NISSAN STANZA

MODEL T12 SERIES

QUICK REFERENCE INDEX

GENERAL INFORMATION	GI
MAINTENANCE	MA
ENGINE MECHANICAL	EM
ENGINE LUBRICATION & COOLING SYSTEMS	LC
ENGINE FUEL & EMISSION CONTROL SYSTEM	EF & EC
ENGINE 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

© 1988 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 1989 NISSAN STANZA.

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

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

IMPORTANT SAFETY NOTICE

The proper performance of service is essential for both the safety of the technician and the efficient functioning of the vehicle.
The service methods in this Service Manual are described in such a manner that the service may be performed safely and accurately.
Service varies with the procedures used, the skills of the technician and the tools and parts available. Accordingly, anyone using service procedures, tools or parts which are not specifically recommended by NISSAN must first completely satisfy himself that neither his safety nor the vehicle's safety will be jeopardized by the service method selected.

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

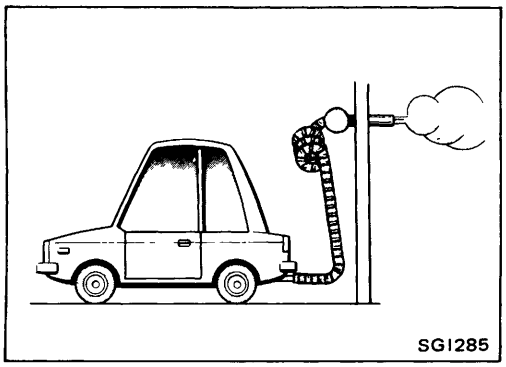
GENERAL INFORMATION

SECTION GI

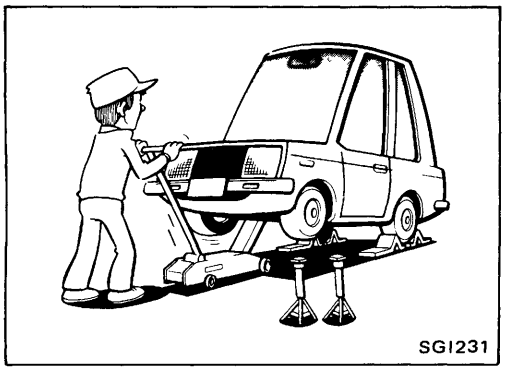
CONTENTS

PRECAUTIONS ..... GI- 2
HOW TO USE THIS MANUAL ..... GI- 5
HOW TO READ WIRING DIAGRAMS ..... GI- 7
IDENTIFICATION INFORMATION GI-11
RECOMMENDED FUEL AND LUBRICANTS GI-15
LIFTING POINTS AND TOW TRUCK TOWING GI-17
TIGHTENING TORQUE OF STANDARD BOLTS GI-21

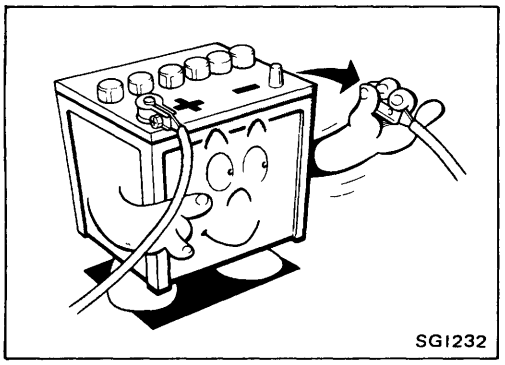
The following precautions should be observed to ensure safe and proper service operations. These precautions are not described in each individual section.


SGI285

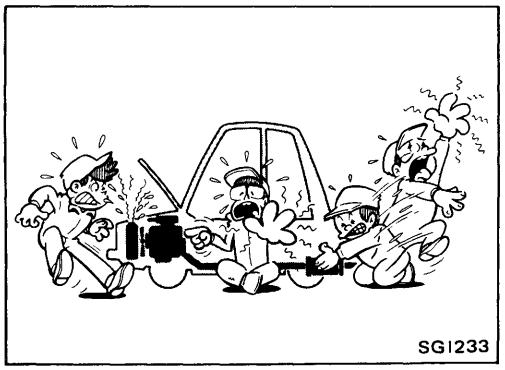
1. Do not operate the engine for an extended period of time without proper exhaust ventilation.
   Keep the work area well ventilated and free of any inflammable materials. Special care should be taken when handling any inflammable or poisonous materials, such as gasoline, refrigerant gas, etc. When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


SGI231

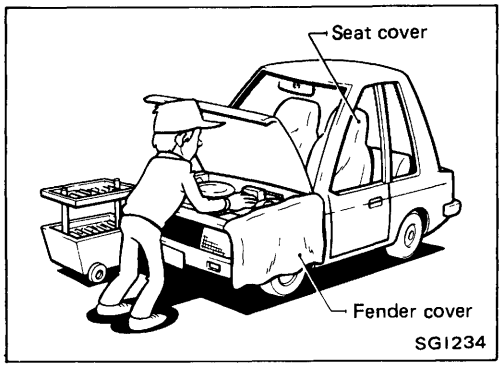
2. Before jacking up the vehicle, apply wheel chocks or other tire blocks to the wheels to prevent the vehicle from moving. After jacking up the vehicle, support the vehicle weight with safety stands at the points designated for proper lifting and towing before working on the vehicle.
   These operations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


SGI232

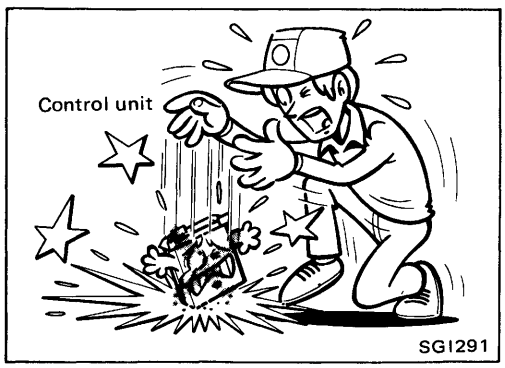
4. Before starting repairs which do not require battery power, always turn off the ignition switch, then disconnect the ground cable from the battery to prevent accidental short circuit.


SGI233

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

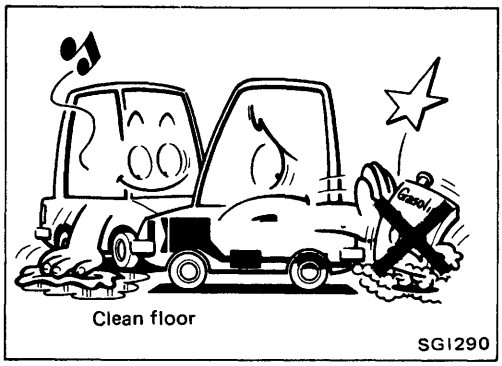


6. To prevent scratches and soiling, protect fenders, upholstery and carpeting with appropriate covers before starting servicing.
   Take caution that keys, buckles or buttons on your person do not scratch the paint.
7. Clean all disassembled parts in the designated liquid or solvent prior to inspection or assembly.
8. Replace oil seals, gaskets, packings, O-rings, locking washers, cotter pins, self-locking nuts, etc. as instructed and discard used ones.
9. Tapered roller bearings and needle bearings should be replaced as a set of inner and outer races.
10. Arrange the disassembled parts in accordance with their assembled locations and sequence.
11. Do not touch the terminals of electrical components which utilize microcomputers such as electronic control units. Static electrical charges stored in your body may damage internal electronic components.
12. After disconnecting vacuum hose or air hose, attach tag which indicates the proper connection to prevent incorrect connection.
13. Use only the lubricants specified in the applicable section or those indicated under "Recommended Fuel and Lubricants".
14. Use approved bonding agent, sealants or their equivalents when required.
15. The use of the proper tools and recommended essential tools should be used where specified for proper, safe and efficient service repairs.
16. When effecting repairs on the fuel, oil, water, vacuum or exhaust systems, make certain to check all affected lines for leaks.
17. Dispose of drained oil or the solvent used for cleaning parts in an appropriate manner.



Precaution 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. 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.



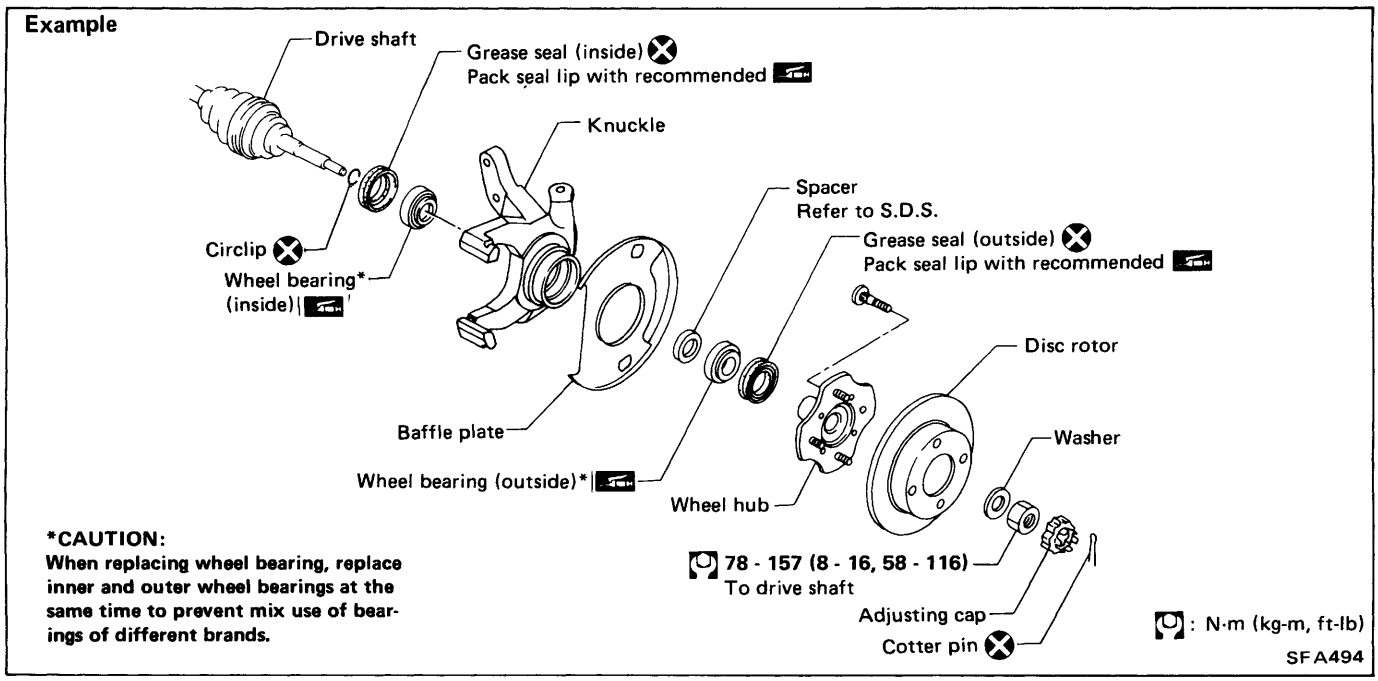
Clean floor
SGI290

Precautions for a 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.

1. **A QUICK REFERENCE INDEX**, a black tab (e.g. FA) is provided on the first page. You can quickly find the first page of each section by matching 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. "FA-5").
5. **THE LARGE ILLUSTRATION** is an exploded view (See below) and contains tightening torques, lubrication points and other information necessary to perform repairs.
   The illustration should be used in reference to the service matters only. When ordering parts, refer to the appropriate **PARTS CATALOG**.



6. **THE SMALL ILLUSTRATION** shows 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 illustration.
   Assembly, inspection and adjustment procedures for the complicated units such as the automatic transaxle or transmission, etc. are presented in a step-by-step format where necessary.
7. The followings **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.

S.D.S.: Service Data and Specifications
L.H., R.H.: Left-Hand, Right-Hand
M/T: Manual Transaxle/Transmission
A/T: Automatic Transaxle/Transmission
Tool: Special Service Tools

8. The **UNIT** given in this manual are primarily expressed with the SI UNIT (International System of Unit), and alternately expressed in the metric system and in the yard/pound system.

   "Example"

   Tightening torque:

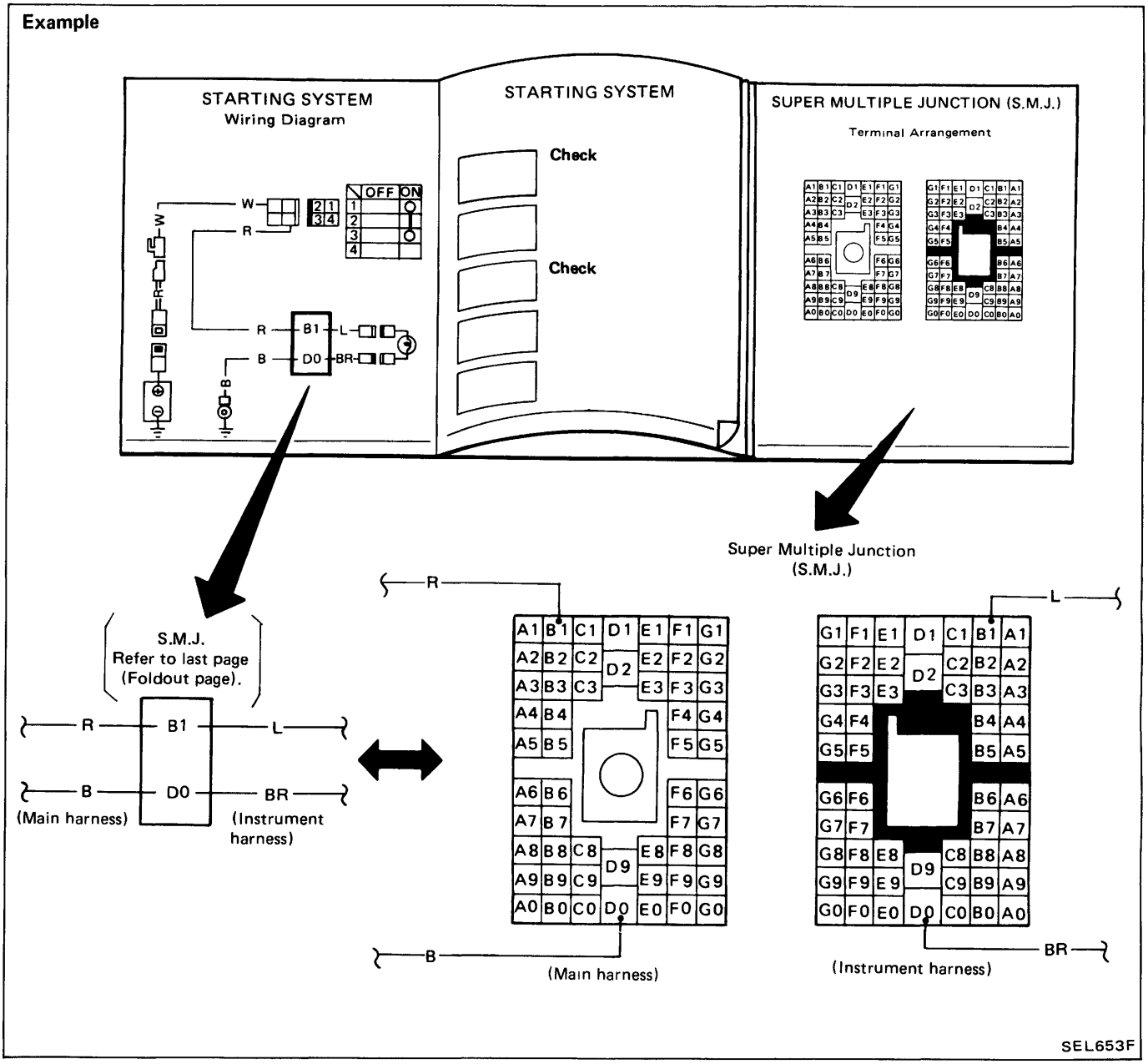
   59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)

9. **TROUBLE DIAGNOSES AND CORRECTIONS** are included in sections dealing with complicated components.
10. **SERVICE DATA AND SPECIFICATIONS** is 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.

SUPER MULTIPLE JUNCTION (S.M.J.)

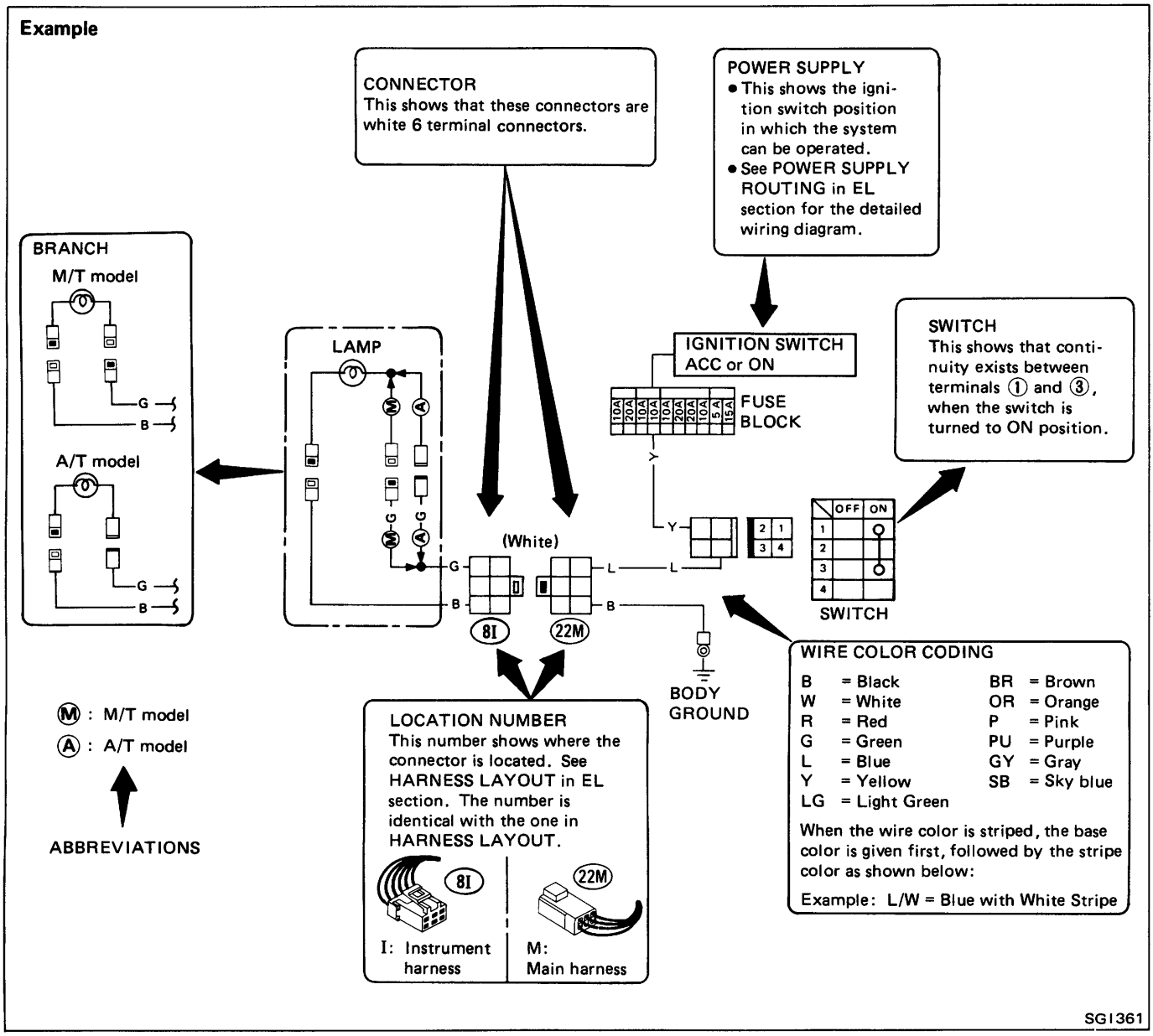
- The "S.M.J." indicated in wiring diagrams is shown in a simplified form. The terminal arrangement should therefore be referred to in the foldout at the end of the Service Manual.
- The foldout should be spread to read the entire wiring diagram.

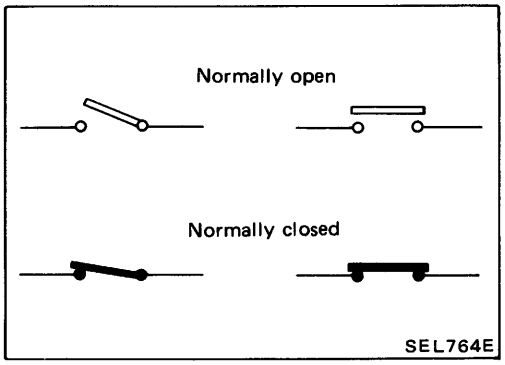
Example



WIRING DIAGRAM

Symbols used in WIRING DIAGRAM are shown below.

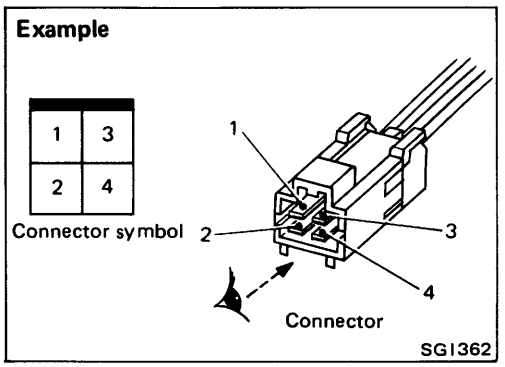




SWITCH POSITIONS

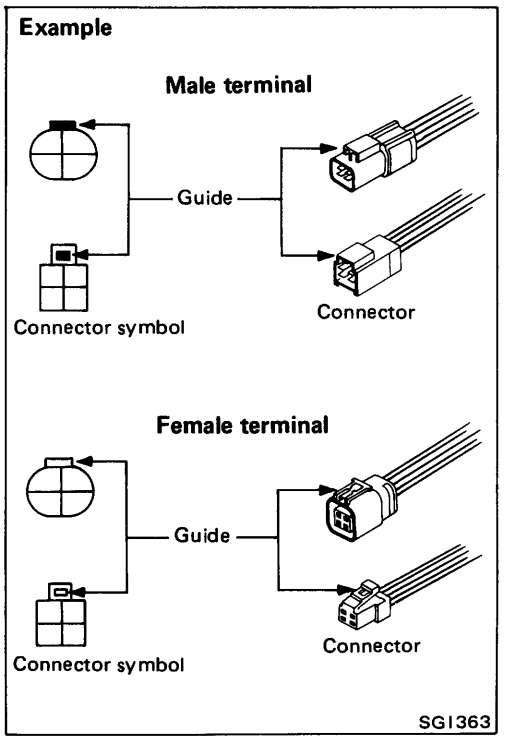
Wiring diagram switches are shown with the vehicle in the following condition:

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

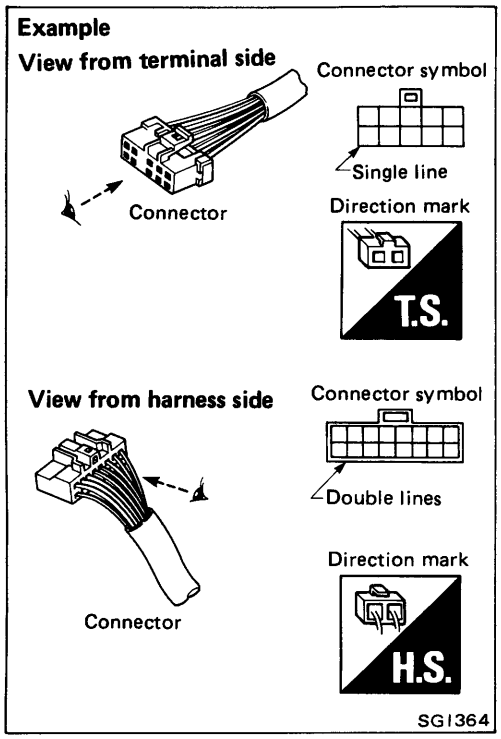


CONNECTOR SYMBOLS

- 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.



DIRECTION MARK

A direction mark is shown to clarify the side of connector (terminal side or harness side).

Direction marks are mainly used in the illustrations indicating terminal inspection.

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

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

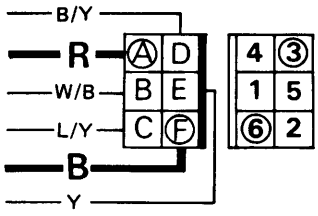
H.S. : **View from harness side . . . H.S.**

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

MULTIPLE SWITCH

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

Example



WIPER SWITCH

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

Continuity circuit of wiper switch

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

Example: Wiper switch in LO position

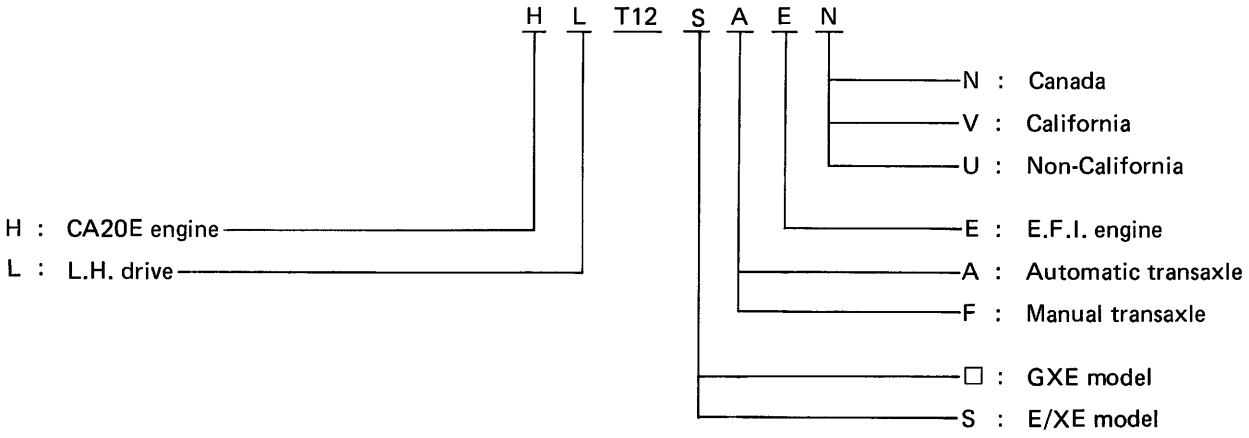
Continuity circuit: Red wire – Ⓐ terminal – ③ terminal – Wiper switch (● – ●: LO) – ⑥ terminal – Ⓕ terminal – Black wire

SGI365

Model Variation

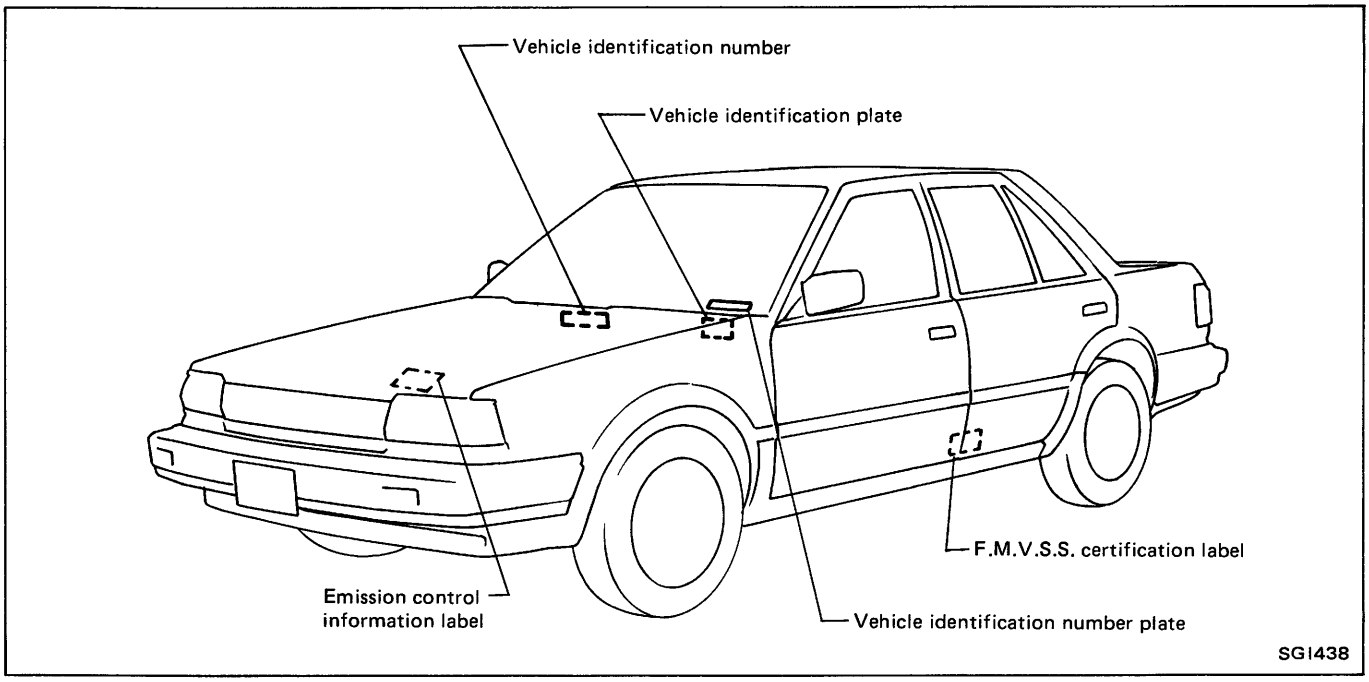
Destination / Body / Grade / Transaxle		Engine	CA20E	
			RS5F50A	RL4F02A
Non-California	4-door Sedan	E	HLT12SFEU	HLT12SAEU
		GXE	HLT12FEU	HLT12AEU
California		E	HLT12SFEV	HLT12SAEV
		GXE	HLT12FEV	HLT12AEV
Canada		E/XE	HLT12SFEN	HLT12SAEN
		GXE	HLT12FEN	HLT12AEN

Prefix and suffix designations:



□ : means no indication.

Identification Number



VEHICLE IDENTIFICATION NUMBER ARRANGEMENT

JN1 H T 2 1 S * K T 000001

Manufacturer
JN1 : Nissan, Passenger vehicle

Engine type
H: CA20E

Vehicle line
T : Nissan STANZA

Model change (0 to 9)

Body type
1 : 4-door Sedan

Vehicle serial number

Manufacture plant
T : Oppama

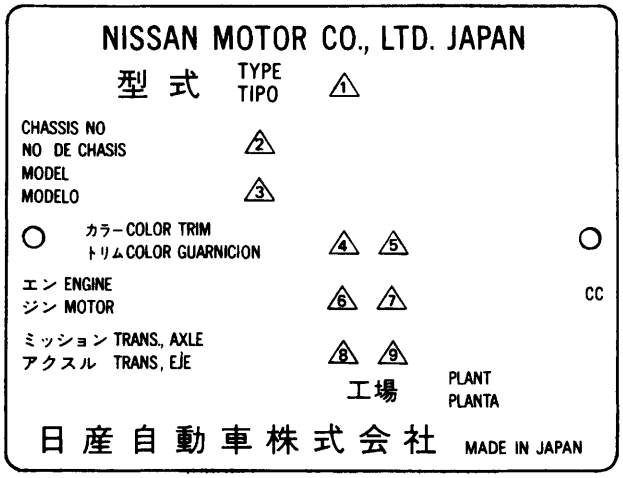
Model year
K : 1989 year model

Check digit (0 to 9 or X)
The code for the check digit is determined by mathematical computation.

Restraint system
S : Standard

Identification Number (Cont'd)

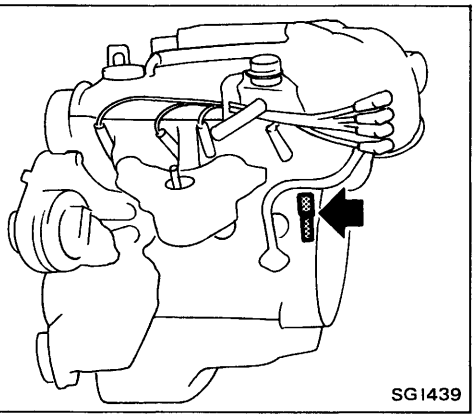
IDENTIFICATION PLATE



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 Transmission model
9 Axle model

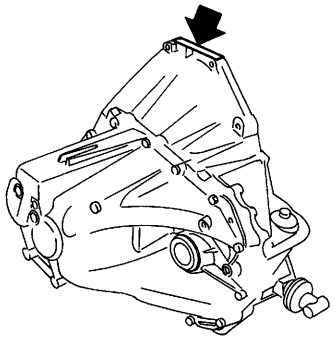
SGI315

ENGINE SERIAL NUMBER



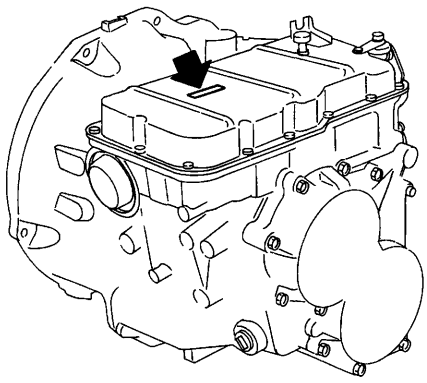
SGI439

TRANSAXLE NUMBER



Manual transaxle

SGI298



Automatic transaxle

SGI299

Dimension

Unit: mm (in)

	Sedan
Overall length	4,530 (178.3)
Overall width	1,690 (66.5)
Overall height	1,395 (54.9)
Wheelbase	2,550 (100.4)
Tread	
Front	1,460 (57.5)
Rear	1,460 (57.5)

Wheels & Tires

Road wheel		
Steel		5-J x 14
Aluminum		5-1/2-JJ x 14
Offset	mm (in)	45 (1.77)
Tire size		
Conventional		P185/70R14 185/70HR14 (Option for military use)
Spare		T135/70D15

Fuel

Use unleaded gasoline with an octane rating of at least A.K.I. (Anti-Knock Index) number 87 (Research octane number 91).

Approximate Refill Capacity

	Liter	US measure	Imp measure
Fuel tank	60	15-7/8 gal	13-1/4 gal
Coolant	7.3	7-3/4 qt	6-3/8 qt
Reservoir tank (Max. level)	0.8	7/8 qt	3/4 qt
Engine			
With oil filter	3.5	3-3/4 qt	3-1/8 qt
Without oil filter	3.1	3-1/4 qt	2-3/4 qt
Transaxle			
M/T	4.7	10 pt	8-1/4 pt
A/T	6.8	7-1/4 qt	6 qt
Power steering system	0.9	1 qt	3/4 qt
Windshield washer tank	2.6	2-3/4 qt	2-1/4 qt
Air conditioning system			
Refrigerant	0.9 - 1.1 kg	2.0 - 2.4 lb	2.0 - 2.4 lb

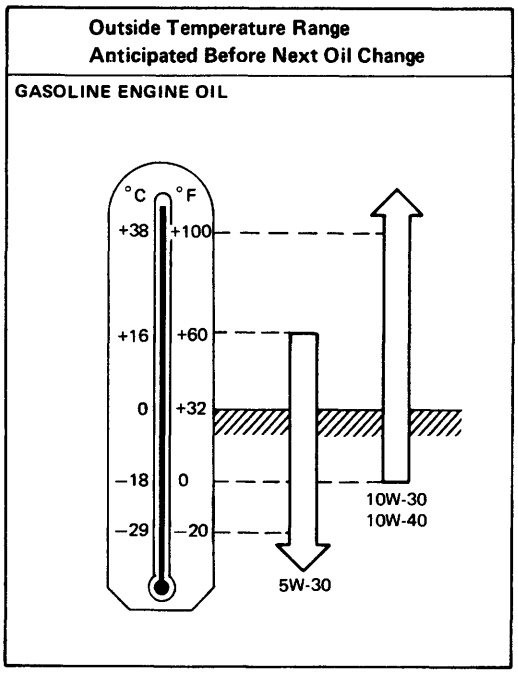
Lubricants

Lubricant	Specifications	Remarks
Engine oil	Genuine Nissan Motor Oil*1 or equivalent Energy Conserving Oils*2 of API SF or SG	For further details, refer to the recommended SAE viscosity chart.
Manual transaxle gear oil	API GL-4	
Automatic-transaxle fluid	Genuine Nissan ATF*1 or equivalent Type DEXRON™	–
Power steering fluid	Type DEXRON™	
Multi-purpose grease	NLGI No. 2	Lithium soap base
Brake and clutch fluid	Genuine Nissan Brake Fluid*1 or equivalent DOT 3	US FMVSS No. 116
Anti-freeze	–	Ethylene glycol base

*1: Available in mainland U.S.A. through your Nissan dealer

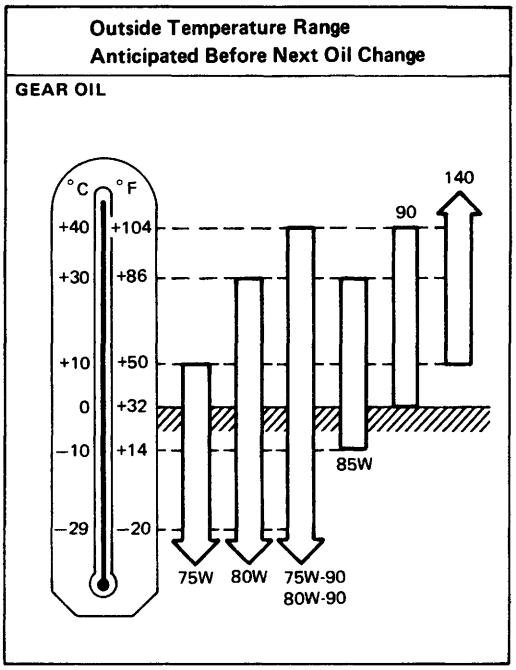
*2: These oils can be identified by such labels as energy conserving, energy saving, improved fuel economy, etc.

SAE Viscosity Number



TI0002

10W-30 is preferable if the ambient temperature is above −18°C (0°F). 20W-40 and 20W-50 are usable if the ambient temperature is above 10°C (50°F) for all seasons.



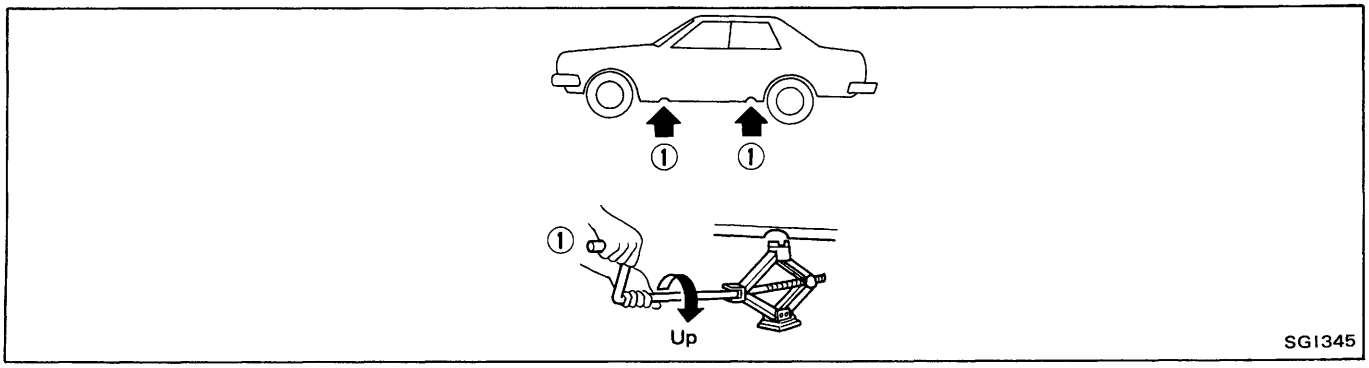
TI0003

80W-90 is preferable if the ambient temperature is below 40°C (104°F).

WARNING:

a. Never get under the vehicle while it is supported only by the jack. Always use safety stands to support the frame when you have to get under the vehicle.
b. Place wheel chocks at both front and back of the wheel which is diagonally opposite the jack position.
   Example: If the jack is positioned at the L.H. front wheel, place wheel chocks at R.H. rear wheel.

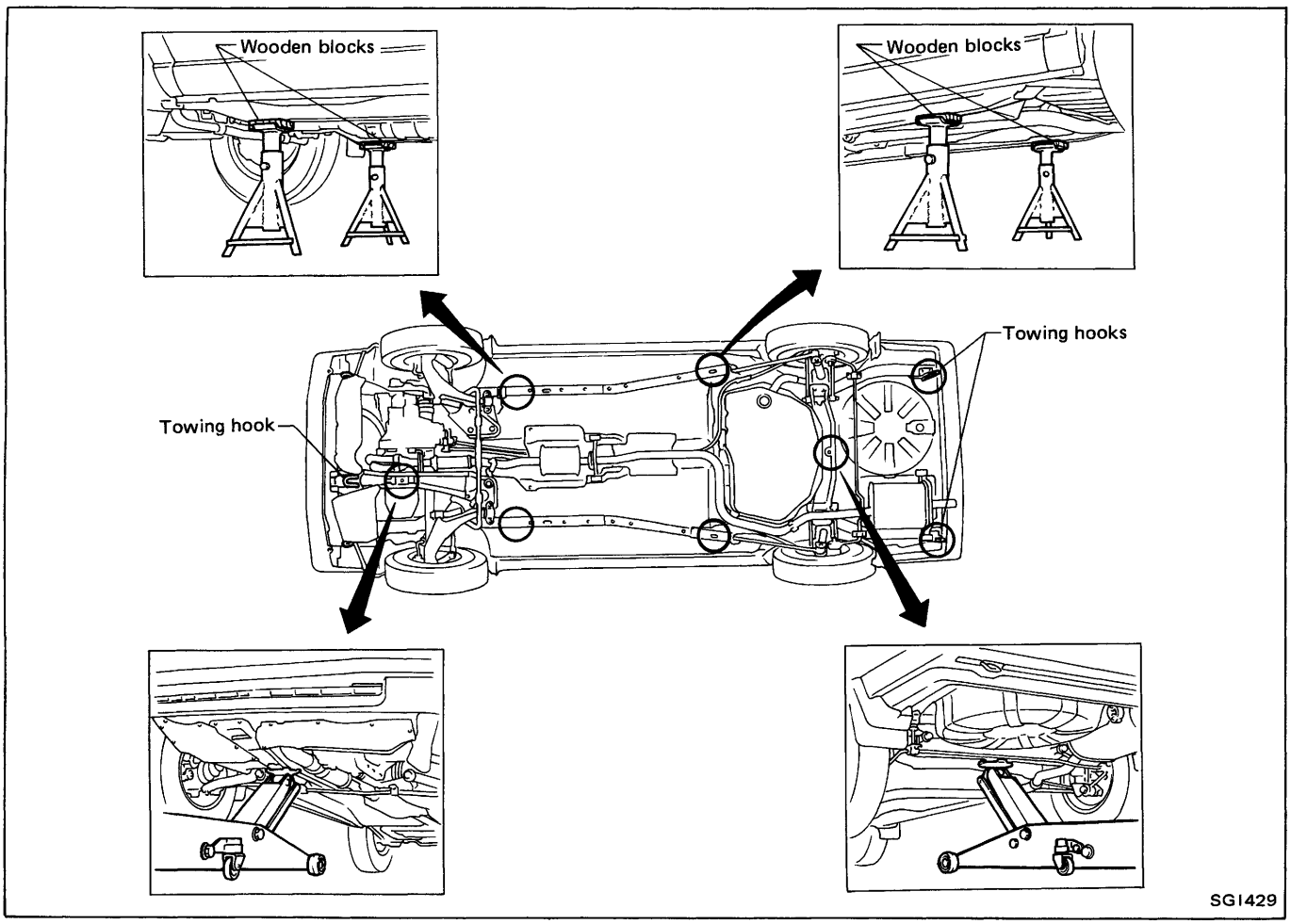
Pantograph Jack



Garage Jack and Safety Stand

CAUTION:

- Place a wooden or rubber block between safety stand and vehicle body when the supporting body is flat.

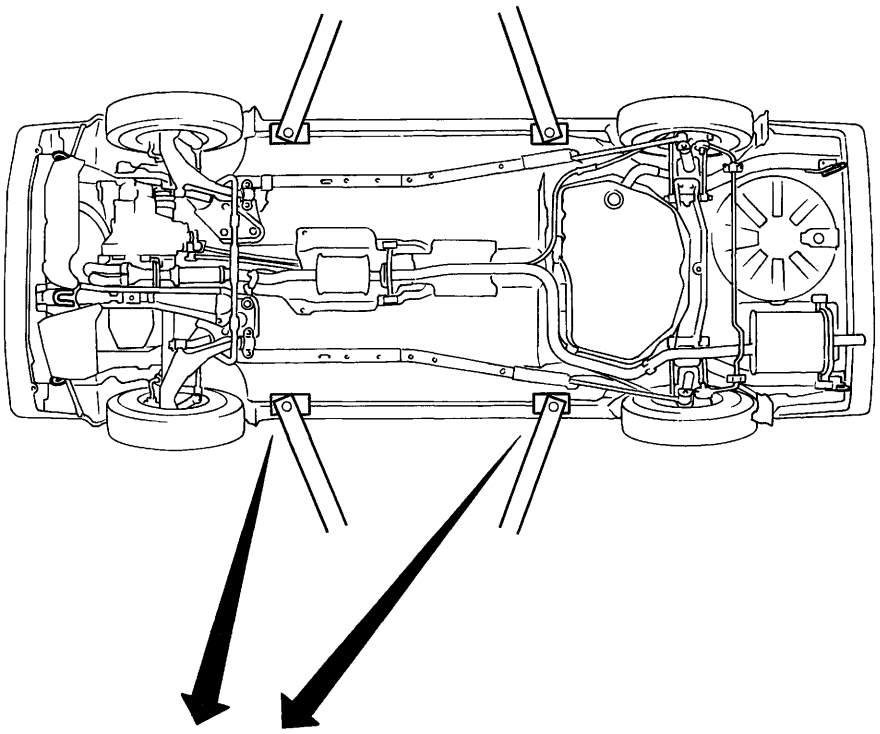


2-pole Lift

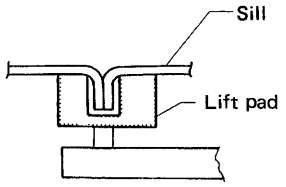
WARNING:

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.



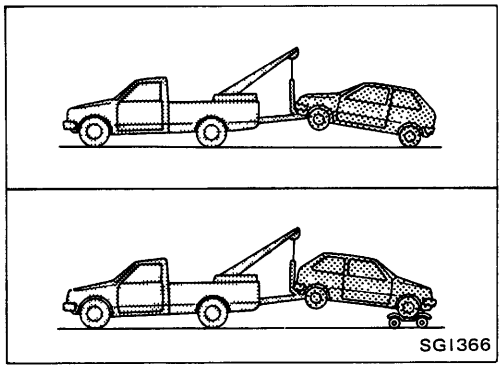
Put the sill in the slit of the lift pad to prevent the sill from deforming. If the pad does not have the slit, prepare a suitable attachment with slit.

SGI459

Tow Truck Towing

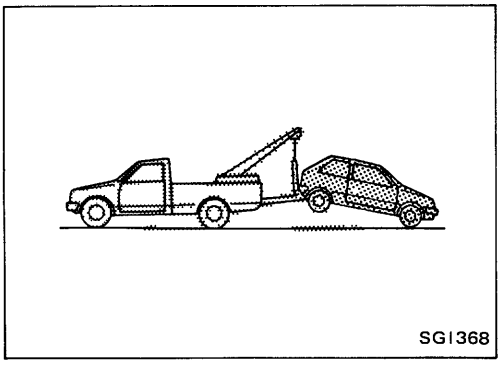
CAUTION:

- All applicable state or provincial (in Canada) laws and 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.
- Towing should be done in accordance with the Towing Procedure Manual.
- Attach safety chains for all towing.
- When towing, make sure that the transaxle, steering system and power train are in good order. If any unit is damaged, a dolly must be used.
- When towing with the front wheels on the ground:
  Turn the ignition key to the "OFF" position and secure the steering wheel in a straight-ahead position with a rope or similar device. Never place the ignition key in the "LOCK" position. This will result in damage to the steering lock mechanism.
  Move the gearshift lever to the neutral ("N" position).
- When towing with the rear wheels on the ground, release the parking brake.



SGI366

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



SGI368

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

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

Tow Truck Towing (Cont'd)

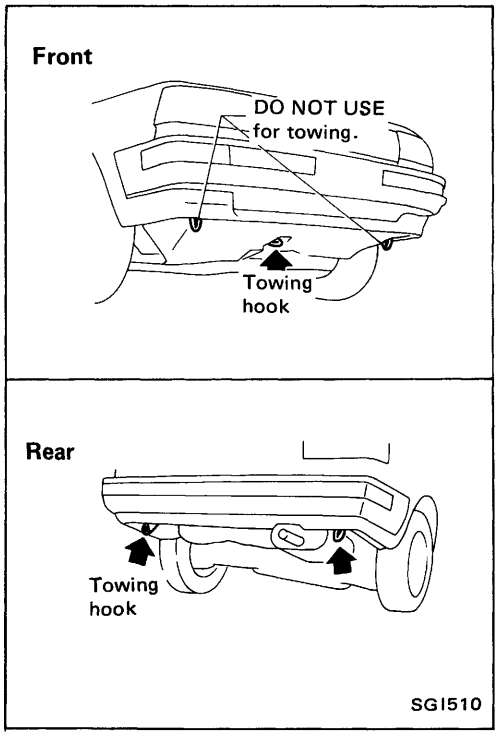
TOWING AN AUTOMATIC TRANSAXLE MODEL WITH FOUR WHEELS ON GROUND

Observe the following restricted towing speeds and distances.

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

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.



TOWING POINT

- Never tow the vehicle using only the towing hooks. Use proper towing equipment when towing. Otherwise, the vehicle body will be damaged.
- Always pull the cable straight out from the vehicle. Never pull on the hook at a sideways angle.

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

M 6
- 6 — Nominal diameter of bolt threads (Unit: mm)
- M — Metric screw threads

MAINTENANCE

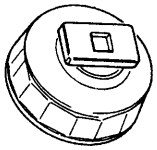
SECTION MA

CONTENTS

PREPARATION ..... MA- 2
PERIODIC MAINTENANCE ..... MA- 3
GENERAL MAINTENANCE ..... MA- 5
LUBRICATION CHART ..... MA- 8
ENGINE MAINTENANCE ..... MA- 9
CHASSIS AND BODY MAINTENANCE MA-15
SERVICE DATA AND SPECIFICATIONS (S.D.S.) MA-33

SPECIAL SERVICE TOOL

For engine maintenance

Tool number (Kent-Moore No.) Tool name	Description
KV10105900 (J34274) Oil filter cap wrench	 Removing oil filter

The following charts show the normal maintenance schedule. Under severe driving conditions, additional or more frequent maintenance will be required. Refer to **"Maintenance under severe driving conditions".**
The periodic maintenance schedule is repeated beyond the last mileage and period shown by returning to the first 15,000 miles (24,000 km) or 12 months.

EMISSION CONTROL SYSTEM MAINTENANCE

MAINTENANCE OPERATION Perform at number of miles, kilometers or months, whichever comes first.		MAINTENANCE INTERVAL					Reference page
	Miles x 1,000	7.5	15	30	45	60	
	(km x 1,000)	(12)	(24)	(48)	(72)	(96)	
	Months	6	12	24	36	48	
Drive belts	See NOTE (1).					I*	MA-9
Air cleaner filter		Replace every 30,000 miles (48,000 km).					MA-10
Vapor lines				I*		I*	MA-10
Fuel lines (hoses, piping, connections, etc.)				I*		I*	MA-10
Fuel filter	See NOTE (2)*.						MA-10
Engine coolant				R		R	MA-11
Engine oil		R	Then replace every 7,500 miles (12,000 km) or 6 months.				MA-12
Engine oil filter (Use Nissan PREMIUM type or equivalent.)		R	Then replace every second oil change.				MA-12
Spark plugs		Replace every 30,000 miles (48,000 km).					MA-13
Ignition wires		Inspect every 3 years*.					MA-14

CHASSIS AND BODY MAINTENANCE

MAINTENANCE OPERATION Perform at number of miles, kilometers or months, whichever comes first.		MAINTENANCE INTERVAL				Reference page
	Miles x 1,000	15	30	45	60	
	(km x 1,000)	(24)	(48)	(72)	(96)	
	Months	12	24	36	48	
Brake lines & hoses		I	I	I	I	MA-24
Brake pads, discs, drums & linings		I	I	I	I	MA-24, 25
Manual and automatic transaxle gear oil		I	I	I	I	MA-15, 16
Steering gear & linkage, axle & suspension parts			I		I	MA-18, 22, 31
Front drive shaft boots		I	I	I	I	MA-21
Exhaust system		I	I	I	I	MA-15

NOTE:
(1) After 60,000 miles (96,000 km) or 48 months, inspect every 15,000 miles (24,000 km) or 12 months.
(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) Maintenance items and intervals with "*" are recommended by NISSAN 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.

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

MAINTENANCE UNDER SEVERE DRIVING CONDITIONS

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

Severe driving conditions

A — Repeated short trips less than 5 miles (8 km) and outside temperatures remain below freezing
B — Extensive idling and/or low speed driving for a long distance such as police, taxi or door-to-door delivery use
C — Driving in dusty conditions
D — Driving on rough, muddy, or salt spread roads
E — Towing a trailer, using a camper or a car-top carrier

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page
. . C . .	Air cleaner filter	R	More frequently	MA-10
A B C D E	Engine oil & oil filter	R	Every 3,000 miles (5,000 km) or 3 months	MA-12
A . C D E	Brake pads, discs, drums & lining	I	Ever 7,500 miles (12,000 km)	MA-24, 25
. . . D E	Manual and automatic transaxle gear oil	R	Every 30,000 miles (48,000 km) or 24 months	MA-16, 17
. . . D .	Steering gear & linkage, axle & suspension parts and front drive shaft boots	I	Every 7,500 miles (12,000 km) or 6 months	MA-18, 21, 22, 31
. . C D .	Steering linkage ball joints & front suspension ball joints	I		MA-18, 31
A . . D E	Exhaust system	I		MA-15

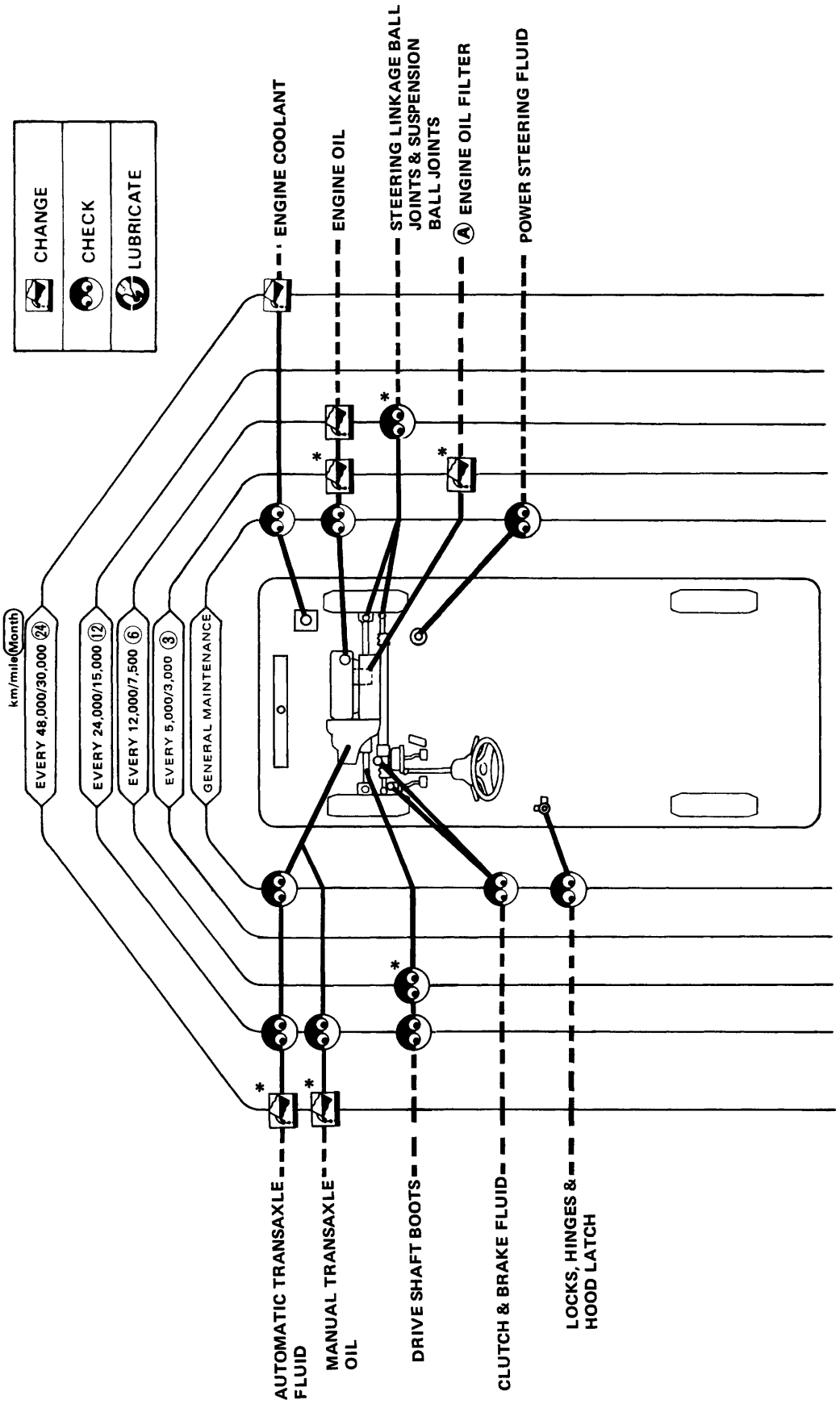
Maintenance operations: I = Inspect. Correct or replace if necessary R = Replace

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

Item	Reference item in MA section
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.	• **CHECKING TIRE CONDITION**
Wheel nuts When checking the tires, make sure no nuts are missing, and check for any loose nuts. Tighten if necessary.	• **TIRE REPLACEMENT**
Tire rotation Tires should be rotated every 12,000 km (7,500 miles).	• **TIRE ROTATION**
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.	• **CHECKING TIRE CONDITION** • **CHECKING FRONT WHEEL ALIGNMENT** • **CHECKING REAR WHEEL ALIGNMENT** • **WHEEL INSPECTION** • **BALANCING WHEELS**
Windshield glass Check for abrasions or scratches.	–
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 properly. Also ensure, that all latches lock securely. Lubricate 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.	• **LUBRICATING HOOD LATCHES, LOCKS AND HINGES**
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.	–
Horn Make sure it operates properly.	–
Windshield wiper and washer Check that the wipers and washer operate properly and that the wipers do not streak.	–

Item	Reference item in MA section
Windshield defroster Check that the air comes out of the defroster outlets properly and in sufficient quantity when operating the heater or air conditioner.	–
Rear view mirror Make sure that it is secure and clean.	–
Sun visors Make sure that they can be moved freely and are secure.	–
Steering wheel Check for changes in the steering condition, such as excessive free play, hard steering or strange noises.	**Specification** **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 restraints move up and down smoothly and that the locks (if so equipped) hold securely in all latched positions.	–
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.	• **CHECKING SEAT BELTS, BUCKLES, RETRACTORS, ANCHORS AND ADJUSTER**
Accelerator pedal Check the pedal for smooth operation and make sure the pedal does not catch or require uneven effort. Keep the floor mats away from the pedal.	–
Clutch pedal Make sure the pedal operates smoothly and check that it has the proper free travel.	• **CHECKING CLUTCH PEDAL OPERATION**
Brakes Check that the brakes do 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.	• **CHECKING FOOT BRAKE PEDAL OPERATION** • **CHECKING BRAKE BOOSTER FUNCTION**
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.	• **CHECKING PARKING BRAKE**
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.	–

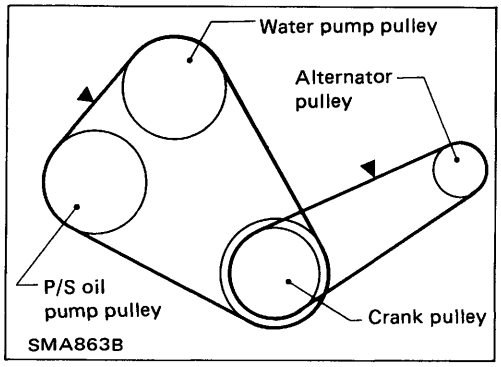
Item	Reference item in MA section
UNDER THE HOOD AND VEHICLE	
The maintenance items listed here should be checked periodically e.g. each time you check the engine oil or refuel.	
Windshield washer fluid Check that there is adequate fluid in the tank.	–
Engine coolant level Check the coolant level when the engine is cold.	• CHANGING ENGINE COOLANT
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 and clutch fluid levels Make sure that the brake and clutch fluid levels are between the "MAX" and "MIN" lines on the reservoir.	• CHECKING CLUTCH FLUID LEVEL AND LEAKS • CHECKING BRAKE FLUID LEVEL AND LEAKS
Engine drive belts Make sure that no belt is frayed, worn, cracked or oily.	• CHECKING DRIVE BELT
Engine oil level Check the level after parking the vehicle on a level spot and turning off the engine.	• CHANGING ENGINE OIL
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.	• CHECKING POWER STEERING SYSTEM FLUID AND LINES
Automatic transaxle fluid level Check the level after putting the selector lever in "P" with the engine idling.	• CHECKING A/T FLUID LEVEL
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.	• CHECKING EXHAUST SYSTEM
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 may 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 if gasoline fumes are evident, check for the cause and have it corrected immediately.	• CHECKING CLUTCH FLUID LEVEL AND LEAKS • CHECKING M/T OIL LEVEL • CHECKING A/T FLUID LEVEL • CHECKING BRAKE LINES & HOSES • CHECKING POWER STEERING SYSTEM FLUID AND LINES


CHANGE
CHECK
LUBRICATE
km/mile
Month
EVERY 48,000/30,000 (24)
EVERY 24,000/15,000 (12)
EVERY 12,000/7,500 (6)
EVERY 5,000/3,000 (3)
GENERAL MAINTENANCE
ENGINE COOLANT
ENGINE OIL
STEERING LINKAGE BALL JOINTS & SUSPENSION BALL JOINTS
(A) ENGINE OIL FILTER
POWER STEERING FLUID
AUTOMATIC TRANSAXLE FLUID
MANUAL TRANSAXLE OIL
DRIVE SHAFT BOOTS
CLUTCH & BRAKE FLUID
LOCKS, HINGES & HOOD LATCH
(A) Replace at the first oil change and then every second oil change.
* : Maintenance under severe driving conditions
SMA987B

Drive Belt Inspection

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

Inspect drive belt deflections when engine is cold. If engine is hot, check deflections in 30 minutes or more.
Adjust if belt deflections exceed the limit.



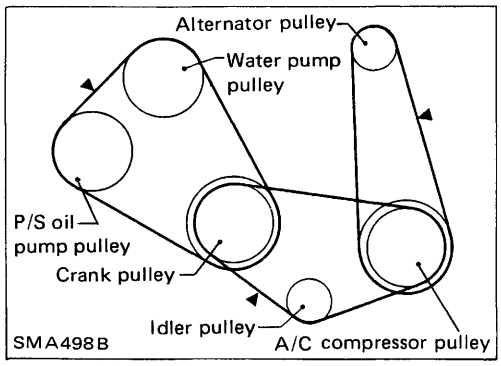
Belt deflection:

Power steering equipped model (Without air conditioner)

Unit: mm (in)

	Used belt deflection		Set deflection of new belt
	Limit	Adjust deflection	
Alternator	12 (0.47)	6 - 8 (0.24 - 0.31)	5 - 7 (0.20 - 0.28)
Power steering oil pump	12.5 (0.492)	7 - 9 (0.28 - 0.35)	6 - 8 (0.24 - 0.31)

Applied pushing force: 98 N (10 kg, 22 lb)

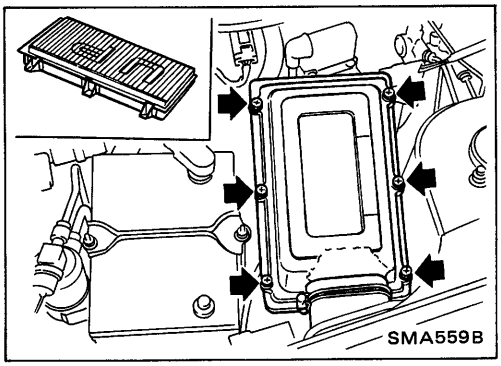


Air conditioner & power steering equipped model

Unit: mm (in)

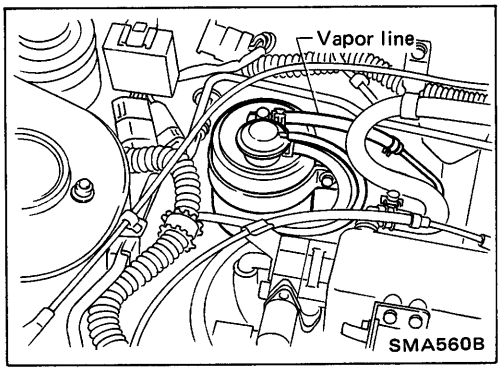
	Used belt deflection		Set deflection of new belt
	Limit	Adjust deflection	
Alternator	10 (0.39)	5 - 7 (0.20 - 0.28)	5 - 7 (0.20 - 0.28)
Power steering oil pump	12.5 (0.492)	7 - 9 (0.28 - 0.35)	6 - 8 (0.24 - 0.31)
Air conditioner compressor	6 (0.24)	3 - 4 (0.12 - 0.16)	3 - 4 (0.12 - 0.16)

Applied pushing force: 98 N (10 kg, 22 lb)



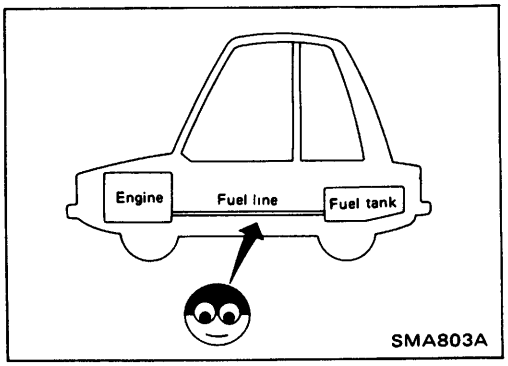
Replacing Air Cleaner Filter

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



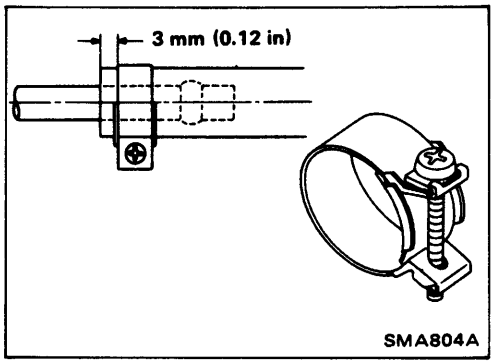
Vaper Line Inspection

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



Fuel Line Inspection

Inspect fuel lines and tank for proper attachment, 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.

Fuel hose clamps:

: 1.0 - 1.5 N·m
(0.10 - 0.15 kg-m, 0.7 - 1.1 ft-lb)

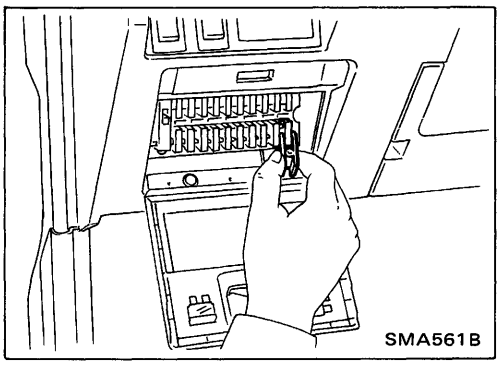
Ensure that screw does not contact adjacent parts.

Fuel Filter Replacement

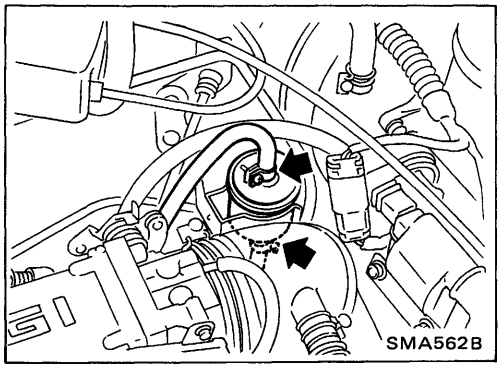
WARNING:

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

Fuel Filter Replacement (Cont'd)


SMA561B

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.


SMA562B

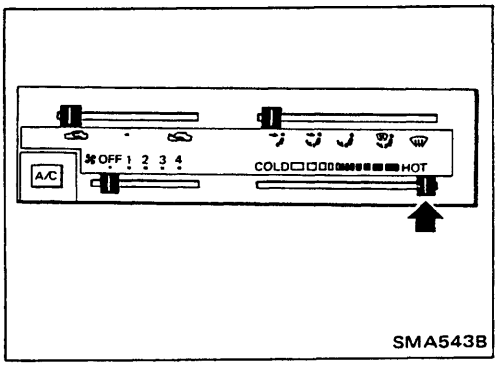
5. Loosen fuel hose clamps.
6. Replace fuel filter.

- **Be careful not to spill fuel in engine compartment. Place a rag to absorb fuel.**
- **Use high-pressure type fuel filter. Do not use a synthetic resinous fuel filter.**

Changing Engine Coolant

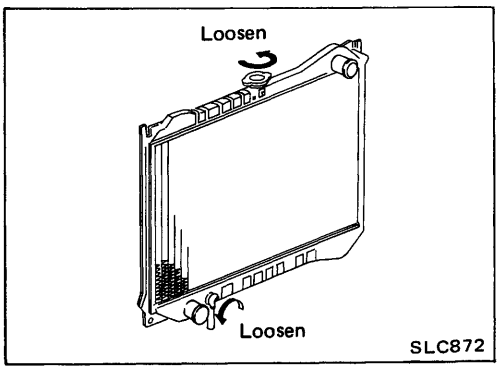
WARNING:

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



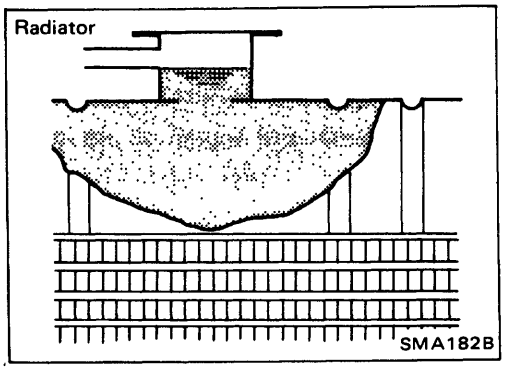
SMA543B

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



SLC872

2. Open drain cock at the bottom left-hand side of radiator, and remove radiator cap.
3. Close drain cock and fill radiator with water.
4. Warm up engine and repeat steps 2, 3 and 4 one or two times to drain old coolant.



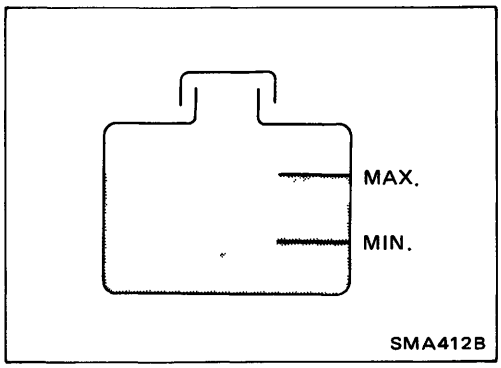
SMA182B

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

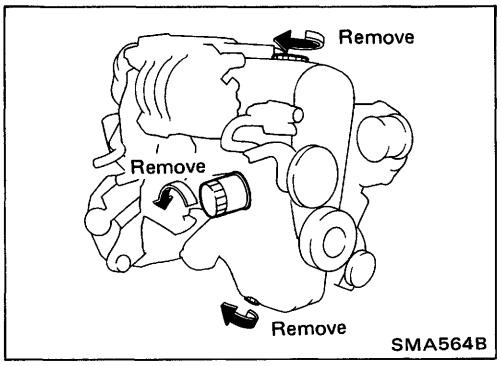
Coolant capacity (Reservoir tank excluded):
7.3ℓ (7-3/4 US qt, 6-3/8 Imp qt)

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

Changing Engine Coolant (Cont'd)



6. Fill reservoir tank up to "MAX" level.
   Reservoir tank capacity ("MAX" level):
   0.8ℓ (7/8 US qt, 3/4 Imp qt)
7. Run the engine at approximately 2,000 rpm for about one minute.
8. Stop engine and cool it down, then refill radiator and reservoir tank.



Changing Engine Oil

WARNING:

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

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

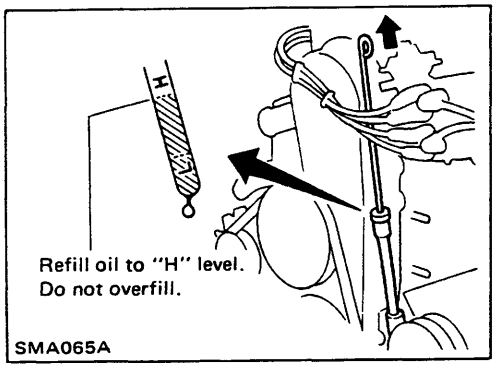
Oil capacity (Approximately):

Unit: ℓ (US qt, Imp qt)

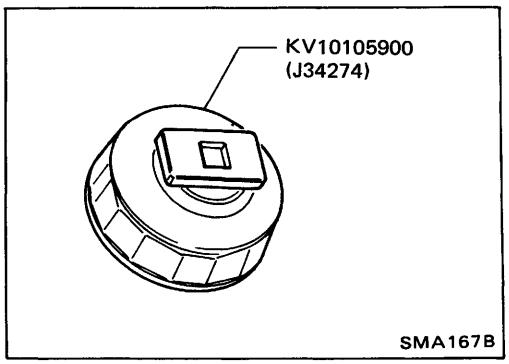
With oil filter change	3.5 (3-3/4, 3-1/8)
Without oil filter change	3.1 (3-1/4, 2-3/4)

CAUTION:

a. **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)
b. **Use recommended engine oil.**
   Refer to GI section.



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



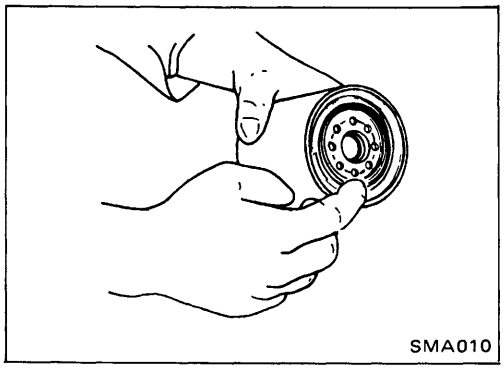
Oil Filter Replacement

1. Remove oil filter with Tool.

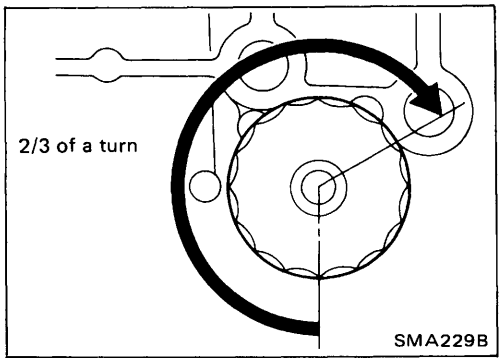
WARNING:

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

Oil Filter Replacement (Cont'd)



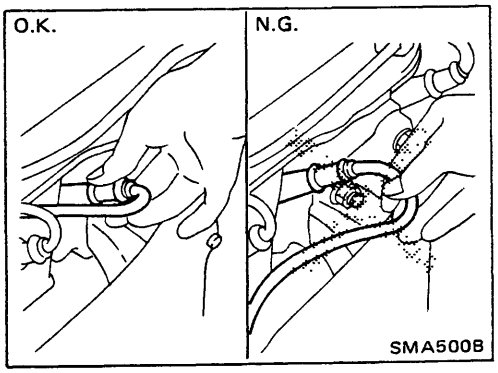
2. Before installing new oil filter, wipe clean oil filter mounting surface on cylinder block, and smear a little engine oil on rubber seal of oil filter.



3. Screw oil filter on until a slight resistance is felt, then tighten an additional 2/3 turn, or more.

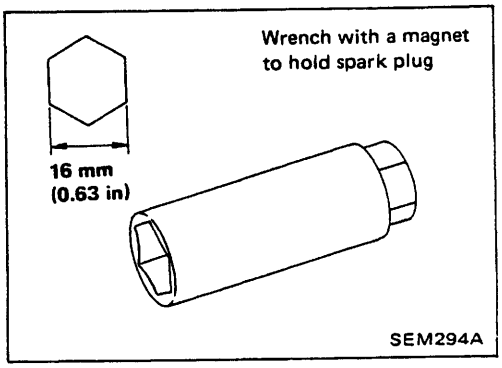
4. Add engine oil.

Refer to Changing Engine Oil.



Spark Plug Replacement

1. Disconnect ignition wires from spark plugs by pulling on boots. Do not pull on wires.

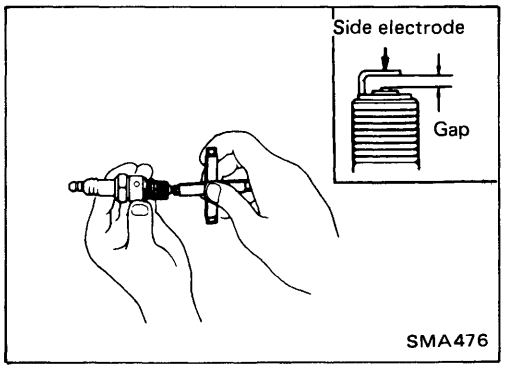


2. Remove spark plugs with suitable spark plug wrench.

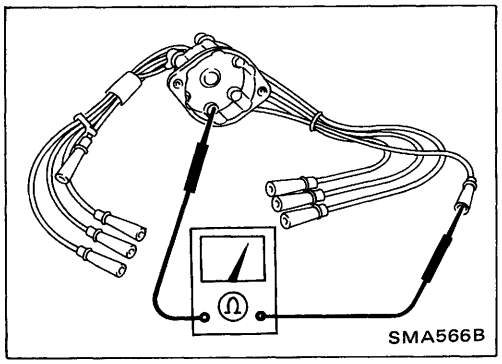
Spark Plug Replacement (Cont'd)

Spark plug:

		INT	EXH
Type	Hot	BCPR5ES-11	
	Standard	BCPR6ES-11	BCPR5ES-11
	Cold	BCPR7ES–11	BCPR6ES-11 BCPR7ES-11

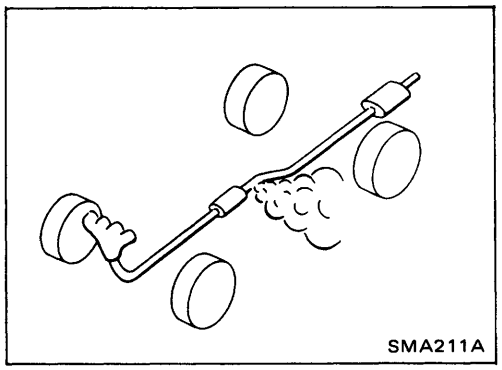


3. Check new spark plug gap.
   Gap: 1.0 - 1.1 mm (0.039 - 0.043 in)
4. Install spark plugs. Reconnect ignition wires according to Nos. indicated on them.
   Spark plug:
   : 20 - 29 N·m (2.0 - 3.0 kg-m, 14 - 22 ft-lb)



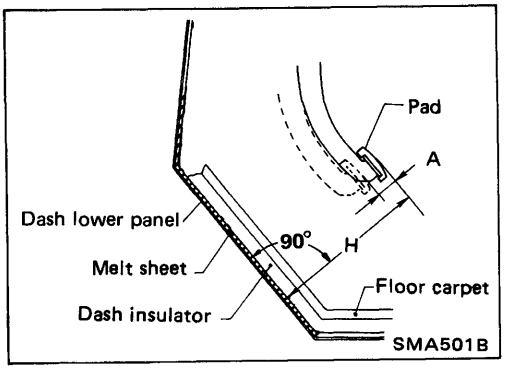
Ignition Wire (High-tension Wire) Inspection

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


SMA211A

Checking Exhaust System

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



SMA501B

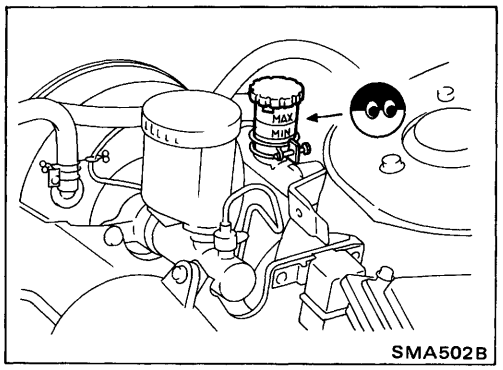
Checking Clutch Pedal Operation

Check clutch pedal height, free play and for smooth operation.

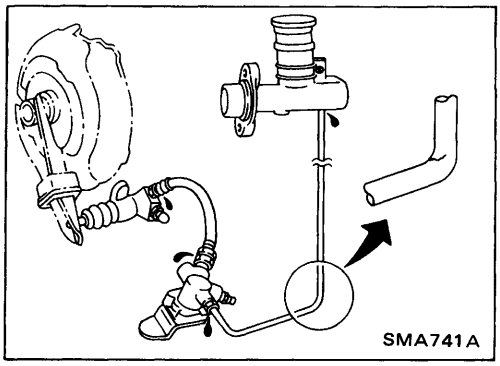
Pedal height "H":
Refer to S.D.S.
Pedal free play "A":
1 - 3 mm (0.04 - 0.12 in)

If necessary, adjust clutch pedal height and pedal free play.
Refer to section CL.

Checking Clutch Fluid Level and Leaks



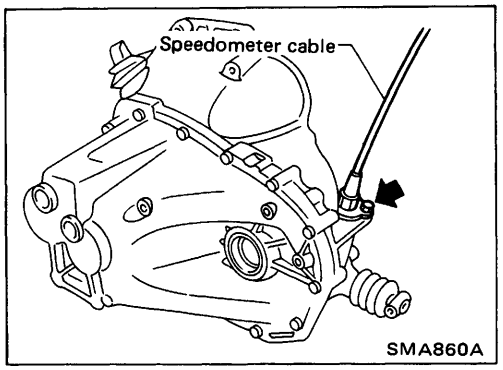
SMA502B


SMA741A

Checking M/T Oil Level

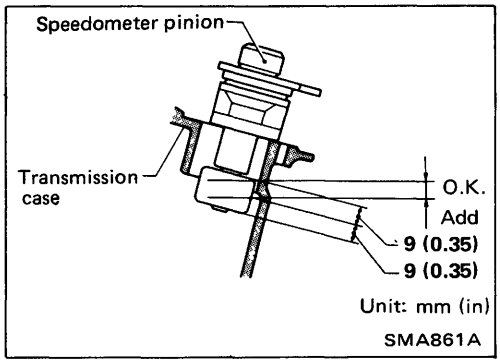
Never start engine while checking oil level.

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



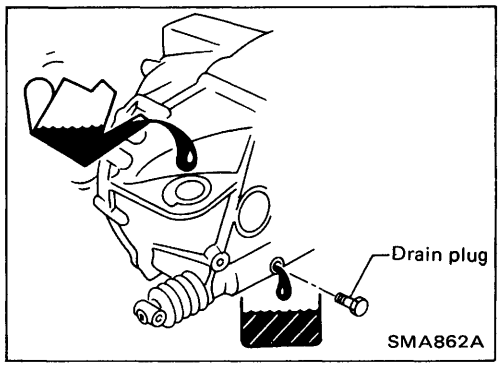
SMA860A

Checking M/T Oil Level (Cont'd)



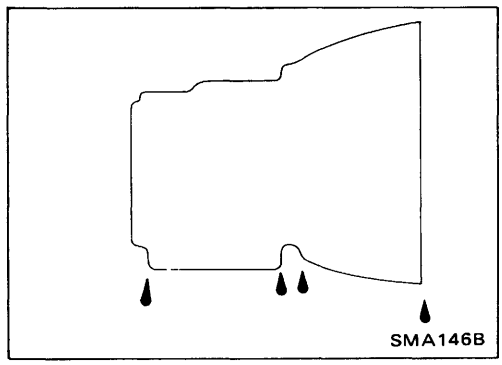
Changing M/T Oil

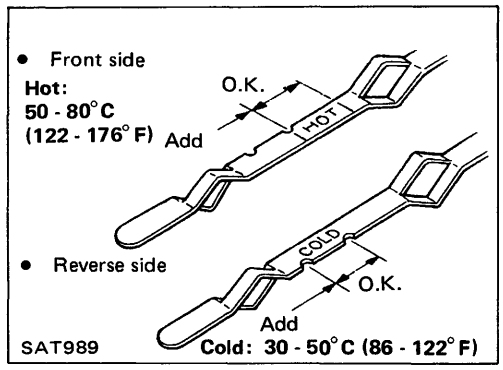
Oil capacity:
4.7 liters (10 US pt, 8-1/4 Imp pt)



Checking A/T Fluid Level

Check automatic transaxle for leakage.





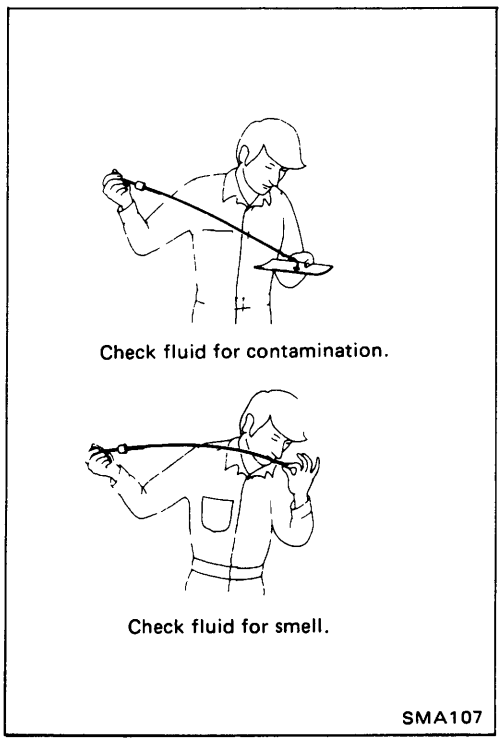
- Check fluid level.
  Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) after vehicle has been driven for approximately 5 minutes and engine is warmed up. But it can be checked at fluid temperatures of 30 to 50°C (86 to 122°F) using "COLD" range on dipstick 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. Reinsert 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.

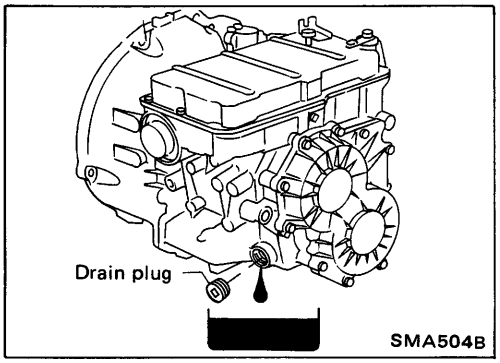
Do not overfill.

Checking A/T Fluid Level (Cont'd)

- **Underfilling may cause clutches to slip, resulting in damage to them.**

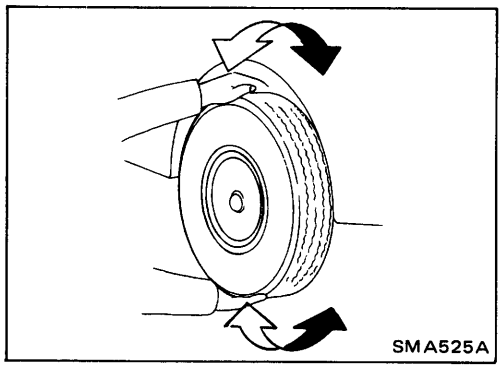


Check automatic tansaxle fluid condition.
Check fluid for contamination. If fluid is very dark or smells burned, or contains frictional material (clutches, band, etc.), check operation of A/T.
Refer to section AT for checking operation of A/T.



Changing A/T Fluid

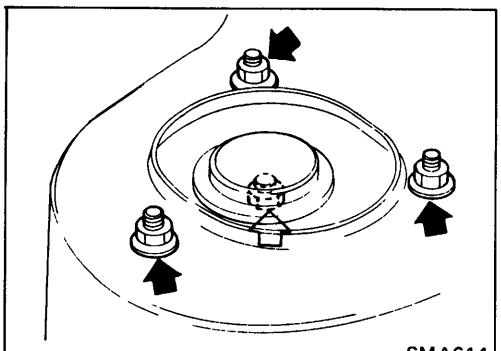
Oil capacity (With torque converter):
6.8 liters (7-1/4 US qt, 6 Imp qt)


SMA525A

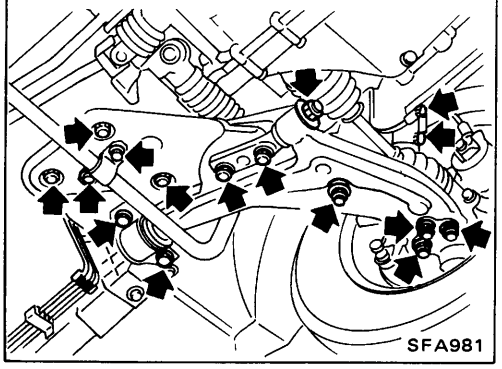
Checking Front Axle and Front Suspension Parts

- Check front axle and front suspension parts for looseness, cracks, wear or other damage.

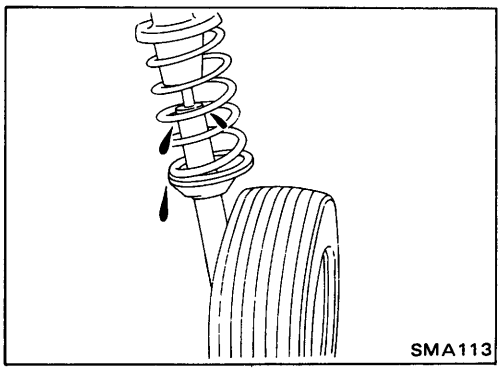
(1) Shake each front wheel.


SMA614

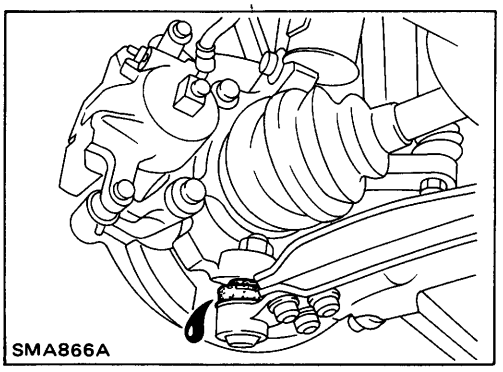
(2) Make sure that cotter pin is inserted.
(3) Retighten all nuts and bolts to the specified torque.
Tightening torque: Refer to section FA.
(4) Check front axle and front suspension parts for wear, cracks or other damage.

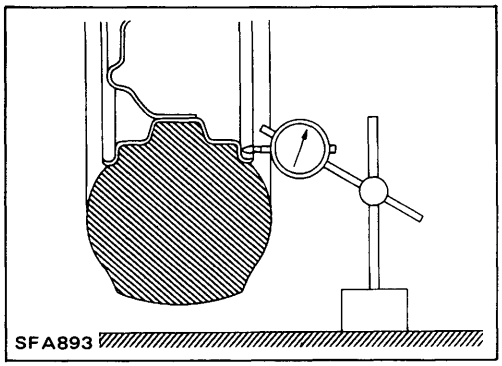

SFA981

- Check strut (shock absorber) for oil leakage or other damage.


SMA113

- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.


SMA866A



Checking Front Wheel Alignment

Before checking front wheel alignment, be sure to make a preliminary inspection.

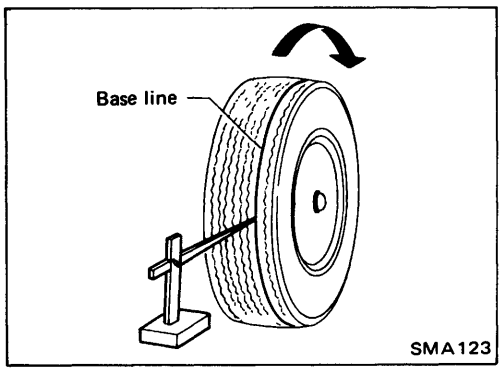
PRELIMINARY INSPECTION

- Check tires for wear and proper inflation.
- Check wheel runout.
  Lateral runout: 1.0 mm (0.039 in) or less
- Check front wheel bearings for looseness.
- Check front suspension for looseness.
- Check steering linkage for looseness.
- Check that front shock absorbers work properly.
- Check vehicle posture (Unladen):
  "Unladen"
  Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated position.

CAMBER, CASTER AND KINGPIN INCLINATION

Camber, caster and kingpin inclination are preset at factory and cannot be adjusted.

Camber	degree	–25′ to 1°5′
Caster	degree	1°20′ - 2°50′
Kingpin inclination	degree	13°50′ - 15°20′

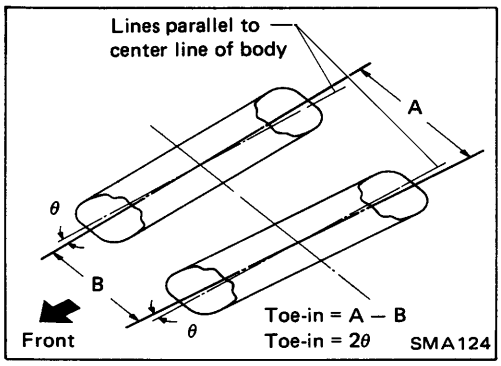


TOE-IN

1. Mark a base line across tread.

After lowering front of vehicle, move it up and down to eliminate friction, and set steering wheel in straight ahead position.

Checking Front Wheel Alignment (Cont'd)



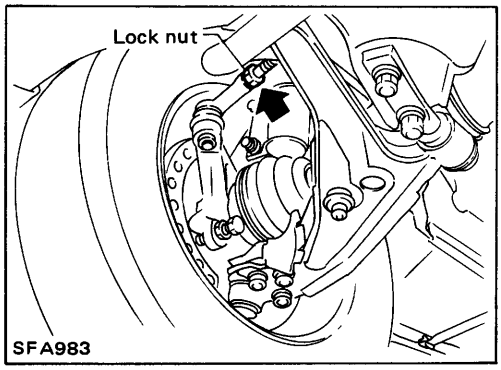
2. Measure toe-in.

Measure distance "A" and "B" at the same height as hub center.

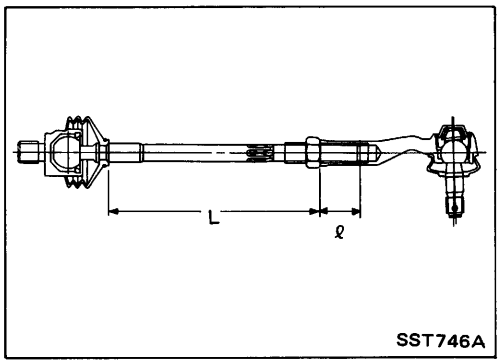
Toe-in (Unladen):

A – B 1 - 3 mm (0.04 - 0.12 in)

2θ 6' - 19' (Total toe-in)



3. Adjust toe-in by varying length of steering tie-rods.



Length "ℓ" must be 25 mm (0.98 in) or more.

Make sure that tie-rods are the same length.

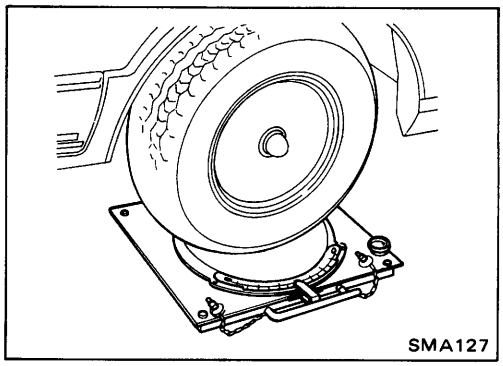
Tie-rod length "L"-reference data:

Pinion gear side

178.4 mm (7.02 in)

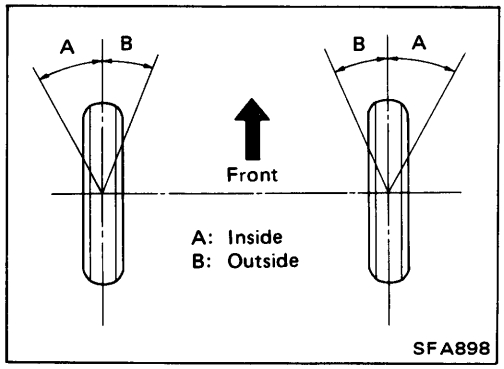
Side opposite pinion gear

179.0 mm (7.05 in)



FRONT WHEEL TURNING ANGLE

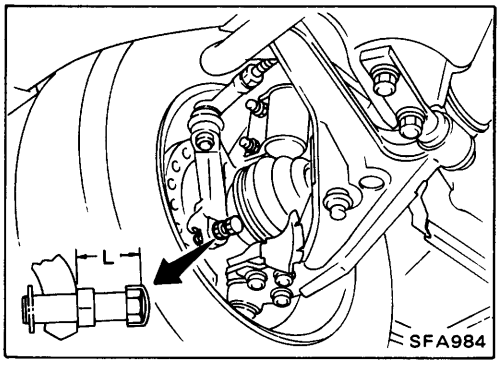
1. Set wheels in straight ahead position and then move vehicle forward until front wheels rest properly on turning radius gauge.



2. Rotate steering wheel all the way right and left; measure turning angle.

Full turns	Inside wheel	38° - 42°
	Outside wheel	29° - 33°
Toe-out turn (at 20°)	Inside wheel	22°20'
	Outside wheel	20°

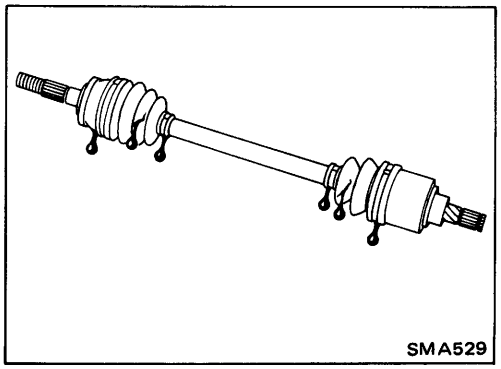
Checking Front Wheel Alignment (Cont'd)



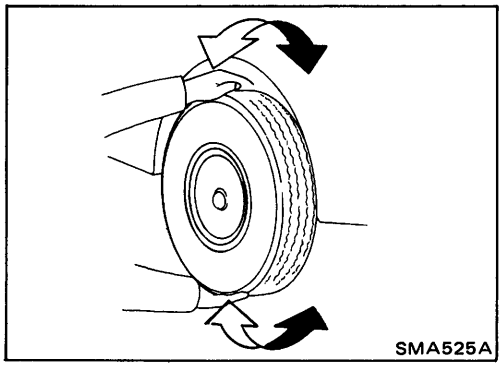
3. Adjust by stopper bolt if necessary.

Standard length "L":
24 mm (0.94 in)

Checking Drive Shafts



- Check boot and drive shaft for cracks, wear, damage or grease leakage.

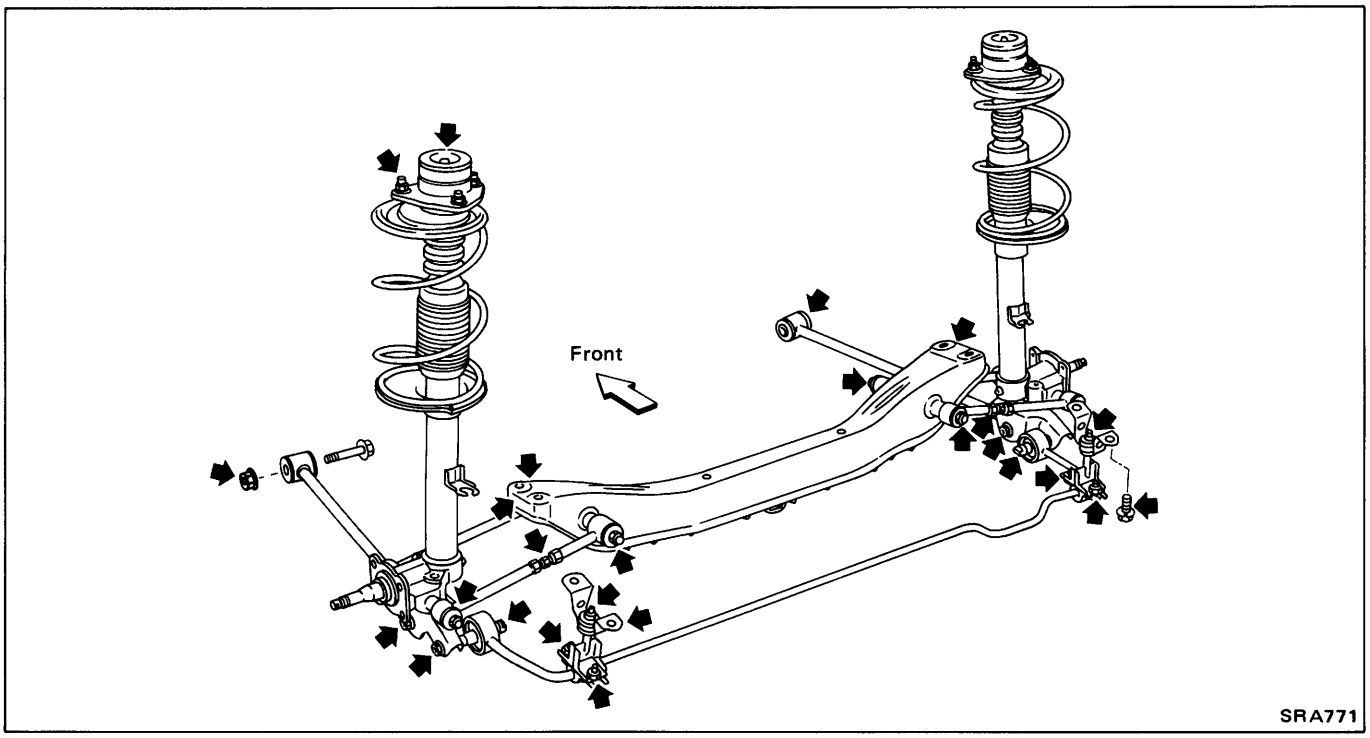

SMA525A

Checking Rear Axle and Rear Suspension Parts

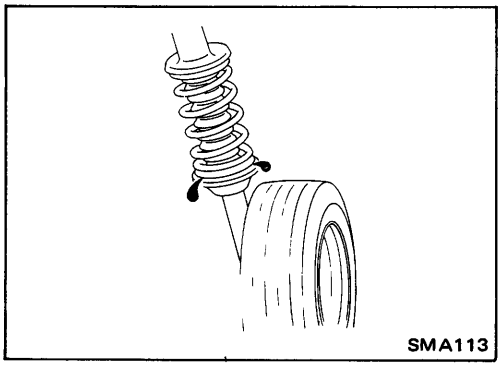
- Check axle and suspension parts for looseness, wear or damage.

(1) Shake each rear wheel.

(2) Retighten all nuts and bolts to the specified torque.
Tightening torque: Refer to section RA.



SRA771


SMA113

(3) Check strut (shock absorber) for oil leakage or other damage.

Checking Rear Wheel Alignment

PRELIMINARY INSPECTION

Make following checks. Adjust, repair or replace if necessary.

- Check tires for wear and proper inflation.
- Check rear wheel bearings for looseness.
- Check wheel runout.
  Lateral runout: 1.0 mm (0.039 in) or less
- Check if rear strut (shock absorber) works properly.
- Check rear axle and rear suspension parts for looseness.
- Check vehicle posture (Unladen).

Checking Rear Wheel Alignment (Cont'd)

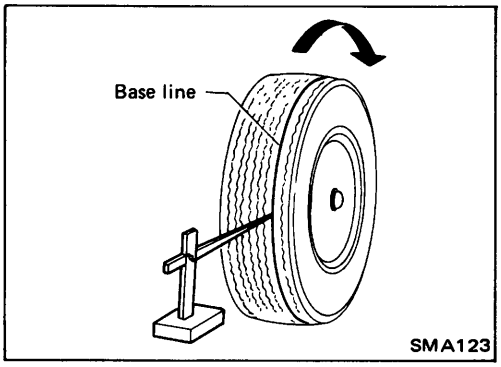
"Unladen":

Fuel tank, radiator and engine oil full. Spare tire, jack, hand tools and mats in designated position.

CAMBER

Camber is preset at factory and cannot be adjusted.

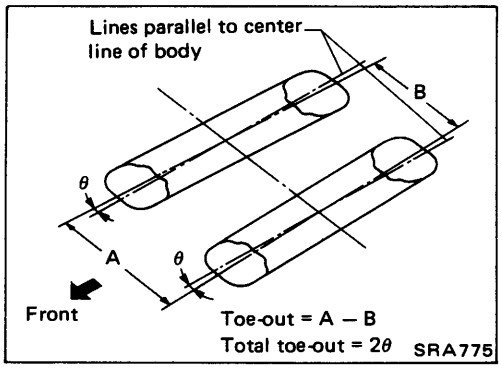
Camber: −1° 10′ to 0° 20′



TOE-OUT

1. Mark a base line across tread.

After lowering rear of vehicle, move it up and down to eliminate friction.



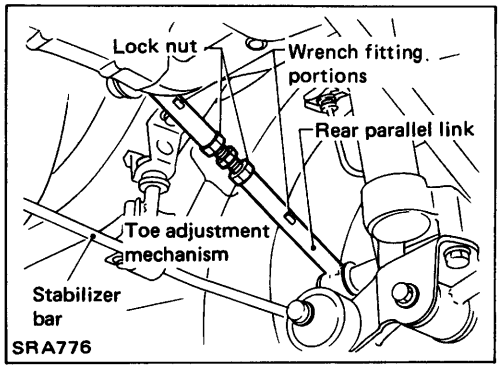
2. Measure toe-out.

Measure distance "A" and "B" at the same height as hub center.

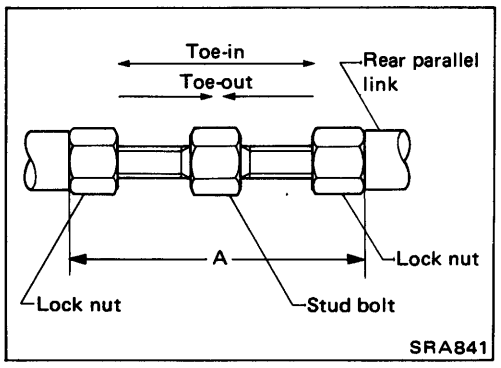
Toe-out:

A − B 2 - 6 mm (0.08 - 0.24 in)

2θ 12′ - 37′ (Total toe-out)



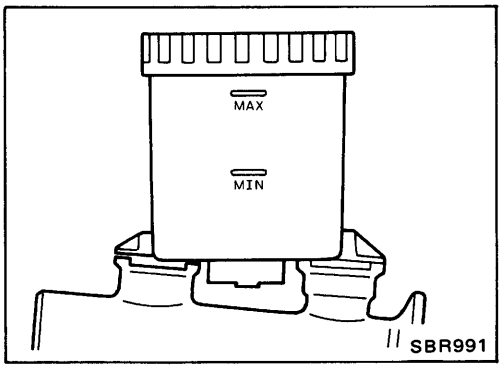
3. Adjust toe-out by varying length of rear parallel links.



- Adjust left and right rear parallel links to the same length "A".

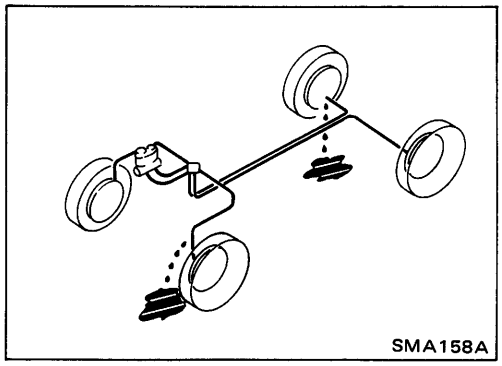
Tighten lock nut while holding rear parallel link with wrench to prevent bushing from twisting.

Standard length "A": 50 - 55 mm (1.97 - 2.17 in)



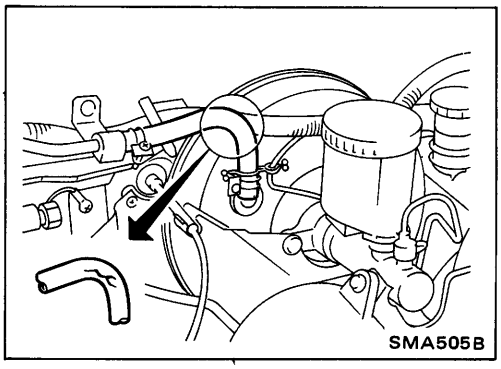
Checking Brake Fluid Level and Leaks

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

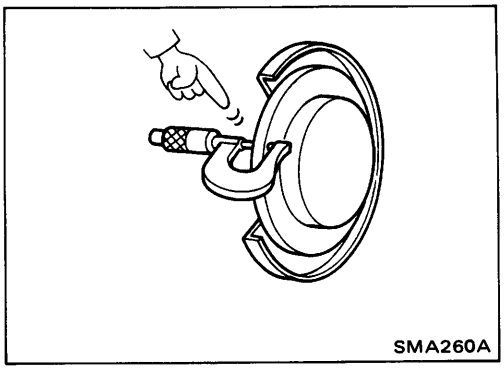


Checking Brake Lines & Hoses

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



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



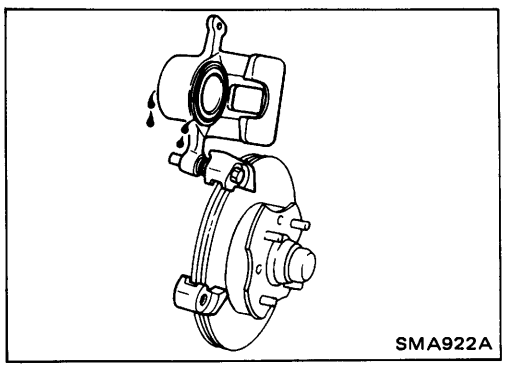
Checking Disc Brake

Check condition of disc brake components.

ROTOR

Check condition and thickness.

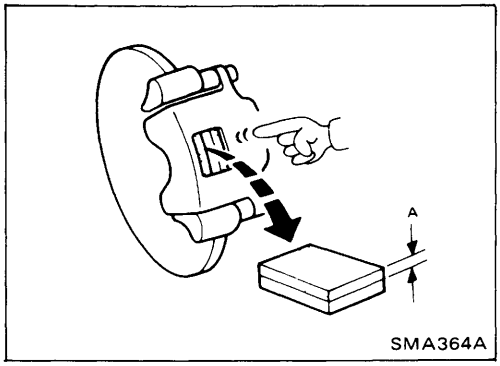
Minimum thickness:
20.0 mm (0.787 in)



CALIPER

Check operation and leakage.

Checking Disc Brake (Cont'd)



PAD

Check wear or damage.

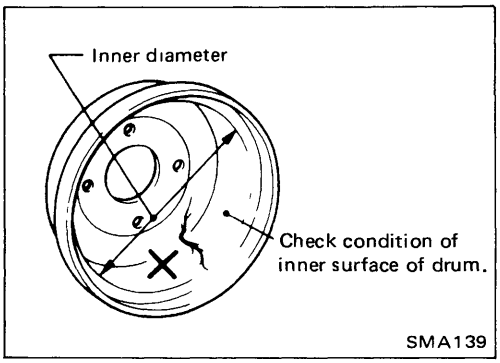
Minimum thickness "A": 2.0 mm (0.079 in)

Checking Drum Brake

Check condition of drum brake components.

WHEEL CYLINDER

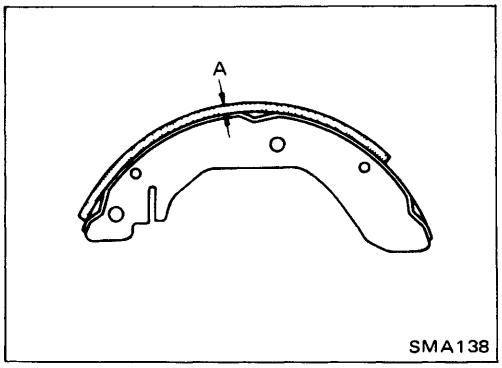
Check operation and leakage.



DRUM

Check condition of inner surface.

Drum repair limit (Inner diameter):
230.0 mm (9.06 in)

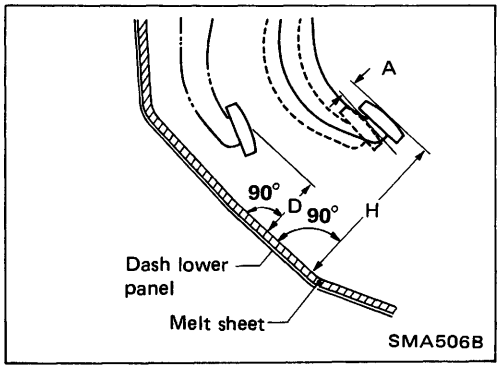


LINING

Check wear or damage.

Minimum thickness "A": 1.5 mm (0.059 in)

Refer to section BR for shoe replacement.

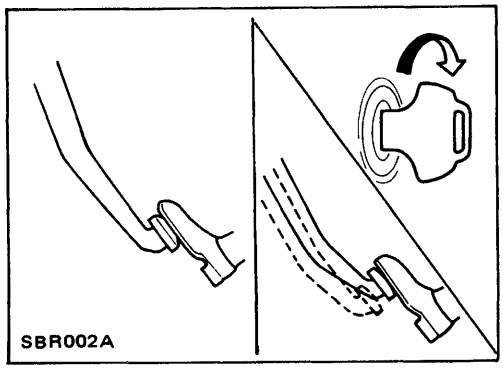


Checking Foot Brake Pedal Operation

H: Free height
Refer to S.D.S.

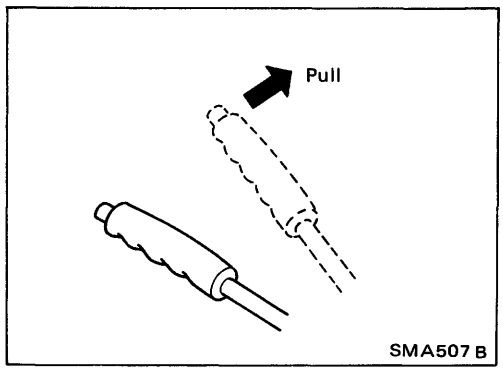
D: Depressed height
Under force of 490 N (50 kg, 110 lb) with engine running
Refer to S.D.S.

A: Pedal free play
1.0 - 3.0 mm (0.039 - 0.118 in)



Checking Brake Booster Function

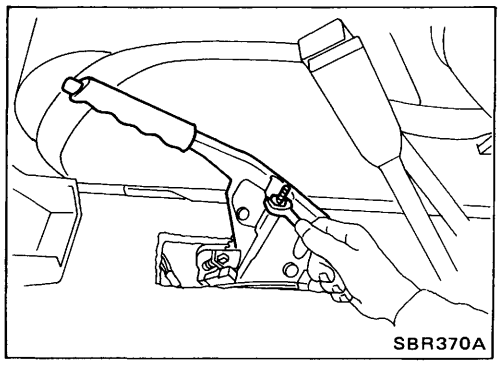
- Depress brake pedal several times with engine off, then check that there is no change in pedal stroke.
- Depress brake pedal, then start engine. If pedal goes down slightly, operation is normal.



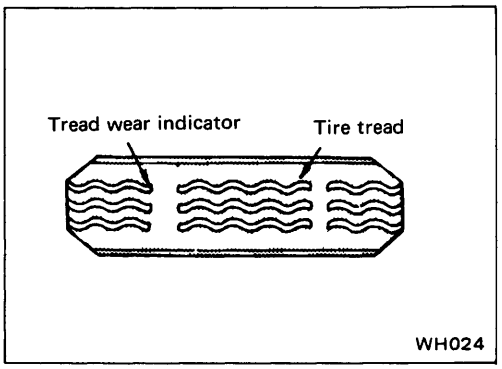
Checking Parking Brake

1. Pull lever with specified amount of force.
   Check lever stroke and for smooth operation.

   Number of notches [At pulling force of 196 N (20 kg, 44 lb)] :
   Refer to S.D.S.



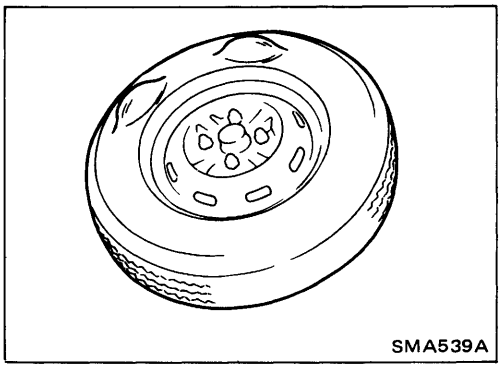
2. Turn adjusting nut.



Checking Tire Condition

TIRE CONDITION

- When tread wear indicators appear, replace tire with new one.



- Check tread and side walls for cracks, holes, separation or damage.
- Check tire valves for air leakage.

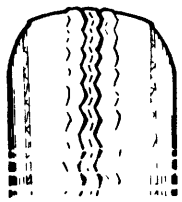
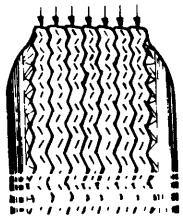
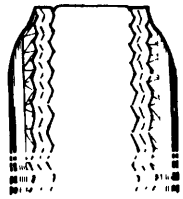
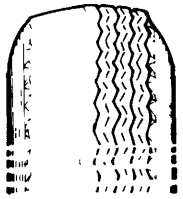
TIRE INFLATION

Tire pressure should be measured when tire is cold.

Tire pressure should be set to the specifications on tire placard located in center console.

ABNORMAL TIRE WEAR

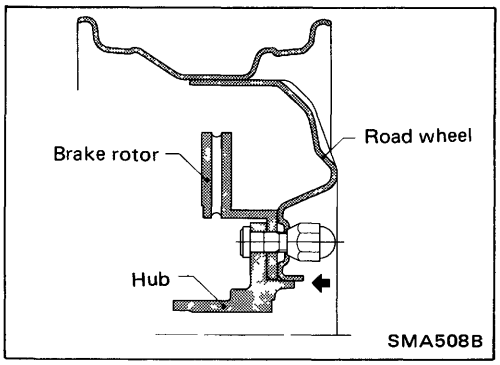
Correct abnormal tire wear according to chart shown below.

Condition	Probable cause	Corrective action	Condition	Probable cause	Corrective action
 Shoulder wear	• Underinflation (both sides wear) • Incorrect wheel camber (one side wear) • Hard cornering • Lack of rotation	• Measure and adjust pressure. • Repair, or replace axle and suspension parts. • Reduce speed. • Rotate tires.	Feathered edge  Toe-in or toe-out wear	• Incorrect toe	• Adjust toe-in.
 Center wear SMA197B	• Overinflation • Lack of rotation	• Measure and adjust pressure. • Rotate tires.	 Uneven wear	• Incorrect camber or caster • Malfunctioning suspension • Unbalanced wheel • Out-of-round brake drum • Other mechanical conditions • Lack of rotation	• Repair, or replace axle and suspension parts. • Repair, replace or, if necessary, reinstall. • Balance or replace. • Correct or replace. • Correct or replace. • Rotate tires.

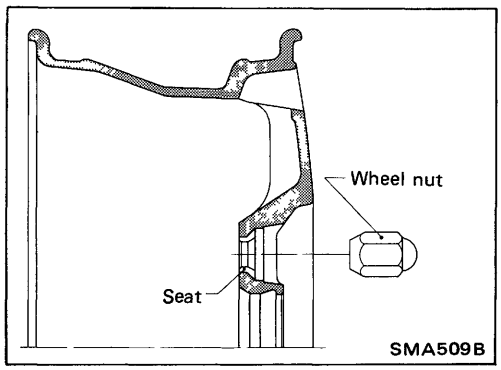
Tire Replacement

CAUTION:

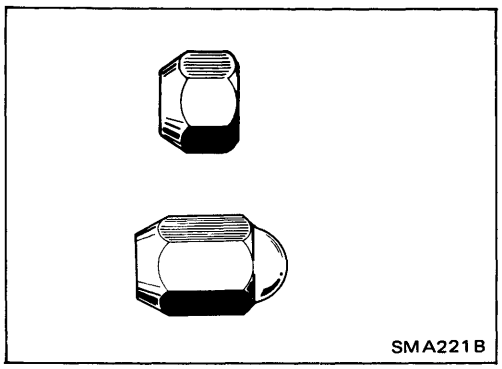
- **Do not mix different types of tires, such as bias, bias belted and radial tires under any circumstances.**
- **When replacing a tire, use a tire of the same size.**
- **Use recommended tires and wheels.**
- **Do not mix tires of different brands or tread patterns.**
- **When replacing standard tires with those tires of an optional recommended size and of different diameter, the speedometer must be recalibrated.**
- **Install road wheel using the wheel hub boss.**



- Use tapered wheel nuts for both steel and aluminum wheels.



- **Tighten wheel nuts in crisscross fashion.**


SMA221B

Wheel Nut

CAUTION:

- **Be careful not to smear threaded portion of bolt and nut as well as seat of nut with oil or grease.**

Tire Repair

CAUTION:

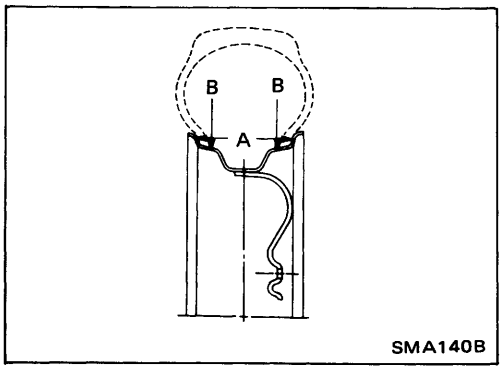
When replacing tire, take extra care not to damage tire bead, rim-flange and bead seat.

When installing tire, note the following items:

a. **Install valve core and inflate to proper pressure. Check locating rings of tire to be sure they show around rim flanges on both sides.**
b. **Check valves for leakage after inflating tires.**
c. **Be sure to tighten valve caps firmly by hand.**

WARNING:

To avoid serious personal injury, never stand over tire when inflating it. Never inflate to a pressure greater than 40 psi (275 kPa). If beads fail to seat at that pressure, deflate tire, lubricate it again, and then reinflate it. If tire is overinflated, the bead might break, possibly resulting in serious personal injury.



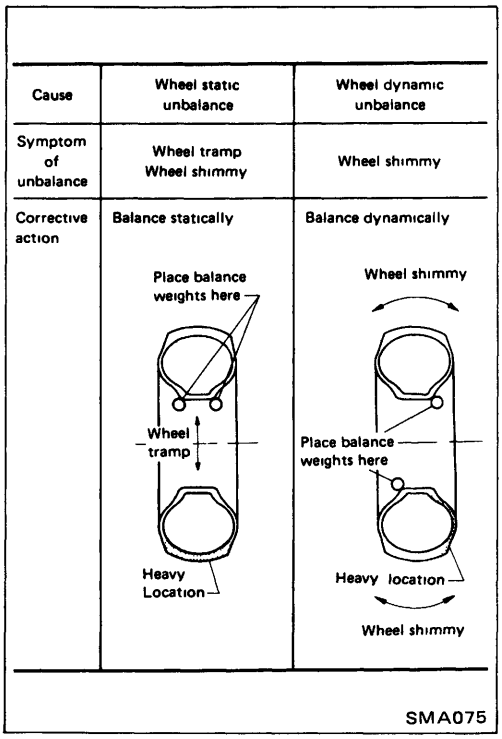
SMA140B

Wheel Inspection

- Check wheel rim (especially rim flange and bead seat) for rust, distortion, cracks or other damage.
- Examine wheel rim for lateral and radial runout with dial gauge.

	Steel wheel	Aluminum wheel
Lateral runout (A) and radial runout (B)	–	0.5 mm (0.020 in) or less
Average (C) of right and left radial runout	0.5 mm (0.020 in) or less	–
Average (D) of right and left lateral runout	0.5 mm (0.020 in) or less	–
Difference between right and left radial runout	0.5 mm (0.020 in) or less	0.2 mm (0.008 in) or less

- Replace wheel when any of the following conditions occur.
  a. Bent, dented or heavily rusted
  b. Elongated bolt holes
  c. Excessive lateral or radial runout
  d. Air leaks through welds
  e. Wheel nuts will not stay tight



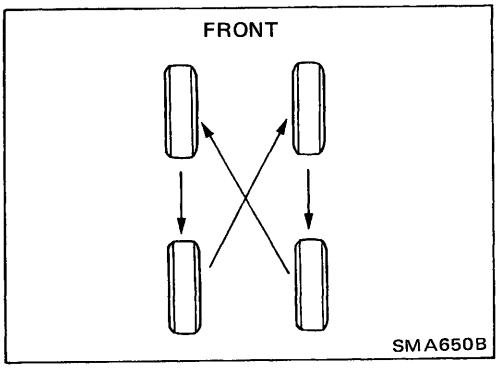
Balancing Wheels

- Adjust wheel balance using road wheel center.

Wheel balance (Maximum allowable unbalance at rim flange):

Refer to S.D.S.

Tire balancing weight: Refer to S.D.S.



Tire Rotation

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

Spare Tire

T-TYPE SPARE TIRE

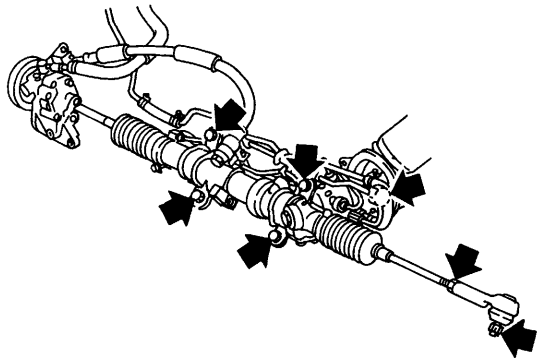
The T-type spare tire is designed for emergency use only.

The spare tire can be used repeatedly for emergency situations.

Precautions when using T-type spare tire

- **Periodically check tire inflation pressure, and always keep it at 60 psi (412 kPa).**
- **Do not drive vehicle at speeds faster than 80 km/h (50 MPH).**
- **T-type spare tire is designed only for temporary use as a spare. Dismount it and keep it as a spare as soon as standard tire repair has been completed.**
- **Do not attach a tire chain.**
- **Do not use T-type spare tire on other vehicles.**
- **Do not make a sharp turn, or apply brakes suddenly while driving.**
- **As soon as tread wear indicator becomes visible, replace tire with a new one.**
- **Mounting and dismounting to and from road wheel can be carried out in the same manner as any ordinary tire.**
- **Use of wheel balance is unnecessary.**

Checking Steering Gear and Linkage



- Steering gear:

(1) Check gear housing and boots for looseness, damage or grease leakage.

(2) Check connection with steering column for looseness.

- Steering linkage:

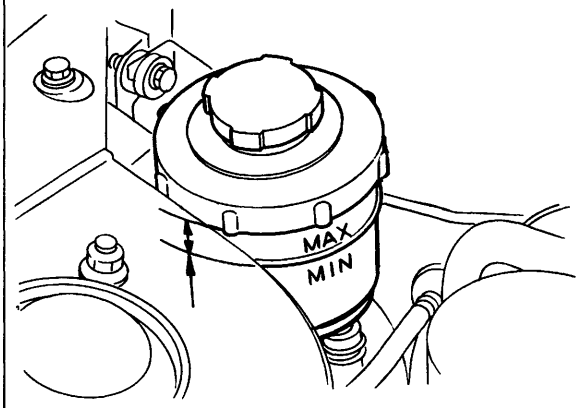
(1) Check ball joint, dust cover and other component parts for looseness, wear, damage or grease leakage.

(2) Check for missing parts (cotter pins, washer, etc.).

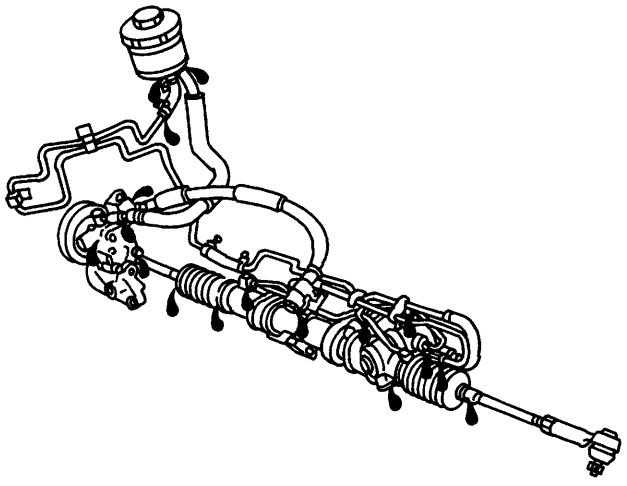
SMA511B

Checking Power Steering System Fluid and Lines

- Check fluid level, when the fluid is cold.



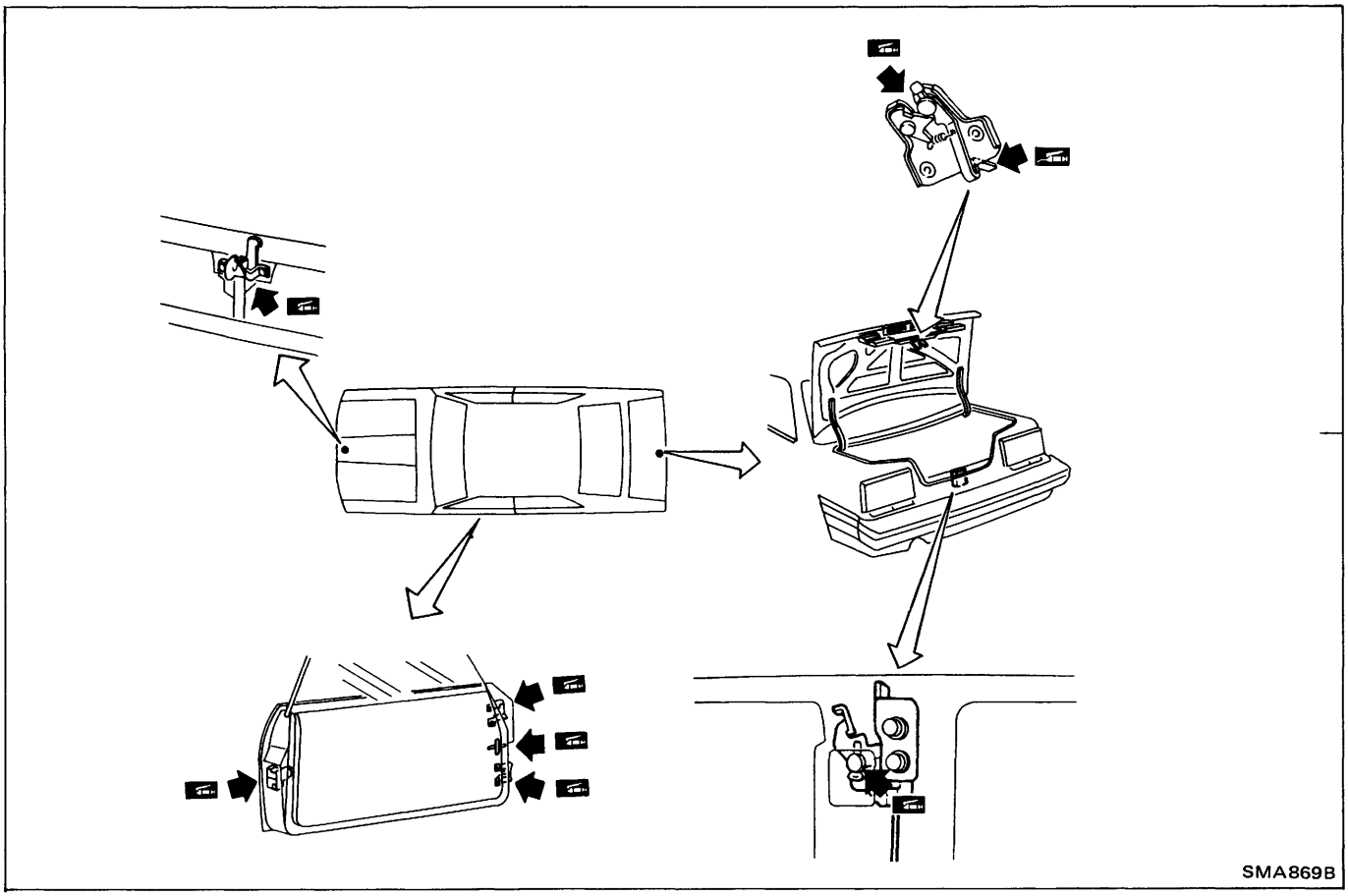
- Check lines for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



SMA512B

Body

LUBRICATING HOOD LATCHES, LOCKS AND HINGES

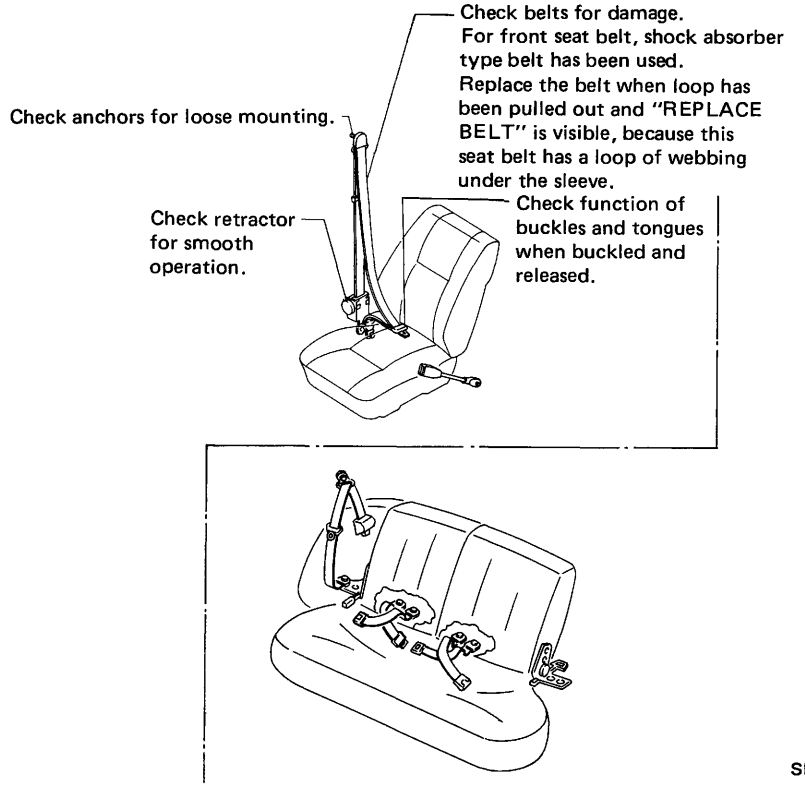


CHECKING SEAT BELTS, BUCKLES, RETRACTORS, ANCHORS AND ADJUSTERS

CAUTION:

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

Anchor bolt
35.8 - 45.6 N·m
(3.65 - 4.65 kg-m, 26.4 - 33.6 ft-lb)



Engine Maintenance

INSPECTION AND ADJUSTMENT

Drive belt deflection

Power steering equipped model (Without air conditioner)

Unit: mm (in)

	Used belt deflection		Set deflection of new belt
	Limit	Adjust deflection	
Alternator	12 (0.47)	6 - 8 (0.24 - 0.31)	5 - 7 (0.20 - 0.28)
Power steering oil pump	12.5 (0.492)	7 - 9 (0.28 - 0.35)	6 - 8 (0.24 - 0.31)
Applied pushing force: 98 N (10 kg, 22 lb)			

Air conditioner & power steering equipped model

Unit: mm (in)

	Used belt deflection		Set deflection of new belt
	Limit	Adjust deflection	
Alternator	10 (0.39)	5 - 7 (0.20 - 0.28)	5 - 7 (0.20 - 0.28)
Power steering oil pump	12.5 (0.492)	7 - 9 (0.28 - 0.35)	6 - 8 (0.24 - 0.31)
Air conditioner compressor	6 (0.24)	3 - 4 (0.12 - 0.16)	3 - 4 (0.12 - 0.16)
Applied pushing force: 98 N (10 kg, 22 lb)			

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

Spark plug

	Intake side	Exhaust side
Standard type	BCPR6ES-11	BCPR5ES-11
Hot type	BCPR5ES-11	
Cold type	BCPR7ES-11	BCPR6ES-11 BCPR7ES-11
Plug gap	1.0 - 1.1 mm (0.039 - 0.043 in)	

TIGHTENING TORQUE

Item	N·m	kg-m	ft-lb
Oil pan drain plug	29 - 39	3.0 - 4.0	22 - 29
Spark plug	20 - 29	2.0 - 3.0	14 - 22

Chassis and Body Maintenance

INSPECTION AND ADJUSTMENT

Clutch

Unit: mm (in)

Pedal height "H"	171 - 181 (6.73 - 7.13)
Pedal free play "A"	1 - 3 (0.04 - 0.12)

Front axle and front suspension (Unladen)*1

Camber degree	–25′ to 1°5′
Caster degree	1°20′ - 2°50′
Toe-in mm (in)	1 - 3 (0.04 - 0.12)
(Total toe-in) degree	6′ - 19′
Kingpin inclination degree	13°50′ - 15°20′
Front wheel turning angle Toe-out turn inside/outside degree	22°20′/20°
Full turn*2 inside/ouside degree	38° - 42°/29° - 33°

*1 Tankful of fuel, radiator coolant and engine oil full
Spare tire, jack, hand tools, mats in designated position

*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

Rear axle and rear suspension (Unladen)*1

Camber	degree	–1°10′ to 0°20′
Toe-out	mm (in)	2 - 6 (0.08 - 0.24)
	(Total toe-out) degree	12′ - 37′

*1 Tankful of fuel, radiator coolant and engine oil full
Spare tire, jack, hand tools, mats in designated position

Brake

Disc brake mm (in)	
Pad minimum thickness	2.0 (0.079)
Rotor minimum thickness	20.0 (0.787)
Drum brake mm (in)	
Lining minimum thickness	1.5 (0.059)
Drum maximum inner dia.	230.0 (9.06)
Pedal mm (in)	
Free height "H"	184 - 194 (7.24 - 7.64)
Free play "A"	1 - 3 (0.04 - 0.12)
Depressed height "D" mm (in) [Under force of 490 N (50 kg, 110 lb) engine running]	95 (3.74) or more
Parking brake Number of notches [at pulling force 196 N (20 kg, 44 lb)]	9 - 11

Chassis and Body Maintenance (Cont'd)

Wheel and tire

Tire inflation

Proper tire pressures are shown on the tire placard in center console.

Tire pressure should be checked when tires are COLD.

	Steel wheel	Aluminum wheel
Lateral runout (A) and radial runout (B)	–	0.5 mm (0.020 in) or less
Average (C) of right and left radial runout	0.5 mm (0.020 in) or less	–
Average (D) of right and left lateral runout	0.5 mm (0.020 in) or less	–
Difference between right and left radial runout	0.5 mm (0.020 in) or less	0.2 mm (0.008 in) or less
Wheel balance (Maximum allowable unbalance at rim flange) gr (oz)	10 (0.35)	
Tire balance weight gr (oz)	5 - 60 (0.18 - 2.12) Spacing 5 (0.18)	

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Clutch			
Pedal stopper lock nut	16 - 22	1.6 - 2.2	12 - 16
Master cylinder push rod lock nut	8 - 11	0.8 - 1.1	5.8 - 8.0
Manual transaxle			
Drain plug	15 - 20	1.5 - 2.0	11 - 14
Automatic transaxle			
Drain plug	15 - 20	1.5 - 2.0	11 - 14
Front axle and front suspension			
Tie-rod lock nut	37 - 46	3.8 - 4.7	27 - 34
Rear axle and rear suspension			
Toe adjusting lock nut	78 - 98	8 - 10	58 - 72
Brake			
Air bleeder valve	7 - 9	0.7 - 0.9	5.1 - 6.5
Stop 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

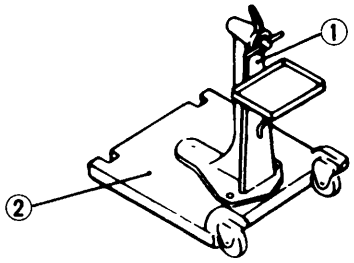
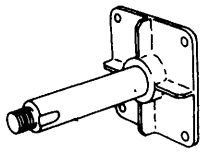
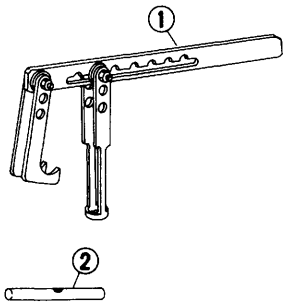
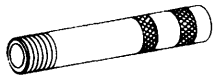
SECTION EM

EM

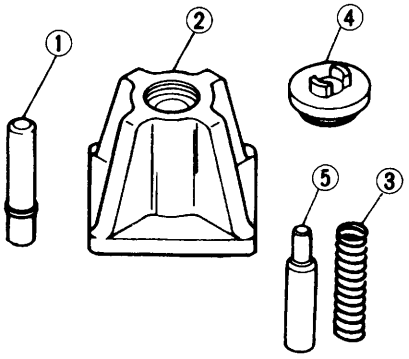
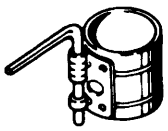
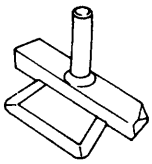
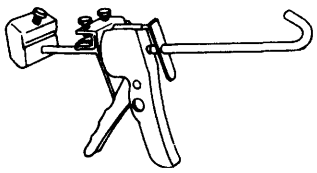
CONTENTS

PREPARATION ..... EM- 2
ENGINE REMOVAL ..... EM- 5
DIAGNOSTIC PROCEDURE ..... EM- 7
ENGINE COMPONENTS – Outer Parts – ..... EM- 8
CHECKING COMPRESSION PRESSURE ..... EM- 9
TIMING BELT EM-11
TIMING BELT – Removal – EM-12
TIMING BELT – Inspection – EM-14
TIMING BELT – Installation – EM-16
CYLINDER HEAD EM-17
CYLINDER HEAD – Removal – EM-18
CYLINDER HEAD – Disassembly – EM-19
CYLINDER HEAD – Inspection – EM-20
CYLINDER HEAD – Assembly – EM-26
CYLINDER HEAD – Installation – EM-27
OIL PAN AND OIL PUMP EM-31
OIL SEAL REPLACEMENT EM-33
ENGINE OVERHAUL EM-35
ENGINE OVERHAUL – Disassembly – EM-36
ENGINE OVERHAUL – Inspection – EM-37
ENGINE OVERHAUL – Assembly – EM-43
SERVICE DATA AND SPECIFICATIONS (S.D.S.) EM-46

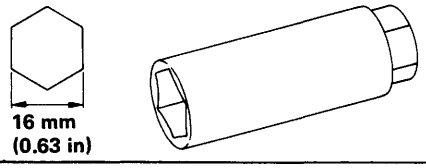
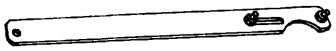
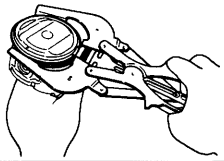
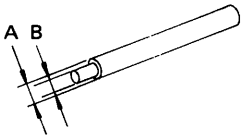
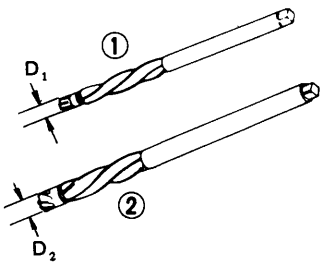
SPECIAL SERVICE TOOLS

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		
KV10108101 (–) Engine sub-attachment		
KV101092S0 (–) Valve spring compressor ① KV10109210 (–) Compressor ② KV10109220 (–) Adapter		Disassembling and assembling valve components
KV10107501 (–) Valve oil seal drift		Installing valve oil seal

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description	
KV101070S0 (–) Piston pin press stand ① KV10107010 (–) Center shaft ② ST13030020 (–) Stand ③ ST13030030 (–) Spring ④ KV10107020 (–) Cap ⑤ ST13030051 (–) Drift		Disassembling and assembling piston with connecting rod
EM03470000 (J8037) Piston ring compressor		Installing piston assembly into cylinder bore
ST16610001 (J23907) Pilot bushing puller		Removing crankshaft pilot bushing
KV10111100 (–) Seal cutter		Removing oil pan
WS39930000 (–) Tube presser		Pressing the tube of liquid gasket

COMMERCIAL SERVICE TOOLS

Tool name	Description	
Spark plug wrench		Removing and installing spark plug
Pulley holder		Holding camshaft pulley while tightening or loosening camshaft bolt
Valve seat cutter set		Finishing valve seat dimensions
Piston ring expander		Removing and installing piston ring
Valve guide drift	**Intake & Exhaust:** **A = 10.5 mm (0.413 in) dia.** **B = 6.6 mm (0.260 in) dia.** 	Removing and installing valve guide
Valve guide reamer	**Intake & Exhaust:** **D_1 = 7.0 mm (0.276 in) dia.** **D_2 = 11.2 mm (0.441 in) dia.** 	Reaming valve guide (①) or hole for oversize valve guide (②)

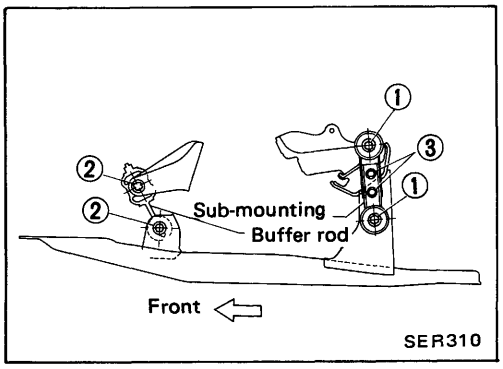
Tightening Engine Mounting Bolts

WARNING:

a. Situate vehicle on as flat and solid a surface as possible.
b. Place chocks at front and rear of rear wheels.
c. Before removing front axle from transaxle unit, place safety stands under designated front supporting points. Refer to GI section for lifting points.
d. Be sure to hoist engine and transaxle in a safe manner.
e. You should not remove engine until exhaust system has completely cooled off.
   Otherwise, you may burn yourself and/or fire may break out in the fuel line.
f. For safety during subsequent steps, the tension of wires or chains should be slackened against the engine.
g. For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.

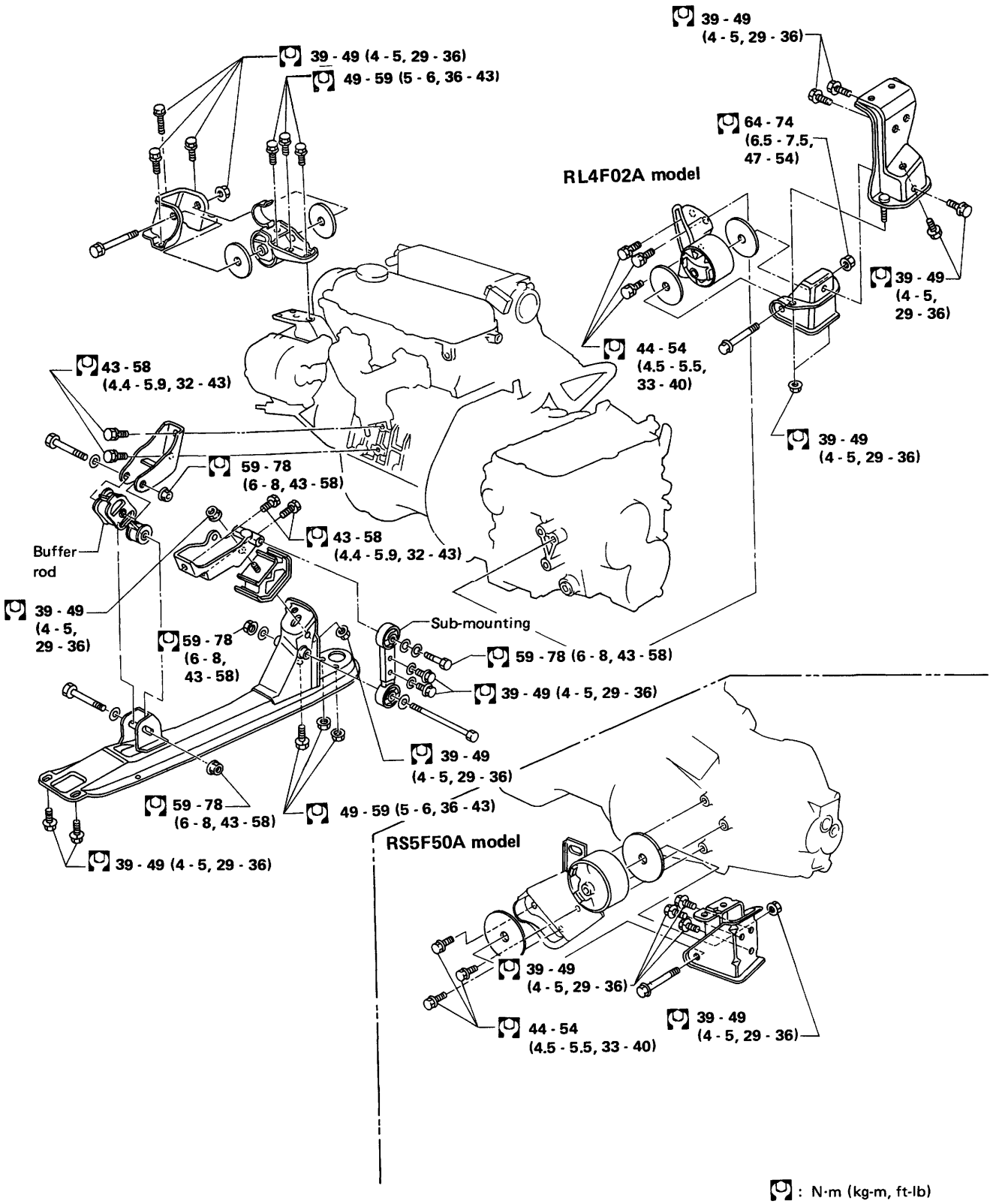
CAUTION:

a. In removing drive shaft, be careful not to damage grease seal of transaxle side.
b. In lifting engine, be careful not to hit it against adjacent parts, especially against brake tube and brake master cylinder.
c. Before disconnecting fuel hoses, release fuel pressure from fuel line to eliminate danger.
   Refer to RELEASING FUEL PRESSURE in EF & EC section.



Tighten R.H., L.H. and rear engine mounting bolts first, then apply engine load to mounting insulators before tightening buffer rod and sub-mounting.
Follow steps ①, ② (and ③) when tightening buffer rod and sub-mounting.

Gasoline Engine



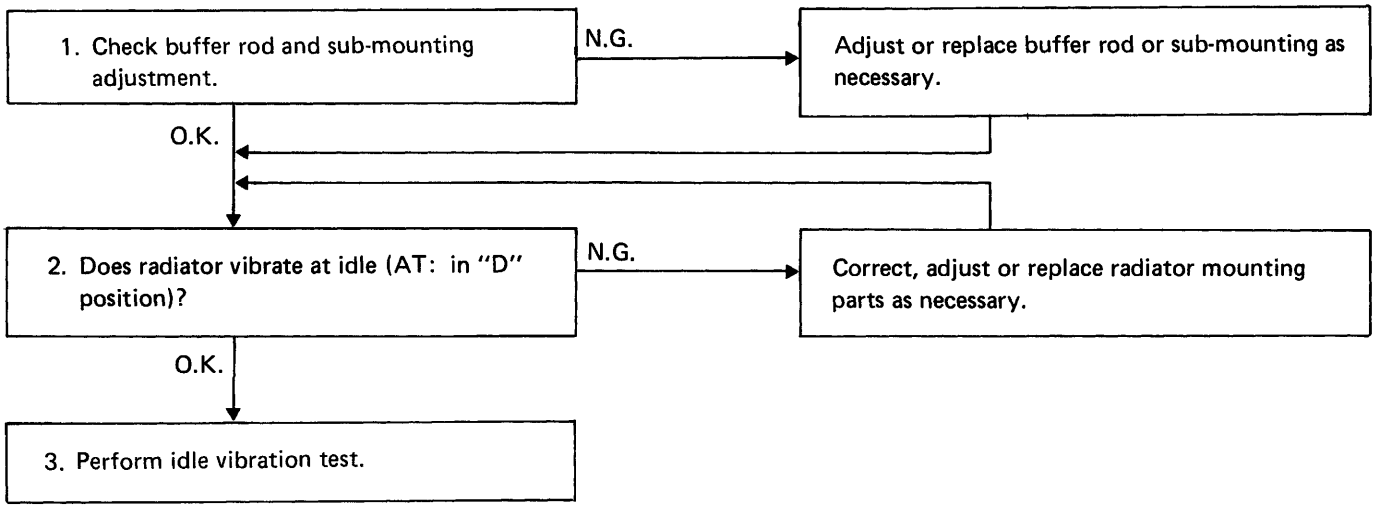
SEM376B

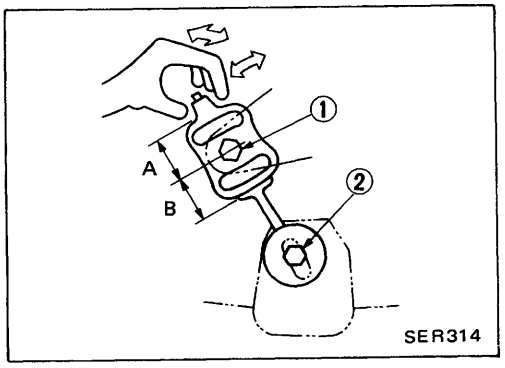
Diagnostic Procedure for Excessive Vibration at Idle

CAUTION:

a. Before evaluating vibration, warm up engine completely.

b. Evaluation of vibration should be done with engine hood and doors closed.





1. Check buffer rod and sub-mounting adjustment.

(1) Check buffer rod adjustment.

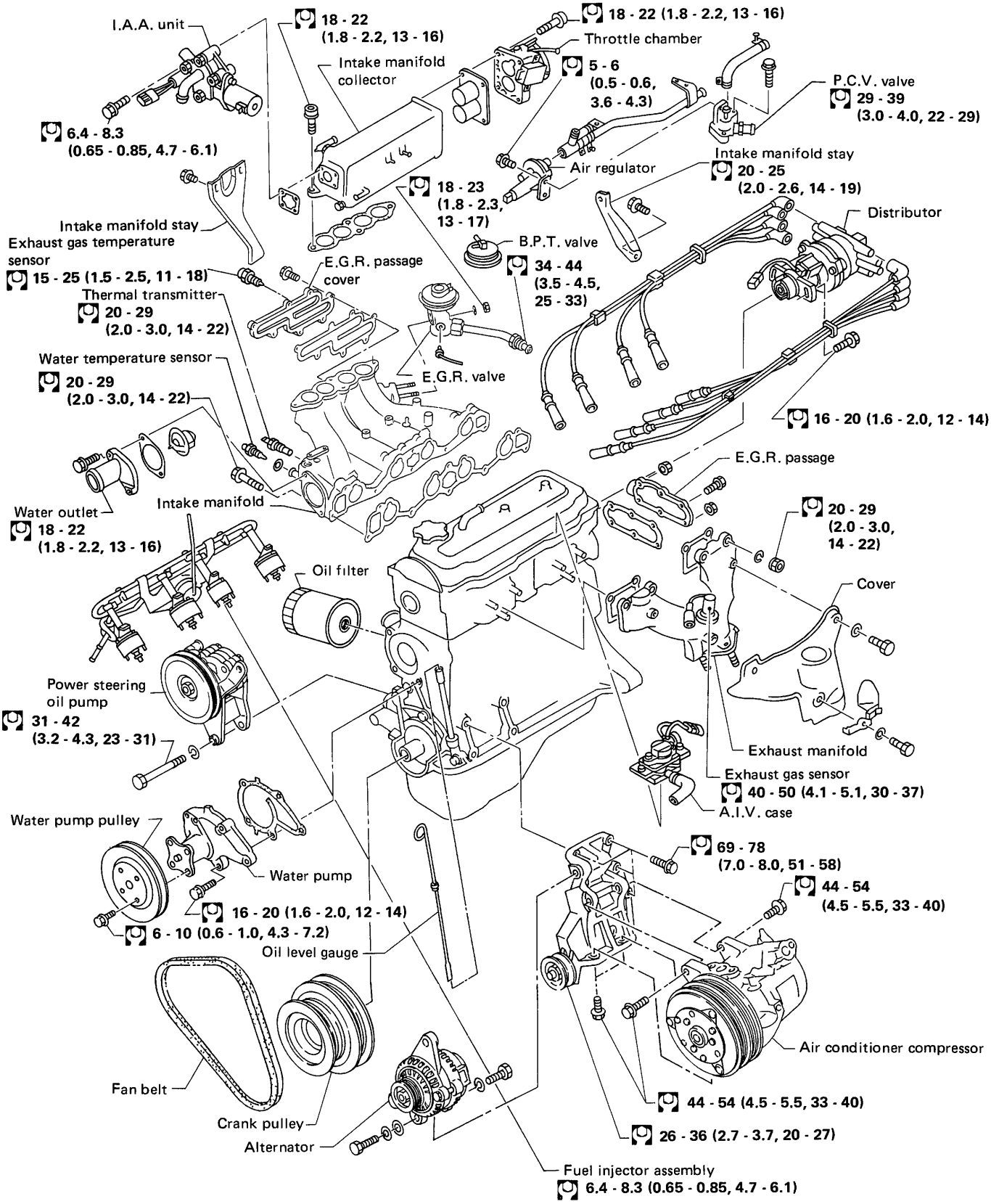
Buffer rod adjustment:

$A - B \leqq \pm 1$ mm (0.04 in)

Span between bolts ① and ② :
100 mm (3.94 in)

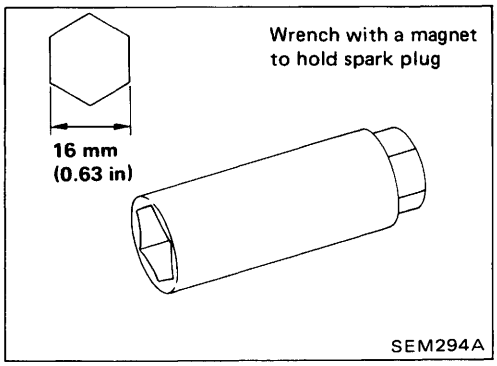
If out of specification, adjust.

Hold end of buffer rod with your fingers and move it to see if rod moves in the fore-and-aft and left-and-right directions smoothly. If not, loosen bolts ① and ② and retighten them in the reverse order. If rod still does not move smoothly, replace.



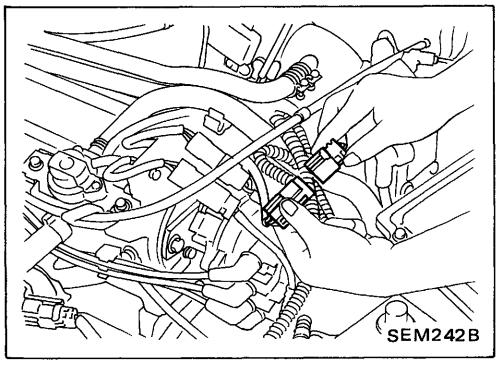
: N·m (kg-m, ft-lb)

SEM043C

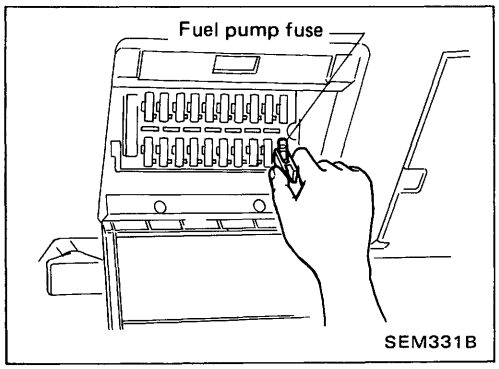


1. Warm up engine.
2. Remove all spark plugs. (Exhaust side)

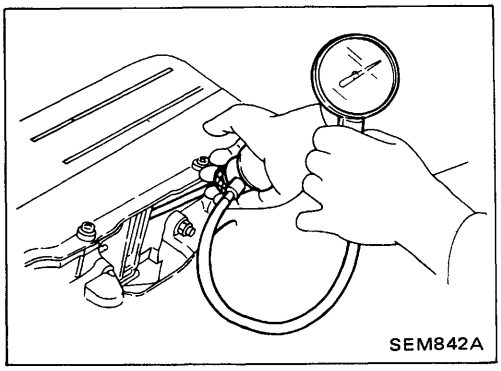
Use a suitable plug wrench.



3. Disconnect distributor harness connector.



4. Remove fuse for fuel pump.



5. Attach a suitable compression tester.
6. Depress accelerator pedal to fully open throttle.
7. Crank engine and read gauge indication.

Compression pressure:

kPa (kg/cm^2, psi) at 350 rpm

Standard

1,177 (12.0, 171)

Minimum

883 (9.0, 128)

Differential limit between cylinders

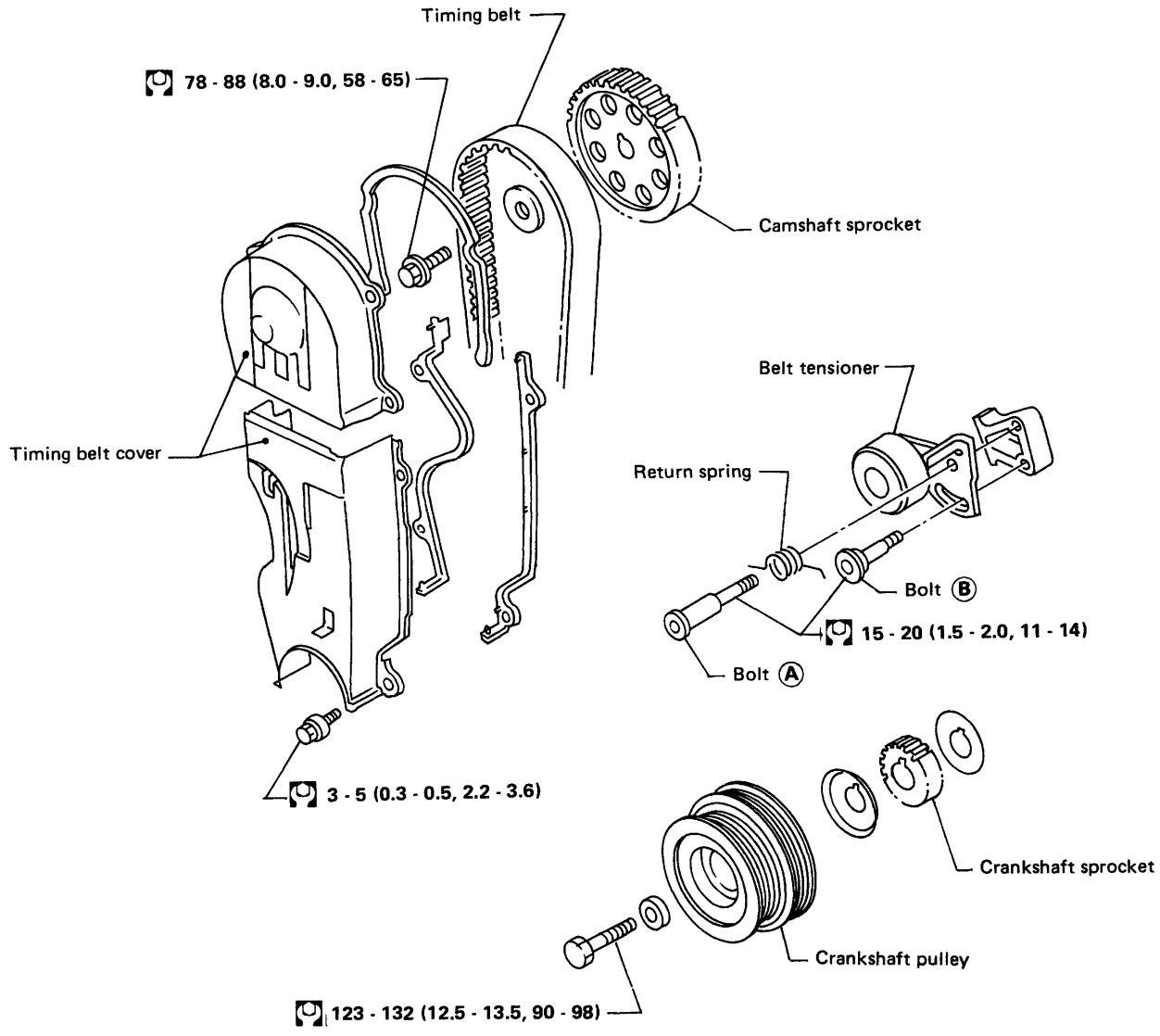
98 (1.0, 14)

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

- If adding oil helps the compression pressure, chances are that piston rings are worn or damaged.
- If pressure stays low, valve may be sticking or seating improperly.
- If cylinder compression in any two adjacent cylinders is low, and if adding oil does not help the compression, there is leakage past the gasket surface.

CAUTION:

a. Do not bend or twist timing belt too tightly.
b. After removing timing belt, do not rotate crankshaft and camshaft separately because valves will hit piston head.
c. Ensure timing belt, timing belt camshaft sprocket, crankshaft sprocket and belt tensioner are clean and free from oil or water.
d. Before installing timing belt, confirm that No. 1 cylinder is set at T.D.C. on compression stroke.
e. Align arrow on timing belt forward.
f. Align white lines on timing belt with punch mark on camshaft sprocket and crankshaft sprocket.
g. Adjust belt tension with all exhaust side spark plugs removed.



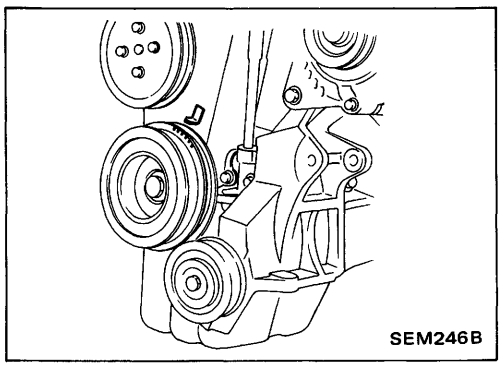
: N·m (kg-m, ft-lb)

SEM244B

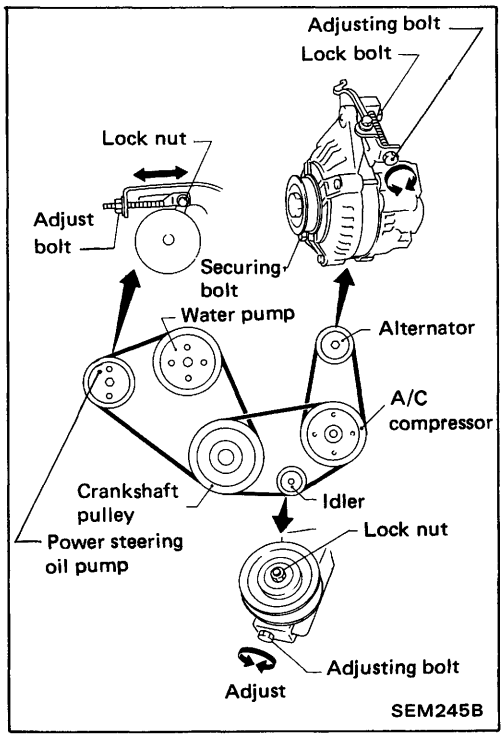
1. Place wheel chocks at both front and back of rear wheel.
2. Place safety stand under designated front supporting points.
3. Remove right front wheel.

Refer to GI section for lifting points.

4. Remove all spark plugs. (Exhaust side)
5. Remove dust cover and under cover.


SEM246B

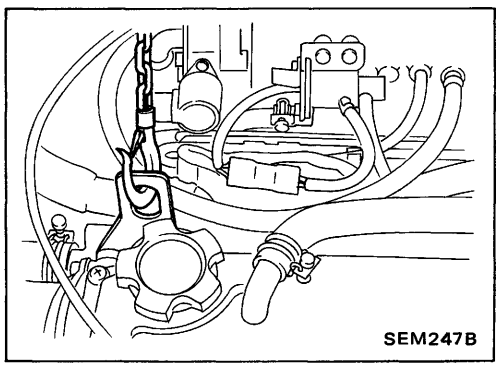
6. Set No. 1 cylinder at T.D.C. on its compression stroke.



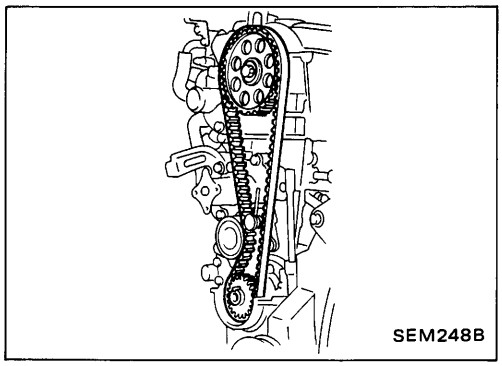
SEM245B

7. Remove the following belts.
- Power steering oil pump drive belt
- Compressor drive belt
- Alternator drive belt

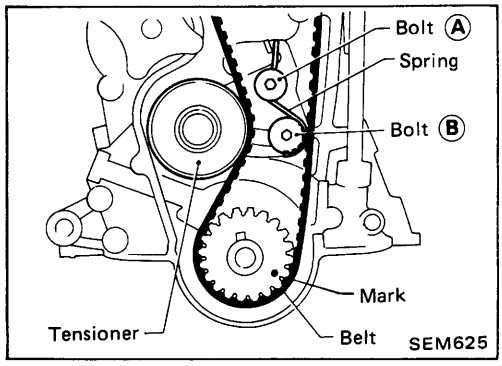
8. Remove crankshaft pulley.


SEM247B

9. Support engine with a hoist or chain block. Remove right-side engine mounting insulator and engine mounting bracket.


SEM248B

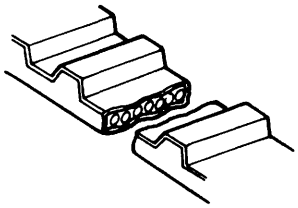
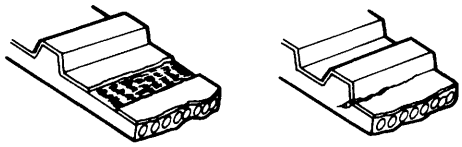
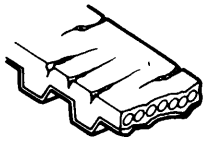
10. Remove front upper and lower belt covers.

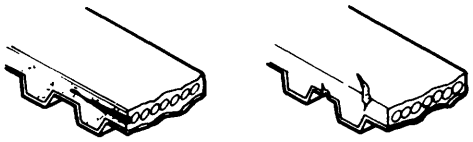
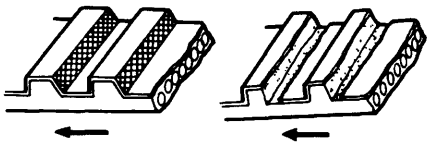


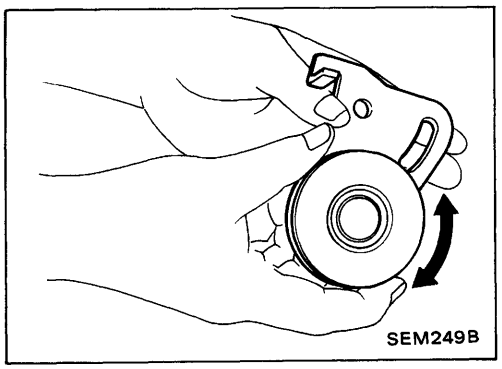
SEM625

11. Loosen timing belt tensioner bolts Ⓐ and Ⓑ and return spring, then remove timing belt.

Visually check the condition of the timing belt.
Replace if any abnormality is found.

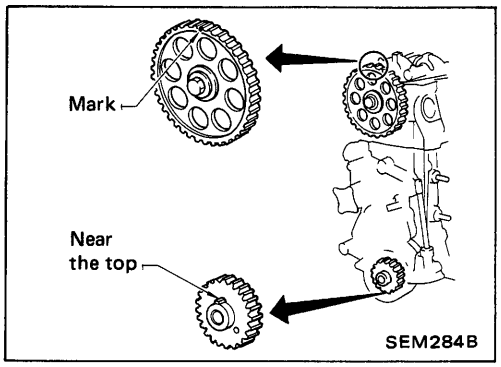
Item to check	Problem	Cause
Belt is broken.	 SEM393A	• Improper handling • Poor belt cover sealing • Coolant leakage at water pump
Tooth is broken/ tooth root is cracked.	 SEM394A	• Camshaft jamming • Distributor jamming • Oil leakage at camshaft/crankshaft oil seal
Back surface is cracked/worn.	 SEM395A	• Tensioner jamming • Overheated engine • Interference with belt cover

Item to check	Problem	Cause
Side surface is worn.	 • Side surface of belt is worn to such an extent that there is no trace of cutoff performed during manufacturing process. • Belt corners are worn and round. • Wicks are frayed and coming out. SEM396A	• Improper installation of belt • Malfunctioning crankshaft sprocket plate/ timing belt plate
Teeth are worn.	 • Canvas on tooth face is worn down. • Canvas on tooth is fluffy, rubber layer is worn down and faded white, or canvas texture is unclear. SEM397A	• Poor belt cover sealing • Coolant leakage at water pump • Camshaft not functioning properly • Distributor not functioning properly • Excessive belt tension
Oil/Coolant or water is stuck to belt.		• Poor oil sealing of each oil seal • Coolant leakage at water pump • Poor belt cover sealing

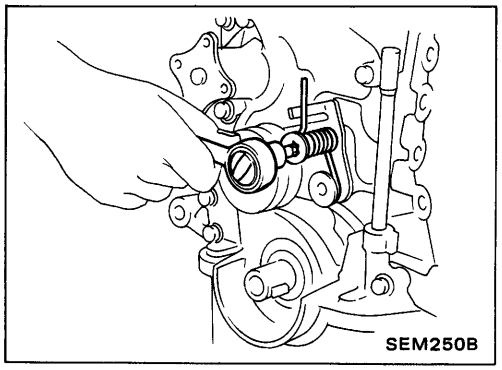


BELT TENSIONER AND RETURN SPRING

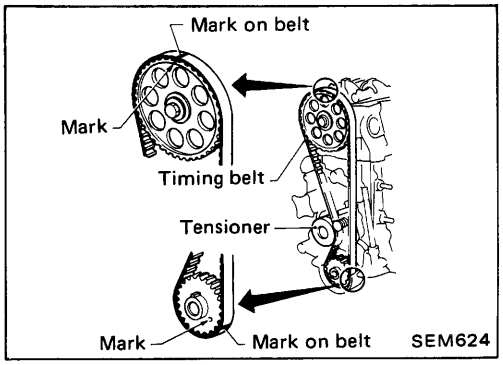
1. Visually check belt tensioner for seizure, rust and any evidence of breaks.
2. Confirm that tensioner pulley can be rotated smoothly.
3. Visually check return spring for corrosion, distortion and any abnormal signs.



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



2. Install tensioner and return spring.
- **Temporarily tighten bolts so that tensioner can swing smoothly.**

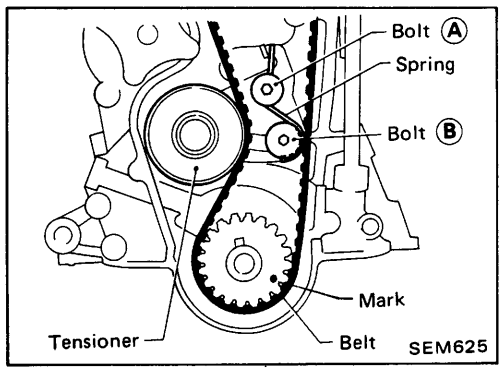


3. Set timing belt.

a. **Ensure that timing belt and pulleys are clean and free from oil or water. Do not bend timing belt tightly.**

b. **Align white lines on timing belt with punch marks on camshaft sprocket and crankshaft sprocket.**

c. **Have arrow on timing belt pointing toward front belt covers.**

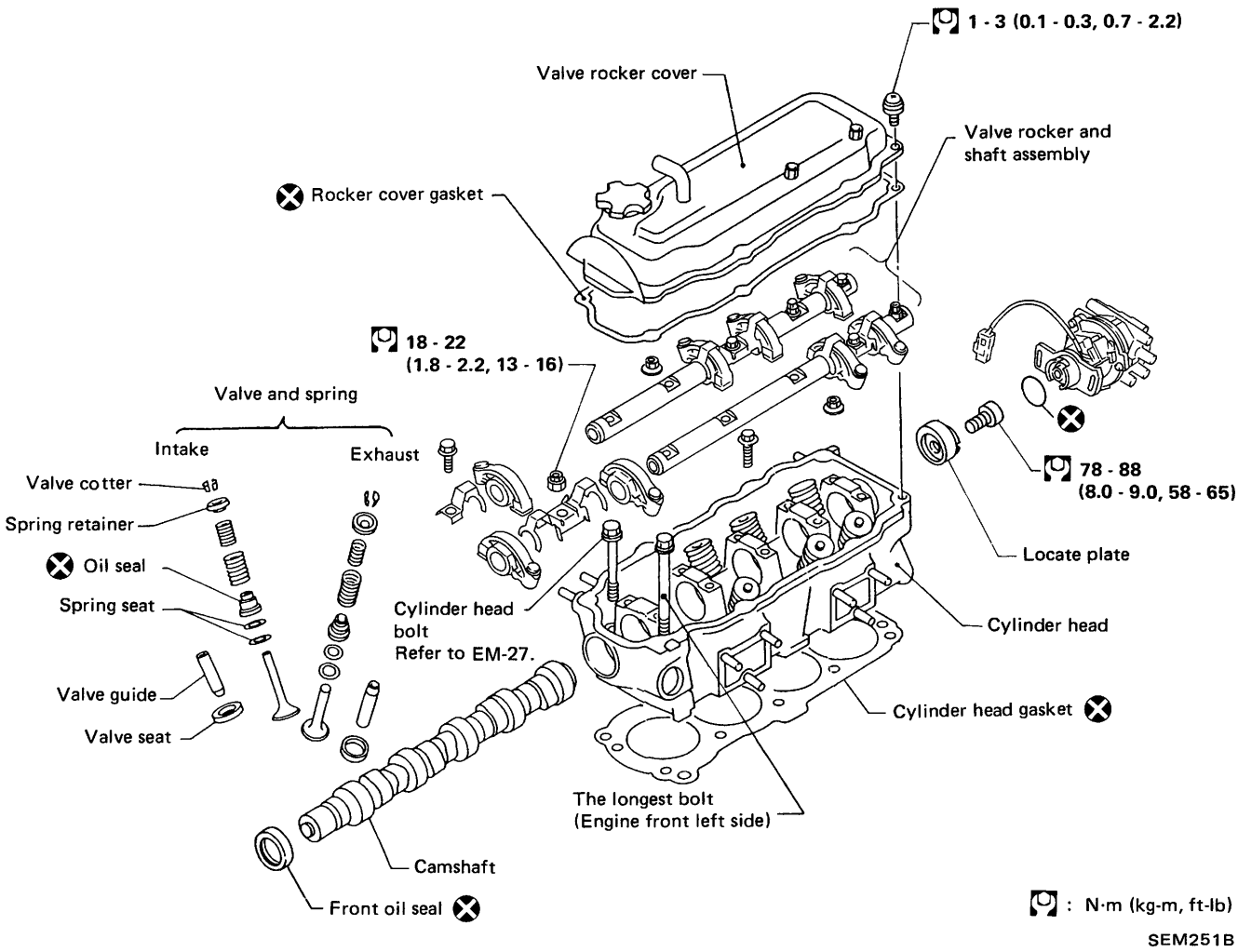


4. Tighten belt tensioner and assemble spring.

To set spring, first hook one end on bolt Ⓑ side, then hook the other end on tensioner bracket pawl. After rotating crankshaft two turns clockwise, tighten bolt Ⓑ and then bolt Ⓐ, and belt tension will automatically be the specified value.

: 15 - 20 N·m (1.5 - 2.0 kg-m, 11 - 14 ft-lb)

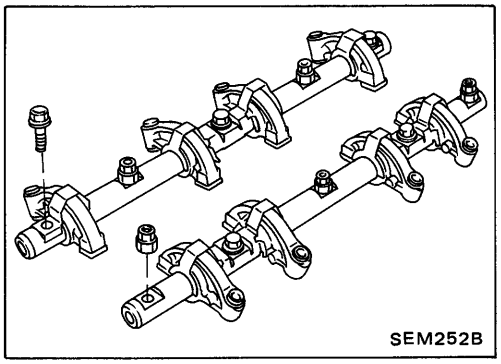
5. Install timing belt covers.



- **When installing sliding parts such as rocker arms and camshaft, be sure to apply engine oil on the sliding surfaces.**
- **When installing welch plug, apply sealant.**

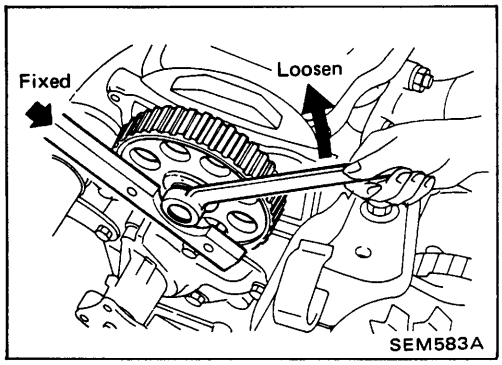
1. Set No. 1 cylinder at T.D.C. on its compression stroke. Then remove timing belt.

After removing timing belt, do not rotate crankshaft and camshaft separately, because valves will hit piston heads.


SEM252B

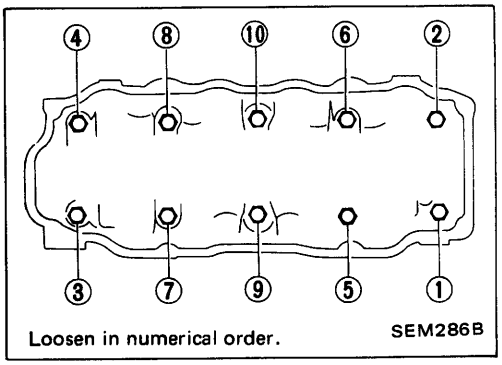
2. Remove rocker shafts with rocker arms and securing bolts.

The bolts should be loosened in two or three stages.



SEM583A

3. Remove camshaft sprocket.

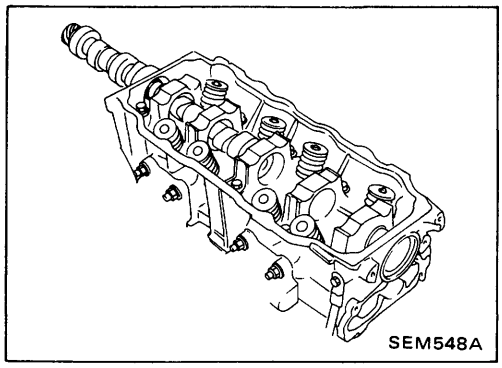


Loosen in numerical order. SEM286B

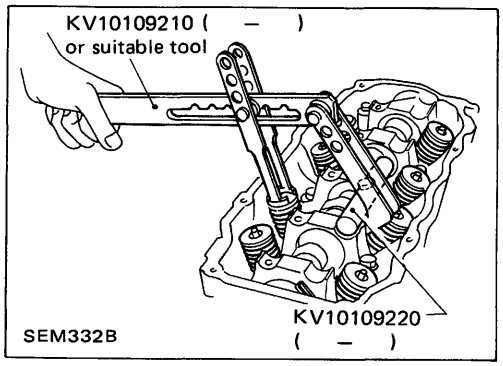
4. Disconnect exhaust tube from exhaust manifold. Remove cylinder head together with manifolds.

Bolts should be loosened in two or three stages. Head warpage or cracking could result from removing in incorrect order.

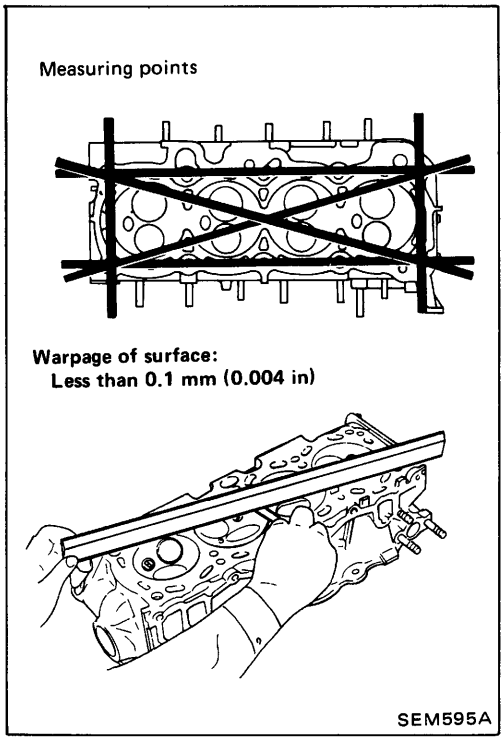
5. Remove manifolds from cylinder head.


SEM548A

1. Remove camshaft locate plate.
2. Remove camshaft and camshaft oil seal.



3. Remove valve components as shown.
4. Remove valve oil seals.



CYLINDER HEAD DISTORTION

Cylinder head distortion:

Less than 0.1 mm (0.004 in)

If beyond the specified limit, resurface it.

Nominal cylinder head height:

116.6 - 117.0 mm (4.591 - 4.606 in)

Resurfacing limit:

The resurfacing limit of cylinder head is determined by the cylinder block resurfacing in an engine.

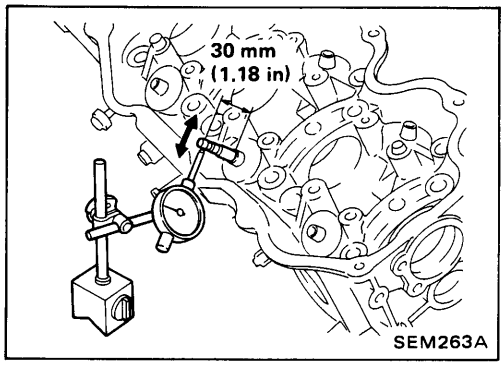
Amount of cylinder head resurfacing is "A"

Amount of cylinder block resurfacing is "B"

The maximum limit is as follows:

A + B = 0.2 mm (0.008 in)

After resurfacing the cylinder head, check that camshaft rotates freely by hand with cylinder block assembled.



VALVE GUIDE CLEARANCE

- **Valve guide clearance should be measured parallel with rocker arm. (Generally, a large amount of wear occurs in this direction.)**

  Stem to guide clearance:

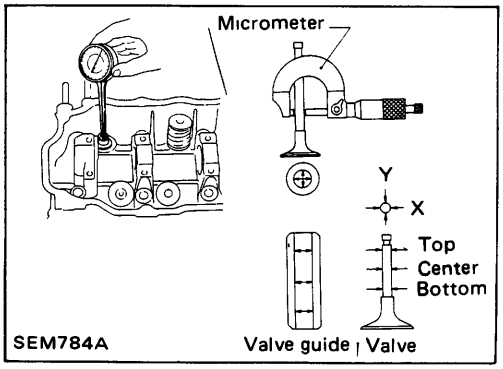
  Maximum limit

  0.10 mm (0.0039 in)

  Maximum allowable deflection

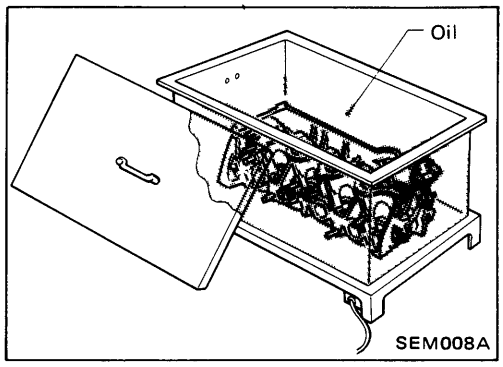
  (Dial indicator reading)

  0.2 mm (0.008 in)



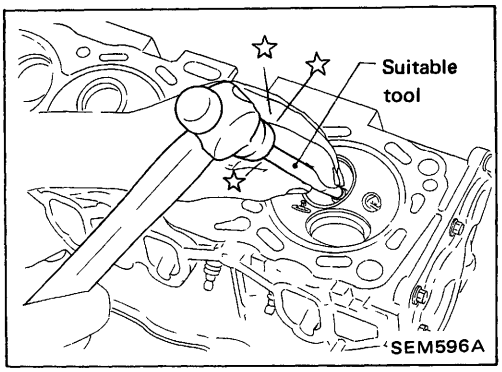
- **To determine either valve or valve guide replacement, measure valve stem diameter and valve guide bore.**

  For dimensions, refer to S.D.S.

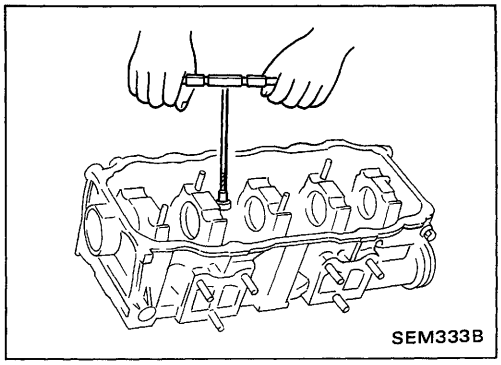


VALVE GUIDE REPLACEMENT

1. To remove valve guide, heat cylinder head to 150 to 160°C (302 to 320°F).

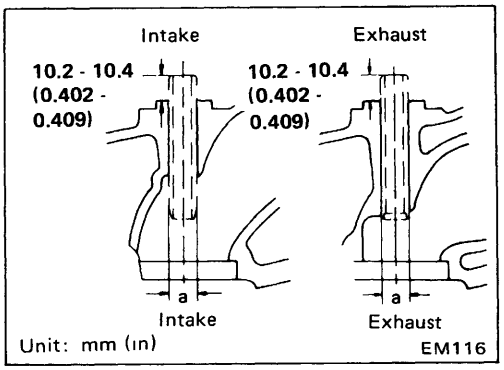


2. Drive out valve guide with a press [under a 20 kN (2t, 2.2 US ton, 2.0 Imp ton) pressure] or hammer and suitable tool.

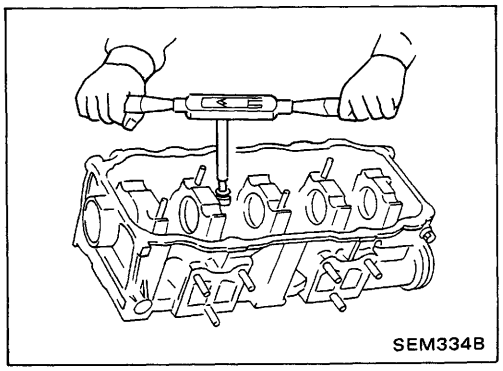


3. Ream cylinder head valve guide hole.

Cylinder head valve guide hole diameter "a"
[For 0.2 mm (0.008 in) oversize]: mm (in)
11.185 - 11.196 (0.4404 - 0.4408)

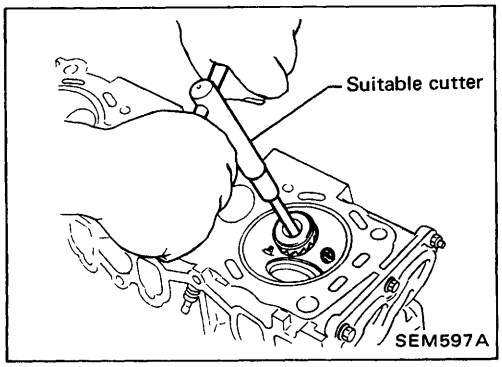


4. Heat cylinder head to 150 to 160°C (302 to 320°F) and press service valve guide onto cylinder head.



5. Ream valve guide.

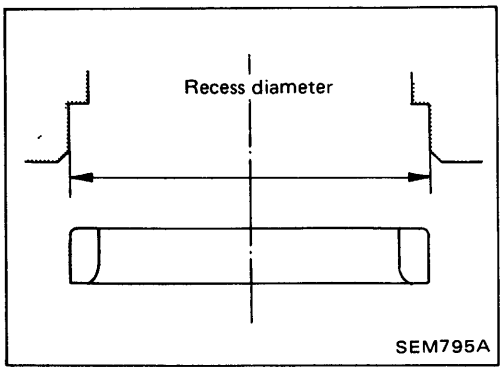
Finished size: mm (in)
7.000 - 7.018 (0.2756 - 0.2763)



VALVE SEATS

Check valve seats for any evidence of pitting at valve contact surface, and reseat or replace if worn out excessively.

- **When repairing valve seats, check valve and valve guide for wear beforehand. If worn, replace them. Then correct valve seat.**
- **The cutting should be done with both hands for uniform cutting.**



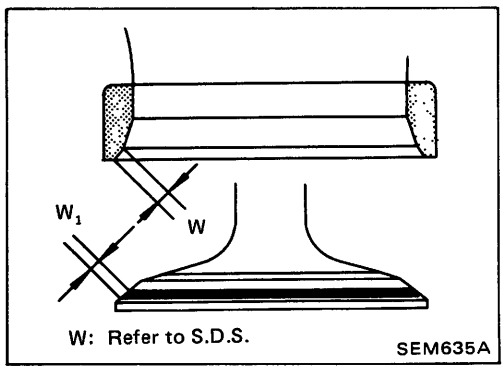
REPLACING VALVE SEAT FOR SERVICE PARTS

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 the cylinder head recess.

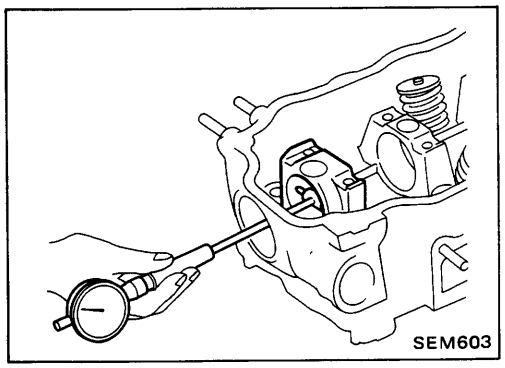
   Reaming bore for service valve seat
   [Oversize 0.5 mm (0.020 in)] :
   Intake
   43.500 - 43.516 mm (1.7126 - 1.7132 in)
   Exhaust
   37.500 - 37.516 mm (1.4764 - 1.4770 in)

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

3. Heat cylinder head to a temperature of 150 to 160°C (302 to 320°F).
4. Press fit seat until it seats on the bottom.
5. Wait until temperature of cylinder head reaches room temperature.



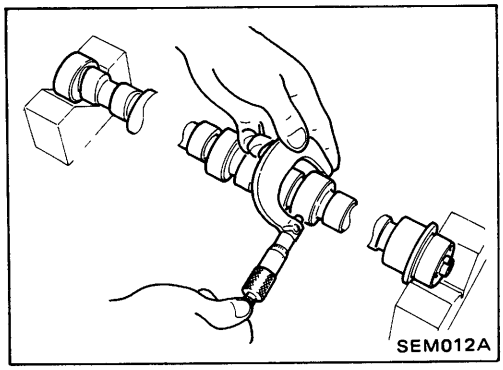
6. Cut or grind valve seat using suitable tool at the specified dimensions as shown in S.D.S.
7. After cutting, lap valve seat with a lapping compound.
8. Check contact condition of valve seat.



CAMSHAFT JOURNAL CLEARANCE

1. Measure the inner diameter of camshaft bearing.

   Standard inner diameter:
   46.000 - 46.016 mm (1.8110 - 1.8116 in)

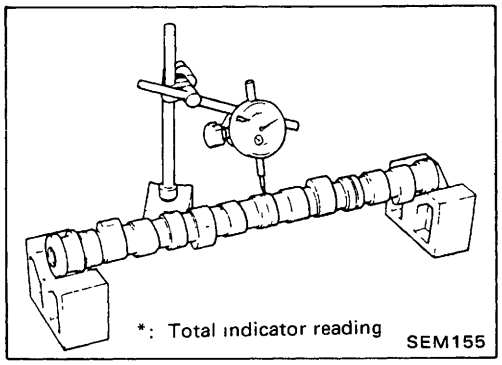


2. Measure the outer diameter of camshaft journal.

   Standard outer diameter
   #1 - #4 journal:
   45.935 - 45.955 mm (1.8085 - 1.8092 in)
   #5 journal:
   45.915 - 45.935 mm (1.8077 - 1.8085 in)

   If the clearance is greater than the maximum, replace camshaft and/or cylinder head.

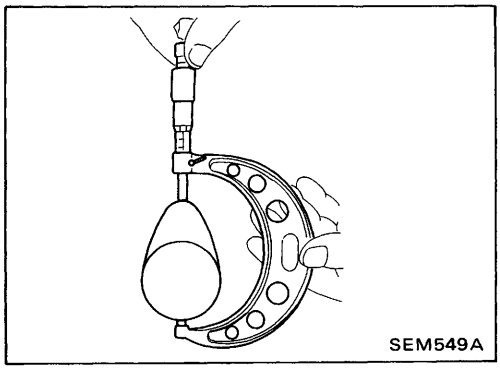
   Maximum clearance:
   0.10 mm (0.0039 in)



CAMSHAFT RUNOUT

Camshaft ronout [T.I.R. (Total Indicator Reading)]:
Limit 0.05 mm (0.0020 in)

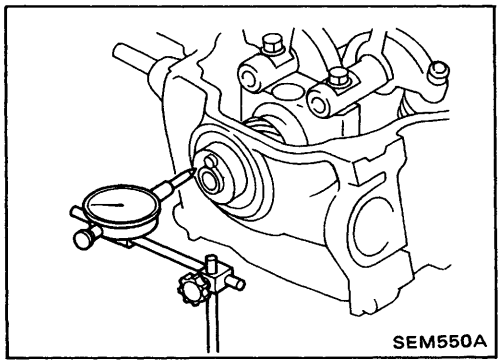
If beyond the limit, replace.



CAMSHAFT CAM HEIGHT

Standard cam height:
Intake
37.675 - 37.755 mm (1.4833 - 1.4864 in)
Exhaust
38.281 - 38.361 mm (1.5071 - 1.5103 in)
Cam wear:
Limit 0.2 mm (0.008 in)

If wear is beyond the limit, replace.



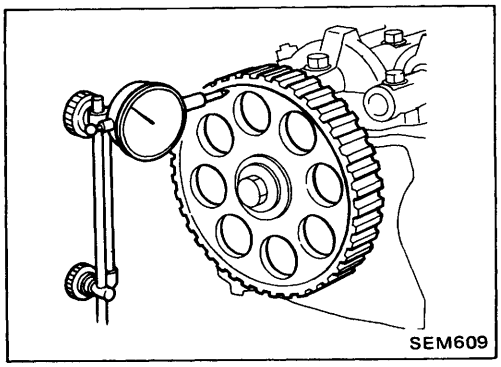
CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.

CAMSHAFT END PLAY

1. Install camshaft and locate plate in cylinder head.
2. Measure camshaft end play.

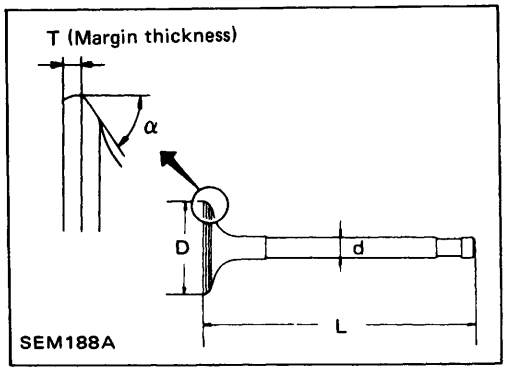
Camshaft end play:
Standard 0.07 - 0.14 mm (0.0028 - 0.0055 in)
Limit 0.2 mm (0.008 in)



CAMSHAFT SPROCKET RUNOUT

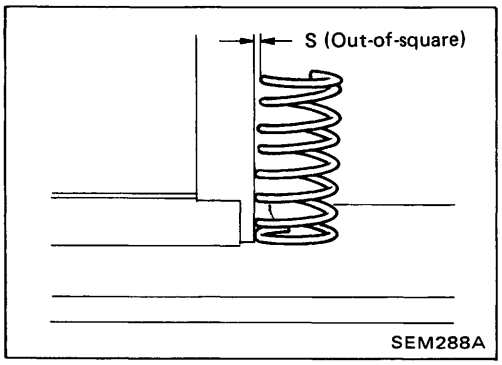
Install sprocket on camshaft and check for runout.
If runout exceeds the specified limit, replace camshaft sprocket.

Runout (Total indicator reading):
Limit 0.05 mm (0.0020 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 the valve.
Grinding allowance for valve stem tip is 0.2 mm (0.008 in) or less.



VALVE SPRING SQUARENESS

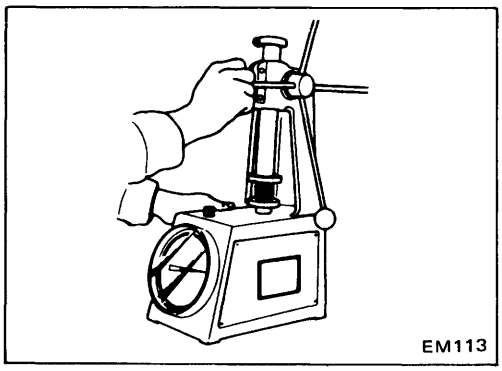
Out-of-square "S":

Outer

Less than 2.2 mm (0.087 in)

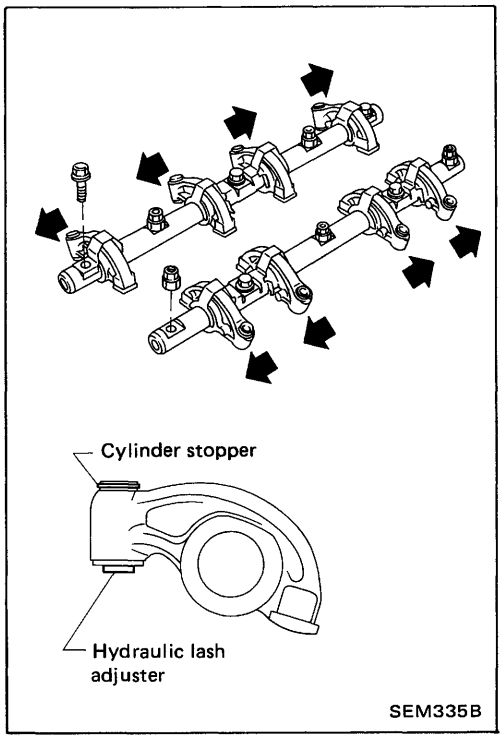
Inner

Less than 1.9 mm (0.075 in)



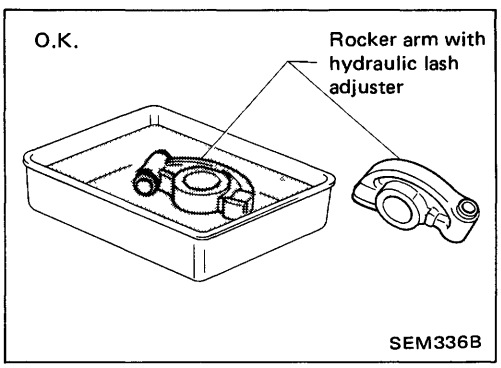
VALVE SPRING PRESSURE LOAD

Refer to S.D.S.



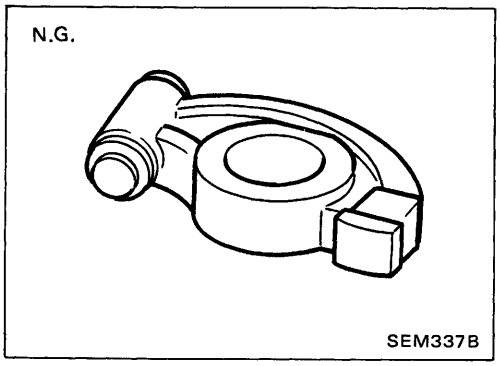
ROCKER SHAFT AND ROCKER ARM

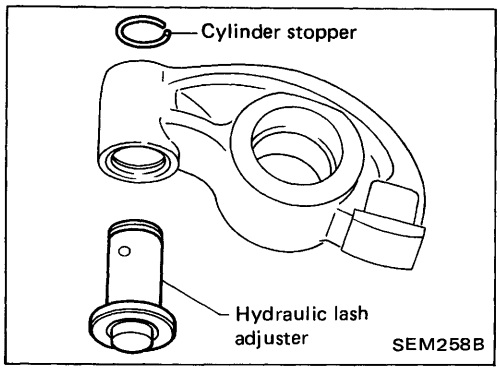
1. Draw all rocker arms from rocker shaft.



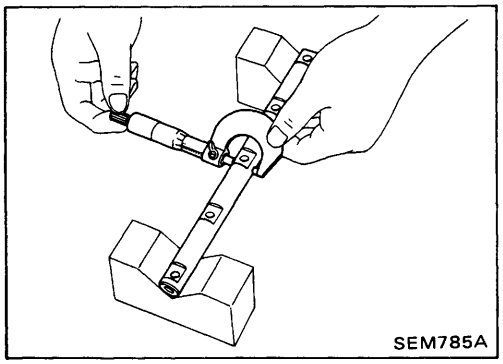
CAUTION:

a. **Hydraulic lash adjuster is installed in each rocker arm. If the hydraulic lash adjuster is kept lying on its side, even when installed in the rocker arm, there is a risk of air entering the valve lifter. During storage, always set the rocker arm straight up, or when on its side, have it coated with oil.**



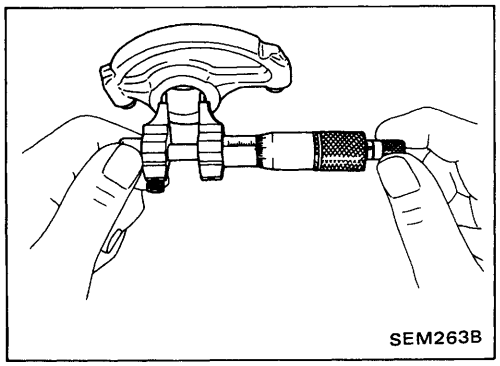


b. **Do not remove the hydraulic lash adjuster from the rocker arm except when exchanging it.**
c. **Do not disassemble the hydraulic lash adjuster.**



2. Check rocker shafts for scratches, seizure and wear.
3. Check outer diameter of rocker shaft.

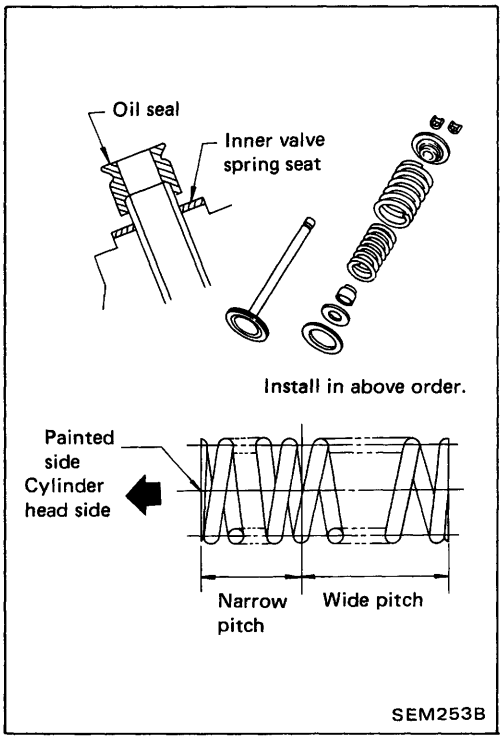
Diameter mm (in):
19.979 - 20.000 (0.7866 - 0.7874)



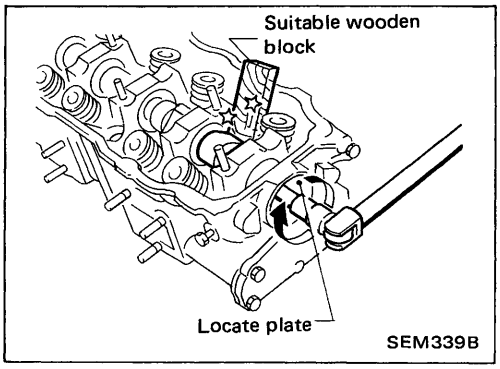
4. Check inner diameter of rocker arm.

Diameter mm (in):
20.007 - 20.028 (0.7877 - 0.7885)
Rocker arm to shaft clearance mm (in):
0.007 - 0.049 (0.0003 - 0.0019)

- **Keep rocker arm with hydraulic lash adjuster standing to avoid mixing air into hydraulic lash adjuster at checking.**



1. Install valve component parts.
- **Always use new valve oil seal.**
- **Before installing valve oil seal, install inner valve spring seat.**
- **Install outer valve spring (uneven pitch type) with its narrow pitch side toward cylinder head side.**



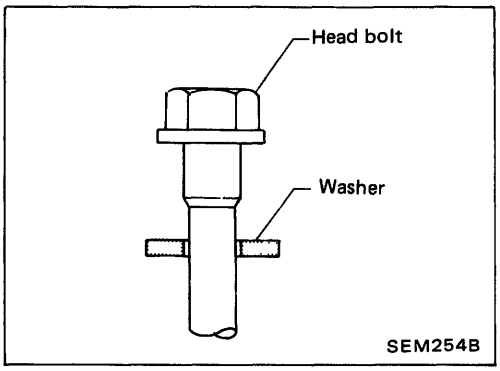
2. Install camshaft.
3. Install camshaft locate plate.

Locate plate bolt:

: 78 - 88 N·m

(8.0 - 9.0 kg-m, 58 - 65 ft-lb)

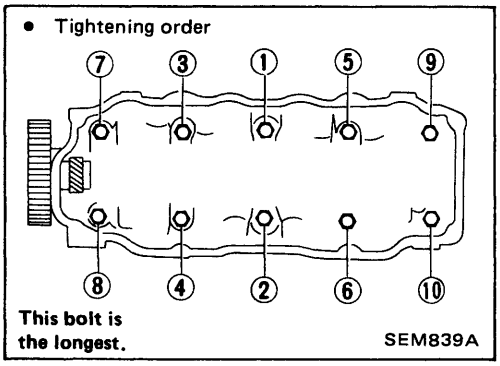
4. Apply engine oil to camshaft oil seal and install it in place.
- **Always use new camshaft oil seal.**
- **When tightening locate plate, apply a wooden block to a suitably positioned cam so as not to turn camshaft together.**



1. Install cylinder head with new gasket.

- **Be sure to install washers between bolts and cylinder head.**

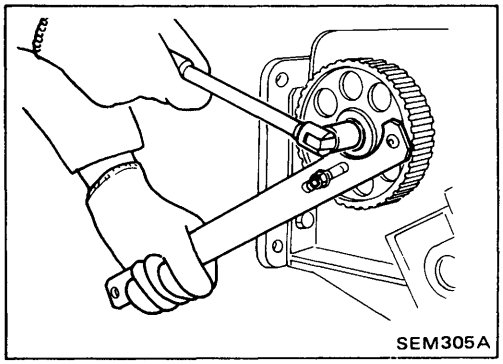
Do not rotate crankshaft and camshaft separately, because valves will hit piston heads.



2. Apply oil to the thread portion and seat surface of bolts and tighten cylinder head bolts with washers.

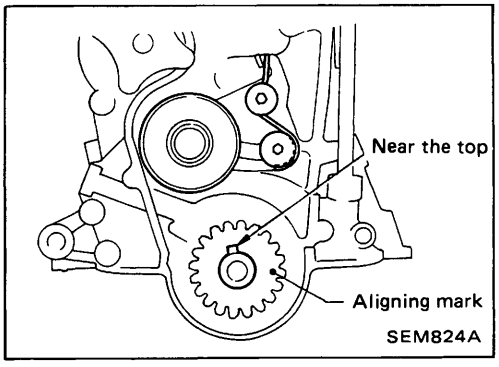
- **Tightening procedure.**

1st **Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).**
2nd **Tighten all bolts to 78 N·m (8.0 kg-m, 58 ft-lb).**
3rd **Loosen all bolts completely.**
4th **Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).**
5th **Tighten all bolts to 74 to 83 N·m (7.5 to 8.5 kg-m, 54 to 61 ft-lb) or if you have an angle wrench, turn bolt ⑧ 83 to 88 degrees and the other bolts 75 to 80 degrees clockwise.**

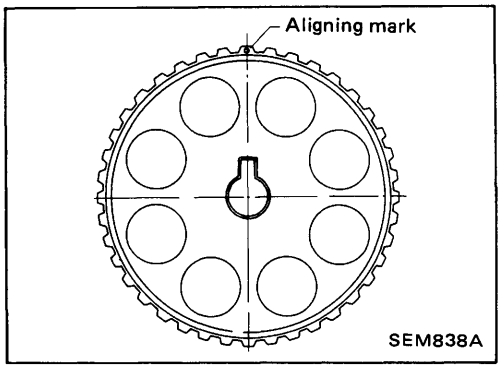


3. Install camshaft sprocket.

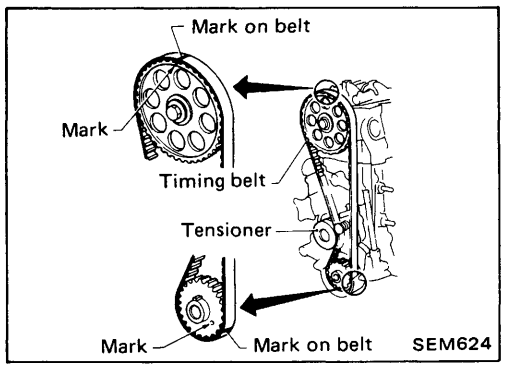
Camshaft sprocket:
: 78 - 88 N·m (8.0 - 9.0 kg-m, 58 - 65 ft-lb)



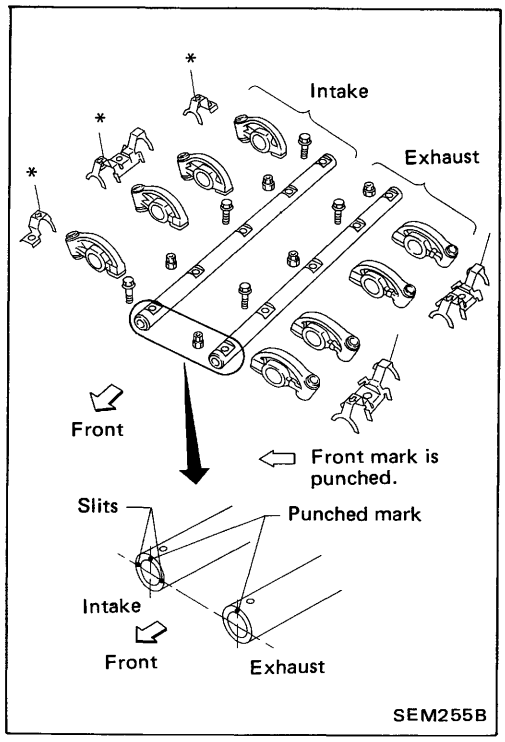
4. Confirm that No. 1 cylinder is set at T.D.C. on its compression stroke as follows:
(1) Set crankshaft key near to the top.



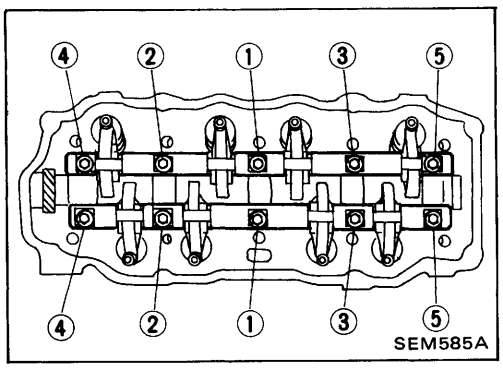
(2) Check camshaft sprocket aligning mark at the top.



5. Install timing belt and adjust belt tension.
Refer to "TIMING BELT - Installation".

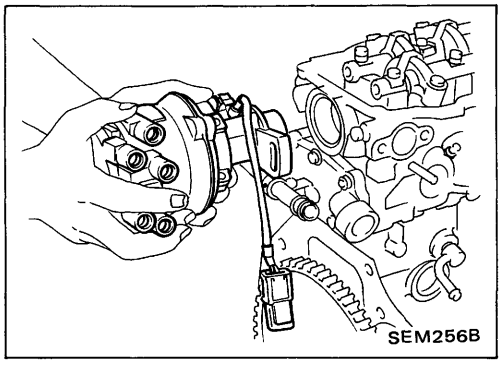


6. Install rocker shaft with rocker arms.

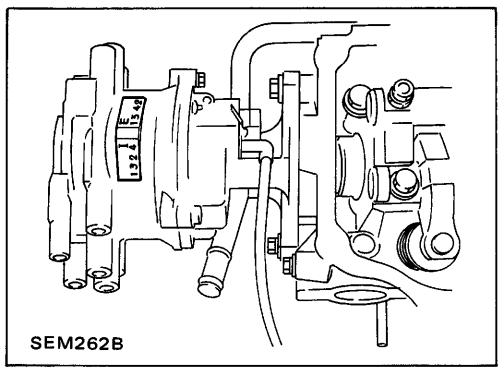


7. Tighten rocker shaft bolts.
- **Tighten bolts gradually, in two or three stages, outwardly from center position.**

Rocker shaft bolts:
: 18 - 22 N·m (1.8 - 2.2 kg-m, 13 - 16 ft-lb)



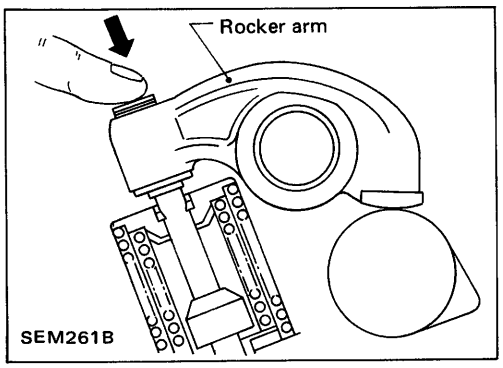
8. Install distributor.
(1) Set No. 1 cylinder at T.D.C. on its compression stroke.
(2) Install distributor in cylinder head.


SEM262B

(3) Make sure that a letter marked on distributor cap is placed on upper side.

9. Install intake and exhaust manifolds.

Intake manifold:
[O] : 20 - 25 N·m (2.0 - 2.6 kg-m, 14 - 19 ft-lb)
Exhaust manifold:
[O] : 20 - 29 N·m (2.0 - 3.0 kg-m, 14 - 22 ft-lb)



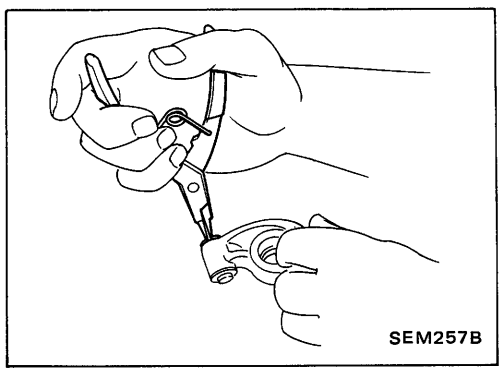
SEM261B

10. Push forcefully on the top face of hydraulic lash adjuster with finger.

If hydraulic lash adjuster moves 1 mm (0.04 in) or more, air may be mixed into it. If so, draw air from hydraulic lash adjuster as follows.

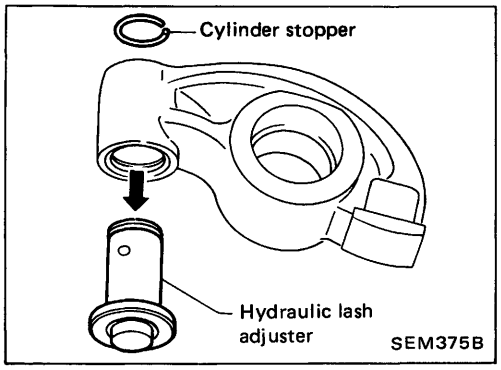
- **Install rocker cover.**
- **Run engine at approximately 1,000 rpm under no-load for about 10 minutes.**
- **Remove rocker cover again and push the top face of hydraulic lash adjuster.**
- **If hydraulic lash adjuster still moves 1 mm (0.04 in) or more, replace hydraulic lash adjuster. (Refer to Step 11.)**

11. Replacement of hydraulic lash adjuster.
1) Remove timing belt.
2) Remove rocker shafts with rocker arms and securing bolts.


SEM257B

3) Remove cylinder stopper at the malfunctional hydraulic lash adjuster.

- Pay attention not to bend cylinder stopper when removing it.

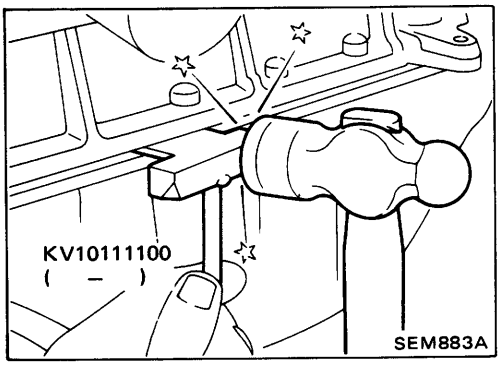


4) Draw the malfunctional lash adjuster and then replace with new one.

5) Reinstall timing belt and adjust belt tension.
(Refer to TIMING BELT - Installation.)
6) Reinstall rocker shaft with rocker arms.
7) Reinstall rocker cover.

Removal

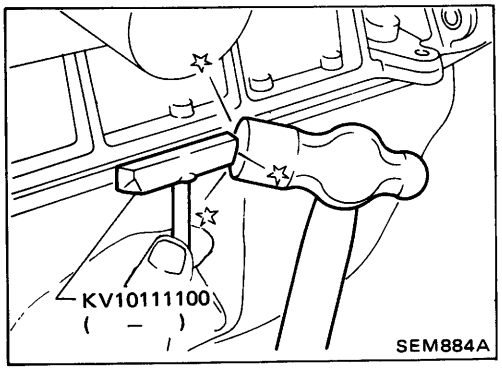
1. Remove oil pan bolts.



2. Remove oil pan.

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

- **Do not drive seal cutter into oil pump or rear oil seal retainer portion, or aluminum mating face will be damaged.**
- **Do not insert screwdriver, or oil pan flange will be deformed.**



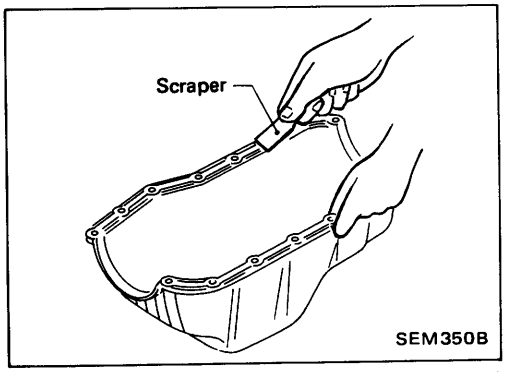
(2) Slide Tool by tapping its side with a hammer, and remove oil pan.

3. Remove oil pump assembly.

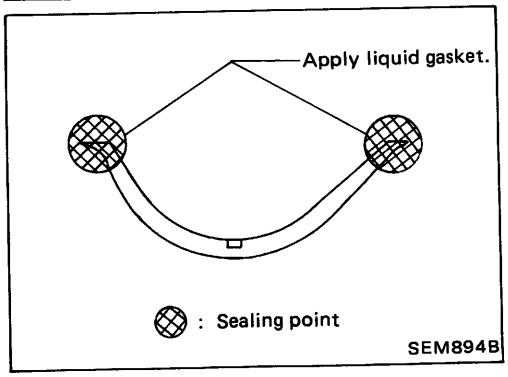
Installation

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

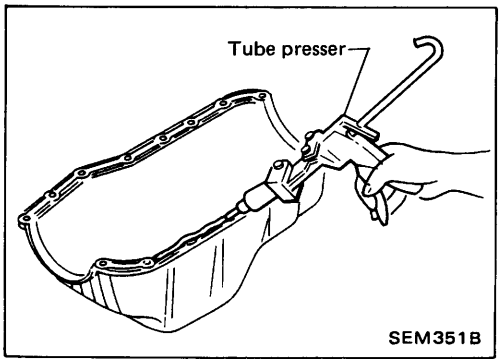
- Also remove traces of liquid gasket from mating surface of cylinder block.



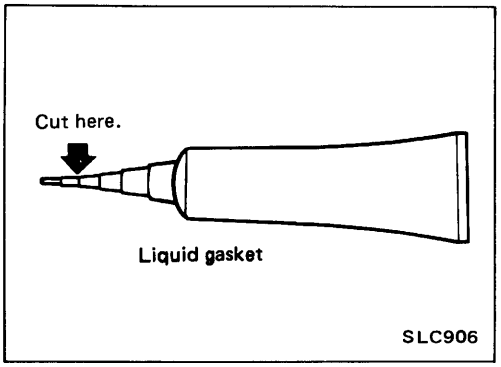
3. Apply liquid gasket to oil pump gasket and rear oil seal retainer gasket.



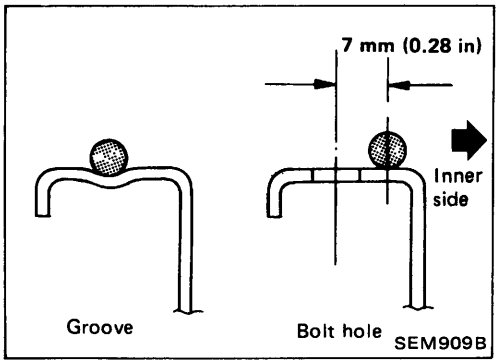
Installation (Cont'd)



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

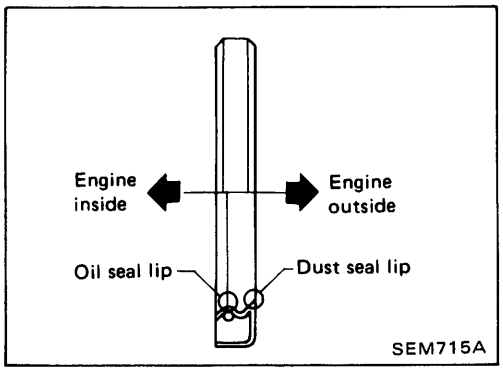


- Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide.
- **Use Genuine Liquid Gasket or equivalent.**

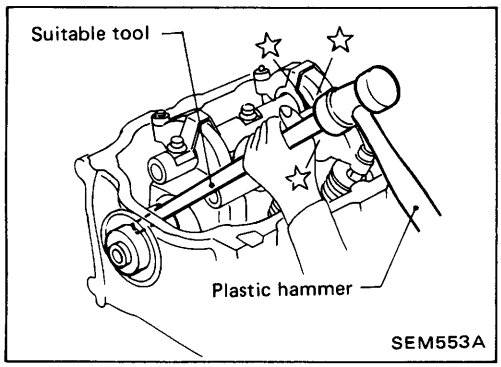


5. Apply liquid gasket to inner sealing surface instead of surface where there is no groove at bolt hole.
- Attaching should be done within 5 minutes after coating.

6. Install oil pan.
- **Install bolts/nuts in their reverse order of removal.**
  : 7 - 8 N·m (0.7 - 0.8 kg-m, 5.1 - 5.8 ft-lb)
- **Wait at least 30 minutes before refilling engine with oil.**



OIL SEAL INSTALLING DIRECTION

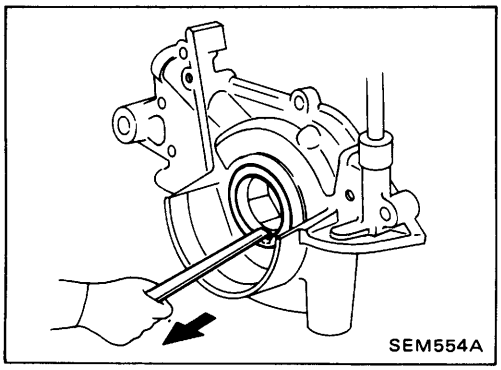


CAMSHAFT OIL SEAL

1. Remove timing belt and camshaft sprocket.
2. Remove camshaft oil seal.

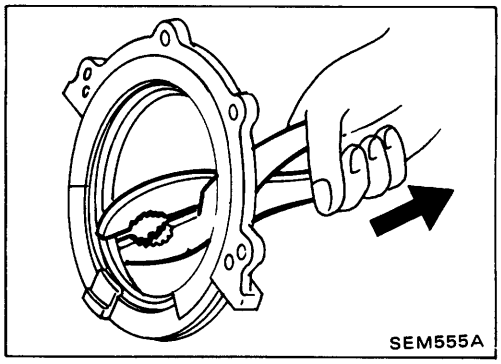
Be careful not to scratch camshaft.

3. Apply engine oil to camshaft oil seal lip and install it in place.



FRONT OIL SEAL

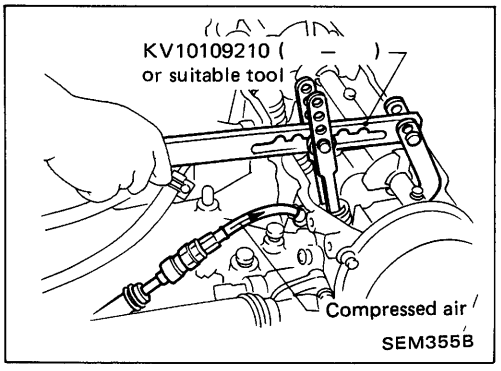
1. Remove oil pump assembly.
2. Remove crankshaft oil seal.
3. Apply engine oil to oil seal lip and install it in place.



REAR OIL SEAL

1. Remove flywheel and rear oil seal retainer.
2. Remove rear oil seal from the retainer.
3. Apply engine oil to oil seal lip and install it in place.
4. Install rear oil seal retainer with gasket.

: 4 - 6 N·m (0.4 - 0.6 kg-m, 2.9 - 4.3 ft-lb)



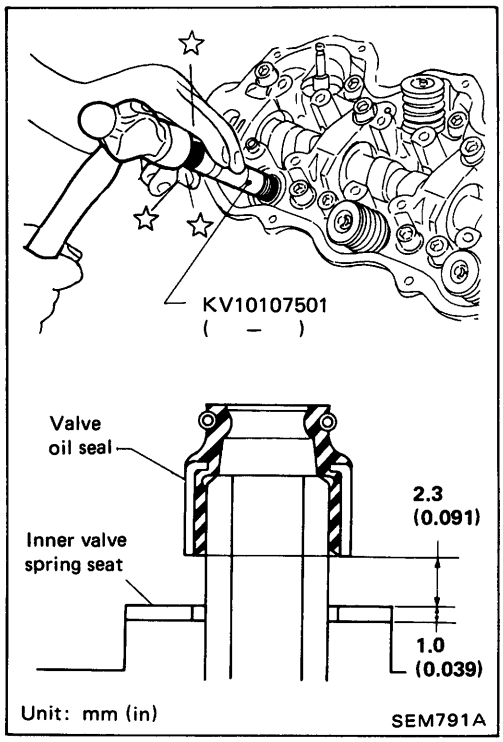
VALVE OIL SEAL

1. Remove rocker cover.
2. Remove rocker shaft assembly.
3. Remove spark plug. (Exhaust side)
4. Install air hose adapter into spark plug hole and apply air pressure to hold valves in place [Apply pressure of 490 kPa (5 kg/cm^2, 71 psi)].

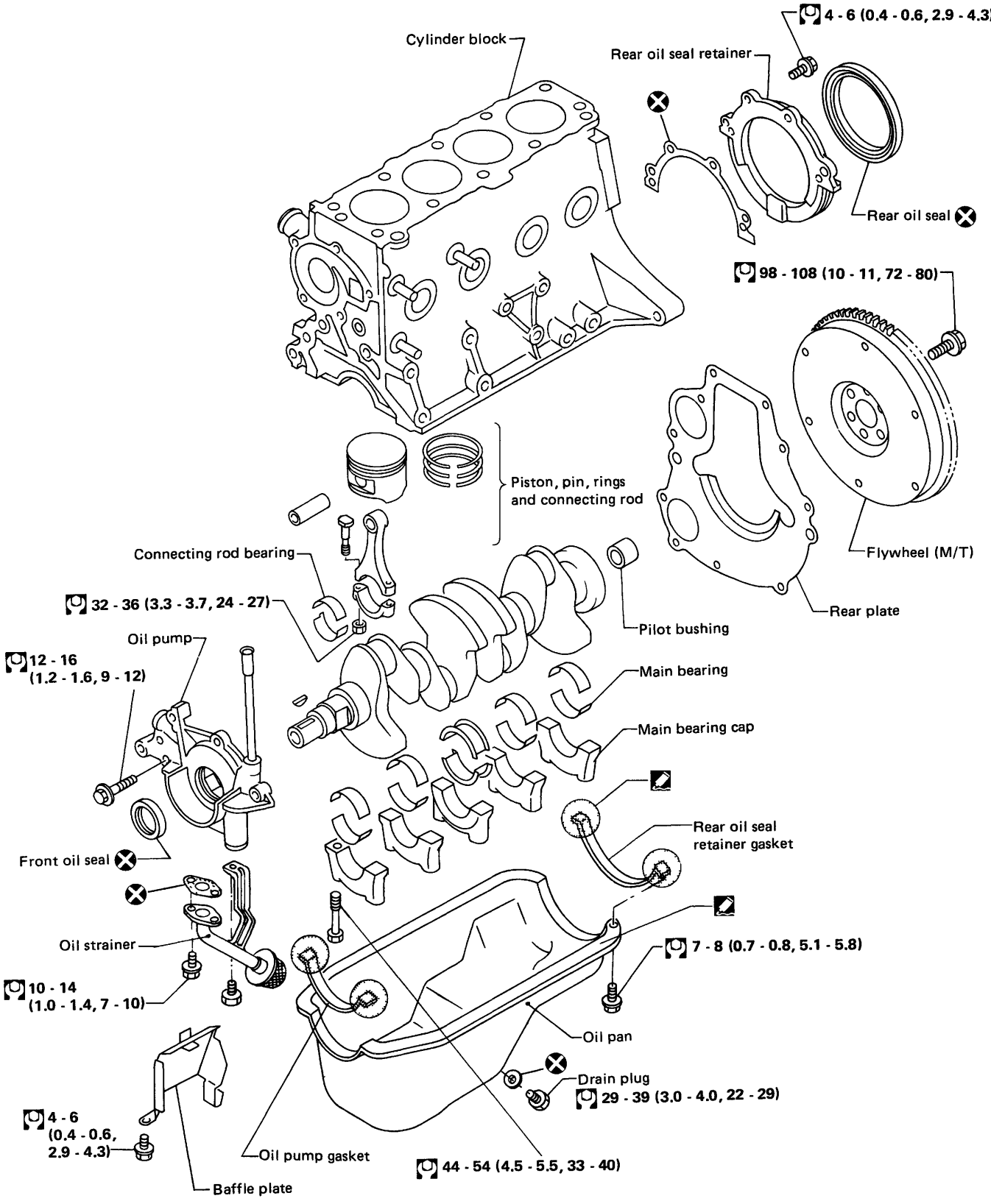
When performing this operation piston should be set at T.D.C.

5. Remove valve spring and valve oil seal.

Be careful not to damage the rocker shaft.



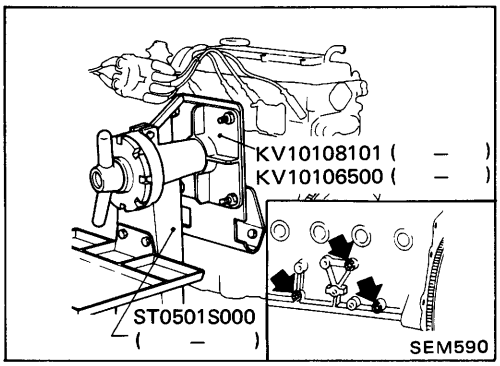
6. Apply engine oil to valve oil seal lip and install it in place.
Before installing valve oil seal, install inner valve spring seat.



- **When installing sliding parts such as bearings, be sure to apply engine oil on the sliding surfaces.**

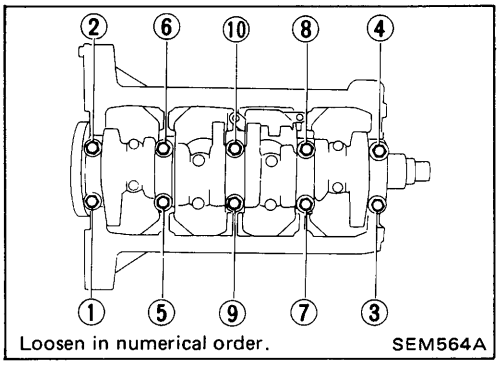
: N·m (kg-m, ft-lb)

SEM928B



PISTON AND CRANKSHAFT

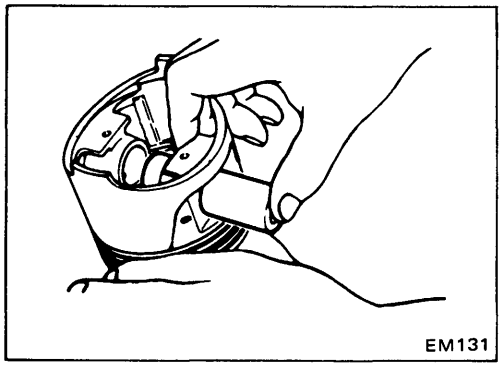
1. Place engine on work stand.
2. Drain coolant and oil.
3. Remove timing belt.
4. Remove water pump.
5. Remove oil pan and oil pump.
6. Remove cylinder head.
7. Remove pistons.

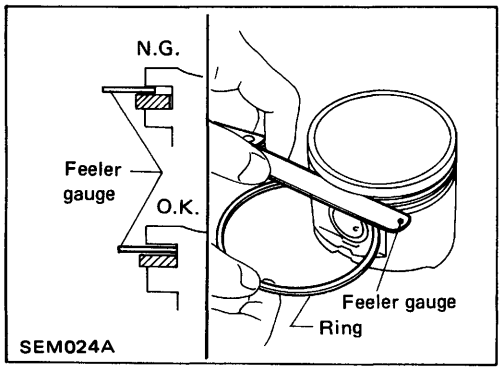


8. Remove bearing caps and crankshaft.

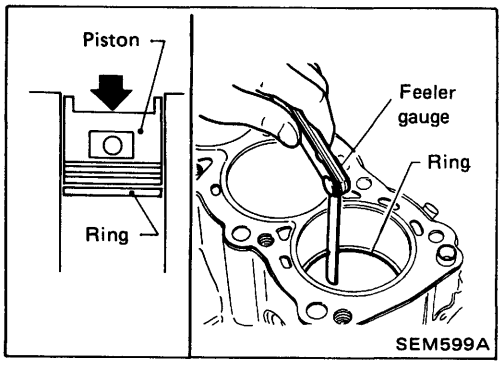
Place the bearings and caps in their proper order.

Upper bearings (cylinder block side) have oil groove.


EM131



SEM024A



SEM599A

PISTON AND PISTON PIN CLEARANCE

- Confirm the fitting of piston pin into piston pin hole to such an extent that it can be pressed smoothly by finger at room temperature.

Piston pin to piston clearance:
0.003 - 0.017 mm (0.0001 - 0.0007 in)

Apply engine oil to piston pin.

PISTON RING SIDE CLEARANCE

Side clearance:
Top ring
0.040 - 0.073 mm (0.0016 - 0.0029 in)
2nd ring
0.030 - 0.063 mm (0.0012 - 0.0025 in)
Max. limit of side clearance (Top and 2nd rings):
0.1 mm (0.004 in)

PISTON RING GAP

Standard ring gap mm (in):
Top ring
0.25 - 0.51 (0.0098 - 0.0201)
2nd ring
0.25 - 0.51 (0.0098 - 0.0201)
Oil ring (Rail ring)
0.20 - 0.76 (0.0079 - 0.0299)
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 the cylinder and use oversize piston/piston ring assembly.

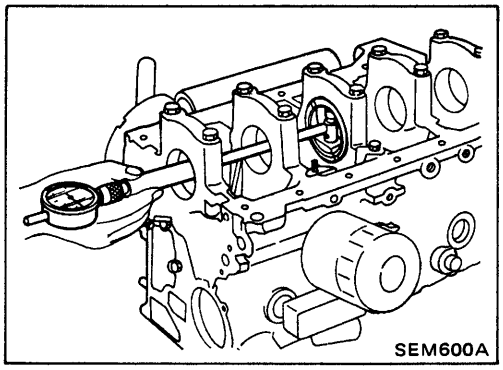
BEARING CLEARANCE

Bearing clearance:
Main bearing
0.020 - 0.047 mm (0.0008 - 0.0019 in)
Limit 0.1 mm (0.004 in)
Connecting rod bearing
0.010 - 0.044 mm (0.0004 - 0.0017 in)
Limit 0.1 mm (0.004 in)

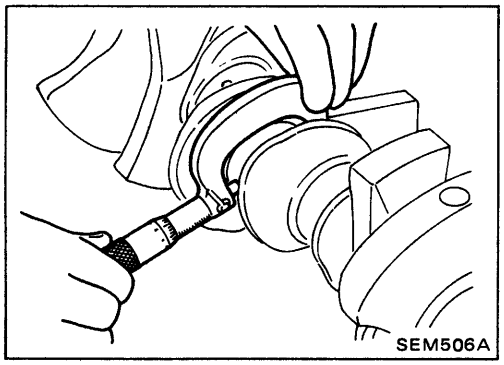
MAIN BEARING

1. Install main bearings to cylinder block and main bearing cap.
2. Install main bearing cap to cylinder block.

Tighten all bolts in correct order and in two or three stages.
: 44 - 54 N·m (4.5 - 5.5 kg-m, 33 - 40 ft-lb)


SEM600A

3. Measure inside diameter "A" of main journal.


SEM506A

4. Measure outside diameter "Dm" of main journal in crankshaft.

5. Calculate main bearing clearance.
   Main bearing clearance = A — Dm
   Standard: 0.020 - 0.047 mm (0.0008 - 0.0019 in)
   Limit: 0.1 mm (0.004 in)

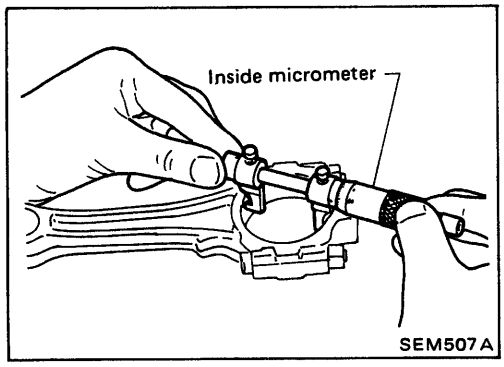
- If it exceeds the limit, replace the bearing.
- If it still exceeds the limit even with a new bearing, regrind crank journal and use undersized bearings.
- **Refer to S.D.S. for regrinding crankshaft and available service parts.**

CONNECTING ROD BEARING CLEARANCE (Big end)

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

Apply oil to the thread portion of bolts and seating surface of nuts.

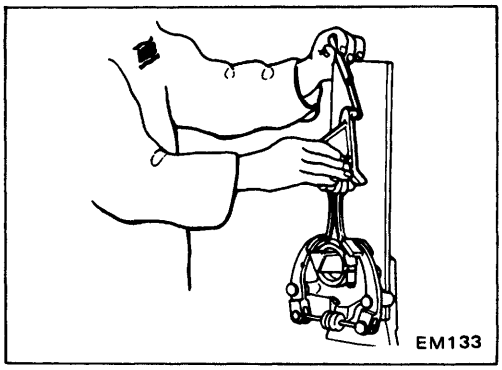
: 32 - 36 N·m (3.3 - 3.7 kg-m, 24 - 27 ft-lb)



SEM507A

3. Measure inside diameter "C" of bearing.
4. Measure outside diameter "Dp" of crankshaft pin journal.
5. Calculate connecting rod bearing clearance.
   Connecting rod bearing clearance = C — Dp
   Standard: 0.010 - 0.044 mm (0.0004 - 0.0017 in)
   Limit: 0.1 mm (0.004 in)

- If it exceeds the limit, replace the bearing.
- If it still exceeds the limit even with a new bearing, regrind crank pin and use undersized bearings.
- **Refer to S.D.S. for regrinding crankshaft and available service parts.**


EM133

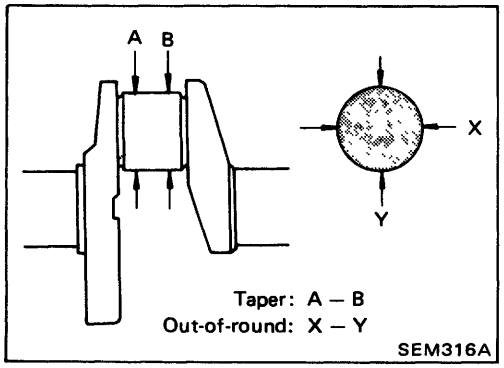
CONNECTING ROD BEND AND TORSION

Bend:

Limit 0.15 mm (0.0059 in) per 100 mm (3.94 in) length

Torsion:

Limit 0.3 mm (0.012 in) per 100 mm (3.94 in) length



SEM316A

CRANKSHAFT

1. Check crankshaft journals for score, bias, wear or cracks. If faults are minor, correct with fine crocus cloth.
2. Check journals with a micrometer for taper and out-of-round.

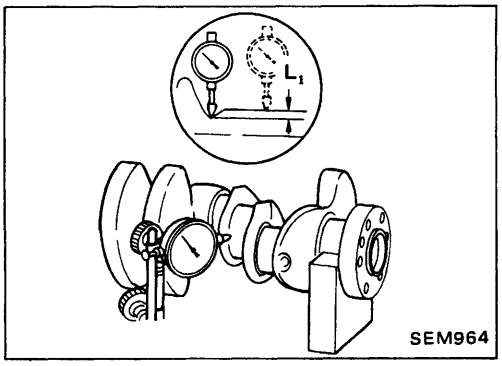
Out-of-round (X – Y):

Less than 0.005 mm (0.0002 in)

Taper (A – B):

Less than 0.005 mm (0.0002 in)

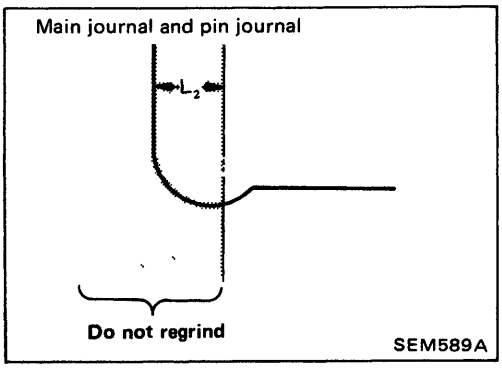
Limit: 0.03 mm (0.0012 in)



SEM964

a. **When regrinding crank pin and crank journal, measure "L" dimension in fillet roll. Make sure the measurements exceed the specified limit. If the measurements are less than the specified limit, do not regrind.**

L_1 : More than 0.10 mm (0.0039 in)



SEM589A

b. **Fillet roll should not be reground.**

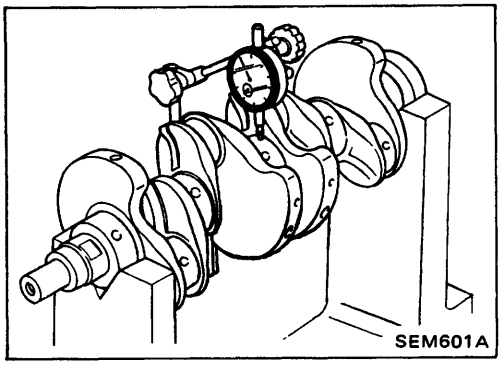
L_2 :

Pin journal

2.5 mm (0.098 in)

Main journal

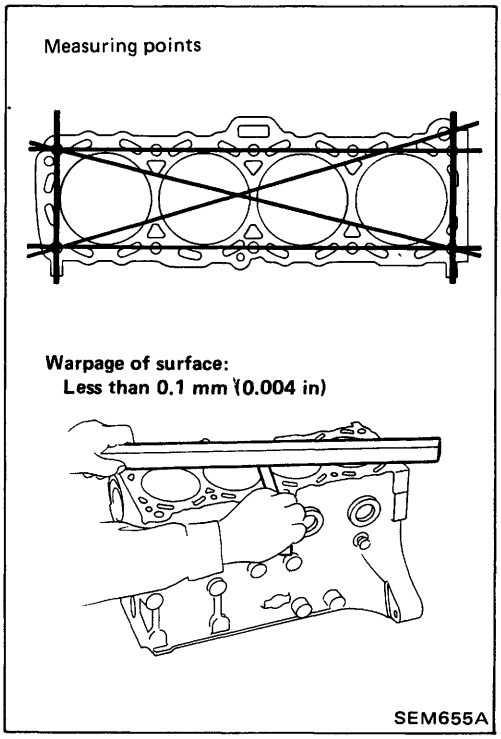
2.0 mm (0.079 in)


SEM601A

3. Check crankshaft runout.

Runout [T.I.R. (Total Indicator Reading)] :

Less than 0.1 mm (0.004 in)



CYLINDER BLOCK DISTORTION AND WEAR

Clean upper face of cylinder block and measure the distortion.

Limit:

0.10 mm (0.0039 in)

If out of specification, resurface it.

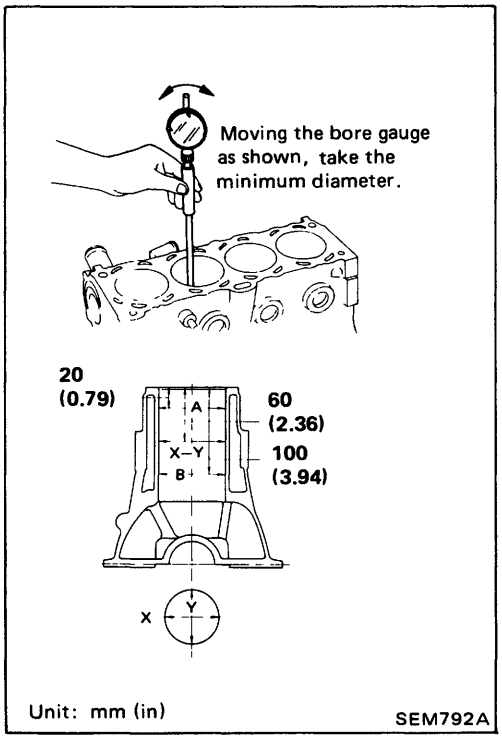
The resurfacing limit of cylinder block is determined by the cylinder head resurfacing in an engine.

Amount of cylinder head resurfacing is "A".

Amount of cylinder block resurfacing is "B".

The maximum limit is as follows:

A + B = 0.2 mm (0.008 in)



CYLINDER BORE

1. Using a bore gauge, measure cylinder bore for wear, out-of-round or taper.

Standard inside diameter:

84.50 - 84.55 mm (3.3268 - 3.3287 in)

Refer to S.D.S.

Wear limit

0.20 mm (0.0079 in)

Out-of-round (X – Y) limit

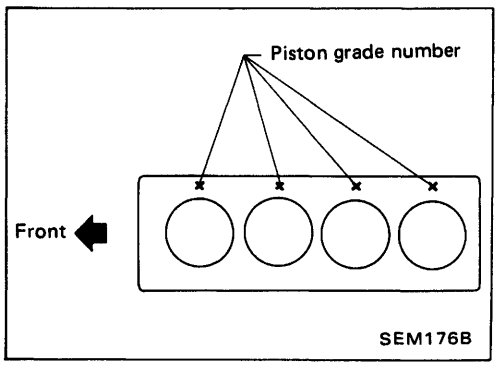
0.015 mm (0.0006 in)

Taper (A – B) limit

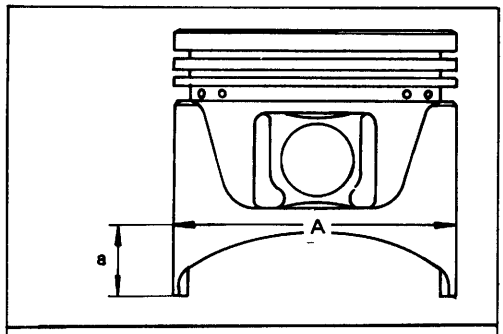
0.010 mm (0.0004 in)

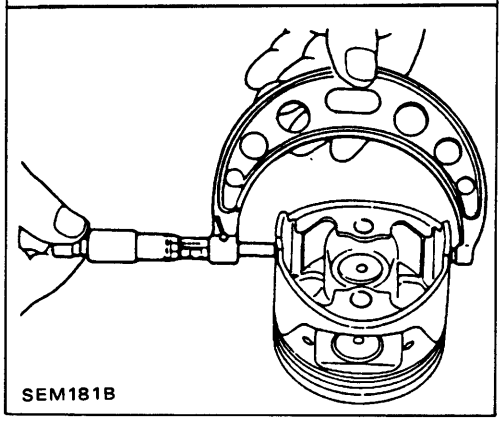
If it exceeds the limit, rebore all four cylinders. Replace cylinder block if necessary.

- Check for scratches or seizure. If seizure is found, hone it.



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





2. The size to which cylinders must be honed is determined by adding piston-to-cylinder clearance to the piston skirt diameter "A".

Dimension "a":
Approximately 20 mm (0.79 in)

Rebored size calculation

D = A + B – C = A + [0.005 to 0.025 mm (0.0002 to 0.0010 in)]

where,

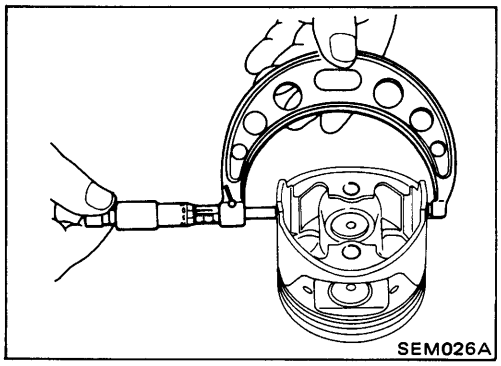
D : Honed diameter
A : Skirt diameter as measured
B : Piston-to-wall clearance
C : Machining allowance 0.02 mm (0.0008 in)

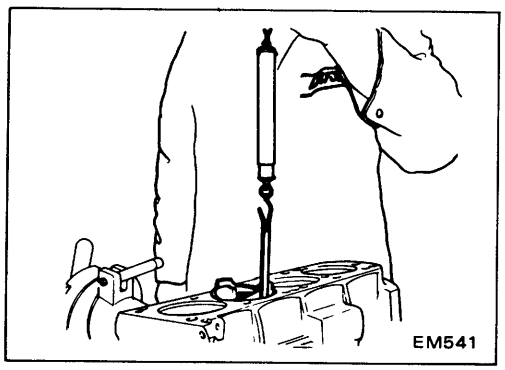
3. Install main bearing caps in place, and tighten to the specified torque to prevent distortion of the cylinder bores in final assembly.
4. Cut cylinder bores in the order of 2-4-1-3.

- **Do not cut too much out of the cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.**

5. Hone the cylinders to the required size, referring to S.D.S.
6. Measure the finished cylinder bore for out-of-round and taper.

- **Measurement of a just-machined cylinder bore requires utmost care since it is expanded by cutting heat.**





PISTON TO CYLINDER WALL CLEARANCE

Using micrometer

1. Measure piston and cylinder bore diameter.

Piston diameter "A":
Refer to S.D.S.
Measuring point "a" (Distance from the bottom):
Approximately 20 mm (0.79 in)

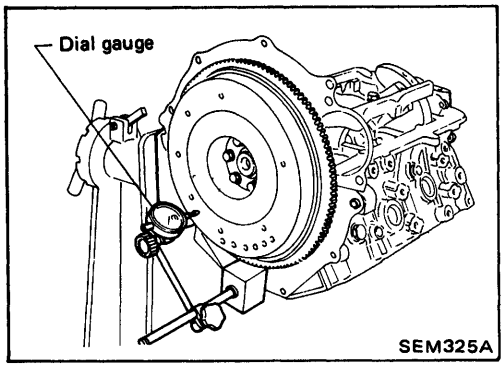
2. Check that piston clearance is within the specification.

Piston clearance:
0.025 - 0.045 mm (0.0010 - 0.0018 in)

Using feeler gauge

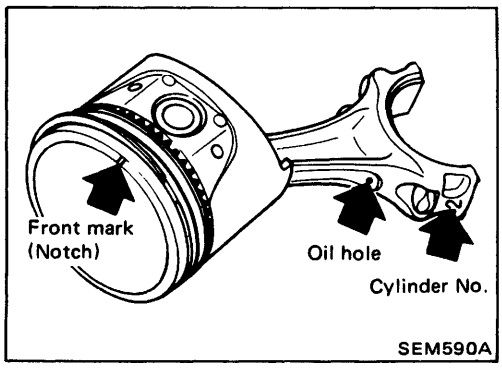
Measure the extracting force by pulling feeler gauge straight upward.

Feeler gauge thickness:
0.04 mm (0.0016 in)
Extracting force:
2.0 - 14.7 N (0.2 - 1.5 kg, 0.4 - 3.3 lb)



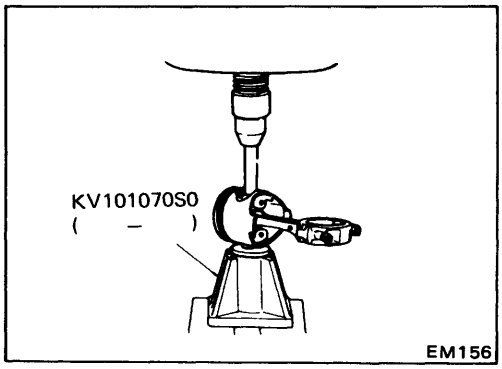
FLYWHEEL RUNOUT

Runout (Total indicator reading):
Less than 0.15 mm (0.0059 in)

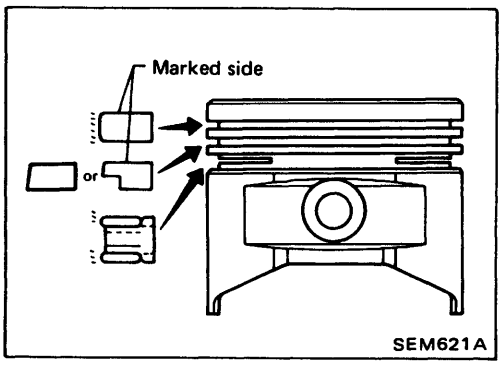


PISTON

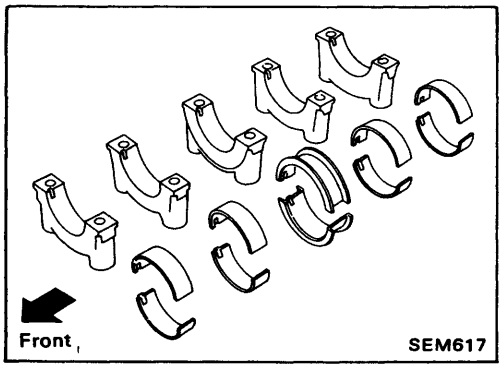
a. Numbers stamped on the connecting rod and cap correspond to each cylinder. Care should be taken to avoid a wrong combination including bearing.



b. When pressing piston pin in connecting rod, apply engine oil to pin and small end of connecting rod.
c. After assembling, ascertain that piston swings smoothly.



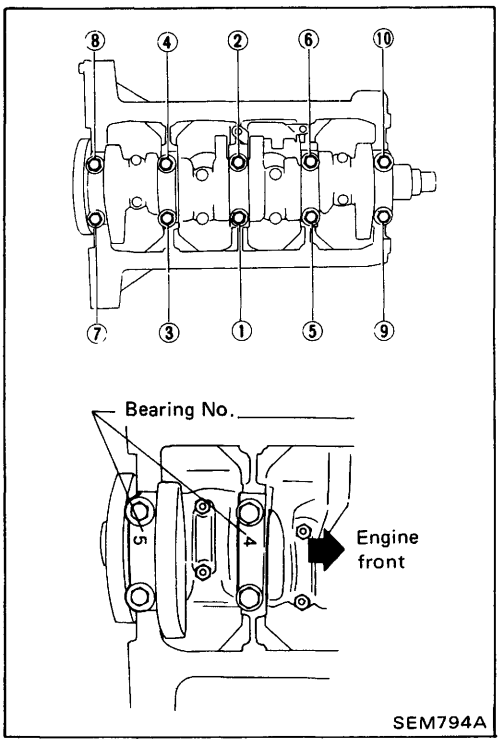
- Install piston rings.



CRANKSHAFT

1. Set main bearings in the proper position on cylinder block.

If either crankshaft, cylinder block or main bearing is reused again, it is necessary to measure main bearing clearance.
Upper bearings (Cylinder block side) have oil groove.



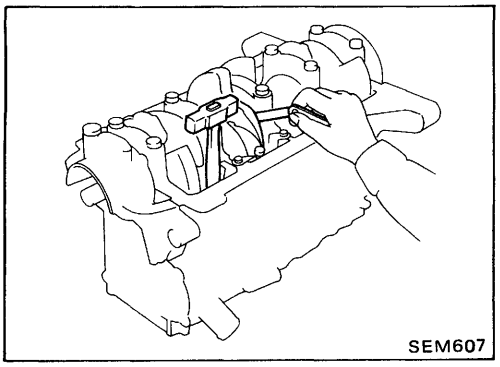
2. Apply engine oil to main bearing surfaces on both sides of cylinder block and cap.
3. Install crankshaft and main bearing caps and tighten bolts to specified torque.

Main bearing cap bolt:

: 44 - 54 N·m

(4.5 - 5.5 kg-m, 33 - 40 ft-lb)

- **Arrange the parts so that the indicated number on bearing cap is in a row from the front of engine.**
- **Prior to tightening bearing cap bolts, place bearing cap in proper position by shifting crankshaft in the axial direction.**
- **Tighten bearing cap bolts gradually in separating two or three stages and outwardly from center bearing in sequence.**
- **After securing bearing cap bolts, make sure that crankshaft turns smoothly.**

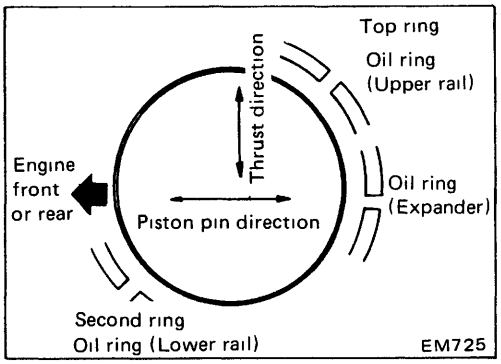


4. Measure crankshaft free end play at center bearing.

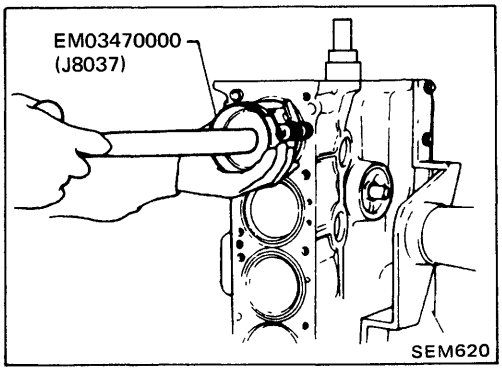
Crankshaft free end play:

Limit

0.30 mm (0.0118 in)



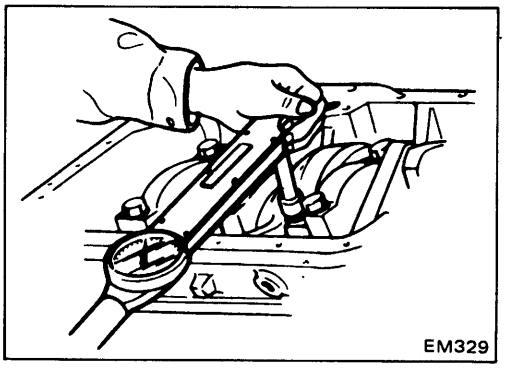
- **Set piston ring as shown.**



5. Install pistons with connecting rods.

(1) Install them into corresponding cylinder using Tool.

- **Be careful not to scratch cylinder wall by connecting rod.**
- **Apply engine oil to cylinder wall, piston and bearing.**
- **Arrange so that the front mark on piston head faces to the front of engine.**



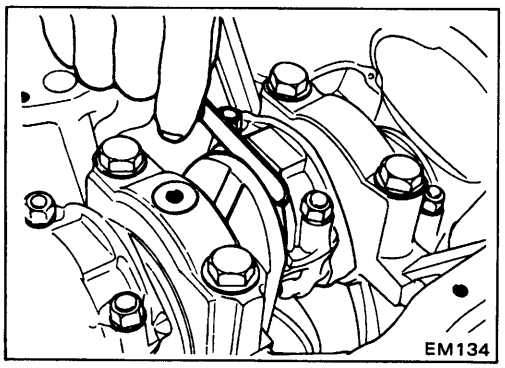
(2) Install connecting rod bearing caps.

- **Tighten in two or three stages.**

Connecting rod bearing nut:

: 32 - 36 N·m

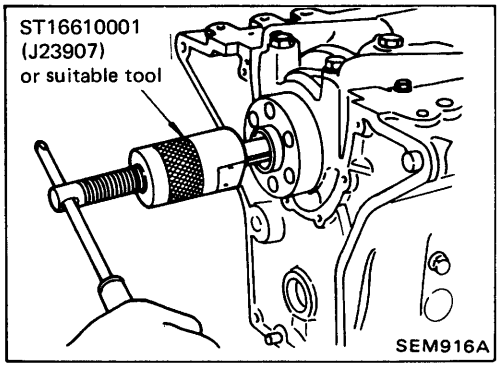
(3.3 - 3.7 kg-m, 24 - 27 ft-lb)



6. Measure connecting rod side clearance.

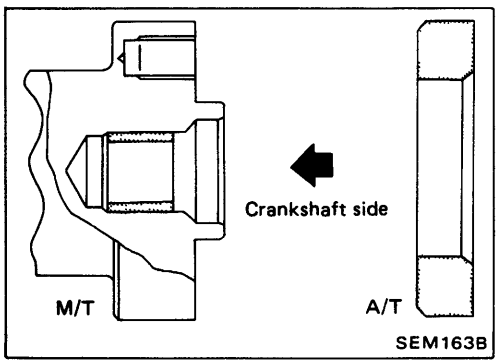
Connecting rod side clearance:

Limit 0.30 mm (0.0118 in)



REPLACING PILOT BUSHING

1. Remove pilot bushing (M/T) or pilot convertor (A/T).



2. Install pilot bushing (M/T) or pilot convertor (A/T).

General Specifications

Cylinder arrangement	4, in-line
Displacement cm^3 (cu in)	1,974 (120.45)
Bore x stroke mm (in)	84.5 x 88.0 (3.327 x 3.465)
Valve arrangement	O.H.C.
Firing order	1-3-4-2
Number of piston rings	
Compression	2
Oil	1
Number of main bearings	5
Compression ratio	8.5

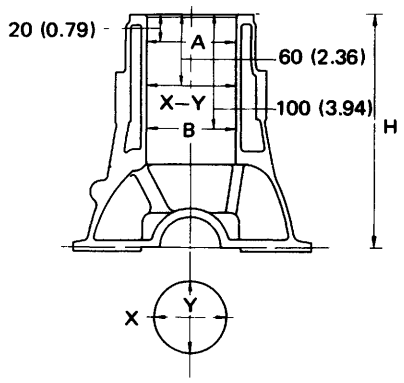
Unit: kPa (kg/cm^2, psi)/rpm

Compression pressure	
Standard	1,177 (12.0, 171)/350
Minimum	883 (9.0, 128)/350
Differential limit between cylinders	98 (1.0, 14)/350

Inspection and Adjustment

CYLINDER BLOCK

Unit: mm (in)



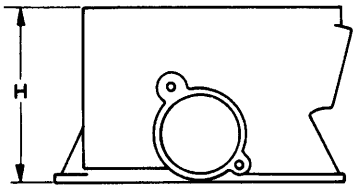
SEM528A

		Standard	Limit (*Wear limit)
Height (H)		223.25 - 223.35 (8.7894 - 8.7933)	Note 1 0.2 (0.008)
Surface flatness		–	0.1 (0.004)
Cylinder bore	Inner diameter	84.50 - 84.55 (3.3268 - 3.3287)	–
	Out-of-round (X – Y)	Less than 0.02 (0.0008)	–
	Taper (A – B)	Less than 0.02 (0.0008)	–
Difference in inner diameter between cylinders		Less than 0.05 (0.0020)	–
Piston to cylinder clearance		0.025 - 0.045 (0.0010 - 0.0018)	–
Feeler gauge extracting force [With gauge thickness 0.04 mm (0.0016 in)] N (kg, lb)		2.0 - 14.7 (0.2 - 1.5, 0.4 - 3.3)	–

Note 1
Total depth of cylinder head surface grinding and cylinder block surface grinding.

