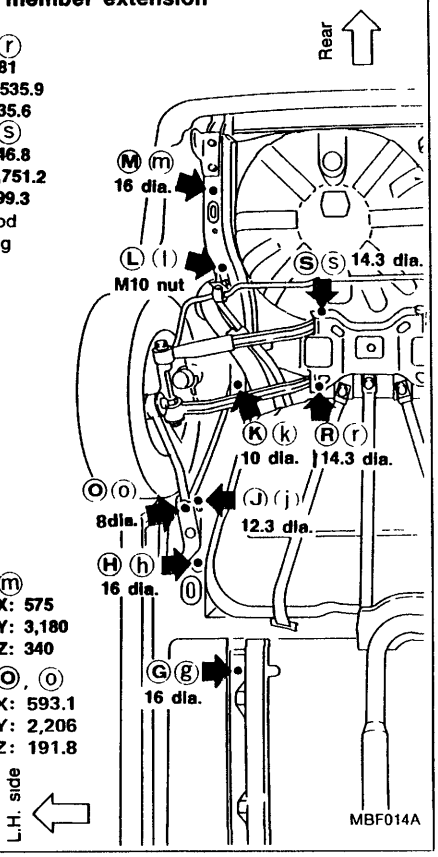
Coordinates:
Ⓐ, ⓐ
X: 247
Y: –645
Z: 225
Ⓑ, ⓑ
X: 495
Y: –490
Z: 355
Ⓒ, ⓒ
X: 455
Y: –35
Z: 376
Ⓓ, ⓓ
X: 450
Y: 70
Z: 254
Ⓔ, ⓔ
X: 410
Y: 310
Z: 131.8
Ⓕ, ⓕ
X: 393
Y: 500
Z: 130
Ⓠ
X: 0
Y: –638
Z: 226
Ⓣ, ⓣ Transverse link bush pin
X: 320
Y: –7
Z: 158



MBF013A

Front side member extension, rear side member and rear side member extension

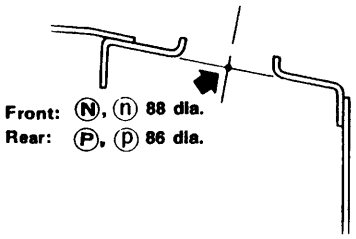
Coordinates:
Ⓖ, ⓖ
X: 393
Y: 1,675
Z: 157
Ⓗ, ⓗ
X: 555
Y: 2,025
Z: 228.6
Ⓙ, ⓙ Radius rod bracket mounting hole
X: 561.8
Y: 2,203
Z: 236
Ⓚ
X: 465
Y: 2,530
Z: 338.1
ⓚ
X: 465
Y: 2,505
Z: 338.1
Ⓛ
X: 503.2
Y: 2,914.4
Z: 336.9
ⓘ
X: 578.5
Y: 2,915.1
Z: 336.9
Ⓜ
X: 536
Y: 3,180
Z: 340
Ⓡ, ⓡ
X: 181
Y: 2,535.9
Z: 235.6
Ⓢ ⓢ
X: 146.8
Y: 2,751.2
Z: 199.3
ⓜ
X: 575
Y: 3,180
Z: 340
Ⓞ, ⓞ
X: 593.1
Y: 2,206
Z: 191.8



MBF014A

Front and rear strut tower centers

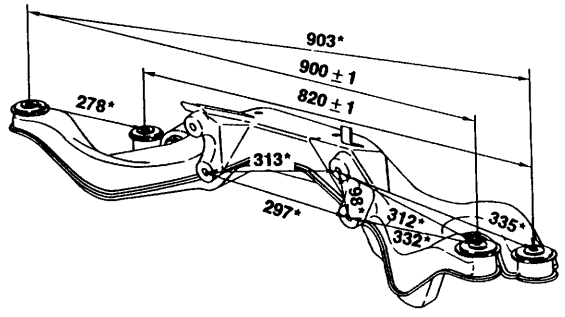
Coordinates:
Ⓝ ⓝ
X: 529
Y: –5
Z: 770
Ⓟ, ⓟ
X: 559.2
Y: 2,567.7
Z: 779.8



MBF056A

Suspension link mounting hole

Front suspension member



MBF686F

HEATER & AIR CONDITIONER

SECTION HA

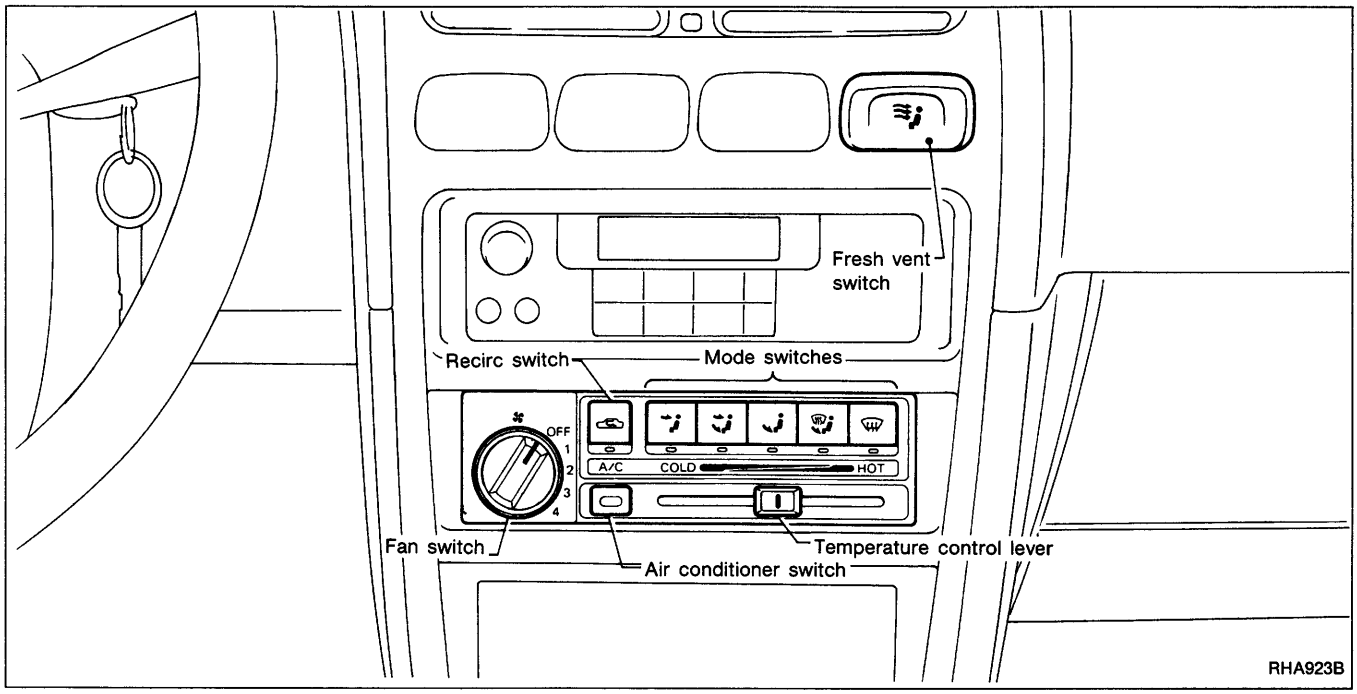
CONTENTS

DESCRIPTION — Overall System ..... HA- 2
OPERATIONAL CHECK ..... HA- 5
DESCRIPTION — Refrigeration System ..... HA- 7
PRECAUTIONS ..... HA- 9
PREPARATION HA-12
DIAGNOSES — Overall System HA-19
DISCHARGING, EVACUATING, CHARGING AND CHECKING HA-25
SERVICE PROCEDURES HA-40
COMPRESSOR OIL — Checking and Adjusting HA-42
COMPRESSOR — Model NVR 140S (ATSUGI make) HA-44
TROUBLE DIAGNOSES HA-49
DOOR CONTROL HA-83
DESCRIPTION — Push Control HA-85
SERVICE DATA AND SPECIFICATIONS (S.D.S.) HA-90

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".

Control Operation



FAN SWITCH

This switch turns the fan ON and OFF, and controls fan speed.

MODE SWITCHES

These switches allow you to select the outlet air flow.
In "DEF" or "F/D" mode, the intake door is set to "FRE". The compressor turns on in the "DEF" mode.

TEMPERATURE CONTROL LEVER

This lever allows you to adjust the temperature of the outlet air.

RECIRC SWITCH

OFF position:
Outside air is drawn into the passenger compartment when this switch is OFF.
ON position:
Interior air is recirculated inside the vehicle. This switch does not work in the "DEF" or "F/D" modes.

AIR CONDITIONER SWITCH

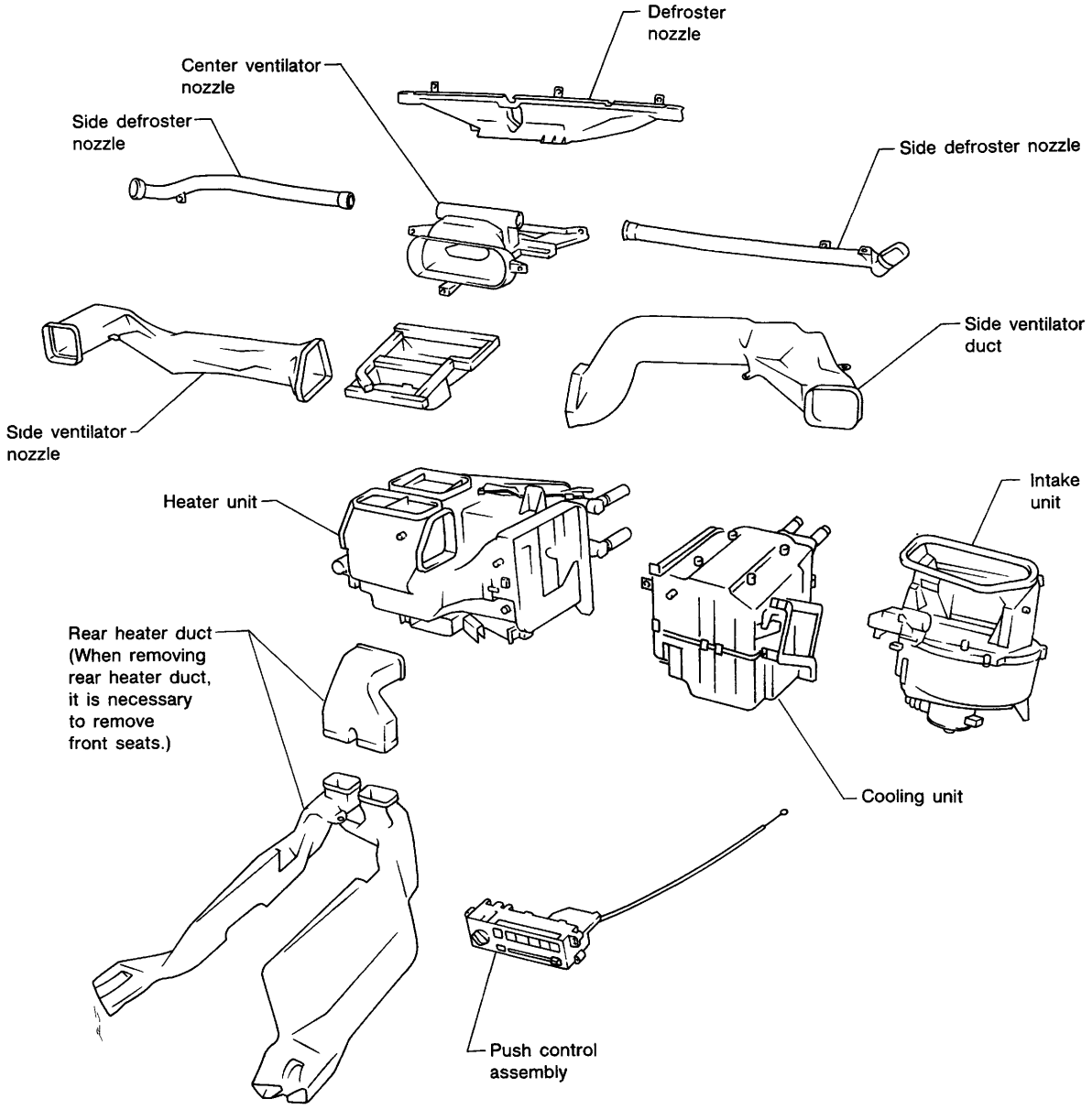
Start the engine, move the fan control switch to the desired (1 to 4) position and push the air conditioner switch to turn ON the air conditioner. The indicator light will come on when the air conditioner is ON. To stop the air conditioner, push the switch again to return it to the original position.

The air conditioner cooling function operates only when the engine is running.

FRESH VENT SWITCH

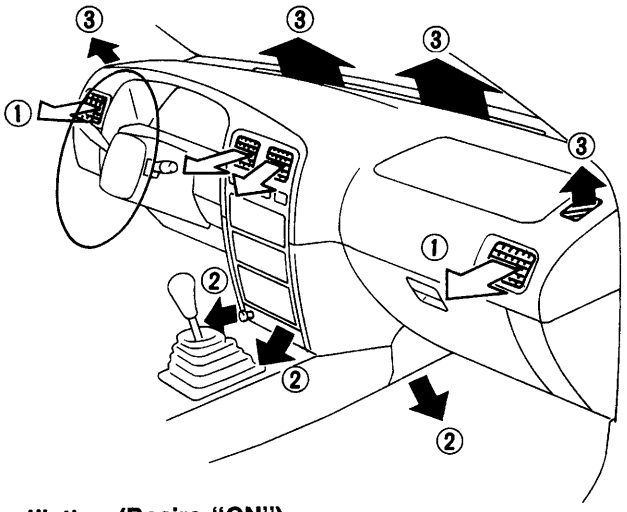
In order to prevent unpleasant hot air on the face in the heater mode, or more especially in the FOOT, FOOT/DEF or DEF modes, this system can supply cold air flow to the ventilator ducts directly (without passing it through the heater core) by means of a fresh air vent switch on the top of the push control unit.

Component Layout

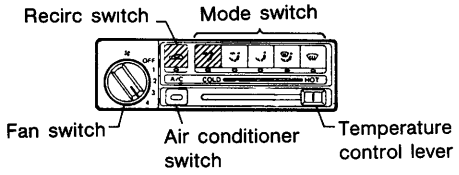


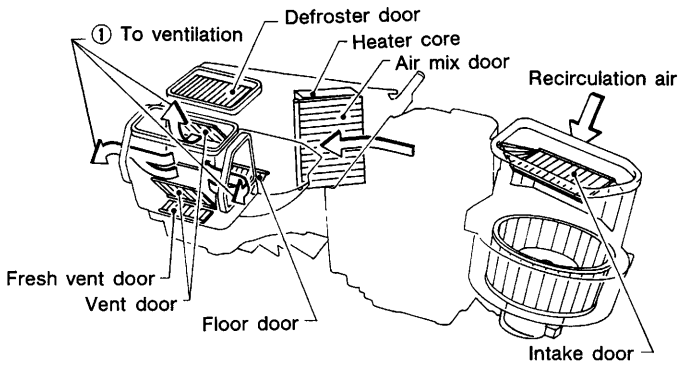
RHA924B

Air Flow

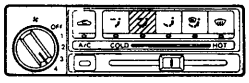


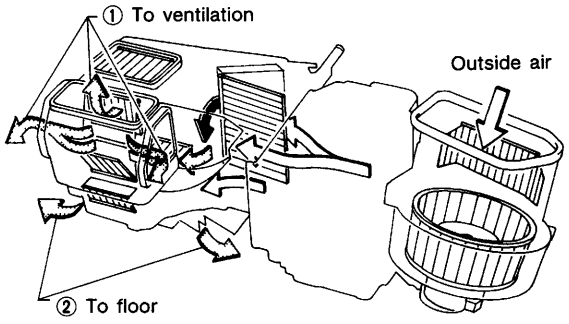
Ventilation (Recirc "ON")



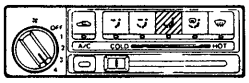


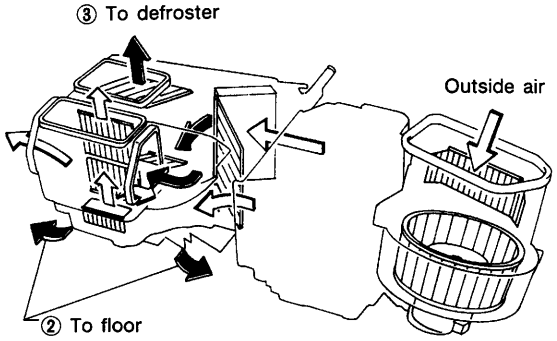
Bi-level (Fresh vent "ON")



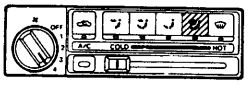


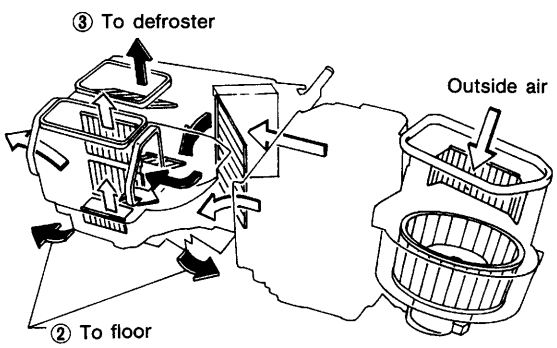
Floor (Fresh vent "ON")



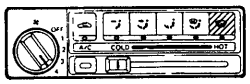


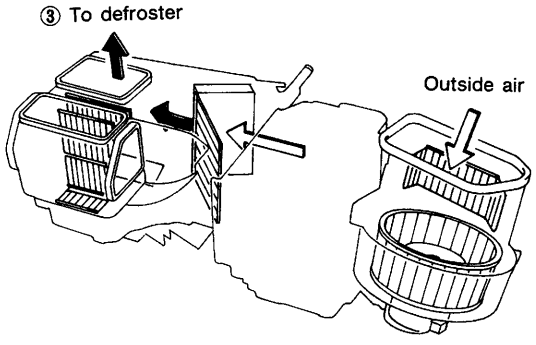
Floor and defroster (Fresh vent "ON")





Defroster





: Air passed through heater core

: Mixed air (+)

: Air not passed through heater core

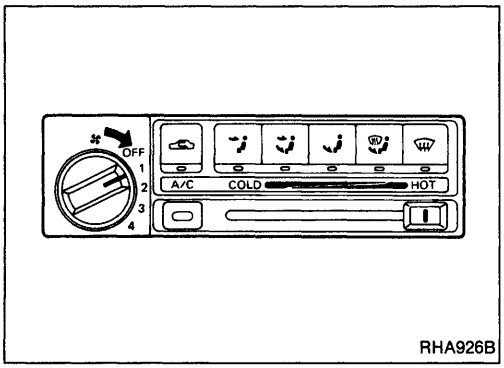
RHA925B

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"

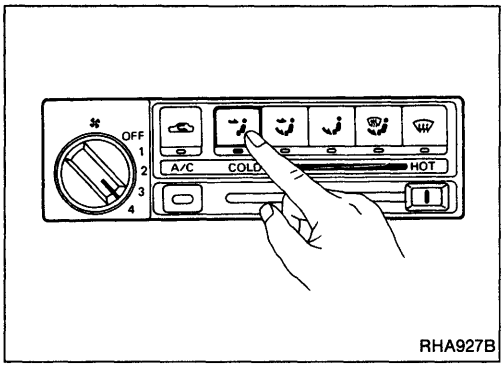


RHA926B

PROCEDURE:

1. Check blower

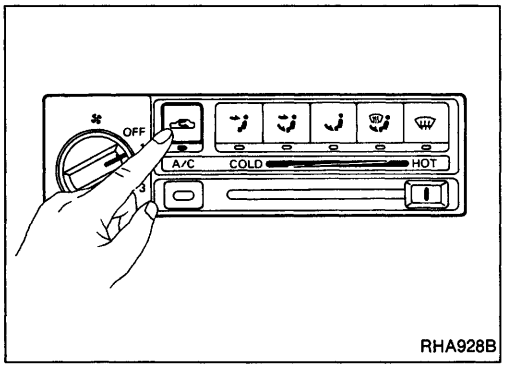
1) Turn Fan switch to 1-speed.
   Blower should operate on 1-speed.
2) Then turn Fan switch to 2-speed.
3) Continue checking blower speed until all four speeds are checked.
4) Leave blower on 4-speed.



RHA927B

2. Check discharge air

1) Press the VENT button.
   VENT indicator should light.
2) Confirm that all discharge air comes out of face vents.
3) Press the B/L button.
   B/L indicator should light.
4) Confirm that discharge air comes out of face vents and foot vents.
5) Press the FOOT button.
   FOOT indicator should light.
6) Confirm that discharge air comes out of foot vents, with some air from defroster vents.
7) Press the F/D button.
   F/D indicator should light.
8) Confirm that discharge air comes out of foot vents, with some air from defroster vents, and that intake door position is at FRE.
9) Press the DEF button.
   DEF indicator should light.
10) The discharge air should be coming only from defroster vents. At the same time compressor should turn ON and intake door position be at FRE.

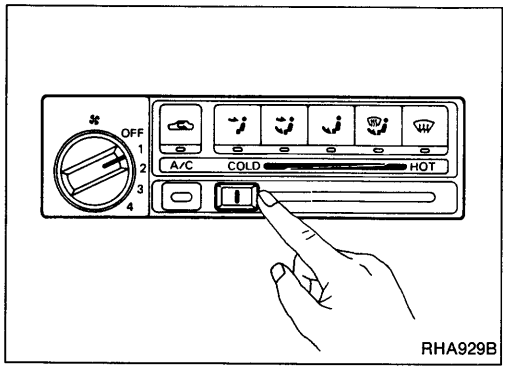


RHA928B

3. Check RECIRC

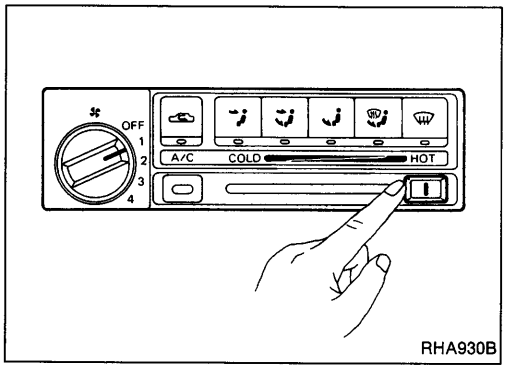
1) Press RECIRC button.
   RECIRC indicator should light.
2) Listen for intake door position change (you should hear blower sound change slightly).

Operational Check (Cont'd)



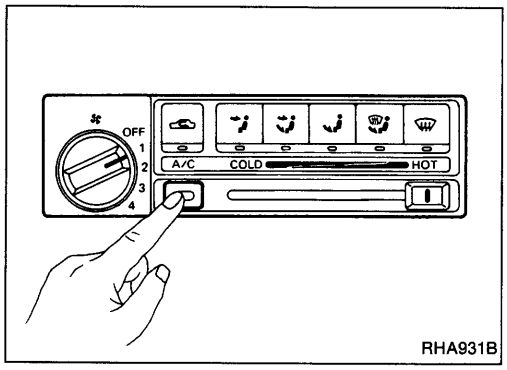
4. Check temperature decrease

1) Slide temperature control lever to full cold.
2) Check for cold air at discharge air outlets.



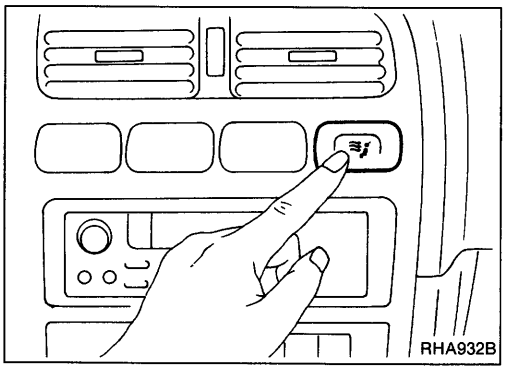
5. Check temperature increase

1) Slide temperature control lever to full hot.
2) Check for hot air at discharge air outlets.



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.



7. Check fresh vent switch

1) Slide temperature control lever to full hot.
2) Press FOOT, FOOT/DEF or DEF button.
3) Press FRESH VENT button.
   FRESH VENT indicator should light.
4) Confirm that discharge air comes out of foot and defroster vents, and that cool air comes from face vents.

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

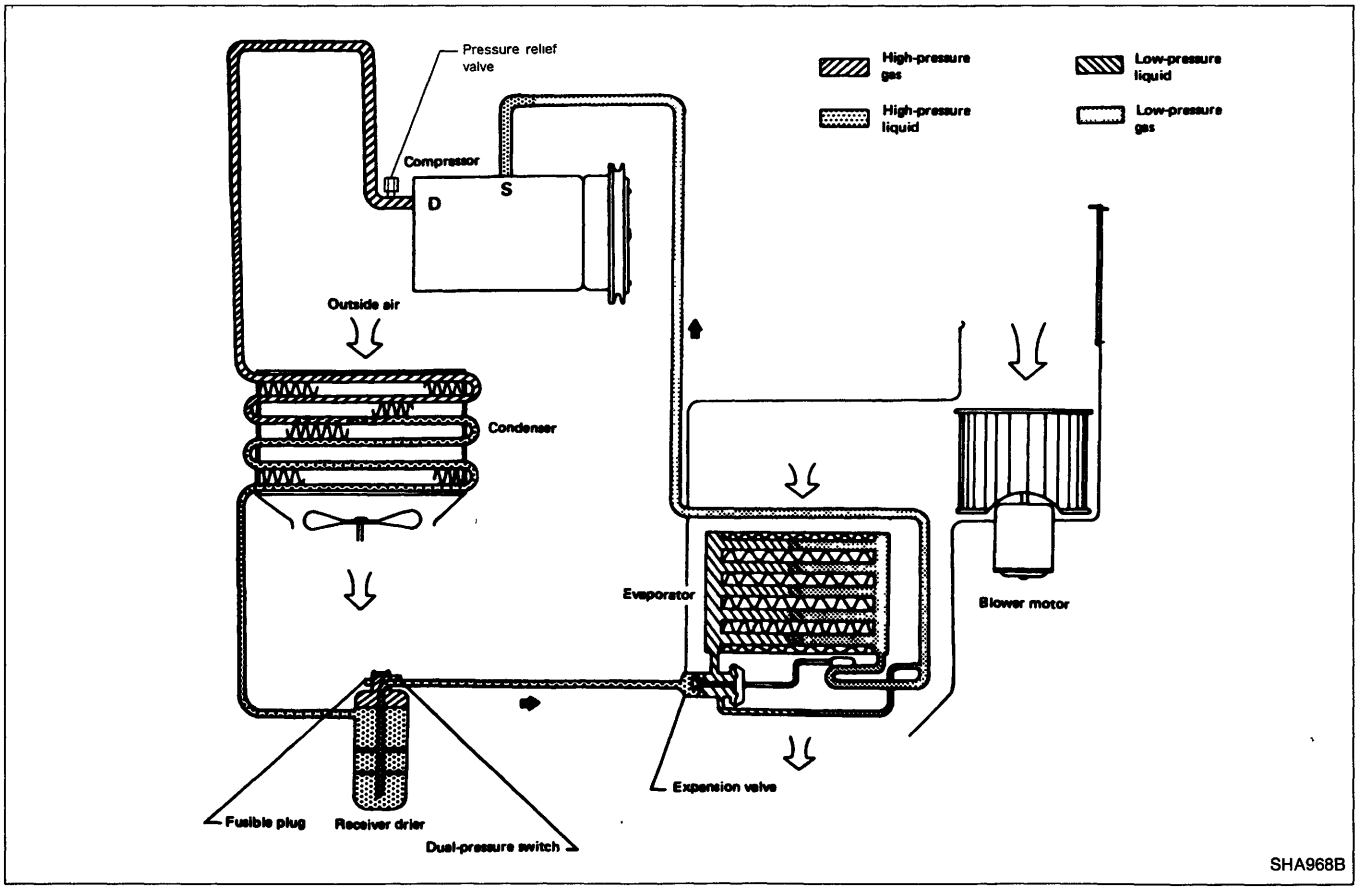
The refrigerant system is protected against excessively high or low pressures by the dual-pressure switch, located on the receiver drier. If the system pressure rises above, or falls below the specifications, the dual-pressure switch opens to interrupt the compressor operation.

Fusible plug

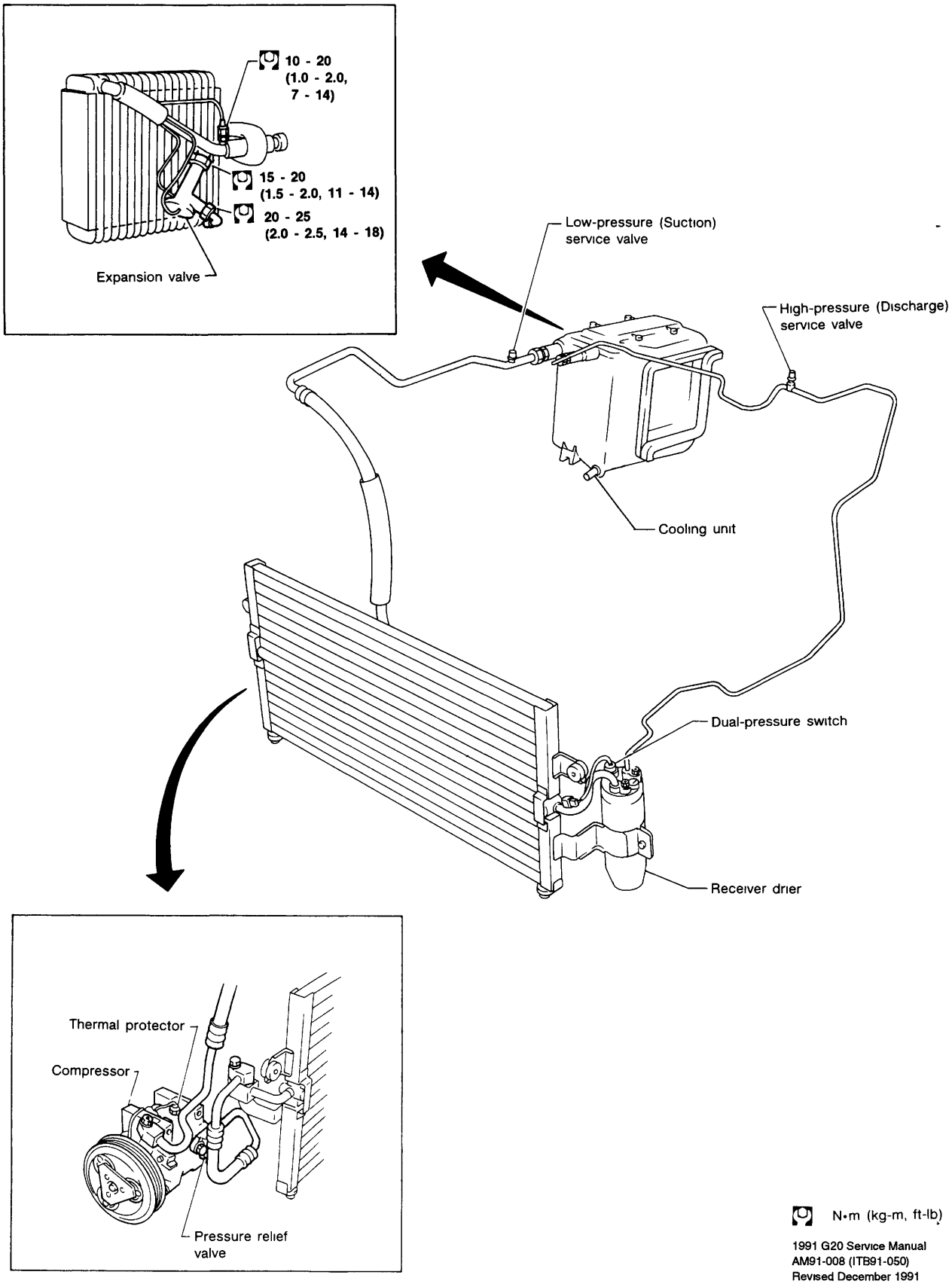
Open at temperature above 105°C (221°F), thereby discharging refrigerant to the atmosphere. If this plug is melted and opened, check the refrigerant line and replace receiver drier.

Pressure relief valve

The refrigerant system is also protected by a pressure relief valve, located on the end of high flexible hose near compressor. When the pressure of refrigerant in the system increases to an abnormal level [more than 3,727 kPa (38 kg/cm^2, 540 psi)], the release port on the pressure relief valve automatically opens and releases refrigerant into the atmosphere.

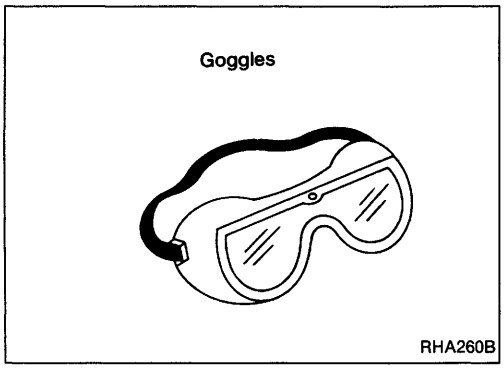


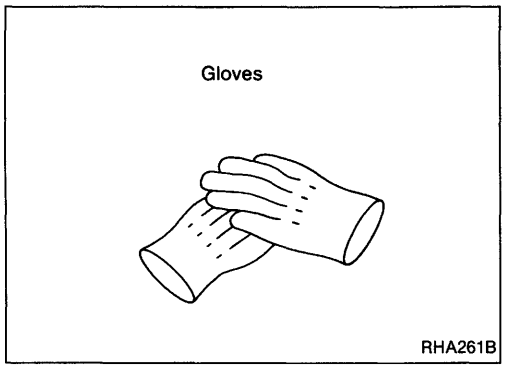
Refrigerant System

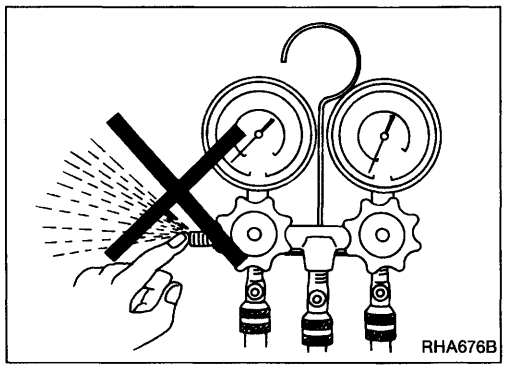


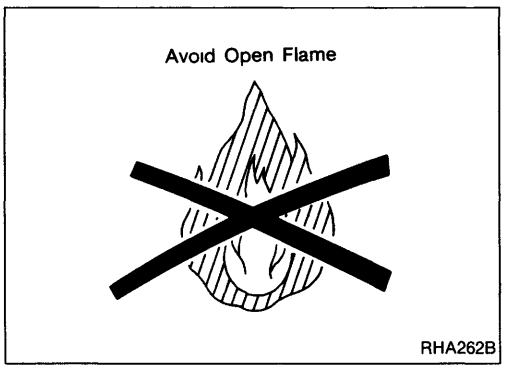
N•m (kg-m, ft-lb)

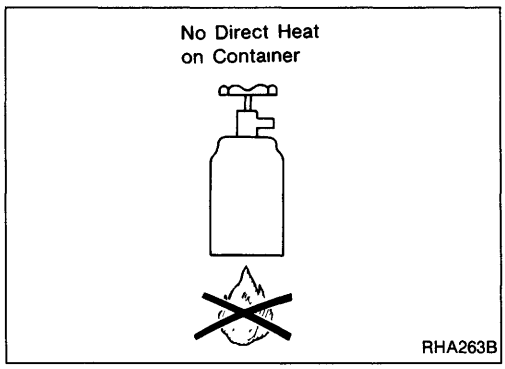
1991 G20 Service Manual
AM91-008 (ITB91-050)
Revised December 1991









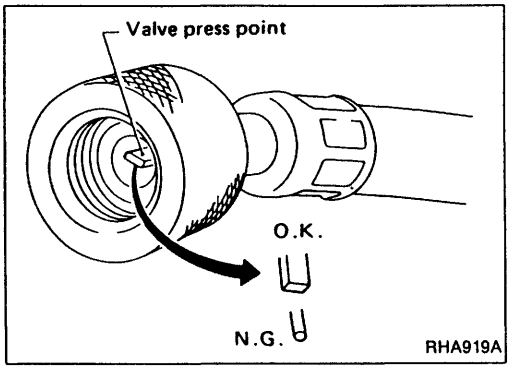


PRECAUTIONS FOR THE HANDLING OF REFRIGERANT

- **Always wear eye protection when working around the system.**
- **Always be careful that refrigerant does not come in contact with your skin.**
- **Do not release refrigerant into the air. Use your refrigerant recycling equipment to capture the refrigerant every time you need to discharge an air conditioning system.**
- **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.**

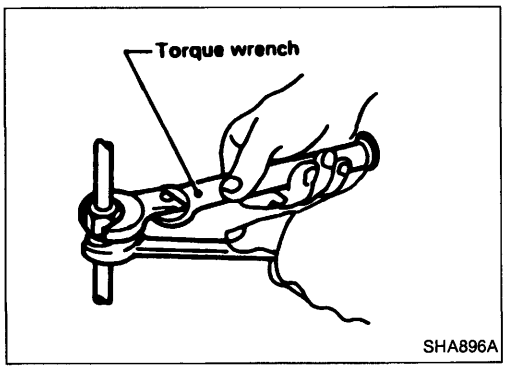
CAUTION:

- **Do not use steam to clean surface of condenser or evaporator. Be sure to use cold water or compressed air.**
- **Do not use compressed air to clean out a contaminated A/C tube or hose. Shake the line over a clean, white paper towel. If it contains obvious moisture or contaminants, replace it. Do not blow out the line with refrigerant.**



- **Do not use manifold gauge set whose press point shape is different from that shown. Otherwise, insufficient evacuating may occur.**

- **Do not over-tighten service valve cap.**
- **Follow the manufacturer's instructions for discharging into your refrigerant recycling equipment.**



PRECAUTIONS FOR REFRIGERANT CONNECTION

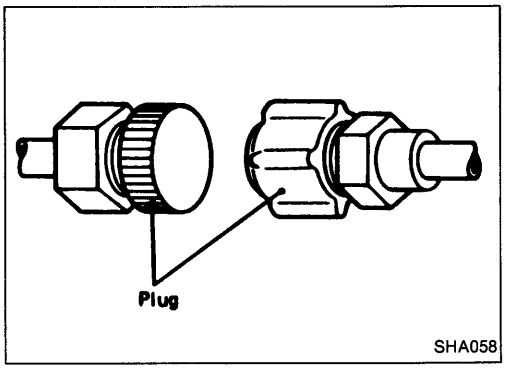
WARNING:

Make sure all refrigerant is discharged into the recycling equipment and the pressure in the system is less than atmospheric. Then gradually loosen the discharge side hose fitting and remove it.

CAUTION:

When replacing or cleaning refrigerant cycle components, observe the following.

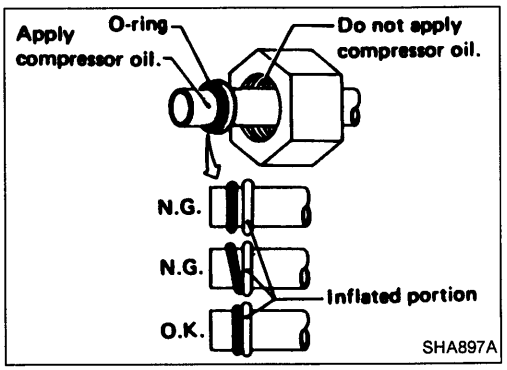
- **Do not leave compressor on its side or upside down for more than 10 minutes, as compressor oil will enter low pressure chamber.**
- **When connecting tubes, always use a torque wrench and a back-up wrench.**



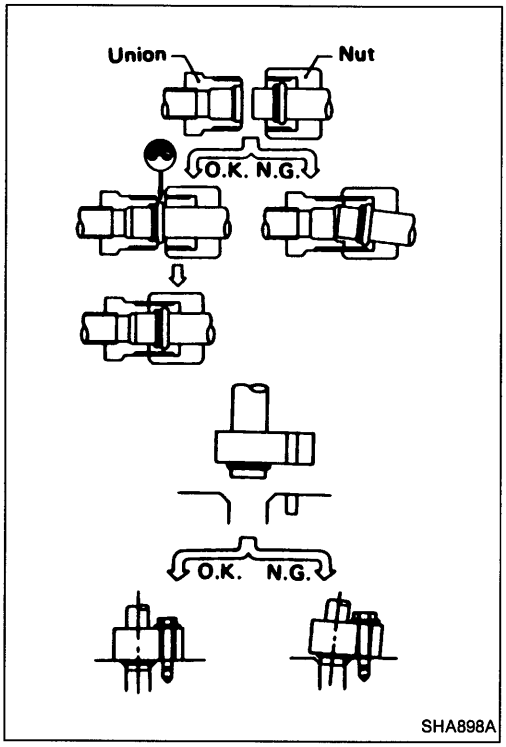
- After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.

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.**



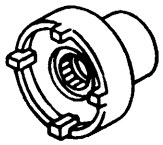
- Always replace used O-rings.
- When connecting tube, apply compressor oil to portions shown in illustration. Be careful not to apply oil to threaded portion.
- O-ring must be closely attached to inflated portion of tube.



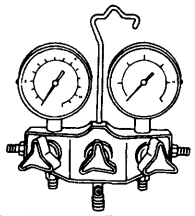
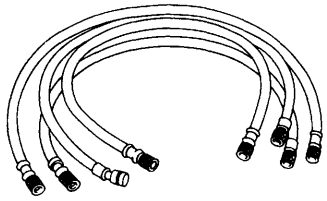
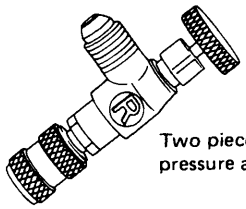
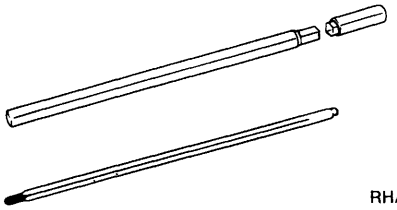
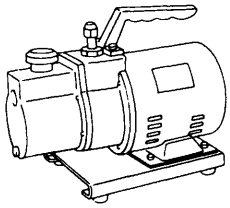
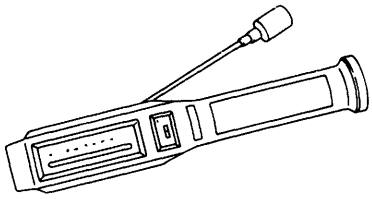
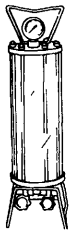
- After inserting tube into union until O-ring is no longer visible,tighten nut to specified torque.
- After connecting line, conduct leak test and make sure that there is no leakage from connections. When the gas leaking point is found, disconnect that line and replace the O-ring. Then tighten connections of seal seat to the specified torque.

SPECIAL SERVICE TOOLS

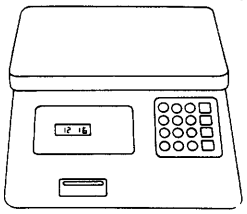
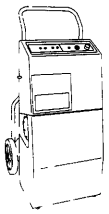
*: Special tool or commercial equivalent

Tool number (Kent-Moore 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

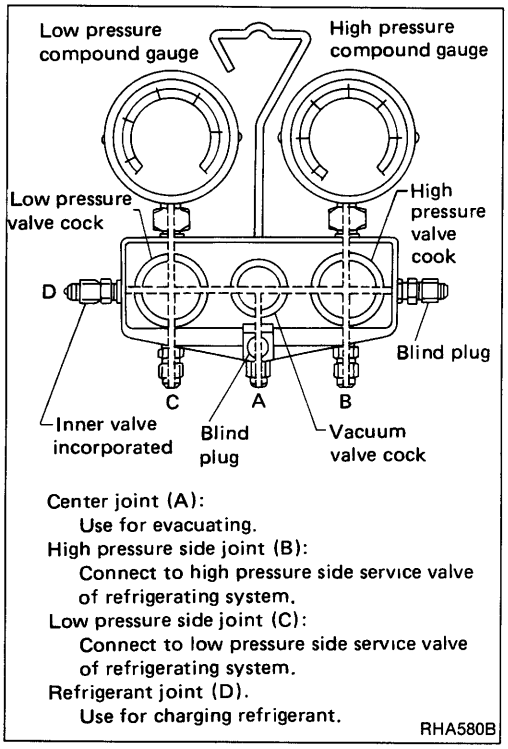
Service Tools

Tool name	Description	
Manifold gauge (3-valve type)	 RHA570B	Discharging, evacuating and charging refrigerant
Charging hose (Four)	 RHA571B	Discharging, evacuating and charging refrigerant
Adapter valve	 Two pieces on each high pressure and low pressure line RHA573B	Discharging, evacuating and charging refrigerant
Thermometer	 RHA574B	Checking temperature
Vacuum pump	 RHA575B	Evacuating
Gas leak detector	 RHA577B	Checking refrigerant leaks
Charging cylinder	 RHA578B	Checking amount of refrigerant and charging refrigerant

Service Tools (Cont'd)

Tool name	Description	
Weight scale	 RHA579B	Checking amount of refrigerant
Refrigerant recycling equipment	 SHA732C	Capturing and recycling refrigerant

For details of such handling methods, refer to the Instruction Manual attached to each of the service tools.



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

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 (–760 mmHg, –29.92 inHg) to 2,942 kPa (30 kg/cm^2, 427 psi), and the low pressure gauge measures generally from –101.3 kPa (–760 mmHg, –29.92 inHg) to 1,471 kPa (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.)**

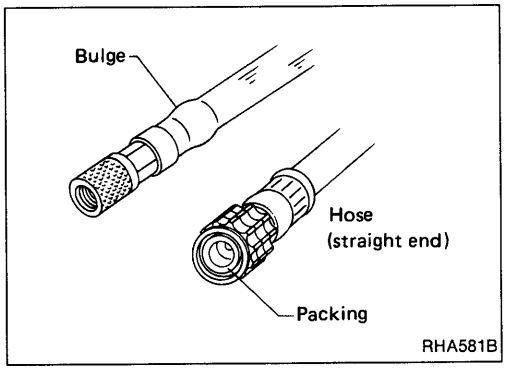
Service Tools (Cont'd)

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 charging cylinder.
4. Connect the vacuum pump hose to the vacuum pump.

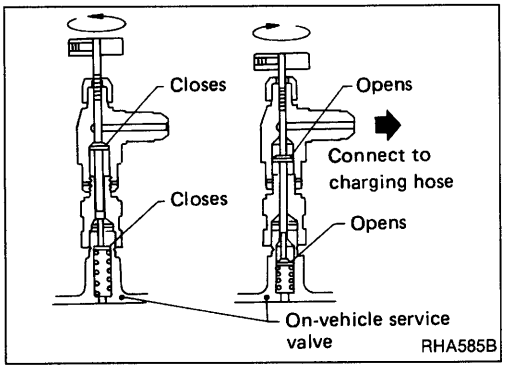
The high and low pressure hoses are color coded to prevent wrong connection.

High pressure line hose	Red
Low pressure line hose	Yellow
Charging hose	Blue or green (with valve core)
Vacuum pump hose	Blue or green



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.**



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.

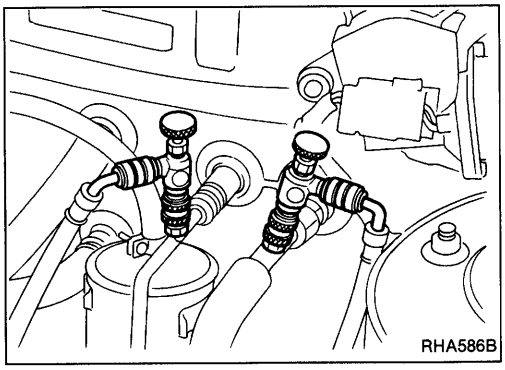
1. Before connecting the adapter valve to the on-vehicle service valve, turn the adapter valve handle fully counterclockwise to retract the pin.

CAUTION:

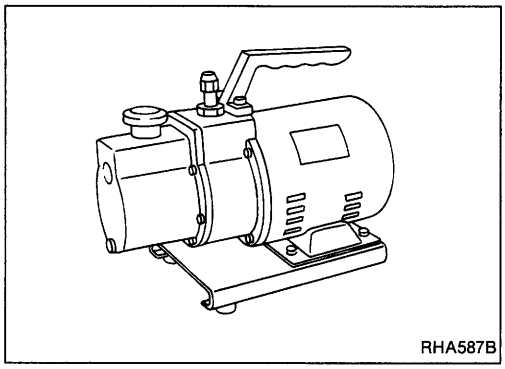
Check the packing for any sign of deterioration or cracks. If any abnormality is found, replace the packing with new.

2. Connect the high and low pressure hoses to the adapter valves.

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.



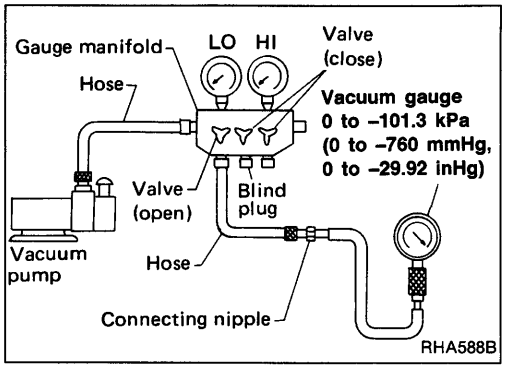
Service Tools (Cont'd)


RHA587B

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.

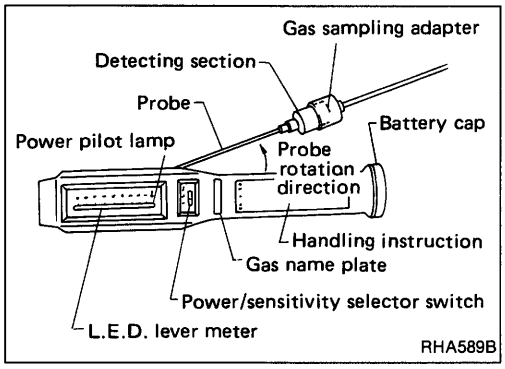
Check the vacuum pump to see that the vacuum pump capacity is greater than –100.0 kPa (–750 mmHg, –29.53 inHg).



RHA588B

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.



RHA589B

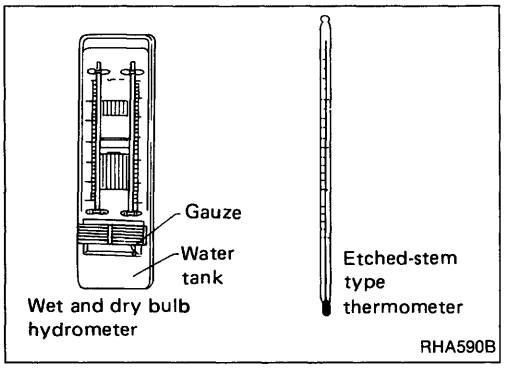
Gas leak detector

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 below. We recommend the electrical type because of its greater detection ability and ease of handling.

Service Tools (Cont'd)

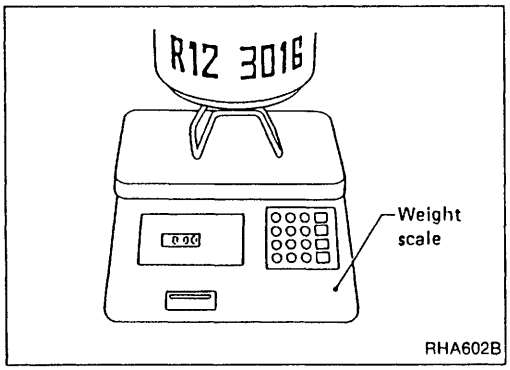
Type		Detection ability	Features
Halide torch		200 g (7.05 oz)/year (thin green)	• Low price • Low sensitivity • Less safe because of the use of flame for detection
Electrical	Discharge type (Suction type)	3 - 50 g (0.11 - 1.76 oz)/year	• Easy handling • Medium sensitivity • Each point needs tow or more 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: Changing in vacuum when evacuating		1 kg (2 lb)/month; if 13.3 kPa (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

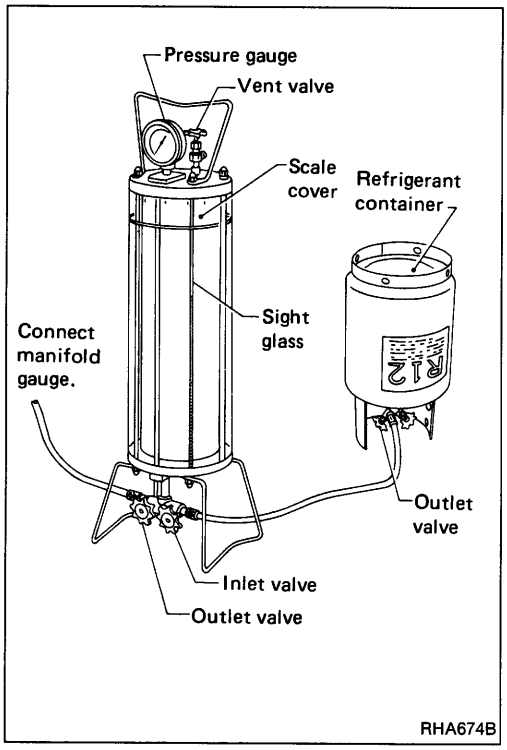
Use to check the air conditioner performance. An etched stem type thermometer may be used. A hydrometer must also be used because the air conditioner performance depends on the humidity.



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

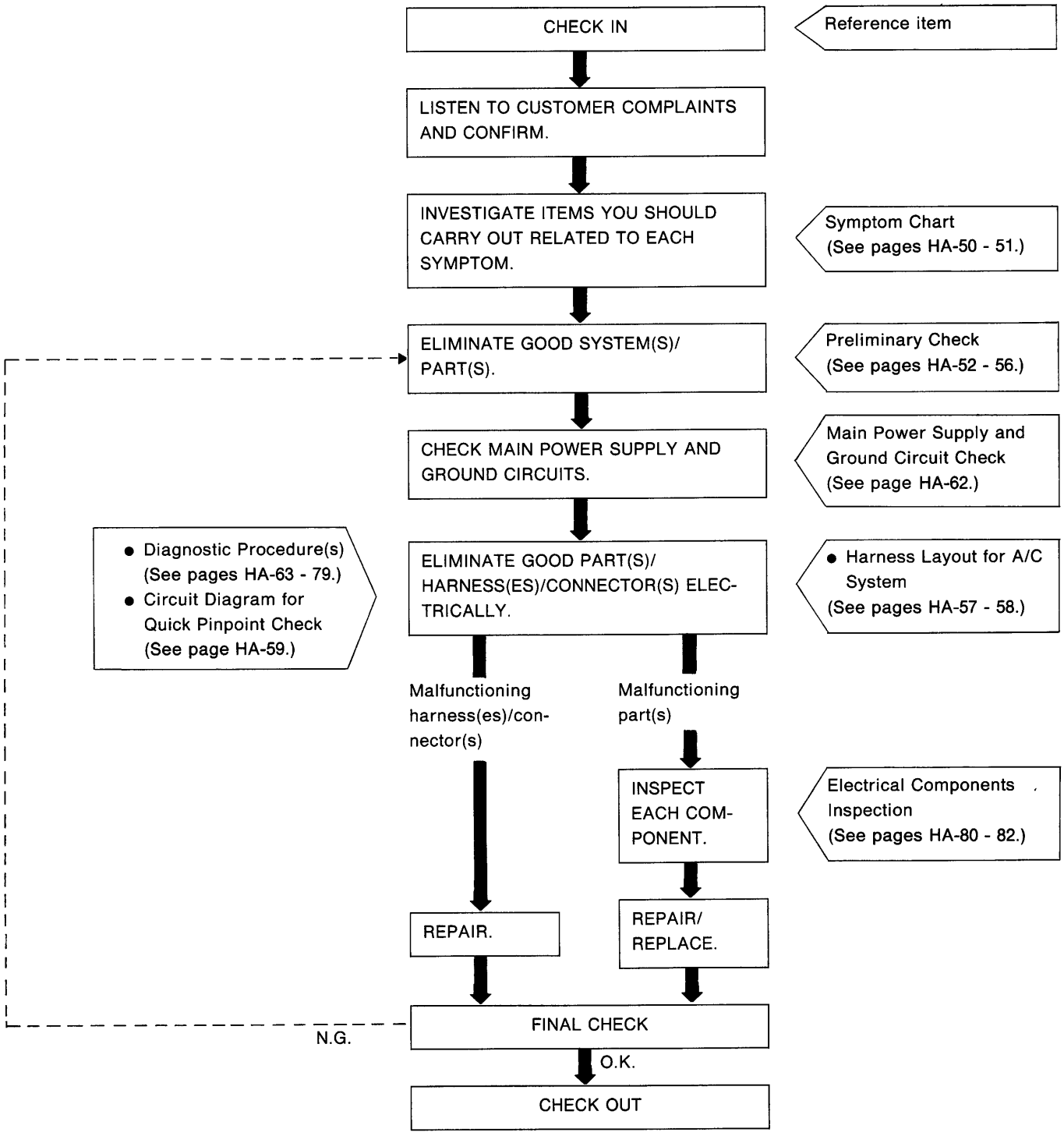
- With the charging cylinder, the operator can measure correctly the amount of refrigerant to be charged into the system.
- Change in the refrigerant volume due to a change in temperature and pressure can be supplemented, and this ensures correct charging of refrigerant.

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.**

How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



Performance Chart

TEST CONDITION

Testing must be performed as follows:

Vehicle location: Indoors or in the shade (in a well ventilated place)
Doors: Closed
Door window: Open
Hood: Open
TEMP. lever position: Max. COLD
MODE SW: (Ventilation) set
RECIRC SW: (Recirculation) set
FAN switch: Max. speed
Engine speed: 1,500 rpm
Time required before starting testing after air conditioner starts operating: More than 10 minutes

TEST READING

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)	2.5 - 4.6 (37 - 40)
	25 (77)	6.3 - 9.0 (43 - 48)
	30 (86)	10.8 - 13.9 (51 - 57)
	35 (95)	16.5 - 20.6 (62 - 69)
	40 (104)	22.5 - 27.5 (73 - 82)
60 - 80	20 (68)	4.6 - 7.3 (40 - 45)
	25 (77)	9.0 - 12.0 (48 - 54)
	30 (86)	13.9 - 17.7 (57 - 64)
	35 (95)	20.6 - 25.6 (69 - 78)
	40 (104)	27.5 - 34.0 (82 - 93)

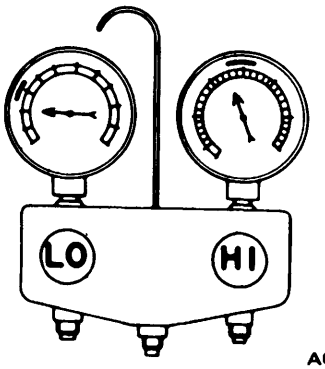
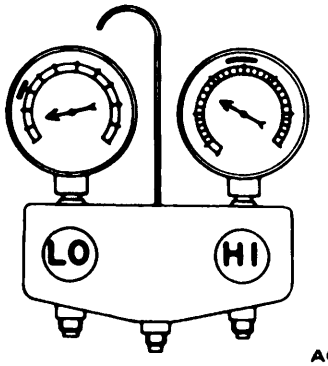
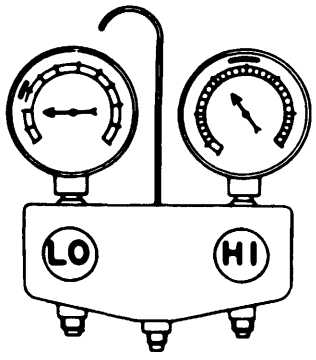
Ambient air temperature-to-compressor pressure table

Ambient air		High-pressure (Discharge side) kPa (kg/cm^2, psi)	Low-pressure (Suction side) kPa (kg/cm^2, psi)
Relative humidity %	Air temperature °C (°F)		
40 - 80	20 (68)	686 - 1,020 (7.0 - 10.4, 100 - 148)	59 - 127 (0.6 - 1.3, 9 - 18)
	25 (77)	883 - 1,226 (9.0 - 12.5, 128 - 178)	78 - 147 (0.8 - 1.5, 11 - 21)
	30 (86)	1,118 - 1,451 (11.4 - 14.8, 162 - 210)	98 - 177 (1.0 - 1.8, 14 - 26)
	35 (95)	1,373 - 1,736 (14.0 - 17.7, 199 - 252)	127 - 226 (1.3 - 2.3, 18 - 33)
	40 (104)	1,657 - 2,020 (16.9 - 20.6, 240 - 293)	196 - 314 (2.0 - 3.2, 28 - 46)

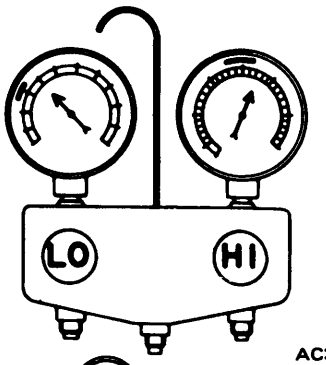
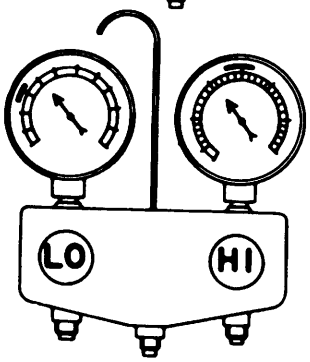
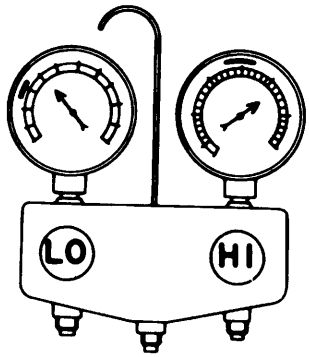
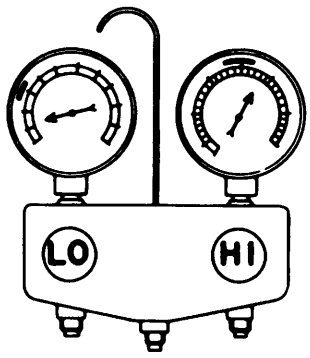
Performance Test Diagnoses

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".

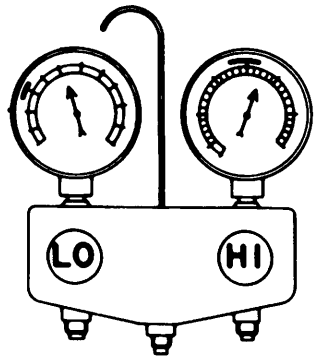
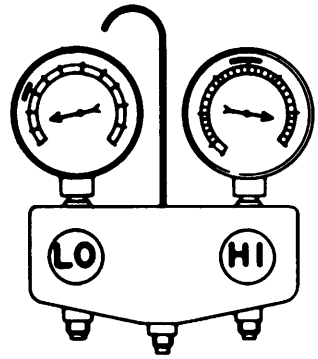
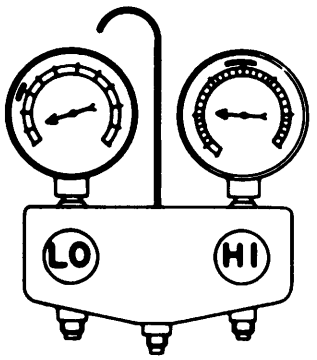
In the following table, the portion smeared with ink on each gauge scale indicates the range showing that the air conditioning system is in good order. This range is described in Performance Chart.

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.

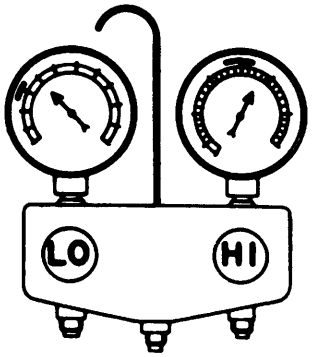
Performance Test Diagnoses (Cont'd)

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 (0.4 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.

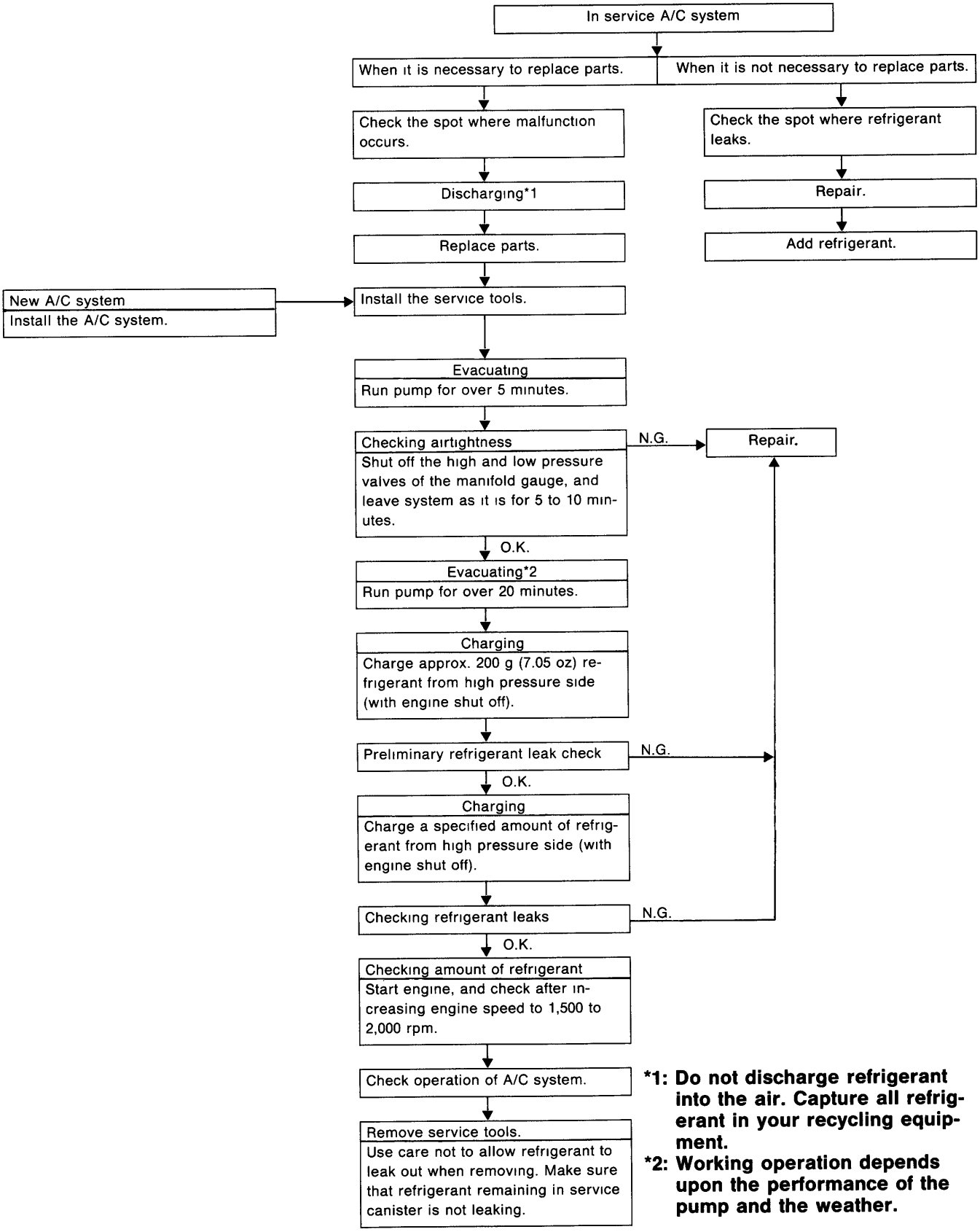
Performance Test Diagnoses (Cont'd)

Condition		Probable cause	Corrective action
MALFUNCTIONING CONDENSER	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.**
 AC361A			
HIGH PRESSURE LINE BLOCKED	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.
 AC362A			
MALFUNCTIONING COMPRESSOR	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.
 AC363A			

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.

Work Procedure

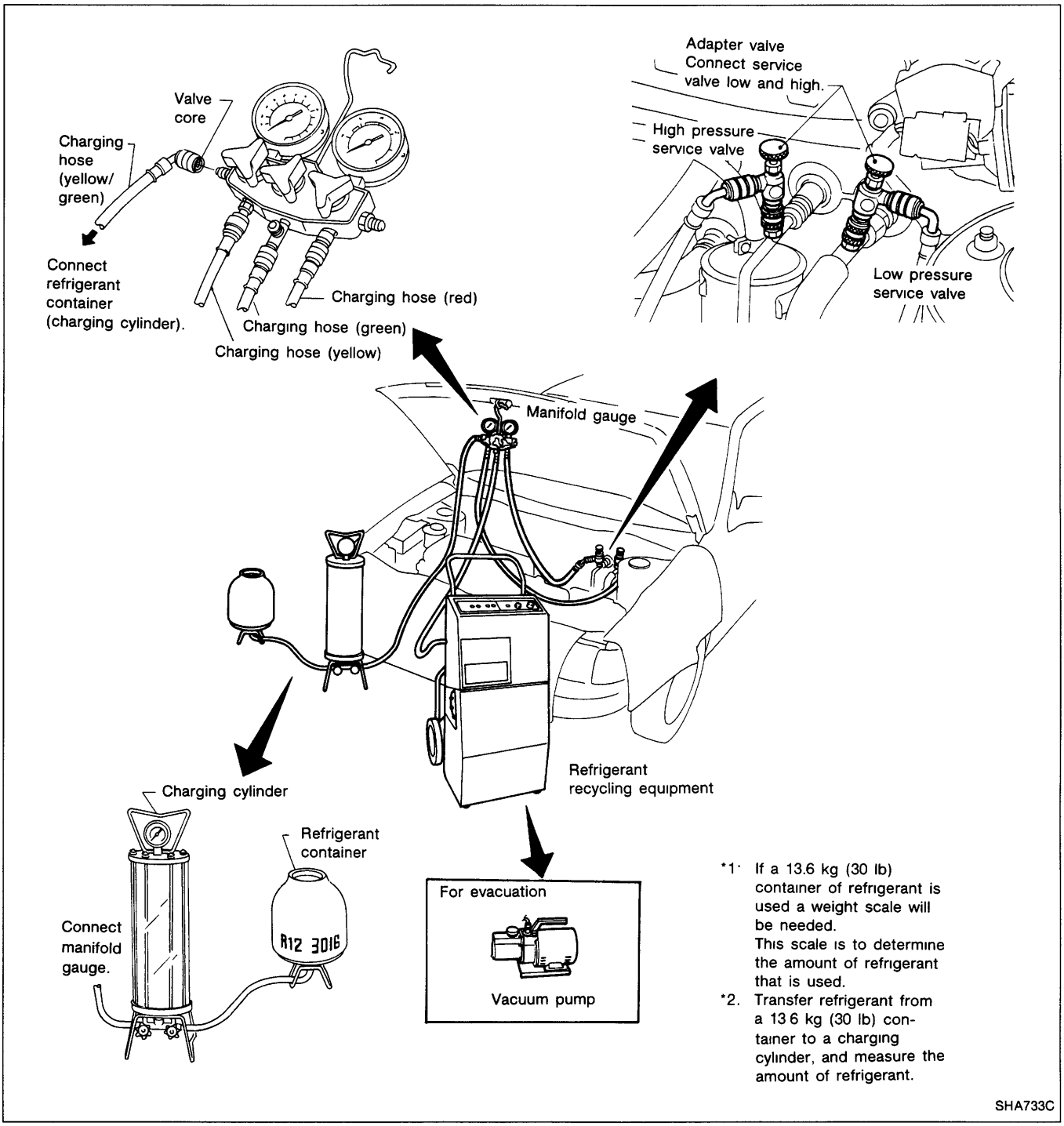


***1: Do not discharge refrigerant into the air. Capture all refrigerant in your recycling equipment.**

***2: Working operation depends upon the performance of the pump and the weather.**

Setting of Service Tools

Make sure that the service tools are set as indicated below and that no refrigerant is leaking.



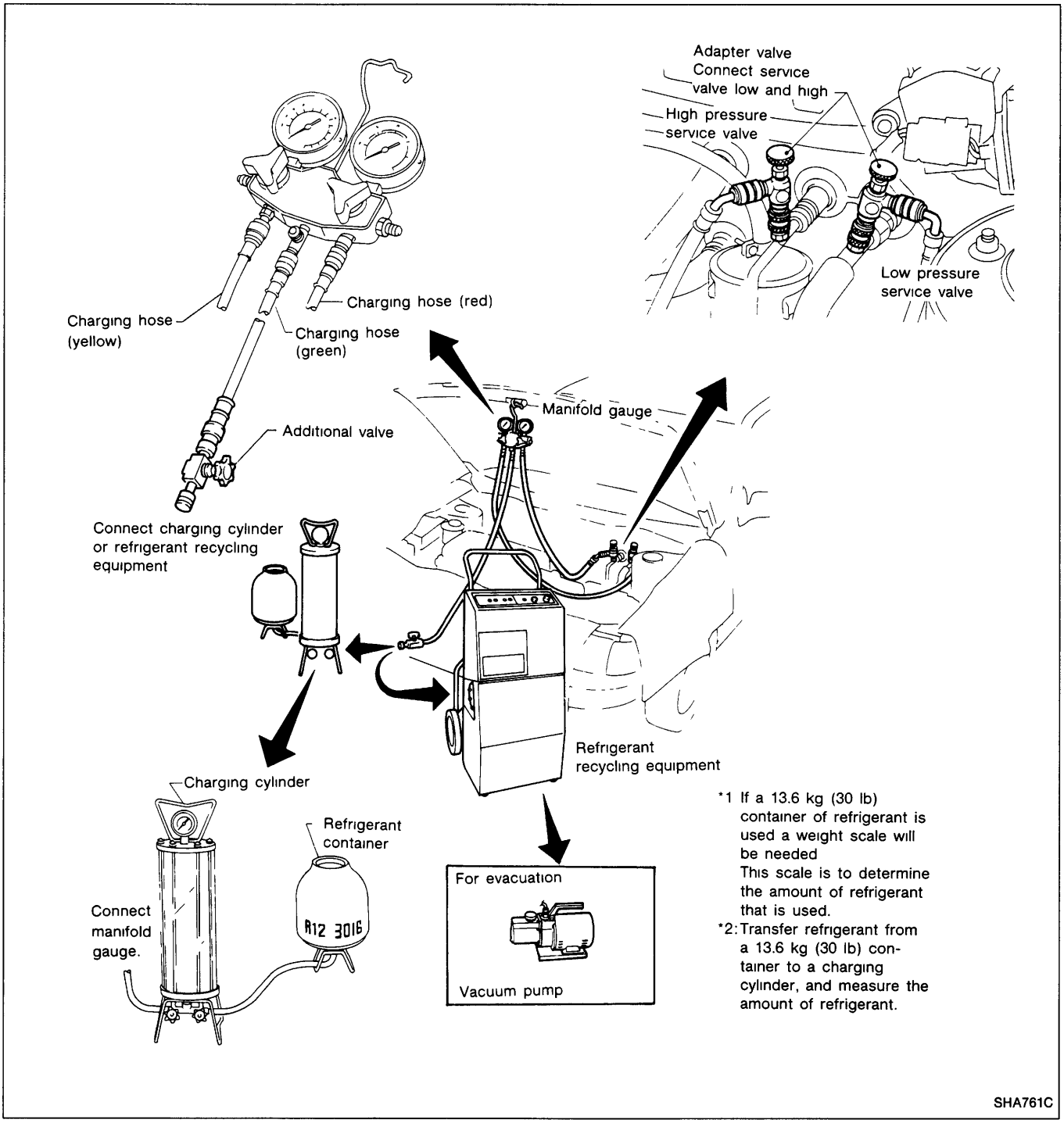
*1. If a 13.6 kg (30 lb) container of refrigerant is used a weight scale will be needed.
This scale is to determine the amount of refrigerant that is used.

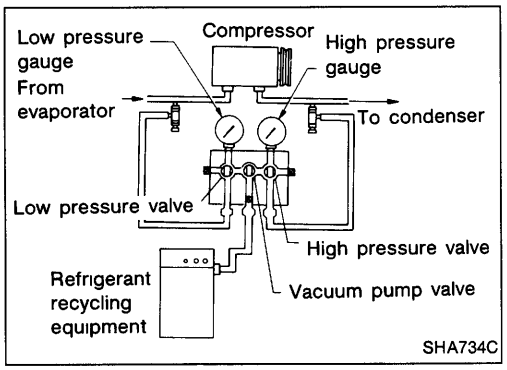
*2. Transfer refrigerant from a 13 6 kg (30 lb) container to a charging cylinder, and measure the amount of refrigerant.

SHA733C

Setting of Service Tools (Cont'd)

When 3-valve type manifold gauge is unavailable, use a 2-valve type manifold gauge with one additional valve at the end of the charging hose.





Discharging

WARNING:
Discharge only into your recycling equipment.
Do not release refrigerant into the air.

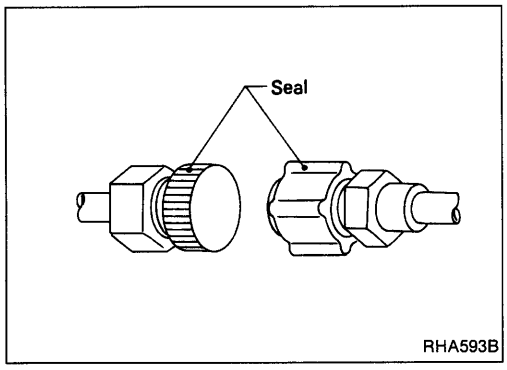
Slowly open the valves to discharge the refrigerant. If they are opened quickly, compressor oil will also be discharged.

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.

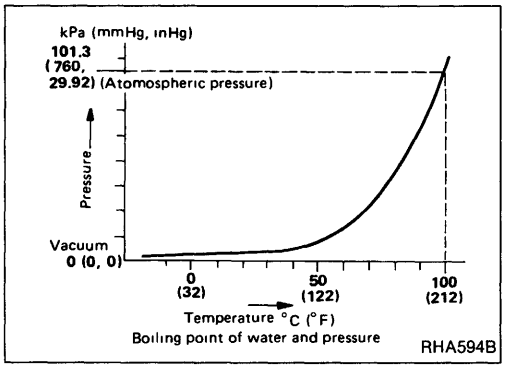
- Poor cooling due to reduction in the thermal exchange rate in condenser
- Moisture recirculating together with the refrigerant through the refrigeration system freezes at the port of the cold expansion valve. This impedes the normal refrigerant flow, thus lowering the cooling efficiency.
- The refrigerant 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.**

Evacuation (Cont'd)



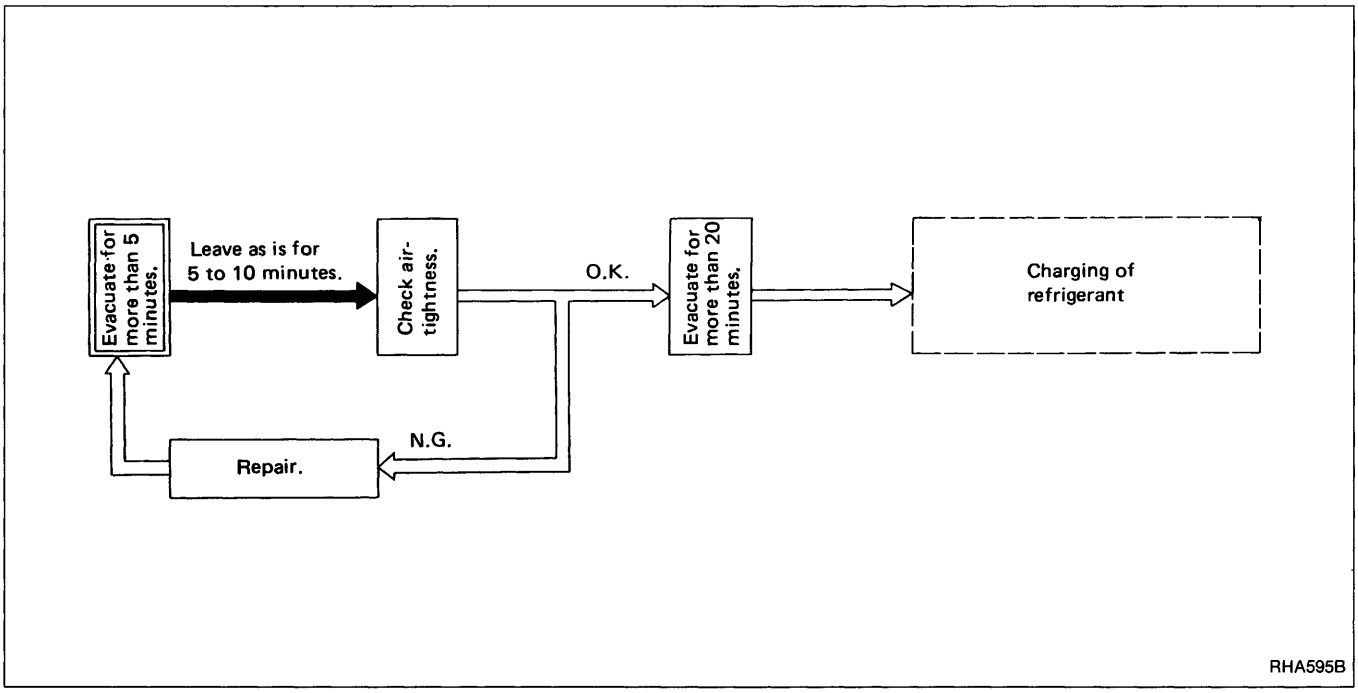
Relation between boiling point of water and atmospheric pressure

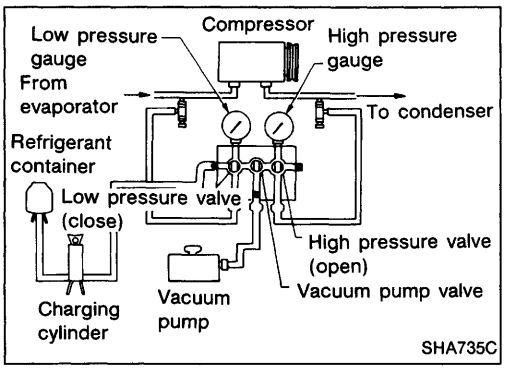
Water boils at 100°C (212°F) under normal atmospheric pressure. The boiling point lowers with the atmospheric pressure. This characteristic of water is utilized to purge it from the system. The pressure inside the refrigeration system is lowered by a vacuum pump so that water can evaporate at a normal temperature. The water vapor is then discharged to the outside together with the air.

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.

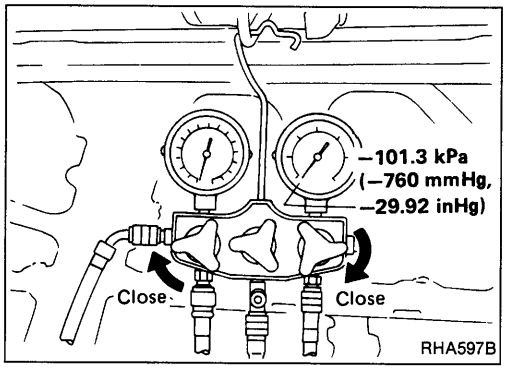
EVACUATION PROCEDURE



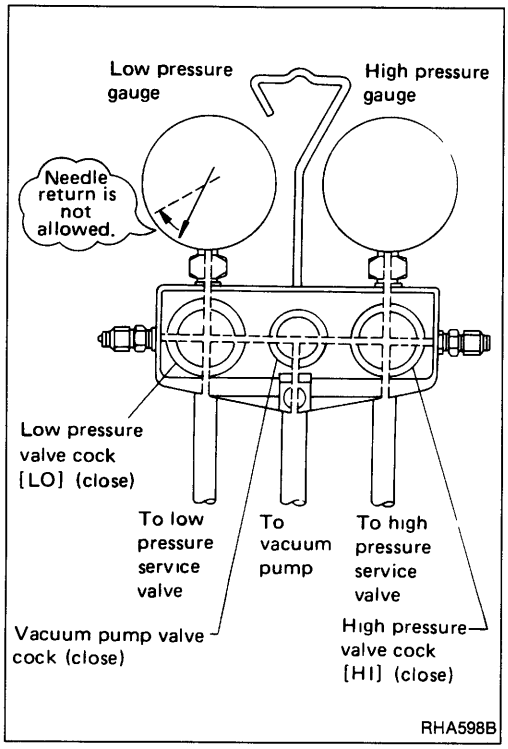


1. Completely tighten the low pressure and high pressure adapter valves. Tightening of the valves opens the service valves.
2. Open the high and low pressure valves and vacuum pump valve of the gauge manifold.
3. Run the vacuum pump.

Evacuation (Cont'd)



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 (–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.



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 (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

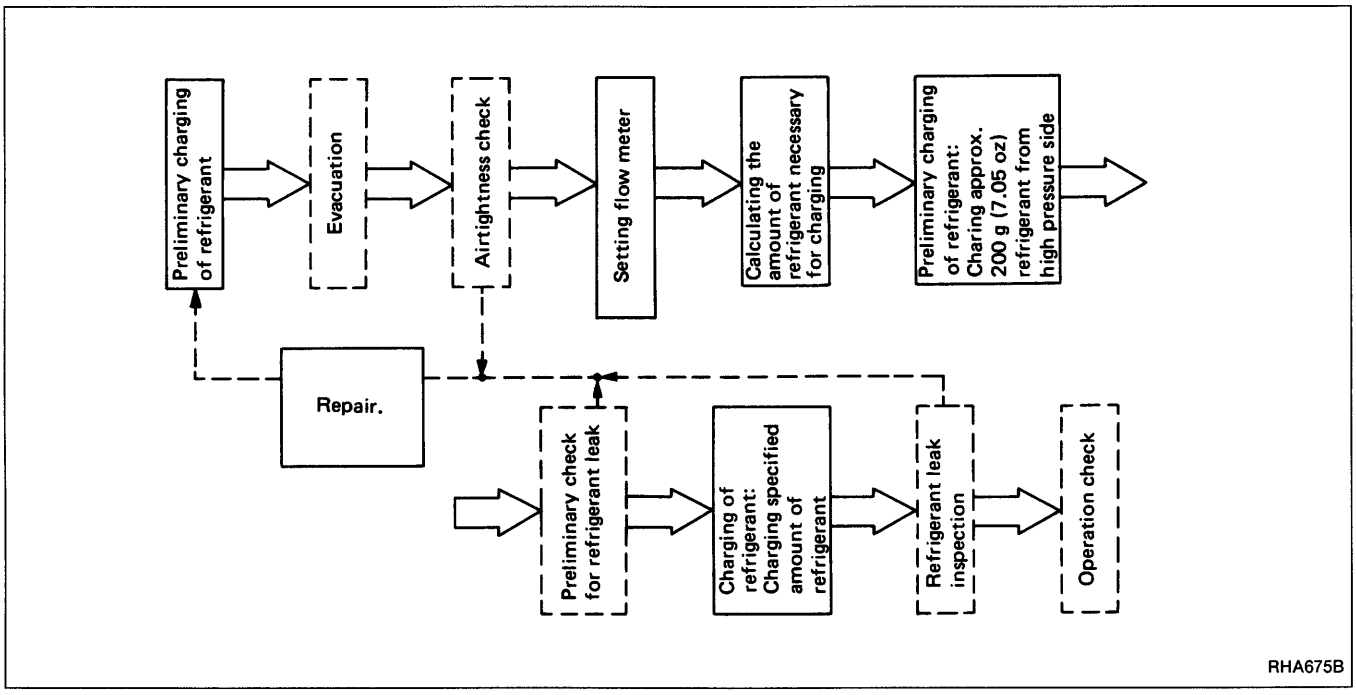
EVACUATION

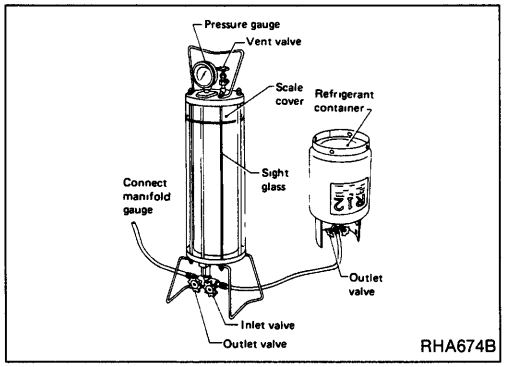
If no abnormality is found during the airtightness check, perform evacuation again for more than 20 minutes.

