

**MONTERO**

Service  
Manual  
1987

Volume — 1

Engine, Chassis & Body





# Service Manual MONTERO

## 1987 : Volume 1

### FOREWORD

This Service Manual has been prepared with the latest service information available at the time of publication. It is subdivided into various group categories and each section contains diagnosis, disassembly, repair, and installation procedures along with complete specifications and tightening references. Use of this manual will aid in properly performing any servicing necessary to maintain or restore the high levels of performance and reliability designed into these outstanding vehicles.



Mitsubishi Motors corporation reserves the right to make changes in design or to make additions to or improvements in its products without imposing any obligations upon itself to install them on its products previously manufactured.

## GROUP INDEX

N00AA-A

Introduction and Master Troubleshooting .....	0
Lubrication and Maintenance .....	2
Front Suspension .....	3
Rear Axle .....	5
Brakes - Service Parking .....	6
Clutch .....	7
Cooling .....	9
Engine .....	11
Intake and Exhaust .....	13
Body and Frame Alignment .....	14
Fuel System .....	16
Propeller Shaft and Universal Joint .....	17
Rear Suspension .....	19
Power Steering .....	21
Transmission - Manual Automatic .....	22
Wheels and Tires .....	23
Body .....	25
Emission Control Systems .....	

NOTE  
For Electrical, Heater & Air-conditioning, refer to ...  
Volume-2  
"Electrical, Heater & Air-conditioning"

# HOW TO USE THIS MANUAL

N00BAAA

## CONTENTS

The preceding page contains the GROUP INDEX which lists the group title and group number.

## PAGE NUMBERS

All page numbers consist of two sets of digits separated by a dash. The digits preceding the dash identify the number of the group. The digits following the dash represent the consecutive page number within the group. The page numbers can be found on the top left or right of each page.

Indicates incidental operation to be performed before removal or after installation

## TEXT

Unless otherwise specified, each service procedure covers all models. Procedures covering specific models are identified by the model codes, or similar designation (engine type, transmission type, etc.). A description of these designations is covered in this unit under "VEHICLE IDENTIFICATION".

Removal steps : The numbers before part names correspond to numbers in the illustration and indicate the order of removal.

Disassembly steps : The numbers before part names correspond to numbers in the illustration, and indicate the order of disassembly.

Installation steps : This is provided if installation cannot be made in the reverse order of "Removal steps"; omitted if installation in the reverse order of "Removal steps" is possible.

Reassembly steps : This is provided if reassembly cannot be made in the reverse order of "Disassembly steps"; omitted if reassembly in the reverse order of "Disassembly steps" is possible.

## TROUBLESHOOTING

Troubleshootings are classified into master troubleshooting and group troubleshooting and located as follows:

The master troubleshooting is prepared when the trouble symptom relates to two or more groups and given in MASTER TROUBLESHOOTING.

The group troubleshooting guide is prepared for causes of problems related to that individual group only; a troubleshooting guide is prepared for each appropriate group.

## SERVICE PROCEDURES

The service steps are arranged in numerical order and attentions to be paid in performing vehicle service are described in detail in SERVICE POINTS.

## DEFINITION OF TERMS

### STANDARD VALUE

Indicates the value used as the standard for judging the quality of a part or assembly on inspection or the value to which the part or assembly is corrected and adjusted. It is given by tolerance.

### LIMIT

Shows the standard for judging the quality of a part or assembly on inspection and means the maximum or minimum value within which the part or assembly must be kept functionally or in strength. It is a value established outside the range of standard value.

### Classification of SERVICE POINTS

- ◀▶ : Removal
- ▶▶ : Installation
- ◀◀ : Disassembly
- ▶◀ : Reassembly

Page number

Group title

Section title

7-10

COOLING – Thermostat

**THERMOSTAT  
REMOVAL AND INSTALLATION**

**Pre-removal Operation**

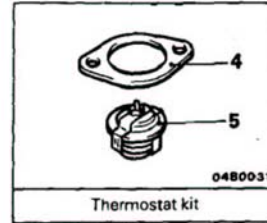
- Draining of the Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE – Maintenance Service.)

**Post-installation Operation**

- Supplying of the Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE – Maintenance Service.)

10-13 Nm  
7-9 ft.lbs.

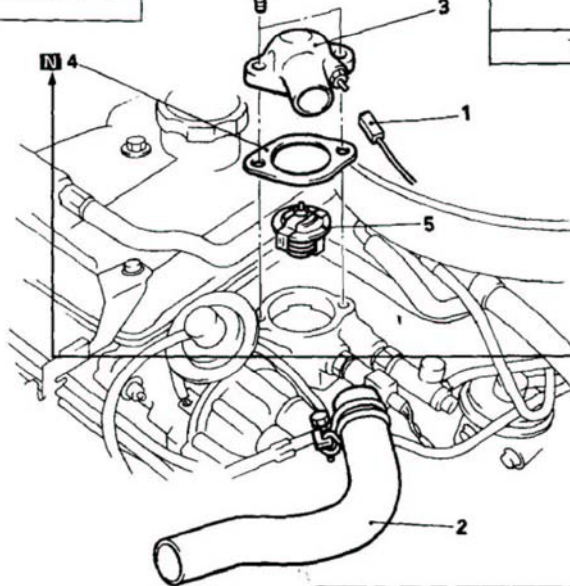
Indicates tightening torque



Repair kit or set parts are shown. (Only very frequently used parts are shown.)

Indicates non-reusable part.

This number corresponds to the number in "Removal steps", "Disassembly steps", "Installation steps" or "Reassembly steps".



**Removal steps**

1. Connection of water temperature switch connector (Vehicles with an air conditioner)
2. Connection of radiator upper hose
3. Water outlet fitting
4. Water outlet fitting gasket
5. Thermostat

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ♦♦ : Refer to "Service Points of Installation"
- (3) N : Non-reusable parts

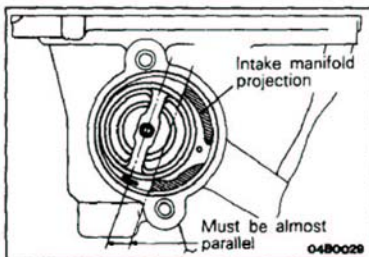
**SERVICE POINTS OF INSTALLATION**

**5. INSTALLATION OF THERMOSTAT**

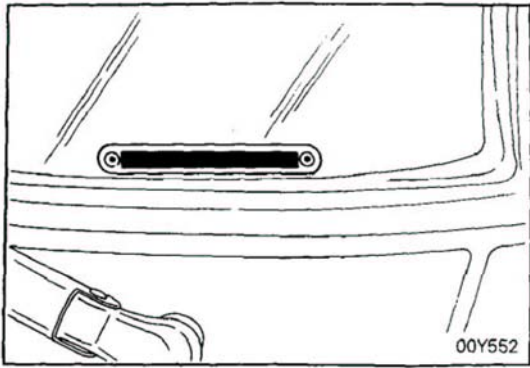
Install the thermostat to the intake manifold as illustrated.

**Caution**

The thermostat flange fits over the manifold seat; ensure that the thermostat is not installed at an angle.



An explanation of procedures, notes, etc. regarding removal, installation, disassembly and reassembly.



## VEHICLE IDENTIFICATION

### VEHICLE IDENTIFICATION NUMBER LOCATION

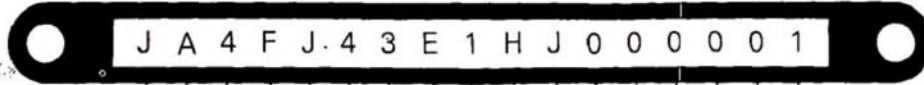
N00CA--

The vehicle identification number (V.I.N.) is located on a plate attached to the left top side of the instrument panel.

### VEHICLE IDENTIFICATION CODE CHART PLATE

N00CB-A

All vehicle identification numbers contain 17 digits. The vehicle number is a code which tells country, make, vehicle type, etc.



1st digit	2nd digit	3rd digit	4th digit	5th digit	6th digit	7th digit	8th digit	9th digit	10th digit	11th digit	12th thru 17th digit
Country	Make	Vehicle type	Others	Line	Price class	Body	Engine	Check digit	Model year	Plant	Serial number
J- Japan	A- Mitsu- bishi	4- Multi- purpose vehicle (MPV)  7-Truck	F- 4001 lbs. or more with hydraulic brakes	J- MON- TERO	2- Low 4- High	3- 3-door metal- top or van	E- 2.6 liters (155.9 C.I.D.)	0 1 2 3 . . . 9 X	H- 1987 year	J- Nagoya -3	000001 to 999999

**NOTE**

\*\*"Check digit" means a single number or letter X used to verify the accuracy of transcription of vehicle identification number.



## 6 INTRODUCTION AND MASTER TROUBLESHOOTING – Vehicle Identification



### CHASSIS NUMBER

#### STAMPING LOCATION

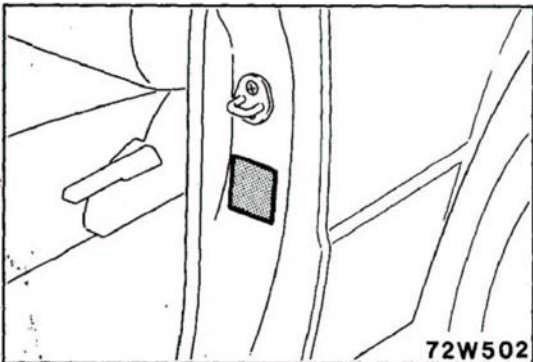
N00CE-A

The chassis number is stamped on the side of the frame near the right rear shock absorber.

#### CHASSIS NUMBER CODE CHART

L04 2 V HJ000001

Vehicle line	Engine displacement	Body type	Refer to 10th thru 17th digits of V.I.N. plate
L04-MONTERO	2-2.555 liters (155.9 C.I.D.)	V-3-door metal-top T-Van	

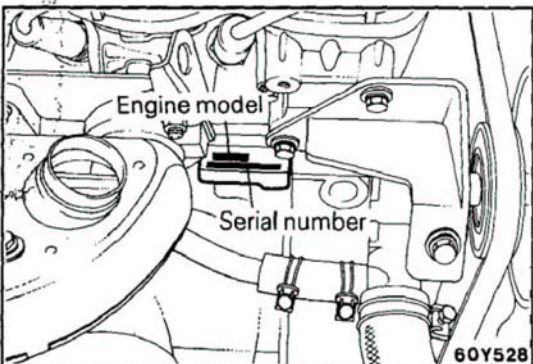


### VEHICLE SAFETY CERTIFICATION LABEL

N00CF--

The vehicle safety certification label is attached to face of left door pillar.

This label indicates the month and year of manufacture, Gross Vehicle Weight Rating (G.V.W.R.), front and rear Gross Axle Weight Rating (G.A.W.R.), and Vehicle Identification Number (V.I.N.).



### ENGINE MODEL STAMPING

N00CG--

The engine model number is stamped at the right front side on the top edge of the cylinder block as shown in the following:

Engine model	Engine displacement
G54B	2.555 liters (155.9 C.I.D.)

The engine serial number is stamped near the engine model number, and the serial number cycles, as shown below.

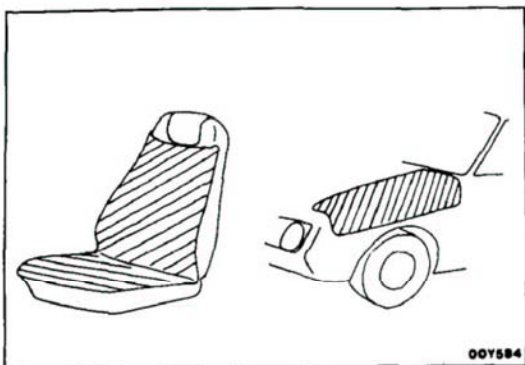
Engine serial number	Number cycling
AA0201 to YY9999	AA0201 ----> AA9999
	AB0001 ----> AY9999
	BA0001 ----> YY9999



**BODY COLOR CODE**

N00CH-

Exterior code	Body color
Monotone B76 C19 H43 R52 S70 X15	Dark blue (Metallic) Brown (Metallic) Silver (Metallic) Red Beige Black
Two-tone B21B76H43 C38C19X13 H15H43X13 R06R52X13 S69S70X13 X45X15H43	Silver (Metallic)/ Dark blue (Metallic) Black/ Brown (Metallic) Black/ Silver (Metallic) Black/Red Black/Beige Black/ Silver (Metallic)



## PRECAUTIONS BEFORE SERVICE

### PROTECTING THE VEHICLE

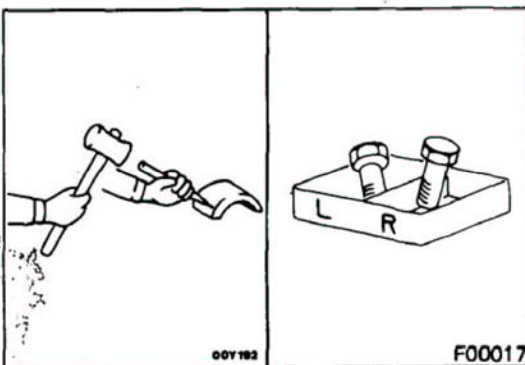
N00DAAC

If there is a likelihood of damaging painted or interior parts during service operations, protect them with suitable covers (such as seat covers, fender covers, etc.).



### REMOVAL AND DISASSEMBLY

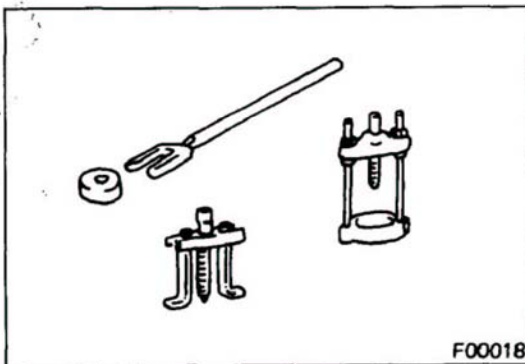
When checking a malfunction, find the cause of the problem. If it is determined that removal and/or disassembly is necessary, perform the work by following the procedures contained in this Workshop Manual.



If punch marks or mating marks are made to avoid error in assembly and facilitate the assembly work, be sure to make them in locations which will have no detrimental effect on performance and/or appearances.

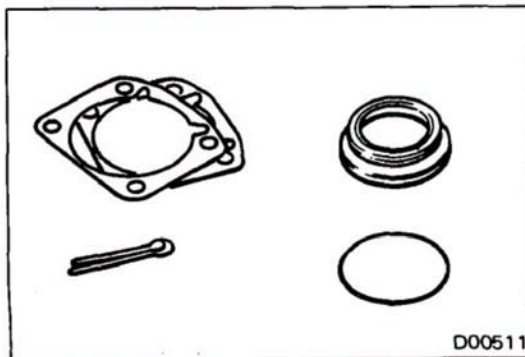
If an area having many parts, similar parts, and/or parts which are symmetrical right and left is disassembled, be sure to arrange the parts so that they do not become mixed during the assembly process.

1. Arrange the parts removed in the proper order.
2. Determine which parts are to be reused and which are to be replaced.
3. If bolts, nuts, etc., are to be replaced, be sure to use only the exact size specified.



### SPECIAL TOOLS

If other tools are substituted for the special tools to do service or repair work, there is the danger that vehicle parts might be damaged, or the mechanic might be injured; therefore, be sure to use the special tool whenever doing any work for which the use of one is specified.



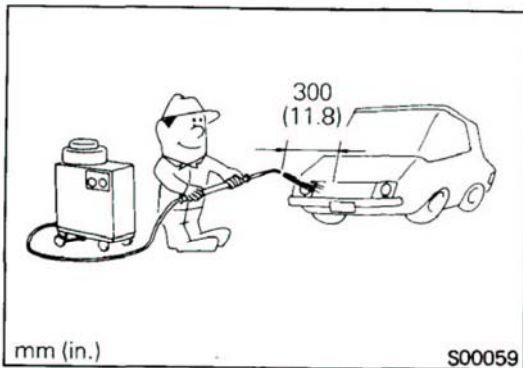
### PARTS TO BE REPLACED

If any of the following parts are removed, they must be replaced with new parts.

1. Oil seals
2. Gaskets (except rocker cover gasket)
3. Packings
4. O-rings
5. Lock washers
6. Cotter pins
7. Self-locking nuts

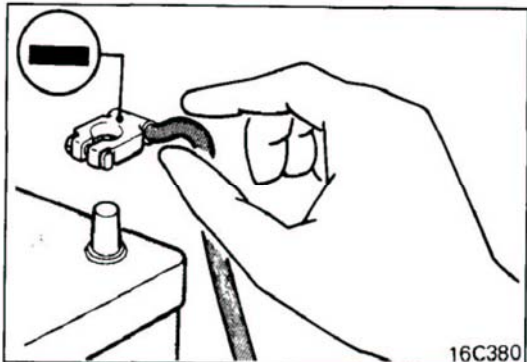
## PARTS

When replacing parts, use MITSUBISHI genuine parts.



## VEHICLE WASHING

If high-pressure car-washing equipment or steam car-washing equipment is used to wash the vehicle, be sure to maintain the spray nozzle at a distance of at least 300 mm (11.8 in.) from any plastic parts and all opening parts (doors, luggage compartment, etc.).

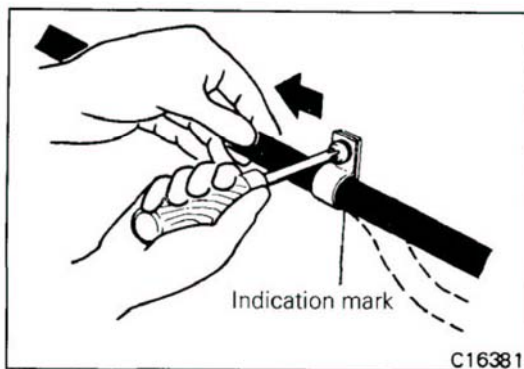


## SERVICING THE ELECTRICAL SYSTEM

When servicing the electrical system, disconnect the negative cable terminal from the battery.

### Caution

**Before connecting or disconnecting the negative cable, be sure to turn off the ignition switch and the lighting switch. (If this is not done, there is the possibility of semiconductor parts being damaged.)**

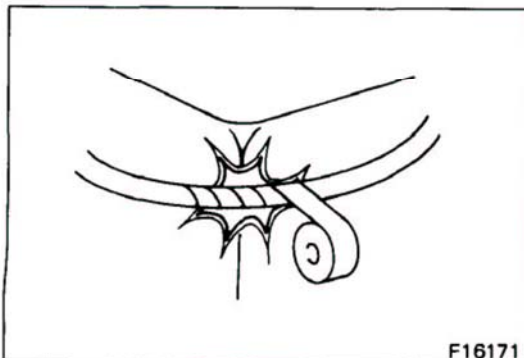


## WIRING HARNESSES

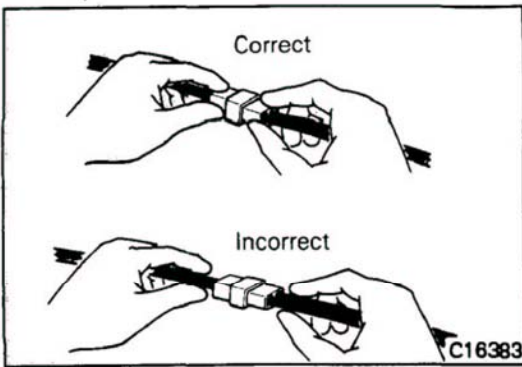
1. Secure the wiring harnesses by using clamps so that there is no slack. However, for any harness which passes to the engine or other vibrating parts of the vehicle, allow some slack within a range that does not allow the engine vibrations to cause the harness to come into contact with any of the surrounding parts. Then secure the harness by using a clamp.

In addition, if a mounting indication mark (yellow tape) is on a harness, secure the indication mark in the specified location.

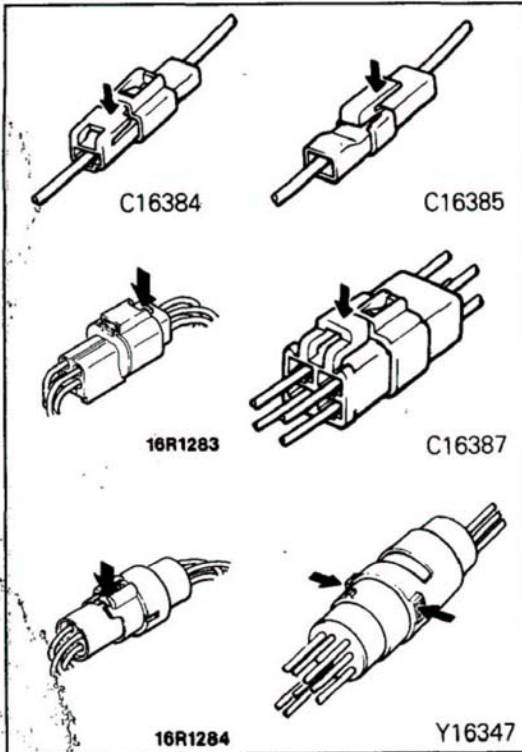
2. If any section of a wiring harness contacts the edge of a part, or a corner, wrap the section of the harness with tape or something similar in order to protect it from damage.



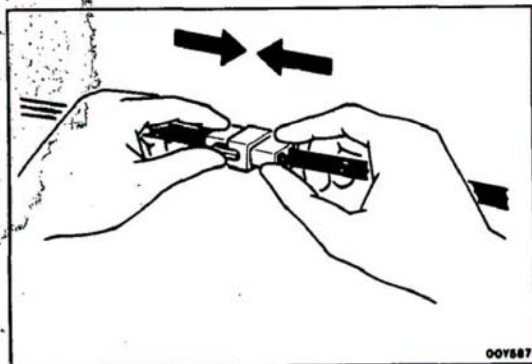
## 10 INTRODUCTION AND MASTER TROUBLESHOOTING -- Precautions Before Service



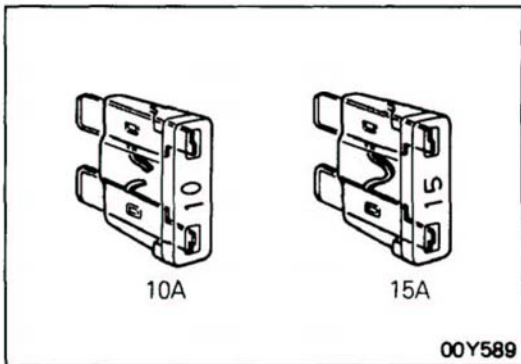
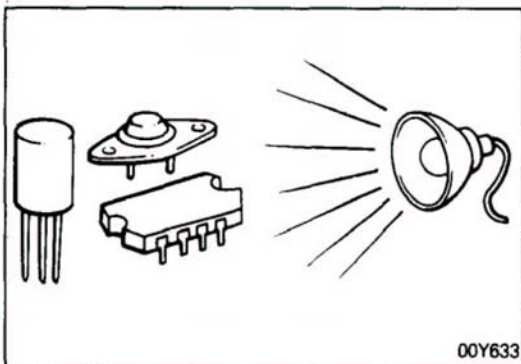
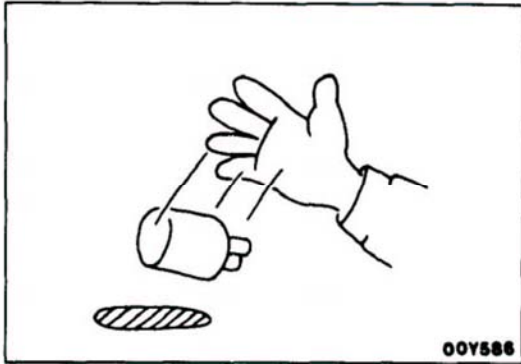
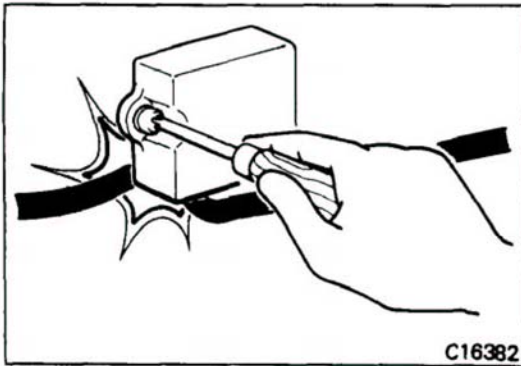
3. When disconnecting a connector, be sure to pull only the connector, not the harness.



4. Disconnect connectors which have catches by pressing in the direction indicated by the arrows in the illustration.



5. Connect connectors which have catches by inserting the connectors until they snap.



**ELECTRICAL COMPONENTS**

1. When installing any of the vehicle parts, be careful not to pinch or damage any of the wiring harnesses.
2. Sensors, relays, etc., are sensitive to strong impacts. Handle them with care so that they are not dropped or mishandled.
3. The electronic parts used for relays, etc., are sensitive to heat. If any service which causes a temperature of 80°C (176°F) or more is performed, remove the part or parts in question before carrying out the service.

**FUSES AND FUSIBLE LINKS**

1. If a blown-out fuse is to be replaced, be sure to use only a fuse of the specified capacity. If a fuse of a capacity larger than that specified is used, parts may be damaged and the circuit may not be protected adequately.

**Caution**

**If a fuse is blown-out, be sure to eliminate the cause of the problem before installing a new fuse.**

2. If additional optional equipment is to be installed in the vehicle, follow the procedure listed in the appropriate instruction manual; however, be sure to pay careful attention to the following points:
  - (1) In order to avoid overloading the wiring, take the electrical current load of the optional equipment into consideration, and determine the appropriate wire size.
  - (2) Where possible, route the wiring through the existing harnesses.

Nominal size	SAE gauge No.	Permissible current	
		In engine compartment	Other areas
0.3 mm <sup>2</sup>	AWG 22	—	5A
0.5 mm <sup>2</sup>	AWG 20	7A	13A
0.85 mm <sup>2</sup>	AWG 18	9A	17A
1.25 mm <sup>2</sup>	AWG 16	12A	22A
2.0 mm <sup>2</sup>	AWG 14	16A	30A
3.0 mm <sup>2</sup>	AWG 12	21A	40A
5.0 mm <sup>2</sup>	AWG 10	31A	54A

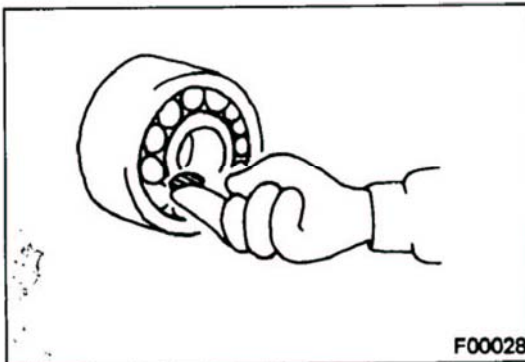
## 12 INTRODUCTION AND MASTER TROUBLESHOOTING – Precautions Before Service

- (3) If an ammeter or similar instrument is to be connected to a live-wire circuit, use tape to protect the wire, use a clamp to secure the wire, and make sure that there is no contact with any other parts.
- (4) Be sure to provide a fuse for the load circuit of the optional equipment.



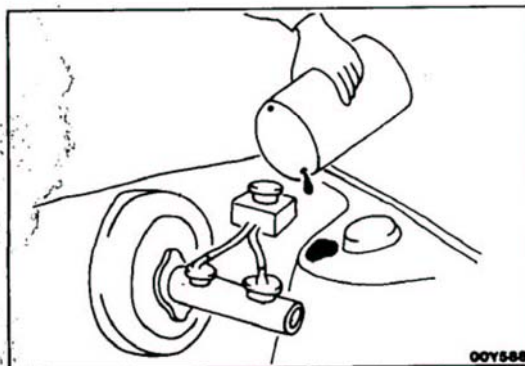
### TUBES AND OTHER RUBBER PARTS

Be careful to avoid spilling any gasoline, oil, etc., because if it adheres to any tubes or other rubber parts, they might be adversely affected.



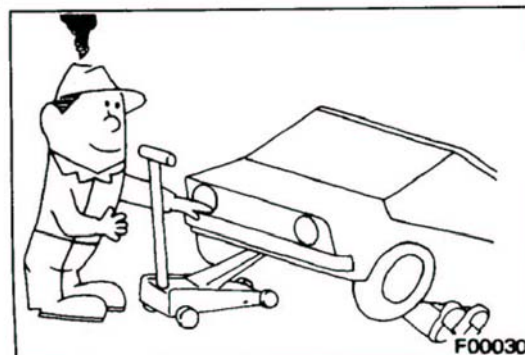
### LUBRICANTS

In accordance with the instructions in this Workshop Manual, apply the specified lubricants in the specified locations during assembly and installation.



### BRAKE FLUID

Be careful to avoid spilling any brake fluid, because if it adheres to the vehicle body, the paint coat might be discolored.



### DOING SERVICE WORK IN GROUPS OF TWO OR MORE TECHNICIANS

If the service work is to be done by two or more technicians extra caution must be taken.

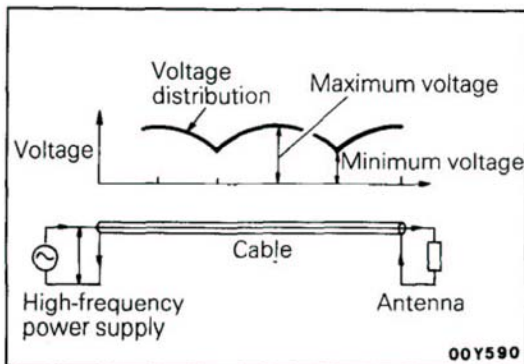
**NOTE ON INSTALLATION OF RADIO EQUIPMENT**  
NO0EA--

The computers of the electronic control system has been designed so that external radio waves will not interfere with their operation.

However, if antenna or cable of amateur transceiver etc. is routed near the computers, it may affect the operation of the computers, even if the output of the transceiver is no more than 25W.

To protect each of the computers from interference by transmitter (hum, transceiver, etc.), the following should be observed.

1. Install the antenna on the roof.
2. Because radio waves are emitted from the coaxial cable of the antenna, keep it 200 mm (8 in.) away from the computers and the wiring harness. If the cable must cross the wiring harness, route it so that it runs at right angles to the wiring harness.
3. The antenna and the cable should be well matched, and the standing-wave ratio\* should be kept low.
4. A transmitter having a large output should not be installed in the vehicle.
5. After installation of transmitter, run the engine at idle, emit radio waves from the transmitter and make sure that the engine is not affected.



**\*STANDING-WAVE RATIO**

If an antenna and a cable having different impedances are connected, the input impedance  $Z_i$  will vary in accordance with the length of the cable and the frequency of the transmitter, and the voltage distribution will also vary in accordance with the location.

The ratio between this maximum voltage and minimum voltage is called the standing-wave ratio. It can also be represented by the ratio between the impedances of the antenna and the cable.

The amount of radio waves emitted from the cable increases as the standing-wave ratio increases, and this increases the possibility of the electronic components being adversely affected.

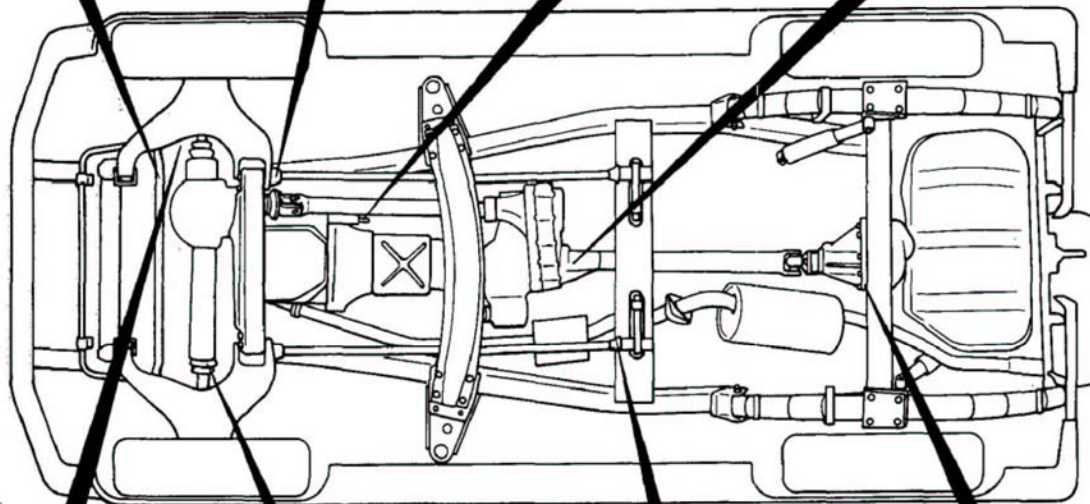
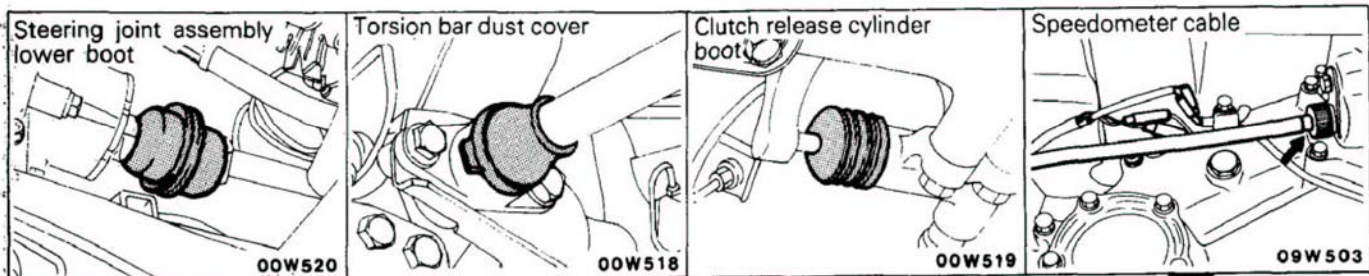
## TREATMENT BEFORE/AFTER THE FORDING OF A STREAM

### INSPECTION AND SERVICE BEFORE FORDING A STREAM

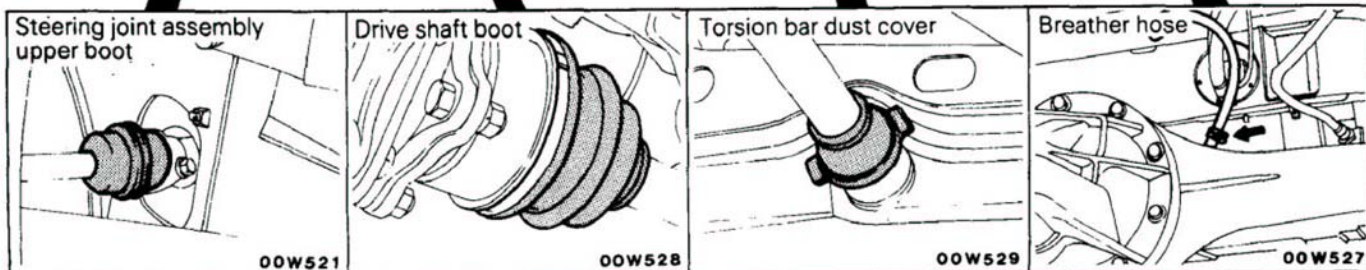
N00FA--

Vehicles which are driven through water, or which may possibly be driven through water, should be subjected to the following inspections and maintenance procedures in advance.

- Seal the speedometer cable with a water-resistant grease or tape.
- Inspect the dust boots and breather hose for cracks or damage, and replace them if cracks or damage are found.

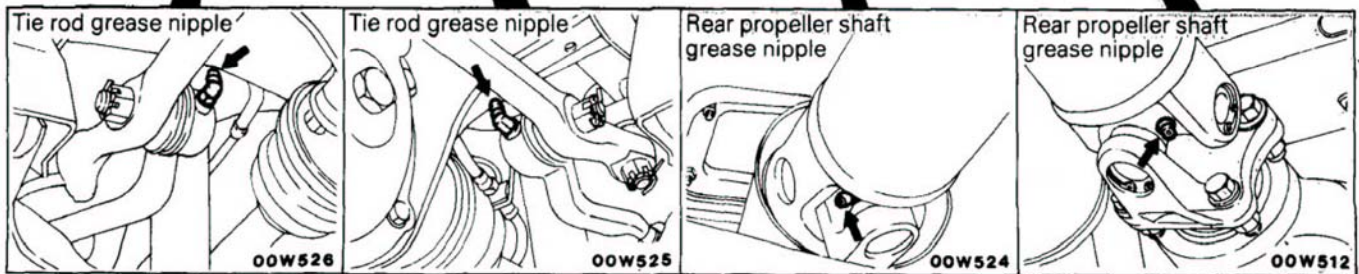
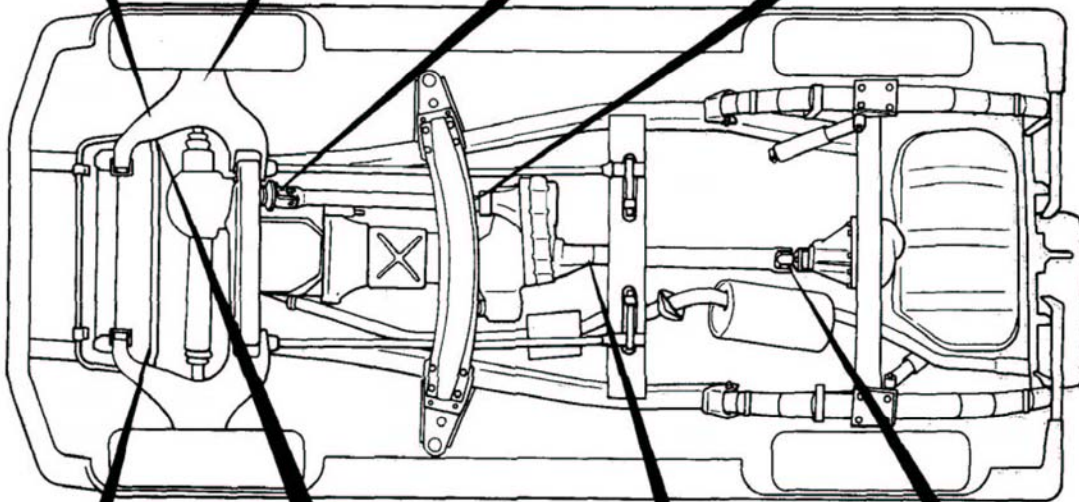
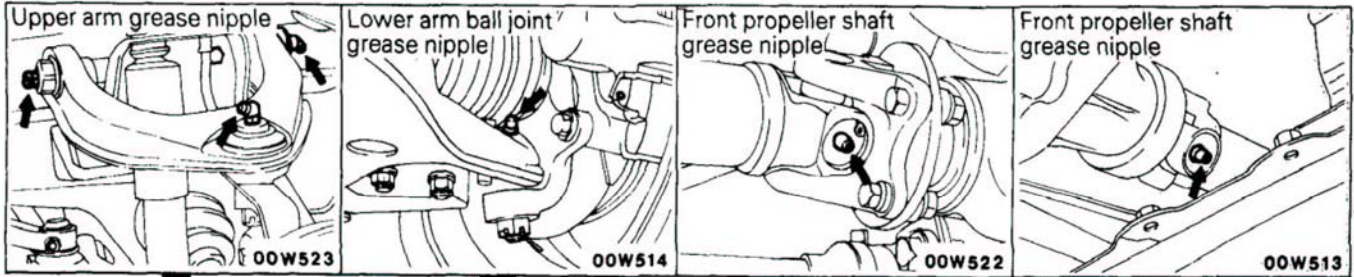


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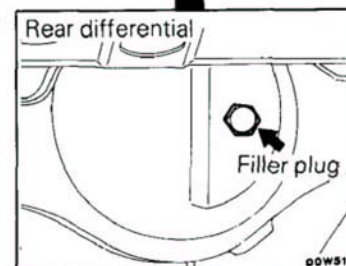
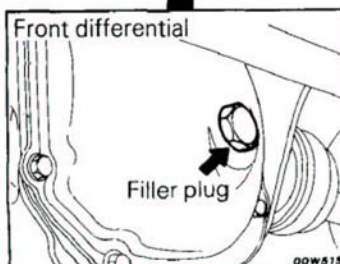
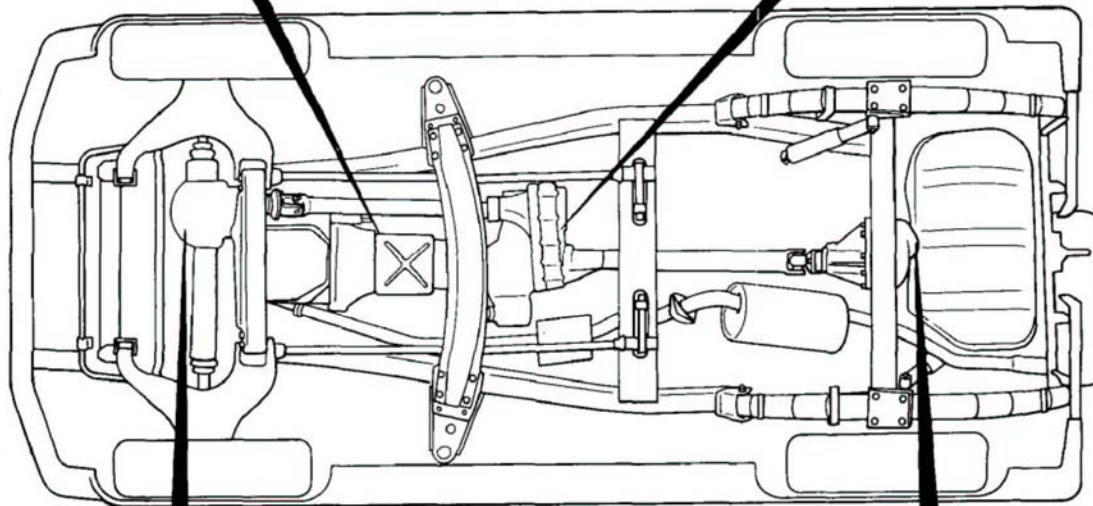
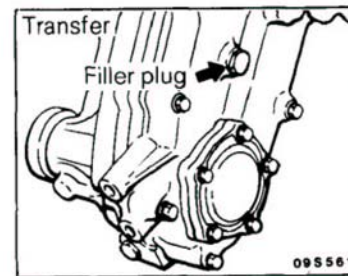
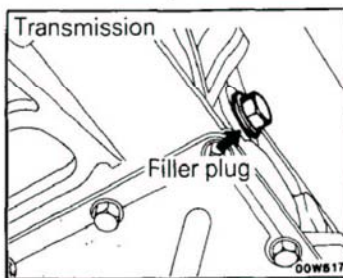
- Apply grease to the lubricating points of the front suspension, steering linkage and propeller shaft.

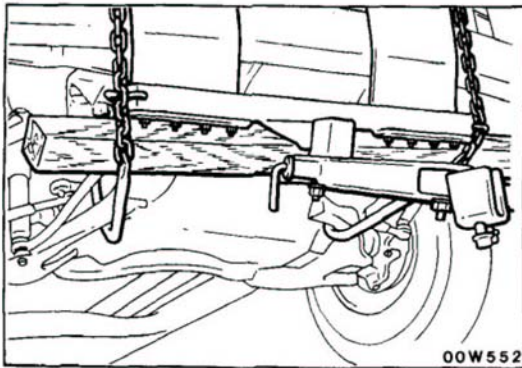


## INSPECTION AND SERVICE AFTER FORDING A STREAM

After fording a stream, check the following points. If abnormal condition is evident, clean, replace or lubricate.

- Check for water, mud, sand, etc, in the rear brake drum, clutch housing, starter motor, brake pipe and fuel pipe.
- Check for water in the fluid or oil inside the front differential, rear differential, transmission and transfer case.
- Apply grease to the lubricating points of the front suspension, steering linkage and propeller shaft.
- Check all boots and breather hoses for cracks and damage.





## **TOWING AND HOISTING**

N00GA--

This vehicle can only be towed from the front with conventional sling-type equipment and tow chain with grab hooks.

If a vehicle is towed from the rear, use a tow dolly.

A lumber spacer (4" x 4" x 55" wood beam) should be placed forward of under guard and under towing hook/shipping tie down hook.

Then, attach J-hook to the lower arm.

A safety chain system must be used. This system must be completely independent of the primary lifting and towing attachment. Care must be taken in the installation of safety chains to insure they do not cause damage to bumper, painted surfaces or lights.

### **LIFTING-GROUND CLEARANCE**

Towed vehicle should be raised until wheels are a minimum of 10 cm (4 in.) from the ground. Be sure there is adequate ground clearance at the opposite end of the vehicle, especially when towing over rough terrain or when crossing sharp rises, such as curbs. If necessary, ground clearance can be increased by removing the wheels from the lifted end of the disabled vehicle and carrying the lifted end closer to the ground. A 20 cm (8 in.) ground clearance must be maintained between brake drums and ground.

### **FRONT TOWING PICKUP**

The vehicle may be towed on its rear wheels for extended distances, provided the parking brake is released.

Make certain the transmission remains in "NEUTRAL".

### **SAFETY PRECAUTIONS**

The following precautions should be taken when towing the vehicle.

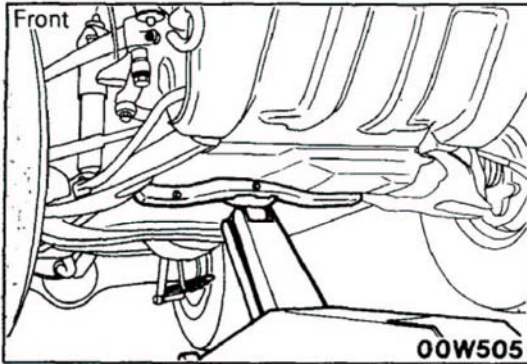
1. Remove exhaust tips and any other optional equipment, that interface with the towing sling. Padding (heavy shop towel or carpeting) should be placed between the towing sling cross bar and any painted surfaces, and bumper surfaces.
2. A safety chain system completely independent of the primary lifting and towing attachment must be used.
3. Any loose or protruding parts of damaged vehicle such as hoods, doors, fenders, trim, etc., should be secured prior to moving the vehicle.
4. Operator should refrain from going under a vehicle unless the vehicle is adequately supported by safety stands.
5. Never allow passengers to ride in a towed vehicle.
6. State and local rules and regulations must be followed when towing a vehicle.

### HOISTING

#### POST TYPE

Special care should be taken when raising the vehicle on a frame contact type hoist. The hoist must be equipped with the proper adapters in order to support the vehicle at the proper locations. (See next page)

Conventional hydraulic hoists may be used after determining that the adapter plates will make firm contact with the side frame.

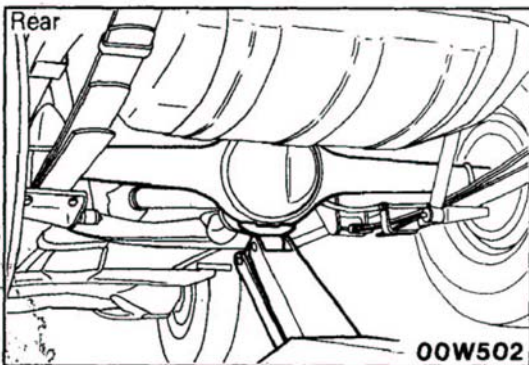


#### FLOOR JACK

A regular floor jack may be used under the front crossmember or rear axle housing.

#### Caution

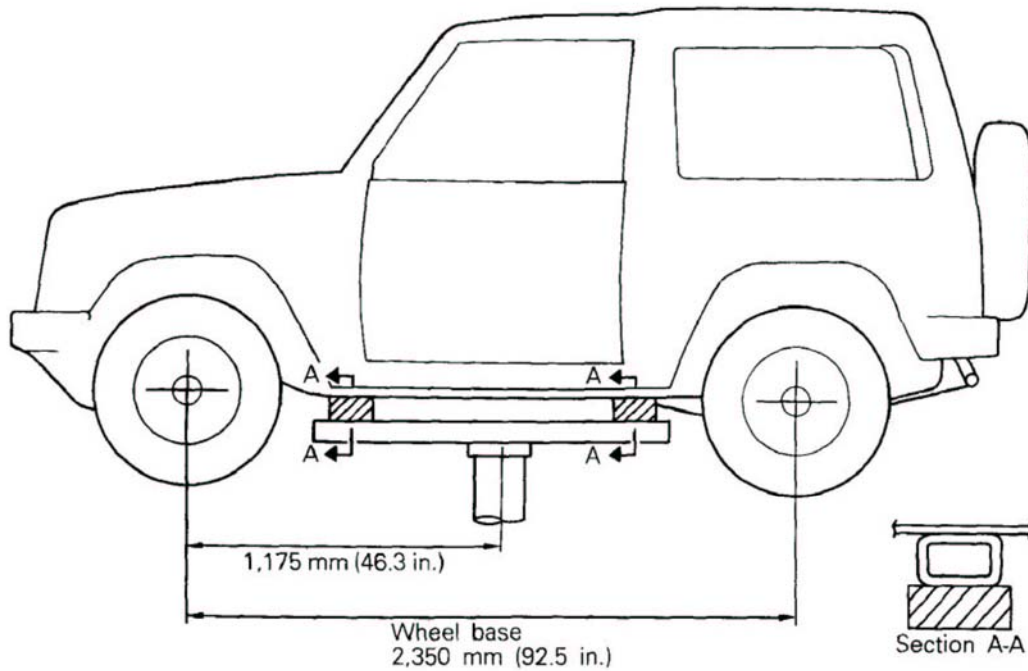
1. A floor jack must never be used on any part of the underbody.
2. Do not attempt to raise one entire side of the vehicle by placing a jack midway between front and rear wheels. This practice may result in permanent damage to the body.



#### EMERGENCY JACKING

Jack receptacles are located at the No. 2 crossmember and rear axle housing to accept the jack supplied with the vehicle for emergency road service. Always block the opposite wheels and jack only on a level surface.

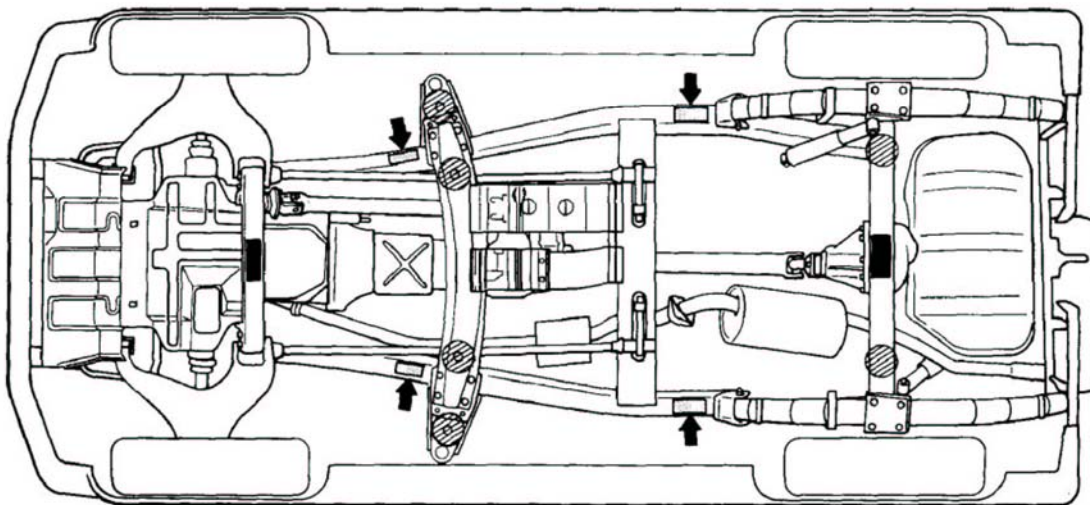
FRAME CONTACT SUPPORT LOCATIONS



NOTE  
The locations of the support point shown as Section A-A are the same as those of the twin post hoist shown in the illustration (00W588) below.

00W553

LIFTING AND JACKING SUPPORT LOCATIONS

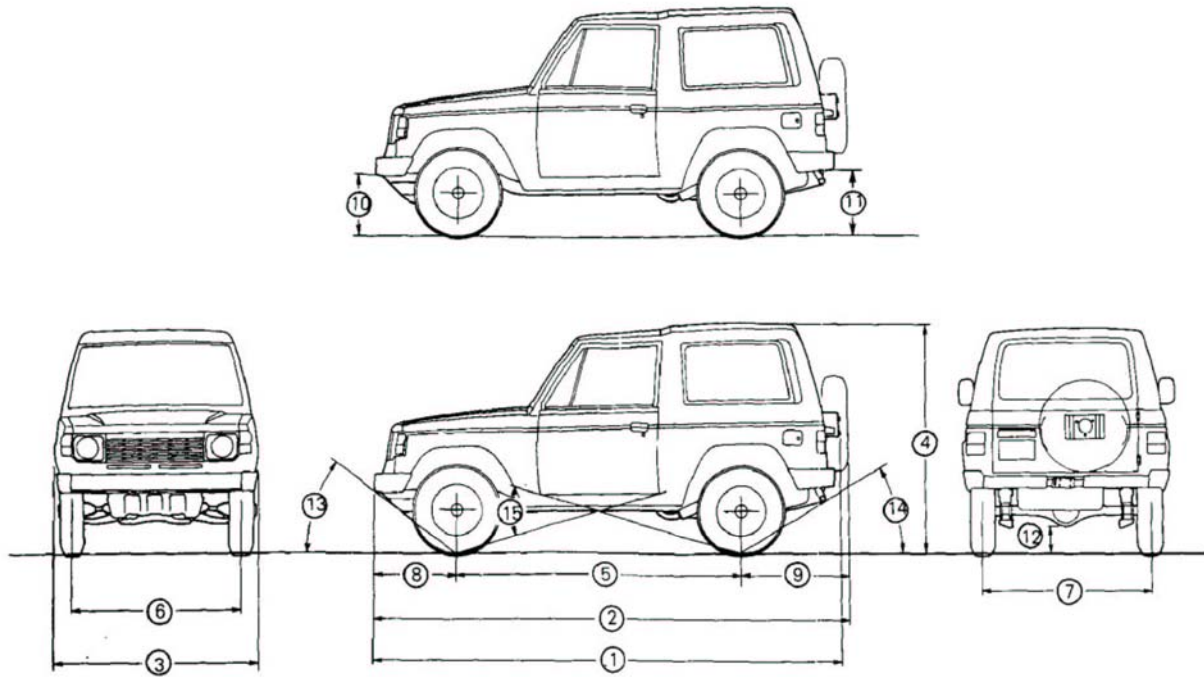


- ← Twin post hoist
- Floor jack
- Emergency jacking (jack supplied with the vehicle)

00W588

GENERAL DATA AND SPECIFICATIONS

N00HA-A



00W556



Description		L042G	VNJLF/H	VRJLF/H	TNSLF/H	TRSLF/H
Vehicle dimensions mm (in.)						
Overall length						
Without spare tire	①	3,960 (155.9)	3,960 (155.9)	3,960 (155.9)	3,960 (155.9)	3,960 (155.9)
With spare tire	②	3,995 (157.3)	3,995 (157.3)	3,995 (157.3)	3,995 (157.3)	3,995 (157.3)
Overall width	③	1,680 (66.1)	1,680 (66.1)	1,680 (66.1)	1,680 (66.1)	1,680 (66.1)
Overall height	④	1,840 (72.4)	1,840 (72.4)	1,840 (72.4)	1,850 (72.8)	1,850 (72.8)
Wheelbase	⑤	2,350 (92.5)	2,350 (92.5)	2,350 (92.5)	2,350 (92.5)	2,350 (92.5)
Tread	Front	⑥	1,400 (55.1)	1,400 (55.1)	1,400 (55.1)	1,400 (55.1)
	Rear	⑦	1,375 (54.1)	1,375 (54.1)	1,375 (54.1)	1,375 (54.1)
Overhang	Front	⑧	745 (29.3)	745 (29.3)	745 (29.3)	745 (29.3)
	Rear	⑨	900 (35.4)	900 (35.4)	900 (35.4)	900 (35.4)
Height at curb weight (wt.)						
Front bumper to ground	⑩	480 (18.9)	480 (18.9)	480 (18.9)	480 (18.9)	480 (18.9)
Rear bumper to ground	⑪	440 (17.3)	440 (17.3)	440 (17.3)	440 (17.3)	440 (17.3)
Minimum running ground clearance	⑫	210 (8.3)	210 (8.3)	210 (8.3)	210 (8.3)	210 (8.3)
Angle of approach	⑬	38°	38°	38°	38°	38°
Angle of departure	⑭	28°	28°	28°	28°	28°
Ramp breakover angle	⑮	21°	21°	21°	21°	21°
Vehicle weights kg (lbs.)						
Curb weight		1,479 (3,260)	1,493 (3,290)	1,440 (3,175)	1,460 (3,219)	
Gross vehicle weight rating		1,910 (4,210)	1,910 (4,210)	1,910 (4,210)	1,910 (4,210)	
Gross axle weight rating	Front	1,100 (2,425)	1,100 (2,425)	1,100 (2,425)	1,100 (2,425)	
	Rear	1,450 (3,197)	1,450 (3,197)	1,450 (3,197)	1,450 (3,197)	
Seating capacity		4	4	2	2	

Description	L042G	VNJLF/H	VRJLF/H	TNSLF/H	TRSLF/H
Engine					
Model No.	G54B	G54B	G54B	G54B	G54B
Type	In-line OHC	In-line OHC	In-line OHC	In-line OHC	In-line OHC
Number of cylinders	4	4	4	4	4
Bore	91.1 mm (3.59 in.)	91.1 mm (3.59 in.)	91.1 mm (3.59 in.)	91.1 mm (3.59 in.)	91.1 mm (3.59 in.)
Stroke	98.0 mm (3.86 in.)	98.0 mm (3.86 in.)	98.0 mm (3.86 in.)	98.0 mm (3.86 in.)	98.0 mm (3.86 in.)
Piston displacement	2,555 cm <sup>3</sup> (155.9 CID)	2,555 cm <sup>3</sup> (155.9 CID)	2,555 cm <sup>3</sup> (155.9 CID)	2,555 cm <sup>3</sup> (155.9 CID)	2,555 cm <sup>3</sup> (155.9 CID)
	8.7	8.7	8.7	8.7	8.7
	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2
	7° BTDC ± 2°	7° BTDC ± 2°	7° BTDC ± 2°	7° BTDC ± 2°	7° BTDC ± 2°
Transmission & transfer case					
Model No.	KM145	KM148	KM145	KM145	KM148
Type	5-speed manual	4-speed automatic	5-speed manual	5-speed manual	4-speed automatic
Gear ratio					
Transmission 1st	3.967	2.826	3.967	3.967	2.826
2nd	2.136	1.493	2.136	2.136	1.493
3rd	1.360	1.000	1.360	1.360	1.000
4th	1.000	0.688	1.000	1.000	0.688
5th	0.856	—	0.856	0.856	—
Reverse	3.578	2.703	3.578	3.578	2.703
Transfer case High	1.000	1.000	1.000	1.000	1.000
Low	1.944	1.944	1.944	1.944	1.944
Final ring gear ratio	4.625	4.625	4.625	4.625	4.625
Clutch					
Type	Dry single disc & diaphragm spring	—	Dry single disc & diaphragm spring	—	—
Chassis					
Tire size			P225/75R15		
Front suspension			Wishbone compression type		
Type			22 N/mm (123 lbs./in.)		
Spring constant (Wheel position)					
Rear suspension			Asymmetrical semi-elliptic leaf spring		
Type					
Spring constant					
At load of 1,000-2,500 N (220-551 lbs.)			22 N/mm (123 lbs./in.)		
At load of 4,670-8,870 N (1,030-1,955 lbs.)			50 N/mm (280 lbs.in.)		

Description	L042G	VNJLF/H	VRJLF/H	TNSLF/H	TRSLF/H
Brakes					
Type	Front Rear		Disc Drum (Leading and trailing)		
Power steering					
Gear type			Integral type (Recirculating ball nut)		
Gear ratio			16.4		
Fuel tank capacity			60 liters (15.9 U.S. gal./13.2 Imp. gal.)		

**TIGHTENING TORQUE**

N00JA--

Description	Head mark 		Head mark 	
	Nm	ft.lbs.	Nm	ft.lbs.
Thread for general purposes (size x pitch) mm				
6 x 1.0	3.0-3.9	2.2-2.9	4.9-7.8	3.6-5.8
8 x 1.25	7.9-12	5.8-8.7	13-19	9.4-14
10 x 1.25	16-23	12-17	27-39	20-29
12 x 1.25	29-43	21-32	47-72	35-53
14 x 1.5	48-70	35-52	77-110	57-85
16 x 1.5	67-100	51-77	130-160	90-120
18 x 1.5	100-150	74-110	180-230	130-170
20 x 1.5	150-190	110-140	160-320	190-240
22 x 1.5	200-260	150-190	340-430	250-320
24 x 1.5	260-320	190-240	420-550	310-410

Description	Nm	ft.lbs.	Remarks
Taper thread for pipes (size)			
PT 1/8	7.9-12 16-19	5.8-8.7 12-14	Internal thread: Aluminum Internal thread: Cast iron
PT 1/4	19-30 34-45	14-22 25-33	Internal thread: Aluminum Internal thread: Cast iron
PT 3/8	39-54 58-73	29-40 43-54	Internal thread: Aluminum Internal thread: Cast iron
Tape thread for dry sealed pipes (size)			
NPTF 1/16	4.9-7.8 7.9-12	3.6-5.8 5.8-8.7	Internal thread: Aluminum Internal thread: Cast iron
NPTF 1/8	7.9-12 16-19	5.8-8.7 12-14	Internal thread: Aluminum Internal thread: Cast iron
NPTF 1/4	19-13 34-45	14-22 25-33	Internal thread: Aluminum Internal thread: Cast iron



## MASTER TROUBLESHOOTING

### ENGINE OVERHEATS

Symptom	Probable cause	Remedy	Reference page
Engine overheats	Cooling system faulty	Troubleshoot cooling system	7-5
	Incorrect ignition timing	Readjust ignition timing	0-13

### ENGINE WILL NOT CRANK OR CRANKS SLOWLY

Symptom	Probable cause	Remedy	Reference page
Engine will not crank or cranks slowly	Starting system faulty	Troubleshoot starting system	8-94

### ENGINE WILL NOT START OR START TO HARD (CRANKS OK)

Symptom	Probable cause	Remedy	Reference page
Engine will not start or start to hard (Crank OK)	No fuel supply to carburetor	Check fuel line	14-85
	Carburetor problems	Troubleshoot fuel system	14-20
	Ignition system problems	Troubleshoot ignition system	8-109
	Vacuum leaks <ul style="list-style-type: none"> <li>● Purge control valve hose</li> <li>● Vacuum hoses</li> <li>● Intake manifold</li> <li>● Carburetor</li> <li>● EGR valve</li> </ul>	Repair as necessary	-
	Compression too low	Check compression (Troubleshoot engine)	9-14

**ROUGH IDLE OR ENGINE STALL**

Symptom	Probable cause	Remedy	Reference page
Rough idle or engine stalls	Vacuum leaks <ul style="list-style-type: none"><li>● Purge control valve hose</li><li>● Vacuum hoses</li><li>● Intake manifold</li><li>● Carburetor</li><li>● EGR valve</li></ul>	Repair as necessary	–
	Ignition system problems	Troubleshoot ignition system	8-109
	Idle speed set too low	Readjust idle speed	0-14
	Idle mixture too lean or too rich	Readjust idle speed and mixture	0-14
	Carburetor problems	Troubleshoot fuel system	14-20
	Exhaust gas recirculation (EGR) system problems	Troubleshoot fuel system	14-20
	Engine overheats	Refer to "Engine Overheats"	–
	Compression too low	Check compression (Troubleshoot engine)	9-14

**ENGINE HESITATES OR POOR ACCELERATION**

Symptom	Probable cause	Remedy	Reference page
Engine hesitates or poor acceleration	Ignition system problem	Troubleshoot ignition system	8-109
	Vacuum leaks <ul style="list-style-type: none"> <li>● Purge control valve hose</li> <li>● Vacuum hoses</li> <li>● Intake manifold</li> <li>● Carburetor</li> <li>● EGR valve</li> </ul>	Repair as necessary	–
	Air cleaner filter clogged	Check air cleaner filter	11-4
	Fuel line clogged	Check fuel line	14-85
	Carburetor problem	Troubleshoot fuel system	14-20
	Auxiliary accelerator pump faulty (cold engine)	Check auxiliary accelerator device	14-43
	Emission control system problem <ul style="list-style-type: none"> <li>● EGR system always on high-altitude compensation (HAC) system problem</li> </ul>	Check EGR system Check HAC system	25-33 25-34
	Engine overheats	Refer to "Engine Overheats"	–
Compression too low	Check compression (Troubleshoot engine)	9-14	

**ENGINE DIESELING**

Symptom	Probable cause	Remedy	Reference page
Engine dieseling (runs after ignition switch is turned off)	Carburetor problems	Troubleshoot fuel system	14-20
	Incorrect ignition timing	Readjust ignition timing	0-13

## 26 INTRODUCTION AND MASTER TROUBLESHOOTING – Master Troubleshooting

### EXCESSIVE OIL CONSUMPTION

Symptom	Probable cause	Remedy	Reference page
Excessive oil consumption	Oil leak	Repair as necessary	–
	Positive crankcase ventilation line clogged	Check positive crankcase ventilation system	0-17
	Valve stem seal worn or damaged	Check valve stem seal	9-45
	Valve stem worn	Check valves and guides	9-45
	Piston ring worn or damaged	Check piston rings	9-55

### POOR FUEL MILEAGE

Symptom	Probable cause	Remedy	Reference page
Poor fuel mileage	Fuel leak	Repair as necessary	–
	Air cleaner filter clogged	Check air cleaner filter	11-4
	Ignition problems	Troubleshoot ignition system	8-109
	Carburetor problems	Troubleshoot fuel system	14-20
	Compression too low	Check compression	9-14
	Tires improperly inflated	Inflate tires to proper pressure	22-2
	Clutch slips	Troubleshoot clutch	6-4
	Brakes drag	Troubleshoot brakes	5-7

### NOISE

Symptom	Probable cause	Remedy	Reference page
Noise	Loose bolts and nuts	Retighten as necessary	–
	Engine noise	Troubleshoot engine	9-11

**HARD STEERING**

N00KBAC

Symptom	Probable cause	Remedy	Reference page
Hard steering	Loose power steering oil pump belt	Adjust	19-11
	Low fluid level	Refill	19-11
	Air in power steering system	Bleed air	19-12
	Low tire pressure	Adjust	22-2
	Excessive turning resistance of upper or lower ball joint	Replace	2-35 2-40
	Excessively tight linkage ball joint	Adjust	19-10
	Improper front wheel alignment	Correct	2-14
	Excessive turning resistance of tie-rod ball joint	Replace	19-40
	No lubrication of tie-rod	Lubricate	–
	Siticky flow control valve	Replace	19-34
No lubrication of idler arm	Lubricate	19-5	

**POOR RETURN OF STEERING WHEEL TO CENTER**

Symptom	Probable cause	Remedy	Reference page
Poor return of steering wheel to center	Improper front wheel alignment	Adjust	2-14
	Improper tire pressure	Adjust	22-2
	Damaged front wheel bearing	Replace	2-23

**POOR RIDING**

Symptom	Probable cause	Remedy	Reference page
Poor riding	Improper tire pressure	Adjust	22-2
	Imbalanced wheels	Repair	22-3
	Improper front or rear wheel alignment	Repair or replace	2-14, 17-3
	Malfunctioning shock absorber	Replace	2-35, 17-4
	Broken or worn stabilizer	Replace	2-51
	Broken or worn torsion bar spring	Replace	2-48
	Loose suspension securing bolt(s)	Retighten	–
	Worn lower arm bushing	Replace	2-40

## 28 INTRODUCTION AND MASTER TROUBLESHOOTING – Master Troubleshooting

### ABNORMAL TIRE WEAR

Symptom	Probable cause	Remedy	Reference page
Abnormal tire wear	Improper front or rear wheel alignment	Adjust	2-14 17-3
	Improper tire pressure	Troubleshooting wheels and tires	22-3
	Imbalanced wheels		
	Loose wheel bearings	Adjust or replace	2-23
	Malfunctioning shock absorber	Replace	2-35, 17-4

### ROAD WANDER

Symptom	Probable cause	Remedy	Reference page
Road wander	Improper front or rear wheel alignment	Adjust	2-14 17-3
	Excessive play of steering wheel	Repair	19-9
	Poor turning resistance of lower ball joint	Repair	2-40
	Improper tire pressure	Adjust	22-2
	Loose or worn lower arm bushing	Retighten or replace	2-40 2-23
	Loose or worn wheel bearings		

### VEHICLE PULLS TO ONE SIDE

Symptom	Probable cause	Remedy	Reference page
Vehicle pulls to one side	Improper front or rear wheel alignment	Adjust	2-14 17-3
	Imbalanced or worn tires	Repair or replace	22-2
	Uneven tire pressure		
	Excessive turning resistance of lower ball joint	Replace	2-40
	Wheel bearing seizure	Replace	2-23
	Broken or worn torsion bar spring	Replace	2-48
	Bend front axle drive shaft	Replace	2-52
	Deformed lower arm	Repair	2-40

**STEERING WHEEL SHIMMY**

Symptom	Probable cause	Remedy	Reference page
Steering wheel shimmy	Improper front or rear wheel alignment	Adjust	2-14 17-3
	Improper tire pressure	Adjust	22-2
	Imbalanced wheels	Repair	–
	Poor turning resistance of upper or lower ball joint	Replace	2-37 2-40
	Excessive play of steering wheel	Repair	19-9
	Broken or weak stabilizer	Replace	2-51
	Worn lower arm bushing	Replace	2-40
	Malfunctioning shock absorber	Replace	2-35
	Broken or weak torsion bar spring or leaf spring	Replace	2-48 17-4
	Wear, play, or seizure of wheel bearing	Replace	2-23

**BOTTOMING**

Symptom	Probable cause	Remedy	Reference page
Bottoming	Overloaded vehicle	Correct	–
	Broken or weak torsion bar spring or leaf spring	Replace	2-48 17-4
	Malfunctioning shock absorber	Replace	2-35, 17-4

**WHEEL BEARING TROUBLESHOOTING**

Trouble	Symptom	probable cause
Pitting	Pitting occurs because of uneven rotation of race and bearing surfaces	Excessive bearing preload Excessive load
Flaking	The surface peels because of uneven rotation of the race and bearing surfaces	End of bearing life Improper bearing assembly
Cracking	Chipping or cracking of cage or roller edges	Impact when bearing was installed (such as being hit with a hammer)
Flat spotting	When large load is applied, race and roller contact surfaces compress, forming indentations	Excessive bearing preload Excessive load Vibration when bearings are not used, such as during shipment on freight cars, transport trucks, etc.
Nicks	Instead of rolling along race surface, rollers slide, thus damaging surface	Improper grease Excessive bearing preload Excessive load Faulty oil seal
Smearing	Damage or wear caused by minute particles adhering to surfaces results in rough movement and such high temperatures that parts of surface melt	Excessive variation of loads on bearings Use of grease other than that specified Improper grease
Rust, corrosion	Appears on various areas of the bearing	Use of grease other than that specified Faulty oil seal Presence of water or moisture
Wear	Wear of surface areas caused by friction	Improper grease Foreign matter Rust or corrosion due to moisture Use of grease other than that specified Faulty oil seal
Discoloration	Grease discoloration results from grease deterioration which causes particles of pigment contained in grease to adhere to surfaces Heat discoloration will appear as a deep brown or purple	Use of grease other than that specified Faulty oil seal Excessive bearing preload Excessive load



# LUBRICATION AND MAINTENANCE

## CONTENTS

N000A-

<b>GENERAL INFORMATION</b> .....	<b>2</b>	Fuel System .....	15
<b>MAINTENANCE SERVICE</b> .....	<b>9</b>	Front Axle and Rear Axle .....	27
Air Filter .....	16	Front Disc Brake Pads .....	25
Automatic Transmission .....	22	Front Wheel Bearings .....	27
Ball Joint, Steering Linkage		Ignition Cables .....	19
Seals and Drive Shaft Boots .....	26	Inspection and Adjustment of Engine Idling	
Ball Joints with Grease Nipple .....	27	Speed .....	13
Brake Fluid .....	26	Intake Temperature Control	
Brake Hoses .....	26	System .....	21
Canister .....	18	Manual Transmission .....	22
Carburetor Choke Mechanism		Oxygen Sensor .....	19
and Linkage .....	14	Propeller Shaft Joints .....	28
Carburetor or Body Mounting .....	21	Rear Axle Oil (Limited Slip	
Cooling System .....	24	Differential) .....	28
Crankcase Emission Control		Rear Drum Brake Linings and	
System (PCV Valve) .....	17	Rear Wheel Cylinders .....	25
Distributor Cap, Rotor and		Secondary Air System .....	21
Advanced angle System .....	19	Solenoid Valve Air Filter of	
Drive Belt .....	10	Vacuum Control System .....	21
EGR Valve .....	19	Spark Plugs .....	18
Engine Oil .....	9	Transfer Case .....	23
Engine Oil Filter .....	9	Vacuum Hoses, Secondary Air Hoses,	
Evaporative Emission Control		Crankcase Ventilation Hoses	
System (except Canisters) .....	17	and Water Hoses .....	15
Exhaust System (Connection		Valve Clearance .....	11
Portion of Muffler and Pippings		<b>RECOMMENDED LUBRICANTS AND</b>	
and Keeping Warmth Covers) .....	28	<b>LUBRICANT CAPACITIES TABLE</b> .....	<b>6</b>
Fuel Filter .....	15	<b>SCHEDULED MAINTENANCE TABLE</b> .....	<b>3</b>
Fuel Hoses, Vapor Hoses, and			
Fuel Filler Cap .....	16		

## GENERAL INFORMATION

N00PA-B

Maintenance and lubrication service recommendations have been compiled to provide maximum protection for the vehicle owner's investment against all reasonable types of driving conditions. Since these conditions vary with the individual vehicle owner's driving habits, the area in which the vehicle is operated and the type of driving to which the vehicle is subjected, it is necessary to prescribe lubrication and maintenance service on a time frequency as well as mileage interval basis.

Oils, lubricants and greases are classified and graded according to standards recommended by the Society of Automotive Engineers (SAE), the American Petroleum Institute (API) and the National Lubricating Grease Institute (NLGI).

## MAINTENANCE SCHEDULES

Information for service maintenance is provided under "SCHEDULED MAINTENANCE TABLE".

Three schedules are provided; one for "Required Maintenance", one for "General Maintenance" and one for "Severe Usage Service".

## SEVERE SERVICE

Vehicles operating under severe service conditions will require more frequent service.

Component service information is included in appropriate units for vehicles operating under one or more of the following conditions:

1. Trailer towing or police, taxi, or commercial type operation.
2. Operation of Vehicle
  - (1) Short-trip operation at freezing temperature (engine not thoroughly warmed up)
  - (2) More than 50% operation in heavy city traffic during hot weather above 32°C (90°F)
  - (3) Extensive idling
  - (4) Driving in sandy areas
  - (5) Driving in salty areas
  - (6) Driving in dusty conditions
  - (7) Driving on-off-road

## ENGINE OIL

The SAE grade number indicates the viscosity of engine oils, for example, SAE 30, which is a single grade oil. Engine oils are also identified by a dual number, for example, SAE 10W-30, which indicates a multigrade oil.

The API classification system defines oil performance in terms of engine usage. Only engine oil designed "For Service SF" or "For Service SF/CC", when available, should be used. These oils contain sufficient chemical additives to provide maximum engine protection. Both the SAE grade and the API designation can be found on the container.

## GEAR LUBRICANTS

The SAE grade number also indicates the viscosity of Multi-Purpose Gear Lubricants.

The API classification system defines gear lubricants in terms of usage. Typically gear lubricants conforming to API GL-4 or GL-5 with a viscosity of SAE 80W, SAE 90 are recommended for manual transmission, front axle and rear axle (conventional differential), and MITSUBISHI genuine gear oil Part No. 8149630EX or equivalent, for rear axle (limited-slip differential).

## LUBRICANTS—GREASES

Semi-solid lubricants, bear the NLGI designation and are further classified as grades 0, 1, 2, 3 etc..

Whenever "Chassis Lubricant" is specified, Multi-Purpose Grease, NLGI grade No. 2, should be used.

## FUEL USAGE STATEMENT

Use gasolines having a minimum ant-knock index (Octane Value) of 87,  $(R + M)/2$ . This designation is comparable to a Research Octane Number of 91.

Unleaded gasolines only must be used in vehicles equipped with catalyst emission control systems. All vehicles, so equipped, have labels located on the instrument panel and on the back of fuel filler lid that state, "UNLEADED GASOLINE ONLY". These vehicles also have fuel filler tubes especially designed to accept the smaller diameter unleaded gasoline dispensing nozzles only.

## MATERIALS ADDED TO FUEL

Indiscriminate use of fuel system cleaning agents should be avoided. Many of these materials intended for gum and varnish removal may contain highly active solvents or similar ingredients that can be harmful to gasket and diaphragm materials used in fuel system component parts.

**SCHEDULED MAINTENANCE TABLE**

N000A--

**SCHEDULED MAINTENANCE SERVICE FOR EMISSION CONTROL AND PROPER VEHICLE PERFORMANCE**

Inspection and Service should be performed any time a malfunction is observed or suspected. Retain receipts for all vehicle emission services to protect your emission warranty.

Emission Control System Maintenance	Service Intervals	Kilometers in Thousands	24	48	72	80	96
		Mileage in Thousands	15	30	45	50	60
Change Engine Oil Every 12 Months	or	Every 12,000 km (7,500 miles)					
Change Engine Oil Filter Every 12 Months	or		x	x	x		x
Replace Drive Belt (for Water Pump, Alternator)	at			x			x
Check Valve Clearance (Jet Valve only); Adjust as Required	at		x	x	x		x
Check Engine Idle Speed* <sup>1</sup> ; Adjust as Required	at		x	x	x		x
Clean Carburetor Choke Mechanism and Linkage	at			x			x
Replace Fuel Filter Every 5 Years	or					x	
Check Fuel System (Tank, Line and Connection) for Leaks Every 5 Years	or					x	
Replace Vacuum Hoses, Secondary Air Hoses, Crankcase Ventilation Hoses and Water Hoses Every 5 Years	or						x
Replace Fuel Hoses, Vapor Hoses and Fuel Filler Cap Every 5 Years	or					x	
Replace Air Filter	at			x			x
Clean Crankcase Emission Control System (PCV Valve) Every 5 Years	or						x
Check Evaporative Emission Control System (except Canister) for Leaks and Clogging Every 5 Years	or						x
Replace Canister	at					x	
Replace Spark Plugs	at			x			x
Replace Ignition Cables Every 5 Years	or						x
Replace EGR Valve* <sup>2</sup>	at					x	
Replace Oxygen Sensor	at					x	
Check Distributor Cap, Rotor and Advanced Angle System * <sup>2</sup> Every 5 Years	or						x
Check Intake Temperature Control System * <sup>2</sup> Every 5 Years	or						x
Check Secondary Air System * <sup>2</sup> Every 5 Years	or						x
Replace Solenoid Valve Air Filter of Vacuum Control System * <sup>2</sup> Every 5 Years	or						x

## NOTE

(1) \*<sup>1</sup>: Shows recommended maintenance items for California vehicles only, but are required for vehicles except for California.

(2) \*<sup>2</sup>: Except for California.

## GENERAL MAINTENANCE SERVICE FOR PROPER VEHICLE PERFORMANCE

General Maintenance	Service Interval	Kilometers in Thou-	24	48	72	80	96
		sands					
		Mileage in Thousands	15	30	45	50	60
Carburetor or Body Mounting* <sup>1</sup>	Check	at				x	
Manual Transmission Oil	Check Oil Level	at		x			x
Automatic Transmission Fluid	Check Fluid Level Every 12 Months	or	x	x	x		x
	Change Fluid	at		x			x
Cooling System	Check and Service as Required Every 12 Months	or	x	x	x		x
	Change Coolant Every 2 Years	or		x			x
Front Disc Brake Pads	Inspect for Wear Every 12 Months	or	x	x	x		x
Rear Drum Brake Linings and Wheel Cylinders	Inspect for Wear and Leaks Every 2 Years	or		x			x
Brake Hoses	Check for Deterioration or Leaks Every 12 Months	or	x	x	x		x
Brake Fluid	Replace Every 4 Years	or					x
Ball Joint, Steering Linkage Seals and Drive Shaft Boots	Inspect for Grease Leaks and Damage Every 2 Years	or		x			x
Ball Joints with Grease Nipple	Lubricate Grease Every 12 Months	or	x	x	x		x
Front Wheel Bearing	Lubricate Grease Every 2 Years	or		x			x
Front Axle and Rear Axle	With LSD* <sup>2</sup>	at	x	x	x		x
	Without LSD* <sup>2</sup>	at		x			x
Propeller Shaft Joint	Lubricate Grease Every 2 Years	or		x			x
Exhaust System (Connection Portion of Muffler, Pipings and Keeping Warmth Covers)	Check and Service as Required Every 12 Months	or	x	x	x		x

## NOTE

(1)\*<sup>1</sup>: Except for California.(2)\*<sup>2</sup>: LSD—Limited slip differential

**SCHEDULED MAINTENANCE UNDER SEVERE USAGE CONDITIONS**

The maintenance items should be performed according to the following table:

Maintenance Item	Service to be Performed	Mileage Intervals Kilometers in Thousands (Miles in Thousands)				Severe Usage Conditions								
		24 (15)	48 (30)	72 (45)	96 (60)	A	B	C	D	E	F	G	H	
Engine Oil	Change Every 3 Months or	Every 4,800 km (3,000 miles)				x	x	x	x				x	
Engine Oil filter	Replace Every 6 Months or	Every 9,600 km (6,000 miles)				x	x	x	x				x	
Air Filter	Replace	More Frequently				x					x			
Crankcase Emission Control System	Check and Clean as Required	More Frequently				x								
Spark Plugs	Replace at	x	x	x	x		x		x					
Front Disc Brake Pads	Inspect for Wear	More Frequently				x						x		
Rear Drum Brake Linings and Rear Wheel Cylinders	Inspect for Wear and Leaks	More Frequently				x						x		
Manual Transmission and Transfer Case	Change oil at		x		x		x					x	x	

Severe usage conditions

- A—Driving in dusty conditions
- B—Trailer towing, or police, taxi, or commercial type operation
- C—Extensive idling
- D—Short-trip operation at freezing temperatures (engine not thoroughly warmed up)
- E—Driving in dandy areas
- F—Driving in salty areas
- G—More than 50% operation in heavy city traffic during hot weather above 32°C (90°F)
- H—Driving on off-road

**RECOMMENDED LUBRICANTS AND LUBRICANT CAPACITIES TABLE**

**RECOMMENDED LUBRICANTS**

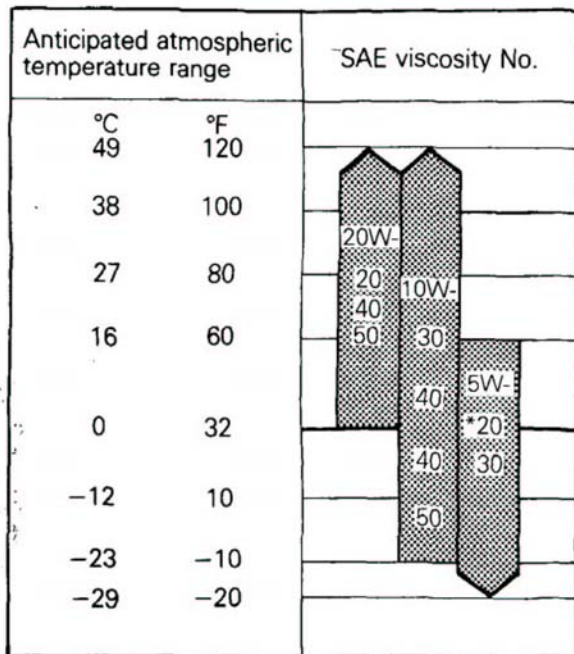
N00RA-B

Parts	Specifications	Remarks
Engine oil	API classification SF or SF/CC	For further details, refer to SAE viscosity number
Manual transmission	API classification GL-4 or higher	SAE grade number: SAE 80W or 75W/85W
Automatic transmission	Automatic transmission fluid "DEXRON II" type	–
Transfer case	API classification GL-4 or higher	SAE grade number: SAE 80W or 75W/85W
Front axle	API classification GL-4 or higher	For further details, refer to SAE viscosity number
Rear axle Conventional differential	API classification GL-4 or higher	For further details, refer to SAE viscosity number
Limited-slip differential	–	Mitsubishi Genuine Gear Oil Part No. 8149630EX or equivalent
Power steering	Automatic transmission fluid "DEXRON" or "DEXRON II" type	–
Brakes and clutch	Conforming to DOT 3	
Front wheel bearings	Multipurpose grease NLGI Grade 2	
Hood lock catch, door lock strikers, seat adjusters, back door lock, parking brake cable mechanism	Multipurpose grease NLGI Grade 2	
Engine coolant		DIA-QUEEN LONG-LIFE COOLANT (Part No. 0103044) or HIGH QUALITY ETHLENE GLYCOL ANTIFREEZE COOLANT
Door hinges, back door hinges	Engine oil	–

**LUBRICANT CAPACITIES TABLE**

Description	Metric measure	U.S. measure	Imperial measure
Engine oil			
Crankcase (include oil filter)	5.0 liters	5.3 qts.	4.4 qts.
Oil filter	0.5 liter	.53 qt.	.44 qt.
Cooling system (including heater and coolant reserve tank)	8.0 liters	8.45 qts.	7.04 qts.
Manual transmission	2.2 liters	4.7 pints	3.9 pints
Automatic transmission	7.2 liters	15.2 pints	12.7 pints
Transfer case	2.2 liters	4.7 pints	3.9 pints
Front axle	1.1 liters	2.3 pints	1.9 pints
Rear axle			
Conventional differential	1.1 liters	2.3 pints	1.9 pints
Limited-slip differential	1.8 liters	3.8 pints	3.2 pints
Power steering	0.9 liter	1.9 pints	1.6 pints
Fuel tank	60 liters	15.9 gals.	13.2 gals.

**SELECTION OF LUBRICANTS**  
**ENGINE OIL**



53E531

\*SAE 5W-20 Not recommended for sustained high speed vehicle operation.

**FRONT AXLE/REAR AXLE (CONVENTIONAL DIFFERENTIAL)**

Lubricant	API classification GL-4 or higher
Anticipated temperature range	Viscosity range
Above -23°C (-10°F)	SAE 90 SAE 85W-90 SAE 80W-90
-23°C to -34°C (-10°F to -30°F)	SAE 80W SAE 80W-90
Below -34°C (-30°F)	SAE 75W

**REAR AXLE (LIMITED-SLIP DIFFERENTIAL)**

Refer to P.3-11.

**COOLANT**

**Relation between Coolant Concentration and Specific Gravity**

Coolant temperature °C (°F) and specific gravity					Freezing temperature °C (°F)	Safe operating temperature °C (°F)	Coolant concentration (Specific volume)
10 (50)	20 (68)	30 (86)	40 (104)	50 (122)			
1.054	1.050	1.046	1.042	1.036	-16 (3.2)	-11 (12.2)	30%
1.063	1.058	1.054	1.049	1.044	-20 (-4)	-15 (5)	35%
1.071	1.067	1.062	1.057	1.052	-25 (-13)	-20 (-4)	40%
1.079	1.074	1.069	1.064	1.058	-30 (-22)	-25 (-13)	45%
1.087	1.082	1.076	1.070	1.064	-36 (-32.8)	-31 (-23.8)	50%
1.095	1.090	1.084	1.077	1.070	-42 (-44)	-37 (-35)	55%
1.103	1.098	1.092	1.084	1.076	-50 (-58)	-45 (-49)	60%

Example  
The safe operating temperature is -15°C (5°F) when the measured specific gravity is 1.058 at the coolant temperature of 20°C (68°F).

**Cautions**

- If the concentration of the coolant is below 30%, the anti-corrosion property will be adversely affected. In addition, if the concentration is above 60%, both the anti-freeze and engine cooling properties will decrease, affecting the engine adversely. For these reasons, be sure to maintain the concentration level within the specified range.**
- Do not use a mixture of different brands of anti-freeze.**



**MAINTENANCE SERVICE**

N00SAAC

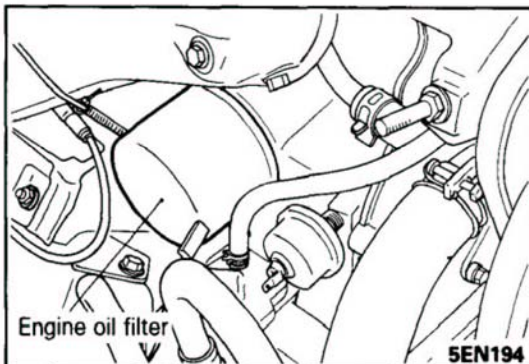
**ENGINE OIL (Change)**

Always use lubricants which conform to the requirements of the API classification "For Service SF/CC" when available, and have the proper SAE grade number for the expected temperature range.

Never use nondetergent or straight mineral oil.

- (1) After warming up the engine, remove the oil filler cap.
- (2) Remove the drain plug to allow the engine oil to drain.
- (3) Replace the drain plug gasket with a new one and tighten the drain plug.
- (4) Pour new engine oil through the oil filler.

**Engine oil total quantity : 5.0 liters (5.3 U.S. qts., 4.4 Imp.qts.)**

**ENGINE OIL FILTER (Replace)**

N00SABC

The quality of replacement filters varies considerably. Only high quality filters should be used to assure most efficient service. Genuine oil filters require that the filter be capable of withstanding a pressure of 1800kPa (256 psi) are, high quality filters and are recommended as follows:

**Oil Filter Part Number**

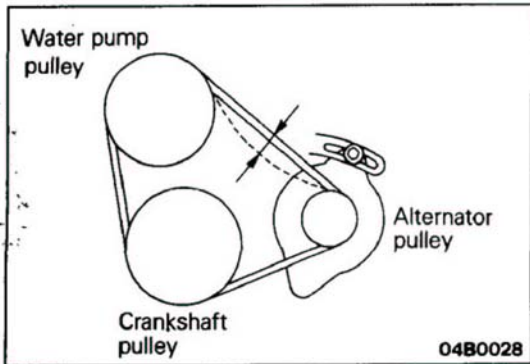
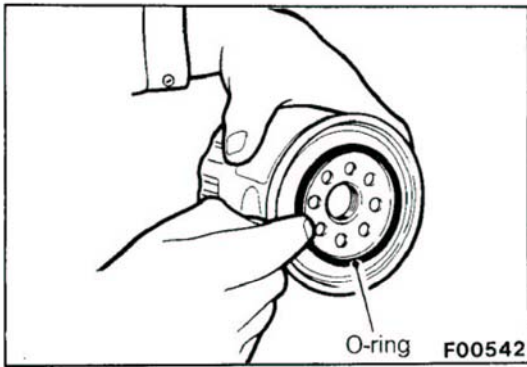
**Mitsubishi Genuine Parts : MD031805 or equivalent**

**ENGINE OIL FILTER SELECTION**

This vehicle is equipped with a full-flow, throw-away oil filter. The same type of replacement filter is recommended as a replacement filter for this vehicle. It is possible, particularly in cold weather, that this vehicle may develop high oil pressure for a short duration. You should be sure that any replacement filter used on this vehicle is a high-quality filter and is capable of withstanding a pressure of 1800kPa (256 psi) (manufacturer's specifications) to avoid filter and engine damage. The following is a high-quality filter and is strongly recommended for use on this vehicle: Mitsubishi Engine Oil Filter Part No. MD084693 or MD031805. Any replacement oil filter should be installed in accordance with the oil filter manufacturer's installation instructions.

**REPLACEMENT OF ENGINE OIL FILTER**

1. Remove the engine oil filler cap.
2. Remove the engine oil drain plug and drain the engine oil.
3. Using the oil filter wrench, remove the engine oil filter.



- After putting a small amount of engine oil on the O-ring of the new oil filter, turn it with hand and install it in the block.

**CAUTION**

**Make sure the installation surfaces are clean.**

- Pour in the engine oil.

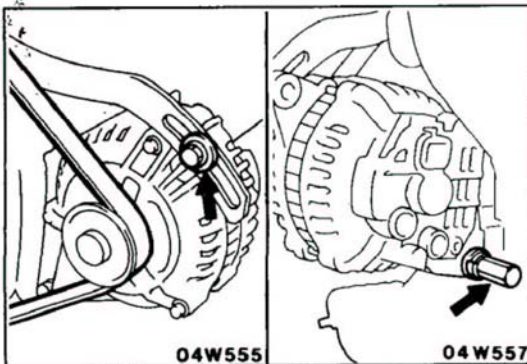
**DRIVE BELT (Replace)**

N005BBA

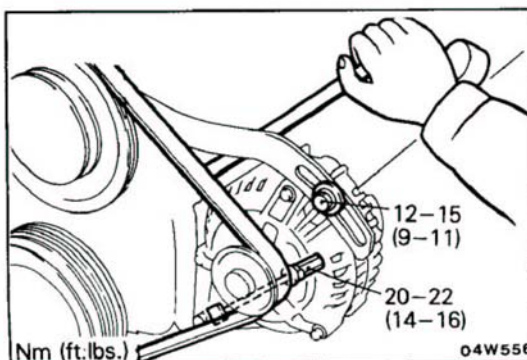
- Inspect the drive belts for evidence of cuts and cracks. Replace, if necessary.
- Check belt for proper deflection. If necessary, adjust the belt deflection as follows.
  - Push the belt with a force of 100 N (22 lbs.) at a point halfway between the alternator pulley and water pump pulley. The belt deflection should be the standard value.

**Standard value: : 9–12 mm (.35–.47 in.)**

- If belt deflection is not within the standard value, loosen alternator support nut and alternator brace bolt, and move alternator to obtain proper belt deflection at 100N (22 lbs.) force.

**REPLACEMENT OF DRIVE BELT****Vehicles without an air conditioner**

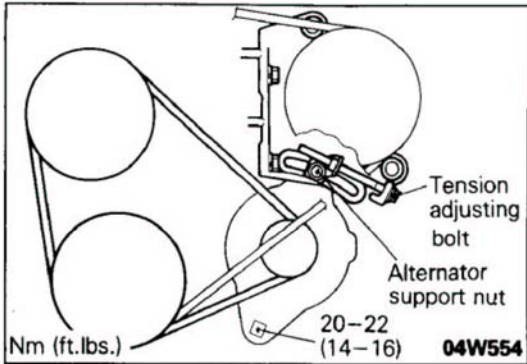
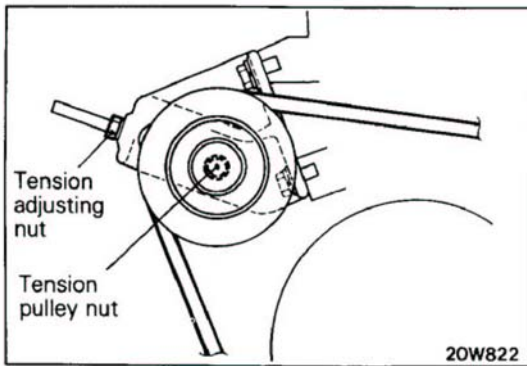
- Loosen the alternator brace bolt and alternator support nut, and then remove the alternator drive belt.
- Install a new alternator drive belt.



- Contact a bar or similar object to the stator part of the alternator in order to provide the appropriate tension, and then adjust the amount of belt deflection.

**Standard value : 9–12 mm (.35–.47 in.)**

- Tighten the alternator brace bolt and alternator support nut at the specified torque.



**Vehicles with an air conditioner**

1. Loosen the tension pulley nut.
2. Loosen the tension adjustment nut and then remove the air conditioner compressor's drive belt.

3. Loosen the alternator brace bolt and alternator support nut.
4. Loosen the tension adjustment bolt, and remove the alternator drive belt.
5. Install a new alternator drive belt.
6. Adjust the amount of deflection of the belt by using the tension adjustment bolt.

**Standard value : 9-12mm (.35-.47 in.)**

7. Tighten the alternator support nut, and the alternator brace bolt at the specified torque.
8. Install the air conditioner compressor's drive belt, and adjust the amount of deflection of the drive belt. Refer to GROUP 24 HEATERS AND AIR CONDITIONING – Service Adjustment Procedures.

**VALVE CLEARANCE (Check and adjust as required)**

NOOSACD

Incorrect valve clearances will not only result in unsteady engine operation, but will also cause excessive noise and reduced engine output.

Check the valve clearances and adjust as required while the engine is hot.

**Valve-to-rocker arm clearances :**

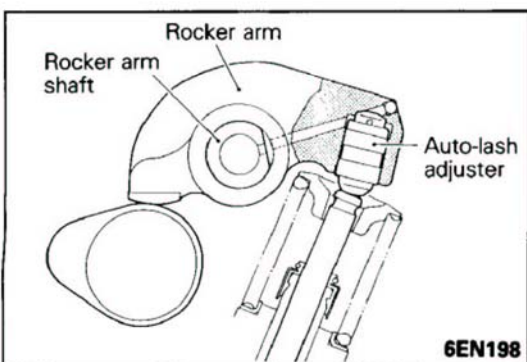
**Jet valves ..... 0.25 mm (.0098 in.)**

**VALVE CLEARANCE ADJUSTMENT**

**Intake and Exhaust Valves**

The auto-lash adjuster is installed to the rocker arm so that the valve clearance adjustment is maintenance-free.

For additional information regarding the auto-lash adjuster, refer to GROUP 9 ENGINE.

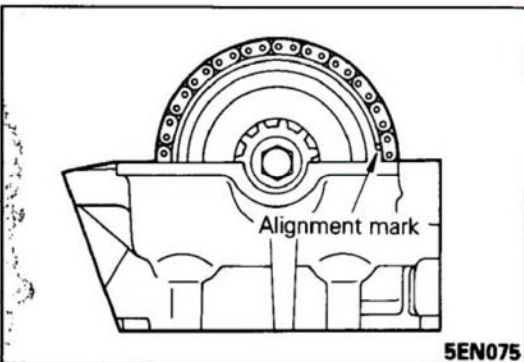
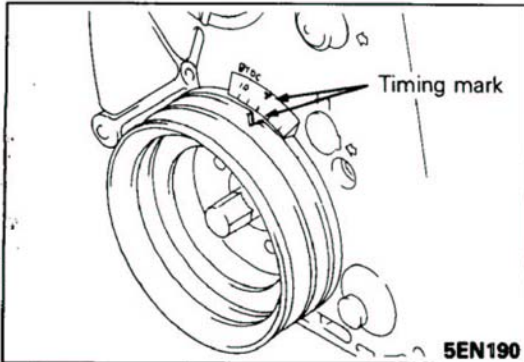


## Jet valves

**Caution**

The cylinder head bolts should be retightened before attempting this adjustment.

1. Warm up the engine until the coolant temperature reaches 85°–95°C (185°–205°F).
2. Remove the air filter assembly.
3. In order to facilitate the work, remove all spark plugs from the cylinder head.
4. Remove the rocker cover.  
Move the No. 1 cylinder to top dead center.
5. Align the notch in the crankshaft pulley with the "T" mark on the timing chain cover.  
Check to be sure that the camshaft sprocket and the timing chain's mating mark are in the position shown in the figure.

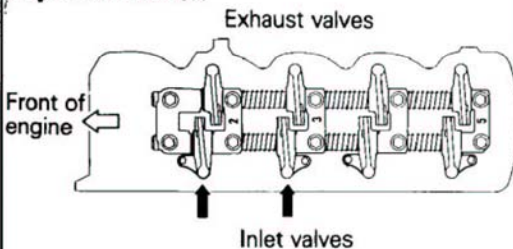
**Caution**

Be sure to turn the crankshaft in the forward rotation direction (right rotation).

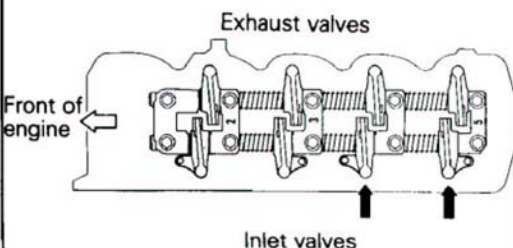
## Note

If the camshaft sprocket's mating mark is at the 180° opposite position, the No. 4 cylinder is at top dead center.

**With the No. 1 cylinder at compression top dead center.**



**With the No. 4 cylinder at compression top dead center.**

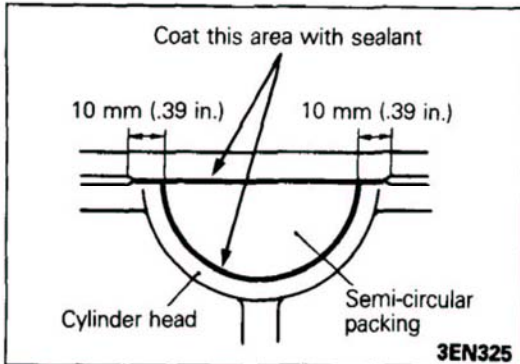
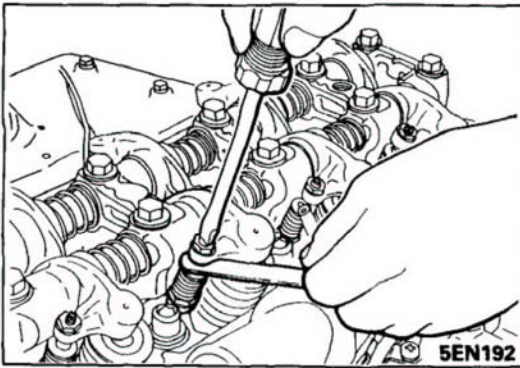


6. Measure the jet valve clearance at the places shown by the arrows in the figure.

**Standard value (when warm) : 0.25 mm (.0098 in.)**

## Note

The valve clearance when cold is 0.17 mm (.007 in.)



7. If the measured value is not the standard value, loosen the lock nut, and, while turning the adjustment screw, adjust the clearance by using the thickness gauge.

#### Caution

**Be careful not to press the jet valve in, because the jet valve spring's force is not strong.**

8. Hold the adjustment screw (so that it won't turn) by using a screwdriver, and tighten the lock nut at the specified torque.
9. Rotate the crankshaft 360° in the forward rotation direction, and align the notch in the pulley with the "T" mark on the timing chain cover.
10. Measuring the remaining valves; if the result is not the standard value, adjust by following steps 7 and 8.
11. Apply a coating of the designated sealant to the semi-circular packing, at the places shown in the figure.

**Specified sealant : 3M ART Part No. 8660 or equivalent**

12. Install the rocker cover.
13. Install the air cleaner.
14. Install the spark plugs.

## INSPECTION AND ADJUSTMENT OF ENGINE IDLING SPEED

NOOSADC

#### Caution

**The improper setting (throttle value opening) will increase exhaust gas temperature at deceleration, reducing catalyst life greatly and deteriorating exhaust gas cleaning performance. It also has effect on fuel consumption and engine braking.**

#### Inspection Conditions

- Engine coolant temperature: 85–95°C (185–205°F)
- Lights and accessories (air-conditioner, etc.): OFF
- Transmission: Neutral
- Steering wheel: Centered (for power steering equipped vehicles)

1. Prepare a timing light and tachometer.
2. Start the engine and allow it to idle.
3. Inspect the ignition timing. Adjust the ignition timing if necessary.

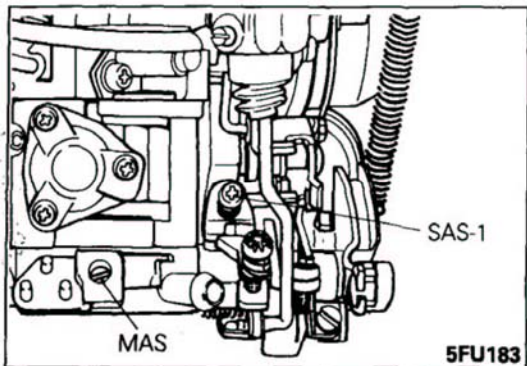
**Standard ignition timing : 7° BTDC ±2°\***

\*: When inspecting the standard ignition timing at high altitudes, disconnect the white striped vacuum hose from the distributor auxiliary compression chamber and temporarily close the end of the hose with a blind plug. (Federal indicated high-altitude specification vehicles, California).