Inspection and Adjustment (Cont'd)

CYLINDER HEAD



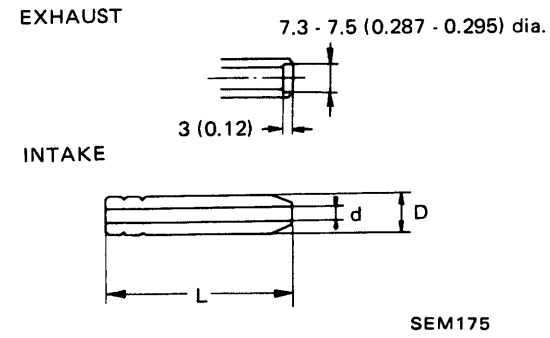
SEM529A

Unit: mm (in)

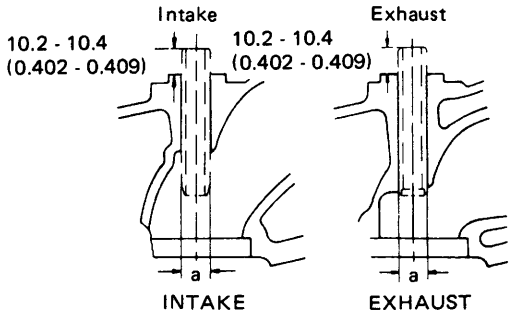
	Standard	Limit
Height (H)	116.6 - 117.0 (4.591 - 4.606)	0.2 (0.008)*
Surface flatness	0.03 (0.0012)	0.1 (0.004)

*: Total amount of cylinder head resurfacing and cylinder block resurfacing

VALVE GUIDE



SEM175



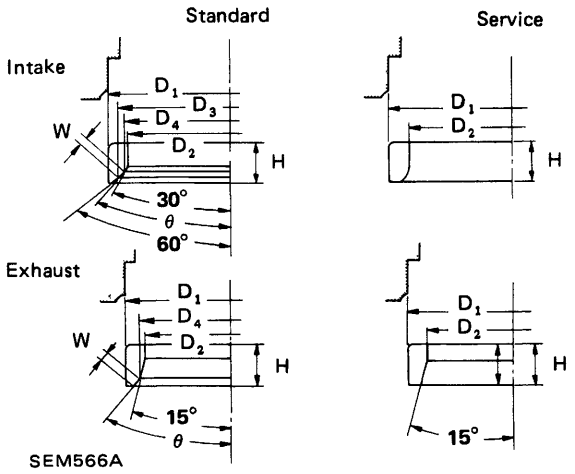
EM116

Unit: mm (in)

		Standard	Service
Length (L)		45.0 (1.772)	45.0 (1.772)
Outer diameter (D)		11.023 - 11.034 (0.4340 - 0.4344)	11.223 - 11.234 (0.4418 - 0.4423)
Inner diameter (d) [Finished size]		7.000 - 7.018 (0.2756 - 0.2763)	
Cylinder head hole diameter (a)		10.975 - 10.996 (0.4321 - 0.4329)	11.185 - 11.196 (0.4404 - 0.4408)
Interference fit		0.027 - 0.059 (0.0011 - 0.0023)	
		Standard	Limit
Stem to guide clearance	In.	0.020 - 0.053 (0.0008 - 0.0021)	0.1 (0.004)
	Ex.	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.004)
Valve deflection		–	0.2 (0.008)

Inspection and Adjustment (Cont'd)

VALVE SEAT

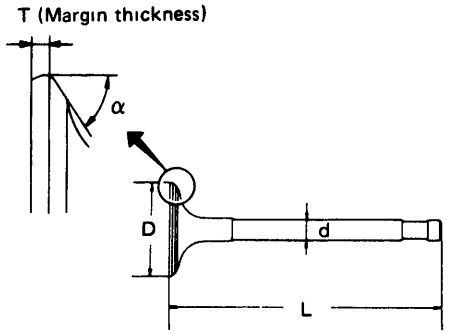


Unit: mm (in)

		Standard	Service*
Cylinder head seat recess diameter (D_1)	In.	43.000 - 43.016 (1.6929 - 1.6935)	43.500 - 43.516 (1.7126 - 1.7132)
	Ex.	37.000 - 37.016 (1.4567 - 1.4573)	37.500 - 37.516 (1.4764 - 1.4770)
Valve seat interference fit	In.	0.081 - 0.113 (0.0032 - 0.0044)	
	Ex.	0.064 - 0.096 (0.0025 - 0.0038)	
Valve seat outer diameter (D_1)	In.	43.097 - 43.113 (1.6967 - 1.6974)	43.597 - 43.613 (1.7164 - 1.7170)
	Ex.	37.080 - 37.096 (1.4598 - 1.4605)	37.580 - 37.596 (1.4795 - 1.4802)
Valve seat inner diameter (D_2)	In.	36.85 - 37.15 (1.4508 - 1.4626)	36.85 - 37.15 (1.4508 - 1.4626)
	Ex.	29.85 - 30.15 (1.1752 - 1.1870)	29.85 - 30.15 (1.1752 - 1.1870)
Height (H)	In.	7.6 - 7.7 (0.299 - 0.303)	6.7 - 6.8 (0.264 - 0.268)
	Ex.	7.4 - 7.5 (0.291 - 0.295)	7.4 - 7.5 (0.291 - 0.295)
Face angle (θ)	In.	45°	
	Ex.	45°	
Contacting width (W)	In.	1.8 - 2.1 (0.071 - 0.083)	
	Ex.	1.4 - 1.8 (0.055 - 0.071)	
Face inner diameter (D_4)	In.	37.8 (1.488)	*: Valve seat surface must be corrected into specified value.
	Ex.	34.4 - 34.6 (1.354 - 1.362)	
Face outer diameter (D_3)	In.	40.6 - 40.8 (1.598 - 1.606)	

Inspection and Adjustment (Cont'd)

VALVE



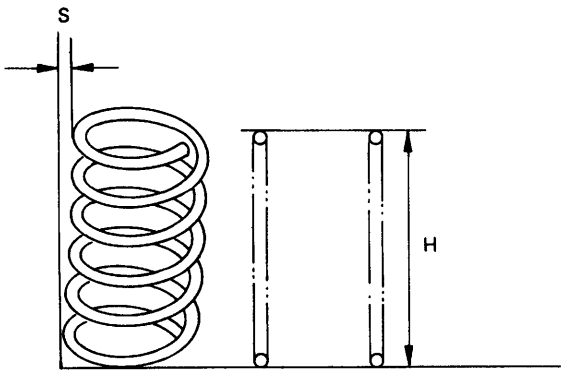
SEM188A

Unit: mm (in)

		Standard	Limit
Valve head diameter (D)	In.	41.0 - 41.2 (1.614 - 1.622)	–
	Ex.	35.0 - 35.2 (1.378 - 1.386)	–
Valve length (L)	In.	106.78 - 107.20 (4.2039 - 4.2205)	–
	Ex.	107.79 - 108.21 (4.2437 - 4.2602)	
Valve stem diameter (d)	In.	6.965 - 6.980 (0.2742 - 0.2748)	–
	Ex.	6.945 - 6.960 (0.2734 - 0.2740)	
Valve face angle (α)	In.	45°15′ - 45°45′	–
	Ex.		
Valve head margin (T)	In.	1.15 - 1.45 (0.0453 - 0.0571)	0.5 (0.020)
	Ex.	1.35 - 1.65 (0.0531 - 0.0650)	

Inspection and Adjustment (Cont'd)

VALVE SPRING



SEM567A

Unit: mm (in)

		Standard	Limit
Free height (H)	Outer	49.77 (1.9594)	–
	Inner	44.10 (1.7362)	–
Spring constant N/mm (kg/mm, lb/in)	Outer	22.75 (2.32, 129.9)	–
	Inner	11.67 (1.19, 66.6)	–
Out-of-square (S)	Outer	–	2.2 (0.087)
	Inner	–	1.9 (0.075)

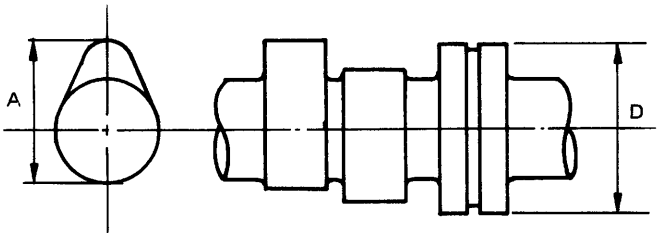
ROCKER ARM AND ROCKER SHAFT

Unit: mm (in)

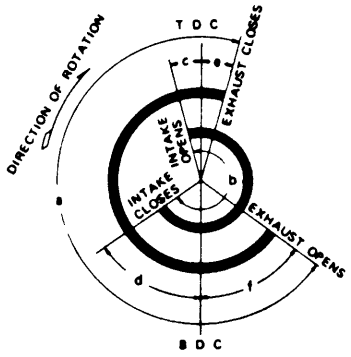
Rocker shaft	
Outer diameter	19.979 - 20.000 (0.7866 - 0.7874)
Rocker arm	
Inner diameter	20.007 - 20.028 (0.7877 - 0.7885)
Clearance between rocker arm and rocker shaft	0.007 - 0.049 (0.0003 - 0.0019)

Inspection and Adjustment (Cont'd)

CAMSHAFT AND CAMSHAFT BEARING



SEM568A



EM120

Unit: mm (in)

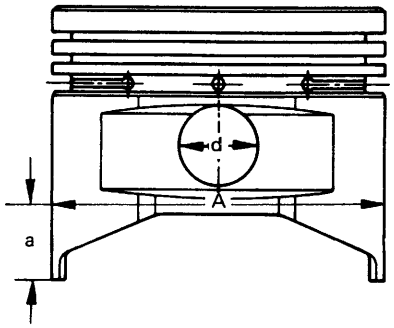
Engine model		Standard	Limit
Cam height (A)	In	37.675 - 37.755 (1.4833 - 1.4864)	–
	Ex.	38.281 - 38.361 (1.5071 - 1.5103)	–
Valve lift (h)	In.	8.5 (0.335)	–
	Ex.	9.5 (0.374)	–
Wear limit of cam height		–	0.2 (0.008)
Camshaft journal to bearing clearance		–	0.1 (0.004)
Inner diameter of camshaft bearing		46.000 - 46.016 (1.8110 - 1.8116)	–
Outer diameter of camshaft journal (D)		Journal No. { #1 - #4: 45.935 - 45.955 (1.8085 - 1.8092) #5 : 45.915 - 45.935 (1.8077 - 1.8085)	–
Camshaft runout		–	0.05 (0.0020)
Camshaft end play		0.07 - 0.14 (0.0028 - 0.0055)	0.2 (0.008)
Valve timing (Degree on crankshaft)	a	248	–
	b	240	–
	c	12	–
	d	48	–
	e	18	–
	f	54	–

Inspection and Adjustment (Cont'd)

PISTON, PISTON RING AND PISTON PIN

Piston

Unit: mm (in)



SEM569A

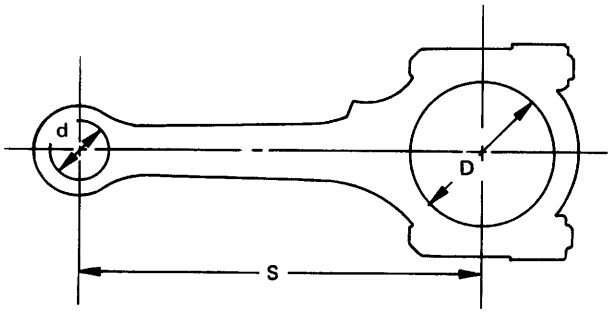
Piston skirt diameter (A) Service (Standard) Grade No. 1	84.465 - 84.475 (3.3254 - 3.3258)
Grade No. 2	84.475 - 84.485 (3.3258 - 3.3262)
Grade No. 3	84.485 - 84.495 (3.3262 - 3.3266)
Grade No. 4	84.495 - 84.505 (3.3266 - 3.3270)
Grade No. 5	84.505 - 84.515 (3.3270 - 3.3274)
Service (Oversize) 0.5 (0.020)	84.965 - 85.015 (3.3451 - 3.3470)
1.0 (0.039)	85.465 - 85.515 (3.3648 - 3.3667)
"a" dimension	19.8 (0.780)
Piston pin hole diameter	20.003 - 20.012 (0.7875 - 0.7879)
Piston clearance to cylinder block	0.025 - 0.045 (0.0010 - 0.0018)

Piston ring

Unit: mm (in)

		Standard	Limit
Side clearance	Top	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.004)
	2nd	0.030 - 0.063 (0.0012 - 0.0025)	
	Oil	–	–
Ring gap	Top	0.25 - 0.51 (0.0098 - 0.0201)	1.0 (0.039)
	2nd	0.15 - 0.31 (0.0059 - 0.0122)	
	Oil (rail ring)	0.20 - 0.76 (0.0079 - 0.0299)	

CONNECTING ROD



SEM570A

Unit: mm (in)

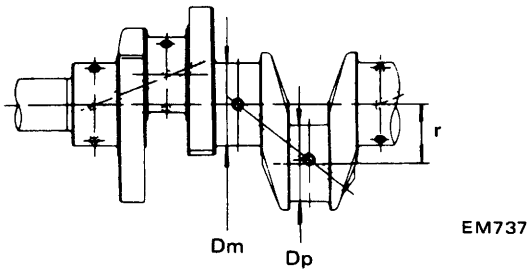
	Standard	Limit
Center distance (S)	149.25 - 149.35 (5.8760 - 5.8799)	–
Bend [per 100 mm (3.94 in)]	–	0.15 (0.0059)
Torsion [per 100 mm (3.94 in)]	–	0.3 (0.012)
Piston pin bore diameter (d)	19.965 - 19.978 (0.7860 - 0.7865)	–
Crank pin bore diameter (D)	48.000 - 48.013 (1.8898 - 1.8903)	–
Big end play	0.2 - 0.3 (0.008 - 0.012)	0.3 (0.012)

Piston pin

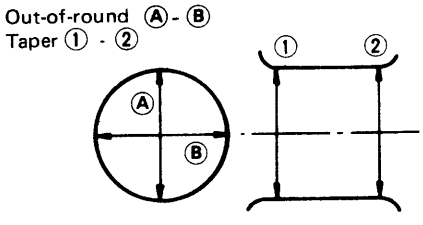
Unit: mm (in)

Piston pin outer diameter	19.995 - 20.000 (0.7872 - 0.7874)
Piston pin to piston pin bore clearance	0.003 - 0.017 (0.0001 - 0.0007)
Interference fit of piston pin to connecting rod	0.017 - 0.035 (0.0007 - 0.0014)

CRANKSHAFT



EM737



EM715

Unit: mm (in)

Main journal diameter (Dm)	52.951 - 52.964 (2.0847 - 2.0852)	
Pin journal diameter (Dp)	44.961 - 44.974 (1.7701 - 1.7706)	
Center distance (r)	43.97 - 44.03 (1.7311 - 1.7335)	
	Standard	Limit
Taper of journal and pin (① - ②)	Less than 0.005 (0.0002)	0.03 (0.0012)
Out-of-round of journal and pin (Ⓐ - Ⓑ)	Less than 0.005 (0.0002)	0.03 (0.0012)
Runout [T.I.R.]*	Less than 0.05 (0.0020)	0.1 (0.004)
Free end play	0.05 - 0.18 (0.0020 - 0.0071)	0.3 (0.012)

* Total indicator reading

BEARING

Bearing clearance

Unit: mm (in)

	Standard	Limit
Main bearing clearance	0.020 - 0.047 (0.0008 - 0.0019)	0.1 (0.004)
Connecting rod bearing clearance	0.010 - 0.044 (0.0004 - 0.0017)	0.1 (0.004)

Main bearing undersize

Unit: mm (in)

	Crank journal diameter
STD	52.951 - 52.964 (2.0847 - 2.0852)
0.25 (0.0098) Undersize	52.701 - 52.714 (2.0748 - 2.0754)
0.50 (0.0197) Undersize	52.451 - 52.464 (2.0650 - 2.0655)

Connecting rod bearing undersize

Unit: mm (in)

	Crank pin diameter
STD	44.961 - 44.974 (1.7701 - 1.7706)
0.08 (0.0031) Undersize	44.881 - 44.894 (1.7670 - 1.7675)
0.12 (0.0047) Undersize	44.841 - 44.854 (1.7654 - 1.7659)
0.25 (0.0098) Undersize	44.711 - 44.724 (1.7603 - 1.7608)
0.5 (0.020) Undersize	44.461 - 44.474 (1.7504 - 1.7509)

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Camshaft sprocket Runout [T.I.R.]	Less than 0.1 (0.004)
Flywheel Runout [T.I.R.]	Less than 0.15 (0.0059)
Drive plate Runout	Refer to AT section.

Tightening Torque

ENGINE OUTER PARTS

Unit	N·m	kg-m	ft-lb
To cylinder block			
Crank damper pulley bolt	123 - 132	12.5 - 13.5	90 - 98
Oil pump bolt	12 - 16	1.2 - 1.6	9 - 12
Belt tensioner bolt	15 - 20	1.5 - 2.0	11 - 14
Flywheel	98 - 108	10 - 11	72 - 80
Clutch cover (M/T)	22 - 29	2.2 - 3.0	16 - 22
Drive plate (A/T)	98 - 108	10 - 11	72 - 80
Oil pan	7 - 8	0.7 - 0.8	5.1 - 5.8
Air conditioner compressor bracket	69 - 78	7.0 - 8.0	51 - 58
Oil pan drain plug	29 - 39	3.0 - 4.0	22 - 29
Oil cooler bracket (A/T)	16 - 21	1.6 - 2.1	12 - 15
Water pump bolt	16 - 20	1.6 - 2.0	12 - 14
To exhaust manifold			
Exhaust gas sensor	40 - 50	4.1 - 5.1	30 - 37
Exhaust tube	26 - 36	2.7 - 3.7	20 - 27
To cylinder head			
Intake manifold	20 - 25	2.0 - 2.6	14 - 19
Exhaust manifold	20 - 29	2.0 - 3.0	14 - 22
Distributor	16 - 20	1.6 - 2.0	12 - 14
Spark plug	20 - 29	2.0 - 3.0	14 - 22
To intake manifold			
Collector	18 - 22	1.8 - 2.2	13 - 16
I.A.A. unit	7 - 8	0.7 - 0.8	5.1 - 5.8
Injector with fuel pipe	2.5 - 3.2	0.25 - 0.33	1.8 - 2.4
Water outlet	18 - 22	1.8 - 2.2	13 - 16
Throttle chamber	18 - 22	1.8 - 2.2	13 - 16
E.G.R. valve	18 - 23	1.8 - 2.3	13 - 17
E.G.R. gallery cover	7 - 8	0.7 - 0.8	5.1 - 5.8
Exhaust gas temperature sensor	15 - 25	1.5 - 2.5	11 - 18

ENGINE INNER PARTS

Unit	N·m	kg-m	ft-lb
In cylinder block			
Oil pump	12 - 16	1.2 - 1.6	9 - 12
Oil strainer	10 - 14	1.0 - 1.4	7 - 10
Connecting rod cap	32 - 36	3.3 - 3.7	24 - 27
Main bearing cap	44 - 54	4.5 - 5.5	33 - 40
In cylinder head			
Cam shaft locate plate	78 - 88	8.0 - 9.0	58 - 65
Cylinder head bolt	Refer to page EM-27.		
Rocker shaft	18 - 22	1.8 - 2.2	13 - 16

ENGINE REMOVAL PARTS

Unit	N·m	kg-m	ft-lb
Center member			
To vehicle body (Front)	39 - 49	4 - 5	29 - 36
To vehicle body (Rear)	49 - 59	5 - 6	36 - 43
Front buffer rod			
Buffer rod to center member	59 - 78	6 - 8	43 - 58
Buffer rod to mount bracket	59 - 78	6 - 8	43 - 58
Mount bracket to cylinder block	43 - 58	4.4 - 5.9	32 - 43
Rear engine mount			
Insulator to center member	39 - 49	4 - 5	29 - 36
Mount bracket to insulator	39 - 49	4 - 5	29 - 36
Mount bracket to cylinder block	43 - 58	4.4 - 5.9	32 - 43
Submount to center member	59 - 78	6 - 8	43 - 58
Submount to mount bracket	59 - 78	6 - 8	43 - 58
Left side engine mount			
Insulator to transmission case	44 - 54	4.5 - 5.5	33 - 40
Submount to insulator			
M/T:	39 - 49	4 - 5	29 - 36
A/T:	64 - 74	6.5 - 7.5	47 - 54
Submount to vehicle body	39 - 49	4 - 5	29 - 36
Right side engine mount			
Insulator to engine side bracket	49 - 59	5 - 6	36 - 43
Submount to insulator	39 - 49	4 - 5	29 - 36
Submount to vehicle body	39 - 49	4 - 5	29 - 36

ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

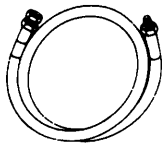
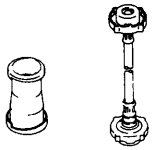
CONTENTS

PREPARATION ..... LC- 2
ENGINE LUBRICATION SYSTEM — Lubrication Circuit ..... LC- 3
ENGINE LUBRICATION SYSTEM — Oil Pressure Check ..... LC- 4
ENGINE LUBRICATION SYSTEM — Oil Pump ..... LC- 5
ENGINE COOLING SYSTEM — Cooling Circuit ..... LC- 7
ENGINE COOLING SYSTEM — Cooling System Inspection ..... LC- 8
ENGINE COOLING SYSTEM — Water Pump ..... LC- 9
ENGINE COOLING SYSTEM — Thermostat LC-10
ENGINE COOLING SYSTEM — Radiator LC-11
ENGINE COOLING SYSTEM — Electric Cooling Fan and Thermoswitches LC-12
ENGINE COOLING SYSTEM — Oil Cooler LC-13
SERVICE DATA AND SPECIFICATIONS (S.D.S.) LC-15

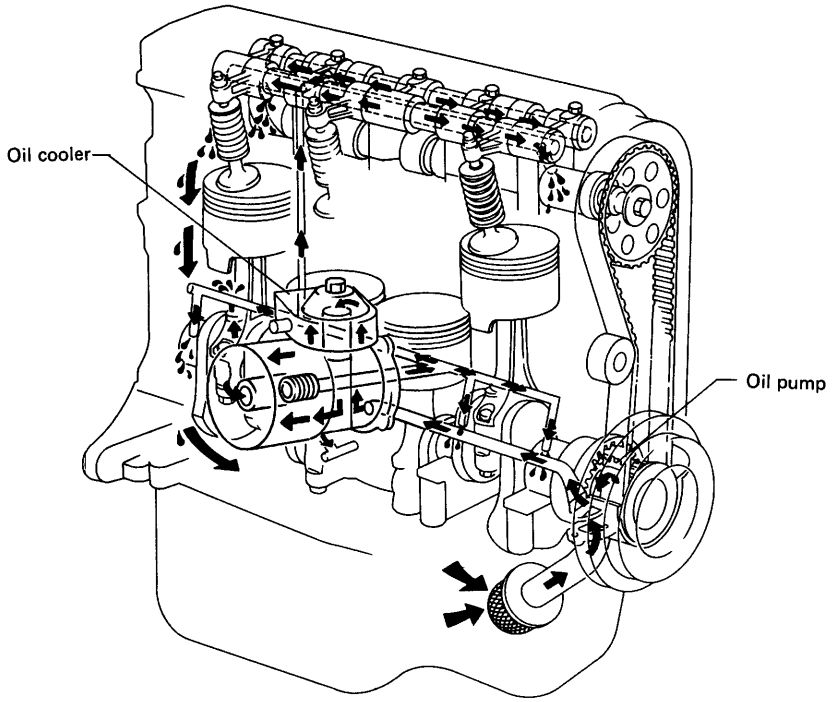
When you read wiring diagrams:

- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

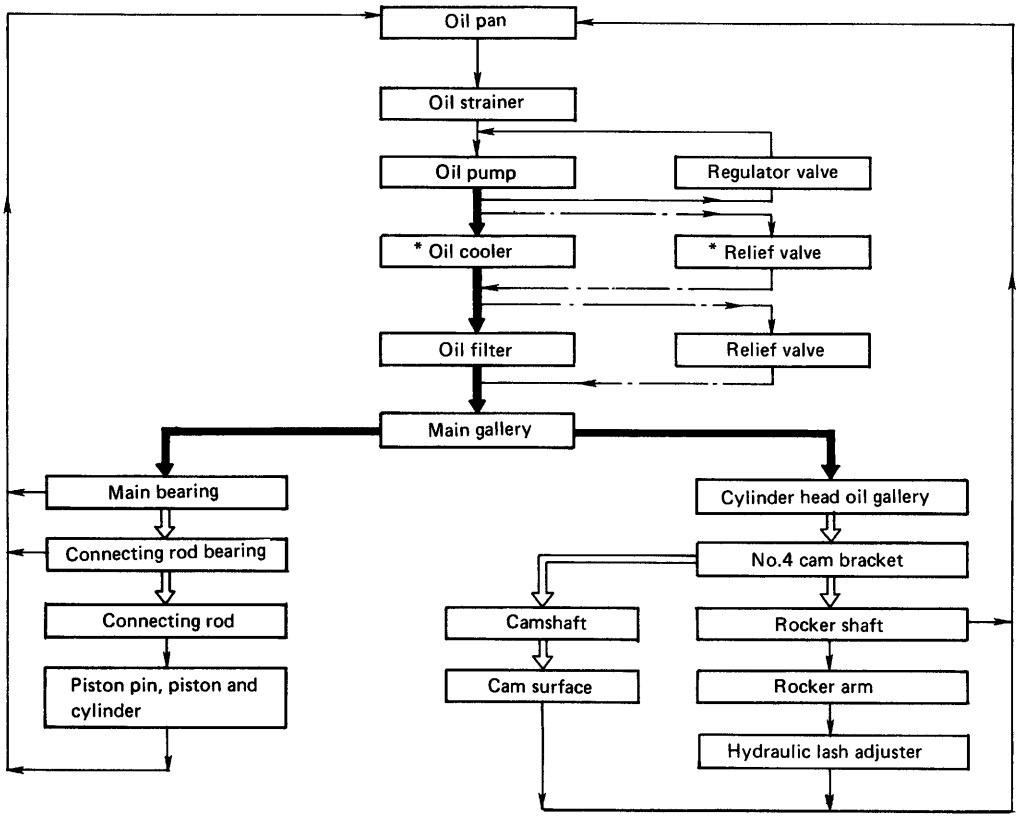
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description	
ST25051001 (J25695-1) Oil pressure gauge		
ST25052000 (J25695-2) Hose		Adapting oil pressure gauge to cylinder block
EG17650301 (–) Radiator cap tester adapter		Adapting radiator cap tester to radiator filler neck

Lubrication Circuit



Note:
- : Oil gallery in cylinder block
- : Oil passage
- : By-pass passage
- * : For A/T model

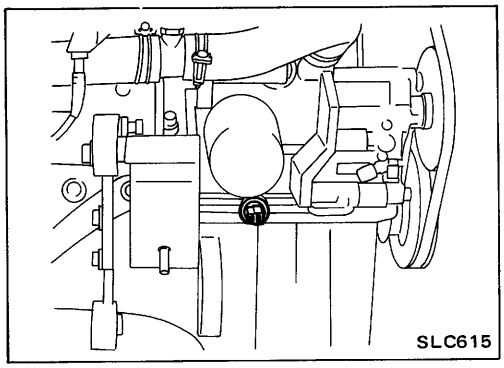


SLC888

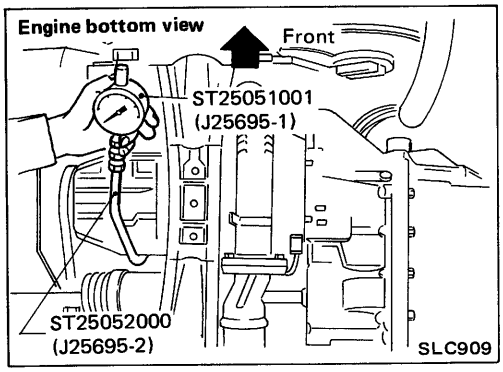
Oil Pressure Check

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 59 (0.6, 9)
3,200	334.4 - 505.1 (3.41 - 5.15, 48.5 - 73.2)

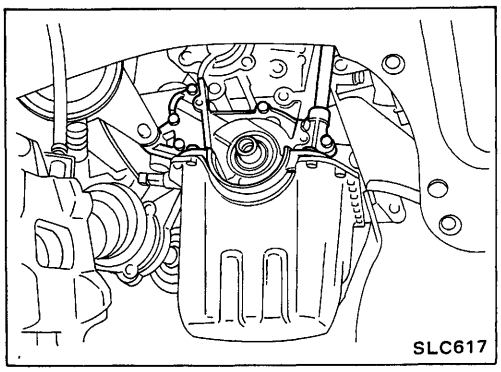
If difference is extreme, check oil passage and oil pump for oil leaks.

6. Install oil pressure switch.

Use proper liquid sealant.

Oil pressure switch:

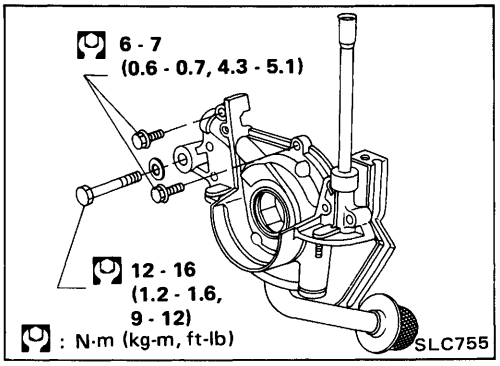
: 10 - 16 N·m (1.0 - 1.6 kg-m, 7 - 12 ft-lb)



Oil Pump

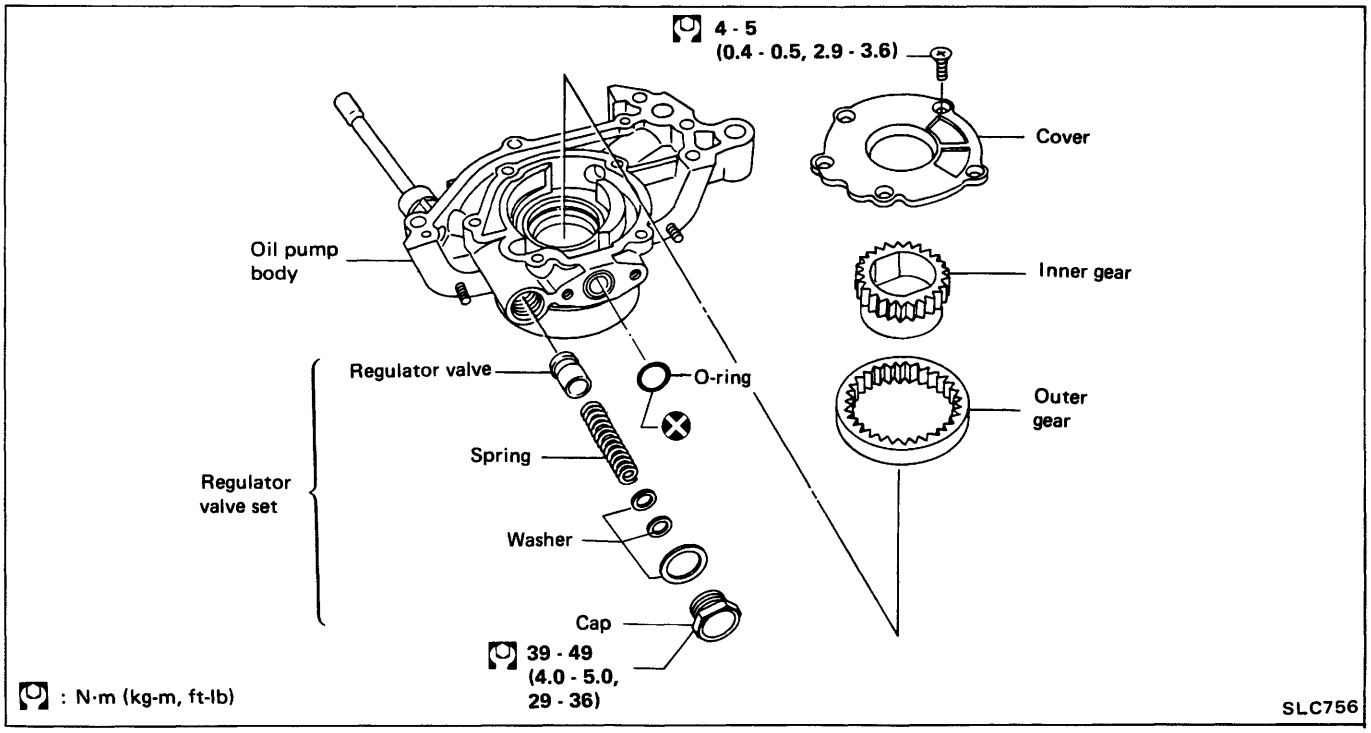
REMOVAL AND INSTALLATION

1. Remove drive belts.
2. Remove timing belt covers and timing belt.
3. Remove center member from body.
4. Remove oil pan.



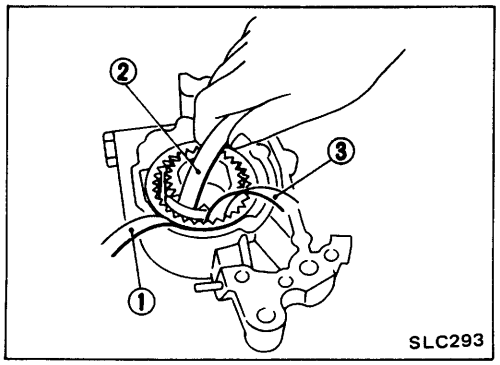
5. Remove oil pump assembly with oil strainer.
6. Installation is in reverse order of removal.

DISASSEMBLY AND ASSEMBLY

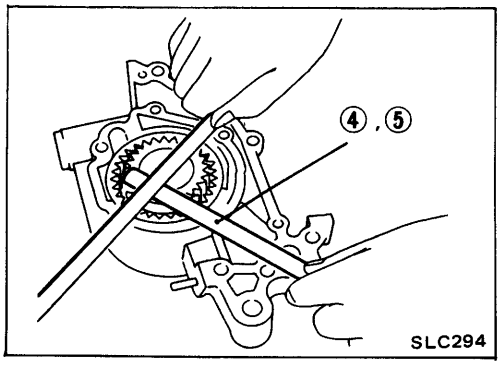


- When installing oil pump, apply engine oil to inner and outer gear.
- Be sure that O-ring is properly fitted.

Oil Pump (Cont'd)



SLC293



SLC294

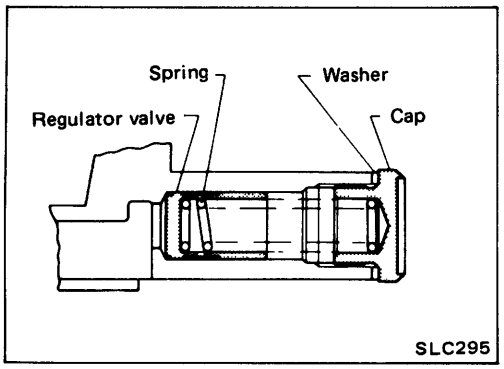
INSPECTION

Using a feeler gauge, check the following clearances.

Unit: mm (in)

Body to outer gear clearance ①	0.11 - 0.20 (0.0043 - 0.0079)
Inner gear to crescent clearance ②	0.12 - 0.23 (0.0047 - 0.0091)
Outer gear to crescent clearance ③	0.21 - 0.32 (0.0083 - 0.0126)
Body to inner gear clearance ④	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear clearance ⑤	0.05 - 0.11 (0.0020 - 0.0043)

If it exceeds the limit, replace gear set or entire oil pump assembly.

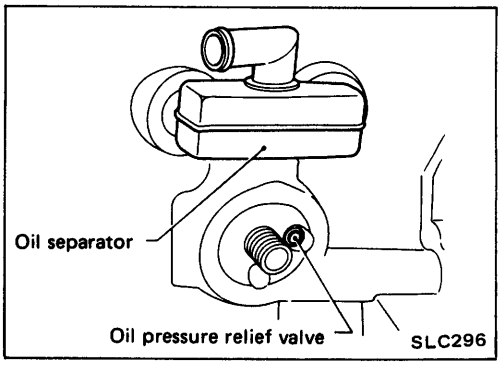


SLC295

REGULATOR VALVE INSPECTION

1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Coat regulator valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

If damaged, replace regulator valve set or oil pump assembly.

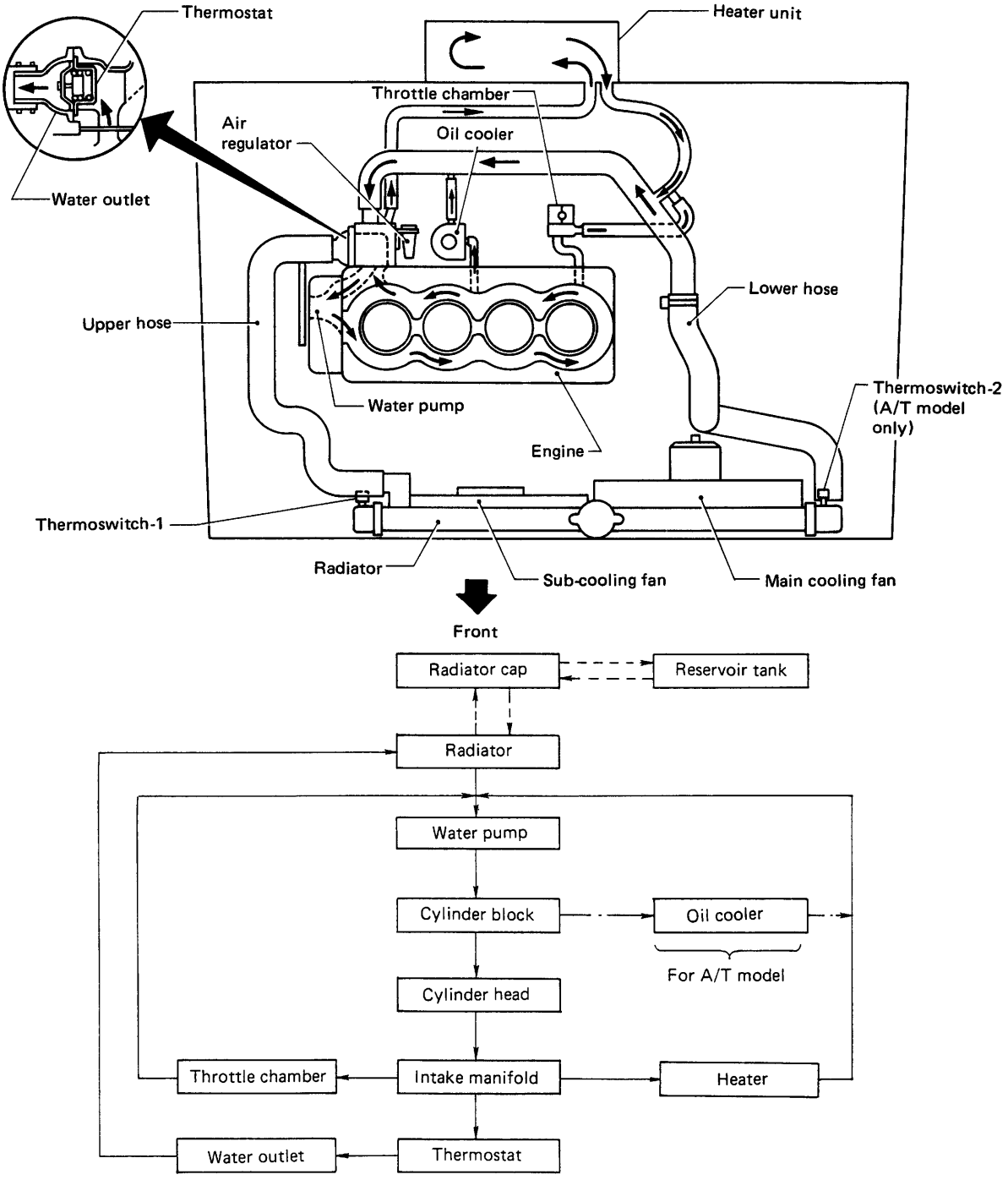


SLC296

OIL PRESSURE RELIEF VALVE INSPECTION

Inspect oil pressure relief valve for movement, cracks and breaks by pushing the ball. If replacement is necessary, remove valve by prying it out with a screwdriver. Install a new valve in place by tapping it.

Cooling Circuit

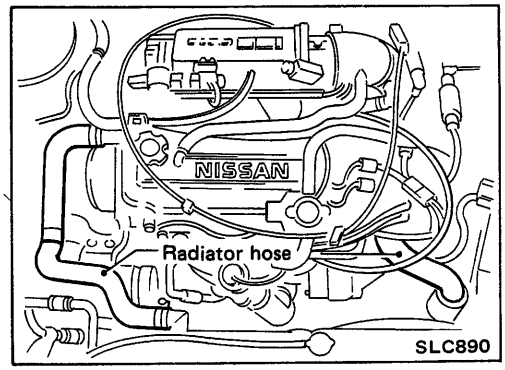


SLC180A

WARNING:

To avoid serious personal injury, never remove radiator cap quickly when engine is hot.

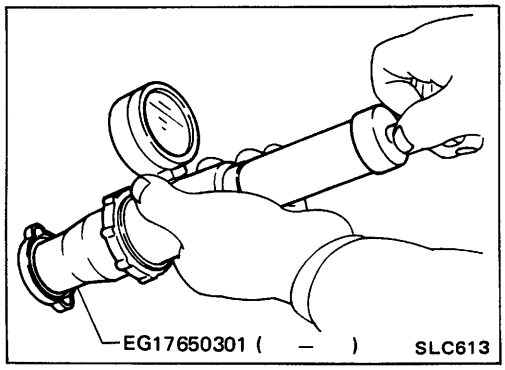
If it is necessary to remove radiator cap when radiator is hot, turn cap slowly counterclockwise to the first stop. After all pressure in the cooling system is released, turn cap past the stop and remove it.



Cooling System Inspection

CHECKING HOSES

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



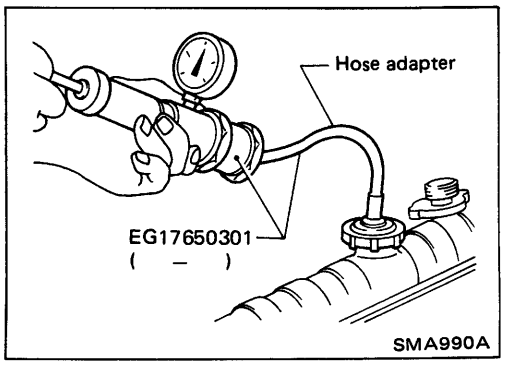
CHECKING RADIATOR CAP

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

Radiator cap relief pressure:

78 - 98 kPa

(0.8 - 1.0 kg/cm^2, 11 - 14 psi)



CHECKING COOLING SYSTEM FOR LEAKS

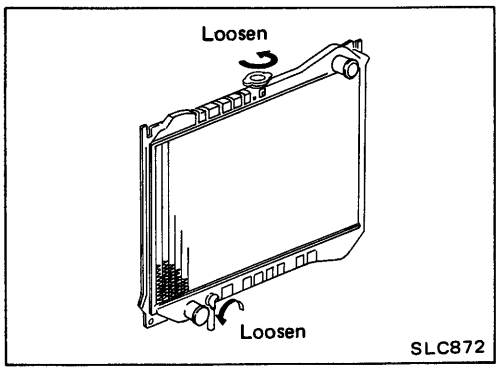
Apply pressure to the cooling system by means of a tester to check for leakage.

Testing pressure:

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

CAUTION:

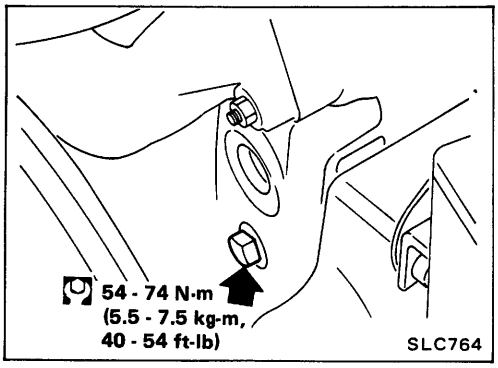
Overpressure may cause radiator damage.



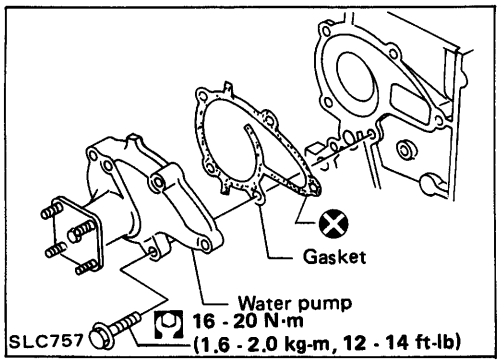
Water Pump

REMOVAL AND INSTALLATION

1. Drain coolant from radiator.



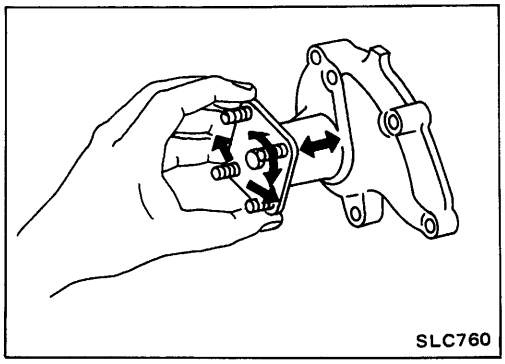
2. Remove cylinder block drain plug located at left rear of cylinder block and drain coolant.



3. Remove water pump assembly.

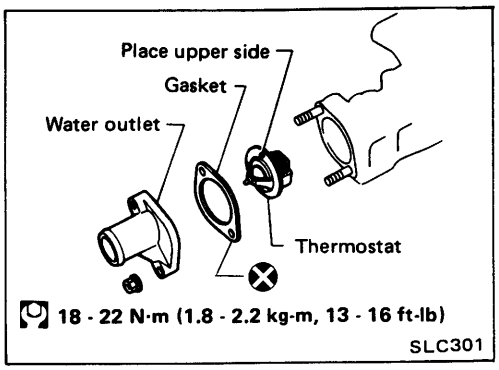
CAUTION:

- **When removing water pump assembly, be careful not to get coolant on timing belt.**
- **Water pump cannot be disassembled and should be replaced as a unit.**
- **After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester.**



INSPECTION

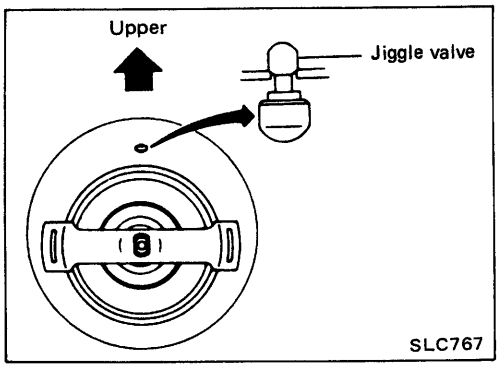
1. Check for badly rusted or corroded body assembly and vane.
2. Check for rough operation due to excessive end play.



Thermostat

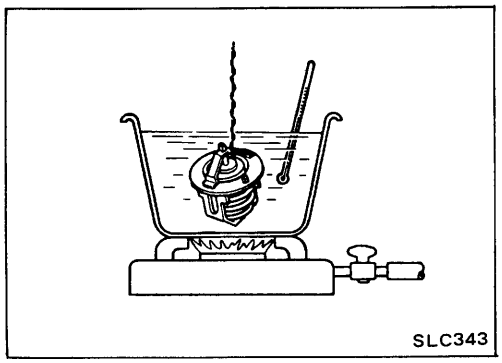
REMOVAL AND INSTALLATION

1. Drain engine coolant.
2. Remove water outlet, then take out thermostat.



3. Install thermostat with jiggle valve or air bleeder facing upward.

- **After installation, run engine for a few minutes, and check for leaks.**



INSPECTION

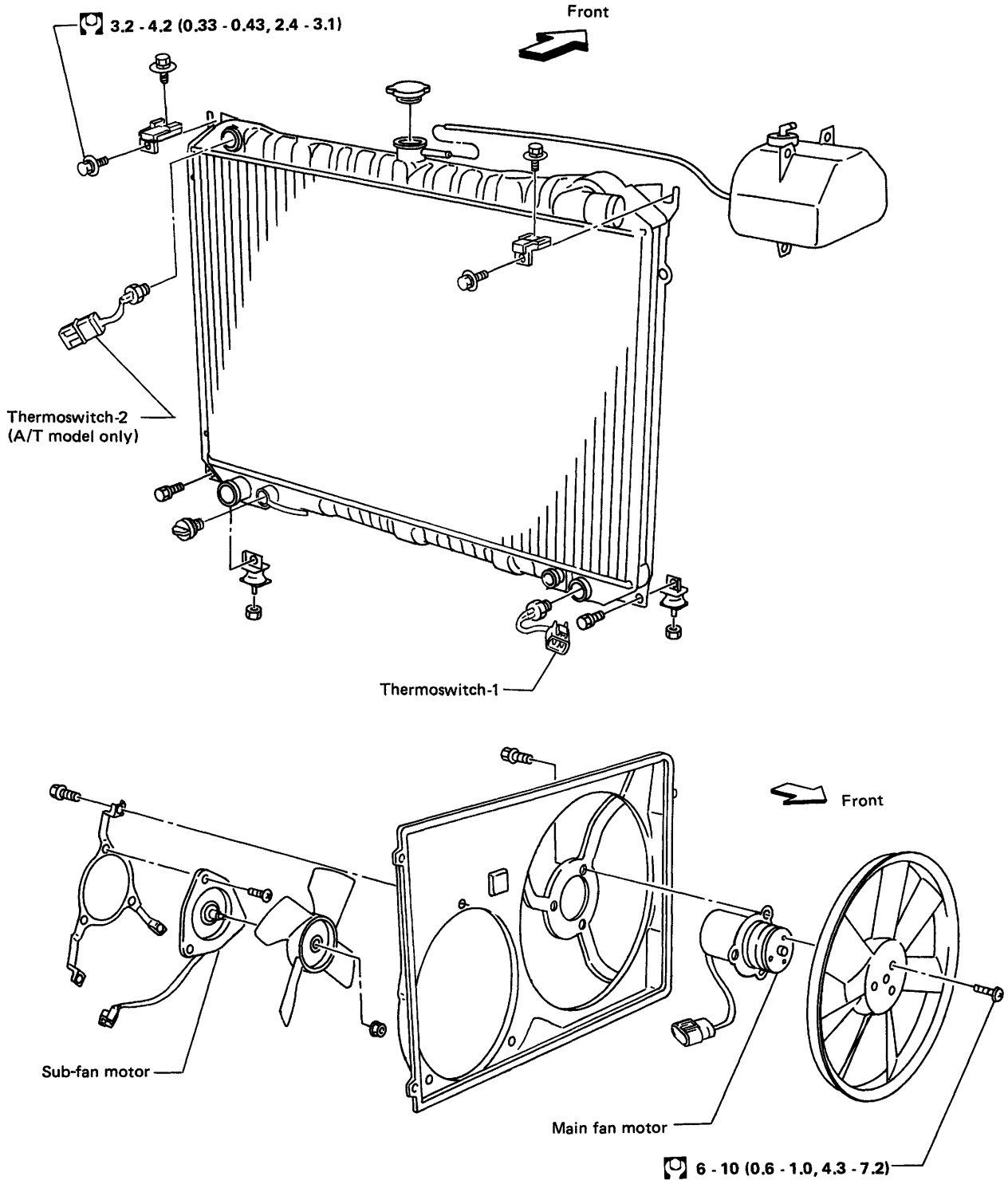
1. Check for valve seating condition at ordinary temperatures. It should seat tightly.
2. Check valve opening temperature and maximum valve lift.

	Standard	Cold type
Valve opening temperature °C (°F)	82 (180)	88 (190)
Max. valve lift mm/°C (in/°F)	8/95 (0.31/203)	8/100 (0.31/212)

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

Radiator

DISASSEMBLY AND ASSEMBLY

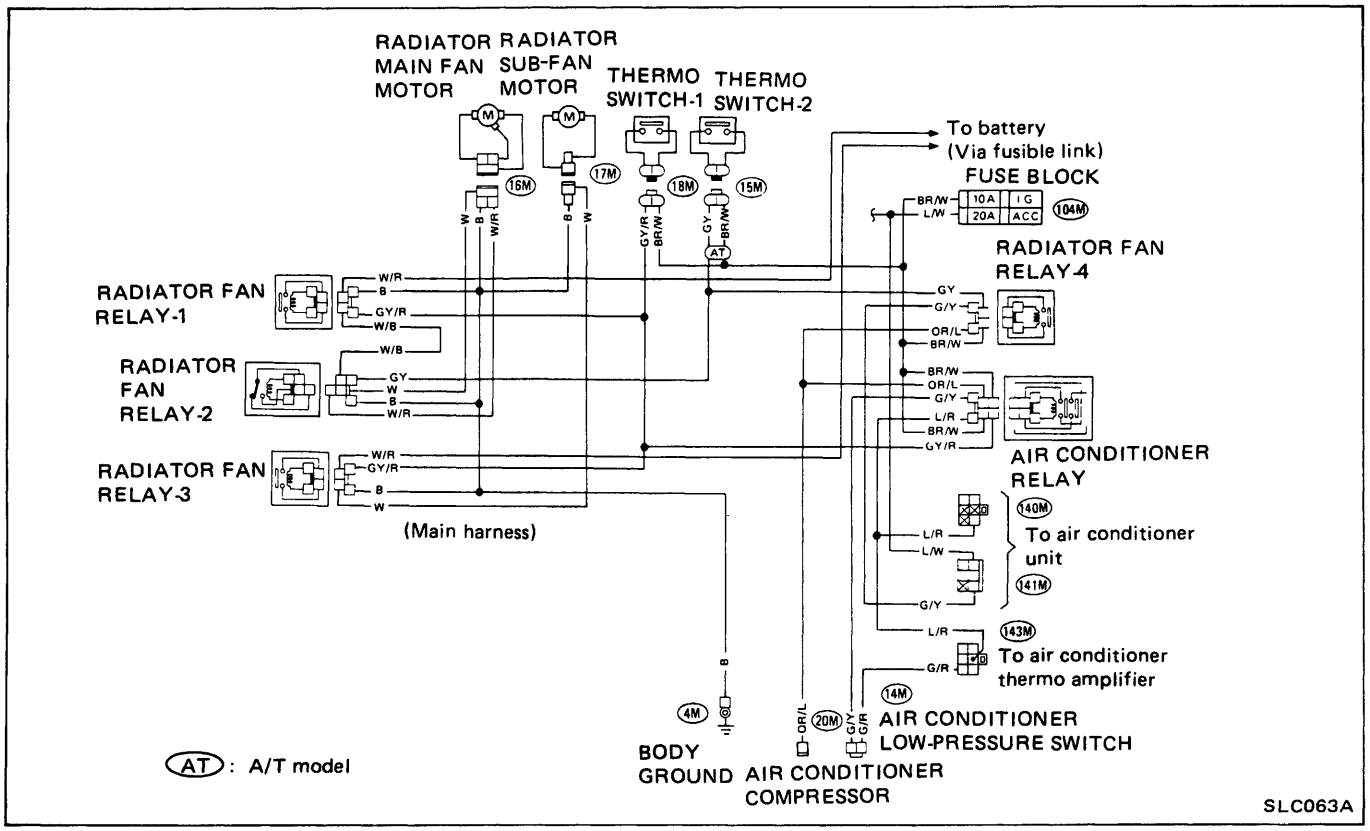


: N·m (kg-m, ft-lb)

SLC908

Electoric Cooling Fan and Thermoswitches

WIRING DIAGRAM



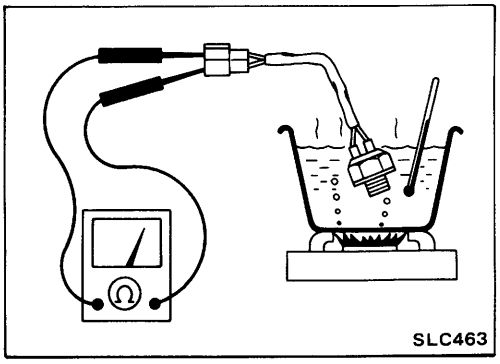
OPERATION

A/T model

Conditions							Fan motor	
Water temperature °C (°F)			and/or	Air conditioner (Blower motor switch)			Main	Sub
... 90 (194) ...	100 (212) ...			OFF	1st/2nd	3rd/4th		
O			and	O			Off	Off
	O		or		O		On (Low speed)	On
		O	or			O	On (High speed)	On

M/T model

Conditions					Fan motor	
Water temperature °C (°F)		and/or	Air conditioner (Blower motor switch)		Main	Sub
... 90 (194) ...			OFF	ON		
O		and	O		Off	Off
	O	or		O	On	On



Thermoswitch Inspection

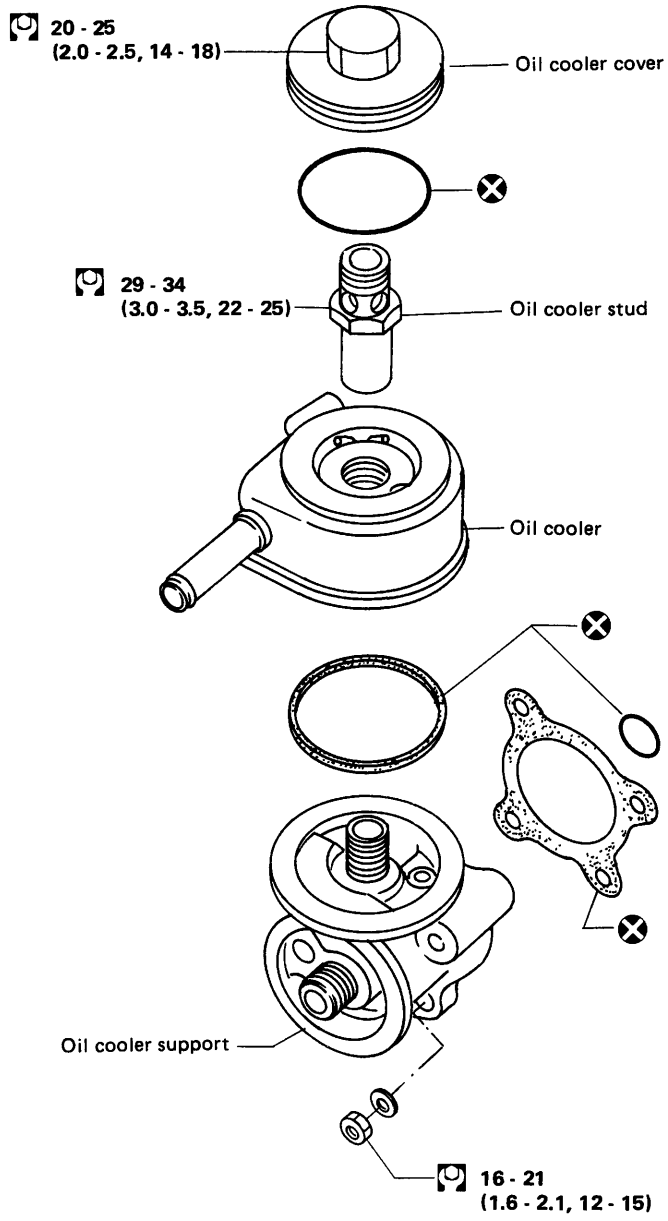
1. Drain coolant.
2. Remove thermoswitches.
3. Check thermoswitches for proper operation.

Operating temperature:

OFF → ON
No. 1 90°C (194°F)
No. 2 100°C (212°F)

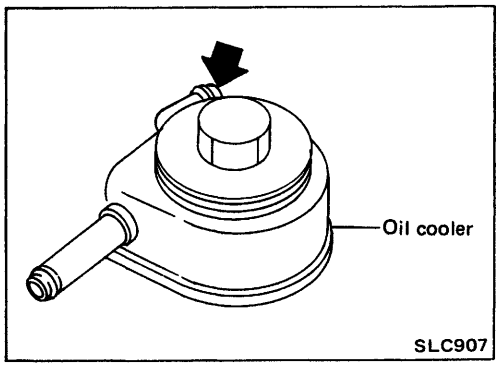
Oil Cooler

CAUTION:
Remove any dust from oil seal surface.



: N·m (kg-m, ft-lb)

SLC920



Inspection

1. Check oil cooler element and housing for cracks.
2. Check coolant inlet of oil cooler for clogging by blowing through it.
   Replace it if necessary.

Engine Lubrication System

Oil pressure check

Engine rpm	Approximate discharge pressure kPa (kg/cm², psi)
Idle speed	More than 59 (0.6, 9)
3,200	334.4 - 505.1 (3.41 - 5.15, 48.5 - 73.2)

Oil pump inspection

Unit: mm (in)

Body to outer gear clearance	0.11 - 0.20 (0.0043 - 0.0079)
Inner gear to crescent clearance	0.12 - 0.23 (0.0047 - 0.0091)
Outer gear to crescent clearance	0.21 - 0.32 (0.0083 - 0.0126)
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)

Oil pressure regulator valve

	kPa (kg/cm², psi)/rpm
Regulator valve opening pressure	373 - 412 (3.8 - 4.2, 54 - 60)/2,000

Tightening torque

Unit	N·m	kg-m	ft-lb
Oil pump securing bolt	12 - 16	1.2 - 1.6	9 - 12
Oil pump cover screw	4 - 5	0.4 - 0.5	2.9 - 3.6
Oil pressure regulator valve cap	39 - 49	4.0 - 5.0	29 - 36
Oil strainer bolt	10 - 14	1.0 - 1.4	7 - 10
Oil pressure switch	10 - 16	1.0 - 1.6	7 - 12

Engine Cooling System

Thermostat

	Standard	Cold type
Valve opening temperature °C (°F)	82 (180)	88 (190)
Max. valve lift mm/°C (in/°F)	8/95 (0.31/203)	8/100 (0.31/212)

Tightening torque

Unit	N·m	kg-m	ft-lb
Water pump securing bolt	16 - 20	1.6 - 2.0	12 - 14
Water outlet securing nut	18 - 22	1.8 - 2.2	13 - 16
Radiator securing bolt	3.2 - 4.2	0.33 - 0.43	2.4 - 3.1
Fan securing bolt	6 - 10	0.6 - 1.0	4.3 - 7.2
Oil cooler cover	20 - 25	2.0 - 2.5	14 - 18
Oil cooler stud	29 - 34	3.0 - 3.5	22 - 25
Oil cooler support installing nut	16 - 21	1.6 - 2.1	12 - 15

ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

CONTENTS

PRECAUTIONS ..... EF & EC- 3
COMPONENT PARTS LOCATION ..... EF & EC- 4
E.C.C.S. DIAGRAM ..... EF & EC- 5
E.C.C.S. CHART ..... EF & EC- 6
FUEL FLOW SYSTEM DESCRIPTION ..... EF & EC- 7
AIR FLOW SYSTEM DESCRIPTION ..... EF & EC- 8
E.C.C.S. CIRCUIT DIAGRAM ..... EF & EC- 9
E.C.C.S. WIRING DIAGRAM ..... EF & EC- 10
E.C.C.S. DESCRIPTION ..... EF & EC- 12
DIAGNOSTIC PROCEDURE ..... EF & EC- 28
SELF-DIAGNOSIS ..... EF & EC- 59
ELECTRONIC CONTROL SYSTEM INSPECTION ..... EF & EC- 80
- CRANK ANGLE SENSOR ..... EF & EC- 82
- AIR FLOW METER & AIR TEMPERATURE SENSOR ..... EF & EC- 84
- WATER TEMPERATURE SENSOR ..... EF & EC- 86
- VEHICLE SPEED SENSOR ..... EF & EC- 88
- IGNITION SIGNAL ..... EF & EC- 90
- FUEL PUMP ..... EF & EC- 92
- THROTTLE VALVE SWITCH ..... EF & EC- 94
- ENGINE CONTROL UNIT ..... EF & EC- 96
- E.G.R. FUNCTION ..... EF & EC- 98
- EXHAUST GAS SENSOR ..... EF & EC-102
- EXHAUST GAS TEMPERATURE SENSOR ..... EF & EC-106
- INJECTOR LEAK ..... EF & EC-110
- START SIGNAL ..... EF & EC-112
- AUXILIARY AIR CONTROL (A.A.C.) VALVE ..... EF & EC-114
- AIR REGULATOR ..... EF & EC-116
- INJECTOR ..... EF & EC-118
- SPARK PLUG SWITCHING CONTROL ..... EF & EC-120
- AIR INDUCTION VALVE (A.I.V.) CONTROL ..... EF & EC-122

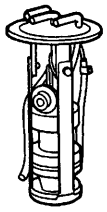
Contents (Cont'd)

E.G.R. CONTROL ..... EF & EC-124
PRESSURE REGULATOR (P.R.) CONTROL SOLENOID VALVE ..... EF & EC-126
NEUTRAL SWITCH ..... EF & EC-128
POWER SOURCE & GROUND CIRCUIT FOR E.C.U. ..... EF & EC-130
E.F.I. RELAY ..... EF & EC-132
E.C.U. INPUT/OUTPUT SIGNAL INSPECTION ..... EF & EC-134
MIXTURE RATIO FEEDBACK SYSTEM INSPECTION ..... EF & EC-139
FUEL SYSTEM INSPECTION ..... EF & EC-144
EVAPORATIVE EMISSION CONTROL SYSTEM ..... EF & EC-146
CRANKCASE EMISSION CONTROL SYSTEM ..... EF & EC-148
E.G.R. SYSTEM INSPECTION ..... EF & EC-149
A.I.V. (Air Induction Valve) SYSTEM INSPECTION ..... EF & EC-151
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... EF & EC-152

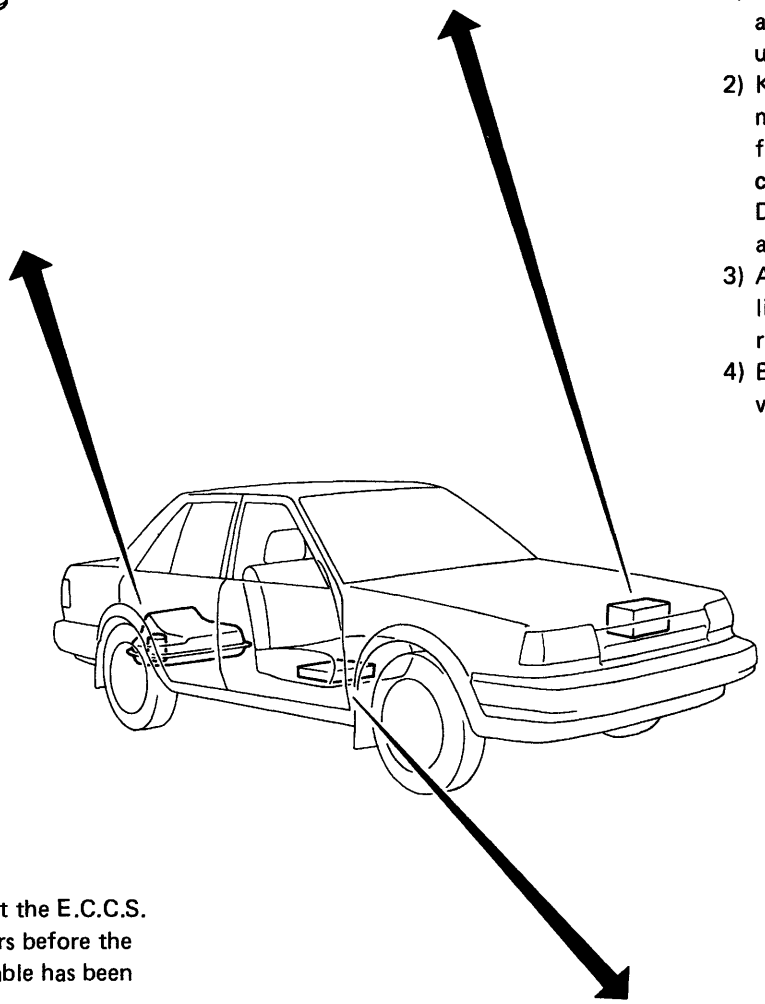
When you read wiring diagrams:

- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

- Do not operate the fuel pump when the fuel lines are empty.
- Tighten fuel hose clamps to the specified torque.

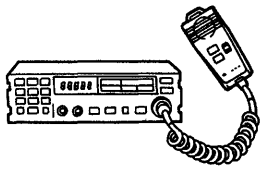


- Always use a 12-volt battery as power source.
- Do not attempt to disconnect the battery cables while the engine is running.

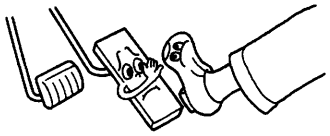


- When installing a C.B. ham radio or a mobile phone, be sure to observe the following notes as it may adversely affect the electronic control systems depending on its installation location.

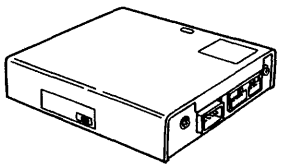
1) Keep the antenna as far as possible away from the electronic control unit.
2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls.
   Do not let them run parallel for a long distance.
3) Adjust the antenna and feeder line so that the standing-wave ratio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



- Do not disconnect the E.C.C.S. harness connectors before the battery ground cable has been disconnected.
- Securely connect the E.C.C.S. harness connector.
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep the 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 an external noise, degraded operation of ICs, etc.
- Keep E.C.C.S. parts and harnesses dry.
- Before removing parts, turn off the ignition switch and disconnect the battery ground cable.

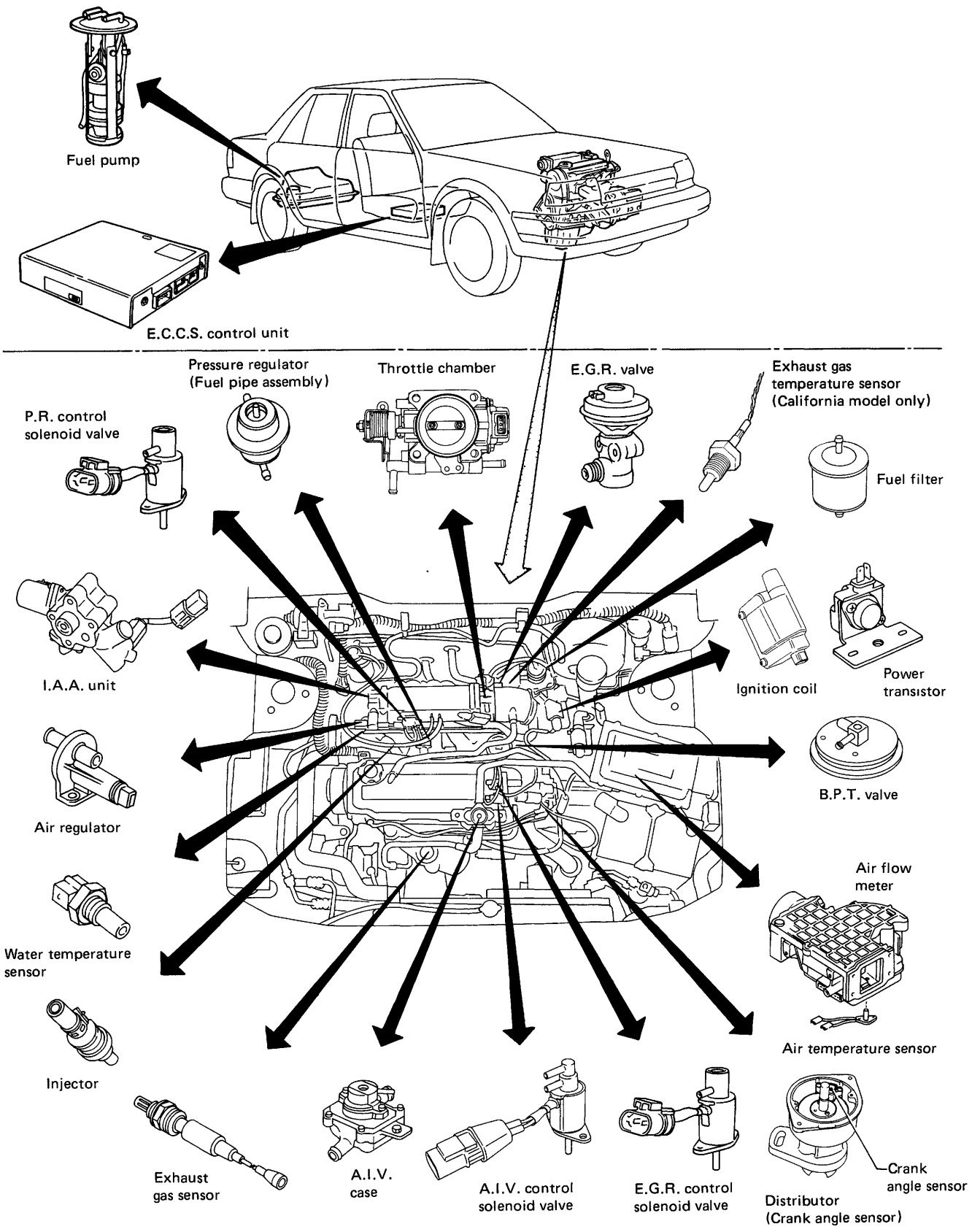


- Do not depress the accelerator pedal when starting.
- Immediately after starting, do not rev up the engine unnecessarily.
- Do not rev up the engine just prior to shutdown.

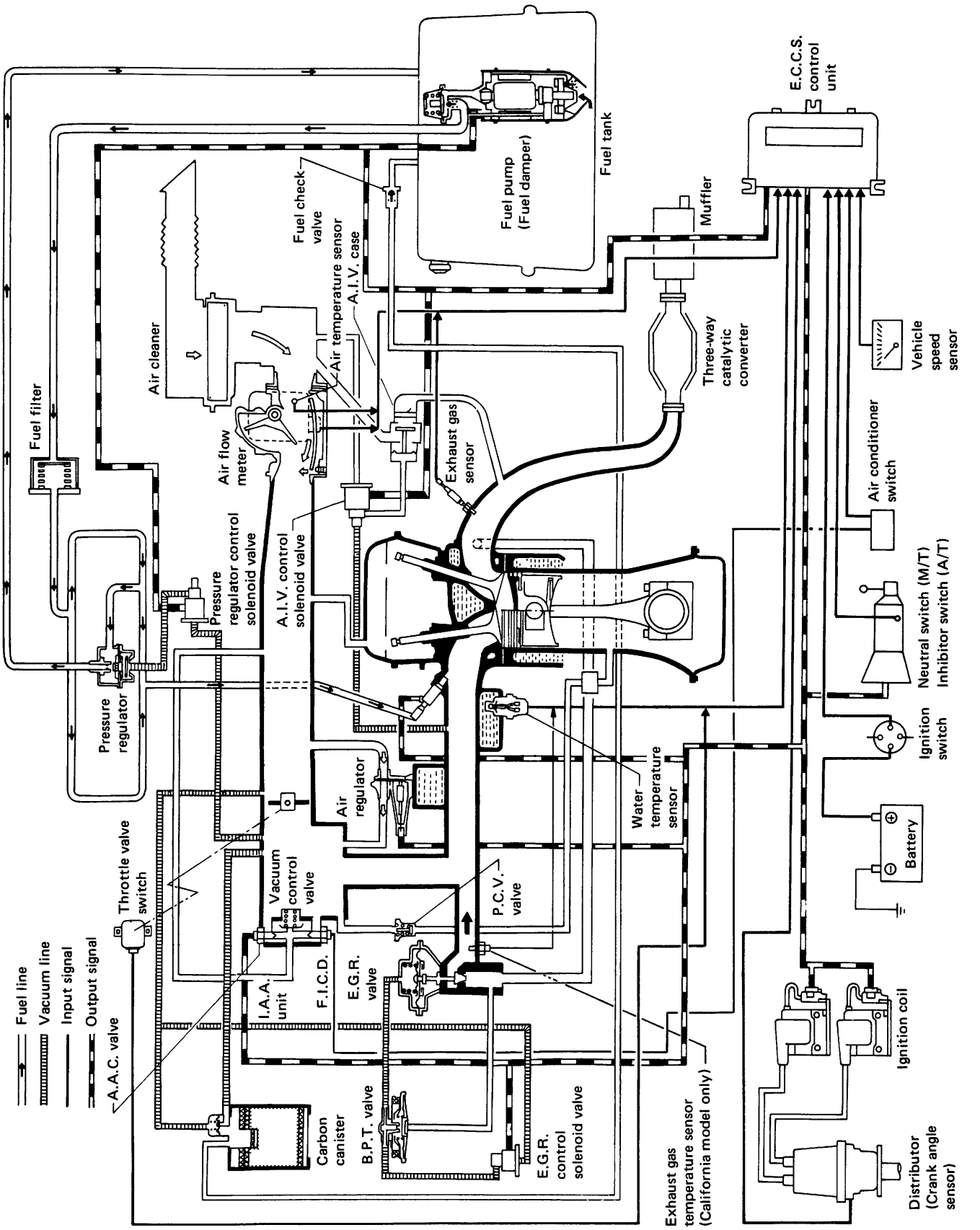


- Do not disassemble the E.C.U. (the E.C.C.S. control unit).
- Do not forcibly turn diagnosis mode selector.

SEF895D

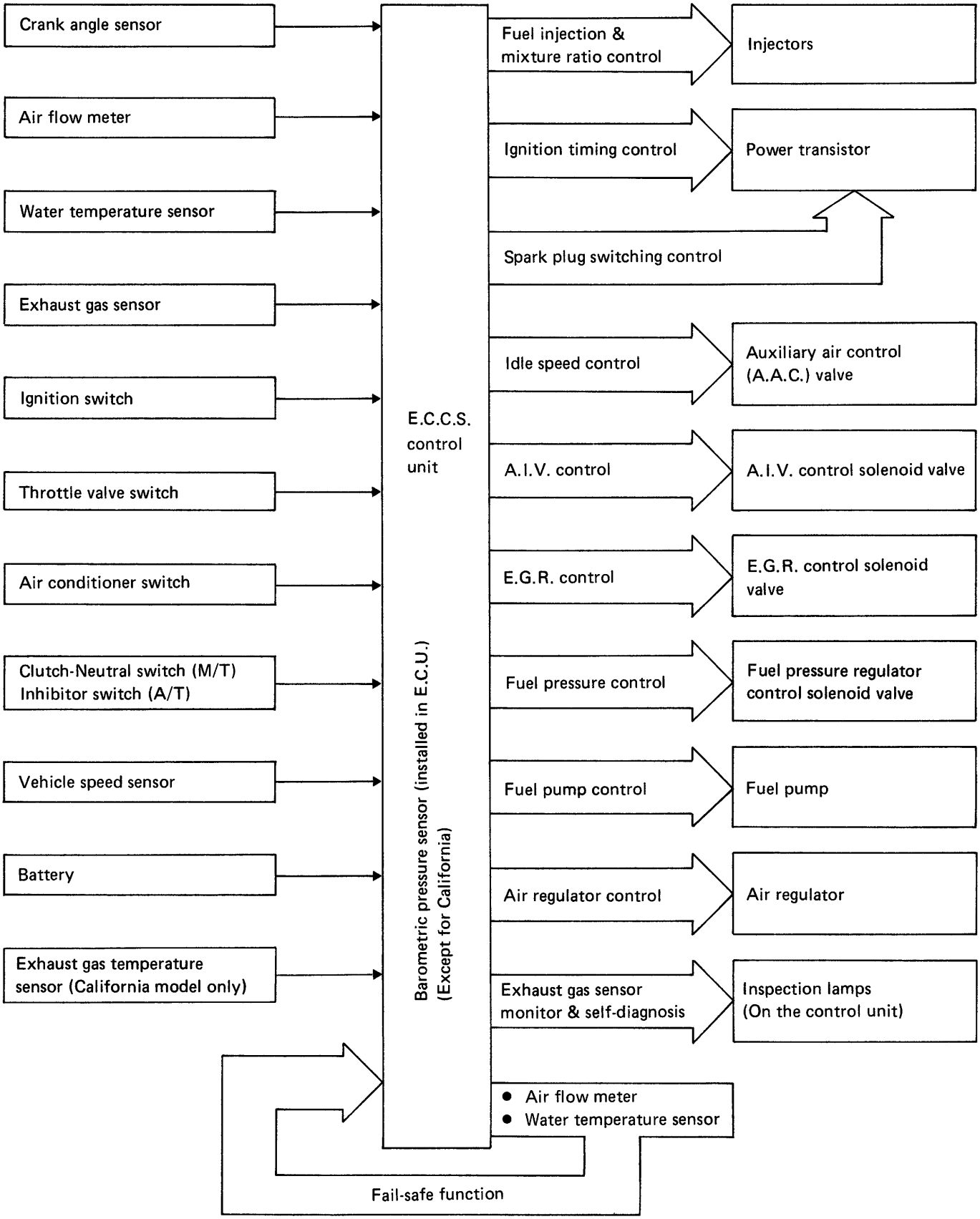

Fuel pump
E.C.C.S. control unit
Pressure regulator
(Fuel pipe assembly)
Throttle chamber
E.G.R. valve
Exhaust gas
temperature sensor
(California model only)
P.R. control
solenoid valve
Fuel filter
I.A.A. unit
Ignition coil
Power
transistor
Air regulator
B.P.T. valve
Air flow
meter
Water temperature
sensor
Air temperature sensor
Injector
Exhaust
gas sensor
A.I.V.
case
A.I.V. control
solenoid valve
E.G.R. control
solenoid valve
Crank
angle sensor
Distributor
(Crank angle sensor)

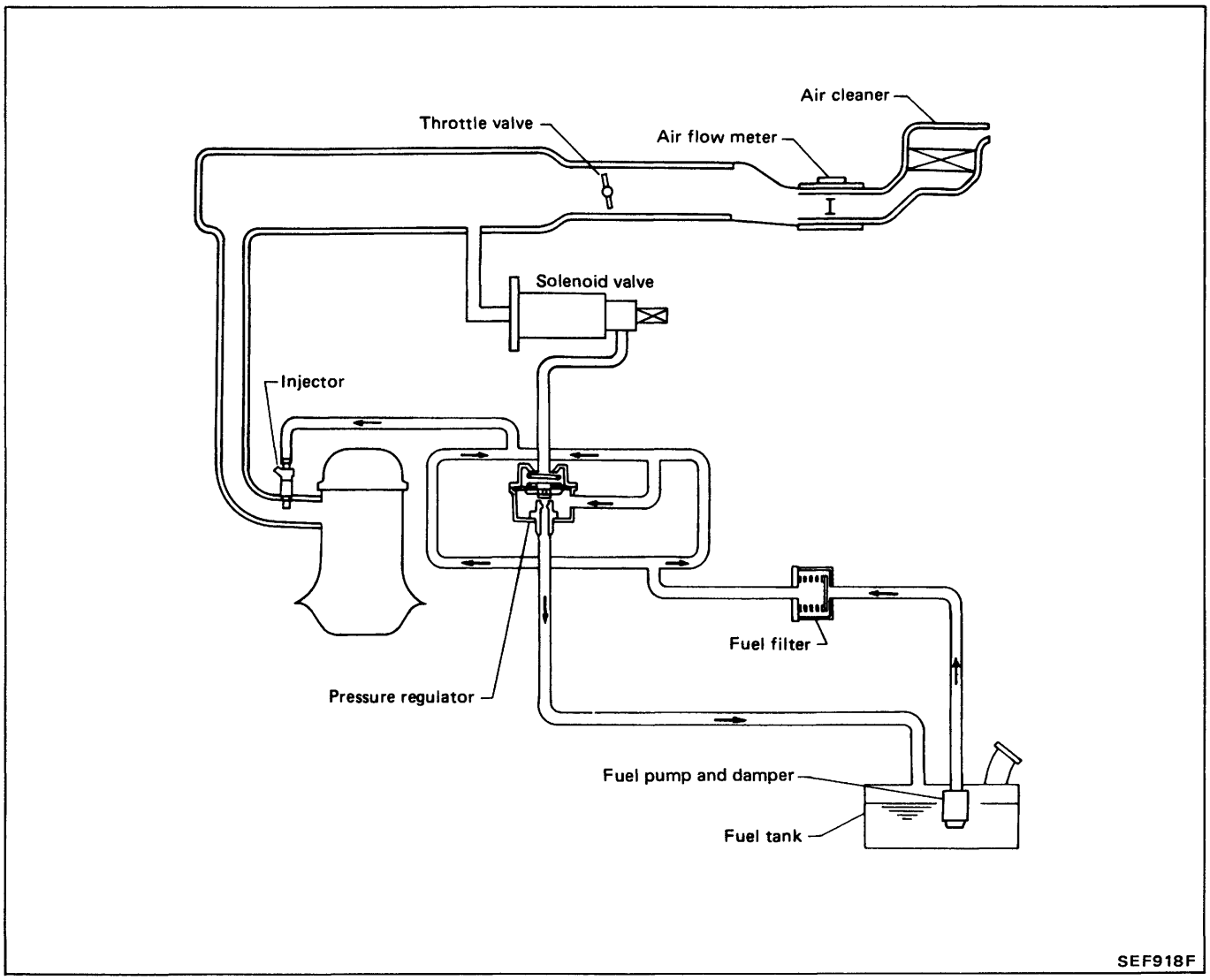
SEF220H

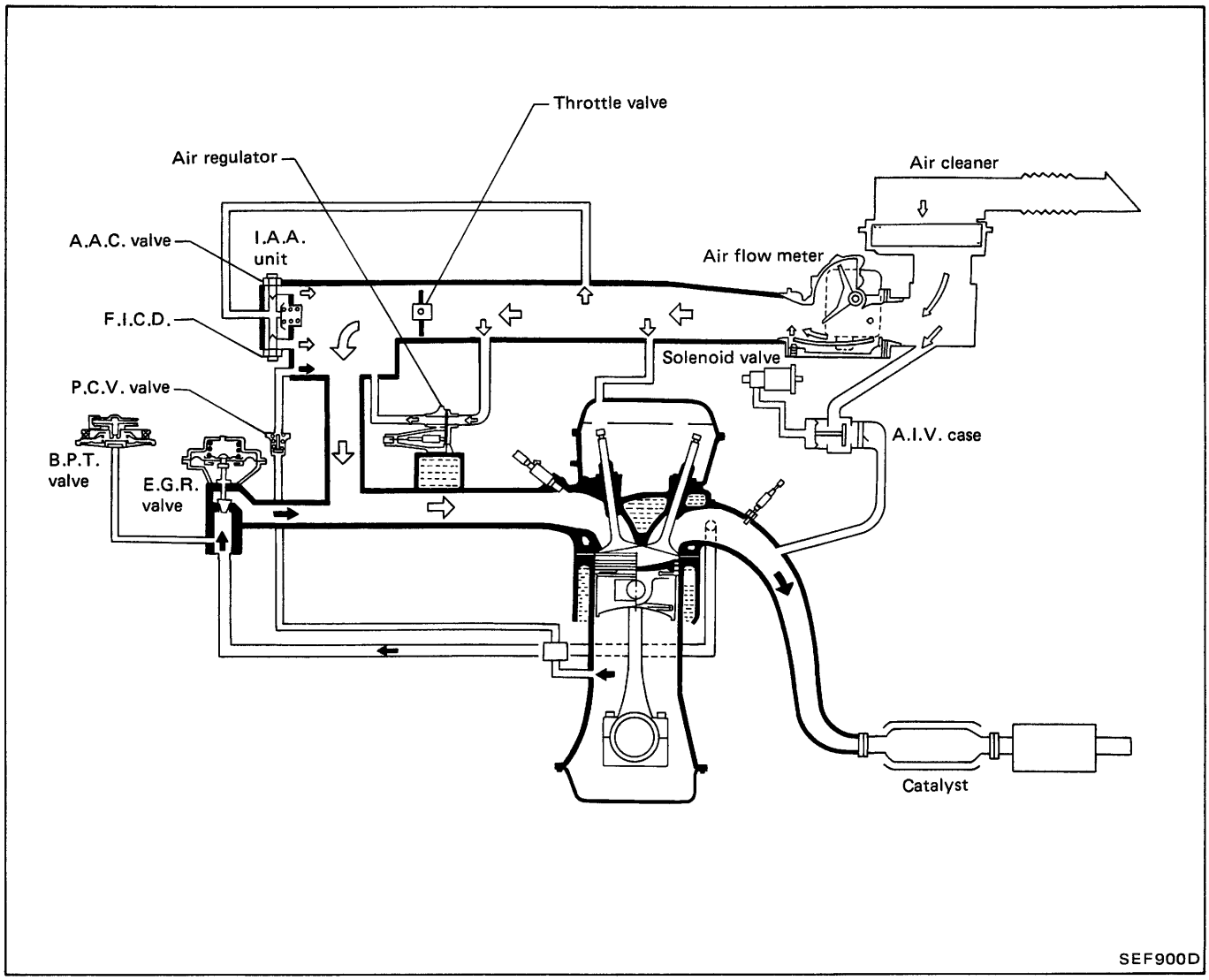

Fuel line
Vacuum line
Input signal
Output signal
A.A.C. valve
Fuel filter
Air cleaner
Fuel check valve
Fuel pump (Fuel damper)
Fuel tank
E.C.C.S. control unit
Muffler
Air temperature sensor
A.I.V. case
Three-way catalytic converter
Vehicle speed sensor
Air flow meter
Exhaust gas sensor
Air conditioner switch
Pressure regulator control solenoid valve
A.I.V. control solenoid valve
Pressure regulator
Neutral switch (M/T)
Inhibitor switch (A/T)
Ignition switch
Air regulator
Water temperature sensor
Throttle valve switch
Vacuum control valve
P.C.V. valve
Battery
I.A.A. unit
F.I.C.D.
E.G.R. valve
Ignition coil
Carbon canister
B.P.T. valve
E.G.R. control solenoid valve
Exhaust gas temperature sensor (California model only)
Distributor (Crank angle sensor)

SEF917F

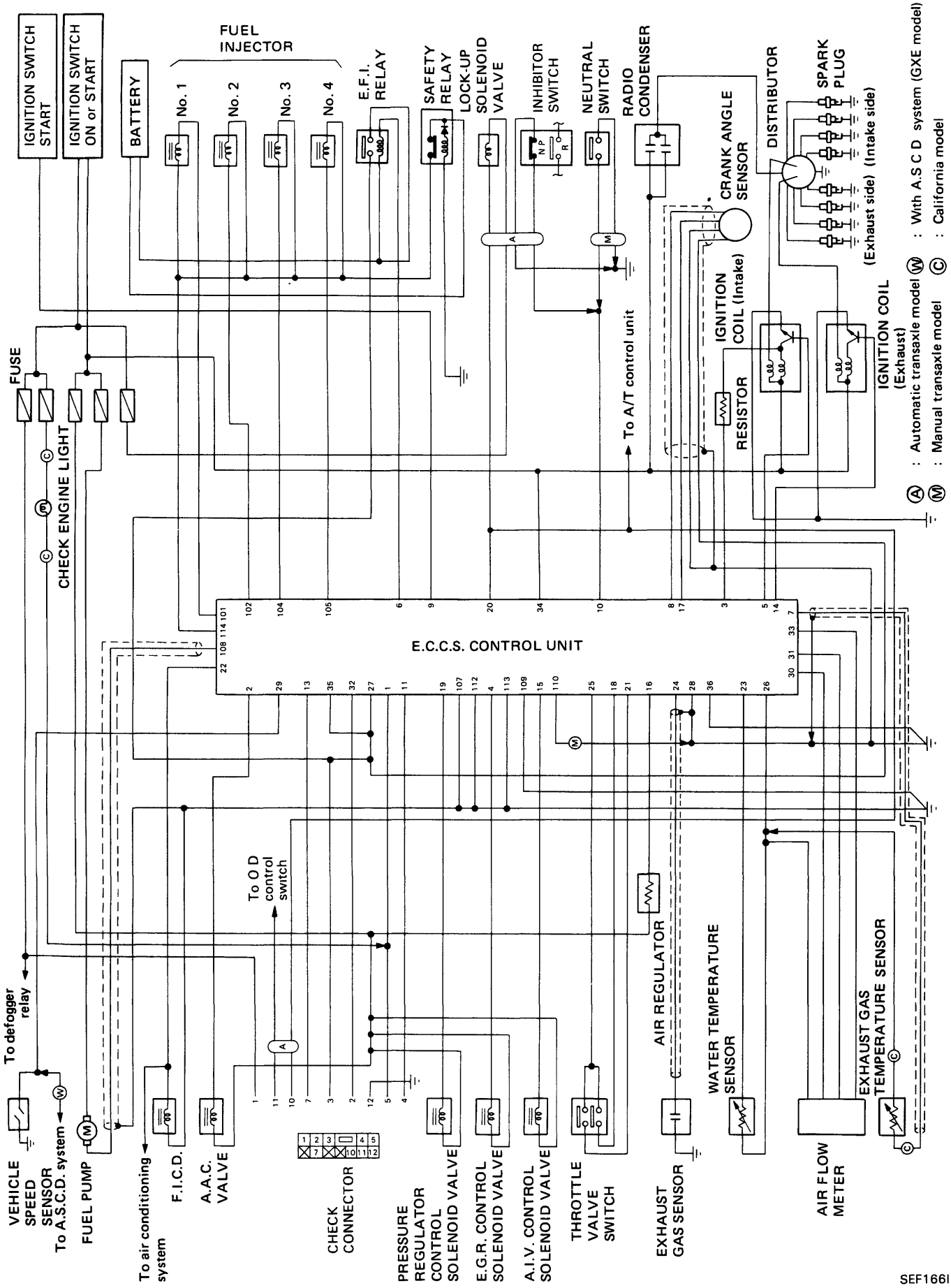
E.C.C.S. CHART

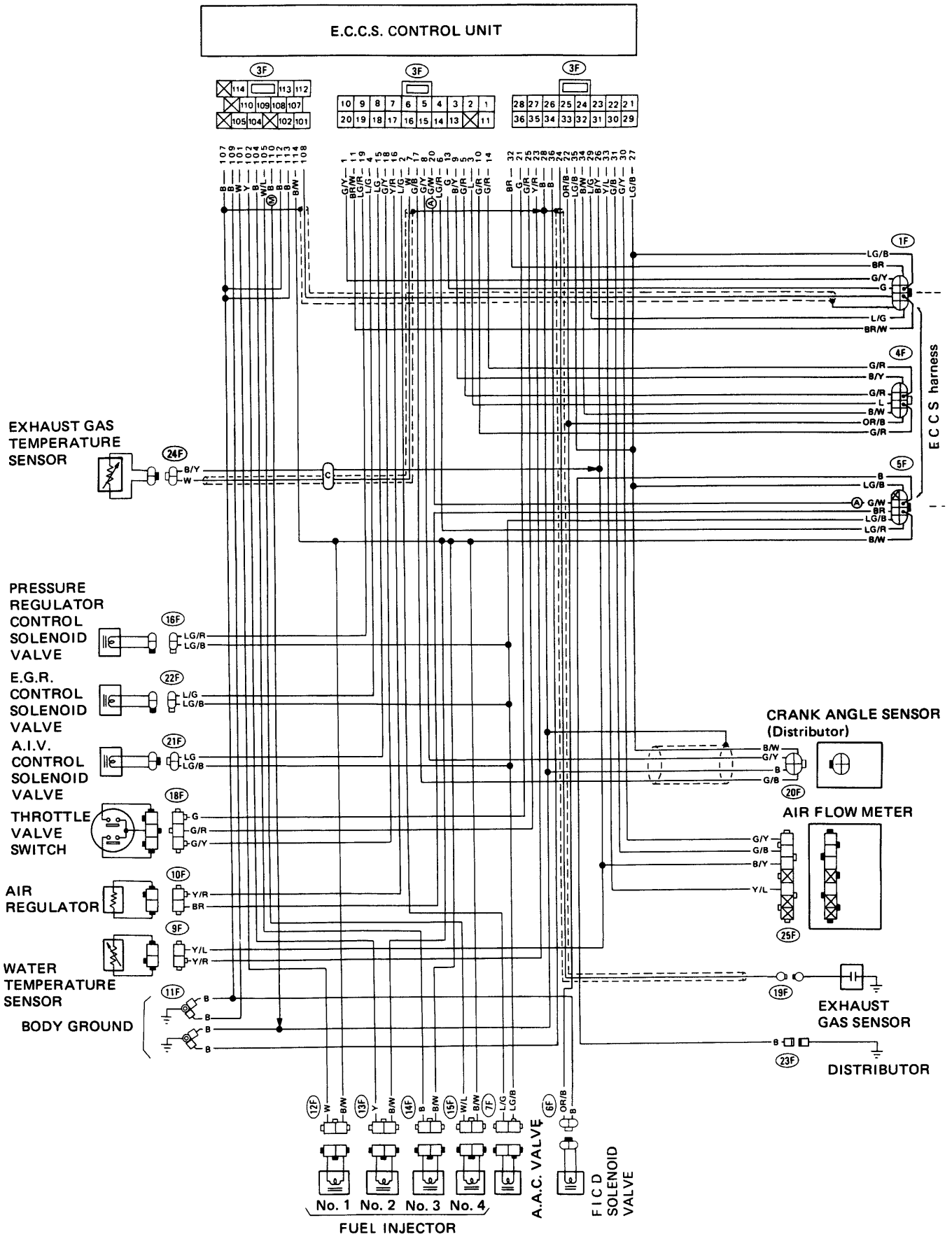

Crank angle sensor
Air flow meter
Water temperature sensor
Exhaust gas sensor
Ignition switch
Throttle valve switch
Air conditioner switch
Clutch-Neutral switch (M/T)
Inhibitor switch (A/T)
Vehicle speed sensor
Battery
Exhaust gas temperature sensor (California model only)
E.C.C.S. control unit
Barometric pressure sensor (installed in E.C.U.)
(Except for California)
Fuel injection & mixture ratio control
Injectors
Ignition timing control
Power transistor
Spark plug switching control
Idle speed control
Auxiliary air control (A.A.C.) valve
A.I.V. control
A.I.V. control solenoid valve
E.G.R. control
E.G.R. control solenoid valve
Fuel pressure control
Fuel pressure regulator control solenoid valve
Fuel pump control
Fuel pump
Air regulator control
Air regulator
Exhaust gas sensor monitor & self-diagnosis
Inspection lamps (On the control unit)
● Air flow meter
● Water temperature sensor
Fail-safe function

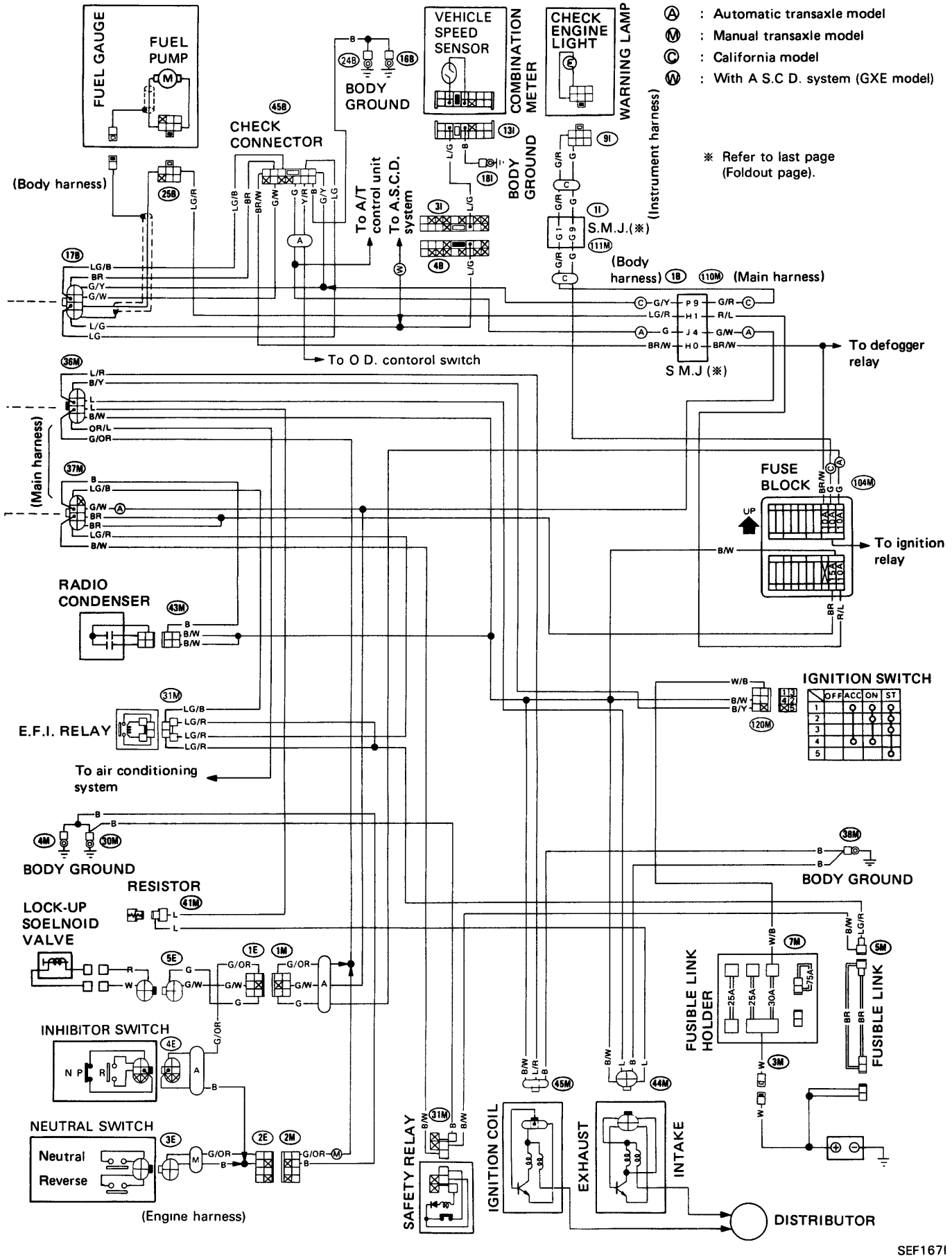

Air cleaner
Throttle valve
Air flow meter
Solenoid valve
Injector
Fuel filter
Pressure regulator
Fuel pump and damper
Fuel tank
SEF918F

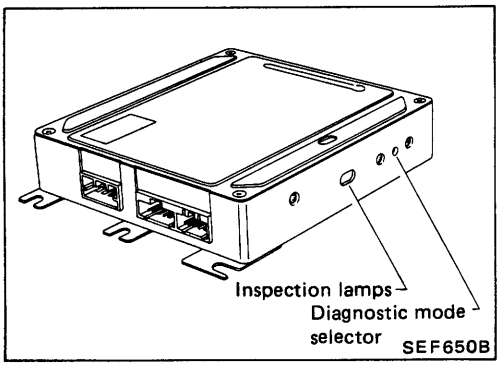

Throttle valve
Air regulator
Air cleaner
A.A.C. valve
I.A.A. unit
Air flow meter
F.I.C.D.
Solenoid valve
P.C.V. valve
A.I.V. case
B.P.T. valve
E.G.R. valve
Catalyst
SEF900D

E.C.C.S. CIRCUIT DIAGRAM




E.C.C.S. CONTROL UNIT
3F
EXHAUST GAS TEMPERATURE SENSOR
24F
PRESSURE REGULATOR CONTROL SOLENOID VALVE
16F
E.G.R. CONTROL SOLENOID VALVE
22F
A.I.V. CONTROL SOLENOID VALVE
21F
THROTTLE VALVE SWITCH
18F
AIR REGULATOR
10F
WATER TEMPERATURE SENSOR
9F
BODY GROUND
11F
1F
4F
5F
E C C S harness
CRANK ANGLE SENSOR (Distributor)
20F
AIR FLOW METER
25F
19F
EXHAUST GAS SENSOR
23F
DISTRIBUTOR
12F
13F
14F
15F
7F
6F
No. 1 No. 2 No. 3 No. 4
FUEL INJECTOR
A.A.C. VALVE
F I C D SOLENOID VALVE


Ⓐ : Automatic transaxle model
Ⓜ : Manual transaxle model
Ⓒ : California model
Ⓦ : With A S.C D. system (GXE model)
※ Refer to last page (Foldout page).
FUEL GAUGE
FUEL PUMP
CHECK CONNECTOR
BODY GROUND
VEHICLE SPEED SENSOR
COMBINATION METER
CHECK ENGINE LIGHT
WARNING LAMP
(Instrument harness)
BODY GROUND
(Body harness)
To A/T control unit
To A.S.C.D. system
S.M.J.(※)
(Body harness)
(Main harness)
To defogger relay
To O D. contorol switch
S M J (※)
(Main harness)
FUSE BLOCK
To ignition relay
RADIO CONDENSER
IGNITION SWITCH
E.F.I. RELAY
To air conditioning system
BODY GROUND
RESISTOR
LOCK-UP SOELNOID VALVE
BODY GROUND
INHIBITOR SWITCH
NEUTRAL SWITCH
Neutral
Reverse
(Engine harness)
FUSIBLE LINK HOLDER
FUSIBLE LINK
SAFETY RELAY
IGNITION COIL
EXHAUST
INTAKE
DISTRIBUTOR
SEF167I

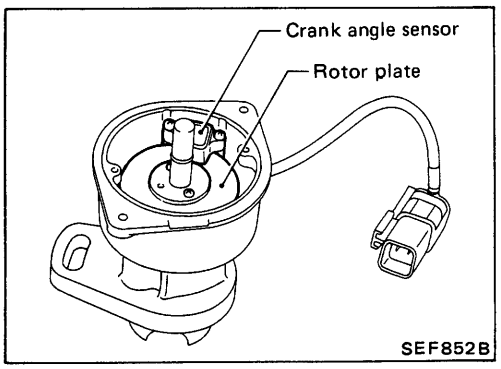


Components

E.C.U. (E.C.C.S. control unit)

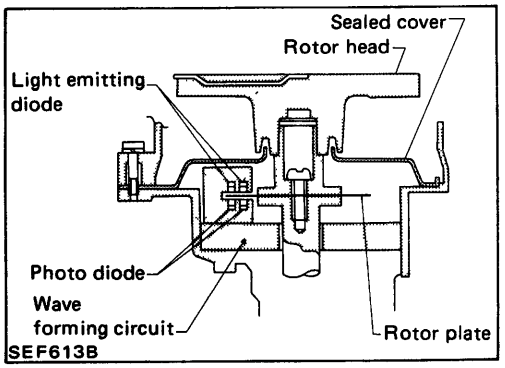
The E.C.U. consists of a microcomputer, inspection lamps and a diagnostic mode selector for signal input and output, and for power supply. The unit has control of the following functions.

- Injected fuel amount
- Mixture ratio feedback
- Ignition timing
- Spark plug switching
- Idle speed
- E.G.R. operation
- A.I.V. operation
- Fuel pressure regulator operation
- Fuel pump operation
- Air regulator operation
- Self-diagnosis



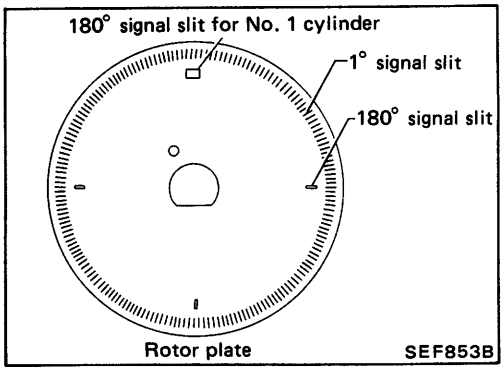
CRANK ANGLE SENSOR

The crank angle sensor is a basic component of the entire E.C.C.S. It monitors engine speed and piston position, and sends to the E.C.U. signals on which the controls of fuel injection, ignition timing and other functions are based.

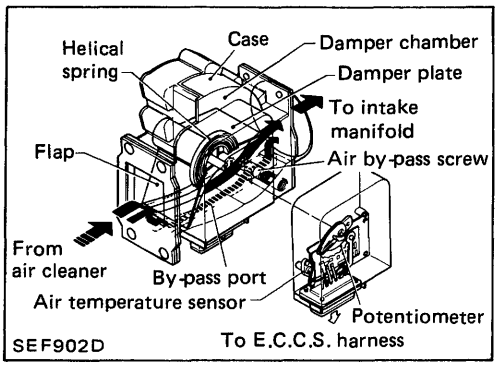


The crank angle sensor has a rotor plate and a wave forming circuit. The rotor plate has 360 slits for 1° signal and 4 slits for 180° signal. Light Emitting Diodes (L.E.D.) and Photo Diodes are built in the wave forming circuit.

When the rotor plate passes the space between the L.E.D. and the Photo Diode, the slits of the rotor plate continually cut the light which is sent to the photo diode from the L.E.D. This causes generating rough-shaped pulses. They are then coverted into on-off pulses by the wave forming circuit, which are sent to the E.C.U.



Components (Cont'd)

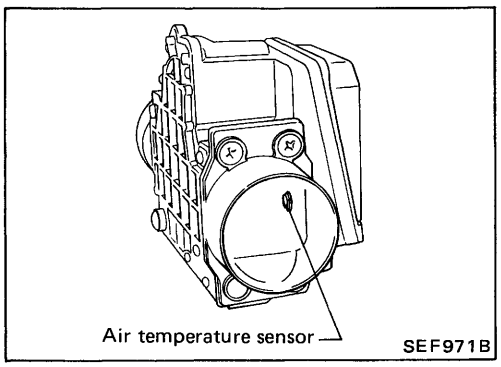


AIR FLOW METER

The air flow meter measures the quantity of intake air, and sends a signal to the E.C.U. The air flow meter is provided with a flap in the air passage.

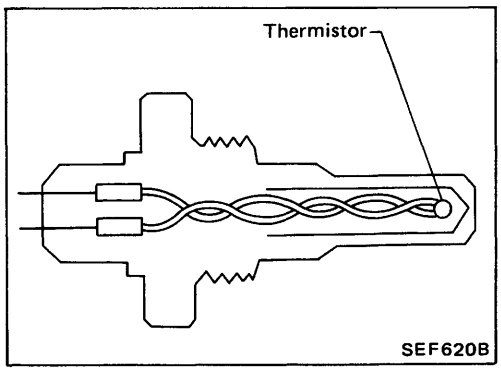
During idling operation when the amount of intake air is extremely small, the air flows parallel with the flap through the by-pass port so that the specified intake air flow can be provided correctly. An air temperature sensor is installed in the air passage.

The by-pass port has the air by-pass screw which regulates the idle mixture ratio. The air by-pass screw is preset and sealed at the factory.



AIR TEMPERATURE SENSOR

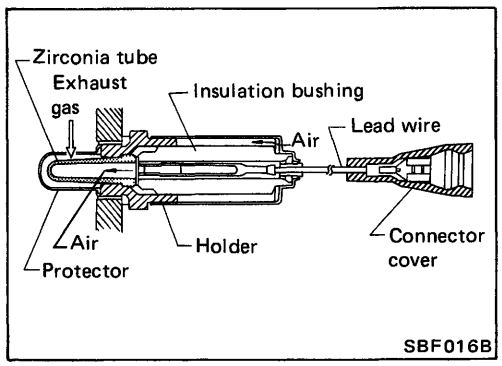
The air temperature sensor transmits an air temperature signal to the E.C.U.



WATER TEMPERATURE SENSOR

The water temperature sensor, built into the water outlet, monitors changes in coolant temperature and transmits a signal to the E.C.U.

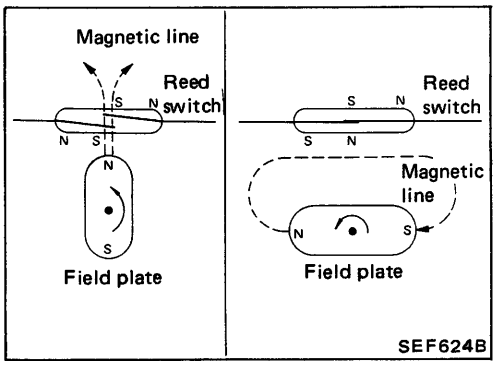
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



EXHAUST GAS SENSOR

The exhaust gas sensor, which is built into the exhaust manifold, monitors the density of oxygen in the exhaust gas. It consists of a closed-end tube made of ceramic zirconia and other components. Porous platinum electrodes cover the tubes inner and outer surfaces. The closed-end of the tube is exposed to the exhaust gas in the exhaust manifold. The outer surface of the tube contacts the exhaust gas while the inner surface contacts the air.

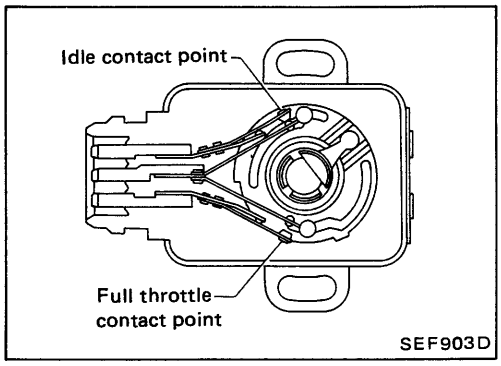
Components (Cont'd)



VEHICLE SPEED SENSOR

The vehicle speed sensor provides a vehicle speed signal to the E.C.U.

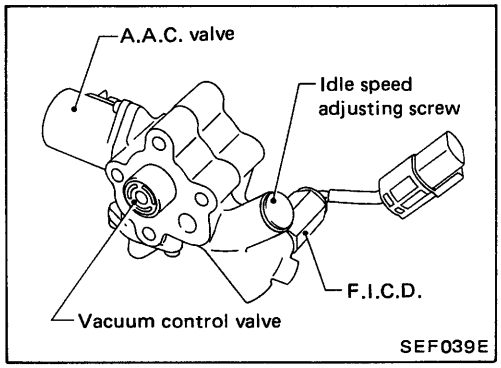
The speed sensor consists of a reed switch, which is installed in the speed meter unit and transforms vehicle speed into a pulse signal.



THROTTLE VALVE SWITCH

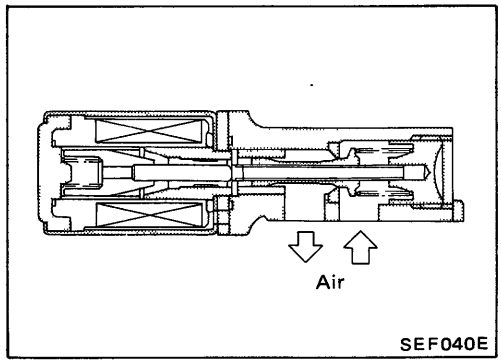
The throttle valve switch is attached to the throttle chamber and actuates in response to accelerator pedal movement.

This switch has idle contact and full throttle contact. The idle contact closes when the throttle valve is positioned at idle and opens when it is at any other position. The full throttle contact closes when the throttle valve is positioned at full throttle and opens when it is at any other position.



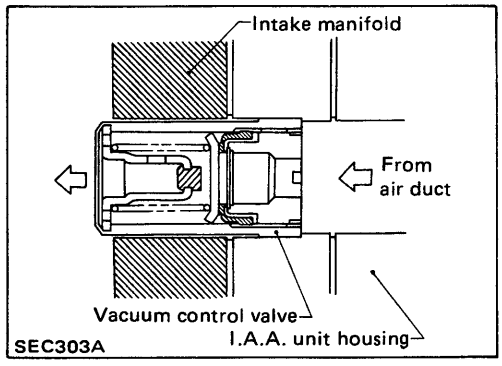
IDLE AIR ADJUSTING (I.A.A.) UNIT

The I.A.A. unit is made up of the A.A.C. valve, F.I.C.D., vacuum control valve and idle speed 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.

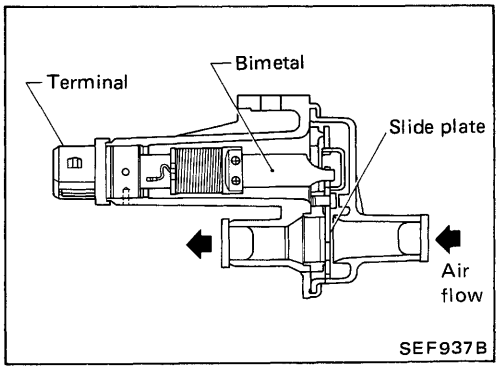


VACUUM CONTROL VALVE

The vacuum control valve is provided to reduce the engine lubricating oil consumption when the intake manifold vacuum increases to a very high level during deceleration.

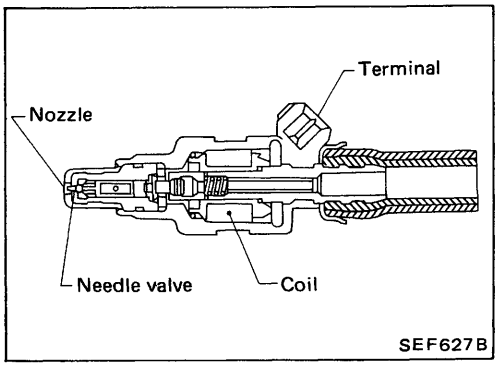
The vacuum control valve senses the manifold vacuum. As the manifold vacuum increases beyond the specified value, the valve opens and air is sucked into the intake manifold.

Components (Cont'd)



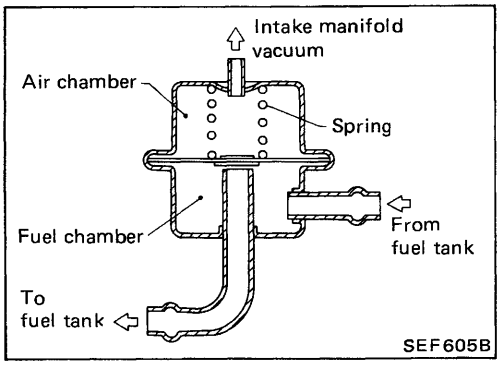
AIR REGULATOR

Air regulator provides an air by-pass when the engine is cold to create 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 is open. As the engine starts and electric current flows through a heater, the bimetal begins to rotate the shutter to close off the by-pass port. The air passage remains closed until the engine is stopped and the bimetal temperature drops.



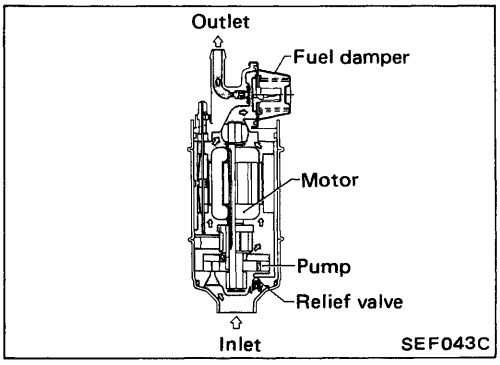
FUEL INJECTOR

The fuel injector is a small, precision solenoid valve. As the E.C.U. outputs an injection signal to each fuel injector, the coil built into the injector pulls the needls valve back, and fuel is injected through the nozzle to intake manifold. The amount of fuel injected is controlled by the E.C.U. as an injection pulse duration.



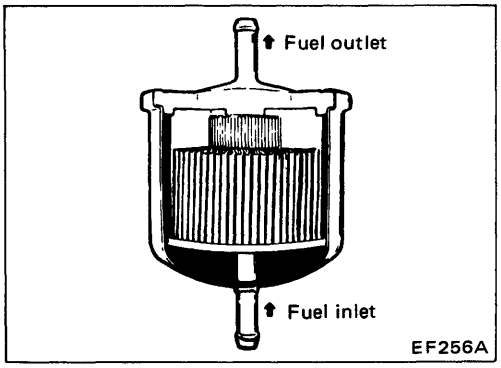
PRESSURE REGULATOR

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.



FUEL PUMP

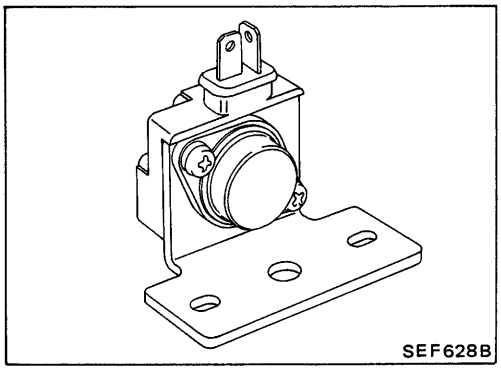
The fuel pump with a fuel damper is an in-take type, that is the pump and damper are located in the fuel tank. The vane rollers are directly coupled to a motor which is cooled by fuel.



FUEL FILTER

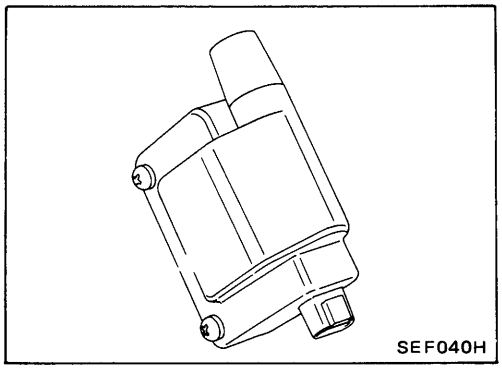
The fuel filter is designed for the fuel injection system, and has a metal case in order to endure the high pressure of fuel.

Components (Cont'd)


SEF628B

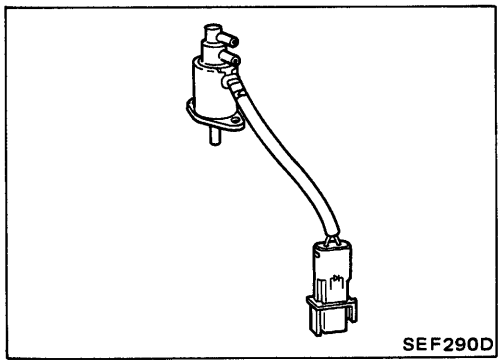
POWER TRANSISTOR

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.


SEF040H

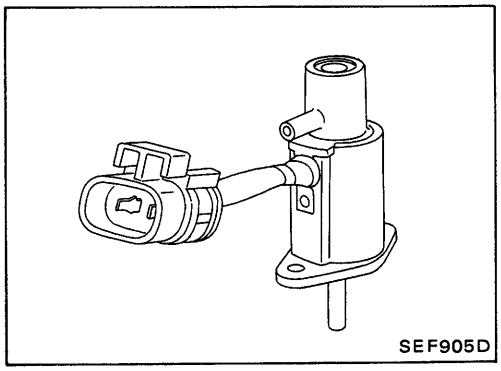
IGNITION COIL

The ignition coil is a small, molded type.


SEF290D

A.I.V. CONTROL SOLENOID VALVE

This three-port solenoid valve controls the A.I.V. vacuum line based on signals supplied by the E.C.U.

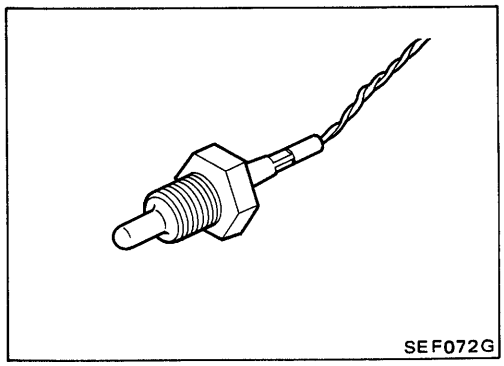

SEF905D

E.G.R. CONTROL SOLENOID VALVE

This two-port solenoid valve controls the B.P.T. vacuum line, based on signals supplied by the E.C.U.

FUEL PRESSURE REGULATOR CONTROL SOLENOID VALVE

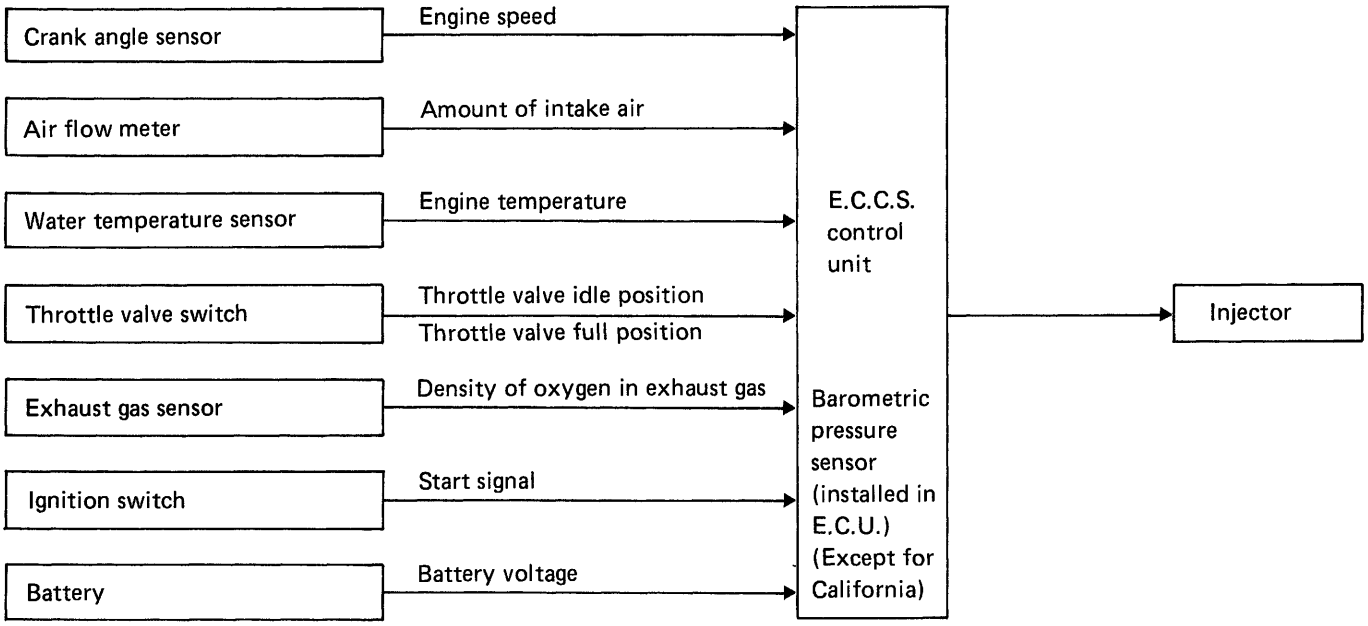
This solenoid valve is the same type as that of E.G.R. This controls the fuel pressure regulator vacuum line, based on signals supplied by the E.C.U.

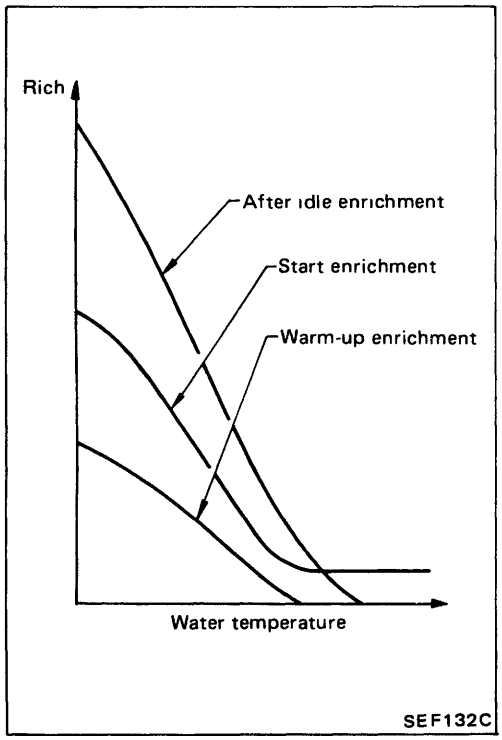

SEF072G

EXHAUST GAS TEMPERATURE SENSOR (California model only)

The exhaust gas temperature sensor, built into the E.G.R. passage, measures the temperature of the inside of E.G.R. passage and transmits a signal to the E.C.C.S. control unit. The temperature sensing unit employs a thermistor which is sensitive to change in temperature. The thermistor's electrical resistance decreases in response to temperature rise.

Fuel Injection Control



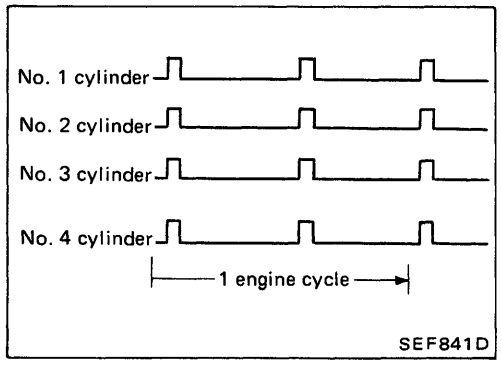


The E.C.U. calculates the basic injection pulse width by processing signals from the crank angle sensor and air flow meter. Receiving signals from each sensor which detects various engine conditions, the E.C.U. adds various enrichments, which are pre-programmed in the E.C.U. to the basic injection amount. Thus, the optimum amount of fuel is injected through the injectors.

1) Fuel enrichment:
   In each of the following conditions, fuel is enriched.

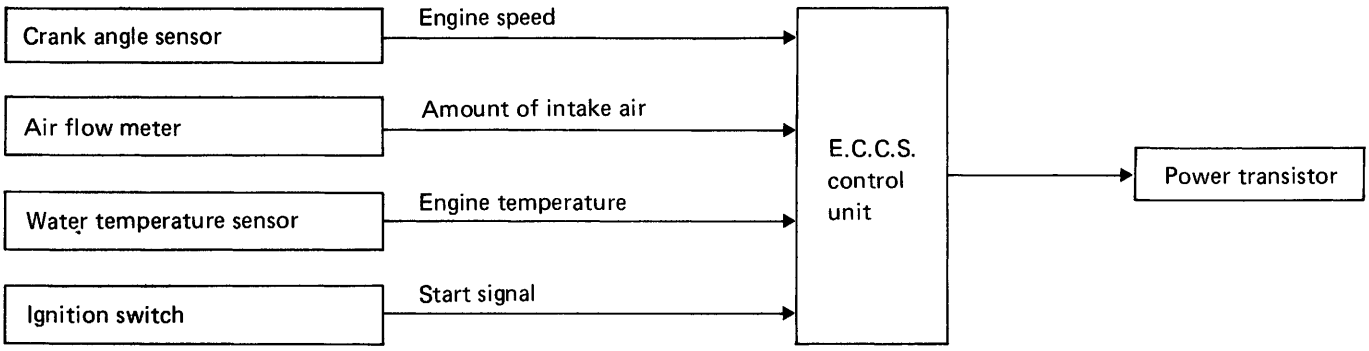
- During warm-up
- When starting
- After idle
- With heavy load
- Full throttle

Enrichment rates for "with heavy load/full throttle" is preprogrammed for engine speed and basic injection pulse width.

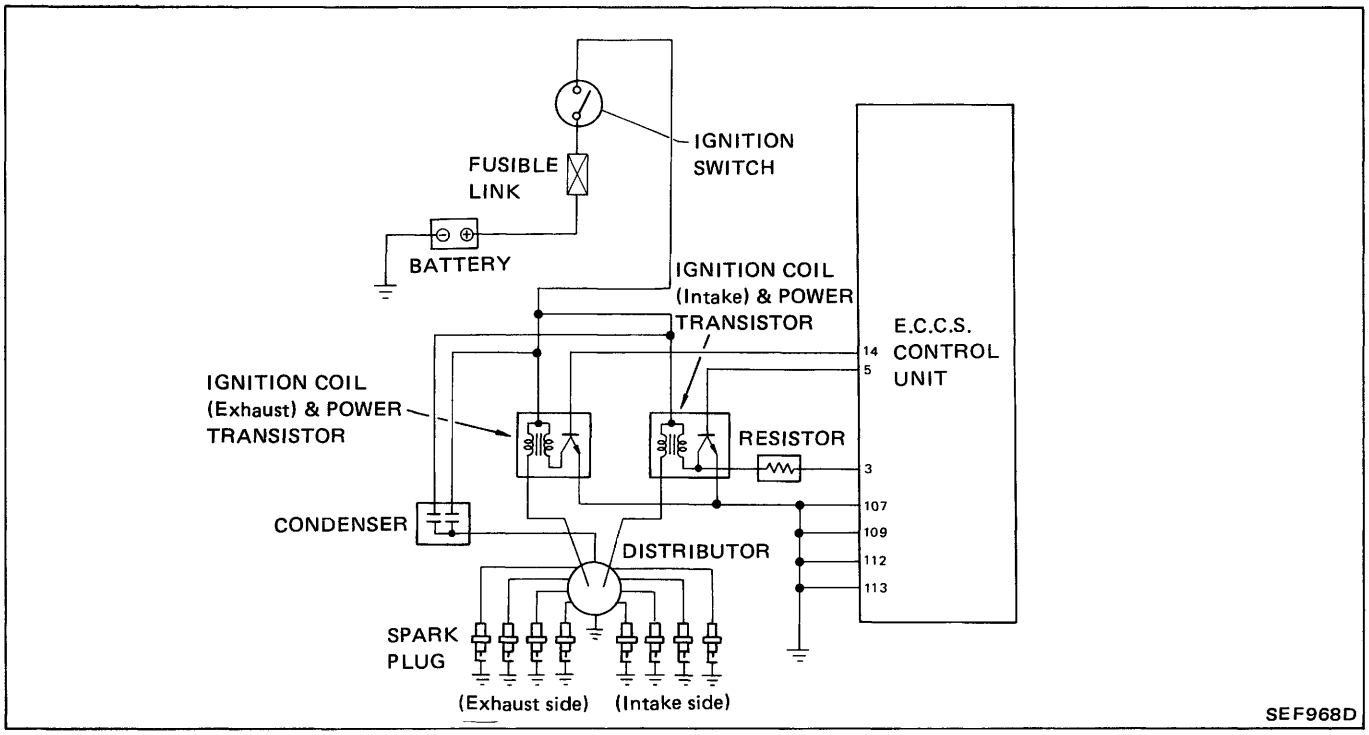


2) Simultaneous injection
   Fuel is injected into all four cylinders simultaneously twice each engine cycle.

Spark Plug Switching Control



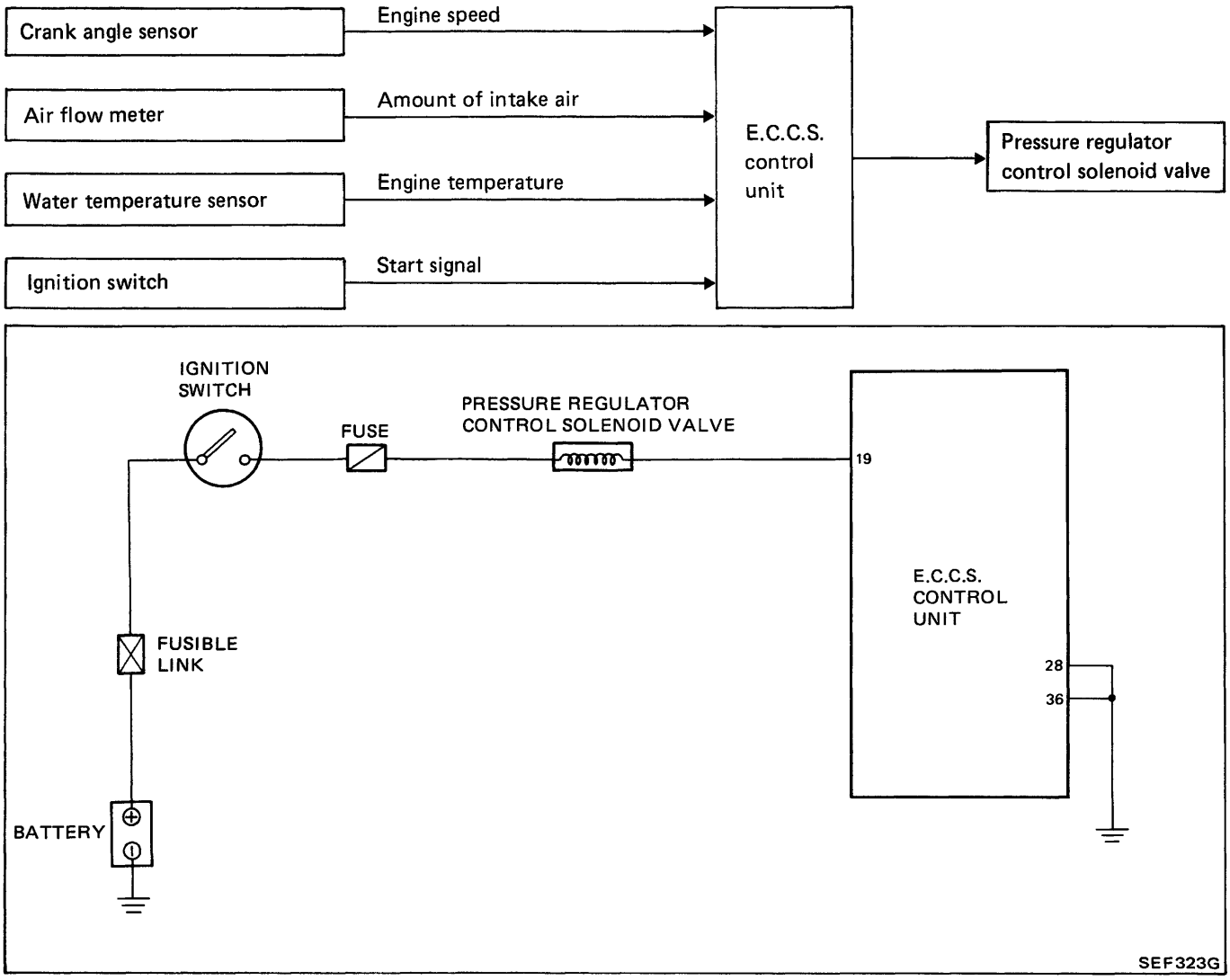
The spark plug switching system is designed to change ignition system from 2-plug ignition to 1-plug ignition during heavy load driving conditions in order to reduce engine noise.



Operation

Water temperature °C (°F)	Engine operation condition	Spark control
Above 65 (149)	Cranking	2-spark plug system
	Light load	
	Heavy load	1-spark plug system
Below 65 (149)	All	2-spark plug system

Fuel Pressure Regulator Control



The pressure regulator control improves hot-restartability by increasing fuel pressure. When the system is in operation, the pressure regulator control solenoid valve comes on, the intake manifold vacuum is cut and atmospheric pressure is supplied to the pressure regulator, thereby increasing the fuel pressure.

Pressure regulator control solenoid valve and pressure pump are controlled by E.C.U.

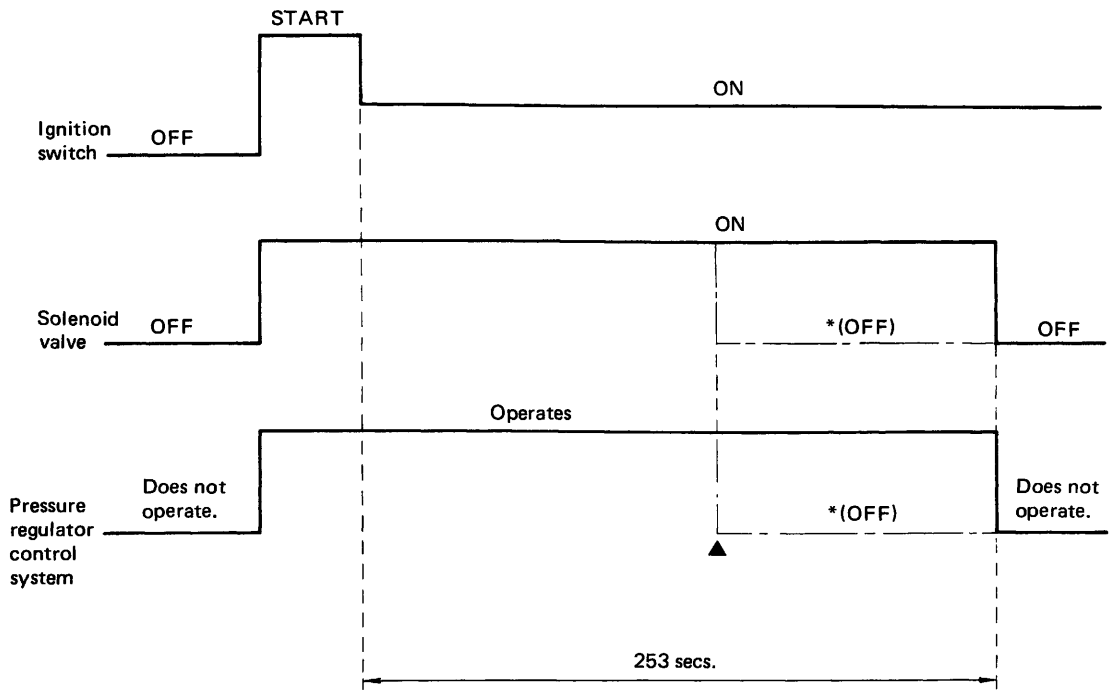
Fuel Pressure Regulator Control (Cont'd)

Operation

This system operates when following conditions are met.

- Water temperature is above 60°C (140°F).
- Engine speed is lower than 6,375 rpm or light load conditions exist.

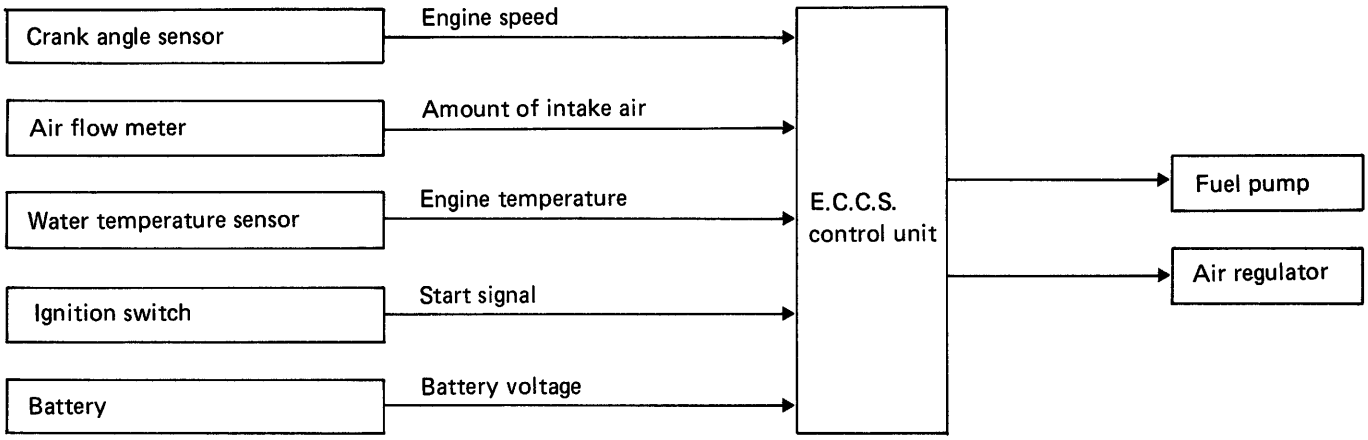
Timing chart

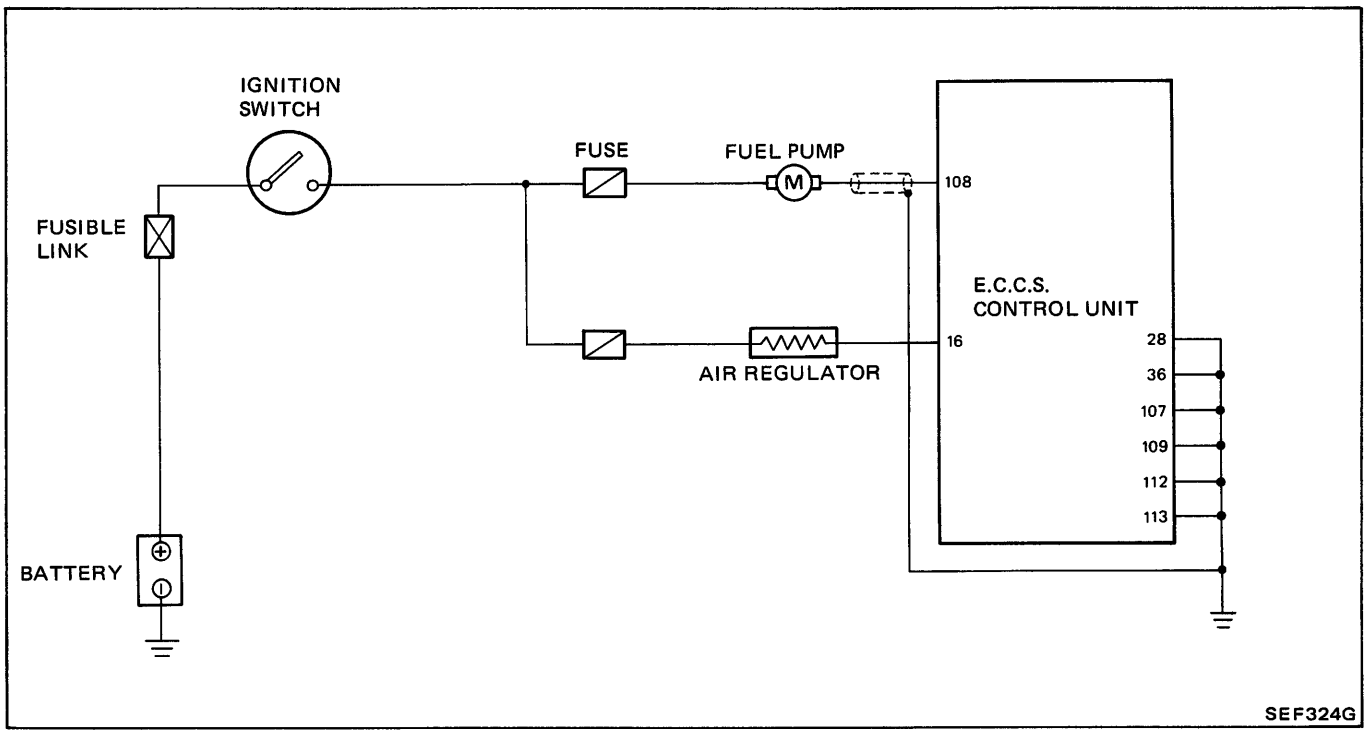


* As soon as E.C.U. detects conditions other than those above, it turns the solenoid valve "OFF". Consequently, pressure regulator control system does not operate at this point.

SEF971F

Fuel Pump and Air Regulator Control





Fuel pump and air regulator control

The fuel pump and air regulator ON-OFF are simultaneously controlled by the E.C.U.

Fuel pump and air regulator ON-OFF control

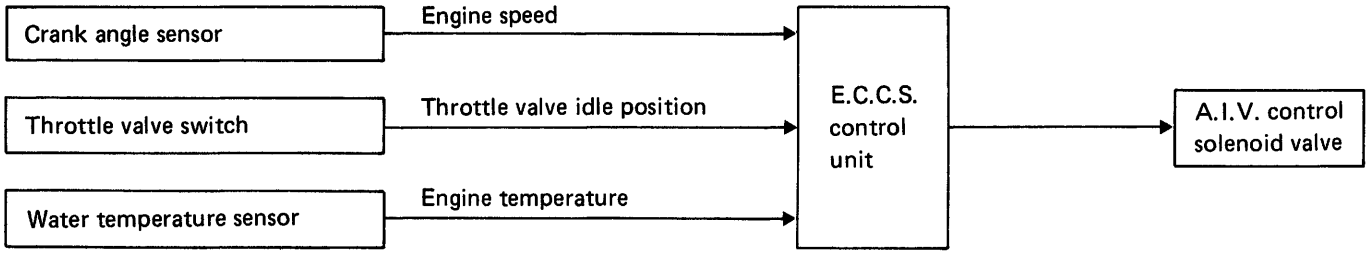
Ignition switch position	Engine condition	Fuel pump/ Air regulator operation
ON	Stopped	Operates for 5 seconds
	Running	Operates
	After stall	Stops in 1 second
START	Starting	Operates

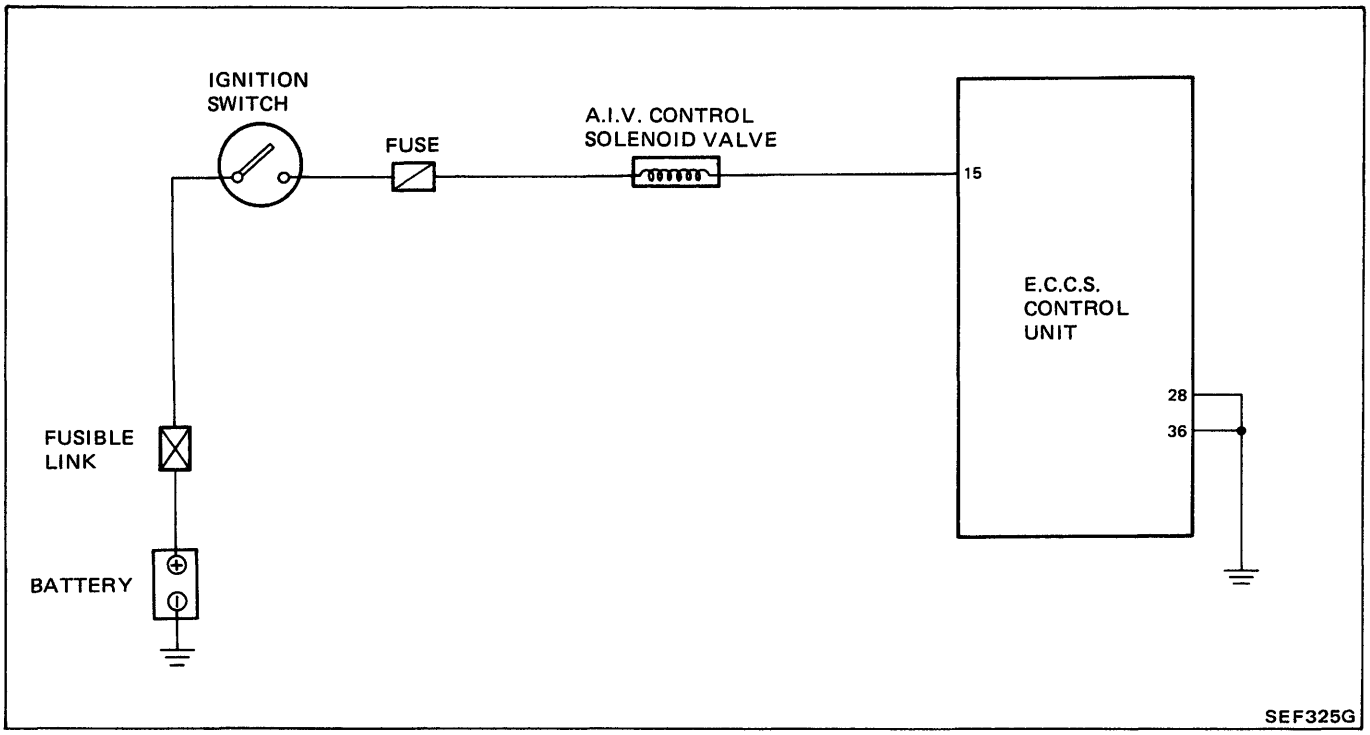
Fuel pump voltage control

The fuel pump is controlled by the E.C.U. adjusting the voltage supplied to the fuel pump.

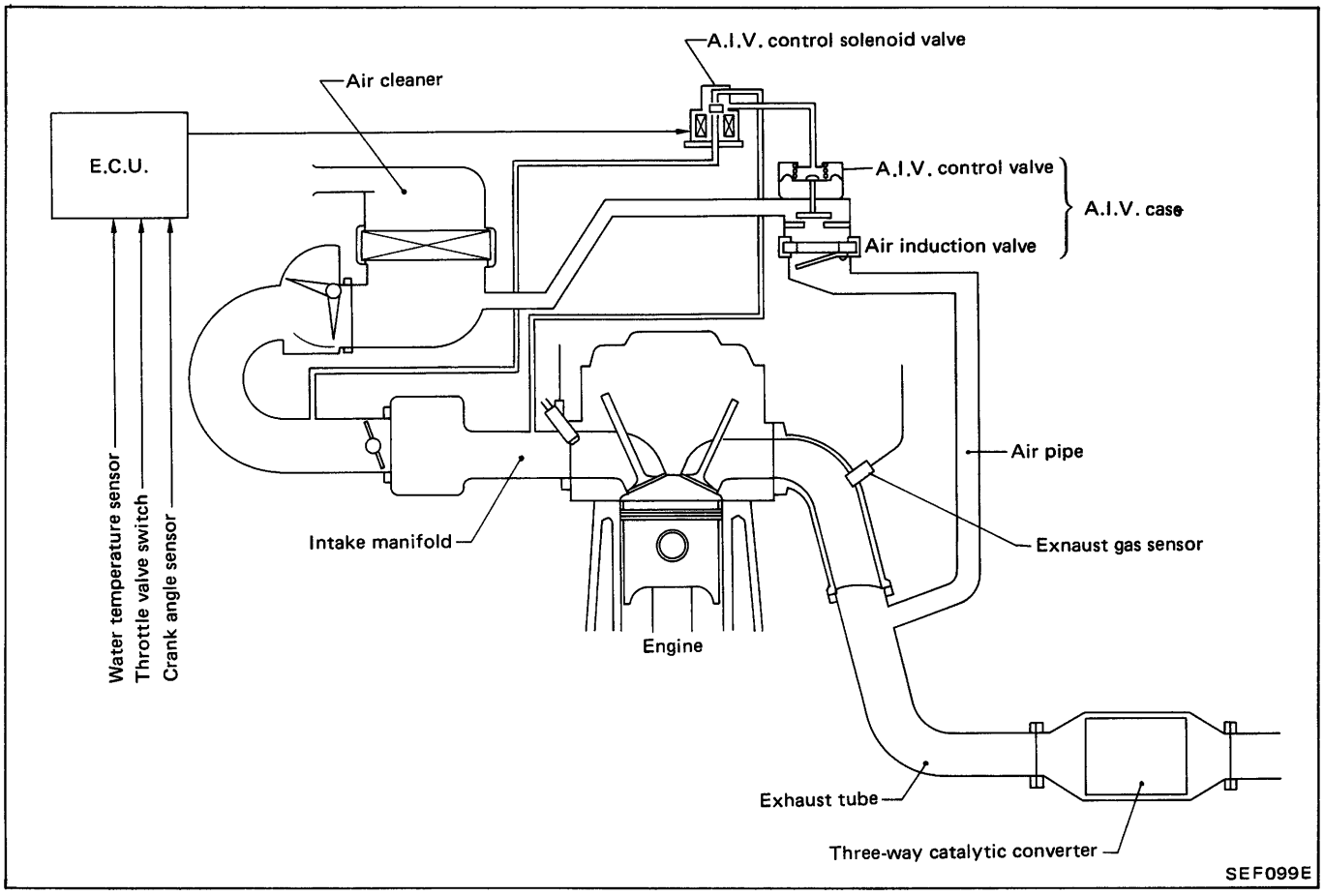
Conditions	Supplied voltage
• 5 seconds after ignition switch is turned to ON • Engine cranking • 25.3 seconds after engine start [above 50°C (122°F)] • Engine temp. above 95°C (203°F) • Engine temp. below 10°C (50°F) • Fuel pressure regulator control system is operating	Approximately 14 [V]
Those other than above	9 - 14 [V]

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





Air Induction Valve (A.I.V.) Control (Cont'd)

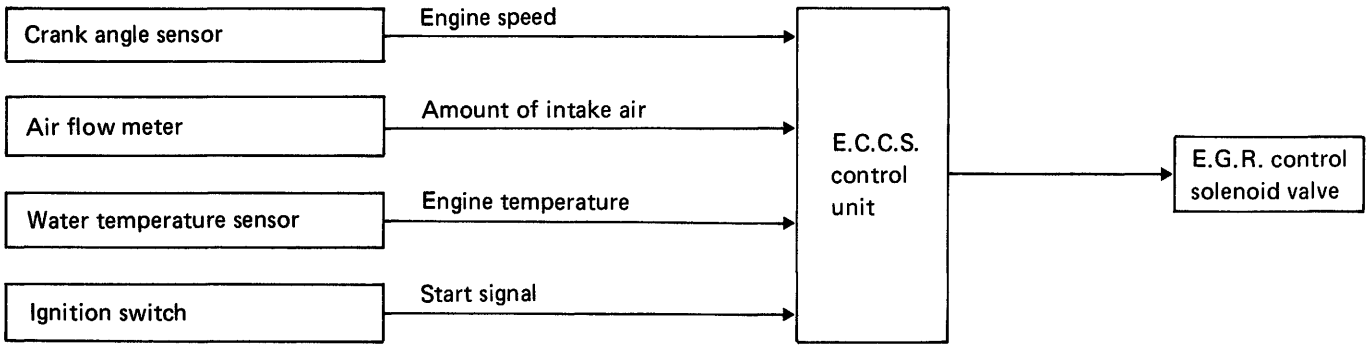


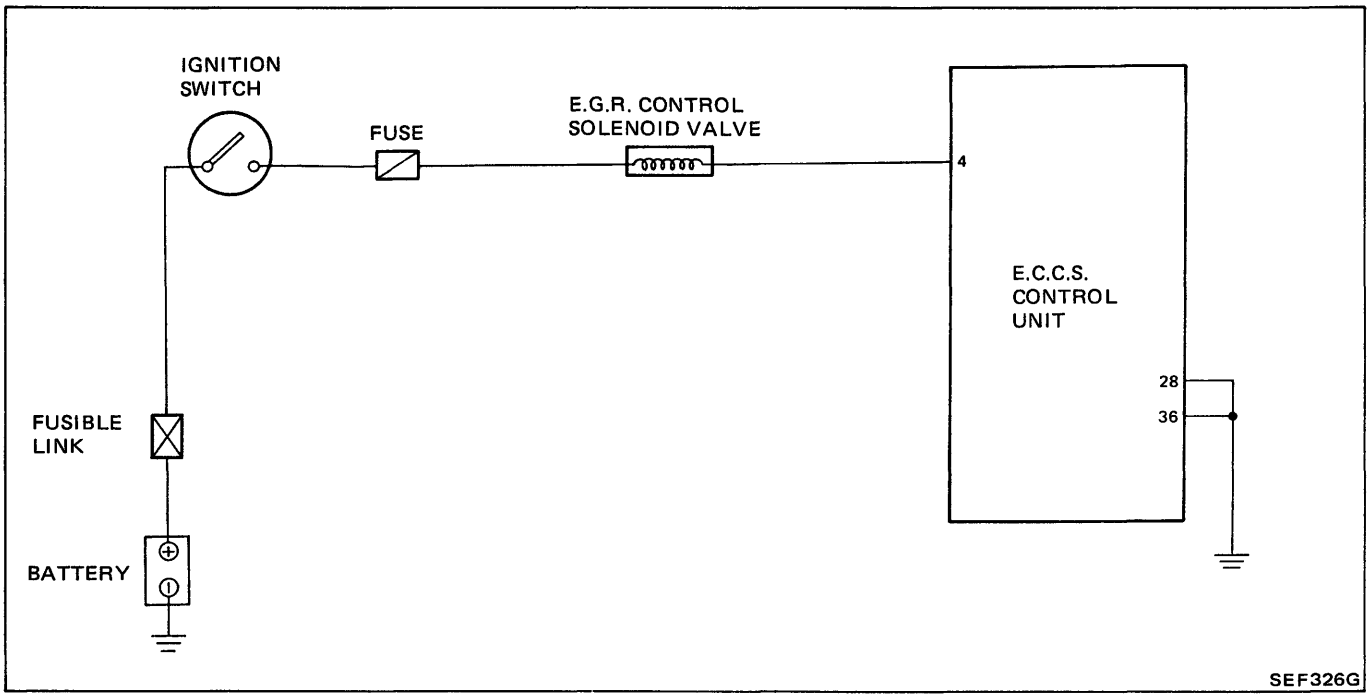
The air induction valve (A.I.V.) system is utilized to reduce HC and CO emissions by supplying air through the air induction valve. This system is composed of the air induction valve, the A.I.V. control valve and the A.I.V. control solenoid valve.
The air induction valve is designed for one-way operation and consists of one-way reed valves. It inducts the secondary air into the exhaust manifold via the exhaust pressure pulsations.
The A.I.V. control valve is controlled by the A.I.V. control solenoid valve which is controlled by the electrical signal from the E.C.U.

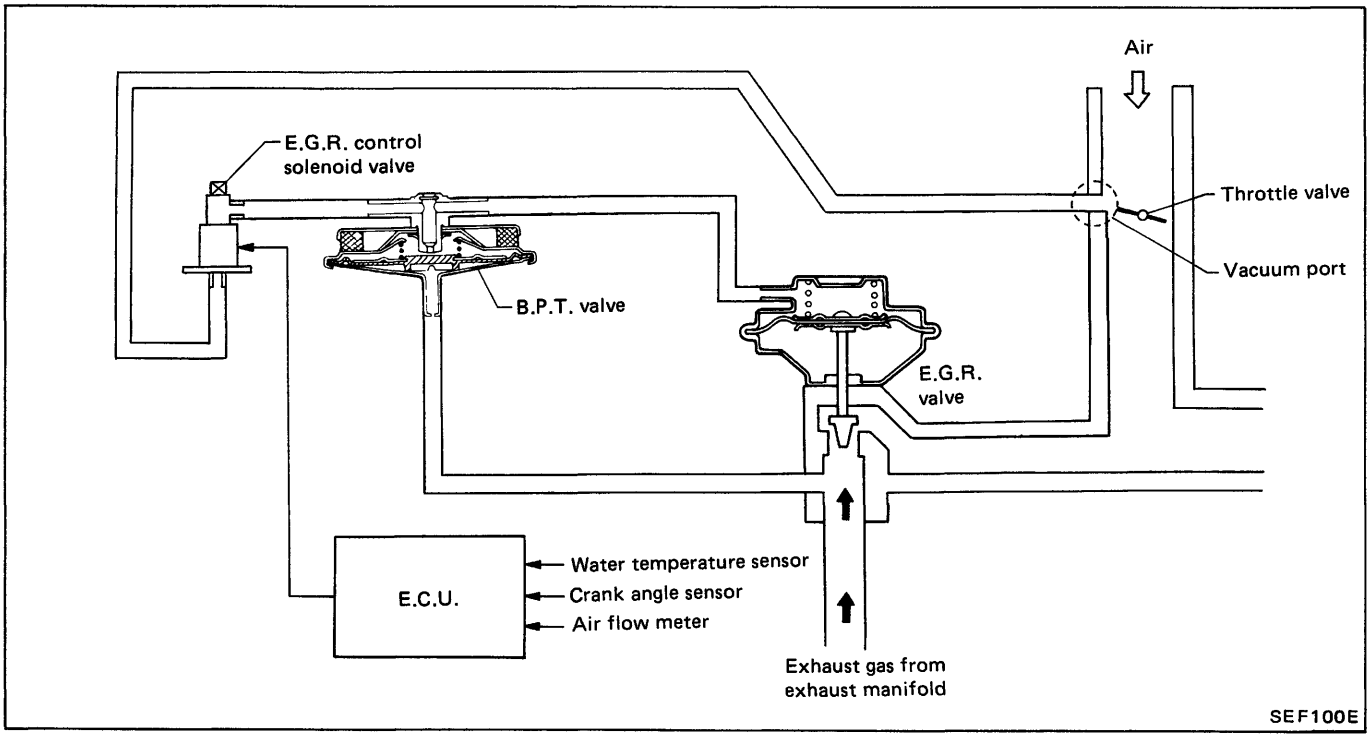
OPERATION

Water temperature °C (°F)	Throttle valve switch	Engine speed (rpm)	A.I.V. system
Below 15 (59)	Any	Any	Does not operate
Above 15 (59) Below 50 (122)	Any	Below 2,500	Operates
Above 50 (122)	OFF	Any	Does not operate
	ON (Idle contact)	Above 1,500	Does not operate
		Below 1,500	Operates

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







Exhaust Gas Recirculation (E.G.R.) Control (Cont'd)

In the exhaust gas recirculation system, some of the exhaust gas is returned to the combustion chamber to lower the flame temperature during combustion. This results in a reduction of the nitrogen oxide density in the exhaust gas.

When the E.G.R. control valve is open, some of the exhaust gas is led from the exhaust manifold to the E.G.R. tube. The exhaust gas is then regulated by E.G.R. valve, and is introduced into the intake manifold.

The signal from the E.C.U. is sent to the E.G.R. control solenoid valve, which cuts the vacuum line for the B.P.T. valve when any of the following conditions are met.

E.G.R. control solenoid valve operation

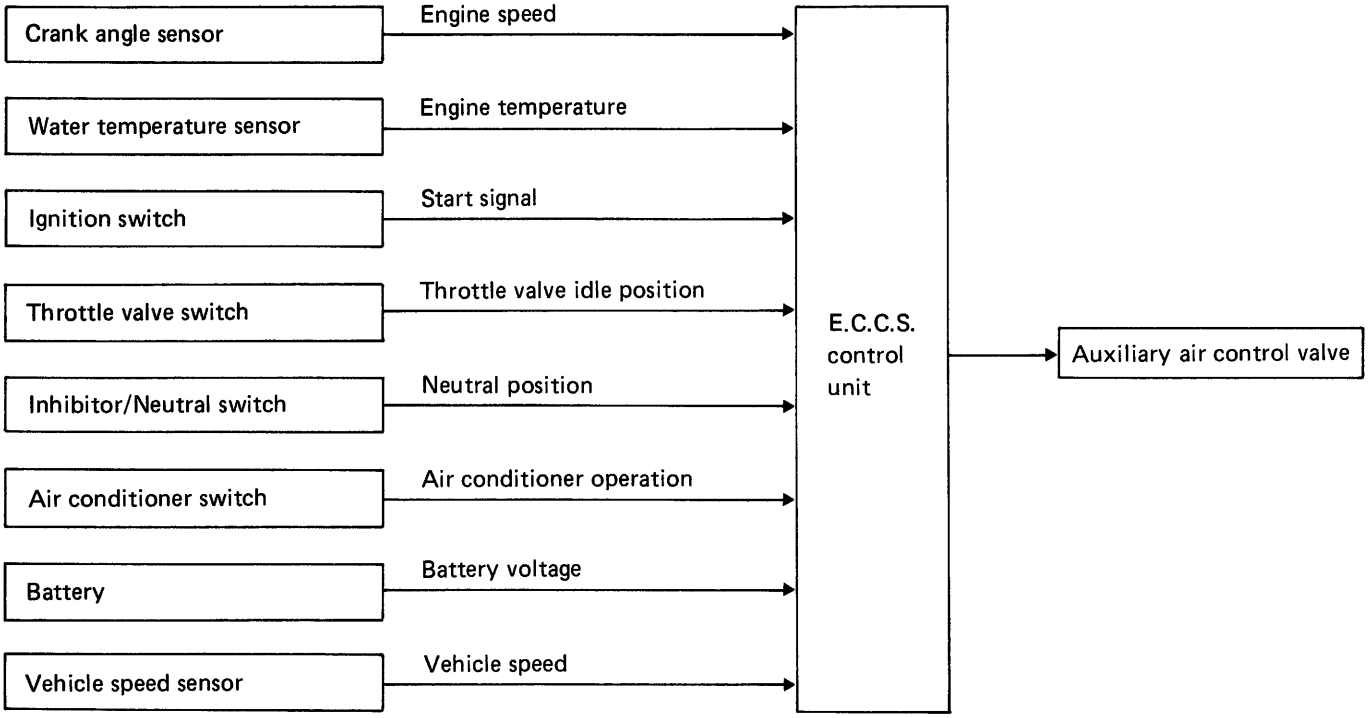
Condition			E.G.R. control solenoid valve
(1) When starting engine			ON
(2) Water temperature	°C (°F)	Below 60 (140)	
		Above 105 (221)	
(3) Deceleration			
Those other than above			OFF

E.G.R. system operation

E.G.R. system operates under only the following conditions.

Water temperature °C (°F)	B.P.T. valve		Throttle position	E.G.R. control solenoid valve	E.G.R. system
	Exhaust gas pressure	Operation			
Above 60 (140) Below 105 (221)	High	Closed	Partially open	OFF	Operates

Idle Speed Control

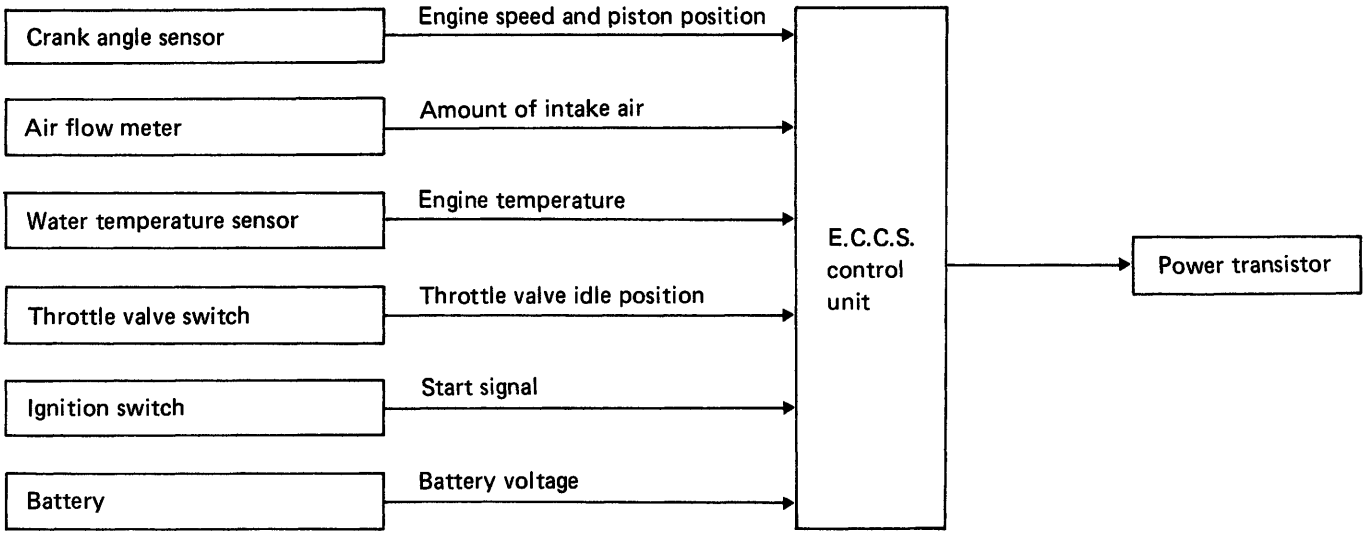


The idle speed is controlled by the E.C.U., corresponding to the engine operating conditions. The E.C.U. senses the engine condition and determines the best idle speed at water temperature and gear position. The control unit then sends an electronic signal corresponding to the difference between the best idle speed and the actual idle speed to the A.A.C. valve.

The E.C.U. controlled idle speed feedback is carried out when the following conditions are satisfied.

1) Idle switch "ON"
2) Vehicle speed is lower than 8 km/h (5 MPH).

Ignition Timing Control



Ignition timing is controlled, corresponding to the engine operating conditions, by the E.C.U. That is, as the optimum ignition timing in each driving condition has been pre-programmed in the E.C.U., the ignition timing is determined by electrical signals processed in the E.C.U.

The signal from the E.C.U. is transmitted to the power transistor, and controls ignition timing.

Fail-safe System

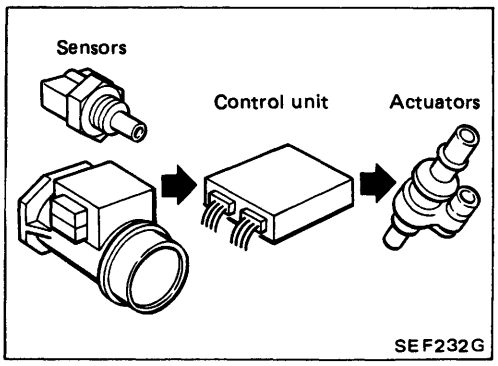
Air flow meter malfunctioning

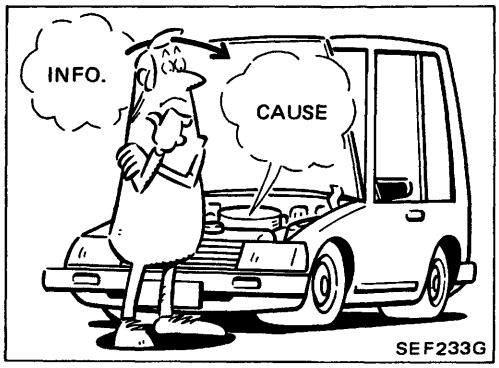
When air flow meter output voltage is lower or higher than the preset value while the engine is running, the fuel injection pulse duration is fixed at the preset value.

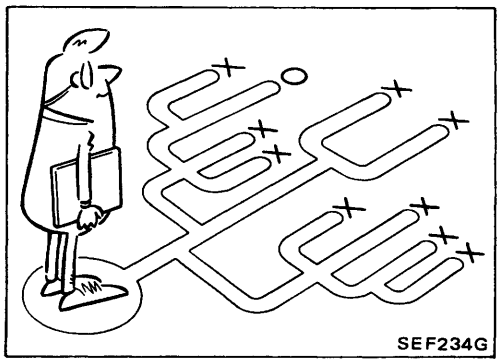
Water temperature sensor malfunctioning

When water temperature sensor output voltage is lower or higher than the specified value, water temperature is fixed at the preset value as follows:

Engine condition	Water temperature preset value °C (°F)
Start	20 (68)
Running	80 (176)







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.

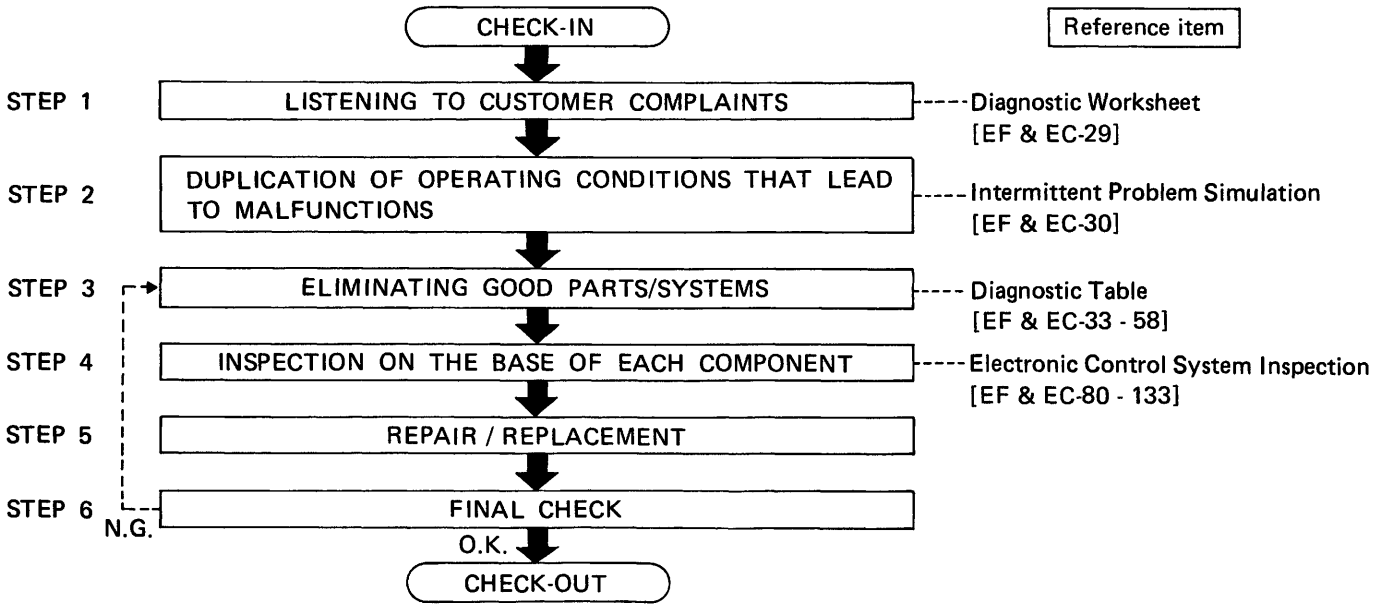
It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or faulty wiring. In this case, careful checking of suspicious circuits may help prevent the replacement of good parts.

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

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a driveability complaint. The customer is a very good supplier of information on such problems, especially intermittent ones. Through the talks with the customer, find out what symptoms are present and under what conditions they occur.

Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot driveability problems on an electronically controlled engine vehicle.

Work Flow



KEY POINTS

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

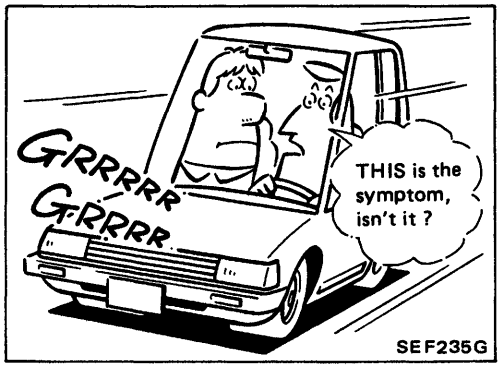
Diagnostic Worksheet

There are many kinds of operating conditions that lead to malfunctions on engine components.
A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, feelings for a problem depend on each customer. It is important to fully understand the symptoms or under what conditions a customer complains..
Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for troubleshooting.

WORKSHEET SAMPLE

Customer name MR/MS	Model & Year	VIN
Engine #	Trans.	Mileage
Incident Date	Manuf. Date	In Service Date

Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]
	☐ Driveability	☐ Stumble ☐ Surge ☐ 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 effected
	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

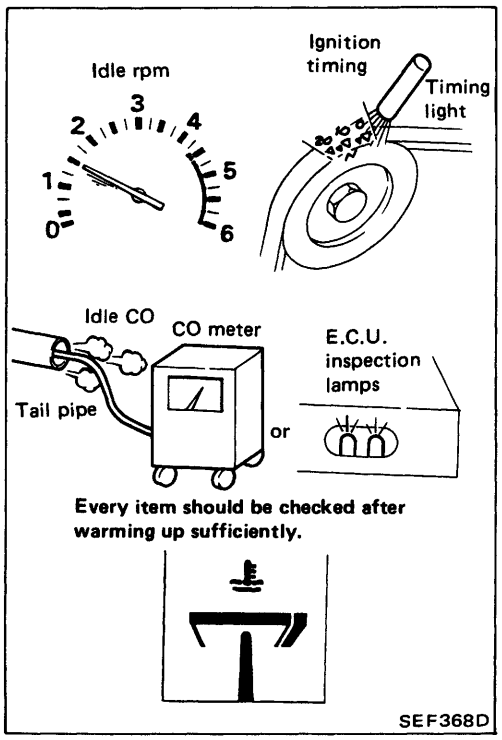


Intermittent Problem Simulation

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	Distributor	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 I/II) at 2,000 rpm.
4	Idle speed	I.A.A. unit	Raised	Turn idle adjust screw counterclockwise.
			Lowered	Turn idle adjust screw clockwise.
5	Electric connection (Electric continuity)	Harness connectors and wires	Poor electric connection or faulty wiring	Tap or wiggle.
				Race engine rapidly. See if the torque reaction of the engine unit causes electric breaks.
6	Temperature	Control unit	Cooled	Cool with an icing spray or similar device.
			Warmed	Heat with a hair drier. **[WARNING: Do not overheat the unit.]**
7	Moisture	Electric parts	Damp	Wet **[WARNING: Do not directly pour water on components. Use a mist sprayer.]**
8	Electric loads	Load switches	Loaded	Turn on head lights, air conditioner, rear defogger, etc.
9	Idle switch condition	Control unit	ON-OFF switching	Perform self-diagnosis (Mode IV).
10	Ignition spark	Timing light	Spark power check	Try to flash timing light for each cylinder.



Specifications

1) Idle speed
   - **M/T: 750±50 rpm**
   - **A/T: 700±50 rpm (in "D" position)**
2) Ignition timing
   - **15°±2° B.T.D.C.**
3) Idle CO
   - **Less than 5% under the following conditions.**
     - **Throttle valve switch harness connector disconnected (No A.I.V. controlled condition).**
     - **Water temperature sensor harness connector disconnected and then 2.5 kΩ resistor connected.**
     - **Exhaust gas sensor harness connector disconnected.**
4) Mixture ratio at middle engine speed (Approximately 2,000 rpm).
   - **Number of simultaneous flashes of E.C.U. inspection green and red lamps:**
     9 times or more/10 seconds
5) Idle switch OFF → ON speed
   - **M/T: Idle speed + 250±150 rpm**
   - **A/T: Engine speed (in "N" position) + 250±150 rpm**

NOTE

Diagnostic Table

To assist with your troubleshooting, some typical diagnostic procedures for the following symptoms are described.

CONTENTS

1. Impossible to start — no combustion ..... EF & EC-34
2. Impossible to start — partial combustion ..... EF & EC-35
3. Impossible to start — partial combustion (not affected by throttle position) ..... EF & EC-36
4. Impossible to start — partial combustion (throttle position changes combustion quality) ..... EF & EC-37
5. Hard to start — before warm-up ..... EF & EC-38
6. Hard to start — after warm-up ..... EF & EC-39
7. Hard to start — every time ..... EF & EC-40
8. Hard to start — morning after a rainy day ..... EF & EC-41
9. Abnormal idling — no fast idle ..... EF & EC-42
10. Abnormal idling — low idle (after warm-up) ..... EF & EC-43
11. Abnormal idling — high idle (after warm-up) ..... EF & EC-44
12. Unstable idling — before warm-up ..... EF & EC-45
13. Unstable idling — after warm-up ..... EF & EC-46
14. Poor driveability — stumble (while accelerating) ..... EF & EC-47
15. Poor driveability — surge (while cruising) ..... EF & EC-48
16. Poor driveability — lack of power ..... EF & EC-49
17. Poor driveability — detonation ..... EF & EC-50
18. Engine stall — during start-up ..... EF & EC-51
19. Engine stall — while idling ..... EF & EC-52
20. Engine stall — while accelerating ..... EF & EC-53
21. Engine stall — while cruising ..... EF & EC-54
22. Engine stall — while decelerating/just after stopping ..... EF & EC-55
23. Engine stall — while loading (power steering, air conditioner, headlamps, etc.) ..... EF & EC-56
24. Backfire — through the intake ..... EF & EC-57
25. Backfire — through the exhaust ..... EF & EC-58

REMARKS

In the following pages, the numbers such as ❶, ❷ in the above chart correspond to those in the service procedure described below.
Possible causes can be checked through the service procedure shown by the mark "○".

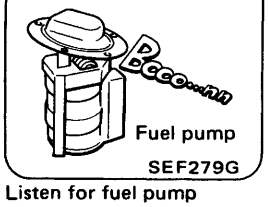
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 1 Impossible to start – no combustion

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽
SPECIFICATIONS	Mixture ratio (too lean)	○	○						
	Ignition sparks (weak, missing)				○	○	○		
	Ignition timing							○	
FUEL SYSTEM	Fuel pump (no operation)	○							
	Fuel pump relay (open circuited)	○							
	Injectors (no operation, clogged)		○						
IGNITION SYSTEM	Ignition switch	○	○	○	○			○	
	Main relay	○	○	○	○			○	
	Power transistor			○	○			○	
	Ignition coil				○			○	
	Center cable (ignition leaks)				○			○	
	Ignition wires (ignition leaks)				○	○			
	Spark plugs						○		
CONTROL SYSTEM	Crank angle sensor	○	○		○			○	○

SERVICE PROCEDURE

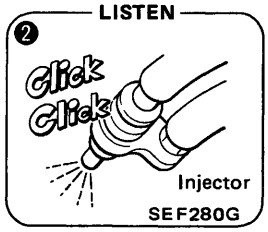
❶ LISTEN



Listen for fuel pump operating sound.

N.G. → Check fuel pump and/or related circuits. [See page EF & EC-92.]

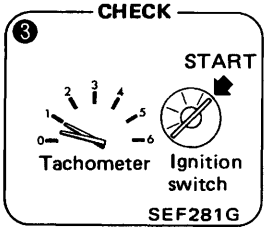
❷ LISTEN



Listen for injector operating sound.

N.G. → Check injector circuit. [See page EF & EC-118.]

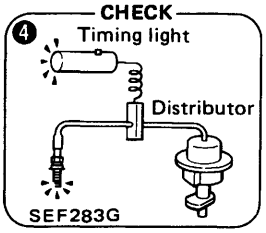
❸ CHECK



Make sure tachometer needle moves when cranking.

N.G. →

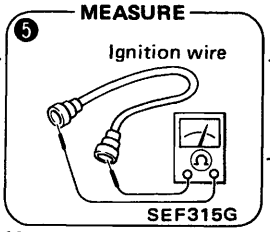
❹ CHECK



Check flashes of timing light for weakness.

N.G. →

❺ MEASURE

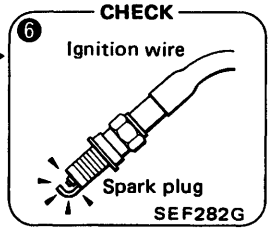


Measure resistance of suspect wires.

N.G. → Replace the wire.

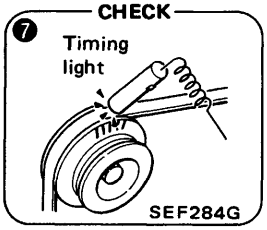
O.K. →

❻ CHECK



Remove spark plugs and check their ignition sparks.

❼ CHECK

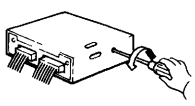


Check ignition timing.

N.G. → Adjust ignition timing. [See page EF & EC-31.]

❽ PERFORM

Self-diagnosis Mode III



Perform self-diagnosis Mode III (for crank angle sensor).

N.G. → Check crank angle sensor and/or related circuits. [See page EF & EC-82.]

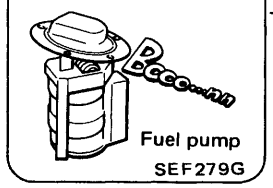
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 2 **Impossible to start – partial combustion**

POSSIBLE CAUSES		❶	❷	❸	❹	❺
SPECIFICATIONS	Mixture ratio	○	○	○		
	Fuel pressure (too low)				○	
	Ignition timing					○
FUEL SYSTEM	Fuel pump	○				
	Fuel pump relay (open circuited)	○				
	Injectors (clogged)		○			

SERVICE PROCEDURE

❶ **LISTEN**



Listen for fuel pump operating sound.

N.G. → Check fuel pump and/or related circuits. [See page EF & EC-92.]

O.K. →

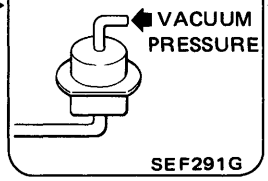
❷ **LISTEN**

Listen for injector operating sound.

N.G. → Check injector circuit. [See page EF & EC-118.]

O.K. →

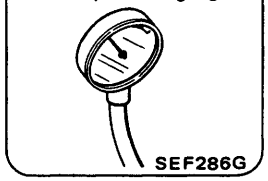
❸ **APPLY**



Remove vacuum hose from pressure regulator, and apply vacuum and/or pressure, and try to start.

Improved →

❹ **MEASURE** Fuel pressure gauge

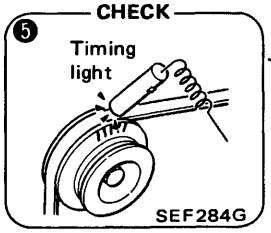


Connect vacuum hose to pressure regulator and measure fuel pressure.

↓

Check Mixture ratio feedback system. [See page EF & EC-139.]

❺ **CHECK**



Check ignition timing.

→ Adjust ignition timing. [See page EF & EC-31.]

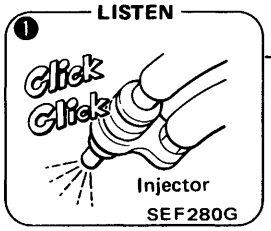
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 3 Impossible to start – partial combustion (not affected by throttle position

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫	⓬
SPECIFICATIONS	Mixture ratio	○		○	○								
	Fuel pressure (too low)			○	○	○							
	Ignition timing						○						
FUEL SYSTEM	Fuel filter (clogged)					○							
	Fuel line (clogged)					○							
	Injectors (clogged)	○											
	Pressure regulator				○								
	Pressure regulator vacuum hose (clogged)			○									
IGNITION SYSTEM	Ignition wires (ignition leaks)							○	○				
	Spark plugs (wet with fuel)									○			
	Ignition switch	○						○			○		
INTAKE SYSTEM	Throttle chamber (with ports clogged)		○										
	Throttle valve (clogged)		○										
CONTROL SYSTEM	Water temperature sensor											○	○
	Crank angle sensor	○						○				○	

SERVICE PROCEDURE

❶ **LISTEN**

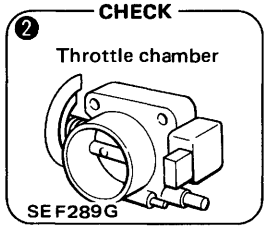


N.G. → Check injector circuit. [See page EF & EC-118.]

Listen for injector operating sound.

O.K. ↓

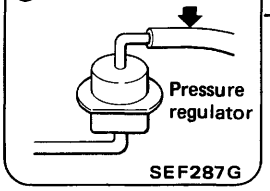
❷ **CHECK** Throttle chamber



N.G. → Clean the ports and/or throttle valve.

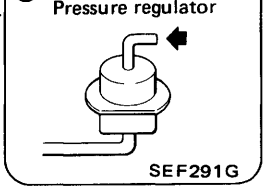
Check throttle chamber ports and valve for clogging.

❸ **CHECK**



O.K. →

❹ **REMOVE** Pressure regulator



Improved →

❺ **MEASURE** Fuel pressure

Check Mixture ratio feedback system. [See page EF & EC-139.]

Connect vacuum hose to pressure regulator and measure fuel pressure.

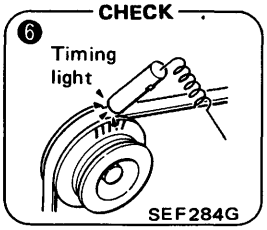
Check vacuum hose of pressure regulator for clogging.

N.G. ↓

Repair or replace the hose.

Remove vacuum hose from pressure regulator, and try to start.

❻ **CHECK**

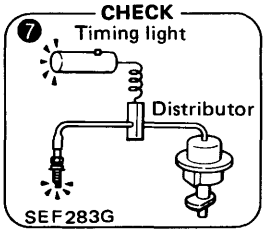


Check ignition timing.

N.G. ↓

Adjust ignition timing. [See page EF & EC-31.]

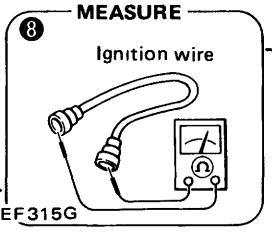
❼ **CHECK** Timing light



Check flashes of timing light for weakness.

N.G. →

❽ **MEASURE** Ignition wire



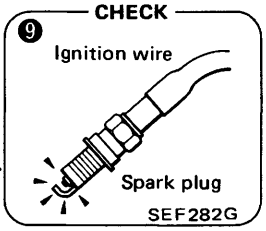
Measure resistance of suspect ignition wires.

N.G. ↓

Replace the wires.

O.K. →

❾ **CHECK** Ignition wire



Remove spark plugs and check their ignition sparks by cranking.

❿ **PERFORM** Self-diagnosis Mode IV

N.G. → Check starter circuit. [See page EF & EC-112.]

Perform self-diagnosis Mode IV (for start signal).

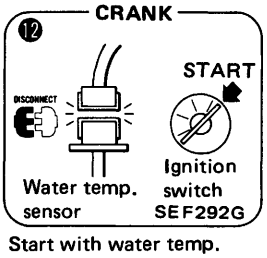
⓫ **PERFORM** Self-diagnosis Mode III

for C.A.S. → Check the sensor circuits. [See page EF & EC-86 (water temp. sensor), page EF & EC-82 (crank angle sensor).]

for C.H.T.S. →

Perform self-diagnosis Mode III (for water temp. sensor and crank angle sensor).

⓬ **CRANK**



N.G. →

Start with water temp. sensor connector disconnected.

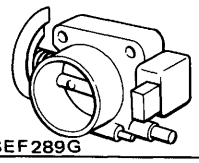
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION **4** **Impossible to start – partial combustion (throttle position changes combustion quality)**

POSSIBLE CAUSES		❶	❷	❸	❹	❺
INTAKE SYSTEM	Throttle chamber (with ports clogged)	○				
	Throttle valve (clogged)		○			
	Air regulator (stuck closed)			○		
CONTROL SYSTEM	Water temperature sensor				○	
	Idle switch				○	
	Neutral switch					○

SERVICE PROCEDURE

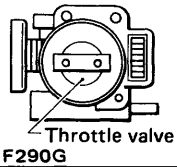
❶ CHECK Throttle chamber



N.G. → Clean the ports.

Check throttle chamber ports for clogging.

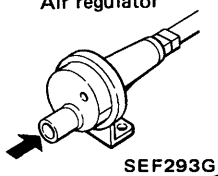
❷ CHECK Throttle chamber



N.G. → Clean the valve.

Check throttle valve for clogging.

❸ CHECK Air regulator



N.G. → Check air regulator and/or its circuit. [See page EF & EC-116.]

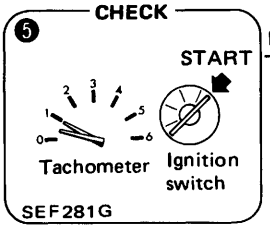
Make sure air regulator stays open before warm-up

❹ PERFORM

Self-dragnosis Mode III/IV

Perform self-diagnosis Mode III (for water temp. sensor), Mode IV (for idle switch).

❺ CHECK



N.G. → Check neutral switch and/or its circuit [See page EF & EC-128.]

Make sure tachometer indicates about 300 rpm while cranking.

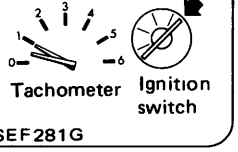
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 5 **Hard to start – before warm-up**

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio			○			○
IGNITION SYSTEM	Ignition switch (no start signal)	○			○		
INTAKE SYSTEM	Air regulator			○			
CONTROL SYSTEM	Water temperature sensor					○	○
	Idle switch				○		
	Neutral switch	○					
OTHERS	Starter (operation too slow)	○					
	Battery (voltage too low)	○	○				

SERVICE PROCEDURE

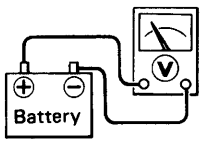
❶ **CHECK**



N.G. →

Make sure tachometer indicates about 300 rpm while cranking.

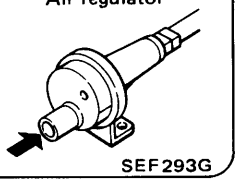
❷ **MEASURE**



N.G. (less than 12V) → Charge the battery.

Measure battery voltage.

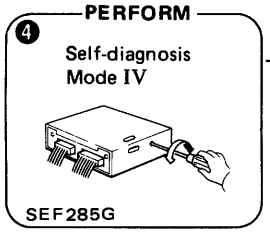
❸ **CHECK**



N.G. → Check air regulator and/or its circuit. [See page EF & EC-116.]

Make sure air regulator stays open before warm-up.

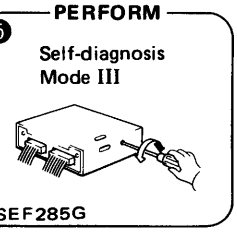
❹ **PERFORM**



N.G. → Check the malfunctioning switches and/or circuits. [See page EF & EC-112 (start signal), page EF & EC-94 (idle switch).]

Perform self-diagnosis Mode IV (for start signal and idle switch).

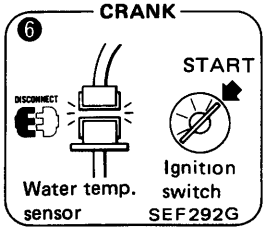
❺ **PERFORM**



N.G. →

Perform sel-diagnosis Mode III (for water temp. sensor).

❻ **CRANK**



N.G. → Check sensor circuit. [See page EF & EC-86 (water temp. sensor).]

Start with water temp. sensor connector disconnected.

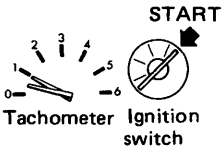
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 6 **Hard to start – after warm-up**

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽
SPECIFICATIONS	Mixture ratio			○			○		
	Fuel pressure			○			○	○	
FUEL SYSTEM	Fuel line (hot fuel)			○					
	Pressure regulator (low fuel pressure)						○		
	Pressure regulator vacuum hose (clogged)						○		
	Pressure regulator control solenoid							○	○
	Pressure regulator control solenoid vacuum hose						○		
IGNITION SYSTEM	Ignition switch (no start signal)	○				○			
CONTROL SYSTEM	Water temperature sensor				○				
	Air flow meter				○				
OTHERS	Starter (operation too slow)	○							
	Battery (voltage too low)	○	○						

SERVICE PROCEDURE

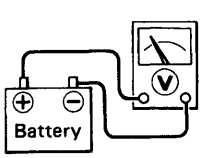
❶ **CHECK**



Make sure tachometer indicates about 300 rpm while cranking.

N.G. →

❷ **MEASURE**



Measure battery voltage.

N.G. (less than 12V) ↓

Charge the battery.

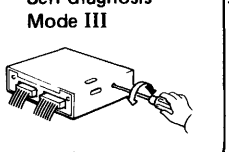
❸ **CRANK**

Cool fuel lines with wet rags, etc. and try to start.

No change → Proceed to other steps.

Improved → Proceed to other steps. If everything is O.K., check fuel vapor pressure.

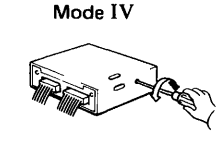
❹ **PERFORM**



Perform self-diagnosis Mode III (for water temp. sensor and air flow meter).

N.G. → Check sensor circuits. [See page EF & EC-86 (water temp. sensor), page EF & EC-84 (air flow meter).]

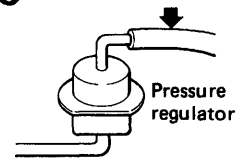
❺ **PERFORM**



Perform self-diagnosis Mode IV (for start signal).

N.G. → Check starter circuit. [See page EF & EC-112.]

❻ **CHECK**



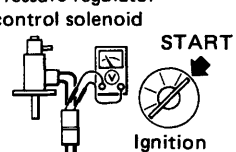
Check vacuum hose of pressure regulator for clogging.

N.G. ↓

Repair or replace the hose.

O.K. →

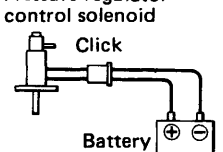
❼ **CHECK**



Check terminal voltage of pressure regulator control solenoid while cranking.

N.G. →

❽ **LISTEN**



Listen for clicking sound from pressure regulator control solenoid when applying battery voltage.

N.G. ↓ Replace the solenoid.

O.K. ↓ Check the solenoid circuit. [See page EF & EC-126.]

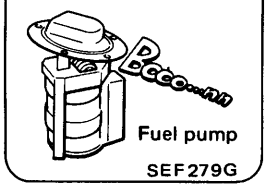
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 7 Hard to start – every time

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫	⓬
SPECIFICATIONS	Mixture ratio	○				○	○						
	Fuel pressure						○	○					
	Ignition sparks (missing)								○	○		○	
	Ignition timing				○								
FUEL SYSTEM	Fuel pump (improper operation)	○											
	Fuel line (clogged)							○					
	Canister (air leaks)					○							
	Pressure regulator (low fuel pressure)						○						
IGNITION SYSTEM	Ignition wires (ignition leaks)								○	○			
	Spark plugs (improper gap)										○		
CONTROL SYSTEM	Crank angle sensor	○							○				○
	Water temperature sensor												○
	Idle switch												○
	Neutral switch		○										
OTHERS	Starter (operation too slow)		○										
	Battery (voltage too low)		○	○									

SERVICE PROCEDURE

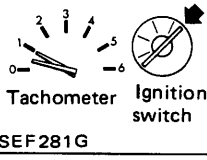
❶ **LISTEN**



Listen for fuel pump operating sound.

N.G. → Check fuel pump and/or related circuits. [See page EF & EC-92.]

❷ **CHECK**



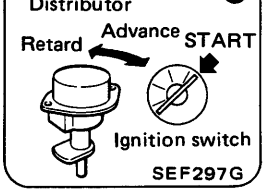
Make sure tachometer indicates about 300 rpm while cranking.

N.G. → ❸ **MEASURE** Battery

Measure battery voltage.

N.G. → Charge the battery.

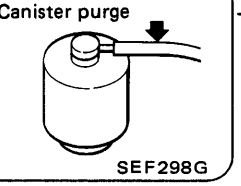
❹ **CRANK**



Advance/retard ignition timing and try to start.

No change → [Proceed to other steps.]

❺ **CHECK**



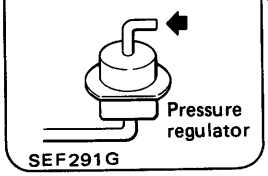
Check vacuum hose of canister for air leaks.

N.G. → Repair or replace the hose.

Check Mixture ratio feedback system. [See page EF & EC-139.]

Improved

❻ **REMOVE**



Remove vacuum hose from pressure regulator, and try to start.

❼ **MEASURE** Fuel pressure

Connect vacuum hose to pressure regulator and measure fuel pressure.

⓬ **PERFORM** Self-diagnosis Mode III/IV

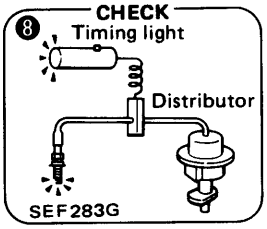
Perform self-diagnosis Mode III (for water temp. sensor and crank angle sensor), Mode IV (for idle switch).

N.G. → Check the malfunctioning circuits. [See page EF & EC-86 (water temp. sensor), page EF & EC-82 (crank angle sensor), page EF & EC-94 (idle switch).]

Replace the wires.

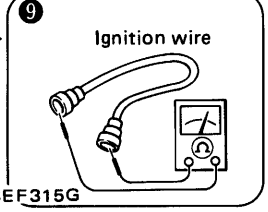
N.G.

❽ **CHECK** Timing light



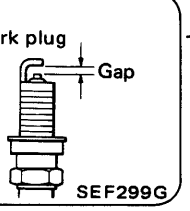
Check flashes of timing light for weakness.

N.G. → ❾ **MEASURE** Ignition wire



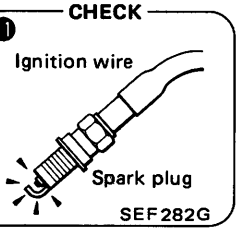
Measure resistance of suspect ignition wires.

O.K. → ❿ **MEASURE** Spark plug



Remove spark plugs and measure their gaps.

O.K. → ⓫ **CHECK** Ignition wire



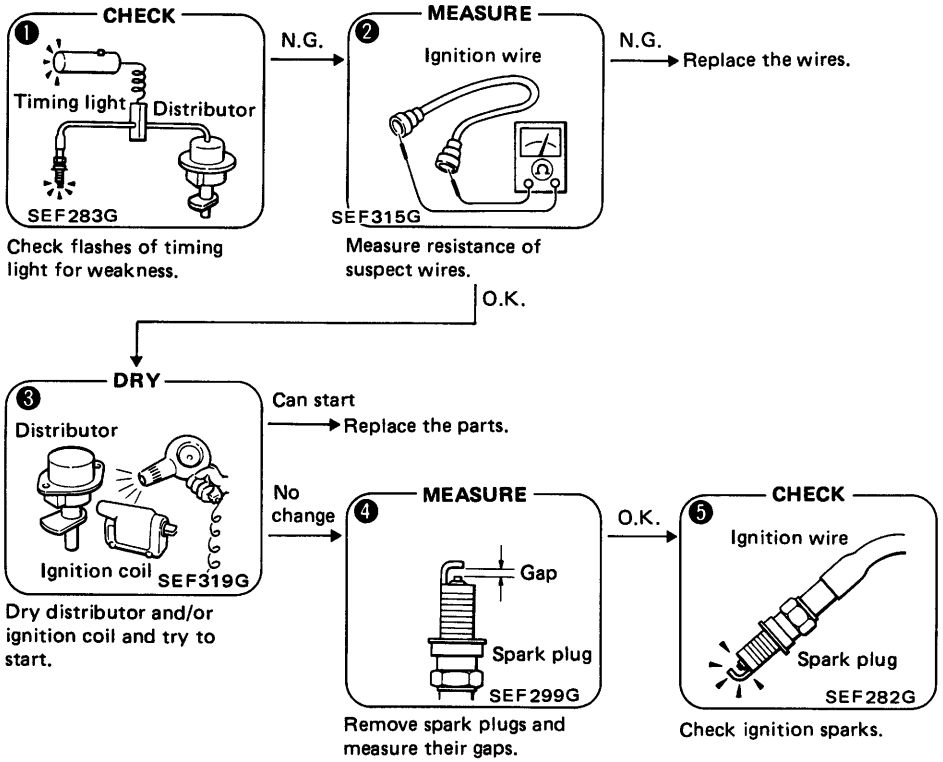
Check ignition sparks.

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 8 **Hard to start – morning after a rainy day**

POSSIBLE CAUSES		❶	❷	❸	❹	❺
SPECIFICATIONS	Ignition sparks (weak)	○	○			○
IGNITION SYSTEM	Power transistor	○				○
	Ignition coil	○		○		○
	Center cable (ignition leaks)	○				○
	Ignition wires (ignition leaks)	○	○			○
	Distributor cap (ignition leaks)	○		○		○
	Spark plugs (improper gap)				○	○

SERVICE PROCEDURE



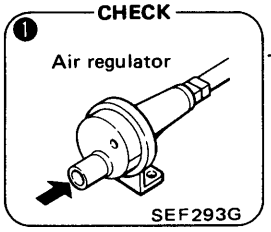
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 9 Abnormal idling – no fast idle

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio	○	○		○		
	Ignition timing			○			
INTAKE SYSTEM	Blow-by hose (clogged)		○				
	Air regulator (stuck closed)	○					
CONTROL SYSTEM	Water temperature sensor					○	○

SERVICE PROCEDURE

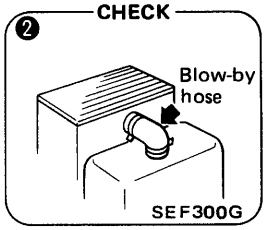
❶ **CHECK**



N.G. → Check air regulator and/or its circuit. [See page EF & EC-116.]

Make sure air regulator stays open before warm-up.

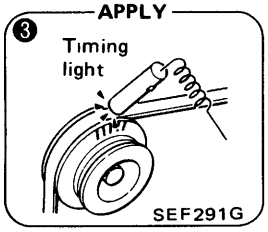
❷ **CHECK**



N.G. → Clean or replace the hose.

Check blow-by hose for clogging.

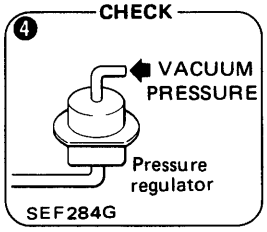
❸ **APPLY**



Improved → Adjust ignition timing. [See page EF & EC-31.]

Check ignition timing.

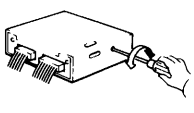
❹ **CHECK**



N.G. → Check Mixture ratio feedback system. [See page EF & EC-139.]

Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and check idling.

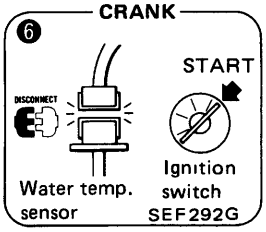
❺ **PERFORM**



N.G. →

Perform self-diagnosis Mode III (for water temp. sensor).

❻ **CRANK**



N.G. → Check sensor circuit. [See page EF & EC-86 (water temp. sensor).]

Start with water temp. sensor connector disconnected.

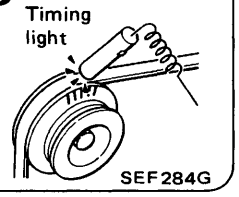
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 10 | **Abnormal idling – low idle (after warm-up)**

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼
SPECIFICATIONS	Mixture ratio		○			○		
	Ignition timing (too retarded)	○						
INTAKE SYSTEM	Throttle chamber (with ports clogged)			○				
	Throttle valve (clogged)				○			
CONTROL SYSTEM	Crank angle sensor						○	
	Air flow meter						○	
	Water temperature sensor						○	○

SERVICE PROCEDURE

❶ CHECK

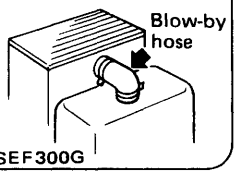


Check ignition timing.

N.G.

Adjust ignition timing. [See page EF & EC-31.]

❷ CHECK

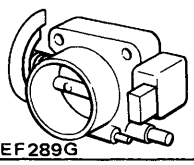


Check blow-by hose for clogging.

N.G.

Clean or replace the hose.

❸ CHECK

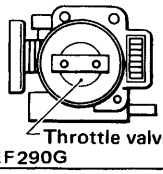


Check throttle chamber ports for clogging.

N.G.

Clean the ports.

❹ CHECK

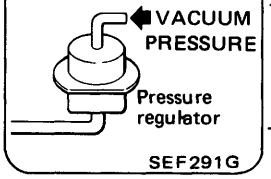


Check throttle valve for clogging.

N.G.

Clean the valve.

❺ APPLY

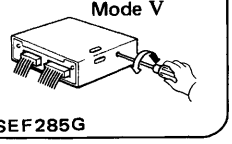


Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and check idling.

Improved → Check Mixture ratio feedback system. [See page EF & EC-139.]

No change → Check load signal circuit. [See EL section.]

❻ PERFORM

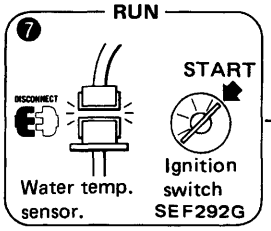


Perform self-diagnosis Modes III and V (for air flow meter, and water temp. sensor.)

N.G.

Check the malfunctioning parts and/or circuits. [See page EF & EC-84 (air flow meter), page EF & EC-86 (water temp. sensor).]

❼ RUN



N.G.

Start and run engine with water temp. sensor connector disconnected.

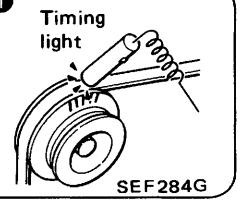
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 11 | **Abnormal idling – high idle (after warm-up)**

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫
SPECIFICATIONS	Mixture ratio		○	○		○	○			○		
	Ignition timing (too advanced)	○										
INTAKE SYSTEM	Air duct (leaks)		○									
	Throttle chamber (air leaks)				○							
	Throttle valve (stuck control wire)				○							
	Intake manifold (gasket) (air leaks)		○									
	Air regulator (stuck open)			○								
	A.A.C. valve							○				
	F.I.C.D. solenoid (remaining ON)								○			
CONTROL SYSTEM	Crank angle sensor										○	
	Air flow meter										○	
	Water temperature sensor										○	○
	Idle switch (remaining OFF)							○		○		
OTHERS	Battery (voltage too low)											

SERVICE PROCEDURE

❶ CHECK

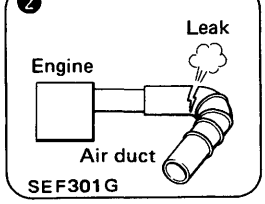


Check ignition timing.

N.G. ↓

Adjust ignition timing.
[See page EF & EC-31.]

❷ CHECK



Check intake system for air leaks.

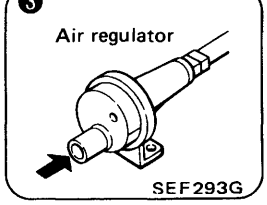
O.K. ↓

N.G. ↓

Check throttle wire for rough sliding.

Repair/replace the part.

❸ CHECK

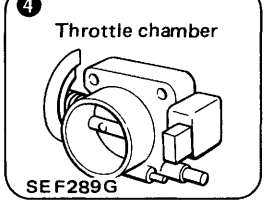


Make sure air regulator stays closed after warm-up.

N.G. ↓

Check air regulator and/or its circuit.
[See page EF & EC-116.]

❹ CHECK

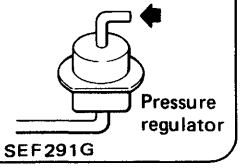


Check throttle chamber ports and valve for clogging.

N.G. ↓

Clean the ports and/or throttle valve.

❺ REMOVE



Remove vacuum hose from pressure regulator, and try to start.

Improved →

❻ MEASURE

Fuel pressure

Connect vacuum hose to pressure regulator and measure fuel pressure.

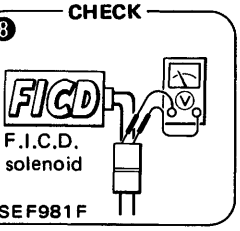
↓

Check Mixture ratio feedback system.
[See page EF & EC-139.]

❼ CHECK

Check A.A.C. valve and/or its circuit
[See page EF & EC-114.]

❽ CHECK



Check terminal voltage of F.I.C.D. solenoid while idling.

↓

Check the part and/or circuit.
[See HA section.]

❾ PERFORM

Self-diagnosis Mode IV

Perform self-diagnosis Mode IV (for idle switch).

N.G. ↓

Check the idle switch circuit.
[See page EF & EC-94.]

❿ PERFORM

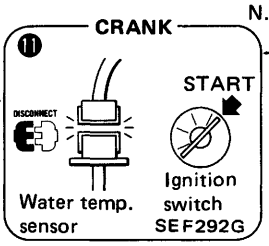
Self-diagnosis Mode III

Perform self-diagnosis Mode III (for water temp. sensor, crank angle sensor and air flow meter).

N.G. →

Check sensor circuit.
[See page EF & EC-86 (water temp. sensor), page EF & EC-82 (crank angle sensor), page EF & EC-84 (air flow meter).]

⓫ CRANK



Start with water temp. sensor connector disconnected.

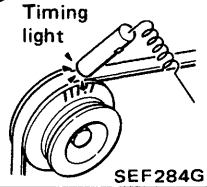
N.G. →

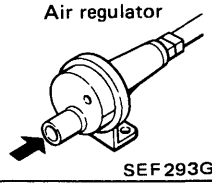
Diagnostic Table (Cont'd)

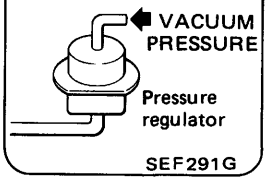
SYMPTOM & CONDITION 12 Unstable idling – before warm-up

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽
SPECIFICATIONS	Mixture ratio		○	○					
	Ignition timing	○							
INTAKE SYSTEM	Air regulator (not open enough)		○						
	A.A.C. valve				○				
CONTROL SYSTEM	Water temperature sensor							○	○
E.G.R. SYSTEM	E.G.R. control valve (stuck open)					○			
	E.G.R. solenoid (remaining OFF)					○	○		

SERVICE PROCEDURE

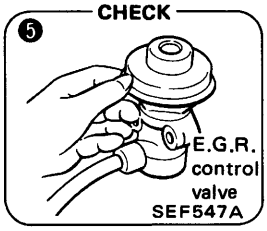
❶ CHECK
Timing light

SEF284G
N.G. → Adjust ignition timing. [See page EF & EC-31.]
Check ignition timing.

❷ CHECK
Air regulator

SEF293G
N.G. → Check air regulator and/or its circuit. [See page EF & EC-116.]
Make sure air regulator stays open before warm-up.

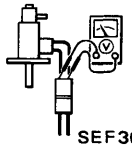
❸ APPLY


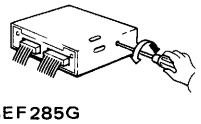
SEF291G
Improved → Check Mixture ratio feedback system. [See page EF & EC-139.]
Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and check idling.

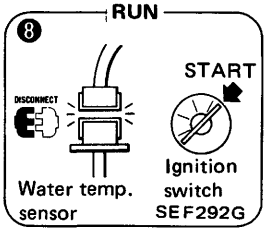
❹ CHECK
Check A.A.C. valve and/or its circuit. [See page EF & EC-114.]

❺ CHECK


SEF547A
Stays lifted
Check E.G.R. valve for operation.

❻ CHECK
E.G.R. solenoid

SEF303G
Check terminal voltage of E.G.R. solenoid while idling.
N.G. → Check the solenoid circuit. [See page EF & EC-124.]

❼ PERFORM
Self-diagnosis Mode III

SEF285G
N.G. → Check sensor circuit. [See page EF & EC-86.]
Perform self-diagnosis Mode III (for water temp. sensor).

❽ RUN


SEF292G
N.G.
Start and run engine with water temp. sensor connector disconnected.

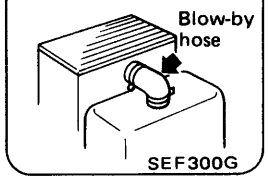
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 13 Unstable idling – after warm-up

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫	⓬
SPECIFICATIONS	Mixture ratio	○	○	○	○								
	Ignition sparks					○	○	○					
	Ignition timing								○				
	Compression pressure									○			
FUEL SYSTEM	Fuel line (clogged)												
	Canister (air leaks)			○									
	Pressure regulator control solenoid				○								
IGNITION SYSTEM	Power transistor					○		○					
	Ignition coil					○		○					
	Ignition wires					○	○	○					
INTAKE SYSTEM	Blow-by hose (leaks)	○											
	Air duct (leaks)		○										
CONTROL SYSTEM	Idle switch												○
E.G.R. SYSTEM	E.G.R. control valve										○		
	E.G.R. solenoid										○	○	

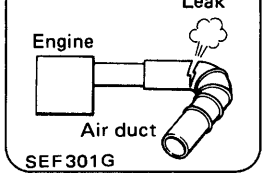
SERVICE PROCEDURE

❶ CHECK



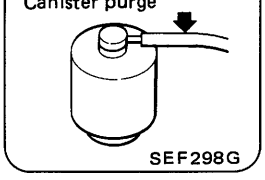
Check blow-by hose for leaks.
↓ N.G.
Repair/replace the hose.

❷ CHECK



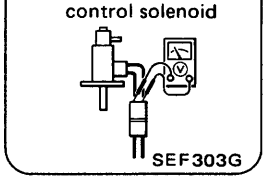
Check intake system for air leaks.
↓ N.G.
Repair/replace the part.

❸ CHECK



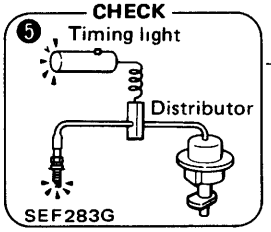
Check purge line for leaks.
↓ N.G.
Repair/replace the hose.

❹ CHECK



Check terminal voltage of the solenoid while idling.
↓ N.G.
Check the solenoid circuit.
[See page EF & EC-126.]

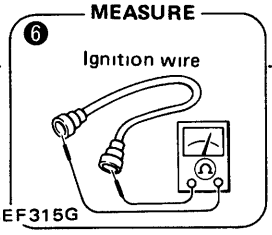
❺ CHECK



Check flashes of timing light for weakness.

N.G. →

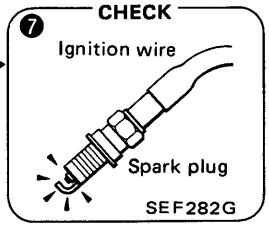
❻ MEASURE



Measure resistance of suspect wires.
↓ N.G.
Replace the wire.

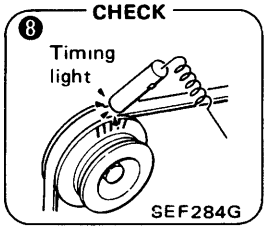
O.K. →

❼ CHECK



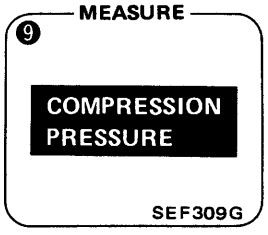
Remove spark plugs and check their ignition sparks.

❽ CHECK



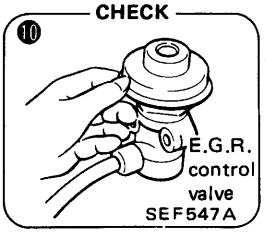
Check ignition timing.
↓ N.G.
Adjust ignition timing.
[See page EF & EC-31.]

❾ MEASURE



Measure compression pressure.
↓ N.G.
Check cylinder head and gasket.
[See EM section.]

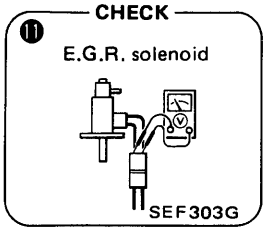
❿ CHECK



Check E.G.R. valve for operation.

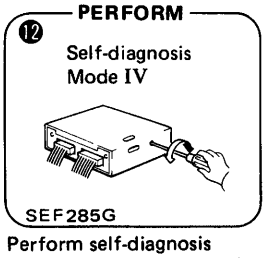
Stays lifted →

⓫ CHECK



Check terminal voltage of E.G.R. solenoid while idling.
↓ N.G.
Check the solenoid circuit.
[See page EF & EC-124.]

⓬ PERFORM



Perform self-diagnosis Mode IV (for idle switch).
↓ N.G.
Check the idle switch circuit.
[See page EF & EC-94.]

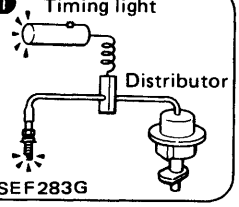
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 14 Poor driveability – stumble (while accelerating)

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾
SPECIFICATIONS	Mixture ratio				○		○	○		○
	Fuel pressure						○	○		
FUEL SYSTEM	Fuel filter (clogged)							○		
	Fuel line (clogged)							○		
	Injectors (clogged)							○		
IGNITION SYSTEM	Power transistor	○		○						
	Ignition coil	○		○						
	Ignition wires (ignition leaks)	○	○	○						
	Spark plugs (ignition leaks, improper gap)			○						
INTAKE SYSTEM	Air duct (leaks)				○					
CONTROL SYSTEM	Crank angle sensor	○							○	
	Air flow meter								○	
	Water temperature sensor	○							○	
	Exhaust gas sensor								○	○
	Idle switch (remaining OFF)					○				
OTHERS	Fuel (poor quality)									

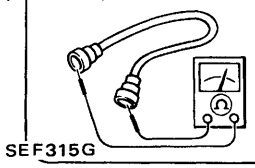
SERVICE PROCEDURE

❶ **CHECK** Timing light



Check flashes of timing light for weakness.

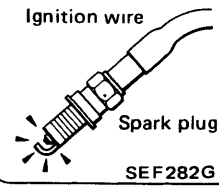
N.G. → ❷ **MEASURE** Ignition wire



Measure resistance of suspect wires.

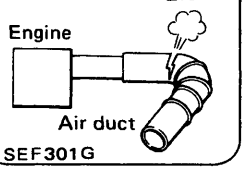
N.G. → Replace the wires.

O.K. → ❸ **CHECK** Ignition wire



Remove spark plugs and check their ignition sparks.

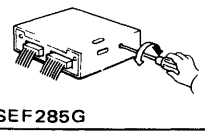
❹ **CHECK**



Check intake system for air leaks.

N.G. → Repair/replace the part.

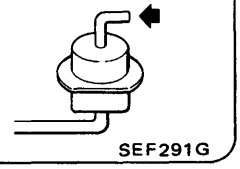
❺ **PERFORM** Self-diagnosis Mode IV



Perform self-diagnosis Mode IV (for idle switch).

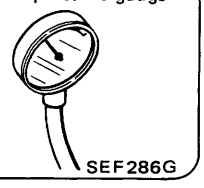
N.G. → Check the idle switch circuit. [See page EF & EC-94.]

❻ **REMOVE** Pressure regulator



Remove vacuum hose from pressure regulator, and try to drive.

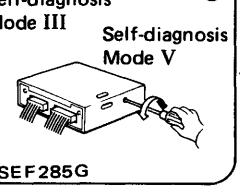
Improved → ❼ **MEASURE** Fuel pressure gauge



Connect vacuum hose to pressure regulator and measure fuel pressure while driving.

→ Check Mixture ratio feedback system. [See page EF & EC-139.]

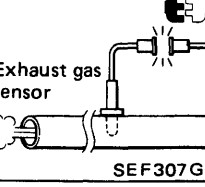
❽ **PERFORM** Self-diagnosis Mode III, Self-diagnosis Mode V



Perform self-diagnosis Mode III and V (for air flow meter and exhaust gas sensor).

N.G. → Check the malfunctioning parts and/or circuits. [See page EF & EC-84 (air flow meter), page EF & EC-102 (exhaust gas sensor).]

❾ **DISCONNECT**



Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check Mixture ratio feedback system. [See page EF & EC-139.]

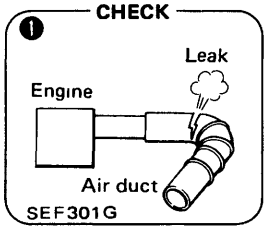
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 15 Poor driveability – surge (while cruising)

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾
SPECIFICATIONS	Mixture ratio (too lean)	○				○	○			○
	Fuel pressure (low)					○	○			
	Ignition timing		○							
IGNITION SYSTEM	(missing)								○	
INTAKE SYSTEM	Air duct (leaks)	○								
	Throttle chamber (air leaks)	○								
	Intake manifold (gasket) (air leaks)	○								
CONTROL SYSTEM	Crank angle sensor								○	
	Air flow meter								○	
	Exhaust gas sensor								○	○
	Idle switch							○		
E.G.R. SYSTEM	E.G.R. control valve (stuck open)			○						
	E.G.R. solenoid (remaining OFF)			○	○					
	E.G.R. vacuum hose (removed)			○						

SERVICE PROCEDURE

❶ **CHECK**

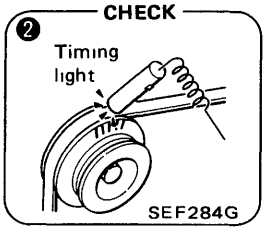


Check intake system for air leaks.

↓ N.G.

Repair/replace the part.

❷ **CHECK**

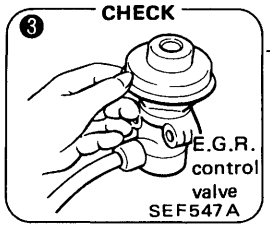


Check ignition timing.

↓ N.G.

Adjust ignition timing.
[See page EF & EC-31.]

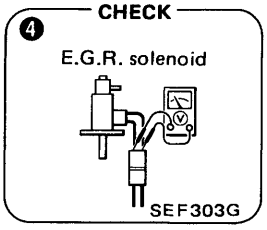
❸ **CHECK**



Check E.G.R. valve for operation.

Stays lifted →

❹ **CHECK**

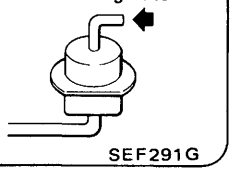


Check terminal voltage of E.G.R. solenoid.

↓ N.G.

Check the solenoid circuit.
[See page EF & EC-124.]

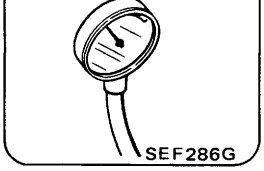
❺ **REMOVE**



Remove vacuum hose from pressure regulator, and try to drive.

Improved →

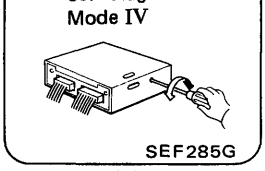
❻ **MEASURE**



Connect vacuum hose to pressure regulator and measure fuel pressure while driving.

→ Check Mixture ratio feedback system.
[See page EF & EC-139.]

❼ **PERFORM**

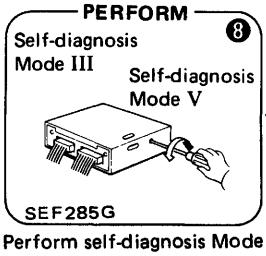


Perform self-diagnosis Mode IV (for idle switch).

↓ N.G.

Check the idle switch circuit.
[See page EF & EC-94.]

❽ **PERFORM**

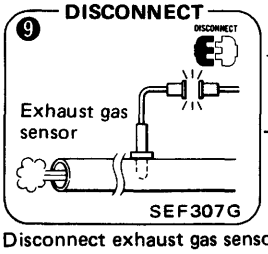


Perform self-diagnosis Mode III and V (for crank angle sensor, air flow meter, ignition signal and exhaust gas sensor).

N.G. →

Check the malfunctioning parts and/or circuits.
[See page EF & EC-82 (crank angle sensor), page EF & EC-84 (air flow meter), page EF & EC-90 (ignition signal), page EF & EC-102 (exhaust gas sensor).]

❾ **DISCONNECT**



Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check mixture ratio feedback system.
[See page EF & EC-139.]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 16 Poor driveability – lack of power

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫
SPECIFICATIONS	Fuel pressure								○	○		
	Ignition timing		○									
	Compression pressure (too low)							○				
FUEL SYSTEM	Fuel pump (low fuel output)									○		
	Fuel filter (clogged)									○		
	Fuel line (clogged)									○		
	Injectors (clogged)									○		
IGNITION SYSTEM	Ignition wires (ignition leaks)				○	○	○					
	Spark plugs (improper gap)						○					
INTAKE SYSTEM	Air cleaner element (clogged)	○										
	Throttle chamber (clogged)			○								
	Throttle valve (not open enough)			○								
CONTROL SYSTEM	Air flow meter										○	
	Exhaust gas sensor											○

SERVICE PROCEDURE

❶ CHECK
AIR CLEANER ELEMENT
SEF320G
Check air cleaner element for clogging.
N.G.
Replace the part.

❷ CHECK
Timing light
SEF284G
Check ignition timing with a timing light.
N.G.
Adjust ignition timing.
[See page EF & EC-31.]

❸ CHECK
Throttle chamber
Throttle valve
SEF290G
Check throttle valve for rough movement.
N.G.
Repair/replace the part.

❹ CHECK
Timing light
Distributor
SEF283G
Check flashes of timing light for weakness.
N.G.

❺ MEASURE
Ignition wire
SEF315G
Measure resistance of suspect wires.
N.G.
Replace the wires.

O.K.

❻ CHECK
Ignition wire
Spark plug
SEF282G
Remove spark plugs and check their ignition sparks.

❼ MEASURE
COMPRESSION PRESSURE
SEF309G
Measure compression pressure.
→ Check cylinder head and gasket.
[See EM section.]

❽ REMOVE
Pressure regulator
SEF291G
Remove vacuum hose from pressure regulator, and try to drive.

Improved

❾ MEASURE
Fuel pressure gauge
SEF286G
Connect vacuum hose to pressure regulator and measure fuel pressure while driving.
Check Mixture ratio feedback system.
[See page EF & EC-139.]

❿ PERFORM
Self-diagnosis Mode III
Self-diagnosis Mode V
SEF285G
Perform self-diagnosis Mode III and V (for air flow meter).
N.G.
Check the malfunctioning parts and/or circuit.
[See page EF & EC-84.]

⓫ DISCONNECT
Exhaust gas sensor
SEF307G
Disconnect exhaust gas sensor connector, and try to drive.
No change
Improved
Replace the sensor.
Check Mixture ratio feedback system.
[See page EF & EC-139.]

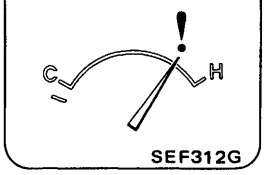
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 17 Poor driveability – detonation

POSSIBLE CAUSES		❶	❷	❸	❹	❺
SPECIFICATIONS	Mixture ratio (too lean)			○	○	
	Fuel pressure (low)			○		
	Ignition timing (too advanced)		○			
FUEL SYSTEM	Fuel filter (clogged)				○	
	Fuel line (clogged)				○	
	Injectors (clogged)				○	
CONTROL SYSTEM	Crank angle sensor (improper 1°-signals)					○
	Air flow meter					○
	Water temperature sensor					○
OTHERS	Water temperature (too high)	○				
	Fuel (low octane rating, poor quality)					

SERVICE PROCEDURE

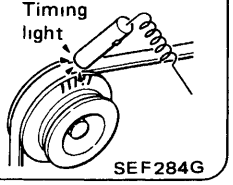
❶ **CHECK** Water temperature



Too high → Check cooling system. [See LC section.]

Check water temperature.

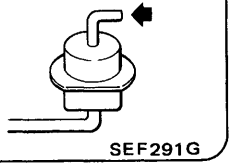
❷ **CHECK** Timing light



N.G. → Adjust ignition timing. [See page EF & EC-31.]

Check ignition timing.

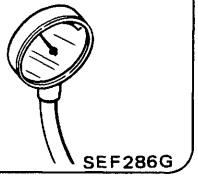
❸ **REMOVE** Pressure regulator



Improved →

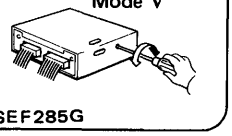
Remove vacuum hose from pressure regulator, and try to drive.

❹ **MEASURE** Fuel pressure gauge



Connect vacuum hose to pressure regulator, and measure fuel pressure while driving.

❺ **PERFORM** Self-diagnosis Mode III, Self-diagnosis Mode V



N.G. → Check the malfunctioning parts. [See page EF & EC-82 (crank angle sensor), page EF & EC-84 (air flow meter).]

Perform self-diagnosis Mode III and V (for crank angle sensor and air flow meter).

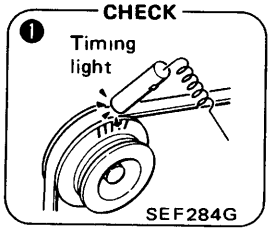
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 18 Engine stall – during start-up

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾
SPECIFICATIONS	Mixture ratio (too rich/too lean)							○	○	○
	Ignition sparks (weak)			○	○					
	Ignition timing	○								
	Compression pressure (too low)						○			
FUEL SYSTEM	Canister (too much evaporation to intake)							○		
IGNITION SYSTEM	Ignition wires (ignition leaks)			○	○	○				
	Spark plugs (wet with fuel, improper gap)					○				
INTAKE SYSTEM	Throttle valve (not open enough)		○							

SERVICE PROCEDURE

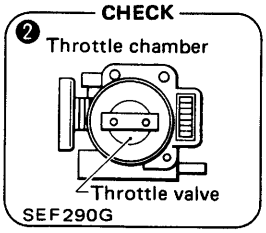
❶ CHECK — Timing light



Check ignition timing.

N.G. → Adjust ignition timing. [See page EF & EC-31.]

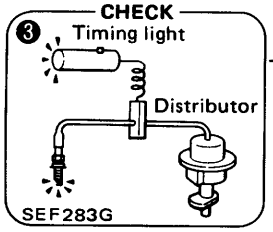
❷ CHECK — Throttle chamber



Check throttle valve for rough movement.

N.G. → Repair/replace the part.

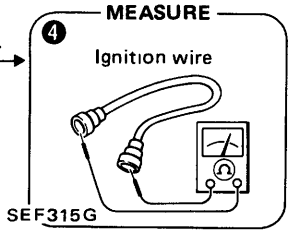
❸ CHECK — Timing light, Distributor



Check flashes of timing light for weakness.

N.G. →

❹ MEASURE — Ignition wire

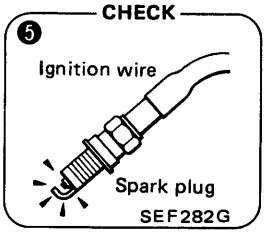


Measure resistance of ignition wires.

N.G. → Replace the wires.

O.K. →

❺ CHECK — Ignition wire, Spark plug



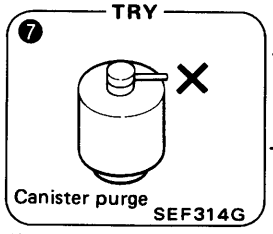
Remove spark plugs and check their ignition sparks.

❻ MEASURE — COMPRESSION PRESSURE

Measure compression pressure.

Check cylinder head and gasket. [See EM section.]

❼ TRY

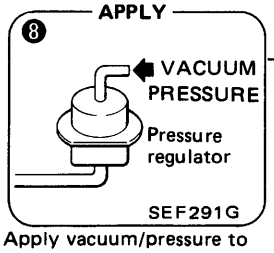


Shut evaporated fuel to intake valve and try to drive.

Improved → Replace the canister and/or the hoses.

No change →

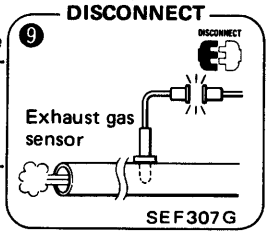
❽ APPLY — VACUUM PRESSURE, Pressure regulator



Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and try to drive.

Improved → Check Mixture ratio feedback system. [See page EF & EC-139.]

❾ DISCONNECT — Exhaust gas sensor



Disconnect exhaust gas sensor connector and try to drive.

No change ← Improved ← Replace the sensor.

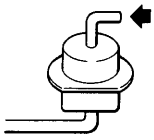
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 19 Engine stall – while idling

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾
SPECIFICATIONS	Mixture ratio (too rich/too lean)	○	○							
	Fuel pressure (low)	○	○							
	Ignition sparks (weak, missing)				○					
	Idle speed (low)			○						
FUEL SYSTEM	Fuel line (clogged)		○							
IGNITION SYSTEM	Spark plugs (wet with fuel, improper gap)					○	○			
INTAKE SYSTEM	A.A.C. valve			○				○		
	F.I.C.D. solenoid (improper operation)			○					○	
CONTROL SYSTEM	Idle switch (remaining OFF)									○
	Neutral switch (remaining OFF)			○						

SERVICE PROCEDURE

❶ REMOVE
Pressure regulator



Remove vacuum hose from pressure regulator, and check idling.

Improved →

❷ MEASURE
Fuel pressure gauge

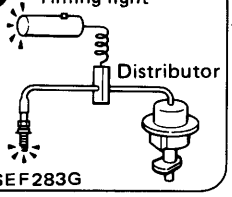
Connect vacuum hose to pressure regulator and measure fuel pressure.

→ Check Mixture ratio feedback system.
[See page EF & EC-139.]

❸ MEASURE
Tachometer

Measure idle speed.
↓ N.G.
Adjust idle speed.
[See page EF & EC-31.]

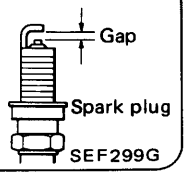
❹ CHECK
Timing light



Check flashes of timing light for weakness.

N.G. →

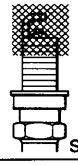
❺ CHECK



Remove spark plugs and check their gaps and tips.

and/or

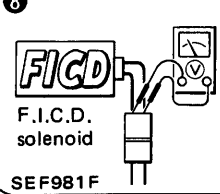
❻ CHECK
Spark plug



Check spark plugs for being foul or wet with fuel.

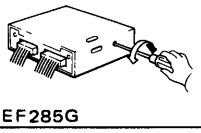
❼ CHECK
Check A.A.C. valve and/or its circuit.
[See page EF & EC-114.]

❽ CHECK



Check terminal voltage of F.I.C.D. solenoid.
↓ N.G.
Check the part and/or circuit.
[See HA section.]

❾ PERFORM
Self-diagnosis Mode IV



Perform self-diagnosis Mode IV (for idle switch).

N.G. → Check the idle switch circuit.
[See page EF & EC-94.]

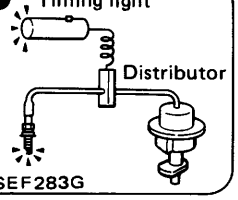
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 20 Engine stall – while accelerating

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼
SPECIFICATIONS	Mixture ratio					○	○	
	Ignition sparks (weak, missing)	○	○	○				
	Compression pressure (low)				○			
CONTROL SYSTEM	Crank angle sensor	○						○
	Air flow meter							○
	Exhaust gas sensor					○	○	

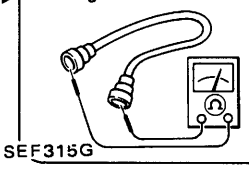
SERVICE PROCEDURE

❶ CHECK Timing light



Check flashes of timing light for weakness during acceleration.

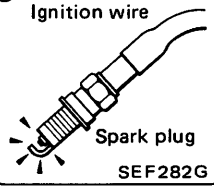
N.G. → **❷ MEASURE** Ignition wire



Measure resistance of suspect wires.

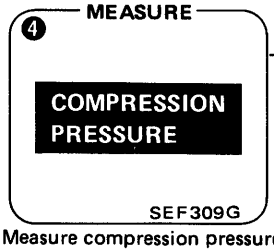
N.G. → Replace the wires.

O.K. → **❸ CHECK** Ignition wire



Remove spark plugs and check their ignition sparks.

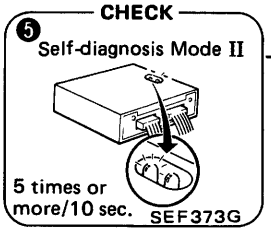
❹ MEASURE COMPRESSION PRESSURE



Measure compression pressure.

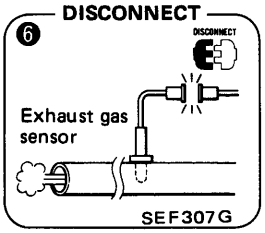
N.G. → Check cylinder head and gasket. [See EM section.]

❺ CHECK Self-diagnosis Mode II



Check mixture ratio by flashes of inspection lamps.

N.G. → **❻ DISCONNECT**

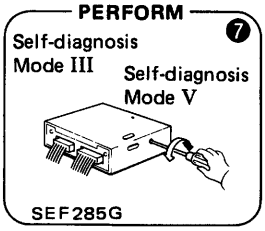


Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check Mixture ratio feedback system. [See page EF & EC-139.]

❼ PERFORM Self-diagnosis Mode III, Self-diagnosis Mode V



Perform self-diagnosis Mode III and V (for crank angle sensor and air flow meter).

N.G. → Check the malfunctioning parts and/or circuits. [See page EF & EC-82 (crank angle sensor), page EF & EC-84 (air flow meter).]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 21 Engine stall – while cruising

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio				○	○	
	Ignition sparks (weak, missing)	○	○	○			
CONTROL SYSTEM	Crank angle sensor						○
	Air flow meter						○

SERVICE PROCEDURE

❶ CHECK — Timing light, Distributor — SEF283G

Check flashes of timing light for weakness at constant engine rev. (1,000 to 2,000 rpm).

N.G. →

❷ MEASURE — Ignition wire — SEF315G

Measure resistance of suspect wires.

N.G. → Replace the wires.

O.K. →

❸ CHECK — Ignition wire, Spark plug — SEF282G

Remove spark plugs and check their ignition sparks.

❹ CHECK — Self-diagnosis Mode II — 5 times or more/10 sec. — SEF373G

Check mixture ratio by flashes of inspection lamps.

N.G. →

❺ DISCONNECT — Exhaust gas sensor — SEF307G

Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check Mixture ratio feedback system. [See page EF & EC-139.]

❻ PERFORM — Self-diagnosis Mode III, Self-diagnosis Move V — SEF285G

Perform self-diagnosis Mode III and V (for air flow meter and crank angle sensor).

N.G. → Check the circuits. [See page EF & EC-82 (crank angle sensor), page EF & EC-84 (air flow meter).]

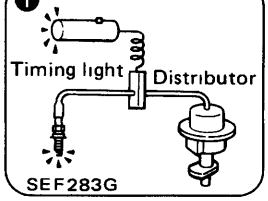
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 22 Engine stall – while decelerating/just after stopping

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio					○	○
	Ignition sparks (missing)	○					
	Idle speed (too low)			○			
IGNITION SYSTEM	(missing)	○	○				
INTAKE SYSTEM	A.A.C. valve			○	○		
CONTROL SYSTEM	Exhaust gas sensor (malfunctioning feedback control)					○	○
	Crank angle sensor		○				
	Idle switch (remaining OFF)			○			

SERVICE PROCEDURE

❶ **CHECK**

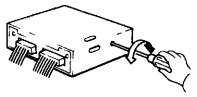


Check flashes of timing light while decreasing engine speed.

N.G. →

❷ **PERFORM**

Self-diagnosis Mode V



Perform self-diagnosis Mode V (for ignition signal and crank angle sensor).

N.G. → Check the malfunctioning parts and/or circuits. [See page EF & EC-90 (ignition siglal), page EF & EC-82 (crank angle sensor).]

❸ **MEASURE**

Tachometer

Measure idle speed.

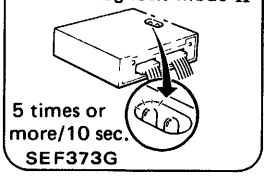
N.G. → Adjust idle speed. [See page EF & EC-31.]

❹ **CHECK**

Check A.A.C. valve and/or its circuit. [See page EF & EC-114.]

❺ **CHECK**

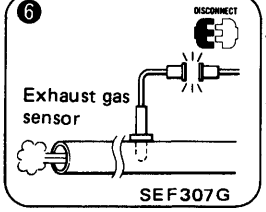
Self-diagnosis Mode II



Check mixture ratio by flashes of inspection lamps.

N.G. →

❻ **DISCONNECT**



Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check Mixture ratio feedback system. [See page EF & EC-139.]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 23 Engine stall – while loading

POSSIBLE CAUSES		❶	❷	❸	❹	❺
SPECIFICATIONS	Ignition timing		○			
	Idle speed (too low)	○				
INTAKE SYSTEM	A.A.C. valve	○		○		
	F.I.C.D. solenoid (remaining OFF)	○			○	
CONTROL SYSTEM	Idle switch (remaining OFF)	○				○

SERVICE PROCEDURE

❶ MEASURE

Tachometer

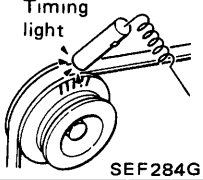
SEF316G

Measure idle speed.

N.G. → Adjust idle speed. [See page EF & EC-31.]

❷ CHECK

Timing light



SEF284G

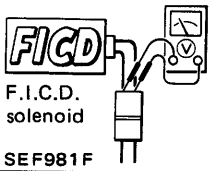
Check ignition timing.

N.G. → Adjust ignition timing. [See page EF & EC-31.]

❸ CHECK

Check A.A.C. valve and/or its circuit. [See page EF & EC-114.]

❹ CHECK



F.I.C.D. solenoid

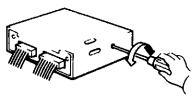
SEF981F

Check terminal voltage of F.I.C.D. solenoid.

→ Check the part and/or circuit. [See HA section.]

❺ PERFORM

Self-diagnosis Mode IV



SEF285G

Perform self-diagnosis Mode IV (for idle switch).

N.G. → Check the idle switch circuit. [See page EF & EC-94.]

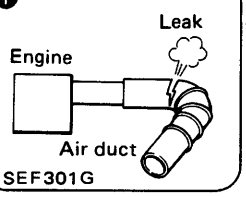
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 24 **Backfire – through the intake**

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼
SPECIFICATIONS	Mixture ratio (too lean)	○		○		○	○	
	Ignition timing (too retarded)		○					
FUEL SYSTEM	Injectors (clogged)				○			
INTAKE SYSTEM	Air duct (air leaks)	○						
	Intake manifold (gaskets) (air leaks)	○						
CONTROL SYSTEM	Air flow meter							○
	Exhaust gas sensor					○	○	

SERVICE PROCEDURE

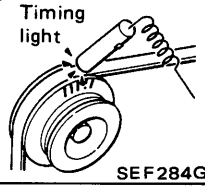
CHECK ❶



N.G. → Repair/replace the part.

Check intake system for air leaks.

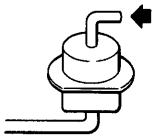
CHECK ❷



N.G. → Adjust ignition timing. [See page EF & EC-31.]

Check ignition timing.

REMOVE ❸



Improved → Check Mixture ratio feedback system. [See page EF & EC-139.]

Remove vacuum hose from pressure regulator, and try to drive.

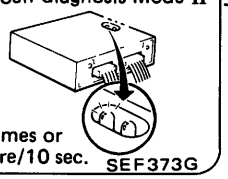
No change ↓

or

CLEAN ❹

Clean the injector.

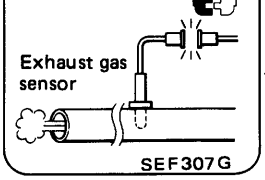
PERFORM ❺



N.G. →

Check mixture ratio by flashes of inspection lamps.

DISCONNECT ❻

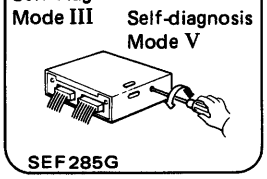


Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check Mixture ratio feedback system. [See page EF & EC-139.]

CHECK ❼



Perform self-diagnosis Mode III and V (for air flow meter).

N.G. ↓

Check the circuits. [See page EF & EC-84 (air flow meter).]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 25 Backfire – through the exhaust

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio (too rich)	○	○				
FUEL SYSTEM	Injectors (fuel leaks)		○				
IGNITION SYSTEM	(missing)				○		
INTAKE SYSTEM	Air cleaner element (clogged)	○					
	A.I.V. (always operating)					○	
	A.I.V. solenoid (remaining ON)					○	○
CONTROL SYSTEM	Idle switch (remaining OFF)			○			

SERVICE PROCEDURE

❶ CHECK
AIR CLEANER ELEMENT
SEF320G
Check air cleaner element for clogging.
N.G. → Replace the element.

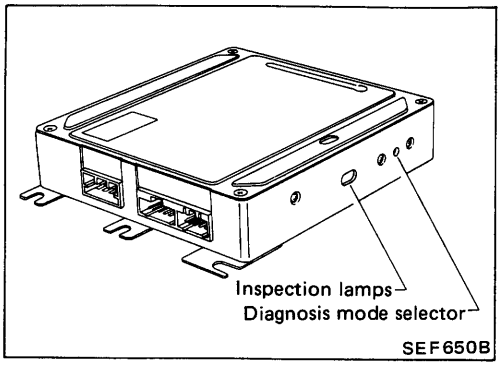
❷ APPLY
PRESSURE
Pressure regulator
SEF291G
Apply pressure to pressure regulator after disconnecting vacuum hose, and try to drive.
Improved → Check Mixture ratio feedback system. [See page EF & EC-139.]

❸ PERFORM
Self-diagnosis Mode IV
SEF285G
Perform self-diagnosis Mode IV (for idle switch).
N.G. → Check idle switch and/or its circuit. [See page EF & EC-94.]

❹ PERFORM
Self-diagnosis Mode V
SEF285G
Perform self-diagnosis Mode V (for ignition signal).
N.G. → Check the malfunctioning part and/or circuit. [See page EF & EC-90 (ignition signal).]

❺ CHECK
A.I.V.
SEF375G
Check secondary air to exhaust system.
Keeps flowing →

❻ CHECK
A.I.V. solenoid
SEF372G
Check terminal voltage of A.I.V. solenoid.
Left ON → Check the solenoid circuit. [See page EF & EC-122.]



Description

The self-diagnosis is useful to diagnose malfunctions in major sensors and actuators of the E.C.C.S. system. There are 5 modes in the self-diagnosis system.

1. **Mode I – Mixture ratio feedback control monitor A**

- During closed loop condition:
  The green inspection lamp turns ON when lean condition is detected and goes OFF by rich condition.
- During open loop condition:
  The green inspection lamp remains ON or OFF.

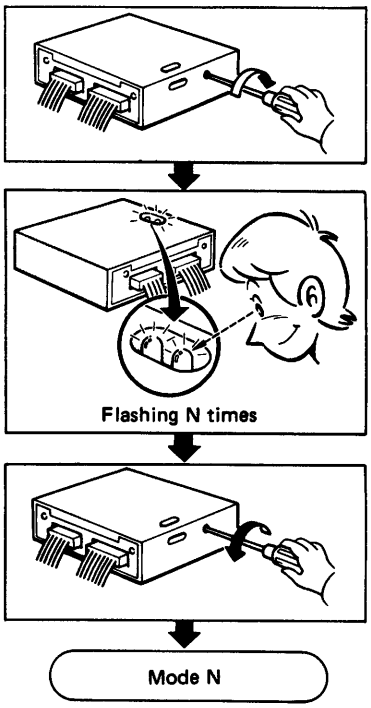
2. **Mode II – Mixture ratio feedback control monitor B**
   The green inspection lamp function is the same as Mode I.

- During closed loop condition:
  The red inspection lamp turns ON and OFF simultaneously with the green inspection lamp when the mixture ratio is controlled within the specified value.
- During open loop condition:
  The red inspection lamp remains ON or OFF.

3. **Mode III – Self-diagnosis**
   This mode is the same as the former self-diagnosis in self-diagnosis mode.
4. **Mode IV – Switches ON/OFF diagnosis**
   During this mode, the inspection lamps monitor the switch ON-OFF condition.

- Idle switch
- Starter switch
- Vehicle speed sensor

5. **Mode V – Real time diagnosis**
   The moment the malfunction is detected, the display will be presented immediately. That is, the condition at which the malfunction occurs can be found by observing the inspection lamps during driving test.

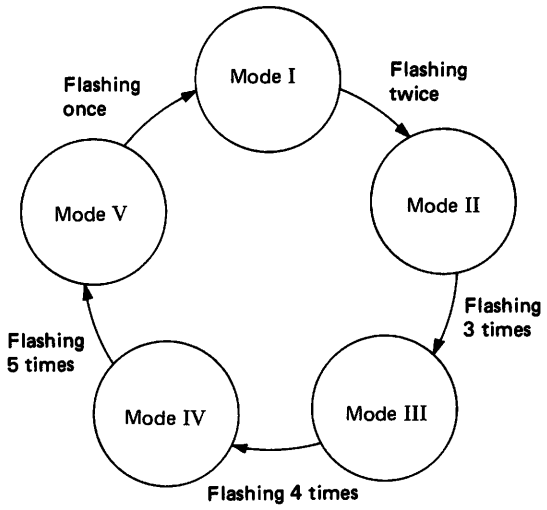


SEF872D

Description (Cont'd)

SWITCHING THE MODES

1. Turn ignition switch "ON".
2. Turn diagnostic mode selector on E.C.U. fully clockwise and wait the inspection lamps flash.
3. Count the number of the flashing time, and after the inspection lamps have flashed the number of the required mode, turn diagnostic mode selector fully counterclockwise immediately.



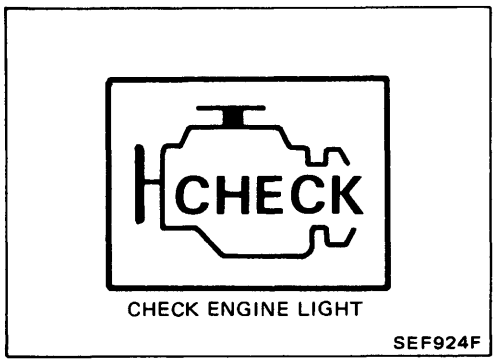
SEF989D

NOTE:

When the ignition switch is turned off during diagnosis, in each mode, and then turned back on again after the power to the E.C.U. has dropped off completely, the diagnosis will automatically return to Mode I.

The stored memory would be lost if:

1. Battery terminal is disconnected.
2. After selecting Mode III, Mode IV is selected.
   However, if the diagnostic mode selector is kept turned fully clockwise, it will continue to change in the order of Mode I → II → III → IV → V → I ... etc., and in this state the stored memory will not be erased.



CHECK ENGINE LIGHT
SEF924F

Description (Cont'd)

CHECK ENGINE LIGHT (For California only)

This vehicle has a check engine light on instrument panel. This light comes ON under the following conditions:

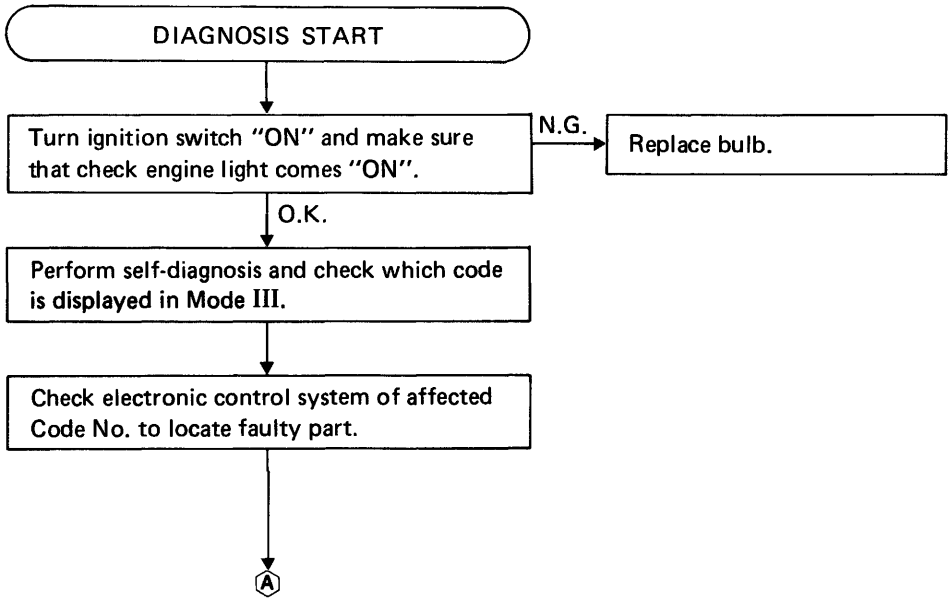
1) When ignition switch is turned "ON" (for bulb check).
2) When systems related to emission performance malfunction in Mode I (with engine running).

- **This check engine light always illuminates and is synchronous with red L.E.D.**
- **Malfunction systems related to emission performance can be detected by self-diagnosis, and they are clarified as self-diagnostic codes in Mode III.**

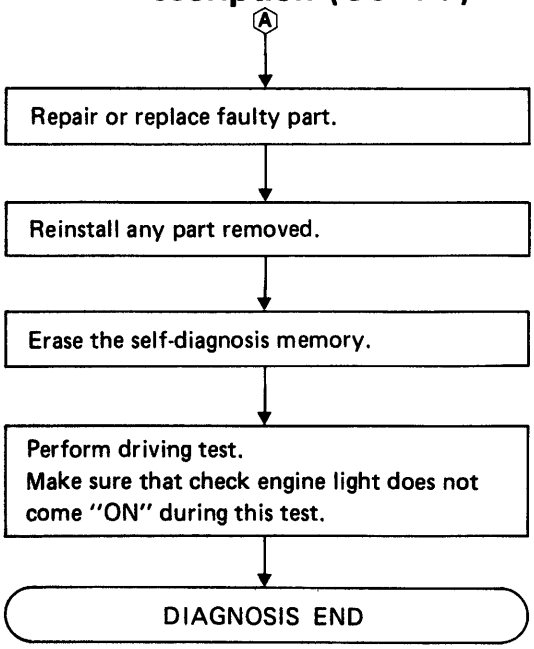
3) Check engine light will be "ON" only when malfunction is sensed.
   The check engine light will turn off when normal operation is resumed. Mode III memory must be cleared as the contents remain stored.

Code No.	Malfunction
12	Air flow meter circuit
13	Water temperature sensor circuit
14	Vehicle speed sensor circuit
23	Idle switch circuit
24	Full switch circuit
31	Engine control unit
32	E.G.R. function
33	Exhaust gas sensor circuit
35	Exhaust gas temperature sensor circuit
41	Air temperature sensor circuit
45	Injector leak

Use the following diagnostic flowchart to check and repair a malfunctioning system.



Description (Cont'd)



- **After repairs, test drive to check that check engine light does not come on.**
- **Test driving modes differ with systems. Read the manual before test driving.**

Modes I & II — Mixture Ratio Feedback Control Monitors A & B

In these modes, the control unit provides the Air-fuel ratio monitor presentation and the Air-fuel ratio feedback coefficient monitor presentation.

<table>
<tr><th rowspan="2">Mode</th><th rowspan="2">LED</th><th rowspan="2">Engine stopped (Ignition switch "ON")</th><th colspan="4">Engine running</th></tr>
<tr><th>Open loop condition</th><th colspan="3">Closed loop condition</th></tr>
<tr><td rowspan="2">Mode I (MonitorA)</td><td>Green</td><td>ON</td><td>*Remains ON or OFF</td><td colspan="3">Blinks</td></tr>
<tr><td>Red</td><td>ON</td><td>Except for California model
• OFF</td><td colspan="3">For California model
• ON: When the following malfunctions are stored in the E.C.U.:
Air flow meter, water temperature sensor, vehicle speed sensor, idle switch, full switch, E.C.U., E.G.R. function, exhaust gas sensor, exhaust gas temperature sensor, air temperature sensor, injector leak
• OFF: except for the above condition</td></tr>
<tr><td rowspan="3">Mode II (Monitor B)</td><td>Green</td><td>ON</td><td>*Remains ON or OFF</td><td colspan="3">Blinks</td></tr>
<tr><td rowspan="2">Red</td><td rowspan="2">OFF</td><td rowspan="2">*Remains ON or OFF (synchronous with green LED)</td><td colspan="3">Compensating mixture ratio</td></tr>
<tr><td>More than 5% rich</td><td>Between 5% lean and 5% rich</td><td>More</td></tr>
<tr><td></td><td></td><td></td><td>OFF</td><td>Synchronized with green LED</td><td>Remains ON</td></tr>
</table>

*: Maintains conditions just before switching to open loop

Mode III — Self-diagnostic System

The E.C.U. constantly monitors the function of these sensors and actuators, regardless of ignition key position. If a malfunction occurs, the information is stored in the E.C.U. and can be retrieved from the memory by turning on the diagnostic mode selector, located on the side of the E.C.U. When activated, the malfunction is indicated by flashing a red and a green L.E.D. (Light Emitting Diode), also located on the E.C.U. Since all the self-diagnostic results are stored in the E.C.U.'s memory even intermittent malfunctions can be diagnosed.

A malfunctioning part's group is indicated by the number of both the red and the green L.E.D.s flashing. First, the red L.E.D. flashes and the green flashes follow. The red L.E.D. refers to the number of tens while the green one refers to the number of units. For example, when the red L.E.D. flashes once and then the green one flashes twice, this means the number "12" showing the air flow meter signal is malfunctioning. In this way, all the problems are classified by the code numbers.

- **When engine fails to start, crank engine more than two seconds before starting self-diagnosis.**
- **Before starting self-diagnosis, do not erase stored memory. If doing so, self-diagnosis function for intermittent malfunctions would be lost.**

The stored memory would be lost if:

1. **Battery terminal is disconnected.**
2. **After selecting Mode III, Mode IV is selected.**

DISPLAY CODE TABLE

Code No.	Detected items	California model	Non-California model
11	Crank angle sensor circuit	X	X
12	Air flow meter circuit	X	X
13	Water temperature sensor circuit	X	X
14	Vehicle speed sensor circuit	X	X
21	Ignition signal missing in primary coil	X	X
22	Fuel pump circuit	X	X
23	Idle switch circuit	X	X
24	Full switch circuit	X	X
31	E.C.U.	X	X
32	E.G.R. function	X	–
33	Exhaust gas sensor circuit	X	X
35	Exhaust gas temperature sensor circuit	X	–
41	Air temperature sensor circuit	X	X
45	Injector leak	X	–
55	No malfunctioning in the above circuit	X	X

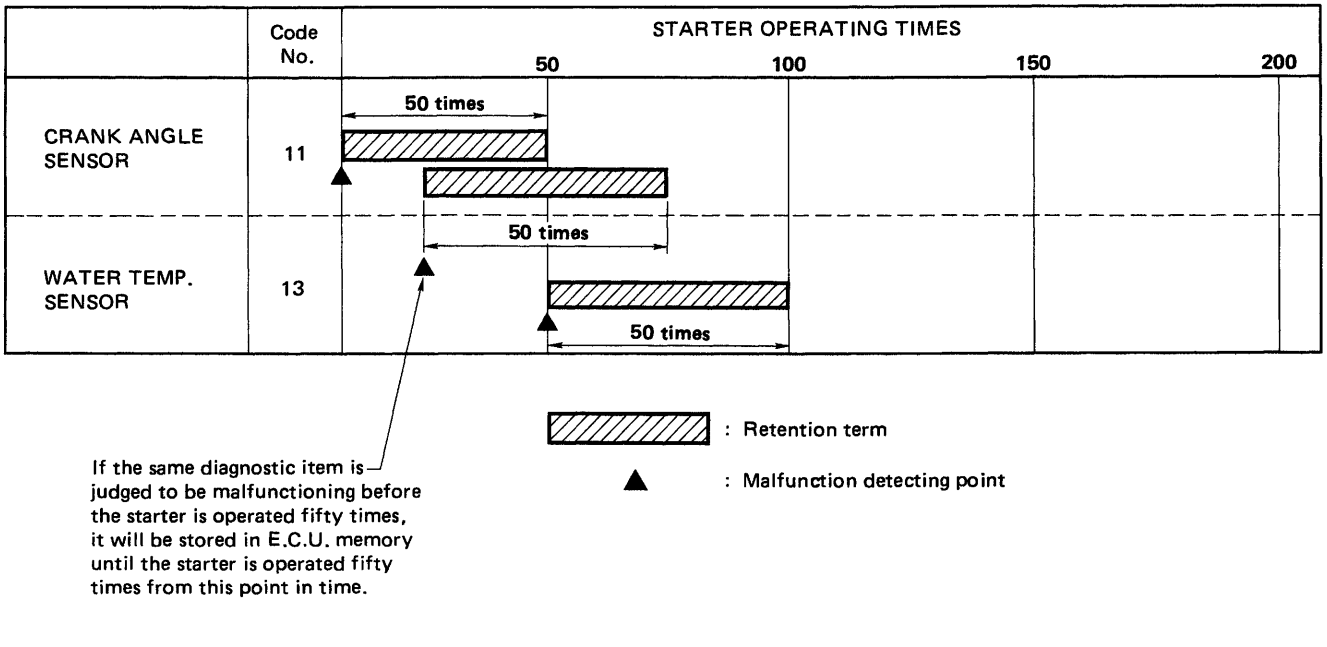
X: Available
–: Not available

Mode III — Self-diagnostic System (Cont'd)

RETENTION OF DIAGNOSTIC RESULTS

The diagnostic result is retained in E.C.U. memory until the starter is operated fifty times after a diagnostic item is judged to be malfunctioning. The diagnostic result will then be cancelled 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.