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.

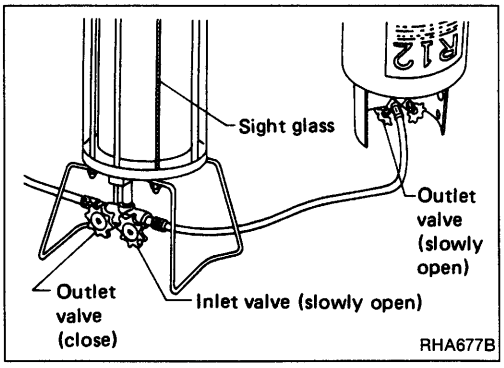
Charging Refrigerant — Charging cylinder

WORK PROCEDURE





Install the charging cylinder correctly to the vehicle. Refer to "Setting of Service Tools".

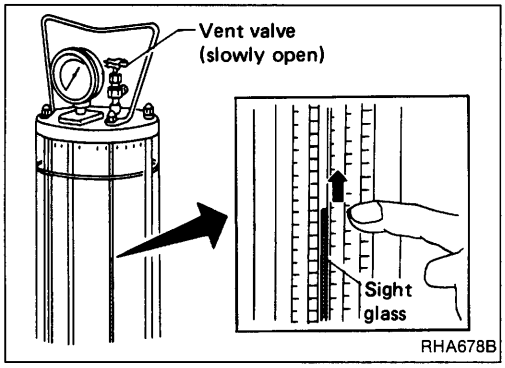


PRELIMINARY CHARGING OF REFRIGERANT-1

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.

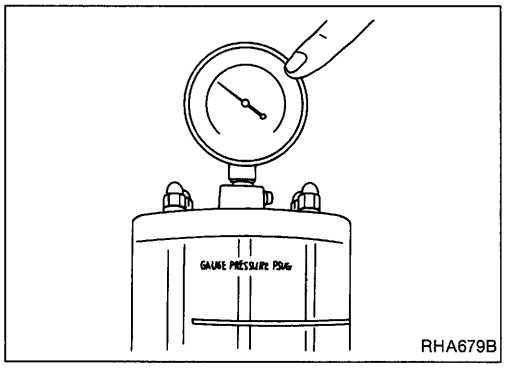
Charging Refrigerant — Charging cylinder (Cont'd)



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).

5. Close the inlet valve and upper vent valve of the charging cylinder.

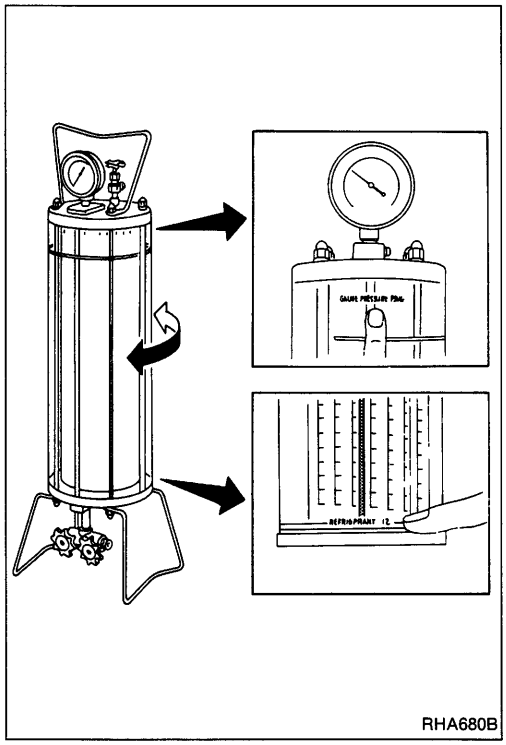


6. Turn on the heater switch (the charging cylinder is provided with a heater.)

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 (10.5 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

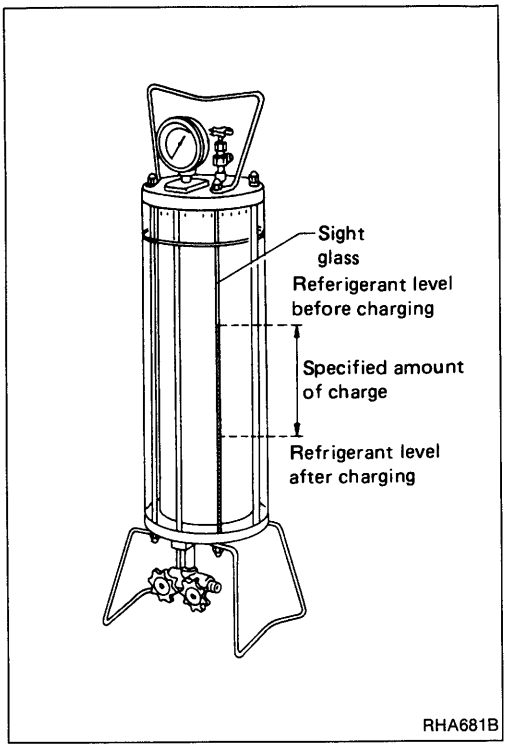
Refer to "EVACUATION PROCEDURE" and "CHECKING AIRTIGHTNESS" in "Evacuation".



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)

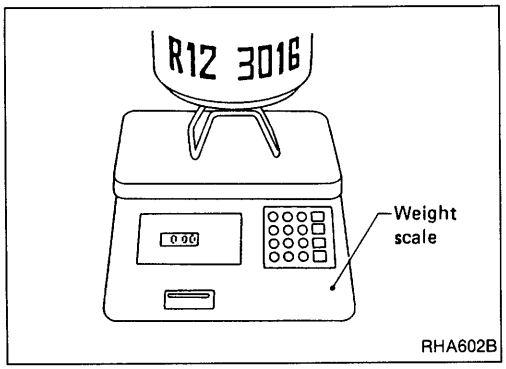


CALCULATING CHARGING AMOUNT OF REFRIGERANT

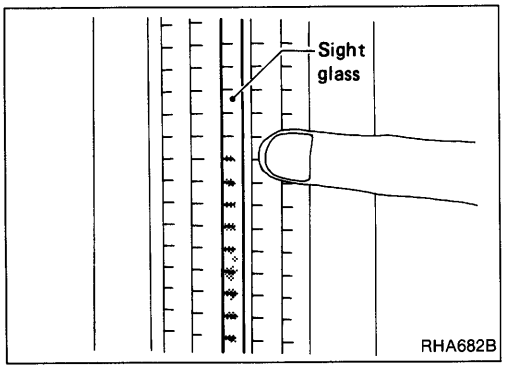
1. Record the amount of refrigerant in the sight glass before charging.
2. Subtract the required amount of refrigerant (charge quantity specified for the vehicle) from the amount of refrigerant recorded in step 1. Charge refrigerant into the system until the remaining value equals to the value indicated 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.



If a flow meter is not available, the amount of charged refrigerant also can be determined by subtracting the weight of the canister measured after charging from its weight measured before charging.



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.

Charging Refrigerant — Charging cylinder (Cont'd)

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".

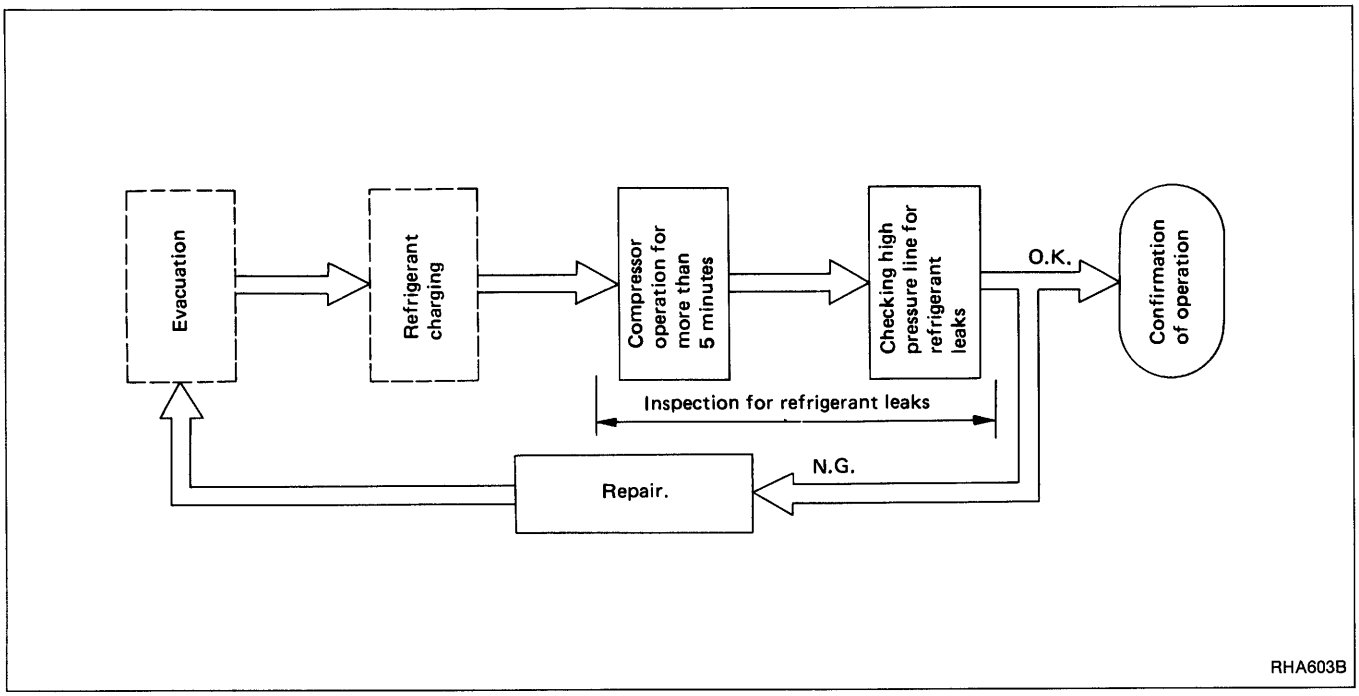
CAUTION:

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).

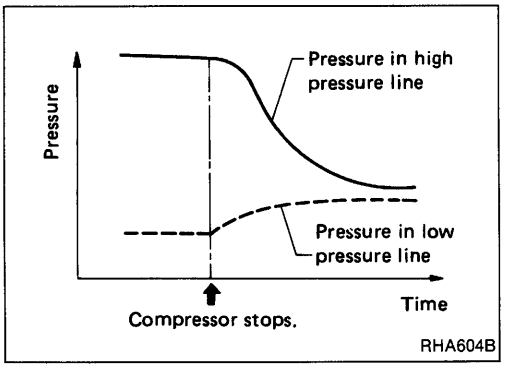
Inspection for Refrigerant Leaks

WORK PROCEDURE



To facilitate inspection for refrigerant leaks, establish the following conditions:

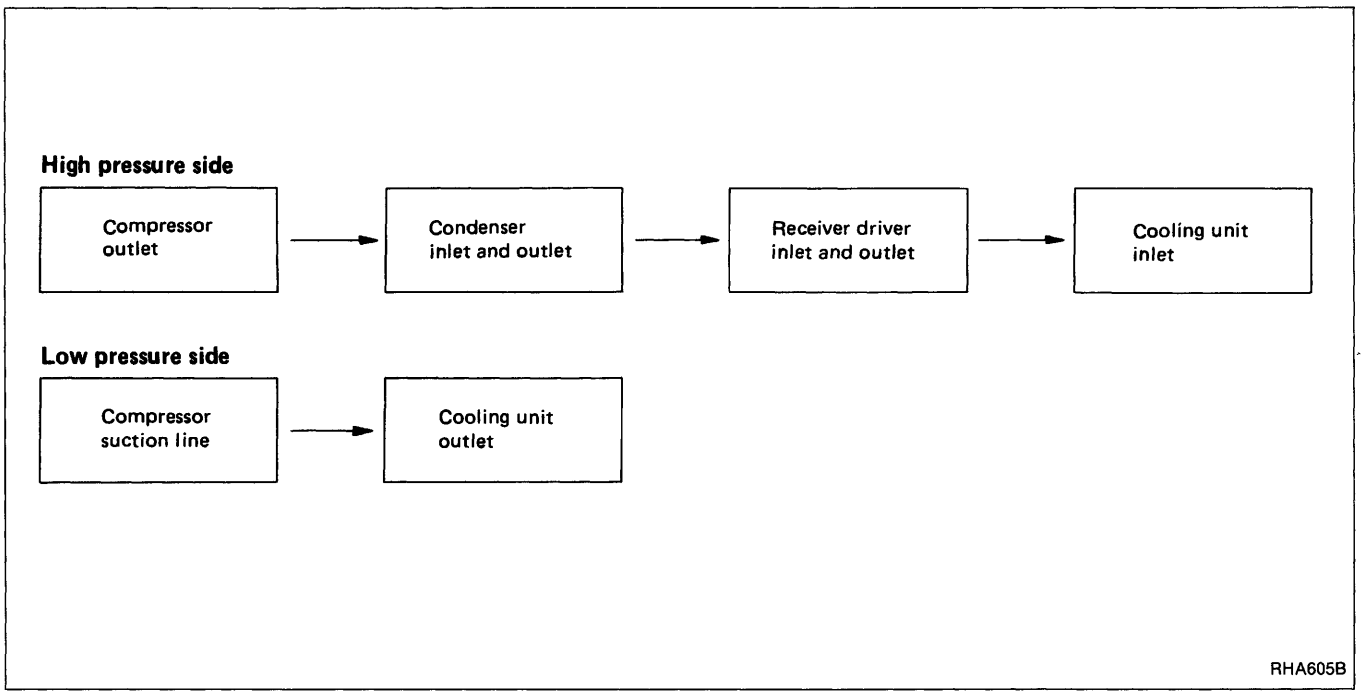
- Start the engine.
- Run the air conditioner.
- Set the blower fan control to MAX.
- Set the temperature control to FULL COLD.
- Run the refrigerant system for more than 5 minutes after setting the above-mentioned conditions (to circulate the refrigerant through the system).



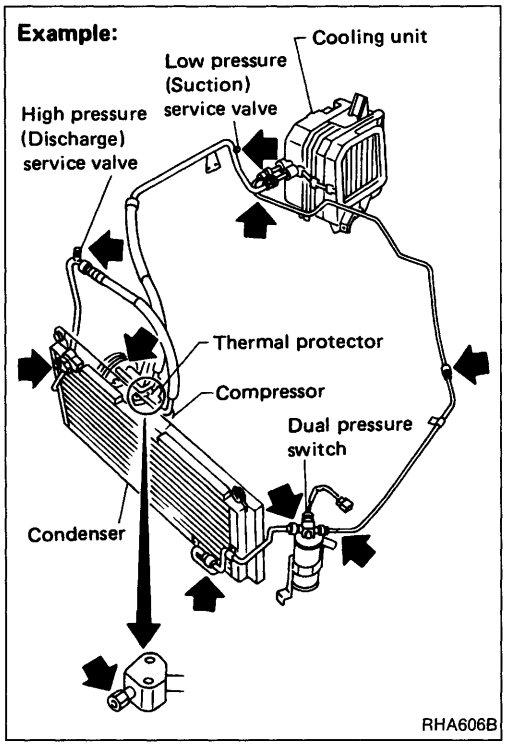
Refrigerant leaks should be checked immediately after stopping the engine, beginning with the high pressure line, using a gas leak tester. This is because the pressure in the high pressure line drops gradually after the refrigerant circulation stops while the pressure in the low pressure line rises gradually 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 valve (Charge port)

Check all around the charge valve. Ensure that the charge port valve 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.)

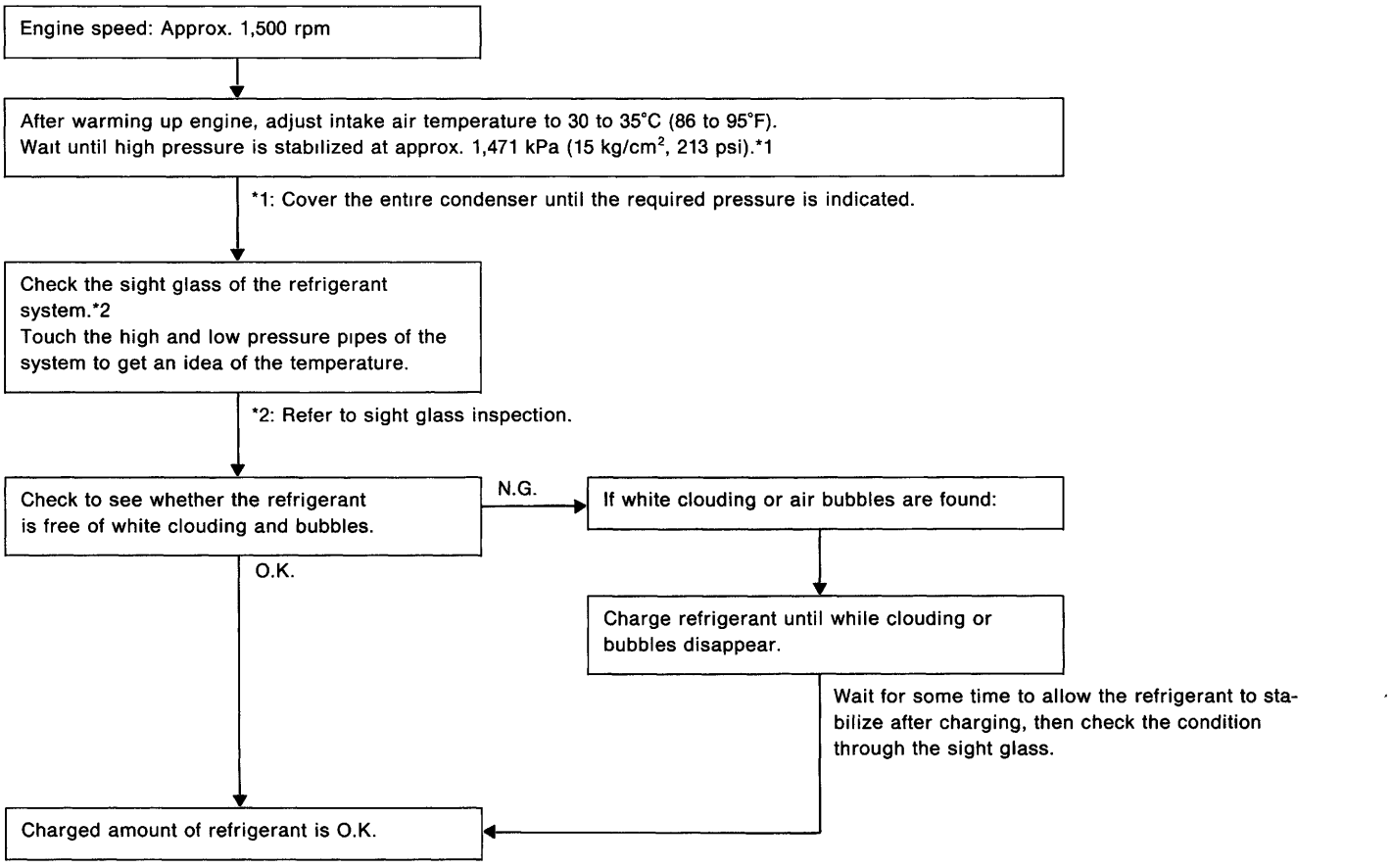
Confirmation of Amount of Charged Refrigerant

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:

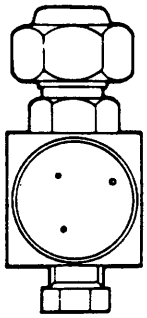
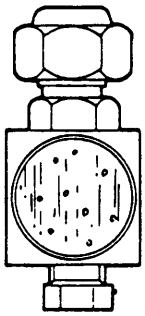
CONDITIONS

- 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

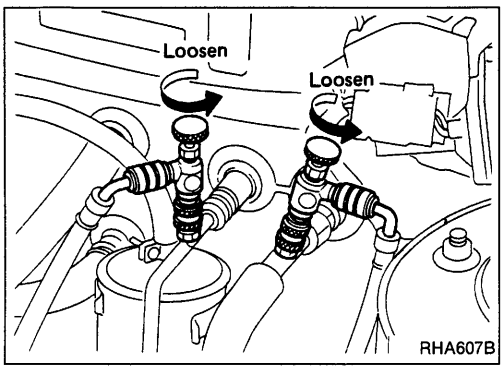


Confirmation of Amount of Charged Refrigerant (Cont'd)

Check item \ Amount of charge	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 (14 - 18 kg/cm^2, 199 - 256 psi) Normal low pressure: 147 - 294 kPa (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	**Air 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

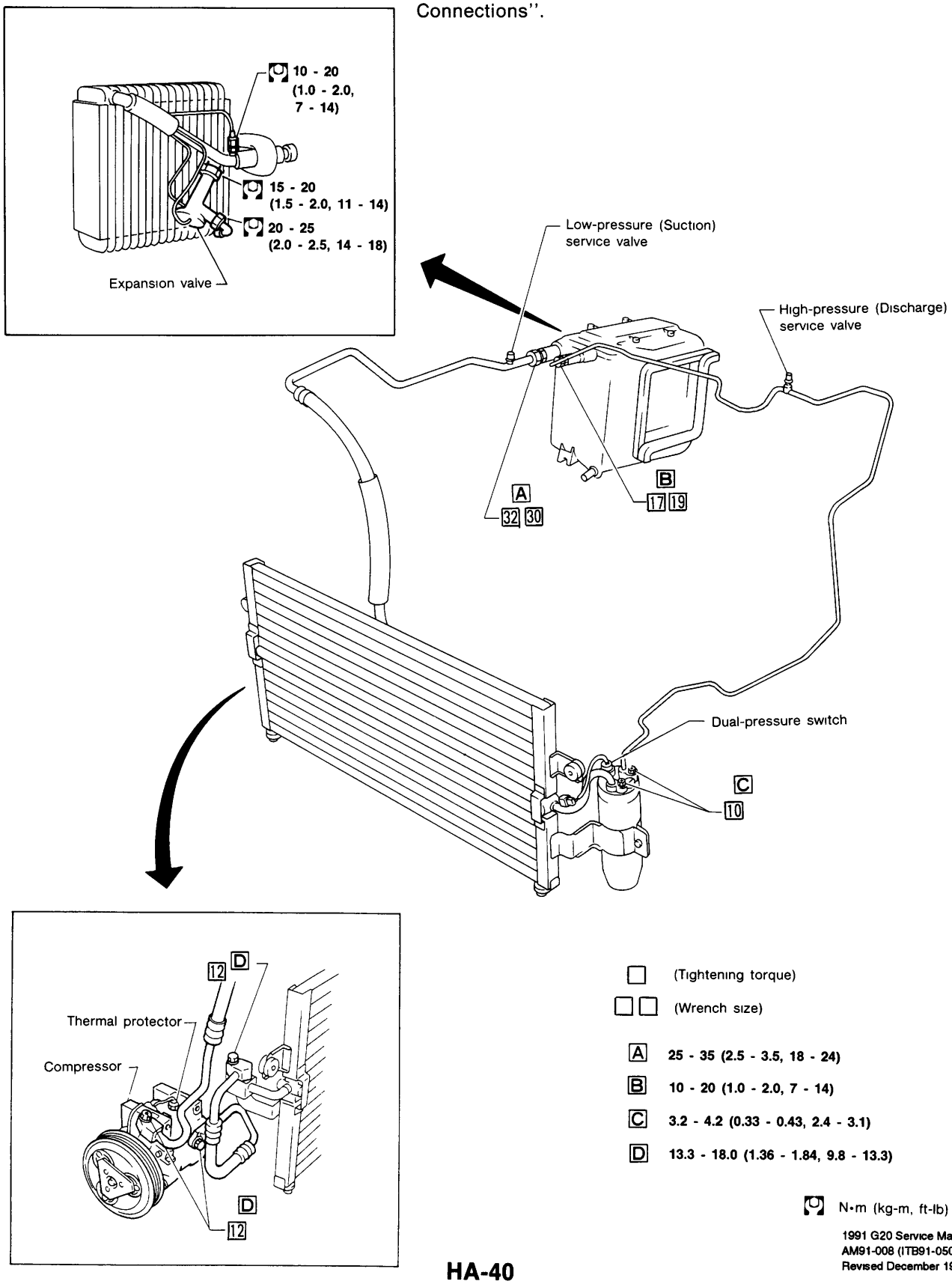
1. Completely loosen the adapter valves of the low pressure and high pressure lines. The inner valve of the adapter valve will prevent the refrigerant from leaking out.
2. Remove both the high-pressure and low-pressure side adapter valves from the on-vehicle service valve.

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 (10 kg/cm^2, 142 psi), then similarly disconnect the high pressure charging hose.

Refrigerant Lines

- Refer to page HA-10 regarding "Precautions for Refrigerant Connections".



□ (Tightening torque)

□□ (Wrench size)

A 25 - 35 (2.5 - 3.5, 18 - 24)

B 10 - 20 (1.0 - 2.0, 7 - 14)

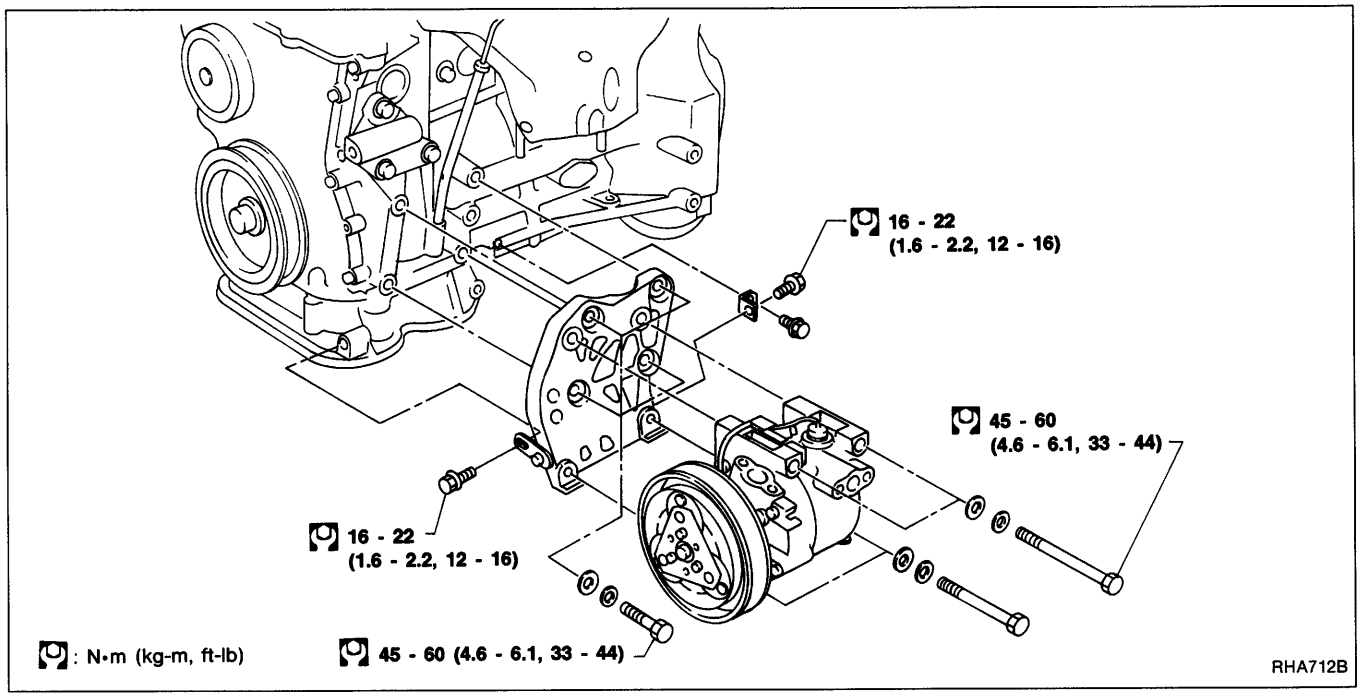
C 3.2 - 4.2 (0.33 - 0.43, 2.4 - 3.1)

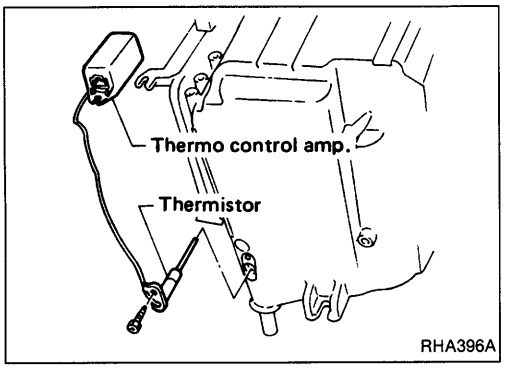
D 13.3 - 18.0 (1.36 - 1.84, 9.8 - 13.3)

N•m (kg-m, ft-lb)

1991 G20 Service Manual
AM91-008 (ITB91-050)
Revised December 1991

Compressor Mounting





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.**

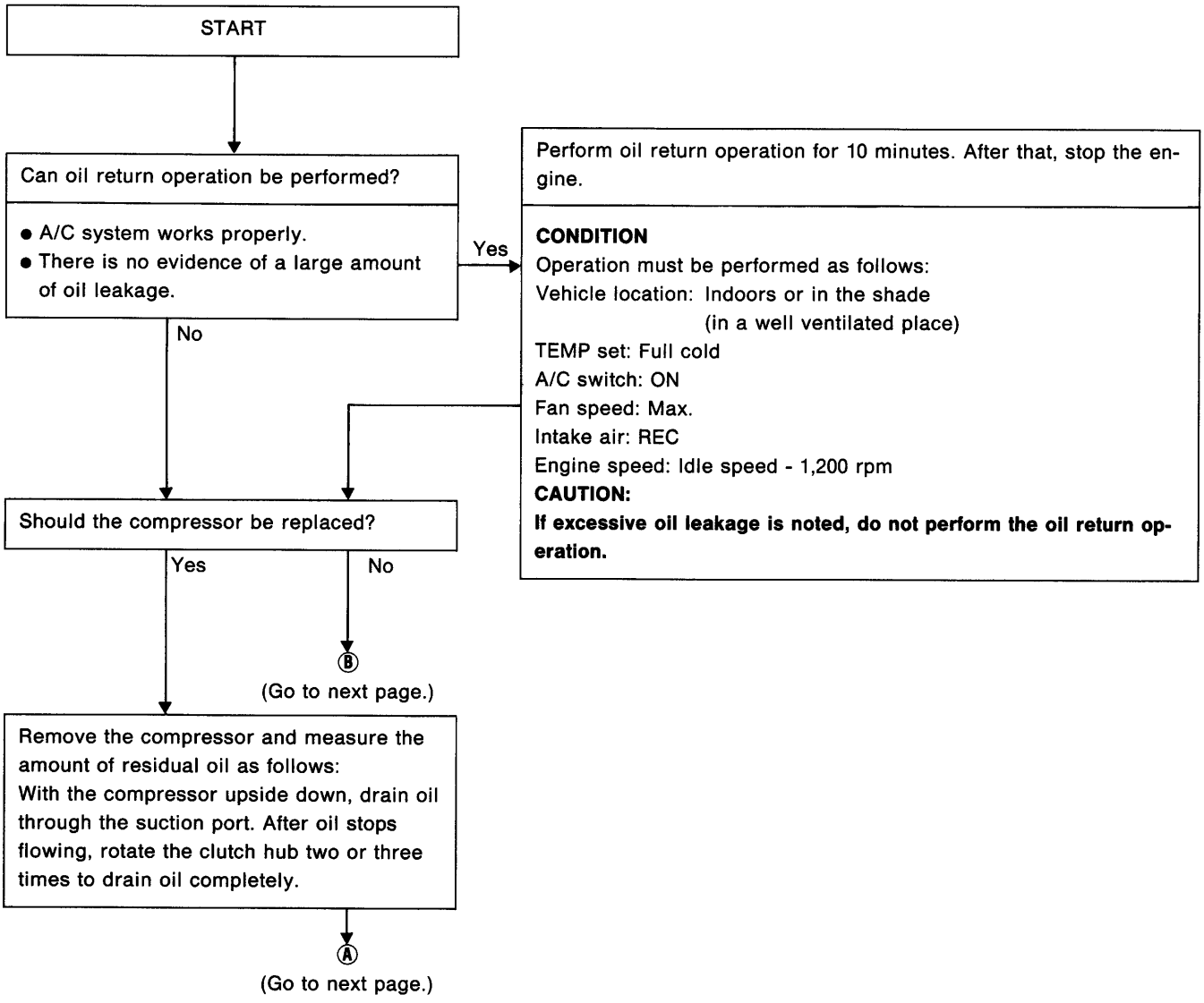
Fast Idle Control Device (F.I.C.D.)

- **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)



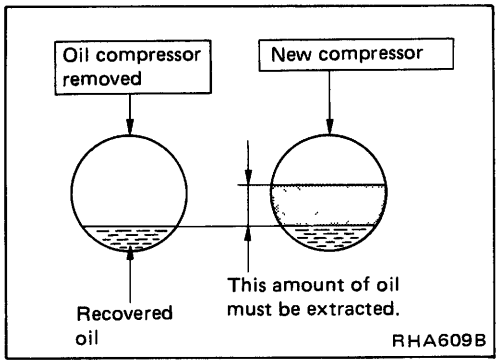
Maintenance of Oil Quantity in Compressor (Cont'd)

Ⓐ

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 (US fl oz, 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	200 (6.8, 7.0)	Less than 70 (2.4, 2 5)	110 (3.7, 3.9)
		Greater than 70 (2.4, 2.5)	200 (6.8, 7.0) – [Recovered amount + 20 (0.7, 0.7)]
NVR140 NVR140S	200 (6.8, 7.0)	Less than 90 (3.0, 3.2)	90 (3.0, 3.2)
		Greater than 90 (3.0, 3.2)	200 (6.8, 7.0) – [Recovered amount + 20 (0.7, 0.7)]
DKS16H DKS16N	250 (8.5, 8.8)	Less than 190 (6.4, 6.7)	60 (2.0, 2.1)
		Greater than 190 (6.4, 6.7)	250 (8.5, 8.8) – [Recovered amount + 20 (0.7, 0.7)]
MJS130 MJS170	150 (5.1, 5.3)	—	80 (2.7, 2.8)
V-5	236 (8.0, 8.3)	Less than 95 (3.2, 3.3)	150 (5.1, 5.3)
		Greater than 95 (3.2, 3.3)	236 (8 0, 8.3) – [Recovered amount + 20 (0.7, 0.7)]

Ⓑ

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.

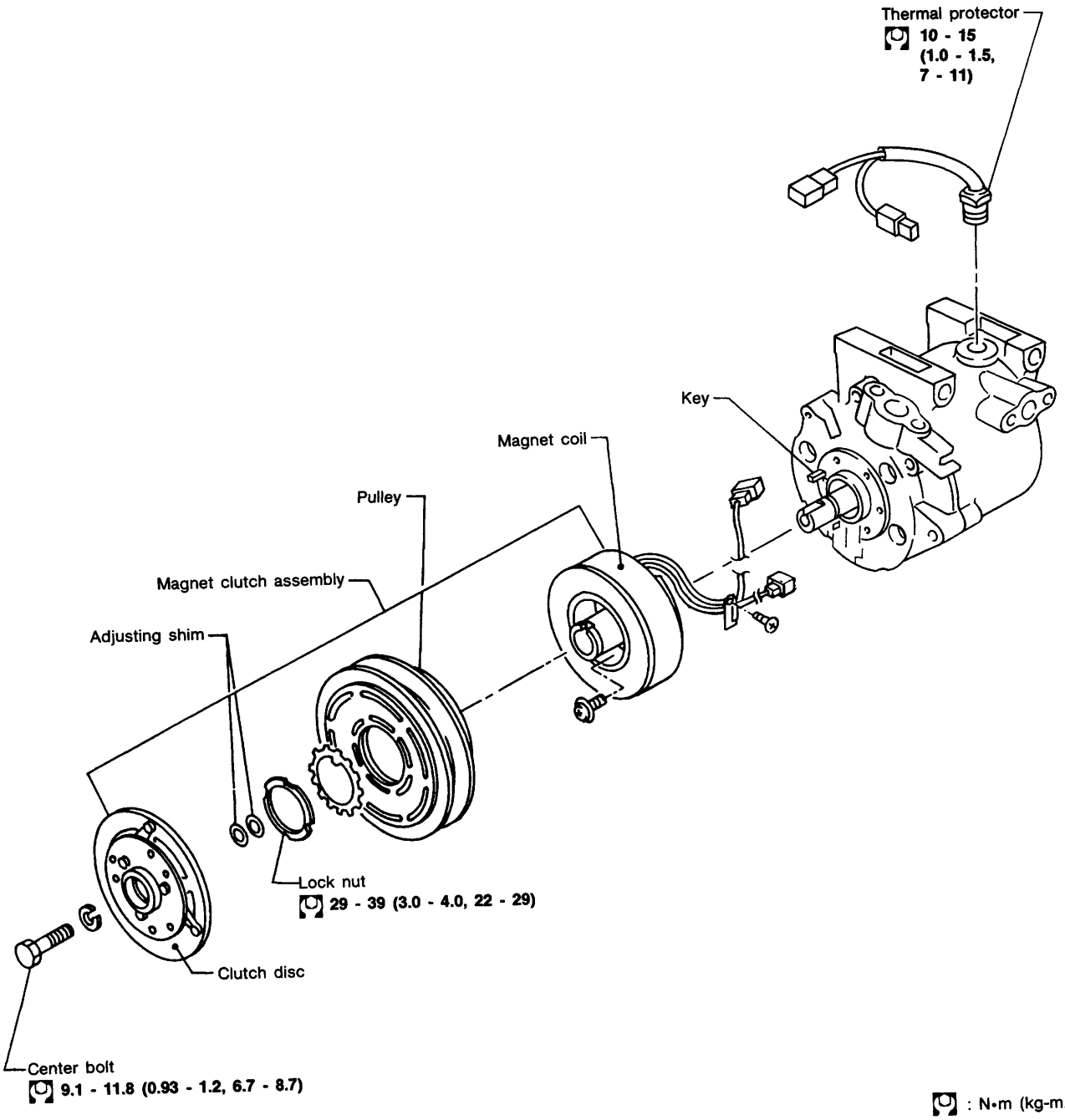
Amount of oil to be added

Part replaced	Oil to be added to system		Remarks
	Amount of oil mℓ (US fl oz, Imp fl oz)	Ratio (%)	
Evaporator	45 - 75 (1.5 - 2.5, 1.6 - 2.6)	30	—
Condenser	30 - 50 (1.0 - 1.7, 1 1 - 1.8)	20	—
Receiver drier	15 - 25 (0.5 - 0.8, 0.5 - 0.9)	10	—
In case of refrigerant leak	30 - 50 (1.0 - 1 7, 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.

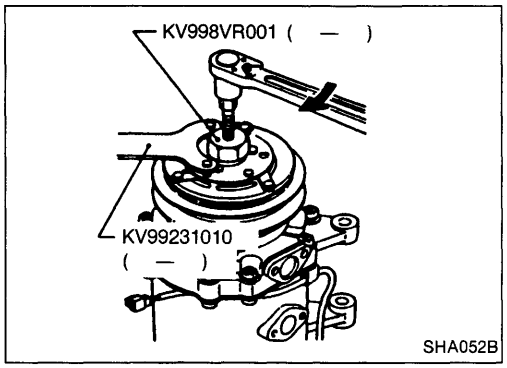
Precautions

- 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)

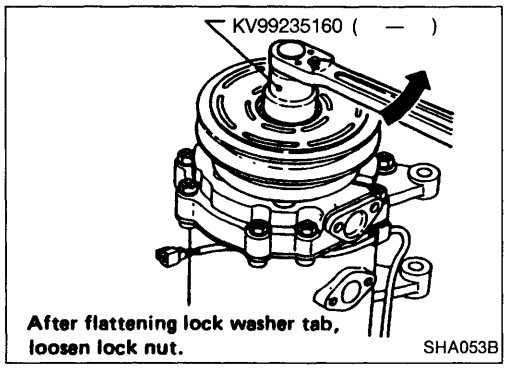
RHA747B



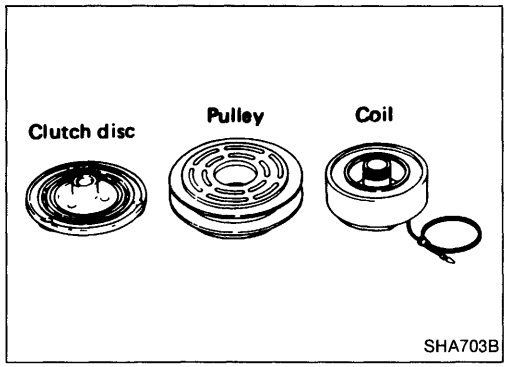
Compressor Clutch

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.

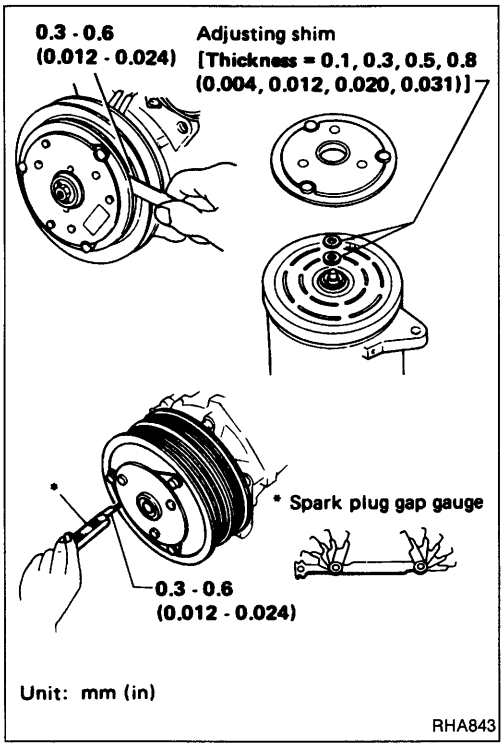
Pulley

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)

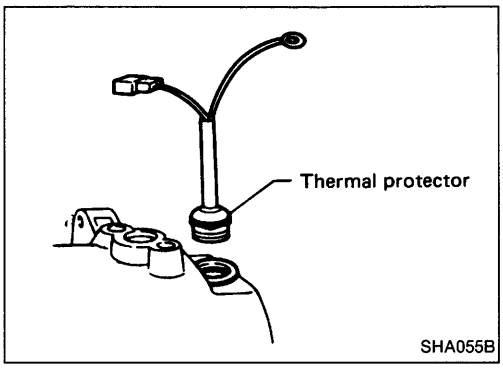


ADJUSTMENT

- 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.

NOTE

Contents

Symptom Chart HA-50
Preliminary Check HA-52
PRELIMINARY CHECK 1
(Intake door is not set at "FRESH" in DEF or F/D mode.) HA-52
PRELIMINARY CHECK 2
(A/C does not blow cold air.) HA-53
PRELIMINARY CHECK 3
(Magnet clutch does not operate in DEF mode.) HA-54
PRELIMINARY CHECK 4
(Air outlet does not change.) HA-55
PRELIMINARY CHECK 5
(Noise) HA-56
Harness Layout for A/C System HA-57
Circuit Diagram for Quick Pinpoint Check HA-59
Wiring Diagram HA-60
Main Power Supply and Ground Circuit Check HA-62
Diagnostic Procedure 1
(SYMPTOM: Blower motor does not rotate.) HA-63
Diagnostic Procedure 2
(SYMPTOM: Air outlet does not change.) HA-66
Diagnostic Procedure 3
(SYMPTOM: Intake door does not change.) HA-68
Diagnostic Procedure 4
(SYMPTOM: Fresh vent door does not change.) HA-69
Diagnostic Procedure 5
(SYMPTOM: Magnet clutch does not operate with A/C switch and fan switch are ON.) HA-70
Diagnostic Procedure 6
(SYMPTOM: Illumination or indicators of push control unit do not come on.) HA-75
Electrical Components Inspection HA-80

Symptom Chart

DIAGNOSTIC TABLE

PROCEDURE	Preliminary Check					Diagnostic Procedure						Main Power Supply and Ground Circuit Check			
REFERENCE PAGE	HA-52	HA-53	HA-54	HA-55	HA-56	HA-63	HA-66	HA-68	HA-69	HA-70	HA-75	HA-62	HA-62	HA-62	HA-62
SYMPTOM	Preliminary check 1	Preliminary check 2	Preliminary check 3	Preliminary check 4	Preliminary check 5	Diagnostic procedure 1	Diagnostic procedure 2	Diagnostic procedure 3	Diagnostic procedure 4	Diagnostic procedure 5	Diagnostic procedure 6	15A Fuses	10A Fuses	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.	❶							○					○	○	
Fresh vent door does not change.									❶				○		
Magnet clutch does not operate when A/C switch and fan switch are ON.		❶								❷			○		○
Magnet clutch does not operate in DEF mode.		❶	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)

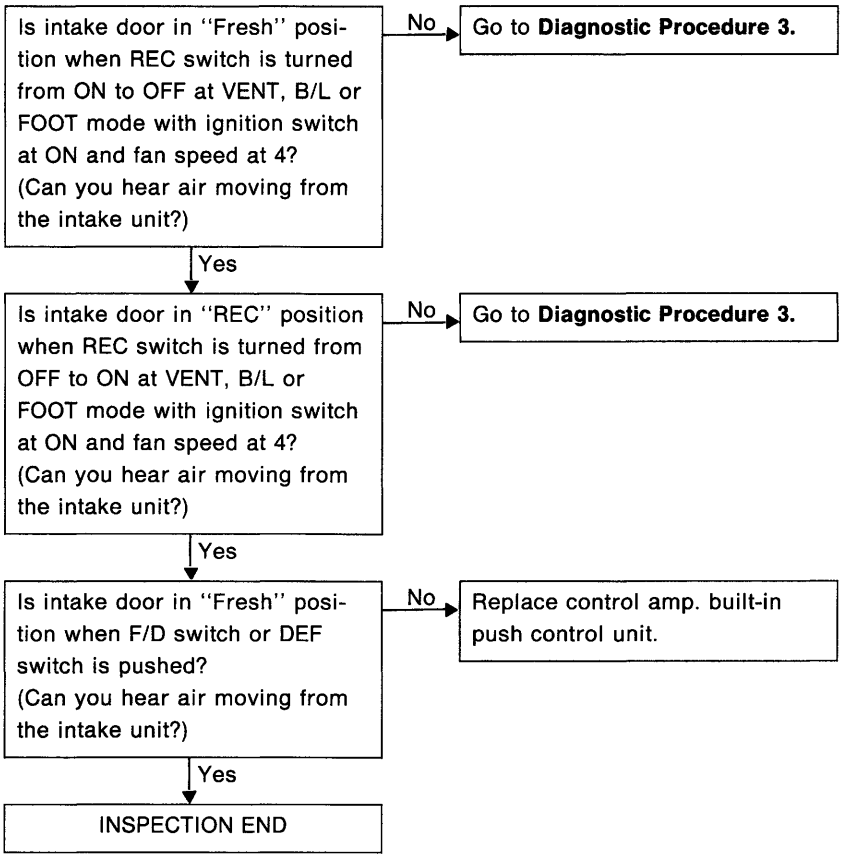
Electrical Components Inspection

Blower motor relay	Blower motor	Resistor	A/C switch	REC switch	VENT switch	B/L switch	FOOT switch	F/D switch	DEF switch	Fan switch	Fresh vent switch	Mode door motor	Intake door motor	Fresh vent door motor	A/C relay	Thermo control amp.	Dual-pressure switch	Compressor (Magnet clutch)	Thermal protector	E.C.C.S. control unit	Illumination system	Knob illumination	Harness	
			Push control unit															Compressor						
HA-82	HA-80	HA-80	HA-80	—	—	—	—	—	—	HA-80	HA-81	HA-86	HA-86	HA-87	HA-82	HA-81	HA-81	HA-46	HA-81	Refer to EF & EC section	Refer to EL section	HA-88	—	
○	○	○	○							○					○	○	○	○	○	○			○	
	○	○								○													○	
					○	○	○	○	○			○											○	
				○									○										○	
				○									○										○	
											○			○										
○			○							○					○	○	○	○	○	○			○	
○									○	○					○	○	○	○	○	○			○	
			○	○	○	○	○	○	○	○							○				○	○	○	

Preliminary Check

PRELIMINARY CHECK 1

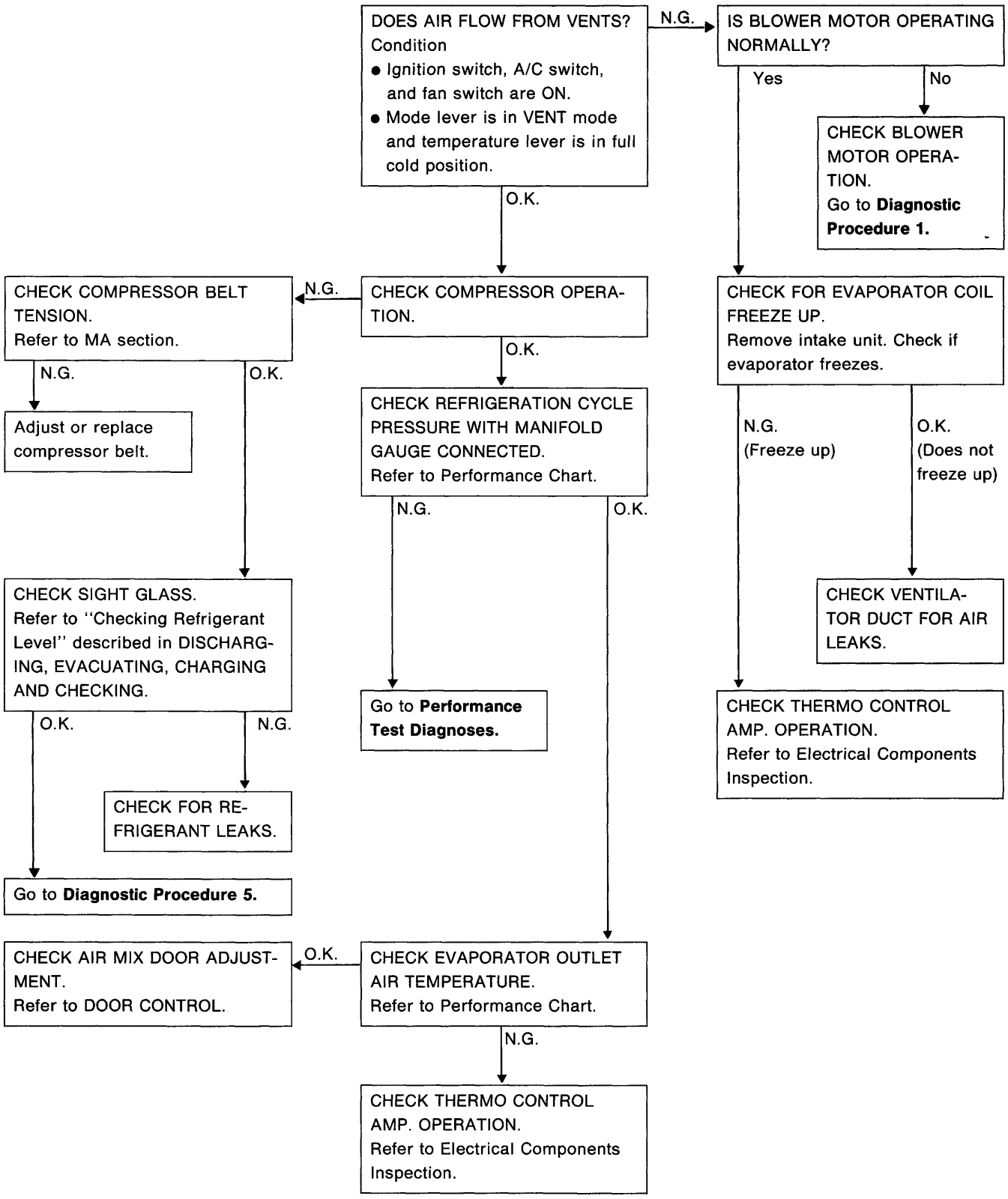
Intake door is not set at "FRESH" in DEF or F/D mode.



Preliminary Check (Cont'd)

PRELIMINARY CHECK 2

A/C does not blow cold air.

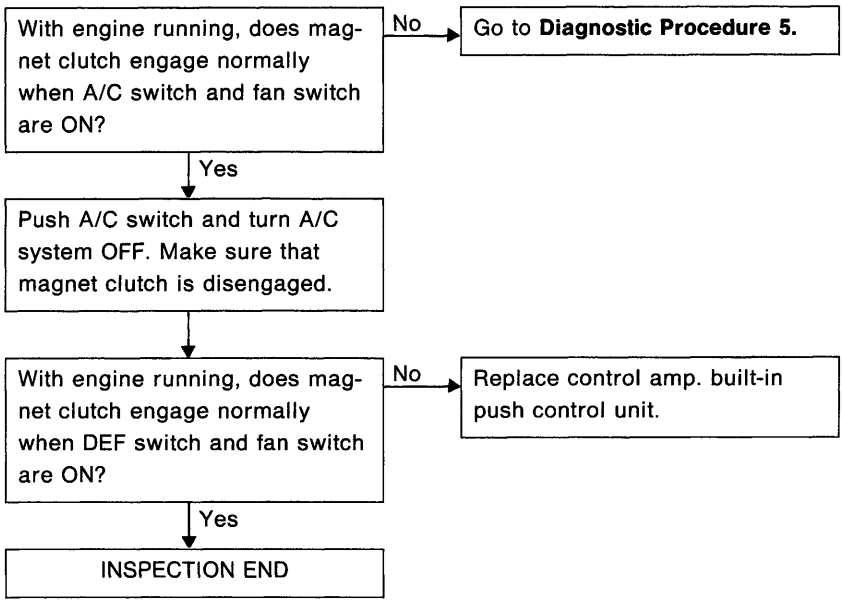


Preliminary Check (Cont'd)

PRELIMINARY CHECK 3

Magnet clutch does not operate in DEF mode.

- **Perform PRELIMINARY CHECK 2 before referring to the following flow chart.**



Preliminary Check (Cont'd)

PRELIMINARY CHECK 4

Air outlet does not change.

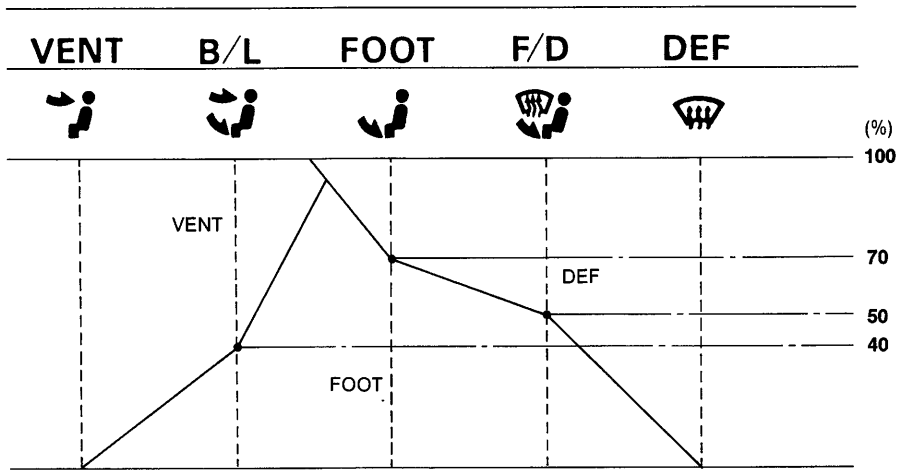
DOES AIR COME OUT FROM EACH DUCT NORMALLY WHEN EACH MODE SWITCH IS PUSHED WITH IGNITION SWITCH AT ON?

No → Go to **Diagnostic Procedure 2.**

Fresh vent "OFF"

Switch	Indicator illuminates					Air outlet
Mode						
	○					VENT
		○				FOOT & VENT
			○			FOOT, DEF & VENT
				○		FOOT, DEF & VENT
					○	DEF & VENT

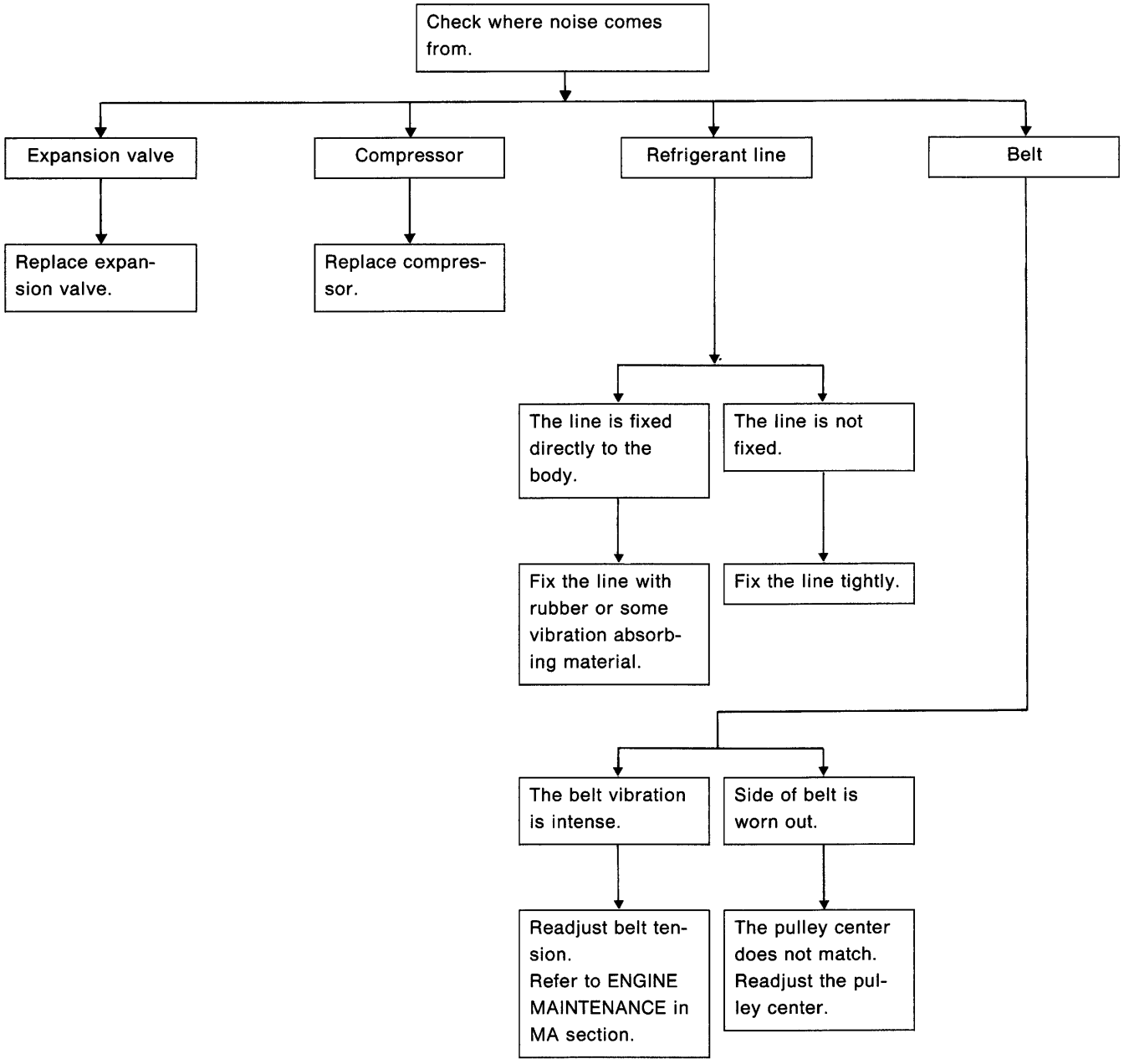
Air distribution ratios



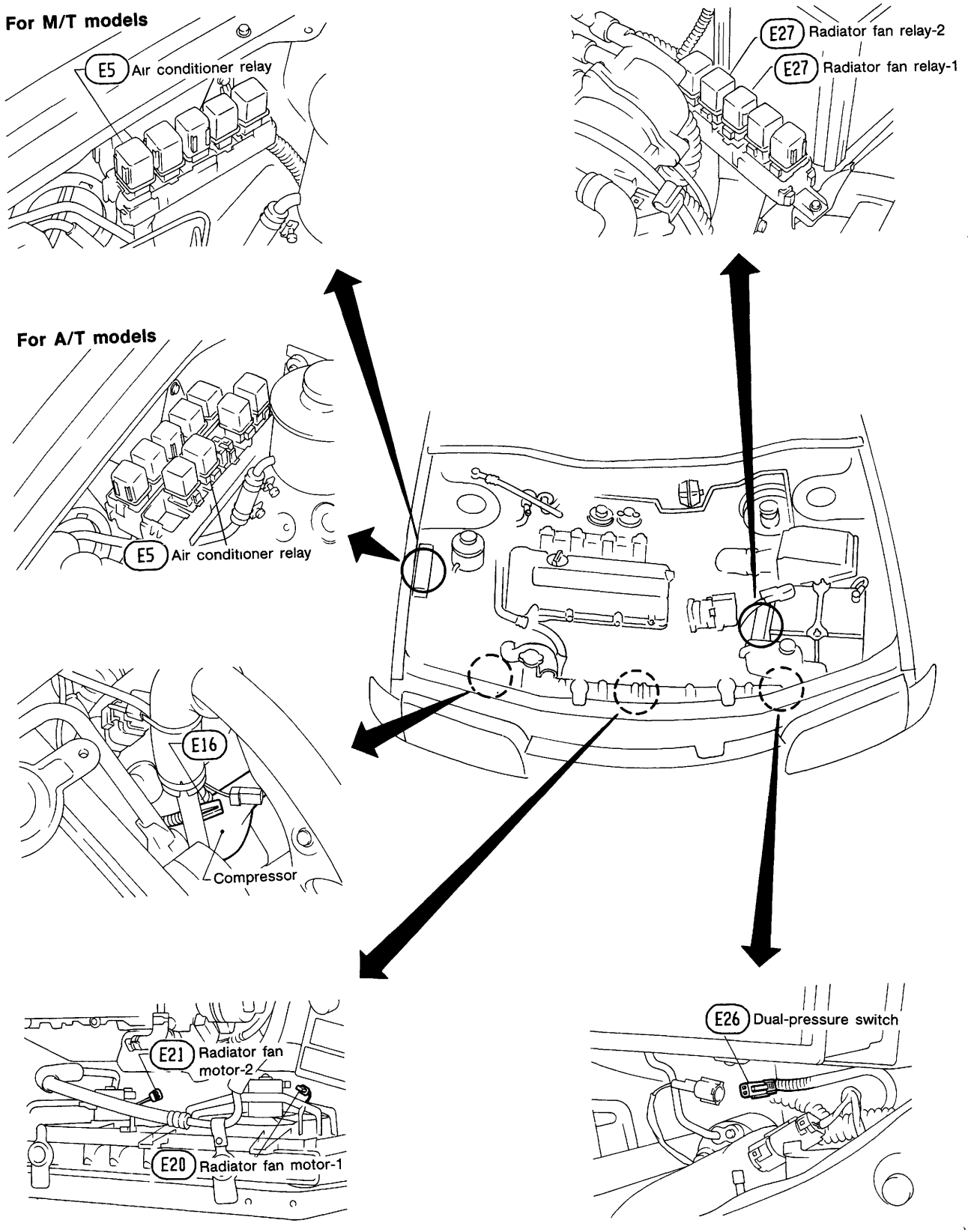
Yes → INSPECTION END

PRELIMINARY CHECK 5

Noise



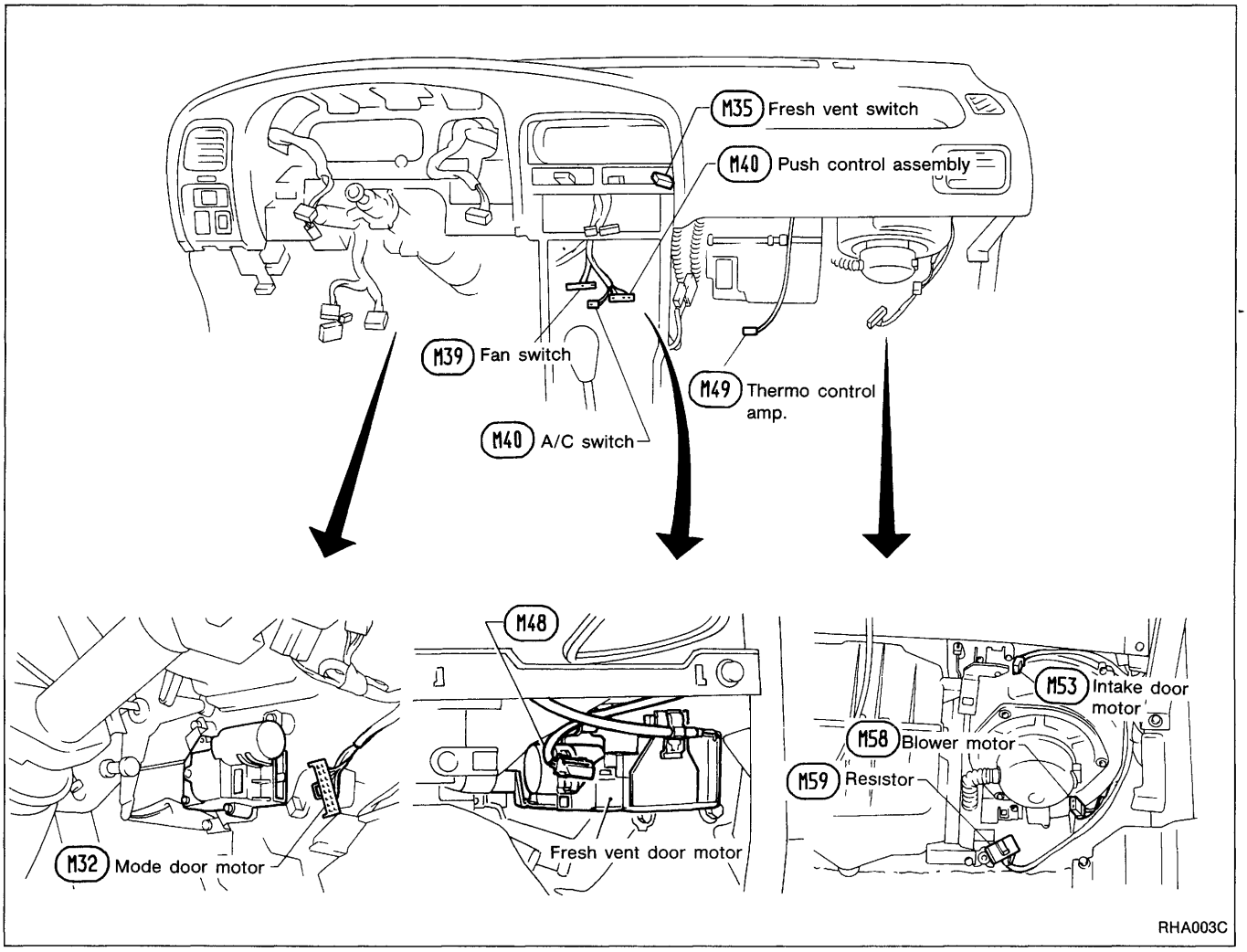
Harness Layout for A/C System



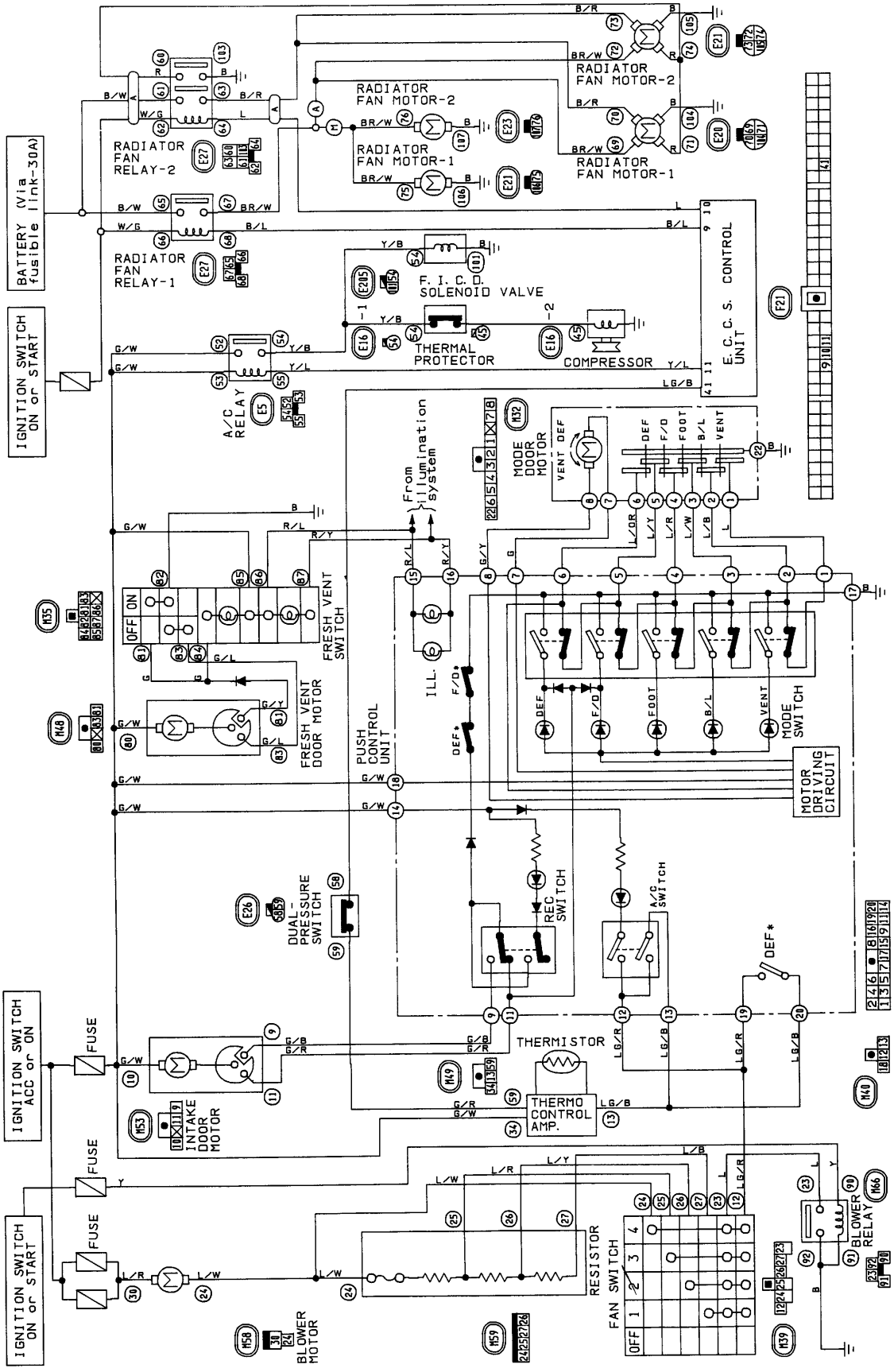
RHA002C

Harness Layout for A/C System (Cont'd)

PASSENGER COMPARTMENT



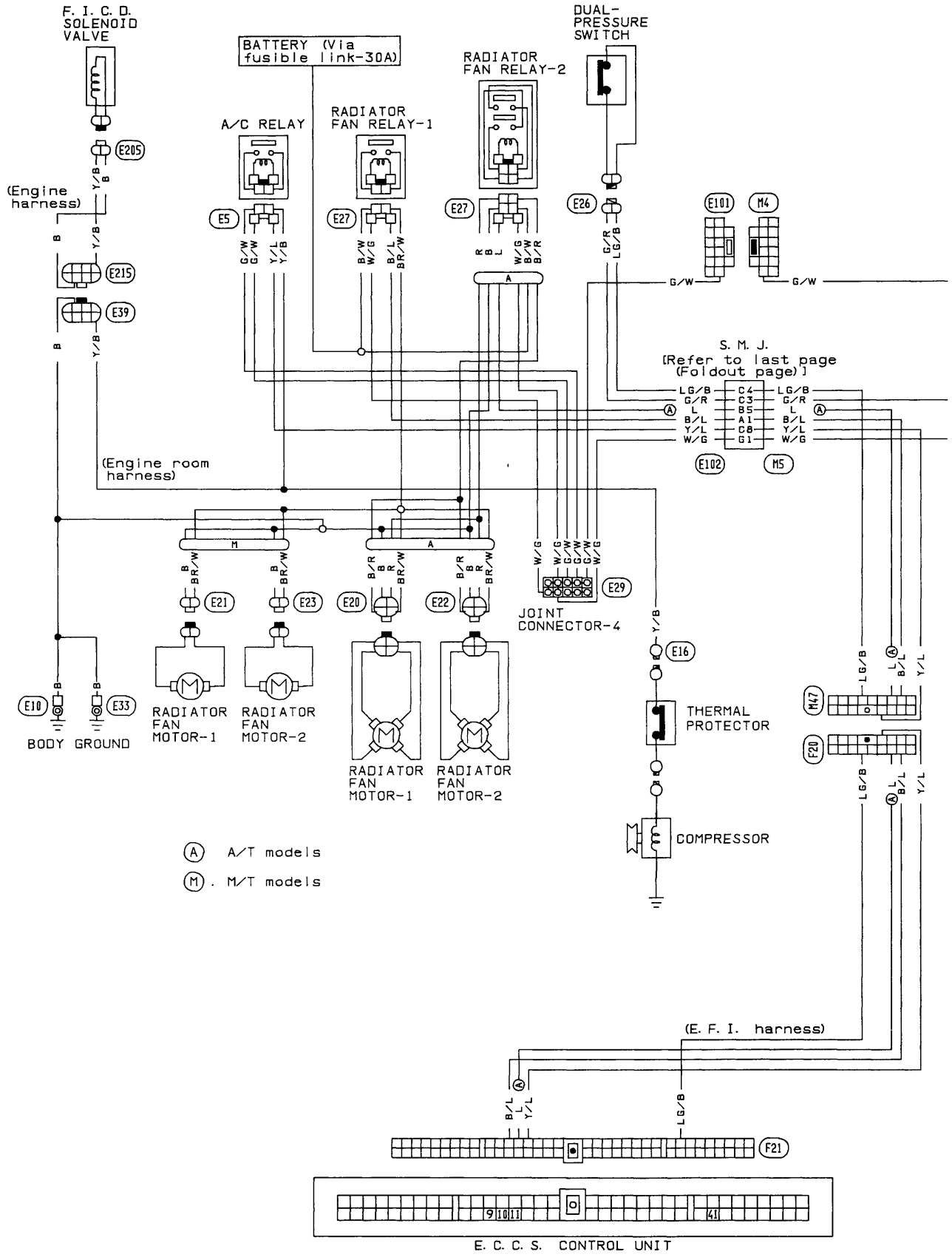
Circuit Diagram for Quick Pinpoint Check



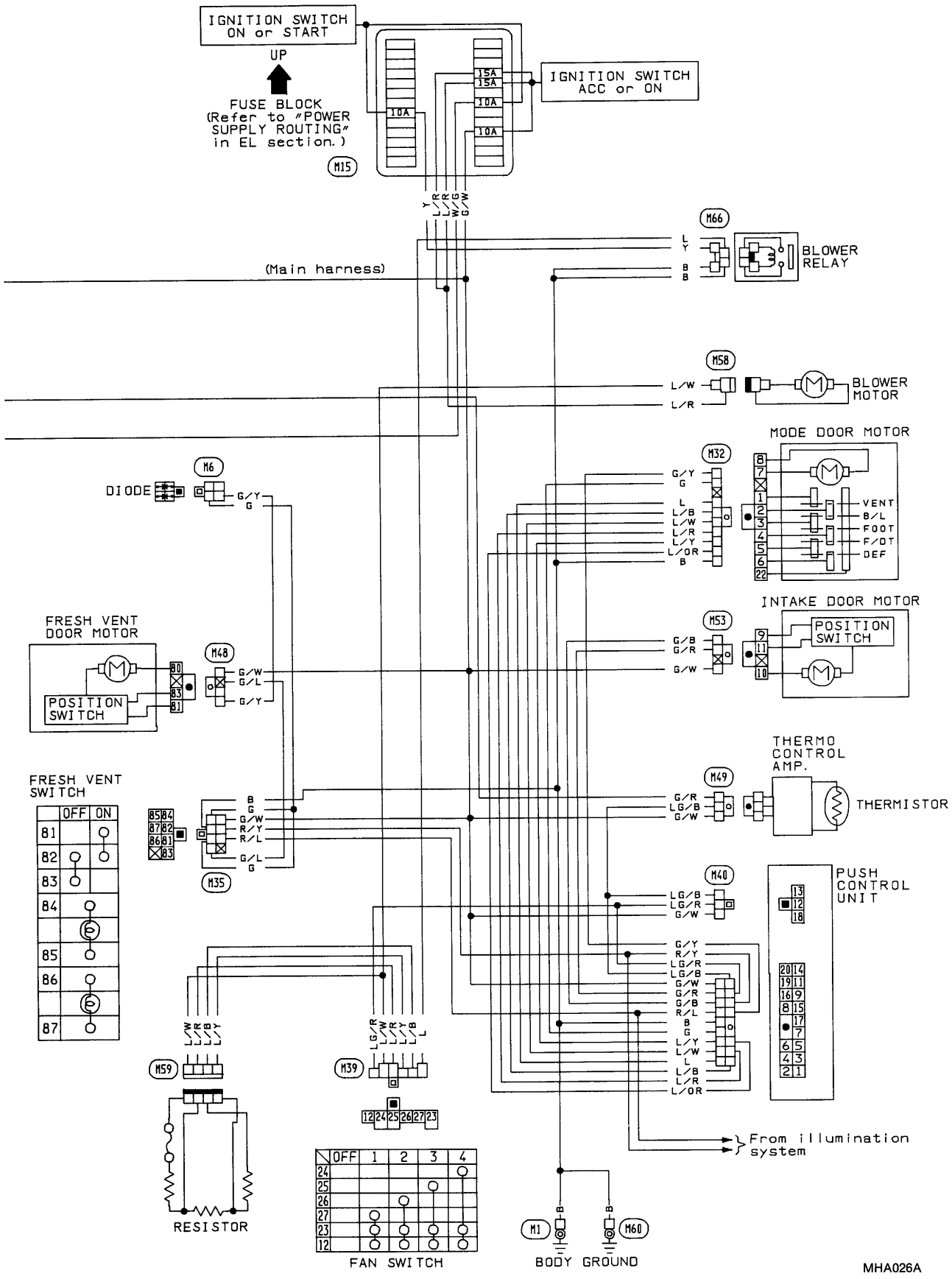
- All connectors shown in this illustration are unit side connectors.
- The unit side connectors with a double circle " ◎ " are connected to the harness side connectors shown in the "Harness Layout for A/C System". (See pages HA-57, HA-58.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle " ○ ".
- *: These switches are built into push control unit and mechanically linked to corresponding switches.

MHA027A

Wiring Diagram



Wiring Diagram (Cont'd)

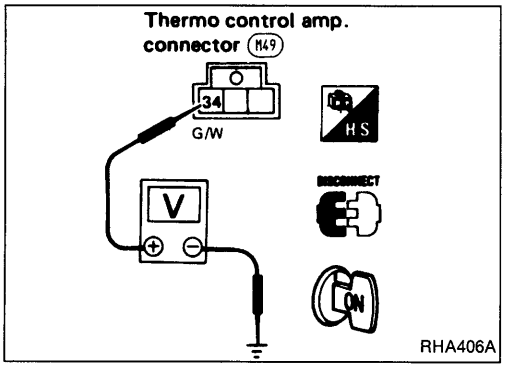


Main Power Supply and Ground Circuit Check

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.

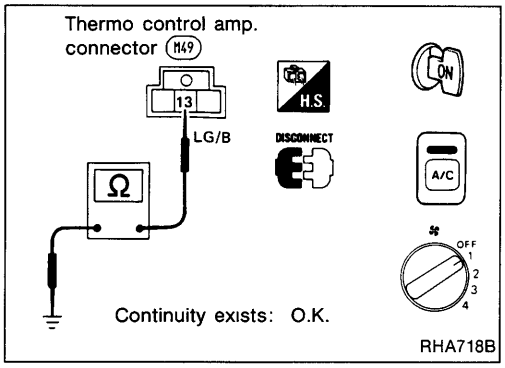


THERMO CONTROL AMP. CHECK

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. ㉞ and body ground.

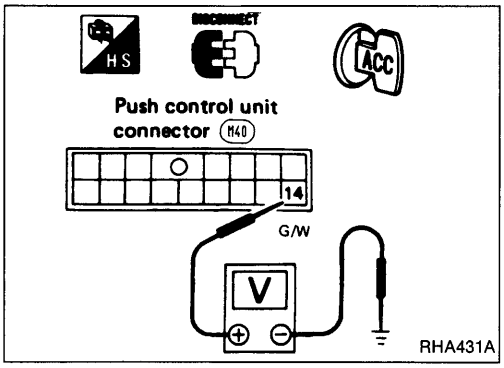
Voltmeter terminal		Voltage
⊕	⊖	
㉞	Body ground	Approx. 12V



Check body ground circuit for thermo control amp. with ignition switch ON, 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. ⑬ and body ground.

Ohmmeter terminal		Continuity
⊕	⊖	
⑬	Body ground	Yes

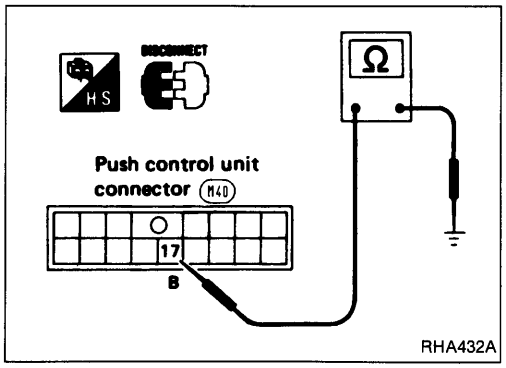


PUSH CONTROL UNIT CHECK

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. ⑭ and body ground.

Voltmeter terminal		Voltage
⊕	⊖	
⑭	Body ground	Approx. 12V

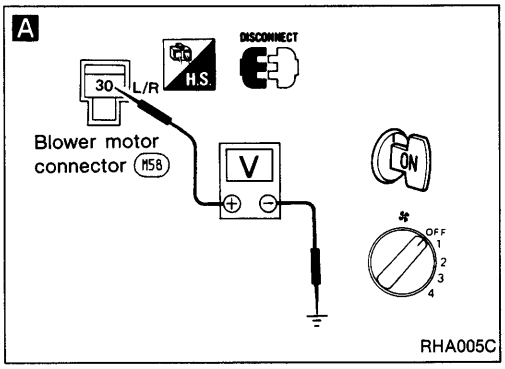


Check body ground circuit for push control unit with ignition switch OFF.

1. Disconnect push control unit harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between terminal No. ⑰ and body ground.

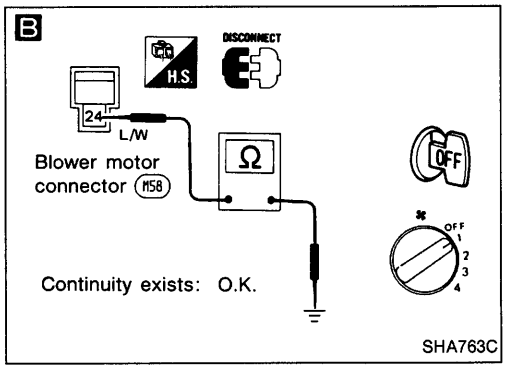
	INCIDENT	Flow chart No.
1	Fan fails to rotate.	1
2	Fan does not rotate at 1-speed.	2
3	Fan does not rotate at 2-speed.	3
4	Fan does not rotate at 3-speed.	4
5	Fan does not rotate at 4-speed.	5

A



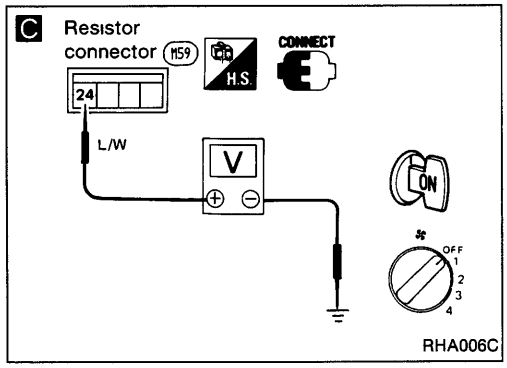
RHA005C

B



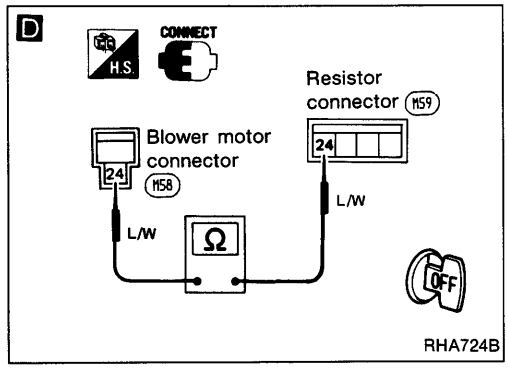
SHA763C

C



RHA006C

D



RHA724B

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)

2 (B) 3 (C) 4 (D) 5 (E) → (Go to next page.)

A

CHECK POWER SUPPLY FOR BLOWER MOTOR.
Disconnect blower motor harness connector.
Do approx. 12 volts exist between blower motor harness terminal No. 30 and body ground?

N.G. → Check 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. 24 and body ground.

N.G. → Reconnect blower motor harness connector.

O.K.

CHECK BLOWER MOTOR.
(Refer to Electrical Components Inspection.)

N.G.

Replace blower motor.

C

CHECK BLOWER MOTOR CIRCUIT BETWEEN BLOWER MOTOR AND RESISTOR.
Do approx. 12 volts exist between resistor harness terminal No. 24 and body ground?

N.G. → Disconnect blower motor and resistor harness connectors.

D

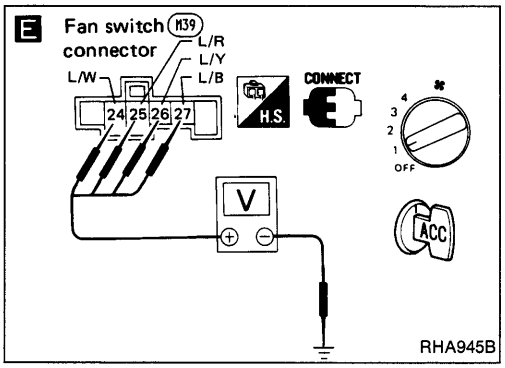
Note: Check circuit continuity between blower motor harness terminal No. 24 and resistor harness terminal No. 24.

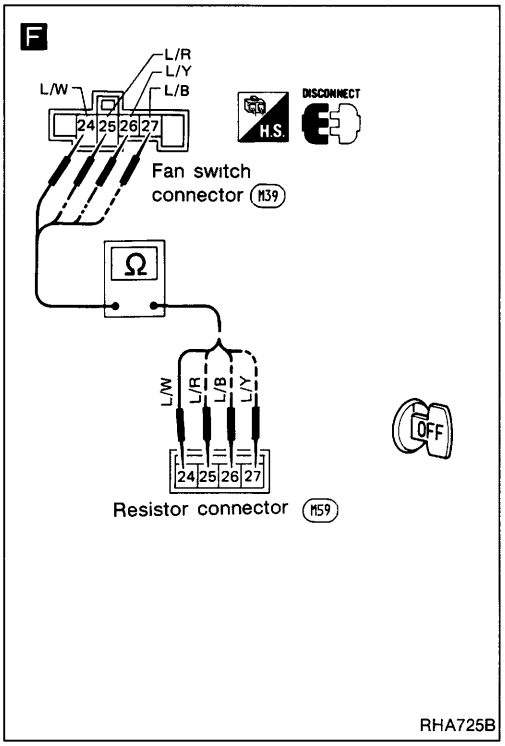
O.K.