NOTE

Inspect and adjust ignition timing as described in GROUP 8 ELECTRICAL–Ignition System.

4. Run the engine for more than 5 seconds at an engine speed of 2,000 to 3,000 rpm.
5. Run the engine at idle for 2 minutes.



6. Read the idling speed. If outside specified limits, readjust the speed to the specified value by adjusting the idle speed adjusting screw No. 1 (SAS-1).

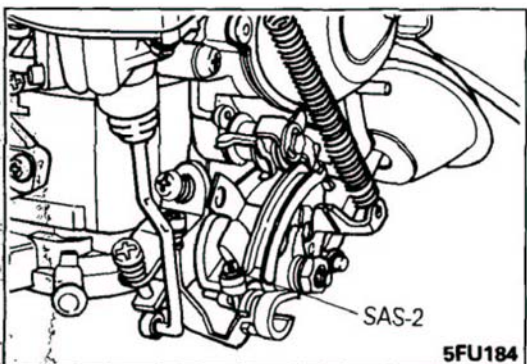
Transmission	Curb idle speed (rpm)	
	For the First 500 km (300 miles)	After 500 km (300 miles)
M/T and A/T	725 $\pm$ 150 - 100	800 $\pm$ 100

NOTE

M/T : Manual transmission  
A/T : Automatic transmission

Caution

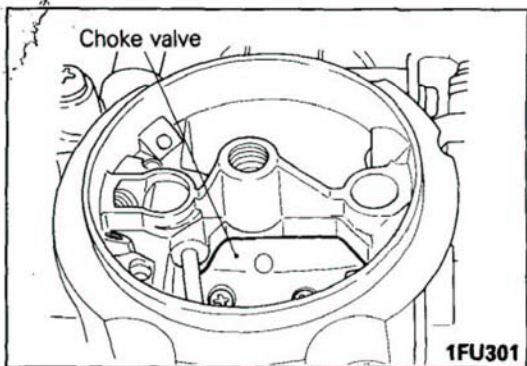
**DO NOT TOUCH SAS-2.** The idle speed adjusting screw (SAS-2) is the preset screw that determines the relationship between the throttle valve and free lever, and has been accurately set at the factory. If this setting is disturbed, throttle opener adjustment and dash pot adjustment cannot be done accurately.

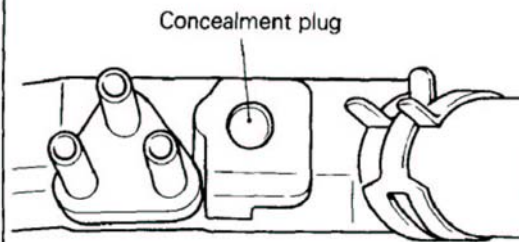


**CARBURETOR CHOKE MECHANISM AND LINKAGE (Clean)**

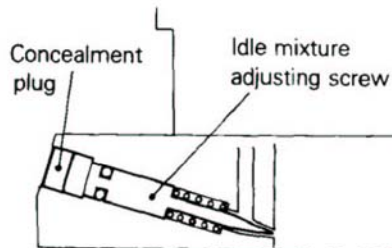
N00SAEB

The choke mechanism is used to facilitate engine starting during cold weather. Inject a solvent into the end of the auto-choke and the throttle valves (where they pass through the air horn) to prevent the choke from becoming stuck by gum deposits on the shaft. At the same time, inject a solvent to clean dirt from the fast idle cam and link.

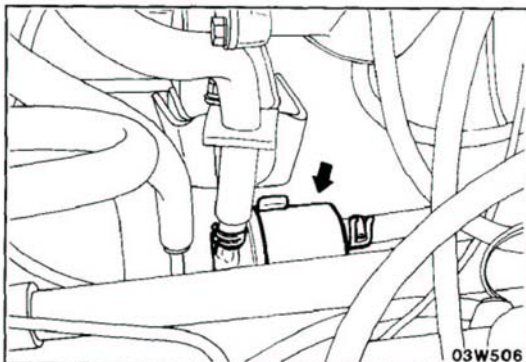


**Tamper Prevention**

1FU345



1FU346



03W506

**Caution**

1. All carburetors have a tamper-proof choke. The choke-related parts are factory adjusted. The choke adjustment is required during service, except when major carburetor service or overhaul choke calibration related parts adjustments are needed by state or local inspections.
2. All carburetors also have a tamper-resistant idle mixture adjusting screw. The CO setting has been done as a factory adjustment. Neither removal of the plug nor adjustment of the mixture screw is required during service unless a major carburetor overhaul, throttle body replacement, or high idle-CO adjustments are needed by state or local inspections.

**FUEL FILTER (Replace)**

N00SAFA

The fuel filter should be replaced regularly because its performance is reduced by dirt and water collected over an extended period of use. Replace as required.

**FUEL SYSTEM (Check for leaks)**

N00SAGA

**TANK, LINES AND CONNECTIONS**

1. Check for damage or leakage in the fuel lines and connections.
2. Inspect the surface of fuel hoses for heat and mechanical damage. Hard and brittle rubber, cracking, checking, tears, cuts, abrasions and excessive swelling indicate deterioration of the rubber.
3. If the fabric casing of the rubber hose is exposed by cracks and abrasions in the fuel system, the hoses should be changed.

**VACUUM HOSES, SECONDARY AIR HOSES, CRANKCASE VENTILATION HOSES AND WATER HOSES (Replace)**

N00SAHA

Replace them and then make sure that the hoses do not come in contact with any heat source or moving component which might cause heat damage or mechanical wear.

## FUEL HOSES, VAPOR HOSES AND FUEL FILLER CAP (Replace)

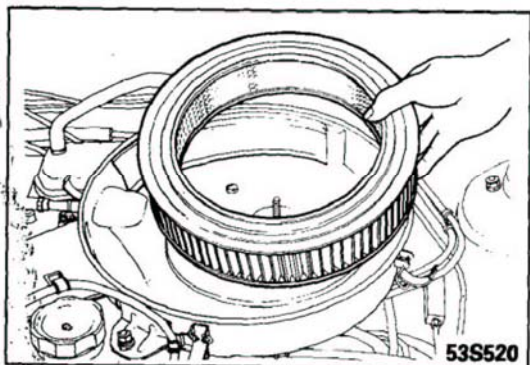
N00SAIC

Service procedures to check the hoses for damage are the same as those described in the section "Vacuum hoses, secondary air hoses, crankcase ventilation hoses and water hoses".

## AIR FILTER (Replace)

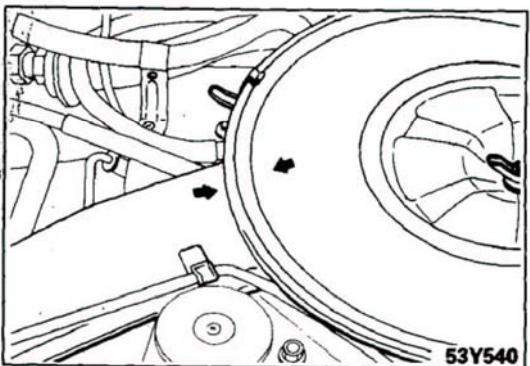
N00SAKC

The air filter will become dirty and loaded with dust during use, and the filtering effect will be substantially reduced. Replace it with a new one.



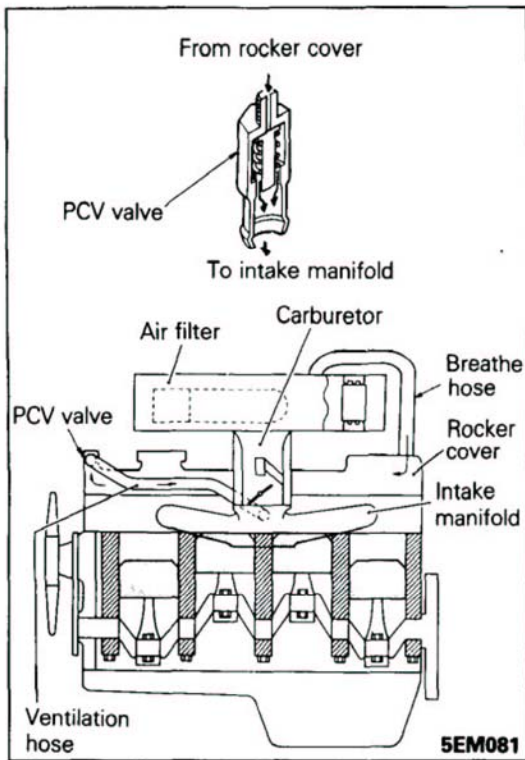
### REPLACEMENT OF AIR FILTER

1. Remove the wing nut. Use pliers only if the wing nut is difficult to remove.
2. Unsnap the finger clips.
3. Remove the filter by hand, and replace it with a new filter.



4. Install the air filter, and then install the cover and housing, taking care that the arrows are aligned.
5. Tighten the wing nut by hand.



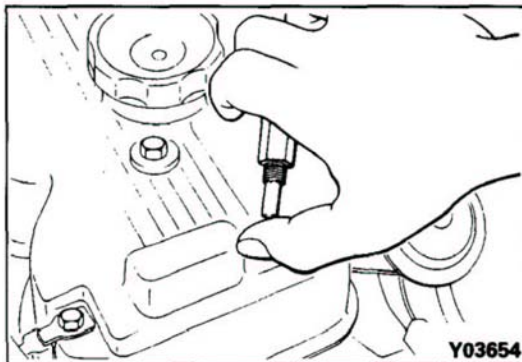


## CRANKCASE EMISSION CONTROL SYSTEM (PCV valve) (Clean)

NO6SALA

The crankcase ventilation system must be kept clean to maintain good engine performance.

Periodic servicing is required to remove combustion products from the PCV valve.



1. Disconnect the ventilation hose from the positive crankcase ventilation (PCV) valve. Then, remove PCV valve from the rocker cover and reconnect it to the ventilation hose.
2. Idle the engine and put a finger to the open end of PCV valve to make sure that intake manifold vacuum is felt on the finger.

### NOTE

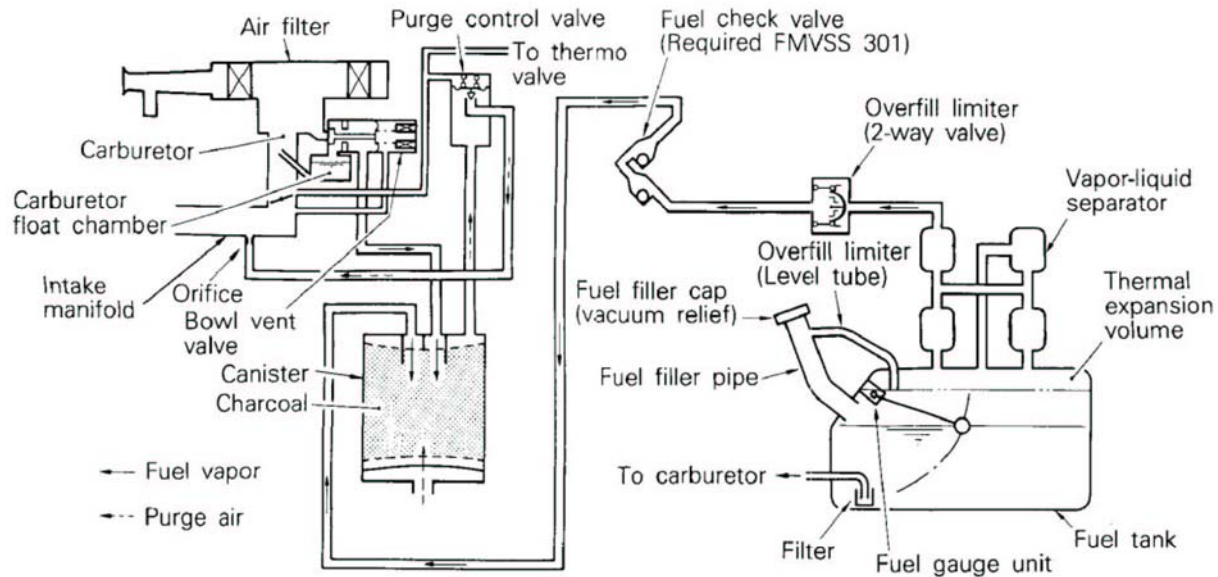
At this time, the plunger inside the PCV valve moves back and forth.

3. If vacuum is not felt on finger, clean the PCV valve and ventilation hose in cleaning solvent or replace if necessary.

## EVAPORATIVE EMISSION CONTROL SYSTEM (Check for leaks and clogging) – except canisters

NO6SAMB

1. If the fuel-vapor vent line is clogged or damaged, a fuel-vapor mixture escapes into the atmosphere causing excessive emissions. Disconnect the line at both ends, and blow it clean with compressed air. Remove the filler cap from the filler pipe and check to see if there is evidence that the packing makes improper contact to the filler pipe.
2. The overfill limiter (2-way valve) installed on the vapor line should be checked for correct operation.



03W527

### CANISTER (Replace)

N00SANC

If or when the canister filter becomes clogged, the purge air volume will decrease and consequently, the canister capacity will be reduced.

### SPARK PLUGS (Replace)

N00SAOB

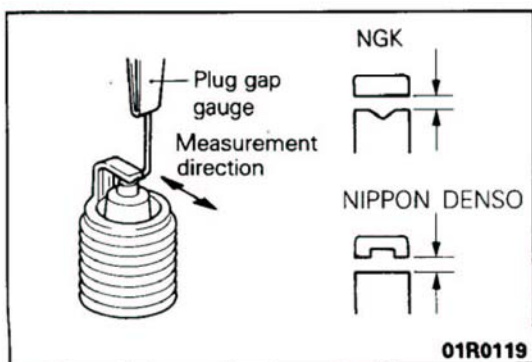
1. Spark plugs must fire properly to assure proper engine performance and emission-control. Therefore, they should be replaced periodically with new ones.

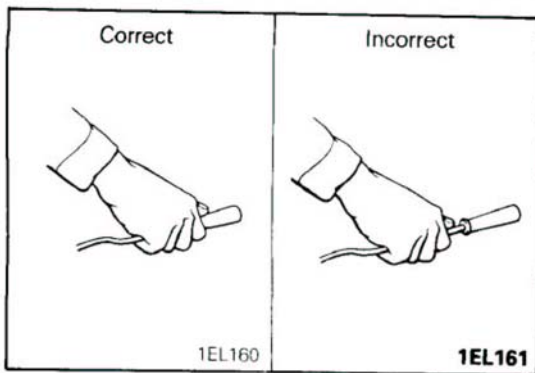
2. The new plugs should be checked for the proper gap.

#### Spark plug gap :

**W20EP-U10, W20EPR-U10** 0.9–1.0 mm (.035–.039 in.)

**Other type** 1.0–1.1 mm (.039–.043 in.)



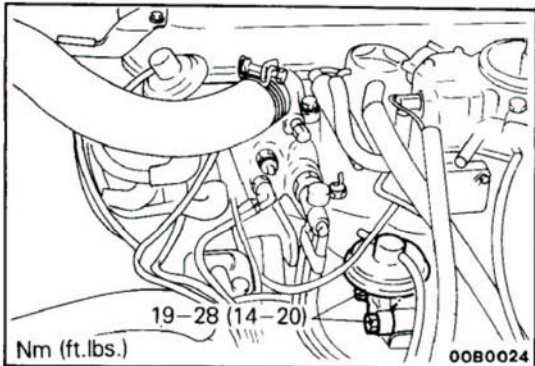
**IGNITION CABLES (Replace)**

N00SAPB

The ignition cables should be replaced periodically with new ones. After replacing, make sure that the ignition cables and terminals are properly connected.

**NOTE**

When disconnecting an ignition cable, be sure to hold cable cap. If the cable is disconnected by pulling on the cable alone, an open circuit might result.

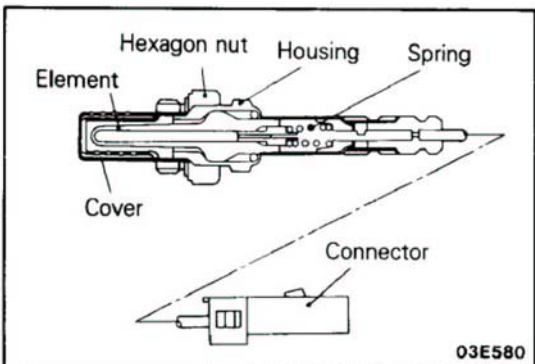
**EGR VALVE (Replace)**

N00SARA

Replace EGR valve to a new one.

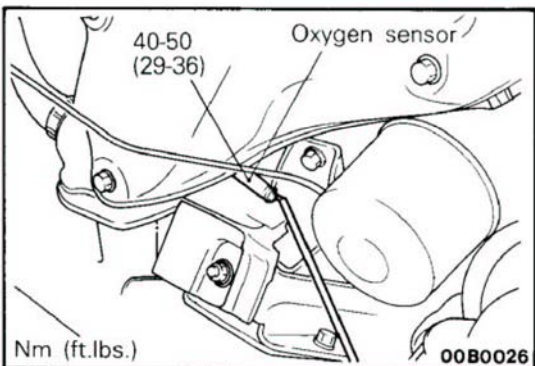
**REMOVAL OF EGR VALVE**

1. Disconnect the vacuum hoses from the EGR valve.
2. Disconnect the EGR valve from the intake manifold.
3. Replace the EGR valve gasket with a new one.
4. Install the EGR valve on the intake manifold and tighten to the specified torque.

**OXYGEN SENSOR (Replace)**

N00SAQB

The oxygen sensor is a device which controls the fuel mixture. If the oxygen sensor is damaged, the exhaust-gas cleaning effect as well as driveability deteriorates. Therefore, it should be replaced periodically with a new one.

**REMOVAL OF OXYGEN SENSOR**

1. Cut off the connector of the oxygen sensor.
2. Remove the oxygen sensor from the exhaust manifold.
3. Replace the oxygen sensor on the exhaust manifold and tighten to the specified torque.

**DISTRIBUTOR CAP, ROTOR AND ADVANCED ANGLE SYSTEM (Check)**

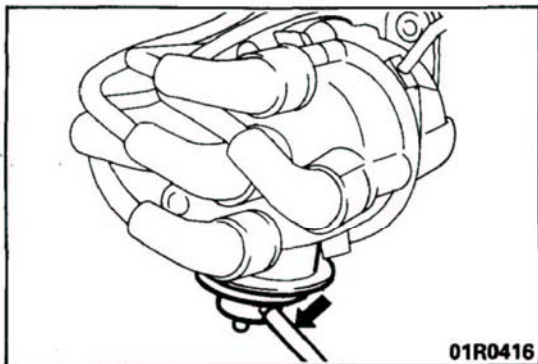
N00SASA

Check the distributor cap, rotor and spark advance system to maintain driveability and good exhaust gas.

**INSPECTION OF DISTRIBUTOR CAP AND ROTOR**

Inspect in accordance with the following procedure. Repair or replace as necessary.

- Check the cap for cracks.
- Check the cap and rotor electrodes for damage.
- Wipe clean the cap and rotor.



01R0416

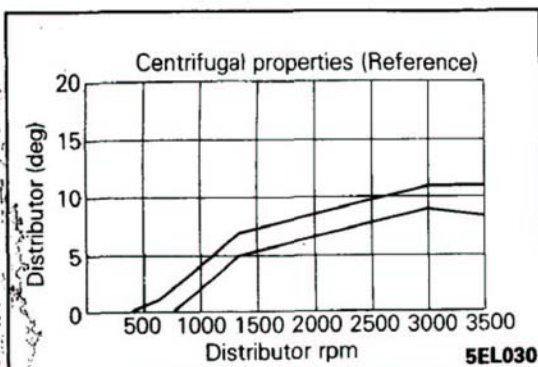
**INSPECTION OF CENTRIFUGAL SPARK ADVANCE DEVICE**

1. Start the engine and allow it to idle.
2. Disconnect the vacuum hoses from the vacuum chambers\*.
  - \*: Disconnect the vacuum hoses from both the main and sub vacuum chambers. (High-altitude areas nationwide, California)
3. Inspect the advance angle while slowly increasing engine speed. The advance angle should change smoothly as engine speed increases.

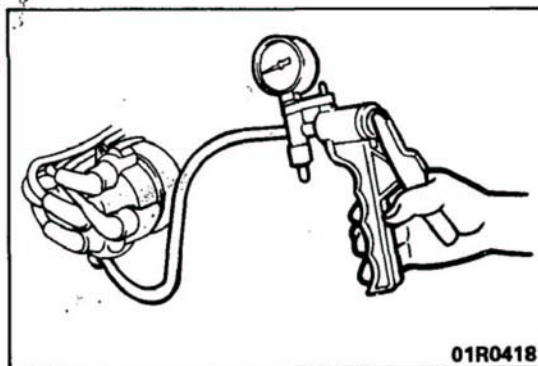
## NOTE

Symptom	Probable Cause
Advance angle is too large	Governor spring weak or missing
Advance angle changes suddenly	Spring is broken
Angle too small or hysteresis is too large	Poor governor weight or cam operation

4. When any of the above symptoms appear, disassemble and inspect the distributor.



5EL030



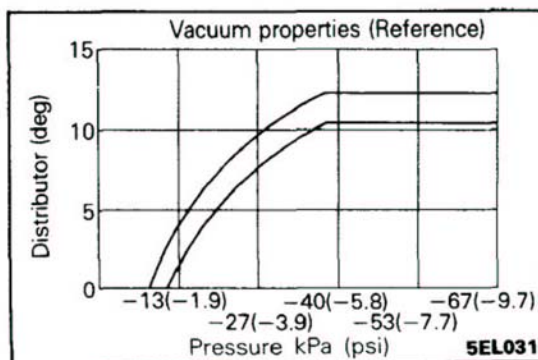
01R0418

**INSPECTION OF VACUUM ADVANCE DEVICE**

1. Start the engine and allow it to idle.
2. Disconnect the vacuum hoses from the vacuum chamber\*. Connect a vacuum pump to the nipple.
  - \*: Disconnect the vacuum hoses from the main vacuum chambers. (High-altitude areas nationwide, California)
3. Slowly apply vacuum with the vacuum pump and inspect the advance angle. The advance angle should change smoothly as the vacuum increases.

## NOTE

Symptom	Probable Cause
Advance angle is too large	Vacuum controller spring is weak or missing
Advance angle changes suddenly	Spring is broken
Angle too small or hysteresis is too large	Poor breaker base operation
Does not advance	Diaphragm is damaged



5EL031

4. When any of the above symptoms appear, disassemble and inspect the distributor.  
After removing the distributor, inspect each part as described in GROUP 8 ELECTRICAL-Ignition System.

### INTAKE TEMPERATURE CONTROL SYSTEM (Check)

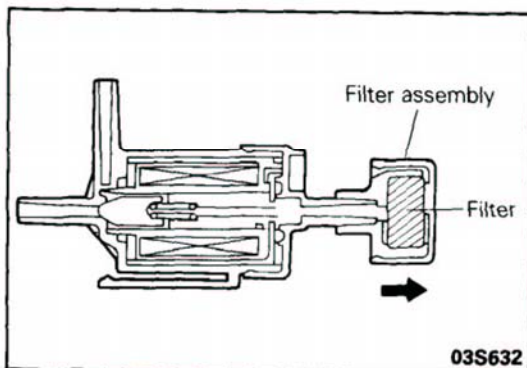
N00SATA

Check the vacuum motor of the intake temperature control system to protect driveability and fuel consumption. Refer to GROUP 25 EMISSION CONTROL SYSTEMS-Exhaust Emission Control System, for the inspection procedure.

### SECONDARY AIR SYSTEM (Check)

N00SAUA

Refer to GROUP 25 EMISSION CONTROL SYSTEMS-Exhaust Emission Control System, for the inspection procedure.



### SOLENOID VALVE AIR FILTER OF VACUUM CONTROL SYSTEM (Replace)

[Secondary air control solenoid valve, throttle opener control solenoid valve]

N00SAVA

Pull out the filter assembly in the direction of the arrow and replace with a new filter assembly.

### CARBURETOR OR BODY MOUNTING (Check)

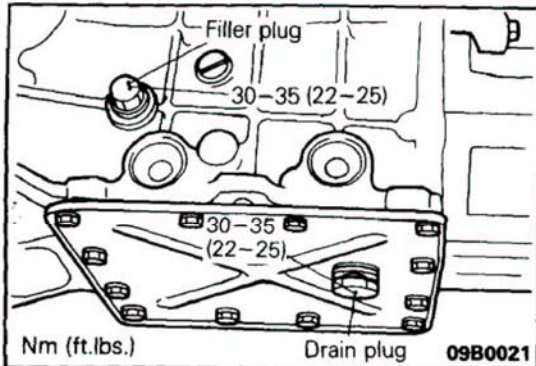
N00SBMA

Check carburetor attachment to inlet manifold and carburetor assembly. And check body mounting. Check the looseness of the carburetor installation bolts and mounting screws.

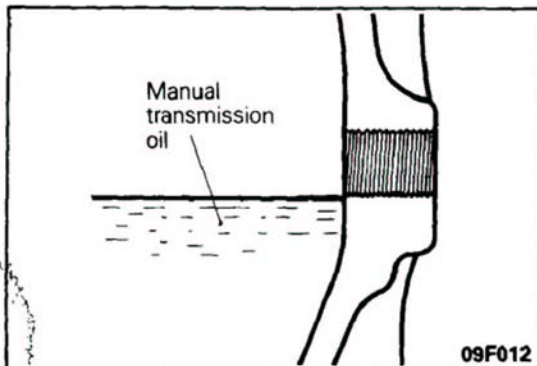
**MANUAL TRANSMISSION (Check oil level)**

N00SBCC

Inspect each component for evidence of leakage, and check the oil level by removing the filler plug. If the oil is contaminated, it is necessary to replace it with new oil.

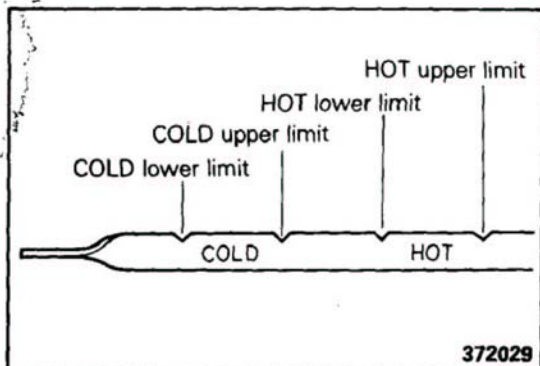
**INSPECTION**

- With the vehicle on a level surface, remove the filler plug and check whether or not the oil is at the same level as the bottom of the threads.
- Check whether or not the transmission oil is excessively dirty, and if the viscosity is normal.

**REPLACING TRANSMISSION OIL**

1. Remove the drain plug and drain the transmission oil.
2. Replace the gasket with a new one and tighten the drain plug.
3. Fill with new oil through the filler plug until the oil level reaches the plug hole.

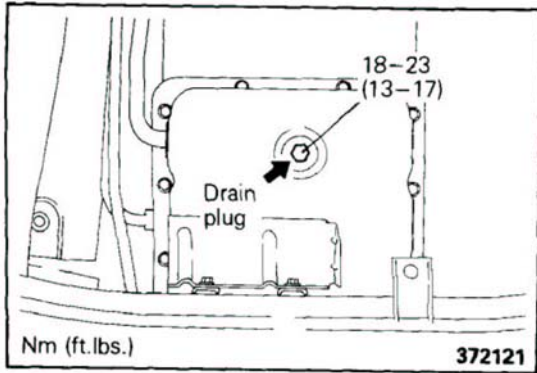
**Manual transmission oil capacity : 2.2 liters (4.7 U.S. pints., 3.9 Imperial pints.)**

**AUTOMATIC TRANSMISSION (Check fluid level)**

N00SBDB

Check the fluid level by removing the fluid level gauge. If the fluid is contaminated, it is necessary to replace it with new fluid.

1. Place the vehicle on a level surface.
2. Wipe the area around the oil dipstick to remove accumulated dirt and then pull out the oil dipstick.
3. Set the selector lever to the "P" (Park) position and apply the parking brake. Next, start the engine.
4. Check if the engine idle speed and fluid operating temperature (50–80°C; 122–176°F) are normal.
5. Move the selector lever to each position in turn to fill the torque converter and hydraulic system with fluid and then return the selector lever to the "N" (Neutral) position.
6. Make sure the fluid level is in the "HOT" range of the oil dipstick. If the fluid level is low, add fluid until it reaches the "HOT" range.

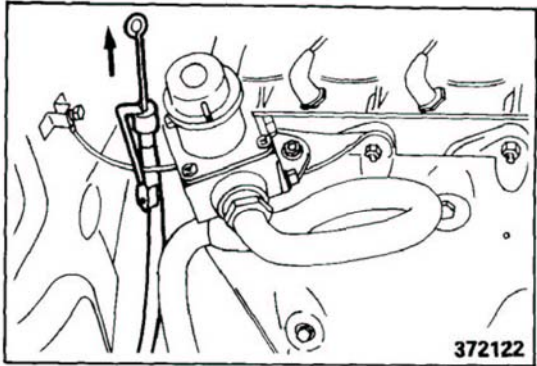


**REPLACEMENT OF AUTOMATIC TRANSMISSION FLUID**

Drain the fluid and check whether there is any evidence of contamination.

Replenish with new fluid after the cause of any contamination has been corrected.

1. Place a large flat container beneath the drain plug.
2. Remove the drain plug and drain the fluid.
3. Replace the gasket with a new one and tighten the drain plug.

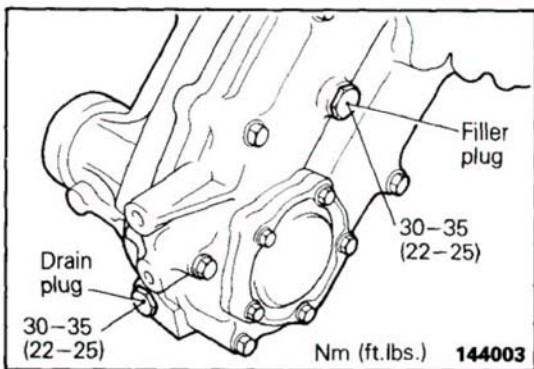


4. Pour 5 liters (10.6 U.S. pints., 8.8 Imp.pints.) of "DEXRON II" ATF into case through dipstick hole. [Total quantity of ATF required is approx. 7 liters (14.8 U.S. pints., 12.3 Imp. pints.). Actually however, approx. 5.5 liters (11.6 U.S. pints., 9.7 Imp. pints.) of fluid can be replaced because rest of fluid remains in torque converter.]
5. Check the fluid level.

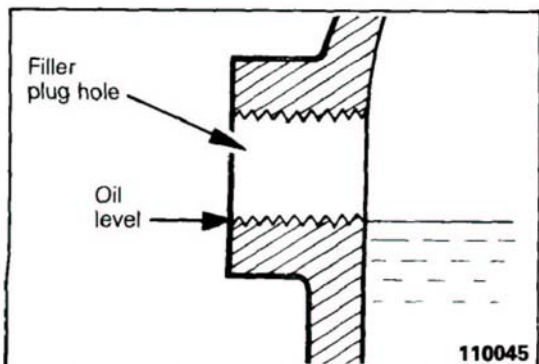
**TRANSFER CASE (Change oil)**

N00SBNB

Drain the fluid and check whether there is any evidence of contamination. Replenish with new fluid after the cause of any contamination has been corrected.



1. With the vehicle on a flat, level surface, drain out the transfer case oil.
2. Replace the packing with a new one, and close the drain plug.



3. Supply new transfer case oil through the filler plug until it reaches the same level as the plug hole.

**Transfer case oil total capacity : 2.2 liters (4.7 U.S. pints, 3.9 Imp. pints)**

## COOLING SYSTEM (Check and service as required)

N00SBEA

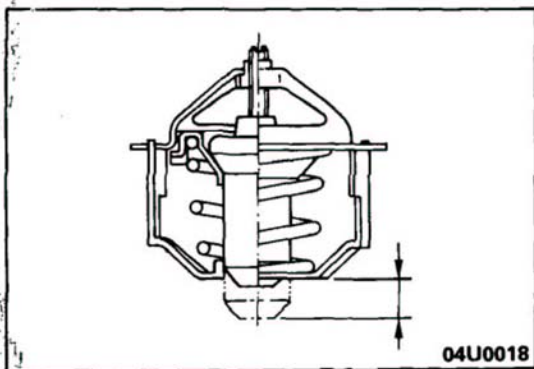
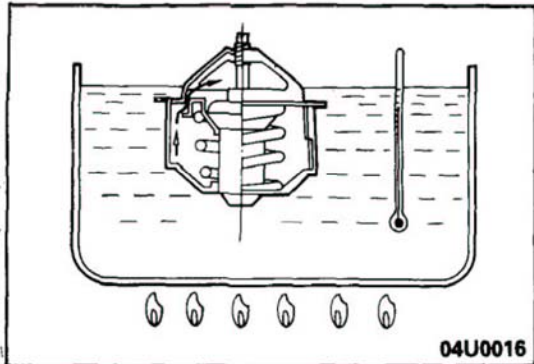
Check the cooling system parts, such as radiator, heater, and oil cooler hoses, thermostat and connections for leakage and damage.

### CHECKING THERMOSTAT

Remove the thermostat. (Refer to GROUP 7 COOLING-Thermostat.)

#### Inspection

- Replace the thermostat if there is even the slightest opening of the valve at room temperature.
- Replace if the exterior of the thermostat is noticeably deformed, or if it is damaged or broken.
- Clean away any corrosion or sediment adhered to the valve.
- Fill a container with water, and immerse the thermostat in it; increase the water temperature and check whether or not the thermostat's initial opening temperature and fully opened temperature [valve lift amount when fully opened: 8 mm (.31 in.) or more] are the specified values.



**Standard value : Initial valve-opening temperature:**

**88° ± 1.5°C (190° ± 3°F)**

**Fully opened valve temperature:**

**100°C (212°F) or higher**

#### NOTE

The lift amount is calculated by first measuring the valve height when fully closed, and then measuring the height at the fully open temperature.

### ANTIFREEZE

The engine cooling system is provided with a mixture of 50% ethylene glycol anti-freeze and 50% water at the time of manufacture.

Since the cylinder head and water pump body are made of aluminum alloy casting, be sure to use a 30 to 60% ethylene glycol antifreeze coolant to provide corrosion protection and freezing prevention.

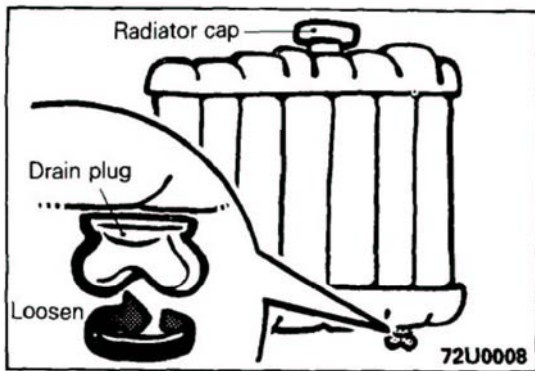
#### Caution

**If the concentration of the antifreeze is below 30%, the anticorrosion property will be adversely affected. In addition, if the concentration is above 60%, both the antifreezing and engine cooling properties will decrease, adversely affecting the engine. For these reasons, be sure to maintain the concentration level within the specified range.**

### MEASUREMENT OF ANTIFREEZE CONCENTRATION

Run the engine until coolant is fully mixed. Drain some coolant (antifreeze), and measure temperature and specific gravity of the coolant. Determine concentration and safe working temperature. If the coolant is short of antifreeze, add antifreeze up to a concentration of 50%.





### CHANGING COOLANT

1. Set the temperature control lever to the hot position.
2. Remove the radiator cap, radiator drain plug and engine drain plug to drain the coolant.

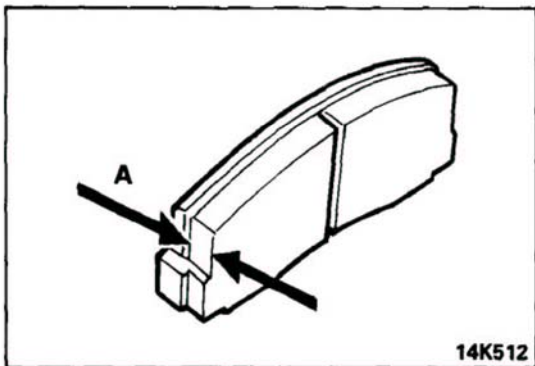
#### Caution

**When removing the radiator cap, use care to avoid contact with hot coolant or steam. Place a shop towel over the cap and turn the cap counterclockwise a little to let pressure escape through the vinyl tube. After relieving the steam pressure, remove the cap by slowly turning it counterclockwise.**

3. Remove the reserve tank and drain the coolant.
4. After draining coolant completely, reinstall the drain plugs and flush the engine and radiator using a radiator cleaning fluid.
5. After the flushing is completed, completely drain the cleaning fluid and install the radiator and engine drain plugs.
6. By referring to the section on coolant (P.0-xx), select an appropriate concentration for safe operating temperature within the range of 30 to 60%. Refill the system with a high quality ethylene glycol antifreeze at the selected concentration. A convenient mixture is a 50% water and 50% antifreeze solution [Freezing point:  $-36^{\circ}\text{C}$  ( $-32.8^{\circ}\text{F}$ )]. Reinstall the radiator cap.
7. After running the engine a while, check the coolant level and add coolant until the specified coolant level is maintained.
8. Add coolant to the reserve tank between the "FULL" and "LOW" mark if necessary.

#### Caution

**Do not overfill the reserve tank.**



### FRONT DISC BRAKE PADS (Inspect for wear)

N00SBFA

Check for fluid contamination and wear. Replace complete set of pads if defective.

#### Thickness of lining (A)

Limit : 1.0 mm (.04 in.)

#### Caution

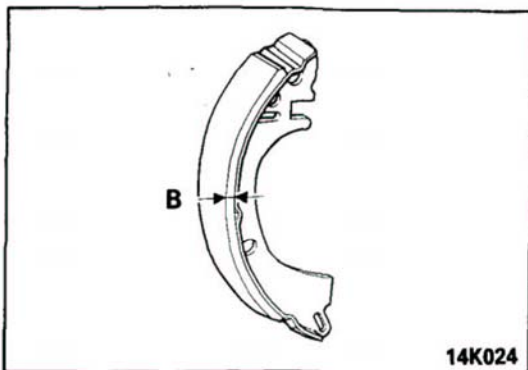
**The pads for the right and left wheels should be replaced at the same time. Never "split" or intermix brake pad sets. All four pads must be replaced as a complete set.**

### REAR DRUM BRAKE LININGS AND REAR WHEEL CYLINDERS (Inspect for wear and leaks)

N00SBGC

1. Remove the brake drum and check the thickness of brake shoe lining for wear. Check the automatic brake adjusting system by hand to see if it operates smoothly. Also see if the gears are in proper mesh with each other. To assure smooth functioning, apply a very thin coat of grease to the friction surface of adjuster and link shaft.

**Specified grease : Brake grease SAE J310, NLGI No.1**



14K024

2. Inspect the wheel cylinder boots for evidence of a brake fluid leak. Visually check the boots for cuts, tears or heat cracks. (A slight amount of fluid on the boot may not be a leak, but may be preservative fluid used at assembly.)

(1) Checking the Brake Shoes for Wear.

**Thickness of lining (B)**  
**Limit : 1.0 mm (.04 in.)**

### **BRAKE HOSES (Check for deterioration or leaks)**

N00SBHA

Inspection of brake hoses and tubing should be included in all brake service operations.

The hoses should be checked for:

1. Correct length, severe surface cracking, pulling, scuffing or worn spots. (If the fabric casing of the hoses is exposed by cracks or abrasion in the rubber hose cover, the hoses should be replaced. Eventual deterioration of hose may occur with possible bursting failure.)
2. Faulty installation, casing twisting or interference with wheel, tire or chassis.

### **BRAKE FLUID (Replace)**

N00SBIB

1. Check the brake system for leakage before replacing brake fluid. Completely drain the brake fluid with the bleeder screws loosened on each brake and refill the brake system with new brake fluid.

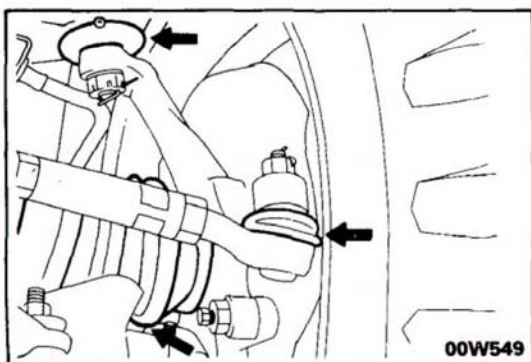
**Specified brake fluid : DOT3**

2. The reservoir cap must be fully tightened to avoid contamination from foreign matter or moisture.

**DO NOT ALLOW PETROLEUM BASE FLUID TO CONTAMINATE THE BRAKE FLUID—SEAL DAMAGE WILL RESULT—**

#### **Caution**

**Take care in handling brake fluid as it is harmful to the eyes and may also cause damage to painted surfaces.**

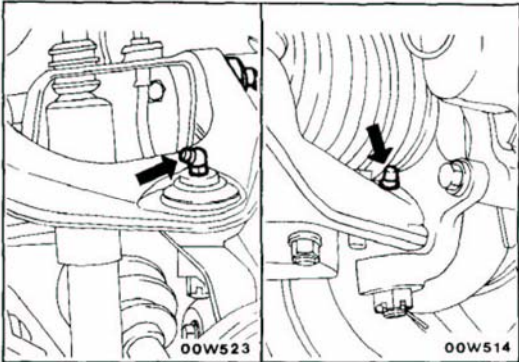
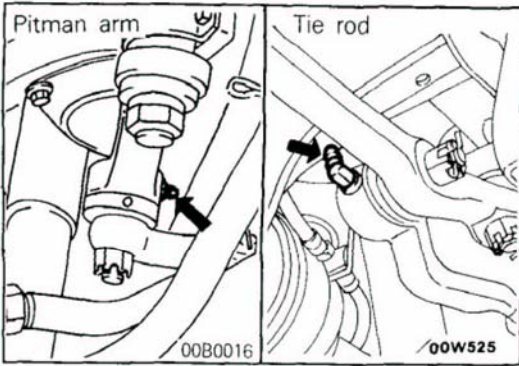


00W549

### **BALL JOINT, STEERING LINKAGE SEALS AND DRIVE SHAFT BOOTS (Inspect for grease leaks and damage)**

N00SBJA

1. These components, which are permanently lubricated at the factory, do not require periodic lubrication. Damaged seals and boots should be replaced to prevent leakage or contamination of the grease.
2. Inspect the dust cover and boots for proper sealing, leakage and damage. Replace them if defective.



**BALL JOINTS WITH GREASE NIPPLE (Lubricate grease)**

N00SBOB

Fill the specified grease at the grease nipple till the grease come out of the dust seal of the pitman arm, tie rod, lower control arm and upper control arm.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

**FRONT WHEEL BEARINGS (Lubricate grease)**

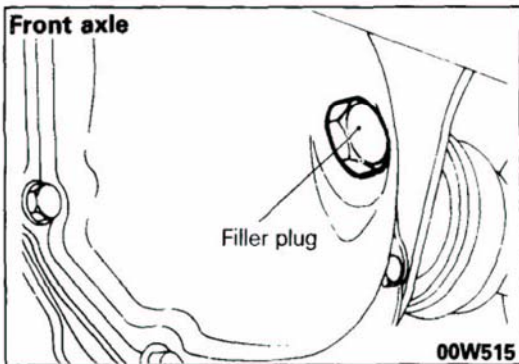
N00SBKD

Inspect for evidence of grease leakage around the hub cap and the back of the hub. If there is leakage of grease, remove the hub and inspect its oil seal for damage. Clean the grease off the hub and bearing and repack with specified new grease.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

**NOTE**

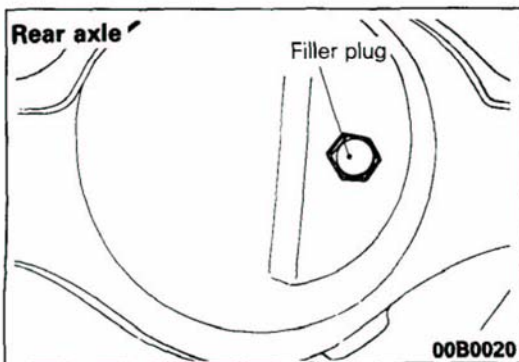
Refer to GROUP 2 FRONT SUSPENSION—Axle Hub and Free-wheeling Hub, for the removal procedures of the front hub.

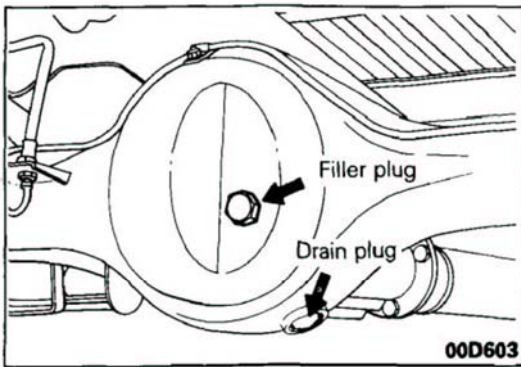


**FRONT AXLE AND REAR AXLE (CONVENTIONAL DIFFERENTIAL)(Inspect oil level)**

N00SBPA

Remove the filler plug and inspect the oil level at bottom of filler hole. If the oil level is slightly below the filler hole, it is in satisfactory condition.

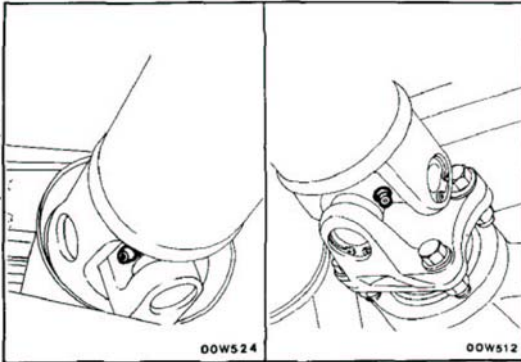




### REAR AXLE OIL (LIMITED-SLIP DIFFERENTIAL) (Change) N00SBQA

Before changing the rear axle oil, check to make sure that there is no oil leakage from the rear axle housing. Remove the drain plug and drain out of the oil. Put the oil plug back in place, and then pour new oil in through the filler hole.

**Oil capacity : 1.8 liter (3.2 U.S.pints., 2.6 Imp.pints.)**



### PROPELLER SHAFT JOINTS (Lubricate grease) N00SBRB

Lubricate grease to the propeller shaft joints. The propeller shaft joints should be repacked with specified grease.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

### EXHAUST SYSTEM (CONNECTION PORTION OF MUFFLER AND PIPINGS AND KEEPING WARMTH COVERS) (Check and service as required) N00SBLA

1. Check for holes and gas leaks due to damage, corrosion, etc.
2. Check the joints and connections for looseness and gas leaks.
3. Check the hanger rubber and brackets for damage.

# FRONT SUSPENSION

## CONTENTS

N02AA--

<b>AXLE HUB AND FREE-WHEELING HUB</b> .....	<b>18</b>	Sealant and Adhesive .....	7
<b>DIFFERENTIAL CARRIER</b> .....	<b>68</b>	Service Specifications .....	5
<b>DRIVE SHAFT</b> .....	<b>52</b>	Torque Specifications .....	6
<b>FRONT DIFFERENTIAL MOUNTING</b> .....	<b>66</b>	<b>STABILIZER BAR</b> .....	<b>51</b>
<b>GENERAL INFORMATION</b> .....	<b>2</b>	<b>TORSION BAR</b> .....	<b>48</b>
<b>INNER SHAFT</b> .....	<b>62</b>	<b>TROUBLESHOOTING</b> .....	<b>11</b>
<b>KNUCKLE</b> .....	<b>44</b>	AUTOMATIC FREE WHEELING HUB .....	11
<b>LOWER ARM</b> .....	<b>40</b>	Does not lock	
Replacement of Lower Arm Bushing .....	42	Locks but does not become free	
Replacement of Lower Ball		Ratcheting readily occurs	
Joint Dust Cover .....	42	<b>DIFFERENTIAL</b> .....	<b>12</b>
<b>SERVICE ADJUSTMENT PROCEDURES</b> .....	<b>14</b>	Bearing noise while driving or coasting	
Checking Drive Shaft End Play .....	16	Constant noise	
Checking Front Axle Total Backlash .....	15	Gear noise while coasting	
Checking Gear Oil Level .....	16	Gear noise while driving	
Inspection and Adjustment of Wheel		Heat	
Alignment .....	14	Noise while turning	
Replacement of Differential Carrier Oil Seal ...	17	Oil leakage	
<b>SHOCK ABSORBER AND UPPER ARM</b> .....	<b>35</b>	<b>DRIVE SHAFT, INNER SHAFT</b> .....	<b>12</b>
Replacement of Upper Ball Joint .....	37	Noise due to excessive play of wheel in	
<b>SPECIAL TOOLS</b> .....	<b>8</b>	turning direction	
<b>SPECIFICATIONS</b> .....	<b>4</b>	Noise due to excessive wheel end play	
General Specifications .....	4	Noise during wheel rotation	
Lubricants .....	7	<b>MANUAL FREE WHEELING HUB,</b>	
		<b>FRONT AXLE HUB, KNUCKLE</b> .....	<b>11</b>
		Noise due to excessive play of wheel in	
		turning direction	
		Noise due to excessive wheel end play	

GENERAL INFORMATION

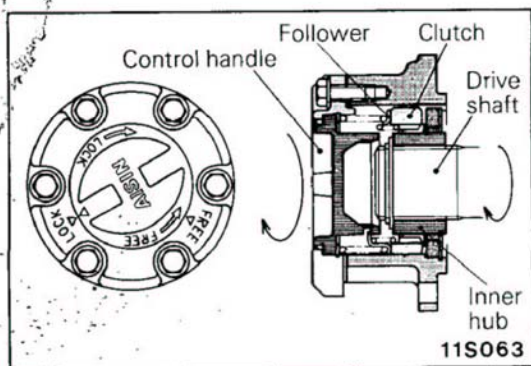
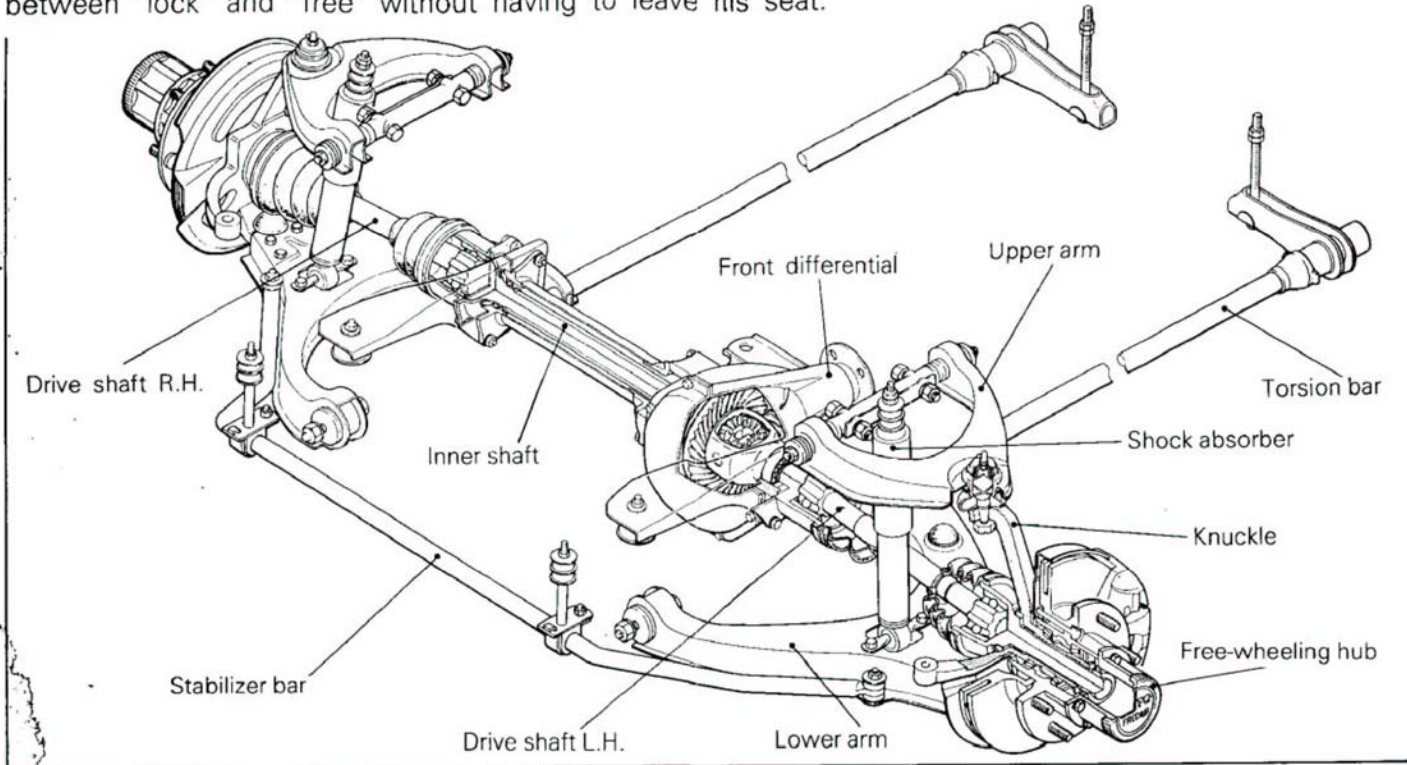
N02BBAA

The front suspension is an independent suspension which is a combination of the double-wishbone and torsion bar spring.

The front axle assembly consists of a front differential, a housing tube, an inner shaft, drive shafts, etc. For better serviceability of the differential, the spacer for backlash adjustment of the final drive gear is placed between the side bearing outer race and the gear carrier.

The double-offset-joint which can slide in the axial direction, is used at the differential carrier side; the Birfield joint, with large operation angle, is used at the axle hub side.

To reduce vibration, noise, and fuel consumption when 2WD is applied, manual or automatic free-wheeling hubs are equipped; in particular, the automatic one is an outstanding feature in that the driver can switch between "lock" and "free" without having to leave his seat.

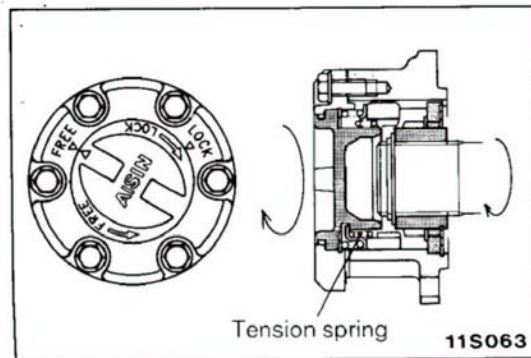


MANUAL FREE-WHEELING HUB OPERATION

N02BCAA

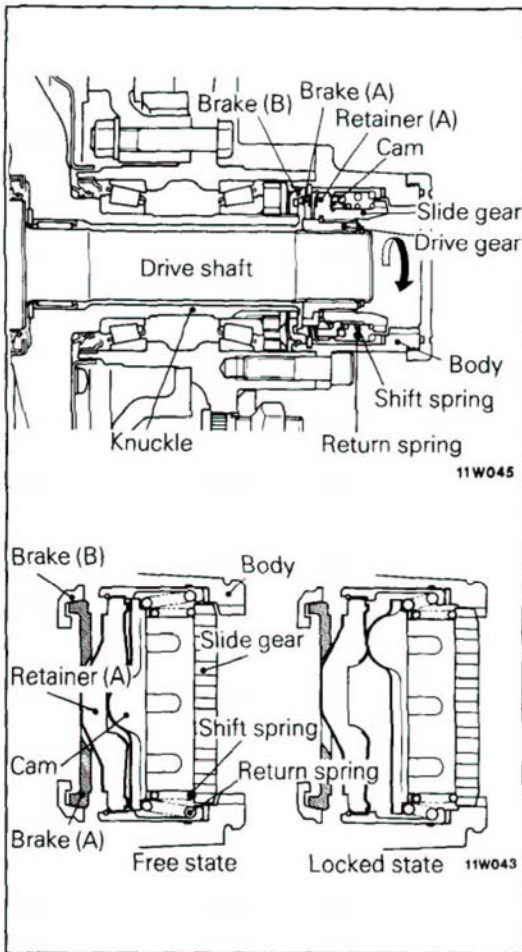
Free State → Locked State

When the control handle is set to the LOCK position, the follower moves along the oblique groove in the control handle and causes the clutch (which is always in mesh with the free-wheeling hub body) to engage the splines of the inner hub, thus coupling the free-wheeling hub body with the drive shaft.



Locked State → Free State

When the control handle is set to the FREE position, the follower moves along the oblique groove in the control handle and uses the tension spring to disengage the clutch from the splines of the inner hub, thus separating the free-wheeling hub body from the drive shaft.



**AUTOMATIC FREE-WHEELING HUB OPERATION**

N02BDAA

**Free State → Locked State**

When the transfer is shifted from 2WD to 4WD and driving is begun, rotation of the drive shaft is transmitted from the drive gear to the slide gear to the cam to retainer (A) to brake (A). When this happens, brake (A) is pressed against brake (B) by the function of the cam of retainer (A), and friction force is generated.

Because brake (B) is secured to the knuckle, retainer (A) ceases to rotate, and therefore, the cam, while compressing the return spring, rises out of the cam groove of the retainer (A) and compresses the shift spring. The slide gear is pushed by the shift spring, and then engages with the gear of the housing when the two are in phase and enters the locked state.

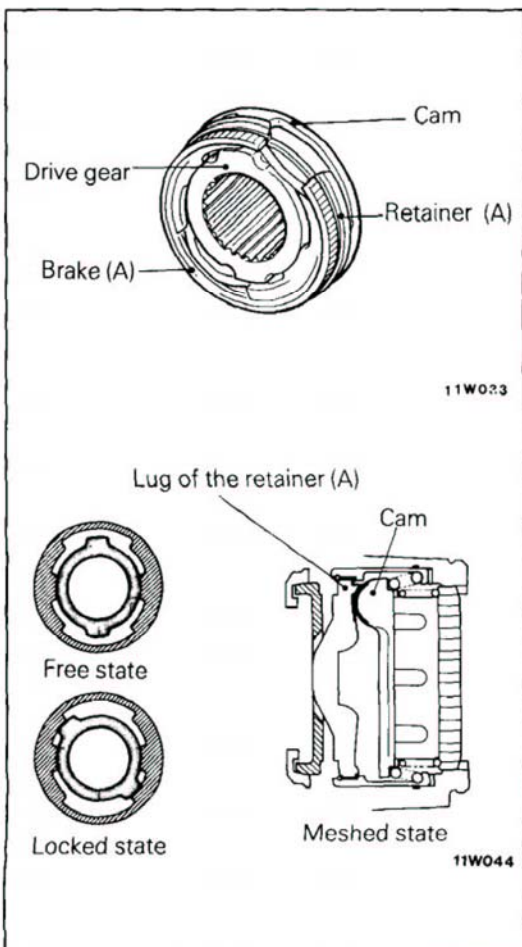
The cam turns until the lug of the drive gear contacts the lug of brake (A). Because of this contact, brake (A) is turned by the drive gear, and therefore, there is also no longer any force of retainer (A) with a tendency to turn brake (A). As a result, there is also no longer any force which presses brake (A) against brake (B) and the drive gear causes brake (A) to turn lightly (there is no friction force).

Because the cam remains meshed, it turns until it contacts the lug of retainer (A), and is locked.

**Locked State → Free State**

When the transfer is shifted from 4WD to 2WD and the vehicle is driven in reverse, rotation of the gear of the body is transmitted from the slide gear to cam to retainer (A) to brake (A), but retainer (A) ceases to turn, just as when the shift is made from the free state to the locked state. The cam therefore, turns as far as the cam groove of retainer (A) and is pushed into the cam groove by the return spring.

The slide gear moves with the cam, disengages from the gear of the doby, and enters a free state.



## SPECIFICATIONS

## GENERAL SPECIFICATIONS

N02CA--

Items	Specifications
Suspension system	Independent double wishbone with torsion bar and telescopic shock absorber
Kingpin inclination angle	8°
Torsion bar	
Length x O.D. mm (in.)	1,277.5 x 24.5 (50.295 x .965)
Spring constant N/mm (lbs./in.)	22 (123)
Shock absorber	
Type	Hydraulic cylindrical double-acting type
Maximum length mm (in.)	335 (13.19)
Compressed length mm (in.)	215 (8.46)
Stroke mm (in.)	120 (4.72)
Damping force [at 0.3m/sec. (.984 ft./sec.)]	
Expansion N (lbs.)	1,940–2,560 (428–564)
Contraction N (lbs.)	900–1,300 (198–287)
Front axle hub bearing	
Type	Tapered roller bearing
Dimensions (O.D. x I.D.) mm (in.)	
Outer	73.431 x 45.242 (2.8910 x 1.7811)
Inner	73.431 x 45.242 (2.8910 x 1.7811)
Drive shaft	
Joint type	B.J. (Birfield Joint)
Inner	D.O.J. (Double Offset Joint)
Length Right mm (in.)	267 (10.5)
(Joint to joint) Left mm (in.)	294 (11.6)
Inner shaft	
Shaft overall length mm (in.)	432 (17.0)
Bearing	
O.D. x I.D. mm (in.)	62 x 35 (2.44 x 1.38)
Differential	
Final drive gear type	Hypoid gear
Reduction ratio	4.625
Differential gear type	Straight bevel gear
Number of teeth	
Drive gear	37
Drive pinion	8
Side gear	14
Pinion gear	10



SERVICE SPECIFICATIONS

N02CB--

Items	Specifications
<b>Standard values</b>	
Toe-in mm (in.)	2-9 (.08-.35)
Camber	1° ± 30'
Caster	2°57' ± 30'
Drive shaft end play mm (in.)	0.2-0.5 (.008-.020)
Front hub turning resistance Ncm (in.lbs.)	30-130 (2.6-11.3)
[Spring scale reading] N (lbs.)	5-18 (1.1-4.0)
Front hub play in the axial direction mm (in.)	0.05 (.0020) or less
<b>Automatic free-wheeling hub</b>	
Brake contact surface height mm (in.)	11.8-12.2 (.465-.480)
Brake assembly thickness mm (in.)	10.5 (.41)
Upper ball joint starting torque Ncm (in.lbs)	80-350 (7-30)
Clearance between bump stopper and bump stopper bracket mm (in.)	71 (2.80)
Shock absorber attaching dimension mm (in.)	7-8 (.27-.31)
Stabilizer attaching bolt end attaching dimension mm (in.)	6-8 (.24-.31)
Anchor arm attaching dimension mm (in.)	
L.H.	135.2-143.2 (5.323-5.638)
R.H.	124.3-132.3 (4.894-5.210)
Setting of D.O.J. boot length mm (in.)	77-83 (3.03-3.27)
<b>Differential</b>	
Final drive gear backlash mm (in.)	0.11-0.16 (.0043-.0063)
Differential gear backlash mm (in.)	0-0.076 (0-.0030)
Drive pinion rotation torque	
with oil seal Nm (in.lbs.)	0.6-0.7 (5.2-6.1)
without oil seal Nm (in.lbs.)	0.4-0.5 (3.5-4.3)
<b>Limits</b>	
Front axle total backlash mm (in.)	14 (.55)
<b>Automatic free-wheeling hub</b>	
Free-wheeling hub turning resistance Ncm (in.lbs.)	100 (8.7)
[Spring scale reading] N (lbs.)	14 (3.1)
Brake assembly thickness mm (in.)	9.6 (.378)
Return spring deterioration mm (in.)	35 (1.38)
Shift spring deterioration mm (in.)	30 (1.18)
Upper arm shaft starting torque Nm (ft.lbs.)	15 (11)
[Spring scale reading] N (lbs.)	6.8 (1.5)
Lower ball joint end play mm (in.)	0.5 (.020)
<b>Differential</b>	
Drive gear runout mm (in.)	0.05 (.0020)
Differential gear backlash mm (in.)	0.2 (.008)

## TORQUE SPECIFICATIONS

N02CC--

Items	Nm	ft.lbs
Automatic free-wheeling hub cover	18-35	13-25
Manual free-wheeling hub cover	10-14	7-10
Free wheeling hub body or drive flange	50-60	36-43
Front hub to brake disc	50-60	36-43
Knuckle to front brake assembly	80-100	58-72
Upper arm shaft to crossmember	100-120	72-87
Rebound stopper to upper arm	8-12	6-9
Upper ball joint to knuckle	60-90	43-65
Front shock absorber to crossmember	12-18	9-13
Front shock absorber to lower arm	15-22	11-16
Lower ball joint to knuckle	120-180	87-130
Lower arm shaft	140-160	101-116
Lower arm ball joint to lower arm	54-75	39-54
Bump stopper to lower arm	20-30	14-22
Anchor arm B	95-120	69-87
Anchor arm lock nut	40-50	29-36
Stabilizer bar clamp A	8-12	6-9
Knuckle to tie rod assembly	45	33
Right drive shaft to inner shaft	50-60	36-43
Left differential mounting bracket to differential carrier	80-100	58-72
Right differential mounting bracket to housing tube	80-100	58-72
Differential mounting brackets to frame	80-110	58-80
Housing tube to differential carrier	80-100	58-72
Bracket to differential carrier	80-110	58-80
Front propeller shaft to differential carrier	50-60	36-43
Front suspension crossmember mounting bolts	100-120	72-87
Drain plug	60-70	43-51
Filler plug	40-60	29-43
Companion flange	160-220	116-159
Cover	15-22	11-16
Bearing cap	55-65	40-47
Differential case to drive gear	80-90	58-65
Under skid plate to side frame	18-25	13-18
Under cover to frame	10-13	7-9
Brake tube flare nut	13-17	9-12

**LUBRICANTS**

NO2CD--

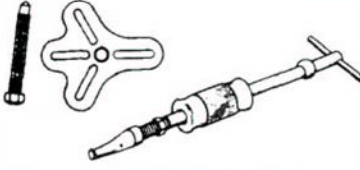







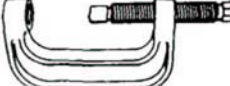

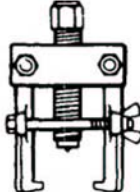
Items	Specified lubricants	Quantity
Front axle gear oil Front differential	Hypoid gear oil API classification GL-4 or higher SAE viscosity No. 80 W, 90	1.10 lit. (1.16 U.S. qts., 0.97 Imp. qts.)
Front axle hub bearing	Multipurpose grease SAE J310, NLGI No. 2	As required
Oil seal lip	Multipurpose grease SAE J310, NLGI No. 2	As required
Automatic free wheeling hub	Multipurpose grease SAE J310, NLGI No. 2	As required
Manual free wheeling hub	Multipurpose grease SAE J310, NLGI No. 2	As required
Upper and lower ball joints	Multipurpose grease SAE J310, NLGI No. 2	As required
Torsion bar serrations, anchor arm assembly serrations, anchor arm B serrations, dust cover inside and anchor bolt thread	Multipurpose grease SAE J310, NLGI No. 2	As required
Needle bearing	Multipurpose grease SAE J310, NLGI No. 2	As required
Contact surface of knuckle and spacer	Multipurpose grease SAE J310, NLGI No. 2	As required
D.O.J. boot grease	Repair kit grease	110 g (1.9 oz.)
B.J. boot grease	Repair kit grease	110 g (1.9 oz.)
Housing tube dust seal lip	Multipurpose grease SAE J310, NLGI No. 2	As required
Housing tube dust cover	Multipurpose grease SAE J310, NLGI No. 2	As required
Companion flange contacting surface of the washer	Multipurpose grease SAE J310, NLGI No. 2	As required

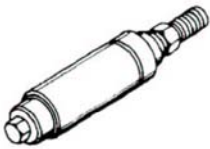
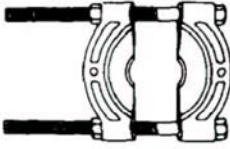
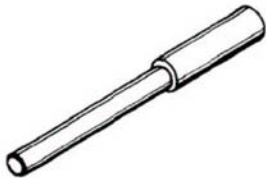

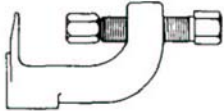




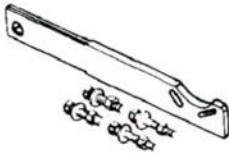
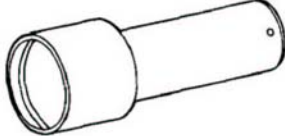

**SEALANTS AND ADHESIVES**




Items	Specified sealants and adhesives
Slot of the upper or lower ball joint	3M ART Part No. 8663, No. 8661 or equivalent
Contact surface of free-wheeling hub and front axle hub	3M ART Part No. 8661, No. 8663 or equivalent
Drive gear threaded hole	3M Adhesive STUD LOCKING 4170 or equivalent
Gasket	3M ART Part No. 8661, No. 8663 or equivalent

## SPECIAL TOOLS

N02DA--

Tool (Number and name)	Use	Tool (Number and name)	Use
MB990241-01 Drive shaft attachment MB990211-01 Sliding hammer 	Removal and insertion of inner shaft assembly	MB990955-01 Oil seal installer 	Pressing of front axle hub oil seal Pressing of housing tube oil seal
MB990925-01 Bearing and oil seal installer set 	Pressing of front axle hub bearing outer race Pressing of drive pinion bearing outer race Pressing of differential carrier oil seal	MB990811-01 Sidebearing cup remover step plate 	Disassembly and reassembly of automatic free-wheeling hub Removal of side bearing inner race
MB990938-01 Handle 	Pressing of front axle hub bearing outer race Pressing of front axle hub oil seal Pressing of knuckle needle bearing Pressing of knuckle oil seal Pressing of housing tube oil seal Pressing of differential carrier oil seal Pressing of drive pinion bearing outer race	MB990778-01 Ball joint remover   MB990799-01 Ball joint remover and installer A   MB990800-01 Ball joint remover and installer B   MB990840-01 Universal joint remover and installer 	Removal of knuckle Disconnection of upper ball joint  Removal and installation of upper arm ball joint
MB990954-01 Lock nut wrench 	Removal and adjustment of lock nut	MB990809-01 Pitman arm puller 	Removal of knuckle Disconnection of lower ball joint

Tool (Number and name)	Use	Tool (Number and name)	Use
MB990958-01 Torsion bar bushing remover and installer 	Removal and pressing of bushing A	MD998348-01 Bearing separator 	Removal and pressing of inner shaft bearing
MB990883-01 Arbor 	Removal and pressing of the bushing B	MB990339-01 Pinion carrier bearing puller 	Removal of side bearing inner race Removal of drive pinion front bearing inner race
MB990635-01 Steering linkage puller 	Removal of knuckle Disconnection of tie rod	MIT303173 Insert 	Removal of side bearing inner race Removal of drive pinion front bearing inner race
MB990956-01 Needle bearing installer 	Pressing of knuckle needle bearing	MIT44801 Collet set 	Removal of side bearing inner race Removal of drive pinion front bearing inner race
MB990985-01 Oil seal installer 	Pressing of knuckle oil seal	MB990767-01 End yoke holder 	Holding of end yoke
MB991150 Dust cover installer 	Pressing of drive shaft dust cover	MB990901-01 Pinion height gauge set 	Adjustment of pinion height

Tool (Number and name)	Use	Tool (Number and name)	Use
<p>MB990802-01 Bearing installer</p> 	<p>Pressing of drive pinion front bearing inner race Pressing of side bearing inner race</p>	<p>MIT304180 Handle</p> 	<p>Pressing of the drive pinion oil seal</p>
<p>MB990031-01 Drive pinion oil seal installer</p> 	<p>Pressing of drive pinion oil seal</p>		

**TROUBLESHOOTING**

N02EA--

Symptom	Probable cause	Remedy	Reference page
<b>MANUAL FREE WHEELING HUB, FRONT AXLE HUB, KNUCKLE</b>  Noise due to excessive play of wheel in turning direction	Free wheeling hub serration play	Replace	2-33
	Front axle hub bearing play, seizure, wear	Check and adjust or replace if necessary	2-15 2-23
Noise due to excessive wheel end play	Knuckle needle bearing play, seizure, wear	Replace	2-46
	Free wheeling hub serration play	Replace	2-33
	Free wheeling hub looseness	Tighten or replace	2-29
<b>AUTOMATIC FREE WHEELING HUB</b>  Does not lock	Brake sliding portion worn	Replace parts and adjust hub attaching surface shims	2-21 2-25
	Brake (B) lug portion broken Housing damaged Drive gear damaged Slide gear damaged Retainer (A) damaged Cam damaged Shift spring deteriorated Slide gear C ring out of position	Replace parts	2-25
	Automatic free wheeling hub attaching bolt loose	Retighten attaching bolts	2-18
Locks but does not become free	Return spring deteriorated Slide gear C ring out of position	Replace parts	2-25
	Foreign substances on tooth surfaces of drive gear and slide gear Foreign substances on tooth surfaces of slide gear and housing gear	Clean tooth surfaces or replace parts	
	Excessive front power train resistance	Adjust differential preload	2-21
Ratcheting readily occurs	Water in brake portion	Clean and then apply grease	2-25
	Retainer (B) worn Slide gear damaged Housing gear damaged Shift spring deteriorated Slide gear C ring out of position	Replace parts	
	Automatic free wheeling hub attaching bolts loose	Retighten the attaching bolts	2-18

Symptom	Probable cause	Remedy	Reference page
DRIVE SHAFT, INNER SHAFT  Noise during wheel rotation	Housing tube bent Inner shaft bent	Replace	2-62
	Inner shaft bearing worn, pounding	Replace	2-64
	Drive shaft assembly worn damaged, bent	Check or replace	2-52
Noise due to excessive play of wheel in turning direction	Inner shaft and side gear serration play	Replace	2-62 2-74
	Drive shaft and side gear serration play	Replace	2-52 2-74
	Drive shaft and drive flange serration play	Replace	2-52 2-62
Noise due to excessive wheel end play	Drive shaft and drive flange end play	Adjust or replace	2-16
	Drive flange looseness	Tighten or replace	2-62
DIFFERENTIAL  Constant noise	Improper adjustment of drive gear and drive pinion (poor meshing)	Correct or replace	2-68
	Loose, worn or damaged side bearing	Correct or replace	2-73, 76
	Loose, worn or damaged drive pinion bearing	Correct or replace	2-73, 2-76
	Worn drive gear, drive pinion	Correct or replace	2-73, 76
	Worn side gear thrust washer or pinion shaft	Replace	2-73, 76
	Deformed drive gear or differential case	Replace	2-73, 76
	Damaged gear	Replace	2-73, 76
	Foreign material	Eliminate the foreign material and check; replace the parts if necessary	2-73, 2-76
	No oil	Fill or change	2-16
Gear noise while driving	Poor gear engagement	Correct or replace	2-69
	Improper gear adjustment	Correct or replace	2-69
	Improper drive pinion preload adjustment	Correct or replace	2-77
	Damaged gear	Replace	2-73, 76
	Foreign material	Eliminate the foreign material and check; replace the parts if necessary	2-73, 2-76
	Insufficient oil	Fill or change	2-16



Symptom	Probable cause	Remedy	Reference page
Gear noise while coasting	Improper drive pinion rotation torque adjustment	Correct or replace	2-77
	Damaged differential gear	Replace	2-73, 76
Bearing noise while driving or coasting	Cracked or damaged drive pinion rear bearing	Replace	2-73, 2-76
Noise while turning	Loose side bearing	Replace	2-73, 76
	Damaged side gear, pinion gear or pinion shaft	Replace	2-73, 2-76
Heat	Improper differential gear backlash Excessive preload	Adjust	2-69
	Insufficient oil	Fill or change	2-16
Oil leakage	Clogged vent plug	Clean or replace the parts	-
	Cover tightened not Seal malfunction	Retighten, apply sealant, or replace the gasket	2-73, 2-76
	Worn or damaged oil seal	Replace	2-73, 76
	Excessive oil	Adjust the oil level	2-16

## SERVICE ADJUSTMENT PROCEDURES

N02FBAC

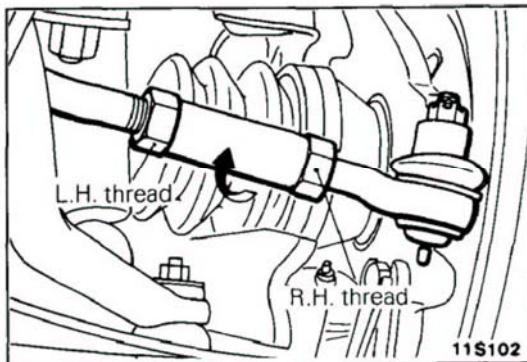
### INSPECTION AND ADJUSTMENT OF WHEEL ALIGNMENT

1. Measure the wheel alignment with the vehicle parked on level ground and with the front wheels placed in the straight ahead positions.
2. Front suspension, steering system, wheels and tires should be serviced to normal condition prior to measurement of wheel alignment.

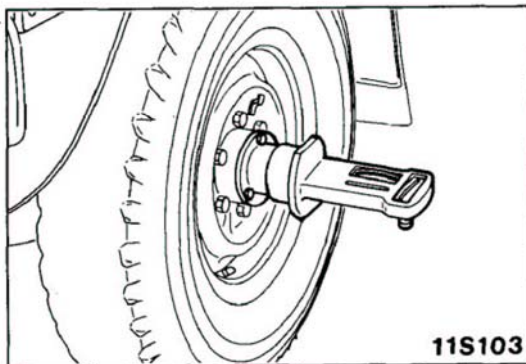
#### TOE-IN

1. Measure the toe-in.

**Standard value : 2-9 mm (.08-.35 in.)**



2. If the toe-in does not agree with the standard value, use the left and right tie rod turnbuckles to adjust it.
3. Make the adjustment by turning the left and right turnbuckles the same amount in opposite directions. The toe-in value will decrease if the left turnbuckle is turned toward the front of vehicle and the right one is turned toward the rear, and vice a half-turn of the turnbuckles will result in an approximately 15 mm (.59 in.) adjustment in the toe-in.



#### CAMBER

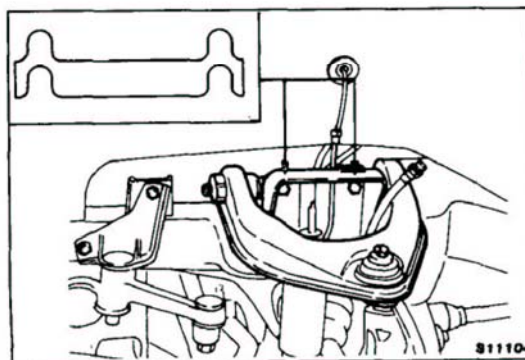
1. Remove the free-wheeling hub.
2. Measure the camber with a camber/caster/kingpin gauge.

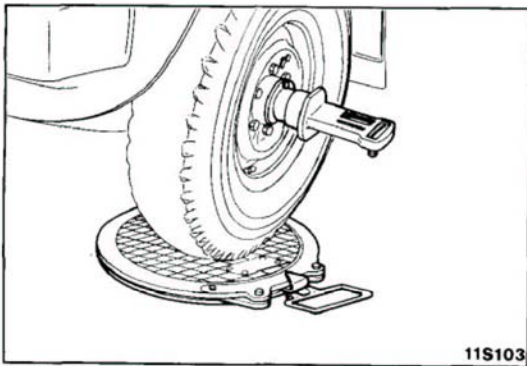
**Standard value : 1°30'**

3. Make adjustment of the camber by increasing or decreasing the thickness of the adjusting shims between the upper arm shaft and the crossmember. A total of 4 mm (.16 in.) shim thickness is normally required for standard camber. A 1.0 mm (.039 in.) adjustment in thickness of shims will provide about 13 minutes adjustment of camber.

Camber adjustment shim (yellow plating)

Part number	Thickness	mm (in.)
MB176288	1.0	(.039)
MB176289	2.0	(.079)

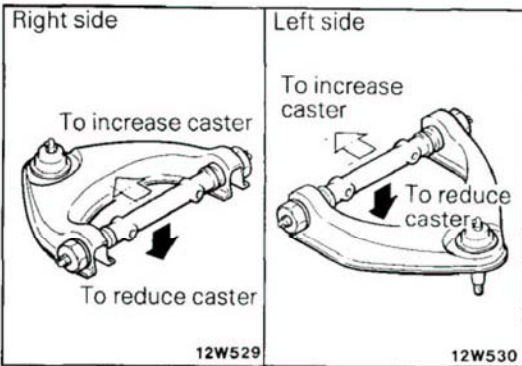




**CASTER**

1. Remove the free-wheeling hub.
2. Measure caster with a camber/caster/kingpin gauge and a turning radius gauge.

**Standard value : 2°57' ± 30'**



3. If caster does not meet specifications, remove the upper arm from the crossmember and then adjust by turning the upper arm shaft.  
A half turn of upper arm shaft will cause 1.25 mm (.049 in.) fore or aft movement of the upper arm shaft, resulting in about 17 minutes adjustment of caster.  
The adjustment must be made so that the difference between the caster's left side and right side is within 30 minutes.

**CHECKING FRONT AXLE TOTAL BACKLASH**

N02FDAA

1. If the vehicle vibrates and produces a booming sound due to the unbalance of the drivetrain, measure the front axle total backlash as follows to see if the differential carrier assembly requires removal.

(1) Set the hubs for 4WD.

**NOTE**

On vehicles with manual free-wheeling hubs, place the control handles in the LOCK position.

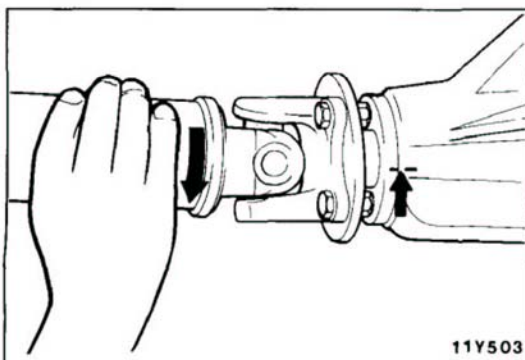
On vehicles with automatic free-wheeling hubs, place the transfer shift lever in 4H position and drive the vehicle 1 to 2 m (3.3 to 6.5 ft.) to engage the hubs with the drive shafts.

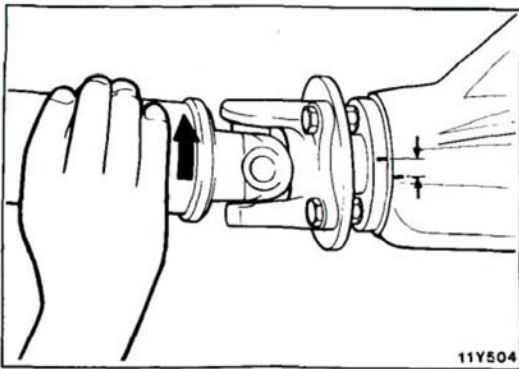
(2) Secure the wheels and set the transfer control lever to "2H".

**NOTE**

If the vehicle is raised on a jack, the wheels will turn and it will not be possible to measure the backlash.

(3) Turn the companion flange clockwise until all play is removed. Make mating marks on the dust cover of the companion flange and on the differential carrier.



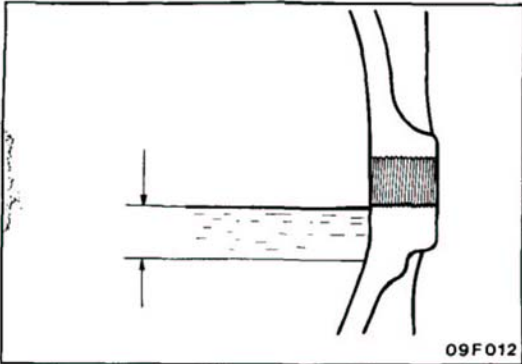


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- (4) Turn the companion flange counterclockwise until all play is removed and measure the amount of distance through which the mating marks moved.
- (5) If the backlash exceeds the limit, remove the differential carrier assembly and adjust the backlash and drive shaft or inner shaft spline play.

**Limit : 14 mm (.55 in.)**

2. If the backlash exceeds the limit, remove the differential carrier assembly and final drive gear, and check for differential gear meshing condition and drive shaft or inner shaft spline looseness.



09F012

### CHECKING GEAR OIL LEVEL

N02FEAB

Remove the filler plug and check the oil level. The oil level should be somewhere within 8 mm (.31 in.) from the bottom of the filler plug hole.

**Specified gear oil : Hypoid gear oil API classification GL-4 or higher SAE viscosity No. 80W, 90 [1.10 lit. (1.16 U.S.qts., 0.97 Imp.qts.)]**

### CHECKING DRIVE SHAFT END PLAY

N02FFAA

#### VEHICLES WITH AUTOMATIC FREE-WHEELING HUBS

1. Place the free-wheeling hubs in the free condition.

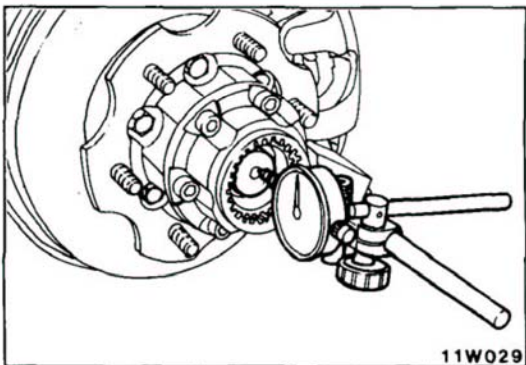
#### NOTE

The free condition can be obtained by shifting the transfer shift lever to the 2H position and then moving in reverse for 1 to 2 m (3.3 to 6.5 ft.).

2. Jack the vehicle up and remove the front wheels.
3. Remove the free-wheeling hub covers.
4. Rotate the drive shaft forward, and backward and then set the drive shaft to the position (the position where end play is maximum) mid-way between where the rotation feels "heavy" for each (where there is a stopping feeling).
5. Set the dial gauge as shown in the figure; then move the drive shaft in the axial direction and measure the play.

**Standard value : 0.2–0.5 mm (.008–.020 in.)**

6. If the play is out of standard value, adjust by adding or removing shims.



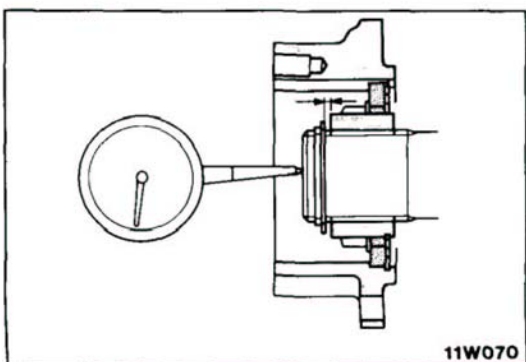
11W029

#### VEHICLES WITH MANUAL FREE-WHEELING HUBS

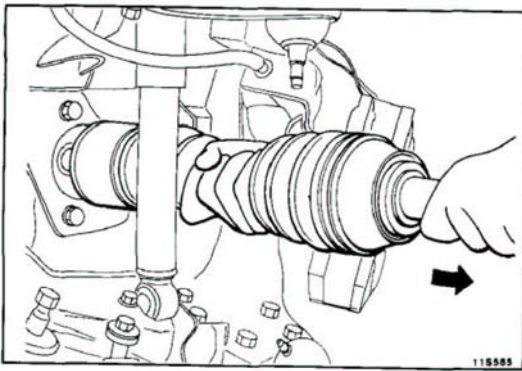
1. Jack the vehicle up and remove the front wheels.
2. Move the control handles for the free-wheeling hub to the FREE position.
3. Remove the free-wheeling hub covers.
4. Set the dial gauge as shown in the figure; then move the drive shaft in the axial direction and measure the play.

**Standard value : 0.2–0.5 mm (.008–.020 in.)**

5. If the play is out of standard value, adjust by adding or removing shims.



11W070



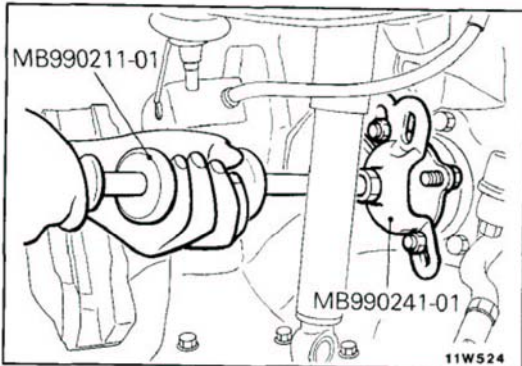
## REPLACEMENT OF DIFFERENTIAL CARRIER OIL SEAL

N02FGAB

1. Remove the under cover. (Refer to 2-40.)
2. Remove the front hub and knuckle assembly.
3. Remove the left drive shaft. (Refer to 2-52.)

### Caution

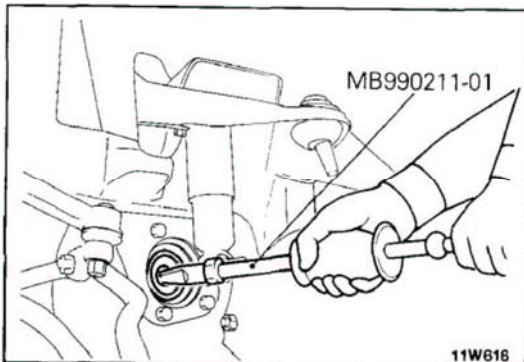
**When pulling the left drive shaft from the differential carrier assembly, be careful that the drive shaft spline does not damage the oil seal.**



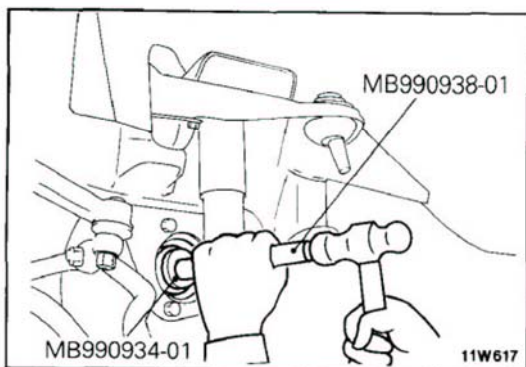
4. Remove the right drive shaft from the inner shaft assembly.
5. Remove the inner shaft assembly by using the special tools.

### Caution

**When pulling the inner shaft assembly from the differential carrier, be careful that the spline of the inner shaft does not damage the oil seal.**



6. Remove the differential mounting bracket (R.H.) and housing tube. (Refer to 2-66, 68.)
7. Use the special tool to remove the oil seal.



8. Press-fit the oil seal positively with the special tool and apply a thin coat of specified grease to the lip of the oil seal.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

9. Install the drive shaft using care not to damage the oil seal lip.

### NOTE

On R.H. side, after installation of the oil seal, install the housing tube and differential mounting bracket (R.H.). Install the inner shaft with care not to damage the oil seal lip, and install the drive shaft.

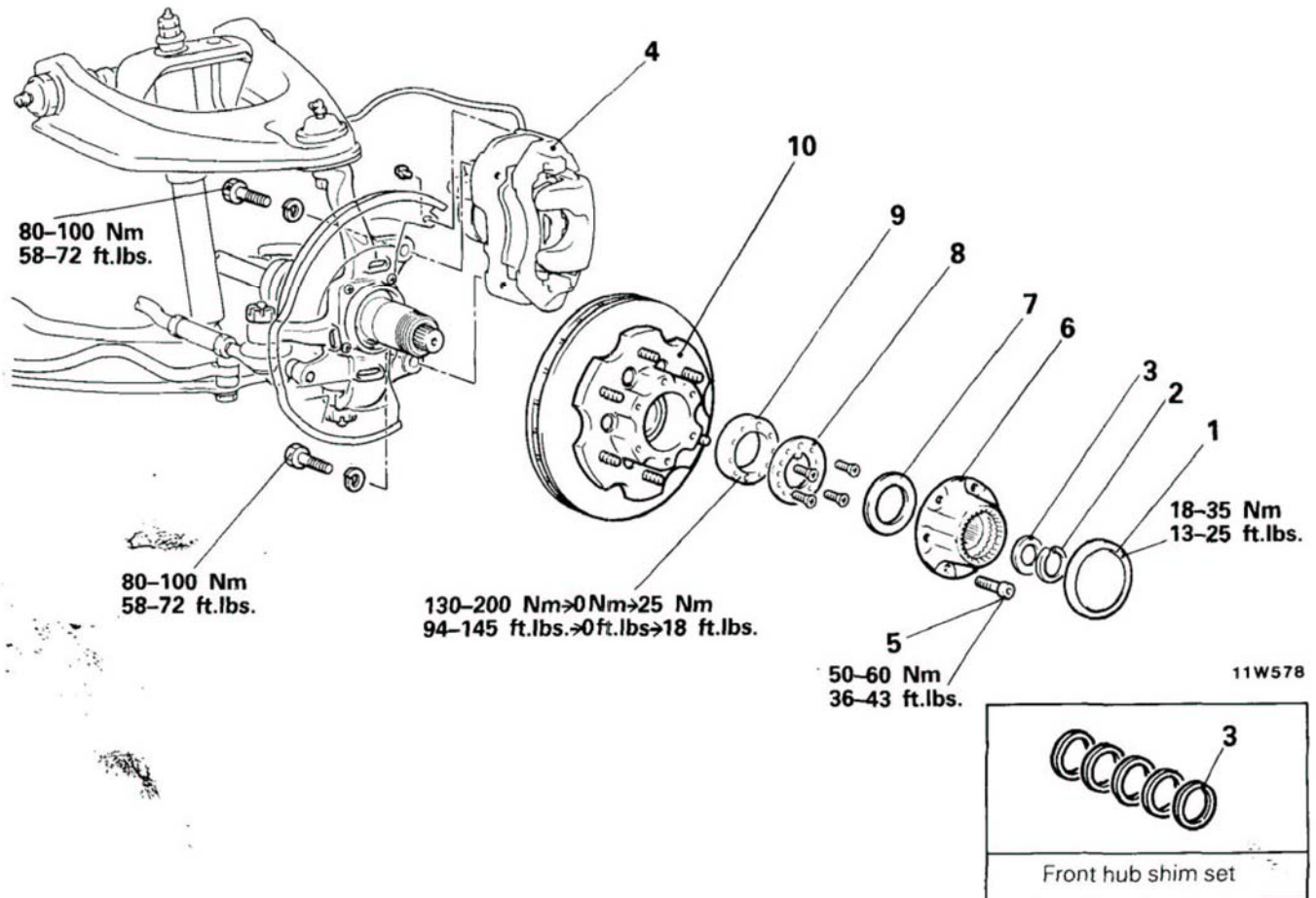
### Caution

**Be careful not to damage the lip of the oil seal. Replace the circlip which is attached to the B.J. side spline with a new one.**

10. Install the front hub and knuckle assembly.
11. Install the under cover.

## AXLE HUB AND FREE-WHEELING HUB

REMOVAL AND INSTALLATION (Vehicles with Automatic Free-Wheeling Hubs) N02GA--



### Removal steps

- ◄► 1. Cover
  - ◆◆ Adjustment of drive shaft end play
- ◄► 2. Snap ring
- ◄► 3. Shim
- ◄► 4. Front brake assembly
  - ◆◆ Adjustment of automatic free-wheeling hub turning resistance
- ◄► 5. Bolts
  - ◆◆ 6. Automatic free-wheeling hub assembly
  - ◆◆ Height adjustment of brake contact surface
- 7. Shim
- 8. Lock washer
  - ◆◆ Adjustment of wheel bearing preload
- ◄► 9. Lock nut
- ◄► 10. Front hub assembly

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◄► : Refer to "Service Points of Removal".
- (3) ◆◆ : Refer to "Service points of Installation".

N02GBAB

**SERVICE POINTS OF REMOVAL****1. REMOVAL OF COVER**

- (1) Place the free-wheeling hub in the free condition.

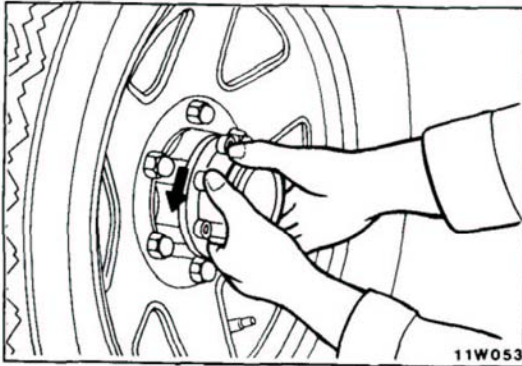
**NOTE**

The free condition can be obtained by shifting the transfer shift lever to the 2H position and then moving in reverse for 1 to 2 meters (3.3 to 6.5 ft.).

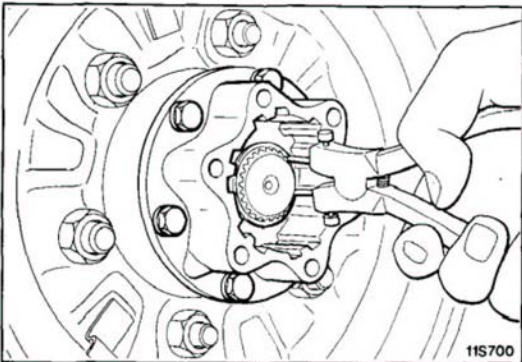
- (2) Remove the automatic free-wheeling hub cover.

**NOTE**

When the cover cannot be loosened by hand, use an oil filter wrench with a protective cloth in between not to damage the cover.

**2. REMOVAL OF SNAP RING**

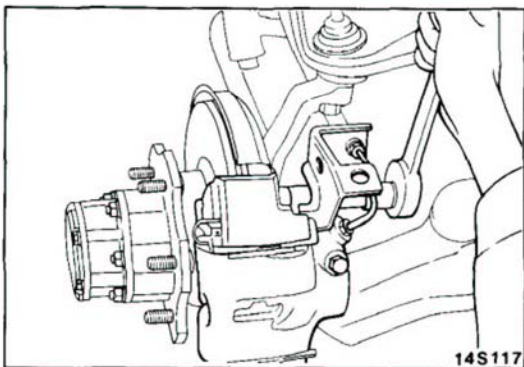
Using a snap ring pliers, remove the snap ring from the drive shaft.

**4. REMOVAL OF FRONT BRAKE ASSEMBLY**

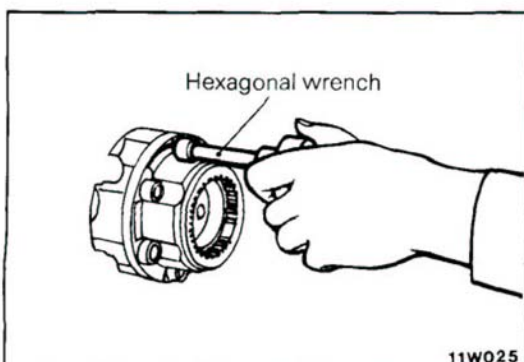
- (1) Remove the front brake assembly with the brake hose connected.
- (2) Use wire to suspend the front brake assembly from the upper arm so that the front brake assembly won't fall.

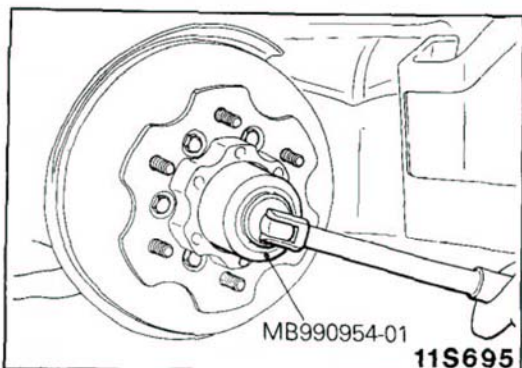
**Caution**

**Do not twist the brake hose.**

**5. REMOVAL OF BOLTS**

Remove the automatic free-wheeling hub by using the hexagonal wrench.



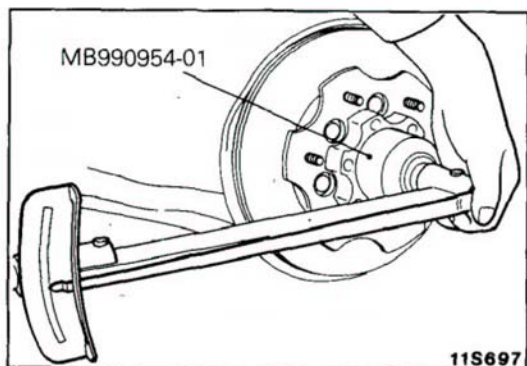
**9. REMOVAL OF LOCK NUT/10. FRONT HUB ASSEMBLY**

- (1) After the lock washer has been removed, remove the lock nut with the special tool.
- (2) Remove the front hub assembly from the knuckle together with the inner and outer bearings.

**INSPECTION**

N02GCAA

- Check the wheel bearing for seizure, discoloration and rough raceway surface.
- Check the front hub for cracks.
- Check the oil seals for cracks and damage.

**SERVICE POINTS OF INSTALLATION**

N02GDAB

- **ADJUSTMENT OF WHEEL BEARING PRELOAD**

- (1) Using the special tool, tighten the lock nut by the following procedures.

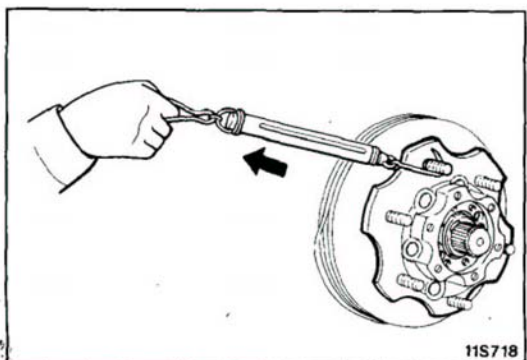
Tighten to 130-200 Nm (94-145 ft.lbs.)



Loosen to 0 Nm (0 ft.lbs.)



Retighten to 25 Nm (18 ft.lbs.) and then loosen 30°-40°

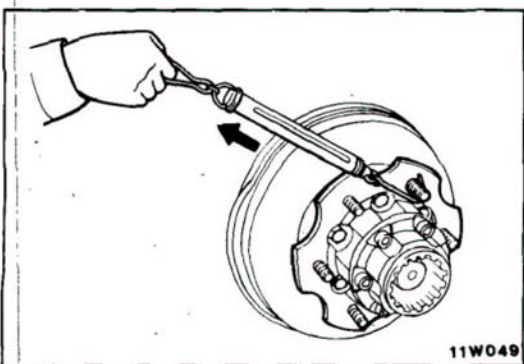
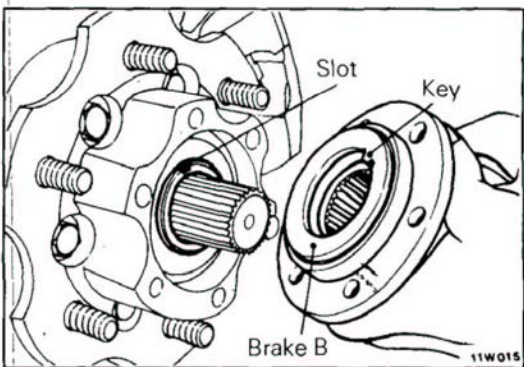
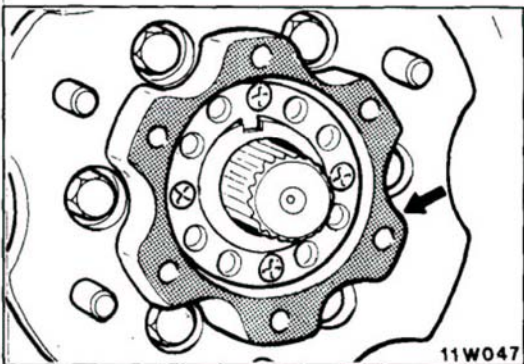
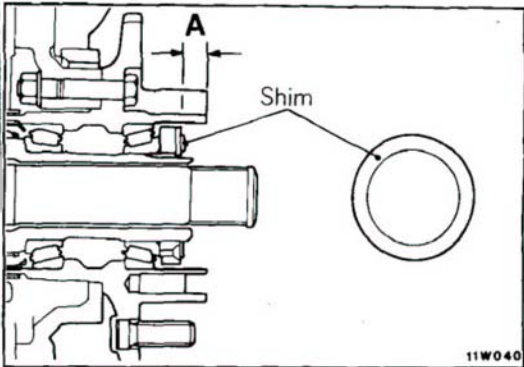
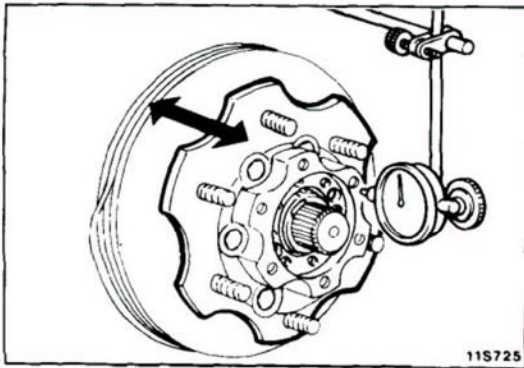


- (2) Loosen the lock nut approximately 30 to 40 degrees to adjust the front hub's turning resistance and play in the axial direction so that they agree with the standard values.