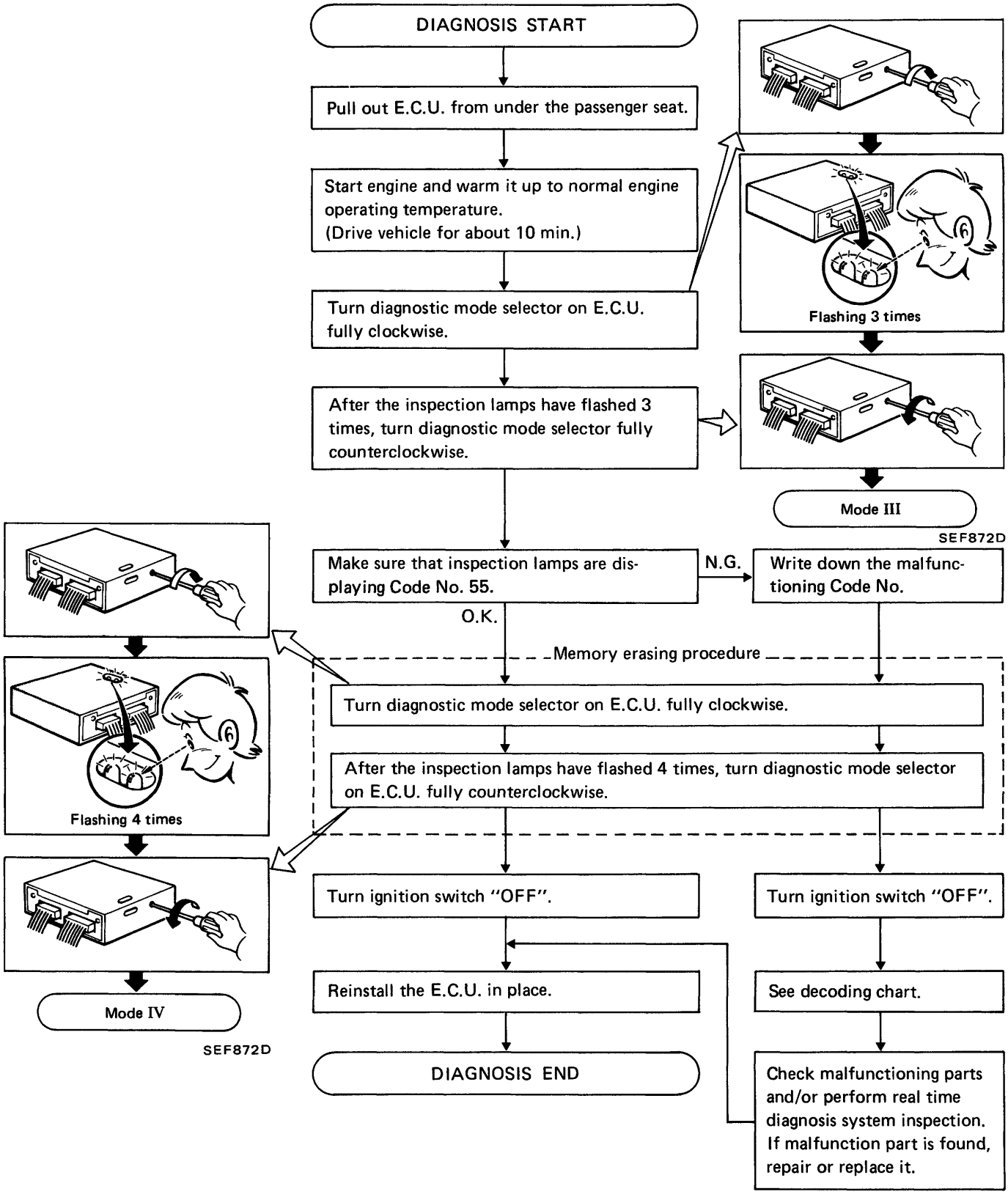
RETENTION TERM CHART (Example)



SEF793D

Mode III — Self-diagnostic System (Cont'd)

SELF-DIAGNOSTIC PROCEDURE

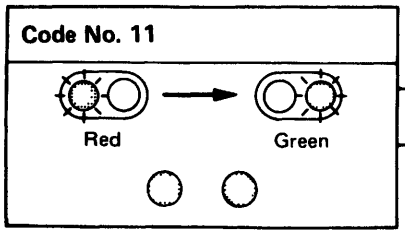
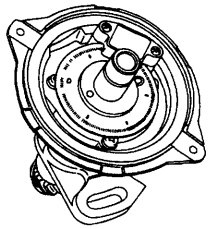
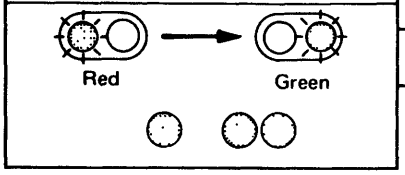
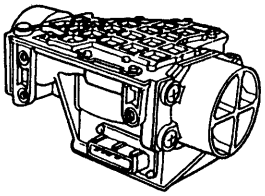
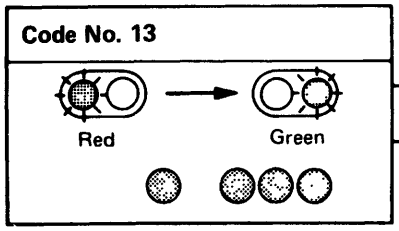
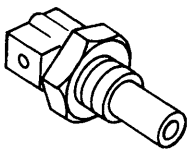
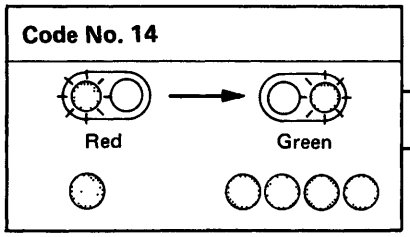
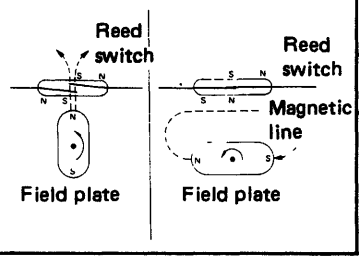


CAUTION:

During displaying Code No. in self-diagnosis mode (Mode III), if the other diagnostic mode should be done, make sure to write down the malfunctioning Code No. before turning diagnostic mode selector on E.C.U. fully clockwise, or select the diagnostic mode after turning switch "OFF". Otherwise self-diagnosis information stored in E.C.U. memory until now would be lost.

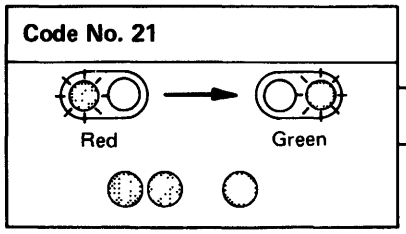
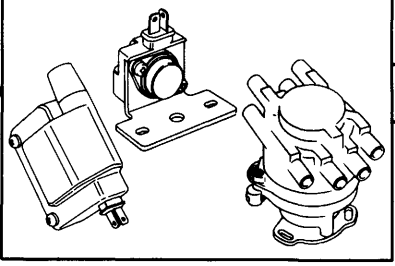
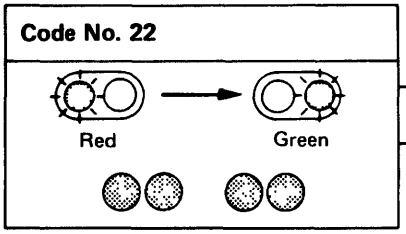
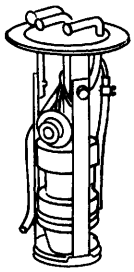
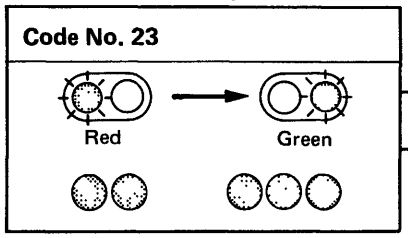
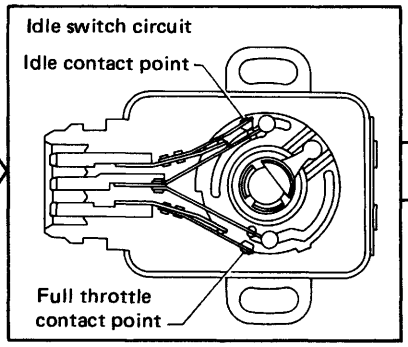
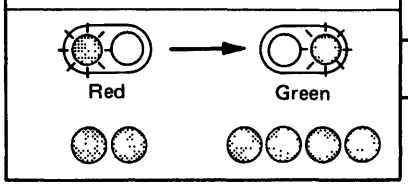
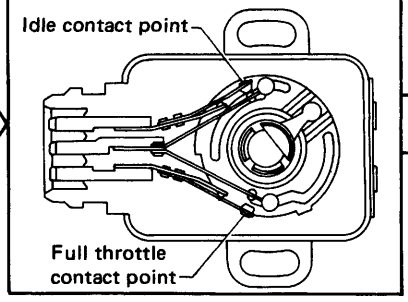
Mode III — Self-diagnostic Procedure

DECODING CHART

Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.
CRANK ANGLE SENSOR **Code No. 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. SYSTEM INSPECTION See page EF & EC-82.
SEF990D		
AIR FLOW METER CHECK **Code No. 12** 	Air flow meter circuit 	• The air flow meter circuit is open or shorted. (An abnormally high or low voltage is entered.) SYSTEM INSPECTION See page EF & EC-84.
SEF991D		
WATER TEMPERATURE SENSOR CHECK **Code No. 13** 	Water temperature sensor circuit. 	• The water temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.) SYSTEM INSPECTION See page EF & EC-86.
SEF992D		
VEHICLE SPEED SENSOR CHECK **Code No. 14** 	Vehicle speed sensor circuit Magnetic line 	• Signal circuit is open. SYSTEM INSPECTION See page EF & EC-88.
SEF928F		

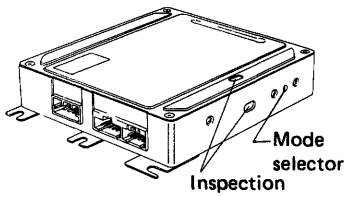
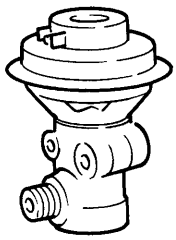
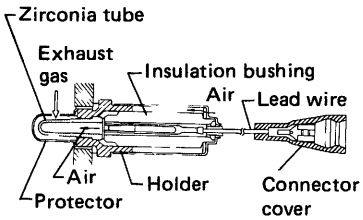
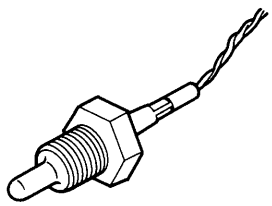
Mode III — Self-diagnostic Procedure (Cont'd)

DECODING CHART

Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.
IGNITION SIGNAL **Code No. 21** 	Ignition signal circuit 	• The ignition signal in primary circuit is not entered during engine cranking or running. SYSTEM INSPECTION See page EF & EC-90.
SEF993D		
FUEL PUMP **Code No. 22** 	Fuel pump circuit 	• The fuel pump circuit is open or shorted. (An abnormally high or low current has entered.) SYSTEM INSPECTION See page EF & EC-92.
SEF994D		
IDLE SWITCH (CHECK) **Code No. 23** 	Idle switch circuit 	• Signal circuit is open. SYSTEM INSPECTION See page EF & EC-94.
SEF929F		
FULL SWITCH (CHECK) **Code No. 24** 	Full switch circuit 	• Signal circuit is shorted. SYSTEM INSPECTION See page EF & EC-94.
SEF930F		

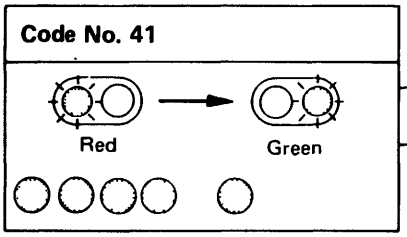
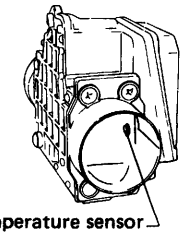
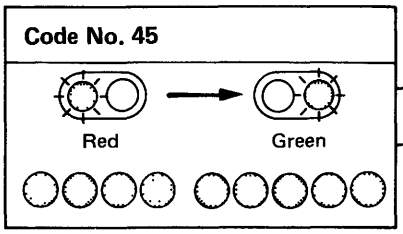
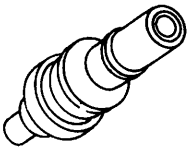
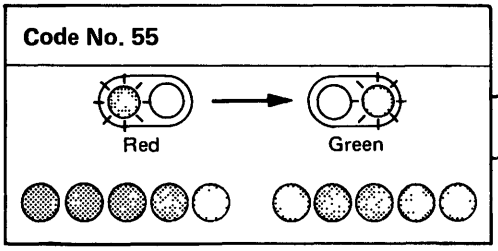
Mode III — Self-diagnostic Procedure (Cont'd)

DECODING CHART

Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.
E.C.U. CHECK Code No. 31 Red → Green	Control unit calculation function  	• Signal is beyond "normal" range. SYSTEM INSPECTION See page EF & EC-96.
SEF931F		
E.G.R. FUNCTION CHECK (California model only) Code No. 32 Red → Green	E.G.R. function 	• E.G R. valve does not operate. (E.G.R. valve spring does not lift.) SYSTEM INSPECTION See page EF & EC-98.
SEF327G		
EXHAUST GAS SENSOR CHECK Code No. 33 Red → Green	Exhaust gas sensor signal  	• Signal circuit is open. SYSTEM INSPECTION See page EF & EC-102.
SEF932F		
EXHAUST GAS TEMPERATURE SENSOR (California model only) CHECK Code No. 35 Red → Green	Exhaust gas temperature sensor circuit 	• Signal circuit is open or shorted. SYSTEM INSPECTION See page EF & EC-106.
SEF328G		

Mode III — Self-diagnostic Procedure (Cont'd)

DECODING CHART

Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.
AIR TEMPERATURE SENSOR (CHECK) Code No. 41 	Air temperature sensor circuit  Air temperature sensor	• The air temperature circuit is open or shorted. (An abnormally high or low voltage has entered.) SYSTEM INSPECTION See page EF & EC-84.
INJECTOR LEAK (CHECK) (California model only) Code No. 45 		• Fuel leakage from the injector SYSTEM INSPECTION See page EF & EC-110.
Code No. 55 		E.C.C.S. is operating properly.

SEF995D

SEF329G

SEF927F

(CHECK) : Check Engine Light Item

Mode IV — Switches ON/OFF Diagnostic System

In switches ON/OFF diagnosis system, ON/OFF operation of the following switches can be detected continuously.

- Idle switch
- Starter switch
- Vehicle speed sensor

(1) Idle switch & Starter switch

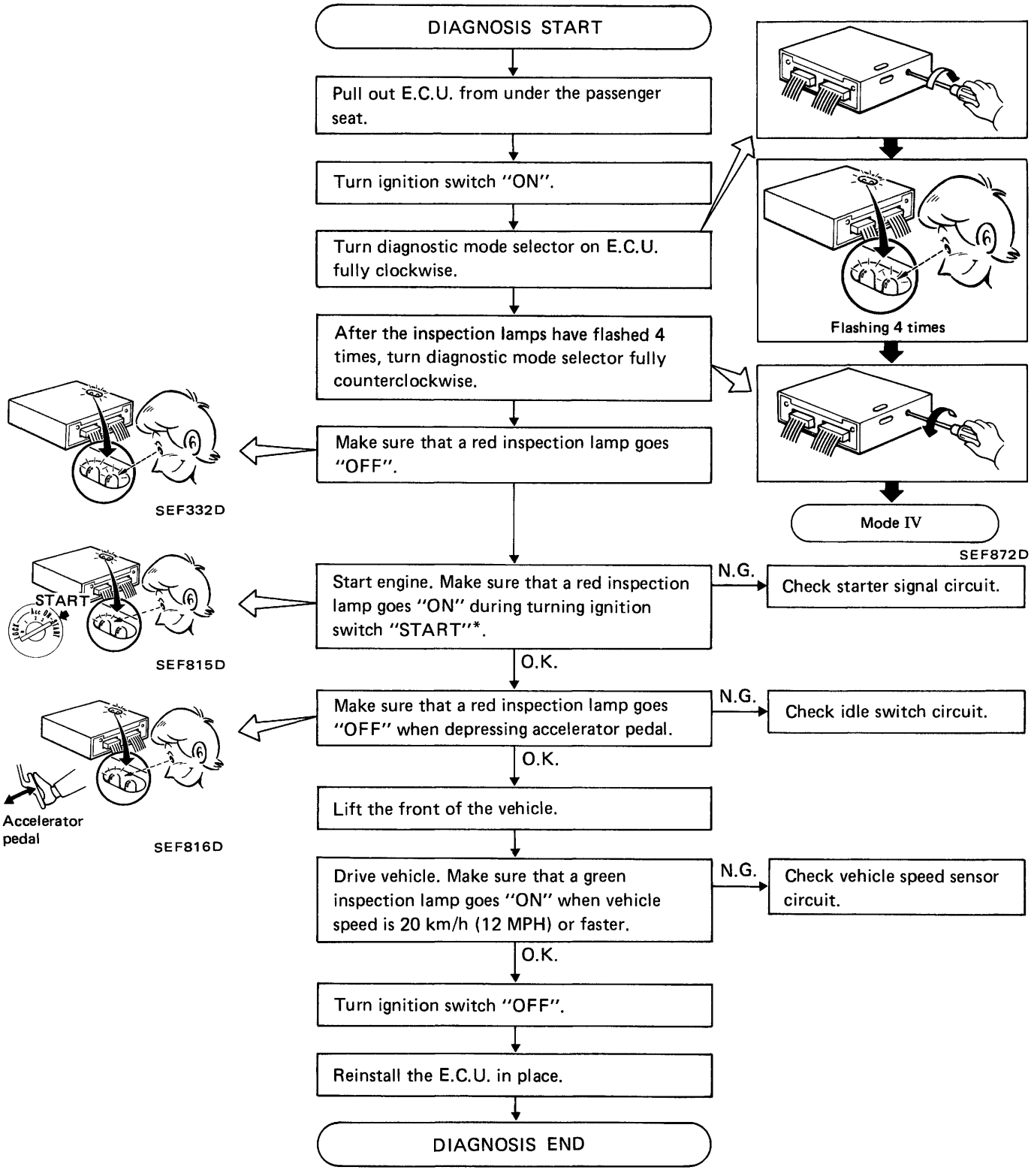
The switches ON/OFF status at the point when Mode IV is selected is stored in E.C.U. memory. When either switch is turned from "ON" to "OFF" or "OFF" to "ON", the red L.E.D. on E.C.U. alternately comes on and goes off each time switching is detected.

(2) Vehicle Speed Sensor

The switches ON/OFF status at the point when Mode IV is selected is stored in E.C.U. memory. When vehicle speed is 20 km/h (12 MPH) or slower, the green L.E.D. on E.C.U. is off. When vehicle speed exceeds 20 km/h (12 MPH), the green L.E.D. on E.C.U. comes "ON".

Mode IV — Switches ON/OFF Diagnostic System (Cont'd)

SELF-DIAGNOSTIC PROCEDURE



CAUTION:

- ***If ignition switch is turned to "START" an even number of times, a red inspection lamp goes "ON" when depressing accelerator pedal.**
- **For safety, do not turn front wheel at higher speed than required.**

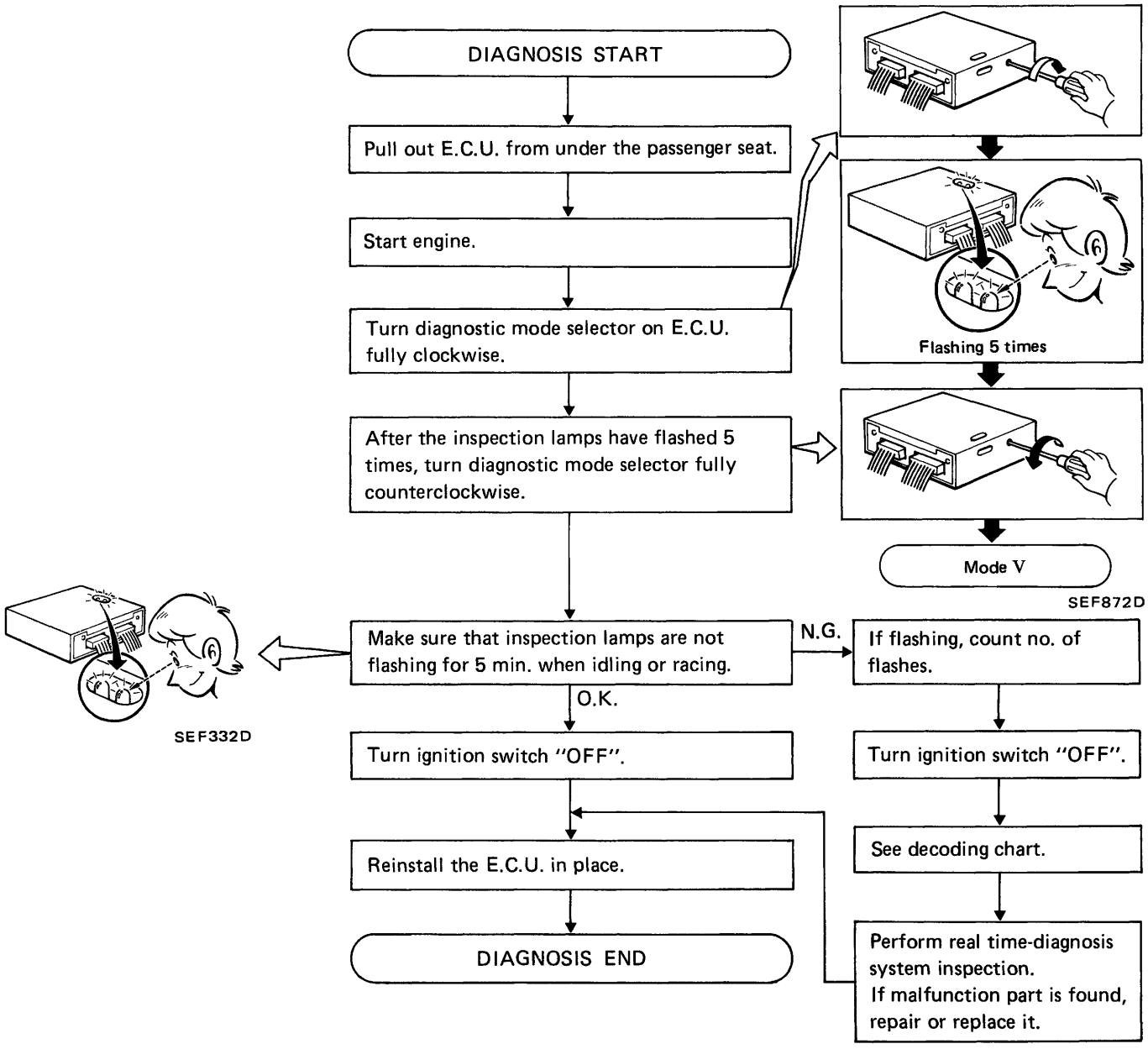
Mode V — Real Time Diagnostic System

In real time diagnosis, if any of the following items are judged to be faulty, a malfunction is indicated immediately.

- Crank angle sensor (180° signal & 1° signal)
- Ignition signal
- Air flow meter output signal
- Fuel pump

Consequently, this diagnosis is a very effective measure to diagnose whether the above systems cause the malfunction or not, during driving test. Compared with self-diagnosis, real time diagnosis is very sensitive, and can detect malfunctioning conditions in a moment. Further, items regarded to be malfunctions in this diagnosis are not stored in E.C.U. memory.

SELF-DIAGNOSITC PROCEDURE

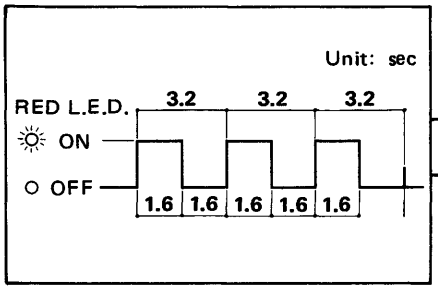
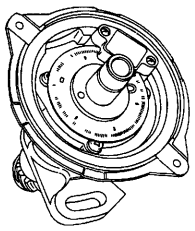
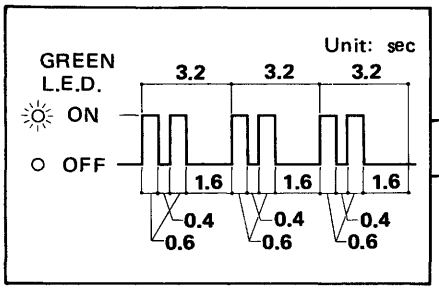
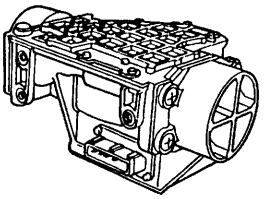
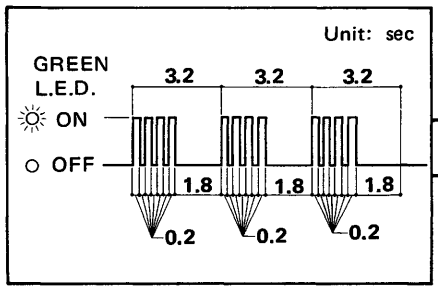
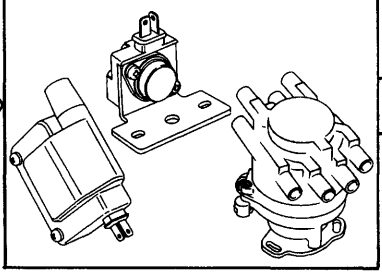
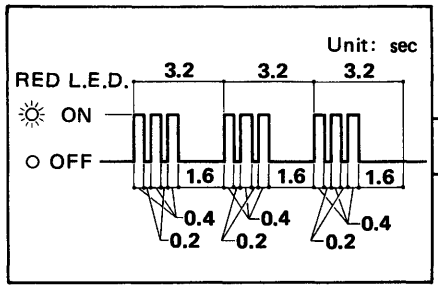
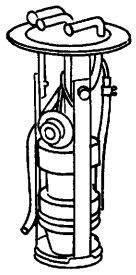


CAUTION:

In real time diagnosis, pay attention to inspection lamp flashing. E.C.U. displays the malfunction code only once, and does not memorize the inspection.

Mode V — Real Time Diagnostic System (Cont'd)

DECODING CHART

Display presentation	Malfunction circuit or parts	Control unit shows a malfunction signal when the following conditions are detected. (Compare with Self-diagnosis — Mode III.)
CRANK ANGLE SENSOR 	Crank angle sensor circuit is malfunctioning. 	The 1° or 180° signal is momentarily missing, or, multiple, momentary noise signals enter. REAL TIME DIAGNOSITC INSPECTION See page EF & EC-75.
SEF311E		
AIR FLOW METER 	Air flow meter circuit is malfunctioning. 	Abnormal, momentary increase in air flow meter output signal REAL TIME DIAGNOSITC INSPECTION See page EF & EC-76.
SEF312E		
IGNITION SIGNAL 	Ignition singal is malfunctioning. 	Signal from the primary ignition coil momentarily drops off. REAL TIME DIAGNOSITC INSPECTION See page EF & EC-77.
SEF313E		
FUEL PUMP 	Fuel pump circuit is malfunctioning. 	Fuel pump circuit is momentarily open or shorted. REAL TIME DIAGNOSITC INSPECTION See page EF & EC-78.
SEF314E		

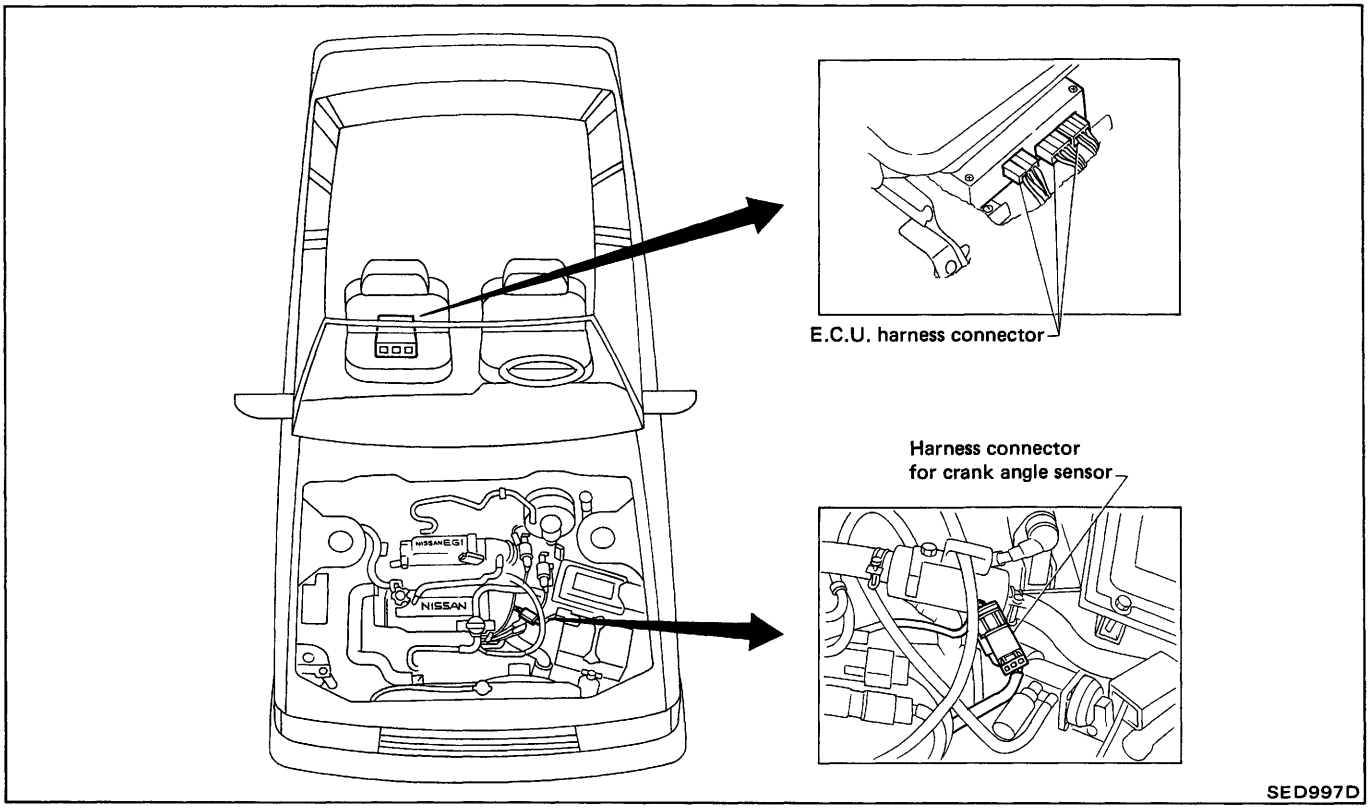
Mode V — Real Time Diagnostic System (Cont'd)

REAL TIME DIAGNOSTIC INSPECTION

Crank Angle Sensor

X: Available
—: Not available

Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Middle connector	Sensor & actuator	E.C.U. 20- & 16-pin connector	
1	Tap harness connector or component during real time diagnosis.	During real time diagnosis	X	X	X	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	X	—	—	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	X	—	X	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	—	—	X	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	X	—	—	Replace terminal.
6	Tap harness connector or component during real time diagnosis.	During real time diagnosis	X	X	X	If malfunction codes are displayed during real time diagnosis, replace terminal.



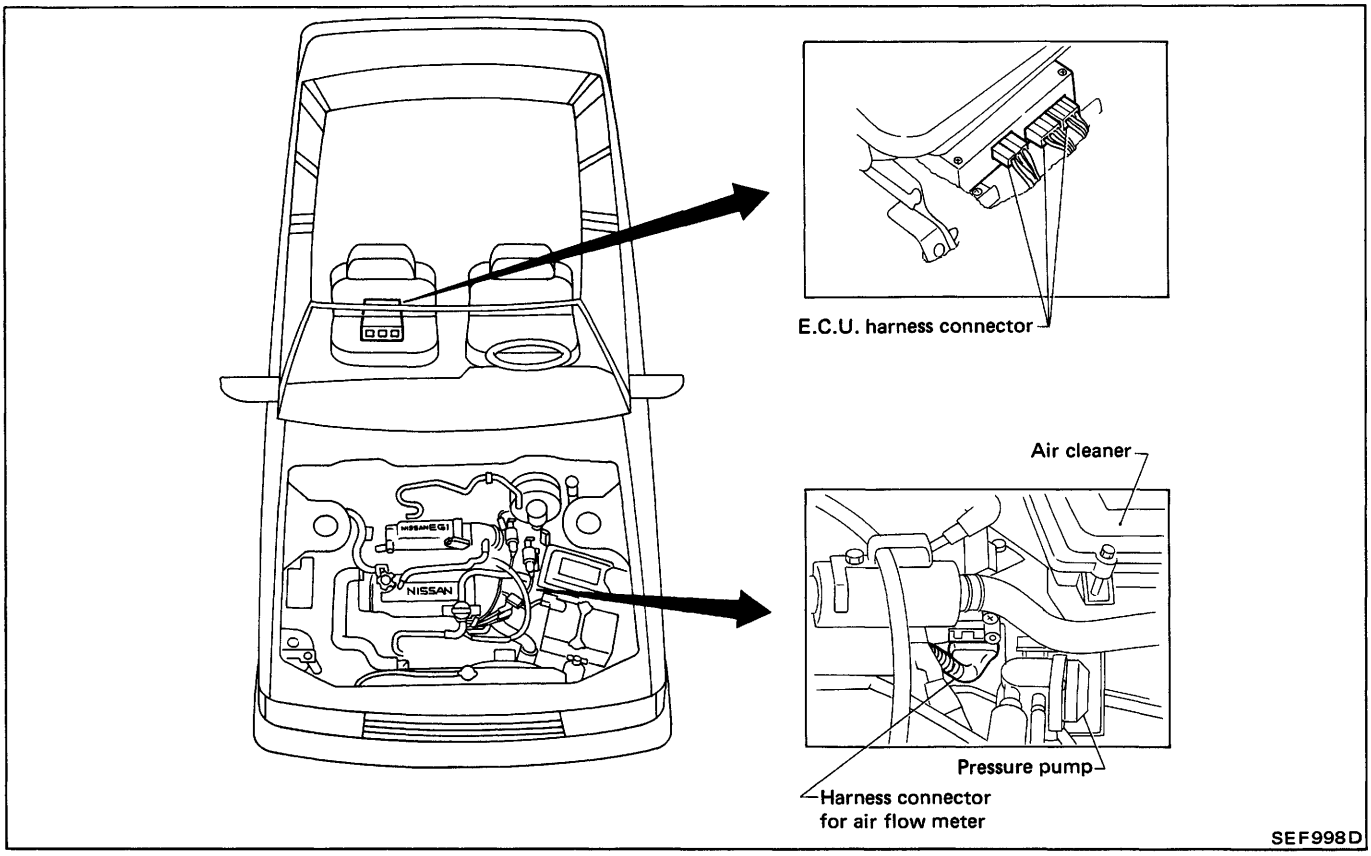
SED997D

Mode V — Real Time Diagnostic System (Cont'd)

Air Flow Meter

X: Available
—: Not available

Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Middle connector	Sensor & actuator	E.C.U. 20- & 16-pin connector	
1	Tap harness connector or component during real time diagnosis.	During real time diagnosis	X	X	X	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	X	—	—	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	X	—	X	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	—	—	X	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	X	—	—	Replace terminal.
6	Tap harness connector or component during real time diagnosis.	During real time diagnosis	X	X	X	If malfunction codes are displayed during real time diagnosis, replace terminal.

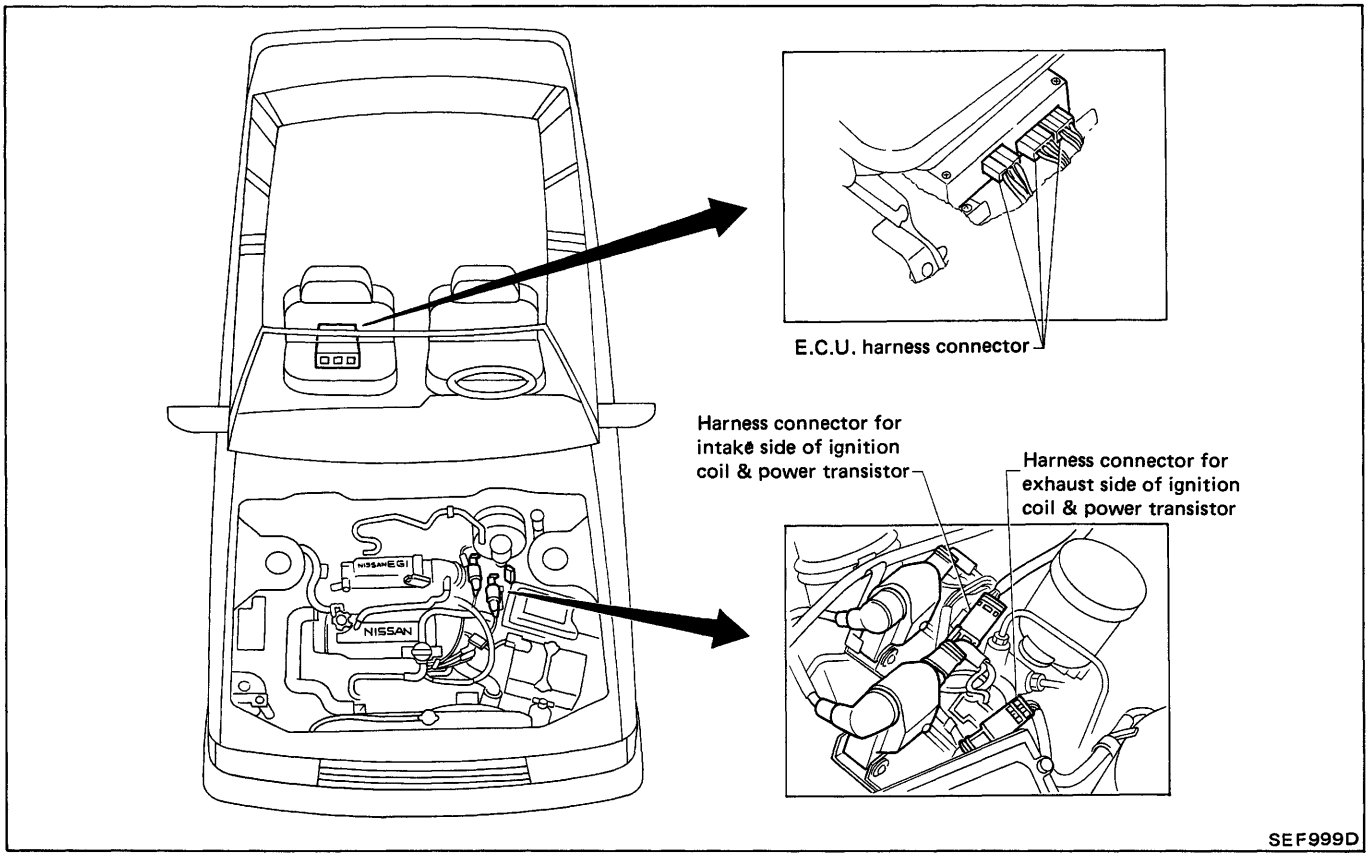


Mode V — Real Time Diagnostic System (Cont'd)

Ignition Signal

X: Available
—: Not available

Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Middle connector	Sensor & actuator	E.C.U. 20- & 16-pin connector	
1	Tap harness connector or component during real time diagnosis.	During real time diagnosis	X	X	X	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	X	—	—	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	X	—	X	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	—	—	X	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	X	—	—	Replace terminal.
6	Tap harness connector or component during real time diagnosis.	During real time diagnosis	X	X	X	If malfunction codes are displayed during real time diagnosis, replace terminal.

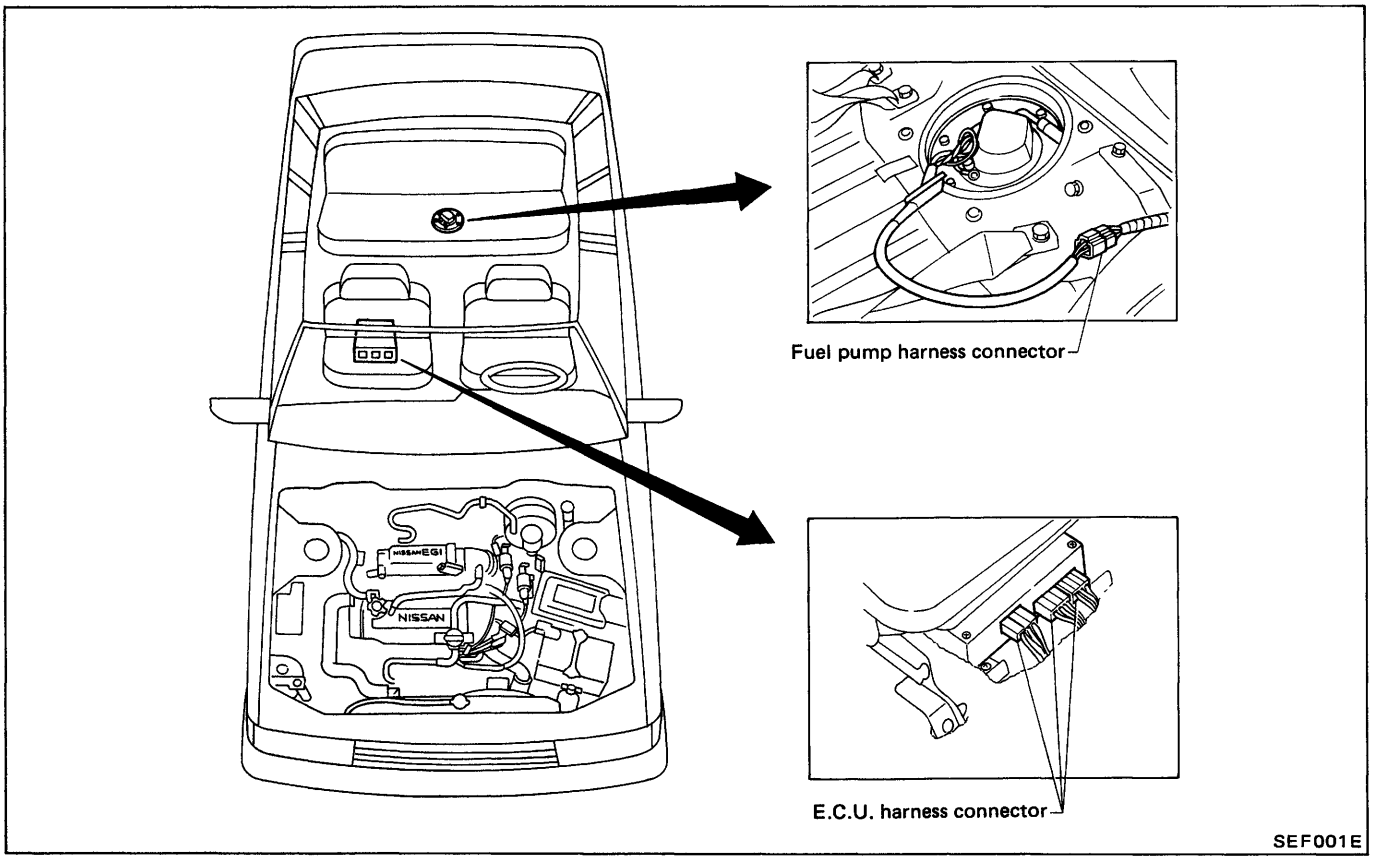


Mode V — Real Time Diagnostic System (Cont'd)

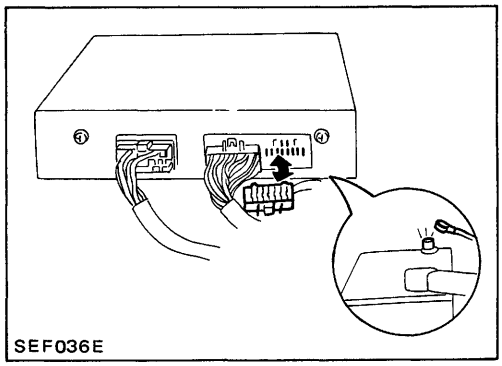
Fuel Pump

X: Available
—: Not available

Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Middle connector	Sensor & actuator	E.C.U. 20- & 16-pin connector	
1	Tap harness connector or component during real time diagnosis.	During real time diagnosis	X	X	X	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	X	—	—	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	X	—	X	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	—	—	X	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	X	—	—	Replace terminal.
6	Tap harness connector or component during real time diagnosis.	During real time diagnosis	X	X	X	If malfunction codes are displayed during real time diagnosis, replace terminal.

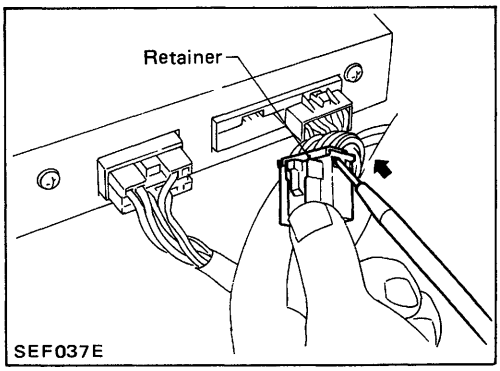


NOTE


SEF036E

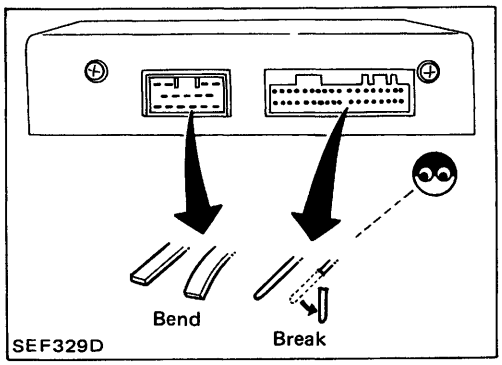
CAUTION:

1. Before connecting or disconnecting E.C.U. harness connector to or from any E.C.U., be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal in order not to damage E.C.U. as battery voltage is applied to E.C.U. even if ignition switch is turned off. Otherwise, there may be damage to the E.C.U.



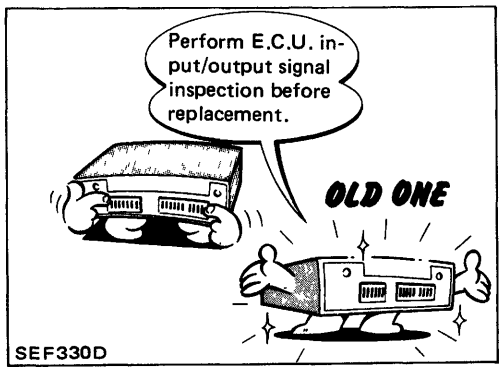
SEF037E

2. When performing E.C.U. input/output signal inspection, remove pin terminal retainer from 20- and 16-pin connector to make it easier to insert tester probe into connector.



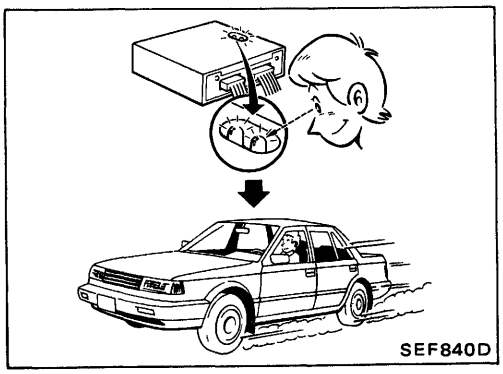
SEF329D

3. When connecting pin connectors into E.C.U. or disconnecting them from E.C.U., take care not to damage pin terminal of E.C.U. (Bend or break).
4. Make sure that there are not any bends or breaks on E.C.U. pin terminal, when connecting pin connectors into E.C.U.

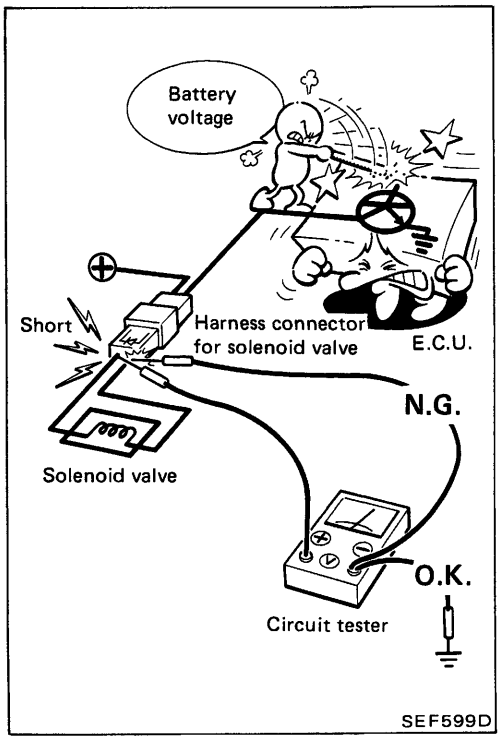


SEF330D

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-134.)


SEF840D

6. After performing this "ELECTRONIC CONTROL SYSTEM INSPECTION", perform E.C.C.S. self-diagnosis and driving test.



7. When measuring supply voltage of E.C.U. controlled components with a circuit tester, separate one tester probe from the other.
   If the two tester probes accidentally make contact with each other during measurement, the circuit will be shorted, resulting in damage to the power transistor of the control unit.

8. Keys to symbols

   DISCONNECT : Check after disconnecting the connector to be measured.

   CONNECT : Check after connecting the connector to be measured.

9. When measuring voltage or resistance at connector with tester probes, there are two methods of measurement; one is done from terminal side and the other from harness side. Before measuring, confirm symbol mark again.

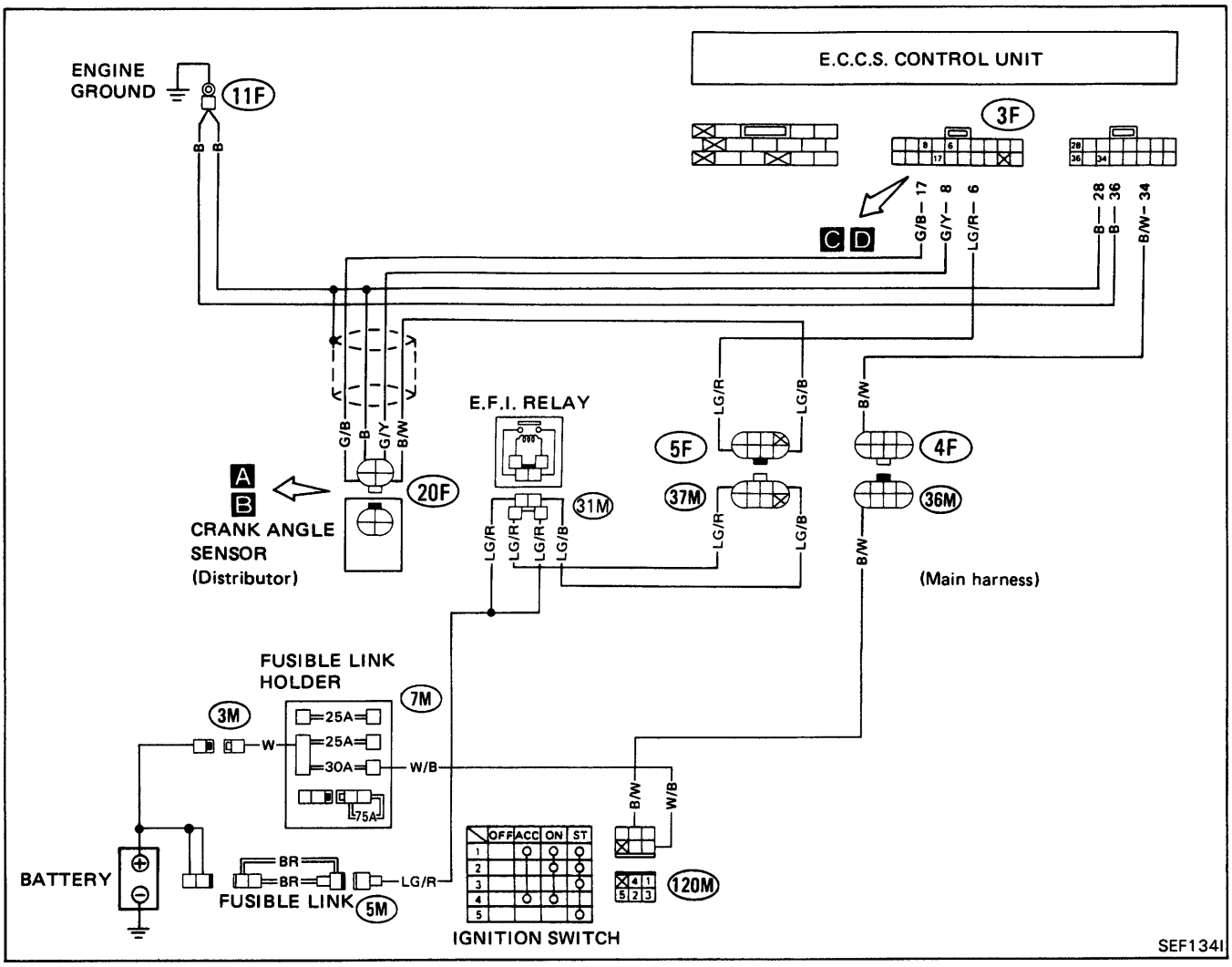
   H.S. : Inspection should be done from harness side.

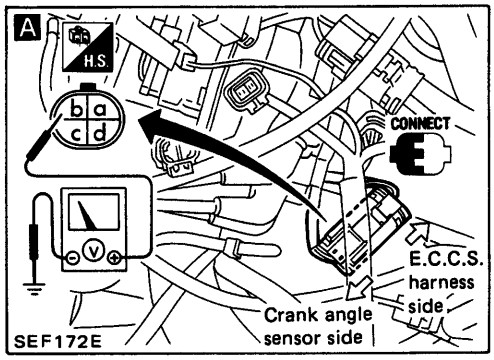
   T.S. : Inspection should be done from terminal side.

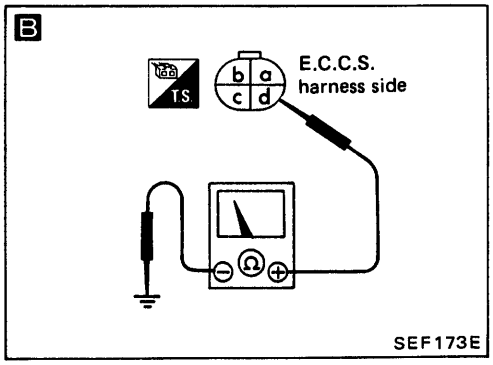
   Refer to GI section.

10. As for continuity check of joint connector, refer to EL section.

CRANK ANGLE SENSOR (Code No. 11)







INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

N.G. → Check the following items.
1) Harness continuity between crank angle sensor and battery.
2) E.F.I. relay (See page EF & EC-132.)
3) "30A" fusible link
4) Power source and ground circuit for E.C.U. (See page EF & EC-130.)
5) Ignition switch

O.K.

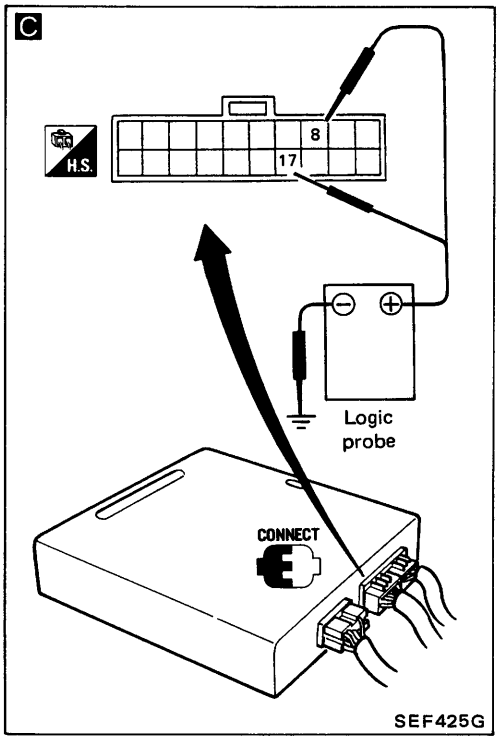
B

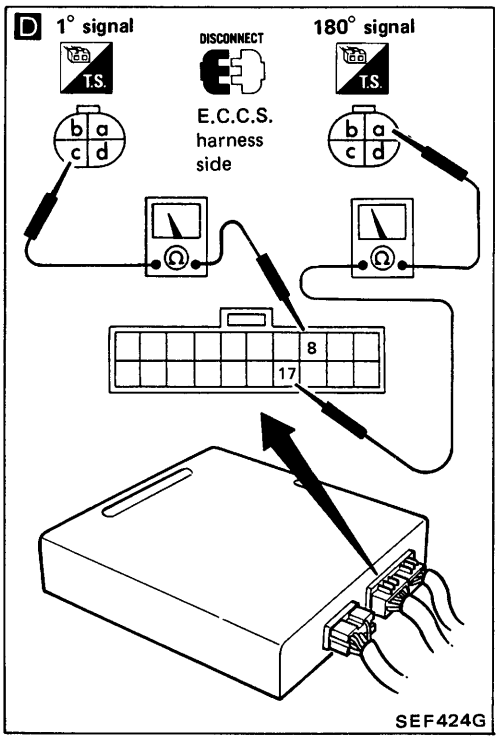
CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect crank angle sensor harness connector.
3) Check resistance between terminal ⓓ and ground.
Resistance:
Approximately 0Ω

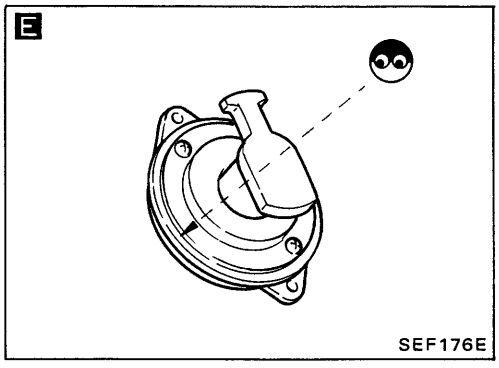
N.G. → Repair harness.

O.K.

CRANK ANGLE SENSOR (Code No. 11)







C

CHECK E.C.U. INPUT SIGNALS.
1) Reconnect crank angle sensor harness connector.
2) Start engine.
3) Check that pulse signals exist in E.C.U. terminals ⑧ and ⑰ with logic probe.
Pulse signals should exist.
⑧ : 1° signal
⑰ : 180° signals

N.G. →
Stop engine and check harness continuity between crank angle sensor and E.C.U.
D
- Disconnect crank angle sensor harness connector.
- Disconnect E.C.U. 20-pin connector.

1° signal circuit
Continuity between ⓒ and ⑧
180° signal circuit
Continuity between ⓐ and ⑰
Resistance:
Approximately 0Ω

O.K. ↓

E

Visually check rotor plate for damage or dust.
N.G. → Clean or replace crank angle sensor.

O.K. ↓

Erase the self-diagnosis memory.

↓

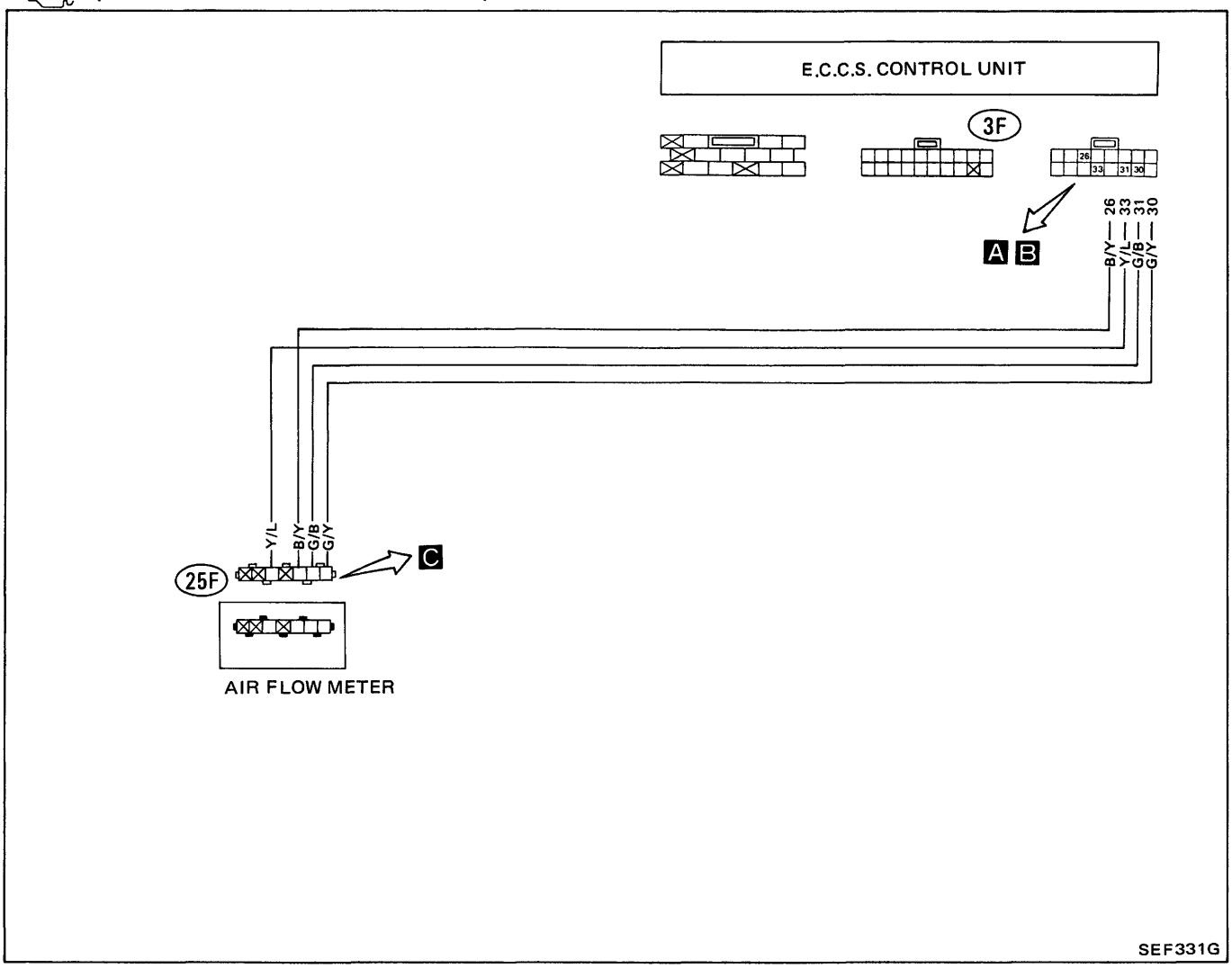
Perform driving test and then perform self-diagnosis (Mode III).
N.G. →
1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminal damage or the connection of E.C.U. harness connector.

O.K. ↓

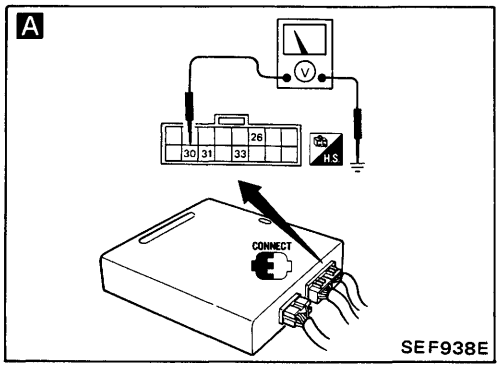
INSPECTION END

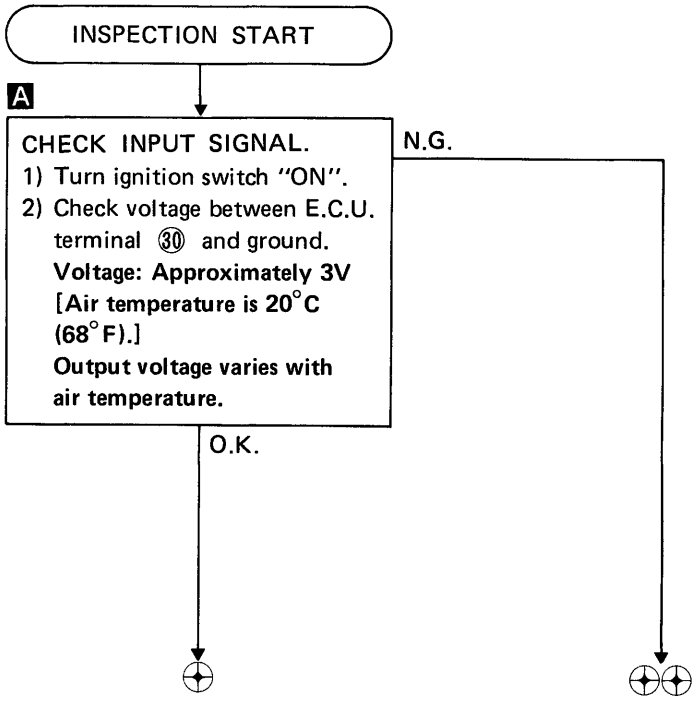
AIR FLOW METER (Code No. 12) & AIR TEMPERATURE SENSOR (Code No. 41)

CHECK (CHECK ENGINE LIGHT ITEM)



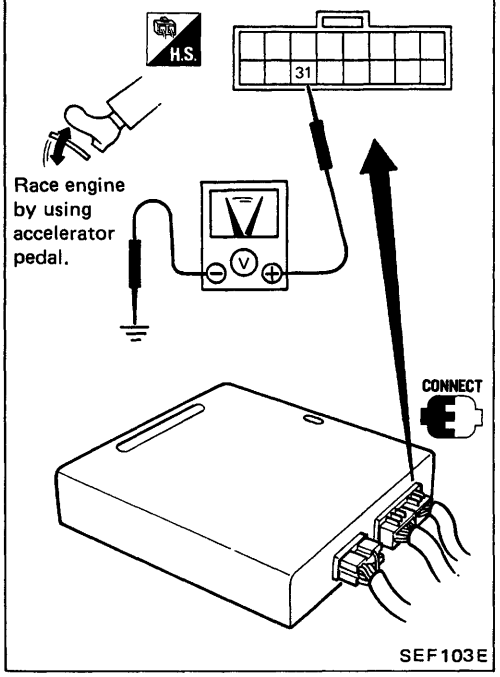
AIR TEMPERATURE SENSOR (Code No. 41)





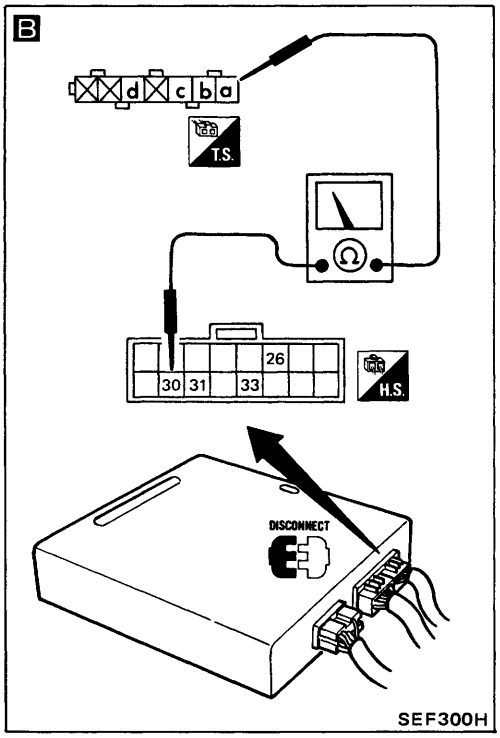
AIR FLOW METER (Code No. 12) & AIR TEMPERATURE SENSOR (Code No. 41) (CHECK ENGINE LIGHT ITEM)

A



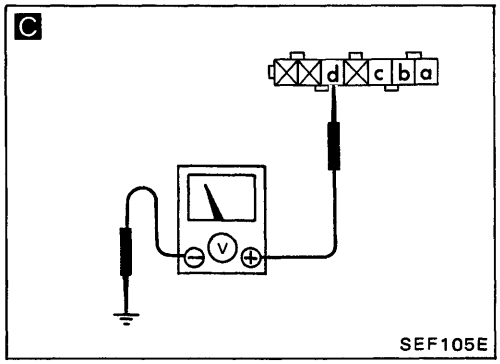
SEF103E

B



SEF300H

C



SEF105E

INSPECTION START

A

CHECK INPUT SIGNAL.
1) Start engine.
2) Make sure that voltage between E.C.U. terminal ㉛ and ground changes by racing engine with accelerator pedal.
Output voltage should change.
0 - Approximately 5.0V

N.G. →

B 1) Check harness continuity between E.C.U. and air flow meter.
- Stop engine.
- Disconnect E.C.U. 16-pin harness connector and air flow meter harness connector.
- Check resistance as follows:

Check terminals	Resistance
ⓐ - ㉚	Approximately 0Ω
ⓑ - ㉛	
ⓒ - ㉖	
ⓓ - ㉝	

C 2) Check power source for air flow meter.
- Turn ignition switch "ON".
- Check voltage between air flow meter terminal ⓓ and ground.
Voltage:
Approximately 8V

3) Check power source and ground circuit for E.C.U.
If above items are O.K., replace air flow meter.

O.K.

Reinstall any part removed.

Erase the self-diagnosis memory.

Perform driving test and then perform self-diagnosis (Mode III).

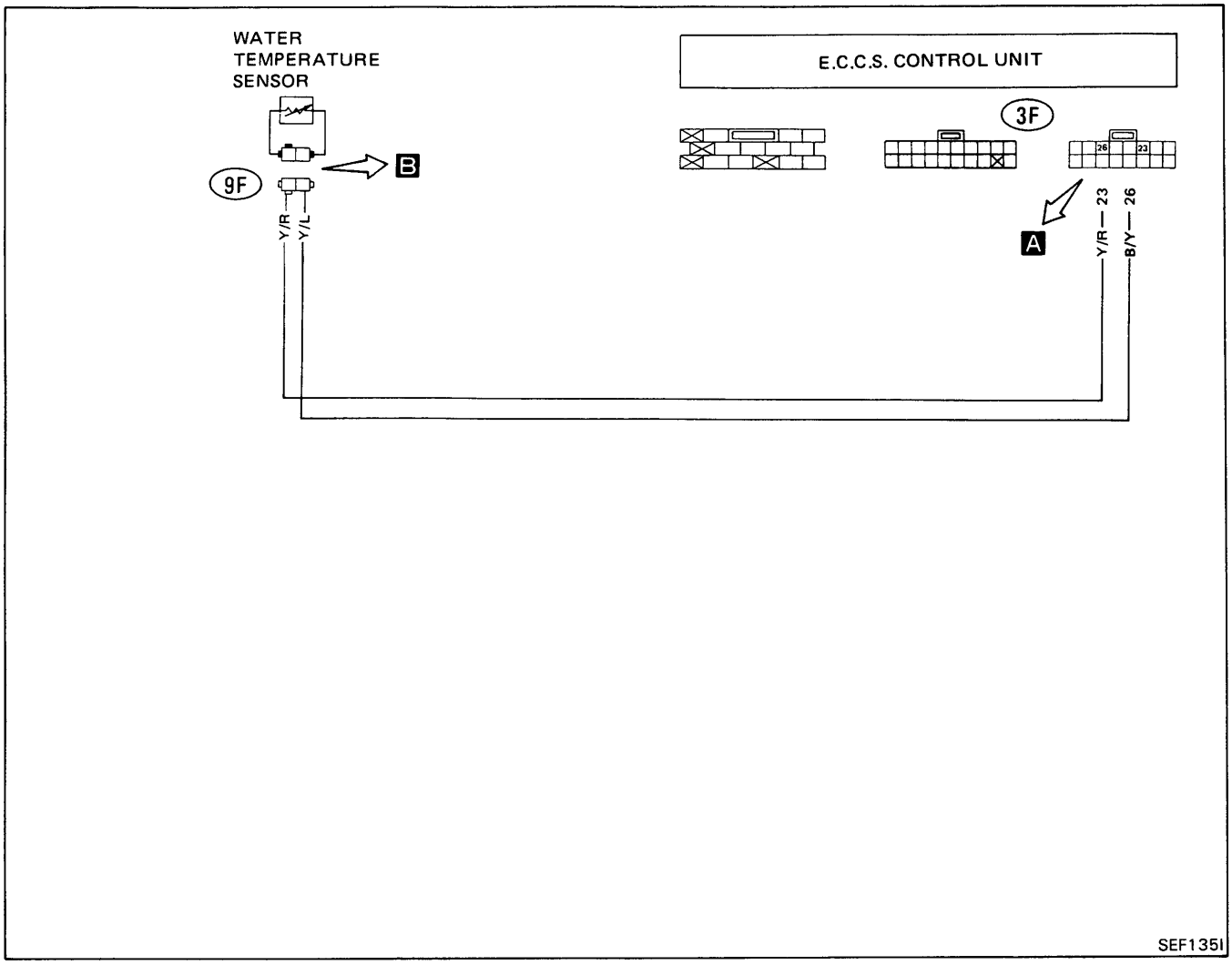
N.G. →

1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

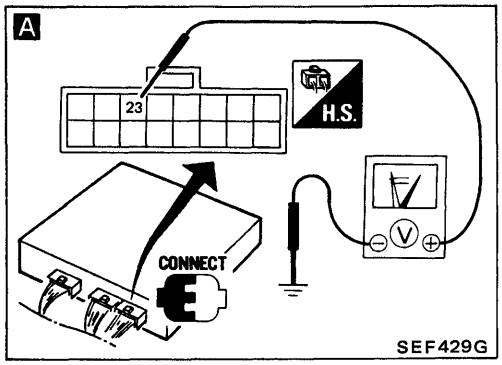
O.K.

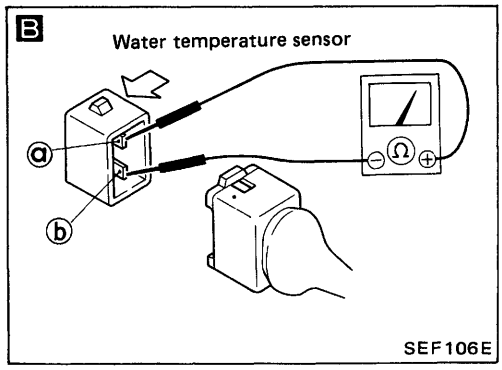
INSPECTION END

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



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





INSPECTION START

A

CHECK INPUT SIGNAL.
1) Start engine.
2) Make sure that voltage between E.C.U. terminal ㉓ and ground changes during engine warm up.
Cold → Hot:
Approximately 5 - 1V

N.G.

1) Stop engine and check harness continuity between E.C.U. and water temperature sensor.
B 2) Check water temperature sensor resistance.
- Disconnect water temperature sensor harness connector.
- Check resistance between terminals ⓐ and ⓑ.

20°C (68°F)	2.3 - 2.7 kΩ
50°C (122°F)	0.77 - 0.87 kΩ
80°C (176°F)	0.30 - 0.33 kΩ

If no continuity, replace water temperature sensor.
3) Check power source and ground circuit for E.C.U. (See page EF & EC-130.)

O.K.

Reinstall any part removed.

Erase the self-diagnosis memory.

Perform driving test and then perform self-diagnosis again (Mode III).

N.G.

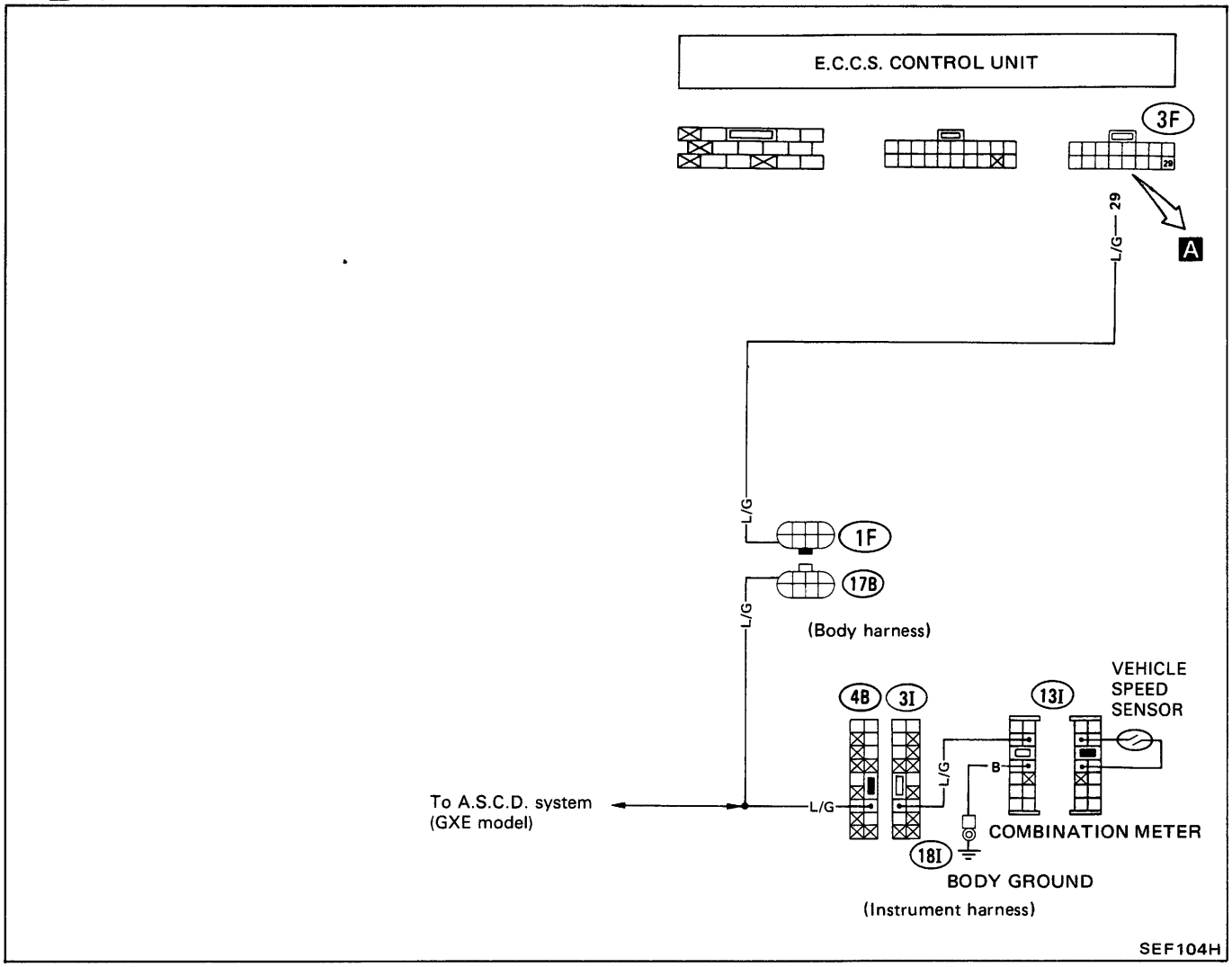
1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

O.K.

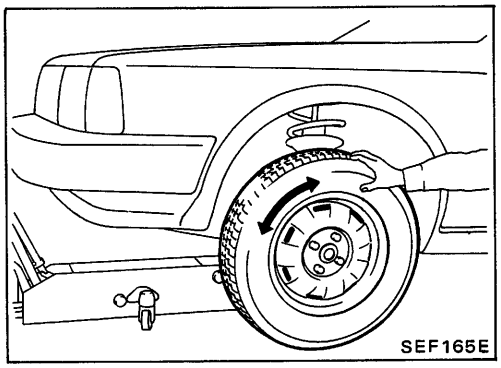
INSPECTION END

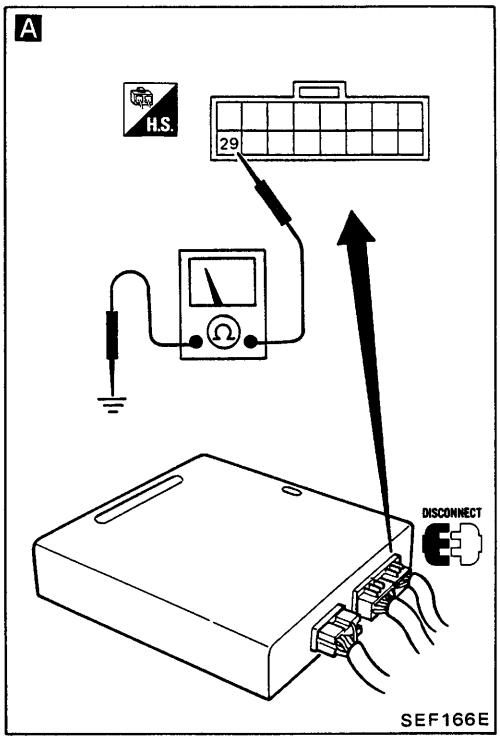
VEHICLE SPEED SENSOR (Switch ON/OFF diagnosis) (Code No. 14)

CHECK (CHECK ENGINE LIGHT ITEM)



VEHICLE SPEED SENSOR (Switch ON/OFF diagnosis) (Code No. 14) (CHECK ENGINE LIGHT ITEM)


SEF165E



SEF166E

INSPECTION START

CHECK INPUT SIGNAL.
1) Jack up front wheels.
2) Disconnect E.C.U. 16-pin connector.
A 3) Check resistance between terminal ㉙ and ground while rotating front wheel by hand.
Continuity should come and go.

N.G. → Check the following items.
1) Harness continuity between speed sensor and E.C.U.
2) S.M.J.
3) Speed sensor
(See EL section.)

O.K.

Reinstall any part removed.

1) Perform switch ON/OFF diagnosis (in Mode IV) again.
2) Make sure green L.E.D. on E.C.U. comes "ON" when vehicle speed reaches 20 km/h (12 MPH).

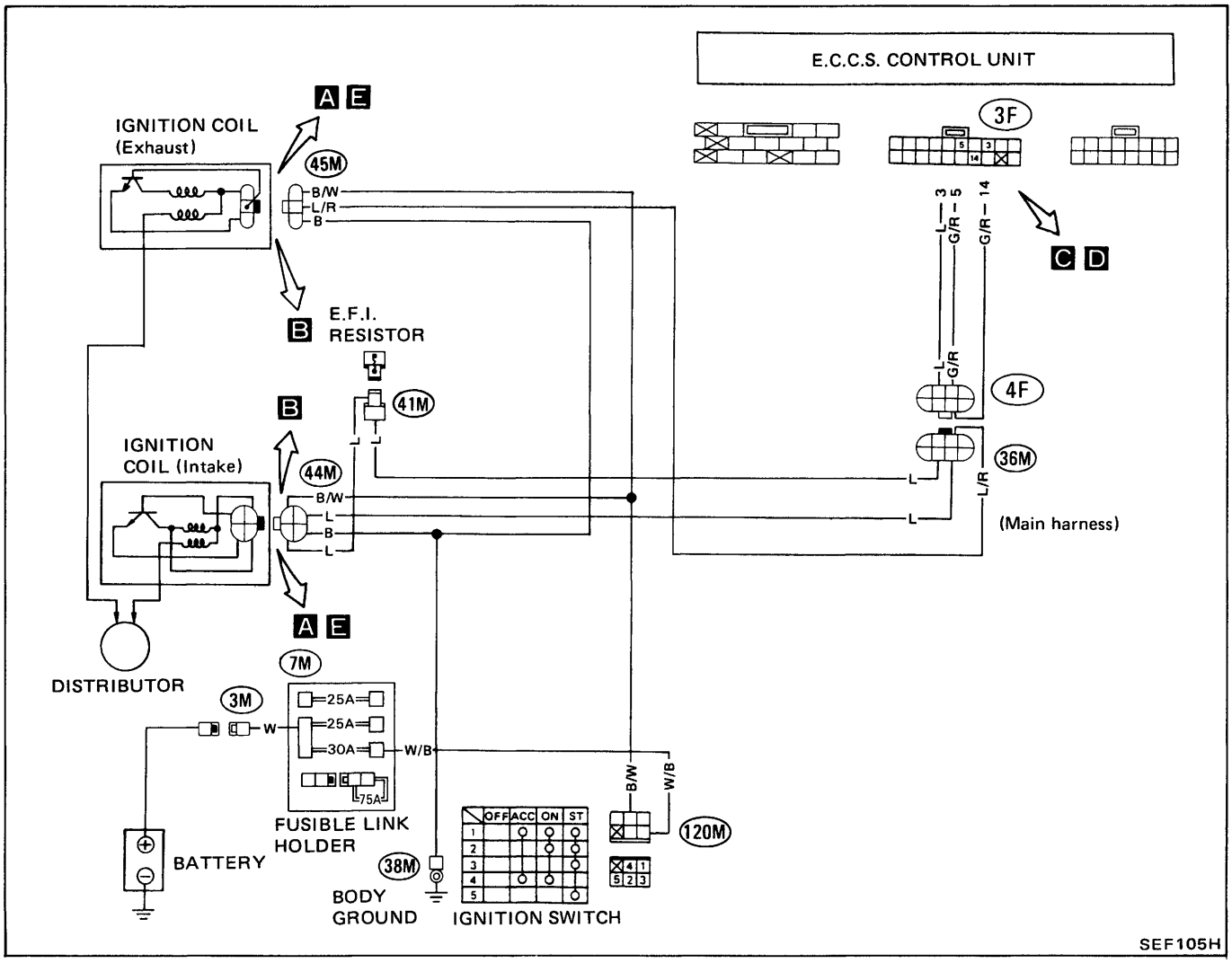
N.G. → 1) Perform self-diagnosis and find malfunction code.
2) According to displayed Code No., perform electronic control system inspection.

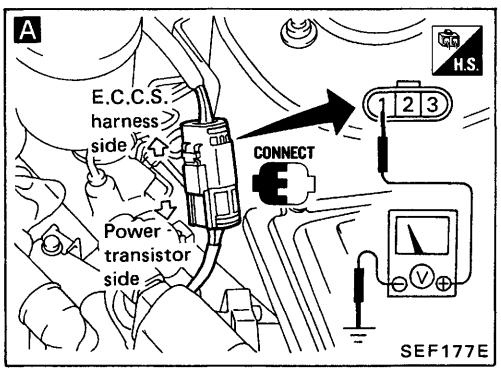
O.K.

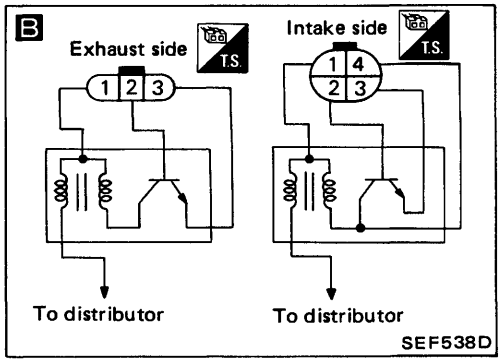
Erase the self-diagnosis memory.

INSPECTION END

IGNITION SIGNAL (Code No. 21)







INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ① and ground.
Voltage: Battery voltage

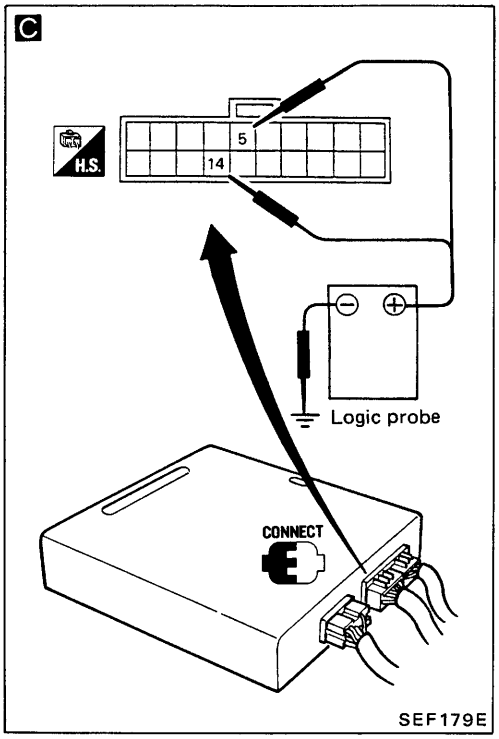
N.G.

Check the following items.
1) Harness continuity between battery and power transistor
2) "30A" fusible link
3) Ignition switch

O.K.

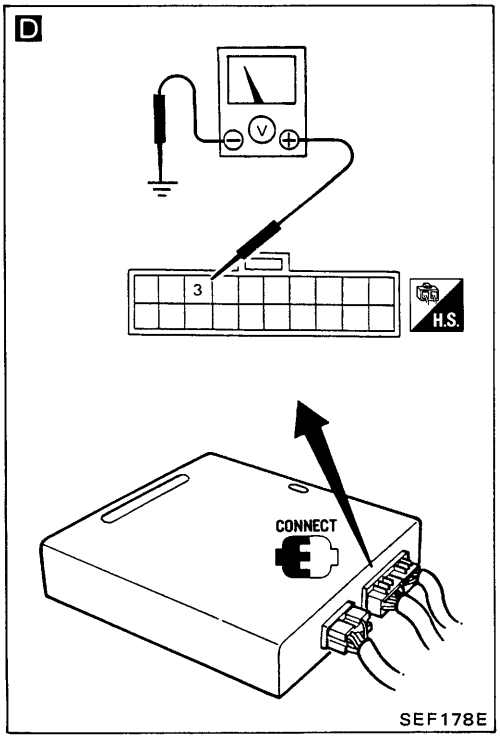
IGNITION SIGNAL (Code No. 21)

C



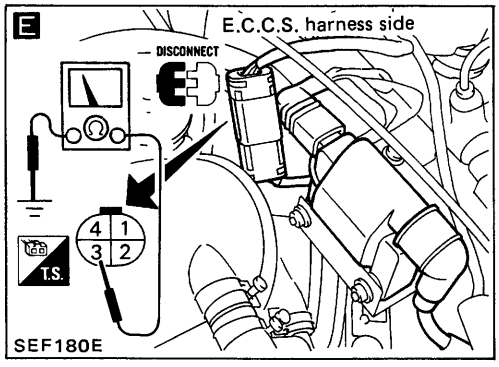
SEF179E

D



SEF178E

E



SEF180E

C

CHECK OUTPUT SIGNAL.
1) Turn ignition switch "OFF".
2) Start engine.
3) Make sure that pulse signals exist between E.C.U. terminals ⑤, ⑭ and ground with logic probe.
Pulse signal should exist.
⑤ : Intake side ignition signal
⑭ : Exhaust side ignition signal

N.G. →
1) Stop engine and check harness continuity between E.C.U. and power transistor.
B 2) Check power transistor with circuit tester.
- Disconnect harness connector for ignition coil and power transistor.
  ① : To ignition coil (+) side
  ② : To E.C.U.
  ③ : To engine ground
  ④ : To ignition coil (–) side

Terminal No	Tester polarity	Continuity
① or ③	+	No continuity
④	–	
① or ③	–	Continuity should exist.
④	+	
① or ③	+	No continuity
②	–	
① or ③	–	Continuity should exist.
②	+	

If N.G., replace power transistor.
3) Check "30A" fusible link.
4) Check continuity of ignition coil.
5) Check ignition switch.

O.K. ↓

D

CHECK INPUT SIGNAL.
1) Stop engine.
2) Turn ignition switch "ON".
3) Check voltage between E.C.U. terminal ③ and ground.
Voltage: Battery voltage

N.G. → Check harness continuity between E.C.U. and battery.

O.K. ↓

E

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect power transistor harness connector.
3) Check resistance between terminal ③ and ground.
Resistance:
Approximately 0Ω

N.G. → Repair harness.

O.K. ↓

Erase the self-diagnosis memory.

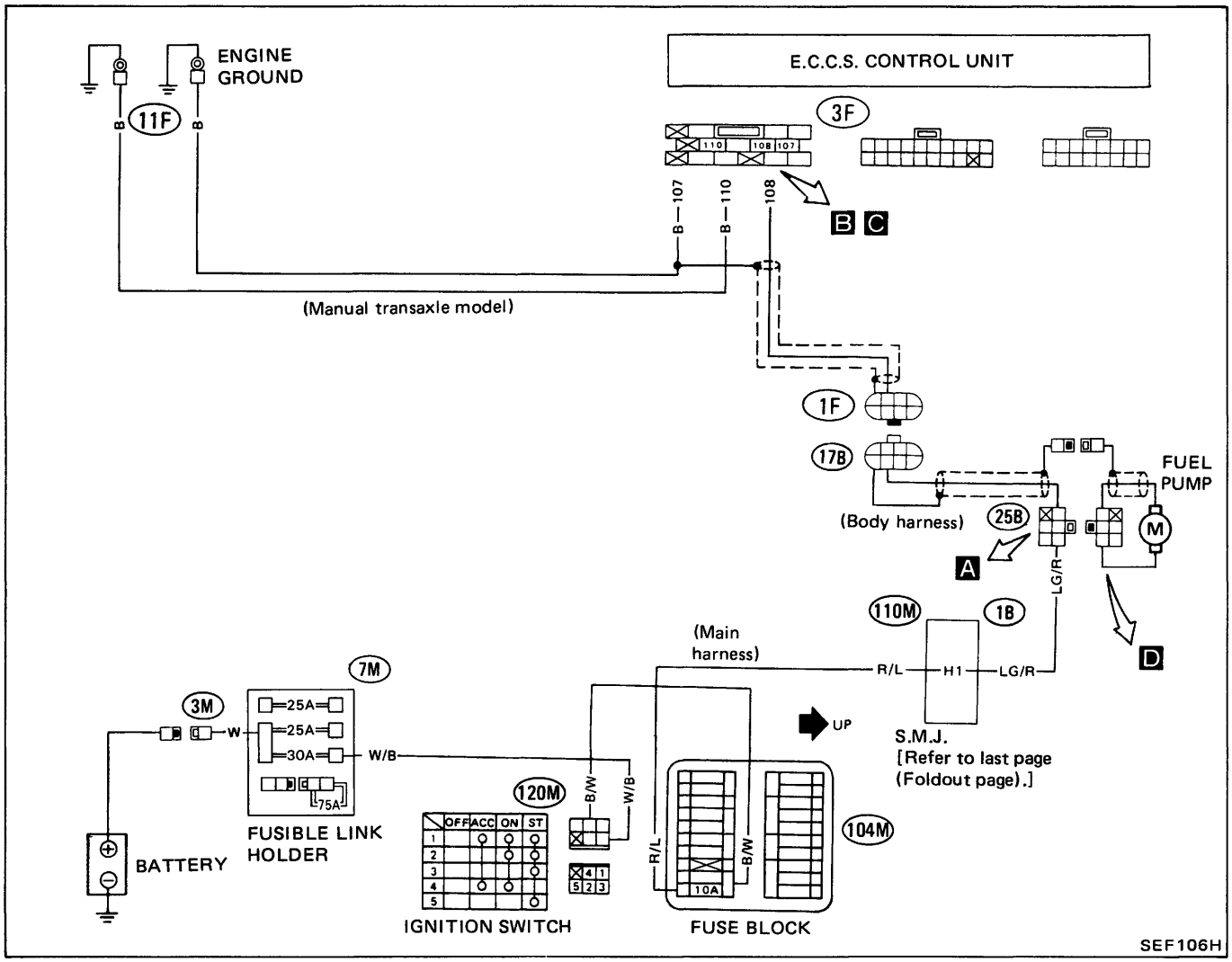
Perform driving test and then perform self-diagnosis again.

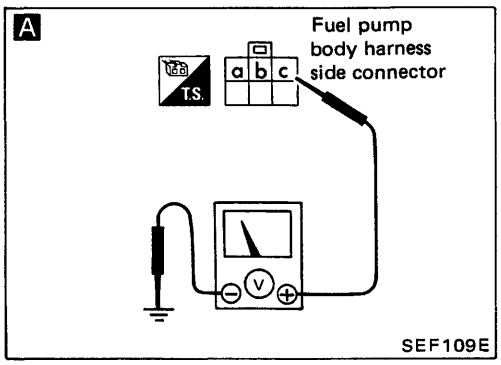
N.G. →
1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

O.K. ↓

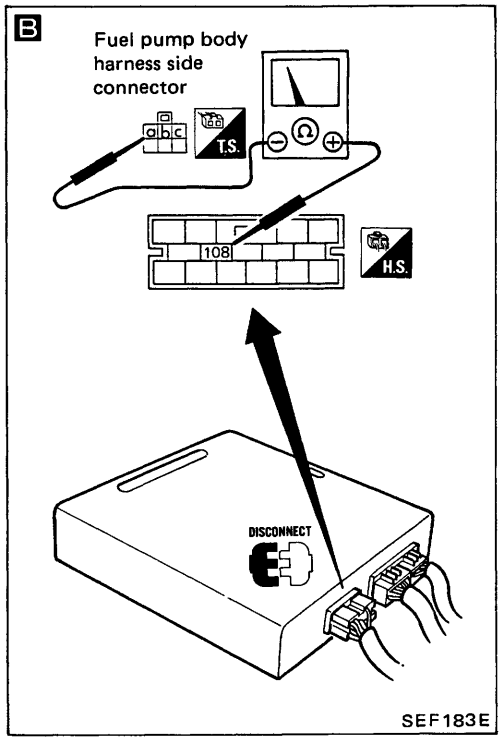
INSPECTION END

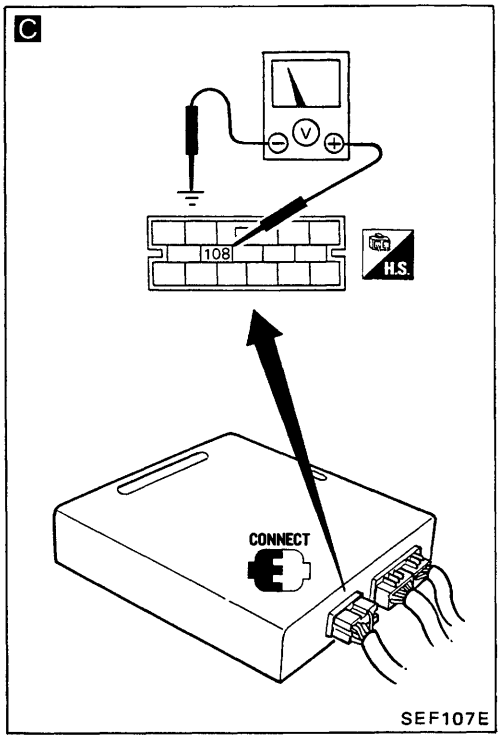
FUEL PUMP (Code No. 22)

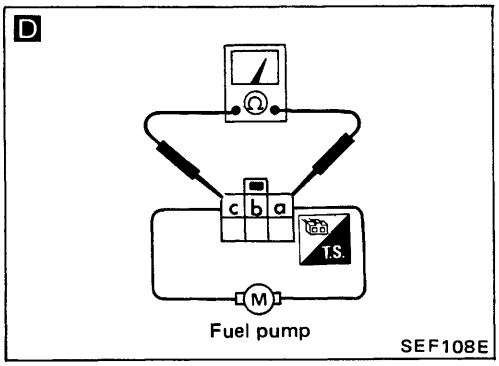




FUEL PUMP (Code No. 22)







INSPECTION START

A

CHECK POWER SOURCE.
1) Disconnect fuel pump harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓒ and ground.
Voltage: Battery voltage

N.G. → Check the following items.
1) Harness continuity between battery and fuel pump.
2) Fuse
3) "30A" fusible link
4) Ignition switch

O.K. ↓

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. 15-pin connector.
3) Check resistance between E.C.U. terminals (108) and ⓐ.
Resistance:
Approximately 0Ω

N.G. → Repair harness.

O.K. ↓

C

CHECK OUTPUT SIGNAL.
1) Reconnect E.C.U. 15-pin connector and fuel pump harness connector.
2) Turn ignition switch "ON".
3) Check voltage between E.C.U. terminal (108) and ground.
Battery voltage should appear in 5 seconds after turning ignition switch "ON".

N.G. → **D**
1) Check fuel pump.
- Disconnect fuel pump harness connector.
- Check resistance between terminals ⓐ and ⓒ.
Continuity should exist.
If N.G., replace fuel pump.

O.K. ↓

Erase the self-diagnosis memory.

↓

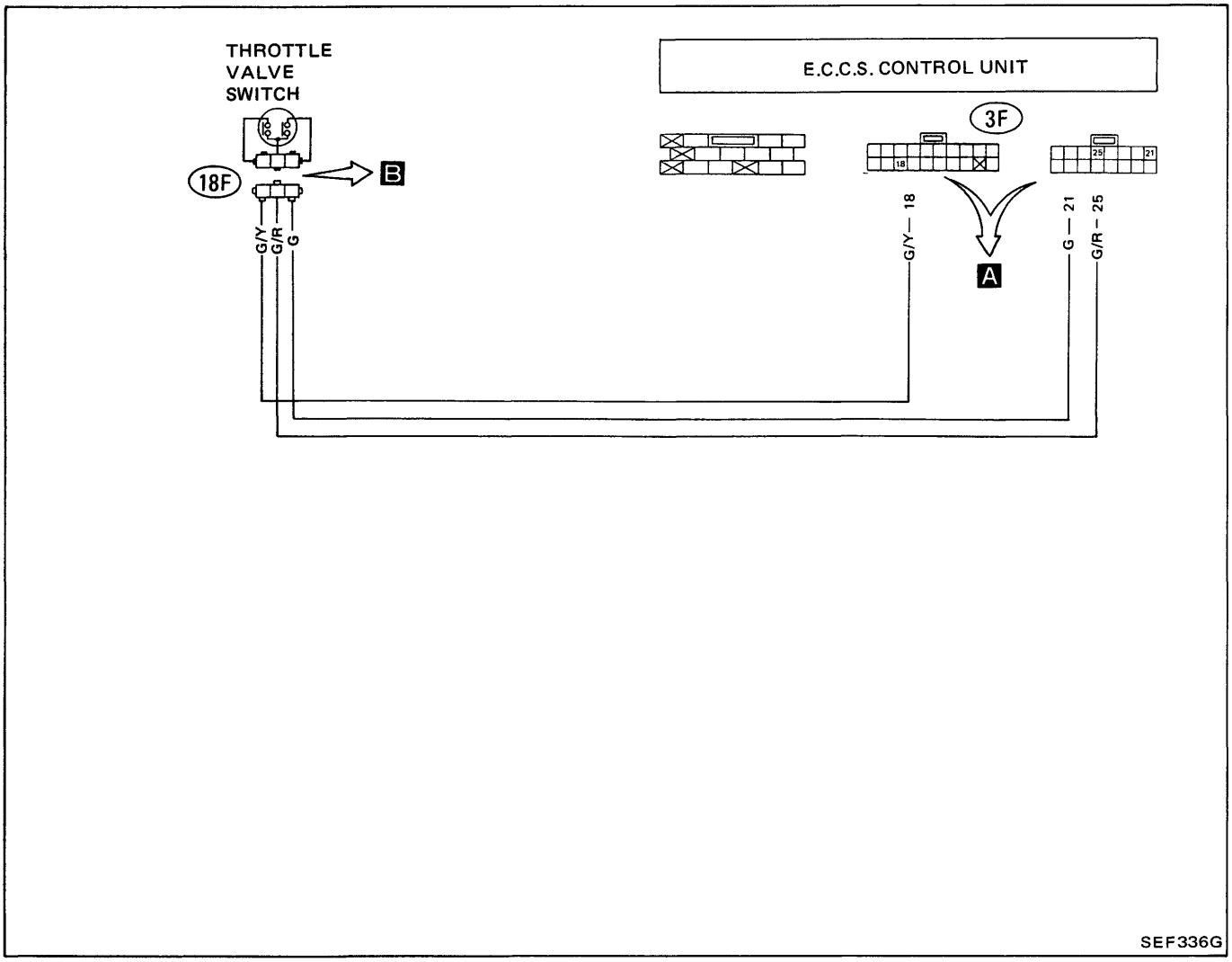
Perform driving test and then perform self-diagnosis again (Mode III).

N.G. → 1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

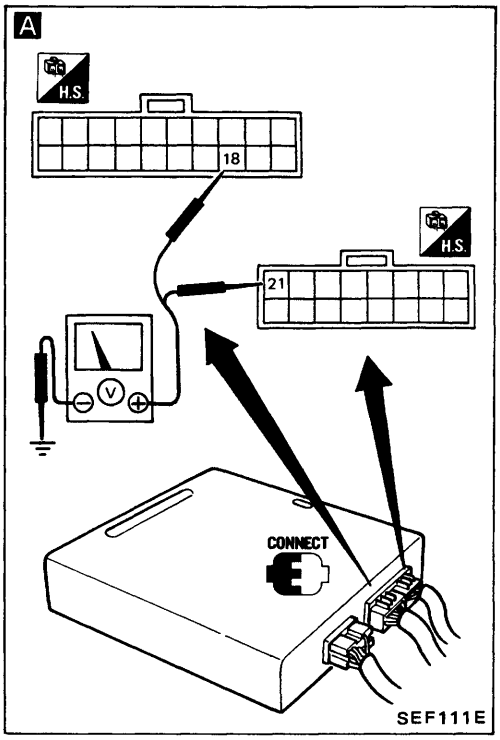
O.K. ↓

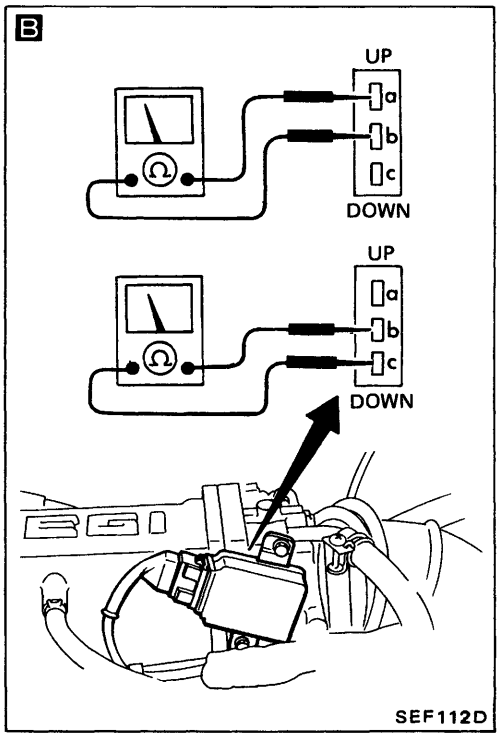
INSPECTION END

THROTTLE VALVE SWITCH (Switch ON/OFF diagnosis) (Code No. 23, 24) (CHECK ENGINE LIGHT ITEM)



THROTTLE VALVE SWITCH (Switch ON/OFF diagnosis) (Code No. 23, 24) (CHECK ENGINE LIGHT ITEM)





INSPECTION START

A

CHECK INPUT SIGNAL.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminals ⑱, ㉑ and ground.

Accel. pedal condition	Voltage	
	⑱ - Ground	㉑ - Ground
Fully closed	9 - 10V	0V
Open	0V	0V
Fully open	0V	9 - 10V

N.G. →
Check the following items.
1) Harness continuity between E.C.U. and throttle valve switch.
B 2) Continuity of throttle valve switch.
- Disconnect throttle valve switch harness connector.
- Check resistance between terminals ⓐ and ⓑ when throttle valve switch closes fully.
  Resistance:
  Approximately 0Ω
- Check resistance between terminals ⓑ and ⓒ when throttle valve switch opens fully.
  Resistance:
  Approximately 0Ω

3) Power source and ground circuit for E.C.U.
(See page EF & EC-130.)

O.K. ↓

Reinstall any part removed.

↓

Erase the self-diagnosis memory.

↓

CHECK IDLE SWITCH OPERATION.
1) Perform switch ON/OFF diagnosis (in Mode IV).
2) Make sure that red L.E.D. comes "ON" or goes "OFF" when accelerator pedal is depressed.

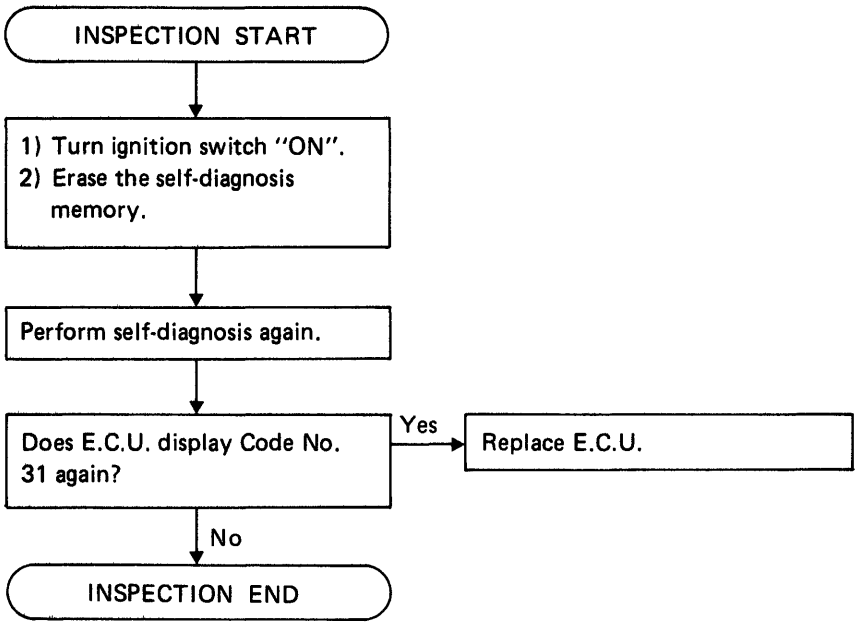
CHECK FULL SWITCH OPERATION
Perform driving test and then perform self-diagnosis (Mode III) again.

N.G. →
1) Perform self-diagnosis and find malfunction code.
2) According to displayed code No., perform electronic control system inspection.

O.K. ↓

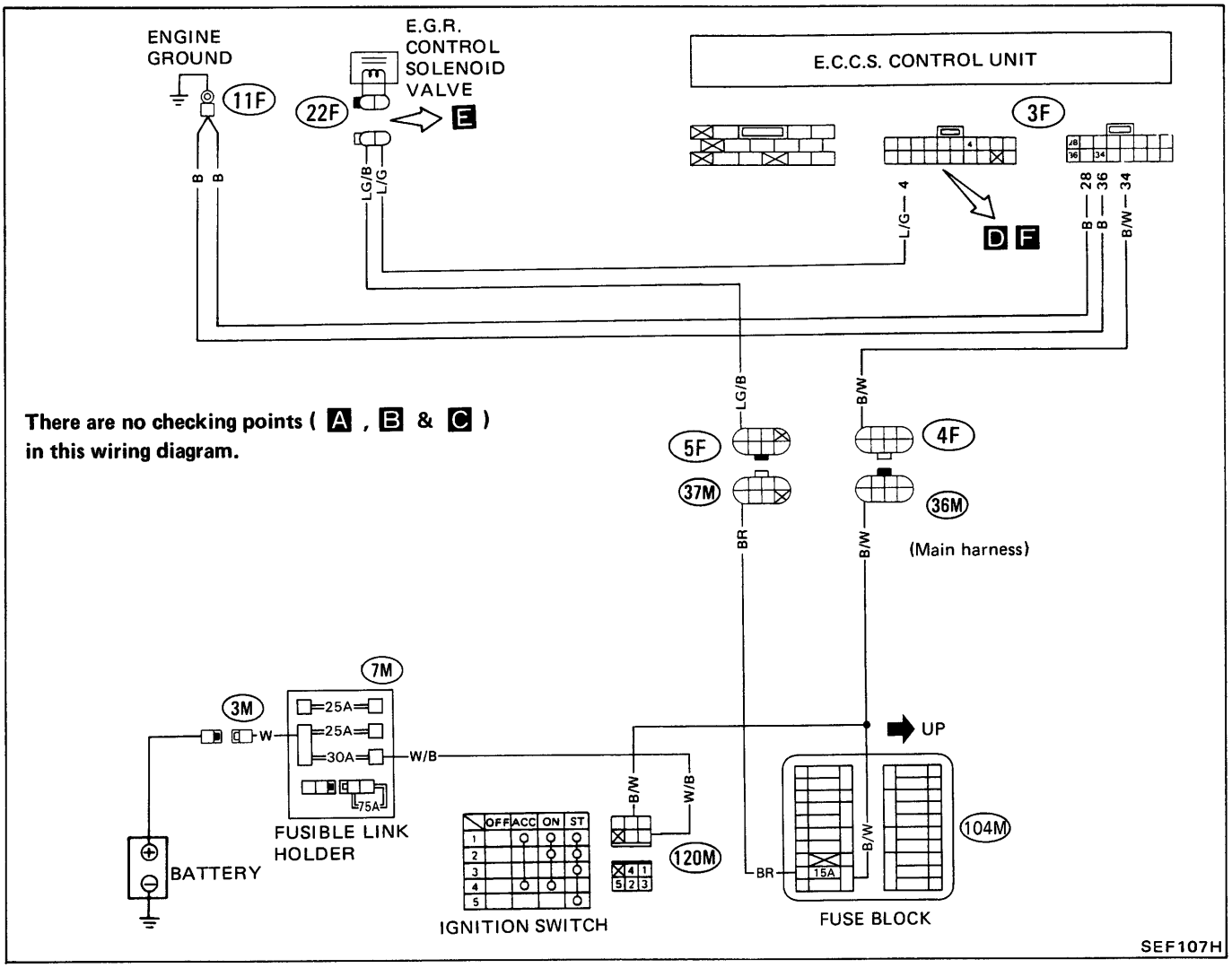
INSPECTION END

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

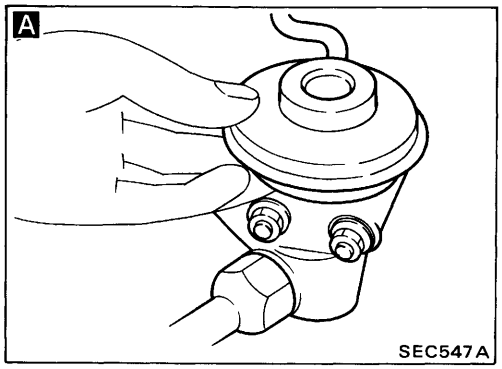


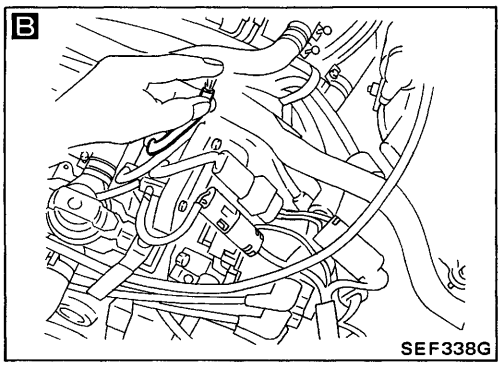
NOTE

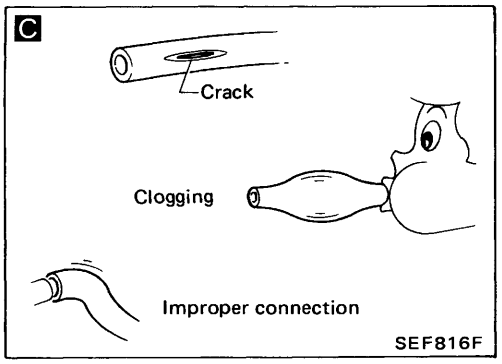
E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY

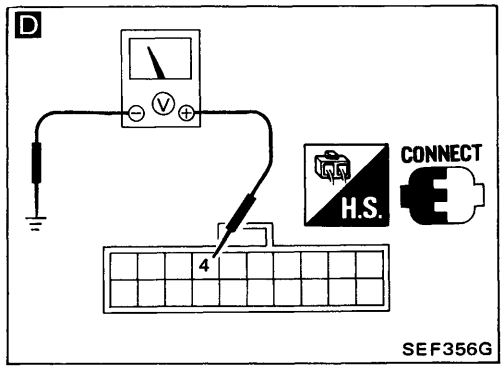


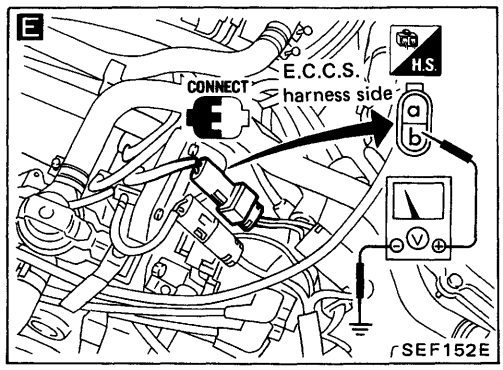
E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY











INSPECTION START

A CHECK E.G.R. CONTROL VALVE OPERATION.
1) Start engine.
2) Make sure engine is warmed up sufficiently.
3) Make sure E.G.R. control valve spring responds to your touch (use your fingers) and also when engine is raced.

Responds → INSPECTION END

Does not respond ↓

B CHECK VACUUM SOURCE TO E.G.R. CONTROL VALVE.
1) Disconnect vacuum hose connected to E.G.R. control valve and B.P.T. valve.
2) Make sure vacuum exists when racing engine.

O.K. → Perform CHECK **H**. (See page EF & EC-100.)

N.G. ↓

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

N.G. → If necessary, replace vacuum hose or reconnect vacuum hose firmly.

O.K. ↓

D CHECK E.C.U. OUTPUT SIGNAL.
1) Check voltage between E.C.U. terminal ④ and ground under the following conditions:

Engine condition	Voltage
Cold	0.7 - 0.9V
After warm up	Battery voltage

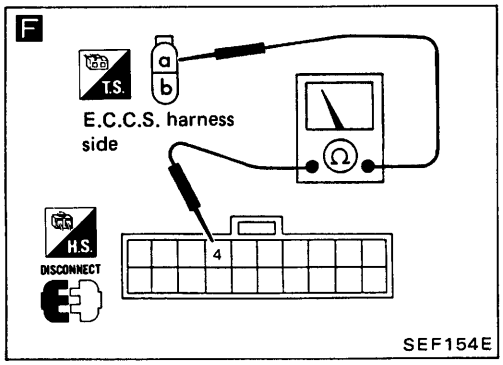
N.G. → **E** CHECK POWER SOURCE TO E.G.R. CONTROL SOLENOID VALVE.
1) Stop engine.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Battery voltage should exist.

F CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. 20-pin connector.
3) Disconnect E.G.R. control solenoid valve harness connector.
4) Check resistance between E.C.U. terminal ④ and terminal ⓐ.
Resistance:
Approximately 0Ω
If N.G., repair or replace harness.

O.K. ↓

E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY

F



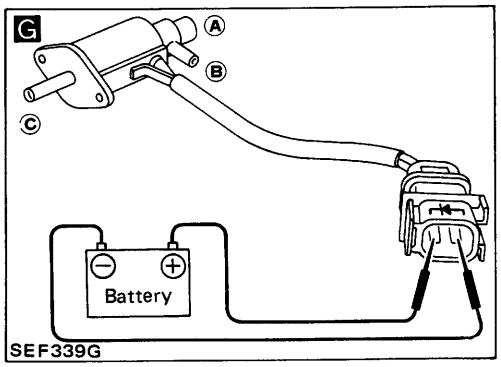
G CHECK E.G.R. CONTROL SOLENOID VALVE.
1) Stop engine.
2) Remove E.G.R. control solenoid valve from vehicle.
3) Check the port continuity.

Solenoid valve	Continuity
When current flows	Ⓐ - Ⓑ
When current does not flow	Ⓑ - Ⓒ

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

O.K.

G

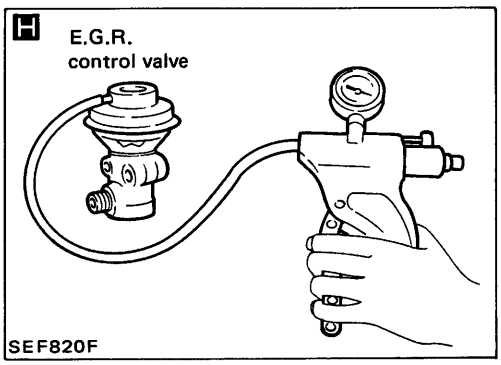


H CHECK E.G.R. CONTROL VALVE.
1) Remove E.G.R. control valve from vehicle.
2) Apply vacuum to E.G.R. vacuum port with a hand vacuum pump.
E.G.R. control valve spring should lift.

N.G. → Valve spring may be stuck. Clean if necessary. If this does not correct trouble, replace E.G.R. control valve.

O.K.

H



Check resistance of exhaust gas temperature sensor. (See page EF & EC-108.)

Reinstall any part removed.

Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode III.

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

J Make sure check engine light does not come "ON" during driving test.

Comes "ON" → Perform self-diagnosis and find malfunction code. According to displayed code No., perform electronic control system inspection.

Does not come "ON"

INSPECTION END

E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY

I ROAD TEST

Test condition

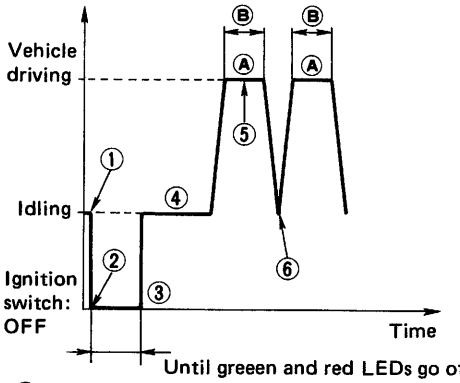
Drive vehicle under the following conditions with a suitable shift position.

① **Engine speed:**
2,800±600 rpm

② **Intake manifold vacuum:**
−38.7±12.0 kPa
(−290±90 mmHg, −11.42±3.54 inHg)

Driving mode

Ⓐ : Test condition
Ⓑ : 21 seconds or more

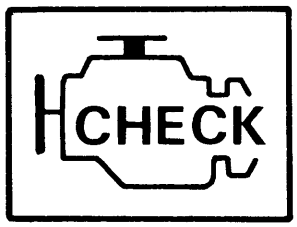


Until greeen and red LEDs go off.

① Start engine and warm it up sufficiently.
② Turn off ignition switch and keep it off until green and red LEDs go off.
③ Start engine and make sure that air conditioner switch and rear defogger are turned "OFF" during driving test.
④ Keep engine running for at least 3 minutes.
⑤ Shift to suitable gear position and drive in "Test condition" for at least 21 seconds.
⑥ Decrease engine revolution to less than 2,000 rpm.
⑦ Repeat steps ⑤ through ⑥ at least 1 time.

SEF302H

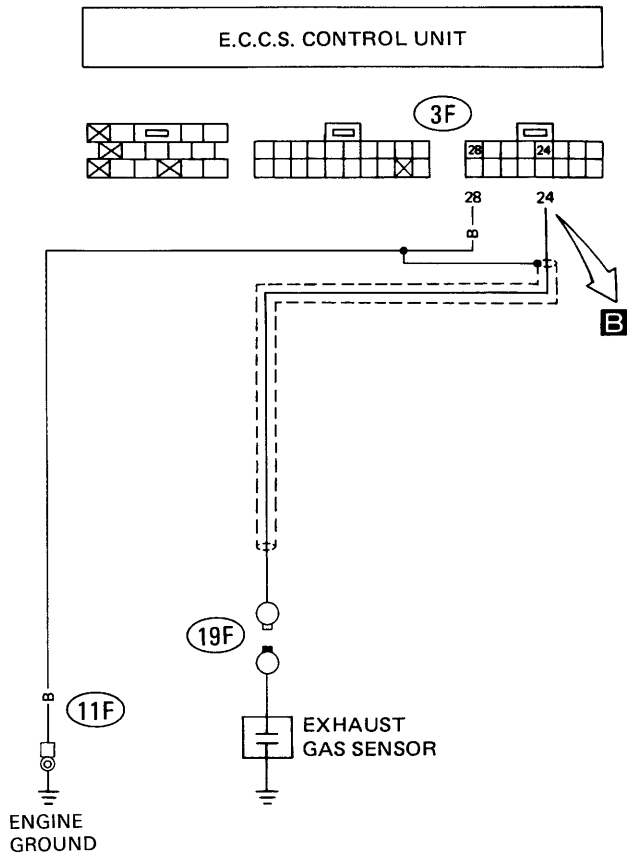
J



CHECK ENGINE LIGHT

SEF924F

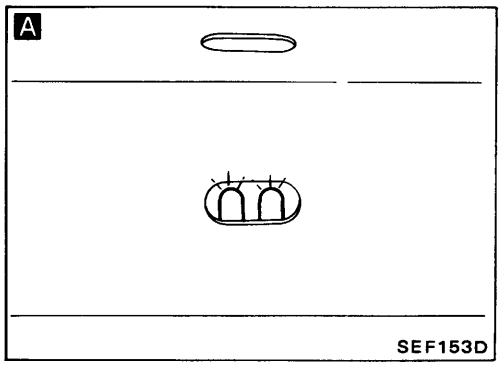
EXHAUST GAS SENSOR (Code No. 33) CHECK (CHECK ENGINE LIGHT ITEM)

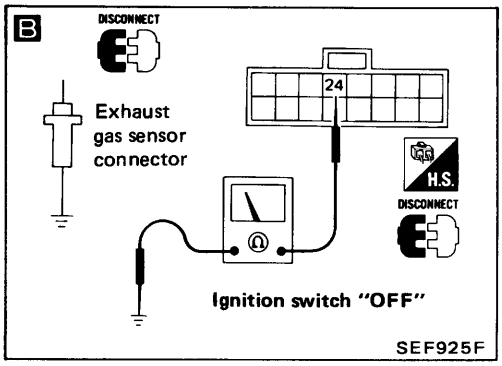


There is no checking point (A) in this wiring diagram.

SEF120H

EXHAUST GAS SENSOR (Code No. 33) (CHECK ENGINE LIGHT ITEM)





INSPECTION START

A CHECK INPUT SIGNAL.
1) Start engine and warm it up sufficiently.
2) Make sure green L.E.D. on E.C.U. blinks more than 9 times during 10 seconds at 2,000 rpm.
3) Check voltage between E.C.U. terminal ㉔ and ground.

Voltage should change between 0V and 1V.

O.K. → INSPECTION END

N.G.

B CHECK EXHAUST GAS SENSOR CIRCUIT.
1) Turn off engine.
2) Disconnect E.C.U. 16-pin connector.
3) Disconnect exhaust gas sensor harness connector.
4) Connect a jumper wire from exhaust gas sensor harness connector to ground.
5) Check resistance between E.C.U. terminal ㉔ and ground.

Resistance:
Approximately 0Ω

N.G. → Repair or replace harness.

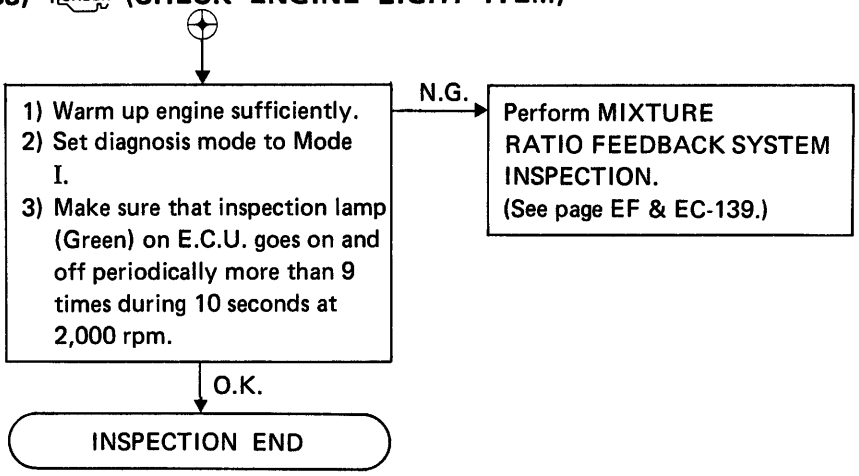
O.K.

Replace exhaust gas sensor.

Reinstall any part removed.

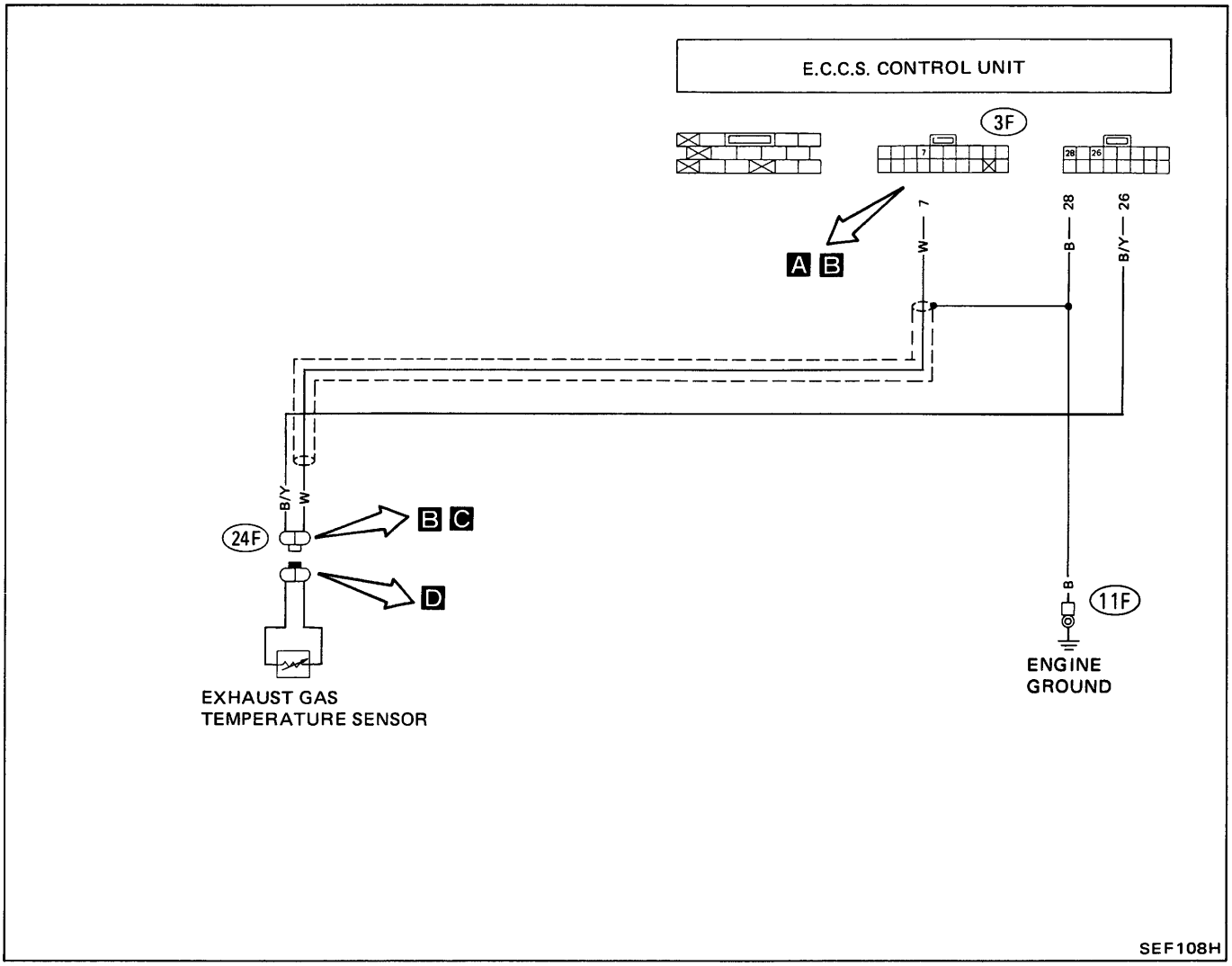
Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode III.

EXHAUST GAS SENSOR (Code No. 33) (CHECK ENGINE LIGHT ITEM)



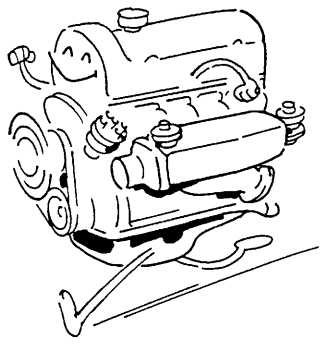
NOTE

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



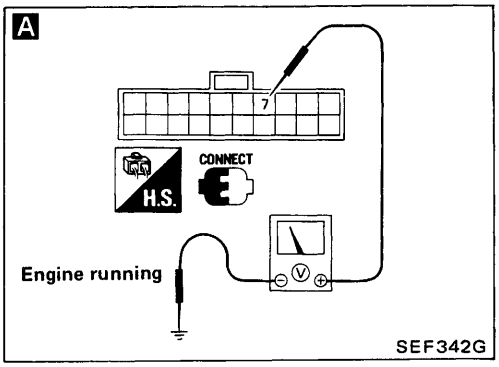
The following is necessary to perform this inspection.

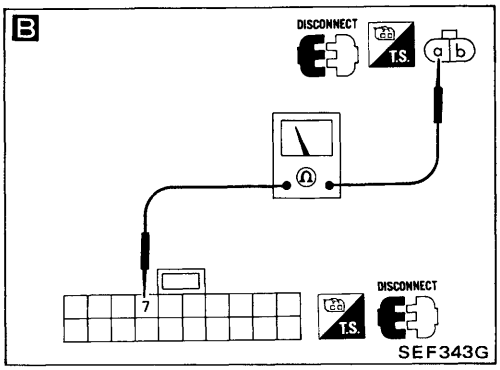
1. Pull out E.C.U.
2. • Disconnect vacuum hose connected to E.G.R. control valve.
   • Connect a hand vacuum pump to E.G.R. control valve.
3. Warm up engine sufficiently.

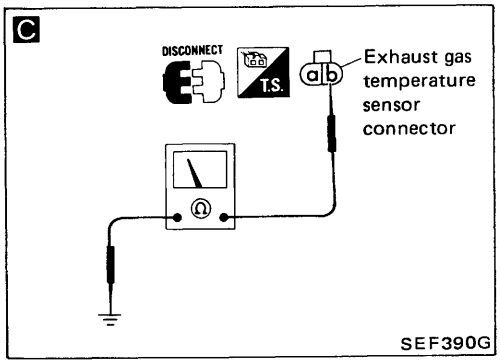


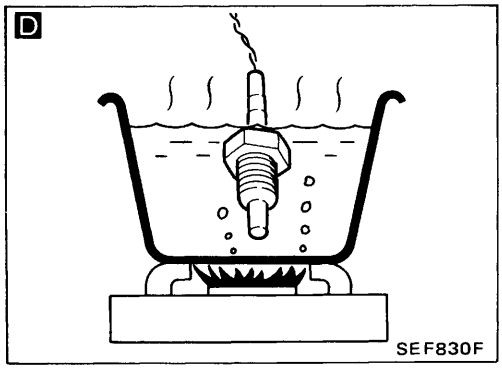
SEF802F

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









INSPECTION START

A CHECK INPUT SIGNAL.
1) Start engine and warm it up sufficiently.
2) Keep engine speed at approximately 2,000 rpm.
3) Check voltage between E.C.U. terminal ⑦ and ground under the following conditions:

Condition	Voltage
When vacuum is not applied to E.G.R. control valve	1.0V or more
When vacuum is applied to E.G.R. control valve	0 - 1.0V

A sufficient vacuum applied with a hand vacuum pump may cause the engine to stall.

O.K. → INSPECTION END

N.G. ↓

B CHECK HARNESS CONTINUITY BETWEEN E.C.U. AND EXHAUST. GAS TEMPERATURE SENSOR
1) Stop engine.
2) Disconnect E.C.U. 20-pin connector.
3) Disconnect exhaust gas temperature sensor harness connector.
4) Check continuity between E.C.U. terminal ⑦ and ⓐ.
Resistance:
Approximately 0Ω

N.G. → 1) Check middle harness connector connection.
2) If necessary, repair or replace harness.

O.K. ↓

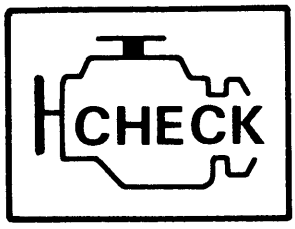
C CHECK GROUND CIRCUIT.
Check continuity between ⓑ and ground.
Resistance:
Approximately 0Ω

N.G. → 1) Check middle harness connector connection.
2) If necessary, repair or replace harness.

O.K. ↓

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

E



CHECK ENGINE LIGHT

SEF924F

D CHECK COMPONENTS.
1) Remove exhaust gas temperature sensor from exhaust gas passage gallery.
2) 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**

N.G. → Replace exhaust gas temperature sensor.
15 - 25 N·m (1.5 - 2.5 kg-m, 11 - 18 ft-lb)

O.K. ↓

Reinstall any part removed.

↓

Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode III.

↓

E

Make sure check engine light does not come "ON" during driving test.

N.G. → 1) Perform E.C.U. pin terminal checks.
2) If N.G., recheck for damaged E.C.U. pin terminals or the connection of E.C.U. harness connector.

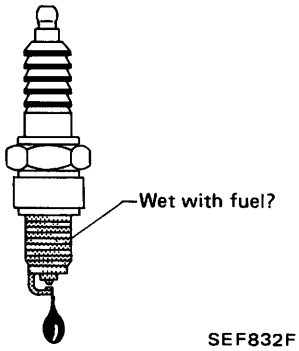
O.K. ↓

INSPECTION END

NOTE

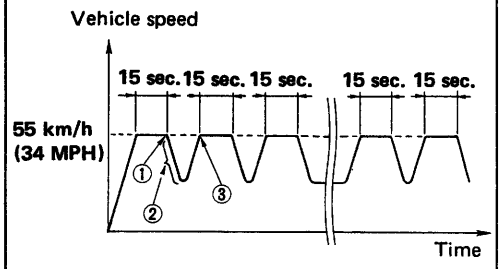
INJECTOR LEAK (Code No. 45) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY

A



SEF832F

B ROAD TEST



① Shift to "4th" position* and drive on a smooth road at constant speed of approximately 55 km/h (34 MPH) for 15 seconds.
② While holding at "4th" position*, release accelerator pedal (fully closed throttle) until speed is reduced to 30 km/h (19 MPH).
③ Accelerate engine and drive at the same constant speed in step ① above for 15 seconds.
④ Repeat steps ① through ③ above at least five times.
*: Refer to "D_3" range for automatic transaxle model.

SEF834F

INSPECTION START

Start engine and warm it up sufficiently.

Perform self-diagnosis (Mode III). Is Code No. 14 or 23 indicated?
Yes → Check vehicle speed sensor or idle switch. (See page EF & EC-88/94.)

No

Make sure engine runs smoothly at idle after warming.
Does not run smoothly. → Ⓐ

Runs smoothly

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

Set diagnosis to Mode II and check that red and green L.E.D. on control unit blink almost simultaneously at 2,000 rpm under no-load.
Does not blink. → Check idle CO% (See page EF & EC-139.)

Blinks

INSPECTION END

Ⓐ

A Remove all spark plugs from intake manifold. Are plugs wet with fuel?
Yes → Replace the injector in which cylinder spark plug is wet with fuel.

No

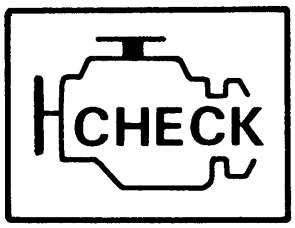
Remove injector assembly. (See page EF & EC-145.) **Keep fuel hose and all injectors connected to injector gallery.**

Turn ignition switch "ON". Make sure fuel does not drip from injector.
Drips → Replace the injectors where fuel is dripping from.

Does not drip

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

C



CHECK ENGINE LIGHT

SEF924F

Reinstall any part removed.

Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode III.

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

C Make sure check engine light does not come "ON" during driving test.

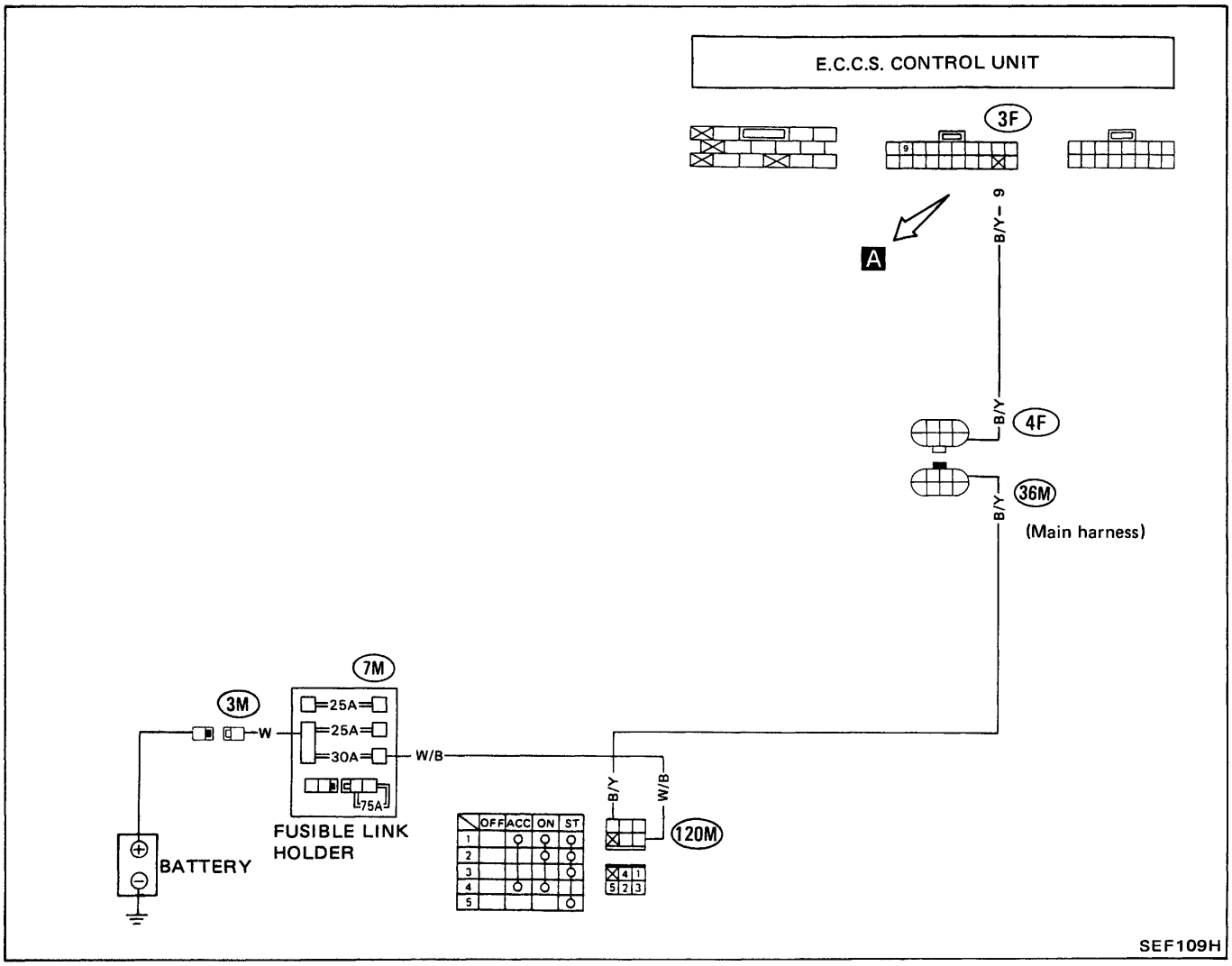
Comes "ON"

1) Perform self-diagnosis and find malfunction code.
2) According to displayed code No., perform electronic control system inspection.
3) If Code No. 45 is displayed again, replace all injectors, then perform electronic control system inspection.

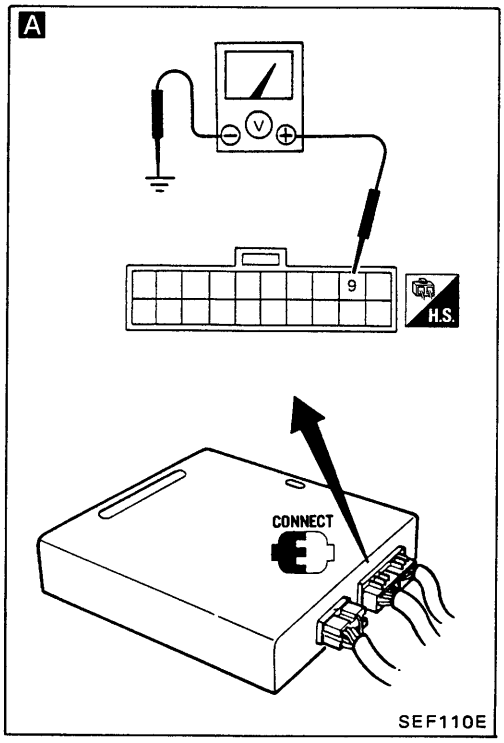
Does not come "ON"

INSPECTION END

START SIGNAL (Switch ON/OFF diagnosis)



START SIGNAL (Switch ON/OFF diagnosis)



INSPECTION START

A

CHECK INPUT SIGNAL.
1) Turn ignition switch "START".
2) Check voltage between terminal ⑨ and ground.
Voltage: Battery voltage

N.G. → Check the following items.
1) Ignition switch.
2) "30A" fusible link
3) Harness continuity between ignition switch and E.C.U.

O.K.

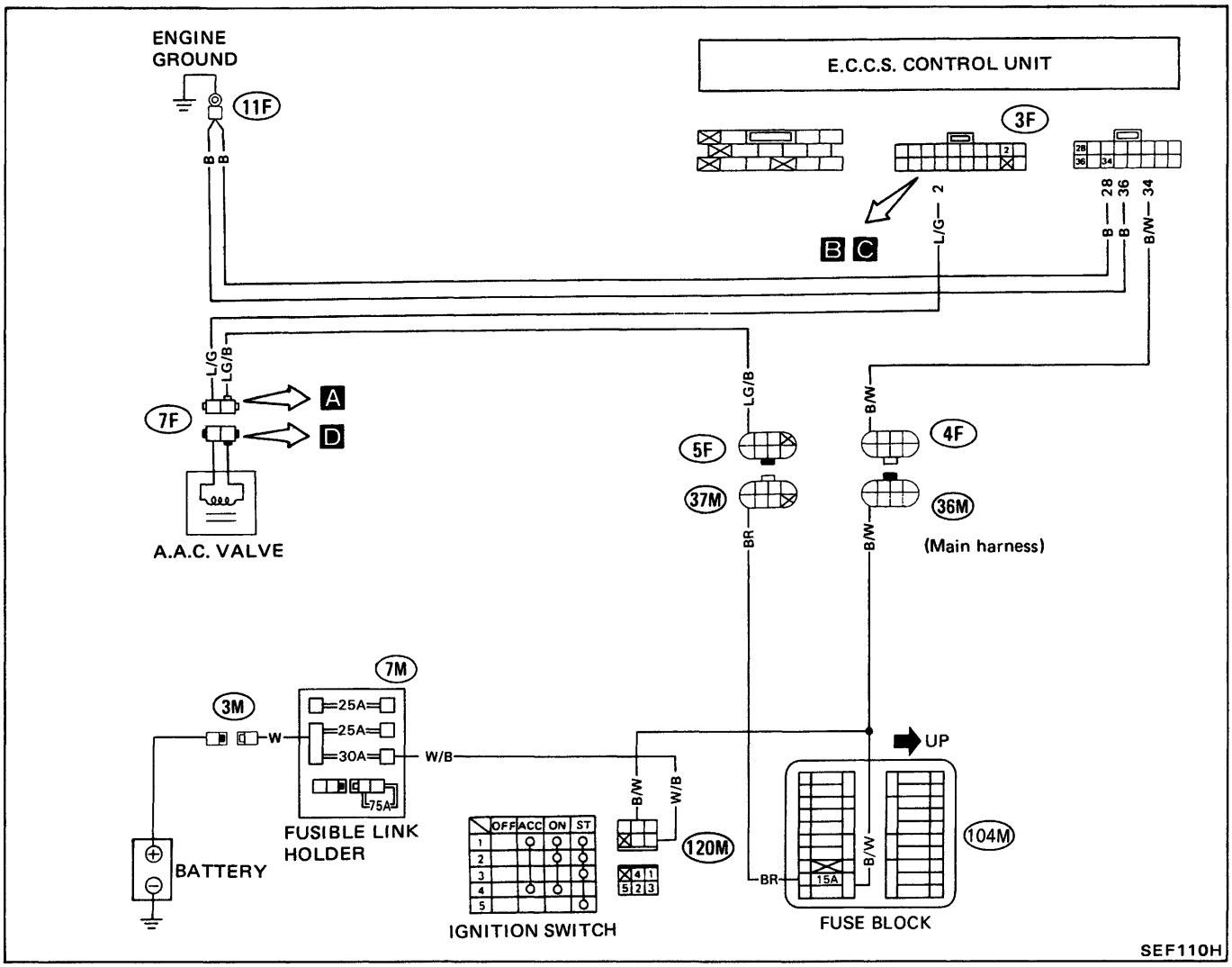
Perform self-diagnosis (Mode IV).

N.G. → 1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

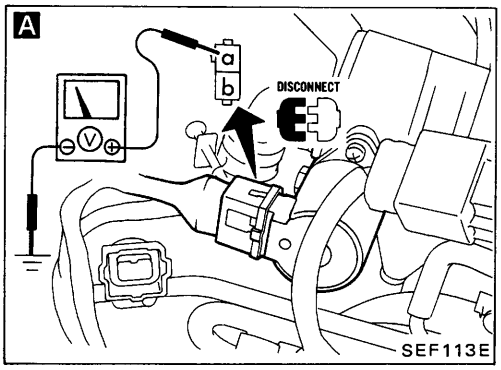
O.K.

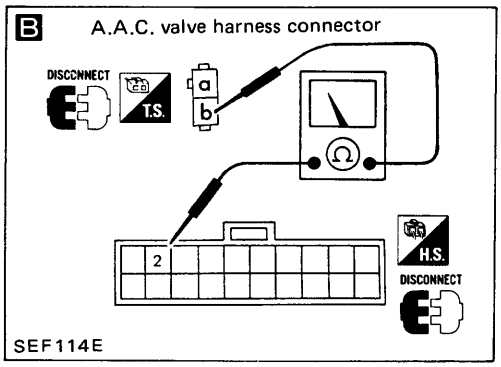
INSPECTION END

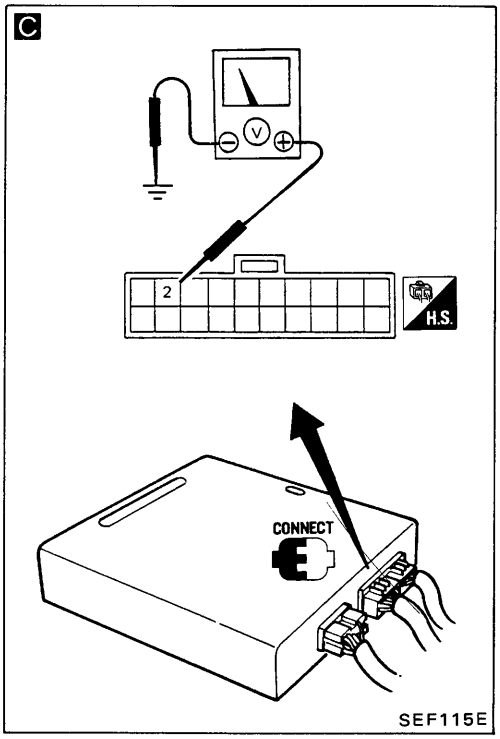
AUXILIARY AIR CONTROL (A.A.C.) VALVE (Not self-diagnostic item)

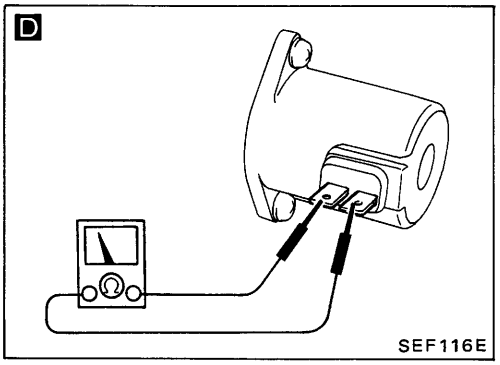


AUXILIARY AIR CONTROL (A.A.C.) VALVE (Not self-diagnostic item)









INSPECTION START

A

CHECK POWER SOURCE.
1) Disconnect A.A.C. valve harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following items.
1) Harness continuity between battery and A.A.C. valve.
2) Ignition switch
3) "30A" fusible relay
4) E.F.I. relay circuit
(See page EF & EC-132.)

O.K. ↓

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF" and disconnect E.C.U. 20-pin connector.
2) Check resistance between terminal ⓑ and E.C.U. terminal ②.
Resistance:
Approximately 0Ω

N.G. → Repair harness.

O.K. ↓

C

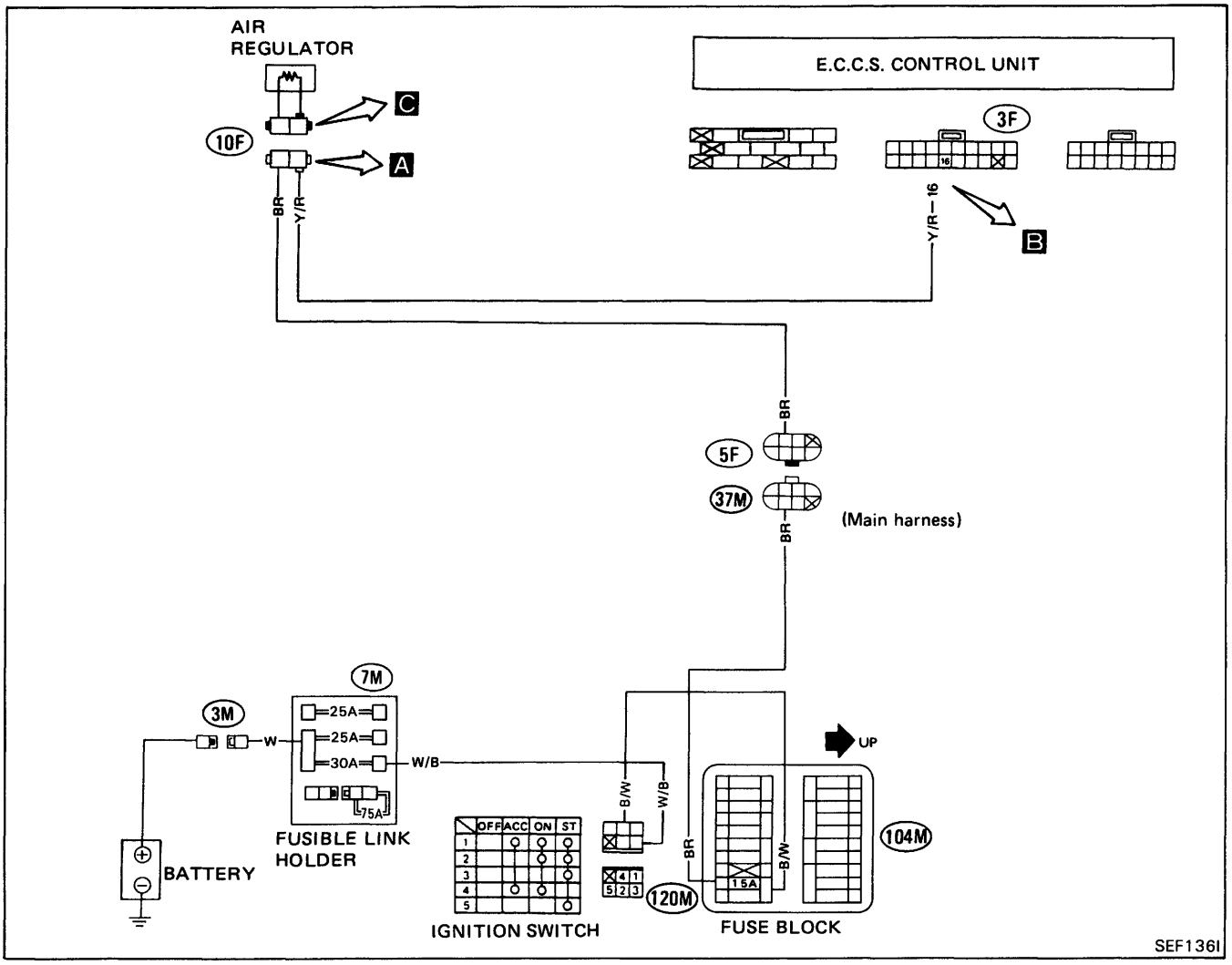
CHECK INPUT SIGNAL.
1) Reconnect E.C.U. 20-pin connector and A.A.C. valve harness connector.
2) Start engine and warm it up sufficiently.
3) Check voltage between E.C.U. terminal ② and ground.
Voltage:
Approximately 6 - 8V
(at idle)

N.G. → **D**
Check A.A.C. valve.
Check resistance of A.A.C. valve.
Continuity should exist.

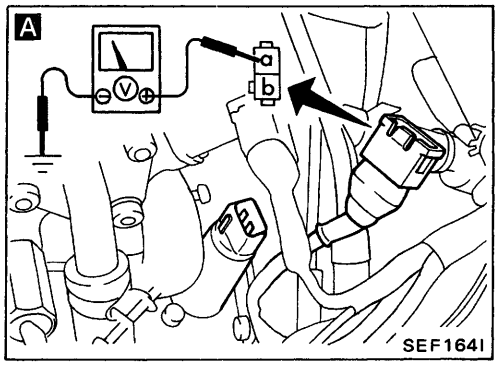
O.K. ↓

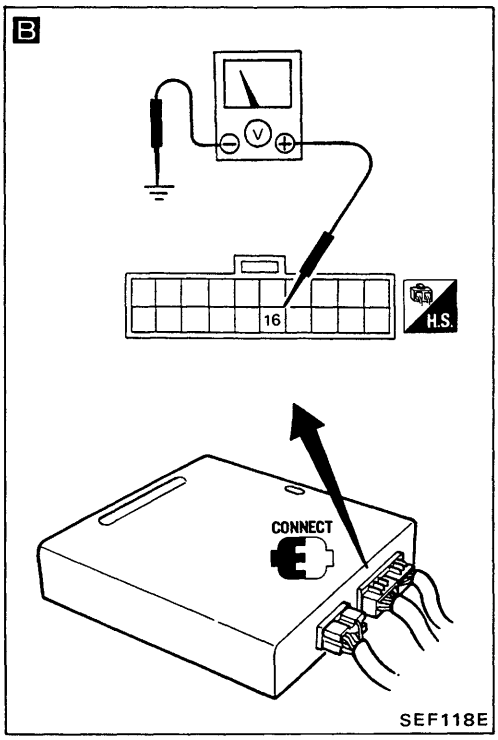
INSPECTION END

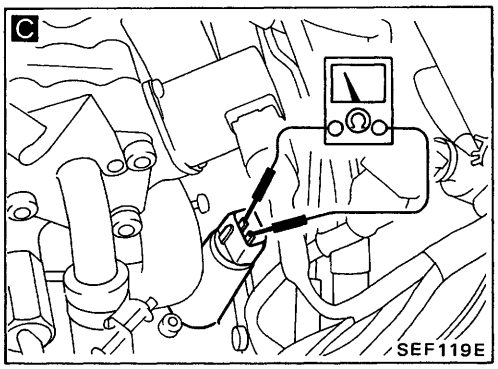
AIR REGULATOR (Not self-diagnostic item)



AIR REGULATOR (Not self-diagnostic item)







INSPECTION START

A

CHECK POWER SOURCE.
1) Disconnect air regulator harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Battery voltage should exist.

N.G. → Check the following items.
1) Harness continuity between battery and air regulator.
2) Ignition switch
3) "30A" fusible link

O.K.

B

CHECK OUTPUT SIGNAL.
1) Turn ignition switch "OFF".
2) Connect air regulator harness connector.
3) Turn ignition switch "ON".
4) Check voltage between E.C.U. terminal ⑯ and ground.
Battery voltage should appear in 5 seconds after turning ignition switch "ON".

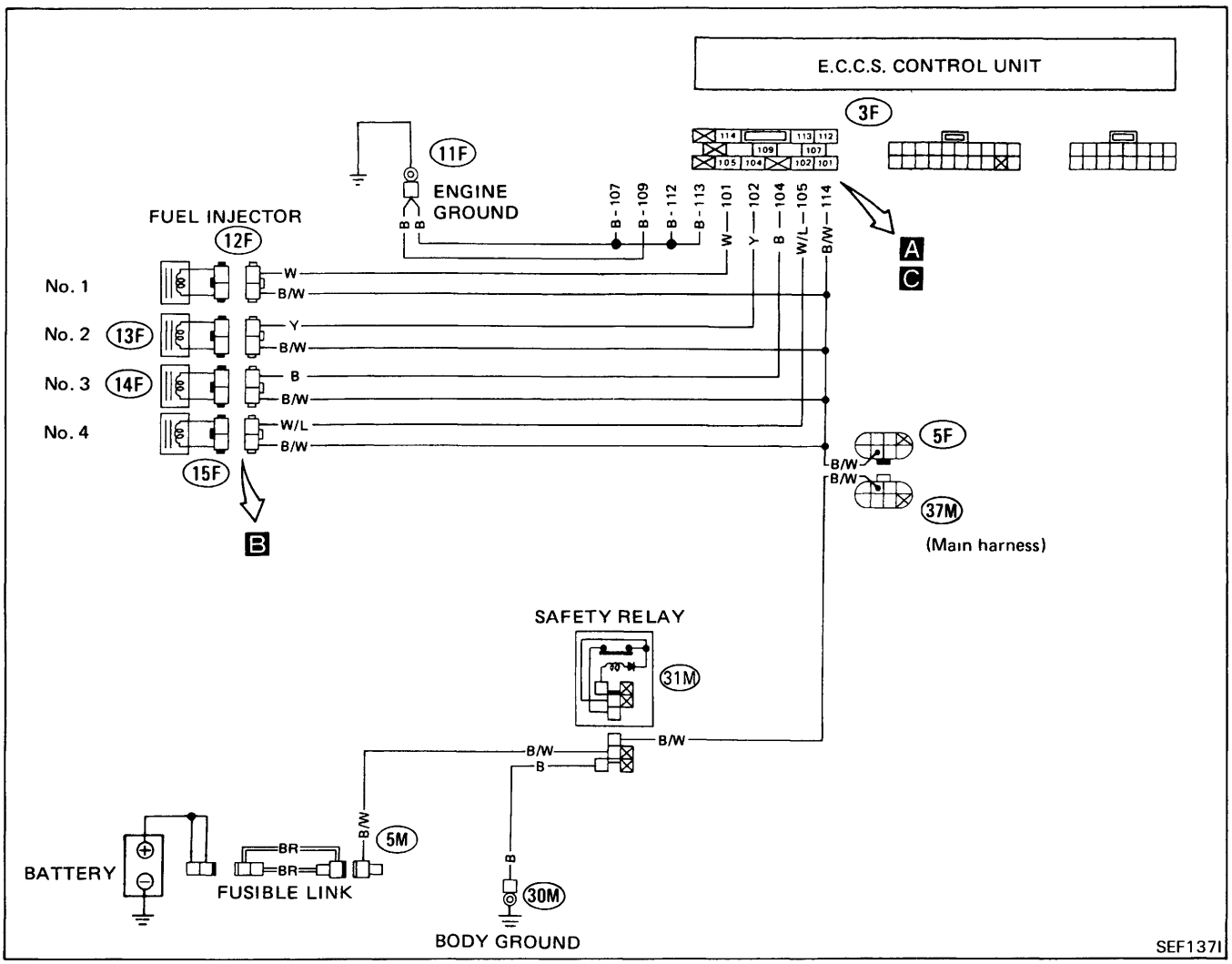
N.G. →
1) Check harness continuity between E.C.U. and air regulator.
C 2) Check air regulator.
- Disconnect air regulator harness connector.
- Check resistance of air regulator.
Resistance:
Approximately 70Ω

3) Check power source and ground circuit for E.C.U.
(See page EF & EC-130.)

O.K.

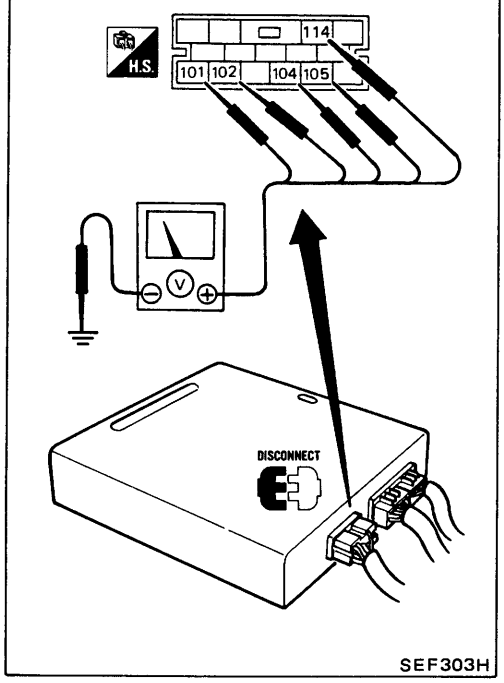
INSPECTION END

INJECTOR (Not self-diagnostic item)



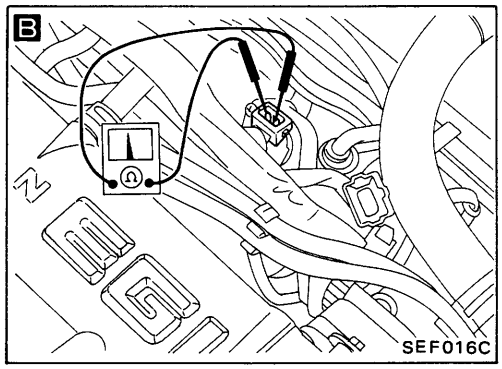
INJECTOR (Not self-diagnostic item)

A



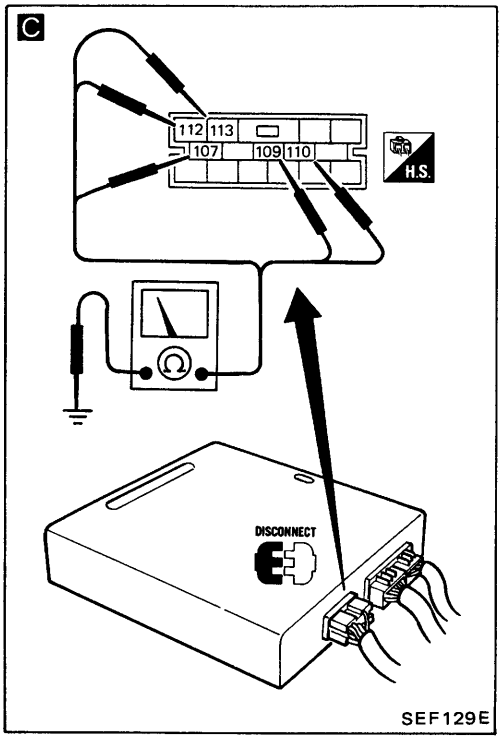
SEF303H

B



SEF016C

C



SEF129E

INSPECTION START

A

CHECK POWER SOURCE.
1) Disconnect E.C.U. 15-pin connector.
2) Check voltage between terminals (101), (102), (104), (105), (114) and ground.
Voltage: Battery voltage

N.G. →

Check the following items.
1) Harness continuity between injectors and battery.
2) Harness continuity between E.C.U. and battery
3) "BR" fusible link
B 4) Injector's continuity
- Check resistance of each injector.
Resistance:
Approximately 2.5Ω
If N.G., replace injector.

O.K. ↓

C

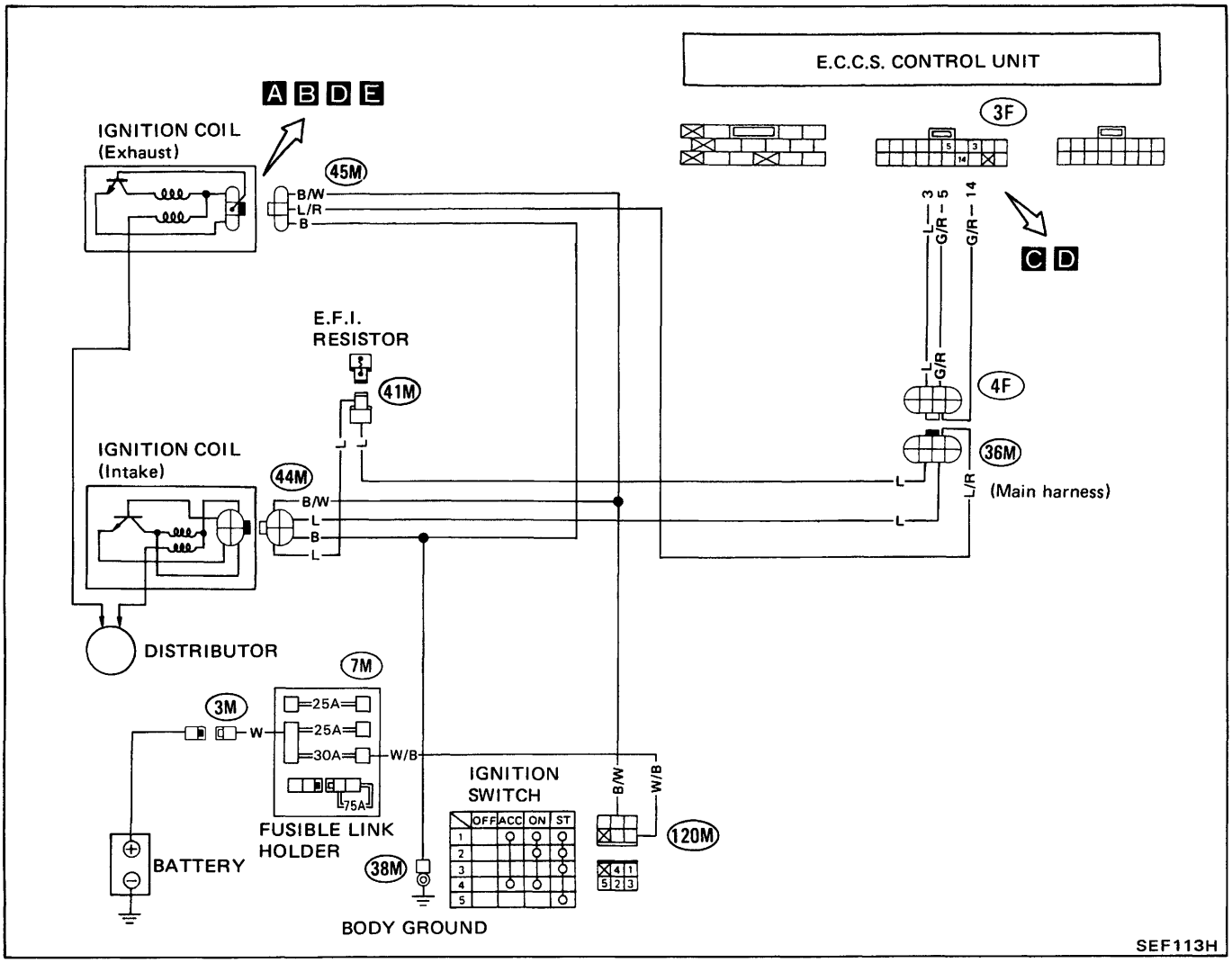
CHECK GROUND CIRCUIT.
1) Disconnect E.C.U. 15-pin connector.
2) Check resistance between terminals (107), (109), (110), (112), (113) and ground.
Resistance:
Approximately 0Ω

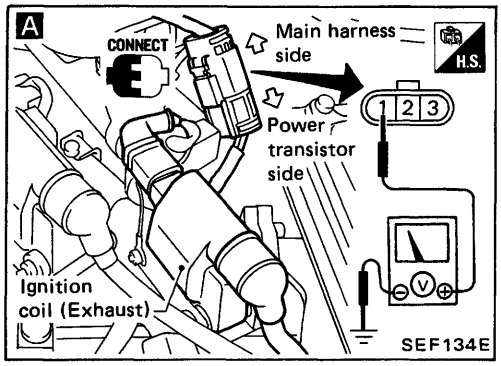
N.G. → Repair harness.

O.K. ↓

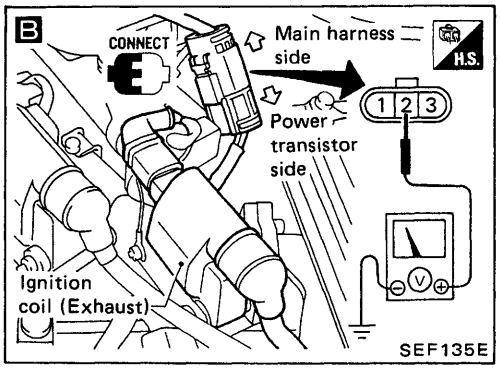
INSPECTION END

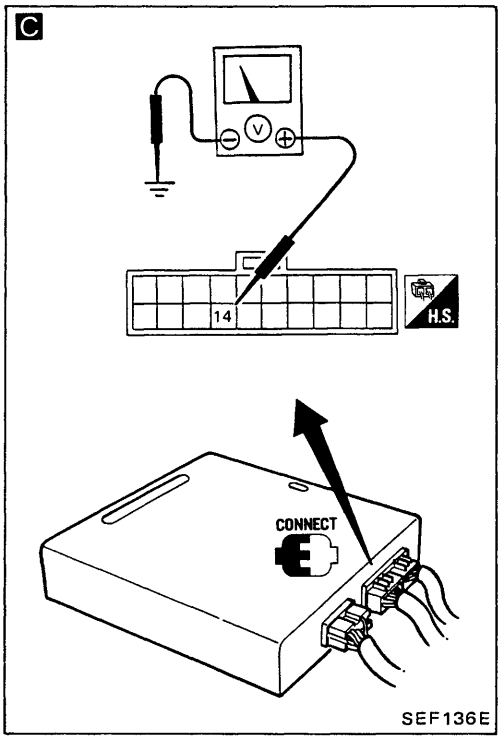
SPARK PLUG SWITCHING CONTROL (Not self-diagnostic item)

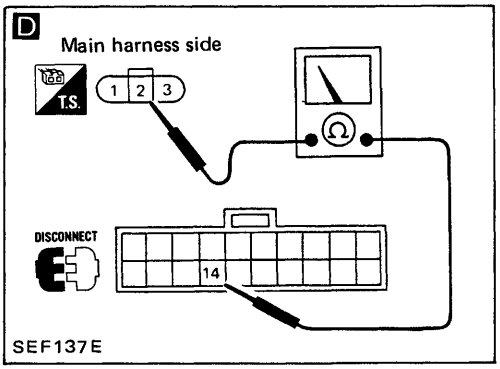


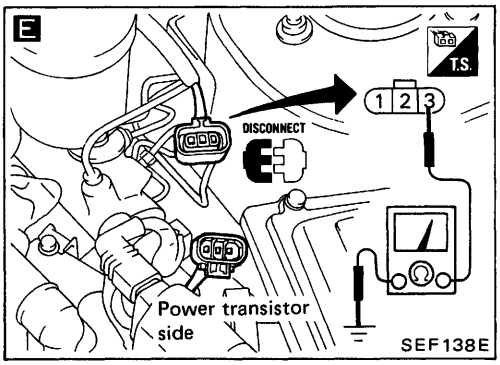


SPARK PLUG SWITCHING CONTROL (Not self-diagnostic item)









INSPECTION START

A CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ① and ground.
Voltage: Battery voltage

N.G. → Check the following items.
1) Harness continuity between battery and power transistor (Exhaust side).
2) "30A" fusible link
3) Ignition switch

O.K.

B CHECK OUTPUT SIGNAL.
1) Start engine and warm it up sufficiently.
2) Check voltage between terminal ② and ground when depressing accelerator pedal fully.
Output voltage drops to approximately 0V.

N.G. → Check the following items.
C 1) E.C.U.
- Check voltage between terminal ⑭ and ground when depressing accelerator pedal fully.
Output voltage drops to approximately 0V.

D 2) Harness continuity between E.C.U. and power transistor
- Stop engine.
- Disconnect power transistor harness connector (Exhaust side).
- Check resistance between terminal ② and E.C.U. terminal ⑭.
Resistance:
Approximately 0Ω

O.K.

E CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect power transistor harness connector.
3) Check resistance between terminal ③ and ground.
Resistance:
Approximately 0Ω

N.G. → Repair harness.

O.K.

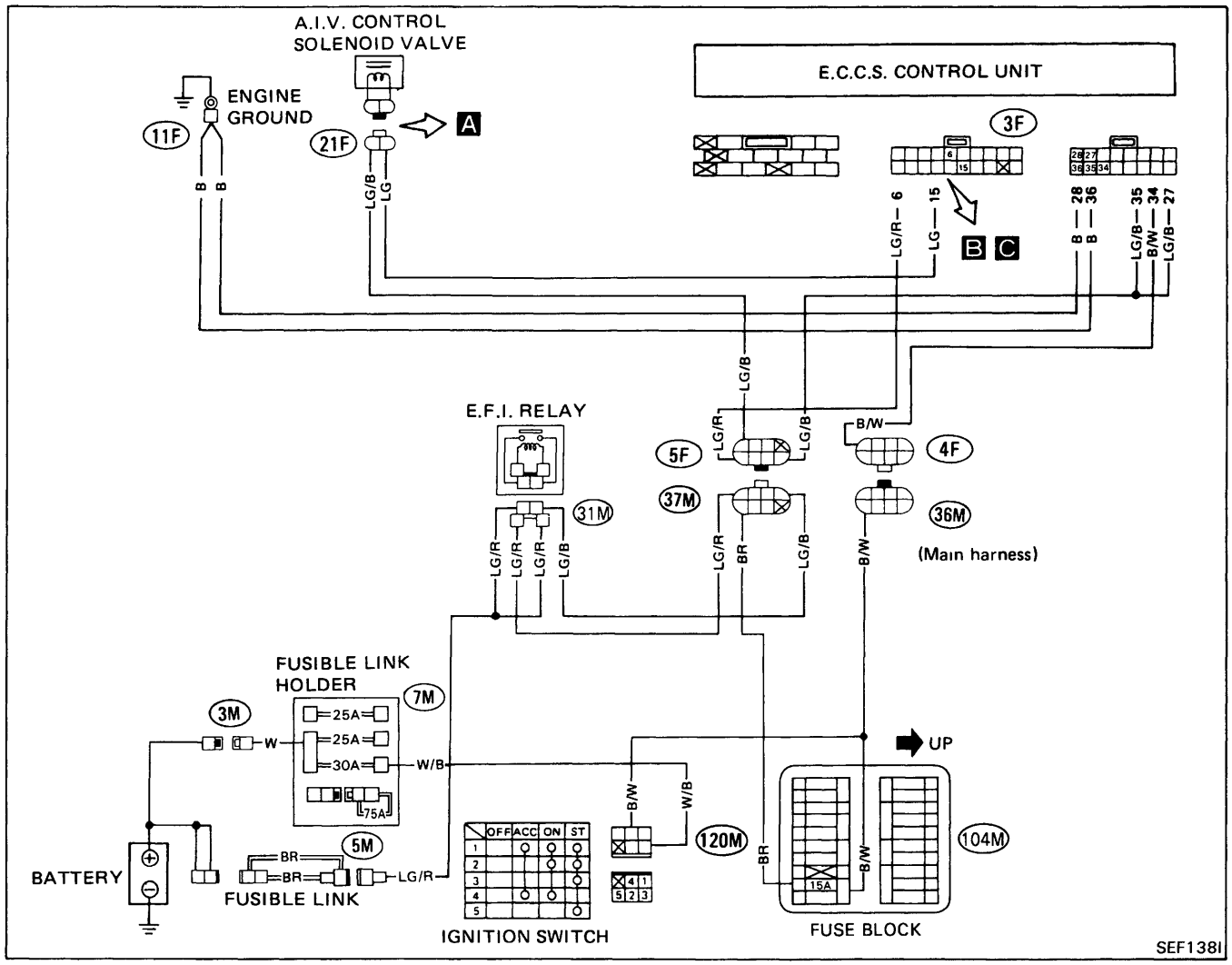
CHECK COMPONENT.
Check power transistor.
(See page EF & EC-91.)

N.G. → Replace power transistor.

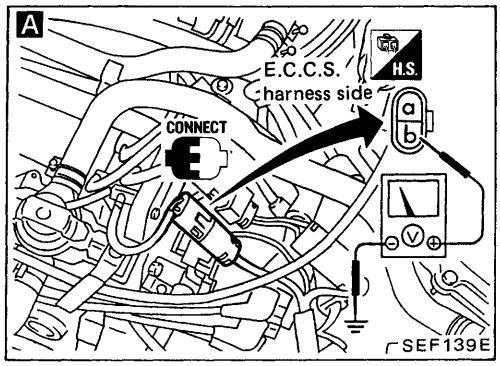
O.K.

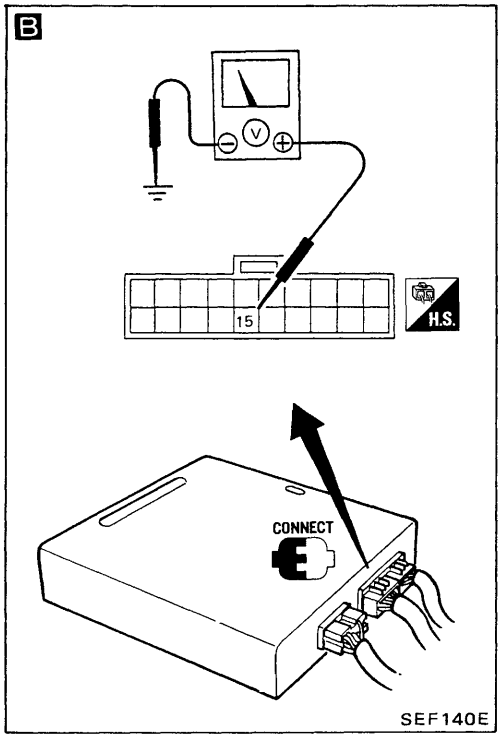
INSPECTION END

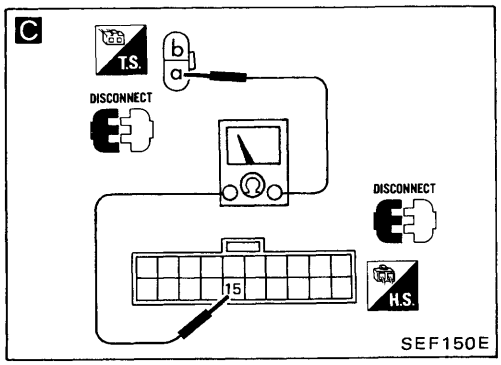
AIR INDUCTION VALVE (A.I.V.) CONTROL (Not self-diagnostic item)



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







INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

N.G. →
Check the following items.
1) Harness continuity between A.I.V. control solenoid valve and battery.
2) "30A" fusible link
3) E.F.I. relay circuit
(See page EF & EC-132.)
4) Ignition switch

O.K. ↓

B

CHECK OUTPUT SIGNAL.
1) Start engine and warm it up sufficiently.
2) Check voltage between E.C.U. terminal ⑮ and ground.

Accel. pedal position	Voltage
Fully closed	Approximately 0.8V
Open	Battery voltage

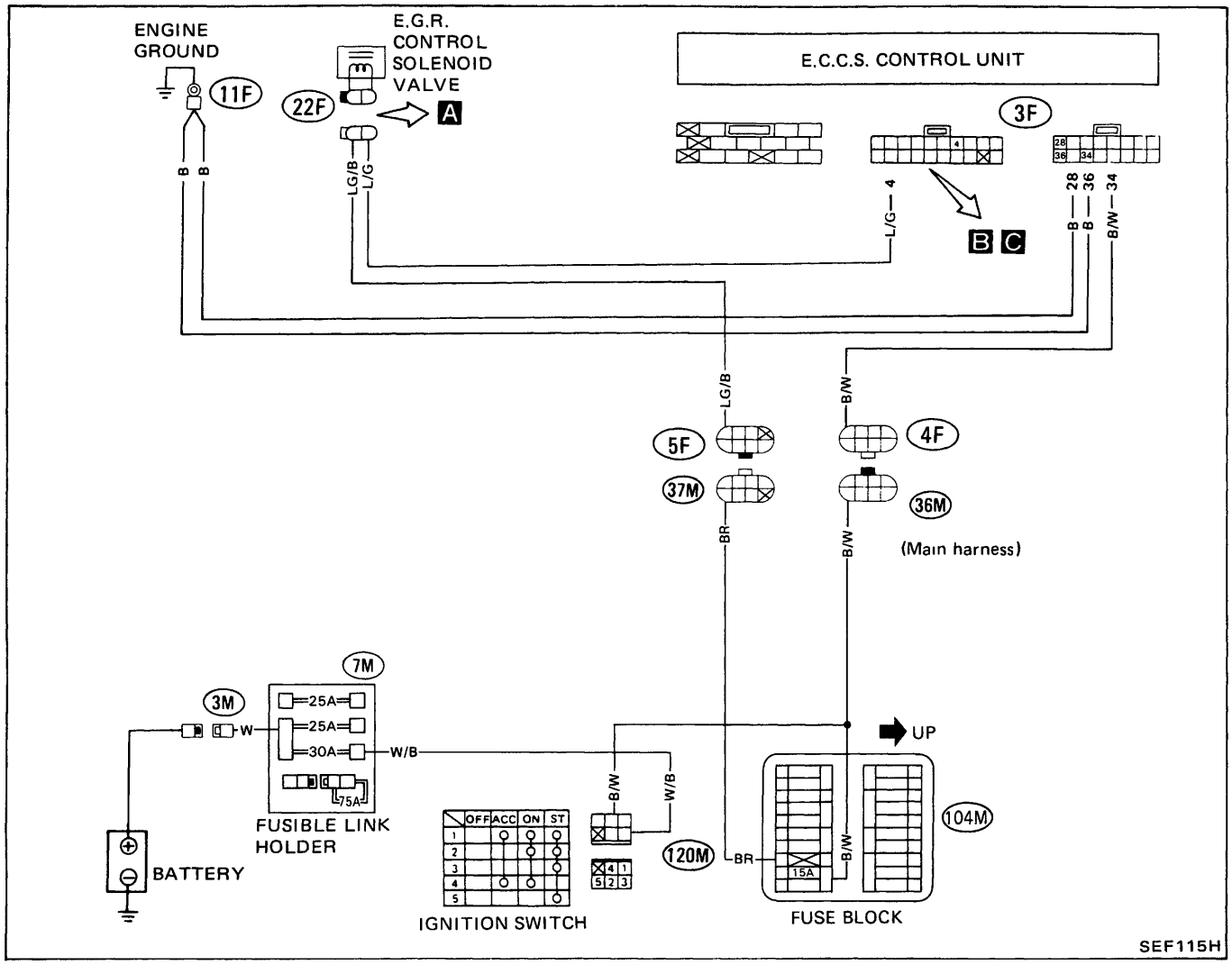
N.G. →
Check the following items.
C 1) Harness continuity between A.I.V. solenoid valve and E.C.U.
- Stop engine and disconnect A.I.V. solenoid valve harness connector.
- Disconnect E.C.U. 20-pin connector.
- Check resistance between terminal ⓐ and E.C.U. terminal ⑮.
Resistance:
Approximately 0Ω

2) A.I.V. control solenoid valve
(See page EF & EC-122.)
3) Check power source and ground circuit for E.C.U.
(See page EF & EC-130.)

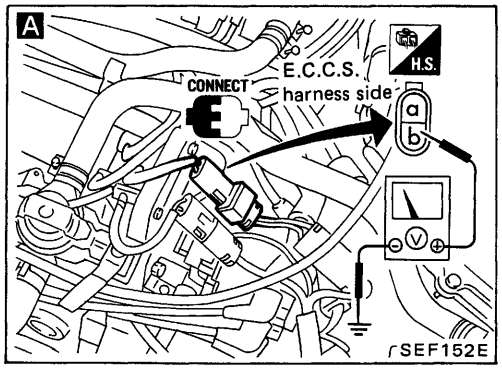
O.K. ↓

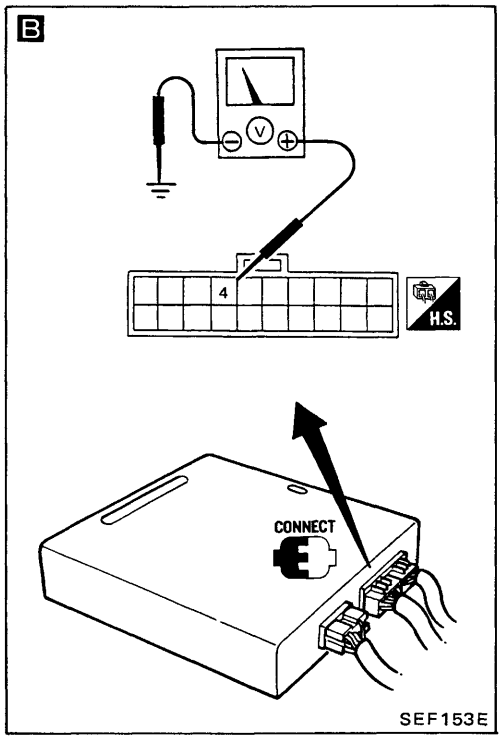
INSPECTION END

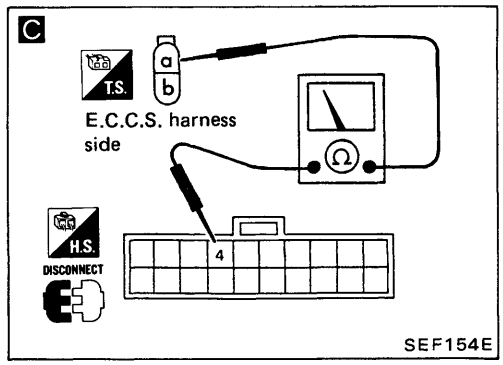
E.G.R. CONTROL (Not self-diagnostic item); EXCEPT FOR CALIFORNIA MODEL



E.G.R. CONTROL (Not self-diagnostic item); EXCEPT FOR CALIFORNIA MODEL







INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

N.G. →
Check the following items.
1) Harness continuity between E.G.R. control solenoid valve and battery.
2) "30A" fusible link
3) E.F.I. relay circuit
(See page EF & EC-132.)
4) Ignition switch

O.K. ↓

B

CHECK OUTPUT SIGNAL.
1) Start engine.
2) Check voltage between E.C.U. terminal ④ and ground.

Engine condition	Voltage between ④ and ground
Cold	0.7 - 0.9V
After warm up	Battery voltage

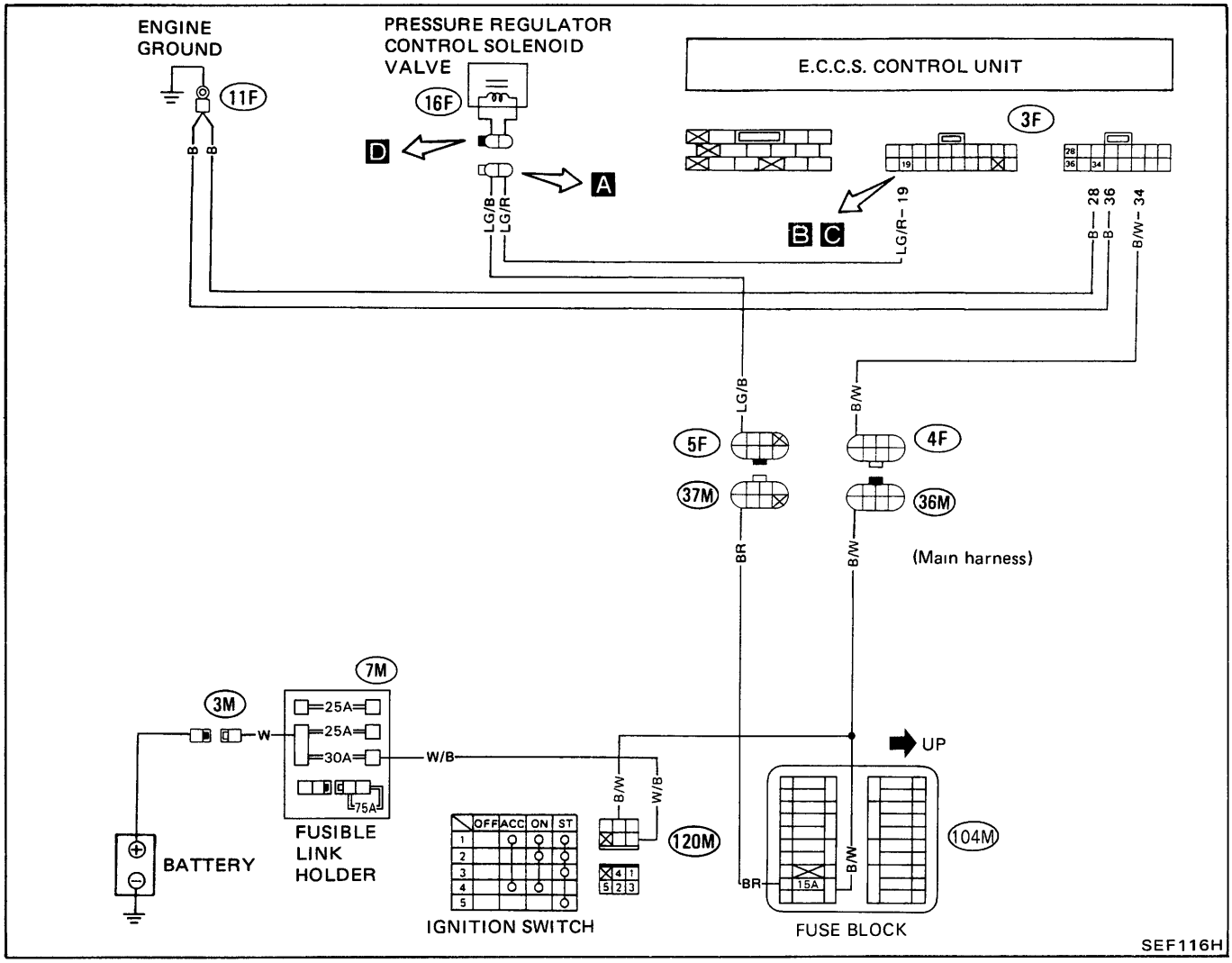
N.G. →
Check the following items.
C 1) Harness continuity between E.G.R. control solenoid valve and E.C.U.
- Stop engine.
- Disconnect E.G.R. control solenoid valve harness connector and E.C.U. 20-pin connector.
- Check resistance between terminals ④ and ⓐ.
Resistance:
Approximately 0Ω

2) E.G.R. control solenoid valve.
(See page EF & EC-149.)
3) Check power source and ground circuit for E.C.U.
(See page EF & EC-130.)

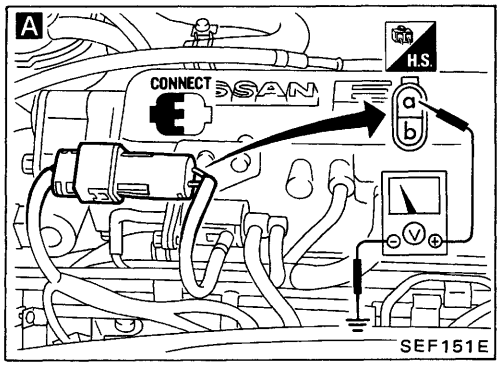
O.K. ↓

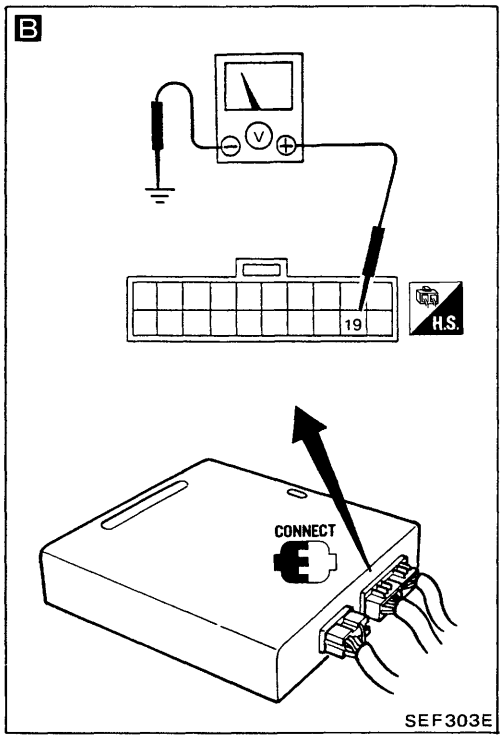
INSPECTION END

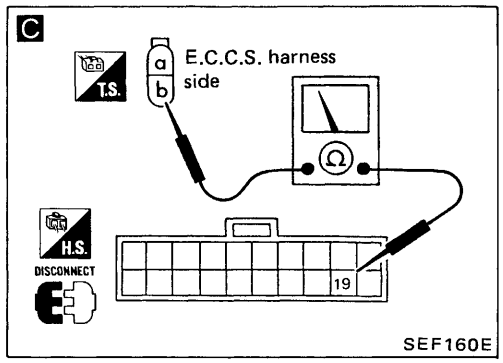
PRESSURE REGULATOR (P.R.) CONTROL SOLENOID VALVE (Not self-diagnostic item)

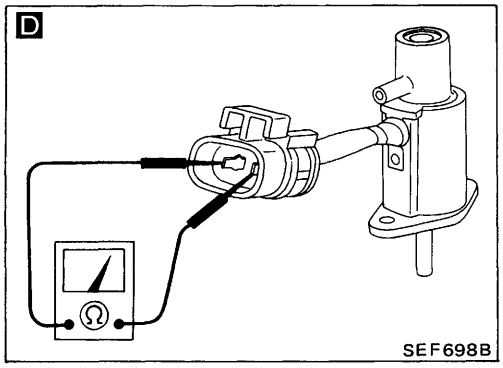


PRESSURE REGULATOR (P.R.) CONTROL SOLENOID VALVE (Not self-diagnostic item)









INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following items.
1) Harness continuity between P.R. control solenoid valve and battery.
2) "30A" fusible link
3) E.F.I. relay circuit
(See page EF & EC-132.)
4) Ignition switch

O.K. ↓

B

CHECK OUTPUT SIGNAL.
1) Start engine and warm it up sufficiently.
2) Stop engine and restart engine.
3) Check voltage between E.C.U. terminal ⑲ and ground.
Battery voltage should appear in 4 minutes after turning ignition switch "START".

N.G. → Check the following items.
C 1) Harness continuity between P.R. control solenoid valve and E.C.U.
- Stop engine.
- Disconnect P.R. control solenoid valve harness connector and E.C.U. 20-pin connector.
- Check resistance between terminals ⑲ and ⓑ.
Resistance:
Approximately 0Ω

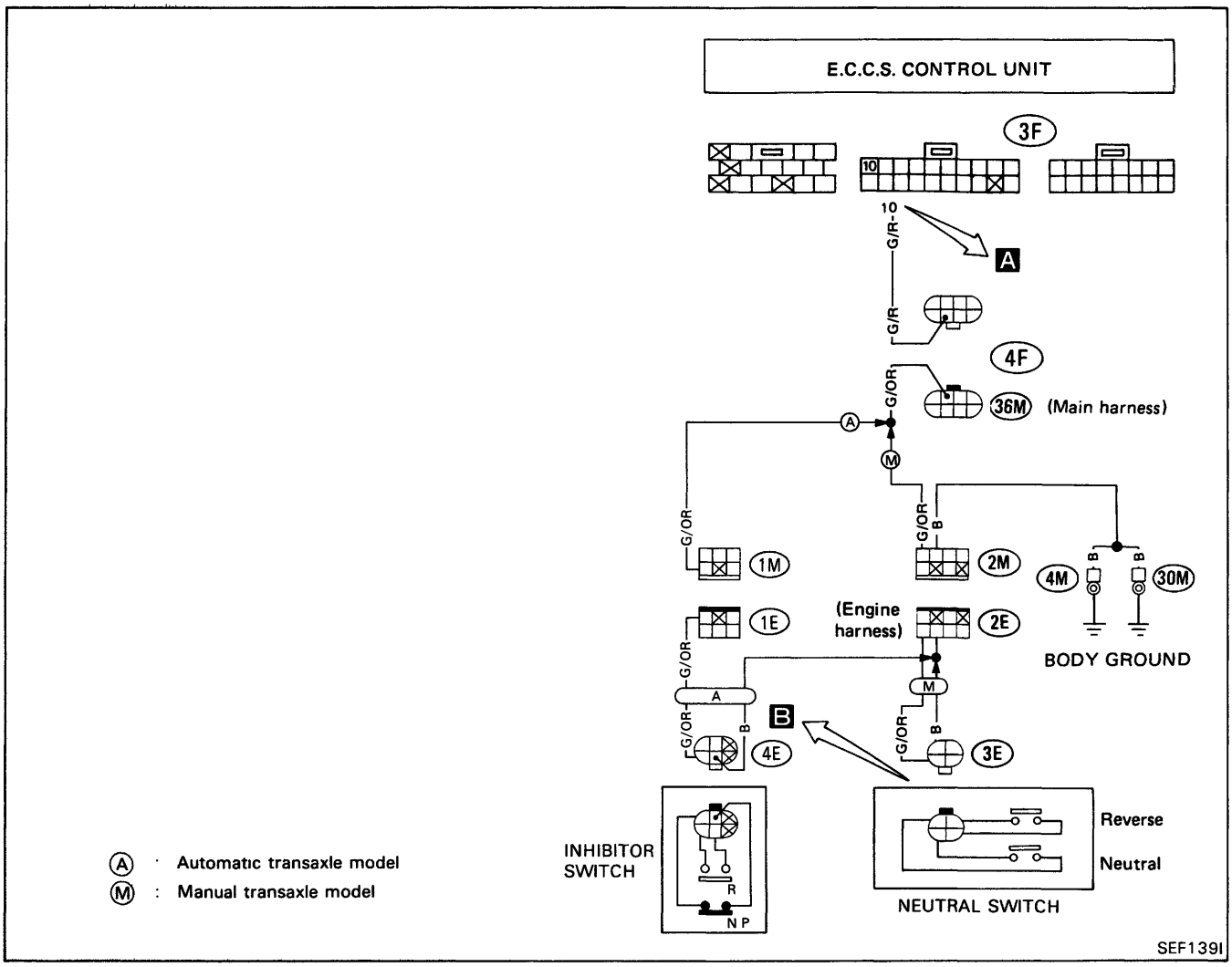
D 2) Check P.R. solenoid valve.
- Check resistance of P.R. control solenoid valve.
Resistance:
Approximately 40Ω

3) Check power source and ground circuit for E.C.U.
(See page EF & EC-130.)

O.K. ↓

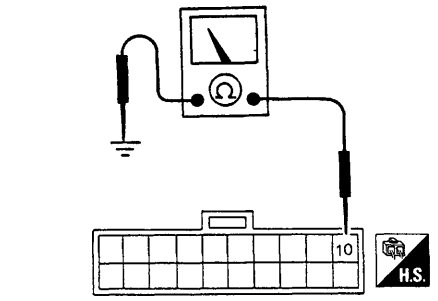
INSPECTION END

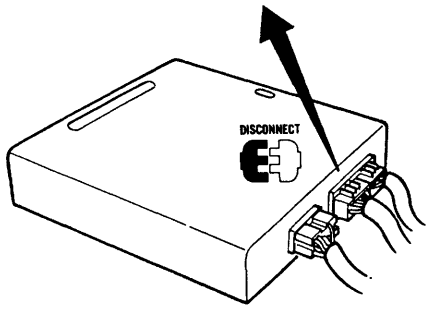
NEUTRAL SWITCH (Not self-diagnostic item)



NEUTRAL SWITCH (Not self-diagnostic item)

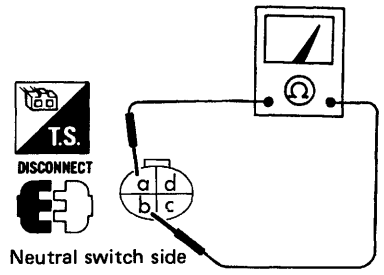
A





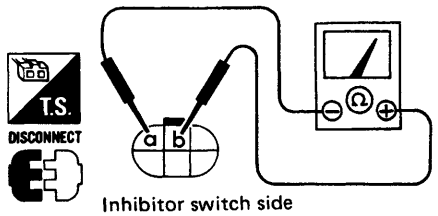
SEF182E

B



SEF407E

C



SEF163I

INSPECTION START

A

CHECK INPUT SIGNAL.
Check continuity between terminal ⑩ and ground.
Continuity should be as shown below.

M/T model

Gear position	Resistance
Neutral	0Ω
Others	∞Ω

N.G.

Check the following items.

M/T model

1) Harness continuity between E.C.U. and ground.

B 2) Continuity of neutral switch
- Disconnect harness connector for neutral switch.
- Shift manual transmission lever to neutral.
- Check continuity between terminals ⓐ and ⓑ.
  Continuity should exist.
  If not, replace neutral switch.

A/T model

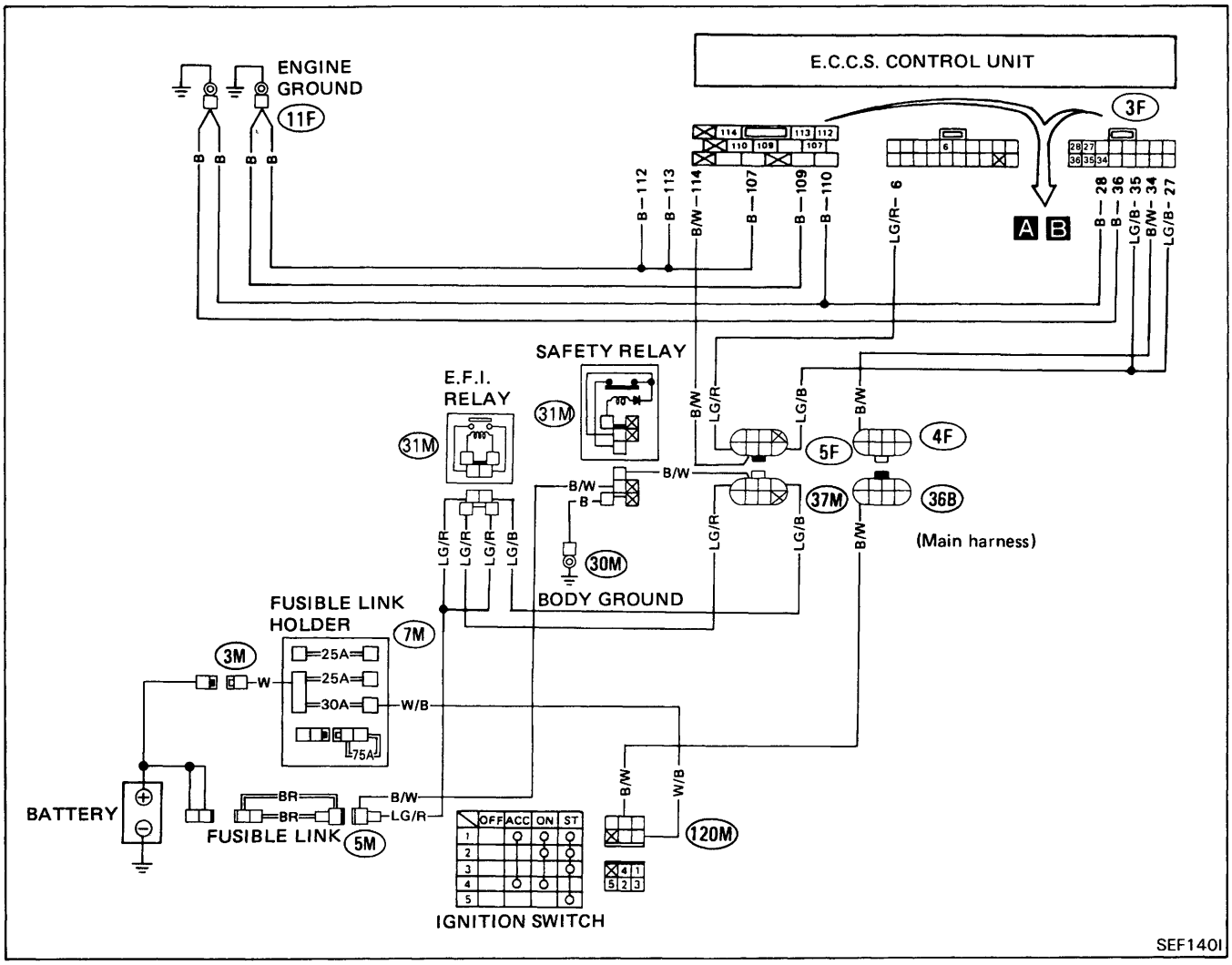
1) Turn ignition switch "OFF".
2) Harness continuity between E.C.U. and ground, ignition switch and ground

C 3) Continuity of inhibitor switch
- Disconnect harness connector for inhibitor switch.
- Shift automatic transmission lever to "P" or "N".
- Check continuity between terminals ⓐ and ⓑ.
  Continuity should exist.
  If not, replace inhibitor switch.

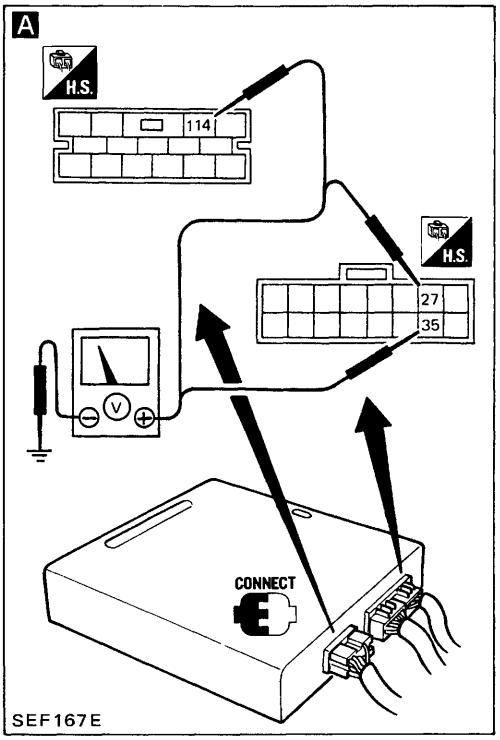
O.K.

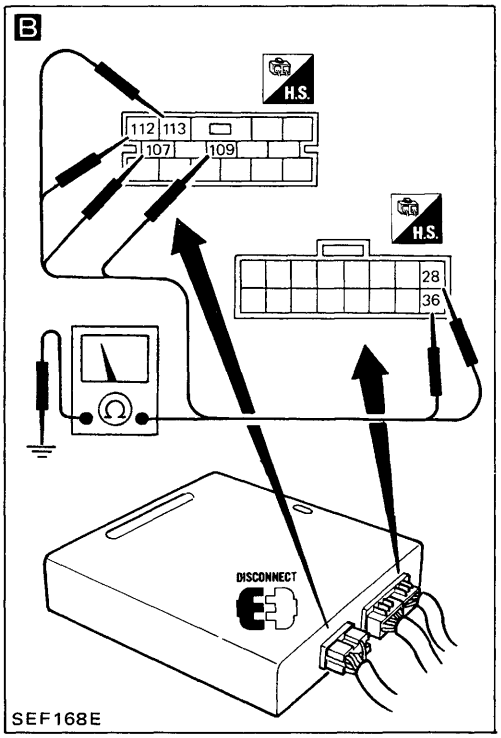
INSPECTION END

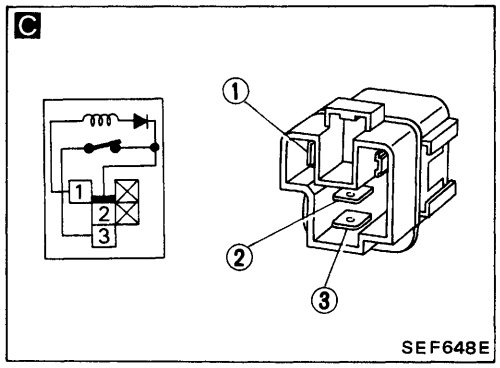
POWER SOURCE & GROUND CIRCUIT FOR E.C.U. (Not self-diagnostic item)



POWER SOURCE & GROUND CIRCUIT FOR E.C.U. (Not self-diagnostic item)







INSPECTION START

A

CHECK POWER SOURCE FOR E.C.U.
1) Turn ignition switch "ON".
2) Check voltage between terminals (27), (35), (114) and ground.
Voltage: Battery voltage

N.G. →

Check the following items.
1) Harness continuity between E.C.U. and battery
2) "BR" fusible link
3) E.F.I. relay circuit
(See page EF & EC-132.)

C 4) Check E.F.I. safety relay.

12V direct current is applied between terminals ① and ②		Continuity between terminals ② and ③
①	②	
–	+	Yes
+	–	No

If N.G., replace E.F.I. safety relay.

O.K. ↓

B

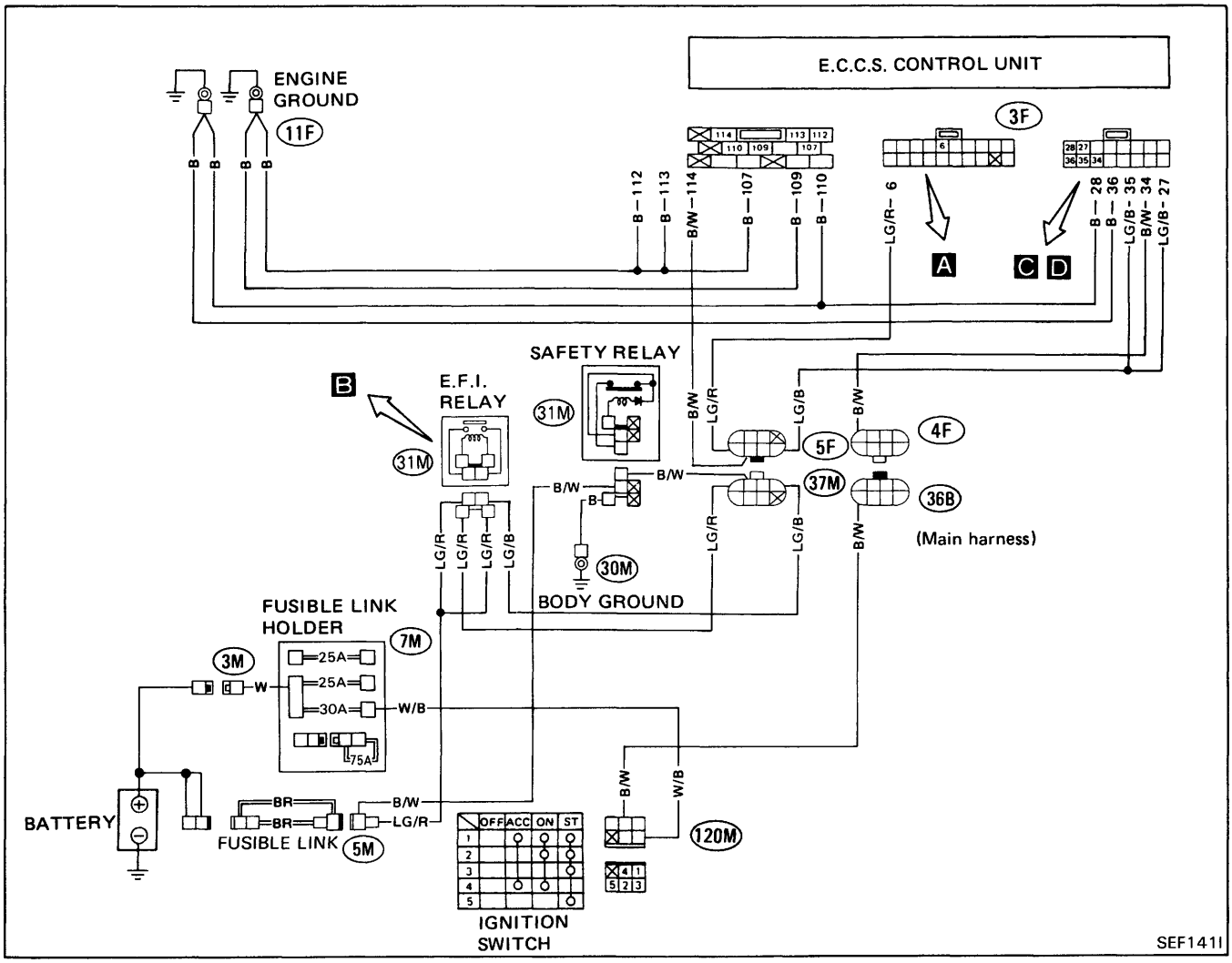
CHECK GROUND CIRCUIT FOR E.C.U.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. 15-pin and 16-pin connectors.
3) Check resistance between terminals (28), (36), (107), (109), (112), (113) and ground.
Resistance:
Approximately 0Ω

N.G. → Repair harness.

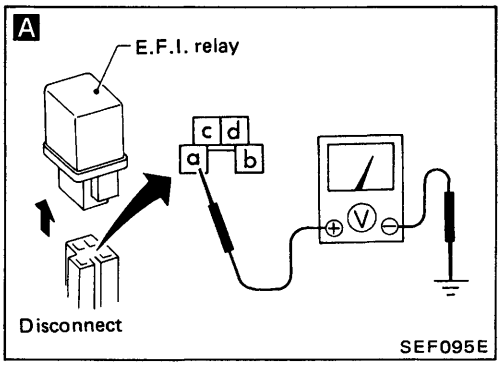
O.K. ↓

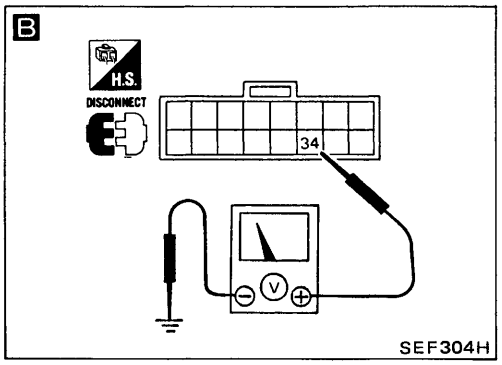
INSPECTION END

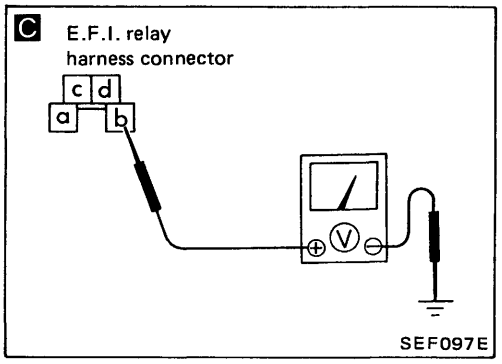
E.F.I. RELAY (For E.C.U.) (Not self-diagnostic item)



E.F.I. RELAY (For E.C.U.) (Not self-diagnostic item)







INSPECTION START

A

CHECK E.C.U. OUTPUT SIGNAL.
1) Remove E.F.I. relay.
2) Turn ignition switch "ON" and check voltage between terminal ⓐ of E.F.I. relay harness connector and ground.
Voltage:
Approximately 0V

N.G. → **B**

1) Disconnect E.C.U. 16-pin harness connector.
2) Turn ignition switch "ON" and check voltage between terminal ㉞ and ground.
Voltage: Battery voltage
3) Check the following:
- "30A" fusible link
- Ignition switch
- Harness between fusible link and E.C.U.

O.K. ↓

C

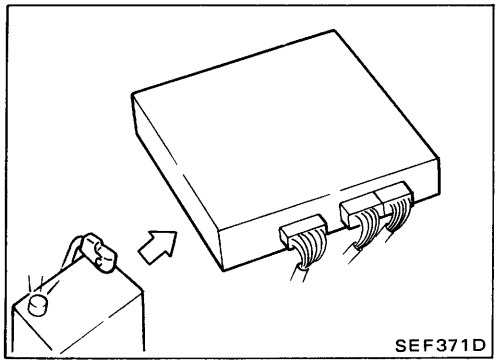
CHECK POWER SOURCE.
Check voltage between terminal ⓑ of E.F.I. relay harness connector and ground.
Voltage: Battery voltage

N.G. → Check the following:
- "BR" fusible link
- Harness between fusible link and E.F.I. relay harness connector.

O.K. ↓

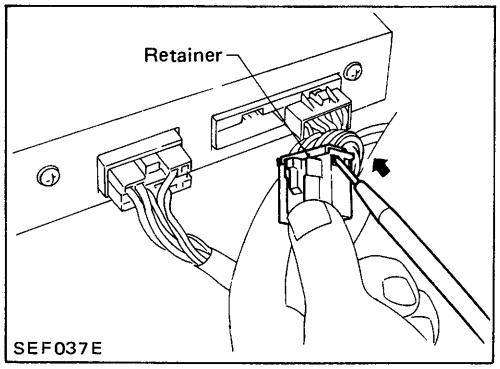
Check E.F.I. relay.
Refer to section EL for checking relay.

INSPECTION END


SEF371D

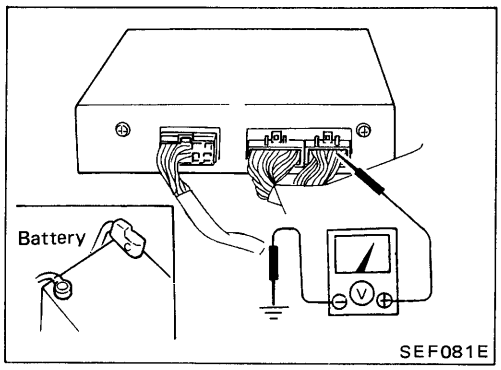
MEASUREMENT VOLTAGE OR RESISTANCE OF E.C.U.

1. Disconnect battery ground cable.
2. Remove assist side or bench seat from vehicle.
3. Disconnect 20- and 16-pin connectors from E.C.U.



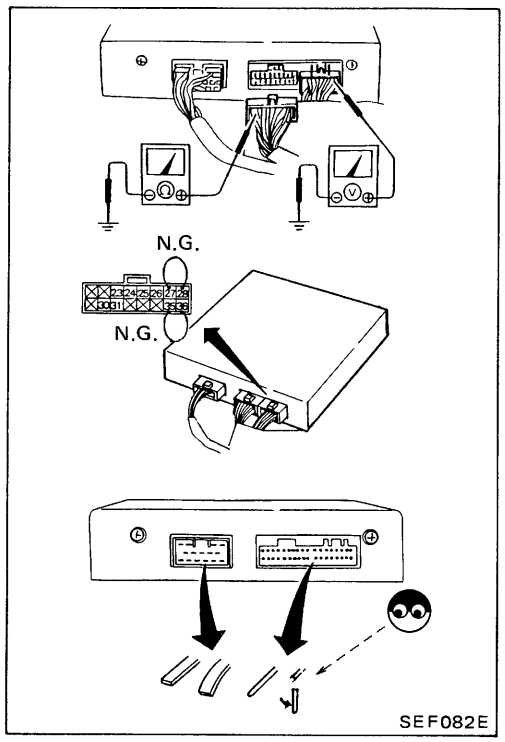
SEF037E

4. Remove pin terminal retainer from 20- and 16-pin connectors to make it easier to insert tester probes.



SEF081E

5. Connect 20- and 16-pin connectors to E.C.U. carefully.
6. Connect battery ground cable.
7. Measure the voltage at each terminal by following "E.C.U. inspection table".



SEF082E

CAUTION:

a. **Perform all voltage measurements with the connectors connected.**
b. **Perform all resistance measurements with the connectors disconnected.**
c. **Make sure that there are not any bends or breaks on E.C.U. pin terminal before measurements.**
d. **Do not touch tester probes between terminals ㉗ and ㉘, ㉟ and ㊱.**

E.C.U. inspection table

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
2	A.A.C. valve	Engine is running. └ At idle (after warming up)	6.0 - 8.0V
3	Ignition signal (from resistor)	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
4	E.G.R. control solenoid valve	Engine is running. └ Engine is cold. [Water temperature is below 60°C (140°F).]	0.7 - 0.9V
		Engine is running. └ After warming up [Water temperature is between 60°C (140°F) and 105°C (221°F).]	BATTERY VOLTAGE (11 - 14V)
5	Ignition signal (from intake side power transistor)	Engine is running.	0.4 - 2.2V Output voltage varies with engine speed.
6	E.F.I. relay	Ignition switch "ON"	0.8 - 1.0V
7	Exhaust gas temperature sensor	Engine is running. └ E.G.R. system is operated.	0 - 1.0V
		Engine is running. └ E.G.R. system is not operated.	1.0V or more
8	Crank angle sensor (position signal)	Engine is running **Do not turn engine at high speed under no-load.**	2.2 - 2.8V
9	Start signal	Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
10	Neutral signal	Ignition switch "ON" └ Gear position: Neutral (M/T) : N or P range (A/T)	0V
		Ignition switch "ON" └ Gear position: [Except neutral (M/T) Except N or P range (A/T)]	BATTERY VOLTAGE (11 - 14V)

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
14	Ignition signal (from exhaust side power transistor)	Engine is running. **Do not turn engine at high speed under no-load.**	0.4 - 2.2V (Output voltage varies with engine revolution.)
15	A.I.V. control solenoid valve	Engine is running. — At idle	0.7 - 0.9V
		Engine is running. — When depressing accelerator pedal [Water temperature is above 50°C (122°F).]	BATTERY VOLTAGE (11 - 14V)
16	Air regulator	Ignition switch "ON" — For 5 seconds after turning ignition switch "ON"	0.7 - 0.9V
		Ignition switch "ON" — After 5 seconds have passed	BATTERY VOLTAGE (11 - 14V)
17	Crank angle sensor (Reference signal)	Engine is running. **Do not turn engine at high speed under no-load.**	0.2 - 0.4V
18	Idle switch (⊖ side)	Ignition switch "ON" — Throttle valve: idle position	9 - 10V
		Ignition switch "ON" — Throttle valve: except idle position	0V

*Data are reference values.

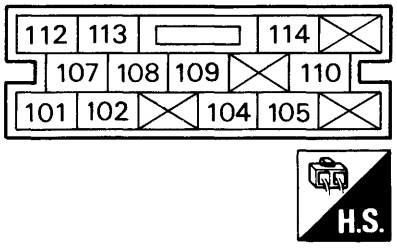
TERMINAL NO.	ITEM	CONDITION	*DATA
19	Pressure regulator control solenoid valve	Ignition switch "ON" └ For approximately 4 minutes after turning ignition switch to "START". [Water temperature is above 60°C (140°F).]	0.7 - 0.9V
		Ignition switch "ON" └ Approximately 4 minutes after turning ignition switch to "START". [Water temperature is above 60°C (140°F).]	BATTERY VOLTAGE (11 - 14V)
		Ignition switch "ON" or "START". [Water temperature is below 60°C (140°F).]	
21	Full throttle switch (⊖ side)	Ignition switch "ON" └ Throttle valve: fully open	9 - 10V
		Ignition switch "ON" └ Throttle valve: Any position except full throttle	0V
22	Air conditioner signal (Air conditioner equipped model)	Ignition switch "ON" └ Air conditioner switch and heater fan switch "ON"	BATTERY VOLTAGE (11 - 14V)
		Ignition switch "ON" └ Air conditioner switch "OFF"	0V
23	Water temperature sensor	Engine is running.	1.0 - 5.0V Output voltage varies with engine water temperature.
24	Exhaust gas sensor	Engine is running. └ After warming up sufficiently.	0 - Approximately 1.0V
25	Idle switch and full throttle switch (⊕ side)	Ignition switch "ON"	9 - 10V
27 35	Power source for E.C.U.	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

*Data are reference values.

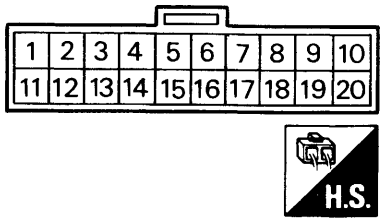
TERMINAL NO.	ITEM	CONDITION	*DATA
29	Vehicle speed sensor	Ignition switch "ON" └—When rotating front wheel slowly	Voltage varies between 0V and approximately 5V.
30	Air temperature sensor	Ignition switch "ON"	Approximately 3V [Air temperature is 20°C (68°F).] Output voltage varies with air temperature.
31	Air flow meter	Engine is running. **Do not turn engine at high speed under no-load.**	2 - 4V Output voltage varies with engine revolution.
33	Power source for air flow meter	Ignition switch "ON"	8V
34	Ignition switch signal	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
101 102 104 105 114	Injector	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
108	Fuel pump	Ignition switch "ON" └—For 5 seconds after turning ignition switch "ON".	0.7 - 0.9V
		Ignition switch "ON" └—After 5 seconds have passed	BATTERY VOLTAGE (11 - 14V)

PIN CONNECTOR TERMINAL LAYOUT

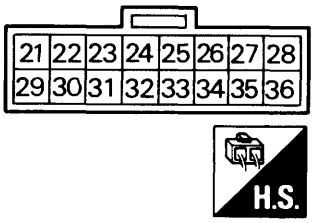
15-pin connector



20-pin connector



16-pin connector



SEF305H

MIXTURE RATIO FEEDBACK SYSTEM INSPECTION

Preparation

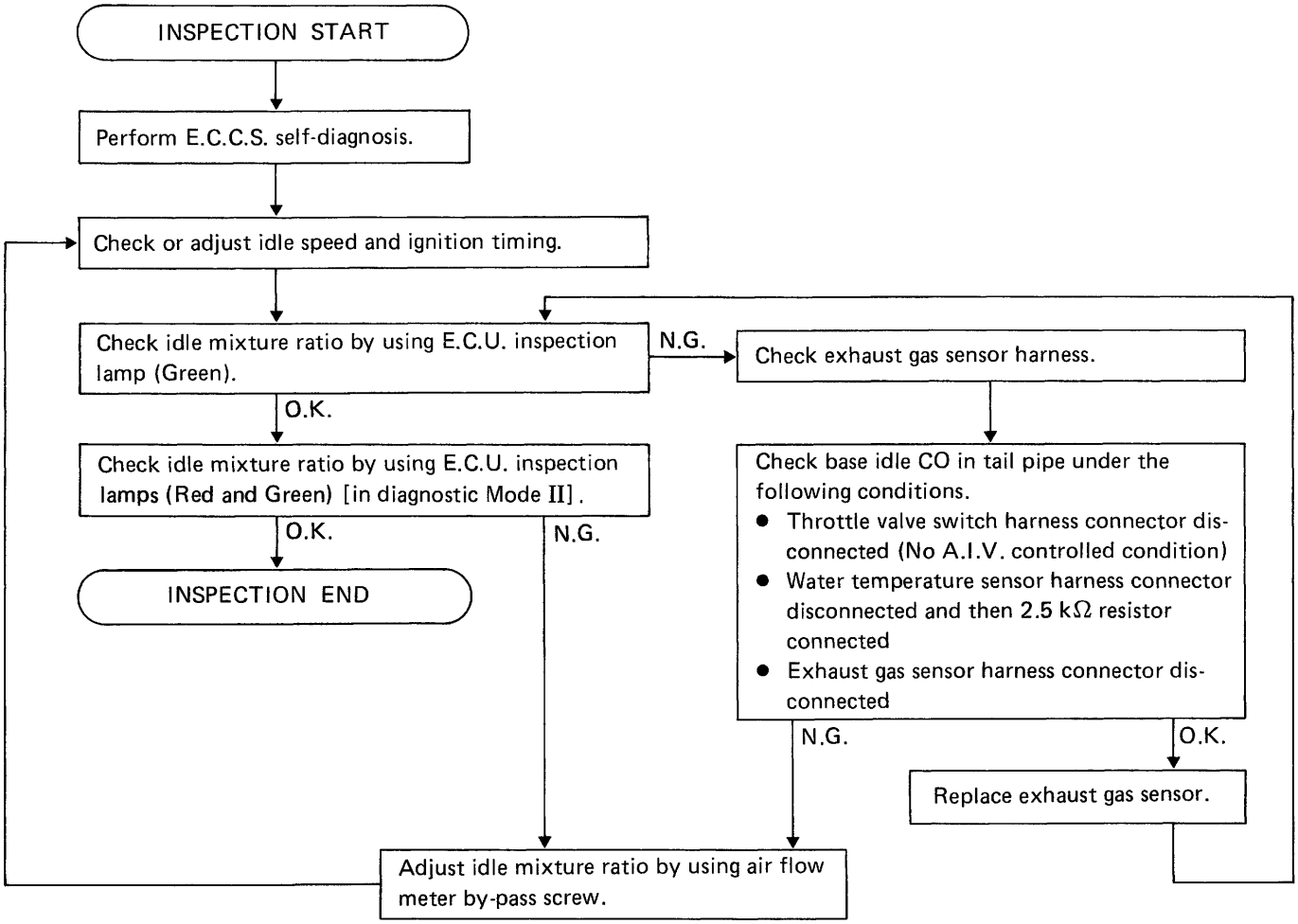
1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.C.S. harness connectors
- Vacuum hoses
- Air intake system
  (oil filler cap, oil level gauge, etc.)
- Valve clearance, engine compression
- E.G.R. valve operation
- Throttle valve and throttle valve switch operation

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 "D" position.
4. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
5. Checking and adjusting should be done while the radiator cooling fan is stopped.

WARNING:

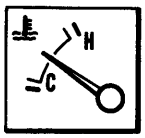
a. When selector lever is shifted to "D" position, apply parking brake and block both front and rear wheels with chocks.
b. Depress brake pedal while accelerating the engine to prevent forward surge of vehicle.
c. After the adjustment has been made, shift the lever to the "N" or "P" position and remove wheel chocks.

Overall inspection sequence



INSPECTION START

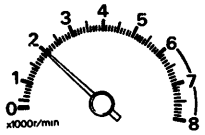
Visually check the following:
- Air cleaner clogging
- Hoses and ducts for leaks
- E.G.R. valve operation
- Electrical connectors
- Gaskets
- Throttle valve and throttle valve switch operation



SEF457C

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

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



SEF477B

Perform E.C.C.S. self-diagnosis.

O.K. / N.G.

Check, correct or replace malfunctioning parts.

Does engine run smoothly?

O.K. / N.G.

Check and clean injectors, and replace injectors if necessary.

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

Check idle speed.

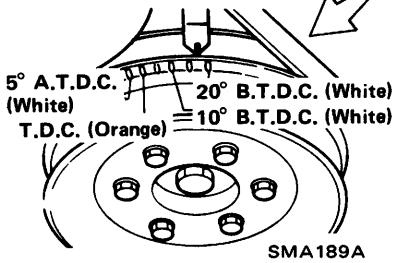
M/T: 750±50 rpm
A/T: 700±50 rpm (in "D" position)

O.K. / N.G.

Check ignition timing with a timing light.

15±2° B.T.D.C.

O.K. / N.G.



SMA189A

Disconnect A.A.C. valve harness connector and throttle valve switch harness connector.

Ensure that engine speed is below 800 rpm.

O.K. / N.G.

Adjust idle speed to less than 800 rpm by turning idle speed adjusting screw.

Ⓐ Ⓑ Ⓒ

Ⓐ

Ⓑ

Check ignition timing with a timing light.

15±2° B.T.D.C.

O.K.

N.G.

Adjust ignition timing by turning distributor after loosening bolt which secures distributor.

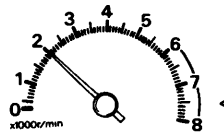
15±2° B.T.D.C.

Adjust idle speed by turning idle speed adjusting screw.

M/T: 700±50 rpm
A/T: 600±50 rpm (in "D" position)

Connect A.A.C. valve harness connector and throttle valve switch harness connector.

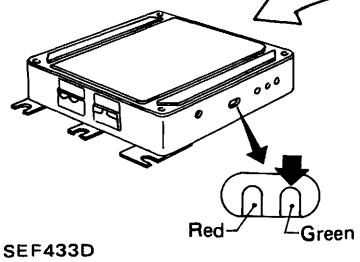
Ⓒ



SEF477B

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

Make sure that inspection lamp (Green) on control unit goes on and off periodically more than 9 times during 10 seconds at 2,000 rpm under no-load.



SEF433D

O.K.

N.G.

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

Set the diagnosis mode of E.C.U. to No. 2 mode and disconnect the throttle valve switch harness connector.
Check inspection lamps (Red and Green) on control unit blink at idle.
They should blink simultaneously.

No

Yes

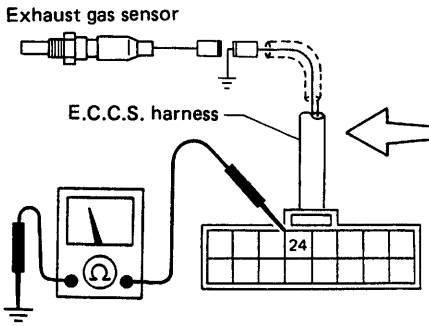
Connect throttle valve switch harness connector.

INSPECTION END

Ⓓ

Ⓔ

Ⓒ



SEF276E

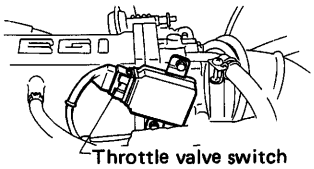
Check exhaust gas sensor harness:
1) Turn off engine and disconnect battery ground cable.
2) Disconnect 16-pin connector from Control Unit.
3) Discnonect exhaust gas sensor harness connector and connect terminal for exhaust gas sensor harness connector to ground with a jumping wire.
4) Check for continuity between terminal No. 24 of 16-pin connector and ground metal on vehicle body.

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

O.K.

N.G.

Repair or replace E.C.C.S. harness and connect battery ground cable.

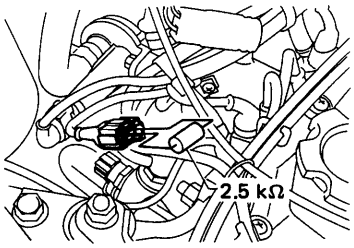


SEF408D

Connect E.C.C.S. 16-pin connector and disconnect jumping wire from exhaust gas sensor.

Disconnect throttle valve switch harness connector.

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



SEF333C

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

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

Check "CO"%

Idle CO: Less than 5%

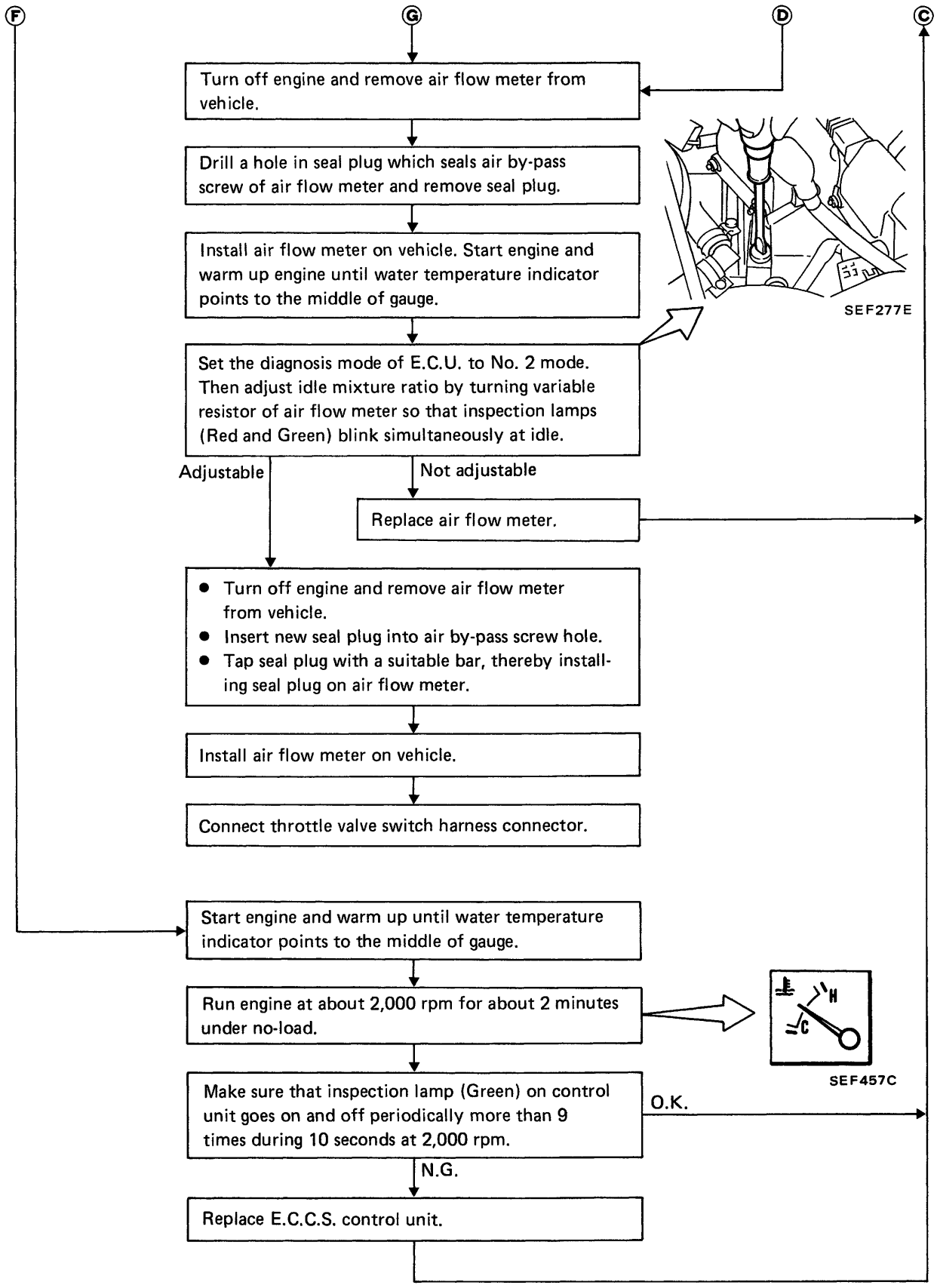
After checking CO%
1) Disconnect the resistor from terminals of water temperature sensor harness connector.
2) Connect water temperature sensor harness connector to water temperature sensor.

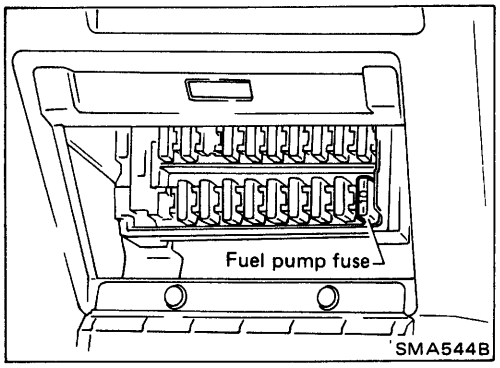
O.K.

N.G.

Turn off engine and replace exhaust gas sensor.

Connect exhaust gas sensor harness to exhaust gas sensor.


Ⓕ
Ⓖ
Ⓓ
Ⓒ
Turn off engine and remove air flow meter from vehicle.
Drill a hole in seal plug which seals air by-pass screw of air flow meter and remove seal plug.
Install air flow meter on vehicle. Start engine and warm up engine until water temperature indicator points to the middle of gauge.
SEF277E
Set the diagnosis mode of E.C.U. to No. 2 mode. Then adjust idle mixture ratio by turning variable resistor of air flow meter so that inspection lamps (Red and Green) blink simultaneously at idle.
Adjustable
Not adjustable
Replace air flow meter.
• Turn off engine and remove air flow meter from vehicle.
• Insert new seal plug into air by-pass screw hole.
• Tap seal plug with a suitable bar, thereby installing seal plug on air flow meter.
Install air flow meter on vehicle.
Connect throttle valve switch harness connector.
Start engine and warm up until water temperature indicator points to the middle of gauge.
Run engine at about 2,000 rpm for about 2 minutes under no-load.
H
C
SEF457C
Make sure that inspection lamp (Green) on control unit goes on and off periodically more than 9 times during 10 seconds at 2,000 rpm.
O.K.
N.G.
Replace E.C.C.S. control unit.

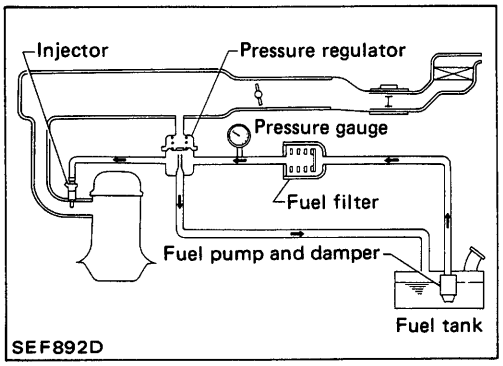


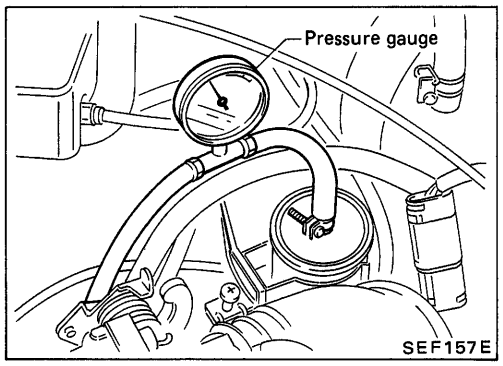
Releasing Fuel Pressure

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

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

Erase the memory (Code No. 22) of the self-diagnosis in the control unit.





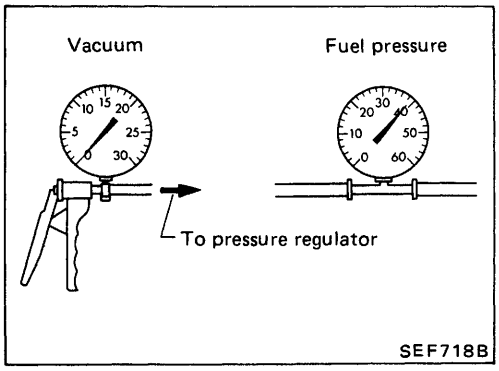
Fuel Pressure Check

a. **Use a torque driver to tighten clamps.**
b. **Use Pressure Gauge to check fuel pressure.**
c. **Disconnect pressure regulator control solenoid valve harness connector.**

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 255 kPa
   (2.6 kg/cm^2, 37 psi)
   The moment accelerator pedal is fully depressed:
   Approximately 304 kPa
   (3.1 kg/cm^2, 44 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.

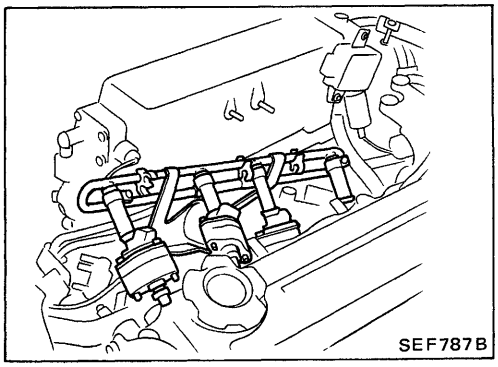
Fuel Pressure Check (Cont'd)



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

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

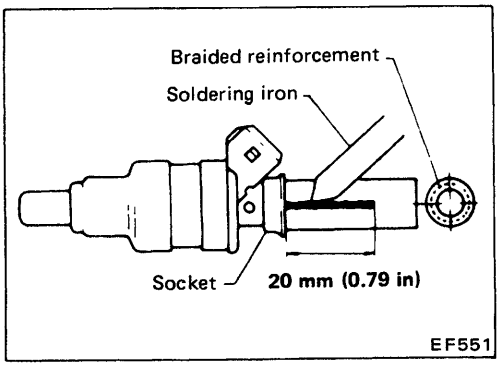
Injector Removal and Installation



1. Release fuel pressure to zero.
2. Disconnect E.C.C.S. harness and ignition wires.
3. Disconnect fuel hoses and pressure regulator vacuum hose.
4. Remove bolts securing fuel tube.
5. Remove bolts securing injectors; then take out fuel tube and injector as an assembly.

Be careful not to damage the injector, nor to deform the fuel tube.

6. Remove injectors from fuel tube.
7. Remove fuel hose.



1) Heat soldering iron (150 watt). Cut hose into braided reinforcement from mark to socket end.

Do not feed soldering iron until it touches injector tail piece.

2) Then pull rubber hose out with hand.

a. Be careful not to damage socket plastic connector, etc. with soldering iron.

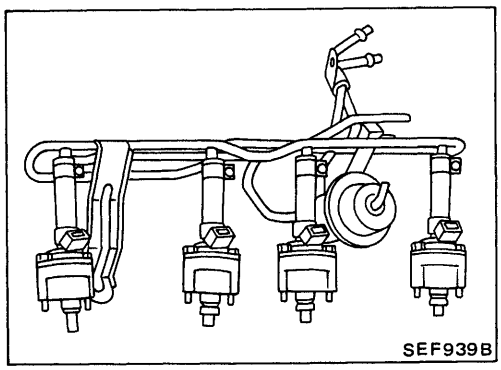
b. Never place injector in a vise when disconnecting rubber hose.

8. Install fuel hose as follows:

1) Clean exterior of injector tail piece.
2) Wet inside of new rubber hose with fuel.
3) Push end of rubber hose with hose sockets onto injector tail piece by hand as far as they will go.

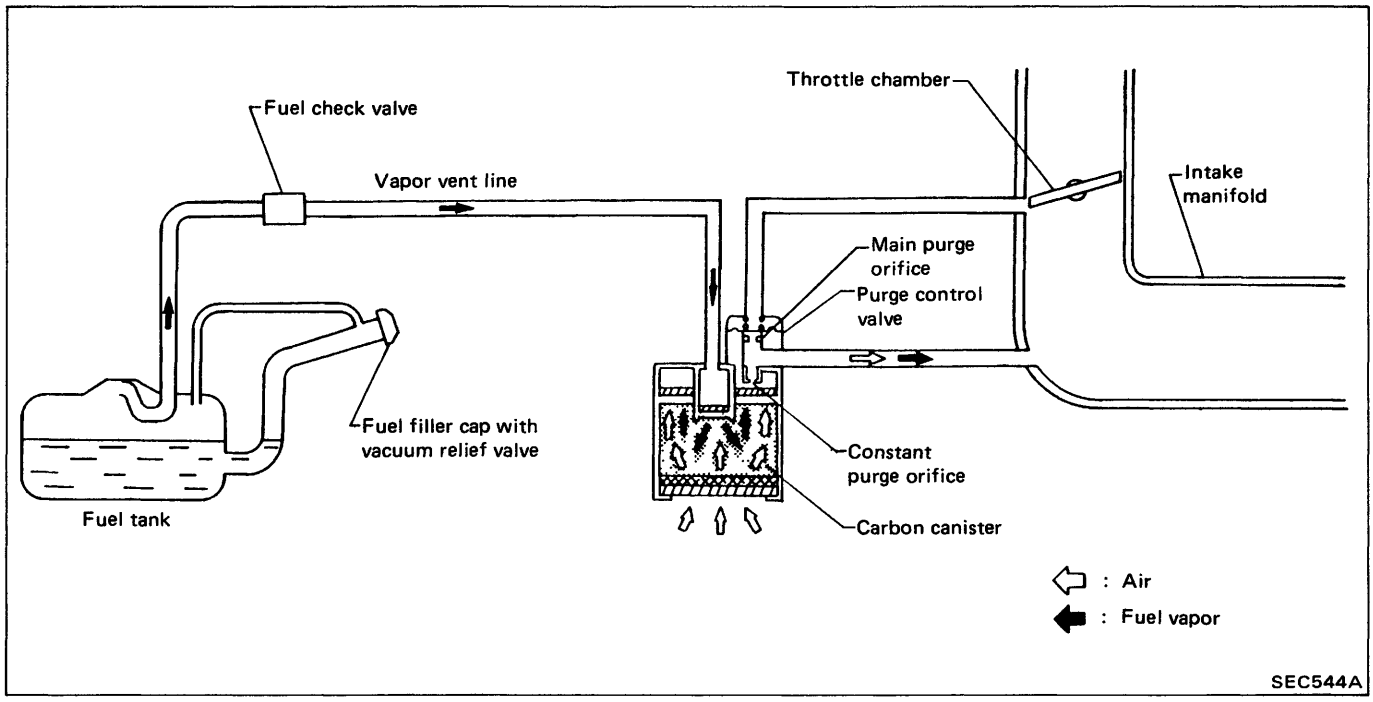
CAUTION:

After properly connecting fuel hose to injector and fuel tube, check connection for fuel leakage.



9. Assemble injectors with fuel pipe.
10. Install injectors.

Description

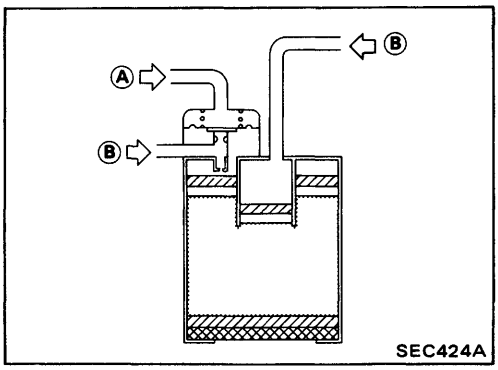


The evaporative emission control system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

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

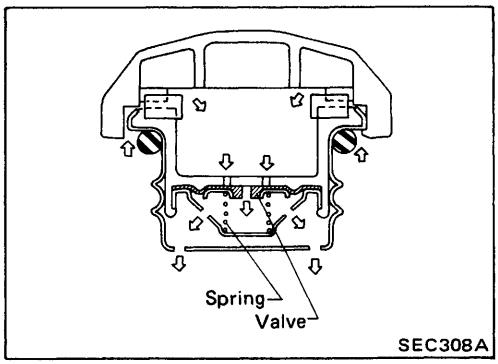
Check carbon canister as follows.

Ⓐ : Blow air and ensure that there is no leakage.

Ⓑ : Blow air and ensure that there is leakage.

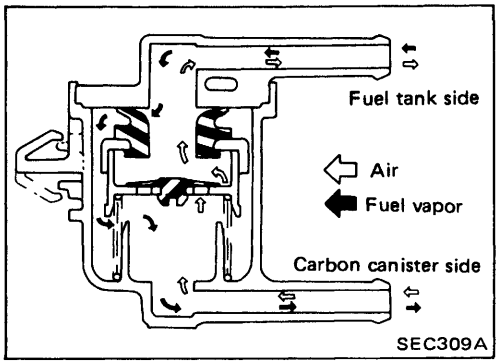
Inspection (Cont'd)

FUEL TANK VACUUM RELIEF VALVE



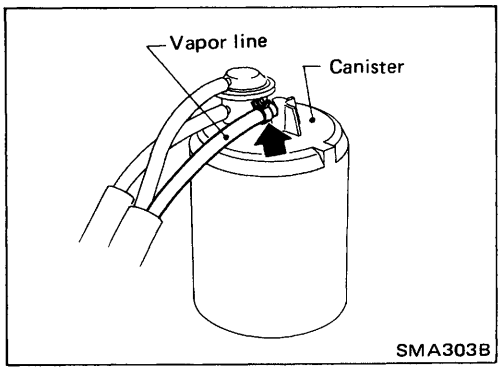
1. Wipe clean valve housing.
2. Inhale air through the cap. A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition. Note also that, by further inhaling air, the resistance should be disappeared with valve clicks.
3. If valve is clogged, or if no resistance is felt, replace cap as an assembly.

FUEL CHECK VALVE

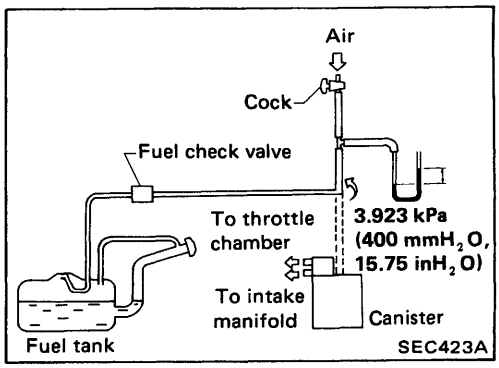


1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt and a portion of air flow be directed toward the canister.
2. Blow air through connector on the canister side.
   Air flow should be smoothly directed toward fuel tank.
3. If fuel check valve is suspected of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

VAPOR VENT LINE

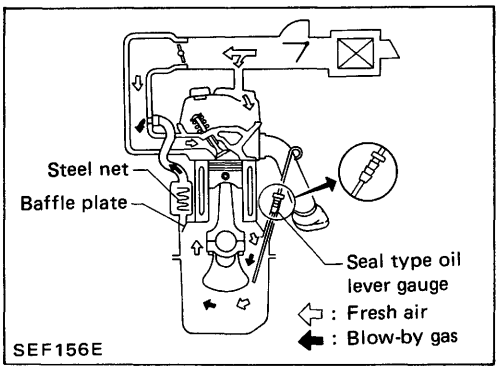


1. Check hoses and fuel tank filler cap.
2. Disconnect the vapor vent line connecting carbon canister to fuel tank.



3. Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way charge cock) to the end of the vent line.
4. Supply fresh air into the vapor vent line through the cock little by little until pressure becomes 3.923 kPa (400 mmH_2O, 15.75 inH_2O).
5. Shut the cock completely and leave it unattended.
6. After 2.5 minutes, measure the height of the liquid in the manometer.
7. Variation in height should remain at 0.245 kPa (25 mmH_2O, 0.98 inH_2O).
8. When filler cap does not close completely, the height should drop to zero in a short time.
9. If the height does not drop to zero in a short time when filler cap is removed, the cause is a blocked hose or a clogged fuel check valve.

In case the vent line is blocked, the fuel tank is not vented properly causing insufficient deliver of fuel to engine, or vapor lock. It must, therefore, be repaired.



Description

This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (P.C.V.) valve is provided to conduct crankcase blow-by gas to the intake manifold.

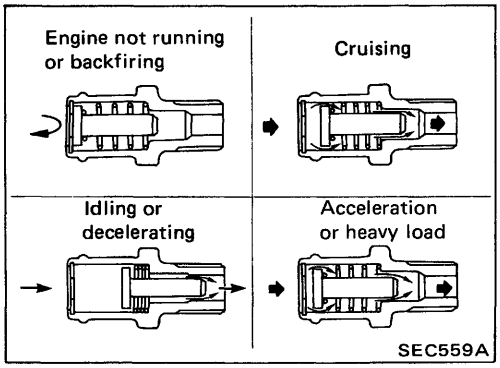
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. valve.

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 duct, through the hose connecting air cleaner to rocker cover, into the crankcase.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.

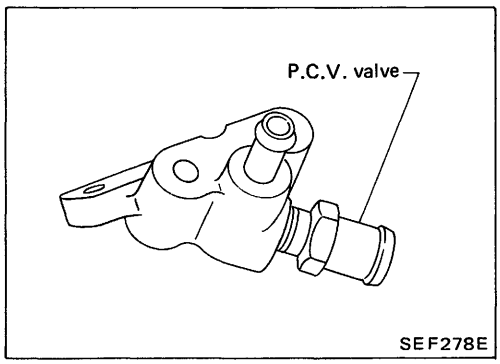
On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air duct under all conditions.

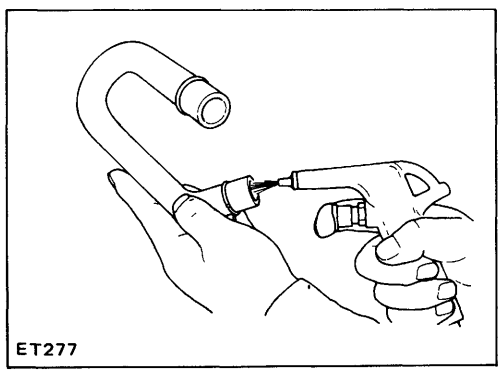


Inspection

P.C.V. VALVE

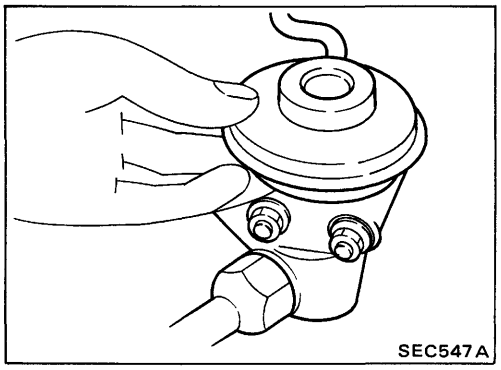
With engine running at idle, remove ventilation hose from P.C.V. valve; if valve is working properly a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.





VENTILATION HOSE

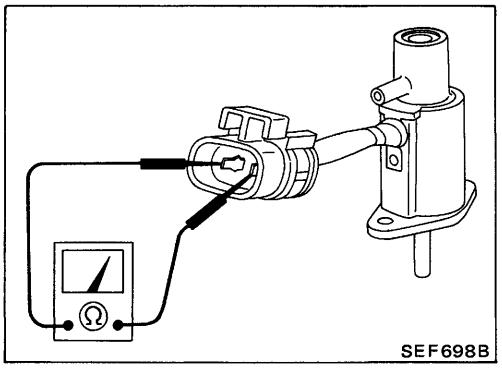
1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

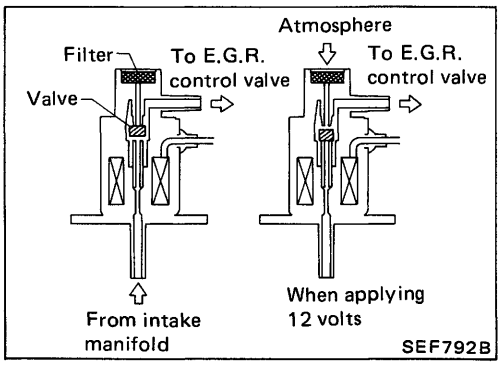

SEC547A

E.G.R. SYSTEM

Ensure that E.G.R. system is functioning properly by placing your finger on E.G.R. control valve diaphragm.
Make sure that E.G.R. control valve operates as follows when engine is revved up to 3,000 to 3,500 rpm.

Water temperature °C (°F)	E.G.R. diaphragm
Below 60 (140)	Not moved
Between 60 (140) and 105 (221)	Moved


SEF698B



SEF792B

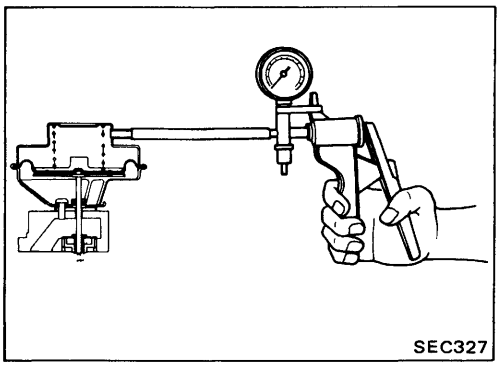
E.G.R. CONTROL SOLENOID VALVE

1. Check the solenoid valve for electric continuity, after disconnecting the harness connector.
   Resistance: 30 - 40Ω
   (Above resistance has no change even if the polarity of the circuit tester is changed when measuring it.)

2. Check the solenoid valve for normal operation as shown at left.

CAUTION:

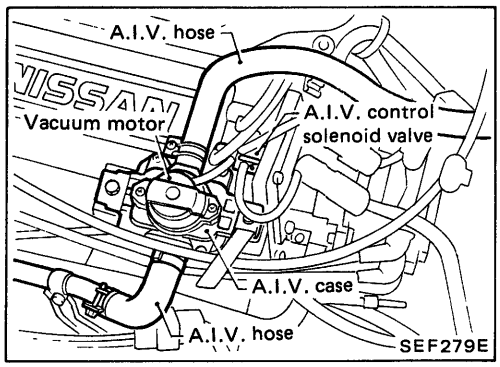
- **Be sure to connect ⊕ terminal of battery with white harness of solenoid valve.**
- **Perform E.G.R. circuit test. (See pages EF & EC-98, 124.)**
- **Perform E.C.U. input/output test. (See page EF & EC-134.)**


SEC327

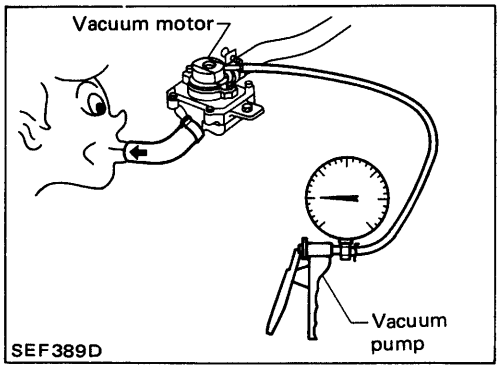
E.G.R. CONTROL VALVE

1. Supply the E.G.R. control valve with vacuum using a handy vacuum pump.
2. Place a finger on the diaphragm of the valve, and make sure that the diaphragm lifts up and down in response to the vacuum leading to the valve.

Full open of E.G.R. valve:
Over −16.0 kPa
(−120 mmHg, −4.72 inHg)

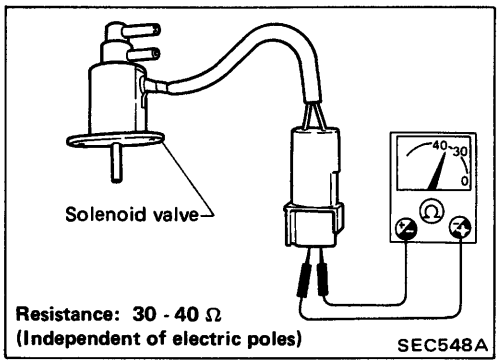


Check hoses for looseness, collapsing, damage or faulty connections, and each part for proper installation.



Air induction valve

Disconnect air induction hose on air induction pipe side. Apply vacuum to vacuum motor. Suck or blow hose to make sure that air flows only to the air induction pipe side.

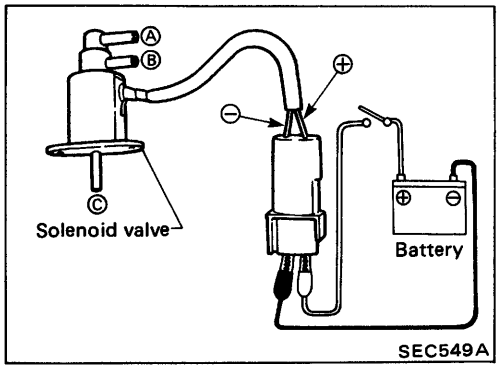


A.I.V. control solenoid valve

1) Check it for electric continuity.

Resistance: 30 - 40Ω

(Above resistance has no change even if the polarity of the circuit tester is changed when measuring it.)



2) Check the solenoid valve for normal operation. Supply it with battery voltage, and check whether there is continuity between ports A, B and C.