(A) → (Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 1 (Cont'd)





Ⓐ 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 — E 2 3 4 — 5

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	27	Body ground	Approx. 12V
3	26		
4	25		
5	24		

O.K. (2 3 4 5) — N.G.

F 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.

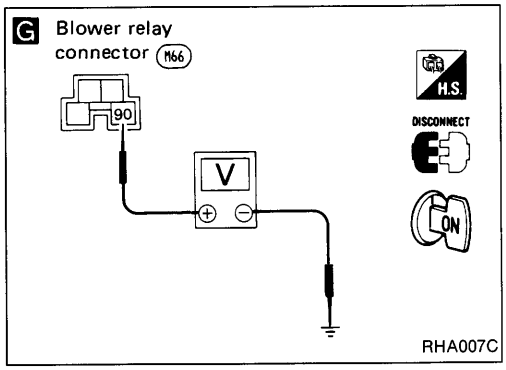
O.K.

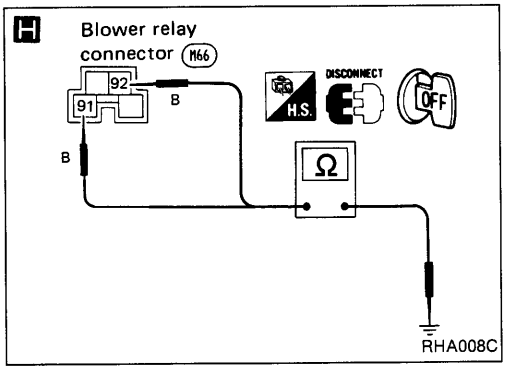
Ⓕ

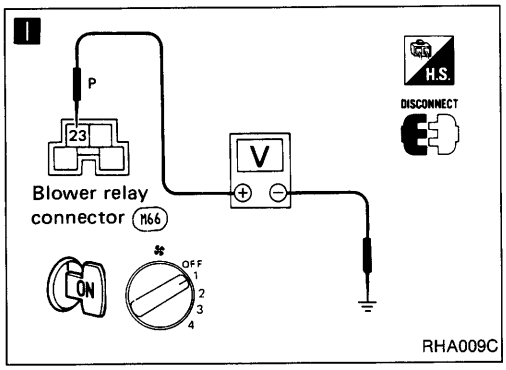
(Go to next page.)

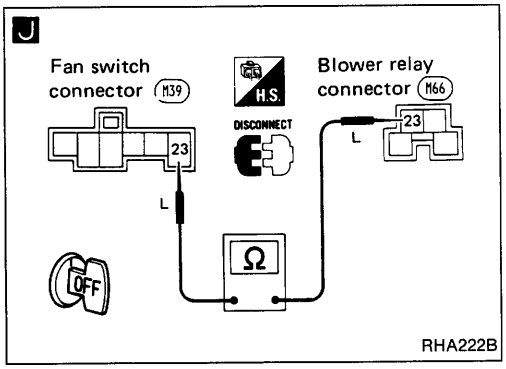
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 1 (Cont'd)









Ⓕ

G CHECK POWER SUPPLY FOR BLOWER RELAY.
Disconnect blower relay harness connector.
Do approx. 12 volts exist between blower relay harness terminal No. 90 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. ↓

H Note
Check circuit continuity between blower relay harness terminal No. 91, 92 and body ground.

O.K. ↓

I Reconnect fan switch harness connector.

CHECK FAN SWITCH CIRCUIT BETWEEN FAN SWITCH AND BLOWER RELAY.
Do approx. 12 volts exist between blower relay harness terminal No. 23 and body ground?

N.G. → Disconnect fan switch harness connector.

J Note
Check circuit continuity between fan switch harness terminal No. 23 and blower relay harness terminal No. 23.

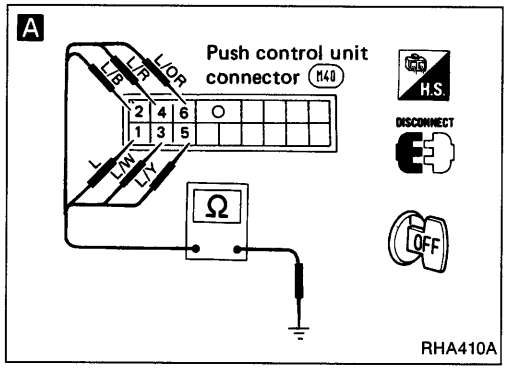
O.K. ↓

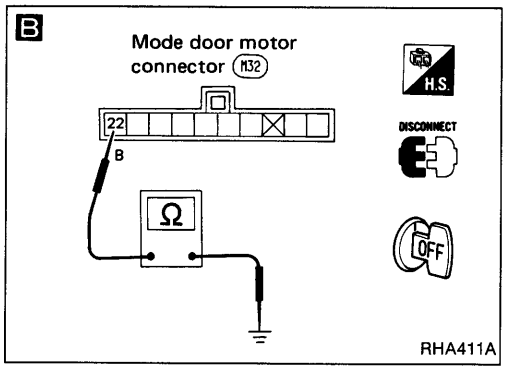
CHECK BLOWER RELAY AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

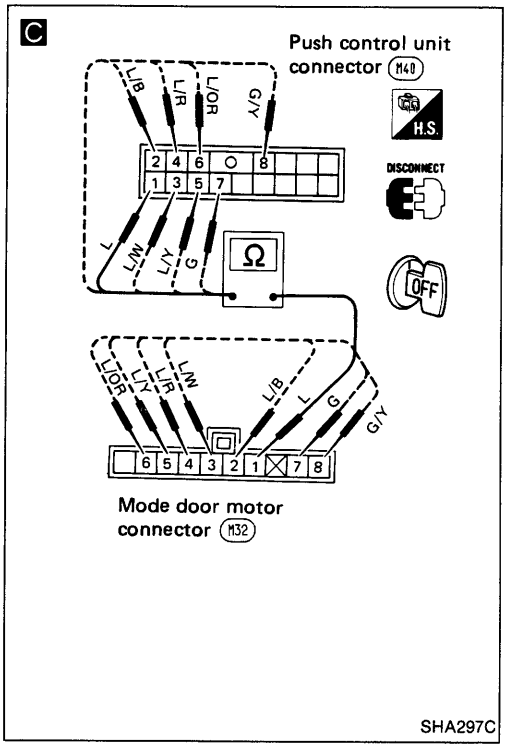
N.G. ↓

Replace blower relay.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.







Diagnostic Procedure 2

SYMPTOM: Air outlet does not change.

- **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. ① or ② 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	① or ②	Body ground	Yes
B/L	② or ③		
FOOT	③ or ④		
F/D	④ or ⑤		
DEF	⑤ or ⑥		

N.G. → Disconnect mode door motor harness connector.

O.K. ↓

CHECK SIDE LINK.
Refer to DOOR CONTROL.

B

Note

CHECK BODY GROUND CIRCUIT FOR MODE DOOR MOTOR.
Does continuity exist between mode door motor harness terminal No. ㉒ and body ground?

O.K. ↓

C

Note

Check circuit continuity between each terminal on push control unit and on mode door motor.

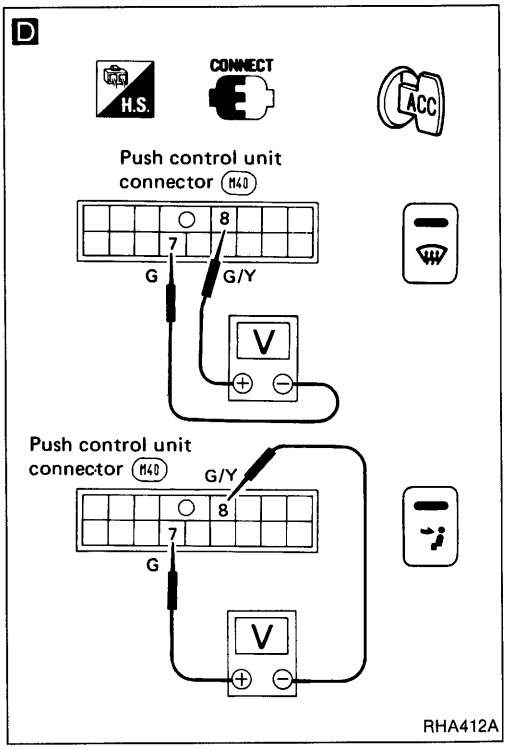
Terminal No. ⊕ (Push control unit)	Terminal No. ⊖ (Mode door motor)	Continuity
①	①	Yes
②	②	
③	③	
④	④	
⑤	⑤	
⑥	⑥	
⑦	⑦	
⑧	⑧	

Ⓐ

(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 2 (Cont'd)



Ⓐ

Reconnect push control unit and mode door motor harness connectors.

D

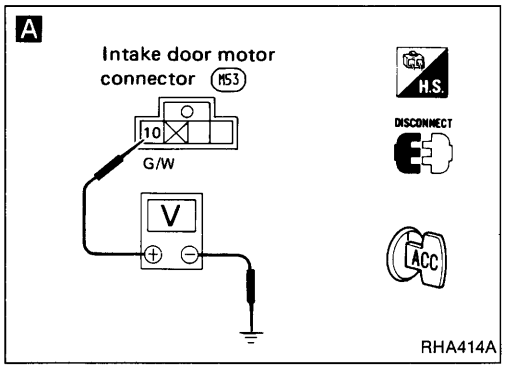
CHECK FOR OUTPUT OF PUSH CONTROL UNIT.
Do approx. 12 volts exist between push control unit harness terminal No. ⑦ and ⑧ when mode is switched from "VENT" to "DEF" or when mode is switched from "DEF" to "VENT"?

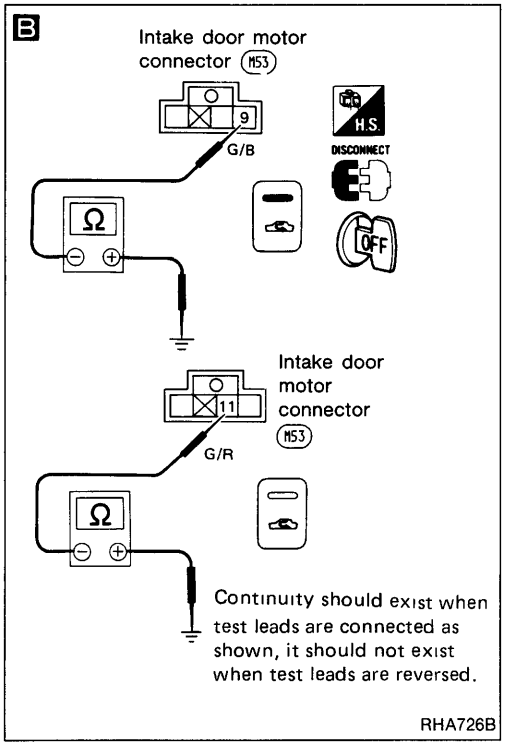
N.G. → Replace control amp. built-in push control unit.

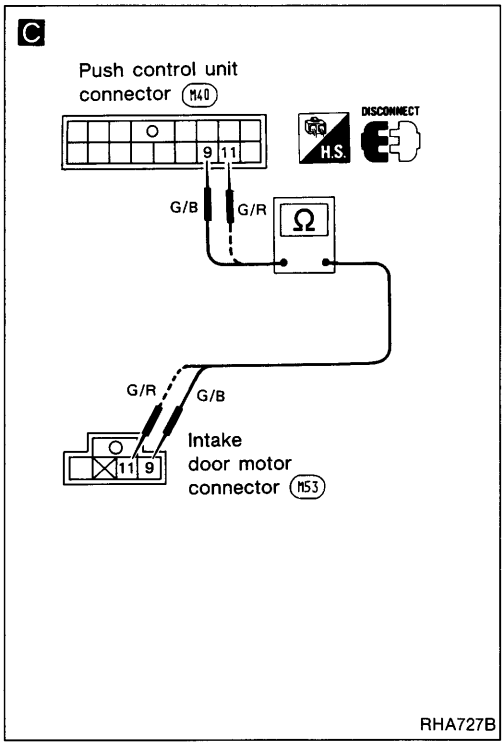
Terminal No.		Mode door motor	
⑦	⑧	Mode door operation	Direction of linkage rotation
⊖	⊖	Stop	Stop
⊖	⊕	VENT → DEF	Clock-wise
⊕	⊖	DEF → VENT	Counter-clock-wise

O.K.

Replace mode door motor.







Diagnostic Procedure 3

SYMPTOM: Intake door does not change.

- **Perform PRELIMINARY CHECK 1 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. ⑩ 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. ⑨ and body ground when REC switch is ON?
Does continuity exist between intake door motor harness terminal No. ⑪ 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. ⑨ (⑪) and intake door motor harness terminal No. ⑨ (⑪)?

O.K. ↓

Replace control amp. built-in push control unit.

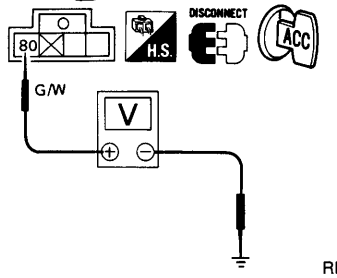
O.K. ↓

Replace intake door motor.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

A

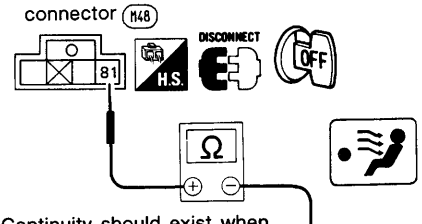
Fresh vent door motor connector (M48)



RHA010C

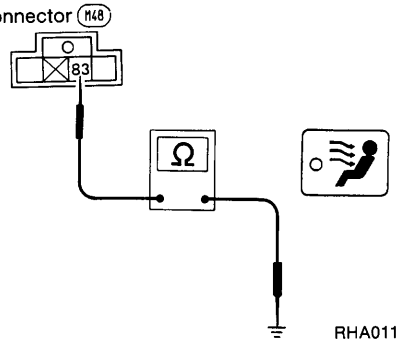
B

Fresh vent door motor connector (M48)



Continuity should exist when test leads are connected as shown It should not exist when test leads are reversed.

Fresh vent door motor connector (M48)

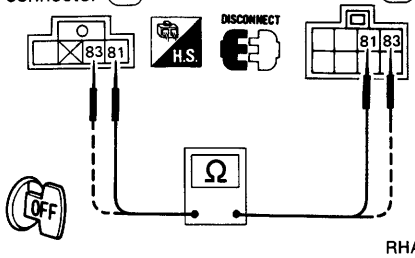


RHA011C

C

Fresh vent door motor connector (M48)

Fresh vent switch connector (M35)



RHA012C

Diagnostic Procedure 4

SYMPTOM: Fresh vent door does not change.

- **Perform Main Power Supply and Ground Circuit Check before referring to the following flow chart.**

A

CHECK POWER SUPPLY FOR FRESH VENT DOOR MOTOR.
Disconnect fresh vent door motor harness connector.
Do approx. 12 volts exist between fresh vent door motor harness terminal No. (80) 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 FRESH VENT DOOR MOTOR.
Does continuity exist between fresh vent door motor harness terminal No. (81) and body ground when FRESH VENT switch is ON?
Does continuity exist between fresh vent door motor harness terminal No. (83) and body ground when FRESH VENT switch is OFF?

N.G. → Disconnect fresh vent switch harness connector.

C

Note

Check circuit continuity between fresh vent switch harness terminal No. (81) ((83)) and fresh vent door motor harness terminal No. (81) ((83)).

O.K. ↓

CHECK FRESH VENT SWITCH. (Refer to Electrical Components Inspection.)

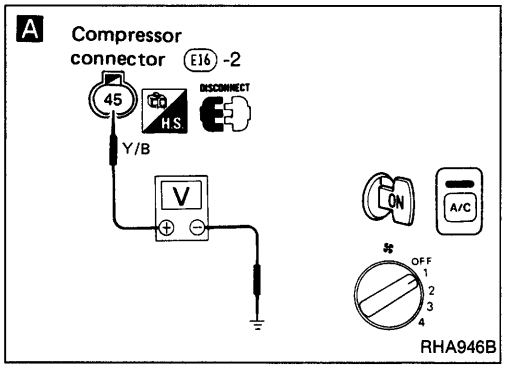
N.G. ↓

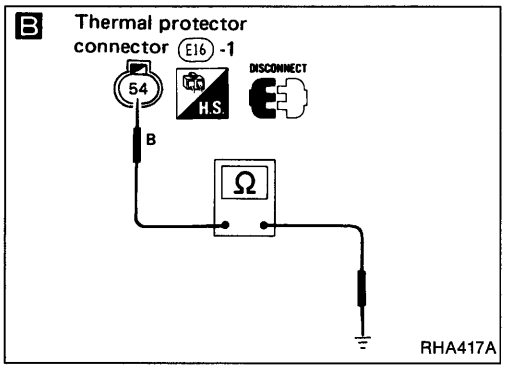
Replace fresh vent switch.

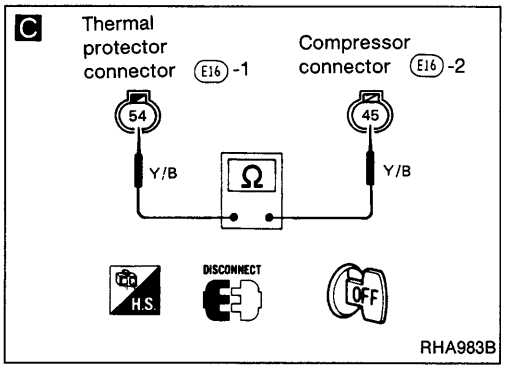
O.K. ↓

Replace fresh vent door motor.

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.

- **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. 45 and body ground?

N.G. → **B**

CHECK POWER SUPPLY FOR THERMAL PROTECTOR.
Disconnect thermal protector harness connector.
Do approx. 12V exist between thermal protector harness terminal No. 54 and body ground?

N.G. → Ⓐ

O.K. → **C**

CHECK THERMAL PROTECTOR.
Check circuit continuity between thermal protector harness terminal No. 54 and compressor harness terminal No. 45.

N.G. →

Replace thermal protector.

O.K. →

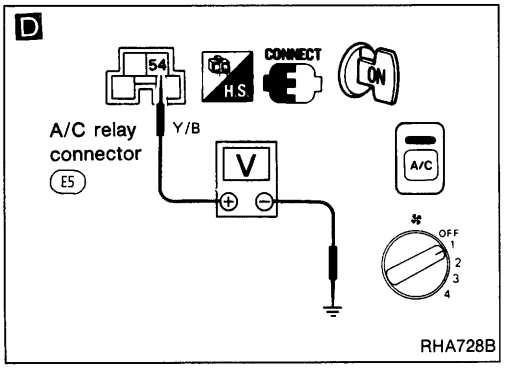
Check magnet clutch coil.

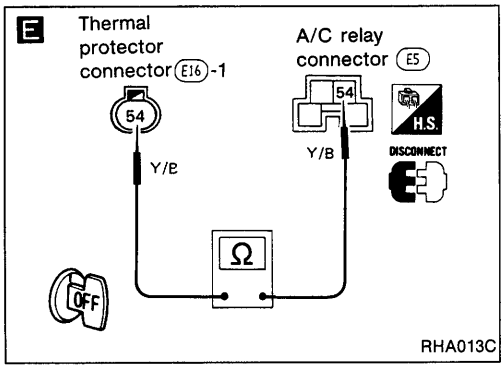
O.K. →

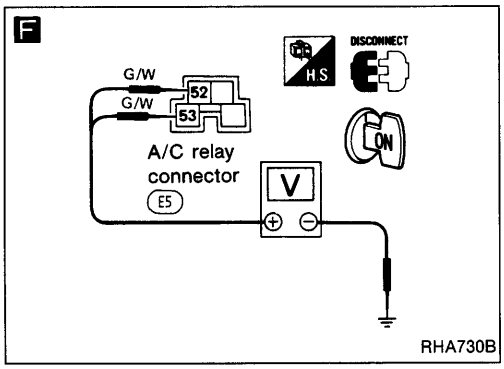
Replace magnet clutch.
Refer to COMPRESSOR.

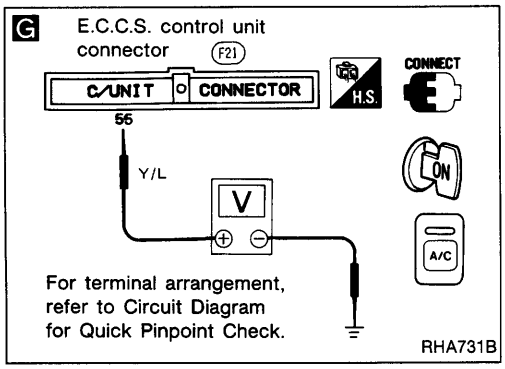
(Go to next page.)

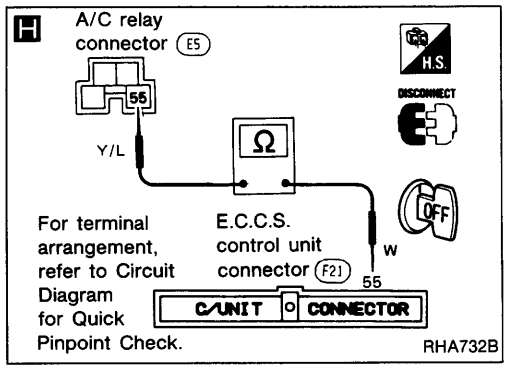
Diagnostic Procedure 5 (Cont'd)











Ⓐ

D CHECK A/C RELAY OPERATION.
Do approx. 12 volts exist between A/C relay harness terminal No. 54 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. 52, 53 and body ground?

- O.K. → CHECK POWER SUPPLY CIRCUIT AND 10A FUSE AT FUSE BLOCK.
(Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)
- N.G.

O.K.

Disconnect A/C relay harness connector.

E Note
Check circuit continuity between A/C relay harness terminal No. 54 and thermal protector harness terminal No. 54.

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. 55 and body ground?

N.G. → **H** Check circuit continuity between A/C relay harness terminal No. 55 and E.C.C.S. control unit harness terminal No. 55.

O.K.

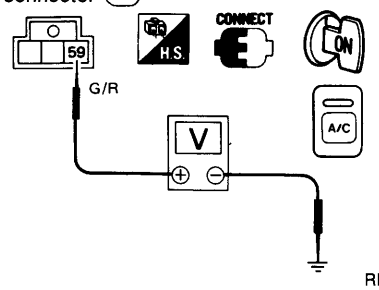
Ⓑ

(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

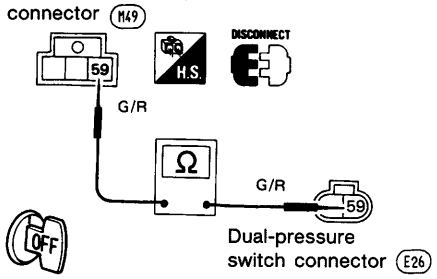
Diagnostic Procedure 5 (Cont'd)

I Thermo control amp. connector (M49)



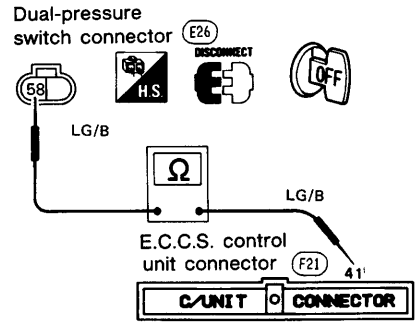
RHA733B

J Thermo control amp. connector (M49)



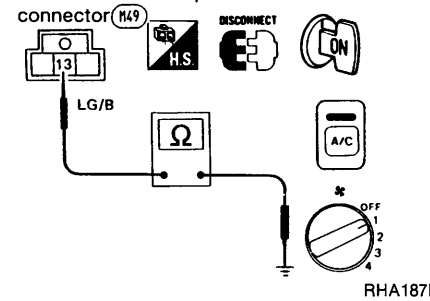
RHA734B

K Dual-pressure switch connector (E26)



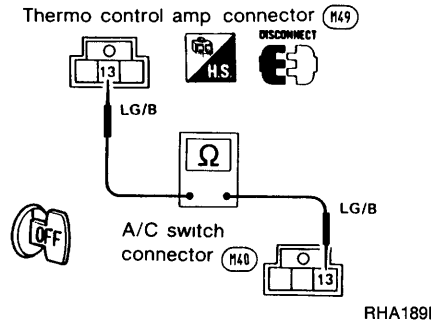
RHA735B

L Thermo control amp connector (M49)



RHA187B

M Thermo control amp connector (M49)



RHA189B

Ⓑ

I CHECK VOLTAGE FOR THERMO CONTROL AMP.
Do approx. 8 to 9 volts exist between thermo control amp. harness terminal No. ⑲ and body ground?

N.G. → **J** Note: Check circuit continuity between thermo control amp. harness terminal No. ⑲ and dual-pressure switch terminal No. ⑲.

O.K. → CHECK DUAL-PRESSURE SWITCH.
(Refer to Electrical Components Inspection.)

O.K. → **K** Note: Check circuit continuity between E.C.C.S. control unit harness terminal No. ㊶ and dual-pressure switch harness terminal No. ⑱.

O.K. → CHECK E.C.C.S. CONTROL UNIT.
(Refer to EF & EC section.)

N.G. → Replace dual-pressure switch.

Ⓒ

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. ⑬ and body ground?

N.G. → Disconnect A/C switch harness connector.

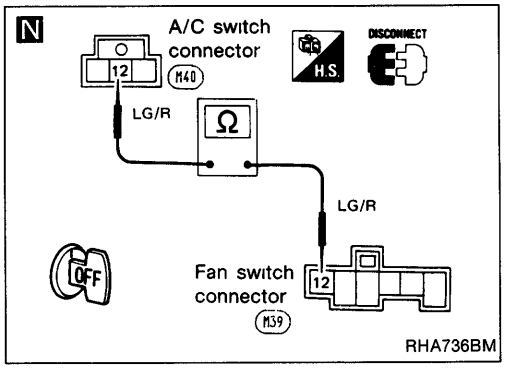
M Note: Check circuit continuity between thermo control amp. harness terminal No. ⑬ and A/C switch harness terminal No. ⑬.

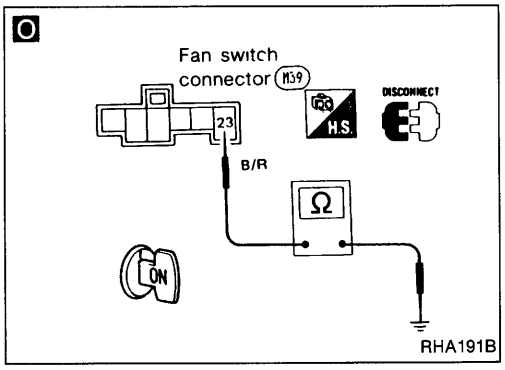
O.K. → Ⓓ

O.K. → Replace thermo control amp.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 5 (Cont'd)





Ⓓ

CHECK A/C SWITCH.
(Refer to Electrical Components Inspection.)

N.G. → Replace A/C switch.

O.K.

Disconnect fan switch harness connector.

N — Note

Check circuit continuity between A/C switch harness terminal No. ⑫ and fan switch harness terminal No. ⑫.

O.K.

O — Note

CHECK BODY GROUND CIRCUIT FOR FAN SWITCH.
Does continuity exist between fan switch harness terminal No. ㉓ and body ground?

N.G. → Ⓔ (Go to next page.)

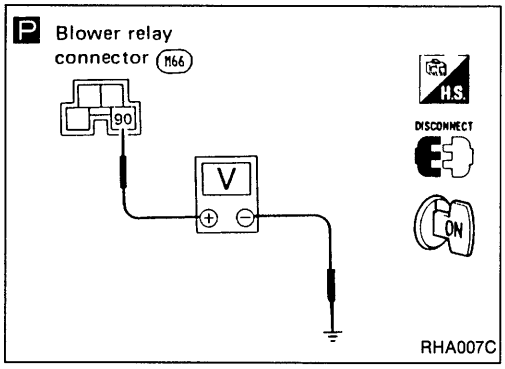
O.K.

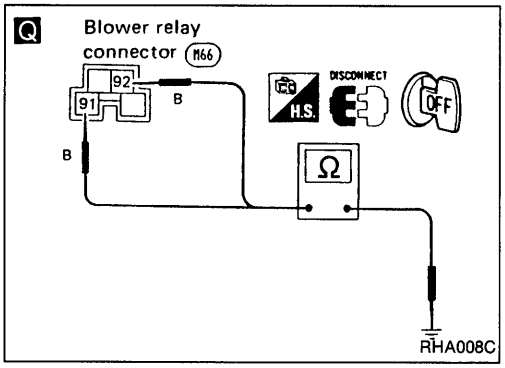
CHECK FAN SWITCH.
(Refer to Electrical Components Inspection.)

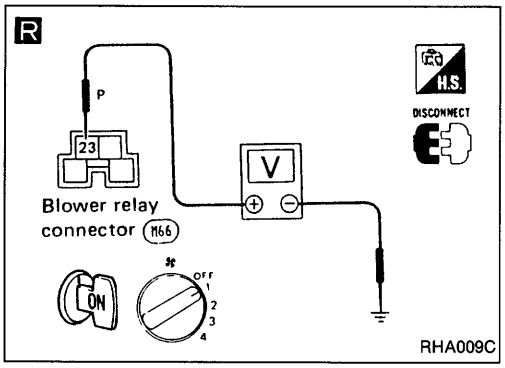
Replace fan switch.

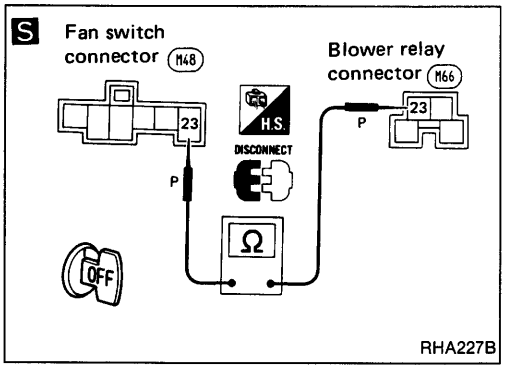
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 5 (Cont'd)









(E)

P CHECK POWER SUPPLY FOR BLOWER RELAY.
Disconnect blower relay harness connector.
Do approx. 12 volts exist between blower relay harness terminal No. 90 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. ↓

Q Note
Check circuit continuity between blower relay harness terminal No. 91, 92 and body ground.

O.K. ↓

Reconnect fan switch harness connector.

R CHECK FAN SWITCH CIRCUIT BETWEEN FAN SWITCH AND BLOWER RELAY.
Do approx. 12 volts exist between blower relay harness terminal No. 23 and body ground?

N.G. → Disconnect fan switch harness connector.

S Note
Check circuit continuity between fan switch harness terminal No. 23 and blower relay harness terminal No. 23.

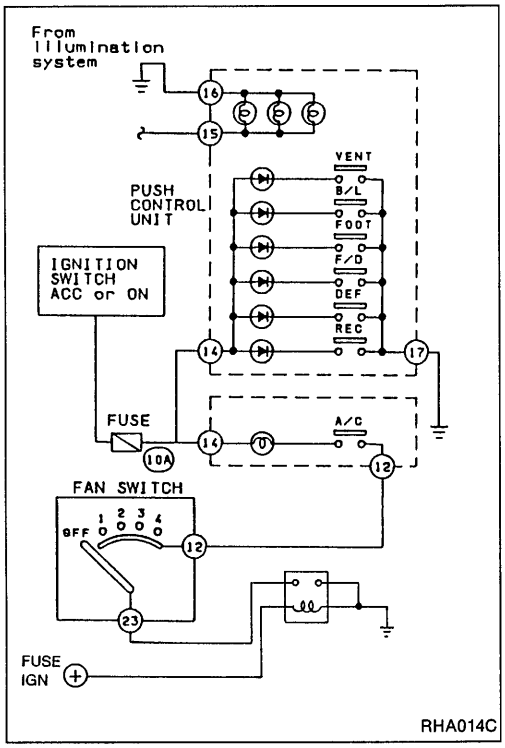
O.K. ↓

CHECK BLOWER RELAY AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

N.G. ↓

Replace blower relay.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.



Diagnostic Procedure 6

SYMPTOM: Illumination or indicators of push control unit do not come on.

- **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:

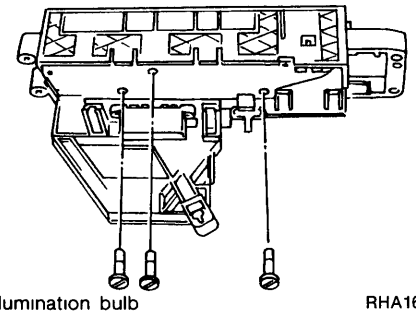
INCIDENTS									"How to repair"
ILL.									
Push control unit	Fresh vent	VENT	B/L	FOOT	F/D	DEF	REC	A/C	
X	O	O	O	O	O	O	O	⟍	Go to DIAGNOSTIC PROCEDURE 6-1.
O	X	O	O	O	O	O	O	⟍	Go to DIAGNOSTIC PROCEDURE 6-2.
⟍		O	O	O	O	O	O	X	Go to DIAGNOSTIC PROCEDURE 6-3.
O		X	X	X	X	X	X	⟍	Go to DIAGNOSTIC PROCEDURE 6-4.
⟍		Δ						⟍	Replace control amp. built-in push control unit.
O		X	X	X	X	X	X	O	Replace control amp. built-in push control unit.
⟍		X	X	X	X	X	X	O	Go to DIAGNOSTIC PROCEDURE 6-5.

O: Illumination or indicator comes on.
X: Illumination or indicator does not come on.
Δ: Some indicators for VENT, B/L, FOOT, F/D, DEF or REC come on.

Diagnostic Procedure 6 (Cont'd)

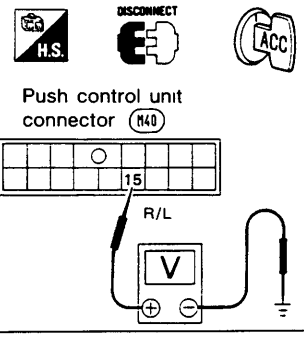
DIAGNOSTIC PROCEDURE 6-1

A



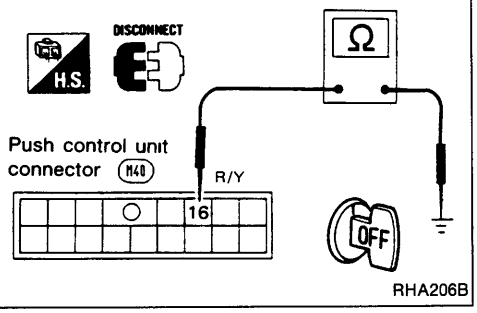
Illumination bulb RHA164B

B



RHA205B

C



RHA206B

CHECK THE OTHER ILLUMINATION SYSTEMS EXCEPT FOR A/C SYSTEM.
Do the 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. ↓

B

CHECK POWER SUPPLY FOR ILLUMINATION WITH LIGHTING SWITCH ON.
Do approx. 12 volts exist between push control unit harness terminal No. ⑮ and body ground?

N.G. → CHECK POWER SUPPLY FOR A/C ILLUMINATION SYSTEM. Refer to illumination/Wiring Diagram in EL section.

O.K. ↓

C Note

CHECK BODY GROUND CIRCUIT FOR ILLUMINATION.
Does continuity exist between push control unit harness terminal No. ⑯ and body ground?

O.K. ↓

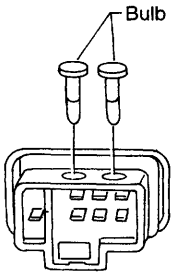
Replace control amp. built-in push control unit.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 6 (Cont'd)

DIAGNOSTIC PROCEDURE 6-2

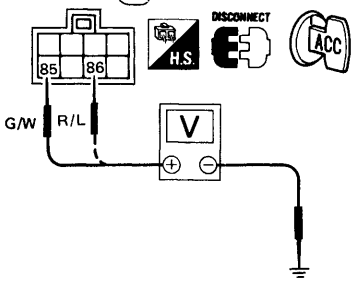
A



RHA015C

B

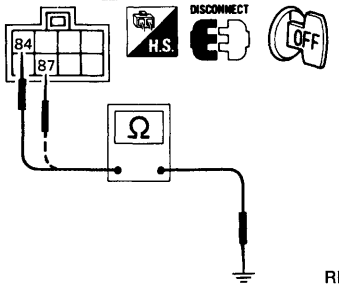
Fresh vent switch connector (M35)



RHA016C

C

Fresh vent switch connector (M35)



RHA017C

CHECK THE OTHER ILLUMINATION SYSTEMS EXCEPT FOR A/C SYSTEM.
Do the other illuminations 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 fresh vent switch and disconnect harness connector.
Remove illumination bulb(s) and check them.

N.G. → Replace illumination bulb(s).

O.K. ↓

B Note

CHECK POWER SUPPLY FOR ILLUMINATIONS WITH LIGHTING SWITCH AND FRESH VENT SWITCH ON.
Do approx. 12 volts exist between fresh vent switch harness terminal No. 85 (86) and body ground?

C Note

CHECK BODY GROUND CIRCUIT FOR ILLUMINATION.
Does continuity exist between fresh vent switch harness terminal No. 84 (87) and body ground?

O.K. → Replace fresh vent switch.

Diagnostic Procedure 6 (Cont'd)

DIAGNOSTIC PROCEDURE 6-3

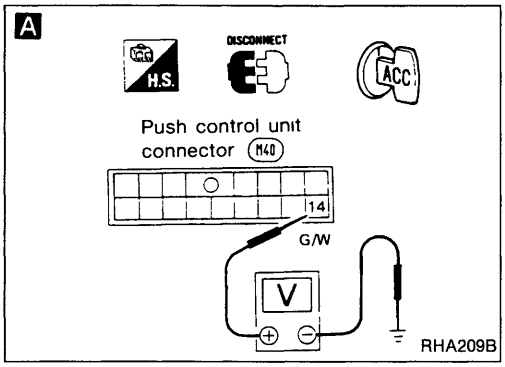
CHECK MAGNET CLUTCH OPERATION.
Does magnet clutch operate normally when engine ON, A/C switch, fan switch are ON?

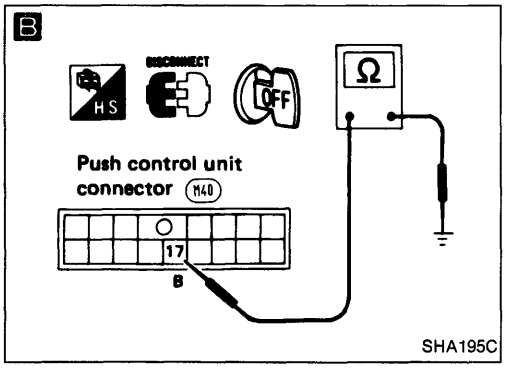
N.G. → Go to Diagnostic Procedure 4.

O.K. ↓

Replace control amp. built-in push control unit.

DIAGNOSTIC PROCEDURE 6-4





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. ⑭ 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. ⑰ and body ground?

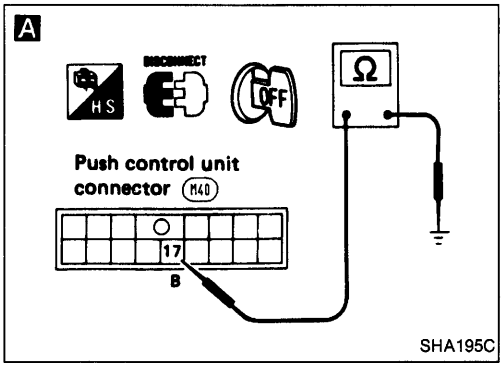
O.K. ↓

Replace control amp. built-in push control unit.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 6 (Cont'd)

DIAGNOSTIC PROCEDURE 6-5



Turn ignition switch and lighting switch OFF.

↓

Disconnect push control unit harness connector.

↓

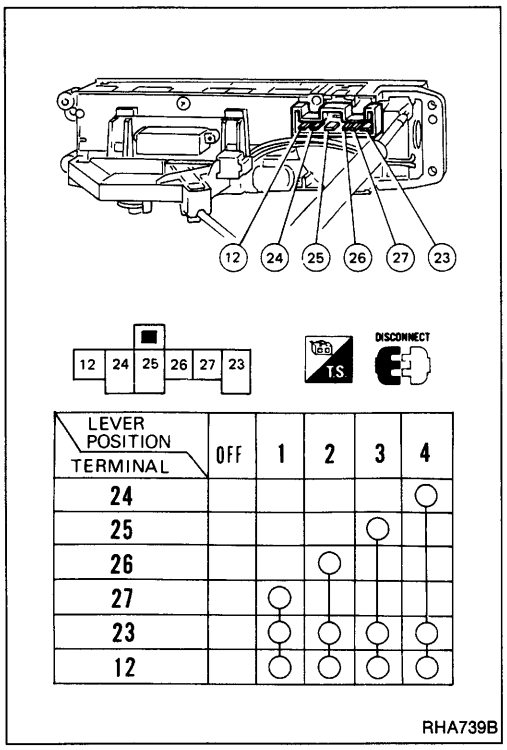
A Note

CHECK BODY GROUND CIRCUIT FOR PUSH CONTROL UNIT.
Does continuity exist between push control unit harness terminal No. ⑰ and body ground?

↓ O.K.

Replace control amp. built-in push control unit.

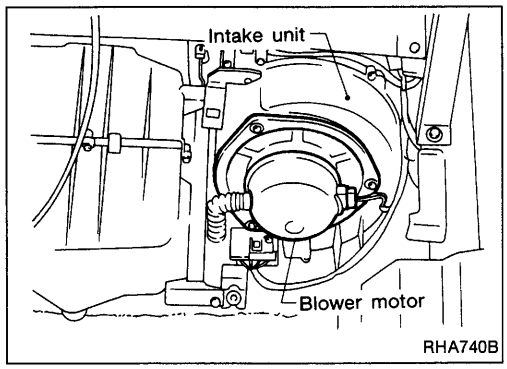
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.



Electrical Components Inspection

FAN SWITCH

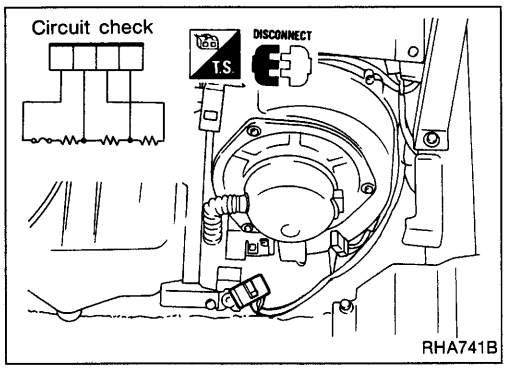
Check continuity between terminals at each switch position.



BLOWER MOTOR

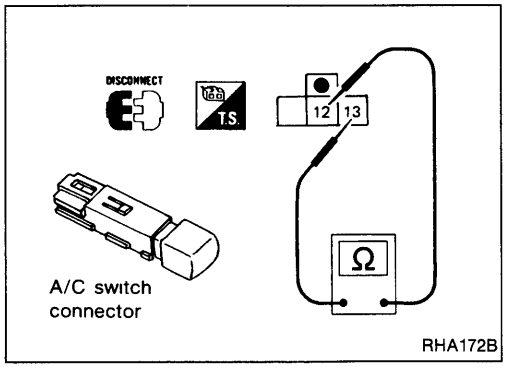
Confirm smooth rotation of the blower motor.

- Ensure that there are no foreign particles inside the intake unit.



BLOWER RESISTOR

Check continuity between terminals.

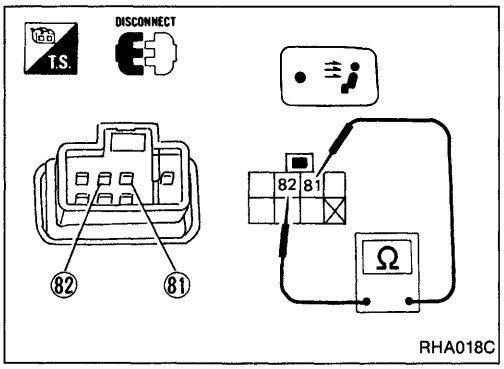


A/C SWITCH

Check continuity between terminals at each switch position.

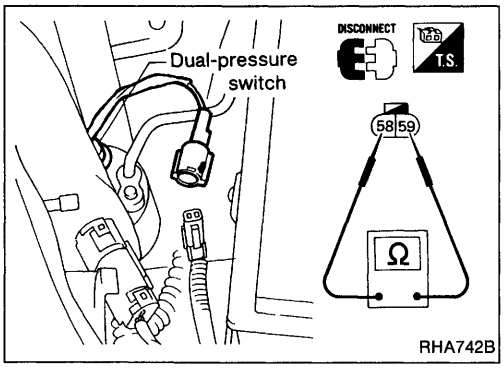
Switch condition		Terminal No.		Continuity
A/C	DEF	⊕	⊖	
ON	ON	⑬	⑫	Yes
ON	OFF			
OFF	ON			

Electrical Components Inspection (Cont'd)



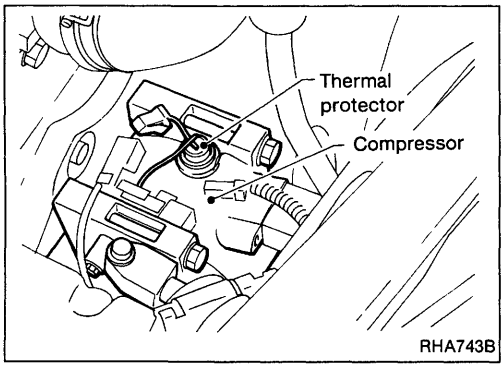
FRESH VENT SWITCH

Check continuity between terminals at each switch position.



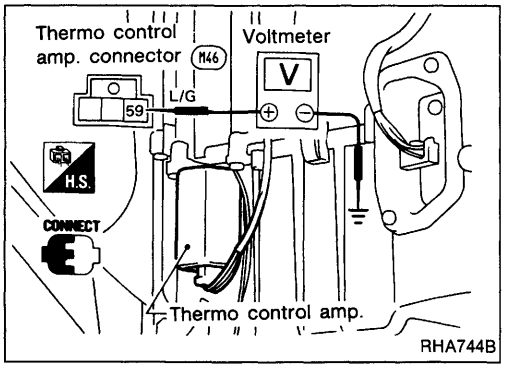
DUAL-PRESSURE SWITCH

High-pressure side line pressure kPa (kg/cm^2, psi)	Operation	Continuity
Decreasing to 177 - 216 (1.8 - 2.2, 26 - 31) Increasing to 2,452 - 2,844 (25 - 29, 356 - 412)	Turn OFF	Does not exist
Increasing to 177 - 235 (1.8 - 2.4, 26 - 34) Decreasing to 1,863 - 2,354 (19 - 24, 270 - 341)	Turn ON	Exists



THERMAL PROTECTOR

Temperature of compressor °C (°F)	Operation
Increasing to approx. 135 - 145 (275 - 293)	Turn OFF
Decreasing to approx. 120 - 130 (248 - 266)	Turn ON



THERMO CONTROL AMP.

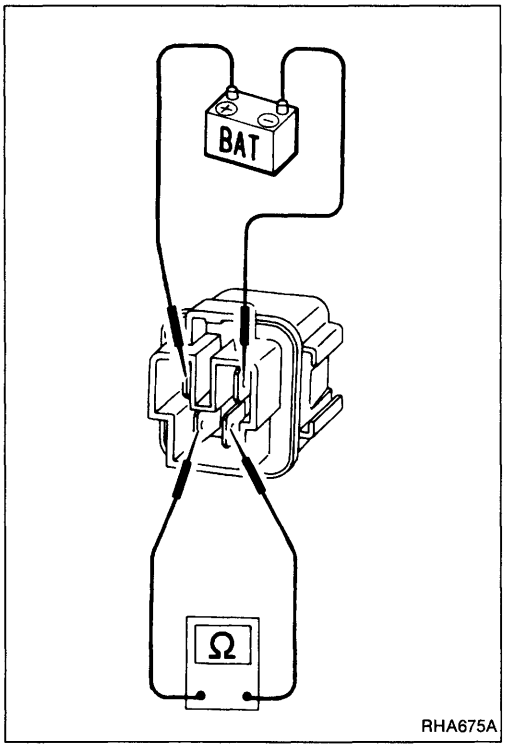
1. Run engine, and operate A/C system.
2. Connect the voltmeter from harness side.
3. Check thermo control amp. operation shown in the table.

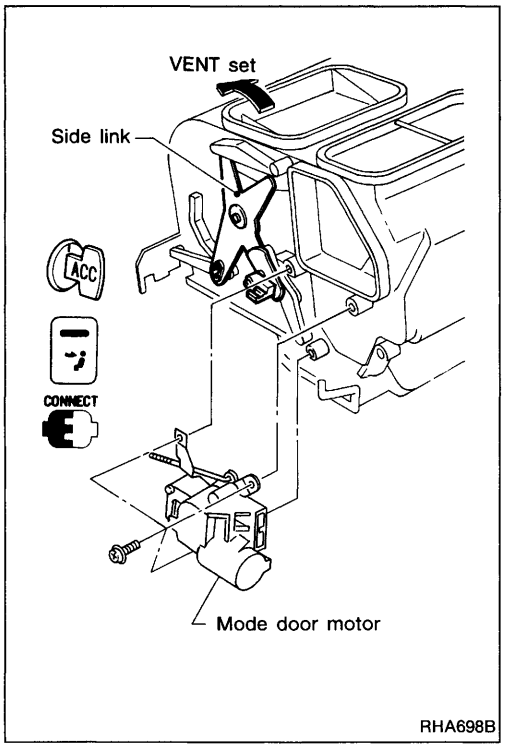
Evaporator outlet air temperature °C (°F)	Thermo amp. operation	Tester
Decreasing to 2.5 - 3.5 (37 - 38)	Turn OFF	Approx. 12V
Increasing to 4.0 - 5.0 (39 - 41)	Turn ON	Approx. 0V

Electrical Components Inspection (Cont'd)

A/C RELAY AND BLOWER MOTOR RELAY

Check circuit continuity between terminals by supplying 12 volts to coil side terminal of A/C relay.

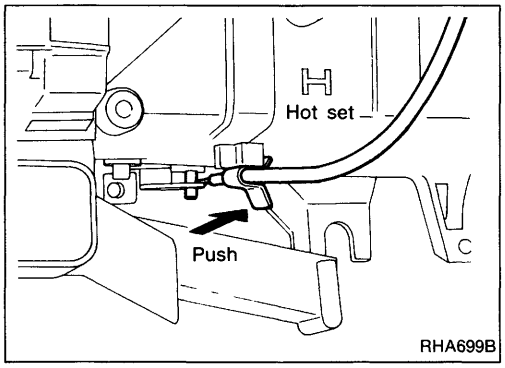




Control Cable and Rod Adjustment

MODE DOOR

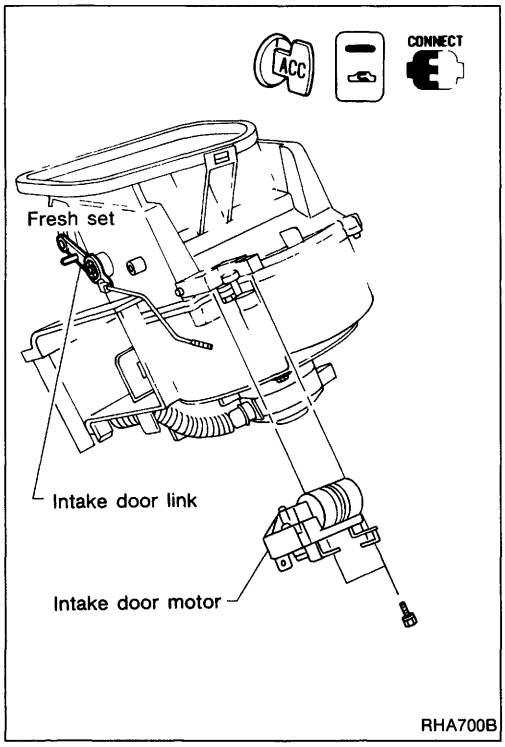
1. Move side link with hand and hold mode door in VENT mode.
2. Install mode door motor on heater unit and connect it to body harness.
3. Turn ignition switch to ACC.
4. Turn VENT switch ON.
5. Attach mode door motor rod to side link rod holder.
6. Turn DEF switch ON. Check that side link operates at the fully-open position. Also turn VENT switch ON to check that side link operates at the fully-open position.



TEMPERATURE CONTROL CABLE

- Move the temperature control lever to the full hot position. Set the air mix door lever in the full hot position. Pull on the outer cable in the direction of the arrow and then clamp it.

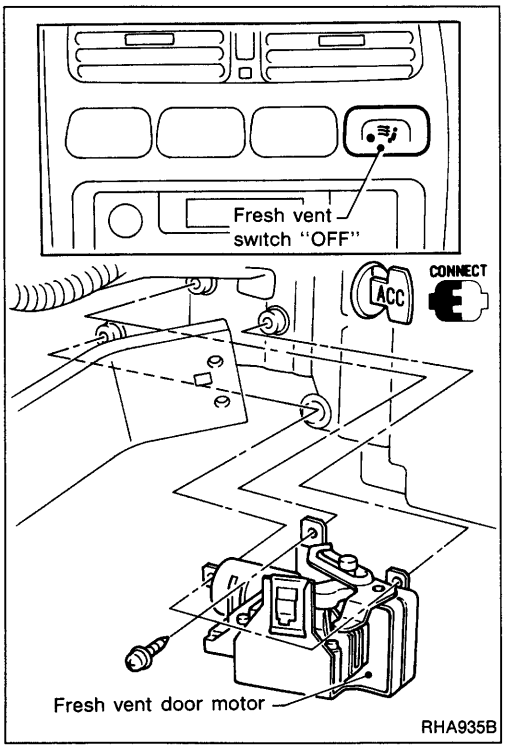
After positioning control cable, check it operates properly.



INTAKE DOOR

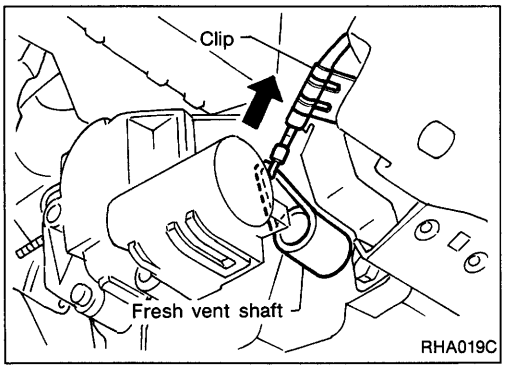
1. Connect the intake door motor harness connector before installing to the intake door motor.
2. Turn ignition switch to ACC.
3. Turn REC switch OFF.
4. Install intake door motor on intake unit.
5. Install intake door lever.
6. Set intake door rod in Fresh position and fasten door rod to holder on intake door lever.
7. Check that intake door operates properly when REC switch is turned ON and OFF.

Control Cable and Rod Adjustment (Cont'd)



FRESH VENT DOOR

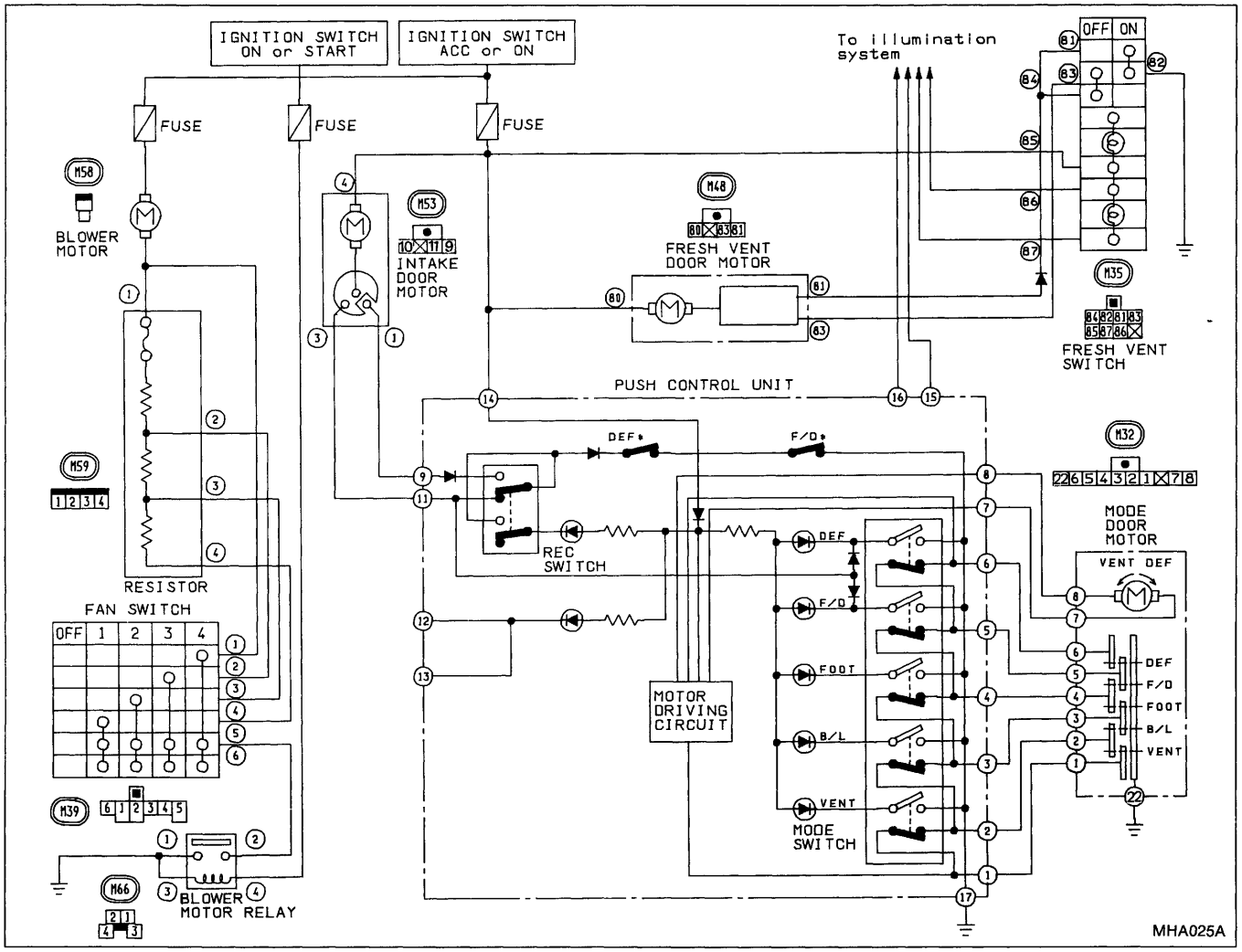
1. Connect the fresh vent door motor harness connector before installing the fresh vent door motor.
2. Turn ignition switch to ACC.
3. Turn FRESH VENT DOOR switch OFF.
4. Install fresh vent door motor on heater unit.



5. Set the fresh vent shaft in the direction of the arrow. Pull on the outer cable and then clamp it.

After positioning control cable, check it operates properly.

Push Control System



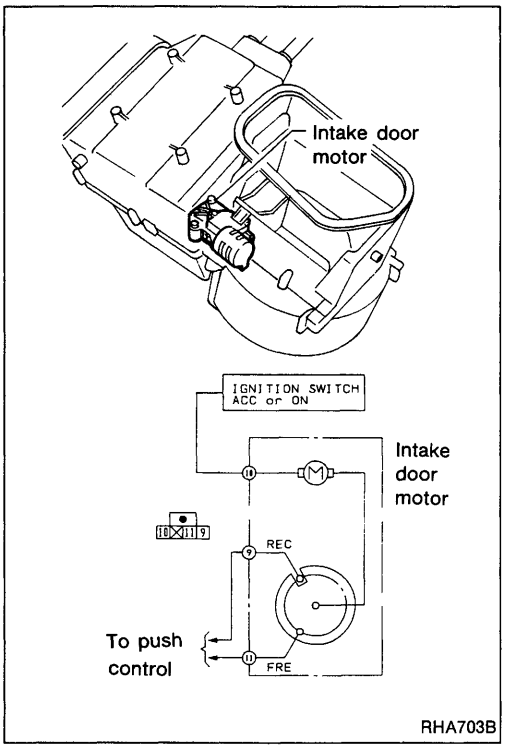
This push control system operates the intake and mode door motors to activate their corresponding doors.

Switches and their control functions

Switch		Indicator illuminates							Air outlet	Intake air	Compressor
		A/C									
A/C		○							Refer to "Air Flow". (See page HA-4.)		ON*1
Mode			○								
				○							
					○						
						○				FRE	
							○			FRE	ON*1
								○*2		REC*2	

*1: Compressor is operated by thermo control amp.

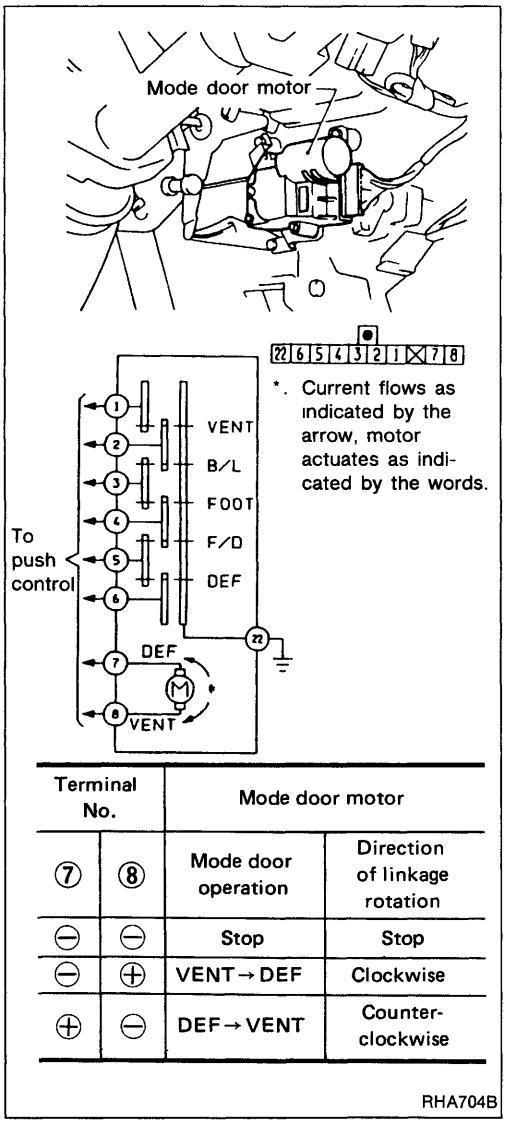
*2: Depending on mode switch position



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.

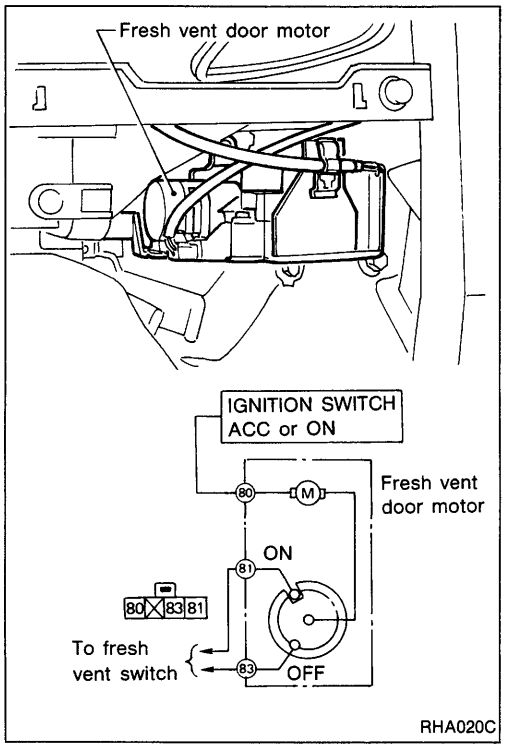


Terminal No.		Mode door motor	
⑦	⑧	Mode door operation	Direction of linkage rotation
⊖	⊖	Stop	Stop
⊖	⊕	VENT→DEF	Clockwise
⊕	⊖	DEF→VENT	Counter-clockwise

Mode Door Motor

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.



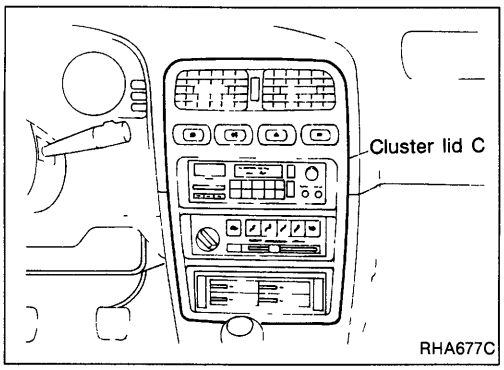
Fresh Vent Door Motor

The fresh vent door motor is installed on the front portion of the intake unit. Using a cable and shaft it opens and closes the fresh vent door.

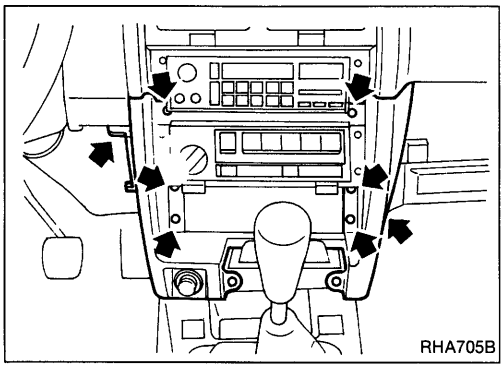
When the FRESH VENT switch is ON (OFF), the ground line of the fresh vent door motor is switched from terminal ⑧③ to ⑧① (⑧① to ⑧③). This causes the motor to start because the position switch contacts built into it are set to the current flow position. The contacts turn along with the motor. When they reach the non-current flow position, the motor will stop. The motor always turns in the same direction.

Removal and Installation

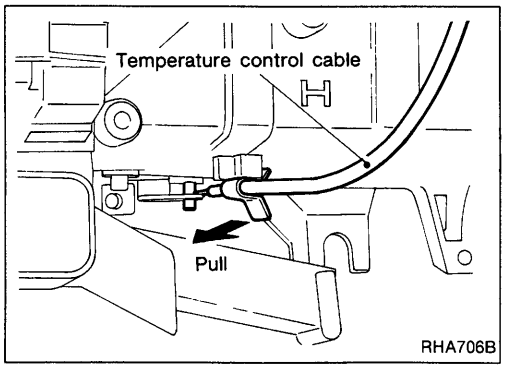
1. Remove cluster lid C.
2. Remove driver's side lower panel.
3. Remove glove box.



4. Remove the 8 bracket screws.



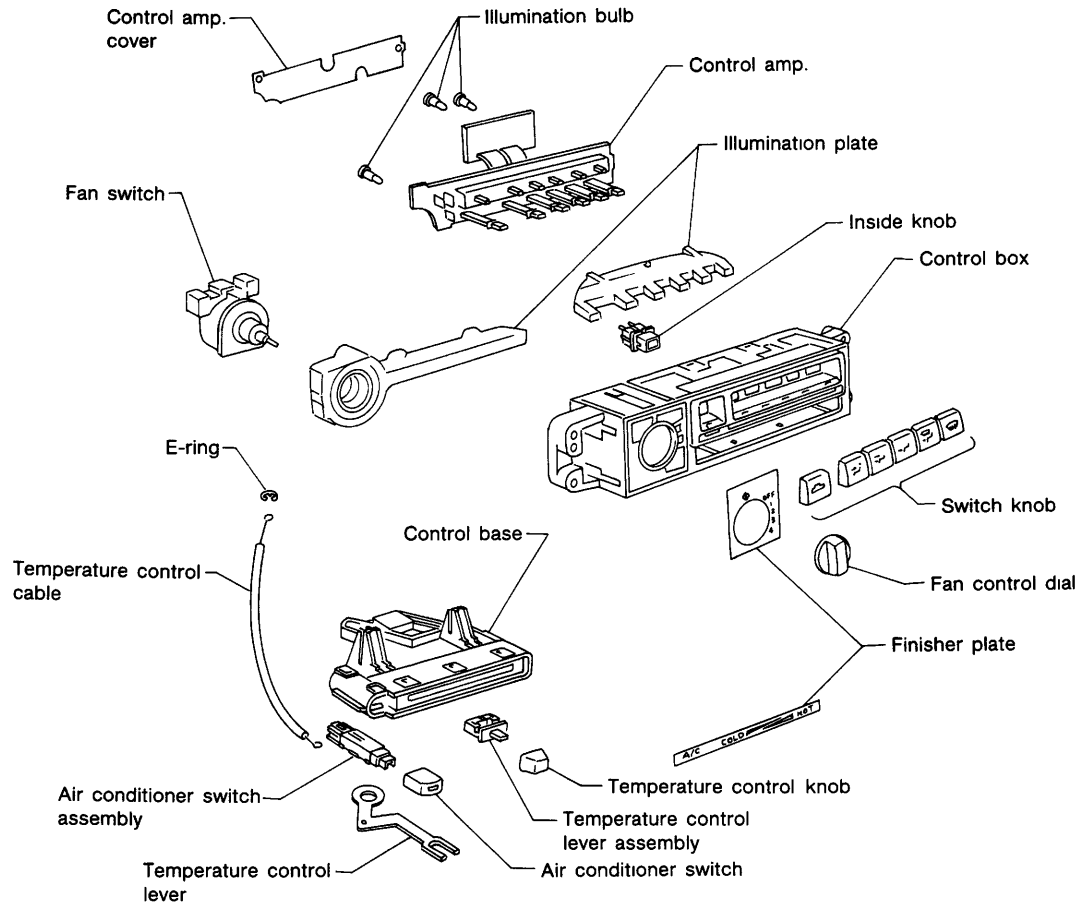
5. Disconnect temperature control cable at heater unit side.

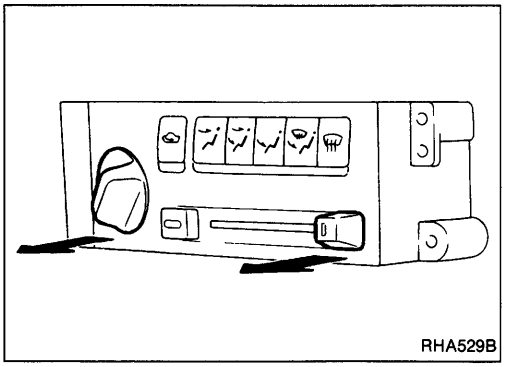


Removal and Installation (Cont'd)

6. Disconnect push control unit harness connectors.
7. Remove bracket with push control unit.
8. Remove push control unit.
9. Installation is in the reverse order of removal.

Refer to "Control Cable and Rod Adjustment" in "DOOR CONTROL" for temperature control cable.



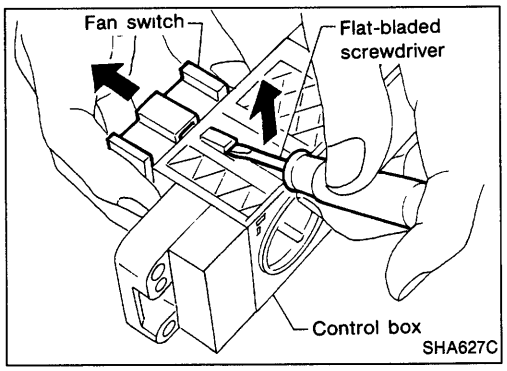


Disassembly

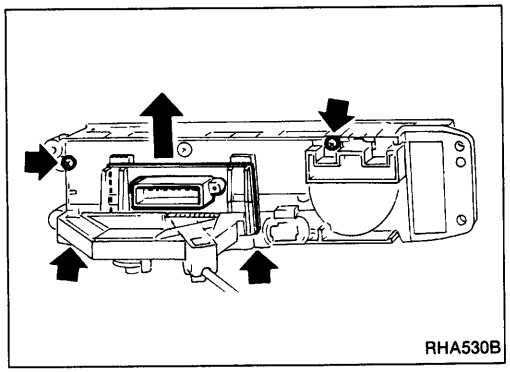
1. Remove temperature control knob & fan control dial.

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.

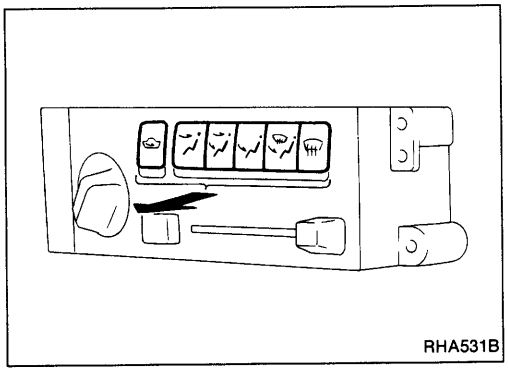
Disassembly (Cont'd)



2. Remove fan switch.

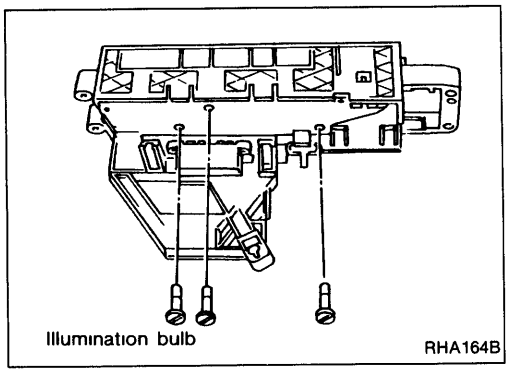


3. Remove control base & control amp. cover.



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.



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.

General Specifications

COMPRESSOR

Model	ATSUGI make NVR 140S
Type	Vane rotary
Displacement cm^3 (cu in)/Rev.	140 (8.54)
Direction of rotation	Clockwise (Viewed from drive end)
Drive belt	Poly V

LUBRICATION OIL

Model	ATSUGI make NVR 140S
Type	SUNISO 5GS
Capacity mℓ (US fl oz, Imp fl oz)	
Total in system	200 (6.8, 7.0)
Amount of oil which can be drained	Approx. 100 (3.4, 3.5)
Compressor (Service parts) charging amount	200 (6.8, 7.0)

REFRIGERANT

Type	R-12
Capacity kg (lb)	0.7 - 0.8 (1.5 - 1.8)

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
Clutch disc-pulley clearance mm (in)	0.3 - 0.6 (0.012 - 0.024)

ELECTRICAL SYSTEM

SECTION EL

When you read wiring diagrams:
- **Read GI section, "HOW TO REAR WIRING DIAGRAMS".**

CONTENTS

HARNESS CONNECTOR ..... EL- 2
STANDARDIZED RELAY ..... EL- 3
POWER SUPPLY ROUTING ..... EL- 6
BATTERY ..... EL- 9
STARTING SYSTEM ..... EL- 17
STARTING SYSTEM — Starter — ..... EL- 20
CHARGING SYSTEM ..... EL- 27
CHARGING SYSTEM — Alternator — ..... EL- 29
COMBINATION SWITCH ..... EL- 36
HEADLAMP ..... EL- 38
EXTERIOR LAMP ..... EL- 43
INTERIOR LAMP ..... EL- 48
METER AND GAUGES ..... EL- 50
WARNING LAMPS AND CHIME ..... EL- 55
TIME CONTROL SYSTEM ..... EL- 59
WIPER AND WASHER ..... EL- 71
HORN, CIGARETTE LIGHTER AND CLOCK ..... EL- 74
REAR WINDOW DEFOGGER ..... EL- 75
AUDIO AND POWER ANTENNA ..... EL- 78
AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.) ..... EL- 83
THEFT WARNING SYSTEM ..... EL- 99
LOCATION OF ELECTRICAL UNITS EL-120
HARNESS LAYOUT EL-123
SPECIAL SERVICE TOOL EL-137
SUPER MULTIPLE JUNCTION (S.M.J.) EL-139

EL

WIRING DIAGRAM REFERENCE CHART

E.C.C.S. (Ignition system) ..... EF & EC SECTION
AUTOMATIC TRANSAXLE CONTROL SYSTEM, SHIFT LOCK SYSTEM ..... AT SECTION
ANTI-LOCK BRAKING SYSTEM ..... BR SECTION
FUEL FILLER LID OPENER, TRUNK LID OPENER, POWER WINDOW AND POWER DOOR LOCK, 2-POINT MOTORIZED SEAT BELT SYSTEM, POWER SEAT, SUN ROOF, DOOR MIRROR ..... BF SECTION
HEATER AND AIR CONDITIONER ..... HA SECTION

Description

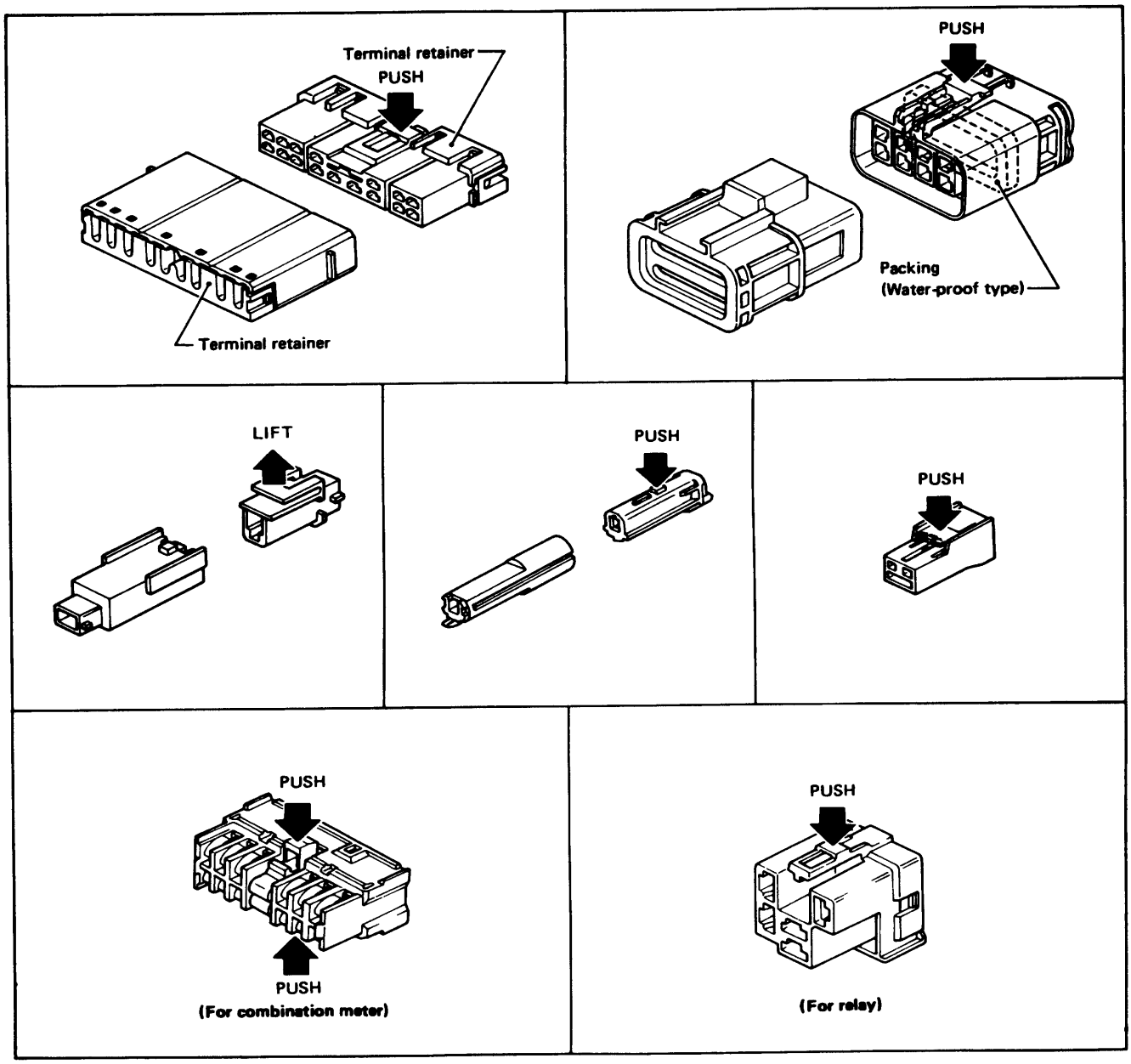
HARNESS CONNECTOR

- 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]

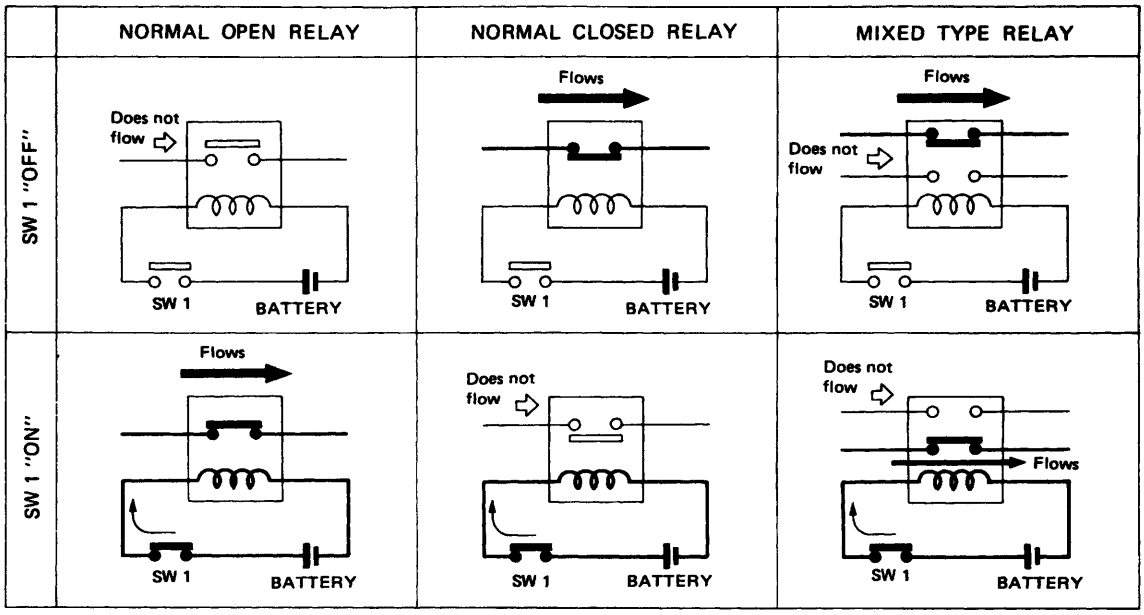


SEL769D

Description

NORMAL OPEN, NORMAL CLOSED AND MIXED TYPE RELAYS

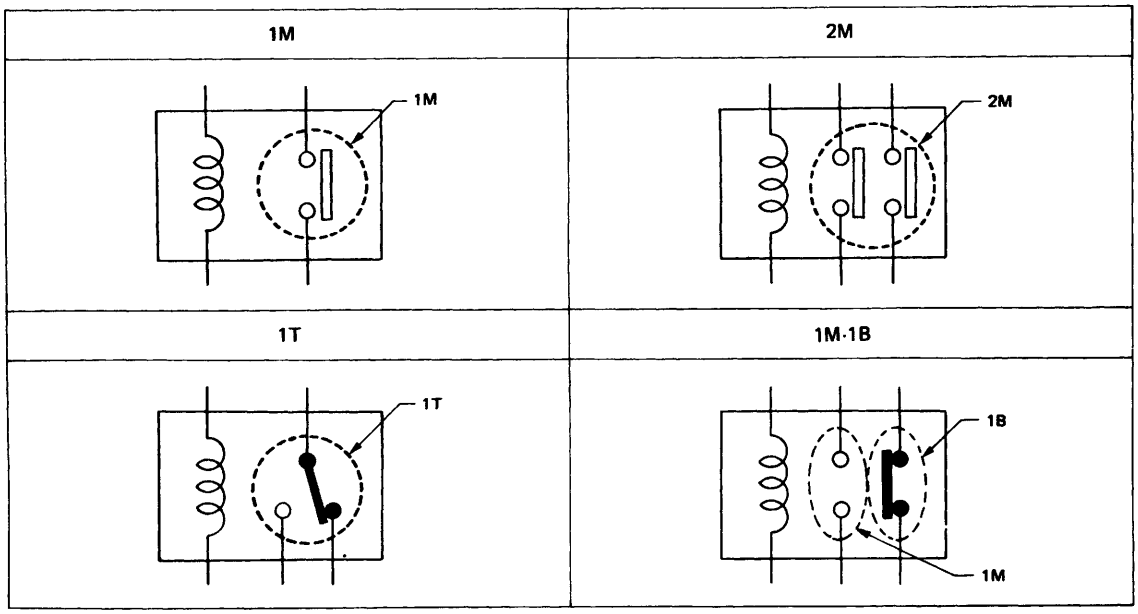
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



SEL881H

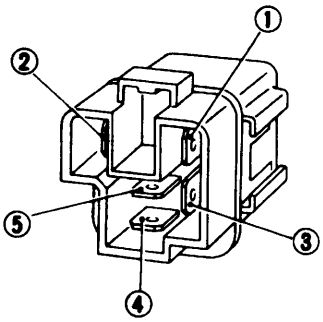
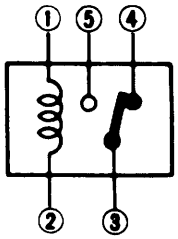
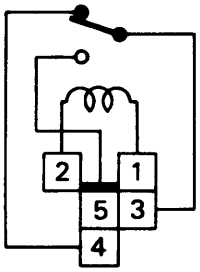
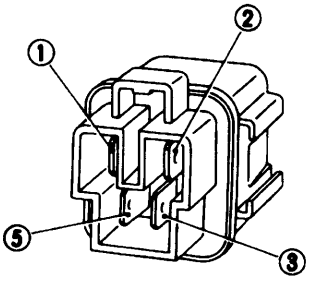
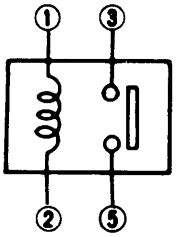
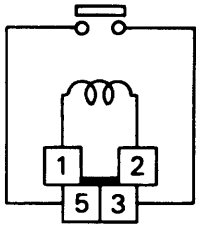
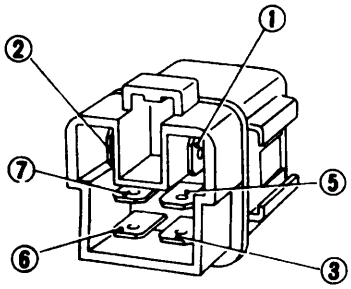
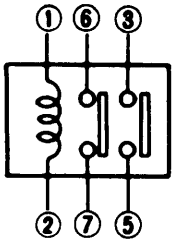
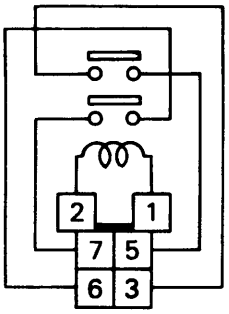
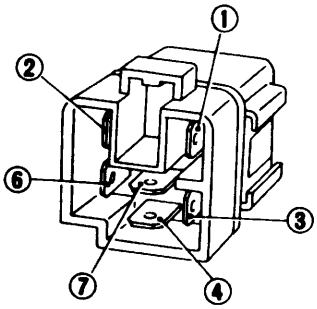
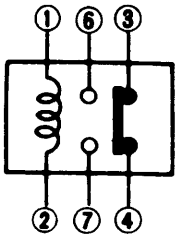
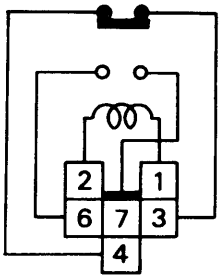
TYPE OF STANDARDIZED RELAYS

1M	1 Make	2M	2 Make
1T	1 Transfer	1M·1B	1 Make 1 Break



SEL882H

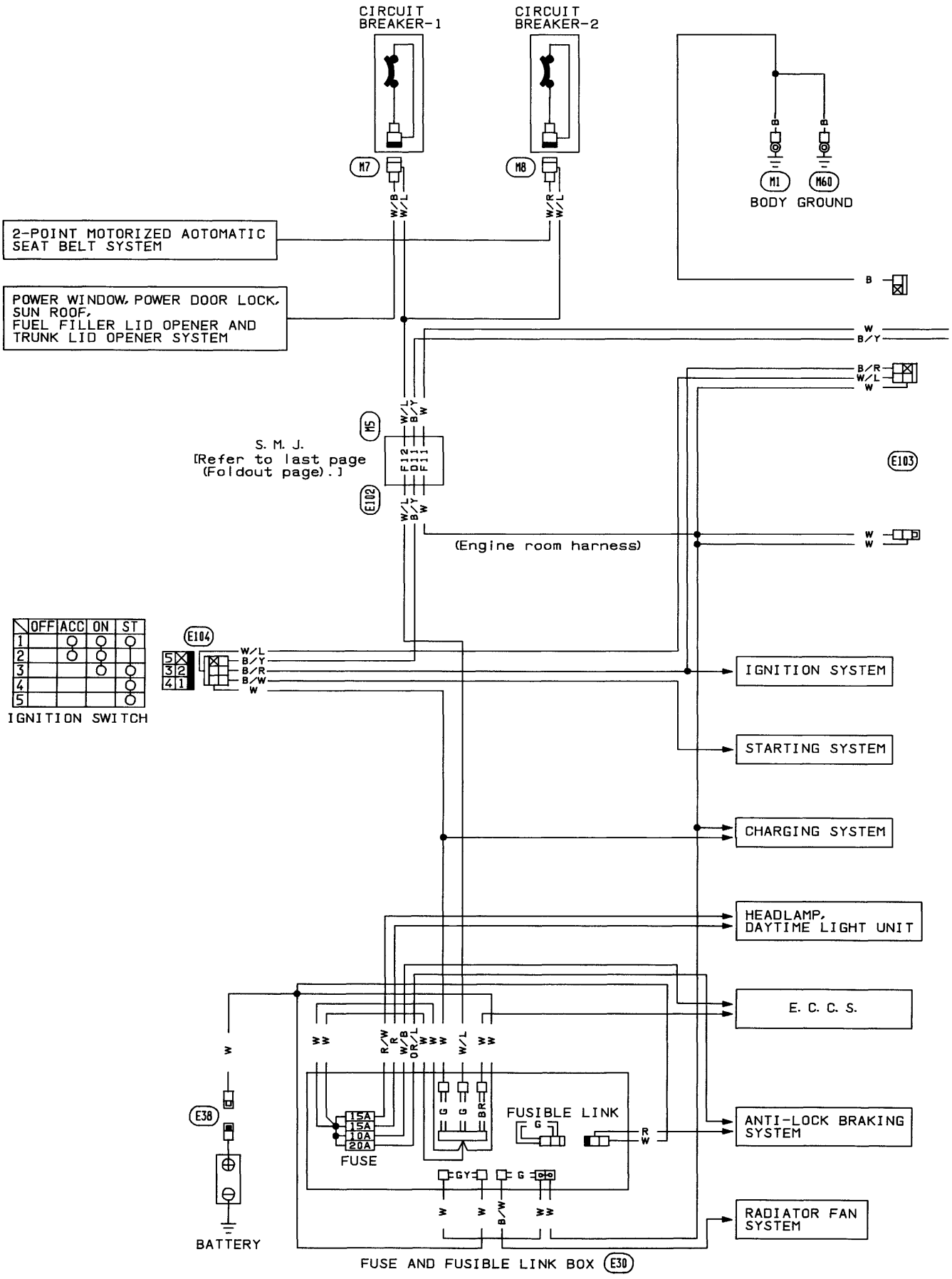
Description (Cont'd)

Type	Outer view	Circuit	Connector symbol and connection	Case color
1T				BLACK
1M				BLUE or GREEN
2M				BROWN
1M·1B				GRAY

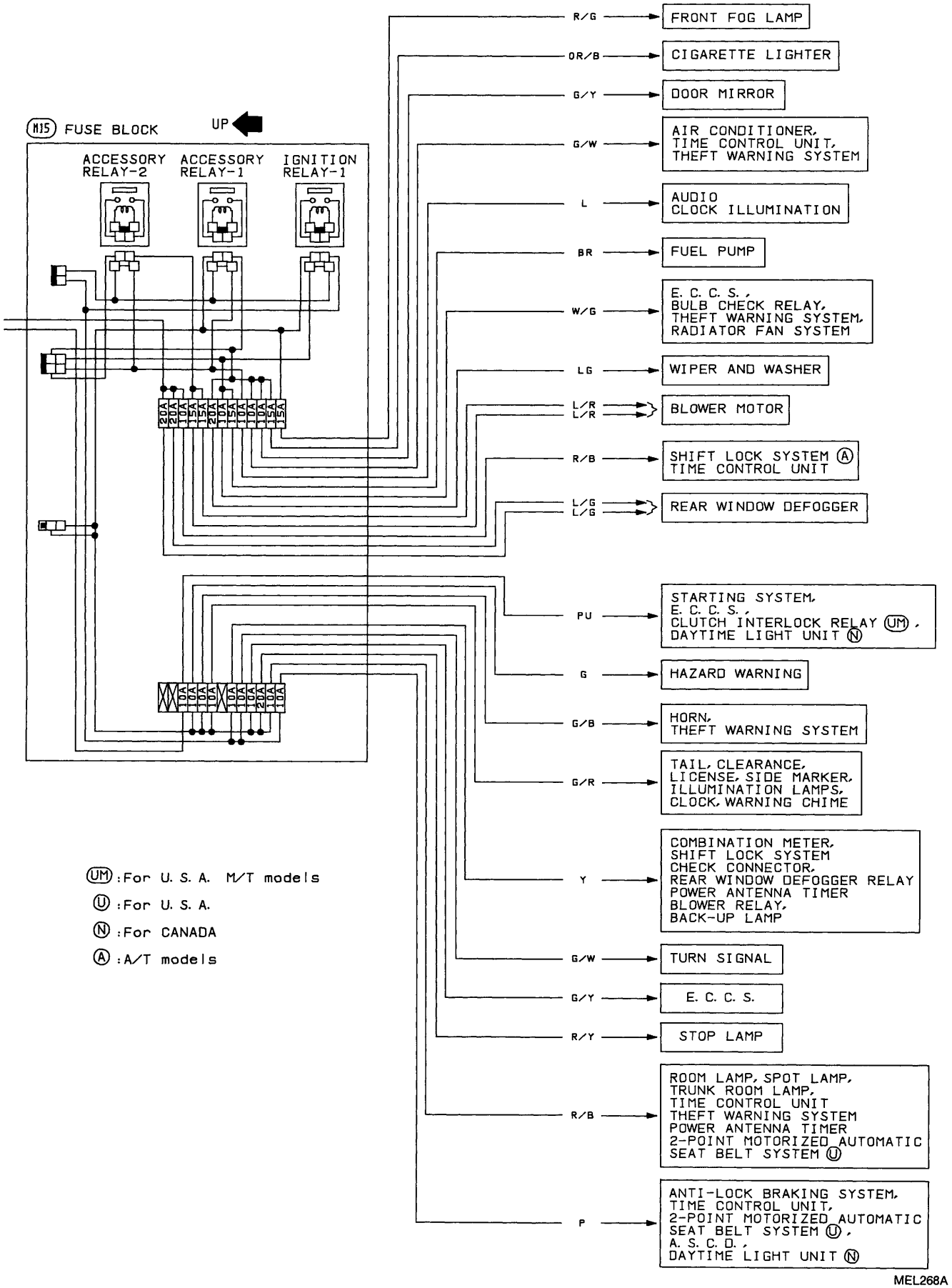
SEL883H

NOTE

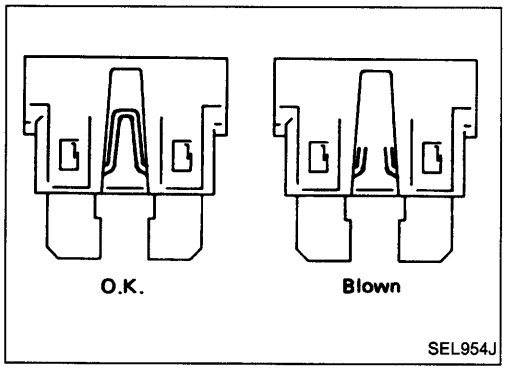
Wiring Diagram



Wiring Diagram (Cont'd)

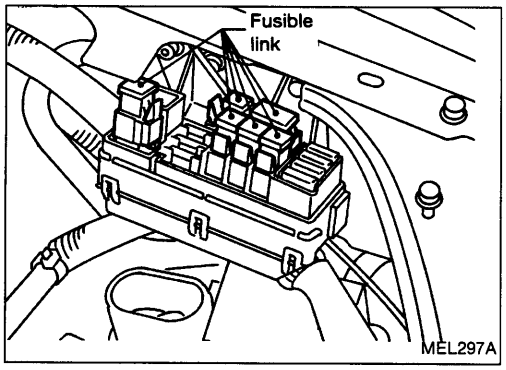


MEL268A



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.