**Standard value : 30-130 Ncm**  
**(2.6-11.3 in.lbs.)**  
**[Spring scale reading]**  
**5-18 N (1.1-4.0 lbs.)**

**Standard value : 0.05 mm (.0020 in.) or less**



**NOTE**

If adjustment is not possible, the bearing may be incorrectly installed; check and, if necessary, repair. The lubrication condition should also be checked.

- (3) Mount the lock washer. If the lock washer holes do not align with the lock nut holes, loosen the lock nut (no more than 30 to 40 degrees) to align them.

- **HEIGHT ADJUSTMENT OF BRAKE CONTACT SURFACE**

Measure the height of brake contact surface.

- ① Using a depth gauge, measure the dimension A shown in illustration at two points.

**Standard value : 11.8–12.2 mm (.465–.480 in.)**

- ② If the average of the measured values is out of standard value, adjust by inserting shims.

## 6. INSTALLATION OF AUTOMATIC FREE-WHEELING HUB ASSEMBLY

- (1) Apply a coating of specified sealant, equally all around and without any missed spots, to the free-wheeling hub body assembly and front hub contact surfaces.

**Specified sealant : 3M ART Part No. 8661 or No. 8663, or equivalent**

**Caution**

**Make sure that there is no excess specified sealant on the hub outside surface.**

- (2) Align the key of the brake (B) and the keyway of knuckle spindle and loosely install the automatic free-wheeling hub assembly.
- (3) Check that the hub proper and automatic free-wheeling hub assembly are brought into intimate contact when the assembly is forced lightly against the hub proper. If not; turn the hub until intimate contact is achieved.

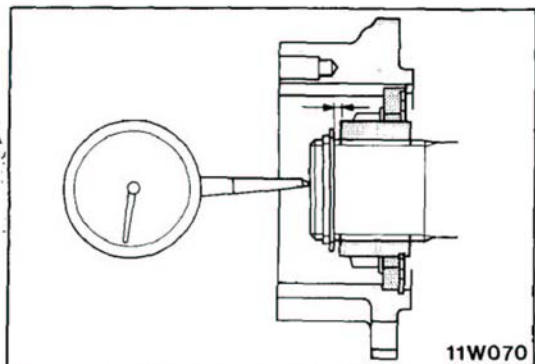
- **ADJUSTMENT OF AUTOMATIC FREE-WHEELING HUB TURNING RESISTANCE**

Check the automatic free-wheeling hub turning resistance by the following procedure.

- ① Use a spring scale to measure the front hub turning resistance again. Subtract the value measured in step (1) from that measured here to find the turning resistance of the free-wheeling hub.

Limit : 100 Ncm (8.7 in. lbs.)  
[Spring scale reading]  
14 N (3.1 lbs.)

- ② If the free-wheeling hub turning resistance exceeds the limit, disassemble and reassemble the free-wheeling hub again.



● **ADJUSTMENT OF DRIVE SHAFT END PLAY**

After the installation of shim and snap ring, check the drive shaft end play by the following procedure.

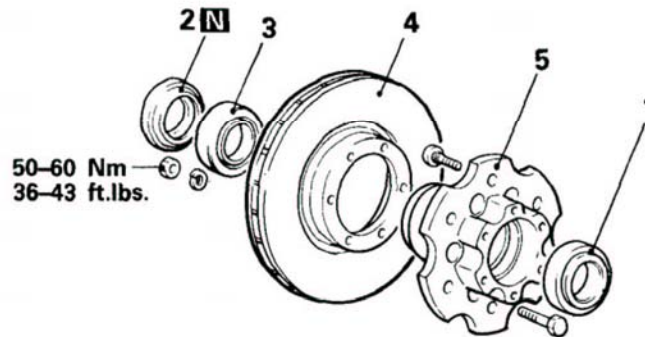
- ① Rotate the drive shaft forward, and backward and then set the drive shaft to the position (the position where end play is maximum) mid-way between where the rotation feels "heavy" for each (where there is a stopping feeling).  
Set the dial gauge as shown in the figure; then move the drive shaft in the axial direction and measure the play.

**Standard value : 0.2–0.5 mm (.008–.020 in.)**

- ② If the play is out of standard value, adjust by adding or removing shims.

DISASSEMBLY AND REASSEMBLY (Front Axle Hub)

N02HA--



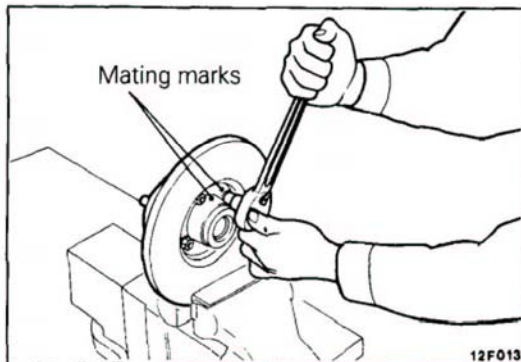
Disassembly steps

- 1. Outer bearing
- ◄◄ 2. Oil seal
- 3. Inner bearing
- ◄◄ 4. Brake disc
- 5. Front hub

NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◄◄ : Refer to "Service Points of Disassembly".
- (3) ◄◄ : Refer to "Service Points of Reassembly".
- (4) N : Non-reusable parts

11W041

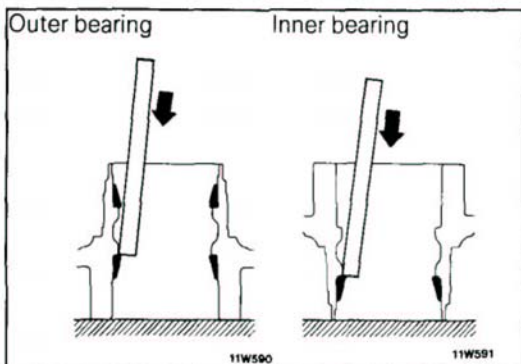


SERVICE POINTS OF DISASSEMBLY

N02HBAA

4. REMOVAL OF BRAKE DISC

Make the mating marks on the brake disc and front hub, and then separate the front hub and brake disc, if necessary.

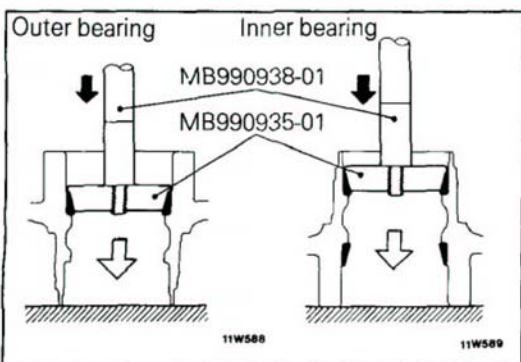


REPLACEMENT OF BEARING

N02HDAB

- (1) Remove the oil seal.
- (2) Wipe off grease from the front hub interior.
- (3) Using the drift against, drive out the inner and outer bearing outer races by tapping them uniformly.
- (4) Apply the specified grease to the outside surface of the new inner and outer bearing outer races.

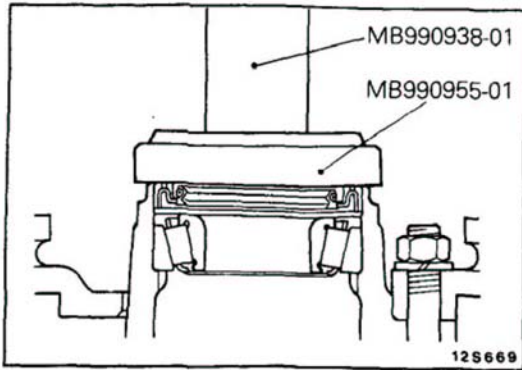
**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**



- (5) Press-fit the inner and outer bearing outer races by using the special tools.

NOTE

The bearing inner race and bearing outer race should be replaced as an assembly.

**SERVICE POINTS OF REASSEMBLY**

N02HEAB

**2. INSTALLATION OF OIL SEAL**

- (1) Apply the specified grease to the oil seal lip and inside surface of the front hub.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

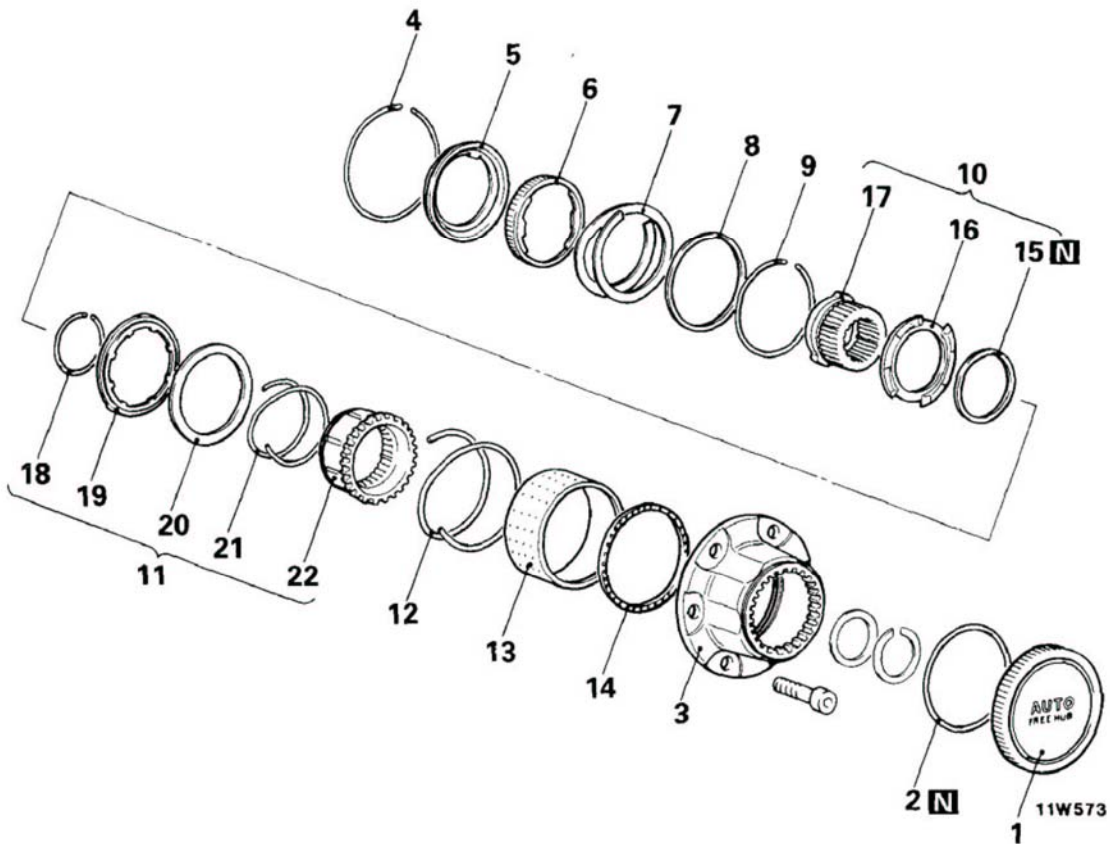
- (2) Apply the specified grease to the inner bearing inner race and install the inner race into the front hub.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

- (3) Press-fit the new oil seal into the front hub by using the special tools, until it is flush with the front hub end face.

DISASSEMBLY AND REASSEMBLY (Automatic Free-Wheeling Hub)

N02JA--



Disassembly steps

- |                            |   |                          |
|----------------------------|---|--------------------------|
| 1. Cover                   | ↔ | 15. Drive gear snap ring |
| 2. O-ring                  |   | 16. Retainer (A)         |
| 3. Housing                 |   | 17. Drive gear           |
| ↔↔ 4. Housing C ring       | ↔ | 18. Slide gear C ring    |
| ↔↔ 5. Brake (B)            |   | 19. Cam                  |
| ↔↔ 6. Brake (A)            |   | 20. Spring holder        |
| ↔↔ 7. Brake spring         |   | 21. Shift spring         |
| ↔↔ 8. Housing snap ring    |   | 22. Slide gear           |
| ↔↔ 9. Retainer (B) C ring  |   |                          |
| ↔↔ 10. Drive gear assembly |   |                          |
| ↔↔ 11. Slide gear assembly |   |                          |
| ↔↔↔ 12. Return spring      |   |                          |
| ↔↔↔ 13. Retainer (B)       |   |                          |
| ↔↔↔ 14. Retainer bearing   |   |                          |

NOTE

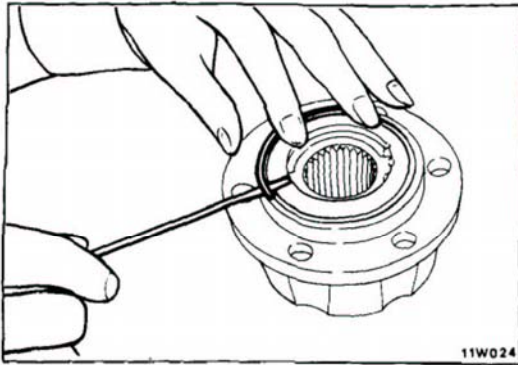
- (1) Reverse the disassembly procedures to reassemble.
- (2) ↔↔ : Refer to "Service Points of Disassembly".
- (3) ↔↔↔ : Refer to "Service points of Reassembly".
- (4) [N] : Non-reusable parts

**SERVICE POINTS OF DISASSEMBLY****4. REMOVAL OF HOUSING C RING**

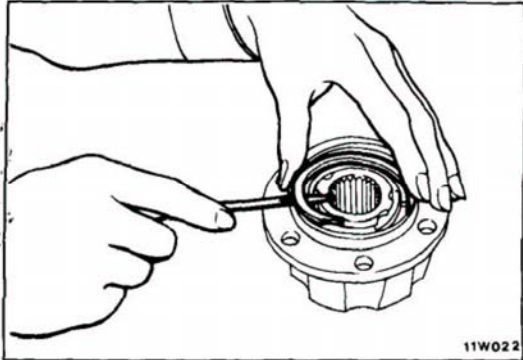
Remove the housing C ring.

**NOTE**

The ring is easily removable by pushing the brake (B) in and using a small-end screwdriver, etc.

**8. REMOVAL OF HOUSING SNAP RING**

Remove the housing snap ring.

**9. REMOVAL OF RETAINER (B) C RING**

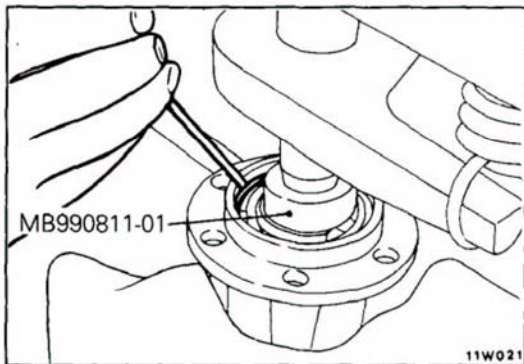
Using a special tool, lightly push the drive gear in and remove the retainer (B) C ring.

**NOTE**

Since the return spring relaxes approx. 40 mm (1.57 in.), the stroke of the press should be set to more than 40 mm (1.57 in.)

**Caution**

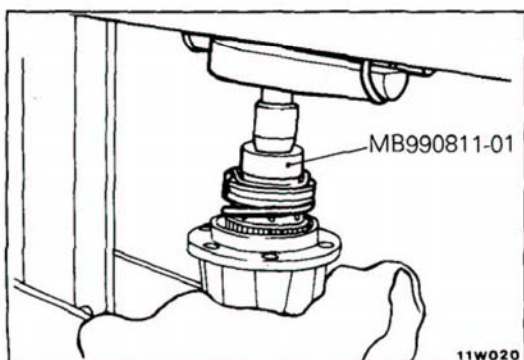
1. Place a protective cover not to damage the cover attaching surface of the housing before setting on the press table.
2. Make sure that the pressing force does not exceed 200 N (44.1 lbs.).

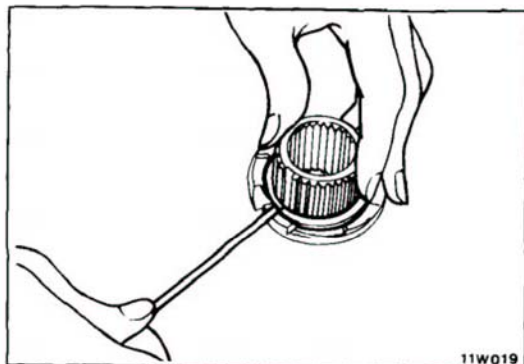
**10. REMOVAL OF DRIVE GEAR ASSEMBLY/11. SLIDE GEAR ASSEMBLY/12. RETURN SPRING**

Slowly reduce the pressure of the press until the return spring fully relaxes.

**Caution**

When the pressure of the press is removed, make sure that the retainer (A) is not caught by the retainer (B).



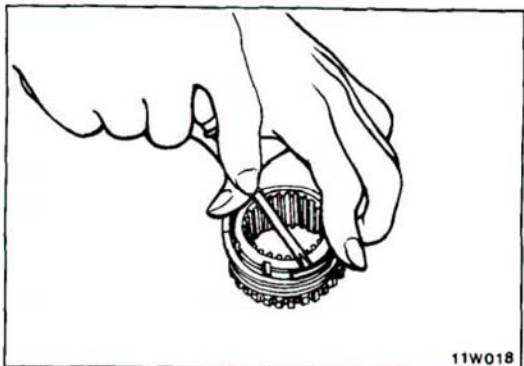


**15. REMOVAL OF DRIVE GEAR SNAP RING**

Remove the drive gear snap ring.

**Caution**

**When the drive gear snap ring is removed, be sure to replace it with a new one.**



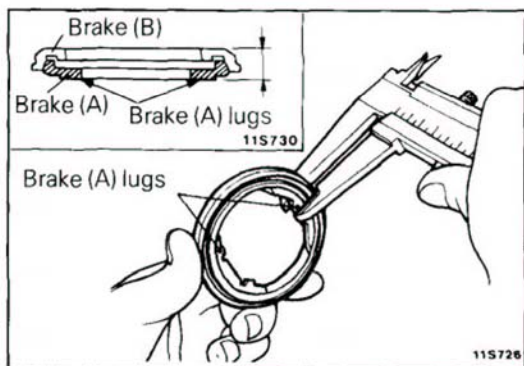
**18. REMOVAL OF SLIDE GEAR C RING**

Push the cam in and remove the slide gear C ring with the spring compressed.

**INSPECTION**

N02JCAA

- Check the drive gear and slide gear splines for damage.
- Check the cam portion of retainer (A) for wear and damage.
- Check the cam for wear and damage.
- Check the slide gear and housing tooth surfaces for damage.
- Check the retainer B and housing contact surfaces for wear and damage.



**BRAKE ASSEMBLY THICKNESS**

Check the brake assembly thickness by following the steps below.

- (1) Assemble brake (A) and brake (B) and then use slide calipers to measure the thickness of the assembly at the two lugs on brake (A).

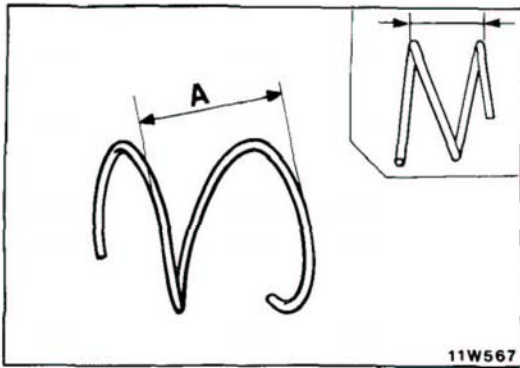
**Standard value : 10.5 mm (.413 in.)**

**Limit : 9.6 mm (.378 in.)**

**NOTE**

Measure each side separately.

- (2) If the measured value is below the limit, replace brake (A) and brake (B) as a set.

**DETERIORATION OF RETURN SPRING**

Check the return spring for deterioration by following the steps below.

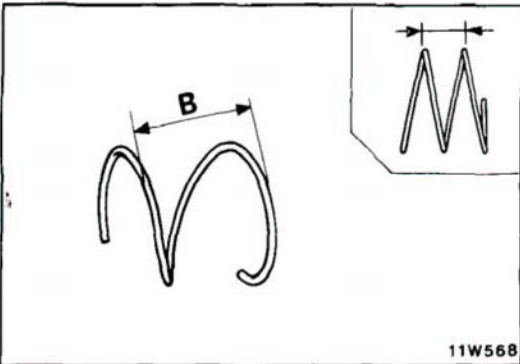
- (1) Measure the dimension A shown in illustration at the opposite side of spring end.

**Limit : 35 mm (1.38 in.)**

**Caution**

**To measure the dimension A shown in illustration, measure the dimension from the outermost extremity of one wire diameter to that of the other wire diameter.**

- (2) If the measured value is below the limit, replace the spring.

**DETERIORATION OF SHIFT SPRING**

Check the shift spring for deterioration by following the steps below.

- (1) Measure the dimension B shown in illustration at the opposite side of spring end.

**Limit : 30 mm (1.18 in.)**

**Caution**

**To measure the dimension B shown in illustration, measure the dimension from the outermost extremity of one wire diameter to that of the other wire diameter.**

- (2) If the measured value is below the limit, replace the spring.

**SERVICE POINTS OF REASSEMBLY**

N02JDAB

Apply the specified grease to the attaching surfaces of all components.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

**13. APPLICATION OF GREASE TO RETAINER (B)**

Pack the grooves of retainer (B) with the specified grease.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

**12. INSTALLATION OF RETURN SPRING**

Install the return spring with the smaller coil diameter side toward the cam.

**5. APPLICATION OF GREASE TO BRAKE (B)**

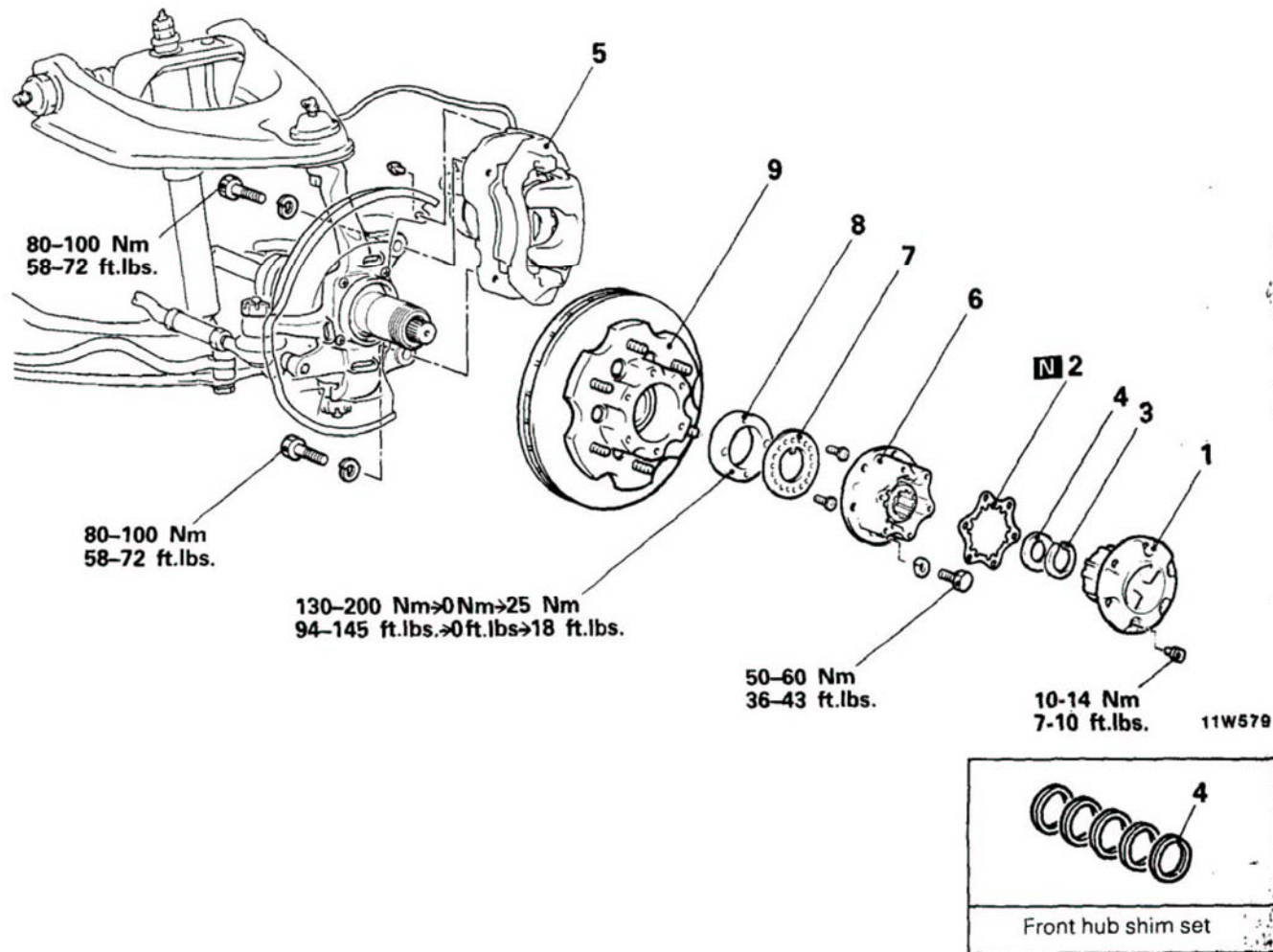
Pack the grooves of brake (B) with the specified grease.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**



REMOVAL AND INSTALLATION (Vehicles with Manual Free-Wheeling Hubs)

N02GA-

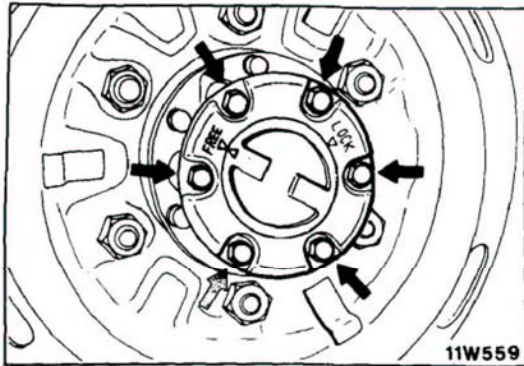


Removal steps

- ↔ 1. Free-wheeling hub cover
- ↔ 2. Gasket
  - ➡ Adjustment of drive shaft end play
- ↔ 3. Snap ring
- ↔ 4. Shim
- ↔ 5. Front brake assembly
  - ➡ 6. Manual free-wheeling hub assembly
- ↔ 7. Lock washer
  - ➡ Adjustment of wheel bearing preload
- ↔ 8. Lock nut
- ↔ 9. Front hub assembly

NOTE

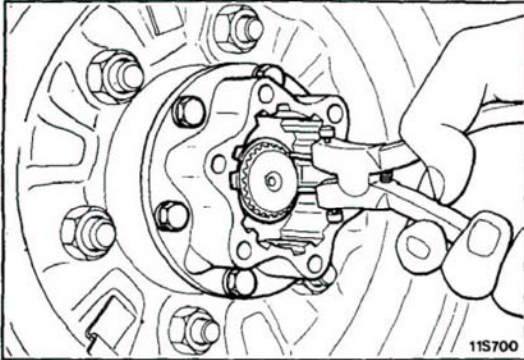
- (1) Reverse the removal procedures to reinstall.
- (2) ↔ : Refer to "Service Points of Removal".
- (3) ➡ : Refer to "Service Points of Installation".
- (4) **N** : Non-reusable parts

**SERVICE POINTS OF REMOVAL**

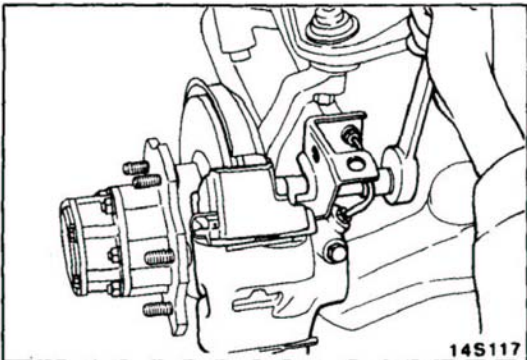
N02GBBA

**1. REMOVAL OF FREE-WHEELING HUB COVER**

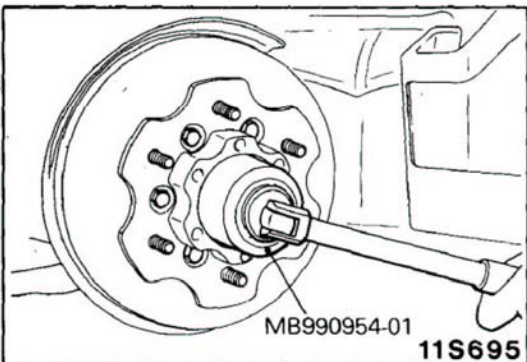
- (1) Set the control handle to the FREE position.
- (2) Remove the free-wheeling hub cover.

**3. REMOVAL OF SNAP RING**

- Using a snap ring pliers, remove the snap ring from the drive shaft.

**5. REMOVAL OF FRONT BRAKE ASSEMBLY**

- (1) Remove the front brake assembly with the brake hose connected.
- (2) Use wire to suspend the front brake assembly from the upper arm so that the front brake assembly won't fall.

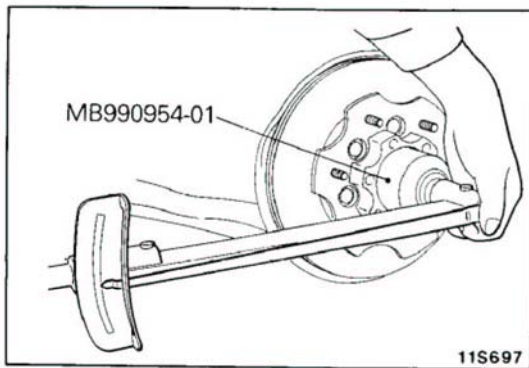
**Caution****Do not twist the brake hose.****8. REMOVAL OF LOCK NUT/9. FRONT HUB ASSEMBLY**

- (1) After the lock washer has been removed, remove the lock nut with the special tool.
- (2) Remove the front hub assembly from the knuckle together with the inner and outer bearings.

**INSPECTION**

N02GCAA

- Check the wheel bearing for seizure, discoloration and rough raceway surface.
- Check the front hub for cracks.
- Check the oil seal for cracks and damage.

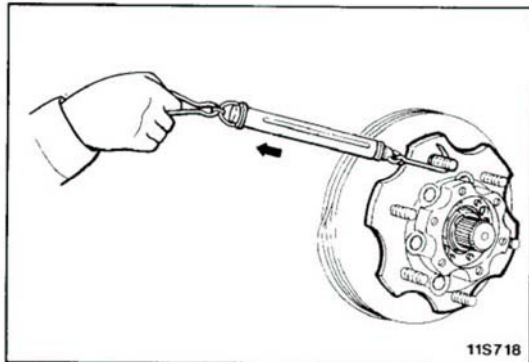
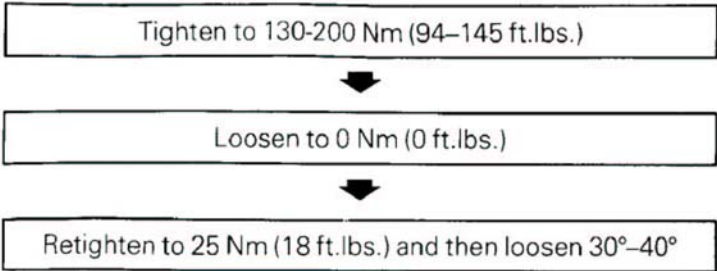


**SERVICE POINTS OF INSTALLATION**

N02GDBB

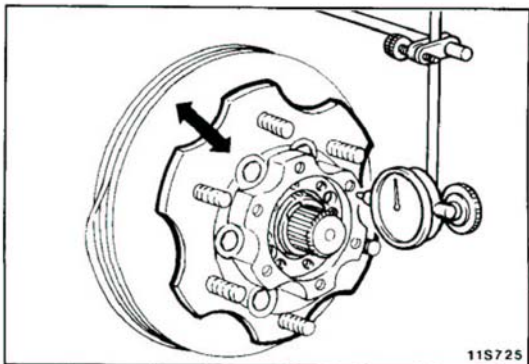
● **ADJUSTMENT OF WHEEL BEARING PRELOAD**

- (1) Using the special tool, tighten the lock nut by the following procedure.



- (2) Loosen the lock nut approximately 30 to 40 degrees to adjust the front hub's turning resistance and play in the axial direction so that they agree with the standard values.

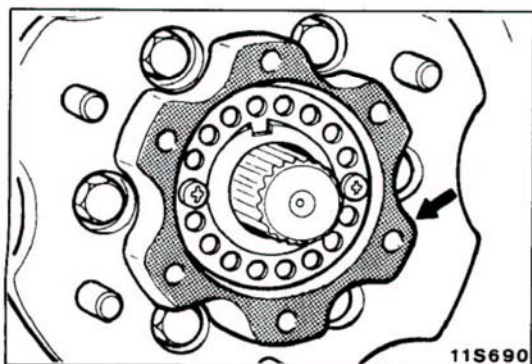
**Standard value : 30-130 Ncm (2.6-11.3 in.lbs.)**  
**[Spring scale reading]**  
**5-18 N (1.1-4.0 lbs.)**  
**Standard value : 0.05 mm (.0020 in.) or less**



**NOTE**

If adjustment is not possible, the bearing may be incorrectly installed; check and, if necessary, repair. The lubrication condition should also be checked.

- (3) Mount the lock washer. If the lock washer holes do not align with the lock nut holes, loosen the lock nut (no more than 30 to 40 degrees) to align them.



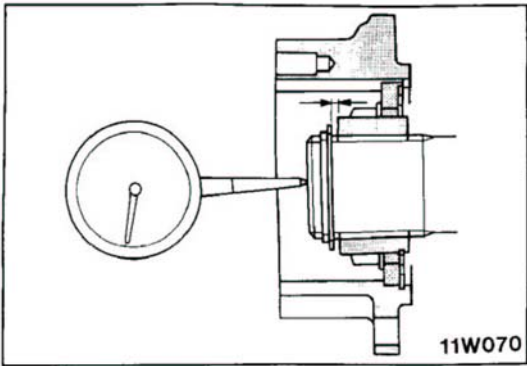
**6. INSTALLATION OF MANUAL FREE-WHEELING HUB ASSEMBLY**

Apply a coating of specified sealant, equally all around and without any missed spots, to the free wheeling hub body assembly and front hub contact surfaces.

**Specified sealant : 3M ART Part No. 8661, No. 8663, or equivalent**

**Caution**

**Make sure that there is no excess specified sealant on the hub outside surface.**



- **ADJUSTMENT OF DRIVE SHAFT END PLAY**

After assembly in the order of the shim and then the snap ring, check the drive shaft end play.

Set the dial gauge as shown in the figure; then move the drive shaft in the axial direction and measure the play.

**Standard value : 0.2–0.5 mm (.008–.020 in.)**

If the play is out of standard value, adjust by adding or removing shims.

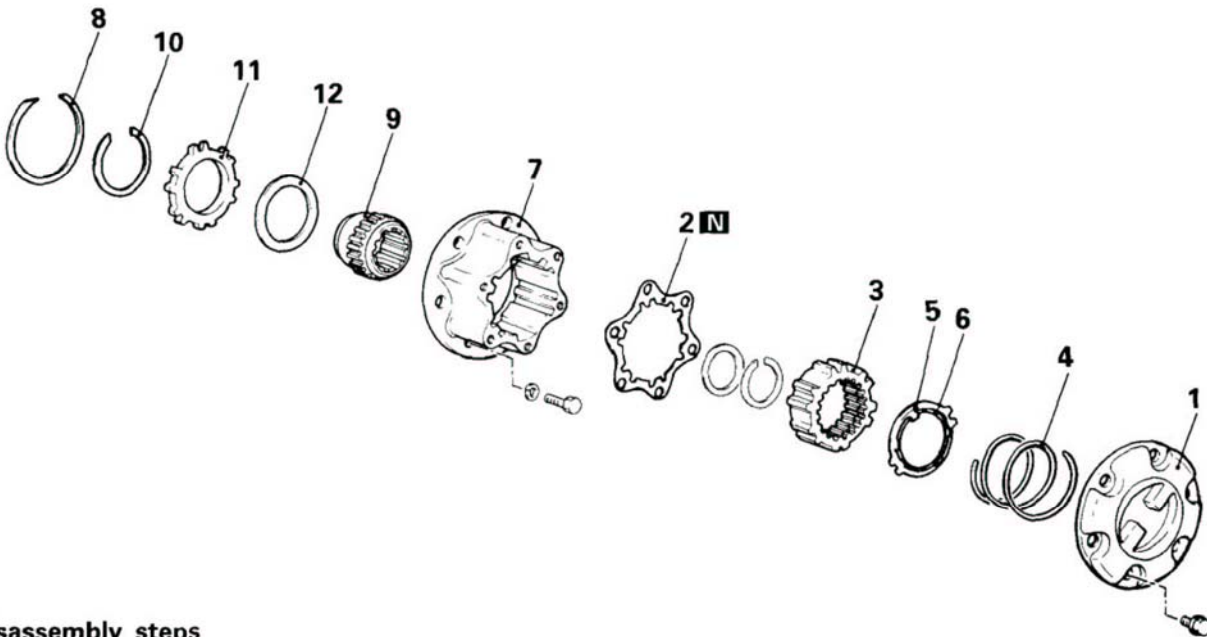
**DISASSEMBLY AND REASSEMBLY (Front Axle Hub)**

N02HA--

Refer to P.2-23.

**DISASSEMBLY AND REASSEMBLY (Manual free-Wheeling Hub)**

N02JA--

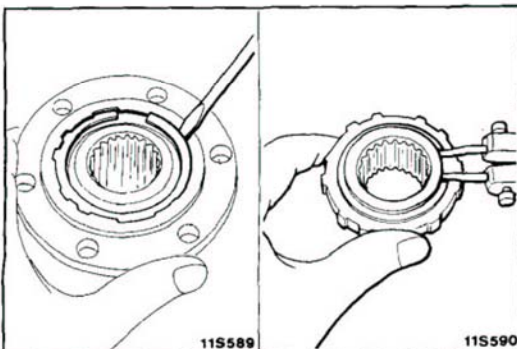


**Disassembly steps**

- ◆◆ 1. Free wheeling hub cover
- ◆◆ 2. Gasket
- ◆◆ 3. Free wheeling hub clutch
- ◆◆ 4. Compression spring
- ◆◆ 5. Follower
- ◆◆ 6. Tension spring
- ◆◆ 7. Free wheeling hub body
- ◆◆ 8. Wheel snap ring
- ◆◆ 9. Inner hub
- ◆◆ 10. Shaft snap ring
- ◆◆ 11. Free wheeling hub ring
- ◆◆ 12. Spacer

**NOTE**

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆ : Refer to "Service Points of Reassembly".
- (4) N : Non-reusable parts



**SERVICE POINTS OF DISASSEMBLY**

N02JBBA

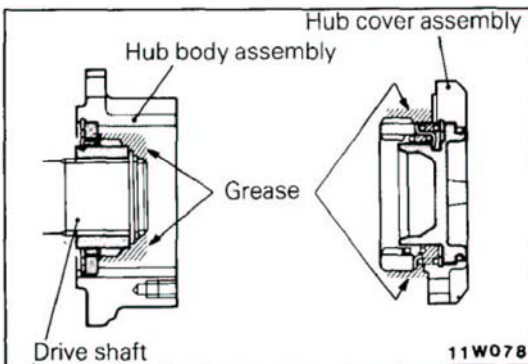
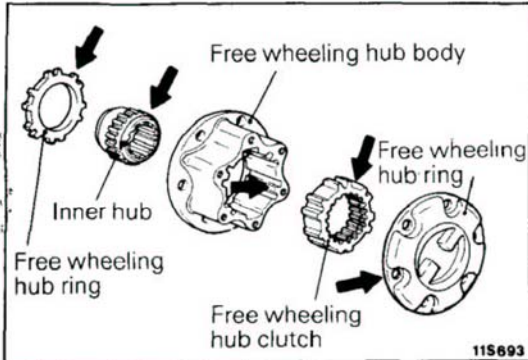
**8. REMOVAL OF WHEEL SNAP RING/10. SHAFT SNAP RING**

- (1) Using a screwdriver, remove the snap ring and remove the inner hub from the free wheeling hub body.
- (2) Remove the snap ring from the inner hub with a snap ring pliers.

## INSPECTION

N02JCBA

- Check the free wheeling hub ring, inner hub, free wheeling hub body, and clutch for wear or seizure.
- Check the gasket for damage.
- Check the compression spring and tension spring for deterioration.



## SERVICE POINTS OF REASSEMBLY

N02JDBB

### 11. APPLICATION OF GREASE TO FREE WHEELING HUB RING/9. INNER HUB/7. FREE WHEELING HUB BODY/3. FREE WHEELING HUB CLUTCH/1. FREE WHEELING HUB COVER

- (1) Apply the specified grease to the entire periphery of the free wheeling hub ring, inner hub and free wheeling hub clutch, free wheeling hub cover and the inside of the free wheeling hub body.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

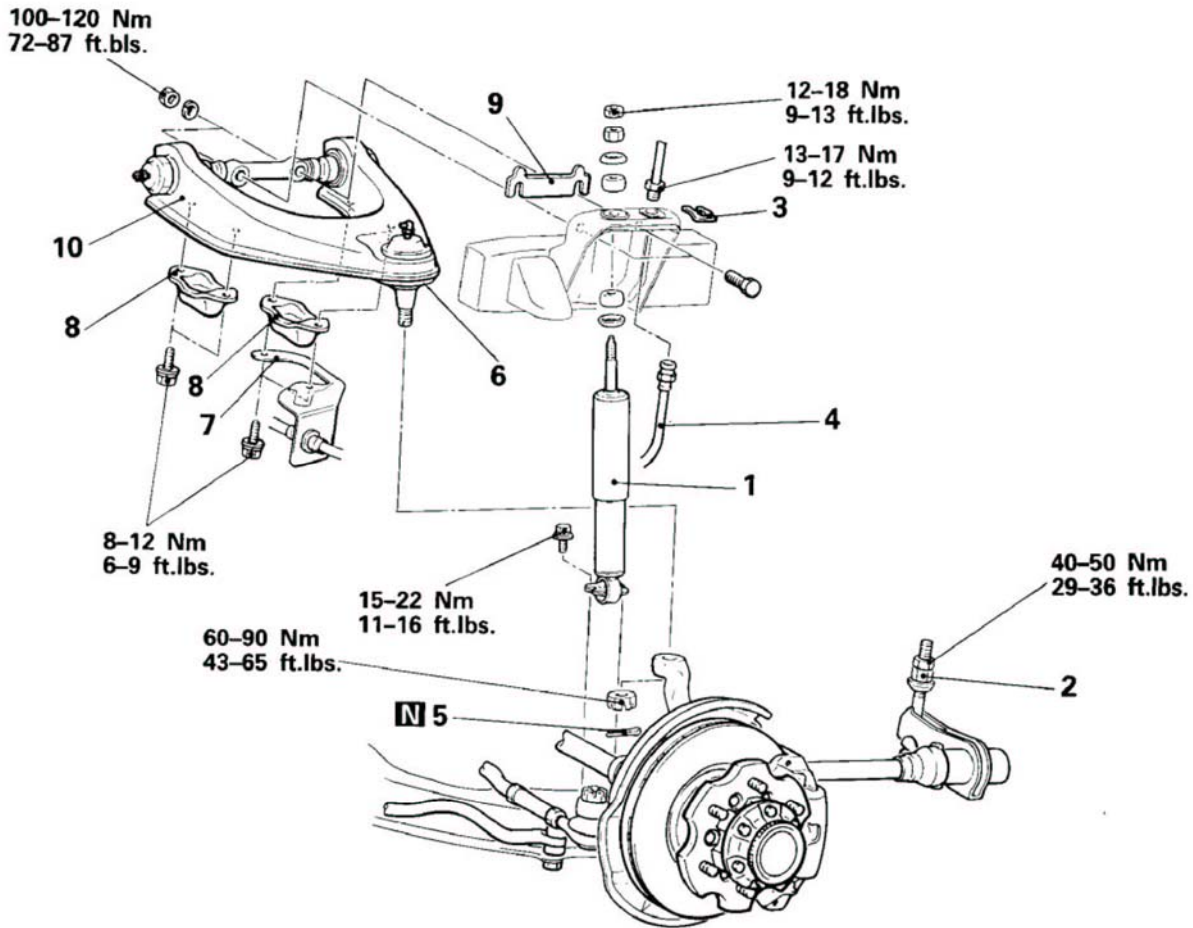
- (2) Check to be sure that the hub body assembly and hub cover assembly are coated (at the positions shown in the figure) with a sufficient coating of the specified grease.
- (3) Add more grease if necessary.

## NOTE

A liberal amount of grease should be applied, especially when grease is wiped away or a new free-wheeling hub is installed.

# SHOCK ABSORBER AND UPPER ARM REMOVAL AND INSTALLATION

N02MA--



12W557

### Post-installation Operation

- Inspection and Adjustment of Wheel Alignment (Refer to P.2-14.)

### Shock absorber removal steps

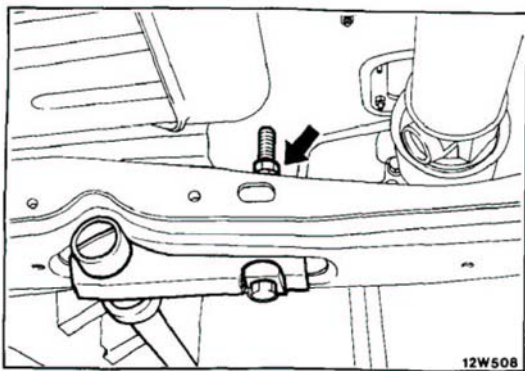
- ◆◆ 1. Shock absorber

### Upper arm removal steps

- ◆◆ Adjustment of clearance between bump stopper and bump stopper bracket
- ◆◆ 2. Anchor arm assembly adjusting nut
- ◆◆ 3. Hose clip
- ◆◆ 4. Connection of brake hose
- ◆◆ 5. Cotter pin
- ◆◆ 6. Connection of upper ball joint and knuckle
- ◆◆ 7. Brake hose support
- ◆◆ 8. Rebound stopper
- ◆◆ 9. Shim
- ◆◆ ◆◆ 10. Upper arm

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆ : Refer to "Service Points of Installation".
- (4) **N** : Non-reusable parts

**SERVICE POINTS OF REMOVAL**

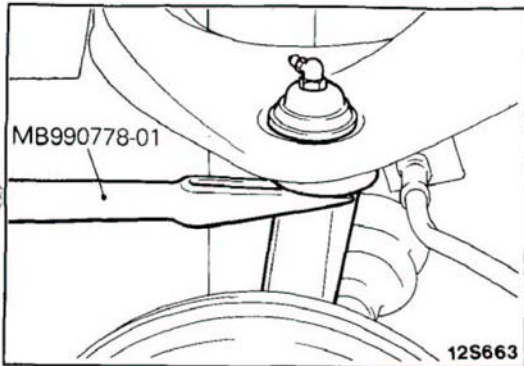
N02MBAA

**2. LOOSENING OF ANCHOR ARM ASSEMBLY ADJUSTING NUT**

Loosen the anchor bolt of the torsion bar all the way.

**NOTE**

When the anchor arm assembly adjusting nut is loosened, use a jack to support the lower arm of the side to be loosened, thus the work easier.

**6. DISCONNECTION OF UPPER BALL JOINT FROM KNUCKLE**

- (1) Loosen the nut tightening the upper ball joint to the knuckle.

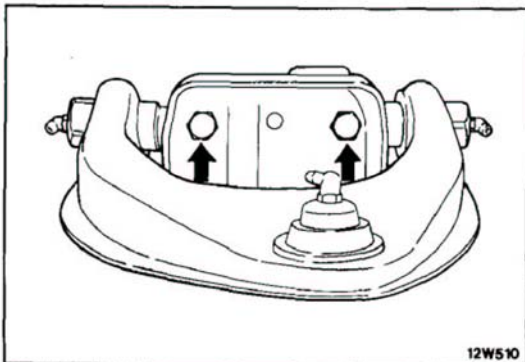
**NOTE**

The nut should be partially loosened and should not be removed.

- (2) Using a special tool, disconnect the upper ball joint from the knuckle.

**Caution**

**Tie the special tool to the upper arm, for example, with a string to prevent bouncing.**

**10. REMOVAL OF UPPER ARM**

Remove the upper arm from the crossmember.

**NOTE**

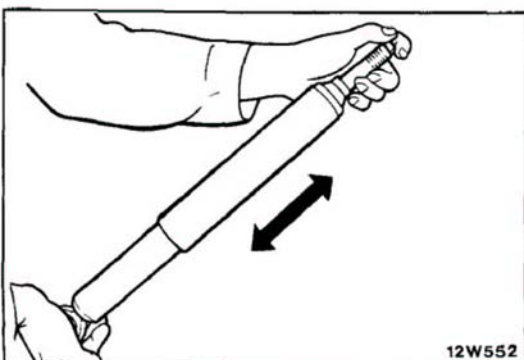
The camber adjustment shims should be stored for reference at assembly.

Do not turn the upper arm shaft, as it changes caster.

**INSPECTION**

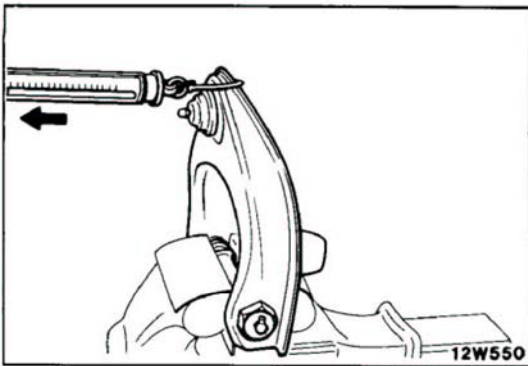
N02MCAA

- Check the upper arm for cracks or deformation.
- Check the upper arm shaft for cracks or bends.

**SHOCK ABSORBER**

Expand and contract the shock absorber to check it for damage, oil leakage or abnormal noise.





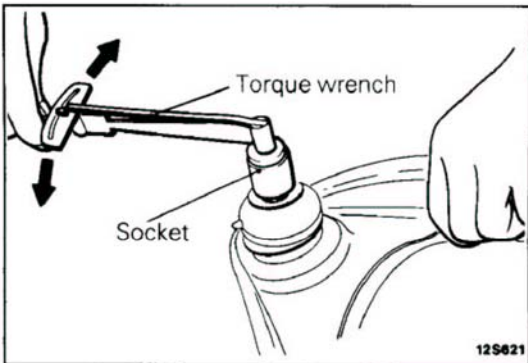
**UPPER ARM SHAFT STARTING TORQUE**

Check the upper arm shaft starting torque by following the steps below.

1. With the upper arm shaft held in a vice, measure the upper arm shaft starting torque with a spring balance.

**Limit : 15 Nm (11ft.lbs.)**  
**[Spring scale reading]**  
**6.8 N (1.5 lbs.)**

2. If the upper arm shaft starting torque exceeds the limit, replace the upper arm assembly



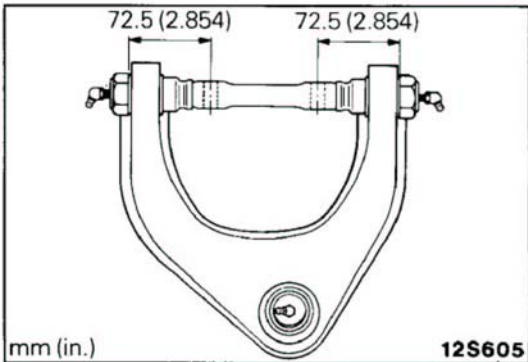
**UPPER BALL JOINT STARTING TORQUE**

Check the upper ball joint starting torque by following the steps below.

1. Measure the upper ball joint starting torque with a torque wrench.

**Standard value : 80–350 Ncm (7–30 in.lbs.)**

2. If the upper ball joint starting torque is out of specification, replace the upper ball joint.

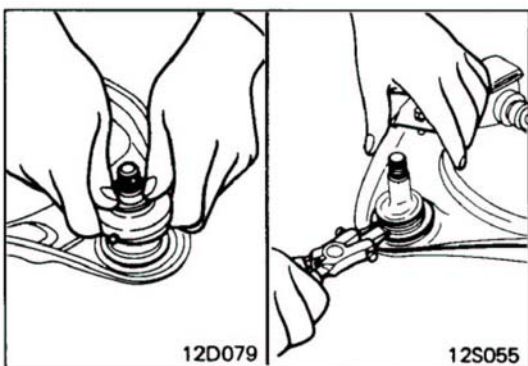


**UPPER ARM SHAFT TIGHTENING AMOUNT**

Give appropriate amount of turn to the shaft so as to obtain the specified dimension.

**Caution**

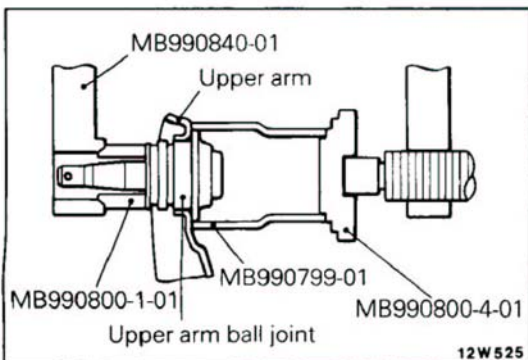
**The dimensions shown in the illustration are important dimensions that determine the caster.**



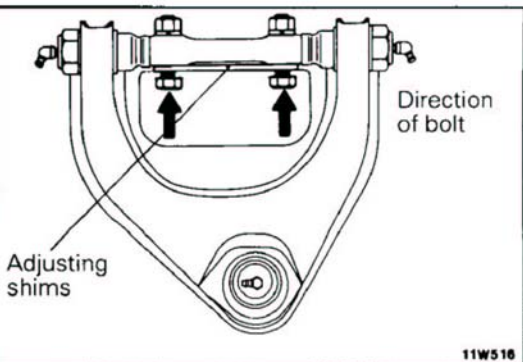
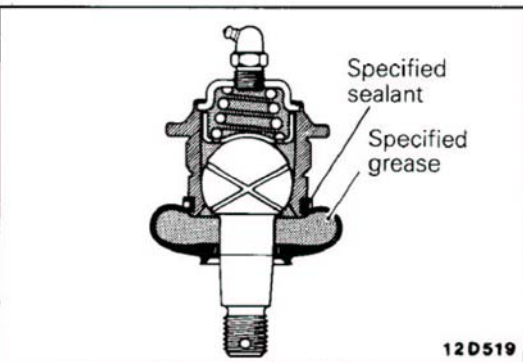
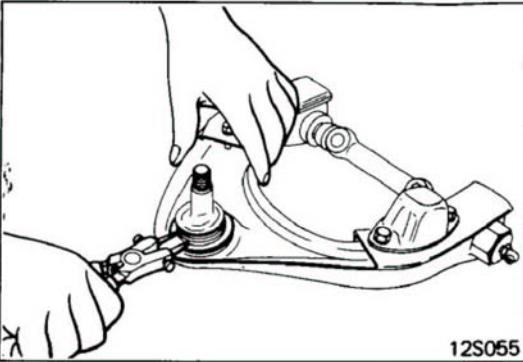
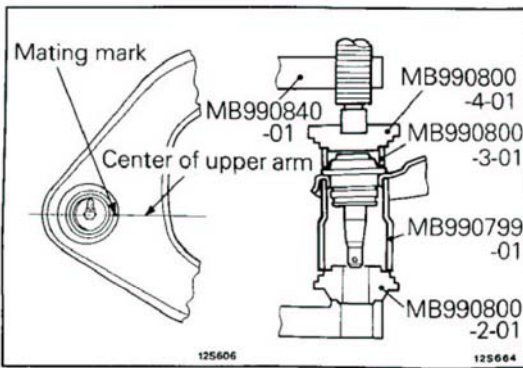
**REPLACEMENT OF UPPER BALL JOINT**

NO2MDAB

1. Remove the dust cover together with the ring.
2. Remove the snap ring from the upper ball joint by using a snap ring pliers.



3. Press the upper ball joint out of the upper arm by using the special tools.



- Press-fit the new upper ball joint with special tools aligning the mating mark with the upper arm center.

- Using a snap ring pliers, fit the snap ring securely in the groove of the joint case.

#### Caution

**Limit the opening of the snap ring to a minimum.**

- Apply the specified grease to both the interior of dust cover and the upper ball joint.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

- Apply the specified sealant to the grooves in the upper ball joint.

**Specified sealant : 3M ART Part No. 8663, No. 8661 or equivalent**

- Secure the dust cover to the upper ball joint with a ring.

### SERVICE POINTS OF INSTALLATION

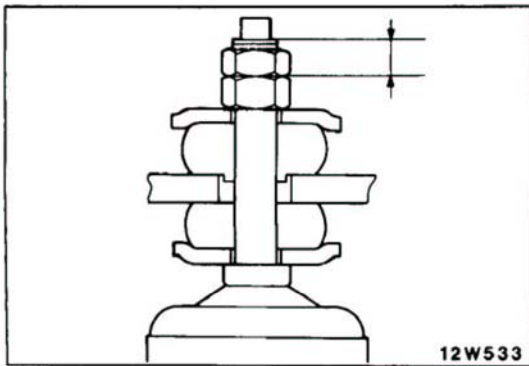
N02MEAA

#### 10. INSTALLATION OF UPPER ARM

When the upper arm assembly is installed to the crossmember, insert the upper arm shaft attaching bolts from outside the crossmember and put adjusting shims between the crossmember and upper arm shaft.

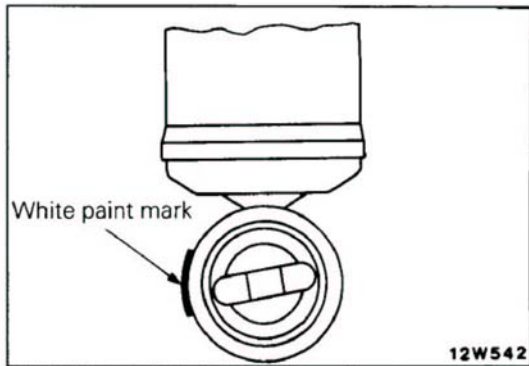
- ADJUSTMENT OF CLEARANCE BETWEEN BUMP STOPPER TO BUMP STOPPER BRACKET**

Refer to P.2-49.

**1. INSTALLATION OF SHOCK ABSORBER**

- (1) Tighten the shock absorber installation nut so that the dimension shown in the figure is the standard value.

**Standard value : 7-8 mm (.27-.31 in.)**

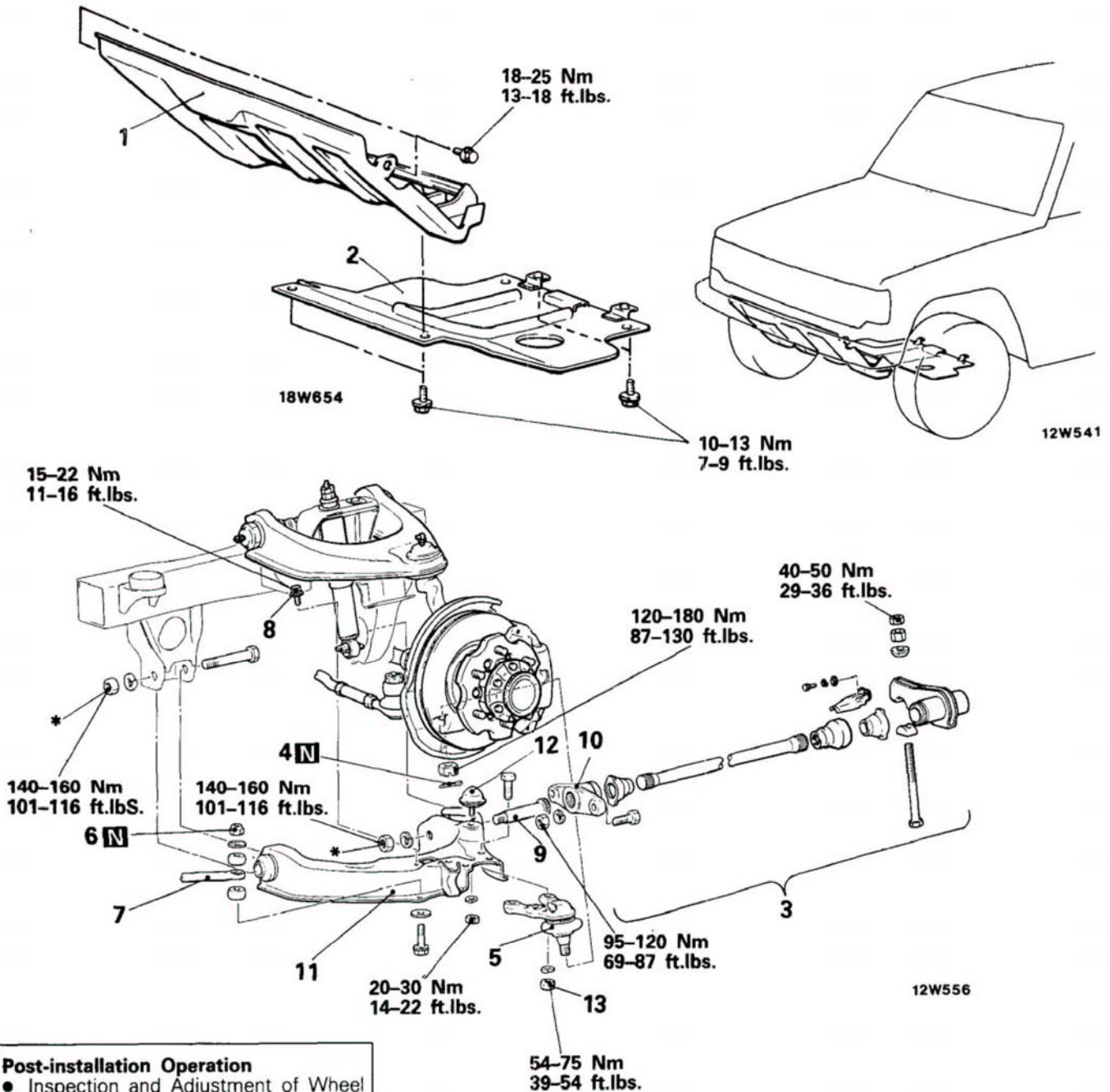


- (2) Install the shock absorber so that the white paint mark at the lower side of the shock absorber faces the outer side of the vehicle.

## LOWER ARM

## REMOVAL AND INSTALLATION

N02NA--

**Removal steps**

1. Under skid plate
2. Under cover
- ◆◆ Adjustment of clearance between bump stopper and bump stopper bracket
- ◆◆◆◆ 3. Torsion bar
- ◆◆ 4. Cotter pin
- ◆◆ 5. Connection of lower ball joint and knuckle
- ◆◆◆ 6. Self-locking nut
- ◆◆◆ 7. Stabilizer bar
- ◆◆◆ 8. Shock absorber mounting bolts

9. Lower arm shaft
10. Anchor arm B
11. Lower arm
12. Bump stopper
13. Lower ball joint mounting nuts

**NOTE**

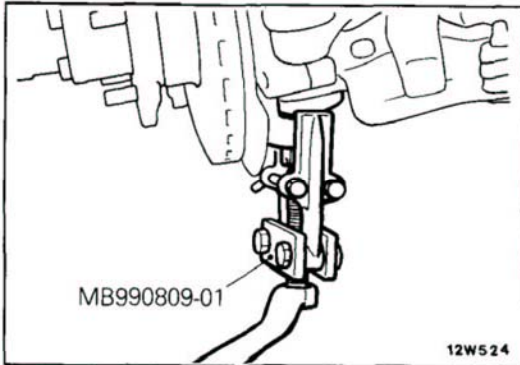
- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆ : Refer to "Service Points of Installation".
- (4) ◆ : Non-reusable parts
- (5) \* : Must be tightened while vehicle is unladen.

**SERVICE POINTS OF REMOVAL**

N02NBAA

**3. REMOVAL OF TORSION BAR**

Refer to P.2-48.

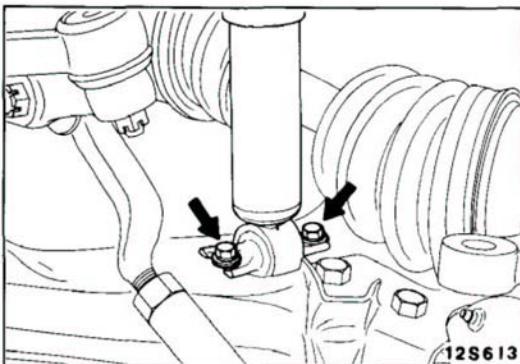
**5. DISCONNECTION OF LOWER BALL JOINT FROM KNUCKLE**

- (1) Loosen the nut tightening the lower ball joint to the knuckle.

**NOTE**

The nut should be partially loosened and should not be removed.

- (2) Using a special tool, disconnect the lower ball joint from the knuckle.

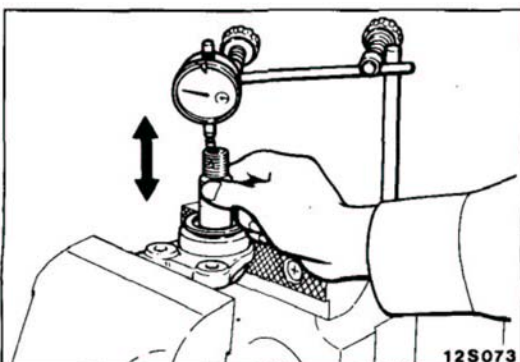
**8. REMOVAL OF SHOCK ABSORBER MOUNTING BOLTS**

Remove the shock absorber lower part and compress the shock absorber.

**INSPECTION**

N02NCAA

- Check the lower arm for cracks or deformation.
- Check the anchor arm assembly for wear or damage.
- Check the lower ball joint dust cover for cracks or deterioration.

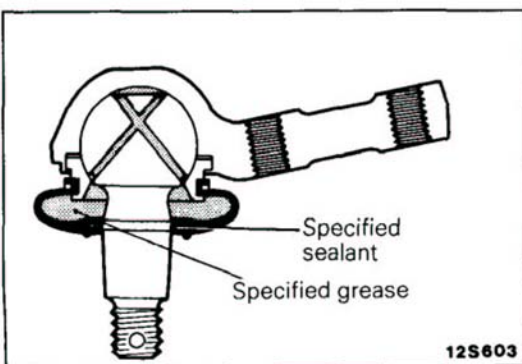
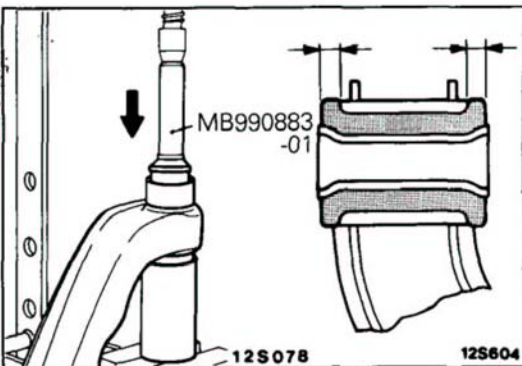
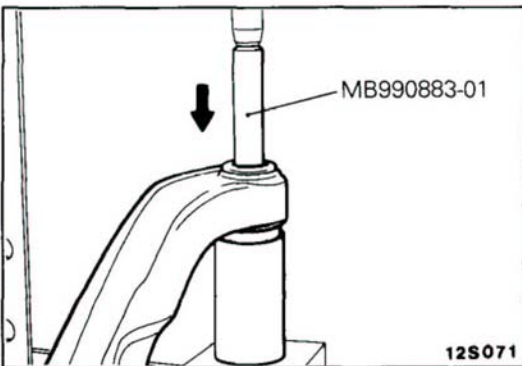
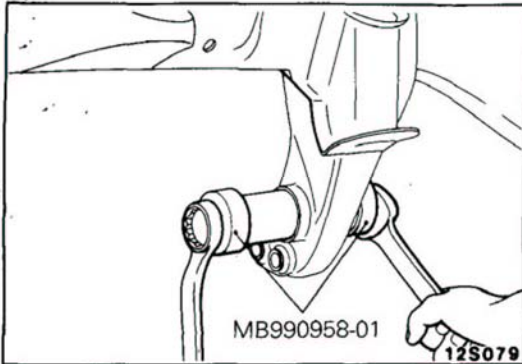
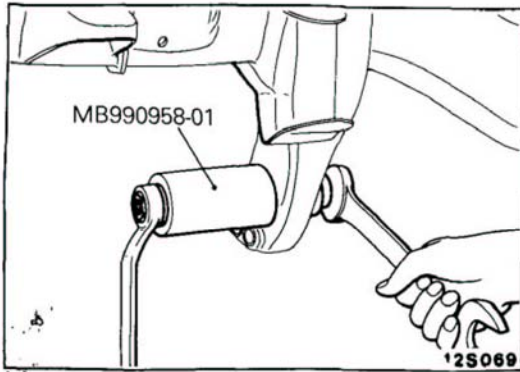
**LOWER BALL JOINT END PLAY**

Check the lower ball joint end play by following the steps below.

1. Measure the lower ball joint end play with a dial indicator.

**Limit : 0.5 mm (.020 in.)**

2. If the lower ball joint end play exceeds the limit, replace the lower ball joint.



## REPLACEMENT OF LOWER ARM BUSHING

NO2NDAA

1. Using a special tool, remove the bushing A from the bracket.

### NOTE

When removing the left hand bushing A, detach the differential carrier. (Refer to P.2-69.)

2. Using a special tool, press-fit the bushing A into the bracket.

3. Remove the bushing B from the lower arm by using special tools.

4. Coat the bushing B and the lower arm with soap solution and press-fit the bushing B into the lower arm by using special tools and taking care not to twist or tilt the bushing B.

### NOTE

Press-fit the bushing again from the opposite side to equalize bushing projections at both ends.

## REPLACEMENT OF LOWER BALL JOINT DUST COVER

NO2NEAB

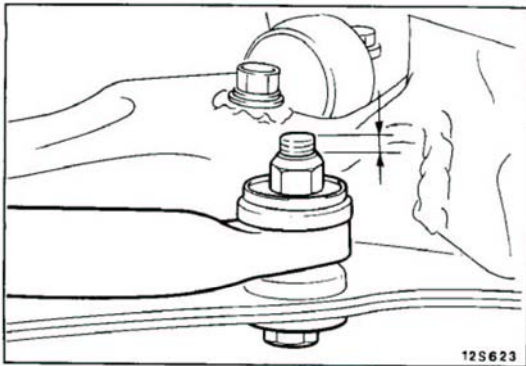
1. Apply the specified grease to the interior of the dust cover and the lower ball joint.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

2. Apply the specified sealant to the grooves in the lower ball joint.

**Specified sealant : 3M ART Part No. 8663, No. 8661 or equivalent**

3. Secure the dust cover to the lower ball joint with a ring.

**SERVICE POINTS OF INSTALLATION**

N02NFAA

**7. INSTALLATION OF STABILIZER BAR**

Install the stabilizer bar to the lower arm in such a way that the amount of protrusion of the stabilizer bar installation bolt is the standard value.

**Standard value : 6–8 mm (.24–.31 in.)**

**NOTE**

The dimension show in figure is the value when a new bushing is used.

**3. INSTALLATION OF TORSION BAR**

Refer to P.2-48.

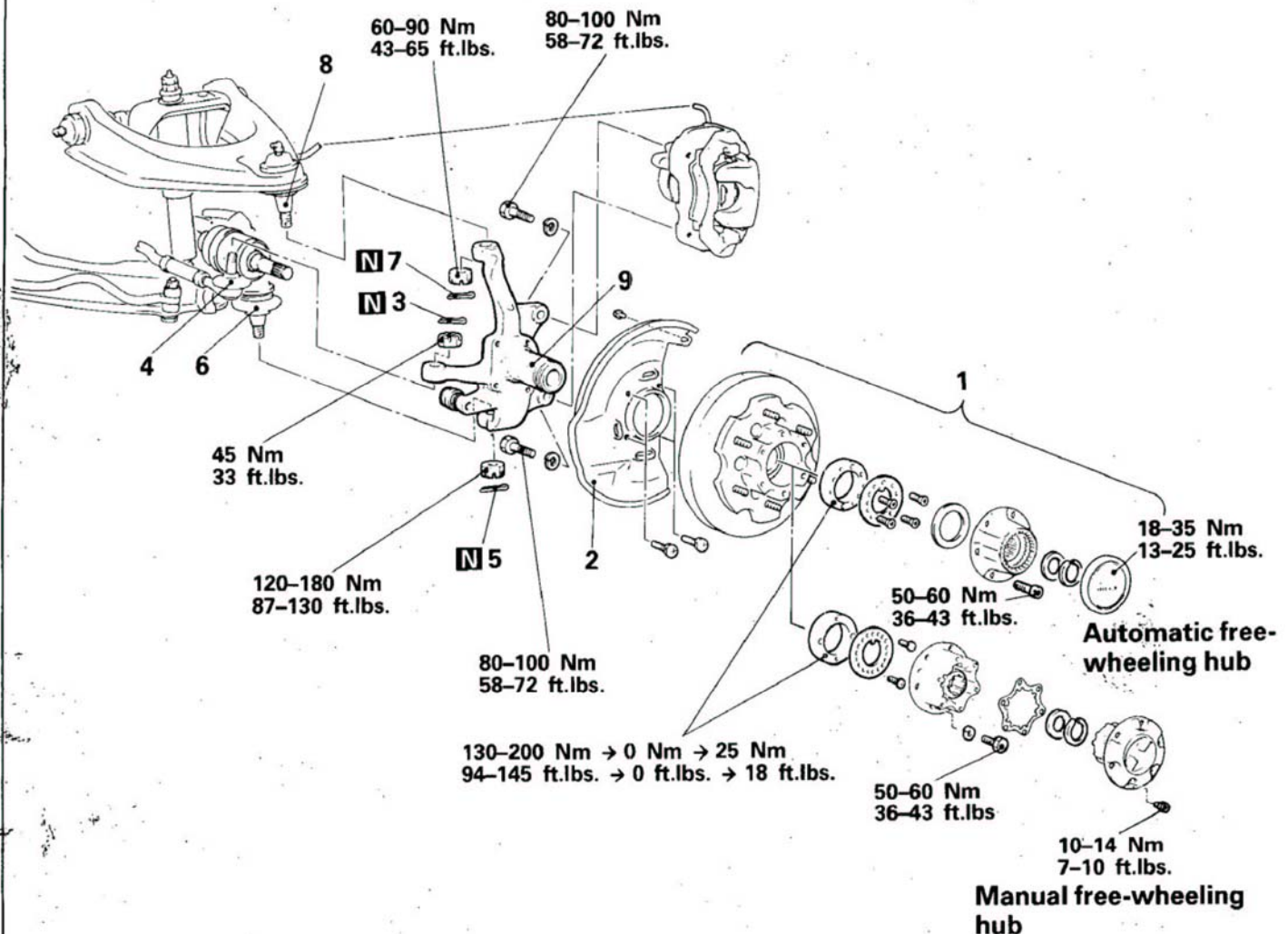
**● ADJUSTMENT OF CLEARANCE BETWEEN BUMP STOPPER AND BUMP STOPPER BRACKET**

Refer to P.2-49

## KNUCKLE

## REMOVAL AND INSTALLATION

N02PA-



11W611

## Removal steps

- ◆◆◆◆ 1. Front axle hub and free-wheeling hub
- ◆◆◆ 2. Dust cover
- ◆◆◆ 3. Cotter pin
- ◆◆ 4. Connection of tie rod assembly and knuckle
- ◆◆ 5. Cotter pin
- ◆◆ 6. Connection of lower ball joint and knuckle
- ◆◆ 7. Cotter pin
- ◆◆ 8. Connection of upper ball joint and knuckle
- ◆◆ 9. Knuckle

## NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆◆ : Refer to "Service Points of Installation".
- (4) [N] : Non-reusable parts

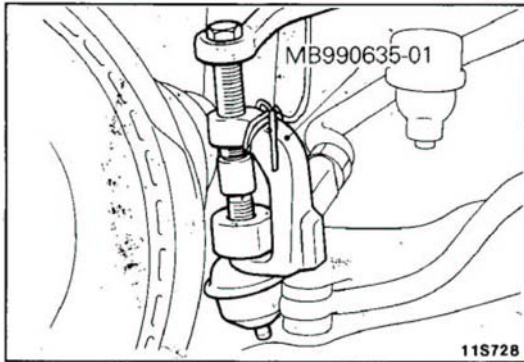


**SERVICE POINTS OF REMOVAL**

N02PBAA

**1. REMOVAL OF FRONT AXLE HUB AND FREE WHEELING HUB**

For models equipped with the automatic free-wheeling hub, refer to page 2-18; for models equipped with the manual free-wheeling hub, refer to page 2-29.

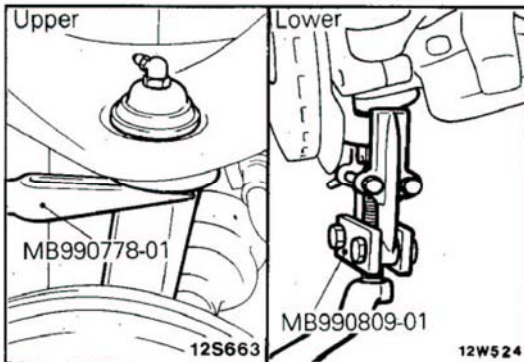


**4. DISCONNECTION OF TIE ROD ASSEMBLY FROM KNUCKLE**

Disconnect the tie rod from the knuckle by using the special tool.

**Caution**

1. Use cord to bind the special tool closely so it won't become separated.
2. The nut should be loosened only, not removed.



**6. DISCONNECTION OF LOWER BALL JOINT FROM KNUCKLE/8. UPPER BALL JOINT FROM KNUCKLE**

Using the special tool, remove the lower ball joint and upper ball joint.

**Caution**

1. Support the lower arm with a jack when removing the knuckle from the lower ball joint or the upper ball joint.
2. After the knuckle has been removed, lower the jack slowly.

**INSPECTION**

N02PCAA

- Check the needle bearing for wear or damage.
- Check the knuckle for cracks or bends.
- Check the knuckle spindle for wear or pounding.

**SERVICE POINT OF INSTALLATION**

N02PDAA

**1. INSTALLATION OF FRONT AXLE HUB AND FREE-WHEELING HUB**

For models equipped with the automatic free-wheeling hub, refer to page 2-18; for models equipped with the manual free-wheeling hub, refer to page 2-29.

## DISASSEMBLY AND REASSEMBLY

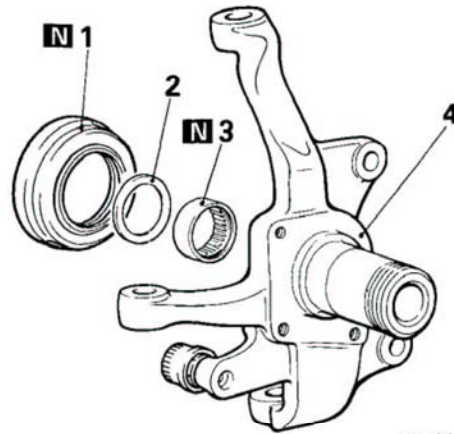
N02PE--

## Disassembly steps

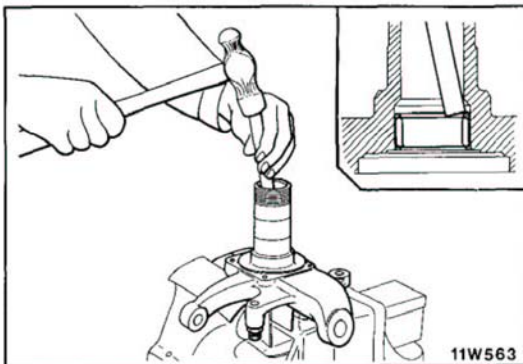
- ◆◆ 1. Oil seal
- ◆◆ 2. Spacer
- ◆◆◆ 3. Needle bearing
- ◆◆◆ 4. Knuckle

## NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆◆ : Refer to "Service Points of Reassembly".
- (4) **N** : Non-reusable parts



11W605



11W563

## SERVICE POINTS OF DISASSEMBLY

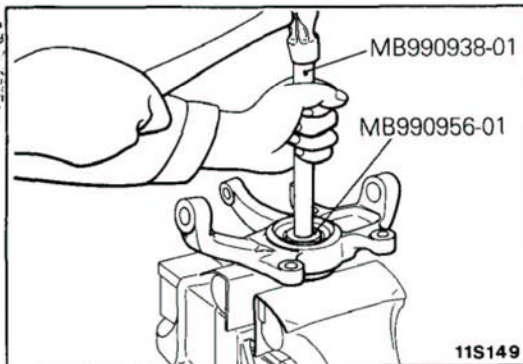
N02PFAA

## 3. REMOVAL OF NEEDLE BEARING

- (1) Remove the oil seal and take out the spacer.
- (2) Drive out the needle bearing by tapping needles uniformly.

**Caution**

Once removed, the needle bearing must not be reused.



11S149

## SERVICE POINTS OF REASSEMBLY

N02PGAB

## 3. INSTALLATION OF NEEDLE BEARING

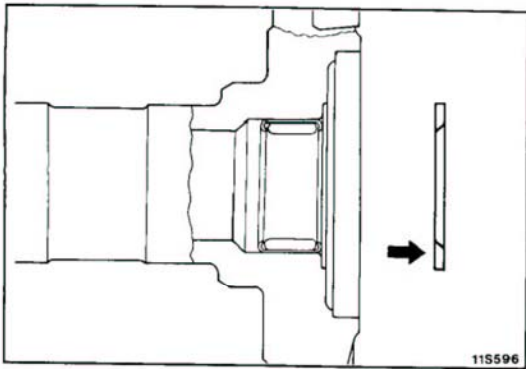
- (1) Apply the specified grease to the roller surface of the new needle bearing.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

- (2) Press-fit the needle bearing by using the special tools, until it is flush with the knuckle end face.

**Caution**

Use care to prevent driving the needle bearing too far in.

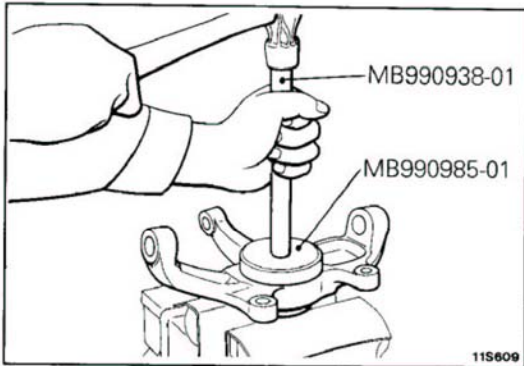


**2. INSTALLATION OF SPACER**

- (1) Apply the specified grease to the knuckle attaching surface of the spacer.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

- (2) Install the spacer to the knuckle with the chamfered side toward the center of vehicle.



**1. INSTALLATION OF OIL SEAL**

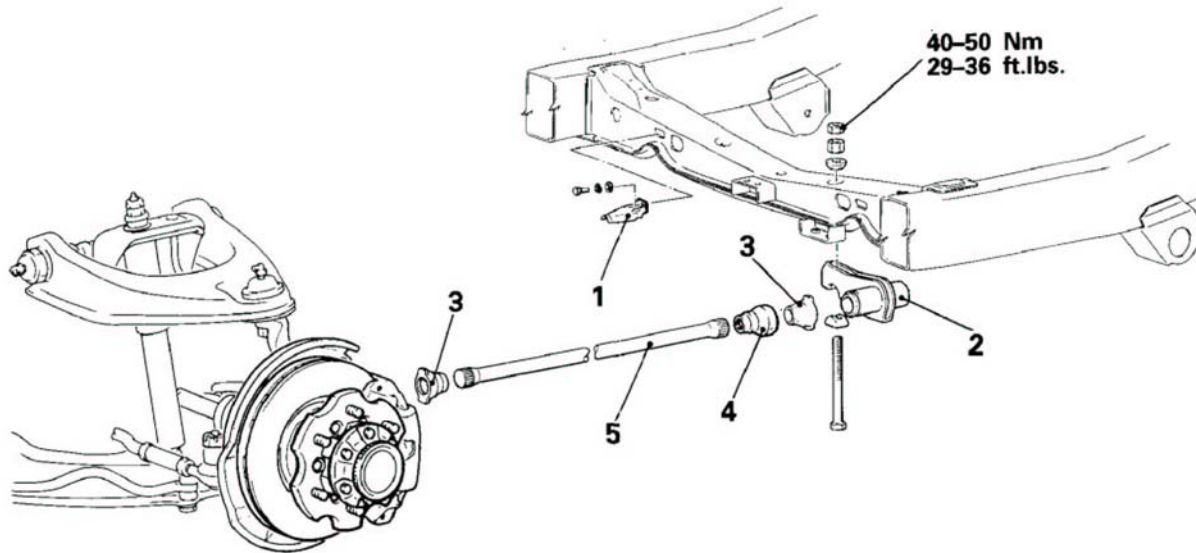
- (1) Press-fit the new oil seal by using the special tools, until it is flush with the knuckle end face.
- (2) Pack the specified grease in the oil seal inside and lip.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

## TORSION BAR

## REMOVAL AND INSTALLATION

N02SA--



12W558

## Removal steps

1. Heat protector (right side only)
- ◆◆ Adjustment of clearance between bump stopper and bump stopper bracket
- ◆◆ 2. Anchor arm assembly
3. Dust covers
4. Heat cover (left side only)
- ◆◆ 5. Torsion bar

## NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆ : Refer to "Service Points of Installation".

## SERVICE POINTS OF REMOVAL

N02SBAA

## 2. REMOVAL OF ANCHOR ARM ASSEMBLY

Support the lower arm from which the torsion bar is to be removed, with a jack.

## INSPECTION

N02SCAA

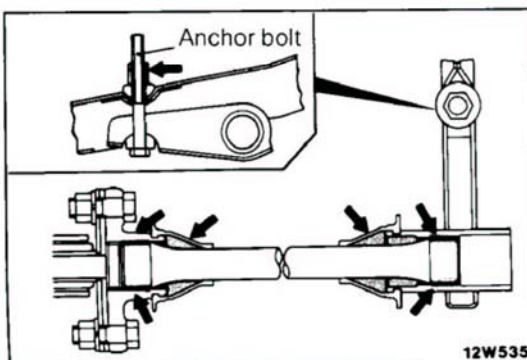
- Check the torsion bar for bends or damage.
- Check the dust cover for cracks or damage.

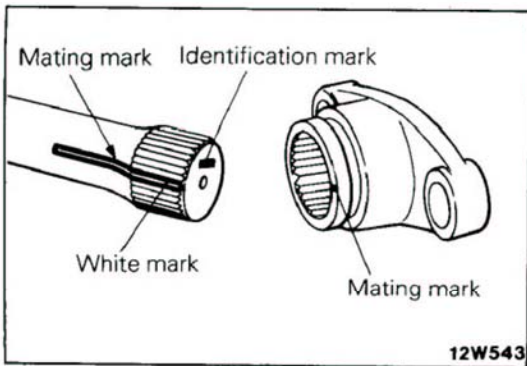
## SERVICE POINTS OF INSTALLATION

N02SDAB

Apply the specified grease to the torsion bar serrations, the anchor arm assembly serrations, the anchor arm B serrations, the dust cover inside and the anchor bolt thread.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**



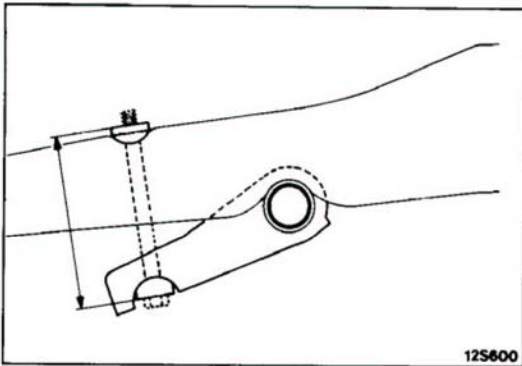


**5. INSTALLATION OF TORSION BAR**

- (1) Identify the right and left torsion bars referring to the identification mark put on the torsion bars. Face the end having identification mark forward, and align the mark on anchor arm B with the mating mark on torsion bar when the torsion bar is inserted in the anchor arm B.

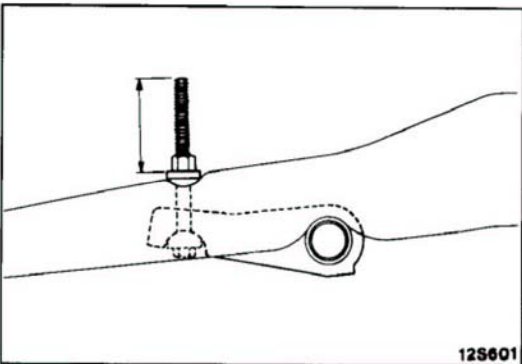
**NOTE**

When installing a new torsion bar, align the serration painted white with the mark on anchor arm B.



- (2) Select the relative position of the torsion bar serrations and the anchor arm serrations so that the length shown in the illustration may have specified dimension when the torsion bar and the anchor arm are assembled, with the upper arm rebound stopper in contact with the crossmember.

**Standard value :** L.H. 135.2–143.2 mm (5.323–5.638 in.)  
R.H. 124.3–132.3 mm (4.894–5.210 in.)



**● ADJUSTMENT OF CLEARANCE BETWEEN BUMP STOPPER AND BUMP STOPPER BRACKET**

- (1) Use the curb weight to obtain the amount of anchor bolt projection from the following table.

**NOTE**

The anchor bolt projection amount is a reference dimension used when the torsion bar spring is installed.

Finally, adjust so that the distance to the bump stopper bracket is the standard value.

This method can also be used to make the adjustment on previously sold vehicles.

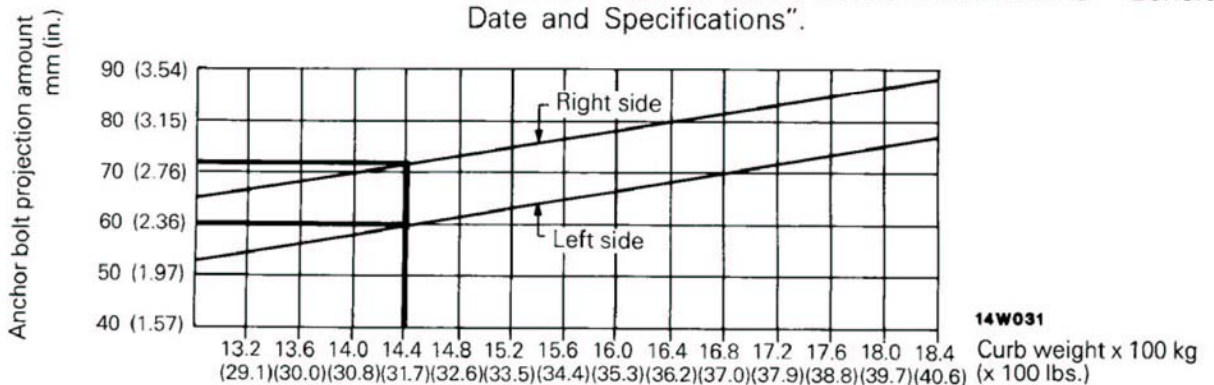
**Example**

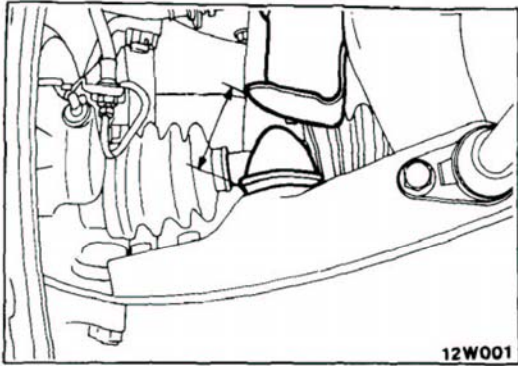
For a vehicle with a curb weight of 1,440 kg (3,175 lbs.), the table shows the following left and right anchor bolt projections.

Left ..... 60 mm (2.36 in.)  
Right ..... 71 mm (2.80 in.)

**NOTE**

For curb weights of the various models, refer to "INTRODUCTION AND MASTER TROUBLESHOOTING - General Date and Specifications".





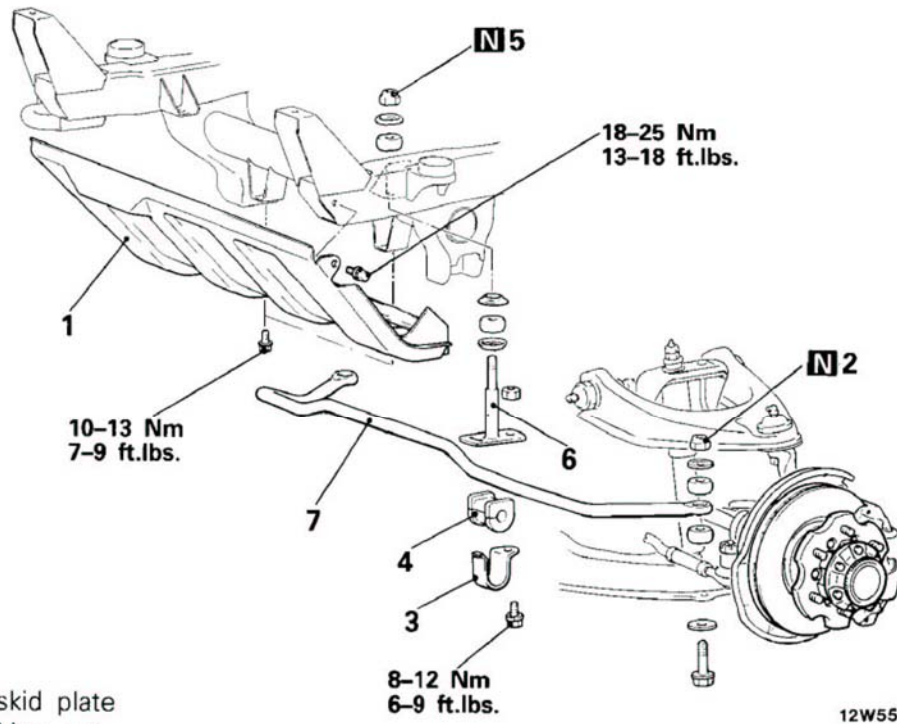
- (2) With the vehicle unladen, measure the dimension from the bump stopper to the bump stopper bracket to check for conformance with standard value.

**Standard value : 71 mm (2.80 in.)**

- (3) If it is out of specification, adjust with the adjusting nut on the anchor bolt.

**STABILIZER BAR  
REMOVAL AND INSTALLATION**

NO2TA--



**Removal steps**

1. Under skid plate
2. Self-locking nut
3. Clamp A
4. Stabilizer bushing
5. Self-locking nut
6. Hanger
- ◆◆ 7. Stabilizer bar

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Installation".
- (3) **N** : Non-reusable parts.

**INSPECTION**

- Check the stabilizer bar for deformation or damage.
- Check the hanger for bends or damage.
- Check the rubber parts for cracks, deterioration or wear.

**SERVICE POINTS OF INSTALLATION**

**7. INSTALLATION OF STABILIZER BAR**

When installing the hanger to the stabilizer bracket, tighten the nut so as to obtain the specified dimension.

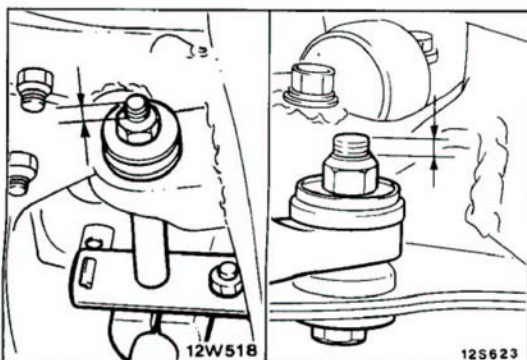
**Standard value : 6-8 mm (.24-.31 in.)**

When installing both ends of the stabilizer bar to the lower arms, tighten the nut so as to obtain the specified dimension.

**Standard value : 6-8 mm (.24-.31 in.)**

**NOTE**

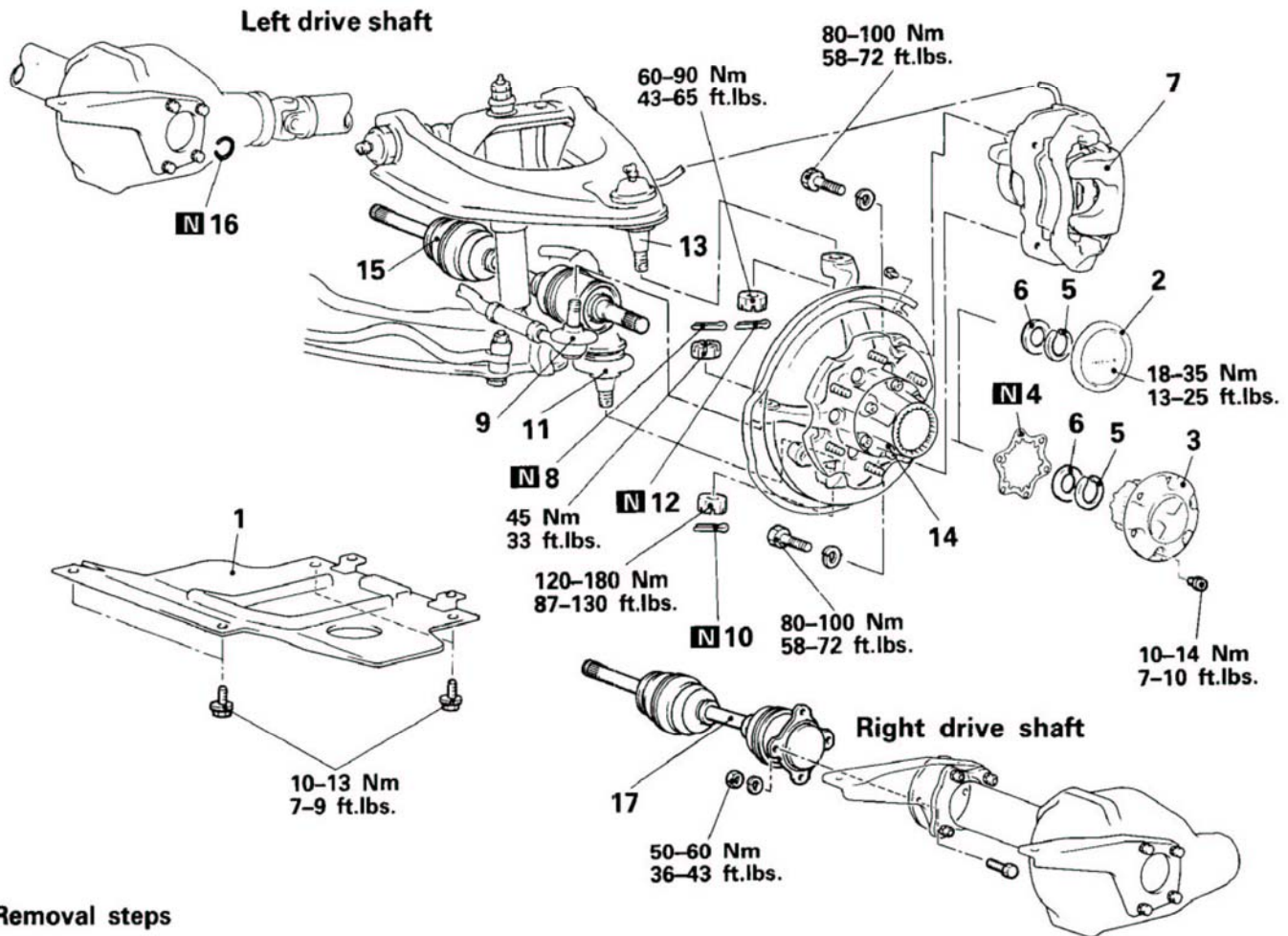
The dimension shown in the figure is the value when a new bushing is used.



## DRIVE SHAFT

## REMOVAL AND INSTALLATION

NO2QA--



## Removal steps

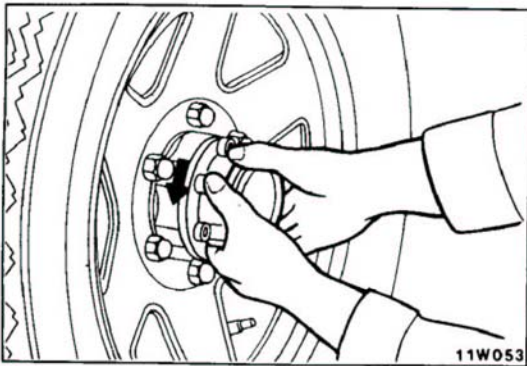
1. Under cover
- ◄◄ 2. Cover  
(automatic free-wheeling hub)
- ◄◄ 3. Free-wheeling hub cover  
(manual free-wheeling hub)
- ◄◄ 4. Gasket (manual free-wheeling hub)
- ◄◄◄ Adjustment of driveshaft end play
- ◄◄ 5. Snap ring
- ◄◄ 6. Shim
- ◄◄ 7. Front brake assembly
- ◄◄ 8. Cotter pin
- ◄◄ 9. Connection of tie rod assembly and knuckle
- ◄◄ 10. Cotter pin
- ◄◄ 11. Connection of lower ball joint and knuckle
- ◄◄ 12. Cotter pin
- ◄◄ 13. Connection of upper ball joint and knuckle
- ◄◄ 14. Front hub and knuckle assembly
- ◄◄◄ 15. Left drive shaft
- ◄◄◄ 16. Circlip
- ◄◄◄ 17. Right drive shaft

## NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◄◄ : Refer to "Service Points of Removal".
- (3) ◄◄◄ : Refer to "Service Points of Installation".
- (4) N : Non-reusable parts

11W581





**SERVICE POINTS OF REMOVAL**

NO20BAC

**2. REMOVAL OF COVER (Automatic free wheeling hub)**

- (1) Place the free-wheeling hub in the free condition.

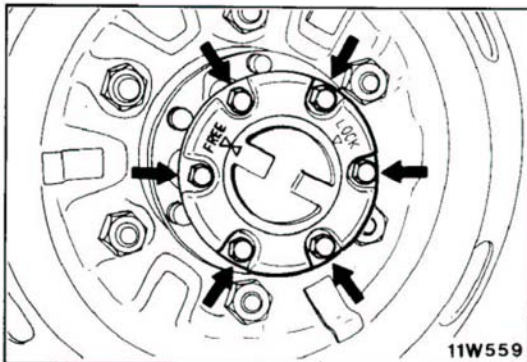
**NOTE**

The free condition can be obtained by shifting the transfer shift lever to the 2H position and then moving in reverse for 1 to 2 meters. (3.3 to 6.5 ft.)

- (2) Remove the automatic free wheeling hub cover.

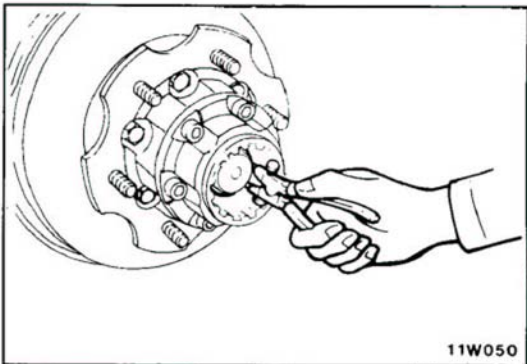
**NOTE**

When the cover cannot be loosened by hand, use an oil filter wrench with a protective cloth in between not to damage the cover.