Item \ Solenoid valve	OFF	ON
Continuity	B-C	A-B

General Specifications

IGNITION TIMING °B.T.D.C.	15±2 (M/T) 15±2 (A/T in "D" position)
IDLE SPEED rpm	750±50 (M/T) 700±50 (A/T in "D" position)
PRESSURE REGULATOR Regulated pressure kPa (kg/cm², psi)	299.1 (3.05, 43.4)

Inspection and Adjustment

AIR TEMPERATURE SENSOR Thermistor resistance	
at −10°C (14°F) kΩ	8.0 - 10.0
at 20°C (68°F) kΩ	2.3 - 2.7
at 50°C (122°F) kΩ	0.7 - 0.9
WATER TEMPERATURE SENSOR Thermistor resistance	
at −10°C (14°F) kΩ	8.0 - 10.0
at 20°C (68°F) kΩ	2.3 - 2.7
at 50°C (122°F) kΩ	0.7 - 0.9
at 80°C (176°F) kΩ	0.30 - 0.33
THROTTLE VALVE SWITCH Engine speed when idle switch is changed from "OFF" to "ON" rpm	M/T: Idle speed + 250±150 A/T: Engine speed (In "N" position) + 250±150
FUEL PRESSURE (Measuring point: between fuel filter and fuel pipe)	
At idling kPa (kg/cm², psi)	Approximately 255 (2.6, 37)
The moment accelerator pedal is fully depressed kPa (kg/cm², psi)	Approximately 304 (3.1, 44)
FUEL INJECTOR Coil resistance Ω	2.0 - 3.0
AIR REGULATOR Circuit resistance Ω	Approximately 65
DASH POT Touch speed rpm	M/T: 2,200 - 2,600 A/T: 3,300 - 3,700

DISTRIBUTOR

Firing order	1-3-4-2
Rotating direction	Counterclockwise
Cap insulation resistance MΩ	More than 50
Rotor head insulator resistance MΩ	More than 50
Cap carbon point length mm (in)	10 (0.39)

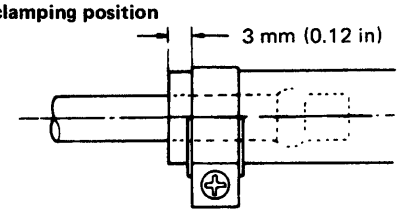
IGNITION COIL

Type	Mold type
Primary voltage V	12
Primary resistance [at 20°C (68°F)] Ω	0.8 - 1.0
Secondary resistance [at 20°C (68°F)] kΩ	7.6 - 11.4

Tightening Torque

Unit	N·m	kg-m	ft-lb
Exhaust gas temperature sensor	15 - 25	1.5 - 2.5	11 - 18
E.G.R. control valve	18 - 23	1.8 - 2.3	13 - 17
E.G.R. tube securing nut	34 - 44	3.5 - 4.5	25 - 33
Water temperature sensor	15 - 20	1.5 - 2.0	11 - 14
Throttle valve switch	2.0 - 2.4	0.20 - 0.24	1.4 - 1.7
Air regulator	5 - 6	0.5 - 0.6	3.6 - 4.3
Injector	2.5 - 3.2	0.25 - 0.33	1.8 - 2.4
Throttle chamber securing screw	18 - 22	1.8 - 2.2	13 - 16
Exhaust gas sensor	40 - 50	4.1 - 5.1	30 - 37
Fuel hose clamp	1.0 - 1.5	0.10 - 0.15	0.7 - 1.1

Fuel hose clamping position



EF336A

ENGINE CONTROL, FUEL & EXHAUST SYSTEMS

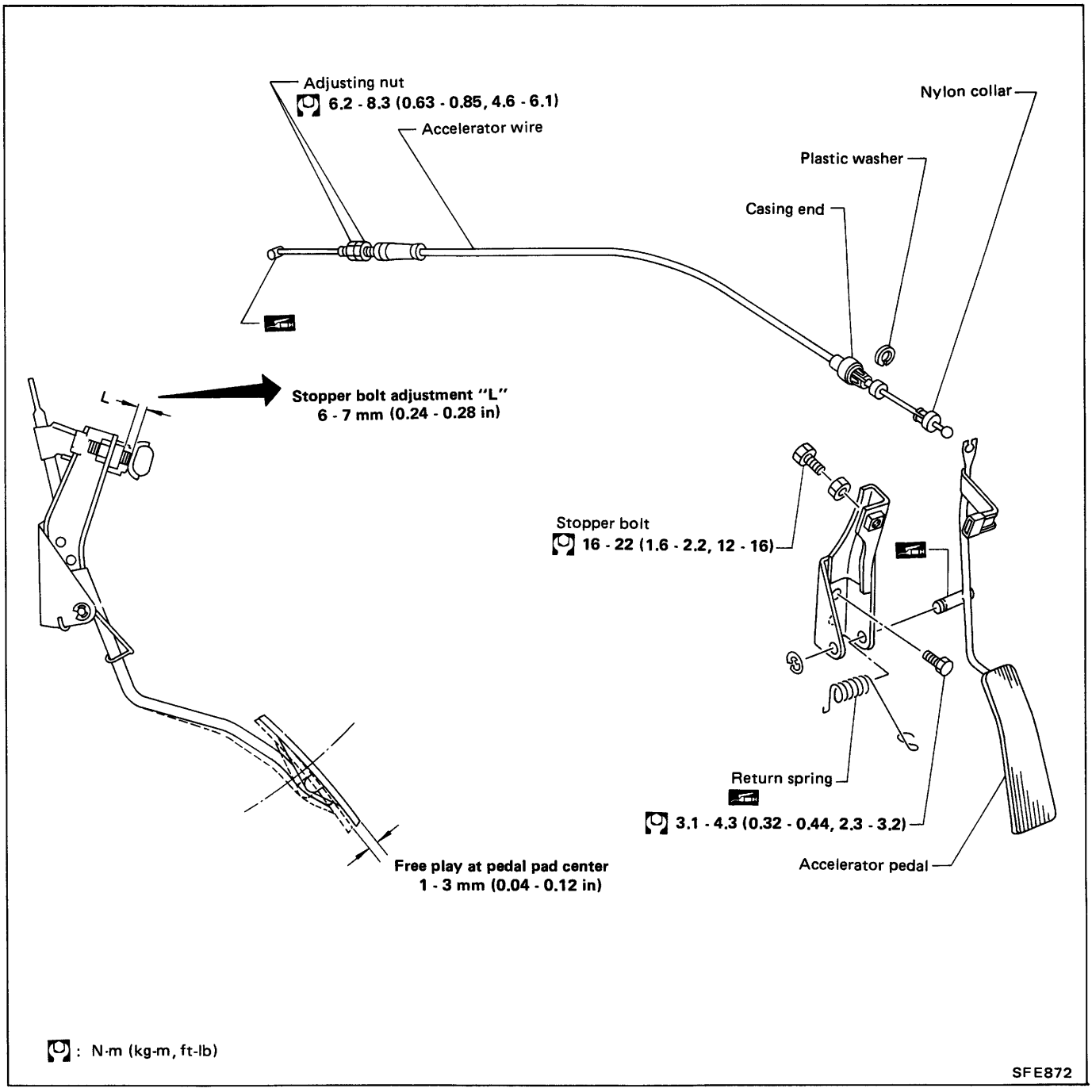
SECTION FE

CONTENTS

ENGINE CONTROL SYSTEM FE-2
FUEL SYSTEM FE-3
EXHAUST SYSTEM FE-4

Accelerator Control System

a. Check to see if throttle valve fully opens when accelerator pedal is fully depressed and if it returns to idle when released.
b. Adjust accelerator pedal free play by turning adjusting nut.
c. On automatic transaxle models, adjust A/T throttle wire. Refer to "ON-VEHICLE SERVICE" in section AT.
d. Check accelerator control parts for improper contact with any adjacent parts.
e. When connecting accelerator wire, be careful not to twist or scratch its inner wire.
f. Apply a light coat of recommended multi-purpose grease to all sliding or friction surfaces. Do not apply grease to wire.
g. On A.S.C.D. equipped models, adjust A.S.C.D. wire. Refer to "AUTOMATIC SPEED CONTROL DEVICE" in section EL.



WARNING:

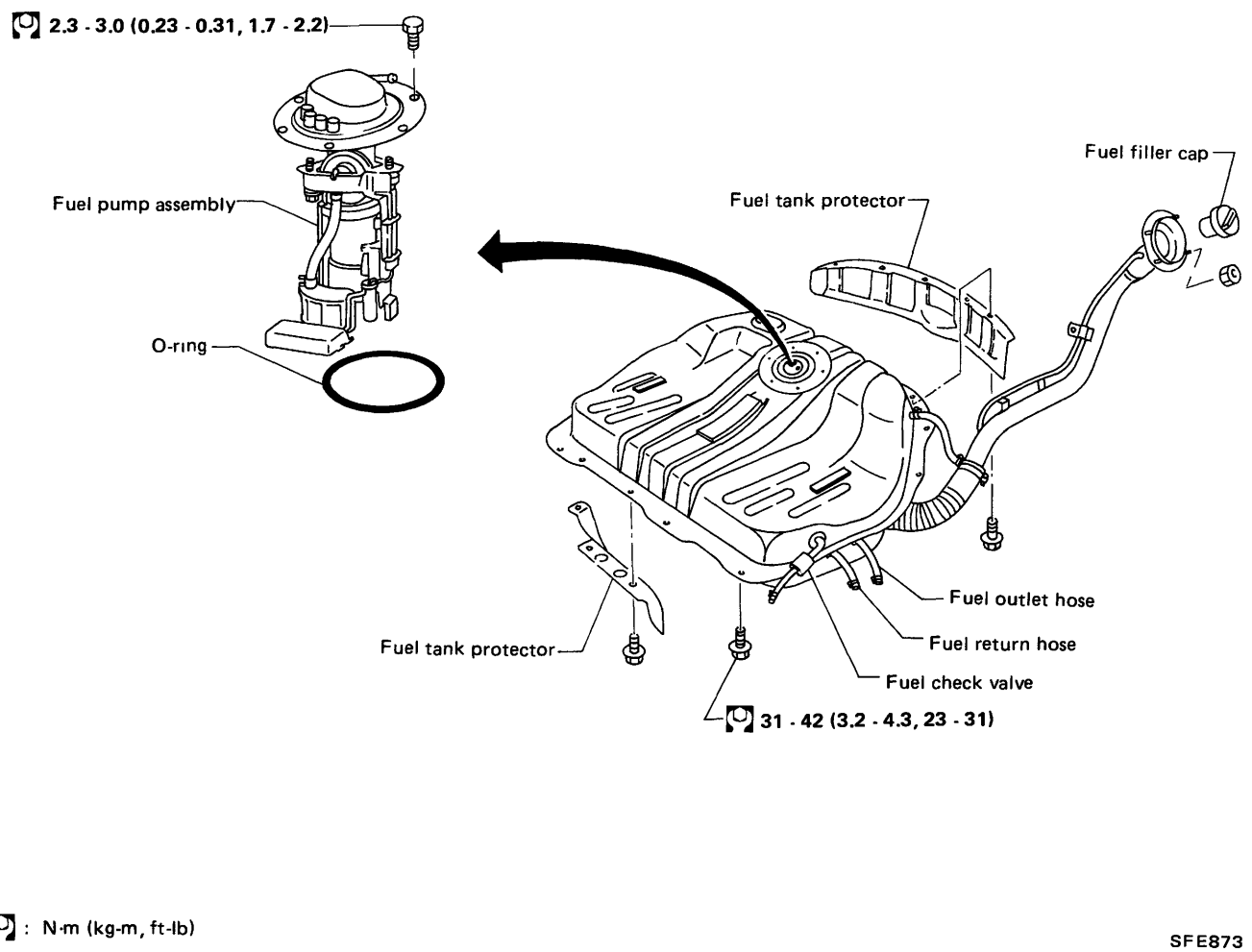
When replacing fuel line parts, be sure to observe the following:

a. Put a "CAUTION: INFLAMMABLE" sign in workshop.
b. Be sure to furnish the workshop with a CO_2 fire extinguisher.
c. Be sure to disconnect battery ground cable before conducting operations.
d. Put drained fuel in an explosion-proof container and attach lid on securely.

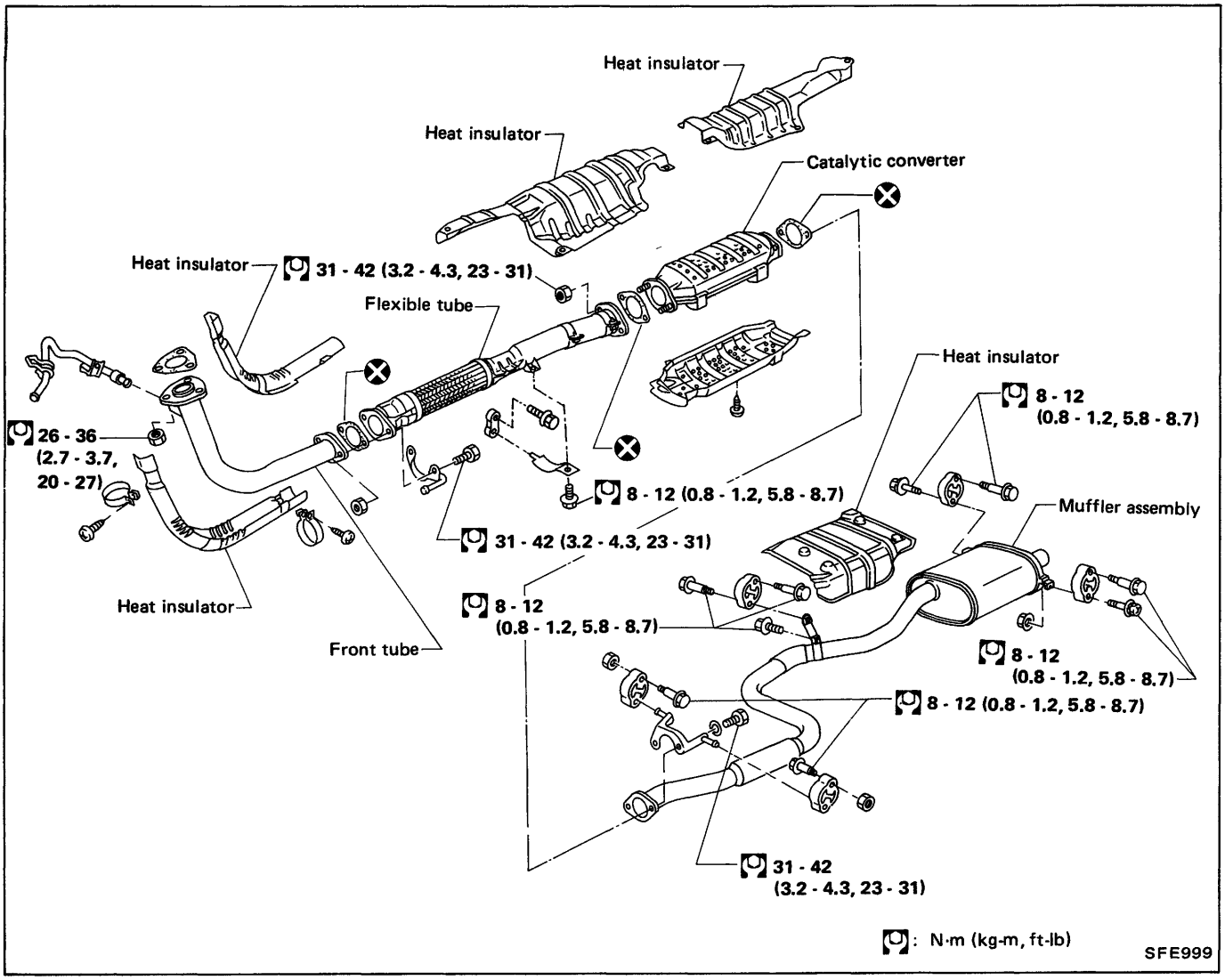
CAUTION:

Before disconnecting fuel hose, release fuel pressure from fuel line. Refer to the "Releasing Fuel Pressure" in section EF & EC.

a. Do not disconnect any fuel line unless absolutely necessary.
b. Plug hose and pipe openings to prevent entry of dust or dirt.
c. Always replace O-ring with a new one.
d. Do not kink or twist hose and tube when they are installed.
e. Do not tighten hose clamps excessively to avoid damaging hoses.
f. When installing fuel check valve, be careful of its designated direction. (Refer to section EF & EC.)
g. Run the engine and check for leaks at connections.



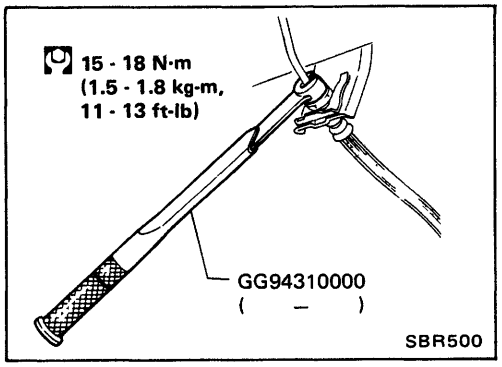
a. After installation, make sure that mounting brackets and mounting insulator are free from undue stress. If any of above parts are not installed properly, excessive noises or vibrations may be transmitted to vehicle body.
b. With engine running, check all tube connections for exhaust gas leaks, and entire system for unusual noises.



SECTION CL

CONTENTS

PRECAUTIONS AND PREPARATION ..... CL- 2
CLUTCH SYSTEM ..... CL- 3
INSPECTION AND ADJUSTMENT ..... CL- 4
HYDRAULIC CLUTCH CONTROL ..... CL- 5
CLUTCH RELEASE MECHANISM ..... CL- 7
CLUTCH DISC AND CLUTCH COVER ..... CL- 8
SERVICE DATA AND SPECIFICATIONS (S.D.S.) CL-11



Precautions

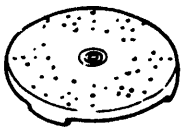
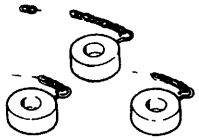
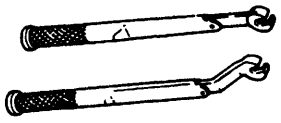
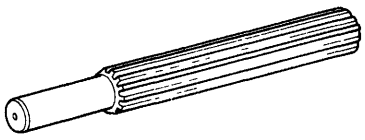
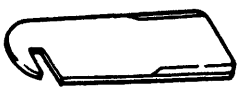
- Recommended fluid is brake fluid "DOT 3".
- Do not reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.
- When removing and installing clutch piping, use Tool.
- To clean or wash all parts of master cylinder, operating cylinder, use clean brake fluid.
- Never use mineral oils such as gasoline or kerosene.
  It will ruin the rubber parts of the hydraulic system.

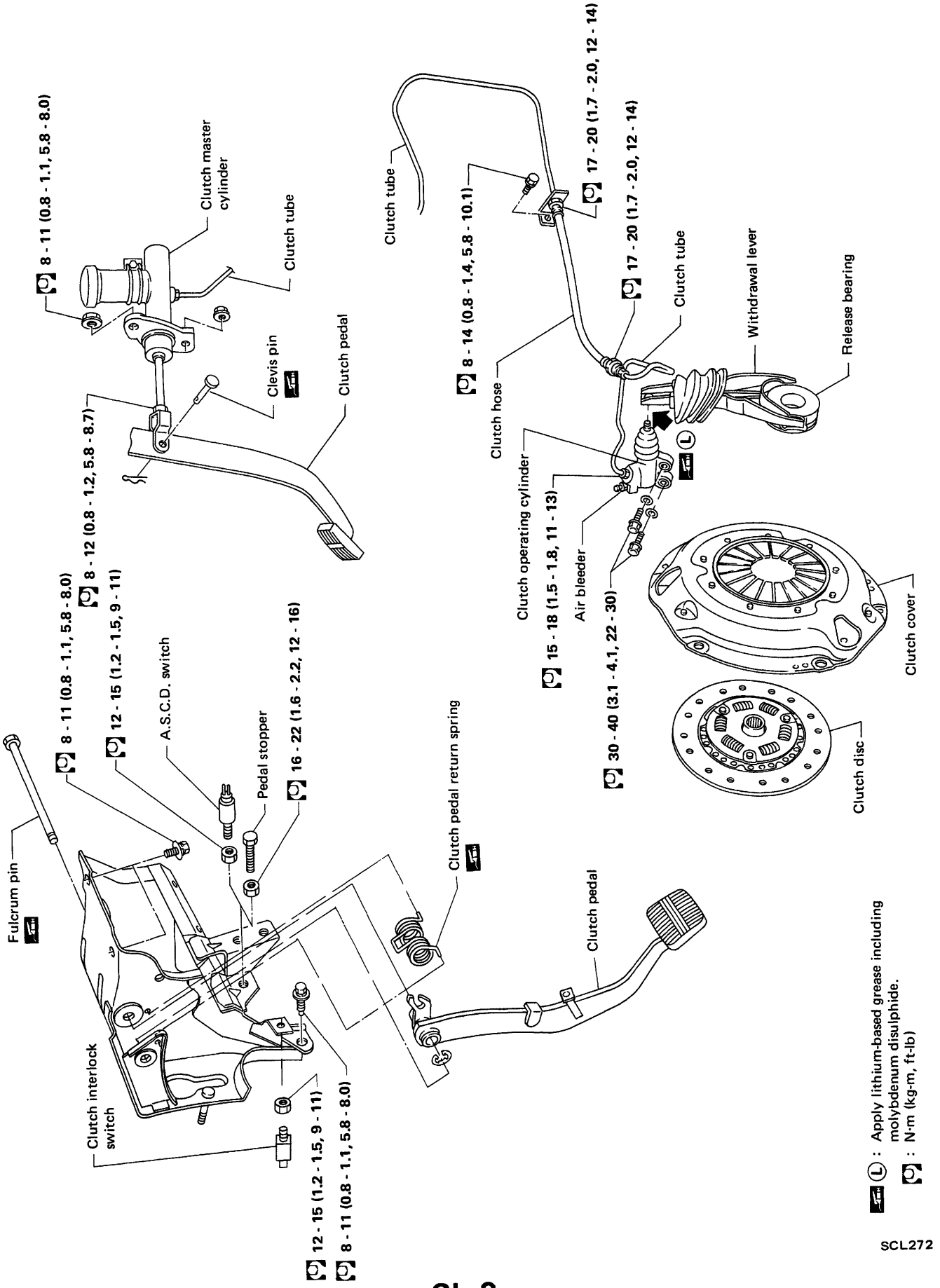
WARNING:

Remove all dust from clutch disc with a dust collector after cleaning with waste cloth.

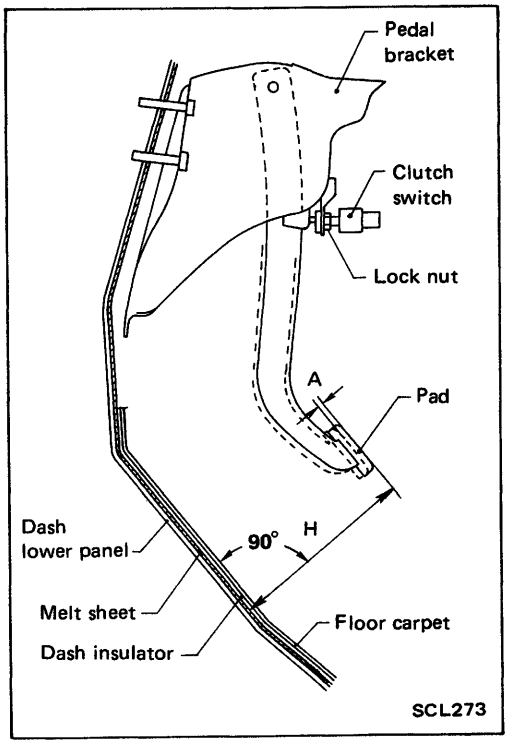
Preparation

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description	
ST20050010 (–) Base plate		Inspecting diaphragm spring of clutch cover
ST20050100 (–) Distance piece		
GG94310000 (–) Flare nut torque wrench		Removing and installing each clutch piping
KV30101000 (J33213) Clutch aligning bar		Installing clutch cover and clutch disc
ST20050240 (–) Diaphragm spring adjusting wrench		Adjusting unevenness of diaphragm spring of clutch cover

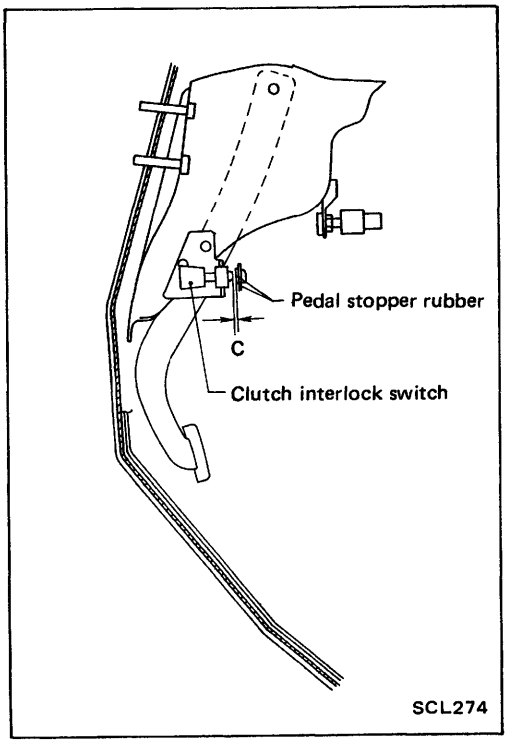

8 - 11 (0.8 - 1.1, 5.8 - 8.0)
Clutch master cylinder
Clutch tube
Clevis pin
Clutch pedal
8 - 12 (0.8 - 1.2, 5.8 - 8.7)
8 - 11 (0.8 - 1.1, 5.8 - 8.0)
12 - 15 (1.2 - 1.5, 9 - 11)
A.S.C.D. switch
Pedal stopper
16 - 22 (1.6 - 2.2, 12 - 16)
Fulcrum pin
Clutch pedal return spring
Clutch pedal
Clutch interlock switch
12 - 15 (1.2 - 1.5, 9 - 11)
8 - 11 (0.8 - 1.1, 5.8 - 8.0)
Clutch tube
8 - 14 (0.8 - 1.4, 5.8 - 10.1)
17 - 20 (1.7 - 2.0, 12 - 14)
17 - 20 (1.7 - 2.0, 12 - 14)
Clutch tube
Withdrawal lever
Release bearing
Clutch hose
Clutch operating cylinder
15 - 18 (1.5 - 1.8, 11 - 13)
Air bleeder
30 - 40 (3.1 - 4.1, 22 - 30)
Clutch disc
Clutch cover
: Apply lithium-based grease including molybdenum disulphide.
: N·m (kg-m, ft-lb)

SCL272

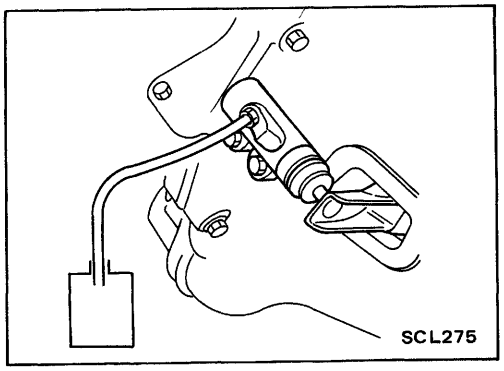


Adjusting Clutch Pedal

1. Adjust pedal height with pedal stopper or clutch switch.
   Pedal height "H":
   171 - 181 mm (6.73 - 7.13 in)
2. Adjust pedal free play with push rod.
   Pedal free play: 1 - 3 mm (0.04 - 0.12 in)



3. Adjust clearance "C" between pedal stopper rubber and threaded end of clutch interlock switch while depressing clutch pedal fully.
   Clearance C:
   1.0 - 2.0 mm (0.039 - 0.079 in)

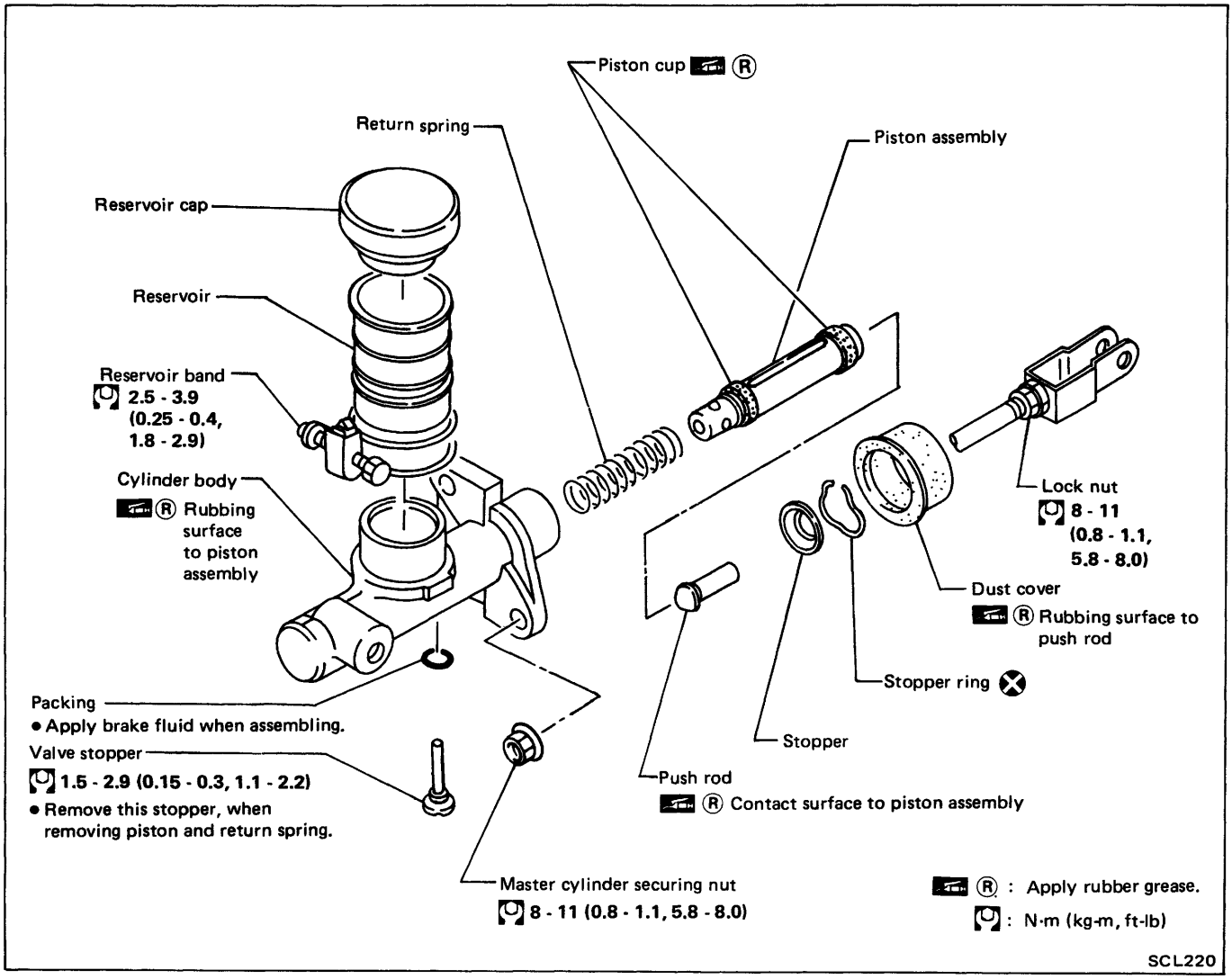


Bleeding Procedure

- **Carefully monitor fluid level at master cylinder during bleeding operation.**

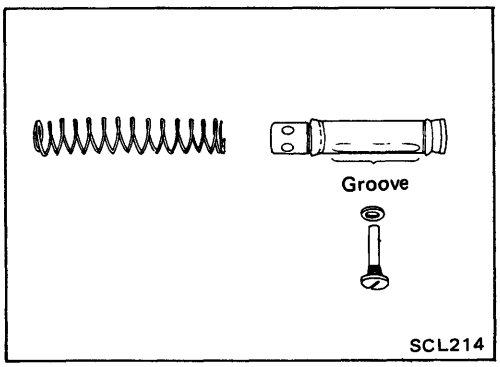
1. Top up reservoir with recommended brake fluid.
2. Connect a transparent vinyl tube to air bleeder valve.
3. Fully depress clutch pedal several times.
4. With clutch pedal depressed, open bleeder valve to release air.
5. Close bleeder valve.
6. Repeat steps 4 through 6 above until clear brake fluid comes out of air bleeder valve.

Clutch Master Cylinder



DISASSEMBLY AND ASSEMBLY

- Push piston in cylinder body with screwdriver when removing and installing valve stopper.



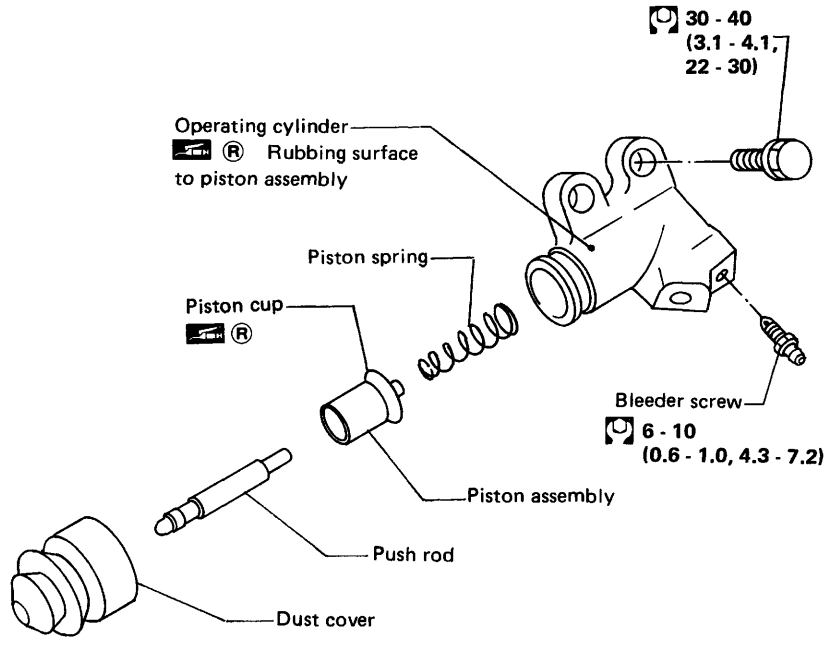
- Align groove of piston assembly and valve stopper portion when installing valve stopper.
- Check direction of piston caps.

Clutch Master Cylinder (Cont'd)

INSPECTION

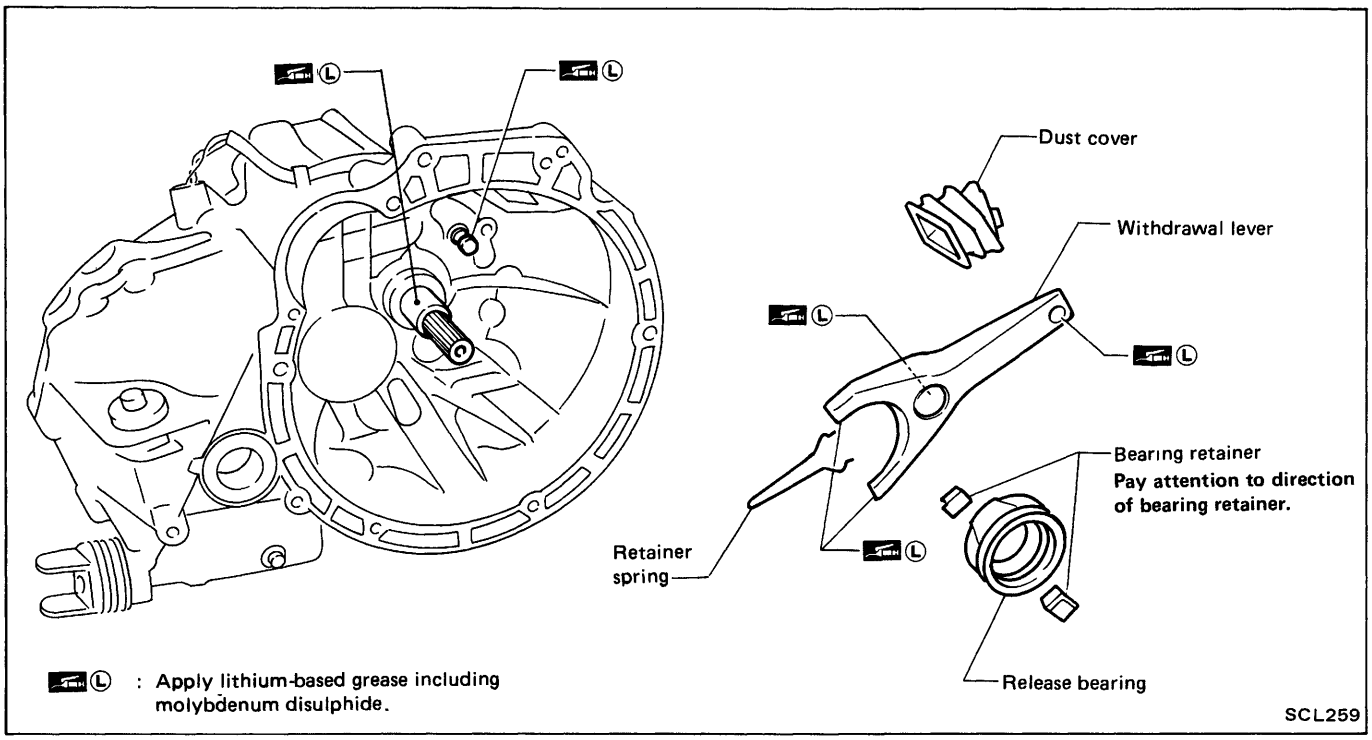
- Check cylinder and piston rubbing surface for uneven wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check return spring for wear or damage. Replace if necessary.
- Check reservoir for deformation or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.

Operating Cylinder



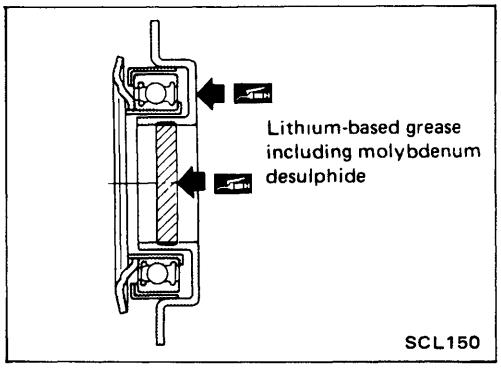
INSPECTION

- Check rubbing surface of cylinder for wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check piston spring for wear or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.



INSPECTION

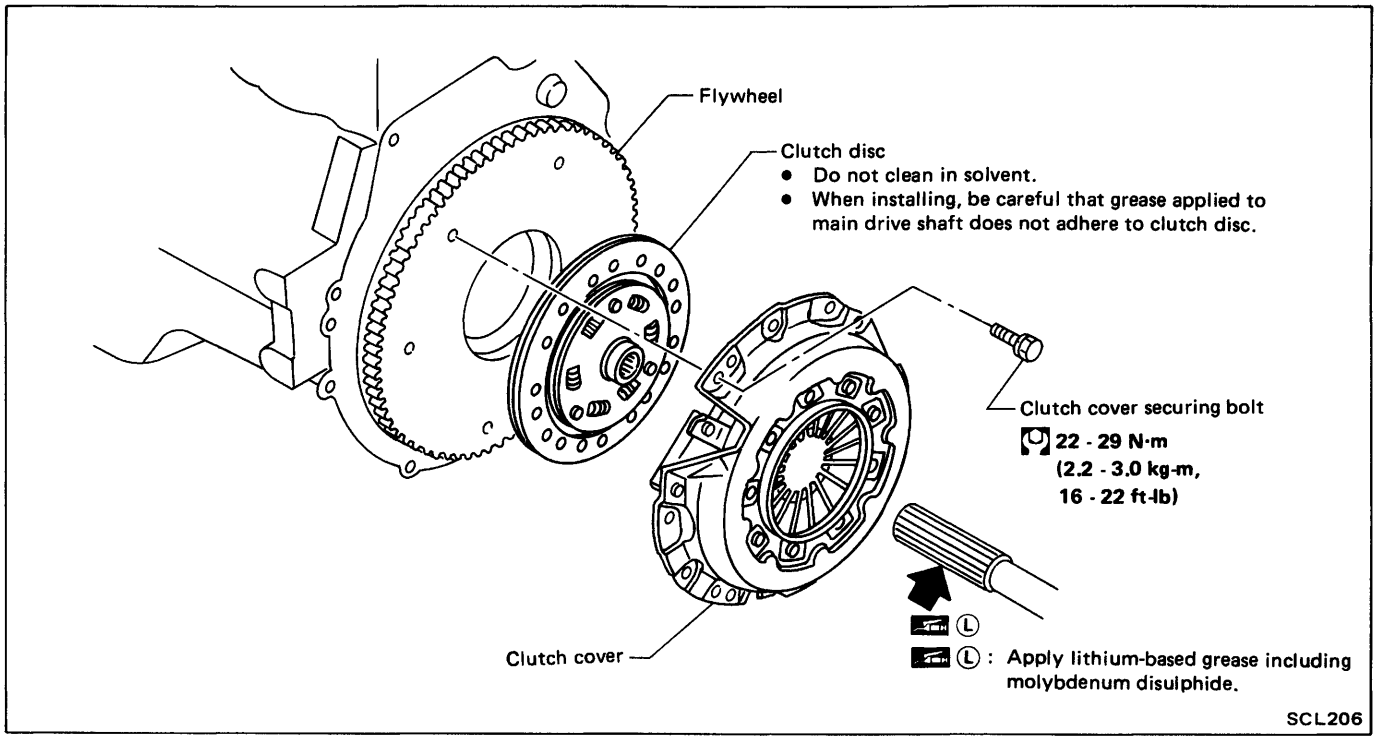
- Check release bearing to see that it rolls freely and is free from noise, cracks, pitting or wear. Replace if necessary.
- Check release sleeve and withdrawal lever rubbing surface for wear, rust or damage. Replace if necessary.

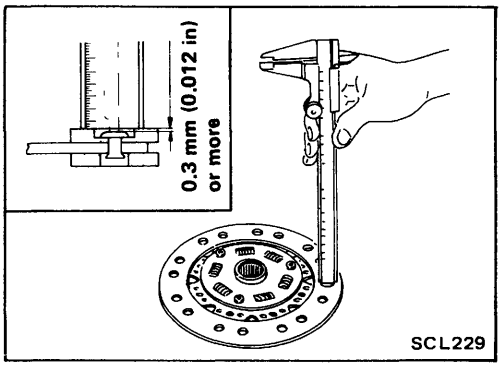


LUBRICATION

- Apply recommended grease to contact surface and rubbing surface.

Too much lubricant might cause clutch disc facing damage.



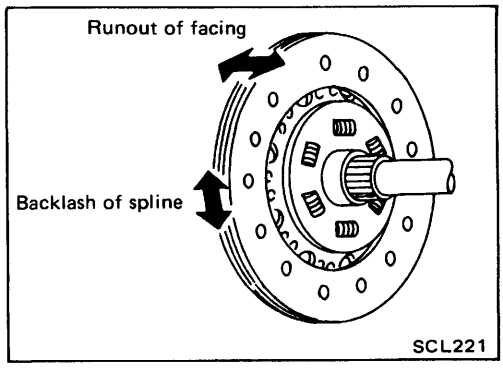


Clutch Disc

INSPECTION

Check clutch disc for wear of facing.

Wear limit of facing surface to rivet head:
0.3 mm (0.012 in)



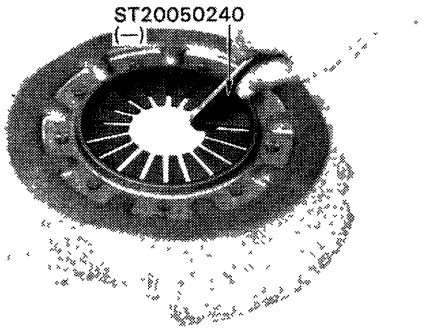
- Check clutch disc for backlash of spline and runout of facing.
  Maximum backlash of spline (at outer edge of disc):
  225TBL 0.9 mm (0.035 in)
  Runout limit:
  0.7 mm (0.028 in)
  Distance of runout check point (from hub center)
  225TBL 107.5 mm (4.23 in)
- Check clutch disc for burns, discoloration or oil or grease leakage. Replace if necessary.

Clutch Disc (Cont'd)

INSTALLATION

- Apply recommended grease to contact surface of spline portion.

Too much lubricant might cause clutch disc facing damage.

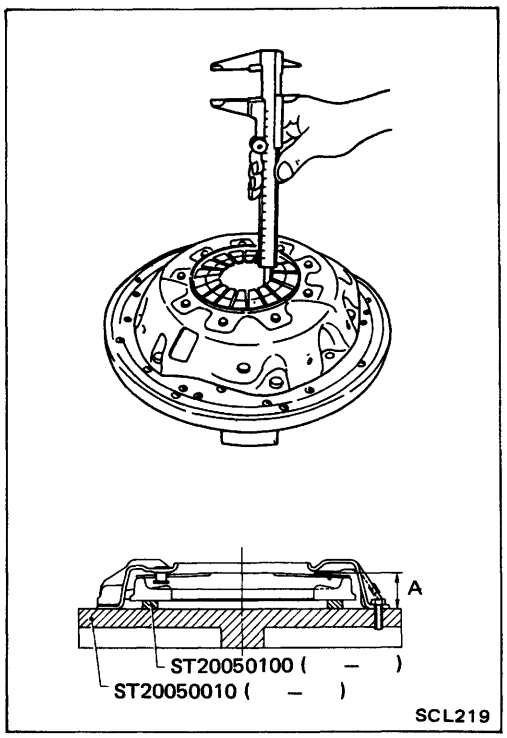


Clutch Cover and Flywheel

INSPECTION

- Adjust unevenness of diaphragm spring with Tool.

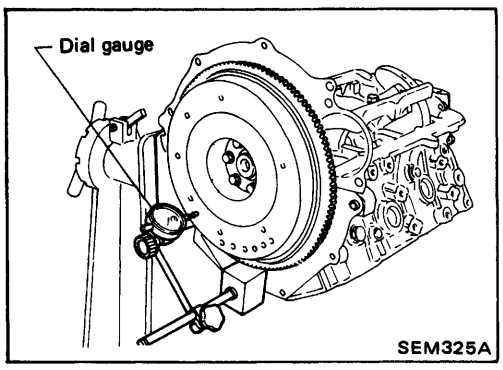
Uneven limit:
0.5 mm (0.020 in)



- Set Tool and check height and unevenness of diaphragm spring.
- **Set 0.3 mm (0.012 in) feeler gauges on distance pieces (ST2005100) when checking C225S.**

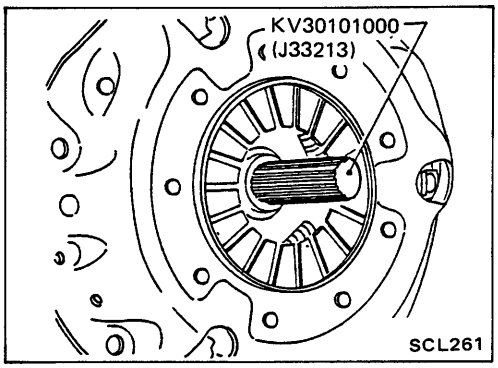
Diaphragm spring height "A":
C225S: 33 - 35 mm (1.30 - 1.38 in)

- Check thrust rings for wear or damage by shaking cover assembly up and down to listen 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.



- Check contact surface of flywheel for slight burns or discoloration. Repair flywheel with emery paper.
- Check flywheel runout.

Runout (Total indicator reading):
Flywheel
Less than 0.15 mm (0.0059 in)



Clutch Cover and Flywheel (Cont'd)

INSTALLATION

- Insert Tool into clutch disc hub when installing clutch cover and disc.

General Specifications

CLUTCH MASTER CYLINDER

Inner diameter	mm (in)	15.87 (5/8)

CLUTCH OPERATING CYLINDER

Inner diameter	mm (in)	19.05 (3/4)

CLUTCH DISC

Model	225TBL
Engine	CA20E
Facing size mm (in) (Outer dia. x inner dia. x thickness)	225 x 150 x 3.5 (8.86 x 5.91 x 0.138)
Thickness of disc assembly With load mm (in)	8.0 - 8.4 (0.315 - 0.331) with 3,923 N (400 kg, 882 lb)

CLUTCH COVER

Model	C225S
Engine	CA20E
Full load N (kg, lb)	3,923 (400, 882)

Inspection and Adjustment

CLUTCH PEDAL

Unit: mm (in)

Pedal height "H*"	171 - 181 (6.73 - 7.13)
Pedal free play	1 - 3 (0.04 - 0.12)

*: Measured from surface of melt sheet to pedal pad

CLUTCH DISC

Unit: mm (in)

Model	225TBL
Wear limit of facing surface to rivet head	0.3 (0.012)
Runout limit of facing	0.7 (0.028)
Distance of runout check point (from the hub center)	107.5 (4.23)
Maximum backlash of spline (at outer edge of disc)	0.9 (0.035)

CLUTCH COVER

Unit: mm (in)

Model	C225S
Diaphragm spring height	33 - 35 (1.30 - 1.38)
Uneven limit of diaphragm spring toe height	0.5 (0.020)

Tightening Torque

Unit	N·m	kg-m	ft-lb
Clutch switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Clutch interlock switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Clutch pedal bracket securing nut	8 - 11	0.8 - 1.1	5.8 - 8.0
Master cylinder push rod lock nut	8 - 12	0.8 - 1.2	5.8 - 8.7
Master cylinder securing nut	8 - 11	0.8 - 1.1	5.8 - 8.0
Valve stopper	1.5 - 2.9	0.15 - 0.3	1.1 - 2.2
Reservoir band	2.5 - 3.9	0.25 - 0.4	1.8 - 2.9
Operating cylinder securing nut	30 - 40	3.1 - 4.1	22 - 30
Clutch tube flare nut	15 - 18	1.5 - 1.8	11 - 13
Bleeder screw	6 - 10	0.6 - 1.0	4.3 - 7.2
Clutch hose to operating cylinder or clutch tube	17 - 20	1.7 - 2.0	12 - 14
Clutch hose clamp to body	8 - 14	0.8 - 1.4	5.8 - 10.1
Clutch cover securing bolt	22 - 29	2.2 - 3.0	16 - 22

MANUAL TRANSAXLE

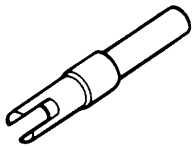
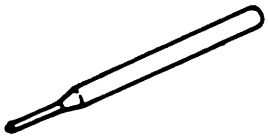
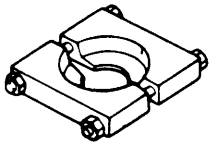
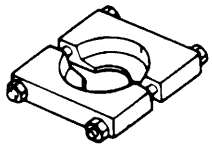
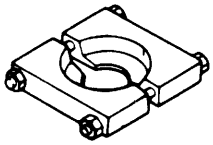
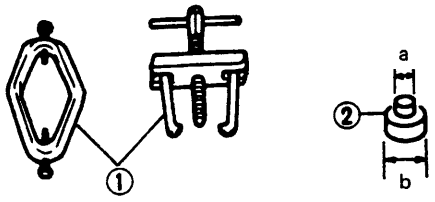
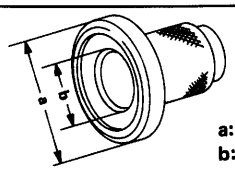
SECTION MT

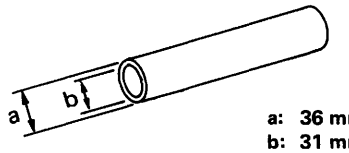
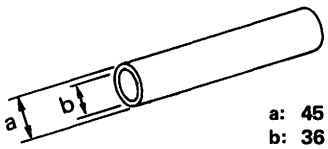
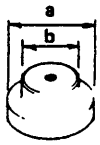
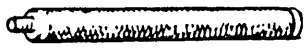
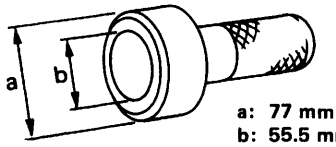
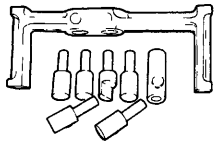
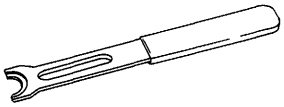
CONTENTS

Model RS5F50A

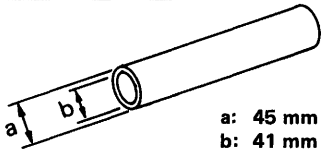
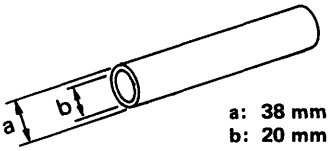
PREPARATION ..... MT- 2
ON-VEHICLE SERVICE ..... MT- 4
REMOVAL AND INSTALLATION ..... MT- 6
TRANSAXLE GEAR CONTROL ..... MT- 7
MAJOR OVERHAUL ..... MT- 8
DISASSEMBLY MT-11
REPAIR FOR COMPONENT PARTS MT-14
ADJUSTMENT MT-27
ASSEMBLY MT-31
SERVICE DATA AND SPECIFICATIONS (S.D.S.) MT-35

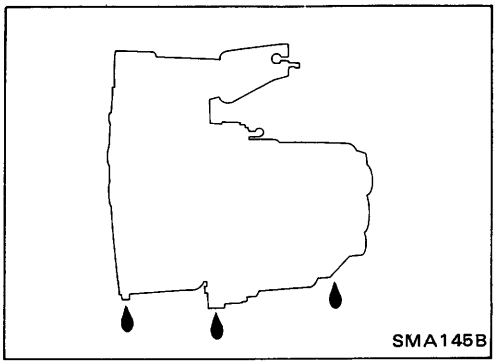
SPECIAL SERVICE TOOLS – for RS5F50A

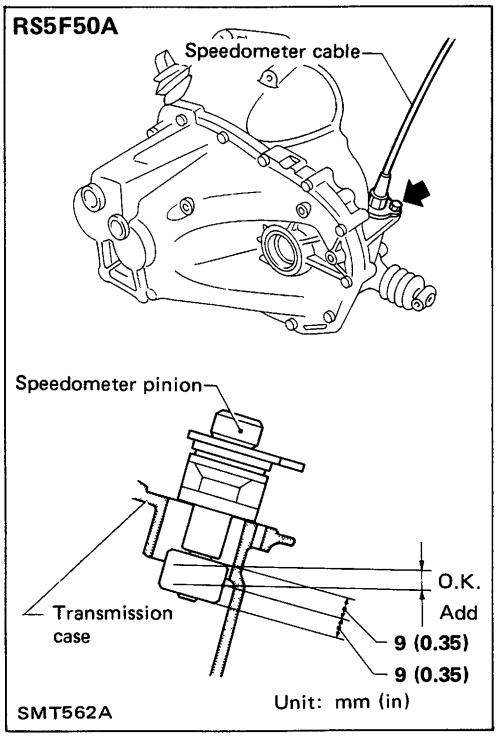
Tool number (Kent-Moore No.) Tool name	Description	
KV38106500 (J34284) Preload adapter		Measuring turning torque of final drive assembly Measuring total turning torque Measuring clearance between side gear and differential case with washer Selecting differential side bearing adjusting shim
KV32101000 (J25689-A) Pin punch		Removing and installing retaining pin
ST22730000 (J25681) Puller		Removing mainshaft front and rear bearing inner race
ST30031000 (J22912-01) Puller		Removing input shaft front and rear bearing Removing 4th & 5th main gear
ST30021000 (J22912-01) Puller		Removing 5th synchronizer Removing 3rd & 4th synchronizer Removing 2nd & 3rd main gear
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.**
ST33290001 (J34286) Puller		Removing differential oil seal Removing mainshaft rear bearing outer race Removing differential side bearing outer race
ST33400001 (J26082) Drift	 **a: 60 mm (2.36 in) dia.** **b: 47 mm (1.85 in) dia.**	Installing differential oil seal

Tool number (Kent-Moore No.) Tool name	Description	
ST30600000 (J25863-01) Drift	 a: 36 mm (1.42 in) dia. b: 31 mm (1.22 in) dia.	Installing input shaft front bearing
ST22452000 (—) Drift	 a: 45 mm (1.77 in) dia. b: 36 mm (1.42 in) dia.	Installing 3rd, 4th and 5th main gear
ST30621000 (J25742-5) Drift	 a: 79 mm (3.11 in) dia. b: 59 mm (2.32 in) dia.	Installing mainshaft rear bearing outer race (Use with ST30611000.)
ST30611000 (J25742-1) Drift		Installing mainshaft rear bearing outer race (Use with ST30621000.)
ST30720000 (—) Drift	 a: 77 mm (3.03 in) dia. b: 55.5 mm (2.185 in) dia.	Installing differential side bearing outer race
(J34290) Shim selecting tool set		Selecting differential side bearing adjusting shim
(J34305) Snap ring remover and installer		Removing and installing stopper ring of shift fork

COMMERCIAL SERVICE TOOLS — for RS5F50A

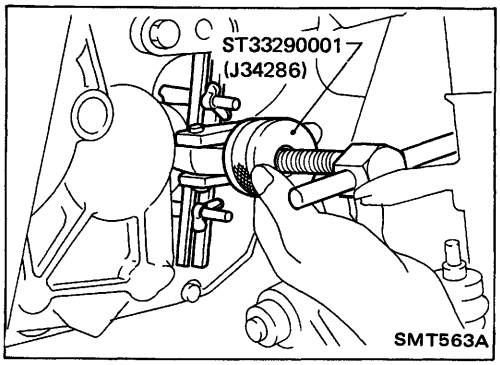
Tool name	Description	
Drift	 a: 45 mm (1.77 in) dia. b: 41 mm (1.61 in) dia.	Installing differential side bearing inner race
Drift	 a: 38 mm (1.50 in) dia. b: 20 mm (0.79 in) dia.	Installing striking rod oil seal





Checking M/T Oil

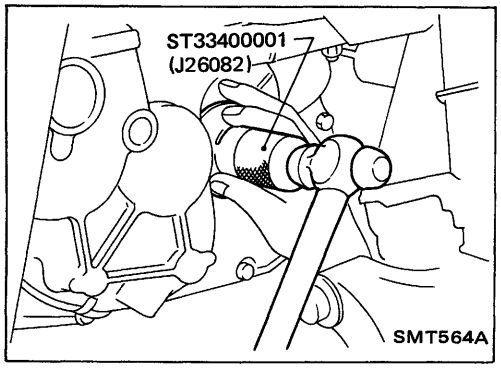
- Check manual transaxle for leakage.



Replacing Oil Seal

DIFFERENTIAL OIL SEAL

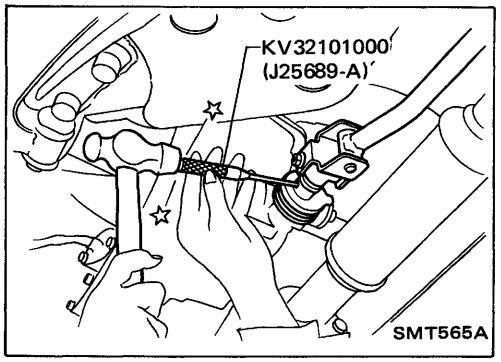
1. Drain gear oil from transaxle.
2. Remove drive shafts – Refer to section FA.
3. Remove differential oil seal.



4. Install differential oil seal.

Apply multi-purpose grease to seal lip of oil seal before installing.

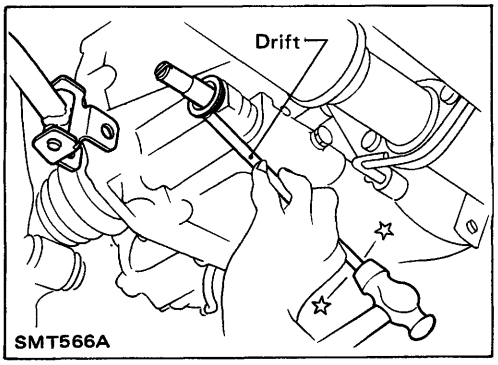
5. Install drive shafts – Refer to section FA.



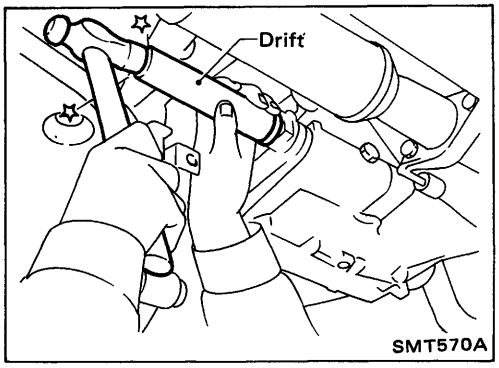
STRIKING ROD OIL SEAL

1. Remove transaxle control rod from yoke.
2. Remove retaining pin of yoke.

Be careful not to damage boot.



3. Remove striking rod oil seal.

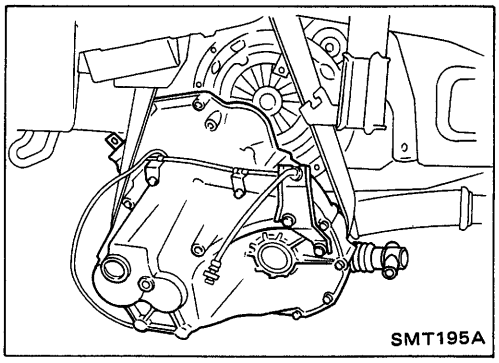


4. Install striking rod oil seal.

Apply multi-purpose grease to seal lip of oil seal before installing.

Removal

- Remove battery and its bracket.
- Remove air cleaner and air flow meter.
- Draw out drive shaft – Refer to section FA.


SMT195A

- Support engine by placing a jack under oil pan.

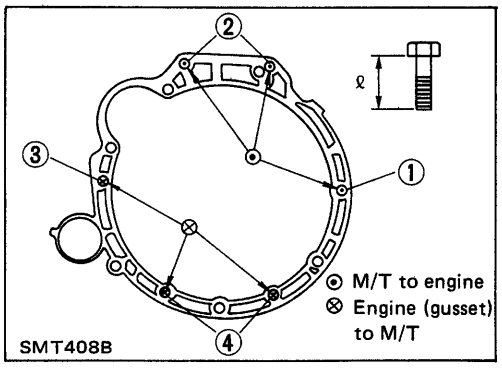
CAUTION:

Do not place jack under the oil pan drain plug.

- Lower transaxle.

WARNING:

Support Manual Transaxle while removing it.



SMT408B

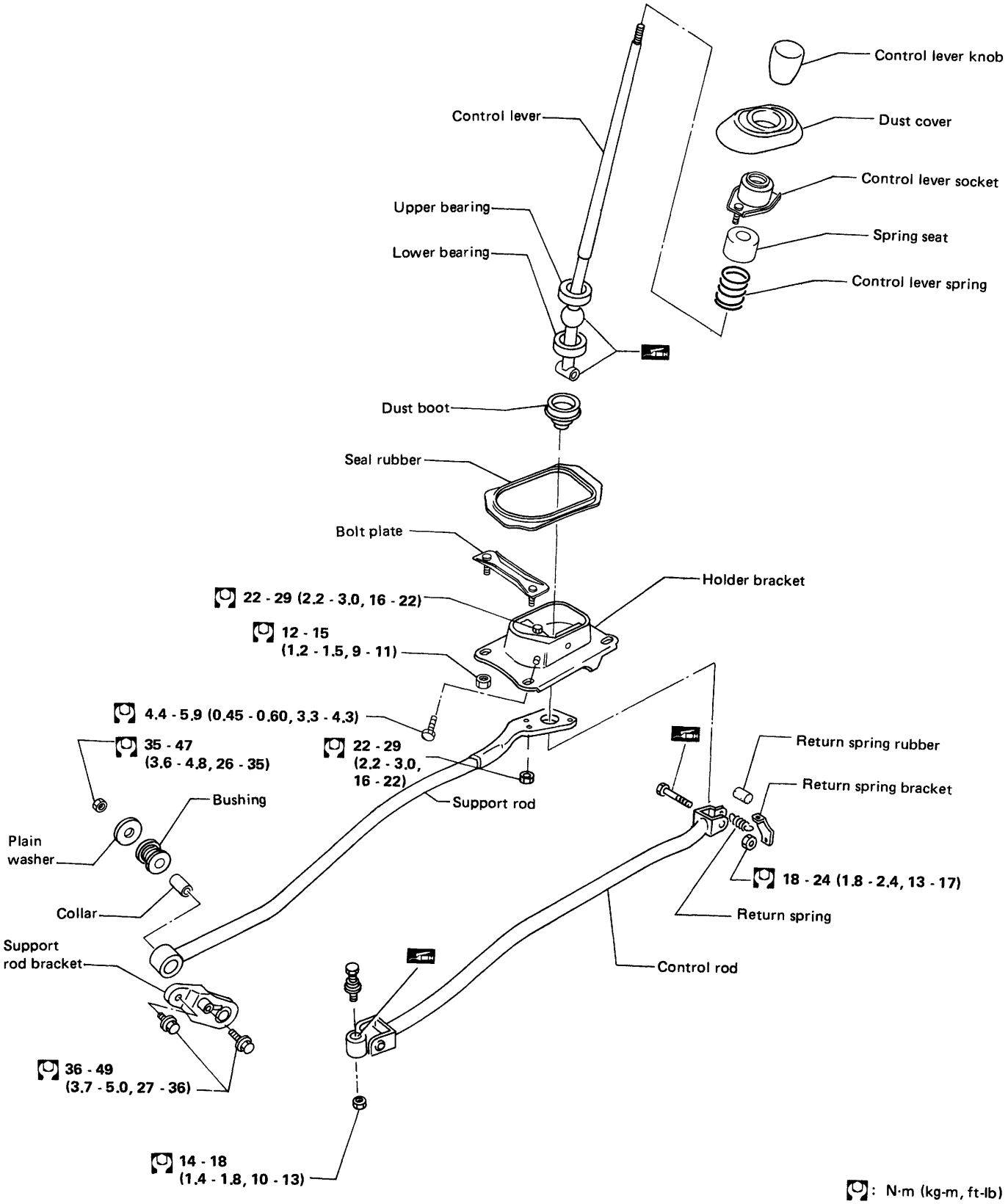
Installation

Tighten bolt securing transaxle.

- **CA20E engine model**

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	ℓ mm (in)
1*	39 - 49 (4.0 - 5.0, 29 - 36)	120 (4.72)
2	39 - 49 (4.0 - 5.0, 29 - 36)	65 (2.56)
3	39 - 49 (4.0 - 5.0, 29 - 36)	70 (2.76)
4	30 - 40 (3.1 - 4.1, 22 - 30)	25 (0.98)

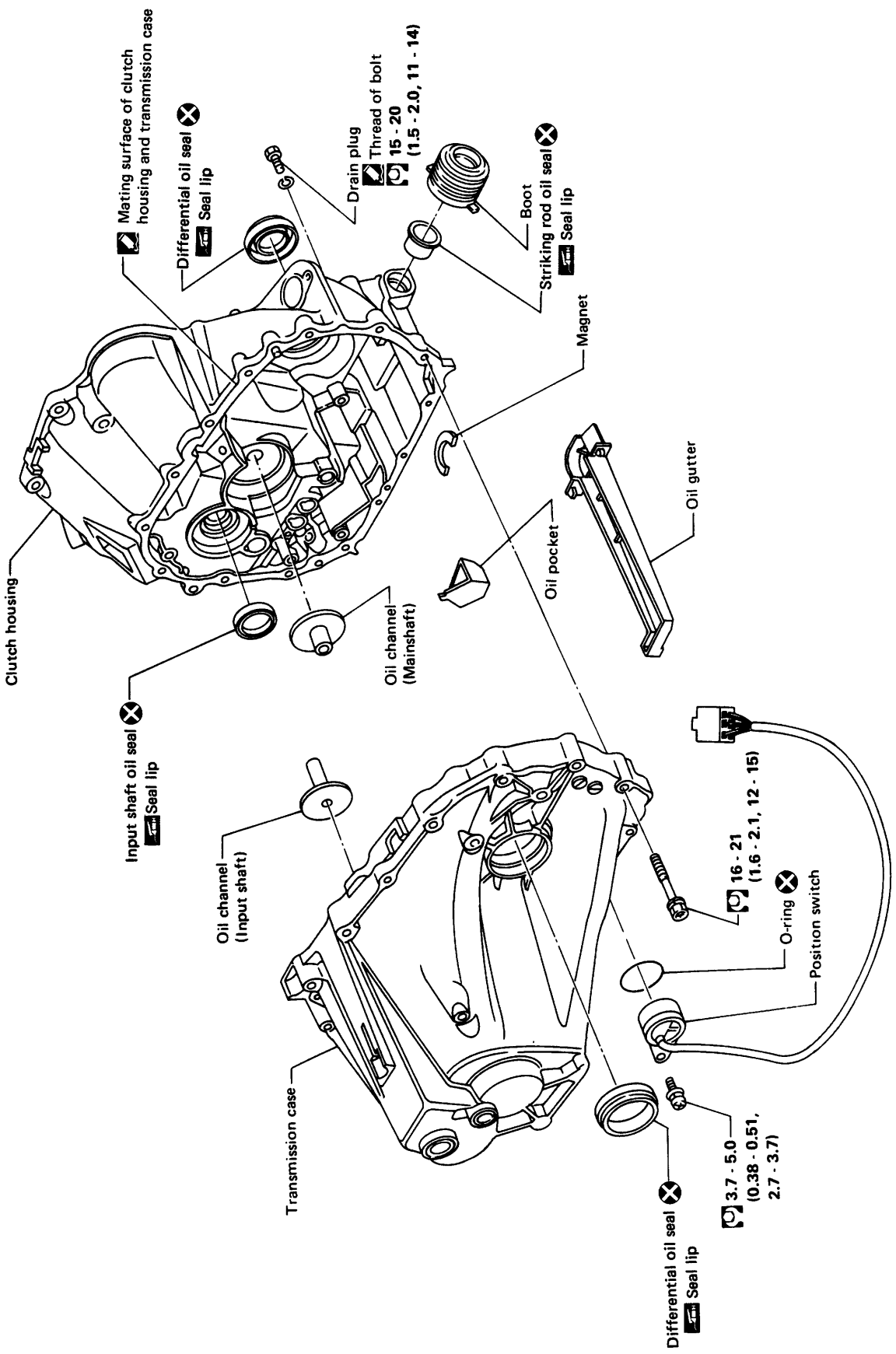
*: With nut



: N·m (kg-m, ft-lb)

SMT409B

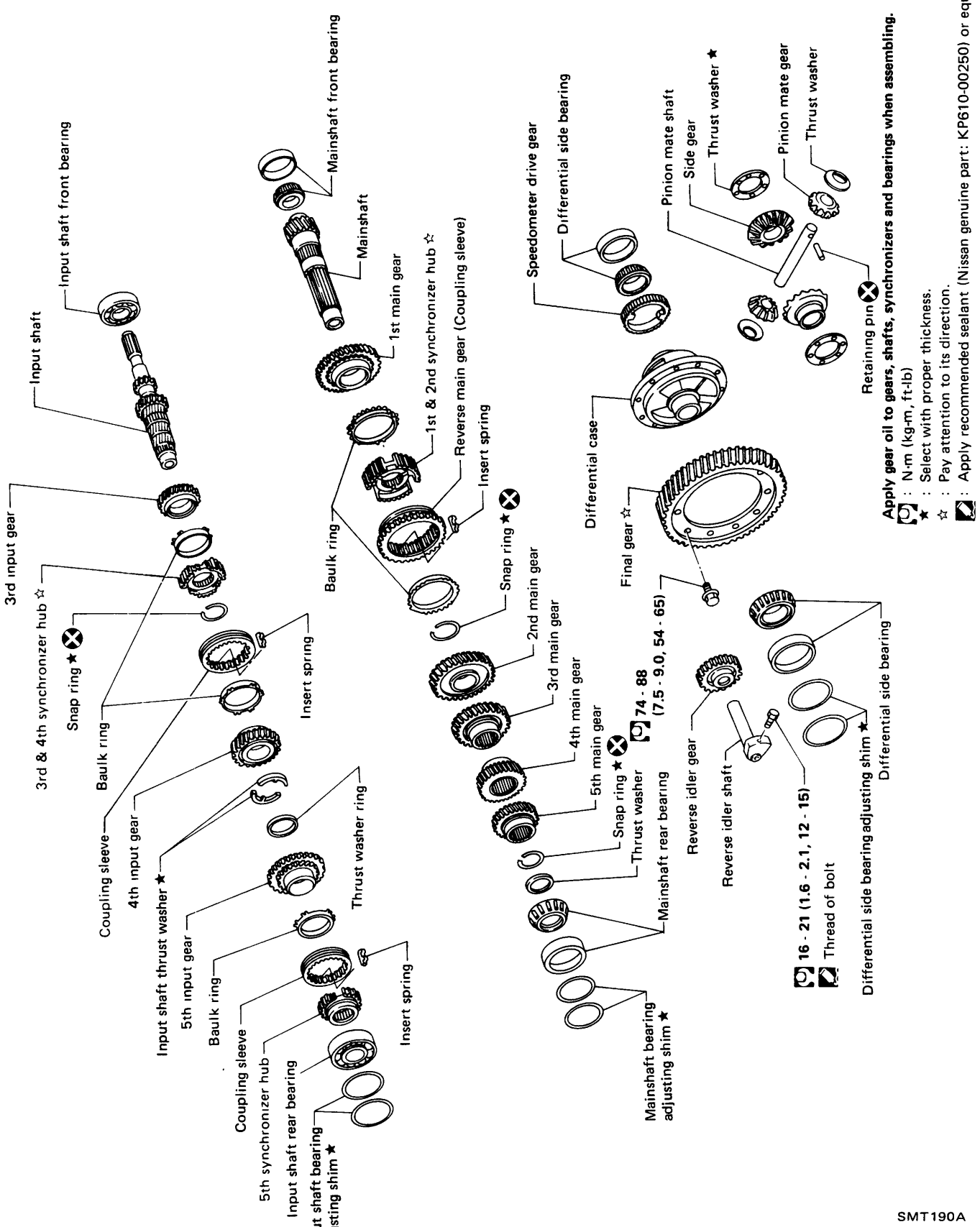
Case Component



: N·m (kg-m, ft-lb)
: Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent.

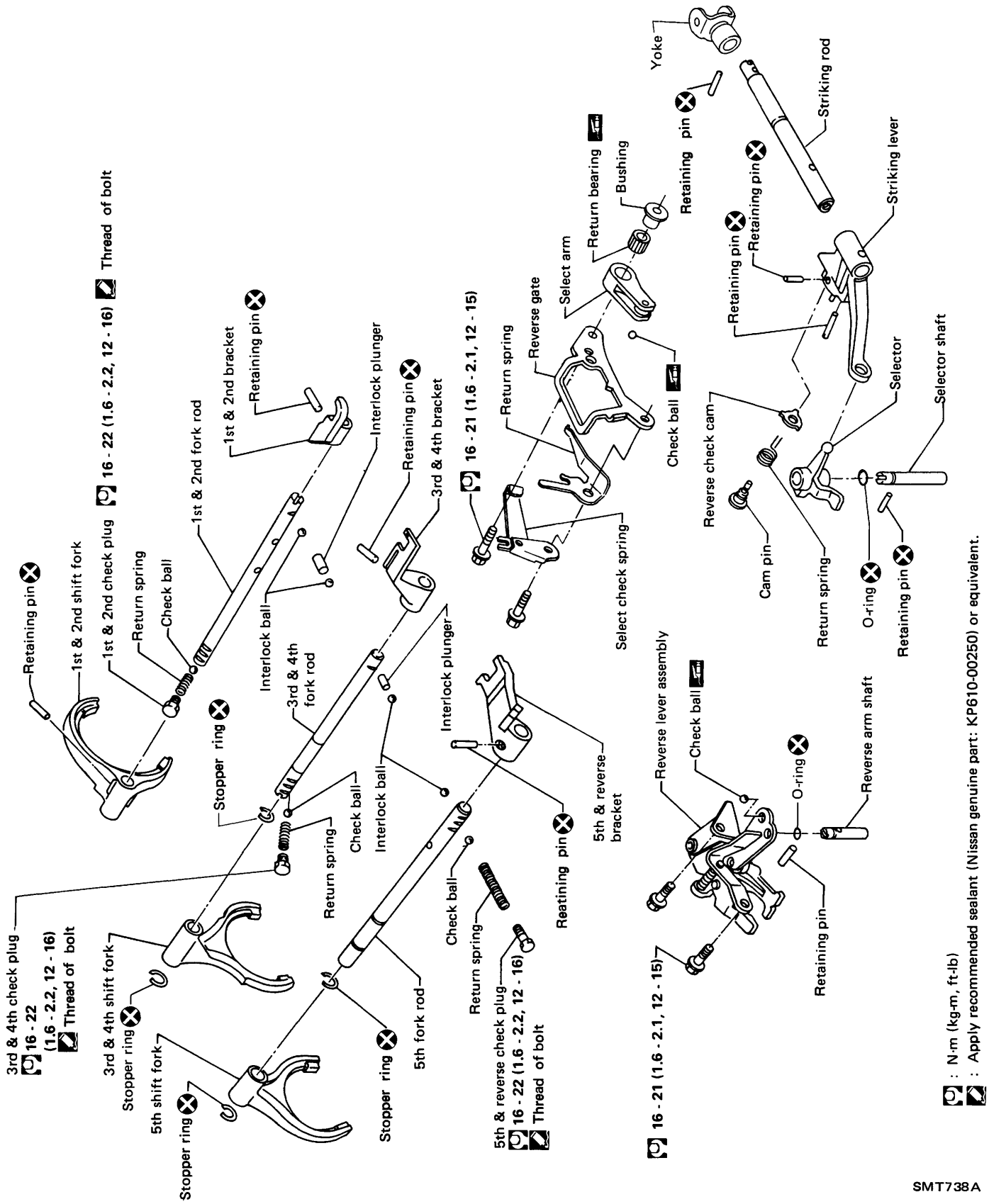
SMT013A

Gear Component



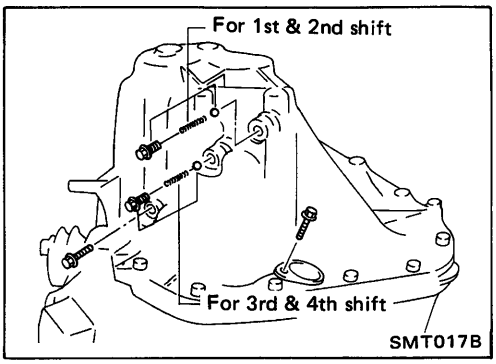
SMT190A

Shift Component

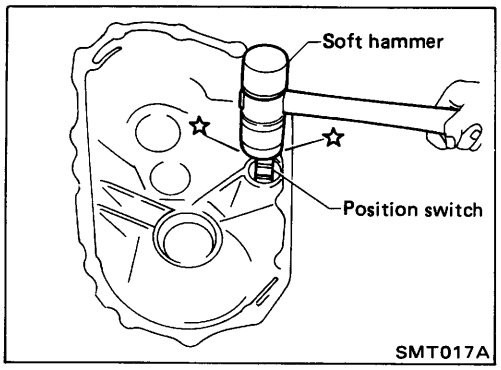


: N·m (kg-m, ft-lb)
: Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent.

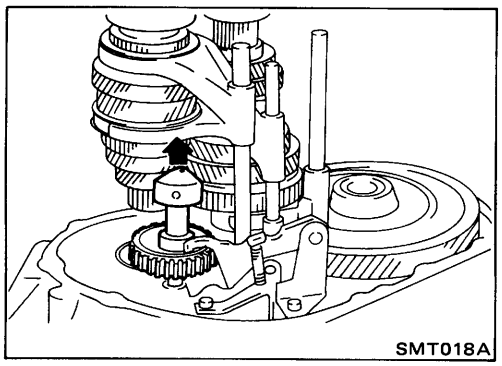
SMT738A



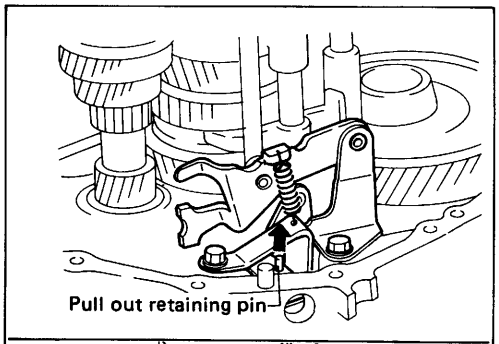
1. Before removing transaxle case, remove bolts and plugs shown left.
2. Take off transmission case.

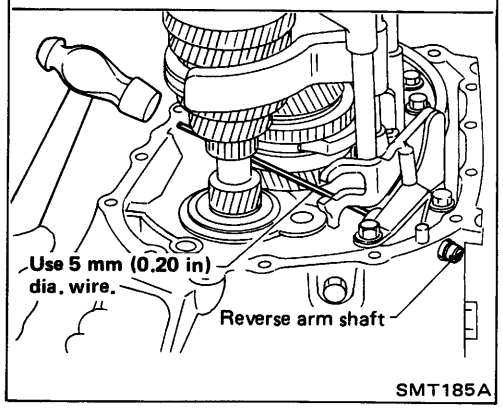


3. Remove position switch.

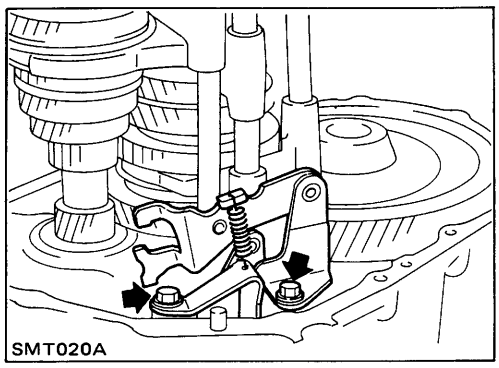


4. Mesh 4th gear, and then remove reverse idler shaft and reverse idler gear.

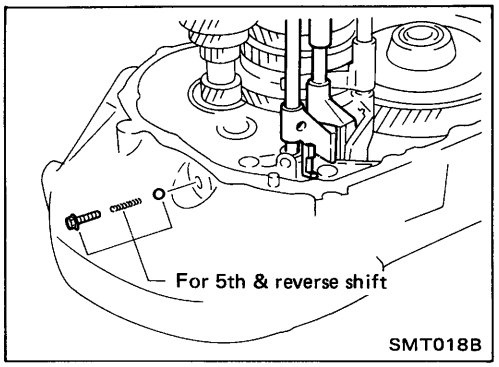




5. Remove reverse arm shaft.

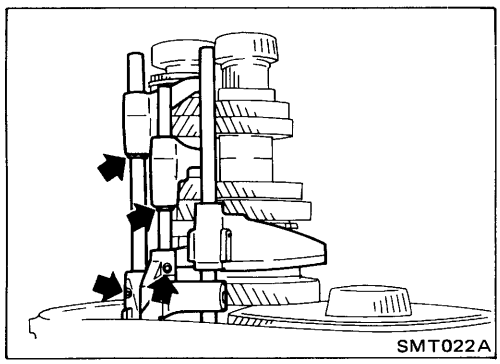

SMT020A

6. Remove reverse lever assembly.

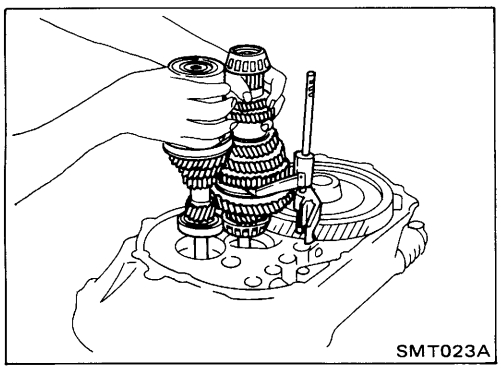


SMT018B

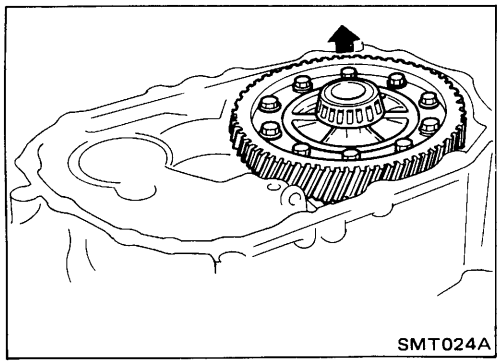
7. Remove 5th & Reverse check plug, spring and ball.


SMT022A

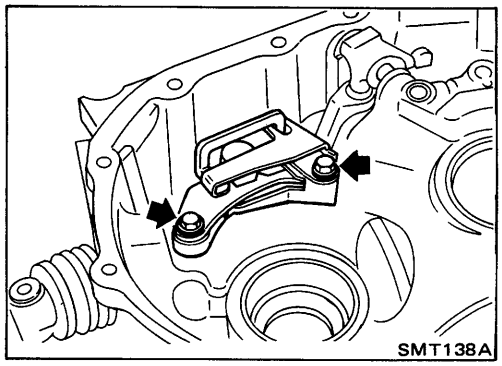
8. Remove stopper rings and retaining pins from 5th & Reverse and 3rd & 4th fork rods.
   When removing stopper rings, use snap ring remover and installer (J34305).
9. Remove 5th & Reverse and 3rd & 4th fork rods. Then remove forks and brackets.


SMT023A

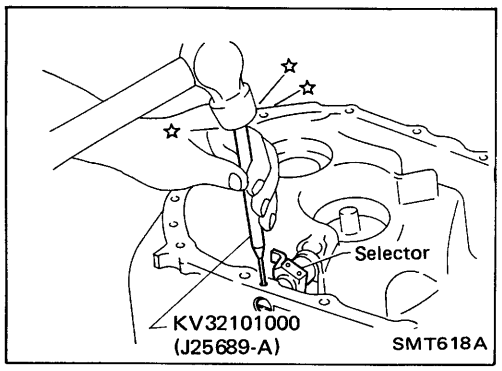
10. Remove both input and mainshafts with 1st & 2nd fork and fork rod as a set.


SMT024A

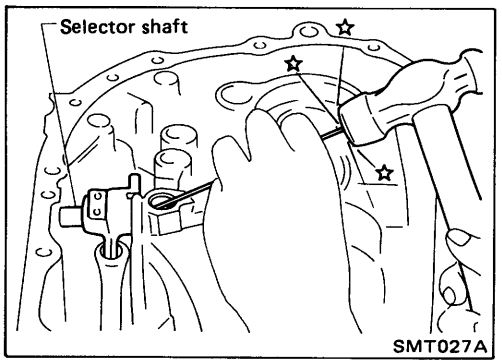
11. Remove final drive assembly.

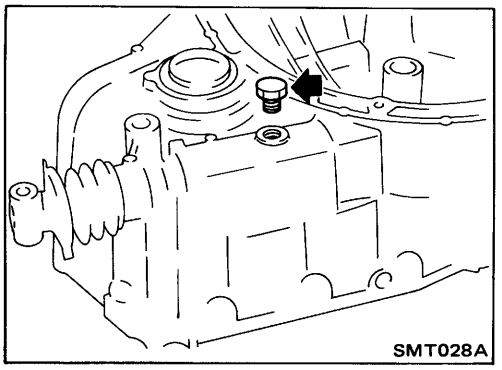


12. Remove reverse check assembly.

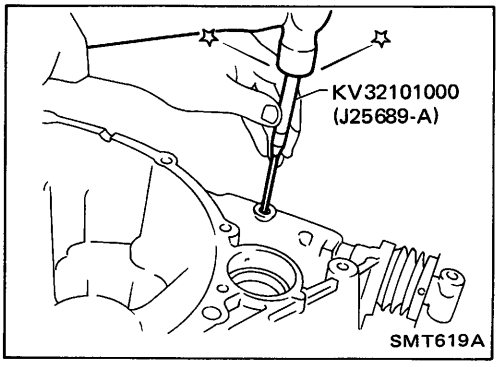


13. Remove retaining pin and detach the selector.

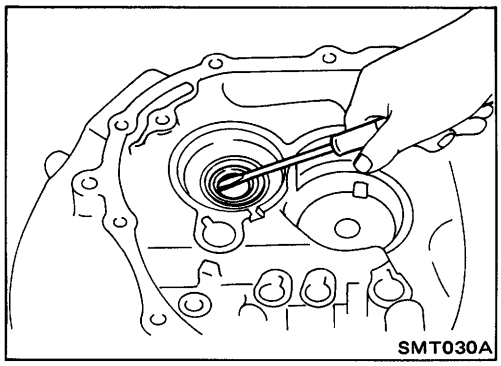




14. Remove drain plug for convenience in removing retaining pin which holds striking lever to striking rod.



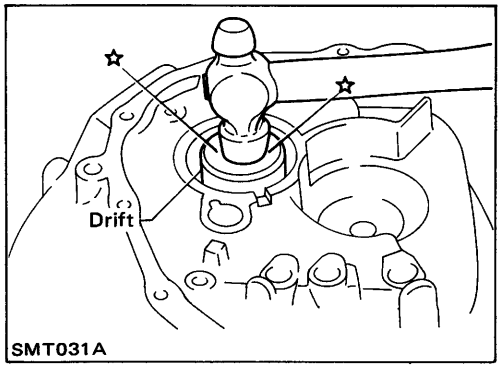
15. Remove retaining pin and then withdraw striking lever and striking rod.


SMT030A

Clutch Housing and Transmission Case

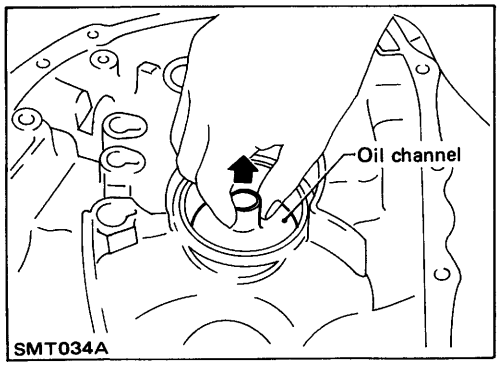
REMOVAL AND INSTALLATION

Input shaft oil seal



SMT031A

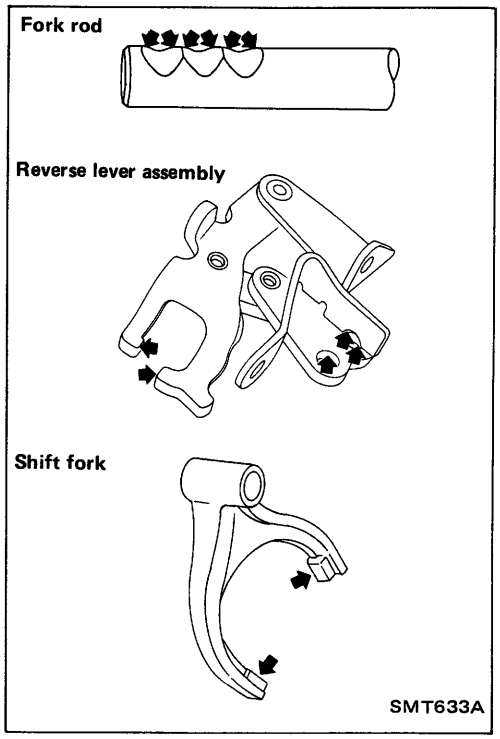
Mainshaft front bearing outer race



SMT034A

Mainshaft rear bearing outer race – Refer to "ADJUSTMENT".

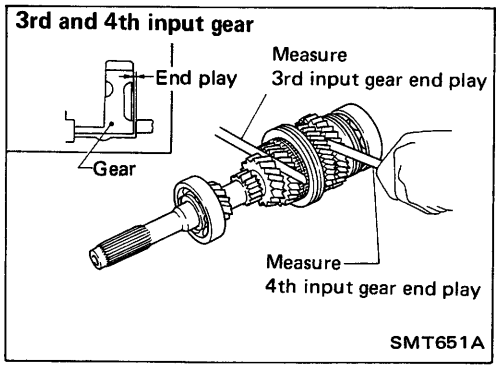
Differential side bearing outer race – Refer to "ADJUSTMENT".



Shift Control Components

INSPECTION

- Check contact surface and sliding surface for wear, scratches, projections or other damage.



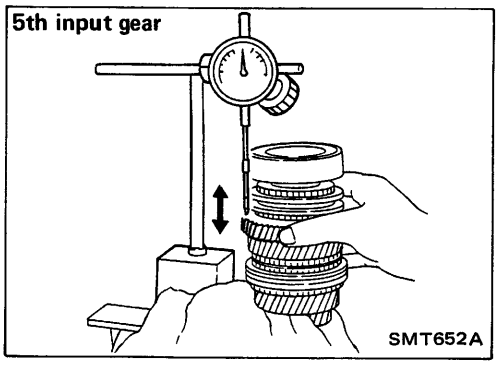
Input Shaft and Gears

DISASSEMBLY

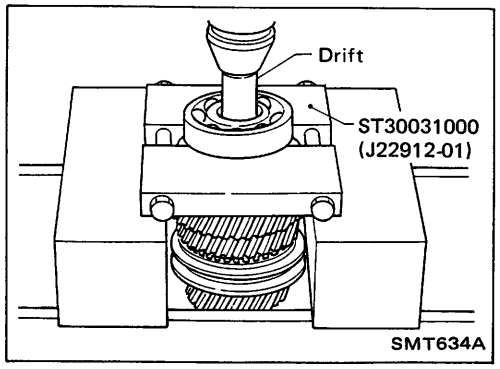
1. Before disassembly, check 3rd, 4th and 5th input gear end plays.

Gear end play

Gears	End play mm (in)
3rd input gear	0.23 - 0.43 (0.0091 - 0.0169)
4th input gear	0.25 - 0.55 (0.0098 - 0.0217)
5th input gear	0.23 - 0.48 (0.0091 - 0.0189)

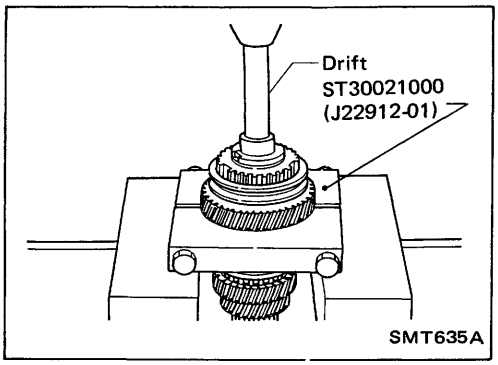


If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of snap ring and thrust washer — Refer to Assembly.

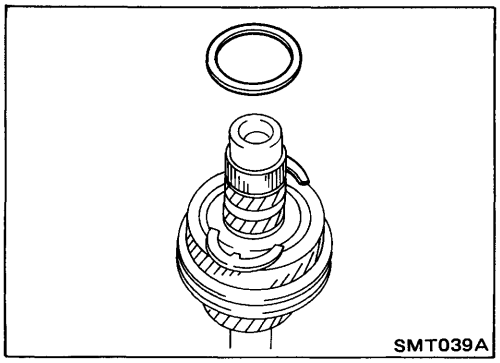


2. Remove input shaft rear bearing.

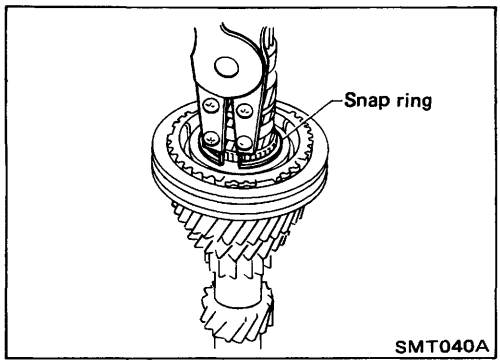
Input Shaft and Gears(Cont'd)



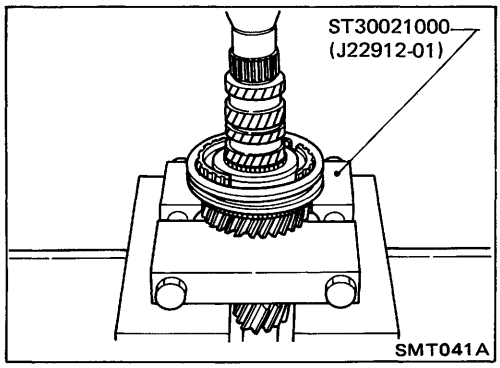
3. Remove 5th synchronizer and 5th input gear.



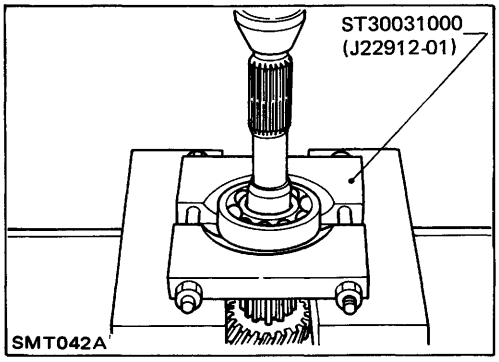
4. Remove thrust washer ring, thrust washers and 4th input gear.



5. Remove snap ring.



6. Remove 3rd & 4th synchronizer and 3rd input gear.



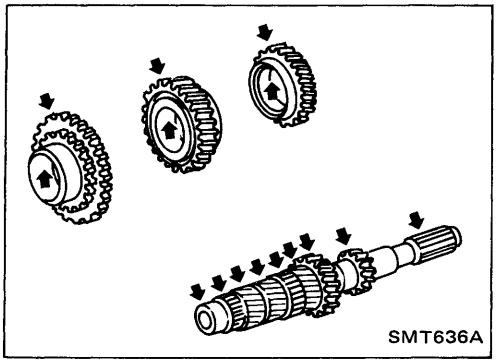
7. Remove input shaft front bearing.

Input Shaft and Gears (Cont'd)

INSPECTION

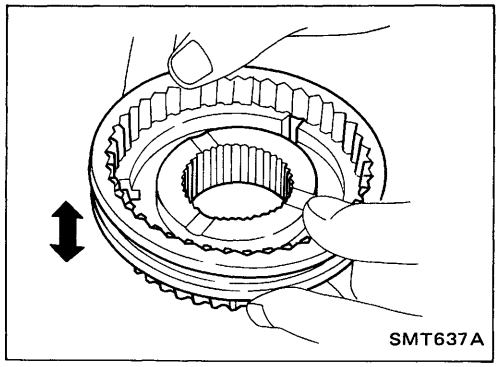
Gear and shaft

- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.


SMT636A

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.


SMT637A

- Measure clearance between baulk ring and gear.

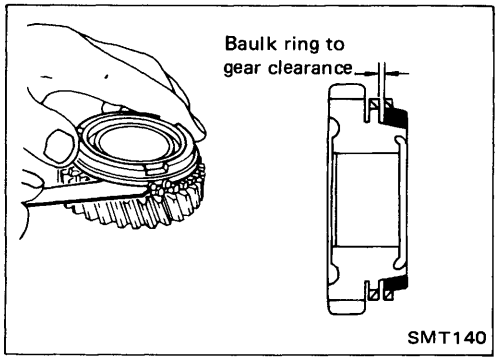
Clearance between baulk rings and 3rd-5th input gears:

Standard

1.0 - 1.35 mm (0.0394 - 0.0531 in)

Wear limit

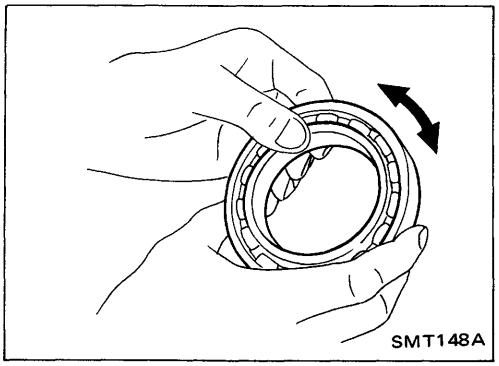
0.7 mm (0.028 in)



SMT140

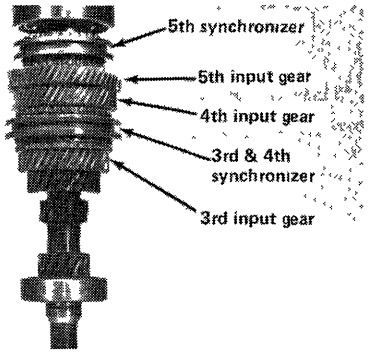
Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

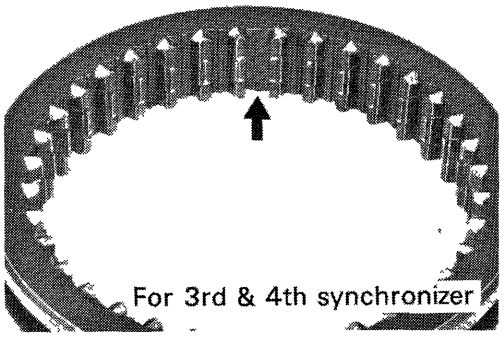

SMT148A

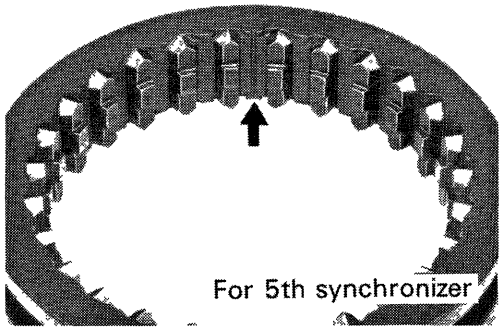
Input Shaft and Gears (Cont'd)

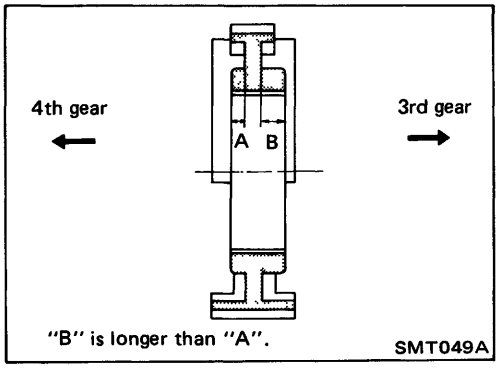
ASSEMBLY



1. Place inserts in the three grooves on the coupling sleeve (3rd & 4th synchronizer, 5th synchronizer).







2. Install 3rd input gear and 3rd baulk ring.
3. Press on 3rd & 4th synchronizer hub.

Pay attention to its direction.

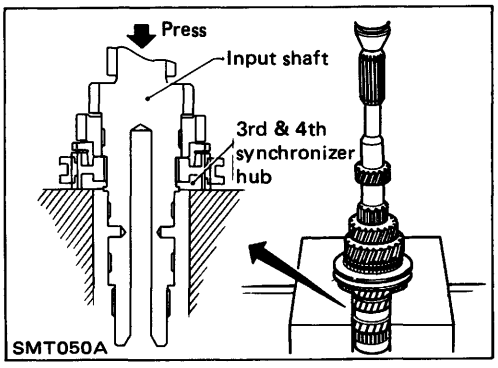
4. Select proper snap ring of 3rd & 4th synchronizer hub to minimize clearance of groove, and then install it.

Allowable clearance of groove:

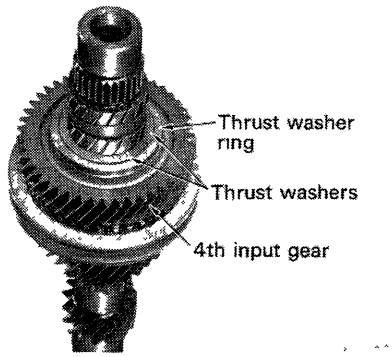
0 - 0.1 mm (0 - 0.004 in)

Snap ring of 3rd & 4th synchronizer hub:

Thickness mm (in)	Part number
1.95 (0.0768)	32269-03E03
2.00 (0.0787)	32269-03E00
2.05 (0.0807)	32269-03E01
2.10 (0.0827)	32269-03E02



Input Shaft and Gears (Cont'd)

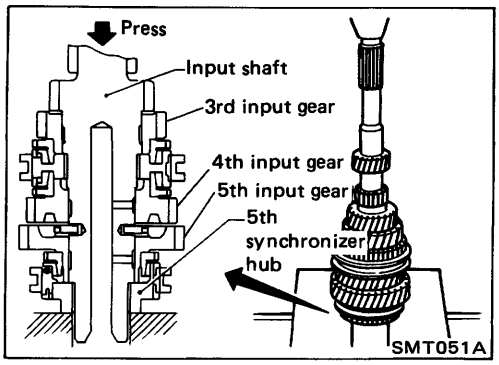


5. Install 4th input gear.
6. Select proper thrust washers to minimize clearance of groove. Then install them and thrust washer ring.

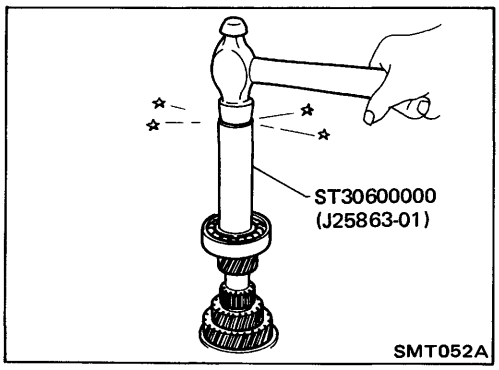
Allowable clearance of groove:
0 - 0.06 mm (0 - 0.0024 in)

Input shaft thrust washer

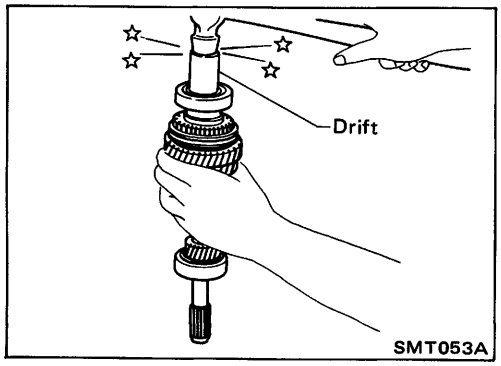
Thickness mm (in)	Part number
4.500 (0.1772)	32278-03E01
4.525 (0.1781)	32278-03E02
4.550 (0.1791)	32278-03E03
4.575 (0.1801)	32278-03E04

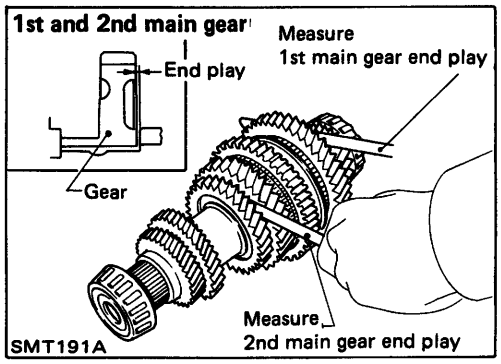


7. Install 5th input gear.
8. Press on 5th synchronizer.



9. Install input shaft front and rear bearings.
10. Measure gear end play as the final check — Refer to "Disassembly".





Mainshaft and Gears

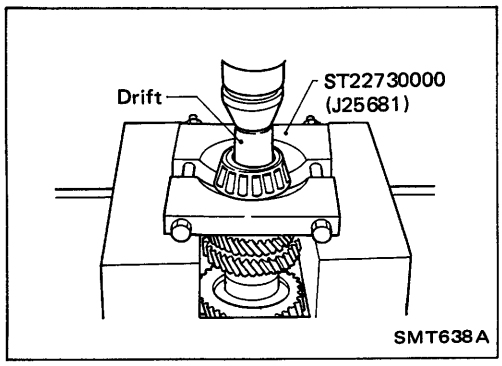
1. Before disassembly, check 1st and 2nd main gear end plays.

Gear end play

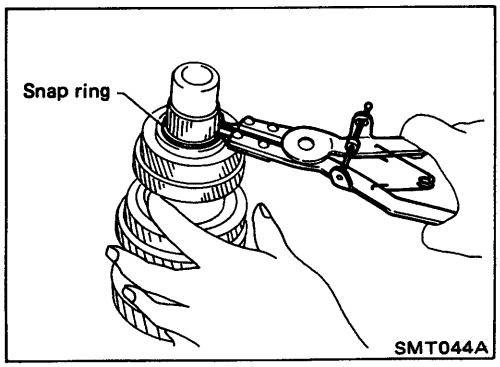
Gears	End play mm (in)
1st main gear	0.23 - 0.43 (0.0091 - 0.0169)
2nd main gear	0.23 - 0.58 (0.0091 - 0.0228)

If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of snap ring — Refer to "Assembly".

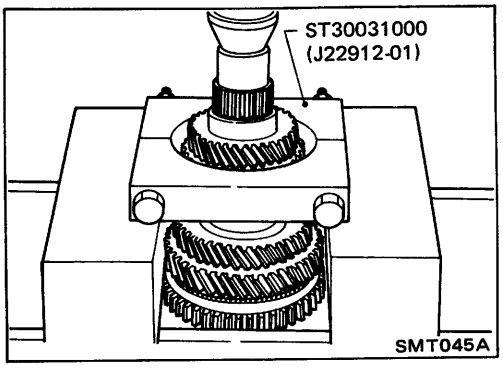
2. Press out mainshaft rear bearing.



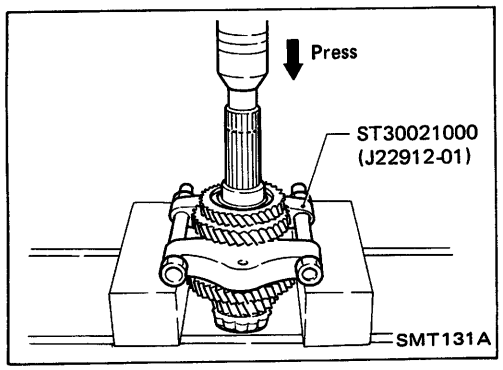
3. Remove thrust washer and snap ring.



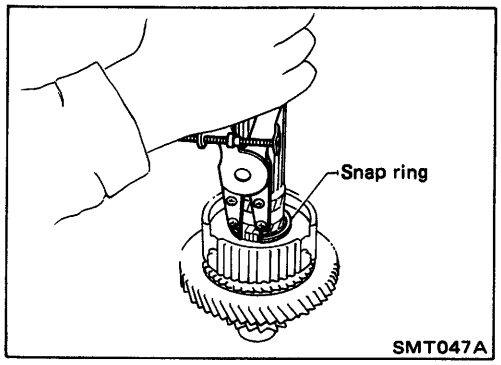
4. Press out 5th main gear and 4th main gear.



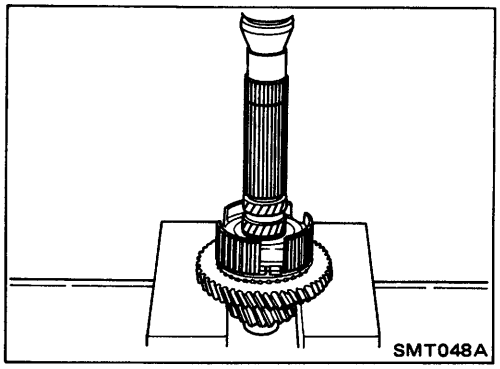
5. Press out 3rd main gear and 2nd main gear.



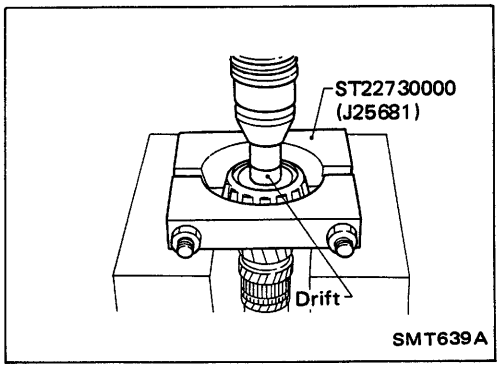
Mainshaft and Gears (Cont'd)



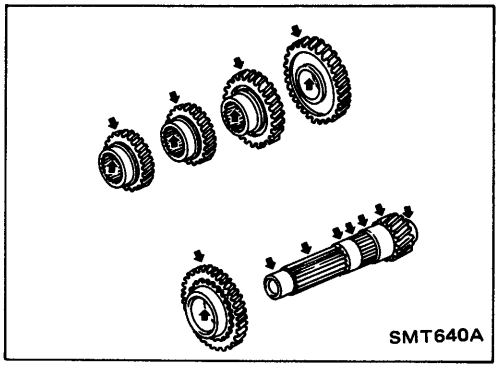
6. Remove snap ring.



7. Remove 1st & 2nd synchronizer and 1st main gear.



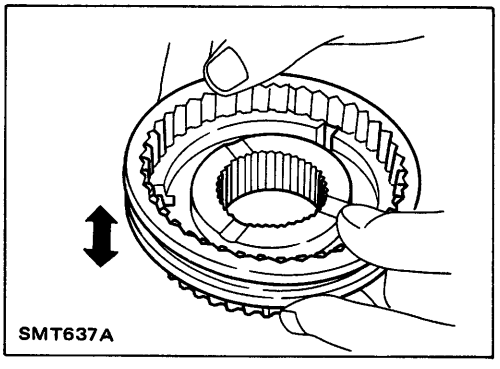
8. Remove mainshaft front bearing.



INSPECTION

Gear and shaft

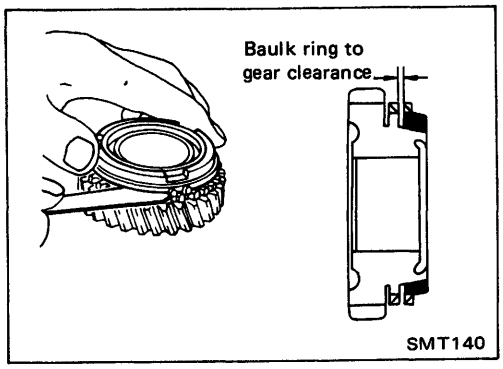
- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.



Synchronizer

- Check spline portion of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check insert springs for deformation.

Mainshaft and Gears (Cont'd)



- Measure clearance between baulk ring and gear.

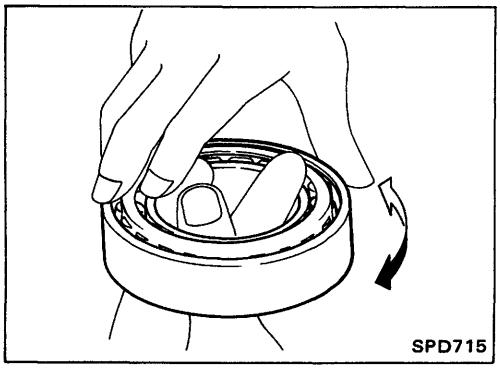
Clearance between baulk ring and gear:

Standard

1.0 - 1.35 mm (0.0394 - 0.0531 in)

Wear limit

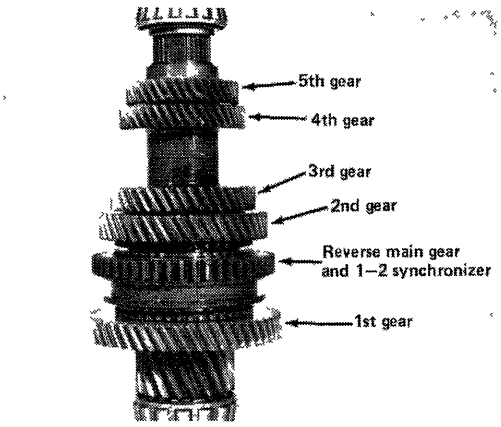
0.7 mm (0.028 in)



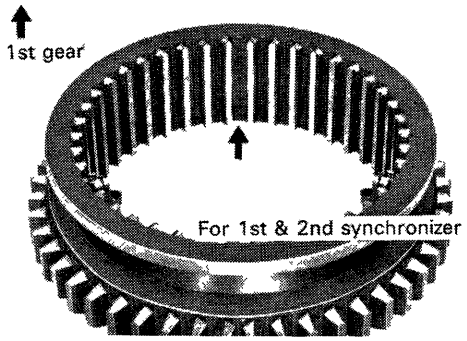
Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

When replacing tapered roller bearing, replace outer and inner race as a set.

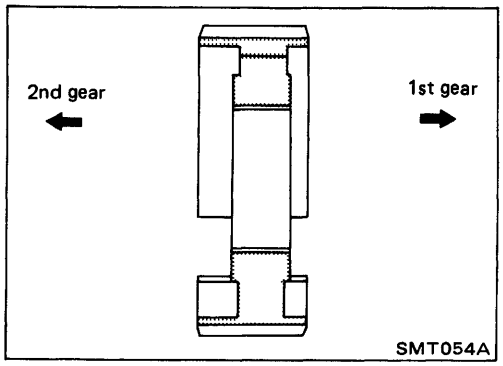


ASSEMBLY



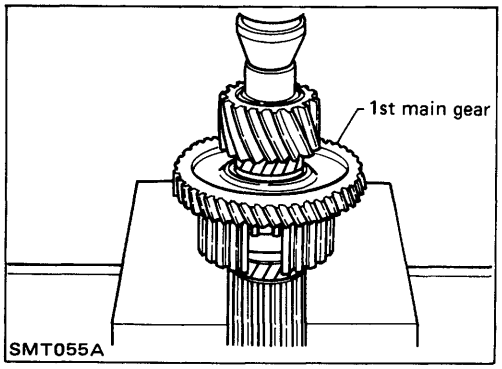
1. Place inserts in three grooves on the coupling sleeve (1st & 2nd synchronizer).

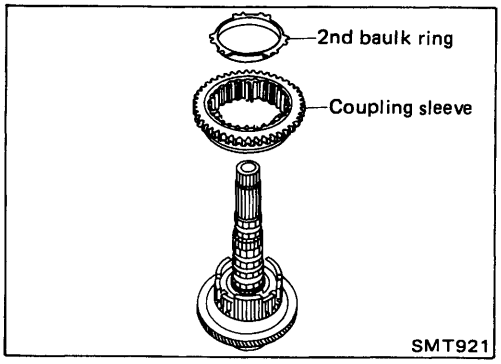
Mainshaft and Gears (Cont'd)



2. Install 1st main gear and 1st baulk ring.
3. Press on 1st & 2nd synchronizer hub.

Pay attention to its direction.





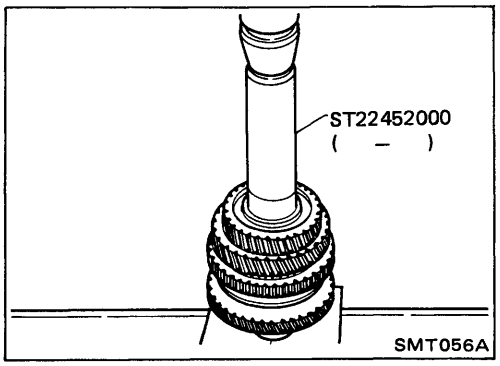
4. Install coupling sleeve with three inserts and 2nd baulk ring.
5. Select proper snap ring of 1st & 2nd synchronizer hub to minimize clearance of groove and then install it.

Allowable clearance of groove:

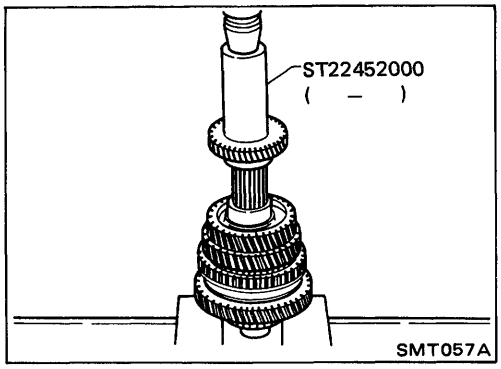
0 - 0.1 mm (0 - 0.004 in)

Snap ring of 1st & 2nd synchronizer hub:

Thickness mm (in)	Part number
1.95 (0.0768)	32269-03E03
2.00 (0.0787)	32269-03E00
2.05 (0.0807)	32269-03E01
2.10 (0.0827)	32269-03E02

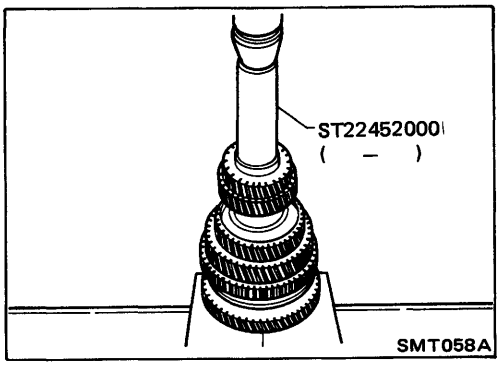


6. Install 2nd main gear.
7. Press on 3rd main gear.



8. Press on 4th main gear.

Mainshaft and Gears (Cont'd)

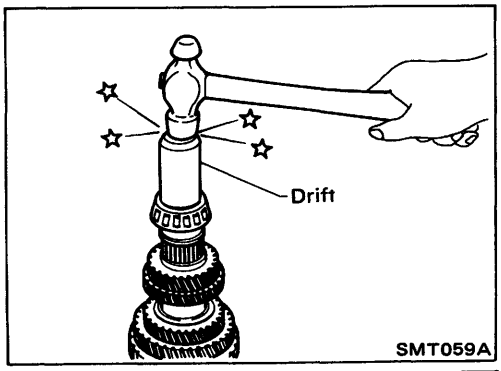


9. Press on 5th main gear.
10. Select proper snap ring of 5th main gear to minimize clearance of groove and then install it.

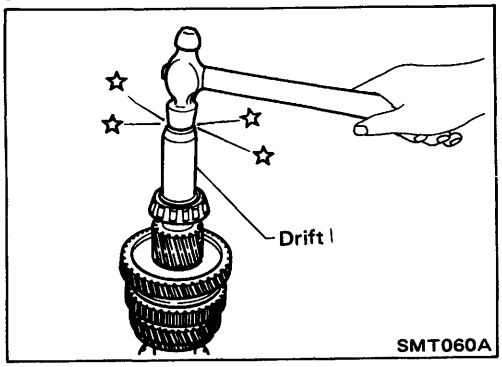
Allowable clearance of groove:
0 - 0.15 mm (0 - 0.0059 in)

Snap ring of 5th main gear:

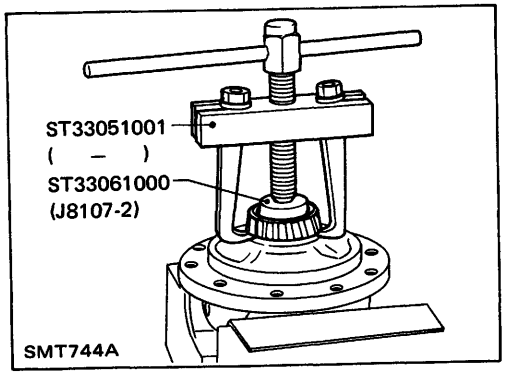
Thickness mm (in)	Part number
1.95 (0.0768)	32348-05E00
2.05 (0.0807)	32348-05E01
2.15 (0.0846)	32348-05E02
2.25 (0.0886)	32348-05E03



11. Press on thrust washer and press on mainshaft rear bearing.



12. Press on mainshaft front bearing.
13. Measure gear end play as the final check – Refer to "Disassembly".



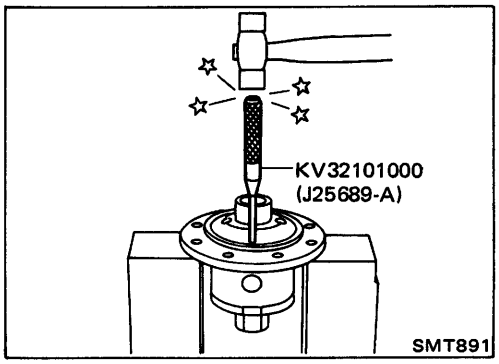
Final Drive

DISASSEMBLY

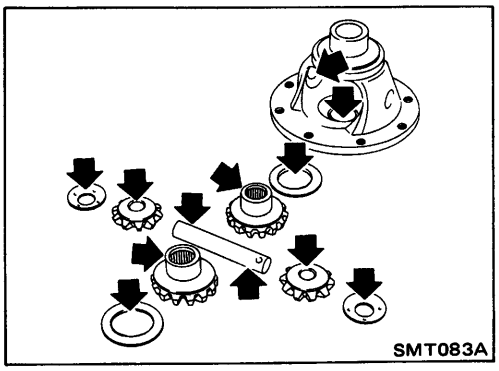
1. Remove final gear.
2. Remove speedometer drive gear by cutting it.
3. Press out differential side bearing inner races.

Be careful not to mix up the right and left bearings.

Final Drive (Cont'd)



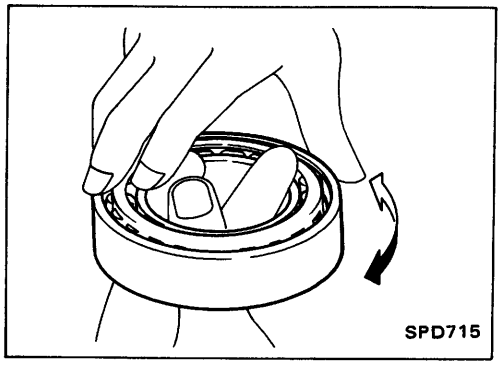
4. Drive out pinion mate shaft lock pin and draw out pinion mate shaft.



INSPECTION

Gear, washer, shaft and case

- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.



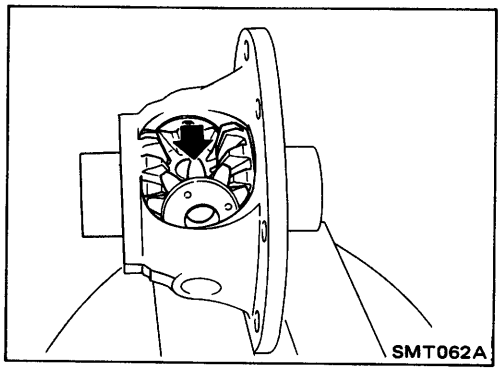
Bearing

- Make sure bearings roll freely and are free from noise, crack, pitting or wear.

When replacing tapered roller bearing, replace outer and inner race as a set.

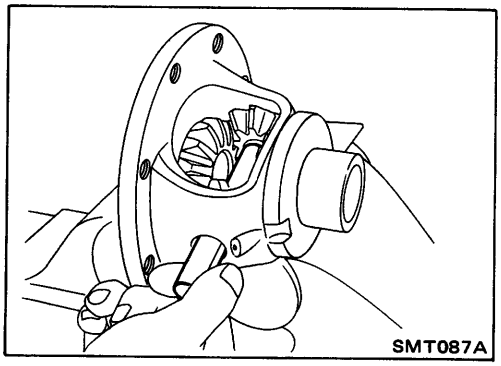
ASSEMBLY

1. Fit side gear thrust washers and side gears, then install pinion mate washers and pinion mate gears in place.

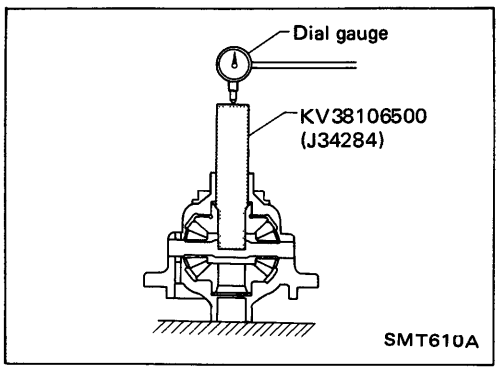


2. Insert pinion mate shaft.

When inserting, be careful not to damage pinion mate washers.



Final Drive (Cont'd)



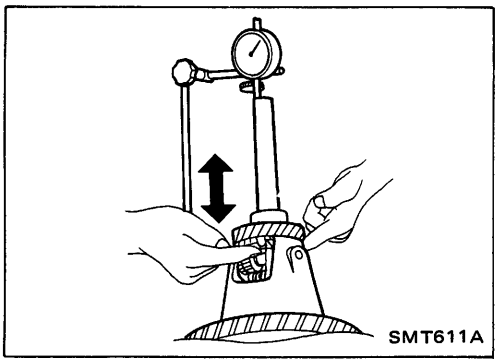
3. Measure clearance between side gear and differential case with washer, following the procedure below.

a. Set Tool and dial indicator on side gear.

b. Move side gear up and down to measure dial indicator deflection. Always measure indicator deflection on both side gears.

Clearance between side gear and differential case with washers:

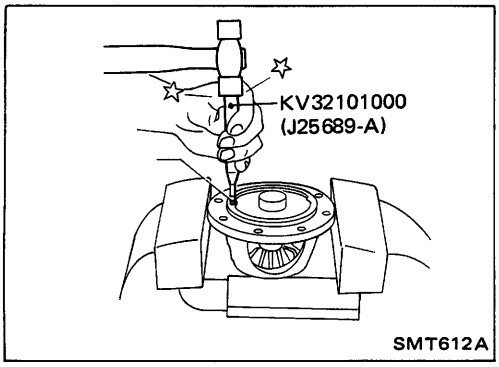
0.1 - 0.2 mm (0.004 - 0.008 in)



c. If not within specification, adjust clearance by changing thickness of side gear thrust washers.

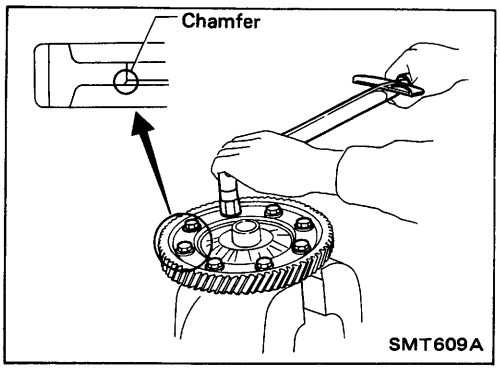
Side gear thrust washer

Thickness mm (in)	Part number
0.75 - 0.80 (0.0295 - 0.0315)	38424-E3000
0.80 - 0.85 (0.0315 - 0.0335)	38424-E3001
0.85 - 0.90 (0.0335 - 0.0354)	38424-E3002
0.90 - 0.95 (0.0354 - 0.0374)	38424-E3003

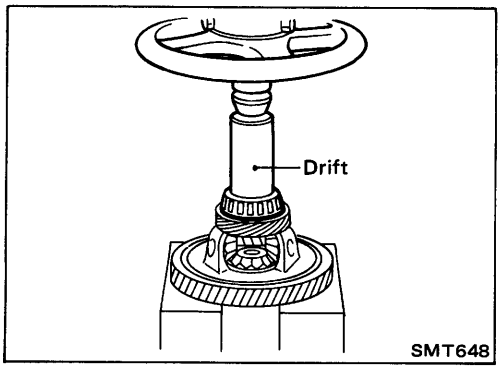


4. Install retaining pin using a punch.

Make sure that lock pin is flush with case.



5. Install final gear.
6. Install speedometer drive gear.



7. Install differential side bearings.

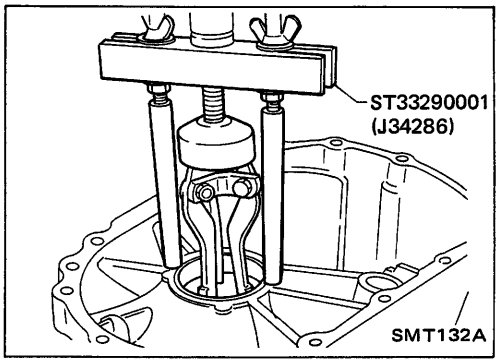
Input Shaft End Play and Differential Side Bearing Preload

If any of the following parts are replaced, adjust input shaft end play.

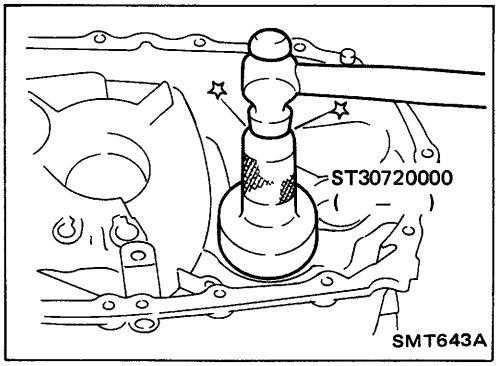
- **Input shaft**
- **Input shaft bearing**
- **Clutch housing**
- **Transmission case**

If any of the following parts is replaced, adjust differential side bearing preload.

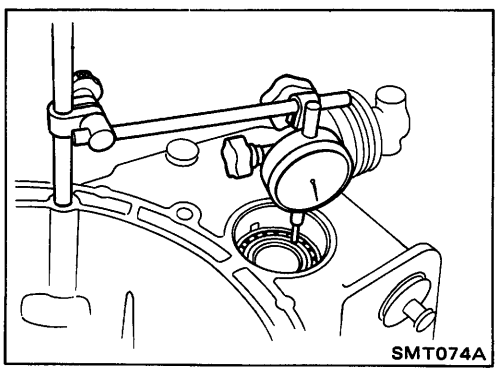
- **Differential case**
- **Differential side bearing**
- **Clutch housing**
- **Transmission case**



1. Remove differential side bearing outer race (transmission case side) and shim(s).



2. Re-install differential side bearing outer race without shim(s).
3. Install input shaft and final drive assembly on clutch housing.
4. Install transmission case without input shaft bearing shim(s). Then tighten it to the specified torque.

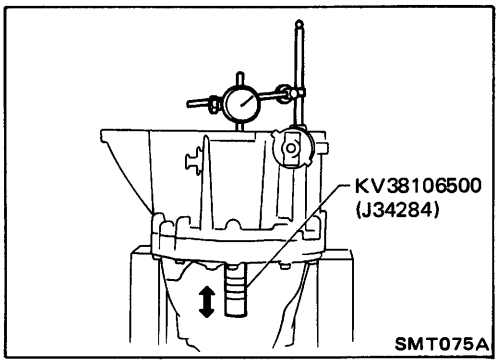


5. Using the following procedures, measure clearance between bearings and transmission case.

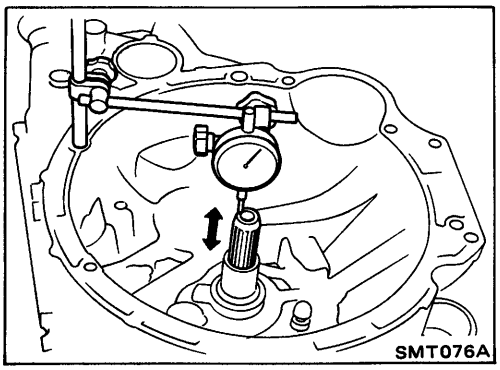
- **Differential side**

a. Attach dial indicator. If cramp diameter of dial indicator is too small or too large, attach dial indicator using a magnetic stand.

Input Shaft End Play and Differential Side Bearing Preload (Cont'd)

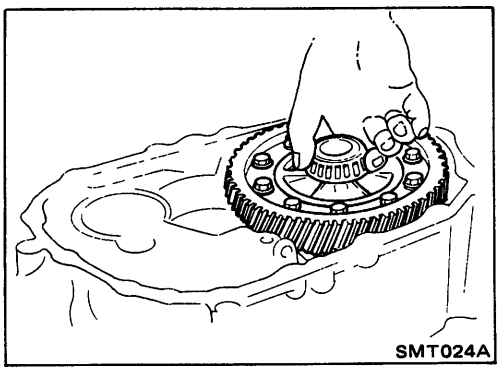


b. Insert preload adapter tool all the way into differential side gear. Move tool up and down and measure dial indicator deflection.



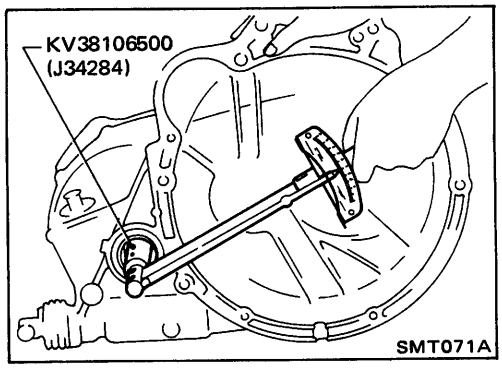
- **Input shaft side**

a. Set dial indicator on rear end of input shaft.
b. Move input shaft up and down and measure dial indicator deflection.
6. Select shims with proper thickness with S.D.S. table as a guide.
7. Install selected differential side bearing adjusting shim and differential side bearing outer race.



8. Check differential side bearing turning torque.
a. Install final drive assembly on clutch housing.
b. Install transmission case on clutch housing.

Tighten transmission case fixing bolts to the specified torque.



c. Measure turning torque of final drive assembly.

Turning torque of final drive assembly
(New bearing):
4.9 - 7.8 N·m
(50 - 80 kg-cm, 43 - 69 in-lb)

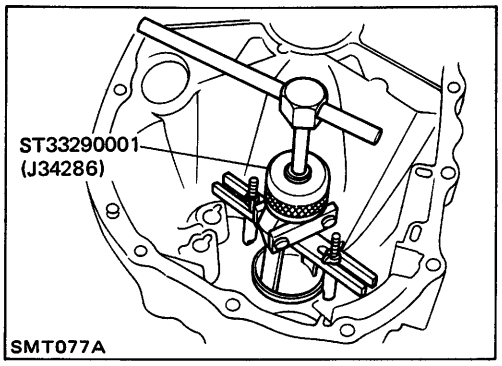
When old bearing is used again, turning torque will be slightly lower than that indicated above. Check turning torque to see if it is not far from specified range.

Mainshaft Bearing Preload

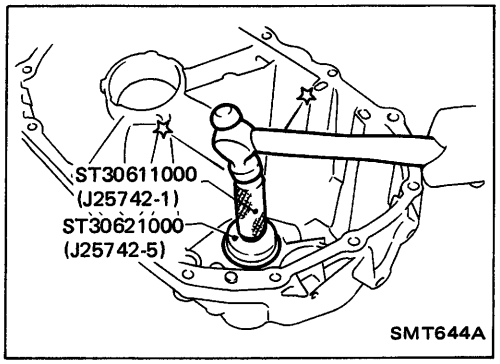
If any of the following parts is replaced, adjust mainshaft bearing preload.

- **Mainshaft**
- **Mainshaft bearing**
- **Clutch housing**
- **Transmission case**

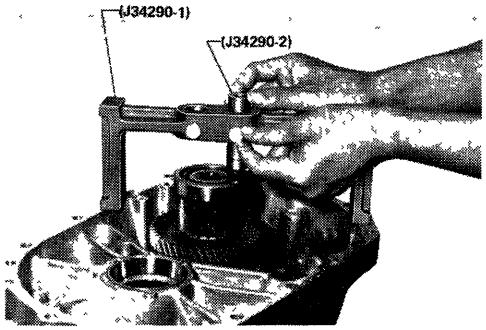
Mainshaft Bearing Preload (Cont'd)



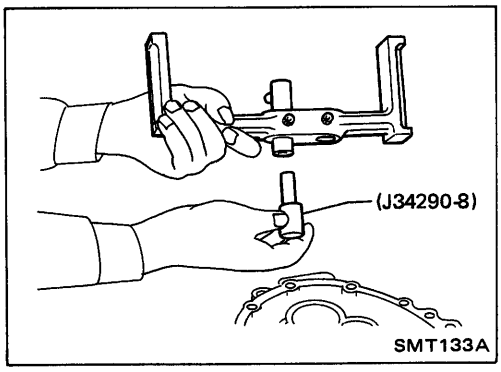
1. Remove mainshaft rear bearing outer race and shim(s).



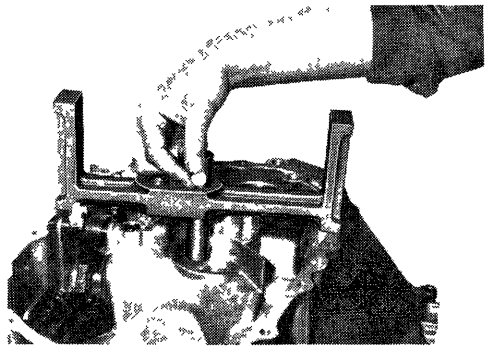
2. Re-install mainshaft rear bearing outer race without shims.
3. Clean mating surfaces of clutch housing and transmission case with solvent.
4. Install mainshaft and mainshaft front bearing outer race into transmission case. Turn mainshaft while holding bearing outer race so that bearings are properly seated.



5. Place Tools (bridge and gauging cylinder) onto machined surface of transmission case, allowing gauging cylinder to rest on surface of mainshaft front bearing outer race. Use proper screw in bridge to lock gauging cylinder in place.

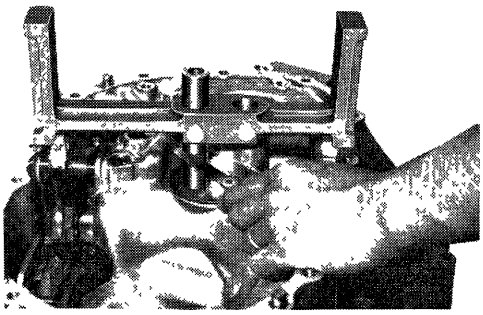


6. Turn bridge over and place Tool (gauging plunger) into gauging cylinder.



7. Place bridge, legs up, onto machined surface of clutch housing and allow gauging plunger to rest upon mating surface where mainshaft front bearing outer race fits.

Mainshaft Bearing Preload (Cont'd)

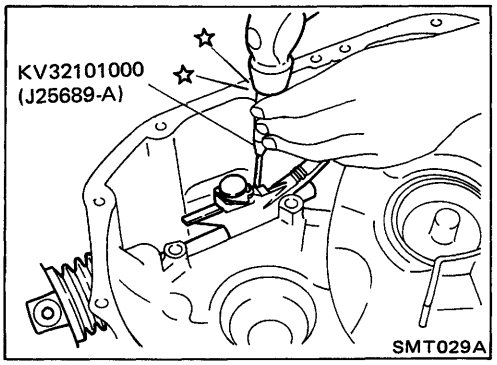


8. Measure with feeler gauge distance between gauging cylinder and shoulder of gauging plunger.
9. Use feeler gauge reading to select correct mainshaft preload shim(s) from following chart.

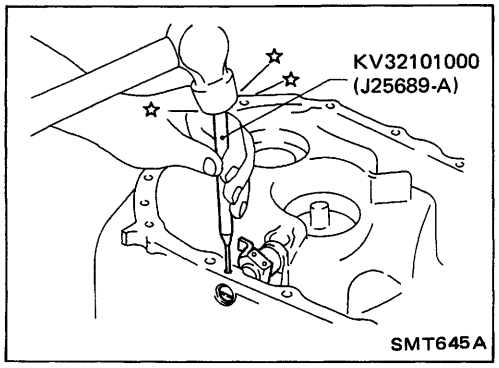
Mainshaft bearing adjusting shim

Thickness mm (in)	Part number
0.40 (0.0157)	32139-03E11
0.44 (0.0173)	32139-03E00
0.48 (0.0189)	32139-03E01
0.52 (0.0205)	32139-03E12
0.56 (0.0220)	32139-03E02
0.60 (0.0236)	32139-03E03
0.64 (0.0252)	32139-03E04
0.68 (0.0268)	32139-03E05
0.72 (0.0283)	32139-03E06
0.76 (0.0299)	32139-03E07
0.80 (0.0315)	32139-03E08
1.20 (0.0472)	32139-03E13

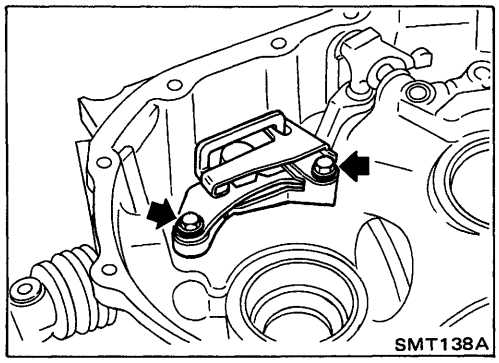
10. Install selected mainshaft bearing adjusting shim and mainshaft rear bearing outer race.
11. Check total turning torque after assembly – Refer to "ASSEMBLY".



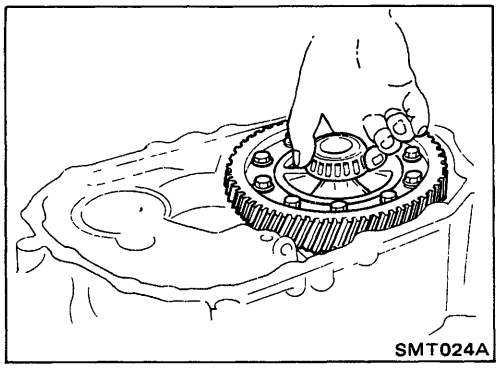
1. Install striking lever and striking rod.



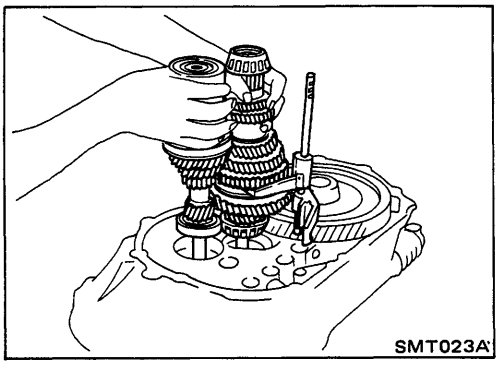
2. Install selector and retaining pin.



3. Install reverse gate assembly.

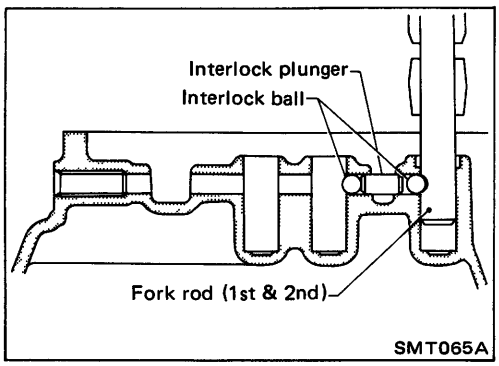


4. Install final drive assembly.

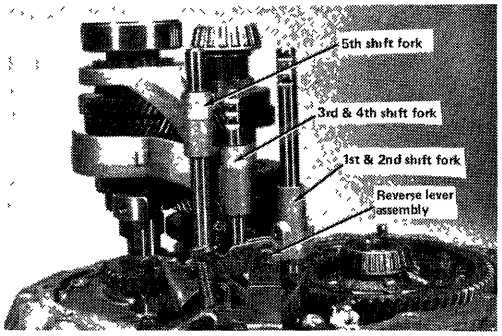


5. Install input shaft and mainshaft with 1st & 2nd shift fork assembly.

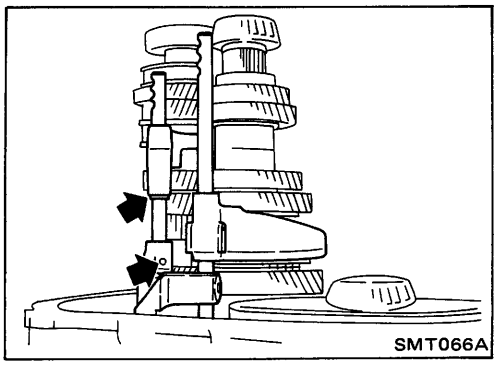
Be careful not to damage input shaft oil seal.

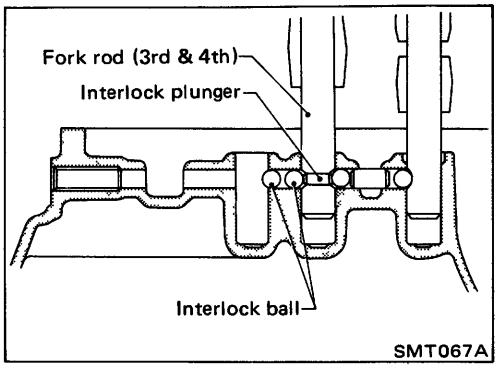


6. Install interlock balls and plunger.

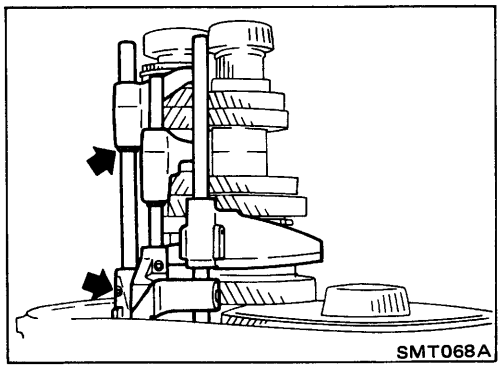


7. Install 3rd & 4th shift fork and bracket, then install 3rd & 4th shift rod, stopper ring and retaining pin.
When installing stopper ring, use snap ring remover and installer (J34305).

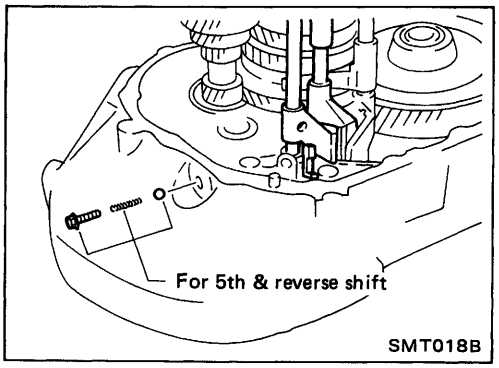




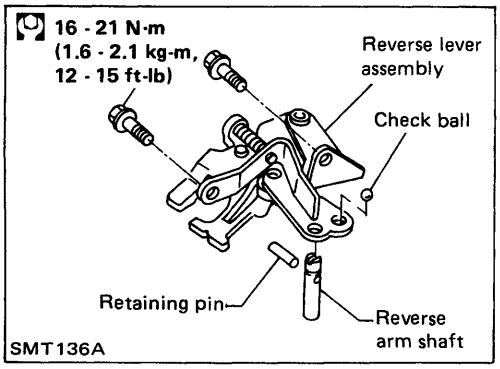
8. Install interlock balls.



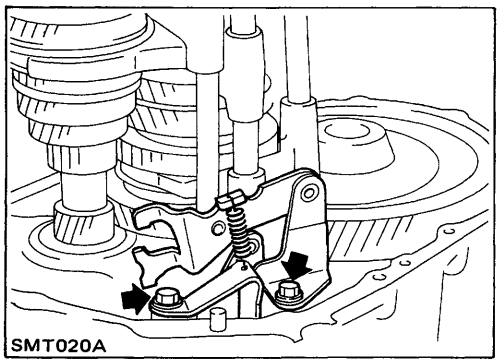
9. Install 5th shift fork and bracket, then install shift rod, stopper ring and retaining pin.
When installing stopper ring, use snap ring remover and installer (J34305).

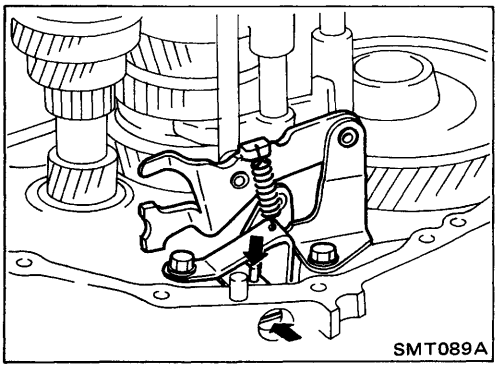


10. Install 5th & reverse check plug, spring and ball.

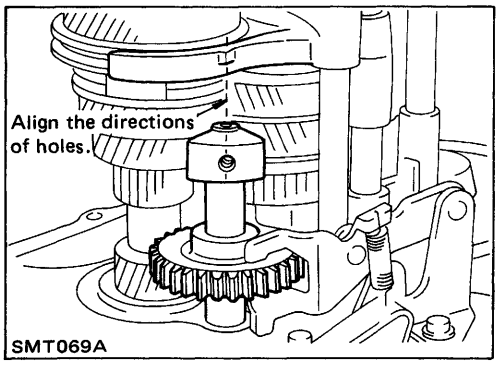


11. Install reverse lever assembly.
Apply multi-purpose grease to check ball.

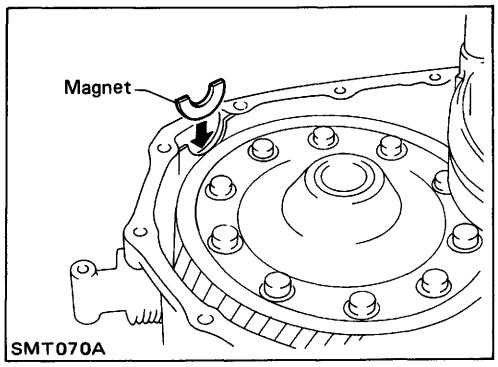




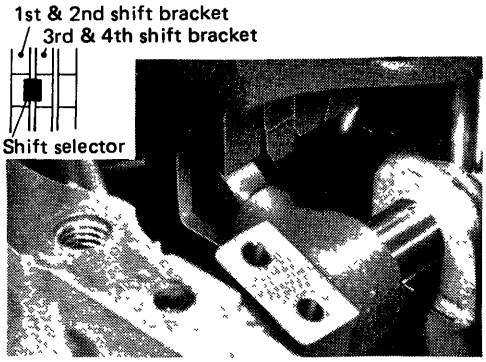
12. Install reverse arm shaft and retaining pin.



13. Mesh 4th gear. Then install reverse idler gear and shaft, paying attention to the direction of the tapped hole.



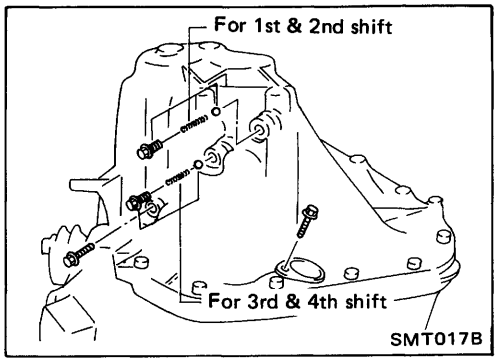
14. Place magnet on clutch housing.



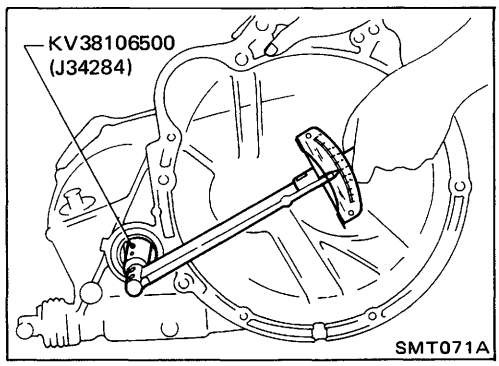
15. If bearing preload was adjusted, install selected shim(s) into transmission case.

To aid in installation of the transmission case, place the shift selector in the 1st and 2nd shift bracket or between the 1st and 2nd bracket and the 3rd and 4th bracket.

16. Apply sealant to mating surface of transmission case and install it.
17. Install position switch.



18. Apply sealant to threads of check plugs. Install balls, springs and plugs.
19. After assembly, check that you can shift into each gear smoothly.



20. Measure total turning torque.

Total turning torque (New bearing):
8.8 - 21.6 N·m
(90 - 220 kg-cm, 78 - 191 in-lb)

When old bearing is used again, preload will be slightly lower than that indicated above. Check preload to see if it is not far from specified range.

General Specifications—RS5F50A

TRANSAXLE

Engine			CA20E
Transaxle model			RS5F50A
Number of speed			5
Synchromesh type			Warner
Shift pattern			
Gear ratio		1st	3.285
		2nd	1.850
		3rd	1.206
		4th	0.911
		5th	0.795
		Rev.	3.428
Number of teeth	Input gear	1st	14
		2nd	20
		3rd	29
		4th	45
		5th	49
		Rev.	14
	Main gear	1st	46
		2nd	37
		3rd	35
		4th	41
		5th	39
		Rev.	48
	Reverse idler gear		29
Oil capacity liter (US pt, Imp pt)			4.7 (10, 8-1/4)

FINAL GEAR

Engine	CA20E
Final gear ratio	4.167
Number of teeth Final gear/Pinion	75/18
Side gear/Pinion	16/10

Inspection and Adjustment—RS5F50A

GEAR END PLAY

Gear	End play mm (in)
1st main gear	0.23 - 0.43 (0.0091 - 0.0169)
2nd main gear	0.23 - 0.58 (0.0091 - 0.0228)
3rd input gear	0.23 - 0.43 (0.0091 - 0.0169)
4th input gear	0.25 - 0.55 (0.0098 - 0.0217)
5th input gear	0.23 - 0.48 (0.0091 - 0.0189)

CLEARANCE BETWEEN BAULK RING AND GEAR

Unit: mm (in)

	Standard	Wear limit
1st & 2nd	1.0 - 1.35 (0.0394 - 0.0531)	0.7 (0.028)
3rd & 4th	1.0 - 1.35 (0.0394 - 0.0531)	0.7 (0.028)
5th	1.0 - 1.35 (0.0394 - 0.0531)	0.7 (0.028)

AVAILABLE SNAP RING

3rd & 4th synchronizer hub (At input shaft)

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
1.95 (0.0768)	32269-03E03
2.00 (0.0787)	32269-03E00
2.05 (0.0807)	32269-03E01
2.10 (0.0827)	32269-03E02

1st & 2nd synchronizer hub

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
1.95 (0.0768)	32269-03E03
2.00 (0.0787)	32269-03E00
2.05 (0.0807)	32269-03E01
2.10 (0.0827)	32269-03E02

5th main gear

Allowable clearance	0 - 0.15 mm (0 - 0.0059 in)
Thickness mm (in)	Part number
1.95 (0.0768)	32348-05E00
2.05 (0.0807)	32348-05E01
2.15 (0.0846)	32348-05E02
2.25 (0.0886)	32348-05E03

AVAILABLE WASHER

Input shaft thrust washer

Allowable clearance	0 - 0.06 mm (0 - 0.0024 in)
Thickness mm (in)	Part number
4.500 (0.1772)	32278-03E01
4.525 (0.1781)	32278-03E02
4.550 (0.1791)	32278-03E03
4.575 (0.1801)	32278-03E04

Differential side gear thrust washer

Allowable clearance between side gear and differential case with washer	0.1 - 0.2 mm (0.004 - 0.008 in)
Thickness mm (in)	Part number
0.75 - 0.80 (0.0295 - 0.0315)	38424-E3000
0.80 - 0.85 (0.0315 - 0.0335)	38424-E3001
0.85 - 0.90 (0.0335 - 0.0354)	38424-E3002
0.90 - 0.95 (0.0354 - 0.0374)	38424-E3003

AVAILABLE SHIM – INPUT SHAFT END PLAY AND MAINSHAFT AND DIFFERENTIAL SIDE BEARING PRELOAD AND ADJUSTING SHIM

Bearing preload and end play

Unit: mm (in)

Mainshaft bearing preload	0.25 - 0.31 (0.0098 - 0.0122)
Input shaft end play	—0.06 - 0 (—0.0024 - 0)
Differential side bearing preload	0.40 - 0.46 (0.0157 - 0.0181)

Turning torque (New bearing)

Unit: N·m (kg-cm, in-lb)

Final drive only	4.9 - 7.8 (50 - 80, 43 - 69)
Total	8.8 - 21.6 (90 - 220, 78 - 191)

Inspection and Adjustment—RS5F50A (Cont'd)

Mainshaft bearing adjusting shim

Thickness mm (in)	Part number
0.40 (0.0157)	32139-03E11
0.44 (0.0173)	32139-03E00
0.48 (0.0189)	32139-03E01
0.52 (0.0205)	32139-03E12
0.56 (0.0220)	32139-03E02
0.60 (0.0236)	32139-03E03
0.64 (0.0252)	32139-03E04
0.68 (0.0268)	32139-03E05
0.72 (0.0283)	32139-03E06
0.76 (0.0299)	32139-03E07
0.80 (0.0315)	32139-03E08
1.20 (0.0472)	32139-03E13

Input shaft bearing adjusting shim

Thickness mm (in)	Part number
0.40 (0.0157)	32225-08E00
0.44 (0.0173)	32225-08E01
0.48 (0.0189)	32225-08E02
0.52 (0.0205)	32225-08E03
0.56 (0.0220)	32225-08E04
0.60 (0.0236)	32225-08E05
0.64 (0.0252)	32225-08E06
0.68 (0.0268)	32225-08E07
0.72 (0.0283)	32225-08E08
0.76 (0.0299)	32225-08E09
0.80 (0.0315)	32225-08E10
1.20 (0.0472)	32225-08E11

Table for selecting input shaft bearing adjusting shim

Unit: mm (in)

Dial indicator deflection	Suitable shim(s)
0.65 - 0.69 (0.0256 - 0.0272)	0.64 (0.0252)
0.69 - 0.73 (0.0272 - 0.0287)	0.68 (0.0268)
0.73 - 0.77 (0.0287 - 0.0303)	0.72 (0.0283)
0.77 - 0.81 (0.0303 - 0.0319)	0.76 (0.0299)
0.81 - 0.85 (0.0319 - 0.0335)	0.80 (0.0315)
0.85 - 0.89 (0.0335 - 0.0350)	0.40 + 0.44 (0.0157 + 0.0173)
0.89 - 0.93 (0.0350 - 0.0366)	0.44 + 0.44 (0.0173 + 0.0173)
0.93 - 0.97 (0.0366 - 0.0382)	0.44 + 0.48 (0.0173 + 0.0189)
0.97 - 1.01 (0.0382 - 0.0398)	0.48 + 0.48 (0.0189 + 0.0189)
1.01 - 1.05 (0.0398 - 0.0413)	0.48 + 0.52 (0.0189 + 0.0205)
1.05 - 1.09 (0.0413 - 0.0429)	0.52 + 0.52 (0.0205 + 0.0205)
1.09 - 1.13 (0.0429 - 0.0445)	0.52 + 0.56 (0.0205 + 0.0220)
1.13 - 1.17 (0.0445 - 0.0461)	0.56 + 0.56 (0.0220 + 0.0220)
1.17 - 1.21 (0.0461 - 0.0476)	0.56 + 0.60 (0.0220 + 0.0236)
1.21 - 1.25 (0.0476 - 0.0492)	0.60 + 0.60 (0.0236 + 0.0236)
1.25 - 1.29 (0.0492 - 0.0508)	0.60 + 0.64 (0.0236 + 0.0252)
1.29 - 1.33 (0.0508 - 0.0524)	0.64 + 0.64 (0.0252 + 0.0252)
1.33 - 1.37 (0.0524 - 0.0539)	0.64 + 0.68 (0.0252 + 0.0268)
1.37 - 1.41 (0.0539 - 0.0555)	0.68 + 0.68 (0.0268 + 0.0268)
1.41 - 1.45 (0.0555 - 0.0571)	0.68 + 0.72 (0.0268 + 0.0283)
1.45 - 1.49 (0.0571 - 0.0587)	0.72 + 0.72 (0.0283 + 0.0283)
1.49 - 1.53 (0.0587 - 0.0602)	0.72 + 0.76 (0.0283 + 0.0299)
1.53 - 1.57 (0.0602 - 0.0618)	0.76 + 0.76 (0.0299 + 0.0299)
1.57 - 1.61 (0.0618 - 0.0634)	0.76 + 0.80 (0.0299 + 0.0315)
1.61 - 1.65 (0.0634 - 0.0650)	0.80 + 0.80 (0.0315 + 0.0315)
1.65 - 1.69 (0.0650 - 0.0665)	0.44 + 1.20 (0.0173 + 0.0472)

Inspection and Adjustment—RS5F50A (Cont'd)

Differential side bearing adjusting shim

Thickness mm (in)	Part number
0.40 (0.0157)	38453-03E11
0.44 (0.0173)	38453-03E00
0.48 (0.0189)	38453-03E01
0.52 (0.0205)	38453-03E12
0.56 (0.0220)	38453-03E02
0.60 (0.0236)	38453-03E03
0.64 (0.0252)	38453-03E04
0.68 (0.0268)	38453-03E05
0.72 (0.0283)	38453-03E06
0.76 (0.0299)	38453-03E07
0.80 (0.0315)	38453-03E08
1.20 (0.0472)	38453-03E13

Table for selecting differential side bearing adjusting shim(s)

Unit: mm (in)

Dial indicator deflection[1]	Suitable shim(s)
0.47 - 0.51 (0.0185 - 0.0201)	0.44 + 0.48 (0.0173 + 0.0189)
0.51 - 0.55 (0.0201 - 0.0217)	0.48 + 0.48 (0.0189 + 0.0189)
0.55 - 0.59 (0.0217 - 0.0232)	0.48 + 0.52 (0.0189 + 0.0205)
0.59 - 0.63 (0.0232 - 0.0248)	0.52 + 0.52 (0.0205 + 0.0205)
0.63 - 0.67 (0.0248 - 0.0264)	0.52 + 0.56 (0.0205 + 0.0220)
0.67 - 0.71 (0.0264 - 0.0280)	0.56 + 0.56 (0.0220 + 0.0220)
0.71 - 0.75 (0.0280 - 0.0295)	0.56 + 0.60 (0.0220 + 0.0236)
0.75 - 0.79 (0.0295 - 0.0311)	0.60 + 0.60 (0.0236 + 0.0236)
0.79 - 0.83 (0.0311 - 0.0327)	0.60 + 0.64 (0.0236 + 0.0252)
0.83 - 0.87 (0.0327 - 0.0343)	0.64 + 0.64 (0.0252 + 0.0252)
0.87 - 0.91 (0.0343 - 0.0358)	0.64 + 0.68 (0.0252 + 0.0268)
0.91 - 0.95 (0.0358 - 0.0374)	0.68 + 0.68 (0.0268 + 0.0268)
0.95 - 0.99 (0.0374 - 0.0390)	0.68 + 0.72 (0.0268 + 0.0283)
0.99 - 1.03 (0.0390 - 0.0406)	0.72 + 0.72 (0.0283 + 0.0283)
1.03 - 1.07 (0.0406 - 0.0421)	0.72 + 0.76 (0.0283 + 0.0299)
1.07 - 1.11 (0.0421 - 0.0437)	0.76 + 0.76 (0.0299 + 0.0299)
1.11 - 1.15 (0.0437 - 0.0453)	0.76 + 0.80 (0.0299 + 0.0315)
1.15 - 1.19 (0.0453 - 0.0469)	0.80 + 0.80 (0.0315 + 0.0315)
1.19 - 1.23 (0.0469 - 0.0484)	0.44 + 1.20 (0.0173 + 0.0472)
1.23 - 1.27 (0.0484 - 0.0500)	0.48 + 1.20 (0.0189 + 0.0472)
1.27 - 1.31 (0.0500 - 0.0516)	0.52 + 1.20 (0.0205 + 0.0472)

Tightening Torque— RS5F50A

TRANSMISSION INSTALLATION

Unit	N·m	kg-m	ft-lb
Clutch operating cylinder	30 - 40	3.1 - 4.1	22 - 30
Transmission securing bolt	Refer to Removal and Installation.		
Engine gusset to engine	30 - 40	3.1 - 4.1	22 - 30
Engine mounting bracket fixing bolt	Refer to section EM.		
Starter motor fixing bolt	Refer to section EM.		

Gear control

Unit	N·m	kg-m	ft-lb
Control rod to transaxle	17 - 22	1.7 - 2.2	12 - 16
Support rod to bracket	31 - 40	3.2 - 4.1	23 - 30
Support rod bracket to transaxle	27 - 36	2.8 - 3.7	20 - 27
Holder bracket fixing bolt	8 - 11	0.8 - 1.1	5.8 - 8.0
Holder bracket to support rod	20 - 25	2.0 - 2.6	14 - 19
Control lever socket to support rod	8 - 11	0.8 - 1.1	5.8 - 8.0
Control lever to control rod	16 - 21	1.6 - 2.1	12 - 15

Gear assembly – RS5F50A

Unit	N·m	kg-m	ft-lb
Clutch housing to transmission case	16 - 21	1.6 - 2.1	12 - 15
Reverse lever assembly securing bolt	16 - 21	1.6 - 2.1	12 - 15
5th & Reverse check plug	16 - 22	1.6 - 2.2	12 - 16
1st & 2nd check plug	16 - 22	1.6 - 2.2	12 - 16
3rd & 4th check plug	16 - 22	1.6 - 2.2	12 - 16
Reverse gate securing bolt	16 - 21	1.6 - 2.1	12 - 15
Reverse idler shaft fixing bolt	16 - 21	1.6 - 2.1	12 - 15
Final gear to differential case	74 - 88	7.5 - 9.0	54 - 65
Drain plug	15 - 20	1.5 - 2.0	11 - 14
Position switch securing bolt	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7

AUTOMATIC TRANSAXLE

SECTION AT

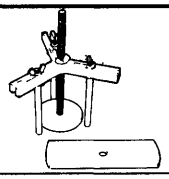
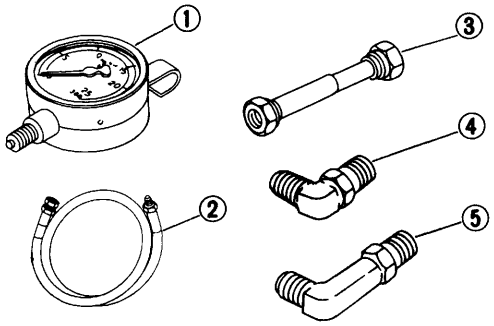
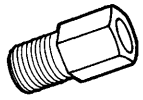
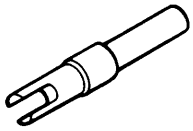
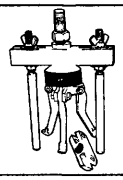
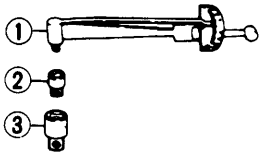
CONTENTS

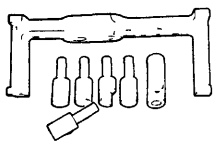
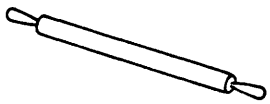
PREPARATION (RL4F02A) ..... AT- 2
ON-VEHICLE SERVICE (RL4F02A) ..... AT- 5
TROUBLE-SHOOTING AND DIAGNOSES (RL4F02A) AT-10
REMOVAL AND INSTALLATION (RL4F02A) AT-29
MAJOR OVERHAUL (RL4F02A) AT-31
DISASSEMBLY (RL4F02A) AT-38
REPAIR FOR COMPONENT PARTS (RL4F02A) AT-43
ASSEMBLY (RL4F02A) AT-67
SERVICE DATA AND SPECIFICATIONS (S.D.S.) AT-85

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
ST25420001 (J34285) Clutch spring compressor	 Removing and installing clutch springs
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 oil pressure
KV31101200 (J34282) Oil pressure gauge adapter	 Measuring oil pressure
KV38106500 (J34284) Preload adapter	 Checking differential side bearing preload
ST33290001 (J34286) Side bearing outer race puller	 Removing differential side bearing outer race
ST3127S000 (See J25765-A) Preload gauge ① GG91030000 (J25765-A) Torque wrench ② HT62940000 (–) Socket adapter ③ HT62900000 (–) Socket adapter	 Checking differential side bearing preload

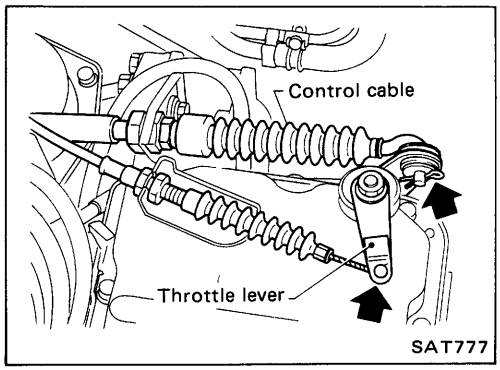
Tool number (Kent-Moore No.) Tool name	Description	
(J34290) Shim selecting tool		Selecting oil pump housing bearing race Selecting clutch pack thrust washer Selecting differential side bearing adjusting shim Selecting output shaft bearing adjusting shim Selecting idler gear bearing adjusting shim
(J26774-A) Seal installation tool		Installing piston

Service Notice

- Before proceeding with disassembly, thoroughly clean the outside of the transaxle. It is important to prevent the internal parts of the transaxle from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use a nylon cloth or paper towel for wiping parts clean. Common shop rags can leave lint that might interfere with the transaxle's operation.
- When disassembling parts, be sure to place them in order in parts rack so they can be put back in 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. It is also very important to perform functional tests whenever it is designated.
- The valve body contains many precision parts and requires extreme care when parts are removed and serviced. Place removed parts 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.
- Before assembly, apply a coat of recommended A.T.F. to all parts. Vaseline may be applied to O-rings and seals. Do not use any grease.
- Care should be taken to avoid damaging O-rings, seals and gaskets when assembling.

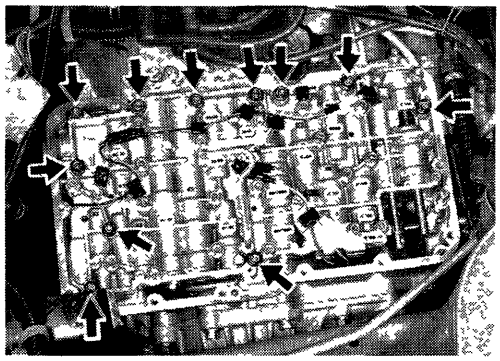
Abbreviations used throughout this section stand for the following:

- 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
- 1_2 ..... 1 range 2nd gear
- 1_1 ..... 1 range 1st gear



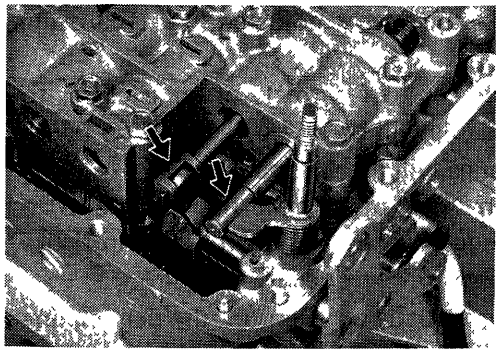
Control Valve

1. Remove battery and its bracket.
2. Disconnect control cable and throttle wire and remove throttle lever.



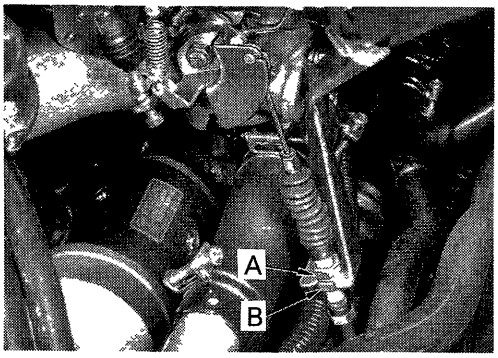
3. Disconnect harness connector on control valve and remove control valve assembly.

Be careful not to drop manual valve out of valve body.



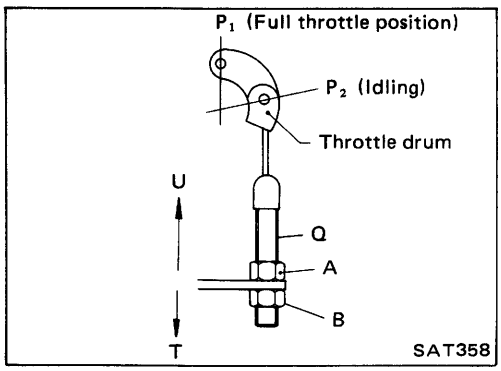
4. Disassemble, inspect and assemble control valve assembly. Refer to Control Valve Body.

- **Set manual shaft at Neutral, then align manual plate with groove in manual valve of control valve assembly.**
- **After installing control valve to transmission case, make sure that selector lever can be moved to all positions.**



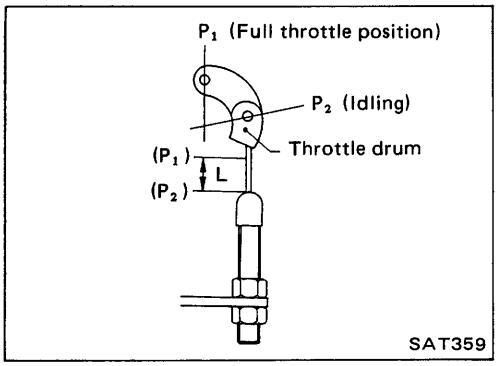
Throttle Wire Adjustment

1. Loosen throttle wire double nuts "A" and "B" on carburetor side.



2. With throttle drum set at "P_1" (fully-open), move fitting "Q" fully in direction "T" and tighten nut "B" in direction "U".
3. Reverse nut "B" 2.75 to 3.25 revolutions in direction "T", then tighten nut "A" securely. Throttle drum should be held at "P_1".

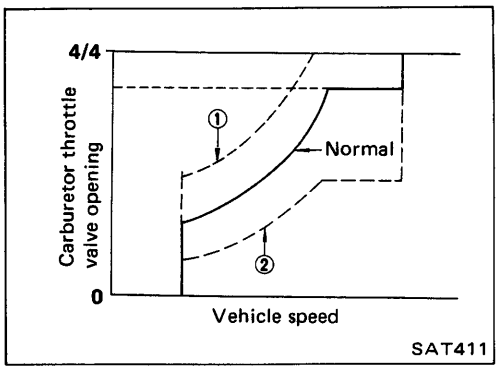
Throttle Wire Adjustment (Cont'd)



4. Ensure that throttle wire stroke "L" is within specified range between full throttle and idle.

Throttle wire stroke "L":
RL4F02A
39 - 43 mm (1.54 - 1.69 in)

- **Adjust throttle wire stroke when throttle wire/accelerator wire is installed or after carburetor has been adjusted.**
- **Put marks on throttle wire to facilitate measuring wire stroke.**



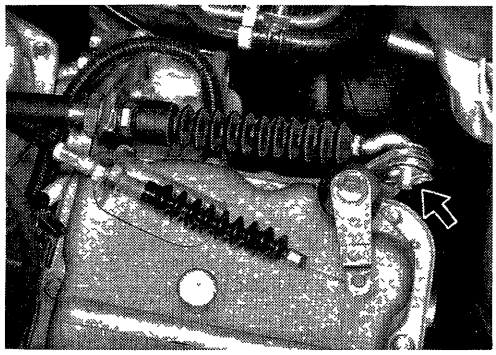
If throttle wire stroke is improperly adjusted, the following problems may arise.

- When full-open position "P_1" of throttle drum is closer to direction "T", shift schedule will be as shown by ② in figure at left, and kickdown range will greatly increase.
- When full-open position "P_1" of throttle drum is closer to direction "U", shift schedule will be as shown by ① in figure at left, and kickdown range will not occur.

5. After properly adjusting throttle wire, ensure the parting line is as straight as possible.

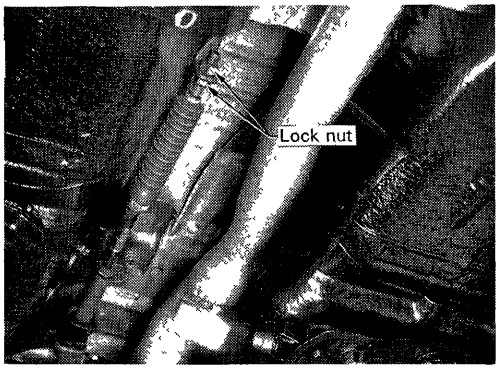
Control Cable Adjustment

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 the range is improperly aligned, the control cable needs adjustment.

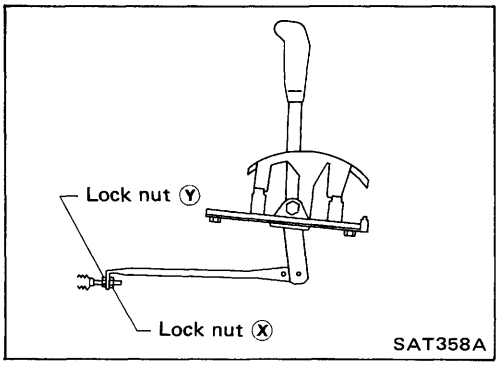


1. Place selector lever at "P" range.
2. Connect control cable end to manual lever in transaxle unit, and tighten control cable securing bolts.

Control Cable Adjustment (Cont'd)



3. Move selector lever from "P" range to "1" range. Make sure that selector lever can move smoothly and without any sliding noise.
4. Place selector lever at "P" range again.
5. Make sure that control lever locks at "P" range.
6. Loosen lock nuts.

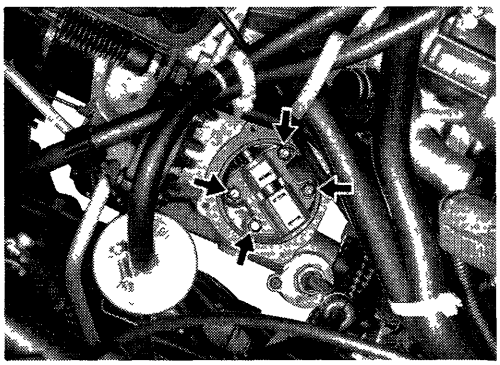


7. Screw lock nut Ⓧ until it touches select rod end while holding select rod horizontal, and tighten lock nut Ⓨ.

8. Move selector lever from "P" range to "1" range again. Make sure that selector lever can move smoothly and without any sliding noise.
9. Apply grease to contacting areas of selector lever and select rod.

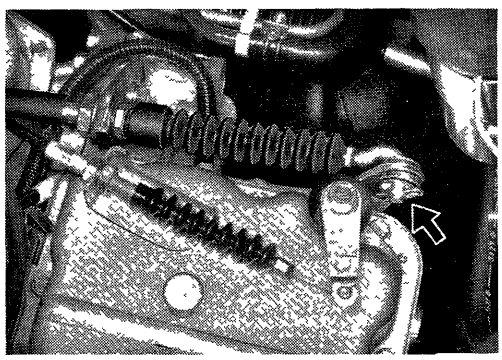
Governor Valve

1. Remove governor cap.



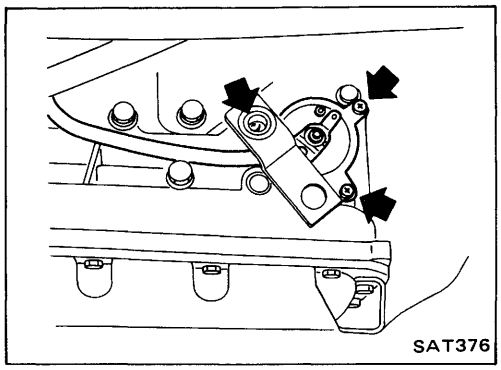
2. Remove governor valve assembly.
3. Disassemble, check and reassemble governor valve assembly. Refer to Repair for Component Parts.

Inhibitor Switch Adjustment

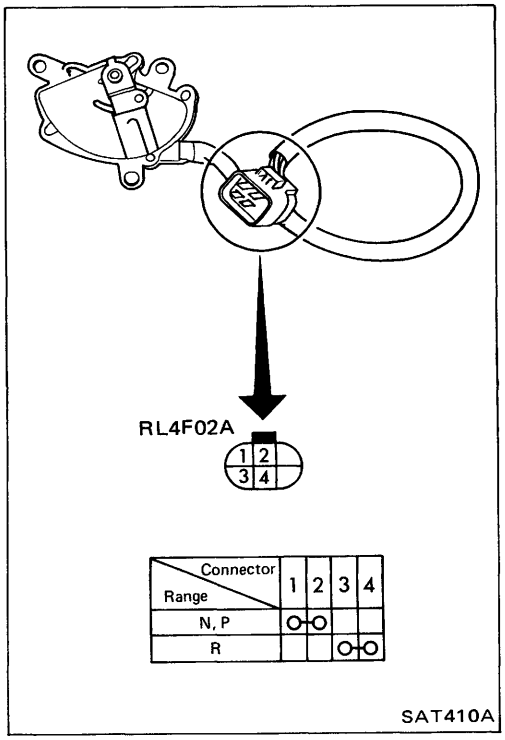


1. Remove control cable end from unit.

Inhibitor Switch Adjustment (Cont'd)


SAT376

2. Disconnect harness at connector, then remove inhibitor switch.

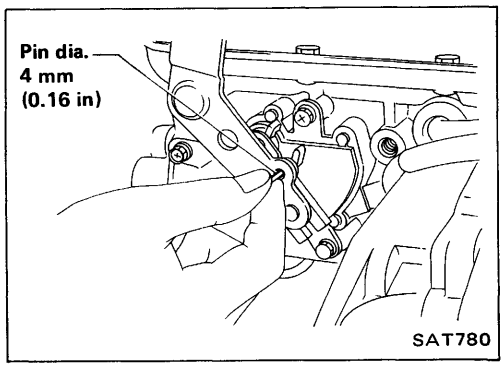


SAT410A

- Check continuity at "N", "P" and "R" ranges.
- With control lever held in "Neutral", turn manual lever an equal amount in both directions to see if current flow ranges are nearly the same. (Current normally begins to flow before manual lever reaches an angle of 1.5° in either direction.)
  If current flows outside normal range, or if normal flow range is out of specifications, properly adjust inhibitor switch.

Adjust inhibitor switch as follows:
This adjustment can be done on the vehicle.

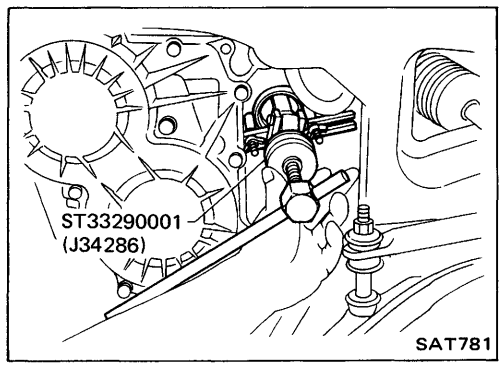
1. Loosen attaching screws.
2. Set select lever (manual shaft) at "N" position.



SAT780

3. Insert a pin into adjustment holes in both inhibitor switch and switch lever as near vertical as possible.
4. Tighten screws.
5. Recheck for continuity. If faulty, replace the switch.

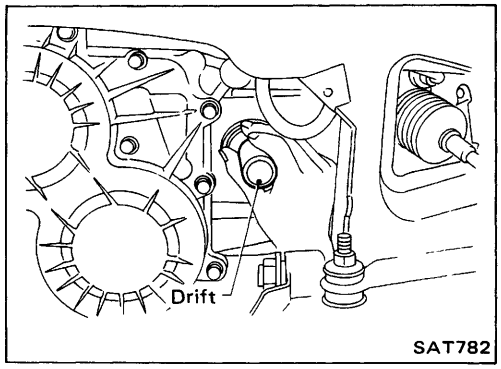
Differential Side Oil Seal Replacement



SAT781

1. Remove drive shaft assembly. Refer to Drive Shaft in section FA.
2. Remove oil seal.

Differential Side Oil Seal Replacement (Cont'd)



3. Apply coat of A.T.F. to oil seal surface, then drive new oil seal into place.
4. Install drive shaft assembly. Refer to Drive Shaft in section FA.

Be extremely careful not to scratch oil seal when inserting drive shaft.

Preliminary Checks (Prior to Road Testing)

FLUID LEAKAGE

If the governor cap and valve cover are suspected:

1) Open hood.
2) Clean the area around the governor cap and valve cover.
3) Run the vehicle at highway speeds.
4) Check the governor cap and valve cover for fresh leakage.

To detect a fluid leak:

1) Raise vehicle.
2) Clean areas suspected of leaking.
3) Start engine, apply foot brake, place selector lever in drive, and wait a few minutes.
4) Stop engine.
5) Check for fresh leakage.

FLUID CONDITION

Examine the A.T.F. and note its color, texture, and odor.

1) Dark of Black Fluid:
   With a burned odor
   - Worn friction material.
2) Milky Pink Fluid: Water Contamination
   - Road water entering through filler tube or breather.
3) Varnished Fluid, light to dark brown and tacky: Oxidation
   - Over or Underfilling.
   - Overheating.

Road Testing

Perform road tests using "Symptom" chart. Refer to page AT-14.

"P" RANGE

1. Place selector lever in "P" range and start the engine. Stop the engine and repeat the procedure in all other 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

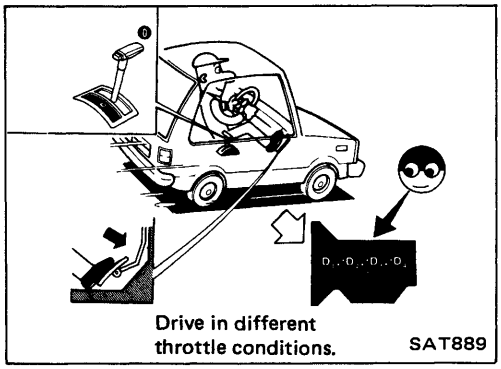
1. Manually move selector lever from "P" to "R", and note shift quality.
2. Drive the vehicle in reverse long enough to detect slippage or other abnormalities.

"N" RANGE

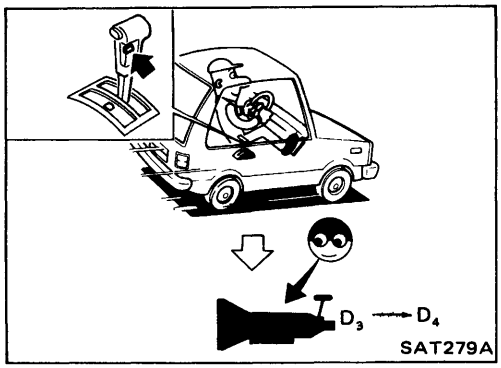
1. Manually move selector lever from "R" and "D" to "N" and note quality.

Road Testing (Cont'd)

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.)



Drive in different throttle conditions. SAT889



SAT279A

"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, by observing lock-up pressure, whether lock-up properly occurs while driving vehicle in "D3" and "D4" ranges. (Refer to Pressure Testing.)
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 65 to 80 km/h (40 to 50 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 25 to 35 km/h (16 to 22 MPH) ("D_2" range) at half to light throttle position, fully depress accelerator pedal to make sure it downshifts from 2nd to 1st gear.

"2" RANGE

1. Shift to "2" range and check to make sure that vehicle starts to move 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.

Road Testing (Cont'd)

5. Allow vehicle to run idle while in 2nd gear 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. Shift control lever to "1" range and accelerate vehicle. Ensure that it does not upshift from 1st to 2nd gear although vehicle speed increases.
2. While vehicle is being 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 the downshift to 1st gear is made.

VEHICLE SPEED AND LINE PRESSURE WHEN SHIFTING GEARS

This check should be carried out when oil temperature is between 43 to 57°C (109 to 135°F) after the vehicle has been driven approx. 10 minutes.

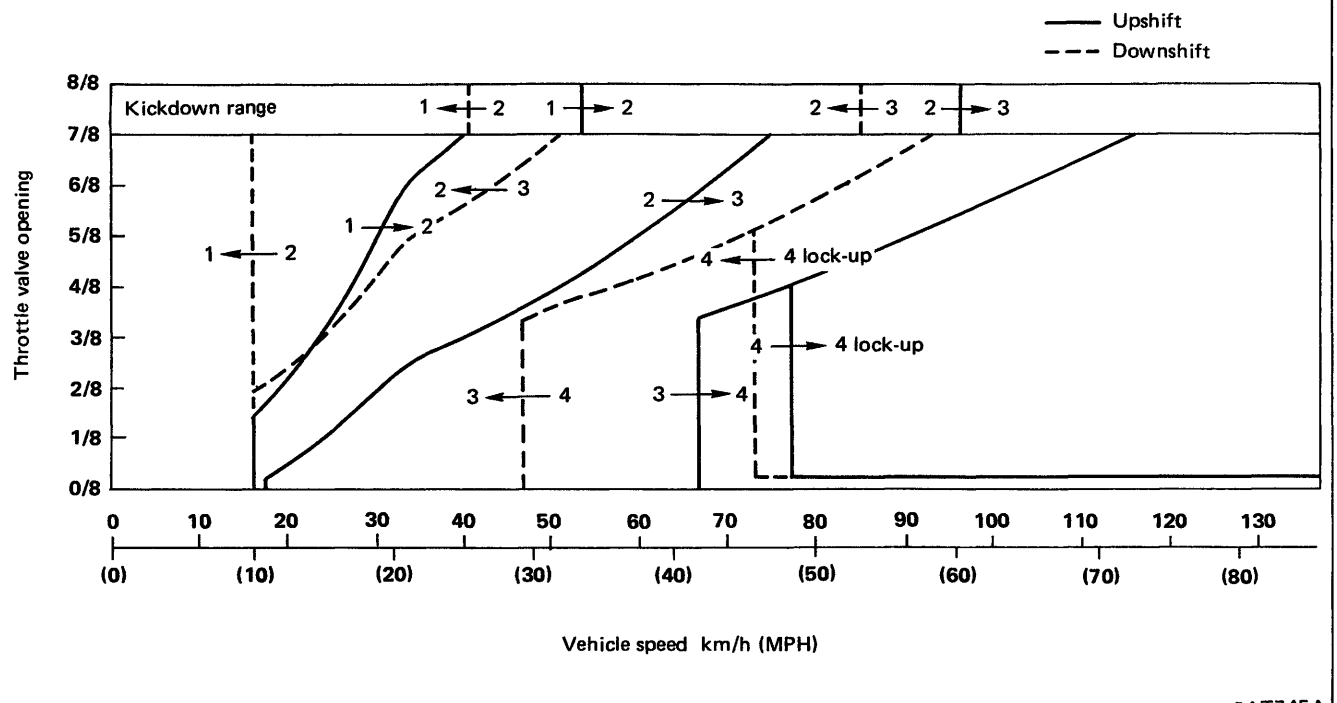
Throttle position	Gearshift	Vehicle speed km/h (MPH)
Full throttle	$D_1 \rightarrow D_2$, $2_1 \rightarrow 2_2$	53 (33)
	$D_2 \rightarrow D_3$	96 (60)
	$D_3 \rightarrow D_4$	–
	$D_4 \rightarrow D_3$	–
	$D_3 \rightarrow D_2$	85 (53)
	$D_2 \rightarrow D_1$, $2_2 \rightarrow 2_1$	40 (25)

Road Testing (Cont'd)

SHIFT SCHEDULE

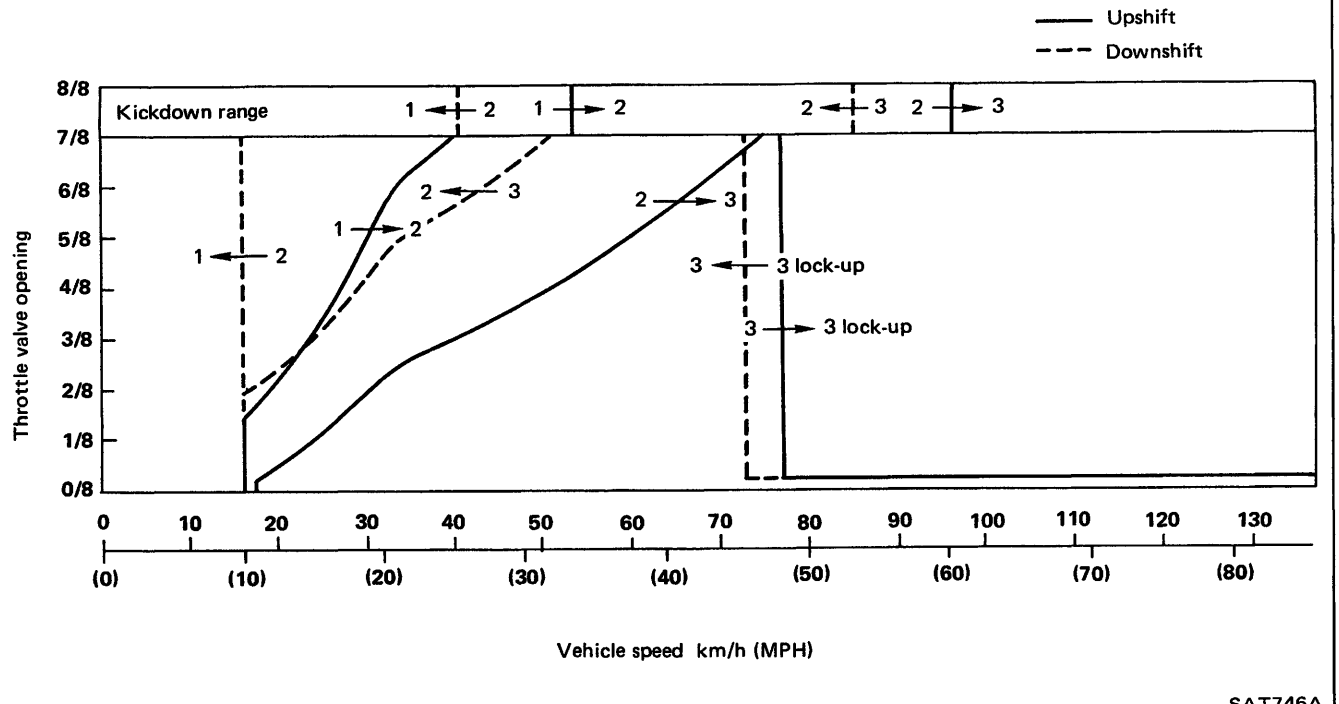
CA20E engine models

When O.D. control switch is "ON"



SAT745A

When O.D. control switch is "OFF"



SAT746A

Road Testing (Cont'd)

ROAD TEST SYMPTOM CHART

Numbers in chart below correspond with those indicated in Trouble-shooting chart.

			SHIFT QUALITY												
			ROUGH	SHIFT TIMING [Mark km/h (MPH)]	NO SHIFT	SHIFT SLIPPAGE	VEHICLE WON'T MOVE	CRUISE SLIPPAGE	POOR POWER/ ACCELERATION	NOISY	ENGINE WON'T START	VEHICLE WON'T STAND STILL	NO ENGINE BRAKING	NO LOCK-UP	COMMENTS
PARK RANGE	ENG. START										Ⓐ				
	HOLDING									Ⓑ		Ⓒ			
"R" RANGE	Man. shift (Vehicle at halt)	P-R					Ⓩ			A1					
	REVERSE						Ⓔ · Ⓩ	Ⓔ	Ⓔ	A1					
"N" RANGE	Man. shift (Vehicle at halt)	R-N								A1					
	ENG. START										Ⓐ				
	N									Ⓑ		Ⓓ			
"D" RANGE	Man. shift	N-D	Ⓕ				Ⓖ · Ⓩ			A1					
	1st						Ⓖ · Ⓩ		Ⓘ	A1					
	Auto shift	1-2	Ⓜ		Ⓙ	Ⓟ				A1					
	2nd									A1					
	Auto shift	2-3	Ⓝ		Ⓚ	Ⓠ				A1					
	3rd (Top)									A1					
	Auto shift	3-4	Ⓞ		Ⓛ	Ⓡ				A1					
	4th (O.D.)								Ⓢ	A1					
	Lock-up "OFF" → "ON"					A7				A1				A6	
	Lock-up "ON" → "OFF"									A1					
	Decel.	4-3			Ⓣ					A1					
	Kickdown	4-3			Ⓣ · Ⓦ	Ⓧ				A1					
	Decel.	3-2			Ⓤ					A1					
	Kickdown	3-2			Ⓤ	Ⓨ				A1					
	Decel.	2-1			Ⓥ					A1					
	Kickdown	2-1			Ⓥ					A1					
"2" RANGE	Man. shift (Vehicle in operation)	D-2			Ⓤ · A2		Ⓗ · Ⓩ			A1					
	1st						Ⓗ · Ⓩ		Ⓘ	A1					
	Auto shift	1-2	Ⓜ		Ⓙ	Ⓟ				A1					
	2nd									A1					
	Decel.	2-1			Ⓥ					A1					
	Kickdown	2-1			Ⓥ					A1					
"1" RANGE	Man. shift (Vehicle in operation)	2-1	A5		Ⓥ · A4					A1					
	Man. shift (Vehicle in operation)	D-1	A5		Ⓥ · A4					A1					
	Acceleration						Ⓗ · Ⓩ		Ⓘ	A1					
	"1"	Engine Braking								A1		A3			

Road Testing (Cont'd)

TROUBLE-SHOOTING CHART

Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transaxle must be removed from the vehicle.

Reference		ON VEHICLE										OFF VEHICLE										
		Oil level	Control cable	Inhibitor switch and wiring	Throttle wire	Engine idling rpm	Line pressure	Control valve	Governor valve	Oil quality	Ignition switch and starter motor Engine adjustment, brake inspection	Oil pump	High clutch	Low clutch	Reverse clutch	Low & reverse brake	Band brake	Transaxle one-way clutch	Final drive	Solenoids	Oil passage leak	Park linkage	Torque converter
Ⓐ	Engine does not start in "N", "P" ranges.	.	2	3	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
	Engine starts in range other than "N" and "P".	.	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ⓑ	Transaxle noise in "P" and "N" ranges.	1	.	.	.	.	2	.	.	.	.	③	.	.	.	.	.	.	.	.	.	.	.
Ⓒ	Vehicle moves when changing into "P" range or parking gear does not disengage when shifted out of "P" range.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	②	.
Ⓓ	Vehicle runs in "N" range.	.	1	.	.	.	.	3	.	2	.	.	.	④	.	.	.	.	.	.	.	.	.
Ⓔ	Vehicle will not run in "R" range (but runs in "D", "2" and "1" ranges). Clutch slips. Very poor acceleration.	1	2	.	.	.	3	5	.	4	.	.	.	⑧	⑥	⑦	.	.	.	.	⑨	.	.
	Vehicle braked when shifting into "R" range.	.	.	.	.	.	.	.	.	1	.	.	.	④	②	③	⑤	.	.	.	.	⑥	.
Ⓕ	Sharp shock in shifting from "N" to "D" range.	.	.	.	2	1	3	4	.	.	.	.	.	⑤	.	.	.	.	.	.	.	.	.
Ⓖ	Vehicle will not run in "D" range (but runs in "2", "1" and "R" ranges).	.	1	.	.	.	2	3	.	.	.	.	.	.	.	.	.	④	.	.	.	.	.
Ⓗ	Vehicle will not run in "D", "1", "2" ranges (but runs in "R" range). Clutch slips. Very poor acceleration.	1	2	.	.	.	4	5	.	3	.	6	.	⑧	⑦	.	.	.	.	.	⑨	.	.
Ⓘ	Clutches or brakes slip somewhat in starting.	1	2	.	6	.	3	5	.	4	.	.	⑦	.	.	.	.	.	.	.	⑧	.	.
	Excessive creep.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	No creep at all.	1	2	.	.	3	.	5	.	4	.	.	⑥	.	⑧	.	.	.	.	.	⑦	.	⑨
Ⓙ	Failure to change gear from "1st" to "2nd".	.	1	.	2	.	.	4	5	3	.	.	.	.	.	.	⑥	.	.	.	⑦	.	.
Ⓚ	Failure to change gear from "2nd" to "3rd".	.	1	.	2	.	.	4	5	3	.	.	.	⑥	.	.	.	.	.	.	⑦	.	.
Ⓛ	Failure to change gear from "3rd" to "4th".	.	1	.	2	.	.	4	5	3	.	.	.	⑥	.	.	⑦	.	.	.	.	.	.
	Too high a gear change point from "1st" to "2nd", from "2nd" to "3rd", from "3rd" to "4th".	.	.	.	1	.	2	4	5	3	.	.	.	.	.	.	.	.	.	.	⑥	.	.
	Gear change directly from "1st" to "3rd" occurs.	.	.	.	.	.	.	2	3	1	.	.	.	.	.	.	④	.	.	.	⑤	.	.
	Engine stops when shifting lever into "D" range.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
Ⓜ	Too sharp a shock in change from "1st" to "2nd".	.	.	.	1	.	3	4	.	2	.	.	.	.	.	.	⑤	.	.	.	.	.	.
Ⓝ	Too sharp a shock in change from "2nd" to "3rd".	.	.	.	1	.	3	4	.	2	.	.	.	⑤	.	.	.	.	.	.	.	.	.

Road Testing (Cont'd)

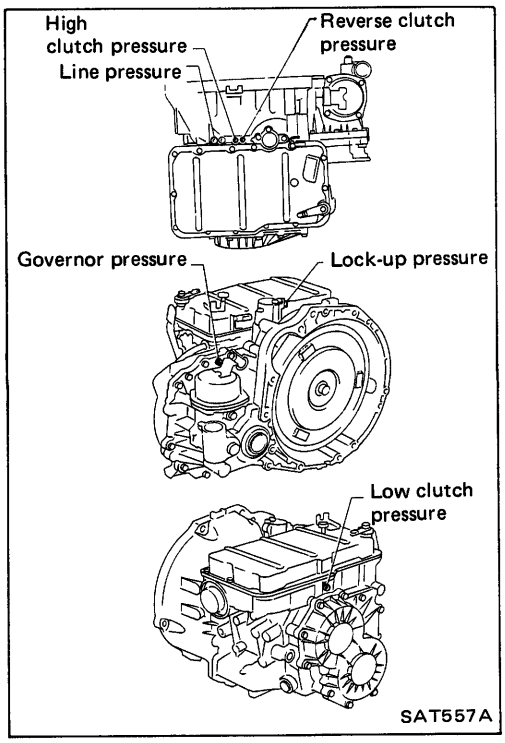
Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transaxle must be removed from the vehicle.

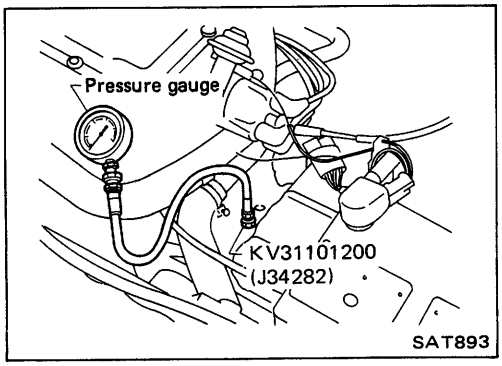
Reference		ON VEHICLE										OFF VEHICLE											
		Oil level	Control cable	Inhibitor switch and wiring	Throttle wire	Engine idling rpm	Line pressure	Control valve	Governor valve	Oil quality	Ignition switch and starter motor	Engine adjustment, brake inspection	Oil pump	High clutch	Low clutch	Reverse clutch	Low & reverse brake	Band brake	Transaxle one-way clutch	Final drive	Solenoids	Oil passage leak	Park linkage	Torque converter
Ⓞ	Too sharp a shock in change from "3rd" to "4th".	.	.	.	1	.	3	4	.	2	.	.	.	.	.	.	.	⑤	.	.	.	.	.	.	.
Ⓟ	Almost no shock or clutches slipping in change from "1st" to "2nd".	1	2	.	3	.	4	6	.	5	.	.	.	.	.	.	.	⑦	.	.	.	.	⑧	.	.
Ⓠ	Almost no shock or slipping in change from "2nd" to "3rd". Engine races extremely fast.	1	2	.	3	.	4	6	.	5	.	.	.	⑦	.	.	.	.	.	.	.	.	⑧	.	.
Ⓡ	Almost no shock or slipping in change from "3rd" to "4th".	1	2	.	3	.	4	6	.	5	.	.	.	.	.	.	.	⑦	.	.	.	.	⑧	.	.
	Vehicle braked by gear change from "1st" to "2nd".	.	.	.	.	.	.	2	.	1	.	.	.	③	.	④	⑤	.	⑥	.	.	.	.	.	.
	Vehicle braked by gear change from "2nd" to "3rd".	.	.	.	.	.	.	2	.	1	.	.	.	.	.	.	.	③	.	.	.	.	.	.	.
	Vehicle braked by gear change from "3rd" to "4th".	.	.	.	.	.	.	2	.	1	.	.	.	.	③	.	.	.	.	.	.	.	.	.	.
Ⓢ	Maximum speed not attained. Acceleration poor.	1	2	.	.	.	4	5	6	3	.	7	⑧	⑨	.	.	.	⑩	.	.	.	.	.	.	⑪
Ⓣ	Failure to change gear from "4th" to "3rd".	.	.	.	1	.	.	3	4	2	.	.	.	.	⑤	.	.	⑥	.	.	.	.	⑦	.	.
Ⓤ	Failure to change gear from "3rd" to "2nd" or from "4th" to "2nd".	.	.	.	1	.	.	3	4	2	.	.	.	.	.	.	.	⑤	.	.	.	.	⑥	.	.
Ⓥ	Failure to change gear from "2nd" to "1st" or from "3rd" to "1st".	.	.	.	1	.	.	3	4	2	.	.	.	.	.	.	.	⑥	⑤	.	.	.	.	.	.
	Gear change shock felt during deceleration by releasing accelerator pedal.	.	1	.	2	.	3	4	5	.	.	.	.	.	.	.	.	.	.	.	.	⑥	⑦	.	.
	Too high a change point from "4th" to "3rd", from "3rd" to "2nd", from "2nd" to "1st".	.	1	.	2	.	3	4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	⑥	.	.
Ⓦ	Kickdown does not operate when depressing pedal in "4th" within kickdown car speed.	.	.	.	1	.	.	3	4	2	.	.	.	.	⑥	.	.	⑤	.	.	.	.	⑦	.	.
	Kickdown operates or engine overruns when depressing pedal in "4th" beyond kickdown vehicle speed limit.	.	1	.	2	.	3	5	6	4	.	.	.	⑦	.	.	.	⑧	.	.	.	.	⑨	.	.
Ⓧ	Races extremely fast or slips in changing from "4th" to "3rd" when depressing pedal.	.	.	.	1	.	2	4	.	3	.	.	.	.	⑤	.	.	⑥	.	.	.	.	.	.	⑦
Ⓨ	Races extremely fast or slips in changing from "3rd" to "2nd" when depressing pedal.	.	.	.	1	.	2	4	.	3	.	.	.	⑤	.	.	.	⑥	.	.	.	.	.	.	.

Road Testing (Cont'd)

Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transaxle must be removed from the vehicle.

Reference		ON VEHICLE											OFF VEHICLE											
		Oil level	Control cable	Inhibitor switch and wiring	Throttle wire	Engine idling rpm	Line pressure	Control valve	Governor valve	Oil quality	Ignition switch and starter motor	Engine adjustment, brake inspection	O.D. control switch and wiring	O.D. indicator switch	Oil pump	High clutch	Low clutch	Reverse clutch	Low & reverse brake	Band brake	Transaxle one-way clutch	Final drive	Solenoids	Oil passage leak	Park linkage	Torque converter	Planetary gear	Lubrication
Ⓩ	Vehicle will not run in any range.	1	2				3	5		4					⑥									⑧	⑩	⑨		
A1	Transmission noise in "D", "2", "1" and "R" ranges.	1					2								③						④					⑤	⑥	
A2	Failure to change from "3rd" to "2nd" when changing lever into "2" range.		1				2	4		3									⑤					⑥				
	Gear change from "2nd" to "3rd" in "2" range.		1				2	3																④				
A3	Engine brake does not operate in "1" range.		1				2	4		3									⑤					⑥				
	Gear change from "1st" to "2nd" in "1" range.		1				2	3																④				
A4	Does not change from "2nd" to "1st" in "1" range.	1	2					4	5	3									⑦	⑥				⑧				
A5	Large shock changing from "2nd" to "1st" in "1" range.				1			4		3		2							⑤									
	Transaxle overheats.	1					2	5		4		3			⑥	⑨	⑪	⑫	⑬	⑩		⑯		⑭		⑦	⑮	⑧
	Oil shoots out during operation. White smoke emitted from exhaust pipe during operation.	1			2		4	6		3		5			⑥	⑨	⑪	⑫	⑬	⑩		⑯		⑭		⑦	⑮	⑧
	Offensive smell at oil charging pipe.	1								2					③	⑥	⑧	⑨	⑩	⑦		⑬		⑪		④	⑫	⑤
A6	Torque converter is not locked up.						3	1	2						⑤									⑥		④		
A7	Lock-up piston slip.						1								②									④		③		
	Lock-up point is extremely high or low.							1	2															③				
	Engine is stopped at R.D. 2 and 1 ranges.							1																②		③		
A8	Torque converter lock-up pressure is not normal.				1		2	3							④											⑤		
	Transaxle shifts to overdrive even if O.D. control switch is turned to "OFF".												1											②				
	Lamp inside O.D. control switch glows even if transaxle is shifted to O.D.												2	1														





Pressure Testing

LINE PRESSURE

1. Install pressure gauge to line pressure port. Locate the gauge so it can be seen by driver.
2. Warm up engine until engine oil and A.T.F. reach operating temperatures after the vehicle has been driven approx. 10 minutes.

   A.T.F. temperature:
   43 - 57°C (109 - 135°F)
3. Measure line pressure at idle and at stall point while depressing brake pedal fully.

At idling

Range	Line pressure kPa (kg/cm^2, psi)
R D 2 1	373 - 441 (3.8 - 4.5, 54 - 64)

At stall test

- Do not perform tests for more than five seconds at any shift range.
- Do not proceed to next "range" test immediately after one "range" test is done. Wait until oil temperature decreases.

Pressure Testing (Cont'd)

Range	Line pressure kPa (kg/cm^2, psi)
R D 2 1	1,206 - 1,363 (12.3 - 13.9, 175 - 198)

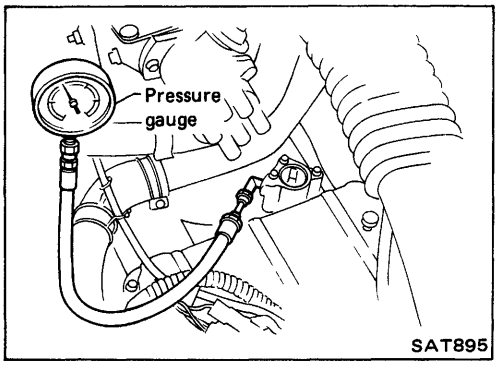
Judgment by line pressure

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 forward clutch (rear) or governor, line pressure is low in "D", "2" or "1" range but is normal in "R" range.
- If oil leaks at or around low and reverse brake circuit, line pressure becomes low in "R" or "P" range but is normal in "D", "2" or "1" range.

3) When line pressure is high while idling, pressure regulator valve may have stuck.

If line pressure does not rise, first check to make sure that throttle wire is connected properly.



LOCK-UP TEST

Install pressure gauge to lock-up pressure port. Shift selector lever in "D" range.

Condition	Torque converter lock-up pressure kPa (kg/cm^2, psi)
Lock-up "ON"	49 (0.5, 7) or less
Lock-up "OFF"	196 (2, 28) or more

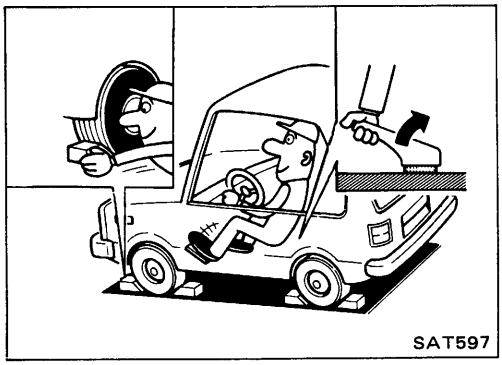
If lock-up pressure is not within specifications, refer to Trouble-shooting chart (A6).

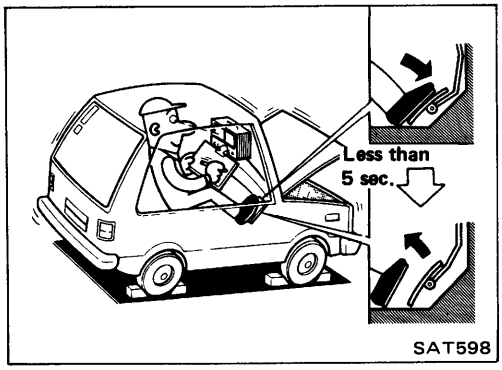
Stall Testing

The stall test is an effective method of testing clutch and band holding ability, torque converter one-way clutch operation, and engine performance. A stall test should only be performed as a last resort because of the high fluid temperature it generates and the excessive load it places on the engine and transaxle.

CAUTION:

a. **Transaxle and engine fluid levels should always be checked and fluid added as needed.**
b. **Run engine at 1,200 rpm to attain proper warm-up.**
c. **During test, never hold throttle wide-open for more than 5 seconds.**
d. **Do not test more than two gear ranges without driving vehicle to cool off engine and transaxle.**


SAT597



SAT598

STALL TEST PROCEDURE

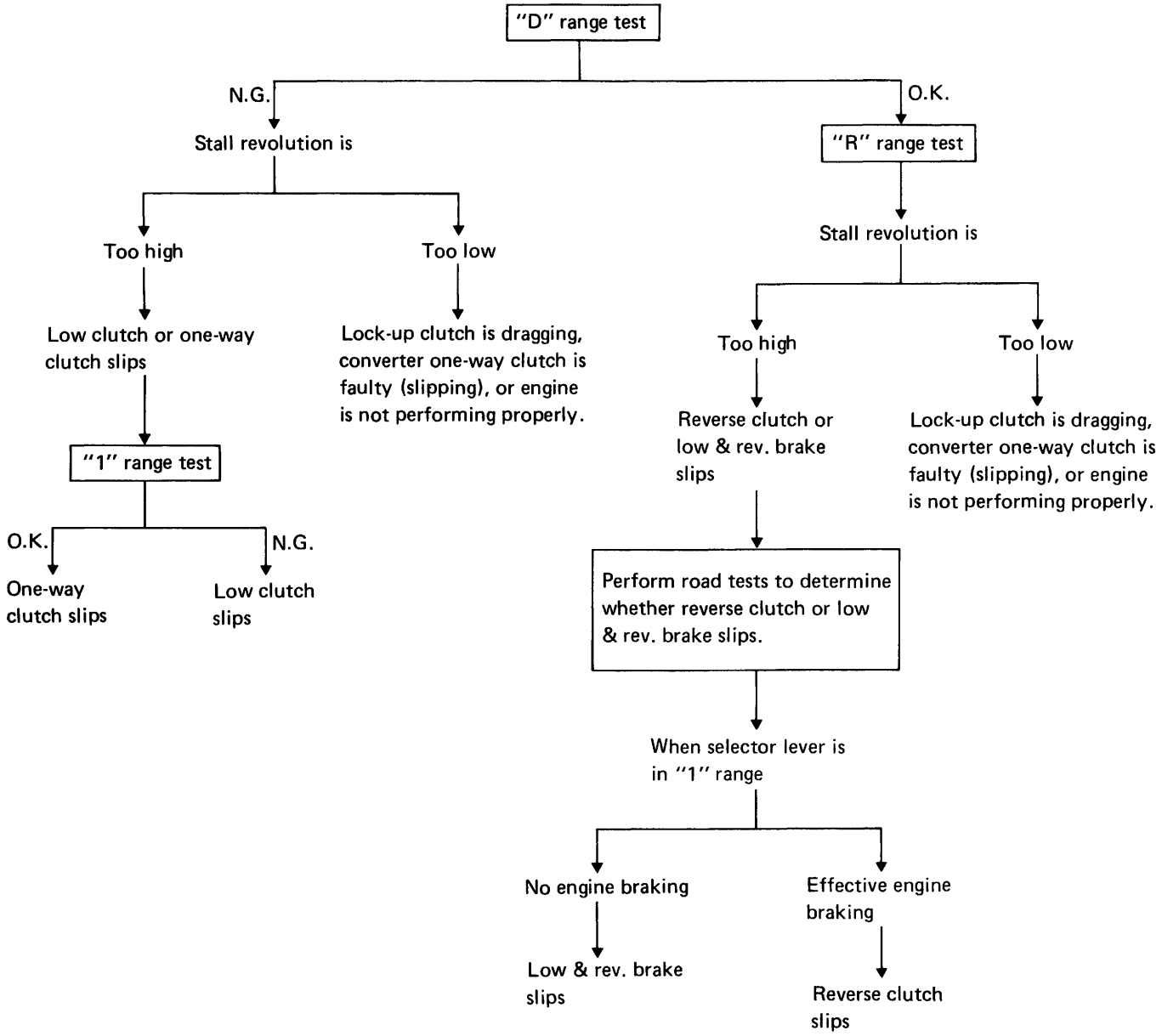
1. Set parking brake and block wheels.
2. Install a tachometer where it can be seen by driver during test.
3. Start engine and place selector lever in "D" range.
4. Apply foot brake and accelerate to wide-open throttle.
5. Quickly note the engine stall speed and immediately release throttle.

   Stall revolution:
   2,150 - 2,450 rpm

6. Shift selector lever to "N".
7. Cool off A.T.F.
8. Perform stall tests in the same manner as in steps 3 through 7 with selector lever in "1" and "R", respectively.
9. If stall revolution is not within specified values, perform trouble-shooting using Stall Test Analysis chart on the next page.

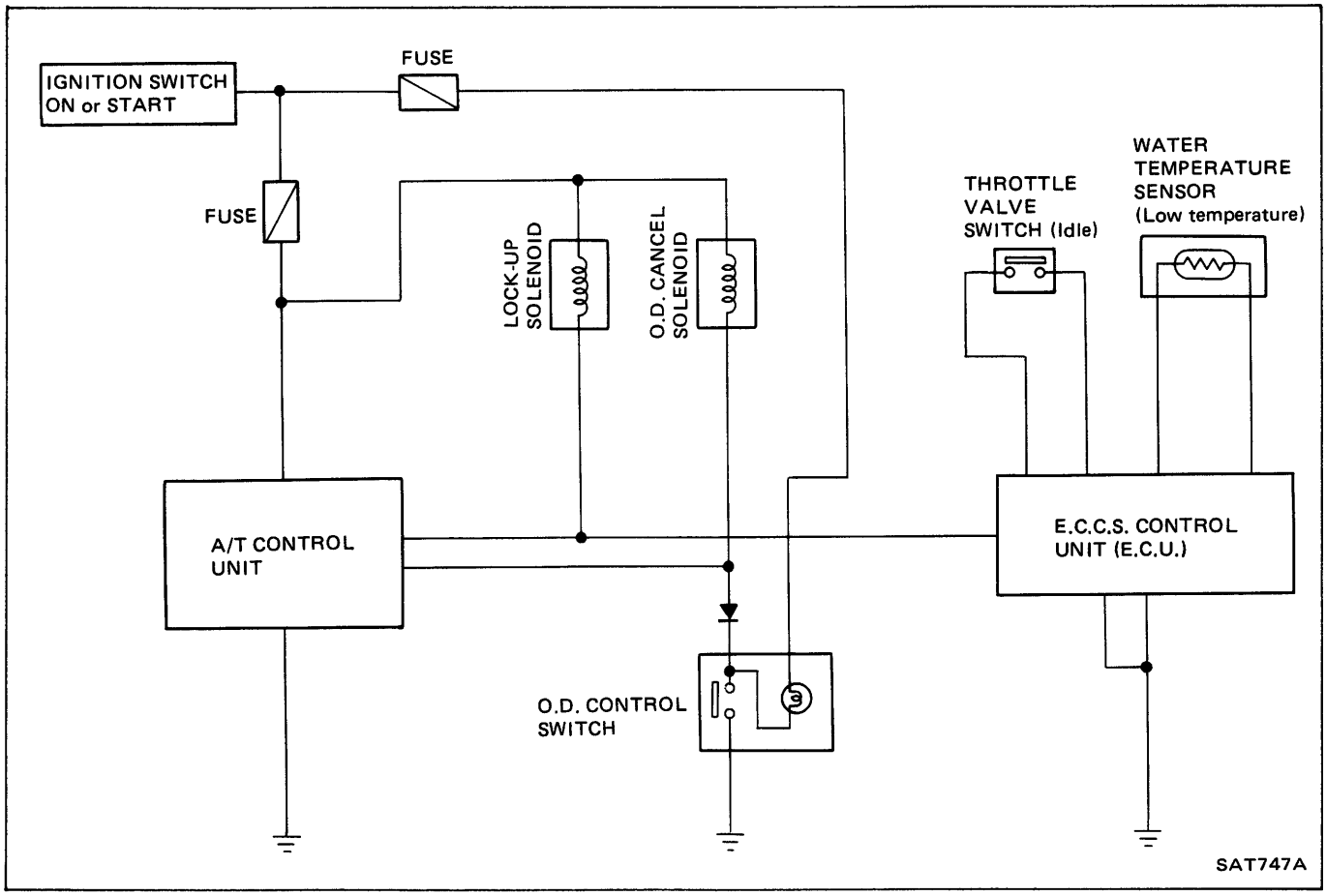
Stall Testing (Cont'd)

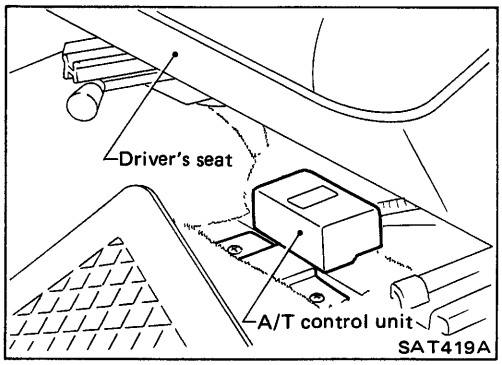
STALL TEST ANALYSIS



If converter one-way clutch is frozen, vehicle will have poor high-speed performance and low engine rpm when it is raced in "N" range. If converter one-way clutch is slipping, vehicle will be sluggish up to 50 or 60 km/h (30 or 40 MPH).

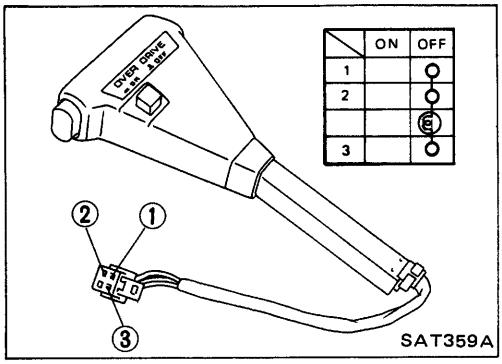
Electrical System/Schematic





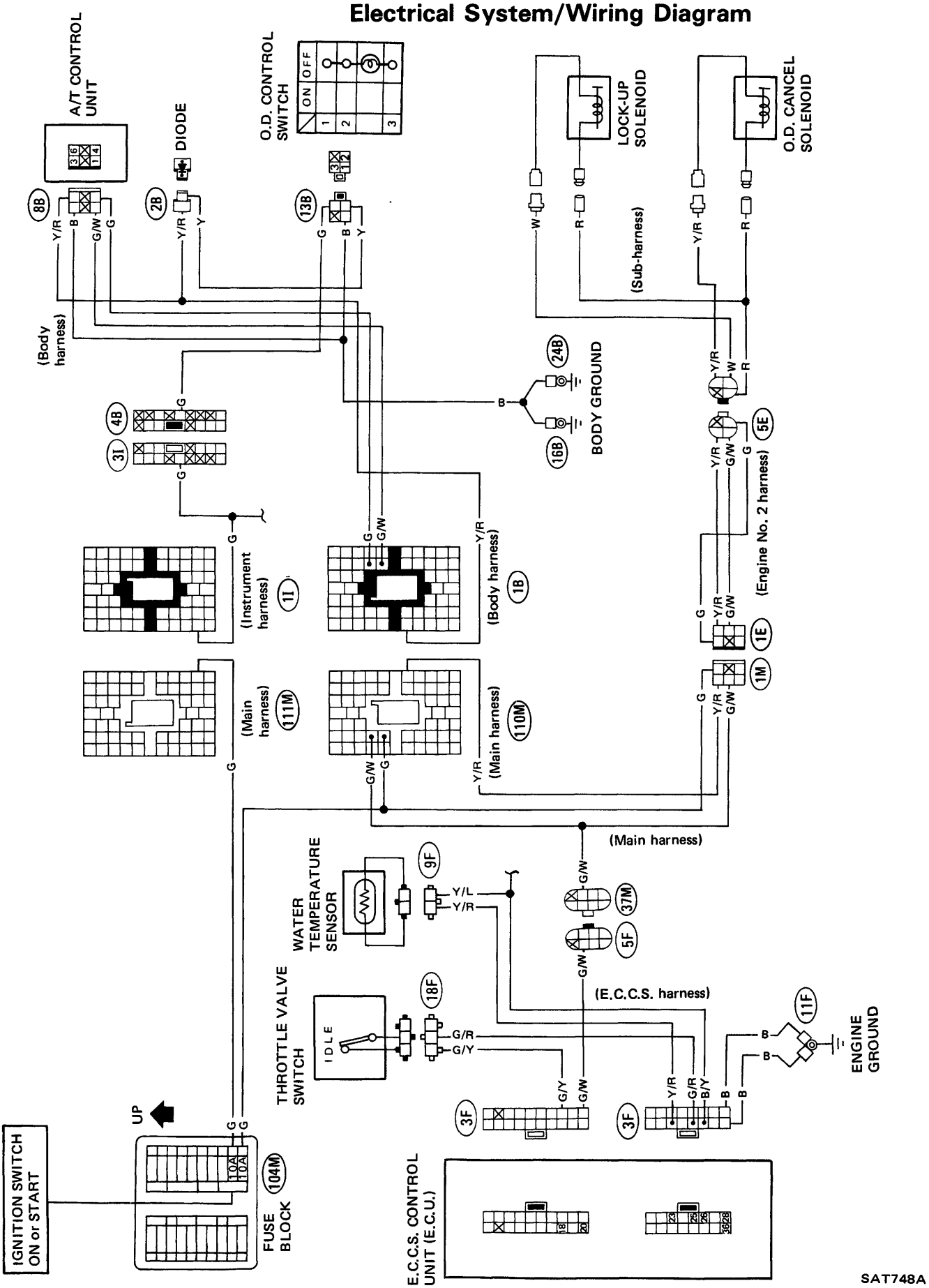
LOCATION OF LOCK-UP CONTROL UNIT

The lock-up control unit is located under driver's seat.



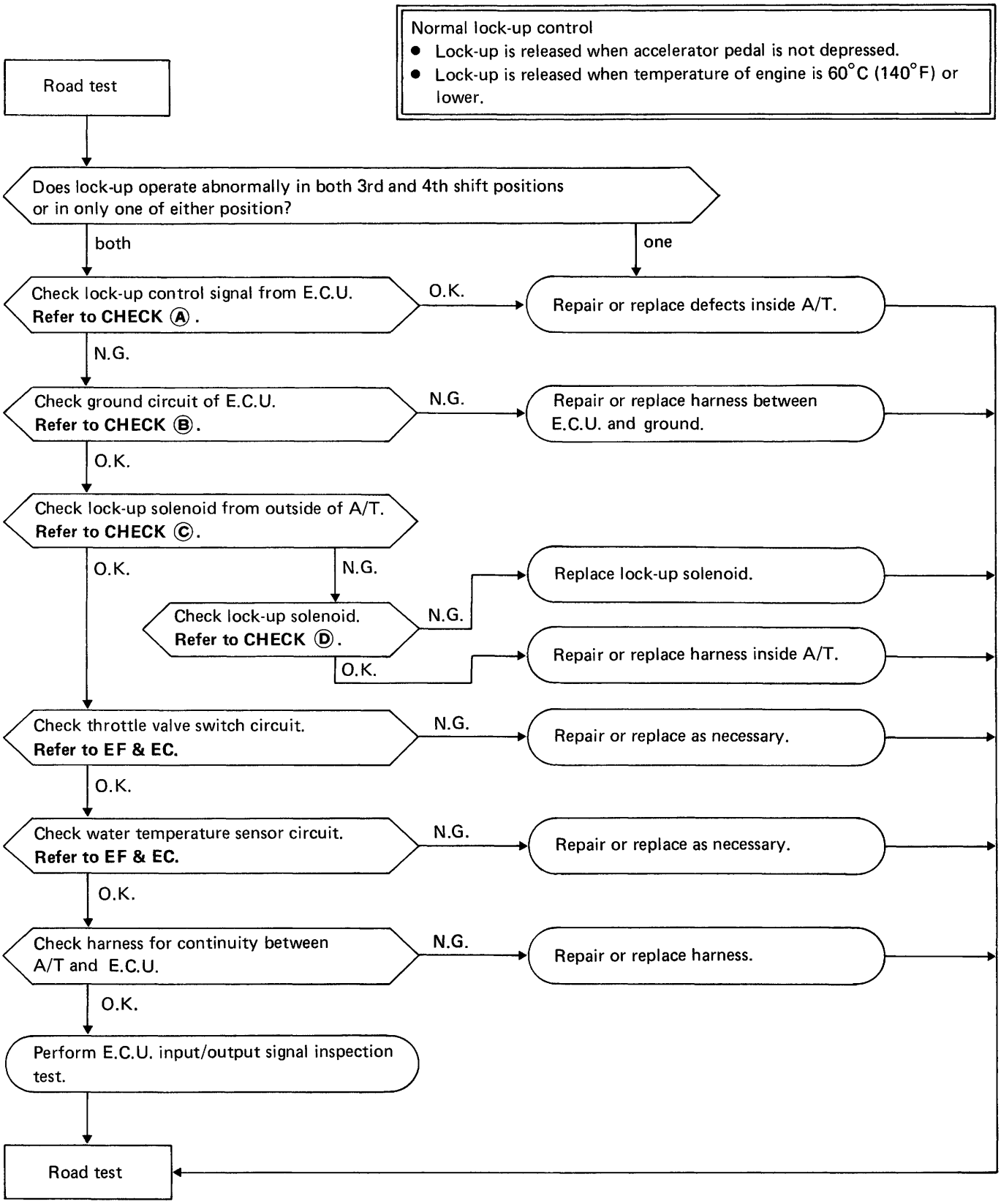
OVERDRIVE CONTROL SWITCH

Electrical System/Wiring Diagram

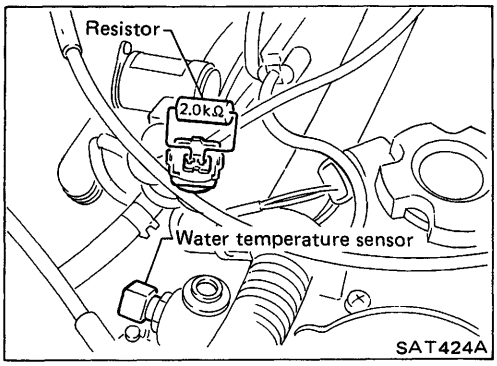


Customer Complaint I

CUSTOMER COMPLAINT I: No lock-up or no lock-up release

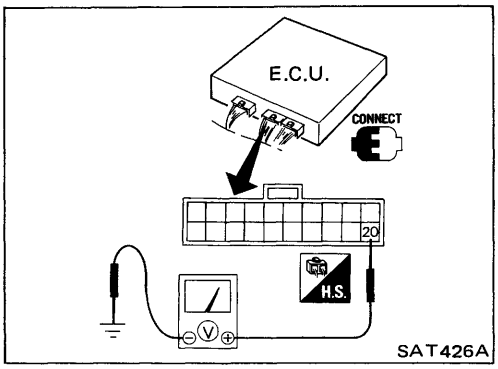


Customer Complaint I (Cont'd)



CHECK Ⓐ : Check lock-up control signal from E.C.U.

1. Disconnect connector for water temperature sensor.
2. Connect resistor (2.0 kΩ) between terminals of water temperature sensor harness connector.
3. Start engine.

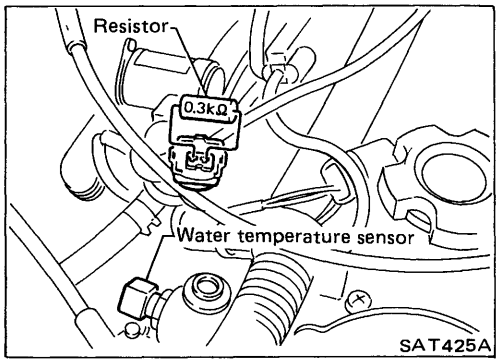


4. Check voltage between terminal ⑳ (+) and ground (—) when accelerator pedal is both depressed and not.

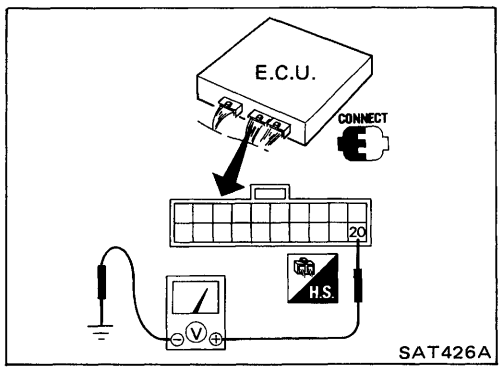
Standard voltage

When accelerator pedal is depressed	Approx. 0V
When accelerator pedal is not depressed	Approx. 0V

5. Stop engine.



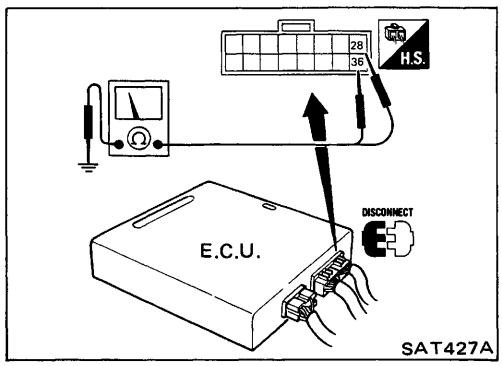
6. Connect resistor (0.3 kΩ) between terminals of water temperature sensor harness connector.
7. Start engine.



8. Check voltage between terminal ⑳ (+) and ground (—) when both accelerator pedal is depressed and not.

Standard voltage

When accelerator pedal is depressed	Battery voltage
When accelerator pedal is not depressed	Approx. 0V

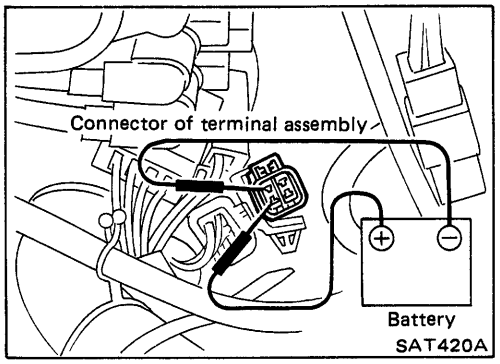


CHECK Ⓑ : Check ground circuit of E.C.U.

1. Turn ignition switch "OFF".
2. Disconnect 16-pin connector from E.C.U.
3. Check resistance between E.C.U. terminal ㉘, ㊱ and ground.

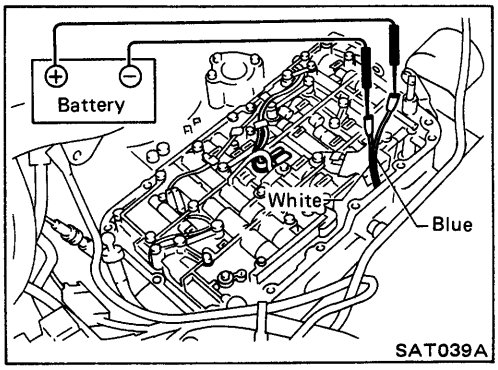
Standard resistance: Approx. 0Ω

Customer Complaint I (Cont'd)



CHECK Ⓒ : Check lock-up solenoid from outside of A/T

1. Start engine.
2. Turn ignition switch "OFF".
3. Disconnect connector for A/T terminal.
4. Confirm that clinking sound is heard when power is applied.

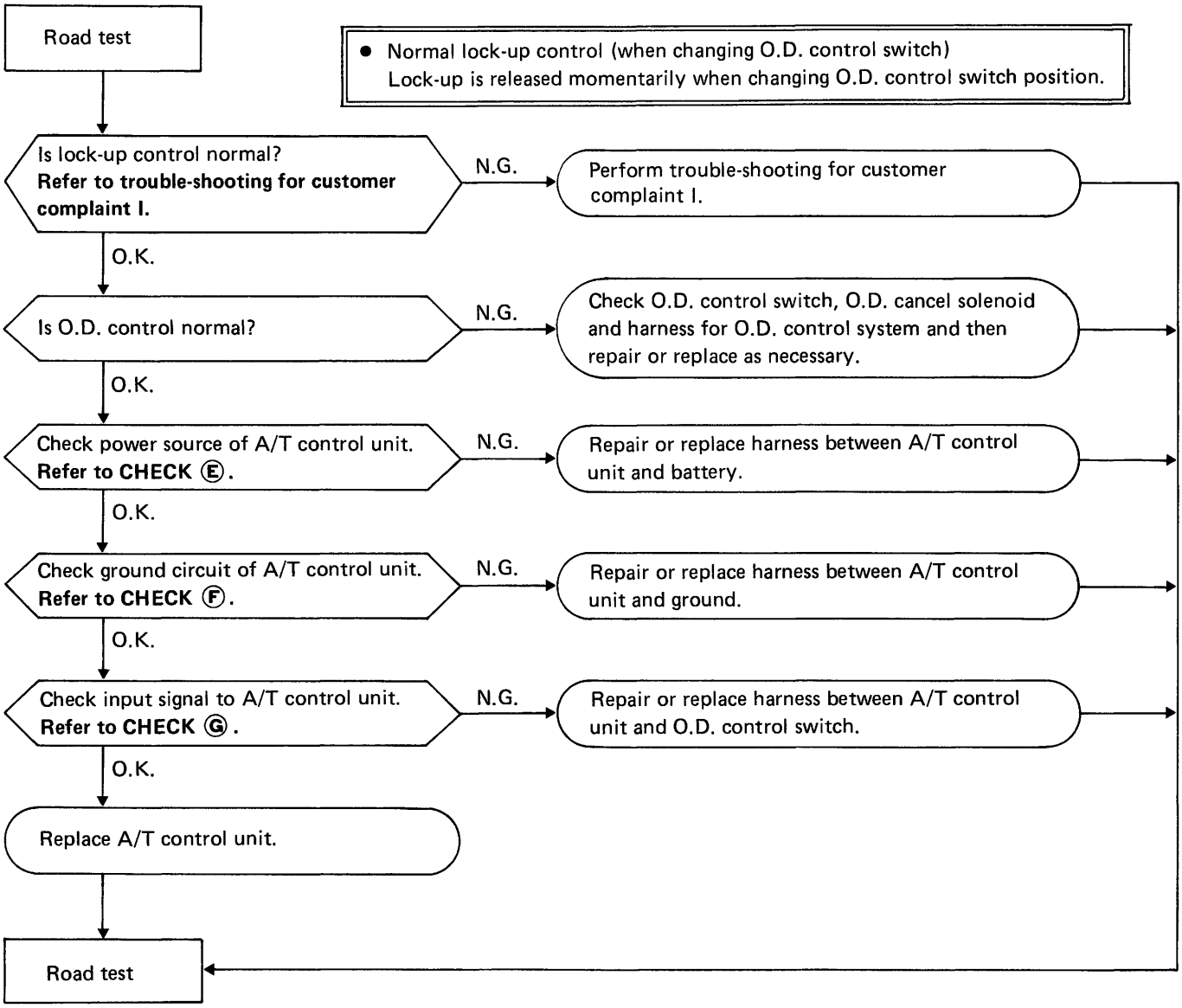


CHECK Ⓓ : Check lock-up solenoid

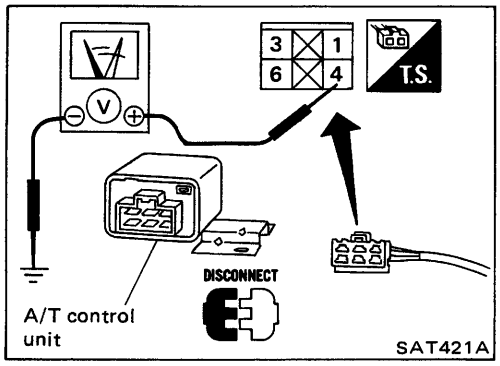
1. Start engine.
2. Turn ignition switch "OFF".
3. Remove control valve cover.
4. Disconnect connector for lock-up solenoid.
5. Confirm that clinking sound is heard when power is applied.

Customer Complaint II

CUSTOMER COMPLAINT II: Strong shock when changing O.D. control switch position while driving in 4th speed (lock-up) range



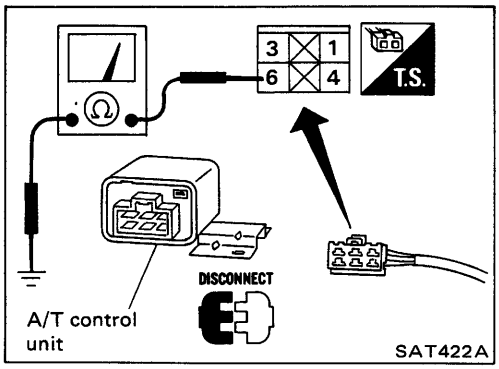
Customer Complaint II (Cont'd)



CHECK Ⓔ : Check power source of A/T control unit.

1. Disconnect connector for A/T control unit.
2. Turn ignition switch "ON".
3. Check voltage between terminal ④ (+) and ground (–).

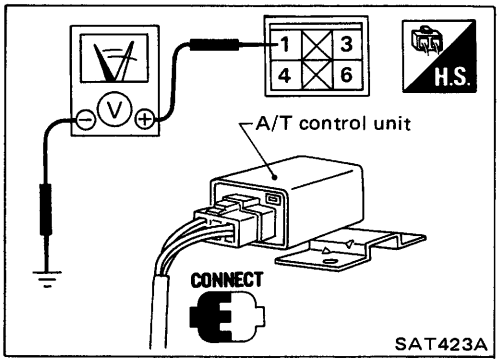
Standard voltage: Battery voltage



CHECK Ⓕ : Check ground circuit of A/T control unit.

1. Turn ignition switch "OFF".
2. Disconnect connector for A/T control unit.
3. Check resistance between terminal ⑥ and ground.

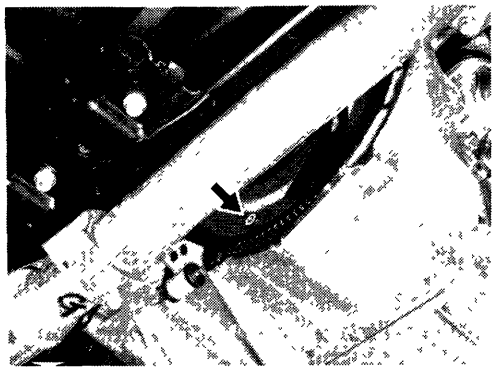
Standard resistance: Approx. 0Ω



CHECK Ⓖ : Check input signal to A/T control unit.

1. Warm up engine until engine water reaches 60° C (140° F).
2. Start engine.
3. Depress accelerator pedal a little.
4. Check voltage between terminal ① (+) and ground (–) while changing O.D. control switch position from "ON" to "OFF", and vice versa.

Standard voltage: Battery voltage → Approx. 0V → Battery voltage



Removal

- Disconnect drive shafts. Refer to Drive Shaft (section FA) for removal.
- Remove bolts securing torque converter to drive plate.

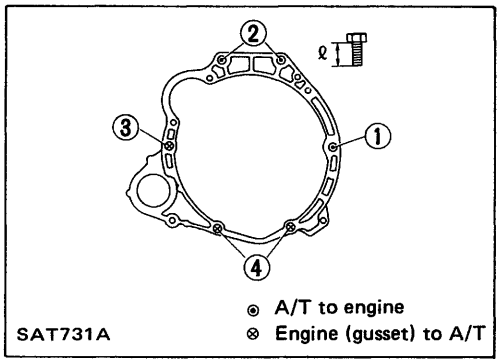
a. Remove those bolts by turning crankshaft.

b. Immediately after transaxle is disconnected, inscribe matching marks on torque converter and drive plate so that they may be reinstalled in their original positions.

- Plug up openings such as oil charging pipe, etc.

CAUTION:

Take care when dismounting transaxle not to strike any adjacent parts.

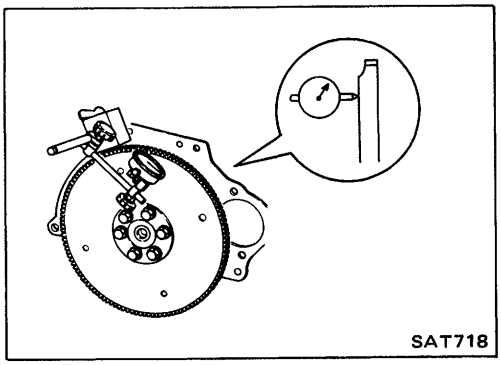


SAT731A

Installation

- Tighten bolt securing transaxle.

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	ℓ mm (in)
1	39 - 49 (4.0 - 5.0, 29 - 36)	85 (3.35)
2	39 - 49 (4.0 - 5.0, 29 - 36)	50 (1.97)
3	39 - 49 (4.0 - 5.0, 29 - 36)	70 (2.76)
4	30 - 40 (3.1 - 4.1, 22 - 30)	25 (0.98)

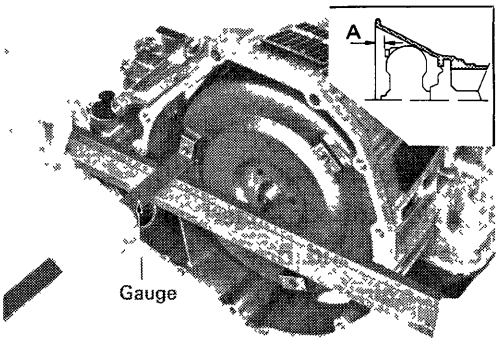

SAT718

- Drive plate runout

  Maximum allowable runout:

  0.5 mm (0.020 in)

  If this runout is out of allowance, replace drive plate and ring gear.



Installation (Cont'd)

- When connecting torque converter to transaxle, measure distance "A" to be certain that they are correctly assembled.

  Distance "A":

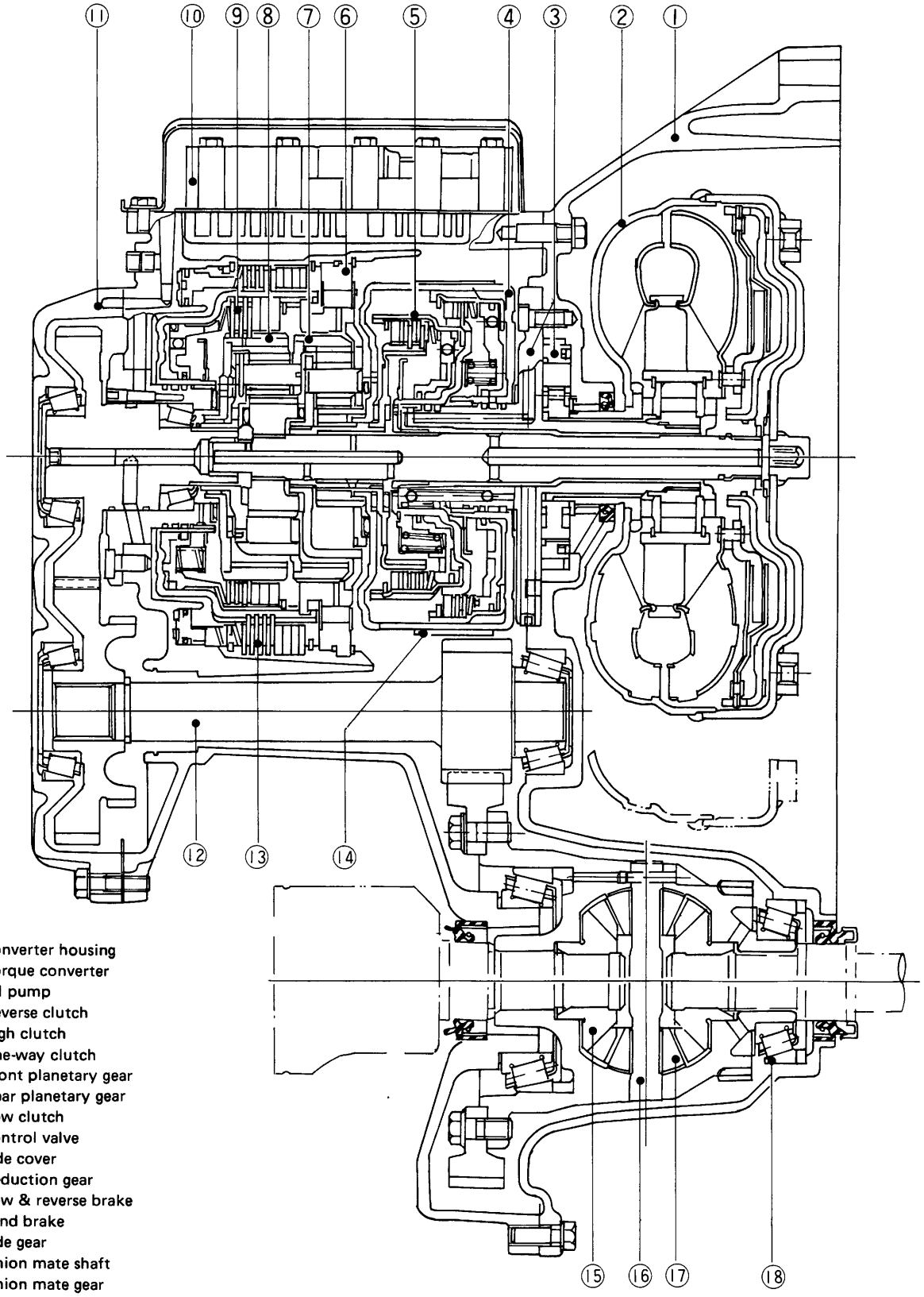
  19 mm (0.75 in) or more

- Install converter to drive plate. Refer to photograph in Removal.

Align matching marks painted across both parts during disassembly.

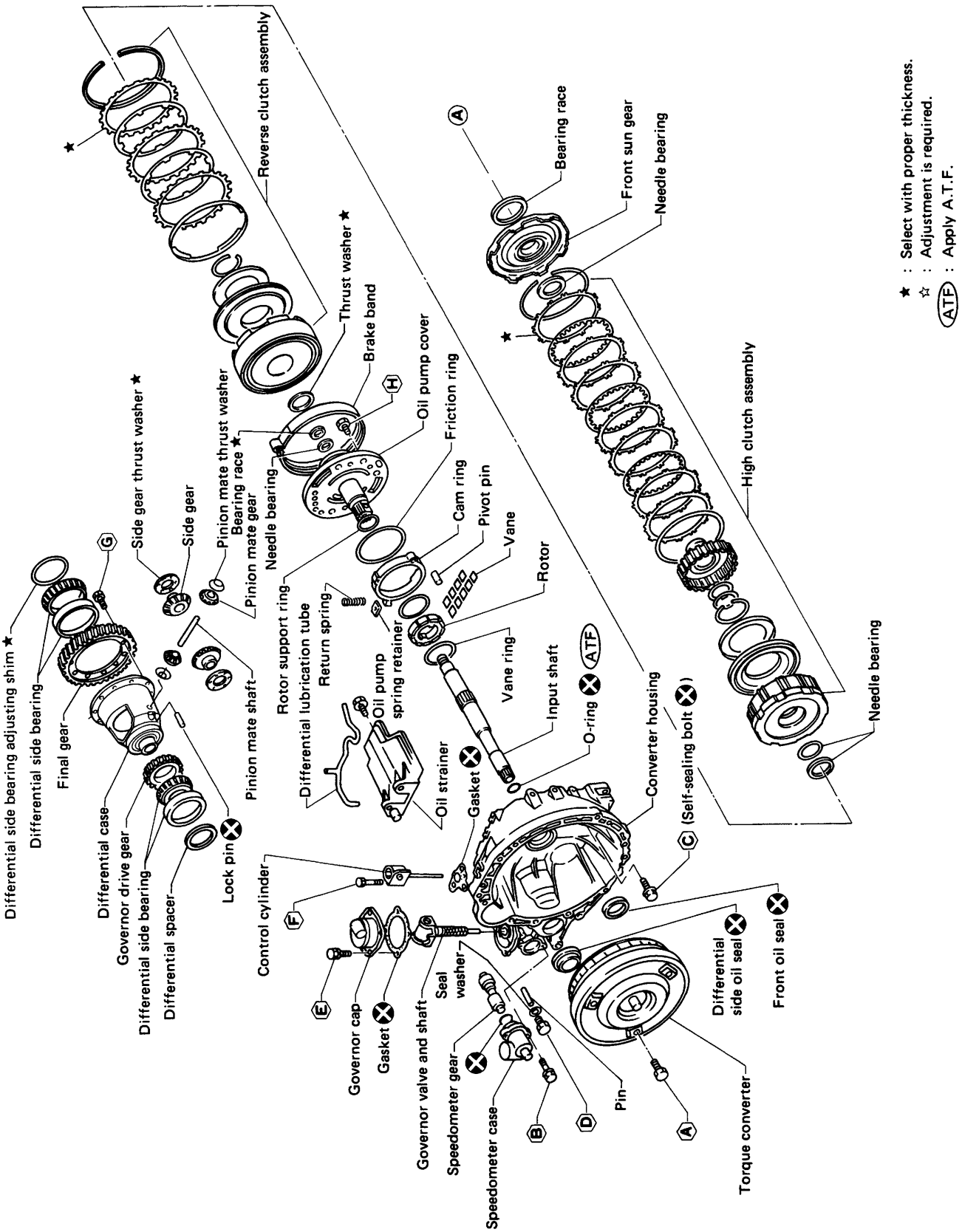
- After converter is installed, rotate crankshaft several turns and check to be sure that transaxle rotates freely without binding.
- Adjust control cable and throttle wire. Refer to On-vehicle Service.
- Check inhibitor switch for operation.
- Check fluid level in transaxle.
- Move selector lever through all positions to be sure that transaxle operates correctly.

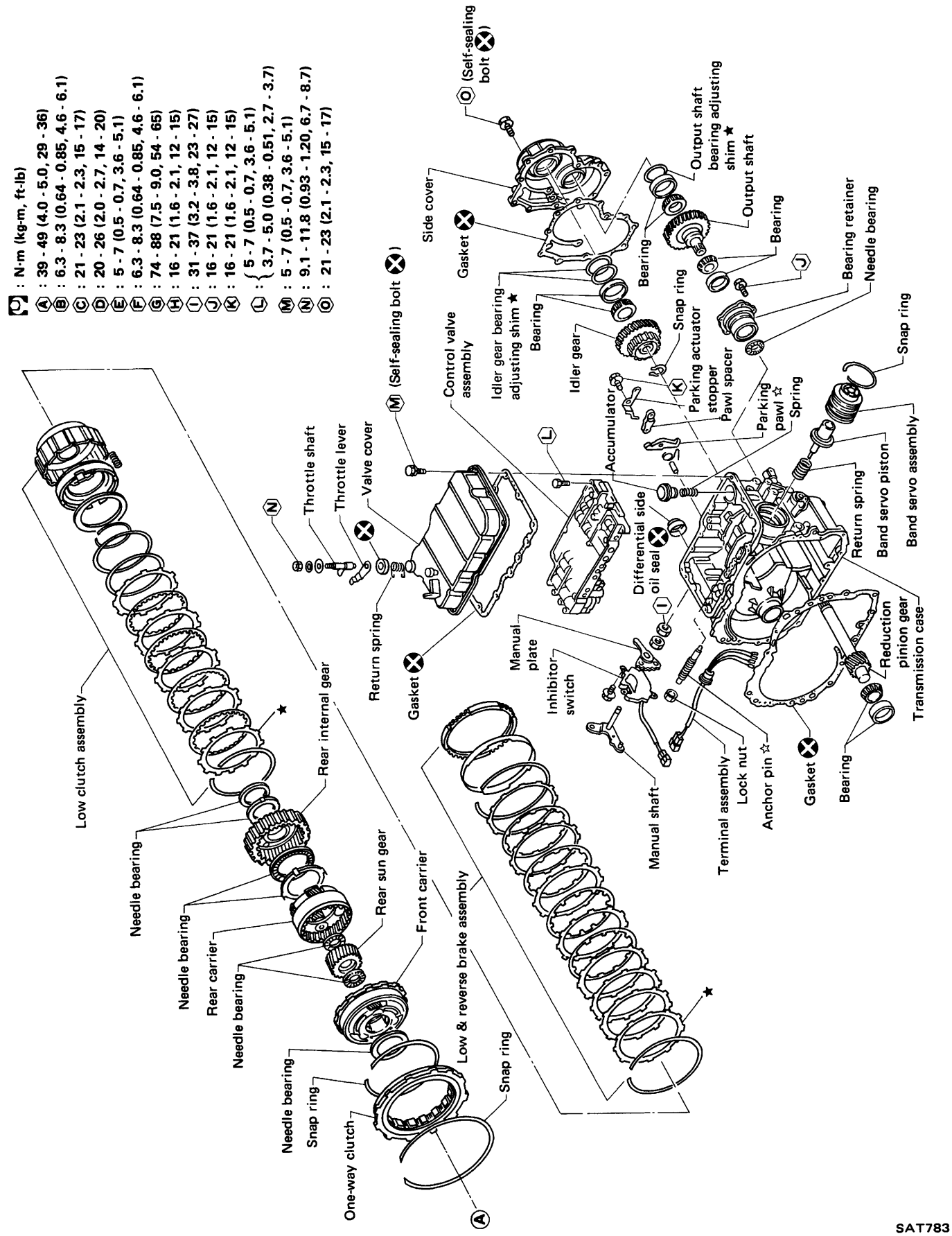
  With hand brake applied, rotate engine at idling. Without disturbing the above setting, move selector lever through "N" to "D", to "2", to "1" and to "R". A slight shock should be felt by hand gripping hand lever each time transaxle is shifted.
- Check to be sure that line pressure is correct. To do this, refer to Pressure Testing.
- Perform stall test.



1 Converter housing
2 Torque converter
3 Oil pump
4 Reverse clutch
5 High clutch
6 One-way clutch
7 Front planetary gear
8 Rear planetary gear
9 Low clutch
10 Control valve
11 Side cover
12 Reduction gear
13 Low & reverse brake
14 Band brake
15 Side gear
16 Pinion mate shaft
17 Pinion mate gear
18 Differential side bearing

SAT768

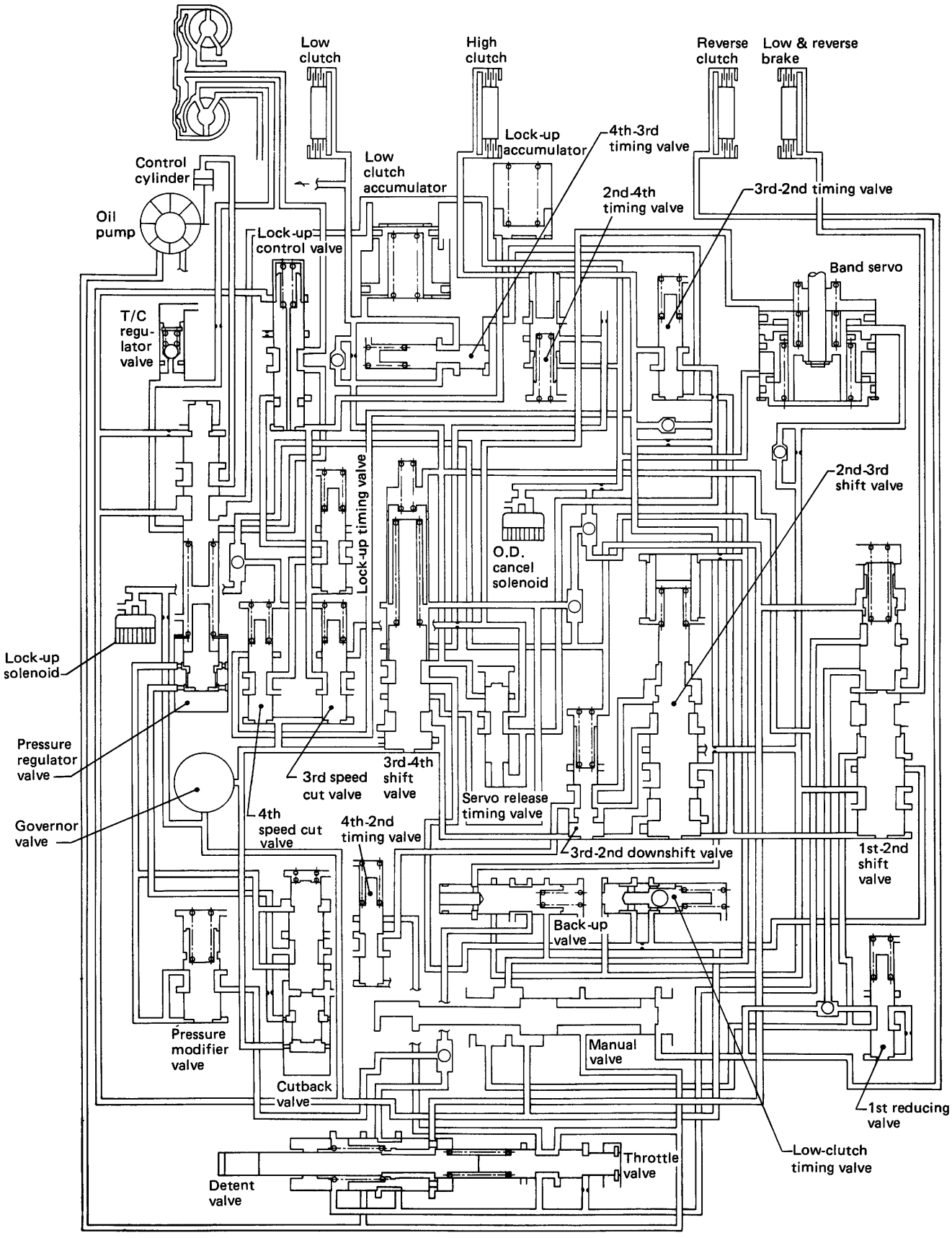

Differential side bearing adjusting shim ★
Differential side bearing
Final gear
Differential case
Governor drive gear
Differential side bearing
Differential spacer
Lock pin ⊗
Side gear thrust washer ★
Side gear
Pinion mate thrust washer
Pinion mate bearing race ★
Pinion mate gear
Pinion mate shaft
Reverse clutch assembly
Thrust washer ★
Brake band
Needle bearing
Rotor support ring
Differential lubrication tube
Return spring
Oil pump spring retainer
Oil pump cover
Friction ring
Cam ring
Pivot pin
Vane
Rotor
Vane ring
Input shaft
O-ring ⊗ (ATF)
Oil strainer
Gasket ⊗
Converter housing
(Self-sealing bolt ⊗)
Control cylinder
Governor cap
Gasket ⊗
Governor valve and shaft
Seal washer
Speedometer gear ⊗
Speedometer case
Pin
Differential side oil seal ⊗
Front oil seal ⊗
Torque converter
Bearing race
Front sun gear
Needle bearing
High clutch assembly
Needle bearing
★ : Select with proper thickness.
☆ : Adjustment is required.
(ATF) : Apply A.T.F.


: N·m (kg-m, ft-lb)
Ⓐ : 39 - 49 (4.0 - 5.0, 29 - 36)
Ⓑ : 6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
Ⓒ : 21 - 23 (2.1 - 2.3, 15 - 17)
Ⓓ : 20 - 26 (2.0 - 2.7, 14 - 20)
Ⓔ : 5 - 7 (0.5 - 0.7, 3.6 - 5.1)
Ⓕ : 6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
Ⓖ : 74 - 88 (7.5 - 9.0, 54 - 65)
Ⓗ : 16 - 21 (1.6 - 2.1, 12 - 15)
Ⓘ : 31 - 37 (3.2 - 3.8, 23 - 27)
Ⓙ : 16 - 21 (1.6 - 2.1, 12 - 15)
Ⓚ : 16 - 21 (1.6 - 2.1, 12 - 15)
Ⓛ : 5 - 7 (0.5 - 0.7, 3.6 - 5.1)
3.7 - 5.0 (0.38 - 0.51, 2.7 - 3.7)
Ⓜ : 5 - 7 (0.5 - 0.7, 3.6 - 5.1)
Ⓝ : 9.1 - 11.8 (0.93 - 1.20, 6.7 - 8.7)
Ⓞ : 21 - 23 (2.1 - 2.3, 15 - 17)
Low clutch assembly
Needle bearing
Needle bearing
Rear carrier
Needle bearing
Needle bearing
Snap ring
One-way clutch
Rear internal gear
Rear sun gear
Front carrier
Low & reverse brake assembly
Snap ring
Ⓐ
Ⓝ
Throttle shaft
Throttle lever
Valve cover
Return spring
Gasket
Ⓜ (Self-sealing bolt)
Control valve assembly
Gasket
Side cover
Ⓞ (Self-sealing bolt)
Idler gear bearing adjusting shim ★
Bearing
Idler gear
Ⓛ
Accumulator
Manual plate
Inhibitor switch
Differential side oil seal
Ⓘ
Manual shaft
Terminal assembly
Lock nut
Anchor pin ☆
Gasket
Bearing
Transmission case
Reduction pinion gear
Bearing
Output shaft bearing adjusting shim ★
Output shaft
Bearing
Ⓙ
Bearing retainer
Needle bearing
Snap ring
Band servo assembly
Band servo piston
Return spring
Parking pawl ☆
Spring
Ⓚ
Parking actuator
Pawl spacer
Snap ring

SAT783

Hydraulic Control Circuits

Oil pressure circuit diagram



SAT418A

Mechanical Operation

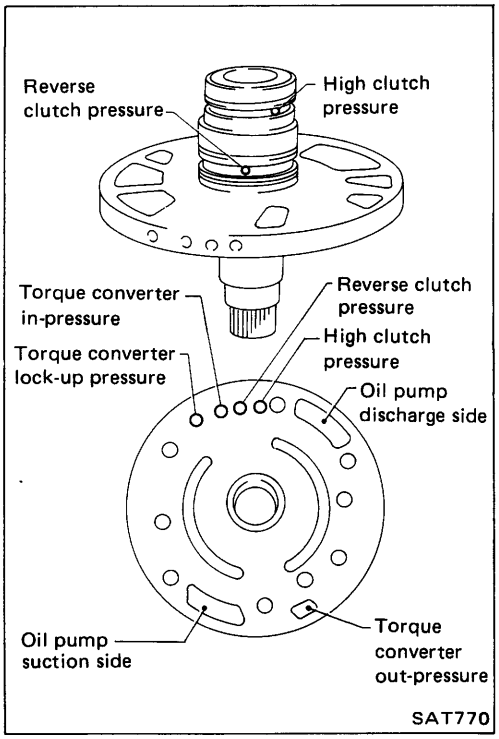
Range		Gear ratio	Reverse clutch	High clutch	Low clutch	Band servo		Low & reverse brake	One-way clutch	Parking pawl	Lock-up
						Operation	Release				
Park		–								on	
Reverse		2.272	on					on			
Neutral		–									
Drive	D_1 Low	2.785			on				on		
	D_2 Second	1.545			on	on					
	D_3 Top (3rd)	1.000		on	on	(on)	on				on*1
	D_4 O.D. (4th)	0.694		on		on					on*2
2	2_1 Low	2.785			on				on		
	2_2 Second	1.545			on	on					
1	1_1 Low	2.785			on			on	on		
	1_2 Second	1.545			on	on					

*1: Lock-up operates in 3rd speed (lock-up) range when O.D. control switch is "OFF" (Overdrive not allowed).
*2: Lock-up operates in 4th speed (lock-up) range when O.D. control switch is "ON" (Overdrive allowed).