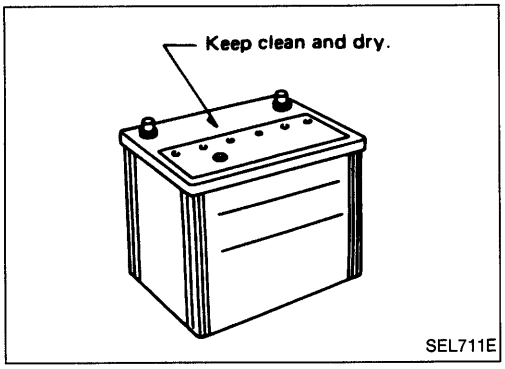
CAUTION:

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.**

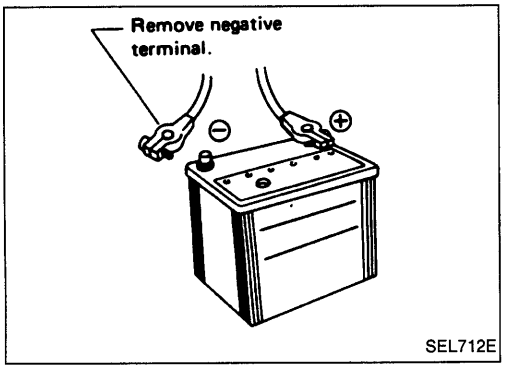


How to Handle Battery

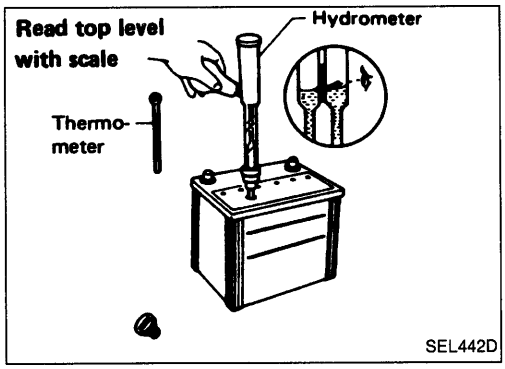
METHODS OF PREVENTING OVER-DISCHARGE

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.

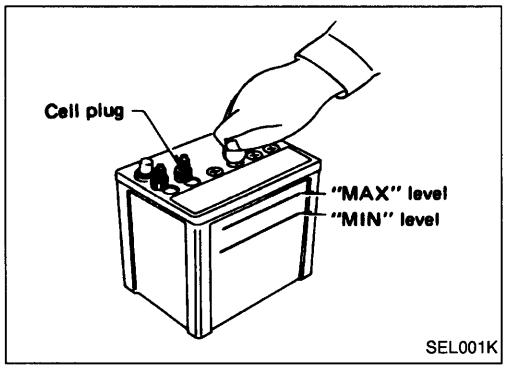
How to Handle Battery (Cont'd)

CHECKING ELECTROLYTE LEVEL

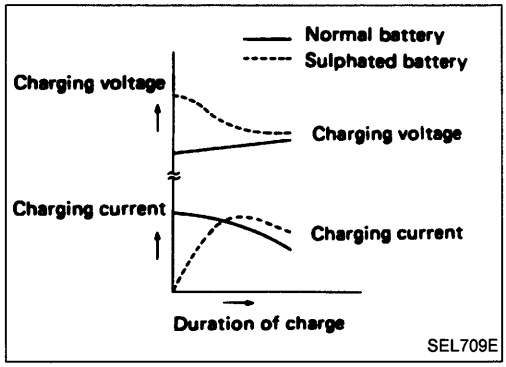
WARNING:

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.



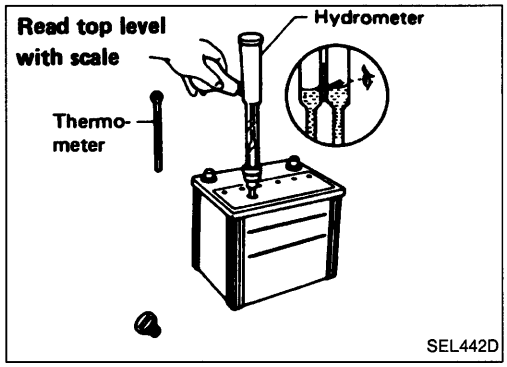
- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



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.

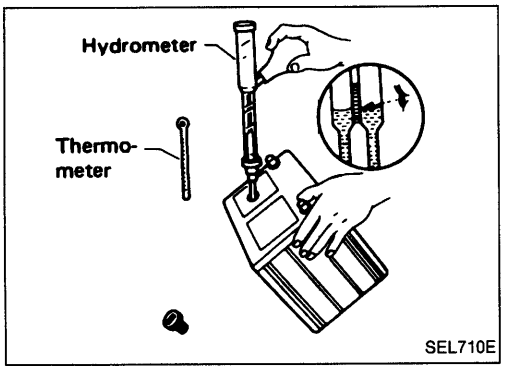
Compared with a battery discharged under normal conditions, the current flow in a "sulphated" battery is not as smooth although its voltage is high during the initial stage of charging, as shown in the figure at the left.



SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.

How to Handle Battery (Cont'd)

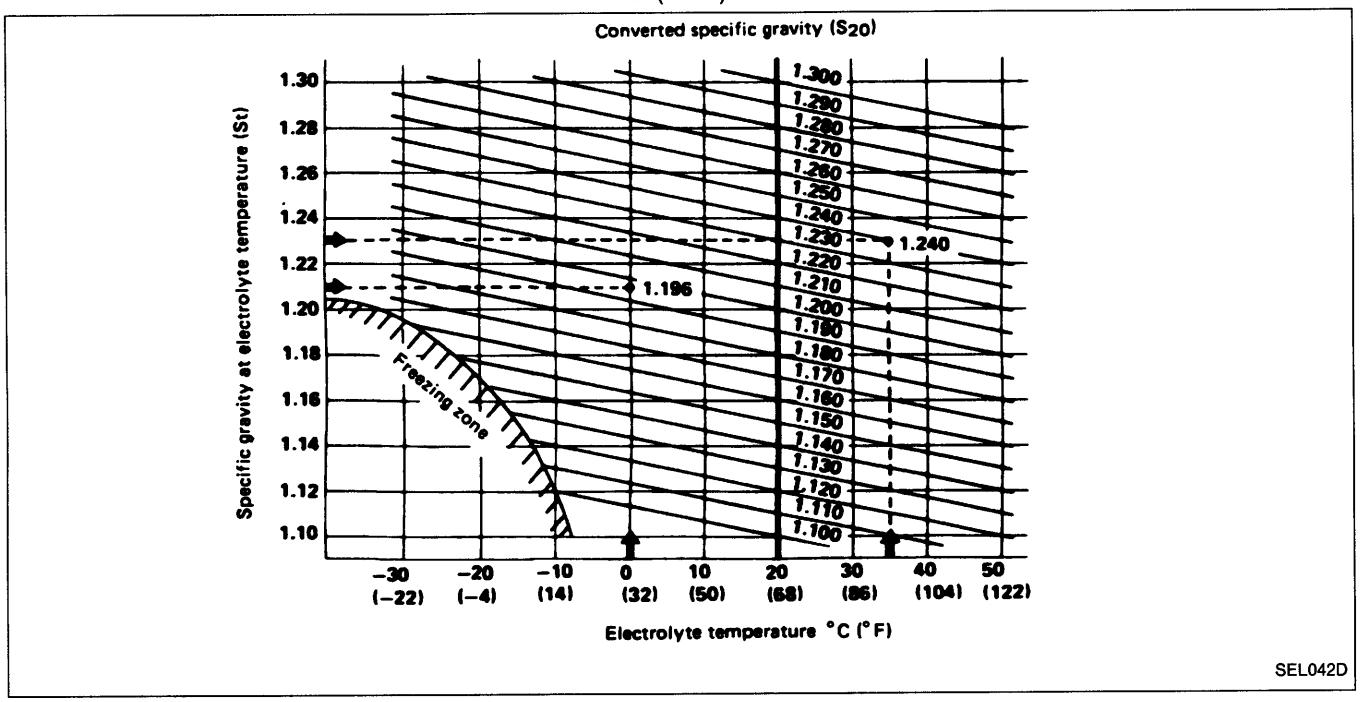


- When electrolyte level is too low, tilt battery case to raise it for easy measurement.

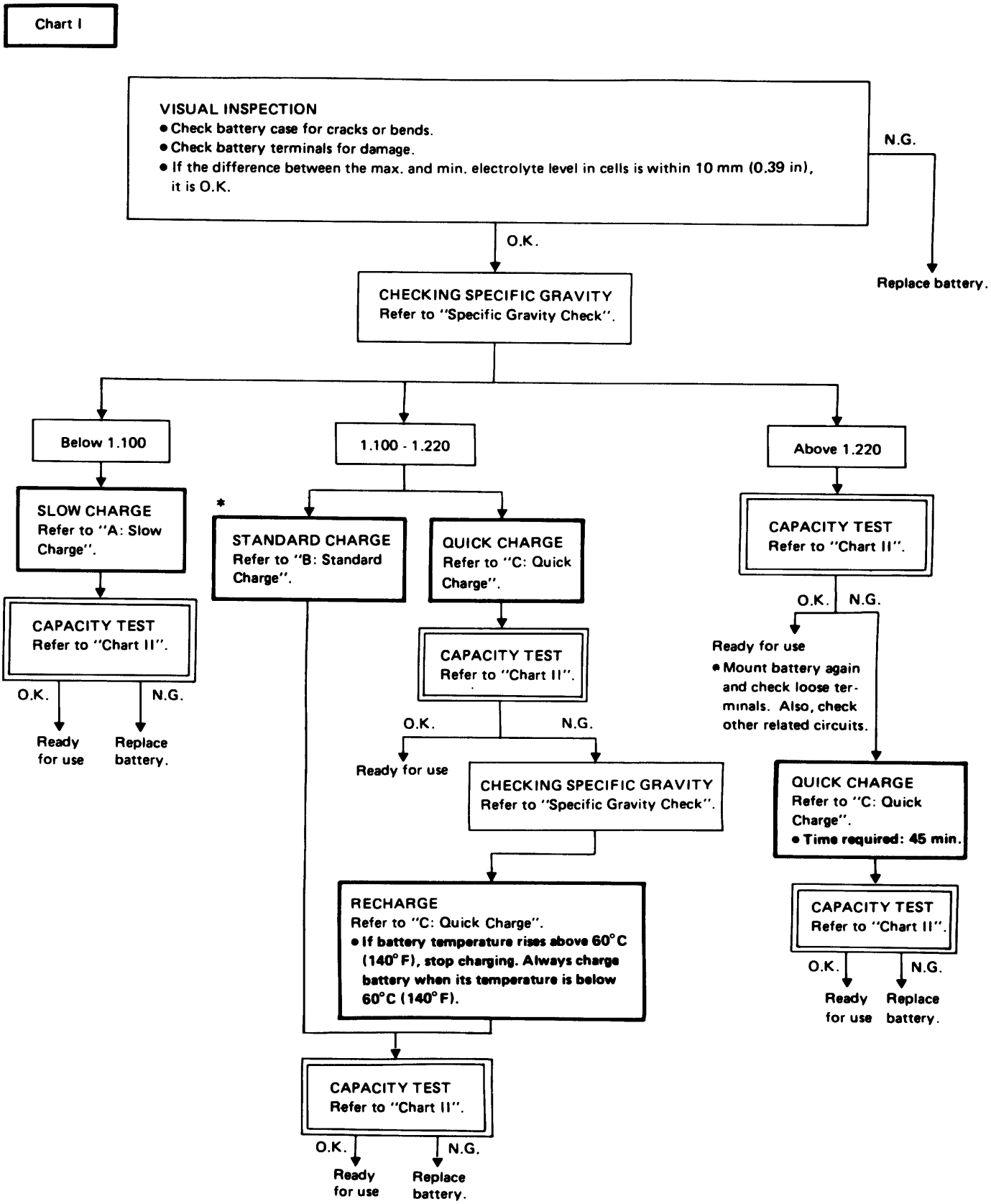
2. Convert into specific gravity at 20°C (68°F).

Example:

- When electrolyte temperature is 35°C (95°F) and specific gravity of electrolyte is 1.230, converted specific gravity at 20°C (68°F) is 1.240.
- When electrolyte temperature is 0°C (32°F) and specific gravity of electrolyte is 1.210, converted specific gravity at 20°C (68°F) is 1.196.



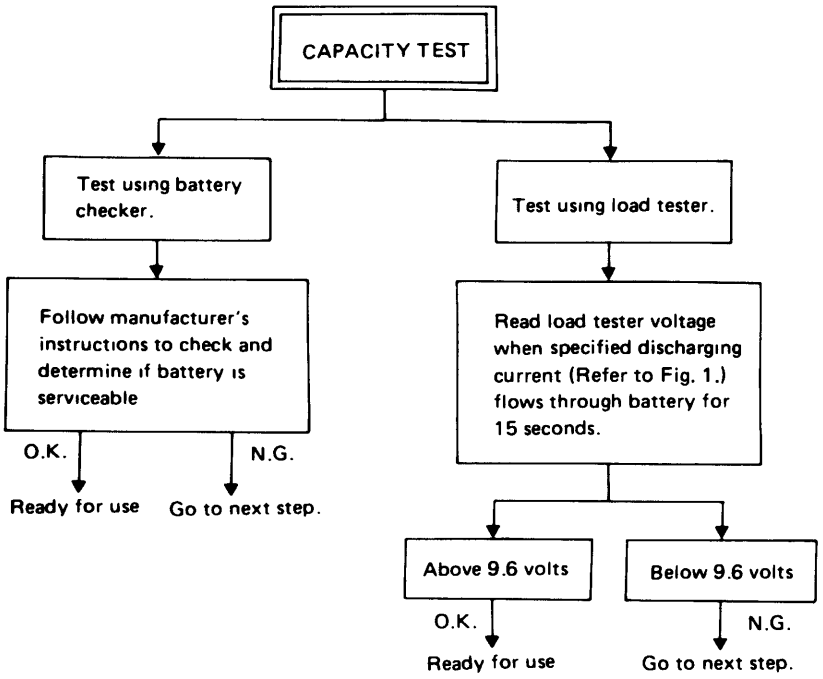
Battery Test and Charging Chart



* "STANDARD CHARGE" is recommended in case that the vehicle is in storage after charging.

Battery Test and Charging Chart (Cont'd)

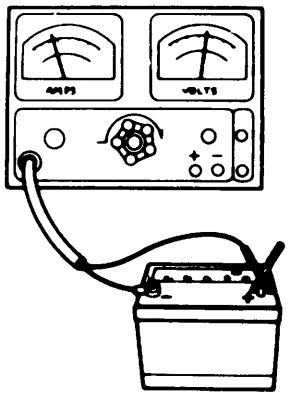
Chart II



- 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

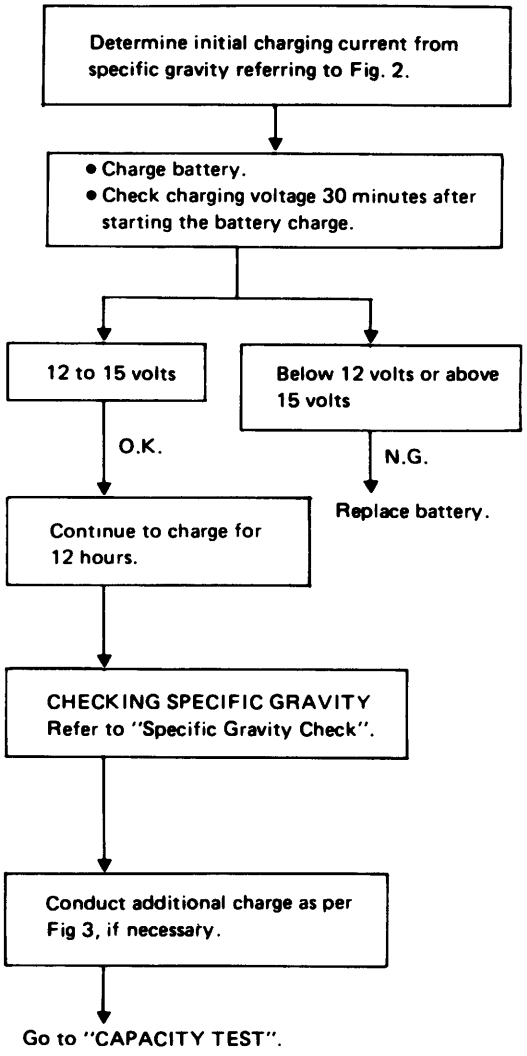
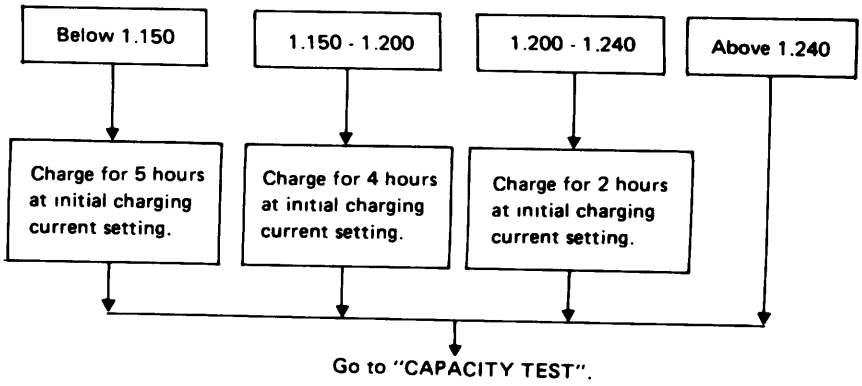


Fig. 2 INITIAL CHARGING CURRENT SETTING (Slow charge)

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

Determine initial charging current from specific gravity, referring to Fig. 4.

↓

Charge battery for 8 hours.

↓

CHECKING SPECIFIC GRAVITY
Refer to "Specific Gravity Check".

↓

Conduct additional charge as per Fig. 5, if necessary.

↓

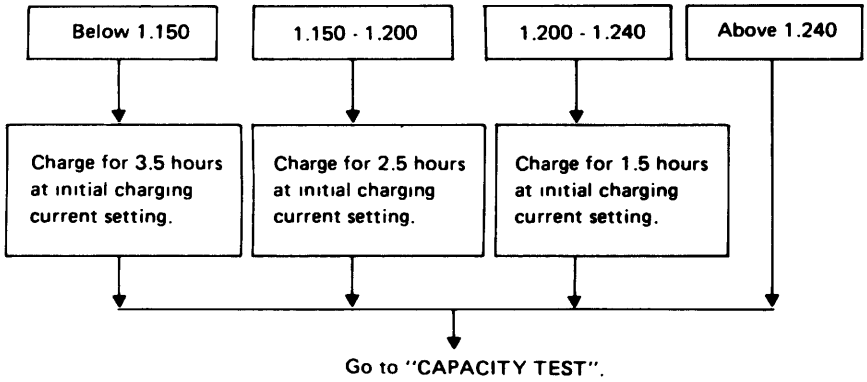
Go to "CAPACITY TEST".

Fig. 4 INITIAL CHARGING CURRENT SETTING
(Standard charge)

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

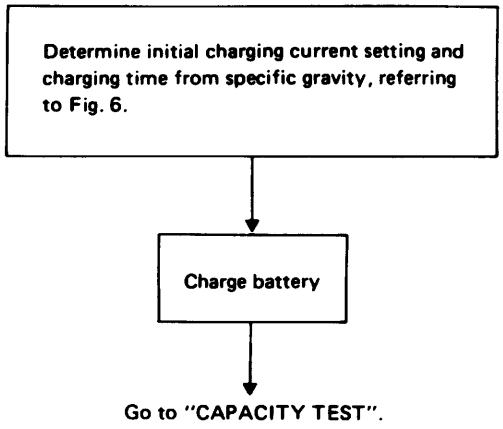


Fig. 6 INITIAL CHARGING CURRENT SETTING AND CHARGING TIME (Quick charge)

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:

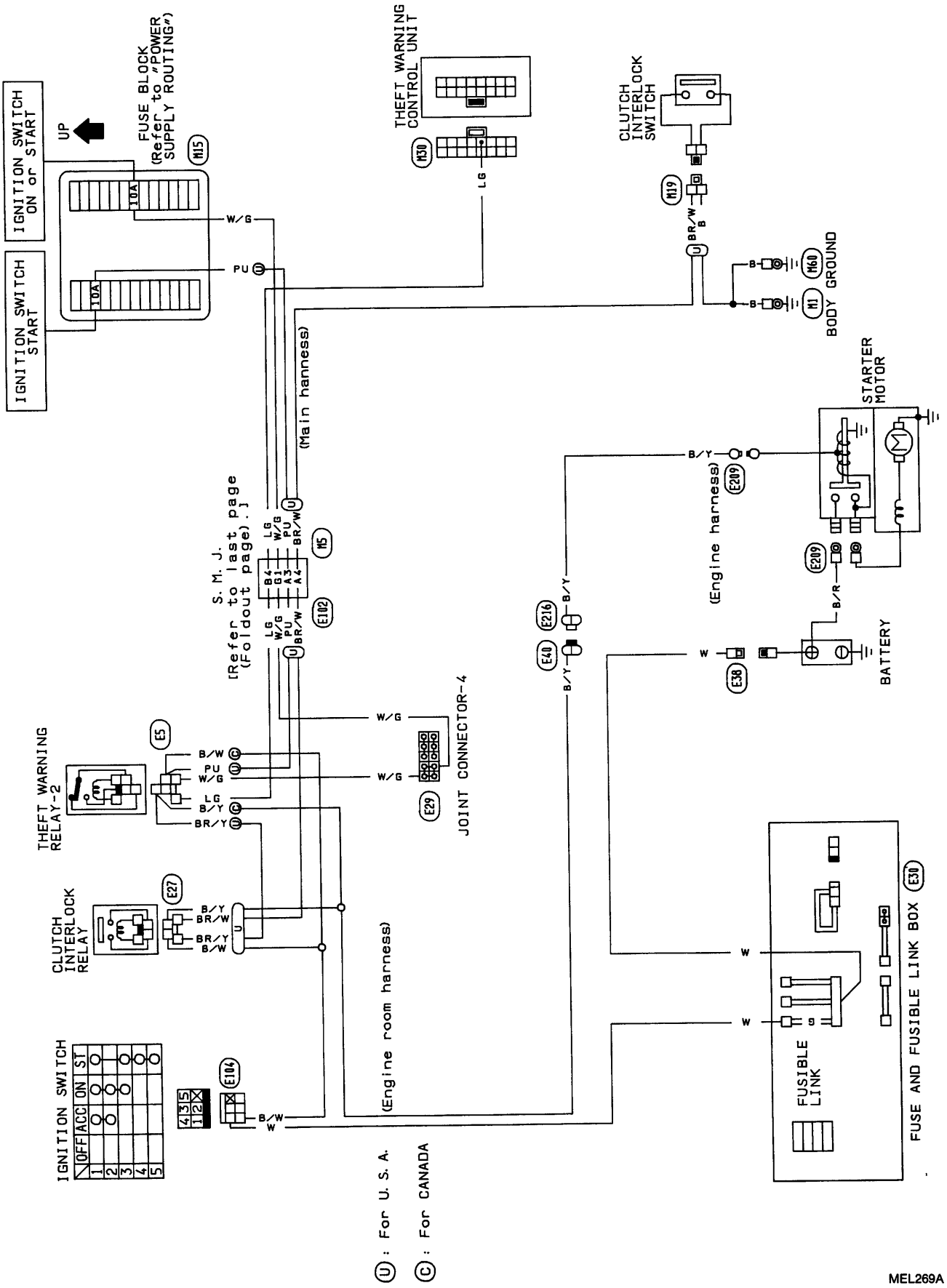
a. Do not use quick charge method on a battery whose specific gravity is less than 1.100.
b. Set initial charging current to value specified in Fig. 6. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.
c. Keep battery away from 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.)

Applied area		California	Except California
Type		55D23L	80D26L
Capacity	V-AH	12-60	12-65

Wiring Diagram

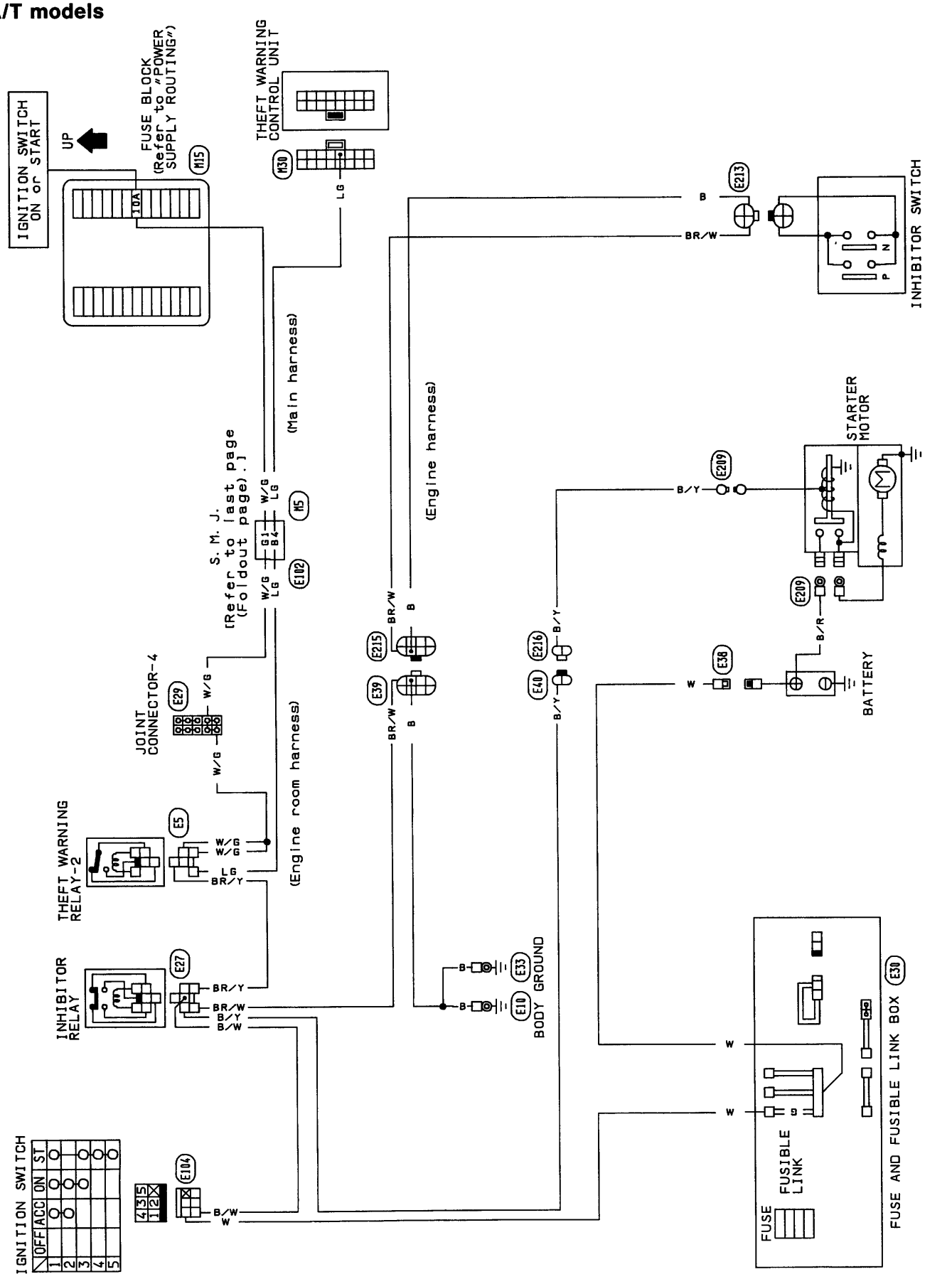
M/T models



MEL269A

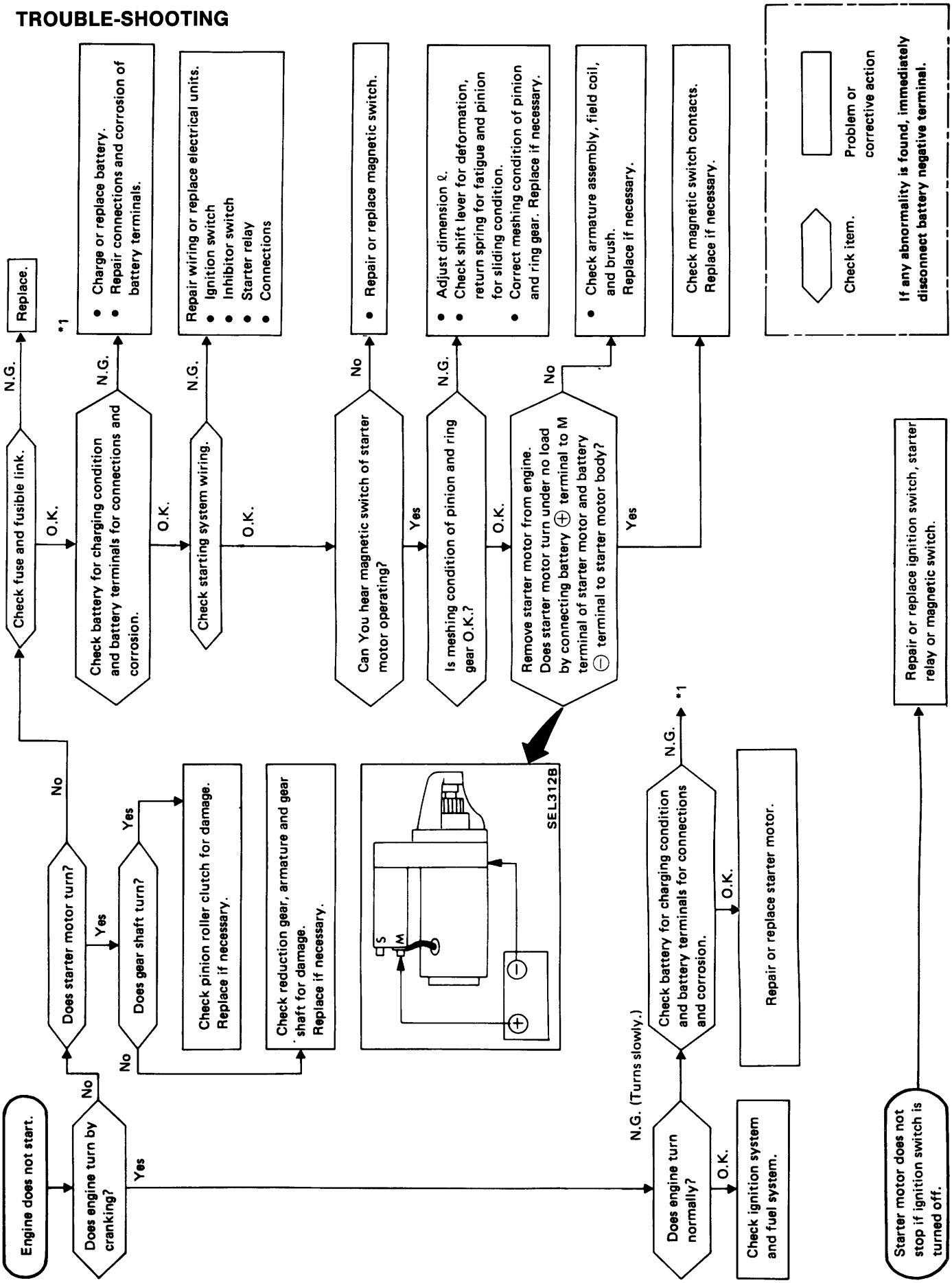
Wiring Diagram (Cont'd)

A/T models



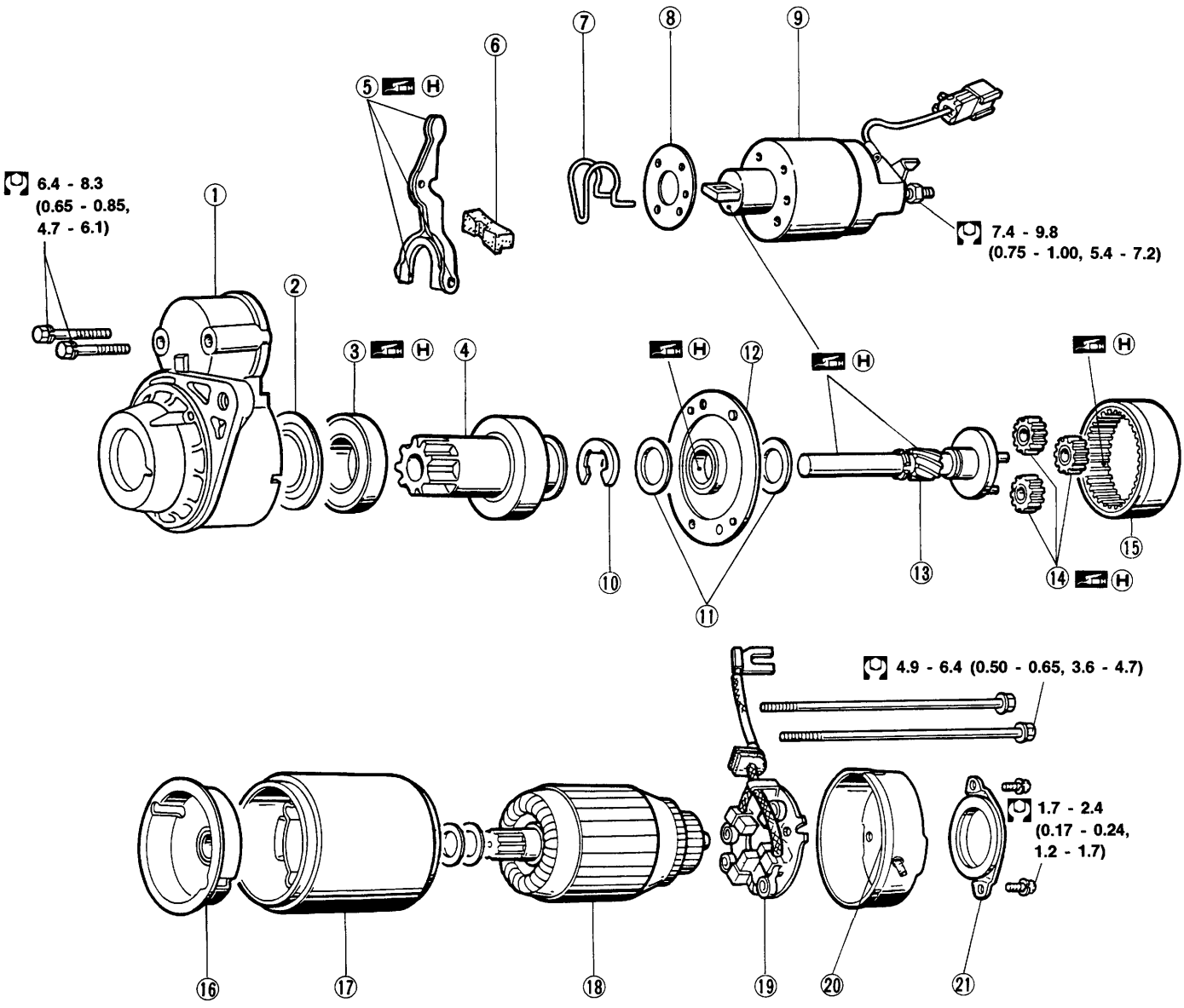
MEL270A

TROUBLE-SHOOTING



Construction

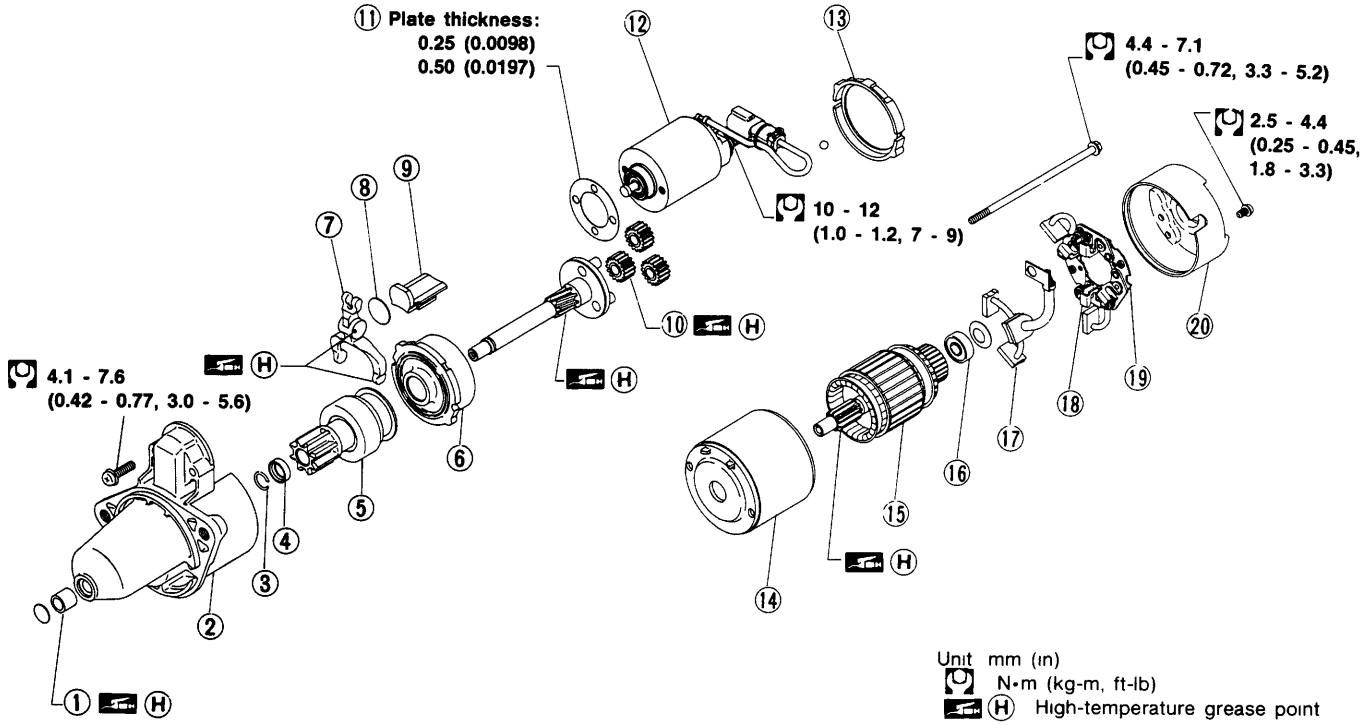
S114-701A



① Gear case
② Bearing cover
③ Ball bearing
④ Pinion assembly
⑤ Shift lever
⑥ Dust cover
⑦ Torsion spring
⑧ Adjusting plate
⑨ Magnetic switch assembly
⑩ E-ring
⑪ Thrust washer
⑫ Center bracket
⑬ Pinion shaft
⑭ Planetary gear
⑮ Internal gear
⑯ Center bracket
⑰ Yoke assembly
⑱ Armature
⑲ Brush holder assembly
⑳ Rear cover
㉑ Dust cover

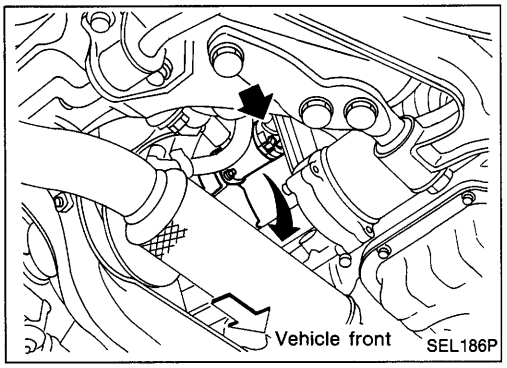
Construction (Cont'd)

M1T72985



SEL483P

① Sleeve bearing
② Gear case
③ Stopper clip
④ Pinion stopper
⑤ Pinion assembly
⑥ Internal gear
⑦ Shift lever
⑧ Plate
⑨ Packing
⑩ Planetary gear
⑪ Adjusting plate
⑫ Magnetic switch assembly
⑬ Packing
⑭ Yoke
⑮ Armature
⑯ Bearing
⑰ Brush (+)
⑱ Brush spring
⑲ Brush holder
⑳ Rear cover



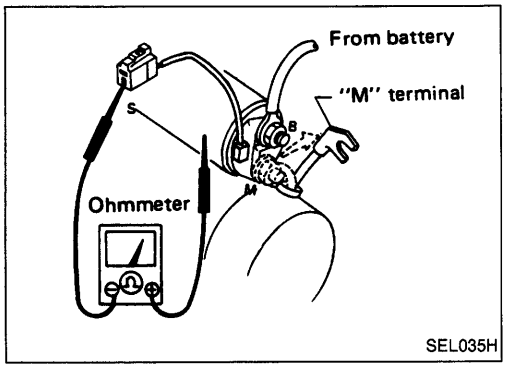
Removal and Installation

REMOVAL

1. Remove battery negative cable from battery.
2. Remove intake air duct.
3. Remove starter motor mounting bolts.
4. Remove battery cable from starter motor.
5. Disconnect harness connector from starter motor harness.
6. Remove starter motor from under vehicle.

INSTALLATION

Installation procedure is basically the reverse order of removal.

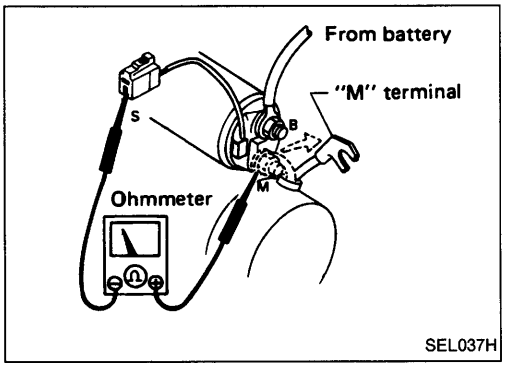


Magnetic Switch Check

- Before starting to check, disconnect battery ground cable.
- Disconnect "M" terminal of starter motor.

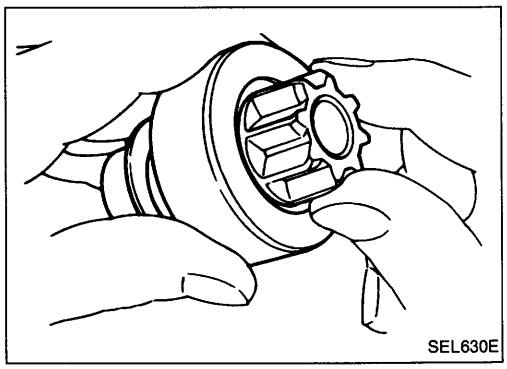
1. Continuity test (between "S" terminal and switch body).

- No continuity ... Replace.



2. Continuity test (between "S" terminal and "M" terminal).

- No continuity ... Replace.



Pinion/Clutch Check

1. Inspect pinion teeth.

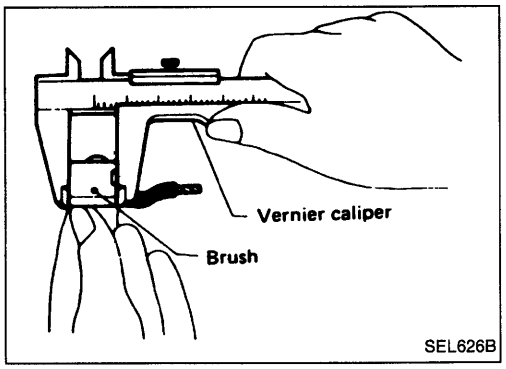
- Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)

2. 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.

3. Inspect reduction gear teeth.

- Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)



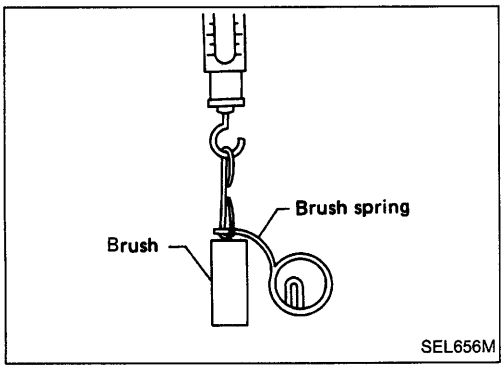
Brush Check

BRUSH

Check brush for wear.

Wear limit length:
Refer to S.D.S.

- Excessive wear ... Replace.

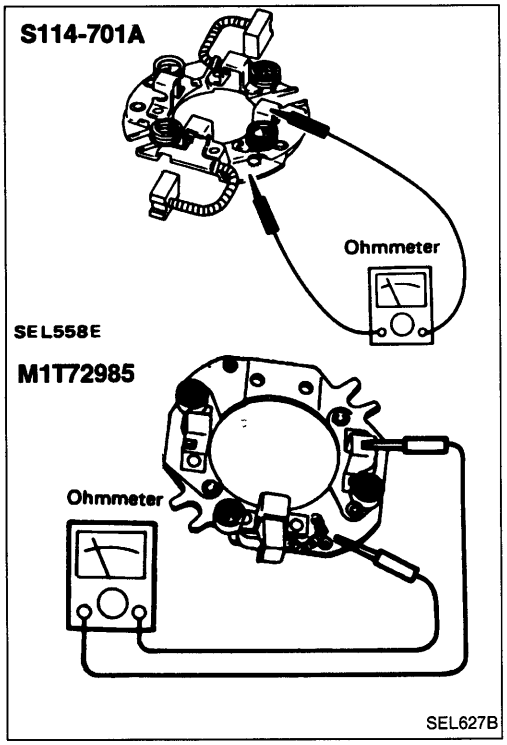


BRUSH SPRING PRESSURE

Check brush spring pressure with brush spring detached from brush.

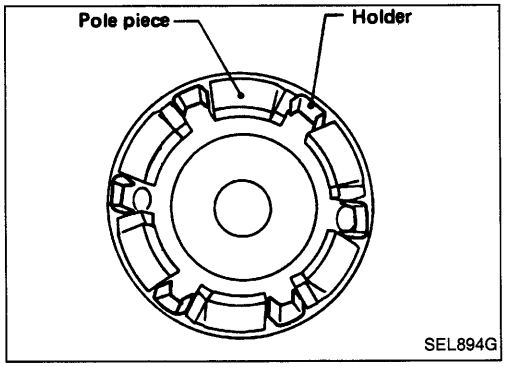
Spring pressure (with new brush):
Refer to S.D.S.

- Not within the specified values ... Replace.



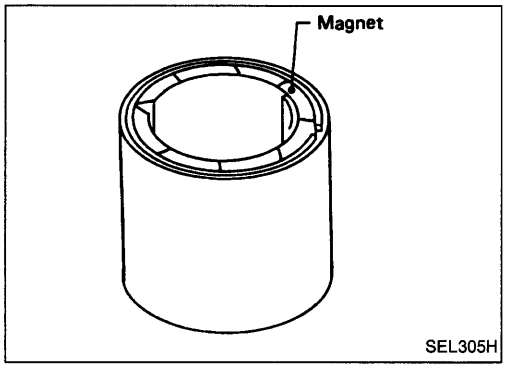
BRUSH HOLDER

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.



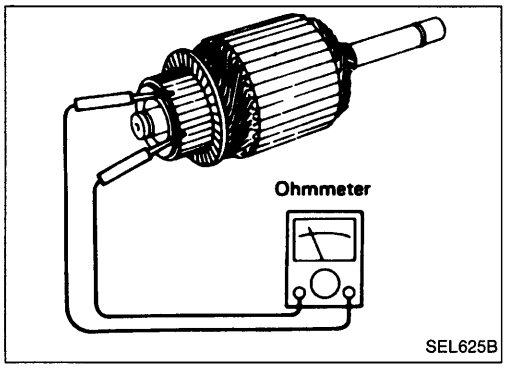
Pole Piece Check (M1T72985)

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.



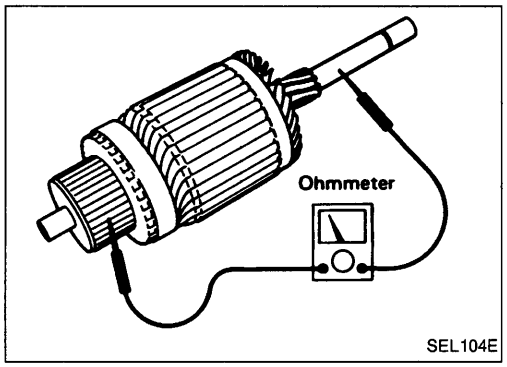
Yoke Assembly Check (S114-701A)

Check magnet for cracks. If there is any crack, replace malfunctioning parts as an assembly.

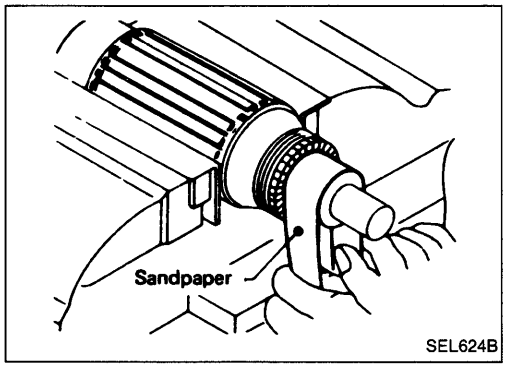


Armature Check

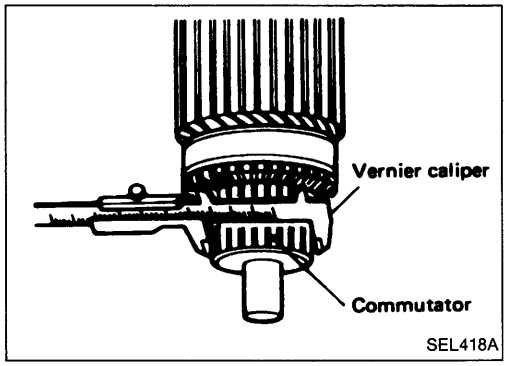
1. Continuity test (between two segments side by side).
- No continuity ... Replace.



2. Insulation test (between each commutator bar and shaft).
- Continuity exists. ... Replace.

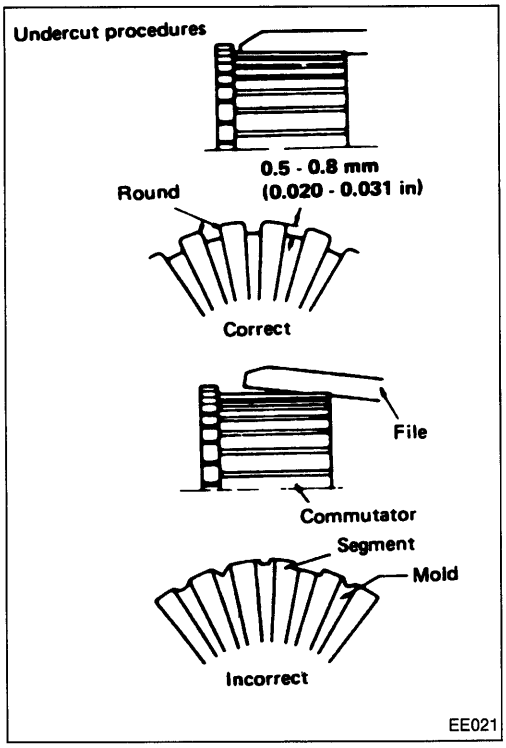


3. Check commutator surface.
- Rough ... Sand lightly with No. 500 - 600 sandpaper.



4. Check diameter of commutator.
   Commutator minimum diameter:
   Refer to S.D.S.
- Less than specified value ... Replace.

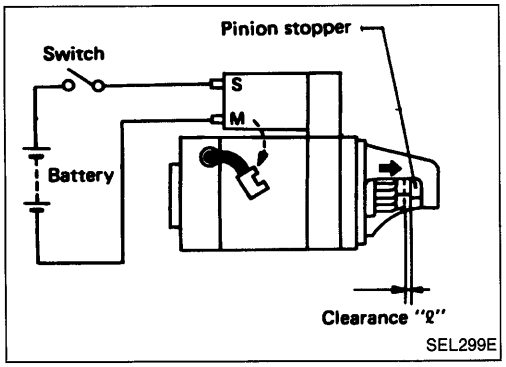
Armature Check (Cont'd)



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.

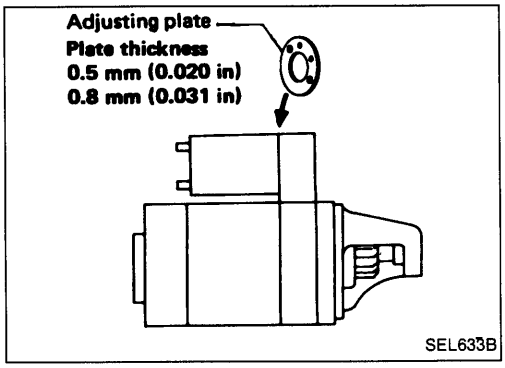


PINION PROTRUSION LENGTH ADJUSTMENT

M1T72985

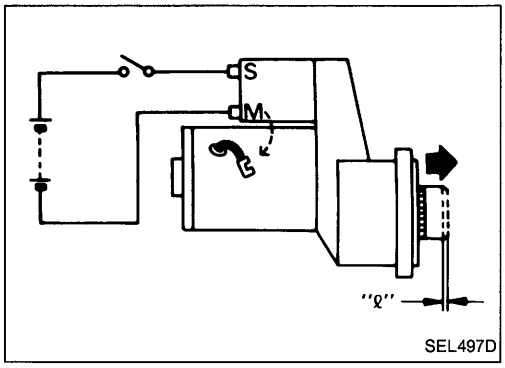
With pinion driven out by magnetic switch, push pinion back to remove slack and measure clearance "ℓ" between the front edge of the pinion and the pinion stopper.

Clearance "ℓ":
Refer to S.D.S.



- Not in the specified value ... Adjust with adjusting plate.

Assembly (Cont'd)

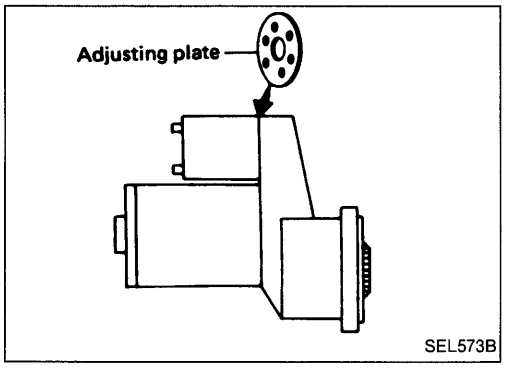


SEL497D

S114-701A

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.



SEL573B

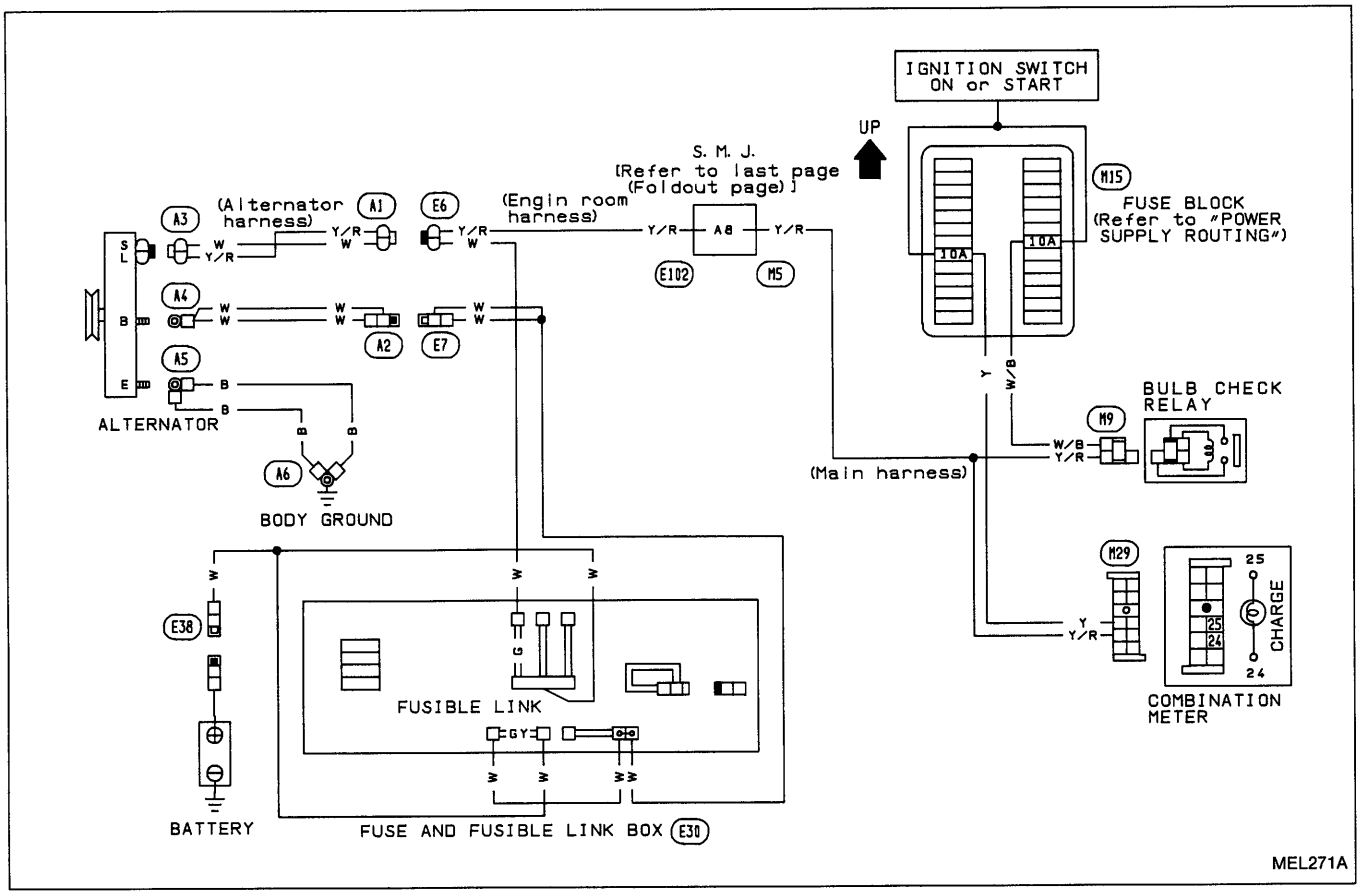
- Not in the specified value ... Adjust by adjusting plate.

Service Data and Specifications (S.D.S.)

STARTER

Type		S114-701A	M1T72985
		HITACHI	MITSUBISHI
		Reduction gear	
System voltage	V	12	
No-load			
Terminal voltage	V	11.0	
Current	A	90	50 - 75
Revolution	rpm	2,950	3,000 - 4,000
Minimum diameter of commutator	mm (in)	32.0 (1.260)	28.8 (1.134)
Minimum length of brush	mm (in)	11.0 (0.433)	12.0 (0.472)
Brush spring tension	N (kg, lb)	17.6 - 21.6 (1.80 - 2.20, 3.96 - 4.86)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)
Movement "ℓ" in height of pinion assembly	mm (in)	—	—
Clearance of bearing metal and armature shaft	mm (in)	0.03 - 0.3 (0.0012 - 0.0118)	—
Clearance "ℓ" between pinion front edge and pinion stopper	mm (in)	0.05 - 1.5 (0.0020 - 0.0591)	0.5 - 2.0 (0.020 - 0.079)

Wiring Diagram

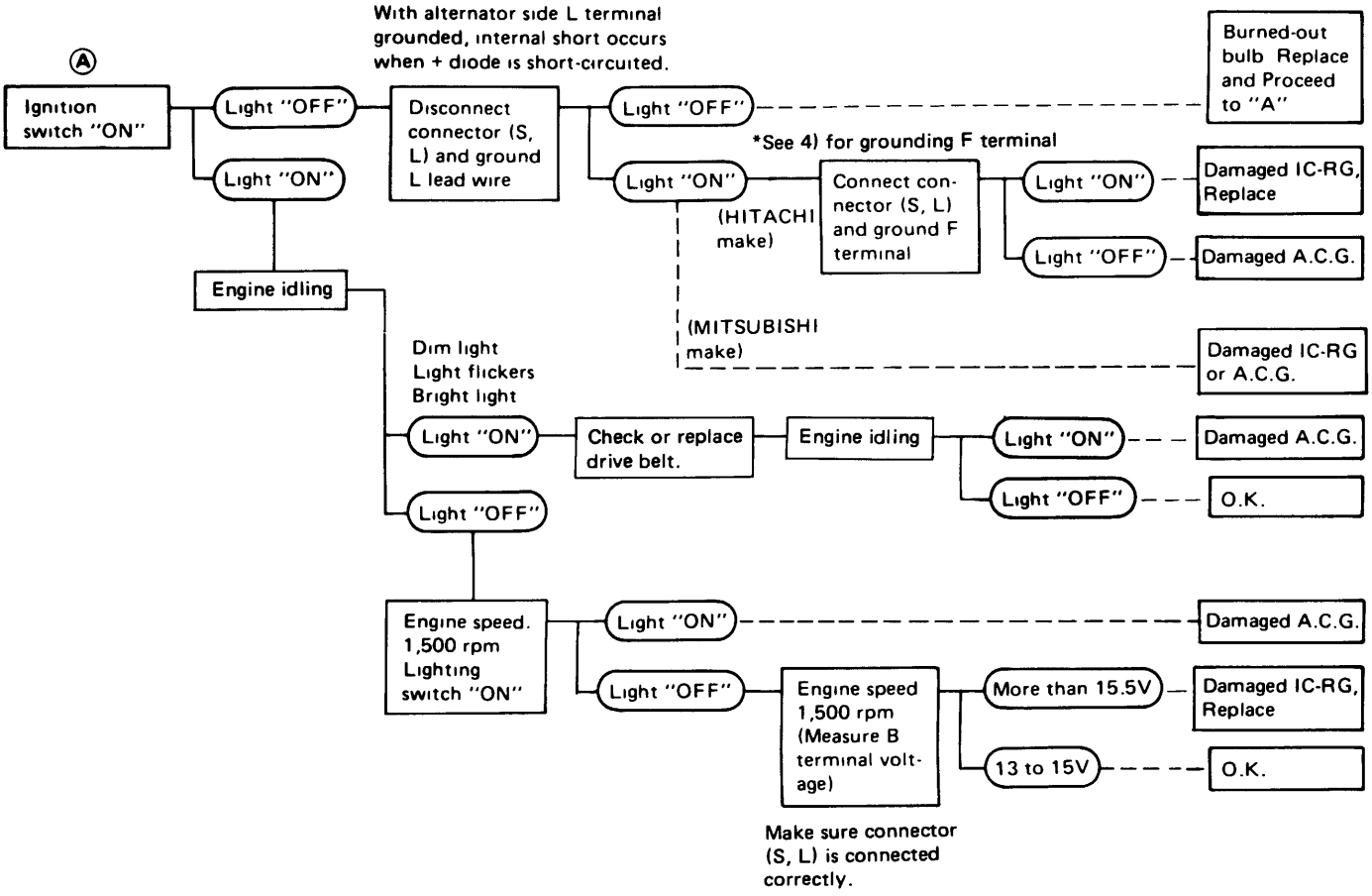


Trouble-shooting

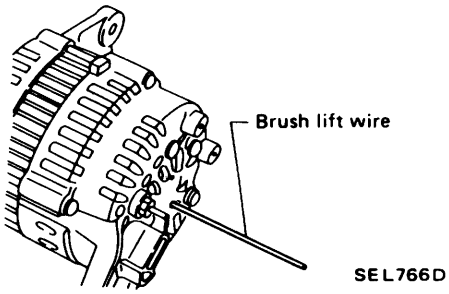
Before conducting an alternator test, make sure that the battery is fully charged. A 30-volt voltmeter and suitable test probes are necessary for the test. The alternator can be checked easily by referring to the Inspection Table.

Before starting trouble-shooting, inspect the fusible link.

WITH IC REGULATOR



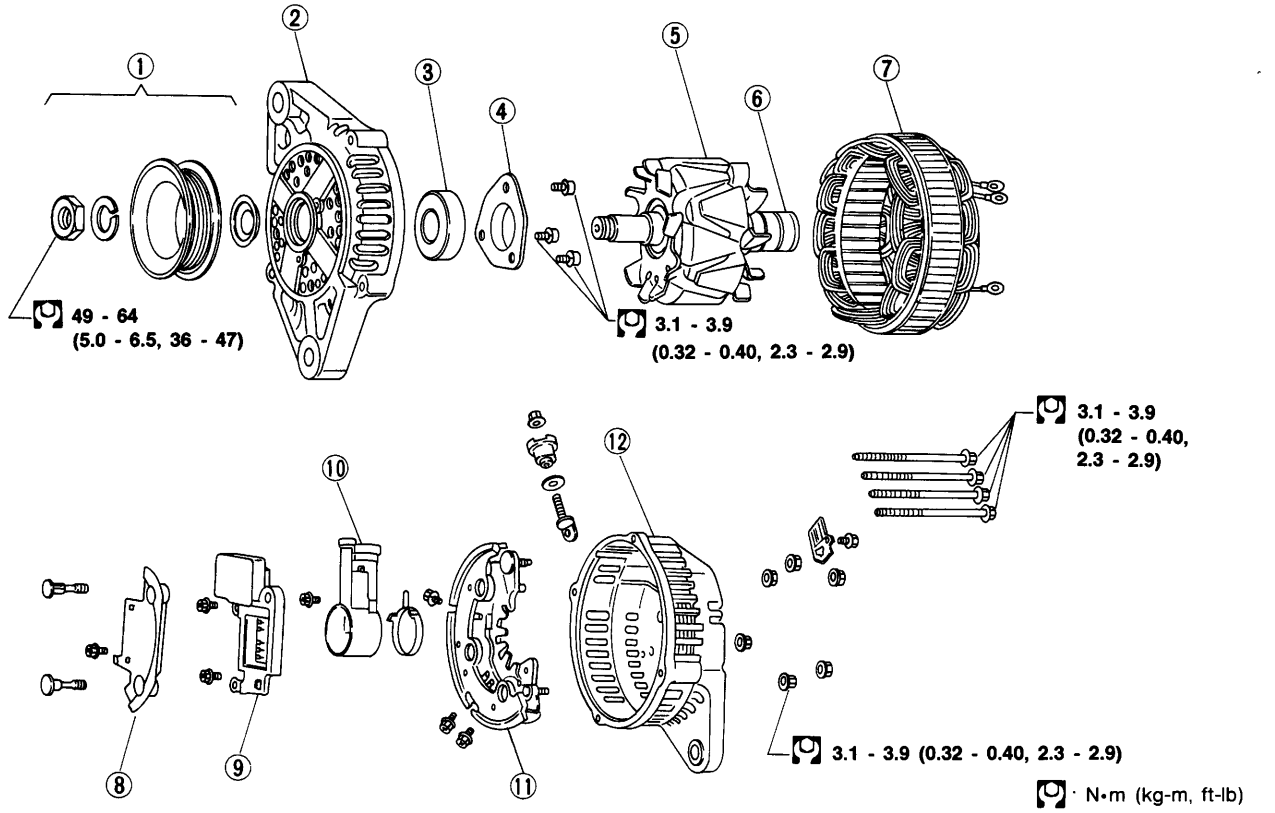
1) **Use fully charged battery.**
2) **Light : Charge warning light**
   A.C.G. :Alternator parts except IC regulator
   IC-RG :IC regulator
   O.K. :IC alternator is in good condition.
3) **When reaching "Damaged A.C.G.", remove alternator from vehicle and disassemble, inspect and correct or replace faulty parts.**
4) ***Method of grounding F terminal (HITACHI make only)**
   Contact tip of wire with brush and attach wire to alternator body.



5) **Terminals "S", "L", "B" and "E" are marked on rear cover of alternator.**

Construction

LR180-725

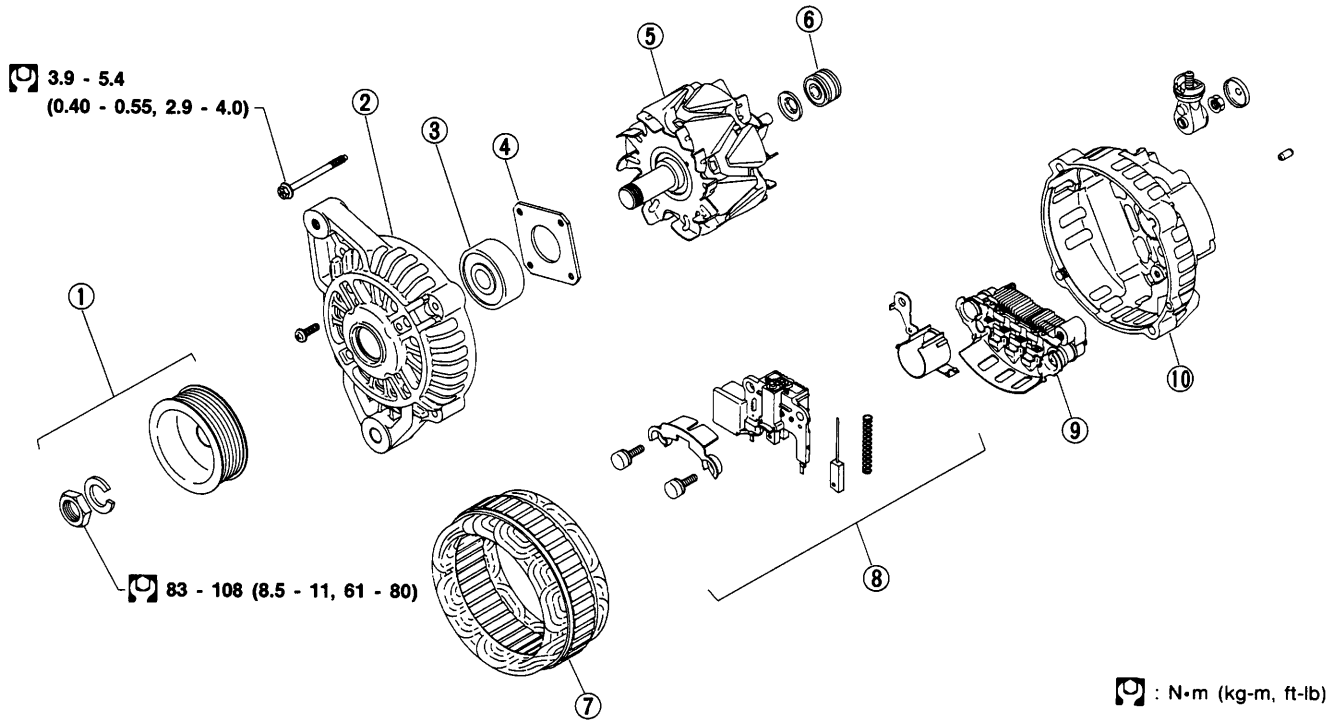


SEL485P

① Pulley assembly
② Front cover
③ Front bearing
④ Retainer
⑤ Rotor
⑥ Slip ring
⑦ Stator
⑧ Condenser
⑨ IC regulator assembly
⑩ Brush holder
⑪ Diode assembly
⑫ Rear cover

Construction (Cont'd)

A2T13894

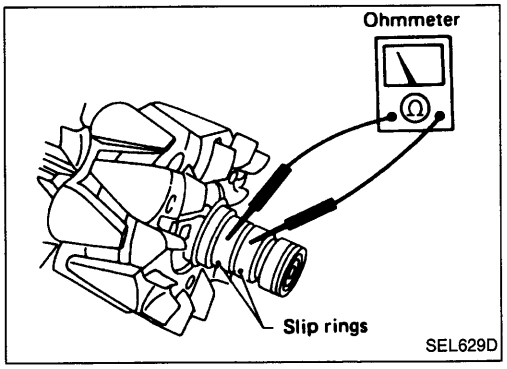


SEL486P

① Pulley assembly
② Front cover
③ Front bearing
④ Bearing retainer
⑤ Rotor
⑥ Rear bearing
⑦ Stator
⑧ IC voltage regulator assembly
⑨ Diode assembly
⑩ Rear cover

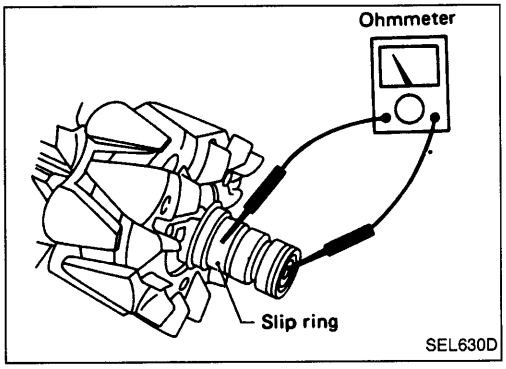
REAR BEARING

CAUTION:
Do not reuse rear bearing or oil seal after removal. Replace with a new one.
Do not lubricate rear bearing outer race.



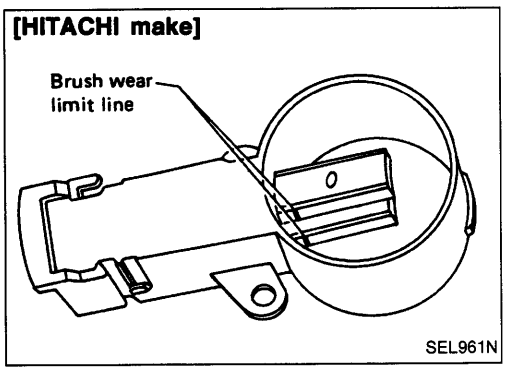
Rotor Slip Ring Check

1. Continuity test
- No continuity ... Replace rotor.



2. Insulator test
- Continuity exists. ... Replace rotor.

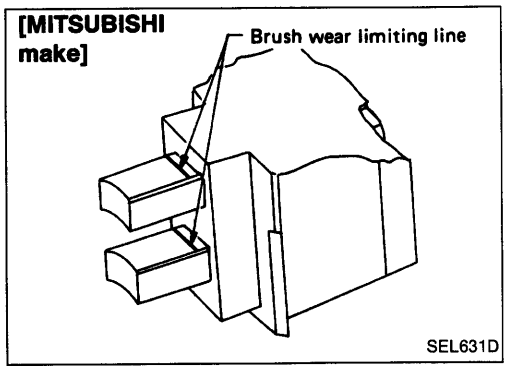
3. Check slip ring for wear.
   Slip ring minimum outer diameter:
   Refer to S.D.S.



Brush Check

Check brush as follows:
1. Smooth movement
2. Wear

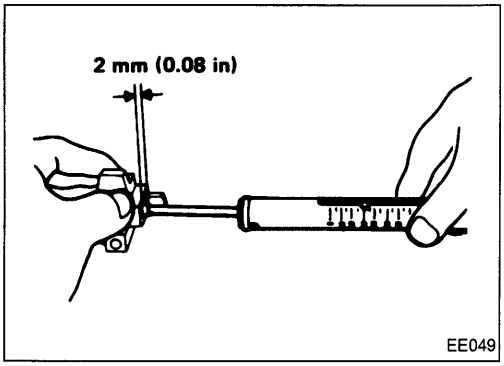
If either of the above conditions occur, replace brush assembly.



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.

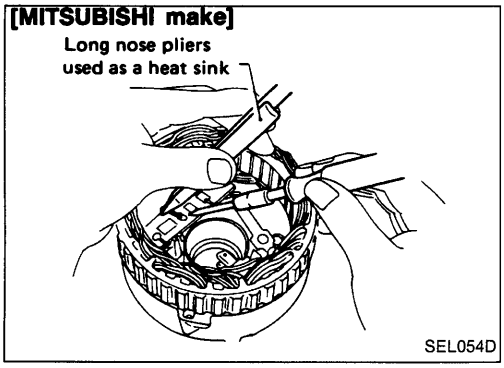
4. Check brush spring pressure.
Measure brush spring pressure with brush projected approximately 2 mm (0.08 in) from brush holder.
Spring pressure:
Refer to S.D.S.
- Not within the specified values ... Replace.

Stator Check

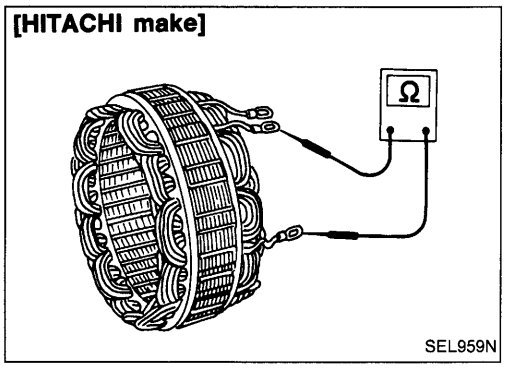
To test the stator or diode, separate them by unsoldering the connecting wires.

CAUTION:
Use only as much heat as required to melt solder. Otherwise, diodes will be damaged by excessive heat.