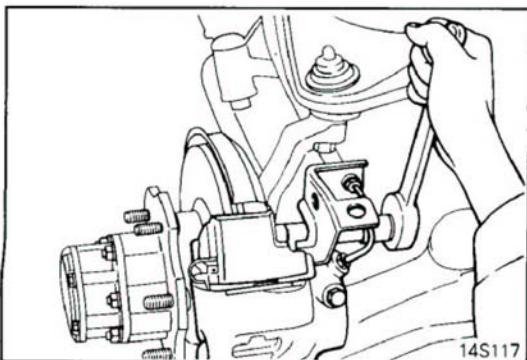
**3. REMOVAL OF FREE WHEELING HUB COVER (Manual free wheeling hub)**

- (1) Set the control handle to the FREE position.
- (2) Remove the free wheeling hub cover.



**5. REMOVAL OF SNAP RING**

Using a snap ring pliers, remove the snap ring from the drive shaft.

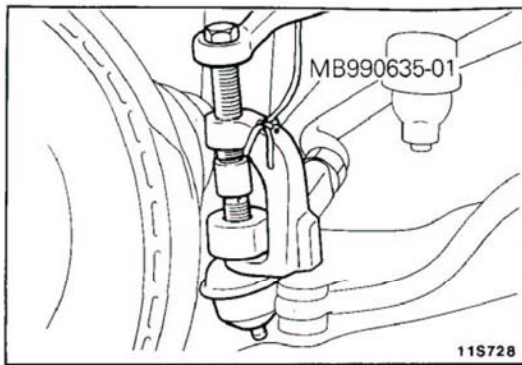


**7. REMOVAL OF FRONT BRAKE ASSEMBLY**

- (1) Remove the front brake assembly with the brake hose connected.
- (2) Use wire to suspend the front brake assembly from the upper arm so that the front brake assembly won't fall.

**Caution**

**Do not twist the brake hose.**

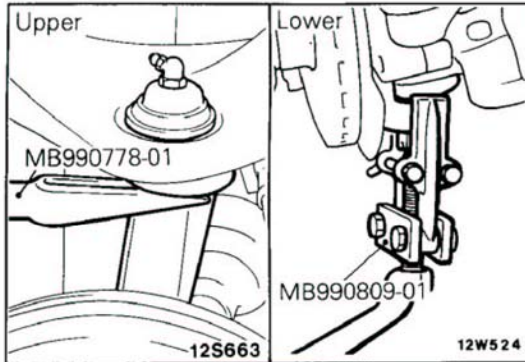


### 9. DISCONNECTION OF TIE ROD ASSEMBLY FROM KNUCKLE

Disconnect the tie rod from the knuckle by using the special tool.

#### Caution

1. Use cord to bind the special tool closely so it won't become separated.
2. The nut should be loosened only, not removed.

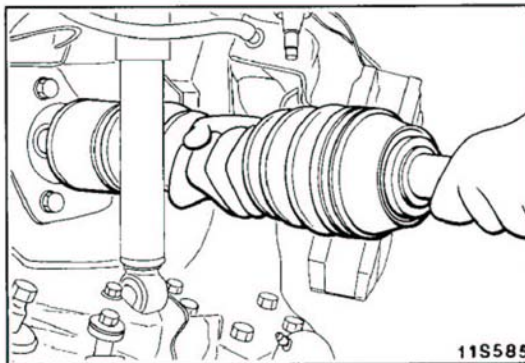


### 11. DISCONNECTION OF LOWER BALL JOINT FROM KNUCKLE/13. UPPER BALL JOINT FROM KNUCKLE

Using the special tool, remove the lower ball joint and upper ball joint.

#### Caution

1. Support the lower arm with a jack when removing the knuckle from the lower ball joint or the upper ball joint.
2. After the knuckle has been removed, lower the jack slowly.



### 15. REMOVAL OF LEFT DRIVE SHAFT

Pull the drive shaft out from the differential carrier.

#### Caution

When pulling the drive shaft out from the differential carrier, be careful that the spline part of the drive shaft does not damage the oil seal.

## INSPECTION

N02QCAB

- Check the boot for damage or deterioration.
- Check the ball joint for operating condition and excessive looseness.
- Check the splines for wear or damage.

## SERVICE POINTS OF INSTALLATION

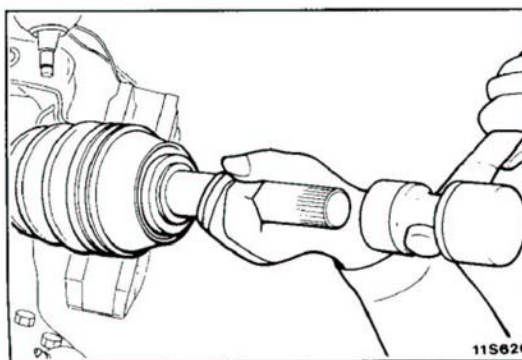
N02QDAC

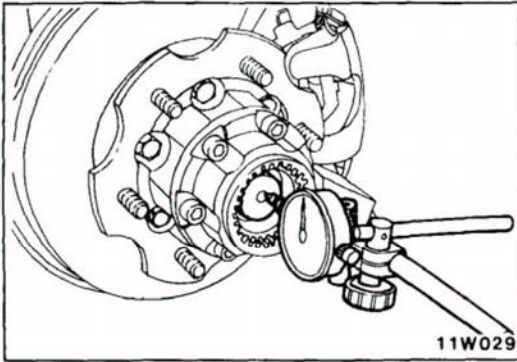
### 15. INSTALLATION OF LEFT DRIVE SHAFT

Drive the drive shaft into the front differential carrier with a plastic hammer.

#### Caution

Be careful not to damage the lip of the oil seal. Replace the circlip which is attached to the D.O.J. side spline part with a new one.





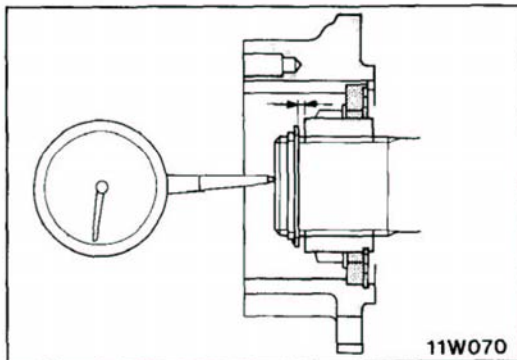
- **ADJUSTMENT OF DRIVE SHAFT END PLAY**

**Vehicles with automatic free-wheeling hubs**

- (1) Rotate the drive shaft forward, and backward and then set the drive shaft to the position (the position where end play is maximum) mid-way between where the rotation feels "heavy" for each (where there is a stopping feeling).
- (2) Set the dial gauge as shown in the figure; then move the drive shaft in the axial direction and measure the play.

**Standard value : 0.2–0.5 mm (.008–.020 in.)**

- (3) If the play is out of standard value, adjust by adding or removing shims.


**Vehicles with manual free-wheeling hubs**

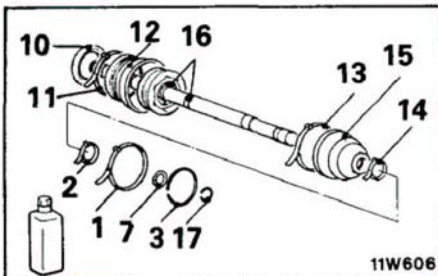
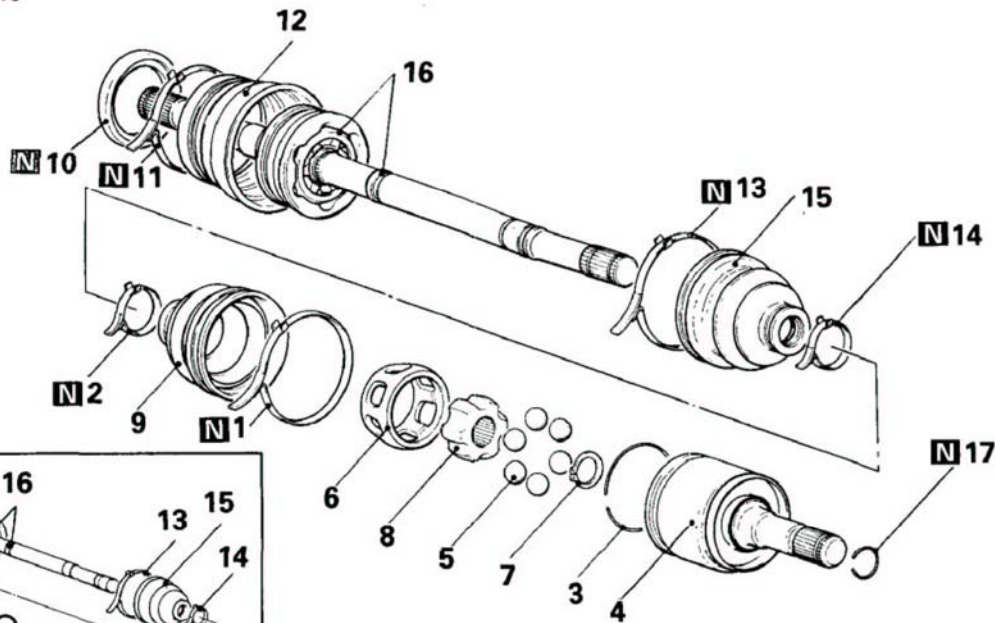
- (1) Set the dial gauge as shown in the figure; then move the drive shaft in the axial direction and measure the play.

**Standard value : 0.2–0.5 mm (.008–.020 in.)**

- (2) If the play is out of standard value, adjust by adding or removing shims.

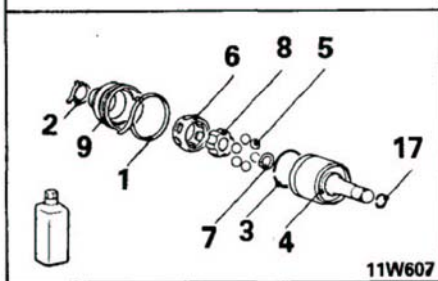
DISASSEMBLY AND REASSEMBLY

Left drive shaft

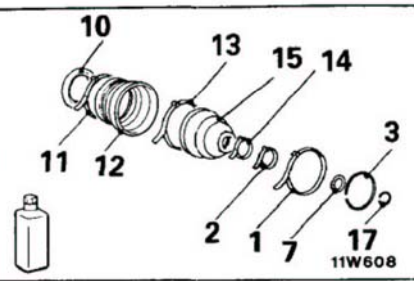


Drive shaft kit LH

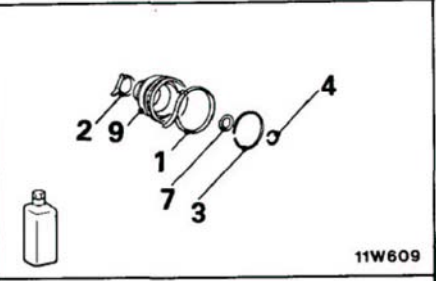
11B0025



D.O.J. kit



Boot repair kit (B.J.)



Boot repair kit (D.O.J.)

11W609

Disassembly steps

- 1. Boot band A
- 2. Boot band B
- 3. Circlip
- 4. D.O.J. outer race
- ◆◆ 5. Balls
- ◆◆ 6. D.O.J. cage
- ◆◆ 7. Snap ring
- ◆◆ 8. D.O.J. inner race
- ◆◆ 9. D.O.J. boot
- ◆◆ 10. Dust cover
- ◆◆ 11. Boot protector band
- ◆◆ 12. Boot protector
- ◆◆ 13. Boot band A
- ◆◆ 14. Boot band B
- ◆◆ 15. B.J. boot
- ◆◆ 16. Drive shaft and B.J.
- ◆◆ 17. Circlip

Reassembly steps

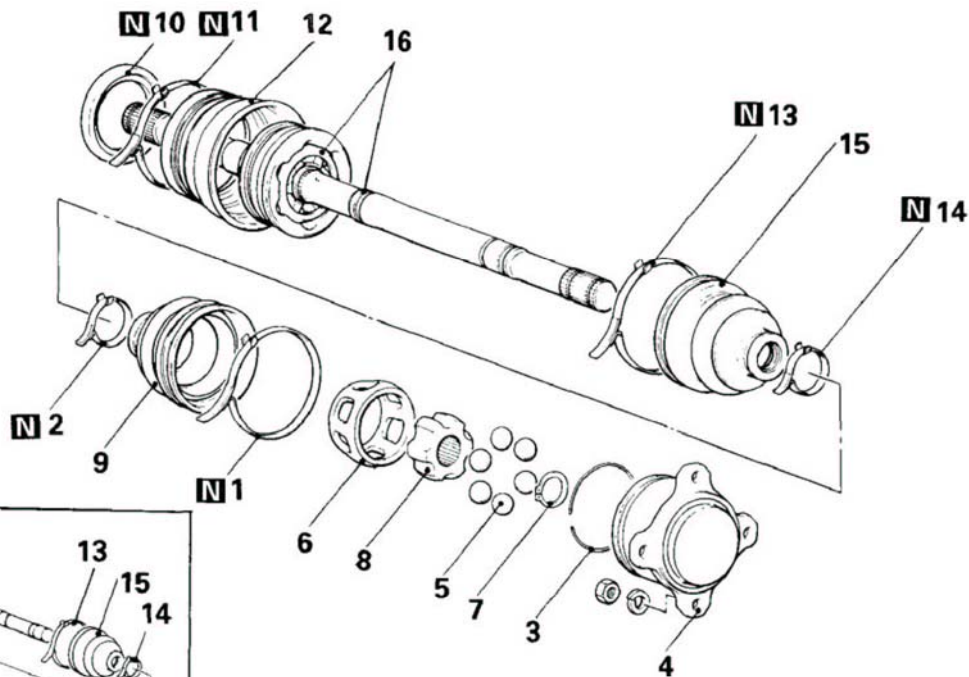
- 16. Drive shaft and B.J.
- ◆◆ 15. B.J. boot
- ◆◆ 13. Boot band A
- ◆◆ 14. Boot band B
- ◆◆ 2. Boot band B
- ◆◆ 9. D.O.J. boot
- ◆◆ 1. Boot band A
- ◆◆ 6. D.O.J. cage
- ◆◆ 8. D.O.J. inner race
- ◆◆ 7. Snap ring
- ◆◆ 5. Balls
- ◆◆ 4. D.O.J. outer race
- ◆◆ 3. Circlip
- ◆◆ 17. Circlip
- ◆◆ 12. Boot protector
- ◆◆ 11. Boot protector band
- ◆◆ 10. Dust cover

NOTE

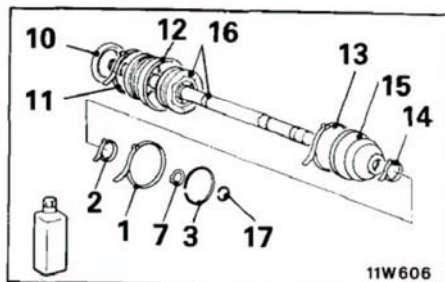
- (1) ◆◆ : Refer to "Service Points of Disassembly".
- (2) ◆◆ : Refer to "Service Points of Reassembly".

- (3) **N** : Non-reusable parts
- (4) B.J. : Birfield Joint
- (5) D.O.J. : Double Offset Joint

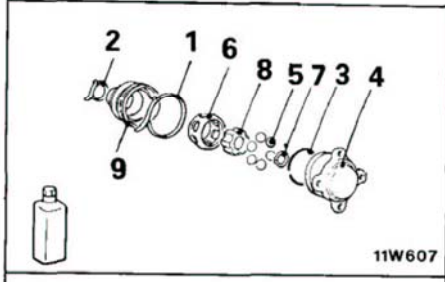
Right drive shaft



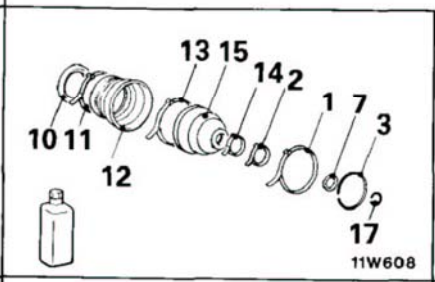
11B0025



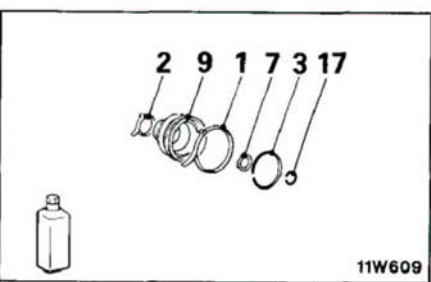
Drive shaft kit RH



D.O.J. kit



Boot repair kit (B.J.)



Boot repair kit (D.O.J.)

Disassembly steps

1. Boot band A
2. Boot band B
3. Circlip
4. D.O.J. outer race
- ◄◄ 5. Balls
- ◄◄ 6. D.O.J. cage
- ◄◄ 7. Snap ring
- ◄◄ 8. D.O.J. inner race
- ◄◄ 9. D.O.J. boot
- ◄◄ 10. Dust cover
- ◄◄ 11. Boot protector band
- ◄◄ 12. Boot protector
- ◄◄ 13. Boot band A
- ◄◄ 14. Boot band B
- ◄◄ 15. B.J. boot
- ◄◄ 16. Drive shaft and B.J.

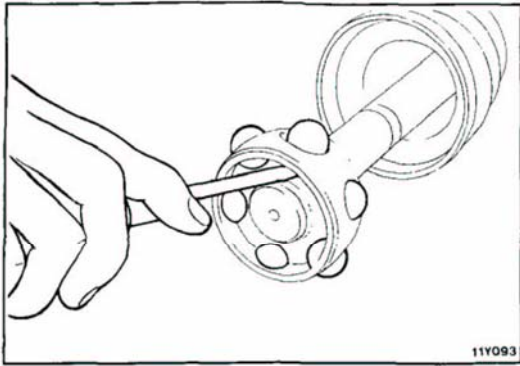
Reassembly steps

16. Drive shaft and B.J.
- ◄◄ 15. B.J. boot
- ◄◄ 13. Boot band A
- ◄◄ 14. Boot band B
- ◄◄ 2. Boot band B
- ◄◄ 9. D.O.J. boot
- ◄◄ 1. Boot band A
- ◄◄ 6. D.O.J. cage
- ◄◄ 8. D.O.J. inner race
- ◄◄ 7. Snap ring
- ◄◄ 5. Balls
- ◄◄ 4. D.O.J. outer race
- ◄◄ 3. Circlip
- ◄◄ 12. Boot protector
- ◄◄ 11. Boot protector band
- ◄◄ 10. Dust cover

NOTE

- (1) ◄◄ : Refer to "Service Points of Disassembly".
- (2) ◄◄ : Refer to "Service Points of Reassembly".

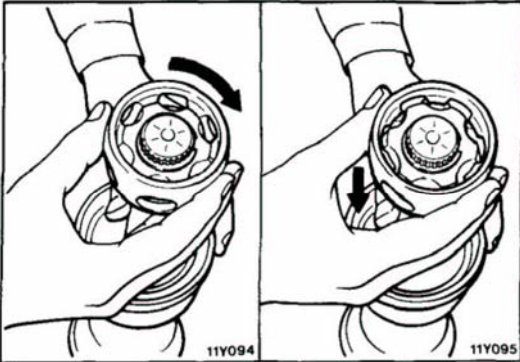
- (3) **N** : Non-reusable parts
- (4) B.J. : Birfield Joint
- (5) D.O.J. : Double Offset Joint

**SERVICE POINTS OF DISASSEMBLY**

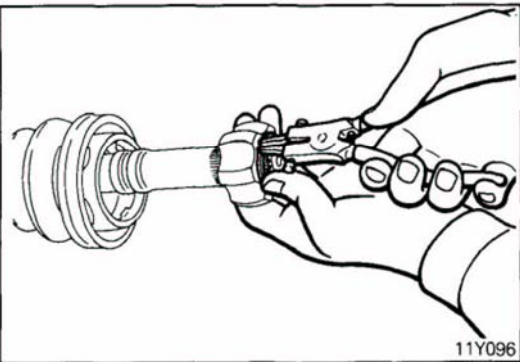
N02QFAB

**5. REMOVAL OF BALLS**

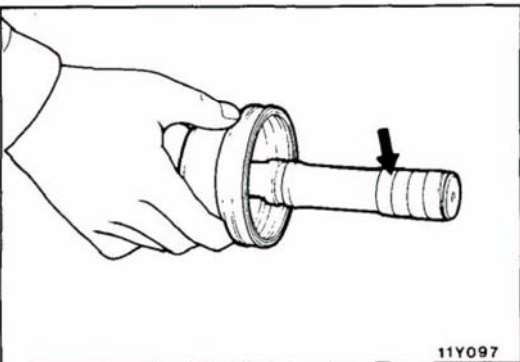
Remove the balls from the D.O.J. cage.

**6. REMOVAL OF D.O.J. CAGE**

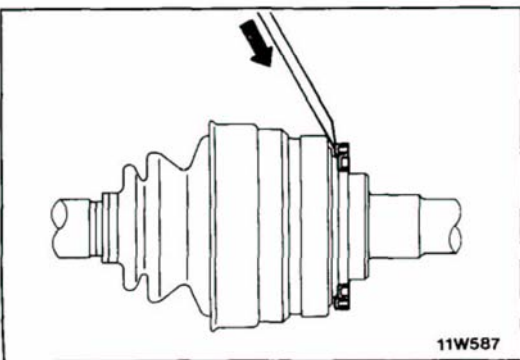
Remove the D.O.J. cage from the D.O.J. inner race in the direction of the B.J.

**7. REMOVAL OF SNAP RING**

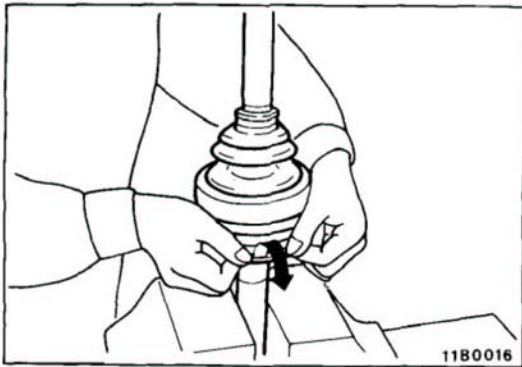
Remove the snap ring from the drive shaft with a snap ring pliers, and then withdraw the D.O.J. Inner race and D.O.J. cage from the drive shaft.

**9. REMOVAL OF D.O.J. BOOT**

- (1) Wrap vinyl tape around the spline part on the D.O.J. side of the drive shaft so that the D.O.J. boots are not damaged when they are removed.
- (2) Withdraw the D.O.J. boots from the drive shaft.

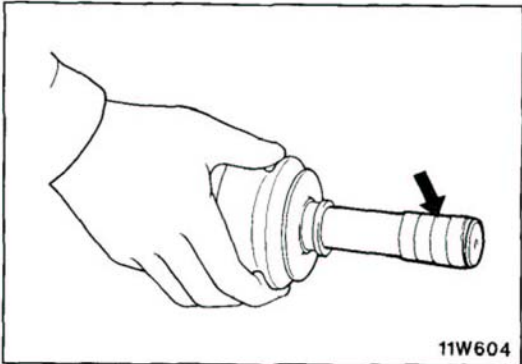
**10. REMOVAL OF DUST COVER**

Remove the dust cover from the drive shaft and B.J.



**12. REMOVAL OF BOOT PROTECTOR**

After extending the folded over part of the boot protector and removing the boot protector band, push the boot protector to the B.J. side and then remove it.



**15. REMOVAL OF B.J. BOOT**

- (1) Wrap vinyl tape around the spline part on the D.O.J. side of the drive shaft so that the B.J. boot are not damaged when they are removed.
- (2) Withdraw the B.J. boot from the drive shaft.

**Caution**  
Do not disassemble the B.J.

**INSPECTION**

N02QGAB

- Check the drive shaft for bending or wear.
- Check the B.J. for entry of water, foreign matter and rust.
- Check the B.J. ball for damage.
- Check the D.O.J. cage, D.O.J. inner race and ball for rust, wear and damage.
- Check the circlip for damage or deformation.
- Check the D.O.J. outer race for wear or damage.

**SERVICE POINTS OF REASSEMBLY**

N02QHAB

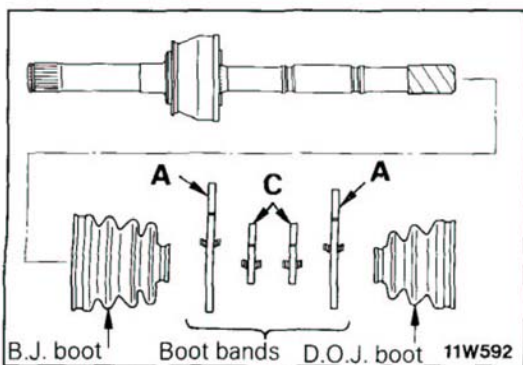
**15. INSTALLATION OF B.J. BOOT / 13. BOOT BAND A / 14. BOOT BAND B / 2. BOOT BAND B / 9. D.O.J. BOOT / 1. BOOT BAND A**

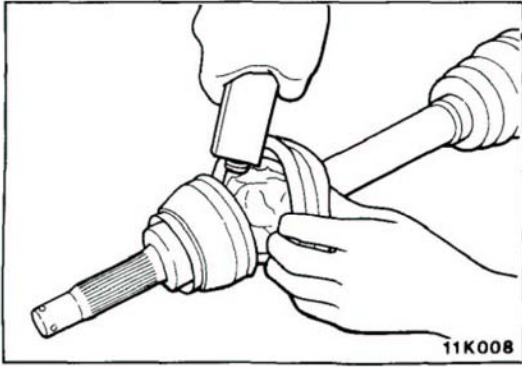
- (1) Apply the specified grease to the drive shaft, and wrap vinyl tape around the spline part on the D.O.J. side of the drive shaft.

**Specified grease : Repair kit grease**

- (2) Install the B.J. boot, boot bands (new ones), and D.O.J. boot on the drive shaft, in that order.

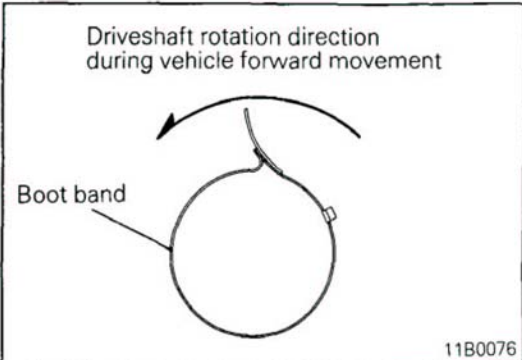
**Caution**  
The B.J. and D.O.J. boots are different in size and shape, so make sure they are correct.





- (3) Apply all the specified grease, half of it to the inner side of the B.J., and the other half to the inner side of the B.J. boot.

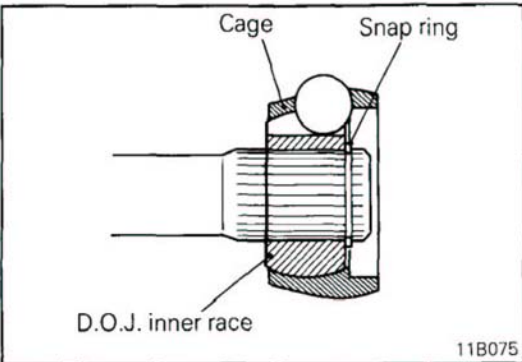
**Specified grease : Repair kit grease [110 gr (3.9 oz.)]**



- (4) Secure the B.J. boot to the driveshaft by boot bands A and B.

**Caution**

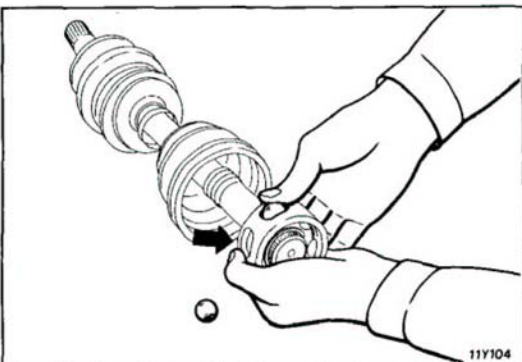
**Be sure that the installation direction of the boot bands is correct.**



**6. INSTALLATION OF D.O.J. CAGE / 8. D.O.J INNER RACE**

- (1) Install the D.O.J. cage onto the drive shaft so that the smaller diameter side of the cage is installed first.  
 (2) Apply the specified grease to the D.O.J. inner race and the D.O.J. cage, and then fit them together.

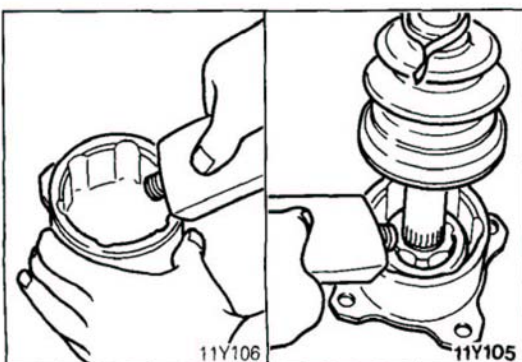
**Specified grease : Repair kit grease**



**5. APPLICATION OF GREASE TO BALLS**

Apply the specified grease to the ball insertion parts of the D.O.J. inner race and D.O.J. cage, and insert the balls.

**Specified grease : Repair kit grease**



**4. INSTALLATION OF D.O.J. OUTER RACE**

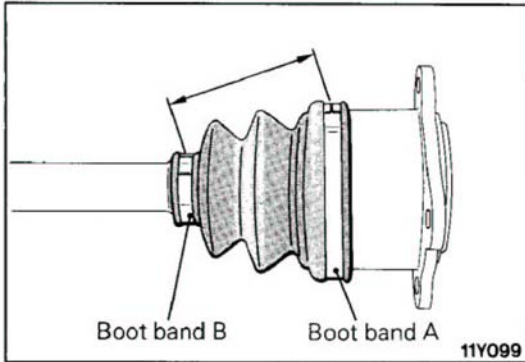
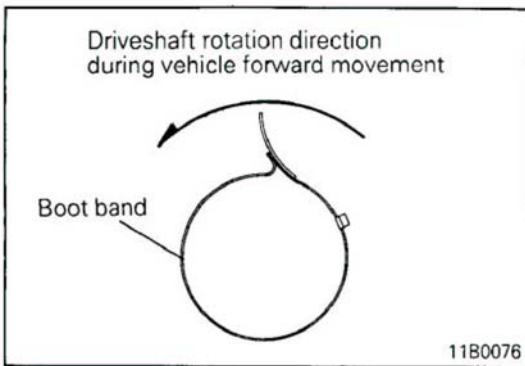
- (1) Apply the specified grease to the D.O.J. outer race.

**Specified grease : Repair kit grease  
 [55 gr (1.9 oz.)]**

- (2) Fit the drive shaft into the D.O.J. outer race.  
 (3) Add the specified grease to the D.O.J. outer race.

**Specified grease : Repair kit grease  
 [55 gr (1.9 oz.)]**





- (4) Install the circlip onto the D.O.J. outer race.
- (5) Place the D.O.J. boot over the D.O.J. outer race, and then use boot band B to secure the boot.

**Caution**

**Be sure that the installation direction of the boot bands is correct.**

- (6) Replace the boot band A on D.O.J. boot.

**Caution**

**Do not secure the boot band A**

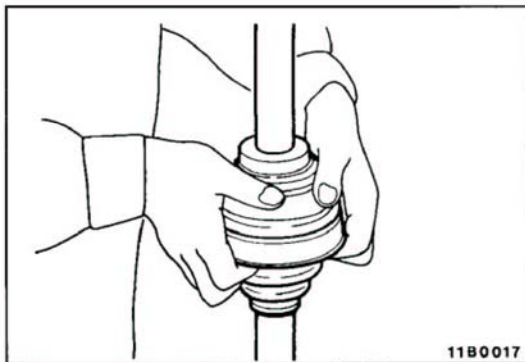
- (7) Secure the driveshaft, and then move the D.O.J. outer race until it is at the position where the D.O.J. boot assembly dimension is the standard value.

**Standard value : 77–83 mm (3.03–3.27 in.)**

- (8) Remove a part of the D.O.J. boot from the D.O.J. outer race and release the air within the boot.
- (9) Secure the boot band A on D.O.J. boot.

**Caution**

**Be sure that the installation direction of the boot bands is correct.**



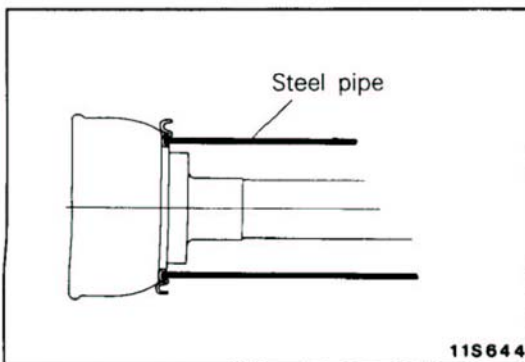
**12. INSTALLATION OF BOOT PROTECTOR / 11. BOOT PROTECTOR BAND**

- (1) After installing the boot protector to the B.J., secure by the boot protector band.

**Caution**

**Be sure that the installation direction of the boot bands is correct.**

- (2) Securely fold over the end of the boot protector.



**10. INSTALLATION OF DUST COVER**

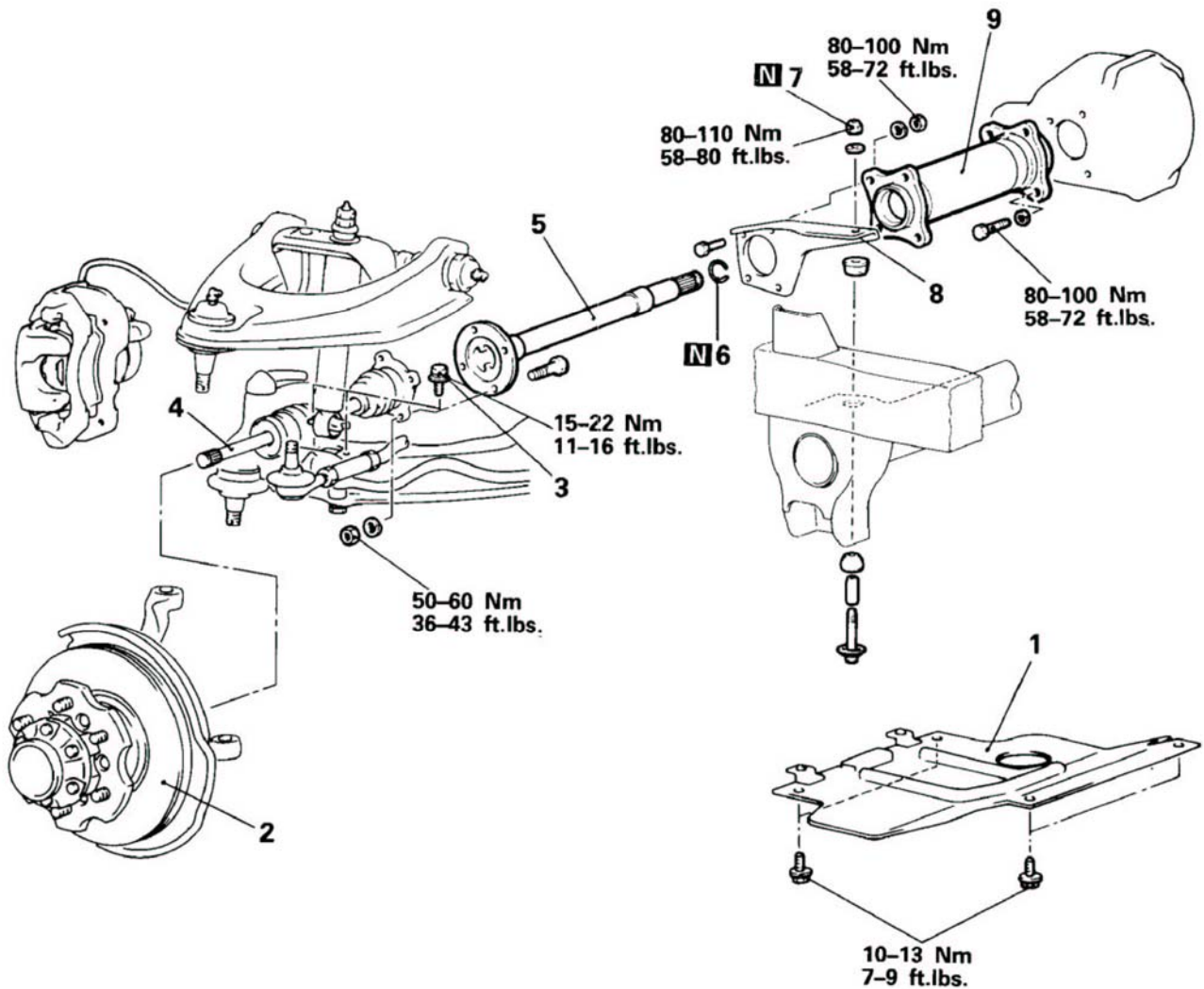
Using the steel pipe as specified below, force the dust cover to the drive shaft.

Steel Pipe	mm (in.)
Overall length	170 (6.70)
Outside diameter	68.9 (2.71)
Wall thickness	2.3 (.09)

## INNER SHAFT

## REMOVAL AND INSTALLATION

N02RA--



## Removal steps

1. Under cover
- ◀▶▶▶ 2. Front hub and knuckle assembly
- ▶▶▶▶ 3. Shock absorber lower mounting bolts
- ◀▶▶▶ 4. Drive shaft assembly (R.H.)
- ◀▶▶▶ 5. Inner shaft
6. Circlip
7. Self locking nut
8. Differential mounting bracket (R.H.)
9. Housing tube

11W582

## NOTE

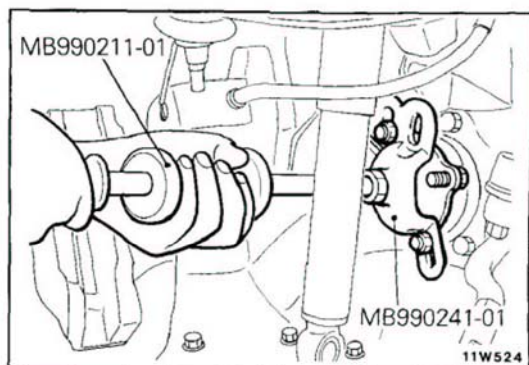
- (1) Reverse the removal procedures to reinstall.
- (2) ▶▶▶▶ : Refer to "Service Points of Removal".
- (3) ▶▶▶▶ : Refer to "Service Points of Installation".
- (4) **N** : Non-reusable parts

**SERVICE POINTS OF REMOVAL**

N02RBAB

**2. REMOVAL OF FRONT HUB AND KNUCKLE ASSEMBLY/4. DRIVE SHAFT ASSEMBLY (R.H.)**

Refer to 2-44, 52.

**5. REMOVAL OF INNER SHAFT**

Attach the special tools to the flange of the shaft, and drive the inner shaft out from the front differential carrier.

**Caution**

1. Being careful not to scratch or scar the shock absorber with the special tool, remove the lower mounting bolts of the shock absorber, and compress the shock absorber as much as possible.
2. When pulling the inner shaft out from the front differential carrier, be careful that the spline part of the inner shaft does not damage the oil seal.

**INSPECTION**

N02RCAA

- Check the inner shaft for bend.
- Check the bearing for wear or discoloration.
- Check the housing tube for cracks.
- Check the dust seal for cracks or damage.

**SERVICE POINTS OF INSTALLATION**

N02DAB

**5. INSTALLATION OF INNER SHAFT**

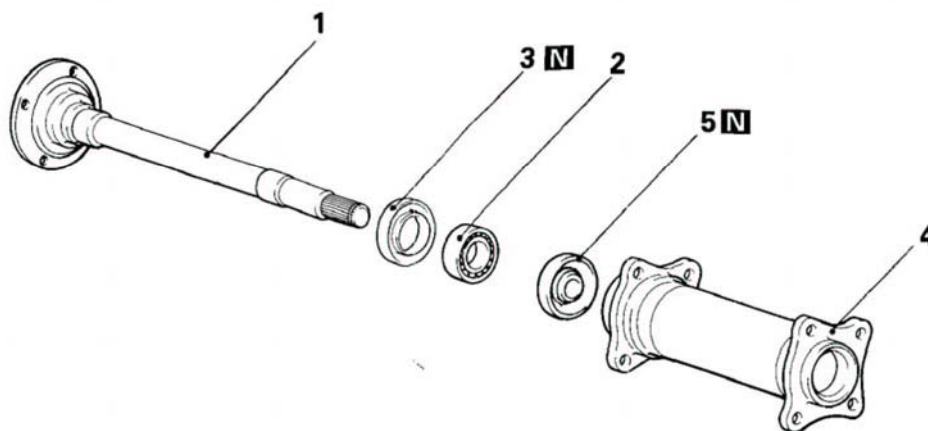
Drive the inner shaft into the front differential carrier by using the special tools.

**Caution**

1. Replace the circlip which is attached to the inner shaft spline part with a new one.
  2. Be careful not to damage the lip of the dust seal and oil seal.
- 4. INSTALLATION OF DRIVE SHAFT ASSEMBLY (R.H.)/2. FRONT HUB AND KNUCKLE ASSEMBLY**
- Refer to 2-44, 52.

DISASSEMBLY AND REASSEMBLY

N02RE--



Disassembly steps

- 1. Inner shaft
- ◆◆◆◆ 2. Bearing
- ◆◆◆◆ 3. Dust cover
- ◆◆◆◆ 4. Housing tube
- ◆◆◆◆ 5. Dust seal

11W597

NOTE

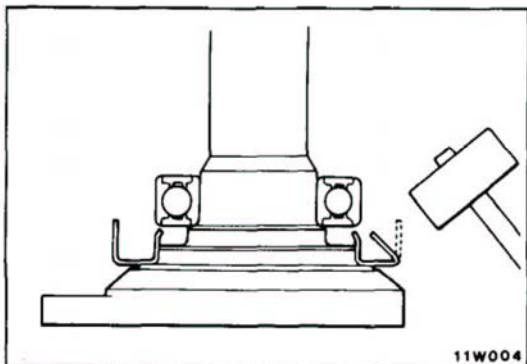
- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆◆ : Refer to "Service Points of Reassembly".
- (4) N : Non-reusable parts

SERVICE POINTS OF DISASSEMBLY

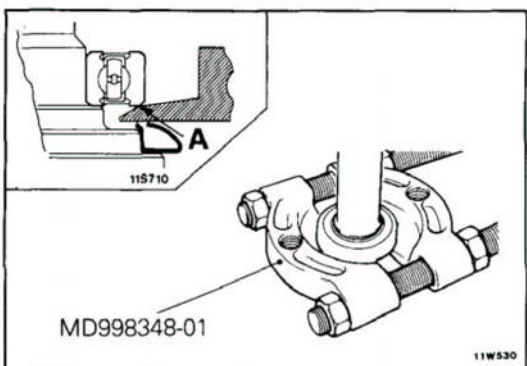
N02RFAB

2. REMOVAL OF BEARING

- (1) Bend the outside periphery of dust cover inward with a hammer.



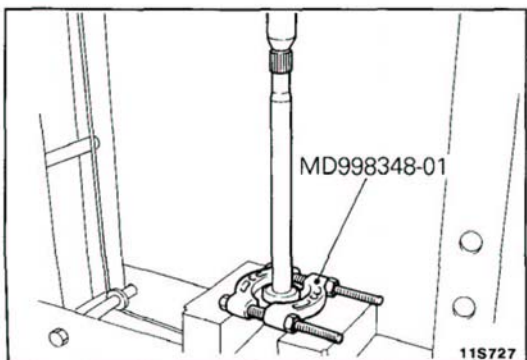
- (2) After the special tool has been installed as shown, tighten the nut of the special tool until the portion "A" of the special tool touches the bearing outer race.

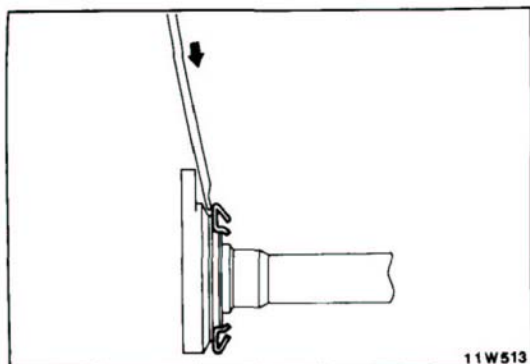


- (3) Press out the inner shaft from the bearing.

Caution

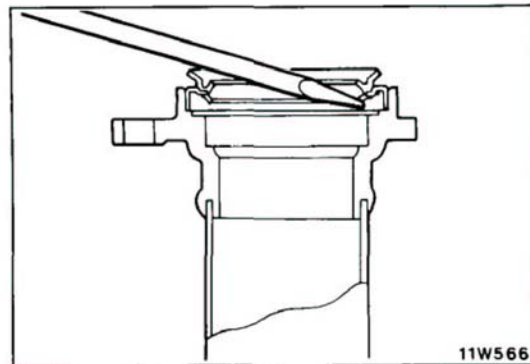
Do not allow the inner shaft to drop.





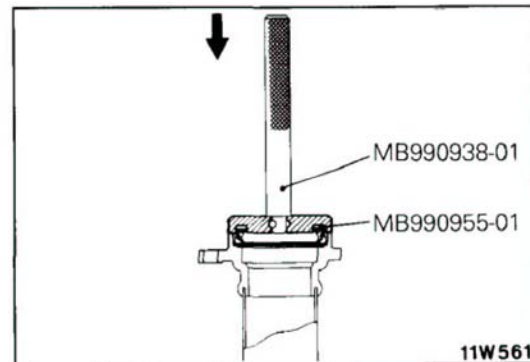
**3. REMOVAL OF DUST COVER**

Remove the dust cover from the inner shaft.



**5. REMOVAL OF DUST SEAL**

Remove the dust seal from the housing tube.



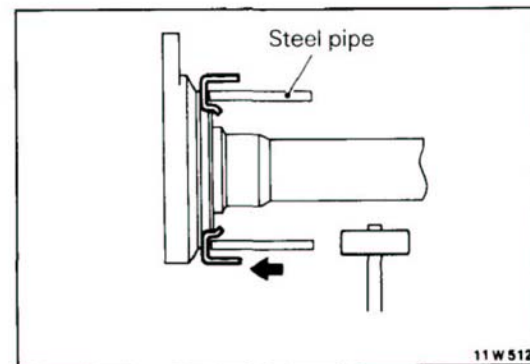
**SERVICE POINTS OF REASSEMBLY**

NO2RHAD

**5. INSTALLATION OF DUST SEAL**

- (1) Press-fit the new dust seal into the housing tube by using the special tools, until it is flush with the housing tube end face.
- (2) Apply the specified grease to the dust seal lip.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**



**3. INSTALLATION OF DUST COVER**

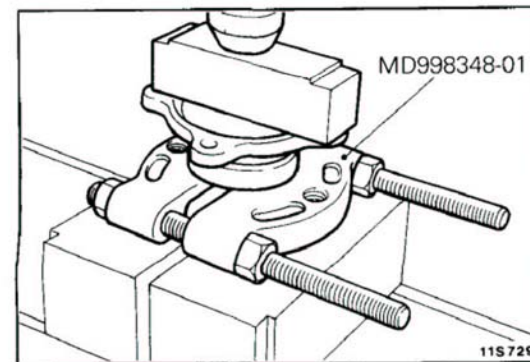
Using a steel pipe, force a new dust cover onto the inner shaft.

Steel pipe	mm (in.)
Overall length	50 (1.97)
Outside diameter	75 (2.95)
Wall thickness	4 (.16)

**NOTE**

After the dust cover has been installed, apply specified grease to the inside of the dust cover.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**



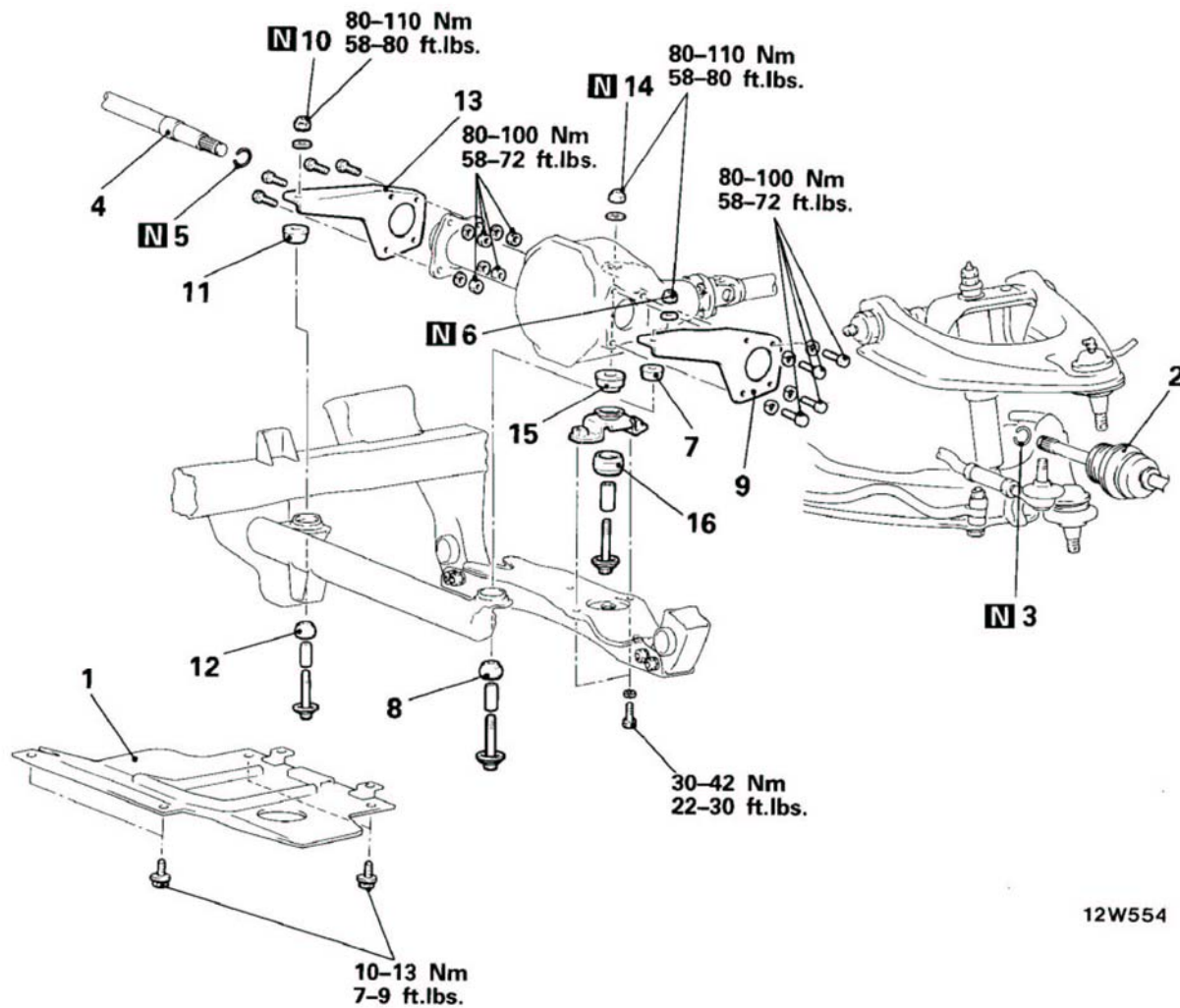
**2. INSTALLATION OF BEARING**

Using the special tool, force the bearing onto the inner shaft.

## FRONT DIFFERENTIAL MOUNTING

## REMOVAL AND INSTALLATION

N02UA--



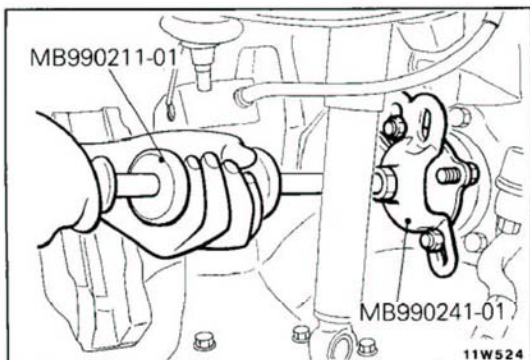
12W554

## Removal steps

- |     |   |   |  |
|-----|---|---|--|
|     | 1. Under cover                          |   |  |
| ↔ ↔ | 2. Drive shaft                          | ↔ | 13. Differential mounting bracket (R.H.) |
|     | 3. Circlip                              |   | 14. Self-locking nut                     |
| ↔ ↔ | 4. Inner shaft                          |   | 15. Differential mounting rubber C       |
|     | 5. Circlip                              |   | 16. Differential mounting rubber D       |
|     | 6. Self-locking nut                     |   |  |
|     | 7. Differential mounting rubber A       |   |  |
|     | 8. Differential mounting rubber B       |   |  |
| ↔   | 9. Differential mounting bracket (L.H.) |   |  |
|     | 10. Self-locking nut                    |   |  |
|     | 11. Differential mounting rubber A      |   |  |
|     | 12. Differential mounting rubber B      |   |  |

## NOTE

- (1) Reverse the removal procedures to reinstall.  
 (2) ↔ : Refer to "Service Points of Removal".  
 (3) ↔ : Refer to "Service Points of Installation".  
 (4) **N** : Non-reusable parts

**SERVICE POINTS OF REMOVAL**

N02UBAB

**2. REMOVAL OF DRIVE SHAFT**

Refer to P.2-52.

**4. REMOVAL OF INNER SHAFT**

Attach the special tools to the flange of the shaft, and drive the inner shaft out from the front differential carrier.

**Caution**

1. Being careful not to scratch or scar the shock absorber with the special tool, remove the lower mounting bolts of the shock absorber, and compress the shock absorber as much as possible.
2. When pulling the inner shaft out from the front differential carrier, be careful that the spline part of the inner shaft does not damage the oil seal.

**9. REMOVAL OF DIFFERENTIAL MOUNTING BRACKET (L.H.) / 13. DIFFERENTIAL MOUNTING BRACKET (R.H.)**

While supporting the differential carrier with a jack, remove the differential mounting bracket.

**NOTE**

Support the differential carrier with a jack until installing the differential mounting bracket.

**INSPECTION**

N02UCAA

- Check the differential mounting bracket for deformation and damage.
- Check the bracket for deformation and damage.
- Check the differential mounting rubber for cracks and damage.

**SERVICE POINTS OF INSTALLATION**

N02UDAA

**4. INSTALLATION INNER SHAFT**

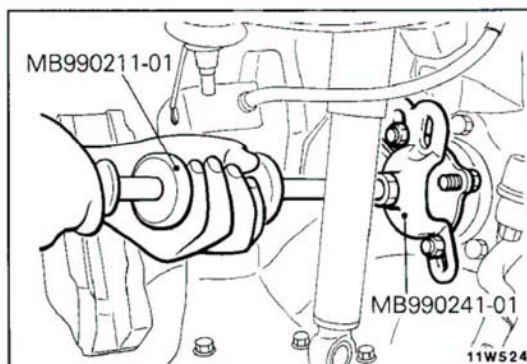
Drive the inner shaft into the front differential carrier by using the special tools.

**Caution**

Be careful not to damage the lip of the dust seal and oil seal.

**2. INSTALLATION OF DRIVE SHAFT**

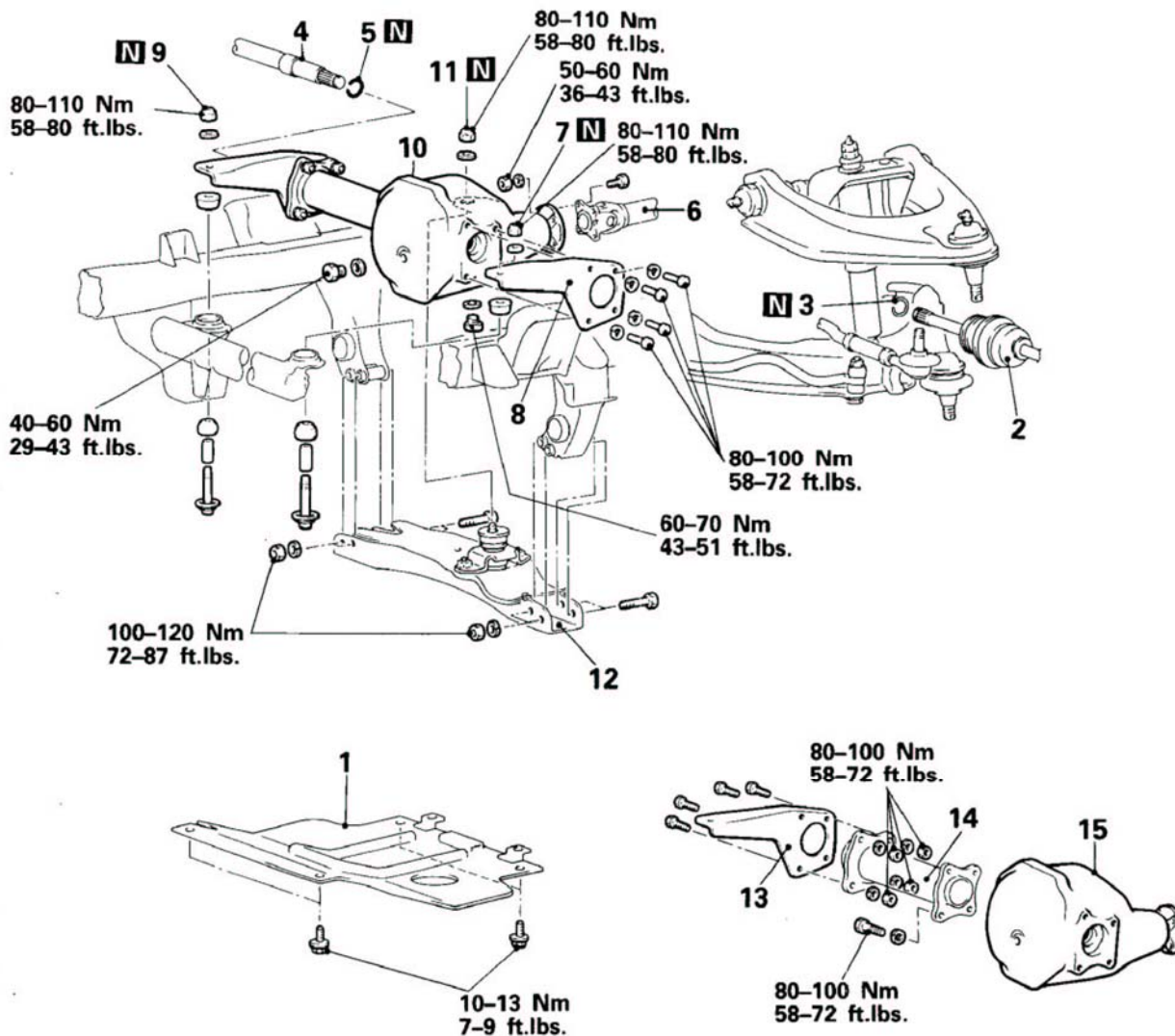
Refer to P.2-52.



# DIFFERENTIAL CARRIER

## REMOVAL AND INSTALLATION

N02VA--



11W612

### Removal steps

1. Under cover
- ◆◆◆◆ 2. Drive shaft
- ◆◆◆◆ 3. Circlip
- ◆◆◆◆ 4. Inner shaft
- ◆◆◆◆ 5. Circlip
- ◆◆ 6. Front propeller shaft
- ◆◆ 7. Self-locking nut
- ◆◆ 8. Differential mounting bracket (L.H.)
9. Self-locking nut
10. Front suspension crossmember and front differential carrier assembly
11. Self-locking nut
12. Front suspension crossmember
13. Differential mounting bracket (R.H.)
14. Housing tube
15. Front differential carrier assembly

### Pre-removal Operation

- Draining of Gear Oil (Refer to P.2-16.)

### Post-installation Operation

- Supplying Gear Oil (Refer to P.2-16.)

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆◆ : Refer to "Service Points of Installation".
- (4) N : Non-reusable parts

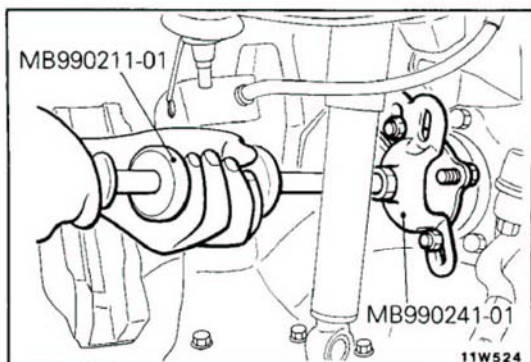


**SERVICE POINTS OF REMOVAL**

N02VBAB

**2. REMOVAL OF KNUCKLE AND DRIVE SHAFT ASSEMBLY**

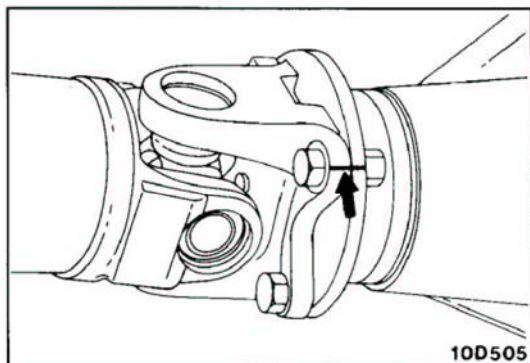
Refer to P.2-44, 52.

**4. REMOVAL OF INNER SHAFT**

Attach the special tools to the flange of the shaft, and pull the inner shaft out from the front differential carrier.

**Caution**

1. Being careful not to scratch or scar the shock absorber with the special tool, remove the lower mounting bolts of the shock absorber, and compress the shock absorber as much as possible.
2. When pulling the inner shaft out from the front differential carrier, be careful that the spline part of the inner shaft does not damage the oil seal.

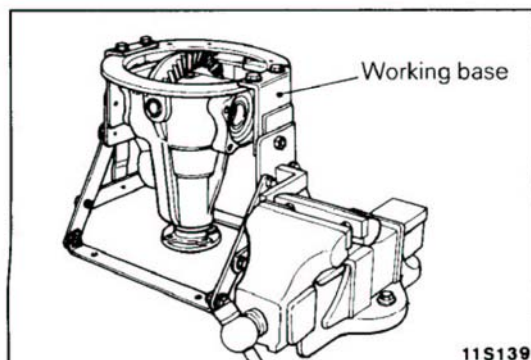
**6. REMOVAL OF FRONT PROPELLER SHAFT**

Make the mating marks on the flange yoke and the differential companion flange.

Detach the propeller shaft from the front differential carrier assembly.

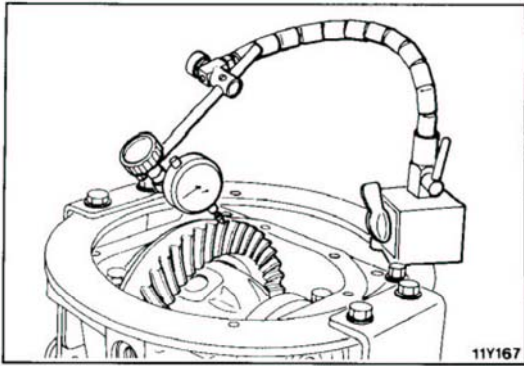
**8. REMOVAL OF DIFFERENTIAL MOUNTING BRACKET (L.H.)**

While supporting the differential carrier with a jack, remove the differential mounting bracket.

**INSPECTION BEFORE DISASSEMBLY**

N02VCAA

Remove the cover and gasket. Hold the working base in a vice, and install the differential carrier assembly to the working base.



### FINAL DRIVE GEAR BACKLASH

Check the final drive gear backlash by following the steps below.

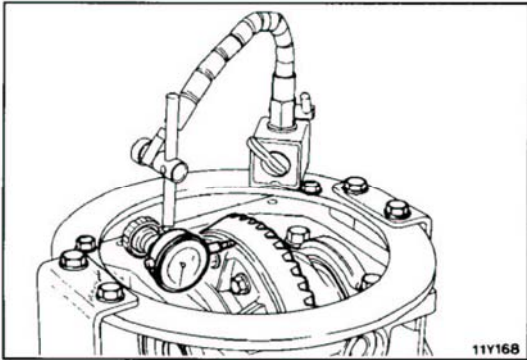
- (1) With the drive pinion locked in place, measure the final drive gear backlash with a dial indicator on the drive gear.

#### NOTE

Measure at four points or more on the circumference of the drive gear.

**Standard value : 0.11–0.16 mm (.0043–.0063 in.)**

- (2) If the backlash is not within the standard value, adjust it by using the side bearing adjustment spacers.



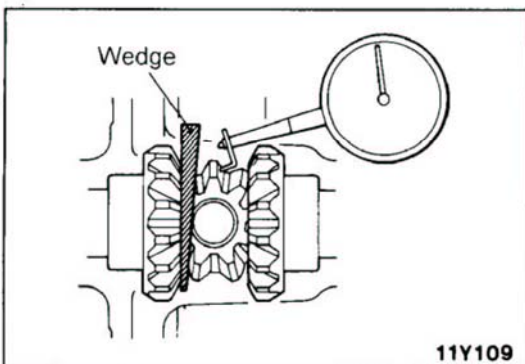
### DRIVE GEAR RUNOUT

Check the drive gear runout by following the steps below.

- (1) Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

**Limit : 0.05 mm (.0020 in.)**

- (2) If the runout exceeds the limit, check for improper tightening of the drive gear and differential case.



### DIFFERENTIAL GEAR BACKLASH

Check the differential gear backlash by following the steps below.

- (1) While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

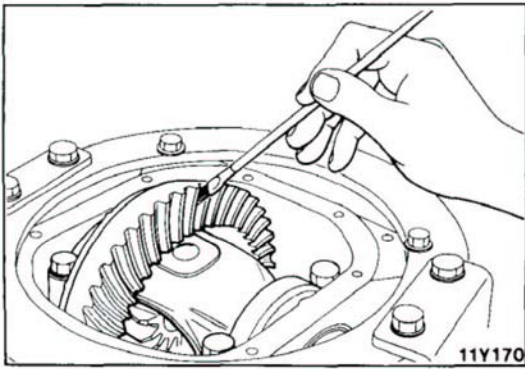
#### NOTE

The measurement should be made for both pinion gears individually.

**Standard value : 0–0.076 mm (0–.0030 in.)**

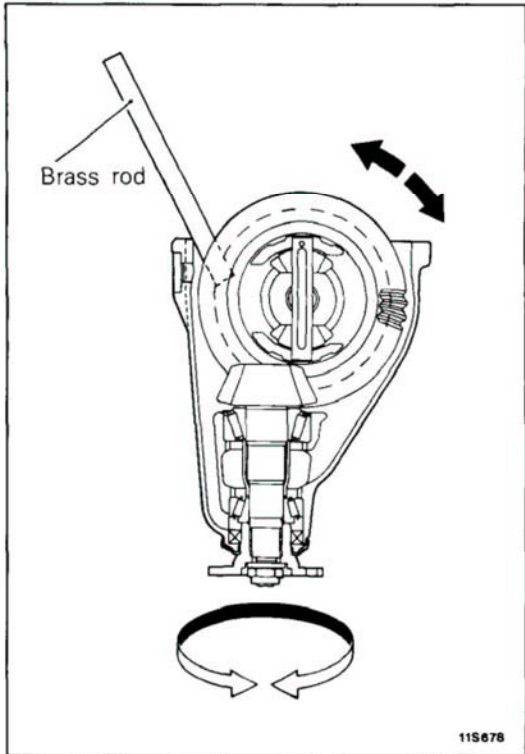
**Limit : 0.2 mm (.0079 in.)**

- (2) If the backlash exceeds the limit, adjust by using the side gear thrust spacers.

**FINAL DRIVE GEAR TOOTH CONTACT**

Check the tooth contact of the final drive gear by following the steps below.

- (1) Apply a thin, uniform coat of machine blue to both surfaces of the drive gear teeth.



- (2) Insert the brass between the differential carrier and the differential case, and then rotate the companion flange by hand (once in the normal direction, and then once in the reverse direction) while applying a load to the drive gear so that the revolution torque [approximately 2.5 to 3.0 Nm (1.8 to 2.2 ft.lbs.)] is applied to the drive pinion.

**Caution**

**If the drive gear is rotated too much, the tooth contact pattern will become unclear and difficult to check.**

- (3) Check the tooth contact condition of the drive gear and drive pinion.

**NOTE**

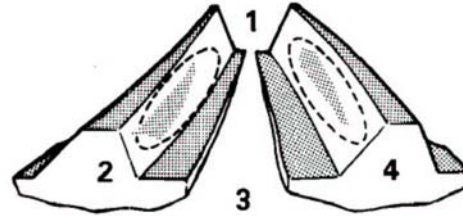
1. Checking the tooth contact pattern is the way to confirm that the adjustments of the pinion height and backlash have been done properly.
2. Continue to adjust the pinion height and backlash until the tooth contact pattern resembles the standard pattern.
3. If, even after adjustments have been made, the correct tooth contact pattern cannot be obtained, it means that the drive gear and the drive pinion have become worn beyond the allowable limit; replace the gear set.

**Caution**

**If either the drive gear or the drive pinion is to be replaced, be sure to replace both gears as a set.**

**Standard tooth contact pattern**

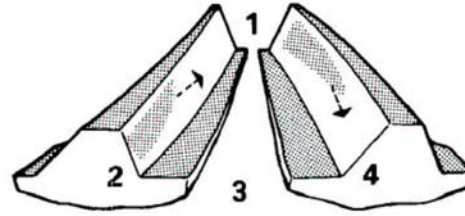
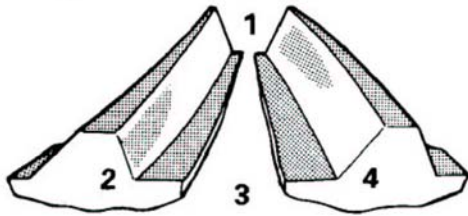
- 1 Toe
- 2 Drive-side
- 3 Heel
- 4 Coast-side



Problem

Solution

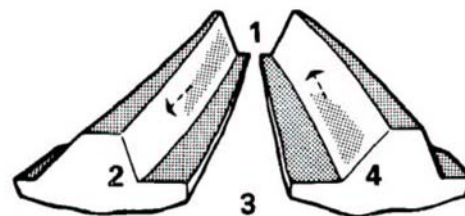
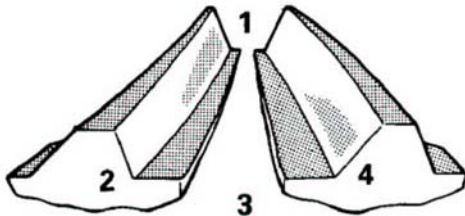
**Tooth contact pattern resulting from excessive pinion height**



The drive pinion is positioned too far from the center of the drive gear.

Increase the thickness of the pinion height adjusting shim, and position the drive pinion closer to the center of the drive gear. Also, for backlash adjustment, position the drive gear farther from the drive pinion.

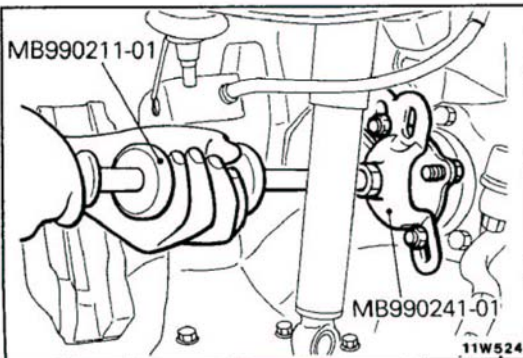
**Tooth contact pattern resulting from improper pinion height**



The drive pinion is positioned too close to the center of the drive gear.

Decrease the thickness of the pinion height adjusting shim, and position the drive pinion farther from the center of the drive gear. Also, for backlash adjustment, position the drive gear closer to the drive pinion.

11S642



**SERVICE POINTS OF INSTALLATION**

NO2VDAB

**4. INSTALLATION OF INNER SHAFT**

Drive the inner shaft into the front differential carrier by using the special tools.

**Caution**

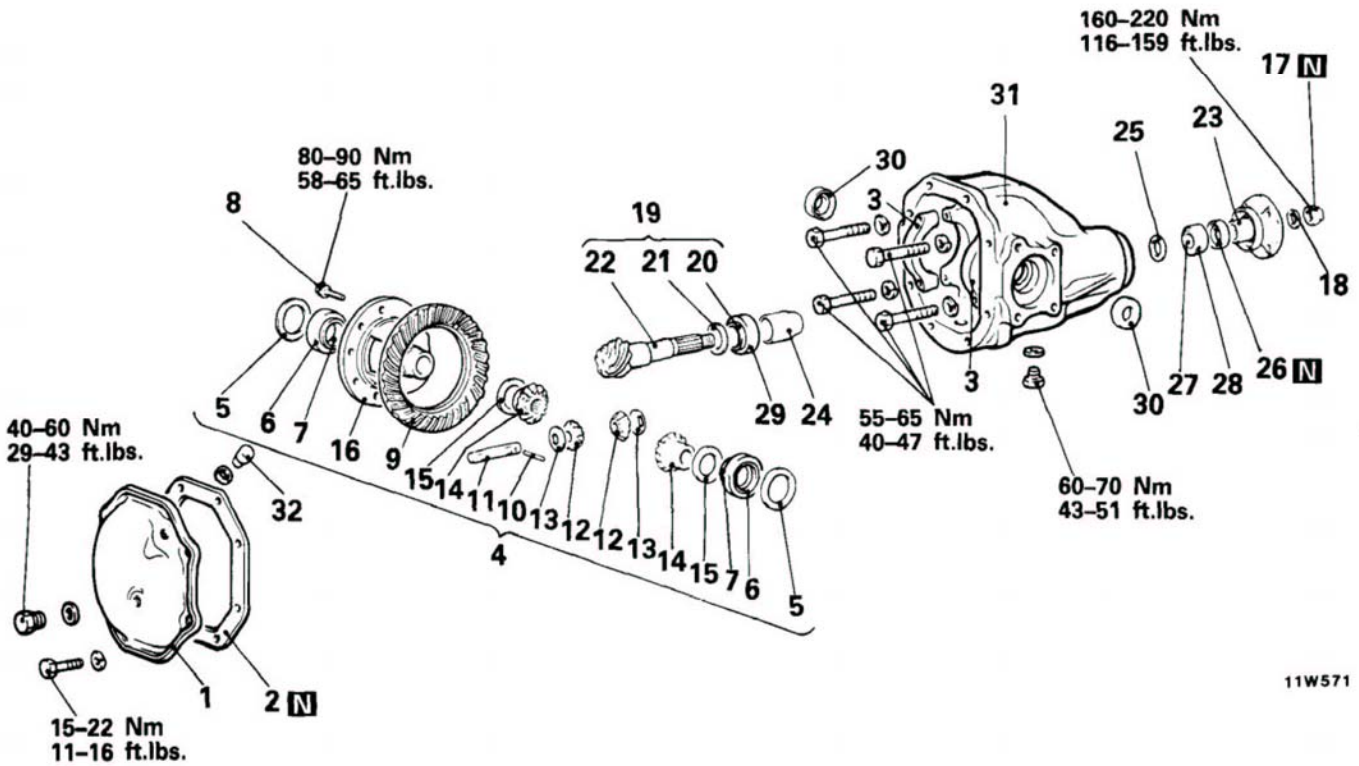
**Be careful not to damage the lip of the dust seal and oil seal.**

**2. INSTALLATION OF DRIVE SHAFT**

Refer to P.2-52.

DISASSEMBLY

N02VE--



11W571

**Inspection before Disassembly**

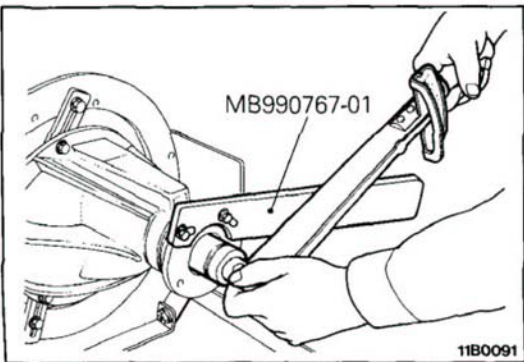
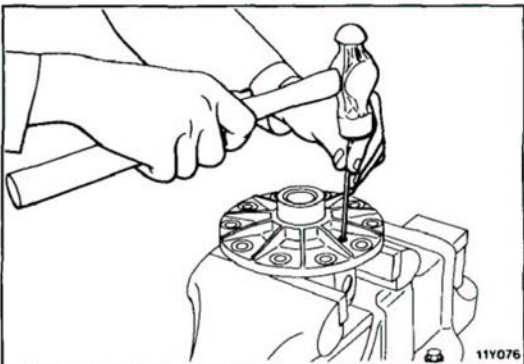
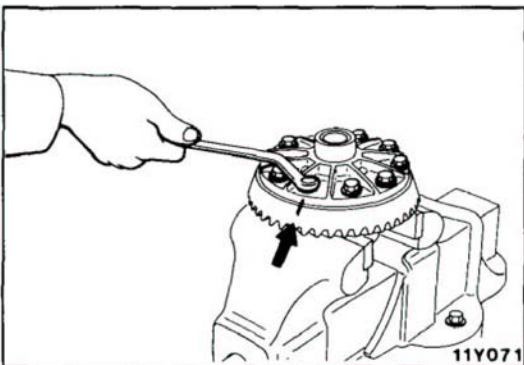
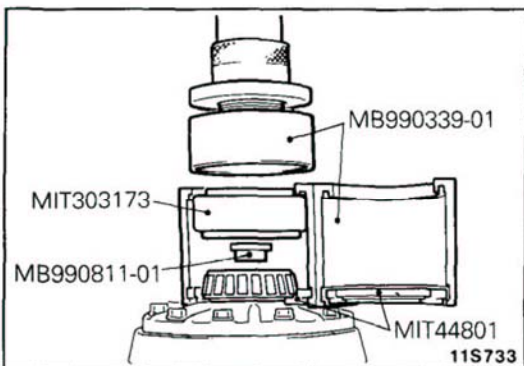
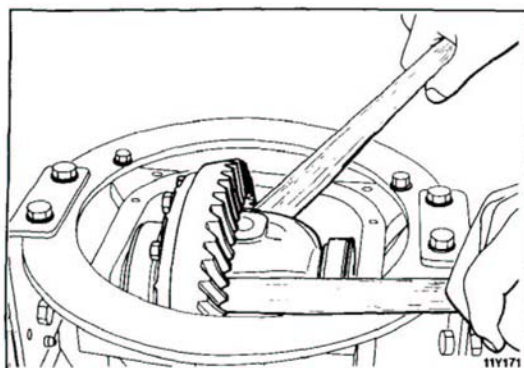
- Final Drive Gear Backlash
  - Drive Gear Backlash
  - Differential Gear Backlash
  - Final Drive Gear Tooth Contact
- } Refer to P.2-69-72.

**Disassembly steps**

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>1. Cover</li> <li>2. Gasket</li> <li>3. Bearing caps</li> <li>↔ 4. Differential case assembly</li> <li>5. Side bearing adjusting spacers</li> <li>6. Side bearing outer races</li> <li>↔ 7. Side bearing inner races</li> <li>8. Bolts (10)</li> <li>↔ 9. Drive gear</li> <li>↔ 10. Lock pin</li> <li>11. Pinion shaft</li> <li>12. Pinion gears</li> <li>13. Pinion washers</li> <li>14. Side gears</li> <li>15. Side gear thrust spacers</li> <li>16. Differential case</li> <li>↔ 17. Companion flange self-locking nut</li> <li>18. Washer</li> <li>↔ 19. Drive pinion assembly</li> <li>↔ 20. Drive pinion front bearing inner race</li> </ul> | <ul style="list-style-type: none"> <li>21. Drive pinion front shim (for pinion height adjustment)</li> <li>22. Drive pinion</li> <li>23. Companion flange</li> <li>24. Drive pinion spacer</li> <li>25. Drive pinion rear shim (for preload adjustment)</li> <li>26. Oil seal</li> <li>27. Drive pinion rear bearing inner race</li> <li>↔ 28. Drive pinion rear bearing outer race</li> <li>↔ 29. Drive pinion front bearing outer race</li> <li>30. Oil seals</li> <li>31. Gear carrier</li> <li>32. Vent plug</li> </ul> |
|--|---|

NOTE

- (1) ↔ : Refer to "Service Points of Disassembly".  
 (2) [N] : Non-reusable parts

**SERVICE POINTS OF DISASSEMBLY**

N02VFAA

**4. REMOVAL OF DIFFERENTIAL CASE ASSEMBLY**

Take out the differential case assembly with a hammer handle.

**Caution**

**When taking out the differential case assembly, be careful not to drop and damage the side bearing outer races.**

**NOTE**

Keep the right and left side bearings and side bearing adjusting spacers separate, so that they do not become mixed at the time of reassembly.

**7. REMOVAL OF SIDE BEARING INNER RACES**

Pull out the side bearing inner races by using the special tools.

**9. REMOVAL OF DRIVE GEAR**

- (1) Make the mating marks to the differential case and the drive gear.
- (2) Loosen the drive gear attaching bolts in diagonal sequence to remove the drive gear.

**10. REMOVAL OF LOCK PIN**

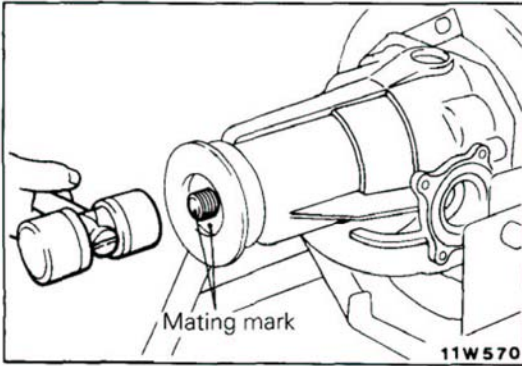
Drive out the lock pin with a punch.

**NOTE**

The removed side gears and side gear thrust spacers, left and right, should be retained for reassembly.

**17. REMOVAL OF COMPANION FLANGE SELF-LOCKING NUT**

Use the special tool to hold the companion flange and remove the companion flange self-locking nut.



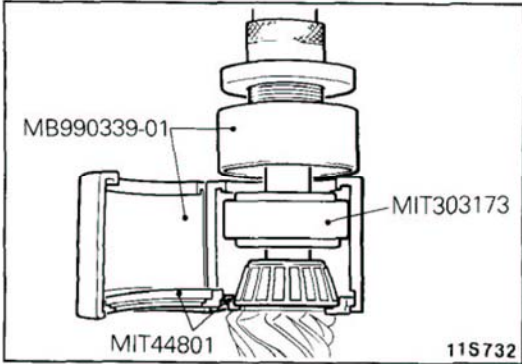
**19. REMOVAL OF DRIVE PINION ASSEMBLY**

- (1) Make mating marks on the drive pinion and companion flange.

**Caution**

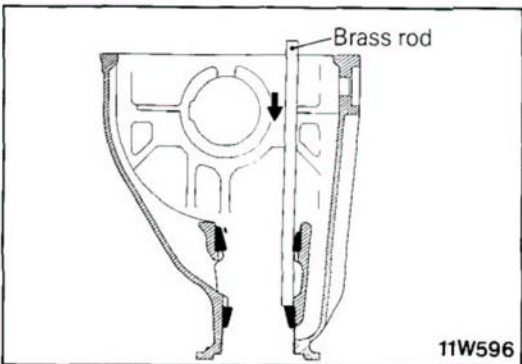
The mating mark made on the companion flange must not be on the coupling surface of the flange yoke and the front propeller shaft.

- (2) Drive out the drive pinion together with the drive pinion spacer and drive pinion shims.



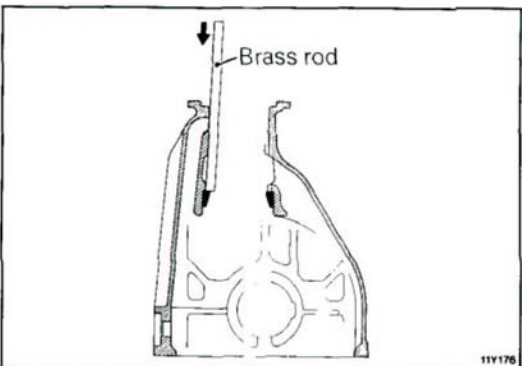
**20. REMOVAL OF DRIVE PINION FRONT BEARING INNER RACE**

Pull out the drive pinion front bearing inner race by using the special tools.



**28. REMOVAL OF DRIVE PINION REAR BEARING OUTER RACE**

Drive out the drive pinion rear bearing outer race from the gear carrier by using the brass rod



**29. REMOVAL OF DRIVE PINION FRONT BEARING OUTER RACE**

Drive out the drive pinion front bearing outer race from the gear carrier by using the brass rod.

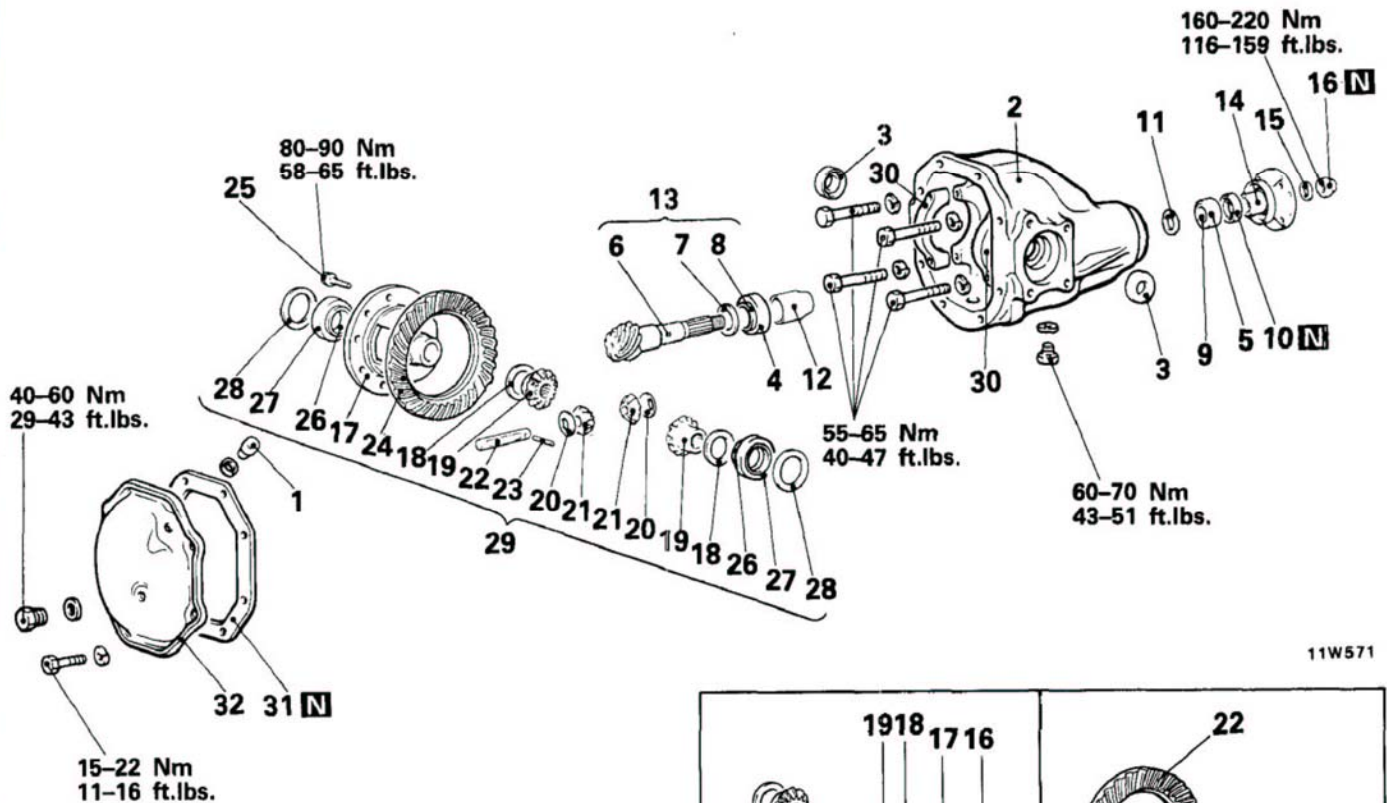
**INSPECTION**

N02VGAA

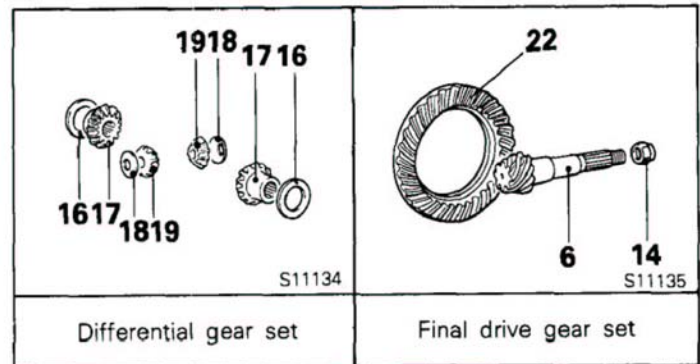
- Check the companion flange for wear or damage.
- Check the oil seal for wear or deterioration.
- Check the bearings for wear or discoloration.
- Check the gear carrier for cracks.
- Check the drive pinion and ring gear for wear or cracks.
- Check the side gears, pinion gears and pinion shaft for wear or damage.
- Check the side gear spline for wear or damage.

REASSEMBLY

N02VH-



11W571



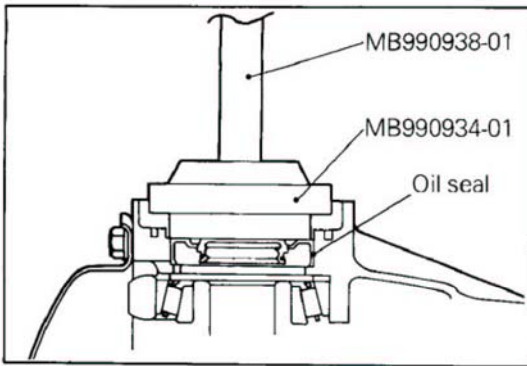
Reassembly steps

1. Vent plug
2. Gear carrier
- ◆◆ 3. Oil seals
- ◆◆ 4. Drive pinion front bearing outer race
- ◆◆ 5. Drive pinion rear bearing outer race
- ◆◆ Adjustment of pinion height
6. Drive pinion
7. Drive pinion front shim (for pinion height adjustment)
8. Drive pinion front bearing inner race
- ◆◆ Adjustment of drive pinion preload
9. Drive pinion rear bearing inner race
10. Oil seal
11. Drive pinion rear shim (for preload adjustment)
12. Drive pinion spacer
13. Drive pinion assembly
14. Companion flange
15. Washer
16. Companion flange self-locking nut
17. Differential case
18. Side gear thrust spacers
19. Side gears
20. Pinion washers
21. Pinion gears
- ◆◆ Adjustment of differential gear backlash
22. Pinion shaft
- ◆◆ 23. Lock pin
- ◆◆ 24. Drive gear
- ◆◆ 25. Bolts (10)
- ◆◆ 26. Side bearing inner races
- ◆◆ 27. Side bearing outer races
- ◆◆ Adjustment of final drive gear backlash
28. Side bearing adjusting spacers
29. Differential case assembly
30. Bearing caps
- ◆◆ 31. Gasket
32. Cover

NOTE

- (1) ◆◆ : Refer to "Service Points of Reassembly".
- (2) [N] : Non-reusable parts





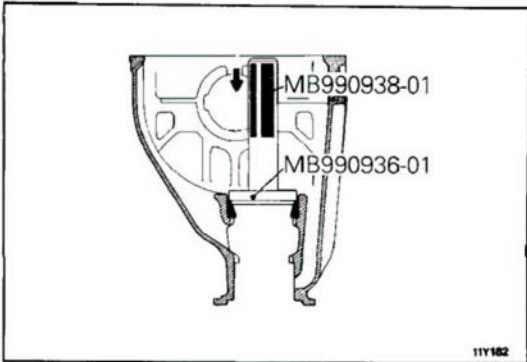
**SERVICE POINTS OF REASSEMBLY**

N02V1AB

**3. INSTALLATION OF OIL SEALS**

Install the oil seal with the special tool and apply a thin coat of specified grease to the lip of the oil seal.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

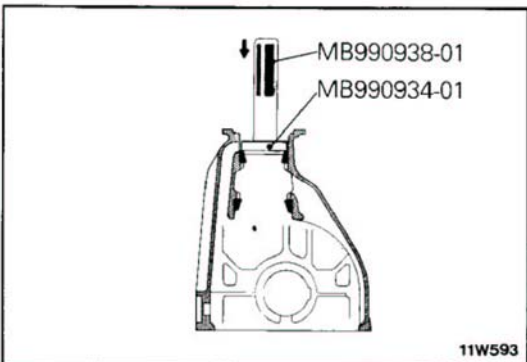


**4. INSTALLATION OF DRIVE PINION FRONT BEARING OUTER RACE**

Press-fit the drive pinion front bearing outer races into the gear carrier by using the special tools.

**NOTE**

Perform press-fitting carefully so as not to tilt the outer race.

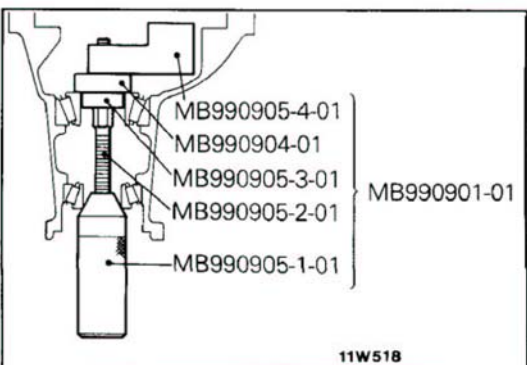


**5. INSTALLATION OF DRIVE PINION REAR BEARING OUTER RACE**

Press-fit the drive pinion rear bearing outer races into the gear carrier by using the special tools.

**NOTE**

Perform press-fitting carefully so as not to tilt the outer race.

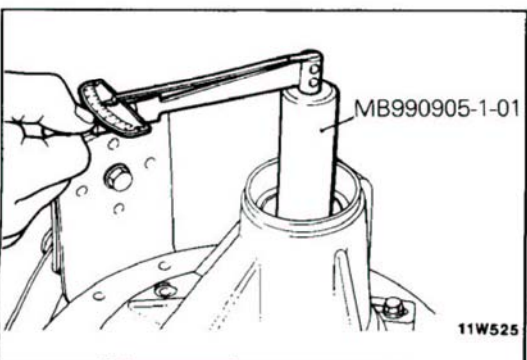


**● ADJUSTMENT OF PINION HEIGHT**

Adjustment the drive pinion height by the following procedures:

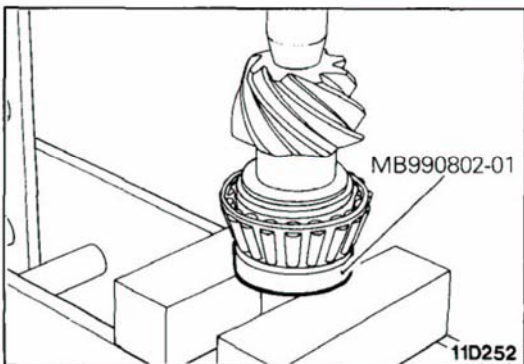
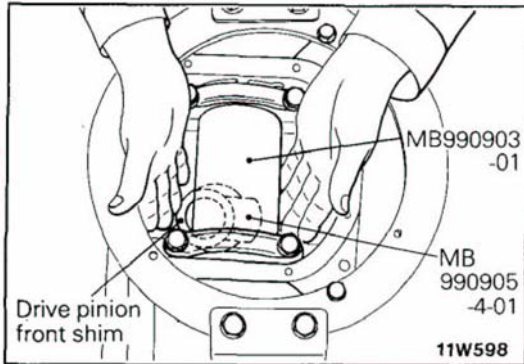
- (1) Install special tools and drive pinion front and rear bearing inner races to the gear carrier in the sequence shown in the illustration.
- (2) Tighten the handle of the special tool until the standard value of drive pinion rotation torque is obtained.
- (3) Measure the drive pinion rotation torque (without the oil seal) by using the special tools.

**Standard value : 0.4–0.5 Nm (3.5–4.3 in. lbs.)**



## NOTE

1. Gradually tighten the handle of the special tool while checking the drive pinion preload.
2. Because one rotation can't be made when the special tool is in contact with the gear carrier, move it a few times and, after seating the bearing, measure the rotation torque.



- (4) Position the special tool in the side bearing seat of the gear carrier, and then select a drive pinion front shim of a thickness which corresponds to the gap between the special tools.

## NOTE

1. Be sure to clean the side bearing seat thoroughly. When positioning the special tool, be sure that the cut-out sections of the special tool are in the position shown in the illustration, and also confirm that the special tool is in close contact with the side bearing seat.
  2. When selecting the drive pinion front shims, keep the number of shims to a minimum.
- (5) Fit the selected drive pinion front shim(s) to the drive pinion, and press-fit the drive pinion front bearing inner race by using the special tool.

#### ● ADJUSTMENT OF DRIVE PINION PRELOAD

Adjust the drive pinion turning torque by using the following procedure:

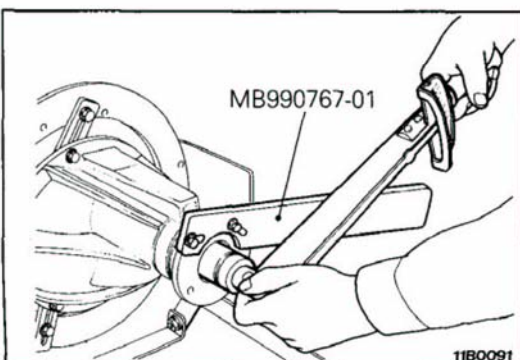
##### Without Oil Seal

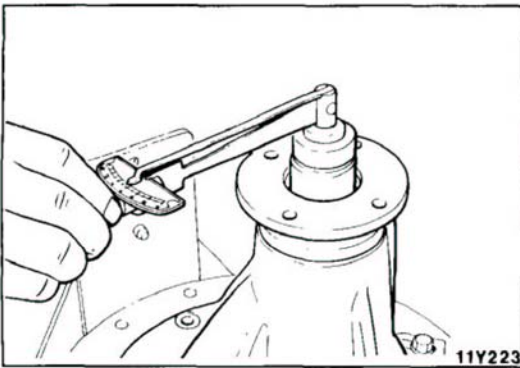
- (1) Insert the drive pinion into the gear carrier, and then install, from the front side of the carrier, the drive pinion spacer, the drive pinion rear shim; the drive pinion rear bearing inner race, and the companion flange in that order.

## NOTE

Do not install the oil seal.

- (2) Tighten the companion flange to the specified torque by using the special tool.





- (3) Measure the drive pinion rotation torque (without the oil seal).

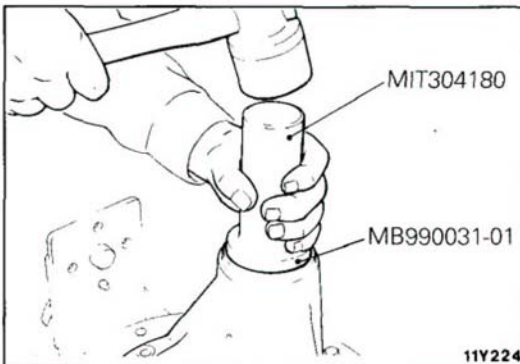
**Standard value : 0.4–0.5 Nm (3.5-4.3 in.lbs.)**

- (4) If the drive pinion rotation torque is not within the range of the standard value, adjust the preload by replacing the drive pinion rear shim(s) or the drive pinion spacer.

**NOTE**

When selecting the drive pinion rear shims, if the number of shims is large, reduce the number of shims to a minimum by selecting the drive pinion spacers.

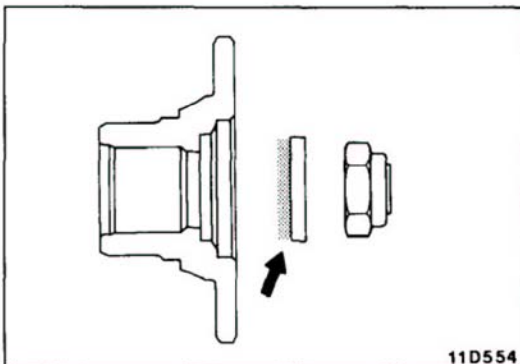
- (5) Remove the companion flange and drive pinion once again.



**With Oil Seal**

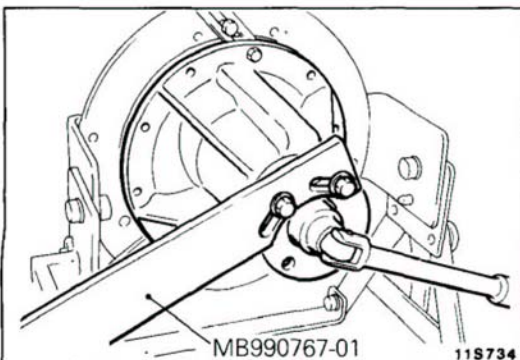
- (1) After setting the drive pinion rear bearing inner race, drive the oil seal into the gear carrier front lip by using the special tool.  
 (2) Apply the specified grease to the oil seal lip.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

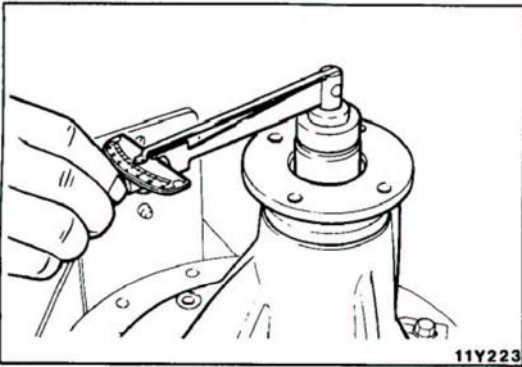


- (3) Apply a thin coat of specified grease to the companion flange contacting surface of the washer before installing drive pinion assembly.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**



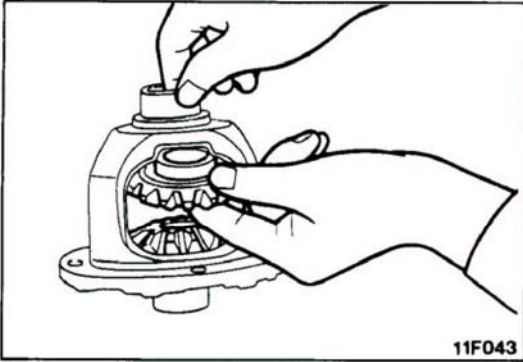
- (4) Install the drive pinion assembly and companion flange with mating marks properly aligned, and tighten the companion flange self-locking nut to the specified torque by using the special tools.



- (5) Measure the drive pinion rotation torque (with oil seal) to verify that the drive pinion preload complies with the standard value.

**Standard value : 0.6–0.7 Nm (5.2–6.1 in.lbs.)**

- (6) If the measured value is not within the standard value range, check for faulty installation of the oil seal or faulty tightening of the self-locking nut.

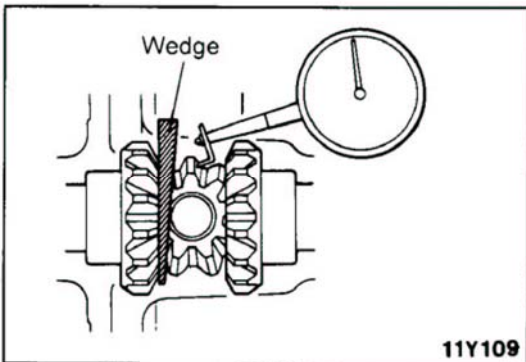


● **ADJUSTMENT OF DIFFERENTIAL GEAR BACKLASH**

- (1) Assemble the side gears, side gear thrust spacers, pinion gears, and pinion washers into the differential case.  
 (2) Temporarily install the pinion shaft.

**NOTE**

Do not drive in the lock pin yet.



- (3) Insert a wedge between the side gear and the pinion shaft to lock the side gear.  
 (4) Measure the differential gear backlash with a dial indicator on the pinion gear.