Oil Channel

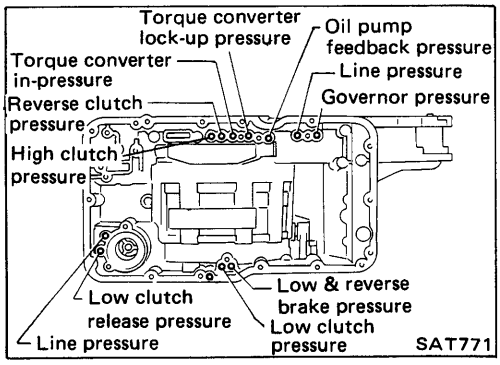
Oil channels which connect components are located in areas shown below.

OIL CHANNELS IN OIL PUMP COVER

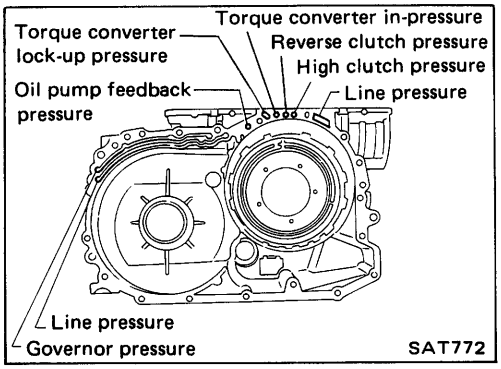


OIL CHANNELS IN TRANSMISSION CASE

Control valve attaching side

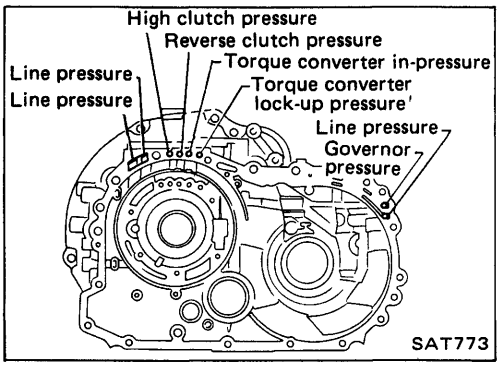


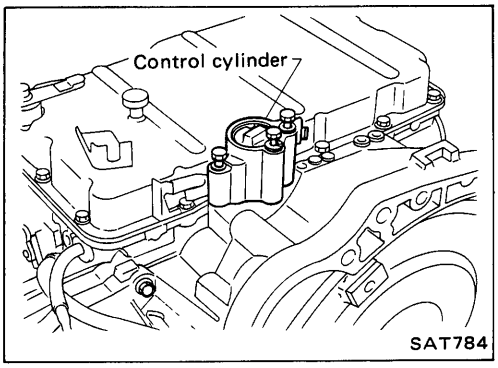
Converter housing attaching side



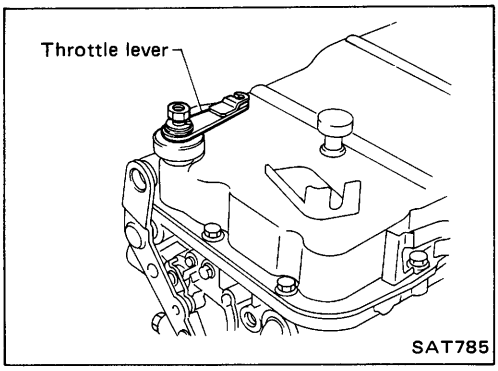
Oil Channel (Cont'd)

OIL CHANNELS IN CONVERTER HOUSING

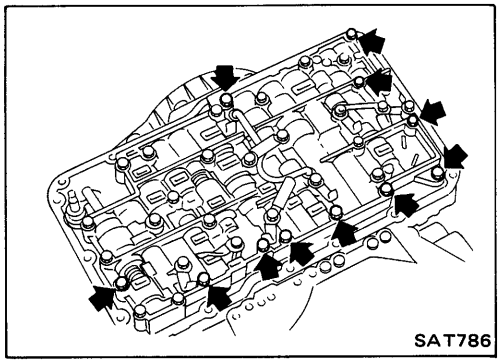




1. Drain A.T.F.
2. Remove torque converter.
3. Remove control cylinder.



4. Remove throttle lever and valve cover.

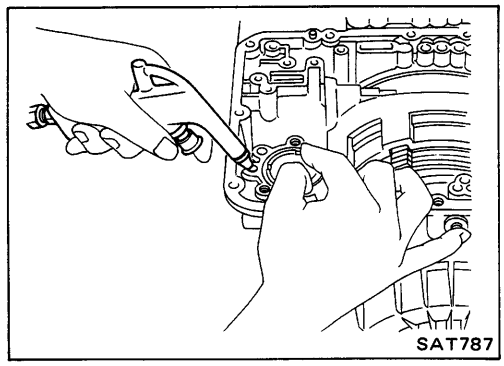


5. Disconnect harness connectors on control valve and remove control valve assembly.

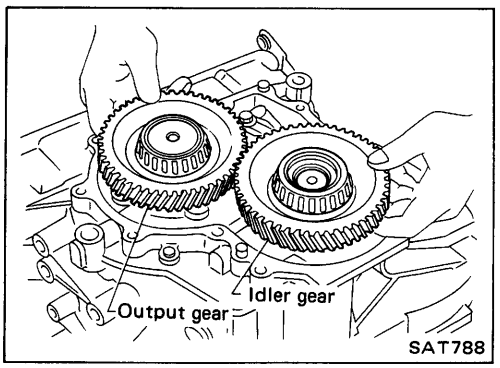
6. Remove terminal assembly.

CAUTION:

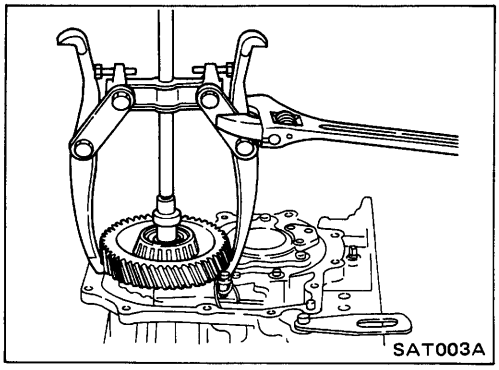
The terminal retrieving hooks will break if they are forced inward too far. Bend them gently inward while pulling carefully outward on the terminal. Do not pull on the wires.



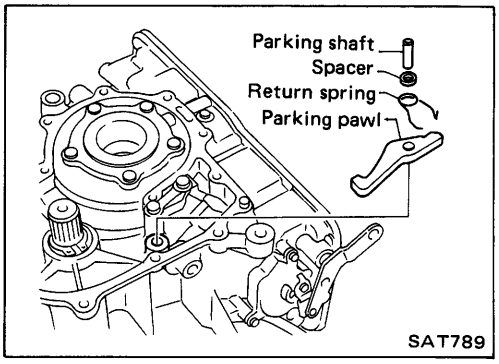
7. Remove throttle shaft and its return spring.
8. Remove accumulator.



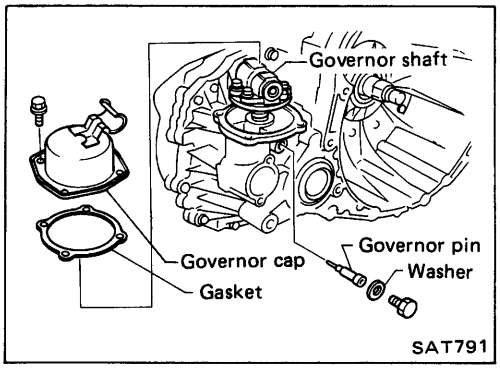
9. Remove side cover.
10. Remove output gear.



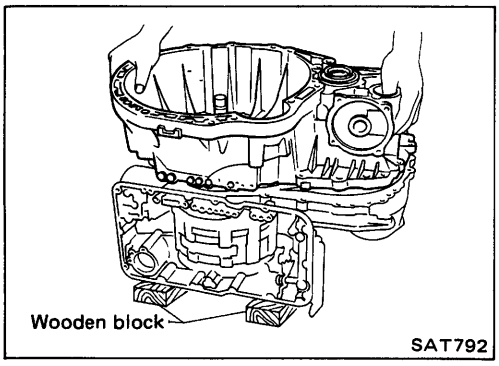
11. Draw out idler gear.



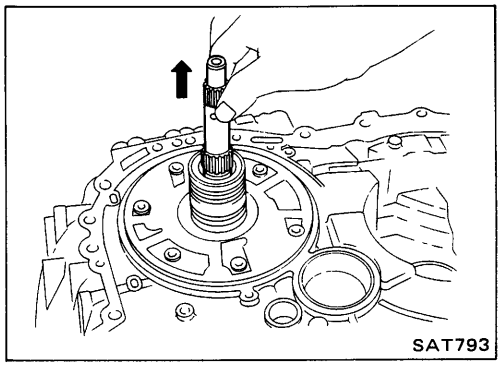
12. Remove parking pawl, return spring, pawl shaft and spacer.



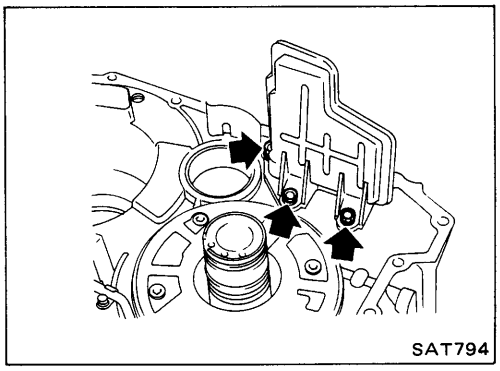
13. Remove speedometer case and speedometer gear.
14. Remove governor cap and pin, then draw out governor shaft assembly.



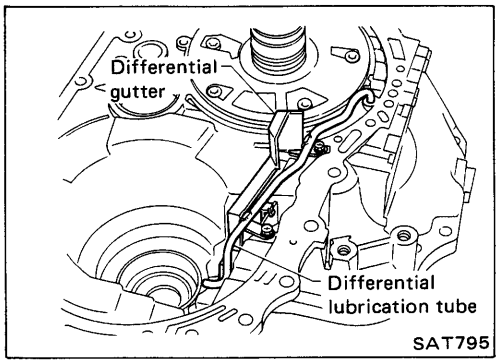
15. Put transmission assembly on wooden block and remove converter housing.


SAT793

16. Remove final drive assembly and reduction pinion gear.
17. After removing O-ring from input shaft, extract input shaft from converter housing.

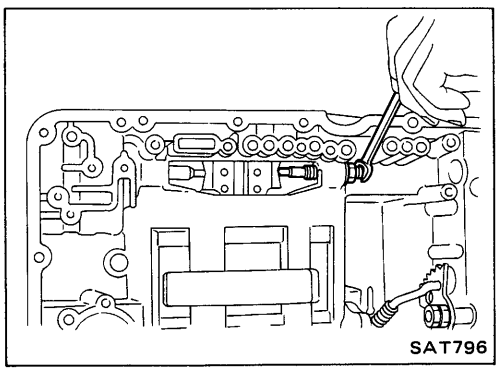

SAT794

18. Remove oil strainer.

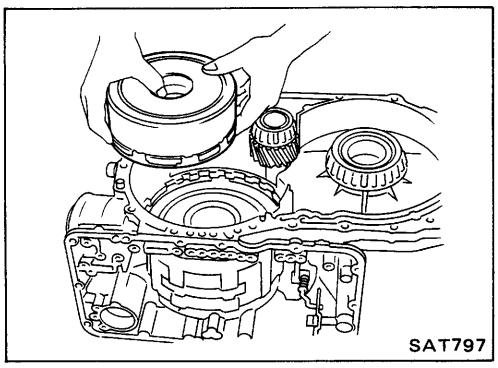


SAT795

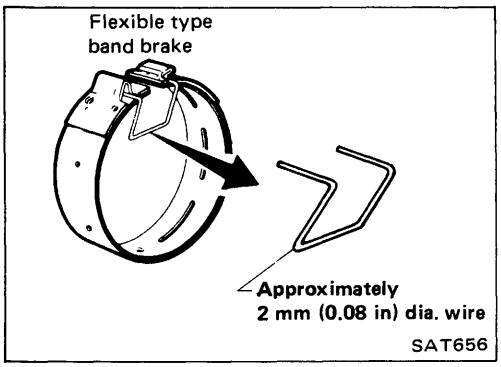
19. Remove diff. lubrication tube and diff. gutter.


SAT796

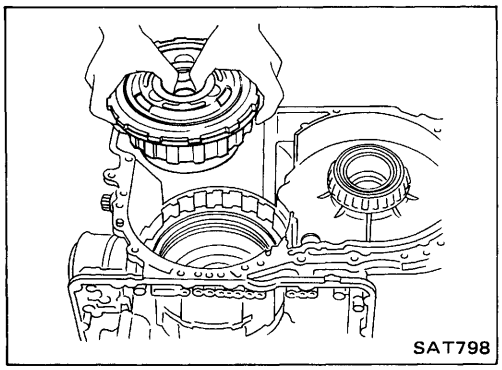
20. Loosen band brake stem lock nut, then back off piston stem.


SAT797

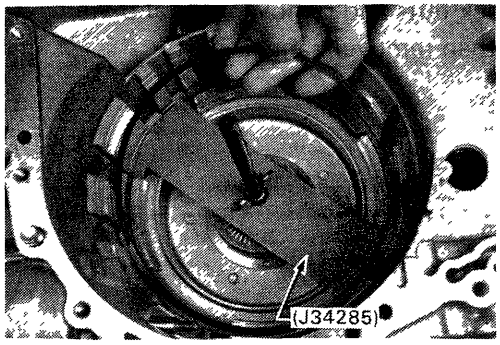
21. Remove brake band and high clutch & reverse clutch pack.



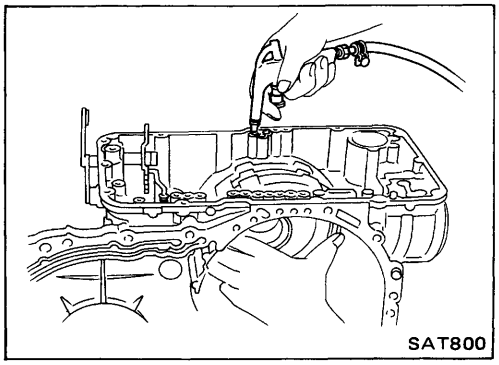
To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. Before removing the brake band, always secure it with a clip as shown in the figure at left.
Leave the clip in position after removing the brake band.



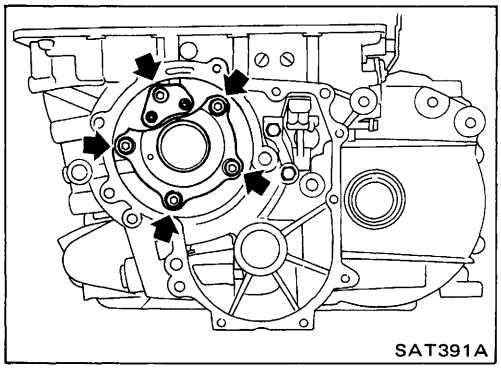
22. Remove one-way clutch, front carrier, rear carrier and low clutch as a set.



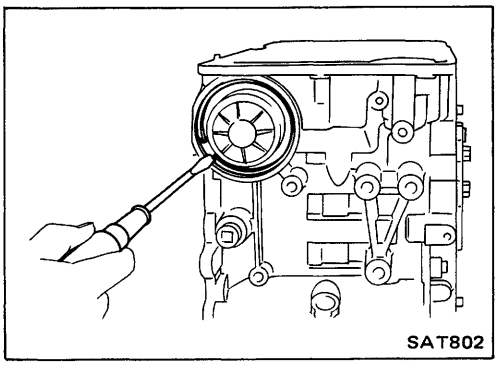
23. Remove low & reverse brake clutches, and detach low & reverse brake retainer snap ring pushing retainer.



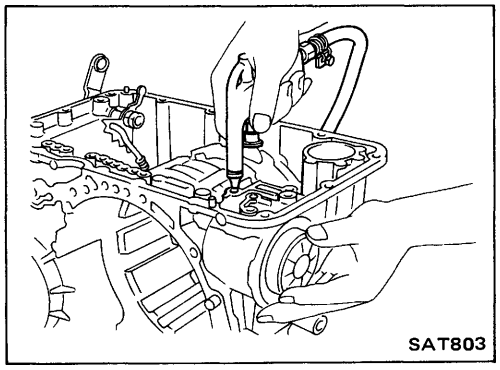
24. Remove low and reverse brake piston with compressed air.



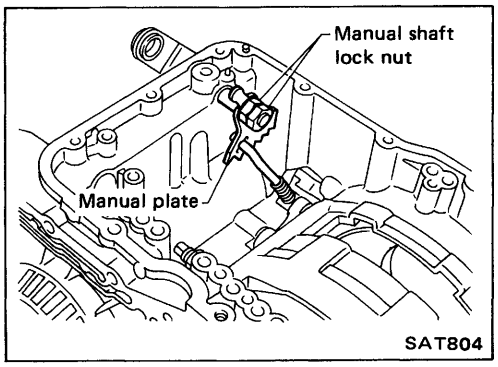
25. Remove bearing retainer assembly.


SAT802

26. Remove band servo snap ring.


SAT803

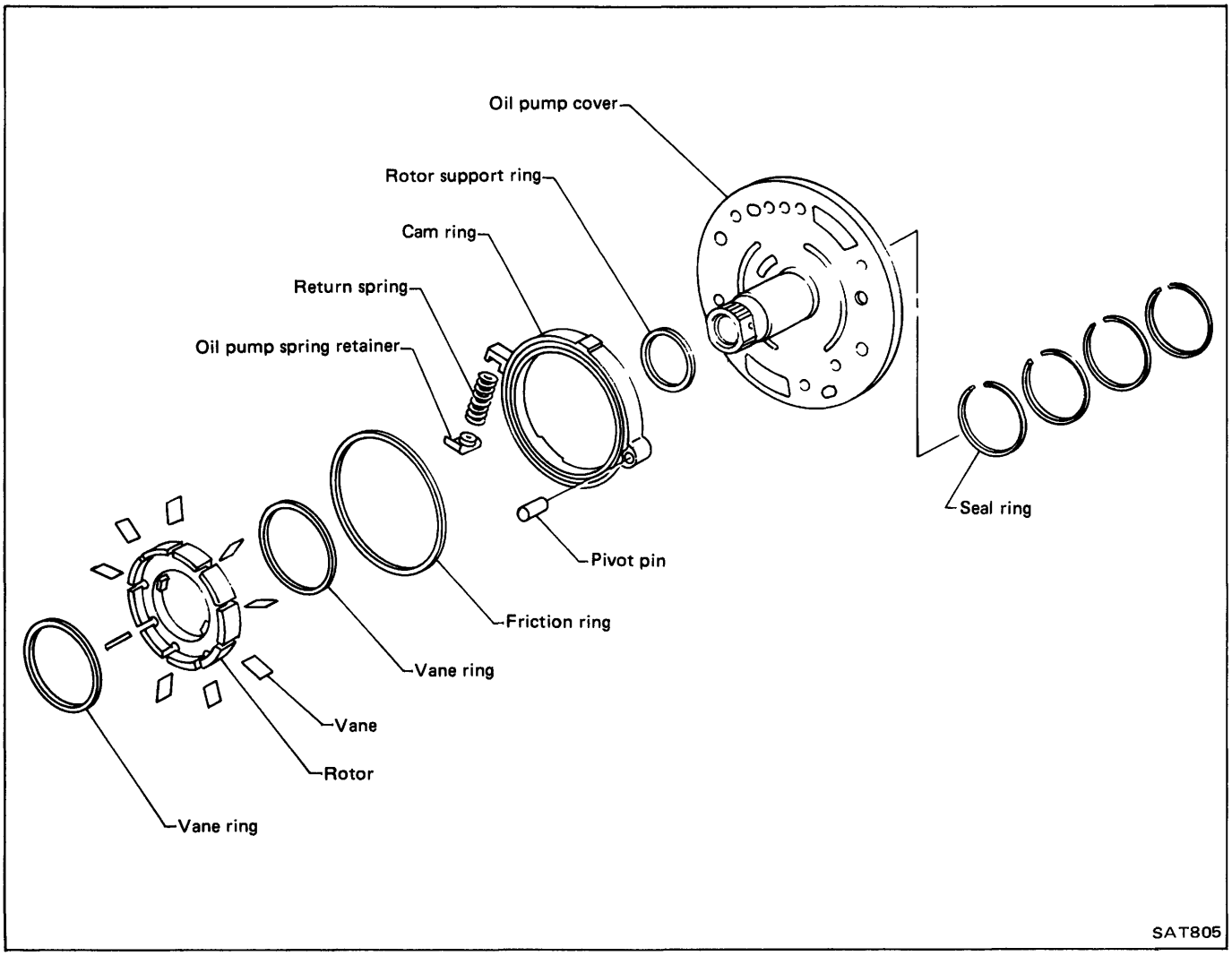
27. Remove band brake servo, retainer and return spring.

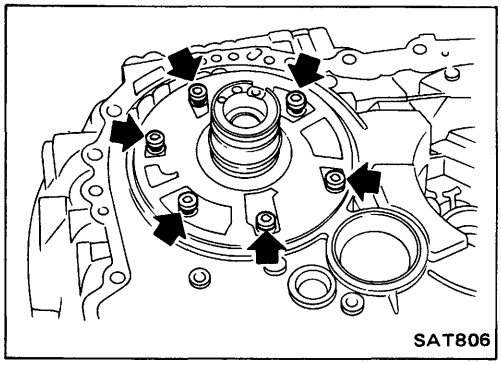


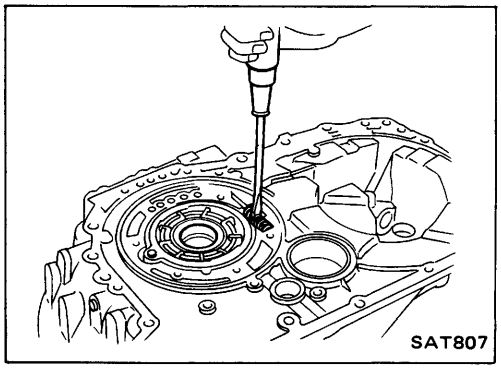
SAT804

28. Loosen manual shaft lock nuts and remove manual plate.
29. Pull out retaining pin, then remove manual shaft.

Oil Pump







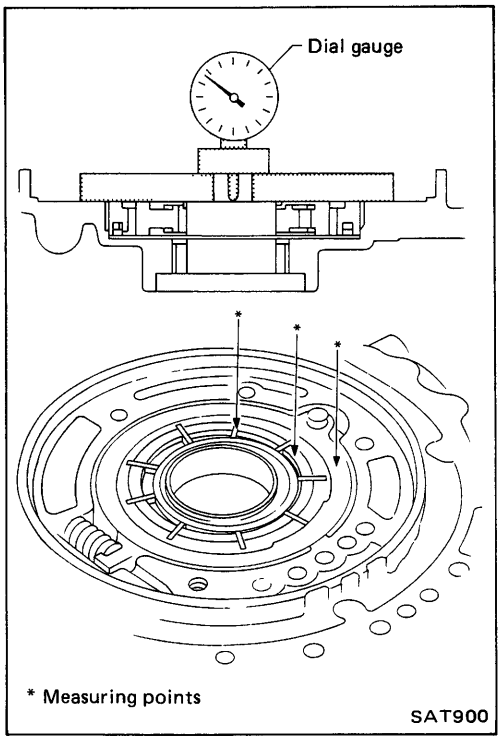
DISASSEMBLY

1. Remove oil pump cover.

2. Remove cam ring spring taking care not to damage converter housing.

Oil Pump (Cont'd)

INSPECTION

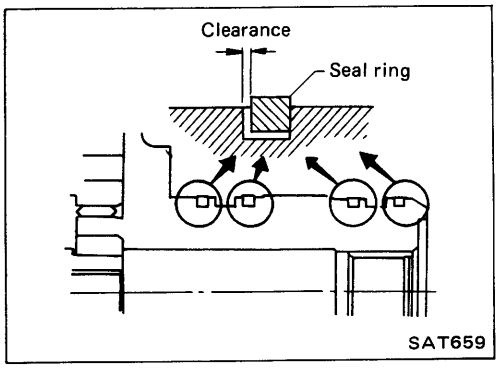


1. Inspect oil pump cover, cam ring, rotor and vanes for damage and visible wear.
2. Measure clearance between clutch housing and cam ring, rotor and vanes in at least four places along their circumstances. The maximum measured value should be within the specified range.

   Be sure to remove friction ring and vane ring when measuring clearance.

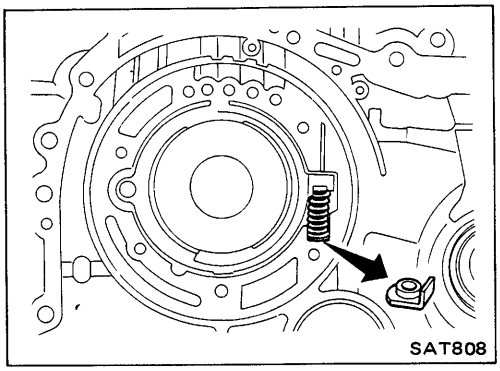
   Standard clearance:
   0.010 - 0.024 mm (0.0004 - 0.0009 in)
   Wear limit:
   0.034 mm (0.0013 in)

   If the clearance is out of above specification, replace oil pump as an assembly.



3. Measure clearance between seal ring and ring groove.

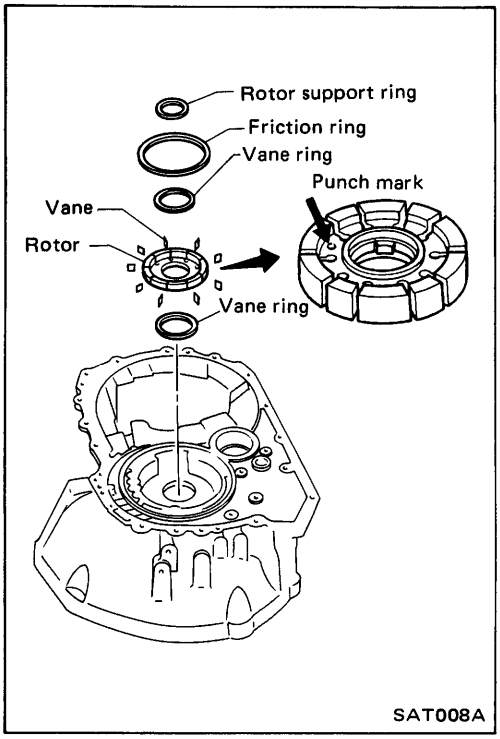
   Standard clearance:
   0.10 - 0.25 mm (0.0039 - 0.0098 in)
   Wear limit:
   0.25 mm (0.0098 in)



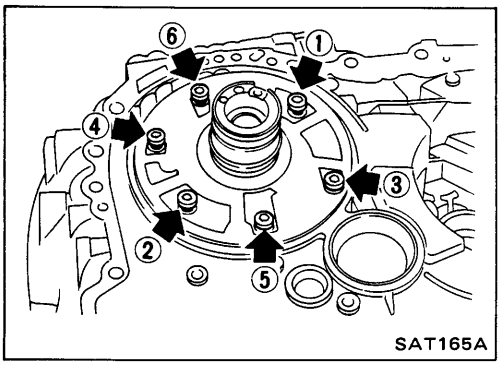
ASSEMBLY

1. Install cam ring, oil pump spring retainer and cam ring spring paying attention to the direction of the retainer.

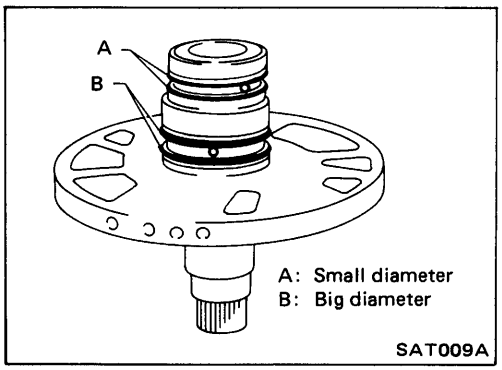
Oil Pump (Cont'd)



2. Assemble rotor, vanes, friction ring, rotor support ring and vane rings.
   Pay attention to direction of rotor.



3. Install oil pump cover.
   Tighten down cover evenly in a criss-cross type pattern.



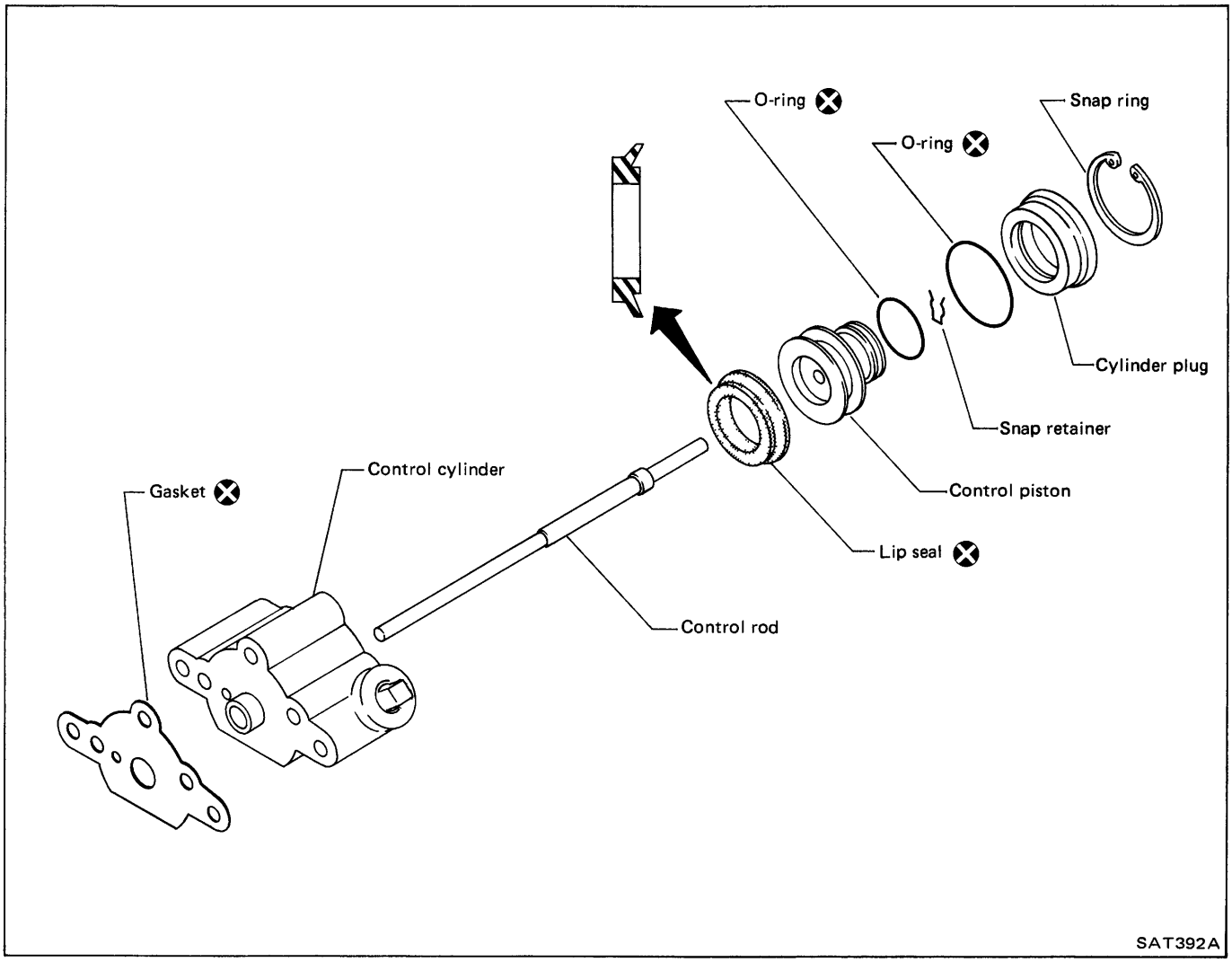
4. Rotate the pump when it has been assembled to ensure that all parts have been correctly assembled.
5. Install seal rings.

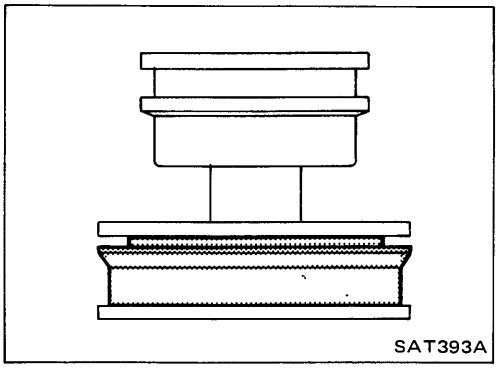
Refer to the figure at left for proper locations of the two different types of seal rings.

CAUTION:

These seal rings can be cut or deformed if they are improperly seated in their grooves when the drum is installed. Clean the ring grooves carefully and fill them with petroleum jelly. Then install the rings making sure they fit into the grooves as tightly as possible.

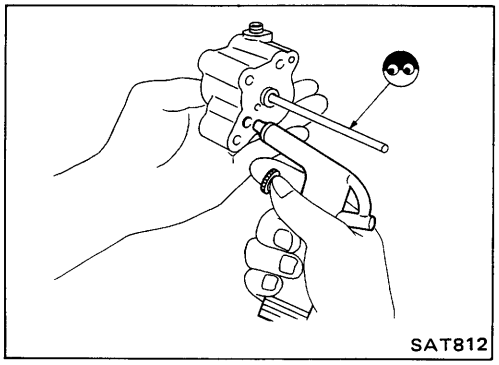
Control Cylinder





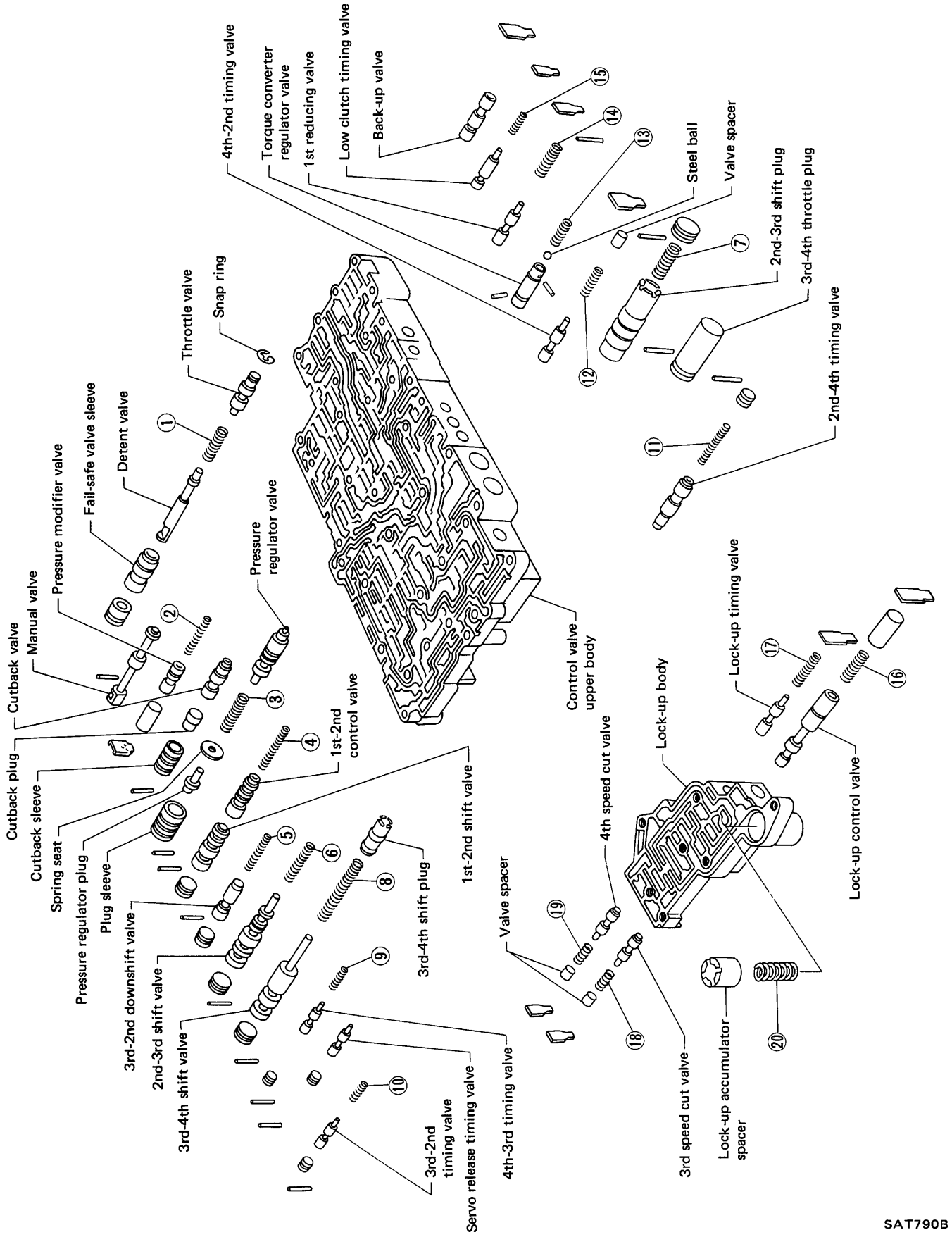
INSPECTION AND ASSEMBLY

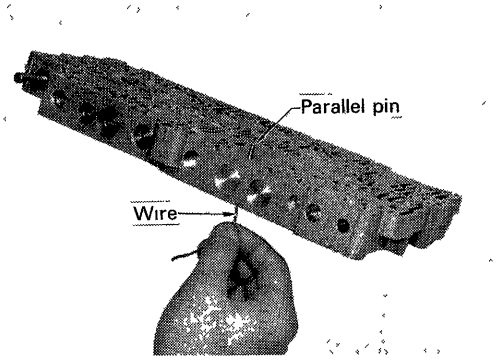
- Inspect control cylinder body, control piston and cylinder plug for scratches or damage. Replace if necessary.
- When assembling, pay attention to the direction of lip seal.



- After assembling, check the operation.

Control Valve Body





Control Valve Body (Cont'd)

DISASSEMBLY

During valve body separation, do not lose the 9 steel balls on valve body.

Manual valve was removed when valve body was removed from transaxle. Include valve in subsequent inspection and service sequence.

INSPECTION

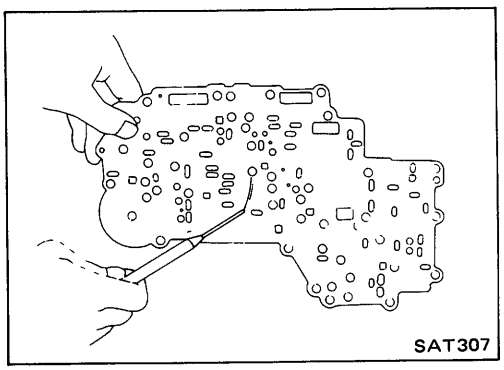
A newly manufactured valve body represents precision manufactured valves assembled with close tolerances into precision bores of the valve body. If inspection reveals excessive clearances, 0.03 mm (0.0012 in) or more, between the valves and the valve body bores, replace the entire valve body rather than attempt rework.

If one or more valves are sticking from varnish deposits or burns resulting from deteriorated oil or overheating, you may be able to clean the valves and valve bodies. Always use crocus cloth, which is a very fine type of cutting material. Never use emery cloth, as it is too coarse and can scratch the valves or valve bores. Scratches can lead to future deposits of varnish or foreign matter. During cleaning, do not remove the sharp edges of the valve. When edges are rounded or scratched, entry is provided for dirt or foreign matter to work into the sides of the valves and hinder valve movement.

The valves may be cleaned using alcohol or lacquer thinner. The valve bodies can be dip cleaned with a good carburetor cleaner or lacquer thinner. Do not leave valve bodies submerged in carburetor cleaner longer than five minutes. Rinse parts thoroughly and dry.

Lubricate all parts in clean A.T.F. before reassembly.

1. Check valves for signs of burning. Replace if beyond clean-up.



2. Check separator plate for scratches or damage. Replace if necessary. Scratches or score marks can cause oil to by-pass correct oil passages and result in system malfunction.

Control Valve Body (Cont'd)

3. Check oil passages in upper and lower valve bodies for varnish deposits, scratches or other damage that would impair valve movement. Check threaded holes and related bolts and screws for stripped threads; replace as needed.
4. Check valve springs for damage. Measure free length of valve springs. If the free length is out of specification, replace it. Numbers of each valve spring listed in table below are the same as those in the figure on page AT-47.

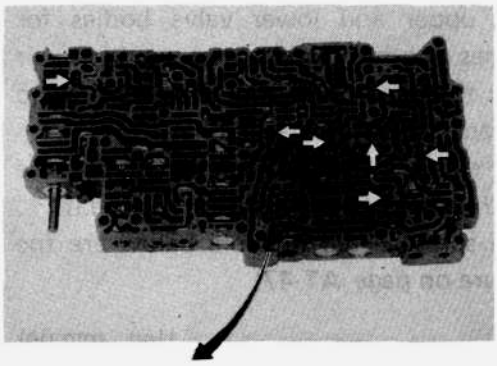
Unit: mm (in)

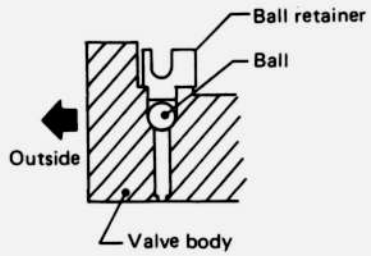
Valve spring	Free length	Outer diameter
① Throttle valve	33.75 (1.3287)	9.10 (0.3583)
② Pressure modifier valve	44.60 (1.7559)	7.20 (0.2835)
③ Pressure regulator valve	40.20 (1.5827)	10.20 (0.4016)
④ 1st-2nd shift valve	50.10 (1.9724)	6.60 (0.2598)
⑤ 3rd-2nd downshift valve	42.00 (1.6535)	6.60 (0.2598)
⑥ 2nd-3rd shift valve	42.70 (1.6811)	8.90 (0.3504)
⑦ 2nd-3rd shift plug	39.50 (1.5551)	8.70 (0.3425)
⑧ 3rd-4th shift valve	70.50 (2.7756)	9.20 (0.3622)
⑨ 4th-3rd timing valve	29.70 (1.1693)	7.00 (0.2756)
⑩ 3rd-2nd timing valve	21.40 (0.8425)	6.75 (0.2657)
⑪ 2nd-4th timing valve	34.00 (1.3386)	4.95 (0.1949)
⑫ 4th-2nd timing valve	20.60 (0.8110)	6.75 (0.2657)
⑬ 1st reducing valve	26.40 (1.0394)	6.75 (0.2657)
⑭ Torque converter regulator valve	27.00 (1.0630)	6.25 (0.2461)
⑮ Low clutch timing valve	29.70 (1.1693)	7.00 (0.2756)
⑯ Lock-up control valve	36.00 (1.4173)	5.95 (0.2343)
⑰ Lock-up timing valve	29.70 (1.1693)	7.00 (0.2756)
⑱ 3rd speed cut valve	21.70 (0.8543)	6.65 (0.2618)
⑲ 4th speed cut valve	23.10 (0.9094)	7.30 (0.2874)
⑳ Lock-up accumulator	41.80 (1.6457)	13.50 (0.5315)

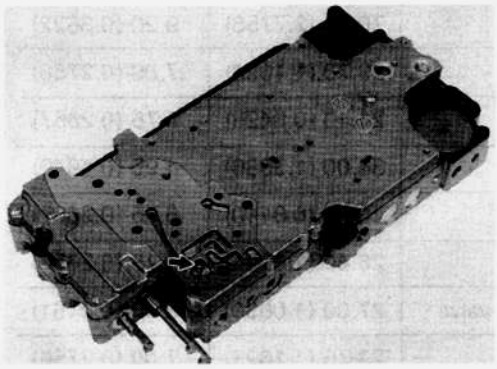
Control Valve Body (Cont'd)

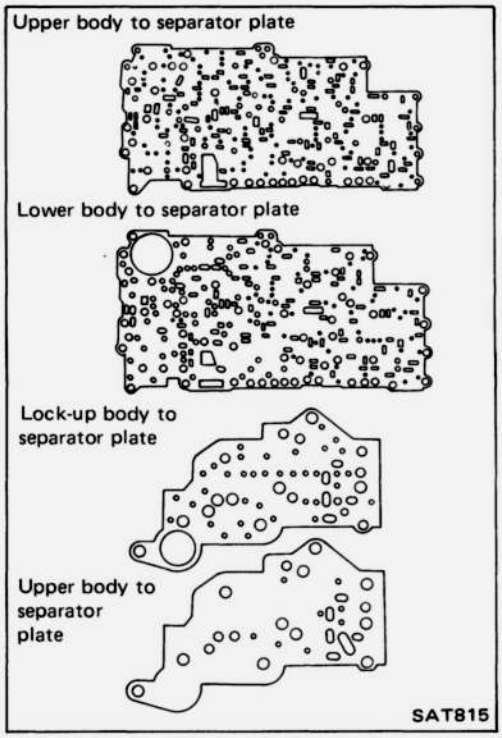
ASSEMBLY

1. Reinstall steel balls in valve body.





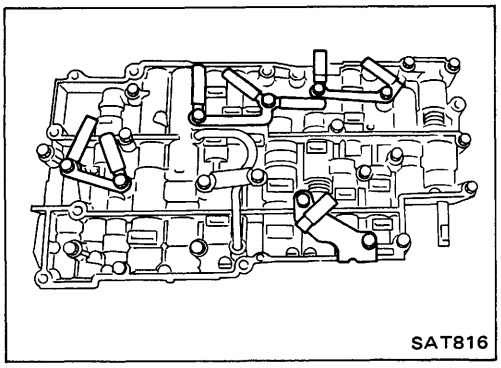




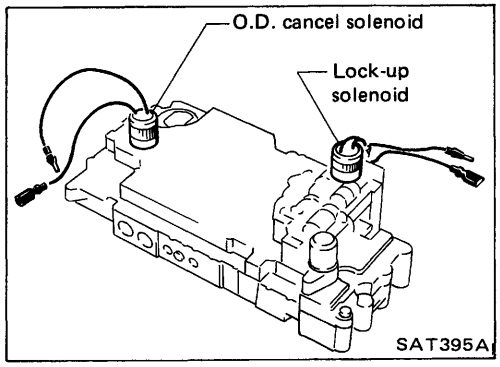
2. Assemble separator plate and lower valve body on upper valve body and lock-up body.

- **Dip gasket in A.T.F. before installation.**
- **Pay attention to the position of gaskets.**

Control Valve Body (Cont'd)


SAT816

- **When installing these bolts, first be sure to install the two reamer bolts to their original positions.**
- **Pay attention to the position of harness clamps when installing control valve bolts.**

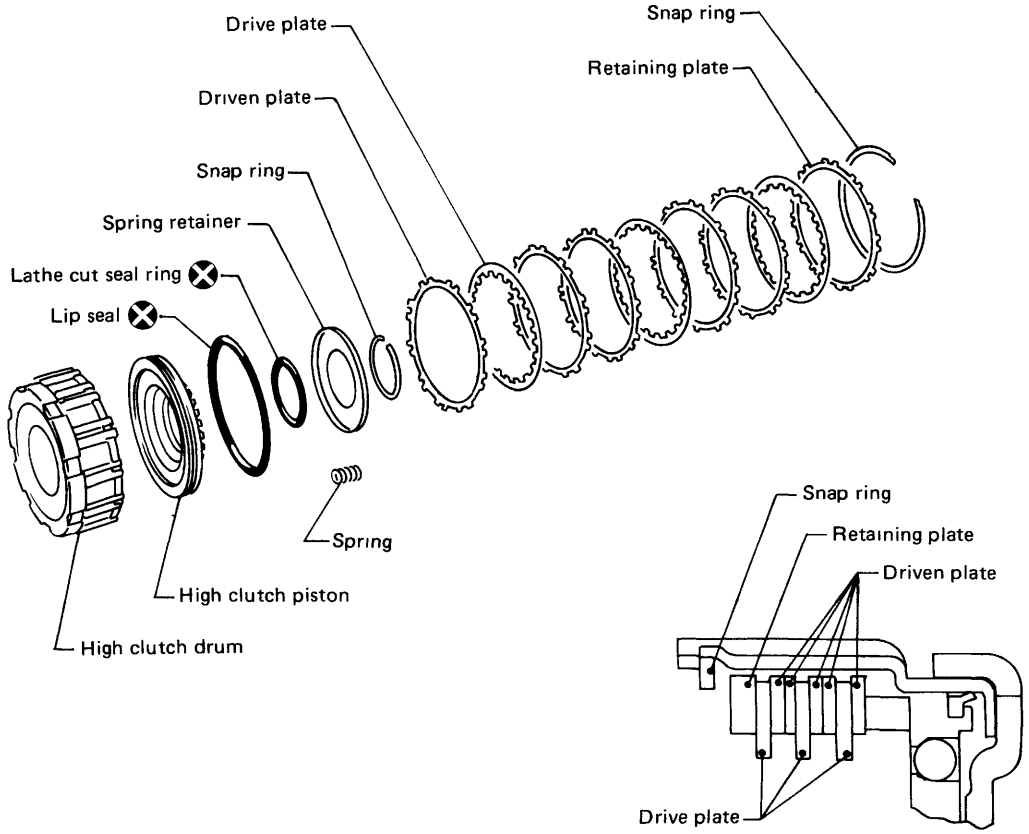


SAT395A

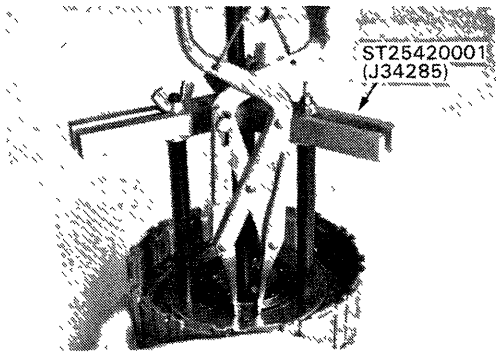
3. Install lock-up solenoid and O.D. cancel solenoid.

High Clutch

In regard to the number of clutch sheets (drive plate and driven plate), refer to S.D.S.

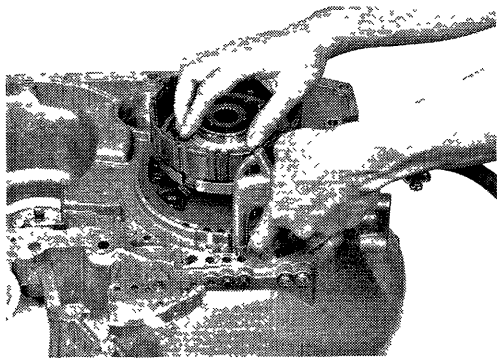


SAT362A



DISASSEMBLY

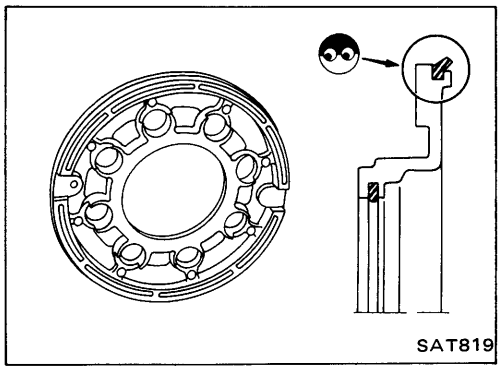
- Compress clutch springs and remove snap ring from spring retainer.



- Place clutch drum onto oil pump, and withdraw clutch piston with compressed air.

High Clutch (Cont'd)

INSPECTION AND ASSEMBLY



1. Check clutch drive plate facing for wear or damage. Drive plate thickness must not be less than 1.8 mm (0.071 in).

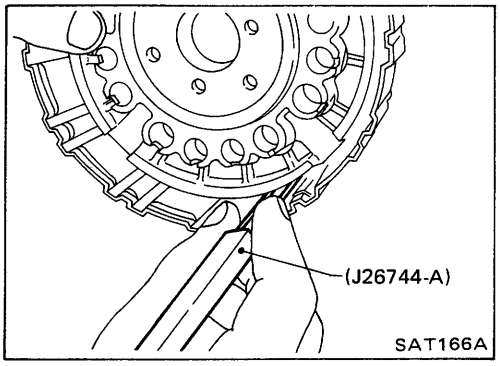
Standard drive plate thickness:
1.6 mm (0.063 in)

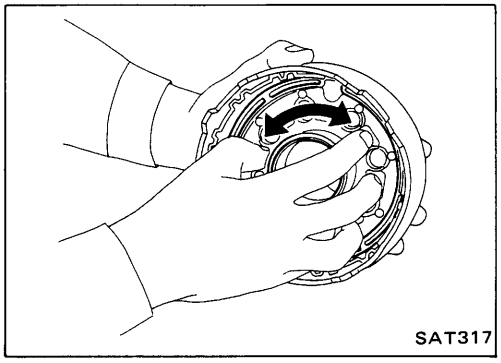
2. Check for wear on snap ring, weak or broken coil springs, and warped spring retainer.
3. Lubricate clutch drum bushing, and install inner seal and piston seal as illustrated. Be careful not to stretch seals during installation.

- Never assemble clutch dry; always lubricate its components thoroughly.
- Always install piston seal in direction shown in figure at left.

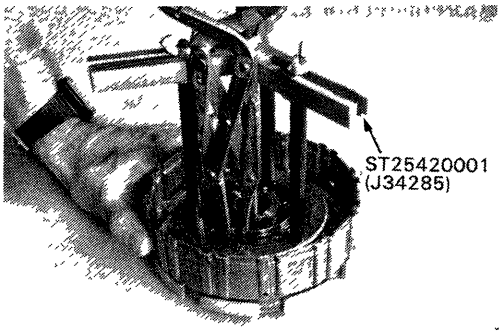
4. Assemble piston, being careful not to allow seal to kink or become damaged during installation.

Use Tool, which does not damage lip seal, to make sure the lip seal goes into place.

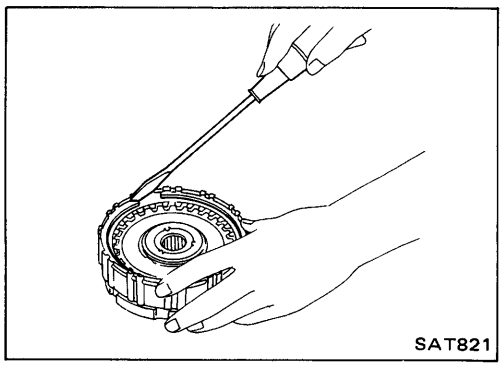




After installing piston, turn piston by hand to ensure that there is no binding.

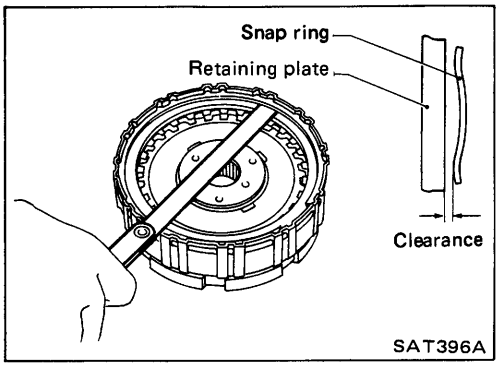


5. Install clutch springs.
6. Reinstall snap ring. Be sure snap ring is properly seated.



7. Install driven plates, drive plates, and secure with snap ring.

High Clutch (Cont'd)



8. Measure clearance between retaining plate and snap ring. Always measure the existing minimum clearance, since snap ring is a wave type.

Specified clearance:

Standard

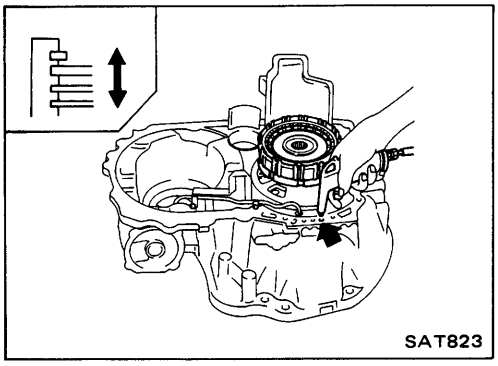
1.4 - 1.8 mm (0.055 - 0.071 in)

Allowable limit

2.4 mm (0.094 in)

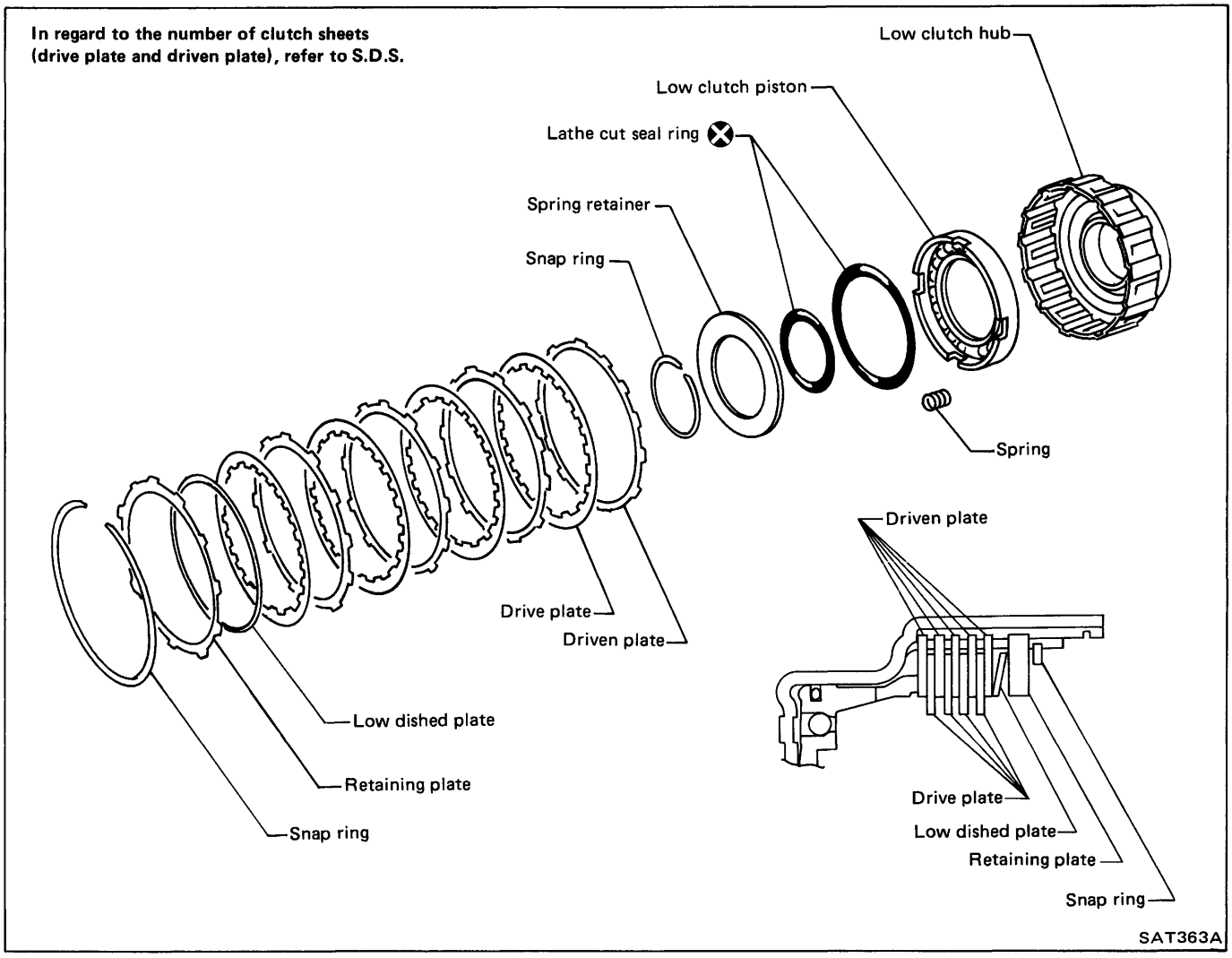
Retaining plate of high clutch

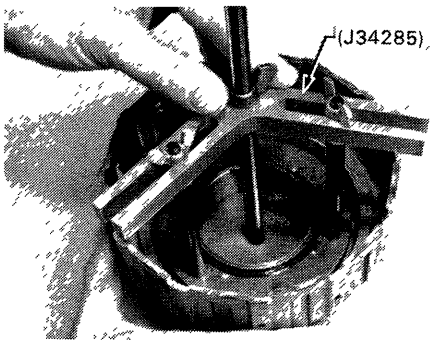
Thickness mm (in)	Part number
3.6 (0.142)	31567-21X00
3.8 (0.150)	31567-21X01
4.0 (0.157)	31567-21X02
4.2 (0.165)	31567-21X03
4.4 (0.173)	31567-21X04
4.6 (0.181)	31567-21X05
4.8 (0.189)	31567-21X06



9. Check high clutch operation using compressed air.

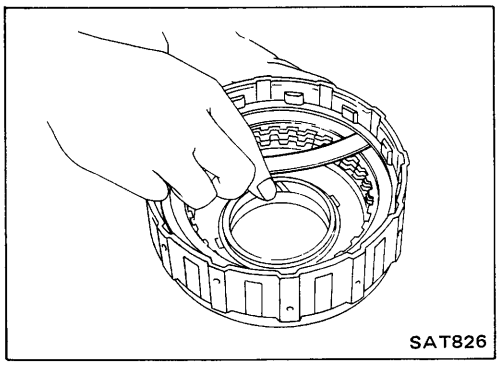
Low Clutch





- Use Tool to remove the clutch spring snap ring.

Low Clutch (Cont'd)


SAT826

Service procedures for low clutch are essentially the same as those for high clutch, with the following exception:

Specified clearance between retaining plate and snap ring:

Standard

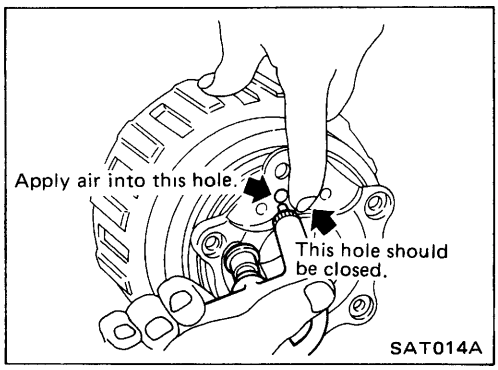
0.5 - 0.8 mm (0.020 - 0.031 in)

Allowable limit

1.6 mm (0.063 in)

Retaining plate of low clutch

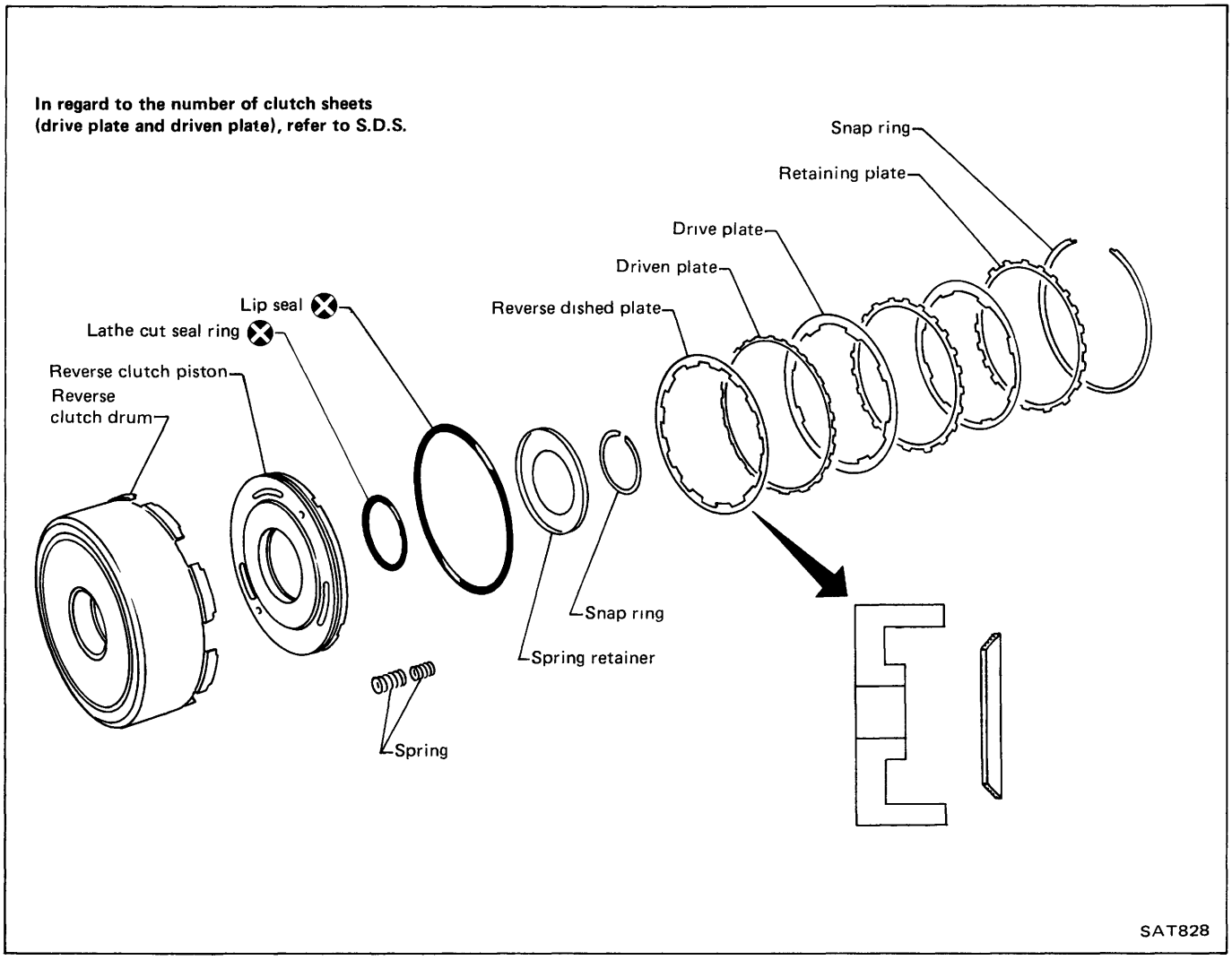
Thickness mm (in)	Part number
4.8 (0.189)	31597-21X00
5.0 (0.197)	31597-21X01
5.2 (0.205)	31597-21X02
5.4 (0.213)	31597-21X03
5.6 (0.220)	31597-21X04
5.8 (0.228)	31597-21X05
6.0 (0.236)	31597-21X06

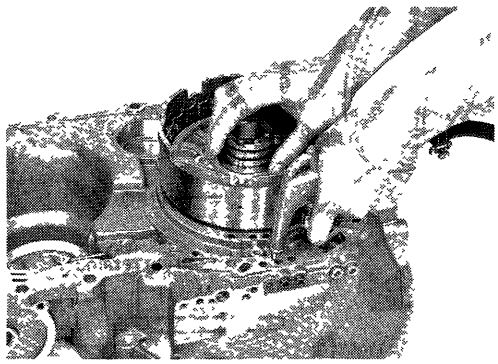


SAT014A

After assembly, check the operation of clutch.

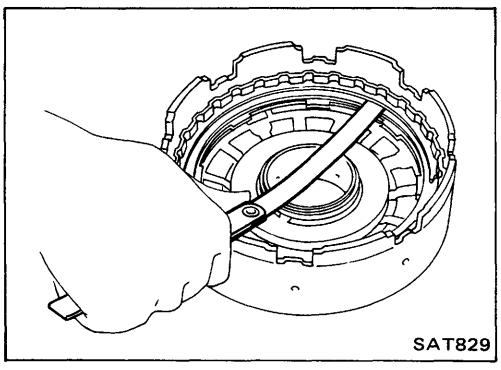
Reverse Clutch





Service procedures for reverse clutch are essentially the same as those for high clutch, with the following exception.

- Remove reverse clutch piston.



Specified clearance between retaining plate and snap ring:

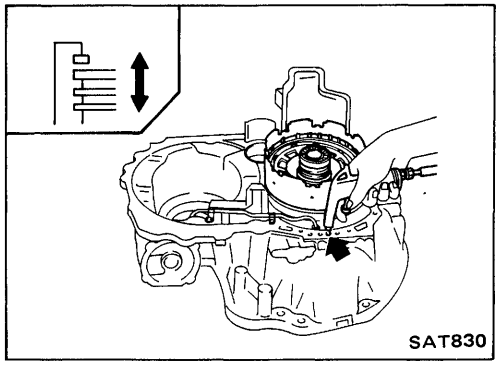
Standard

0.5 - 0.8 mm (0.020 - 0.031 in)

Allowable limit

1.2 mm (0.047 in)

Reverse Clutch (Cont'd)



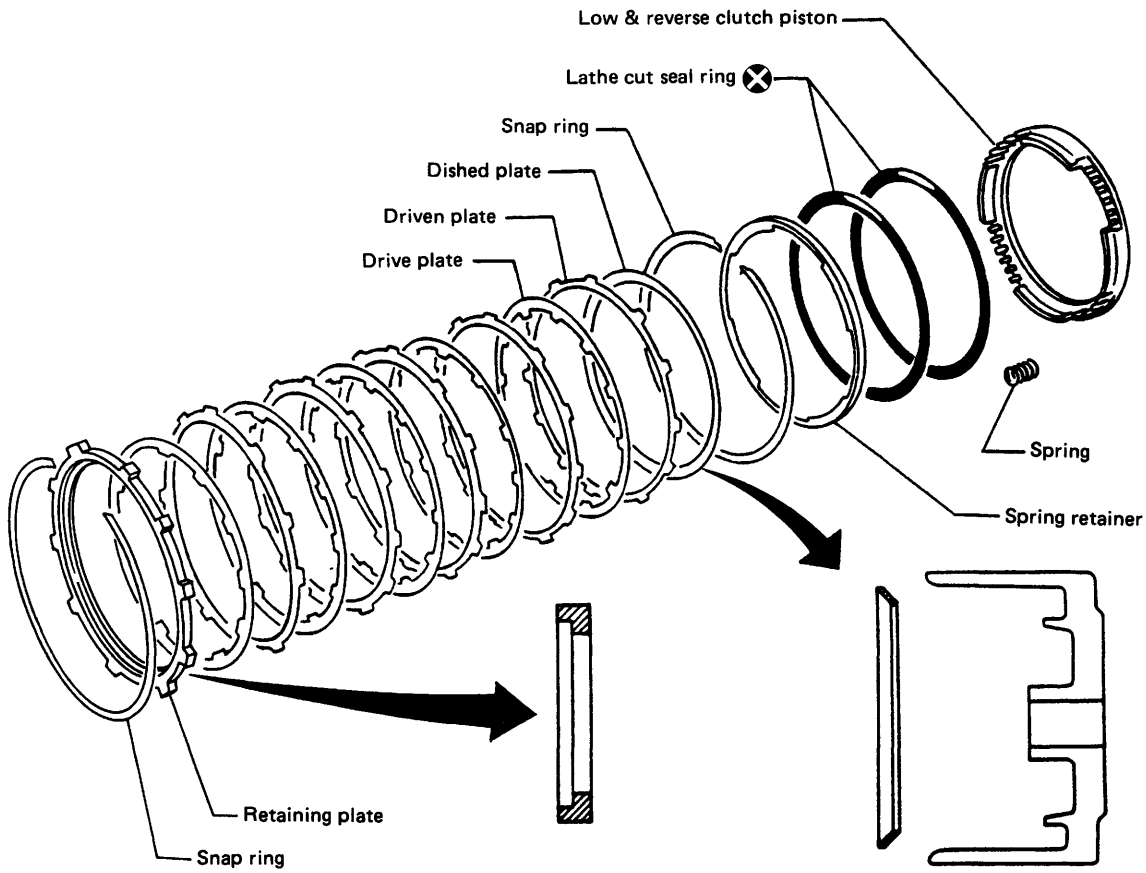
Retaining plate of reverse clutch

Thickness mm (in)	Part number
4.6 (0.181)	31537-21X00
4.8 (0.189)	31537-21X01
5.0 (0.197)	31537-21X02
5.2 (0.205)	31537-21X03
5.4 (0.213)	31537-21X04
5.6 (0.220)	31567-21X13
5.8 (0.228)	31567-21X14
6.0 (0.236)	31567-21X15

After assembly, check the operation of clutch.

Low & Reverse Brake

In regard to the number of clutch sheets (drive plate and driven plate), refer to S.D.S.



SAT182A

Low & Reverse Brake (Cont'd)

INSPECTION

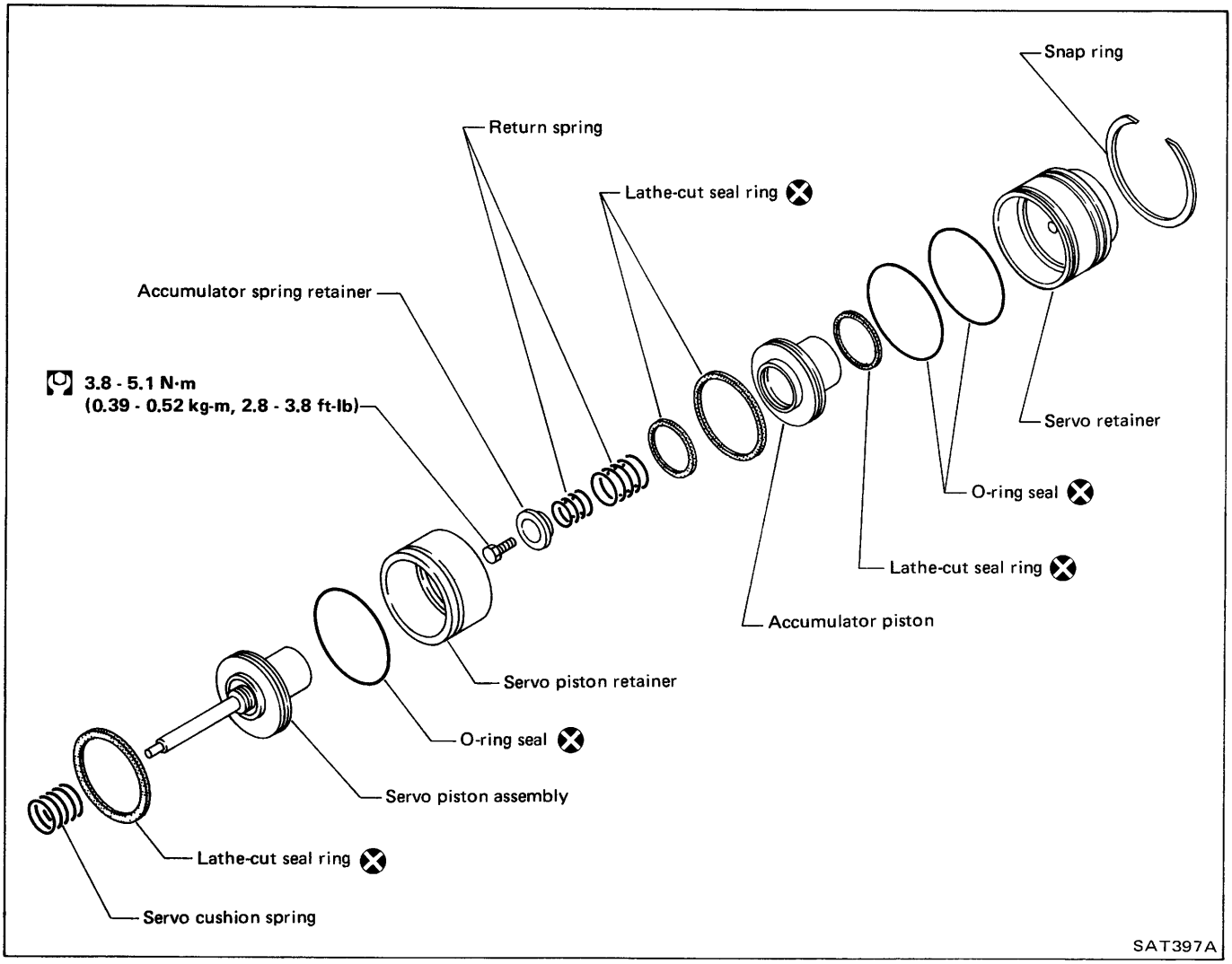
- Examine low and reverse brake for damaged clutch drive plate facing and worn snap ring.
- Check drive plate facing for wear or damage; if necessary, replace.

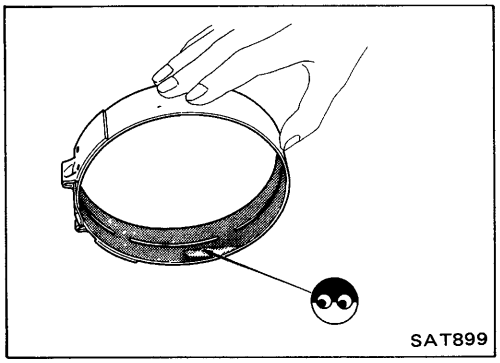
Drive plate thickness:
Standard
2.0 mm (0.079 in)
Allowable limit
1.8 mm (0.071 in)
Specified clearance between retaining plate and snap ring:
Standard
2.2 - 2.6 mm (0.087 - 0.102 in)
Allowable limit
3.6 mm (0.142 in)

Retaining plate of low & reverse brake

Thickness mm (in)	Part number
12.4 (0.488)	31667-23X13
12.6 (0.496)	31667-23X14
12.8 (0.504)	31667-23X15
13.0 (0.512)	31667-23X16
13.2 (0.520)	31667-23X71
13.4 (0.528)	31667-23X72
13.6 (0.535)	31667-23X73
13.8 (0.543)	31667-23X74
14.0 (0.551)	31667-23X75

Brake Band and Band Servo

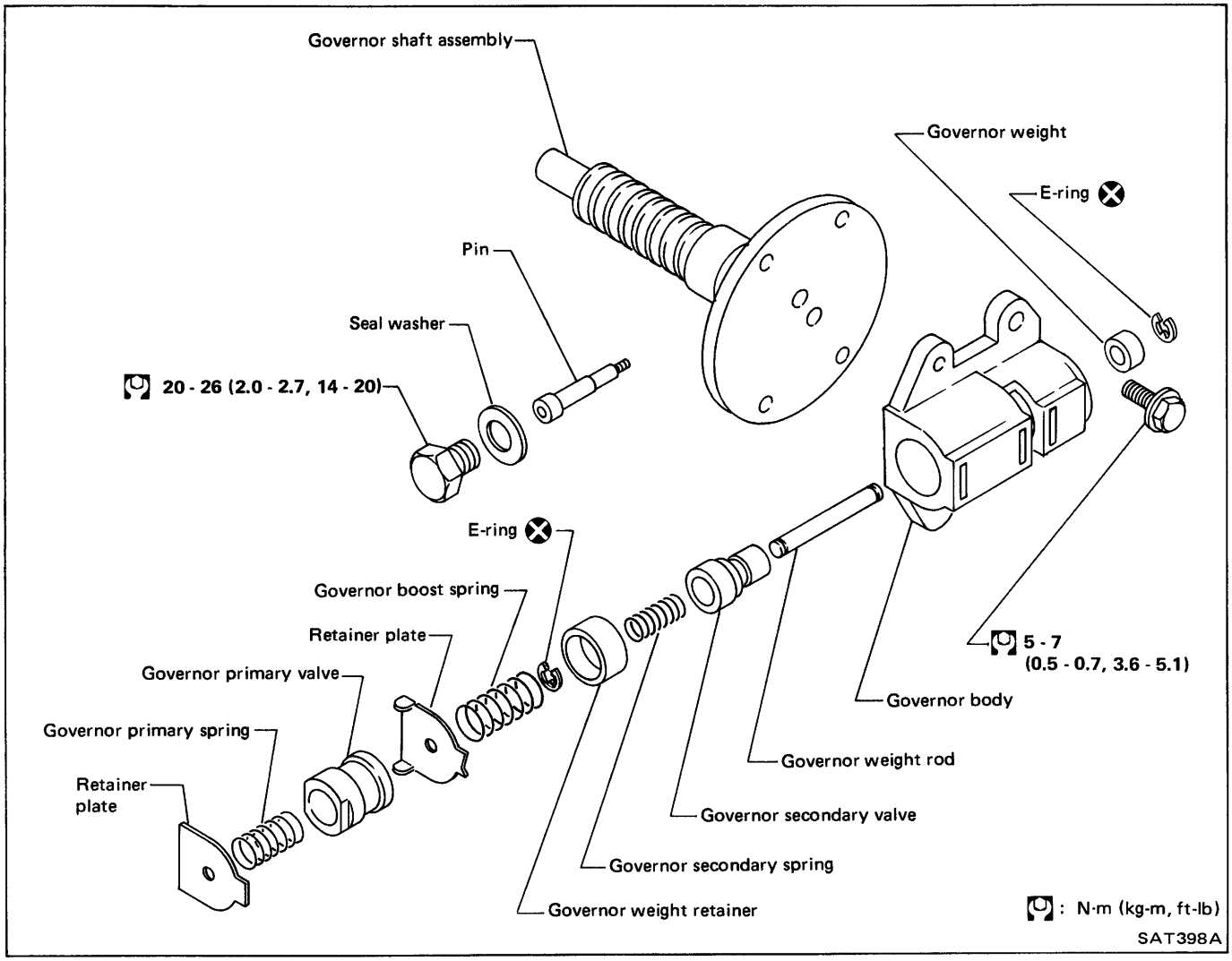




INSPECTION

- Inspect band friction material for wear. If cracked, chipped or burnt spots are apparent, replace the band.
- Check band servo components for wear and scoring.

Governor

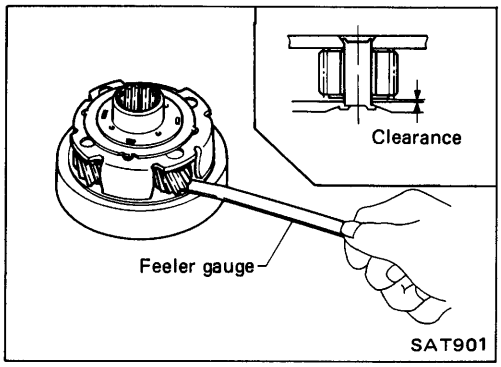


INSPECTION

- Check governor valves and valve body for indication of burning or scratches.
- Check valve springs for damage.
  Measure free length of valve springs.

Valve spring	Free length mm (in)
Primary governor	32.3 (1.272)
Secondary governor	29.5 (1.161)
Governor boost	28.1 (1.106)

If any abnormalities are found, replace governor body, valves and springs as an assembly.



Planetary Carrier

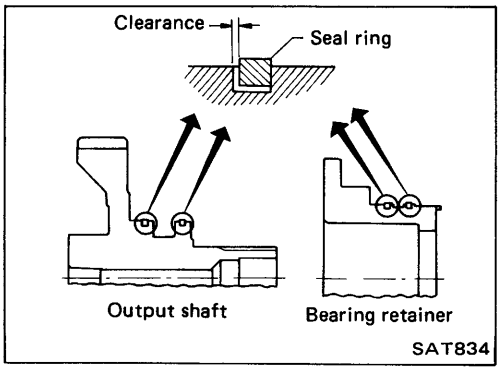
INSPECTION

- Check clearance between pinion washer and planetary carrier with a feeler gauge.

  Standard clearance:

  0.20 - 0.70 mm (0.0079 - 0.0276 in)

  Replace if the clearance exceeds 0.80 mm (0.0315 in).
- Check planetary gear sets and bearings for damaged or worn gears.



Bearing Retainer and Output Shaft

INSPECTION

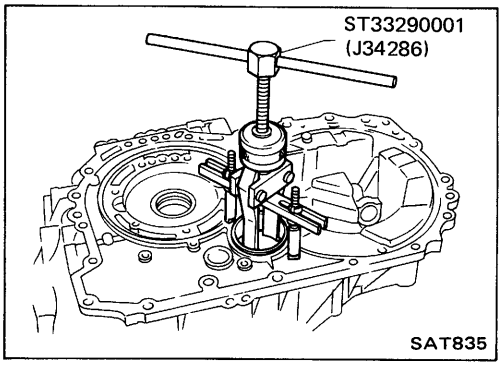
Measure clearance between seal ring and ring groove.

Standard clearance:

0.10 - 0.25 mm (0.0039 - 0.0098 in)

Wear limit:

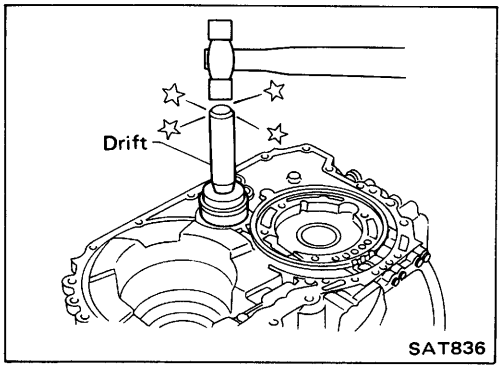
0.25 mm (0.0098 in)

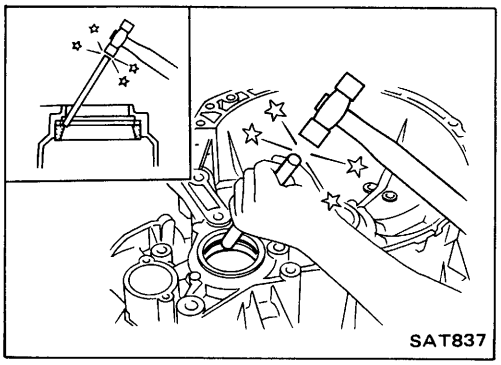


Converter Housing and Transmission Case

BEARING OUTER RACE

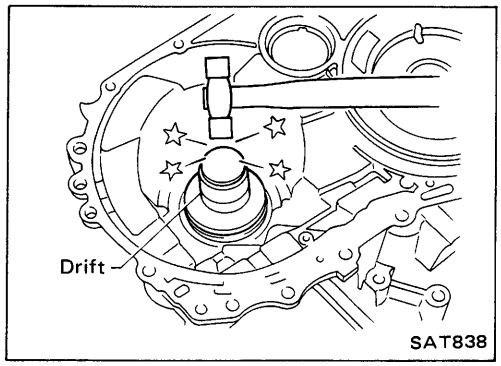
- Reduction pinion gear front bearing outer race.

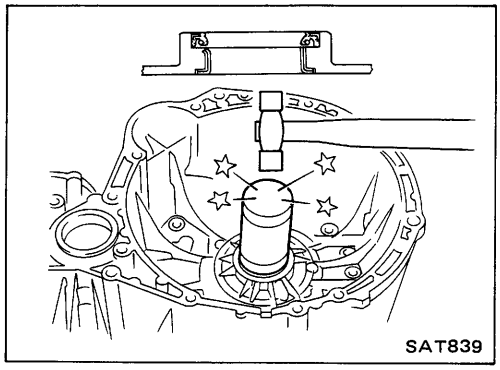




- Diff. side bearing outer race.

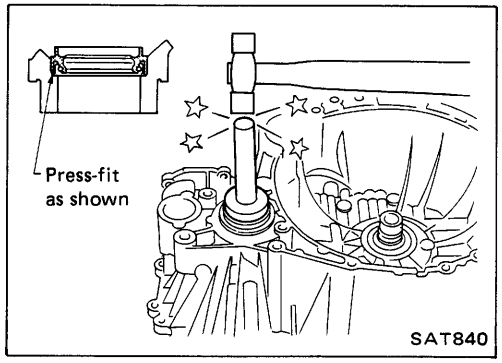
Converter Housing and Transmission Case (Cont'd)





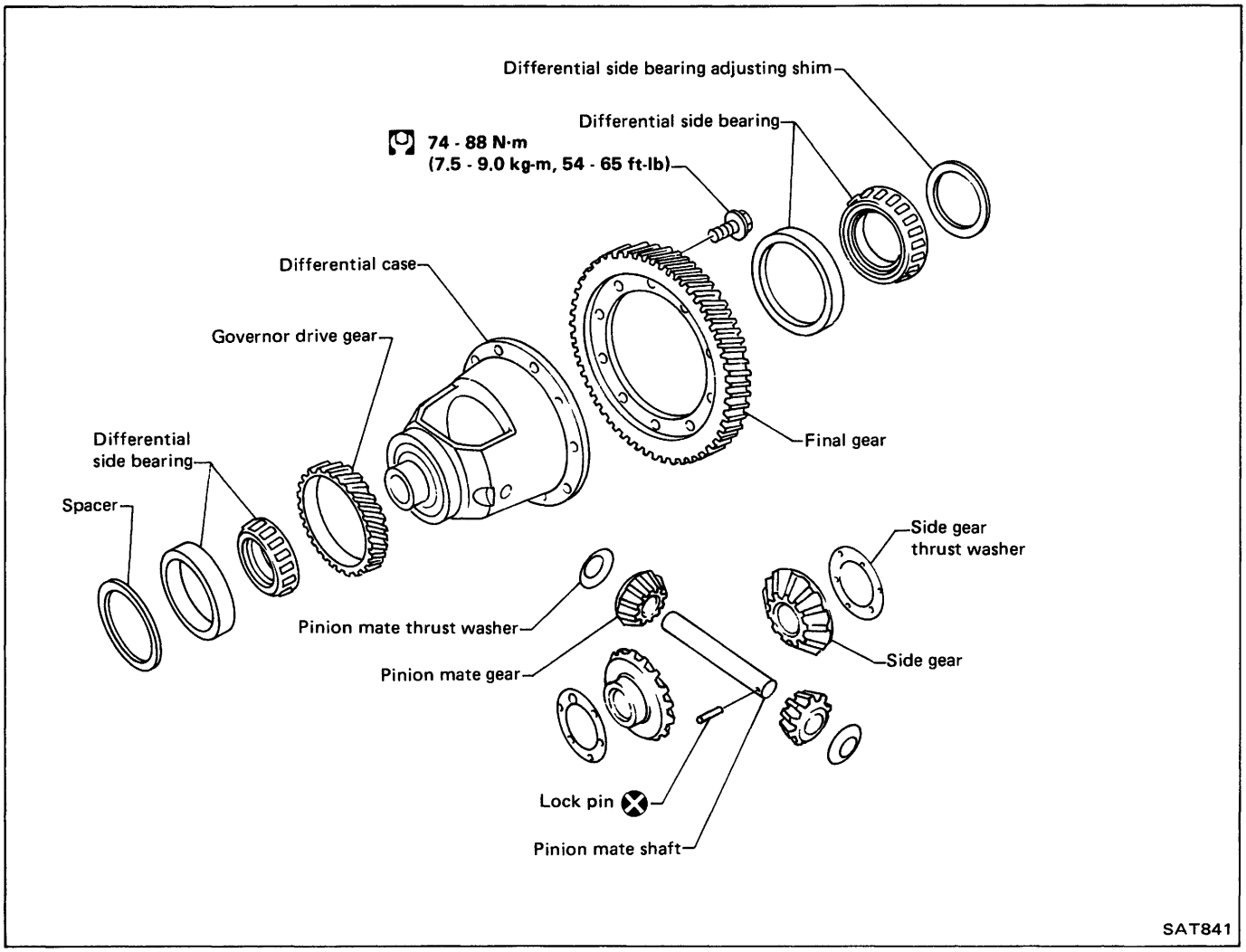
OIL SEAL

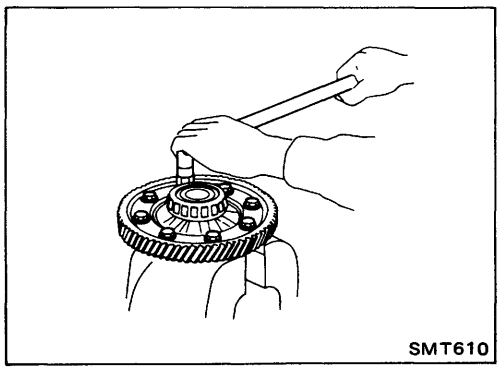
- Torque converter oil seal.



- Diff. side oil seal.

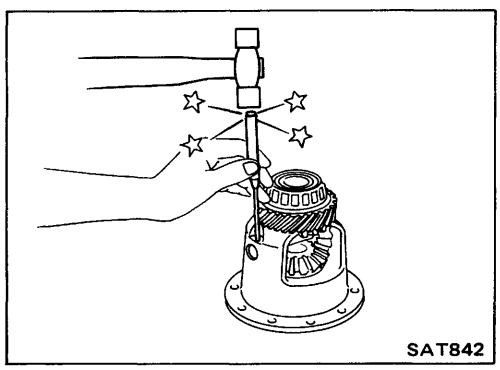
Final Drive





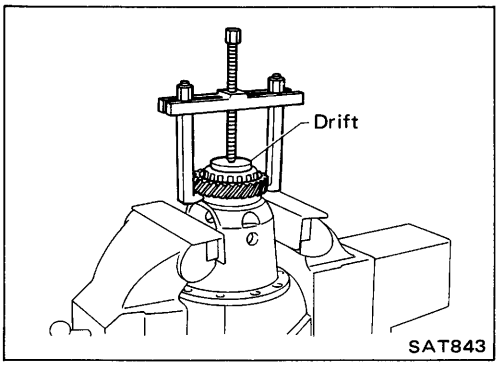
DISASSEMBLY

1. Remove final gear.

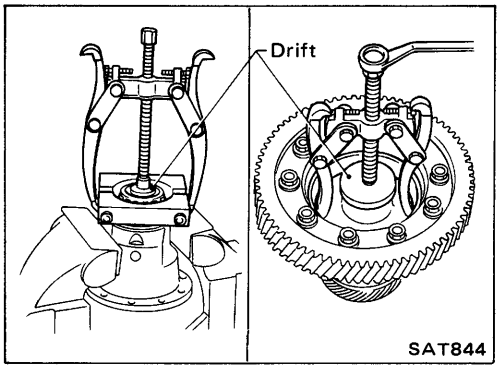


2. Drive out pinion mate shaft lock pin and draw out pinion mate shaft.

Final Drive (Cont'd)

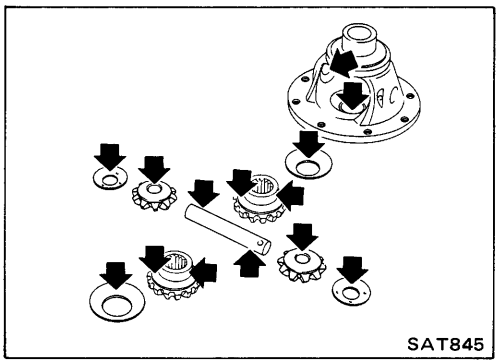


3. Remove governor drive gear.

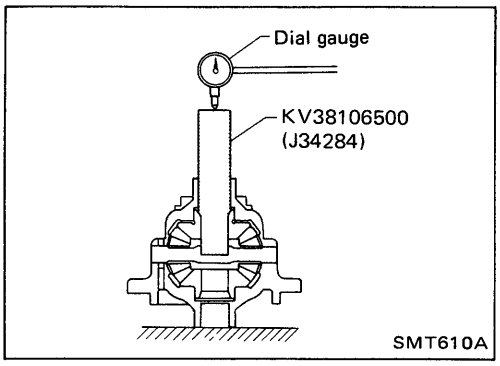


4. Drive out diff. side bearing outer race and inner cone.

INSPECTION

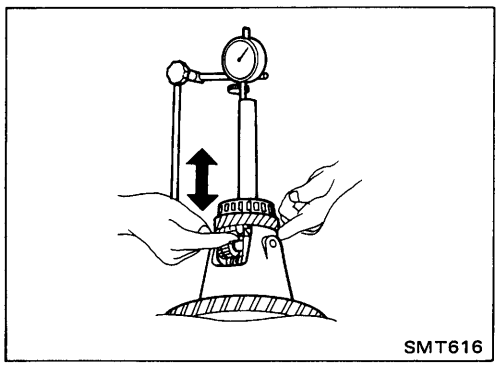


1. Check mating surface of differential case, side gears and pinion mate gears. Replace as required.



2. Check clearance between side gear and diff. case with washer following the procedure below.

a. Set Tool and dial gauge on side gear.



b. Move side gear up and down to measure dial gauge deflection. Always measure gauge deflection on both side gears.

Clearance between side gear and diff. case with washer:

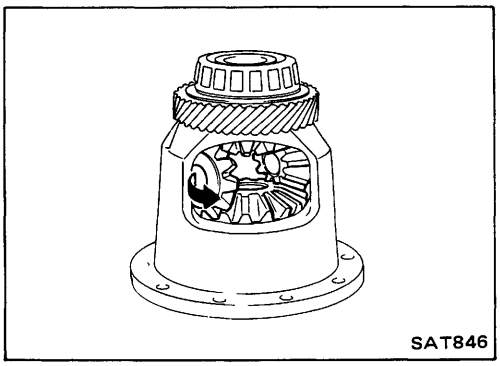
0.1 - 0.2 mm (0.004 - 0.008 in)

c. If clearance exceeds the specified value, check for wear and replace necessary parts.

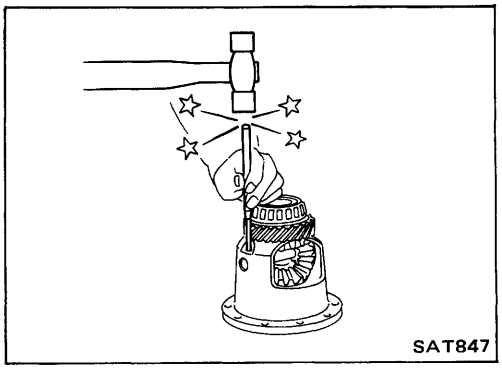
3. Check tapered roller bearings for wear, scratches, pitching or flaking.

Final Drive (Cont'd)

ASSEMBLY


SAT846

1. Install the side gear and thrust washer in the differential case.
2. Install the pinion mate gear and thrust washer in the differential case while rotating them.


SAT847

3. Insert pinion mate shaft.

When inserting, be careful not to damage pinion mate washers.

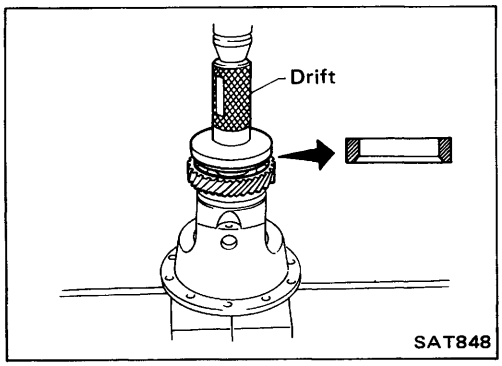
4. Measure clearance between side gear and pinion mate gear, referring to "Inspection". If necessary, adjust.

Side gear to pinion mate clearance:
0.1 - 0.2 mm (0.004 - 0.008 in)
Side gear thrust washer:
Refer to S.D.S.

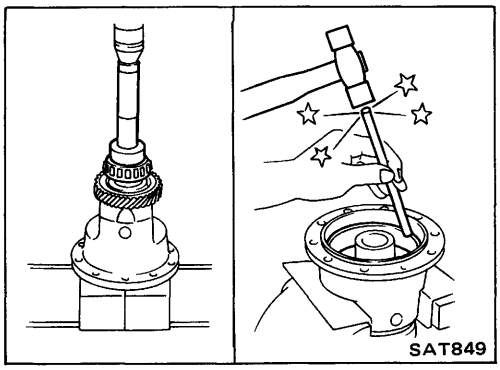
5. Install pinion mate shaft lock pin using a punch.

Make sure that lock pin is flush with case.

6. Install governor drive gear.

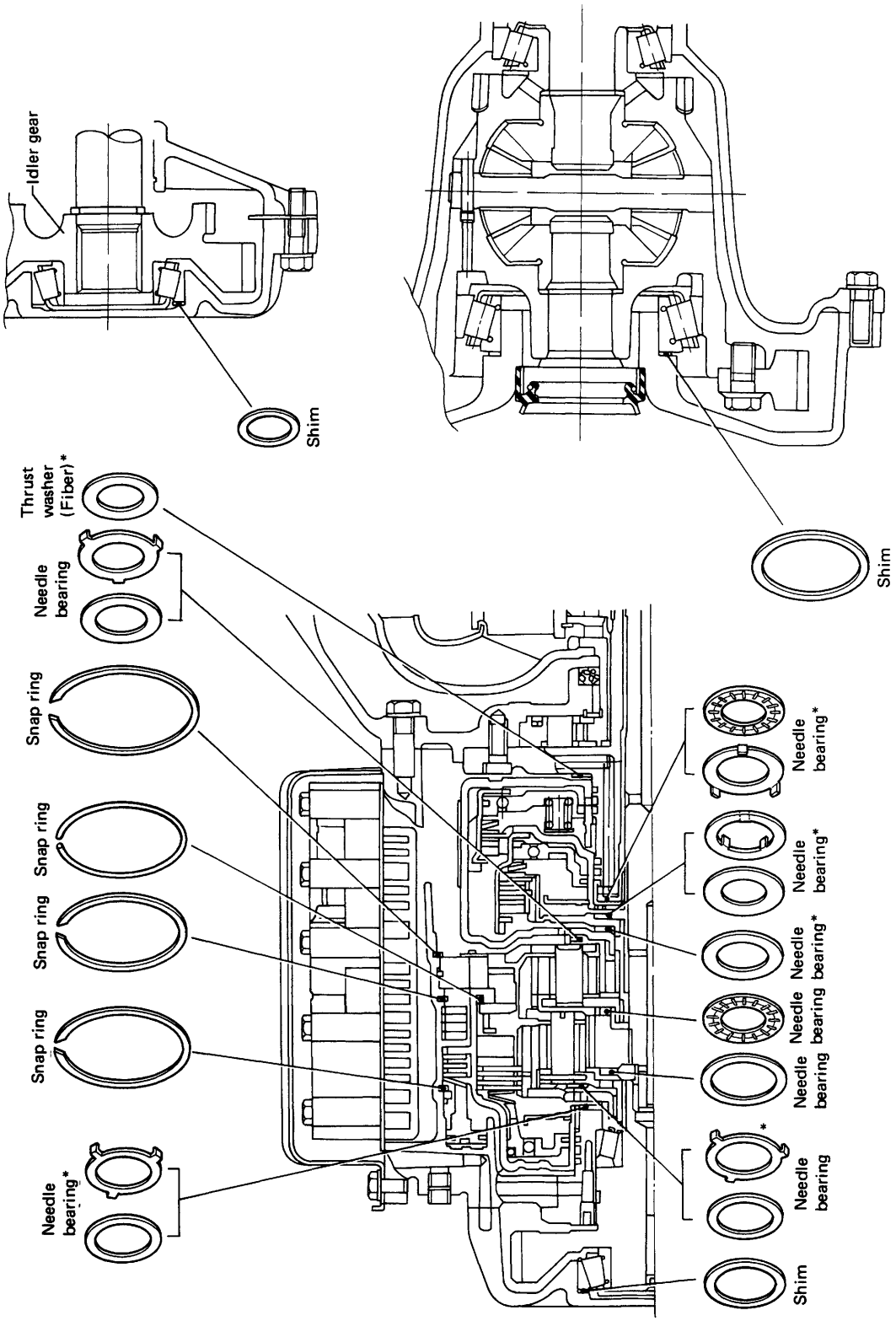


SAT848

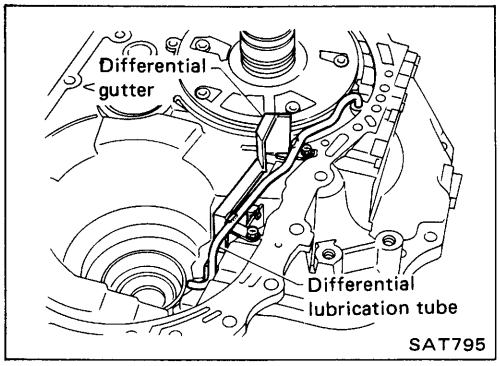

SAT849

7. Press on diff. side bearing inner cone and outer race.
8. Install final gear.

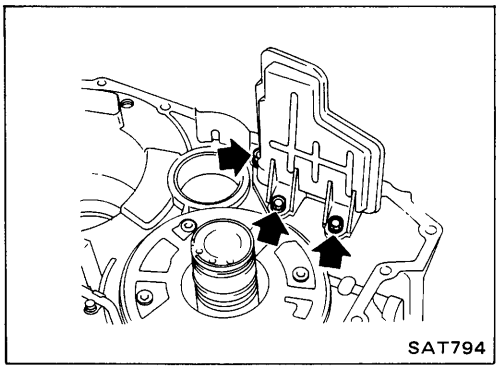
When installing/assembling needle bearing and bearing race, use the following illustration as a guide to installation procedures and locations.



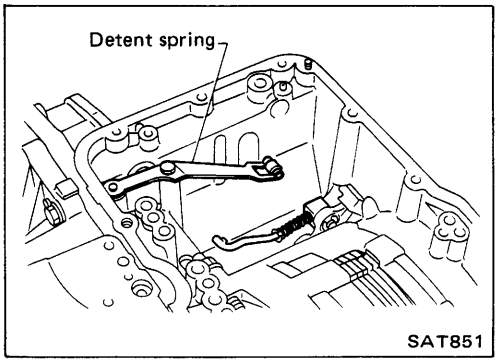
SAT850



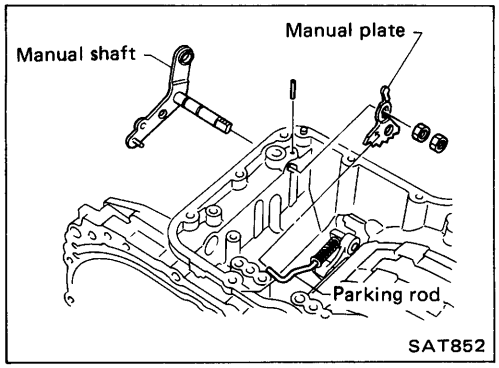
1. Install diff. lubrication tube and diff. gutter to converter housing.



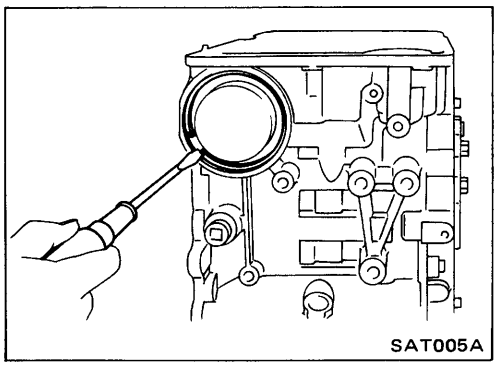
2. Install oil strainer.



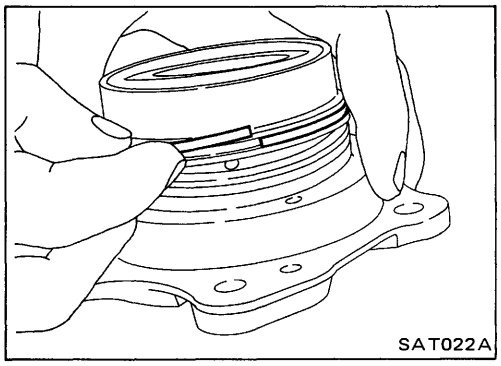
3. Install detent spring assembly.



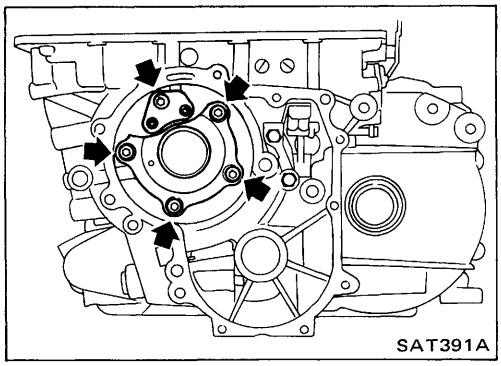
4. Pass parking rod into the hole in the manual plate and then install manual plate on manual shaft.



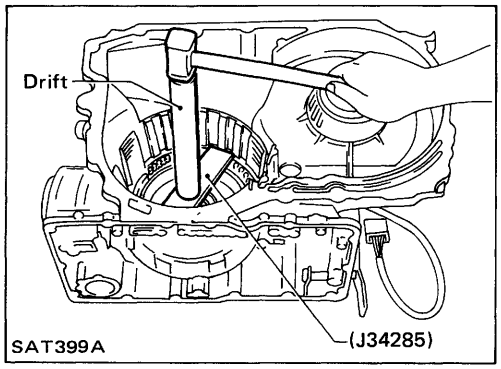
5. Install band brake servo, retainer and return spring and secure with snap ring.


SAT022A

6. Install bearing retainer assembly.
a. Install seal rings onto bearing retainer with great care. Clean the grooves and liberally apply petroleum jelly to hold the rings in place. Otherwise, they could be cut or deformed when the low clutch and carrier assembly are installed.

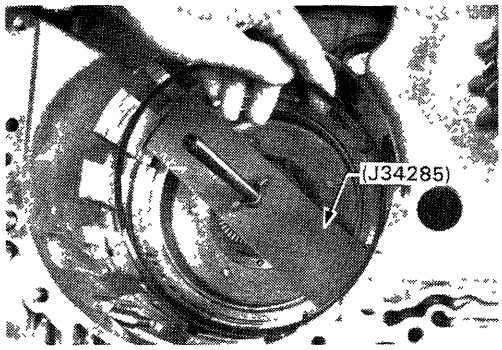

SAT391A

b. Install bearing retainer assembly.

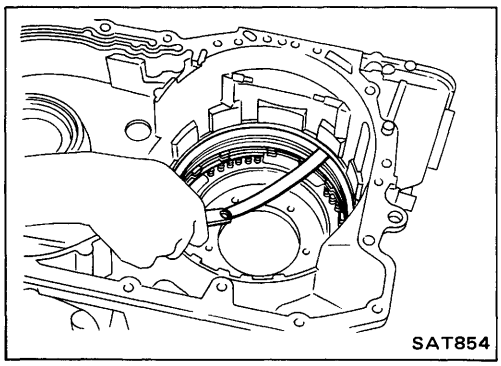


SAT399A

7. Lubricate low and reverse brake piston seal, then install piston by tapping it evenly with Tool.



8. Install low and reverse brake retainer, and secure with snap ring.
9. Install low and reverse brake driven & drive plates and retaining plate, then secure with snap ring.


SAT854

10. After low and reverse brake has been completely assembled, measure clearance between snap ring and retainer plate. If measurement exceeds specifications, it can be adjusted by replacing retainer plate with one of a different thickness.

Low and reverse brake clearance:

Standard

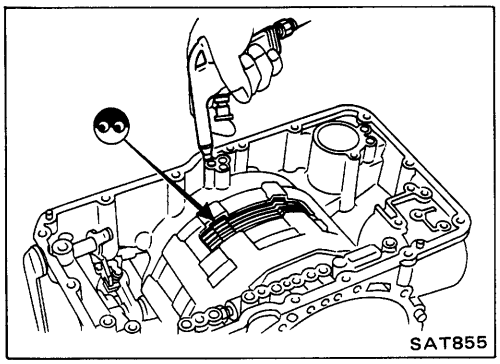
2.2 - 2.6 mm (0.087 - 0.102 in)

Allowable limit

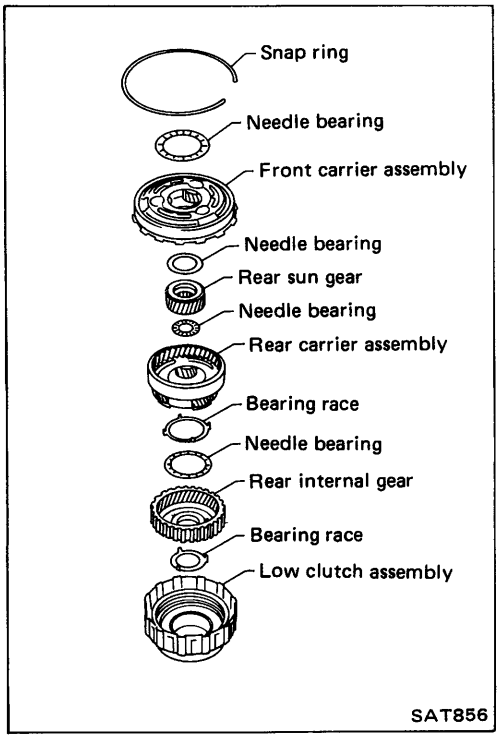
3.6 mm (0.142 in)

Retaining plate of low & reverse brake

Thickness mm (in)	Part number
11.4 (0.449)	31667-21X68
11.6 (0.457)	31667-21X09
11.8 (0.465)	31667-21X10
12.0 (0.472)	31667-21X11
12.2 (0.480)	31667-21X12
12.4 (0.488)	31667-21X13
12.6 (0.496)	31667-21X14
12.8 (0.504)	31667-21X15
13.0 (0.512)	31667-21X16

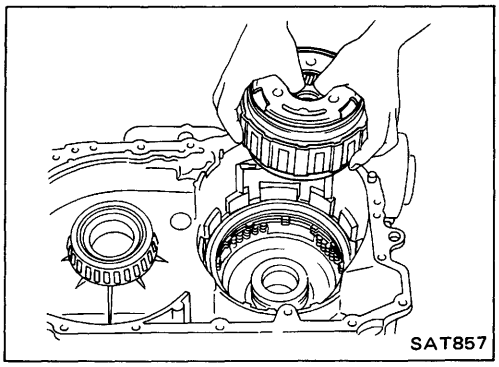

SAT855

Check low & reverse brake operation using air.

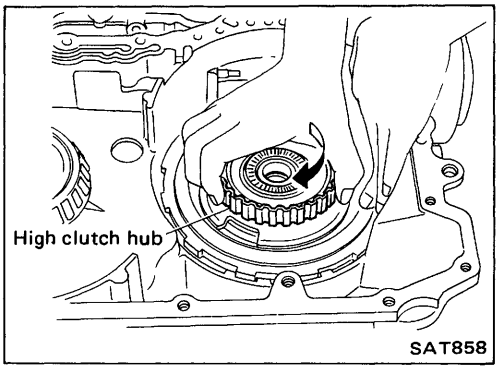


SAT856

11. Assemble front carrier, rear carrier and low clutch.

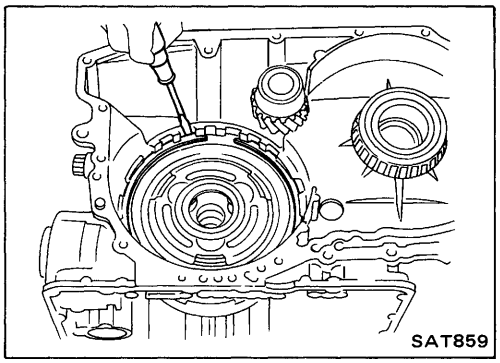

SAT857

12. Install carrier set.

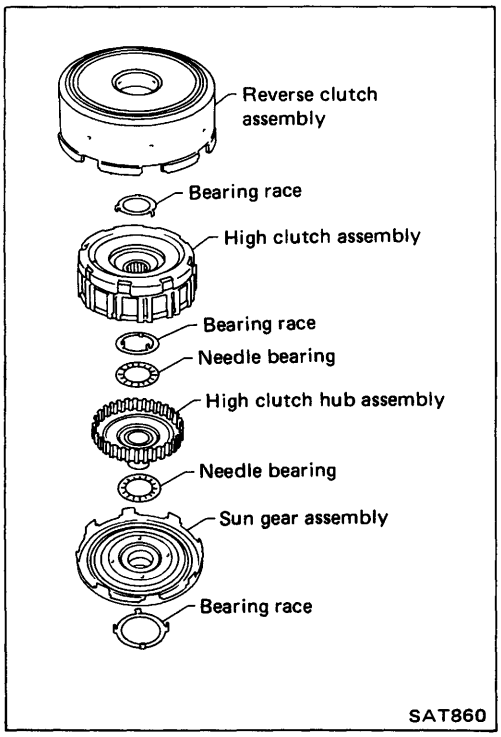


SAT858

13. Install one-way clutch assembly while rotating front carrier with high clutch hub.

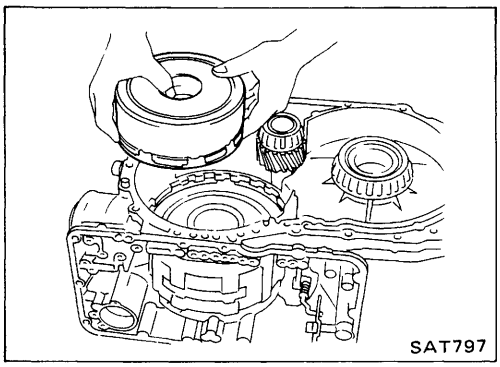

SAT859

14. Remove high clutch hub, and install clutch snap ring.

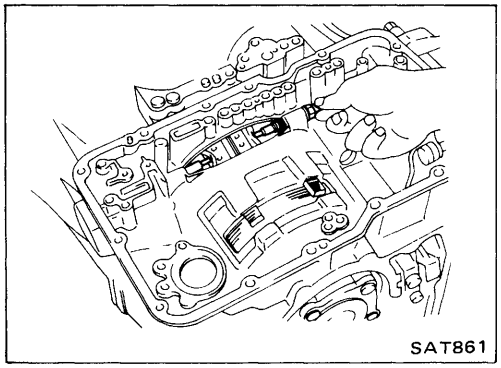


SAT860

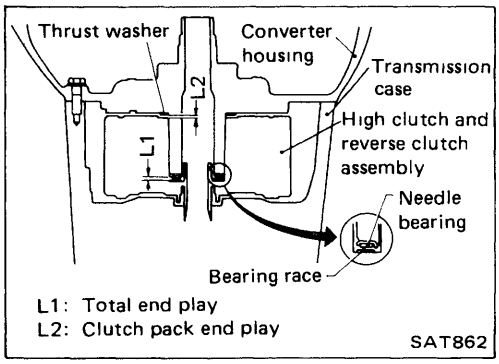
15. Assemble reverse clutch and high clutch.


SAT797

16. Install reverse and high clutch as a pack.


SAT861

17. Install brake band and anchor pin. Temporarily tighten anchor bolt by hand.

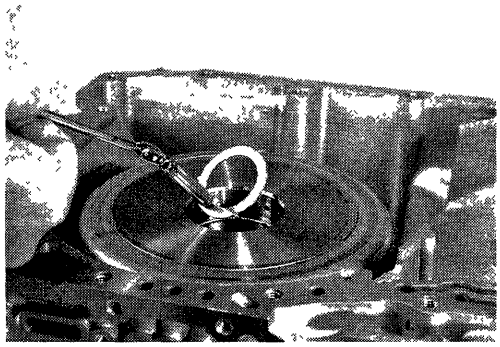


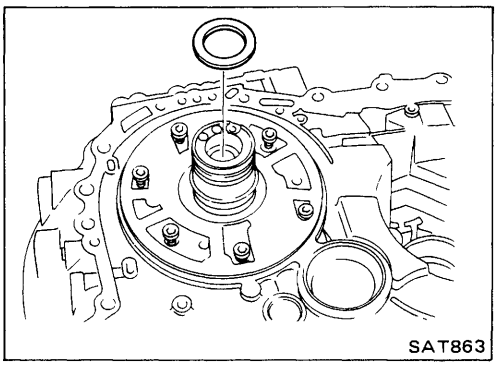
SAT862

18. Adjust total end play and clutch pack end play as follows:

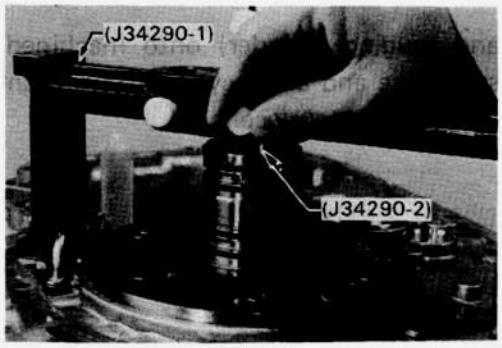
Total end play

a. Remove thrust bearing race from high clutch drum.

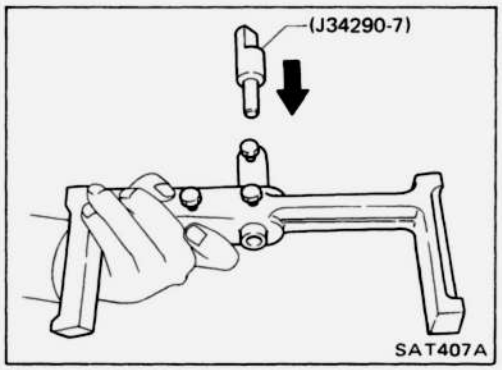



SAT863

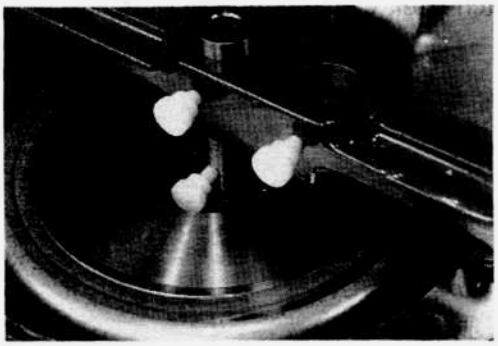
b. Install needle bearing on top of oil pump cover.



c. Place Tools (bridge and gauging cylinder) on machined gasket surface of converter housing. Allow gauging cylinder to rest on needle bearing and lock it in place with thumbscrew.



d. Insert Tool (total end play gauging plunger) into gauging cylinder.

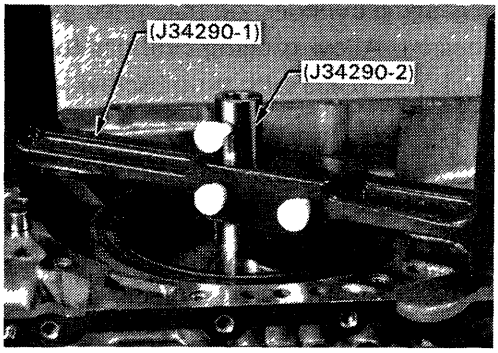


e. Place bridge, legs up, onto machined gasket surface of transaxle case, allowing gauging plunger to rest on surface where bearing race was removed. Lock plunger in place.

f. Remove bridge and use feeler gauge to measure gap between gauging cylinder and shoulder of gauging plunger.
g. Use your feeler gauge reading to select appropriate bearing race thickness from following chart:

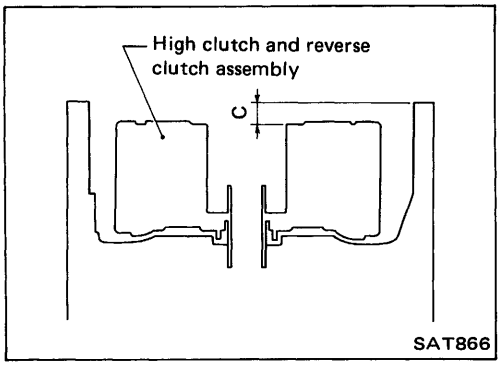
Oil pump housing bearing race

Thickness mm (in)	Part number
0.8 (0.031)	31429-21X00
1.0 (0.039)	31429-21X01
1.2 (0.047)	31429-21X02
1.4 (0.055)	31429-21X03
1.6 (0.063)	31429-21X04
1.8 (0.071)	31429-21X05
2.0 (0.079)	31429-21X06

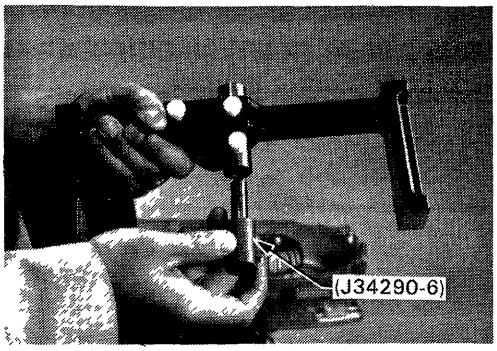


Clutch pack end play

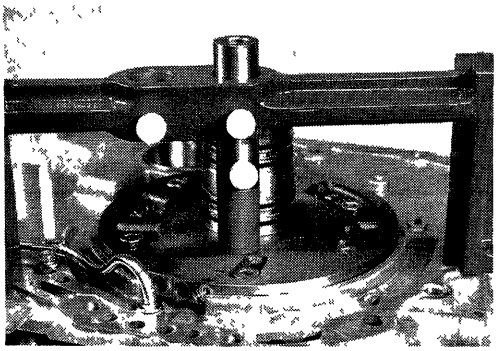
a. Place Tools (bridge and gauging cylinder) onto machined gasket surface of transaxle case and allow cylinder to rest on high clutch drum. Lock cylinder into place.



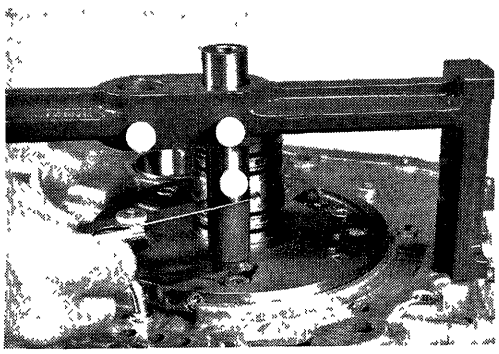
- You are now measuring dimension "C".



b. Now, insert Tool (clutch pack gauging plunger) into gauging cylinder.

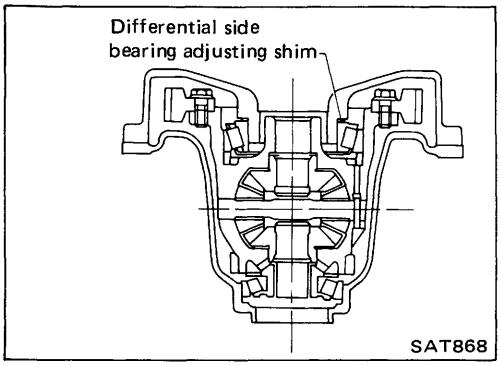


c. Place bridge, gauging cylinder, and gauging plunger onto machined gasket surface of converter housing. Make sure thrust washer is removed. Lock gauging plunger in place.
d. Use feeler gauge to measure gap between gauging cylinder and shoulder of gauging plunger.
e. Use your feeler gauge measurement and following thrust washer chart to select correct washer thickness to give proper clutch pack end play:

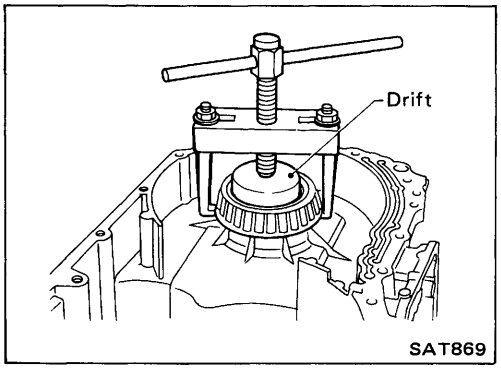


Clutch pack thrust washer

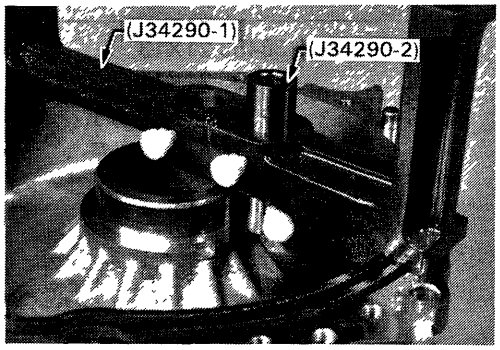
Thickness mm (in)	Part number
0.7 (0.028)	31528-21X00
0.9 (0.035)	31528-21X01
1.1 (0.043)	31528-21X02
1.3 (0.051)	31528-21X03
1.5 (0.059)	31528-21X04
1.7 (0.067)	31528-21X05
1.9 (0.075)	31528-21X06



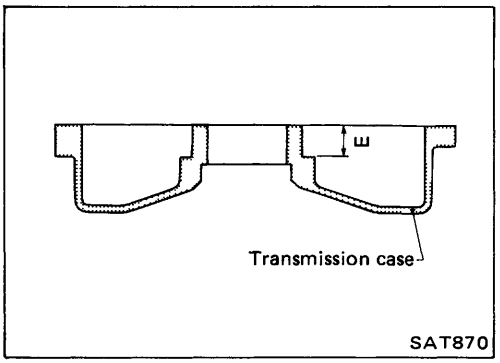
19. Adjust diff. side bearing preload as follows:



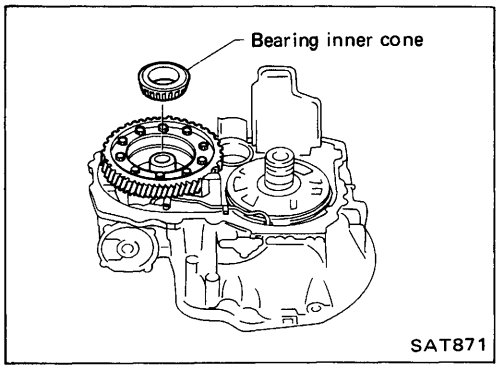
a. Remove left side bearing inner cone from transmission case.



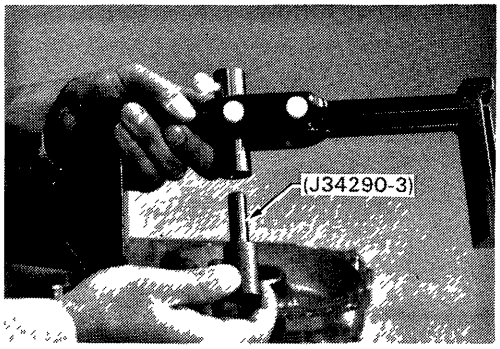
b. Place Tools (bridge and gauging cylinder) on machined gasket surface of transmission case and allow gauging cylinder to rest on bearing mating surface. Lock gauging cylinder in place.



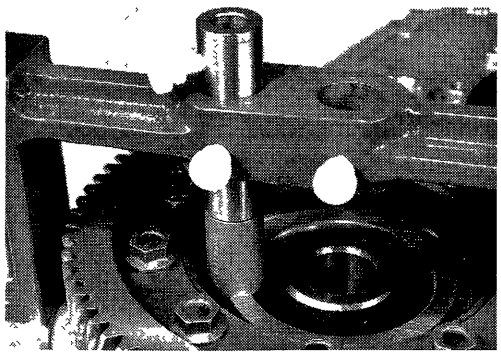
- You are now measuring dimension "E".



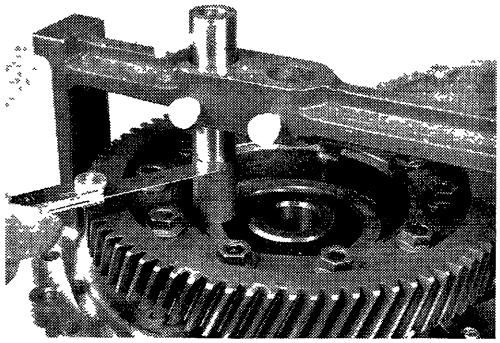
c. Put final drive assembly into converter housing, then put side bearing inner cone on diff. case.
d. Hold inner bearing cone in place while spinning final drive assembly in order to seat bearings.



e. Insert Tool (differential side bearing gauging plunger) into gauging cylinder.

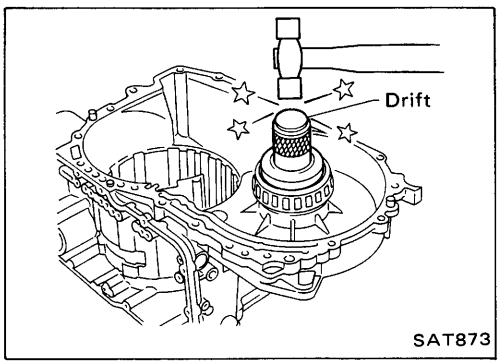


f. Place bridge, gauging cylinder, and gauging plunger onto machined gasket surface of converter housing and allow gauging plunger to rest on surface of bearing inner cone. Lock plunger in place.
g. Use feeler gauge to measure clearance between gauging cylinder and shoulder of the gauging plunger.
h. Use your feeler gauge reading and following chart to select appropriate side bearing preload shim(s).

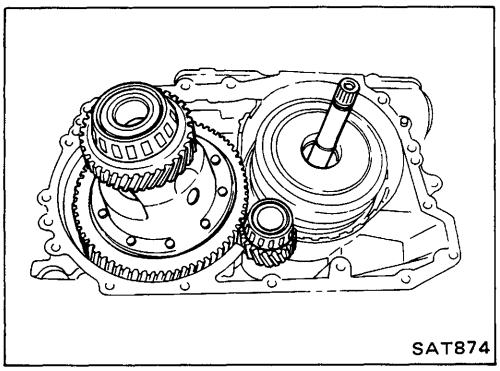


Differential side bearing adjusting shim

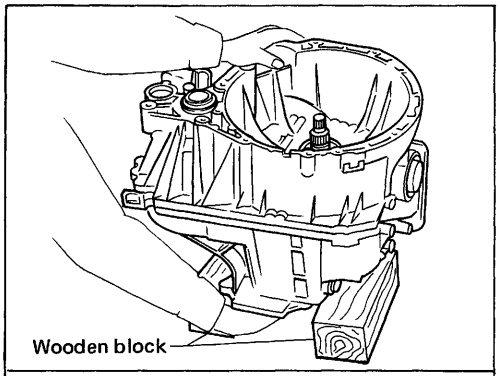
Thickness mm (in)	Part number
0.12 (0.0047)	38453-21X13
0.16 (0.0063)	38453-21X14
0.20 (0.0079)	38453-21X15
0.24 (0.0094)	38453-21X16
0.28 (0.0110)	38453-21X17
0.32 (0.0126)	38453-21X18
0.36 (0.0142)	38453-21X19
0.40 (0.0157)	38453-21X20
0.44 (0.0173)	38453-21X00
0.48 (0.0189)	38453-21X01
0.52 (0.0205)	38453-21X02
0.56 (0.0220)	38453-21X03
0.60 (0.0236)	38453-21X04
0.64 (0.0252)	38453-21X05
0.68 (0.0268)	38453-21X06
0.72 (0.0283)	38453-21X07
0.76 (0.0299)	38453-21X08
0.80 (0.0315)	38453-21X09
0.84 (0.0331)	38453-21X10
0.88 (0.0346)	38453-21X11
0.92 (0.0362)	38453-21X12



i. Install selected shims and left side bearing inner cone.

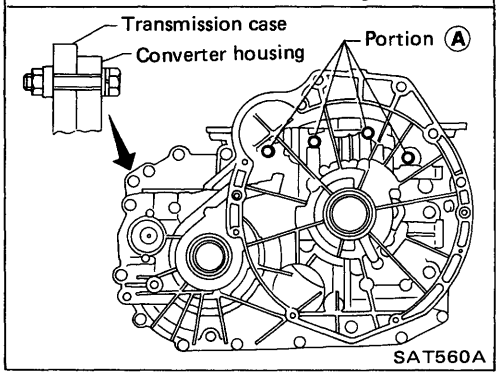

SAT874

20. Place transmission case onto wooden blocks, and install reduction pinion gear, differential case assembly and input shaft.

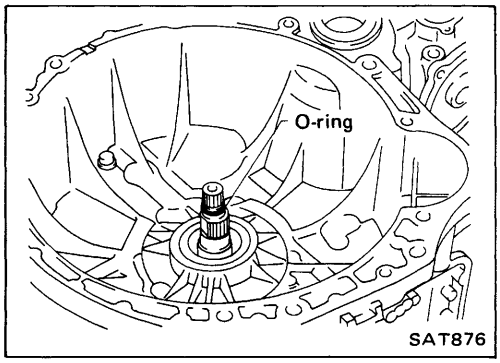


21. Place gasket on transmission case and install converter housing while assuring that reduction pinion gear does not interfere with transmission case.

Always use new bolts at portion Ⓐ as they are self-sealing bolts. Apply A.T.F. to thread of other bolts by that fix converter housing to transmission case when installing them.

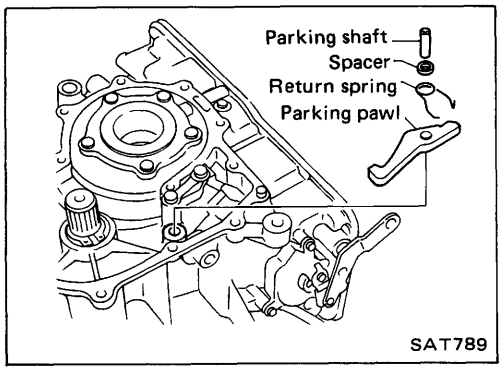


SAT560A



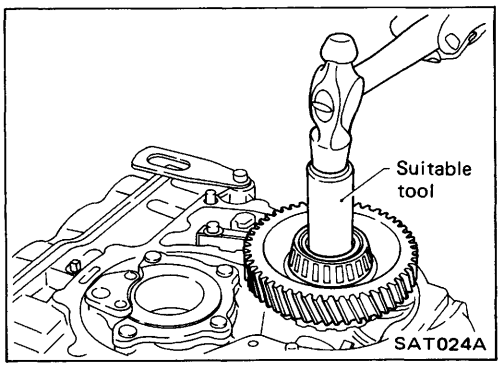
SAT876

22. Install O-ring onto input shaft.

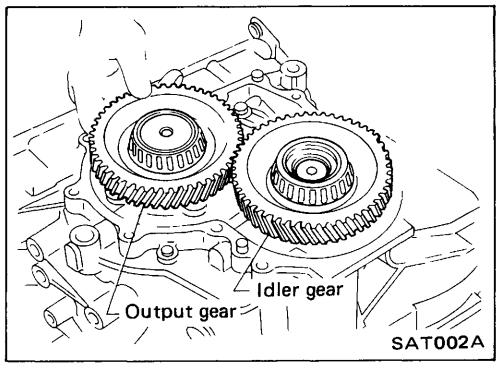


SAT789

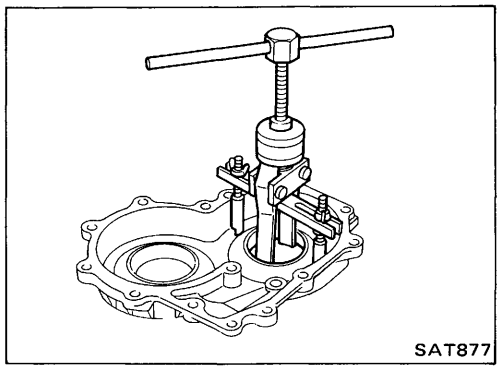
23. Install parking pawl, return spring, pawl shaft and spacer.



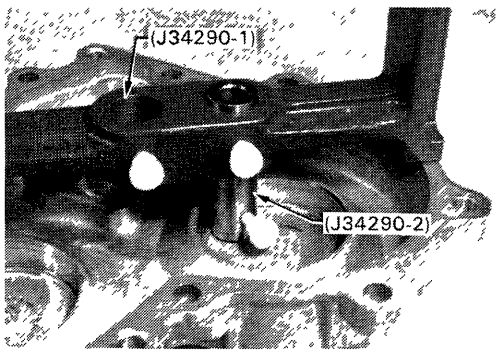
24. Install idler gear.



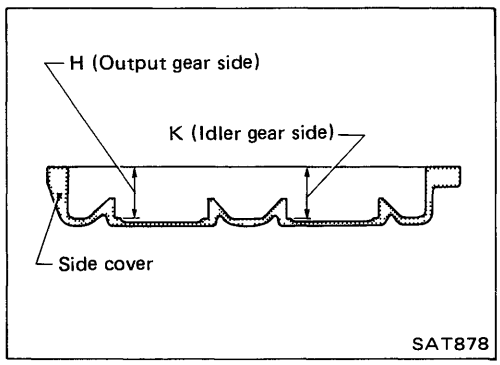
25. Install output gear.



26. Adjust output shaft and idler gear bearing preload as follows:
a. Remove output gear and idler gear bearing outer races and shims. (The races will interchange, so be sure to keep each race with its correct bearing.)

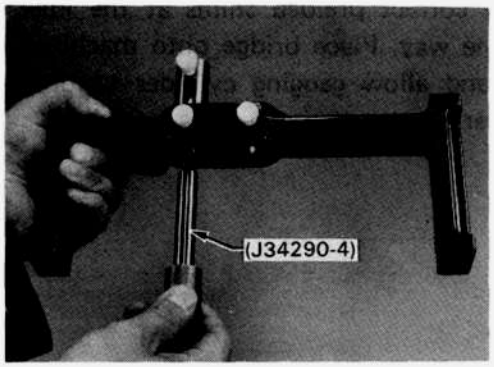


b. Place Tools (bridge and gauging cylinder) onto machined gasket surface of side cover. Allow gauging cylinder to drop into output gear bearing race bore until it bottoms. Lock cylinder in place with the thumbscrew.

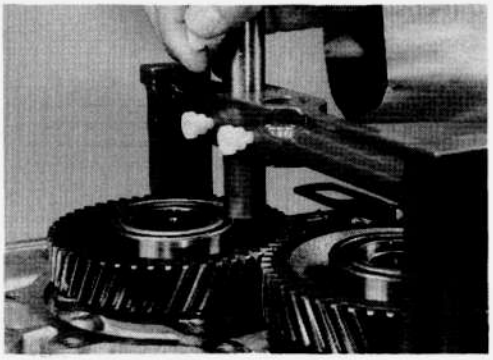


- You are now measuring dimension "H".

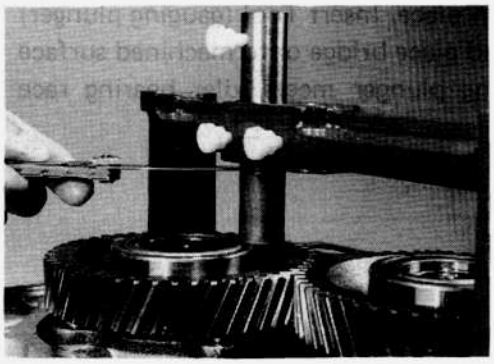
c. Put correct bearing races on the output gear and idler gear bearings, and turn races to seat bearings.



d. Place Tool (output gauging plunger) into the gauging cylinder.



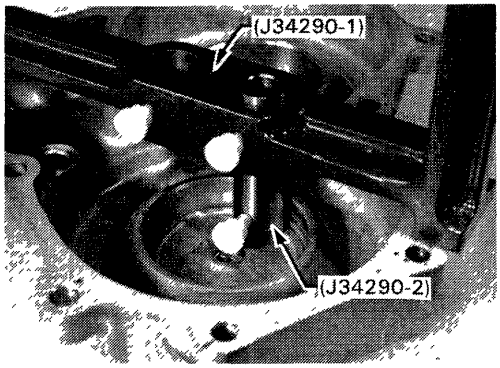
e. Now, place bridge onto machined gasket surface of transmission case and allow gauging plunger to drop onto rear surface of output gear bearing race.



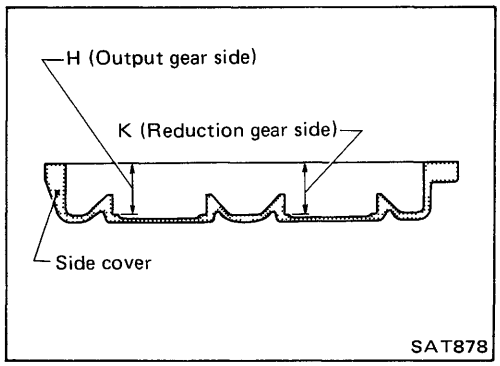
f. Lock gauging plunger in place with thumbscrew. Use feeler gauge to measure gap between gauging cylinder and shoulder of gauging plunger.
g. Use feeler gauge reading to select the correct shim(s) from following chart:

Output shaft bearing adjusting shim

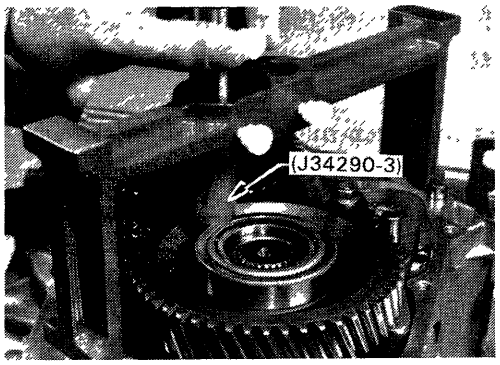
Thickness mm (in)	Part number
0.12 (0.0047)	31499-21X00
0.16 (0.0063)	31499-21X01
0.20 (0.0079)	31499-21X02
0.24 (0.0094)	31499-21X03
0.28 (0.0110)	31499-21X04
0.32 (0.0126)	31499-21X05
0.36 (0.0142)	31499-21X06
0.40 (0.0157)	31499-21X07
0.44 (0.0173)	31499-21X08
0.48 (0.0189)	31499-21X09
0.52 (0.0205)	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
1.96 (0.0772)	31499-21X22



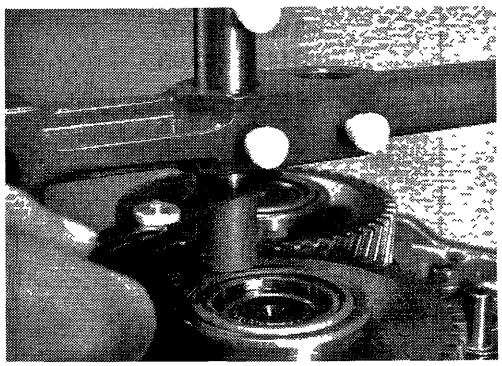
h. Now, measure for the correct preload shims at the idler gear bearing in the same way. Place bridge onto machined surface of side cover and allow gauging cylinder to drop until it contacts idler bearing race mating surface.



- You are now measuring dimension "K".



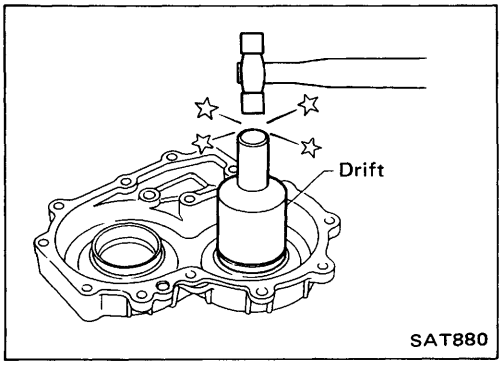
i. Lock gauging cylinder in place. Insert Tool (gauging plunger) into gauging cylinder and place bridge onto machined surface of case, so that gauging plunger meets idler bearing race rear surface.



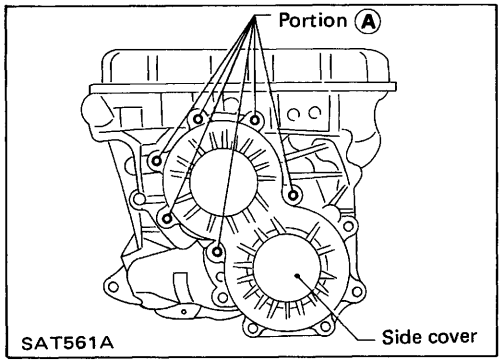
j. Lock gauging plunger in place and use feeler gauge to measure gap between gauging cylinder and gauging plunger.
k. Use your measured distance and the following chart to select correct shim(s) for idler gear bearing preload.

Idler gear bearing adjusting shim

Thickness mm (in)	Part number
0.36 (0.0142)	31499-21X06
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
1.96 (0.0772)	31499-21X22

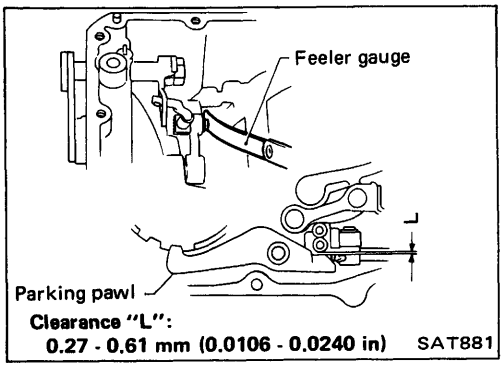


l. Install selected shim(s) and bearing outer races.



27. Install side cover and gasket.

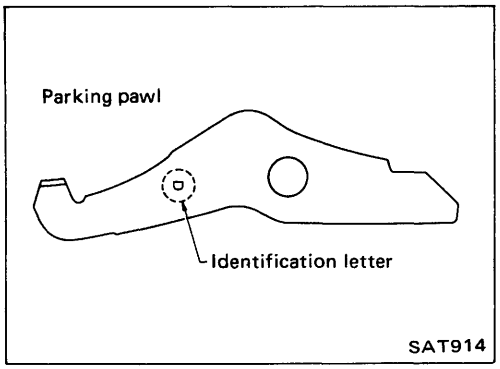
Always use new bolts at portion Ⓐ as they are self-sealing bolts. Apply A.T.F. to thread of other bolts by that fix side cover to transmission case when installing them.



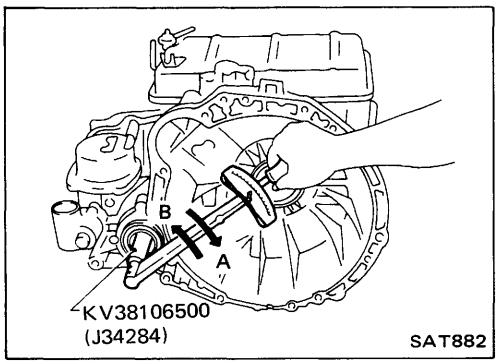
28. Move manual lever until parking pawl engages idler gear. Measure clearance between parking pawl and parking actuator.

If clearance is outside specifications, replace parking pawl.

Part number	Identification letter
31989-21X00	D
31989-21X01	E
31989-21X02	F



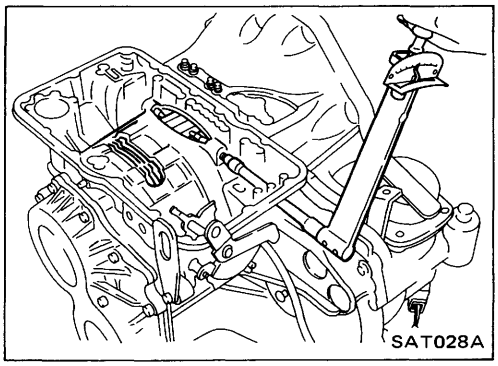
Example:
When parking pawl with identification letter "E" is used:
Clearance "L" is larger → Replace with parking pawl with identification letter "D".
Clearance "L" is smaller → Replace with parking pawl with identification letter "F".



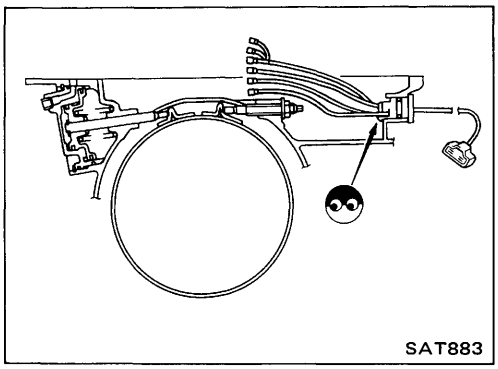
29. Insert Tool into final drive portion to see if internal parts rotates smoothly. Rotating in direction "B" is slightly harder than in direction "A".

If abnormalities are noted, proceed with the following.

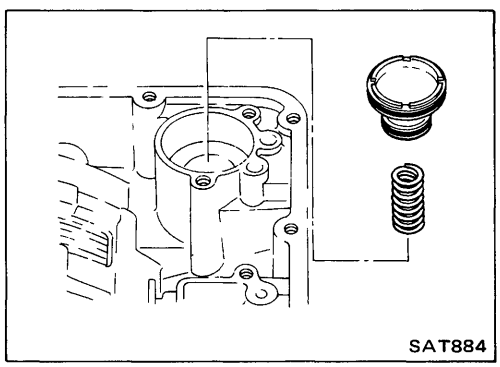
- Disassemble parts to see if they are properly assembled.
- Readjust bearing preloads of final drive, output shaft and idler gear.



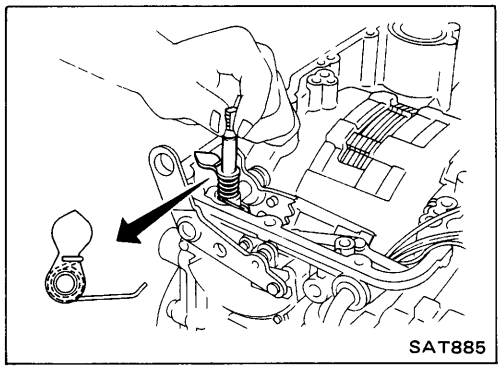
30. Adjust brake band.
1) First tighten anchor end pin.
2) Back off anchor end pin 5-1/4 turns.
3) Tighten lock nut while holding anchor end pin stationary.



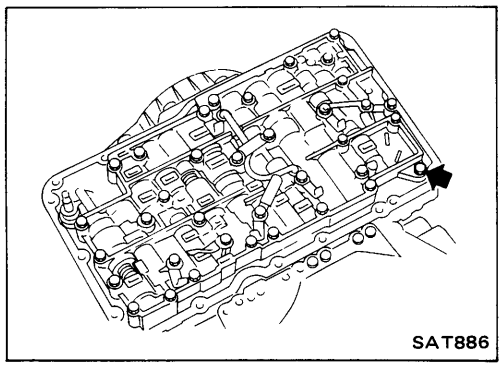
31. Install terminal assembly, paying attention to the direction of its hook.



32. Install accumulator and spring.

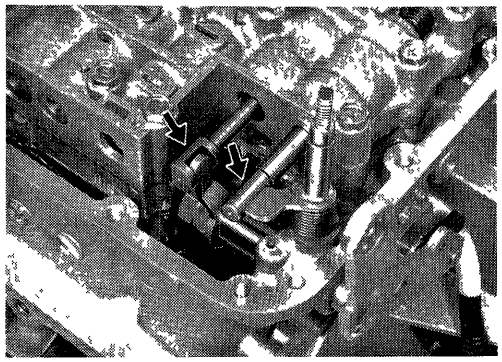

SAT885

33. Install throttle shaft and return spring.

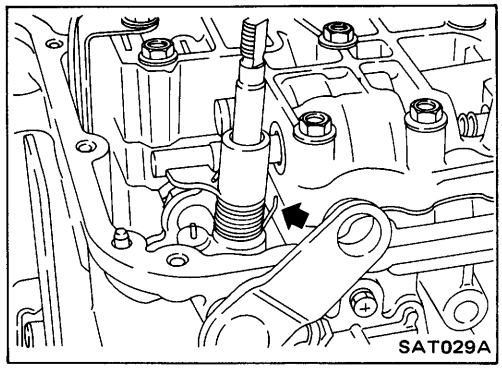

SAT886

34. Insert manual valve to control valve body, then assemble them to transmission case.

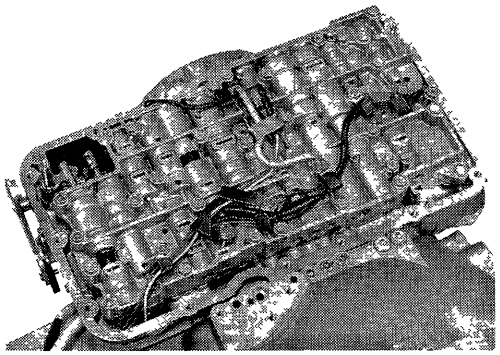
Arrow marks:
3.7 - 5.0 N·m
(0.38 - 0.51 kg-m, 2.7 - 3.7 ft-lb)
Others:
7 - 9 N·m
(0.7 - 0.9 kg-m, 5.1 - 6.5 ft-lb)



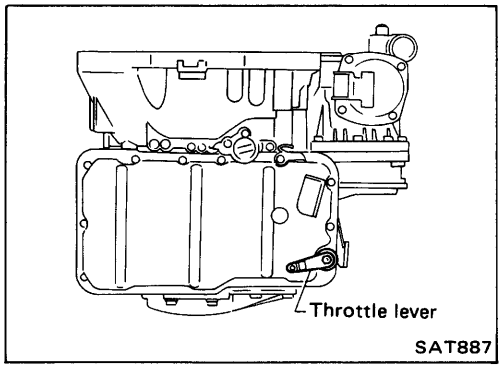
- **Pay attention to the direction of manual and detent valves' grooves.**


SAT029A

35. Set throttle shaft return spring as shown at left.

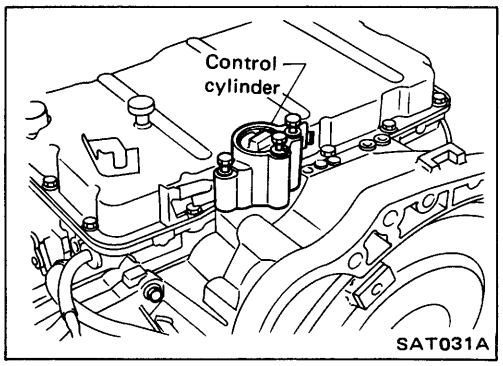


36. Connect harness connectors between terminal assembly and solenoids.

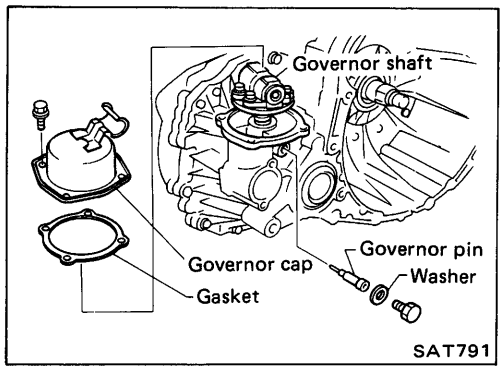


37. Put gasket on transmission case and install valve cover and throttle lever.

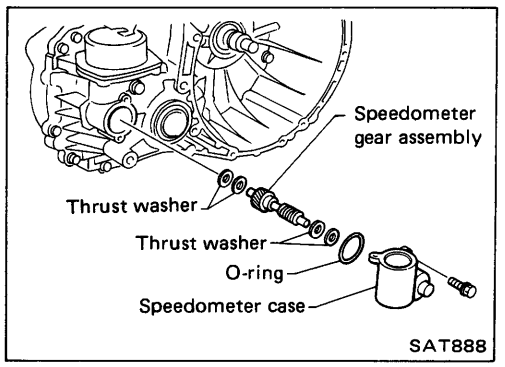
Always use new bolts as they are self-sealing bolts.



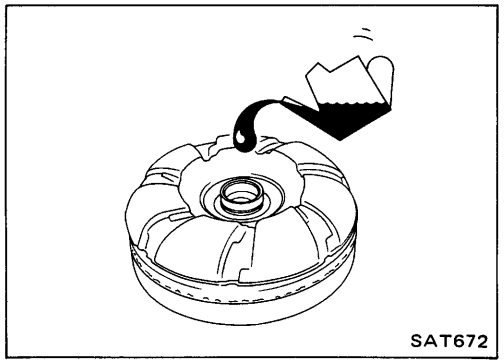
38. Install control cylinder.



39. Install governor parts.



40. Install speedometer parts.



41. Pour approx. 2 liters (2-1/8 US qt, 1-3/4 Imp qt) of automatic transmission fluid into converter housing.
42. Install torque converter to converter housing.

Be careful not to scratch front oil seal.

43. Apply sealant to threads of drain plug and install it in place.
44. Install inhibitor switch to transmission case.
45. **Adjust inhibitor switch. Refer to On-vehicle Service.**
46. Make sure that manual lever operates smoothly.

General Specifications

Applied model	CA20E
Automatic transaxle model	RL4F02A
Automatic transaxle assembly Model code number	23X10
Transaxle gear ratio 1st 2nd 3rd 4th Reverse Final drive	 2.785 1.545 1.000 0.694 2.272 4.133
Recommended oil	Automatic transmission fluid Type DEXRON™
Oil capacity ℓ (US qt, Imp qt)	6.8 (7-1/4, 6)

Specifications and Adjustment

Transaxle model number	23X10	
High clutch Number of drive plates	3	
Number of driven plates	5	
Clearance mm (in) Standard Allowable limit	 1.4 - 1.8 (0.055 - 0.071) 2.4 (0.094)	
Drive plate thickness mm (in) Standard Allowable limit	 1.6 (0.063) 1.4 (0.055)	
Thickness of retaining plate	Thickness mm (in)	Part number
	3.6 (0.142)	31567-21X00
	3.8 (0.150)	31567-21X01
	4.0 (0.157)	31567-21X02
	4.2 (0.165)	31567-21X03
	4.4 (0.173)	31567-21X04
	4.6 (0.181)	31567-21X05
	4.8 (0.189)	31567-21X06
Low clutch Number of drive plates	4	
Number of driven plates	5	
Clearance mm (in) Standard Allowable limit	 0.5 - 0.8 (0.020 - 0.031) 1.6 (0.063)	
Drive plate thickness mm (in) Standard Allowable limit	 2.0 (0.079) 1.8 (0.071)	

Transaxle model number	23X10	
Thickness of retaining plate	Thickness mm (in)	Part number
	4.8 (0.189)	31597-21X00
	5.0 (0.197)	31597-21X01
	5.2 (0.205)	31597-21X02
	5.4 (0.213)	31597-21X03
	5.6 (0.220)	31597-21X04
	5.8 (0.228)	31597-21X05
	6.0 (0.236)	31597-21X06
Reverse clutch Number of drive plates	2	
Number of driven plates	2	
Clearance mm (in) Standard Allowable limit	 0.5 - 0.8 (0.020 - 0.031) 1.2 (0.047)	
Drive plate thickness mm (in) Standard Allowable limit	 2.0 (0.079) 1.8 (0.071)	
Thickness of retaining plate	Thickness mm (in)	Part number
	4.6 (0.181)	31537-21X00
	4.8 (0.189)	31537-21X01
	5.0 (0.197)	31537-21X02
	5.2 (0.205)	31537-21X03
	5.4 (0.213)	31537-21X04
	5.6 (0.220)	31567-21X13
	5.8 (0.228)	31567-21X14
	6.0 (0.236)	31567-21X15

Specifications and Adjustment (Cont'd)

Transaxle model number	23X10	
Low & reverse brake Number of drive plates	5	
Number of driven plates	5	
Clearance mm (in) Standard Allowable limit	2.2 - 2.6 (0.087 - 0.102) 3.6 (0.142)	
Drive plate thickness mm (in) Standard Allowable limit	2.0 (0.079) 1.8 (0.071)	
Thickness of retaining plate	Thickness mm (in)	Part number
	12.4 (0.488)	31667-23X13
	12.6 (0.496)	31667-23X14
	12.8 (0.504)	31667-23X15
	13.0 (0.512)	31667-23X16
	13.2 (0.520)	31667-23X71
	13.4 (0.528)	31667-23X72
	13.6 (0.535)	31667-23X73
	13.8 (0.543)	31667-23X74
	14.0 (0.551)	31667-23X75
Brake band piston size mm (in) Big dia. Small dia.	65 (2.56) 36 (1.42)	
Planetary carrier mm (in) Clearance between pinion washer and planetary carrier Standard Allowable limit	0.20 - 0.70 (0.0079 - 0.0276) 0.80 (0.0315)	
Oil pump clearance mm (in) Cam ring — oil pump cover Standard Allowable limit	0.010 - 0.024 (0.0004 - 0.0009) 0.034 (0.0013)	
Rotor — oil pump cover Standard Allowable limit	0.010 - 0.024 (0.0004 - 0.0009) 0.034 (0.0013)	
Vane — oil pump cover Standard Allowable limit	0.010 - 0.024 (0.0004 - 0.0009) 0.034 (0.0013)	

CLUTCH PACK END PLAY

0.4 - 0.8 mm (0.016 - 0.031 in)

Clutch pack thrust washer

Thickness mm (in)	Part number
0.7 (0.028)	31528-21X00
0.9 (0.035)	31528-21X01
1.1 (0.043)	31528-21X02
1.3 (0.051)	31528-21X03
1.5 (0.059)	31528-21X04
1.7 (0.067)	31528-21X05
1.9 (0.075)	31528-21X06

TOTAL END PLAY

0.25 - 0.55 mm (0.0098 - 0.0217 in)

Oil pump housing bearing race (For total end play)

Thickness mm (in)	Part number
0.8 (0.031)	31429-21X00
1.0 (0.039)	31429-21X01
1.2 (0.047)	31429-21X02
1.4 (0.055)	31429-21X03
1.6 (0.063)	31429-21X04
1.8 (0.071)	31429-21X05
2.0 (0.079)	31429-21X06

Differential side bearing adjusting shim

Thickness mm (in)	Part number
0.12 (0.0047)	38453-21X13
0.16 (0.0063)	38453-21X14
0.20 (0.0079)	38453-21X15
0.24 (0.0094)	38453-21X16
0.28 (0.0110)	38453-21X17
0.32 (0.0126)	38453-21X18
0.36 (0.0142)	38453-21X19
0.40 (0.0157)	38453-21X20
0.44 (0.0173)	38453-21X00
0.48 (0.0189)	38453-21X01
0.52 (0.0205)	38453-21X02
0.56 (0.0220)	38453-21X03
0.60 (0.0236)	38453-21X04
0.64 (0.0252)	38453-21X05
0.68 (0.0268)	38453-21X06
0.72 (0.0283)	38453-21X07
0.76 (0.0299)	38453-21X08
0.80 (0.0315)	38453-21X09
0.84 (0.0331)	38453-21X10
0.88 (0.0346)	38453-21X11
0.92 (0.0362)	38453-21X12

Specifications and Adjustment (Cont'd)

Output shaft bearing adjusting shim

Thickness mm (in)	Part number
0.12 (0.0047)	31499-21X00
0.16 (0.0063)	31499-21X01
0.20 (0.0079)	31499-21X02
0.24 (0.0094)	31499-21X03
0.28 (0.0110)	31499-21X04
0.32 (0.0126)	31499-21X05
0.36 (0.0142)	31499-21X06
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
1.96 (0.0772)	31499-21X22

Idler gear bearing adjusting shim

Thickness mm (in)	Part number
0.36 (0.0142)	31499-21X06
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
1.96 (0.0772)	31499-21X22

CLEARANCE BETWEEN SIDE GEAR AND DIFFERENTIAL CASE WITH WASHER

0.1 - 0.2 mm (0.004 - 0.008 in)

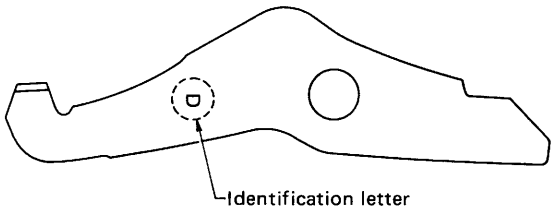
Side gear thrust washer

Thickness mm (in)	Part number
0.75 - 0.80 (0.0295 - 0.0315)	38424-E3000 or E3020
0.80 - 0.85 (0.0315 - 0.0335)	38424-E3001 or E3021
0.85 - 0.90 (0.0335 - 0.0354)	38424-E3002 or E3022
0.90 - 0.95 (0.0354 - 0.0374)	38424-E3003 or E3023

PARKING PAWL

Clearance "A":

0.27 - 0.61 mm (0.0106 - 0.0240 in)



SAT914

Identification letter	Part number
D	31989-21X00
E	31989-21X01
F	31989-21X02

STALL REVOLUTION

Engine model	rpm
CA20E	2,150 - 2,450

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Drive plate to torque converter	39 - 49	4.0 - 5.0	29 - 36
Transaxle securing bolt	Refer to REMOVAL AND INSTALLATION.		
Dust cover to converter housing	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Transmission case to converter housing	21 - 23	2.1 - 2.3	15 - 17
Transmission case to side cover	21 - 23	2.1 - 2.3	15 - 17
Transmission case to valve cover	5 - 7	0.5 - 0.7	3.6 - 5.1
Transmission case to bearing retainer	16 - 21	1.6 - 2.1	12 - 15
Oil pump cover to converter housing	16 - 21	1.6 - 2.1	12 - 15

Specifications and Adjustment (Cont'd)

Unit	N·m	kg-m	ft-lb
Control valve body to transmission case	5 - 7 3.7 - 5.0	0.5 - 0.7 0.38 - 0.51	3.6 - 5.1 2.7 - 3.7
Governor cap to converter housing	5 - 7	0.5 - 0.7	3.6 - 5.1
Speedometer case to converter housing	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Inhibitor switch to transmission case	2.0 - 2.5	0.20 - 0.26	1.4 - 1.9
Throttle lever lock nut	9.1 - 11.8	0.93 - 1.20	6.7 - 8.7
Actuator support to transmission case	16 - 21	1.6 - 2.1	12 - 15
Band piston stem (when adjusting band brake)	4 - 6*	0.4 - 0.6*	2.9 - 4.3*
Lower valve body to upper valve body	3.4 - 4.4	0.35 - 0.45	2.5 - 3.3
Final drive bolt	74 - 88	7.5 - 9.0	54 - 65
Governor valve body to governor shaft	5 - 7	0.5 - 0.7	3.6 - 5.1
Governor shaft securing bolt	20 - 26	2.0 - 2.7	14 - 20
Manual shaft lock nut	31 - 37	3.2 - 3.8	23 - 27
Oil strainer to converter housing	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Control cylinder to transmission case	6.3 - 8.3	0.64 - 0.84	4.6 - 6.1
Test plug (oil pressure inspection hole)	5 - 10	0.5 - 1.0	3.6 - 7.2
Piston stem lock nut	31 - 42	3.2 - 4.3	23 - 31
Detent spring to transmission case	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
Drain plug to transmission case	15 - 20	1.5 - 2.0	11 - 14
Drain plug to converter housing	10 - 15	1.0 - 1.5	7 - 11
Oil cooler pipe to transmission case	29 - 49	3.0 - 5.0	22 - 36

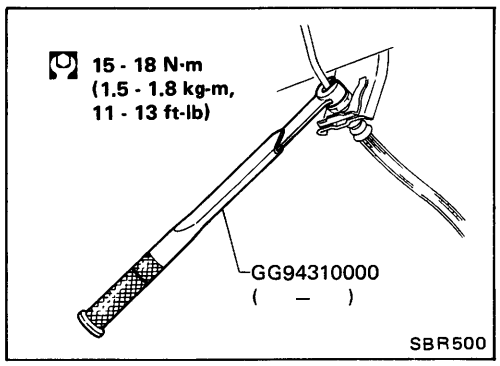
*: Turn back 5-1/4 turns after tightening.

FRONT AXLE & FRONT SUSPENSION

SECTION FA

CONTENTS

PRECAUTIONS AND PREPARATION ..... FA- 2
FRONT AXLE AND FRONT SUSPENSION ..... FA- 4
CHECK AND ADJUSTMENT – On-vehicle ..... FA- 5
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 Strut Assembly FA-24
FRONT SUSPENSION – Stabilizer Bar FA-26
FRONT SUSPENSION – Transverse Link and Transverse Link Gusset FA-27
FRONT SUSPENSION – Lower Ball joint FA-28
SERVICE DATA AND SPECIFICATIONS (S.D.S.) FA-30

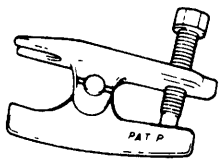
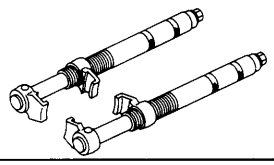
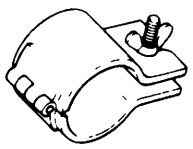
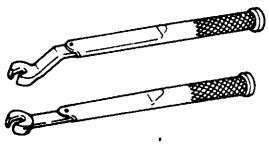
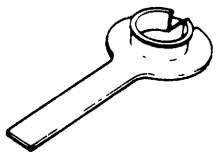


Precautions

(1) 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 position.**
(2) When removing each suspension part, check wheel alignment and adjust if necessary.
(3) Use Tool when removing or installing brake tubes.

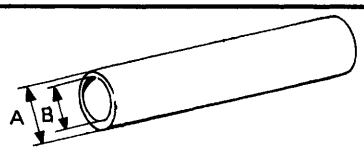
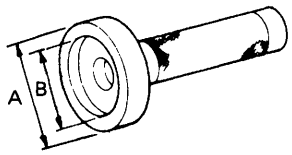
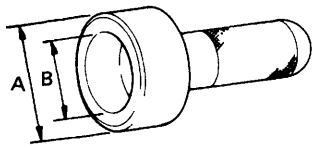
Preparation

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
ST35652001 (–) Strut attachment		Fixing strut assembly
GG94310000 (–) Flare nut torque wrench		Removing and installing brake piping
KV38106700 (J34296) KV38106800 (J34297) Differential side oil seal protector		Installing drive shaft L.H. KV38106700 R.H. KV38106800

Preparation (Cont'd)

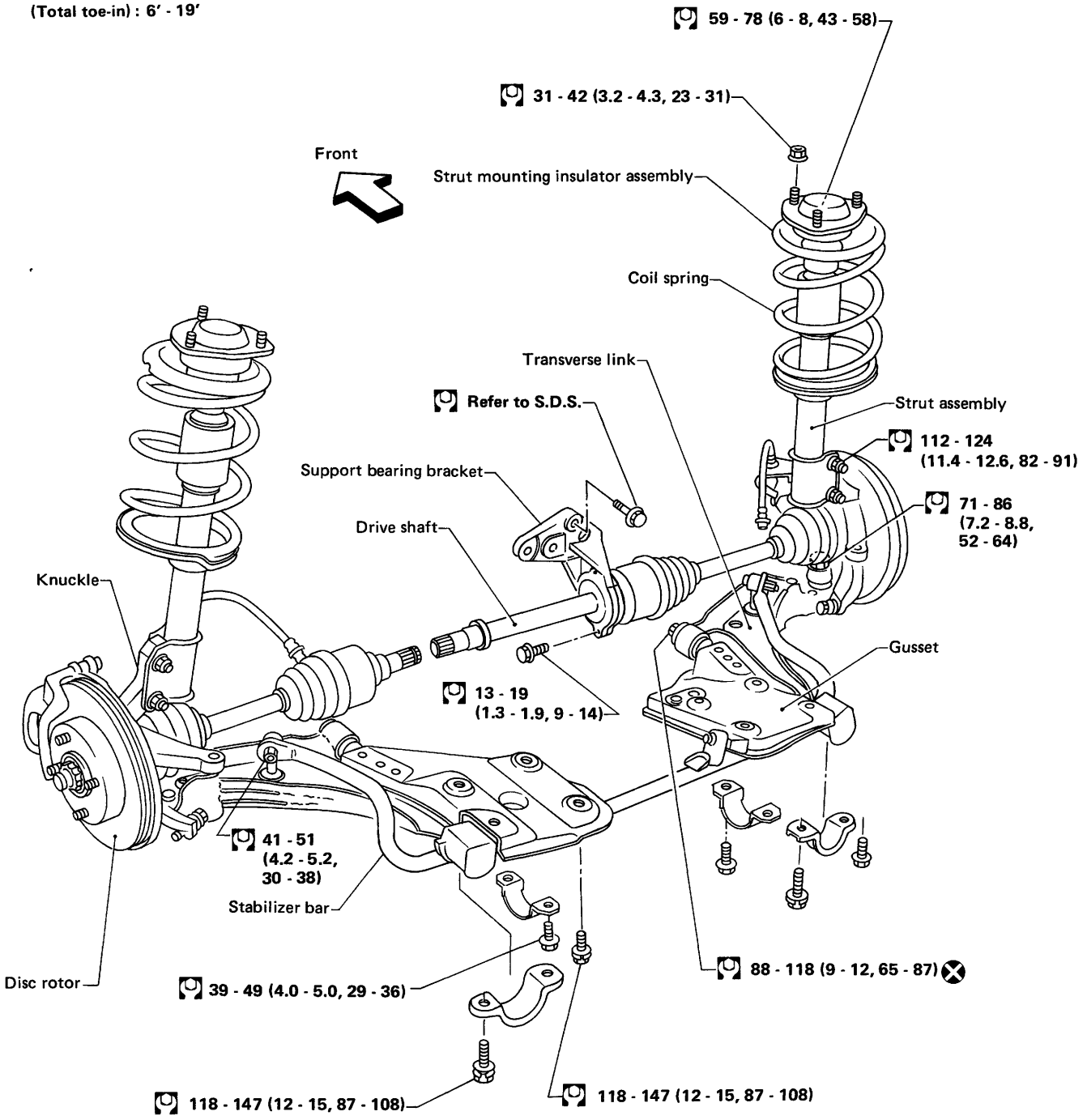
COMMERCIAL SERVICE TOOLS

Tool name	Description
Front wheel hub drift	 Removing wheel hub **A : 42 mm (1.65 in) dia.** **B : 33 mm (1.30 in) dia.**
Front wheel bearing outer race drift	 Removing and installing wheel bearing outer race **A : 72 mm (2.83 in) dia.** **B : 68 mm (2.68 in) dia.**
Grease seal drift	 Installing outer grease seal **A : 77 mm (3.03 in) dia.** **B : 72 mm (2.83 in) dia.**

Wheel bearing
- **Refer to FRONT AXLE — Wheel Hub and Knuckle.**
- **Axial end play: 0 mm (0 in)**

Wheel alignment
- **Camber, caster and kingpin inclination cannot be adjusted.**
- **The vehicle requires only toe-in adjustments.**

Toe-in : 1 - 3 mm (0.04 - 0.12 in)
(Total toe-in) : 6' - 19'

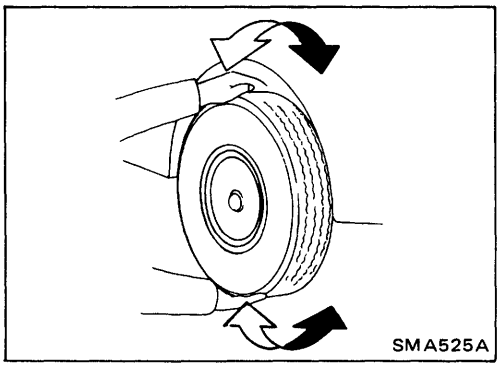


When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.

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

: N·m (kg-m, ft-lb)

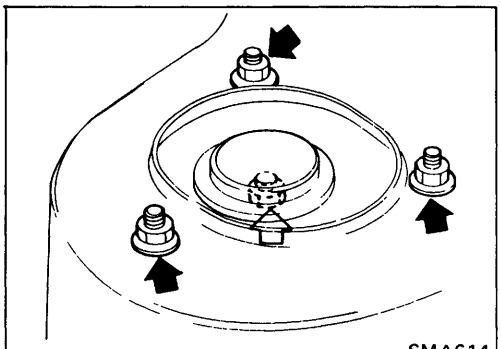
SFA147A


SMA525A

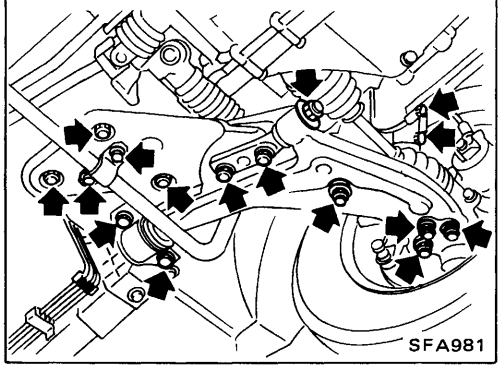
Front Axle and Front Suspension Parts

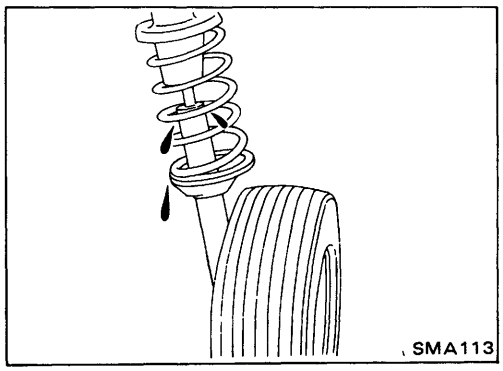
- Check front axle and front suspension parts for looseness, cracks, wear or other damage.

(1) Shake each front wheel.

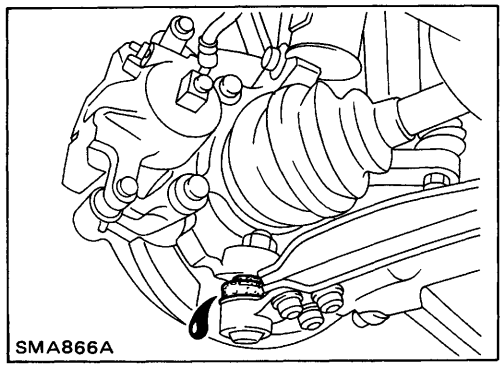

SMA614

(2) Make sure that cotter pin is inserted.
(3) Retighten all nuts and bolts to the specified torque.
Tightening torque: Refer to S.D.S.
(4) Check front axle and front suspension parts for wear, cracks or other damage.

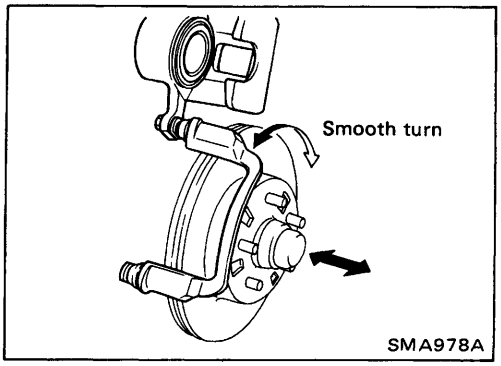

SFA981


SMA113

- Check strut (shock absorber) for oil leakage or other damage.


SMA866A

- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.

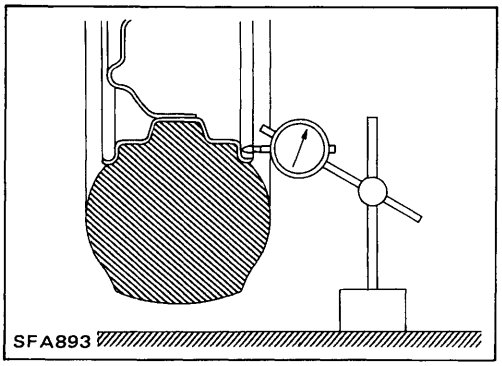


Front Wheel Bearing

- Check that wheel bearings operate smoothly.
- Check axial end play.

  Axial end play: 0 mm (0 in)
- Adjust wheel bearing preload if there is any axial end play or wheel bearing does not turn smoothly.

  Refer to FRONT AXLE — Wheel Hub and Knuckle.



Front Wheel Alignment

Before checking front wheel alignment, be sure to make a preliminary inspection.

PRELIMINARY INSPECTION

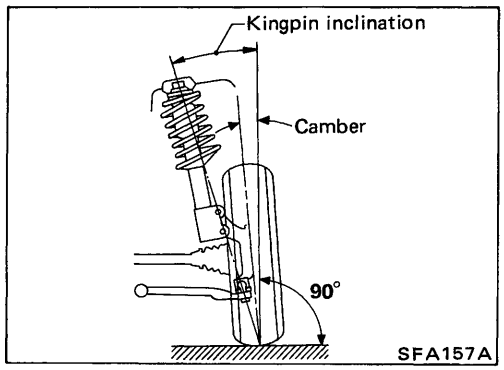
- Check tires for wear and proper inflation.
- Check wheel runout.

  Lateral runout:

  1.0 mm (0.039 in) or less
- Check front wheel bearings for looseness.
- Check front suspension for looseness.
- Check steering linkage for looseness.
- Check that front shock absorbers work properly.
- Check vehicle posture (Unladen):

  "Unladen"

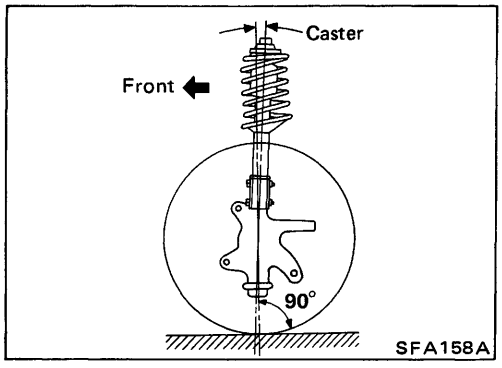
  Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated position.



CAMBER, CASTER AND KINGPIN INCLINATION

Camber, caster and kingpin inclination are preset at factory and cannot be adjusted.

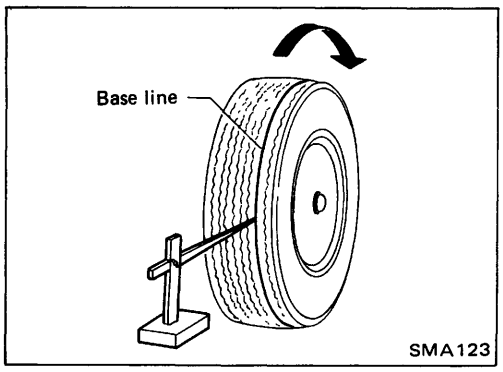
Camber	degree	−25′ to 1°5′
Caster	degree	1°20′ - 2°50′
Kingpin inclination	degree	13°50′ - 15°20′



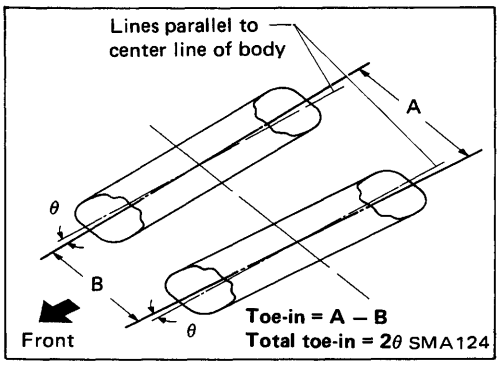
TOE-IN

1. Mark 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.



Front Wheel Alignment (Cont'd)



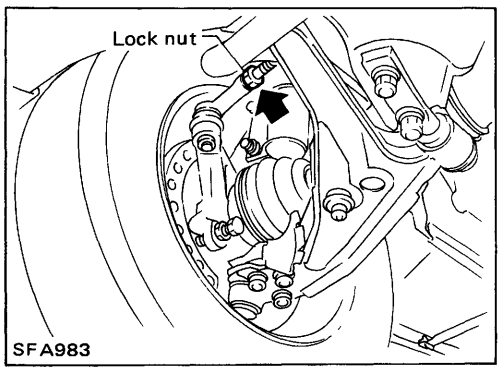
2. Measure toe-in.

Measure distance "A" and "B" at the same height as hub center.

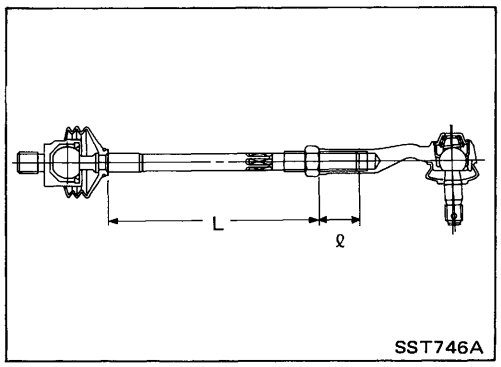
Toe-in (Unladen):

A – B 1 - 3 mm (0.04 - 0.12 in)

2θ 6' - 19' (Total toe-in)



3. Adjust toe-in by varying the length of steering tie-rods.



Length "ℓ" must be 25 mm (0.98 in) or more.

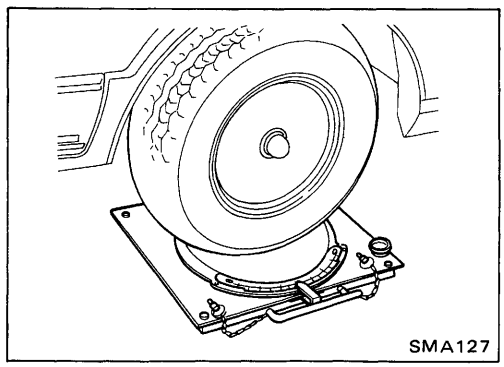
Make sure that the left and right tie-rods are the same length.

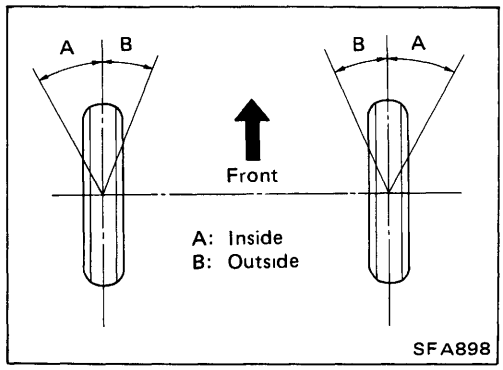
Tie-rod length "L"-reference data:

179 mm (7.05 in)

FRONT WHEEL TURNING ANGLE

1. Set wheels in straight ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.

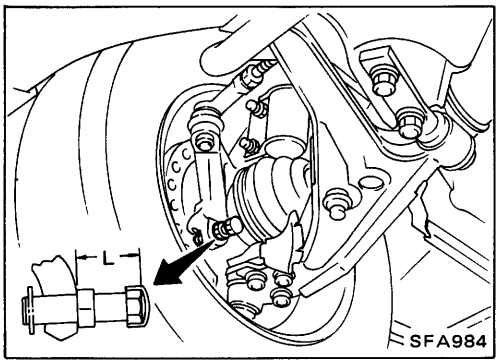




2. Rotate steering wheel all the way right and left; measure turning angle.

	Wheel turning angle	
Full turns	Inside wheel	38° - 42°
	Outside wheel	29° - 33°
Toe-out turn (at 20°)	Inside wheel	22°20'
	Outside wheel	20°

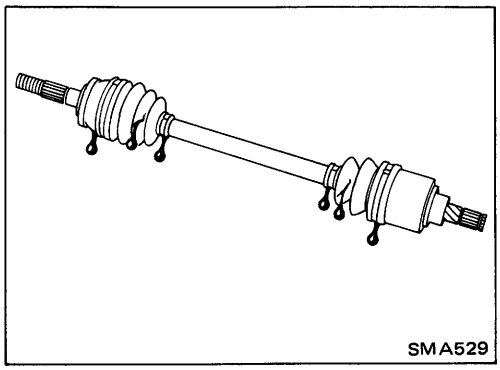
Front Wheel Alignment (Cont'd)



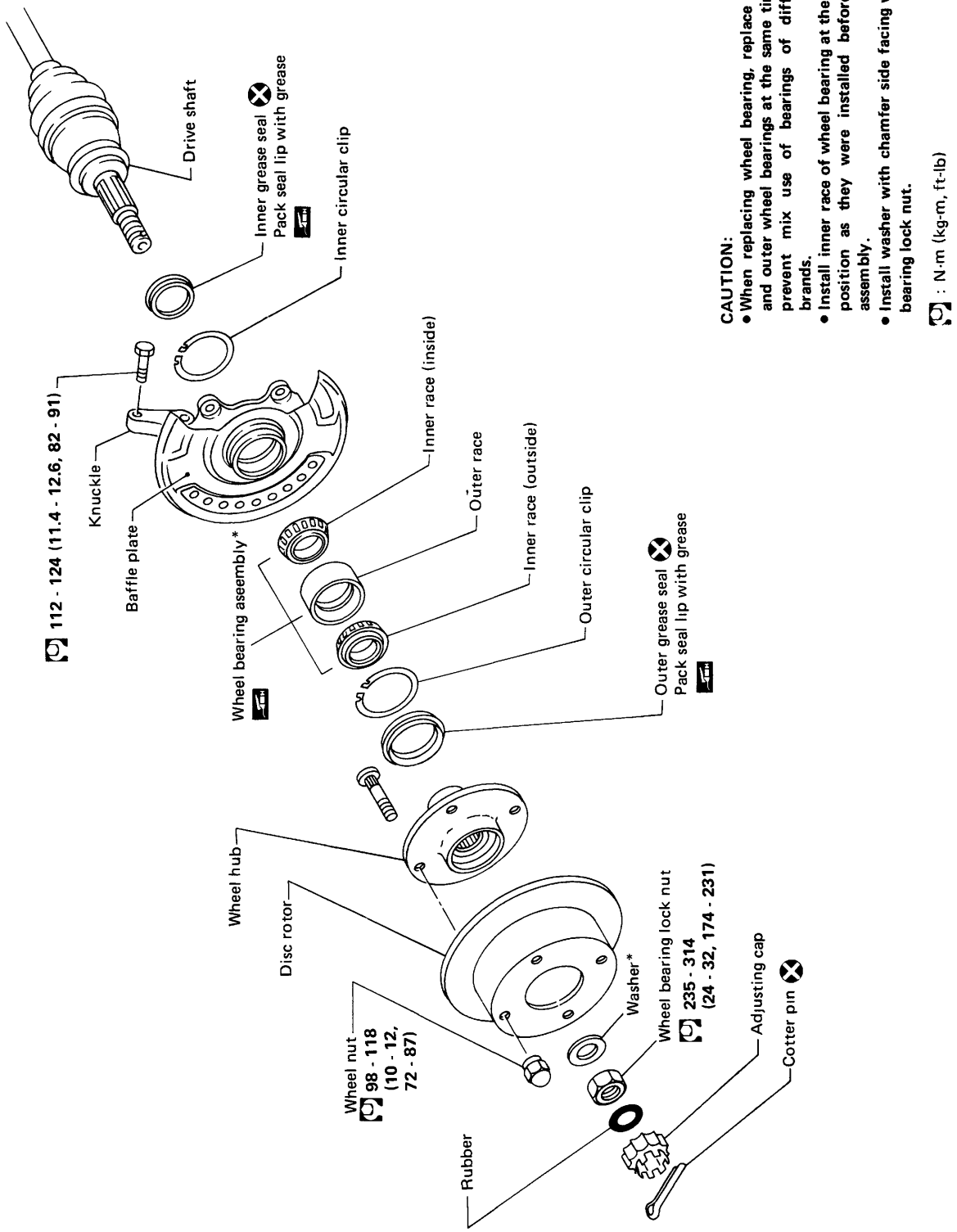
3. Adjust by stopper bolt if necessary.

Standard length "L":
24 mm (0.94 in)

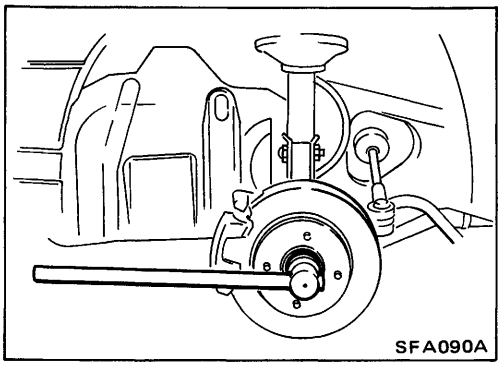
Drive Shaft



- Check for grease leakage or other damage.

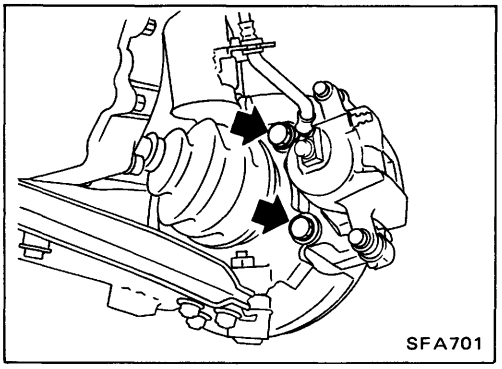

Drive shaft
Inner grease seal
Pack seal lip with grease
Inner circular clip
112 - 124 (11.4 - 12.6, 82 - 91)
Knuckle
Baffle plate
Wheel bearing assembly*
Inner race (inside)
Outer race
Inner race (outside)
Outer circular clip
Outer grease seal
Pack seal lip with grease
Wheel hub
Disc rotor
Wheel nut
98 - 118
(10 - 12,
72 - 87)
Rubber
Washer*
Wheel bearing lock nut
235 - 314
(24 - 32, 174 - 231)
Adjusting cap
Cotter pin
CAUTION:
• When replacing wheel bearing, replace inner and outer wheel bearings at the same time to prevent mix use of bearings of different brands.
• Install inner race of wheel bearing at the same position as they were installed before disassembly.
• Install washer with chamfer side facing wheel bearing lock nut.
: N·m (kg-m, ft-lb)

SFA475A



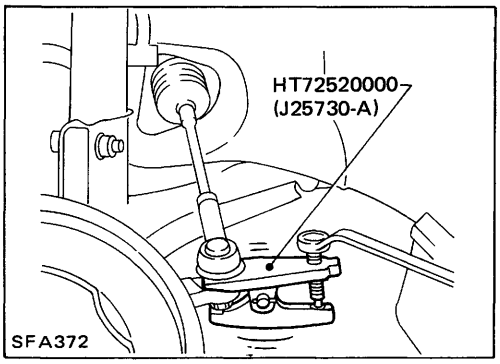
Removal

- Remove wheel bearing lock nut while depressing brake pedal

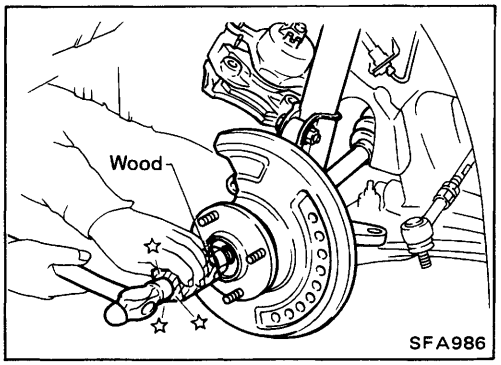


- Remove brake caliper assembly.

Brake hose does not need to be disconnected from brake caliper.
Be careful not to depress brake pedal, or piston will pop out.
Make sure brake hose is not twisted.

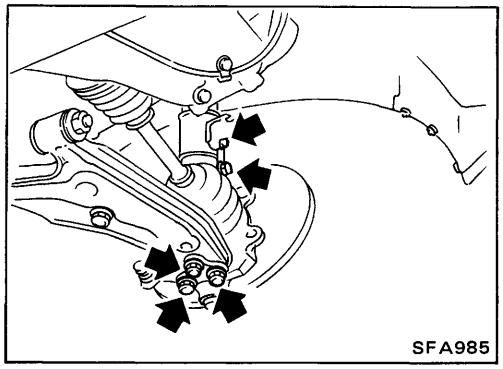


- Remove tie-rod ball joint.

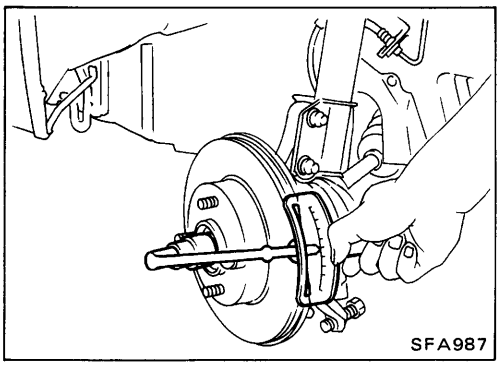


- Separate drive shaft from knuckle by slightly tapping it.

Cover boots with waste cloth so as not to damage them when removing drive shaft.



- Remove bolts and nuts as shown.


SFA987

Installation

- Install knuckle with wheel hub.
- Tighten wheel bearing lock nut.

[Method A]

: **235 - 314 N·m (24 - 32 kg-m, 174 - 231 ft-lb)**

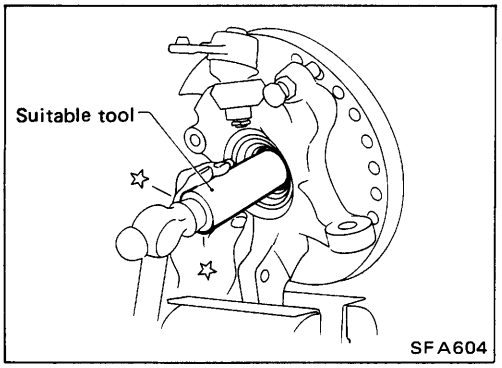
[Method B]

: **Refer to Assembly of FRONT AXLE — Wheel Hub and Knuckle.**

Disassembly

WHEEL HUB

- Drive out hub with inner race (outside) from knuckle.

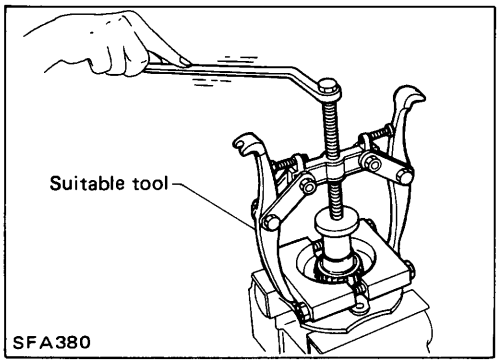


SFA604

WHEEL BEARING

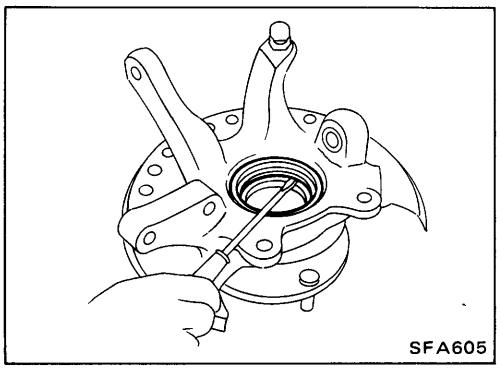
When replacing wheel bearing, replace wheel bearing assembly (inner races and outer race).

- Remove bearing inner race (outside), then remove outer grease seal.

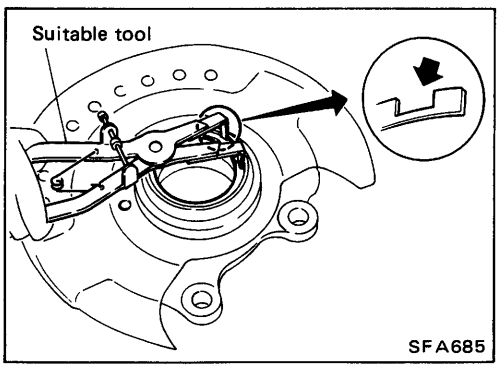


SFA380

- Remove inner grease seal from knuckle.

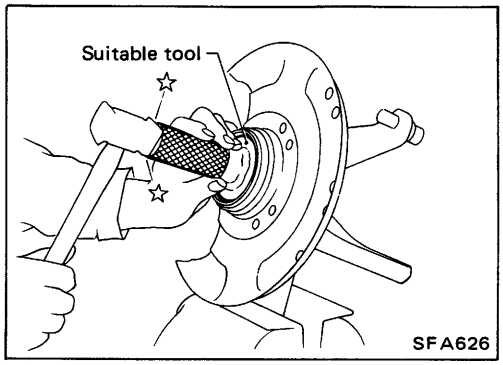

SFA605

- Remove inner and outer circular clips.



SFA685

Disassembly (Cont'd)



- Press out bearing outer race.

Inspection

WHEEL BEARING

- Make sure wheel bearing rolls freely and is free from noise, cracks, pitting or wear.
  When replacing, replace as a set (inner races and outer race).

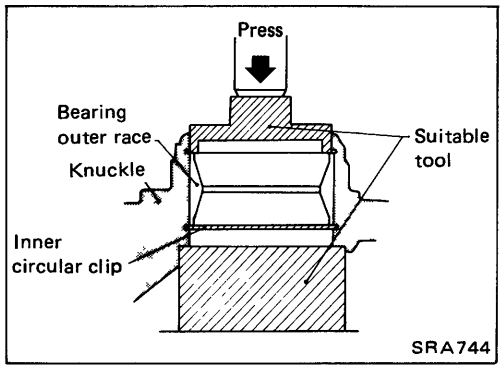
WHEEL HUB AND KNUCKLE

- Check wheel hub for cracks by using a magnetic exploration or dyeing test.

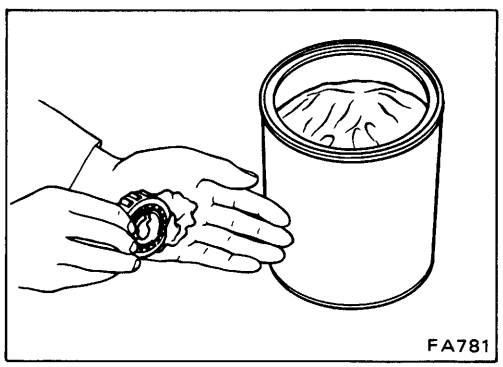
CIRCULAR CLIP

- Check circular clip for wear or cracks.
  Replace if necessary.

Assembly



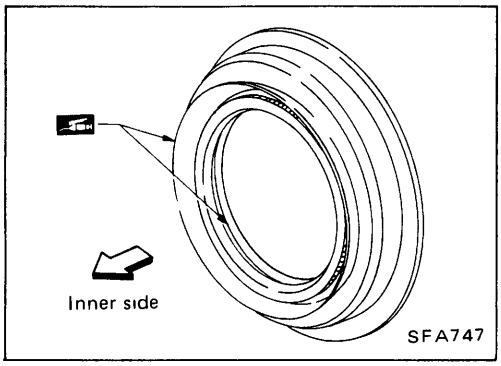
1. Install inner circular clip into groove of knuckle.
2. Press bearing outer race into knuckle.



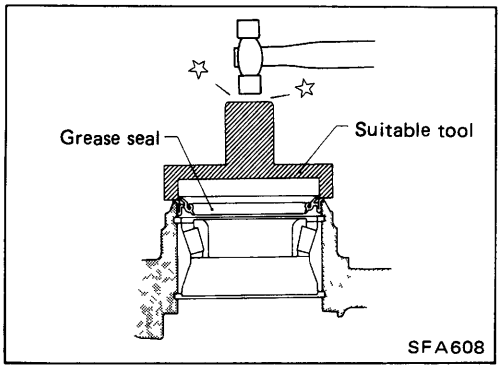
3. Apply multi-purpose grease to each bearing cone.

Assembly (Cont'd)

4. Pack grease seal lip with multi-purpose grease.



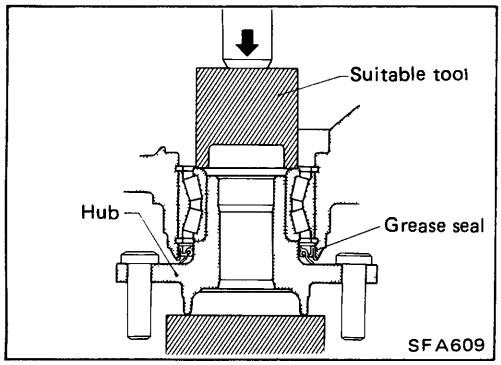
5. Install outer circular clip into groove of knuckle.
6. Install bearing inner races, and then install outer grease seal.



7.

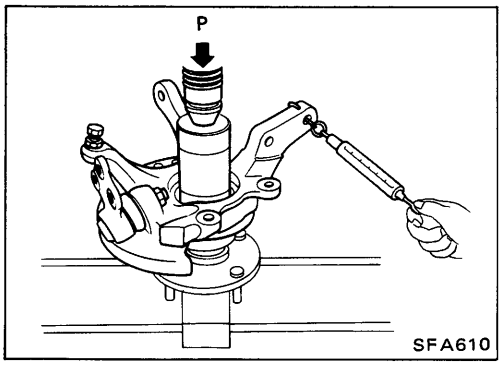
- **Method A (In cases where drive shaft is not removed from transaxle)**

(1) Adjust bearing preload when pressing hub into knuckle.
(2) Spin knuckle several turns in both directions and then measure bearing preload.



P kN (ton, US ton, Imp ton)	Rotation running torque N·m (kg-cm, in-lb)	As measured at knuckle as shown at left N (kg, lb)
34.3 (3.5, 3.9, 3.44)	0.3 - 2.4 (3 - 24, 2.6 - 20.8)	2.0 - 15.7 (0.2 - 1.6, 0.4 - 3.5)
or		
49 (5, 5.5, 4.9)	0.3 - 2.5 (3 - 26, 2.6 - 22.6)	2.0 - 17.7 (0.2 - 1.8, 0.4 - 4.0)

If bearing preload does not meet the specification, replace wheel bearing assembly.



Assembly (Cont'd)

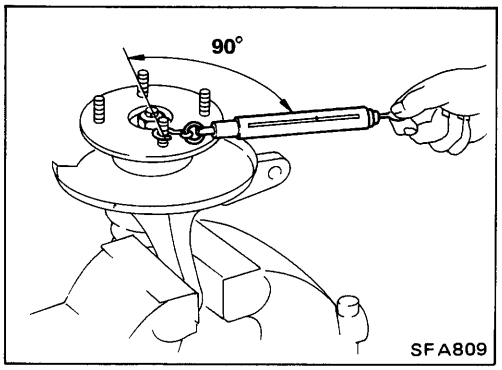
- **Method B (In cases where drive shaft is removed from transaxle)**

(1) Draw out drive shaft from transaxle. Refer to FRONT AXLE — Drive Shaft.

(2) Put drive shaft into hub, and tighten wheel bearing lock nut.

: 235 - 314 N·m
(24 - 32 kg-m, 174 - 231 ft-lb)

Note torque just tightened in this procedure.



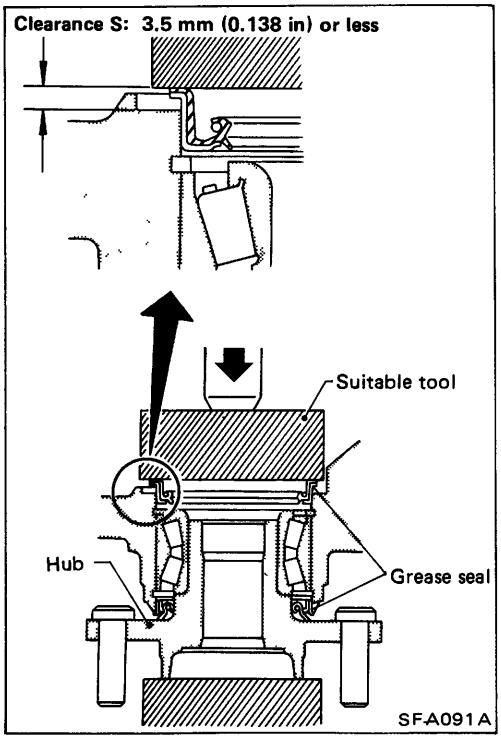
(3) Spin wheel hub several turns in both direction, and then measure bearing preload.

Rotation running torque
0.3 - 2.5 N·m
(3 - 26 kg-cm, 2.6 - 22.6 in-lb)
As measured at wheel bolt:
4.9 - 45.1 N
(0.5 - 4.6 kg, 1.1 - 10.1 lb)

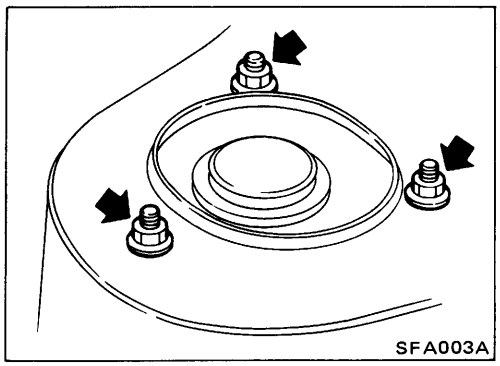
If bearing preload does not meet the specification, replace wheel bearing assembly.

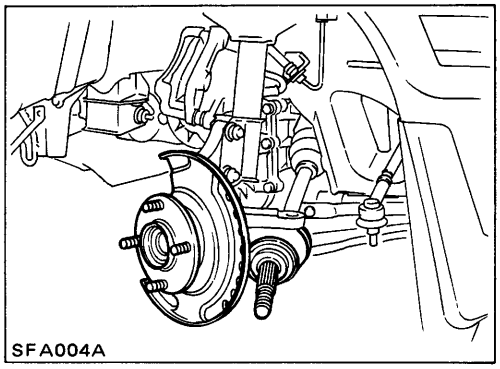
When tightening wheel bearing lock nut on-vehicle, tighten by the tightening torque which was noted in step (2).

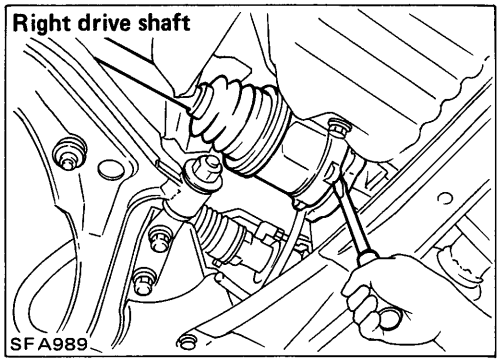
(4) Remove wheel bearing lock nut, and then draw out drive shaft from hub.



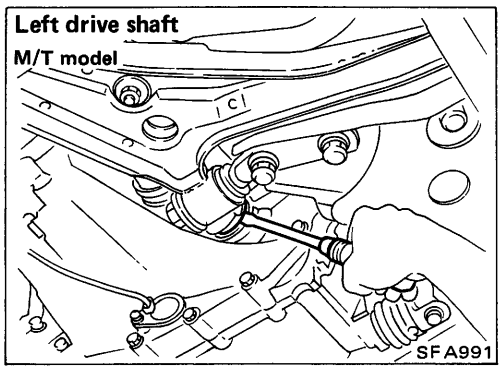
8. Install inner grease seal into knuckle.


SFA003A


SFA004A



SFA989



SFA991

Removal

- Remove wheel bearing lock nut while depressing brake pedal.
- Remove brake caliper assembly.

Brake hose does not need to be disconnected from brake caliper.
Be careful not to depress brake pedal, or piston will pop out.
Make sure brake hose is not twisted.

- Remove tie-rod ball joint and lower ball joint securing nuts.
- Loosen (do not remove) strut mounting nuts.
- Separate drive shaft from knuckle by slightly tapping it.

Cover boots with waste cloth so as not to damage them when removing drive shaft.

- Remove lower ball joint securing nuts.

Refer to FRONT AXLE — Wheel Hub and Knuckle.

- For A/T models, remove left drive shaft after removing right drive shaft.

1. Remove right drive shaft from transaxle.

2. Remove left drive shaft from transaxle.

FOR M/T MODELS

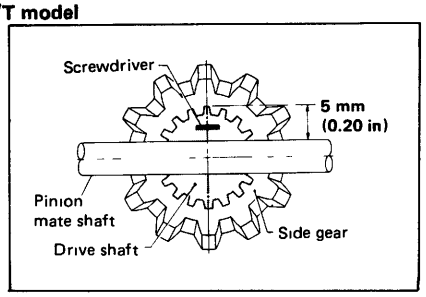
Removal (Cont'd)

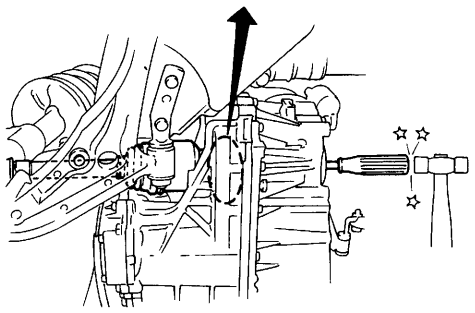
FOR A/T MODELS

- Remove left drive shaft with a screwdriver.

Be careful not to damage pinion mate shaft and side gear.

Left drive shaft
A/T model



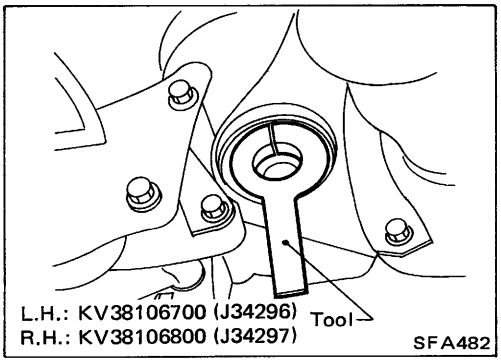


SFA730

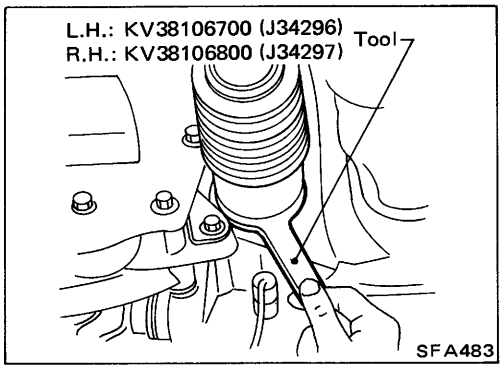
Installation

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 (transaxle side).



SFA482



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.

- **After it is inserted, try to pull flange out of slide joint by hand to make sure that circular clip is properly meshed with side gear and will not come out.**

WHEEL SIDE

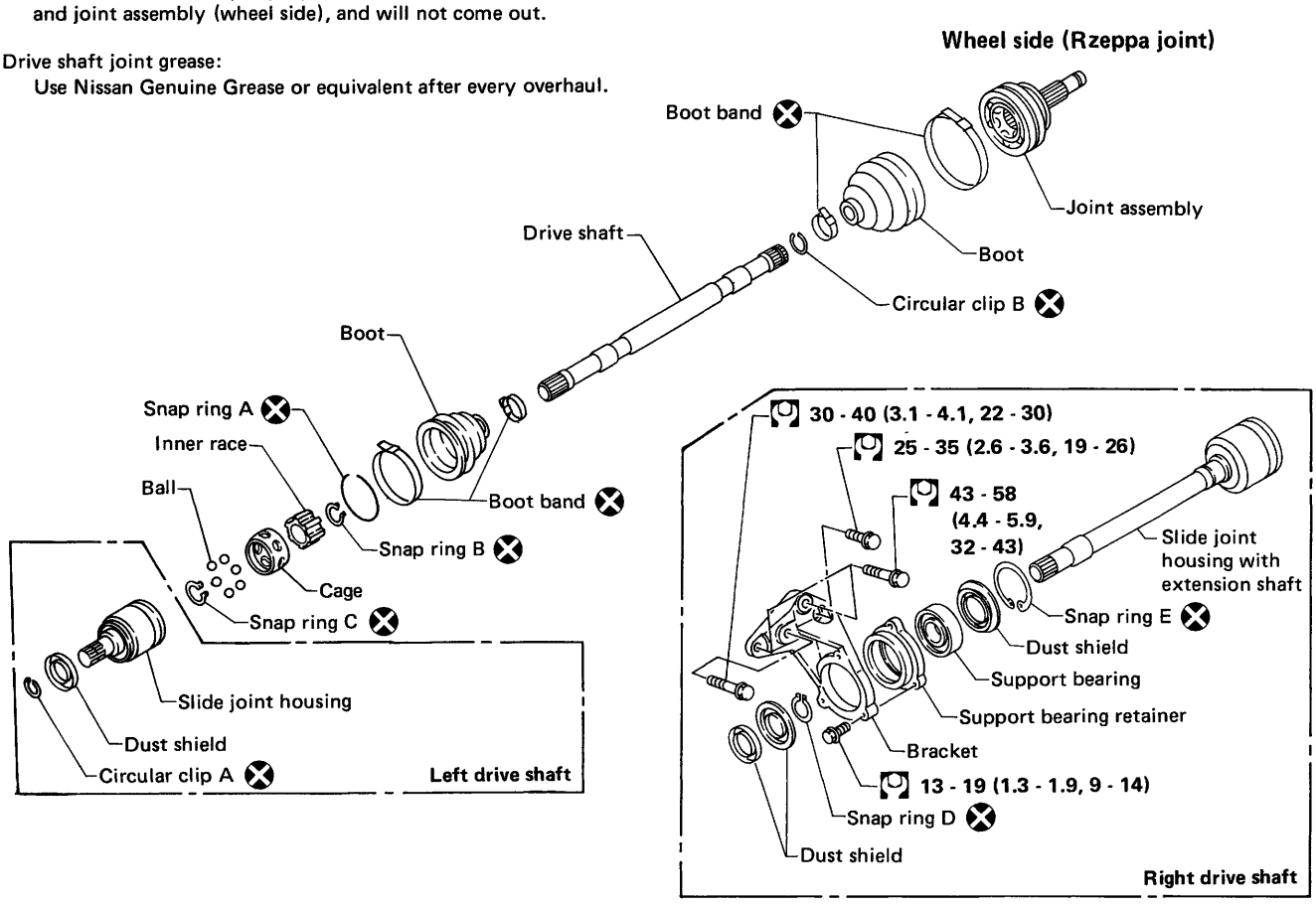
- Tighten wheel bearing lock nut.

Adjust bearing preload. Refer to Method B in FRONT AXLE — Wheel Hub and Knuckle.

Components

Circular clip:
Make sure circular clip is properly meshed with side gear (transaxle side) and joint assembly (wheel side), and will not come out.

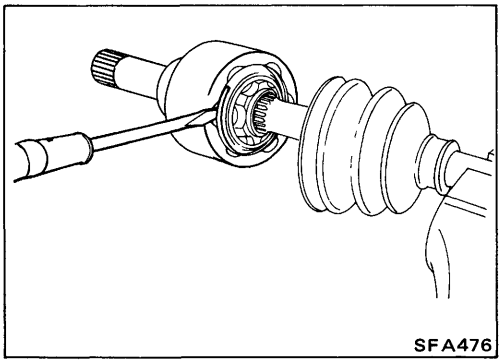
Drive shaft joint grease:
Use Nissan Genuine Grease or equivalent after every overhaul.



Be careful not to damage boots. Use suitable protector or cloth during removal and installation.

: N·m (kg-m, ft-lb)

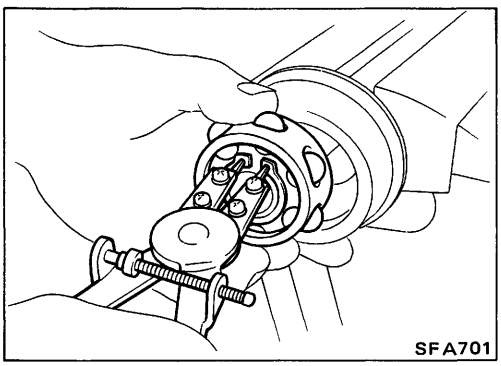
SFA148A



Disassembly

TRANSAXLE SIDE

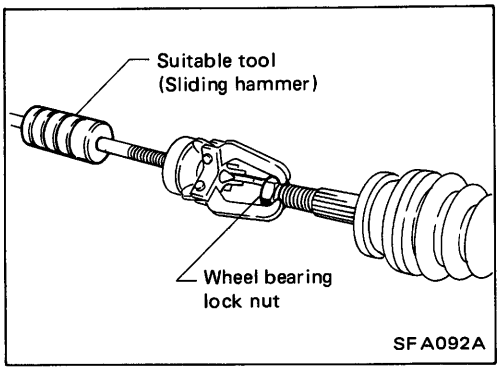
1. Remove boot bands.
2. Put matching marks on slide joint housing and inner race, before separating joint assembly.
3. Pry off snap ring "A" with a screwdriver, and pull out slide joint housing.



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 serration with tape so as not to damage the boot.

Disassembly (Cont'd)



WHEEL SIDE

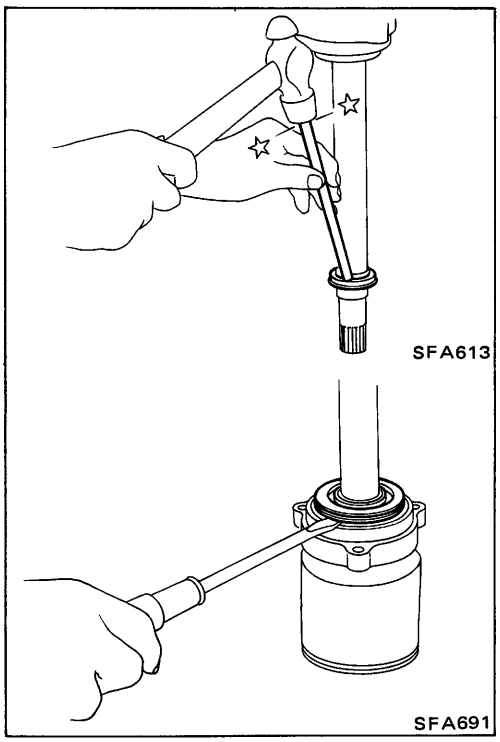
CAUTION:

The joint on the wheel side cannot be disassembled.

- Before separating joint assembly, put matching marks on drive shaft and joint assembly.
- Separate joint assembly with suitable tool.

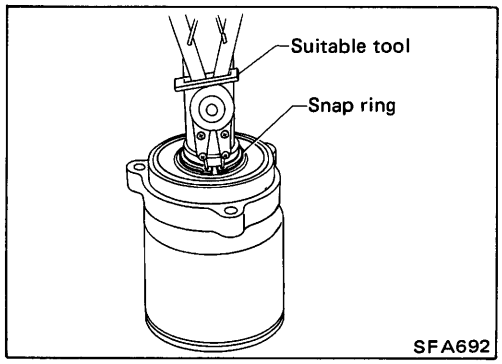
Be careful not to damage threads on drive shaft.

- Remove boot bands.

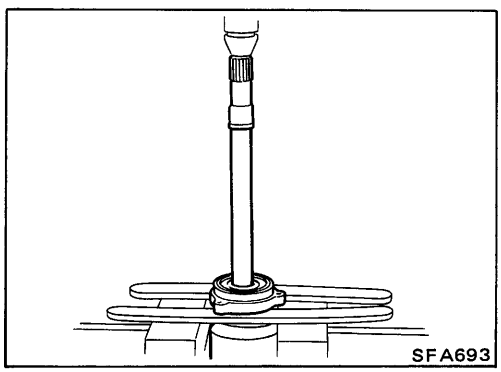


SUPPORT BEARING

- Remove dust shield.

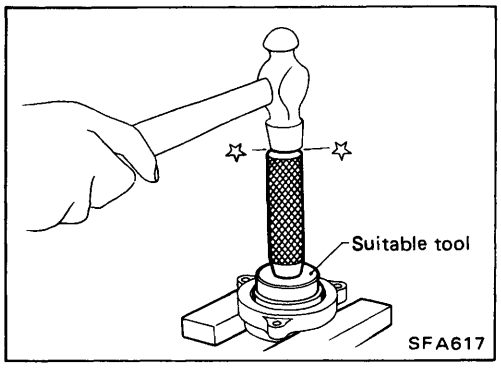


- Pry off snap ring.



- 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

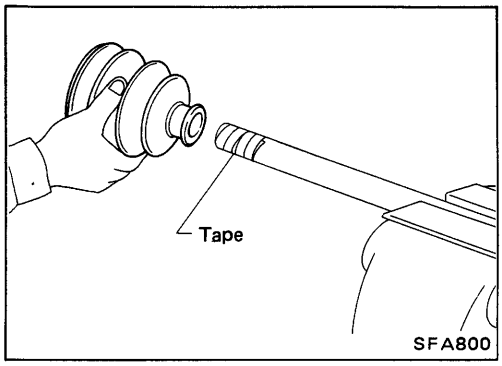
Check support bearing bracket for cracks with a magnetic exploration or dyeing test.

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.**

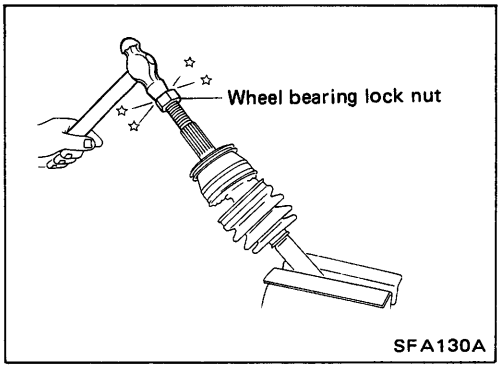
Assembly (Cont'd)

WHEEL SIDE

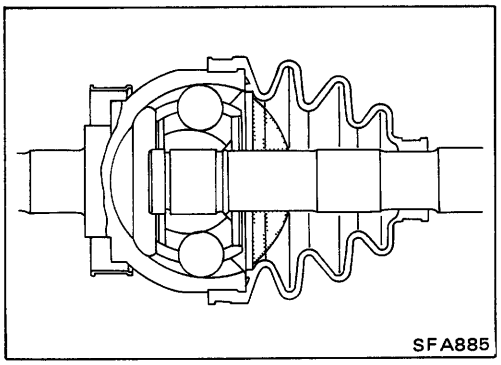


1. Install boot and new small boot band on drive shaft.

Cover drive shaft serration with tape so as not to damage boot during installation.

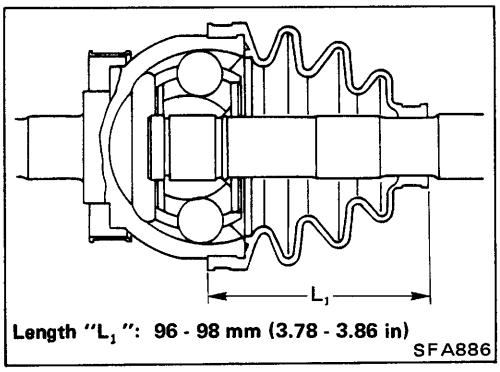


2. Set joint assembly onto drive shaft by lightly tapping it. Install joint assembly securely, ensuring marks which were made during disassembly are properly aligned.



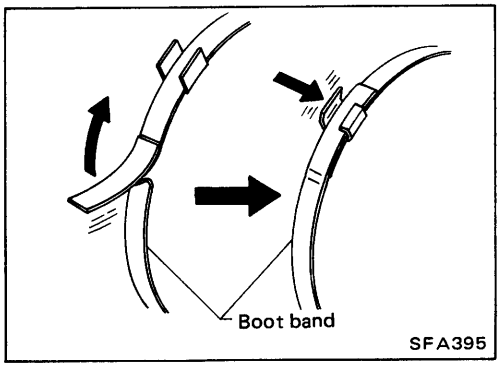
3. Pack drive shaft with specified amount of grease.

Specified amount of grease:
205 - 225 g (7.23 - 7.94 oz)



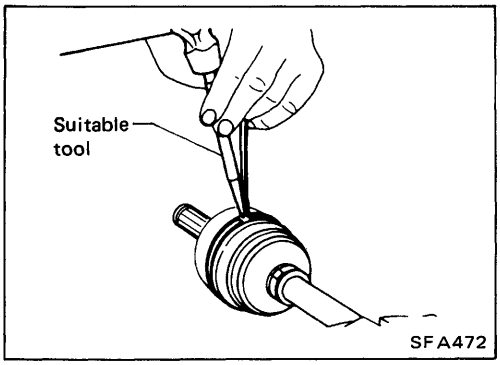
4. Set boot so that it does not swell and deform when its length is "L_1".

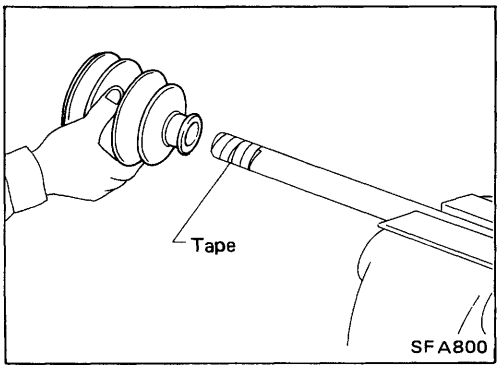
Make sure that boot is properly installed on the drive shaft groove.



5. Lock new larger and smaller boot bands securely with a suitable tool.

Assembly (Cont'd)

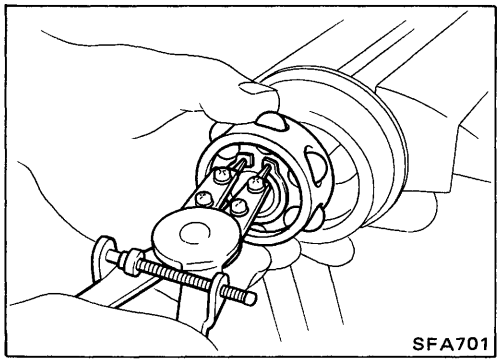




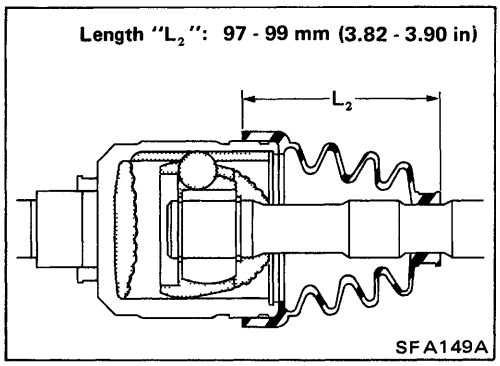
TRANSAXLE SIDE

1. Install boot and new small boot band on drive shaft.

Cover drive shaft serration with tape so as not to damage boot during installation.



2. Install new snap ring "B", then securely install ball cage, inner race and balls as a unit, making sure the marks which were made during disassembly are properly aligned.
3. Install new snap ring "C".

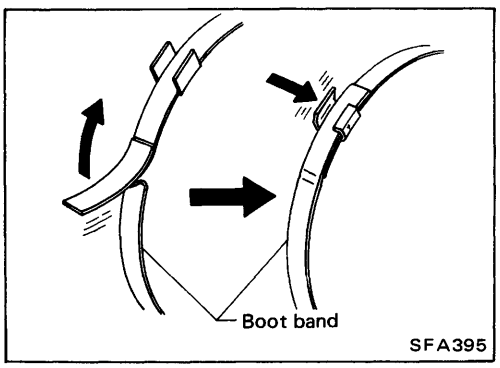


4. Pack drive shaft with specified amount of grease.

Specified amount of grease:
153 - 187 g (5.40 - 6.60 oz)

5. Install slide joint housing, then install new snap ring "A".
6. Set boot so that it does not swell and deform when its length is "L_2".

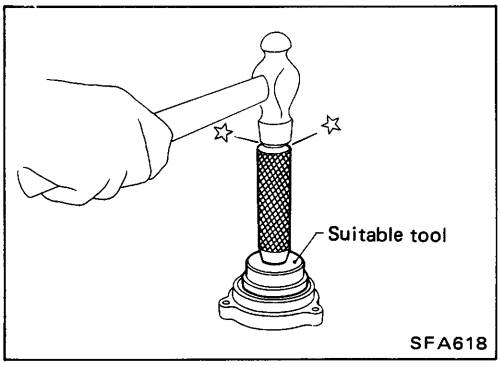
Make sure that boot is properly installed on the drive shaft groove.



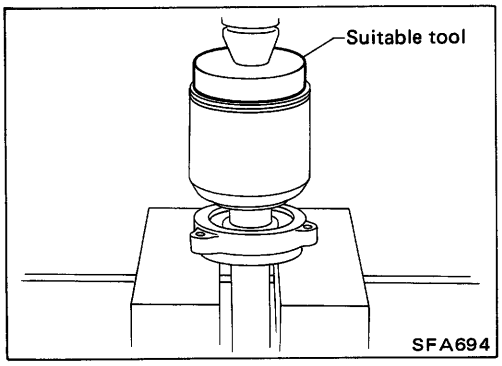
7. Lock new larger and smaller boot bands securely with a suitable tool.

Assembly (Cont'd)

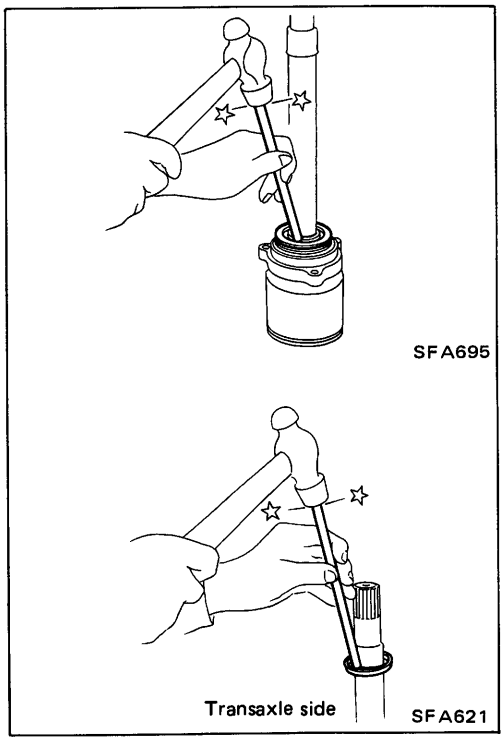
SUPPORT BEARING



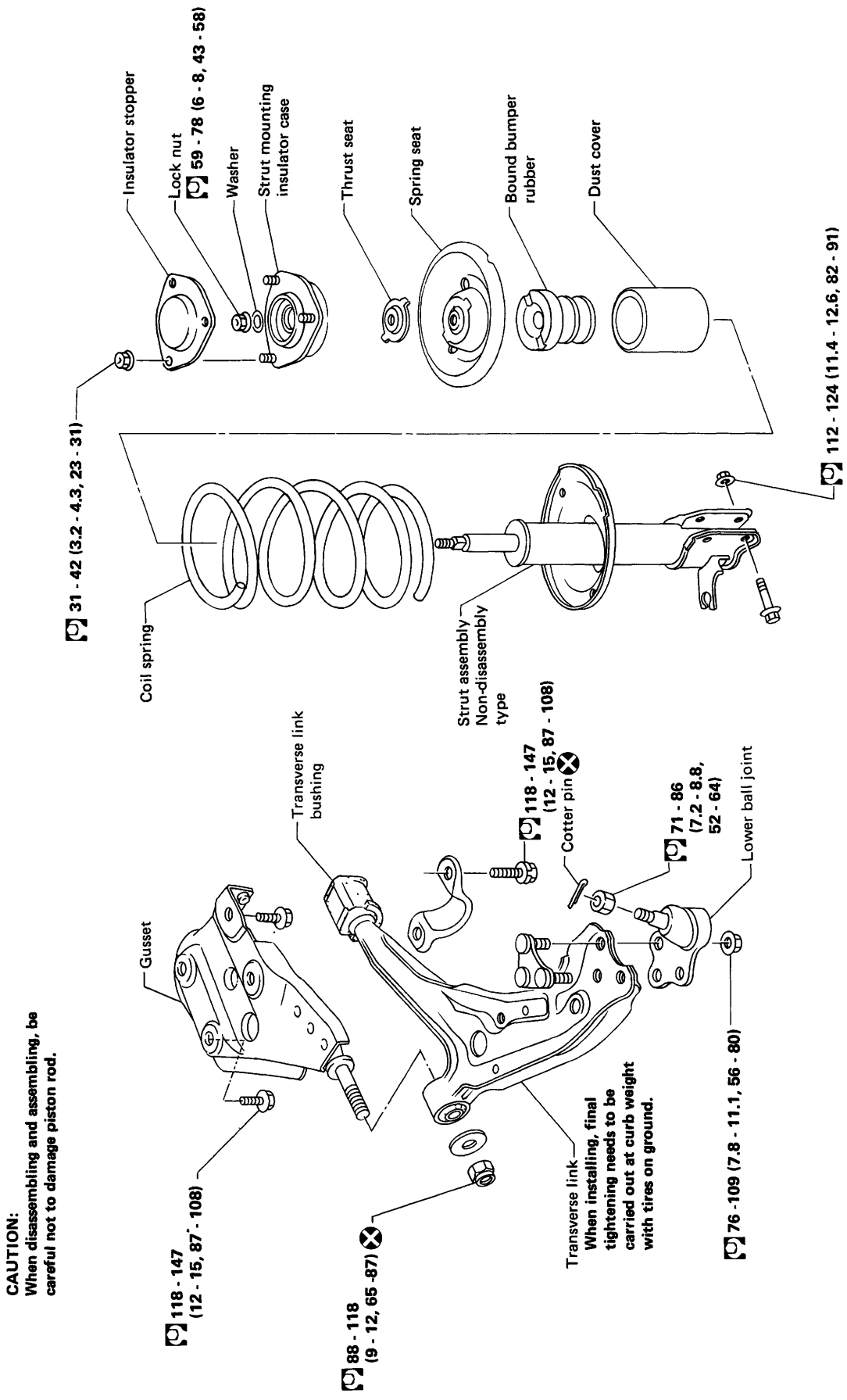
- Press bearing into retainer.



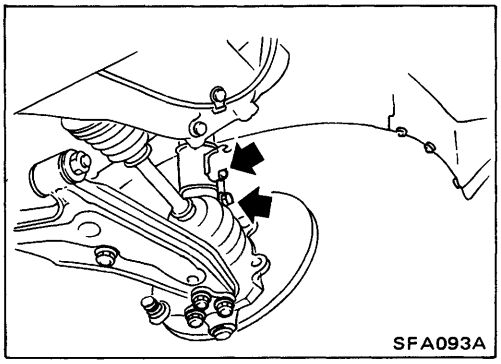
- Press drive shaft into bearing.



- Install snap ring.
- Install new dust shields.


Insulator stopper
Lock nut
59 - 78 (6 - 8, 43 - 58)
Washer
Strut mounting insulator case
Thrust seat
Spring seat
Bound bumper rubber
Dust cover
31 - 42 (3.2 - 4.3, 23 - 31)
112 - 124 (11.4 - 12.6, 82 - 91)
Coil spring
Strut assembly Non-disassembly type
Transverse link bushing
118 - 147 (12 - 15, 87 - 108)
Cotter pin
71 - 86 (7.2 - 8.8, 52 - 64)
Lower ball joint
Gusset
118 - 147 (12 - 15, 87 - 108)
88 - 118 (9 - 12, 65 - 87)
Transverse link
When installing, final tightening needs to be carried out at curb weight with tires on ground.
76 - 109 (7.8 - 11.1, 56 - 80)
CAUTION:
When disassembling and assembling, be careful not to damage piston rod.
: N·m (kg-m, ft-lb)

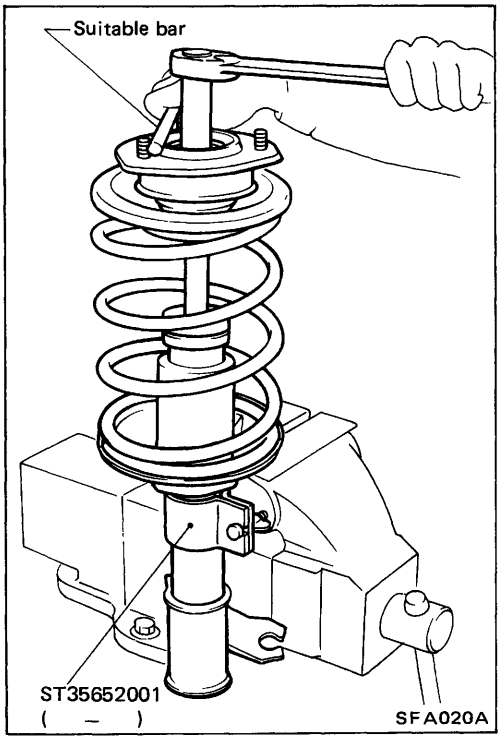
SFA994



Removal and Installation

- Remove strut assembly fixing bolts and nuts (to hoodledge).

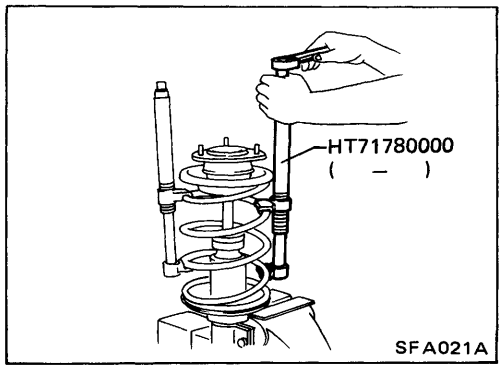
Do not remove piston rod lock nut on vehicle.



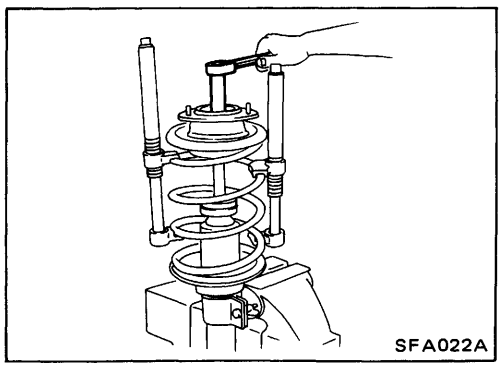
Disassembly

1. Set strut assembly on vise with Tool, then loosen piston rod lock nut.

- **Do not remove piston rod lock nut.**



2. Compress spring with Tool so as to permit turning of strut mounting insulator by hand.



3. Remove piston rod lock nut.

Inspection

STRUT ASSEMBLY

- If oil leakage occurs on welded or gland packing portion, replace strut assembly.
- Inspect piston rod for cracks, deformation or other damage. Replace strut assembly if necessary.
- Inspect threads for cracks or other damage. Replace strut assembly if necessary.

STRUT MOUNTING INSULATOR

Check cemented rubber-to-metal portion for melting or cracks. Check rubber parts for deterioration.

THRUST SEAT

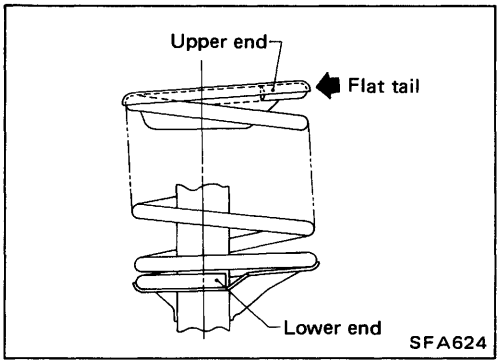
Check for cracks, deformation or other damage. Replace if necessary.

COIL SPRING

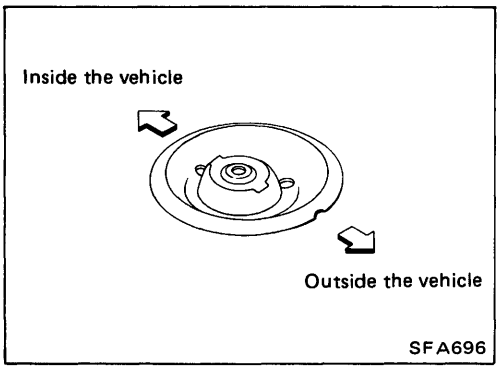
Check for cracks, deformation or other damage. Replace if necessary.

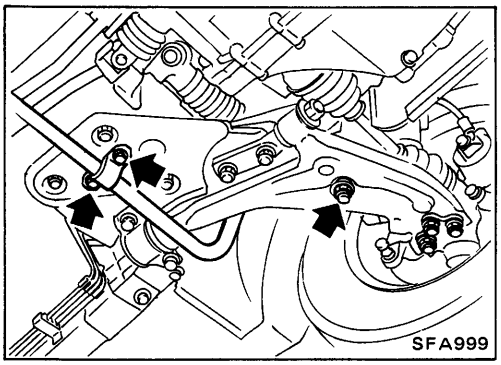
Assembly

- When installing coil spring on strut, it must be positioned as shown.



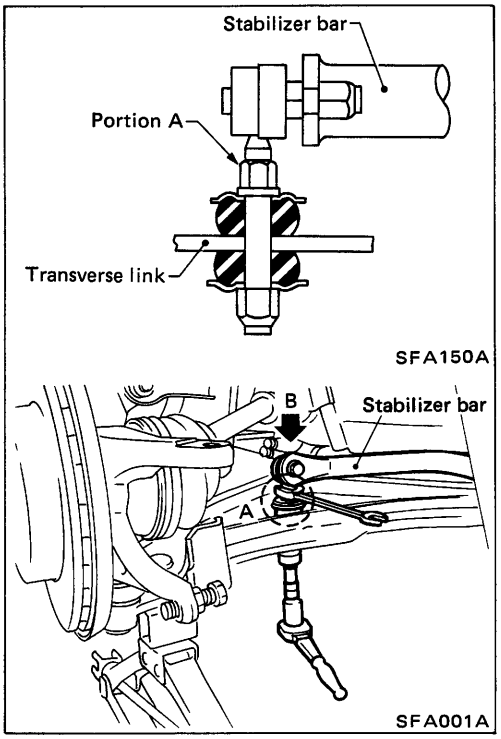
- When installing spring seat, make sure that it is positioned as shown.



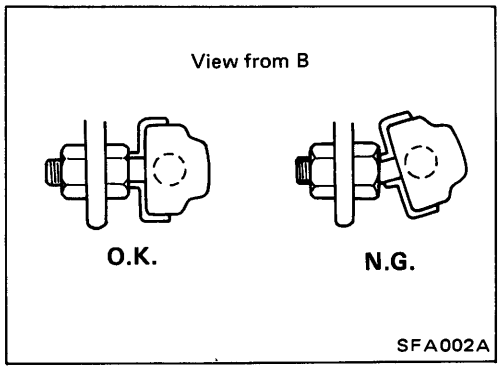


Removal and Installation

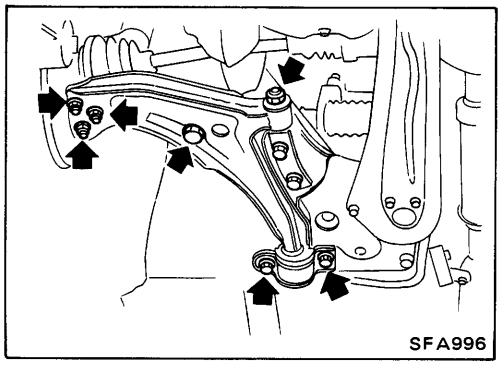
- Remove stabilizer bar.



- When removing and installing stabilizer bar, fix portion A.



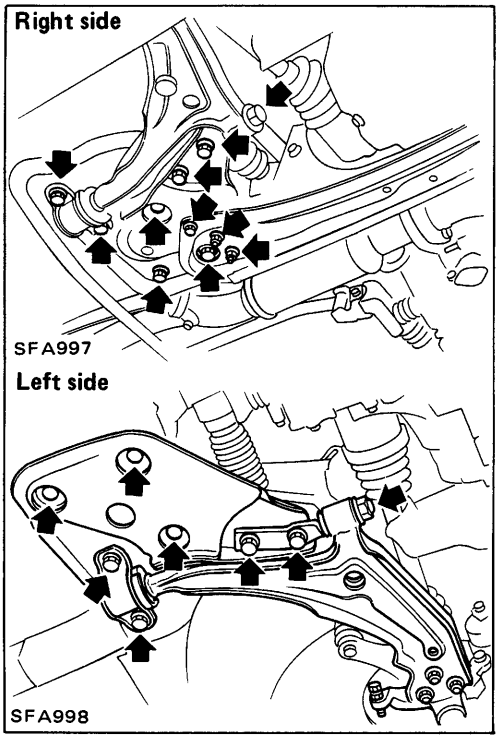
- Install stabilizer bar and ball joint socket properly placed.


SFA996

Removal and Installation

TRANSVERSE LINK

- Remove stabilizer bar.
- Remove bolts and nuts as shown.



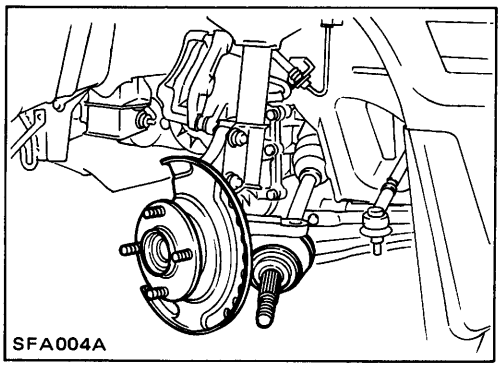
TRANSVERSE LINK GUSSET

- Remove bolts as shown.

- When installing, final tightening must be carried out under unladen condition with tires on ground.
- After installing, check wheel alignment.
  Refer to CHECK AND ADJUSTMENT – On-vehicle.

Inspection

- Check transverse link for damage, cracks and deformation; replace transverse link if necessary.
- Check rubber bushing for damage, cracks and deformation; replace transverse link if necessary.
- Check transverse link gusset for damage, cracks and deformation; replace transverse link gusset if necessary.

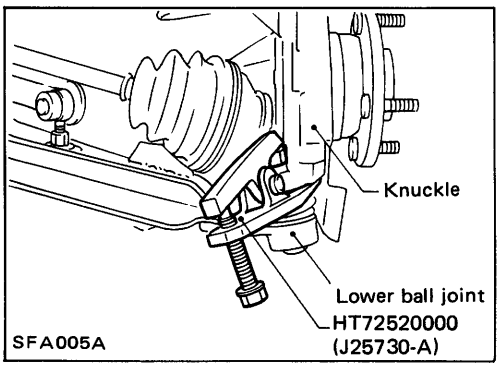

SFA004A

Removal and Installation

- Separate drive shaft from knuckle by slightly tapping drive shaft end.

Cover boots with waste cloth so as not to damage them when removing drive shaft.

Refer to FRONT AXLE-Drive Shaft.



SFA005A

- Remove lower ball joint from knuckle with Tool.

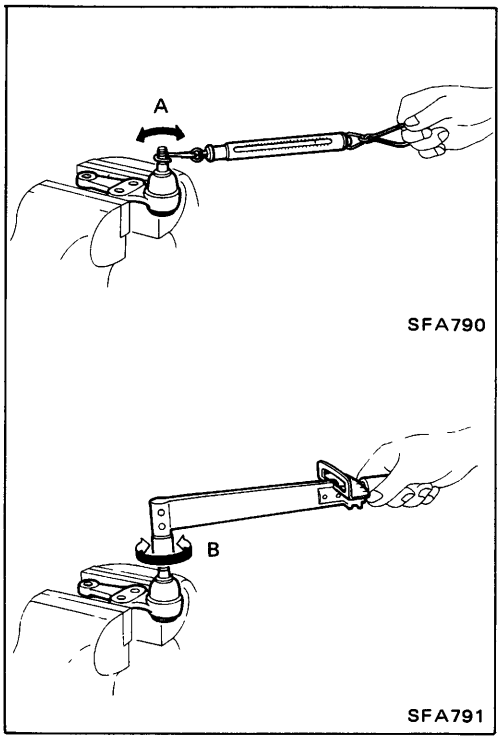
Inspection

- Check ball joint for play. If ball stud is worn, play in axial direction is excessive or joint is hard to swing, replace lower ball joint.

Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.

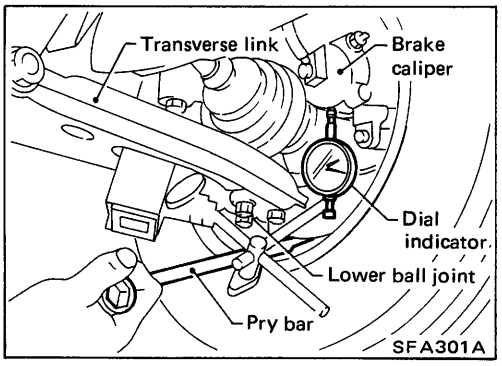
Turning torque "A":
(measure point: cotter pin hole of ball stud)
New parts
15.7 - 79.4 N (1.6 - 8.1 kg, 3.5 - 17.9 lb)
Used parts
7.8 - 79.4 N (0.8 - 8.1 kg, 1.8 - 17.9 lb)

Turning torque "B":
New parts
1.0 - 4.9 N·m (10 - 50 kg-cm, 8.7 - 43.4 in-lb)
Used parts
0.5 - 4.9 N·m (5 - 50 kg-cm, 4.3 - 43.4 in-lb)



Vertical end play "C" (on vehicle):
1.0 mm (0.039 in) or less

(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.



SFA301A

Inspection (Cont'd)

(5) While pushing and releasing pry bar, observe maximum dial indicator value.

(6) Replace transverse link or lower ball joint if ball joint movement is beyond specifications.

- Check dust cover for damage.
  Replace dust cover if necessary.

General Specifications

COIL SPRING

Item \ Transaxle		M/T	A/T
Wire diameter	mm (in)	13.7 (0.539)	
Coil diameter	mm (in)	159.7 (6.29)	
Free length [Left/right]	mm (in)	372 (14.65)	381.5 (15.02)/ 372 (14.65)
Spring constant N/mm (kg/mm, lb/in)		21.6 (2.2, 123)	
Identification color [Left/right]		White x 1, Yellow green x 1	Blue x 1, Yellow green x 1/ White x 1, Yellow green x 1

STRUT

Piston rod diameter	mm (in)	22 (0.87)
Stroke	mm (in)	159.5 (6.28)
Damping force [at 0.3 m (1.0 ft)/sec.]	N (kg, lb)	
Expansion		1,049 - 1,402 (107 - 143, 236 - 315)
Compression		284 - 441 (29 - 45, 64 - 99)

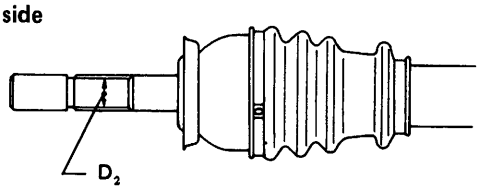
FRONT STABILIZER BAR

Stabilizer diameter	mm (in)	26 (1.02)

DRIVE SHAFT

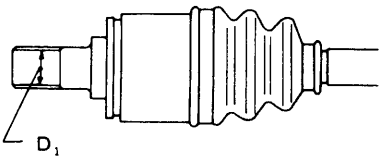
Joint type	
Transaxle side	DS90
Wheel side	ZF100
Diameter mm (in)	
Transaxle side D_1	28 (1.10)
Wheel side D_2	28 (1.10)
Grease name	
Transaxle side	Nissan Genuine Grease or equivalent
Wheel side	Nissan Genuine Grease or equivalent
Capacity g (oz)	
Transaxle side	153 - 187 (5.40 - 6.60)
Wheel side	205 - 225 (7.23 - 7.94)

Wheel side



SFA562

Transaxle side



SFA563

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*1)

Camber	degree	−25′ to 1°5′
Caster	degree	1°20′ - 2°50′
Toe-in	mm (in)	1 - 3 (0.04 - 0.12)
(Total toe-in)	degree	6′ - 19′
Kingpin inclination	degree	13°50′ - 15°20′
Front wheel turning angle Toe-out turn inside/outside	degree	22°20′/20°
Full turn*2 inside/outside	degree	38° - 42°/29° - 33°

*1: Tankful of fuel, radiator coolant and engine oil full
Spare tire, jack, hand tools, mats in designated position
*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

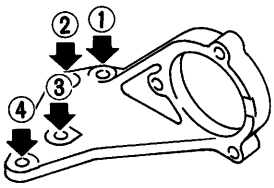
Wheel bearing axial end play	mm (in)	0 (0)
Wheel bearing lock nut Tightening torque	N·m (kg-m, ft-lb)	235 - 314 (24 - 32, 174 - 231)
Rotation starting torque	N·m (kg-cm, in-lb)	0.3 - 2.5 (3 - 26, 2.6 - 22.6)
at wheel bolt	N (kg, lb)	4.9 - 45.1 (0.5 - 4.6, 1.1 - 10.1)
at knuckle	N (kg, lb)	2.0 - 17.7 (0.2 - 1.8, 0.4 - 4.0)

LOWER BALL JOINT

Turning torque "A" (Measuring point: cotter pin hole of ball stud)		
New parts	N (kg, lb)	15.7 - 79.4 (1.6 - 8.1, 3.5 - 17.9)
Used parts	N (kg, lb)	7.8 - 79.4 (0.8 - 8.1, 1.8 - 17.9)
Turning torque "B"	N·m (kg-cm, in-lb)	
New parts		1.0 - 4.9 (10 - 50, 8.7 - 43.4)
Used parts		0.5 - 4.9 (5 - 50, 4.3 - 43.4)
Vertical end play "C"	mm (in)	1.0 (0.039) or less

Tightening Torque

Item	N·m	kg-m	ft-lb
Strut assembly			
Piston rod self-locking nut	59 - 78	6.0 - 8.0	43 - 58
Strut to body	31 - 42	3.2 - 4.3	23 - 31
Strut to knuckle	112 - 124	11.4 - 12.6	82 - 91
Lower ball joint			
Transverse link to ball joint	76 - 109	7.8 - 11.1	56 - 80
Stud nut	71 - 86	7.2 - 8.8	52 - 64
Tie-rod			
Lock nut	37 - 46	3.8 - 4.7	27 - 34
Stud nut	29 - 39	3.0 - 4.0	22 - 29
Transverse link			
Securing bolt	118 - 147	12 - 15	87 - 108
Securing nut	88 - 118	9.0 - 12	65 - 87
Gusset to body	118 - 147	12 - 15	87 - 108
Axle			
Wheel bearing lock nut	235 - 314	24 - 32	174 - 231
Caliper	72 - 97	7.3 - 9.9	53 - 72
Steering stopper	54 - 72	5.5 - 7.3	40 - 53
Wheel nut	98 - 118	10 - 12	72 - 87
Stabilizer bar			
Stabilizer bar clamp to gusset	39 - 49	4.0 - 5.0	29 - 36
Stabilizer bar to ball joint	41 - 51	4.2 - 5.2	30 - 38
Connecting rod to transverse link	16 - 22*	1.6 - 2.2*	12 - 16*
Engine mount member to gusset	49 - 59	5.0 - 6.0	36 - 43
Front axle support bearing bracket			
To retainer	13 - 19	1.3 - 1.9	9 - 14
To engine			



SFA096A

No. 1	25 - 35	2.6 - 3.6	19 - 26
No. 2, 4	43 - 58	4.4 - 5.9	32 - 43
No. 3	30 - 40	3.1 - 4.1	22 - 30

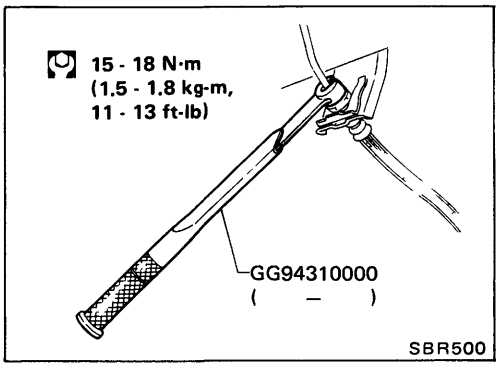
* Tighten as far as thread ends.

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 AND REAR SUSPENSION ASSEMBLY ..... RA- 8
REAR AXLE ..... RA- 9
REAR SUSPENSION RA-11
REAR SUSPENSION — Coil Spring and Strut Assembly RA-12
SERVICE DATA AND SPECIFICATIONS (S.D.S.) RA-16

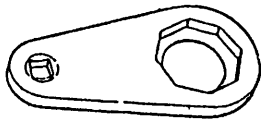
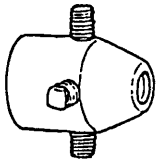
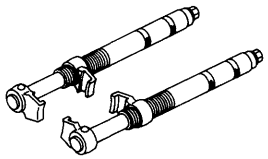
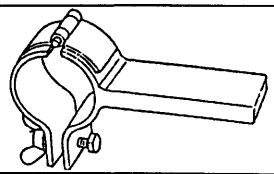
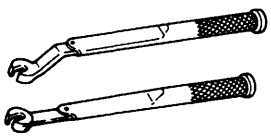


Precautions

(1) 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 position.
(2) When removing each suspension part, check wheel alignment and adjust if necessary.
(3) Use Tool when removing or installing brake tubes.
(4) Do not jack up at the parallel links or radius rods.

Preparation

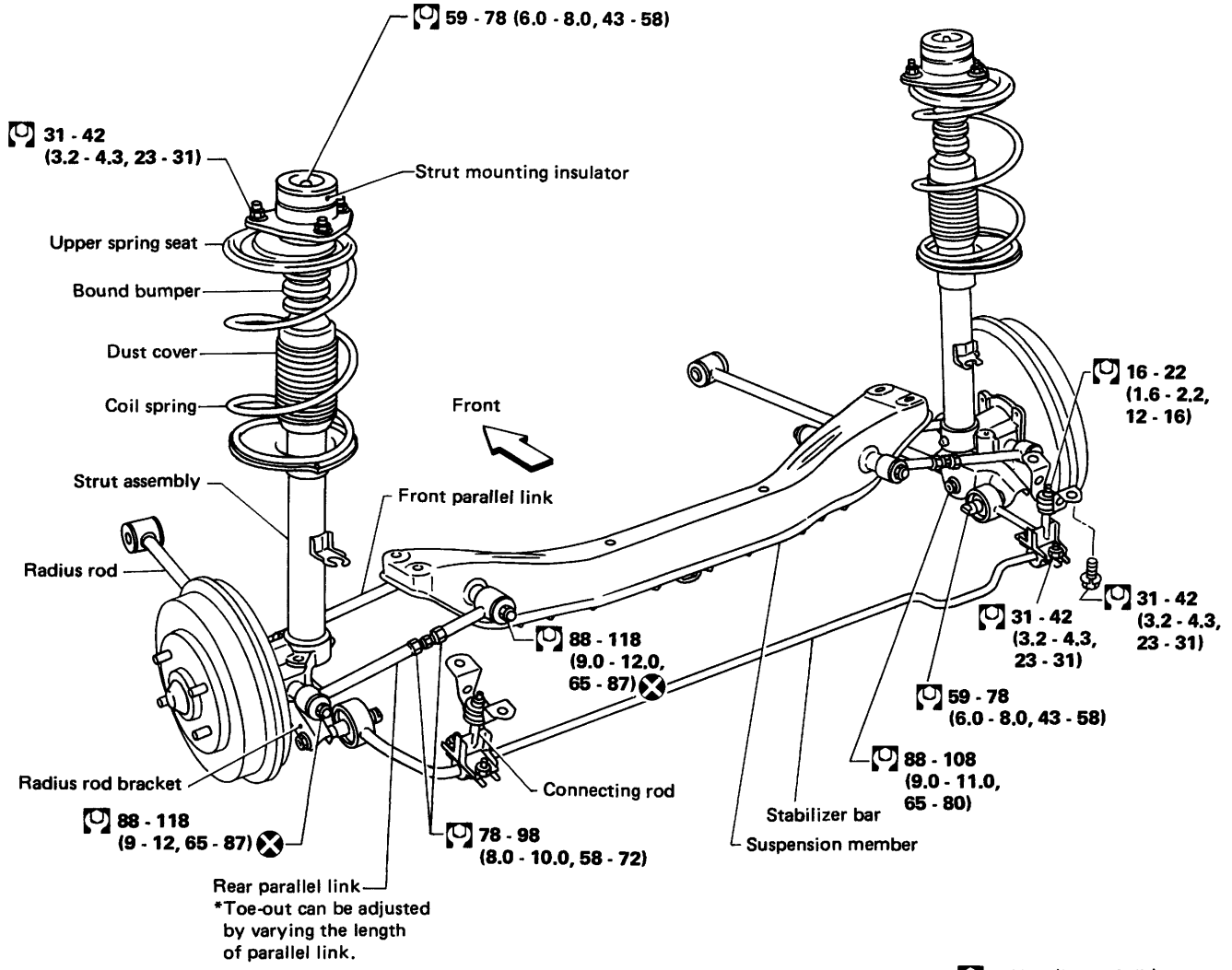
SPECIAL SERVICE TOOLS

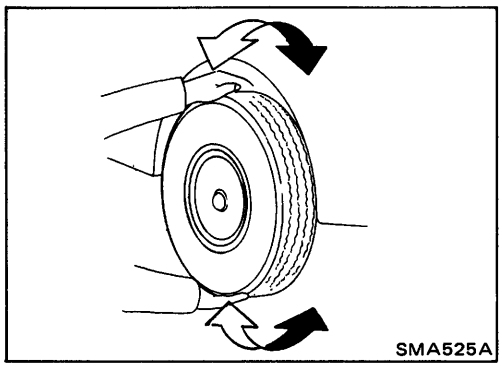
Tool number (Kent-Moore No.) Tool name	Description	
ST35490000 (J26083) Gland packing wrench		Removing and installing gland packing
KV401021S0 (–) Bearing race drift		Installing wheel bearing outer race
HT71780000 (–) Spring compressor		Removing and installing coil spring
ST35652000 (–) Strut attachment		Fixing strut assembly
GG94310000 (–) Flare nut torque wrench		Removing and installing brake piping

CAUTION:
Do not jack up at the parallel links or radius rods.