[MITSUBISHI make]

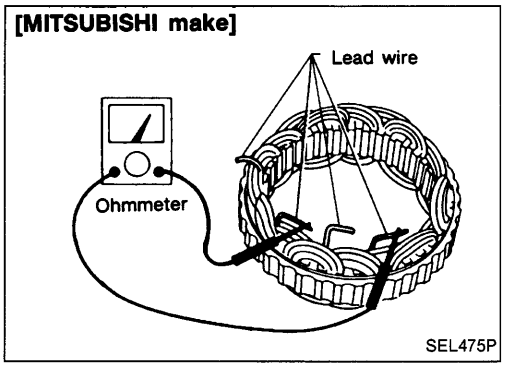


[HITACHI make]

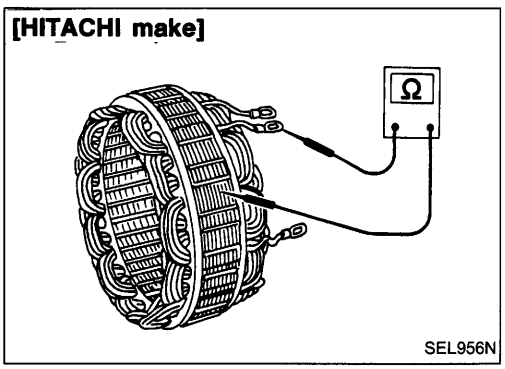


1. Continuity test
- No continuity ... Replace stator.

[MITSUBISHI make]

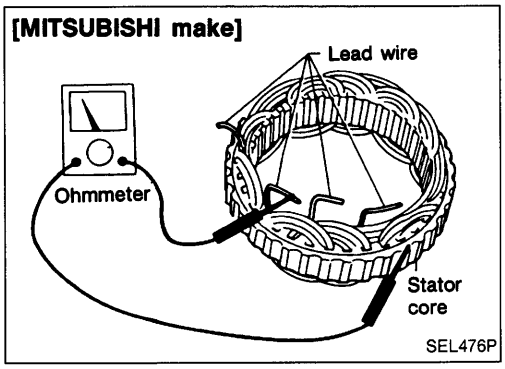


[HITACHI make]



2. Ground test
- Continuity exists ... Replace stator.

Stator Check (Cont'd)



Diode Check

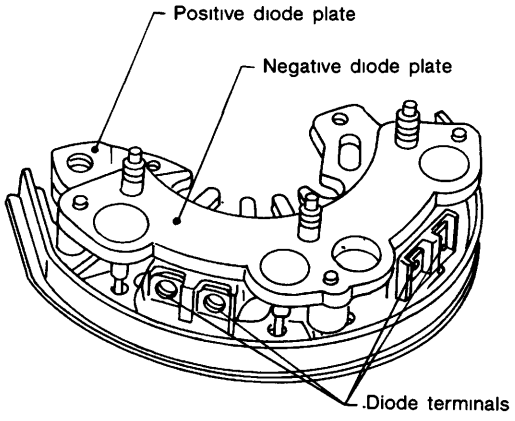
DIODES

- 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]

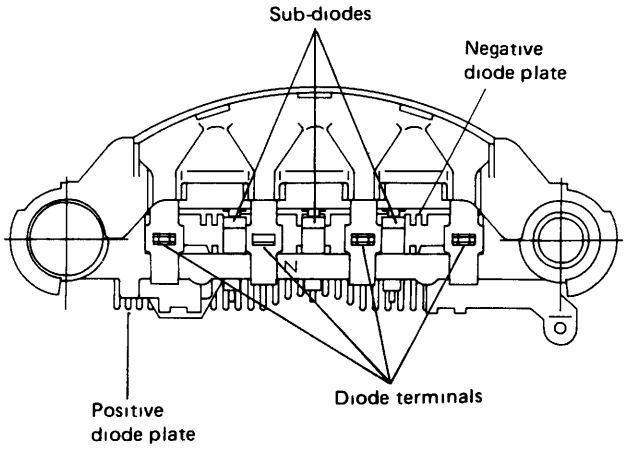
LR180-725



SEL477P

[MITSUBISHI make]

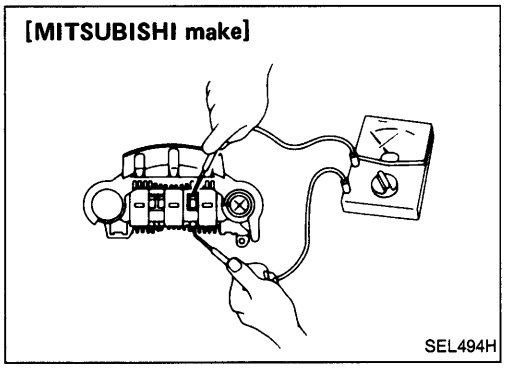
A2T13894



SEL385L

Diode Check (Cont'd)

[MITSUBISHI make]



SEL494H

SUB-DIODES

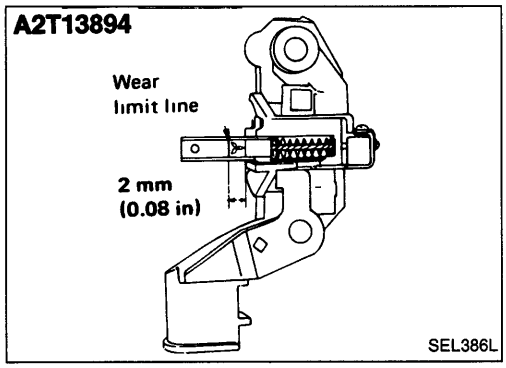
- Attach ohmmeter's probe to each end of diode to check for continuity.
- Continuity is N.G. ... Replace diode assembly.

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.

A2T13894

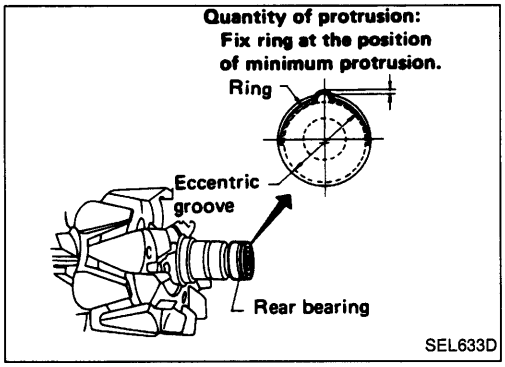


SEL386L

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.

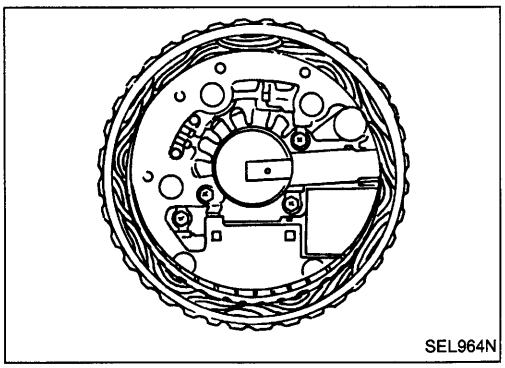


SEL633D

RING FITTING IN REAR BEARING

[HITACHI make]

- Fix ring into groove in rear bearing so that it is as close to the adjacent area as possible.



SEL964N

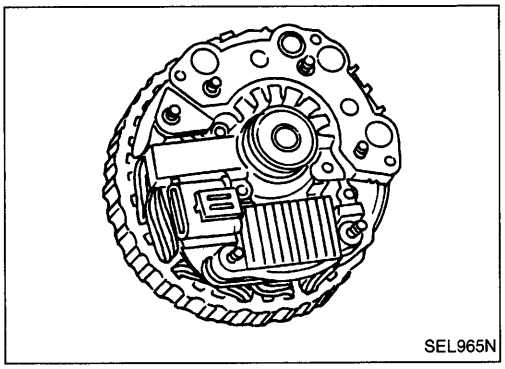
REAR COVER INSTALLATION

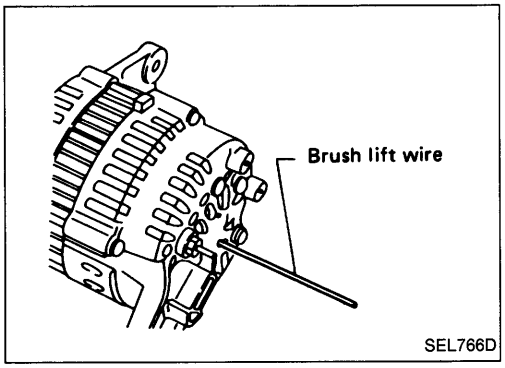
[HITACHI make]

(1) Fit brush assembly, diode assembly, regulator assembly and stator.
(2) Push brushes up with fingers and install them to rotor.

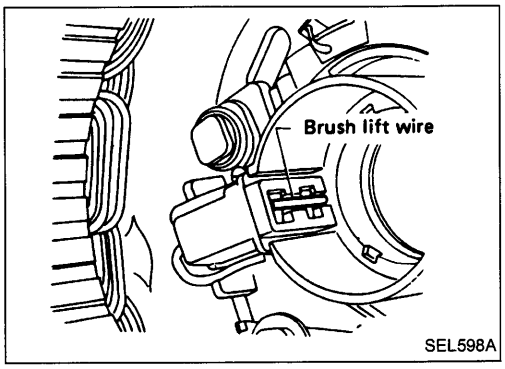
Take care not to damage slip ring sliding surface.

Assembly (Cont'd)


SEL965N



SEL766D



SEL598A

[MITSUBISHI make]

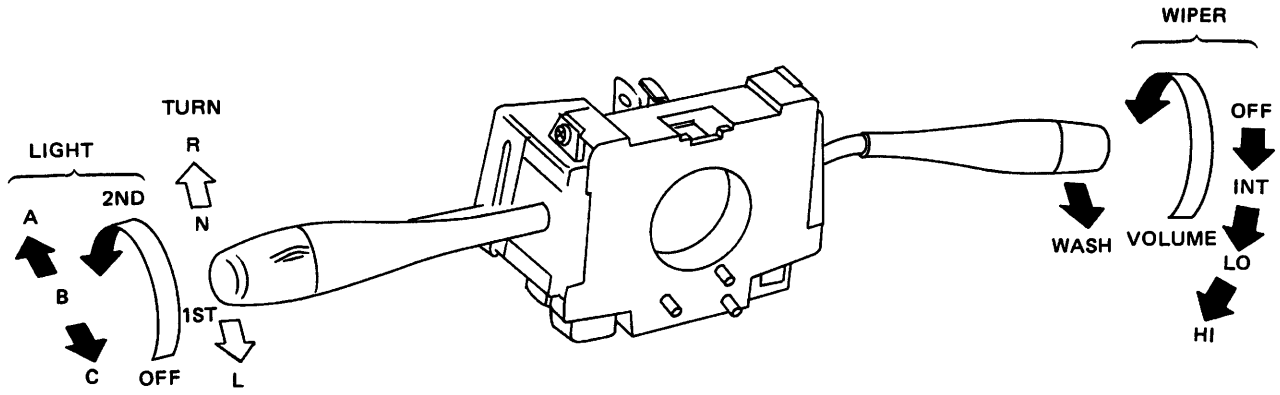
(1) Before installing front cover with pulley and rotor with rear cover, push brush up with fingers and retain brush by inserting brush lift wire into brush lift hole from outside.
(2) After installing front and rear sides of alternator, pull brush lift wire by pushing toward the center.

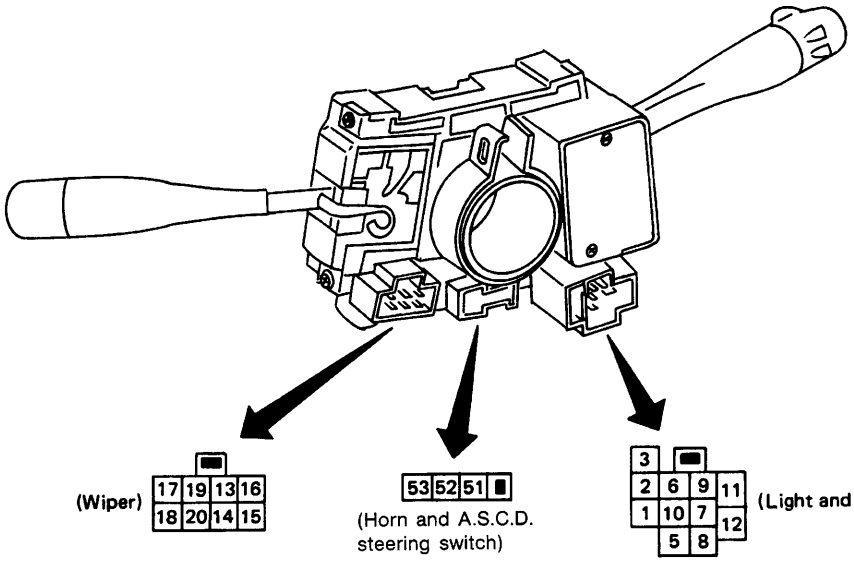
Service Data and Specifications (S.D.S.)

ALTERNATOR

Type		LR180-725	A2T13894
		HITACHI	MITSUBISHI
Nominal rating	V-A	12-80	
Ground polarity		Negative	
Minimum revolution under no-load (When 13.5 volts is applied)	rpm	950	1,300
Hot output current	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
Regulated output voltage	V	14.1 - 14.7	
Minimum length of brush	mm (in)	6.0 (0.236)	8 (0.31)
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)
Slip ring minimum outer diameter	mm (in)	More than 26.0 (1.024)	More than 22.1 (0.870)

Combination Switch/Check





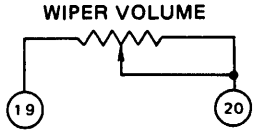
LIGHTING SWITCH

	OFF			1ST			2ND		
	A	B	C	A	B	C	A	B	C
5			○			○	○	○	○
6			○			○	○		○
7								○	
8			○			○	○	○	○
9			○			○	○		○
10								○	
11				○	○	○	○	○	○
12				○	○	○	○	○	○

WIPER SWITCH

	OFF	INT	LO	HI	WASH
13	○	○			
14	○	○	○		
15		○			
16				○	
17		○	○	○	○
18					○

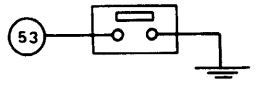
INTERMITTENT WIPER VOLUME



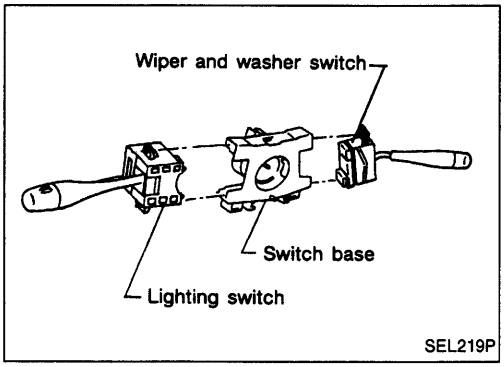
TURN SIGNAL SWITCH

	R	N	L
1	○		○
2	○		
3			○

HORN SWITCH

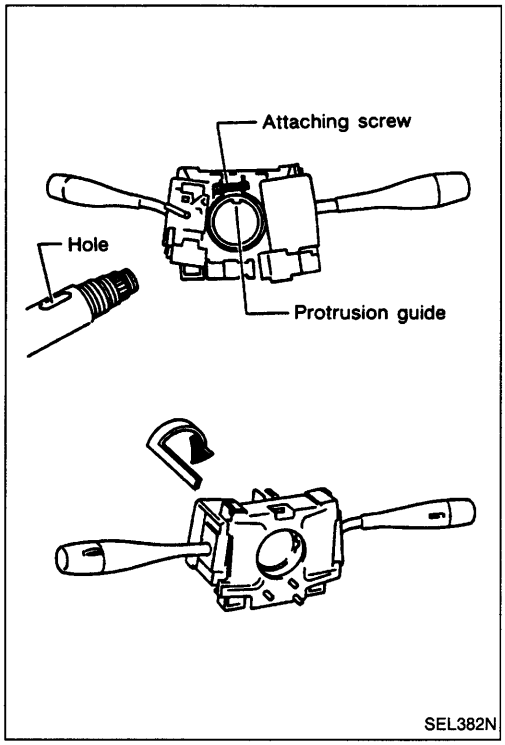


SEL615N



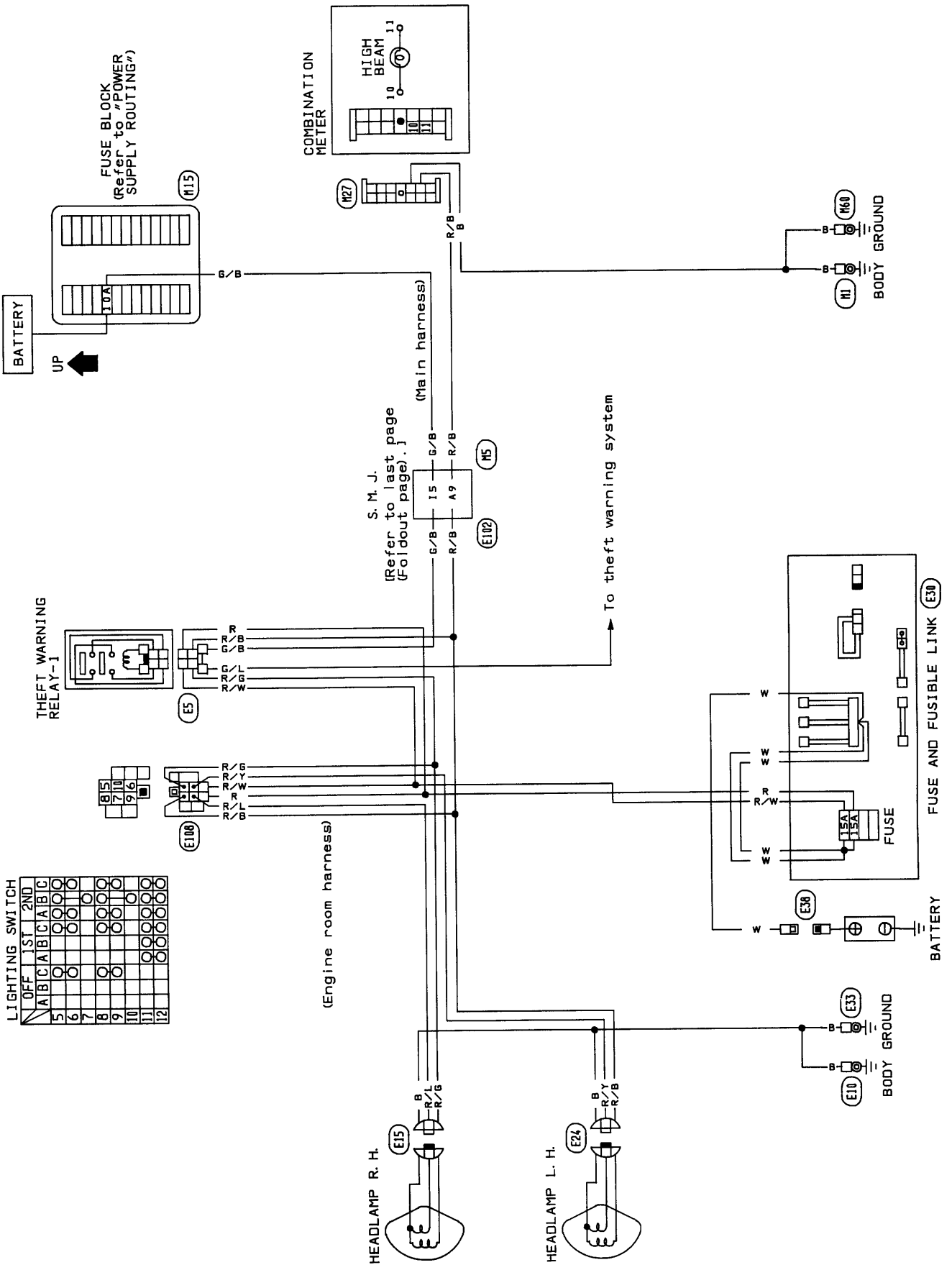
Replacement

- Each switch can be replaced without removing combination switch base.



- To remove combination switch base, remove base attaching screw and turn after pushing on it.

Wiring Diagram



MEL272A

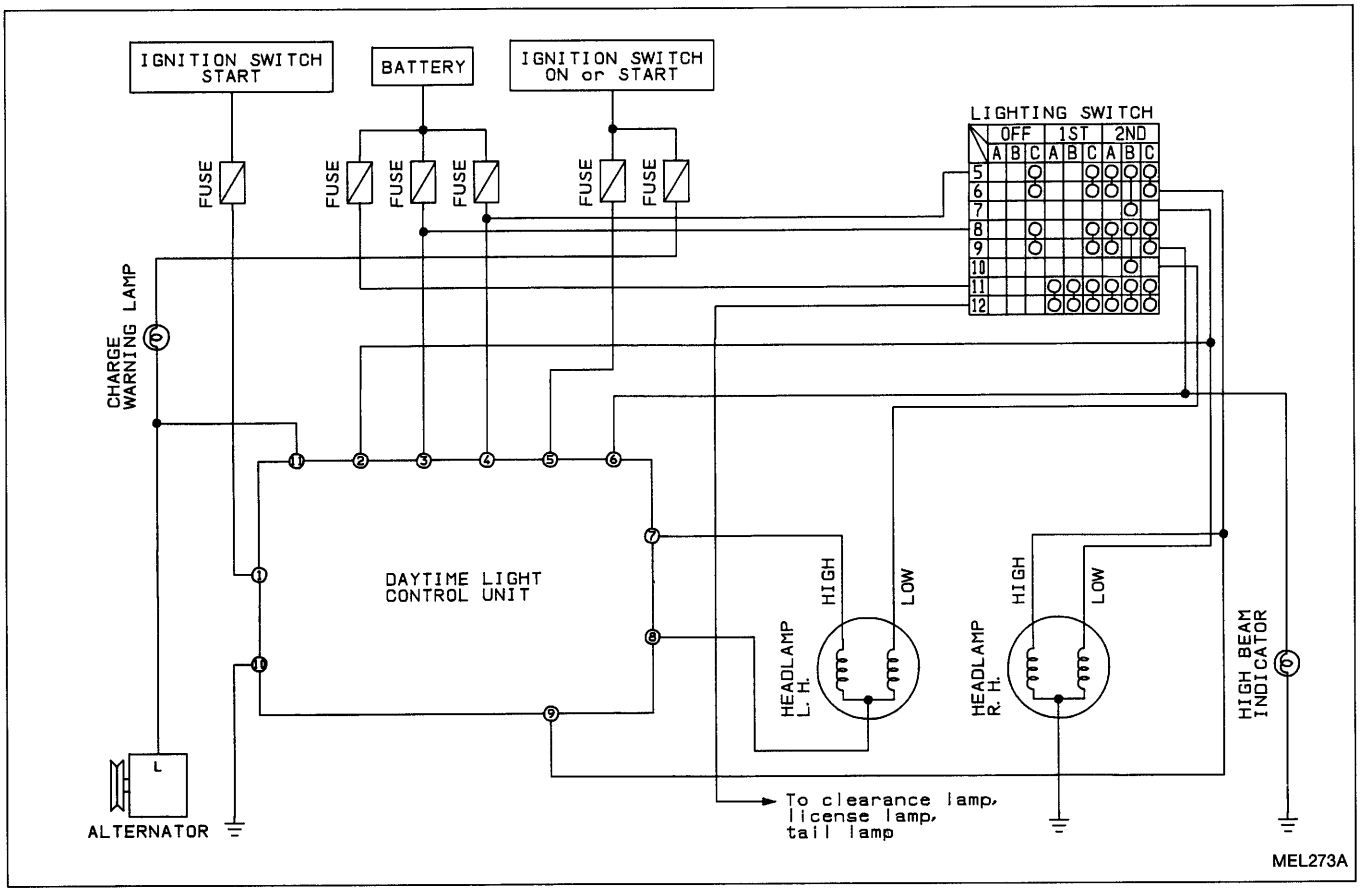
Operation

After starting the engine with the lighting switch in the "OFF" position or "1ST" position, the headlamp high beam automatically turns on. Lighting switch operations other than the above are the same as conventional light systems.

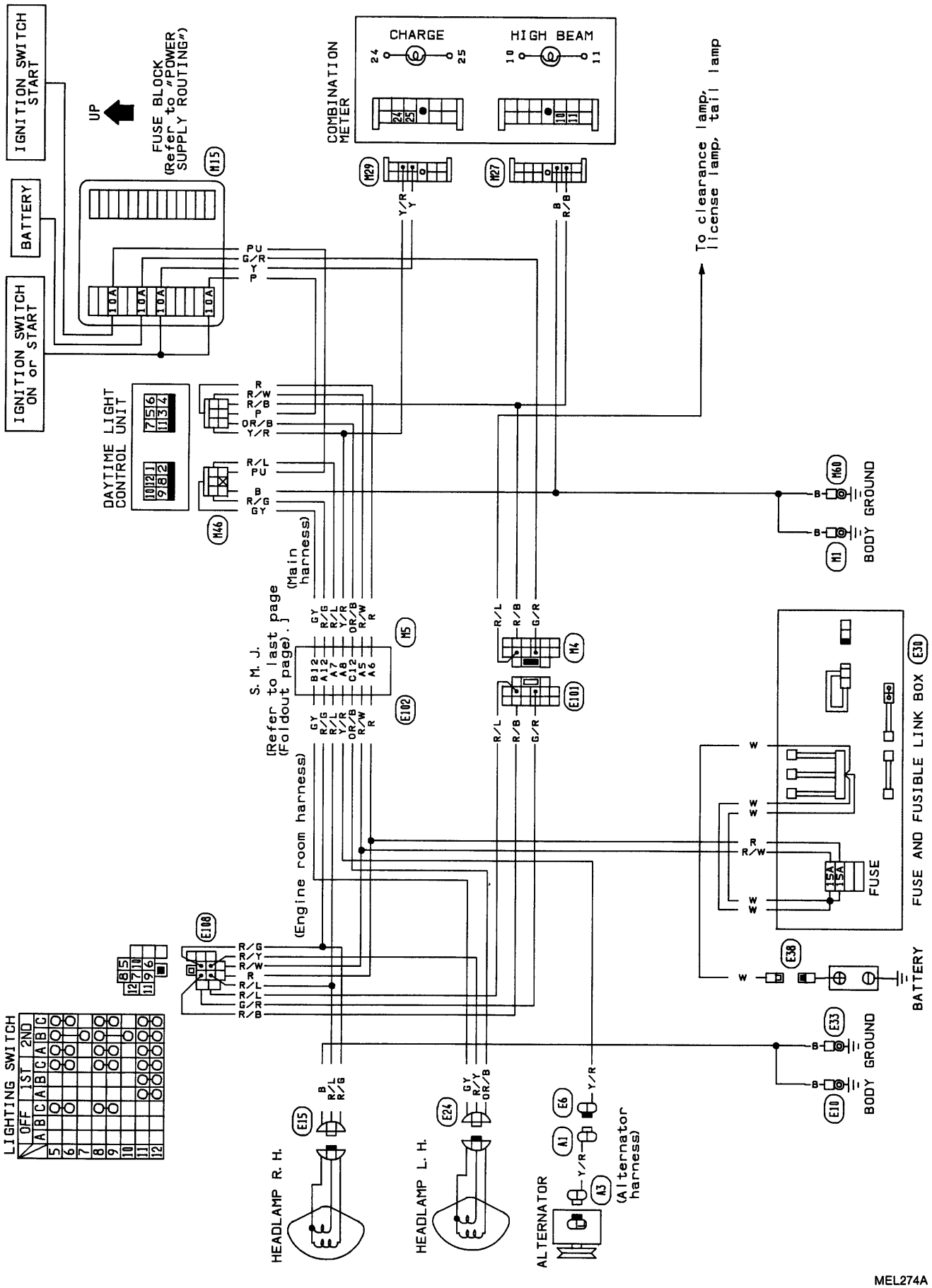
Engine		With engine stopped									With engine running								
Lighting switch		OFF			1ST			2ND			OFF			1ST			2ND		
		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Headlamp	High beam	X	X	O	X	X	O	O	X	O	△	△	O	△	△	O	O	X	O
	Low beam	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	O	X
Clearance and tail lamp		X	X	X	O	O	O	O	O	O	X	X	X	O	O	O	O	O	O
License and instrument illumination lamp		X	X	X	O	O	O	O	O	O	X	X	X	O	O	O	O	O	O

O : Lamp "ON"
X : Lamp "OFF"
△ : Lamp dims.
□ : Added functions

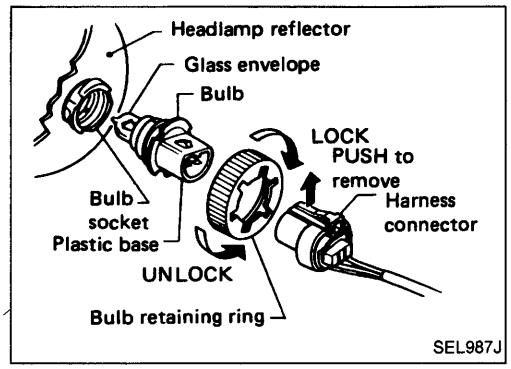
Schematic



Wiring Diagram



MEL274A



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. Turn the bulb retaining ring counterclockwise until it is free from the headlamp reflector, and then remove it.
3. Disconnect the harness connector from the back side of the bulb.
4. Remove the headlamp bulb carefully. Do not shake or rotate the bulb when removing it.
5. 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.

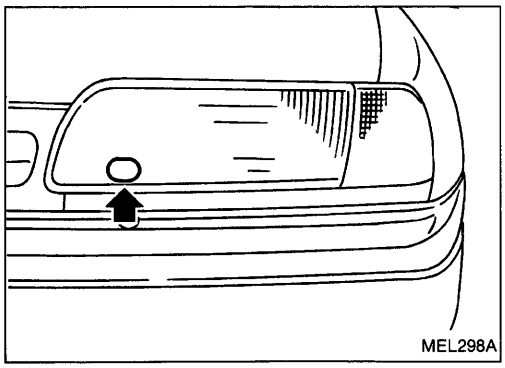
If any aimer is not available, aiming adjustment can be done as follows:

For details, refer to the regulations in your own country.

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).



AIMER ADJUSTMENT MARK

When using a mechanical aimer, adjust adapter legs to the data marked on the headlamps.

Example:

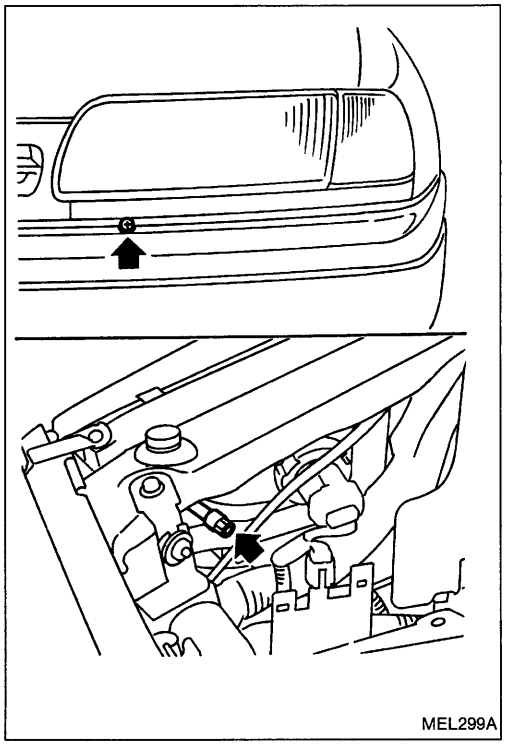
4H2V
- Vertical side: 2
- Horizontal side: 4

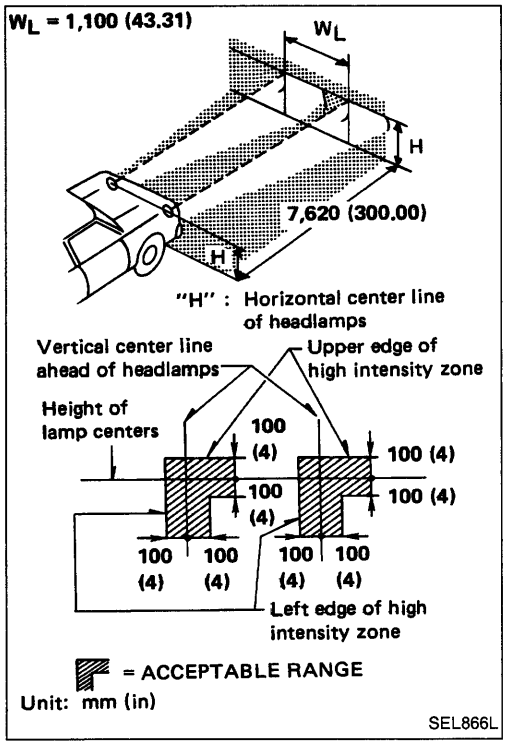
Aiming Adjustment (Cont'd)

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.**


MEL299A

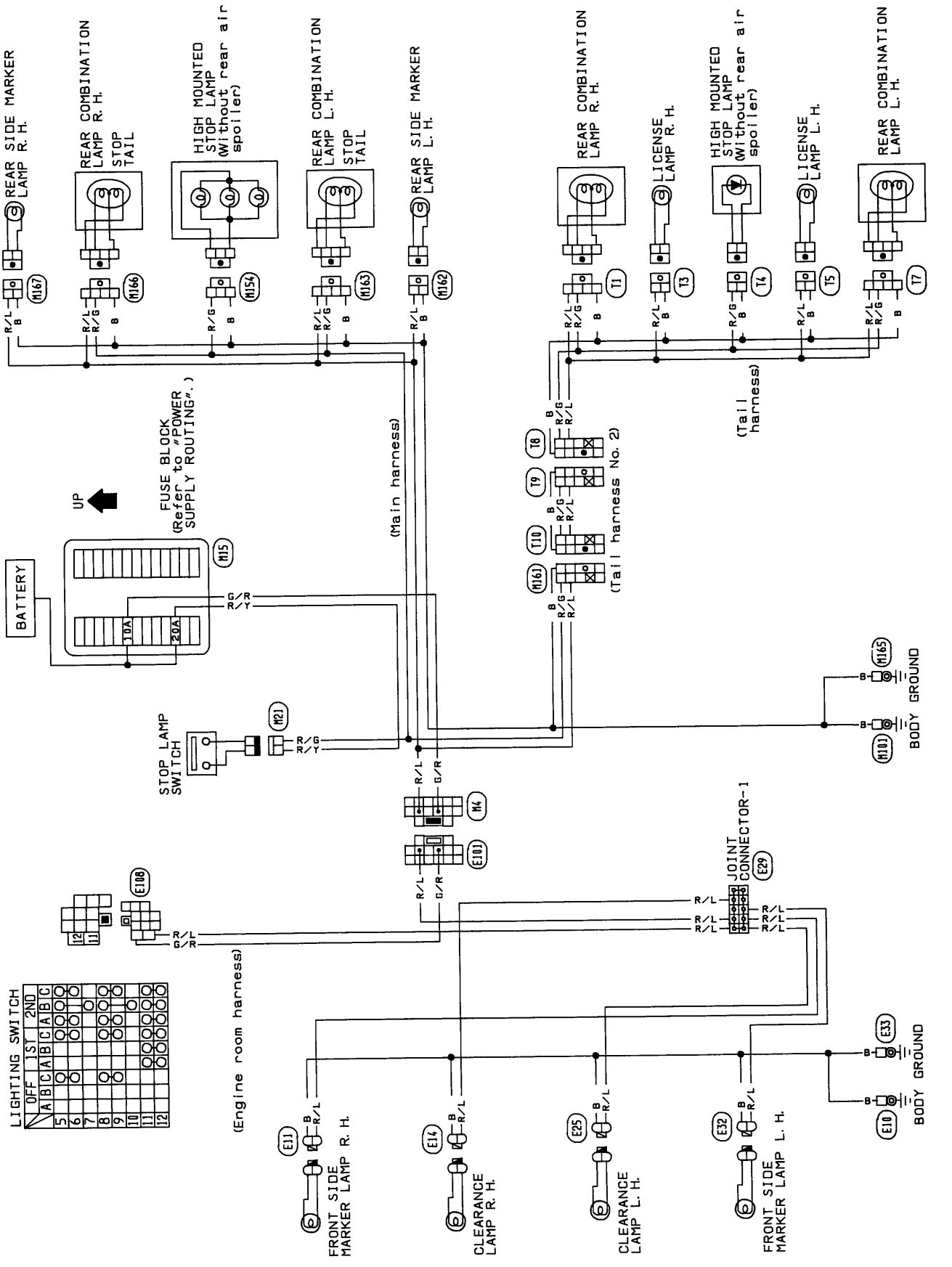


SEL866L

- **Adjust headlamps so that upper edge and left edge of high intensity zone are within the acceptable range as shown at left.**
- **Dotted lines in illustration show center of headlamp.**

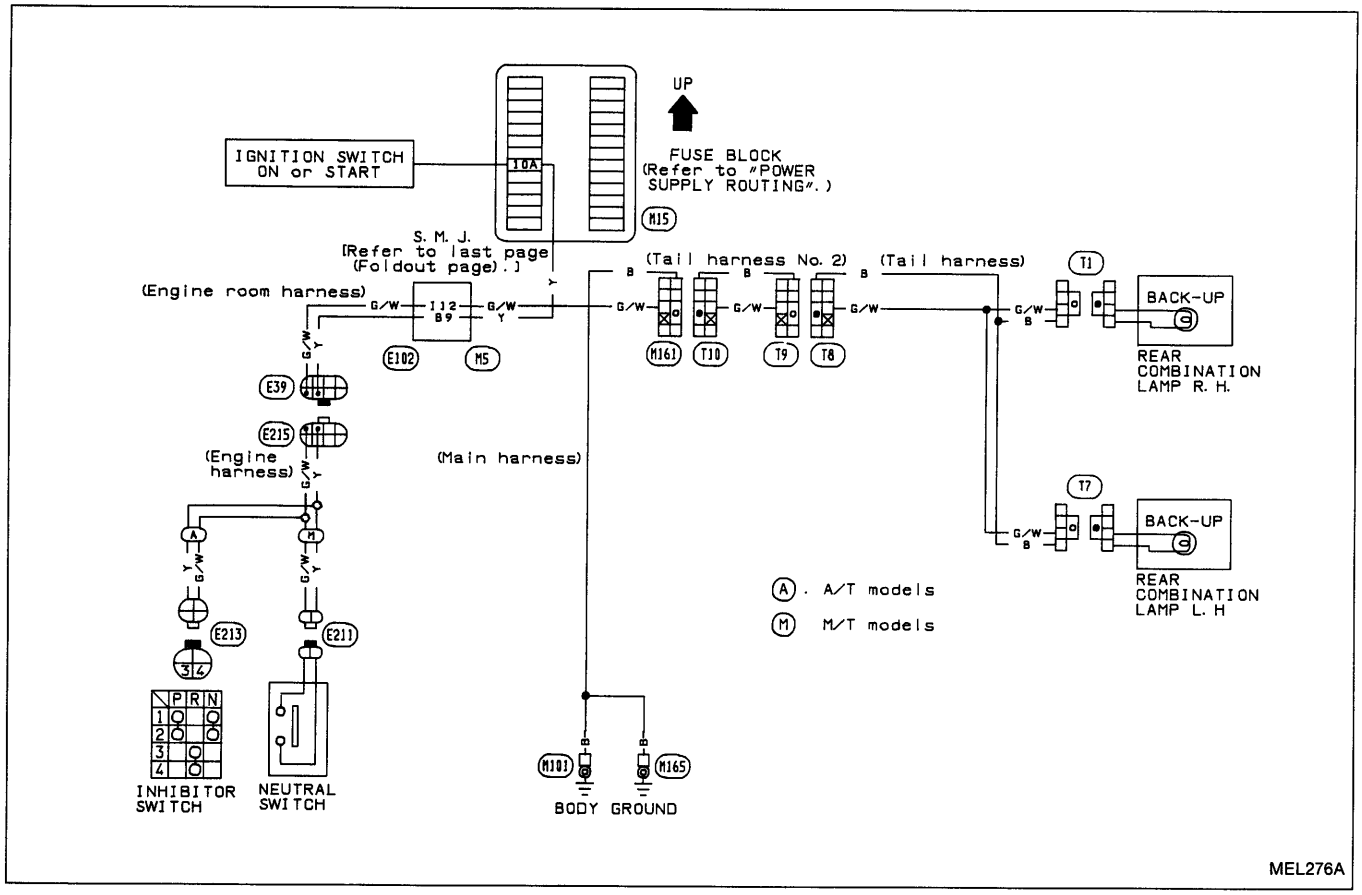
"H": Horizontal center line of headlamps
"WL": Distance between each headlamp center

Clearance, License, Tail and Stop Lamps/Wiring Diagram

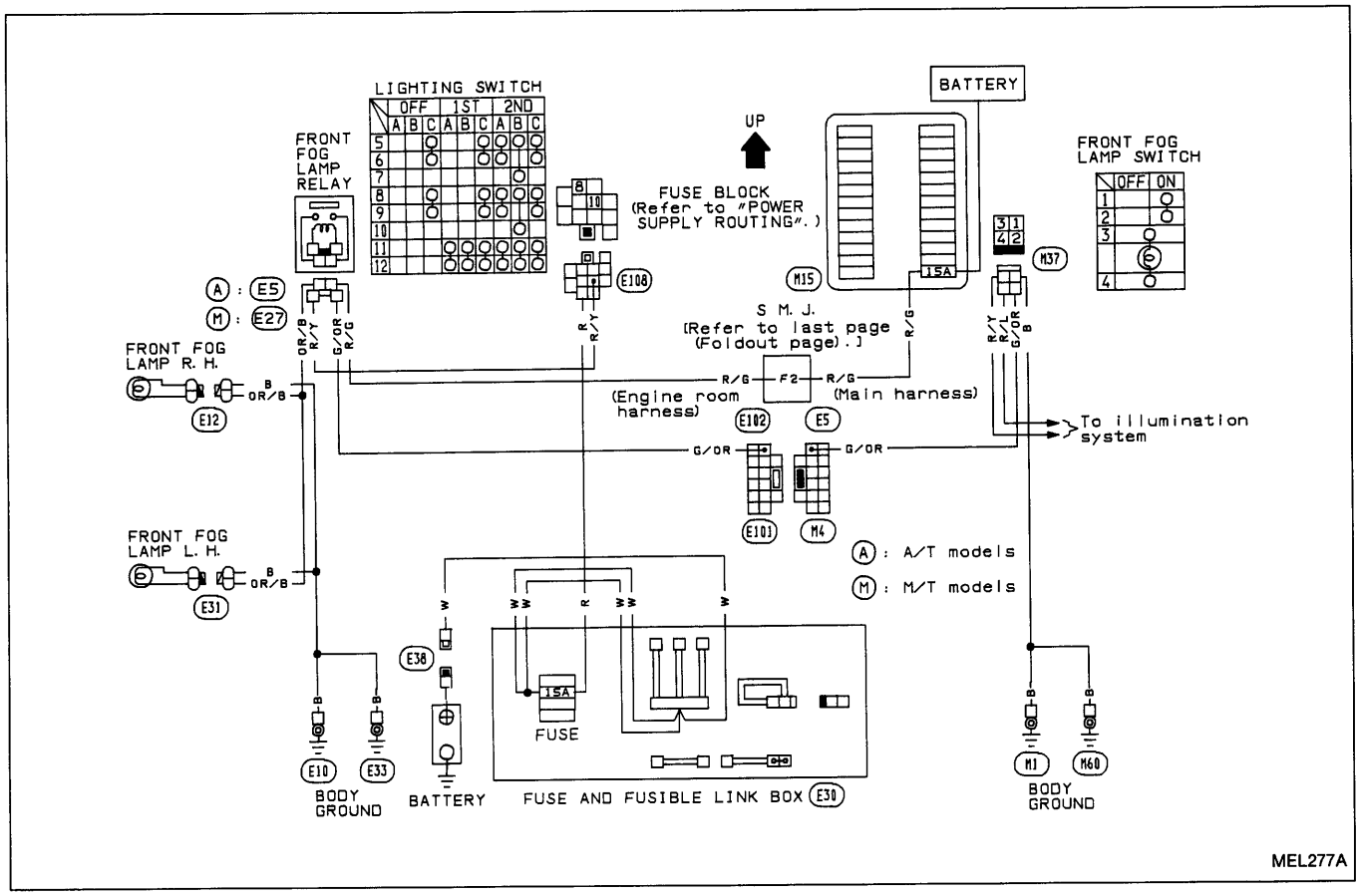


MEL275A

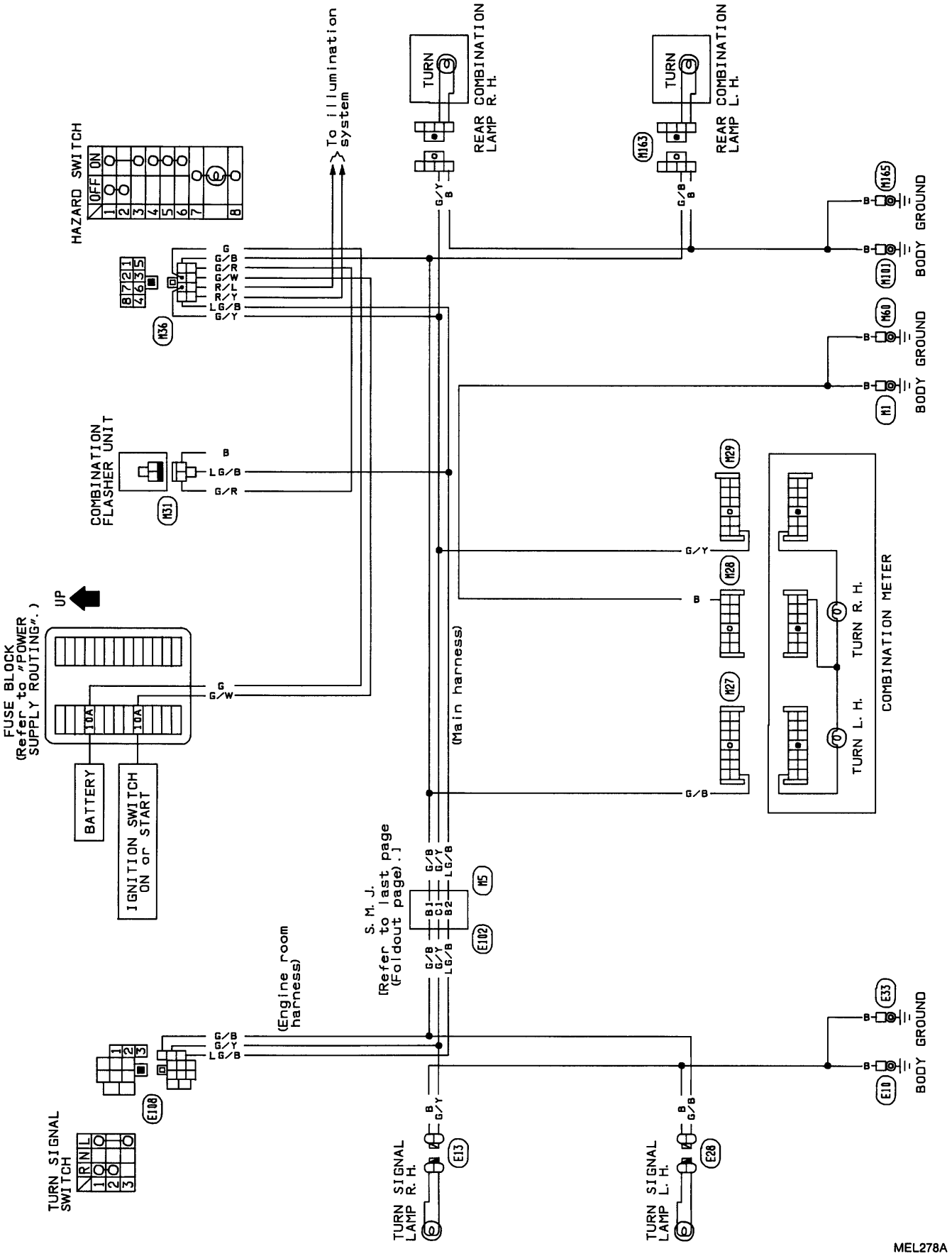
Back-up Lamp/Wiring Diagram

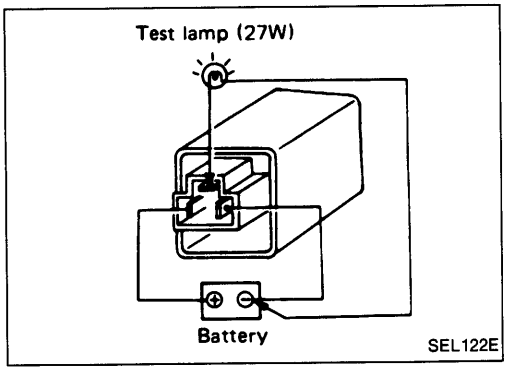


Front Fog Lamp/Wiring Diagram



Turn Signal and Hazard Warning Lamps/Wiring Diagram





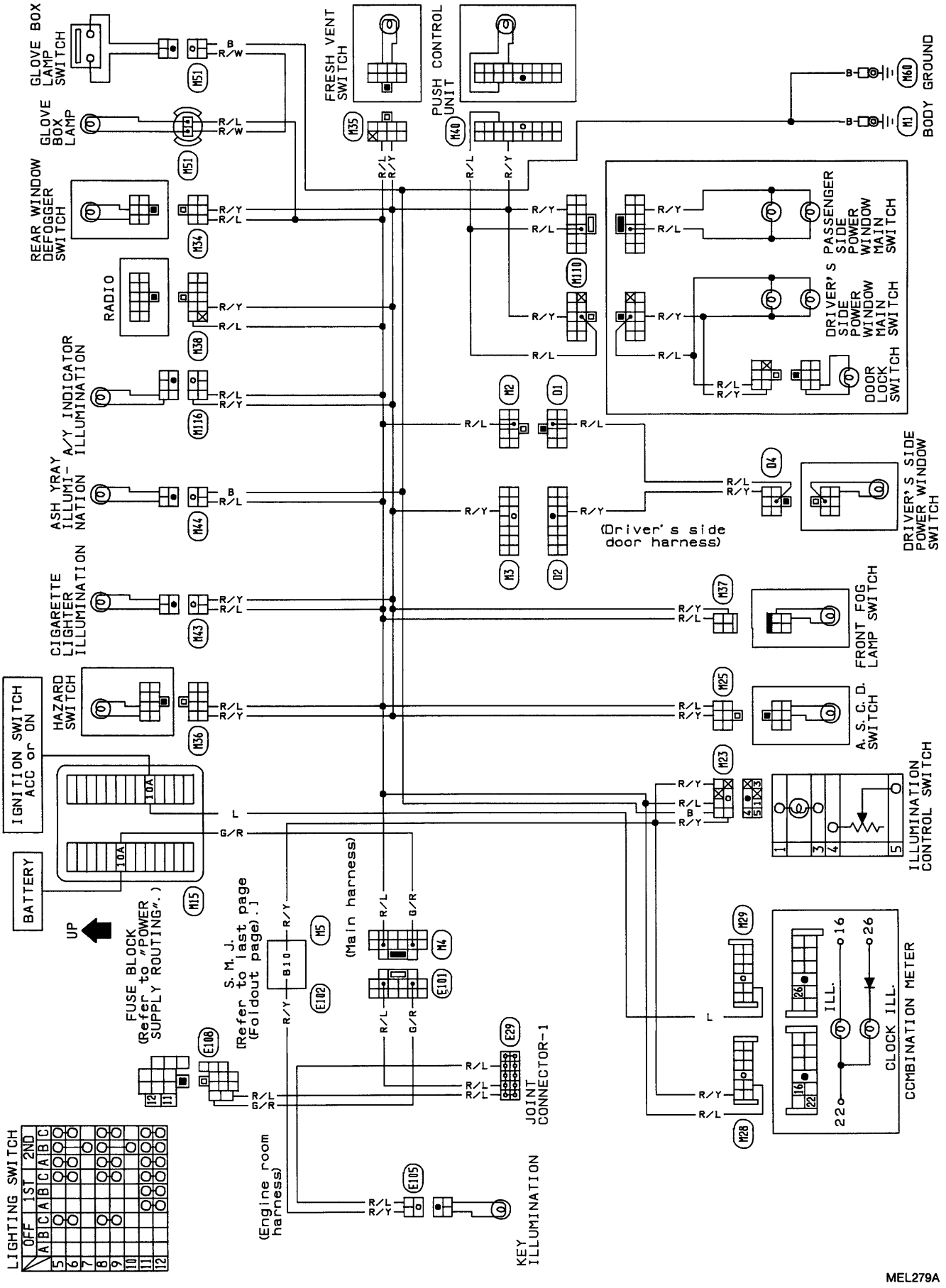
Combination Flasher Unit Check

- 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

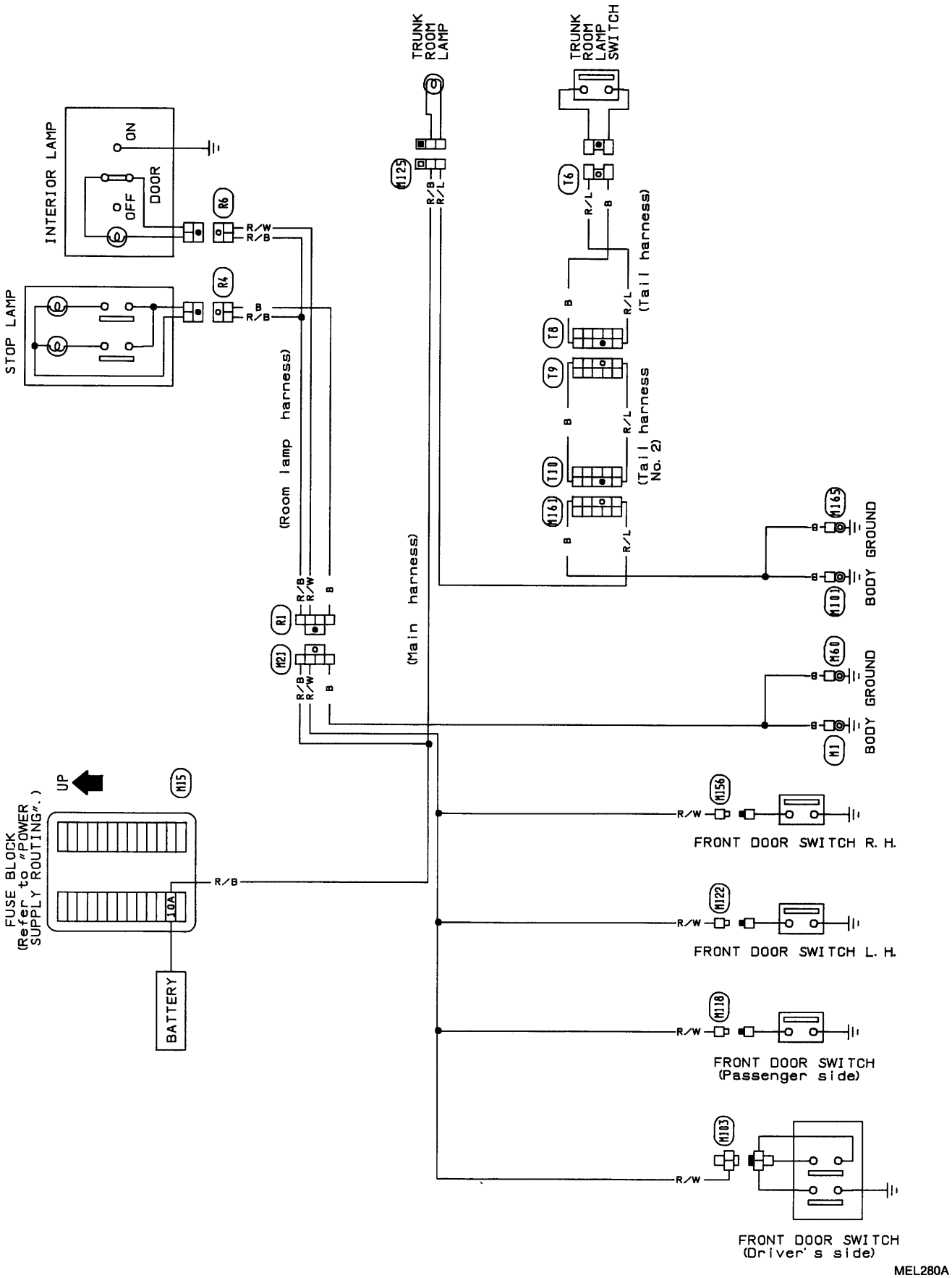
	Wattage (12 volt)
Headlamp (Semi-sealed beam)	
High/Low	65/45
Front turn signal lamp	27
Front clearance lamp	3.8
Front side marker lamp	3.8
Front fog lamp	55
Rear combination lamp	
Turn signal	27
Stop/Tail	27/8
Back-up	27
Rear side marker lamp	3.8
License plate lamp	5
High-mounted stop lamp	12
Interior lamp	10
Spot lamp	10
Trunk room lamp	3.4

Illumination/Wiring Diagram



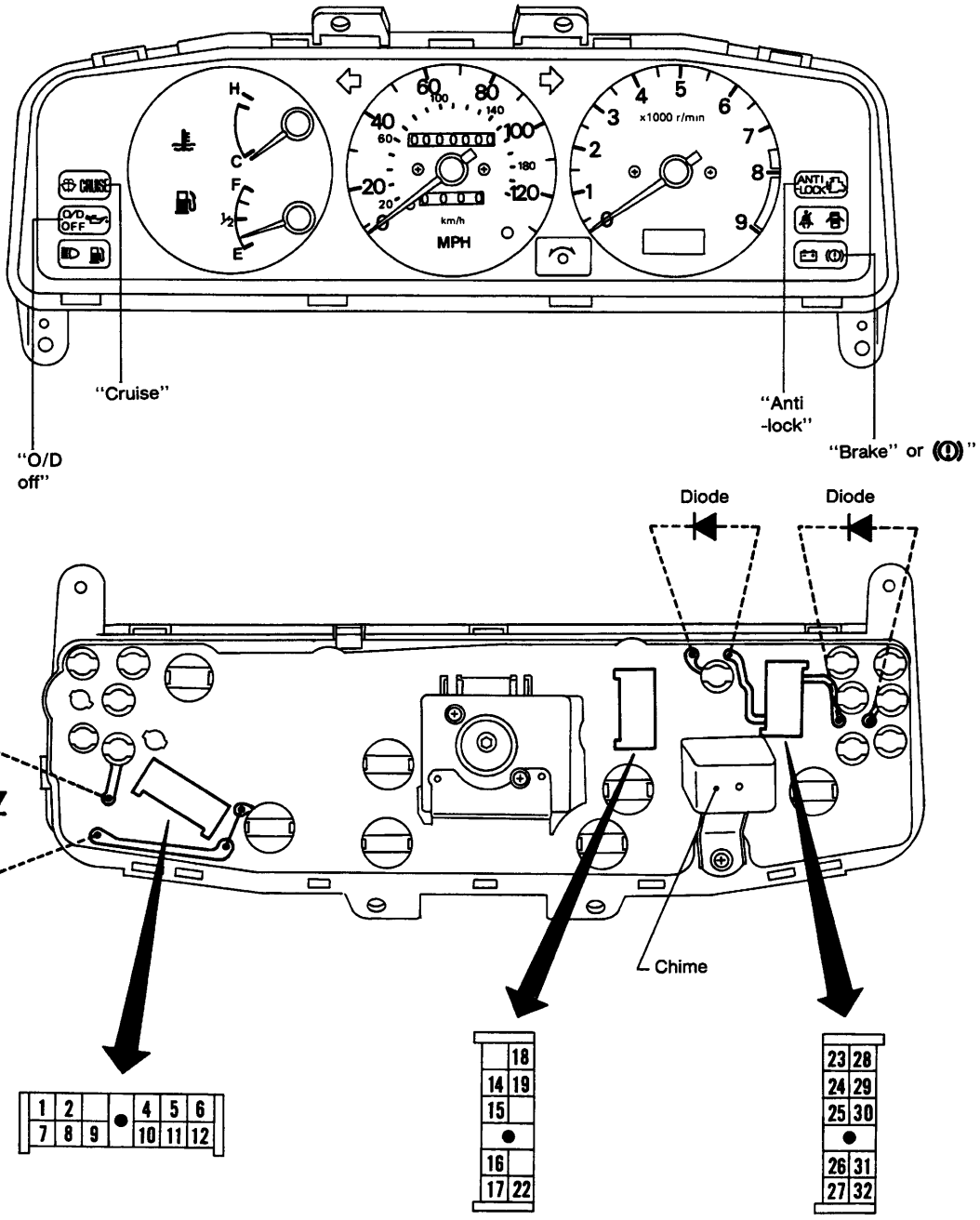
MEL279A

Interior, Spot and Trunk Room Lamps/Wiring Diagram



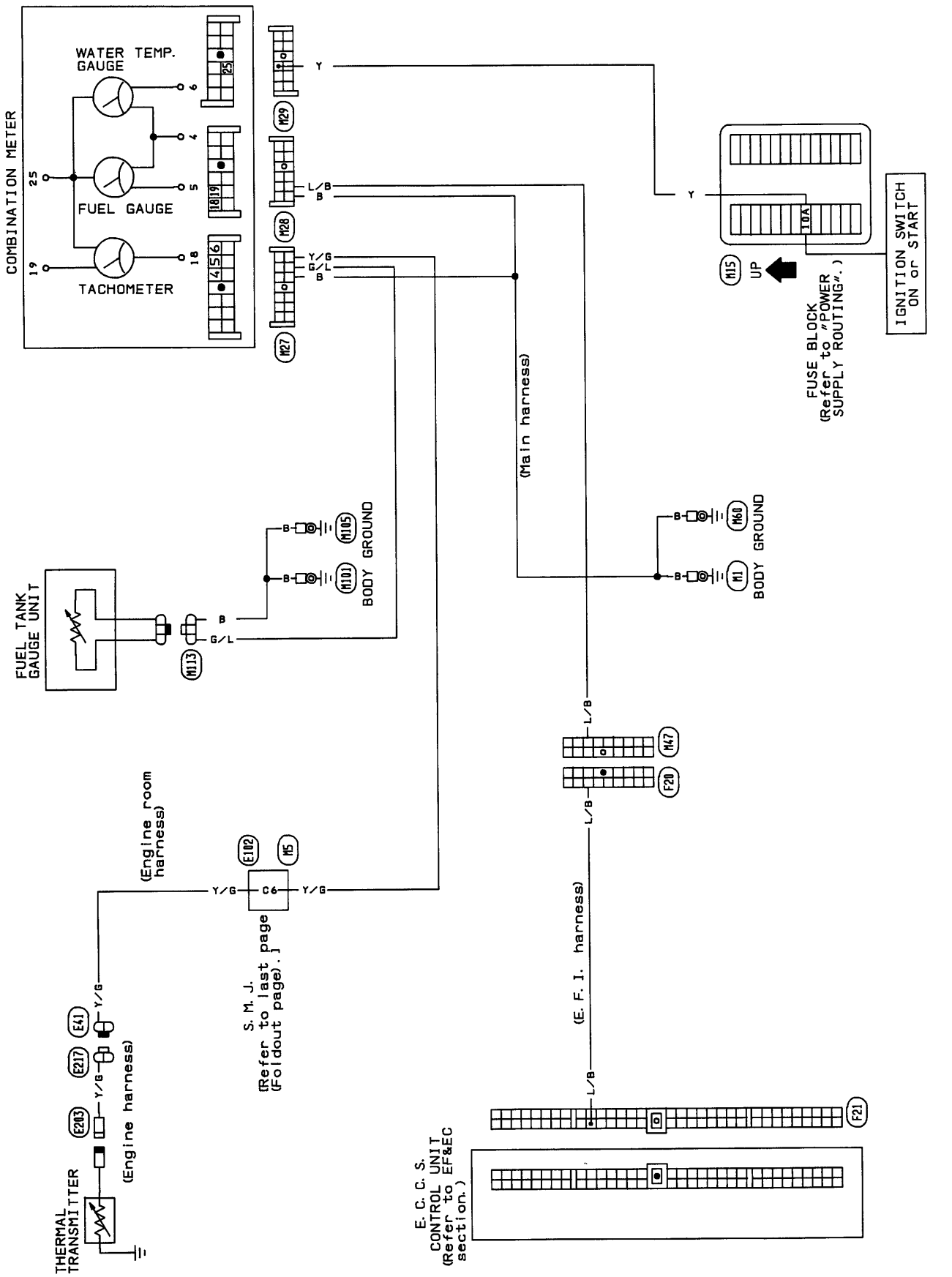
MEL280A

Combination Meter

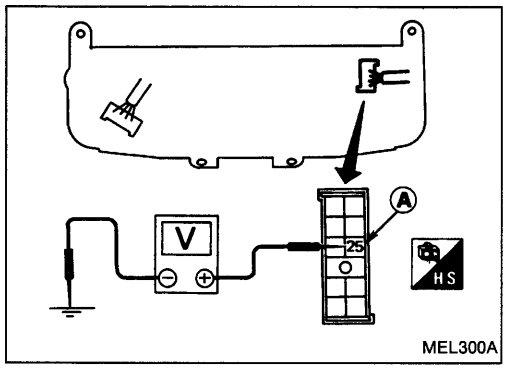


MEL281A

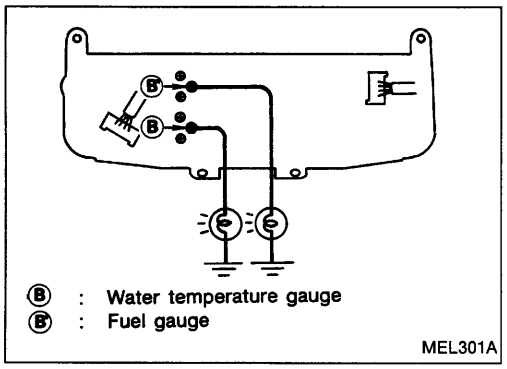
Tachometer, Temp., Oil and Fuel Gauges/Wiring Diagram



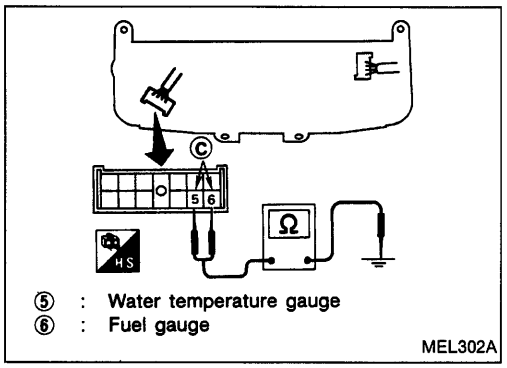
MEL282A



MEL300A



Ⓑ : Water temperature gauge
Ⓑ' : Fuel gauge
MEL301A



⑤ : Water temperature gauge
⑥ : Fuel gauge
MEL302A

Inspection/Fuel Gauge, Water Temperature Gauge and Oil Pressure Gauge

INSPECTION START

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-1
3) Fusible link and fuse
4) Ignition switch

O.K. ↓

CHECK GAUGE OPERATION.
1) Turn ignition switch "ON".
2) Connect terminals Ⓑ, Ⓑ' 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. ↓

Check harness continuity between component and combination meter Ⓒ.

N.G. → Repair or replace.

O.K. ↓

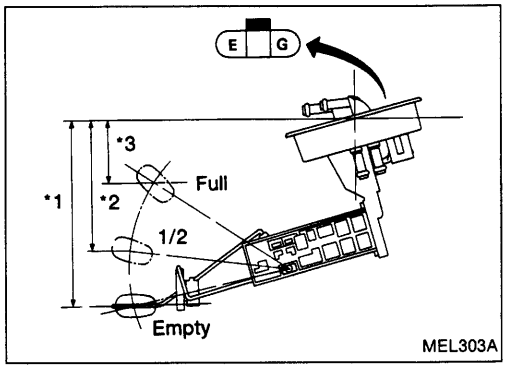
CHECK COMPONENT.
Check gauge units and harness.
Refer to "Fuel Tank Gauge Unit Check" and "Thermal Transmitter check".

N.G. → Repair or replace.
Refer to FE section. (Fuel tank gauge unit)

O.K. ↓

Reinstall any part removed.

INSPECTION END

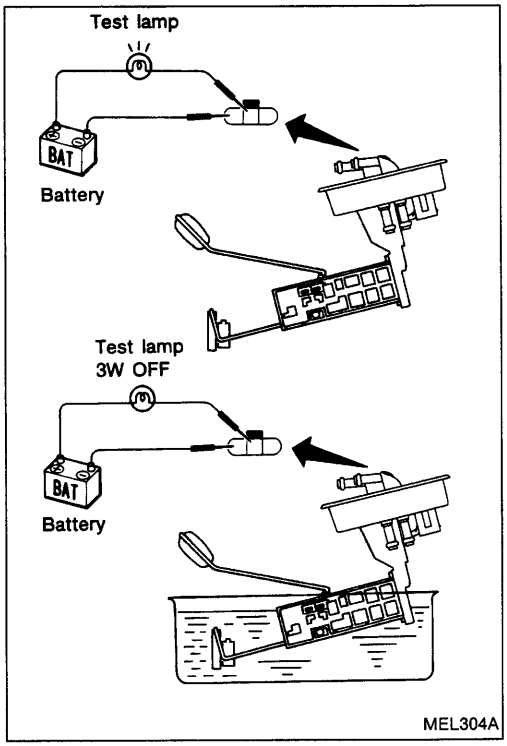


Fuel Tank Gauge Unit Check

- For removal, refer to FE section.

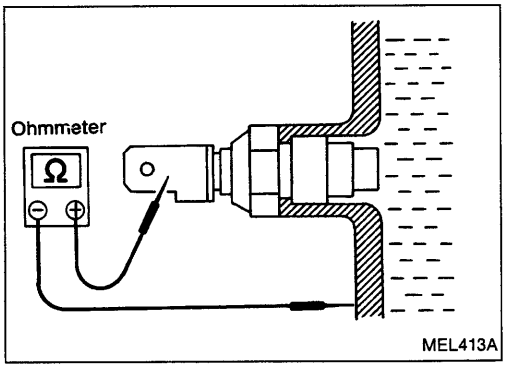
Check the resistance between terminals (G) and (E).

Ohmmeter		Float position mm (in)			Resistance value (Ω)
(+)	(–)				
G	E	*3	Full	49 (1.93)	Approx. 4 - 6
		*2	1/2	106 (4.17)	27 - 34
		*1	Empty	161 (6.34)	73 - 85



Fuel Warning Lamp Sensor Check

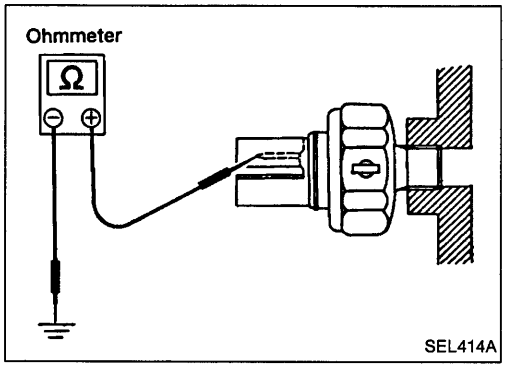
- It will take a short time for the bulb to light.



Thermal Transmitter Check

Check the resistance between the terminals of thermal transmitter and body ground.

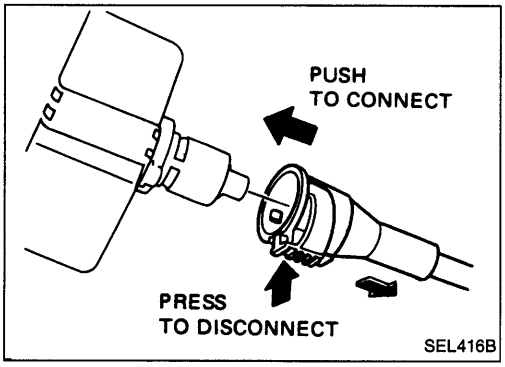
Water temperature	Resistance
65°C (149°F)	Approx. 60 - 75Ω
91°C (196°F)	Approx. 21 - 24Ω



Oil Pressure Switch Check

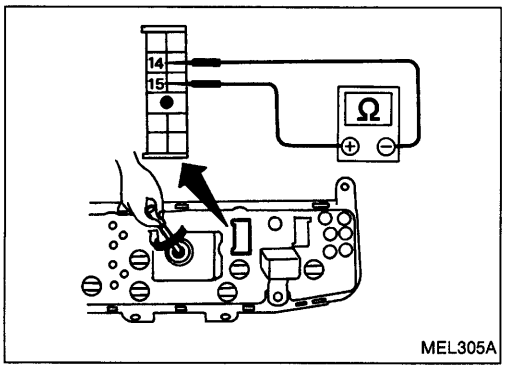
Check the continuity between the terminals of oil pressure switch and body ground.

	Oil pressure kPa (kg/cm^2, psi)	Continuity
Engine start	More than 10 - 20 (0.1 - 0.2, 1.4 - 2.8)	NO
Engine stop	Less than 10 - 20 (0.1 - 0.2, 1.4 - 2.8)	YES



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.



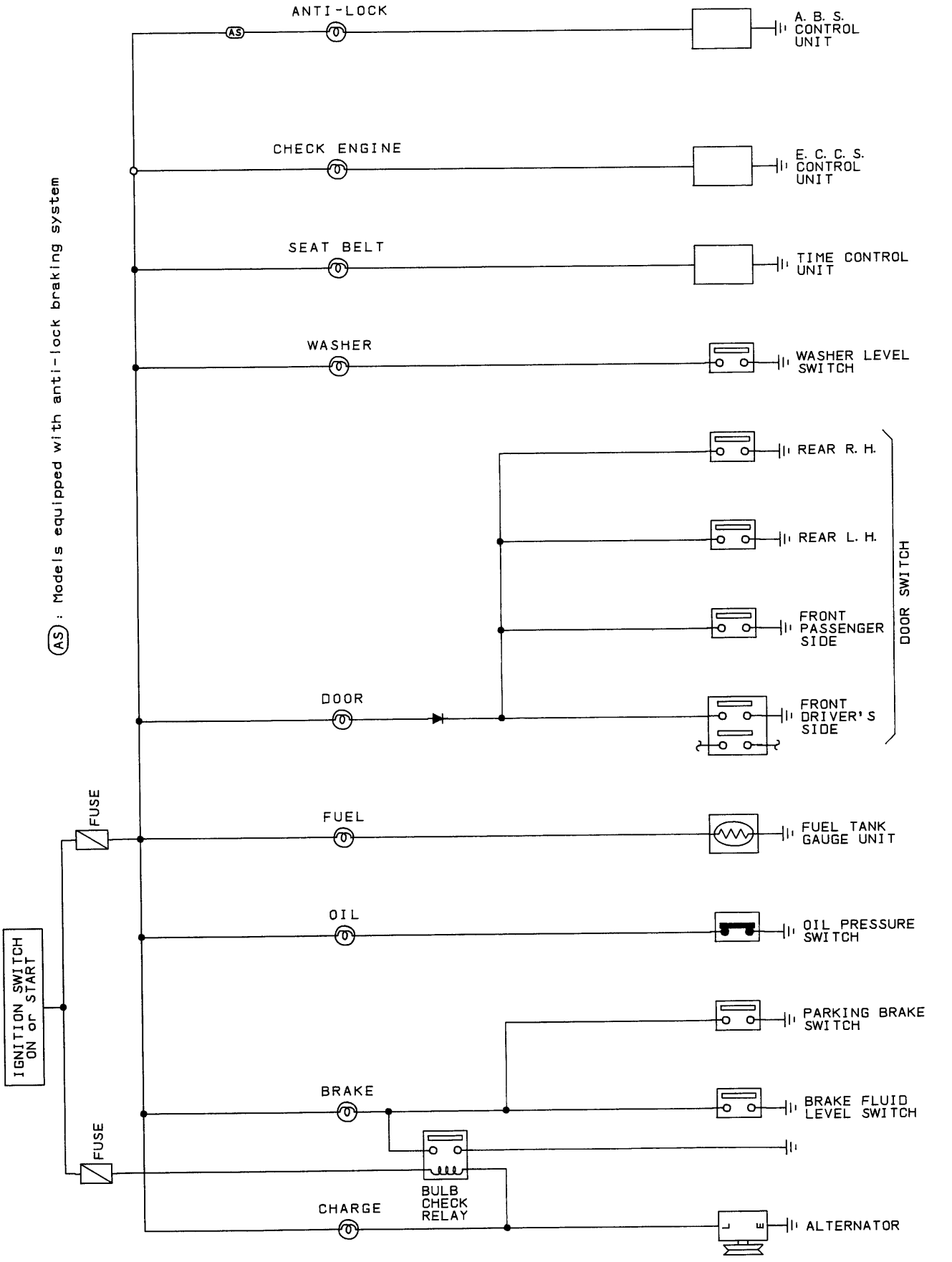
Speed Sensor Signal Check

- A speed sensor is built into the speedometer.

1. Turn speedometer slowly using a small screwdriver.
2. Check continuity of speed sensor circuit.

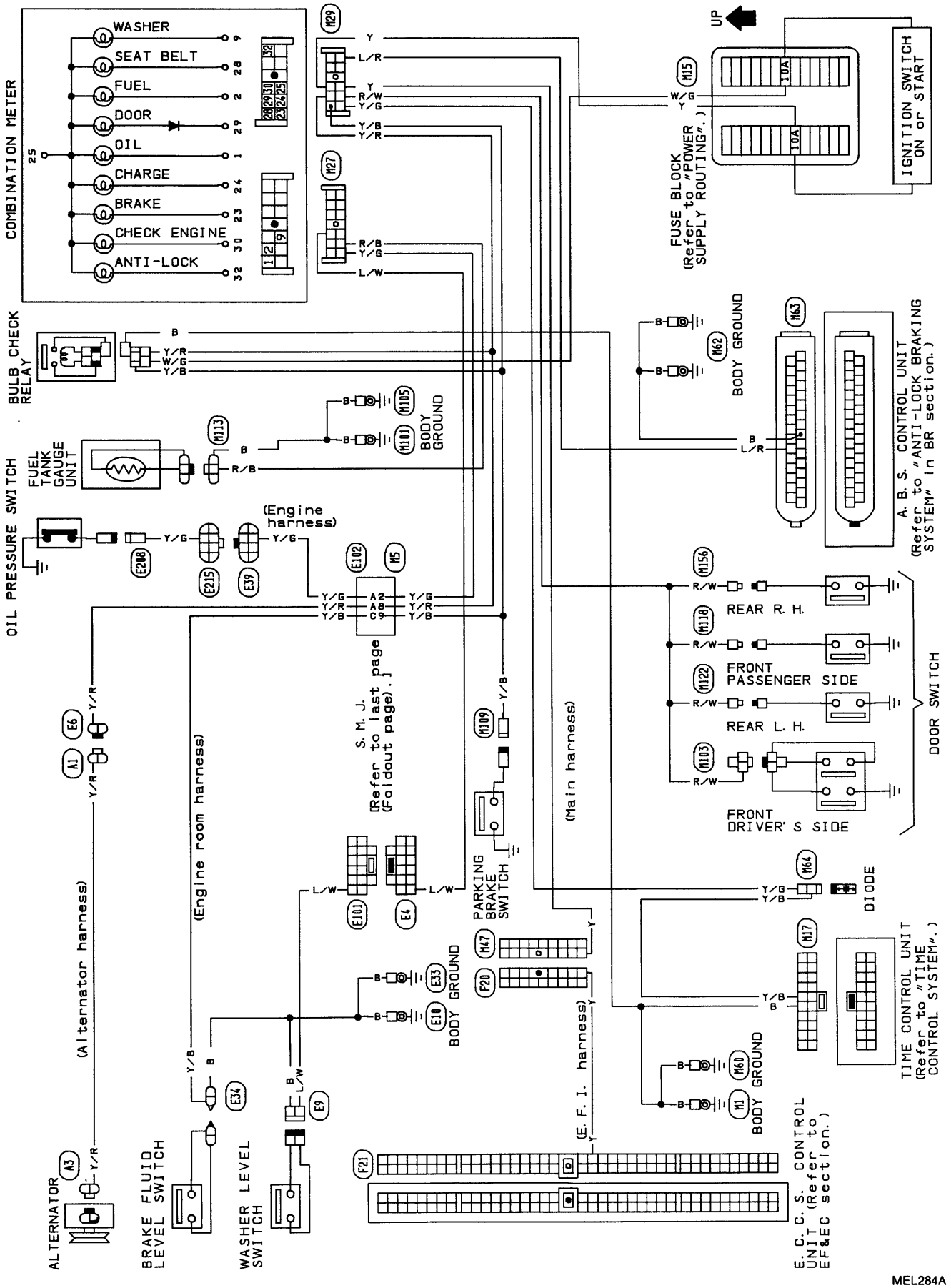
Continuity exists two times for each turn ... O.K.

Warning Lamps/Schematic



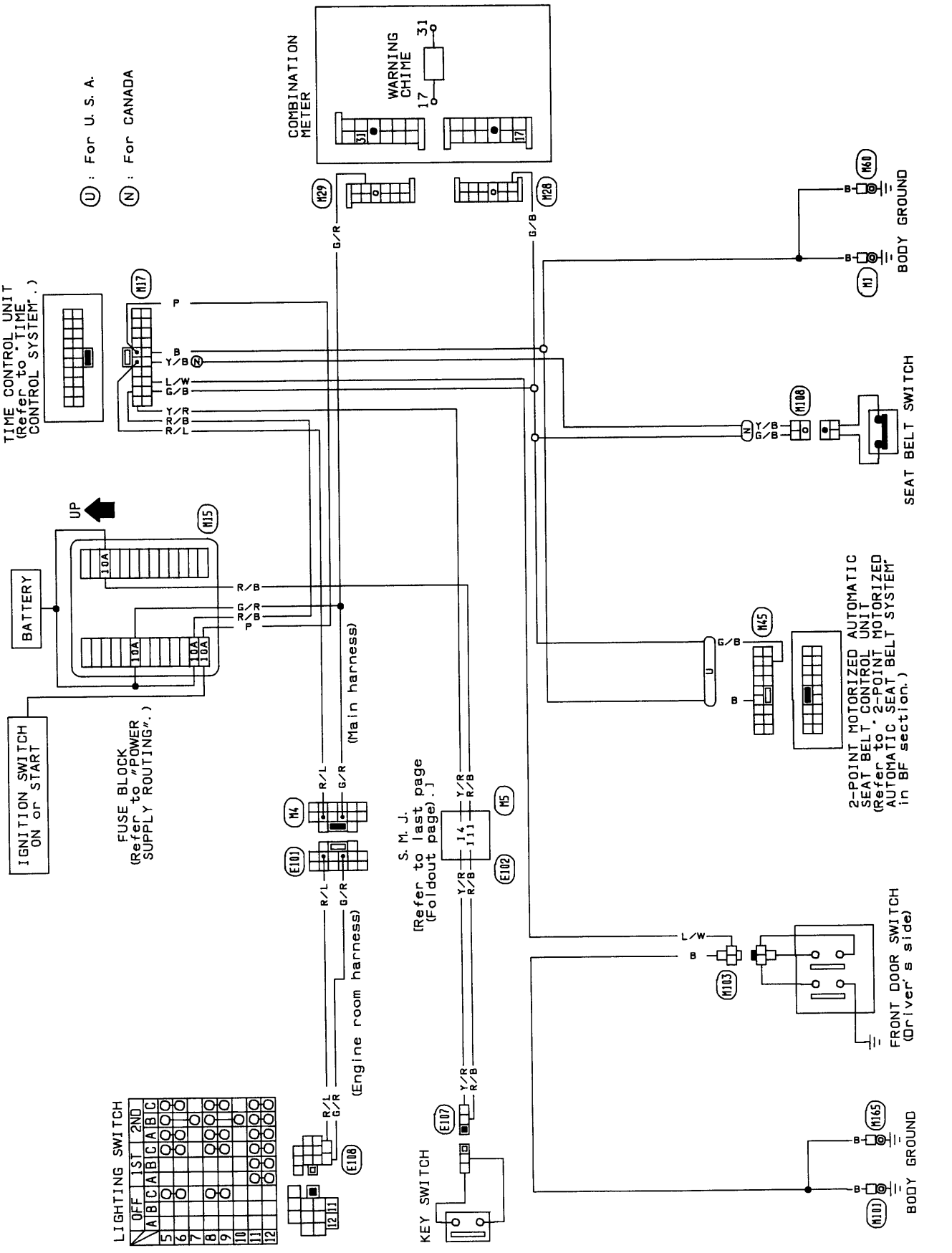
MEL283A

Warning Lamps/Wiring Diagram

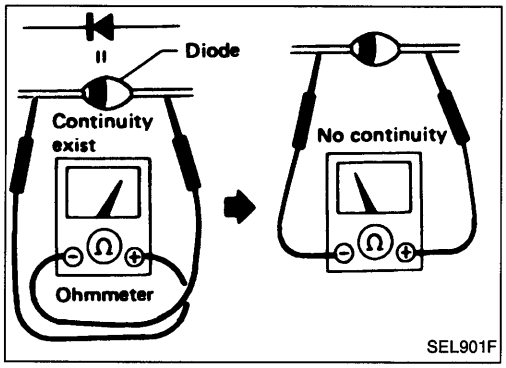


MEL284A

Warning Chime/Wiring Diagram

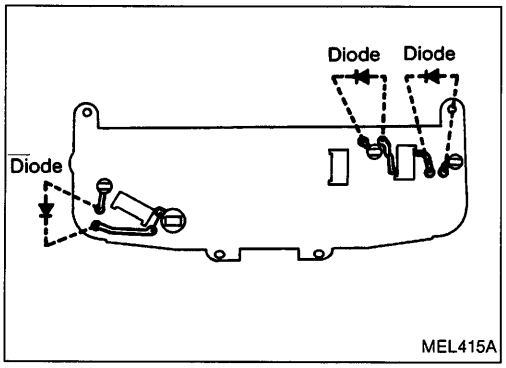


MEL285A

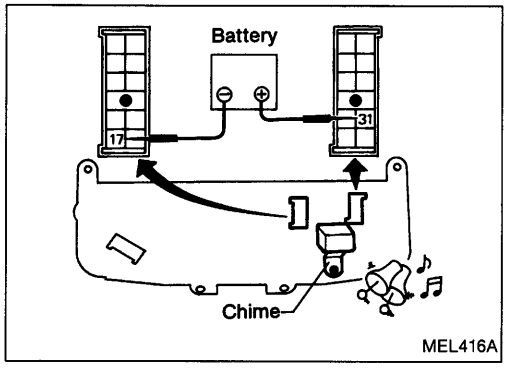


Diode Check

- 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.



Warning Chime Check

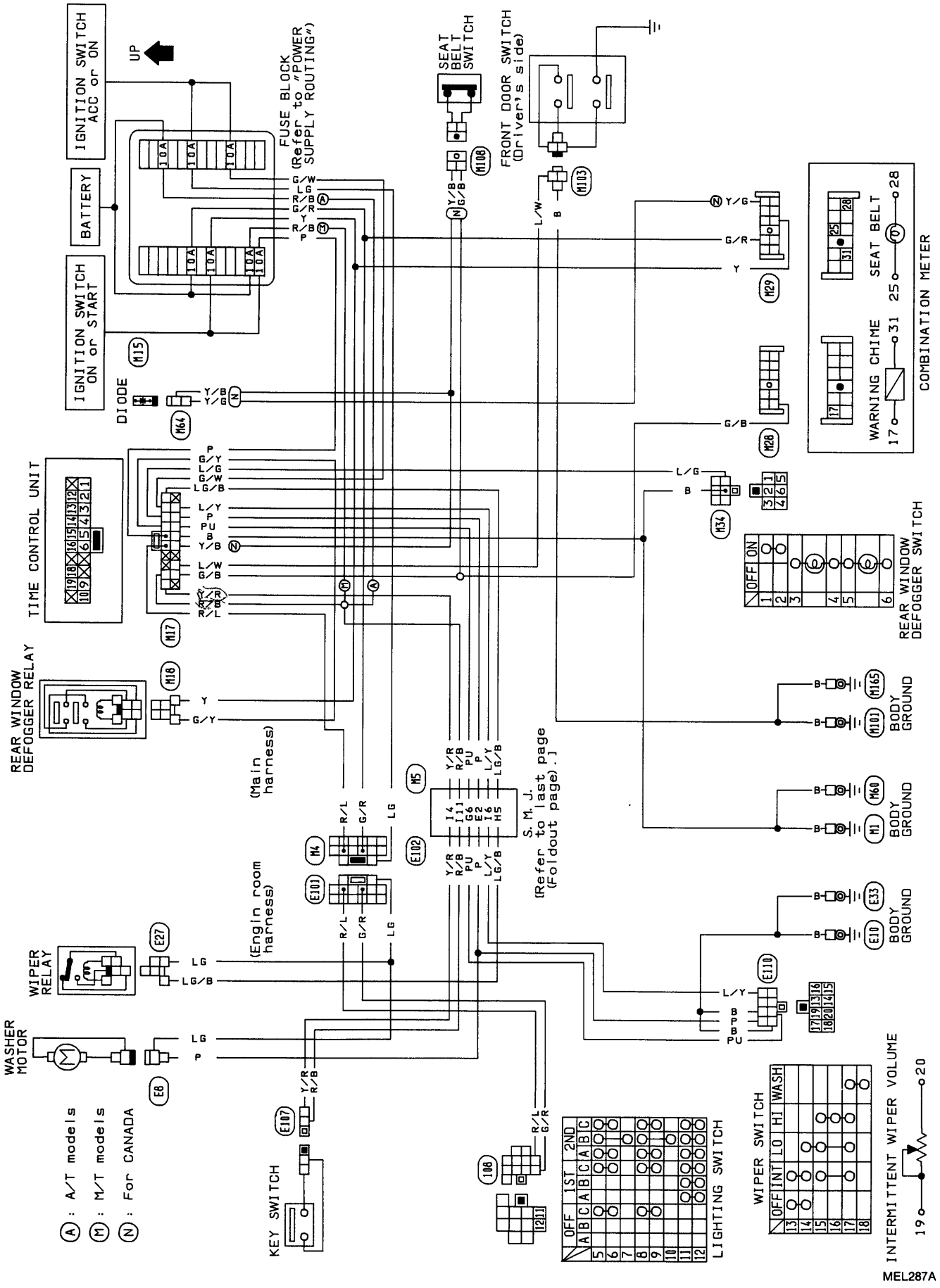
Description

FUNCTION

- Time control unit has the following functions.