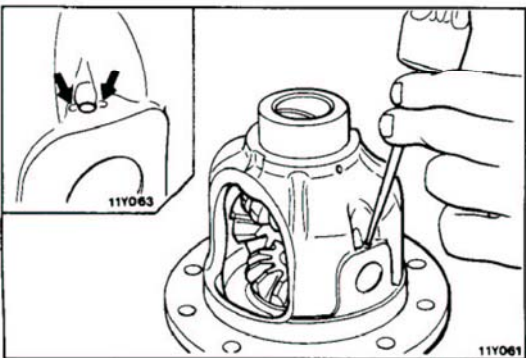
**Standard value : 0–0.076 mm (0–.0030 in.)**

**Limit : 0.2 mm (.008 in.)**

- (5) If the differential gear backlash exceeds the limit, adjust the backlash by installing thicker side gear thrust spacers.

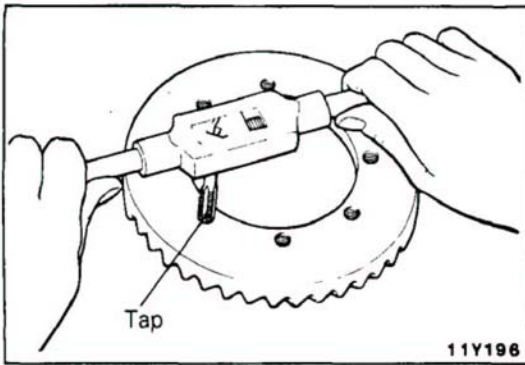
- (6) Measure the differential gear backlash once again, and confirm that it is within the limit.

If adjustment is not possible, replace the side gears and pinion gears as a set.



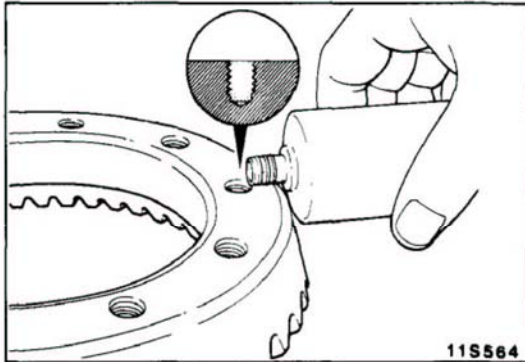
**23. INSTALLATION OF LOCK PIN**

- (1) Align the pinion shaft lock pin hole with the differential case lock pin hole, and drive in the lock pin.  
 (2) Stake the lock pin with a punch at two points.



**24. INSTALLATION OF DRIVE GEAR**

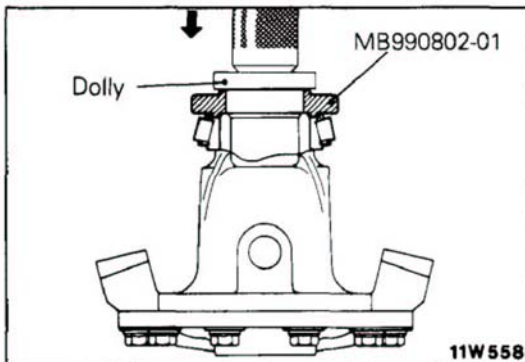
- (1) Clean the drive gear attaching bolts.
- (2) Remove the adhesive adhered to the threaded holes of the drive gear by turning the tap tool (M10 x 1.25), and then clean the threaded holes by applying compressed air.



- (3) Apply the specified adhesive to the threaded holes of the drive gear.

**Specified adhesive : 3M Adhesive stud locking 4170 or equivalent**

- (4) Install the drive gear onto the differential case with the mating marks properly aligned. Be sure to tighten the bolts to the specified torque in a diagonal sequence.



**26. INSTALLATION OF SIDE BEARING INNER RACES**

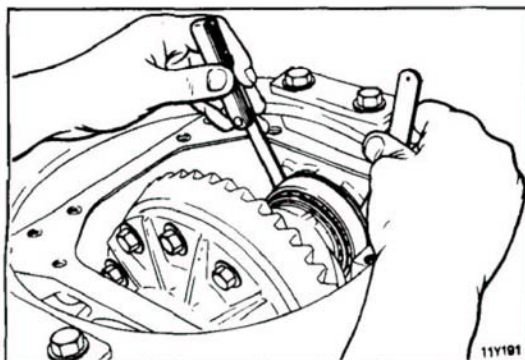
Press-fit the side bearing inner races to the differential case by using the special tool.

● **ADJUSTMENT OF FINAL DRIVE GEAR BACKLASH**

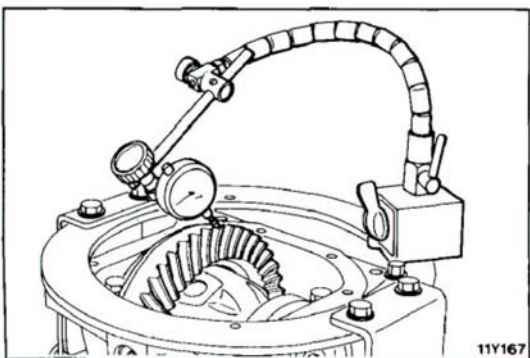
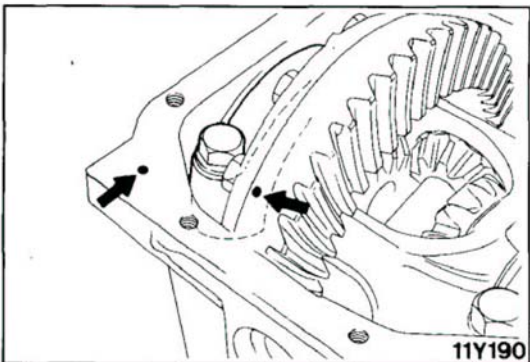
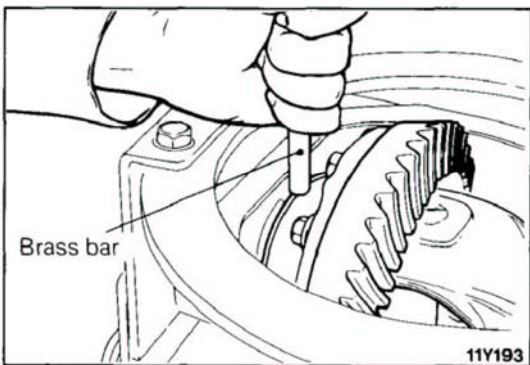
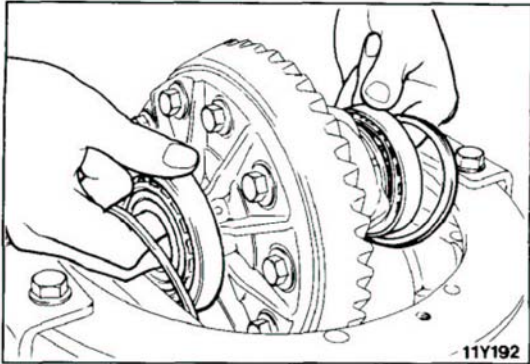
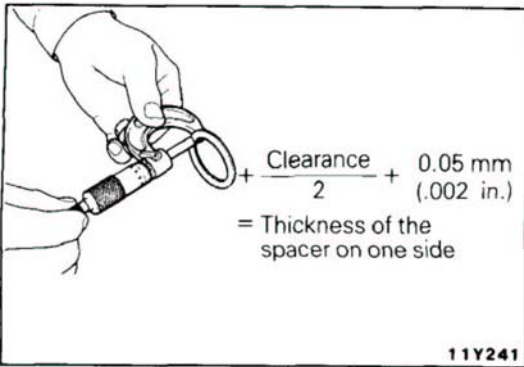
- (1) Install the side bearing adjusting spacers, which are thinner than those removed, to the side bearing outer races, and then mount the differential case assembly into the gear carrier.

**NOTE**

Select side bearing adjusting spacers with the same thickness for both the drive pinion side and the drive gear side.



- (2) Push the differential case assembly to one side, and measure the clearance between the gear carrier and the side bearing adjusting spacer with a feeler gauge.



(3) Measure the thickness of the side bearing adjusting spacers on one side, select two pairs of spacers which correspond to that thickness plus one half of the clearance plus 0.05 mm (.002 in.), and then install one pair each to the drive pinion side and the drive gear side.

(4) Install the side bearing adjusting spacers and differential case assembly, as shown in the illustration, to the gear carrier.

(5) Tap the side bearing adjusting spacers with the brass bar to fit them to the side bearing outer race.

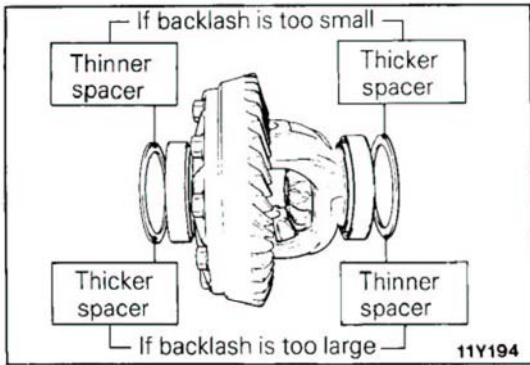
(6) Align the mating marks on the gear carrier and the bearing cap, and then tighten the bearing cap.

(7) With the drive pinion locked in place, measure the final drive gear backlash with a dial indicator on the drive gear.

**NOTE**

Measure at four points or more on the circumference of the drive gear.

**Standard value : 0.11–0.16 mm (.0043–.0063 in.)**

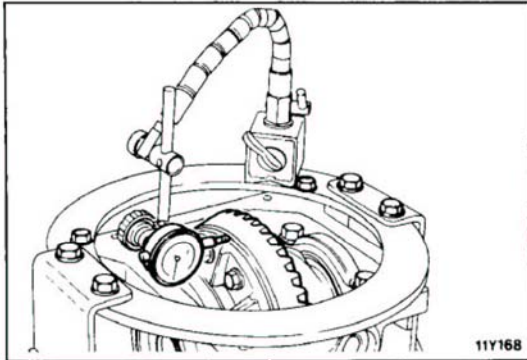


- (8) Change the side bearing adjusting spacers as illustrated, and then adjust the final drive gear backlash between the drive gear and the drive pinion.

**NOTE**

When increasing the number of side bearing adjusting spacers, use the same number for each, and as few as possible.

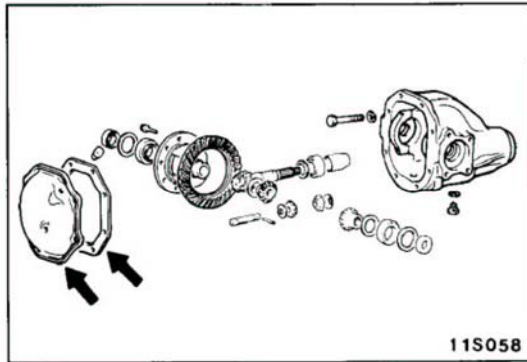
- (9) Check the drive gear and drive pinion for tooth contact. If poor contact is evident, make adjustment. (Refer to P.2-71)



- (10) Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

**Limit : 0.05 mm (.0020 in.)**

- (11) If the drive gear runout exceeds the limit, reinstall by changing the phase of the drive gear and differential case, and remeasure.



**31. APPLICATION OF SEALANT TO GASKET**

Apply the specified sealant to both sides of the gasket and install the differential cover to the differential carrier.

**Specified sealant : 3M ART Part No. 8661 or No. 8663, or equivalent**

# REAR AXLE

## CONTENTS

N03AA--

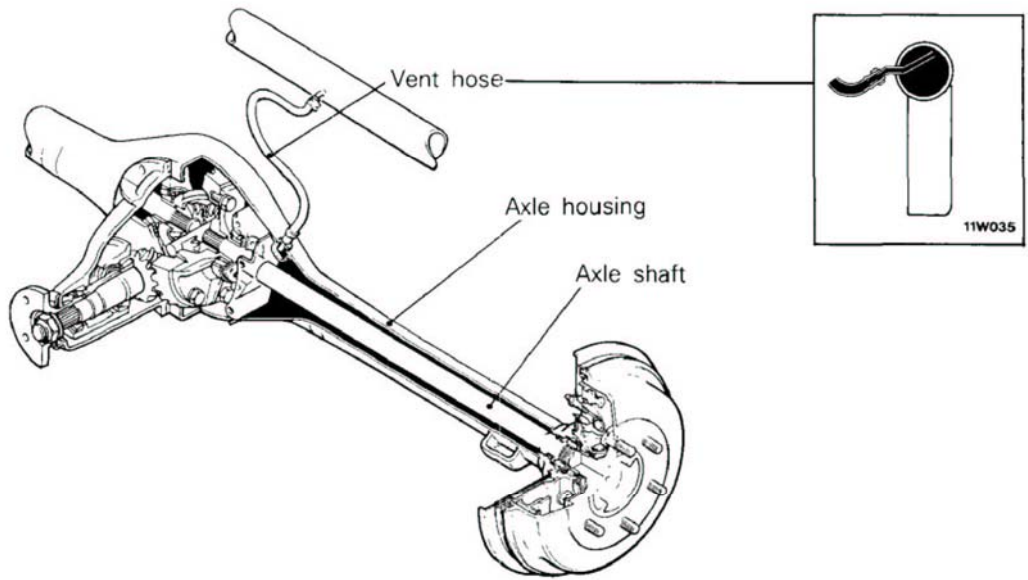
<b>AXLE ASSEMBLY</b> .....	<b>20</b>	<b>TROUBLESHOOTING</b> .....	<b>14</b>
<b>AXLE SHAFT</b> .....	<b>22</b>	AXLE SHAFT, AXLE HOUSING .....	14
<b>DIFFERENTIAL CARRIER</b> .....	<b>27</b>	Grease Leakage	
<b>GENERAL INFORMATION</b> .....	<b>2</b>	Noise While Wheels are Rotating	
<b>SERVICE ADJUSTMENT PROCEDURES</b> .....	<b>17</b>	DIFFERENTIAL (CONVENTIONAL DIFFERENTIAL) .....	14
Checking Axle Shaft for End Play .....	17	Bearing Noise While Driving or Coasting	
Checking Gear Oil Level .....	17	Constant Noise	
Checking Rear Axle Total Backlash .....	17	Gear Noise While Coasting	
Limited Slip Differential Preload Measurement .....	18	Gear Noise While Driving	
Replacement of Axle Housing Oil Seal .....	18	Heat	
<b>SPECIAL TOOLS</b> .....	<b>12</b>	Noise While Turning	
<b>SPECIFICATIONS</b> .....	<b>9</b>	Oil Leakage	
General Specifications .....	9	DIFFERENTIAL (LIMITED SLIP DIFFERENTIAL) .....	15
Lubricants .....	11	Abnormal Noise during Driving or Gear Changing	
Sealant and Adhesive .....	11	Abnormal Noise When Cornering	
Service Specifications .....	10	Breakdown	
Torque Specifications .....	11	Gear Noise	
		Gear Oil Leakage	
		Seizure	
		Limited Slip Differential Does not Function	



### GENERAL INFORMATION

N03BAAB

The banjo-type, semi-floating type of rear axle has been adopted. In order to improve the river-crossing ability of this model, a vent hose has been installed from the axle housing, and a differential breather (air bleeder) has been used within the frame crossmember. There are two types of differential; conventional differential and limited slip differential. The limited slip differential is of great help when driving on muddy and other slippery ground.



11W508

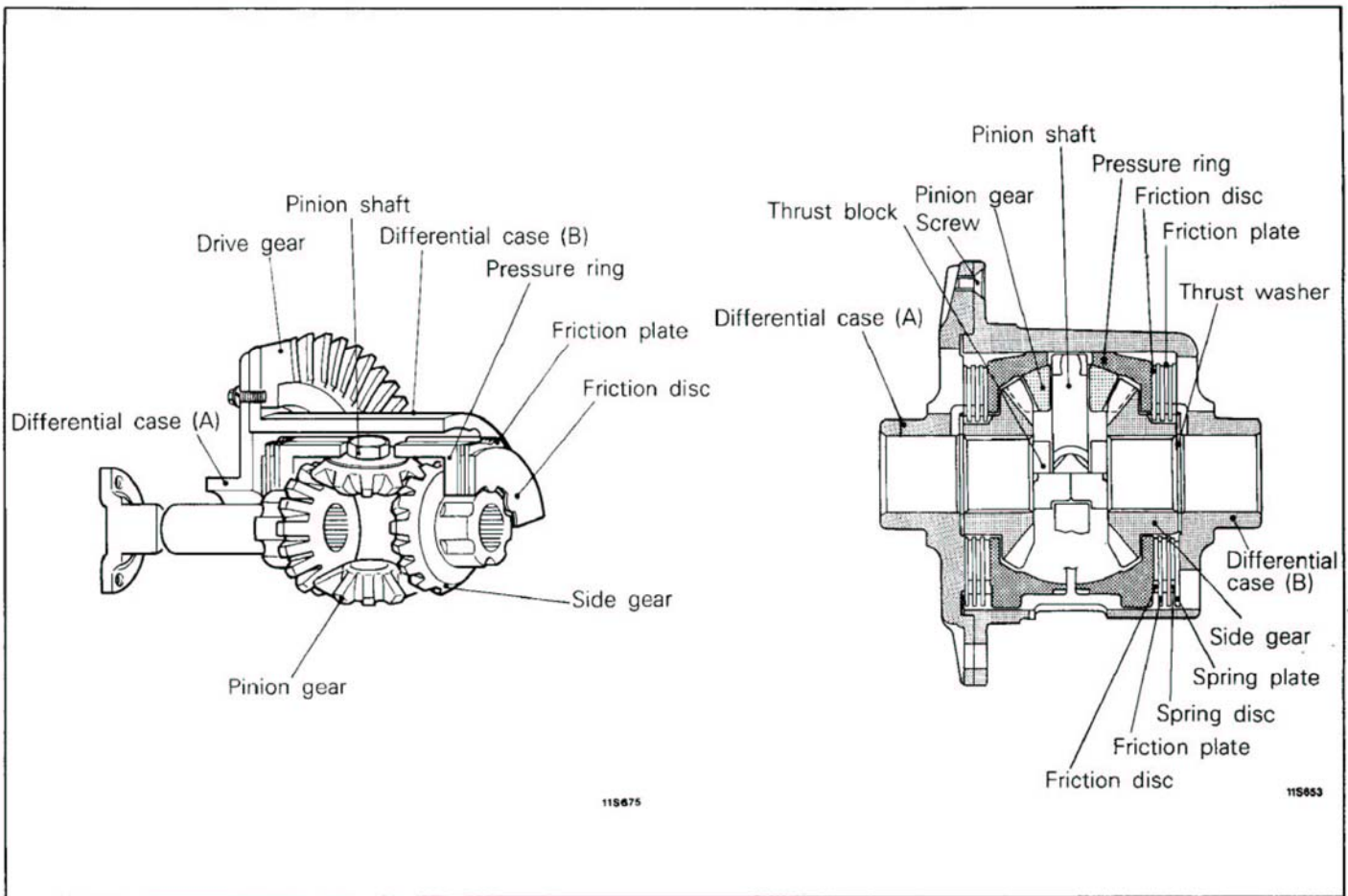
**LIMITED SLIP DIFFERENTIAL**

N03BBAB

A limited slip differential is an anti-slipping device which functions as a differential during cornering to allow the outer wheel to turn at a faster speed than the inner wheel. In the event that one wheel begins spinning (driving on slippery road surfaces, one wheel leaves the road surface, etc.), it automatically functions to prevent such spinning.

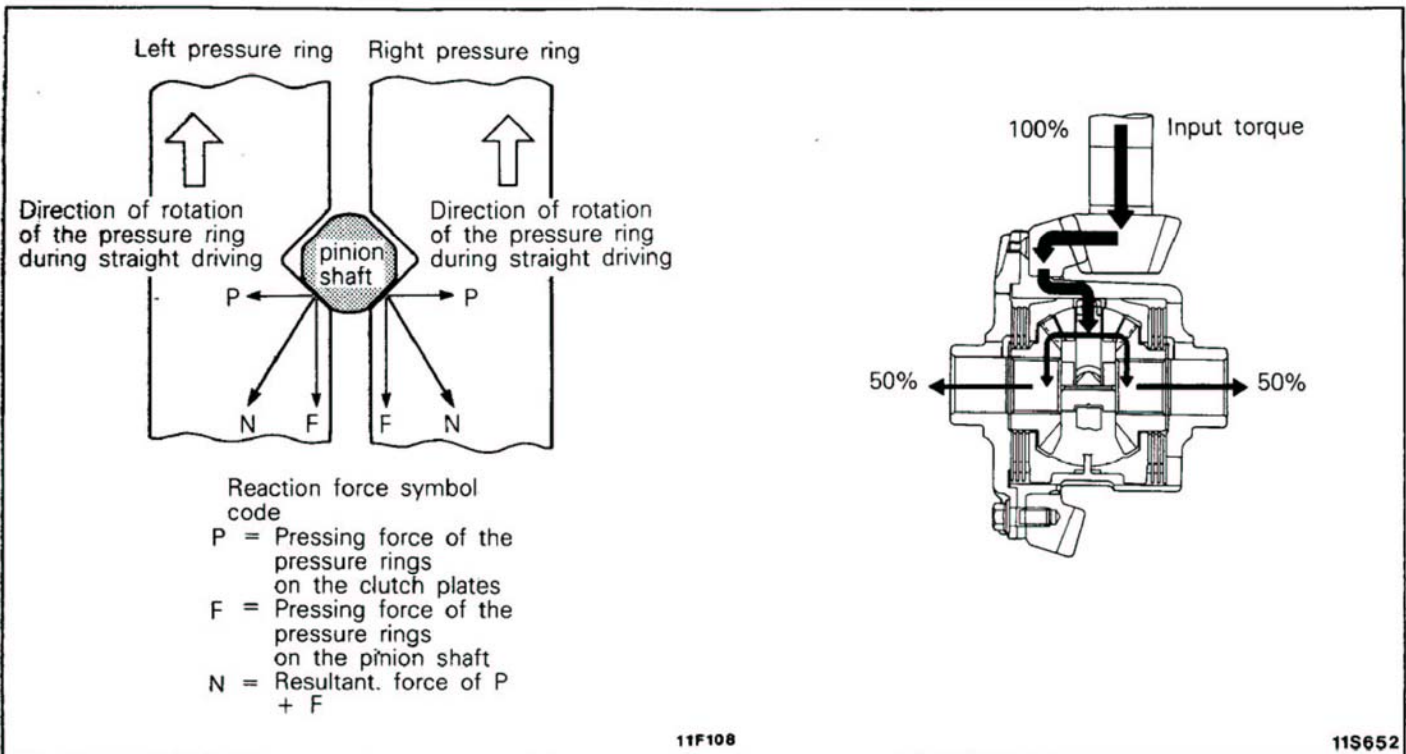
**CONSTRUCTION AND FUNCTION**

With a conventional differential, in the event that one wheel of the vehicle is on ice, mud, or some other slippery surface, the wheel will spin and the drive force of the vehicle will be greatly reduced. If this happens, the speeds of the differential case and of the side gear (axle shaft) are different because of differential operation. The limited slip function acts to limit this differential operation. The construction is shown in the illustration. The multi-plate clutches engage with the differential case and with each of the side gears. If spinning causes a difference in component speeds, the frictional force between the clutch plates will cause the speed of the side gear to become closer to that of the differential case, and thus the limited slip function will control the spinning. In addition, the purpose of the pressure rings inside the differential case is to transmit the driving force to the pinion gear, and the reason for the separation is to provide an increase in the clutch plate pressing force through the leverage of the pinion shaft.



**OPERATION (TORQUE TRANSMISSION) DURING STRAIGHT DRIVING**

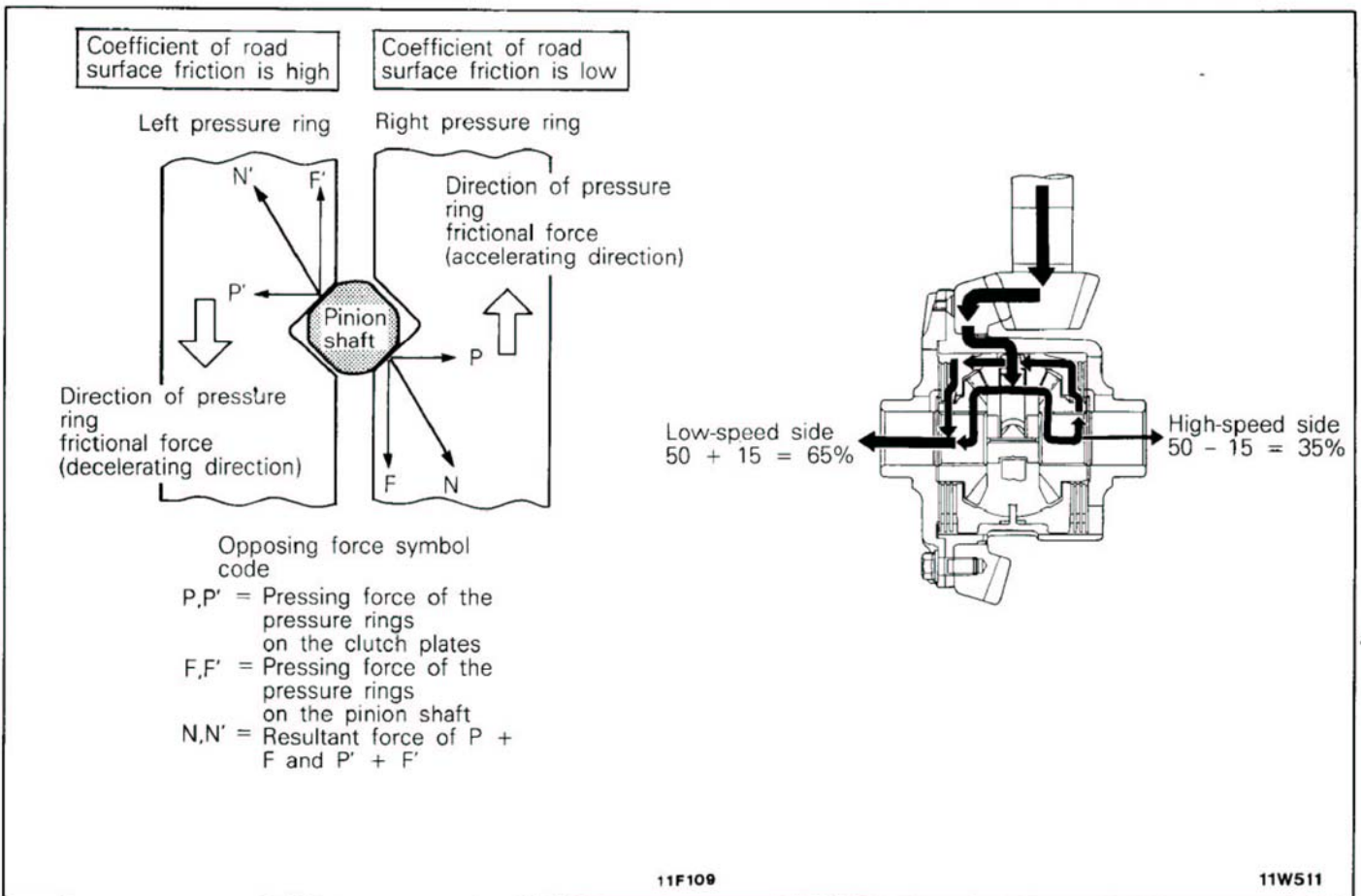
When the differential case is turned the drive pinion via the drive gear, the pressure rings which are interlocked with the differential case will also turn at the same speed. (The projections located on the outside of the pressure rings engage (with some play) the grooves located on the inside of the differential case). When the pressure rings move in the direction of rotation, they contact the tapered portion of the pinion shaft, and thereby receive reaction force in both the lateral direction and the direction of rotation. The reaction force in the lateral direction presses the clutch plates together, and maintains straight driving. During such driving, because the road surface gives equal resistance to both the left and right wheels, equal resistance is applied to the left and right side gears. Therefore, the pinion gear does not revolve, and the drive gear, the differential case, the pinion shaft, the pinion gear, and the left and right side gears all turn as one unit.



**OPERATION (TORQUE TRANSMISSION) WHEN THE SPEEDS OF LEFT AND RIGHT WHEELS ARE DIFFERENT**

When one wheel is in contact with a concrete road surface (which has high coefficient of friction) and the other wheel is in contact with a muddy or other slippery road surface (which has low coefficient of friction), the differential operation will cause the speed of the wheel in contact with the slippery surface to be faster than the speed of the drive gear, lowering the maximum drive force. If this occurs, the limited slip function will control the differential operation and increase the driving force. The transmission of torque through the limited slip device in this event is as follows:

When the differential case is turned by the drive gear and the drive pinion, the pressure rings which are interlocked with the differential case will turn at the same speed. Also, the difference in the road surface resistances will cause differential operation and the left and right side gears will revolve at speeds different from that of the differential case. Because of the friction produced between the clutch plates in mesh with both the side gear and differential case, one of the pressure rings increases its rotating speed, whereas the other reduces its rotating speed. The pressure rings press the tapered portion of the pinion shaft with which they are in contact, and thereby receive reaction force in both the lateral direction and the direction of rotation. The reaction force in the lateral direction causes the clutch plates to mesh, increasing the frictional and the drive force.



11F109

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**FEATURES OF LIMITED SLIP DIFFERENTIAL**

- (1) When one wheel of the vehicle is in contact with a road surface which has poor traction, the limited slip differential, in comparison to a conventional differential, supplies additional torque to the wheel which has the better traction conditions by utilizing clutch plates, thus improving the traction capacity. Moreover, the effect of the limited slip differential is to prevent the vehicle from becoming stuck, even if the traction of one of the wheels becomes radically reduced.
- (2) When one wheel moves from a road surface which has poor traction onto one which has good traction, or when the wheels are constantly leaving the road surface while driving on a rough, bumpy road, the clutch plates of the limited slip differential allow the torque to absorb the differences between the revolution speeds of the right and left wheels. In addition, the sudden changes (jolting) in the drive force are also absorbed, thus preventing skidding.
- (3) Because in the limited slip differential, the differential operation is slightly restricted during normal cornering, the understeer tendency (the tendency for the cornering of the vehicle to exceed the turning of the steering wheel) becomes greater; however, this does not have any detrimental effect on the driving of the vehicle. Moreover, in the event that the inside wheel lifts up (the tire leaves the road surface) during high speed cornering, the clutch plates function to limit differential operation which would simultaneously decrease the drive force of the outside wheel; therefore, the limited slip differential moderates sudden speed reductions during vehicle cornering, and thereby provides greater cornering capability than a conventional differential.

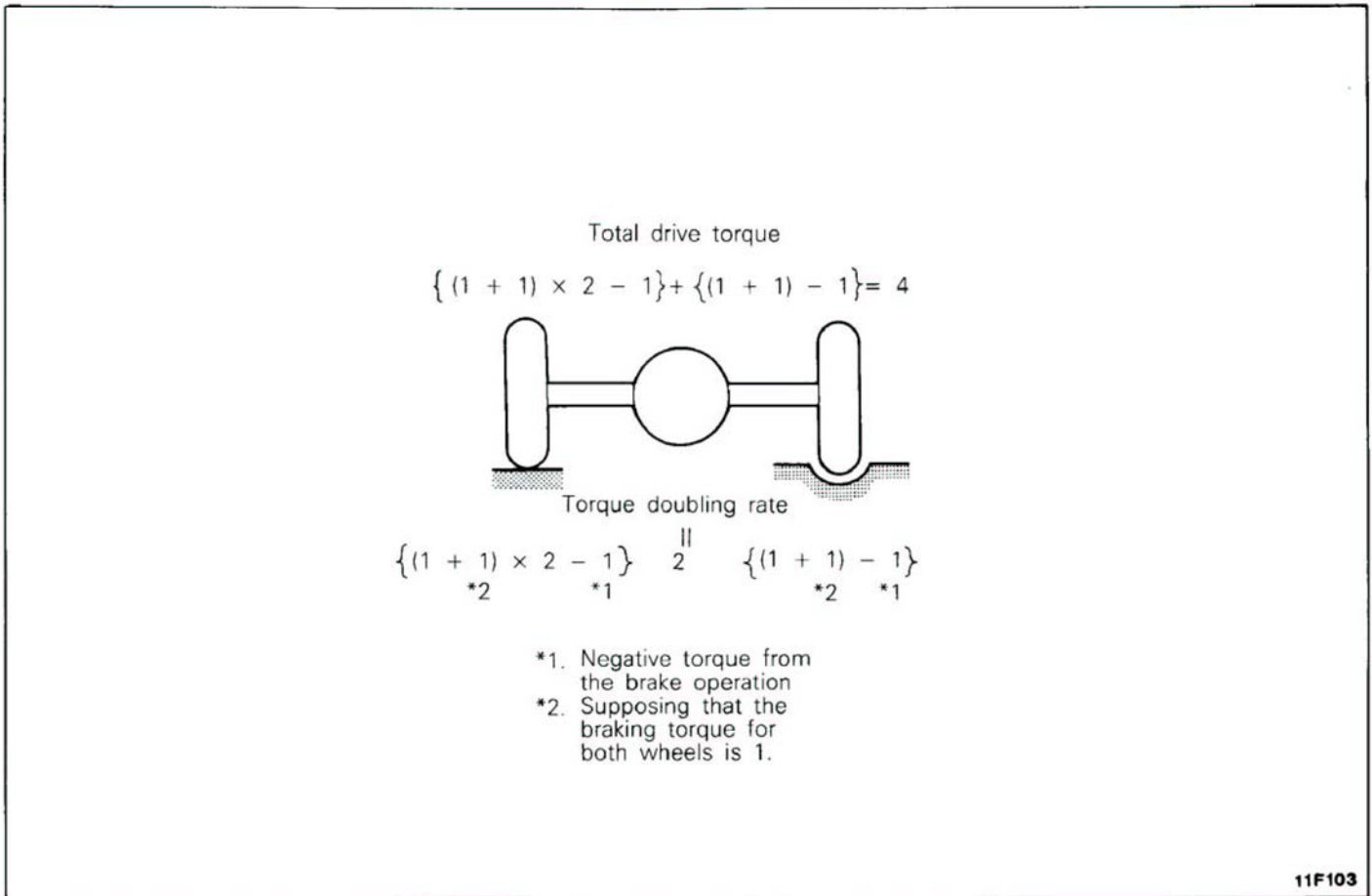
**MAKING EFFECTIVE USE OF LIMITED SLIP DIFFERENTIAL**

**Effective Use in Combination with Brakes**

If a wheel is in contact with a slippery road surface and has begun to spin, using the brakes in combination with the limited slip differential will provide even greater traction capability. The resistance caused by the brakes will further increase the drive torque of the engine, and this increased torque will increase the clutch plate pressing force of the pressure ring, thus increasing the traction. Also, the drive force transmitted to the brakes will not function as real drive force. This is shown in the illustration below.

In the illustration, the application rate is  $R_t = 2$ , and, supposing the torque from the brake operation is 1, a drive torque of  $1 + 1 = 2$  will be applied to the spinning wheel (the right wheel), and a drive torque of twice that which is applied to the spinning wheel, or  $(1 + 1) \times 2 = 4$ , will be applied to the wheel which is not spinning (the left wheel). However, because the brake force of 1 is a negative value with regard to the propulsion torque of each wheel, the propulsion torque actually obtained by the right wheel is  $(1 + 1) - 1 = 1$ , and that obtained by the left wheel is  $[(1 + 1) \times 2 - 1] = 3$ .

Therefore, the total drive torque is  $1 + 3 = 4$ . In the same circumstances, the total drive torque of a conventional differential is  $1 + 1 = 2$ , and that of a limited slip differential when the brakes are not used in combination is  $1 + 2 = 3$ . This represents an increase in the traction by a factor of 2 over that of a conventional differential, and by a factor of 1.3 over that of a limited slip differential when the brakes are not used.



**NOTES REGARDING SERVICE PROCEDURES FOR LIMITED SLIP DIFFERENTIAL**

- (1) The engine must never be operated while only a single wheel is jacked up. Doing so is extremely dangerous; if the differential functions while the engine is operated at high speed, the oil film between the clutch plates will decrease, thus causing the friction coefficient to increase, the prescribed torque ratio will be exceeded, an excessive amount of torque will be applied to the stationary wheel, and the vehicle will move forward. Also, resistance must never be applied to the spinning wheel.
- (2) In the event that one of the wheels comes in contact with a slippery road surface and begins to spin, if the engine continues to be operated at high speed for too long, the clutch plates might become abnormally worn; such action must be avoided.
- (3) As gear oil, use MITSUBISHI Genuine Gear Oil (part number 8149630 EX) or equivalent. MITSUBISHI Genuine Gear Oil was especially developed for limited-slip differential use, and is different from ordinary gear oil. When changing the oil, the oil which is removed will appear considerably blacker than ordinary oil. This, however, is not a change in color due to the deterioration of the oil, but rather the oil has become mixed with worn particles of the special treatment on the clutch plates.

**SPECIFICATIONS**

**GENERAL SPECIFICATIONS**

N03CA--

Items	Vehicles with conventional differential	Vehicles with limited slip differential
Axle housing type	Banjo type	Banjo type
Axle shaft		
Supporting type	Semi-floating type	Semi-floating type
Shaft dimensions		
Bearing portion dia. mm (in.)	40 (1.57)	40 (1.57)
Center portion dia. mm (in.)	34.5 (1.358)	34.5 (1.358)
Overall length mm (in.)	703.5 (27.700)	703.5 (27.700)
Bearing		
O.D. × I.D. × width mm (in.)	80 × 40 × 19.75 (3.15 × 1.57 × .7776)	80 × 40 × 19.75 (3.15 × 1.57 × .7776)
Differential		
Reduction gear type	Hypoid gear	Hypoid gear
Reduction ratio	4.625	4.625
Differential lock type	–	Disc type
Differential gear type and configuration		
Side gear	Straight bevel gear × 2	Straight bevel gear × 2
Pinion gear	Straight bevel gear × 2	Straight bevel gear × 4
Number of teeth		
Drive gear	37	37
Drive pinion	8	8
Side gear	14	16
Pinion gear	10	10



## SERVICE SPECIFICATIONS

N03CB--

Items	Vehicles with conventional differential	Vehicles with limited slip differential
Standard values		
Axle shaft end play mm (in.)	0.05–0.20 (.0020–.0079)	0.05–0.20 (.0020–.0079)
Limited slip differential preload (on Vehicle) Nm (ft.lbs.)	–	35 (25) or more
Parking brake lever stroke	4–6 clicks	4–6 clicks
Final drive gear backlash mm (in.)	0.11–0.16 (.0043–.0063)	0.11–0.16 (.0043–.0063)
Differential gear back lash mm (in.)	0.10–0.25 (.0004–.0098)	–
Drive pinion turning torque without oil seal Nm (in. lbs.)	0.4–0.5 (3.5–4.3)	0.4–0.5 (3.5–4.3)
with oil seal Nm (in. lbs.)	0.65–0.75 (5.6–6.5)	0.65–0.75 (5.6–6.5)
Difference in total thickness between left and right clutch plates mm (in.)	–	0.05 (.0020) or less
Clearance between the clutch plates and the differential case mm (in.)	–	0.06–.20 (.0024–.0079)
Difference in distances from backs of left and right pressure rings to end of thrust washer mm (in.)	–	0.05 (.0020) or less
Clearance of the side gear in the axial direction mm (in.)	–	0.05–0.20 (.0020–.0079)
Limited slip differential preload When equipped with new clutch plates Nm (ft. lbs.)	–	65–100 (47–72)
When equipped with old clutch plates Nm (ft. lbs.)	–	35–100 (25–72)
Limits		
Rear axle total backlash mm (in.)	5 (.20)	5 (.20)
Drive gear runout mm (in.)	0.05 (.0020)	0.05 (.0020)
Differential gear backlash mm (in.)	0.2 (.008)	–
Friction plates and friction discs warping (flatness) mm (in.)	–	0.08 (.0031)
Friction plates and friction discs wear (difference in thicknesses of friction surfaces and projections) mm (in.)	–	0.1 (.004)

**TORQUE SPECIFICATION**

N03CC--

Items	Nm	ft. lbs.
Shackle assembly attaching nut	45-60	33-43
Shock absorber attaching nut	18-25	13-18
U-bolt attaching nut	85-110	61-80
Brake tube flare nut	13-17	9-12
Propeller shaft attaching nut	50-60	36-43
Bearing case to rear axle housing	50-60	36-43
Rear axle bearing lock nut	180-220	130-159
Filler plug	40-60	29-43
Drain plug	60-70	43-51
Differential carrier to rear axle housing	25-30	18-22
Companion flange	190-250	137-181
Differential case to drive gear	80-90	58-65
Bearing cap	55-65	40-47
Lock plate	15-22	11-16

**LUBRICANTS**

N03CD--

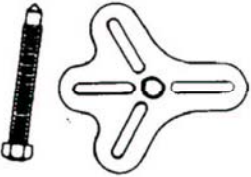

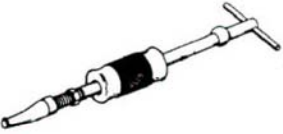







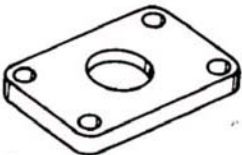

Items	Specified lubricants	Quantity
Rear axle gear oil		
Conventional differential	Hypoid gear oil API classification GL-4 or higher/SAE viscosity No. 90, 80W	1.80 lit. (3.80 U.S.pints., 3.20 Imp.pints.)
Limited slip differential	MITSUBISHI Genuine Gear Oil Part No. 8149630 EX or equivalent	1.80 lit. (3.80 U.S.pints., 3.20 Imp.pints.)
Axle housing oil seal	Multipurpose grease SAE J310, NLGI No. 2	As required
Axle shaft bearing	Multipurpose grease SAE J310, NLGI No. 2	As required
Axle shaft oil seal	Multipurpose grease SAE J310, NLGI No. 2	As required
Axle shaft thread portion	Multipurpose grease SAE J310, NLGI No. 2	As required
Differential carrier oil seal lip	Multipurpose grease SAE J310, NLGI No. 2	As required
Companion flange washer	Multipurpose grease SAE J310, NLGI No. 2	As required


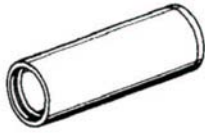



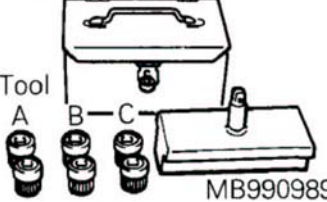
**SEALANT AND ADHESIVE**

N03CE--

Item	Specified sealant and adhesive	Quantity
Axle shaft shim	3M ART Part No.8663,8661 or equivalent	As required
Differential carrier gasket	3M ART Part No.8663,8661 or equivalent	As required
Drive gear threaded hole	3M Adhesive stud locking 4170 or equivalent	As required

## SPECIAL TOOLS

Tool (Number and name)	Use	Tool (Number and name)	Use
MB990241-01 Axle puller 	Measurement of limited slip differential preload Removal of axle shaft	MB990799-01 Axle bearing remover and installer 	Pressing of axle shaft bearing inner race
MB990211-01 Sliding hammer with adapter 	Removal of axle shaft Removal of axle housing oil seal	MB990201-01 Adjustable wrench 	Removal and adjustment of side bearing nut
MB990925-01 Bearing and oil seal installer disc set 	Pressing of axle housing oil seal Pressing of axle shaft bearing outer race Pressing of axle shaft oil seal Pressing of drive pinion rear bearing outer race Pressing of drive pinion front bearing outer race	MB990339-01 Pinion carrier bearing puller 	Removal of side bearing inner race Removal of drive pinion rear bearing inner race
MB990938-01 Handle 	Pressing of axle housing oil seal Pressing of axle shaft bearing outer race Pressing of axle shaft oil seal Pressing of drive pinion rear bearing outer race Pressing of drive pinion front bearing outer race	MIT303173 Insert 	Removal of side bearing inner race Removal of drive pinion rear bearing inner race
MB990785-01 Lock nut spanner wrench 	Removal and installation of lock nut	MIT44801 Collet set 	Removal of side bearing inner race Removal of drive pinion rear bearing inner race
MB990787-01 Rear axle bearing case remover 	Removal of axle shaft bearing and bearing case	MB990811-01 Side bearing cup remover step plate 	Removal of side bearing inner race

Tool (Number and name)	Use	Tool (Number and name)	Use
MB990767-01 End yoke holder 	Holding of companion flange	MIT304180 Handle 	Pressing of drive pinion oil seal
MB990901-01 Pinion height gauge set 	Measurement of pinion height	MB990031-01 Drive pinion oil seal installer 	Pressing of drive pinion oil seal
MB990802-01 Bearing installer 	Pressing of drive pinion rear bearing inner race Pressing of side bearing inner race	MB990988 Side gear holding tool 	Measurement of limited slip differential preload

## TROUBLESHOOTING

N03EAAA

Symptom	Probable cause	Remedy	Reference page
AXLE SHAFT, AXLE HOUSING			
Noise while wheels are rotating	Brake drag Bent axle shaft Worn or scarred axle shaft bearing	Replace	3-22
Grease leakage	Worn or damaged oil seal Malfunction of bearing seal	Replace	3-22
DIFFERENTIAL (CONVENTIONAL DIFFERENTIAL)			
Constant noise	Improper final drive gear tooth contact adjustment Loose, worn or damaged side bearing Loose, worn or damaged drive pinion bearing	Correct or replace	3-29 3-32, 35
	Worn drive gear, drive pinion Worn side gear thrust washer or pinion shaft Deformed drive gear or differential case Damaged gear	Replace	3-32, 35
	Foreign material	Eliminate the foreign material and check; replace the parts if necessary	3-32, 35
	No oil	Fill or change	3-17
Gear noise while driving	Poor gear engagement Improper gear adjustment Improper drive pinion preload adjustment	Correct or replace	3-29, 37
	Damaged gear	Replace	3-32, 35
	Foreign material	Eliminate the foreign material and check; replace the parts if necessary	3-32, 35
	Insufficient oil	Fill or change	3-17
Gear noise while coasting	Improper drive pinion preload adjustment	Correct or replace	3-37
	Damaged gear	Replace	3-32, 35
Bearing noise while driving or coasting	Cracked or damaged drive pinion rear bearing	Replace	3-32, 35
Noise while turning	Loose side bearing Damaged side gear, pinion gear or pinion shaft	Replace	3-32, 35
Heat	Improper gear backlash Excessive preload	Adjust	3-29
	Insufficient oil	Fill or change	3-17

Symptom	Probable cause	Remedy	Reference page
Oil leakage	Clogged breather hose	Clean or replace	3-20
	Cover tightened not Seal malfunction	Retighten, apply sealant, or replace the gasket	3-27
	Worn or damaged oil seal	Replace	3-32, 35
	Excessive oil	Adjust the oil level	3-17
DIFFERENTIAL (LIMITED SLIP DIFFERENTIAL) Abnormal noise during driving or gear changing	Excessive final drive gear backlash Insufficient drive pinion preload	Adjust	3-29, 47
	Excessive differential gear backlash	Adjust or replace	3-29
	Worn spline of a side gear	Replace	3-42, 45
	Loose spline coupling self-locking nut	Retighten or replace	3-42, 45

**NOTE**

In addition to a malfunction of the differential carrier components, abnormal noise can also be caused by the universal joint of the propeller shaft, the axle shafts, the wheel bearings, etc. Before disassembling any parts, take all possibilities into consideration and confirm the source of the noise.

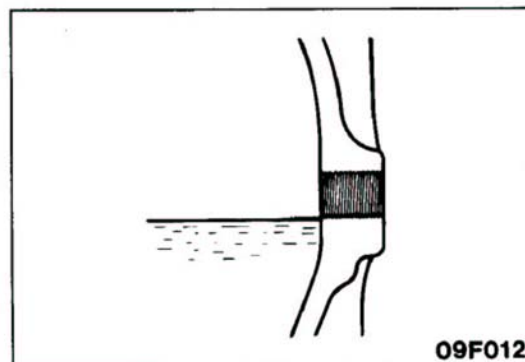
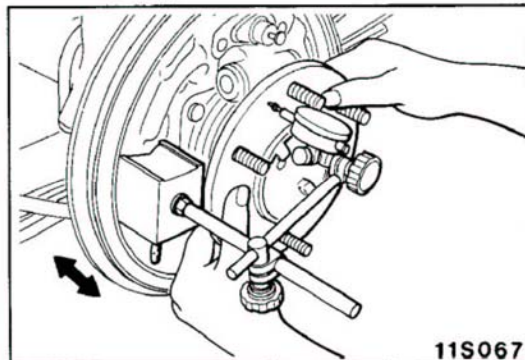
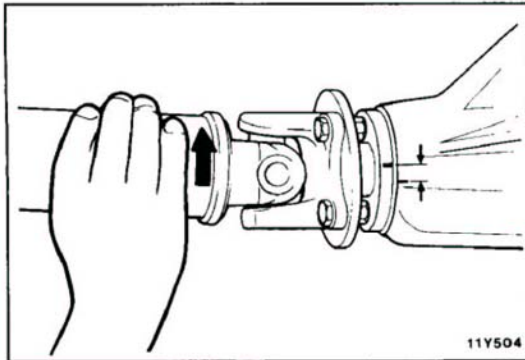
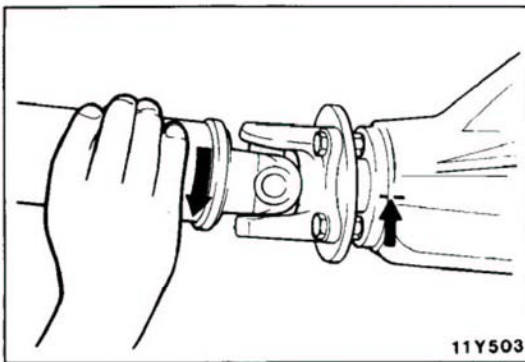
Abnormal noise when cornering	Damaged differential gears Damaged pinion shaft Nicked and/or abnormal wear of inner and outer clutch plates Poor gear oil Abnormally worn or damaged thrust washer	Replace	3-42, 45 3-51
	Improper gear oil quantity	Refill or replace	3-17
Gear noise	Improper final drive gear tooth contact adjustment	Adjust or replace	3-29
	Incorrect final drive gear backlash Improper drive pinion preload adjustment	Adjust	3-29, 47
	Damaged, broken, and/or seized tooth surfaces of the drive gear and drive pinion Damaged, broken, and/or seized drive pinion bearings Damaged broken, and/or seized side bearings Damaged differential case Poor gear oil	Replace	3-42, 45
	Improper gear oil quantity	Refill or replace	3-17

**NOTE**

Noise from the engine, muffler vibration, transmission, propeller shaft, wheel bearings, tires, body, etc., is easily mistaken as being caused by malfunction in the differential carrier components. Be extremely careful and attentive when performing the driving test, etc.

Test methods to confirm the source of the abnormal noise include: coasting, acceleration, constant speed driving, raising the rear wheels on a jack, etc. Use the method most appropriate to the circumstances.

Symptom	Probable cause	Remedy	Reference page
Gear oil leakage	Worn or damaged front oil seal, or an improperly installed oil seal Damaged gasket	Replace	3-42, 45
	Loose spline coupling self-locking nut	Retighten or replace	3-42, 45
	Loose filler or drain plug	Retighten or apply adhesive	3-27
	Clogged or damaged breather hose	Clean or replace	3-20
Seizure	Improper final drive gear backlash Excessive drive pinion preload Excessive side bearing preload Improper differential gear backlash Excessive clutch plate preload	Adjust	3-29, 47, 51
	Improper gear oil	Replace	3-17
	Improper gear oil quantity	Refill or replace	3-17
NOTE In the event of seizure, disassemble and replace the parts involved, and also be sure to check all components for any irregularities and repair or replace as necessary.			
Breakdown	Incorrect final drive gear backlash Incorrect drive pinion preload Incorrect side bearing preload Excessive differential gear backlash Incorrect clutch plate preload	Adjust	3-29, 47, 51
	Loose drive gear clamping bolts	Retighten	3-42, 45
	Operational malfunction due to overloaded clutch	Avoid excessively rough operation	–
NOTE In addition to disassembling and replacing the failed parts, be sure to check all components for irregularities and repair or replace as necessary.			
Limited slip differential does not function (on snow, mud, ice, etc.).	The limited slip device is damaged	Disassemble, check the functioning, and replace the damaged parts	3-42, 45, 51



## SERVICE ADJUSTMENT PROCEDURES N03FAAB

### CHECKING REAR AXLE TOTAL BACKLASH

If the vehicle vibrates and produces a booming sound due to the unbalance of the drivetrain, use the following procedure to measure the rear axle total backlash to see if it is necessary to remove the differential carrier assembly.

- (1) Park the vehicle on a flat, level surface.
- (2) Set both the transmission shift lever and the transfer shift lever to neutral.
- (3) Chock the wheels.

#### NOTE

If the vehicle is to be raised on a lift, engage the parking brake to lock the wheels.

- (4) Manually turn the propeller shaft clockwise as far as it will go and make mating marks on the companion flange dust cover and the gear carrier.
- (5) Manually turn the propeller shaft counterclockwise as far as it will go and measure the movement of the mating marks.

**Limit : 5 mm (.20 in.)**

- (6) If the backlash exceeds the limit, remove the differential carrier assembly and adjust it.

### CHECKING AXLE SHAFT FOR END PLAY N03FBAB

1. Jack up the vehicle and remove the rear wheels.
2. Remove the brake drums.
3. Measure the axle shaft end play with a dial indicator.
4. Pull the axle shaft all the way out and note the end play indication on the dial indicator.

**Standard value : 0.05–0.20 mm (.0020–.0079 in.)**

5. If the axle shaft end play exceeds the standard value, withdraw the axle shaft, and then adjust to the standard value by changing the shim thickness. (Refer to P.3-26.)

### CHECKING GEAR OIL LEVEL N03FCAC

1. Remove the filler plug, and check the oil level.
2. The oil level is sufficient if it reaches the level plug hole.

#### Specified gear oil:

##### Conventional differential

**Hypoid gear oil API classification GL-4 or higher/SAE viscosity No. 90, 80W**  
 [1.80 lit. (3.80 U.S.pints., 3.20 Imp.pints.)]

##### Limited slip differential

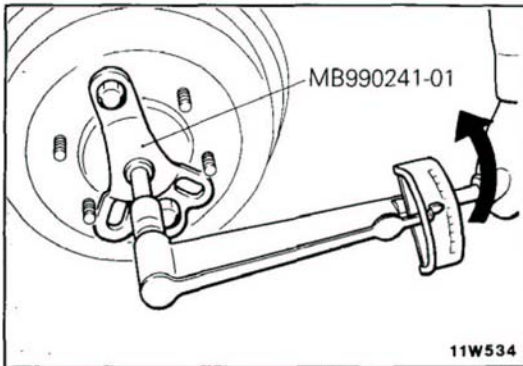
**MITSUBISHI Genuine Gear Oil Part No. 8149630 EX or equivalent**  
 [1.80 lit. (3.80 U.S.pints., 3.20 Imp.pints.)]



**LIMITED SLIP DIFFERENTIAL PRELOAD MEASUREMENT**

N03FDAD

1. To measure the preload of the limited slip differential, set the shift lever of the transmission to the neutral position, lock the front wheels, and fully release the parking brake. One of the rear wheels should be maintained in contact with the ground surface, and the other should be raised up.
2. Measure the axle shaft turning torque at the side on which the wheel is raised position by using the following procedure:
  - (1) Remove the wheel.
  - (2) Mount the special tool to the hub bolts with the hub nuts.
  - (3) Find the limited slip differential preload by measuring the axle shaft turning torque in the forward direction with a torque wrench.

**NOTE**

Before measuring the turning torque, turn the axle shaft to remove any initial resistance.

**Standard value : 35 Nm (25 ft.lbs.) or more**

- (4) If the turning torque is less than the standard value, remove the limited slip differential from the vehicle and repair it. (Refer to P.3-45.)

**REPLACEMENT OF AXLE HOUSING OIL SEAL**

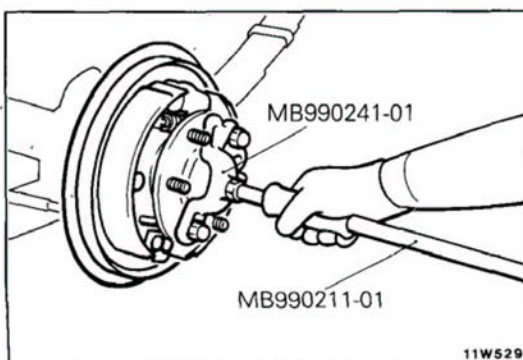
N03FEAC

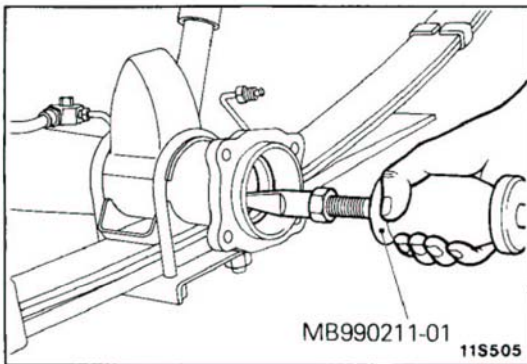
1. Disconnect the parking brake cables from the equalizer and then remove the clamps from the parking brake cables. (Refer to GROUP 5 BRAKES – Parking Brake Cable.)

**NOTE**

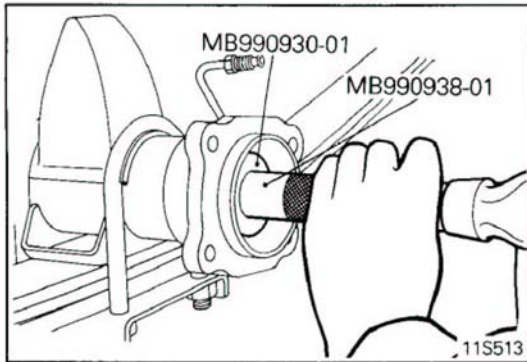
Do not disconnect the parking brake cable and rear brake connection.

2. Before disconnecting the brake tube, drain the brake fluid from the bleeder screw at the left side of the rear brake.
3. Pull the rear axle shaft with rear brake assembly attached. If the rear axle shaft is hard to remove, use the special tools.





4. Use special tool with hook attached to remove the oil seal.



5. Apply the specified grease to the oil seal fitting area of the rear axle housing.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

6. Drive the new oil seal into the rear axle housing end by using the special tools.

7. Apply the specified grease to the oil seal lip.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

8. Adjust the clearance between the bearing case and rear axle housing end. (Refer to P.3-26.)

9. Install the rear axle shaft assembly to the rear axle housing.  
10. Connect the brake tube and bleed out the air. (Refer to GROUP 5 BRAKES-Service Adjustment Procedures.)

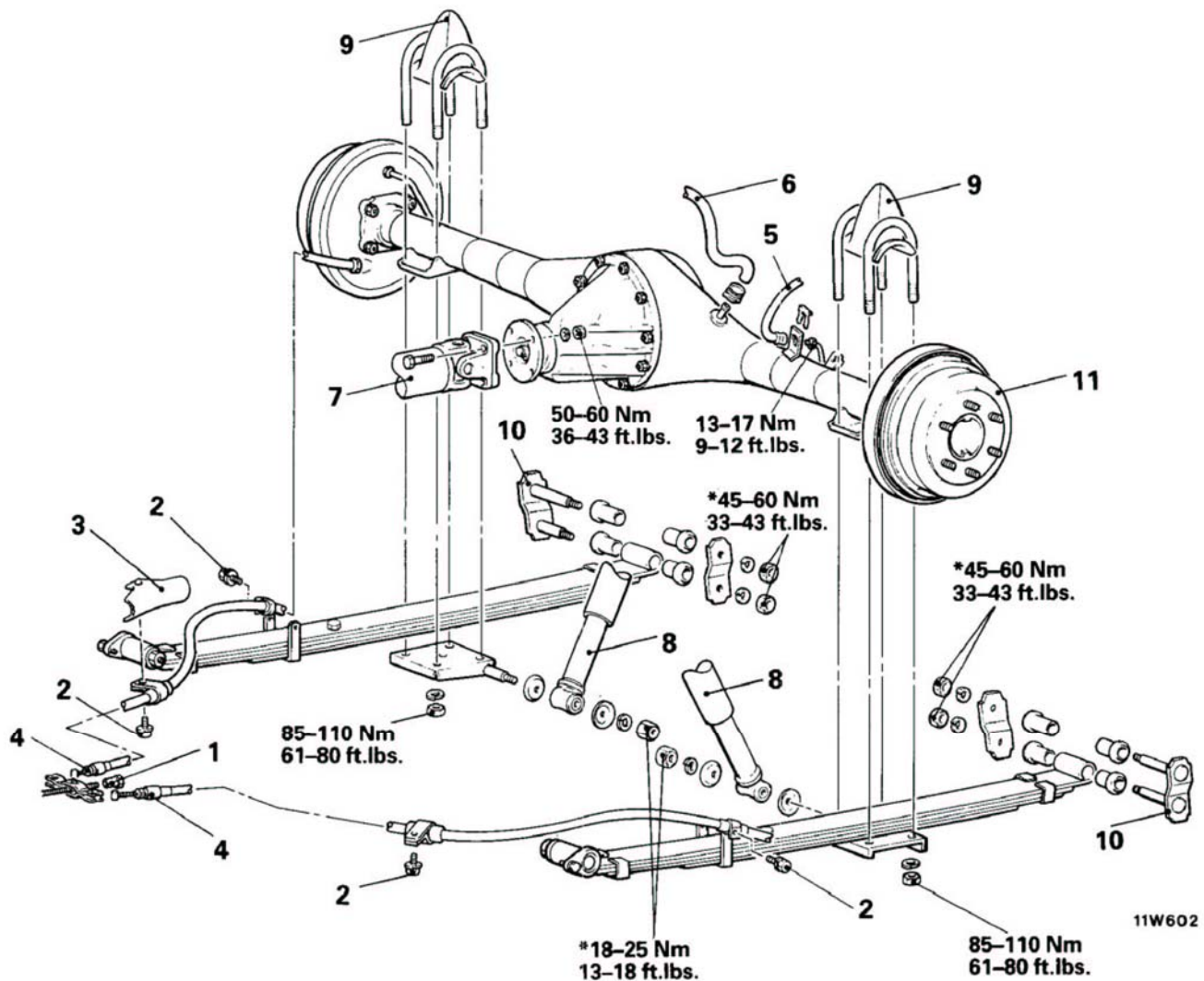
11. Connect the parking brake cable, and adjust the stroke of the parking brake lever.

**Standard value : 4-6 clicks**

(Refer to GROUP 5 BRAKES-Service Adjustment Procedures.)

## AXLE ASSEMBLY

## REMOVAL AND INSTALLATION

**Post-installation Operation**

- Air Bleeding from Brake Lines (Refer to GROUP 5 BRAKES - Service Adjustment Procedures)
- Adjustment of Parking Brake Lever Stroke (Refer to GROUP 5 BRAKES - Service Adjustment Procedures)

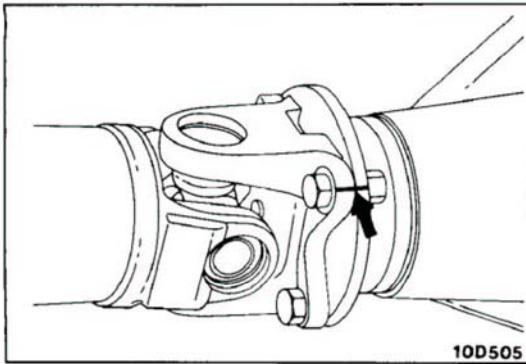
**Removal steps**

1. Adjuster (Parking brake cable)
2. Parking brake cable attaching bolts
3. Parking brake cable heat protector (right side only)
4. Connection of parking brake cables and equalizer
5. Connection of brake hose
6. Connection of breather hose
7. Rear propeller shaft

8. Connection of shock absorbers (lower part only)
9. U-bolts and bump stopper
10. Shackle assembly
11. Axle assembly

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆ : Refer to "Service Points of Installation".
- (4) The part with \* must be tightened with the vehicles lowered to the ground.



10D505

**SERVICE POINTS OF REMOVAL**

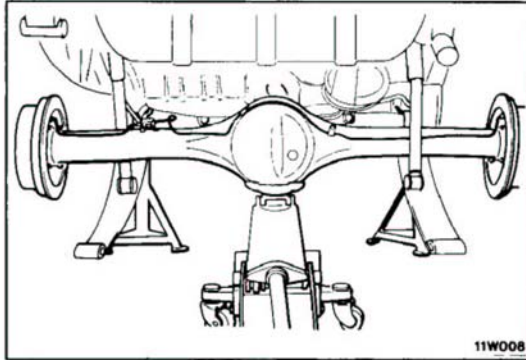
N03GBAB

**5. DISCONNECTION OF BRAKE HOSE**

Before disconnecting the brake tube, drain the brake fluid from the bleeder screw at the right side of the rear brake.

**7. REMOVAL OF REAR PROPELLER SHAFT**

Make the mating marks on the flange yoke of the rear propeller shaft and the companion flange of the differential case.



11W008

**9. REMOVAL OF U-BOLT AND BUMP STOPPER**

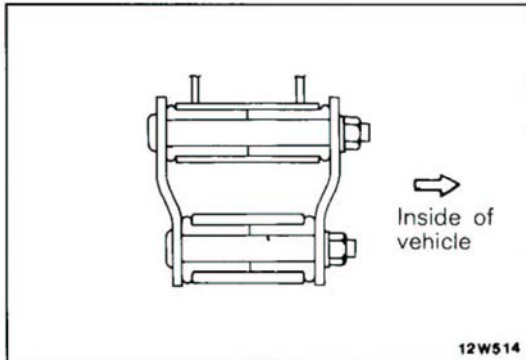
Before removing the U-bolt and the bumper stopper, place the jack underneath the center of the axle assembly to hold it slightly upward.

**11. REMOVAL OF AXLE ASSEMBLY**

Draw out the axle assembly toward the rear of the vehicle.

**Caution**

The axle assembly is unstable on the jack; be careful not to allow it to fall.



12W514

**SERVICE POINTS OF INSTALLATION**

N03GDAB

**10. INSTALLATION OF SHACKLE ASSEMBLY**

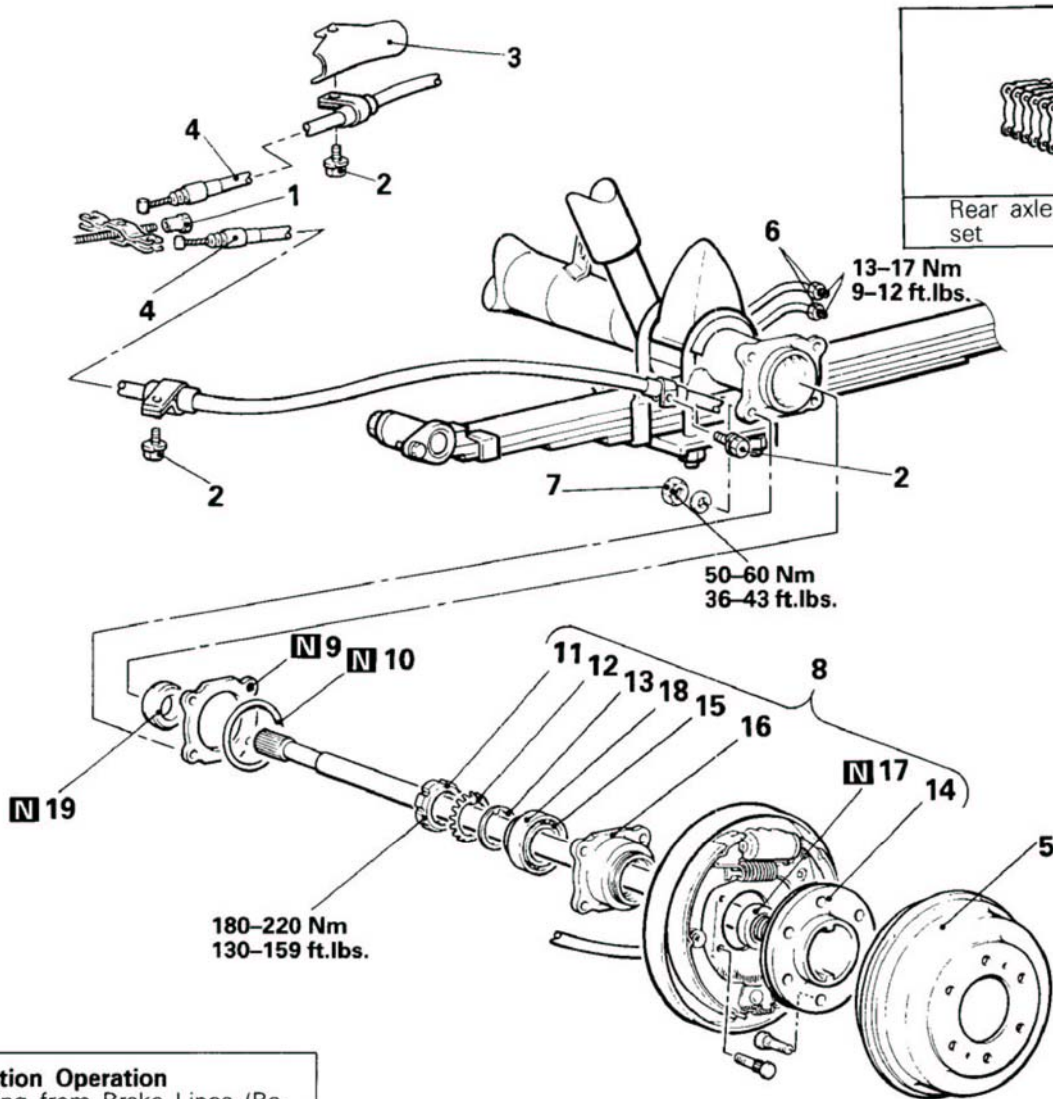
Install the shackle assembly from the outside toward the inside of vehicle.

**7. INSTALLATION OF REAR PROPELLER SHAFT**

Align the mating marks on the flange yoke and the companion flange to install the rear propeller shaft.

**AXLE SHAFT  
REMOVAL AND INSTALLATION**

N03HA--



11W603

**Post-installation Operation**

- Air Bleeding from Brake Lines (Refer to GROUP 5 BRAKES - Service Adjustment Procedures)
- Adjustment of Parking Brake Lever Stroke (Refer to GROUP 5 BRAKES - Service Adjustment Procedures)

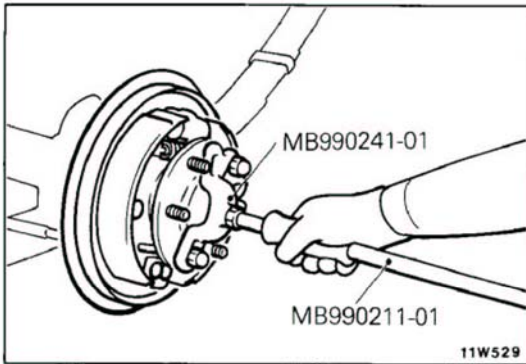
**Removal steps**

- 1. Adjuster (Parking brake cable)
- 2. Parking brake cable attaching bolts
- 3. Parking brake cable heat protector (right side only)
- 4. Connection of parking brake cable and equalizer
- 5. Brake drum
- ◀▶ 6. Connection of brake tubes
- 7. Nuts
- ◀▶ 8. Rear axle shaft assembly (with parking brake cable)
- 9. Shims
- 10. O-ring
- ▶◀ Adjustment of axle shaft end play

- ◀▶ ▶◀ 11. Lock nut
- ▶◀ 12. Lock washer
- ▶◀ 13. Washer
- ◀▶ ▶◀ 14. Rear axle shaft
- ▶◀ 15. Bearing inner race
- ▶◀ 16. Bearing case
- ▶◀ 17. Oil seal
- ◀▶ ▶◀ 18. Bearing outer race
- ◀▶ ▶◀ 19. Oil seal

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ▶◀ : Refer to "Service Points of Removal".
- (3) ▶◀ ▶◀ : Refer to "Service Points of Installation".
- (4) [N] : Non-reusable parts



**SERVICE POINTS OF REMOVAL**

N03HBAB

**6. DISCONNECTION OF BRAKE TUBES**

Before disconnecting the brake tube, drain the brake fluid from the bleeder screw at the right side of the rear brake.

**8. REMOVAL OF REAR AXLE SHAFT ASSEMBLY**

Pull the rear axle shaft with rear brake assembly attached. If the rear axle shaft is hard to remove, use the special tools.

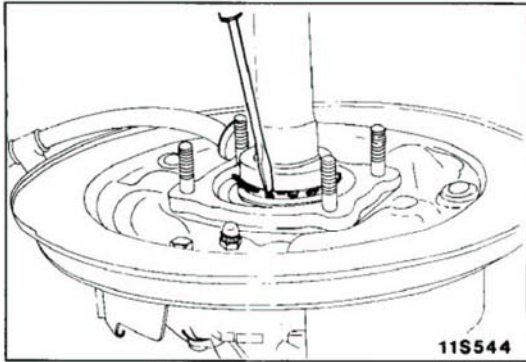
**NOTE**

Do not damage the oil seal during its removal.

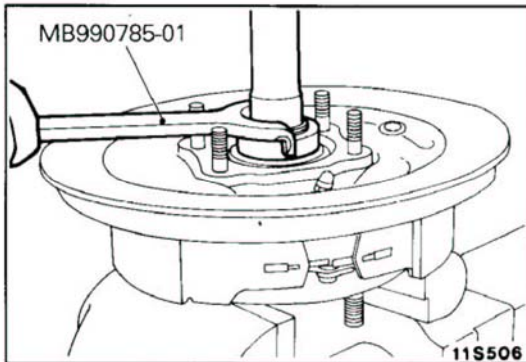
**11. REMOVAL OF LOCK NUT**

Remove the lock nut by following the steps below.

(1) Straighten the bent tab of the lock washer with the screwdriver.

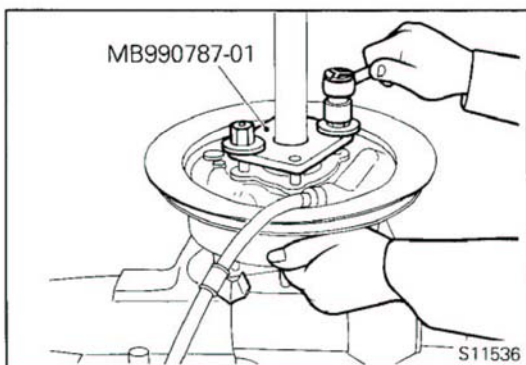


(2) Remove the lock nut by using the special tool.  
 (3) Remove the lock washer and the washer.



**14. REMOVAL OF REAR AXLE SHAFT**

- (1) Reinsert the lock nut on the axle shaft approximately three turns.
- (2) Install the special tool as figure to remove the rear axle shaft from the bearing case.  
Be sure to install nuts and washers diagonally.
- (3) Turn nuts with equal pressure to ensure smooth removal of the wheel bearing.

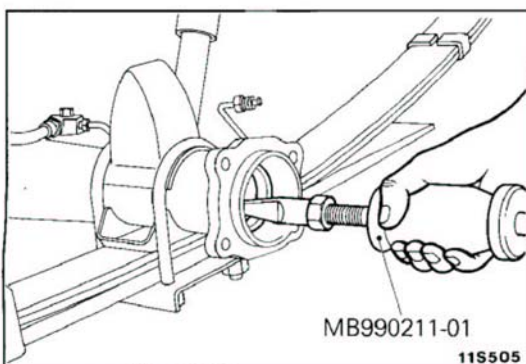


**18. REMOVAL OF BEARING OUTER RACE**

Using a hammer and drift, remove bearing outer race from bearing case.

**19. REMOVAL OF OIL SEAL**

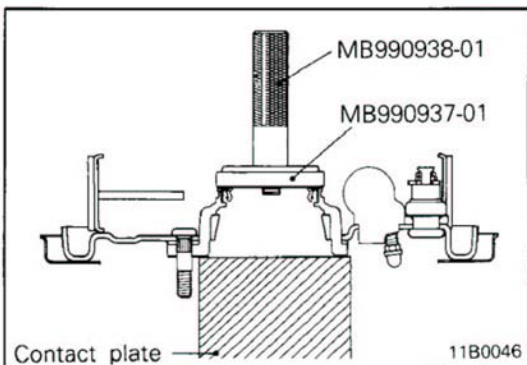
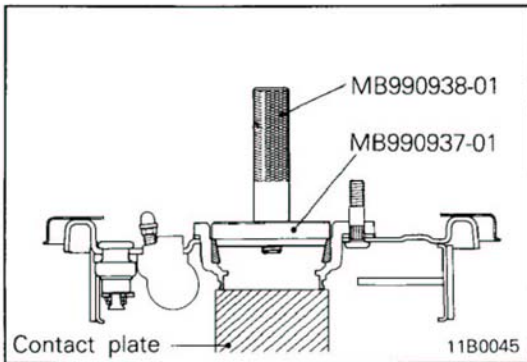
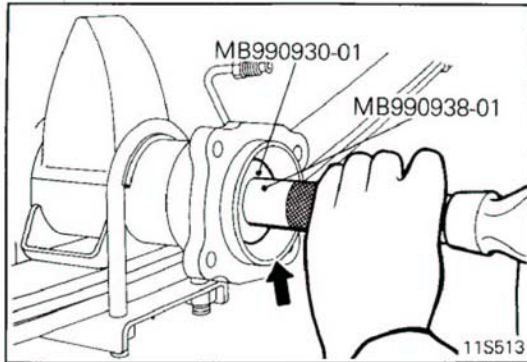
Remove the oil seal from the end of rear axle housing with the special tool, if necessary.



## INSPECTION

N03HCAA

- Check the dust cover for deformation and damage.
- Check the oil seal for damage.
- Check the inner and outer bearings for seizure, discoloration and rough raceway surface.
- Check the axle shaft for cracks, wear and damage.



## SERVICE POINTS OF INSTALLATION

N03HDAD

## 19. INSTALLATION OF OIL SEAL

- (1) Apply the specified grease to the oil seal fitting area of the rear axle housing.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

- (2) Drive the new oil seal into the rear axle housing end by using the special tools.
- (3) Apply the specified grease to the oil seal lip.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

## 18. INSTALLATION OF BEARING OUTER RACE

- (1) Apply the specified grease to the external periphery of the bearing outer race.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

- (2) Press-fit the bearing outer race into the bearing case by using the special tools.

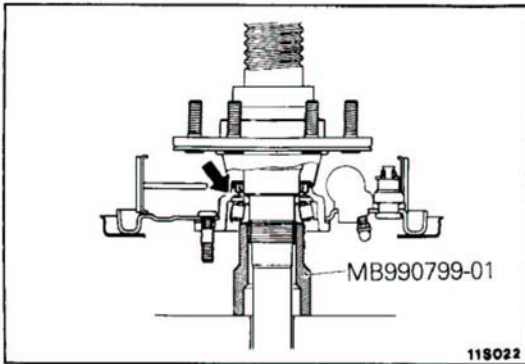
## 17. INSTALLATION OF OIL SEAL

- (1) Apply the specified grease to the external periphery of the new oil seal.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

- (2) Press-fit the new oil seal into the bearing case until it is flush with the face of the bearing case by using special tools.
- (3) Apply the specified grease to the lips of the oil seal.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**



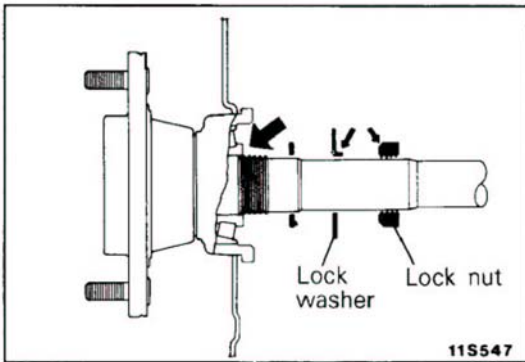
**15. INSTALLATION OF BEARING INNER RACE/14. REAR AXLE SHAFT**

- (1) Apply the specified grease to the roller surfaces of the bearing inner race.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

- (2) Install the rear brake assembly attached with bearing case and the bearing inner race in that order to the axle shaft.
- (3) Press-fit the bearing inner race into the axle shaft using the special tool.
- (4) Pack the bearing case with the specified grease.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**



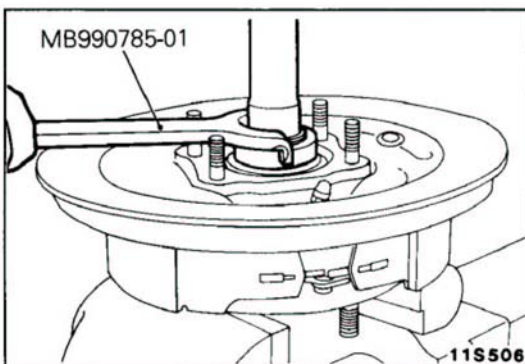
**13. INSTALLATION OF WASHER/12. LOCK WASHER/11. LOCK NUT**

Install these parts with cares described below.

- (1) Apply the specified grease to the thread portion of the axle shaft, to which the locking nut is installed.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

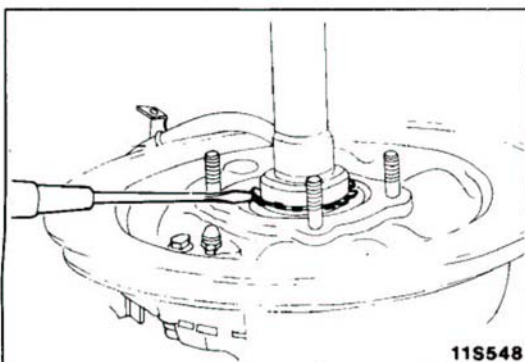
- (2) Align the washer tab with the slot of the axle shaft to install the washer.
- (3) Align the lock washer tab with the slot of the axle shaft to install the lock washer as figure.
- (4) Install the lock nut with its chamfering in the directions shown in the illustration.
- (5) Tighten the lock nut to the specified torque by using the special tool.



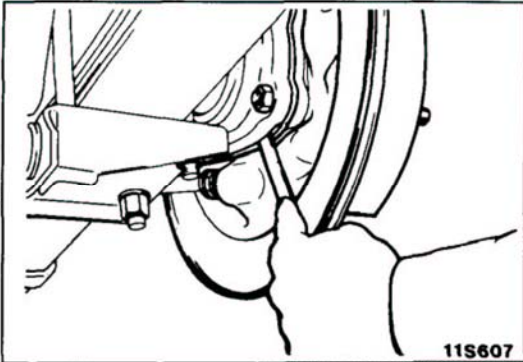
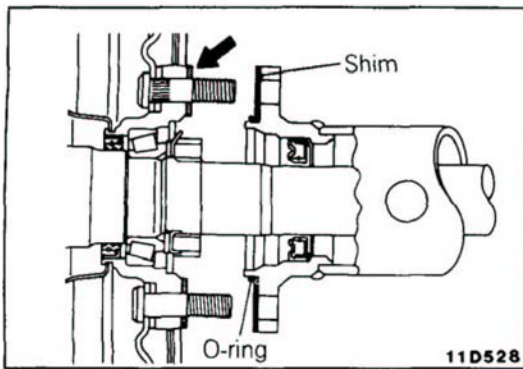
- (6) Bend the tab of the lock washer into the slot of the lock nut.

**NOTE**

If the slot in the lock nut and the tab of the lock washer are out of alignment, turn the lock nut in until they are in alignment.







### ● ADJUSTMENT OF AXLE SHAFT END PLAY

Adjust the clearance between the bearing case and rear axle housing end by the following procedure.

- (1) Insert a 1 mm (.04 in.) thick shim and O-ring into the left side rear axle housing.
- (2) Apply the specified sealant to the mating surface of bearing case, install the left axle shaft into rear axle housing and tighten the nuts.

#### NOTE

Tighten the nuts in diagonal sequence.

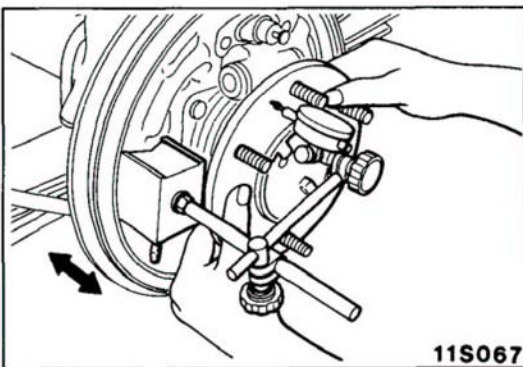
**Specified sealant : 3M ART Part No 8663, 8661 or equivalent**

- (3) Install the right axle shaft without a shim (s) and O-ring and temporarily tighten to about 6 Nm (4.3 ft.lbs.).
- (4) Measure the clearance between the bearing case and rear axle housing end with a feeler gage.
- (5) Select shims of the thickness which is equal to the sum of the measured clearance and 0.05–0.20 mm (.0020–.0079 in.)
- (6) Remove the right axle shaft, and install shim (s) and O-ring on the right side rear axle housing end.
- (7) Apply the specified sealant to the mating surface of bearing case, install the right axle shaft into rear axle housing and tighten the nut.

#### NOTE

Tighten the nuts in diagonal sequence.

**Specified sealant : 3M ART Part No. 8663, 8661 or equivalent**

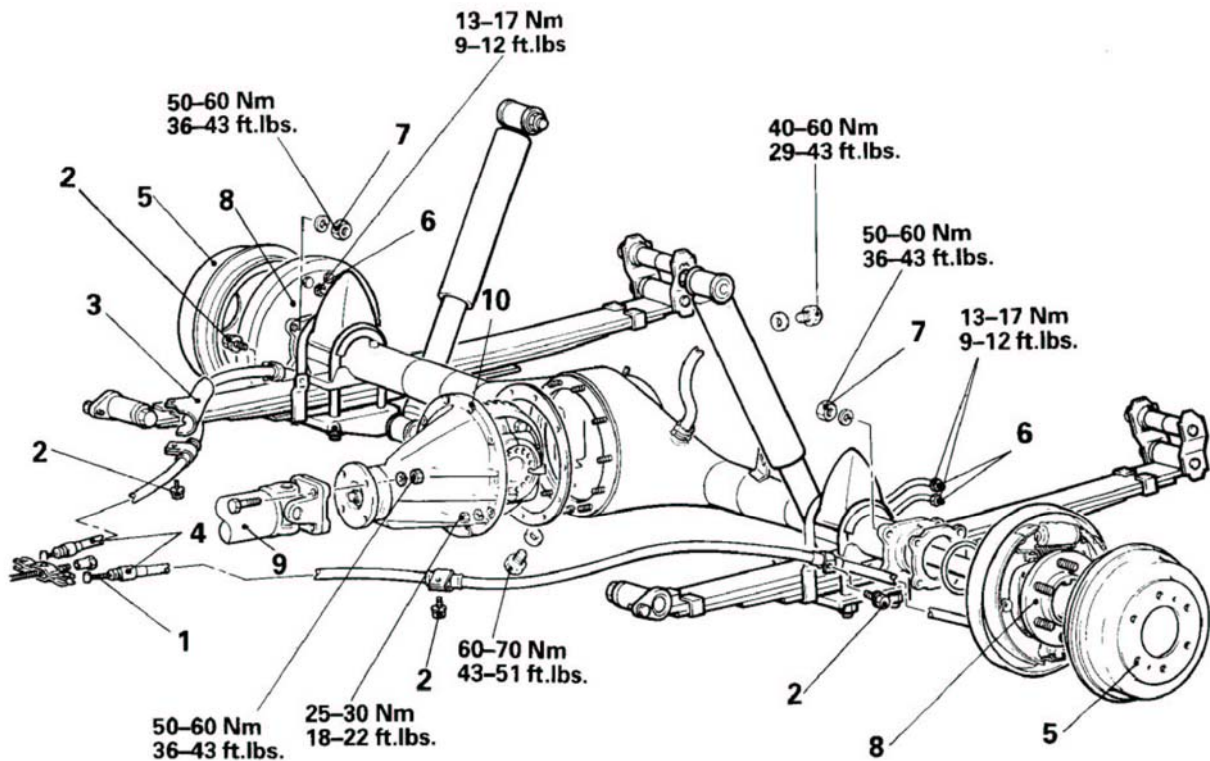


- (8) Check to assure that the axle shaft axial play is within the standard value.

**Standard value : 0.05–0.20 mm (.0020–.0079 in.)**

**DIFFERENTIAL CARRIER  
REMOVAL AND INSTALLATION**

N031A--



11W615

**Pre-removal Operation**

- Drain of Differential Gear Oil (Refer to P.3-17.)

**Post-installation Operation**

- Air Bleeding from Brake Lines (Refer to GROUP 5 BRAKES – Service Adjustment Procedures)
- Adjustment of Parking Brake Lever Stroke (Refer to GROUP 5 BRAKES – Service Adjustment Procedures)
- Addition of Differential Gear Oil (Refer to P.3-17.)

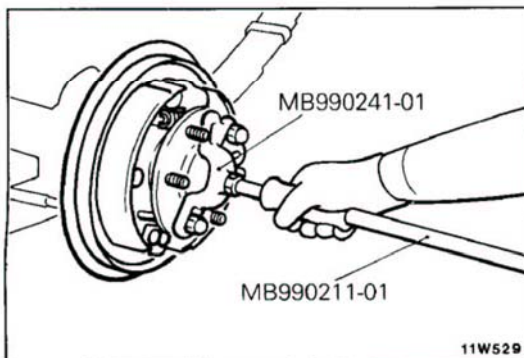
**Removal steps**

1. Adjuster (Parking brake cable)
2. Parking brake cable attaching nuts
3. Parking brake cable heat protector (right side only)
4. Connection of parking brake cable and equalizer
5. Brake drums
6. Connection of brake tubes

7. Nuts
8. Rear axle shaft assembly
9. Rear propeller shaft
10. Differential carrier

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◀▶ : Refer to "Service Points of Removal".
- (3) ▶▶▶ : Refer to "Service Points of Installation".



**SERVICE POINTS OF REMOVAL**

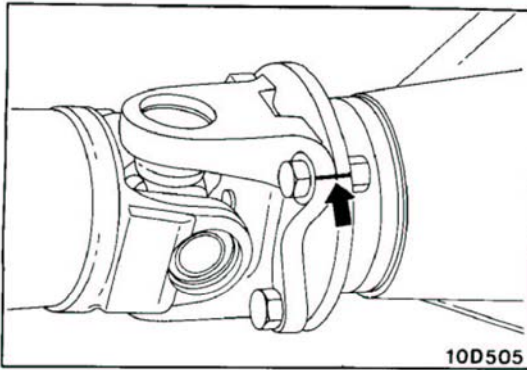
N031BAB

**6. DISCONNECTION OF BRAKE TUBES**

Before disconnecting the brake tube, drain the brake fluid from the bleeder screw at the right side of the rear brake.

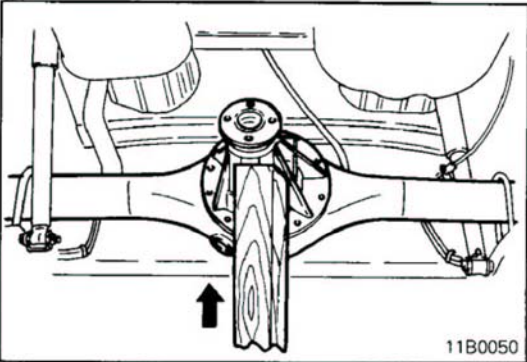
**8. REMOVAL OF REAR AXLE SHAFT ASSEMBLY**

Pull out the right and left axle shafts by about 70 mm (2.8 in.). If it is hard to pull out, use the special tools.



### 9. REMOVAL OF REAR PROPELLER SHAFT

Make the mating marks on the flange yoke of the rear propeller shaft and the companion flange of the differential case.



### 10. REMOVAL OF DIFFERENTIAL CARRIER

Remove the attaching nuts and strike the lower part of differential carrier assembly with a square lumber several times, to remove the assembly.

#### NOTE

Do not remove the uppermost nut but keep it loosened all the way to the stud bolt end.

#### Caution

Use care not to strike the companion flange.

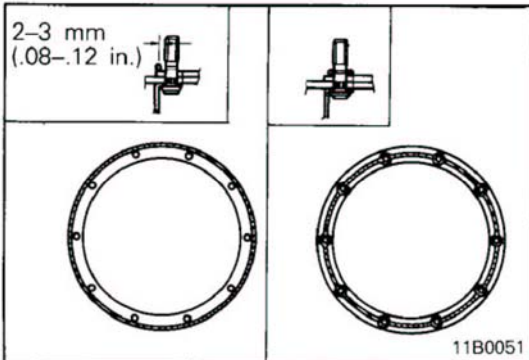
### SERVICE POINTS OF INSTALLATION

N031DAB

#### 10. APPLICATION OF SEALANT TO DIFFERENTIAL CARRIER

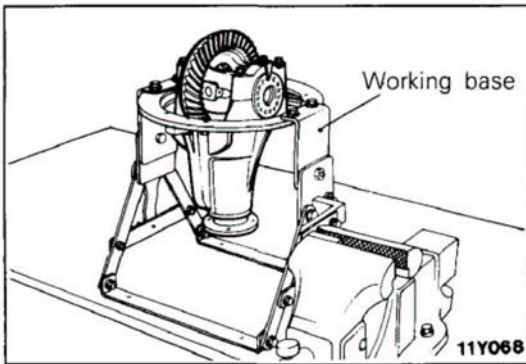
When the differential carrier is installed, apply specified sealant to the differential carrier mounting surface of the axle housing as illustrated in either of the illustrations.

**Specified sealant : 3M ART Part No. 8663, 8661 or equivalent**



#### 9. INSTALLATION OF REAR PROPELLER SHAFT

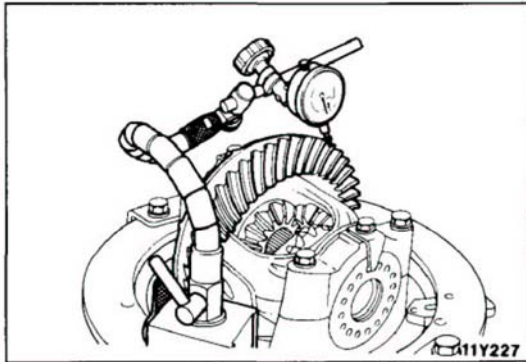
Align the mating marks on the flange yoke and the companion flange to install the rear propeller shaft.



**INSPECTION BEFORE DISASSEMBLY**

N031EAA

Secure the working base in a vice and then install the removed differential carrier assembly.



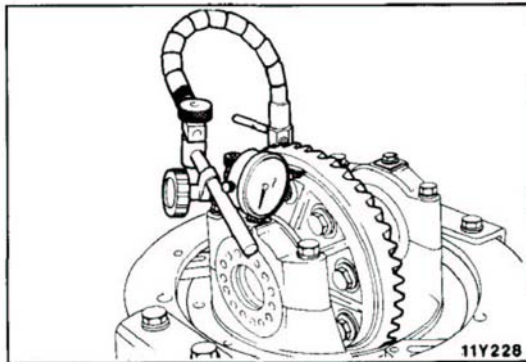
**FINAL DRIVE GEAR BACKLASH**

With the drive pinion locked in place, measure the final drive gear backlash with a dial indicator on the drive gear.

**NOTE**

Measure at four points or more on the circumference of the drive gear.

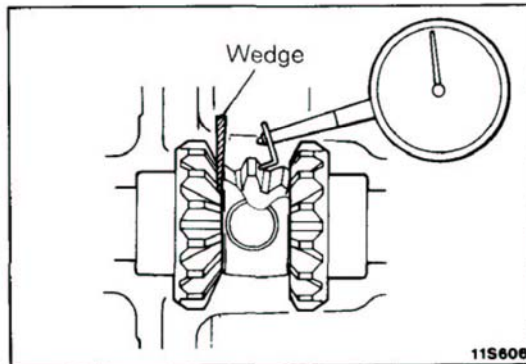
**Standard value : 0.11–0.16 mm (.0043–.0063 in.)**



**DRIVE GEAR RUNOUT**

Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

**Limit : 0.05 mm (.0020 in.)**

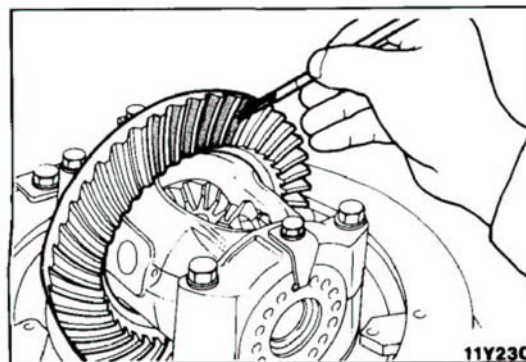


**DIFFERENTIAL GEAR BACKLASH (CONVENTIONAL DIFFERENTIAL)**

While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

**Standard value : 0.01–0.076 mm (.0004–.0030 in.)**

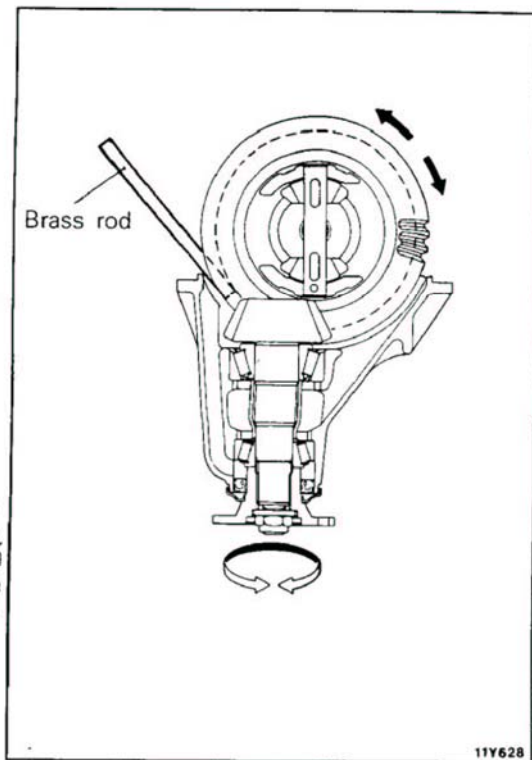
**Limit : 0.2 mm (.008 in.)**



**FINAL DRIVE GEAR TOOTH CONTACT**

Check the final drive gear tooth contact by following the steps below.

- (1) Apply a thin, uniform coat of machine blue to both surfaces of the drive gear teeth.



- (2) Insert a brass rod between the differential carrier and the differential case, and then rotate the companion flange by hand (once in the normal direction, and then once in the reverse direction) while applying a load to the drive gear, so that the revolution torque [approximately 2.5–3.0 Nm (1.8–2.2 ft.lbs.)] is applied to the drive pinion.

**Caution**

**If the drive gear is rotated too much, the tooth contact pattern will become unclear and difficult to check.**

- (3) Check the tooth-contact condition of the drive gear and drive pinion.

**NOTE**

Checking the tooth contact pattern is the way to confirm that the adjustments of the pinion height and backlash have been done properly. Continue to adjust the pinion height and backlash until the tooth contact pattern resembles the standard pattern.

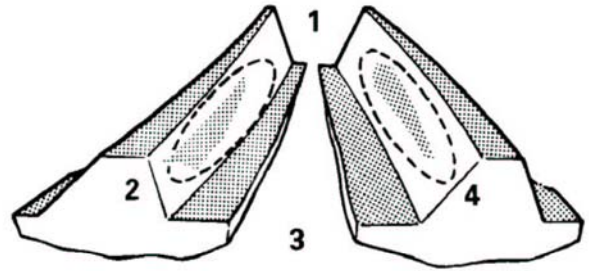
If, after adjustments have been made, the correct tooth contact pattern cannot be obtained, it means that the drive gear and the drive pinion have become worn beyond the allowable limit. Replace the gear set.

**Caution**

**If either the drive gear or the drive pinion is to be replaced, be sure to replace both gears as a set.**

**Standard tooth contact pattern**

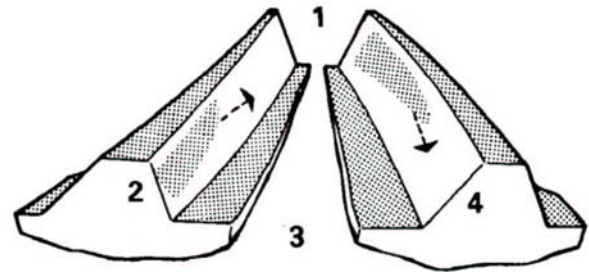
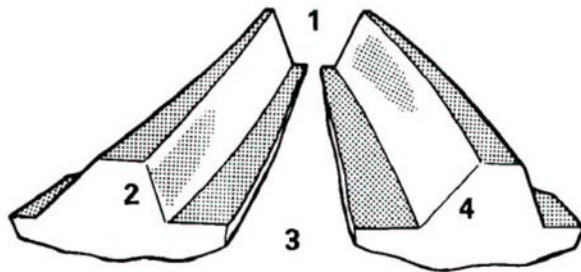
- 1 Toe
- 2 Drive-side
- 3 Heel
- 4 Coast-side



Problem

Solution

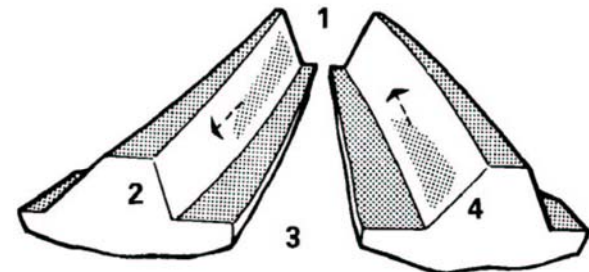
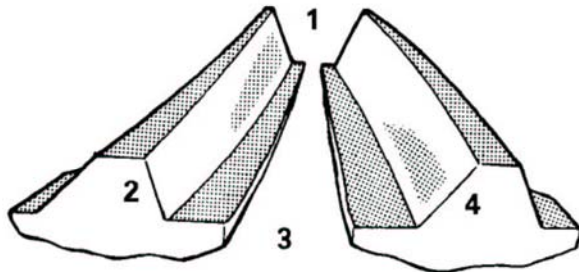
**Tooth contact pattern resulting from excessive pinion height**



The drive pinion is positioned too far from the center of the drive gear.

Increase the thickness of the pinion height adjusting shim, and position the drive pinion closer to the center of the drive gear. Also, for backlash adjustment, position the drive gear farther from the drive pinion.

**Tooth contact pattern resulting from insufficient pinion height**



The drive pinion is positioned too close to the center of the drive gear.

Decrease the thickness of the pinion height adjusting shim, and position the drive pinion farther from the center of the drive gear. Also, for backlash adjustment, position the drive gear closer to the drive pinion.