Wheel alignment
- **Camber cannot be adjusted.**
  −1°10′ to 0°20′
- **Vehicle requires only toe-out adjustment.**
  2 - 6 mm (0.08 - 0.24 in)

Wheel bearing
- **Axial end play:** **0 mm (0 in)**
- **Bearing preload:** **Refer to PRELOAD ADJUSTMENT of Rear Wheel Bearing in CHECK AND ADJUSTMENT — On-vehicle.**




SMA525A

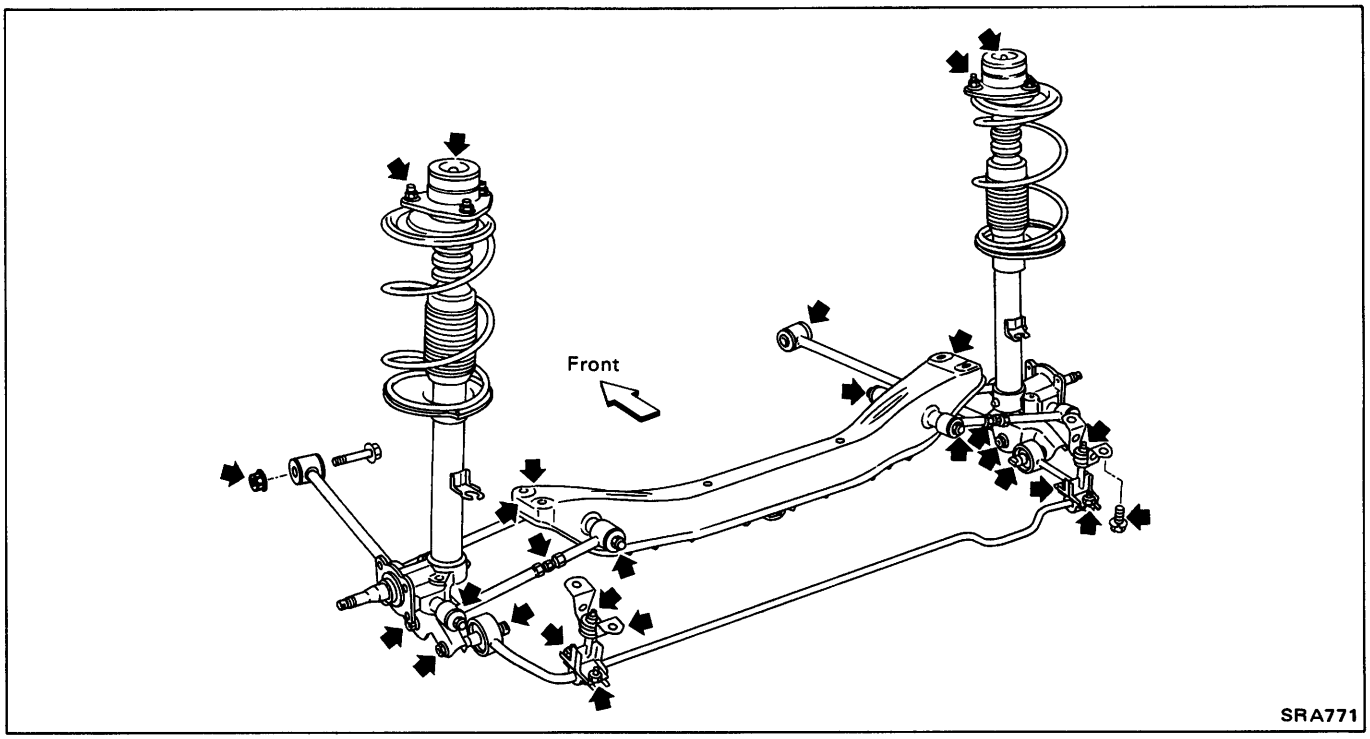
Rear Axle and Rear Suspension Parts

- Check axle and suspension parts for looseness, wear or damage.

(1) Shake each rear wheel.

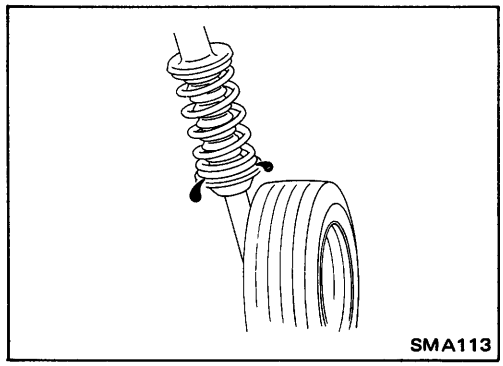
(2) Retighten all nuts and bolts to the specified torque.

Tightening torque: Refer to S.D.S.



SRA771

(3) Check strut (shock absorber) for oil leakage or other damage.

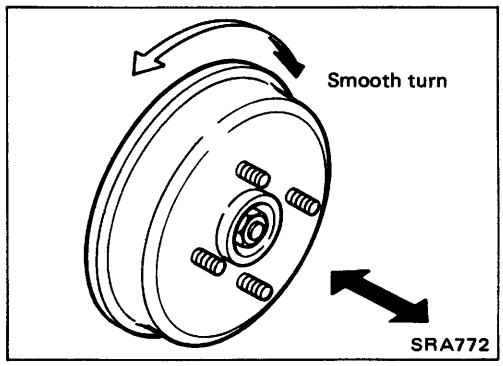

SMA113

Rear Wheel Bearing

- Check that wheel bearings operate smoothly.
- Check axial end play.

Axial end play: 0 mm (0 in)

- Adjust wheel bearing preload if there is any axial end play or wheel bearing does not turn smoothly.



SRA772

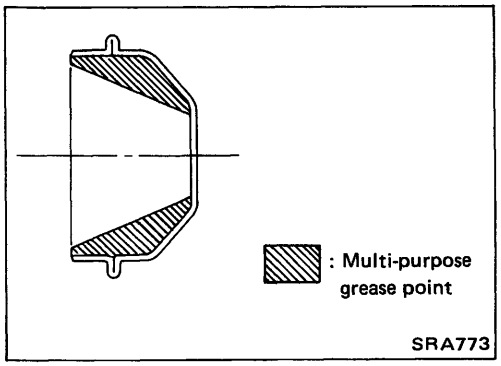
Rear Wheel Bearing (Cont'd)

PRELOAD ADJUSTMENT

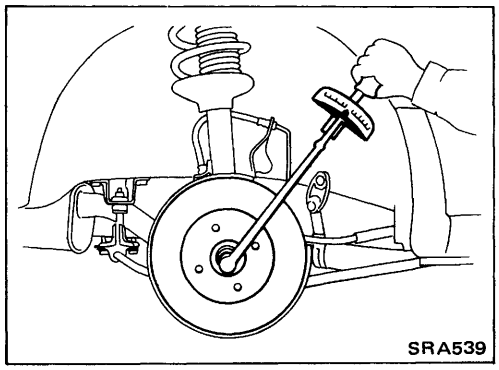
Adjust wheel bearing preload after wheel bearing has been replaced or rear axle has been reassembled.

Adjust wheel bearing preload as follows:

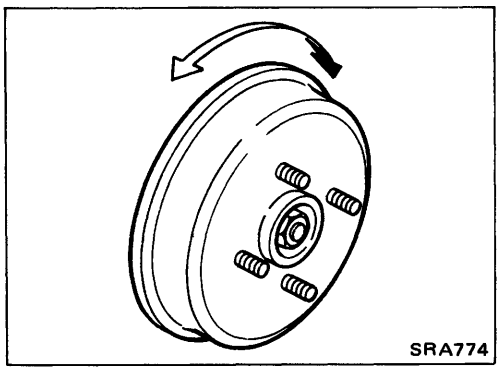
1. Before adjustment, thoroughly clean all parts to prevent dirt entry.



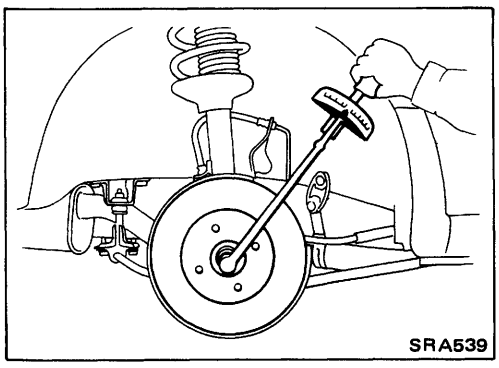
2. Apply multi-purpose grease sparingly to the following parts:
- Rubbing surface of spindle
- Contact surface between lock washer and outer wheel bearing
- Hub cap (as shown at the left)
- Grease seal lip



3. Tighten wheel bearing lock nut to the specified torque.
   : 25 - 34 N·m (2.5 - 3.5 kg-m, 18 -25 ft-lb)

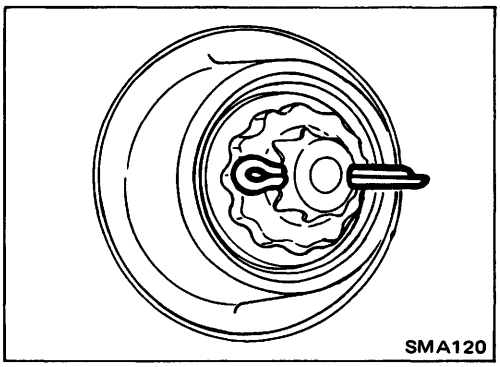


4. Turn wheel hub several times in both directions to seat wheel bearing correctly.
5. Loosen wheel bearing lock nut so that the preload becomes 0 N·m (0 kg-cm, 0 in-lb) [Axial end play 0 mm (0 in)].
6. Retighten wheel bearing lock nut.
   : 9 - 12 N·m (0.9 - 1.2 kg-m, 6.5 - 8.7 ft-lb)

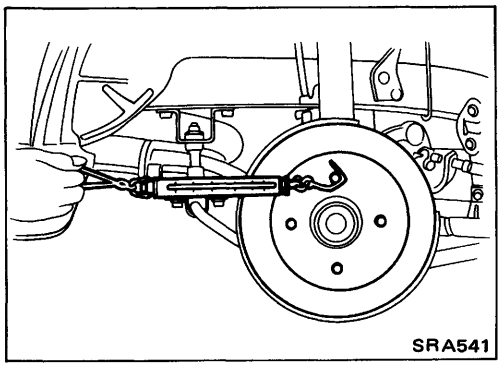


7. Turn wheel hub several times in both directions.
8. Retighten wheel bearing lock nut.
   : 9 - 12 N·m (0.9 - 1.2 kg-m, 6.5 - 8.7 ft-lb)

Rear Wheel Bearing (Cont'd)


SMA120

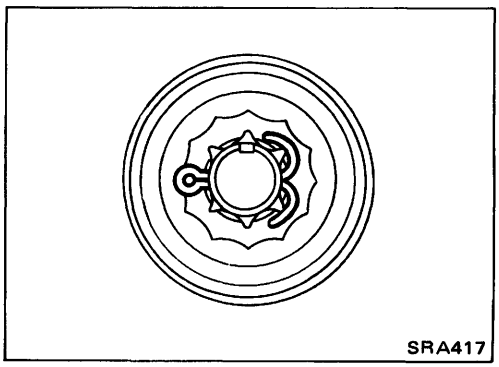
9. Fit adjusting cap and new cotter pin.
Align cotter pin slot, by loosening nut within 15°.


SRA541

10. Turn wheel hub several times in both directions.
11. Measure wheel bearing preload and axial end play.

Axial end play: 0 mm (0 in)
Wheel bearing preload
(As measured at wheel hub bolt):
[New grease seal]
13.7 N (1.4 kg, 3.1 lb) or less
[Used grease seal]
10.8 N (1.1 kg, 2.4 lb) or less

- Above figures do not include "dragging" resistance.
  When measuring wheel bearing preload, be sure to confirm no "dragging" resistance exists.
- Repeat above procedures until correct bearing preload is obtained.


SRA417

12. Spread cotter pin.
13. Install hub cap.

Rear Wheel Alignment

PRELIMINARY INSPECTION

Make following checks. Adjust, repair or replace if necessary.

- Check tires for wear and proper inflation.
- Check rear wheel bearings for looseness.
- Check wheel runout.

Lateral runout:
1.0 mm (0.039 in) or less

- Check if rear strut (shock absorber) works properly.
- Check rear axle and rear suspension parts for looseness.

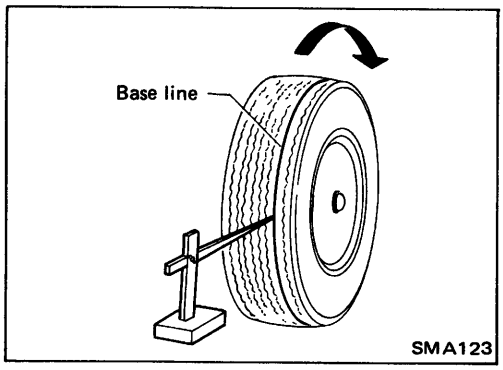
Rear Wheel Alignment (Cont'd)

- Check vehicle posture (Unladen).
  "Unladen":
  Fuel tank, radiator and engine oil full. Spare tire, jack, hand tools and mats in designated position.

CAMBER

Camber is preset at factory and cannot be adjusted.

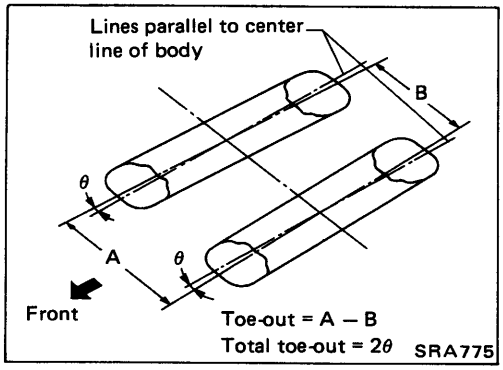
Camber: −1° 10′ to 0° 20′



TOE-OUT

1. Mark a base line across the tread.

After lowering rear of vehicle, move it up and down to eliminate friction.

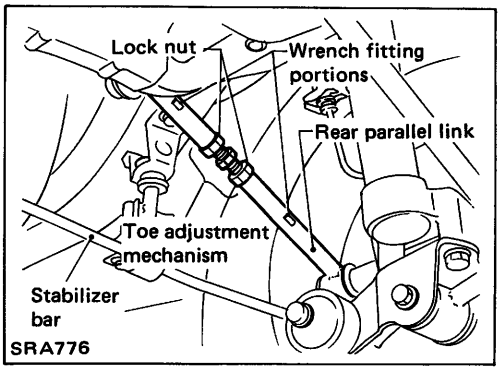


2. Measure toe-out.

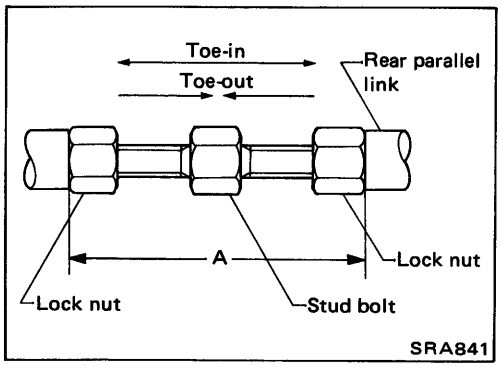
Measure distance "A" and "B" at the same height as hub center.

Toe-out:

A − B	2 - 6 mm (0.08 - 0.24 in)
2θ	12′ - 37′ (Total toe-out)



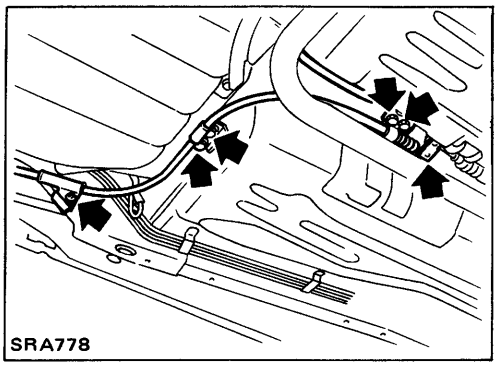
3. Adjust toe-out by varying the length of rear parallel links.



- Adjust left and right rear parallel links to the same length "A".

Tighten lock nut while holding rear parallel link with wrench to prevent bushing from twisting.

Standard length "A": 50 - 55 mm (1.97 - 2.17 in)

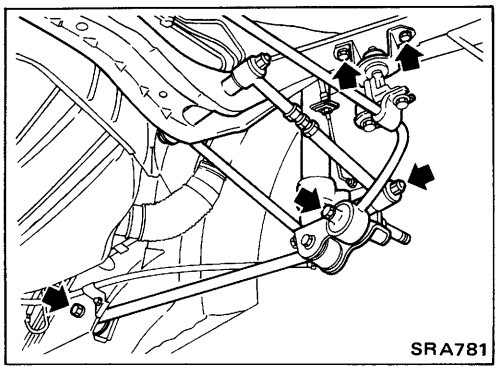

SRA778

Removal and Installation

CAUTION:

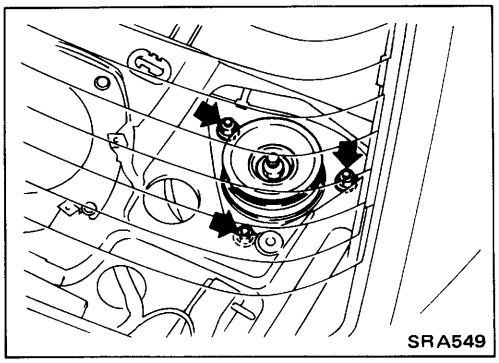
Do not jack up at the parallel links or radius rods.

- Disconnect brake hydraulic line and parking brake cable at equalizer.

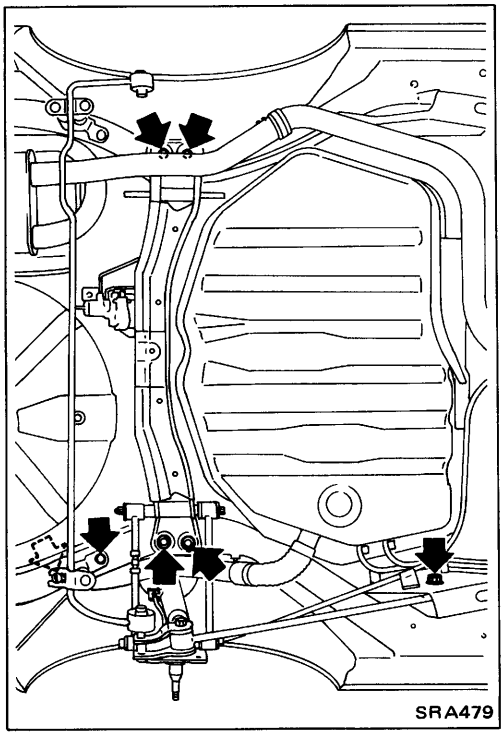

SRA781

- **Remove right suspension assembly.**

1) Remove parallel link fixing bolt, radius rod fixing bolt, stabilizer fixing bolt and stabilizer connecting rod brackets.

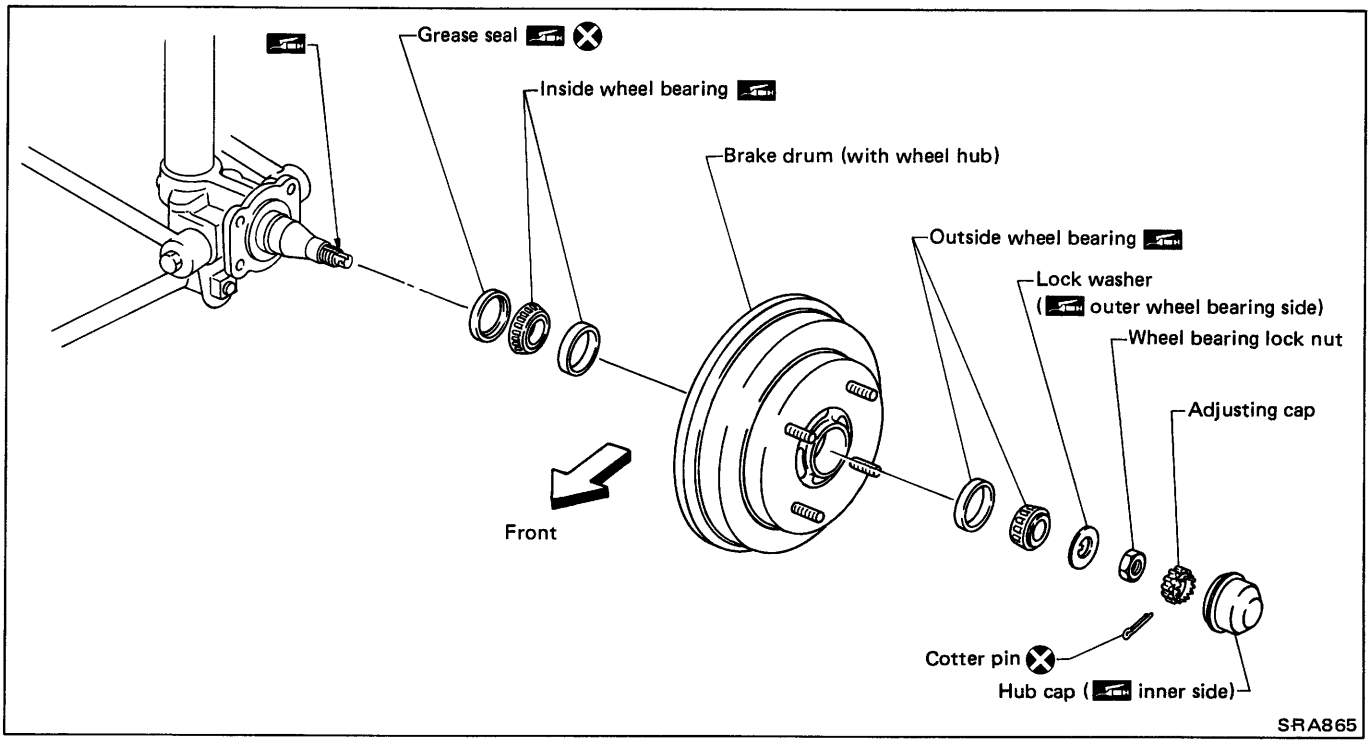

SRA549

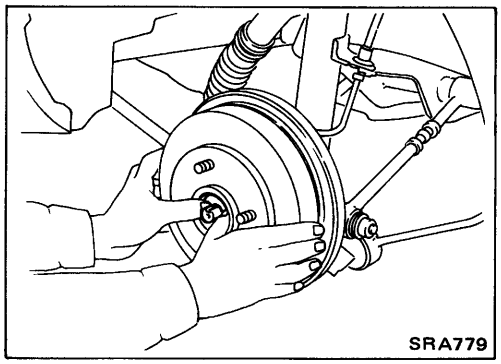
2) Remove rear seat and parcel shelf. Refer to section BF.
3) Remove strut securing nuts (Upper side).
   Then pull out strut assembly.

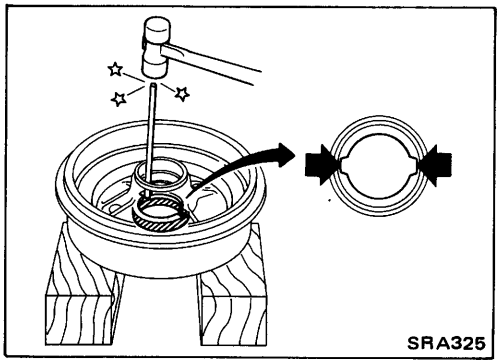

SRA479

- **Remove left suspension assembly with suspension crossmember.**

1) Remove front radius rod fixing bolt, stabilizer connecting rod bracket and suspension crossmember fixing nuts.
2) Remove strut securing nuts (Upper side).
   Then draw out left suspension assembly with suspension crossmember.







Removal and Installation

- Remove wheel hub and wheel bearing from spindle.

Be careful not to drop outer bearing.

- **After installing wheel hub and wheel bearing, adjust wheel bearing preload.**

  Refer to PRELOAD ADJUSTMENT of Rear Wheel Bearing in CHECK AND ADJUSTMENT – On-vehicle.

Disassembly

- Remove bearing outer races with suitable brass bar.

Inspection

Throughly clean wheel bearings and wheel hub.

WHEEL BEARING

- Make sure wheel bearing rolls freely and is free from noise, cracks, pitting or wear.

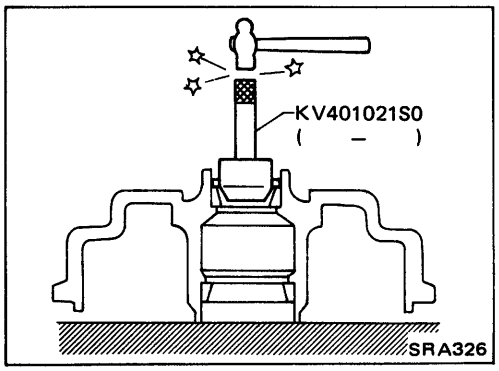
WHEEL HUB

- Check wheel hub for any cracks by using a magnetic exploration or dyeing test.

Inspection (Cont'd)

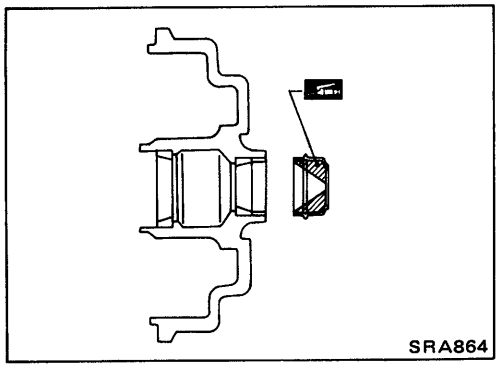
KNUCKLE SPINDLE

Check knuckle spindle for deformation, tapping mark or cracks (by magnetic or dyeing test) and replace if damaged.

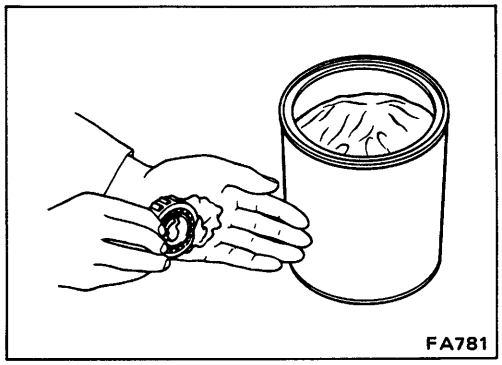


Assembly

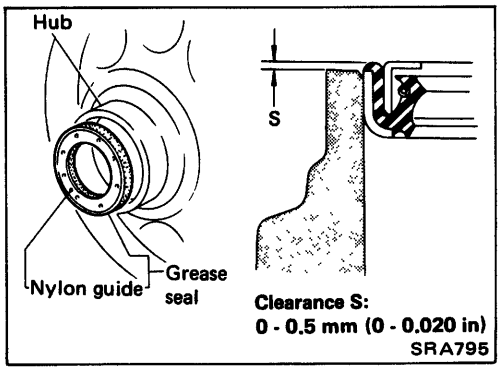
- Install bearing outer race with Tool so that it seats in hub.



- Pack hub cap with multi-purpose grease.

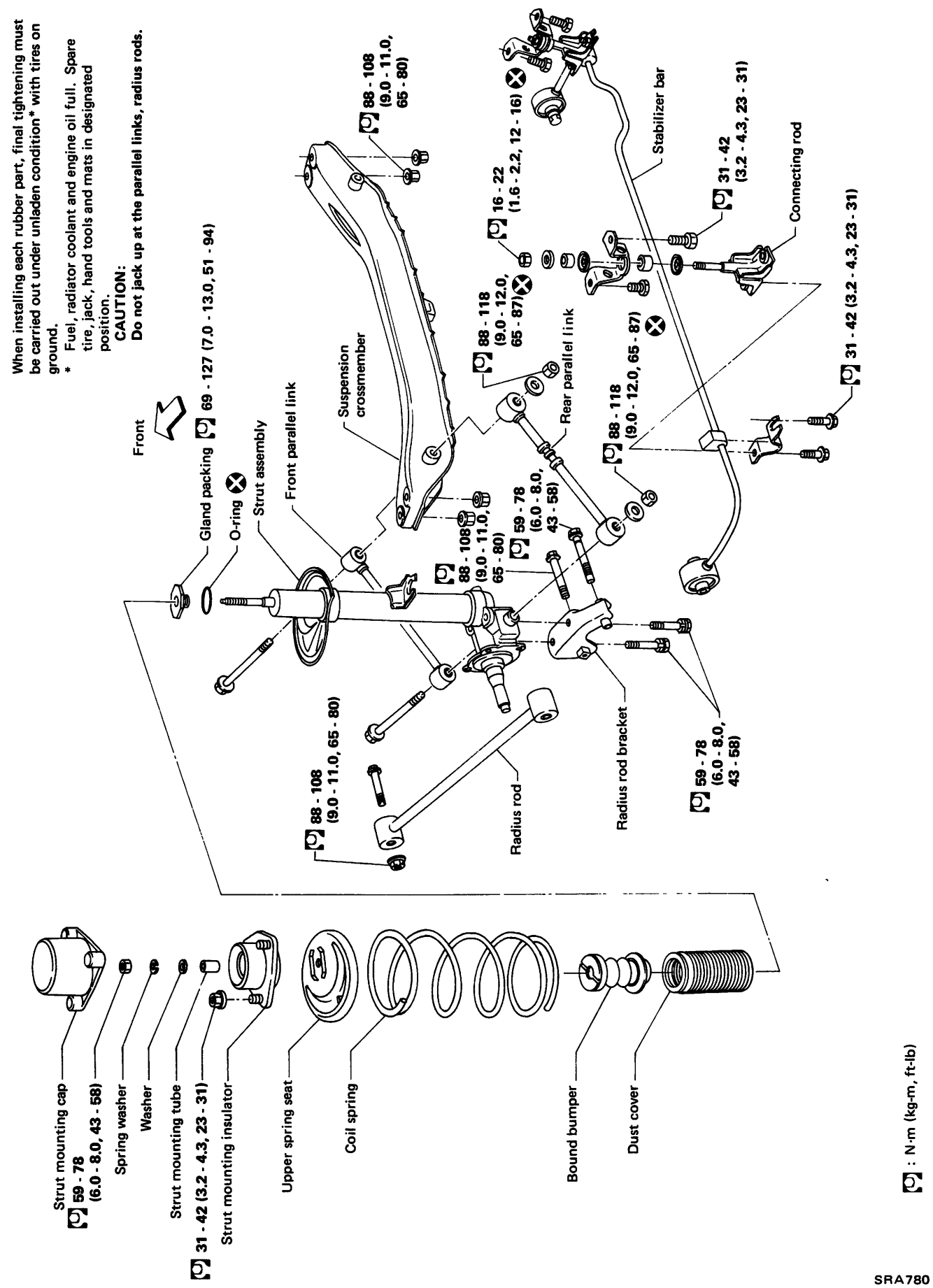


- Apply multi-purpose grease to each bearing cone.

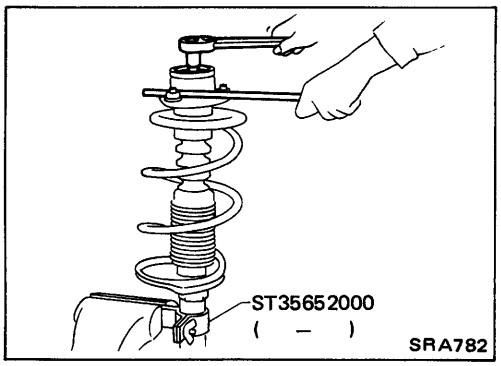


- Pack grease seal lip with multi-purpose grease, then install it into wheel hub with suitable drift.

Make sure that the white nylon guide faces the spindle.


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 position.
CAUTION:
Do not jack up at the parallel links, radius rods.
Front
Gland packing
69 - 127 (7.0 - 13.0, 51 - 94)
O-ring
Strut assembly
Front parallel link
Suspension crossmember
88 - 108 (9.0 - 11.0, 65 - 80)
16 - 22 (1.6 - 2.2, 12 - 16)
Stabilizer bar
31 - 42 (3.2 - 4.3, 23 - 31)
Connecting rod
88 - 118 (9.0 - 12.0, 65 - 87)
Rear parallel link
59 - 78 (6.0 - 8.0, 43 - 58)
Radius rod
Radius rod bracket
Strut mounting cap
Spring washer
Washer
Strut mounting tube
Strut mounting insulator
Upper spring seat
Coil spring
Bound bumper
Dust cover
: N·m (kg-m, ft-lb)

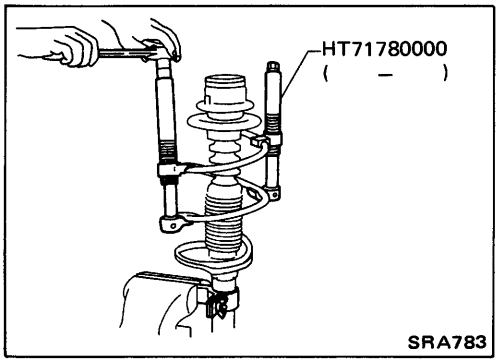
SRA780



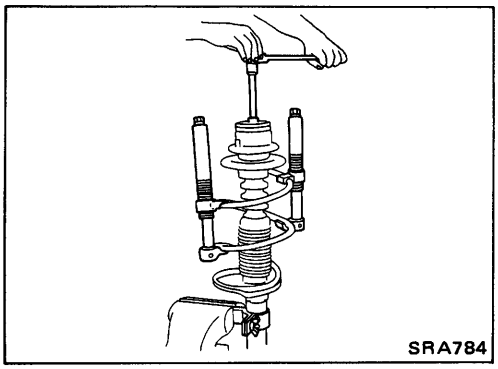
Disassembly

1. Set strut assembly on vice with attachment, then loosen piston rod lock nut.

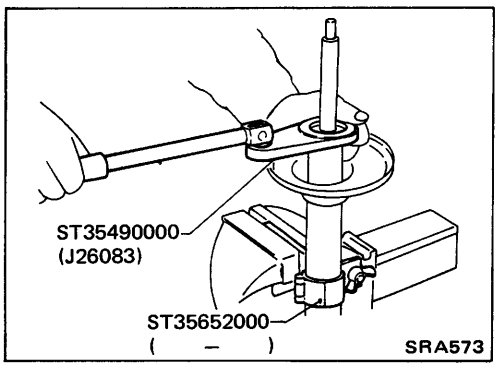
- **Do not remove piston rod lock nut.**



2. Compress spring with Tool so that the strut mounting insulator can be turned by hand.



3. Remove piston rod lock nut.



4. Remove gland packing with Tool.

- **Avoid dirt and dust getting into gland packing portion.**

5. Retract piston rod by pushing it down until it bottoms. Then, slowly withdraw piston rod from cylinder together with piston guide.

Inspection

Wash all parts, except for nonmetallic parts, clean with suitable solvent and dry with compressed air.

Blow dirt and dust off of nonmetallic parts with compressed air.

STRUT ASSEMBLY

- **Oil oozing out around gland packing does not need strut replacement.**

Inspection (Cont'd)

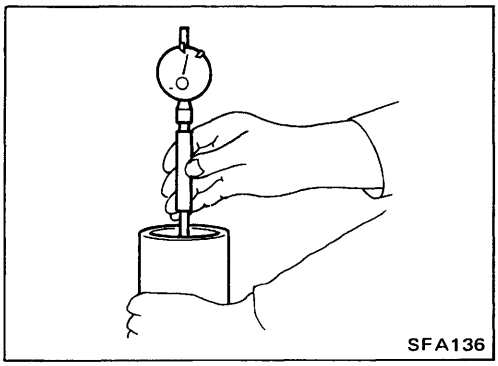
If oil leakage is evident on spring seat, check piston rod gland packing and O-ring.

If oil leakage occurs on welded portion of outer strut casing, replace strut assembly.

- **If shock absorber itself is malfunctioning, replace as shock absorber kit or shock absorber kit-cartridge.**

GLAND PACKING

Check gland packing for oil leakage. Replace gland packing if necessary.

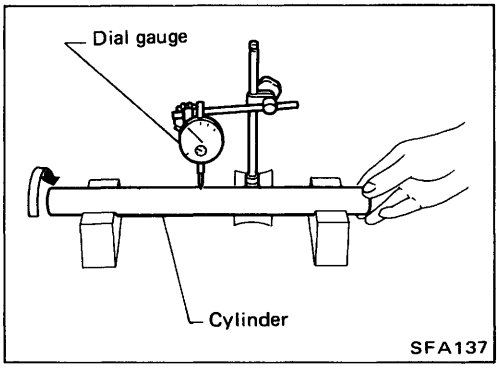

SFA136

INNER CYLINDER

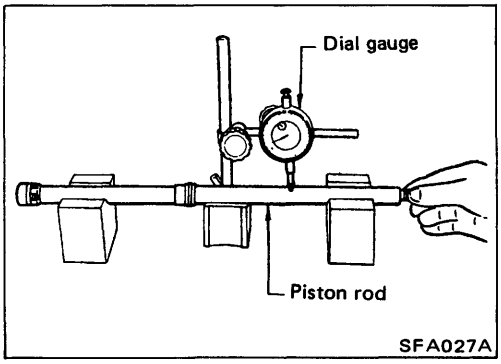
- Check inner cylinder for cracks, deformation or other damage. For inner cylinder damage, replace shock absorber kit (gland packing, inner cylinder, piston rod, spring washer and self-locking nut) or shock absorber kit-cartridge (shock absorber kit with oil).

Inner diameter:
Inner cylinder
Refer to S.D.S.

Maximum runout:
Inner cylinder
0.2 mm (0.008 in)



SFA137



SFA027A

PISTON ROD

- Check piston rod for cracks, deformation or other damage. Replace shock absorber kit (Gland packing, inner cylinder, piston rod, spring washer and self-locking nut) or shock absorber kit-cartridge (Shock absorber kit with oil), if necessary.
- Check threads for cracks or other damage. Replace shock absorber kit (Gland packing, inner cylinder, piston rod, spring washer and self-locking nut) or shock absorber kit-cartridge (Shock absorber kit with oil), if necessary.

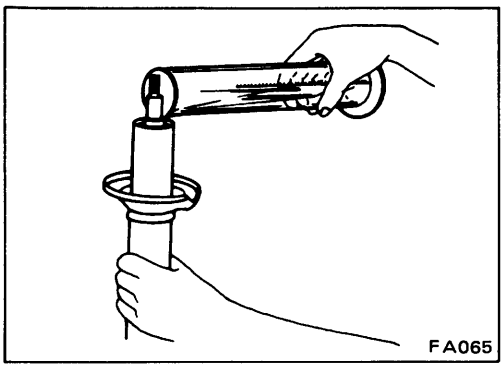
Rod diameter:
Refer to S.D.S.
Maximum runout:
0.1 mm (0.004 in)

STRUT MOUNTING INSULATOR

Check cemented rubber-to-metal portion for melting or cracks. Check rubber parts for deterioration.

COIL SPRING

Check for cracks, deformation or other damage. Replace if necessary.



Assembly

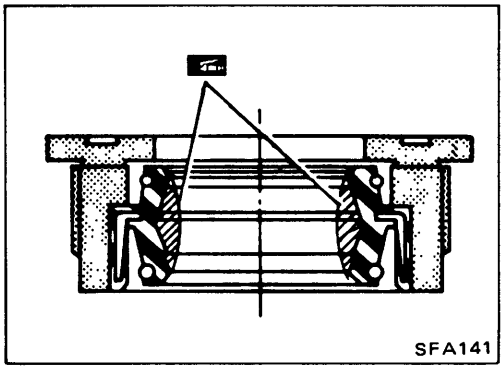
Before assembly, keep away from dust.

- Add correct amount of fluid. [Except shock absorber kit-cartridge]

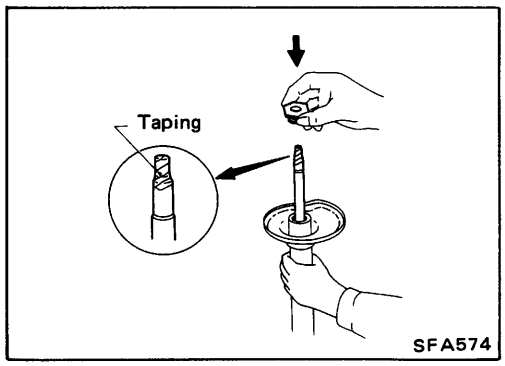
Use "NISSAN GENUINE STRUT FLUID" or equivalent.

Oil capacity is very important since performance of strut varies with amount of fluid in strut.

Capacity: 330 mℓ (11.2 US fl oz, 11.6 Imp fl oz)



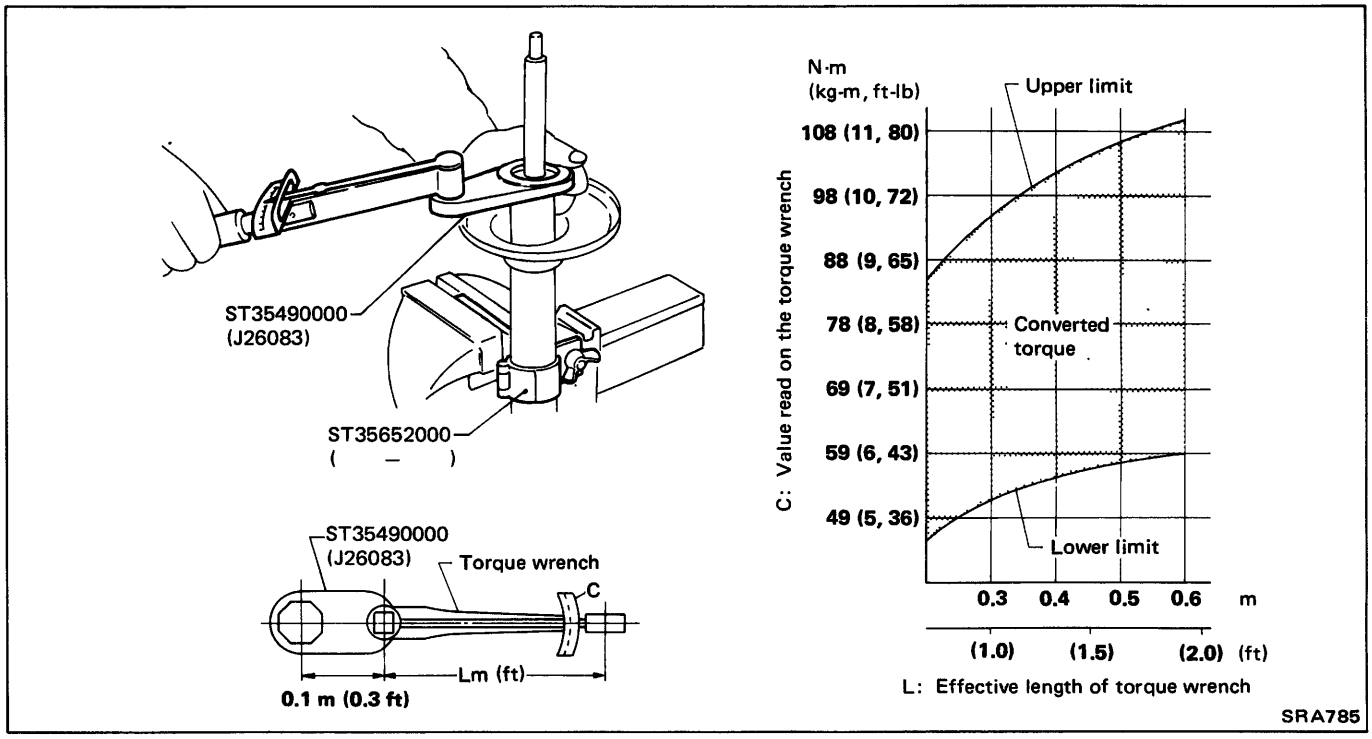
- Lubricate sealing lip of gland packing with multi-purpose grease.



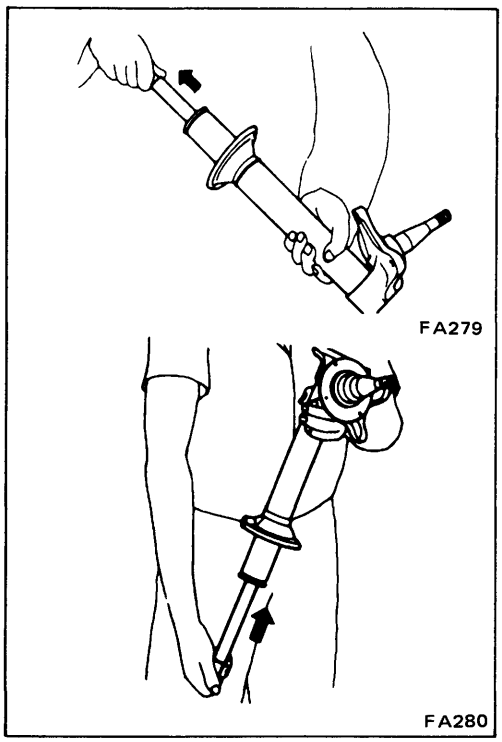
- Install gland packing.

Cover piston rod with tape so as not to damage oil sealing lip.

- Tighten gland packing to the specified torque (refer to chart below.) with Tool.

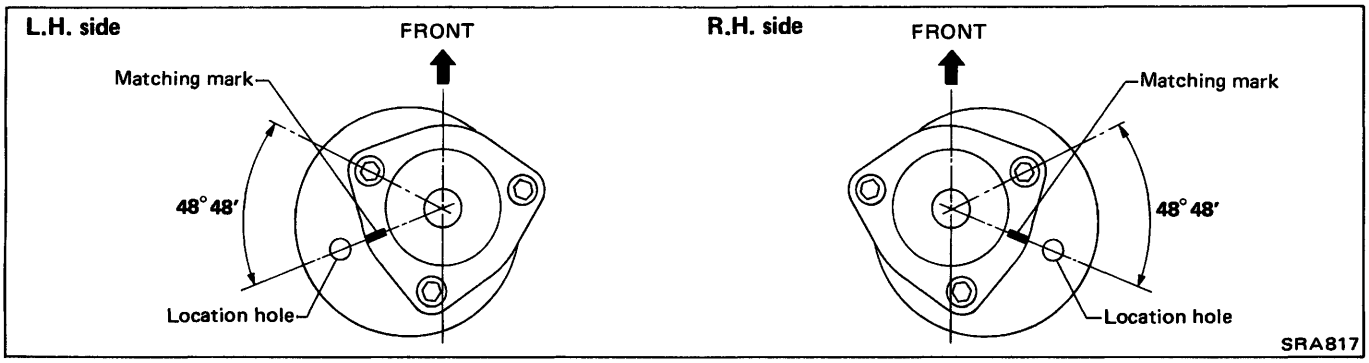


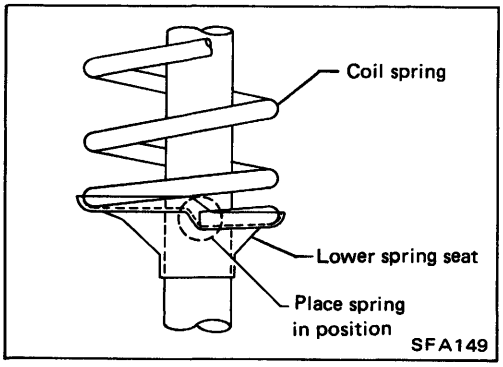
Assembly (Cont'd)



- Repeat procedures (as shown left) several times so that air will be thoroughly bled from strut [Except shock absorber kit-cartridge].

- Locate upper spring seat as shown.





- After placing coil spring in position on lower spring seat, release spring compressor gradually.

General Specifications

COIL SPRING

Item \ Model		All
Wire diameter	mm (in)	12.5 (0.492)
Coil diameter	mm (in)	149.5 (5.89)
Free length	mm (in)	353.5 (13.92)
Spring constant N/mm (kg/mm, lb/in)		16.7 - 18.6 (1.7 - 1.9, 95 - 106)
Identification color		Yellow x 1 Orange x 1

STABILIZER BAR

Diameter	mm (in)	13.5 (0.531)

STRUT

Item \ Model	All
Oil capacity mℓ (US fl oz, Imp fl oz)	330 (11.2, 11.6)
Piston rod diameter mm (in)	20 (0.79)
Cylinder inner diameter mm (in)	30.0 - 30.1 (1.181 - 1.185)
Stroke mm (in)	197 (7.76)
Damping force [at 0.3 m (1.0 ft)/sec.]	
Expansion N (kg, lb)	579 - 794 (59 - 81, 130 - 179)
Compression N (kg, lb)	226 - 363 (23 - 37, 51 - 82)

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*1)

		All
Camber	degree	−1°10′ to 0°20′
Toe-out	mm (in)	2 - 6 (0.08 - 0.24)
	(Total toe-out) degree	12′ - 37′

*1 Tankful of fuel, radiator coolant and engine oil full
Spare tire, jack, hand tools, mats in designated position

WHEEL BEARING

Wheel bearing lock nut	
Tightening torque N·m (kg-m, ft-lb)	25 - 34 (2.5 - 3.5, 18 - 25)
Retightening torque after loosening wheel bearing lock nut N·m (kg-m, ft-lb)	9 - 12 (0.9 - 1.2, 6.5 - 8.7)
Axial end play mm (in)	0 (0)
Wheel bearing preload	
With new grease seal N·m (kg-cm, in-lb)	0.78 (8.0, 6.9) or less
With used grease seal N·m (kg-cm, in-lb)	0.64 (6.5, 5.6) or less
At wheel hub bolt N (kg, lb)	
With new grease seal	13.7 (1.4, 3.1) or less
With used grease seal	10.8 (1.1, 2.4) or less

Tightening Torque

Unit	N·m	kg-m	ft-lb
Wheel nut	98 - 118	10 - 12	72 - 87
Parallel link			
Parallel link to suspension member	88 - 118	9 - 12	65 - 87
Parallel link to strut	88 - 118	9 - 12	65 - 87
Adjust lock nut	78 - 98	8 - 10	58 - 72
Radius rod			
Radius rod to body	88 - 108	9 - 11	65 - 80
Radius rod to radius rod bracket	88 - 108	9 - 11	65 - 80
Radius rod bracket to strut	59 - 78	6 - 8	43 - 58
Strut			
Piston rod self-locking nut	59 - 78	6 - 8	43 - 58
Gland packing	69 - 127	7 - 13	51 - 94
Strut to body	31 - 42	3.2 - 4.3	23 - 31

BRAKE SYSTEM

SECTION BR

CONTENTS

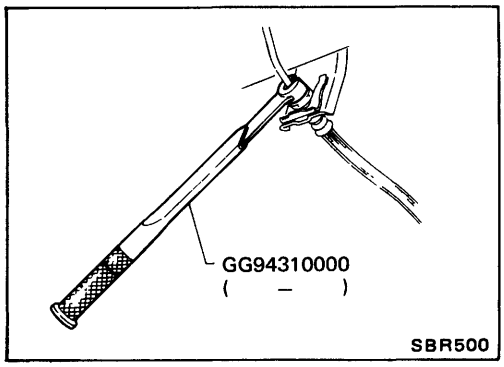
PRECAUTION AND PREPARATION ..... BR- 2
CHECK AND ADJUSTMENT ..... BR- 3
BRAKE HYDRAULIC LINE ..... BR- 4
BRAKE PEDAL AND BRACKET ..... BR- 6
BRAKE BOOSTER ..... BR- 8
VACUUM PIPING ..... BR- 9
MASTER CYLINDER BR-10
FRONT DISC BRAKE (CL28VA) – Caliper BR-11
FRONT DISC BRAKE (CL28VA) – Rotor BR-15
REAR DRUM BRAKE (LT23B) BR-16
PARKING BRAKE CONTROL BR-19
SERVICE DATA AND SPECIFICATIONS (S.D.S.) BR-21

Precaution

- **Recommended fluid is brake fluid "DOT 3".**
- Never reuse drained brake fluid.
- **Be careful not to splash brake fluid on painted areas.**
- **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 the rubber parts of the hydraulic system.**

WARNING:

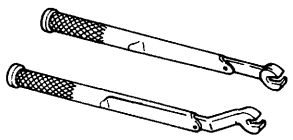
- **Clean pad and shoe dust using a dust collector after cleaning with waste cloth.**

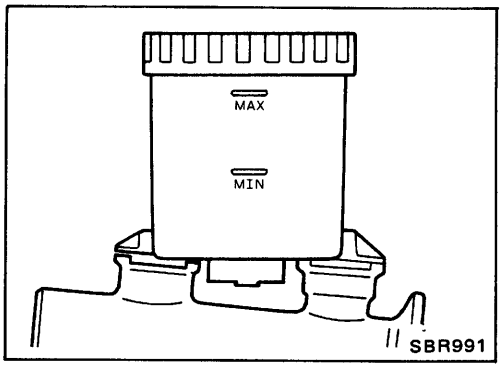


- **Use Tool when removing and installing brake tube.**

Preparation

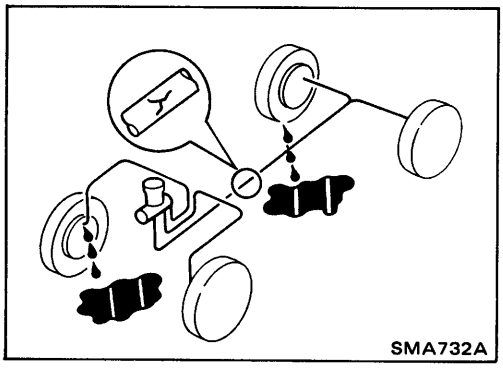
SPECIAL SERVICE TOOL

Tool number (Kent-Moore No.) Tool name	Description	
GG94310000 (–) Flare nut torque wrench		Removing and installing each brake piping



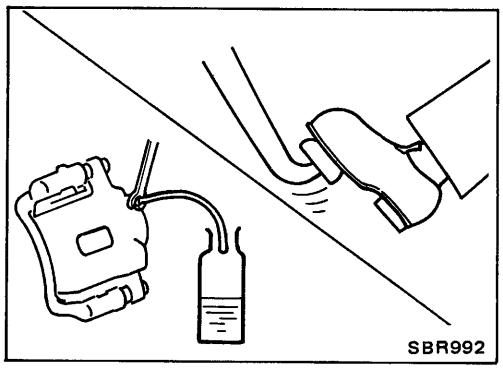
Checking Brake Fluid Level

- 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.



Checking Brake System

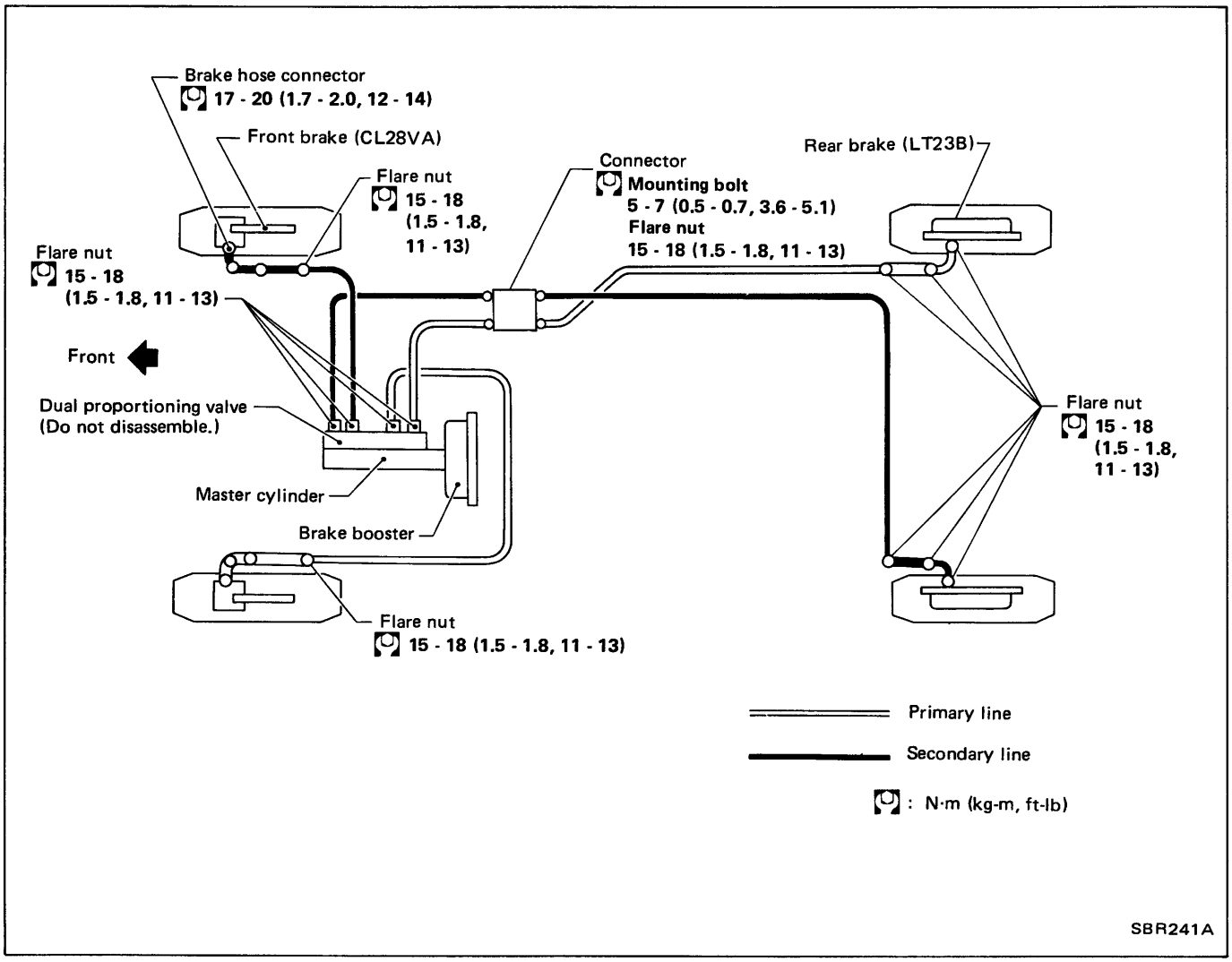
- Check brake lines (tubes and hoses) for evidence of cracks, deterioration or other damage. Replace any damaged parts.
  If leakage occurs around joints, retighten or, if necessary, replace damaged parts.
- Be sure to check for oil leakage by fully depressing brake pedal.

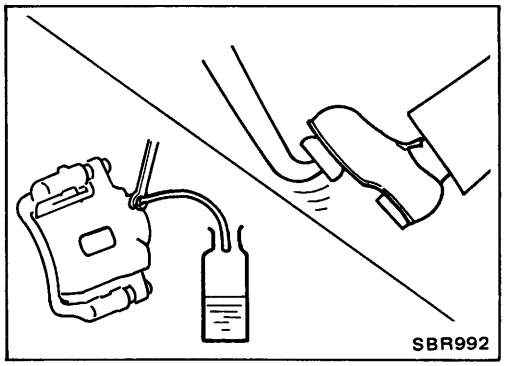


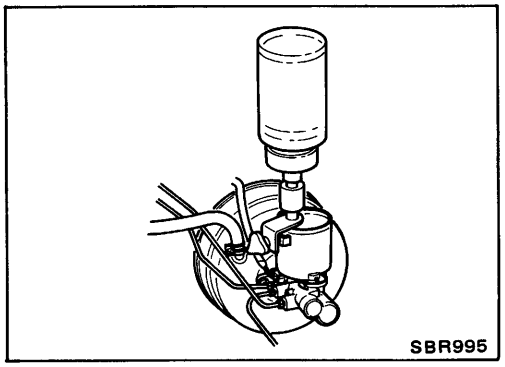
Changing Brake Fluid

1. Drain brake fluid using each air bleeder valve.
2. 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.

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





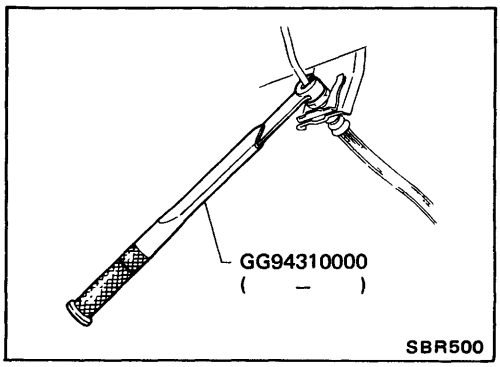


Bleeding Procedure

- Bleed air according to the following procedure:
  Left rear cylinder → Right front caliper → Right rear cylinder → Left front caliper
- Connect a transparent vinyl tube to air bleeder valve of caliper or cylinder.

CAUTION:

- **Carefully monitor brake fluid level at master cylinder during bleeding operation.**



Removal and Installation

CAUTION:

a. **Use Tool when removing and installing brake tube.**

b. **Cover openings to prevent entrance of dirt whenever disconnecting hydraulic line.**

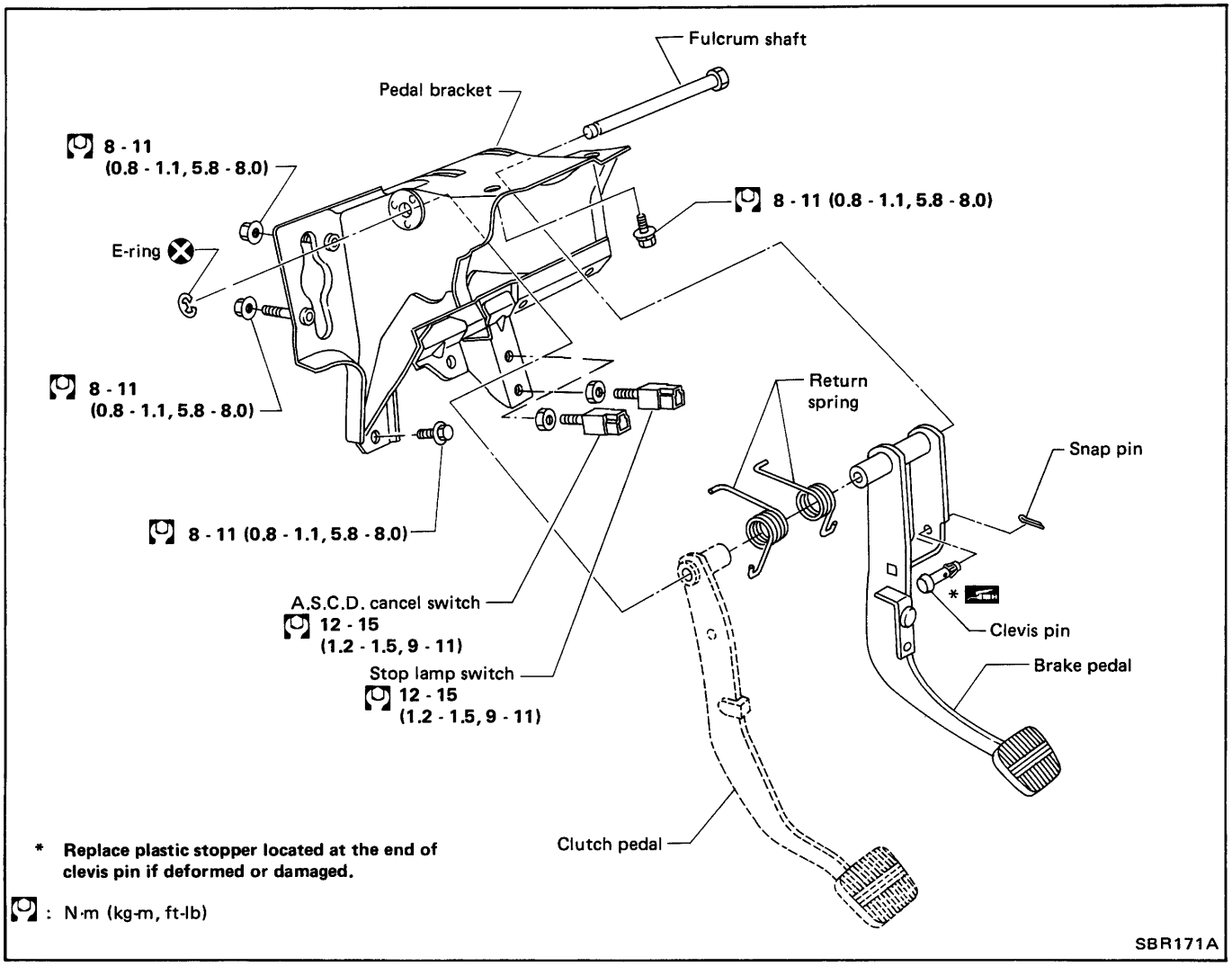
- To remove brake hose, first remove flare nut securing brake tube to hose, then withdraw lock spring. Next disconnect the other side.
- All hoses must be free from excessive bending, twisting and pulling.
- After installing brake lines, be sure to check for oil leakage by fully depressing brake pedal.

Inspection

Check brake lines (tubes and hoses) for evidence of cracks, deterioration or other damage. Replace any damaged parts.

If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

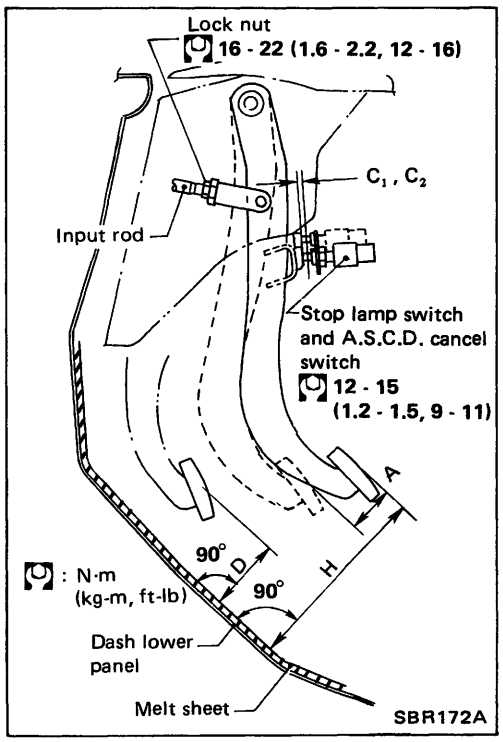
Removal and Installation

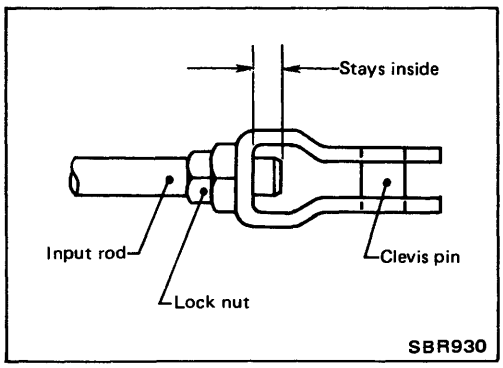


Inspection

Check brake pedal for the following items.

- Brake pedal bend
- Clevis pin deformation
- Cracks of any welded portion





Pedal Adjustment

Check brake pedal free height from melt sheet. 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

C_1: **Clearance between pedal stopper and threaded end of stop lamp switch**
0.3 - 1.0 mm (0.012 - 0.039 in)

C_2: **Clearance between pedal stopper and threaded end of A.S.C.D. cancel switch**
0.3 - 1.0 mm (0.012 - 0.039 in)

A: **Pedal free play**
1 - 3 mm (0.04 - 0.12 in)

1. Adjust pedal free height with brake booster input rod. Then tighten lock nut.

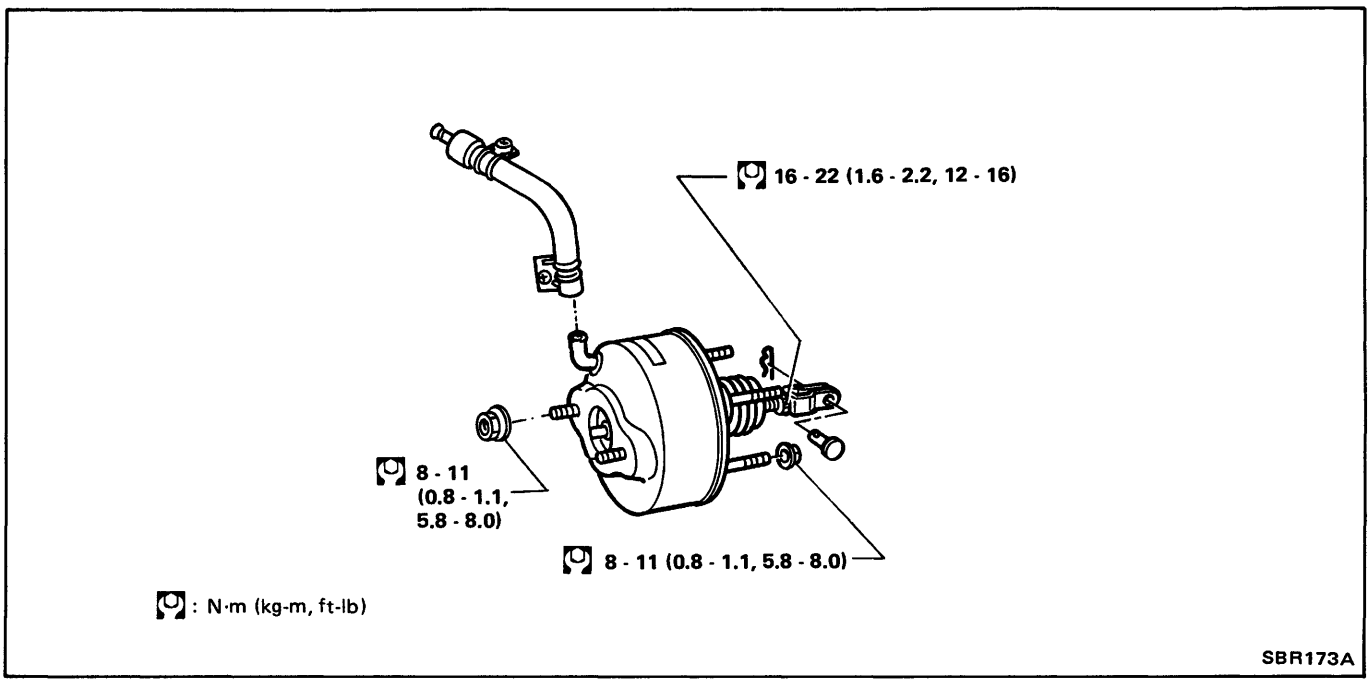
Make sure that the tip of input rod stays inside.

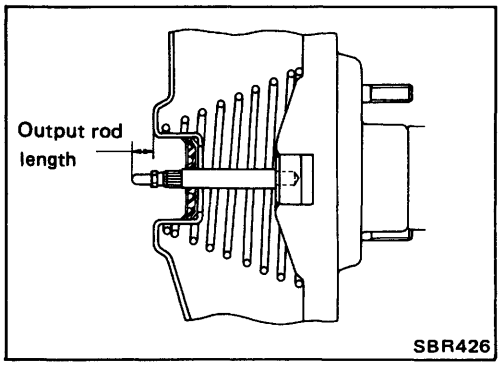
2. Adjust clearance "C_1" and "C_2" with stop lamp switch and A.S.C.D. cancel switch respectively. Then tighten lock nuts.
3. Check pedal free play.

Make sure that stop lamp is off when pedal is released.

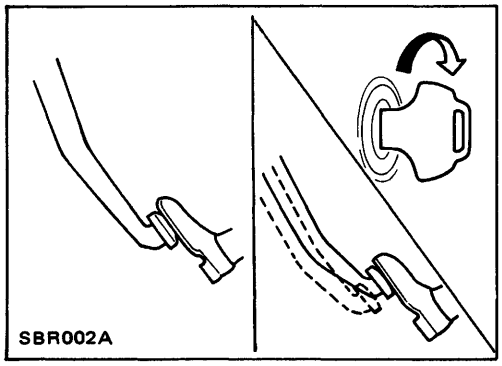
4. Check brake pedal depressed height with engine running.
   If depressed height is below the specified value, check brake system for leaks, accumulation of air or any damaged components such as master cylinder, wheel cylinder, etc. Make the necessary repairs, if necessary.

Removal and Installation





Do not adjust output rod length.



Inspection

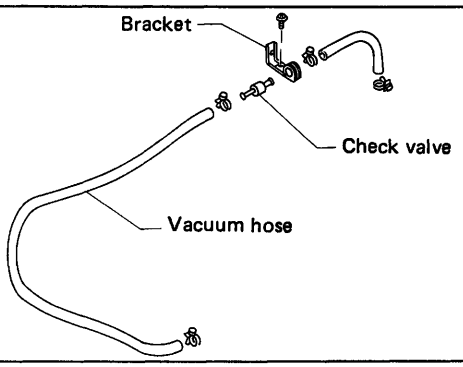
OPERATING CHECK

- Depress brake pedal several times with engine off, then 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

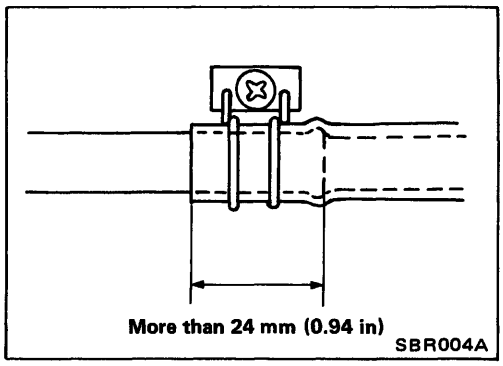
- Start engine, then stop it in one or two minutes. Depress brake pedal several times slowly. If pedal goes further down the first time and gradually rises after second or third time, the booster is airtight.
- Depress brake pedal while engine is running, then stop engine with pedal depressed. If there is no change in pedal stroke for thirty seconds, brake booster is airtight.

Removal and Installation



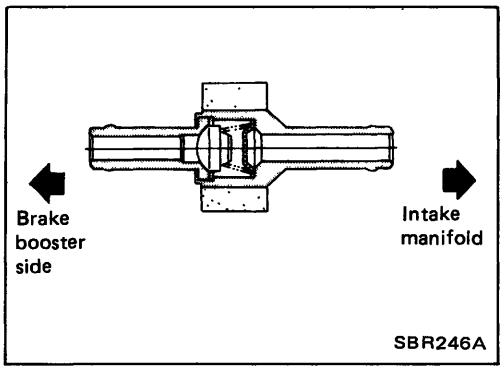
CAUTION:
Do not apply any oil or lubricants to vacuum hose and check valve.

SBR242A



SBR004A

- Insert vacuum tube into vacuum hose more than 24 mm (0.94 in).



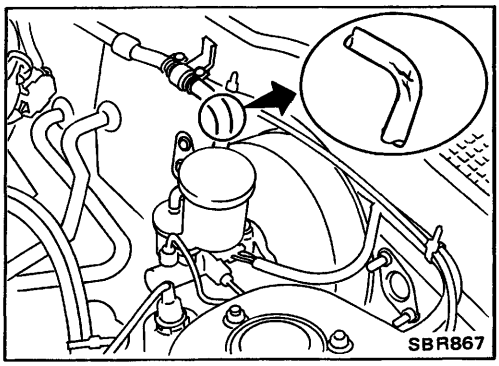
SBR246A

- Install check valve properly paying attention to its direction.

Inspection

HOSES AND CONNECTORS

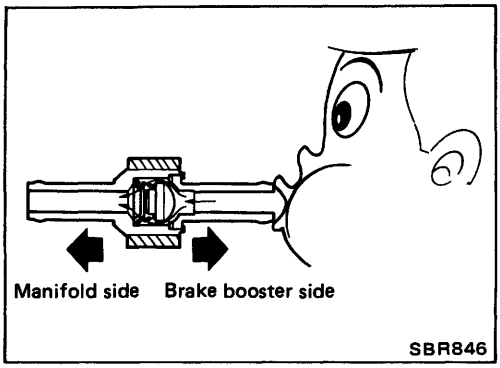
- Check condition of vacuum hoses and connectors.
- Check vacuum hoses for air tightness.



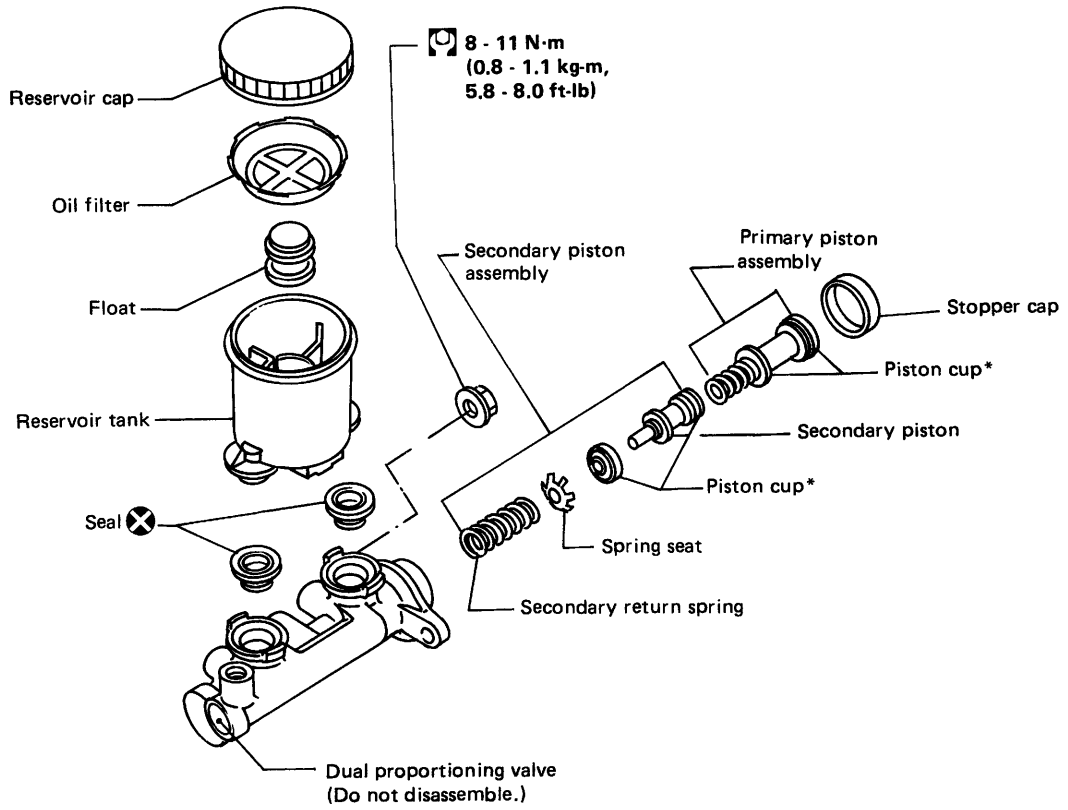
SBR867

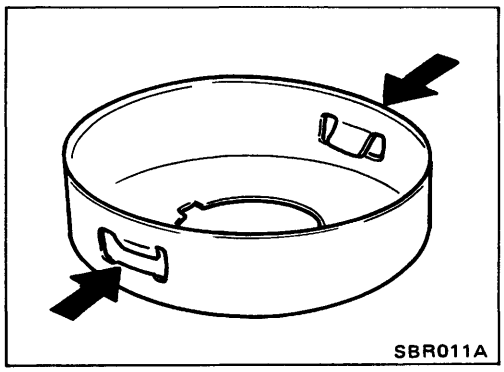
CHECK VALVE

- If valve does not open when pressure is applied to the brake booster side of check valve, replace check valve with a new one.

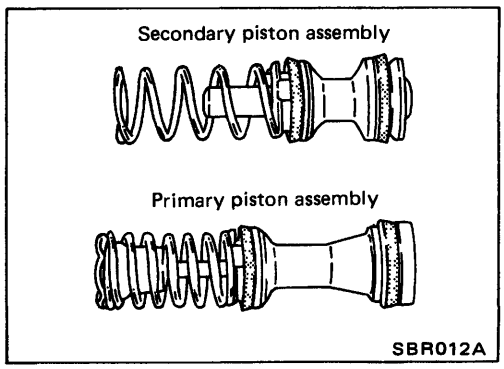


SBR846

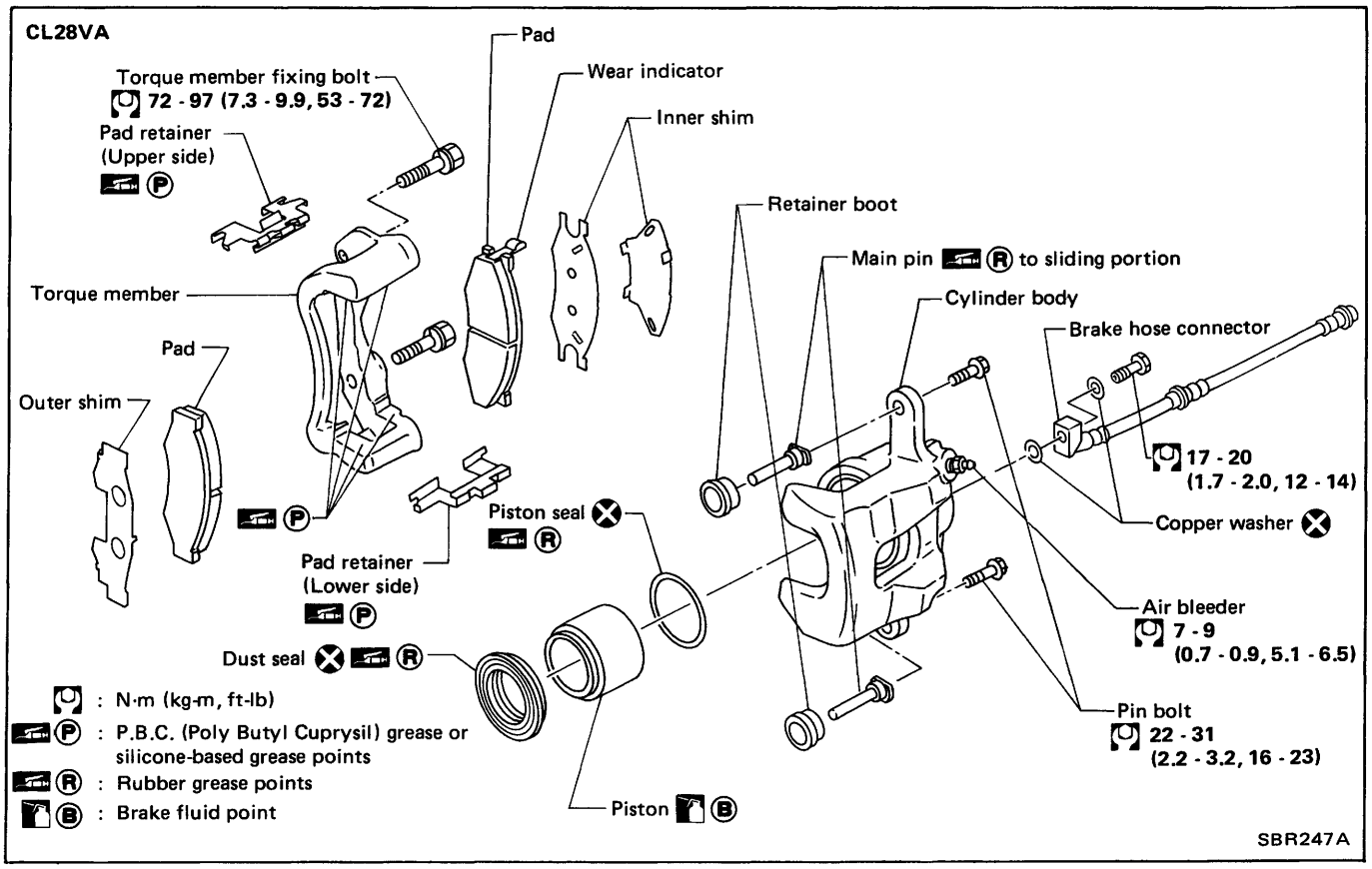


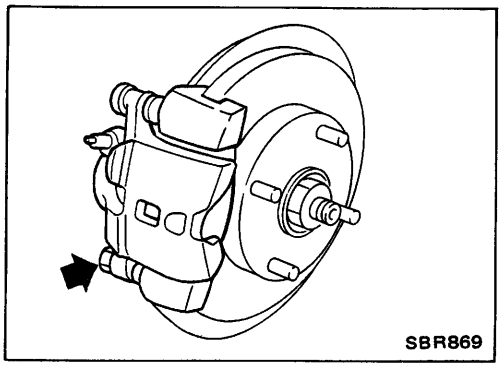


- Replace stopper cap if the claw is damaged or deformed.
- Bend claws inside when installing stopper cap.



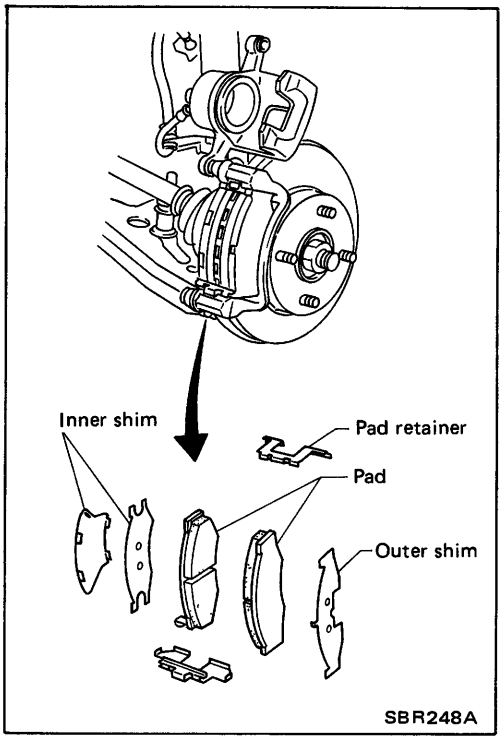
- Replace piston as an assembly when disassembled.
- Pay attention to the direction of piston cups in figure at left.
- Check parts for wear or damage. Replace if any of above conditions are observed.


CL28VA
Torque member fixing bolt
72 - 97 (7.3 - 9.9, 53 - 72)
Pad retainer
(Upper side)
Pad
Wear indicator
Inner shim
Retainer boot
Main pin (R) to sliding portion
Cylinder body
Brake hose connector
Torque member
Pad
Outer shim
Piston seal (R)
Pad retainer
(Lower side)
17 - 20
(1.7 - 2.0, 12 - 14)
Copper washer
Air bleeder
7 - 9
(0.7 - 0.9, 5.1 - 6.5)
Dust seal (R)
Pin bolt
22 - 31
(2.2 - 3.2, 16 - 23)
: N·m (kg-m, ft-lb)
(P) : P.B.C. (Poly Butyl Cuprysil) grease or silicone-based grease points
(R) : Rubber grease points
(B) : Brake fluid point
Piston (B)
SBR247A


SBR869

Pad Replacement

1. Remove pin bolt.



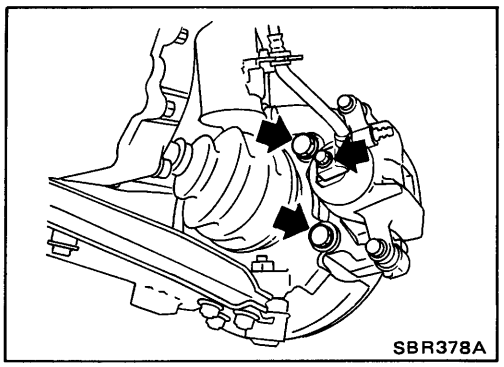
SBR248A

2. Swing cylinder body upward. Then remove pad retainers, and inner and outer shims.

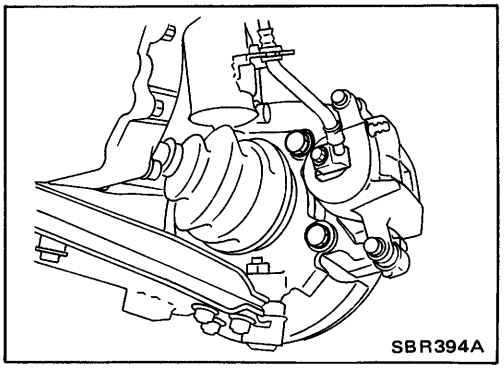
CAUTION:

- **When cylinder body is swung up, do not depress brake pedal because piston will pop out.**
- **Be careful not to damage dust seal or get oil on rotor. Always replace shims when replacing pads.**

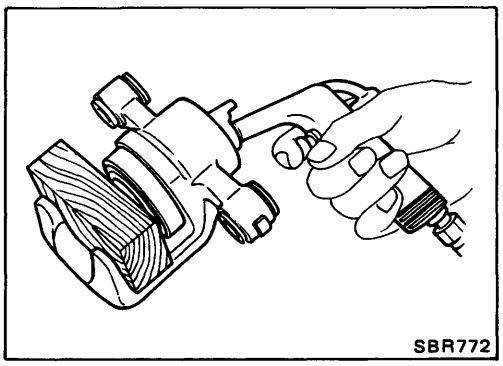
Removal and Installation


SBR378A

- Remove torque member fixing bolts and brake hose connector bolt.

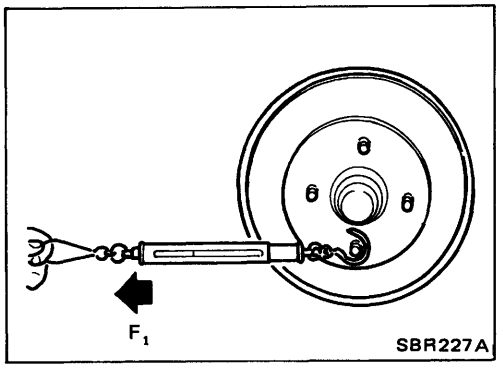

SBR394A

- Install brake hose to caliper securely.


SBR772

Disassembly

Push out piston with dust seal using compressed air.

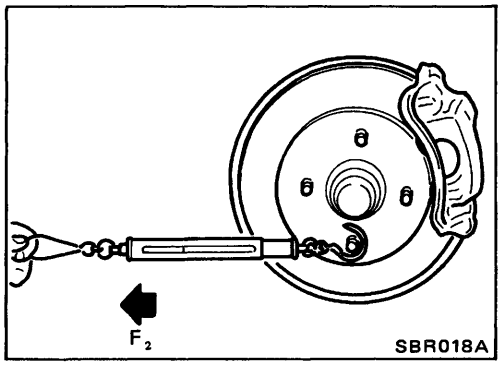


SBR227A

Inspection

INSPECTION OF BRAKE DRAG FORCE

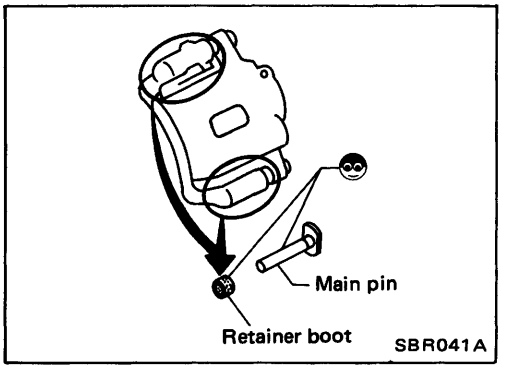
(1) Swing cylinder body upward.
(2) Make sure that wheel bearing is adjusted properly. Refer to section FA.
(3) Measure rotating force (F_1).



SBR018A

(4) Install caliper with pads to the original position.
(5) Depress brake pedal for 5 seconds.
(6) Release brake pedal, rotate disc rotor 10 revolutions.
(7) Measure rotating force (F_2).
(8) Calculate brake drag force by subtracting F_1 from F_2.

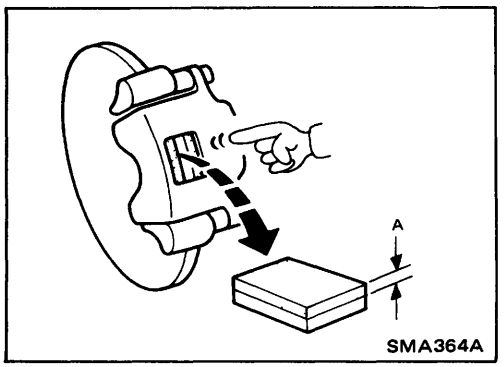
Maximum brake drag force ($F_2 - F_1$):
103.0 N (10.5 kg, 23.2 lb)



SBR041A

If it is not within specification, check main pins and retainer boots in caliper.

- **Make sure that wheel bearing is adjusted properly.**
- **Disc pads and disc rotor must be dried.**



SMA364A

DISC PAD

Check disc pad for wear or damage.

Pad wear limit (A):
2.0 mm (0.079 in)

Inspection (Cont'd)

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

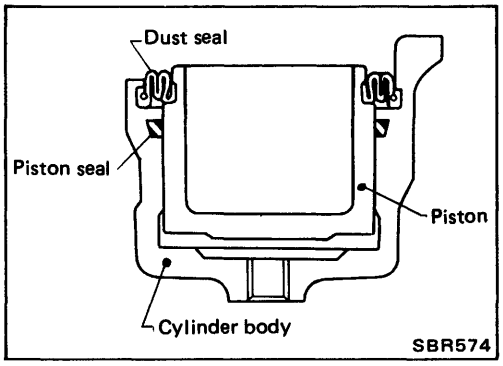
Check piston for score, rust, wear, damage or presence of foreign materials. Replace if any of the above conditions are observed.

CAUTION:

Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

MAIN PIN, PIN BOLT AND RETAINER BOOT

Check for wear, cracks or other damage. Replace if any of the above conditions are observed.



Assembly

- Insert piston seal into groove on cylinder body.
- With dust seal fitted to piston, install piston into cylinder body.

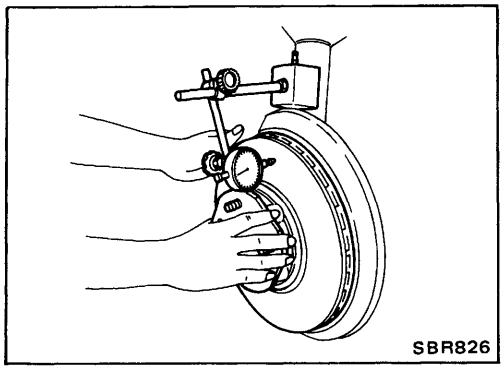
CAUTION:

- **Secure dust seal properly.**

Inspection

RUBBING SURFACE

Check rotor for roughness, cracks or chips.


SBR826

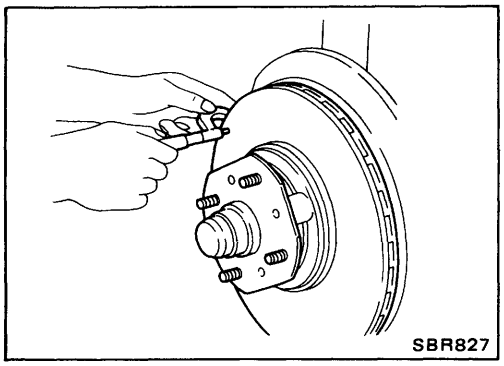
RUNOUT

Make sure that axial end play is within the specifications before measuring. Refer to section FA.

Then check runout with a dial indicator.

Rotor repair limit:

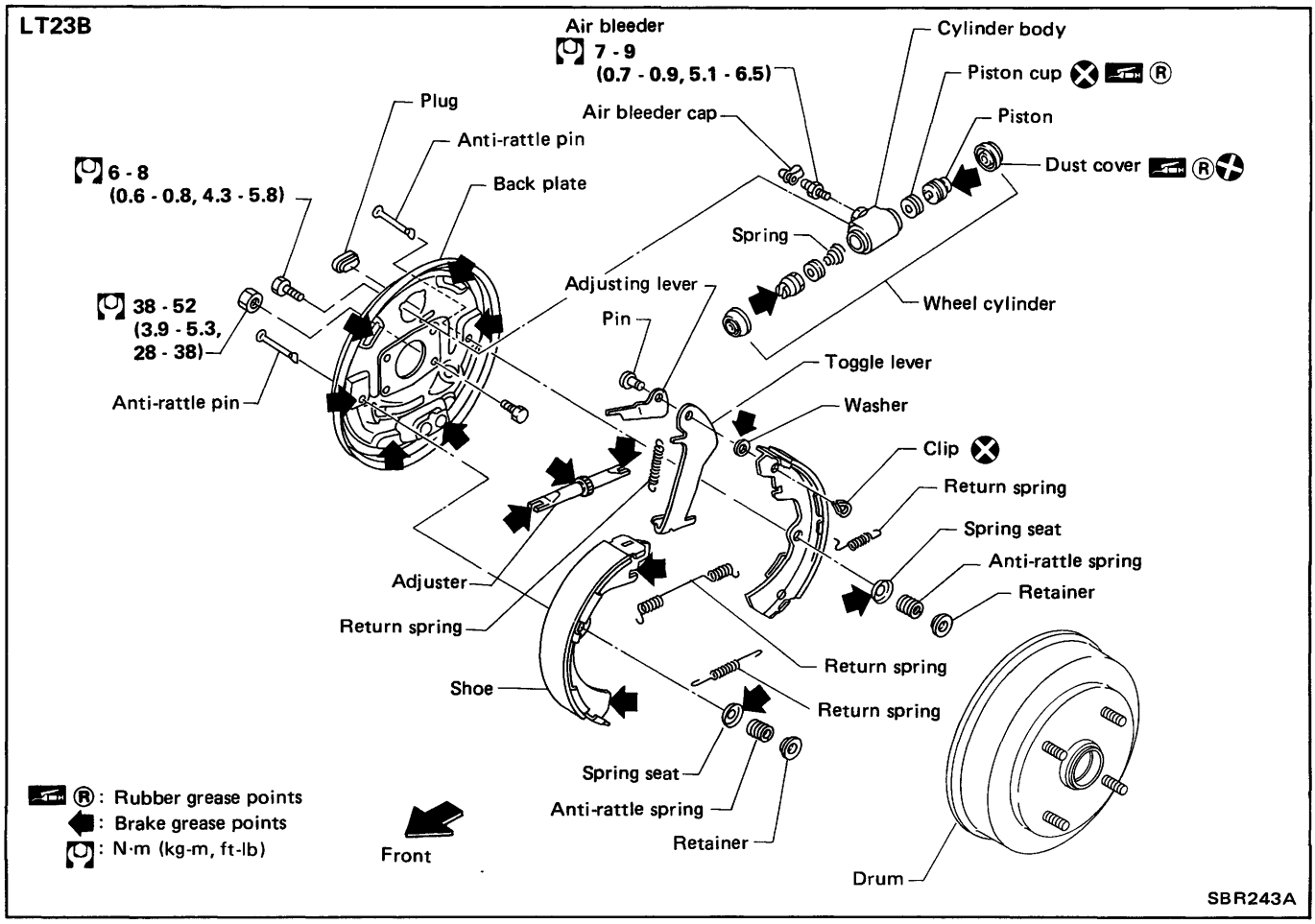
Maximum runout
(Total indicator reading at center of rotor pad contact surface)
0.07 mm (0.0028 in)


SBR827

THICKNESS

Rotor repair limit:

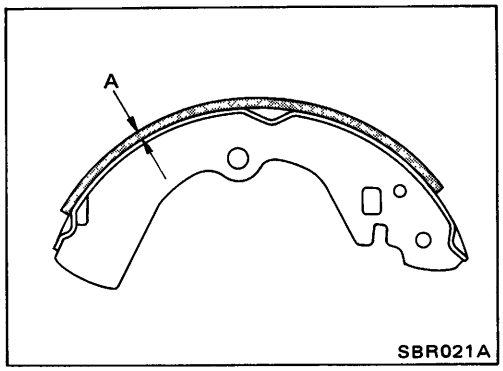
Minimum thickness
20.0 mm (0.787 in)


LT23B
Air bleeder
7 - 9
(0.7 - 0.9, 5.1 - 6.5)
Cylinder body
Piston cup
Piston
Dust cover
Plug
Air bleeder cap
Anti-rattle pin
6 - 8
(0.6 - 0.8, 4.3 - 5.8)
Back plate
Spring
Adjusting lever
Wheel cylinder
38 - 52
(3.9 - 5.3,
28 - 38)
Pin
Toggle lever
Anti-rattle pin
Washer
Clip
Return spring
Spring seat
Anti-rattle spring
Retainer
Adjuster
Return spring
Return spring
Shoe
Return spring
Spring seat
Anti-rattle spring
Retainer
Drum
: Rubber grease points
: Brake grease points
: N·m (kg-m, ft-lb)
Front
SBR243A

Brake Drum Removal

- Release parking brake control lever fully.
- Remove hub cap and wheel bearing lock nut.

Refer to section RA.



Shoe Replacement

- Measure lining thickness.

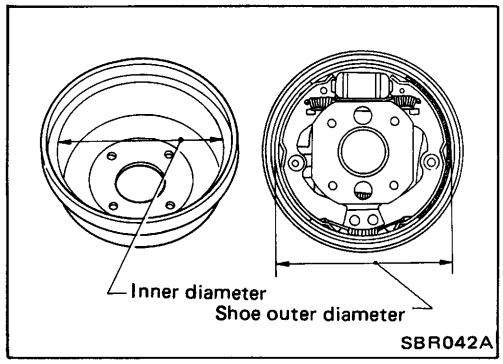
Lining wear limit (A):
1.5 mm (0.059 in)

Before installing new shoes, rotate nut until adjuster rod is at its shortest point.

After installation is completed, adjust shoe-to-drum clearance. Refer to Removal and Installation.

Wheel Cylinder Inspection

Check parts for score, wear or damage. Replace if any of the above conditions are observed.



Removal and Installation

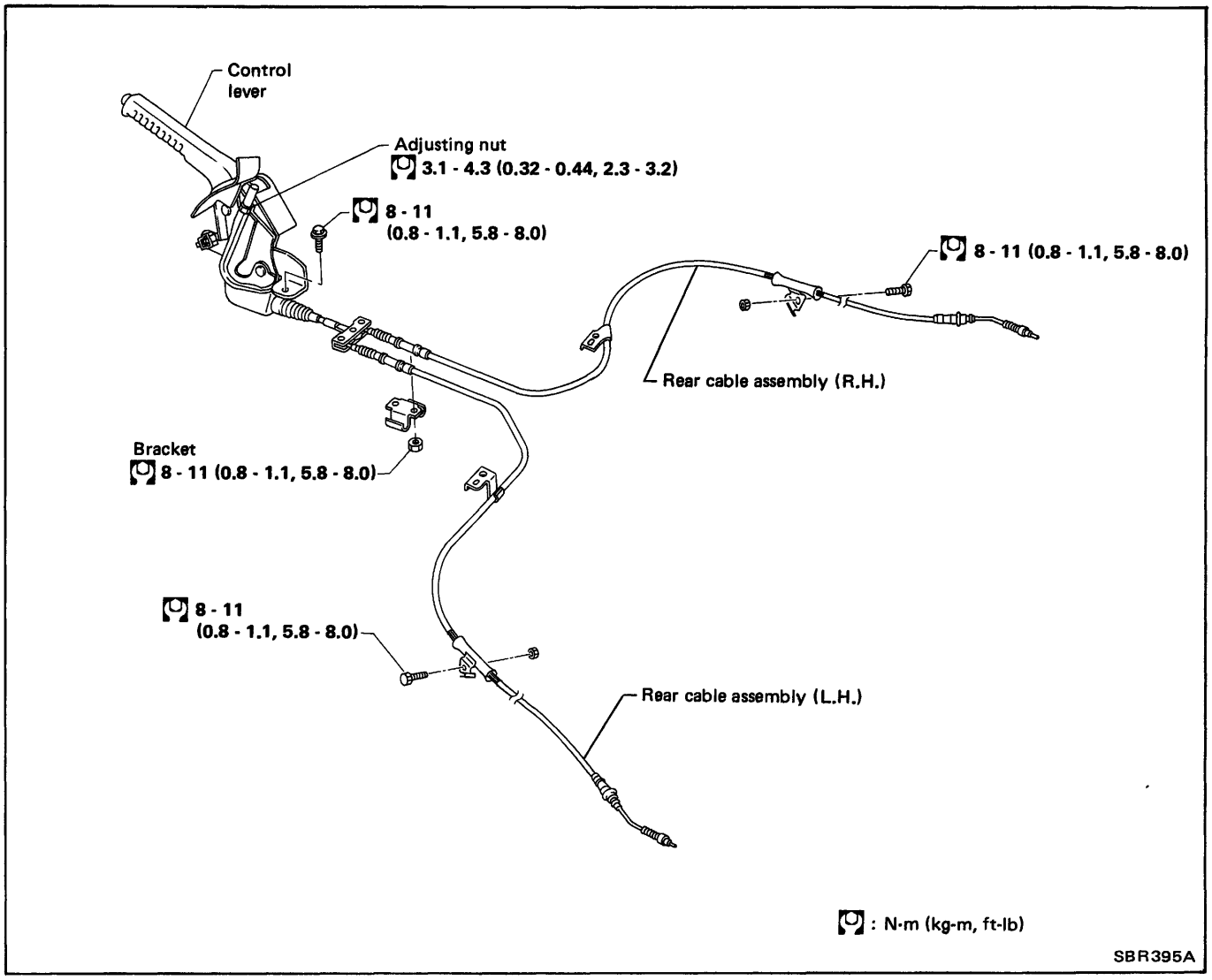
When installing, measure inner diameter of the drum and adjust so that shoe outer diameter at its center is smaller than drum inner diameter by 0.35 to 0.55 mm (0.0138 to 0.0217 in) by rotating the adjuster. Then operate parking brake lever to adjust shoe clearance.

Drum Inspection

Standard inner diameter:
228.6 mm (9 in)
Maximum inner diameter:
230.0 mm (9.06 in)
Out-of-roundness (ellipticity):
0.03 mm (0.0012 in) or less
Radial runout (Total indicator reading):
0.05 mm (0.0020 in) or less

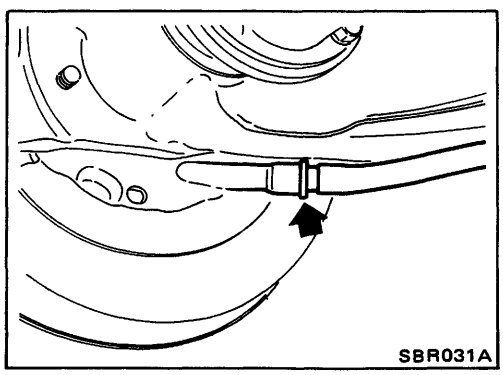
Drum Inspection (Cont'd)

- Contact surface should be finefinished with No. 120 to 150 emery paper.
- Using a drum lathe, lathe brake drum if it shows score marks, partial wear or stepped wear.
- After brake drum has been completely reconditioned or replaced, check drum and shoes for proper contact pattern.



Removal and Installation

- Before removing parking brake cable, release muffler assembly fixing bolt.



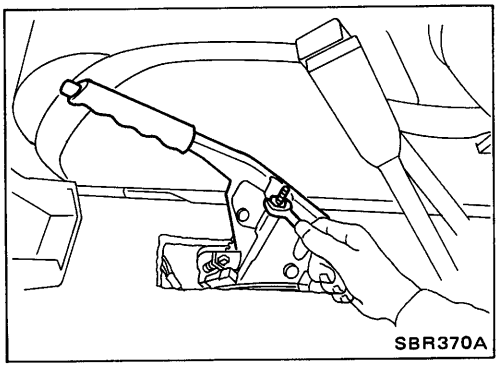
- Install rear cable by tapping the flanged section of cable cover with a hammer and punch.
  Be careful not to damage cable.
- Make sure there is no free play after installation.

Inspection

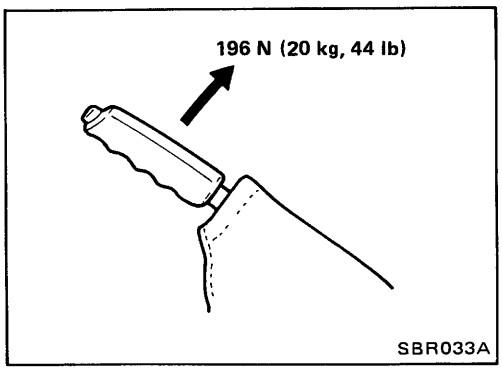
1. Check control lever for wear or other damage. Replace if necessary.
2. Check parking brake cables and switch for discontinuity or deterioration. Replace if necessary.
3. Check warning lamp and switch. Correct if necessary.
4. Check parts at each connecting portion and, if found deformed or damaged, replace.

Adjustment

Adjust control lever stroke as follows.



1. Turn adjusting nut.



2. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.
   Number of notches: 9 - 11

3. Bend parking brake warning lamp switch plate so that brake warning light comes on when ratchet at parking brake lever is pulled "A" notches and goes out when fully released.
   Number of notches "A": 1 - 2

General Specifications

Front brake Brake model		CL28VA	
Pad Width x thickness x length	mm (in)	Inner 43.0 x 11.0 x 126.5 (1.693 x 0.433 x 4.98)	Outer 43.0 x 11.0 x 129.0 (1.693 x 0.433 x 5.08)
Rotor outer diameter	mm (in)	250 (9.84)	
Caliper	mm (in)	60.6 (2.386)	
Rear brake Brake model		LT23B	
Lining Width x thickness x length	mm (in)	40.0 x 4.5 x 219.4 (1.575 x 0.177 x 8.64)	
Drum inner diameter	mm (in)	228.6 (9)	
Wheel cylinder inner diameter	mm (in)	19.05 (3/4)	
Master cylinder Inner diameter	mm (in)	25.4 (1)	
Brake booster Model		M195T	
Diaphragm diameter	mm (in)	Primary . . . 205 (8.07)	Secondary . . . 180 (7.09)
Control valve Type		Dual proportioning valve within master cylinder	
Split point x reducing ratio	kPa (kg/cm^2, psi)	1,961 (20, 284) x 0.4	
Recommended brake fluid		DOT 3	

Inspection and Adjustment

BRAKE PEDAL

Free height "H"	mm (in)	184 - 194 (7.24 - 7.64)
Depressed height "D" [Under force of 490 N (50 kg, 110 lb) with engine running]	mm (in)	95 (3.74) or more
Clearance "C" between the threaded end of stop lamp switch screw and brake pedal stopper	mm (in)	0.3 - 1.0 (0.012 - 0.039)
Pedal free play "A"	mm (in)	1 - 3 (0.04 - 0.12)

PARKING BRAKE

Type	Center lever type
Number of notches when warning switch comes on	1 - 2
Number of notches [When pulled force of 196 N (20 kg, 44 lb)]	9 - 11

DISC BRAKE

Brake model		CL28VA
Pad wear limit Minimum thickness	mm (in)	2.0 (0.079)
Rotor repair limit Maximum runout	mm (in)	0.07 (0.0028)
Minimum thickness	mm (in)	20.0 (0.787)

DRUM BRAKE

Brake model		LT23B
Lining wear limit Minimum thickness	mm (in)	1.5 (0.059)
Drum repair limit Maximum inner diameter	mm (in)	230.0 (9.06)
Out-of-roundness	mm (in)	0.03 (0.0012) or less
Radial runout	mm (in)	0.05 (0.0020) or less

Tightening Torque

Item	N·m	kg-m	ft-lb
Brake pedal			
Pedal bracket to body	8 - 11	0.8 - 1.1	5.8 - 8.0
A.S.C.D. cancel switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Stop lamp switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Brake booster			
Brake booster to body (pedal bracket)	8 - 11	0.8 - 1.1	5.8 - 8.0
Input rod lock nut	16 - 22	1.6 - 2.2	12 - 16
Brake booster to master cylinder	8 - 11	0.8 - 1.1	5.8 - 8.0
Brake tube connector			
Connector to brake tube	15 - 18	1.5 - 1.8	11 - 13
Connector mounting bolt	5 - 7	0.5 - 0.7	3.6 - 5.1
Brake hose connector	17 - 20	1.7 - 2.0	12 - 14
Brake tube flare nut	15 - 18	1.5 - 1.8	11 - 13
Wheel cylinder air bleeder	7 - 9	0.7 - 0.9	5.1 - 6.5
Front disc brake			
Pin bolt	22 - 31	2.2 - 3.2	16 - 23
Torque member fixing bolt	72 - 97	7.3 - 9.9	53 - 72
Rear drum brake			
Back plate	38 - 52	3.9 - 5.3	28 - 38
Wheel cylinder fixing bolt	6 - 8	0.6 - 0.8	4.3 - 5.8
Parking brake			
Center lever type			
Control lever to body	8 - 11	0.8 - 1.1	5.8 - 8.0
Adjuster lock nut	3.1 - 4.3	0.32 - 0.44	2.3 - 3.2
Cable clamp to body	8 - 11	0.8 - 1.1	5.8 - 8.0

STEERING SYSTEM

SECTION ST

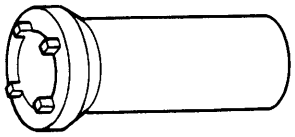
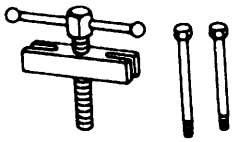
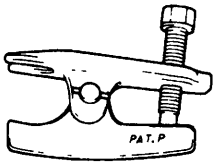
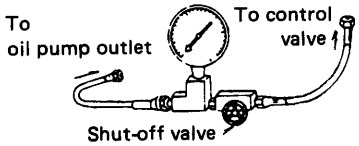
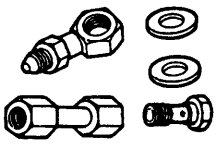
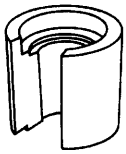
CONTENTS

PRECAUTIONS ..... ST- 2
PREPARATION ..... ST- 3
DESCRIPTION ..... ST- 5
ON-VEHICLE INSPECTION ..... ST- 6
STEERING WHEEL AND STEERING COLUMN ST-10
POWER STEERING GEAR AND LINKAGE (Model PR24SA) ST-15
POWER STEERING OIL PUMP ST-29
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ST-34

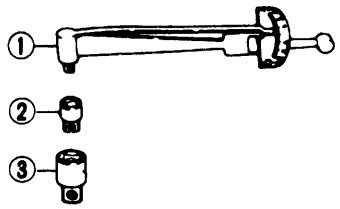
- The power steering gear and oil pump should be disassembled only when repairing an "oil leak". They should not be disassembled to repair any other steering defect, steering noise, etc.
- Before disassembly, thoroughly clean the outside of the unit.
- Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- When disassembling parts, be sure to place them in order in parts rack so they can be put back in the unit in their proper positions.
- Use a nylon cloth or paper towel for wiping parts clean. Common shop rags can leave lint that might interfere with the operation.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Before assembly, apply a coat of recommended A.T.F.* to hydraulic parts. Vaseline may be applied to O-rings and seals. Do not use any grease.
- Gaskets, seals and O-rings should be replaced. Care should be taken to avoid damaging O-rings, seals and gaskets when assembling. It is also very important to perform functional tests whenever it is designated.

*: Automatic Transmission Fluid

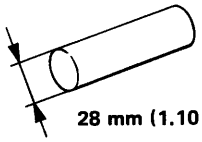
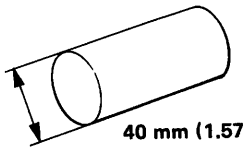
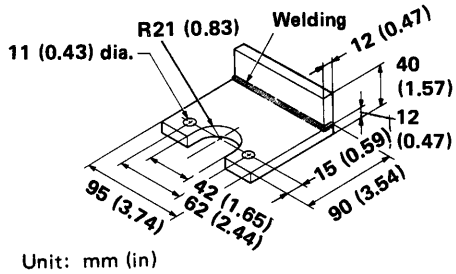
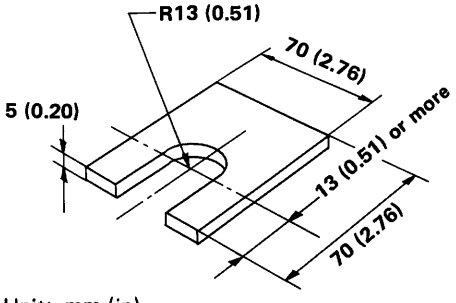
SPECIAL SERVICE TOOLS

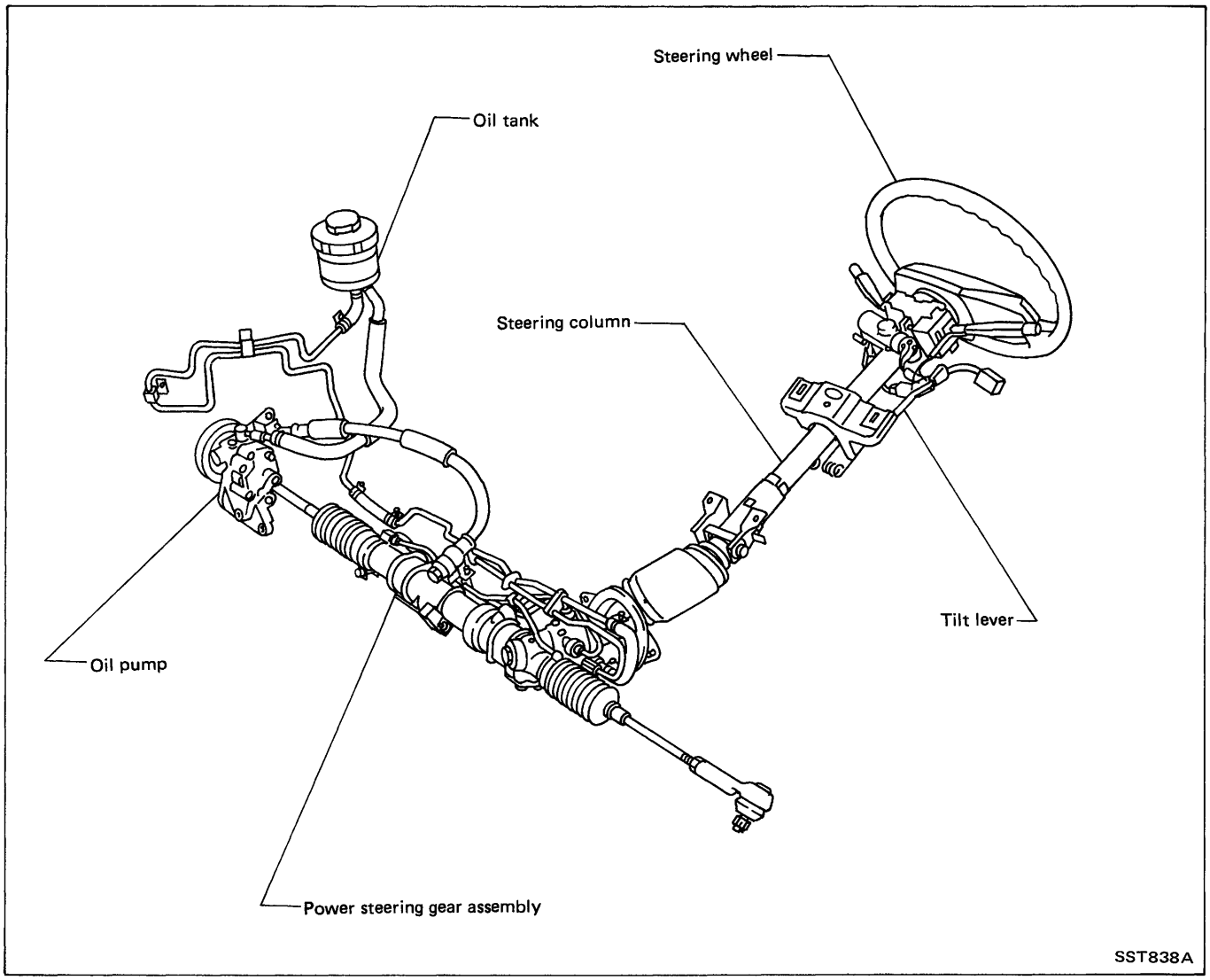
Tool number (Kent-Moore No.) Tool name	Description	
KV48102000 (J28822) End cover socket wrench		Removing and installing rear cover and end cover
KV48100700 (J26364) Torque adapter		Measuring pinion rotating torque
ST27180001 (J25726-A) Steering wheel puller		Removing and installing steering wheel
HT72520000 (J25730-A) Ball joint remover		Removing ball joint
ST27091000 (J26357) Pressure gauge		Measuring oil pressure
KV48102500 (–) Pressure gauge adapter		Measuring oil pressure
KV48103100 (J34264) Oil seal drift		Installing oil seal
KV48102300 (J28820) Cylinder lock nut wrench		Removing and installing cylinder assembly

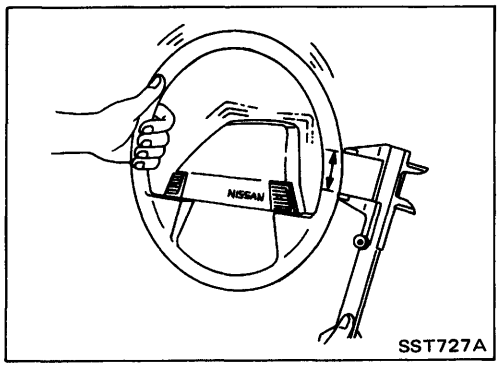
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description
ST3127S000 (See J25765-A) ① GG91030000 (J25765-A) Torque wrench ② HT62940000 (–) Socket adapter ③ HT62900000 (–) Socket adapter	Measuring turning torque 

COMMERCIAL SERVICE TOOLS

Tool name	Description
Rear oil seal drift	Installing rear oil seal 
Pinion oil seal drift	Installing pinion oil seal 
Oil pump attachment	Disassembling and assembling oil pump  SST481A
Oil seal drift attachment	Installing oil seal  SST736A


Steering wheel
Oil tank
Steering column
Tilt lever
Oil pump
Power steering gear assembly
SST838A



SST727A

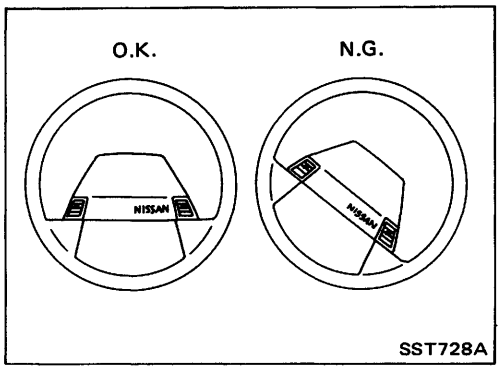
Checking Steering Wheel Play

- With wheels in a straight ahead position, check steering wheel play.

  Steering wheel play:

  35 mm (1.38 in) or less

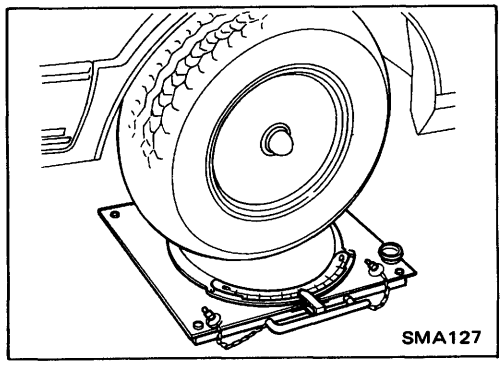
- If it is not within specification, check tie-rod outer and inner ball joints and/or pinion & rack assembly.



SST728A

Checking Neutral Position on Steering Wheel

- Check that the steering wheel is in the neutral position when driving straight ahead.
- If it is not in the neutral position, remove the steering wheel and re-install it correctly in the neutral position.
- 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

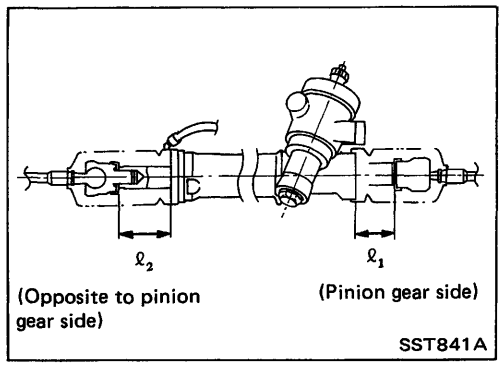
Checking Front Wheel Turning Angle

- Rotate steering wheel all the way right and left; measure turning angle.

  Turning angle:

  Full turns and toe-out turn

  Refer to section FA for S.D.S.

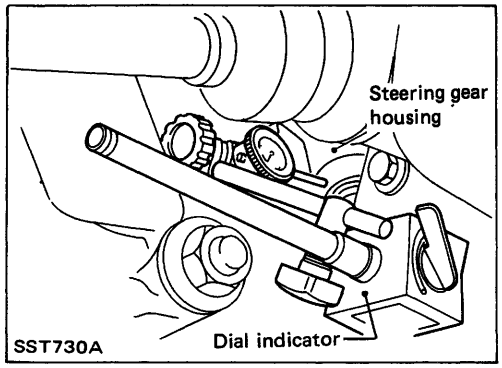


SST841A

- If it is not within specification, check rack stroke.

  Measure length "ℓ_1 & ℓ_2":

  Refer to S.D.S.



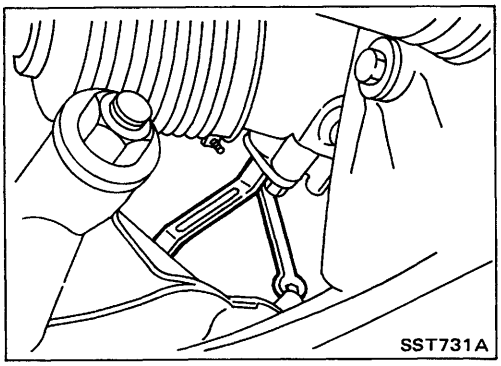
Checking Gear Housing Movement

- Check the movement of steering gear housing during stationary steering. The maximum allowable movement is as follows:

Movement of gear housing:
±2 mm (±0.08 in) (on dry paved surface) or less

When a force of 49 N (5 kg, 11 lb) is applied to steering wheel. On models equipped with power steering, turn off ignition key while checking.

- If movement exceeds the limit, replace mount insulator after confirming proper installation of gear housing clamps.



Adjusting Rack Retainer

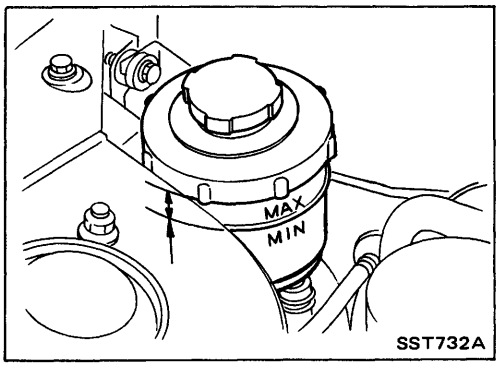
- Perform driving test on a flat road.

1. Check whether vehicle moves in a straight line when steering wheel is released.
2. Check whether steering wheel returns to neutral position when steering wheel is released from a slightly turned (approx. 20°) position.

- If any abnormality is found, correct it by adjusting screw.

Checking and Adjusting Drive Belts (Power steering)

Refer to section MA for Checking and Adjusting Drive Belts.



Checking Fluid Level (Power steering)

Check the fluid level when the fluid is cold.

CAUTION:

- **Do not overfill.**
- **Recommended fluid is Automatic Transmission Fluid "Dexron Type".**

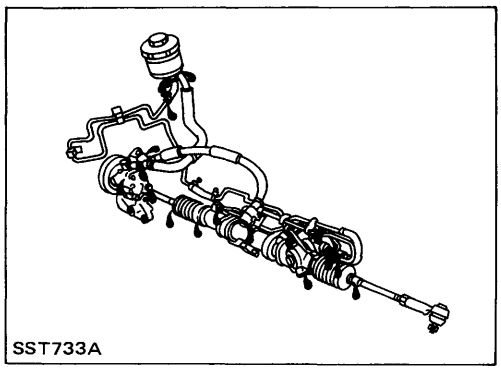
Bleeding Hydraulic System (Power steering)

1. Raise front end of vehicle until wheels clear ground.
2. While adding fluid, 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.

- Imcomplete air bleeding will cause the following to occur. When this happens, bleed air again.

① Generation of air bubbles in reservoir tank
② Generation of clicking noise in oil pump
③ Excessive buzzing in oil pump

In steering while the vehicle is stationary, or when moving wheel slowly, fluid noise may occur in the valve or oil pump. This type of fluid noise is inherent in an integral power steering system, and it will not affect performance or durability of the system.


SST733A

Checking Fluid Leakage (Power steering)

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

1. Run engine at idle speed or 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 steering wheel at lock position for more than fifteen seconds at a time.

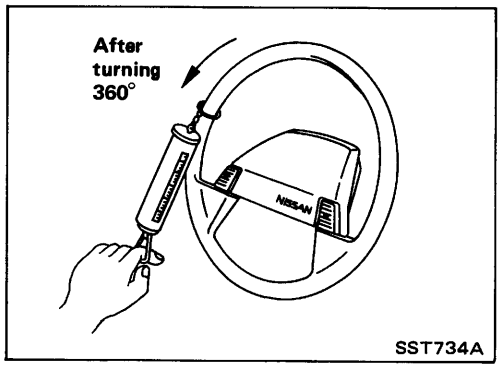
4. If fluid leakage at connectors is noticed, once loosen flare nut and then retighten.

Do not overtighten connector as this can damage O-ring, washer and connector.

Checking Steering Wheel Turning Force (Power steering)

1. Park vehicle on a level, dry surface and set parking brake.
2. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F)].

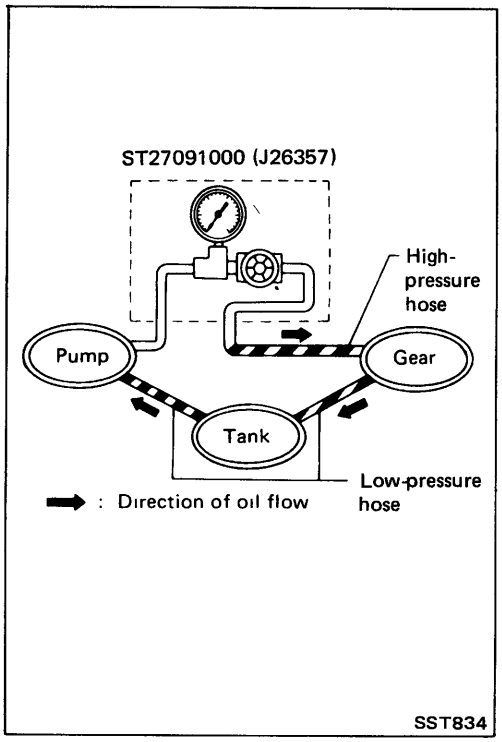
Tires need to be inflated to normal pressure.



Checking Steering Wheel Turning Force (Power steering) (Cont'd)

3. 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



Checking Hydraulic System (Power steering)

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.

CAUTION:

Do not hold steering wheel at lock position for more than fifteen seconds.

Oil pump maximum standard pressure:
6,865 kPa
(70 kg/cm², 995 psi) at idling

4. If oil pressure is below the standard, slowly close shut-off valve and check pressure.

- When pressure becomes standard, gear is damaged.
- When pressure remains beyond standard, pump is damaged.

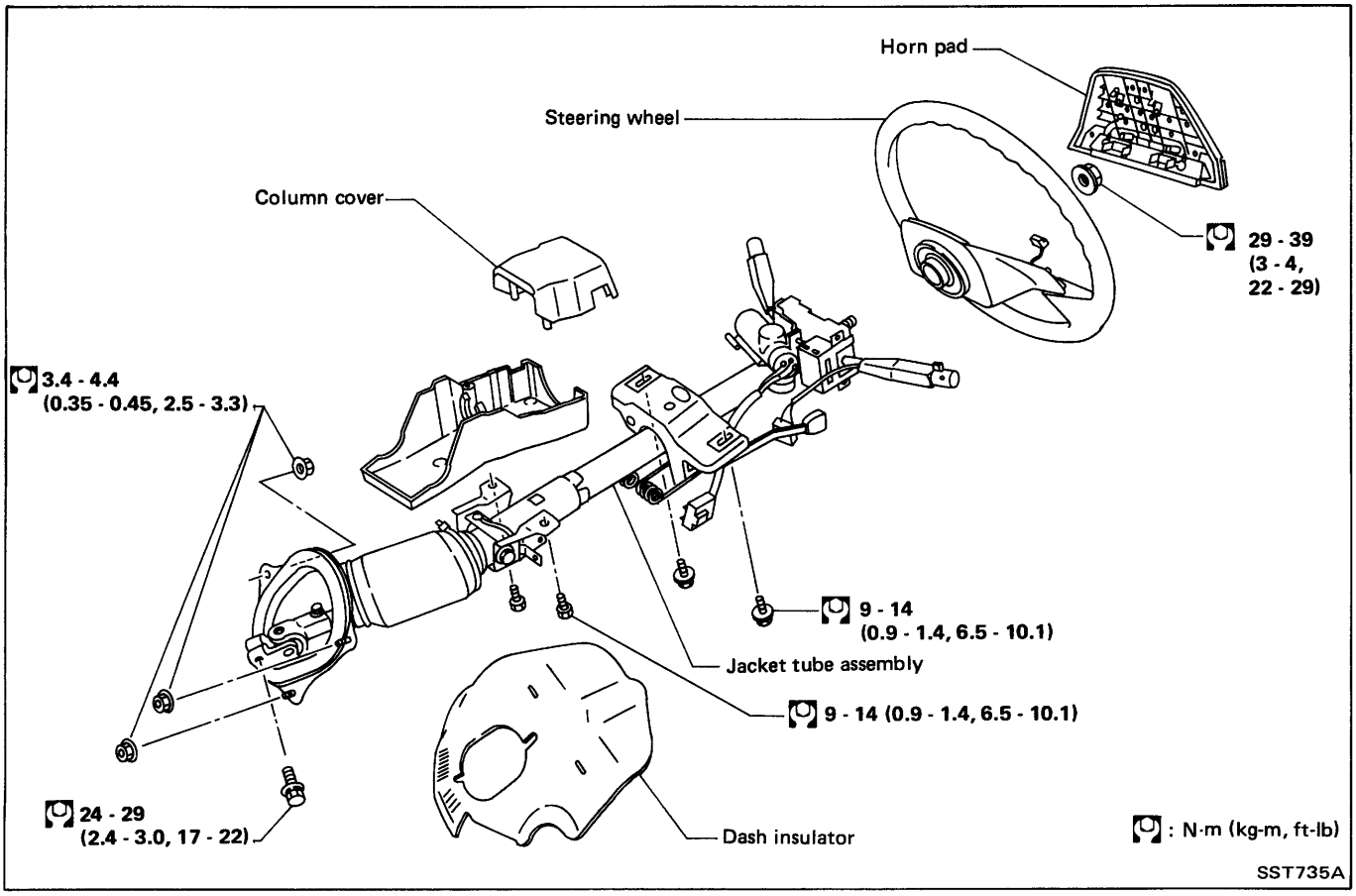
5. If oil pressure is above the standard, pump may be damaged.

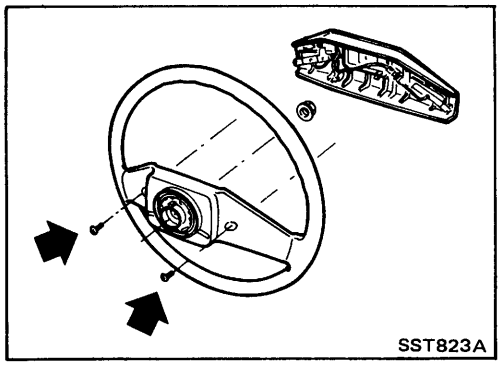
CAUTION:

Do not close shut-off valve for more than fifteen seconds.

6. After checking hydraulic system, remove Tool and add fluid as necessary, then completely bleed air out of system.

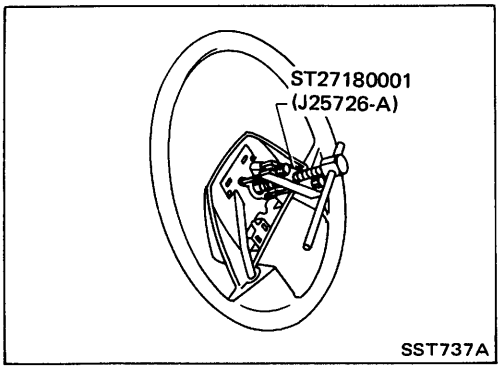
Removal and Installation





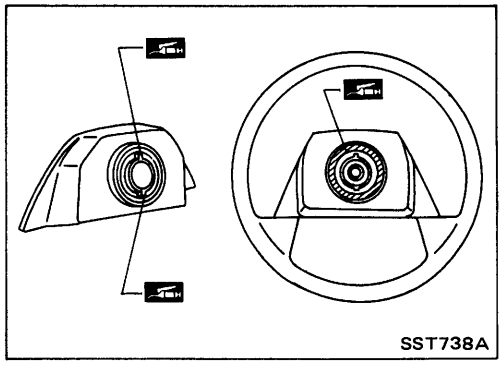
STEERING WHEEL

- Remove two screws from the rear of steering wheel.



- Remove steering wheel with Tool.

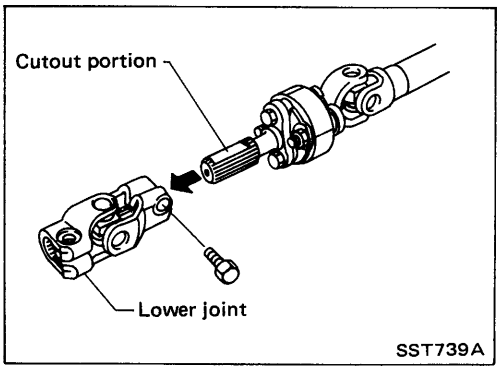
Removal and Installation (Cont'd)


SST738A

- 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.

STEERING COLUMN

- When installing steering column, finger tighten all lower bracket and clamp retaining bolts; then retighten them securely. Make sure that undue stress is not applied to steering column.

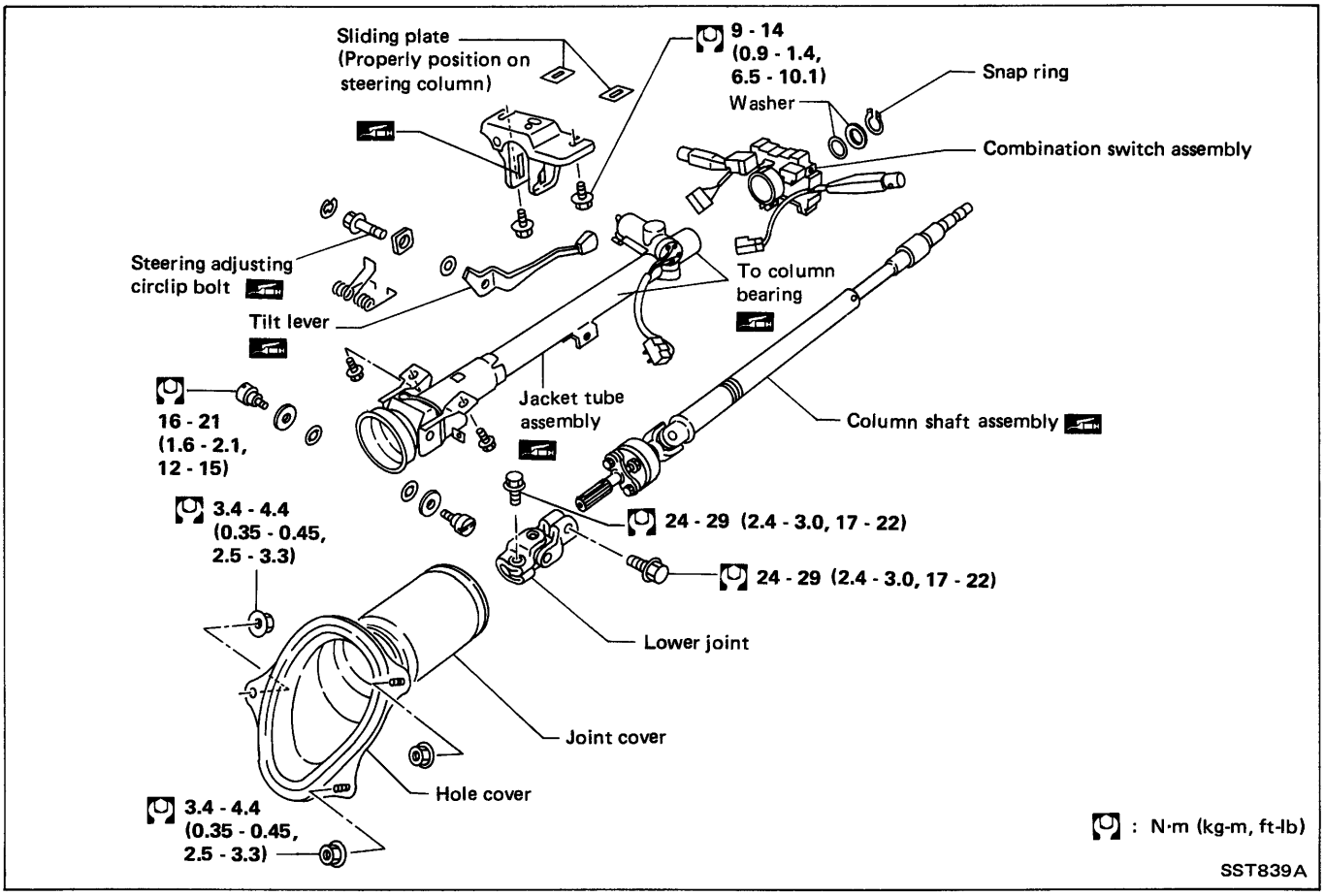


SST739A

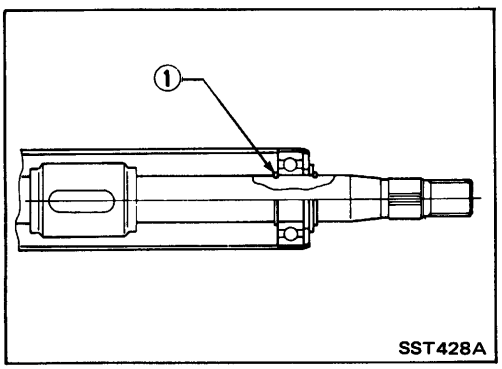
- When fitting steering lower joint, be sure tightening bolt faces cutout portion perfectly.

- 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.

Disassembly and Assembly

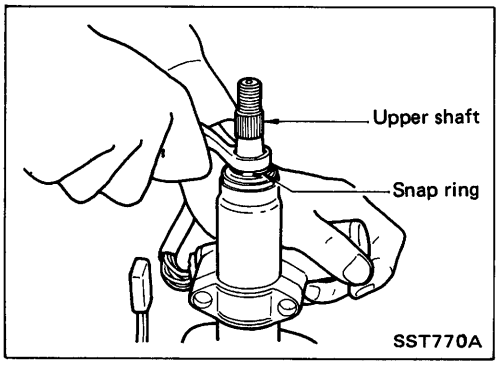


- After installing, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight forward position to left and right locks are equal.

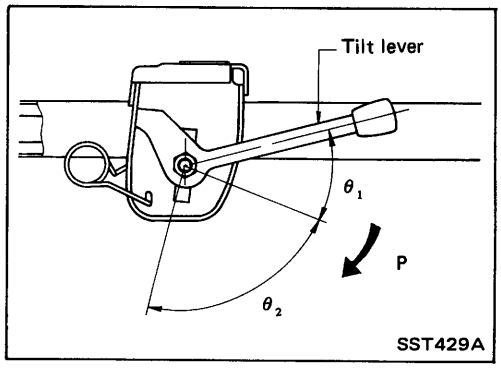


- When disassembling and assembling, unlock steering lock with key.
- Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.
- Install snap ring ① before inserting shaft into jacket tube.

Disassembly and Assembly (Cont'd)



- Install snap ring on upper shaft with box wrench.



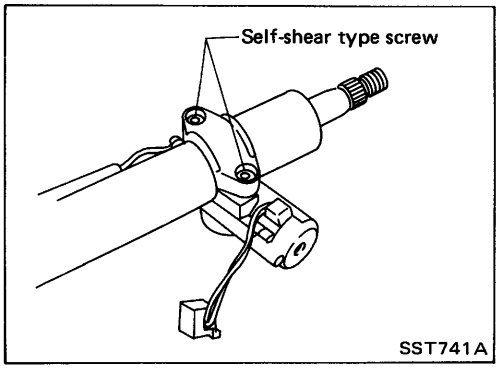
- Adjust tilt lever as follows.

(1) Adjust tilt lever to 13° to 16° (θ_1). Tighten adjusting bolt to specification.

: 8 - 11 N·m
(0.8 - 1.1 kg-m, 5.8 - 8.0 ft-lb)

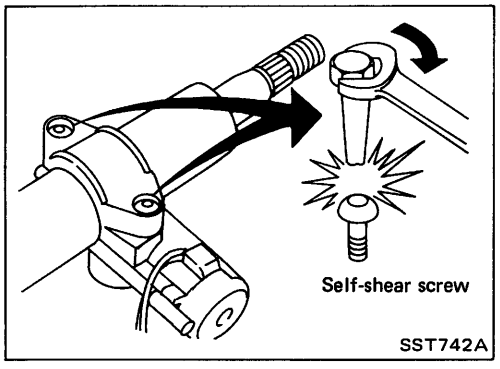
(2) Turn tilt lever by 80° (θ_2) in direction P to make sure steering column moves smoothly without binds.

(3) Return tilt lever to position θ_1. Make sure there is no free play (=0) of steering column when steering wheel is pushed down by force.

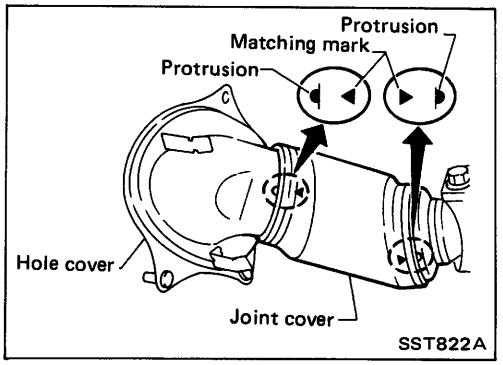


- Steering lock

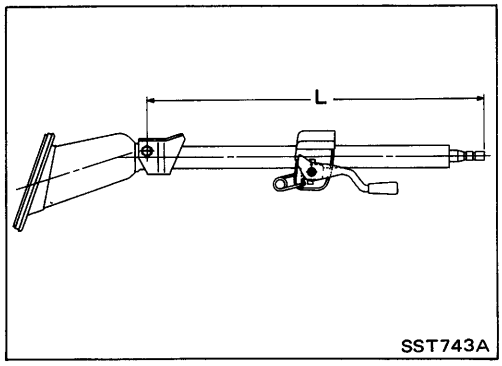
a) Break self-shear type screws with a drill or other appropriate tool.



b) Install self-shear type screws and then cut off self-shear type screw heads.



- When assembling, align matching marks on joint cover with protrusions on hole cover.



Inspection

- When steering wheel can not be rotated smoothly, check the steering column for the following matters and replace damaged parts.

(1) Check column bearings for damage or unevenness. Lubricate with recommended multipurpose grease or replace steering column as an assembly, if necessary.

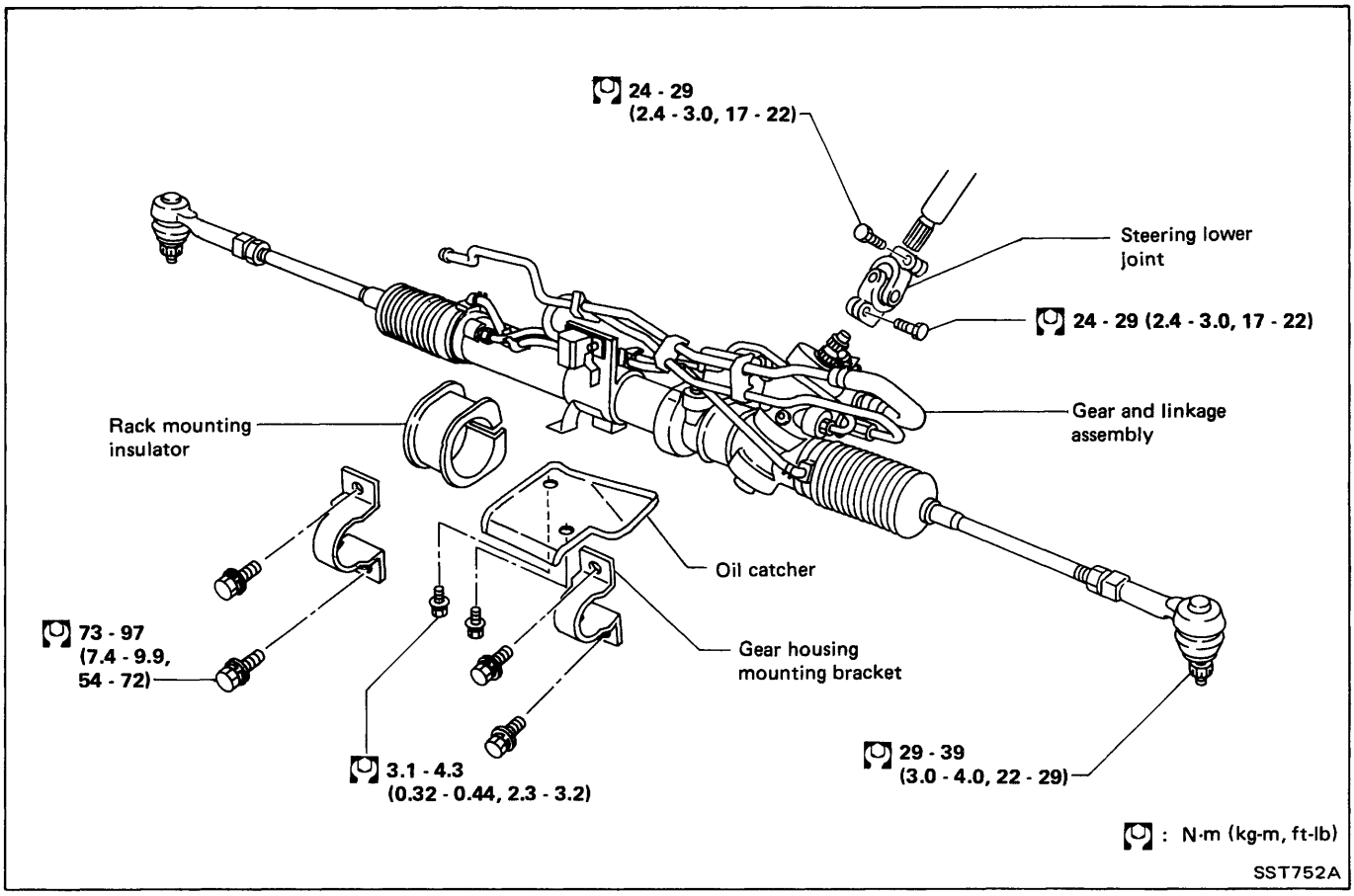
(2) Check jacket tube for deformation or breakage. Replace if necessary.

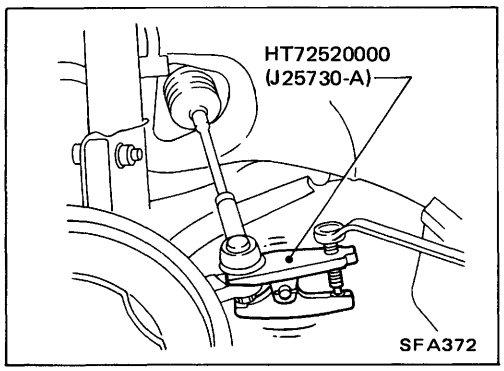
- When the vehicle is involved in a light collision, check column length "L". If it is not within specifications, replace steering column as an assembly.

Column length "L":

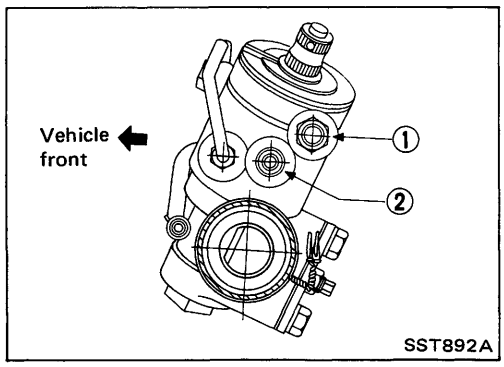
L = 572.5 - 573.5 mm (22.54 - 22.58 in)

Removal and Installation





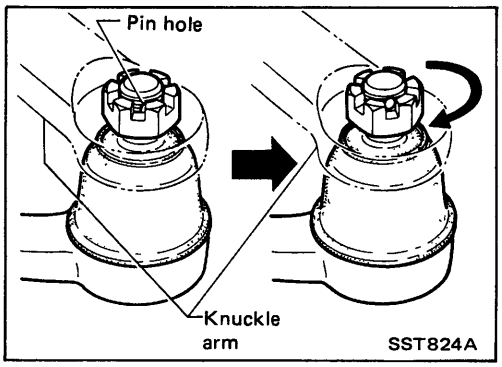
- Detach tie-rod outer sockets from knuckle arms with Tool.



- Install pipe connector as shown in figure at left.
  - ① Low-pressure side
  - ② High-pressure side

Removal and Installation (Cont'd)

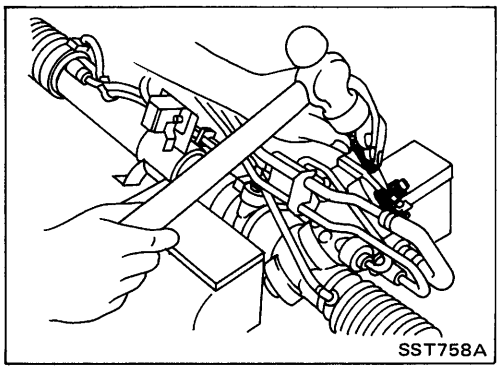
- Observe specified tightening torque when tightening high-pressure and low-pressure pipe connectors. Excessive tightening can damage threads or damaged connector O-ring.
- The O-ring in low-pressure pipe connector is larger than that in high-pressure connector. Take care to install the proper O-ring.



- Initially, tighten nut on tie-rod outer socket and knuckle arm to 29 to 39 N·m (3 to 4 kg-m, 22 to 29 ft-lb). Then tighten further to align nut groove with first pin hole so that cotter pin can be installed.

CAUTION:

Tightening torque must not exceed 49 N·m (5 kg-m, 36 ft-lb).

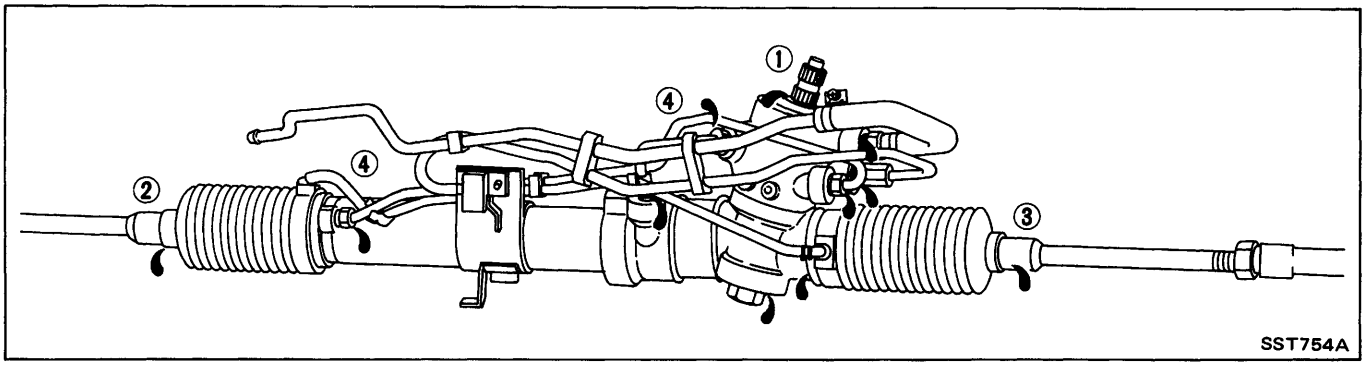


- Before removing lower joint from gear, set gear in neutral (wheels in straight ahead position). After removing lower joint, put matching mark on pinion shaft and pinion housing to record neutral position of gear.
- To install, set left and right dust boost to equal deflection, and attach lower joint by aligning match marks of pinion shaft and pinion housing.

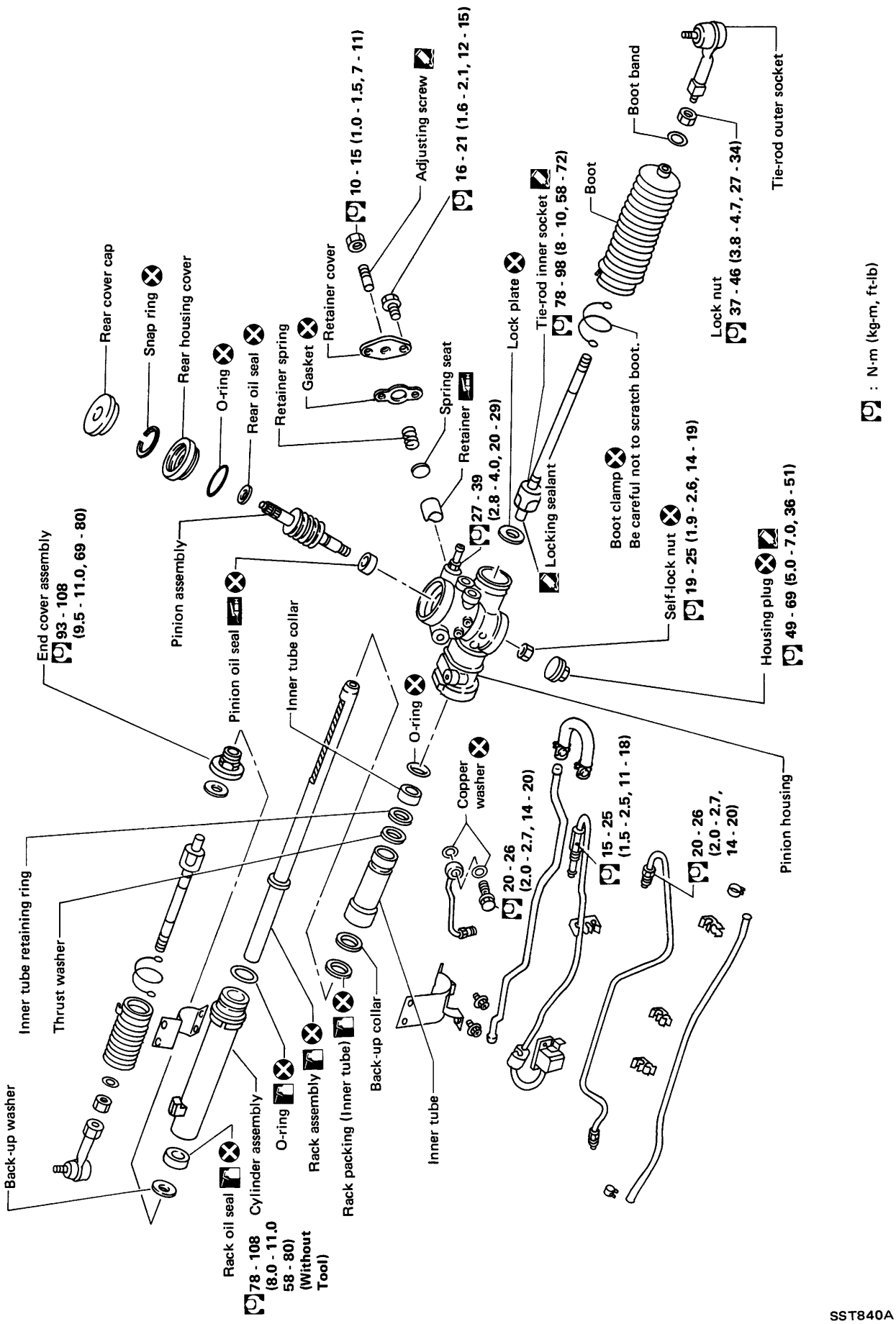
Disassembly and Assembly

The table below lists four ways to repair oil leaks in the steering gear, depending on the location of the leak. **See the following figure for oil leak locations.**

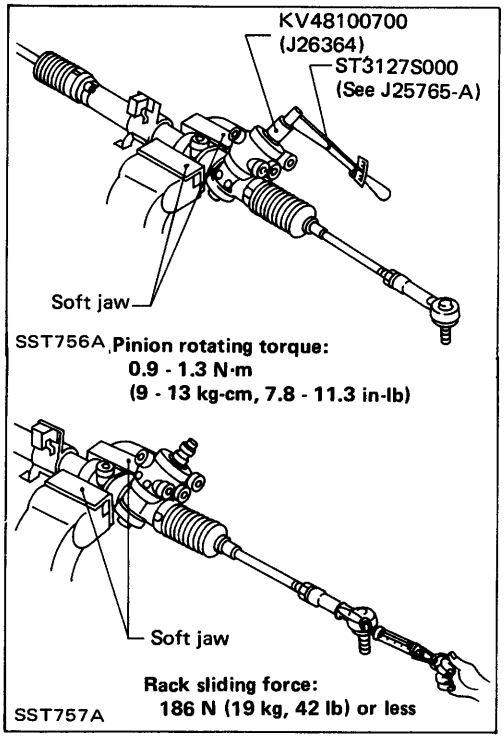
Position of oil leak / Item	① Rear cover cap portion and rear housing	② Boot	③ Boot	④ Cylinder tube
Operation	■ Replacement • Rear oil seal • Pinion oil seal • O-ring • Snap ring	■ Replacement • Rack oil seal • Boot clamp	■ Replacement • Rack oil seals • Rack packing • O-ring • Back-up collar • Boot clamp	■ Replacement • Cylinder tube • Copper washer
Procedure	Replace parts described above.	Remove gear from vehicle. Measure rack starting force and pinion rotating torque. Replace rack oil seal. Measure pinion rotating torque. Adjust adjusting screw. Measure rack starting force and pinion rotating torque.	Replace parts described above.	Replace cylinder tube.
Service parts to be prepared	• Pinion seal kit	• Gear housing seal kit	• Rack packing • Pinion seal kit	• Gear housing seal kit



Disassembly and Assembly (Cont'd)



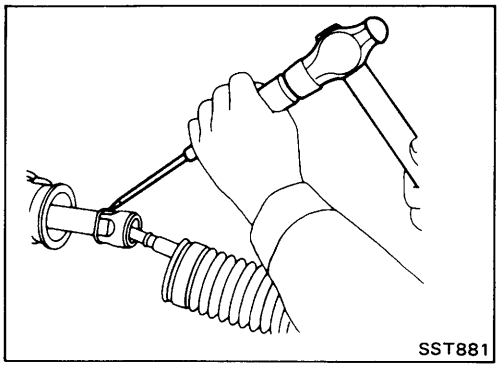
SST840A



Disassembly

1. Prior to disassembling, measure pinion rotating torque and rack sliding force. Record the pinion rotating torque and rack sliding force as a reference.

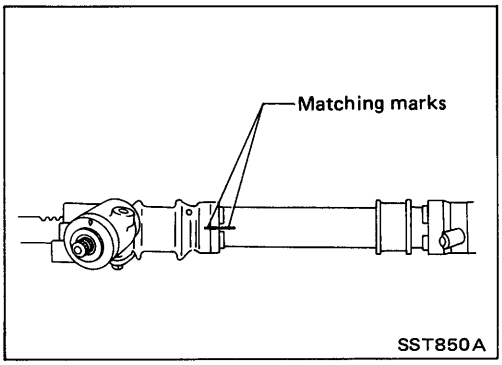
- **Before measuring, be sure to disconnect cylinder tube and drain fluid.**
- **Use soft jaws when holding steering gear housing. Handle it carefully as it is made of aluminum.**



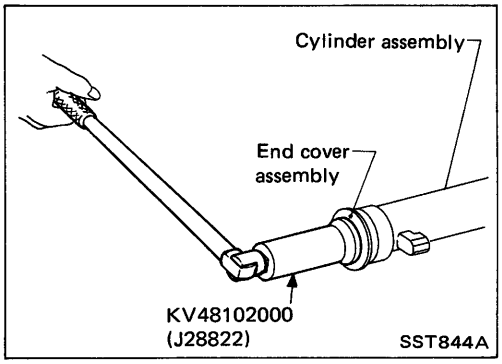
2. Remove cylinder tube and breather hose.
3. Remove tie-rod outer sockets and boots.

Before removing boot, put matching mark on boot and pinion housing.

4. Loosen tie-rod inner socket.
5. Remove retainer.
6. Remove pinion assembly.

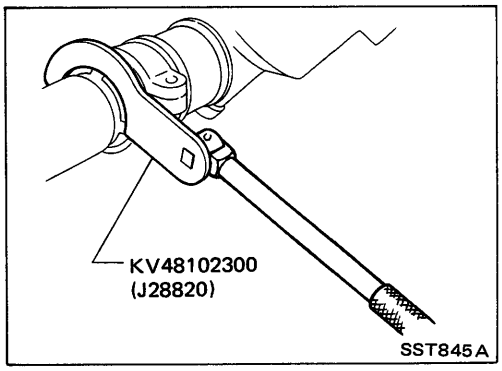


7. Inscribe matching marks as shown in figure at left.

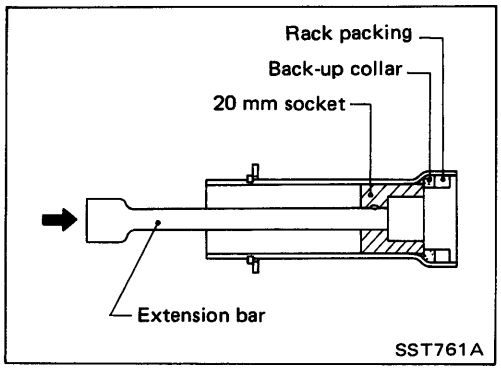


8. Remove end cover assembly with Tool.

Disassembly (Cont'd)



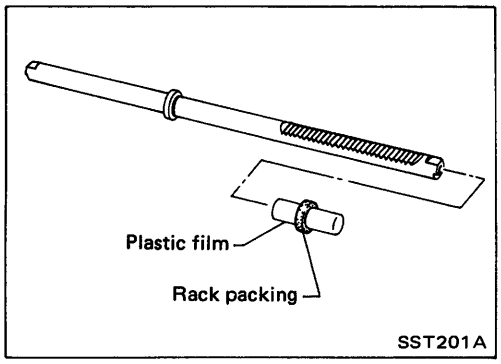
9. Disconnect cylinder lock nut with Tool and separate cylinder from pinion housing.
10. Draw out rack assembly.



11. Remove rack packing and back-up collar with 20 mm socket and extension bar.

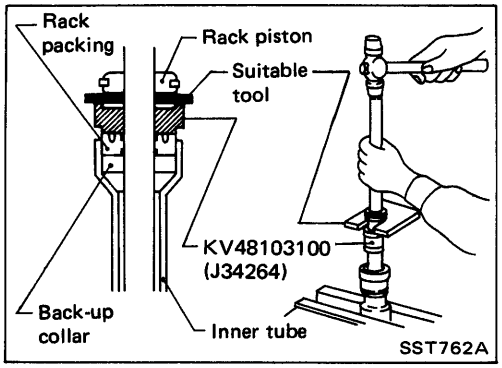
Do not scratch inner surfaces of cylinder.

Assembly

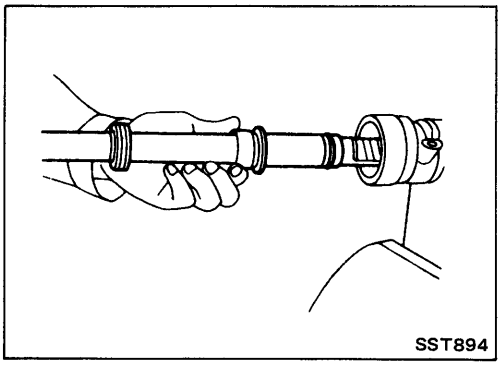


1. Insert rack packing.

- Place plastic film into rack packing to prevent damage by rack teeth.
- Always remove plastic film after rack packing is positioned properly.



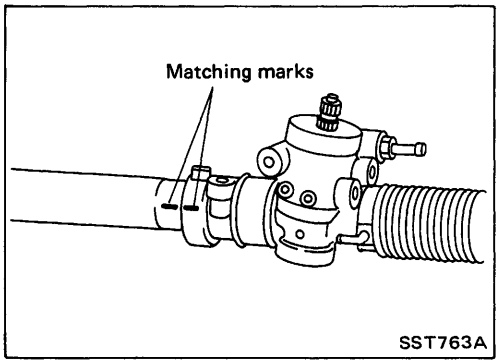
2. Attach back-up collar to inner tube with Tool.
3. Insert rack assembly into inner tube.
4. Press rack packing into inner tube.



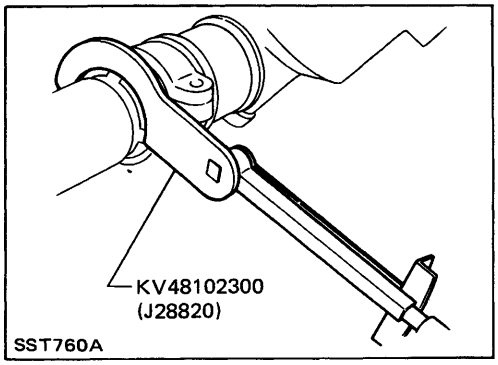
5. Insert rack assembly and inner tube assembly to pinion housing.

Coat rack teeth with multi-purpose grease.

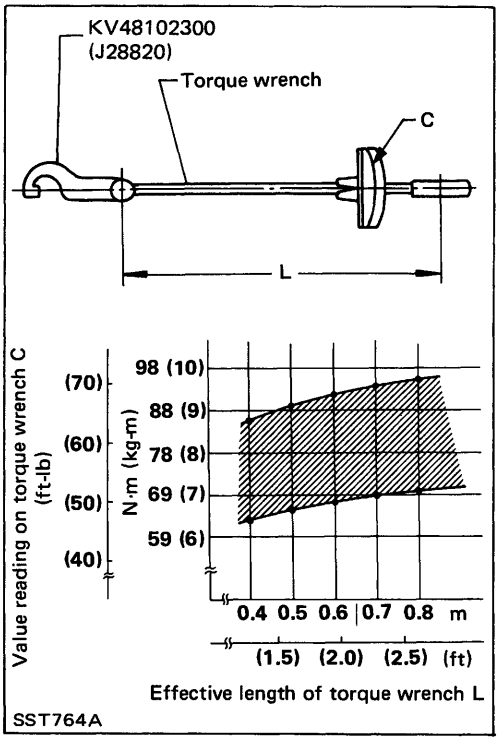
Assembly (Cont'd)

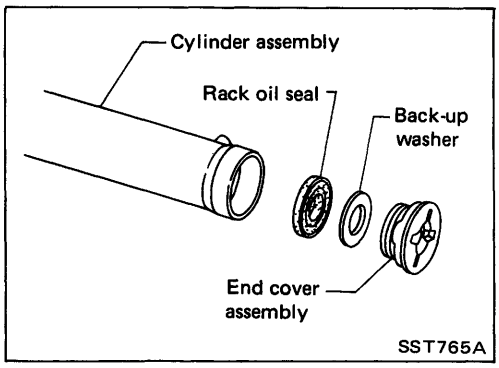


6. Position cylinder assembly on pinion housing by aligning matching marks.



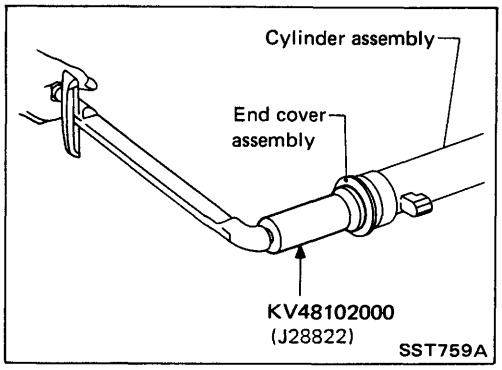
7. Tighten cylinder lock nut with Tool to the specified torque as shown in figure at left.



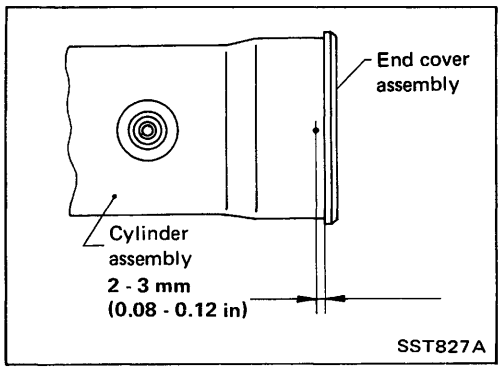


8. Install back-up washer and rack oil seal to cylinder assembly.

Assembly (Cont'd)

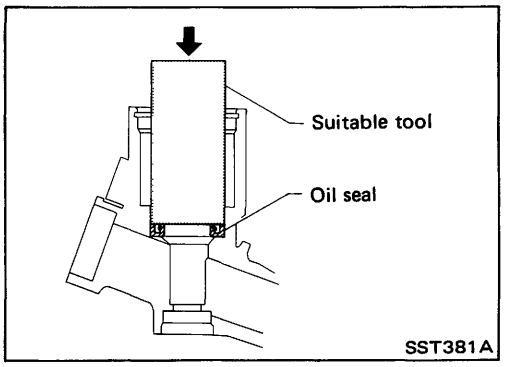


9. Tighten end cover assembly with Tool.

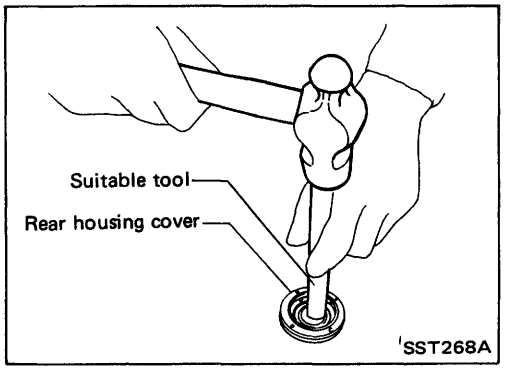


10. Fasten end cover assembly to cylinder assembly by staking.

11. Set rack gear in neutral position.

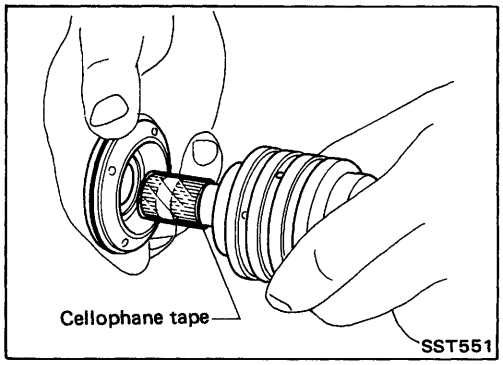


12. Coat seal lip of oil seal with multi-purpose grease and install new pinion oil seal to pinion housing with suitable tool.



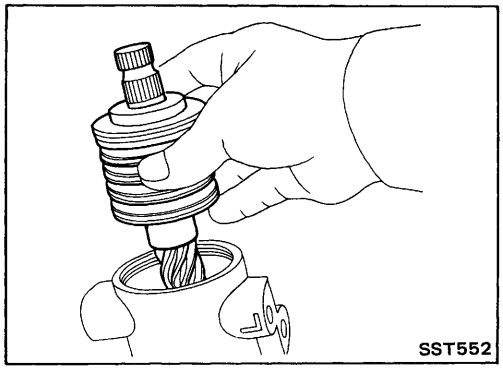
13. Install rear oil seal with suitable tool.

Assembly (Cont'd)



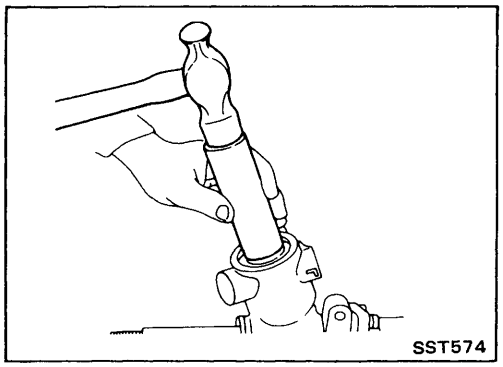
14. Install rear housing cover assembly to pinion.

Wrap cellophane tape around pinion serrations to prevent rear oil seal from being damaged.

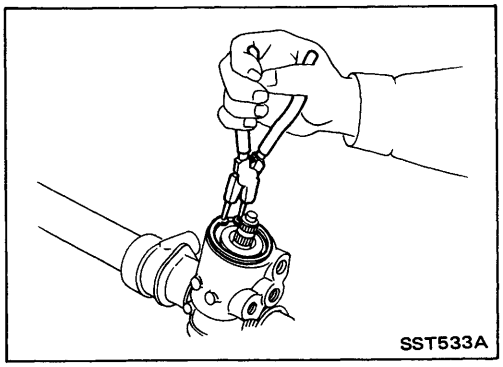


15. Install pinion assembly to pinion housing.

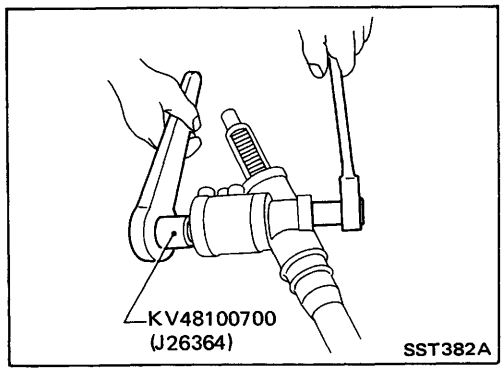
Be careful not to damage pinion oil seal.



Install pinion assembly with suitable tool.



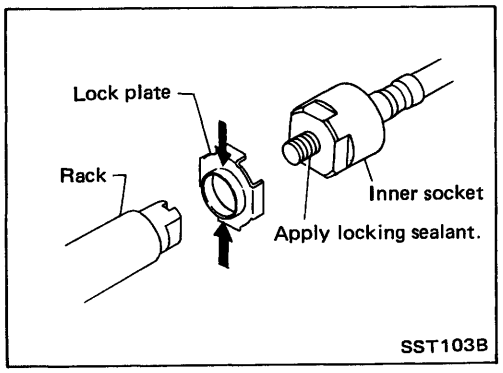
16. Install snap ring.



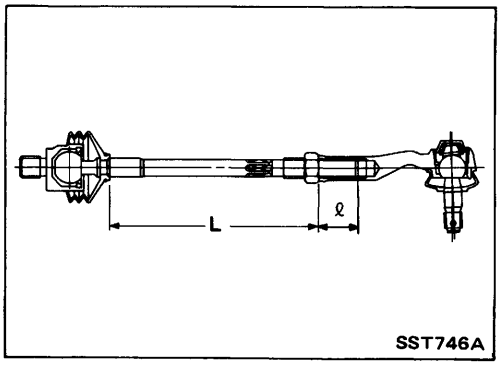
17. Tighten self-lock nut with Tool.

Assembly (Cont'd)

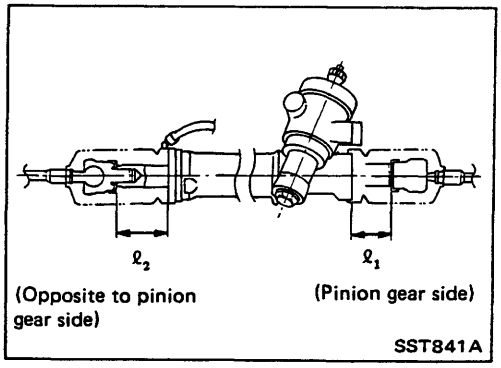
18. Install retainer, spring seat, retainer spring, gasket and retainer cover.



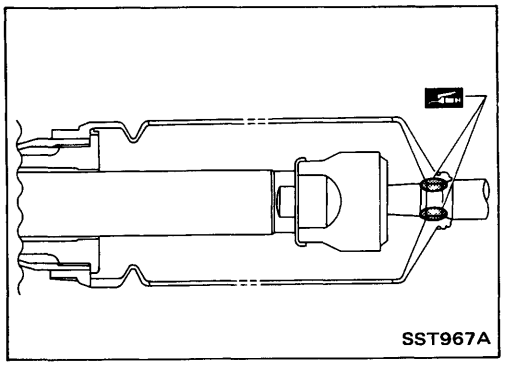
19. Apply locking sealant to threaded portion of inner socket and install inner socket to rack end together with new lock plate.
20. Tighten inner socket and securely punch lock plate at groove portion of rack.



21. Tighten tie-rod outer socket lock nut.
    Tie-rod length "L": Refer to S.D.S.
    Screwed length "ℓ": 25 mm (0.98 in) or more

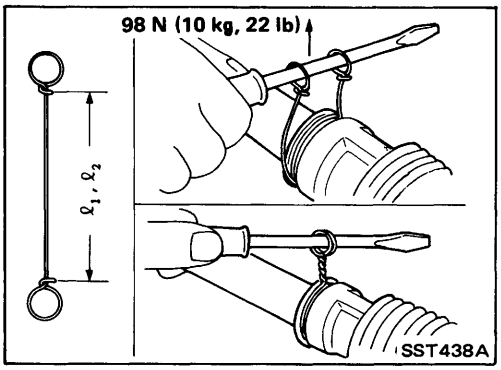


22. Measure rack stroke.
    Measure length "ℓ_1 & ℓ_2": Refer to S.D.S.



23. Apply a coat of sealant to contact surfaces between boot and cylinder before installing boot.
24. Install boot by aligning matching mark.

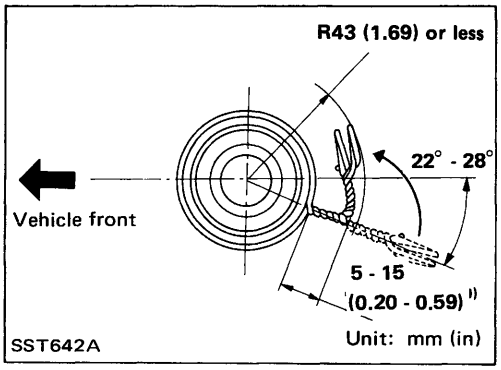
Assembly (Cont'd)



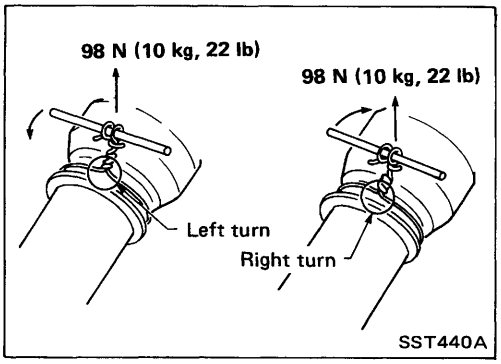
25. Install boot clamps.

- To install, wrap boot clamp around boot groove twice. Tighten clamp by twisting rings at both ends four or four and a half turns with screwdriver while pulling with a force of approx. 98 N (10 kg, 22 lb).

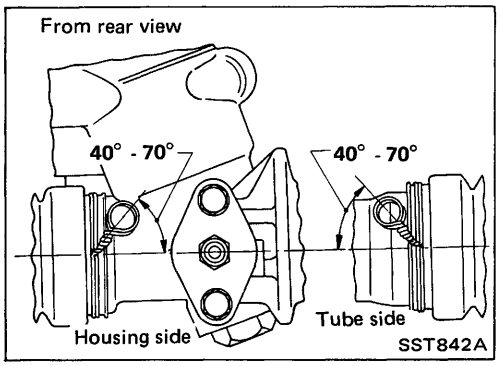
Boot clamp length: ℓ_1, ℓ_2
ℓ_1 = 390 mm (15.35 in)
... at pinion gear side
ℓ_2 = 430 mm (16.93 in)
... at opposite pinion gear side



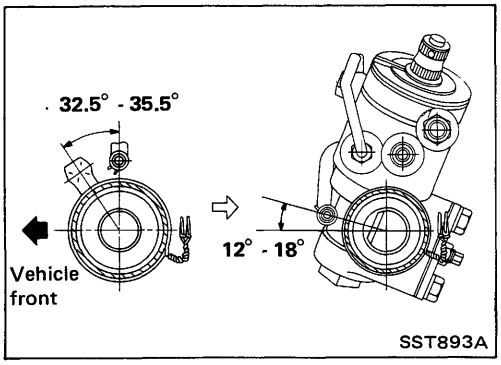
- Install boot clamp so that it is to the rear of the vehicle when gear housing is attached to the body. (This will avoid interference with other parts.)



- Twist boot clamp in the direction shown in figure at left.

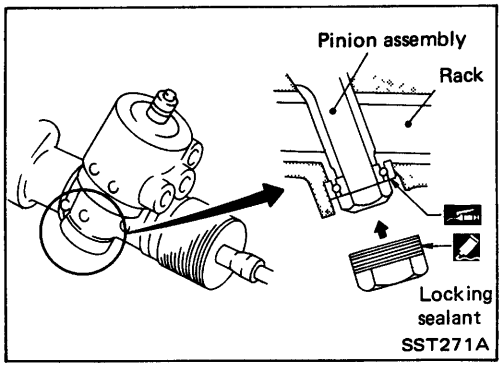


- After twisting boot clamp four or four and a half turns, bend twisted end diagonally so it does not contact boot.

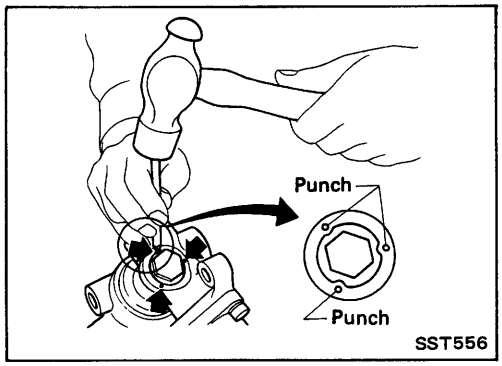


26. Install boot by aligning matching mark.
27. Install breather hose by aligning matching marks.

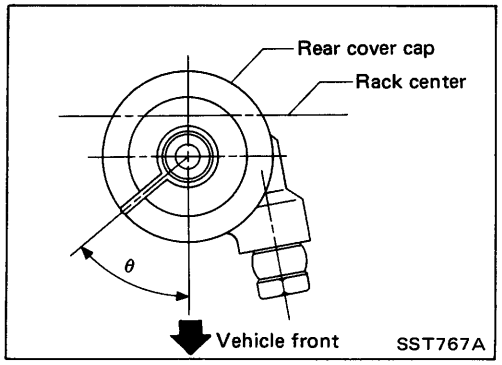
Assembly (Cont'd)



28. Install cylinder tube.
29. Apply grease to pinion bearing, coat threads of housing plug with locking sealant, and tighten plug.



30. Stake housing plug at three places with a punch.



31. Set rear cover cap at neutral position.
    Rear cover set angle "θ":
    12° to 20°

Inspection

Thoroughly clean all parts in cleaning solvent or automatic transmission fluid "Dexron Type", and blow dry with compressed air, if available.

BOOT

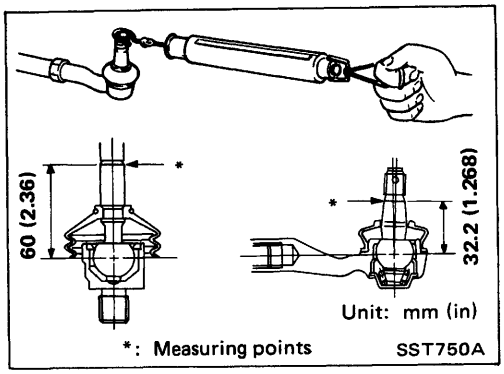
Check condition of boot. If it is cracked excessively, replace boot.

RACK

Thoroughly examine rack gear. If rack gear is damaged, cracked or worn, replace.

PINION ASSEMBLY

- Thoroughly examine pinion gear. If pinion gear is damaged, cracked or worn, replace.
- Inspect bearings to see that they roll freely and are free from cracked, pitted, or worn balls, rollers and races. Replace if necessary.

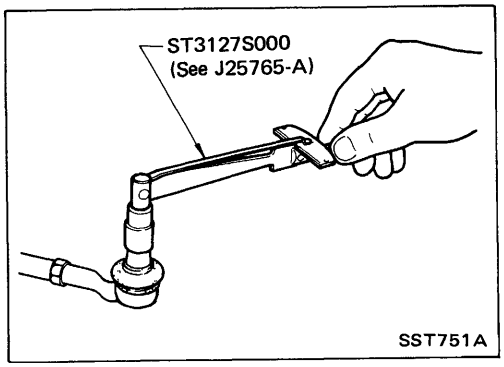


Inspection (Cont'd)

TIE-ROD OUTER AND INNER SOCKET

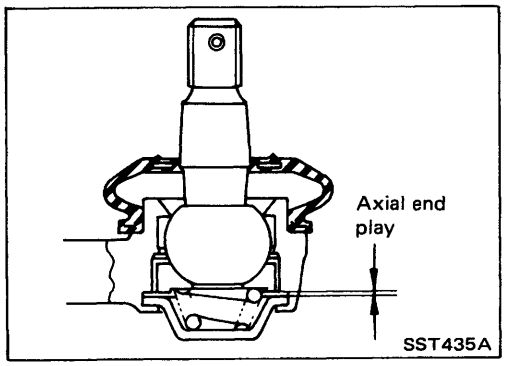
- Check ball joint for swinging force.

  Tie-rod outer ball joint:
  4.51 - 91.21 N
  (0.46 - 9.3 kg, 1.01 - 20.51 lb)
  Tie-rod inner ball joint:
  1.67 - 122.59 N
  (0.17 - 12.5 kg, 0.37 - 27.56 lb)



- Check ball joint for rotating torque.

  Tie-rod outer ball joint:
  0.15 - 2.94 N·m
  (1.5 - 30 kg-cm, 1.3 - 26.0 in-lb)



- Check ball joint for axial end play.

  Tie-rod outer ball joint:
  1.3 mm (0.051 in) or less
  Tie-rod inner ball joint:
  0 mm (0 in)

- Check condition of dust cover. If it is cracked excessively, replace it.

CYLINDER TUBES AND BREATHER HOSE

Check cylinder tubes and breather hose for scratches or other damage. Replace if necessary.

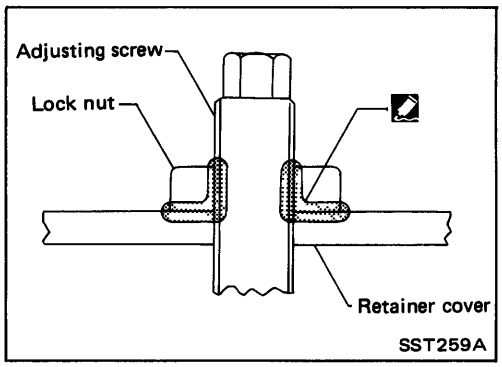
STEERING GEAR COMPONENT PARTS

Thoroughly examine steering gear component parts. If parts are damaged, cracked or worn, replace steering gear as an assembly.

Adjustment

Adjust pinion rotating torque as follows.

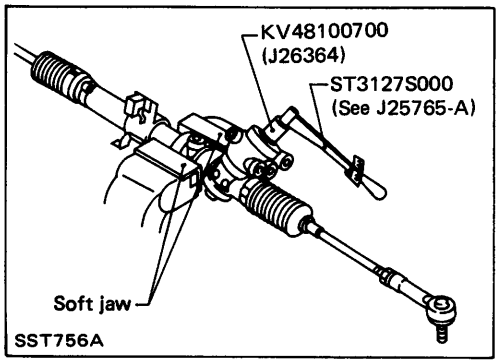
1. Set gears to Neutral.
2. Tighten adjusting screw one or two times to a torque of 4.9 N·m (50 kg-cm, 43 in-lb).
3. Loosen adjusting screw, then retighten it to 0.05 to 0.20 N·m (0.5 to 2 kg-cm, 0.43 to 1.74 in-lb).



4. Apply a coat of locking sealant to adjusting screw and lock nut.

- Shaded areas shown in the figure at left refer to portions that should be coated with sealant.

5. Prevent adjusting screw from turning, and tighten lock nut to specified torque.

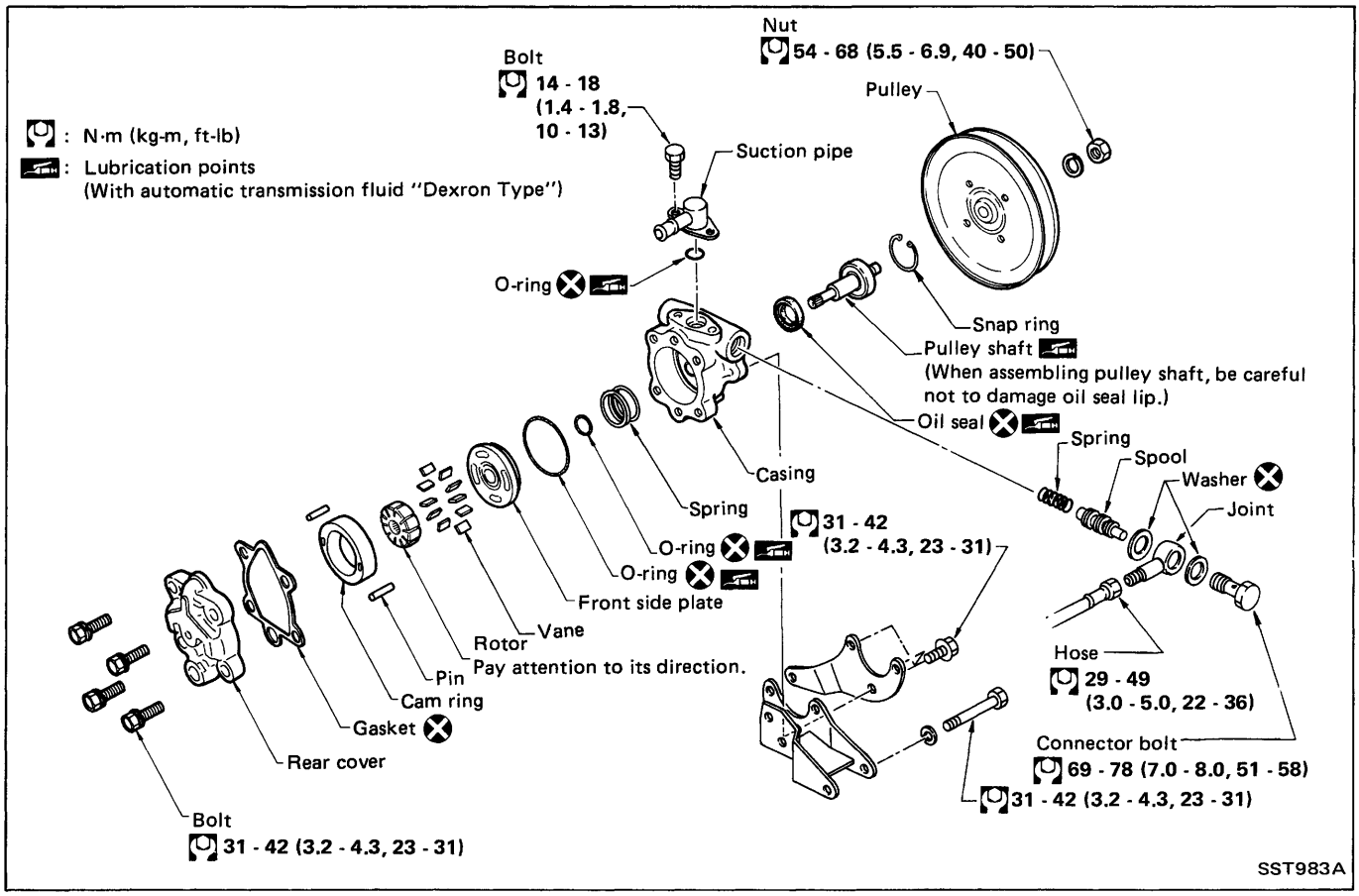


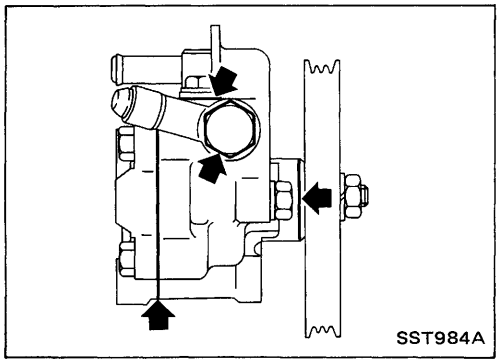
6. Move rack over its entire stroke several times.
7. Measure pinion rotating torque within the range of ±100° from neutral position.

   Average rotating torque:
   [(Max. value + Min. value) x 0.5]
   0.9 - 1.3 N·m
   (9 - 13 kg-cm, 7.8 - 11.3 in-lb)
   Max. rotating torque:
   1.9 N·m (19 kg-cm, 16 in-lb) or less

8. If pinion rotating torque is not within the specifications, readjust.

Disassembly and Assembly




SST984A

Pre-disassembly Inspection

The power steering oil pump should be disassembled only if any of the following phenomena are noted.

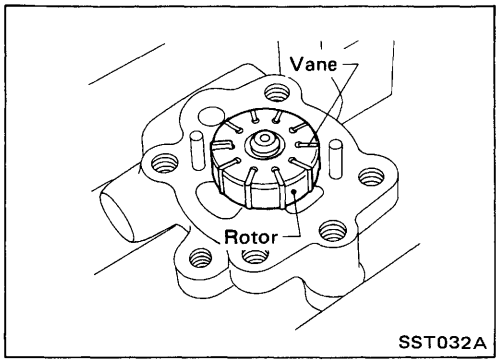
- Oil leak at any of the following points
- Deformed or damaged pulley

Disassembly

CAUTION:

- **The parts which can be disassembled are strictly limited. Never disassemble parts other than the specified ones.**
- **Disassembly should be performed in a place as clean as possible.**
- **Hands should be cleaned before disassembly.**
- **Do not use a rag. Be sure to use nylon or paper cloth.**
- **Be sure to follow procedures and cautions indicated in the Service Manual.**
- **When disassembling and reassembling, do not allow any foreign matter to enter or contact any parts.**

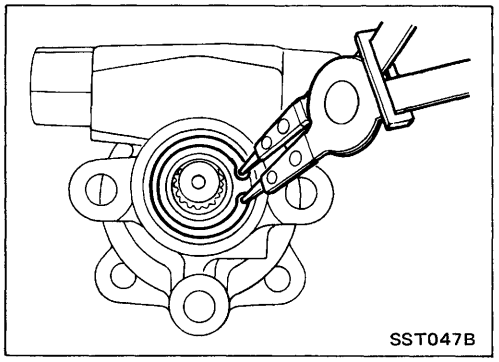
1. Remove rear cover.



SST032A

CAUTION:

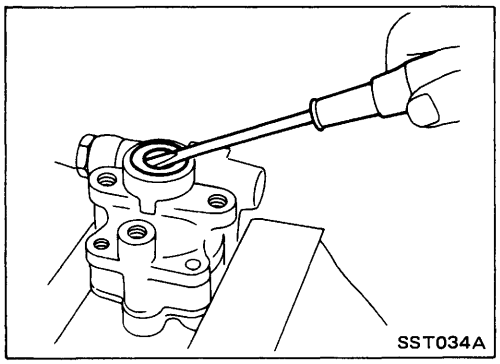
When removing cam case, be sure that the vane does not come off the rotor.


SST047B

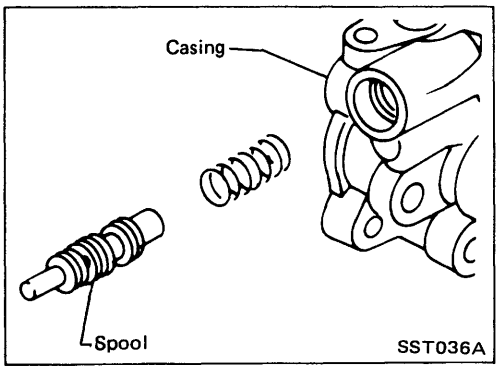
2. Remove snap ring, then draw pulley shaft out.

- **Be careful not to drop pulley shaft.**

Disassembly (Cont'd)


SST034A

3. Remove cam case and rear cover, then remove oil seal.
- **Be careful not to damage casing.**



SST036A

4. Remove joint.
- **Be careful not to drop spool.**

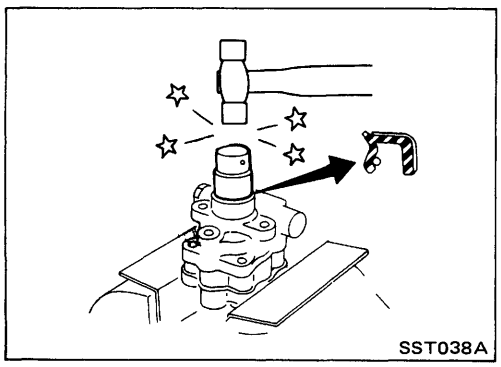
5. Remove suction pipe, then remove O-ring.

Inspection

Wash all disassembled parts in suitable cleaning solvent.

PULLEY AND PULLEY SHAFT

a. **If pulley is cracked or deformed, replace it.**
b. **If an oil leak is noticed around pulley shaft oil seal, replace it.**
c. **If serration of pulley or pulley shaft is deformed or worn, replace.**


SST038A

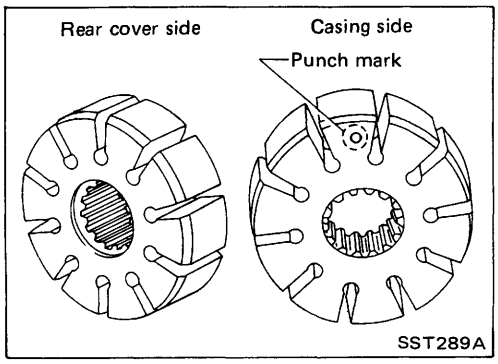
Assembly

Assemble oil pump in the reverse order of disassembly, noting the following instructions.

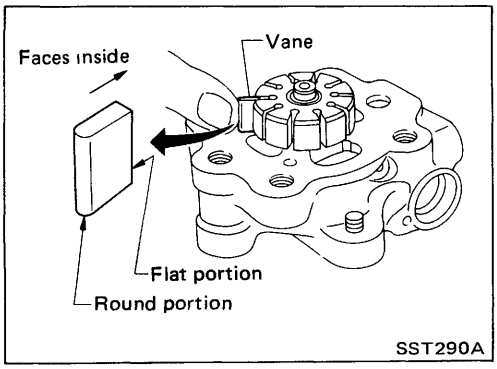
- Before installing O-rings and oil seal, apply a thin coat of A.T.F.* to them.
- Make certain that O-rings and oil seal are installed properly.
- When assembling vanes to rotor, rounded surfaces of vanes must be facing cam case side.
- Always install new O-rings and oil seal.
- Be careful of oil seal direction.

*: Automatic Transmission Fluid

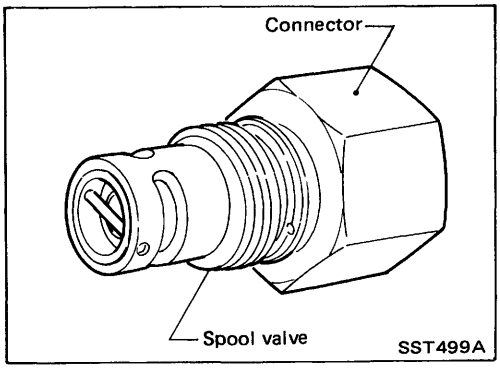
Assembly (Cont'd)



- Pay attention to the direction of rotor.

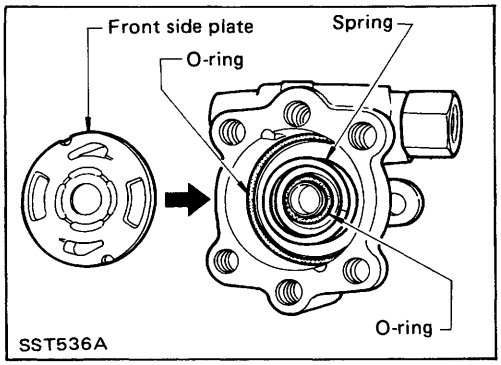


- Install vanes properly.



CAUTION:

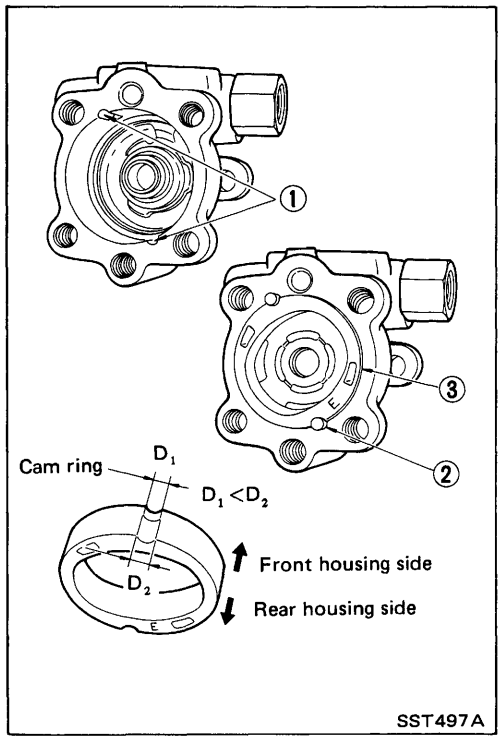
Do not remove spool valve from connector.



- Apply A.T.F.* to O-ring.

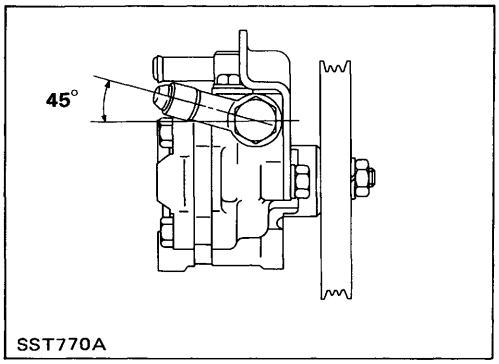
*: Automatic Transmission Fluid

Assembly (Cont'd)



SST497A

- Insert pin ② into pin groove ① of front housing and rotor. Then install cam ring ③ as shown at left.



SST770A

- Install connector properly.

General Specifications

Item \ Steering model	Power steering
	PR24SA
Steering column	Collapsible
	Tilt type
Turns of steering wheel (Lock to lock)	3.0

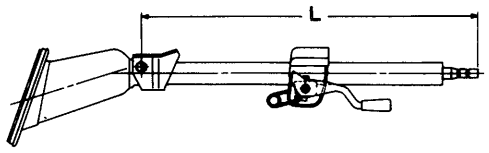
Inspection and Adjustment

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)	
Tilt type	572.5 - 573.5 (22.54 - 22.58)

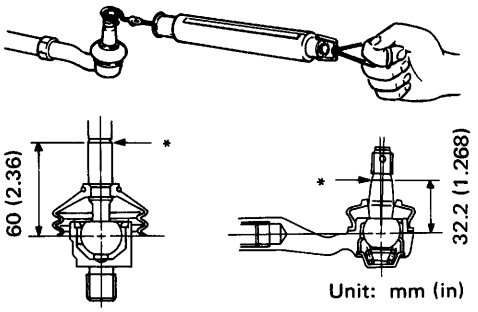


SST743A

Inspection and Adjustment (Cont'd)

STEERING GEAR AND LINKAGE

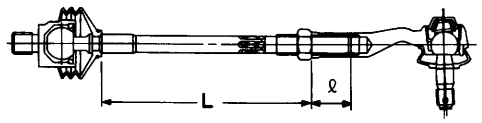
Tie-rod outer ball joint Swing force* N (kg, lb)	4.51 - 91.21 (0.46 - 9.3, 1.01 - 20.51)
Rotating torque N·m (kg-cm, in-lb)	0.15 - 2.94 (1.5 - 30, 1.3 - 26.0)
Axial end play mm (in)	1.3 (0.051) or less
Tie-rod inner ball joint Swinging force* N (kg, lb)	1.67 - 122.59 (0.17 - 12.5, 0.37 - 27.56)
Axial end play mm (in)	0 (0)



Unit: mm (in)

*: Measuring points SST750A

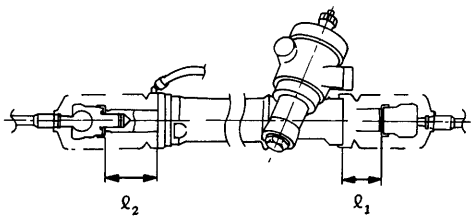
Tie-rod length "L" mm (in) Pinion gear side	178.4 (7.02)
Opposite pinion gear side	179.0 (7.05)



SST746A

Pinion rotating torque (Pinion gear and rack gear assembly) N·m (kg-cm, in-lb)	Average 0.9 - 1.3 (9 - 13, 7.8 - 11.3)
Rack sliding force N (kg, lb)	186 (19, 42) or less
Steering wheel turning force at 360° position from neutral N (kg, lb)	39 (4, 9) or less
Normal operating temperature of fluid °C (°F)	60 - 80 (140 - 176)
Fluid capacity ℓ (US qt, Imp qt)	Approximately 0.9 (1, 3/4)
Oil pump maximum standard pressure kPa (kg/cm², psi)	6,865 (70, 995)

Measured length "ℓ_1" & "ℓ_2" mm (in) Pinion gear side "ℓ_1"	62 (2.44)
Opposite pinion gear side "ℓ_2"	75 (2.95)



(Opposite to pinion gear side) (Pinion gear side)

SST841A

Tightening Torque

STEERING COLUMN

Unit	N·m	kg-m	ft-lb
Steering wheel nut	29 - 39	3.0 - 4.0	22 - 29
Lower joint to column	24 - 29	2.4 - 3.0	17 - 22
Lower joint to gear	24 - 29	2.4 - 3.0	17 - 22
Hole cover to dash panel	3.4 - 4.4	0.35 - 0.45	2.5 - 3.3
Lower bracket to pedal bracket	9 - 14	0.9 - 1.4	6.5 - 10.1
Steering column clamp to mounting bracket	9 - 14	0.9 - 1.4	6.5 - 10.1

Model PR24SA

Unit	N·m	kg-m	ft-lb
Gear and linkage			
Tie-rod to knuckle	29 - 39	3 - 4	22 - 29
Tie-rod lock nut	37 - 46	3.8 - 4.7	27 - 34
Tie-rod to gear	78 - 98	8 - 10	58 - 72
Gear housing clamp bolt	73 - 97	7.4 - 9.9	54 - 72
Retainer cover fixing bolt	16 - 21	1.6 - 2.1	12 - 15
Adjusting screw lock nut	10 - 15	1.0 - 1.5	7 - 11
Self-lock nut	19 - 25	1.9 - 2.6	14 - 19
Housing plug	49 - 69	5 - 7	36 - 51
Cylinder tube flare nut	20 - 26	2.0 - 2.7	14 - 20
Cylinder lock nut (Without Tool)	78 - 108	8 - 11	58 - 80
Low pressure connector at gear	27 - 39	2.8 - 4.0	20 - 29
End cover assembly	93 - 108	9.5 - 11.0	69 - 80
Oil pump, tank and hoses			
High pressure hose to pump	29 - 49	3 - 5	22 - 36
Connector bolt	69 - 78	7.0 - 8.0	51 - 58
High pressure pipe to gear	15 - 25	1.5 - 2.5	11 - 18
Pulley lock nut	54 - 68	5.5 - 6.9	40 - 50
Suction pipe	14 - 18	1.4 - 1.8	10 - 13
Tank bracket securing bolt	3.1 - 4.3	0.32 - 0.44	2.3 - 3.2

SECTION BF

CONTENTS

GENERAL SERVICING
(Including all clips & fasteners) ..... BF- 2
BODY END
(Including trunk lid and fuel filler lid openers) ..... BF- 7
DOOR
(Including "Power Window" & "Power Door Lock") BF-10
INSTRUMENT BF-20
INTERIOR AND EXTERIOR
(In EXTERIOR, including "Weatherstrips") BF-21
SEAT BF-30
SUN ROOF
(Including "Electrical Sun Roof") BF-32
WINDSHIELD AND WINDOWS BF-36
MIRROR — Door Mirror
(Including "Power Door Mirror") BF-39
REAR COMBINATION LAMP BF-40
BODY ALIGNMENT — Engine Compartment & Underbody BF-41

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

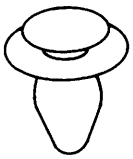
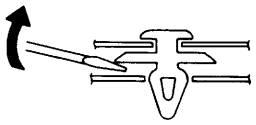
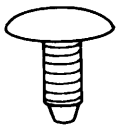
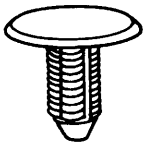
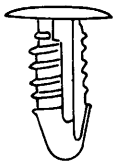
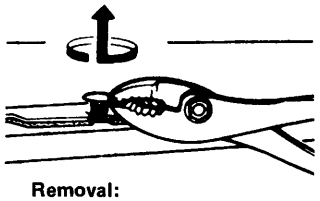
★ **For seat belt, refer to MA section.**

Precautions

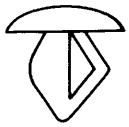
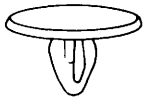
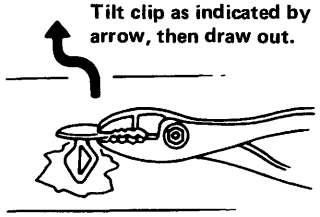
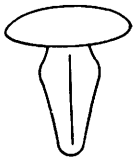
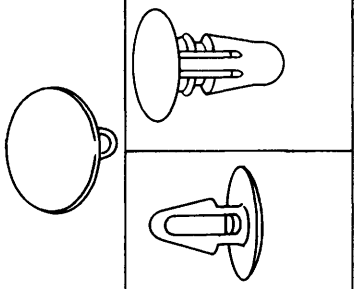
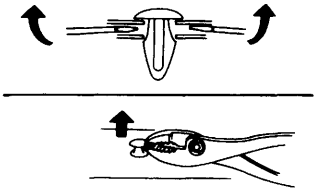
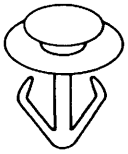
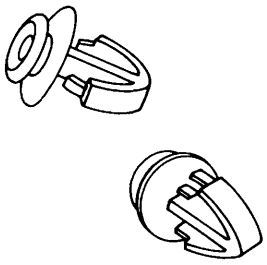
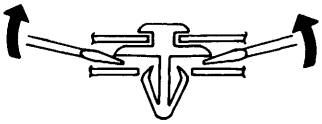
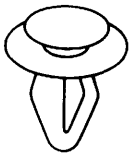
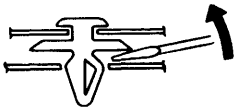
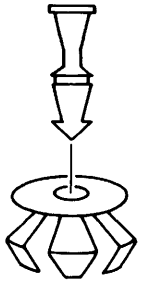
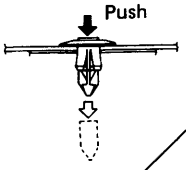
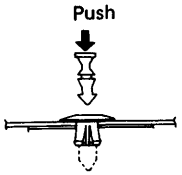
- When removing or installing various parts, place a cloth or padding onto the vehicle body to prevent scratches.
- Handle trim, molding, instruments, grille, etc. carefully during removing or installation. Be careful not to soil or damage them.
- Apply sealing compound where necessary when installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.
- When replacing any metal parts (for example body outer panel, members, etc.), be sure to take rust prevention measures.

Clip and Fastener

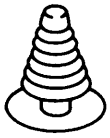
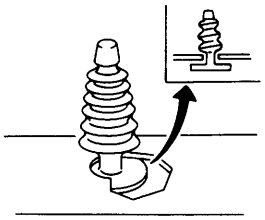
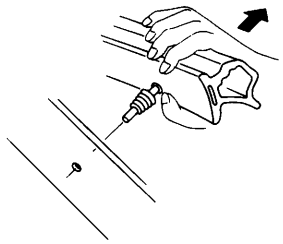
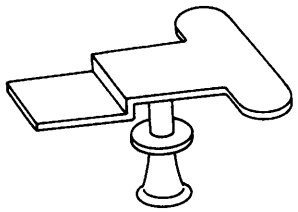
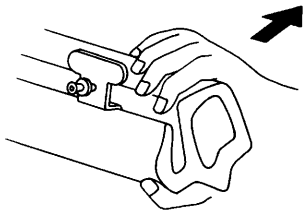
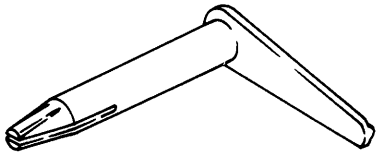
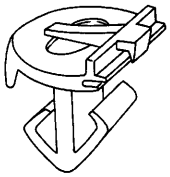
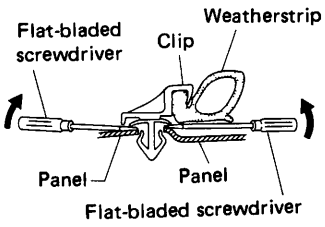
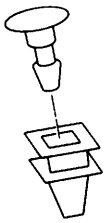
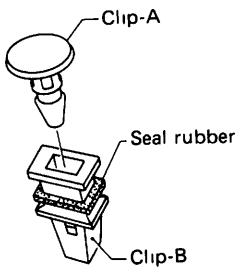
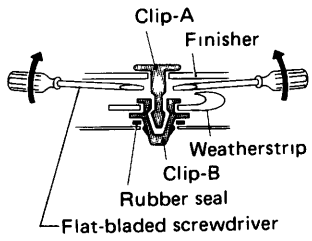
- Clips and fasteners in BF section correspond to the following numbers and symbols.
- Replace any clips and/or fasteners which are damaged during removal or installation.

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

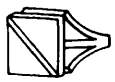
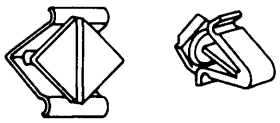
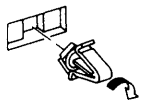
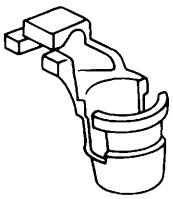
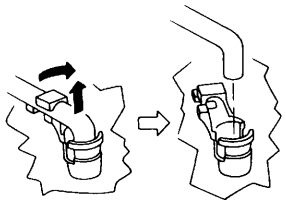
Clip and Fastener (Cont'd)

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 flat-bladed screwdrivers or pliers.**  SBF091B
C107	 SBF365B	 SBF366B	**Removal:** **Remove by bending up with flat-bladed screwdrivers.**  SBF367B
C108	 SBF564B	SBF565B	**Removal:** **Remove by bending up with a flat-bladed screwdriver.**  SBF566B
C203	 SBF318C	SBF319C	**Removal:** Push  Push  **Installation:** SBF320C

Clip and Fastener (Cont'd)

No.	Symbol	Shape	Removal & Installation
CE103	 SBF103B	 SBF104B	**Removal:**  SBF147B
CE112	 SBF028C		**Removal:**  SBF029C
CE114	 SBF353C		—
CE115	 SBF758C		**Removal:**  SBF759C
CF110	 SBF647B	 SBF648B	**Removal:**  SBF649B

Clip and Fastener (Cont'd)

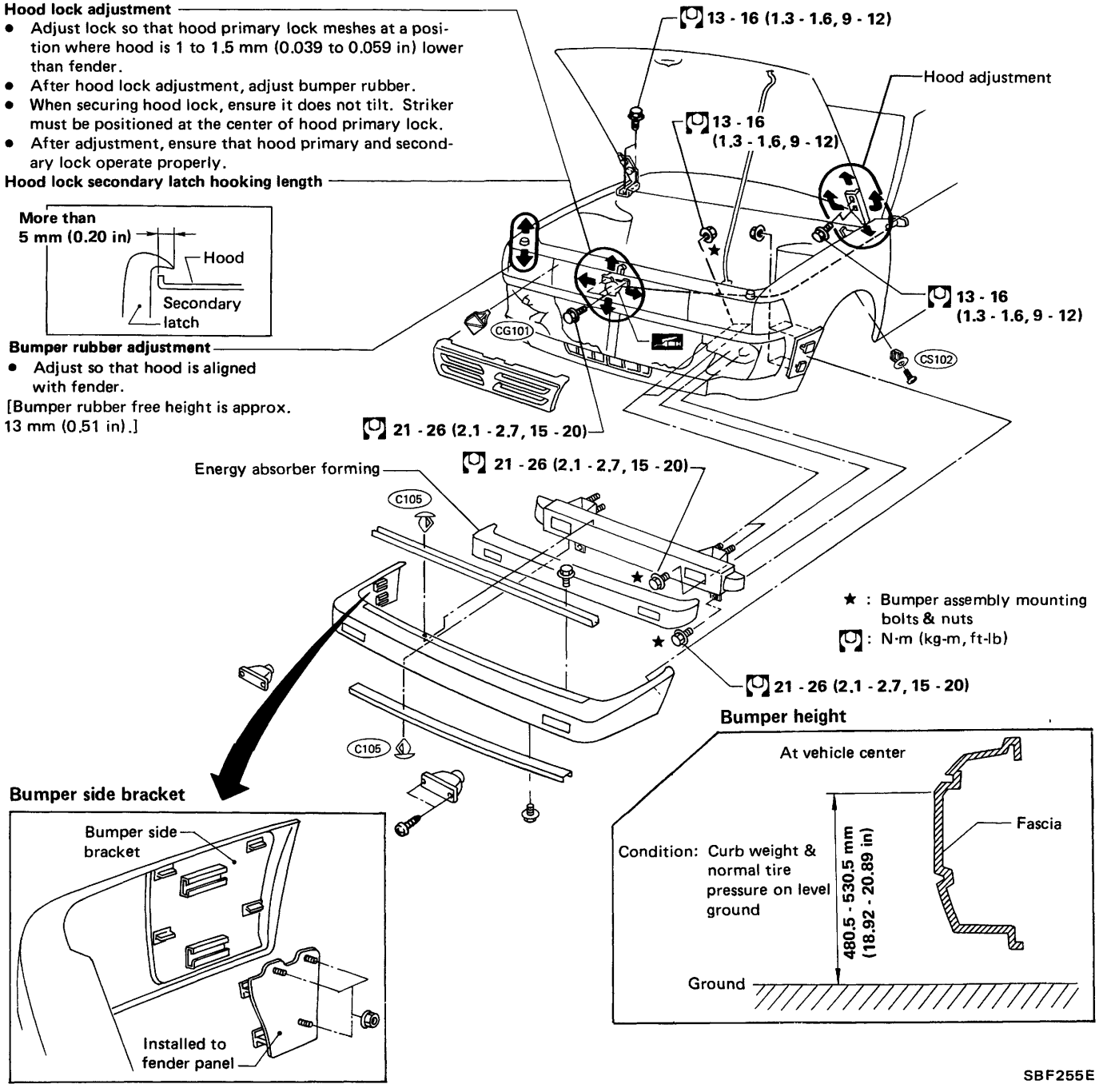
No.	Symbol	Shape	Removal & Installation
CG101	 SBF144B	 SBF145B	**Removal:** Rotate 45° to remove. **Removal:** **Installation:**  SBF085B
CR103	 SBF768B		**Removal:** **Holder portion of clip must be spread out to remove rod.**  SBF770B

NOTE

- When removing and installing hood, trunk lid or back door, place a cloth or other padding on hood, trunk lid or back door corners to avoid scratching vehicle body.
- When removing clip or fastener, refer to "Clip and Fastener".
- Apply sealing compound where necessary when installing parts.

Body Front End

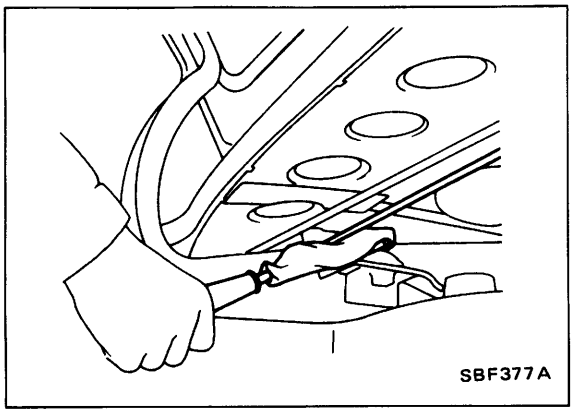
- Hood adjustment: Adjust at hinge portion.
- Hood lock adjustment: After adjusting, check hood lock control operation. Apply a coat of grease to hood locks engaging mechanism.
- Hood opener: Do not attempt to bend cable forcibly. Doing so increases effort required to unlock hood.
- Bumper fascia: It is made of plastic, so do not use excessive force and take care to keep oil away from it.
- Front grille: It is made of plastic, so do not use excessive force and take care to keep oil away from it.



Body Rear End and Opener

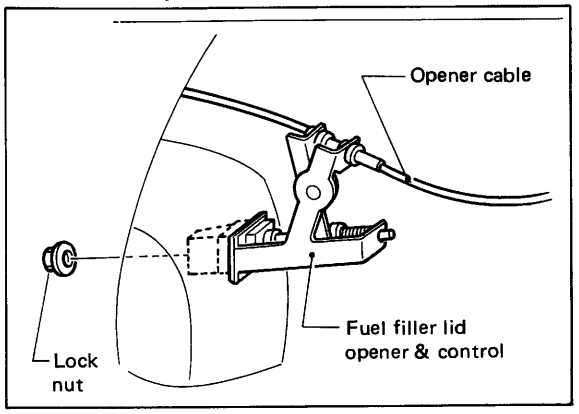
- Trunk lid adjustment: Adjust at hinge-trunk lid portion for proper trunk lid fit.
- Trunk lid lock system adjustment: Adjust striker so that it is in the center of the lock. After adjustment, check trunk lid lock operation.
- Bumper fascia: It is made of plastic, so do not use excessive force and take care to keep oil away from it.
- Opener cable: Do not attempt to bend cable using excessive force.
- After installing/adjusting opener, make sure that trunk lid and fuel filler lid open smoothly.

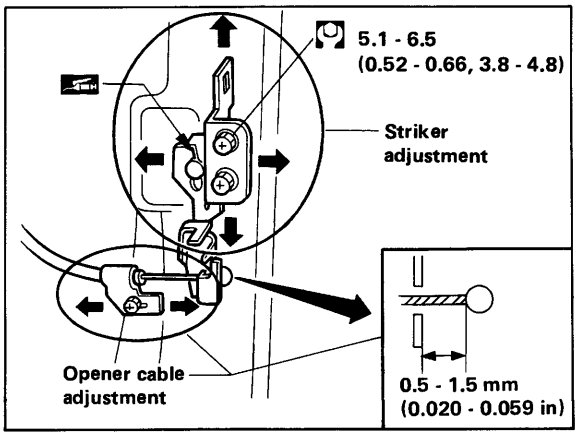
Trunk lid torsion bar removal & installation



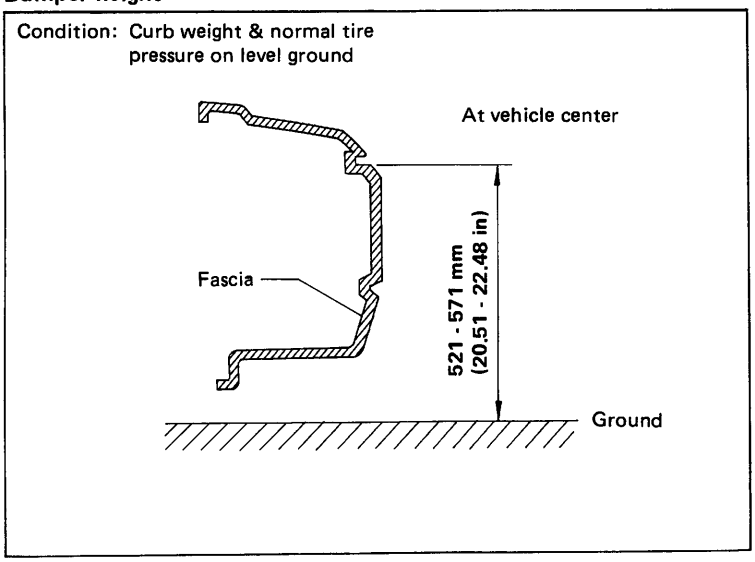
WARNING:
When removing and installing torsion bar, be careful as it is under torsion.

Fuel filler lid opener and control



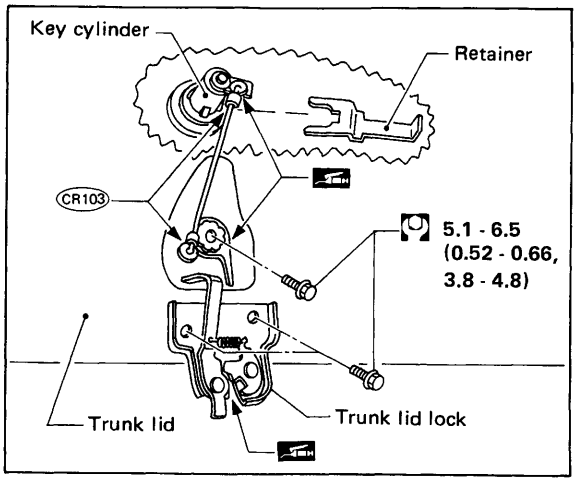


Bumper height

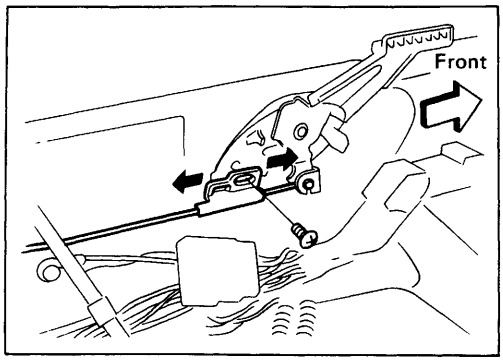


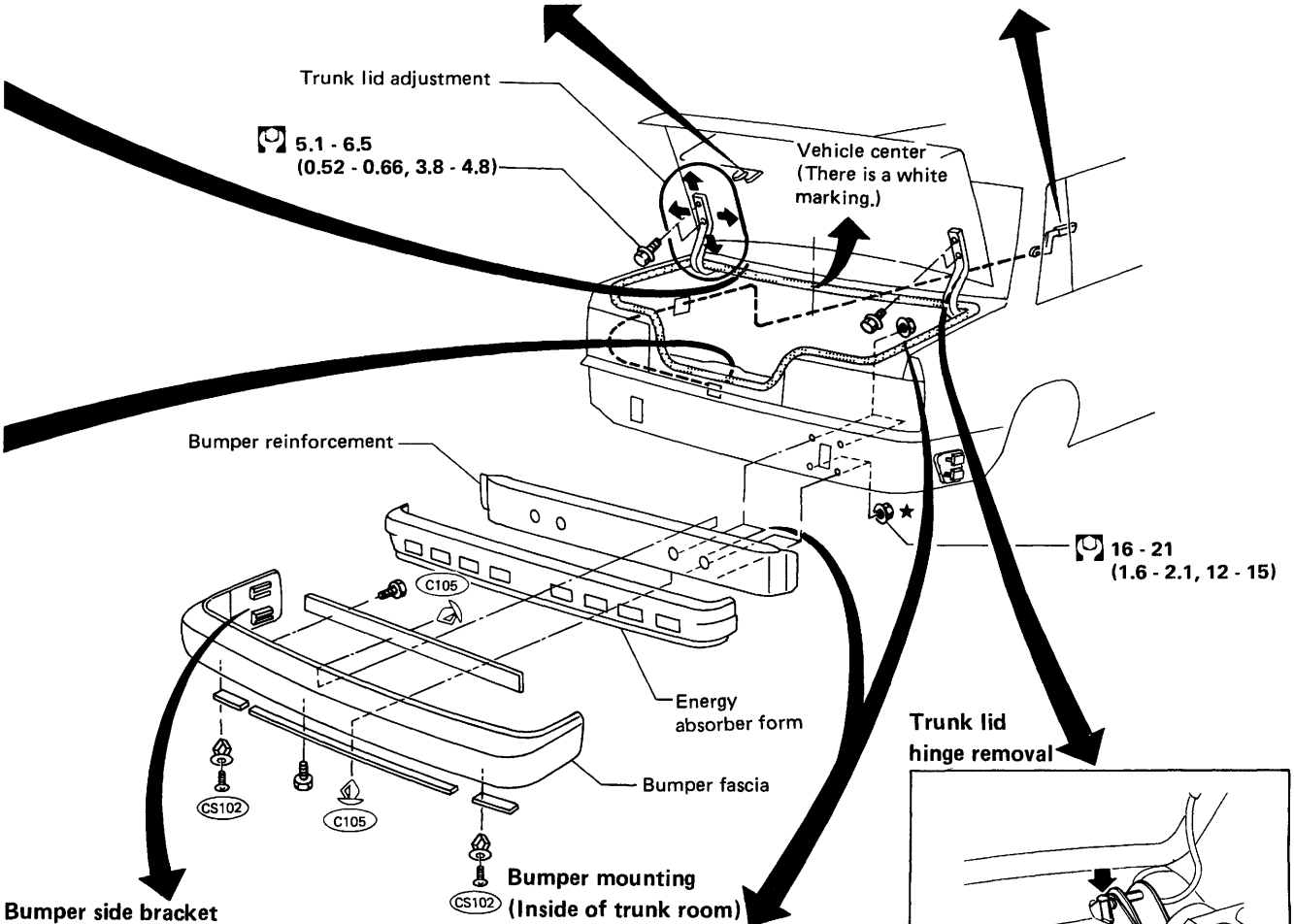
★ : Bumper assembly mounting bolts & nuts
[O] : N·m (kg-m, ft-lb)

Body Rear End and Opener (Cont'd)

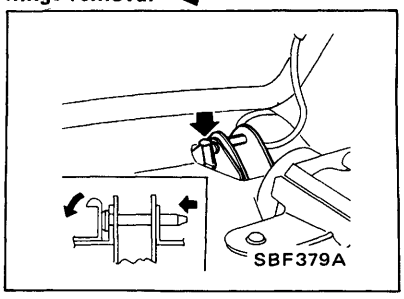


Opener handle adjustment

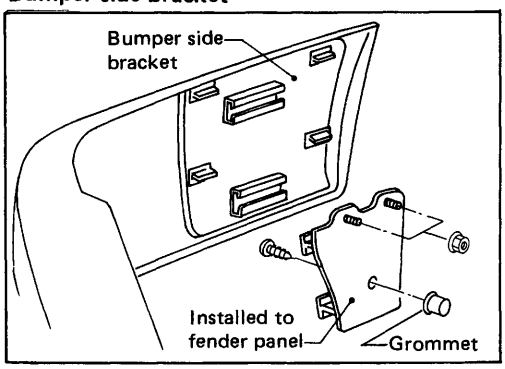




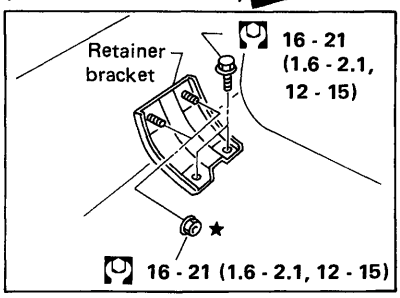
Trunk lid hinge removal



Bumper side bracket



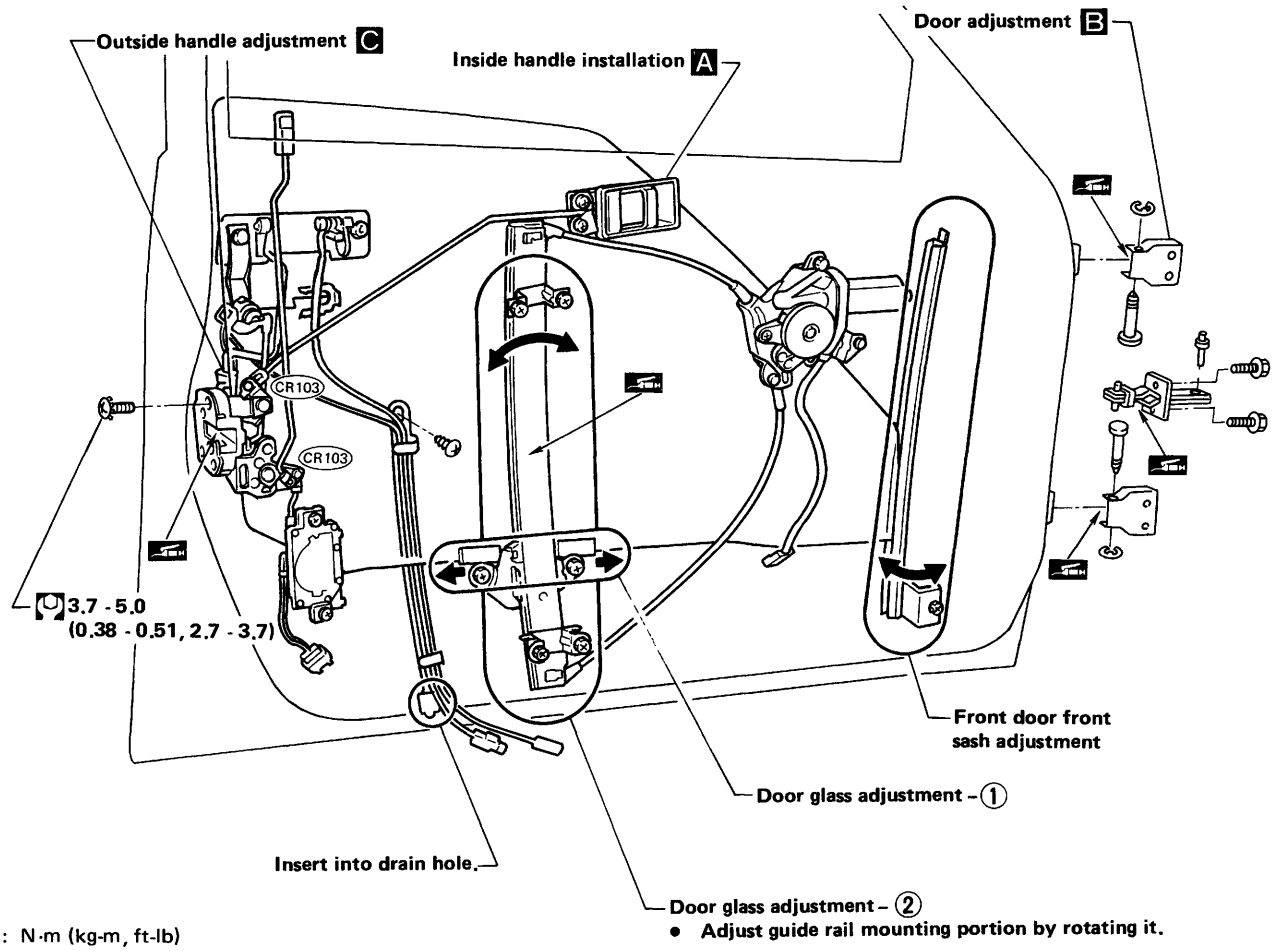
Bumper mounting (Inside of trunk room)



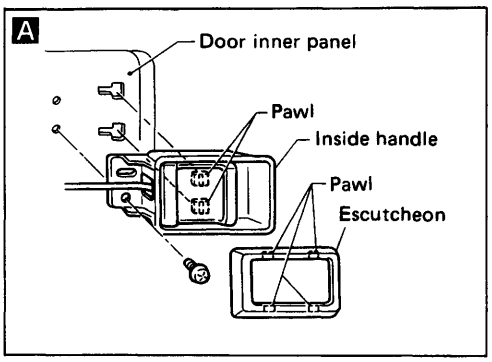
SBF256E

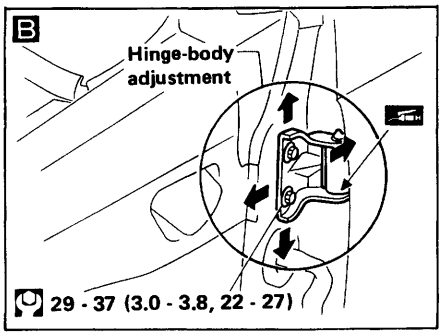
- When removing door, be sure not to scratch vehicle body.
- When removing clip or fastener, refer to "Clip and Fastener".
- After adjusting door and door lock, check door lock operation.

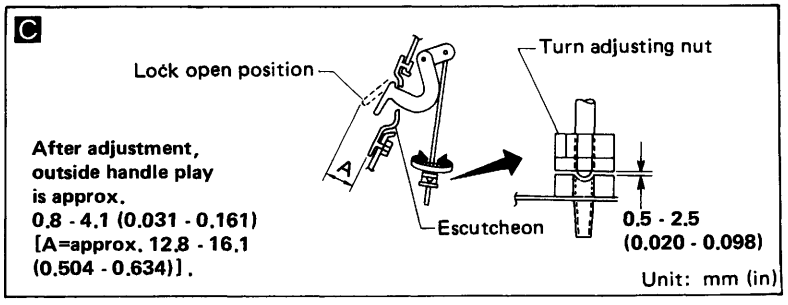
Front Door



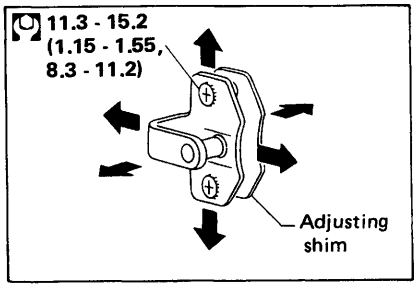
: N·m (kg-m, ft-lb)







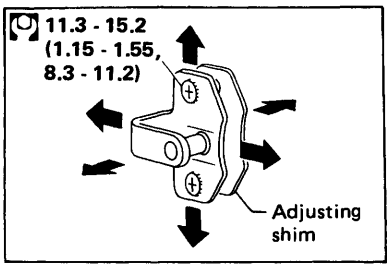
Striker adjustment

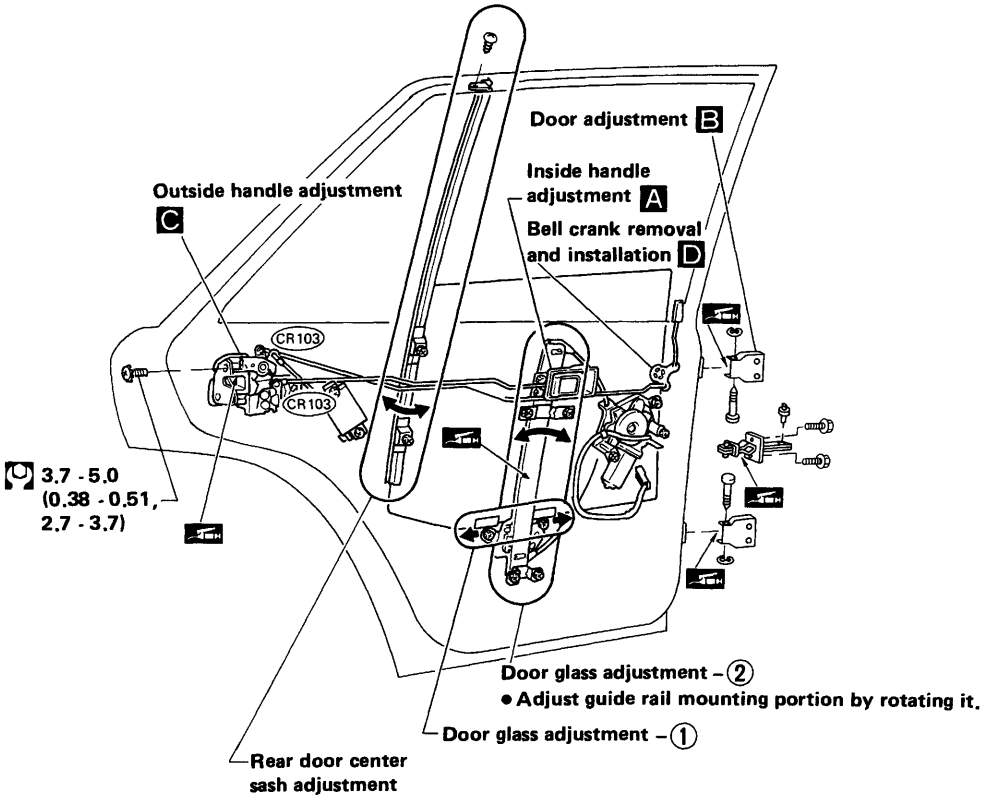


SBF257E

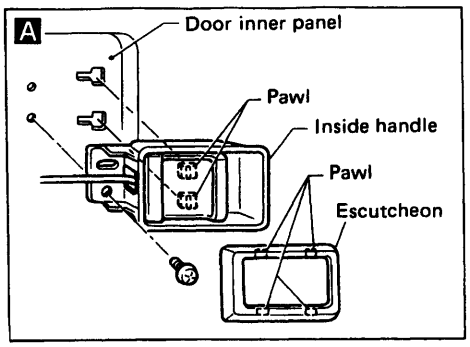
Rear Door

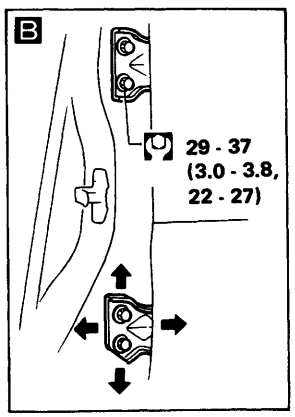
Striker adjustment

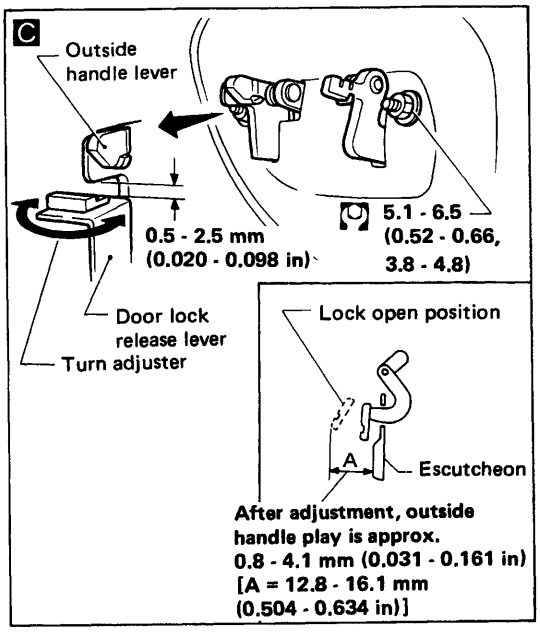


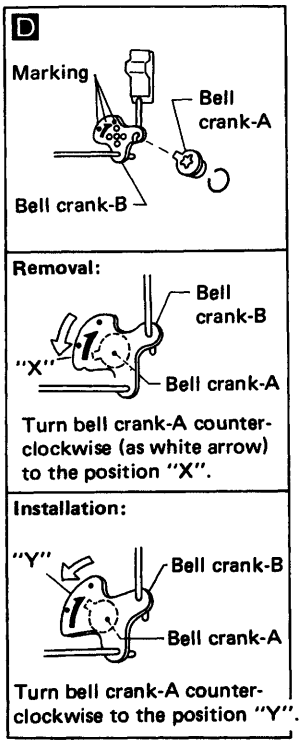


: N·m (kg-m, ft-lb)









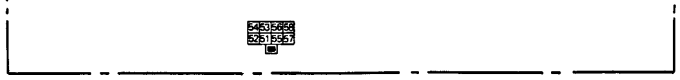
SBF258E

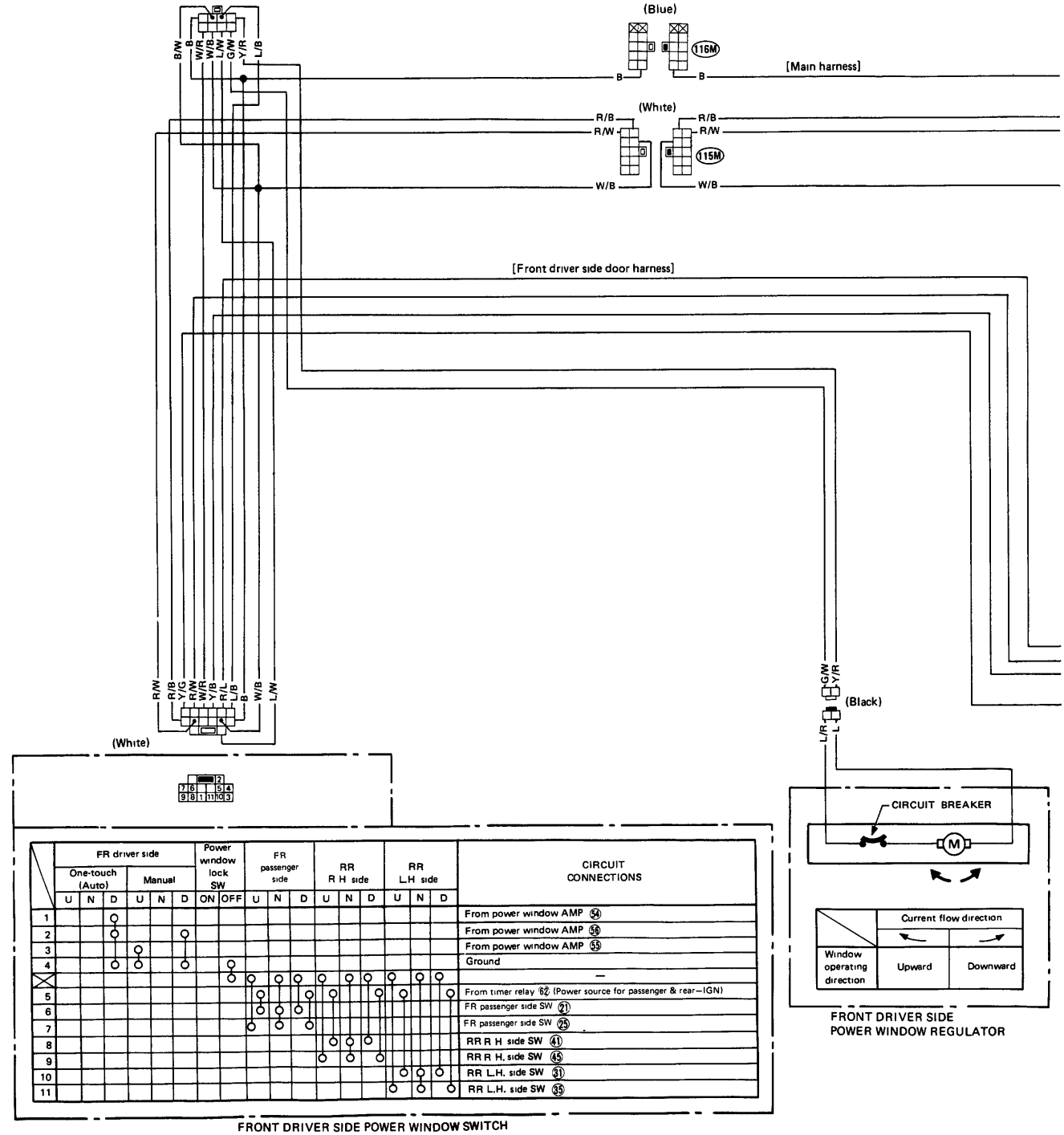
Power Window

WIRING DIAGRAM

POWER WINDOW AMP. – Front side door (Inside of trim)

	CIRCUIT CONNECTIONS		
	REMARKS		
51	Power source (IGN.)		
52	Ground		
53	Input signal	Ignition switch condition	From ignition switch ON or ST
54		For detecting AUTO signal	To front driver side power window switch– ①
55		For detecting UP signal	To front driver side power window switch– ③
56		For detecting DOWN signal	To front driver side power window switch– ②
57	Output signal	Window upward power source	To/From front driver side power window regulator
58		Window downward power source	To/From front driver side power window regulator

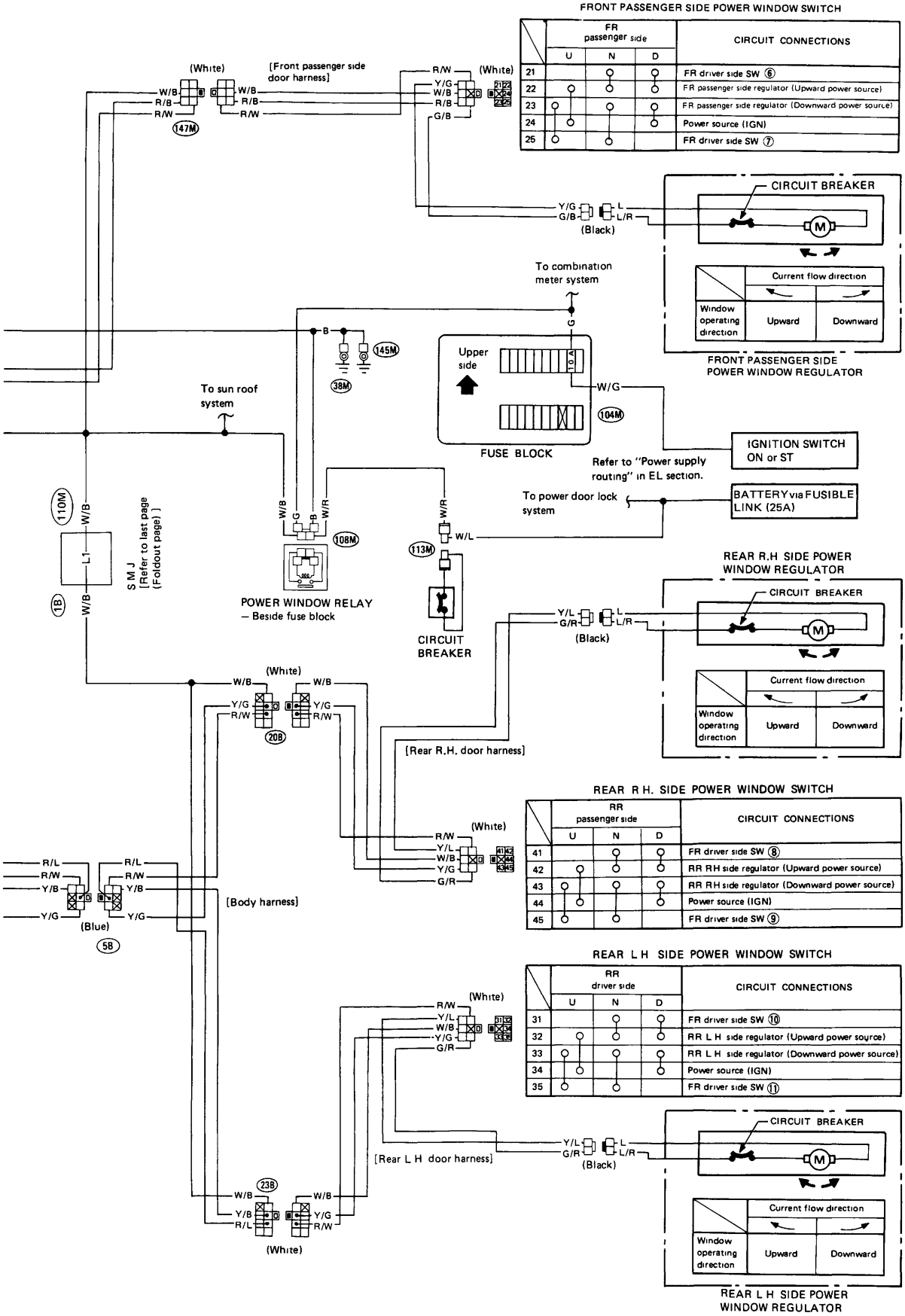




	FR driver side						Power window lock SW		FR passenger side			RR R.H side			RR L.H side			CIRCUIT CONNECTIONS
	One-touch (Auto)			Manual														
	U	N	D	U	N	D	ON	OFF	U	N	D	U	N	D	U	N	D	
1			○															From power window AMP ㊹
2			○			○												From power window AMP ㊸
3				○														From power window AMP ㊺
4			○	○		○		○										Ground
⊠								○	○	○	○	○	○	○	○	○	○	–
5									○	○	○	○	○	○	○	○	○	From timer relay ㊷ (Power source for passenger & rear–IGN)
6									○	○								FR passenger side SW ㉑
7									○	○								FR passenger side SW ㉕
8												○	○	○				RR R.H side SW ㊶
9												○	○					RR R.H. side SW ㊺
10															○	○	○	RR L.H. side SW ㉛
11															○	○	○	RR L.H. side SW ㉟

FRONT DRIVER SIDE POWER WINDOW SWITCH

Power Window (Cont'd)



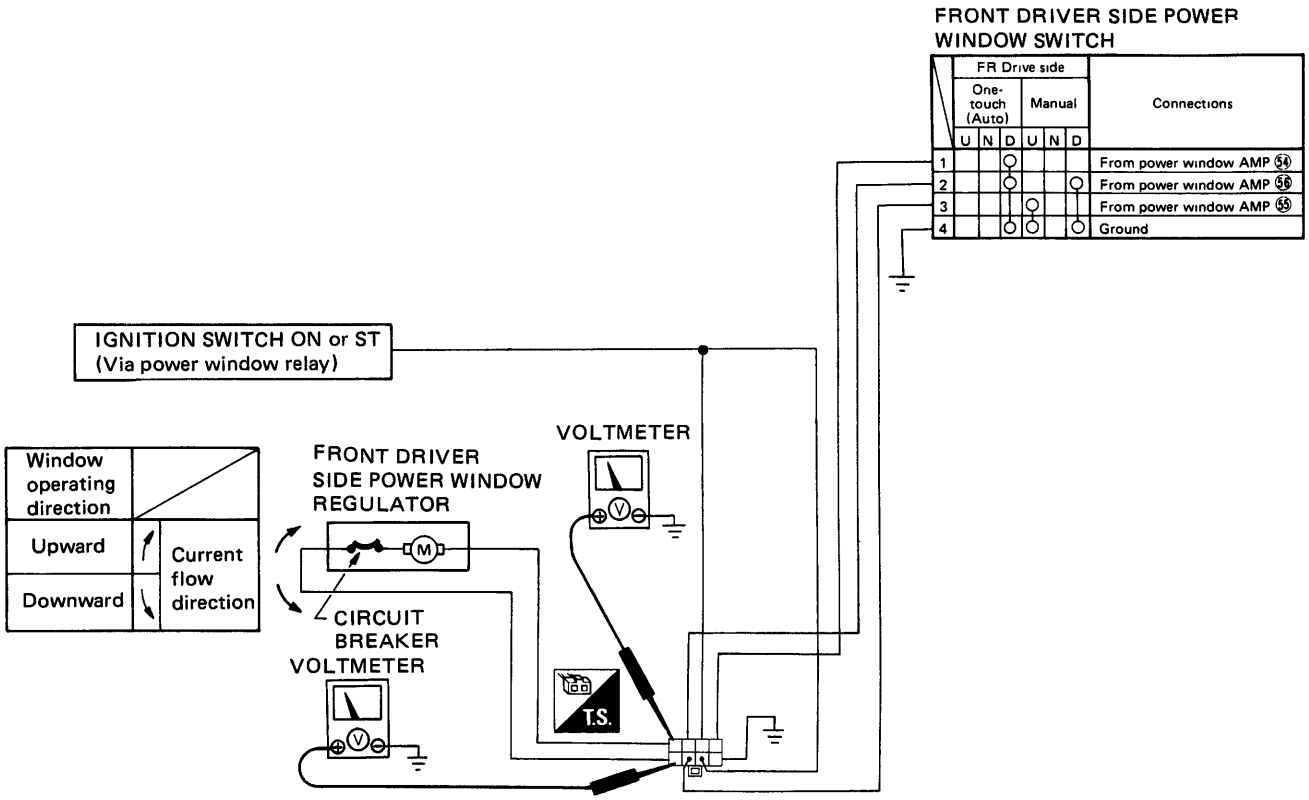
SBF267E

Power Window (Cont'd)

ONE-TOUCH (Auto) OPERATION

Power window system is designed to fully open or close the driver's window automatically by one-touch (Auto) operation of driver's door window switch. Stopping the window at the fully open or closed position is done by power window amp. operation.

Power window amp. inspection



AMP. OPERATION

	Connections		Operations					
			Manual operation			One-touch (Auto) Operation		
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)	ON or ST	ON or ST	ON or ST	ON or ST	ON or ST	ON or ST
54	Input signal	To FR driver side power window SW (AUTO) ①	OFF	OFF	OFF	OFF	ON	OFF
55	Input signal	To FR driver side power window SW (UP) ③	OFF	ON	OFF	OFF	OFF	OFF
56	Input signal	To FR driver side power window SW (DOWN) ②	OFF	OFF	ON	OFF	ON	OFF
57	Output signal	FR driver side regulator (Upward power source)	Approx. 0V	Approx over 9V	Approx 0V	Approx 0V	Approx 0V	Approx 0V
58	Output signal	FR driver side regulator (Downward power source)	Approx 0V	Approx 0V	Approx over 9V	Approx 0V	Aprrox 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	

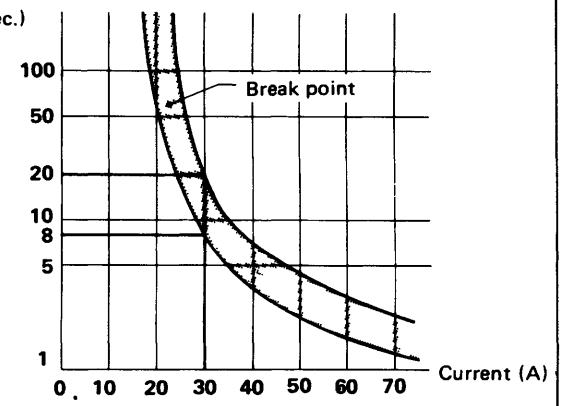
Carry out this operation check in this chart from left to right continuously.

POWER WINDOW AMP. – Front driver side door (Behind door trim)

SBF789C

Power Window (Cont'd)

CIRCUIT BREAKER INSPECTION

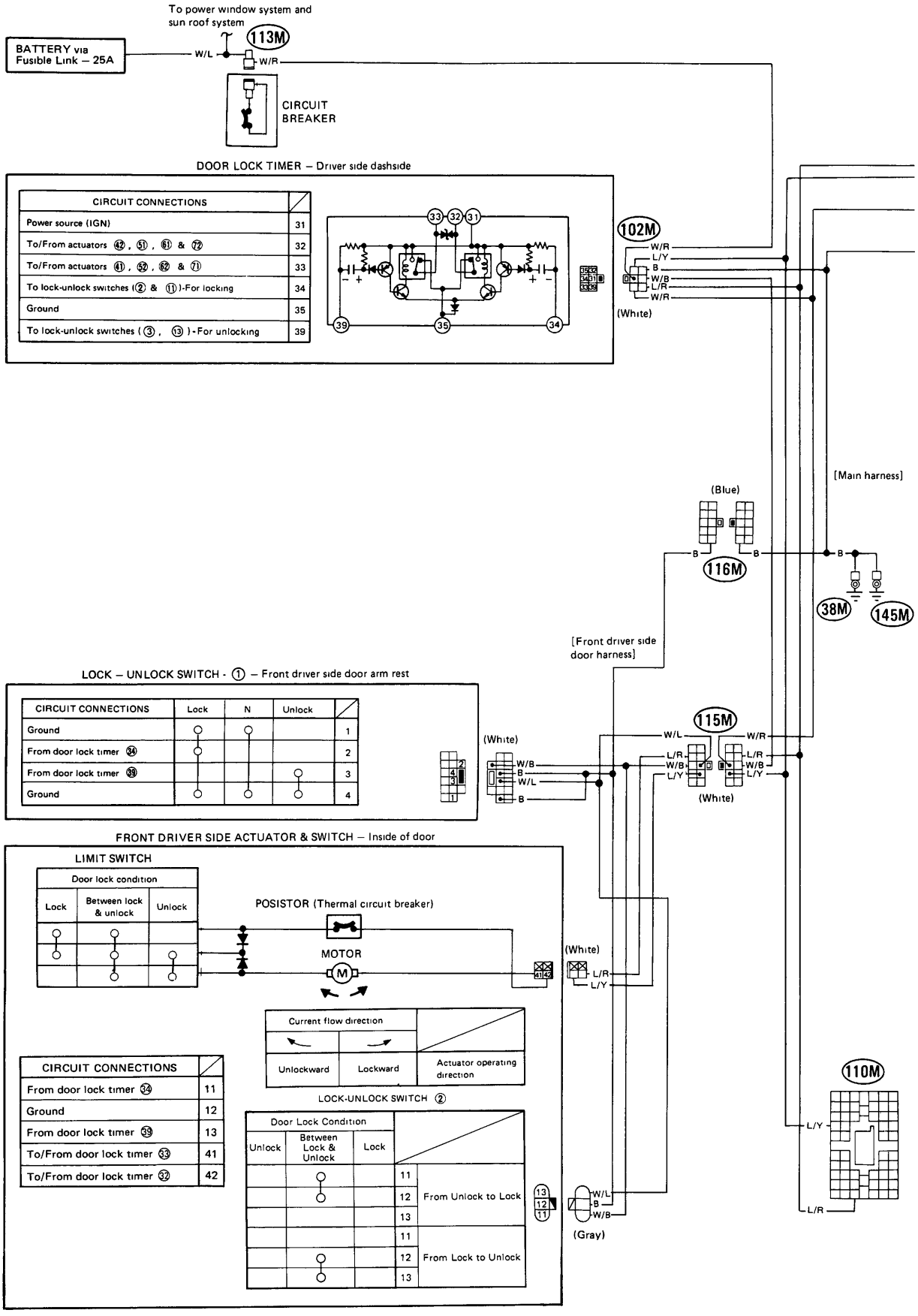


For example, when current is 30A, the circuit is broken within 8 to 20 seconds.