Item		Details of control
1, 2	Intermittent wiper control	Regulates intermittent time from approximately 3 to 23 seconds depending on the intermittent wiper volume setting.
3	Washer and wiper combination control	Wiper is operated in conjunction with washer switch.
4	Light warning chime timer	When driver's door is opened with light switch ON and ignition switch OFF, warning chime sounds.
5	Ignition key warning chime timer	When driver's door is opened with ignition switch OFF, warning chime sounds.
6	Seat belt warning chime timer	Sounds warning chime for about 7 seconds if ignition switch is turned "ON" when seat belt switch is "ON" (seat belt is unfastened).
7	Seat belt warning lamp timer	Seat belt warning lamp blinks for about 7 seconds when ignition switch is turned to "ON".
8	Rear defogger timer	Rear defogger operates for about 15 minutes when defogger switch is ON.

Wiring Diagram



Trouble Diagnoses

SYMPTOM CHART

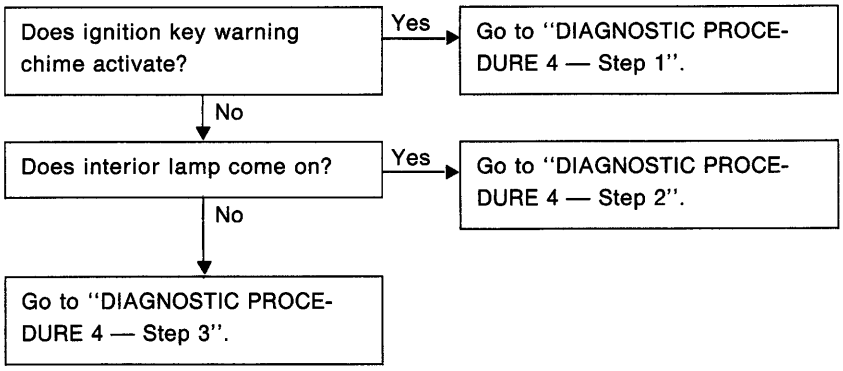
PROCEDURE		Preliminary Check			Main Power Supply and Ground Circuit Check	Diagnostic Procedure							
REFERENCE PAGE		EL-62			EL-63	EL-65	EL-66	EL-66	EL-67	EL-68	EL-69	EL-70	EL-70
SYMPTOM		Procedure 1	Procedure 2	Procedure 3	Main power supply and Ground circuit	Diagnostic Procedure 1	Diagnostic Procedure 2	Diagnostic Procedure 3	Diagnostic Procedure 4	Diagnostic Procedure 5	Diagnostic Procedure 6	Diagnostic Procedure 7	Diagnostic Procedure 8
Wiper & washer	Intermittent wiper does not operate.				○	○							
	Intermittent time of wiper cannot be adjusted.						○						
	Wiper and washer activate individually but not in combination.							○					
Warning	Light warning chime does not activate.	○			○				○				
	Ignition key warning chime does not activate.		○		○					○			
	Seat belt warning chime does not activate.			○	○						○		
	Seat belt warning lamp does not come on, or does not go off after coming on.				○							○	
Rear defogger	Rear defogger does not activate, or go off after activating.				○								○

Trouble Diagnoses (Cont'd)

PRELIMINARY CHECK

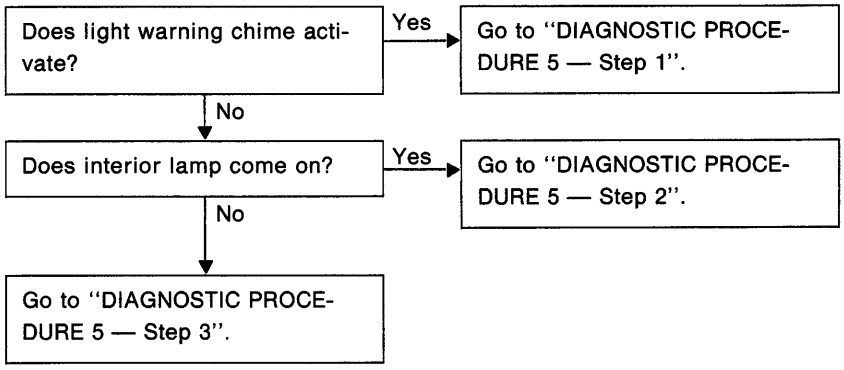
Preliminary check 1

- **Light warning chime does not activate.**



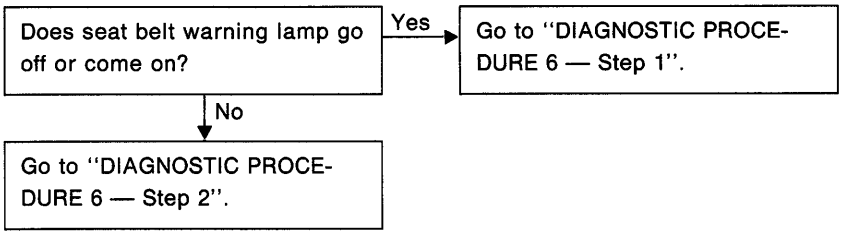
Preliminary check 2

- **Ignition key warning chime does not activate.**



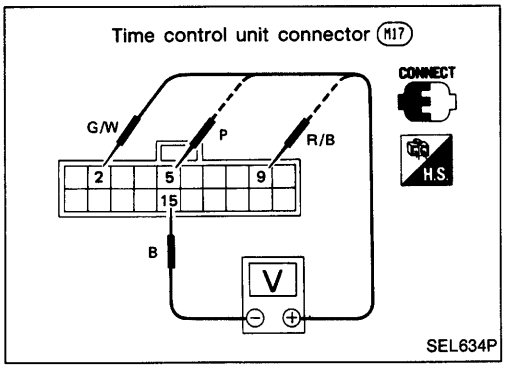
Preliminary check 3

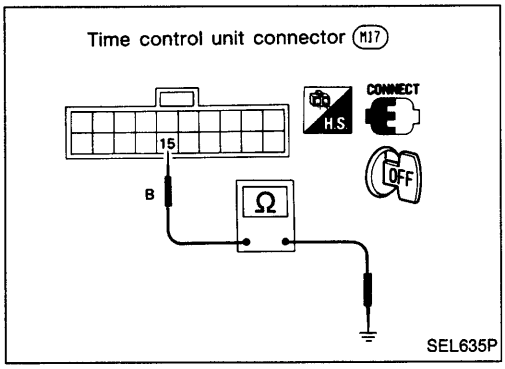
- **Seat belt warning chime does not activate.**



Trouble Diagnoses (Cont'd)

MAIN POWER SUPPLY AND GROUND CIRCUIT CHECK





Main power supply

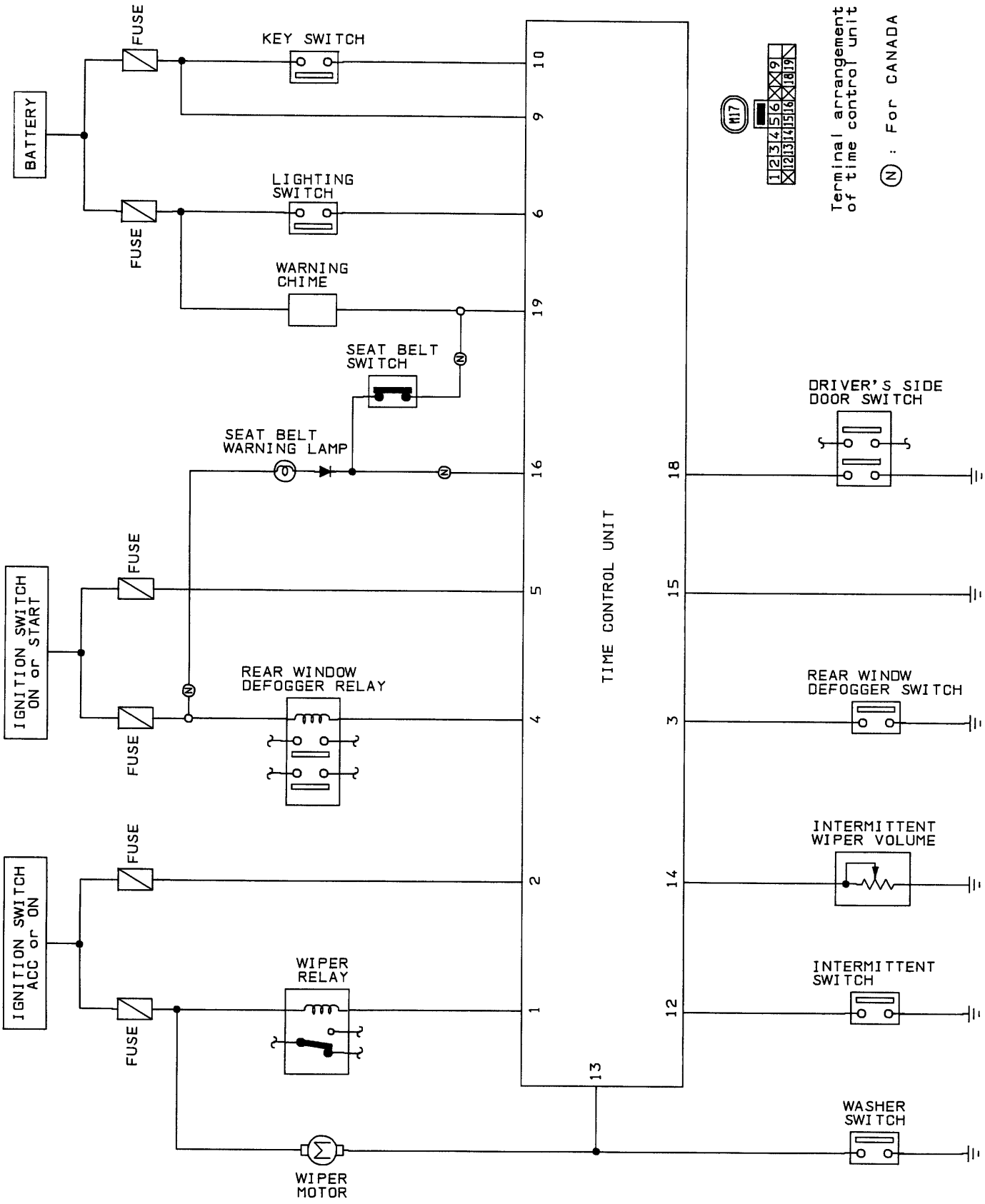
Terminals	Battery voltage existence condition		
	Ignition switch position		
	OFF	ACC	ON
⑨ - ⑮	Yes	Yes	Yes
⑤ - ⑮	No	No	Yes
② - ⑮	No	Yes	Yes

Ground circuit

Terminals	Continuity
⑮ - Ground	Yes

Trouble Diagnoses (Cont'd)

CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK



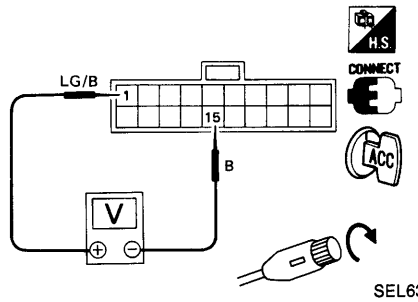
MEL286A

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1

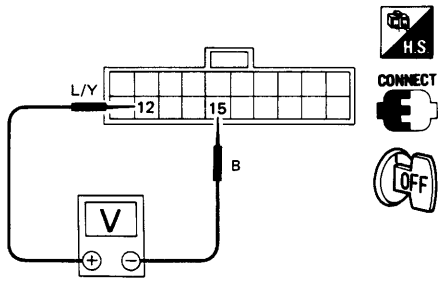
SYMPTOM: Intermittent wiper does not operate.

A Time control unit connector (M17)



SEL636P

B Time control unit connector (M17)



SEL637P

A

WIPER RELAY OUTPUT SIGNAL CHECK

1) Turn ignition switch to "ACC".
2) Turn wiper switch to "INT" or "OFF".
3) Measure voltage between control unit harness terminals ① and ⑮.

Condition of wiper switch	Voltage [V]
OFF	Approx. 12
INT	Pointer swings from 0 to 12 every 3 to 23 seconds

O.K. → Check wiper relay. Refer to "WIPER AND WASHER".

- O.K. → Check wiper relay circuit.
- N.G. → Replace wiper relay.

N.G. ↓

B

INTERMITTENT SWITCH INPUT SIGNAL CHECK

Measure voltage between control unit harness terminals ⑫ and ⑮.

Condition of wiper switch	Voltage [V]
OFF	Approx. 12
INT	0

N.G. → Check wiper switch. Check harness continuity between T.C.U. and wiper switch.

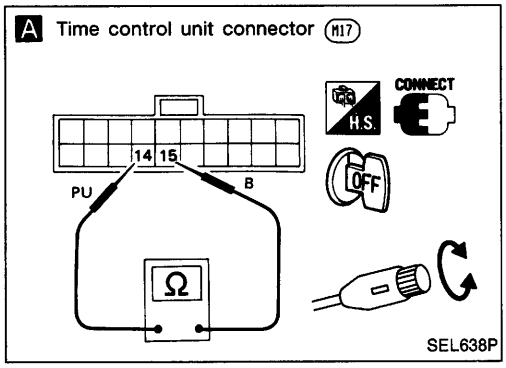
O.K. ↓

Replace control unit.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 2

SYMPTOM: Intermittent time of wiper cannot be adjusted.



A

INTERMITTENT WIPER VOLUME INPUT SIGNAL CHECK
Measure resistance between control unit harness terminals ⑭ and ⑮ while turning intermittent wiper volume.

Position of wiper knob	Resistance [Ω]
S	0
L	Approx. 1 k

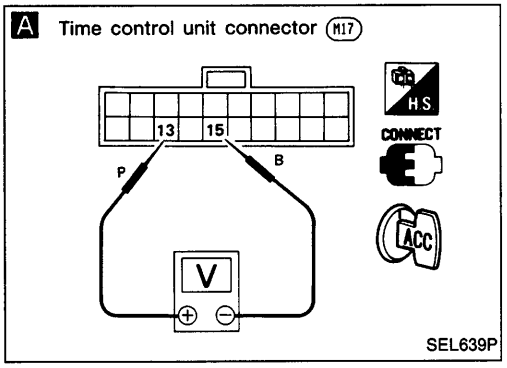
O.K. → Replace control unit.

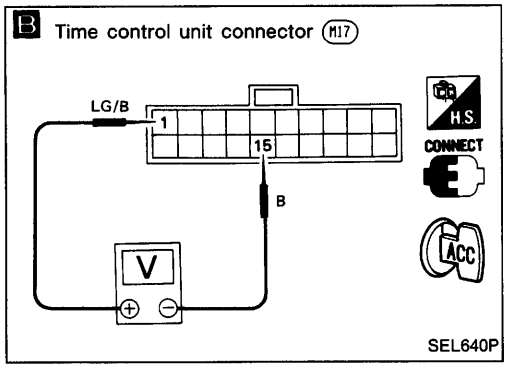
N.G. ↓

Check intermittent wiper volume.
Check harness continuity between T.C.U. and wiper switch.

DIAGNOSTIC PROCEDURE 3

SYMPTOM: Wiper and washer activate individually but not in combination.





A

WASHER SWITCH INPUT SIGNAL CHECK
1) Turn ignition switch to "ACC".
2) Measure voltage between control unit harness terminals ⑬ and ⑮.

Condition of washer switch	Voltage [V]
OFF	Approx. 12
ON	0

N.G. → Check harness continuity between T.C.U. and washer switch.

O.K. ↓

B

WIPER RELAY OUTPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ① and ⑮ after operating washer switch.
0V for approx. 3 seconds after washer has operated.

N.G. → Replace control unit.

O.K. ↓

Replace wiper relay.

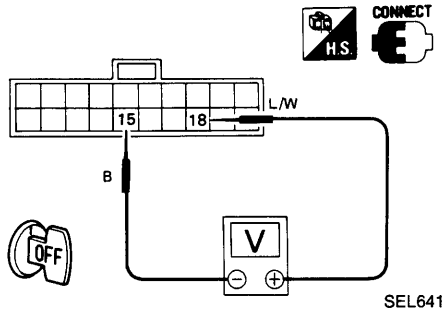
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4

SYMPTOM: Light warning chime does not activate.

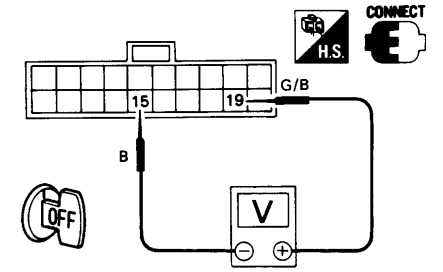
- Perform "PRELIMINARY CHECK — Procedure 1" before referring to the following flow chart.

A Time control unit connector (M17)



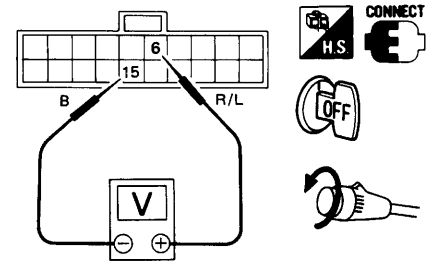
SEL641P

B Time control unit connector (M17)



SEL643P

C Time control unit connector (M17)



SEL642P

A Step 3

DOOR SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑱ and ⑮.

Condition of driver's door	Voltage [V]
Door is closed	Approx. 12
Door is open	0

N.G. → Check door switch.
Check harness continuity between T.C.U. and door switch.

O.K. ↓

B Step 2

CHIME OUTPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑲ and ⑮.

Condition of driver's door	Voltage [V]
Door is closed	Approx. 12
Door is open	Pointer deflects intermittently

O.K. → Check chime.
Check harness continuity between T.C.U. and chime.

N.G. ↓

C Step 1

LIGHT SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑥ and ⑮.

Condition	Voltage [V]
Light switch is ON	Approx. 12
Light switch is OFF	0

N.G. → Check light switch.
Check harness continuity between T.C.U. and light switch.

O.K. ↓

Replace control unit.

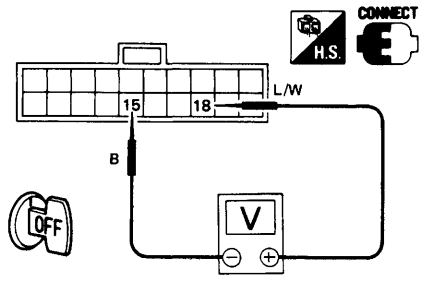
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 5

SYMPTOM: Ignition key warning chime does not activate.

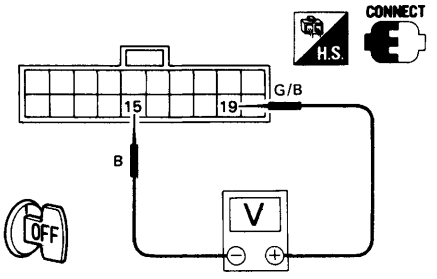
- Perform "PRELIMINARY CHECK — Procedure 2" before referring to the following flow chart.

A Time control unit connector (M17)



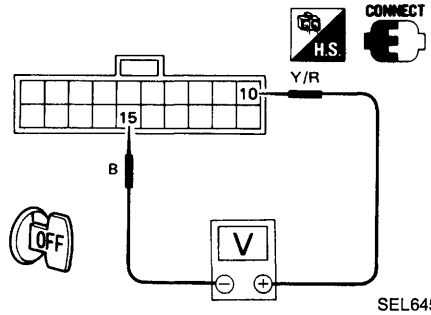
SEL644P

B Time control unit connector (M17)



SEL646P

C Time control unit connector (M17)



SEL645P

A — Step 3

DOOR SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑱ and ⑮.

Condition of driver's door	Voltage [V]
Door is closed	Approx. 12
Door is open	0

N.G. → Check door switch. Check harness continuity between T.C.U. and door switch.

O.K. ↓

B — Step 2

CHIME OUTPUT SIGNAL CHECK
Measure voltage between control unit harness between ⑲ and ⑮.

Condition of driver's door	Voltage [V]
Door is closed	Approx. 12
Door is open	Pointer deflects intermittently

O.K. → Check chime. Check harness continuity between T.C.U. and chime.

N.G. ↓

C — Step 1

IGNITION KEY SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑩ and ⑮.

Condition	Voltage [V]
Key is inserted	Approx. 12
Key is pulled	0

N.G. → Check ignition key switch. Check harness continuity between T.C.U. and ignition key switch.

O.K. ↓

Replace control unit.

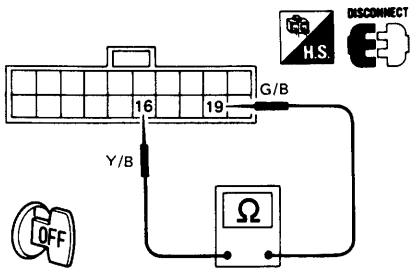
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 6

SYMPTOM: Seat belt warning chime does not activate.

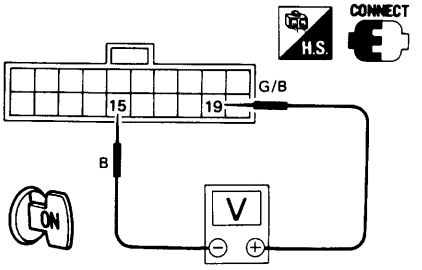
- Perform "PRELIMINARY CHECK — Procedure 3" before referring to the following flow chart.

A Time control unit connector (M17)



SEL647P

B Time control unit connector (M17)



SEL648P

A Step 2

SEAT BELT SWITCH INPUT SIGNAL CHECK

Check continuity between control unit harness terminals ⑯ and ⑲.

Condition	Continuity
Unfastened	Yes
Fastened	No

N.G. → Check seat belt switch. Check harness continuity between T.C.U. and seat belt switch.

O.K. ↓

B Step 1

CHIME OUTPUT SIGNAL CHECK

1) Connect T.C.U. harness connector.
2) Turn ignition switch "ON".
3) Measure voltage between control unit harness terminals ⑲ and ⑮.

Condition of seat belt	Voltage [V]
Unfastened	Pointer deflects intermittently
Fastened	Approx. 12

O.K. → Check chime. Check harness continuity between T.C.U. and chime.

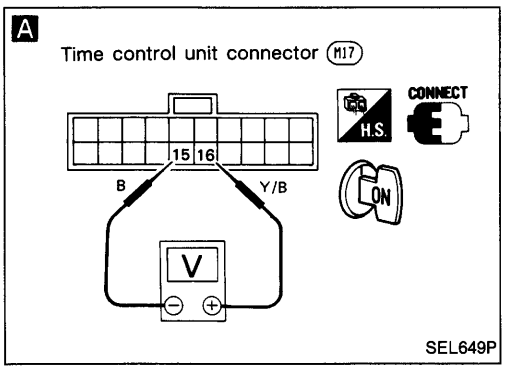
N.G. ↓

Replace control unit.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 7

SYMPTOM: Seat belt warning lamp does not come on, or does not go off after coming on.



A

WARNING LAMP OUTPUT SIGNAL CHECK
1) Connect T.C.U. harness connector.
2) Turn ignition switch "ON", after connecting control unit harness terminals ⑯ and ⑮.
3) Does voltmeter needle keep swinging for about 7 seconds after ignition switch has been turned "ON"?

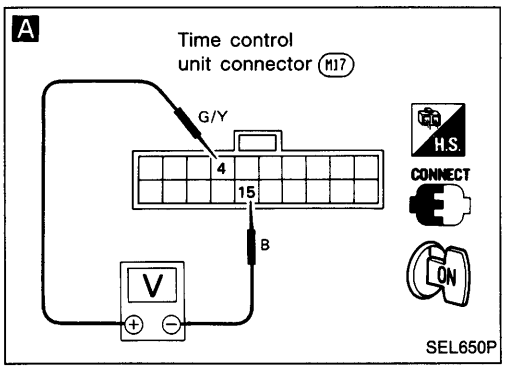
Yes → Check warning lamp.
Check harness continuity between T.C.U. and warning lamp.

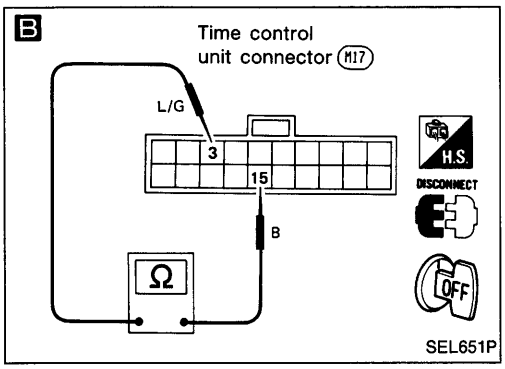
No ↓

Replace control unit.

DIAGNOSTIC PROCEDURE 8

SYMPTOM: Rear defogger does not activate, or does not go off after activating.





A

REAR WINDOW DEFOGGER OUTPUT SIGNAL CHECK
Measure voltage between control unit harness ④ and ⑮.

Condition of defogger switch	Voltage [V]
Defogger switch is "OFF"	Approx. 12
Defogger switch is "ON"	0

O.K. → Check rear window defogger relay.
Check rear window defogger circuit.

N.G. ↓

B

REAR WINDOW DEFOGGER SWITCH INPUT SIGNAL CHECK
1) Disconnect T.C.U. harness connector.
2) Check continuity between control unit harness terminals ③ and ⑮.

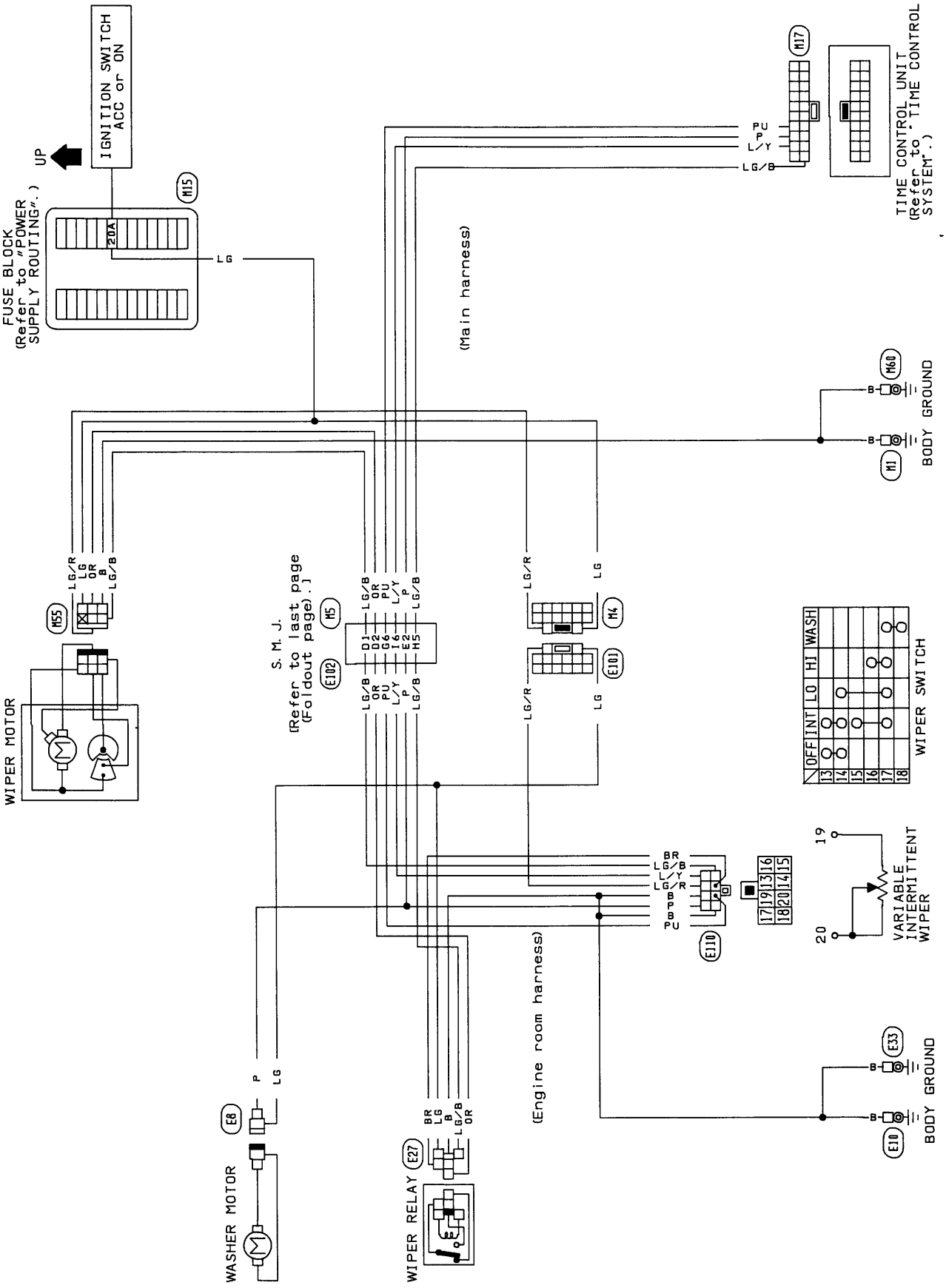
Condition of defogger switch	Continuity
Defogger switch is "OFF"	No
Defogger switch is "ON"	Yes

N.G. → Check rear window defogger switch.
Check harness continuity between T.C.U. and rear window defogger switch.

O.K. ↓

Replace control unit.

Front Wiper and Washer/Wiring Diagram



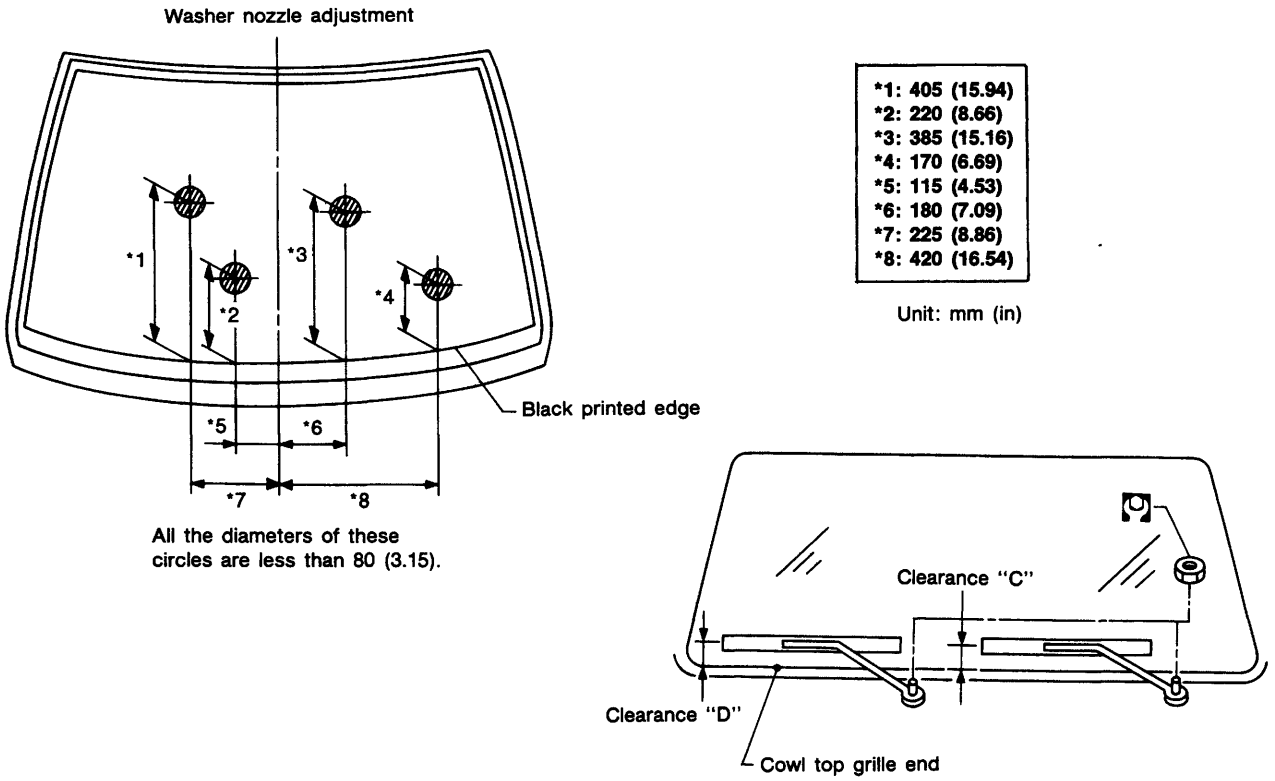
MEL288A

Installation

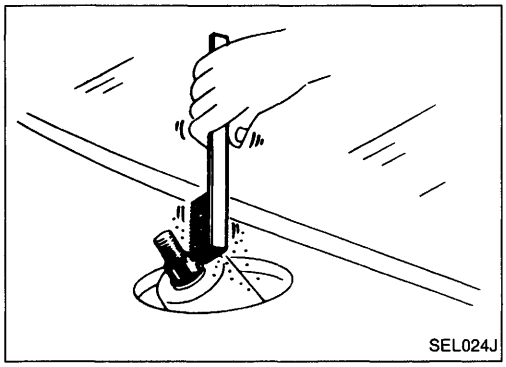
1. Prior to wiper arm installation, turn on wiper switch to operate wiper motor and then turn it "OFF" (Auto Stop).
2. Lift the blade up and then set it down onto glass surface to set the blade center to clearance "C" or "D" immediately before tightening nut.
3. Eject washer fluid. Turn on wiper switch to operate wiper motor and then turn it "OFF".
4. Ensure that wiper blades stop within clearance "C" or "D".
   Clearance "C": 18 - 34 mm (0.71 - 1.34 in)
   Clearance "D": 19 - 35 mm (0.75 - 1.38 in)

- Tighten windshield wiper arm nuts to specified torque.
  Front wiper:
  17 - 23 N·m (1.7 - 2.3 kg-m, 12 - 17 ft-lb)

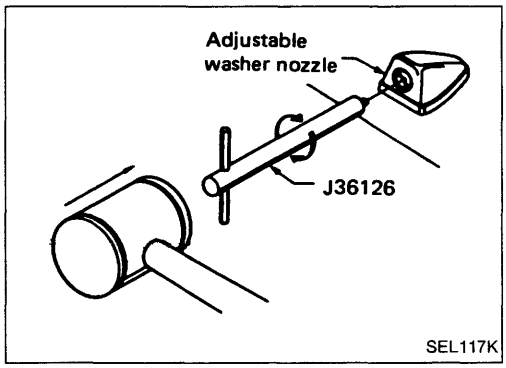
Front wiper and washer



Installation (Cont'd)


SEL024J

- **Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.**

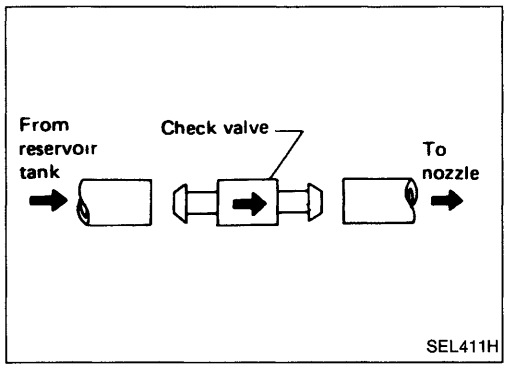


SEL117K

Washer Nozzle Adjustment

- Adjust washer nozzle with J36126 as shown in the figure at left.

Before attempting to turn the nozzle, gently tap the end of the tool to free the nozzle. This will prevent "rounding out" the small female square in the center of the nozzle.

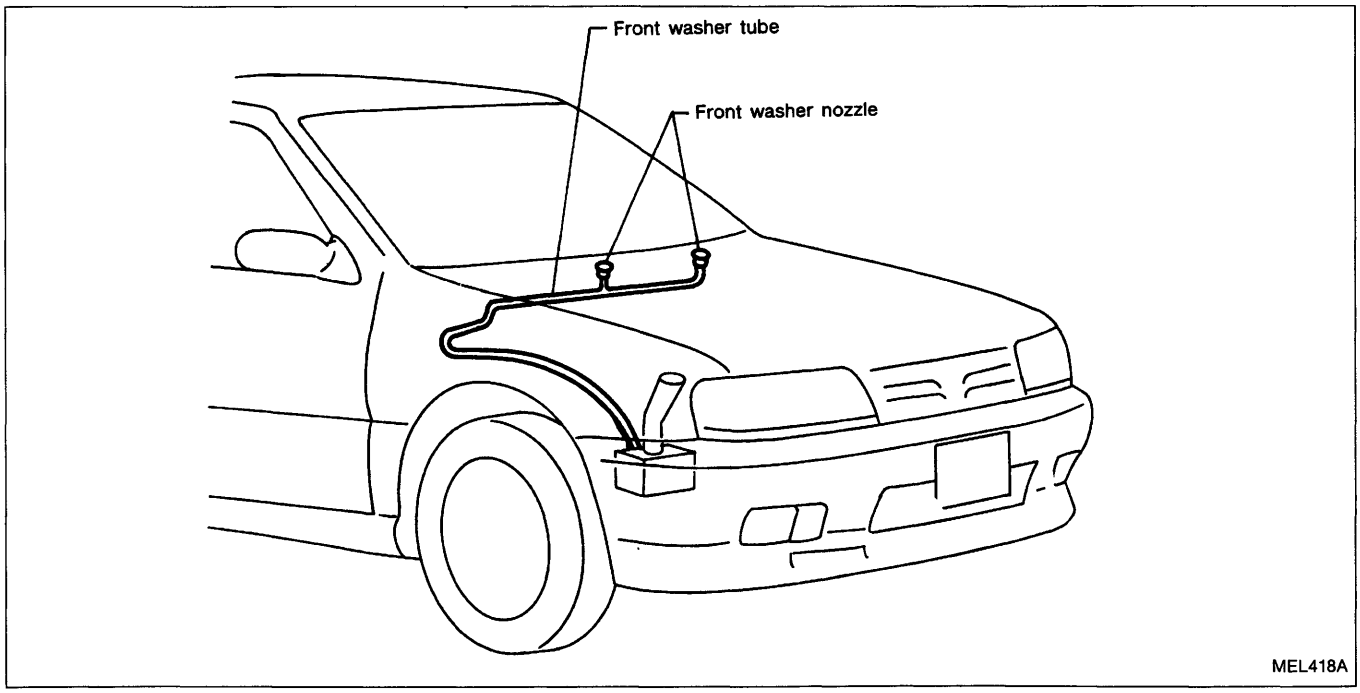


SEL411H

Check Valve

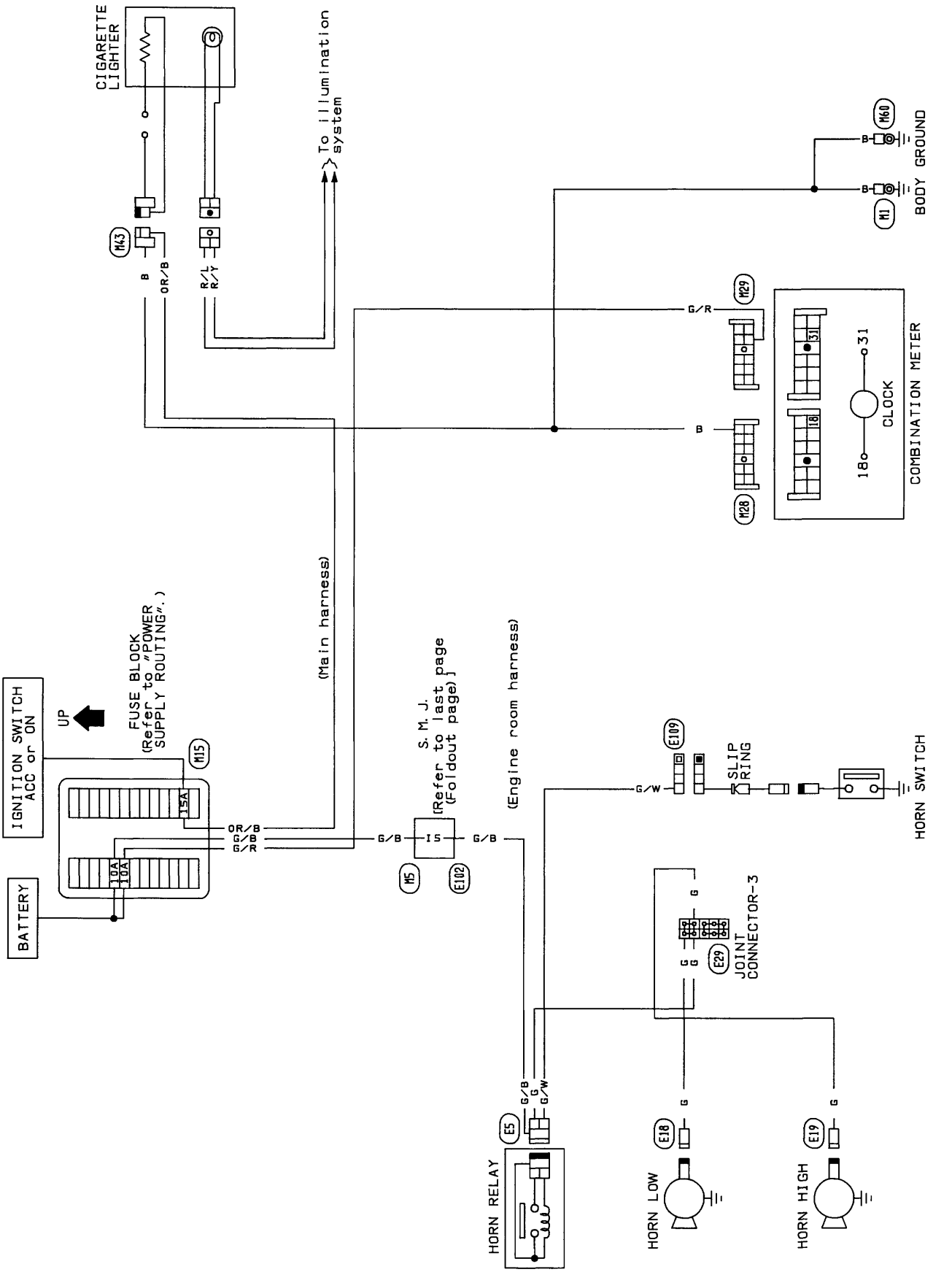
- A check valve is provided in the washer fluid line. Be careful not to connect check valve to washer tube in the wrong direction.

Washer Tube Layout



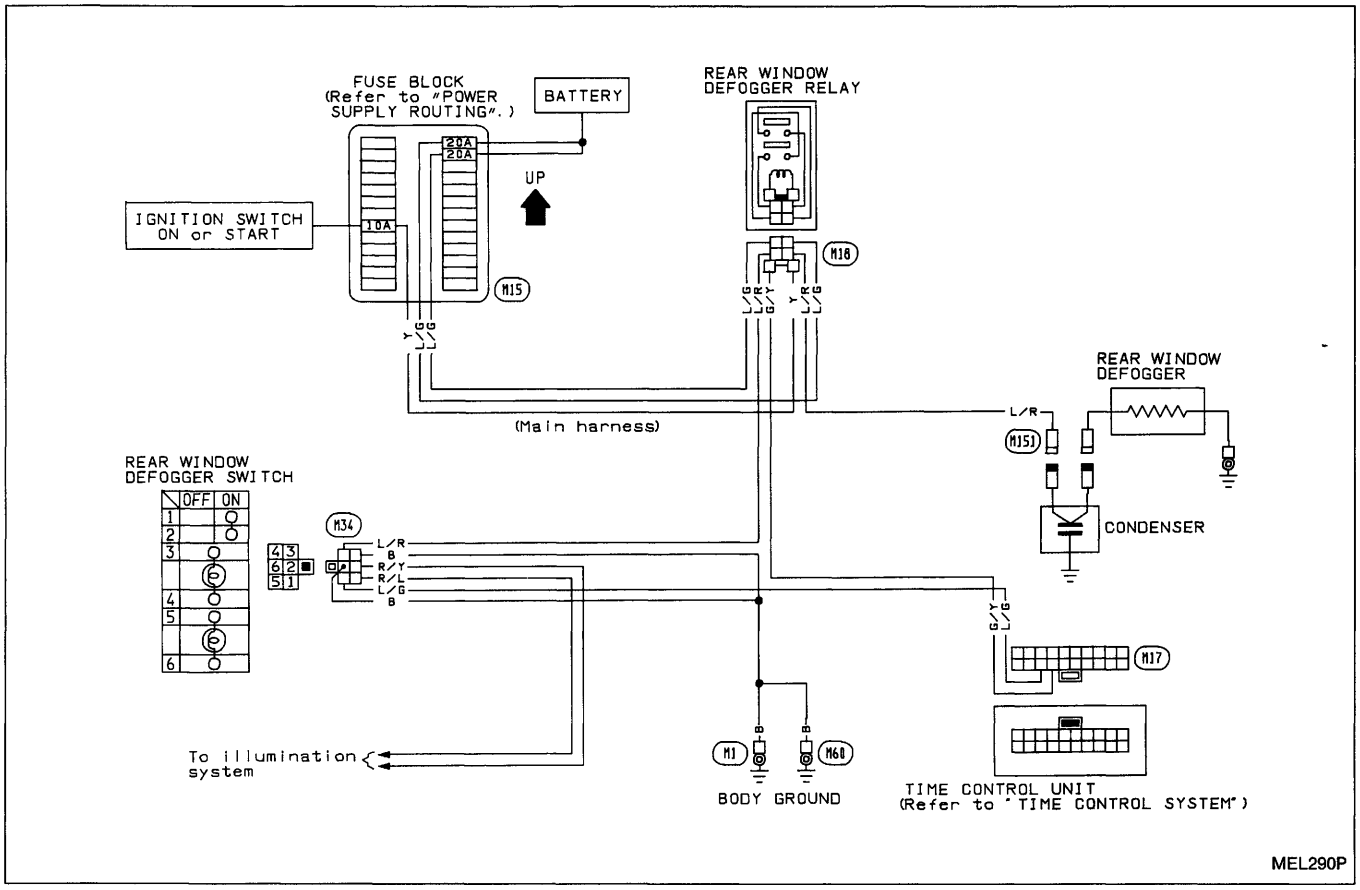
MEL418A

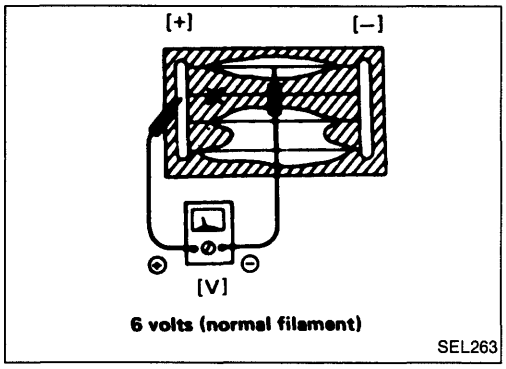
Wiring Diagram



MEL289A

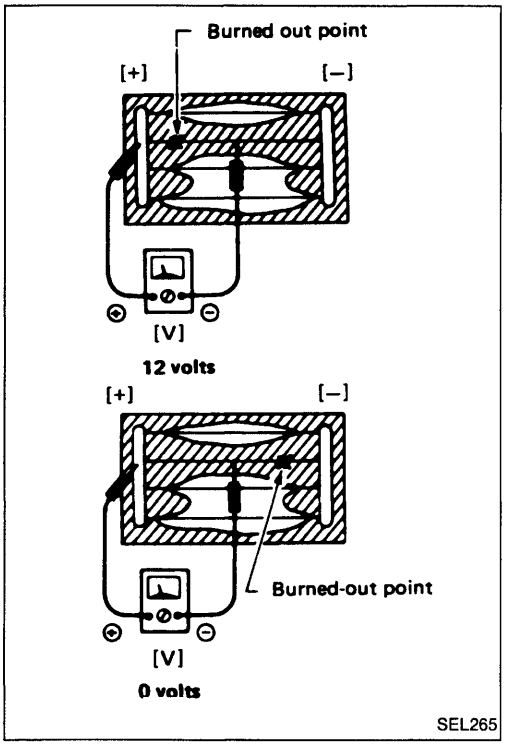
Wiring Diagram



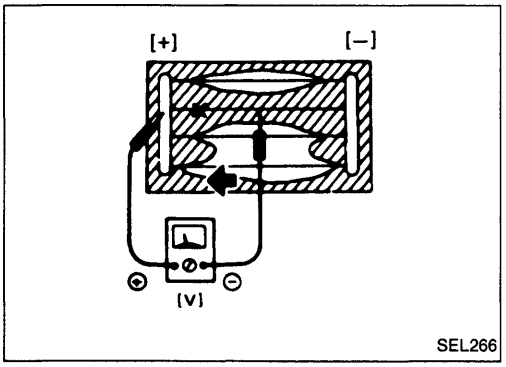


Filament Check

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.

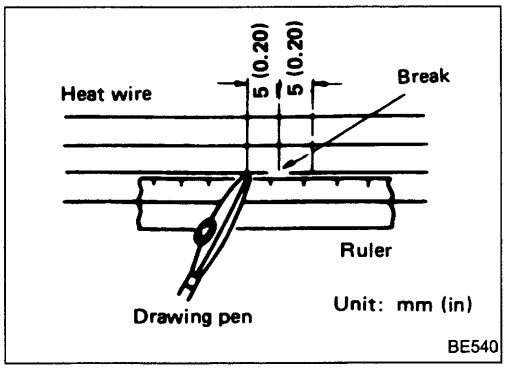


3. To locate burned out point, move probe to left and right along filament to determine point where tester needle swings abruptly.

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

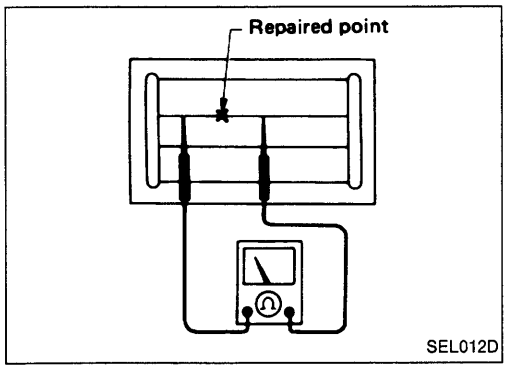


REPAIRING PROCEDURE

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.

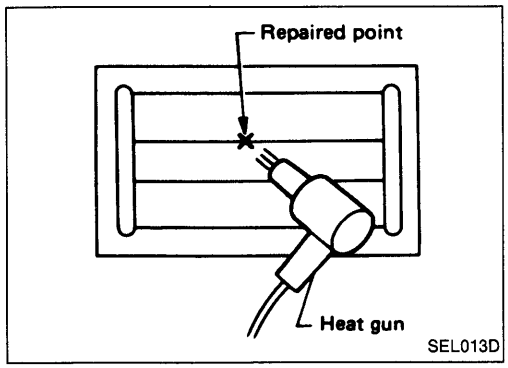
Shake silver composition container before use.

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.



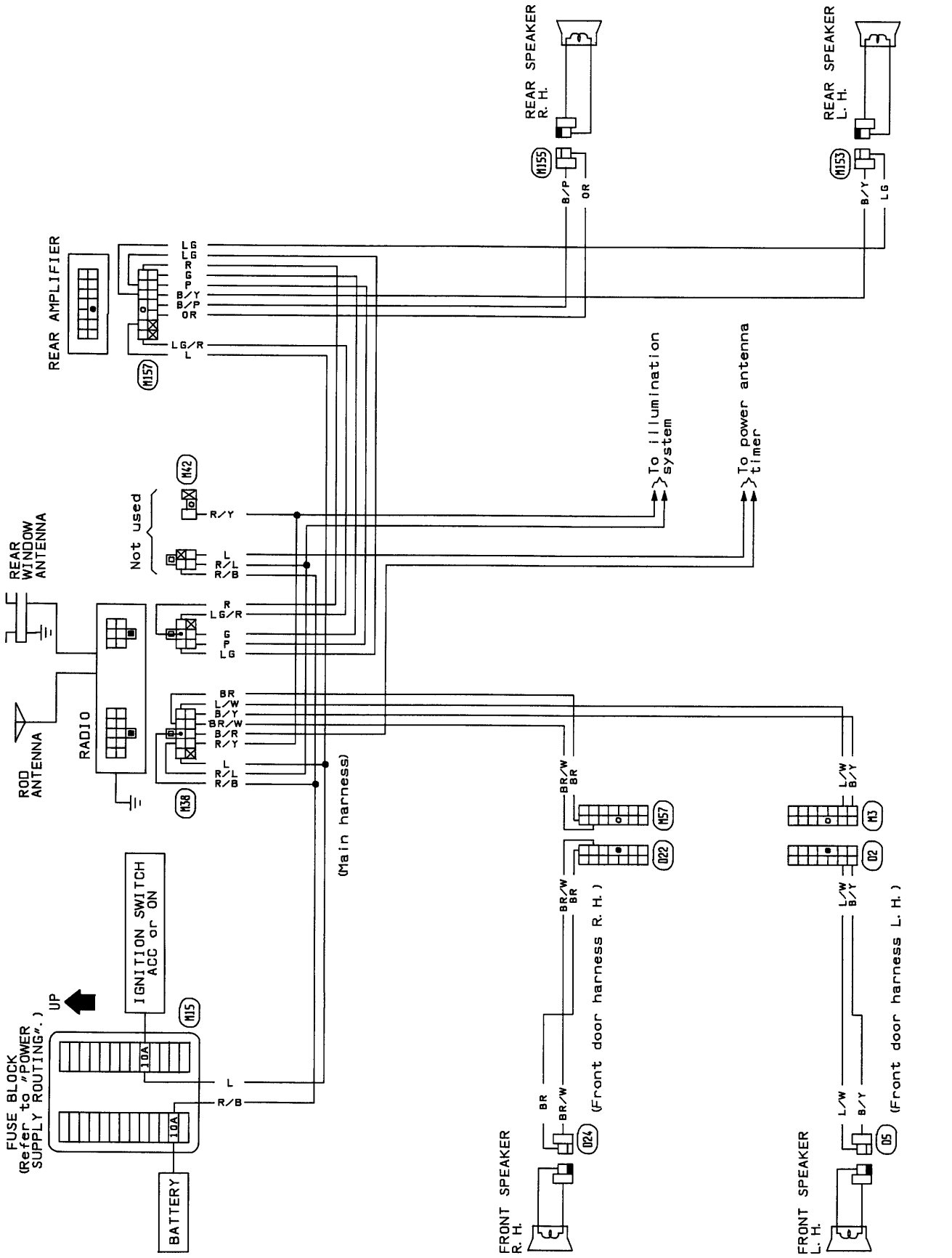
4. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

Do not touch repaired area while test is being conducted.



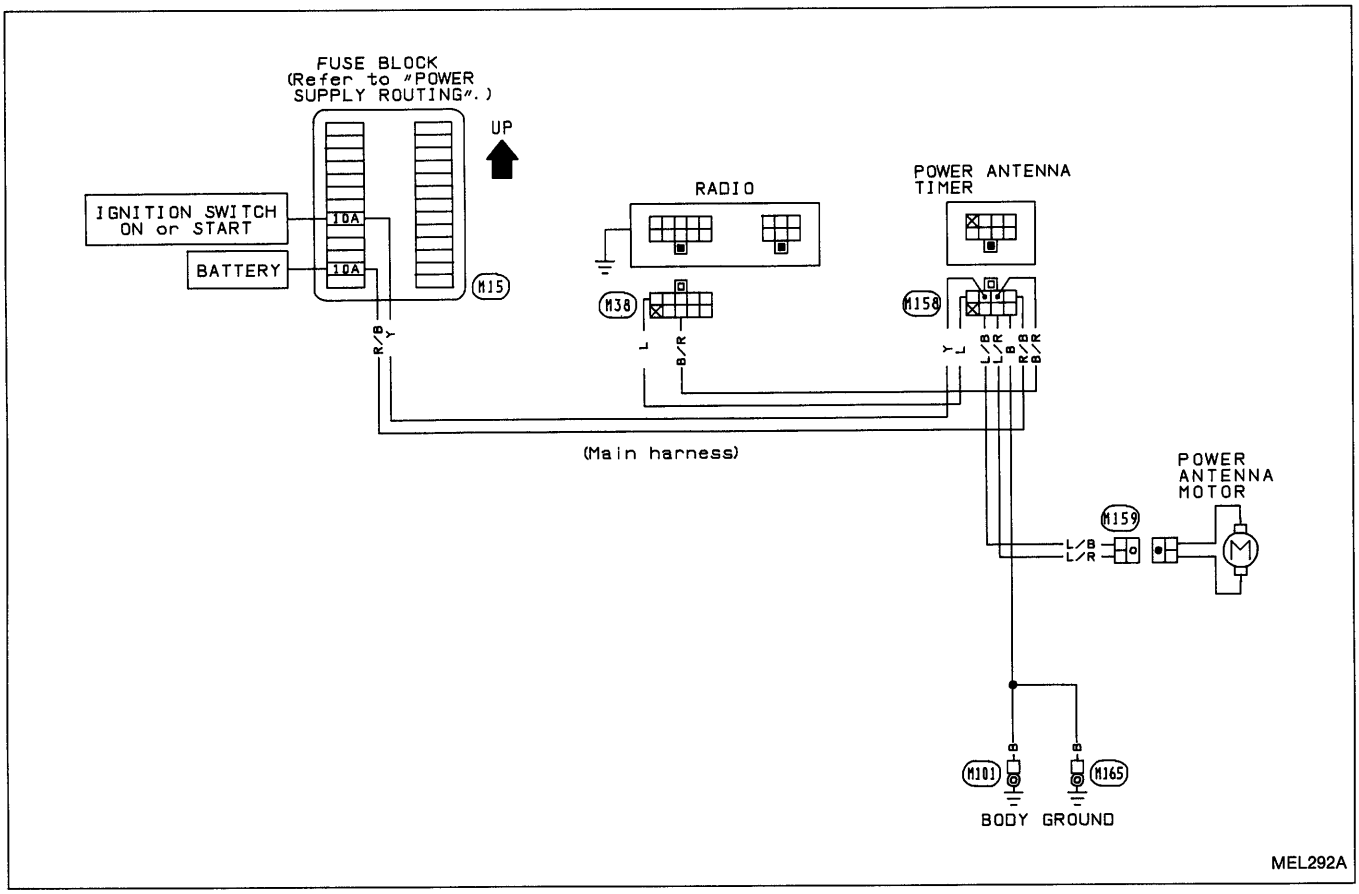
5. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.

Audio/Wiring Diagram

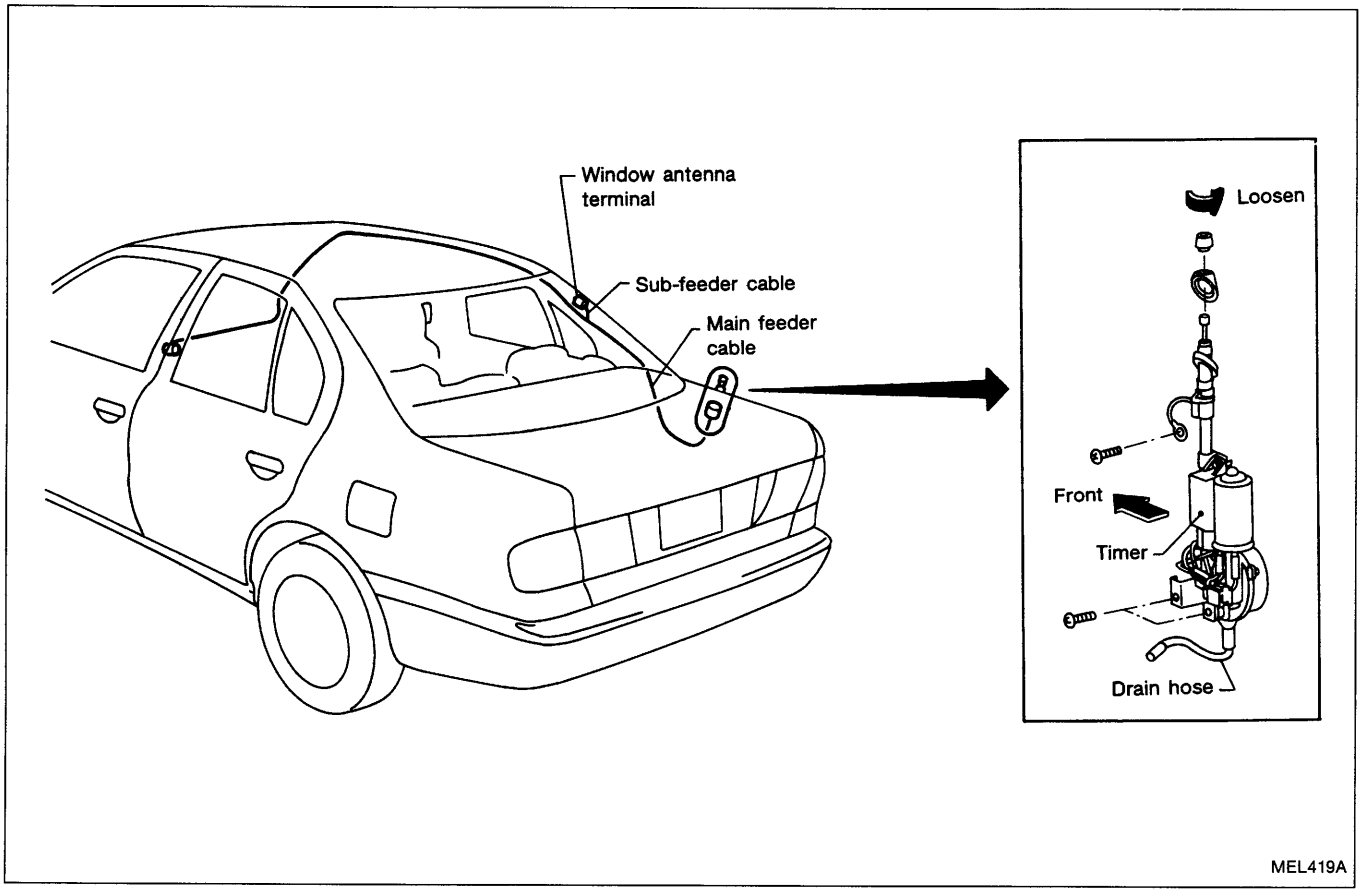


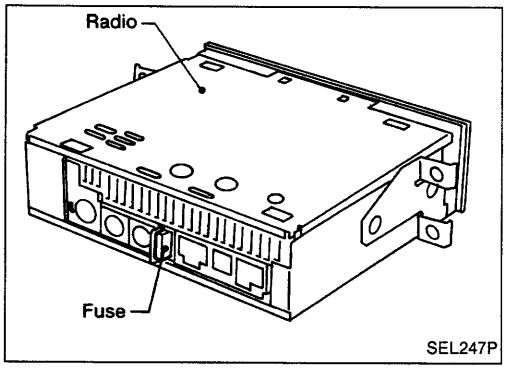
MEL291A

Power Antenna/Wiring Diagram

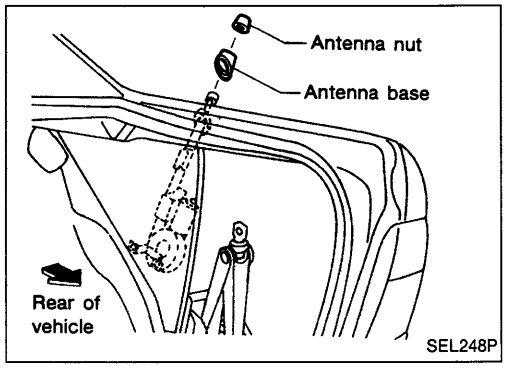


Location of Antenna





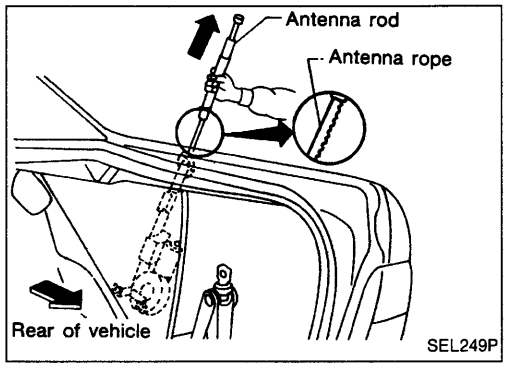
Radio Fuse Check



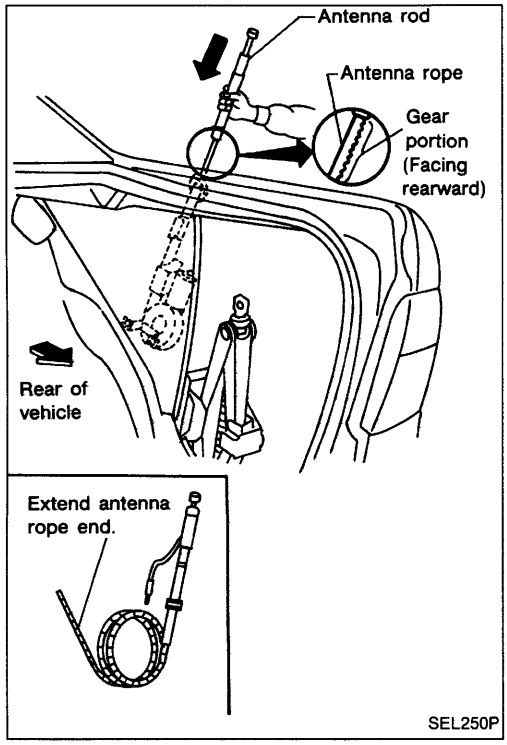
Antenna Rod Replacement

REMOVAL

1. Remove antenna nut and antenna base.

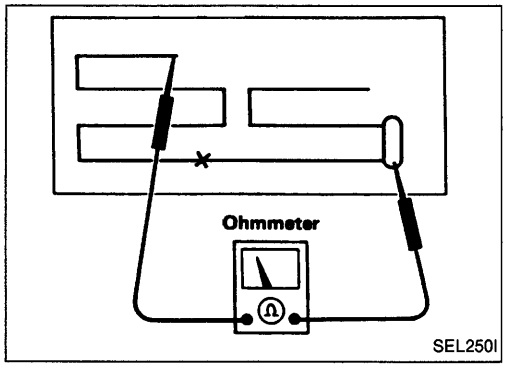


2. Withdraw antenna rod while raising it by operating antenna motor.



INSTALLATION

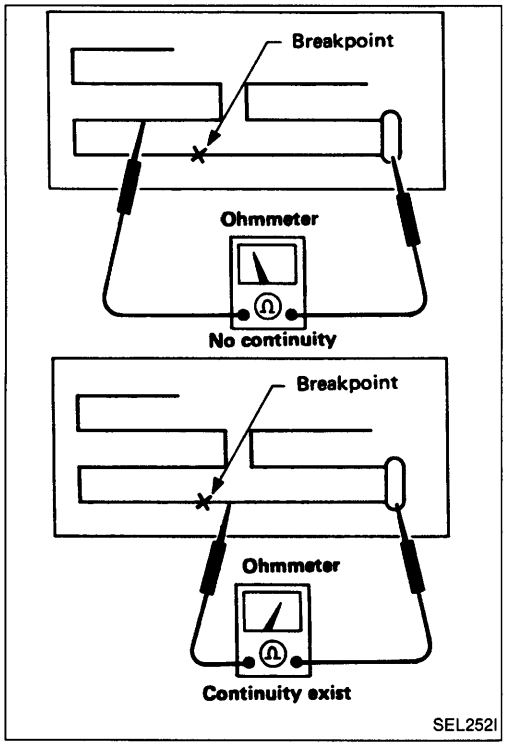
1. Lower antenna rod by operating antenna motor.
2. Insert gear section of antenna rope into place with it facing toward antenna motor.
3. As soon as antenna rope is wound on antenna motor, stop antenna motor. Insert antenna rod lower end into antenna motor pipe.
4. Retract antenna rod completely by operating antenna motor.
5. Install antenna nut and base.



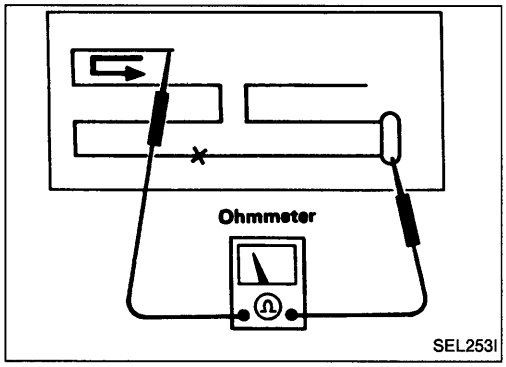
Window Antenna Repair

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.

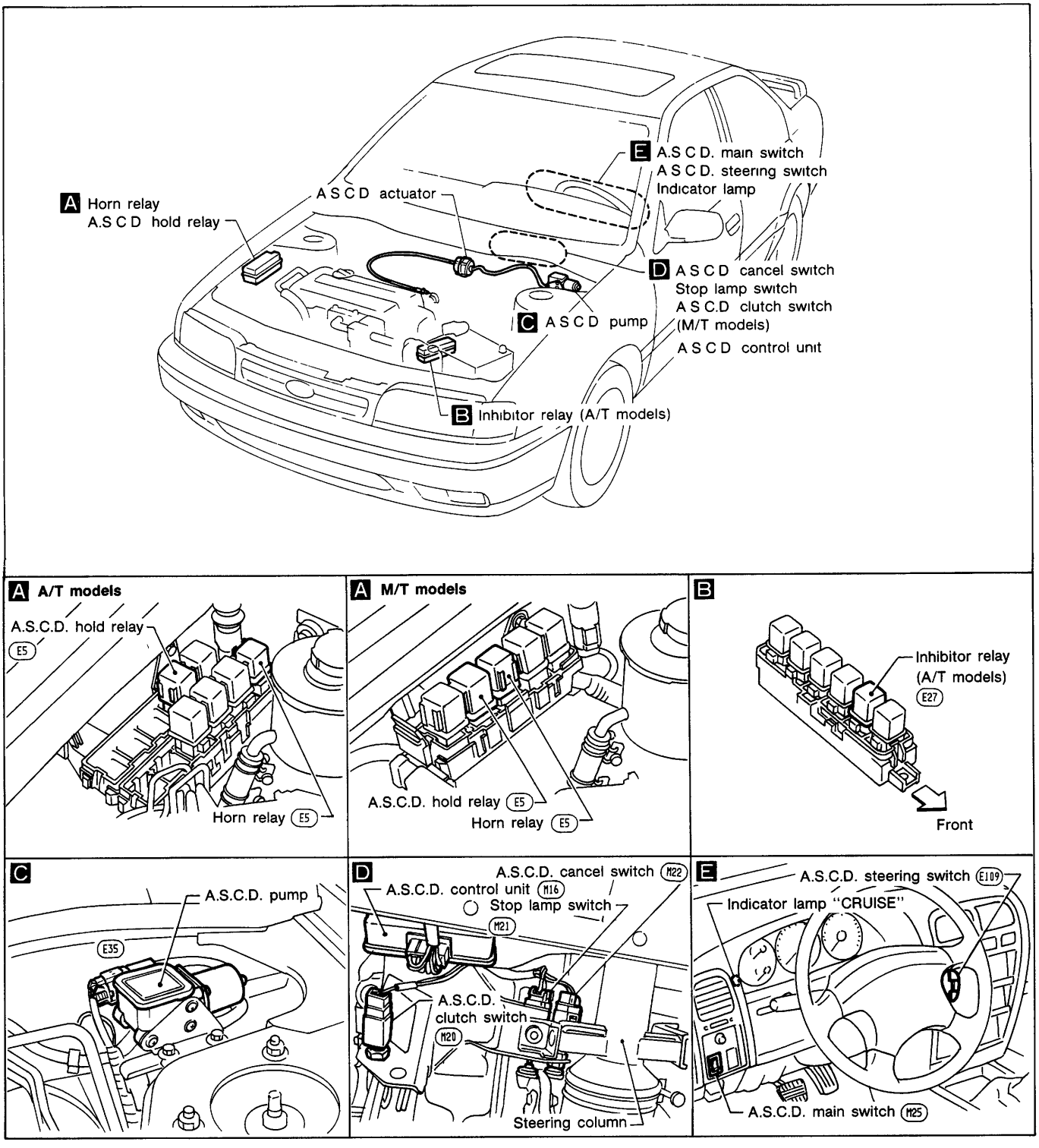


3. To locate broken point, move probe to left and right along element to determine point where tester needle swings abruptly.

ELEMENT REPAIR

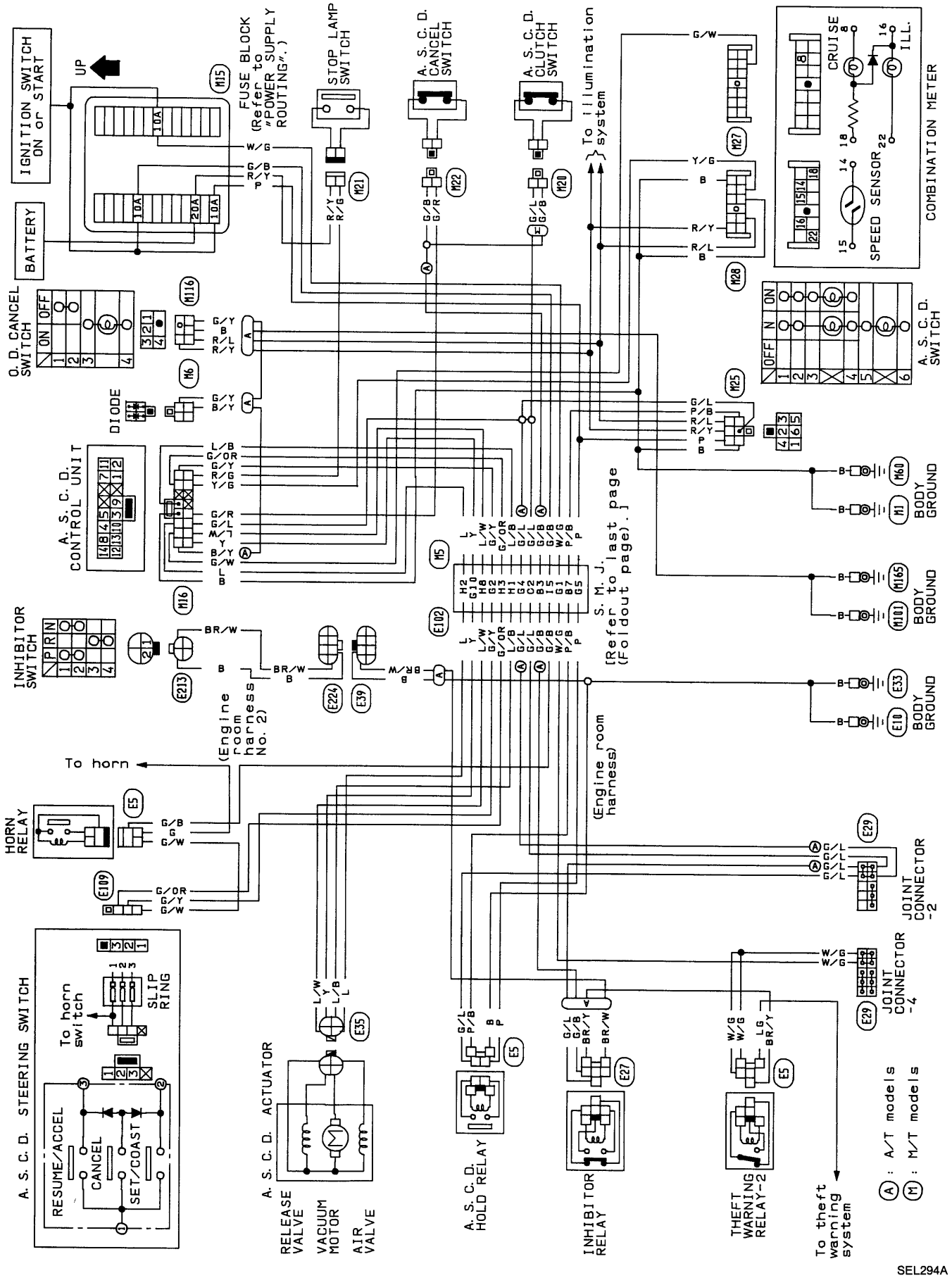
Refer to REAR WINDOW DEFOGGER "Filament Repair".

Component Parts and Harness Connector Location



SEL683P

Wiring Diagram



SEL294A

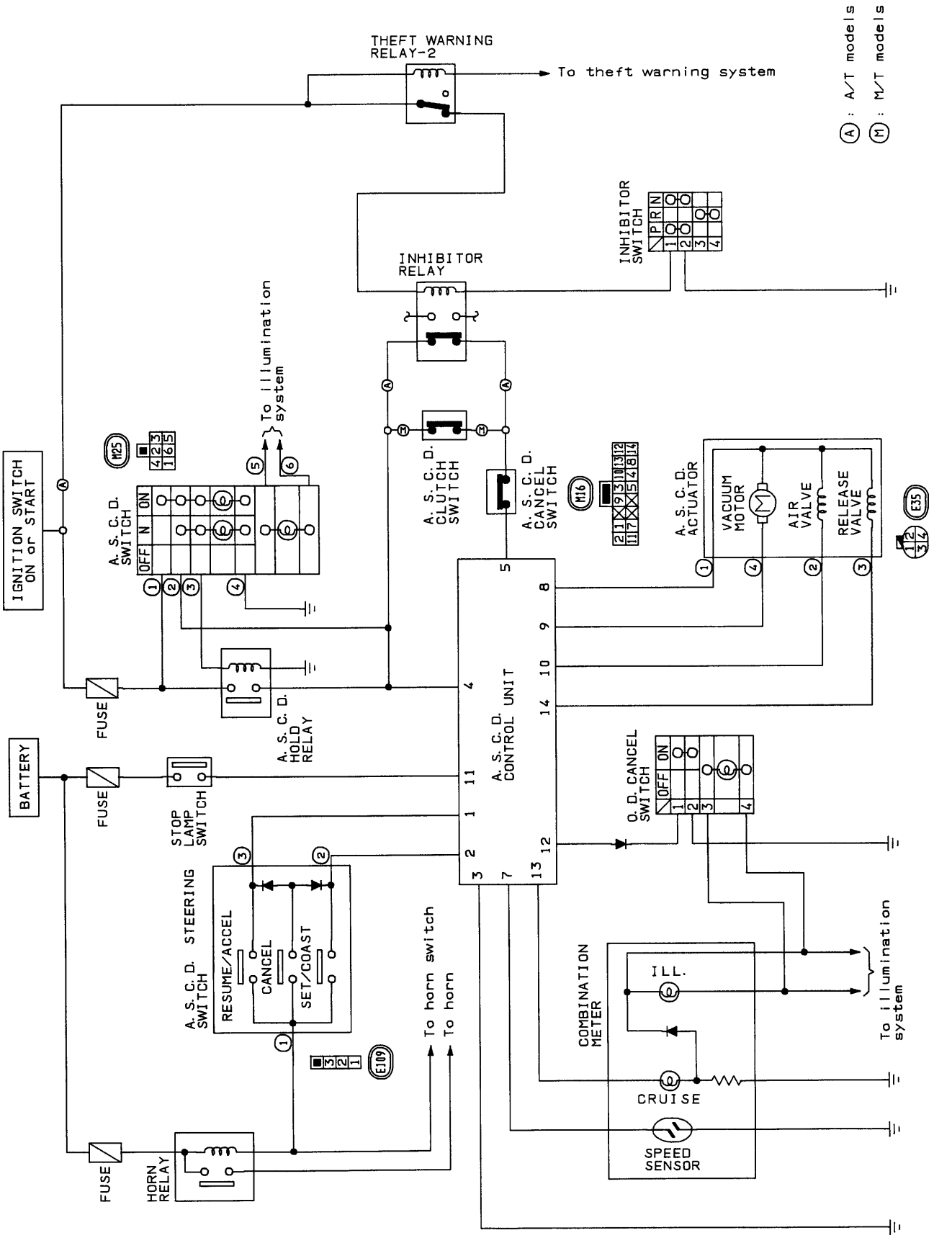
Trouble Diagnoses

SYMPTOM CHART

PROCEDURE	Diagnostic Procedure								Electrical Components Inspection							
REFERENCE PAGE	EL-87	EL-89	EL-89	EL-90	EL-91	EL-92	EL-93	EL-94	EL-95	EL-96	EL-97	EL-97	EL-97	EL-97	EL-98	EL-98
SYMPTOM	Diagnostic Procedure 1	Diagnostic Procedure 2	Diagnostic Procedure 3	Diagnostic Procedure 4	Diagnostic Procedure 5	Diagnostic Procedure 6	Diagnostic Procedure 7	Diagnostic Procedure 8	A.S.C.D. wire adjustment	A.S.C.D. actuator/A.S.C.D. pump	A.S.C.D. main switch	A.S.C.D. steering switch	A.S.C.D. cancel switch and stop lamp switch	A.S.C.D. clutch switch (For M/T models)	Inhibitor switch (For A/T models)	Speed sensor
A.S.C.D. control unit cannot be set properly.	○									○	○	○	○	○	○	○
Engine hunts		○							○	○						
Large difference between set speed and actual vehicle speed.			○						○	○						
Deceleration is greatest immediately after A.S.C.D. has been set.				○					○	○						
ACCEL switch will not operate.	○				○							○				
RESUME switch will not operate.	○					○						○	○	○		
Set speed cannot be cancelled.							○		○	○			○	○		
"CRUISE" indicator lamp blinks.								○		○		○	○			

Trouble Diagnoses (Cont'd)

CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK



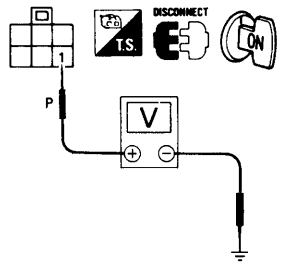
MEL293A

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1

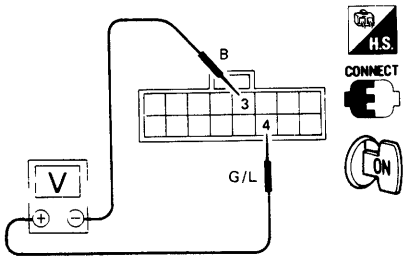
SYMPTOM: A.S.C.D. control cannot be set.

A A S C D main switch connector (M25)



SEL684P

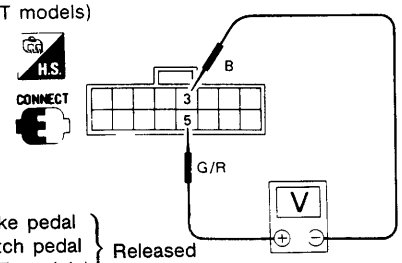
B A S C D control unit connector (M16)



SEL685P

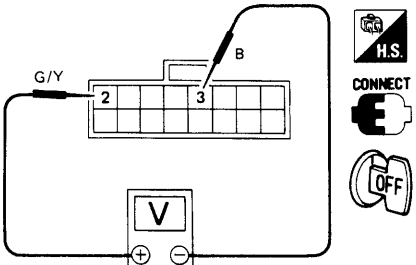
C A S C D control unit connector (M16)

A/T shift lever → Except "N" and "P" (A/T models)



SEL686P

D A S C D control unit connector (M16)



SEL687P

A

Turn A.S.C.D. main switch "OFF" and "ON" to make sure indicator illuminates. — N.G. → CHECK POWER SUPPLY FOR A.S.C.D. MAIN SWITCH.
1. Disconnect main switch harness connector.
2. Do approx. 12 volts exist between main switch harness terminal ① and body ground?

No. → Check fuse and harness.

Yes → CHECK A.S.C.D. MAIN SWITCH. Refer to "Electrical Components Inspection".
CHECK A.S.C.D. HOLD RELAY.

O.K.

B

CHECK POWER SUPPLY CIRCUIT FOR A.S.C.D. CONTROL UNIT. — N.G. → Check continuity between control unit harness terminal ④ and A.S.C.D. hold relay.
1. Turn A.S.C.D. main switch "ON".
2. Check voltage between control unit harness terminal ④ and ③.
Battery voltage should exist.

O.K.

C

CHECK CUT-OFF CIRCUIT FOR A.S.C.D. CONTROL UNIT. — N.G. → CHECK A.S.C.D. CANCEL SWITCH, A.S.C.D. CLUTCH SWITCH (M/T models) AND INHIBITOR SWITCH (A/T models). Refer to "Electrical Components Inspection".
CHECK INHIBITOR RELAY (A/T models) AND THEFT WARNING RELAY.
Check voltage between control unit harness terminals ⑤ and ③.
Battery voltage should exist.

O.K.

D

CHECK SET/COAST SWITCH CIRCUIT FOR A.S.C.D. CONTROL UNIT. — N.G. → Does horn work?
1. Push and hold SET/COAST button on A.S.C.D. steering switch.
2. Check voltage between control unit harness terminals ② and ③.
Battery voltage should exist.

No → Check fuse and horn relay.

Yes → CHECK A.S.C.D. STEERING SWITCH. Refer to "Electrical Components Inspection".

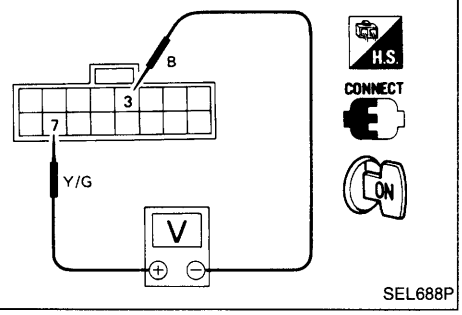
O.K.

Ⓐ

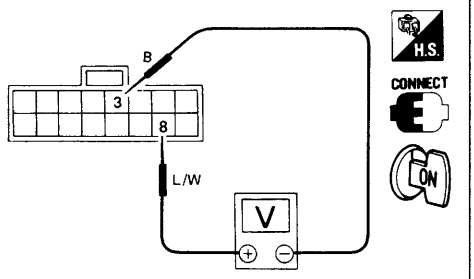
(Next page)

Trouble Diagnoses (Cont'd)

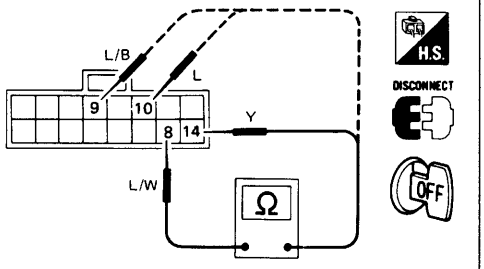
E A S C.D control unit connector (M16)



F A S.C D control unit connector (M16)



A.S.C.D. control unit connector (M16)



Ⓐ

E

CHECK SPEED SENSOR CIRCUIT.
1. Apply wheel chocks and jack up front of vehicle.
2. Connect voltmeter between control unit harness terminals ⑦ and ③.
3. Slowly turn front wheel.
4. Check deflection of voltmeter pointer.

N.G. → CHECK SPEED SENSOR. Refer to "Electrical Components Inspection".

O.K. ↓

CHECK A.S.C.D. ACTUATOR/A.S.C.D. PUMP. Refer to "Electrical Components Inspection".

N.G. → Replace A.S.C.D. actuator/A.S.C.D. pump.

O.K. ↓

F

CHECK A.S.C.D. ACTUATOR/A.S.C.D. PUMP CIRCUIT.
1. Check voltage between control unit harness terminals ⑧ and ③.
   Voltage is 0V.
2 Disconnect A.S.C.D. control unit connector.
3 Measure resistance between control unit harness terminals ⑧ and ⑨, ⑩, ⑭.

N.G. → Repair short or open circuit in A.S.C.D. actuator/A.S.C.D. pump harness.