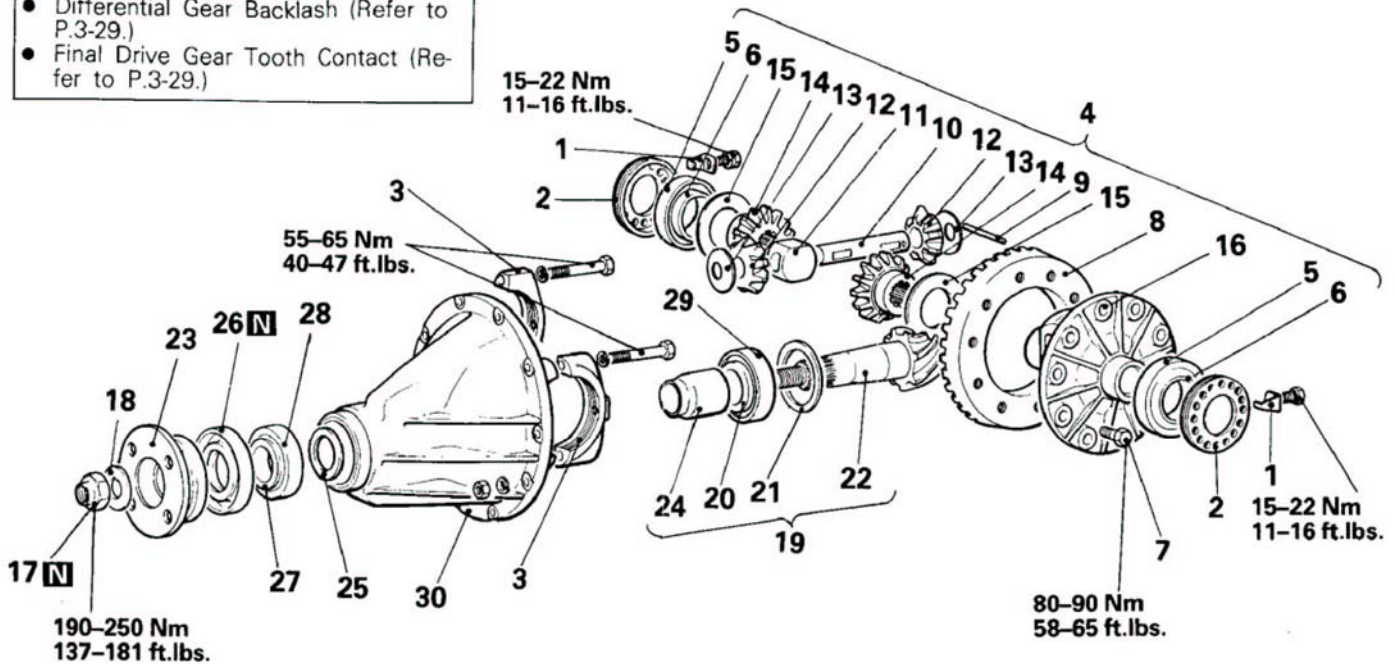
11S642

DISASSEMBLY

N031F--

**Inspection Before Disassembly**

- Final Drive Gear Backlash (Refer to P.3-29.)
- Drive Gear Runout (Refer to P.3-29.)
- Differential Gear Backlash (Refer to P.3-29.)
- Final Drive Gear Tooth Contact (Refer to P.3-29.)



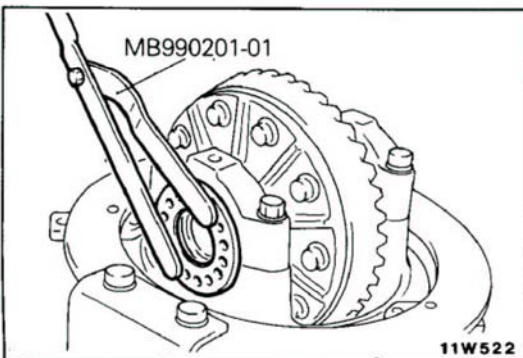
**Disassembly steps**

11W546

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>1. Lock plates</li> <li>↔ 2. Side bearing nuts</li> <li>3. Bearing caps</li> <li>↔ 4. Differential case assembly</li> <li>↔ 5. Side bearing outer races</li> <li>↔ 6. Side bearing inner races</li> <li>7. Bolts (10)</li> <li>↔ 8. Drive gear</li> <li>↔ 9. Lock pin</li> <li>10. Pinion shaft</li> <li>11. Thrust block</li> <li>12. Pinion gears</li> <li>13. Pinion washers</li> <li>14. Side gears</li> <li>15. Side gear thrust spacers</li> <li>16. Differential case</li> <li>↔ 17. Self-locking nut</li> <li>18. Washer</li> </ul> | <ul style="list-style-type: none"> <li>↔ 19. Drive pinion assembly</li> <li>↔ 20. Drive pinion rear bearing inner race</li> <li>21. Drive pinion rear shim (for pinion height adjustment)</li> <li>22. Drive pinion</li> <li>23. Companion flange</li> <li>24. Drive pinion spacer</li> <li>25. Drive pinion front shim (for preload adjustment)</li> <li>↔ 26. Oil seal</li> <li>↔ 27. Drive pinion front bearing inner race</li> <li>↔ 28. Drive pinion front bearing outer race</li> <li>↔ 29. Drive pinion rear bearing outer race</li> <li>30. Differential carrier</li> </ul> |
|--|---|

**NOTE**

- (1) ↔ : Refer to "Service Points of Disassembly".
- (2) **N** : Non-reusable parts

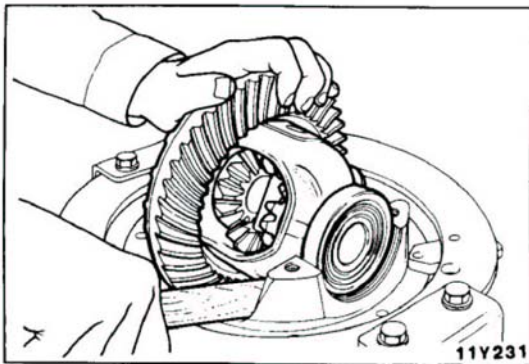


**SERVICE POINTS OF DISASSEMBLY**

N031GAA

**2. REMOVAL OF SIDE BEARING NUT**

Using the special tool, remove the side bearing nut.

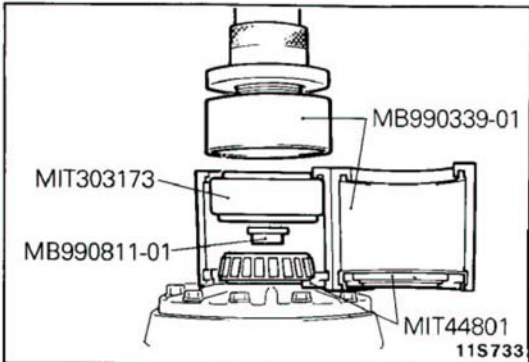


**4. REMOVAL OF DIFFERENTIAL CASE ASSEMBLY**

Take out the differential case assembly with hammer handles.

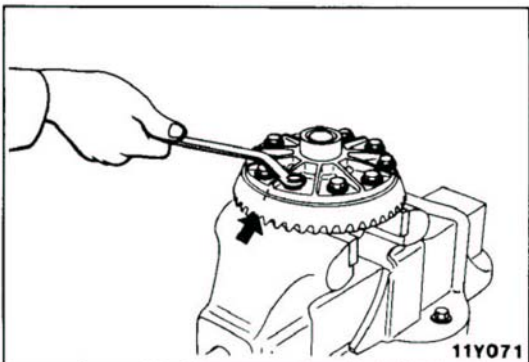
**NOTE**

Keep the right and left side bearings and side bearing nuts separate, so that they do not become mixed at the time of reassembly.



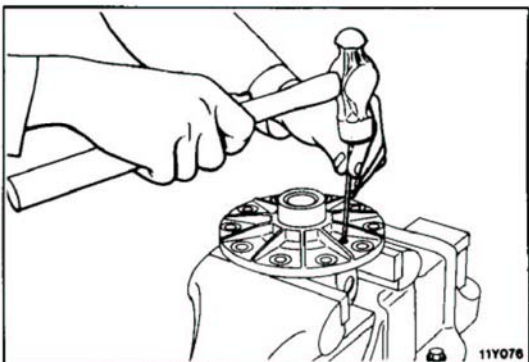
**6. REMOVAL OF SIDE BEARING INNER RACE**

Pull out the side bearing inner races by using the special tools.



**8. REMOVAL OF DRIVE GEAR**

- (1) Make the mating marks to the differential case and the drive gear.
- (2) Loosen the drive gear attaching bolts in diagonal sequence to remove the drive gear.

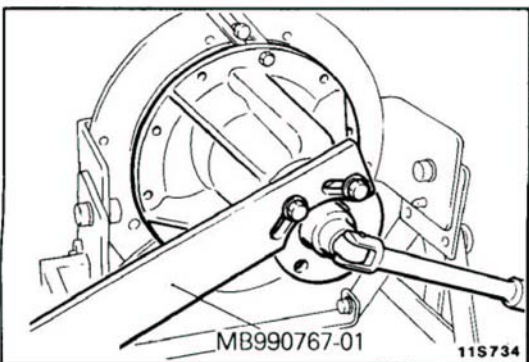


**9. DRIVE-OUT OF LOCK PIN**

Drive out the lock pin with a punch.

**NOTE**

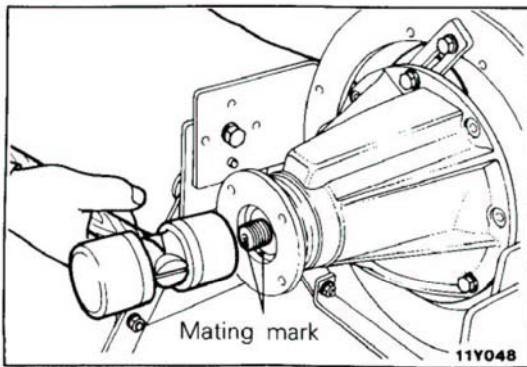
The removed side gears and side gear thrust spacers, left and right, should be retained for reassembly.



**17. REMOVAL OF SELF-LOCKING NUT**

Use the special tools to hold the companion flange and remove the companion flange self-locking nut.



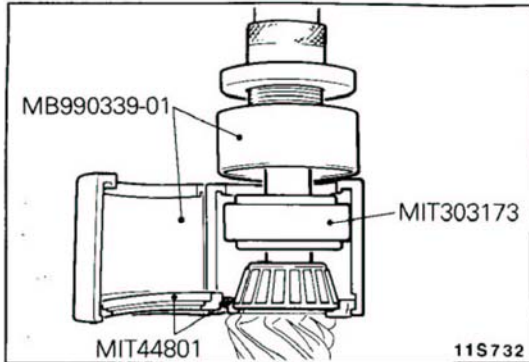
**19. REMOVAL OF DRIVE PINION ASSEMBLY**

- (1) Make the mating marks to the drive pinion and companion flange.

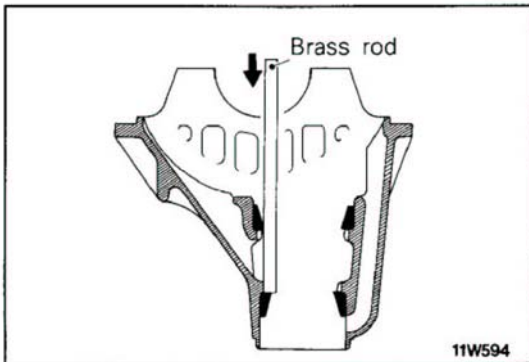
**Caution**

The mating mark made on the companion flange must not be on the coupling surface of the flange yoke and the rear propeller shaft.

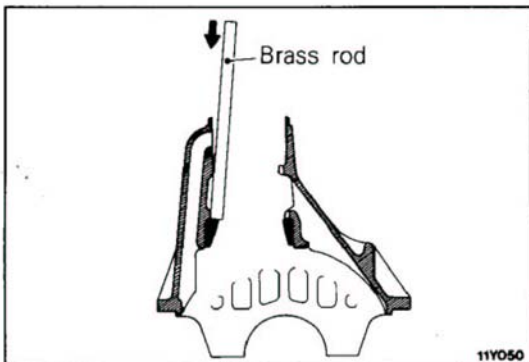
- (2) Drive out the drive pinion together with the drive pinion spacer and drive pinion front shims.

**20. REMOVAL OF DRIVE PINION REAR BEARING INNER RACE**

Pull out the drive pinion rear bearing inner race by using the special tools.

**28. REMOVAL OF DRIVE PINION FRONT BEARING OUTER RACE**

Drive out the drive pinion front bearing outer race from the gear carrier.

**29. REMOVAL OF DRIVE PINION REAR BEARING OUTER RACE**

Drive out the drive pinion rear bearing outer race from the gear carrier.

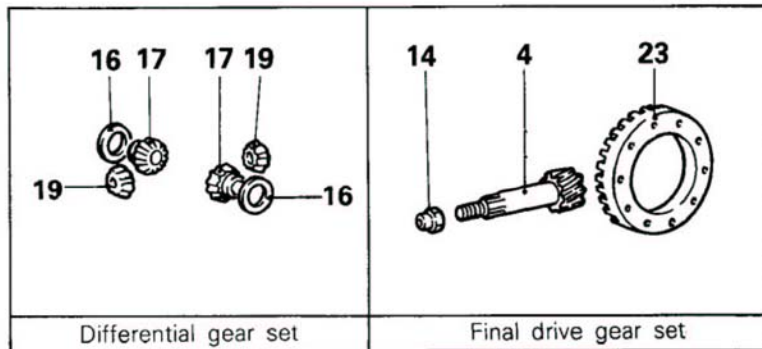
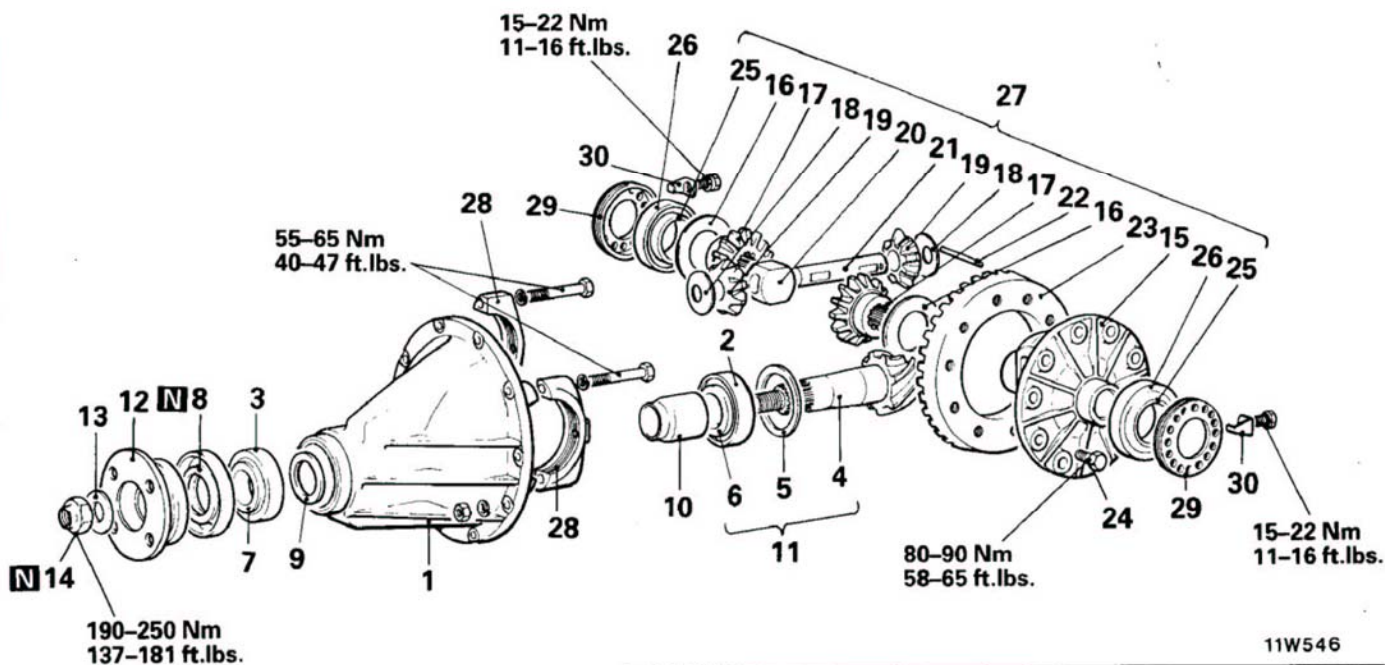
**INSPECTION**

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- Check the companion flange for wear or damage.
- Check the oil seal for wear or deterioration.
- Check the bearings for wear or discoloration.
- Check the gear carrier for cracks.
- Check the drive pinion and ring gear for wear or cracks.
- Check the side gears, pinion gears and pinion shaft for wear or damage.
- Check the side gear spline for wear or damage.

REASSEMBLY

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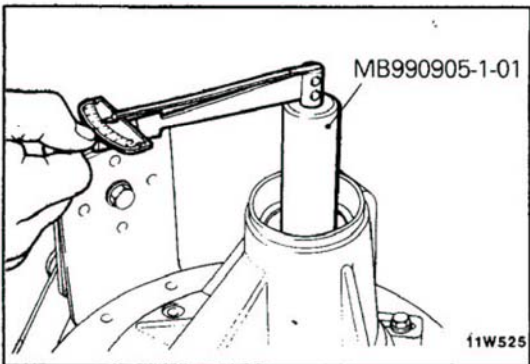
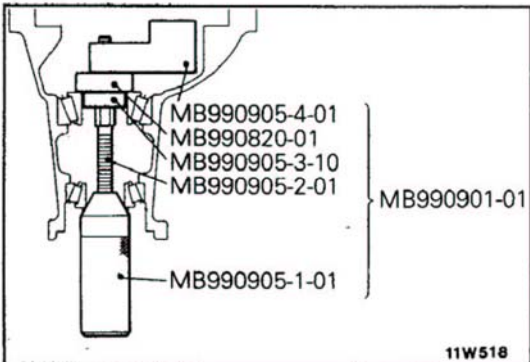
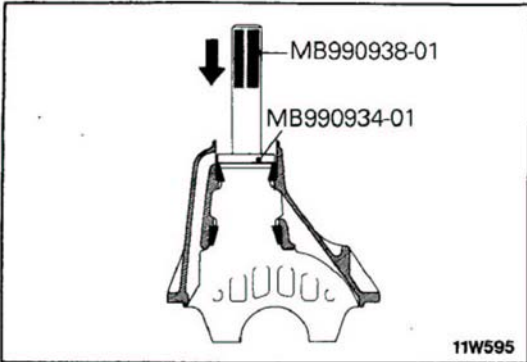
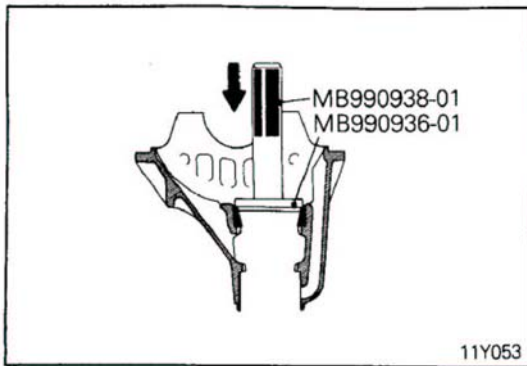


Reassembly steps

- 1. Differential carrier
- ◆◆ 2. Drive pinion rear bearing outer race
- ◆◆ 3. Drive pinion front bearing outer race
- ◆◆ Adjustment of pinion height
- 4. Drive pinion
- 5. Drive pinion rear shim (for pinion height adjustment)
- 6. Drive pinion rear bearing inner race
- ◆◆ Adjustment of drive pinion preload
- 7. Drive pinion front bearing inner race
- 8. Oil seal
- 9. Drive pinion front shim (for preload adjustment)
- 10. Drive pinion spacer
- 11. Drive pinion assembly
- 12. Companion flange
- 13. Washer
- 14. Self-locking nut
- 15. Differential case
- 16. Side gear thrust spacers
- 17. Side gears
- 18. Pinion washers
- 19. Pinion gears
- ◆◆ Adjustment of differential gear backlash
- 20. Thrust block
- 21. Pinion shaft
- ◆◆ 22. Lock pin
- ◆◆ 23. Drive gear
- 24. Bolts (10)
- ◆◆ 25. Side bearing inner races
- 26. Side bearing outer races
- 27. Differential case assembly
- ◆◆ 28. Bearing caps
- ◆◆ Adjustment of final drive gear backlash
- 29. Side bearing nuts
- 30. Lock plates

NOTE

- (1) ◆◆ : Refer to "Service Points of Reassembly".
- (2) [N] : Non-reusable parts



## SERVICE POINTS OF REASSEMBLY

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### 2. INSTALLATION OF DRIVE PINION REAR BEARING OUTER RACE

Press-fit the drive pinion rear bearing outer race into the gear carrier by using the special tools.

#### NOTE

Perform press-fitting carefully so as not to tilt the outer race.

### 3. INSTALLATION OF DRIVE PINION FRONT BEARING OUTER RACE

Press-fit the drive pinion front bearing outer race into gear carrier by using the special tools.

#### NOTE

Perform press-fitting carefully so as not to tilt the outer race.

### ● ADJUSTMENT OF PINION HEIGHT

Adjustment the drive pinion height by the following procedures:

- (1) Install special tools and drive pinion front and rear bearing inner races to the gear carrier in the sequence shown in the illustration.

#### NOTE

Apply a thin coat of the specified grease to the mating face of the washer of the special tool.

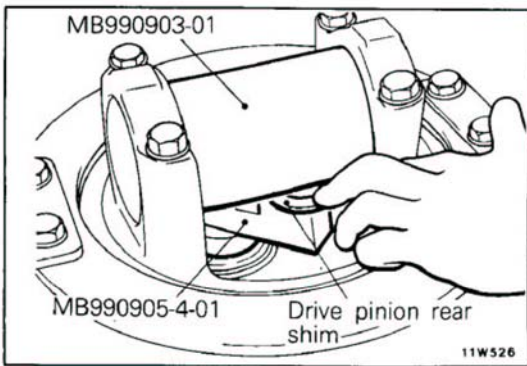
**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

- (2) Tighten the handle of the special tool until the standard value of drive pinion turning torque is obtained.
- (3) Measure the drive pinion turning torque (without the oil seal).

**Standard value : 0.4–0.5 Nm (3.5–4.3 in.lbs.)**

#### NOTE

Gradually tighten the handle of the special tool while checking the drive pinion turning torque.

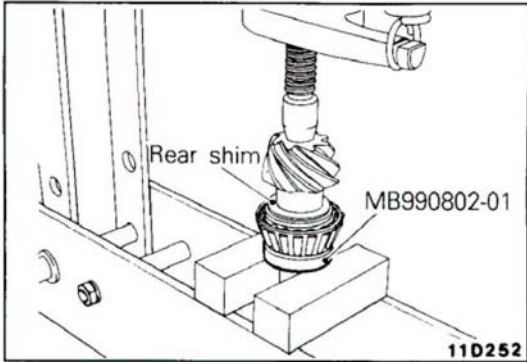


- (4) Position the special tool in the side bearing seat of the gear carrier, and then select a drive pinion rear shim of a thickness which corresponds to the gap between the special tools.

**NOTE**

Be sure to clean the side bearing seat thoroughly. When positioning the special tool, be sure that the cut-out sections of the special tool are in the position shown in the illustration, and also confirm that the special tool is in close contact with the side bearing seat.

When selecting the drive pinion rear shims, keep the number of shims to a minimum.



- (5) Fit the selected drive pinion rear shim(s) to the drive pinion, and press-fit the drive pinion rear bearing inner race by using the special tool.

● **ADJUSTMENT OF DRIVE PINION PRELOAD**

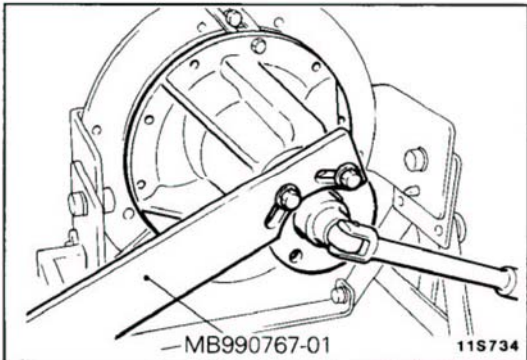
Adjust the drive pinion turning torque by using the following procedure:

**Without Oil Seal**

- (1) Fit the drive pinion front shim(s) between the drive pinion spacer and the drive pinion front bearing inner race.
- (2) Tighten the companion flange to the specified torque by using the special tools.

**NOTE**

Do not install the oil seal.



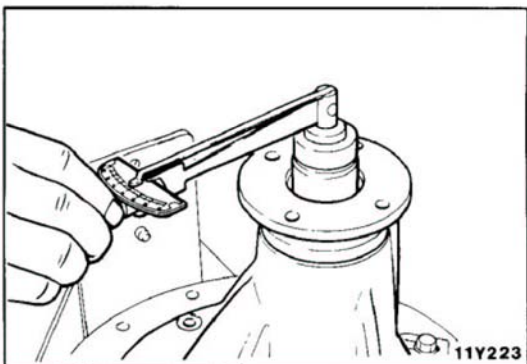
- (3) Measure the drive pinion turning torque (without the oil seal)

**Standard value : 0.4–0.5 Nm (3.5–4.3 in.lbs.)**

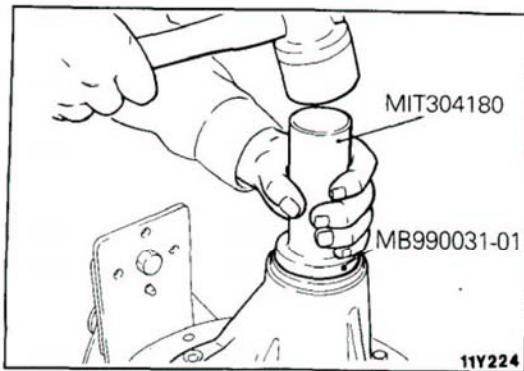
- (4) If the drive pinion turning torque is not within the range of the standard value, adjust the turning torque by replacing the drive pinion front shim(s) or the drive pinion spacer.

**NOTE**

When selecting the drive pinion front shims, if the number of shims is large, reduce the number of shims to a minimum by selecting the drive pinion spacers.

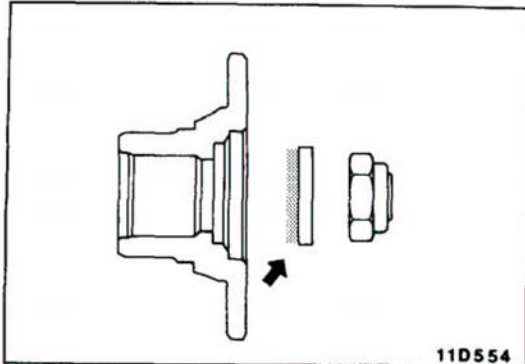


- (5) Remove the companion flange and drive pinion once again.

**With Oil Seal**

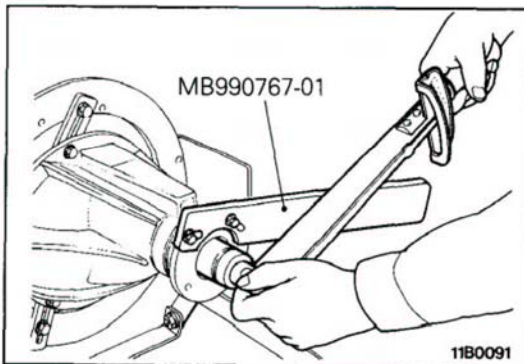
- (1) After setting the drive pinion front bearing inner race, drive the oil seal the gear carrier front lip by using the special tool.
- (2) Apply specified grease to the Oil seal lip.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

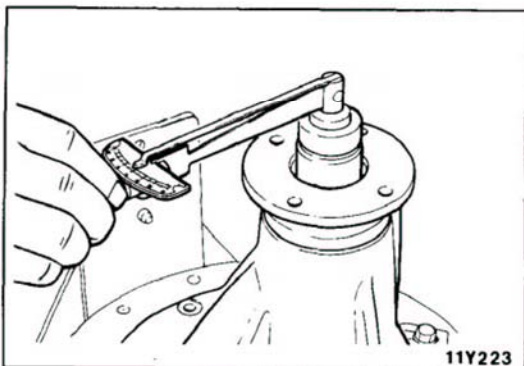


- (3) Apply a thin coat of specified grease to the companion flange contacting surface of the washer before installing drive pinion assembly.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

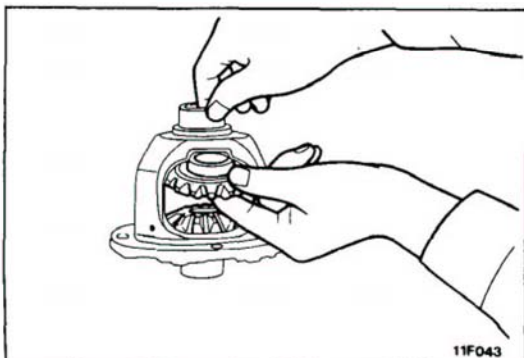


- (4) Install the drive pinion assembly and companion flange with mating marks properly aligned, and tighten the companion flange self-locking nut to the specified torque by using the special tools.



- (5) Measure the drive pinion turning torque (with oil seal) to verify that the drive pinion turning torque complies with the standard value.

**Standard value : 0.65–0.75 Nm (5.6–6.5 in.lbs.)**

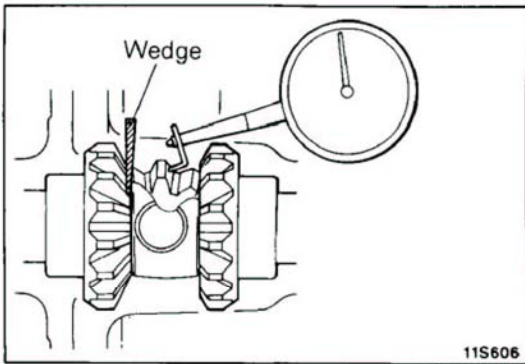


- **ADJUSTMENT OF DIFFERENTIAL GEAR BACKLASH**

- (1) Assemble the side gears, side gear thrust spacers, pinion gears, and pinion washers into the differential case.
- (2) Temporarily install the pinion shaft.

**NOTE**

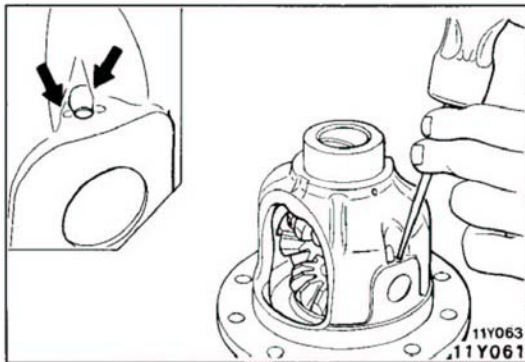
Do not drive in the lock pin yet.



- (3) Insert a wedge between the side gear and the pinion shaft to lock the side gear.
- (4) While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

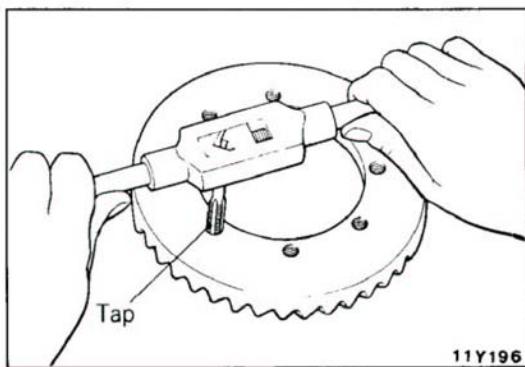
**Standard value : 0.01–0.076 mm (.0004–.0030 in.)**  
**Limit : 0.2 mm (.008 in.)**

- (5) If the differential gear backlash exceeds the limit, adjust the backlash by installing thicker side gear thrust spacers.
- (6) Measure the differential gear backlash once again, and confirm that it is within the limit.  
 If adjustment is not possible, replace the side gears and pinion gears as a set.



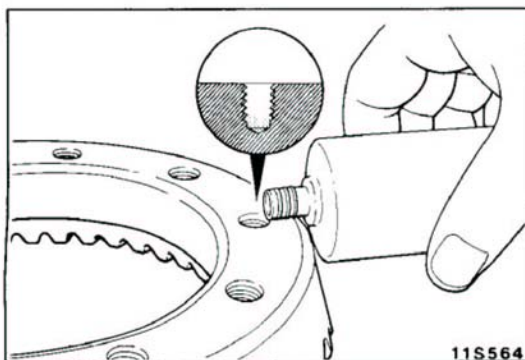
**22. INSTALLATION OF LOCK PIN**

- (1) Align the pinion shaft lock pin hole with the differential case lock pin hole, and drive in the lock pin.
- (2) Stake the lock pin with a punch at two points.



**23. INSTALLATION OF DRIVE GEAR**

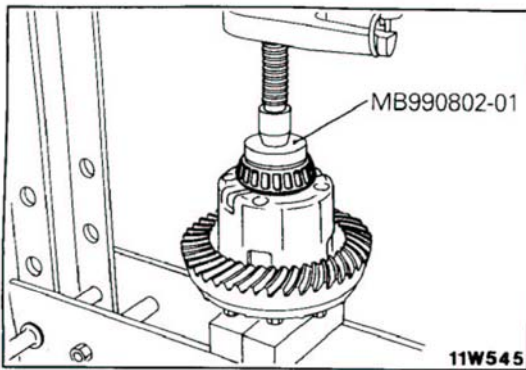
- (1) Clean the drive gear attaching bolts.
- (2) Remove the adhesive adhered to the threaded holes of the drive gear by turning the tap tool (M10 × 1.25); and then clean the threaded holes by applying compressed air.



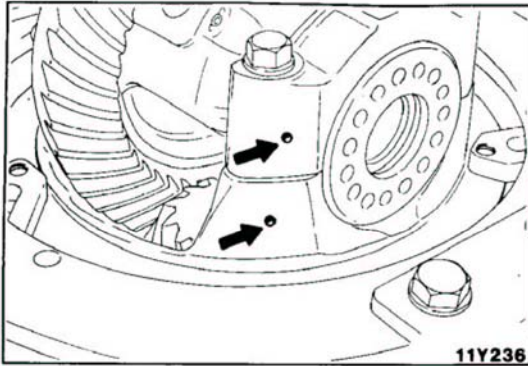
- (3) Apply the specified adhesive to the threaded holes of the drive gear.

**Specified adhesive : 3M adhesive stud locking 4170 or equivalent**

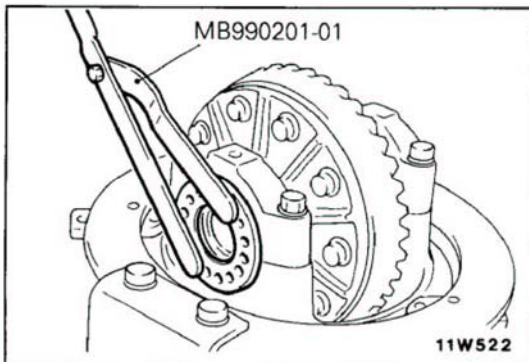
- (4) Install the drive gear onto the differential case with the mating marks properly aligned. Be sure to tighten the bolts to the specified torque in a diagonal sequence.

**25. PRESS-FIT OF SIDE BEARING INNER RACE**

Press-fit the side bearing inner races to the differential case by using the special tool.

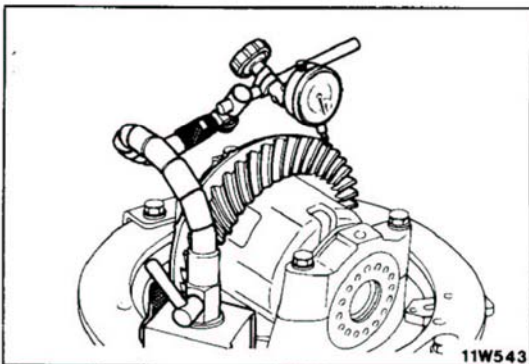
**28. INSTALLATION OF BEARING CAP**

Align the mating marks on the gear carrier and the bearing cap, and then tighten the bearing cap.



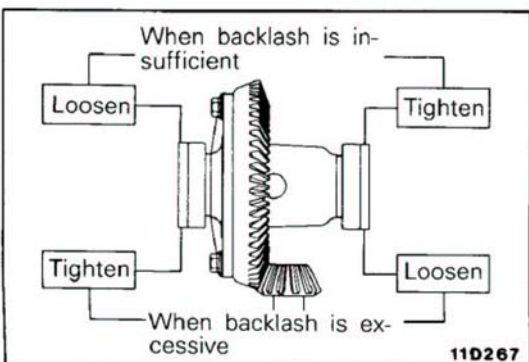
- ADJUSTMENT OF FINAL DRIVE GEAR BACKLASH**

(1) Using the special tool, temporarily tighten the side bearing nut until it is in the state just before preloading of the side bearing.



(2) Measure the final drive gear backlash.

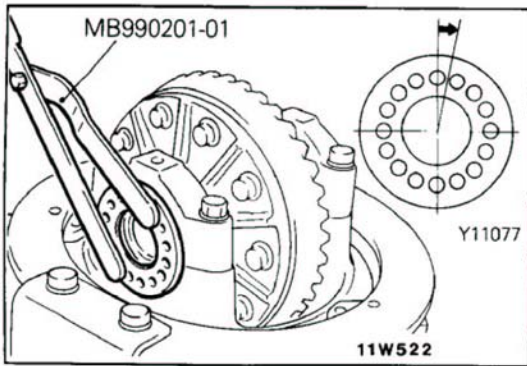
**Standard value : 0.11–0.16 mm (.0043–.0063 in.)**



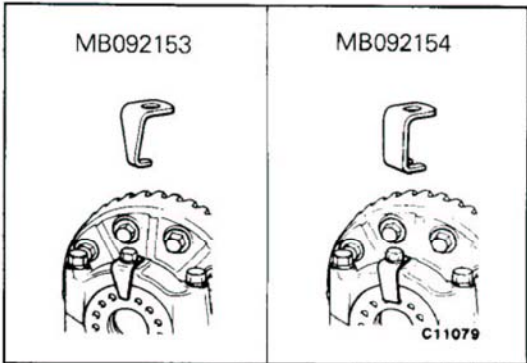
(3) Using the special tool (MB990201-01), adjust the backlash to standard value by moving the side bearing nut as shown.

**NOTE**

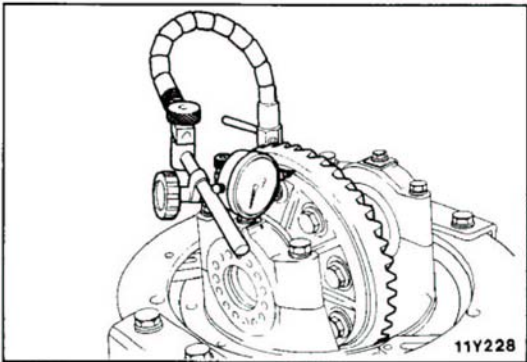
First turn the side bearing nut for loosening, and then turn (by the same amount) the side bearing nut for tightening.



- (4) Using the special tool, to apply the preload, turn down both right and left side bearing nuts on half the distance between centres of two neighbouring holes.



- (5) Choose and install the lock plates (two kinds).



- (6) Check the final tooth contact. If poor contact is evident, make adjustment. (Refer to P.3-29.)  
 (7) Measure the drive gear runout.

**Limit : 0.05 mm (.0020 in.)**

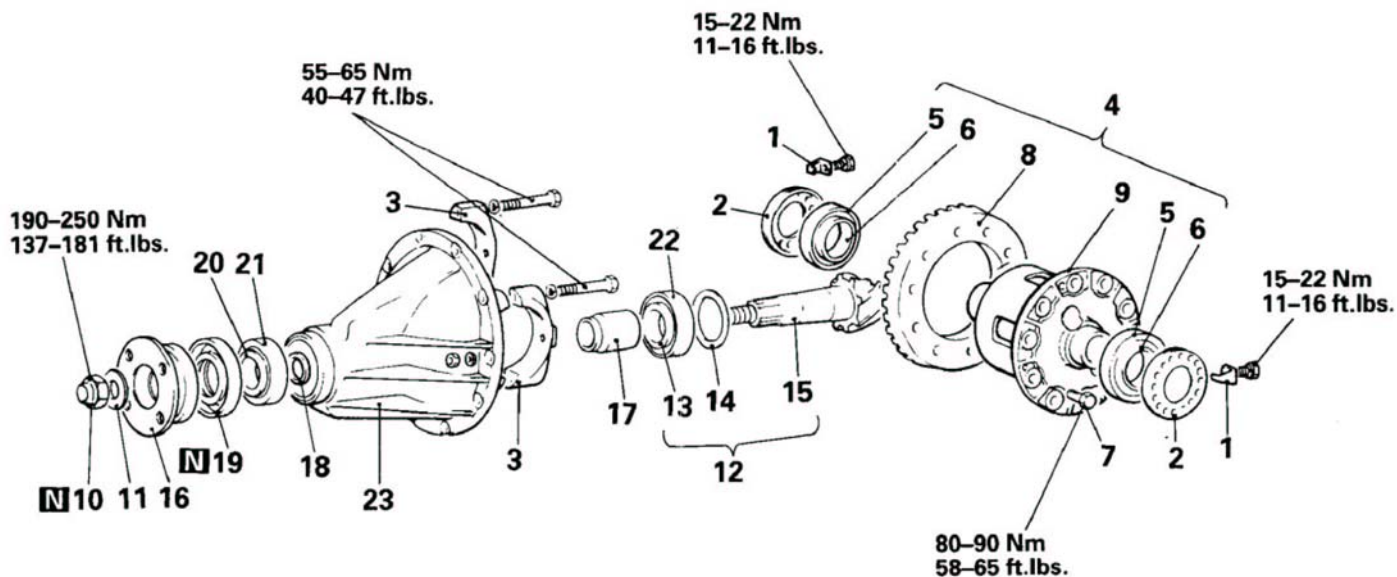
If the drive gear runout exceeds the limit, reinstall by changing the phase of the drive gear and differential case, and remeasure



DISASSEMBLY

**Inspection Before Disassembly**

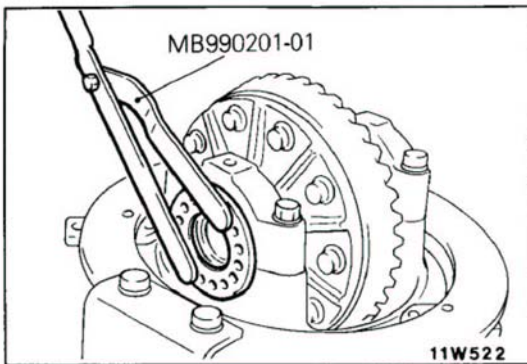
- Final Drive Gear Backlash (Refer to P.3-29.)
- Drive Gear Runout (Refer to P.3-29.)
- Final Drive Gear Tooth Contact (Refer to P.3-29.)



**Disassembly steps**

- |    |   |    |  |
|----|---|----|--|
| ◆◆ | 1. Lock plates  |    | 15. Drive pinion                                     |
| ◆◆ | 2. Side bearing nuts                                      |    | 16. Companion flange                                 |
|    | 3. Bearing caps   |    | 17. Drive pinion spacer                              |
| ◆◆ | 4. Differential case assembly                             |    | 18. Drive pinion front shim (for preload adjustment) |
|    | 5. Side bearing outer races                               |    | 19. Oil seal   |
| ◆◆ | 6. Side bearing inner races                               |    | 20. Drive pinion front bearing inner race            |
|    | 7. Bolts  |    | 21. Drive pinion front bearing outer race            |
| ◆◆ | 8. Drive gear   |    | 22. Drive pinion rear bearing outer race             |
|    | 9. Limited slip differential case assembly                |    | 23. Differential carrier                             |
| ◆◆ | 10. Self-locking nut                                      | ◆◆ |  |
|    | 11. Washer  | ◆◆ |  |
| ◆◆ | 12. Drive pinion assembly                                 |    |  |
| ◆◆ | 13. Drive pinion rear bearing inner race                  |    |  |
|    | 14. Drive pinion rear shim (for pinion height adjustment) |    |  |

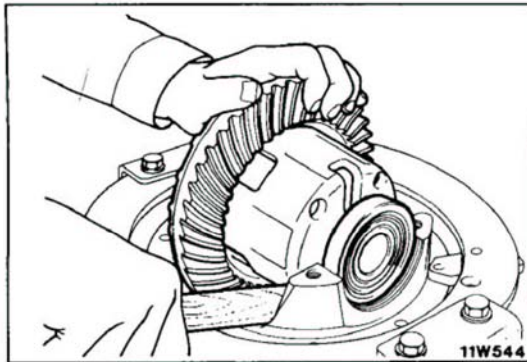
NOTE  
 (1) ◆◆ : Refer to "Service Points of Disassembly".  
 (2) N : Non-reusable parts



**SERVICE POINTS OF DISASSEMBLY**

**2. REMOVAL OF SIDE BEARING NUT**

Using the special tool, remove the side bearing.

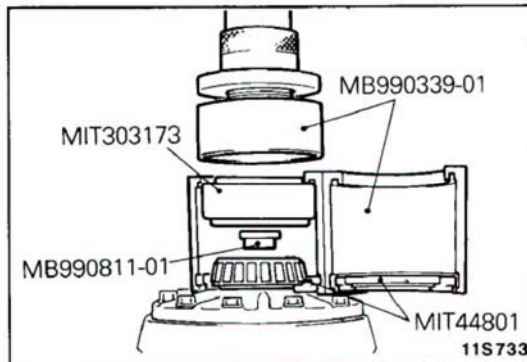


**4. REMOVAL OF DIFFERENTIAL CASE ASSEMBLY**

Take out the differential case assembly with hammer handles.

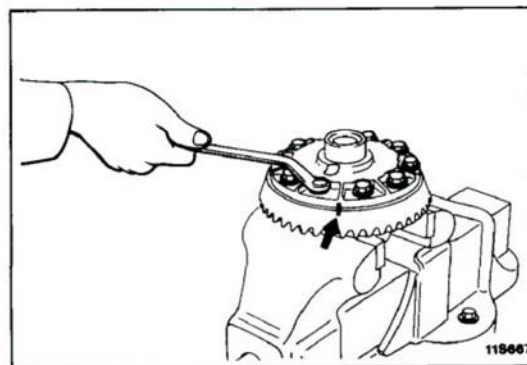
**NOTE**

Keep the right and left side bearings and side bearing nuts separate, so that they do not become mixed at the time of reassembly.



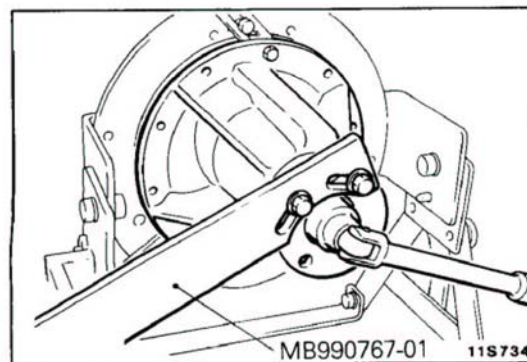
**6. REMOVAL OF SIDE BEARING INNER RACE**

Pull out the side bearing inner races by using the special tools.



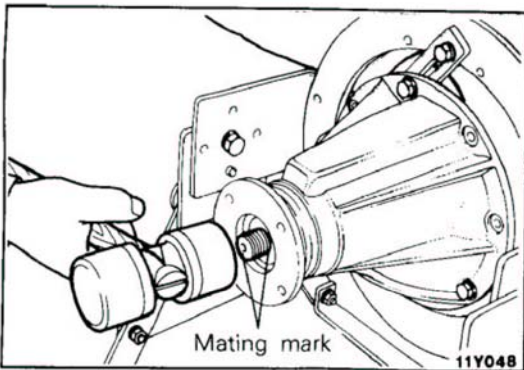
**8. REMOVAL OF DRIVE GEAR**

- (1) Make the mating marks to the differential case and the drive gear.
- (2) Loosen the drive gear attaching bolts in diagonal sequence to remove the drive gear.



**10. REMOVAL OF SELF-LOCKING NUT**

Use the special tools to hold the companion flange and remove the companion flange self-locking nut.

**12. REMOVAL OF DRIVE PINION ASSEMBLY**

- (1) Make the mating marks to the drive pinion and companion flange.

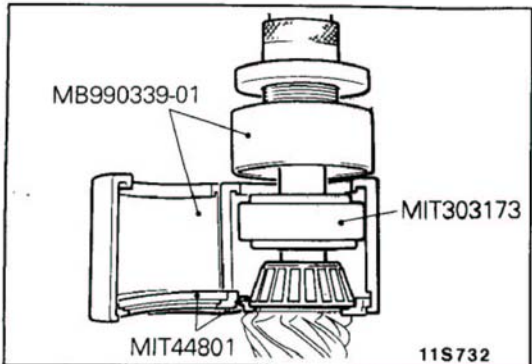
**Caution**

The mating mark made on the companion flange must not be on the coupling surface of the flange yoke and the rear propeller shaft.

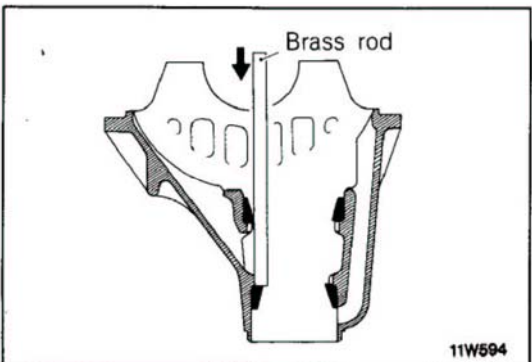
- (2) Drive out the drive pinion together with the drive pinion spacer and drive pinion front shims.

**13. REMOVAL OF DRIVE PINION REAR BEARING INNER RACE**

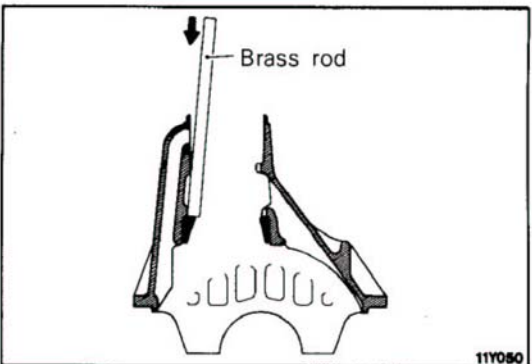
Pull out the drive pinion rear bearing inner race by using the special tools.

**21. REMOVAL OF DRIVE PINION FRONT BEARING OUTER RACE**

Drive out the drive pinion front bearing outer race from the gear carrier.

**22. REMOVAL OF DRIVE PINION REAR BEARING OUTER RACE**

Drive out the drive pinion rear bearing outer race from the gear carrier.

**INSPECITON**

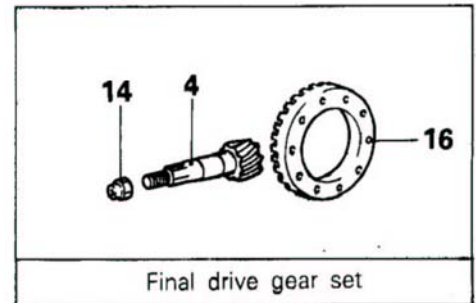
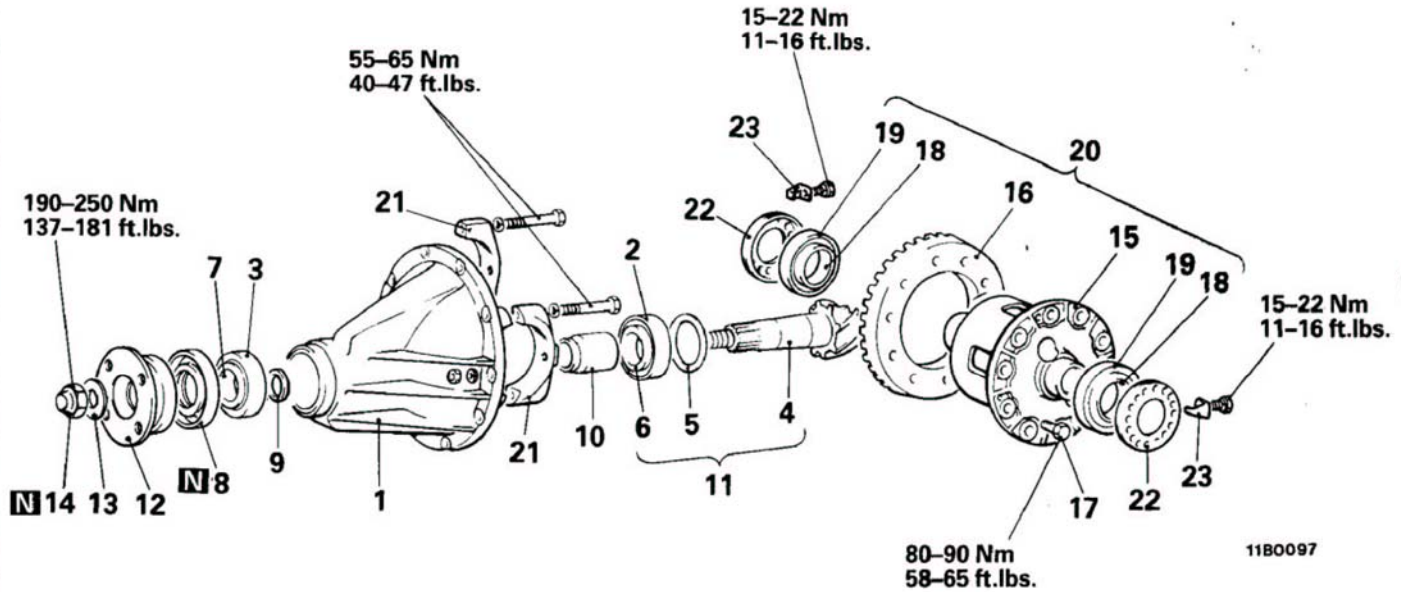
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Wash the disassembled parts in cleaning solvent, dry them using compressed air, and then check the following areas:

- Check the companion flange for wear or damage.
- Check the oil seal for wear or deterioration.
- Check the bearings for wear or discoloration
- Check the gear carrier for cracks.
- Check the drive pinion and ring gear for wear or cracks.

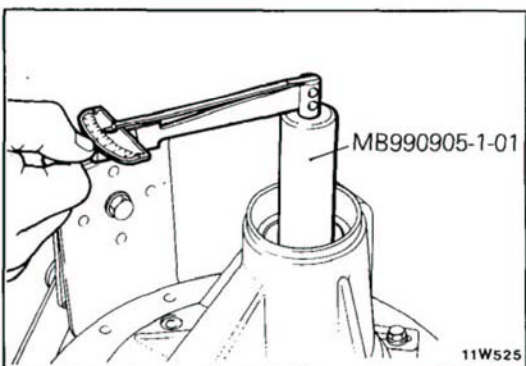
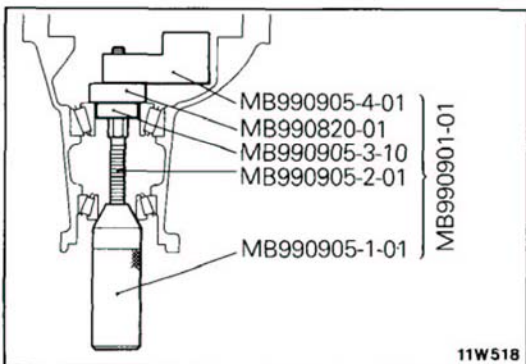
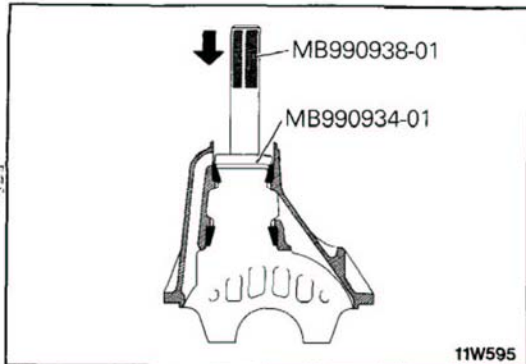
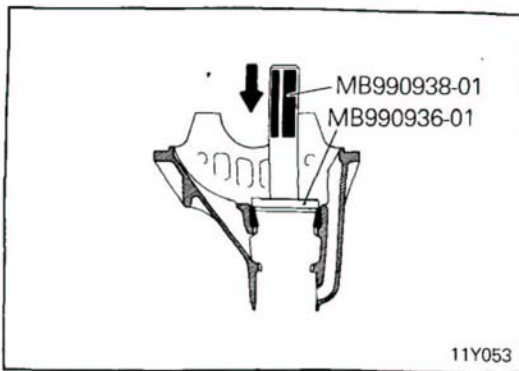
REASSEMBLY

N03IT--



Reassembly steps

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>1. Differential carrier</li> <li>◆◆ 2. Drive pinion rear bearing outer race</li> <li>◆◆ 3. Drive pinion front bearing outer race</li> <li>◆◆ Adjustment of pinion height</li> <li>4. Drive pinion</li> <li>5. Drive pinion rear shim (for pinion height adjustment)</li> <li>6. Drive pinion rear bearing inner race</li> <li>◆◆ Adjustment of drive pinion preload</li> <li>7. Drive pinion front bearing inner race</li> <li>8. Oil seal</li> <li>9. Drive pinion front shim (for preload adjustment)</li> <li>10. Drive pinion spacer</li> <li>11. Drive pinion assembly</li> <li>12. Companion flange</li> </ul> | <ul style="list-style-type: none"> <li>13. Washer</li> <li>14. Self-locking nut</li> <li>15. Limited slip differential case assembly</li> <li>◆◆ 16. Drive gear</li> <li>17. Bolts</li> <li>◆◆ 18. Side bearing inner races</li> <li>19. Side bearing outer races</li> <li>20. Differential case assembly</li> <li>◆◆ 21. Bearing caps</li> <li>◆◆ Adjustment of final drive gear backlash</li> <li>22. Side bearing nuts</li> <li>23. Lock plate</li> </ul> |
|---|--|
- NOTE
- (1) ◆◆ : Refer to "Service Points of Reassembly".
  - (2) N : Non-reusable parts



## SERVICE POINTS OF REASSEMBLY

N03INAB

### 2. INSTALLATION OF DRIVE PINION REAR BEARING OUTER RACE

Press-fit the drive pinion rear bearing outer race into the gear carrier by using the special tools.

#### NOTE

Perform press-fitting carefully so as not to tilt the outer race.

### 3. INSTALLATION OF DRIVE PINION FRONT BEARING OUTER RACE

Press-fit the drive pinion front bearing outer race into gear carrier by using the special tools.

#### NOTE

Perform press-fitting carefully so as not to tilt the outer race.

### • ADJUSTMENT OF PINION HEIGHT

Adjust the drive pinion height by the following procedures:

- (1) Install special tools and drive pinion front and rear bearing inner races to the gear carrier in the sequence shown in the illustration.

#### NOTE

Apply a thin coat of the specified grease to the mating face of the washer of the special tool.

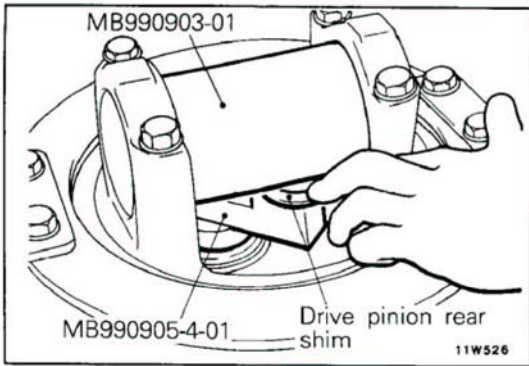
**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

- (2) Tighten the handle of the special tool until the standard value of drive pinion turning torque is obtained.
- (3) Measure the drive pinion turning torque (without the oil seal).

**Standard value : 0.4–0.5 Nm (3.5–4.3 in.lbs.)**

#### NOTE

Gradually tighten the handle of the special tool while checking the drive pinion turning torque.

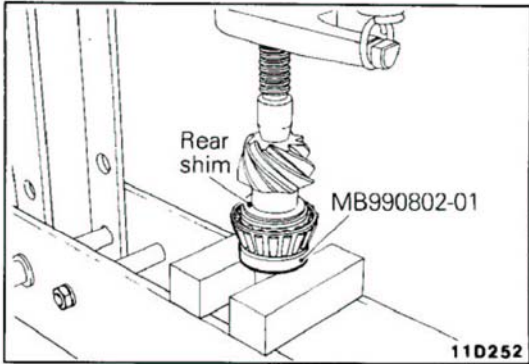


- (4) Position the special tool in the side bearing seat of the gear carrier, and then select a drive pinion rear shim of a thickness which corresponds to the gap between the special tools.

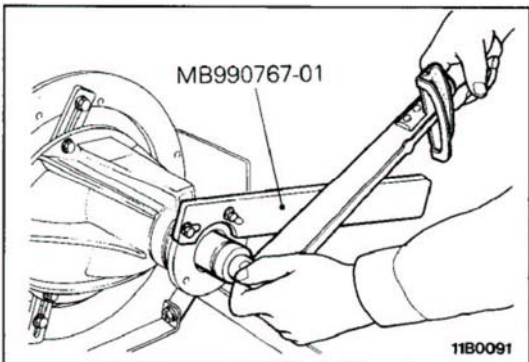
**NOTE**

Be sure to clean the side bearing seat thoroughly. When positioning the special tool, be sure that the cut-out sections of the special tool are in the position shown in the illustration, and also confirm that the special tool is in close contact with the side bearing seat.

When selecting the drive pinion rear shims, keep the number of shims to a minimum.



- (5) Fit the selected drive pinion rear shim(s) to the drive pinion, and press-fit the drive pinion rear bearing inner race by using the special tool.



● **ADJUSTMENT OF DRIVE PINION PRELOAD**

Adjust the drive pinion turning torque by using the following procedure:

**Without Oil Seal**

- (1) Fit the drive pinion front shim(s) between the drive pinion spacer and the drive pinion front bearing inner race.
- (2) Tighten the companion flange to the specified torque by using the special tools.

**NOTE**

Do not install the oil seal.

- (3) Measure the drive pinion turning torque (without the oil seal).

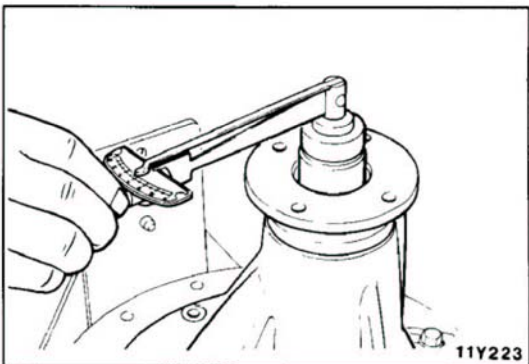
**Standard value : 0.4–0.5 Nm (3.5–4.3 in.lbs.)**

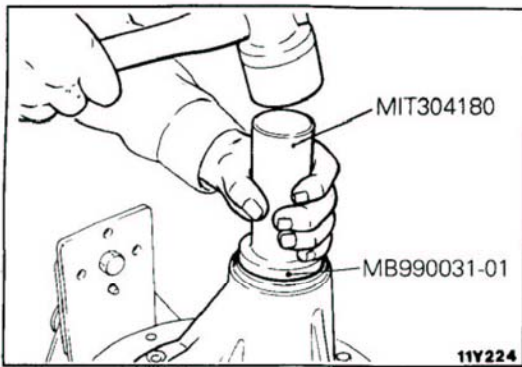
- (4) If the drive pinion turning torque is not within the range of the standard value, adjust the turning torque by replacing the drive pinion front shim(s) or the drive pinion spacer.

**NOTE**

When selecting the drive pinion front shims, if the number of shims is large, reduce the number of shims to a minimum by selecting the drive pinion spacers.

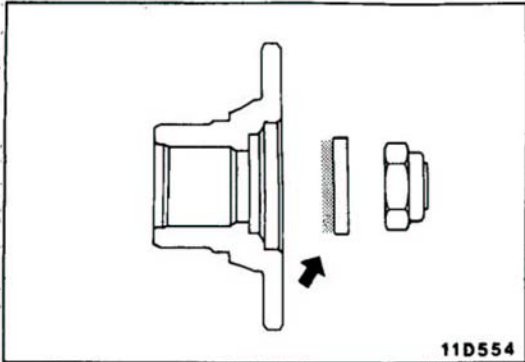
- (5) Remove the companion flange and drive pinion once again.



**With Oil Seal**

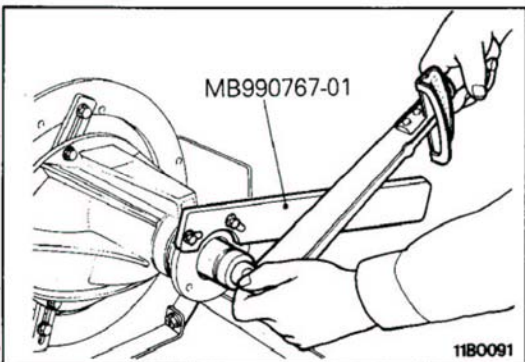
- (1) After setting the drive pinion front bearing inner race, drive the oil seal the gear carrier front lip by using the special tool.
- (2) Apply specified grease to the Oil seal lip.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

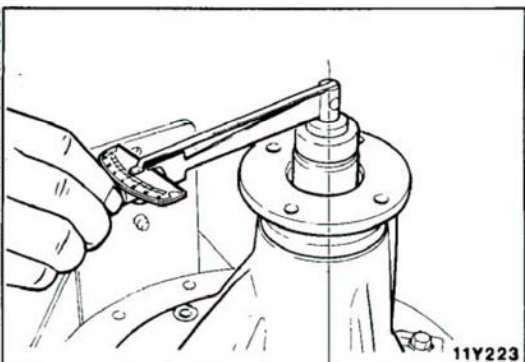


- (3) Apply a thin coat of specified multipurpose grease to the companion flange contacting surface of the washer before installing drive pinion assembly.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

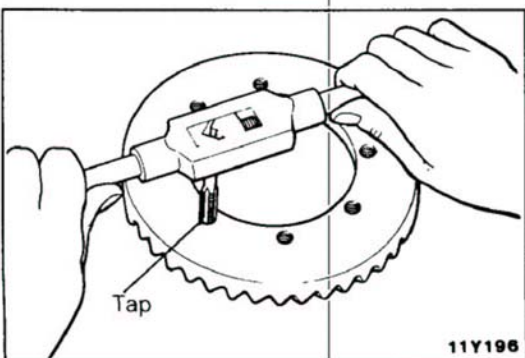


- (4) Install the drive pinion assembly and companion flange with mating marks properly aligned, and tighten the companion flange self-locking nut to the specified torque by using the special tools.

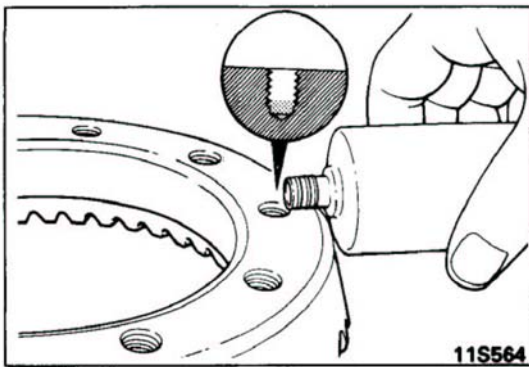


- (5) Measure the drive pinion turning torque (with oil seal) to verify that the drive-pinion turning torque complies with the standard value.

**Standard value : 0.65–0.75 Nm (5.6–6.5 in.lbs.)**

**16. INSTALLATION OF DRIVE GEAR**

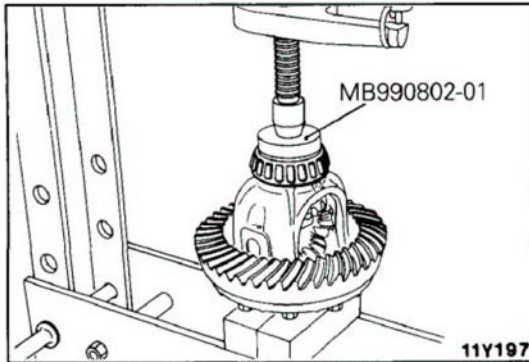
- (1) Clean the drive gear attaching bolts.
- (2) Remove the adhesive adhered to the threaded holes of the drive gear by turning the tap tool (M10 × 1.25), and then clean the threaded holes by applying compressed air.



- (3) Apply the specified adhesive to the threaded holes of the drive gear.

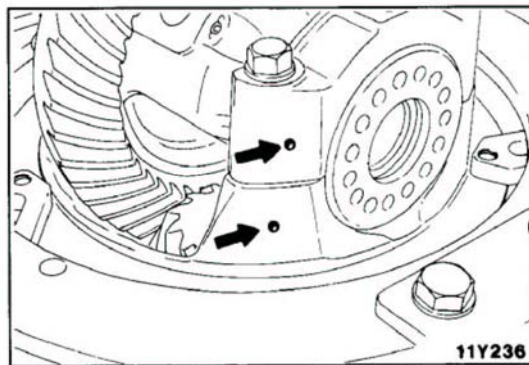
**Specified adhesive : 3M Adhesive stud locking 4170 or equivalent**

- (4) Install the drive gear onto the differential case with the mating marks properly aligned. Be sure to tighten the bolts to the specified torque in a diagonal sequence.



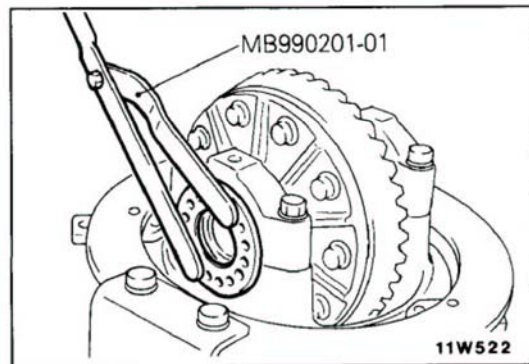
**18. PRESS-FIT OF SIDE BEARING INNER RACE**

Press-fit the side bearing inner races to the differential case by using the special tool.



**21. INSTALLATION OF BEARING CAP**

Align the mating marks on the gear carrier and the bearing cap, and then tighten the bearing cap.

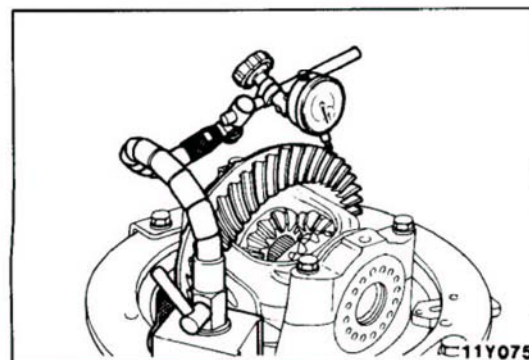


● **ADJUSTMENT OF FINAL DRIVE GEAR BACKLASH**

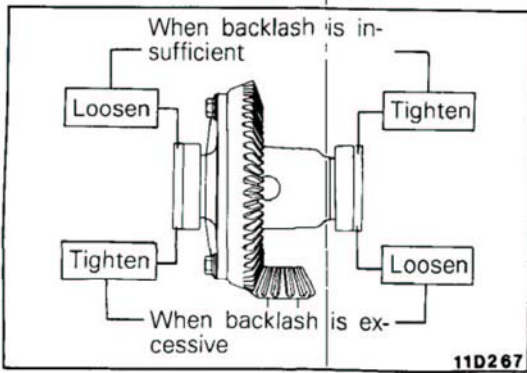
- (1) Using the special tool temporarily tighten the side bearing nut until it is in the state just before preloading of the side bearing.

- (2) Measure the final drive gear backlash.

**Standard value : 0.11–0.16 mm (.0043–.0063 in.)**



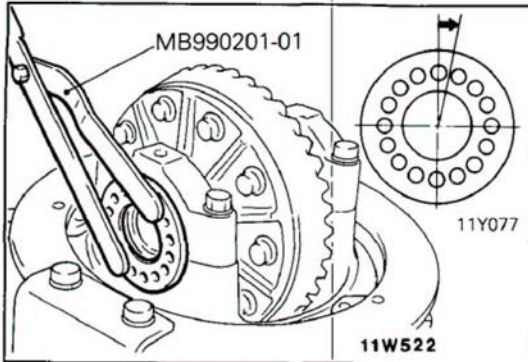




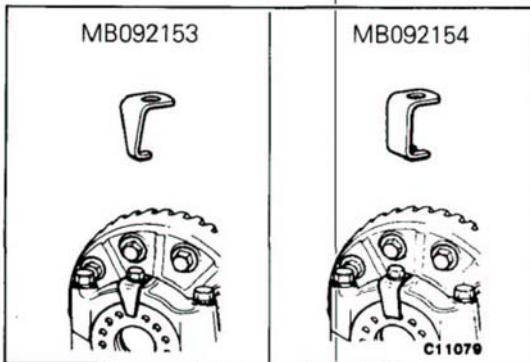
- (3) Using the special tool (MB990201-01), adjust the backlash to standard value by moving the side bearing nut as shown.

NOTE

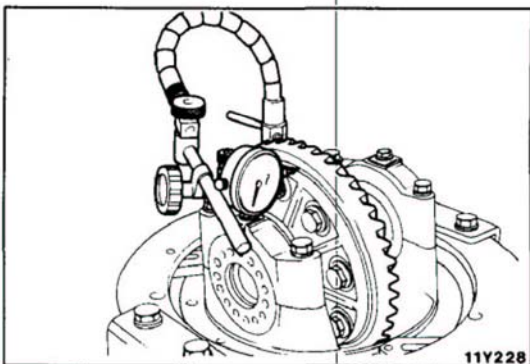
First turn the side bearing nut for loosening, and then turn (by the same amount) the side bearing nut for tightening.



- (4) Using the special tool, to apply the preload, turn down both right and left side bearing nuts on half the distance between centres of two neighbouring holes.



- (5) Choose and install the lock plates (two kinds).



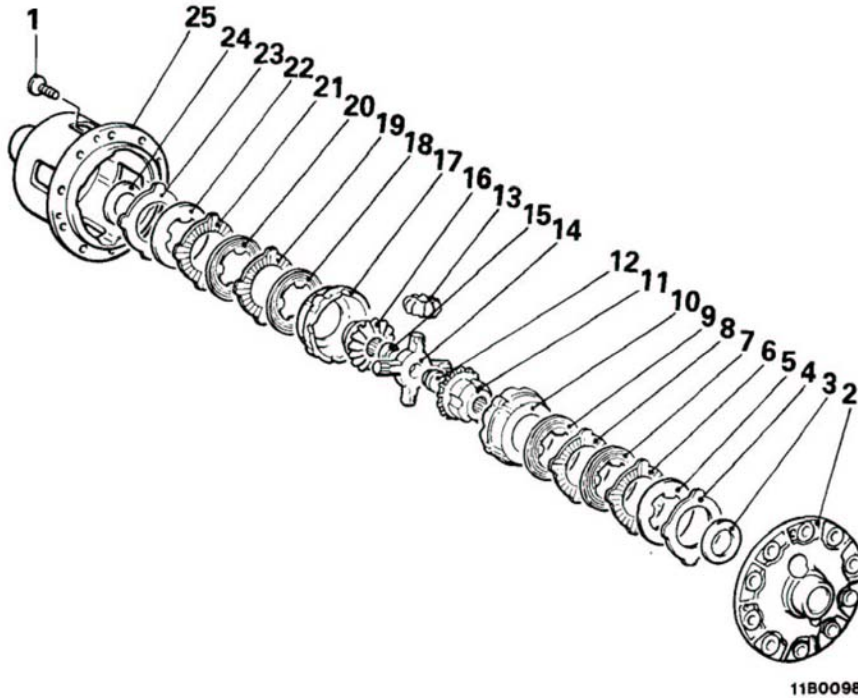
- (6) Check the final tooth contact. If poor contact is evident, make adjustment. (Refer to P.3-29.)
- (7) Measure the drive gear runout.

**Limit : 0.05 mm (.0020 in.)**

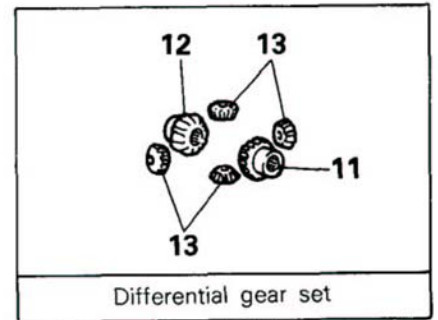
If the drive gear runout exceeds the limit, reinstall by changing the phase of the drive gear and differential case, and remeasure.

OVERHAUL

N0310--



11B0098



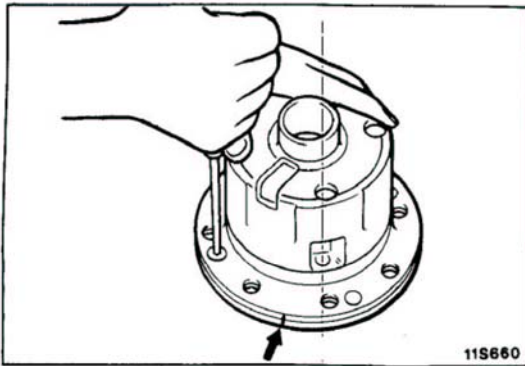
Differential gear set

Disassembly steps

- ◆◆◆◆ 1. Screw
- ◆◆◆◆ 2. Differential case (A)
- ◆◆◆◆ 3. Thrust washer
- ◆◆◆◆ 4. Spring plate
- ◆◆◆◆ 5. Spring disc
- ◆◆◆◆ 6. Friction plate
- ◆◆◆◆ 7. Friction disc
- ◆◆◆◆ 8. Friction plate
- ◆◆◆◆ 9. Friction disc
- ◆◆◆◆ 10. Pressure ring
- ◆◆◆◆ 11. Side gear
- ◆◆◆◆ 12. Thrust block
- ◆◆◆◆ 13. Differential pinion gear
- ◆◆◆◆ 14. Differential pinion shaft
- ◆◆◆◆ 15. Thrust block
- ◆◆◆◆ 16. Side gear
- ◆◆◆◆ 17. Pressure ring
- ◆◆◆◆ 18. Friction disc
- ◆◆◆◆ 19. Friction plate
- ◆◆◆◆ 20. Friction disc
- ◆◆◆◆ 21. Friction plate
- ◆◆◆◆ 22. Spring disc
- ◆◆◆◆ 23. Spring plate
- ◆◆◆◆ 24. Thrust washer
- ◆◆◆◆ 25. Differential case (B)

NOTE

- (1) Reverse the disassembly procedures to reassembly
- (2) ◆◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆◆◆ : Refer to "Service Points of Reassembly".

**SERVICE POINTS OF DISASSEMBLY**

N031PAA

**1. REMOVAL OF SCREW**

- (1) Loosen screws of the differential cases (A) and (B) uniformly a little at a time.
- (2) Separate differential case (A) from differential case (B).

**NOTE**

Before disassembling the differential cases, confirm that the mating marks (numbers) on case A and case B are the same.

- (3) Remove the components from differential case (B).

**NOTE**

Keep the right and left thrust washers, spring plates, spring discs, friction plates, and friction discs separate in order to be able to distinguish them for reassembly.

**INSPECTION**

N031QAA

- Check the side gears, pinion gears and pinion shaft for wear or damage.
- Check the side gear spline for wear or damage.

**INSPECTION OF CONTACT AND SLIDING SURFACES OF PARTS**

- (1) Inspect the friction plate, friction disc, spring plate, spring disc and pressure ring.

- A** The friction surfaces of the friction plate, friction disc, spring plate, and spring disc. If there are any signs of seizure, severe friction, or color change from the heat, it will adversely affect the locking performance; replace the part with a new one.

**NOTE**

The strong contact on the inner circumference of the friction surfaces is because of the spring plate and the spring disc; this wear is not abnormal.

- B** The six projections on the inner circumference of the friction disc. If there are nicks and dents, it will cause abnormalities in the clutch pressure.

Repair the parts by using an oil stone; if the parts cannot be repaired, replace them.

- C** The four projections on the outer circumference of the friction disc.

If there are nicks and dents, it will cause abnormalities in the clutch pressure.

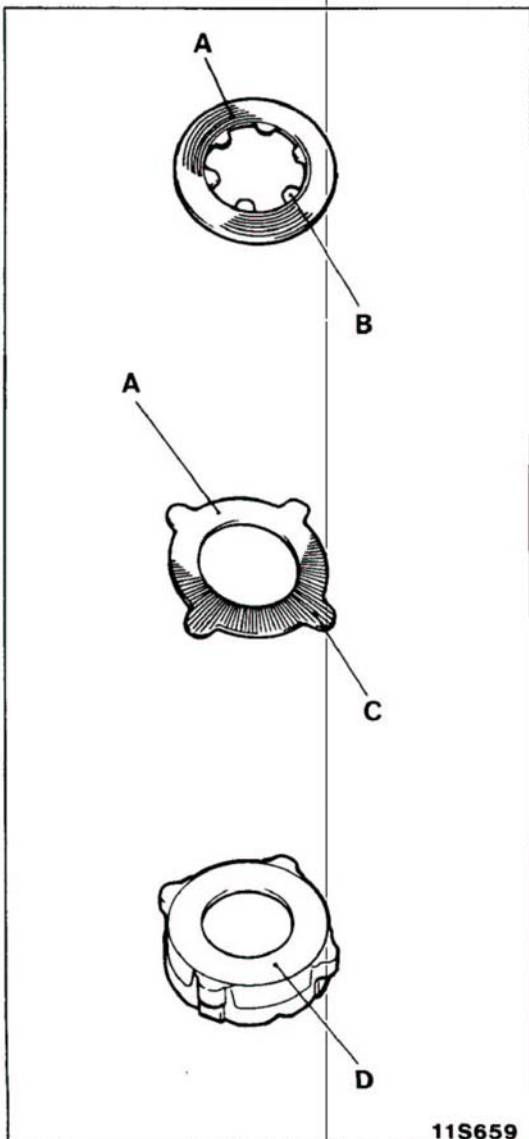
Repair the parts by using an oil stone; if the parts cannot be repaired, replace them.

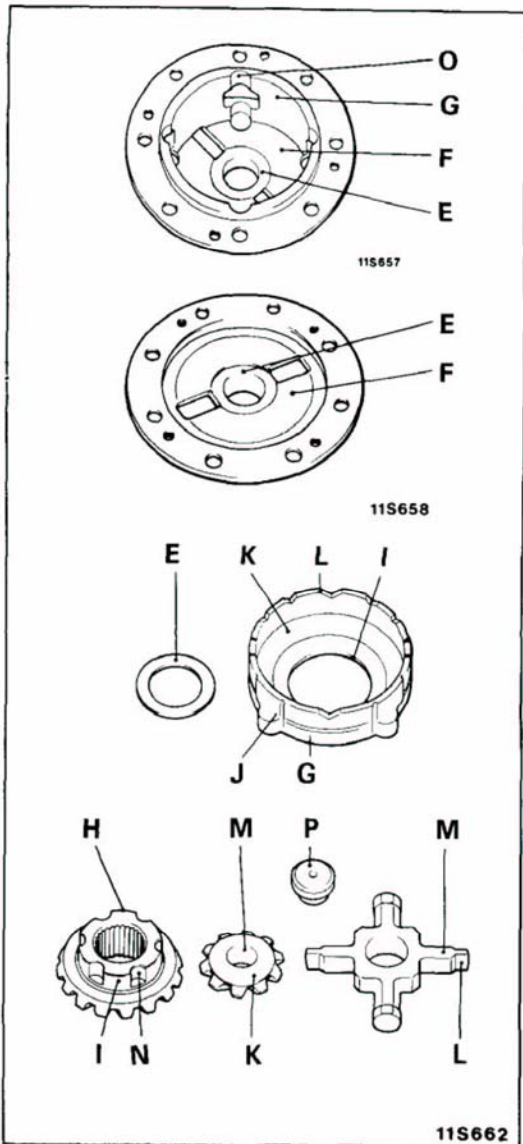
- D** The friction surface of the friction disc of the pressure ring.

If there are nicks or scratches, repair the part by first grinding with an oil stone and then polishing with rubbing compound on a surface plate.

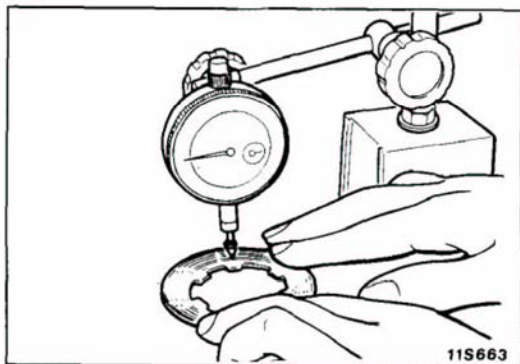
**NOTE**

The strong contact on the inner circumference of the friction surface is because of the spring plate and the spring disc; this wear is not abnormal.





- (2) Inspect the contact and sliding surfaces listed below, and repair any nicks and burrs by using an oil stone.
- E** The sliding surfaces of the thrust washer and the case.
  - F** The spring contacting surface of the differential case.
  - G** The contact surfaces of the outer circumference of the pressure ring and the inner circumference of the differential case.
  - H** The sliding surface of the thrust washer.
  - I** The sliding surfaces of the hole in the pressure ring and the outer circumference of the side gear.
  - J** The projection on the outer circumference of the pressure ring.
  - K** The spherical surface of the differential pinion gear and the inner diameter of the pressure ring.
  - L** The V-shaped groove in the pressure ring, and the V-shaped part in the pinion shaft.
  - M** The outer diameter of the pinion shaft and the hole of the differential pinion gear.
  - N** The outer circumference groove of the side gear.
  - O** The inner circumference groove of the differential case.
  - P** The sliding surface of the thrust block.



**INSPECTION FOR WARPING OF FRICTION PLATE AND FRICTION DISC**

Using a dial indicator, measure the amount of warping (the flatness) of the friction plate and the friction disc on a surface plate by turning the friction plate or disc.

**Limit : 0.08 mm (.0031 in.)**

**INSPECTION FOR WEAR OF FRICTION PLATE AND FRICTION DISC**

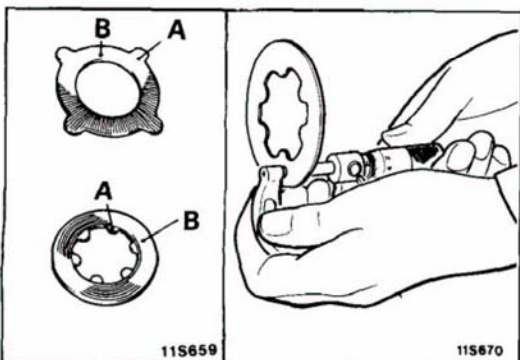
- (1) In order to measure the wear, measure the thickness of the friction surfaces and projections of the friction disc and plate, and then find the difference. (The same procedure is used for the spring discs and the spring plates.)

**Limit : 0.1 mm (.004 in.)**

**NOTE**

Make the measurement at several different points.

- (2) If the parts are worn beyond the allowable limit, replace them with new parts.

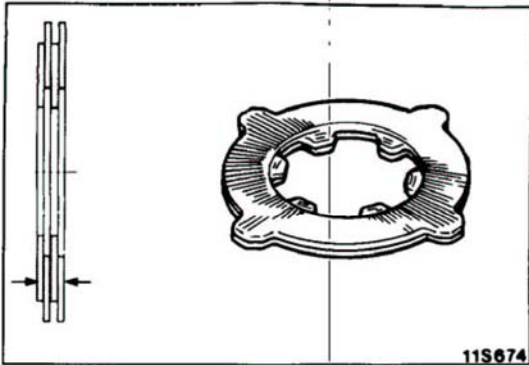


## SERVICE POINTS OF REASSEMBLY

N031RAC

## 25. INSTALLATION OF DIFFERENTIAL CASE (B)

Before assembly, use the following method to adjust the clearance between the spring plates and differential cases (for adjustment of the clutch plate friction force), and to adjust the axial clearance of the side gear when installing the internal components into the differential case.

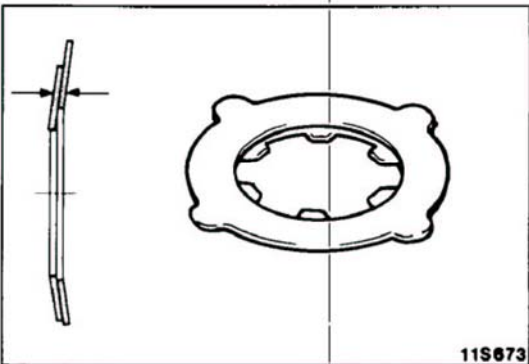


- (1) Arrange the two (each) friction discs and friction plates for each side, one on top of another, as shown in the figure, combining them so that the difference in thickness between the left and the right is the standard value.

**Standard value : 0.05 mm (.0020 in.) or less**

## NOTE

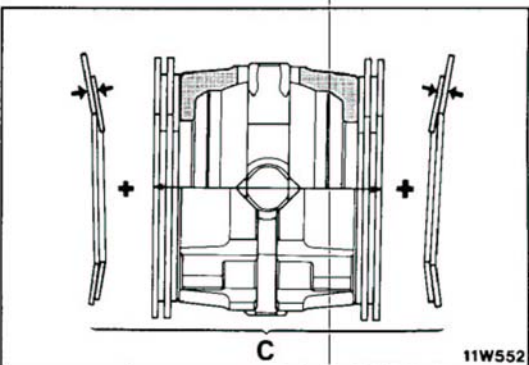
For new ones, there is one type of friction plate: 1.75 mm (.0689 in.); there are two types of friction disc: 1.75 mm (.0689 in.) and 1.85 mm (.0728 in.).



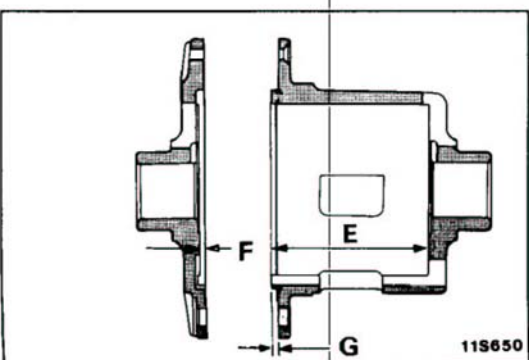
- (2) Arrange one spring disc and one spring plate for each side, one on top of the other, so that the difference between the left and the right thickness is minimized.

## NOTE

For new ones, there is one type of spring disc and spring plate: 1.75 mm (.0689 in.).



- (3) Assemble the pressure ring's internal components (differential pinion shaft and pressure ring) and the friction discs and friction plates, and then, as shown in the figure, measure the overall width.
- (4) Calculate the total value (C) of the thickness of the spring discs and spring plates plus the value measured in (3) above.

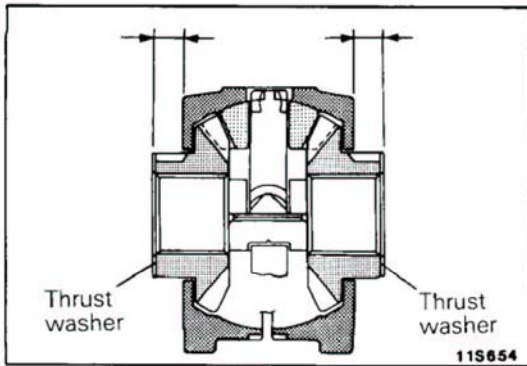


- (5) Obtain the dimension (D) between the spring plate contact surfaces when differential cases (A) and (B) are combined.

$$(D = E + F - G)$$

- (6) Change the thickness of the friction disc so that the clearance (D - C) between the differential case and the spring plate becomes the standard value.

**Standard value : 0.06–0.20 mm (.0024–.0079 in.)**

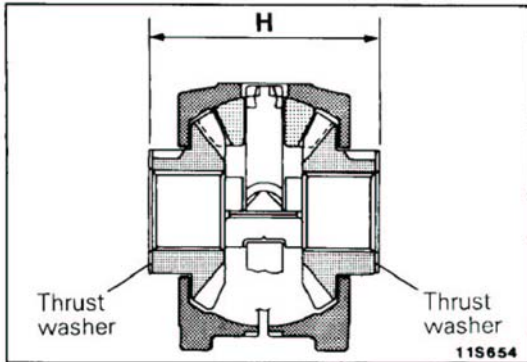


- (7) Remove the spring plates, spring discs, friction plates and friction disc.
- (8) Install the thrust washer as shown in the figure, and then select a thrust washer so that the difference between the left and right dimensions from the pressure ring rear face to the thrust washer end face is the standard value.

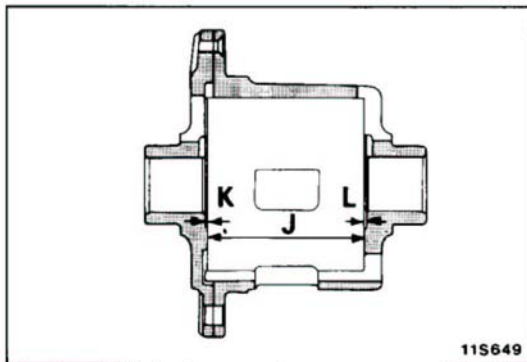
**Standard value : 0.05 mm (.0020 in.) or less**

**NOTE**

Measure the distance while squeezing the V-shaped groove manually.



- (9) Measure the dimension (H) from the thrust washer end surface to end surface.



- (10) Obtain the dimension (I) between the thrust washer contact surfaces when differential cases (A) and (B) are combined.

$$( I = J + K + L )$$

**NOTE**

Dimension J is the distance between the spring plate contact surfaces when differential cases (A) and (B) are combined. (Refer to P.3-54.)

- (11) Change the thickness of the thrust washer so that the clearance ( I – H ) between the thrust washer and the differential case is the standard value.

**Standard value : 0.05–0.20 mm (.0020–.0079 in.)**

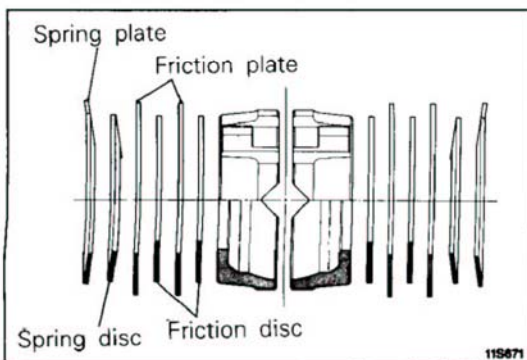
**NOTE**

1. Select the thrust washer so that the difference between the left and right dimensions from the pressure ring rear face and the thrust washer end surface are the standard value even when the thrust washer is changed.
2. There are three sizes of new thrust washers: 1.50 mm (.0591 in.), 1.60 mm (.0630 in.), and 1.70 mm (.0670 in.)

- (12) Place the each part in the differential case (B) as directions shown in the figure.

**NOTE**

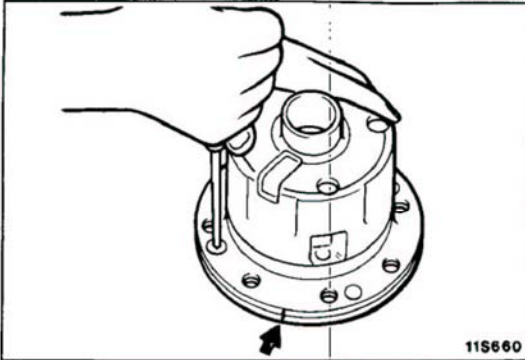
1. Before assembly, apply the specified gear oil to each component especially careful to coat contact surfaces and sliding surfaces.



**Specified gear oil:**

**MITSUBISHI Genuine Gear Oil Part No. 8149630 EX or equivalent**

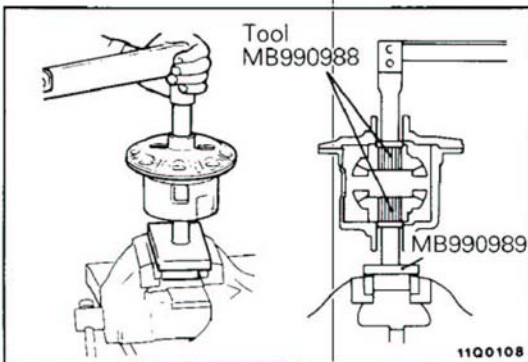
2. Be careful not to insert the friction plates and friction discs in the incorrect order and to install the spring plates and spring disc in incorrect direction.

**1. INSTALLATION OF SCREW**

- (1) Align the mating marks (the same numeral on each case) of differential case (A) and differential case (B).
- (2) Turning the screwdriver slowly several times, tighten the screw so that the cases are in close contact.

**NOTE**

If, even though the screw is tightened, the end surfaces of case (A) and case (B) do not come into close contact, probably the thrust washer and spring plate are not fit correctly into the groove, so make the assembly again.



- (3) After assembly, in order to check the frictional force of the clutch plate, use the special tools to measure the starting torque.

**Standard value:**

**When a new clutch plate is used**

**65–100 Nm (47–72 ft.lbs.)**

**When an old clutch plate is used**

**35–100 Nm (25–72 ft.lbs.)**

**NOTE**

Measure the starting torque after rotating slightly. When measuring the torque, do so at the beginning of movement.

# BRAKES

## SERVICE AND PARKING

### CONTENTS

N05AA--

<b>BRAKE BOOSTER</b> .....	<b>25</b>	Inspection and Adjustment of Brake Pedal .....	<b>10</b>
<b>BRAKE LINE</b> .....	<b>27</b>	Inspection and Replacement of Brake Pad .....	<b>15</b>
<b>BRAKE PEDAL</b> .....	<b>18</b>	<b>SPECIAL TOOLS</b> .....	<b>7</b>
<b>FRONT DISC BRAKE CALIPER</b> .....	<b>29</b>	<b>SPECIFICATIONS</b> .....	<b>4</b>
<b>GENERAL INFORMATION</b> .....	<b>2</b>	General Specifications .....	<b>4</b>
<b>MASTER CYLINDER</b> .....	<b>21</b>	Lubricants .....	<b>6</b>
<b>PARKING BRAKE CABLE</b> .....	<b>40</b>	Sealants and Adhesives .....	<b>6</b>
<b>PARKING BRAKE LEVER</b> .....	<b>39</b>	Service Specifications .....	<b>5</b>
<b>REAR BRAKE SHOE</b> .....	<b>33</b>	Torque Specifications .....	<b>6</b>
<b>REAR BRAKE WHEEL CYLINDER</b> .....	<b>36</b>	<b>TROUBLESHOOTING</b> .....	<b>7</b>
<b>SERVICE ADJUSTMENT PROCEDURES</b> .....	<b>10</b>	Brake drag	
Bleeding .....	14	Groaning, clicking or rattling noise	
Blend Proportioning Valve Function Test .....	14	Improper braking power	
Brake Booster Operating Test .....	12	Improper parking brake function	
Checking and Adjustment of Parking Brake Lever Stroke .....	11	Increased pedal stroke	
Checking Brake Fluid Level Sensor .....	12	Poor parking brake function	
Checking Parking Brake Switch .....	12	Scraping or grinding noise	
		Squealing, groaning or chattering noise	
		Squealing noise	
		Vehicle pulls to one side	



**CAUTION**

When servicing brake assemblies or components, do not create dust by sanding, grinding, or by cleaning brake parts with a dry brush or with compressed air.

A WATER DAMPENED CLOTH SHOULD BE USED. Many brake components contain asbestos fibers which can become airborne if dust is created during service operations.

Breathing dust which contains asbestos fibers can cause serious bodily harm.

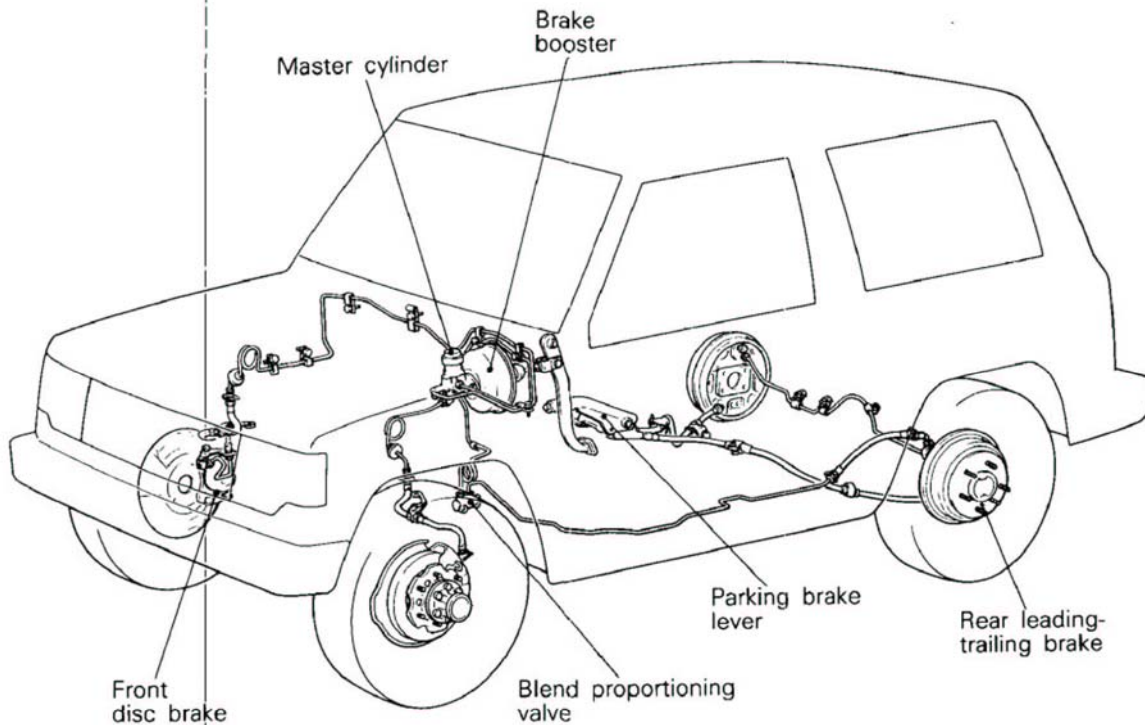
**GENERAL INFORMATION**

N05BA--

**SERVICE BRAKE**

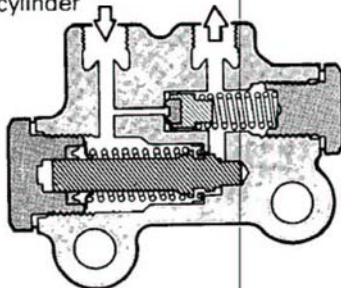
For high reliability and stopping force, the brake system comprises ventilated disc brakes for the front wheels and leading-trailing drum brakes with automatic adjuster for the rear wheels. A brake booster is also added to reduce the force required for braking.

Braking stability is improved by the adoption of the blend-proportioning valve.



14W614

From master cylinder      To rear brake cylinder



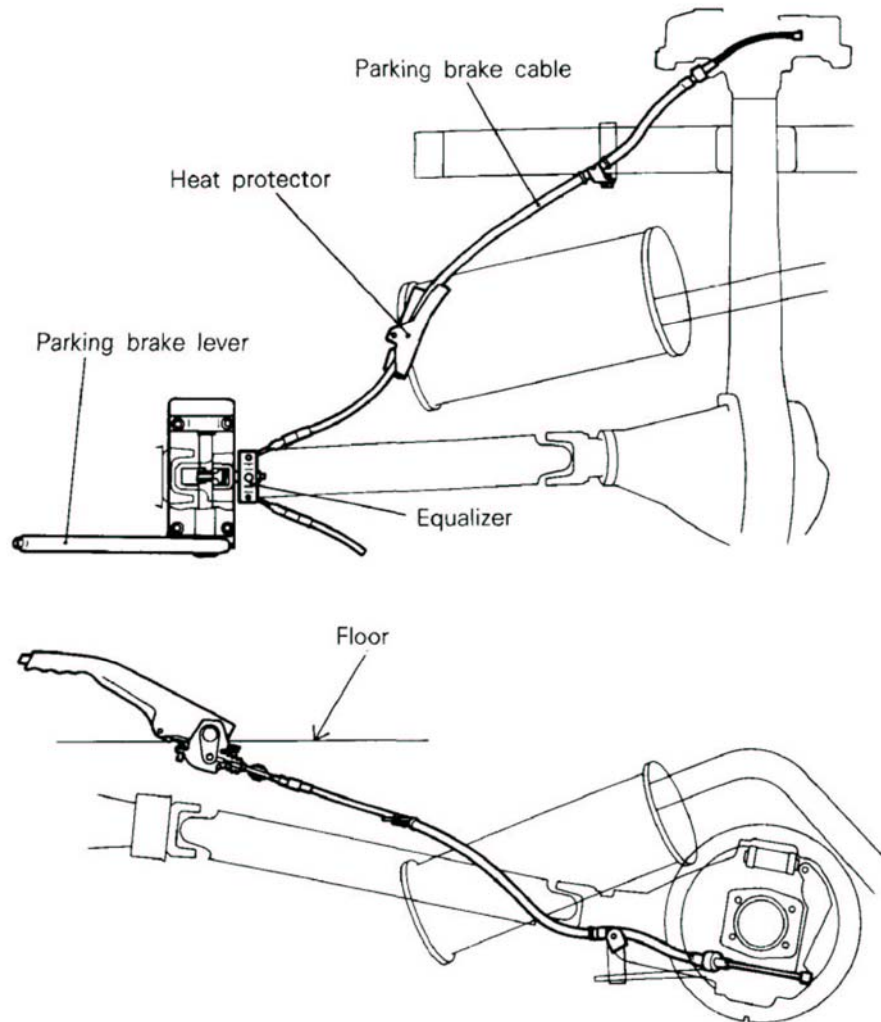
14W591

**BLEND PROPORTIONING VALVE**

The blend proportioning valve serves to improve efficiency within normal braking range by distributing braking force most effectively to the front and rear wheels and also to increase braking force to the rear wheels by releasing decompressing effect if a large braking force is required also for the rear wheels as when the vehicle is loaded or when the front brake should burst.