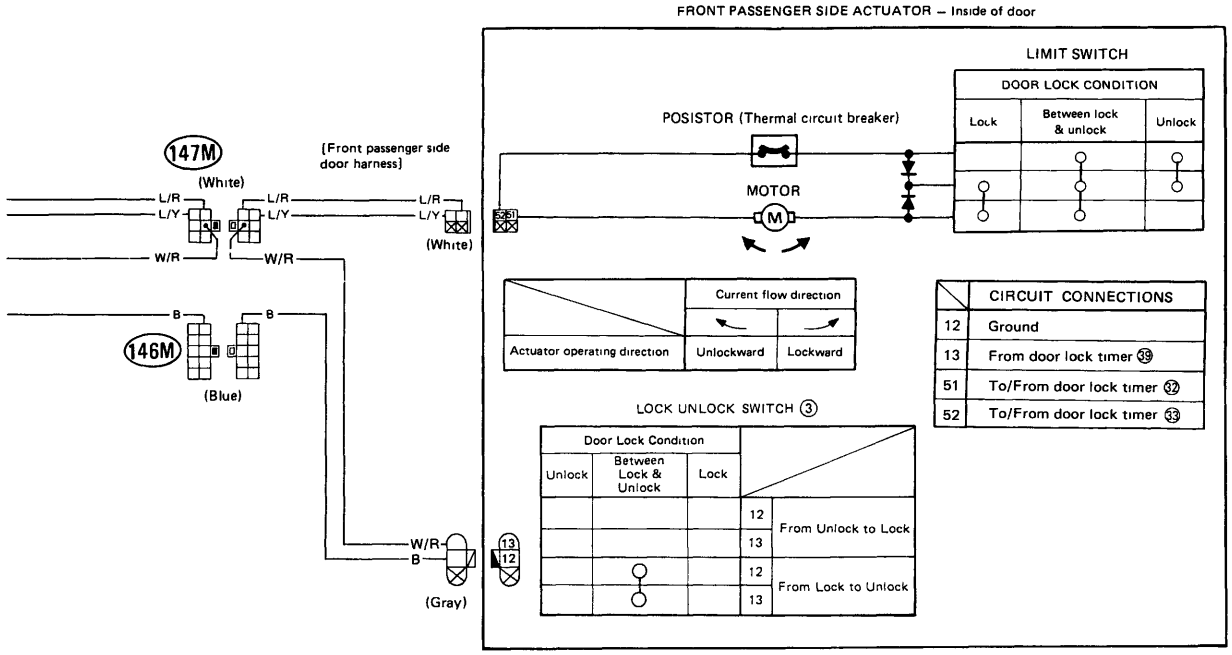
SBF560B

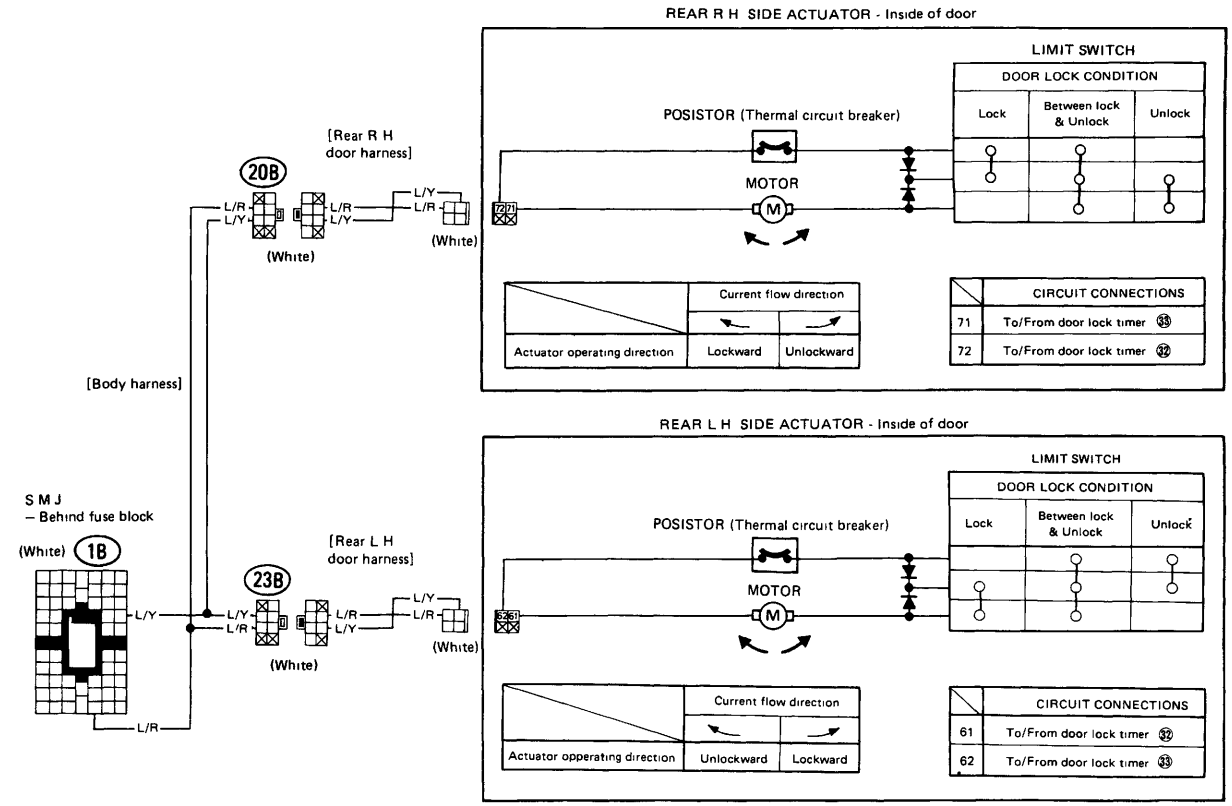
Power Door Lock

WIRING DIAGRAM



Power Door Lock (Cont'd)

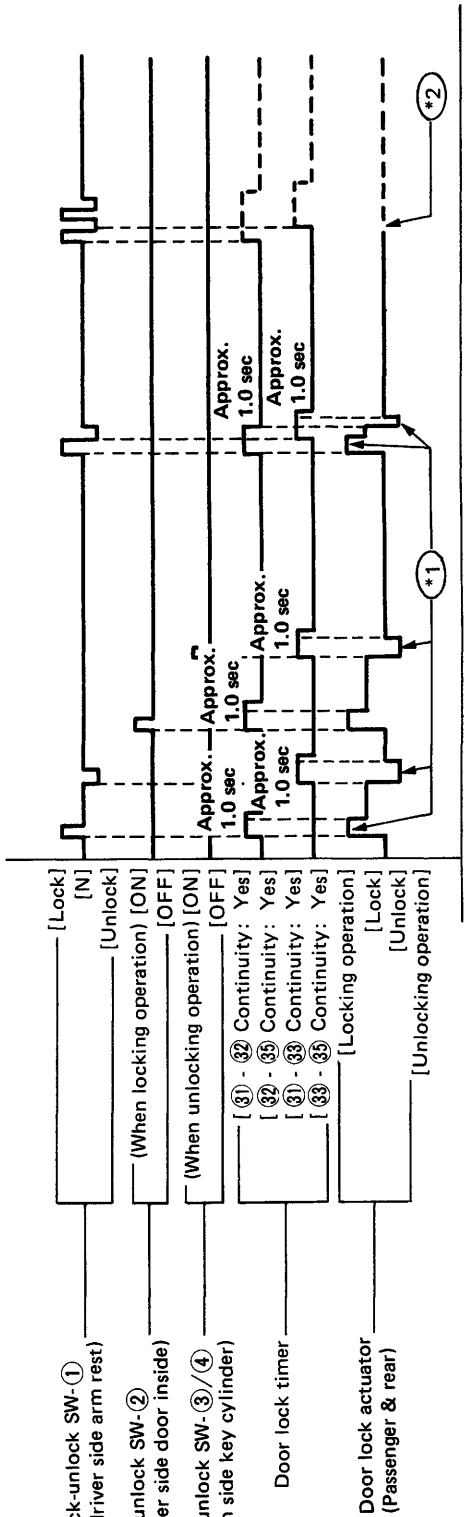




SBF268E

Power Door Lock (Cont'd)

SYSTEM OPERATION



*1 : The actuator is operated up to "Lock" or "Unlock" position, then stopped automatically by the actuation of the limit SW.

*2 : When Lock-Unlock is repeated more than three times using the lock-unlock switch, the door may either be locked or unlocked by itself, or the actuator may not be activated. This depends on the Lock-Unlock operation period and other conditions. Avoid this type of operation as a system fault may occur.

SBF799C

Power Door Lock (Cont'd)

DOOR LOCK TIMER INSPECTION

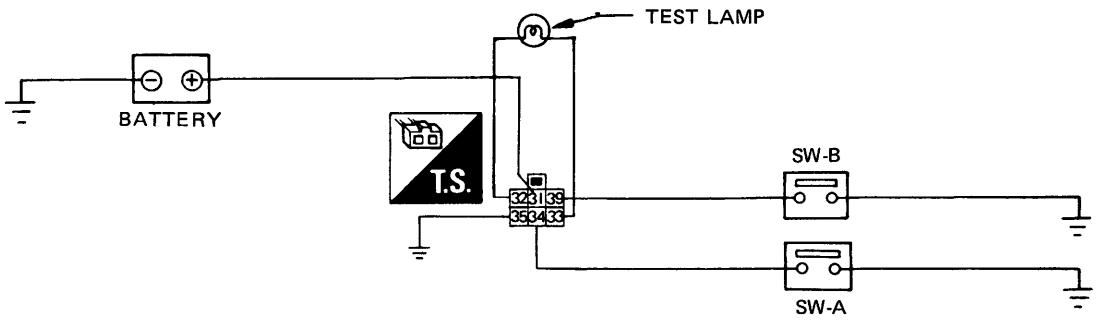
TESTING OPERATION

Input signal	SW-A operation	OFF	Turns ON	ON	Turns OFF	OFF	OFF	OFF	Turns ON	Turns OFF
	SW-B operation	OFF	OFF	OFF	OFF	Turns ON	ON	Turns OFF	After SW-A operation, immediately turns ON	Turns OFF
Output signal	Test lamp operation	OFF	ON (Approx. 1.0 sec.) → OFF	OFF	OFF	ON (Approx. 1.0 sec.) → OFF	OFF	OFF	ON → OFF → ON → OFF	OFF

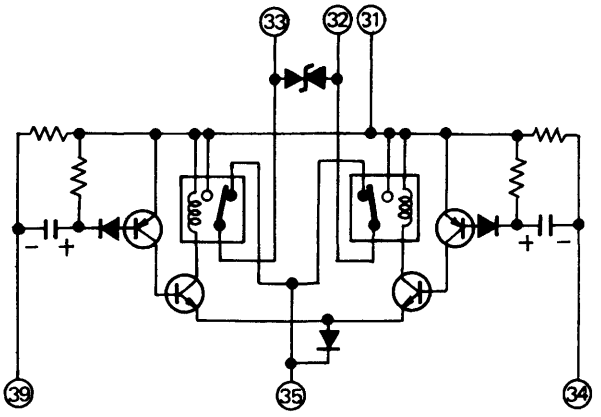
- Carry out the complete inspection in this chart from left to right.
- Do not carry out any switch operations that are not described in the above chart so as to avoid breaking the door lock timer.

Lighting period of test lamp differs according to SW-B operation. Moreover, test lamp may come on once or it may not come on at all. If this occurs, do not judge it faulty solely from this step, but use other steps to make final judgement.

INSPECTION CIRCUIT (This test circuit must be wired by the technician.)



DOOR LOCK TIMER



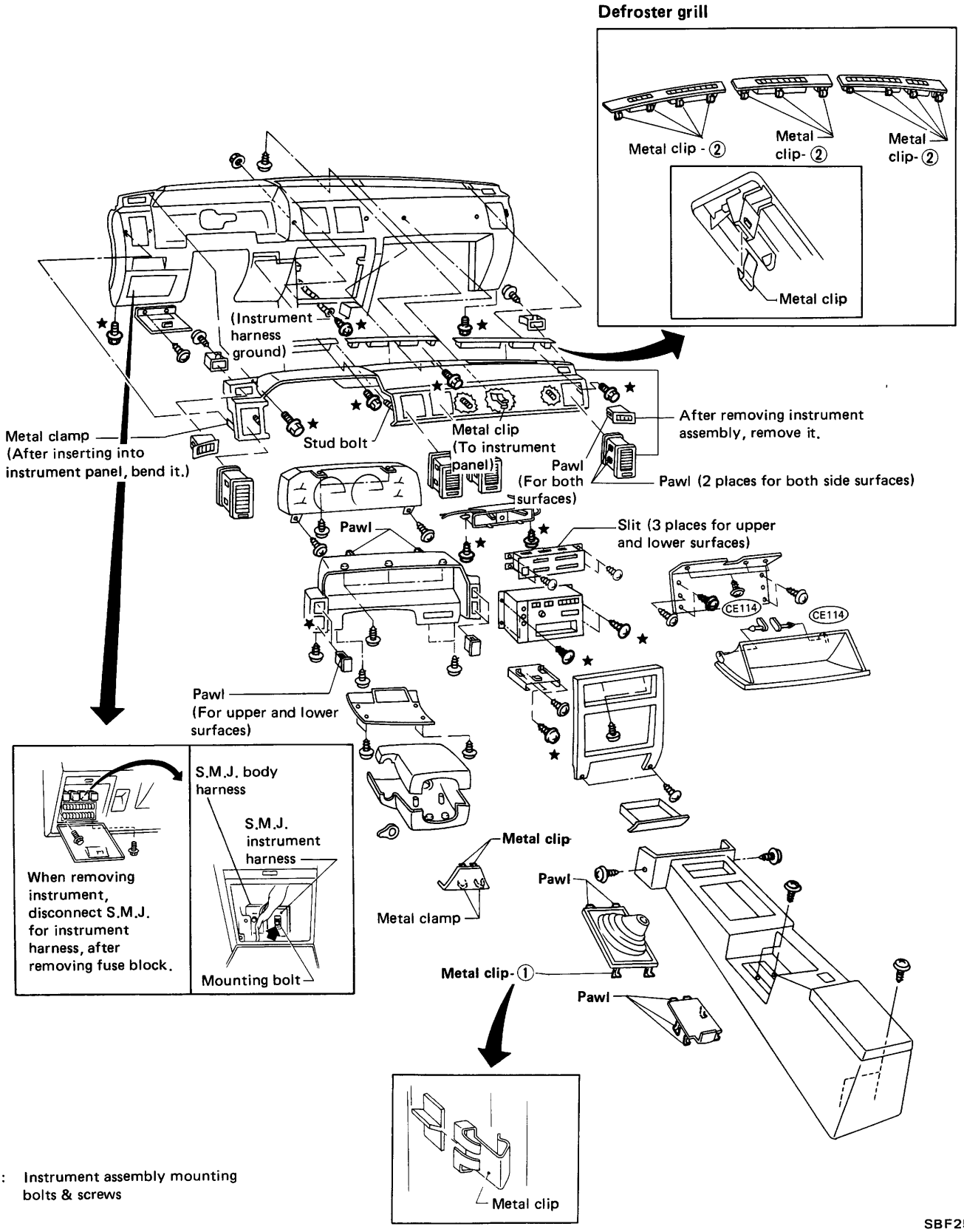
	CIRCUIT CONNECTIONS
31	Power source (BAT)
32	To/From actuators (Lock power source & Unlock ground)
33	To/From actuators (Lock ground & Unlock power source)
34	To lock-unlock switches (Input signal for lock)
35	Ground
39	To lock-unlock switches (Input signal for unlock)

SBF800C

CIRCUIT BREAKER

The circuit breaker is the same as the one for Power Window system.
So refer to "Power Window".

- These parts are made of plastic, so do not use excessive force and be careful not to damage them.
- When removing clip or fastener, refer to "Clip and Fastener".
- When you remove instrument assembly, you should remove defroster grille, combination meter, cluster lid for radio, heater control finisher, heater control, radio, glove box, S.M.J. harness ground behind radio, hook lock control lever and front pillar garnish first.

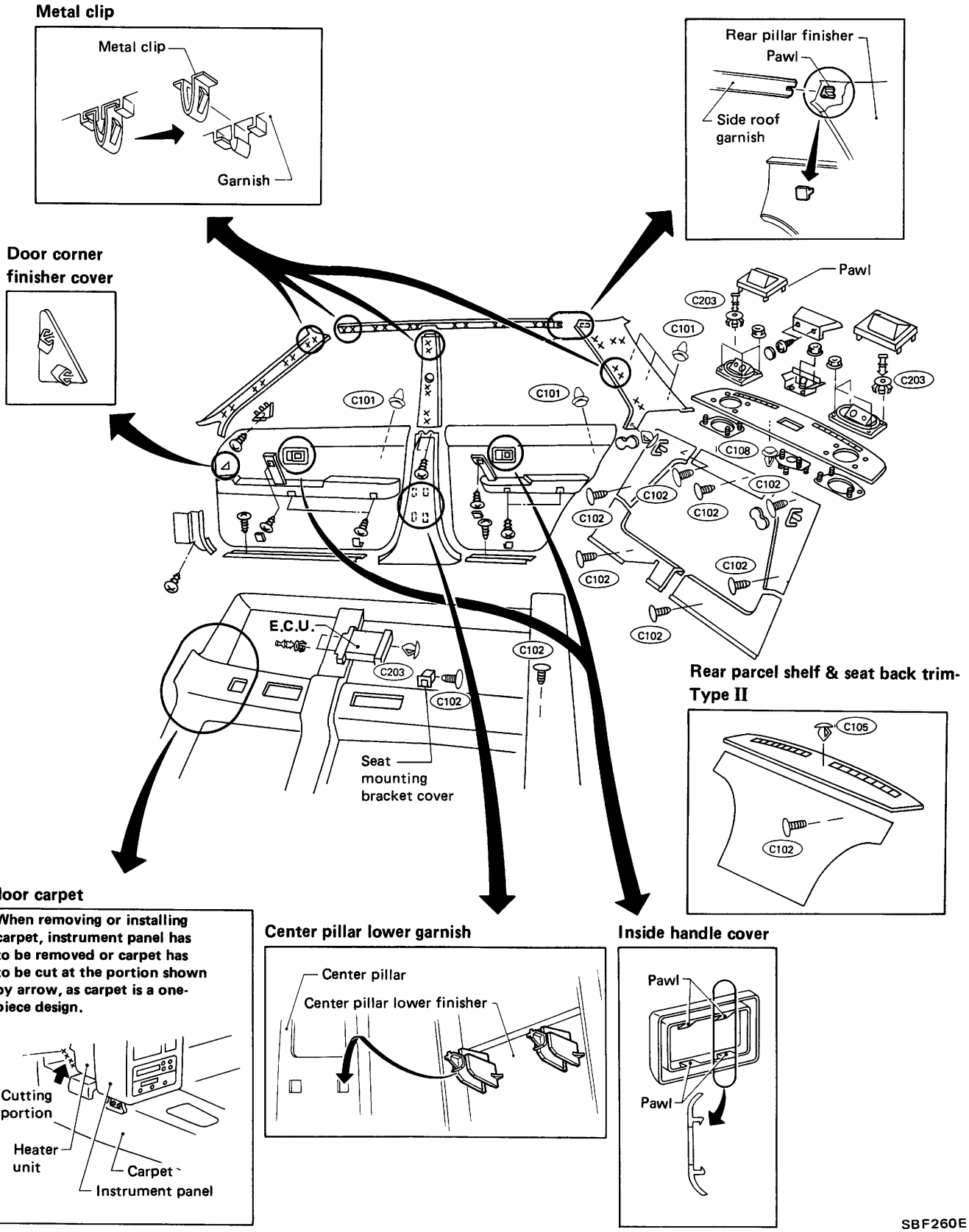


★: Instrument assembly mounting bolts & screws

SBF259E

- When removing clip or fastener, refer to "Clip and Fastener".
- When handling interior or exterior components, do not use excessive force and take care not to damage them.

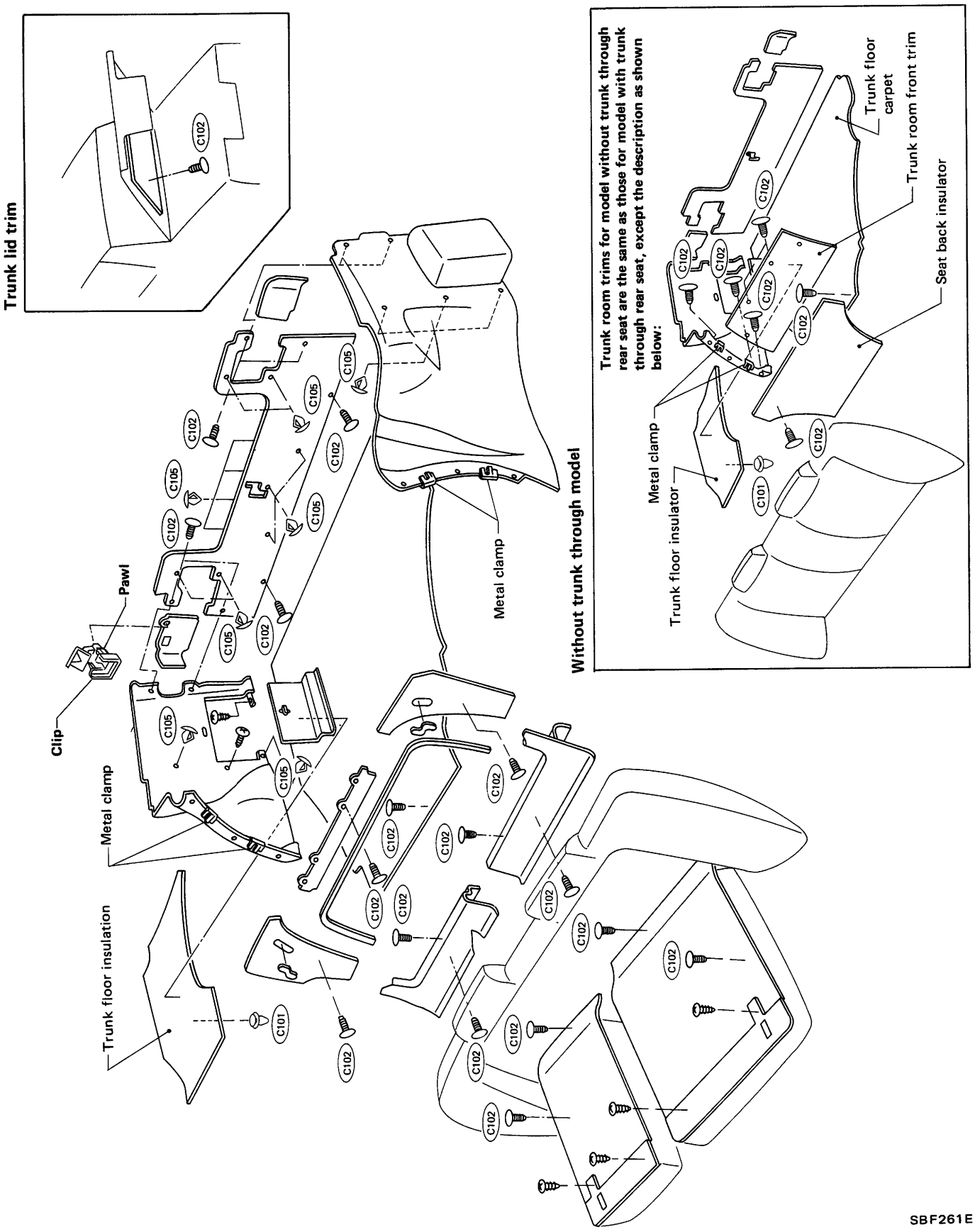
Side Trim



SBF260E

Trunk Room Trim

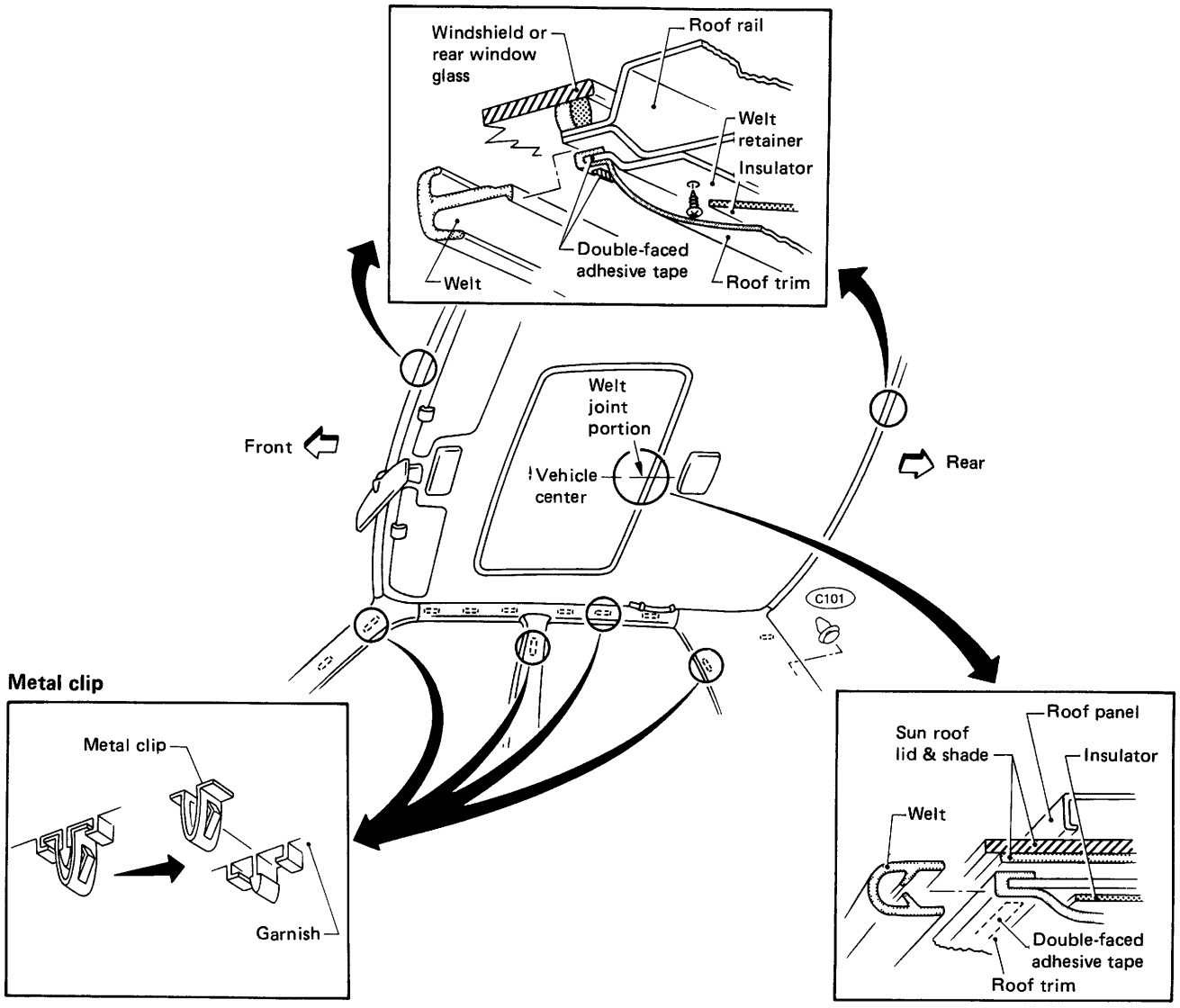
When removing clip or fastener, refer to "Clip and Fastener".



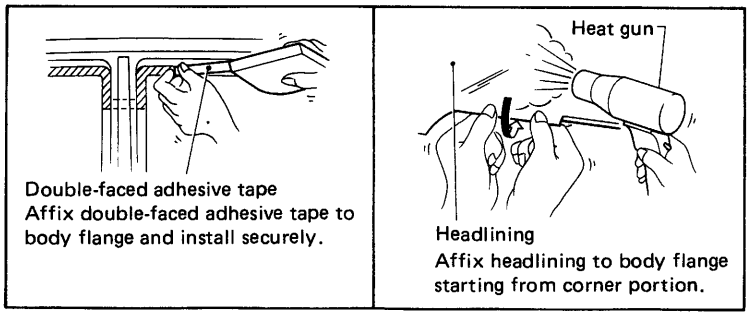
SBF261E

Roof Trim

When removing clip or fastener, refer to "Clip and Fastener".



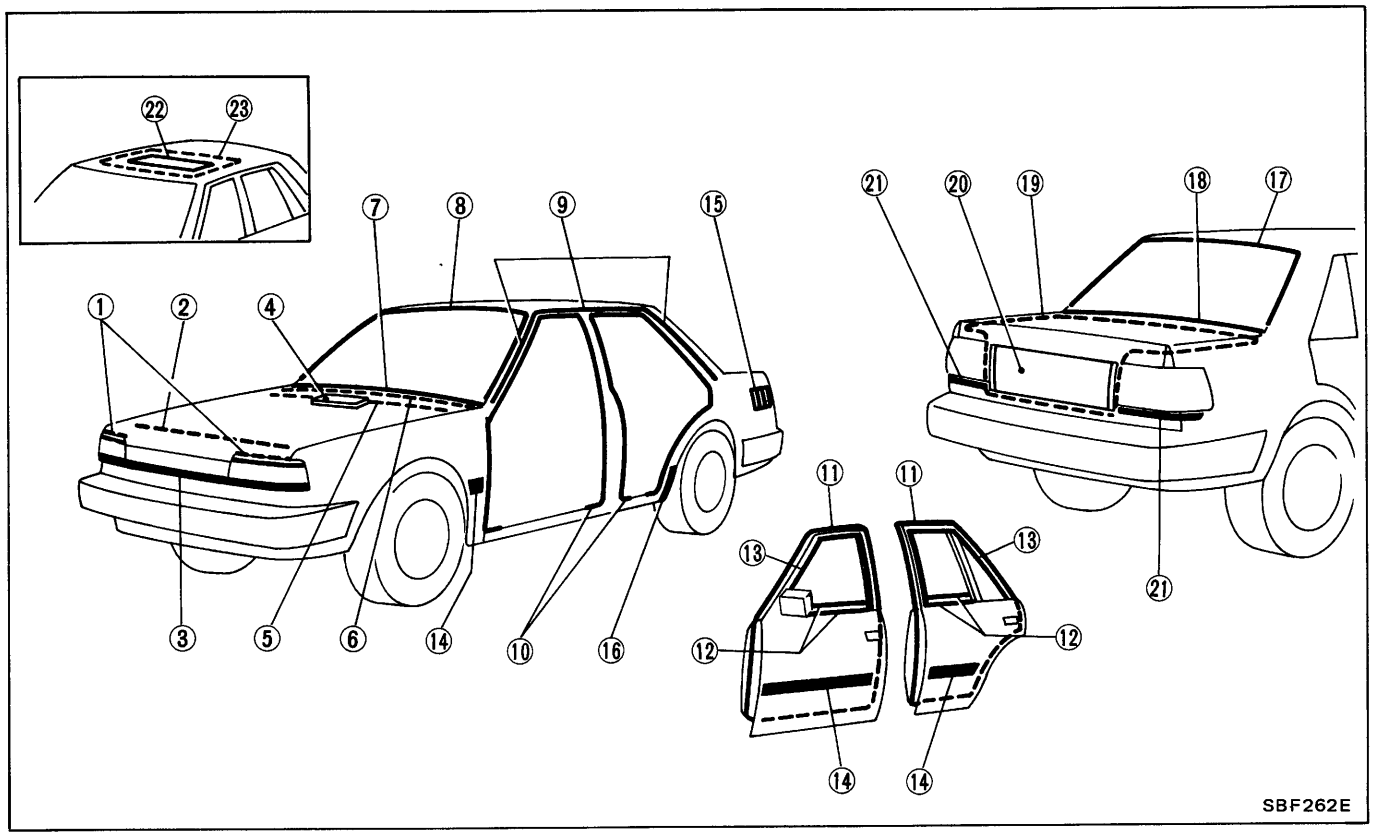
Roof trim installation



SBF680C

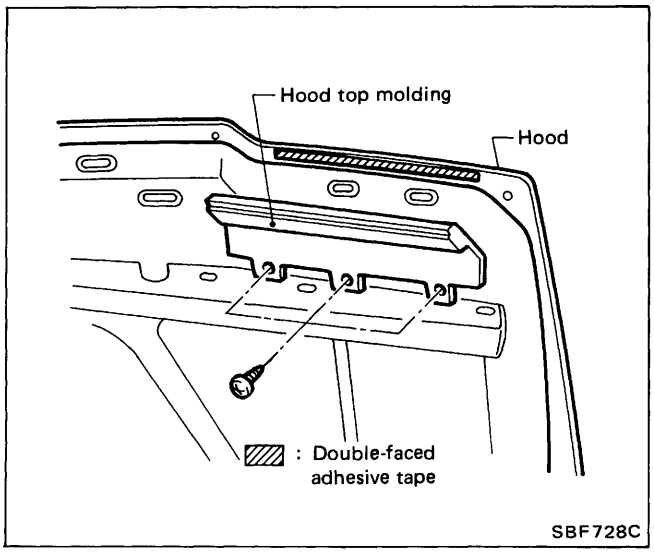
Exterior

- Apply sealing compound where necessary while installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.
- When removing clip or fastener, refer to "Clip and Fastener".

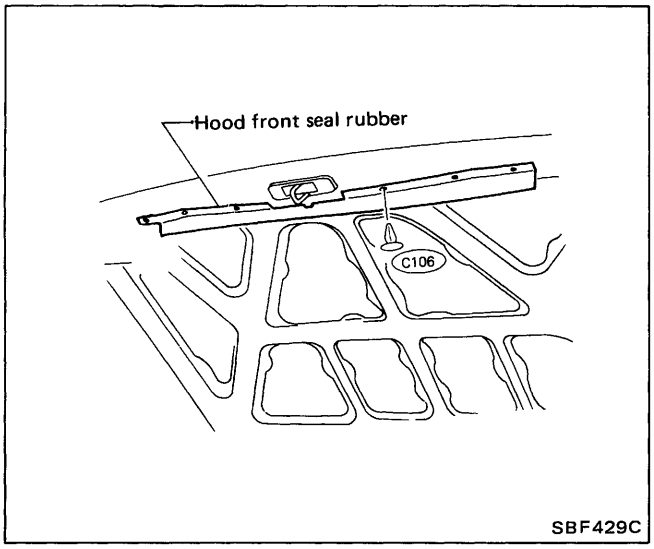


Exterior (Cont'd)

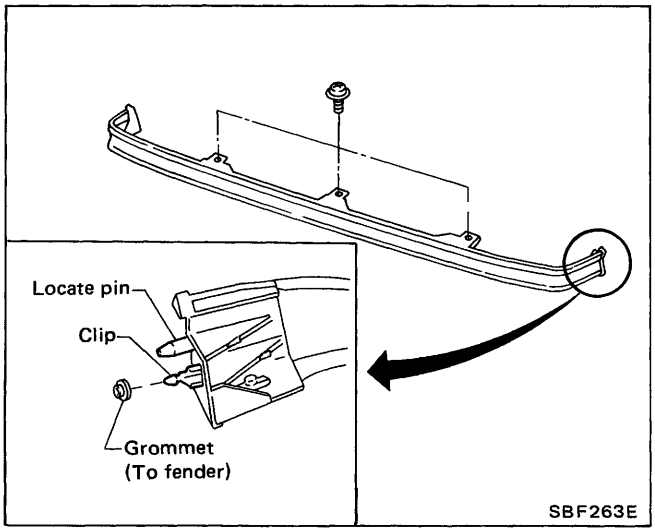
① Hood top molding



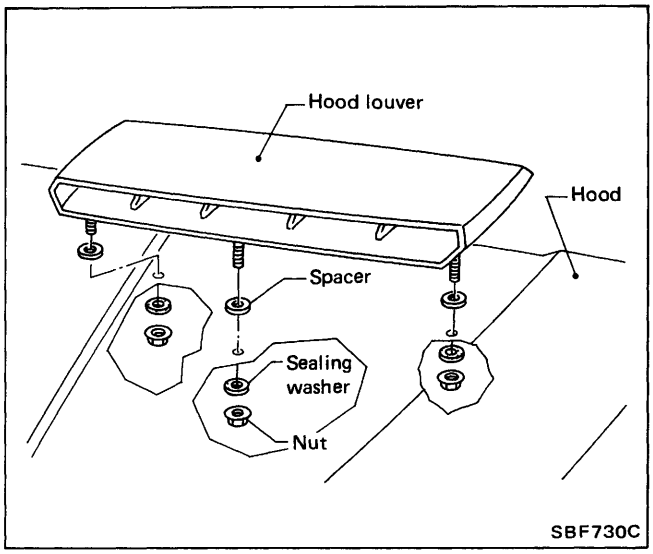
② Hood front sealing rubber



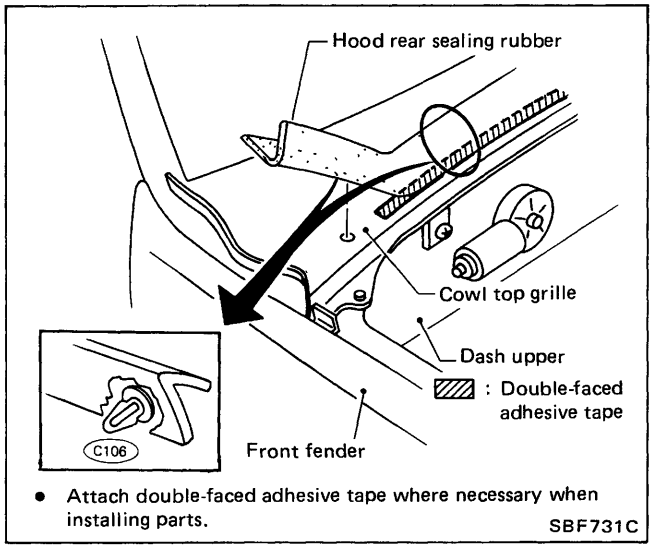
③ Headlamp finisher & radiator grille lower molding



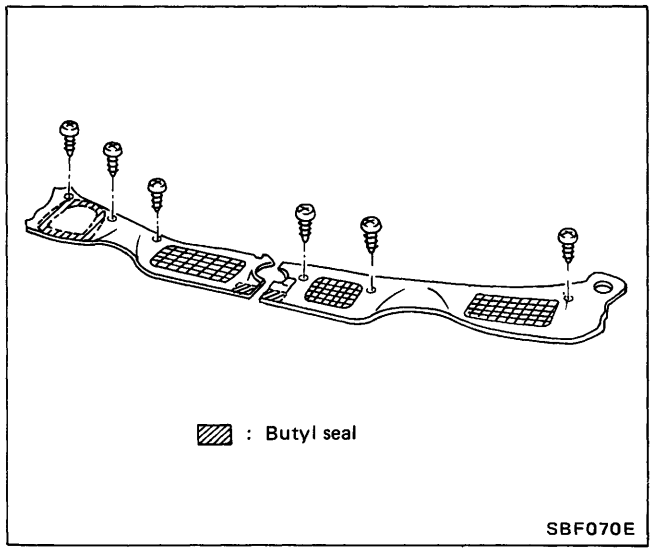
④ Hood louver



⑤ Hood rear sealing rubber

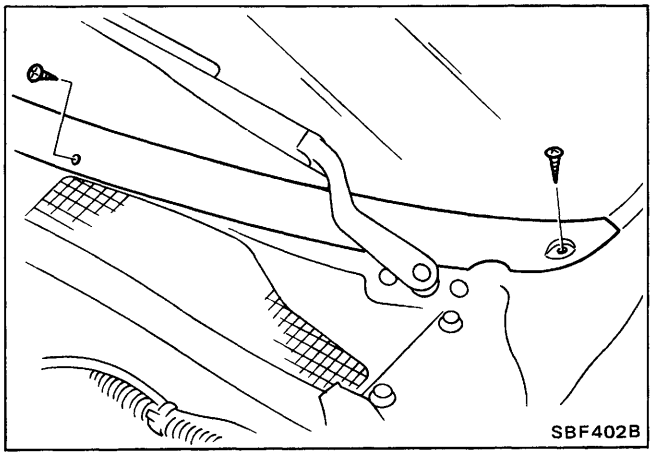


⑥ Cowl top grille



Exterior (Cont'd)

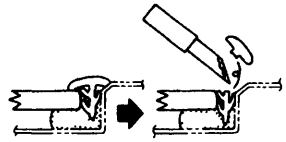
⑦ Windshield lower molding



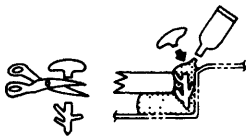
⑧ Windshield upper & side molding

Method 1

Cut off top portion of molding and clean glass and panel surfaces.



Apply sealant to top portion of molding.



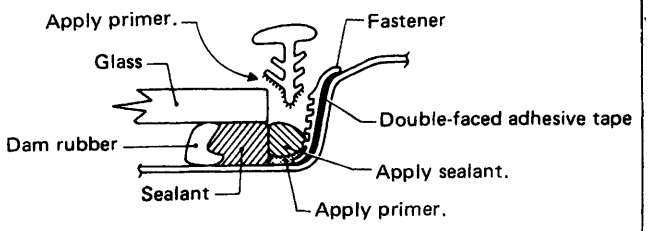
Cut off lower portion of new molding.

Finish well to give it a good appearance.

SBF734C

Method 2

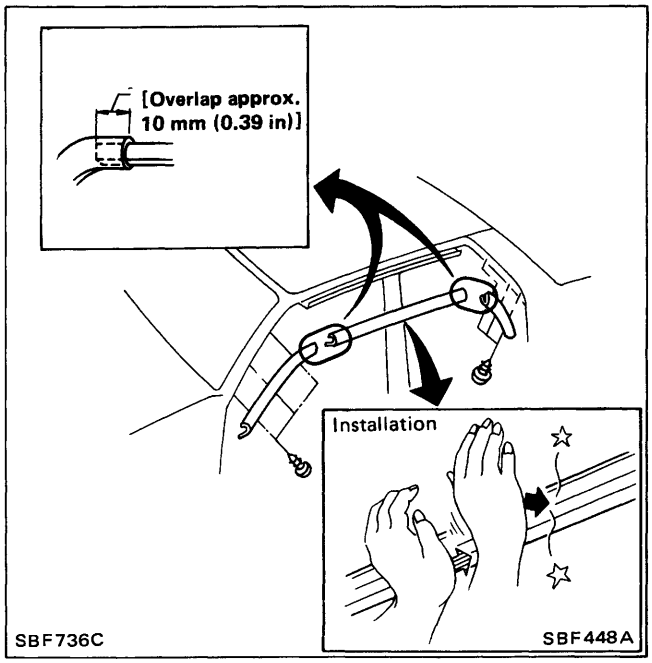
1. Cut off sealant at glass end.
2. Clean the side on which panel was mounted.
3. Set molding fastener and apply sealant to body panel, and apply primer to molding and body.



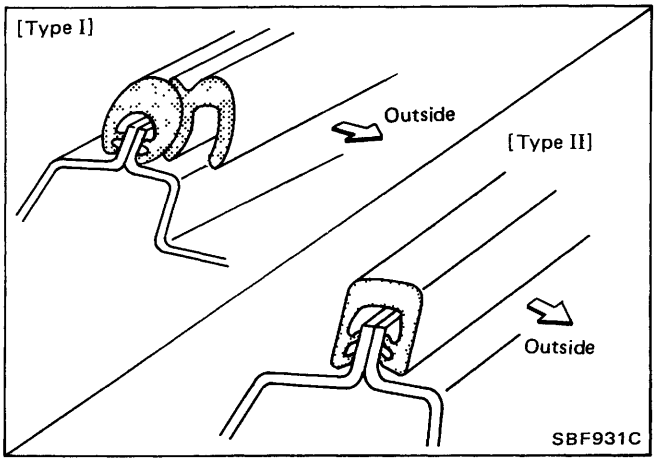
4. Install molding by aligning the molding mark located on center with vehicle center.
   Be sure to install tightly so that there is no gap around the corner.

SBF735C

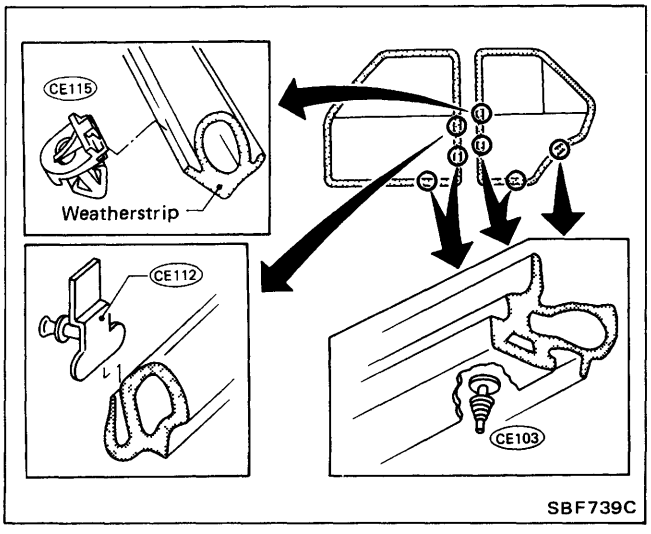
⑨ Drip molding



⑩ Body side welt & seal

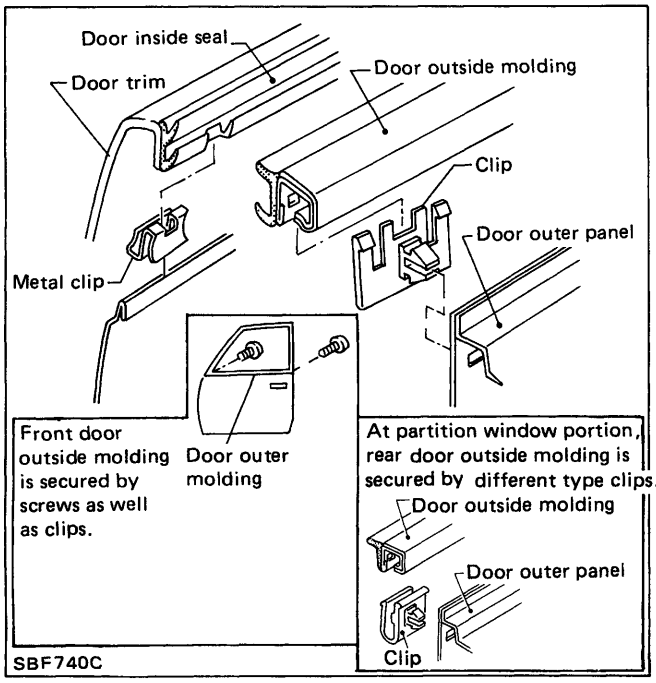


⑪ Door weatherstrip

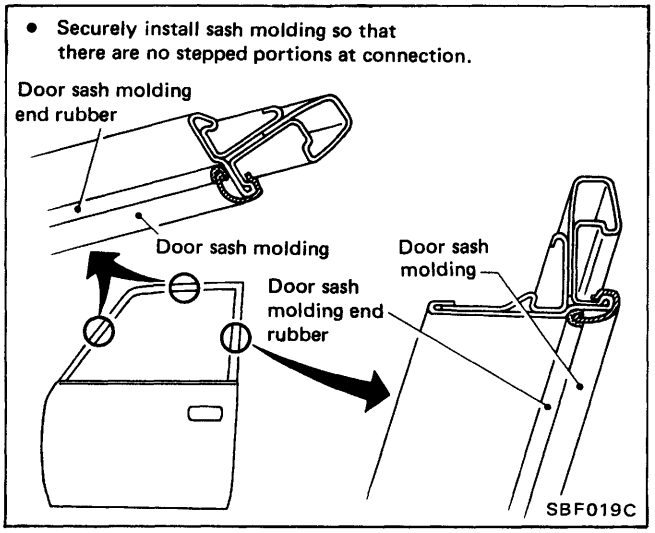


Exterior (Cont'd)

⑫ Door outside molding & inside seal



⑬ Door sash molding

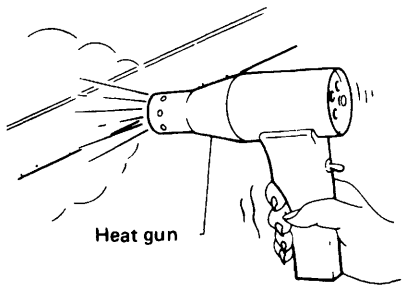


⑭ Side guard molding

- Side guard molding is affixed to front fender panel with double-faced adhesive tape.
- Side guard molding is affixed to door panel with double-faced adhesive tape and sealant.
- And the repair part is affixed with double-faced adhesive tape.

- **Removal:**

1. Heat molding portion to 30 to 40°C (86 to 104°F) with a heat gun.



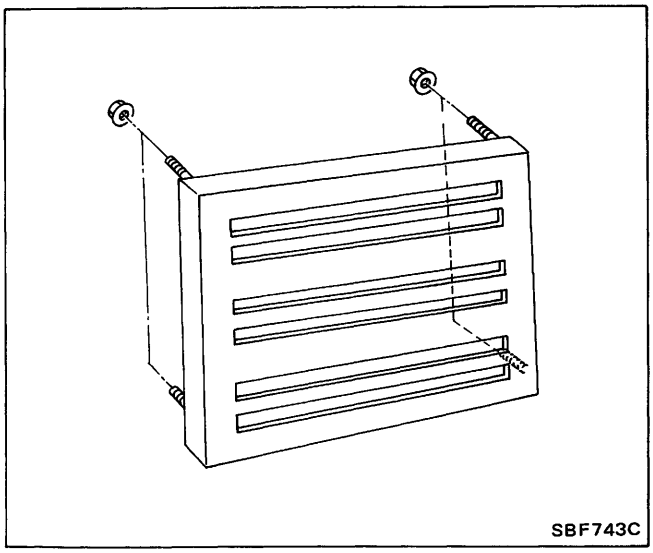
2. Raise end of molding and, while cutting off bonding agent, detach molding.

- **Installation:**

1. Remove all traces of bonding agent from body panel. Then clean contact face of body.
2. Heat body panel and molding to 30 to 40°C (86 to 104°F) with a heat gun. Then install molding.

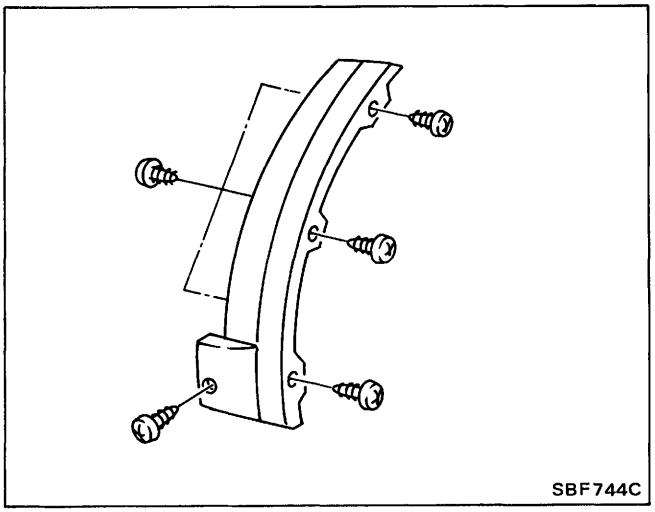
SBF742C

⑮ Drafter grille



Exterior (Cont'd)

⑯ **Rear fillet molding**



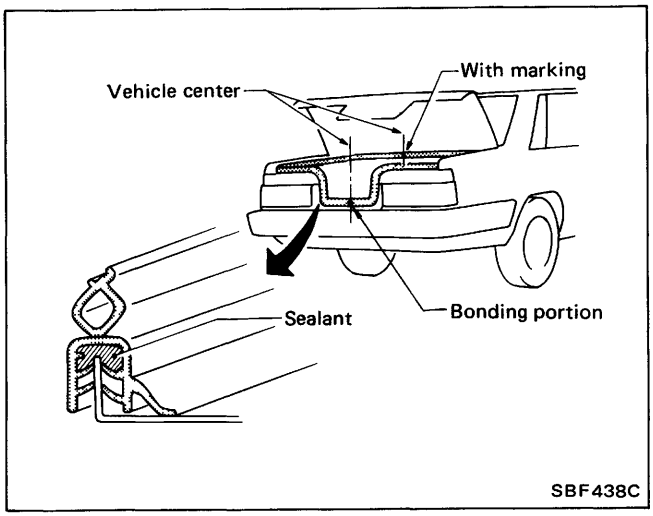
⑰ **Rear window upper & side molding**

Basically the same as windshield upper & side molding.

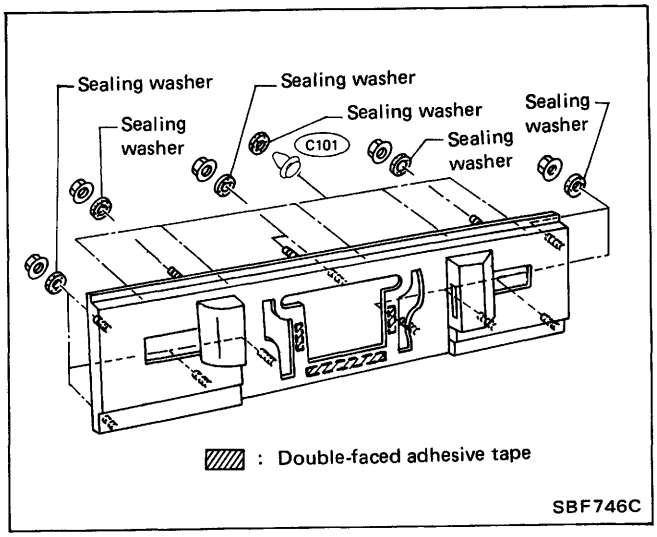
⑱ **Rear window lower molding**

Basically the same as windshiled lower molding.

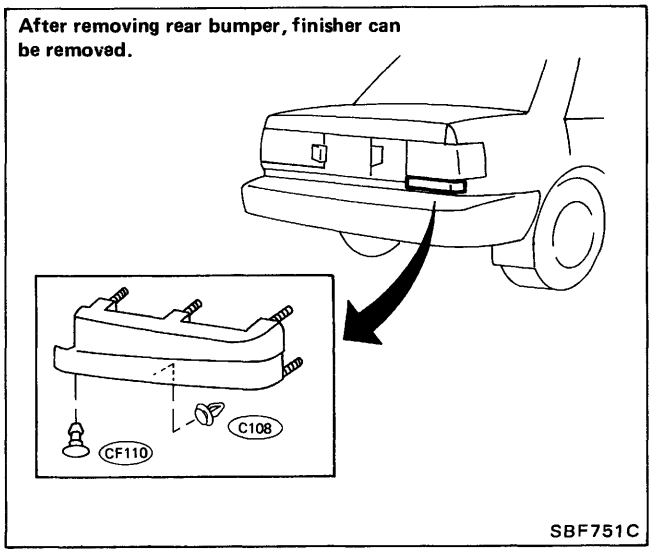
⑲ **Trunk lid weatherstrip**



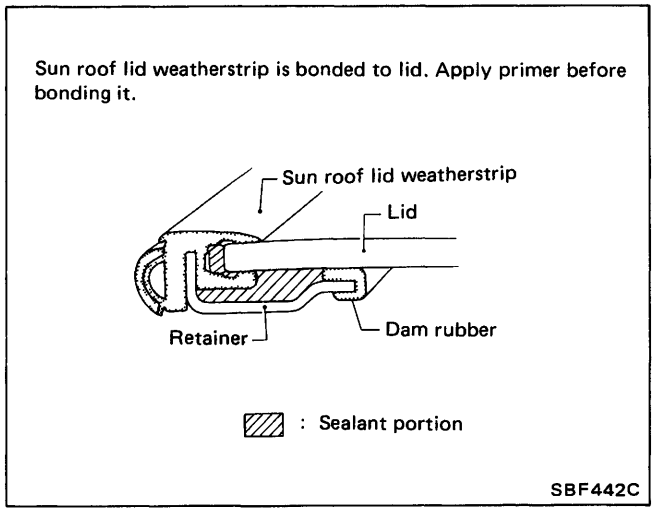
⑳ **Trunk lid finisher**



㉑ **Rear combination lamp lower finisher**

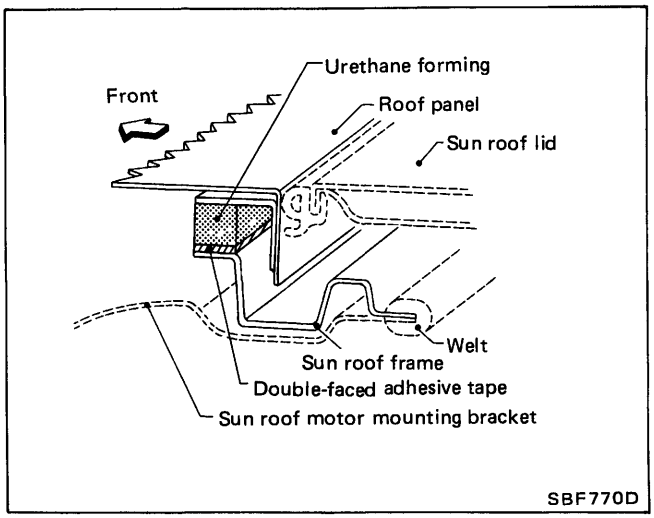


㉒ **Sun roof lid weatherstrip**



Exterior (Cont'd)

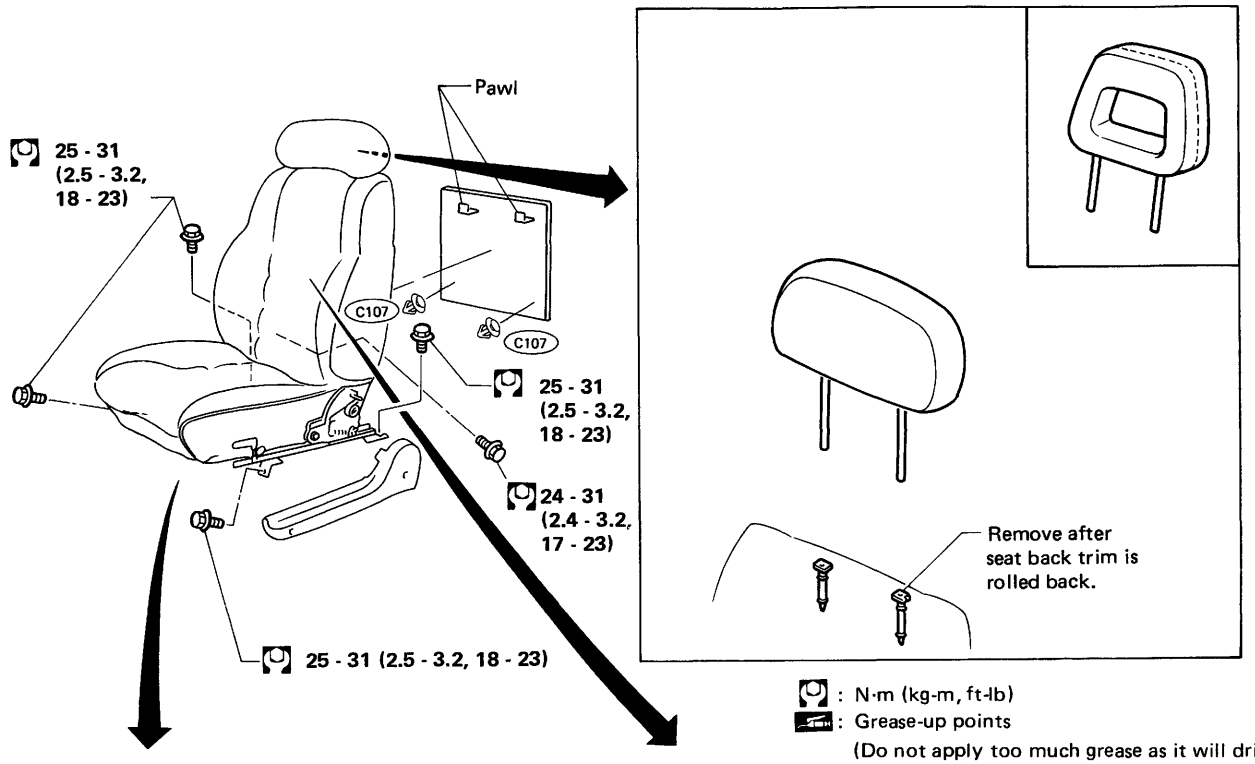
㉓ Sun roof weatherstrip

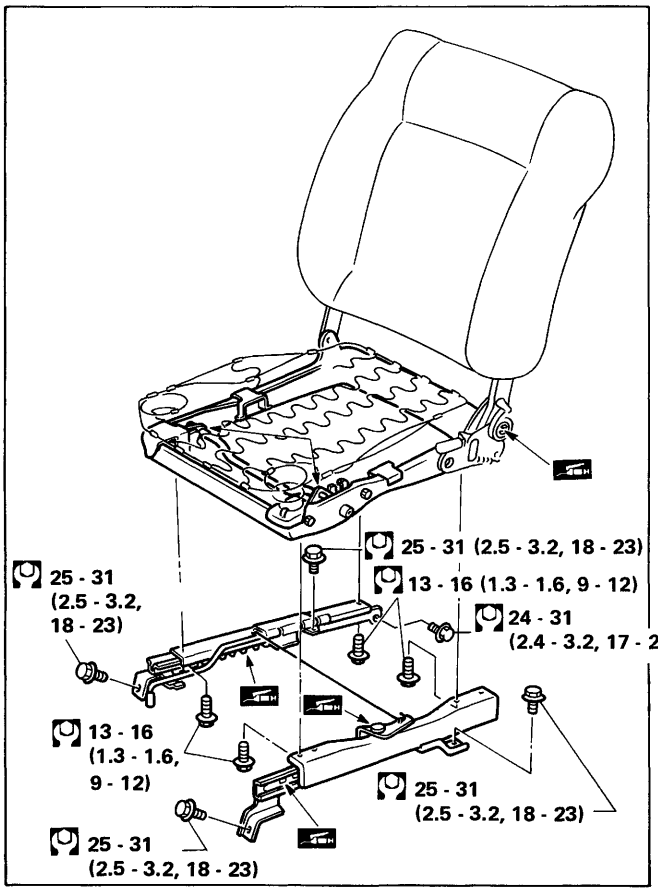


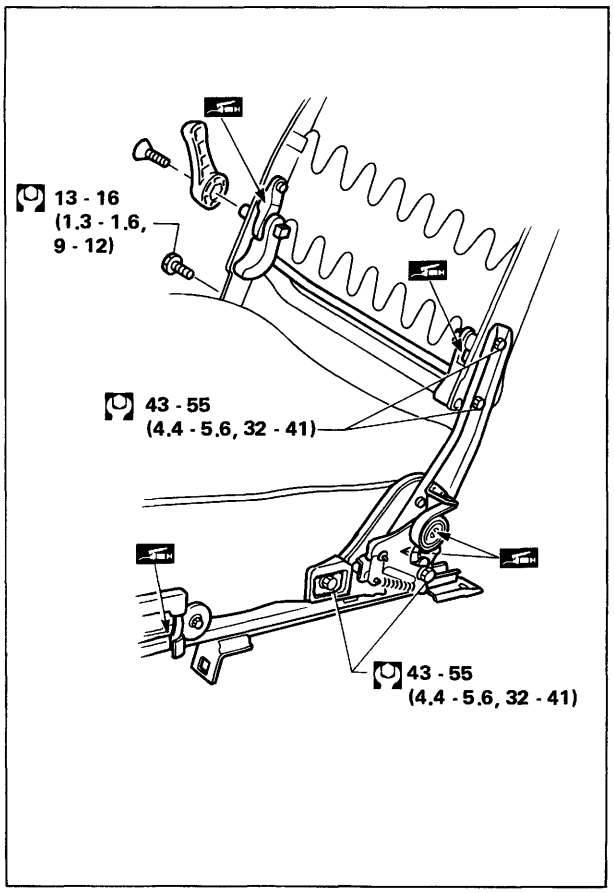
Front Seat

MANUAL SEAT

- When removing or installing the seat trim, handle it carefully to keep dirt out and avoid damage.
- When removing clip or fastener, refer to "Clip and Fastener".



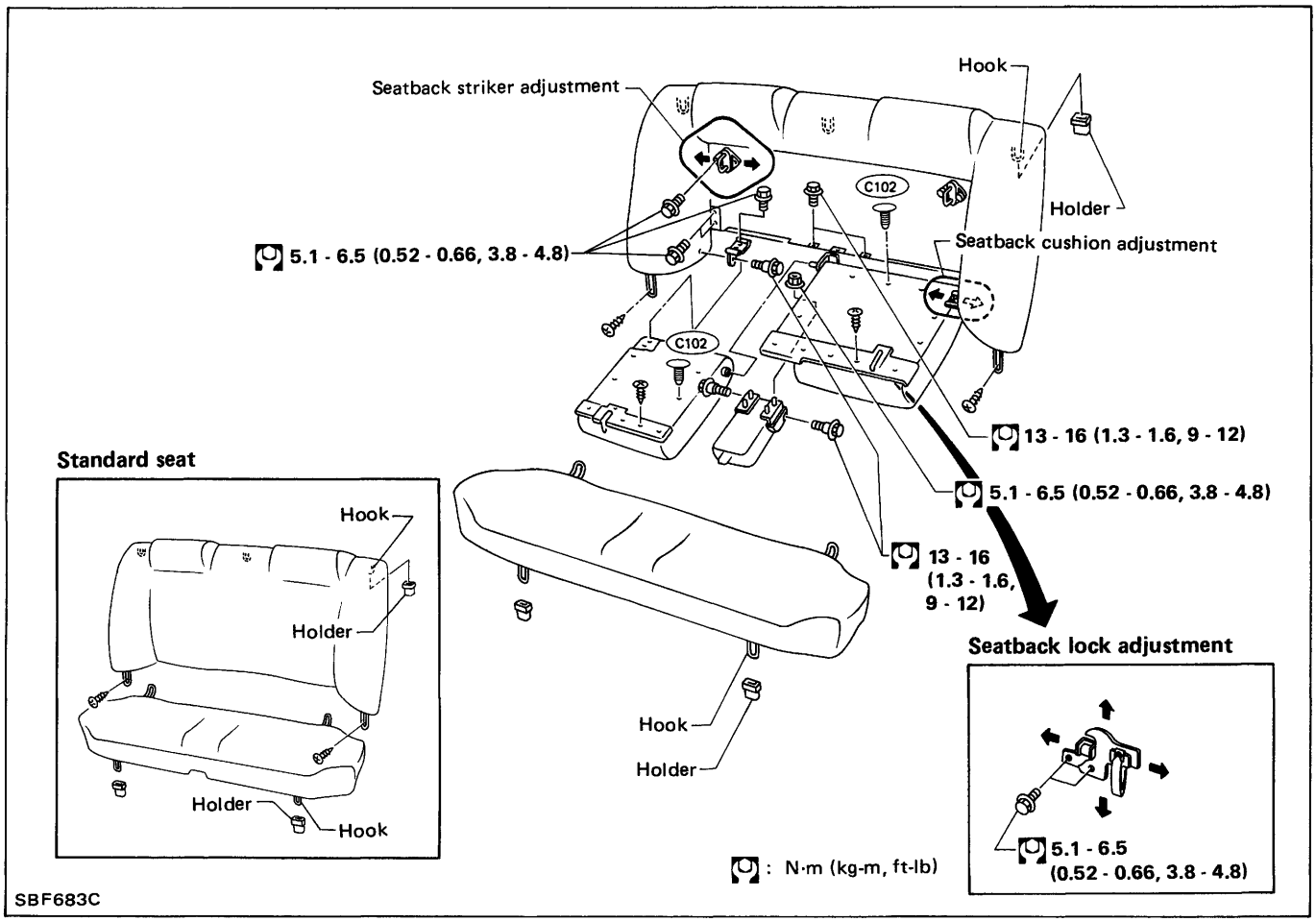




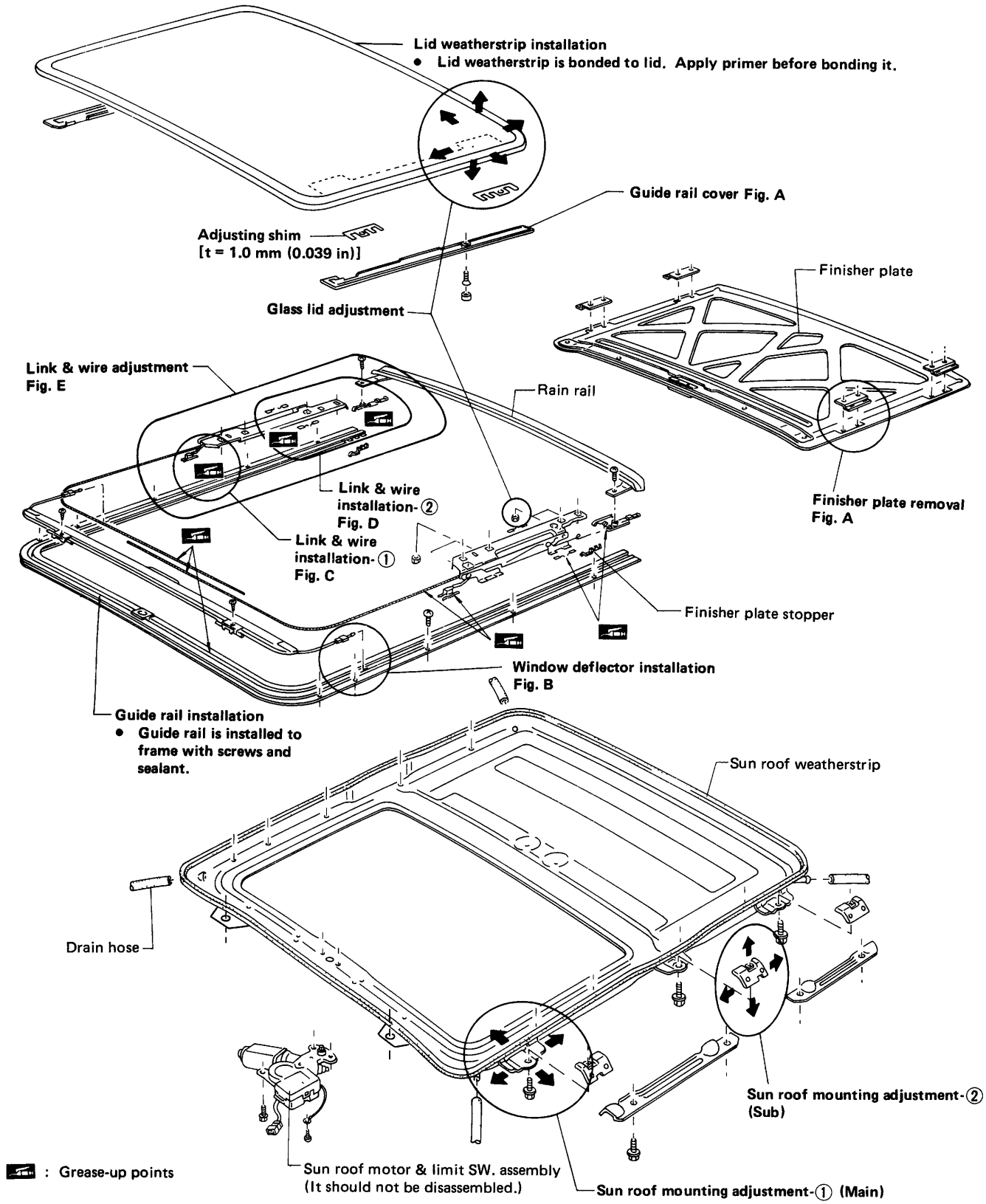
SBF264E

Rear Seat

- When removing or installing the seat trim, handle it carefully to keep dirt out and avoid damage.
- When removing clip or fastener, refer to "Clip and Fastener".

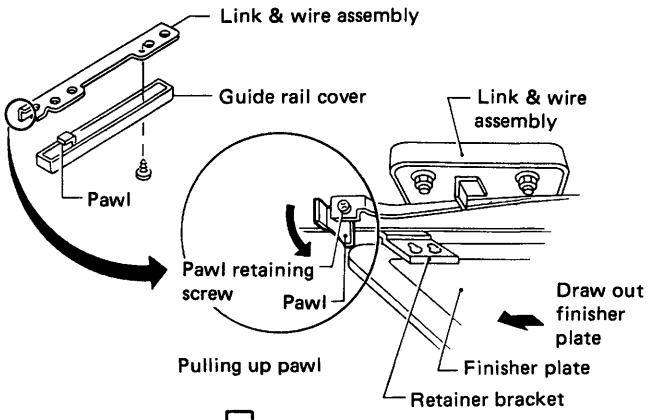


- After any adjustment, check sun roof operation and lid alignment.
- Handle finisher plate and glass lid with care so not to damage it.
- It is desirable for easy installation to mark each point before removal.

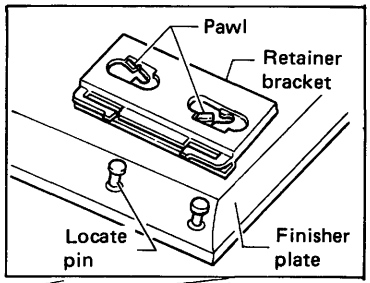


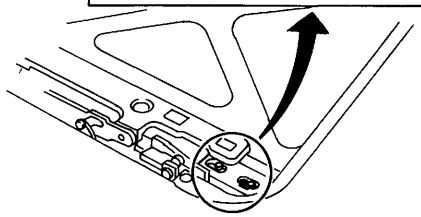
Finisher plate removal (Fig. A)

Remove guide rail cover and pull up pawl by loosening retaining screw, then draw out finisher plate with sun roof lid open.

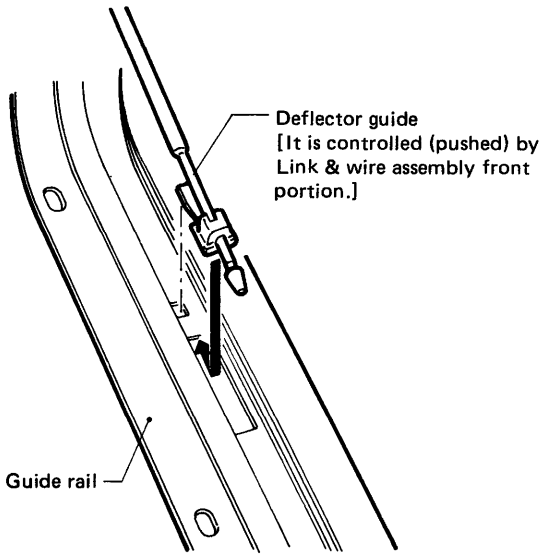


Removal:
Raise pawl of retainer bracket, shift finisher plate and remove locate pins from retainer bracket. Then remove finisher plate.

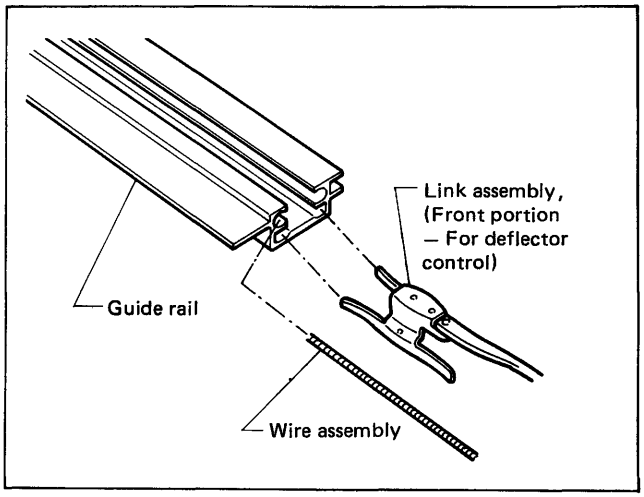




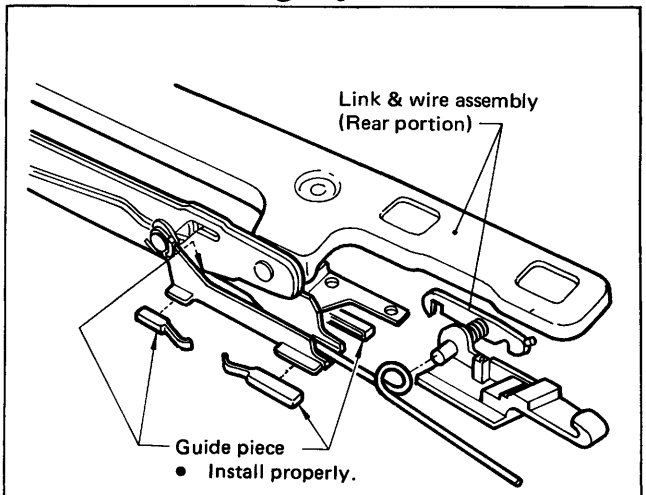
Wind deflector installation (Fig. B)



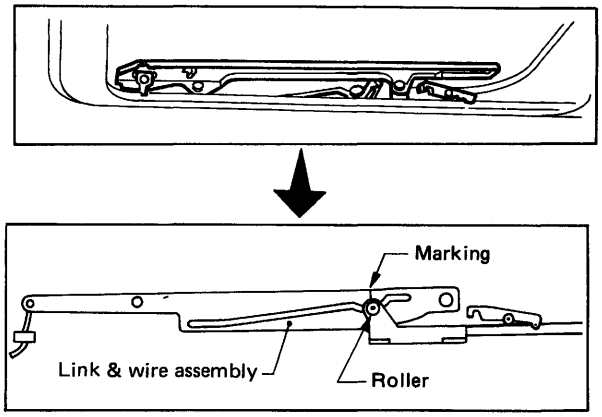
Link & wire installation-① (Fig. C)



Link & wire installation-② (Fig. D)



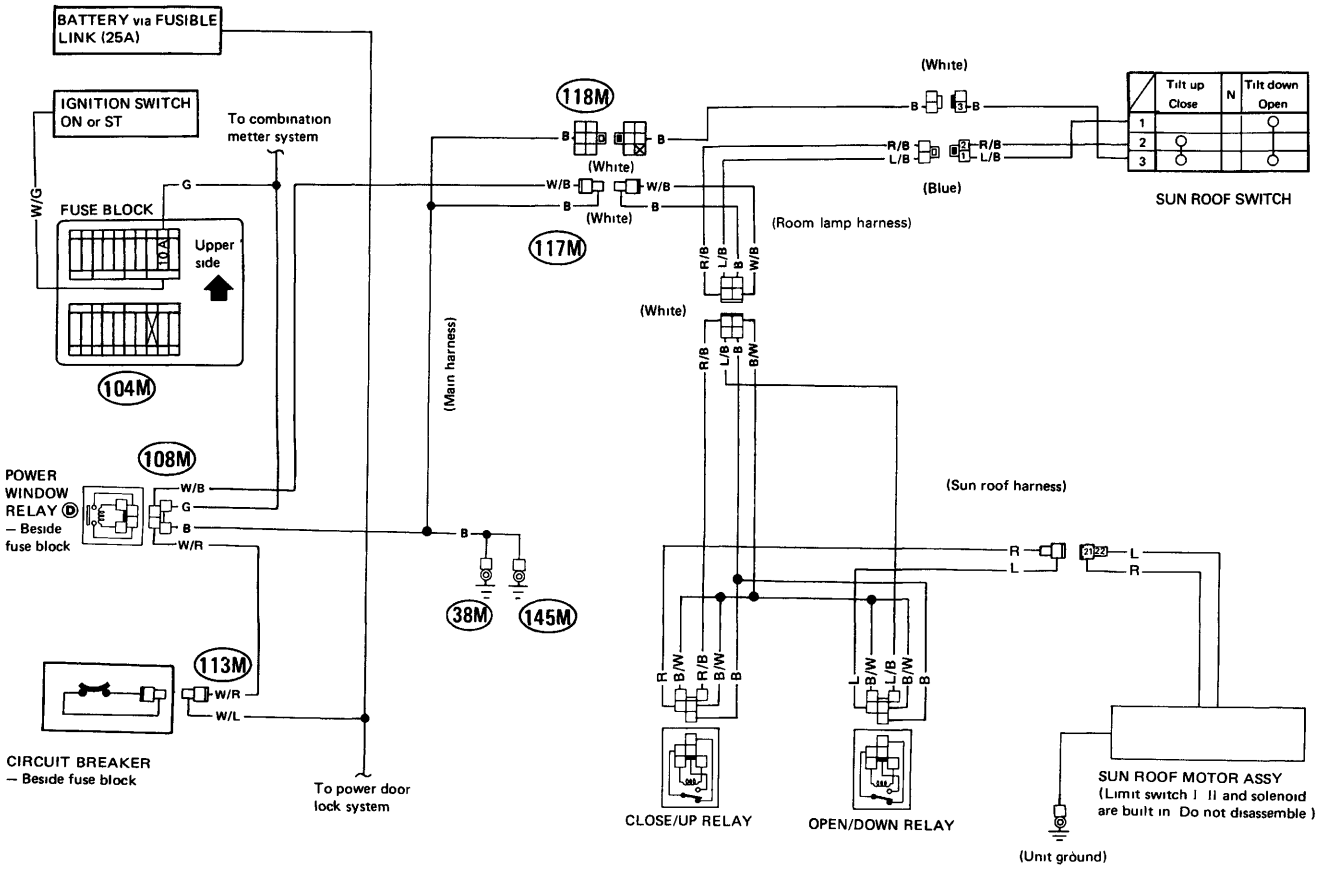
Link & wire adjustment (Fig. E)



When installing motor & limit SW. assembly, set motor & limit SW. assembly to fully closed condition using the vehicle's harness and SW. first. And adjust link & wire assembly's position as the roller line up at the marking. Then install the motor & limit SW. assembly.

SBF772D

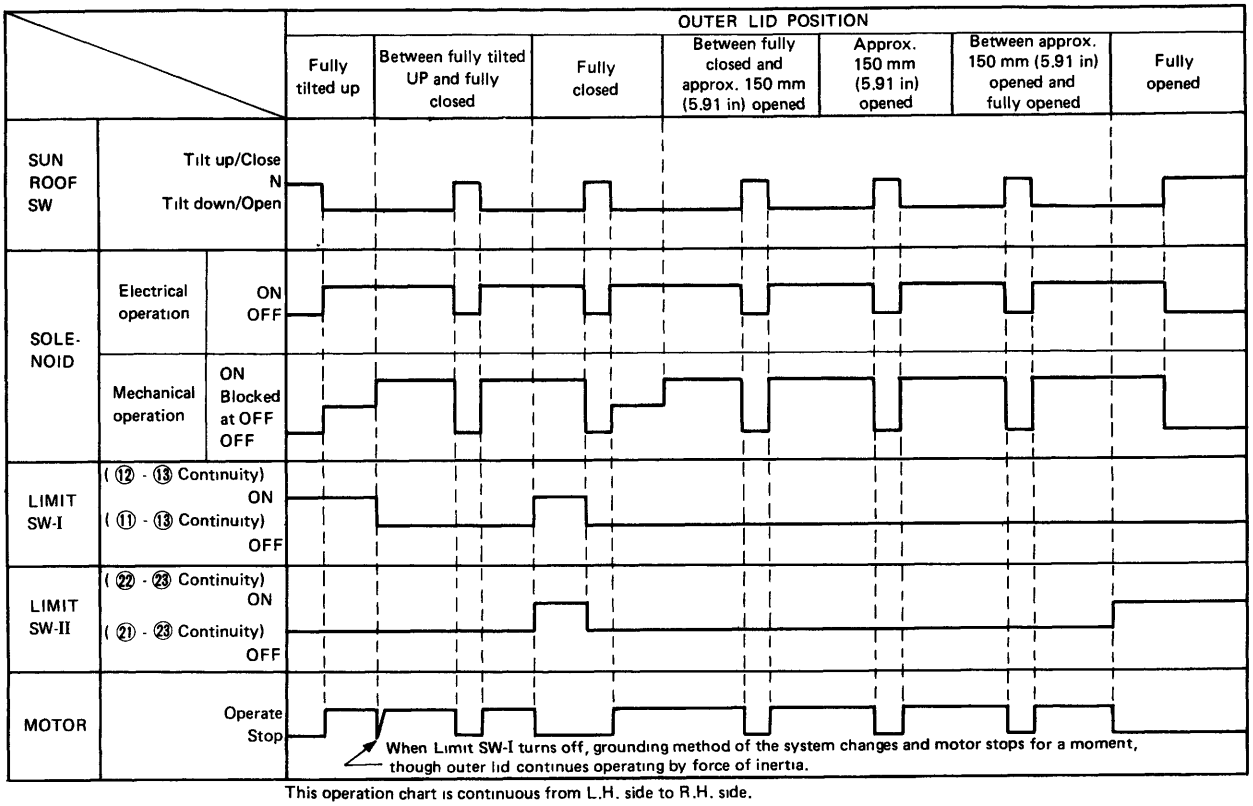
Electrical Circuit



SBF269E

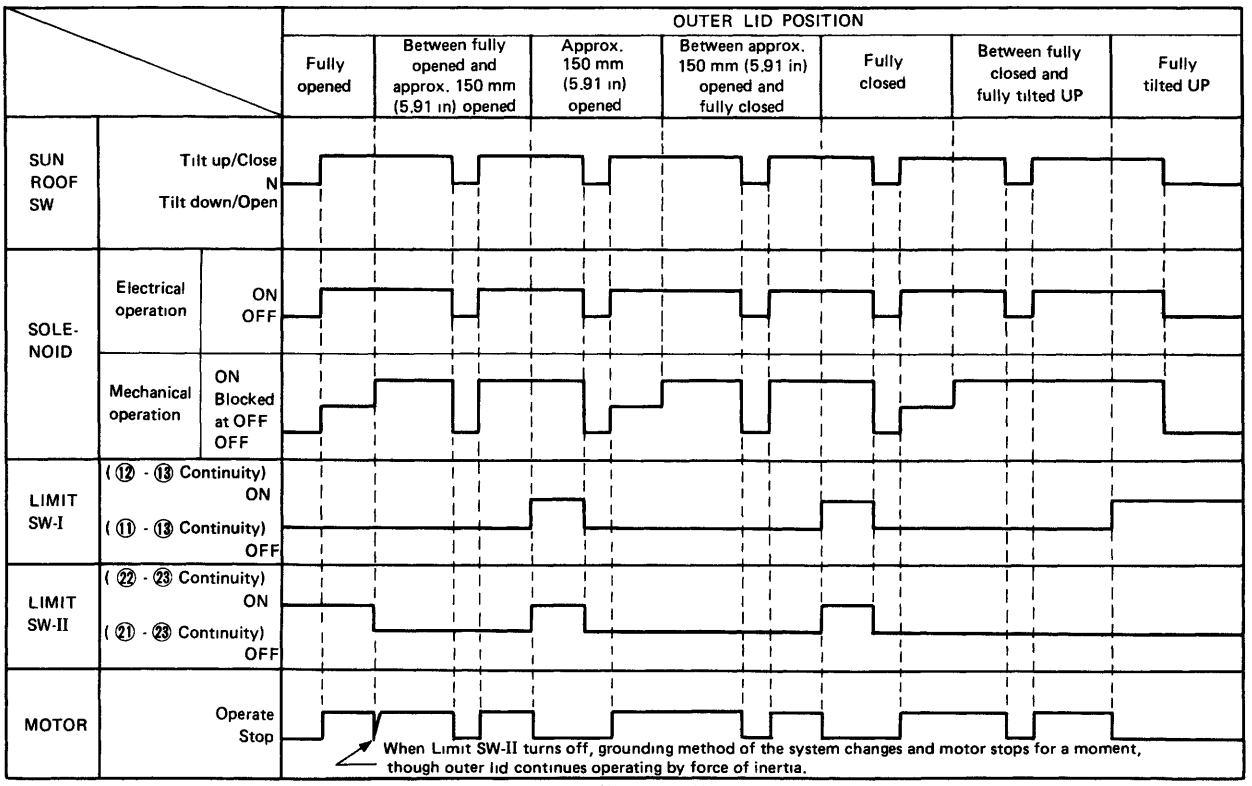
Sun Roof Operation

[Outer lid operating direction: Tilt down/Open]



This operation chart is continuous from L.H. side to R.H. side.

[Outer lid operating direction: Tilt up/Close]



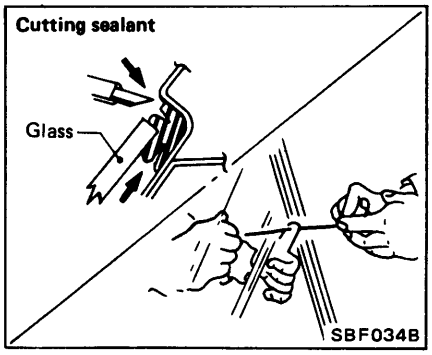
This operation chart is continuous from L.H. side to R.H. side.

SBF619C

Windshield and Rear Window

REMOVAL

After removing moldings, remove glass.



CAUTION:

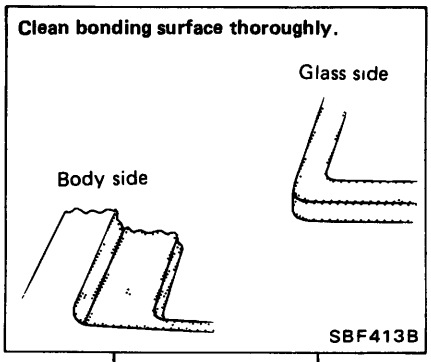
Be careful not to scratch glass when removing.

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, sealant should be stored in a refrigerator.**
- **Be sure to install moldings.**

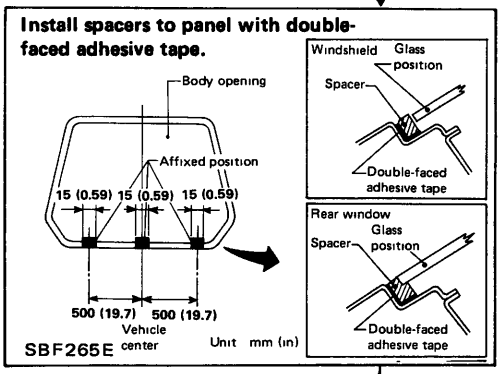
WARNING:

Keep heat or open flames away as Primers are flammable.



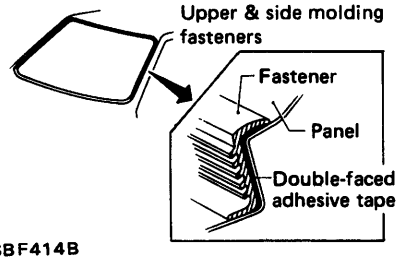
Body side

Install spacers to panel with double-faced adhesive tape.



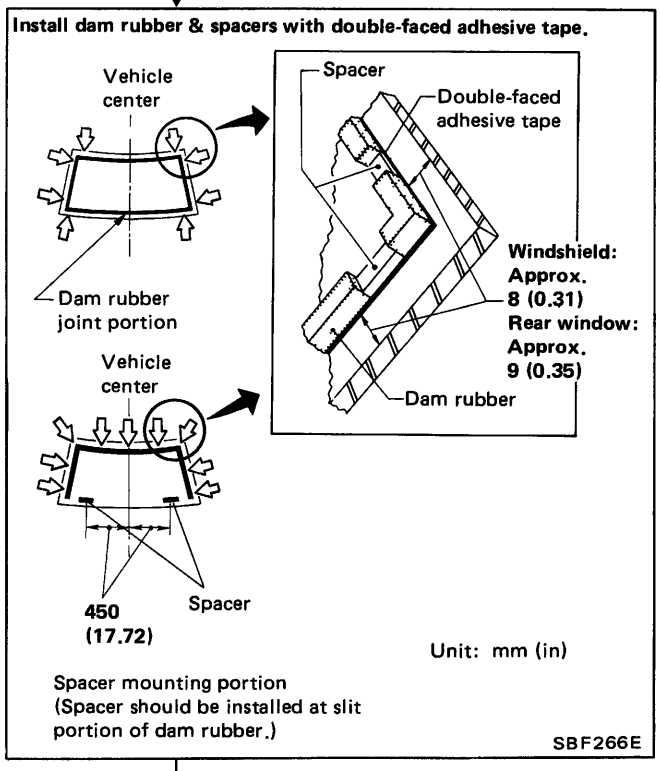
Install molding fastener.

When installing it, heat body panel and fastener to approx. 30 to 40°C (86 to 104°F)



Glass side

Install dam rubber & spacers with double-faced adhesive tape.

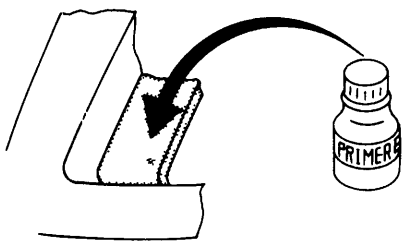


Ⓐ Ⓑ

Windshield and Rear Window (Cont'd)

Ⓐ

Apply primer E.

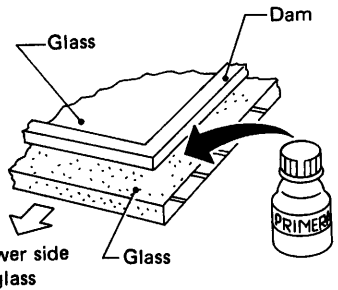


SBF038B

CAUTION:
Allow Primers to dry for 10 to 15 minutes before proceeding to the next step.

Ⓑ

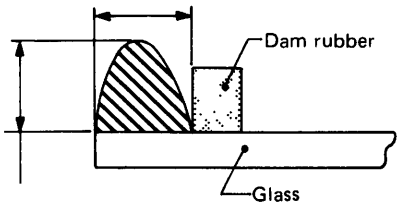
Apply primer A.



SBF719C

CAUTION:
Allow Primers to dry for 10 to 15 minutes before processing to the next step.

Apply sealant evenly.
Windshield: Approx. 8 (0.31)
Rear window: Approx. 9 (0.35)



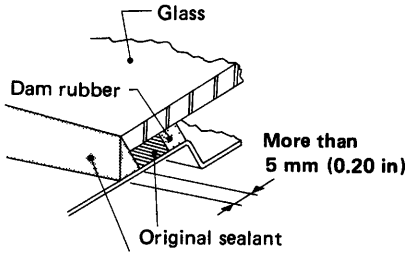
Windshield: More than 13 (0.51) Unit: mm (in)
Rear window: More than 10 (0.39) SBF961B

CAUTION:
Glass should be installed within 15 minutes of applying sealant: sealant starts to harden 15 minutes after it is applied.

Set glass in position and press glass lightly and evenly.

Windshield

Apply sealant additionally to lower portion of glass and make it uniform as shown below:



SBF720C

Rear window

Check for water leakage.

CAUTION:
For sealant drying time, refer to "Drying Time for Sealant".

Apply sealant to upper & side molding fixing portion.

Install moldings.
(For details, refer to "Exterior".)

CAUTION:
Molding must be installed securely so that it is in position and leaves no gap.

Drying Time for Sealant

- Below is time required for sealant to dry to desired hardness.

Unit: days

		Windshield			Rear window		
	Relative humidity %	90	50	25	90	50	25
Temperature °C (°F)	25 (77)	1.2	2.2	4.3	2.3	4.2	8.0
	5 (41)	2.7	7.2	11.5	5.1	13.7	21.9

CAUTION:

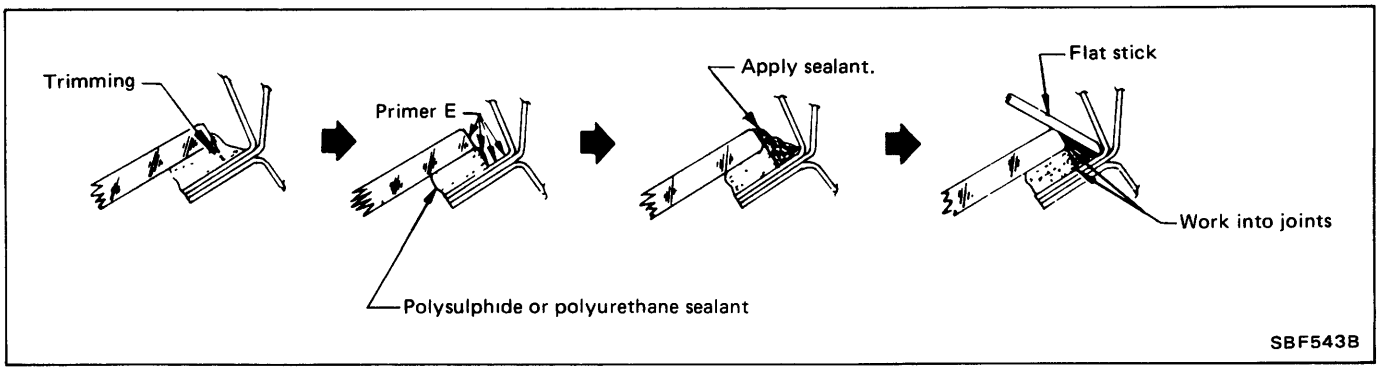
Advise the user of the fact that vehicle should not be driven on rough roads or surfaces until sealant has properly vulcanized.

Repairing Water Leak for Windshield and Rear Window

Leaks can be repaired without removing and reinstalling glass.

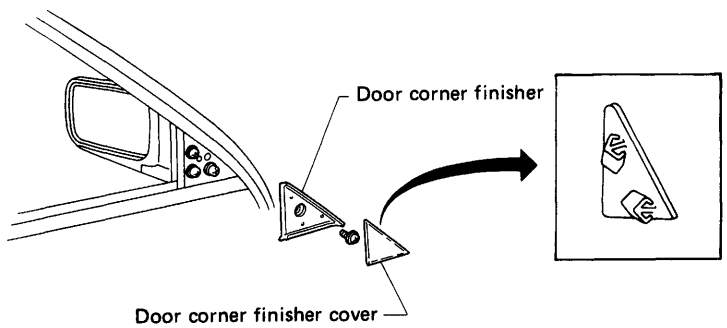
If water is leaking between caulking material and body or between glass and caulking material, determine the extent of the leak by applying water while pushing glass outward.

To stop the leak, apply primer and then sealant to the leak point.



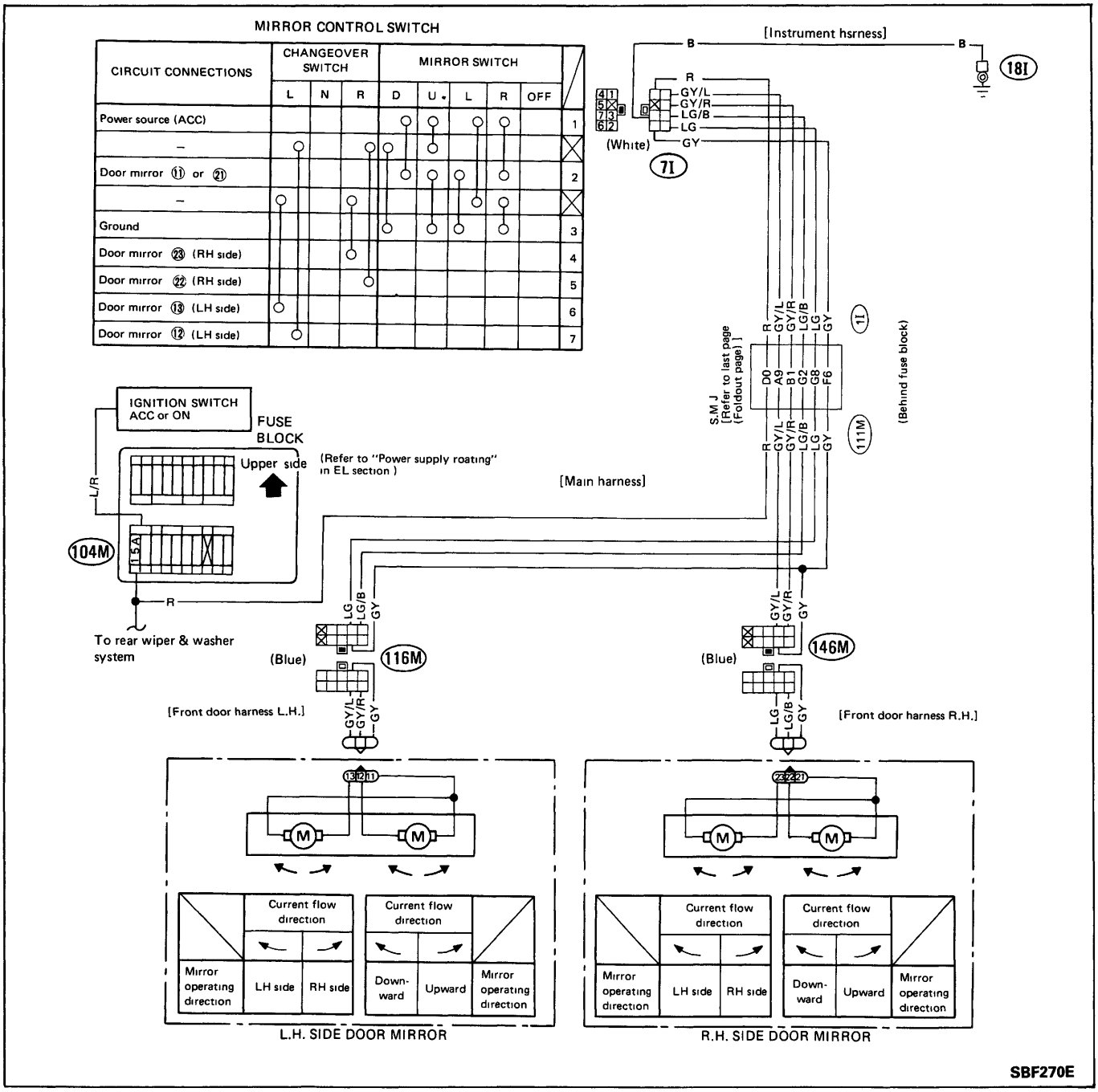
After this, install molding securely.

Door Mirror



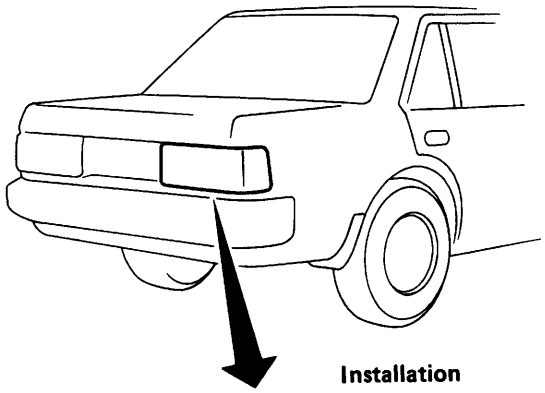
SBF809C

WIRING DIAGRAM

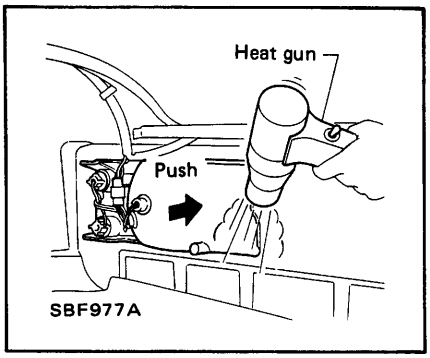


SBF270E

- Rear combination lamps are installed with nuts and butyl sealant.

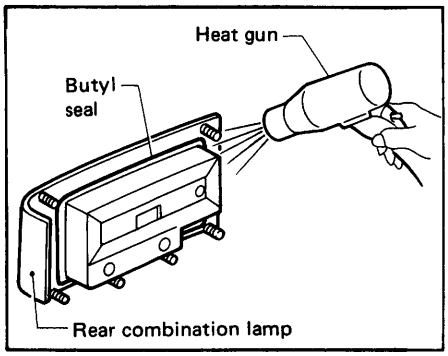


Removal



- **Warm up lamp assembly area to a temperature of a little below 60°C (140°F).**

Installation



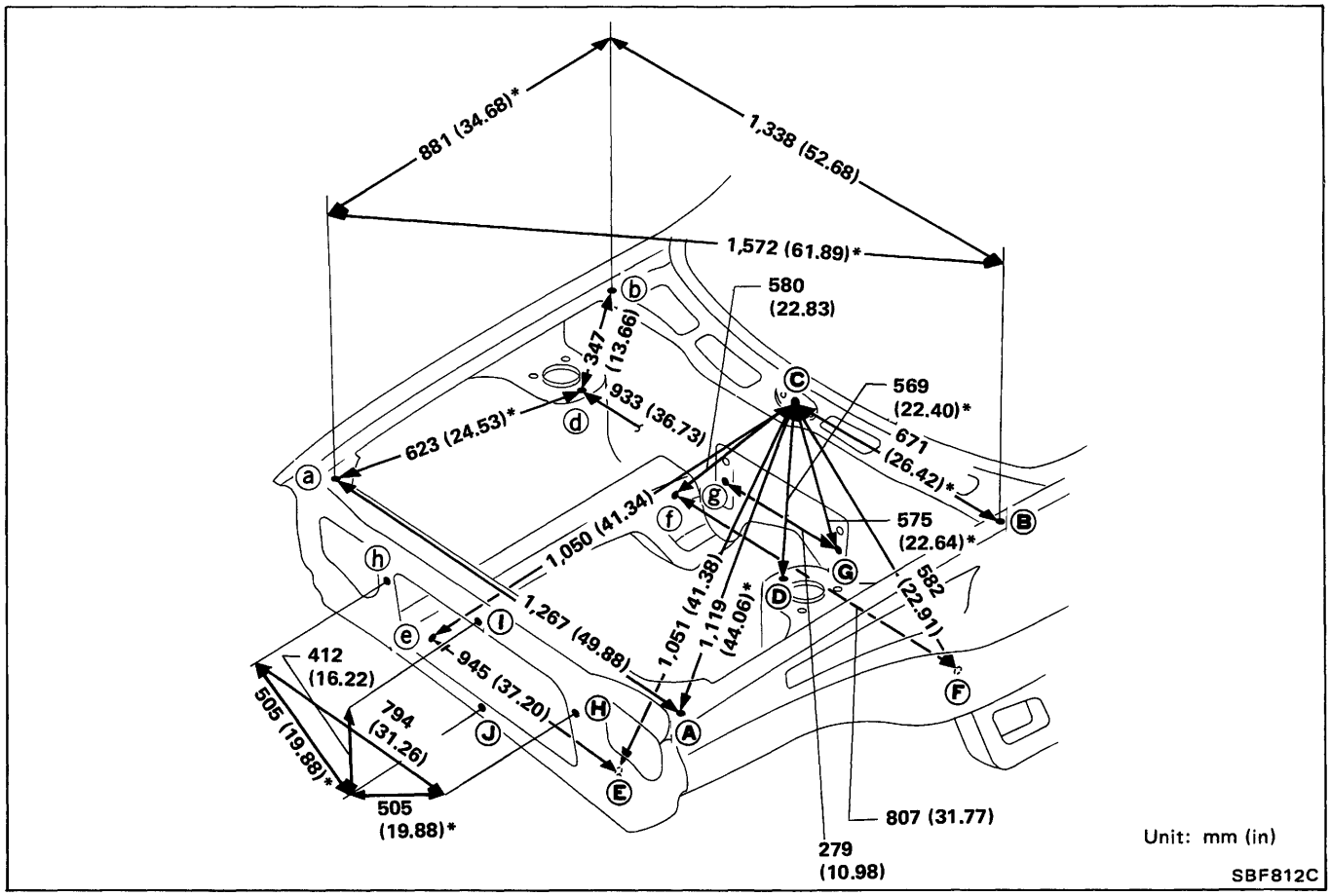
- **Apply butyl seal evenly as it tends to become thin in the corners.**
- **Warm up lamp assembly area to a temperature of a little below 60°C (140°F).**

SBF623C

- 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.
- Measurement points
  The coordinates of the measurement points are the distances measured from the respective dimension lines in the directions of "x", "y" and "z".
  Dimension lines: "x" line – Center line of vehicle
  "y" line – Center line of front axle (Any measurement point in front of the dimension line refers to a minus "–" value.)
  "z" line – Datum line (Any measurement point under the dimension line refers to a minus "–" value.)

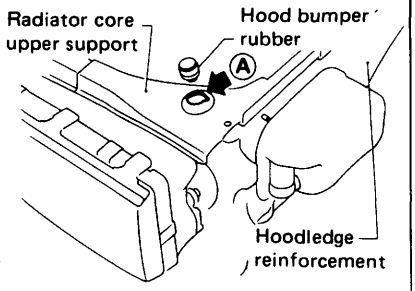
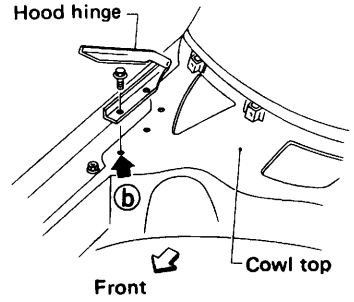
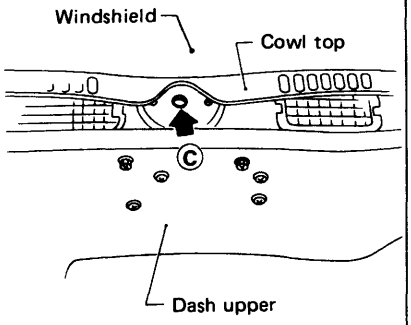
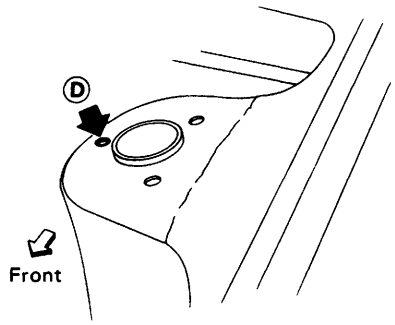
Engine Compartment

MEASUREMENT

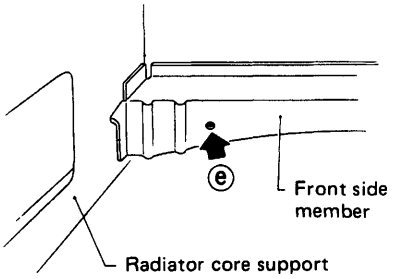
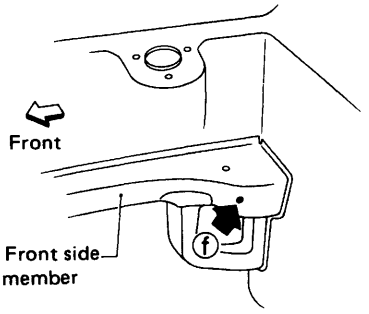
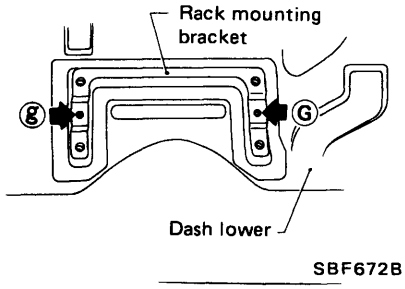
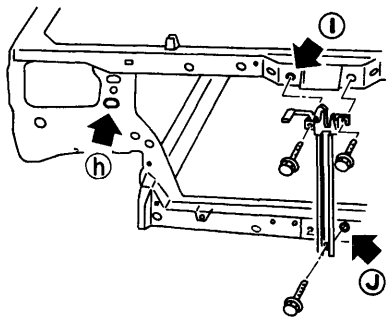


Engine Compartment (Cont'd)

MEASUREMENT POINTS

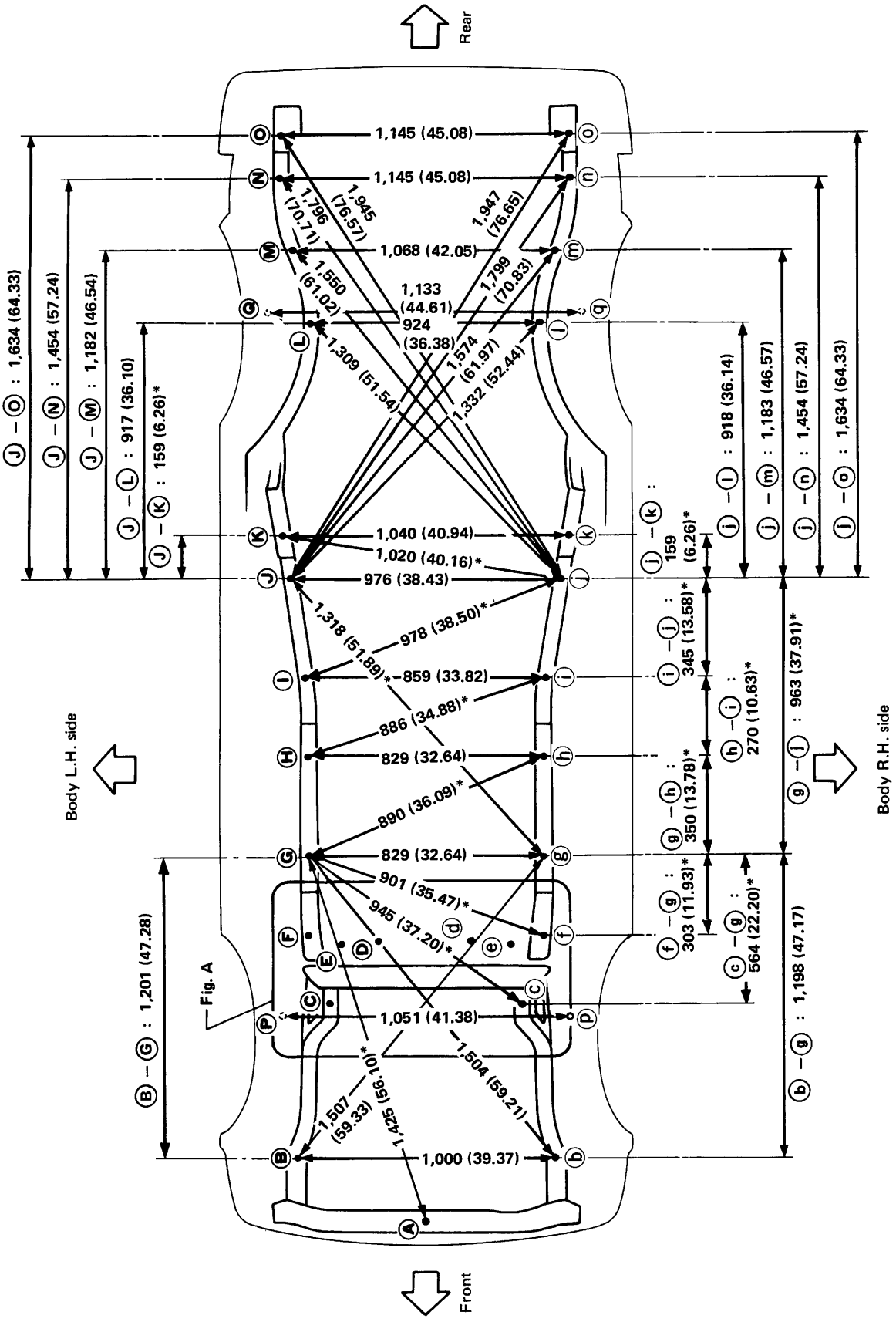
Points	Hole dia. mm (in)	Detailed points		Coordinates mm (in)		
				"x"	"y"	"Z"
Ⓐ ⓐ	16 (0.63)	 SBF666B	Hole for fixing hood bumper rubber at upper side of radiator core upper support	633.5 (24.94)	−575.7 (−22.67)	521.6 (20.54)
Ⓑ ⓑ	12 (0.47)	 SBF673B	Hole for hood hinge mounting (Front side hole)	669.0 (26.34)	300.0 (11.81)	610.4 (24.03)
Ⓒ	25 (0.98)	 SBF668B	Hole for windshield wiper pivot at vehicle center	0.0 (0.00)	339.9 (13.38)	638.0 (25.12)
Ⓓ ⓓ	12 (0.47)	 SBF669B	Hole for strut tower upper mounting	466.4 (18.36)	22.7 (0.894)	563.7 (22.19)

Engine Compartment (Cont'd)

Points	Hole dia. mm (in)	Detailed points		Coordinates mm (in)		
				"x"	"y"	"Z"
Ⓔ ⓔ	16 (0.63)	 SBF670B	Hole for locating at front side member front portion	R.H. side 479.5 (18.88) L.H. side 465.0 (18.31)	−500.0 (−19.69)	R.H. side 230.0 (9.06) L.H. side 210.0 (8.27)
Ⓕ ⓕ	16 (0.63)	 SBF671B	Hole for locating at front side member rear portion	R.H. side 402.1 (15.83) L.H. side 404.7 (15.93)	160.0 (6.30)	260.0 (10.24)
Ⓖ ⓖ	8 (0.31)	 SBF672B	Hole for locating at rack gear mountings bracket	139.5 (5.49)	199.4 (7.85)	97.8 (3.850)
Ⓗ ⓗ	6.5 x 12 (0.256 x 0.472)	 SBF815C	Hole for locating at radiator core side support	397.0 (15.63)	−629.0 (−24.76)	359.0 (14.13)
Ⓘ	11 (0.43)		Hole for hood lock mounting (R.H. side hole)	55.5 (2.185) [R.H. side]	−671.0 (−26.42)	463.0 (18.23)
Ⓙ	11 (0.43)		Hole for hood lock support lower mounting	0.0 (0.00)	−703.0 (−27.68)	56.0 (2.205)

Underbody

MEASUREMENT



Underbody (Cont'd)

All dimensions in this figure are actual ones. There are no projected dimensions.

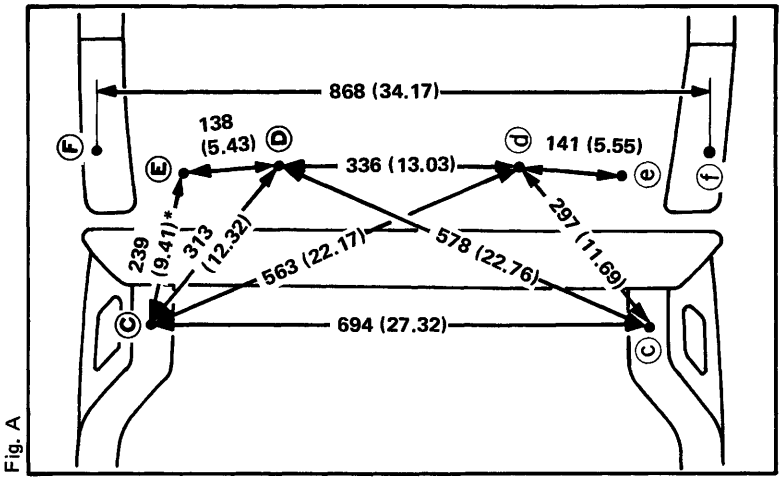


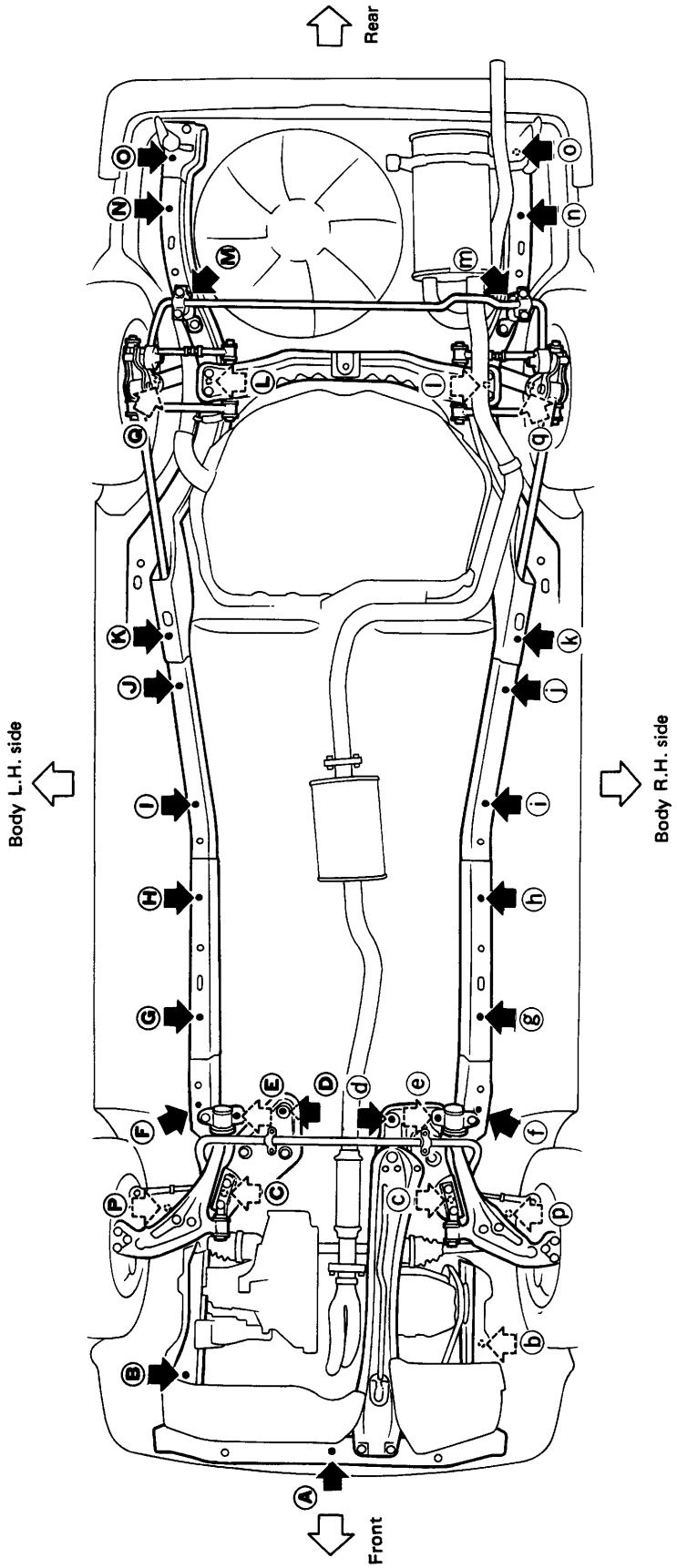
Fig. A

Unit: mm (in)

SBF814C

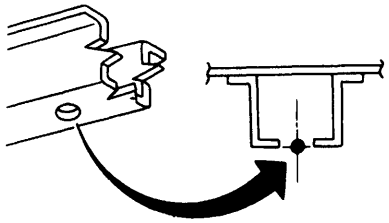
Underbody (Cont'd)

MEASUREMENT POINTS

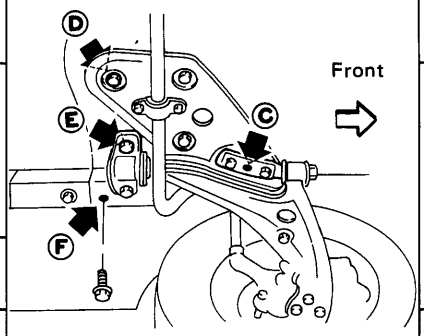
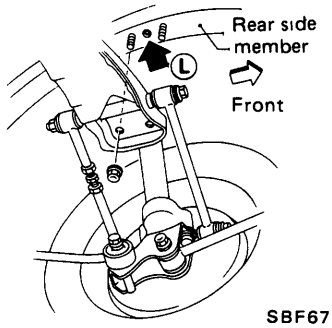
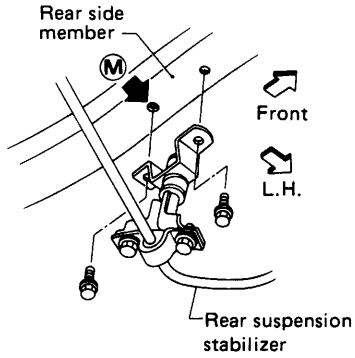
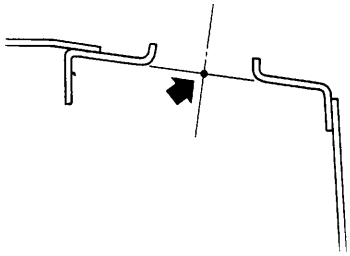


SBF813C

Underbody (Cont'd)

Points	Hole dia. mm (in)	Detailed points		Coordinates mm (in)		
				"x"	"y"	"z"
Ⓐ ⓐ	14 (0.55)	 SBF427B	Hole for locating at underside of radiator core lower support	0.0 (0.00)	−660.0 (−25.98)	17.6 (0.693)
Ⓑ ⓑ	16 (0.63)		Hole for locating at underside of front side member front portion	500.0 (19.69)	−470.0 (−18.50)	R.H. side 160.5 (6.32) L.H. side 177.8 (7.00)
Ⓖ ⓖ	14 (0.55)		Hole for locating at underside of front side member center extension front portion	414.5 (16.32)	700.0 (27.56)	−80.0 (−3.150)
Ⓗ ⓗ	14 (0.55)		Hole for locating at underside of front side member center extension rear portion	414.5 (16.32)	1,050.0 (41.34)	−80.0 (−3.150)
Ⓘ ⓘ	14 (0.55)		Hole for locating at underside of front side member rear extension front portion	429.4 (16.91)	1,320.0 (51.97)	−79.3 (−3.122)
Ⓙ ⓙ	14 (0.55)		Hole for locating at underside of front side member rear extension rear portion	488.0 (19.21)	1,660.0 (65.35)	−79.3 (−3.122)
Ⓚ ⓚ	12 (0.47)		Hole for locating at rear suspension front mounting bracket	519.9 (20.47)	1,816.0 (71.50)	−80.7 (−3.177)
Ⓝ ⓝ	14 (0.55)		Hole for locating at underside of rear side member rear end	R.H. side 575.0 (22.64) L.H. side 570.0 (22.44)	3,100.0 (122.05)	104.0 (4.09)
Ⓞ ⓞ	14 (0.55)		Hole for locating at underside of rear side member extension front portion	R.H. side 575.0 (22.64) L.H. side 570.0 (22.44)	3,280.2 (129.14)	114.6 (4.51)

Underbody (Cont'd)

Points	Hole dia. mm (in)	Detailed points		Coordinates mm (in)		
				"x"	"y"	"z"
Ⓒ ⓒ	15 (0.59)	 SBF816C	Hole for locating at underside of front suspension mounting member	347.0 (13.66)	142.0 (5.59)	−35.4 (−1.394)
Ⓓ ⓓ	17 (0.67)		Hole for mounting front suspension transverse link at underside of dash lower cross member	L.H. side 170.0 (6.69) R.H. side 165.0 (6.50)	L.H. side 400.0 (15.75) R.H. side 376.0 (14.80)	−19.9 (−0.783)
Ⓔ ⓔ	17 (0.67)			306.0 (12.05)	376.5 (14.82)	−19.9 (−0.783)
Ⓕ ⓕ	12 (0.47)		Hole for plugging bolt at underside of front side member extension	434.0 (17.09)	401.0 (15.79)	−38.2 (−1.504)
Ⓛ ⓛ	16 (0.63)	 SBF675B	Hole for locating at behind rear suspension member	R.H. side 477.0 (18.78) L.H. side 447.0 (17.60)	2,555.0 (100.59)	R.H. side 124.0 (4.88) L.H. side 114.0 (4.49)
Ⓜ ⓜ	15 (0.59)	 SBF676B	Hole for mounting rear suspension stabilizer	R.H. side 552.2 (21.74) L.H. side 516.2 (20.32)	2,826.5 (111.28)	R.H. side 109.9 (4.33) L.H. side 106.9 (4.21)
Ⓟ ⓟ	89 (3.50)	 SBF119C	Front suspension upper mounting	525.5 (20.69)	22.6 (0.890)	574.2 (22.61)
Ⓠ ⓠ	86 (3.39)		Rear suspension upper mounting	566.7 (22.31)	2,598.6 (102.31)	613.1 (24.14)

HEATER & AIR CONDITIONER

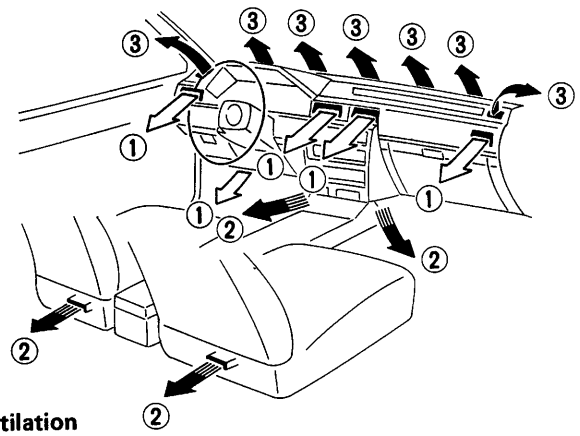
SECTION HA

CONTENTS

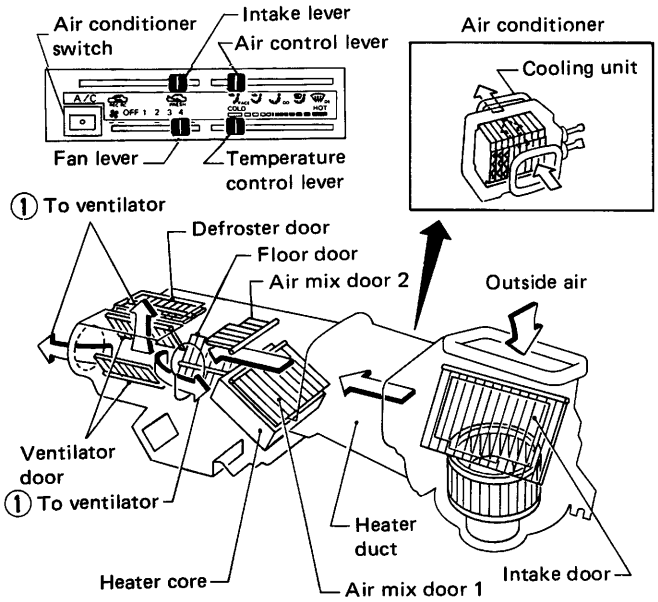
AIR FLOW AND COMPONENT LAYOUT ..... HA- 2
DOOR CONTROL ..... HA- 4
HEATER ELECTRICAL CIRCUIT ..... HA- 6
PRECAUTIONS ..... HA- 7
PRECAUTIONS FOR REFRIGERANT CONNECTION ..... HA- 8
PREPARATION ..... HA- 9
DISCHARGING, EVACUATING, CHARGING AND CHECKING HA-11
PIPING, COMPRESSOR MOUNTING AND F.I.C.D. HA-17
DESCRIPTION OF AIR CONDITIONER HA-20
A/C PERFORMANCE TEST HA-21
COMPRESSOR OIL – For NVR 140S (ATSUGI make) HA-23
COMPRESSOR – Model NVR 140S (ATSUGI make) HA-25
A/C ELECTRICAL CIRCUIT HA-29
A/C ELECTRICAL COMPONENTS HA-31
A/C COMPONENT LAYOUT HA-32
SERVICE DATA AND SPECIFICATIONS (S.D.S.) HA-33

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

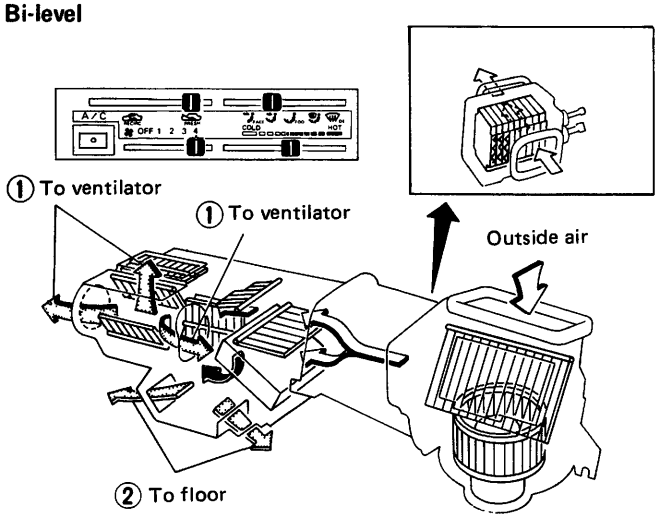
Air Flow



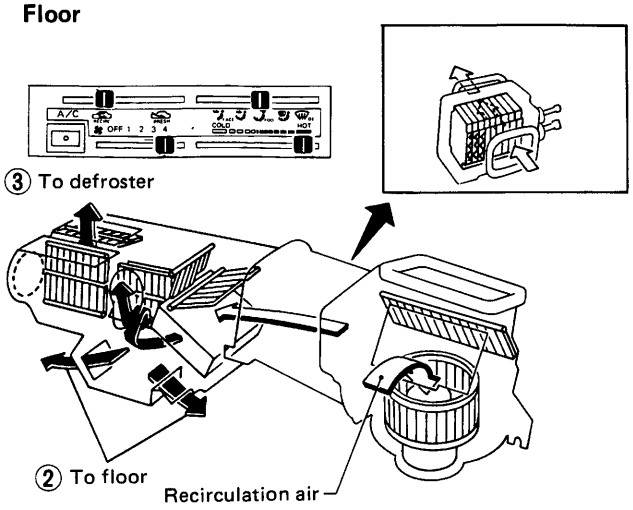
Ventilation



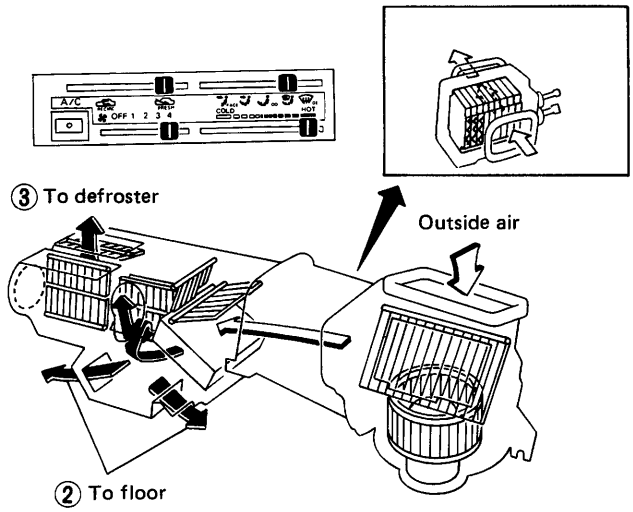
Bi-level



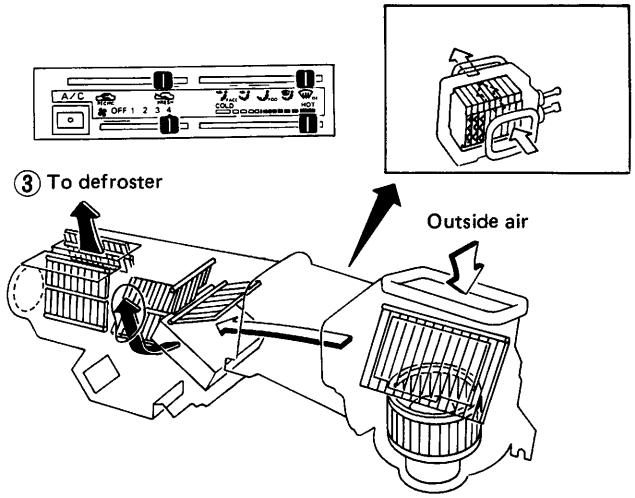
Floor



Floor and defroster



Defroster



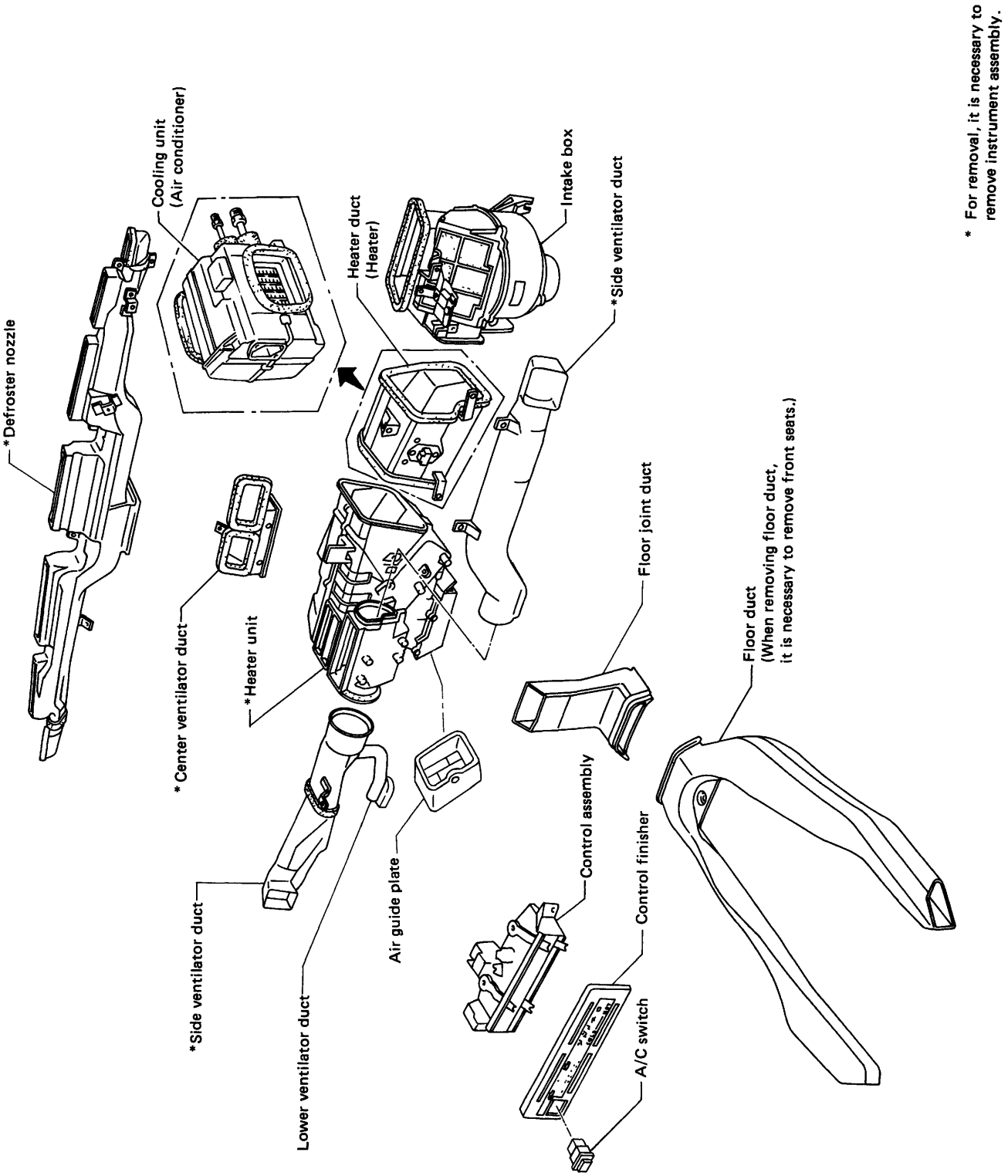
: Air passed through heater core

: Air not passed through heater core

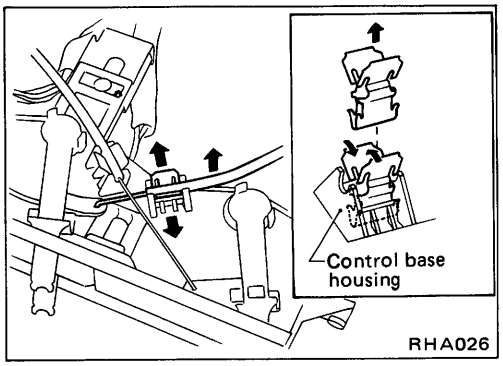
: Mixed air (+)

RHA996

Component Layout

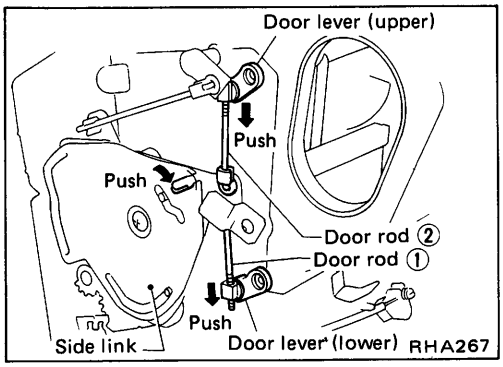


RHA990



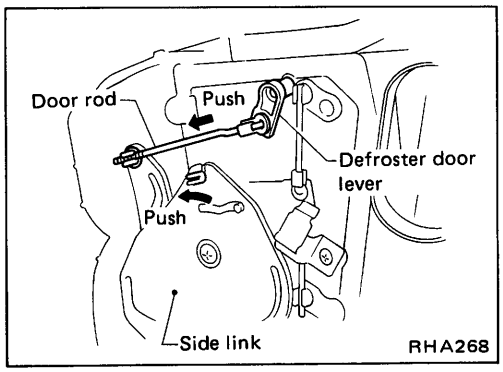
Control Cable and Rod Adjustment

- Expand control cable clip with both hands and then remove control cable from cable clip.
- Compress cable clip with both hands and then remove it from control base housing.
- Butt clip against the bottom of control base housing.
- When adjusting ventilator door rod and defroster door rod, first disconnect air control cable from side link. Reconnect and readjust air control cable.



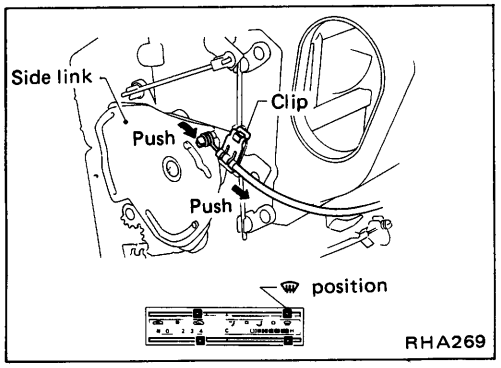
VENTILATOR DOOR CONTROL ROD

1. Move side link in direction of arrow.
2. With upper and lower ventilator door levers held in the direction of the arrow, connect rods ① and ② to their corresponding ventilator door levers in that order.



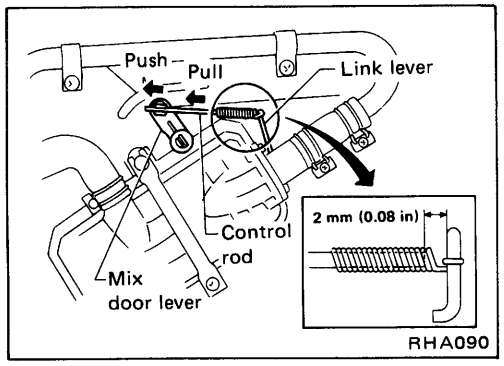
DEFROSTER DOOR CONTROL ROD

1. Move side link in direction of arrow.
2. Connect rod to side link while pushing defroster door lever in direction of arrow.



AIR CONTROL CABLE

- Clamp the cable while pushing cable outer and side link in direction of arrow.

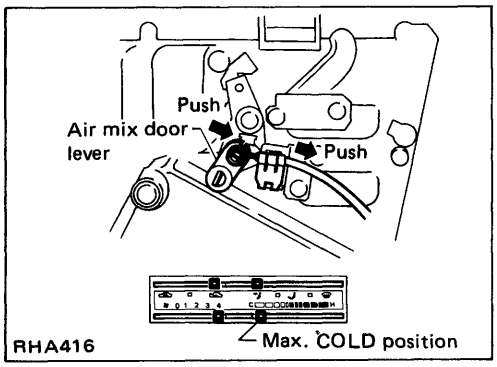


WATER COCK CONTROL ROD

- **When adjusting water cock control rod, first disconnect temperature control cable from air mix door lever and then adjust control rod. Reconnect temperature control cable and readjust it.**

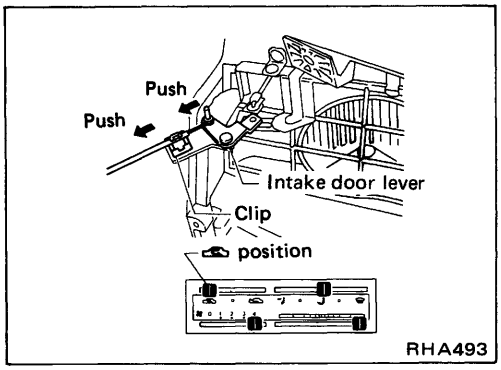
1. Push air mix door lever in direction of arrow.
2. Pull control rod of water cock in direction of arrow so as to make clearance of about 2 mm (0.08 in) between ends of rod and link lever and connect the rod to door lever.

Control Cable and Rod Adjustment (Cont'd)



TEMP CONTROL CABLE

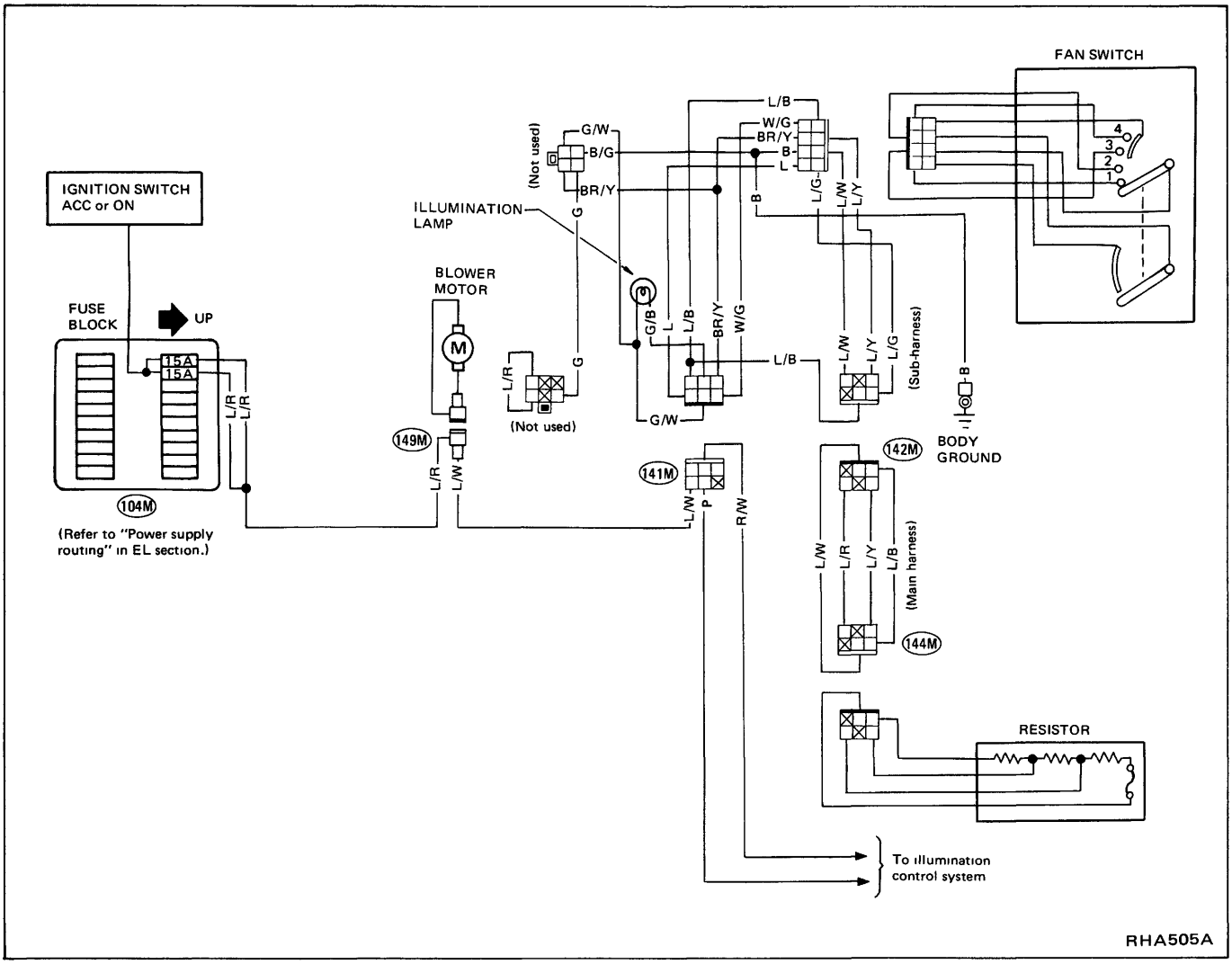
- Clamp the cable while pushing cable outer and air mix door lever in direction of arrow.



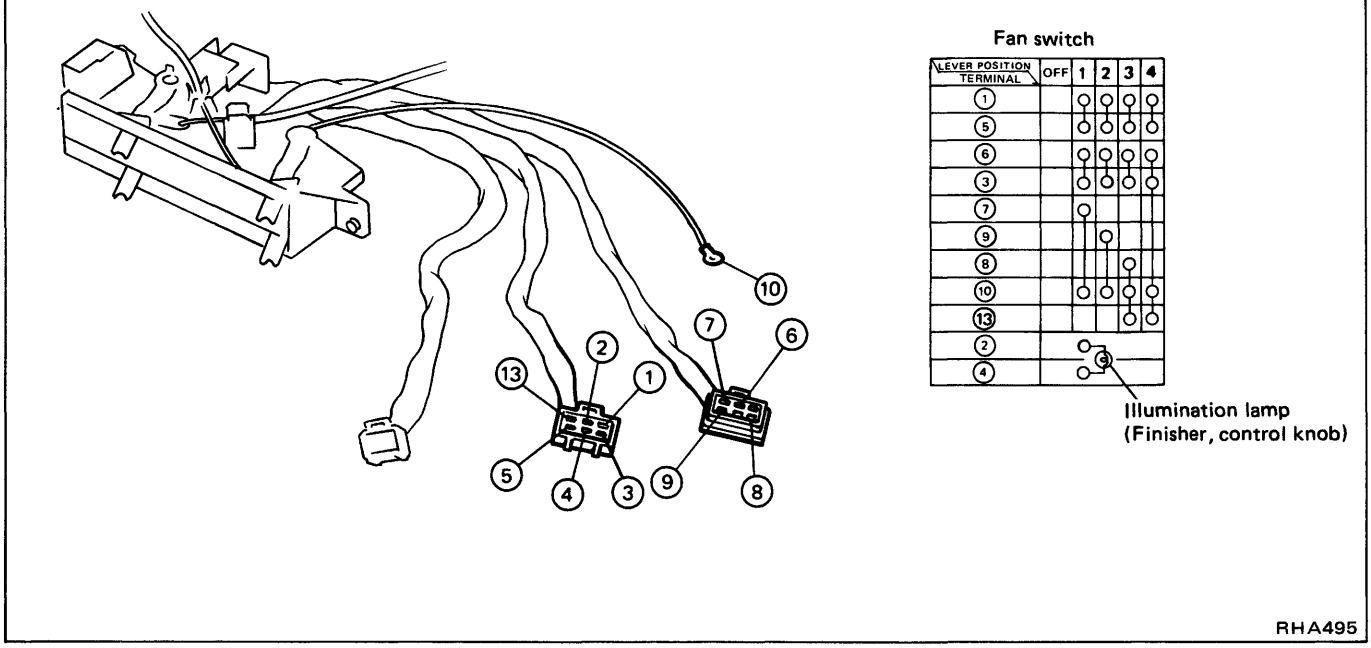
INTAKE DOOR CONTROL CABLE

- Clamp the cable while pushing cable outer and intake door lever in direction of arrow.

Wiring Diagram



Fan Switch Check

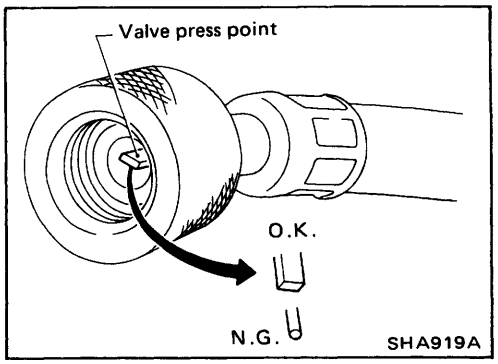


WARNING:

- **Always wear eye protection when working around the system.**
- **Always be careful that refrigerant does not come in contact with your skin.**
- **Keep refrigerant containers stored below 40°C (104°F) and never drop from high places.**
- **Work in well-ventilated area because refrigerant gas evaporates quickly and breathing may become difficult due to the lack of oxygen.**
- **Keep refrigerant away from open flames because poisonous gas will be produced if it burns.**
- **Do not increase can temperature beyond 40°C (104°F) in charging.**
- **Do not heat refrigerant can with an open flame. There is a danger that can will explode.**

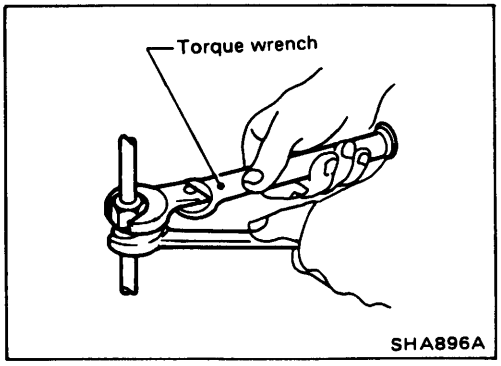
CAUTION:

- **Do not use steam to clean surface of condenser or evaporator. Be sure to use cold water or compressed air.**
- **Compressed air must never be used to clean a dirty line. Clean with refrigerant gas.**



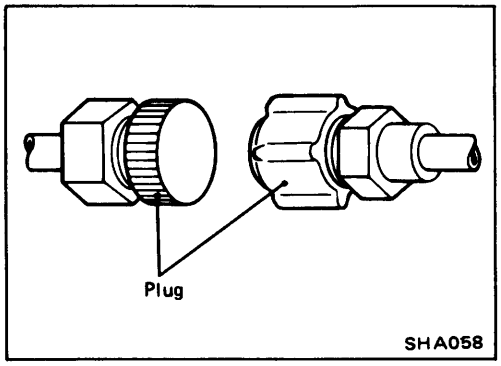
- **Do not use manifold gauge whose press point shape is different from that shown. Otherwise, insufficient evacuating may occur.**

- **Do not over-tighten service valve cap.**
- **Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.**

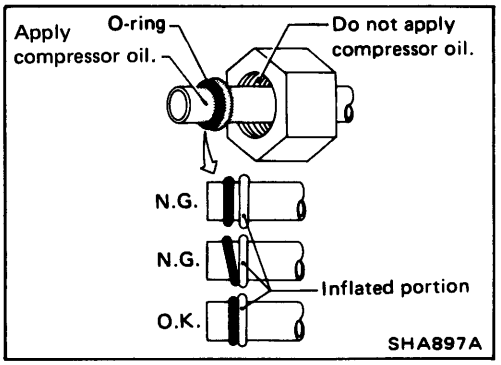


WARNING:
Gradually loosen discharge side hose fitting, and remove it after remaining pressure has been released.
CAUTION:
When replacing or cleaning refrigerant cycle components, observe the following.

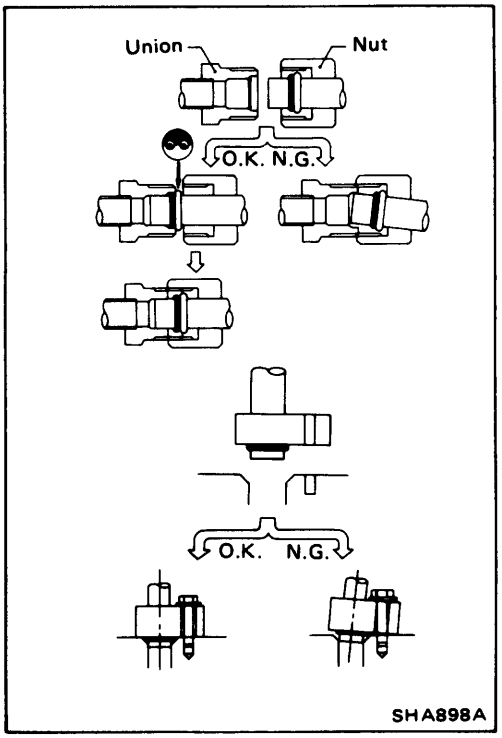
- **Do not leave compressor on its side or upside down for more than 10 minutes, as compressor oil will enter low pressure chamber.**
- **When connecting tubes, always use a torque wrench.**



- **After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.**

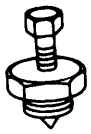
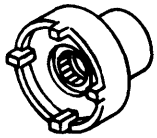


- **Always replace used O-rings.**
- **When connecting tube, apply compressor oil to portions shown in illustration. Be careful not to apply oil to threaded portion.**
- **O-ring must be closely attached to inflated portion of tube.**

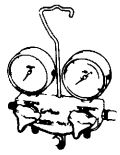
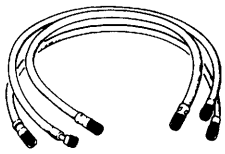
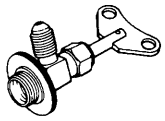
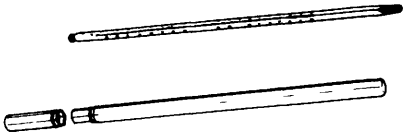
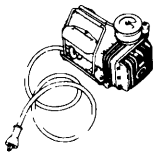


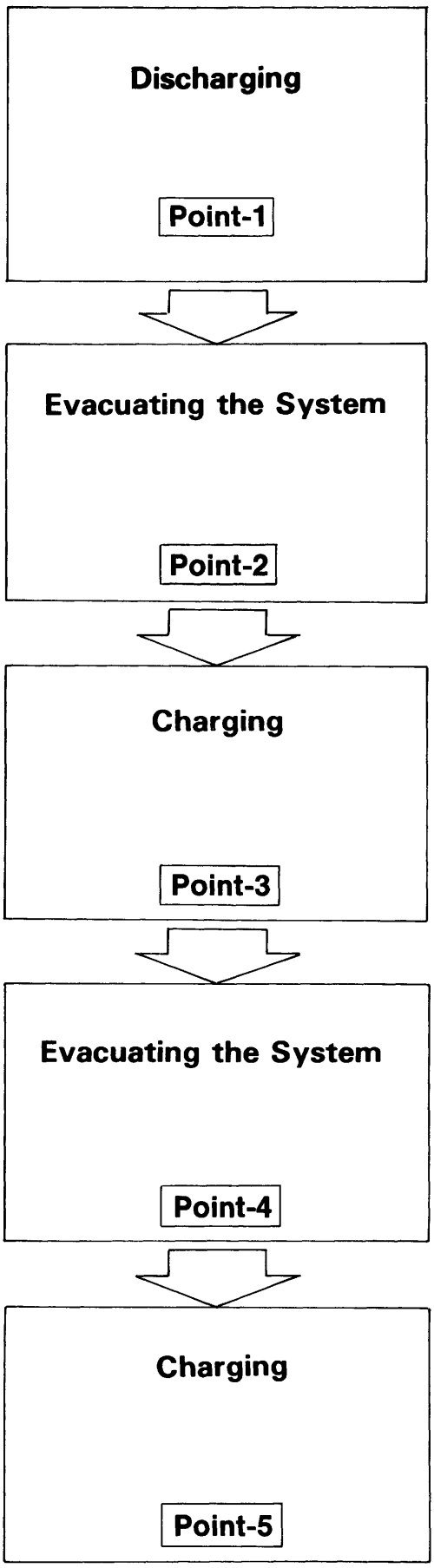
- **After inserting tube into union until O-ring is no longer visible, tighten nut to specified torque.**
- **After connecting line, conduct leak test and make sure that there is no leakage from connections. When the gas leaking point is found, disconnect that line and replace the O-ring. Then tighten connections of seal seat to the specified torque.**

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description	
KV998VR001 (–) Clutch disc puller		Removing clutch disc
KV99231010 (–) Clutch disc wrench		Removing shaft nut and clutch disc
KV99235160 (J29751) Nut wrench		Removing lock nut

SERVICE TOOLS

Tool name	Description	
Manifold gauge		Discharging and charging refrigerant into system
Charging hose		Discharging, evacuating and charging refrigerant into system
Charge valve		Discharging and charging refrigerant into system
Thermometer		Checking temperature
Vacuum pump		Evacuating refrigerant system
Electric leak-detector	**Nominal sensitivity:** **15 - 25 g (0.53 - 0.88 oz)/year** 	Checking refrigerant leaks



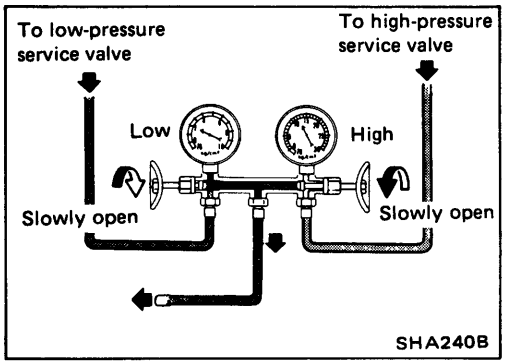
Discharge refrigerant system.

Run pump for 5 minutes.

Charge refrigerant into system.
When low-pressure gauge reading is 98 kPa (1.0 kg/cm^2, 14 psi), completely close high-pressure valve of manifold gauge and stop charging.

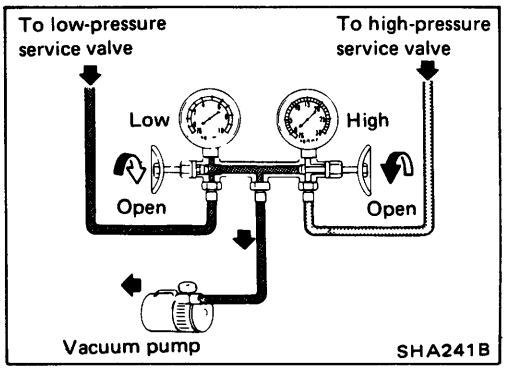
Run pump for 20 minutes.

Charge the specified amount of refrigerant into system.



Discharging—Point-1

Slowly open the valves to discharge only refrigerant. If they are opened quickly, compressor oil will also be discharged.



Evacuating the System—Point-2

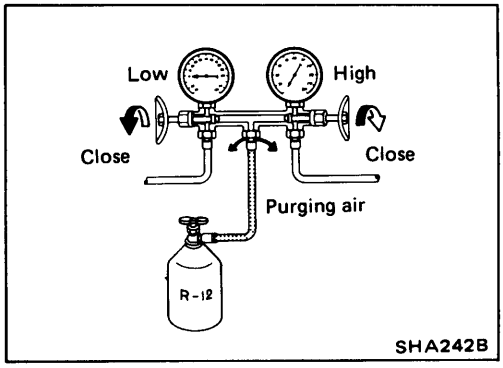
1. Start pump, then open both valves and run pump for about 5 minutes.
2. When low gauge has reached approx. 101.3 kPa (760 mmHg, 29.92 inHg), completely close both valves of gauge and stop vacuum pump. Let it stand for 5 to 10 minutes in this state and confirm that the reading does not rise.

a. The low-pressure gauge reads lower by 3.3 kPa (25 mmHg, 0.98 inHg) per 300 m (1,000 ft) elevation. Perform evacuation according to the following table.

b. The rate of ascension of the low-pressure gauge should be less than 3.3 kPa (25 mmHg, 0.98 inHg) in 5 minutes.

Elevation m (ft)	Vacuum of system* kPa (mmHg, inHg)
0 (0)	101.3 (760, 29.92)
300 (1,000)	98.0 (735, 28.94)
600 (2,000)	94.6 (710, 27.95)
900 (3,000)	91.3 (685, 26.97)

*: Values show reading of the low-pressure gauge.

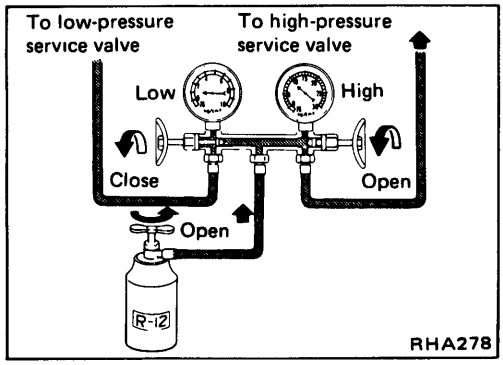


Charging—Point-3

1. Evacuate refrigerant system.

Refer to "Point-2".

2. Close manifold gauge valves securely and disconnect charging hose from vacuum pump.
3. Purge air from center charging hose.
   1) Connect center charging hose to refrigerant can through charge valve.
   2) Break seal of refrigerant can and purge air.

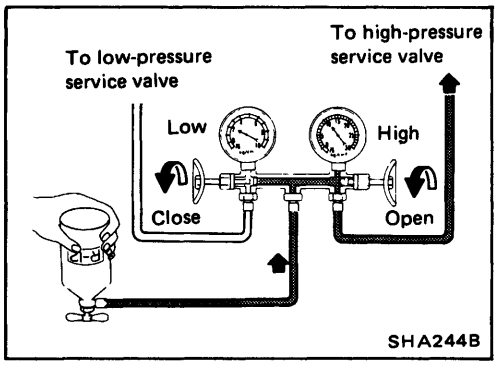


4. Charge refrigerant into system.

WARNING:

Ensure that engine is off.

   1) Open high-pressure valve of manifold gauge and charge refrigerant into system.

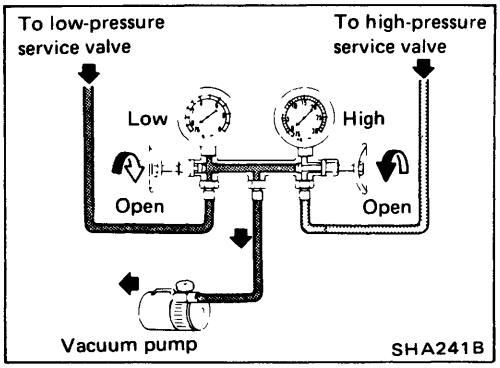


Charging—Point-3 (Cont'd)

CAUTION:

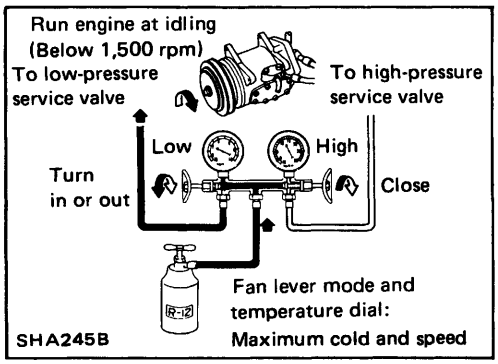
If charging liquefied refrigerant into system with the can turned upside down to reduce charging time, charge it only through high-pressure (discharge) service valve. After charging, the compressor should always be turned several times manually.

2) When low-pressure gauge reading is 98 kPa (1.0 kg/cm^2, 14 psi), completely close high-pressure valve of manifold gauge and stop charging.



Evacuating the System—Point-4

1. Close manifold gauge valve securely and disconnect charging hose from refrigerant can.
2. Connect center charging hose to vacuum pump.
3. Start pump, then open both valves and run pump for about 20 minutes.



Charging—Point-5

1. Charge refrigerant into system.

Refer to " Point-3 ".

WARNING:

Ensure that engine is off.

1) Open low-pressure valve of manifold gauge and charge refrigerant into system.
2) When refrigerant charging speed slows down, close high-pressure valve of manifold gauge and open low-pressure valve of manifold gauge and charge refrigerant while running the compressor for ease of charging.
3) Start engine — Air conditioning system ON, maximum temperature set, maximum blower speed. Open low-pressure valve on gauge set, with can in upright position, and monitor sight glass. Charge is complete when sight glass is clear.

Charging—Point-5 (Cont'd)

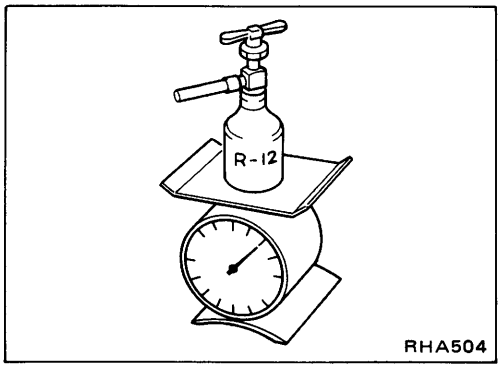
Cycling clutch systems will produce bubbles in sight glass when clutch engages. Therefore, allow 5 seconds after clutch engages to determine if bubbles continue, and, if so, add refrigerant to clear sight glass.

WARNING:

Never charge refrigerant through high-pressure side (discharge side) of system since this will force refrigerant back into refrigerant can and can may explode.

4. Charge refrigerant while controlling low-pressure gauge reading at 275 kPa (2.8 kg/cm^2, 40 psi) or less by turning in or out low-pressure valve of manifold gauge.

- **Be sure to purge air from charging hose when replacing can with a new one.**



5. Charge the specified amount of refrigerant into system by weighing charged refrigerant with scale. Overcharging will cause discharge pressure to rise.

   Refrigerant amount:

   0.9 - 1.1 kg (2.0 - 2.4 lb)

The state of the bubbles in sight glass should only be used for checking whether the amount of charged refrigerant is small or not. The amount of charged refrigerant can be correctly judged by means of discharge pressure.

6. After charging, be sure to install valve cap on service valve.
7. Confirm that there are no leaks in system by checking with a leak detector.

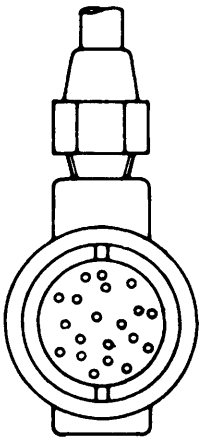
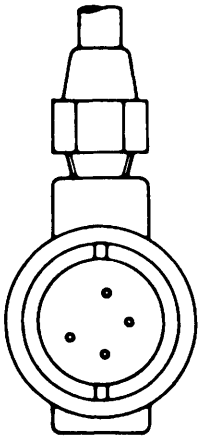
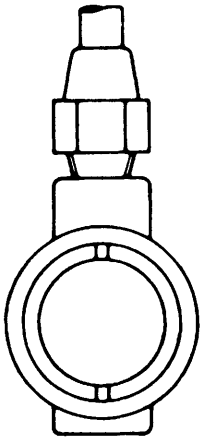
- When refrigerant charging is performed with a charging cylinder, charging station, or automatic charging equipment, engine off, charge only through high side, after specified refrigerant amount has entered the system, close high pressure valve on gauge set. Start engine return to idle speed, operate A/C at maximum temperature setting, high blower. Observe sight glass to confirm complete charge.

Overcharging will result in increased high pressures, and reduced performance.

Checking Refrigerant Level

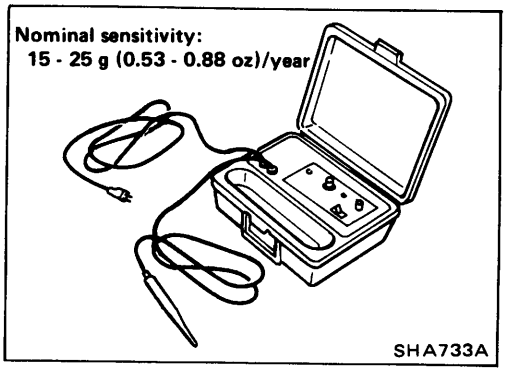
CONDITION

- Door window: Open
- A/C switch: ON
- TEMP. lever position: Max. COLD
- FAN lever position: 4
- Check sight glass after a lapse of about five minutes.

Amount of refrigerant / Check item	Almost no refrigerant	Insufficient	Suitable	Too much refrigerant
Temperature of high-pressure and low-pressure lines.	Almost no difference between high-pressure and low-pressure side temperature.	High-pressure side is warm and low-pressure side is fairly cold.	High-pressure side is hot and low-pressure side is cold.	High-pressure side is abnormally hot.
State in sight glass.	Bubbles flow continuously. Bubbles will disappear and something like mist will flow when refrigerant is nearly gone.	The bubbles are seen at intervals of 1 - 2 seconds.	Almost transparent. Bubbles may appear when engine speed is raised and lowered.	No bubbles can be seen.
			No clear difference exists between these two conditions.	
	 AC256	 AC257	 AC258	
Pressure of system.	High-pressure side is abnormally low.	Both pressures on high and low-pressure sides are slightly low.	Both pressures on high and low-pressure sides are normal.	Both pressures on high and low-pressure sides are abnormally high.
Repair.	Stop compressor immediately and conduct an overall check.	Check for gas leakage, repair as required, replenish and charge system.		Discharge refrigerant from service valve of low pressure side.

a. The bubbles seen through the sight glass are influenced by the ambient temperature. Since the bubbles are hard to show up in comparatively low temperatures below 20°C (68°F), it is possible that a slightly larger amount of refrigerant would be filled, if supplied according to the sight glass. Recheck the amount when it exceeds 20°C (68°F). In higher temperature the bubbles are easy to show up.

b. When the screen in the receiver drier is clogged, the bubbles will appear even if the amount or refrigerant is normal. In this case, the outlet side pipe of the receiver drier becomes considerably cold.

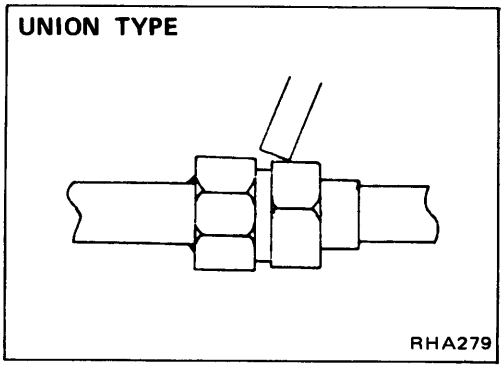


Checking Refrigerant Leaks

ELECTRIC LEAK DETECTOR

The leak detector is a delicate device that detects small amounts of halogen.

To use the device properly, read the manufacturer's manuals. Also perform the specified maintenance and inspections.

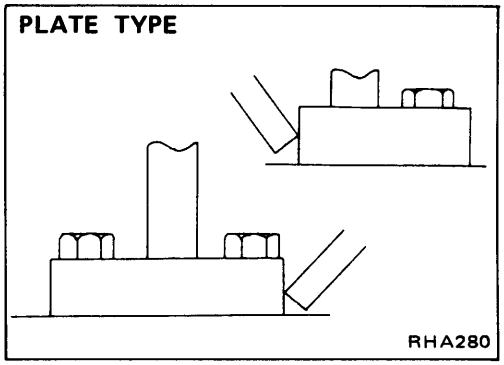


GENERAL PRECAUTIONS FOR HANDLING LEAK DETECTOR

Place the probe on connection fitting and wait for 5 seconds or more.

To check cooling unit, wait for 10 seconds or more.

If a leak is detected, keep the probe as still as possible for one more minute.



When testing single-bolt flange, place the probe on the opposite side of the fitting.

MEASUREMENT STANDARD

If any leak is noted with a detector having a nominal sensitivity of 15 to 25 g (0.53 to 0.88 oz)/year, that leak must be repaired.

- The nominal sensitivity of the detector is determined under the assumption that all the leaking gas is collected by the detector. Accordingly, the quantity of gas actually leaking can amount to five to ten times the indicated value. Generally speaking, leakage of 150 to 200 g (5.29 to 7.05 oz) of refrigerant can cause insufficient cooling.
- Oil deposited during assembling must be wiped off before inspection. Refrigerant easily dissolves in oil, and the presence of oil can cause an error in measurement.
  This precaution is important when checking a used car for refrigerant leakage.
- If oil is noted at or around connections, it indicates that refrigerant is leaking.

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.

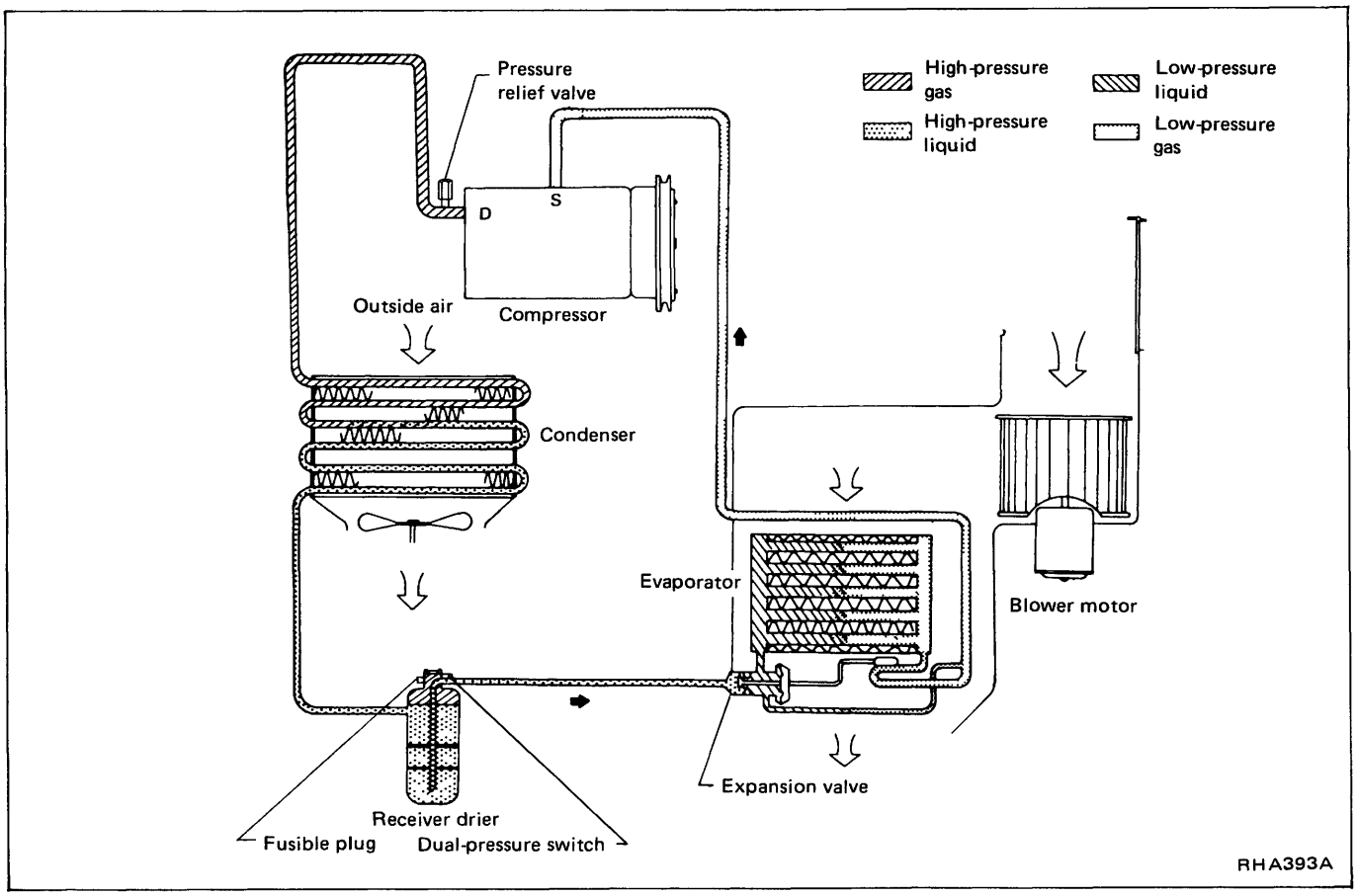
FREEZE PROTECTION – Compressor control

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.

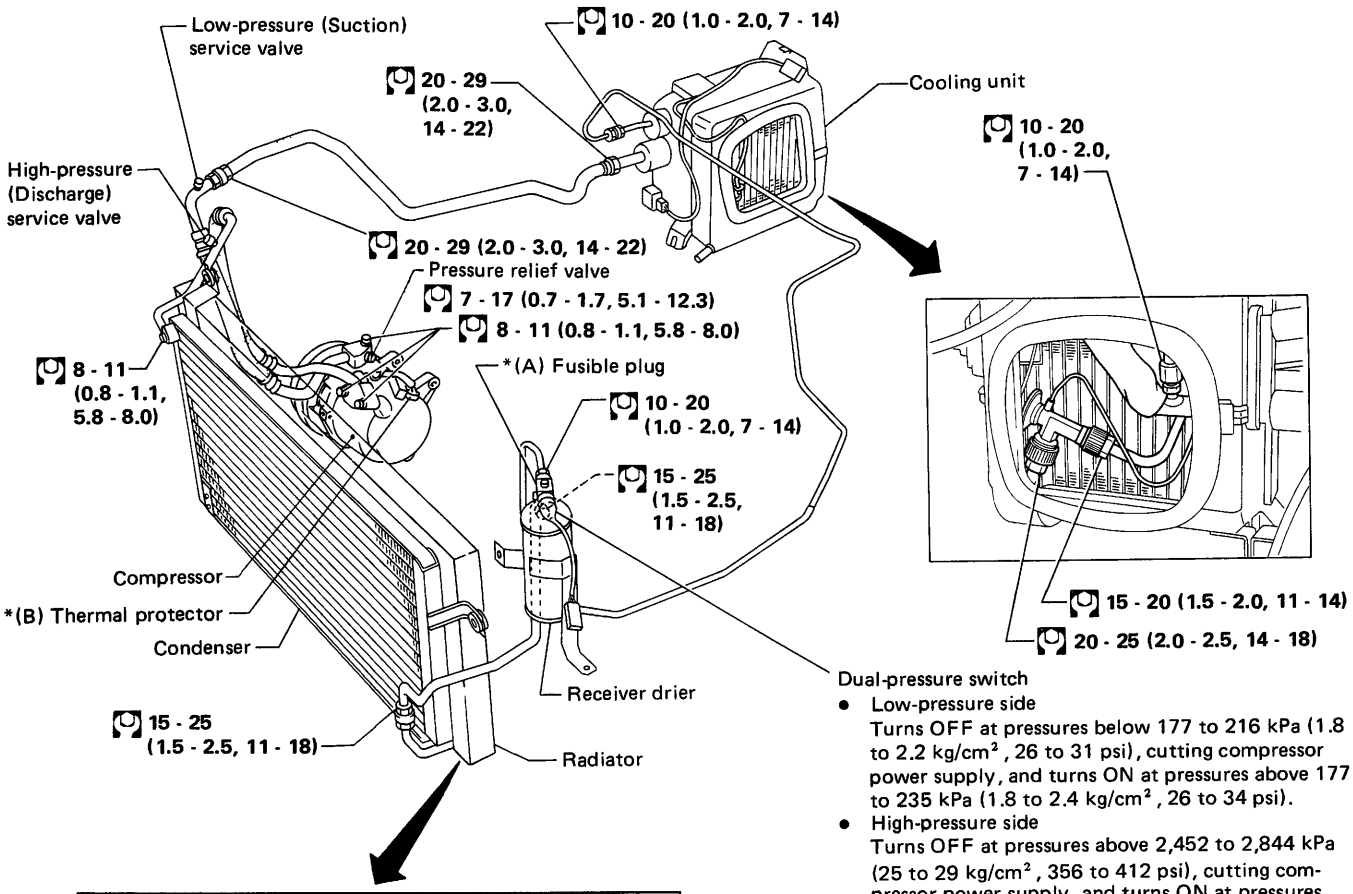
The refrigerant system is protected against excessively high or low pressures by the dual pressure switch, located on the receiver drier. If the system pressure rises above, or falls below the specifications, the dual pressure switch opens to interrupt the compressor operation.

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 refrigerant pressure 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 releasing the refrigerant into the atmosphere.



Refrigerant Lines



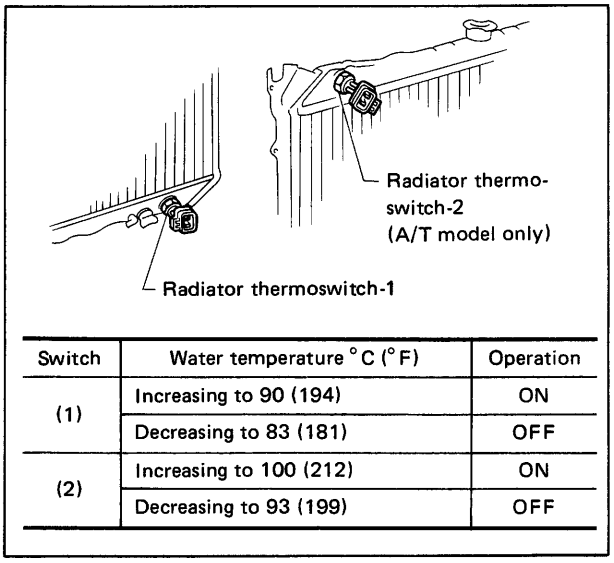
Dual-pressure switch

- Low-pressure side
  Turns OFF at pressures below 177 to 216 kPa (1.8 to 2.2 kg/cm², 26 to 31 psi), cutting compressor power supply, and turns ON at pressures above 177 to 235 kPa (1.8 to 2.4 kg/cm², 26 to 34 psi).
- High-pressure side
  Turns OFF at pressures above 2,452 to 2,844 kPa (25 to 29 kg/cm², 356 to 412 psi), cutting compressor power supply, and turns ON at pressures below 1,863 to 2,256 kPa (19 to 23 kg/cm², 270 to 327 psi).

*(A) Fusible plug
Open at temperatures above 105°C (221°F), thereby discharging refrigerant to the atmosphere If this valve opened, check the refrigerant line and replace receiver drier.

*(B) Thermal protector

Temperature in compressor	°C (°F)	Operation
Increasing to approx.	135 - 145 (275 - 293)	Turns OFF
Decreasing to approx.	120 - 130 (248 - 266)	Turns ON



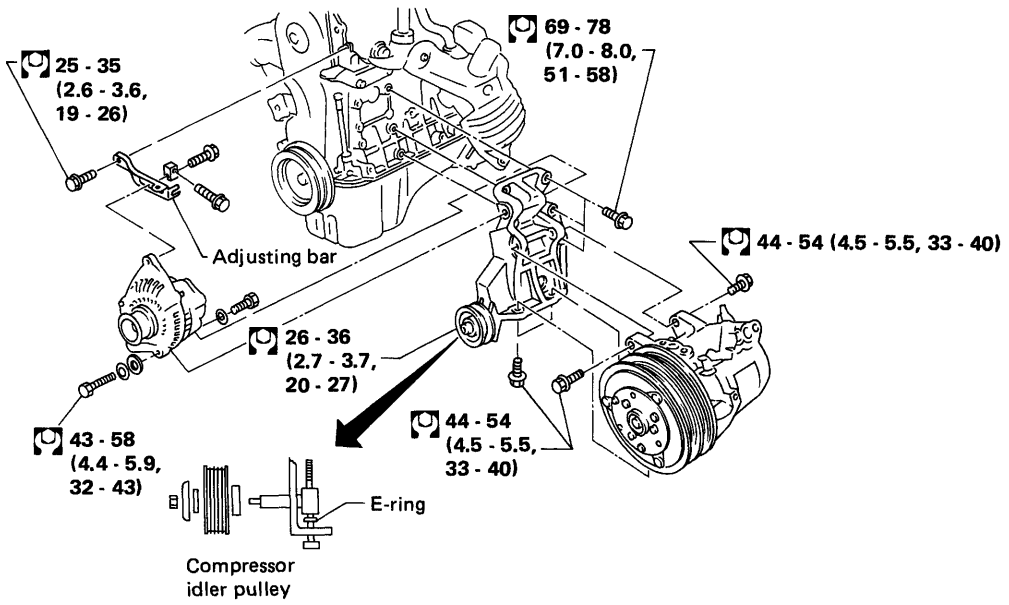
Switch	Water temperature °C (°F)	Operation
(1)	Increasing to 90 (194)	ON
	Decreasing to 83 (181)	OFF
(2)	Increasing to 100 (212)	ON
	Decreasing to 93 (199)	OFF

: N·m (kg-m, ft-lb)

RHA506A

Compressor Mounting

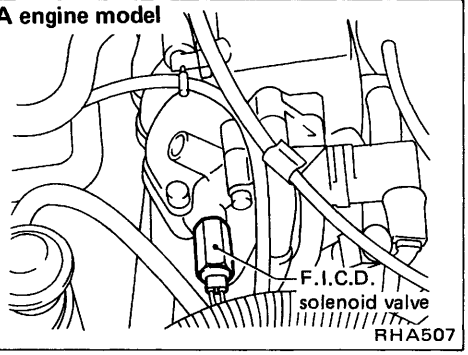
CA engine model



: N·m (kg-m, ft-lb)

RHA992

CA engine model



RHA507

Idle Speed Adjusting

FAST IDLE CONTROL DEVICE (F.I.C.D.)

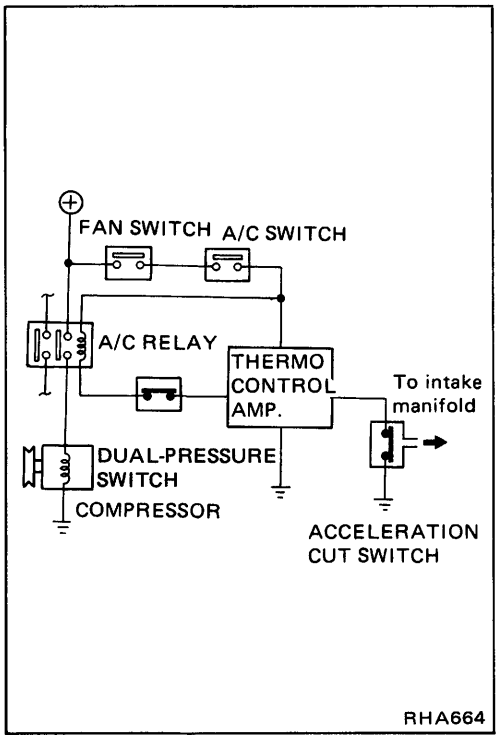
CA engine model

- Make sure that idle speed is at the specified value. (Non-adjustable)
- When the adjustment values are different from those given below, refer to EF & EC section and adjust correctly.

Engine rpm
(Air conditioner: ON):

Unit: rpm

Transmission	CA engine model
Manual	950 - 1,050
Automatic (At "N" range)	



Acceleration Cut System

This system is used to monitor the vacuum pressure in the intake manifold. When the engine is heavily overloaded, the compressor is turned off for 3 seconds to reduce the overloading.

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
Air control lever position:	(FACE)
INTAKE lever position:	(RECIRC)
FAN lever position:	4
Engine speed:	1,500 rpm
Time required before starting testing after air conditioner starts operating:	More than 10 minutes

TEST READING

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)		
50 - 90	25 (77)	981 - 1,324 (10.0 - 13.5, 142 - 192)	49 - 118 (0.5 - 1.2, 7 - 17)
	30 (86)	1,236 - 1,599 (12.6 - 16.3, 179 - 232)	98 - 177 (1.0 - 1.8, 14 - 26)
	35 (95)	1,492 - 1,883 (15.2 - 19.2, 216 - 273)	147 - 245 (1.5 - 2.5, 21 - 36)
	40 (104)	1,736 - 2,158 (17.7 - 22.0, 252 - 313)	196 - 314 (2.0 - 3.2, 28 - 46)

Performance Chart (Cont'd)

Recirculating-to-discharge air temperature table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	At temperature °C (°F)	
50 - 70	20 (68)	4.4 - 6.6 (40 - 44)
	25 (77)	7.6 - 10.2 (46 - 50)
	30 (86)	10.8 - 13.8 (51 - 57)
70 - 90	20 (68)	6.6 - 8.8 (44 - 48)
	25 (77)	10.2 - 12.8 (50 - 55)
	30 (86)	13.8 - 16.9 (57 - 62)

a. The pressure will change in the following manner with changes in conditions:

- When blower speed is low, discharge pressure will drop.
- When the relative humidity of intake air is low, discharge pressure will drop.

b. The temperature will change in the following manner with changes in conditions:
When the ambient air temperature is low, the outlet air temperature will become low.

Checking and Adjusting

The oil used to lubricate the compressor is circulating with the refrigerant.
Whenever replacing any component of the system or a large amount of gas leakage occurs, add oil to maintain the original amount of oil.

OIL CAPACITY

Unit: mℓ (US fl oz, Imp fl oz)

Applied model	All models
Capacity	
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)

*: All oil cannot be drained from system.

OIL RETURN OPERATION

Before checking and adjusting oil level, operate compressor at engine idling speed, with controls set for maximum cooling and high blower speed, for 20 to 30 minutes in order to return oil to compressor.

CHECKING AND ADJUSTING FOR USED COMPRESSOR

1. After oil return operation, stop the engine and discharge refrigerant and then remove compressor from the vehicle.
2. Drain compressor oil from compressor discharge port and measure the amount.

Oil is sometimes hard to extract when compressor is cooled. Remove oil while compressor is warm [maintained to 40 to 50°C (104 to 122°F)].

3. If the amount is less than 90 mℓ (3.0 US fl oz, 3.2 Imp fl oz), some refrigerant may have leaked out. Conduct leak tests on connections of each system, and if necessary, repair or replace malfunctioning parts.
4. Check the purity of the oil and then adjust oil level following the procedure below.
   (a) When oil is clean;

Unit: mℓ (US fl oz, Imp fl oz)

Amount of oil drained	Adjusting procedure
Above 90 (3.0, 3.2)*	Oil level is right. Pour in same amount of oil as was drained out.
Below 90 (3.0, 3.2)	Oil level may be low. Pour in 90 mℓ (3.0 US fl oz, 3.2 Imp fl oz) of oil.

*: If amount of oil drained is much greater than under normal circumstances, flush air conditioner system with refrigerant. Then pour 200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil into air conditioner system.

   (b) When oil contains chips or other foreign material;
   After air conditioner system has been flushed with refrigerant, replace receiver drier. Then pour 200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil into air conditioner system.

CHECKING AND ADJUSTING FOR COMPRESSOR REPLACEMENT

200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil is charged in compressor (service parts). So it is necessary to drain the proper amount of oil from new compressor. Follow the procedure below.

1. After oil return operation, drain compressor oil from used compressor and measure the amount.
   (It is the same procedure as CHECKING AND ADJUSTING FOR USED COMPRESSOR.)

Checking and Adjusting (Cont'd)

2. Check the purity of the oil and then adjust oil level following the procedure below.
   (a) When oil is clean;

Unit: mℓ (US fl oz, Imp fl oz)

Amount of oil drained from used compressor	Draining amount of oil from new compressor
Above 90 (3.0, 3.2)*	200 (6.8, 7.0) − [Amount of oil drained + 20 (0.7, 0.7)]
Below 90 (3.0, 3.2)	90 (3.0, 3.2)

*: If amount of oil drained is greater than under normal circumstances, flush air conditioner system with refrigerant. Then install new compressor [200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil is charged compressor service parts.].

Example:

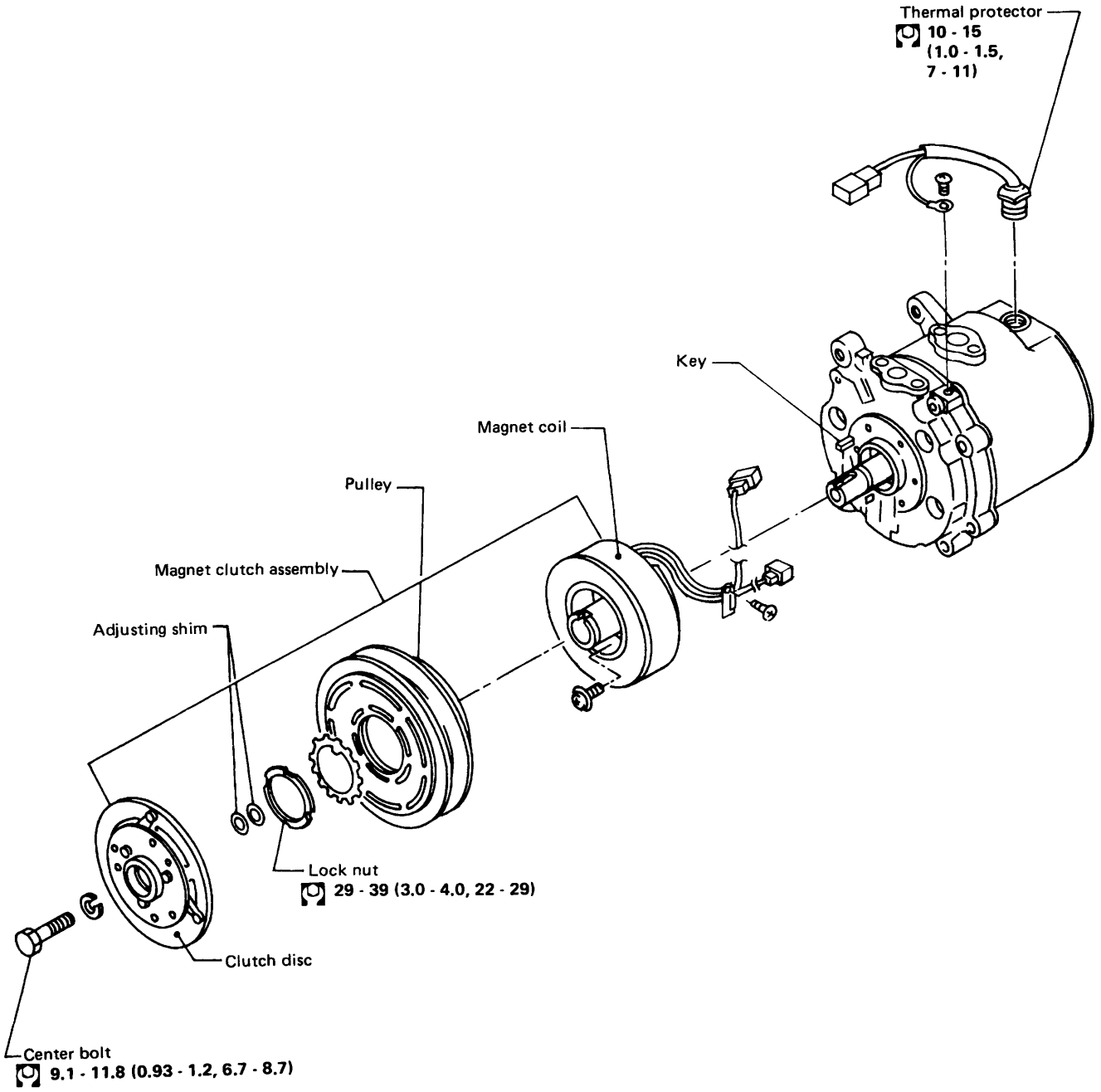
Unit: mℓ (US fl oz, Imp fl oz)

Amount of oil drained from used compressor	Draining amount of oil from new compressor
110 (3.7, 3.9)	70 (2.4, 2.5)
70 (2.4, 2.5)	90 (3.0, 3.2)

   (b) When oil contains chips or foreign material; After air conditioner system has been flushed with refrigerant, replace receiver drier. Then install new compressor [200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil is charged in compressor service parts.].

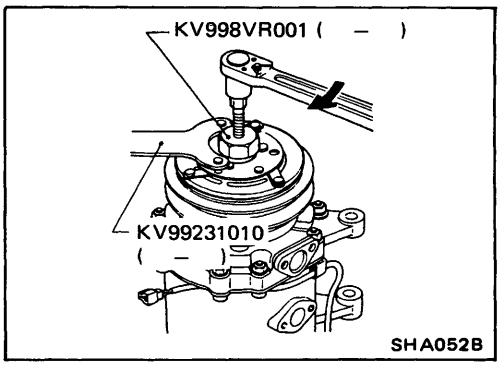
Precautions

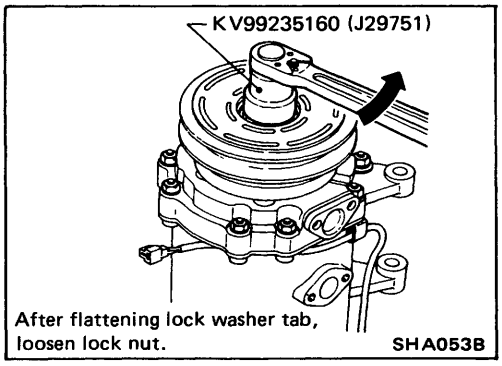
- Plug all openings to prevent moisture and foreign matter from entering.
- Do not leave compressor on its side or upside down for more than 10 minutes.
- When replacing or repairing compressor, check compressor oil level in system.
- When replacing with a new compressor, drain specified oil from new 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.
- When storing a compressor, be sure to fill it with refrigerant to prevent rust formation. Add refrigerant at the low-pressure side and purge air at the high-pressure side, while rotating shaft by hand.

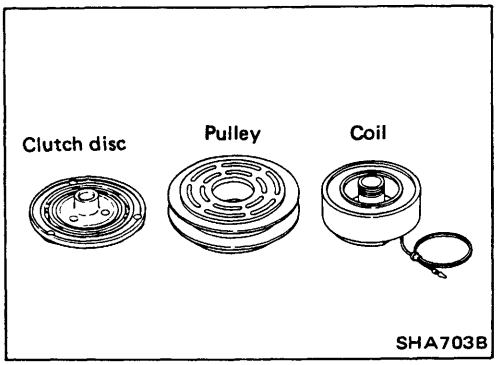


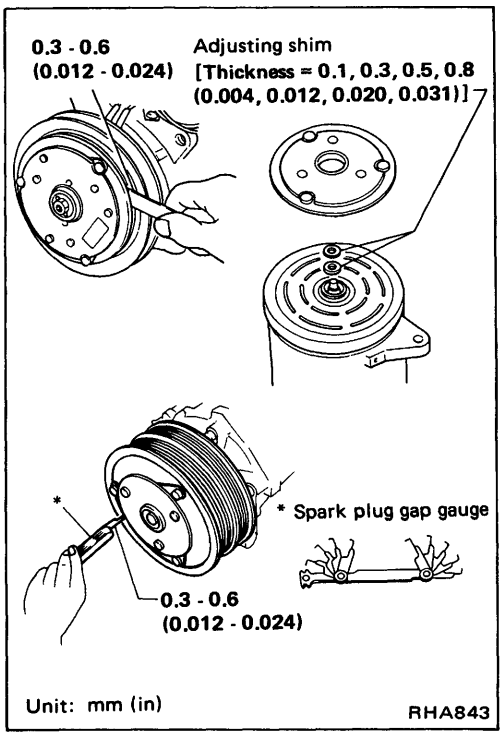
: N·m (kg-m, ft-lb)

RHA283









Compressor Clutch

REPLACEMENT

- When removing center bolt, hold clutch disc with clutch disc wrench.
- Using clutch disc puller, clutch disc can be removed.

- Bend down pawl of lock washer.
- When removing pulley, remove lock nut with nut wrench.

INSPECTION

Clutch disc

If the contact surface shows signs of damage due to excessive heat, the drive plate and pulley should be replaced.

Pulley

Check the appearance of the pulley assembly. If the contact surface of the pulley shows signs of excessive grooving due to slippage, both the pulley and drive plate should be replaced. The contact surfaces of the pulley assembly should be cleaned with a suitable solvent before reinstallation.

Coil

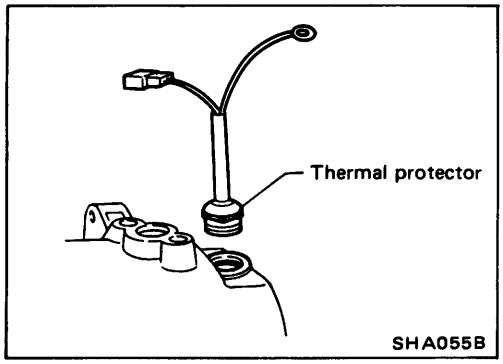
Check coil for loose connection or cracked insulation.

ADJUSTMENT

- When assembling clutch disc, adjust disc-to-pulley clearance with shims.

BREAK-IN OPERATION

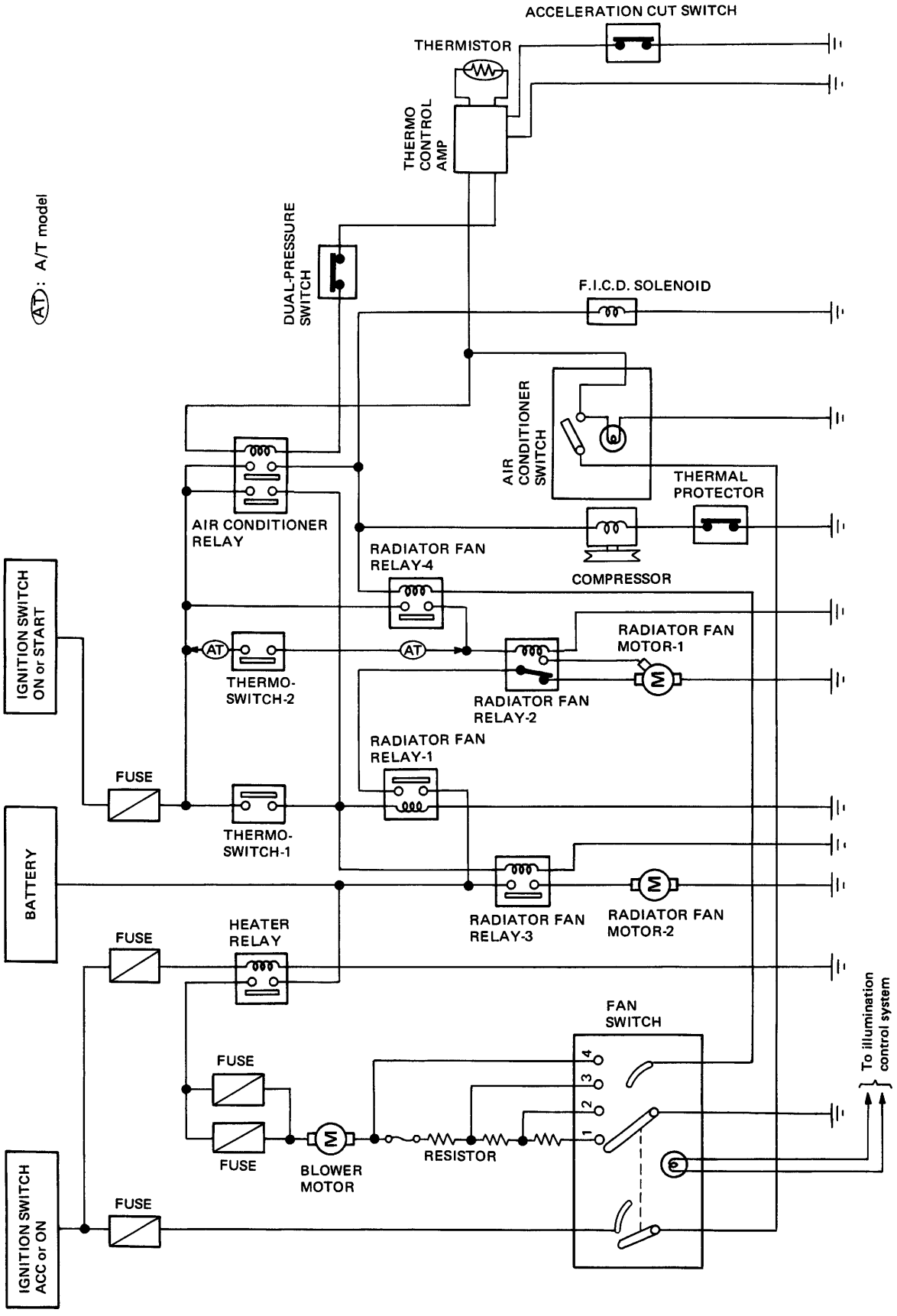
When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch about thirty times.
Break-in operation raises the level of transmitted torque.



Thermal Protector

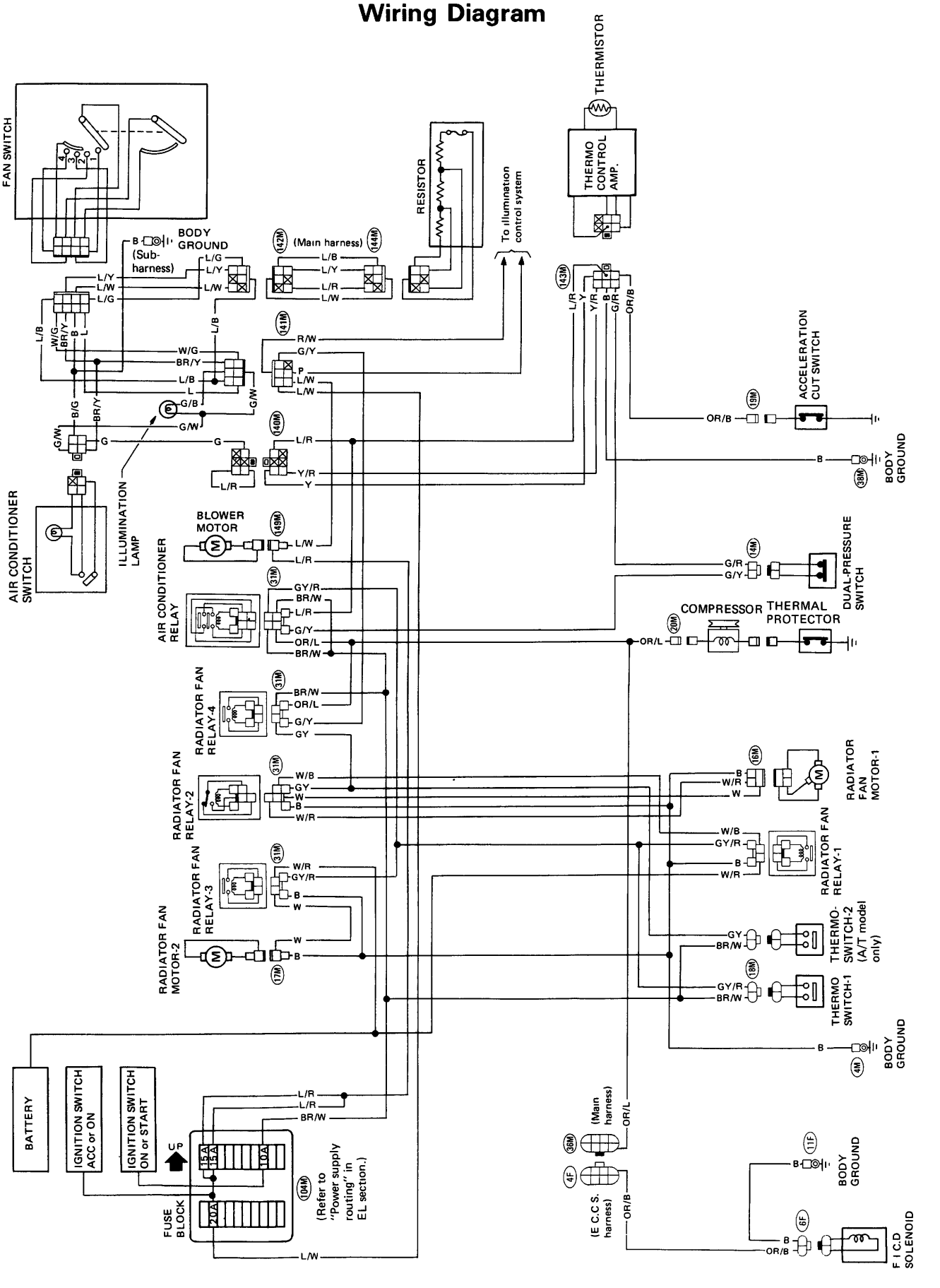
- When servicing, do not allow foreign matter to get into compressor.
- Check continuity between two terminals.

Schematic



RHA507A

Wiring Diagram



Inspection

FAN SWITCH AND A/C SWITCH

A/C switch

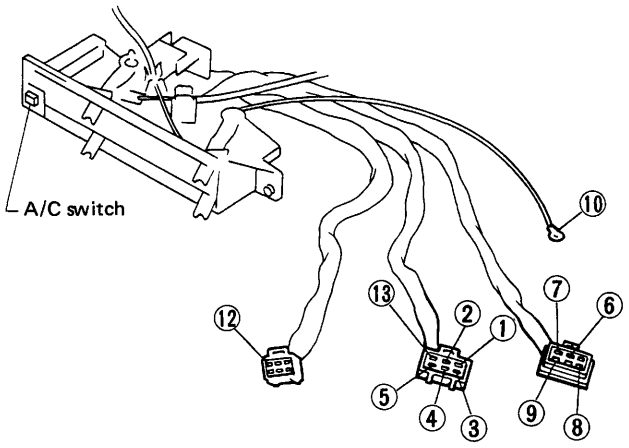
A/C SW	ON	OFF
⑤	○ ○	
⑫	○	○ ⑨
⑩	⑨	○ ⑨

Illumination lamp (A/C)

Fan switch

LEVER POSITION / TERMINAL	OFF	1	2	3	4
①		○	○	○	○
⑤		○	○	○	○
⑥		○	○	○	○
③		○	○	○	○
⑦		○			
⑨			○		
⑧				○	
⑩		○	○	○	○
⑬				○	○
②	⑨				
④	⑨				

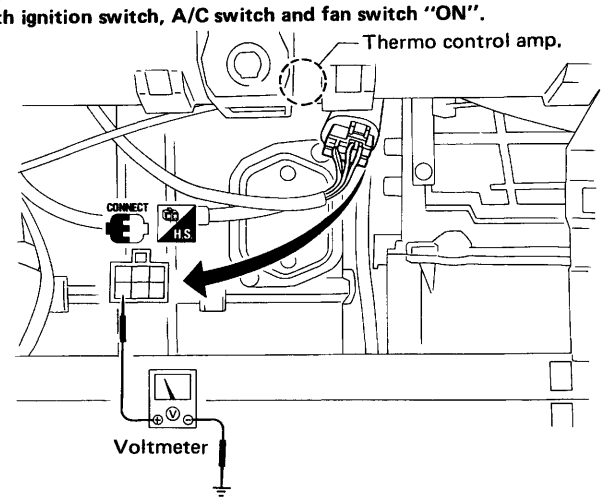
Illumination lamp (Finisher)



RHA993

THERMO CONTROL AMP.

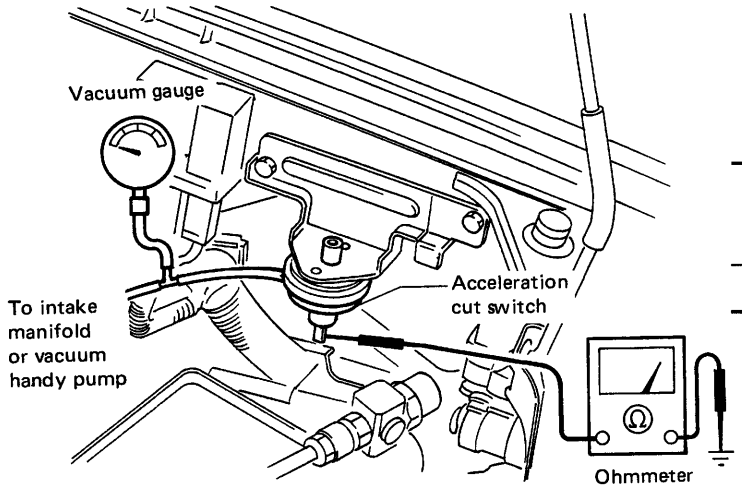
Condition:
With ignition switch, A/C switch and fan switch "ON".



	Evaporator outlet air temperature °C (°F)	Thermo AMP. operation	Tester
Standard	Decreasing to 0 - 2 (32 - 36)	OFF	Approx. 12V
	Increasing to 3.4 - 5.0 (38 - 41)	ON	Approx. 0V
Acceleration cut condition	Decreasing to 2.4 - 4.0 (36 - 39)	OFF	Approx. 12V
	Increasing to 5.6 - 7.2 (42 - 45)	ON	Approx. 0V

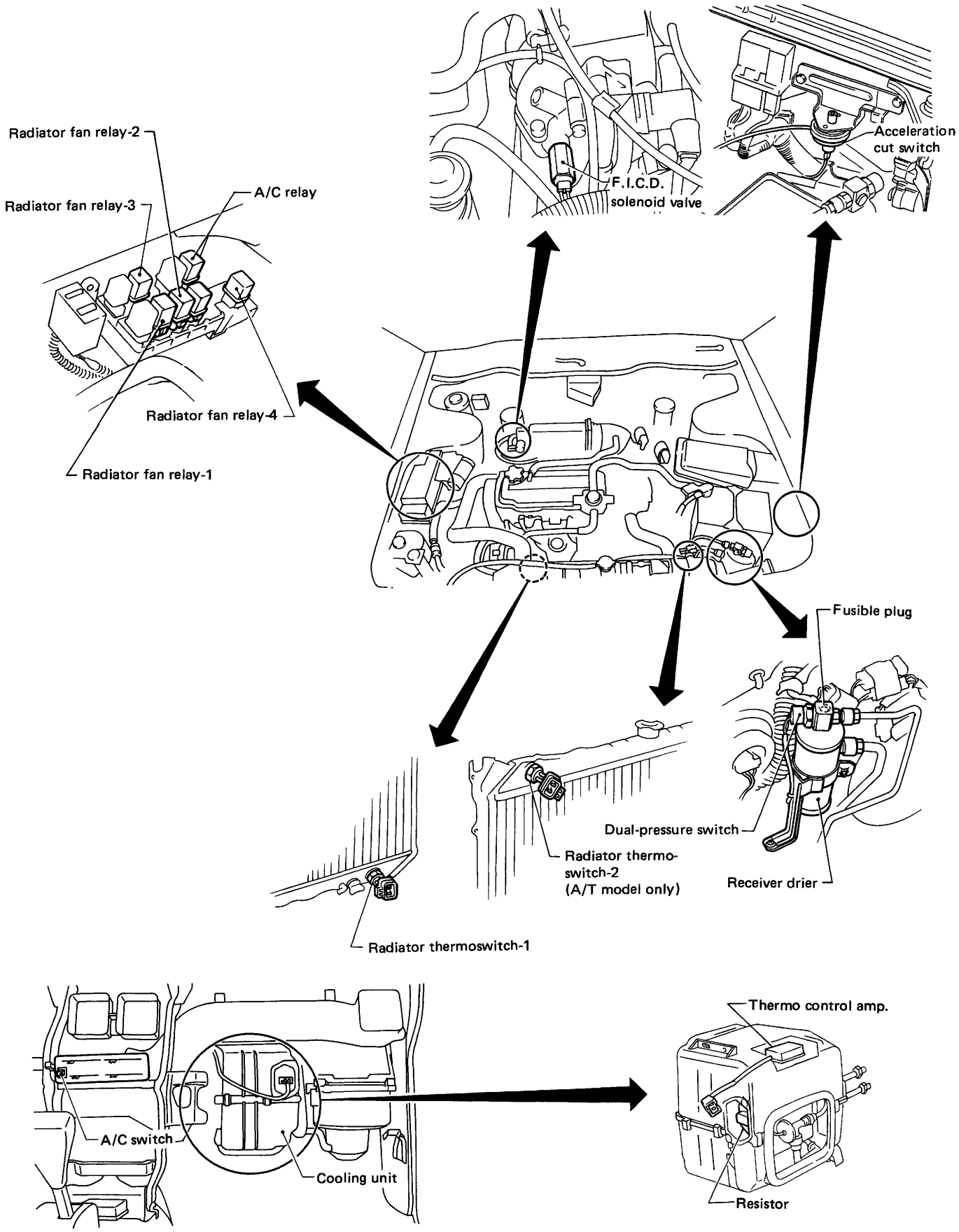
RHA994

ACCELERATION CUT SWITCH



Pressure	Above −13.3 kPa (−100 mmHg, −3.94 inHg)	Below −24.0 kPa (−180 mmHg, −7.09 inHg)
Switch	ON	OFF

RHA587


Radiator fan relay-2
Radiator fan relay-3
A/C relay
Radiator fan relay-4
Radiator fan relay-1
F.I.C.D. solenoid valve
Acceleration cut switch
Fusible plug
Dual-pressure switch
Radiator thermo-switch-2 (A/T model only)
Receiver drier
Radiator thermoswitch-1
A/C switch
Cooling unit
Thermo control amp.
Resistor

RHA995

General Specifications

COMPRESSOR

Model	ATSUGI make NVR140S
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 NVR140S
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)	0.9 - 1.1 (2.0 - 2.4)

Inspection and Adjustment

ENGINE IDLING SPEED

When A/C is ON (F.I.C.D. is actuated)

Unit: rpm

Transmission	CA engine model
Manual	950 - 1,050
Automatic (At "N" range)	

Inspection and Adjustment (Cont'd)

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)

Tightening Torque

COMPRESSOR INSTALLATION

Model	CA engine model		
	N·m	kg-m	ft-lb
Compressor bracket to cylinder block	69 - 78	7.0 - 8.0	51 - 58
Compressor to compressor bracket	44 - 54	4.5 - 5.5	33 - 40

COMPRESSOR

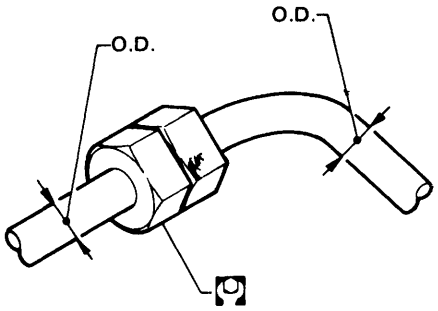
Model	NVR 140S		
	N·m	kg-m	ft-lb
Center bolt	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7
Clutch pulley lock nut	29 - 39	3.0 - 4.0	22 - 29
Thermal protector	10 - 15	1.0 - 1.5	7 - 11

Tightening Torque (Cont'd)

REFRIGERANT LINE

When connecting lines made of different material, basically use the lower tightening torque of the two.

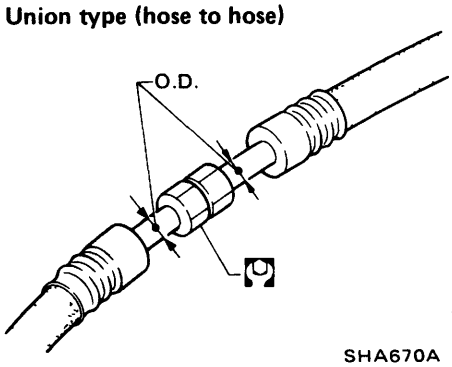
Union type (pipe to pipe)



SHA669A

Pipe O.D. mm (in)	Material					
	Steel or copper			Aluminum		
	N·m	kg-m	ft-lb	N·m	kg-m	ft-lb
6 (1/4)	10 - 20	1.0 - 2.0	7 - 14	–	–	–
8 (5/16)	15 - 25	1.5 - 2.5	11 - 18	10 - 20	1.0 - 2.0	7 - 14
10 (3/8)	15 - 25	1.5 - 2.5	11 - 18	10 - 20	1.0 - 2.0	7 - 14
12 (1/2)	20 - 29	2.0 - 3.0	14 - 22	15 - 25	1.5 - 2.5	11 - 18
16 (5/8)	25 - 34	2.5 - 3.5	18 - 25	20 - 29	2.0 - 3.0	14 - 22
19 (3/4)	25 - 34	2.5 - 3.5	18 - 25	20 - 29	2.0 - 3.0	14 - 22

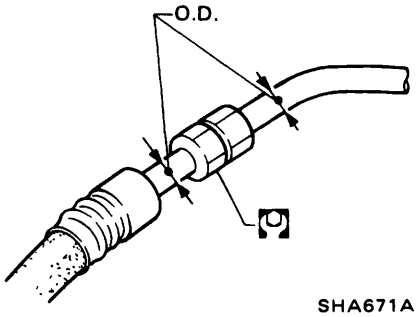
Union type (hose to hose)



SHA670A

Pipe O.D. mm (in)	Material					
	Steel or copper			Aluminum		
	N·m	kg-m	ft-lb	N·m	kg-m	ft-lb
6 (1/4)	10 - 20	1.0 - 2.0	7 - 14	–	–	–
8 (5/16)	15 - 25	1.5 - 2.5	11 - 18	10 - 20	1.0 - 2.0	7 - 14
10 (3/8)	15 - 25	1.5 - 2.5	11 - 18	10 - 20	1.0 - 2.0	7 - 14
12 (1/2)	25 - 34	2.5- 3.5	18 - 25	20 - 29	2.0 - 3.0	14 - 22
16 (5/8)	25 - 34	2.5 - 3.5	18 - 25	20 - 29	2.0 - 3.0	14 - 22

Union type (hose to pipe)

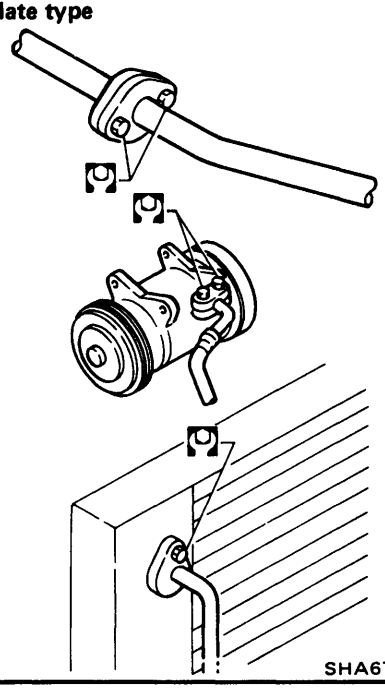


SHA671A

- Use tightening torque for flexible hose.

Tightening Torque (Cont'd)

Plate type



Bolt type				Tightening torque		
Grade	Nominal size	Bolt diameter mm	Pitch mm	N·m	kg-m	ft-lb
4T	M6	6.0	1.0	3 - 4	0.3 - 0.4	2.2 - 2.9
	M8	8.0	1.25	8 - 11	0.8 - 1.1	5.8 - 8.0
	M10	10.0	1.5	16 - 22	1.6 - 2.2	12 - 16
7T	M6	6.0	1.0	6 - 7	0.6 - 0.7	4.3 - 5.1
	M8	8.0	1.25	14 - 18	1.4 - 1.8	10 - 13
	M10	10.0	1.5	25 - 35	2.6 - 3.6	19 - 26

ELECTRICAL SYSTEM

SECTION EL

When you read wiring diagrams:
- Read GI section, "HOW TO READ WIRING DIAGRAMS".

CONTENTS

HARNESS CONNECTOR ..... EL- 2
STANDARDIZED RELAY ..... EL- 3
POWER SUPPLY ROUTING ..... EL- 5
BATTERY ..... EL- 7
STARTING SYSTEM EL-15
STARTING SYSTEM — Starter — EL-17
CHARGING SYSTEM EL-25
CHARGING SYSTEM — Alternator — EL-27
COMBINATION SWITCH EL-34
HEADLAMP EL-36
EXTERIOR LAMP EL-39
INTERIOR LAMP EL-43
METER AND GAUGES EL-45
WARNING LAMPS AND CHIME EL-48
TIME CONTROL SYSTEM EL-52
WIPER AND WASHER EL-62
HORN, CIGARETTE LIGHTER AND CLOCK EL-64
REAR WINDOW DEFOGGER EL-65
AUDIO AND POWER ANTENNA EL-68
AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.) EL-71
LOCATION OF ELECTRICAL UNITS EL-81
HARNESS LAYOUT EL-85
SPECIAL SERVICE TOOL EL-95
SUPER MULTIPLE JUNCTION (S.M.J.) EL-97

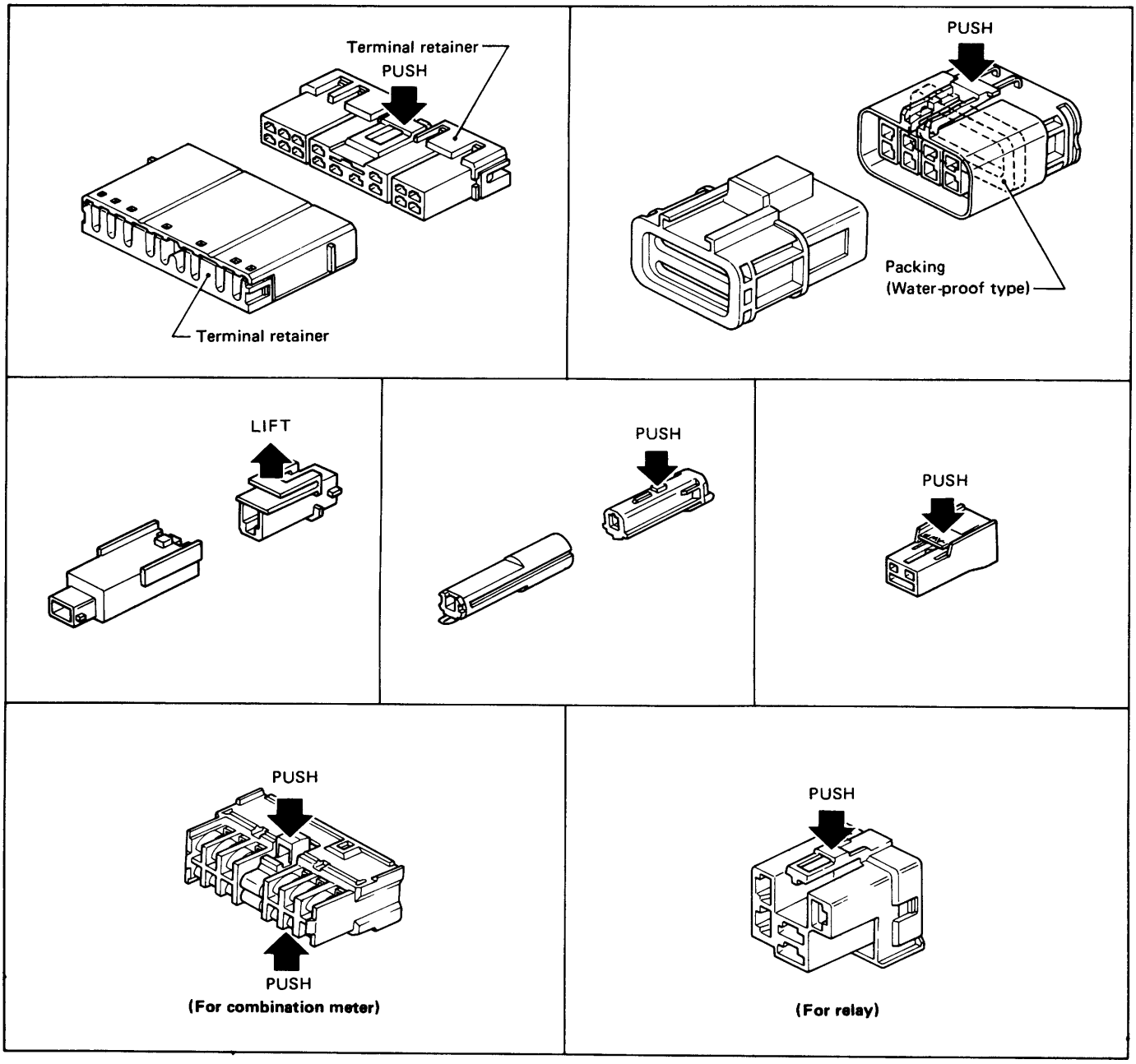
WIRING DIAGRAM REFERENCE CHART

RADIATOR FAN MOTOR	LC SECTION	POWER WINDOW	BF SECTION
E.C.C.S.	EF & EC SECTION	POWER DOOR LOCK	BF SECTION
ELECTRIC FUEL PUMP	EF & EC SECTION	SUN ROOF	BF SECTION
LOCK-UP CONTROL	AT SECTION	ELECTRIC CONTROL DOOR MIRROR	BF SECTION
O.D. CONTROL	AT SECTION	HEATER AND AIR CONDITIONER	HA SECTION

- All harness connectors 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.

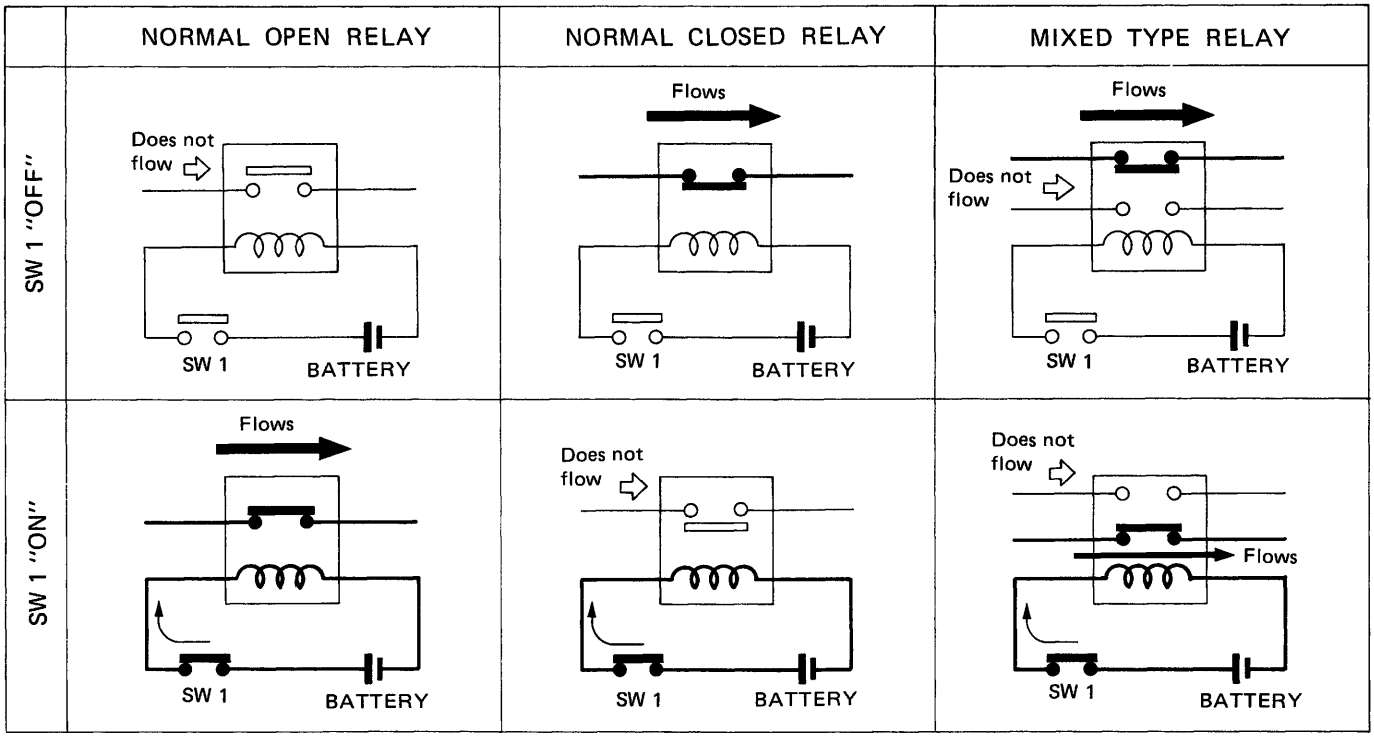
[Example]



SEL769D

Normal Open, Normal Closed and Mixed Type Relays

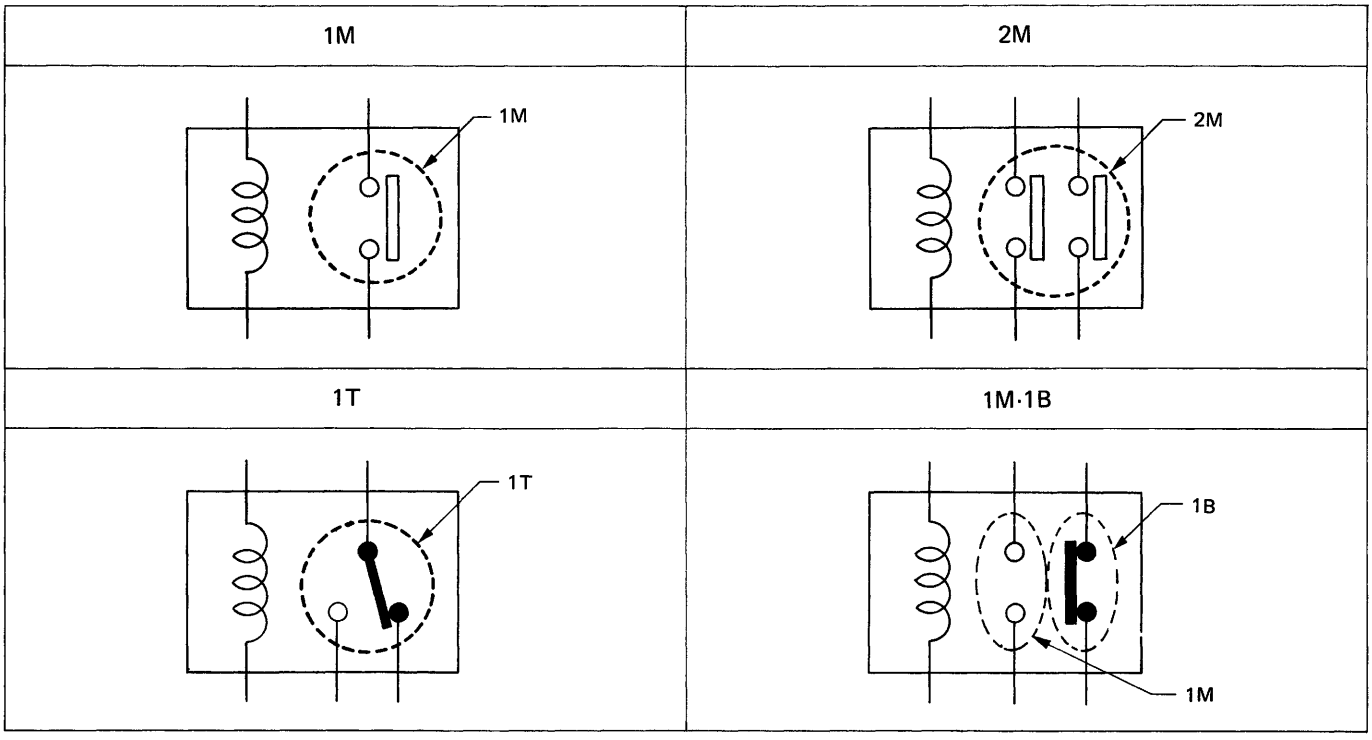
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



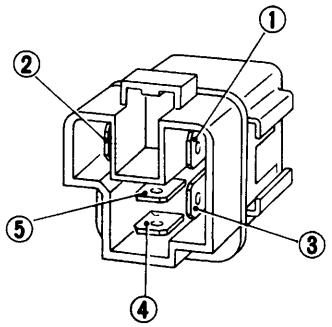
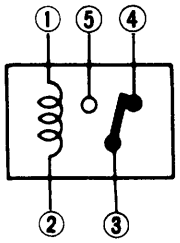
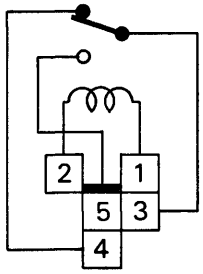
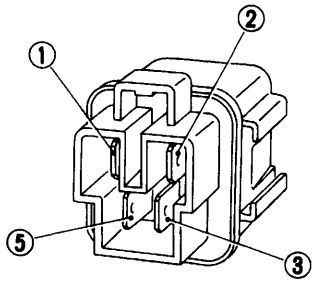
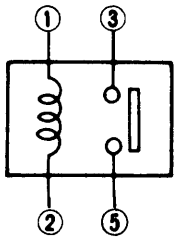
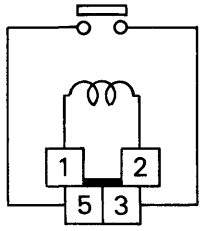
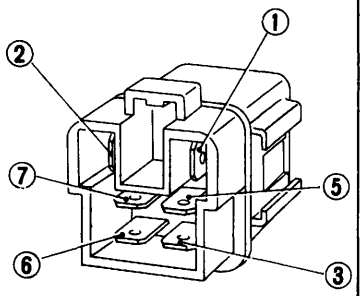
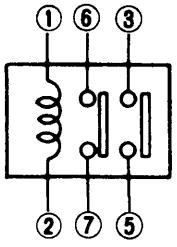
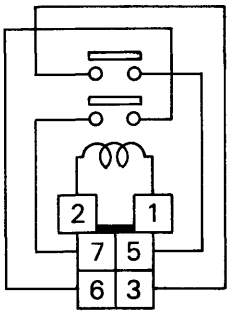
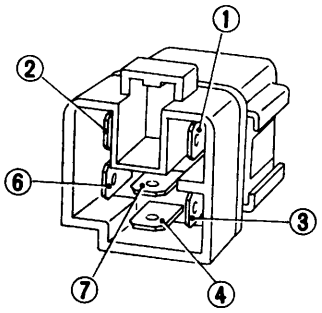
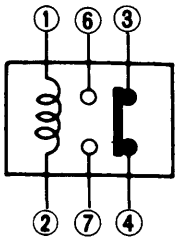
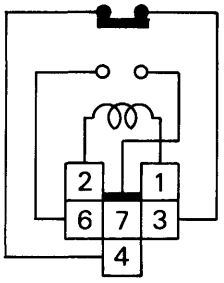
SEL881H

Type of Standardized Relays

1M ..... 1 Make
1T ..... 1 Transfer
2M ..... 2 Make
1M·1B ..... 1 Make 1 Break

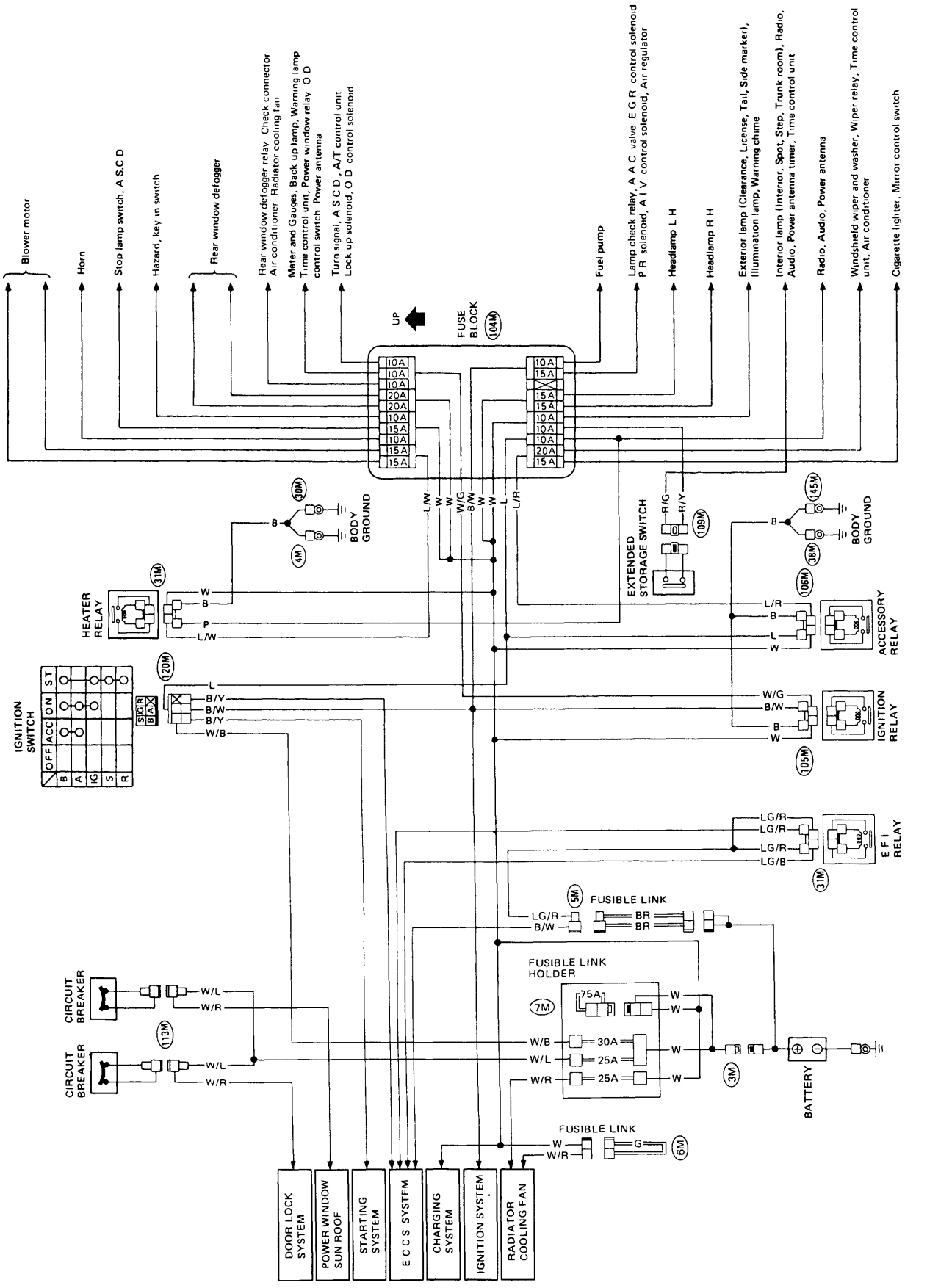


SEL882H

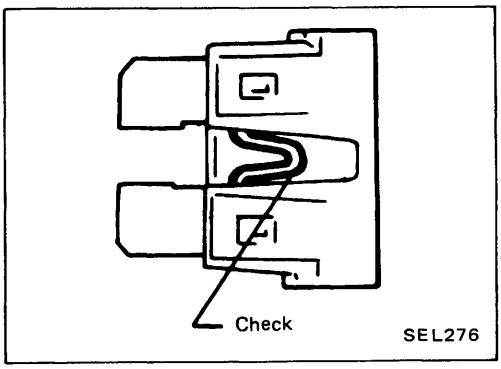
Type	Outer view	Circuit	Connector symbol and connection	Case color
1T				BLACK
1M				BLUE
2M				BROWN
1M·1B				GRAY

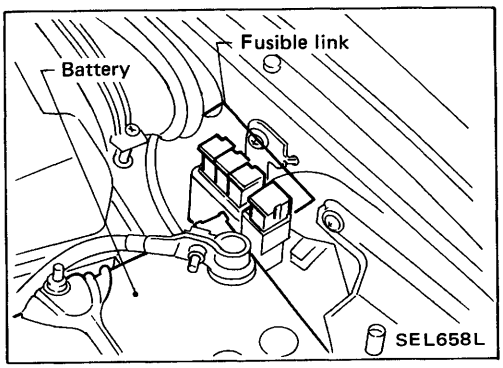
SEL883H

Wiring Diagram



SEL651M





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

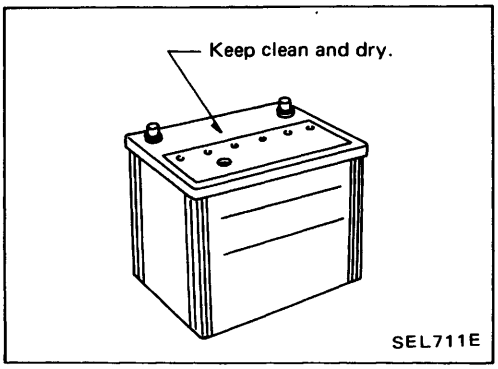
A melted fusible link can be detected either by visual inspection or by feeling with finger tip. If its condition is questionable, use circuit tester or test lamp.

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.**

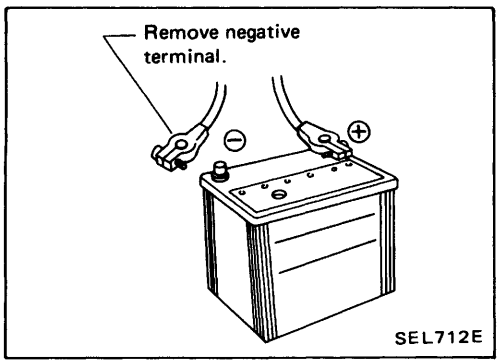


How to Handle Battery

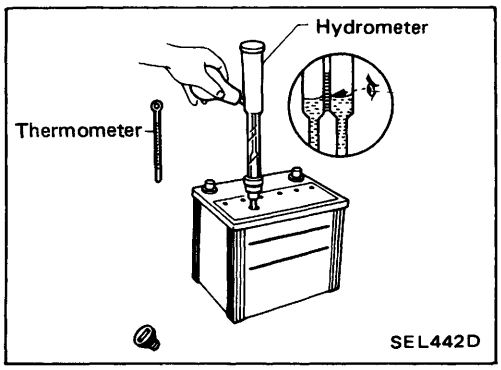
METHODS OF PREVENTING OVER-DISCHARGE

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.

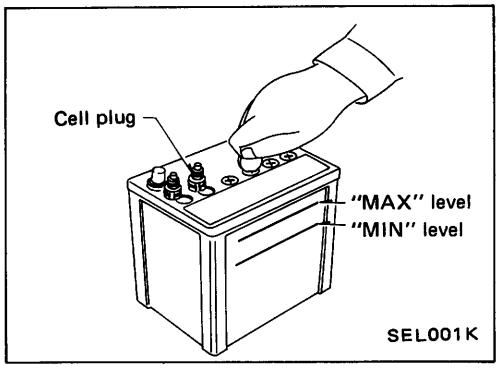
How to Handle Battery (Cont'd)

CHECKING ELECTROLYTE LEVEL

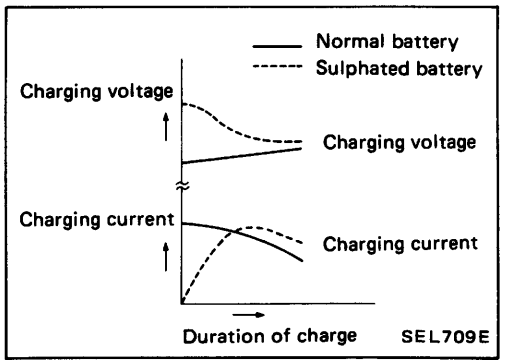
WARNING:

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.



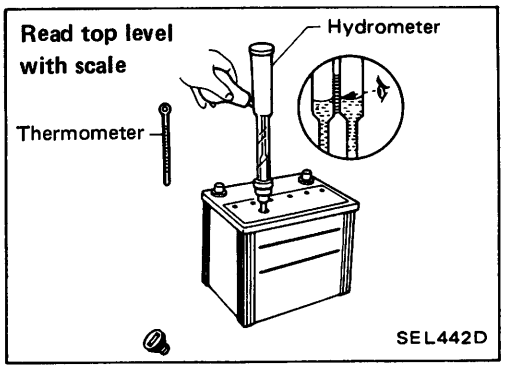
- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



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.

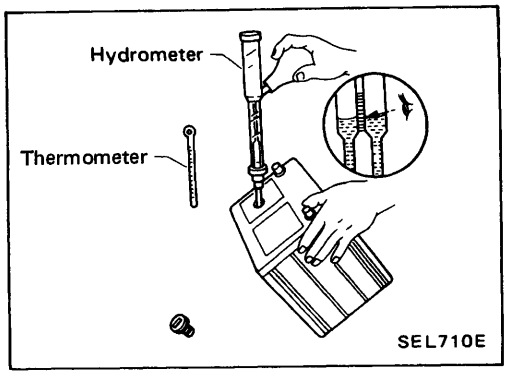
Compared with a battery discharged under normal conditions, the current flow in a "sulphated" battery is not as smooth although its voltage is high during the initial stage of charging, as shown in the figure at the left.



SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.

How to Handle Battery (Cont'd)

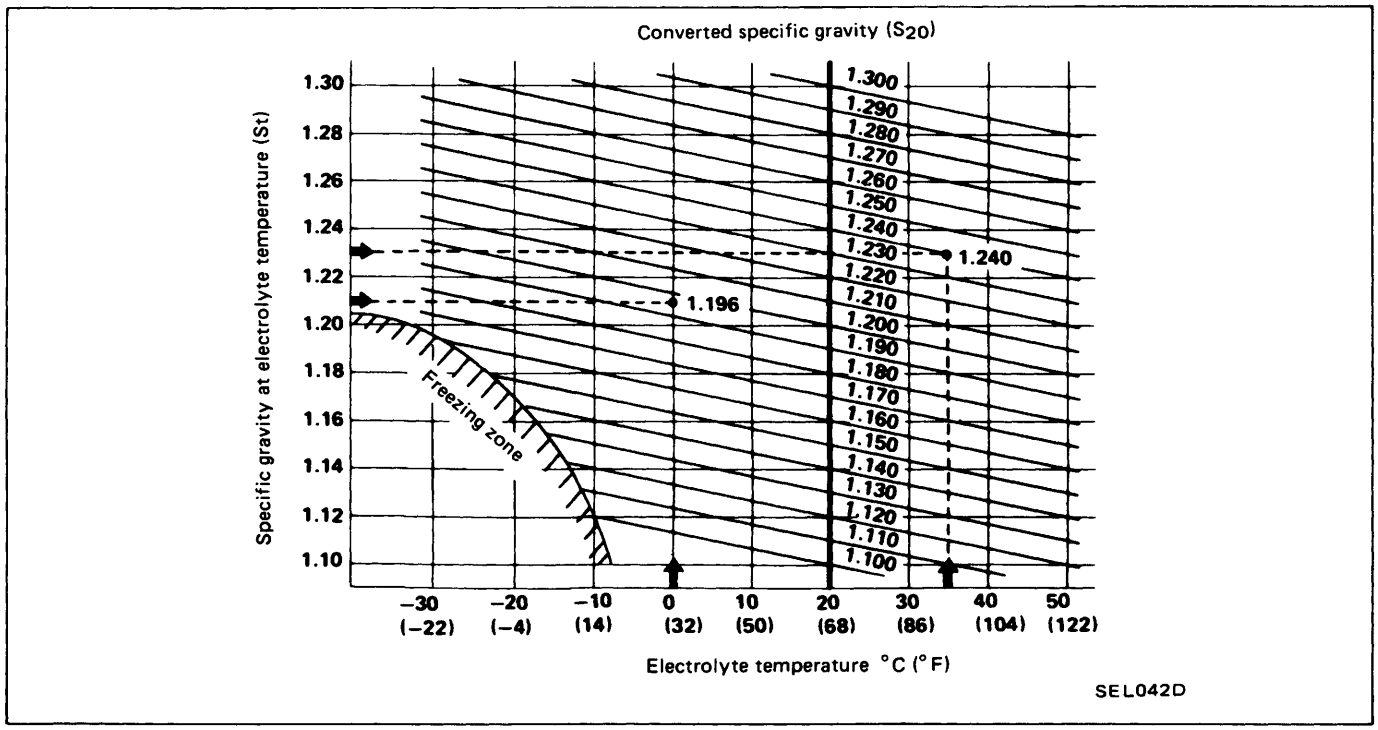


- When electrolyte level is too low, tilt battery case to raise it for easy measurement.

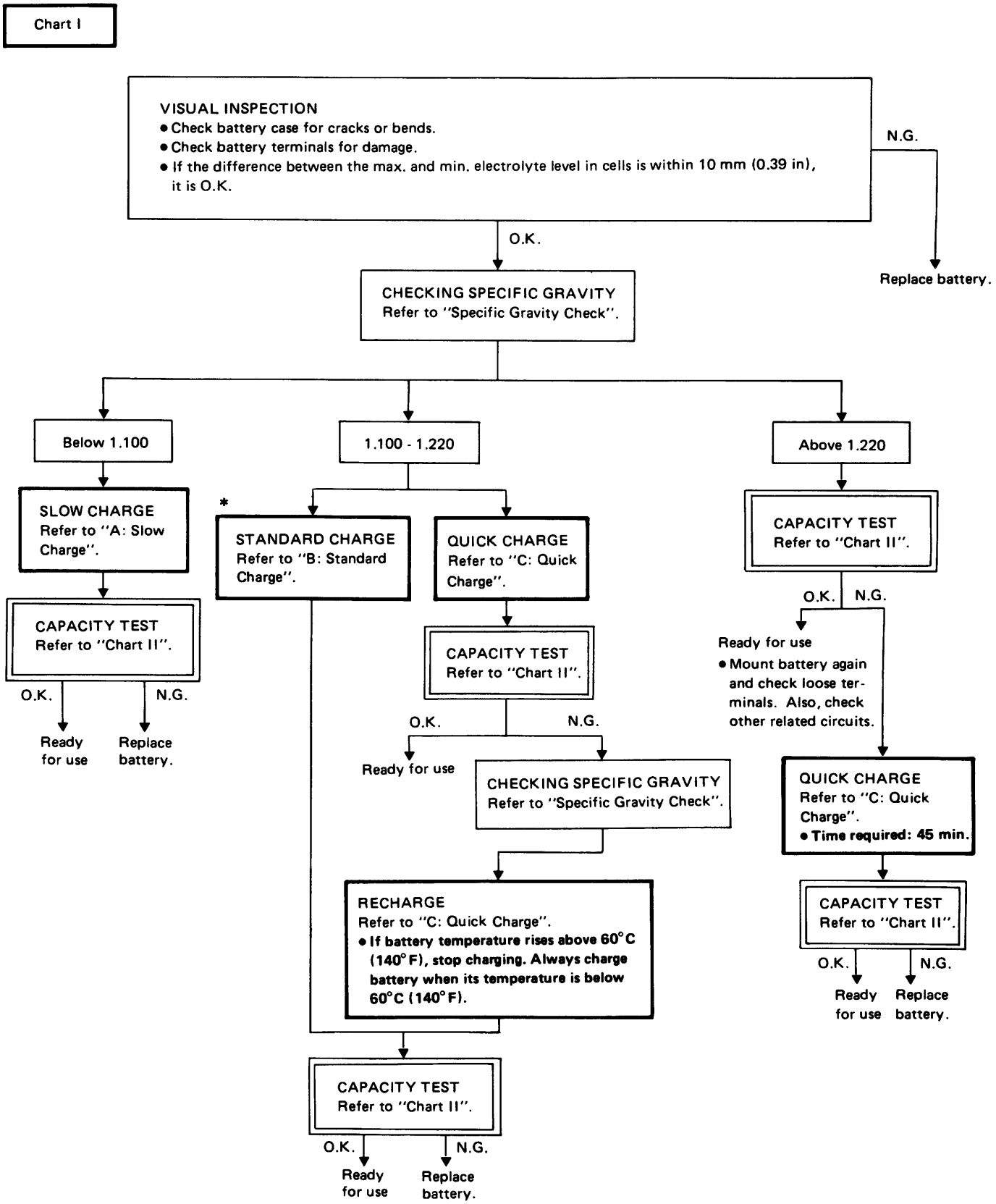
2. Convert into specific gravity at 20°C (68°F).

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.



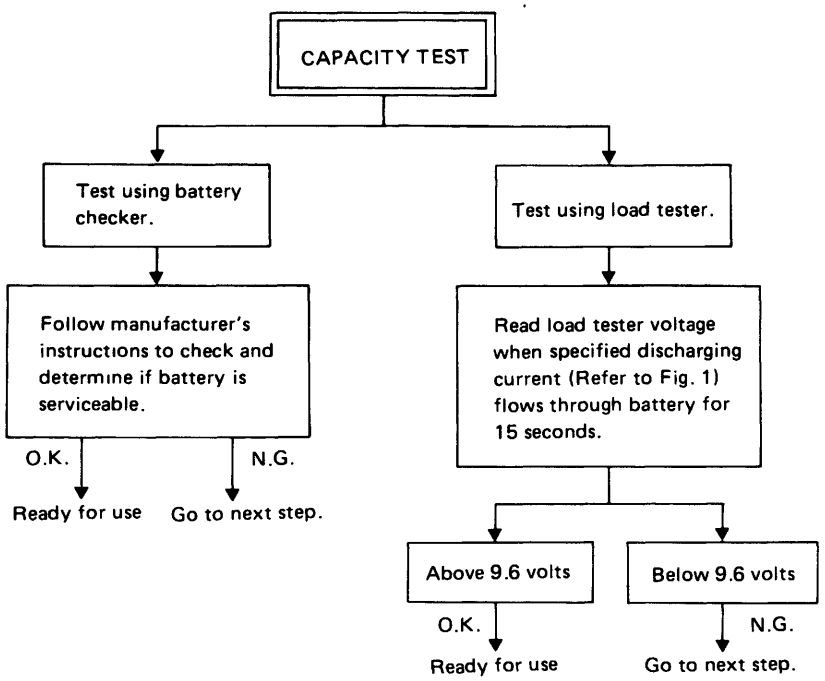
Battery Test and Charging Chart



* "STANDARD CHARGE" is recommended in case that the vehicle is in storage after charging.

Battery Test and Charging Chart (Cont'd)

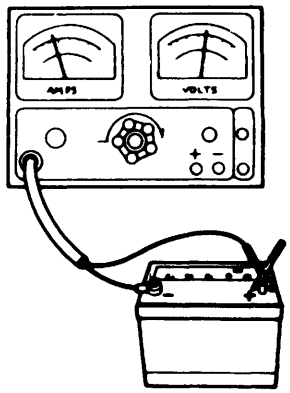
Chart II



- 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

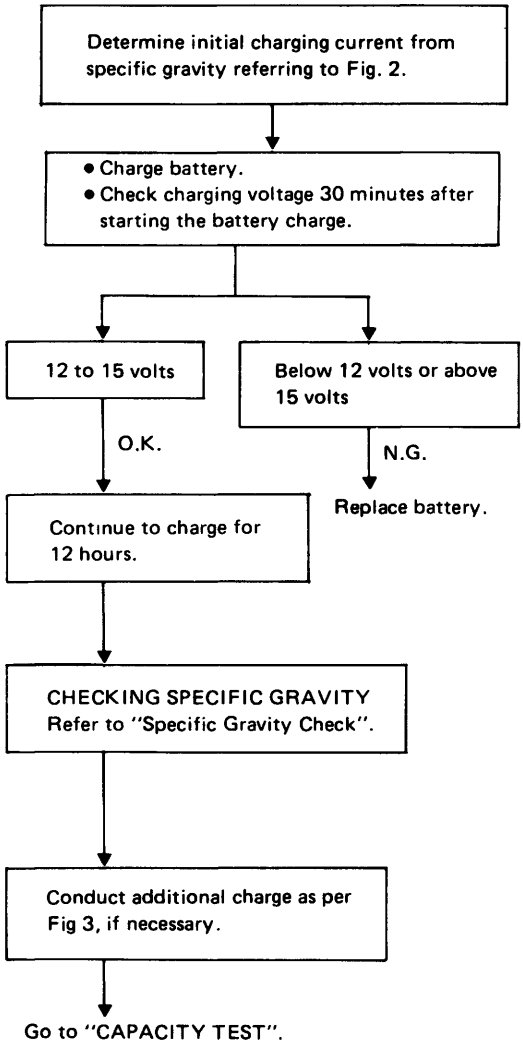
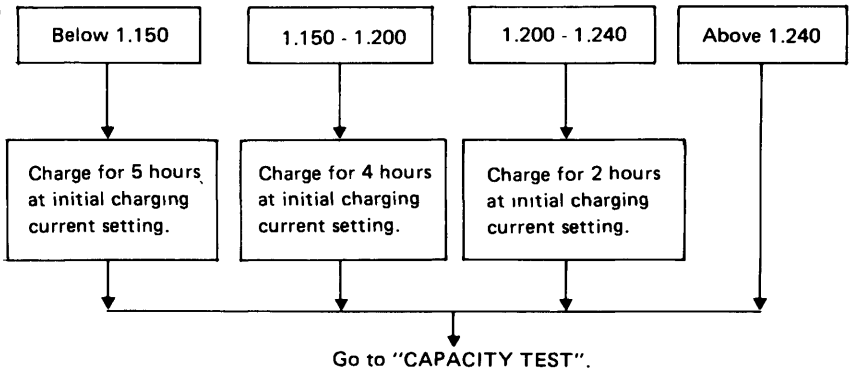


Fig. 2 INITIAL CHARGING CURRENT SETTING (Slow charge)

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

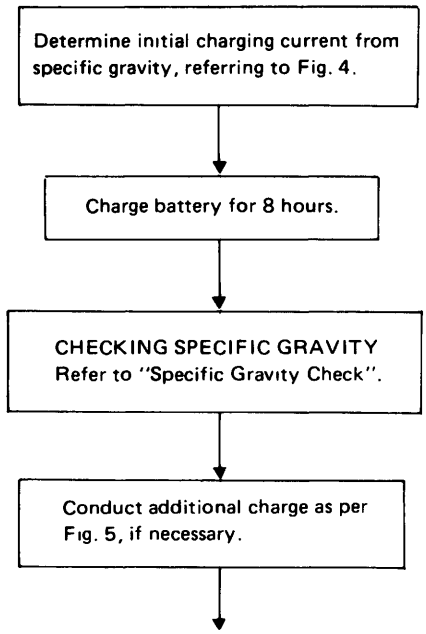
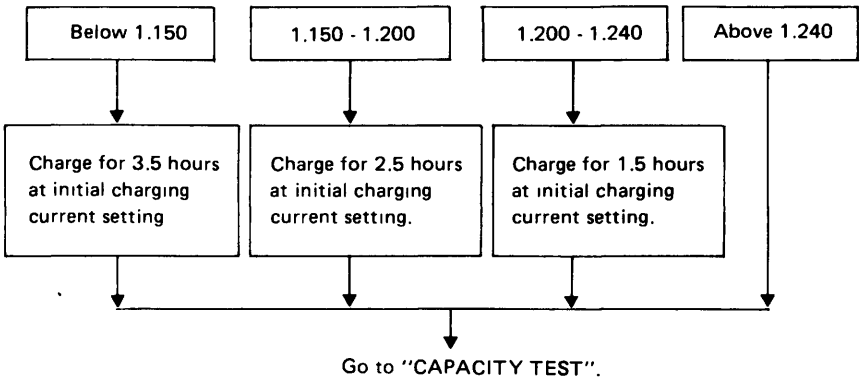


Fig. 4 INITIAL CHARGING CURRENT SETTING
(Standard charge)

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

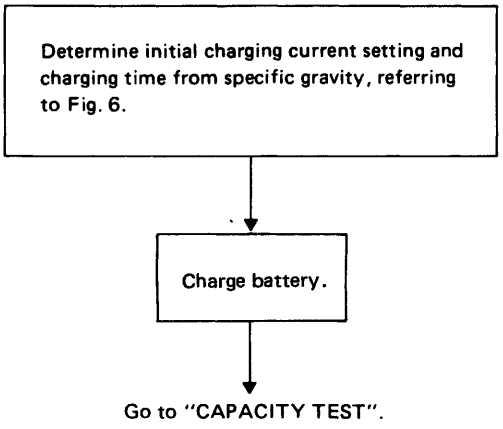


Fig. 6 INITIAL CHARGING CURRENT SETTING AND CHARGING TIME (Quick charge)

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).

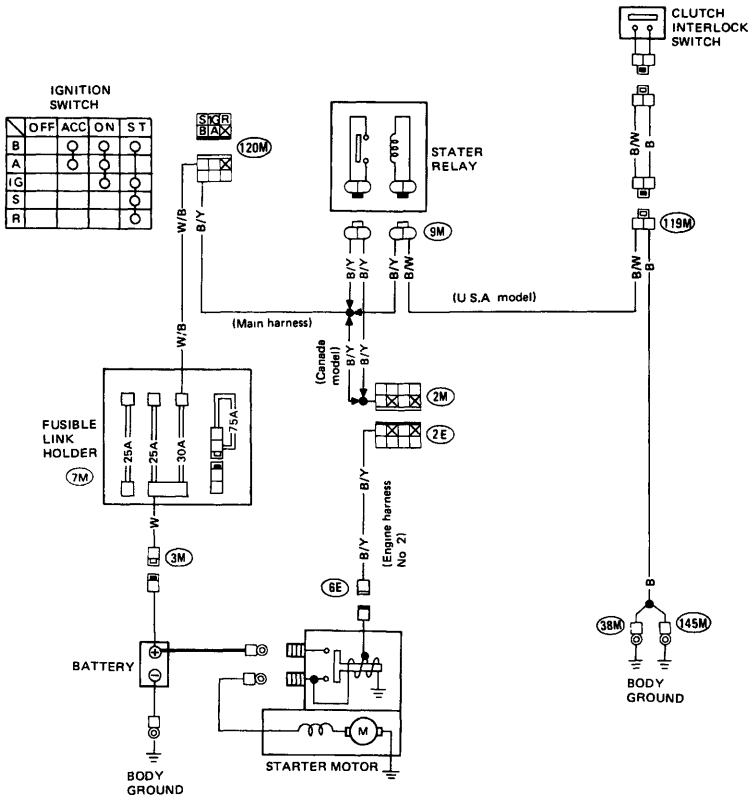
f. Do not exceed the charging time specified in Fig. 6, because charging battery over the charging time can cause deterioration of the battery.

Service Data and Specifications (S.D.S.)