Terminals		Resistance [Ω]
⑧	⑨	Approx. 8 - 45
	⑩	Approx. 65
	⑭	Approx. 65

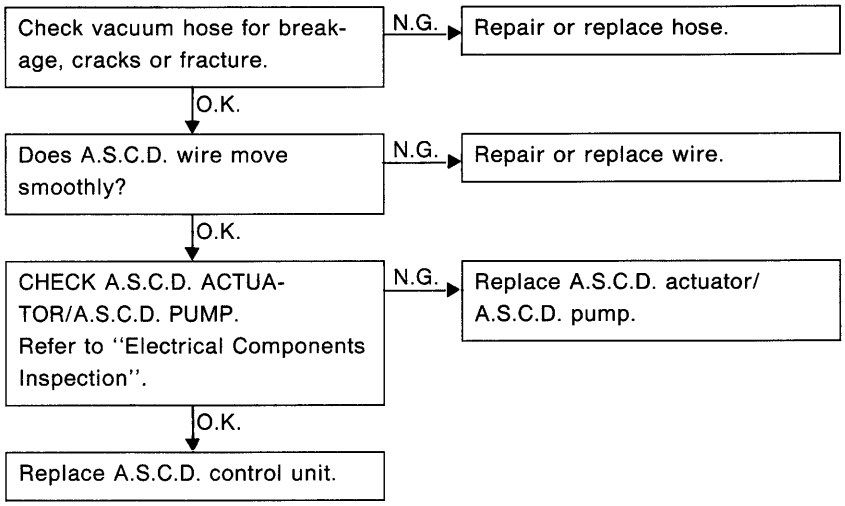
O.K. ↓

Replace A.S.C.D. control unit.

Trouble Diagnoses (Cont'd)

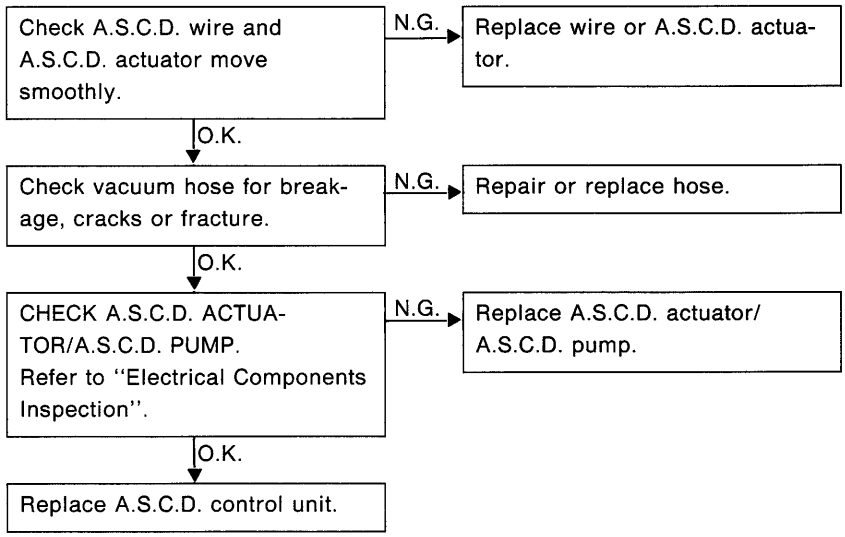
DIAGNOSTIC PROCEDURE 2

SYMPTOM: Engine hunts.



DIAGNOSTIC PROCEDURE 3

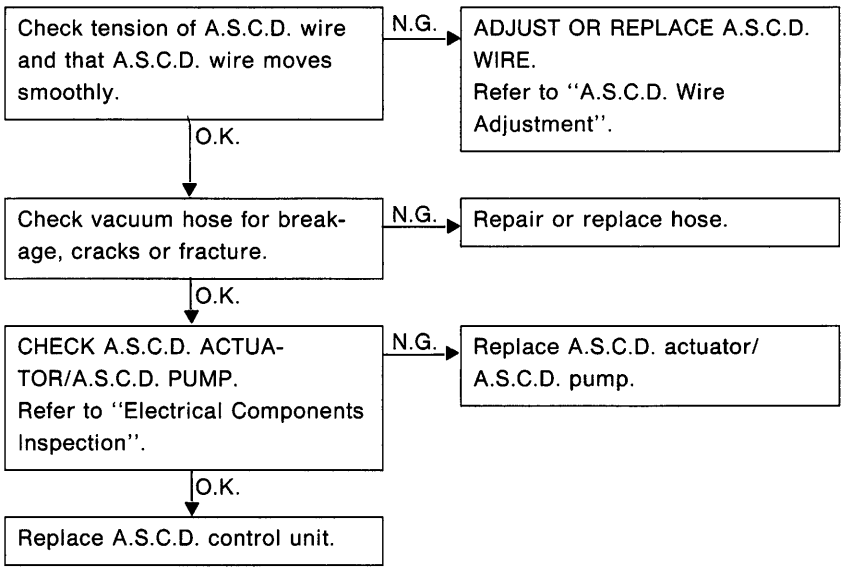
SYMPTOM: Large difference between set vehicle speed and actual speed.



Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4

SYMPTOM: Deceleration is greatest immediately after A.S.C.D. has been set.

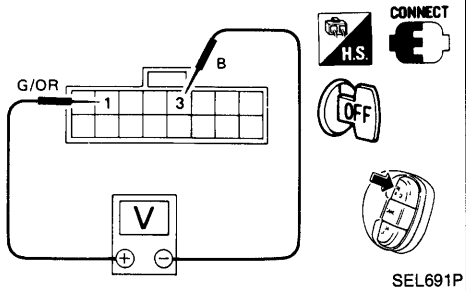


Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 5

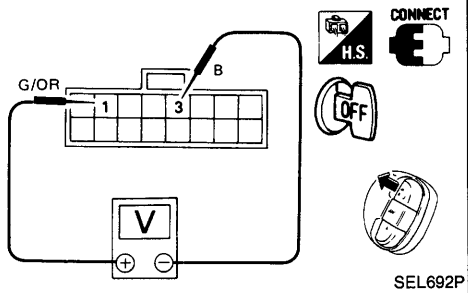
SYMPTOM: ACCEL switch will not operate.

A A S C D control unit connector (M16)



SEL691P

B A S C D control unit connector (M16)



SEL692P

C



SEL693P

Check constant-speed function for operating using SET/COAST switch.
- N.G. → Go to "DIAGNOSTIC PROCEDURE 1".
- O.K. ↓

A

Check voltage between control unit harness terminals ① and ③ after pressing and holding RESUME/ACCEL switch.
Battery voltage should exist.
- N.G. → (CHECK A.S.C.D. STEERING SWITCH. Refer to "Electrical Components Inspection".)
- O.K. ↓

B

Check voltage between control unit harness terminals ① and ③ after releasing RESUME/ACCEL switch.
Voltage is 0V.
- N.G. → CHECK A.S.C.D. STEERING SWITCH. Refer to "Electrical Components Inspection".
- O.K. ↓

C

Does vehicle accelerate when RESUME/ACCEL switch is pressed?
- No → Replace control unit.
- Yes ↓

C

Does vehicle maintain the new (faster) speed when RESUME/ACCEL switch is released?
- No → Replace control unit.
- Yes ↓

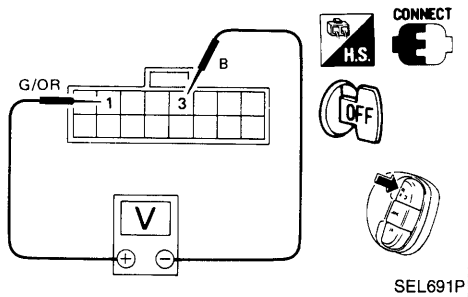
System is O.K.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 6

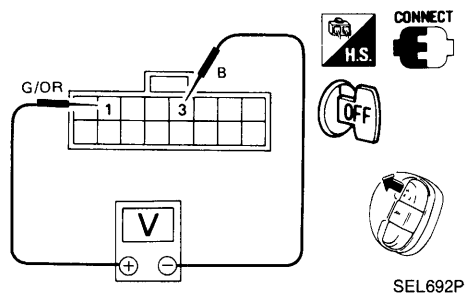
SYMPTOM: RESUME switch will not operate.

A A S C D control unit connector (M16)



SEL691P

B A S C D control unit connector (M16)



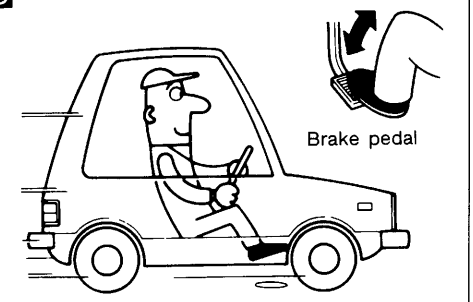
SEL692P

C



SEL694P

D



SEL695P

E



SEL693P

Check constant-speed function for operation using SET/COAST switch.
- N.G. → Go to "DIAGNOSTIC PROCEDURE 1".
- O.K. ↓

A

Check voltage between control unit harness terminals ① and ③ after pressing and holding RESUME/ACCEL switch.
Battery voltage should exist.
- N.G. → CHECK A.S.C.D. STEERING SWITCH. Refer to "Electrical Components Inspection".
- O.K. ↓

B

Check voltage between control unit harness terminals ① and ③ after releasing RESUME/ACCEL switch.
Voltage is 0V.
- N.G. → CHECK A.S.C.D. STEERING SWITCH. Refer to "Electrical Components Inspection".
- O.K. ↓

C

Set vehicle speed at 80 km/h (50 MPH) by pressing SET/COAST switch.
- O.K. ↓

D

While cruising at set speed, depress and release brake pedal.
- O.K. ↓

Does speed control disengage and "CRUISE" lamp turn off?
- No → CHECK STOP LAMP SWITCH, A.S.C.D. CANCEL SWITCH AND A.S.C.D. CLUTCH SWITCH (M/T models). Refer to "Electrical Components Inspection".
- Yes ↓

E

Above 48 km/h (30 MPH), press and release "RESUME/ACCEL switch.
- O.K. ↓

Does vehicle return to previously set speed [80 km/h (50 MPH)]?
- No → Replace control unit.
- Yes ↓

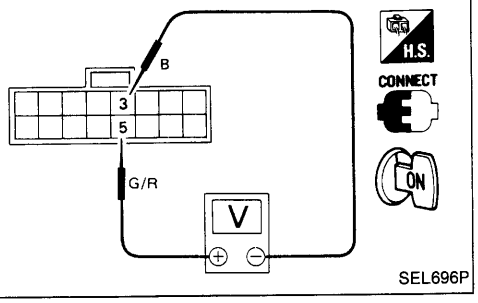
System is O.K

Trouble Diagnoses (Cont'd)

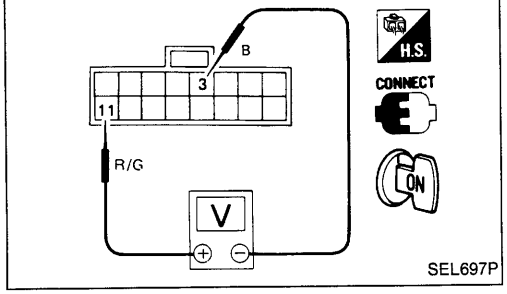
DIAGNOSTIC PROCEDURE 7

SYMPTOM: Set speed cannot be cancelled.

A A S C D control unit connector (M16)



B A S C D control unit connector (M16)



A

CHECK A.S.C.D. CANCEL, CLUTCH, INHIBITOR SWITCH CIRCUIT.

1. Turn A.S.C.D. main switch "ON".
2. Check voltage between control unit harness terminals ⑤ and ③.

Conditions			Voltage [V]
M/T	A.S.C.D. cancel switch	De-pressed	0
		Released	Approx. 12
	A.S.C.D. clutch switch	De-pressed	0
		Released	Approx. 12
A/T	A/T shift lever position is at any position except N or P.		Approx. 12
	A/T shift lever position is at N or P.		0

N.G. → CHECK A.S.C.D. CANCEL, CLUTCH, and INHIBITOR SWITCH. Refer to "Electrical Components Inspection".

O.K. ↓

B

CHECK STOP LAMP SWITCH CIRCUIT.
Check voltage between control unit harness terminals ⑪ and ③.

Condition		Voltage [V]
Stop lamp switch	Depressed	Approx. 12
	Released	0

N.G. → CHECK STOP LAMP SWITCH. Refer to "Electrical Components Inspection.

O.K. ↓

Check A.S.C.D. wire moves smoothly.

N.G. → Replace A.S.C.D. wire.

O.K. ↓

CHECK A.S.C.D. ACTUATOR/A.S.C.D. PUMP. Refer to "Electrical Components Inspection".

N.G. → Replace A.S.C.D. actuator/ A.S.C.D. pump.

O.K. ↓

Replace A.S.C.D. control unit.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 8

SYMPTOM: "CRUISE" indicator lamp blinks.

Does indicator lamp blink when A.S.C.D. main switch is turned to "ON" again?

Yes → Does indicator lamp blink when brake pedal is depressed slowly?

No → CHECK A.S.C.D. ACTUATOR/A.S.C.D. PUMP. Refer to "Electrical Components Inspection".

N.G. → Replace A.S.C.D. actuator/A.S.C.D. pump

O.K. → CHECK A.S.C.D. ACTUATOR/A.S.C.D. PUMP CIRCUIT.

1. Check voltage between control unit harness terminals ⑧ and ③. **Voltage is 0V.**
2. Disconnect A.S.C.D. control unit connector.
3. Measure resistance between control unit harness terminals ⑧ and ⑨, ⑩, ⑭.

Terminals		Resistance [Ω]
⑧	⑨	Approx. 8 - 45
	⑩	Approx. 65
	⑭	Approx. 65

N.G. → Repair short or open circuit in A.S.C.D. actuator/A.S.C.D. pump harness.

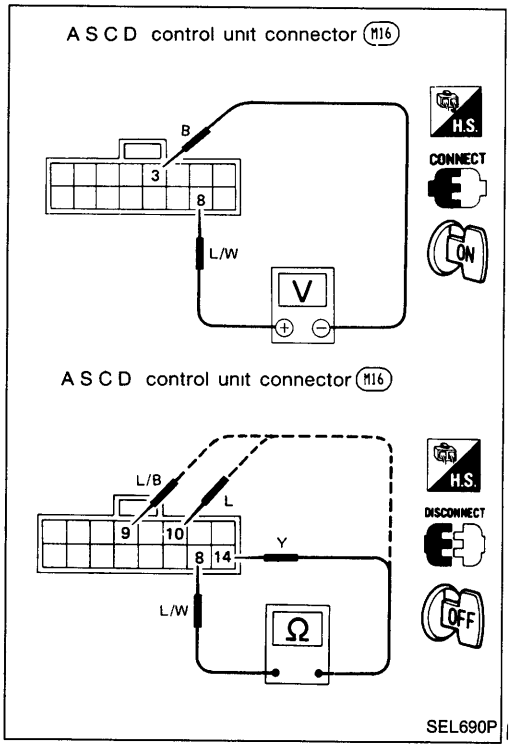
O.K. → Replace A.S.C.D. control unit.

No → Adjust installation of stop lamp switch and A.S.C.D. cancel switch. Refer to BR section.

→ CHECK A.S.C.D. STEERING SWITCH. Refer to "Electrical Components Inspection".

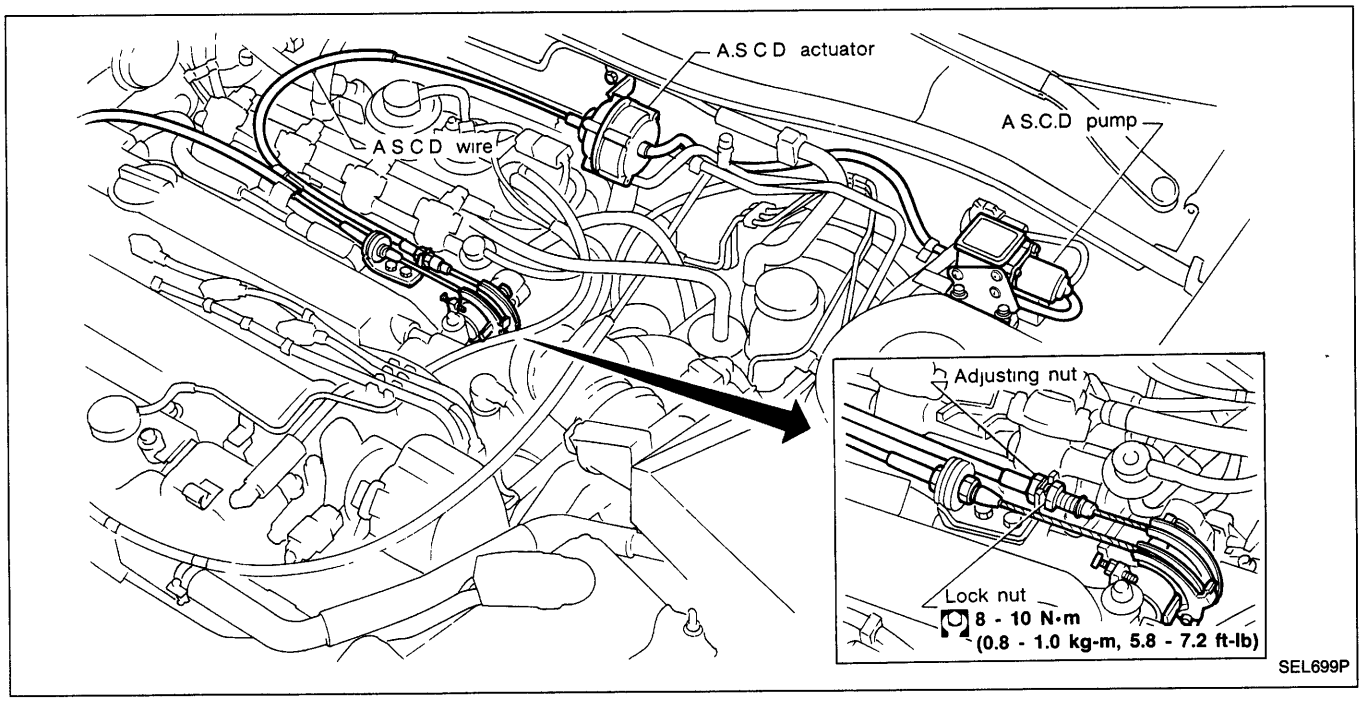
N.G. → Replace A.S.C.D. steering switch.

O.K. → Replace control unit.



Trouble Diagnoses (Cont'd)

A.S.C.D. WIRE ADJUSTMENT



CAUTION:

- **Be careful not to twist A.S.C.D. wire when removing it.**
- **Do not tense A.S.C.D. wire excessively during adjustment.**

After confirming that accelerator wire is properly adjusted, adjust the tension of A.S.C.D. wire in the following manner.

(1) After adjusting the length of the accelerator wire, turn a securing nut by 1/2 to 1 turn from throttle open starting position to the wire loosening direction to fix. (Must be securing carried out to prevent response delay of operation of the A.S.C.D.)

(2) Securely tighten lock nut to hold adjusting nut in place.

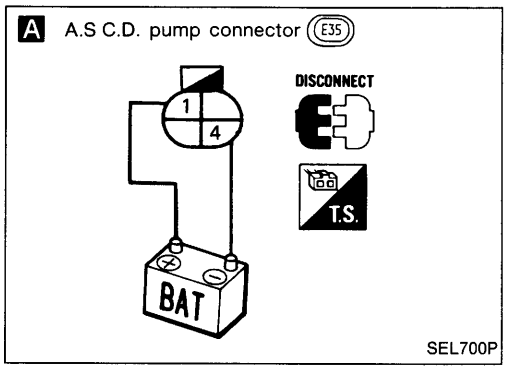
Trouble Diagnoses (Cont'd)

ELECTRICAL COMPONENTS INSPECTION

A.S.C.D. actuator/A.S.C.D. pump

1. Disconnect A.S.C.D. actuator/A.S.C.D. pump connector.
2. Check A.S.C.D. actuator/A.S.C.D. pump operations as shown.

A

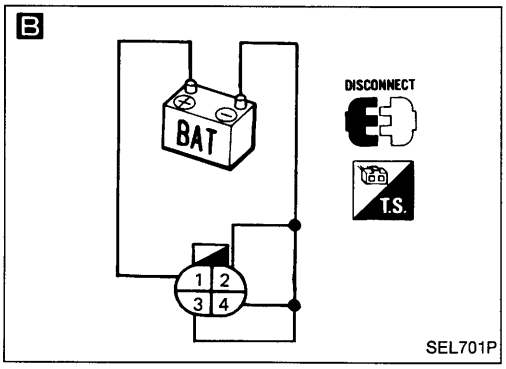


Check to see if motor starts when 12V D.C. is applied across ① and ④.

N.G. → Replace A.S.C.D pump.

O.K. ↓

B



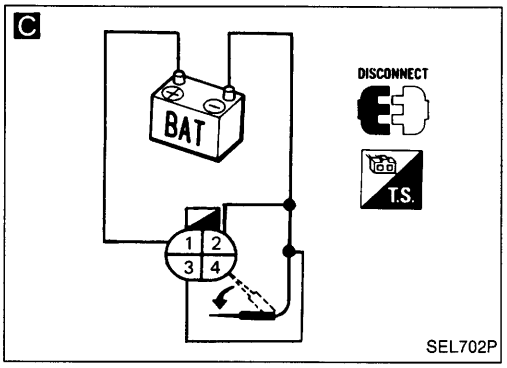
Check to see if A.S.C.D. wire is pulled when 12V D.C. is applied across ①, ②, ③ and ④.

N.G. → Disconnect vacuum hose from A.S.C.D. actuator and check for presence of vacuum pressure at A.S.C.D. pump.

- N.G. → Replace A.S.C.D. actuator.
- O.K.

O.K.(Wire is pulled.) ↓

C

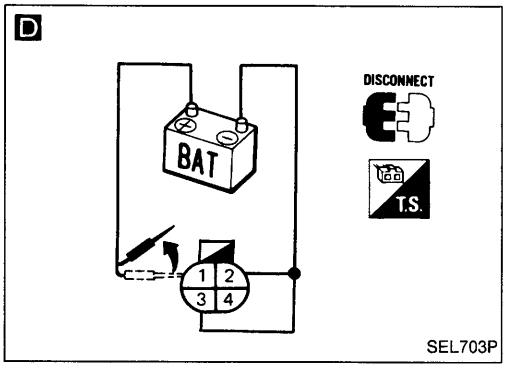


Check to see if A.S.C.D. wire returns to original position 50 to 60 seconds after disconnecting lead from ④.

N.G. → Replace A.S.C.D. pump.

O.K. (Wire does not return.) ↓

D



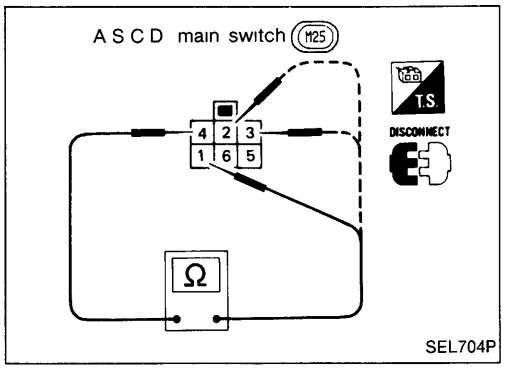
Disconnect lead from ① to see if A.S.C.D. wire returns immediately.

N.G. → Replace A.S.C.D. pump.

O.K. (Wire returns.) ↓

A.S.C.D. actuator/A.S.C.D. pump are O.K.

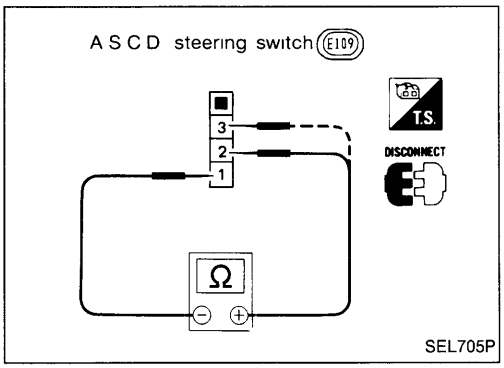
Trouble Diagnoses (Cont'd)



A.S.C.D. main switch

Check continuity between terminals by pushing switch to each position.

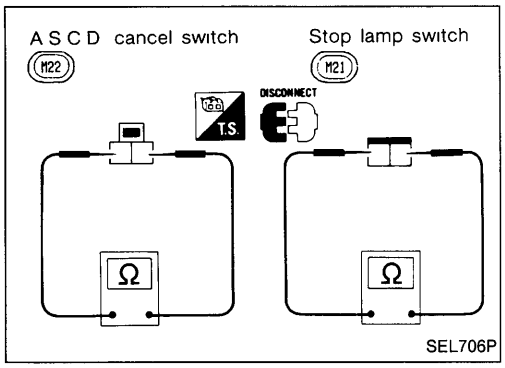
Switch position \ Terminals	1	2	3	4	5	6
ON	○	○	○	○		
N		○	○	○	ILL. ○	○
OFF						



A.S.C.D. steering switch

Check continuity between terminals by pushing each button.

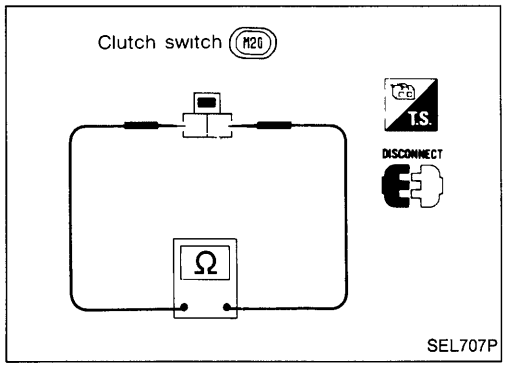
Button \ Terminal	1	2	3
SET/COAST	○	○	
RESUME/ACCEL	○		○
CANCEL	○	▶ ○	
	○	▶	○



A.S.C.D. cancel switch and stop lamp switch

Condition	Continuity	
	A.S.C.D. cancel switch	Stop lamp switch
When brake pedal is depressed	No	Yes
When brake pedal is released	Yes	No

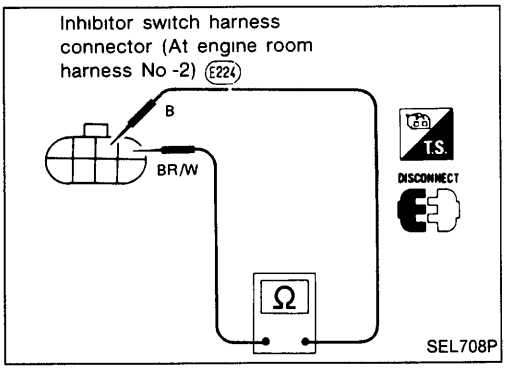
Check each switch after adjusting brake pedal — refer to BR section.



Clutch switch (For M/T models)

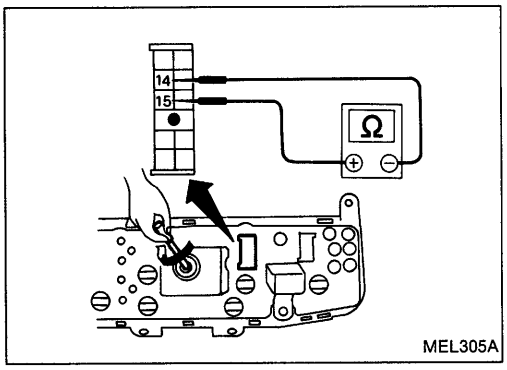
Condition	Continuity
When clutch pedal is depressed	No
When clutch pedal is released	Yes

Trouble Diagnoses (Cont'd)



Inhibitor switch (For A/T models)

Condition	Continuity
When shift lever position is "N" or "P"	Yes
When shift lever position is any position except "N" or "P"	No



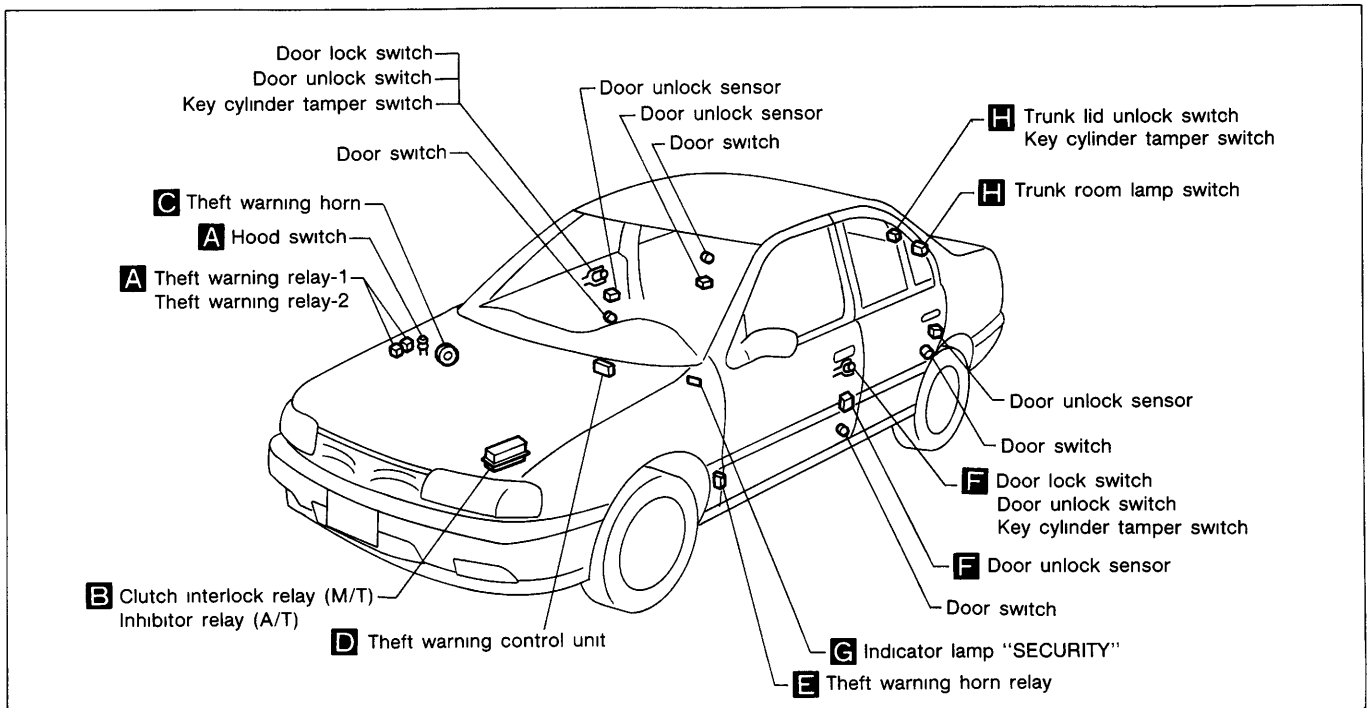
Speed sensor

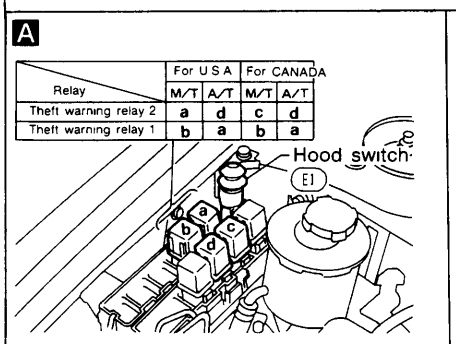
- A speed sensor is built into the speedometer.

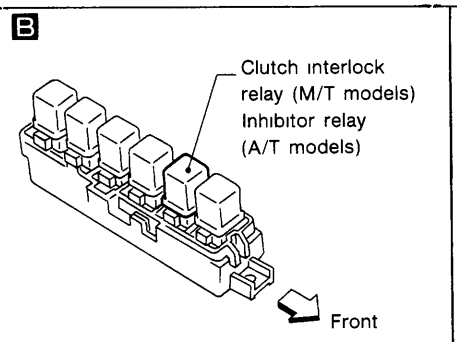
1. Turn speedometer slowly using a small screwdriver.
2. Check continuity of speed sensor circuit.

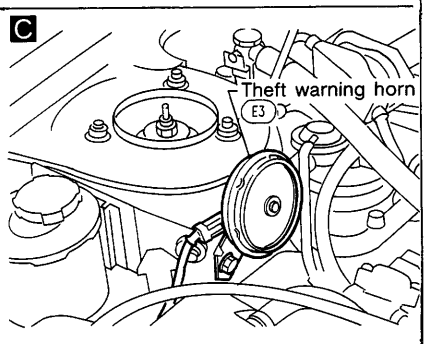
Continuity exists two times for each turn ... O.K.

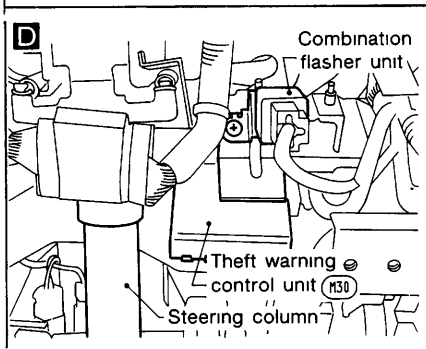
Component Parts and Harness Connector Location

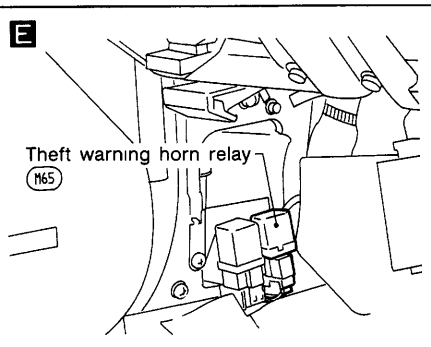


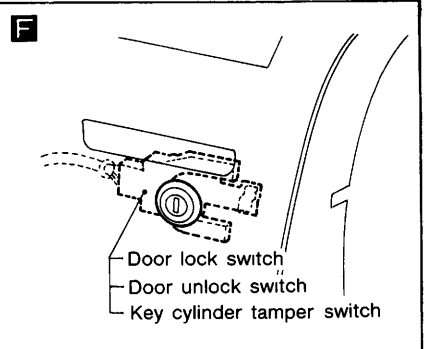


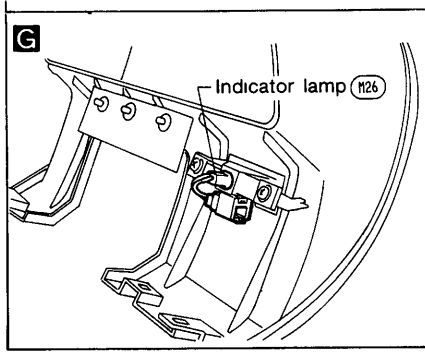


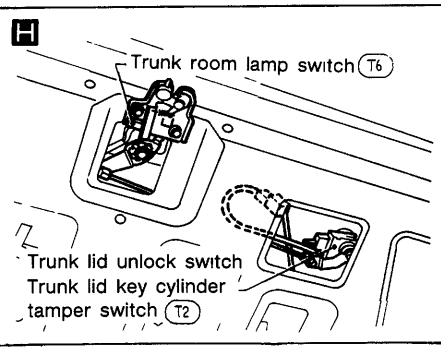


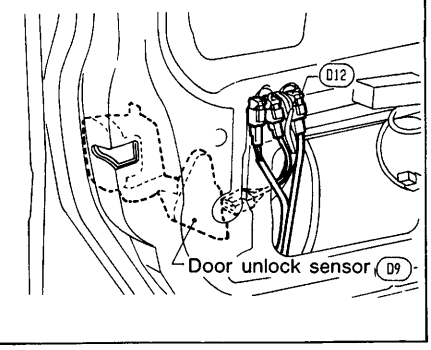




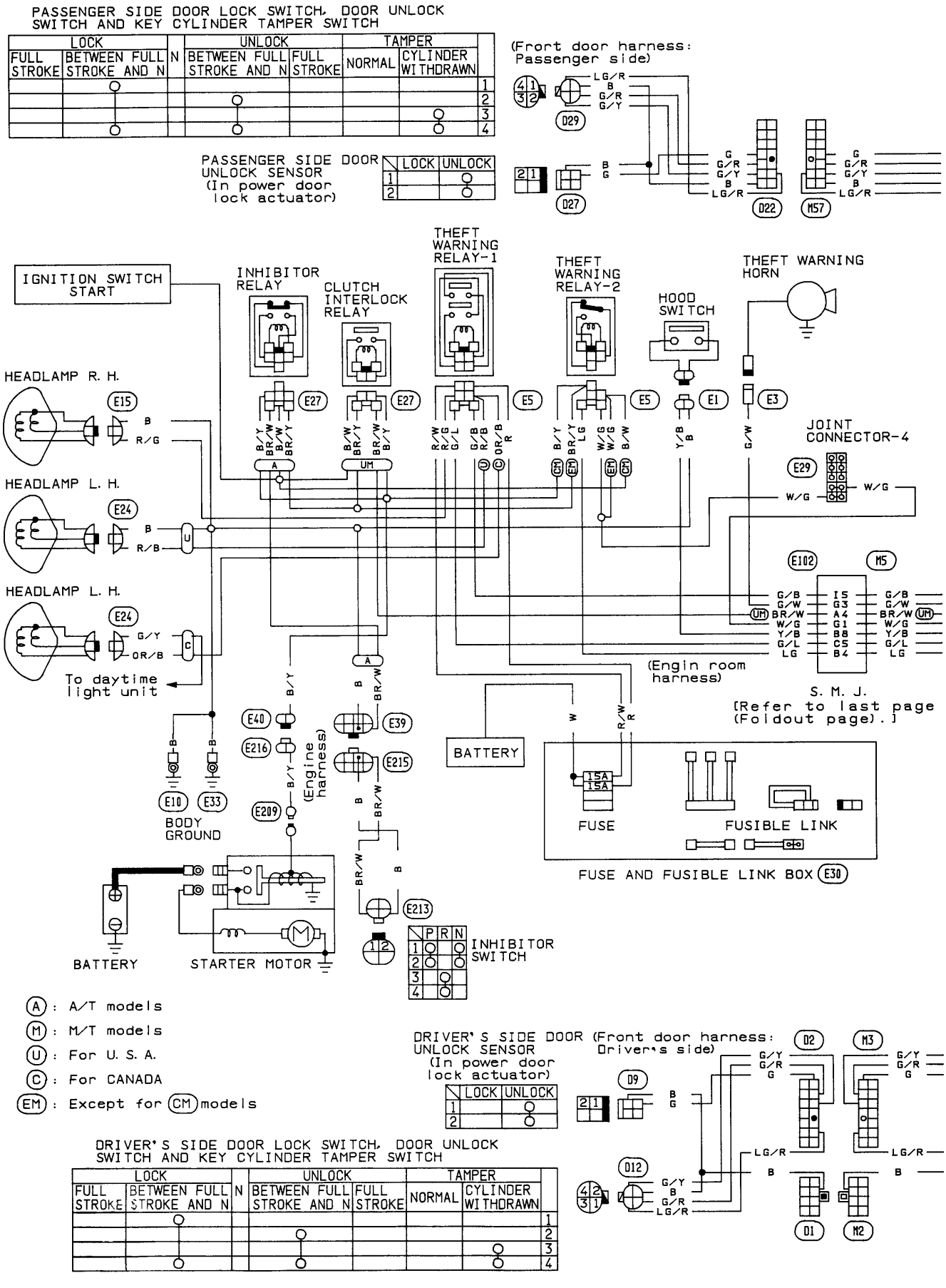




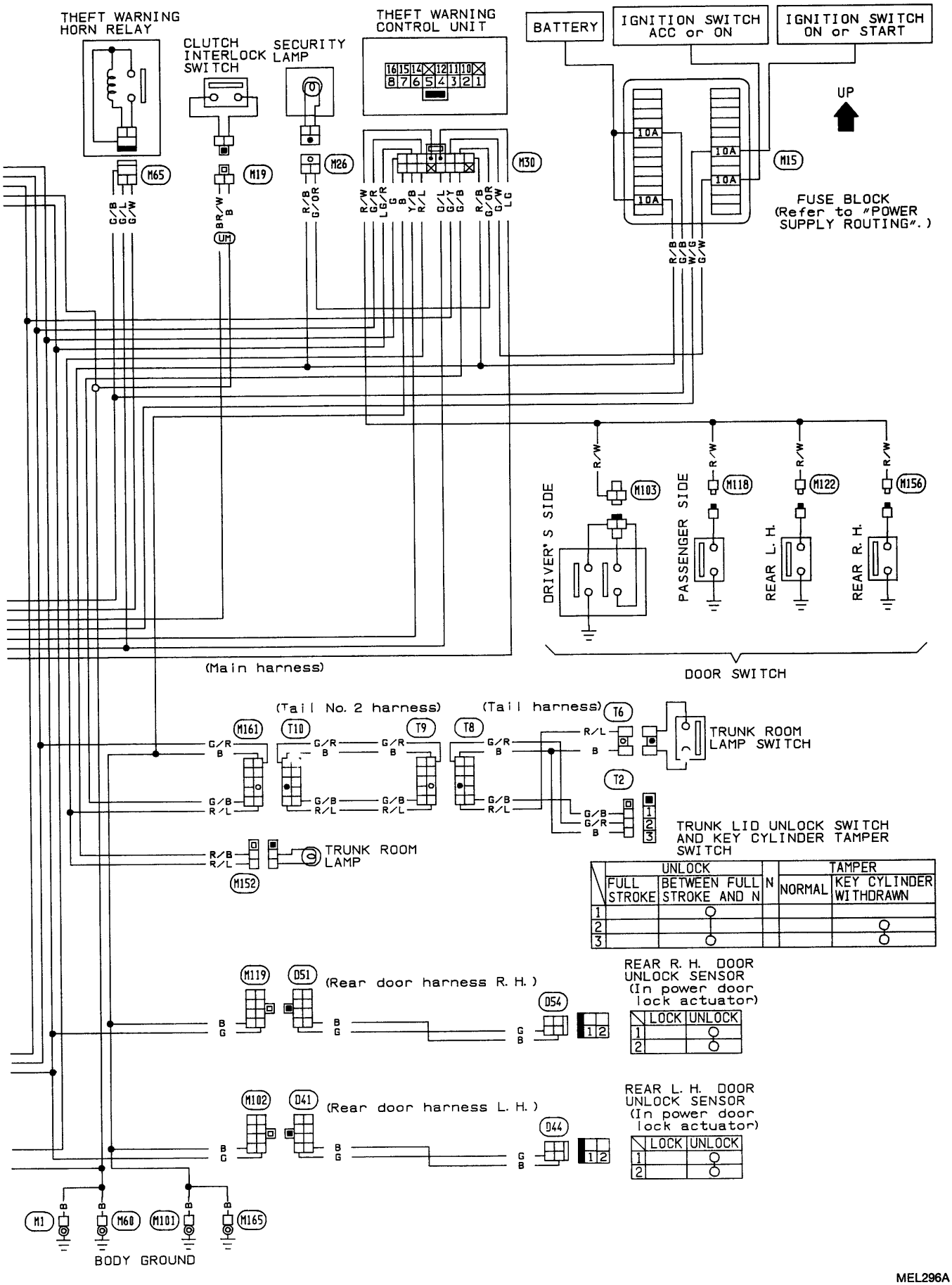




Wiring Diagram



Wiring Diagram (Cont'd)

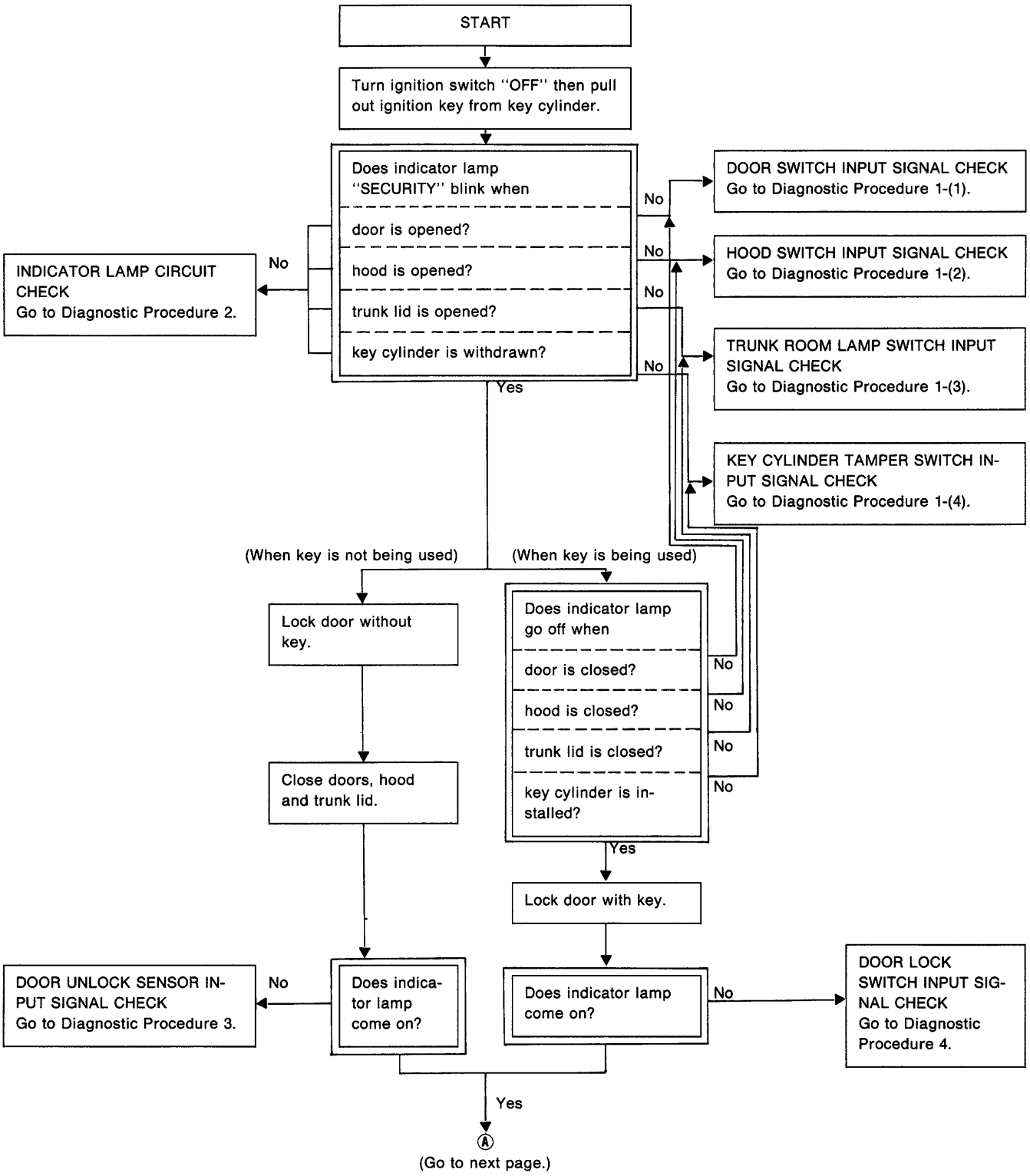


MEL296A

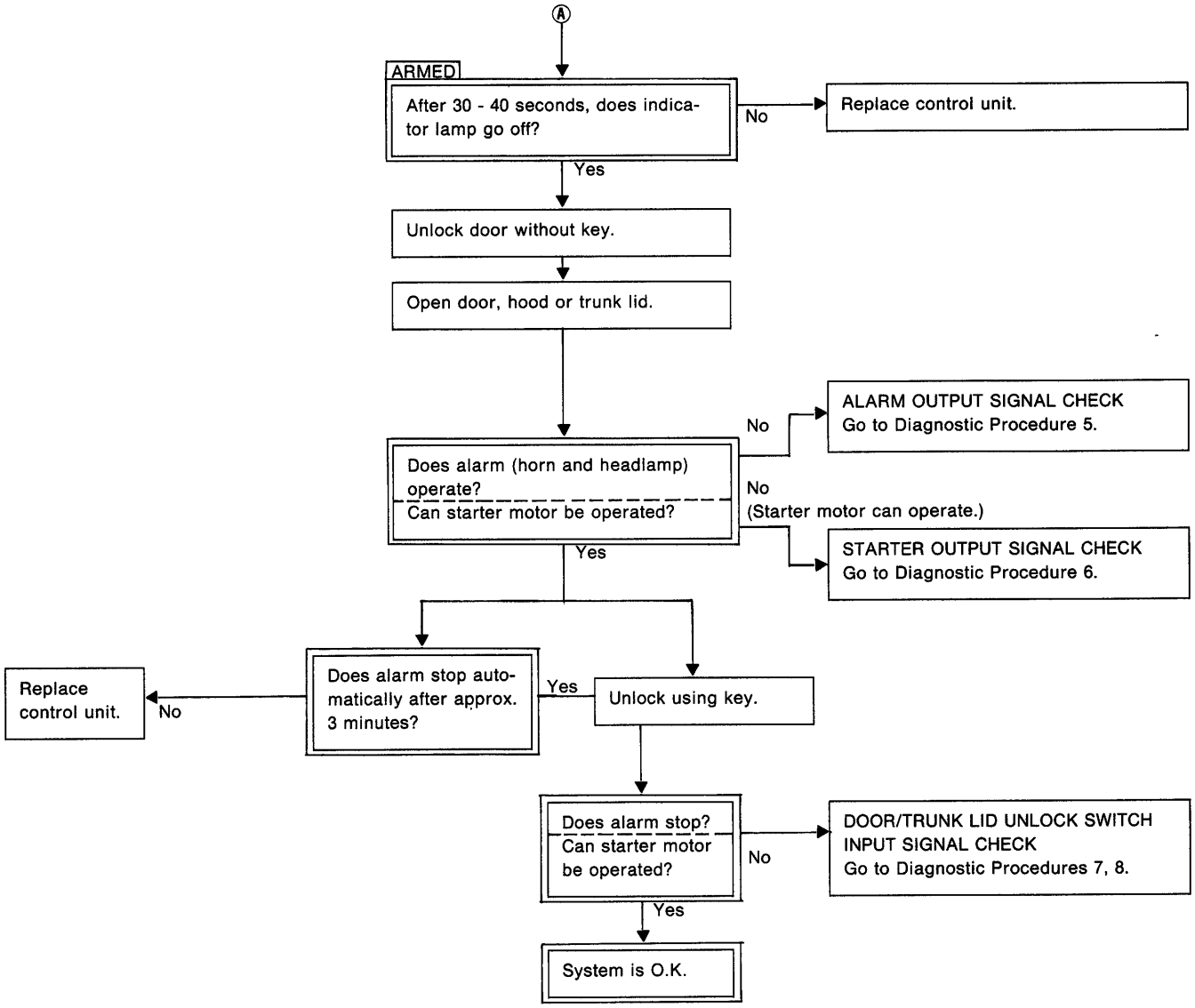
Trouble Diagnoses

SYSTEM OPERATION CHECK

If ignition switch is set in the "ACC" position in the step of START to ARMED or in the ARMED state shown in this flow chart, the system operation is canceled.

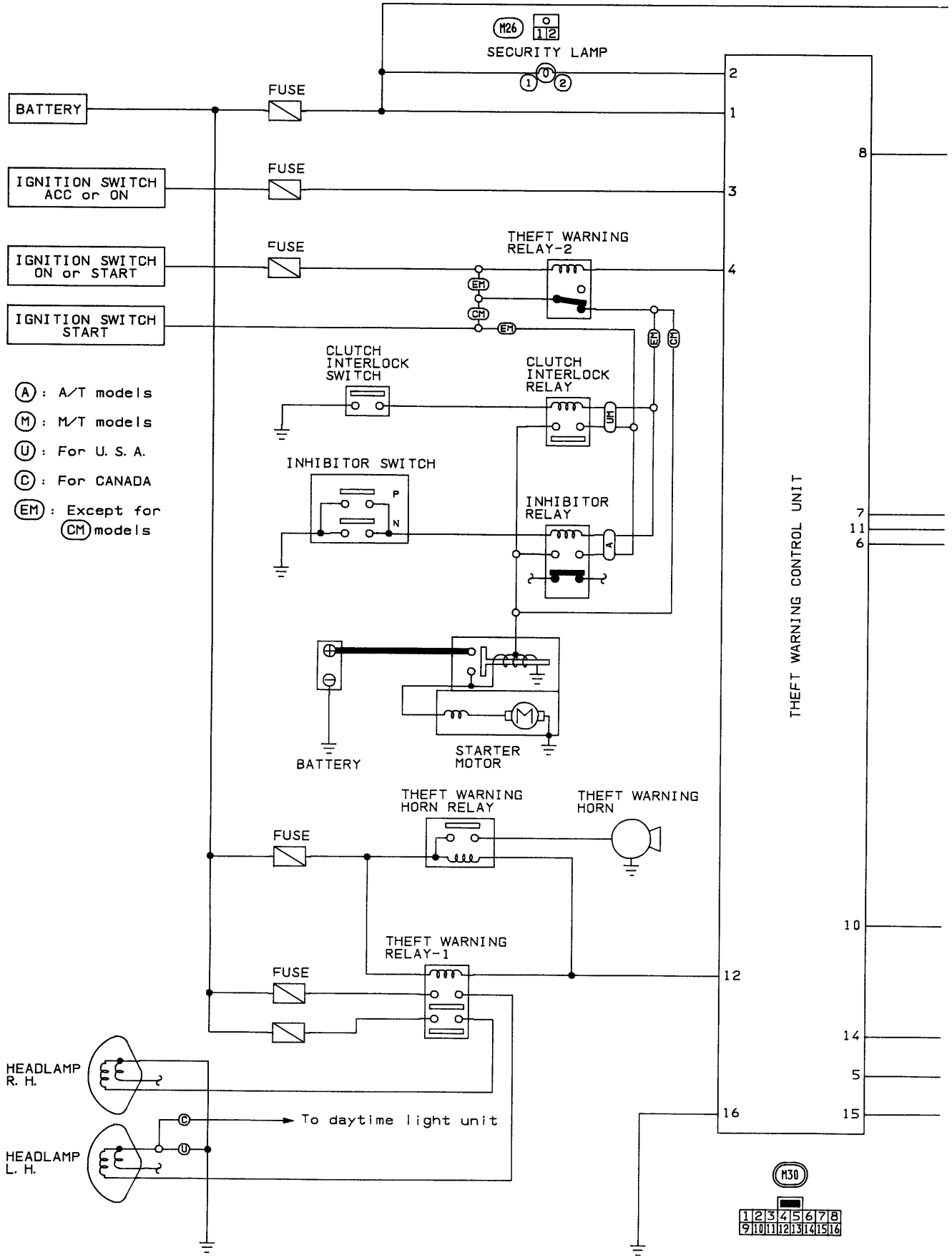


Trouble Diagnoses (Cont'd)

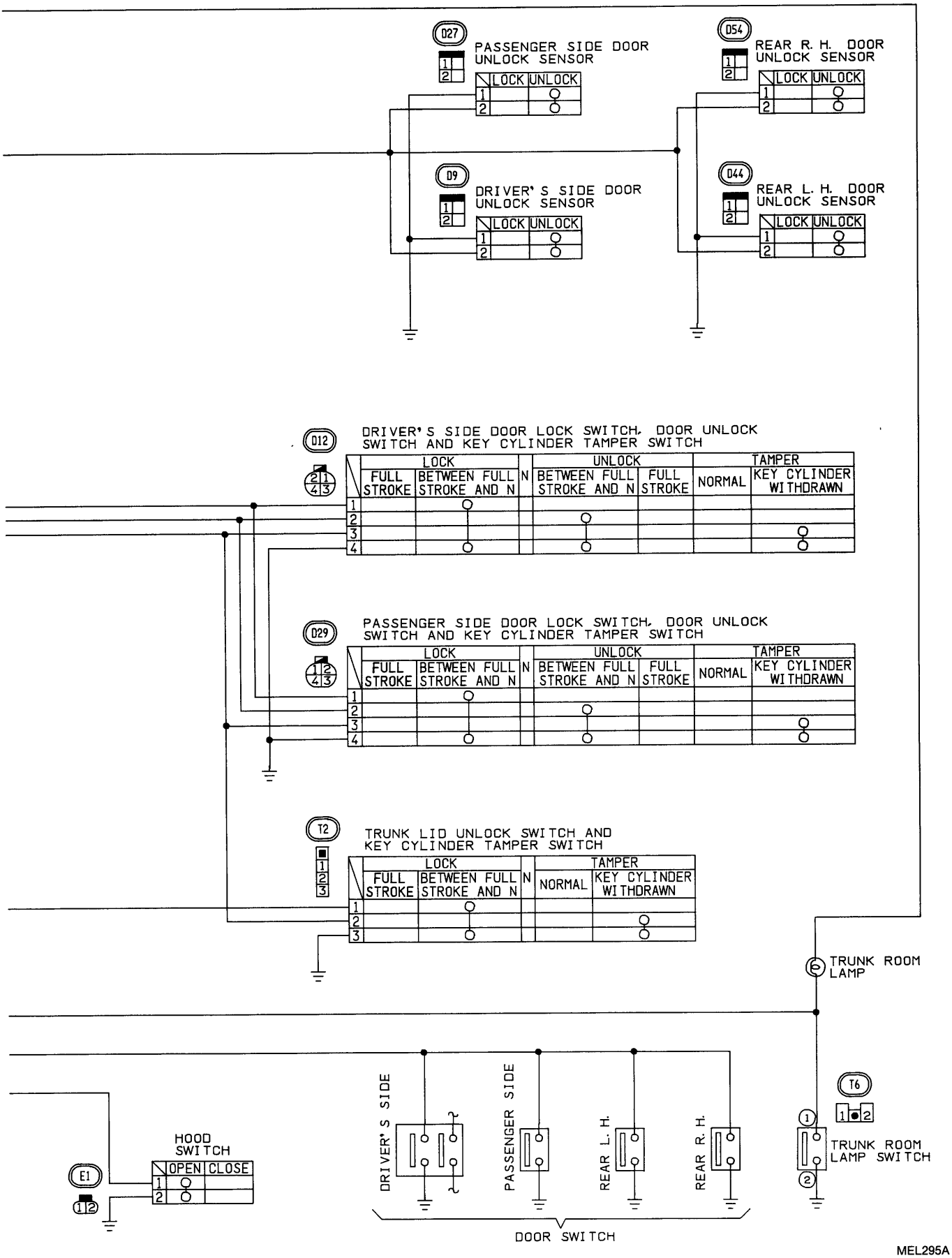


Trouble Diagnoses (Cont'd)

CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK

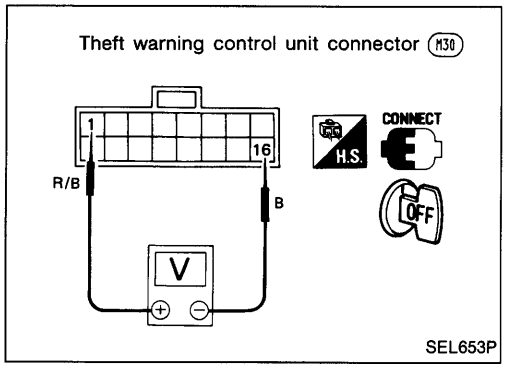


Trouble Diagnoses (Cont'd)



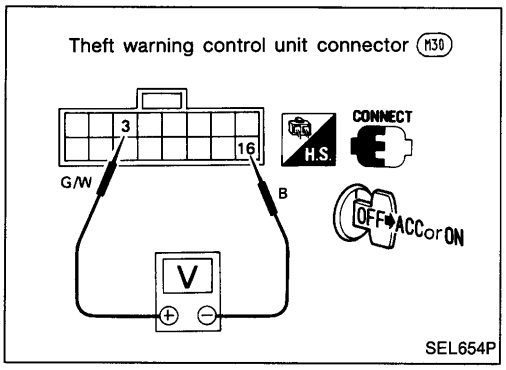
Trouble Diagnoses (Cont'd)

POWER SUPPLY AND GROUND CIRCUIT CHECK



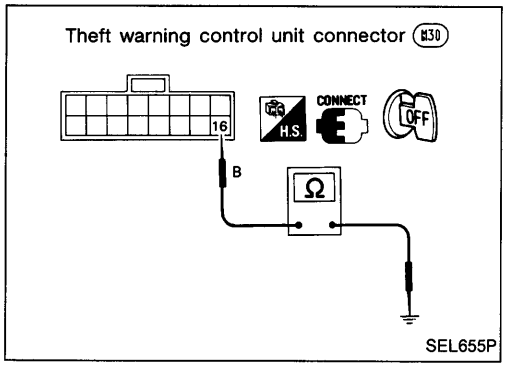
Main power supply circuit check

Terminals	Ignition switch position		
	OFF	ACC	ON
① - ⑯	Battery voltage	Battery voltage	Battery voltage



Power supply circuit check for system cancel

Terminals	Ignition switch position		
	OFF	ACC	ON
③ - ⑯	0V	Battery voltage	Battery voltage



Ground circuit check

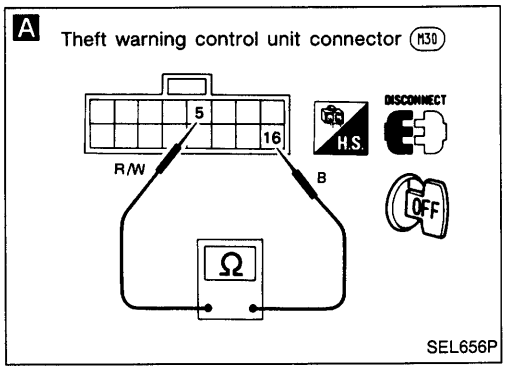
Terminals	Continuity
⑯ - Ground	Yes

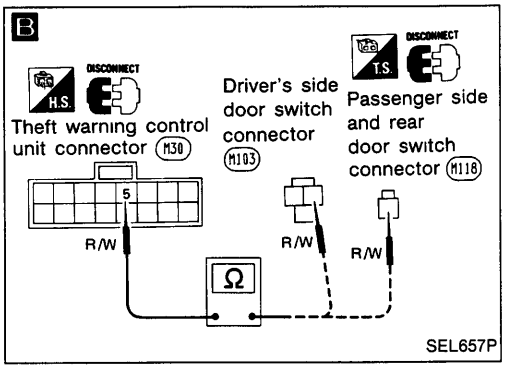
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1

SYMPTOM:
- **Indicator lamp does not blink.**
- **Indicator lamp remains blinking.**

Diagnostic procedure 1-(1)





A

DOOR SWITCH INPUT SIGNAL CHECK
Check continuity between control unit harness terminals ⑤ and ⑯.

Condition	Continuity
All doors are closed	No
At least one door is open	Yes

O.K. → Go to Diagnostic Procedure 2.

N.G.

DOOR SWITCH CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace door switch.

O.K.

B

DOOR SWITCH CIRCUIT CHECK
Check harness continuity between control unit harness terminal ⑤ and door switch harness terminal.
Continuity should exist.

N.G. → Repair harness or connectors.

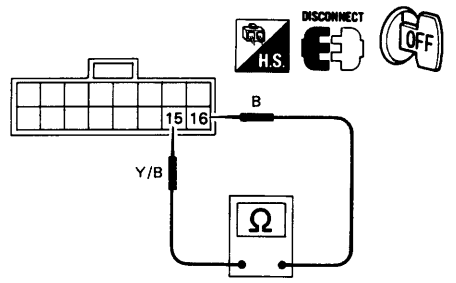
O.K.

CHECK THE CONNECTIONS AT EACH CONNECTOR.

Trouble Diagnoses (Cont'd)

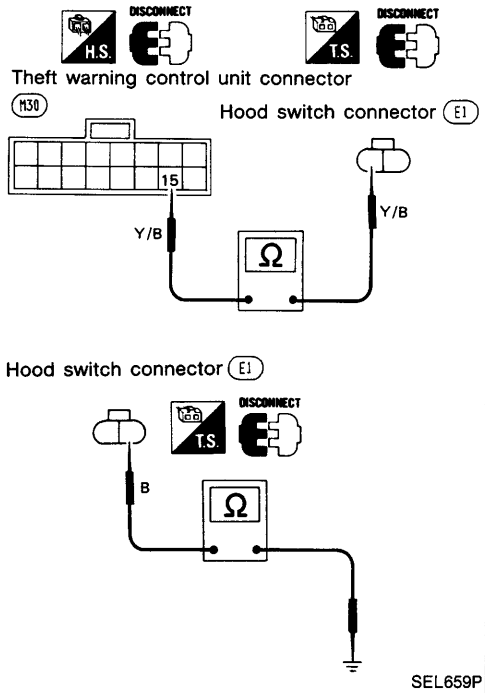
Diagnostic procedure 1-(2)

A Theft warning control unit connector (M30)



SEL658P

B



SEL659P

A

HOOD SWITCH INPUT SIGNAL CHECK
Check continuity between control unit harness terminals ⑮ and ⑯.

Condition	Continuity
Hood is open	Yes
Hood is closed	No

O.K. → Go to Diagnostic Procedure 2.

N.G.

Check hood switch and hood fitting condition.

N.G. → Adjust installation of hood switch or hood.

O.K.

HOOD SWITCH CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace hood switch.

O.K.

B

HOOD SWITCH CIRCUIT CHECK
- Check harness continuity between control unit harness terminal ⑮ and hood switch harness terminal.
- Check harness continuity between hood switch terminal and body ground.

Continuity should exist.

N.G. → Repair harness or connectors.

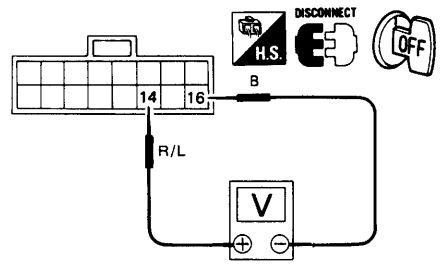
O.K.

CHECK THE CONNECTIONS AT EACH CONNECTOR.

Trouble Diagnoses (Cont'd)

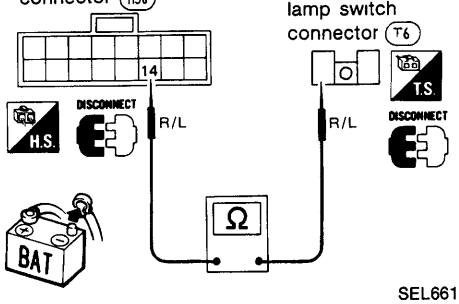
Diagnostic procedure 1-(3)

A Theft warning control unit connector (M30)



B Theft warning control unit connector (M30)

Trunk room lamp switch connector (T6)



A

TRUNK ROOM LAMP SWITCH INPUT SIGNAL CHECK
Check voltage between control unit harness terminals ⑭ and ⑯.

Condition	Voltage
Trunk lid is open	Approx. 0V
Trunk lid is closed	Approx. 12V

O.K. → Go to Diagnostic Procedure 2.

N.G.

Does trunk room lamp come on?

Yes → B

No

TRUNK ROOM LAMP SWITCH CHECK
Refer to "Electrical Components Inspection".

O.K. → B

N.G.

Replace trunk room lamp switch.

B

TRUNK ROOM LAMP SWITCH CIRCUIT CHECK
Check harness continuity between control unit harness terminal ⑭ and trunk room lamp harness terminal.

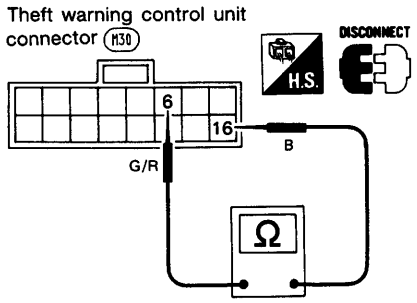
O.K.

CHECK THE CONNECTIONS AT EACH CONNECTOR.

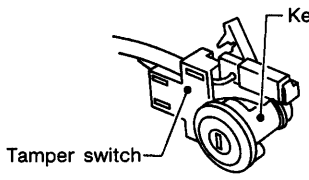
Trouble Diagnoses (Cont'd)

Diagnostic procedure 1-(4)

A

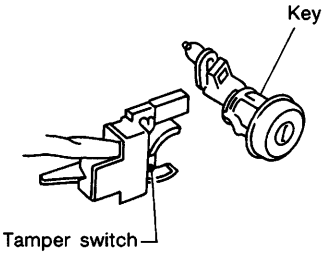


[Example]



No continuity ... O.K.

[Example]

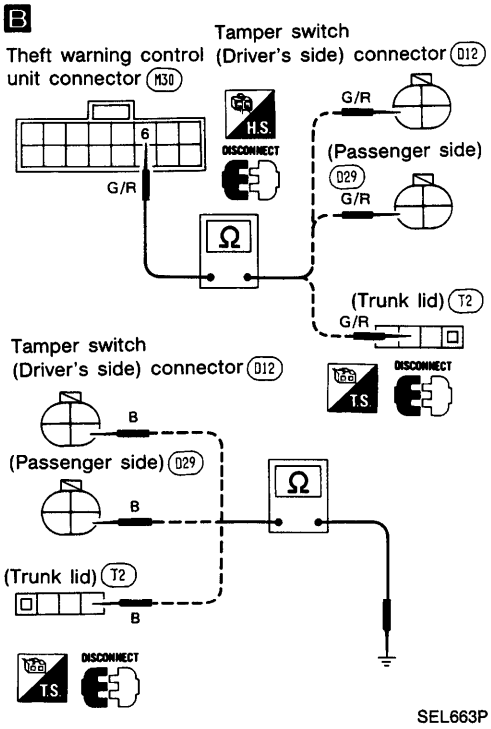


Read switch turns on when key cylinder is removed.

Continuity exists ... O.K.

SEL662P

B



SEL663P

A

KEY CYLINDER TAMPER SWITCH INPUT SIGNAL CHECK
Check continuity between control unit harness terminals ⑥ and ⑯.

Condition	Continuity
Tamper switch is	
Normal	No
Removed	Yes

O.K. → Go to Diagnostic Procedure 2.

N.G.

KEY CYLINDER TAMPER SWITCH CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace key cylinder tamper switch.

O.K.

B

KEY CYLINDER TAMPER SWITCH CIRCUIT CHECK

- Check harness continuity between control unit harness terminal ⑥ and tamper switch harness terminal.
- Check harness continuity between tamper switch terminal and body ground.

Continuity should exist.

N.G. → Repair harness and connectors.

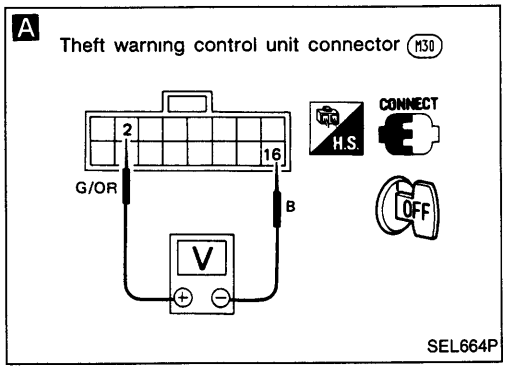
O.K.

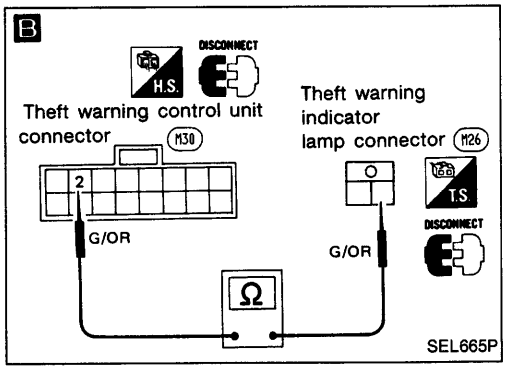
CHECK THE CONNECTIONS AT EACH CONNECTOR.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 2

SYMPTOM: Indicator lamp does not blink.





A

INDICATOR LAMP OUTPUT SIGNAL CHECK
Check voltage between control unit harness terminals ② and ⑯.
Pointer of voltmeter should deflect intermittently.

N.G. → Replace control unit.

O.K. ↓

INDICATOR LAMP CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace indicator lamp.

O.K. ↓

B

INDICATOR LAMP CIRCUIT CHECK
Check harness continuity between control unit harness terminal ② and indicator lamp harness terminal.
Continuity should exist.

N.G. → Repair harness or connectors.

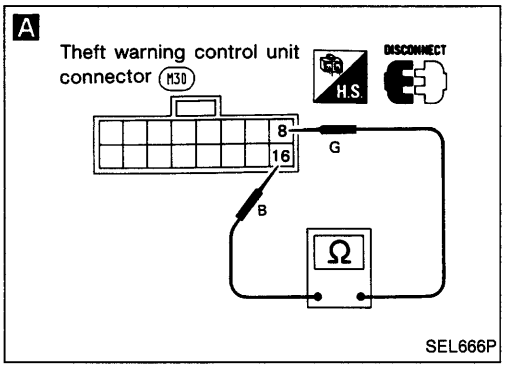
O.K. ↓

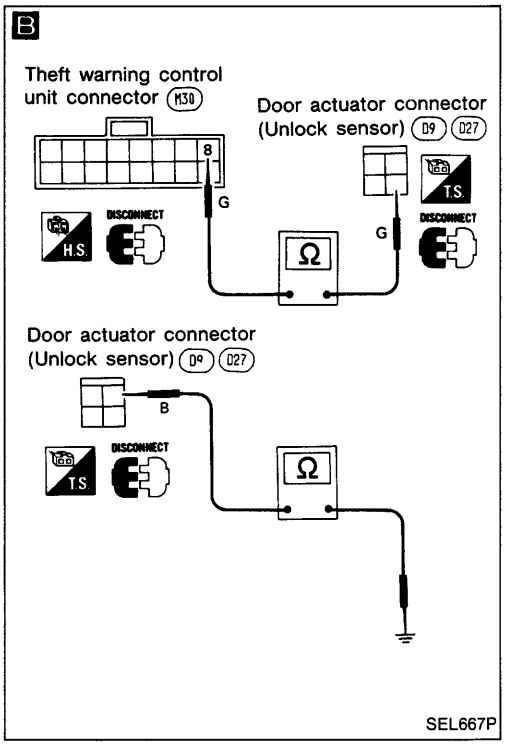
CHECK THE CONNECTIONS AT EACH CONNECTOR.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 3

SYMPTOM: Indicator lamp does not come on.





A

DOOR UNLOCK SENSOR INPUT SIGNAL CHECK
Check continuity between control unit harness terminals ⑧ and ⑯

Condition	Continuity
Locked	No
Unlocked	Yes

O.K. → Go to Diagnostic Procedure 4.

O.K. → Replace control unit.

N.G. →

DOOR UNLOCK SENSOR CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace door lock actuator.

O.K. →

B

DOOR UNLOCK SENSOR CIRCUIT CHECK
- Check harness continuity between control unit harness terminal ⑧ and door actuator terminal.
- Check harness continuity between door actuator terminal and body ground.

Continuity should exist.

N.G. → Repair harness or connectors.

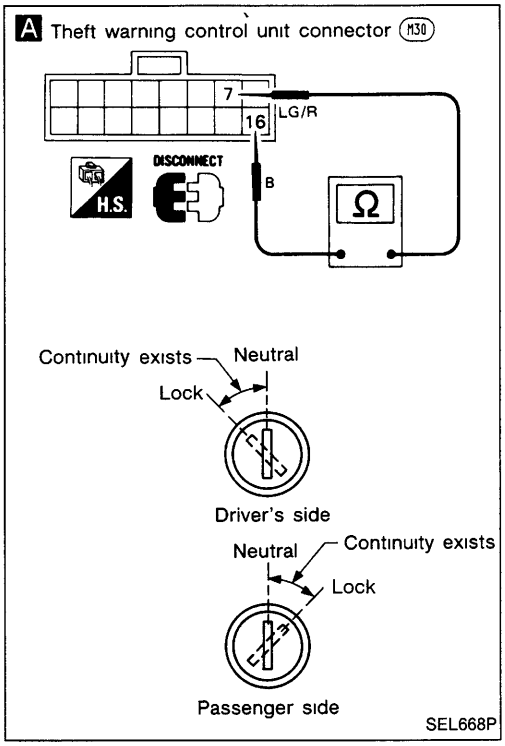
O.K. →

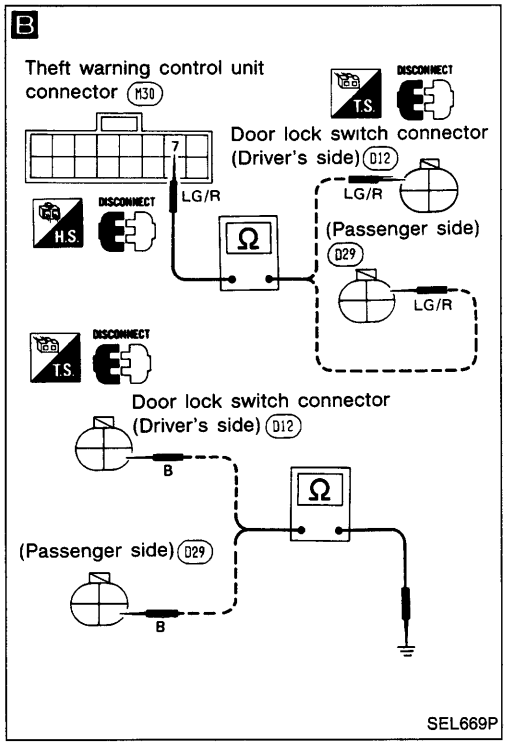
CHECK THE CONNECTIONS AT EACH CONNECTOR.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4

SYMPTOM: Indicator lamp does not come on.





A

DOOR LOCK SWITCH INPUT SIGNAL CHECK (LOCK SIGNAL)
Check continuity between control unit harness terminals ⑦ and ⑯.

Key position	Continuity
Neutral/Lock	No
Between neutral and lock	Yes

O.K. → Go to Diagnostic Procedure 3. → O.K. → Replace control unit.

N.G.

DOOR LOCK SWITCH CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace key cylinder switch.

O.K.

B

DOOR LOCK SWITCH CIRCUIT CHECK
- Check harness continuity between control unit harness terminal ⑦ and door lock switch terminal.
- Check harness continuity between door lock switch terminal and body ground.

Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

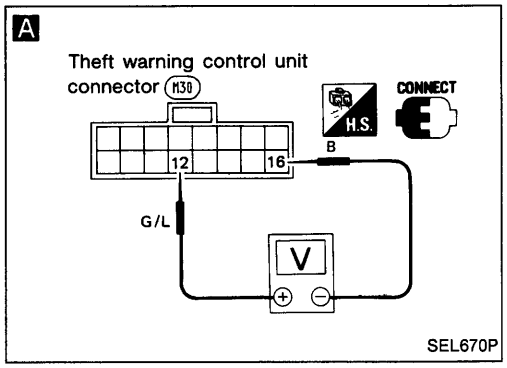
CHECK THE CONNECTIONS AT EACH CONNECTOR.

Trouble Diagnoses (Cont'd)

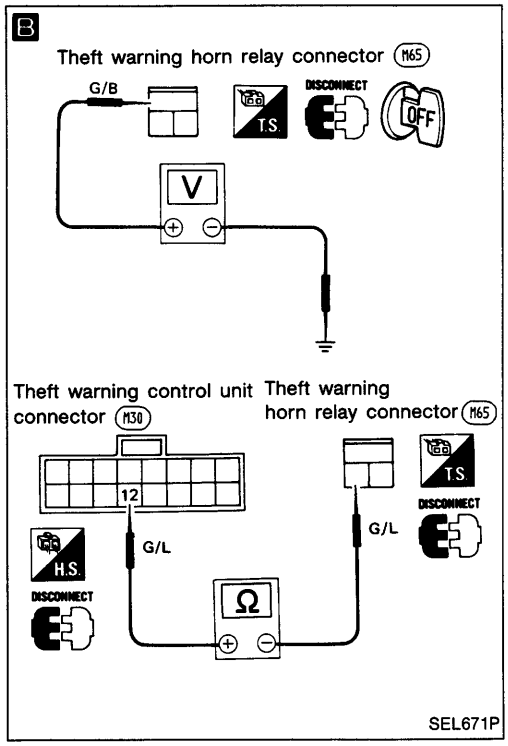
DIAGNOSTIC PROCEDURE 5

SYMPTOM: Alarm does not operate.

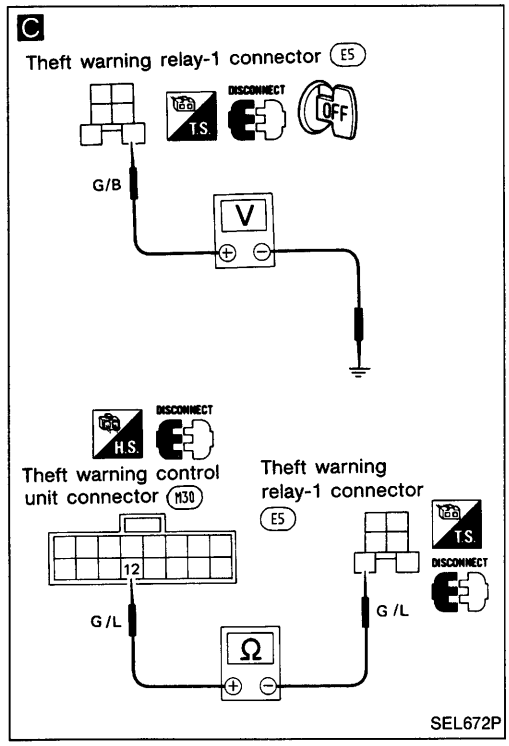
A



B



C



A

ALARM SIGNAL OUTPUT CHECK
Check voltage between control unit harness terminals ⑫ and ⑯.

Condition	Voltmeter
Except alarm phase	12V
Alarm phase	Pointer deflects intermittently

N.G. → Replace control unit.

O.K. ↓

Check theft warning horn relay. N.G. → Replace relay.

O.K. ↓

B

THEFT WARNING HORN CIRCUIT CHECK
Check if voltage across theft warning horn relay harness terminal and body is 12V.
Check continuity between theft warning horn relay terminal and control unit harness terminal ⑫.
Continuity should exist.

N.G. → Repair harness and connectors.

O.K. ↓

Check theft warning relay-1. N.G. → Replace theft warning relay-1.

O.K. ↓

C

THEFT WARNING HEADLAMP CIRCUIT CHECK
Check if voltage across theft warning relay-1 harness terminal and body is 12V.
Check continuity between theft warning relay-1 terminal and control unit harness terminals ⑫.

N.G. → Repair harness and connectors.

O.K. ↓

Does headlamp come on when turning lighting switch "ON"? No → Check headlamp system. Refer to "HEADLAMP".

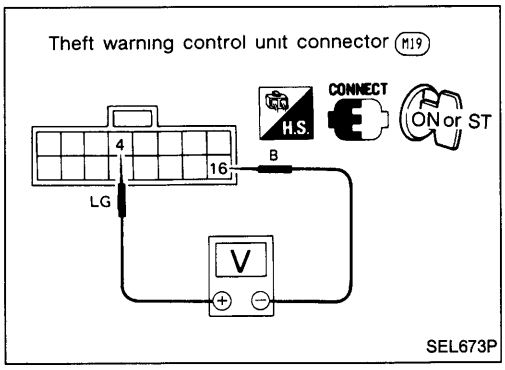
Yes ↓

Repair harness and connectors between lamp relay and headlamp.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 6

SYMPTOM: STARTER MOTOR can be operated. (Starter killed phase)



Approx. 12V

STARTER MOTOR KILL OUTPUT SIGNAL CHECK
Check voltage between control unit harness terminals ④ and ⑯ when ignition switch is turned to ON or "START".

→ Replace control unit.

↓ Approx. 0 volt

Check theft warning relay-2.

N.G. → Replace theft warning relay-2.

↓ O.K.

Repair harness between control unit and theft warning relay-2.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 7

SYMPTOM: Alarm does not stop even if stop signal is given.

A

DOOR UNLOCK SWITCH INPUT SIGNAL CHECK (UNLOCK SIGNAL)
Check continuity between control unit harness terminals ⑪ and ⑯.

Key position	Continuity
Neutral/Unlock	No
Between neutral and unlock	Yes

O.K. → Replace control unit.

N.G.

DOOR UNLOCK SWITCH CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace key cylinder switch.

O.K.

B

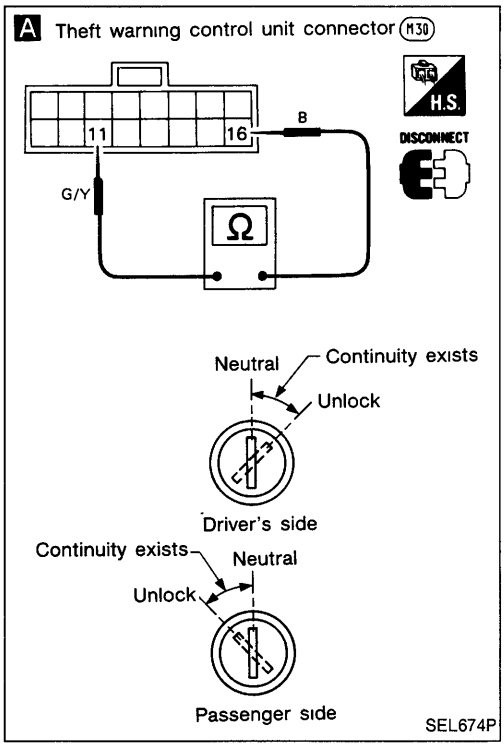
DOOR UNLOCK SWITCH CIRCUIT CHECK
- Check harness continuity between control unit harness terminal ⑪ and door unlock switch terminal.
- Check harness continuity between door unlock switch terminal and body ground.

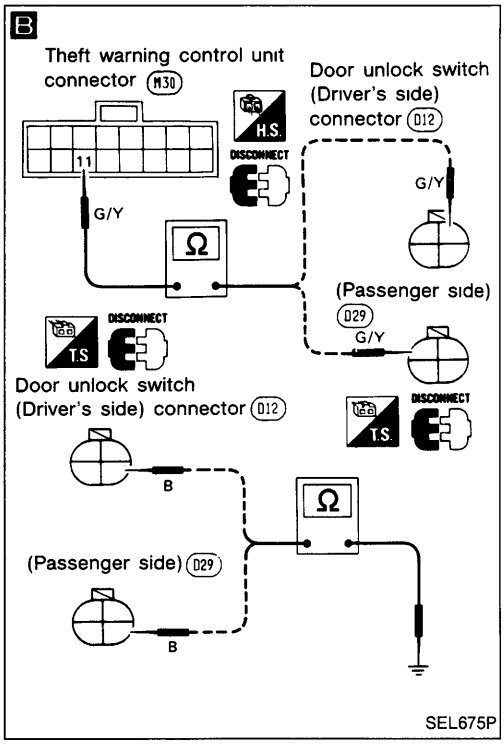
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK THE CONNECTIONS AT EACH CONNECTOR.



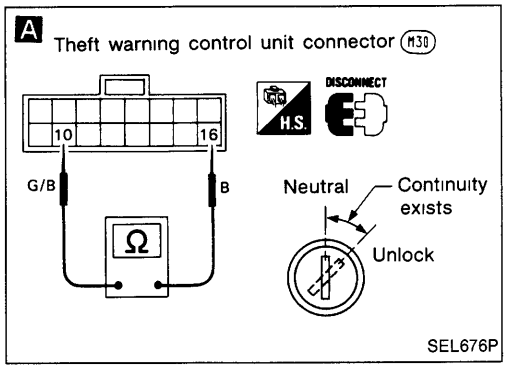


Trouble Diagnoses (Cont'd)

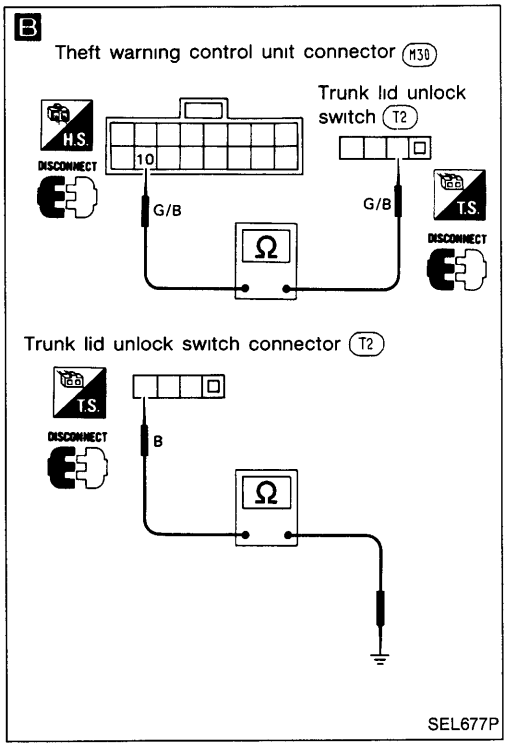
DIAGNOSTIC PROCEDURE 8

SYMPTOM: Alarm does not stop even if stop signal is given.

A



B



A

TRUNK LID UNLOCK SWITCH INPUT SIGNAL CHECK (UNLOCK SIGNAL)
Check continuity between control unit harness terminals ⑩ and ⑯.