**PARKING BRAKE**

The parking brake is the mechanical type (internal-expansion type). The parking brake lever is located to the driver's side of the center of the floor's back bone for easier operational access. The brake cable is the V-type, and the parking brake lever stroke adjustment is made by the equalizer at the lower part of the floor.



14W559

## SPECIFICATIONS

## GENERAL SPECIFICATIONS

N05CA--

Items	Specifications
Master cylinder Type I.D. mm (in.)	Tandem type 22.22 (7/8)
Brake booster Type Effective dia. of power cylinder mm (in.) Boosting ratio [Brake pedal depressing force]	Vacuum type 203.2 (8.0) 4.0
Front brakes Type Disc O.D. mm (in.) Disc thickness mm (in.) Pad thickness mm (in.) Cylinder I.D. mm (in.) Clearance adjustment	F-type disc 255 (10.0) 20 (.79) 10.5 (.413) 53.97 (2.1248) Automatic
Rear brakes Type Drum I.D. mm (in.) Lining thickness mm (in.) Cylinder I.D. mm (in.) Clearance adjustment	Leading and trailing shoe type drum 254 (10.0) 4.6 (.18) 20.64 (13/16) Automatic
Parking brakes Type Brake engagement Cable routing	Mechanical brake acting on rear wheels Lever type V-type

SERVICE SPECIFICATIONS

N05CB--

Items	Specifications
<b>Standard Value</b>	
Brake pedal height mm (in.)	191–196 (7.5–7.7)
Stop light switch outer case to pedal arm clearance mm (in.)	0.5–1.0 (.020–.039)
Brake pedal free play mm (in.)	10–15 (.39–.59)
Brake pedal to firewall clearance mm (in.)	95 (3.74) or more
Parking brake lever stroke	4–6 clicks
<b>Brake booster operating test</b>	
Air-tightness test with no load kPa (mmHg)	3.3 (25) or less
Air-tightness test under load kPa (mmHg)	3.3 (25) or less
<b>Boosting function test MPa (psi)</b>	
At 100 N (22 lbs.) foot force	3.0–4.0 (427–570)
At 300 N (66 lbs.) foot force	6.5–8.0 (925–1138)
<b>Non-boosting function test MPa (psi)</b>	
At 100 N (22 lbs.) foot force	0.2 (28)
At 300 N (66 lbs.) foot force	0.4 (57)
<b>Blend proportioning valve function test MPa (psi)</b>	
At 6.0 MPa (853 psi) input pressure	3.325–3.725 (472.9–529.8)
At 9.0 MPa (1,280 psi) input pressure	4.725–5.325 (672.0–757.4)
Brake dragging force N (lbs.)	57 (13.1) or less
[Brake dragging torque] Nm (ft.lbs.)	[4 (3) or less]
Booster push rod to master cylinder piston clearance mm (in.)	0.1–0.5 (.004–.020)
<b>Limit</b>	
Pad thickness mm (in.)	1.0 (.039)
Disc thickness mm (in.)	18.4 (.724)
Brake disc runout mm (in.)	0.15 (.0059)
Master cylinder body to piston clearance mm (in.)	0.15 (.0059)
Lining thickness mm (in.)	1.0 (.039)
Drum I.D. mm (in.)	256.0 (10.079)
Wheel cylinder body to piston clearance mm (in.)	0.15 (.0059)

## TORQUE SPECIFICATIONS

N05CC--

Items	Nm	ft.lbs.
Brake booster to pedal support member	8–12	6–9
Brake pedal shaft	25–35	18–25
Pedal support member installation bolt	8–12	6–9
Steering column assembly installation bolt	18–25	13–18
Reservoir stopper bolt	1.5–3.0	1–2
Piston stopper	1.5–3.0	1–2
Master cylinder to brake booster	8–12	6–9
Fitting	15–18	11–13
Master cylinder to brake line connector	25–35	18–25
Brake line flare nut	13–17	9–12
Bleeder screw	7–9	5–7
Mounting support to knuckle	80–100	58–72
Wheel cylinder to backing plate	18–21	13–15

## LUBRICANTS

N05CD--

Items	Specified lubricant	Quantity
Brake fluid	DOT 3	As required
Brake pedal bushing and spacer	Chassis grease SAE J310, NLGI No. 0	Small quantity
Clevis pin and washer	Wheel bearing grease SAE J310, NLGI No. 2	Small quantity
Dust boot mounting groove in the caliper body	Repair kit grease (orange)	As required
Plug plate and stopper plug	Brake grease SAE J310, NLGI No. 1	Small quantity
Contacting surfaces at the shoe assemblies and backing plate	Brake grease SAE J310, NLGI No. 1	Small quantity
Rear brake piston and wheel cylinder	Repair kit grease (orange)	As required
Rotating portion of the shoe adjuster assembly	Brake grease SAE J310, NLGI No. 1	Small quantity
Clevis pin, bushing and ratchet plate	Chassis grease SAE J310, NLGI No. 0	As required


## SEALANTS AND ADHESIVES

N05CE--

Items	Specified sealants and adhesives	Quantity
Thread part of fitting	3M ART Part No. 8663, 8661 or equivalent	As required
Shoe hold-down pin	3M Sealant Part No. 8634 or equivalent	As required
Rear wheel cylinder	3M Sealant Part No. 8634 or equivalent	As required
Both sides of the sealer	3M ART Part No. 8661 or equivalent	As required

**SPECIAL TOOLS**

N05DA--

Tool (Number and name)	Use
MB990620-01 Piston cap installer 	Installation of rear wheel cylinder piston cap

**TROUBLESHOOTING**

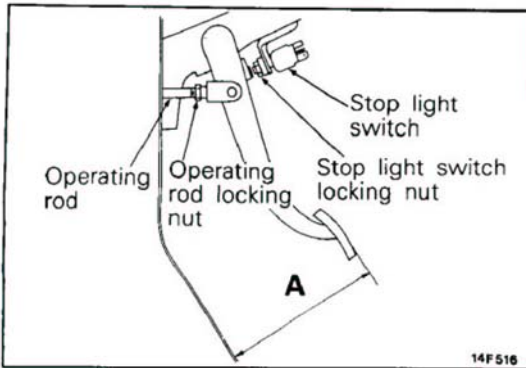
N05EAB

Symptom	Probable cause	Remedy	Reference page
Vehicle pulls to one side when brakes are applied	Grease or oil on pad or lining surface	Replace	5-15
	Inadequate contact of pad or lining	Correct	5-15, 34
	Auto adjuster malfunction	Adjust	–
	Drum eccentricity or uneven wear	Repair or replace as necessary	5-33
Improper braking power	Low or deteriorated brake fluid	Replenish or change	–
	Air in brake system	Bleed air	5-14
	Overheated brake rotor due to dragging of pad or lining	Correct	–
	Grease or oil on pad surface	Replace	5-15
	Inadequate contact of pad or lining	Correct	5-15, 34
	Brake booster malfunction	Replace	5-25
	Auto adjuster malfunction	Adjust	–
	Clogged brake line	Correct	–
	Proportioning valve malfunction	Replace	5-27
Increased pedal stroke (Reduced pedal to firewall clearance)	Air in brake system	Bleed air	5-14
	Worn lining or pad	Replace	5-15, 34
	Broken vacuum hose	Replace	5-25
	Brake fluid leaks	Correct	5-27
	Auto adjuster malfunction	Adjust	–
	Excessive push rod to master cylinder clearance	Adjust	5-23
	Faulty master cylinder	Replace	5-21

Symptom	Probable cause	Remedy	Reference page
Brake drag	Incomplete release of parking brake	Correct	-
	Incorrect parking brake adjustment	Adjust	-
	Worn brake pedal return spring	Replace	5-18
	Broken rear drum brake shoe return spring	Replace	5-33
	Lack of lubrication in sliding parts	Lubricate	5-35
	Improper push rod to master cylinder clearance	Adjust	5-23
	Faulty master cylinder piston return spring	Replace	5-21
	Clogged master cylinder return port	Correct	5-21
Improper parking brake function	Worn brake lining	Replace	5-33
	Excessive parking brake lever stroke	Adjust the parking brake lever stroke or check the parking brake cable routing	-
	Grease or oil on lining surface	Replace	5-15, 34
	Auto adjuster malfunction	Adjust	-
	Parking brake cable sticking	Replace	5-40
	Sticked wheel cylinder or caliper piston	Replace	5-29, 36
Scraping or grinding noise when brakes are applied	Worn brake linings	Replace	5-15, 34
	Caliper to wheel interference	Correct or replace	5-29
	Dust cover to drum interference	Correct or replace	5-33
	Bent brake backing plate	Correct or replace	5-33
	Cracked drums or brake disc	Correct or replace	5-29, 33
Squealing, groaning or chattering noise when brakes are applied	Disc brakes-missing or damaged brake pad outer shim	Replace	5-15
	Brake drums and lining, discs and pads worn or scored	Correct or replace	5-15, 34
	Improper lining parts	Correct or replace	5-29, 33
	Disc brakes-burred or rusted calipers	Clean or deburr	5-29
	Dirty, greased, contaminated or glazed linings	Clean or replace	5-29, 33
	Drum brakes-weak damaged or incorrect shoe hold-down springs, loose or damaged shoe hold-down pins and springs	Correct or replace	5-33
	Incorrect adjustment of brake pedal or booster push rod	Adjust	5-10

Symptom	Probable cause	Remedy	Reference page
Squealing noise when brakes are not applied	Bent or warped backing plate causing interference with drum	Replace	5-33
	Improper machining of drum causing interference with backing plate or shoe	Replace drum	5-33
	Disc brakes-rusted, stuck	Lubricate or replace	5-29
	Worn, damaged or insufficiently lubricated wheel bearings Drum brakes-weak, damaged or incorrect shoe return spring	Lubricate or replace	5-33
	Loose or extra parts in brakes	Retighten	-
	Improper positioning of pads in caliper	Correct	5-29
	Improper installation of support mounting and caliper body	Correct	5-29
	Poor return of brake booster or master cylinder or wheel cylinder	Replace	5-21, 25
	Incorrect adjustment of brake pedal or booster push rod	Adjust	5-10, 23
Groaning, clicking or rattling noise when brakes are not applied	Stones or foreign material trapped inside wheel covers	Remove stones, etc.	-
	Loose wheel nuts	Retighten	-
	Disc brakes-failure of shim	Replace	5-15
	Disc brakes-loose installation bolt	Retighten	5-29
	Worn, damaged or dry wheel bearings	Lubricate or replace	-
	Incorrect adjustment of brake pedal or booster push rod	Adjust	5-10, 23
Poor parking brake function	Worn brake lining Poor condition of brake lining surface Parking brake cable sticking	Replace	5-33, 40
	Auto-adjuster malfunction	-	-
	Excessive parking brake lever stroke	Adjust the parking brake lever stroke or check the parking brake cable arrangement	5-39





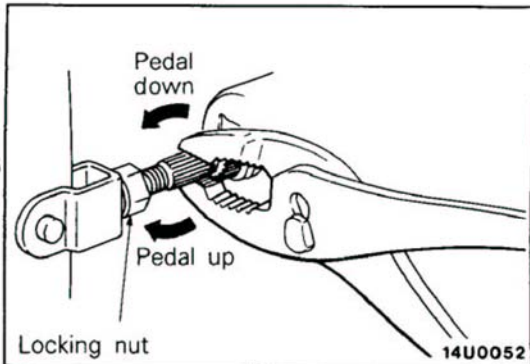
## SERVICE ADJUSTMENT PROCEDURES

N05FAAA

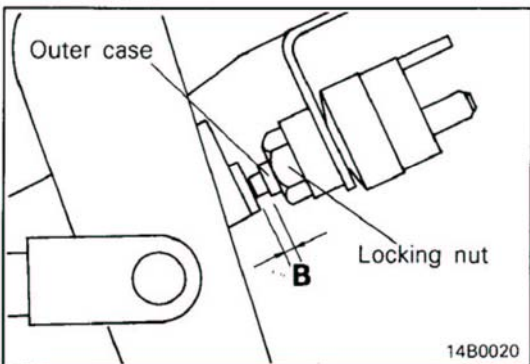
### INSPECTION AND ADJUSTMENT OF BRAKE PEDAL

1. Measure the brake pedal height as illustrated. If the brake pedal height is not within the standard value, adjust as follows.

**Standard value (A) : 191–196 mm (7.5–7.7 in.)**



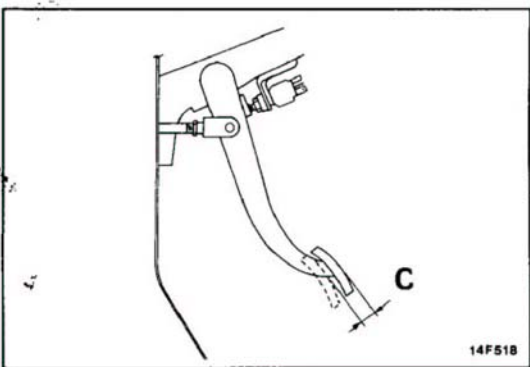
- (1) Disconnect the stop light switch connector, and then loosen the stop light switch locking nut. Move the stop light switch to a position where it does not contact the brake pedal arm.
- (2) Adjust the brake pedal height by turning the operating rod with pliers (with the operating rod locking nut loosened), until the correct brake pedal height is obtained.



- (3) Adjust the stop light switch until the dimension between the outer case of the stop light switch and the brake pedal arm reaches the standard value, and then lock the switch in place with locking nut.

**Standard value (B) : 0.5–1.0 mm (.020–.039 in.)**

- (4) Connect the stop light switch connector.

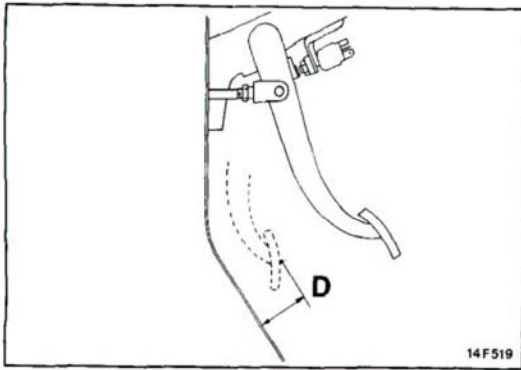


2. While the engine is stopped, depress the brake pedal two or three times. After thus eliminating the vacuum in the brake booster, press the pedal down by hand, and confirm that the amount of movement before resistance is met (the free play) is within the standard value range.

**Standard value (C) : 10–15 mm (.39–.59 in.)**

If the free play is less than the standard value, confirm that the clearance between the outer case of the stop light switch and brake pedal is within the standard value.

If the free play exceeds the standard value, the clearance between the clevis pin and the brake pedal arm might be excessive. Check and replace the faulty parts if necessary.



3. Start the engine, depress the brake pedal with approximately 500N (110 lbs.) of force, and measure the clearance between the brake pedal and the firewall.

**Standard value (D) : 95 mm (3.74 in.) or more**

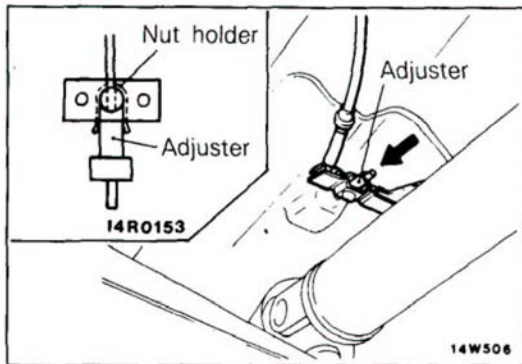
If the clearance is less than the standard value, check for air in the brake line or brake fluid leakage, and check the brakes themselves (for excessive shoe clearance caused by a malfunction of the automatic adjuster mechanism), and repair where necessary.

**CHECKING AND ADJUSTMENT OF PARKING BRAKE LEVER STROKE**

N05FEAB

1. Pull the parking brake lever with a force of approx. 200N (45 lbs.), and count the number of clicks.

**Standard value : 4-6 clicks**



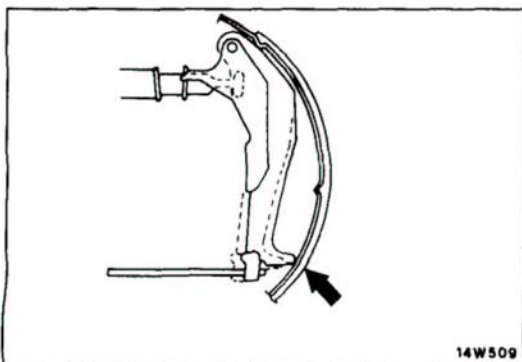
2. If the parking brake lever stroke is not within the standard value range, make adjustment by the following procedures:
  - (1) Loosen the adjuster to slacken the parking brake cable.
  - (2) Tighten the adjuster slightly, repeating pulling and releasing the parking brake lever, to adjust the brake shoe clearance.
  - (3) Tighten the adjuster until the parking barke lever stroke is the standard value.

**NOTE**

After adjustment, be sure that the adjuster is secured with the nut holder.

**Caution**

**If the number of brake lever clicks engaged is less than the standard value, the cable has been pulled excessively, and failure of the automatic adjuster mechanism will result. Be sure to adjust it to within the standard value.**

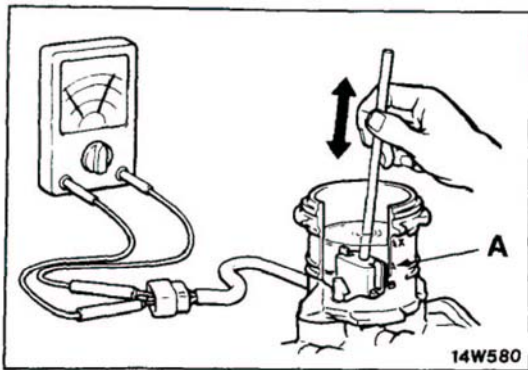


3. Return the parking brake lever, remove the brake drum, and check to ensure that the brake lever adjuster is touching the shoe.

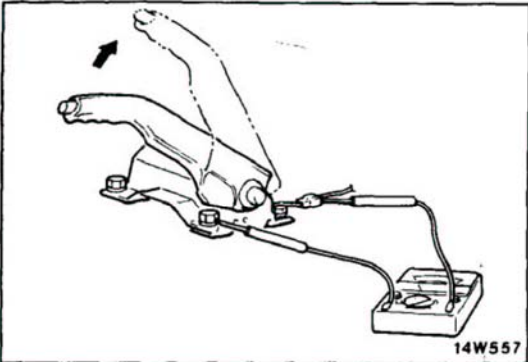
**Caution**

**If the parking brake cable is pulled too far, the adjuster lever does not fit the adjuster, resulting in faulty operation of the brake shoe adjuster.**

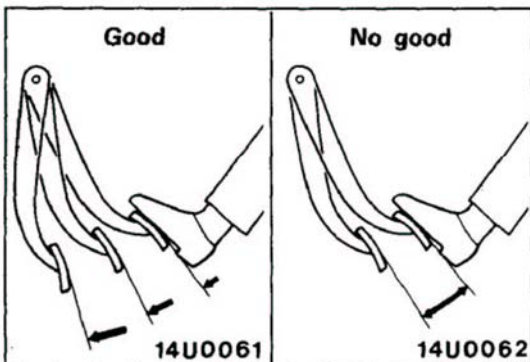
4. With the parking brake lever in the released position, turn the rear wheel to confirm that the rear brakes are not dragging.

**CHECKING BRAKE FLUID LEVEL SENSOR** N05FBAA

1. Connect an ohmmeter to the connector of the brake fluid level sensor.
2. Move the float from top to bottom and check for continuity. The brake fluid level sensor is in good condition if there is no continuity when the float surface is above "A", and if there is continuity when the float surface is below "A".

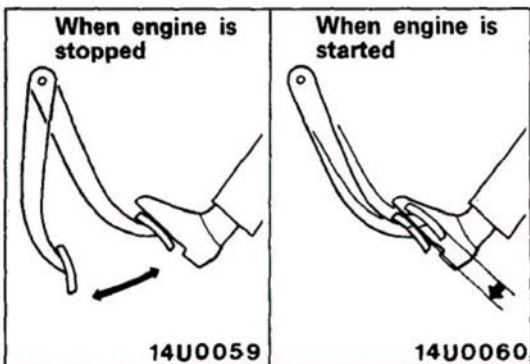
**CHECKING PARKING BRAKE SWITCH** N05FDAA

1. Remove the floor console.
2. Disconnect the parking brake switch connector, and then connect an ohmmeter between parking brake switch terminal and the mounting bolt.
3. If there is continuity when the parking brake is pulled, and there is no continuity when it is released, the parking brake switch is good condition.

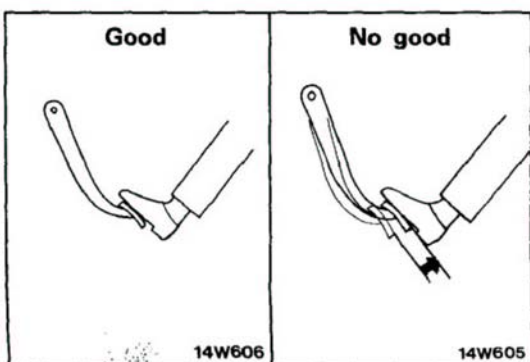
**BRAKE BOOSTER OPERATING TEST** N05FCAD  
**TEST WITHOUT A TESTER**

For simple checking of the brake booster operation, carry out the following tests:

1. Run the engine for one or two minutes, and then stop it. Step on the brake pedal several times with normal pressure. If the pedal depress fully the first time but gradually becomes higher when depressed succeeding times, the booster is operating properly. If the pedal height remains unchanged, the booster is faulty.



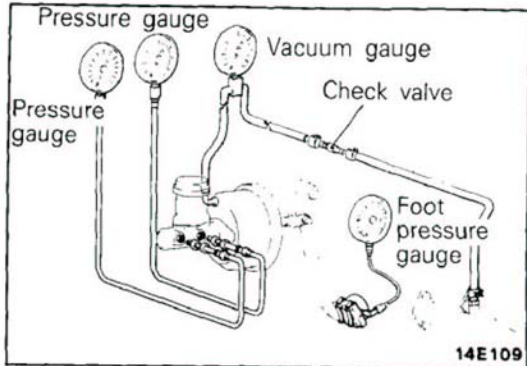
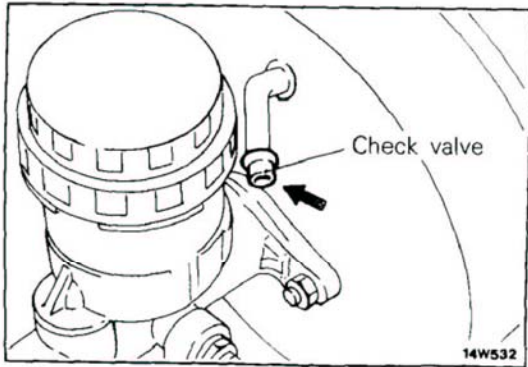
2. With the engine stopped, step on the brake pedal several times with the same foot pressure to make sure that the pedal height will not change. Then step on the brake pedal and start the engine. If the pedal moves downward slightly, the booster is in good condition. If there is no change, the booster is faulty.



3. With the engine running, step on the brake pedal and then stop the engine. Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition, if the pedal rises, the booster is faulty.

If the above three tests are okay, the booster performance can be determined as good.

If one of the above three tests is not okay at last, the check valve, vacuum hose, or booster will be faulty.



### TEST WITH A SIMPLE TESTER

Prior to the test, remove the check valve from the brake booster and check the check valve for operation. (Refer to P.5-26.)

With the check valve removed, make connections as shown, using another check valve (MB238892, etc.), vacuum gauge, pressure gauges and foot pressure gauge, bleed the pressure gauges, and proceed as follows:

#### Test 1 – Air-tightness Test with No Load

- (1) Start the engine.
- (2) Stop the engine when the vacuum gauge reaches approximately 68 kPa (500 mmHg).  
After stopping the engine, wait approximately 15 seconds, and then measure the decrease in vacuum.

**Standard value : 3.3 kPa (25 mmHg) or less**

- (3) If the vacuum decrease exceeds the standard value, check the vacuum hoses, and the brake booster, and make any necessary corrections.

#### Test 2 – Air-tightness Test Under Load

- (1) Start the engine.
- (2) Depress the brake pedal at a force of approximately 200 N (44 lbs.).  
Stop the engine when the vacuum gauge reaches approximately 68 kPa (500 mmHg).
- (3) After stopping the engine, wait approximately 15 seconds, and then measure the decrease in vacuum.

**Standard value : 3.3 kPa (25 mmHg) or less**

- (4) If the vacuum decrease exceeds the standard value, check the check valve, the vacuum hoses, and the brake booster, and make any necessary corrections.

#### Test 3 – Boosting Function Test

- (1) Start the engine.
- (2) Depress the brake pedal when the vacuum gauge reaches approximately 68 kPa (500 mmHg).
- (3) Check to be sure that the brake fluid pressure is the standard value when the brake pedal is depressed at a foot force of 100 N (22 lbs.) and 300 N (66 lbs.).

**Standard value : -**

**At 100 N (22 lbs.) foot force**

**3.0–4.0 MPa (427–570 psi)**

**At 300 N (66 lbs.) foot force**

**6.5–8.0 MPa (925–1,138 psi)**

- (4) If the output fluid pressure agrees with the standard value, the brake booster is functioning properly.

**Test 4 – Non-boosting Function Test**

- (1) Stop the engine.
- (2) Confirm that the vacuum gauge indicates 0 kPa (0 mmHg).
- (3) Check to be sure that the brake fluid pressure is the standard value when the brake pedal is depressed at a foot force of 100N (22 lbs.) and 300N (66 lbs.)

**Standard value :**

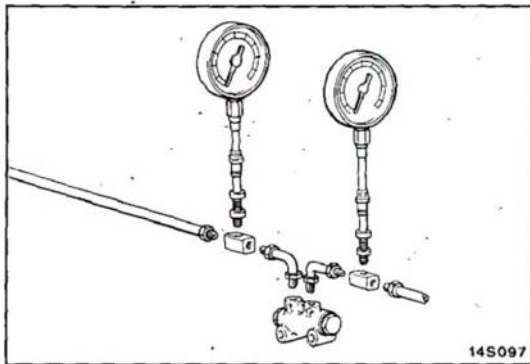
**At 100 N (22 lbs.) foot force**

**0.2 MPa (28 psi)**

**At 300 N (66 lbs.) foot force**

**0.4 MPa (57 psi)**

- (4) If the output fluid pressure agrees with the standard value the brake booster is functioning properly.

**BLEND PROPORTIONING VALVE FUNCTION TEST**

N05FKAB

1. Connect two pressure gauges, one each, to the input side and output side of blend proportioning valve. Bleed the system.
2. Gradually depress the brake pedal and check to be sure that the fluid pressure at the output side is the standard value when the fluid pressure at the input side is 6.0 MPa (853 psi) and 9.0 MPa (1,280 psi).

**Standard value :**

**At 6.0 MPa (853 psi)**

**3.325–3.725 MPa**

**(472.9–529.8 psi)**

**At 9.0 MPa (1,280 psi)**

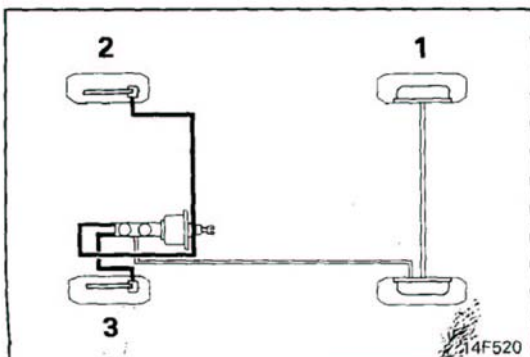
**4.725–5.325 MPa**

**(672.0–757.4 psi)**

3. If the measured pressures are not within the permissible ranges, replace the blend proportioning valve.

**Caution**

**Do not disassemble the B.P.V. since its performance depends on preset load of the spring.**

**BLEEDING**

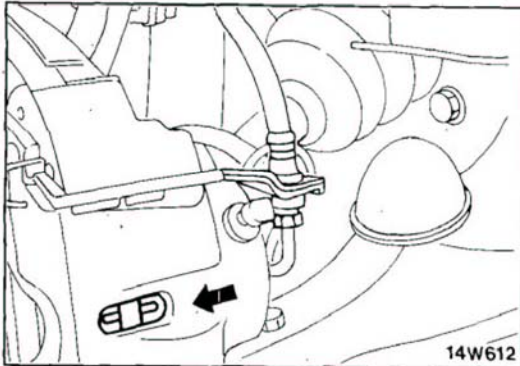
N05FYBa

The brake hydraulic system should be bled whenever the brake tube, brake hose, master cylinder or wheel cylinder has been removed or whenever the brake pedal feels spongy when depressed. Bleed the brake system in the sequence shown in the illustration.

**Specified brake fluid : DOT 3**

**Caution**

1. Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.
2. If brake fluid is exposed to the air, it will absorb moisture; as water is absorbed from the atmosphere, the boiling point of the brake fluid will decrease and the braking performance will be seriously impaired. For this reason, use a hermetically sealed 1 lit. (1.06 U.S.qt., 0.88 Imp.qt.) or 0.5 lit. (0.52 U.S.qt., 0.44 Imp.qt.) brake fluid container.
3. Firmly close the cap of the brake fluid container after use.

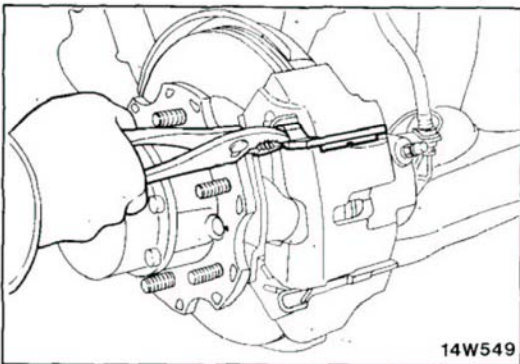


**INSPECTION AND REPLACEMENT OF BRAKE PAD**  
N05FZAC

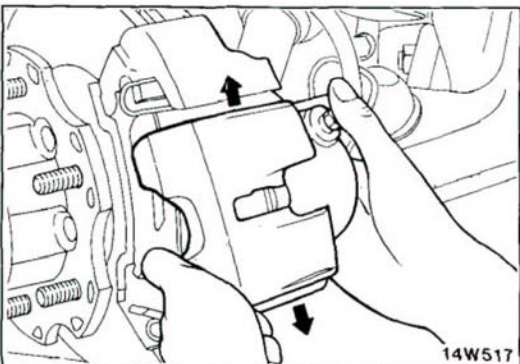
1. Check the wear condition of the brake pads through the inspection hole in the caliper body.

**Limit : 1.0 mm (.039 in.)**

2. If the pad assemblies are worn beyond the limit, replace them as following procedure.



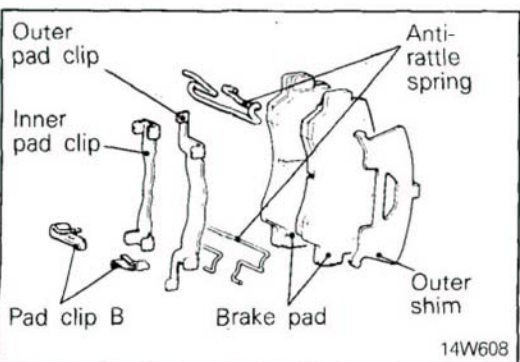
- (1) Pull out the spigot pins.
- (2) Use pliers to pull the stopper plug out to the side.



- (3) Remove the caliper assembly by moving it upward or downward at an angle.

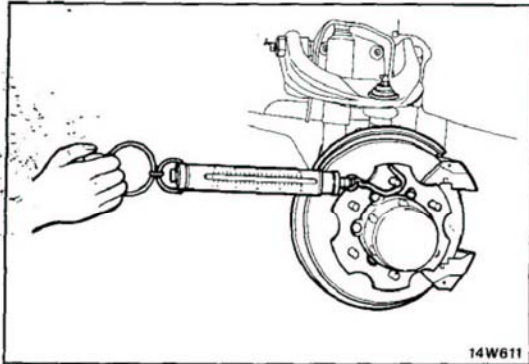
**NOTE**

Hold the front brake assembly by suspending it with wires or other suitable means in such a manner that the brake hose is not twisted.

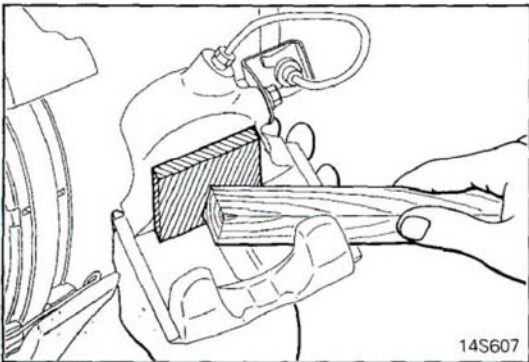


- (4) Remove the pad assemblies, outer shim, pad clips, anti-rattle springs from the mounting support.

- (5) Check the brake disc thickness. (Refer to P.5-31.)  
 (6) Check the brake disc runout. (Refer to P.5-32.)



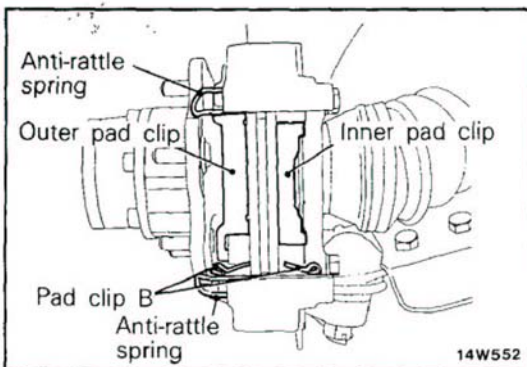
- (7) Measure the rotational force of the hub, with the pad removed so as to measure the pad dragging force after installation.



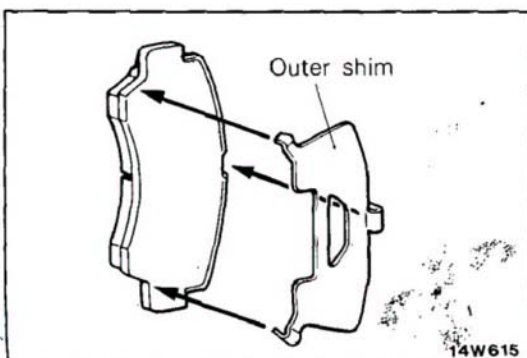
- (8) Clean the exposed part of the piston. Then, gently push the piston into the original position, taking care to push it straight.

**Caution**

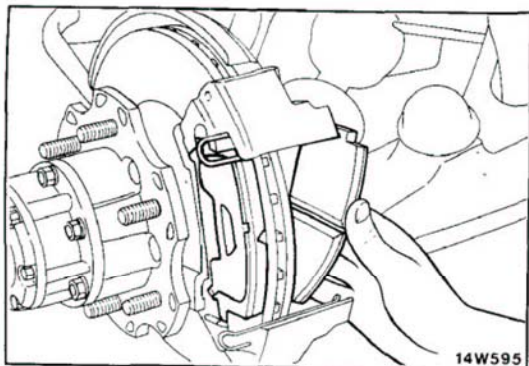
If it is hard to push the piston with the hammer handle, loosen the bleeder screw, and the piston will go in easily. After the piston has been set in this manner, be sure to bleed the system. (Refer to P.5-14.)



- (9) Install new anti-rattle springs to the mounting support.  
 (10) Install new pad clips to the mounting support.



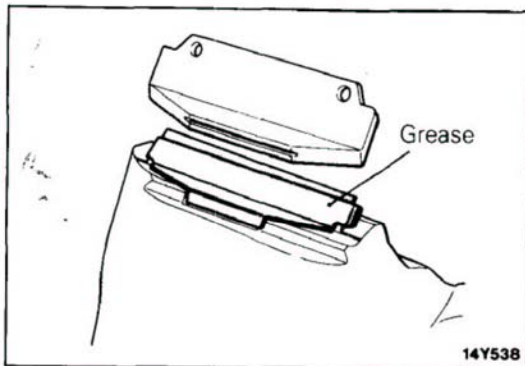
- (11) Attach the tabs of the new outer shim to the outer brake pad at three places, and install the outer shim to the brake pad.



(12) Install the new pad assemblies to the mounting support.

**Caution**

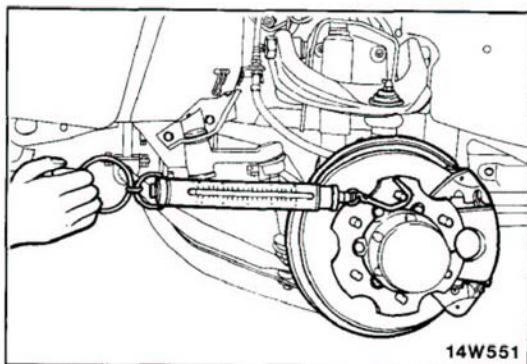
**The pad assemblies should be replaced as sets (inner and outer) for both the left and right wheels at the same time.**



(13) Apply a thin coat of specified grease to the plug plate and stopper plug contact surface.

**Specified grease : Brake grease SAE J310, NLGI No. 1**

(14) Install the caliper assembly.



(15) Use the following procedure to measure the brake dragging force:

- ① Start the engine and depress the brake pedal for 5 seconds.
- ② Turn engine off.
- ③ Rotate the brake disc a few revolutions.
- ④ Use a spring scale as illustrated to measure the brake drag.
- ⑤ The difference between brake drag and rotational force (measured at the time of inspection) should not exceed the standard value.

**Standard value : 57 N (13.1 lbs.) or less [Dragging torque : 4 Nm (3 ft.lbs.) or less]**

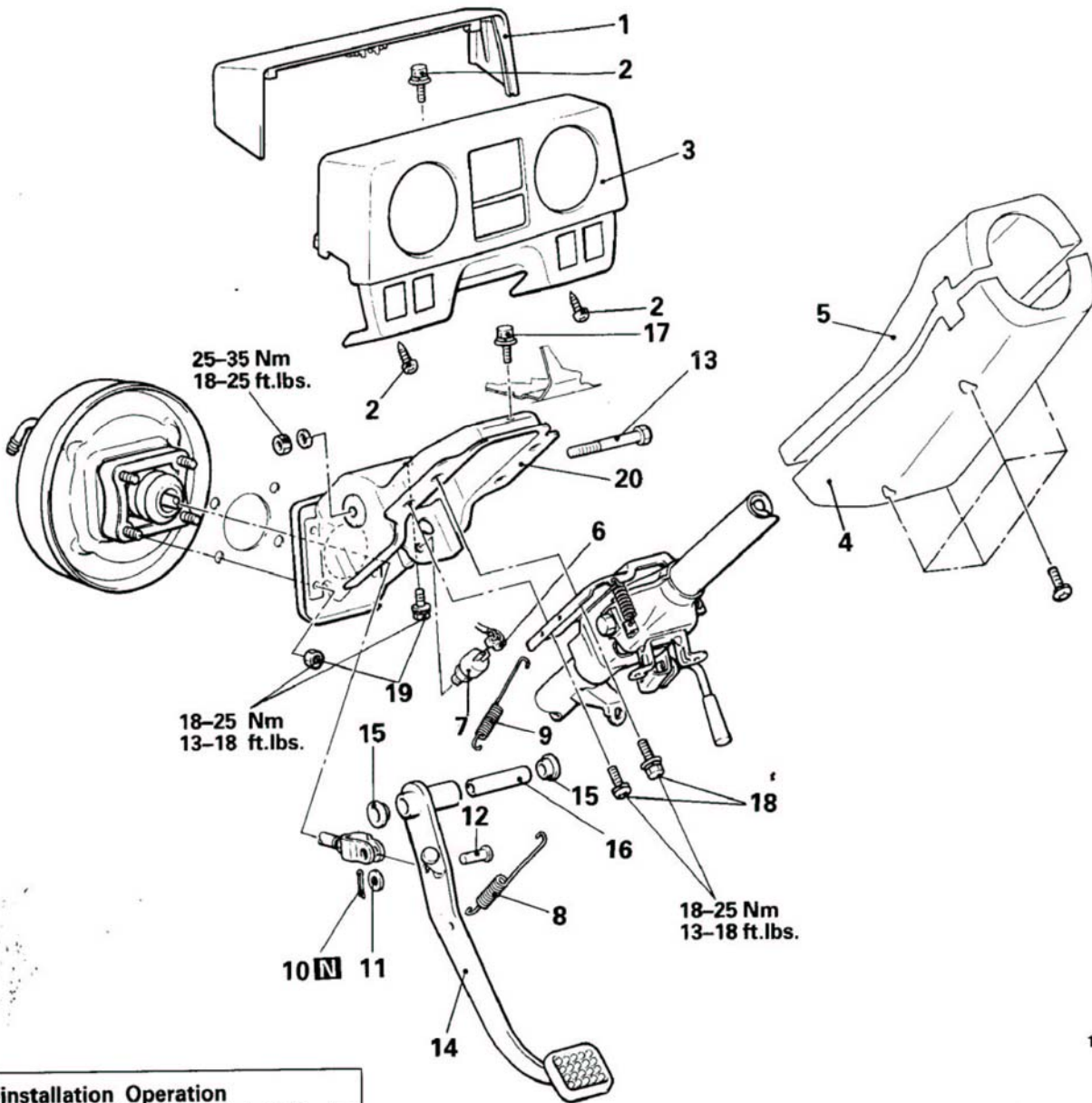
- ⑥ If the difference exceeds the standard value, remove the caliper body and disassemble it. Check the piston and seal for deterioration, corrosion, dirt or scoring. (Refer to P.5-29.)



**BRAKE PEDAL**

**REMOVAL AND INSTALLATION**

N05GA--



**Post-installation Operation**  
 ● Adjustment of Brake Pedal (Refer to P.5-10.)

**Removal steps**

- 1. Meter cover
- 2. Combination meter installation bolt and screw
- ↔ 3. Combination meter assembly
- 4. Lower column cover
- 5. Upper column cover
- 6. Stop light switch connector connection
- 7. Stop light switch
- ↔↔ 8. Return spring
- ↔↔ 9. Return spring of clutch pedal
- 10. Cotter pin
- ↔↔ 11. Washer
- ↔↔ 12. Clevis pin

- 13. Brake pedal installation bolt
- 14. Brake pedal
- ↔↔ 15. Bushing
- ↔↔ 16. Spacer
- 17. Pedal support member installation bolt (under the combination meter)
- 18. Pedal support member installation bolt (fastened together with the steering column assembly)
- 19. Pedal support member installation bolt and nut
- ↔↔ 20. Pedal support member

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ↔↔ : Refer to "Service Points of Removal".
- (3) ↔↔ : Refer to "Service Points of Installation".
- (4) **N** : Non-reusable parts

14W604

**SERVICE POINTS OF REMOVAL**

N05GBAB

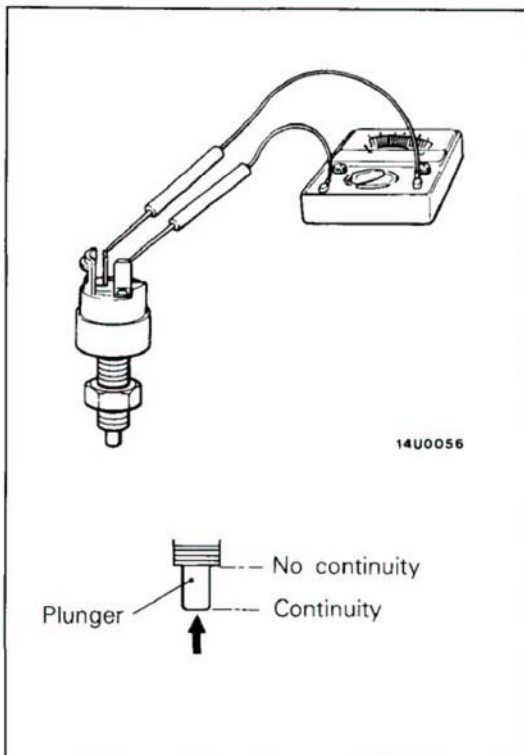
**3. REMOVAL OF COMBINATION METER ASSEMBLY**

Refer to GROUP 8 ELECTRICAL-Meter and Gauges.

**INSPECTION**

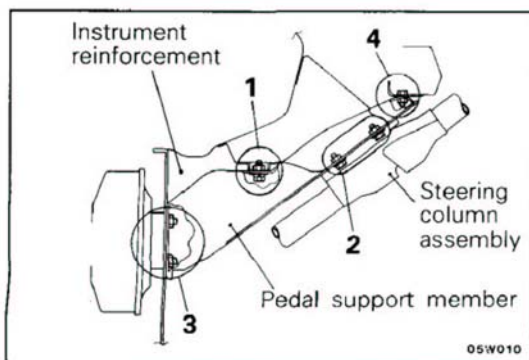
N05GCAD

- Check the bushing for wear.
- Check the brake pedal for bend or twisting.
- Check the brake pedal return spring for damage.

**CHECKING STOP LIGHT SWITCH**

Connect an ohmmeter to the connector of the stop light switch, and then check for continuity when the plunger of the stop light switch is pressed in and when it is released outward.

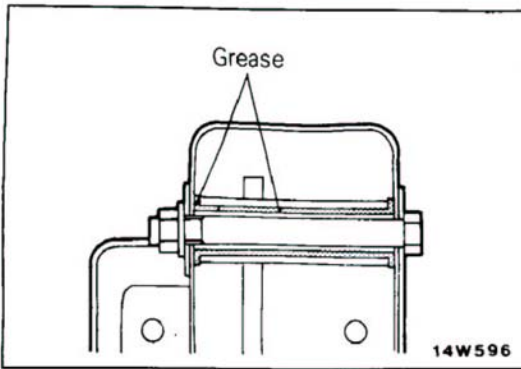
The stop light switch is in good condition if there is no continuity when the plunger is pressed in, and if there is continuity when the plunger is released outward.

**SERVICE POINTS OF INSTALLATION**

N05GDAG

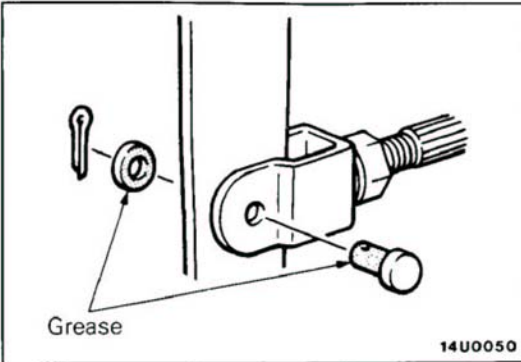
**20. INSTALLATION OF PEDAL SUPPORT MEMBER**

After temporarily fastening the installation bolts and nuts of the pedal support member, tighten them in the sequence shown by the numbers in the figure.

**16. APPLICATION OF GREASE TO SPACER/15. BUSHING**

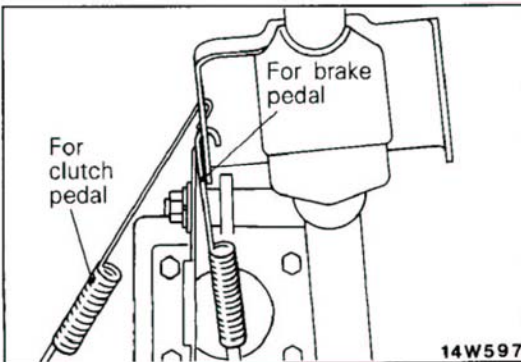
Apply the specified grease to the outer surface of the spacer and the inner surface of the bushing.

**Specified grease : Chassis grease SAE J310, NLGI No. 0**

**12. APPLICATION OF GREASE TO CLEVIS PIN/11. WASHER**

After applying the specified grease to the clevis pin and washer, insert a clevis pin and bend the cotter pin tightly.

**Specified grease : Wheel bearing grease SAE J310, NLGI No. 2**

**9. INSTALLATION OF RETURN SPRING OF CLUTCH PEDAL/8. RETURN SPRING**

Install the return spring to the position as shown in the figure.

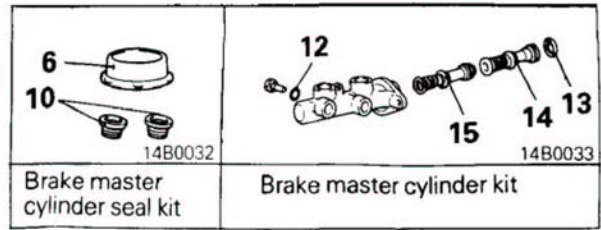
**MASTER CYLINDER  
REMOVAL AND INSTALLATION**

**Pre-removal Operation**

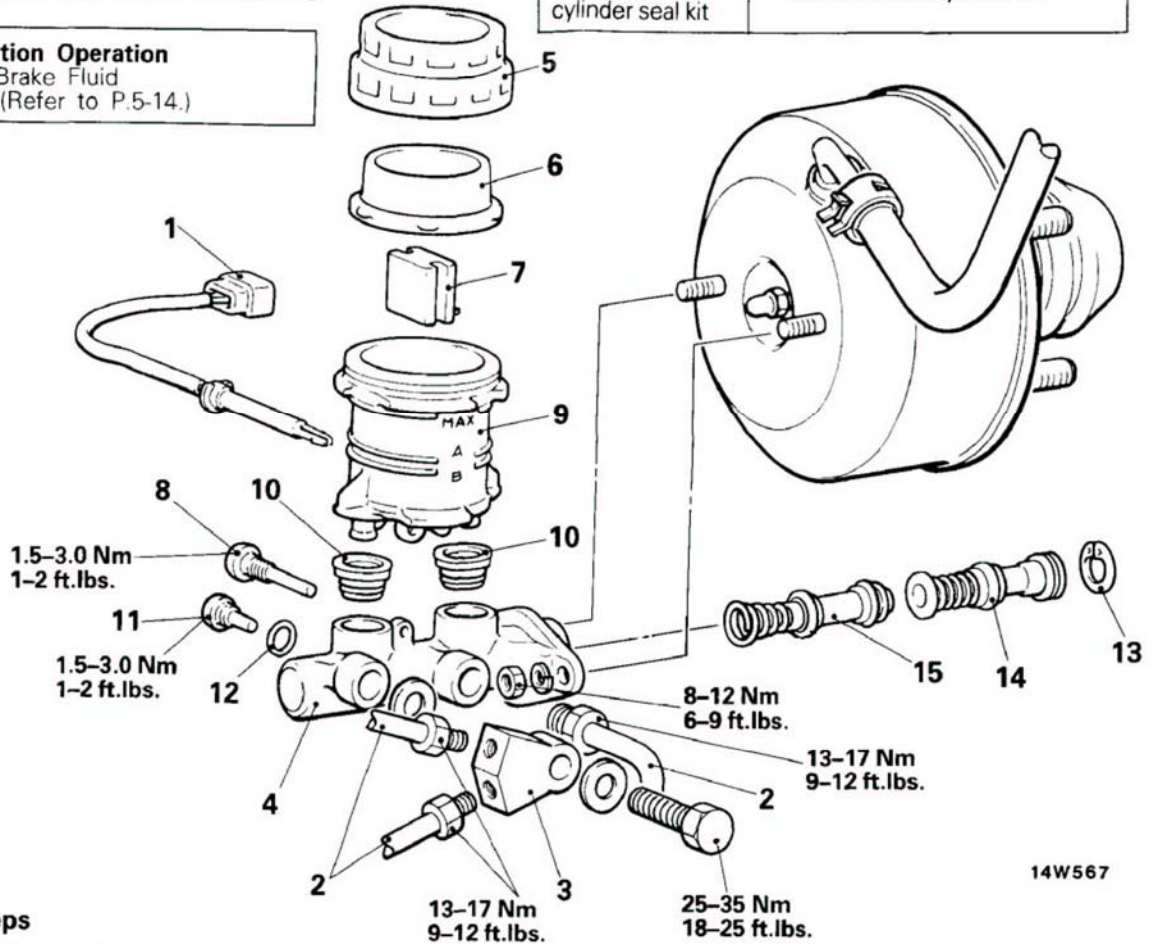
- Draining Brake Fluid

**Post-installation Operation**

- Draining Brake Fluid
- Bleeding (Refer to P.5-14.)



N051A--



14W567

**Removal steps**

- |   |      |  |
|---|------|--|
| 1. Connection of brake fluid level sensor connector | ◆◆   | 11. Piston stopper bolt  |
| 2. Connection of brake tube                         |      | 12. Gasket   |
| 3. Connector  |      | ◆◆◆◆ Adjustment of clearance between brake booster push rod and primary piston |
| 4. Master cylinder                                  |      | 13. Piston stopper ring  |
| 5. Reservoir cap                                    | ◆◆   | 14. Primary piston assembly  |
| 6. Diaphragm  | ◆◆◆◆ | 15. Secondary piston assembly  |
| 7. Oil reservoir float                              | ◆◆◆◆ |  |
| 8. Reservoir installation screw                     | ◆◆◆◆ |  |
| ◆◆ 9. Reservoir                                     |      |  |
| 10. Reservoir seal                                  |      |  |

**NOTE**

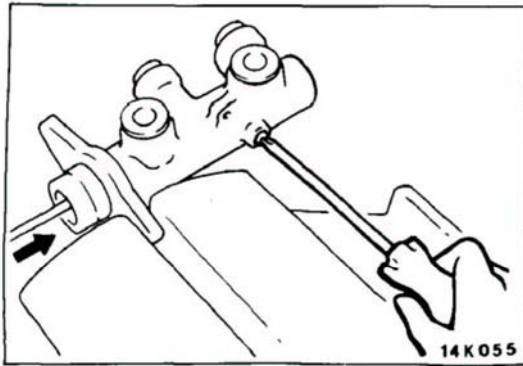
- (1) Reverse the removal procedures to reinstall.  
 (2) ◆◆ : Refer to "Service Points of Removal".  
 (3) ◆◆◆ : Refer to "Service Points of Installation".

**SERVICE POINTS OF REMOVAL**

N051BAD

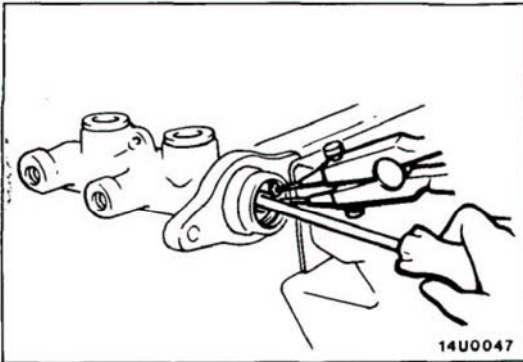
**9. REMOVAL OF RESERVOIR**

When removing the reservoir, pull it out straight upward.



**11. REMOVAL OF PISTON STOPPER BOLT**

Remove the piston stopper bolt while depressing the piston.



**13. REMOVAL OF PISTON STOPPER RING**

Remove the piston stopper ring while depressing the piston.

**14. REMOVAL OF PRIMARY PISTON ASSEMBLY**

**Caution**  
Do not disassemble the primary piston assembly.

**15. REMOVAL OF SECONDARY PISTON ASSEMBLY**

**NOTE**  
If the secondary piston is difficult to remove, apply compressed air gradually from the secondary side outlet port of the master cylinder, and then remove the secondary piston from the cylinder.

**Caution**  
Do not disassemble the secondary piston assembly.

**INSPECTION**

N05ICAA

- Check the inner surface of master cylinder body for rust or scars.
- Check the primary and secondary pistons for rust, scouring, wear, damage or deterioration.
- Check the diaphragm for cracks or deterioration.

**CLEARANCE BETWEEN MASTER CYLINDER INNER DIAMETER AND PISTON OUTER DIAMETER**

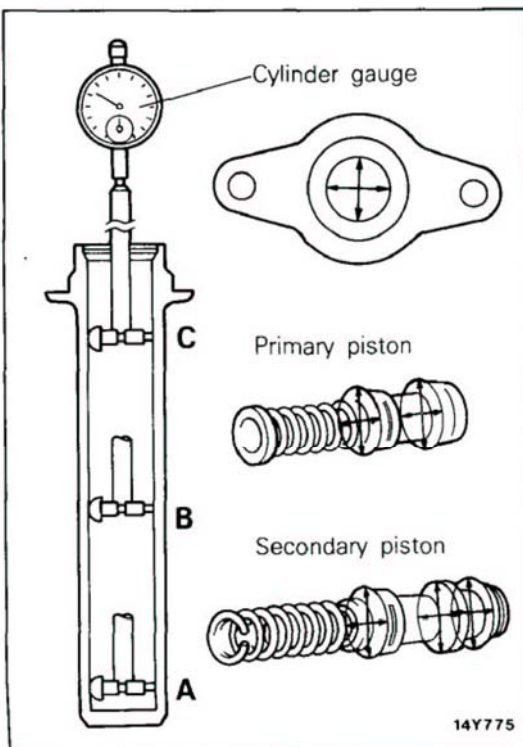
N05ICBC

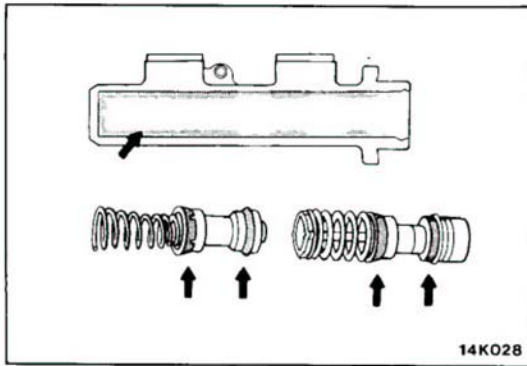
- (1) Measure approximately three positions of the master cylinder inner diameter [bottom (A), middle (B) and top (C)] by using a cylinder gauge.
- (2) Measure O.D. of pistons at illustrated location using a micrometer.

**NOTE**  
Measure the inner diameter of master cylinder at the two places described above and at D and E shown in the illustration.

- (3) If the difference between these inner diameters and the piston outer diameter exceeds the limit, replace the master cylinder and the piston assembly as set.

**Limit : 0.15 mm (.0059 in.)**





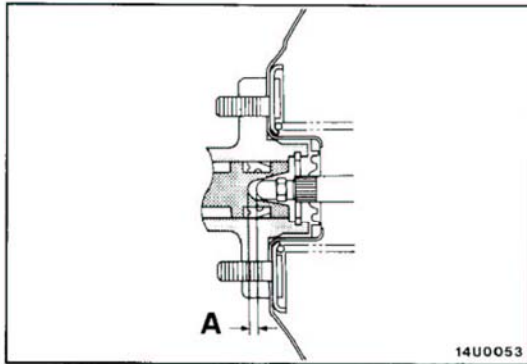
**SERVICE POINTS OF INSTALLATION**

N05IDAH

**15. APPLICATION OF BRAKE FLUID TO SECONDARY PISTON ASSEMBLY/14. PRIMARY PISTON ASSEMBLY**

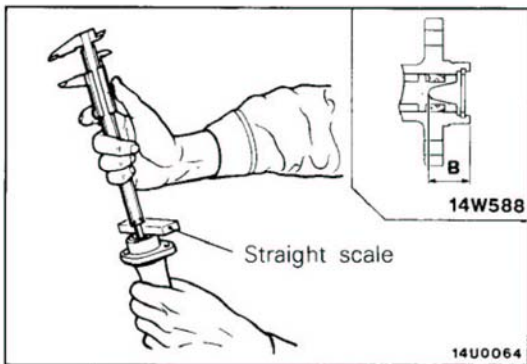
Apply the specified brake fluid sufficiently to the inner surface of the master cylinder body and to the entire periphery of the secondary and primary pistons.

**Specified brake fluid : DOT 3**



• **ADJUSTMENT OF CLEARANCE BETWEEN BRAKE BOOSTER PUSH ROD AND PRIMARY PISTON**

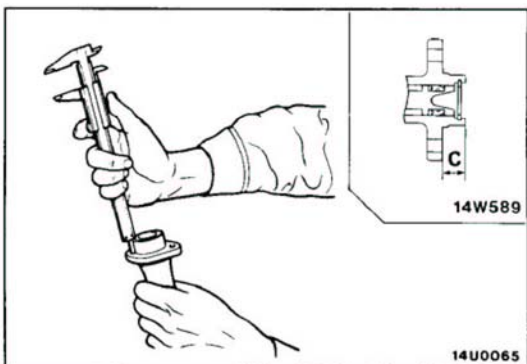
Check and adjust the clearance (A) between the brake booster push rod and the primary piston by following the steps below.



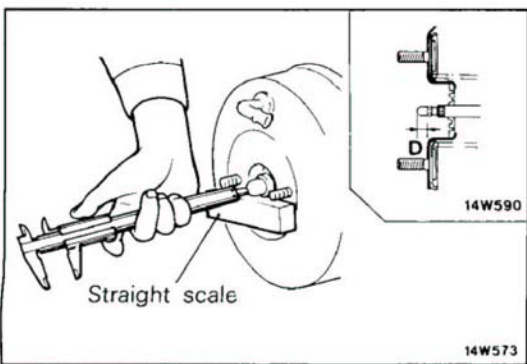
- (1) Measure the dimension (B) from the edge of the master cylinder to the piston.

**NOTE**

Obtain the dimension (B) by first placing a straight scale against the edge of the master cylinder, and then measuring and subtracting the thickness of the straight scale.



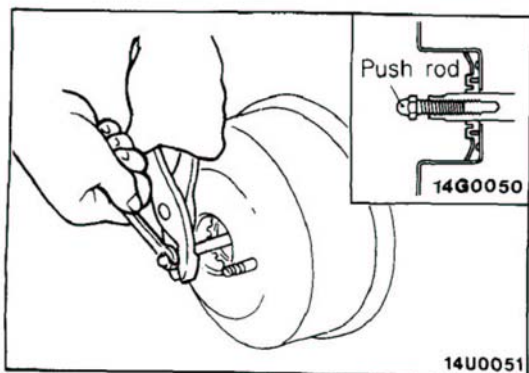
- (2) Obtain the dimension (C) from the master cylinder's brake booster installation surface to the edge.



- (3) Measure the dimension (D) from the brake booster's master cylinder installation surface to the end of the push rod.

**NOTE**

Obtain the dimension (D) by first placing a straight scale against the edge of the brake booster, and then measuring and subtracting the thickness of the straight scale.



- (4) Obtain the clearance (A) between the brake booster push rod and the primary piston from the values obtained in (1), (2) and (3) previously.

**Standard value : 0.1–0.5 mm (.004–.020 in.)**

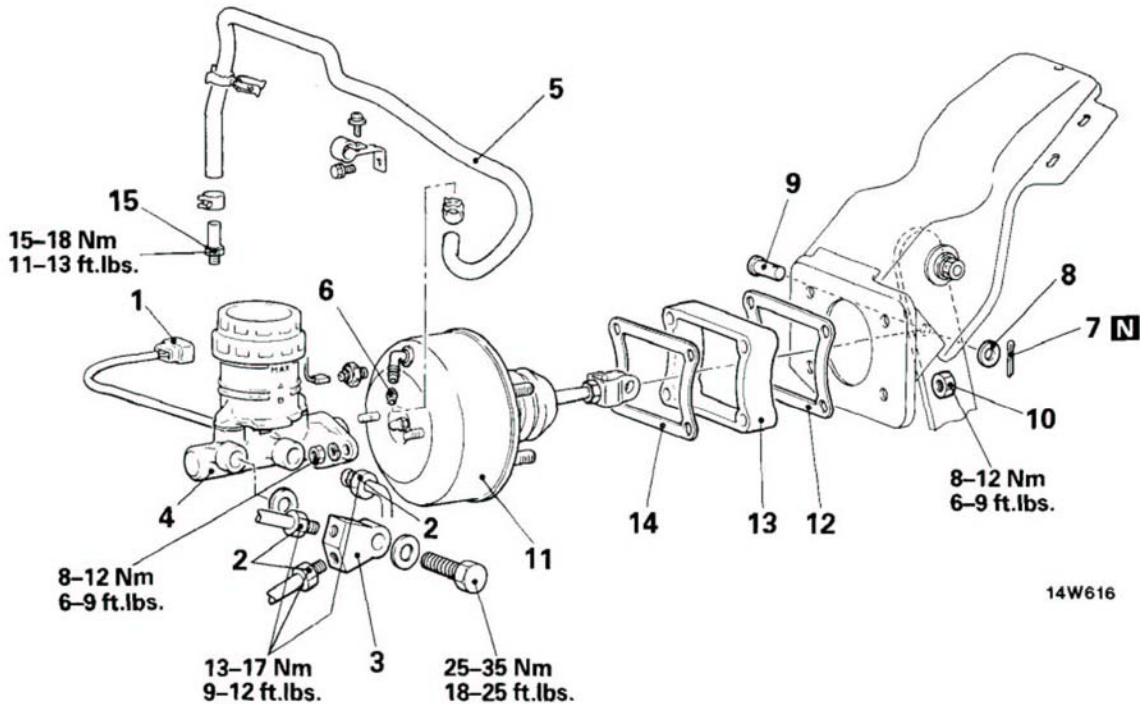
- (5) If the clearance is not within the standard value range, adjust by changing the push rod length by turning the screw of the push rod.

**Caution**

**Improper clearance may cause excessive brake drag.**

**BRAKE BOOSTER  
REMOVAL AND INSTALLATION**

N05JA--



14W616

**Removal steps**

1. Connection of brake fluid level sensor connector
2. Connection of brake tube
3. Connector
4. Master cylinder assembly
- ◆◆ Adjustment of clearance between brake booster push rod and primary piston
- ◆◆◆◆ 5. Vacuum hose
6. Check valve
7. Cotter pin
- ◆◆ 8. Washer
- ◆◆ 9. Clevis pin
10. Brake booster installation nuts
11. Brake booster
12. Sealer
13. Spacer
14. Sealer
- ◆◆ 15. Fitting

**Pre-removal Operation**  
 ● Draining of Brake Fluid

**Post-installation Operation**  
 ● Supplying Brake Fluid  
 ● Bleeding (Refer to P.5-14.)  
 ● Adjustment of Brake Pedal (Refer to P.5-10.)

- NOTE**
- (1) Reverse the removal procedures to reinstall.
  - (2) ◆◆ : Refer to "Service Points of Removal".
  - (3) ◆◆◆ : Refer to "Service Points of Installation".
  - (4) N : Non-reusable parts

**SERVICE POINTS OF REMOVAL**

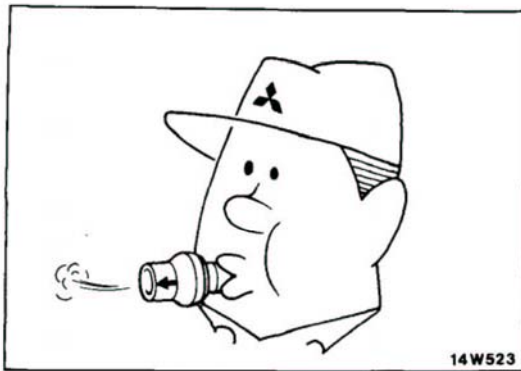
N05JBAD

**5 . REMOVAL OF VACUUM HOSE**

**Caution**

1. When removing the vacuum hose from the brake booster, pull it out straight.
2. The check valve installed on the brake booster will be damaged if the vacuum hose is forced up and down or to the left and right.

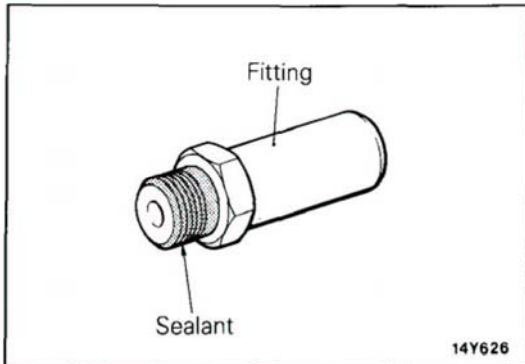


**INSPECTION**

N05JCAB

**CHECKING CHECK VALVE**

Blow into the check valve. If the air passes through when you blow from the booster side, but not when you blow from the engine side, the check valve is functioning properly.

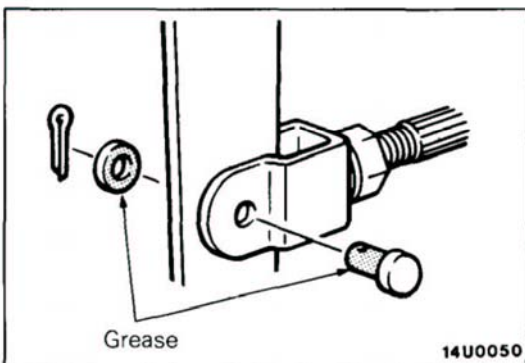
**SERVICE POINTS OF INSTALLATION**

N05JDAG

**15. INSTALLATION OF FITTING**

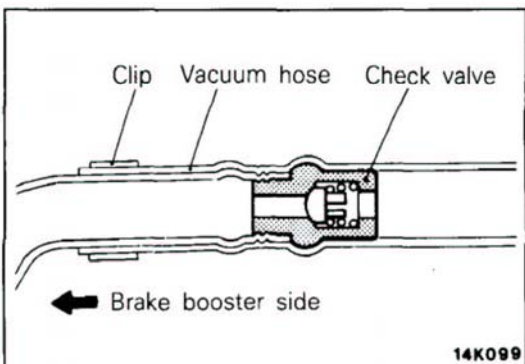
When installing the fitting, apply the specified sealant to its threaded portion.

**Specified sealant : 3M ART Part No. 8663, 8661 or equivalent**

**9. APPLICATION OF GREASE TO CLEVIS PIN/8. WASHER**

After applying the specified grease to the clevis pin and washer, insert a clevis pin and bend the split pin tightly.

**Specified grease : Wheel bearing grease SAE J310, NLGI No. 2**

**5. INSTALLATION OF VACUUM HOSE**

Fasten the vacuum hose securely to prevent air leaks from the connections.

**NOTE**

When the hose clip on the brake booster side is installed, fix it on the brake booster pipe and do not bring it into contact with the check valve.

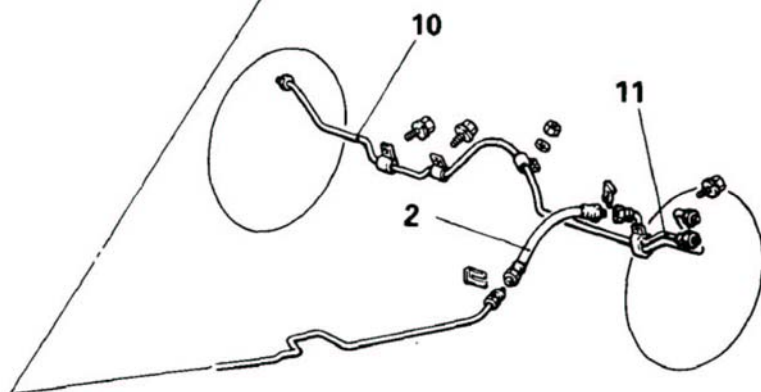
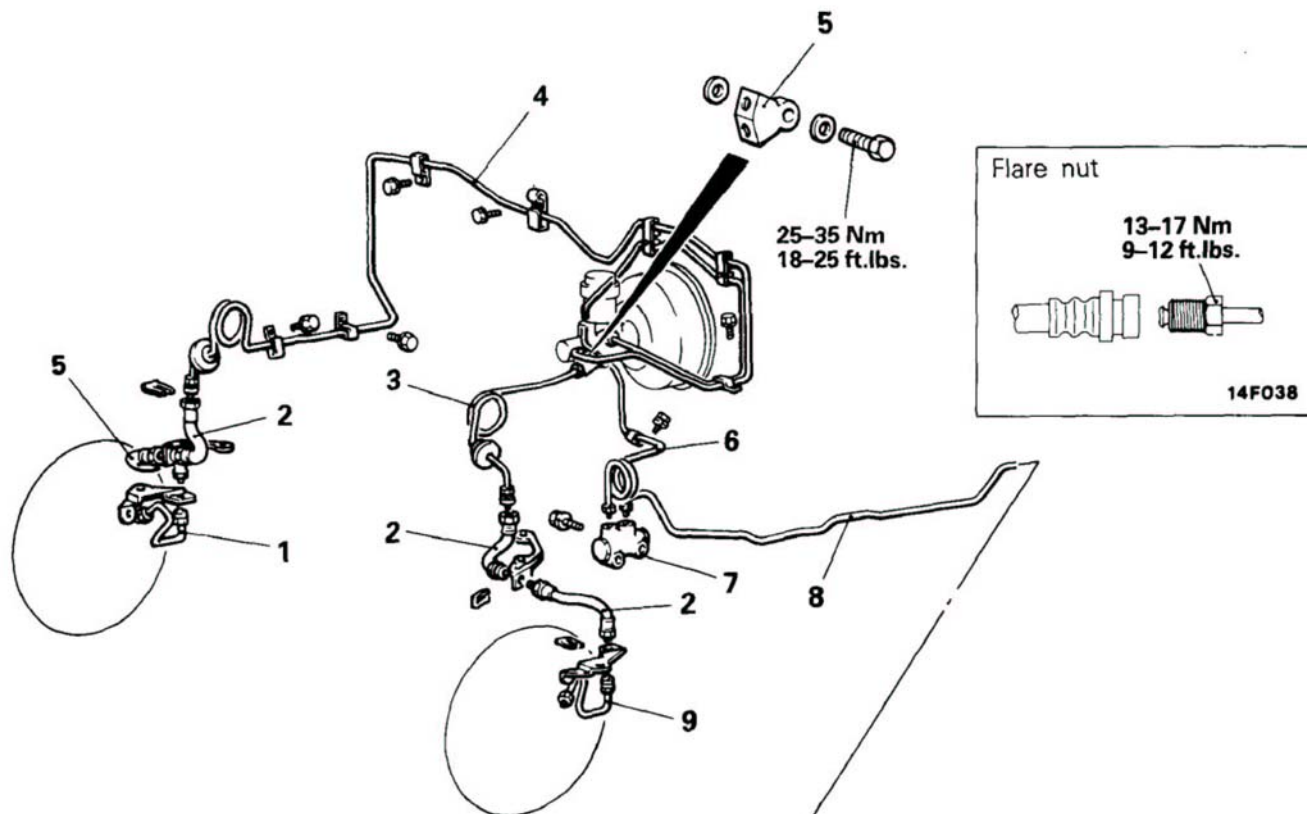
- ADJUSTMENT OF CLEARANCE BETWEEN BRAKE BOOSTER PUSH ROD AND PRIMARY PISTON**

Refer to P.5-23.

# BRAKE LINE

## REMOVAL AND INSTALLATION

N05KA-



14W578

### Pre-removal Operation

- Draining of Brake Fluid

### Post-installation Operation

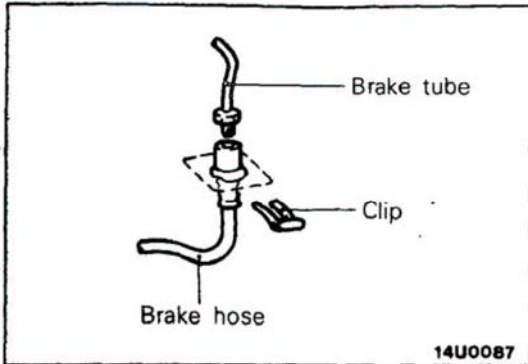
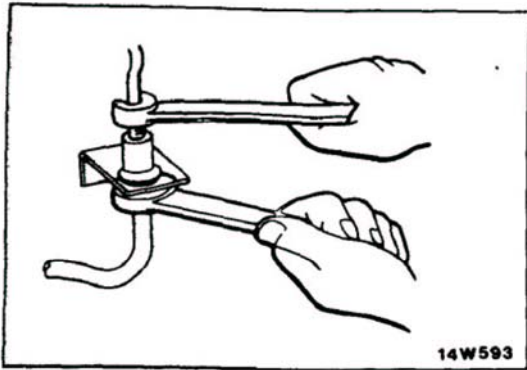
- Supplying Brake Fluid
- Bleeding (Refer to P.5-14.)

### Removal steps

- 1. Brake tube (R.H.)
- ◆◆◆◆ 2. Brake hoses
- 3. Brake tube (front, L.H.)
- 4. Brake tube (front, R.H.)
- 5. Connector
- 6. Brake tube (A)
- ◆◆ 7. Blend proportioning valve
- 8. Brake tube (main)
- 9. Brake tube (L.H.)
- 10. Brake tube (rear, R.H.)
- 11. Brake tube (rear, L.H.)

### NOTE

- (1) ◆◆ : Refer to "Service Points of Removal".
- (2) ◆◆◆ : Refer to "Service Points of Installation".



## SERVICE POINTS OF REMOVAL

N05KBAD

### 2. REMOVAL OF BRAKE HOSE

- (1) Holding the nut at the brake hose side, loosen the flare nut of the brake tube.

- (2) Pull off the brake hose clip and remove the brake hose from the bracket.

### 7. REMOVAL OF BLEND PROPORTIONING VALVE

#### Caution

Do not disassemble the B.P.V. since its performance depends on preset load of the spring.

### INSPECTION

N05KCAB

- Check the brake tubes for cracks, crimps and corrosion.
- Check the brake hoses for cracks, damage and leakage.
- Check the brake tube flare nuts for damage and leakage.

### SERVICE POINTS OF INSTALLATION

N05KDAB

### 2. INSTALLATION OF BRAKE HOSE

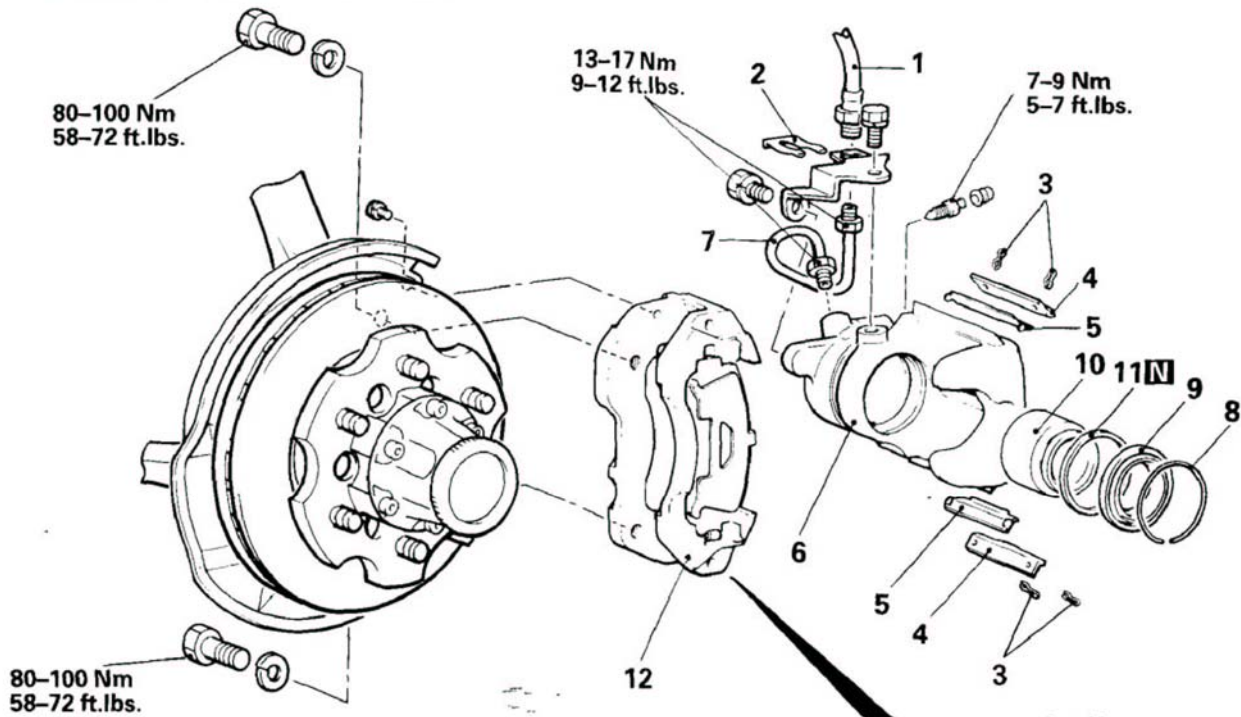
Install the brake hoses without twisting them.

#### NOTE

When installing, check to be sure the brake hose does not contact edges, weld beads or moving parts.

**FRONT DISC BRAKE CALIPER  
REMOVAL AND INSTALLATION**

N05LA-



**Pre-removal Operation**  
 ● Draining of Brake Fluid

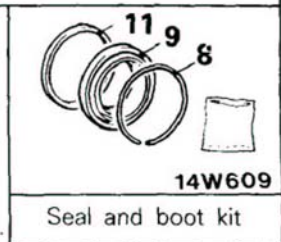
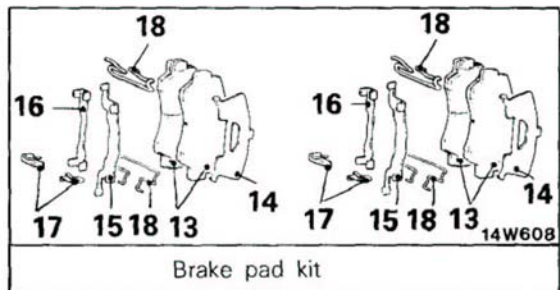
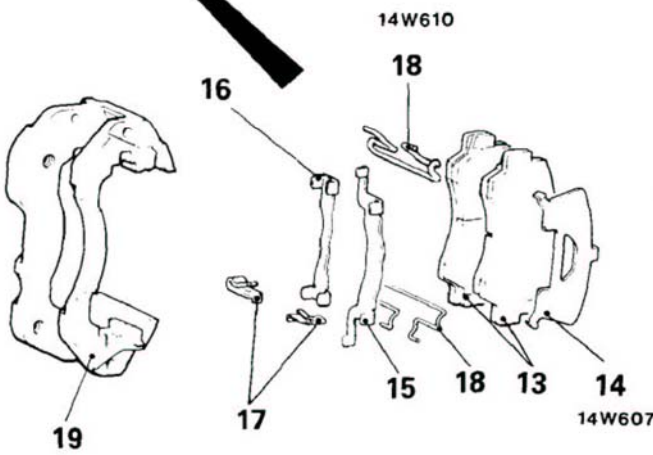
**Post-installation Operation**  
 ● Supplying brake fluid  
 ● Bleeding (Refer to P.5-14.)

**Disc brake caliper removal steps**

- ◆◆◆◆ 1. Connection of brake hose
- ◆◆◆◆ 2. Clip
- ◆◆◆◆ 3. Spigot pin
- ◆◆◆◆ 4. Stopper plug
- ◆◆◆◆ 5. Plug plate
- ◆◆◆◆ 6. Caliper assembly
- ◆◆◆◆ 7. Brake tube
- ◆◆◆◆ 8. Boot ring
- ◆◆◆◆ 9. Piston boot
- ◆◆◆◆ 10. Piston
- ◆◆◆◆ 11. Piston seal
- ◆◆◆◆ 12. Mounting support and brake pad assembly

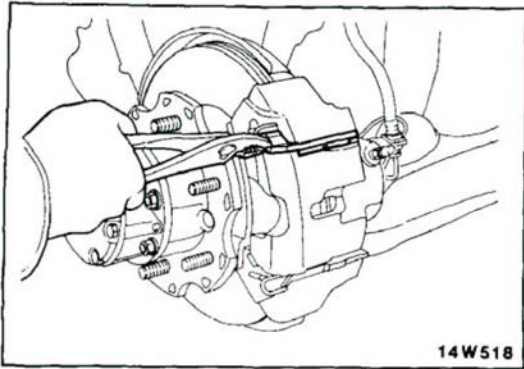
**Brake pad removal steps**

- ◆◆◆◆ 3. Spigot pin
- ◆◆◆◆ 4. Stopper plug
- ◆◆◆◆ 5. Plug plate
- ◆◆◆◆ 13. Pad assembly
- ◆◆◆◆ 14. Outer shim
- ◆◆◆◆ 15. Outer pad clip
- ◆◆◆◆ 16. Inner pad clip
- ◆◆◆◆ 17. Pad clip B
- ◆◆◆◆ 18. Anti-rattle spring
- ◆◆◆◆ 19. Mounting support



**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆◆ : Refer to "Service Points of Installation".
- (4) N : Non-reusable part



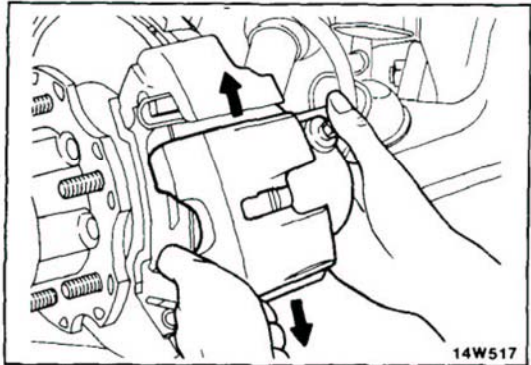
14W518

**SERVICE POINTS OF REMOVAL****1. DISCONNECTION OF BRAKE HOSE**

Refer to P.5-28.

**4. REMOVAL OF STOPPER PLUG**

Pull the stopper plug out to the side by using pliers.



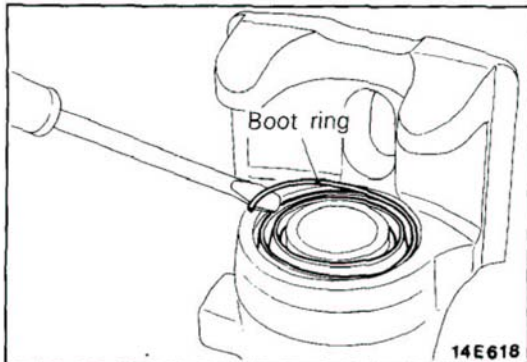
14W517

**6. REMOVAL OF CALIPER ASSEMBLY**

Remove the caliper assembly by moving it upward or downward at an angle.

**NOTE**

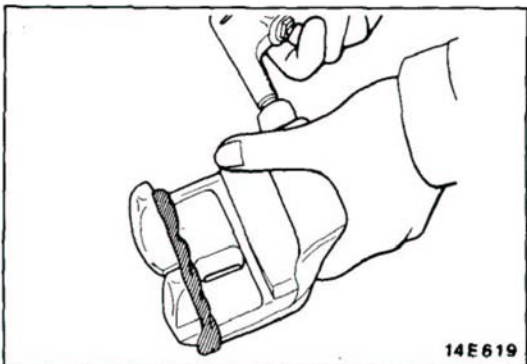
Hold the front brake assembly by suspending it with wires or other suitable means in such a manner that the brake hose is not twisted.



14E618

**8. REMOVAL OF BOOT RING**

Remove the boot ring by using a screwdriver.



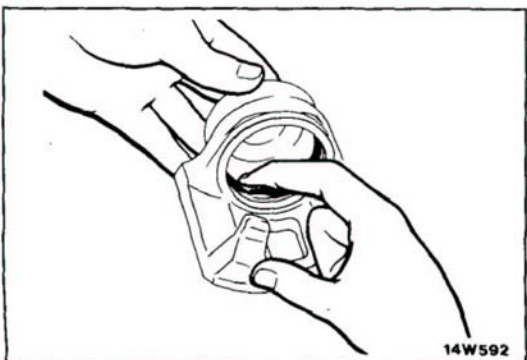
14E619

**9. REMOVAL OF PISTON BOOT/10. PISTON**

Remove the piston and piston boot by applying compressed air through the brake hose fitting hole.

**Caution**

**Place a piece of cloth in front of the piston, and slowly increase the force of the compressed air to prevent the piston from springing out abruptly.**



14W592

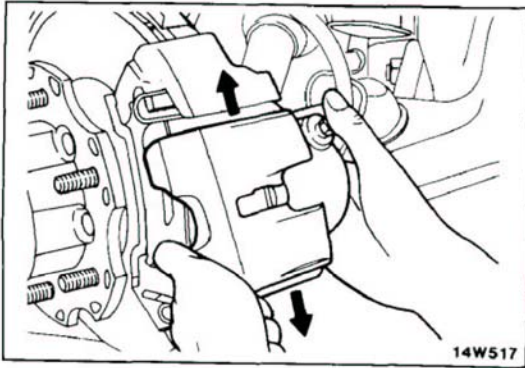
**11. REMOVAL OF PISTON SEAL**

(1) Remove the piston seal from the cylinder by hand.

**Caution**

**Never use a screwdriver or similar tools, because doing so could damage the cylinder surface.**

(2) Clean the caliper bore with trichloroethylene, alcohol or brake fluid.

**13. REMOVAL OF PAD ASSEMBLY**

- (1) Remove the caliper assembly by moving it upward or downward at an angle.

**NOTE**

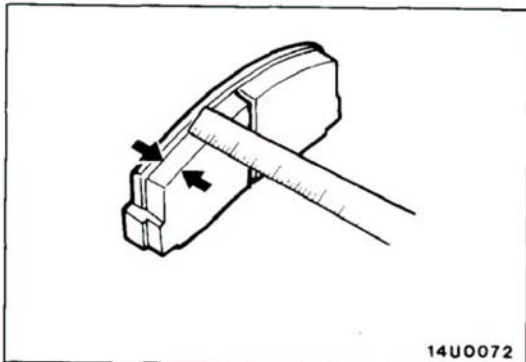
Hold the front brake assembly by suspending it with wires or other suitable means in such a manner that the brake hose is not twisted.

- (2) Remove the brake pad assembly.

**INSPECTION**

N05LCAB

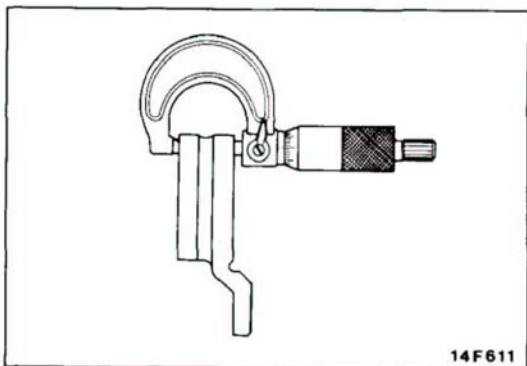
- Check the piston for rust.
- Check the cylinder portion of caliper body for cracks or rust.
- Check the piston seal for wear and deterioration.
- Check the piston boot for cracks and deterioration.
- Check the mounting support for cracks.
- Check pads for deformation, metal backing for damage, and oil on the linings.

**CHECKING BRAKE PAD THICKNESS**

Measure the thickness of the pad assembly at the place where wear is the greatest.

**Limit : 1.0 mm (.039 in.)**

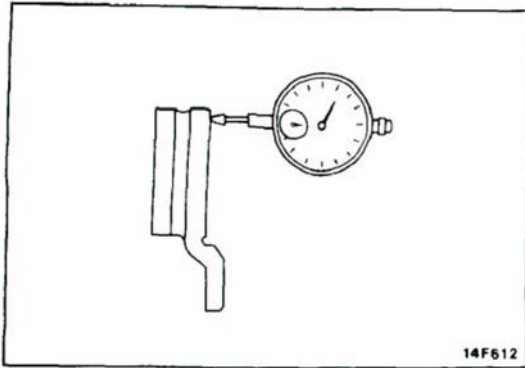
If the pad assemblies are worn beyond the limit, replace them.

**CHECKING BRAKE DISC THICKNESS**

- (1) Clean the brake disc surface to remove dirt and rust.
- (2) Measure the thickness of the brake disc at least four places on the sliding surface of the brake disc and the pad.

**Limit : 18.4 mm (.724 in.)**

If the thickness of the brake disc is less than the limit (even at only one location) or there is wear, replace the brake disc. (for removal of the brake disc, refer to GROUP 2 FRONT SUSPENSION-Axle Hub and Free-Wheeling Hub.)

**CHECKING BRAKE DISC RUNOUT**

Measure the runout of the brake disc at the edge of the brake disc circumference.

**Limit : 0.15 mm (.0059 in.)**

If the brake disc runout exceeds the limit, change its position on the hub and/or retorque evenly.

Check the runout again, and if it cannot be corrected, replace the brake disc. Do not resurface it. (for removal of the brake disc, refer to GROUP 2 FRONT SUSPENSION-Axle Hub and Free-Wheeling Hub.)

**NOTE**

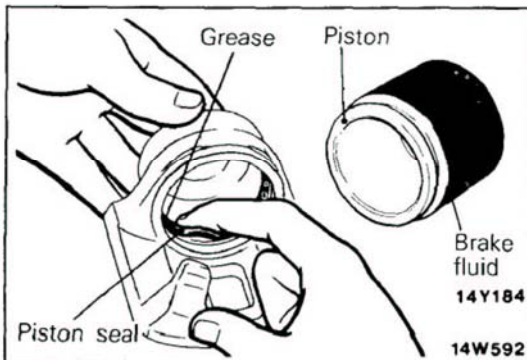
Before measuring the runout of the brake disc, check the play of the wheel bearing and, if necessary, correct it:

**SERVICE POINTS OF INSTALLATION**

N05LDCB

**13. INSTALLATION OF PAD ASSEMBLY**

Refer to P.5-15.

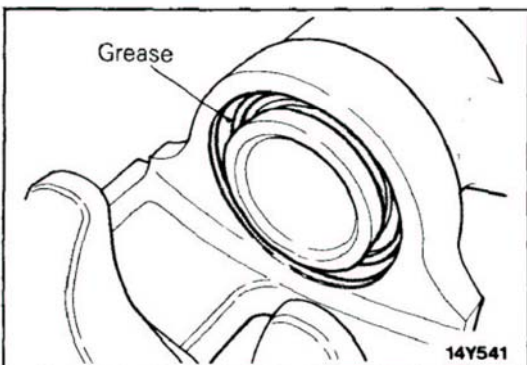
**11. INSTALLATION OF PISTON SEAL**

The piston seal is already packed and coated with the specified grease; do not wipe it away.

**10. APPLICATION OF BRAKE FLUID TO PISTON**

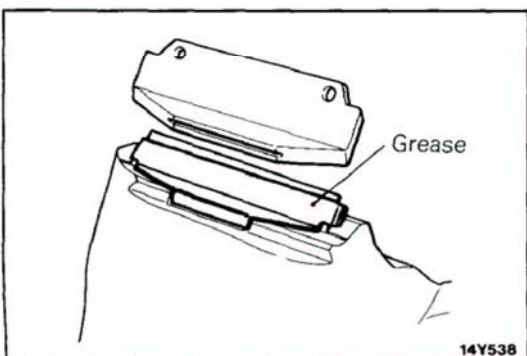
Apply brake fluid to the outside surface of the piston and slowly insert the piston by hand, while using care not to twist it.

**Specified brake fluid : DOT 3**

**9. APPLICATION OF GREASE TO PISTON BOOT**

Apply the specified grease to the piston boot mounting groove in the caliper body.

**Specified grease : Repair kit grease (orange)**

**5. APPLICATION OF GREASE TO PLUG PLATE/4. STOPPER PLUG**

Apply a thin coat of the specified grease to the plug plate and stopper plug contact surface.

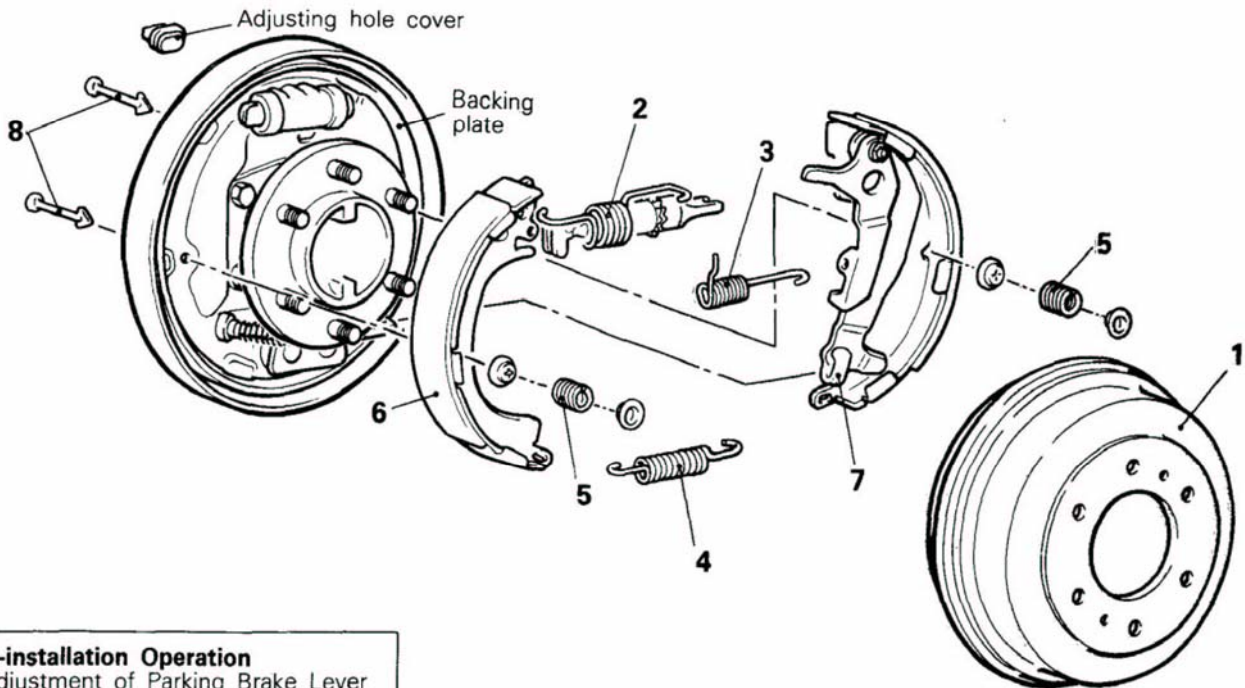
**Specified grease : Brake grease SAE J310, NLGI No. 1**

**1. CONNECTION OF BRAKE HOSE**

Refer to P.5-28.

**REAR BRAKE SHOE  
REMOVAL AND INSTALLATION**

N05UA-



**Post-installation Operation**  
 • Adjustment of Parking Brake Lever Stroke (Refer to P.5-11.)

14W599

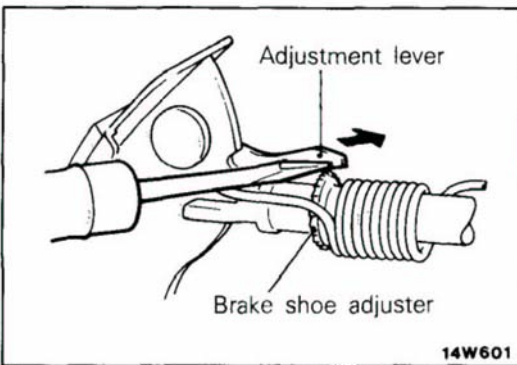
**Removal steps**

- ◄◄ 1. Brake drum
- ◆◆ 2. Shoe return spring with brake shoe adjuster
- 3. Adjusting spring
- 4. Shoe retainer spring
- 5. Shoe hold-down spring

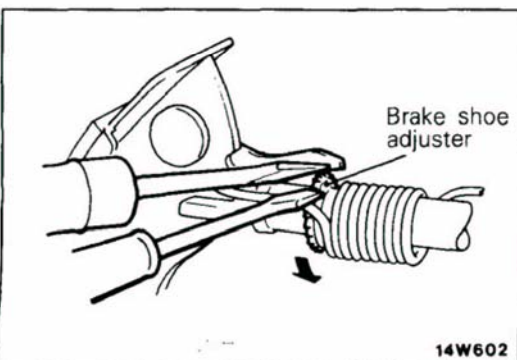
- ◆◆ 6. Shoe and lining assembly
- ◆◆ 7. Shoe and lever assembly
- ◆◆ 8. Shoe hold-down pin

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆ : Refer to "Service Points of Installation".



14W601



14W602

**SERVICE POINTS OF REMOVAL**

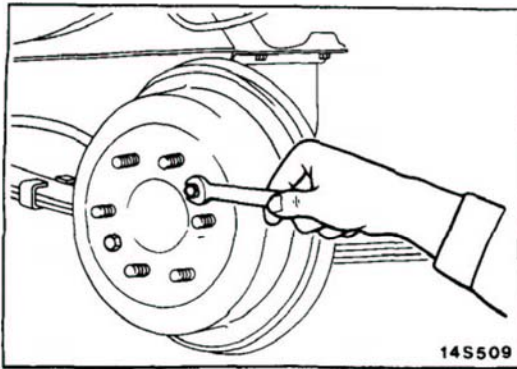
N05UBAB

**1. REMOVAL OF BRAKE DRUM**

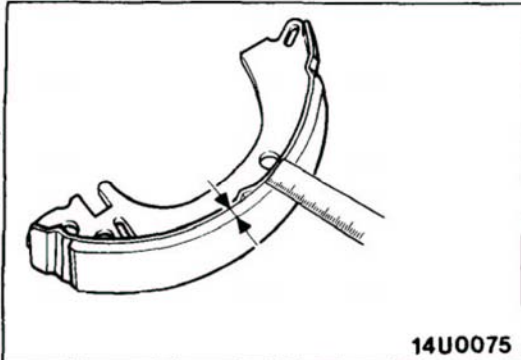
If the brake drum is difficult to remove, follow either of the steps described below.

- (1) When using the brake shoe adjuster.
  - ① Remove the adjusting hole cover at the rear side of the backing plate.
  - ② Insert a screwdriver into the adjustment hole and use it to separate the adjustment lever from the brake shoe adjuster.
  - ③ Insert another screwdriver into the adjustment hole and use it to turn the brake shoe adjuster in the direction of the arrow so as to compress the brake shoe.





- (2) When using the bolts.  
Screw the bolts (M8 × 1.25) in the threaded holes provided in the drum flange surface.



## INSPECTION

N05UCAD

### CHECKING BRAKE LINING THICKNESS

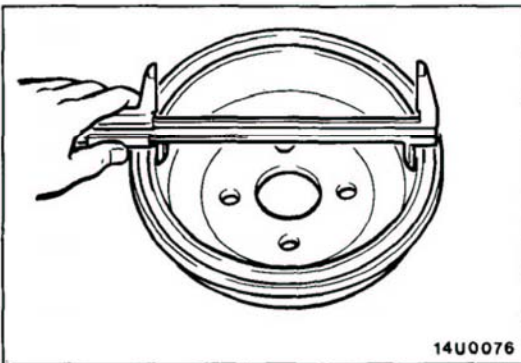
- (1) Measure the wear of the brake lining at the place worn the most.

**Limit : 1.0 mm (.039 in.)**

- (2) If the thickness of the brake lining is the limit value or below, or if there is noticeable abnormal wear, replace the shoe assembly.

### NOTE

In order to prevent one-sided braking, replace both the left and right shoe assemblies as a set.

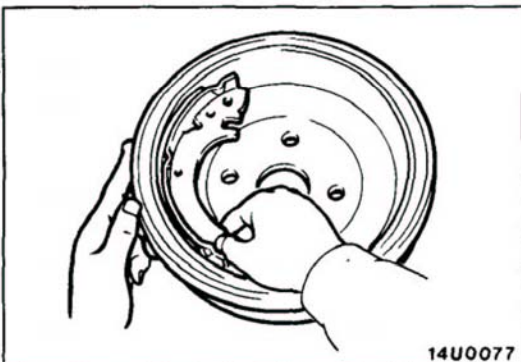


### CHECKING BRAKE DRUM INSIDE DIAMETER

- (1) Measure the inside diameter of the drum at more than two positions by using a caliper gage.

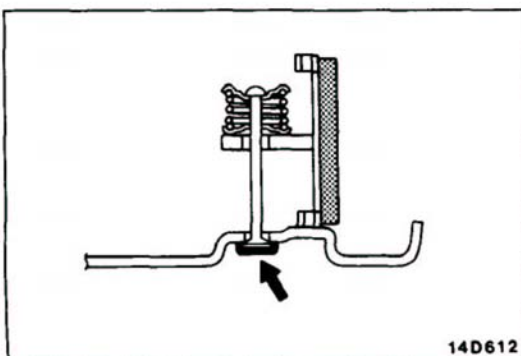
**Limit : 256.0 mm (10.079 in.)**

- (2) If the internal diameter of the brake drum is the limit value or more, or if there is noticeable abnormal wear, replace the brake drum.