Applied area		U.S.A.	Canada, optional for U.S.A.
Engine		Gasoline	
Type		55D23L	65D26L
Capacity	V-AH	12-60	12-65

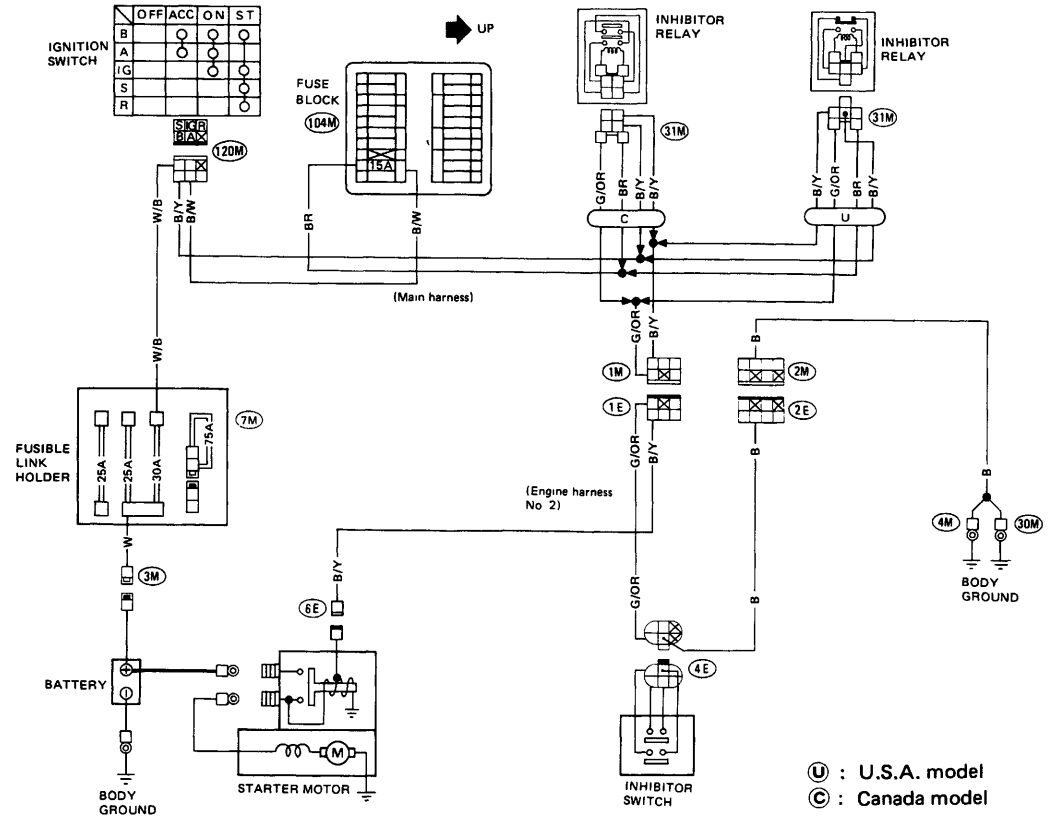
Wiring Diagram

M/T model



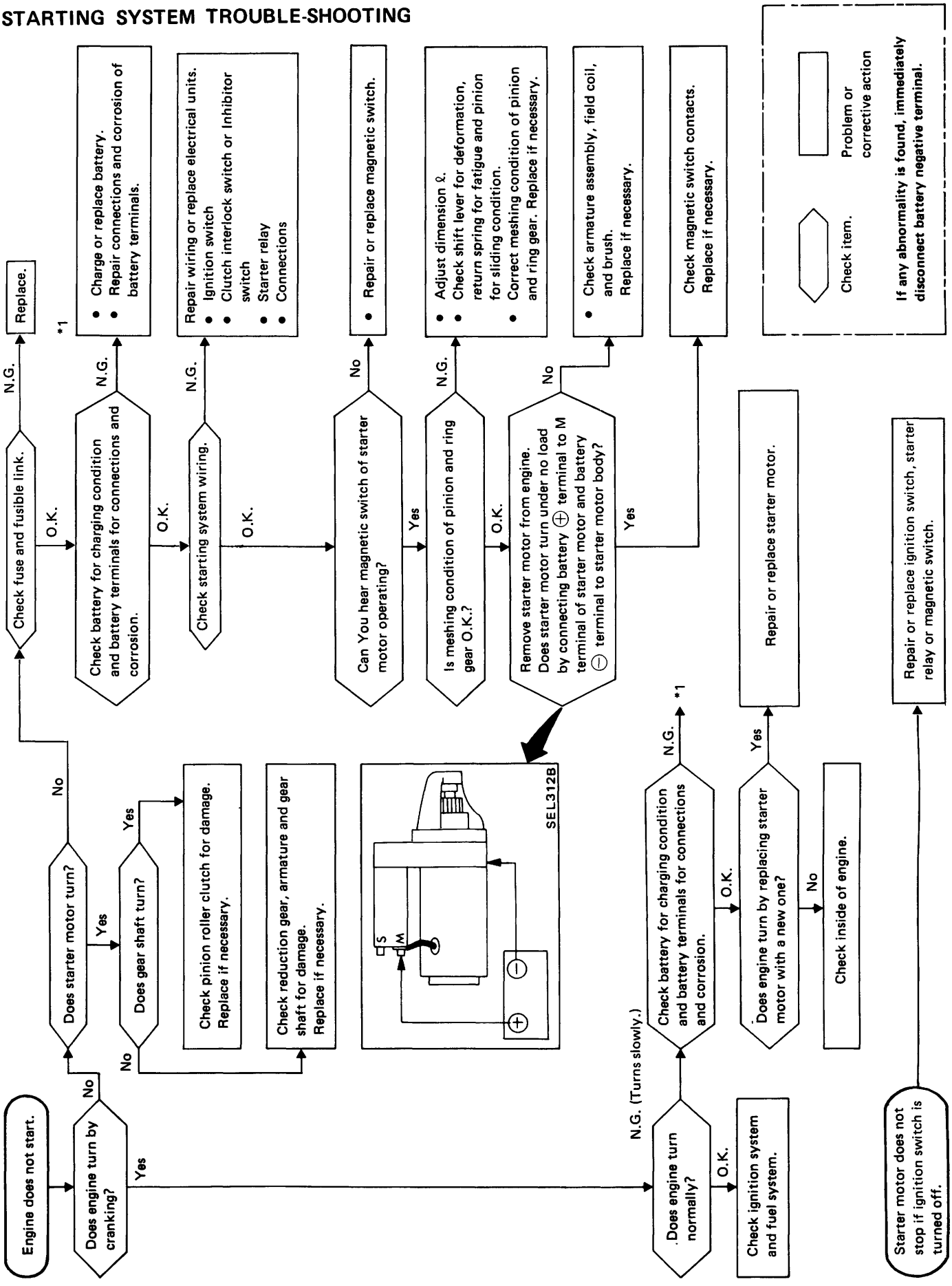
SEL621L

A/T model



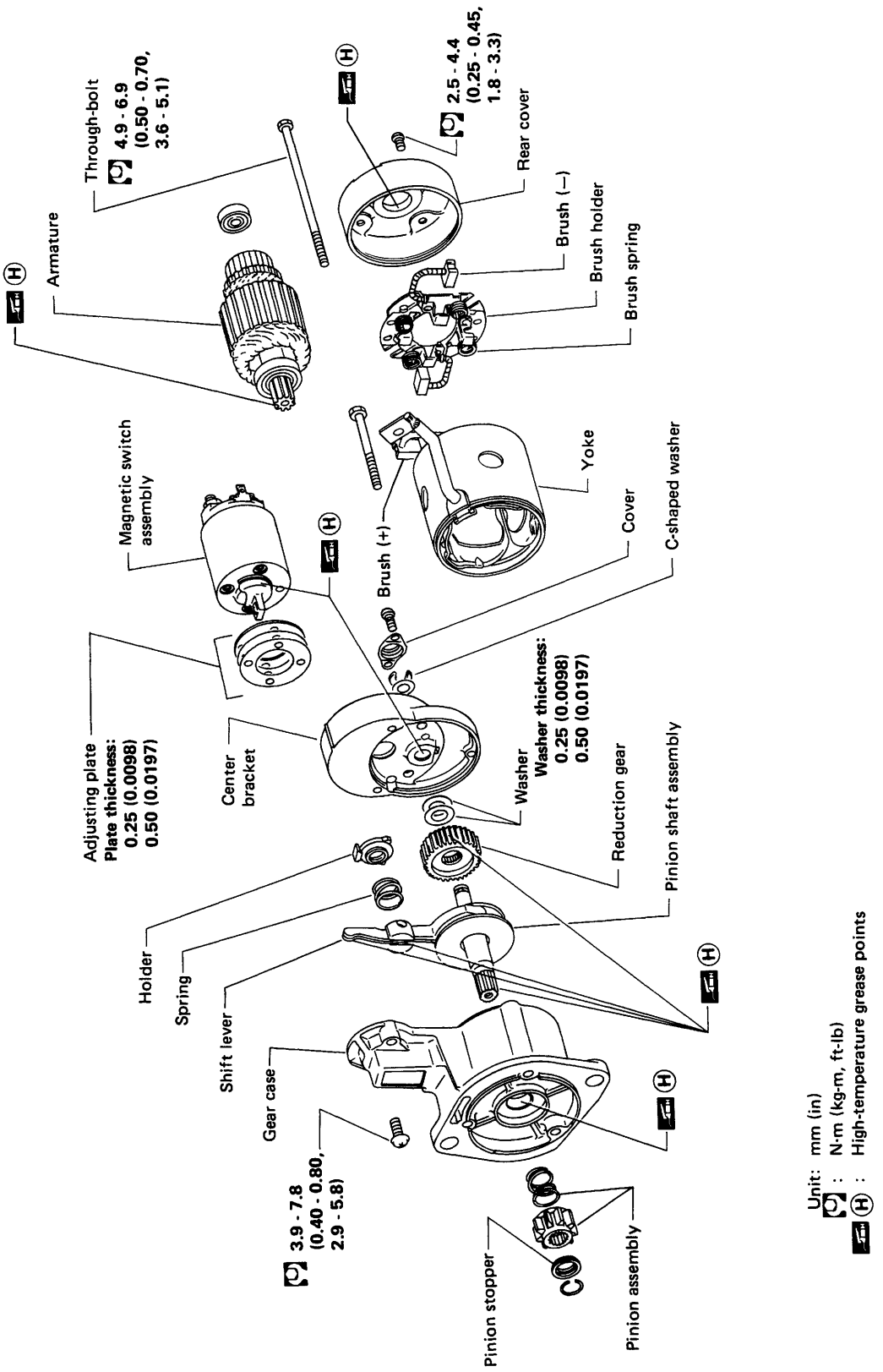
SEL622L

STARTING SYSTEM TROUBLE-SHOOTING



Construction

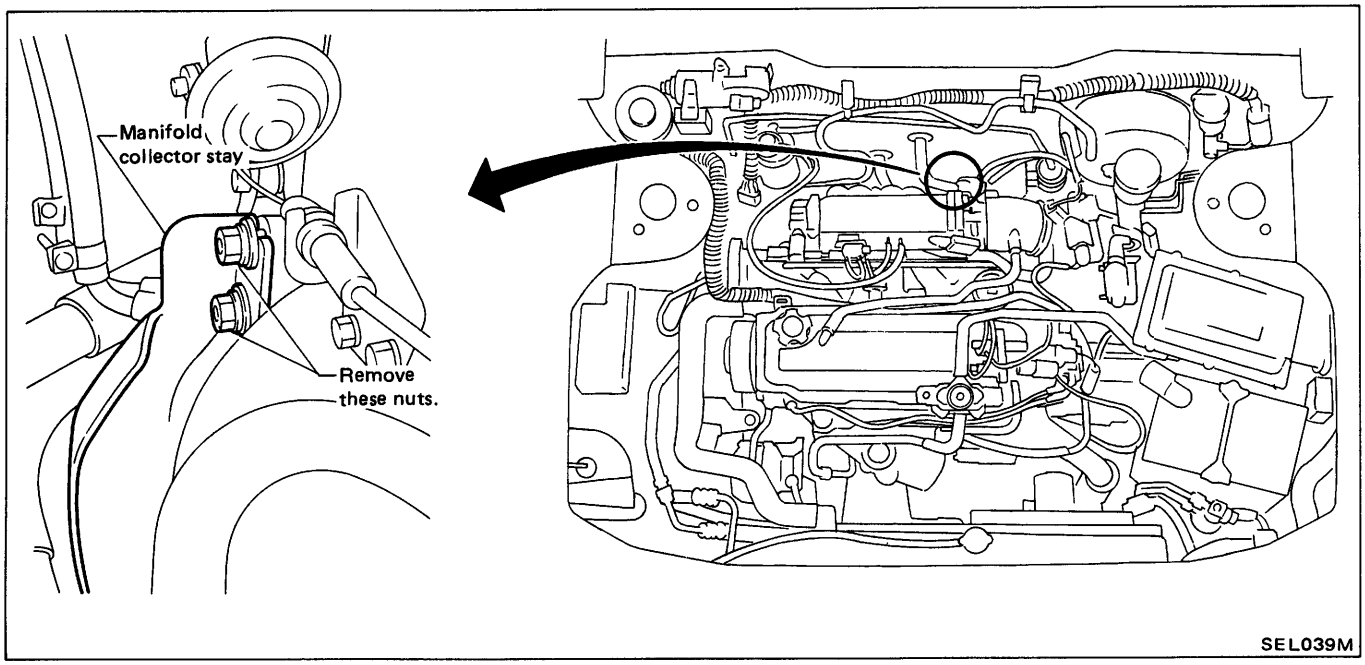
M2T53781

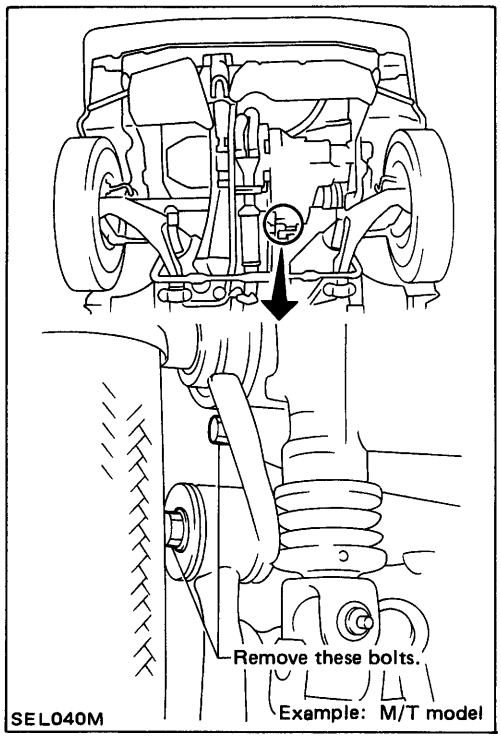


SEL554E

Removal and Installation

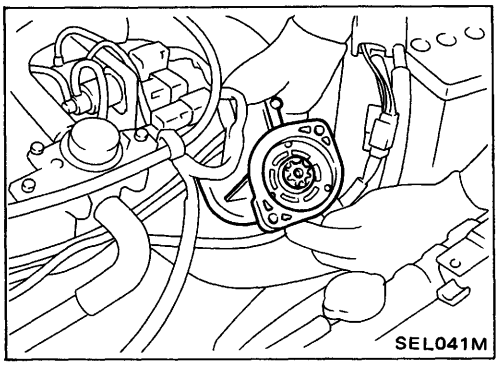
REMOVAL





1. Remove manifold collector stay upper fixing nuts as shown above.
2. Remove manifold collector stay lower fixing bolts as shown at left.
3. Remove one more collector stay lower fixing bolt which is located above R.H. drive shaft. And take off manifold collector stay.

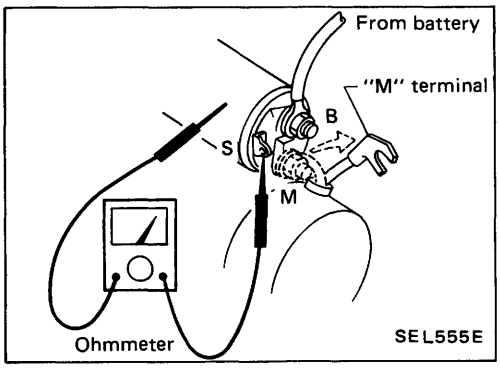
Removal and Installation (Cont'd)



4. Remove starter fixing bolts.
5. Move starter to right side and then remove connector and cable.
6. Take out starter from above through the clearance between transaxle and other components.

INSTALLATION

- Components should be installed in reverse order of removal.
- When installing starter, connect cable first, and then install and fix starter fixing bolts.

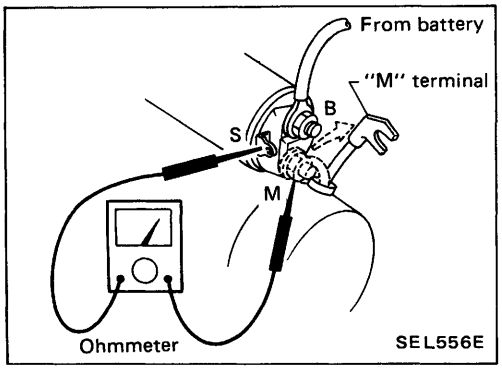


Magnetic Switch Check

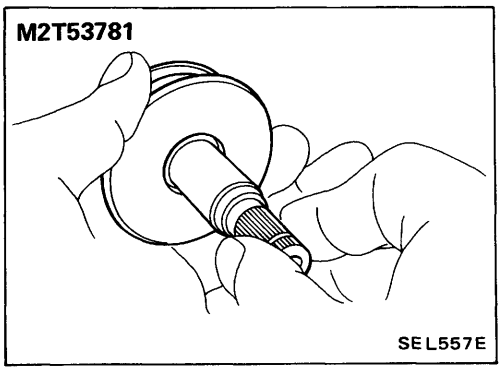
Magnetic Switch Check

- 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.



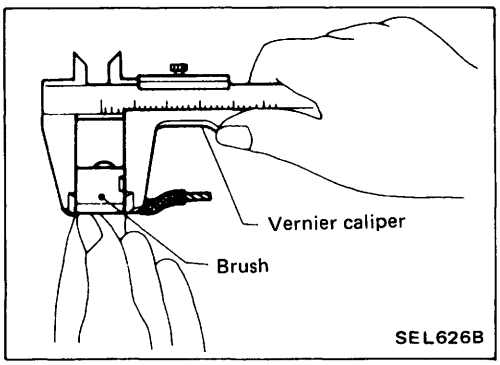
2. Continuity test (between "S" terminal and "M" terminal).
   - No continuity ... Replace.



Pinion/Clutch Check

1. 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.

2. Inspect pinion teeth.
   - Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
3. Inspect reduction gear teeth.
   - Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)



Brush Check

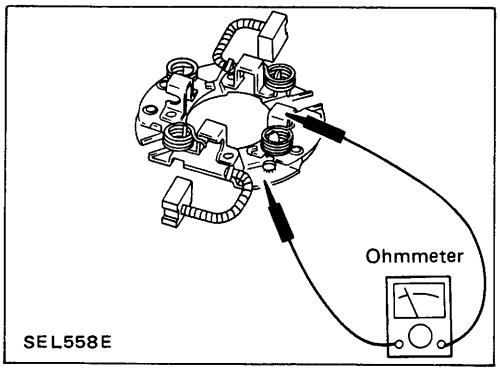
BRUSH

Check wear of brush.

Wear limit length:
Refer to S.D.S.

- Excessive wear ... Replace.

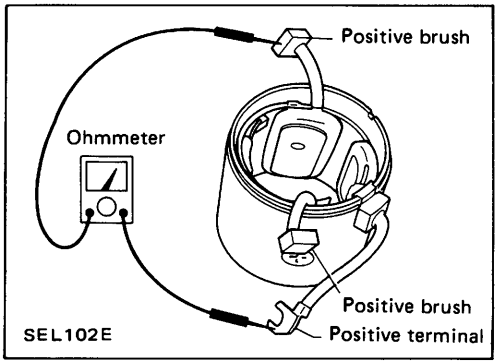
Brush Check (Cont'd)



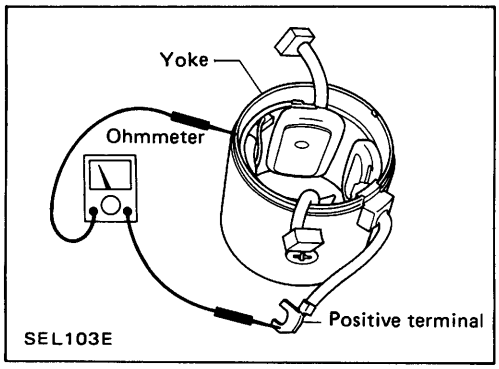
BRUSH HOLDER

1. Perform insulation test between brush holder (positive side) and its base (negative side).
   - Continuity exists ... Replace.
2. Check brush to see if it moves smoothly.
   - If brush holder is bent, replace it; if sliding surface is dirty, clean.

Field Coil Check

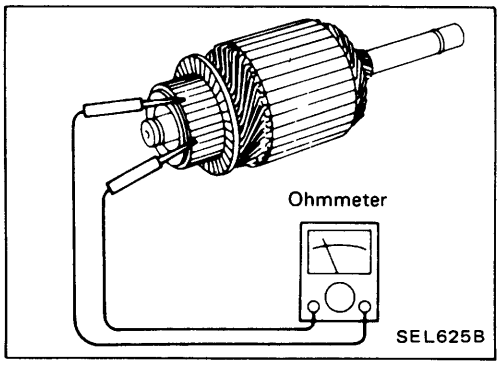


1. Continuity test (between field coil positive terminal and positive brushes).
   - No continuity ... Replace field coil.

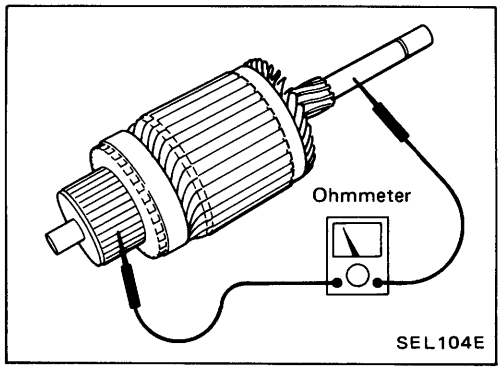


2. Insulation test (between field coil positive terminal and yoke).
   - Continuity exists ... Replace field coil.

Armature Check

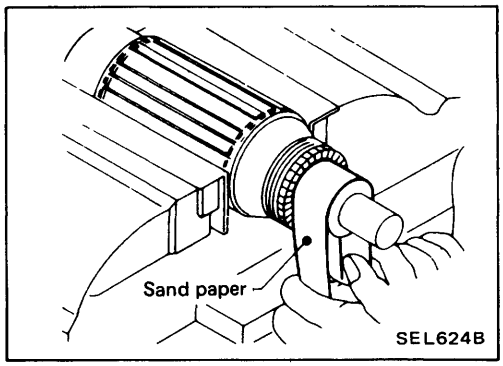


1. Continuity test (between two segments side by side).
   - No continuity ... Replace.

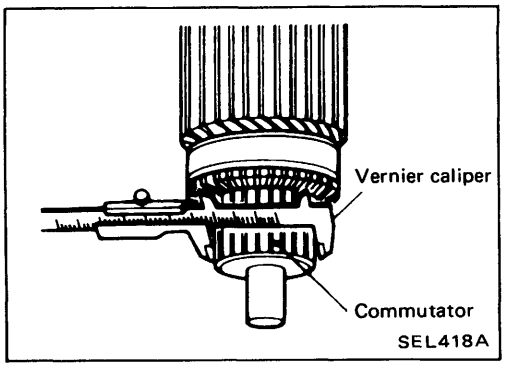


2. Insulation test (between each commutator and shaft).
   - Continuity exists ... Replace.

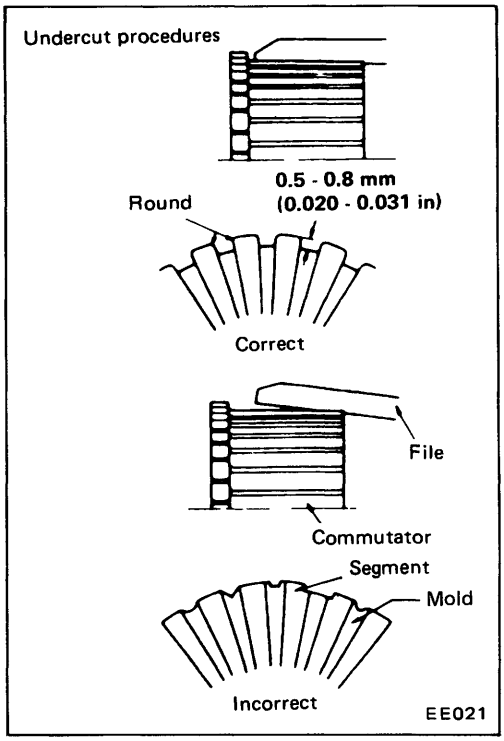
Armature Check (Cont'd)



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.



5. Check depth of insulating mold from commutator surface.
   - Less than 0.2 mm (0.008 in) ... Undercut to 0.5 - 0.8 mm (0.020 - 0.031 in)

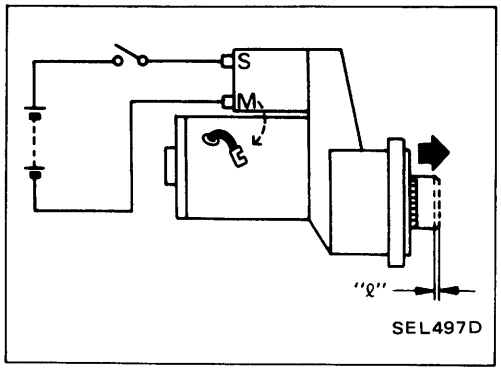
Assembly

Carefully observe the following instructions.

HIGH-TEMPERATURE GREASE POINT

- Rear cover metal
- Gear case metal
- Center bracket metal
- Frictional surface of pinion
- Moving portion of shift lever
- Plunger of magnetic switch
- Reduction gear

Assembly (Cont'd)



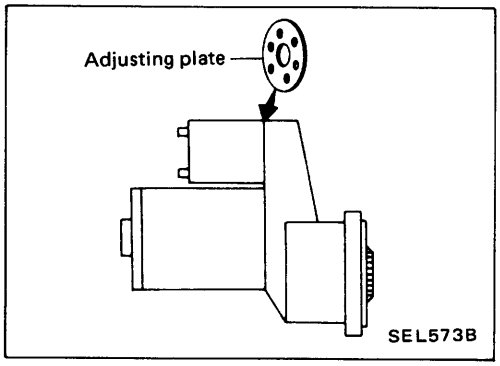
PINION PROTRUSION LENGTH ADJUSTMENT

Reduction gear type

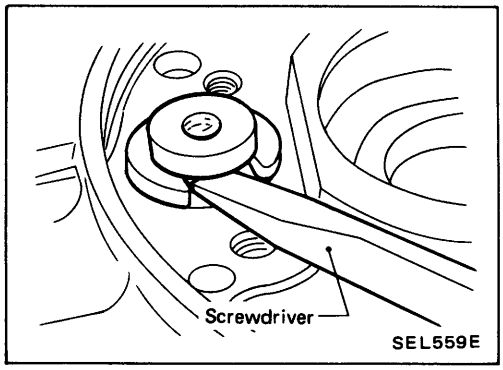
Measure movement "ℓ" in height of pinion when pinion is pushed out with magnetic switch energized and when pinion is pulled out by hand until it touches stopper.

Movement "ℓ":

Refer to S.D.S.



- Not in the specified value ... Adjust by adjusting plate.



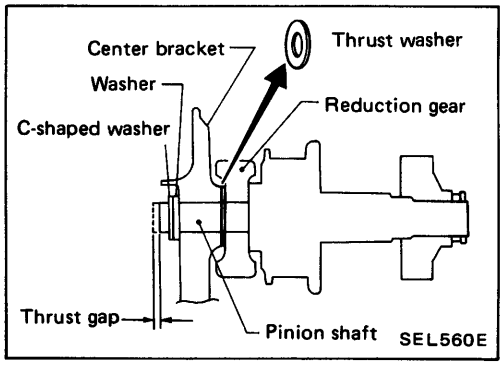
PINION SHAFT THRUST GAP ADJUSTMENT

Reduction gear type

Check thrust gap with a gap gauge by pulling pinion shaft in the axial direction with a screwdriver.

Maximum of thrust gap:

0.5 mm (0.020 in)



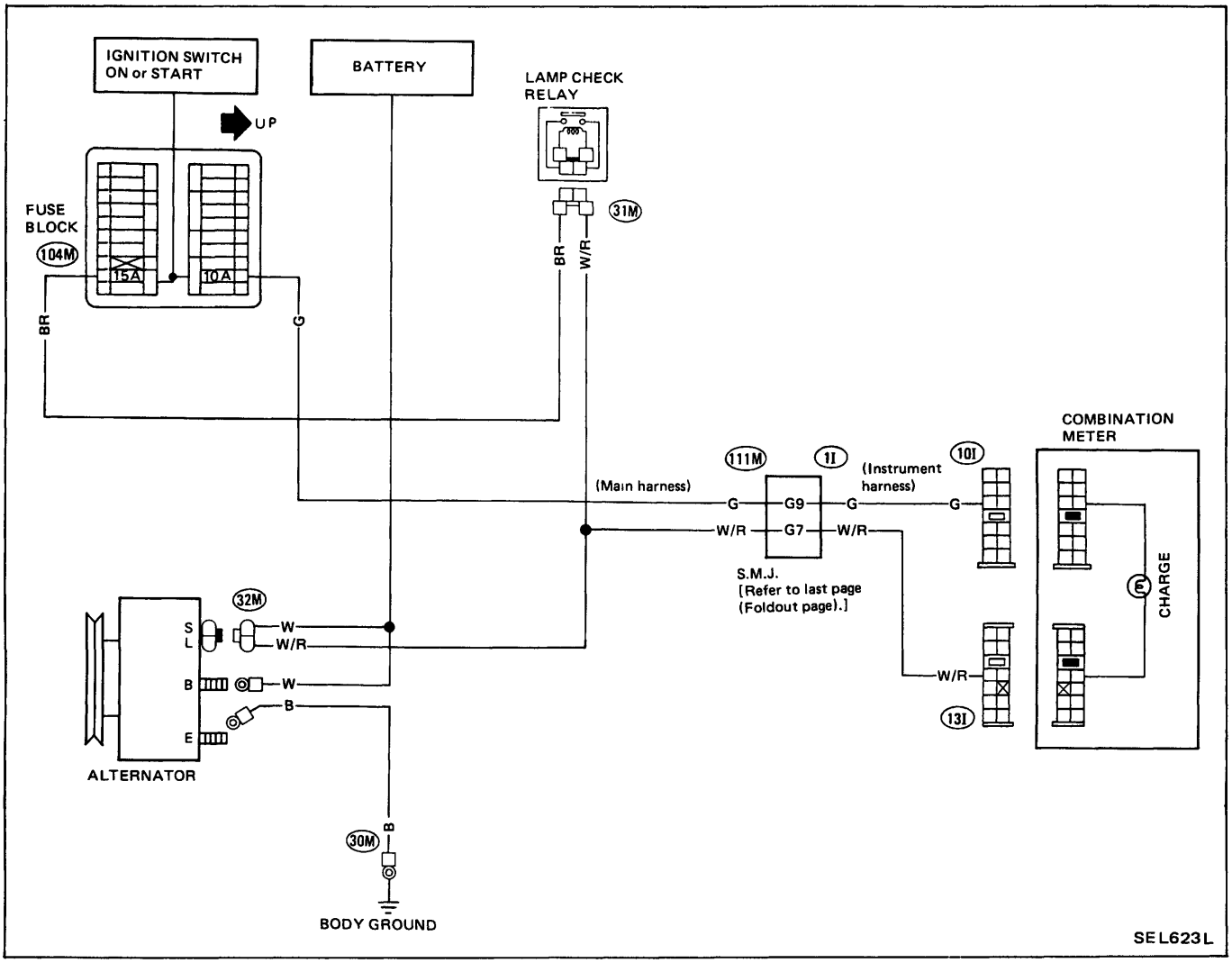
- If thrust gap is over the specified value, adjust it with thrust washer.

Service Data and Specifications (S.D.S.)

STARTER

Type		M2T53781
		MITSUBISHI make
		Reduction gear type
Applied model		All
System voltage	V	12
No-load		
Terminal voltage	V	11.5
Current	A	Less than 100
Revolution	rpm	More than 2,750
Minimum diameter of commutator	mm (in)	More than 31.4 (1.236)
Minimum length of brush	mm (in)	11.5 (0.453)
Brush spring tension	N (kg, lb)	16.7 - 21.6 (1.7 - 2.2, 3.7 - 4.9)
Movement "ℓ" in height of pinion assembly	mm (in)	0.5 - 2.0 (0.020 - 0.079)
Clearance between bearing metal and armature shaft	mm (in)	Less than 0.2 (0.008)
Maximum thrust gap of pinion shaft	mm (in)	0.5 (0.020)

Wiring Diagram

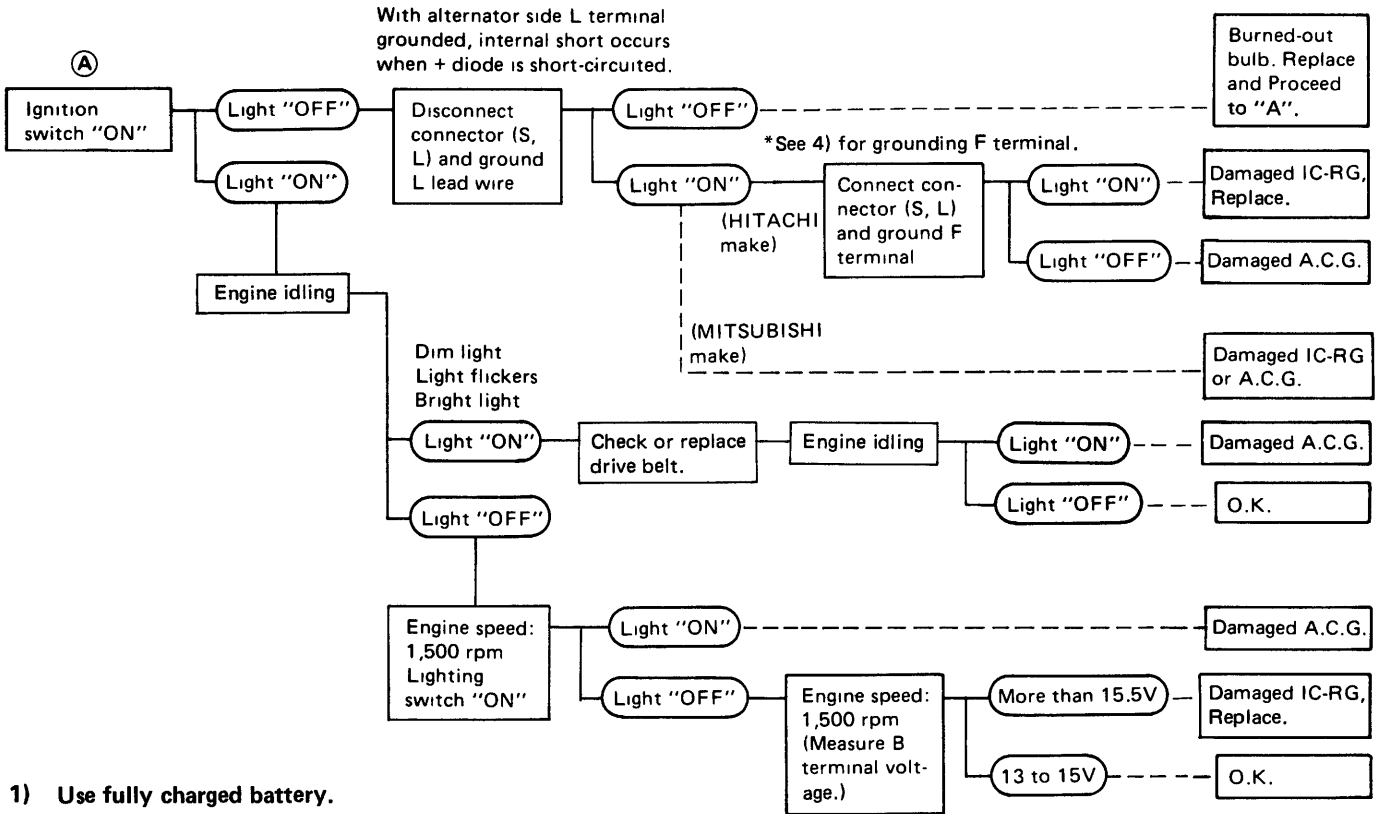


Trouble-shooting

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.

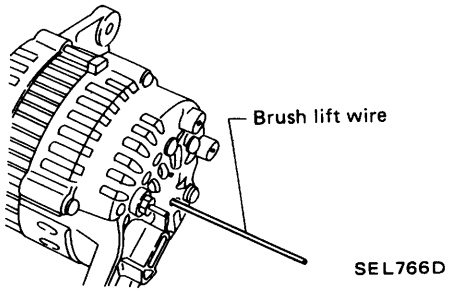
WITH IC REGULATOR



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)**

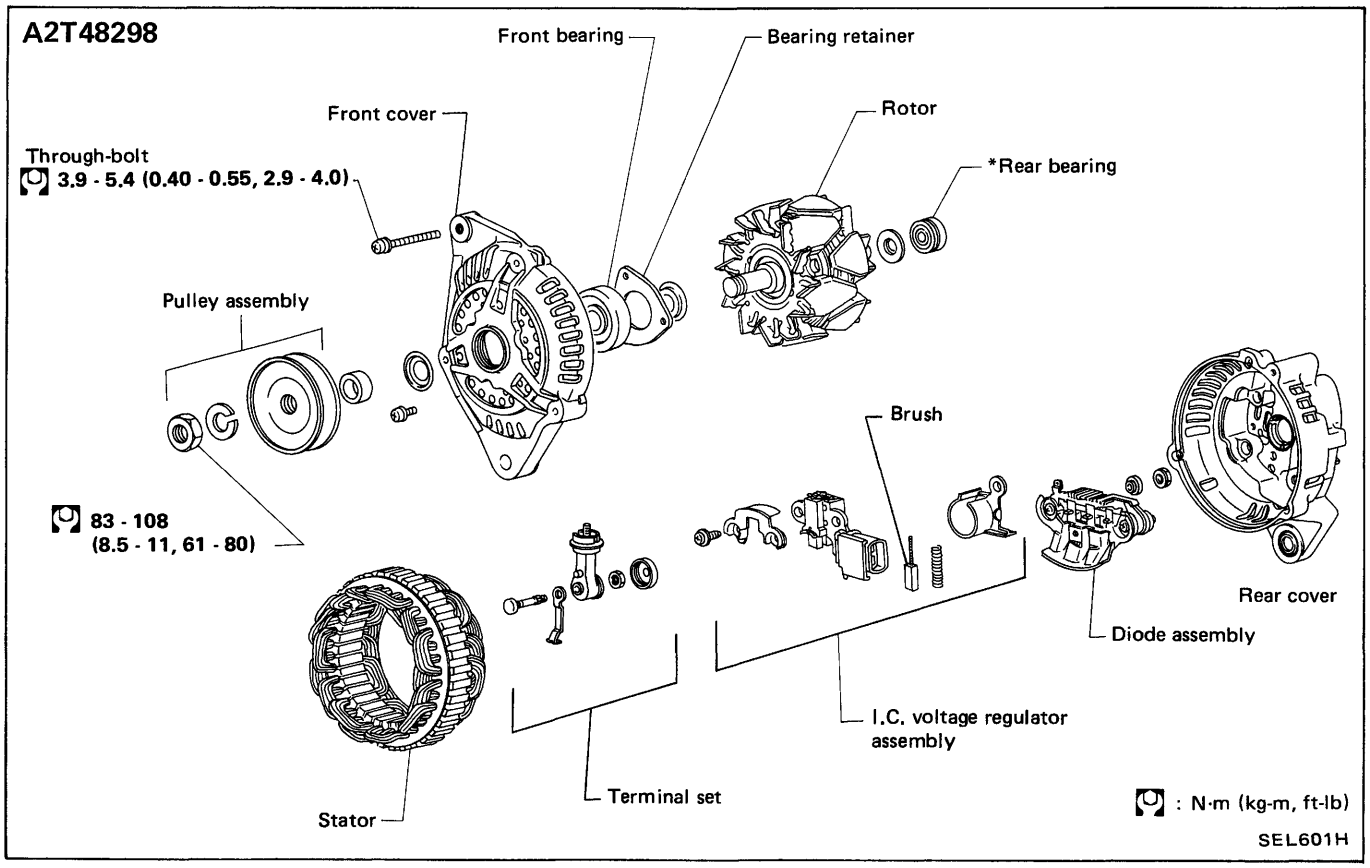
Gasoline engine model

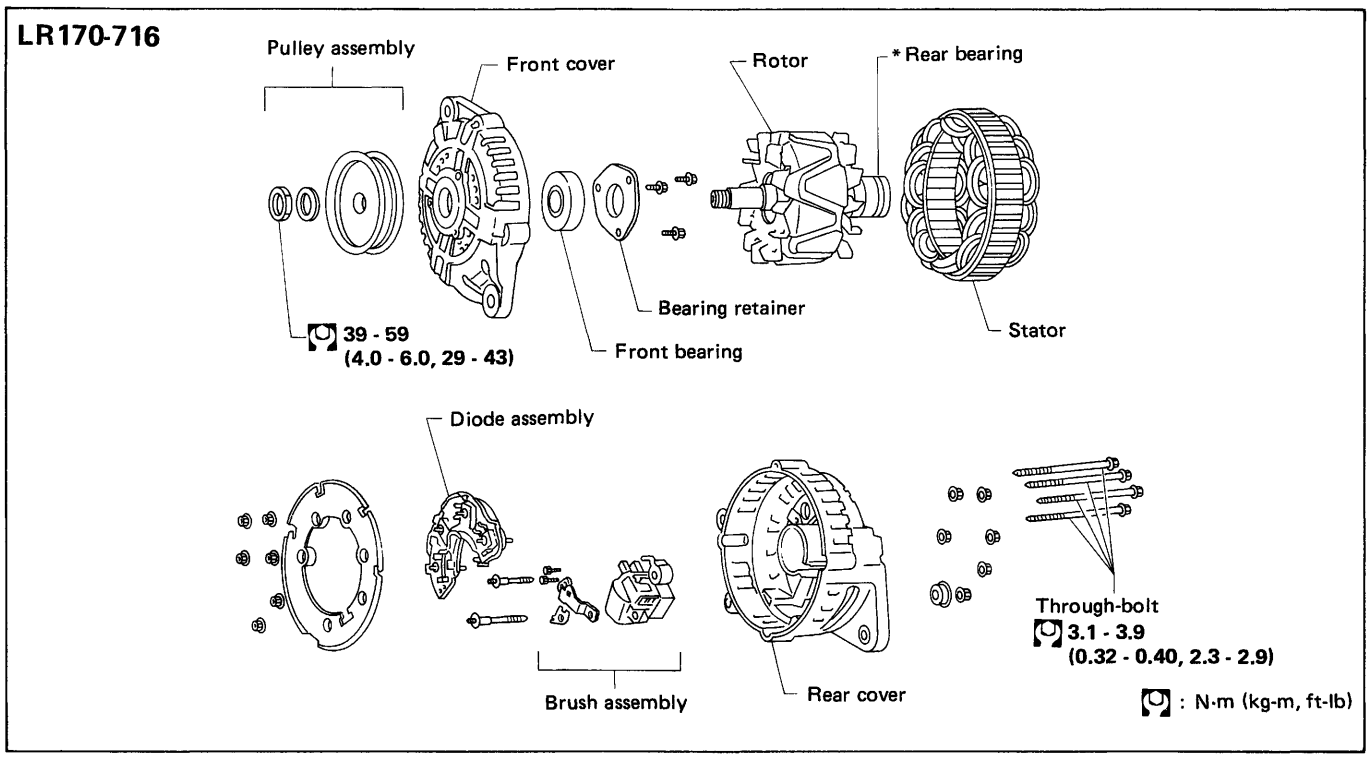
Contact tip of wire with brush and attach wire to alternator body.



5) **Terminals "S", "L", "B" and "E" are marked on rear cover of alternator.**

Construction

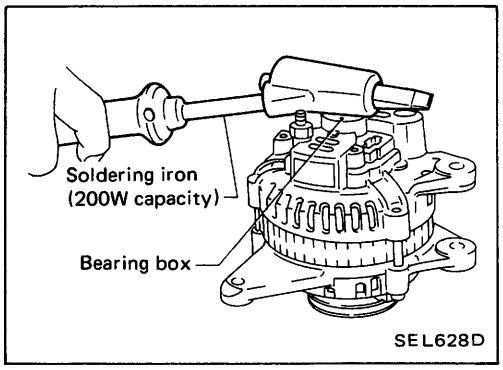




***Rear bearing**

CAUTION:

Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. Be careful not to lose this ring during removal.

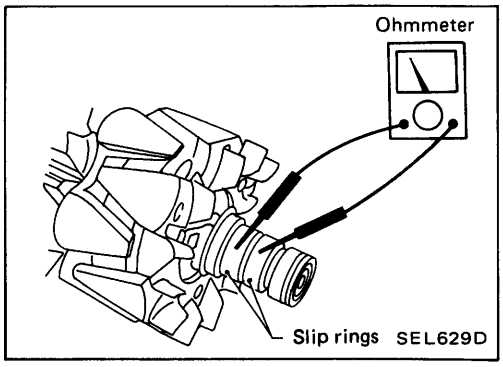


Disassembly

REAR COVER REMOVAL

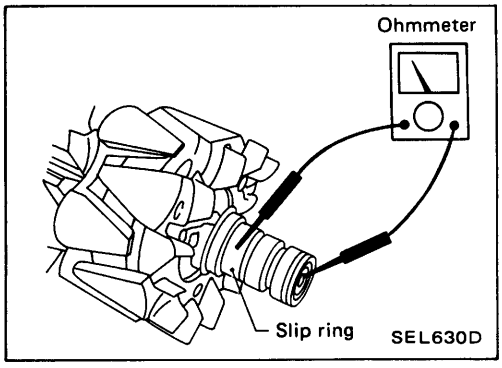
CAUTION:

Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. To facilitate removal of rear cover, heat just bearing box section with a 200W soldering iron.
Do not use a heat gun, as it can damage diode assembly.



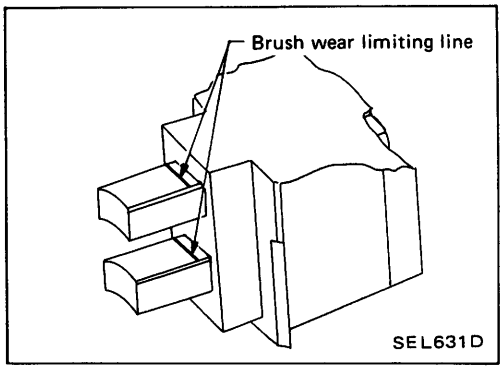
Rotor Slip Ring Check

1. Continuity test
   - No continuity ... Replace rotor.



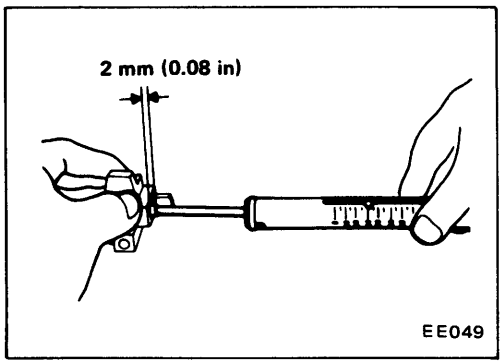
2. Insulator test
   - Continuity exists ... Replace rotor.
3. Check slip ring for wear.

   Slip ring minimum outer diameter:
   Refer to S.D.S.



Brush Check

1. Check smooth movement of brush.
   - Not smooth ... Check brush holder and clean.
2. Check brush for wear.
   - Replace brush if it is worn down to the limit line.

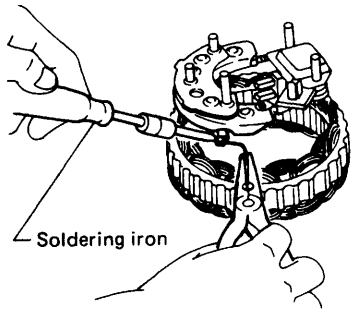


3. Check brush lead wire for damage.
   - Damaged ... Replace.
4. Check brush spring pressure.

   Measure brush spring pressure with brush projected approximately 2 mm (0.08 in) from brush holder.

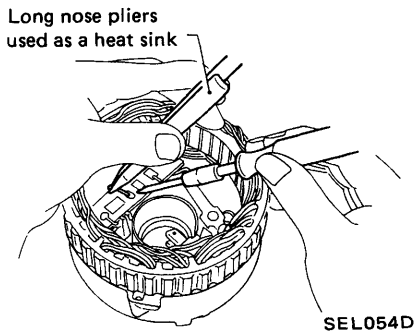
   Spring pressure:
   Refer to S.D.S.
   - Not within the specified values ... Replace.

[HITACHI make]



SEL587A

[MITSUBISHI make]



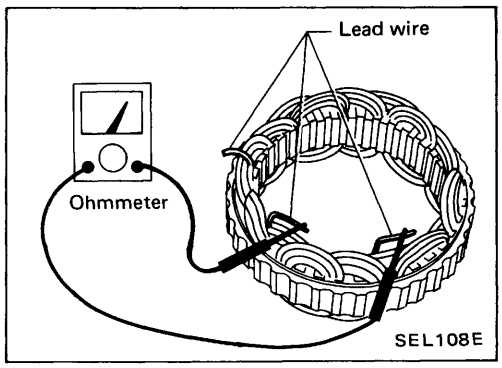
SEL054D

Stator Check

To test the stator or diode, you must separate them by unsoldering the connecting wires.

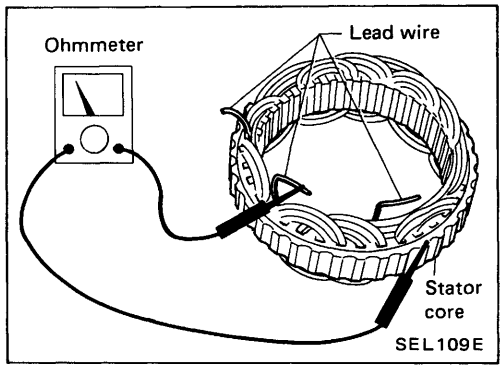
CAUTION:

Use only as much heat as required to melt solder. Otherwise, diodes will be damaged by excessive heat.



SEL108E

1. Continuity test
   - No continuity ... Replace stator.



SEL109E

2. Ground test
   - Continuity exists ... Replace stator.

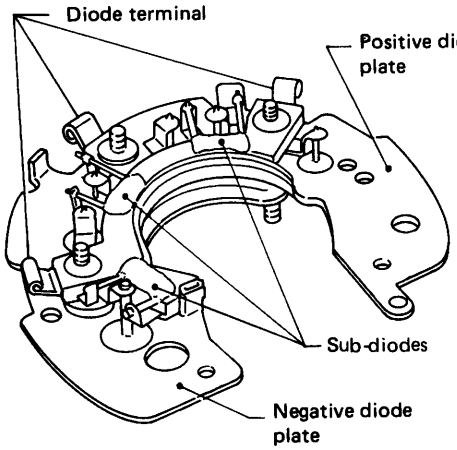
Diode Check

MAIN DIODES

- Use an ohmmeter to check condition of diodes as indicated in chart below.
- If any of the test results is not satisfactory, replace diode assembly.

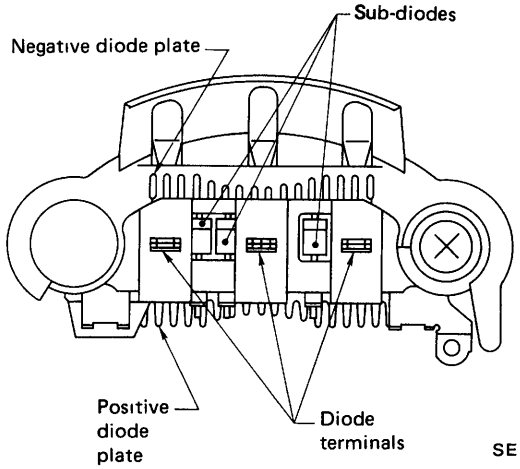
	Ohmmeter probes		Continuity
	Positive ⊕	Negative ⊖	
Diodes check (Positive side)	Positive diode plate	Diode terminals	Yes
	Diode terminals	Positive diode plate	No
Diodes check (Negative side)	Negative diode plate	Diode terminals	No
	Diode terminals	Negative diode plate	Yes

[HITACHI make]



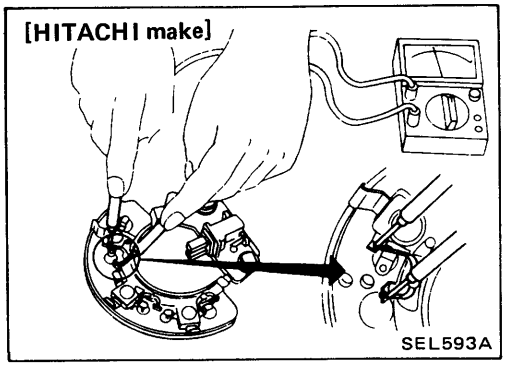
SEL768D

[MITSUBISHI make]



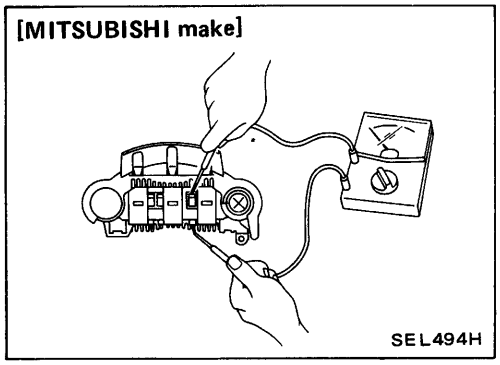
SEL493H

[HITACHI make]



SEL593A

[MITSUBISHI make]



SEL494H

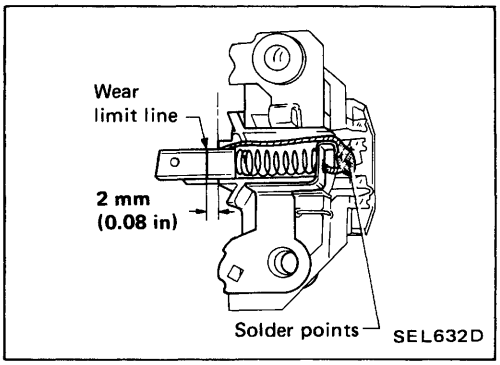
SUB-DIODES

- 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.

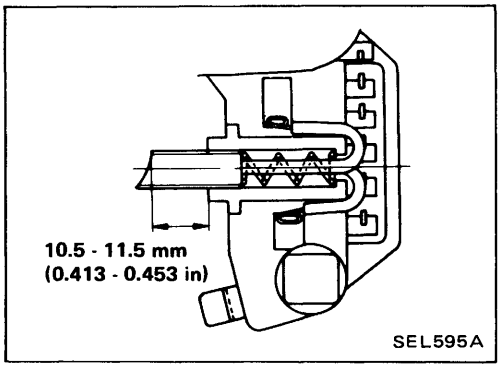
- When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.



WHEN SOLDERING BRUSH LEAD WIRE

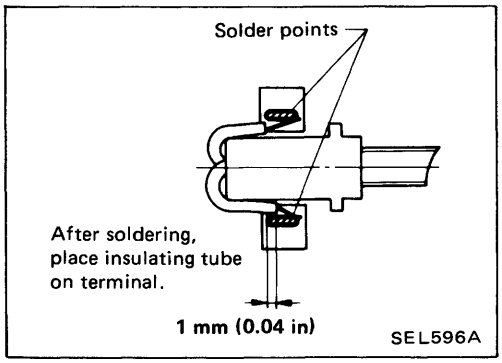
[MITSUBISHI make]

- Position brush so that its wear limit line protrudes 2 mm (0.08 in) beyond end face of brush holder.



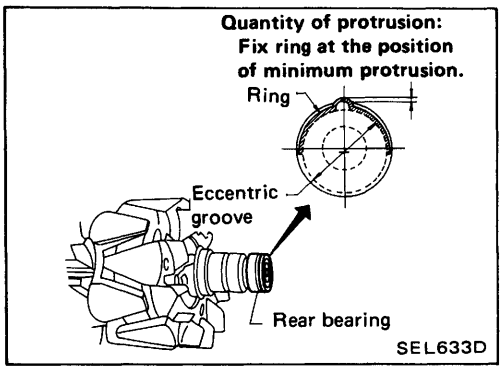
[HITACHI make]

(1) Position brush so that it extends 10.5 - 11.5 mm (0.413 - 0.453 in) from brush holder.



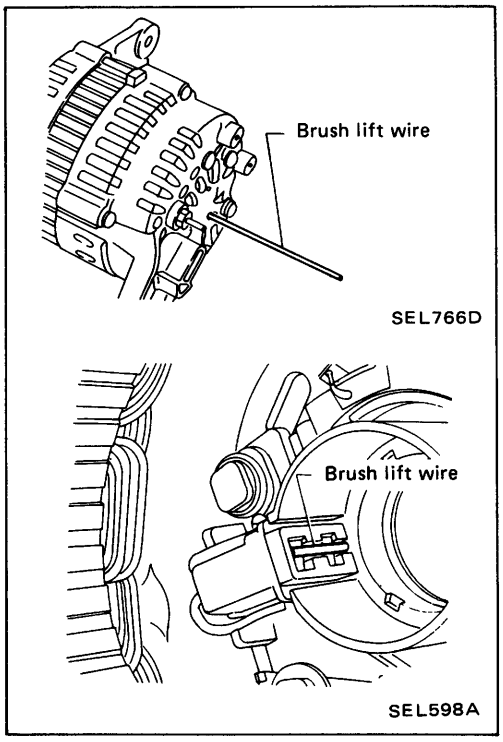
(2) Coil lead wire 1.5 times around terminal groove. Solder outside of terminal.

When soldering, be careful not to let solder adhere to insulating tube as it will weaken the tube and cause it to break.



RING FITTING IN REAR BEARING

- Fix ring into groove in rear bearing so that it is as close to the adjacent area as possible.



Assembly (Cont'd)

REAR COVER INSTALLATION

(1) Before installing front cover with pulley and rotor with rear cover, push brush up with fingers and retain brush by inserting brush lift wire into brush lift hole from outside.

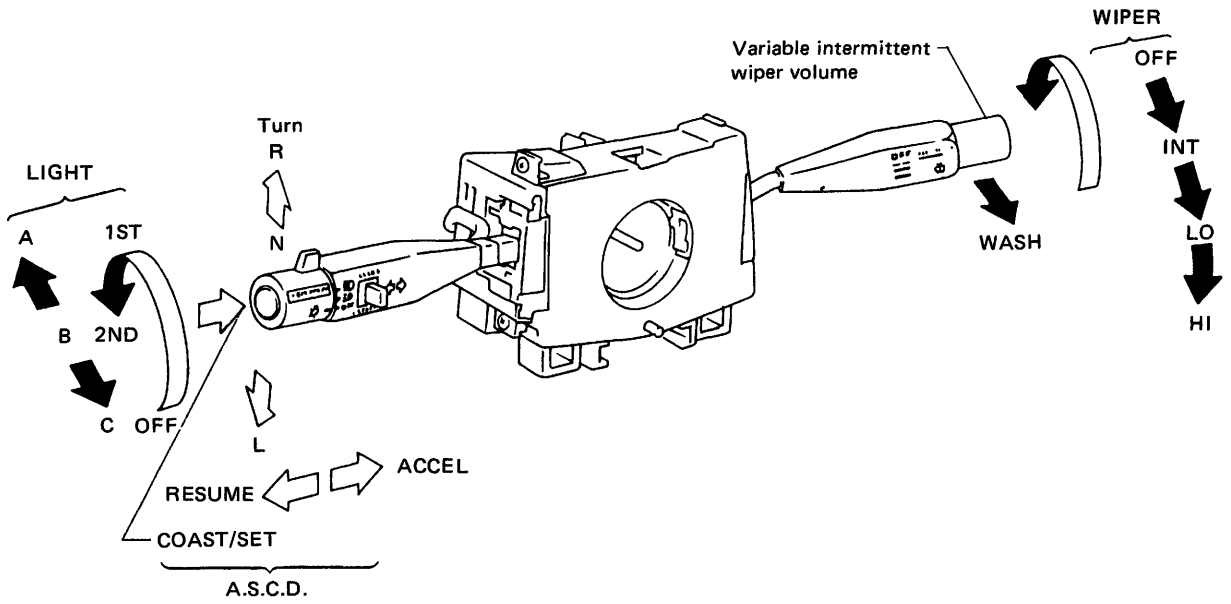
(2) After installing front and rear sides of alternator, pull out brush lift wire.

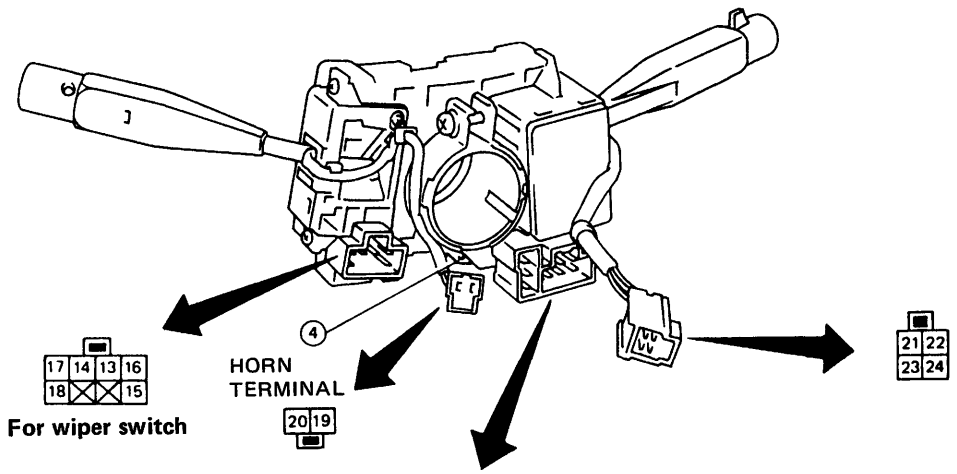
Service Data and Specifications (S.D.S.)

ALTERNATOR

Type	A2T48298	LR170-716
	MITSUBISHI make	HITACHI make
Applied model	Standard	Model equipped with air conditioner in factory
Nominal rating V-A	12-70	
Ground polarity	Negative	
Minimum revolution under no-load (when 14 volts is applied) rpm	Less than 1,300	Less than 950 (when 13.5 volts is applied)
Hot output current A/rpm	More than 50/2,500 More than 70/5,000	More than 50/2,500 More than 67/5,000
Regulated output voltage V	14.1 - 14.7	
Minimum length of brush mm (in)	More than 8 (0.31)	More than 7 (0.28)
Brush spring pressure N (g, oz)	3.040 - 4.217 (310 - 430, 10.93 - 15.17)	2.746 - 3.923 (280 - 400, 9.88 - 14.11)
Slip ring minimum outer diameter mm (in)	More than 22.4 (0.882)	More than 30.6 (1.205)

Check





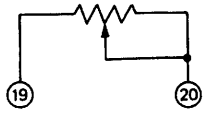
LIGHTING SWITCH

	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					○

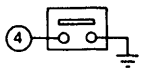
INTERMITTENT WIPER VOLUME



A.S.C.D. RESUME SWITCH

	COAST SET	RESUME	ACCEL
21	○	○	○
22	○		
23		○	
24			○

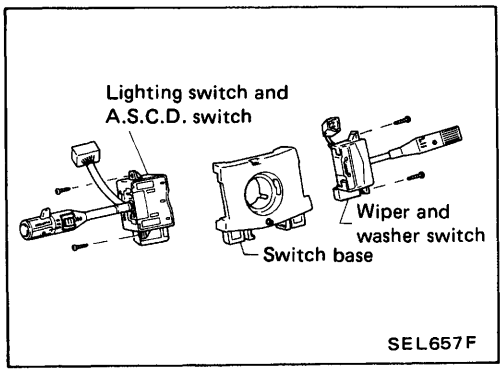
HORN SWITCH



	R	N	L
1	○		○
2	○		
3			○

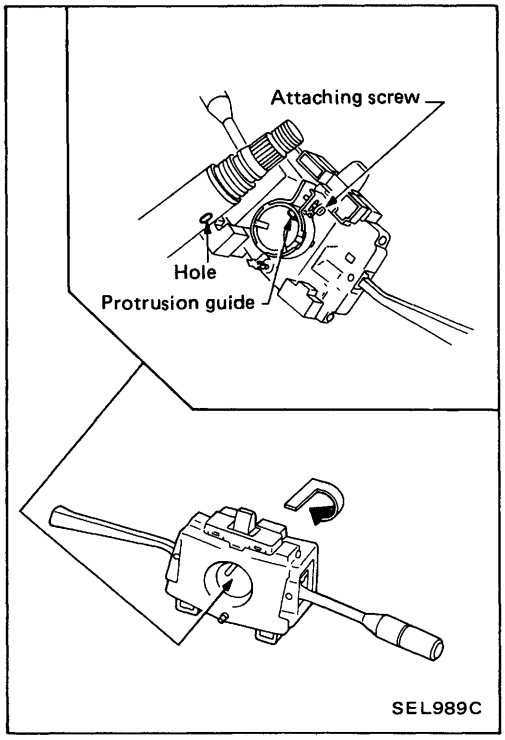
TURN SIGNAL SWITCH

SEL659L



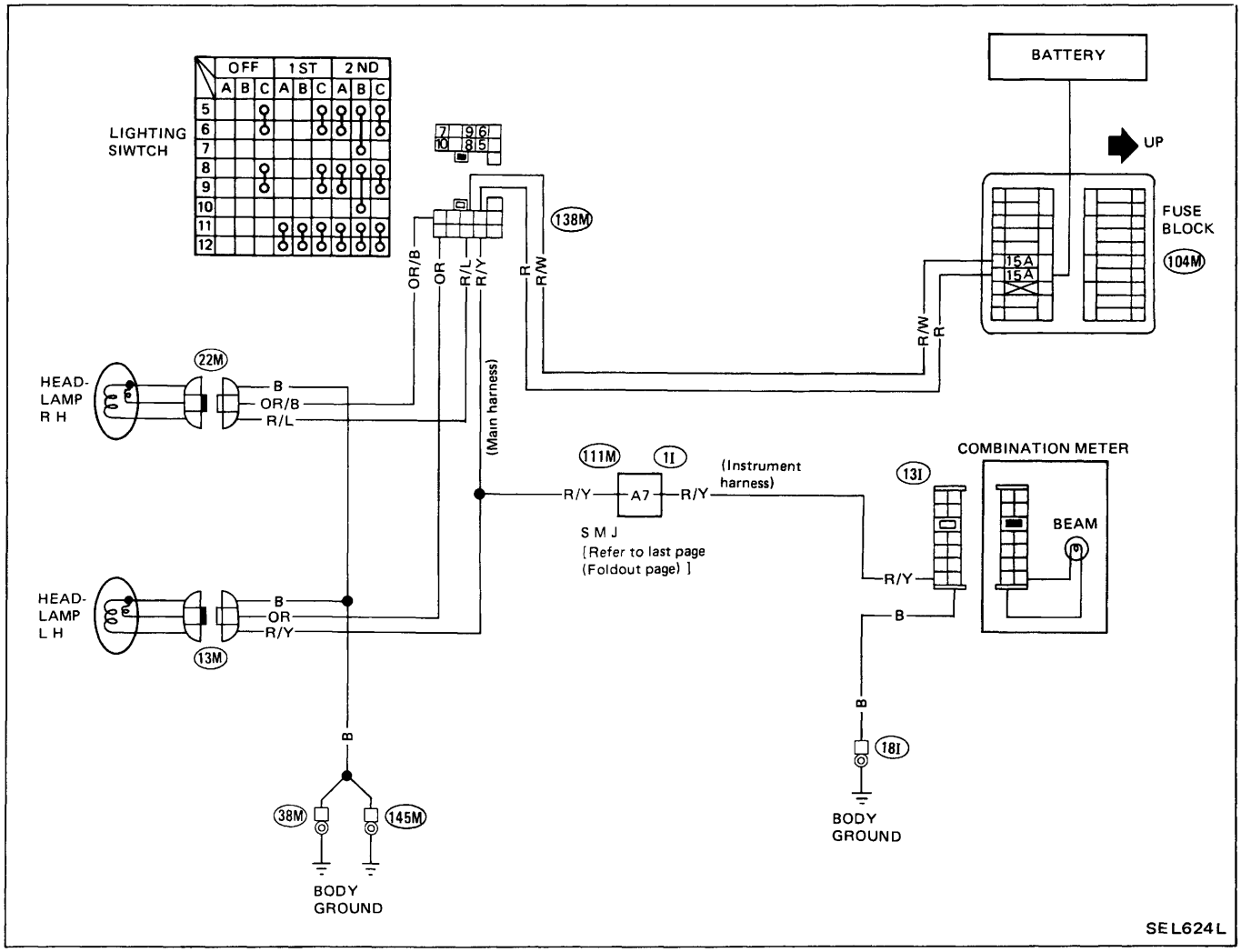
Replacement

- Lighting switch, wiper & washer switch and A.S.C.D. 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



Aiming Adjustment

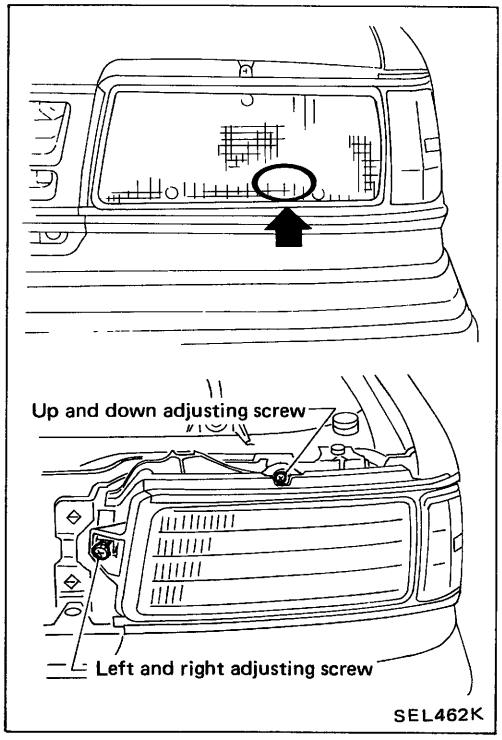
When performing headlamp aiming adjustment, use an aiming machine, aiming wall screen or headlamp tester. For operating instructions of any aimer, it should be in good repair, calibrated and used according to respective operation manuals supplied with the unit.

If any aimer is not available, aiming adjustment can be done as follows:

For details, refer to the regulations in your own country.

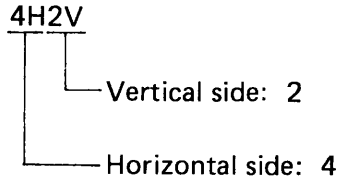
CAUTION:

a. **Keep all tires inflated to correct pressures.**
b. **Place vehicle and tester on one and same flat surface.**
c. **See that there is no load in vehicle (coolant, engine oil filled up to correct level and full fuel tank) other than the driver (or equivalent weight placed in driver's position).**



When using a mechanical aimer, adjust adapter legs to the data marked on the headlamps.

Example:

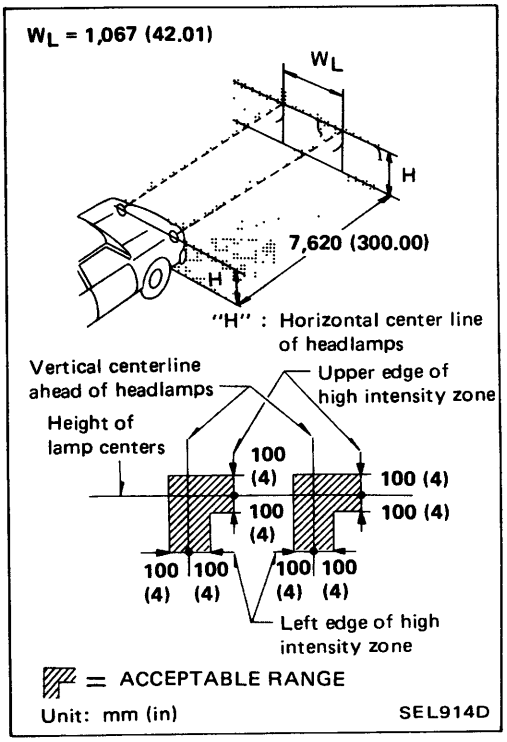


LOW BEAM

1. Turn headlamp low beam on.
2. Use adjusting screws to perform aiming adjustment.

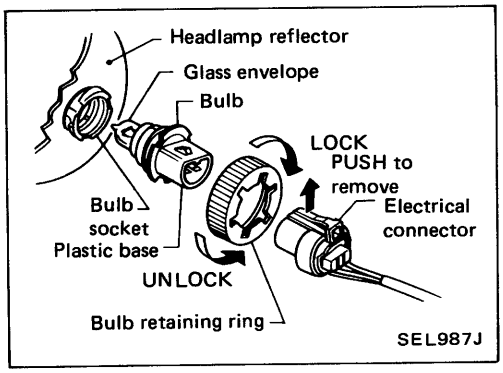
- **Before adjusting headlamps, remove covers.**
- **First tighten the adjusting screw all the way and then make adjustment by loosening the screw.**

Aiming Adjustment (Cont'd)



- **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
"W_L": Distance between each headlamp center



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.

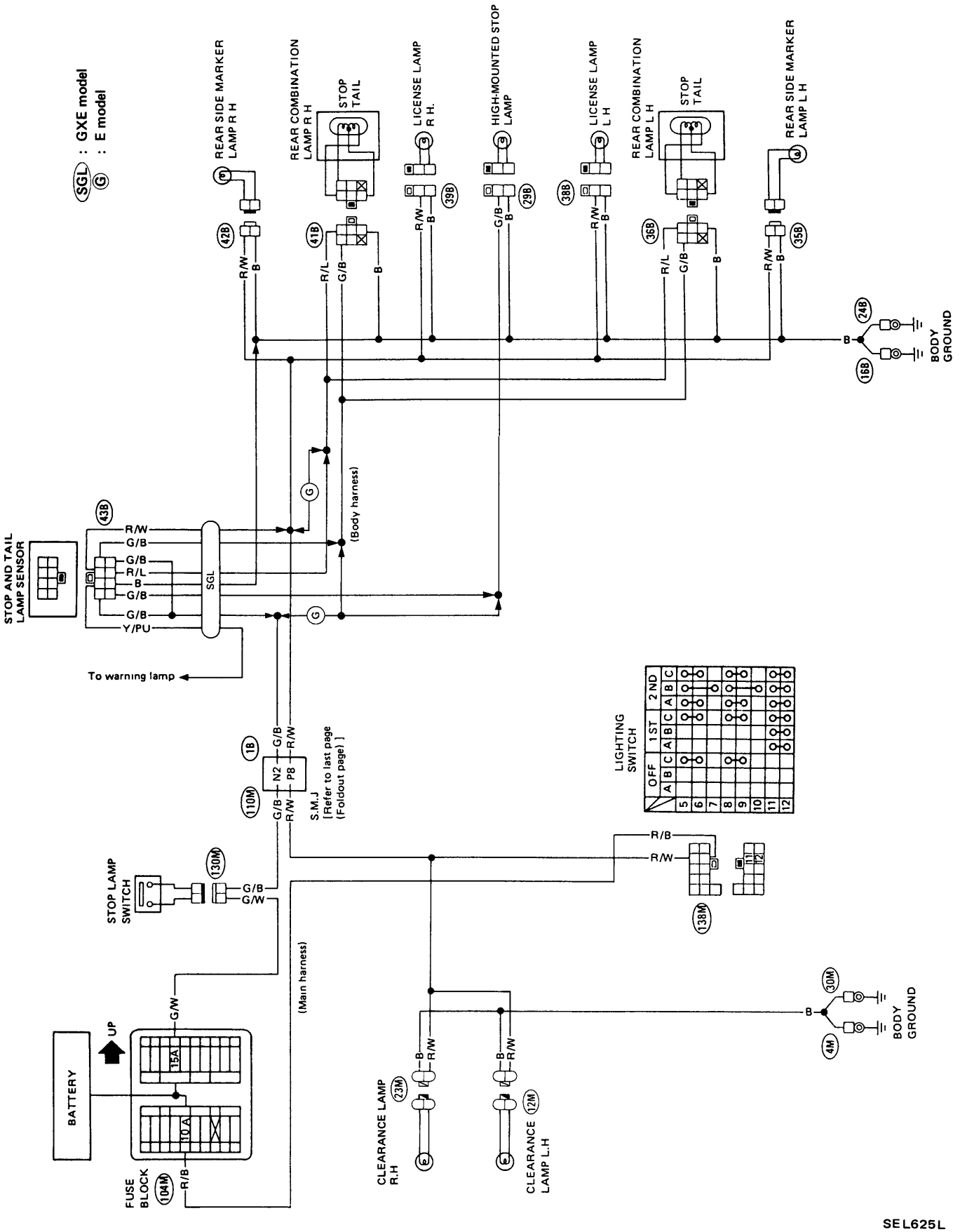
- **Grasp only the plastic base when handling the bulb. Never touch the glass envelope.**

1. Disconnect the battery cable.
2. Turn the bulb retaining ring counterclockwise until it is free from the headlight 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:

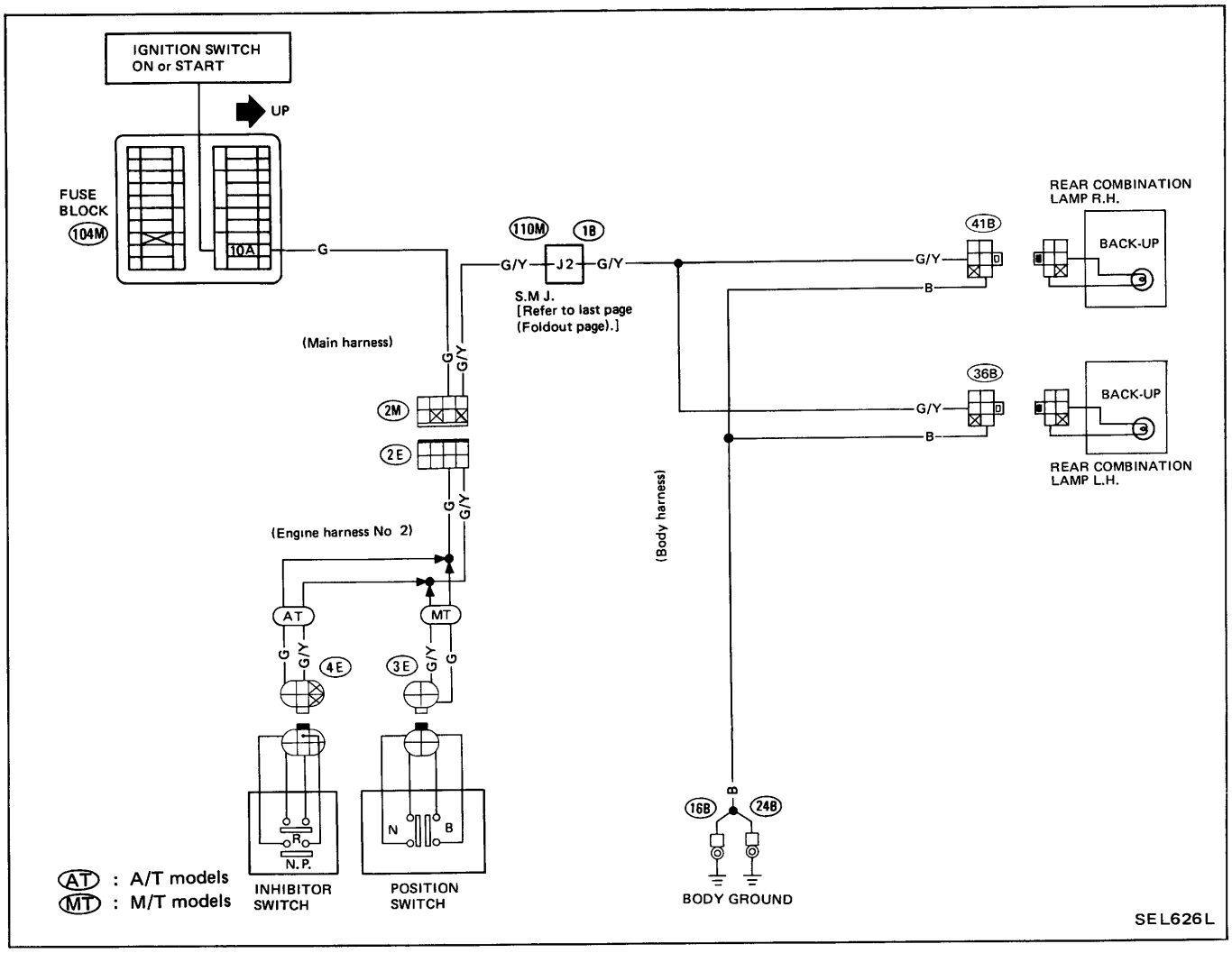
- **Do not leave the bulb out of the headlamp reflector for a long period of time as dust, moisture, smoke, etc. may enter the headlamp body and affect the performance of the headlamp. Thus, the headlamp bulb should not be removed from the headlamp reflector until just before a replacement bulb is to be installed.**

Clearance, License, Tail and Stop Lamps/Wiring Diagram

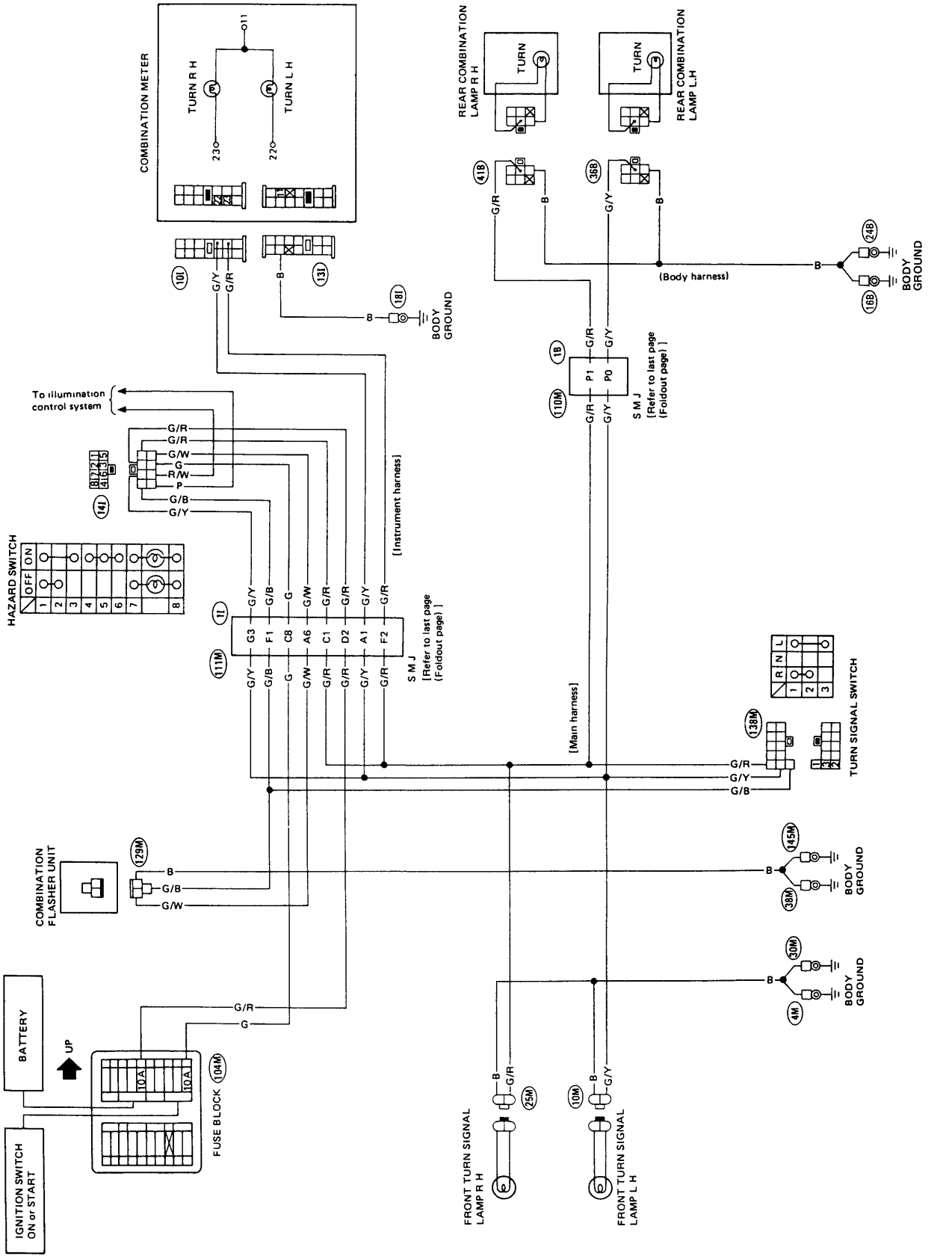


SEL625L

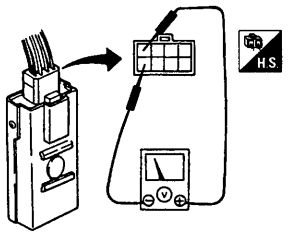
Back-up Lamp/Wiring Diagram



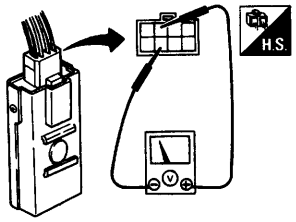
Turn Signal and Hazard Warning Lamps/Wiring Diagram



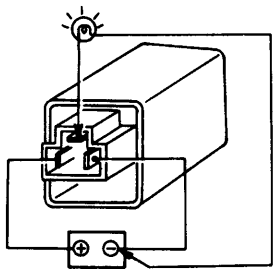
SEL627L



All stop lamps in good order ... Approx. 12V
At least one of stop lamps is removed ... Approx. 1V
SEL463K



All tail lamps in good order ... Approx. 12V
At least one of tail lamps is removed ... Approx. 1V
SEL878G



SEL122E

Stop and Tail Lamp Sensor Check

- Before checking, ensure that bulbs meet specifications.

STOP LAMP

1. Start engine.
2. Stop lamp switch on.

Tail Lamp

1. Start engine.
2. Lighting switch on.

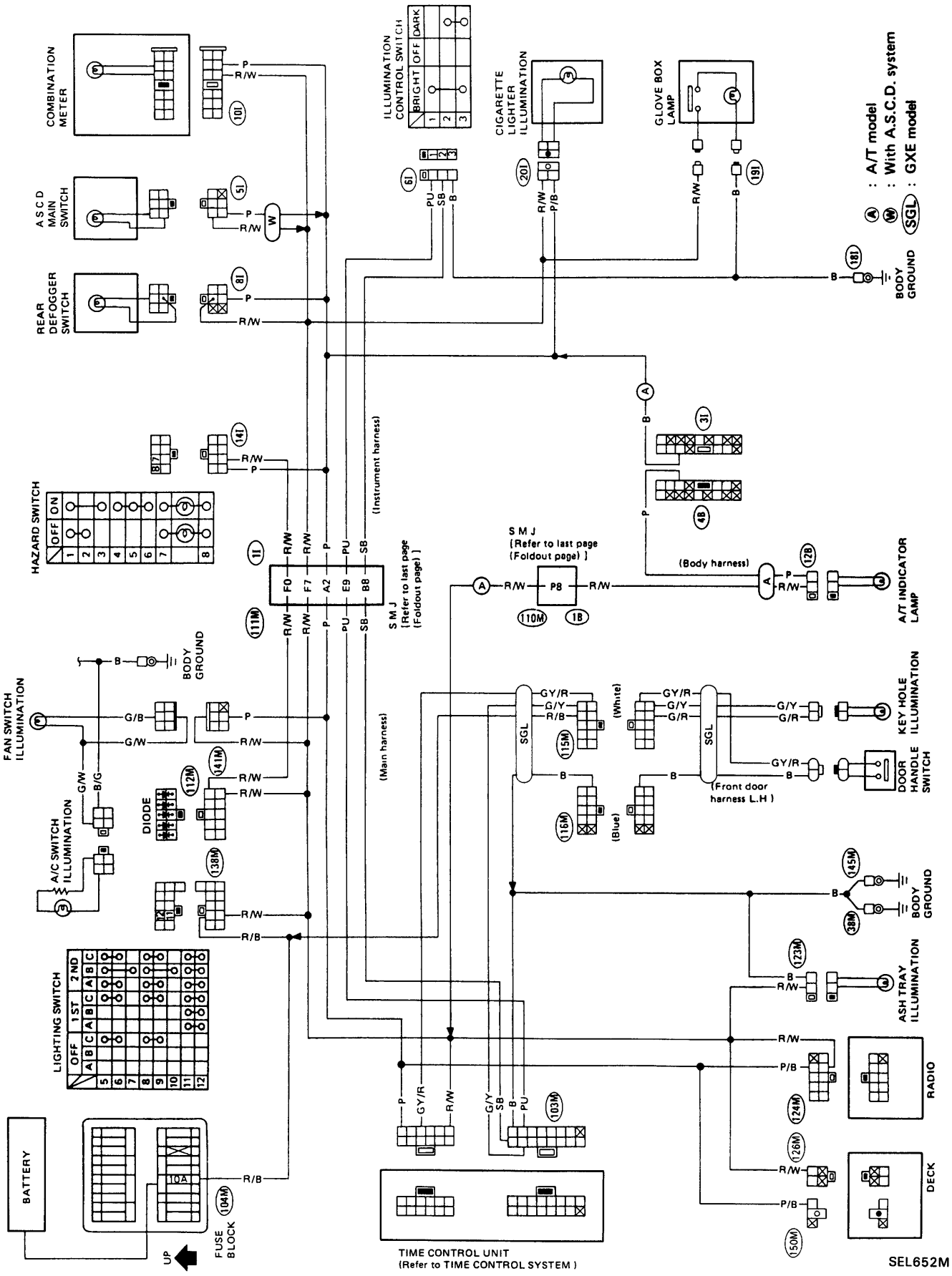
Combination Flasher Unit Check

- 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.

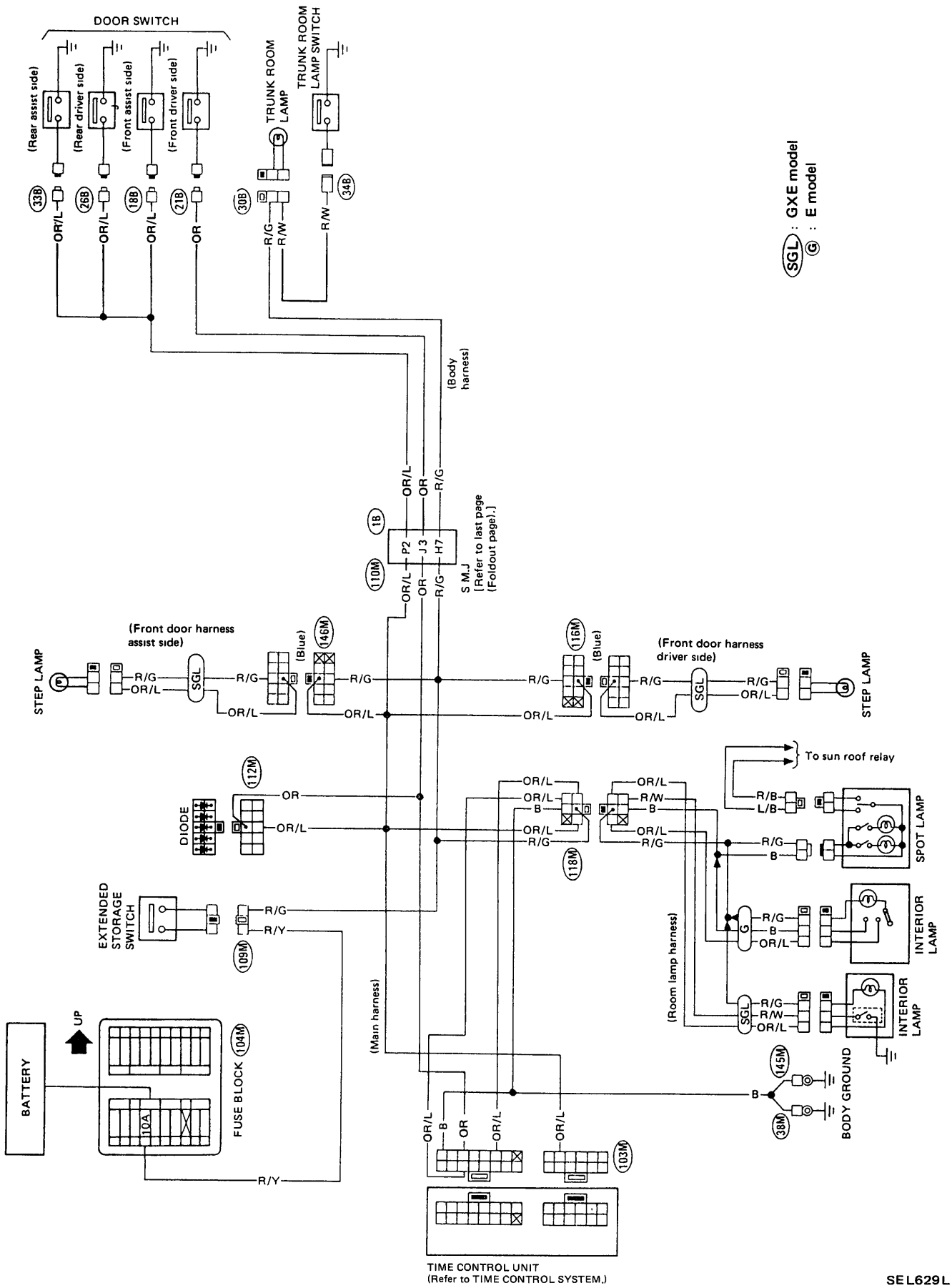
Bulb Specifications

	Wattage (12 volt)
Headlamp (Semi-sealed beam)	
High/Low	60/45
Clearance lamp	3.8
Front turn signal lamp	27
Rear combination lamp	
Turn signal	27
Stop/Tail	27/8
Back-up	27
Rear side marker lamp	3.8
License plate lamp	10
High-mounted stop lamp	27
Interior lamp	10
Spot lamp	8
Step lamp	3.4
Trunk room lamp	3.4

Illumination/Wiring Diagram

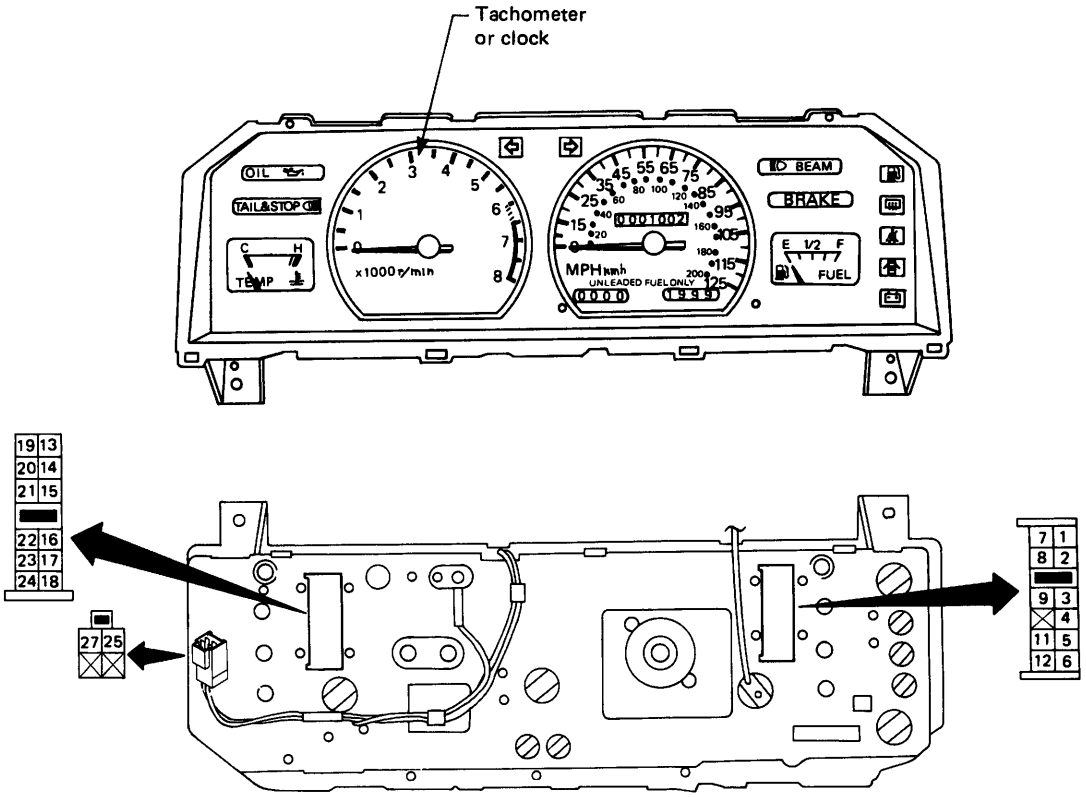


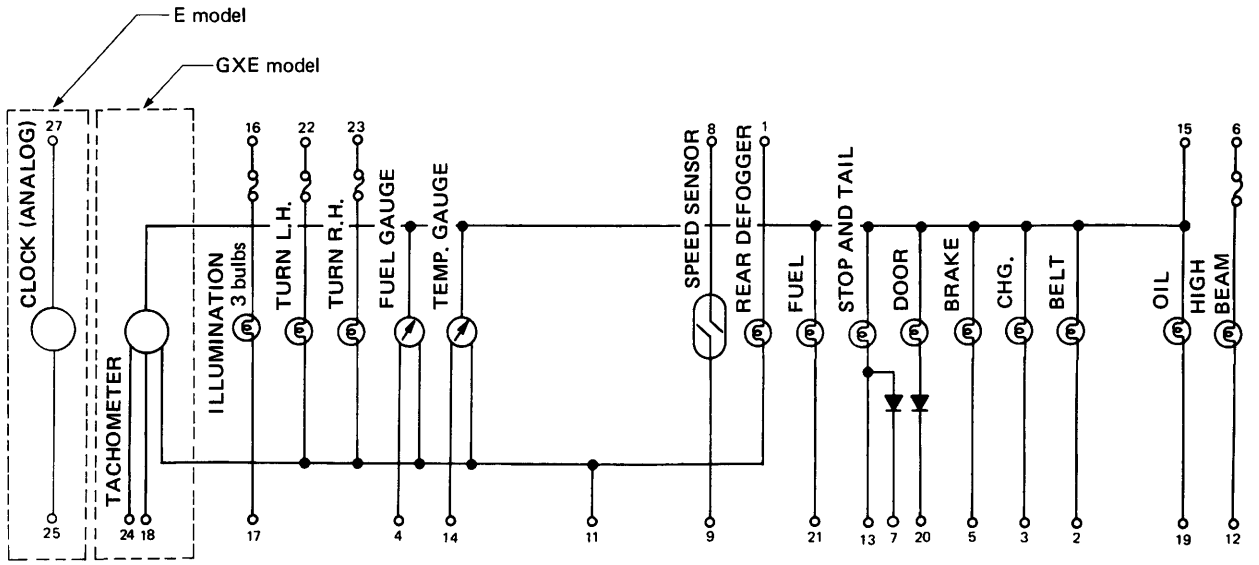
Interior, Spot and Step Lamps/Wiring Diagram



SEL629L

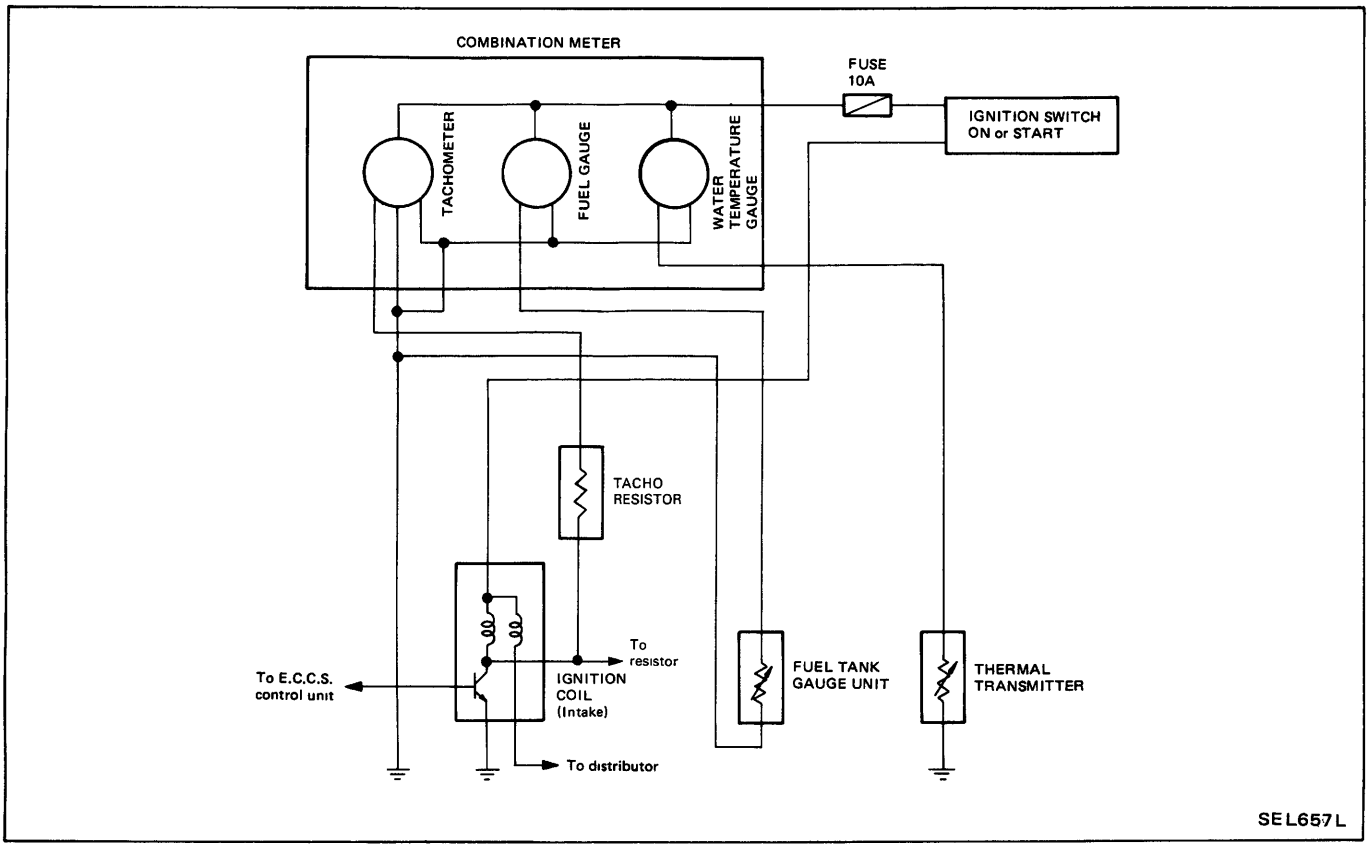
Combination Meter



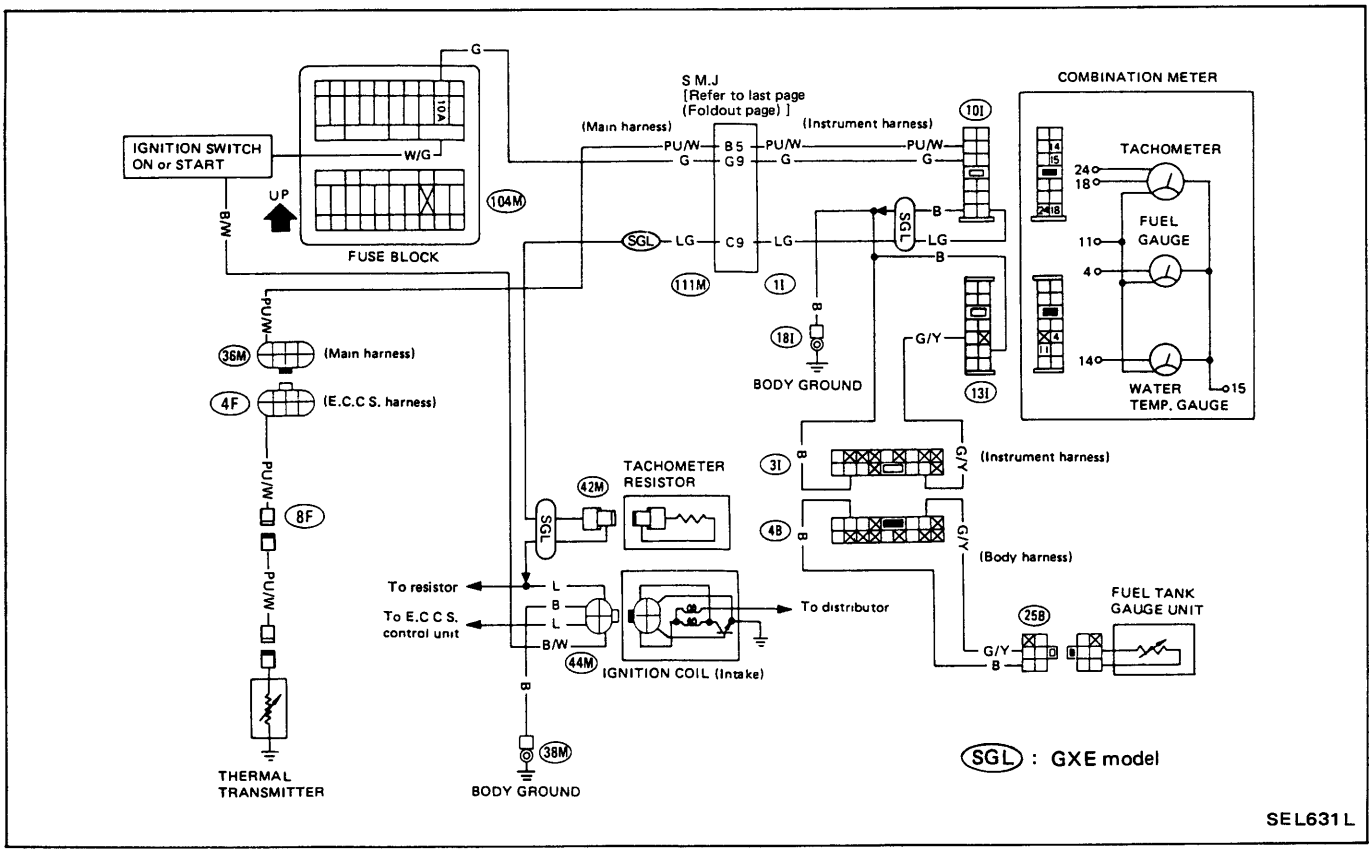


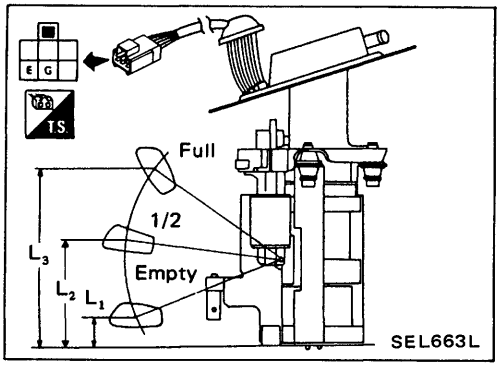
SEL630L

Tachometer, Temp. and Fuel Gauges/Schematic



Tachometer, Temp. and Fuel Gauges/Wiring Diagram



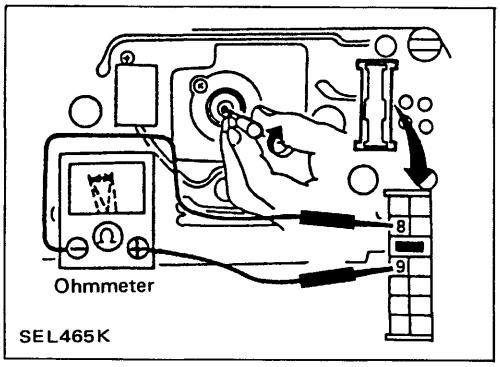


Fuel Tank Gauge Unit Check

- For removal, refer to FE section.

Check the resistance between terminals Ⓖ and Ⓔ.

Ohmmeter (+)	Ohmmeter (−)	Float position L mm (in)	Resistance value (Ω)
G	E	Full L_3 = Approx. 124 (4.88)	4.5 - 5.5
		1/2 L_2 = Approx. 69 (2.72)	30.5 - 32.5
		Empty L_1 = Approx. 12 (0.47)	80 - 83

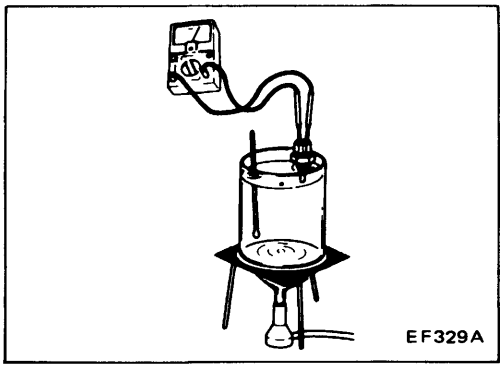


Speed Sensor Signal Check

- A speed sensor is built into the speedometer.

1. Turn speedometer slowly using a small screwdriver.
2. Check continuity of speed sensor circuit.

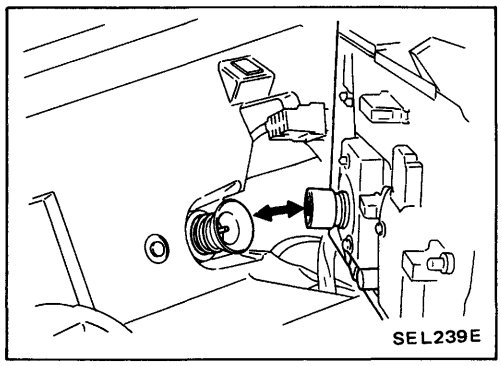
Continuity exists two times for each turn ... O.K.



Thermal Transmitter Check

Check the resistance between the terminals of thermal transmitter and body ground.

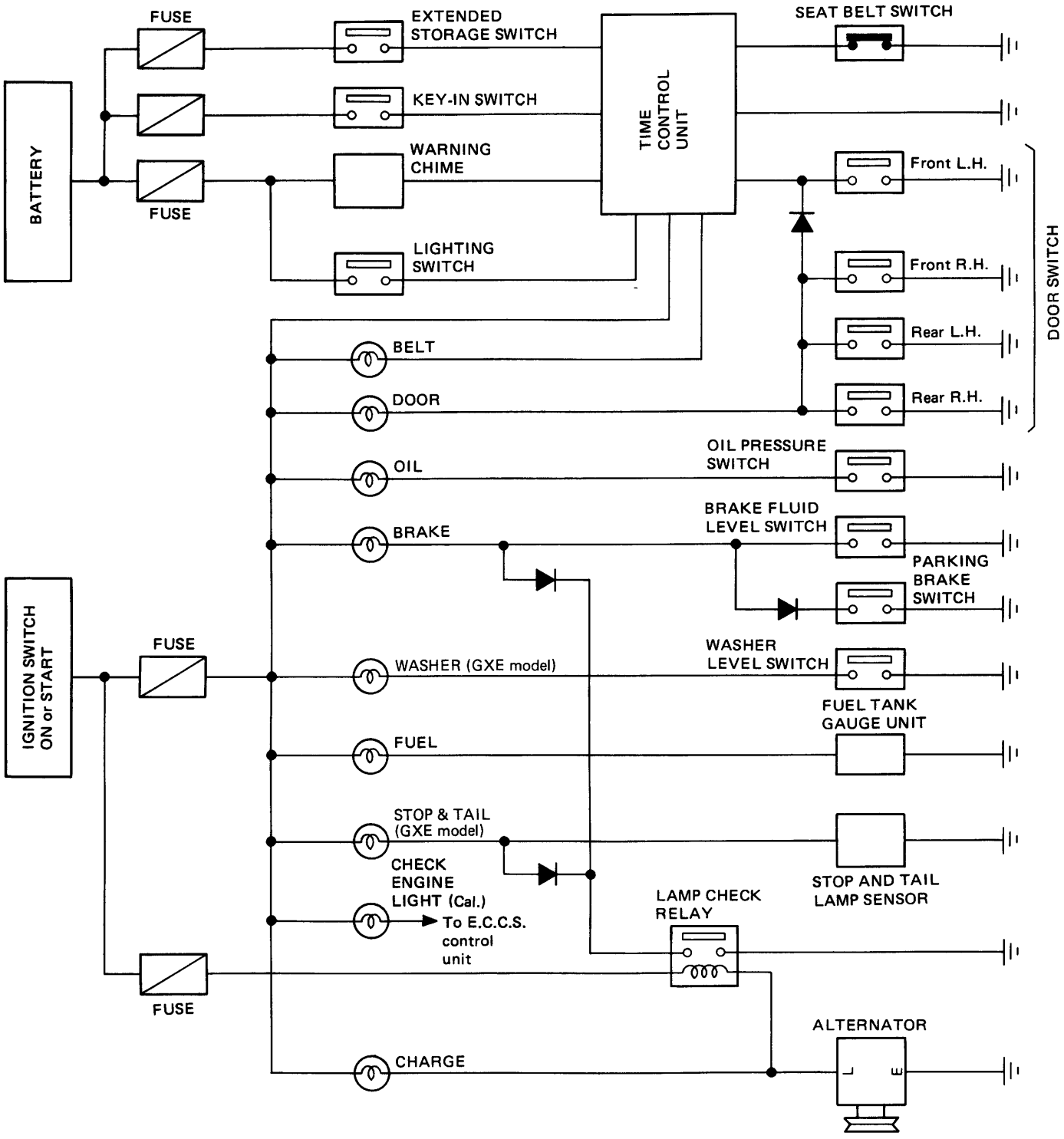
Water temperature	Resistance
60°C (140°F)	Approx. 70 - 90Ω
100°C (212°F)	Approx. 20 - 24Ω



Speedometer Cable Removal and Installation

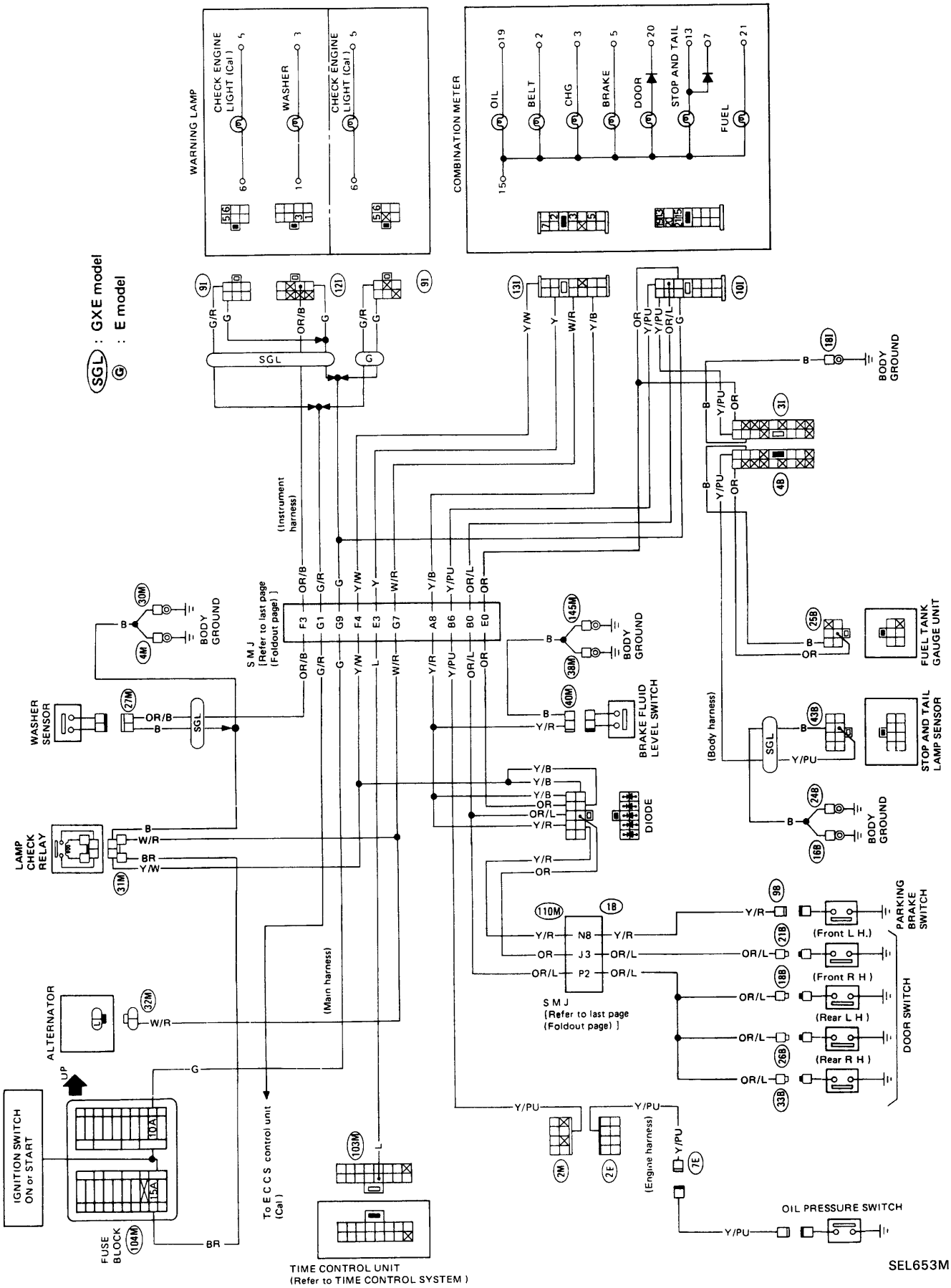
Combination meter and speedometer cable can be joined together simply by inserting combination meter.

Warning Lamps and Chime/Schematic

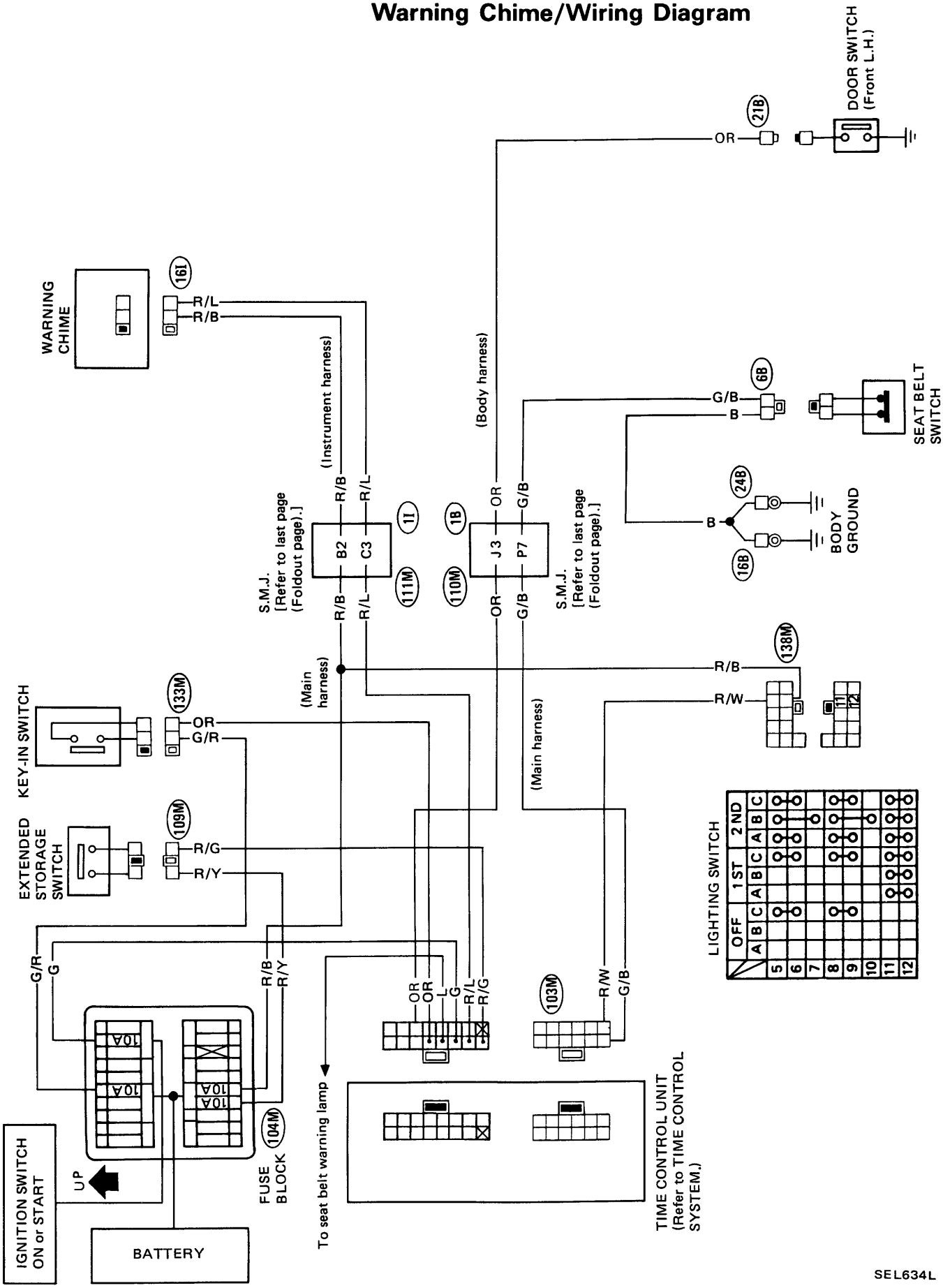


SEL632L

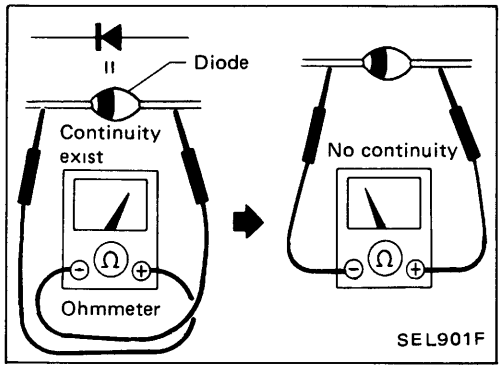
Warning Lamps/Wiring Diagram



Warning Chime/Wiring Diagram

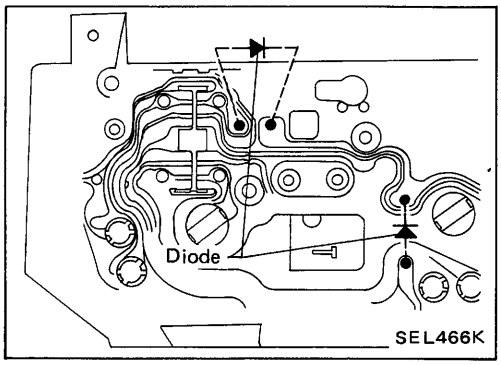


SEL634L

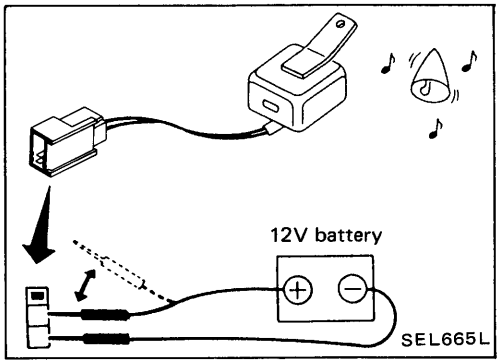


Diode Check

- Check continuity using an ohmmeter.
- Diode is functioning properly if test results are as shown in the figure on the left.



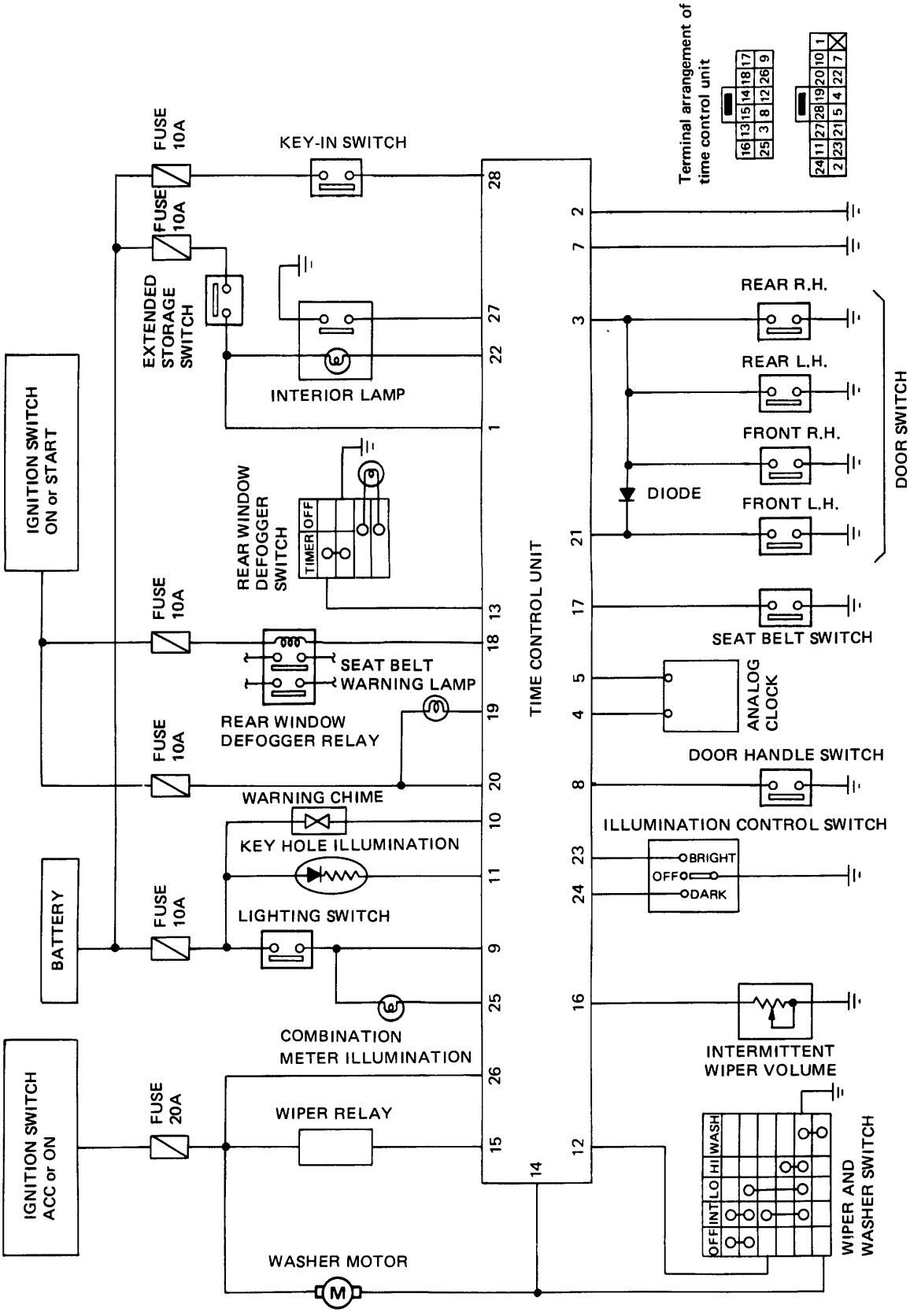
- Diodes for warning lamps are built into the combination meter printed circuit.



Warning Chime Check

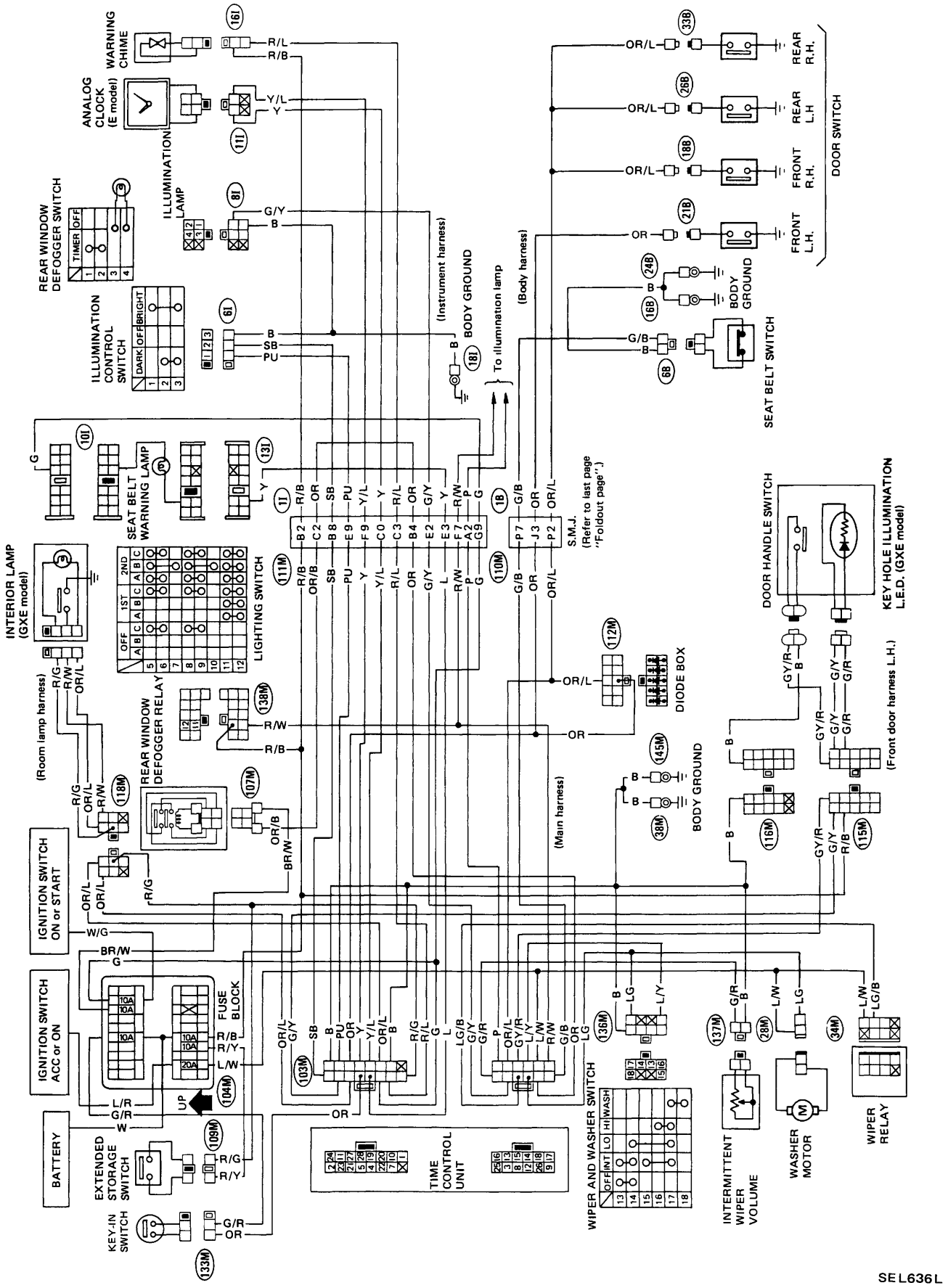
Schematic

CAUTION:
Never touch the terminals of time control unit with bare hands.



SEL635L

Wiring Diagram



SEL636L

Description

FUNCTION

- Time control unit has the following functions.

Item		Details of control
1	Intermittent wiper control	Regulates intermittent time from approximately 3 to 12 seconds depending on the intermittent wiper volume setting.
2	Washer and wiper combination control	Wiper is operated in conjunction with washer switch.
3	Interior lamp timer	Fades out interior lamp when driver's side door is opened and closed.
4	Illumination control	Regulates brightness of illumination in 16 stages depending on the illumination control switch setting.
5	Door key hole illumination	Illuminates for about 7 seconds when driver door outside handle is pulled.
6	Light warning chime timer	When driver's door is opened with light switch ON and ignition switch OFF, warning chime sounds.
7	Seat belt warning lamp timer	Seat-belt warning lamp blinks for about 7 seconds when ignition switch is turned to "ON".
8	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).
9	Clock	Generates clock pulses and drive clock.

Description (Cont'd)

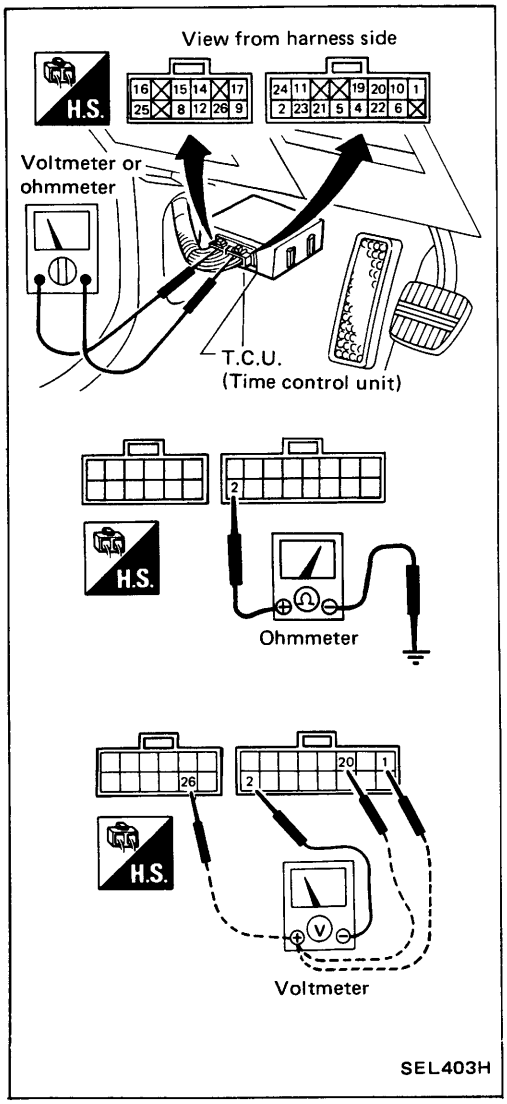
OPERATING CONDITIONS

Input signal / Input terminal / Output terminal / Item		Power source from battery	Ignition switch	Light switch	Wiper switch "INT"	Washer switch	Driver's side door switch *1	Driver's outside door handle switch *2	Seat belt switch *3	Illumination control switch
		①	㉖ or ⑳	⑨	⑫	⑭	㉑	⑧	⑰	㉓ or ㉔
Intermittent wiper control	⑮	ON	ACC or ON		ON					
Washer and wiper combination control	⑮	ON	ACC or ON			ON				
Interior lamp timer	㉒	ON					ON → OFF			
Illumination control	㉕	ON		ON						ON
Door key hole Illumination	⑪	ON						ON → OFF		
Light warning chime timer	⑩	ON	OFF or ACC	ON			ON			
Seat belt warning lamp timer	⑲	ON	OFF or ACC → ON							
Seat belt warning chime timer	⑩	ON	OFF or ACC → ON						ON	
Clock	④	ON								

*1 Door switch is turned ON when door is opened.
*2 Door handle switch is turned ON when driver's outside door handle is pulled.
*3 Seat belt switch is turned ON when driver's side seat belt is unfastened.

Trouble-shooting

Trouble		Refer to TROUBLE-SHOOTING PROCEDURE.
Wiper & washer	Intermittent wiper does not operate.	1
	Intermittent time of wiper cannot be adjusted.	2
	Wiper and washer activate individually but not in combination.	3
Interior lamp	Interior lamp does not fade out after driver's door is closed.	4
Illumination	Illumination control system does not actuate.	5
	Door key hole illumination does not come on even if driver's side door handle is pulled.	6
Warning	Light warning chime does not activate.	7
	Seat belt warning chime does not activate.	8
	Seat belt warning lamp does not go off nor come on.	9
Clock	Clock does not activate.	10



PREPARATION FOR TROUBLE-SHOOTING.

1. Remove driver's side dash cover.
2. Remove time control unit with harness connected.

POWER SUPPLY CIRCUIT CHECK

1. Connect ohmmeter from harness side.
2. Check continuity between terminal ② and body ground.

Ohmmeter terminals		Continuity
(+)	(−)	
②	Body ground	Yes

3. Connect voltmeter from harness side.
4. Measure voltage across terminal ② and terminals ①, ⑳ and ㉖.

Voltmeter terminals		Ignition switch position		
(+)	(−)	OFF	ACC	ON
①	②	Approx. 12V	Approx. 12V	Approx. 12V
⑳	②	0V	0V	Approx. 12V
㉖	②	0V	Approx. 12V	Approx. 12V

Trouble-shooting (Cont'd)

1	Intermittent wiper does not operate.

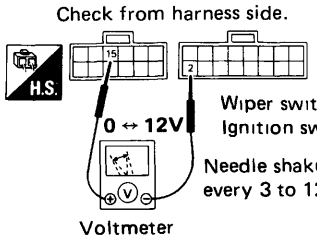
Go to "Power Supply Circuit Check".
- O.K. → Check T.C.U. output for wiper relay circuit.
- N.G. → Check harness for T.C.U. power supply circuit.

Check T.C.U. output for wiper relay circuit.
- N.G. → Check wiper switch circuit check.
- O.K. → Check wiper relay. Refer to "WIPER AND WASHER".
  - O.K. → Check harness between T.C.U. and wiper relay.
  - N.G. → Replace wiper relay.

Check wiper switch circuit check.
- O.K. → Replace T.C.U.
- N.G. → Check wiper switch.
  - O.K. → Check harness between T.C.U. and wiper switch.
  - N.G. → Replace wiper switch.

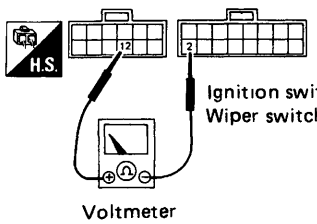
T.C.U. OUTPUT FOR WIPER RELAY CIRCUIT CHECK

1. Turn wiper switch to "INT".
2. Turn ignition switch to "ACC".
3. Connect voltmeter from harness side.
4. Measure voltage across ⑮ and ②.



WIPER SWITCH CIRCUIT CHECK

1. Turn wiper switch to "INT".
2. Turn ignition switch to "OFF".
3. Connect voltmeter from harness side.
4. Measure voltage across ⑫ and ②.

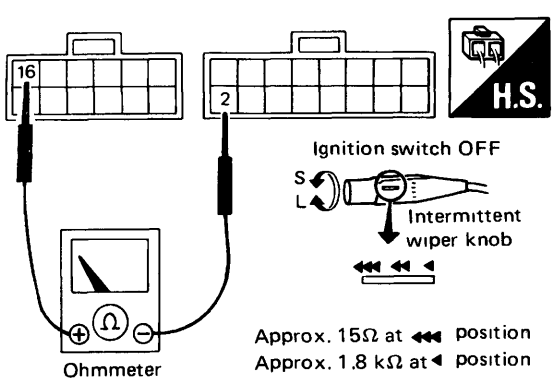


SEL404H

2	Intermittent time of wiper cannot be adjusted.

Check intermittent wiper volume circuit.
- O.K. → Replace T.C.U.
- N.G. → Check intermittent wiper volume.
  - O.K. → Check harness between T.C.U. and intermittent wiper volume.
  - N.G. → Replace wiper switch.

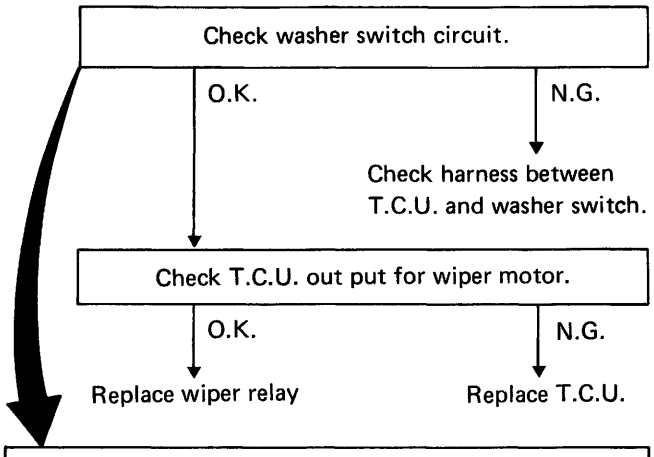
1. Turn ignition switch to "OFF".
2. Connect ohmmeter from harness side.
3. Measure resistance across ⑯ and ② while turning intermittent wiper volume.



SEL405H

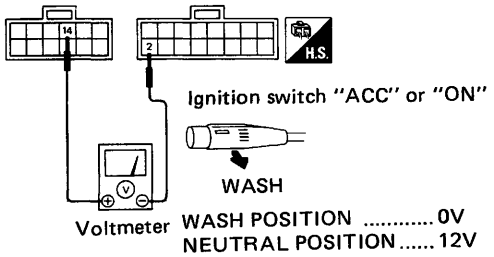
Trouble-shooting (Cont'd)

3	Wiper and washer activate individually but not in combination.



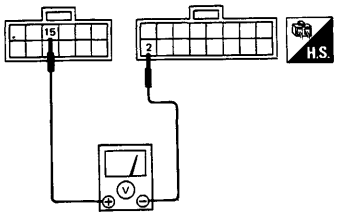
WASHER SWITCH CIRCUIT CHECK

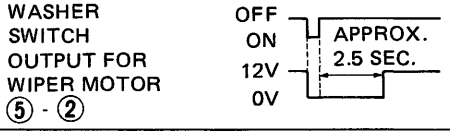
1. Turn ignition switch to "ACC" or "ON".
2. Connect voltmeter between ⑭ and ② from harness side.
3. Pull washer switch to "ON".
4. Measure voltage.



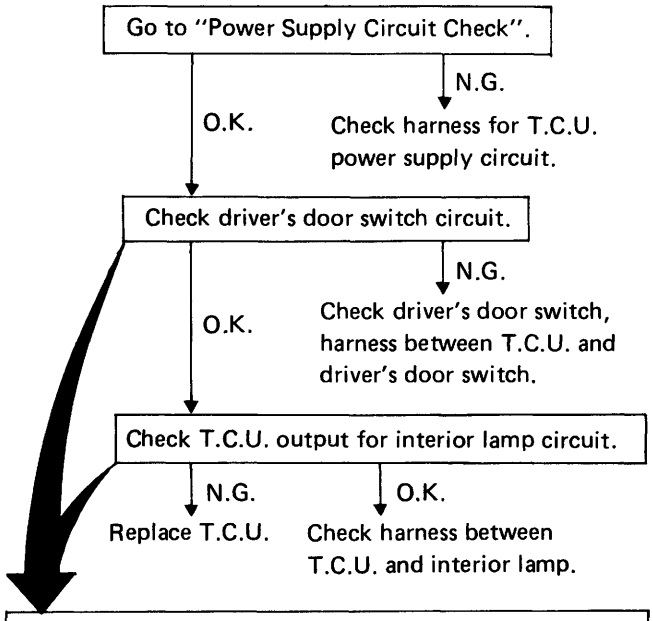
T.C.U. OUTPUT FOR WIPER MOTOR CHECK

1. Turn ignition switch to "ACC" or "ON".
2. Connect voltmeter between ⑮ and ② from harness side.
3. Pull washer switch to "ON" and release it.
4. Measure voltage.



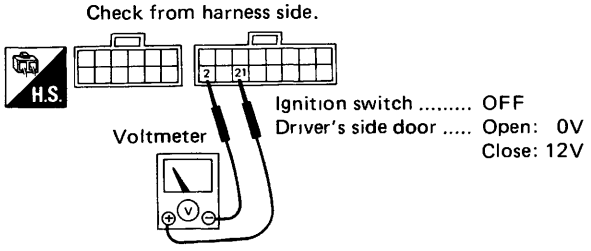


4	Interior lamp does not fade out after driver's door is closed.



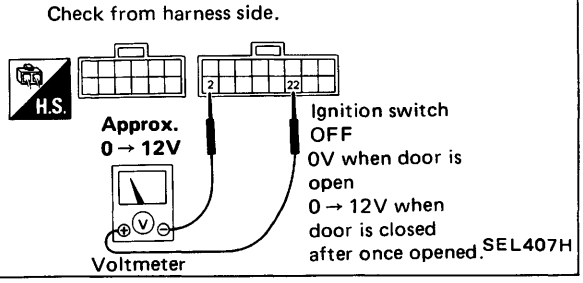
DRIVER'S DOOR SWITCH CIRCUIT CHECK

1. Turn ignition switch to "OFF".
2. Open driver's door.
3. Connect voltmeter from harness side.
4. Measure voltage across ㉑ and ②.



T.C.U. OUTPUT FOR INTERIOR LAMP CIRCUIT CHECK

1. Turn ignition siwtch to "OFF".
2. Connect voltmeter from harness side.
3. Measure voltage across ㉒ and ②.



Trouble-shooting (Cont'd)

5	Illumination control system does not actuate.

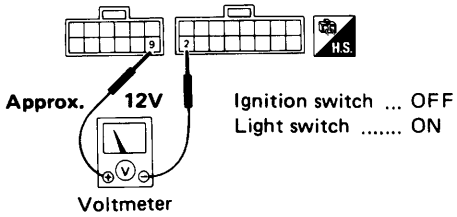
Check T.C.U. output for light switch circuit.
- O.K. → Check illumination circuit.
- N.G. → Check harness between T.C.U. and light switch.

Check illumination circuit.
- O.K. → Check illumination control circuit.
- N.G. → Check for loose harness connector.

Check illumination control circuit.
- O.K. → Replace T.C.U.
- N.G. → Check illumination control switch.

T.C.U. OUTPUT FOR LIGHT SWITCH CIRCUIT CHECK

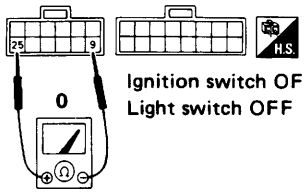
Check from harness side.



SEL715D

ILLUMINATION CIRCUIT CHECK

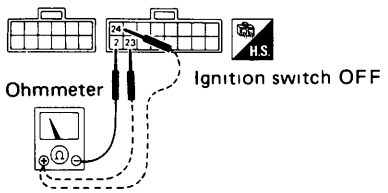
Check from harness side.



SEL913F

ILLUMINATION CONTROL CIRCUIT CHECK

Check from harness side.



Ohmmeter (+)	Ohmmeter (−)	Illumination control switch: DARK	Illumination control switch: BRIGHT
㉔	②	0 Ω	Except 0 Ω
㉓	②	Except 0 Ω	0 Ω

SEL889H

6	Door key hole illumination does not come on even if driver's side door handle is pulled.

Go to "Power Supply Circuit Check".
- N.G. → Check key hole illumination circuit.
- O.K. → Check harness for T.C.U. power supply circuit.

Check key hole illumination circuit.
- N.G. → Check door handle switch circuit
- O.K. → Check key hole illumination and diode.

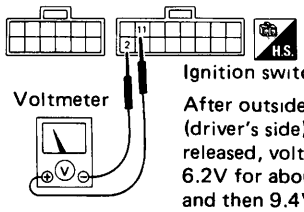
Check key hole illumination and diode.
- O.K. → Check harness between T.C.U. and key hole illumination.

Check door handle switch circuit
- O.K. → Replace T.C.U.
- N.G. → Check door handle switch, and harness between T.C.U. and door handle switch

KEY HOLE ILLUMINATION CIRCUIT CHECK

1. Turn ignition switch to "OFF".
2. Pull outside door handle (driver's side).
3. Connect voltmeter from harness side.
4. Measure voltage across ⑪ and ②.

Check from harness side.



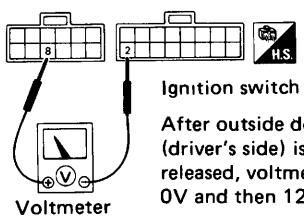
After outside door handle (driver's side) is pulled and released, voltmeter indicates 6.2V for about 7 seconds and then 9.4V.

SEL914F

DOOR HANDLE SWITCH CIRCUIT CHECK

1. Turn ignition switch to "OFF".
2. Pull outside door handle (driver's side).
3. Connect ohmmeter.
4. Check continuity between ⑧ and ②.

Check from harness side.



After outside door handle (driver's side) is pulled and released, voltmeter indicates 0V and then 12V.

SEL890H

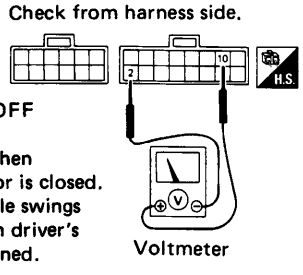
Trouble-shooting (Cont'd)

7	Light warning chime does not activate.

Do other warning chimes activate?
- N.G. → Go to "Power Supply Circuit Check".
  - O.K. → Check T.C.U. output for chime circuit.
    - N.G. → Go to "T.C.U. output for light switch circuit check". (Refer to back page.)
      - O.K. → Replace T.C.U.
      - N.G. → Check harness between T.C.U. and light switch.
    - O.K. → Check chime, and harness between T.C.U. and chime.
  - N.G. → Check harness for T.C.U. power supply circuit.
- O.K.

T.C.U. OUTPUT FOR CHIME CIRCUIT CHECK

1. Turn ignition switch to "OFF".
2. Connect voltmeter from harness side.
3. Measure voltage across ⑩ and ② when driver's door is opened and closed.



Ignition switch ... OFF
Light switch ... 1st
- Approx. 12V when driver's side door is closed.
- Voltmeter needle swings (0↔12V) when driver's side door is opened.

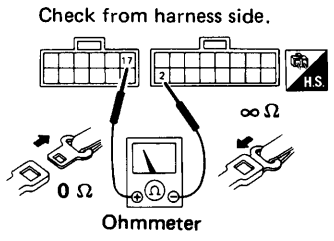
SEL891H

8	Seat belt warning chime does not activate.

Do other warning chimes activate?
- N.G. → Go to "Power Supply Circuit Check".
  - O.K. → Go to "T.C.U. Output For Chime Circuit Check".
    - N.G. → Check seat belt switch circuit.
      - O.K. → Replace T.C.U.
      - N.G. → Check harness between T.C.U. and seat belt switch.
    - O.K. → Check chime, and harness between T.C.U. and chime.
  - N.G. → Check harness for T.C.U. power supply circuit.
- O.K.

SEAT BELT SWITCH CIRCUIT CHECK

1. Turn ignition switch to "OFF".
2. Unfasten driver's seat belt.
3. Connect ohmmeter from harness side.
4. Check for continuity between ⑰ and ② .
5. Fasten driver's seat belt.
6. Check to determine if continuity does not exist between ⑰ and ② .



SEL892H

Trouble-shooting (Cont'd)

9	Seat belt warning lamp does not go off nor come on.

Go to "Power Supply Circuit Check".

O.K. → Check T.C.U. output for belt warning lamp circuit.

N.G. → Check harness for T.C.U. power supply circuit.

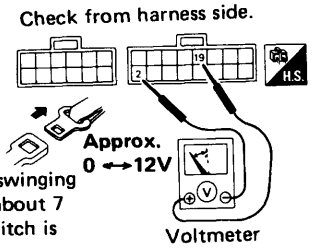
Check T.C.U. output for belt warning lamp circuit.

N.G. → Replace T.C.U.

O.K. → Check warning lamp, and harness between T.C.U. and warning lamp.

T.C.U. OUTPUT FOR BELT WARNING LAMP CIRCUIT CHECK

1. Unfasten seat belt.
2. Connect voltmeter from harness side.
3. Measure voltage across ⑲ and ② when ignition switch is "ON".



Voltmeter needle keeps swinging (approx. 0 ↔ 12V) for about 7 seconds after ignition switch is turned ON.

SEL893H

10	Clock does not activate.

Go to "Power Supply Circuit Check".

O.K. → Check T.C.U. output for clock circuit.

N.G. → Check harness for T.C.U. power supply circuit.

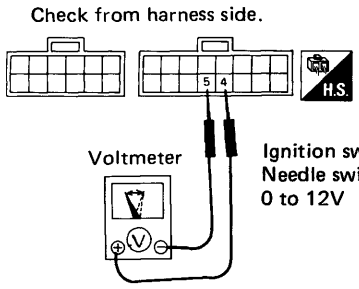
Check T.C.U. output for clock circuit.

O.K. → Check clock, and harness between T.C.U. and clock.

N.G. → Replace T.C.U.

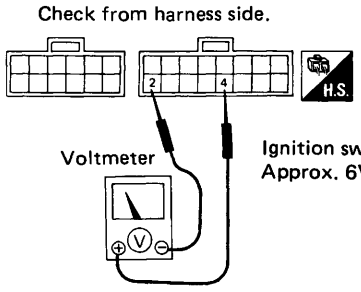
T.C.U. OUTPUT FOR CLOCK CIRCUIT CHECK

- **Analog clock**



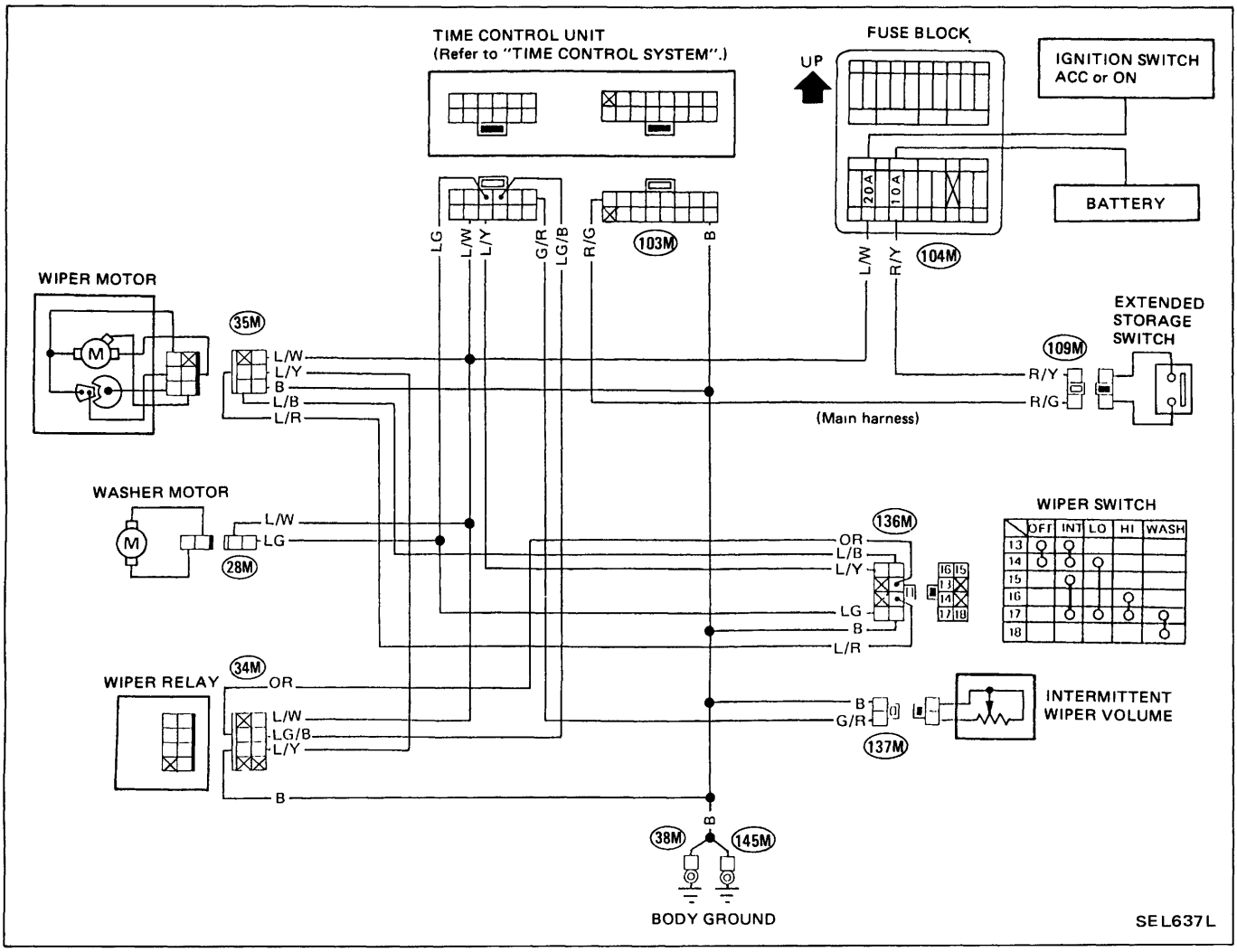
SEL161E

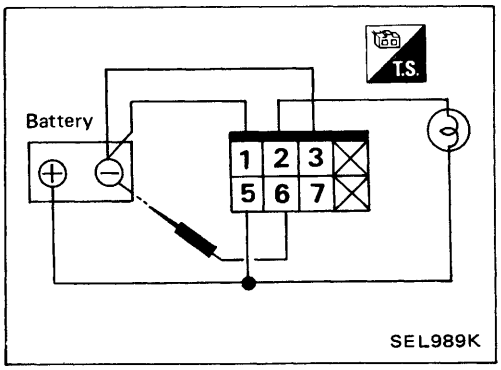
- **Digital clock**



SEL894H

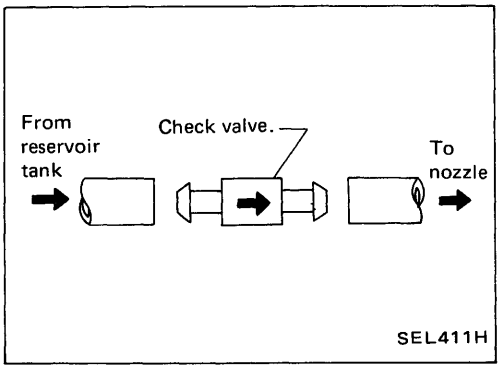
Windshield Wiper and Washer/Wiring Diagram





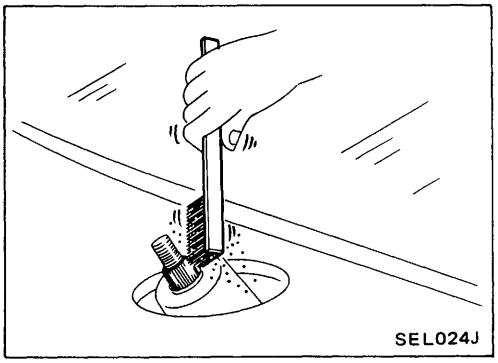
Wiper Relay Check

1. Connect as shown in the figure to the left.
2. If test lamp comes on when connect to terminal ⑥ and battery ground, wiper relay is normal.



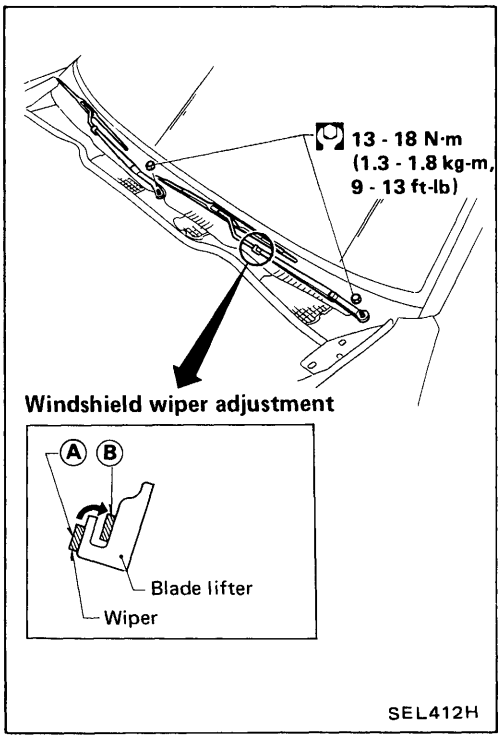
Check Valve

- A check valve is provided in the washer fluid line. Be careful not to connect check valve to washer tube in the wrong direction.


SEL024J

Windshield Wiper Installation

- **Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.**



SEL412H

Wiper arms of different length are used for the driver's side and passenger side. They have an identifying mark and care must be taken to install them properly.

Identifying mark

"D" (short arm) . . . . . Driver's side

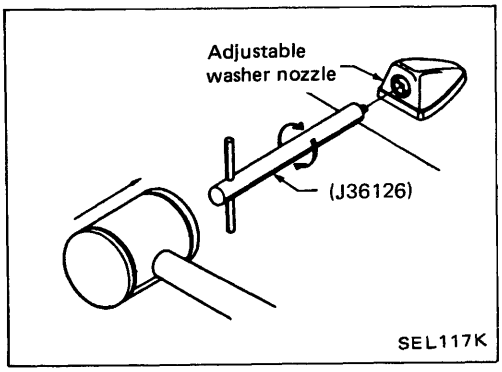
"A" (long arm) . . . . . Passenger side

Adjustment

1. Prior to wiper arm installation, set wiper switch to "LOW" to operate wiper motor and then turn it "OFF" (Auto Stop).
2. Install wiper arm to portion Ⓐ as in figure below and tighten wiper arm nut to specification.
3. Then, set wiper arm to portion Ⓑ.

- Tighten windshield wiper arm nuts to specified torque.

13 - 18 N·m
(1.3 - 1.8 kg-m, 9 - 13 ft-lb)



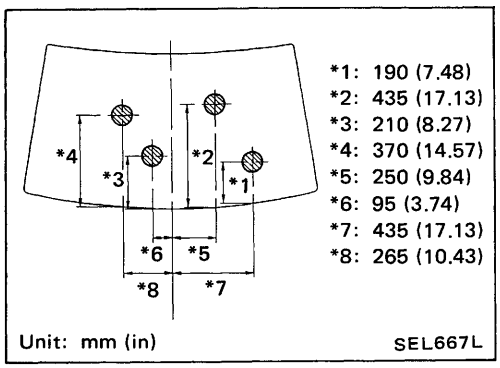
SEL117K

Washer Nozzle Adjustment

- Using Tool (J36126), adjust windshield washer nozzle to correct its spray pattern.

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.

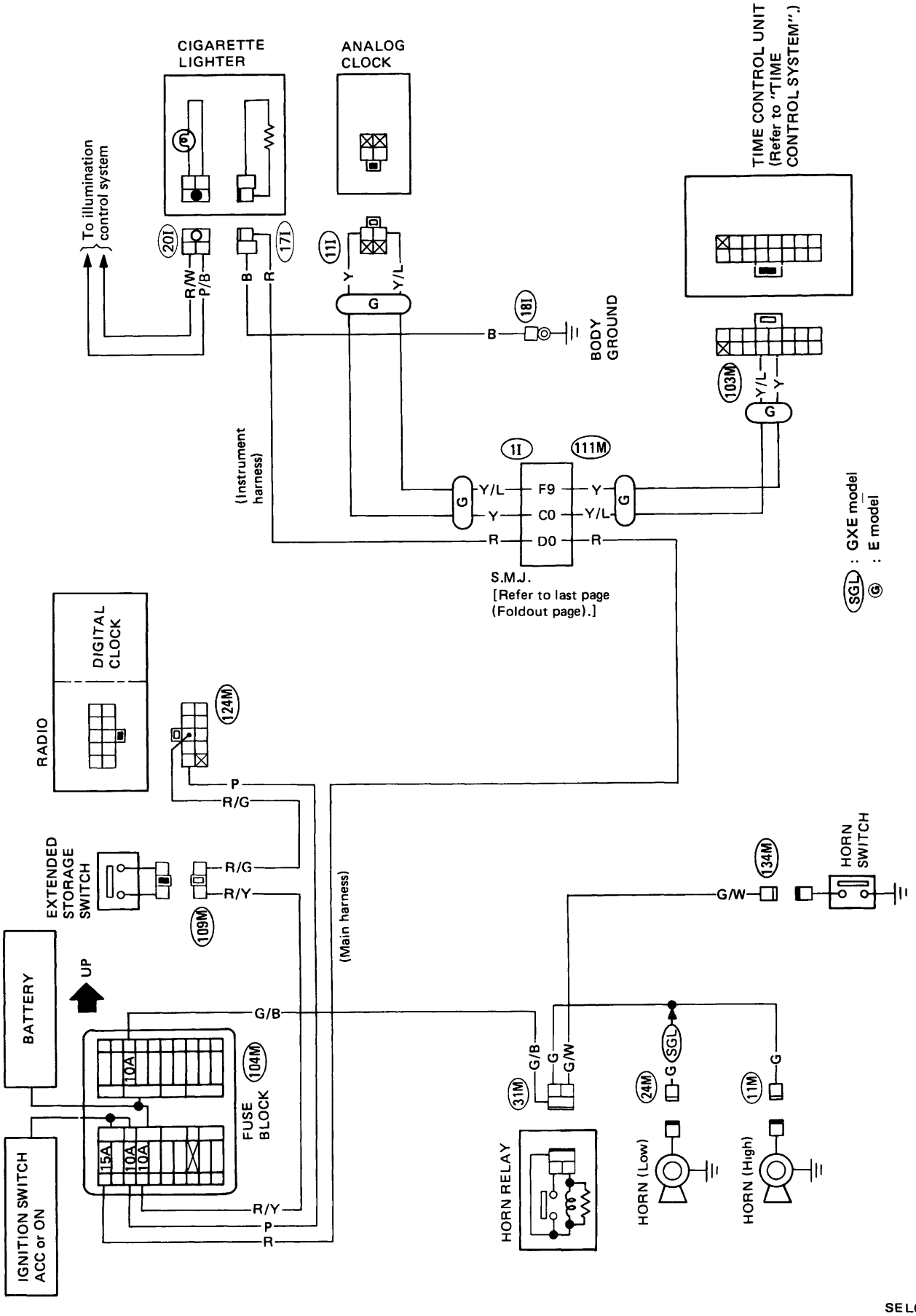


SEL667L

CAUTION:

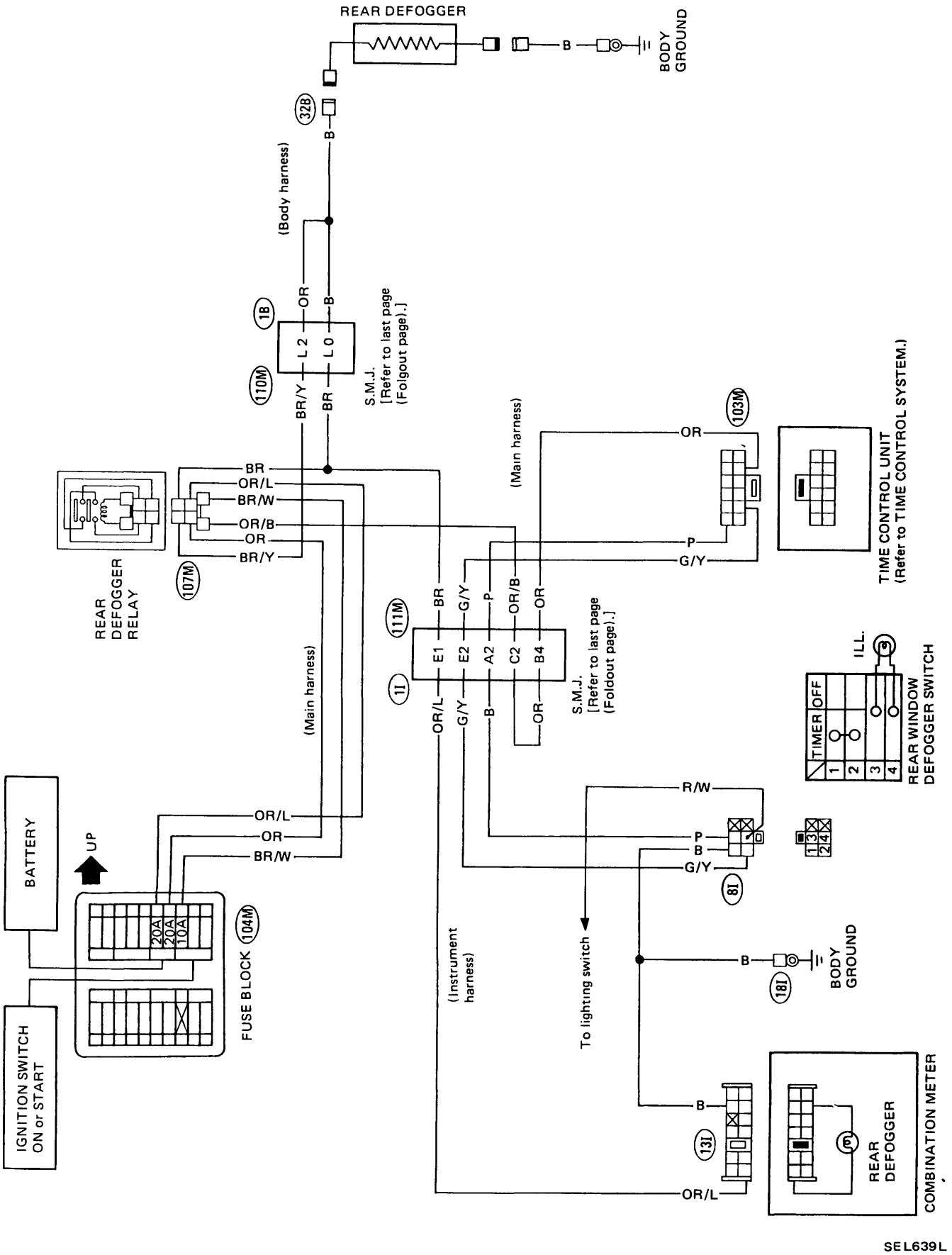
When adjusting washer nozzle, do not use nozzle holes.

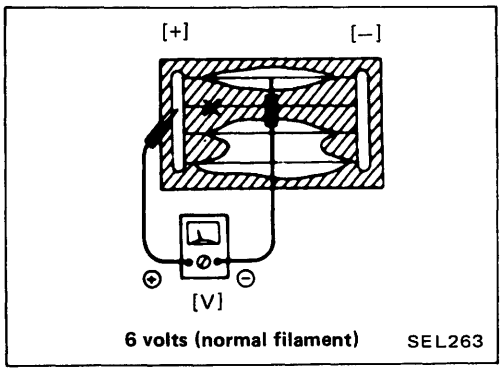
Wiring Diagram



SEL638L

Wiring Diagram

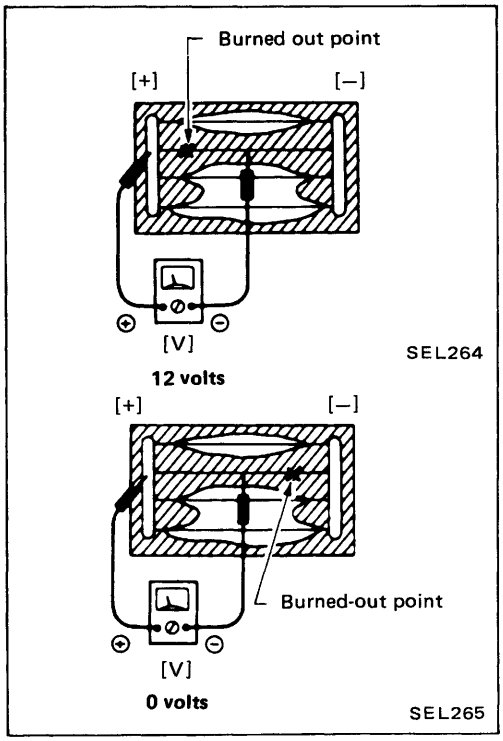




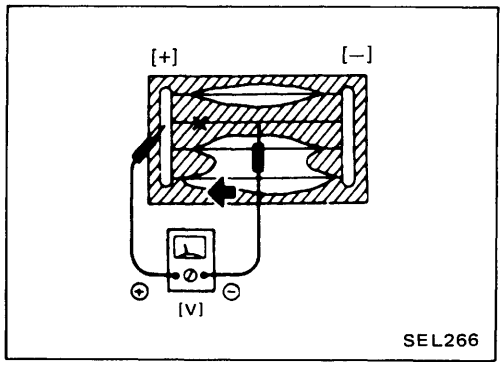
6 volts (normal filament) SEL263

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.

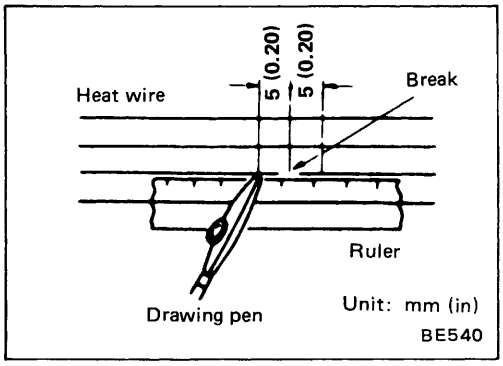


3. To locate burned out point, move probe to left and right along filament to determine point where tester needle swings abruptly.

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

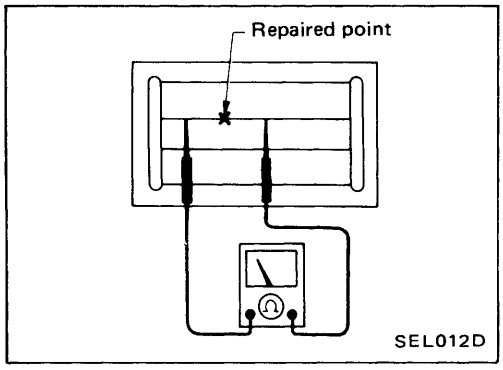


REPAIRING PROCEDURE

1. Wiper 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.

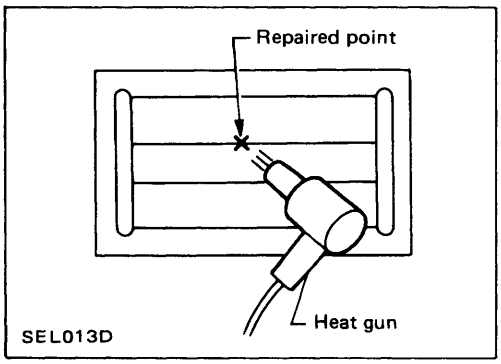
Shake silver composition container before use.

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.



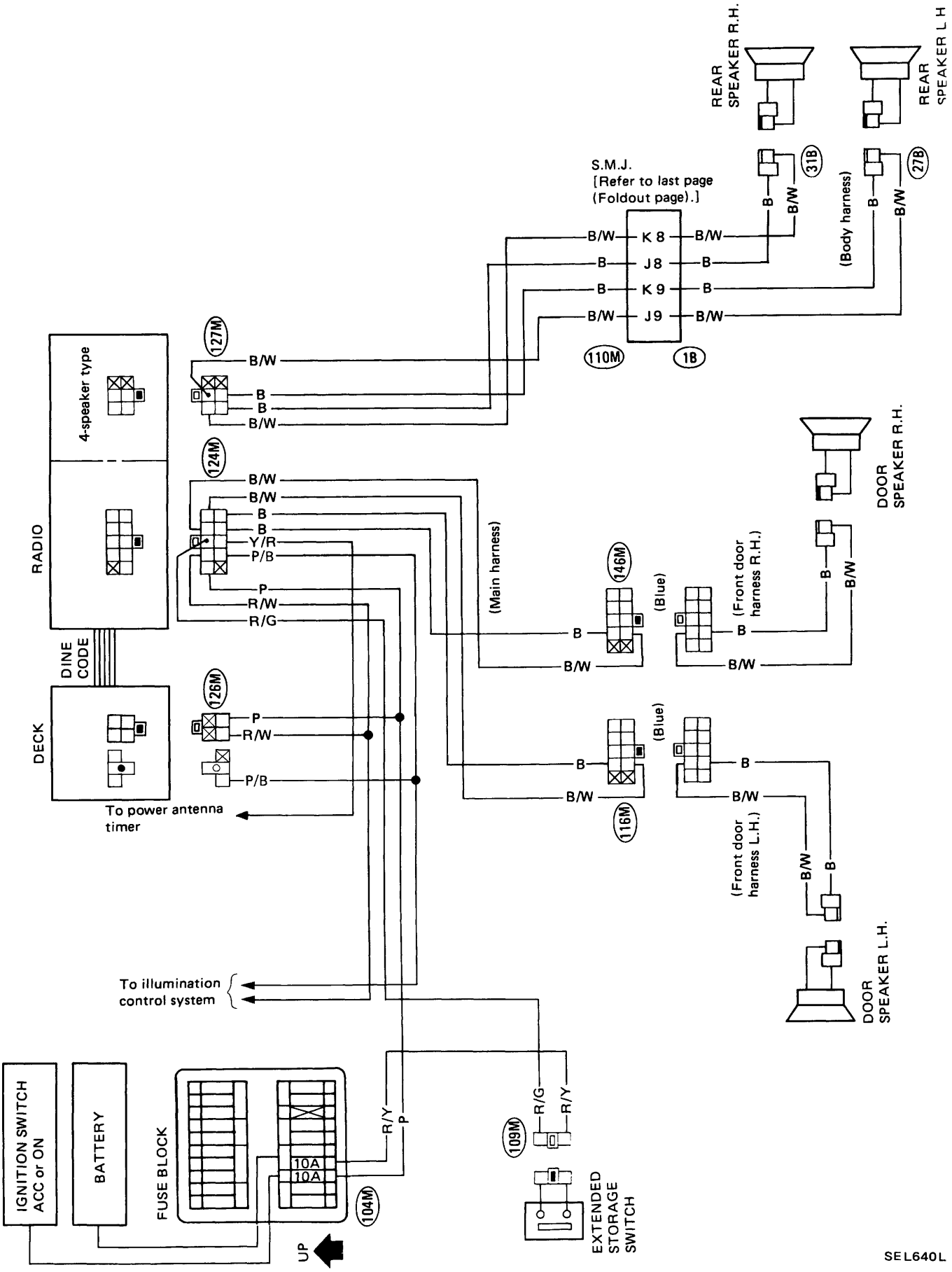
4. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

Do not touch repaired area while test is being conducted.

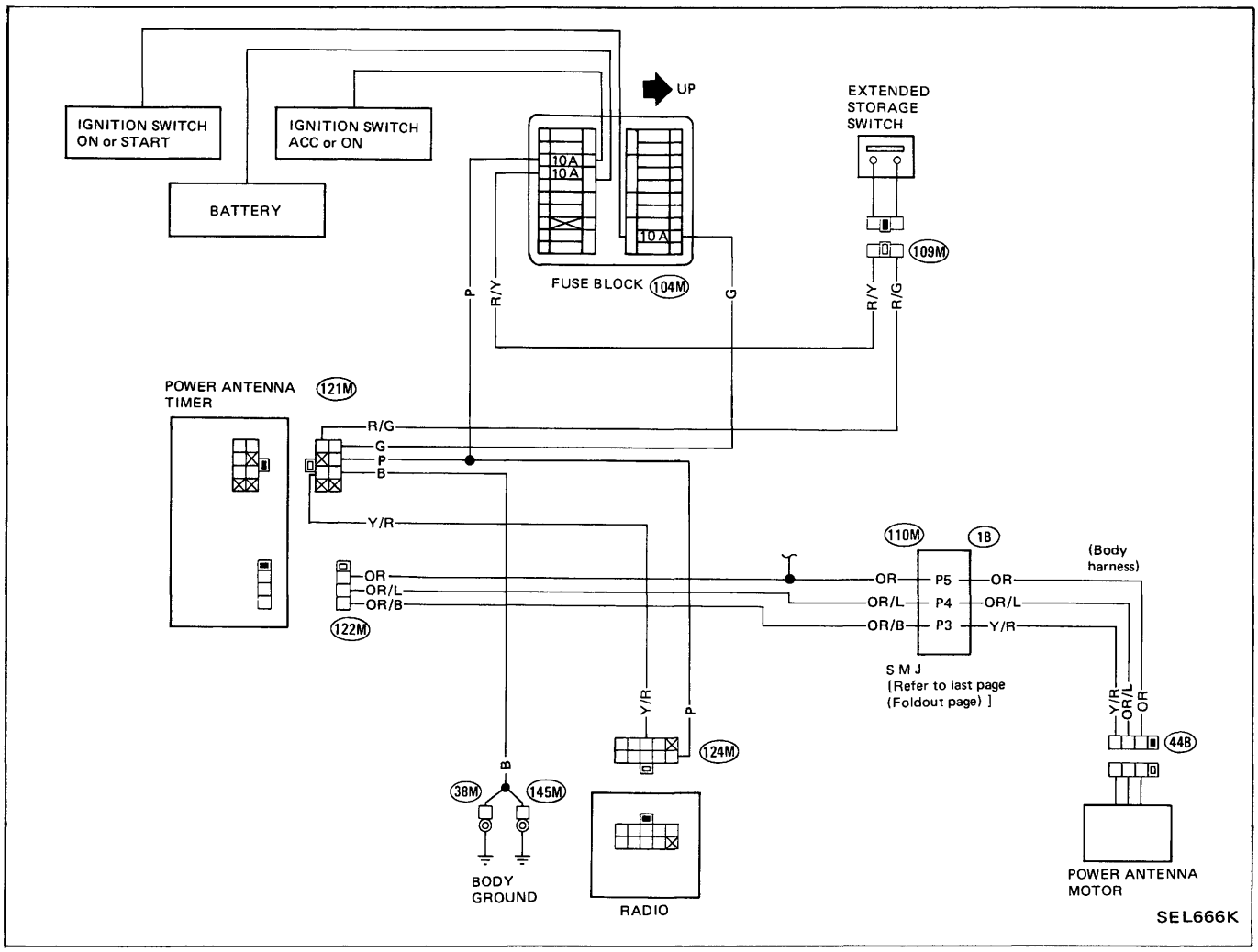


5. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.

Audio/Wiring Diagram

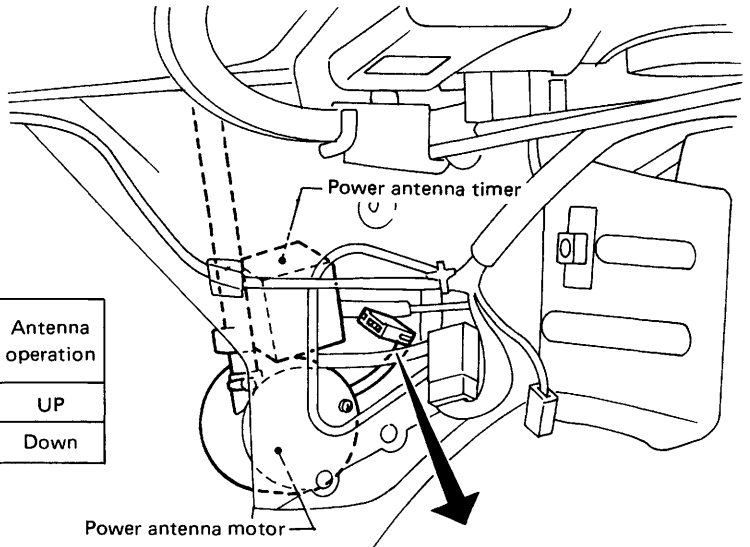


Power Antenna/Wiring Diagram



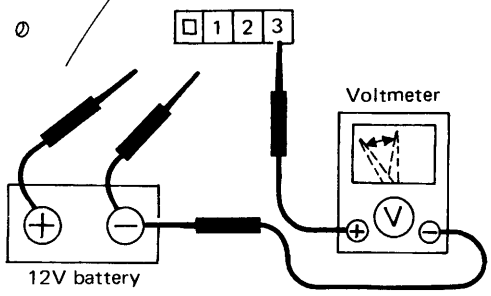
Power Antenna Motor Check

Battery terminal ⊕	Battery terminal ⊖	Antenna operation
①	②	UP
②	①	Down



1. Disconnect, at connector, harness between power antenna unit and antenna timer.
2. Apply 12-volt battery voltage across ① and ② to make sure antenna rod extends and retracts.
3. Connect a voltmeter across terminal ③ and ground terminal of battery.
4. Check to determine if voltmeter varies between 0 and 12 volts (approx.) in relation to movement of antenna rod when 12-volt battery voltage is applied across ① and ②.

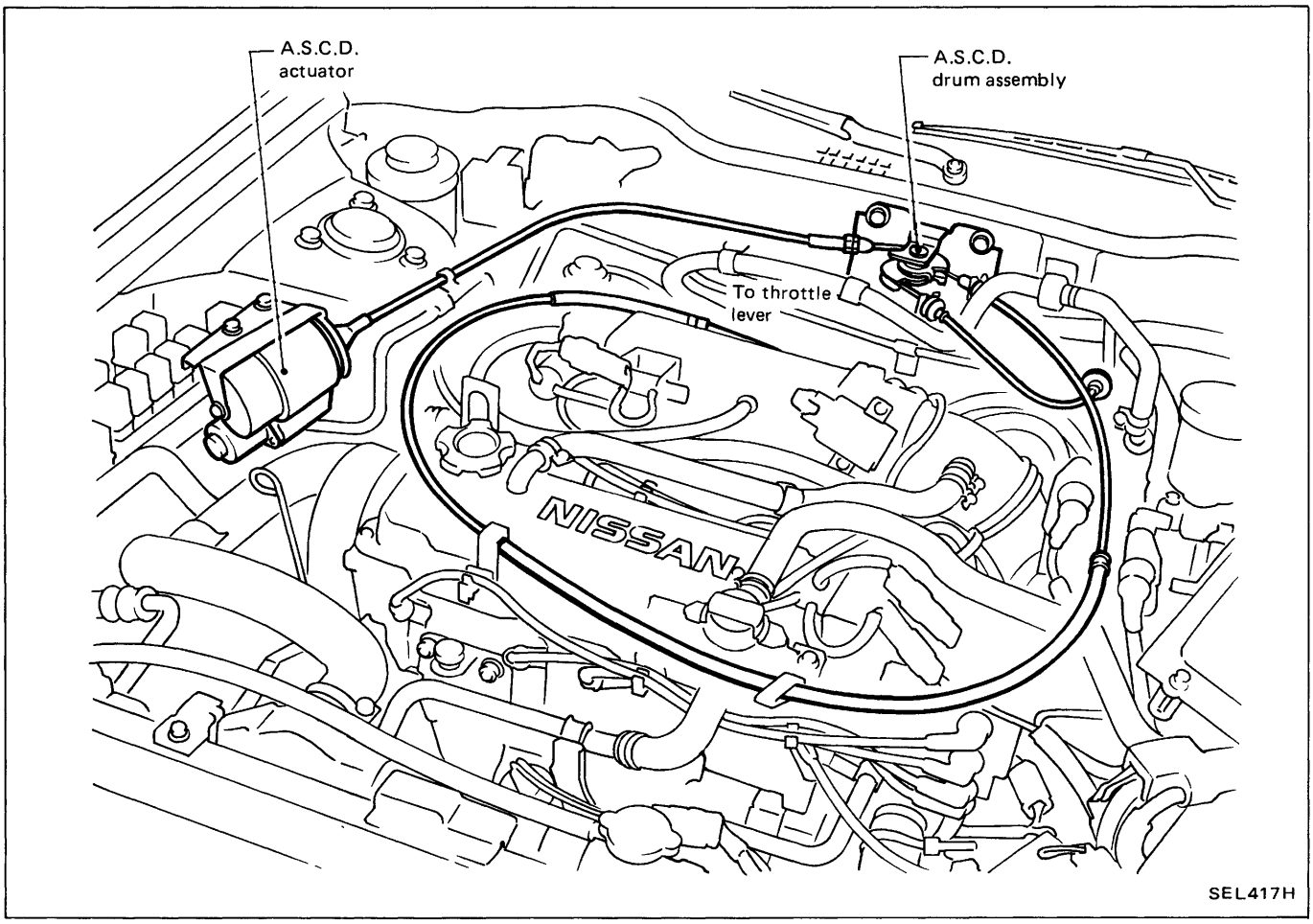
- **If above test results are not satisfactory, replace antenna motor.**



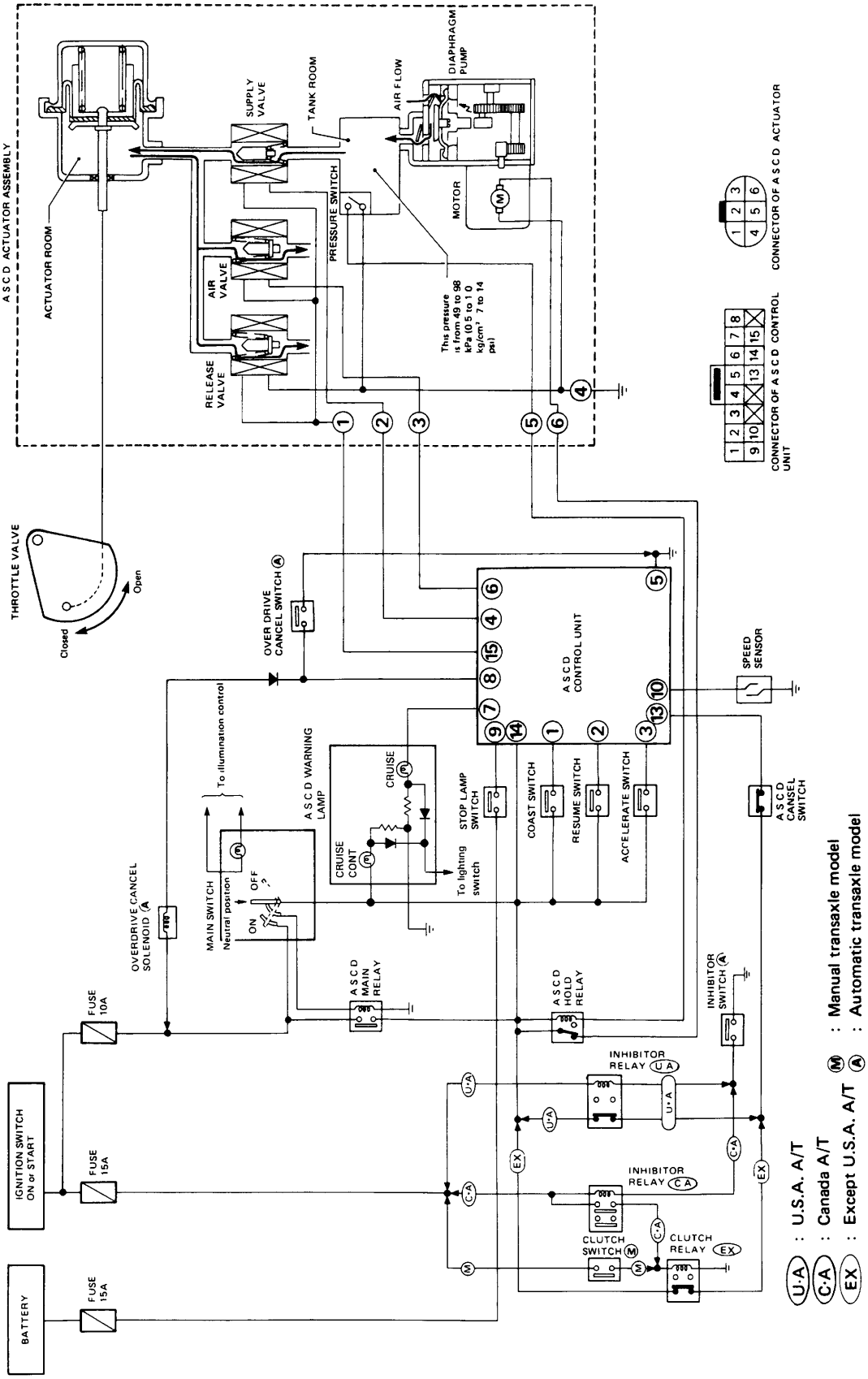
SEL795F

Positive Pressure Type

The A.S.C.D. actuator control cable is operated by compressed air produced in the compressor built in the actuator.

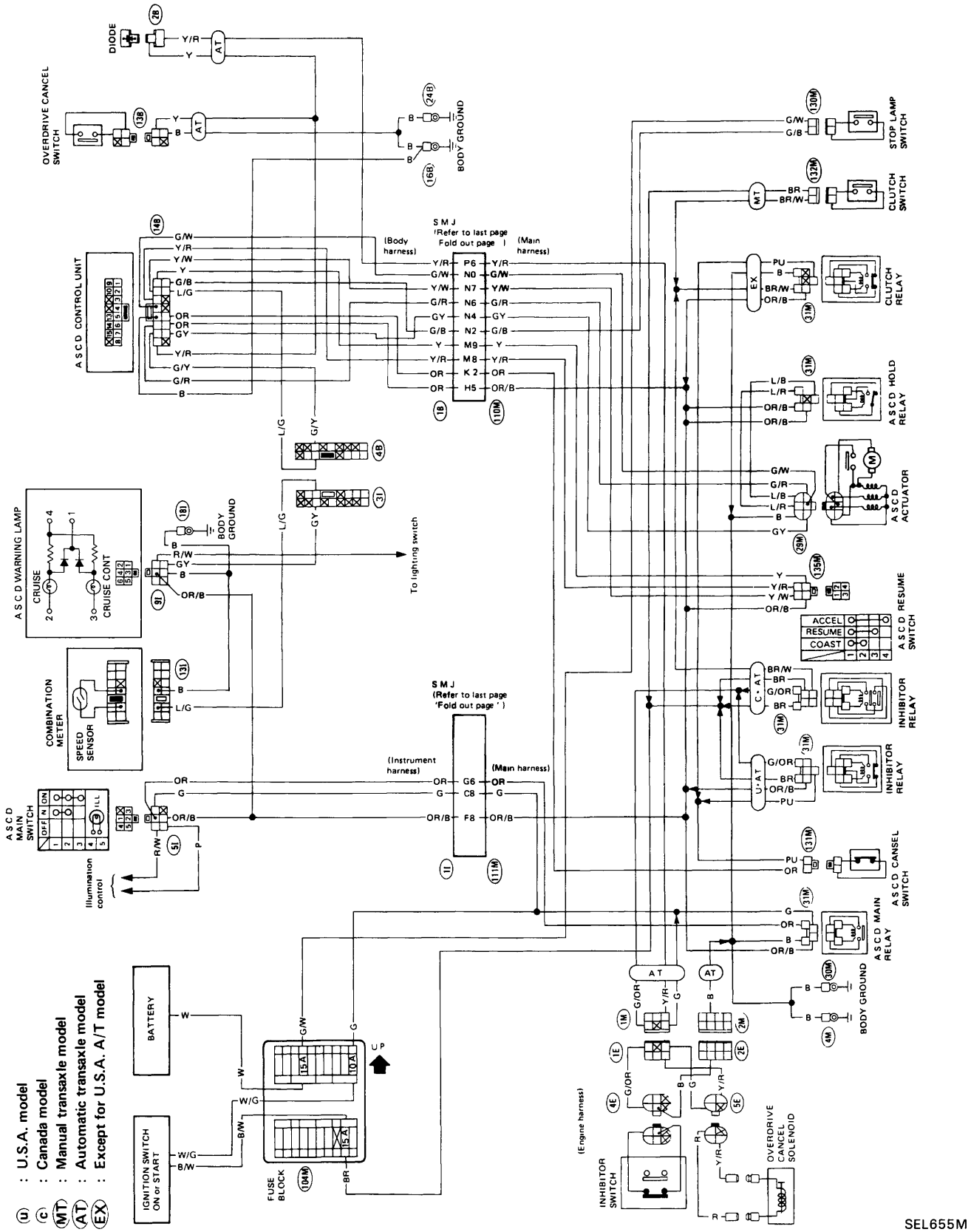


Schematic



SEL654M

Wiring Diagram



SEL655M

Trouble-shooting

A.S.C.D. control unit cannot be set properly.

Turn A.S.C.D. main switch "OFF" and then "ON" to make sure indicator illuminates.

N.G. → Check indicator bulb, A.S.C.D. main switch and hold relay.

O.K. ↓

Check power supply circuit for A.S.C.D. control unit.

N.G. → Check A.S.C.D. power supply harness.

O.K. ↓

Check cut-off circuit for A.S.C.D. control unit.

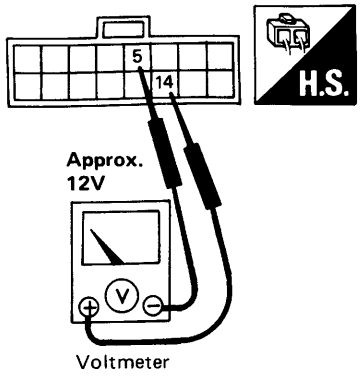
N.G. → Check A.S.C.D. cancel switch, clutch switch (M/T model), inhibitor relay and inhibitor switch (A/T model).

O.K. → Check A.S.C.D. cut-off circuit.

O.K. → Proceed to the next page.

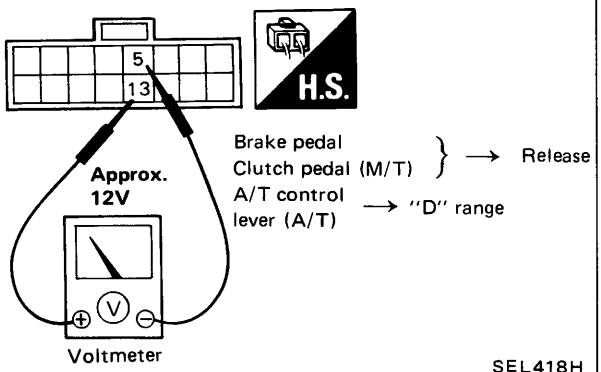
POWER SUPPLY CIRCUIT CHECK

1. Turn ignition switch to "ON".
2. Turn A.S.C.D. main switch to "ON".
3. Check voltage between ⑭ and ⑤.



CUT-OFF CIRCUIT CHECK

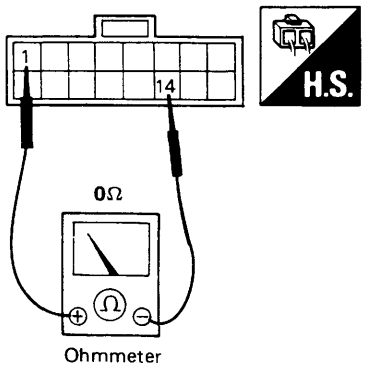
1. Release brake and clutch pedal.
2. Turn ignition switch to "ON".
3. Turn A.S.C.D. main switch to "ON".
4. Check voltage between ⑬ and ⑤.



Trouble-shooting (Cont'd)

SET SWITCH CIRCUIT CHECK

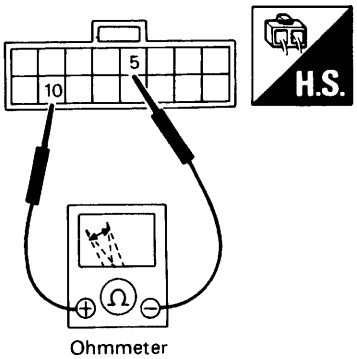
1. Turn ignition switch to "OFF".
2. Push A.S.C.D. set switch.
3. Check continuity between ⑭ and ①.



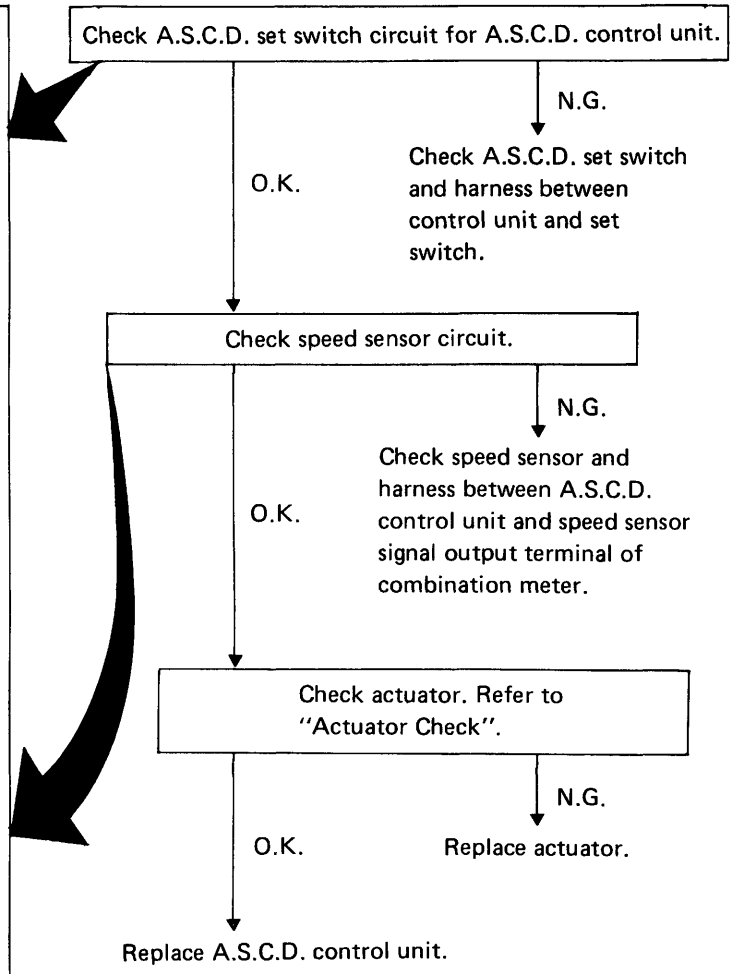
SPEED SENSOR CIRCUIT CHECK

1. Turn ignition switch to "OFF".
2. Disconnect speedometer cable from transmission.
3. Connect an ohmmeter between ⑩ and ⑤.
4. Slowly turn speedometer cable pinion by hand to make sure ohmmeter pointer deflects.

- **Ohmmeter pointer deflects twice per rotation of pinion.**



SEL419H



Trouble-shooting (Cont'd)

Set speed cannot be canceled.

Check cut-off circuit.

N.G. → Check A.S.C.D. cancel switch, clutch switch (M/T model), inhibitor relay and inhibitor switch (A/T model).

O.K.

Check stop lamp circuit.

N.G. → Check stop lamp switch and power supply harness.

O.K.

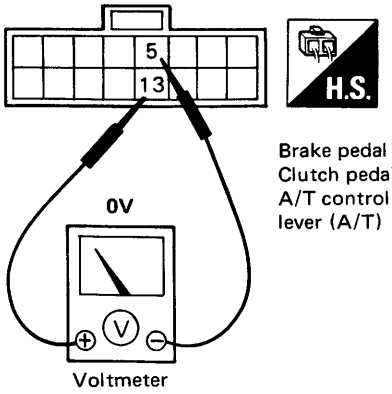
Check actuator. Refer to "Actuator check".

O.K. → Replace A.S.C.D. control unit.

N.G. → Replace actuator.

CUT-OFF CIRCUIT CHECK

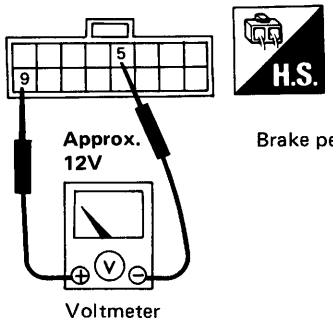
1. Turn ignition switch to "ON".
2. Turn A.S.C.D. main switch to "ON".
3. Step on brake pedal.
4. Check voltage between ⑬ and ⑤.
5. Turn A.S.C.D. main switch to "ON" again.
6. Step on clutch pedal (M/T) or shift in "N" range (A/T).
7. Check voltage between ⑬ and ⑤.



Brake pedal → Step on.
Clutch pedal (M/T) → Step on.
A/T control → "N" range lever (A/T)

STOP LAMP CIRCUIT CHECK

1. Turn ignition switch to "ON".
2. Turn A.S.C.D. main switch to "ON".
3. Keep pressure on brake pedal.
4. Check voltage between ⑨ and ⑤.



Brake pedal → Keep pressure on it.

SEL420H

Trouble-shooting (Cont'd)

Resume switch will not operate.

↓

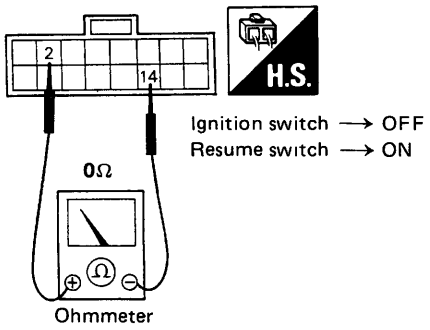
Check resume switch circuit.

↓ O.K. → Replace A.S.C.D. control unit.

↓ N.G. → Check resume switch.

RESUME SWITCH CIRCUIT CHECK

1. Turn ignition switch to "OFF".
2. Turn resume switch to "ON".
3. Check continuity between 2 and 14.



Accelerate switch will not operate.

↓

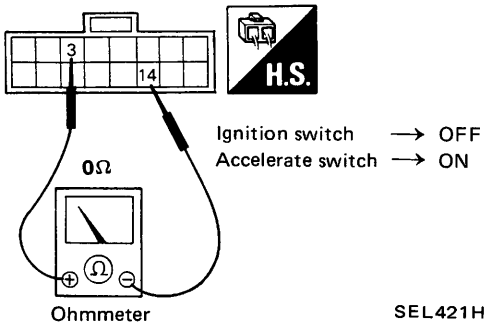
Check accelerate switch circuit.

↓ O.K. → Replace A.S.C.D. control unit.

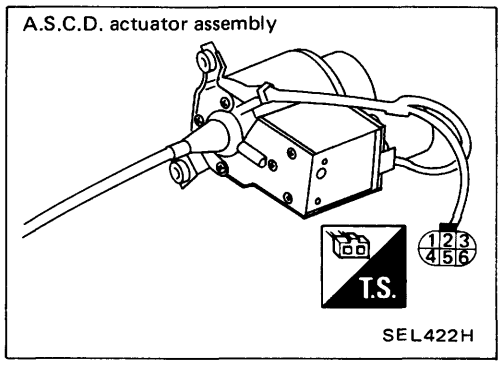
↓ N.G. → Check accelerate switch.

ACCELERATE SWITCH CIRCUIT CHECK

1. Turn ignition switch to "OFF".
2. Turn accelerate switch to "ON".
3. Check continuity between 3 and 14.

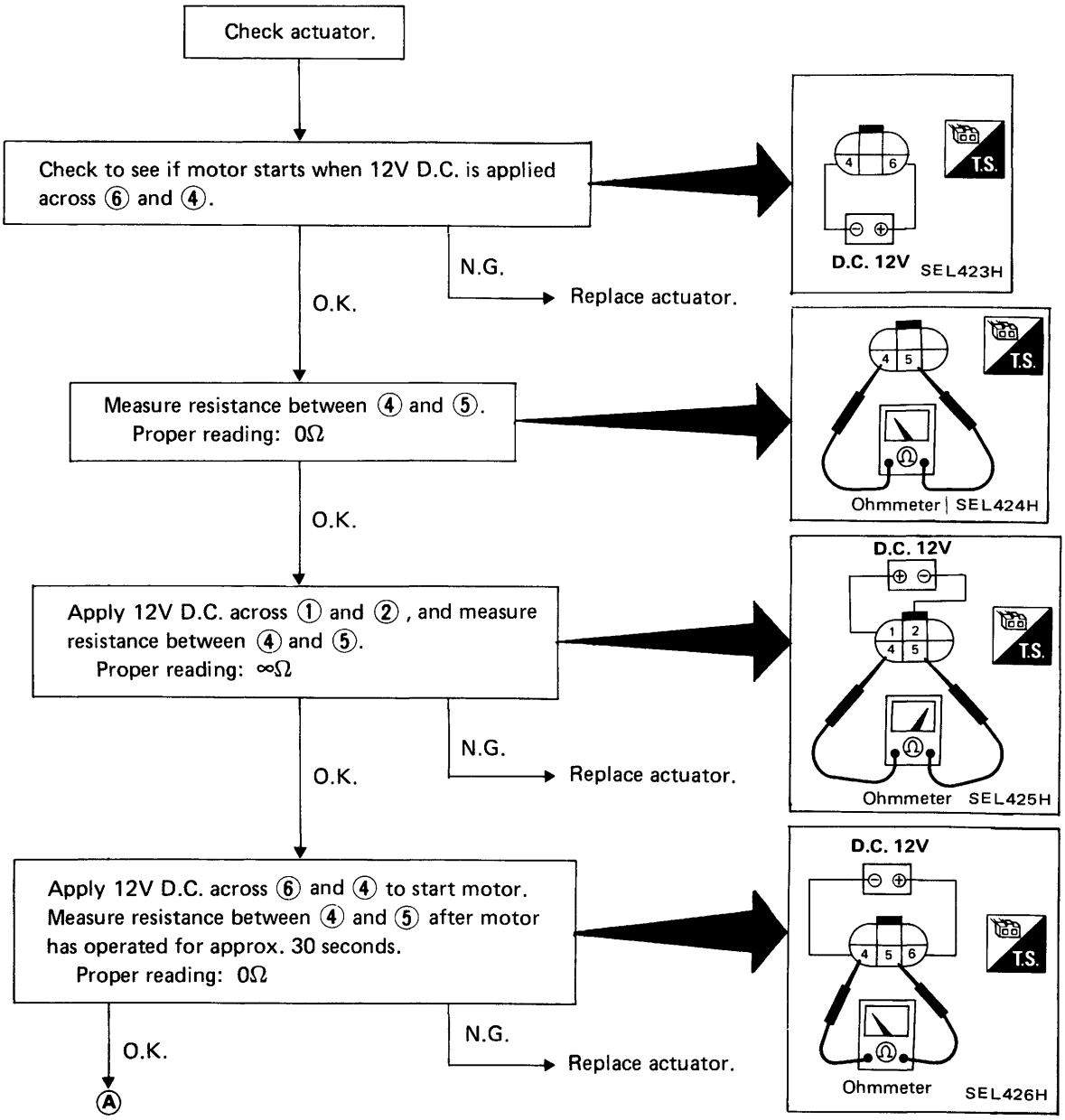


SEL421H

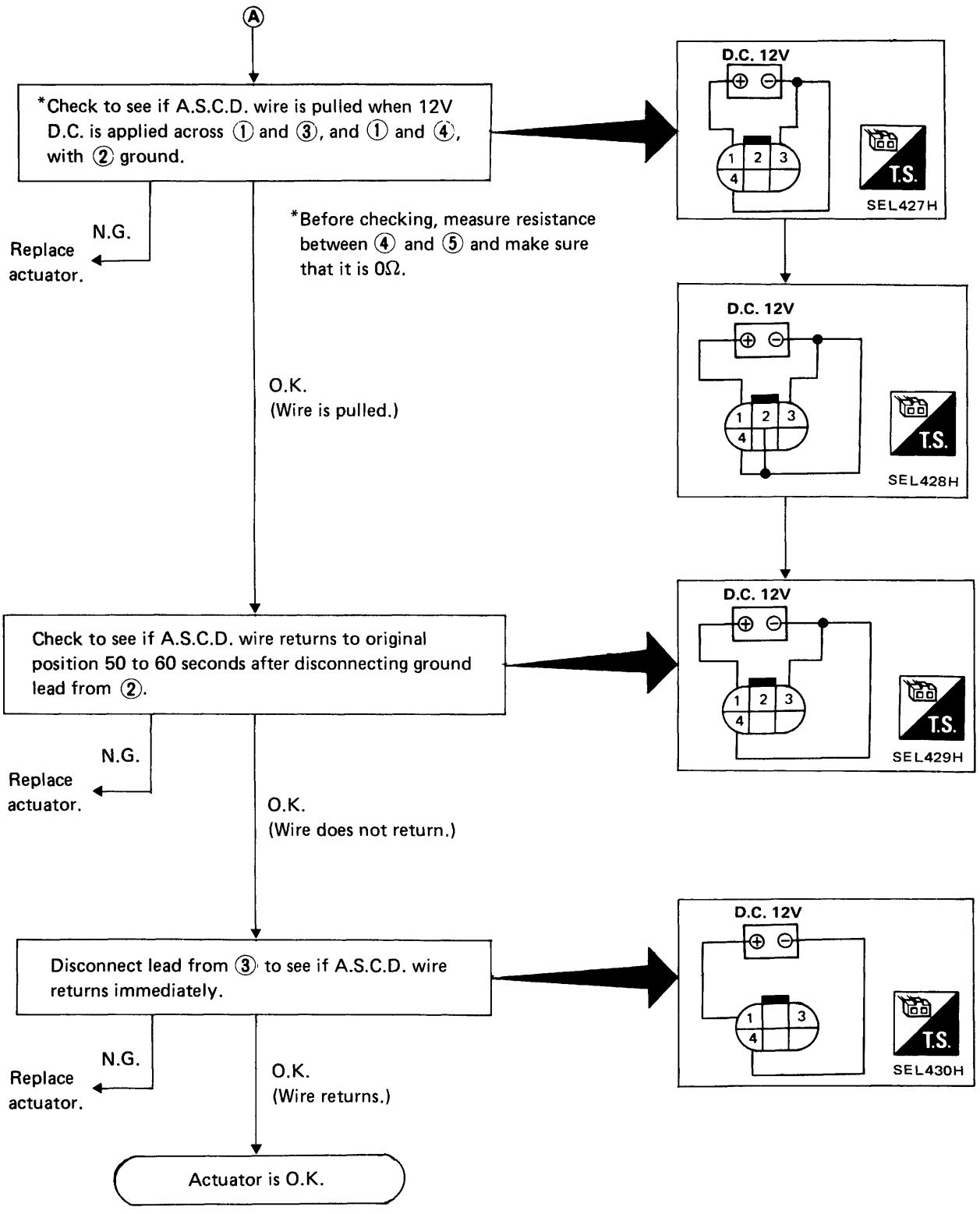


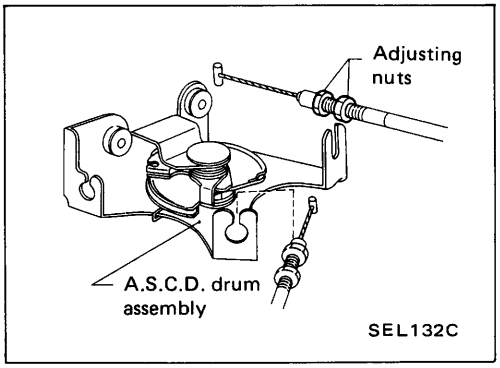
Actuator Check

1. Disconnect connector of actuator from main harness.
2. Check actuator operations as shown.



Actuator Check (Cont'd)





Cable Adjustment

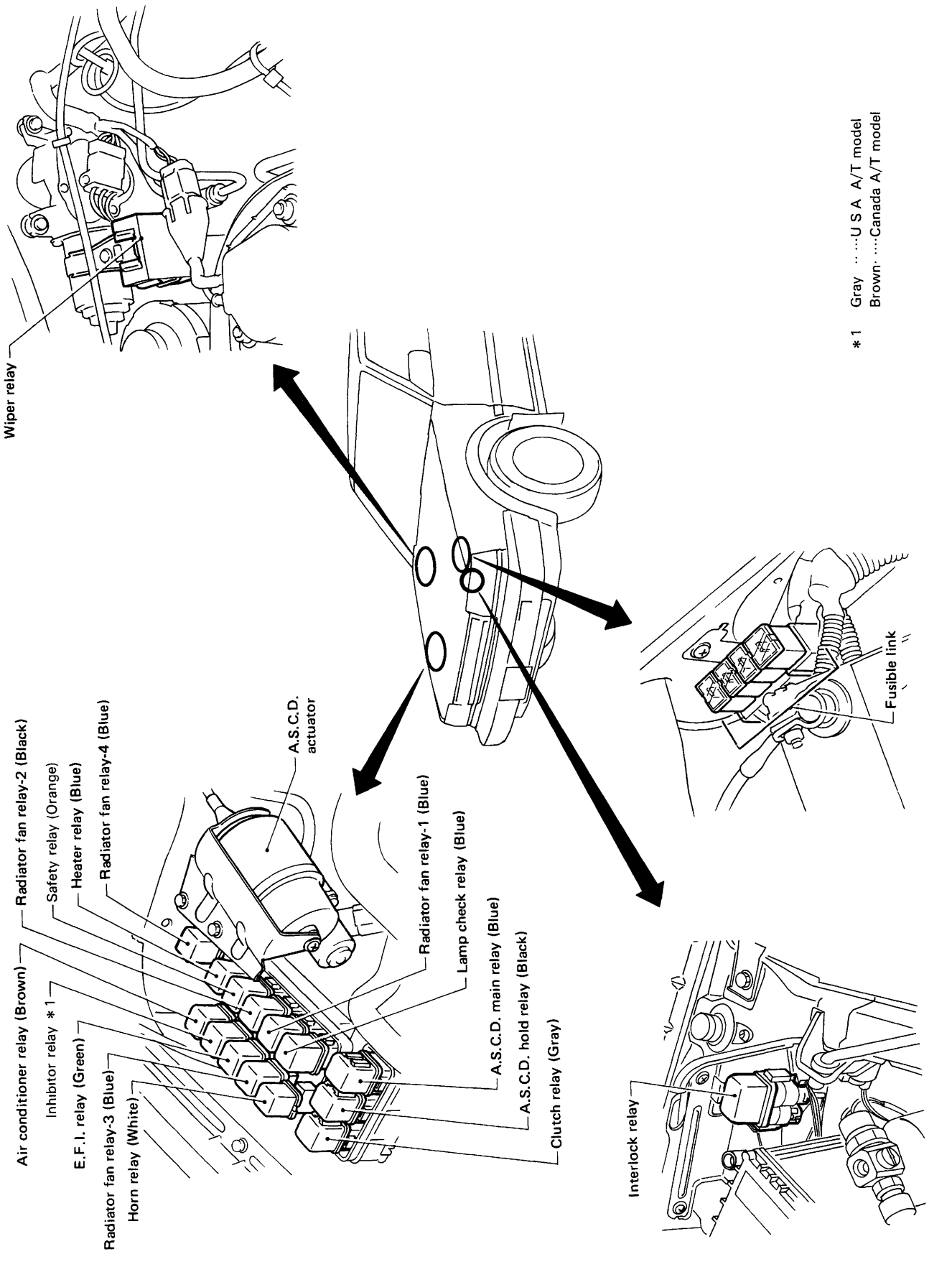
Without depressing the accelerator pedal, adjust the adjusting nuts until there is no cable free play.

- **For A.S.C.D. cancel switch and clutch switch adjustment, refer to BR and CL sections.**

CAUTION:

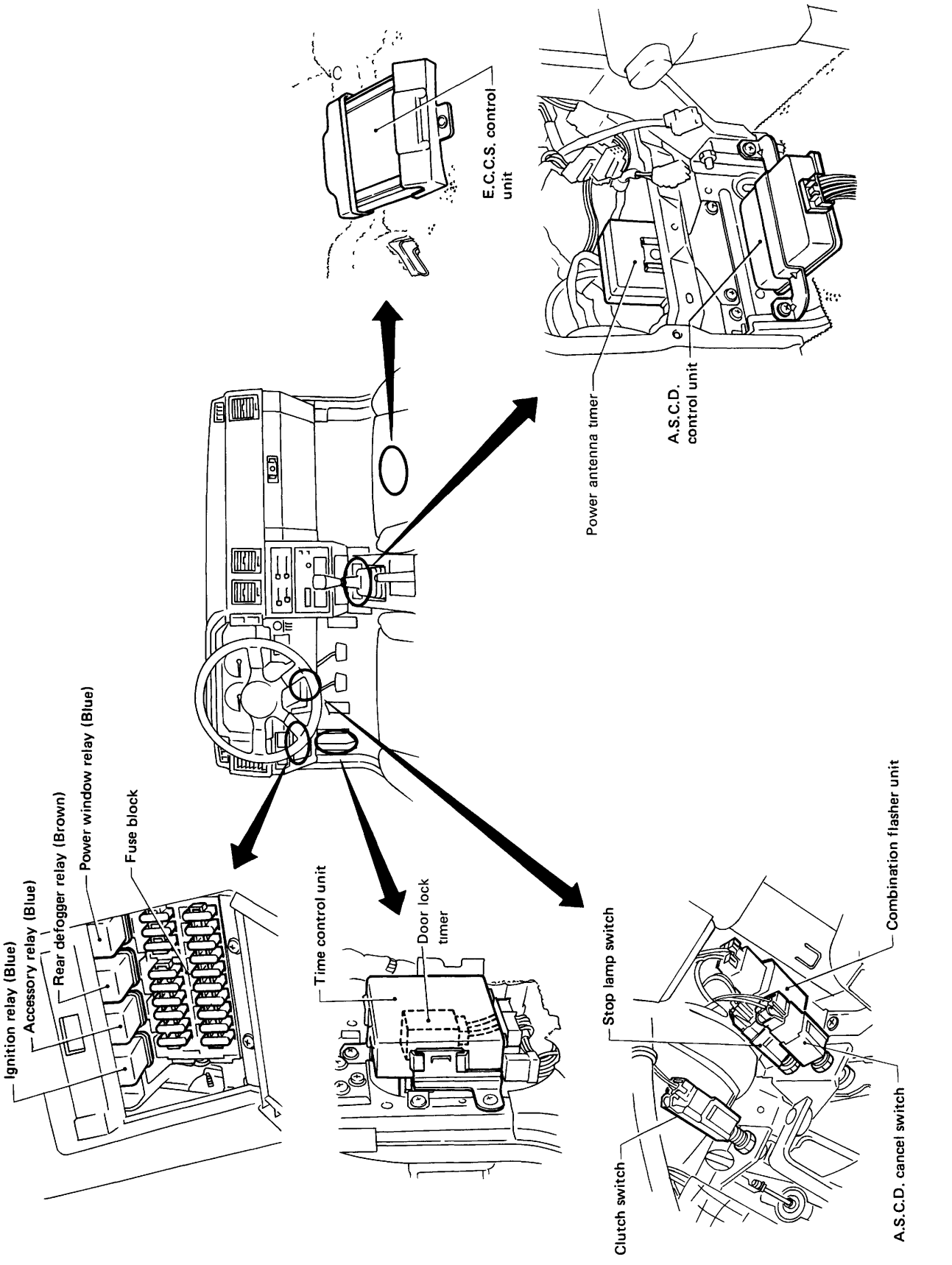
Do not increase tension of cable excessively, as this may cause throttle lever to rotate.

Engine Compartment

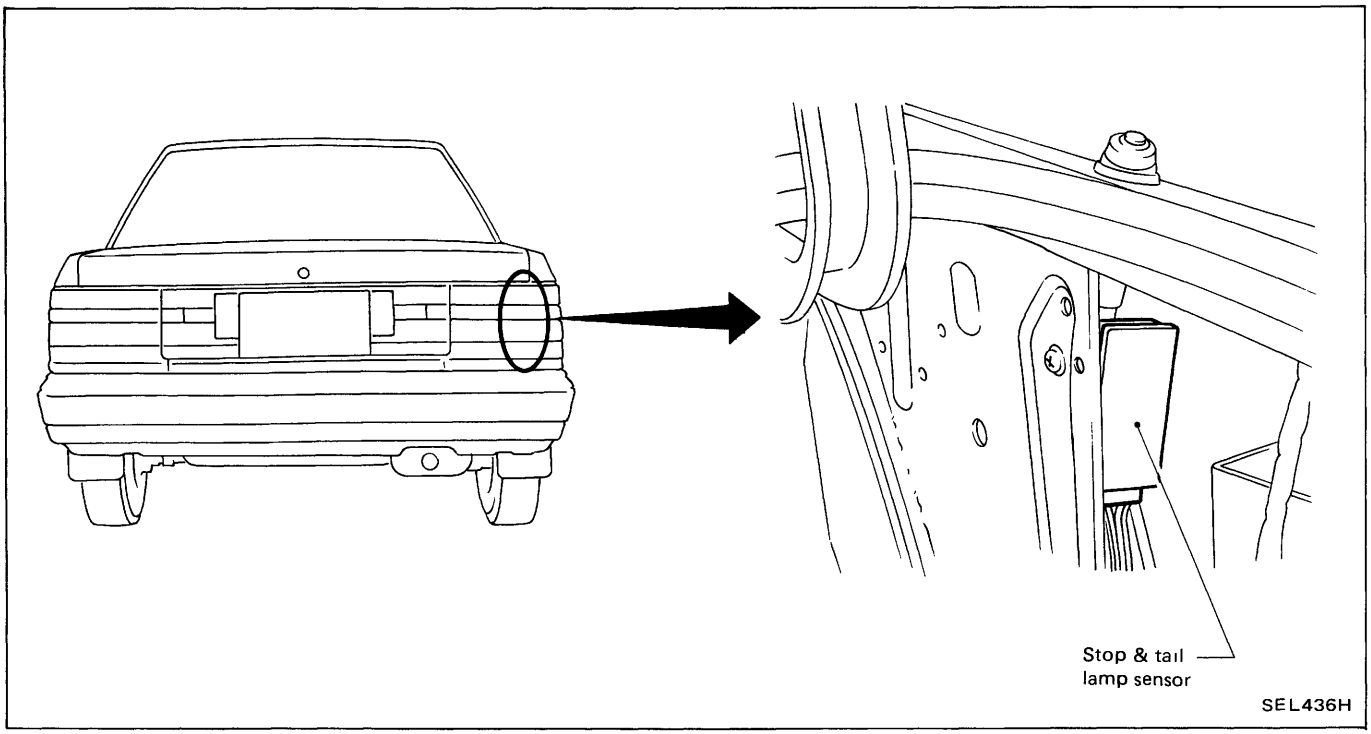


SEL644L

Passenger Compartment

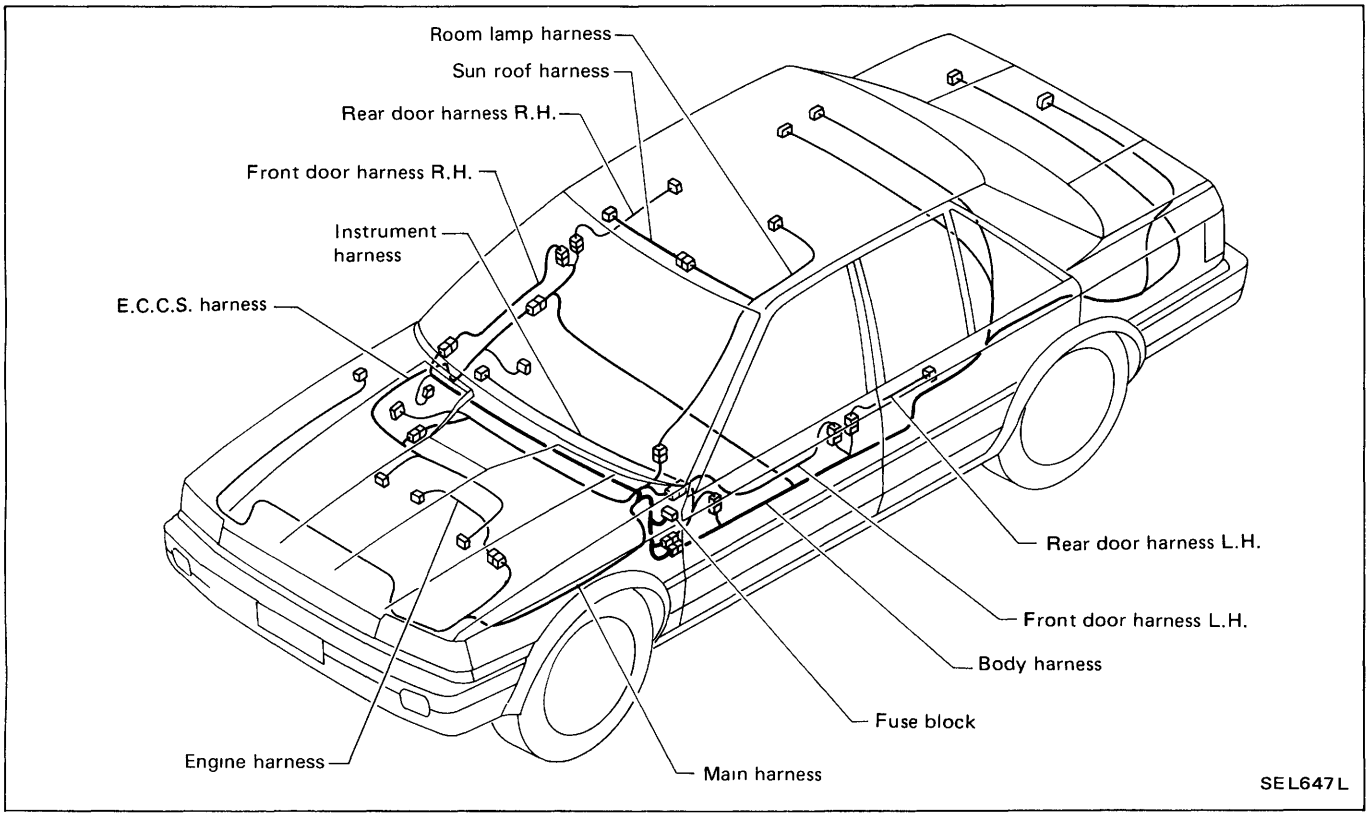


Luggage Compartment



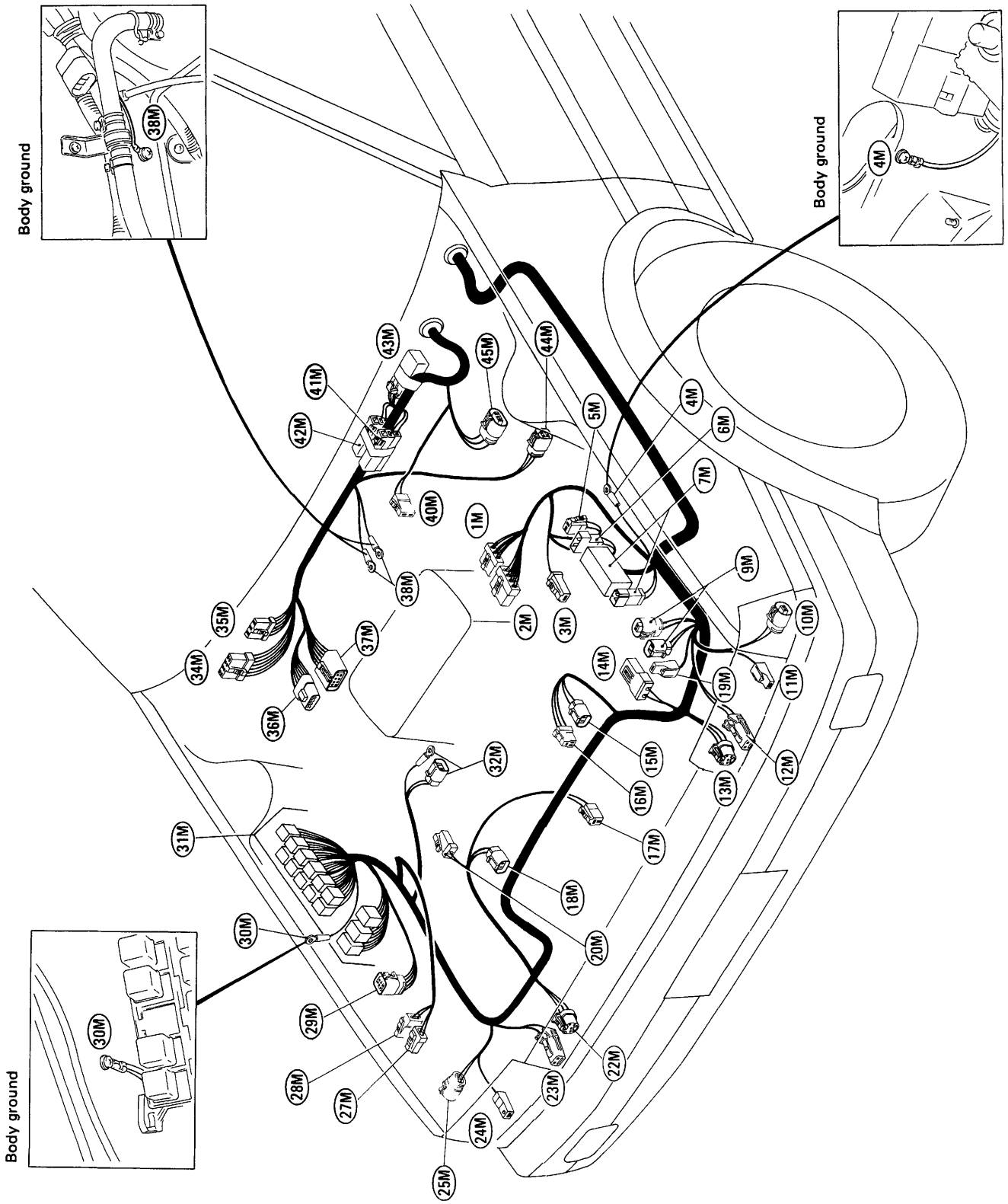
NOTE

Outline


Room lamp harness
Sun roof harness
Rear door harness R.H.
Front door harness R.H.
Instrument harness
E.C.C.S. harness
Rear door harness L.H.
Front door harness L.H.
Body harness
Fuse block
Engine harness
Main harness
SEL647L

Main Harness

ENGINE COMPARTMENT SIDE



Main Harness (Cont'd)

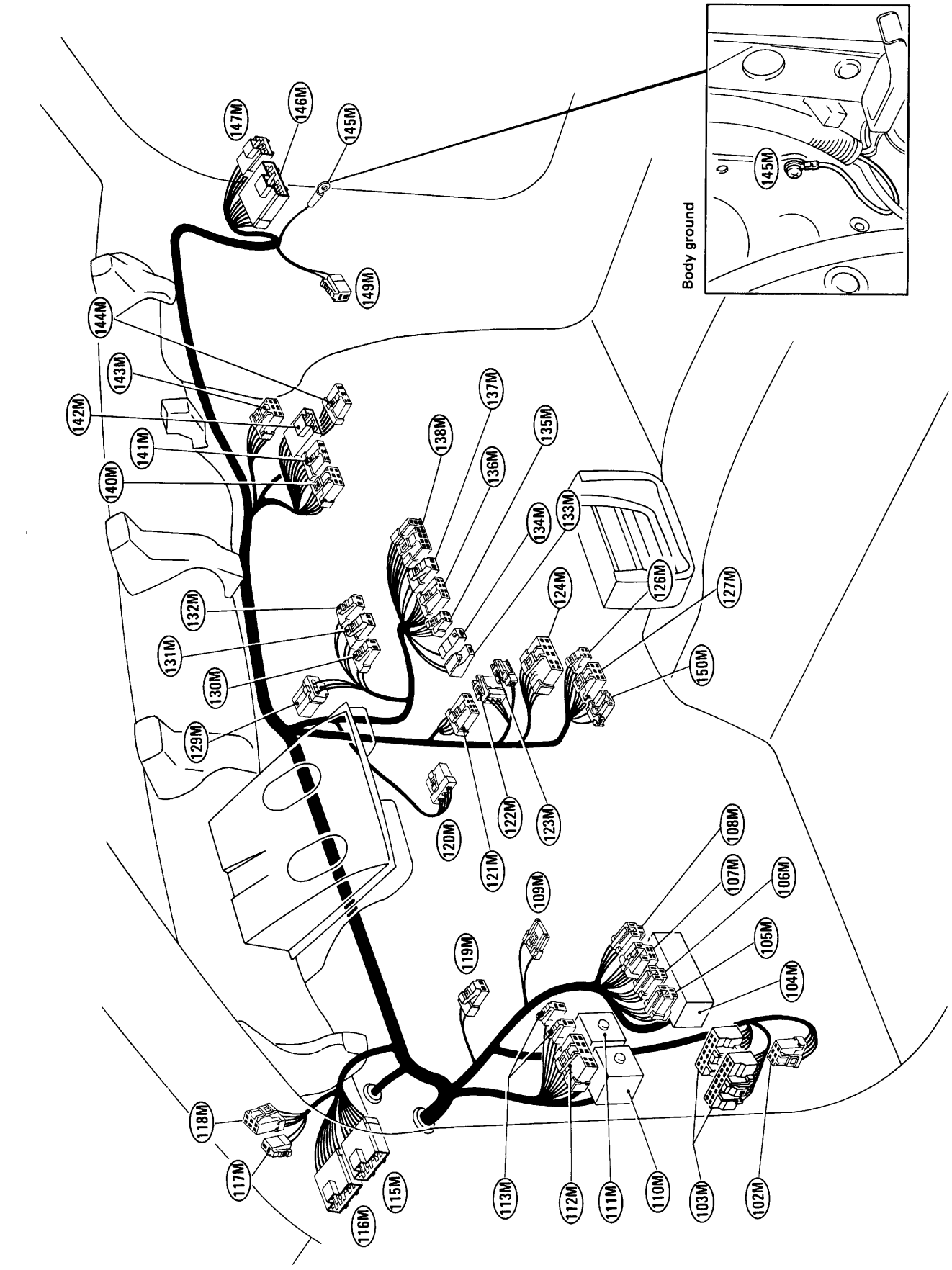
(1M) : To (1E) (A/T model)
(2M) : To (2E)
(3M) : Battery
(4M) : Body ground
(5M) : Fusible link
(6M) : Fusible link
(7M) : Fusible link holder
(9M) : Starter relay
(10M) : Front turn signal lamp L.H.
(11M) : Horn (High)
(12M) : Clearance lamp L.H.
(13M) : Headlamp L.H.
(14M) : Low-pressure switch
(15M) : Thermoswitch-2 (A/T)
(16M) : Radiator fan motor-1
(17M) : Radiator fan motor-2
(18M) : Thermoswitch-1
(19M) : Acceleration cut switch
(20M) : Compressor
(22M) : Headlamp R.H.
(23M) : Clearance lamp R.H.

(24M) : Horn (Low) (GXE model)
(25M) : Front turn signal lamp R.H.
(27M) : Washer sensor (GXE model)
(28M) : Washer motor
(29M) : A.S.C.D. actuator
(30M) : Body ground
(31M) : Relay bracket (Refer to LOCATION OF ELECTRICAL UNITS.)
(37M) : Alternator
(34M) : Wiper relay
(35M) : Wiper motor
(36M) : To (4F)
(37M) : To (5F)
(38M) : Body ground
(40M) : Brake fluid level switch
(41M) : Resistor
(42M) : Tachometer resistor (GXE model)
(43M) : Radio condenser
(44M) : Ignition coil (Intake)
(45M) : Ignition coil (Exhaust)

SEL648L

Main Harness (Cont'd)

PASSENGER COMPARTMENT SIDE



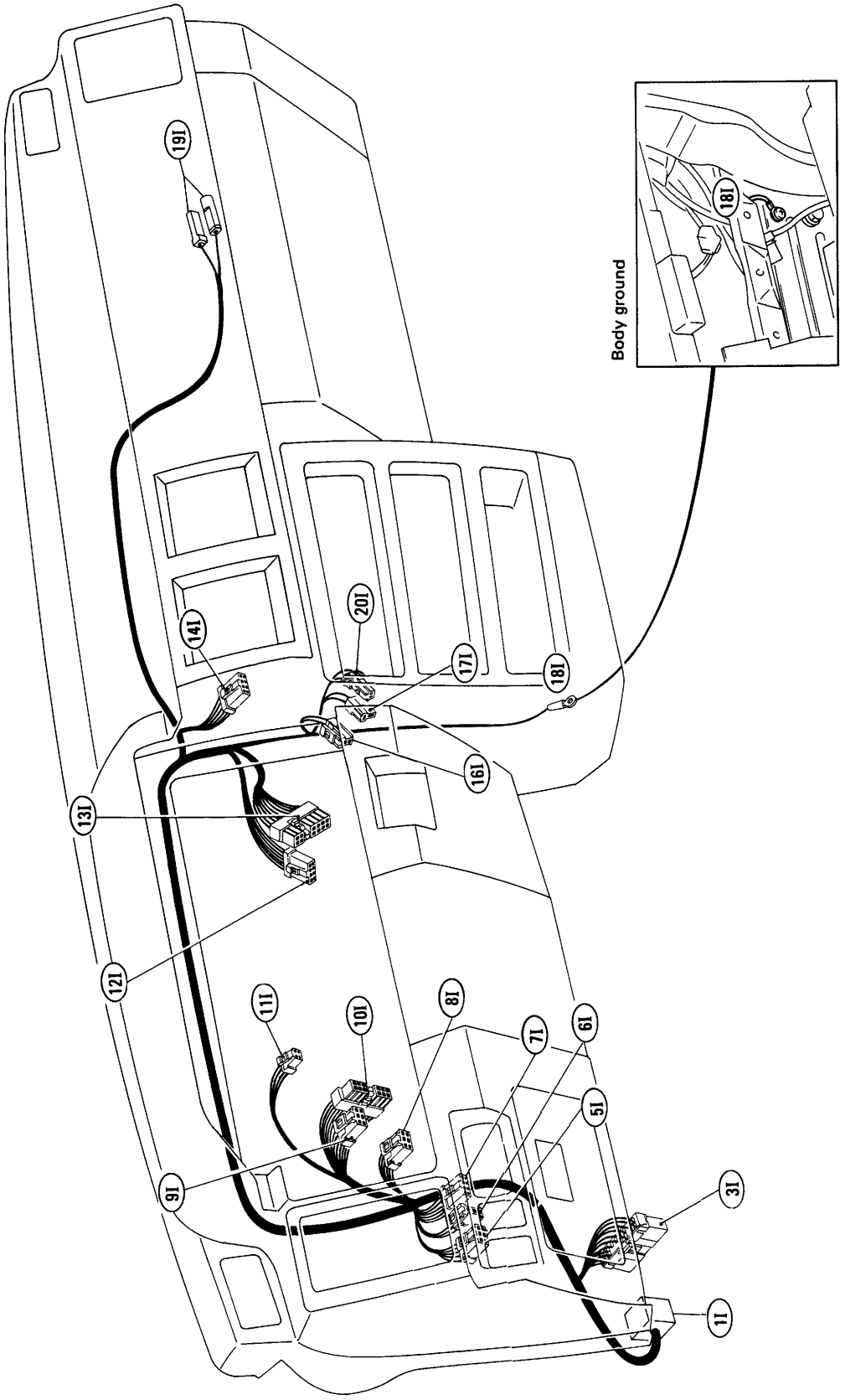
Main Harness (Cont'd)

(102M) : Door lock timer
(103M) : Time control unit
(104M) : Fuse block
(105M) : Ignition relay
(106M) : Accessory relay
(107M) : Rear defogger relay
(108M) : Power window relay
(109M) : Extended storage switch
(110M) : To (1B)
(111M) : To (1I)
(112M) : Diode
(113M) : Circuit breaker
(115M) : To front door harness L.H.
(116M) : To front door harness L.H.
(117M) : To sun roof harness
(118M) : To room lamp harness
(119M) : Clutch interlock switch (M/T model for U S A)
(120M) : Ignition switch
(121M) : Power antenna timer
(122M) : Power antenna timer
(123M) : Ash tray illumination
(124M) : Radio

(126M) : Deck
(127M) : Radio
(129M) : Combination flasher unit
(130M) : Stop lamp switch
(131M) : A.S.C.D. cancel switch
(132M) : Clutch switch
(133M) : Key-in switch
(134M) : Horn switch
(135M) : A.S.C.D. resume switch
(136M) : Wiper switch
(137M) : Intermittent wiper volume
(138M) : Lighting switch and turn signal switch
(140M) : Air conditioner amplifier
(141M) : Heater control unit
(142M) : Heater control unit
(143M) : Thermo control amplifier
(144M) : Resistor
(145M) : Body ground
(146M) : To front door harness R H
(147M) : To front door harness R H
(149M) : Blower motor
(150M) : Deck illumination

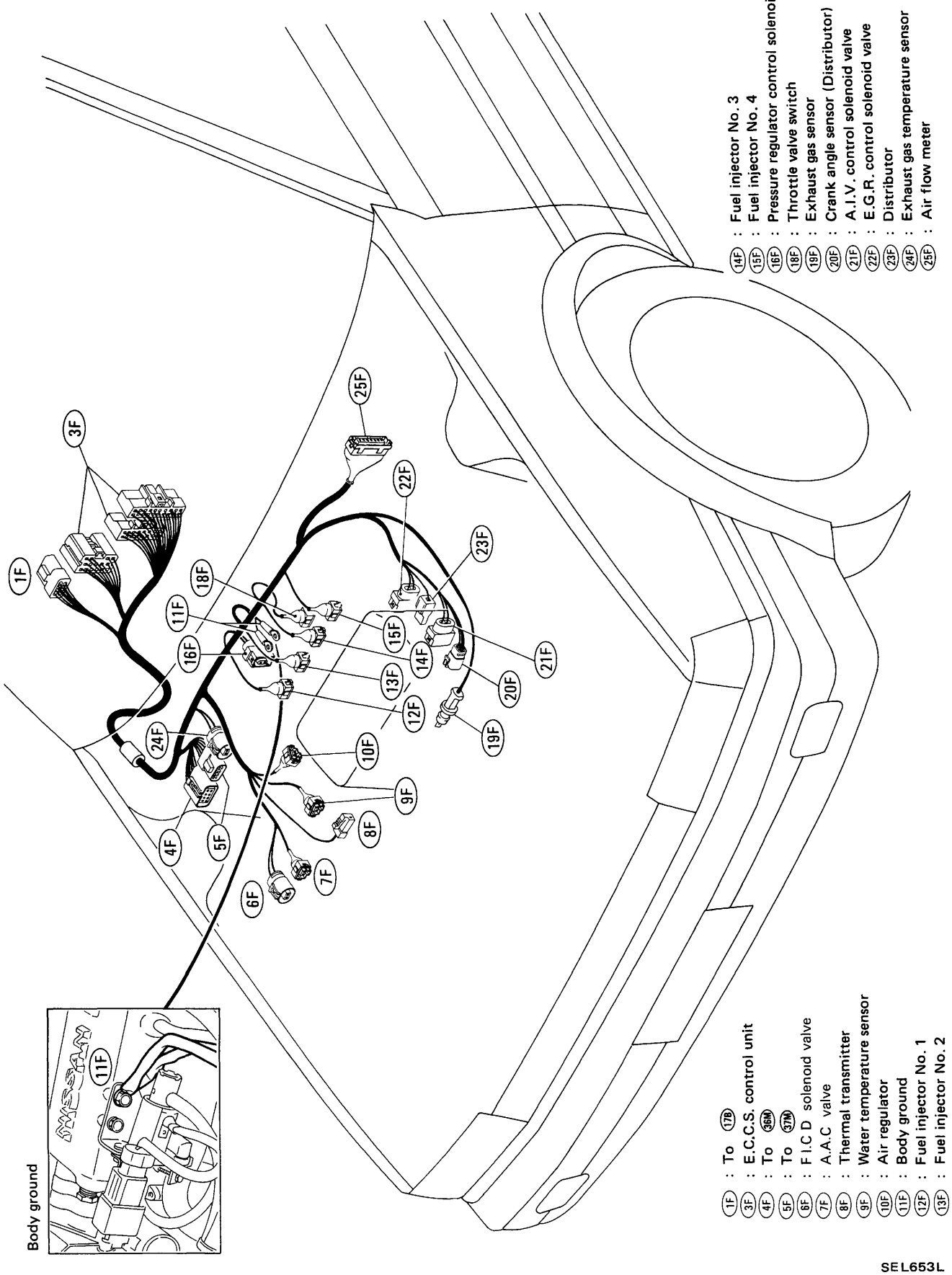
SEL650L

Instrument Harness



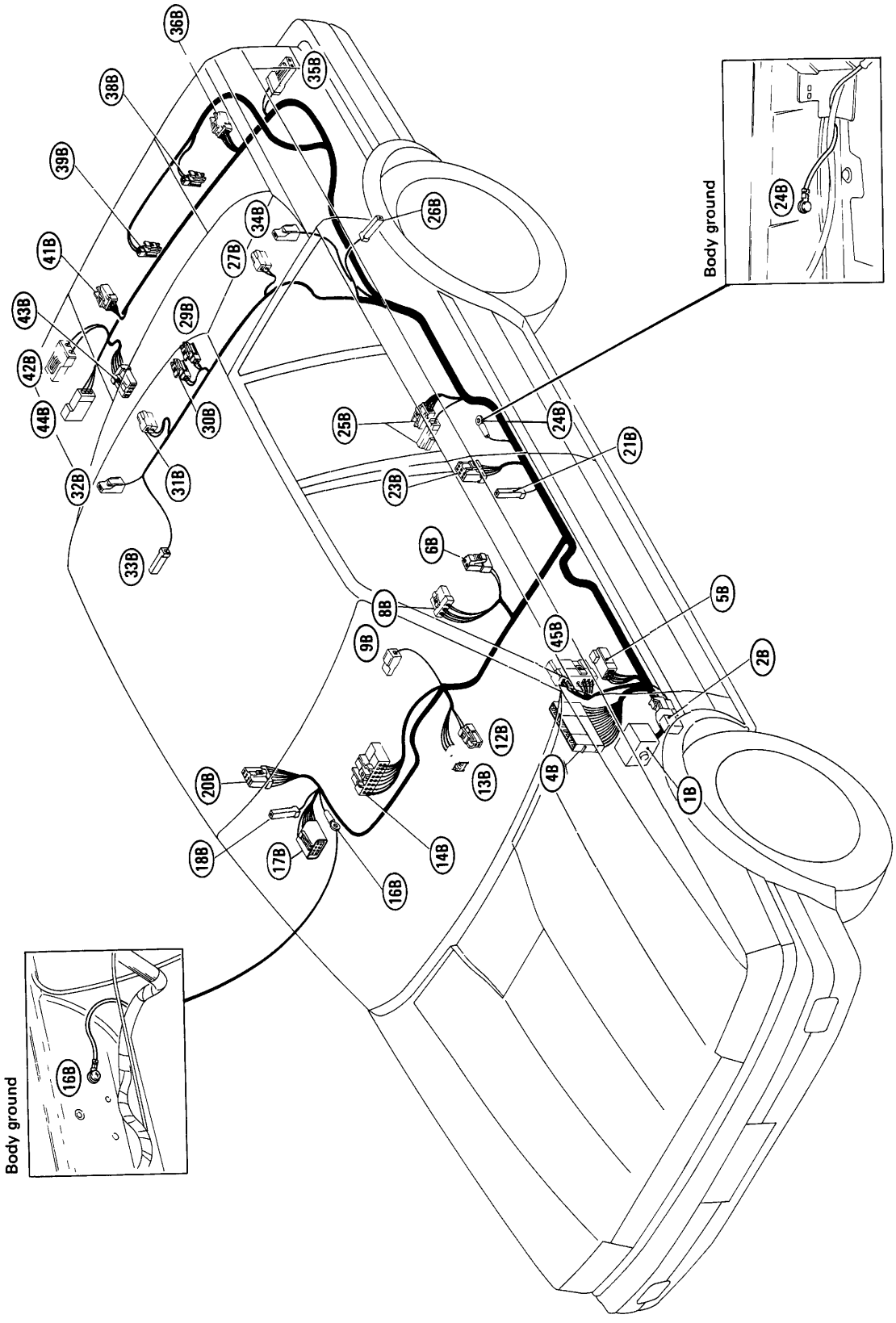
SEL652L

E.C.C.S. Harness



SEL653L

Body Harness



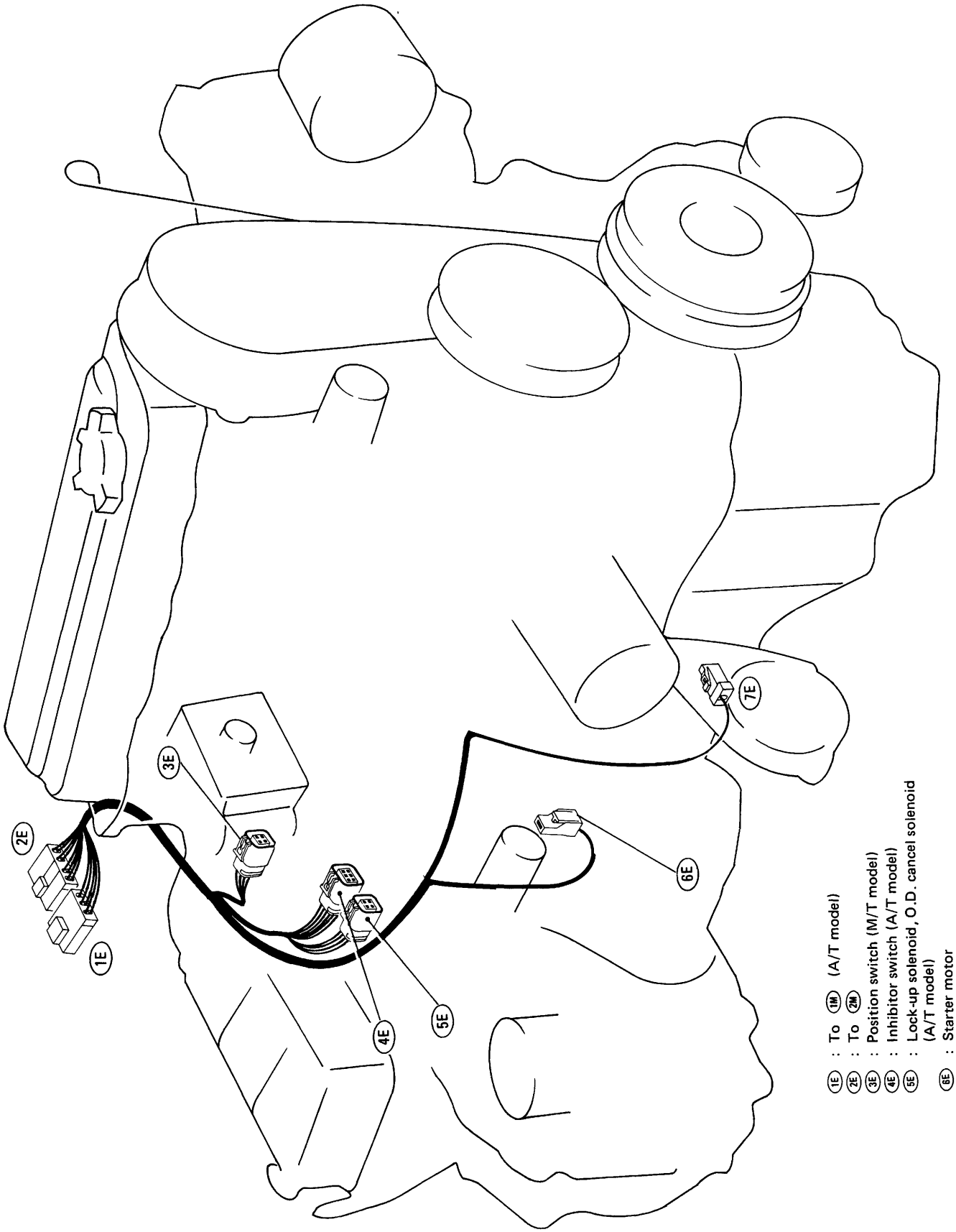
Body Harness (Cont'd)

(1B) : To (100)
(2B) : Diode (A/T control unit equipped model)
(4B) : To (31)
(5B) : To front door harness L H
(6B) : Seat belt switch
(8B) : A/T control unit
(9B) : Parking brake switch
(12B) : A/T indicator lamp
(13B) : O D control switch (A/T model)
(14B) : A.S.C.D. control unit
(16B) : Body ground
(17B) : To (1F)
(18B) : Front door switch R.H.
(20B) : To rear door harness R H
(21B) : Front door switch L.H.
(23B) : To rear door harness L H
(24B) : Body ground
(25B) : Fuel tank gauge unit
(26B) : Rear door switch L.H.
(27B) : Rear speaker L.H.
(29B) : High-mounted stop lamp
(30B) : Trunk room lamp
(31B) : Rear speaker R.H.
(32B) : Rear defogger
(33B) : Rear door switch R.H.
(34B) : Trunk room lamp switch
(35B) : Rear side marker lamp L.H.
(36B) : Rear combination lamp L.H.
(38B) : License lamp L.H.
(39B) : License lamp R.H.
(41B) : Rear combination lamp R.H.
(42B) : Rear side marker lamp R.H.
(43B) : Stop and tail lamp sensor (GXE model)
(44B) : Power antenna motor (GXE model)
(45B) : Check connector (Check for E.C.C.S. system)

(2B) Diode

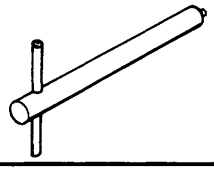
SEL654L

Engine Harness



1E : To 1M (A/T model)
2E : To 2M
3E : Position switch (M/T model)
4E : Inhibitor switch (A/T model)
5E : Lock-up solenoid, O.D. cancel solenoid (A/T model)
6E : Starter motor
7E : Oil pressure switch

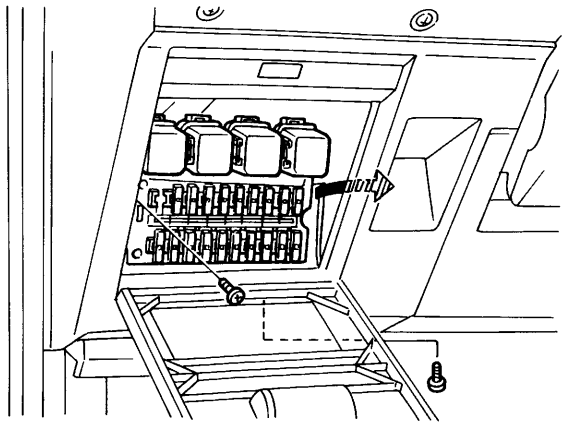
SEL674K

Tool number	Tool name
(J36126)	Washer nozzle adjusting tool 

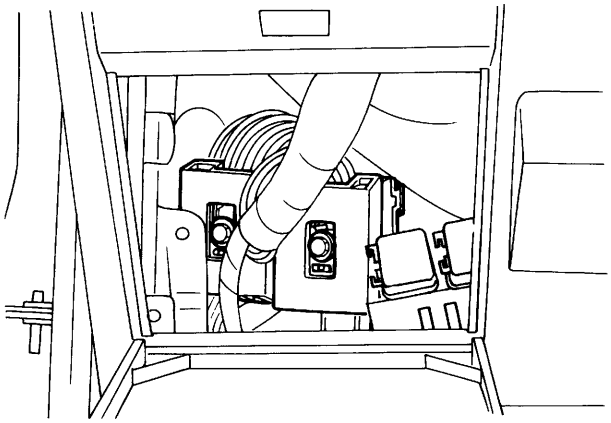
NOTE

REMOVAL

- Remove fuse block retaining screws to gain access to S.M.J.
- Slide fuse block to the side, and remove S.M.J. retaining bolts to detach S.M.J.



SEL148E

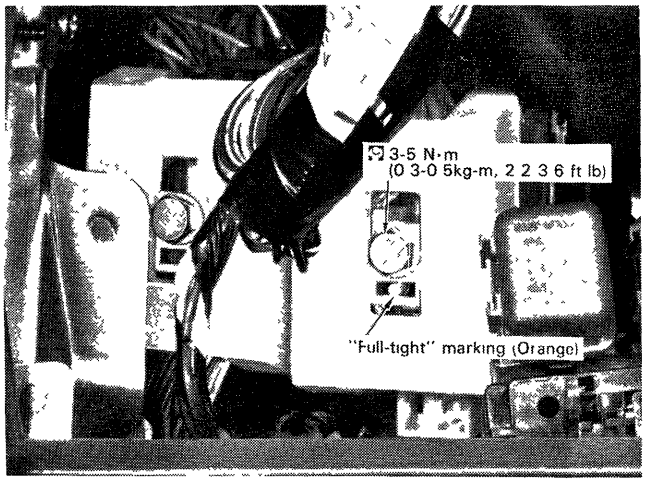


SEL149E

INSTALLATION

To install S.M.J., tighten bolts until orange "full-tight" mark appears and then retighten to specified torque as required.

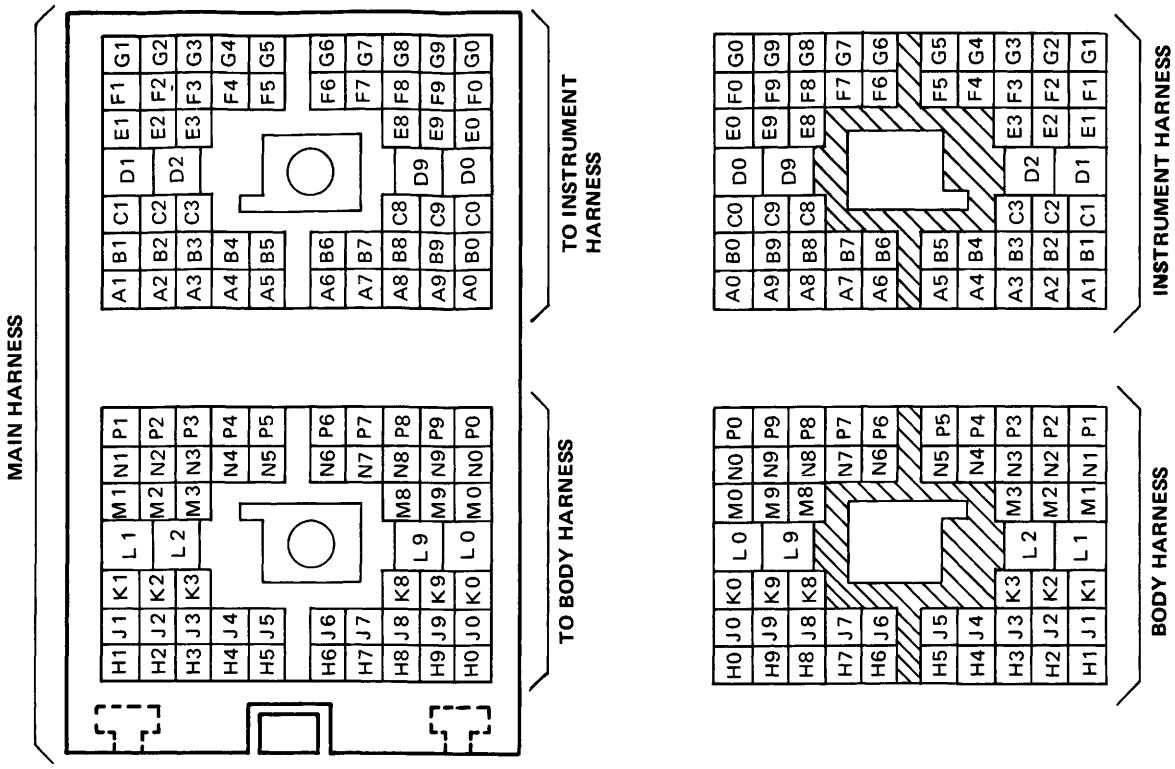
: 3 - 5 N·m (0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb)



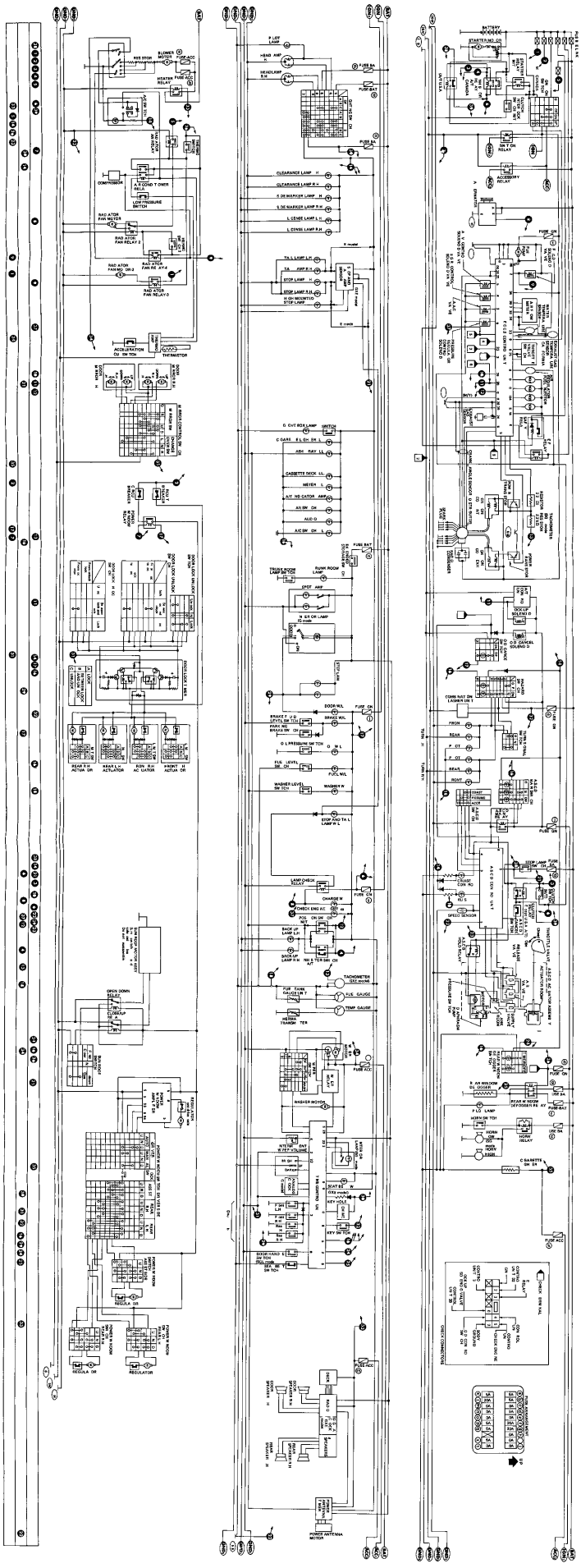
CAUTION:

Do not overtighten bolts, otherwise, bolts may be damaged.

Terminal Arrangement (Model T12 series)



1989 NISSAN STANZA
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

QUICK REFERENCE CHART : STANZA [ ] 1989

ENGINE TUNE-UP DATA

Engine model			CA20E		
Firing order			1-3-4-2		
Idle speed rpm		M/T	750±50		
		A/T	700±50 (in "D" position)		
Ignition timing (degree B.T.D.C. at idle speed)			15°±2°		
"CO"% at idle speed (No air) %			Idle mixture screw is preset and sealed at factory.		
Drive belt deflection (Cold) mm (in)			Used belt		Set deflection of new belt
	Alternator		Limit	Adjust deflection	
		With A/C	10 (0.39)	5 - 7 (0.20 - 0.28)	5 - 7 (0.20 - 0.28)
		Without A/C	12 (0.47)	6 - 8 (0.24 - 0.31)	5 - 7 (0.20 - 0.28)
	Power steering pump		12.5 (0.492)	7 - 9 (0.28 - 0.35)	6 - 8 (0.24 - 0.31)
	Air conditioner compressor		6 (0.24)	3 - 4 (0.12 - 0.16)	3 - 4 (0.12 - 0.16)
Applied pressed force N (kg, lb)			98 (10, 22)		
Ignition wires resistance kΩ			Less than 30		
Spark pulg			INT.		EXH.
	Type	Hot	BCPR5ES-11		
		Standard	BCPR6ES-11		BCPR5ES-11
		Cold	BCPR7ES-11		BCPR6ES-11, BCPR7ES-11
	Gap mm (in)		1.0 - 1.1 (0.039 - 0.043)		
Tightening torque			N-m	kg-m	ft-lb
	Spark plug		20 - 29	2.0 - 3.0	14 - 22
	Oil pan drain plug		29 - 39	3.0 - 4.0	22 - 29

CLUTCH PEDAL

Unit: mm (in)

Pedal height	171 - 181 (6.73 - 7.13)
Pedal free play	1 - 3 (0.04 - 0.12)

WHEEL ALIGNMENT (Unladen*)

		Front	Rear
Camber	degree	−25′ to 1°05′	−1°10′ to 0°20′
Caster	degree	1°20′ - 2°50′	−
Toe-in	mm (in)	1 - 3 (0.04 - 0.12)	2 - 6 (0.08 - 0.24) (Toe-out)
	degree	6′ - 19′ (Total toe-in)	12′ - 37′ (Total toe-out)
Turning angle Toe-out turns (Inside/Outside)		22°20′/20°	−
Inside		38° - 42°	−
Outside		29° - 33°	−

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

REAR WHEEL BEARING

Wheel bearing lock nut Tightening torque N·m (kg-m, ft-lb)	25 - 34 (2.5 - 3.5, 18 - 25)
Retightening torque after loosening wheel bearing lock nut N·m (kg-m, ft-lb)	9 - 12 (0.9 - 1.2, 6.5 - 8.7)
Axial end play mm (in)	0 (0)
Wheel bearing preload* N (kg, lb)	
With new grease seal	13.7 (1.4, 3.1) or less
With used grease seal	10.8 (1.1, 2.4) or less

* As measured at wheel hub bolt

BRAKE

Unit: mm (in)

Disc brake Pad minimum thickness	2.0 (0.08)
Rotor repair limit Runout	0.07 (0.0028) or less
Minimum thickness	20.0 (0.787)
Drum brake Lining minimum thickness	1.5 (0.059)
Drum repair limit Maximum inner diameter	230.0 (9.06)
Radial runout	0.05 (0.0020) or less
Out-of-roundness	0.03 (0.0012) or less

REFILL CAPACITIES

Unit		Liter	US measure
Fuel tank		60	15-7/8 gal
Coolant		7.3	7-3/4 qt
Engine	With oil filter	3.5	3-3/4 qt
	Without oil filter	3.1	3-1/4 qt
Transaxle	M/T	4.7	10 pt
	A/T	6.8	7-1/4 qt
Power steering system		0.9	1 qt
Air conditioning system	Compressor oil	0.2	6.8 fl oz
	Refrigerant	0.9 - 1.1 kg	2.0 - 2.4 lb

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

Edition: June 1988
Printing: January 1989 (06)
Publication No. SM9E-0T12U0

Printed in Japan