Key position	Continuity
Neutral/Unlock	No
Between neutral and unlock	Yes

O.K. → Replace control unit.

N.G.

TRUNK LID UNLOCK SWITCH CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace key cylinder switch.

O.K.

B

TRUNK LID UNLOCK SWITCH CIRCUIT CHECK
- Check harness continuity between control unit harness terminal ⑩ and trunk lid unlock switch terminal.
- Check harness continuity between trunk lid unlock switch terminal and body ground.

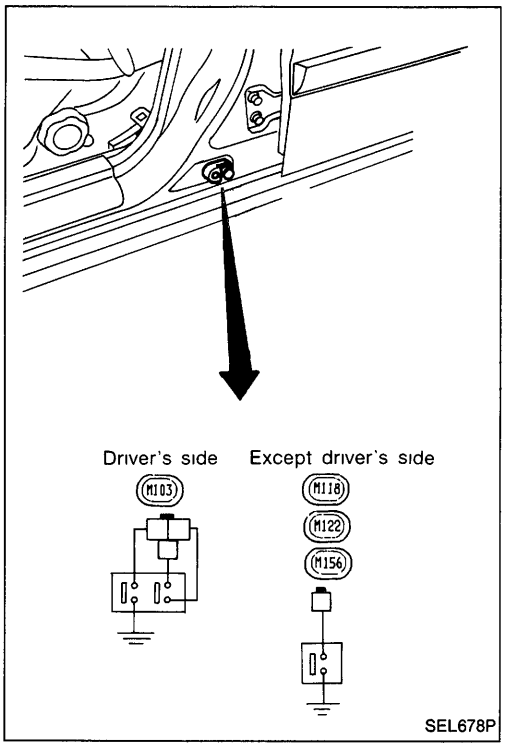
N.G. → Repair harness or connectors.

O.K.

CHECK THE CONNECTIONS AT EACH CONNECTOR.

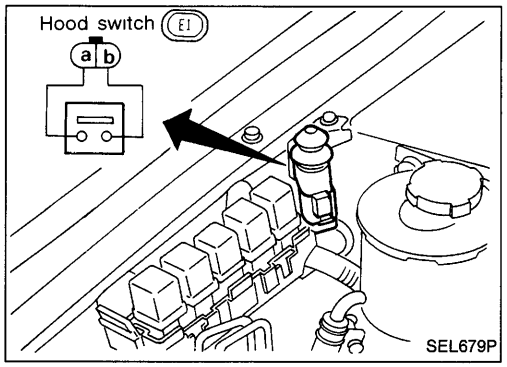
Trouble Diagnoses (Cont'd)

ELECTRICAL COMPONENTS INSPECTION



Door switches

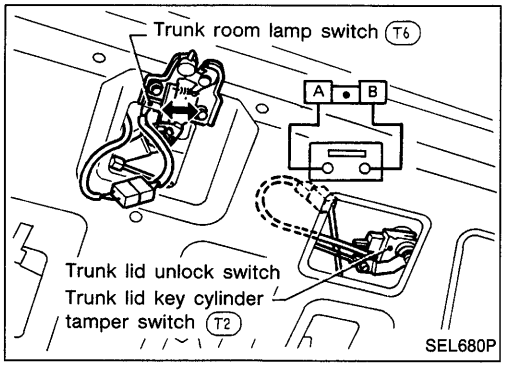
Check continuity between terminal and switch body.



Hood switch

Check continuity between terminals when hood switch is pushed and released.

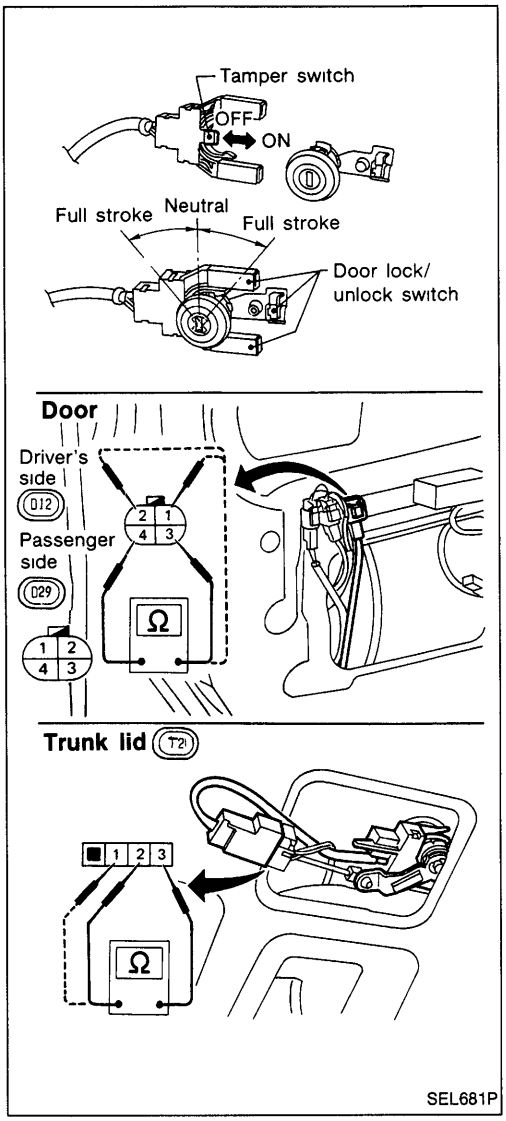
Terminal	Pushed	Released
a		○
b		○



Trunk room lamp switch

Terminal \ Trunk lid	Closed	Open
a		○
b		○

Trouble Diagnoses (Cont'd)



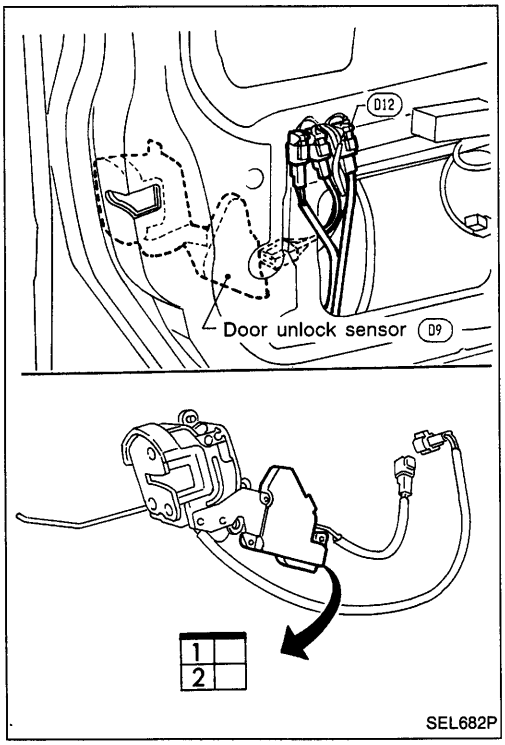
Key cylinder tamper switch, door lock switch and door unlock switch

- **Door**

	TAMPER SWITCH		DOOR LOCK SWITCH			DOOR UNLOCK SWITCH	
	Key cylinder is installed	Key cylinder is removed	Full stroke	Between full stroke and neutral	Neutral	Between full stroke and neutral	Full stroke
1				○			
2						○	
3		○					
4		○		○		○	

Trunk lid

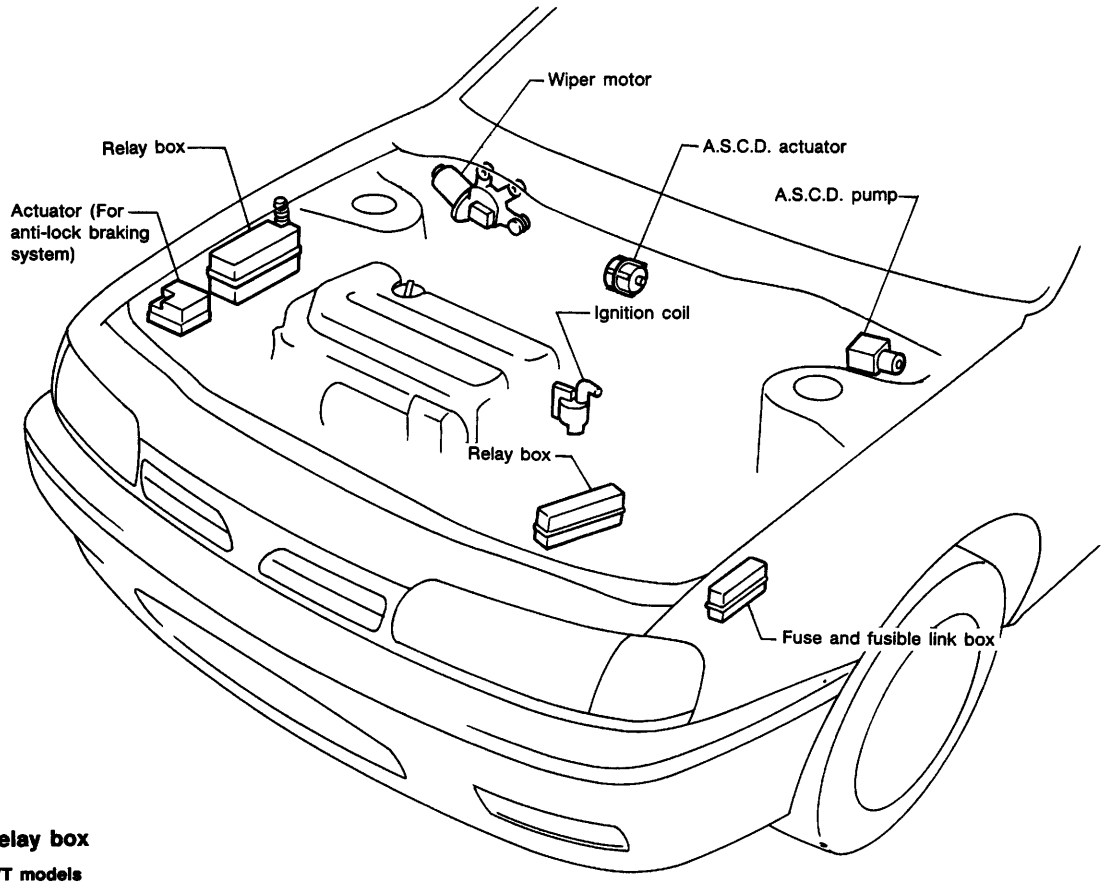
	TAMPER SWITCH		Trunk lid unlock switch		
	Key cylinder is installed	Key cylinder is removed	Full stroke	Between full stroke and neutral	Neutral
1				○	
2		○			
3		○		○	



Door unlock sensor

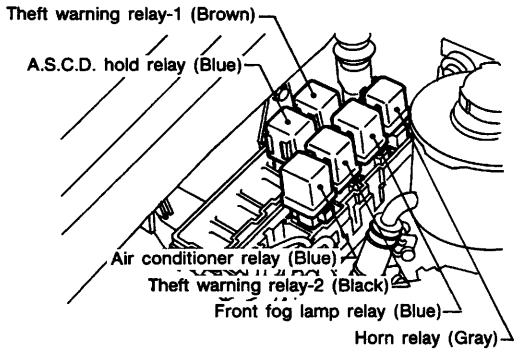
	LOCK	UNLOCK
1		○
2		○

Engine Compartment

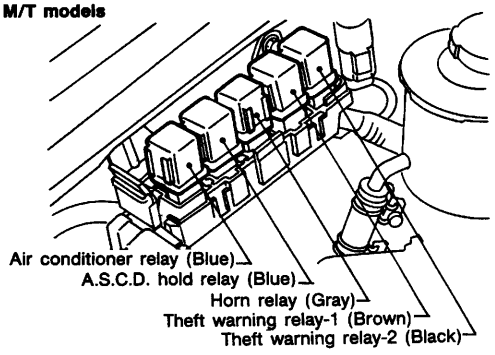


Relay box

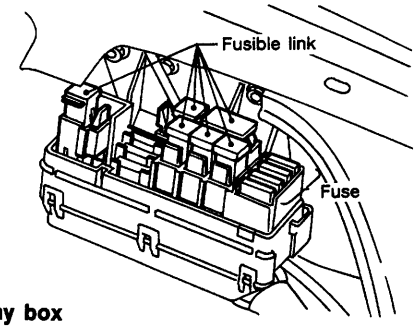
A/T models



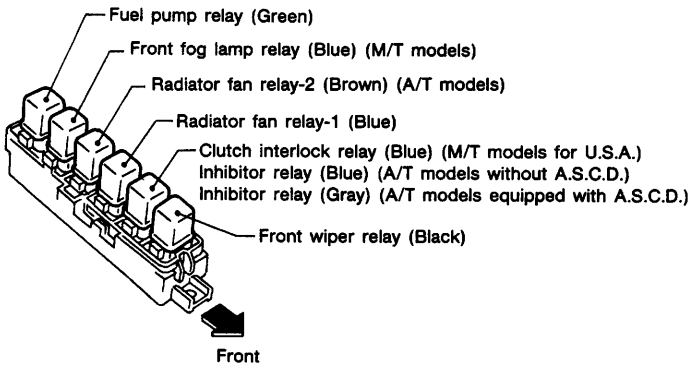
M/T models



Fuse and fusible link box

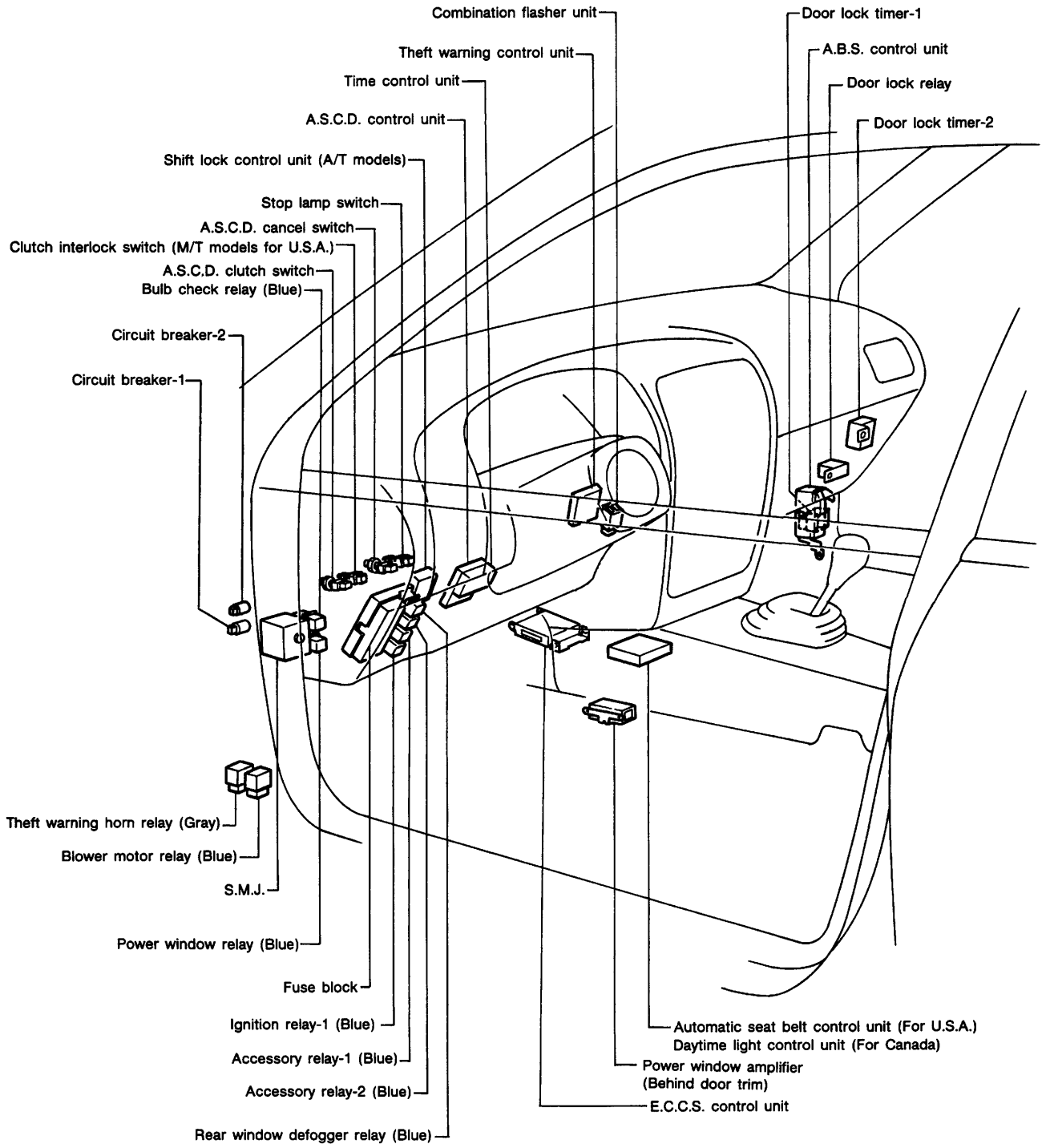


Relay box



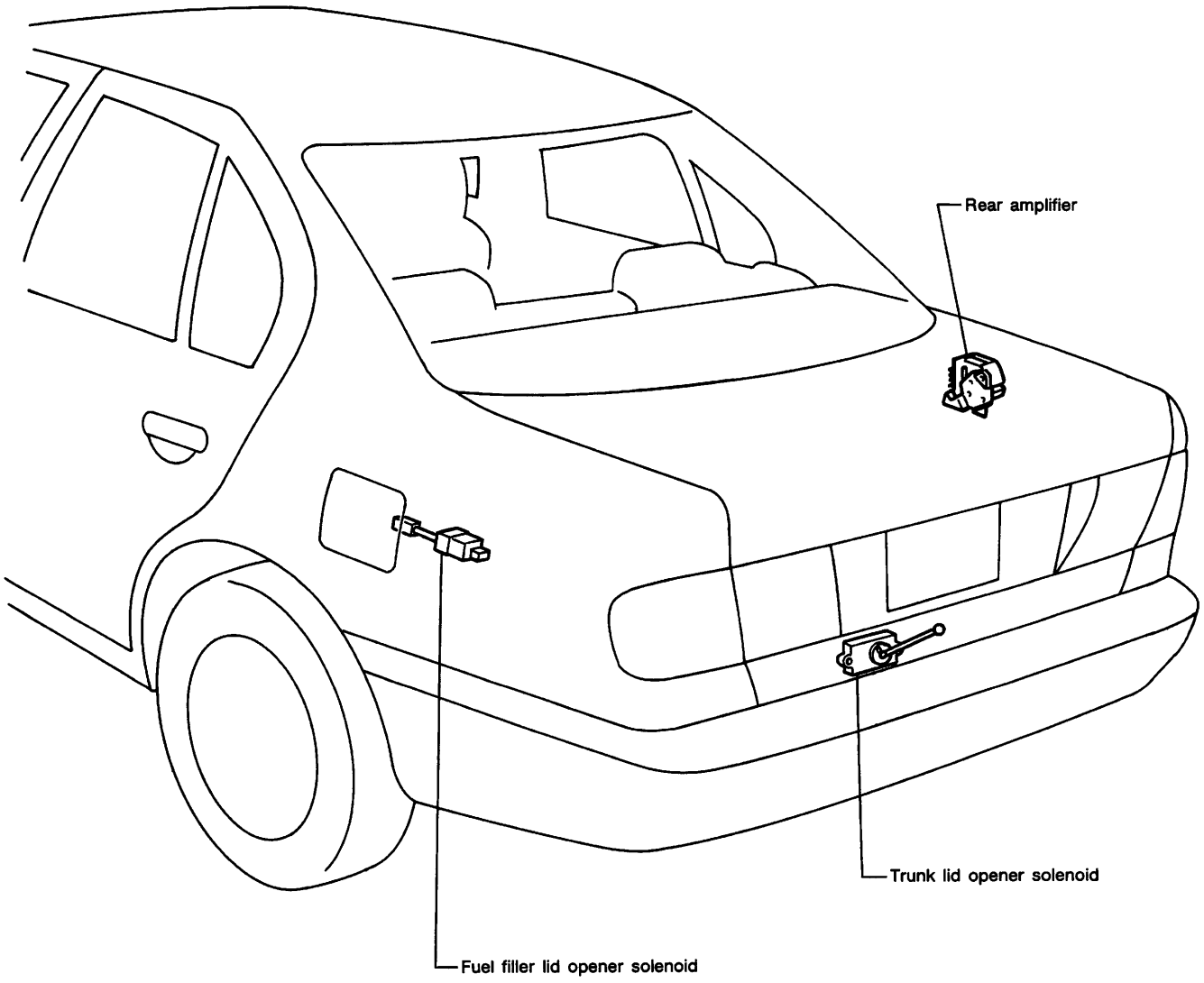
MEL265A

Passenger Compartment



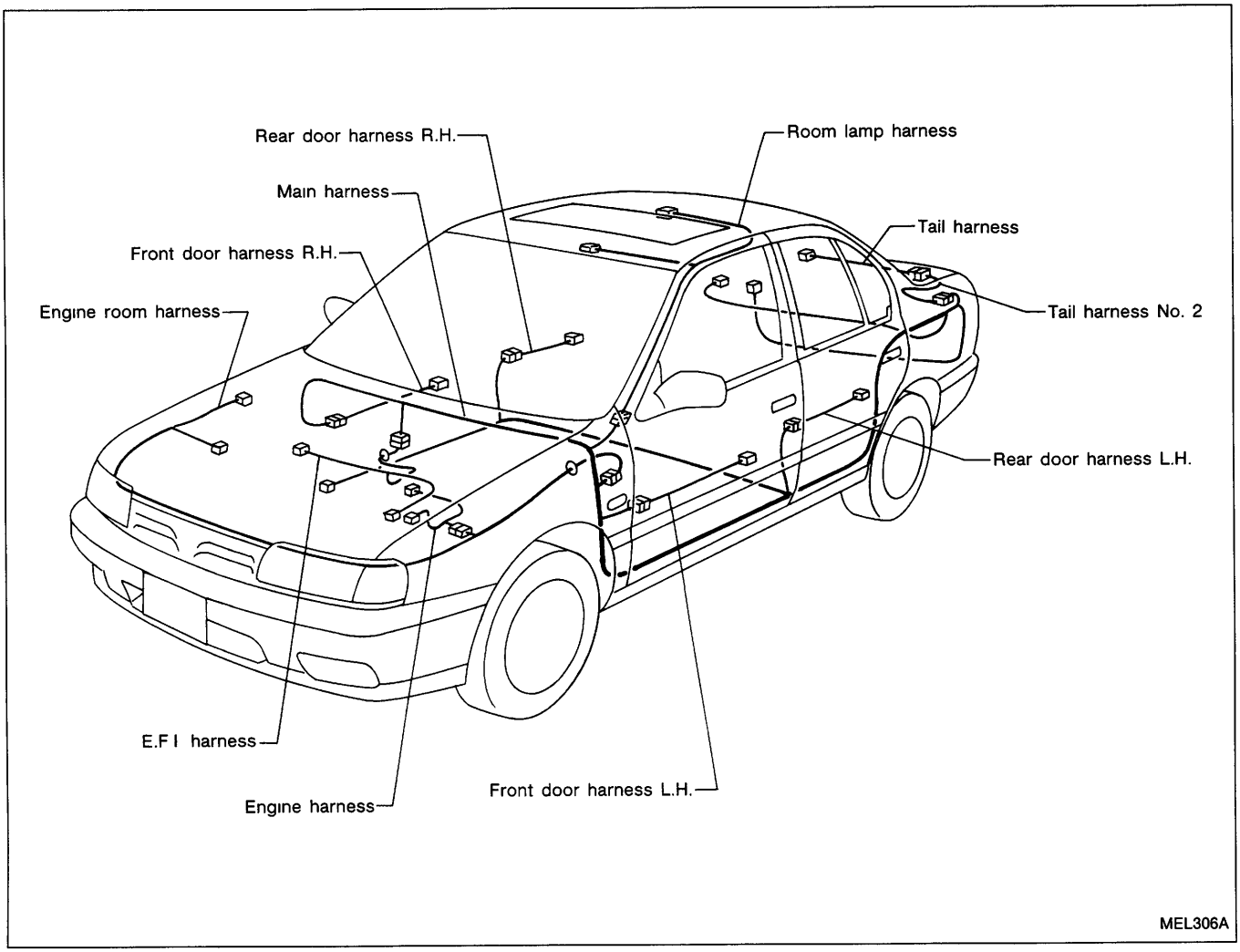
MEL266A

Luggage Compartment

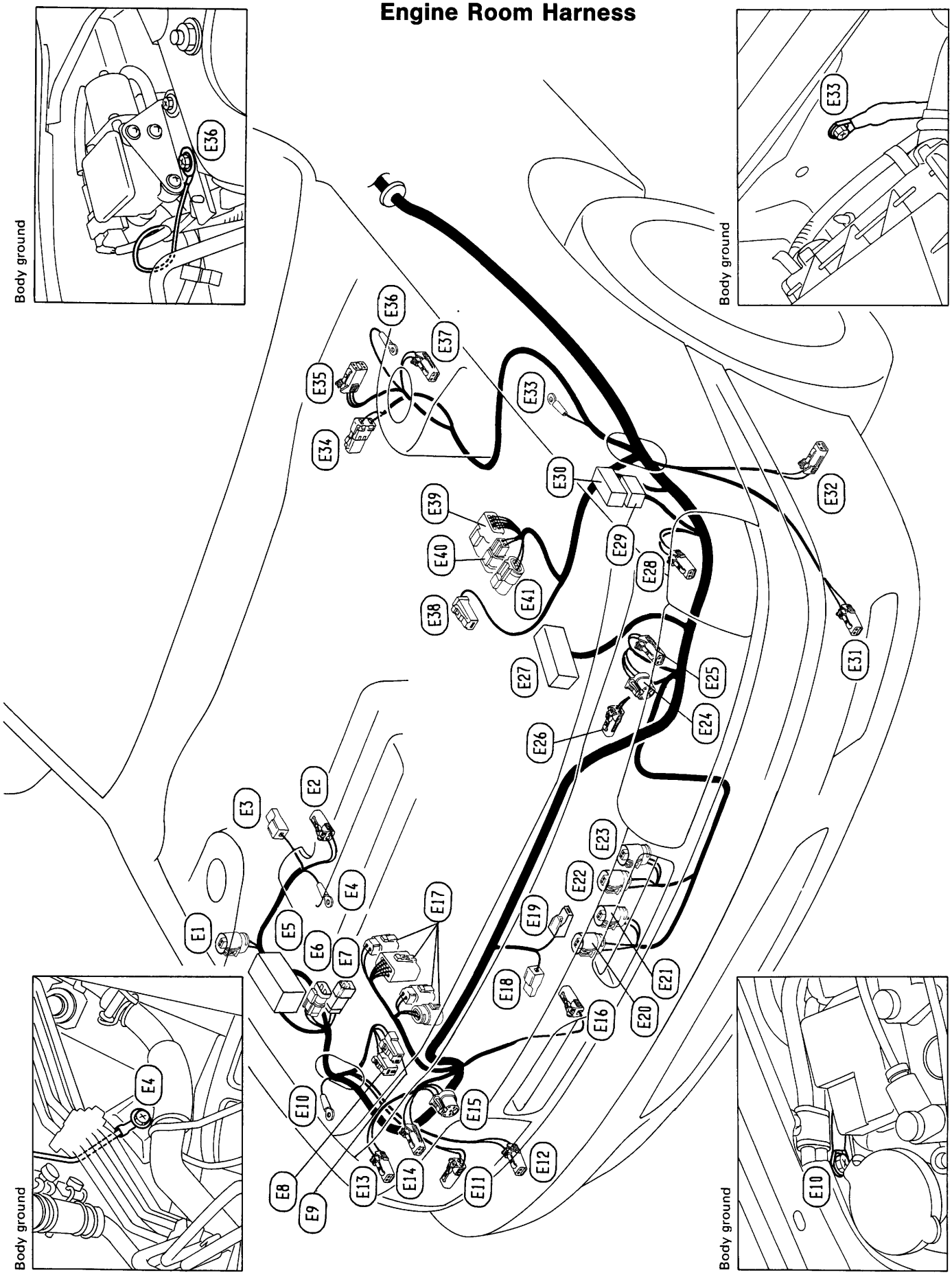


MEL267A

Outline

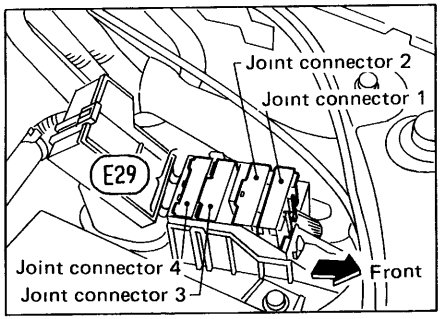

Rear door harness R.H.
Room lamp harness
Main harness
Tail harness
Front door harness R.H.
Engine room harness
Tail harness No. 2
Rear door harness L.H.
E.F.I. harness
Front door harness L.H.
Engine harness
MEL306A

Engine Room Harness

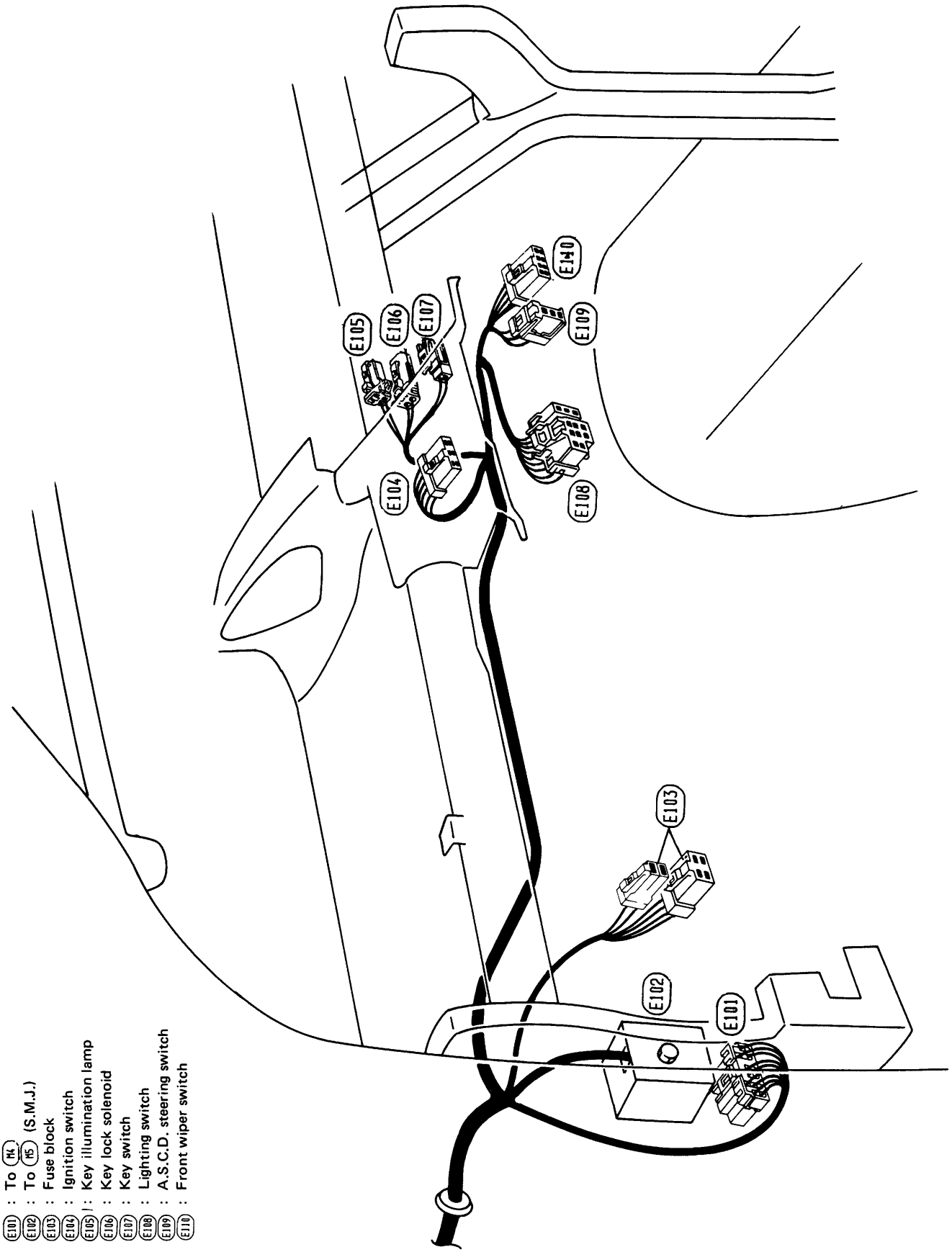


(E1) : Hood switch
(F2) : Front wheel sensor R.H. (For anti-lock braking system)
(E3) : Theft warning horn
(E4) : Body ground (For anti-lock braking system)
(E5) : Relay box (Refer to "LOCATION OF ELECTRICAL UNITS".)
(E6) : To (A1)
(E7) : To (A2)
(E8) : Front washer motor
(E9) : Washer level switch
(E10) : Body ground
(E11) : Front side marker lamp R.H.
(E12) : Front fog lamp R.H.
(E13) : Front turn signal lamp R.H.
(E14) : Clearance lamp R.H.
(E15) : Headlamp R.H.
(E16) : Compressor
(E17) : Actuator (For anti-lock braking system)
(E18) : Horn (Low)
(E19) : Horn (High)
(E20) : Radiator fan motor-1 (A/T models)
(E21) : Radiator fan motor-1 (M/T models)
(E22) : Radiator fan motor-2 (A/T models)
(E23) : Radiator fan motor-2 (M/T models)
(E24) : Headlamp L.H.
(E25) : Clearance lamp L.H.
(E26) : Dual-pressure switch
(E27) : Relay box (Refer to "LOCATION OF ELECTRICAL UNITS".)
(E28) : Front turn signal lamp L.H.
(E29) : Joint connector box
(E30) : Fuse and fusible link box
(E31) : Front fog lamp L.H.
(E32) : Front side marker lamp L.H.
(E33) : Body ground
(E34) : Brake fluid level switch
(E35) : A.S.C.D. pump
(E36) : Body ground (For anti-lock braking system)
(E37) : Front wheel sensor L.H. (For anti-lock braking system)
(E38) : Battery
(E39) : To (E215)
(E40) : To (E216)
(E41) : To (E217)

Joint connector



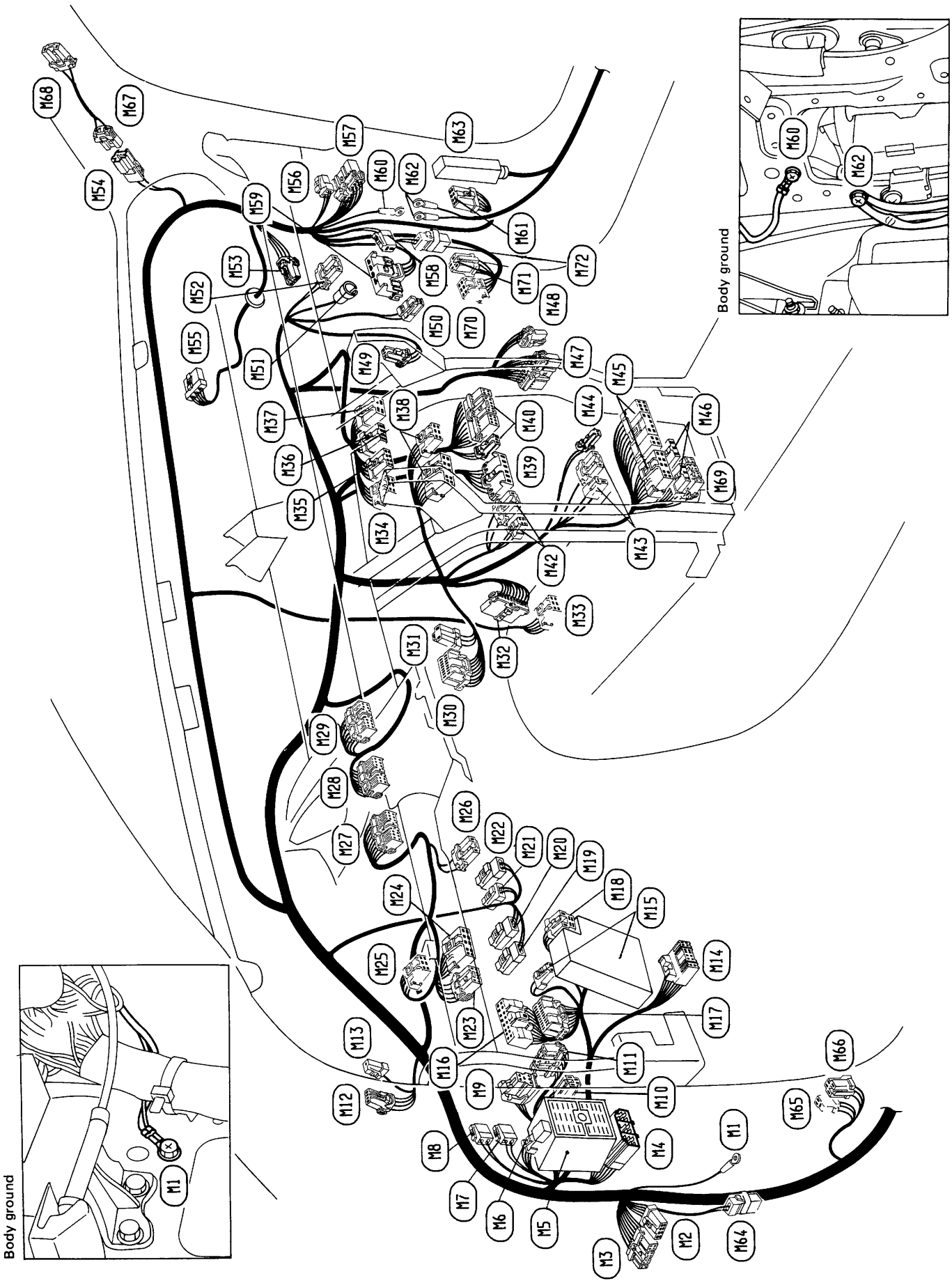
Engine Room Harness (Cont'd)



MEL308A

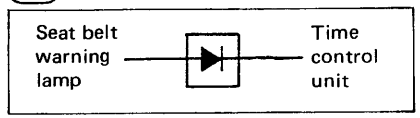
NOTE

Main Harness

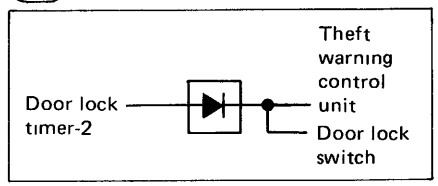


(M1) : Body ground
(M2) : To (D1)
(M3) : To (D2)
(M4) : To (E101)
(M5) : To (E102) (S.M.J.)
(M6) : Diode
(M7) : Circuit breaker-1
(M8) : Circuit breaker-2 (For U.S.A.)
(M9) : Bulb check relay
(M10) : Power window relay
(M11) : Shift lock control unit (A/T models)
(M12) : To (R1)
(M13) : To (R2)
(M14) : Diagnostic connector for CONSULT
(M15) : Fuse block
(M16) : A.S.C.D. control unit
(M17) : Time control unit
(M18) : Rear window defogger relay
(M19) : Clutch interlock switch (For U.S.A. M/T models)
(M20) : A.S.C.D. clutch switch (M/T models)
(M21) : Stop lamp switch
(M22) : A.S.C.D. cancel switch
(M23) : Illumination control switch
(M24) : Door mirror switch
(M25) : A.S.C.D. main switch
(M26) : Theft warning indicator lamp
(M27) : Combination meter
(M28) : Combination meter
(M29) : Combination meter
(M30) : Theft warning control unit
(M31) : Combination flasher unit
(M32) : Mode door motor
(M33) : To (F19)
(M34) : Rear window defogger switch
(M35) : Fresh vent switch
(M36) : Hazard switch
(M37) : Fog lamp switch
(M38) : Radio
(M39) : Fan switch
(M40) : Push control unit
(M42) : Not used
(M43) : Cigarette lighter
(M44) : Ashtray illumination lamp
(M45) : 2-point motorized automatic seat belt control unit (For U.S.A.)
(M46) : Daytime light control unit (For Canada)
(M47) : To (F20)
(M48) : Fresh vent motor
(M49) : Thermo control amplifier
(M50) : Trunk lid opener cancel switch
(M51) : Glove box lamp
(M52) : Glove box lamp switch
(M53) : Intake door motor
(M54) : To (M67)
(M55) : Front wiper motor
(M56) : To (D21)
(M57) : To (D22)
(M58) : Blower motor
(M59) : Resistor
(M60) : Body ground
(M61) : Door lock timer-1
(M62) : Body ground (For anti-lock braking system)
(M63) : A.B.S. control unit
(M64) : Diode
(M65) : Theft warning horn relay
(M66) : Blower motor relay
(M67) : To (M54)
(M68) : Front limit switch R.H. (For U.S.A.)
(M69) : E.L.R. control unit
(M70) : Door lock timer-2
(M71) : Door lock relay
(M72) : Diode

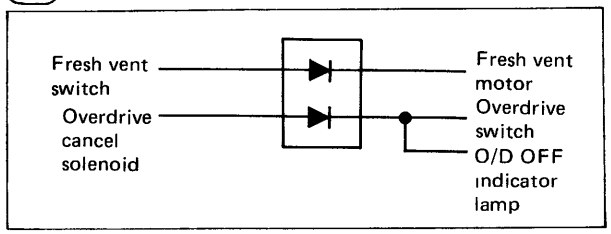
(M64) Diode



(M72) Diode

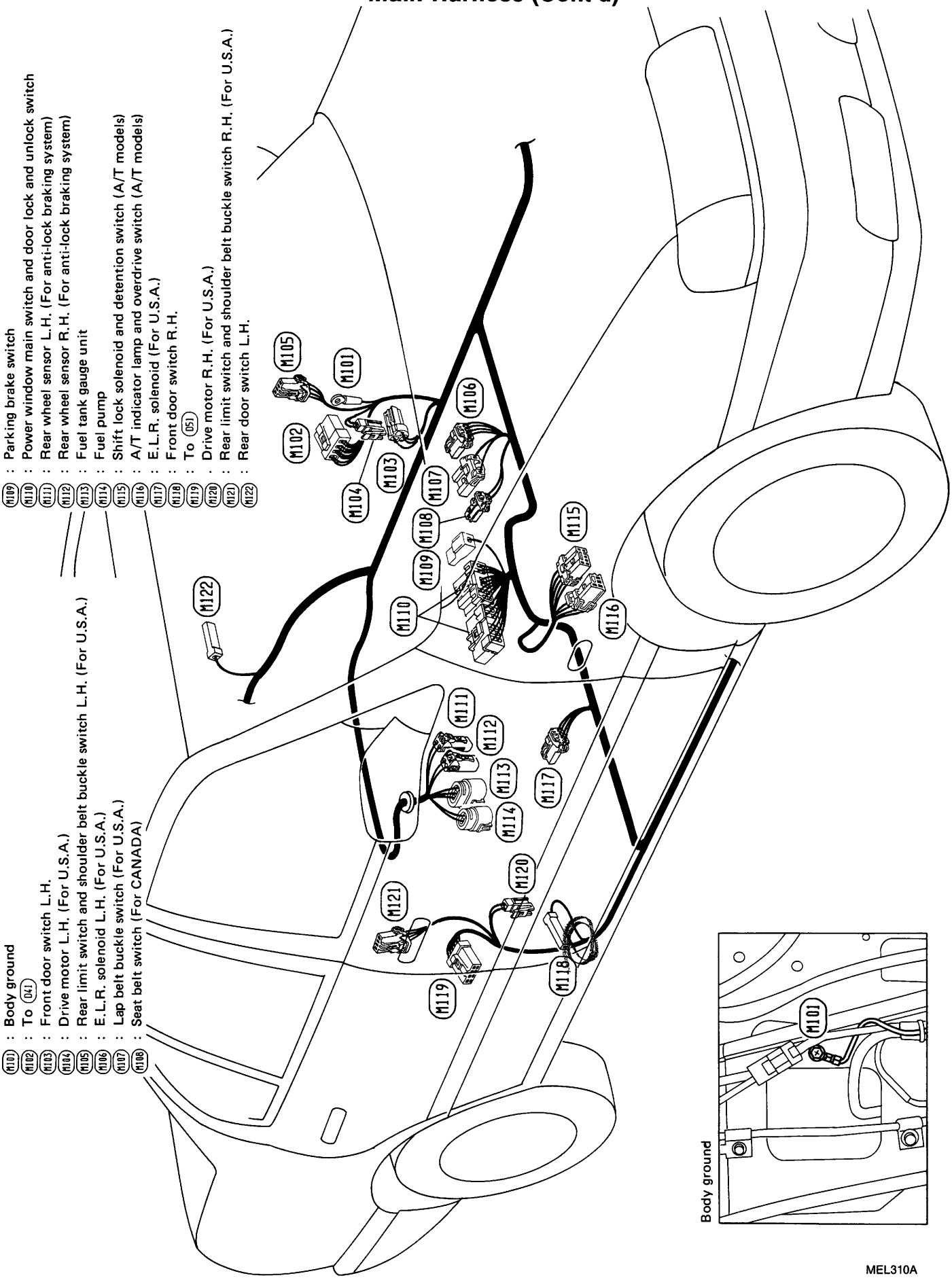


(M6) Diode



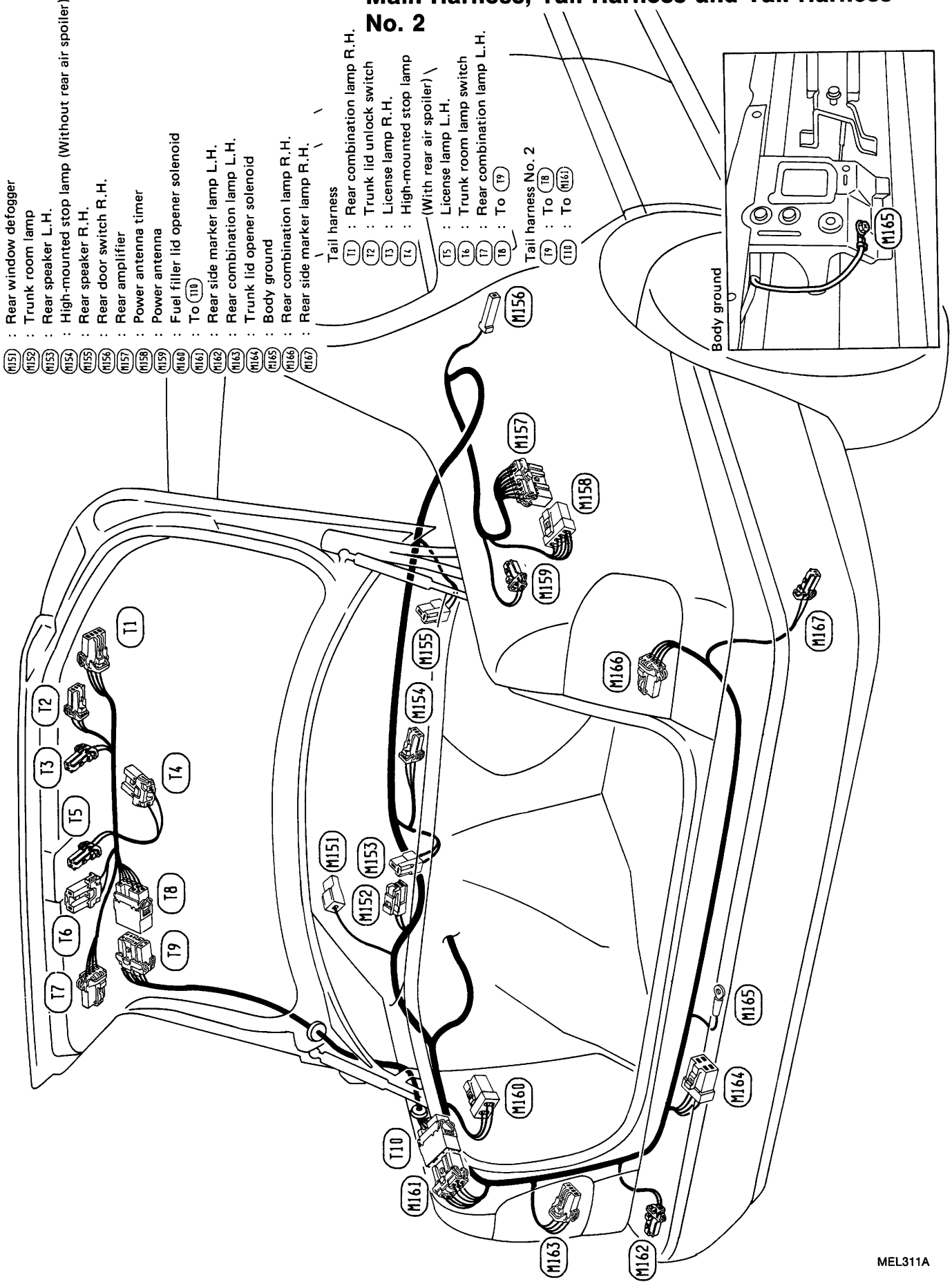
Main Harness (Cont'd)

(M101) : Body ground
(M102) : To (041)
(M103) : Front door switch L.H.
(M104) : Drive motor L.H. (For U.S.A.)
(M105) : Rear limit switch and shoulder belt buckle switch L.H. (For U.S.A.)
(M106) : E.L.R. solenoid L.H. (For U.S.A.)
(M107) : Lap belt buckle switch (For U.S.A.)
(M108) : Seat belt switch (For CANADA)
(M109) : Parking brake switch
(M110) : Power window main switch and door lock and unlock switch
(M111) : Rear wheel sensor L.H. (For anti-lock braking system)
(M112) : Rear wheel sensor R.H. (For anti-lock braking system)
(M113) : Fuel tank gauge unit
(M114) : Fuel pump
(M115) : Shift lock solenoid and detention switch (A/T models)
(M116) : A/T indicator lamp and overdrive switch (A/T models)
(M117) : E.L.R. solenoid (For U.S.A.)
(M118) : Front door switch R.H.
(M119) : To (051)
(M120) : Drive motor R.H. (For U.S.A.)
(M121) : Rear limit switch and shoulder belt buckle switch R.H. (For U.S.A.)
(M122) : Rear door switch L.H.

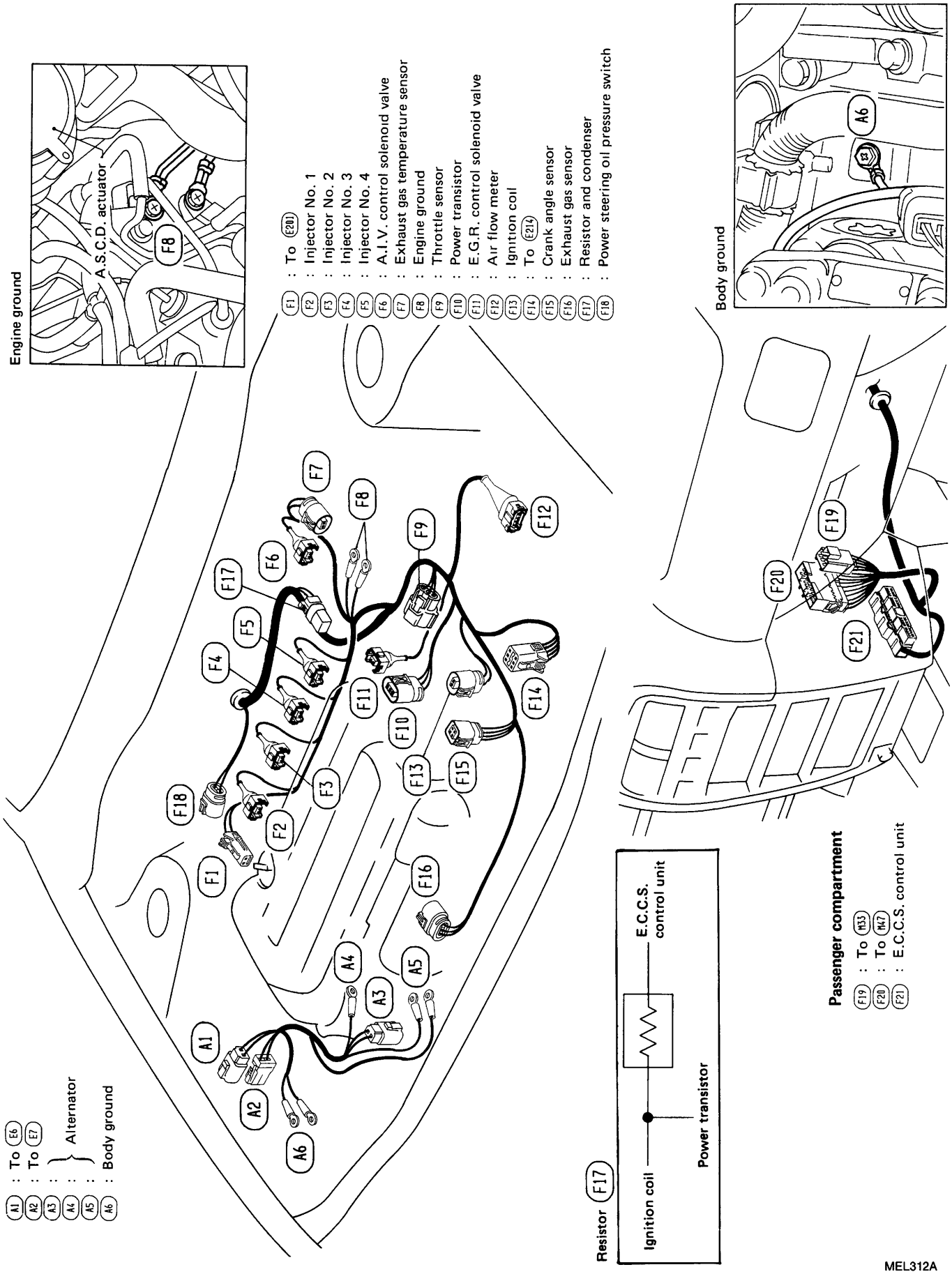


MEL310A

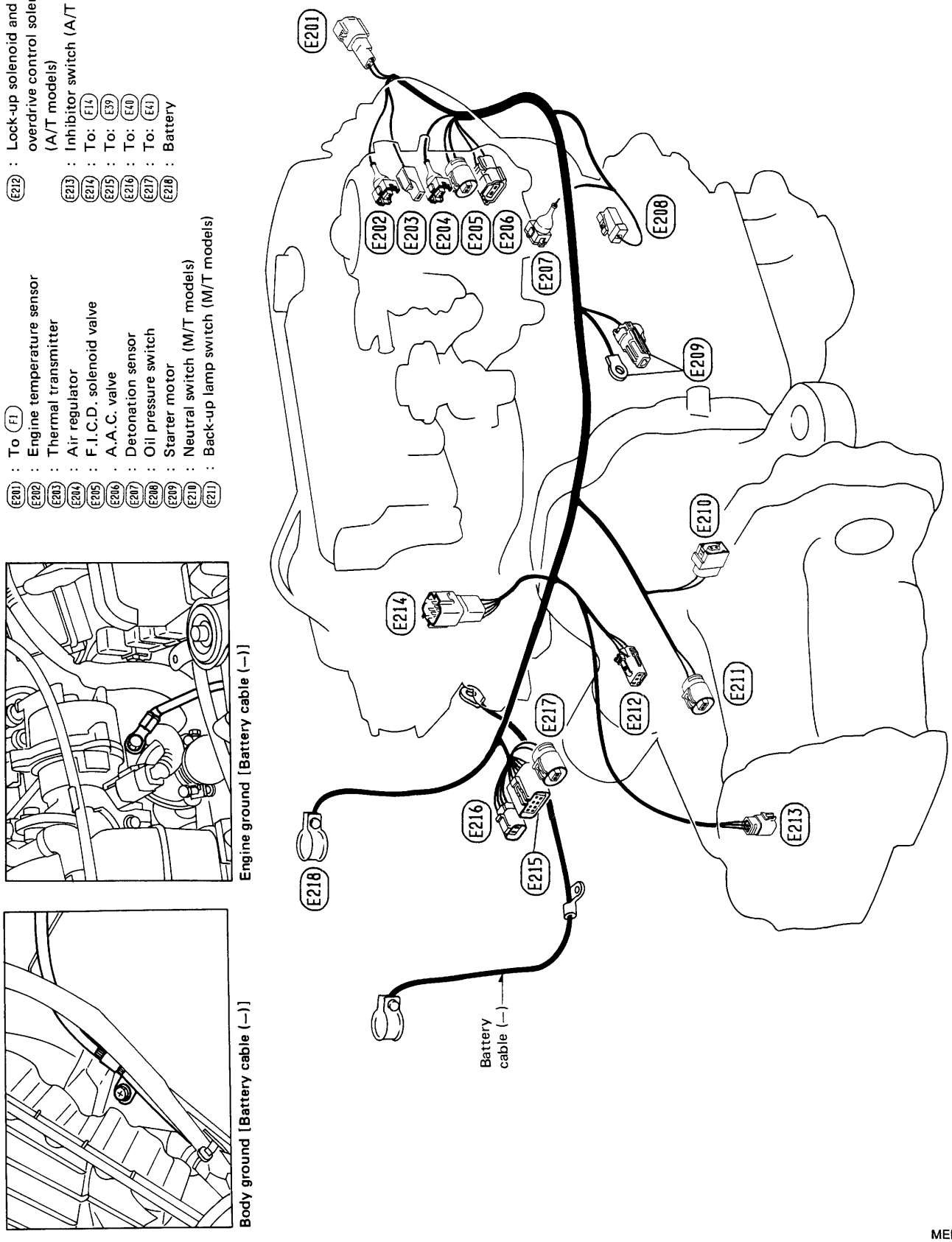
Main Harness, Tail Harness and Tail Harness No. 2



E.F.I. Harness and Alternator Harness



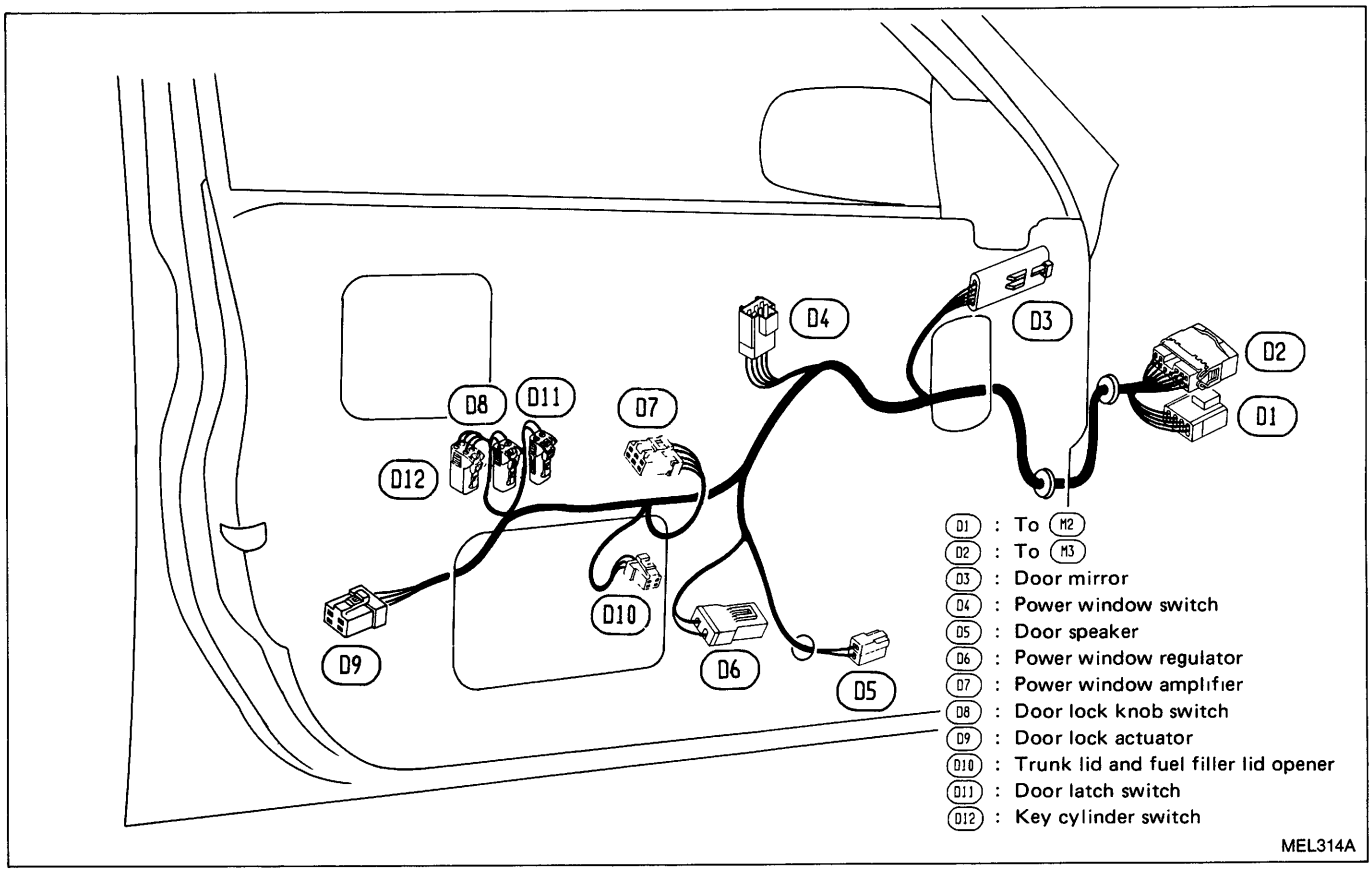
Engine Harness



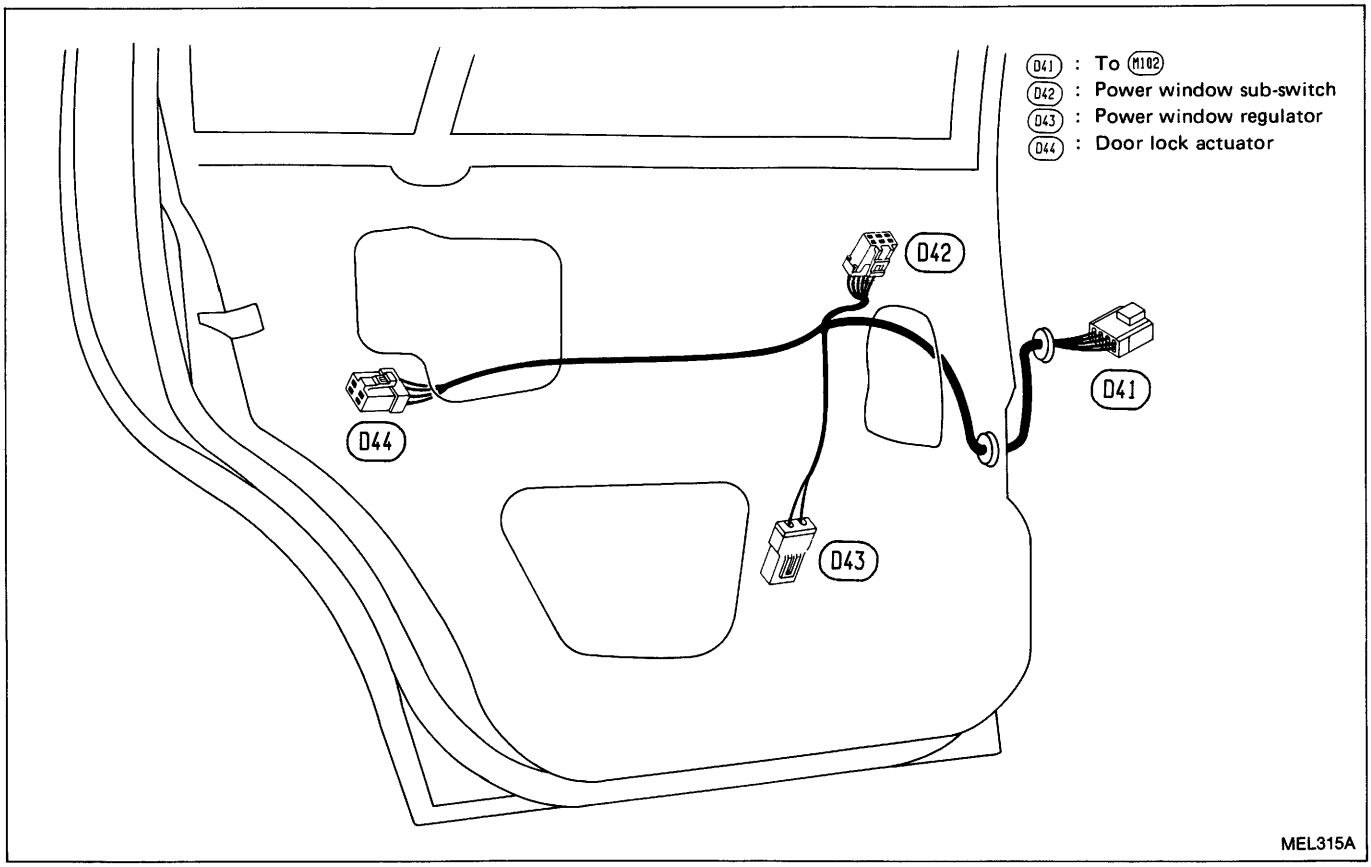
MEL313A

Door Harness (L.H. side)

FRONT

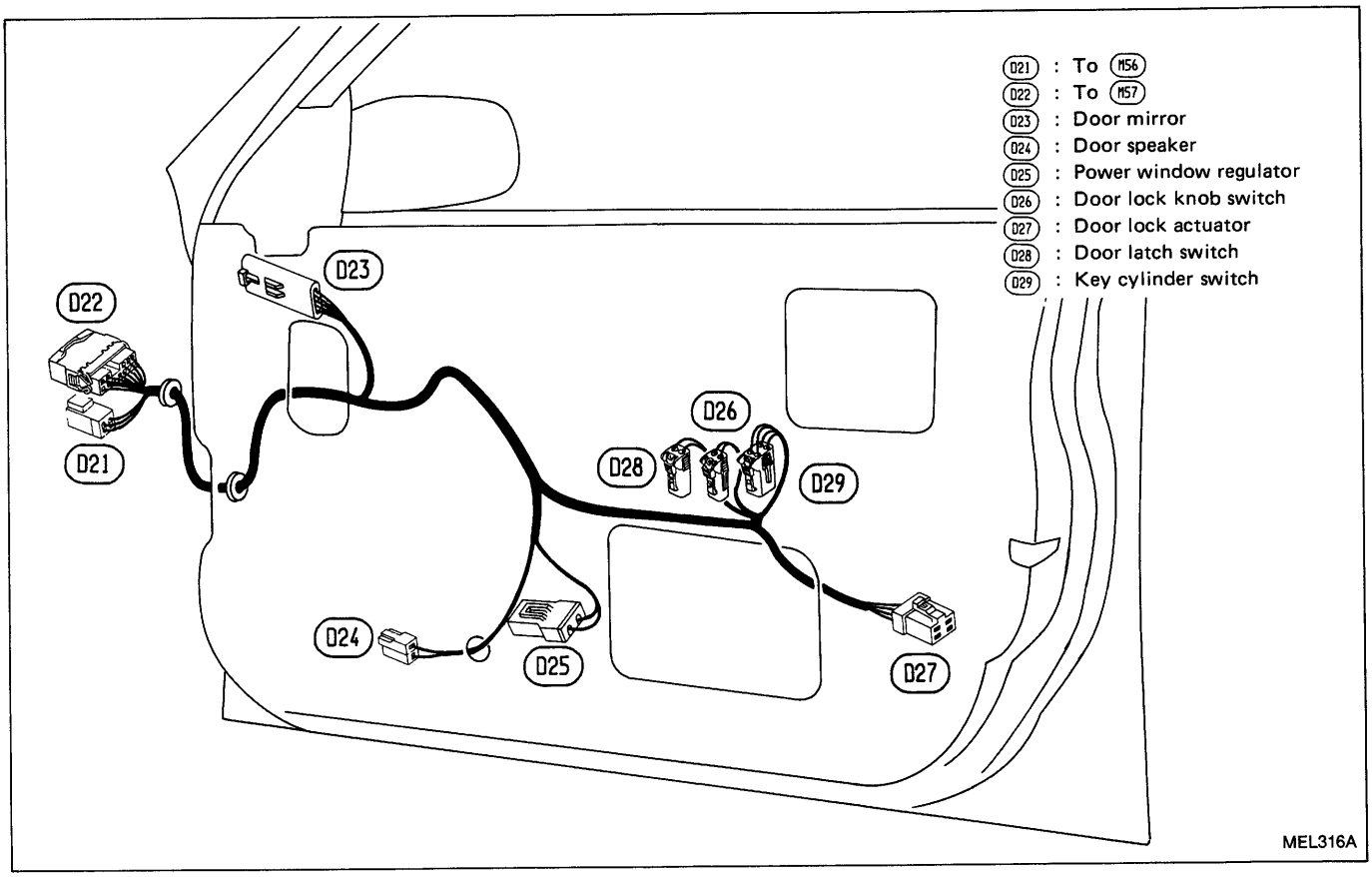


REAR

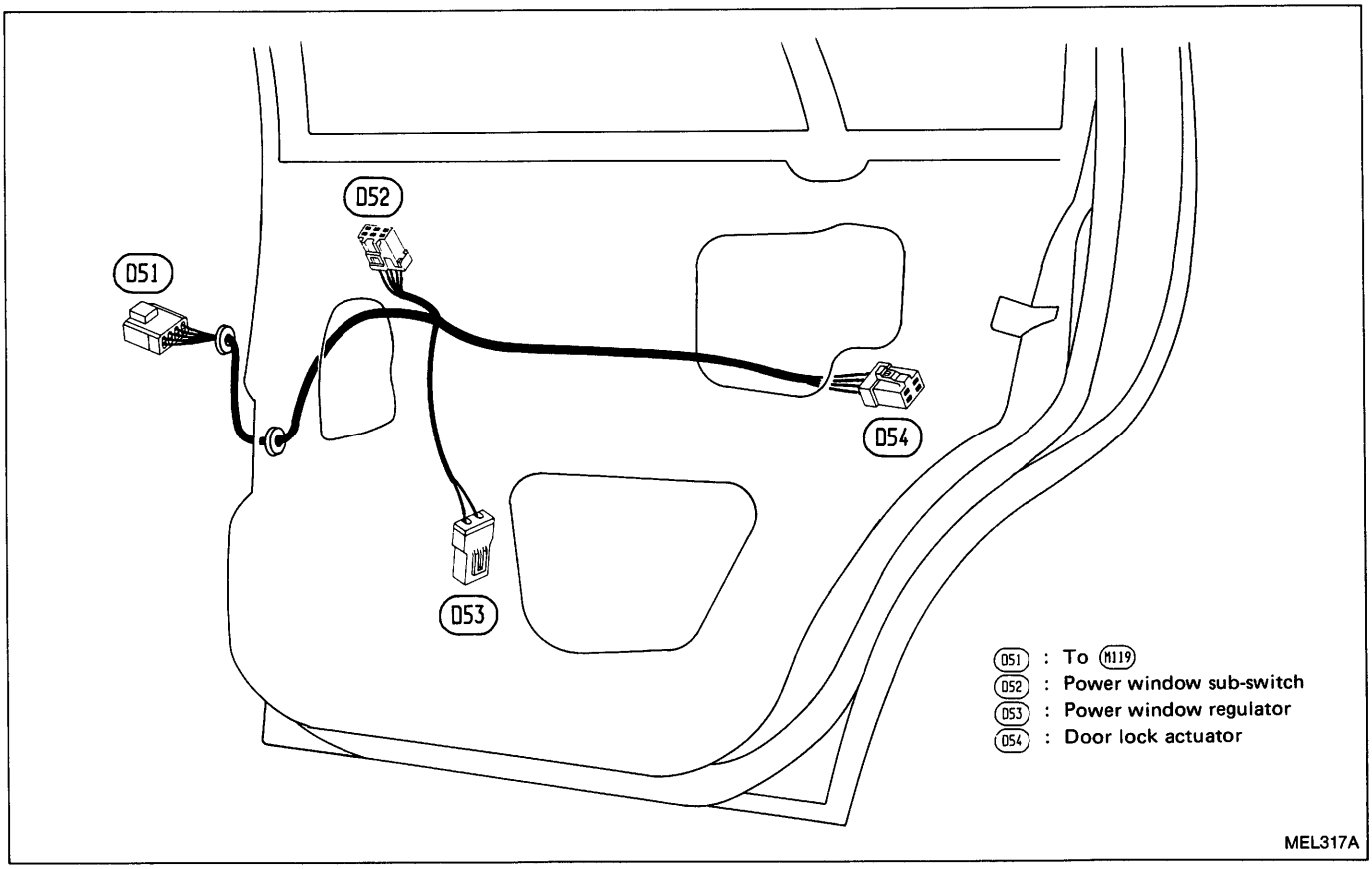


Door harness (R.H. side)

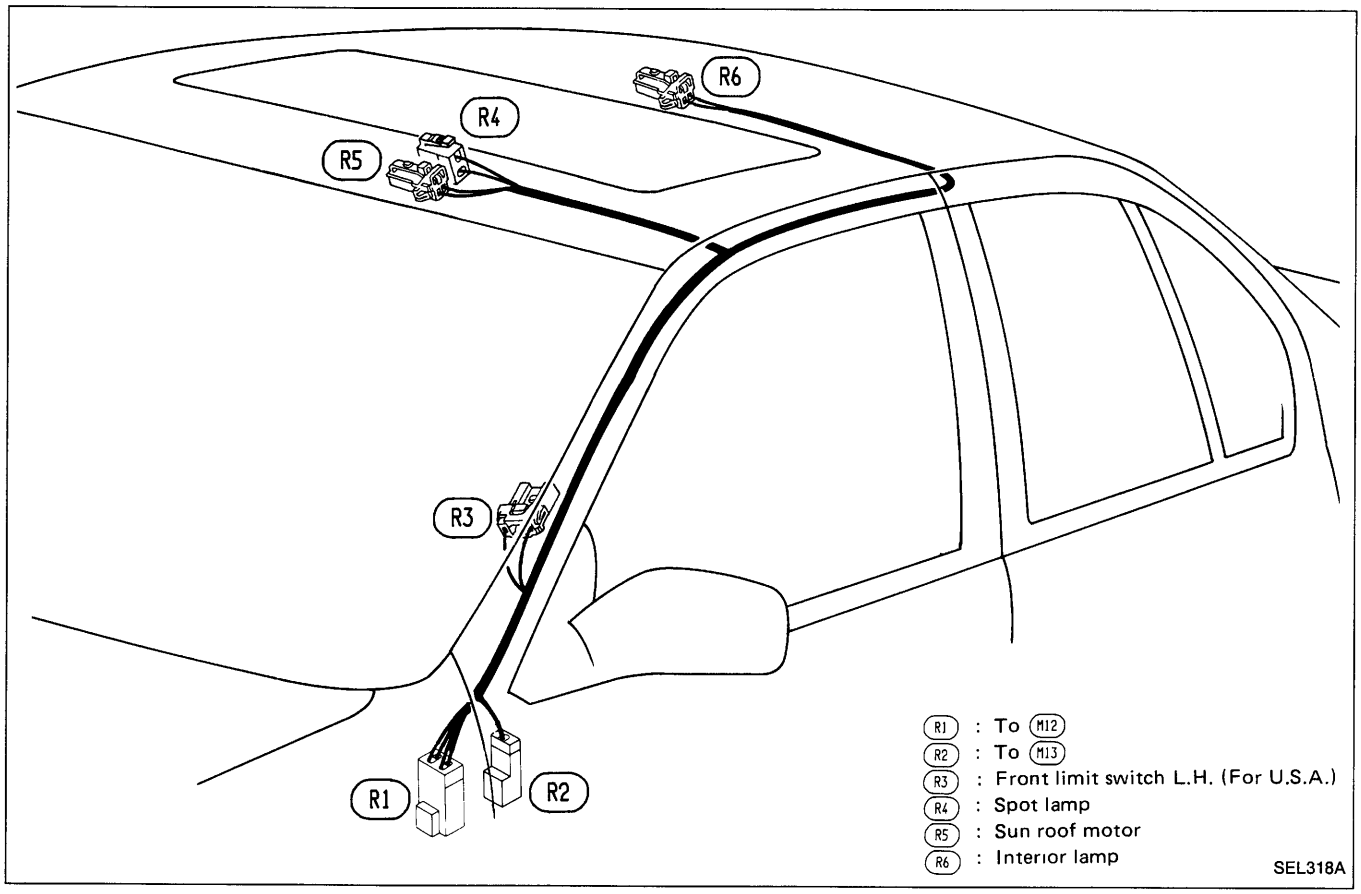
FRONT

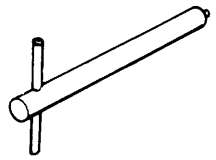


REAR

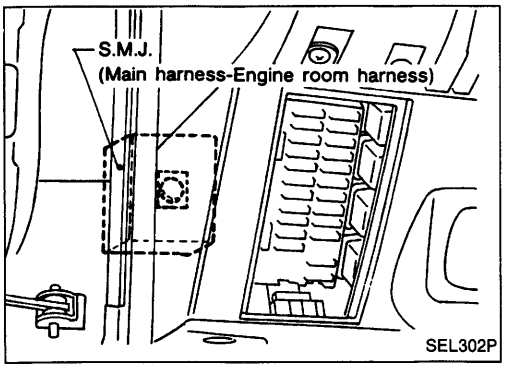


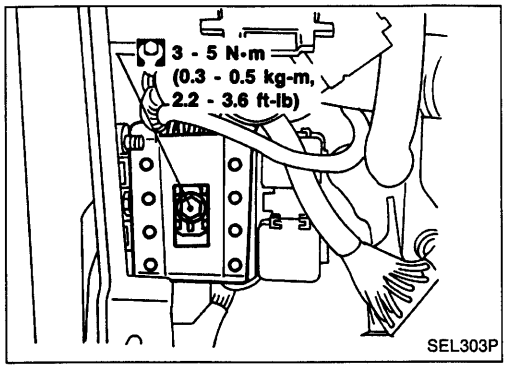
Room Lamp Harness



Tool number	Tool name
(J36126)	Washer nozzle adjusting tool 

NOTE





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

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

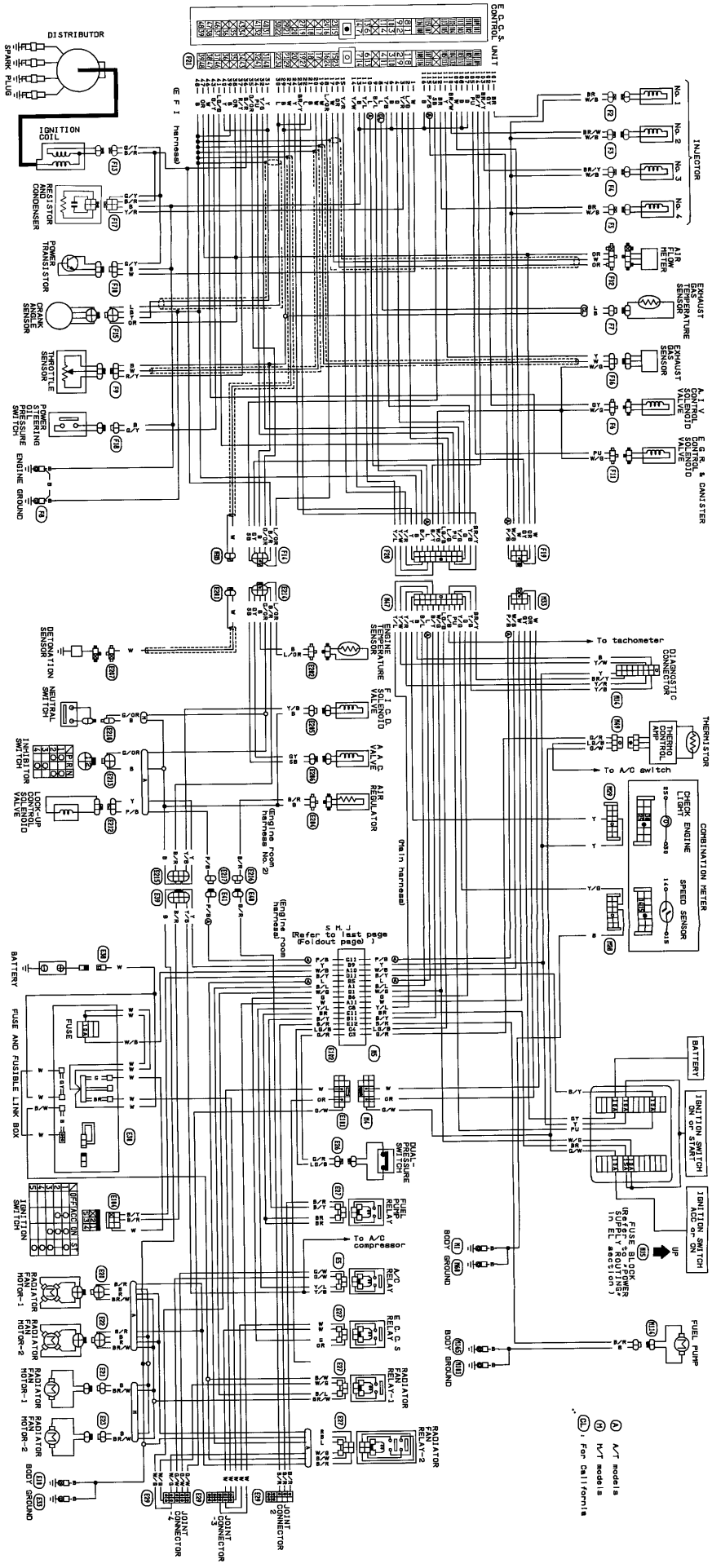
I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12
H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12
G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12
F1	F2								F11	F12	
E1	E2								E11	E12	
D1	D2								D11	D12	
C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12

ENGINE ROOM HARNESS

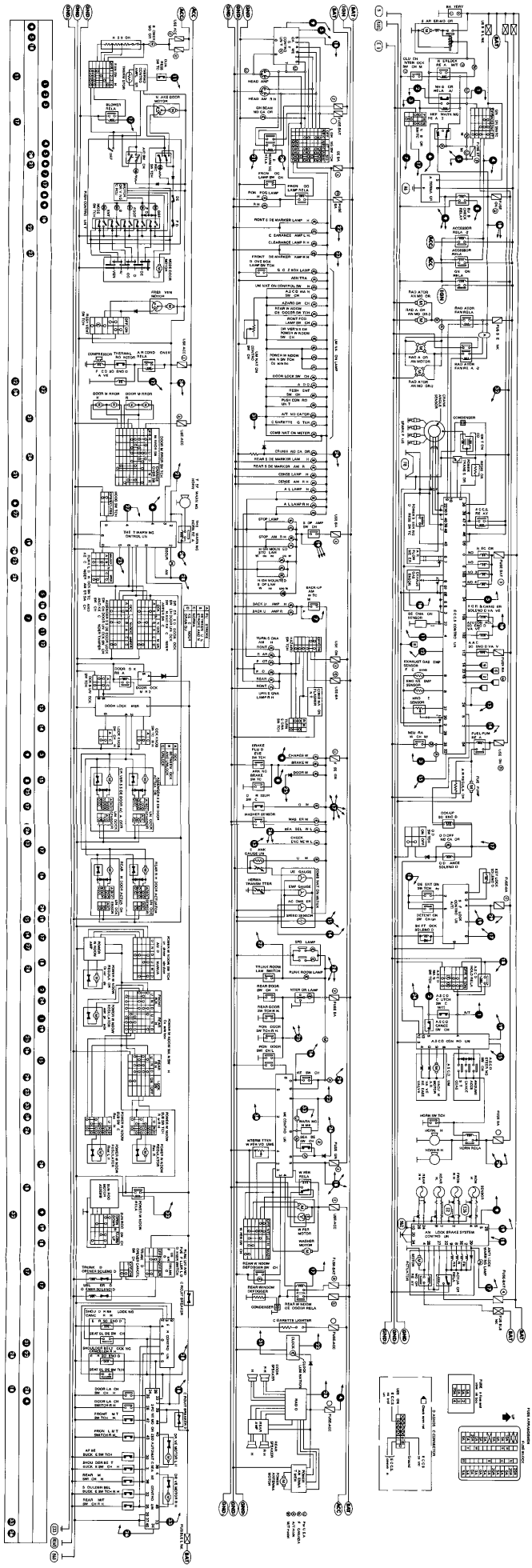
E. C. C. S. CONTROL UNIT

| | | | | | | | | | | |

1991 INFINITI G20
E. C. C. S. WIRING DIAGRAM



1991 INFINITI G20
CIRCUIT DIAGRAM



INCH TO METRIC CONVERSION TABLE

(Rounded-off for automotive use)

inches	mm	inches	mm
.100	2.54	.610	15.49
.110	2.79	.620	15.75
.120	3.05	.630	16.00
.130	3.30	.640	16.26
.140	3.56	.650	16.51
.150	3.81	.660	16.76
.160	4.06	.670	17.02
.170	4.32	.680	17.27
.180	4.57	.690	17.53
.190	4.83	.700	17.78
.200	5.08	.710	18.03
.210	5.33	.720	18.29
.220	5.59	.730	18.54
.230	5.84	.740	18.80
.240	6.10	.750	19.05
.250	6.35	.760	19.30
.260	6.60	.770	19.56
.270	6.86	.780	19.81
.280	7.11	.790	20.07
.290	7.37	.800	20.32
.300	7.62	.810	20.57
.310	7.87	.820	20.83
.320	8.13	.830	21.08
.330	8.38	.840	21.34
.340	8.64	.850	21.59
.350	8.89	.860	21.84
.360	9.14	.870	22.10
.370	9.40	.880	22.35
.380	9.65	.890	22.61
.390	9.91	.900	22.86
.400	10.16	.910	23.11
.410	10.41	.920	23.37
.420	10.67	.930	23.62
.430	10.92	.940	23.88
.440	11.18	.950	24.11
.450	11.43	.960	24.38
.460	11.68	.970	24.64
.470	11.94	.980	24.89
.480	12.19	.990	25.15
.490	12.45	1.000	25.40
.500	12.70	2.000	50.80
.510	12.95	3.000	76.20
.520	13.21	4.000	101.60
.530	13.46	5.000	127.00
.540	13.72	6.000	152.40
.550	13.97	7.000	177.80
.560	14.22	8.000	203.20
.570	14.48	9.000	228.60
.580	14.73	10.000	254.00
.590	14.99	20.000	508.00
.600	15.24		

METRIC TO INCH CONVERSION TABLE

(Rounded-off for automotive use)

mm	inches	mm	inches
1	.0394	51	2.008
2	.079	52	2.047
3	.118	53	2.087
4	.157	54	2.126
5	.197	55	2.165
6	.236	56	2.205
7	.276	57	2.244
8	.315	58	2.283
9	.354	59	2.323
10	.394	60	2.362
11	.433	61	2.402
12	.472	62	2.441
13	.512	63	2.480
14	.551	64	2.520
15	.591	65	2.559
16	.630	66	2.598
17	.669	67	2.638
18	.709	68	2.677
19	.748	69	2.717
20	.787	70	2.756
21	.827	71	2.795
22	.866	72	2.835
23	.906	73	2.874
24	.945	74	2.913
25	.984	75	2.953
26	1.024	76	2.992
27	1.063	77	3.031
28	1.102	78	3.071
29	1.142	79	3.110
30	1.181	80	3.150
31	1.220	81	3.189
32	1.260	82	3.228
33	1.299	83	3.268
34	1.339	84	3.307
35	1.378	85	3.346
36	1.417	86	3.386
37	1.457	87	3.425
38	1.496	88	3.465
39	1.535	89	3.504
40	1.575	90	3.543
41	1.614	91	3.583
42	1.654	92	3.622
43	1.693	93	3.661
44	1.732	94	3.701
45	1.772	95	3.740
46	1.811	96	3.780
47	1.850	97	3.819
48	1.890	98	3.858
49	1.929	99	3.898
50	1.969	100	3.937