### CHECKING BRAKE LINING AND BRAKE DRUM CONTACT

- (1) Apply chalk powder to the inner surface of the brake drum and turn the brake drum so that it rubs against the shoe assembly.
- (2) If places of noticeably poor contact are discovered, replace the shoe assembly and/or brake drum.



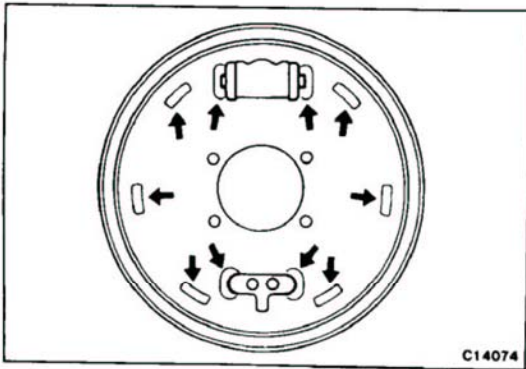
## SERVICE POINTS OF INSTALLATION

N05UDAH

### 8. APPLICATION OF GREASE TO SHOE HOLD-DOWN PIN

Apply the specified sealant to the shoe hold-down pin inserting portion of the backing plate.

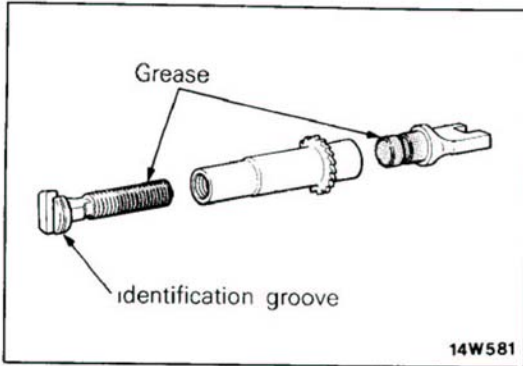
**Specified sealant : 3M Sealant Part No. 8634 or equivalent**



## 7. APPLICATION OF SEALANT TO SHOE AND LEVER ASSEMBLY/6. SHOE AND LINING ASSEMBLY

Apply the specified grease to the contacting surfaces of the shoes and backing plate, anchor plate and wheel cylinder piston ends.

**Specified grease : Brake grease SAE J310, NLGI No. 1  
lent**



## 2. INSTALLATION OF SHOE RETURN SPRING WITH BRAKE SHOE ADJUSTER

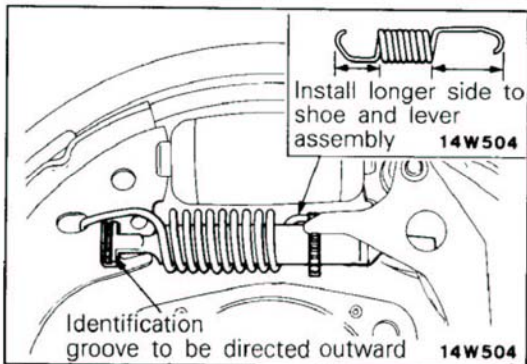
(1) Apply the specified grease to the thread portion of the adjuster.

**Specified grease : Brake grease SAE J310, NLGI  
No. 1**

(2) Install the R.H. thread brake adjuster to the L.H. side brake, and L.H. thread brake adjuster to the R.H. side brake.

(3) Install the brake shoe adjuster, so that the identification grooves face outward.

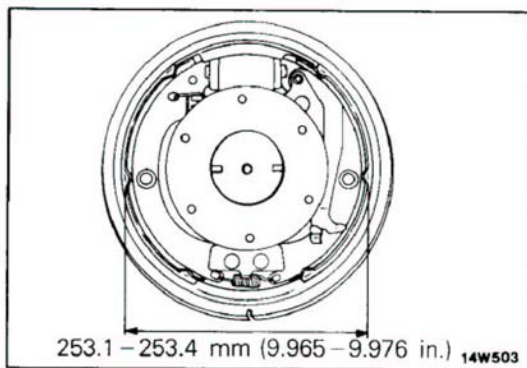
(4) Attach the longer end of the shoe return spring to the shoe and lever assembly.



(5) Turn the brake shoe adjuster to adjust the outside diameter of brake shoe as illustrated.

### NOTE

Adjusting the outside diameter of brake shoe as illustrated will facilitate adjustment of the shoe clearance.



## REAR BRAKE WHEEL CYLINDER

## REMOVAL AND INSTALLATION

N05VA--

18-21 Nm  
13-15 ft.lbs.13-17 Nm  
9-12 ft.lbs.7-9 Nm  
5-7 ft.lbs.**Pre-removal Operation**

- Draining of Brake Fluid

**Post-installation Operation**

- Supplying Brake Fluid
- Bleeding (Refer to P.5-14.)

**Removal steps**

- ◄◄ 1. Brake drum  
2. Bleeder screw  
3. Brake tube  
◆◆ 4. Wheel cylinder assembly

**NOTE**

- (1) Reverse the removal procedures to reinstall.  
(2) ◄◄ : Refer to "Service Points of Removal".  
(3) ◆◆ : Refer to "Service Points of Installation".

14W600

**SERVICE POINTS OF REMOVAL**

N05VBAB

**1. REMOVAL OF BRAKE DRUM**

Refer to P.5-33.

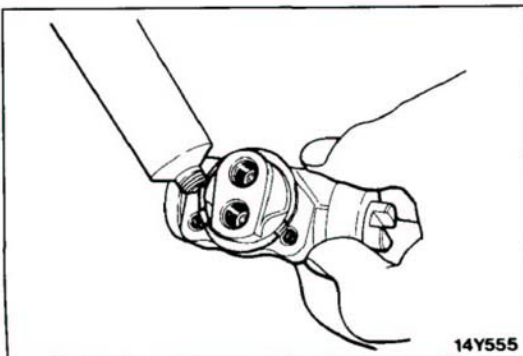
**SERVICE POINTS OF INSTALLATION**

N05VDAE

**4. APPLICATION OF SEALANT TO WHEEL CYLINDER ASSEMBLY**

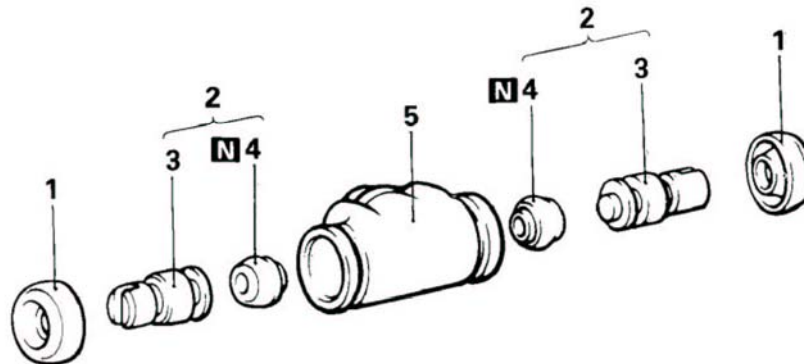
Apply the specified sealant to the wheel cylinder assembly fitting surface before installation to the backing plate.

**Specified sealant : 3M Sealant Part No. 8634 or equivalent**

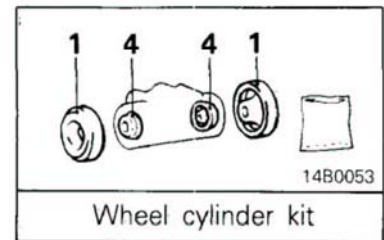


DISASSEMBLY AND REASSEMBLY

N05VE--



14D545



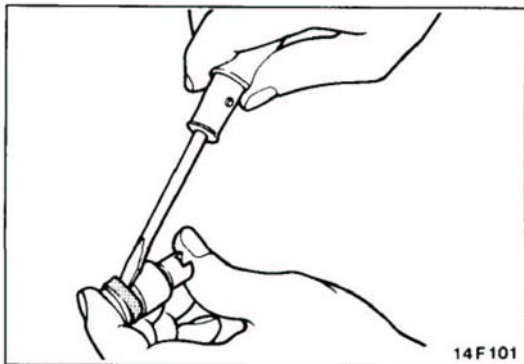
14B0053

Disassembly steps

- ➡➡ 1. Wheel cylinder boot
- ➡➡ 2. Piston assembly
- ➡➡ 3. Piston
- ↔↔↔↔ 4. Piston cup
- ↔↔↔↔ 5. Wheel cylinder body

NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2) ↔↔ : Refer to "Service Points of Disassembly".
- (3) ➡➡ : Refer to "Service Points of Reassembly".
- (4) **N** : Non-reusable parts



14F101

SERVICE POINT OF DISASSEMBLY

N05VFAB

4. REMOVAL OF PISTON CUP

Remove the piston cup from the piston by using a screwdriver.

INSPECTION

N05VGAB

- Check the piston and wheel cylinder walls for rust or damage.

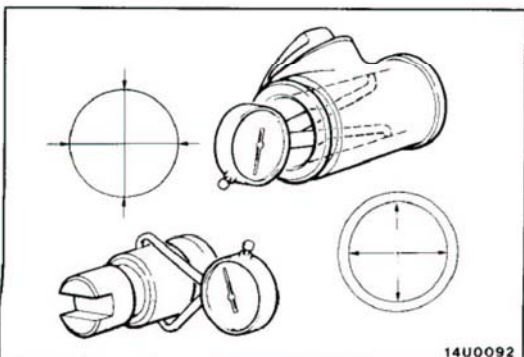
CHECKING CYLINDER AND PISTON CLEARANCE

Measure in two perpendicular directions to figure the clearance between the wheel cylinder inner diameter (max. value) and the piston outer diameter (min. value).

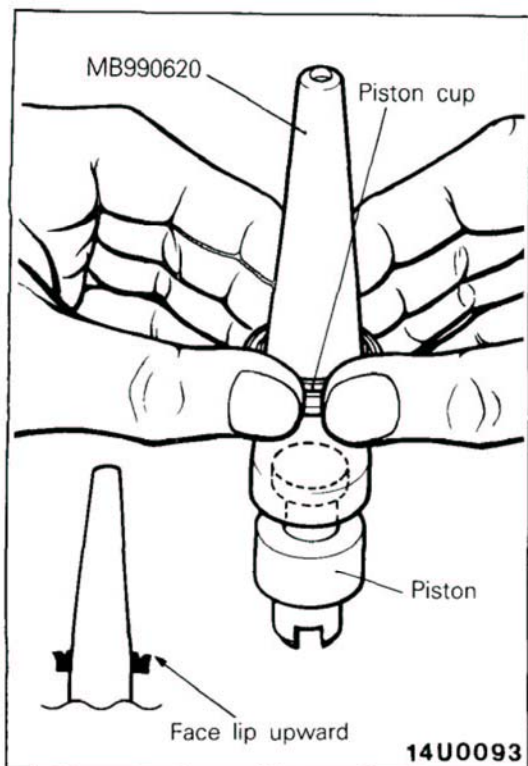
Limit : 0.15 mm (.0059 in.)

NOTE

If the difference is more than the limit, replace the piston and wheel cylinder as an assembly.



14U0092



## SERVICE POINTS OF REASSEMBLY

### 4. INSTALLATION OF PISTON CUP

- (1) Wash the inner surface of the wheel cylinder and outer surface of the piston with trichloroethylene, alcohol or brake fluid.
- (2) Apply the specified brake fluid to the entire surface of the piston cups and to the external periphery of the special tool.

**Specified brake fluid : DOT 3**

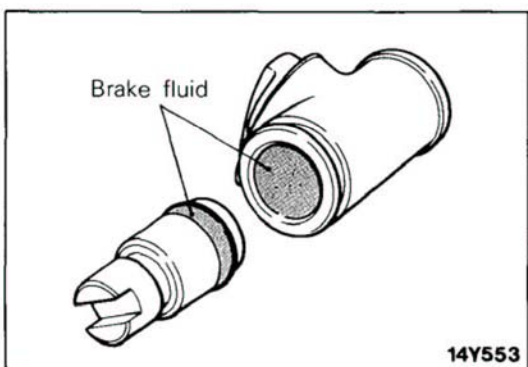
#### Caution

**Use a repair kit to replace the piston cup and wheel cylinder boot.**

- (3) Attach the special tool to the piston, fit the piston cup onto the special tool with the lips of the piston cup directed upward, and push down (with finger tips) to let it slide along the outer surface of the special tool until it fits into position.

#### Caution

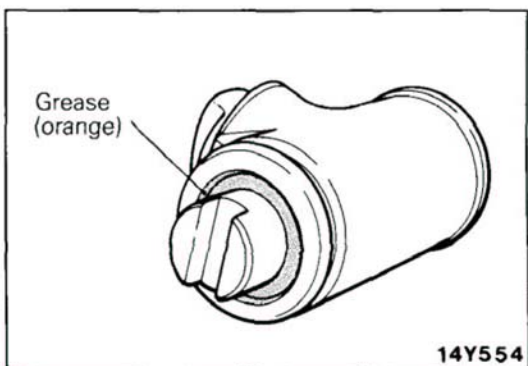
**When pushing down the piston cup, push uniformly and slowly with both hands, without stopping, so that deformation or turning over will not result.**



### 2. APPLICATION OF BRAKE FLUID TO PISTON ASSEMBLY

Apply the specified brake fluid to the inner surface of the wheel cylinder and to the entire periphery of the piston cups, and install the piston assemblies.

**Specified brake fluid : DOT 3**



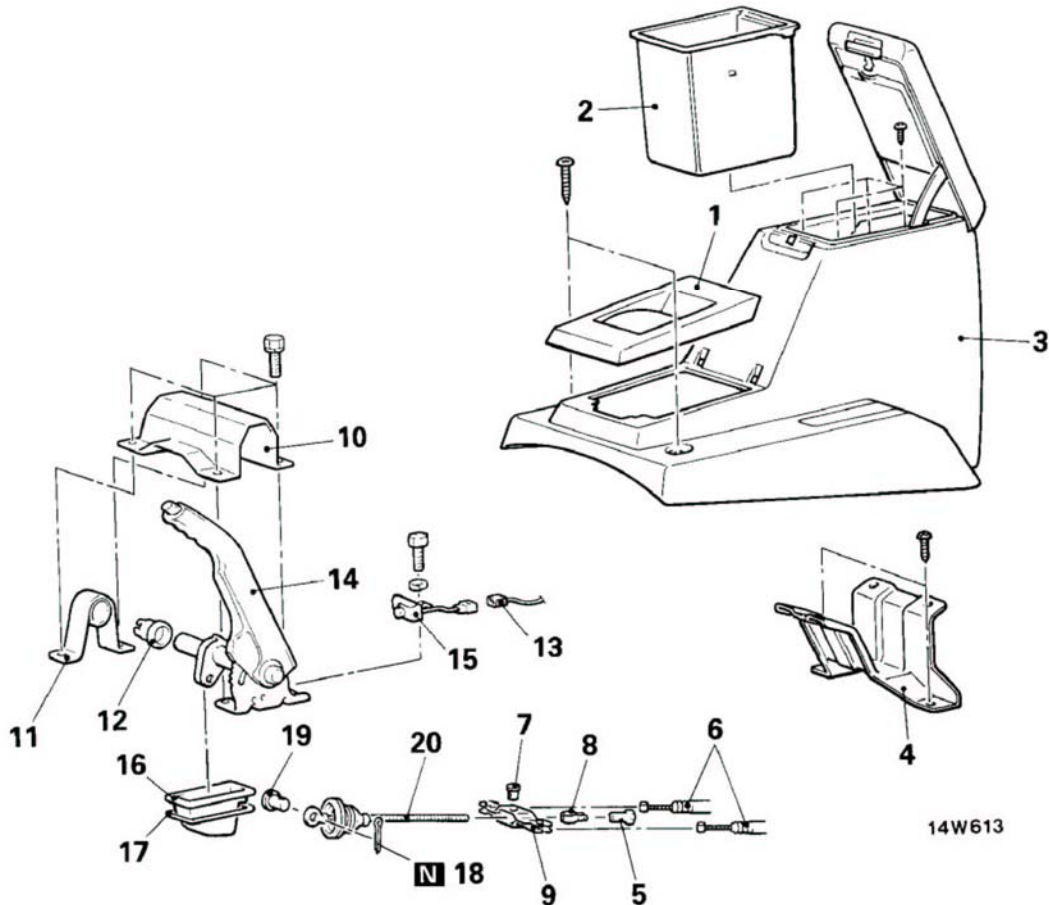
### 1. APPLICATION OF GREASE TO WHEEL CYLINDER BOOT

Apply the specified grease to the piston and the wheel cylinder, and install the boot.

**Specified grease : Repair kit grease (orange)**

**PARKING BRAKE LEVER  
REMOVAL AND INSTALLATION**

N05WA--



**Post-installation Operation**

- Adjustment of Parking Brake Lever Stroke (Refer to P.5-11.)

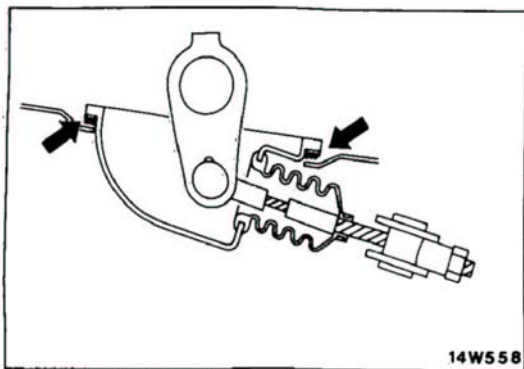
**Removal steps**

1. Rear console panel
2. Inner box
3. Floor console assembly
4. Floor console bracket
5. Cable adjuster
6. Connection of parking brake cables
7. Lever pin
8. Nut holder
9. Cable equalizer
10. Parking brake shaft cover
11. Parking lever stay

- ◆◆ 12. Parking lever bushing
- ◆◆ 13. Connection of parking brake switch connector
- ◆◆ 14. Parking brake lever assembly
- ◆◆ 15. Parking brake switch
- ◆◆ 16. Cover
- ◆◆ 17. Sealer
- ◆◆ 18. Cotter pin
- ◆◆ 19. Clevis pin
- ◆◆ 20. Parking brake cable

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Installation".
- (3) **N** : Non-reusable parts



**INSPECTION**

N05WCAA

- Check the brake lever ratchet for wear.

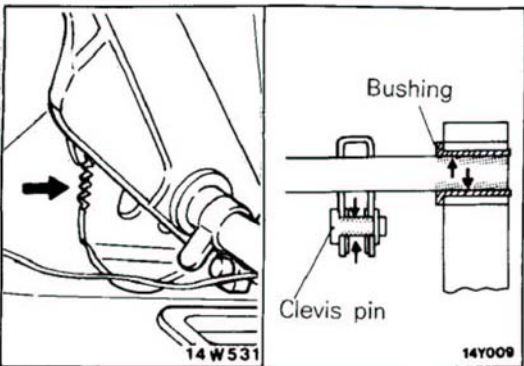
**SERVICE POINTS OF INSTALLATION**

N05WDAB

**16. APPLICATION OF SEALANT TO COVER**

Apply a coat of the specified sealant to the both side of the sealer.

**Specified sealant : 3M ART Part No. 8661 or equivalent**



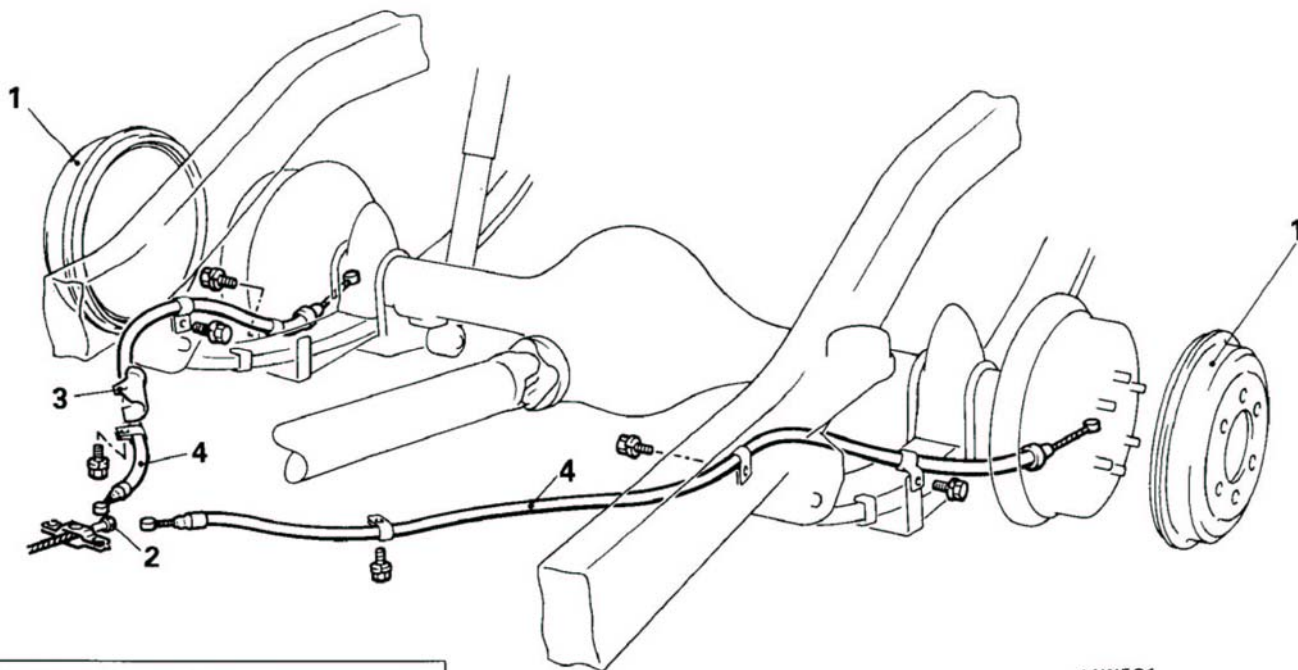
**14. APPLICATION OF GREASE TO PARKING BRAKE LEVER ASSEMBLY/12. PARKING LEVER BUSHING**

Apply the specified grease to the clevis pin, bushing and ratchet plate.

**Specified grease : Chassis grease SAE J310, NLGI No. 0**

**PARKING BRAKE CABLE REMOVAL AND INSTALLATION**

N05XA--



**Post-installation Operation**  
 ● Adjustment of Parking Brake Lever Stroke (Refer to P.5-11.)

14W561

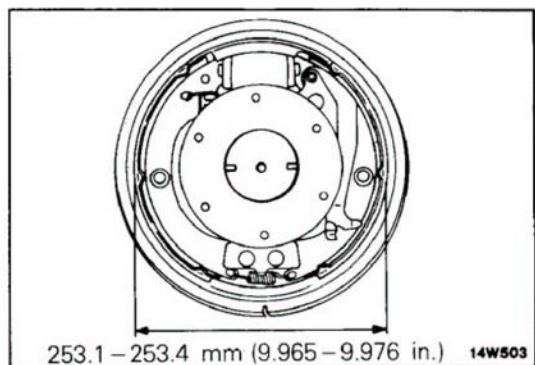
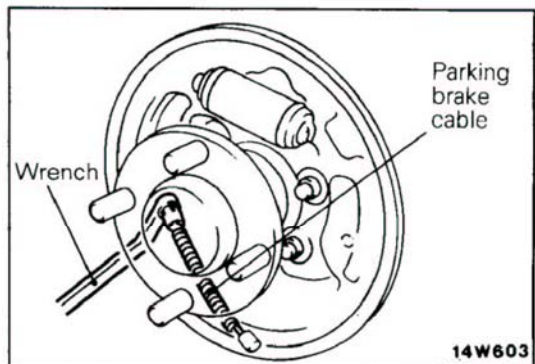
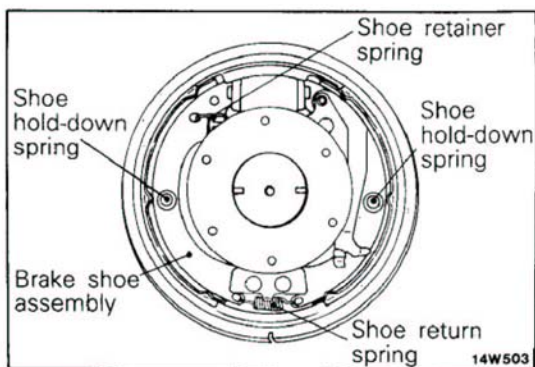
**Removal steps**

1. Brake drum
2. Cable adjuster
3. Parking cable heat protector
4. Parking brake cables



**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◀▶ : Refer to "Service Points of Removal".
- (3) ▶◀ : Refer to "Service Points of Installation".

**SERVICE POINTS OF REMOVAL**

N05XBAA

**4. REMOVAL OF PARKING BRAKE CABLE**

- (1) Remove the shoe return spring, shoe retainer spring and shoe hold-down pin and remove the brake shoe assembly.
- (2) Disconnect the cable end of the parking brake cable from brake shoe assembly.
- (3) Pass the parking brake cable through an offset box-end wrench (12 mm) and push the wrench further on the parking brake cable until it reaches the stopper part. In that condition, pull the parking brake cable out from the rear side of the backing plate.

**NOTE**

Push the offset box-end wrench until the tab of the stopper is pushed in.

**INSPECTION**

N05XCAA

- Check the parking brake cable for operation or damage.

**SERVICE POINTS OF INSTALLATION**

N05XDAA

**4. INSTALLATION OF PARKING BRAKE CABLE**

- (1) Install the cable end to the brake shoe assembly.
- (2) Install the brake shoe assembly.
- (3) Turn the brake shoe adjuster to adjust the outside diameter of brake shoe as shown in the illustration.

**NOTE**

Adjusting the outside diameter of brake shoe as shown in the illustration will facilitate adjustment of the shoe clearance.



# CLUTCH

## CONTENTS

N06AA--

<b>CLUTCH DISC AND RELEASE FORK</b> .....	<b>14</b>	Service Specifications .....	<b>2</b>
<b>CLUTCH MASTER CYLINDER AND TUBE</b> .....	<b>8</b>	Torque Specifications .....	<b>3</b>
<b>CLUTCH PEDAL</b> .....	<b>7</b>	<b>TROUBLESHOOTING</b> .....	<b>4</b>
<b>CLUTCH RELEASE CYLINDER</b> .....	<b>12</b>	Clutch Chattering	
<b>GENERAL INFORMATION</b> .....	<b>2</b>	Clutch Dragged (Clutch Not Released)	
<b>SERVICE ADJUSTMENT PROCEDURES</b> .....	<b>6</b>	Clutch Noisy	
Bleeding .....	6	Clutch Operation Erratic or Rough	
Inspection and Adjustment of Clutch Pedal ...	6	Clutch Slipping	
<b>SPECIFICATIONS</b> .....	<b>2</b>	Difficult Gear Shifting (Gear Noise During Shifting)	
General Specifications .....	2	Hard Pedal Effort	
Lubricants .....	3		

**CAUTION**

When servicing clutch assemblies or components, do NOT create dust by sanding, grinding or by cleaning clutch parts with a dry brush or with compressed air. (A water dampened cloth should be used.) The clutch disc contains "Asbestos Fibers" which can become airborne if dust is created during service operations. Breathing dust containing "Asbestos Fibers" may cause serious bodily harm.

**GENERAL INFORMATION**

The clutch is the dry single-plate diaphragm type; hydraulic pressure is used for the clutch control. The clutch control is composed of the clutch pedal, the clutch master cylinder, the clutch tube, the release cylinder, etc. Note that the clutch pedal is the suspended type.

**SPECIFICATIONS****GENERAL SPECIFICATIONS**

Items	Specifications
Clutch operating method	Hydraulic type
Inside diameter of clutch master cylinder mm (in.)	15.87 (.6248)
Clutch disc	
Type	Single dry disc type
Facing Size (outside x inside) mm (in.)	225 x 150 (8.9 x 5.9)
Number of torsion springs	4
Clutch cover assembly	
Type	Diaphragm spring, strap drive type
Setting load N (lbs.)	3,432 (772)
Mounting bolt circle diameter mm (in.)	264 (10.4)
Clutch release bearing	
Type	Self-centering type
Free travel mm (in.)	0 (0)-Constant contact type
Clutch release cylinder	
Cylinder bore diameter mm (in.)	19.05 (.75)

**SERVICE SPECIFICATIONS**

Items	Specifications
Standard values	
Clutch pedal height mm (in.)	186–191 (7.3–7.5)
Clutch pedal clevis pin play mm (in.)	1–3 (.04–.12)
Clutch pedal free play mm (in.)	8–16 (.31–.63)
Clearance between clutch pedal and floorboard when pedal is depressed mm (in.)	35 (1.38) or more
Limit	
Master cylinder to piston clearance mm (in.)	0.15 (.0059)
Clutch disc rivet sink mm (in.)	0.3 (.012)

**TORQUE SPECIFICATIONS**

N06CC--

Items	Nm	ft.lbs.
Clutch to flywheel	15-22	11-16
Release cylinder to transmission case	31-42	22-30
Fulcrum	31-42	22-30
Clutch pedal to pedal bracket	25-35	18-25
Eye bolt	20-25	15-18
Clutch tube flare nut	13-17	10-12
Clutch master cylinder to firewall	7-9	5-7
Clutch pedal bracket	18-25	13-18
Push rod lock nut	8-12	6-9

**LUBRICANTS**

N06CD--

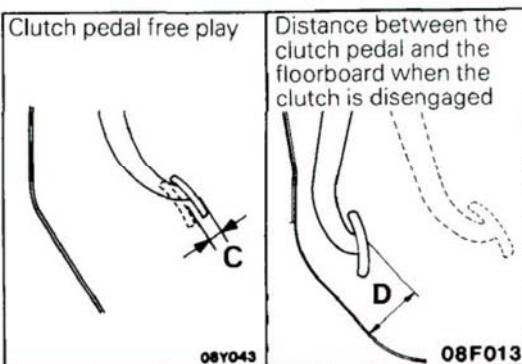
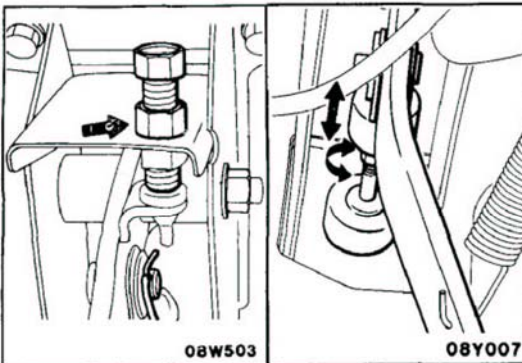
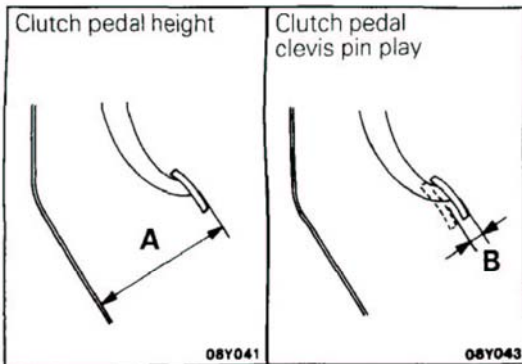
Items	Specified lubricants	Quantity
Fluid	DOT 3	As required
Clutch master cylinder push rod, clevis pin and washer	Wheel bearing grease SAE J310, NLGI No. 2	As required
Clutch pedal shaft and bushings	Multipurpose grease SAE J310, NLGI No.3	As required
Clutch disc spline	MITSUBISHI Genuine Grease Part No. 0101011	As required
Clutch release fork shaft bearing	MITSUBISHI Genuine Grease Part No. 0101011	As required
Clutch release bearing inner surface	MITSUBISHI Genuine Grease Part No. 0101011	As required
Release cylinder inner diameter	DOT 3	As required

## TROUBLESHOOTING

N06EAAF

Symptom		Probable cause	Remedy	Reference page
Clutch slipping <ul style="list-style-type: none"> <li>Vehicle will not respond to engine speed during acceleration.</li> <li>Improper vehicle speed</li> <li>Lack of power during uphill driving</li> </ul>		Improper pedal free play	Adjust	6-6
		Excessive wear of clutch disc facing	Replace	6-14
		Hardened clutch disc facing, or oil on surface	Replace	6-14
		Damaged pressure plate or flywheel	Replace	6-14, 9-60
		Weak or broken pressure spring	Replace	6-14
Clutch drags or does not release		Excessive clutch pedal free play	Adjust	6-6
		Interference between pedal and floor panel	Correct	6-6
		Pilot bearing worn or broken	Replace	9-57
		Clutch disc warped	Replace	6-14
		Pressure plate, disc or throwout bearing damaged	Replace	6-14
		Hydraulic system fluid leakage or air mixed in	Repair or replace	6-6
Difficult gear shifting (gear noise during shifting)		Excessive pedal free play	Adjust	6-6
		Hydraulic system fluid leakage or air mixed in	Repair or Replace	6-6
		Unusual wear or corrosion of clutch disc spline	Replace	6-14
		Excessive vibration (distortion) of clutch disc	Replace	6-14
Clutch noisy	When clutch is not used	Improper play of clutch pedal	Adjust	6-6
		Excessive wear of clutch disc facing	Replace	6-14
	A noise is heard after clutch is disengaged	Unusual wear and/or damage of release bearing	Replace	6-14
	A noise is heard when clutch is disengaged	Improper grease on the sliding surface of bearing sleeve	Repair	6-14
		Improperly installed clutch assembly or bearing	Repair	6-14
A noise is heard when vehicle is suddenly rolled of with clutch partially engaged	Damaged pilot bearing	Replace	9-60	

Symptom	Probable cause	Remedy	Reference page
Clutch chatters	Facing hardened	Replace	6-14
	Facing stained with oil or grease	Repair or replace	6-14
	Weak or broken disc damper springs	Replace	6-14
	Improper facing contact or disc runout	Replace	6-14
	Pressure plate or flywheel warped	Replace	6-14, 9-62
	Loose engine mounting	Repair or replace	9-20, 21
Hard pedal effort	Improper lubrication of clutch pedal shaft	Repair	6-7
	Improper lubrication of clutch disc spline	Repair	6-17
	Improper lubrication of clutch release lever shaft	Repair	6-12
	Improper lubrication of front bearing retainer	Repair	Refer to GROUP 21.
Clutch operation erratic or rough	Facing stained with grease or oil	Repair or replace	6-14
	Facing worn or rivet loose	Replace	6-14
	Torsion spring deteriorated or broken	Replace	6-14
	Improper lubricant on clutch pedal pivot	Lubricate	6-7



## SERVICE ADJUSTMENT PROCEDURES

### INSPECTION AND ADJUSTMENT OF CLUTCH PEDAL

N06FAAH

1. Measure the clutch pedal height (from the face of the pedal pad to the floorboard) and the clutch pedal clevis pin play (measured at the face of the pedal pad).

**Standard value (A) : 186–191 mm (7.3–7.5 in.)**

**Standard value (B) : 1–3 mm (.04–.12 in.)**

2. If either the clutch pedal height or the clutch pedal clevis pin play are not within the standard value range, adjust as follows:

- (1) Turn the stopper bolt to adjust the clutch pedal height to agree with the standard value and then secure the bolt with the lock nut.
- (2) Turn the push rod to adjust the clutch pedal clevis pin play to agree with the standard value and then secure the push rod with the lock nut.

#### Caution

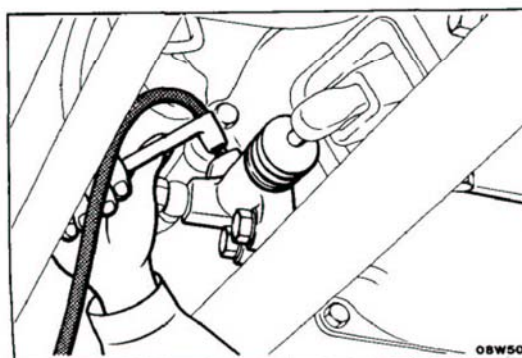
**When adjusting the clutch pedal clevis pin play, be careful not to push the push rod toward the master cylinder.**

3. After completing the adjustments, confirm that the clutch pedal free play (measured at the face of the pedal pad) and the distance between the clutch pedal (the face of the pedal pad) and the floorboard when the clutch is disengaged are within the standard value ranges.

**Standard value (C) : 8–16 mm (.31–.63 in.)**

**Standard value (D) : 35 mm (1.38 in.) or more**

4. If the clutch pedal free play and the distance between the clutch pedal and the floorboard when the clutch is disengaged do not agree with the standard values, it is probably the result of either air in the hydraulic system, or a faulty master cylinder or clutch. Bleed the air, or disassemble and inspect the master cylinder or clutch.



### BLEEDING

N06FBAB

Whenever the clutch tube, the clutch hose, and/or the clutch master cylinder have been removed, or if the clutch pedal is spongy, bleed the system.

#### Caution

**Use the specified brake fluid. Avoid using a mixture of the specified fluid and other fluid.**

**Specified brake fluid : DOT 3**

**CLUTCH PEDAL****REMOVAL AND INSTALLATION**

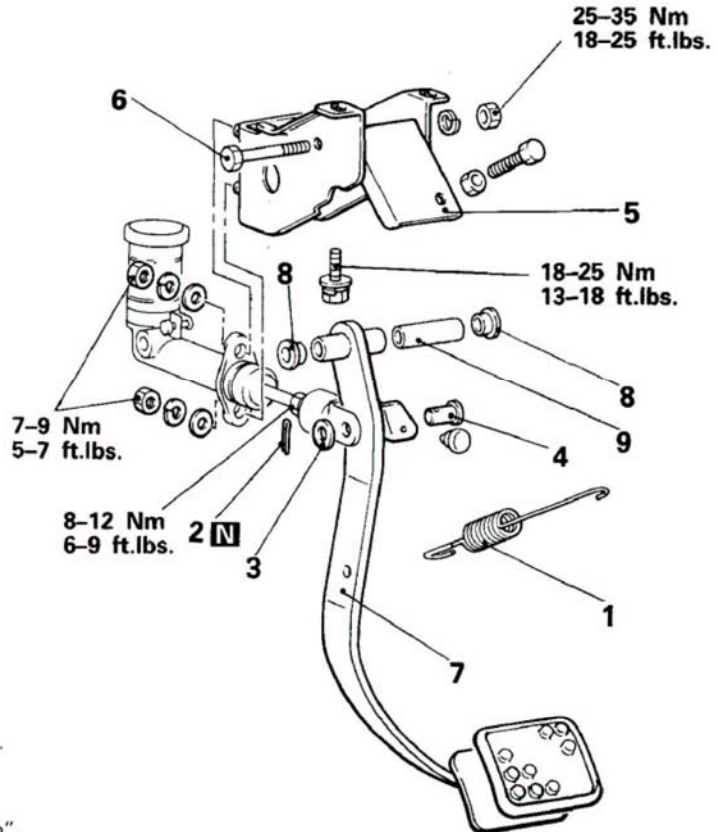
N06PA-

**Post-installation Operation**

- Adjustment of Clutch Pedal  
(Refer to P.6-6.)

**Removal steps**

1. Return spring
2. Cotter pin
- ◆◆ 3. Washer
- ◆◆ 4. Clevis pin
5. Clutch pedal bracket
- ◆◆ 6. Pedal shaft
7. Clutch pedal
- ◆◆ 8. Bushing
- ◆◆ 9. Spacer

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Installation".
- (3) N : Non-reusable parts

08W510

**INSPECTION**

N06PCAC

- Check the pedal shaft bushing for wear.
- Check the pedal arm for bend or torsion.
- Check the return spring for deterioration.

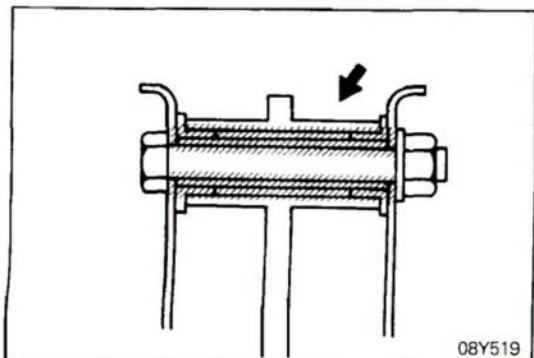
**SERVICE POINTS OF INSTALLATION**

N06PDAK

**9. APPLICATION OF GREASE TO SPACER/8. BUSHING/6. PEDAL SHAFT**

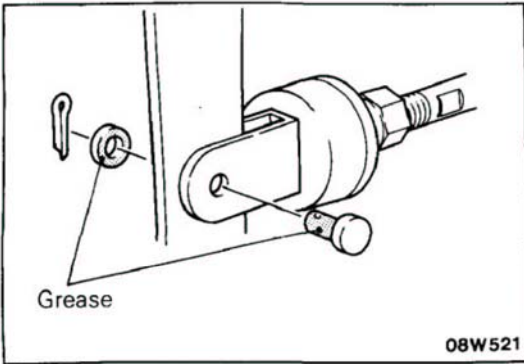
Apply specified grease to the pedal shaft, spacer and bushings.

**Specified Grease : Multipurpose grease SAE J310, NLGI No. 3**



08Y519

**STB Revision**



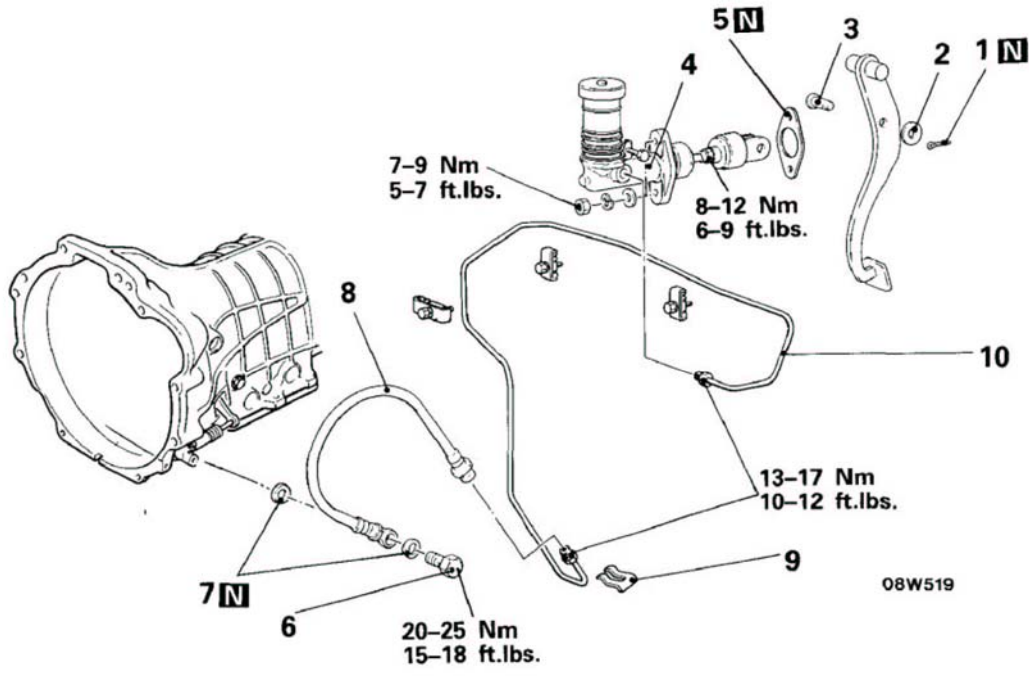
**4. APPLICATION OF GREASE TO CLEVIS PIN/3. WASHER**

Apply the specified grease to the outer surface of the spacer and the inner surface of the bushing.

**Specified grease : Wheel bearing grease SAE J310, NLGI No. 2**

**CLUTCH MASTER CYLINDER AND TUBE  
REMOVAL AND INSTALLATION**

N06MA--



08W519

**Clutch master cylinder removal steps**

- 1. Cotter pin
- ◆◆ 2. Washer
- ◆◆ 3. Clevis pin
- 4. Clutch master cylinder
- 5. Sealer

**Clutch line removal steps**

- 6. Eye bolt
- 7. Gasket
- ◆◆◆ 8. Clutch hose
- 9. Hose clip
- ◆◆ 10. Clutch tube

**Pre-removal Operation**

- Draining of Clutch Fluid

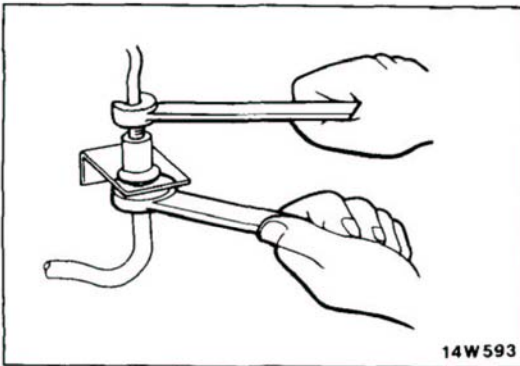
**Post-installation Operation**

- Supplying Clutch Fluid
- Bleeding  
(Refer to P.6-6.)
- Adjustment of Clutch Pedal  
(Refer to P.6-6.)

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆ : Refer to "Service Points of Installation".
- (4) N : Non-reusable parts

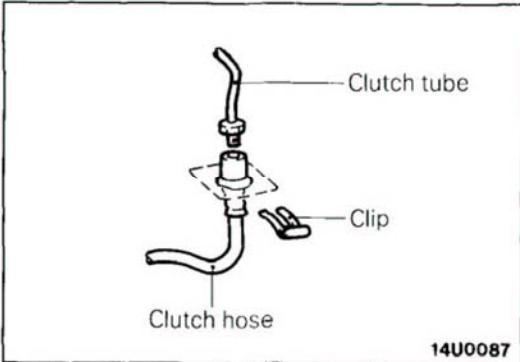


**SERVICE POINTS OF REMOVAL**

N06MBAD

**8. REMOVAL OF CLUTCH HOSE**

- (1) Holding the nut at the clutch hose side, loosen the flare nut of the clutch tube.

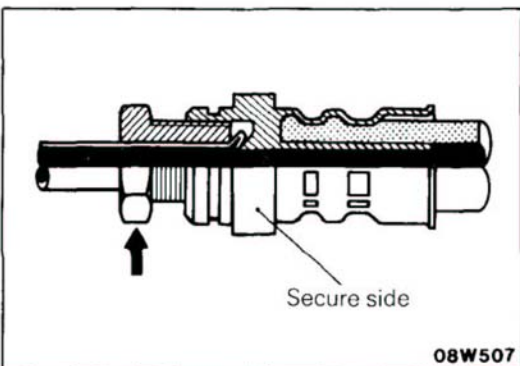


- (2) Pull off the clutch hose clip and remove the clutch hose from the bracket.

**INSPECTION**

N06MCAA

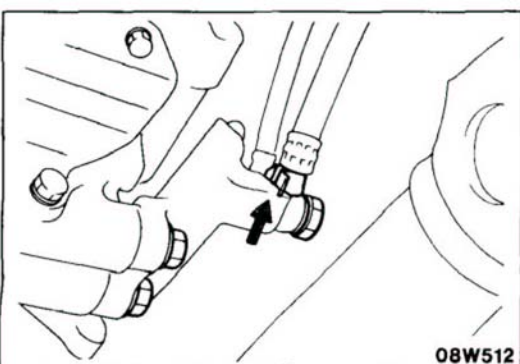
- Check the master cylinder or clutch hose for fluid leakage.
- Check the clutch hose or tube for cracks or clogging.

**SERVICE POINTS OF INSTALLATION**

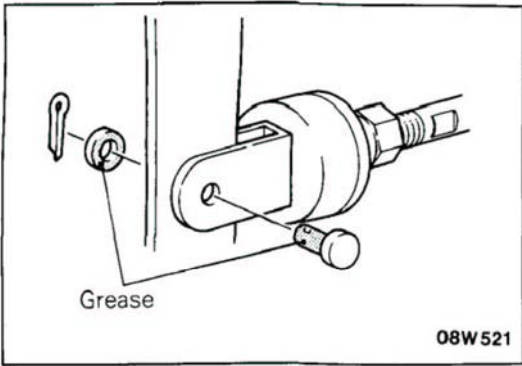
N06MDAE

**10. INSTALLATION OF CLUTCH TUBE/8. CLUTCH HOSE**

- (1) Temporarily tighten the clutch tube flare nut by hand, and then tighten it to the specified torque, being careful that the clutch hose does not become twisted.



- (2) Connect the clutch hose to the release cylinder at the stepped portion shown in the illustration.
- (3) After tightening the clutch tube flare nut and eye bolt, check to be sure there is no leakage of the clutch fluid.



**3. APPLICATION OF GREASE TO CLEVIS PIN/2. WASHER**  
N06MDAF

Apply the specified grease to the outer surface of the spacer and the inner surface of the bushing.

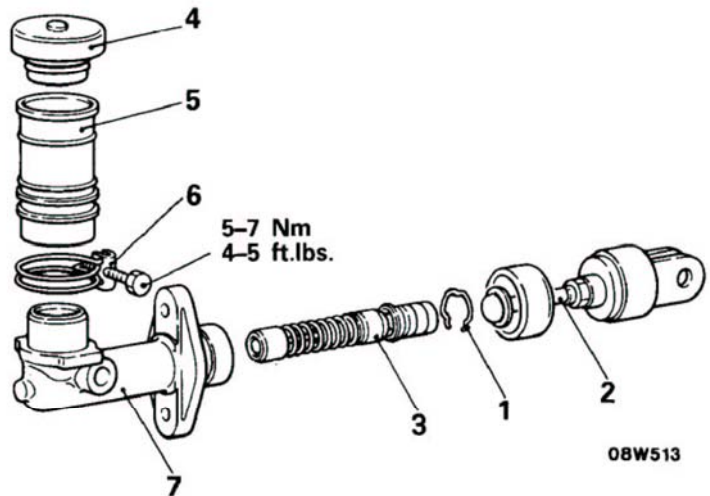
**Specified grease : Wheel bearing grease SAE J310, NLGI No. 2**

**DISASSEMBLY AND REASSEMBLY**

N06NA--

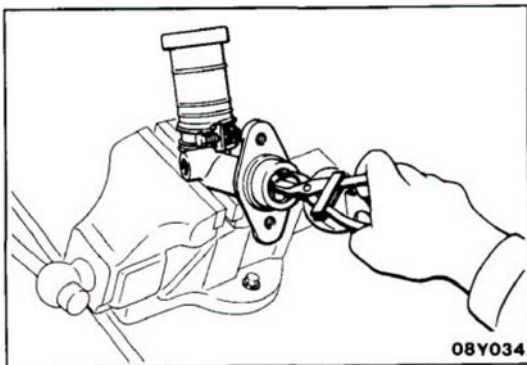
**Disassembly steps**

- ◄◄ 1. Piston stop ring
- 2. Damper and push rod
- ◄◄ ◄◄ 3. Piston assembly
- 4. Reservoir cap
- 5. Reservoir
- ◄◄ 6. Reservoir band
- 7. Master cylinder body



**NOTE**

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◄◄ : Refer to "Service Points of Disassembly".
- (3) ◄◄ ◄◄ : Refer to "Service Points of Reassembly".



**SERVICE POINTS OF DISASSEMBLY**

N06NBAA

**1. REMOVAL OF PISTON STOP RING**

Remove the piston stop ring.

**3. REMOVAL OF PISTON ASSEMBLY**

Pull out the piston assembly.

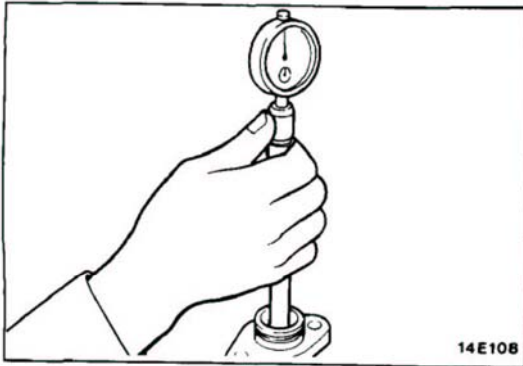
**Caution**

- 1. Do not damage the master cylinder body and piston assembly.**
- 2. Do not disassemble piston assembly.**

**INSPECTION**

N06NCAB

- Check the inside cylinder body for rust or scars.
- Check the piston cup for wear or deformation.
- Check the piston for rust or scars.



### CLEARANCE BETWEEN MASTER CYLINDER INNER DIAMETER AND PISTON OUTER DIAMETER

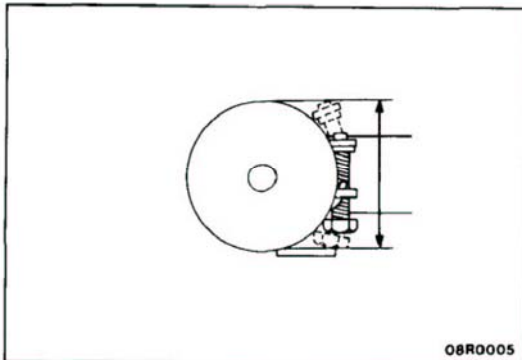
- (1) Measure the master cylinder inside diameter and the piston outside diameter with a cylinder gauge and a micrometer.

**Limit : 0.15 mm (.0059 in.)**

#### NOTE

Measure the inside diameter of the master cylinder at three-places (bottom, middle, and top), each in two perpendicular directions.

- (2) If master cylinder-to-piston clearance exceeds the limit, replace the master cylinder and/or piston assembly.

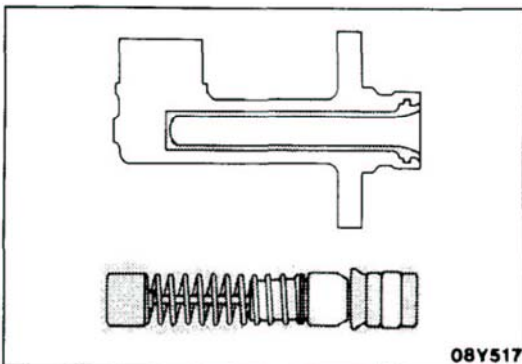


### SERVICE POINTS OF REASSEMBLY

N06NDAG

#### 6. INSTALLATION OF RESERVOIR BAND

After installing the reservoir, tighten the reservoir band in the range shown in the figure.



#### 3. APPLICATION OF CLUTCH FLUID TO PISTON ASSEMBLY

Apply specified clutch fluid to the inner surface of the cylinder and to the entire periphery of the piston assembly.

**Specified clutch fluid : DOT 3**

## CLUTCH RELEASE CYLINDER

## REMOVAL AND INSTALLATION

N06HA--

**Pre-removal Operation**

- Draining of Clutch Fluid

**Post-installation Operation**

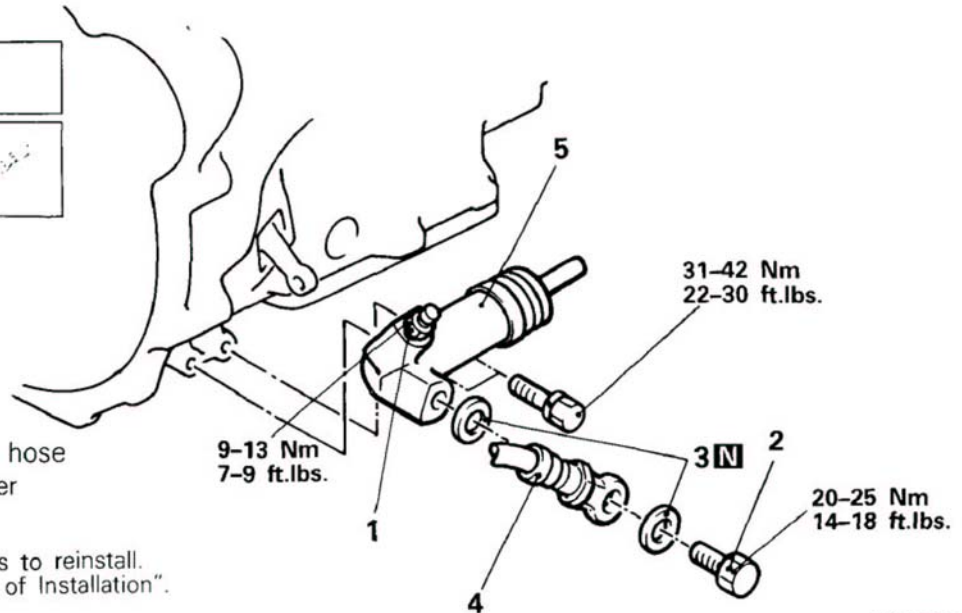
- Supplying Clutch Fluid
- Bleeding (Refer to P.6-6.)

**Removal steps**

1. Bleeder screw
2. Eye bolt
3. Gasket
- ◆◆ 4. Connection of clutch hose
- ◆◆ 5. Clutch release cylinder

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Installation".
- (3) **N** : Non-reusable parts

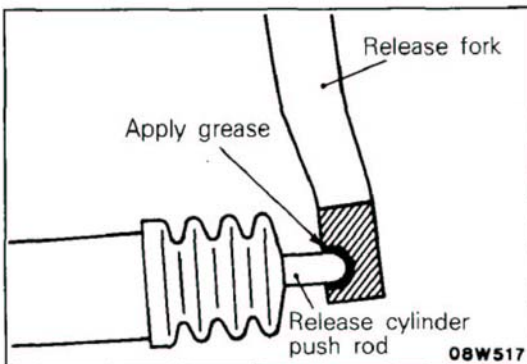


08W520

**INSPECTION**

N06HCAA

- Check the clutch release cylinder for fluid leakage.
- Check the clutch release cylinder boots for damage.

**SERVICE POINTS OF INSTALLATION**

N06HDAE

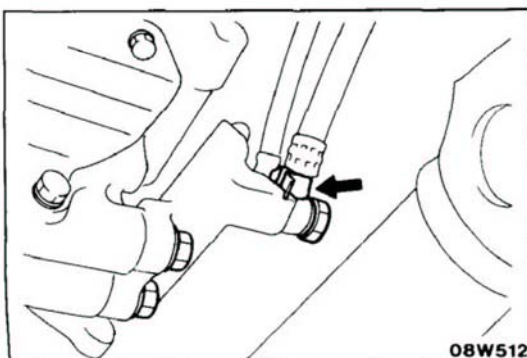
**5. APPLICATION OF GREASE TO CLUTCH RELEASE CYLINDER**

Apply a coating of the specified grease to the contact parts of the release fork and release cylinder push rod.

**Specified Grease : MITSUBISHI Genuine Grease Part No. 0101011**

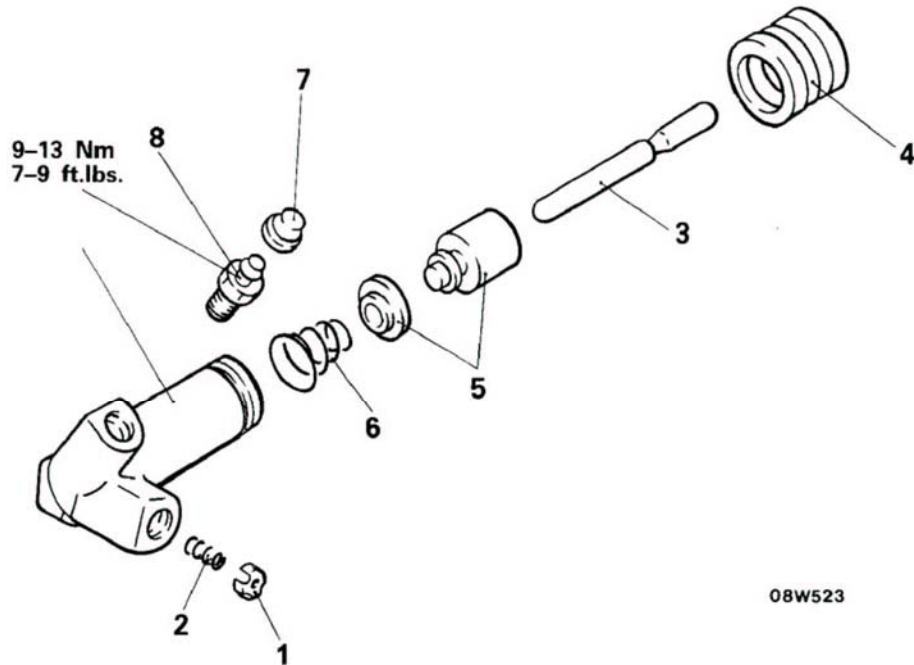
**4. CONNECTION OF CLUTCH HOSE**

- (1) Connect the clutch hose to the release cylinder at the stepped portion shown in the illustration.
- (2) After tightening the eye bolt, check to be sure there is no leakage of the clutch fluid.



DISASSEMBLY AND REASSEMBLY

N06LA--



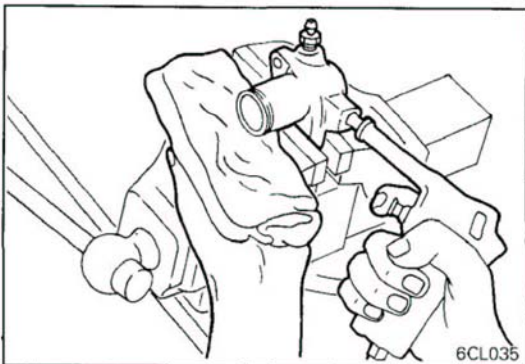
Disassembly steps

1. Valve plate
2. Spring
3. Push rod
4. Boots
- ↔ ↔ ↔ 5. Piston and cup
6. Conical spring
7. Cap
8. Bleeder plug
9. Release cylinder

08W523

NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2) ↔ ↔ ↔ : Refer to "Service Points of Disassembly".
- (3) ↔ ↔ : Refer to "Service Points of Reassembly".



SERVICE POINTS OF DISASSEMBLY

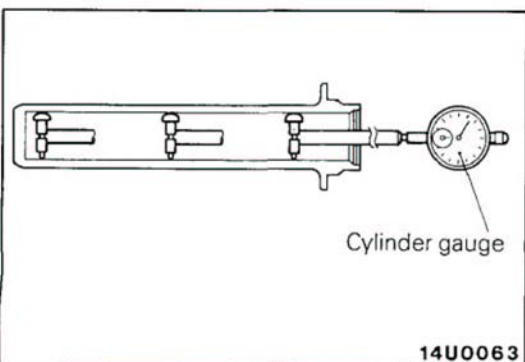
N06LBAA

5. REMOVAL OF PISTON AND CUP

Remove the piston from the release cylinder using compressed air.

Caution

1. Cover with rags to prevent the piston from popping out.
2. Apply compressed air slowly to prevent brake fluid from splashing.



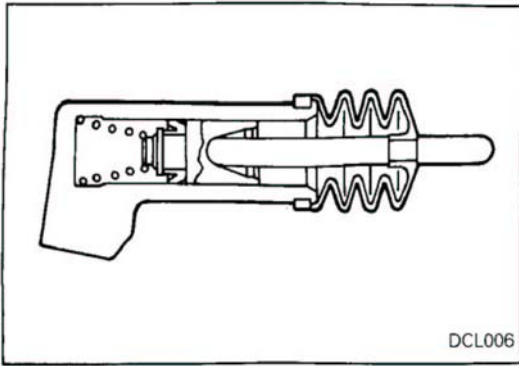
INSPECTION

N06LCAA

- Check the release cylinder bore for rust and damage.
- Measure the release cylinder bore at three locations (bottom, middle and top) with a cylinder gauge and replace the release cylinder assembly if the clearance to the piston outside exceeds the limit.

Limit : 0.15 mm (.006 in.)

## 6-14 CLUTCH – Clutch Release Cylinder / Clutch Disc and Release Fork



### SERVICE POINTS OF REASSEMBLY

N06LDAB

#### 5. APPLICATION OF FLUID TO PISTON AND CUP

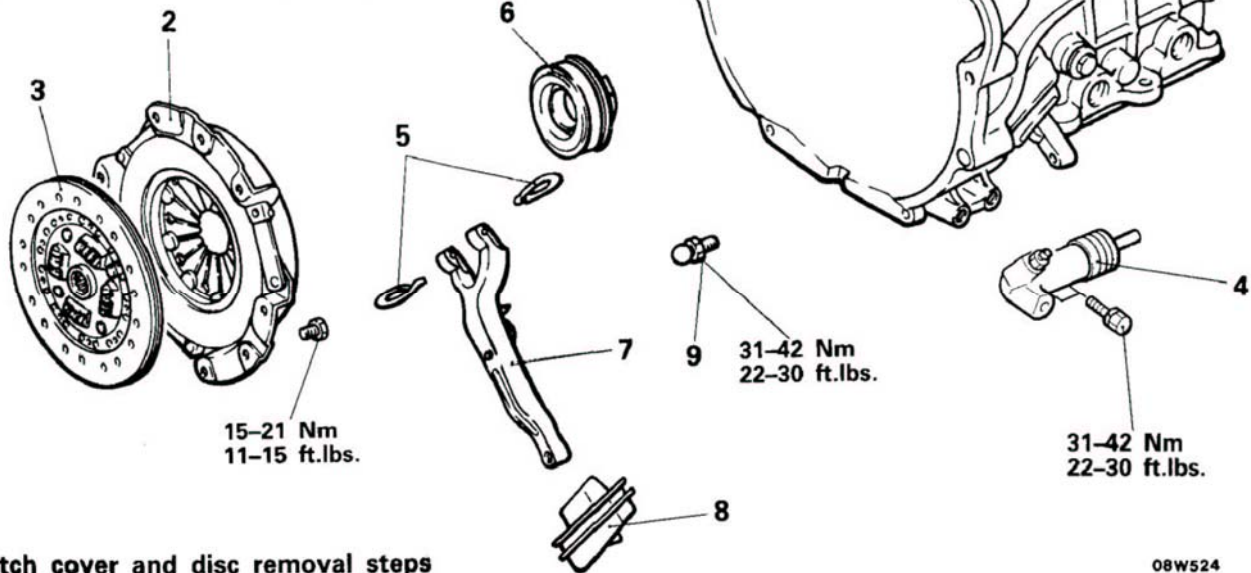
After applying a coating of the specified brake fluid to the inner surface of the release cylinder body and to the entire circumference of the piston and cup, insert the piston and cup into the release cylinder.

**Specified brake fluid : DOT 3**

### CLUTCH DISC AND RELEASE FORK REMOVAL AND INSTALLATION

#### Post-installation Operation

- Adjustment of Clutch Pedal (Refer to P.6-6.)



#### Clutch cover and disc removal steps

- ◄◄ ◆◆ 1. Transmission case assembly
- ◄◄ ◆◆ 2. Clutch cover assembly
- ◆◆ 3. Clutch disc

#### Clutch release bearing and release fork removal steps

- ◄◄ ◆◆ 1. Transmission case assembly
- ◆◆ 4. Clutch release cylinder
- ◆◆ 5. Return clip

- ◆◆ 6. Clutch release bearing
- ◄◄ ◆◆ 7. Release fork
- 8. Release fork boot
- 9. Fulcrum

#### NOTE

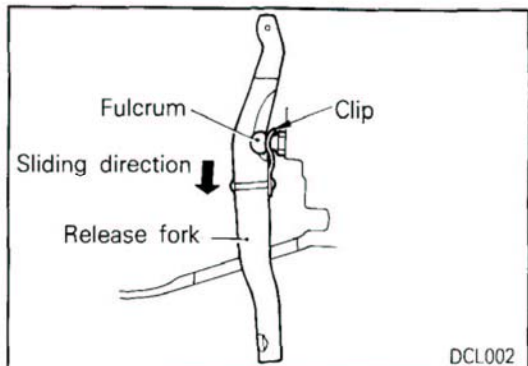
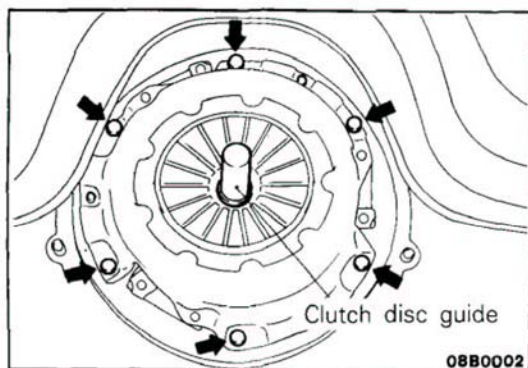
- (1) Reverse the removal procedures to reinstall.
- (2) ◄◄ : Refer to "Service Points of Removal."
- (3) ◆◆ : Refer to "Service Points of Installation."

### SERVICE POINTS OF REMOVAL

N06QBAB

#### 1. REMOVAL OF TRANSMISSION CASE ASSEMBLY

Refer to GROUP 21 TRANSMISSION – Transmission case Assembly.



## 2. REMOVAL OF CLUTCH COVER ASSEMBLY

- (1) Insert clutch disc guide, or main drive gear of transmission in center spline to prevent dropping of clutch disc.
- (2) Diagonally loosen bolts retaining clutch cover to flywheel.

Back off bolts, one or two turns at a time, in succession, to avoid bending cover flange.

### Caution

**DO NOT** clean clutch disc or release bearing with cleaning solvent.

## 7. REMOVAL OF RELEASE FORK

Slide release fork in direction of arrow to disengage fulcrum from clip.

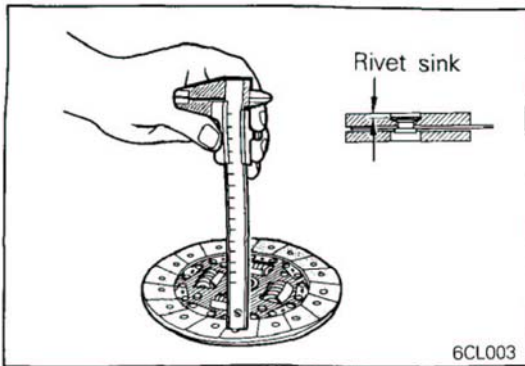
### Caution

**Attempting to remove release fork by sliding it in other direction will result in damage to clip.**

## CLEANING AND INSPECTION

N06QCAB

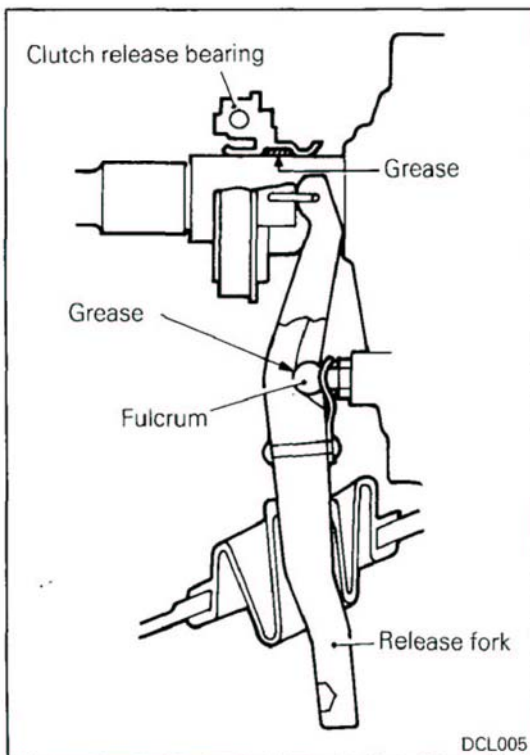
- Clean clutch dust from clutch housing with vacuum brush or shop towel. Do not use compressed air. Inspect for oil leakage through engine rear main bearing oil seal and transmission front oil seal. If leakage is noted, it should be corrected at this time.
- Friction face of pressure plate should have a uniform appearance throughout entire disc contact area. If there is evidence of heavy contact on one portion of wear circle and a very light contact 180 degrees from that portion, pressure plate may be improperly mounted or sprung.
- Friction face of flywheel should also be free from excessive discoloration, burned areas, small cracks, deep grooves, or ridges.
- Wipe friction surface of pressure plate with a cleaning solvent.
- Using a straight edge, check pressure plate for flatness. The pressure plate friction area should be flat within 0.5 mm (.020 in.) and free from discoloration, burned area, cracks, grooves or ridges.
- Visually inspect the cover outer mounting flange for flatness. It should be free of nicks, burrs, dents or other damage.
- The three dowels on the flywheel should be tight and undamaged. The cover stamping should be a snug fit on the dowels.
- If the clutch assembly does not meet these requirements, it should be replaced.

**CLUTCH DISC**

- (1) The disc assembly should be handled without touching facings. Replace disc if facings show evidence of grease or oil soakage.
- (2) Use the caliper gauge to measure the dimension from the facing surface to the rivet head.

**Limit : 0.3 mm (.012 in.)**

- (3) If the measured value is below the limit, replace the clutch disc.
- (4) The hub splines and splines on transmission input shaft should be a snug fit without signs of excessive wear.
- (5) Metallic portions of disc assembly should be dry and clean and show no evidence of having been hot. Each of the arched springs between facings should be unbroken and all rivets should be tight.

**SERVICE POINTS OF INSTALLATION**

N06QDAC

**7. APPLICATION OF GREASE TO RELEASE FORK**

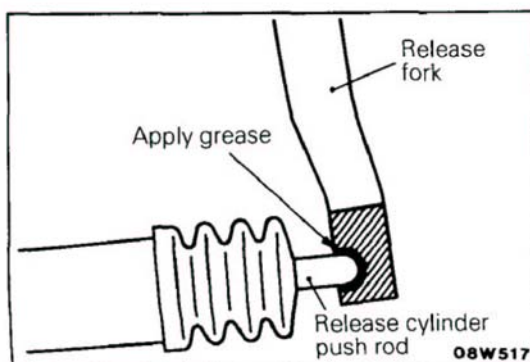
Pack the release fork fulcrum hole with specified grease.

**Specified grease : MITSUBISHI Genuine Grease Part No. 0101011**

**6. APPLICATION OF GREASE TO CLUTCH RELEASE BEARING**

Pack specified grease in groove on clutch release bearing I.D.

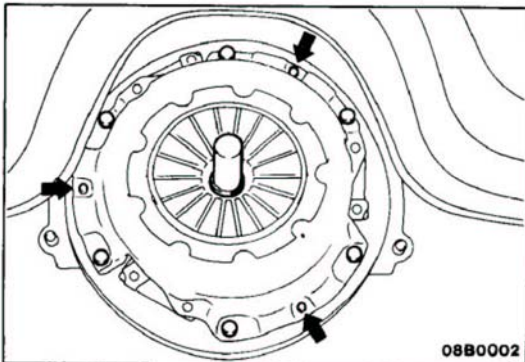
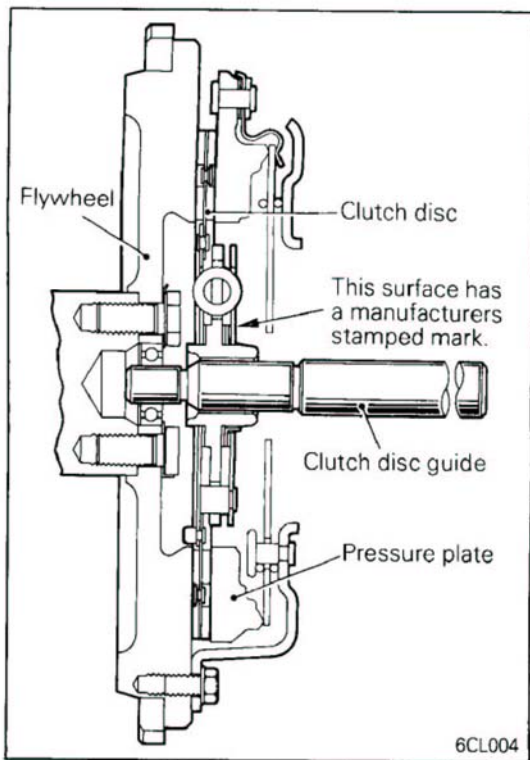
**Specified grease : MITSUBISHI Genuine Grease Part No. 0101011 or equivalent**

**4. APPLICATION OF GREASE TO CLUTCH RELEASE CYLINDER**

Apply specified grease to release fork to release cylinder push rod contacting surfaces.

**Specified grease : MITSUBISHI Genuine Grease Part No. 0101011**





### 3. INSTALLATION OF CLUTCH DISC/2. CLUTCH COVER ASSEMBLY

- (1) If there are oils or greases on clutch facing and pressure plate, thoroughly wipe away with a dry cloth.
- (2) Lightly specified grease clutch disc spline.

**Specified grease : MITSUBISHI Genuine Grease Part No. 0101011**

- (3) Using clutch disc guide, or main drive gear of transmission, install clutch disc and clutch cover assembly on flywheel.
- (4) When installing clutch disc, be sure that surface having manufacturers stamped mark is on pressure plate side.

- (5) When installing the clutch cover assembly, align the clutch cover assembly's dowel pin hole and the flywheel's dowel pin, and then gradually tighten the bolts alternately.

### 1. INSTALLATION OF TRANSMISSION CASE ASSEMBLY

Refer to GROUP 21 TRANSMISSION–Transmission case Assembly.

# COOLING

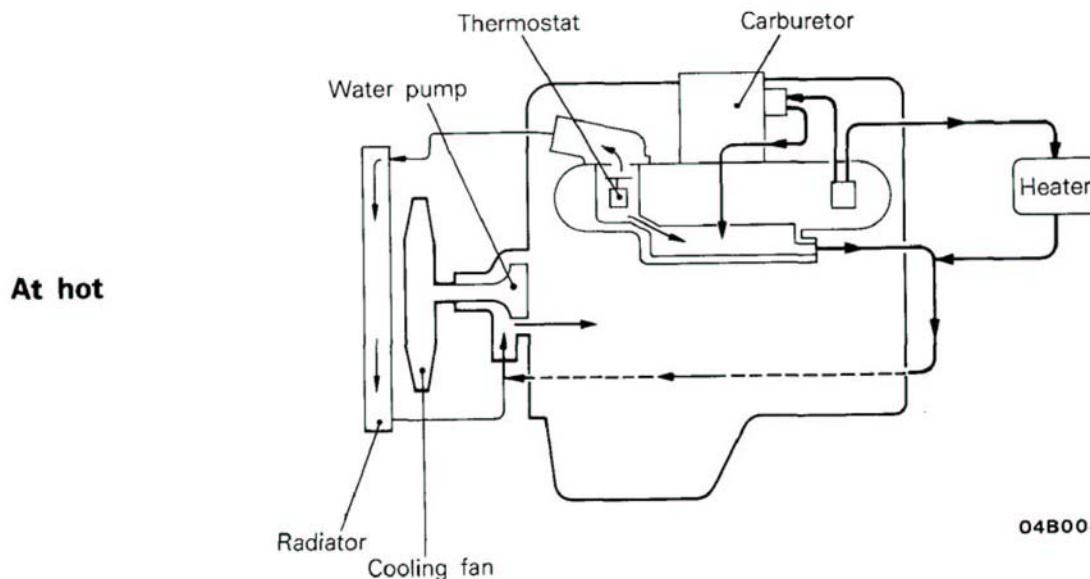
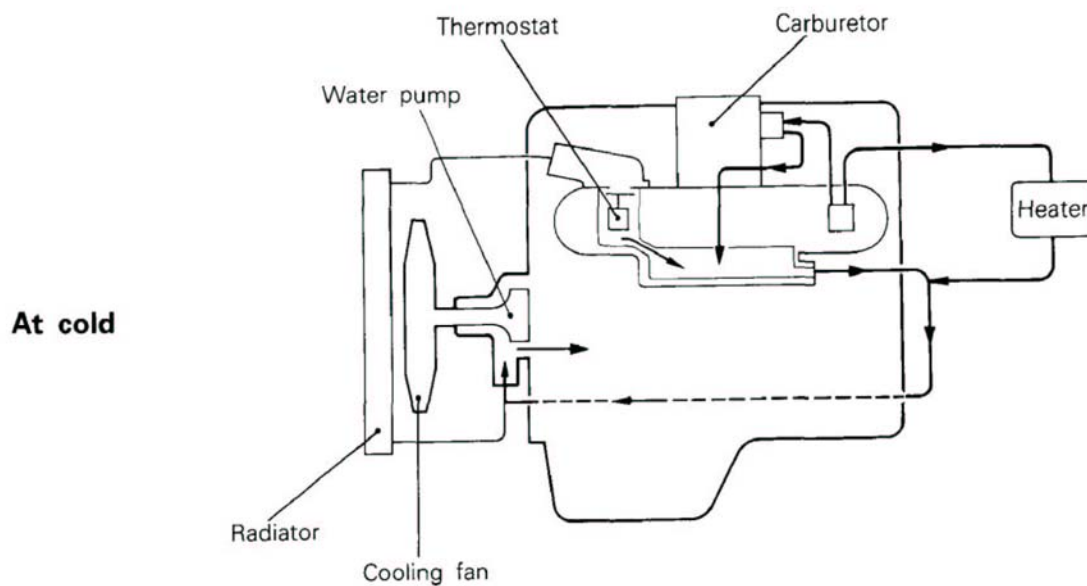
## CONTENTS

N07AA--

<b>COOLING FAN</b> .....	<b>9</b>	<b>SPECIFICATIONS</b> .....	<b>3</b>
<b>GENERAL INFORMATION</b> .....	<b>2</b>	General Specifications .....	3
<b>RADIATOR</b> .....	<b>8</b>	Lubricants .....	4
<b>SERVICE ADJUSTMENT PROCEDURES</b> .....	<b>6</b>	Sealants .....	4
Coolant Concentration Test .....	6	Service Specifications .....	3
Coolant Leak Check .....	6	Torque Specifications .....	4
Coolant Replacement .....	6	<b>THERMOSTAT</b> .....	<b>10</b>
Drive Belt Deflection Adjustment .....	7	<b>TROUBLESHOOTING</b> .....	<b>5</b>
Drive Belt Deflection Checking Procedure .....	6	No Rise in Temperature	
Radiator Cap Pressure Test .....	6	Overheat	
<b>SPECIAL TOOL</b> .....	<b>5</b>	<b>WATER HOSE AND PIPE</b> .....	<b>15</b>
		<b>WATER PUMP</b> .....	<b>12</b>
		<b>WATER TEMPERATURE GAUGE UNIT</b> .....	<b>17</b>

## GENERAL INFORMATION

The cooling system is a water cooling type and the coolant is forcibly circulated by the water pump. The temperature control of the coolant is conducted by the thermostat installed in the intake manifold. Immediately after engine starting, the coolant does not flow into the radiator until the coolant temperature reaches the thermostat valve opening temperature. The coolant circulates in the engine and it is promptly warmed up to the proper temperature, and at the same time, the temperature of the coolant in the cylinder block and cylinder head is made uniform. When the coolant temperature rises and the thermostat valve opens, the coolant flows into the radiator. The coolant cooled by the radiator is pumped up and pressurized by the water pump and delivered to the cylinders and cools the engine. Also, the cooling fan is installed at the water pump pulley and reduces the coolant temperature in proportion to the engine revolution. Furthermore, between the fan and pulley, the fan clutch is installed, which reduces the engine output loss and noise.



04B0047

**SPECIFICATIONS**

**GENERAL SPECIFICATIONS**

N07CA--

Items	Specifications
Cooling method	Water-cooled, pressurized, forced circulation
Radiator	
Type	Pressurized corrugated fin type
Performance   kJ/h (kcal/h, B.T.U./h)	
Vehicles with a manual transmission	182,512 (43,600, 173,016)
Vehicles with an automatic transmission	187,326 (44,750, 177,579)
Fan clutch	
Type	Thermostatic control type with spiral type bimetal
Water pump	
Type	Impeller of centrifugal type
Thermostat	
Type	Wax pellet type with jiggle valve
Identification mark	88 (Stamped on flange)
Drive belt	
Type	V-belt
Water temperature gauge unit	
Type	Thermistor type
Thermoswitch for automatic transmission	
Type	Thermo-ferrite type
Water temperature sensor	
Type	Thermistor type
Thermoswitch for air conditioner	
Type	Heat-sensitive thermistor type

**SERVICE SPECIFICATIONS**

N07CB--

Items	Specifications
Standard value	
Opening pressure of radiator cap high pressure valve   kPa (psi)	75–105 (11–15)
Range of concentration of anti-freeze in coolant   %	30–60
Alternator drive belt deflection   mm (in.)	9–12 (.35–.47)
Thermostat valve opening temperature   °C (°F)	88 (190)
Thermostat full-opening temperature   °C (°F)	100 (212) or more
Limit	
Opening pressure of radiator cap high pressure valve   kPa (psi)	65 (9.2)

## TORQUE SPECIFICATIONS

N07CC--

Items	Nm	ft.lbs.
Alternator brace bolt	12-15	9-11
Alternator support nut	20-22	14-16
Radiator		
Radiator shroud to radiator	3-7	2-5
Radiator to headlight support	8-11	6-8
Cooling fan to fan clutch	10-12	7-9
Fan clutch to water pump pulley	8-10	6-7
Water outlet fitting attaching bolt	10-13	7-9
Air cleaner attaching nut	16-19	12-14
Air pipe assembly to reed valve bracket	10-13	7-9
Air pipe assembly flare nut	70-100	51-72
Exhaust manifold cover	12-15	9-11
Exhaust manifold attaching nut	15-20	11-14
Exhaust manifold to exhaust pipe	20-30	14-22
Water pipe attaching bolt	10-12	7-9
Thermoswitch	6-9	4-7
Water temperature switch	10-14	7-10
Water temperature sensor	20-40	14-29
Water temperature gauge unit	8-10	6-7

## LUBRICANTS

N07CD--

lit. (U.S.qts., Imp.qts.)

Items	Recommended antifreeze	*Quantity
Engine coolant	DIA QUEEN LONG-LIFE COOLANT (Part No. 0103044) or HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT	8.0 (8.5, 7.0)

NOTE : \* Includes 0.65 lit. (0.69 U.S.qts., 0.57 Imp.qts.) in reserve tank

## SEALANTS AND ADHESIVES


N07CE--

Items	Specified sealants and adhesive	Quantity
Water temperature gauge unit	3M ART Part No. 8660 or equivalent	As required
Water temperature sensor	3M Adhesive Nut locking 4171 or equivalent	As required
Water temperature switch	3M ART Part No. 8660 or equivalent	As required
Thermo switch	3M Adhesive Nut Locking 4171 or equivalent	As required

**SPECIAL TOOL**

N07DA--

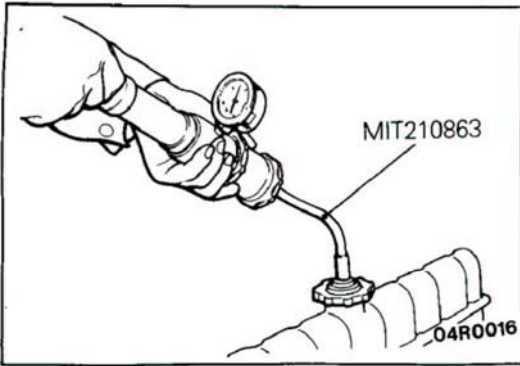
Tool (Number and name)	Use
MIT210863 Radiator cap test adapter	Radiator cap test



**TROUBLESHOOTING**

N07EBAA

Symptom	Probable cause	Remedy	Reference page
Overheat	Improper coolant	Replenish	7-6
	Coolant concentration too thick	Correct	7-6
	Loose or broken drive belt	Replace	7-6
	Inoperative fan clutch	Replace	7-9
	Damaged or blocked (insufficiently ventilated) radiator fins	Correct	–
	Water leaks		
	Damaged radiator core joint	Replace	7-8
	Corroded or cracked hoses (radiator hose, heater hose, etc.)	Replace	7-8, 15
	Loose bolt or faulty gasket in water outlet fitting (thermostat)	Correct or replace	7-10
	Loose water pump mounting bolt or faulty gasket	Correct or replace	7-12
	Faulty radiator cap valve or setting of spring	Replace	7-6
	Loose cylinder head bolt	Correct	9-39
	Damaged cylinder head gasket	Replace	9-17
	Cracked cylinder block	Replace	9-64
Cracked cylinder head	Replace	9-39	
	Faulty thermostat operation	Replace	7-10
	Faulty water pump operation	Replace	7-12
	Water passage clogged with slime or rust deposit or foreign substance	Clean	–
No rise in temperature	Faulty thermostat	Replace	7-10



## SERVICE ADJUSTMENT PROCEDURES

### COOLANT LEAK CHECK

N07FAAD

1. Loosen radiator cap.
2. Confirm that the coolant level is up to the filler neck.
3. Using a special tool, install a radiator cap tester to the radiator filler neck and apply 160 kPa (23 psi) pressure. Hold for two minutes in that condition, while checking for leakage from the radiator, hose or connections.

#### Caution

Be sure to completely clean away any moisture from the places checked. When the tester is removed, be careful not to spill any coolant from it. Be careful, when installing and removing the tester and when testing, not to deform the filler neck of the radiator.

4. If there is leakage, repair or replace the appropriate part.

### RADIATOR CAP PRESSURE TEST

N07FBAC

1. Use a special tool to attach the cap to the tester.
2. Increase the pressure until the indicator of the gauge stops moving.

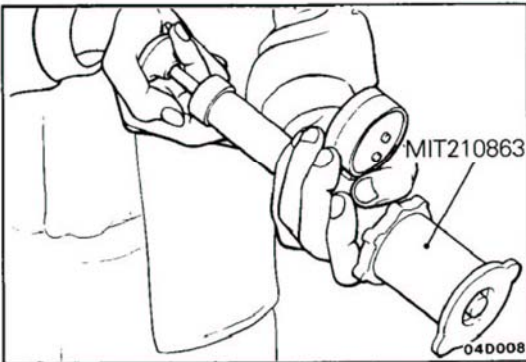
**Standard value : 75–105 kPa (11–15 psi)**

**Limit : 65 kPa (9.2 psi)**

3. Replace the radiator cap if the reading does not remain at or above the limit.

#### NOTE

Be sure that the cap is clean before testing, since rust or other foreign material on the cap seal will cause an improper indication.



### COOLANT REPLACEMENT

N07FCAA

Refer to GROUP 0 LUBRICATION AND MAINTENANCE – Maintenance Service.

### COOLANT CONCENTRATION TEST

N07FDAC

Refer to GROUP 0 LUBRICATION AND MAINTENANCE – Maintenance Service.

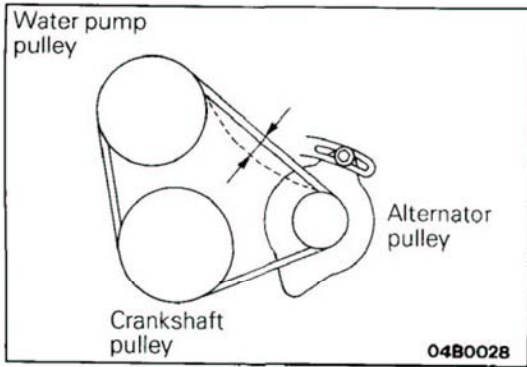
### DRIVE BELT DEFLECTION CHECKING PROCEDURE

N07FEAE

1. Check to be sure that the belt is correctly installed in the groove of the pulley.

#### Caution

If there is belt squeal or slippage, check the amount of deflection, check for wear, damage or deterioration at the surface of contact with the pulley, and check for scars on the pulley.

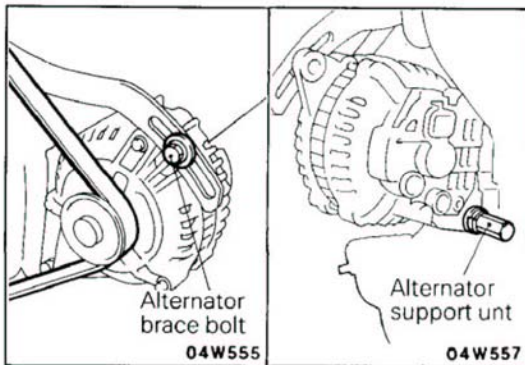


2. Apply a pressure of 100 N (22 lbs.) to the rear surface of the belt at the center between the pulleys, as shown in the figure, and then measure the amount of deflection.

**Standard value : 9–12 mm (.35–.47 in.)**

**Caution**

- Measure the amount of belt deflection between the designated pulleys.
- An overtensioned belt could cause not only premature belt wear but also noise and damage to water pump bearing and alternator bearing. A loose belt also could cause failure of the alternator to generate enough power and consequently a rundown battery.

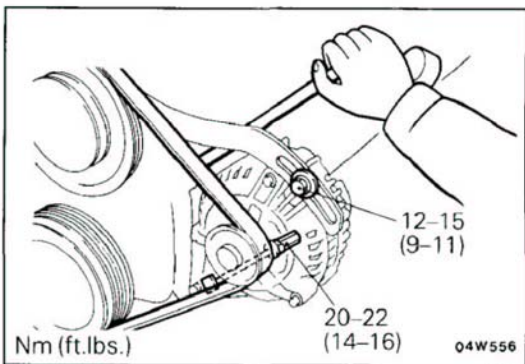


**DRIVE BELT DEFLECTION ADJUSTMENT**

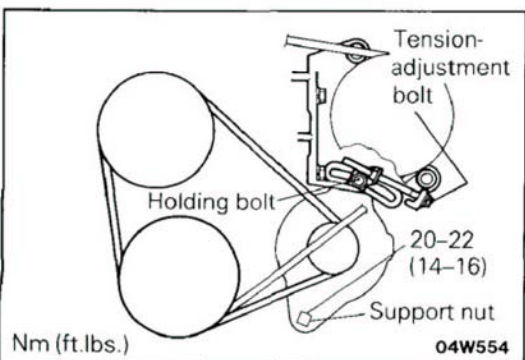
N07FFAD

**Vehicles without an air conditioner**

1. Loosen the alternator brace bolt and the alternator support nut.



2. Place a bar or similar object in contact with the stator part of the alternator, and manually provide the suitable tension to adjust the amount of belt deflection.
3. Tighten the alternator brace bolt and the alternator support nut to the specified torque.



**Vehicles with an air conditioner**

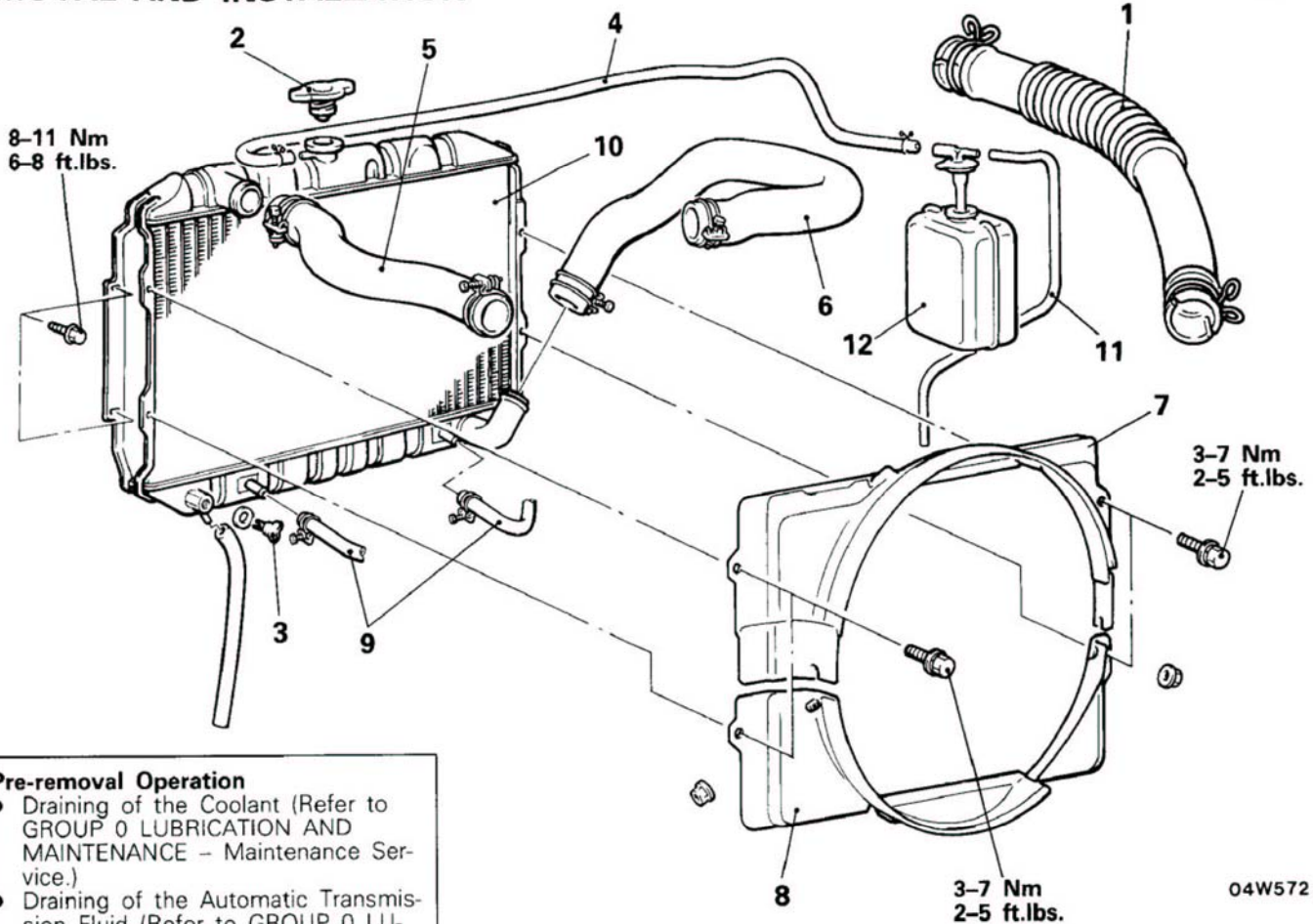
1. Loosen the alternator support nut and the bolt holding the alternator.
2. Adjust the amount of deflection of the belt by using the tension-adjustment bolt.
3. Tighten the alternator support nut and the bolt holding the alternator.



## RADIATOR

## REMOVAL AND INSTALLATION

N07QA--

**Pre-removal Operation**

- Draining of the Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE - Maintenance Service.)
- Draining of the Automatic Transmission Fluid (Refer to GROUP 0 LUBRICATION AND MAINTENANCE - Maintenance Service.)

**Post-installation Operation**

- Supplying of the Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE - Maintenance Service.)
- Supplying of the Automatic Transmission Fluid (Refer to GROUP 0 LUBRICATION AND MAINTENANCE - Maintenance Service.)

**Radiator removal steps**

1. Air duct
2. Radiator cap
3. Drain plug

4. Connection of overflow hose
5. Radiator upper hose
6. Radiator lower hose
7. Radiator upper shroud
8. Radiator lower shroud
9. Connection of automatic oil cooler hoses (Vehicles with an automatic transmission)
10. Radiator

**Reserve tank removal steps**

4. Connection of overflow hose
11. Overflow tube
12. Reserve tank

**NOTE**

Reverse the removal procedures to reinstall.

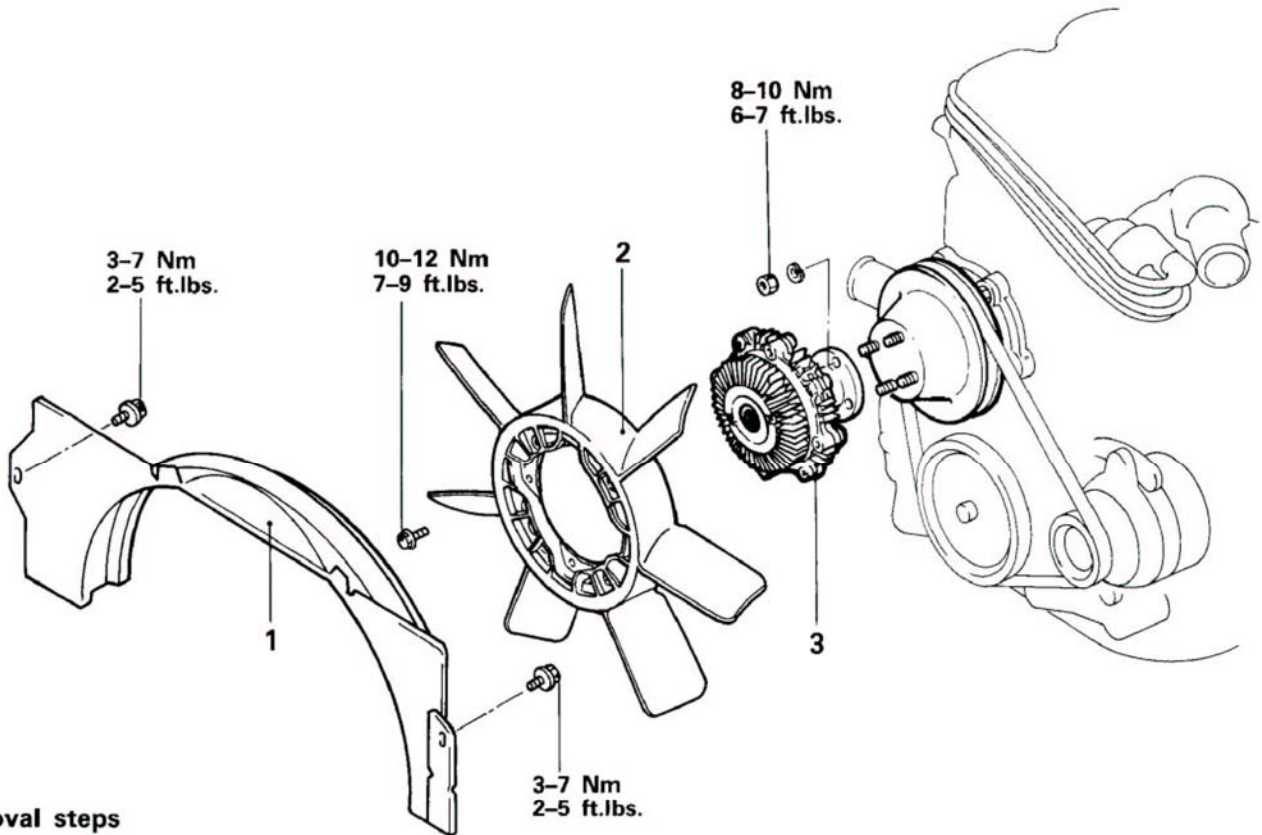
## INSPECTION

N07Q CAB

- Check for foreign material between radiator fins.
- Check the radiator fins for bend or damage.
- Check the radiator for corrosion, damage, rust or scale.
- Check the radiator hoses for cracks, damage or deterioration.
- Check the reserve tank for damage.
- Check the spring of radiator cap for deterioration.
- Check the packing of radiator cap for damage or cracks.

**COOLING FAN  
REMOVAL AND INSTALLATION**

N07HA--

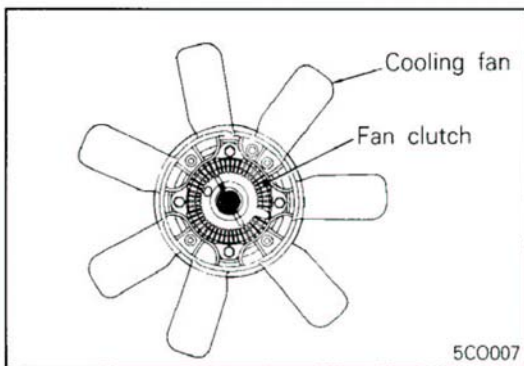


**Removal steps**

1. Radiator upper shroud
2. Cooling fan
3. Fan clutch

**NOTE**  
Reverse the removal procedures to reinstall.

04B0024



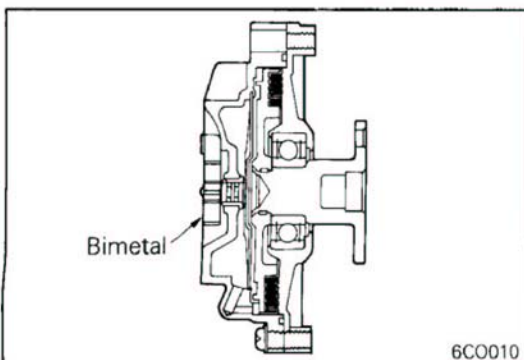
5C0007

**INSPECTION**

N07HCAA

**COOLING FAN**

- Check blades for damage and cracks.
- Check bolt holes or their vicinity in fan hub for cracks and damage.



6C0010

**FAN CLUTCH**

- Check fan clutch for fluid leaks from case joint and seals. If fluid quantity decreases due to leakage, fan speed will decrease and engine overheating might result.
- When a fan attached to an engine is turned by hand, it should give a sense of some resistance. If fan turns lightly, it is faulty.
- Check bimetal strip for damage.

# THERMOSTAT

## REMOVAL AND INSTALLATION

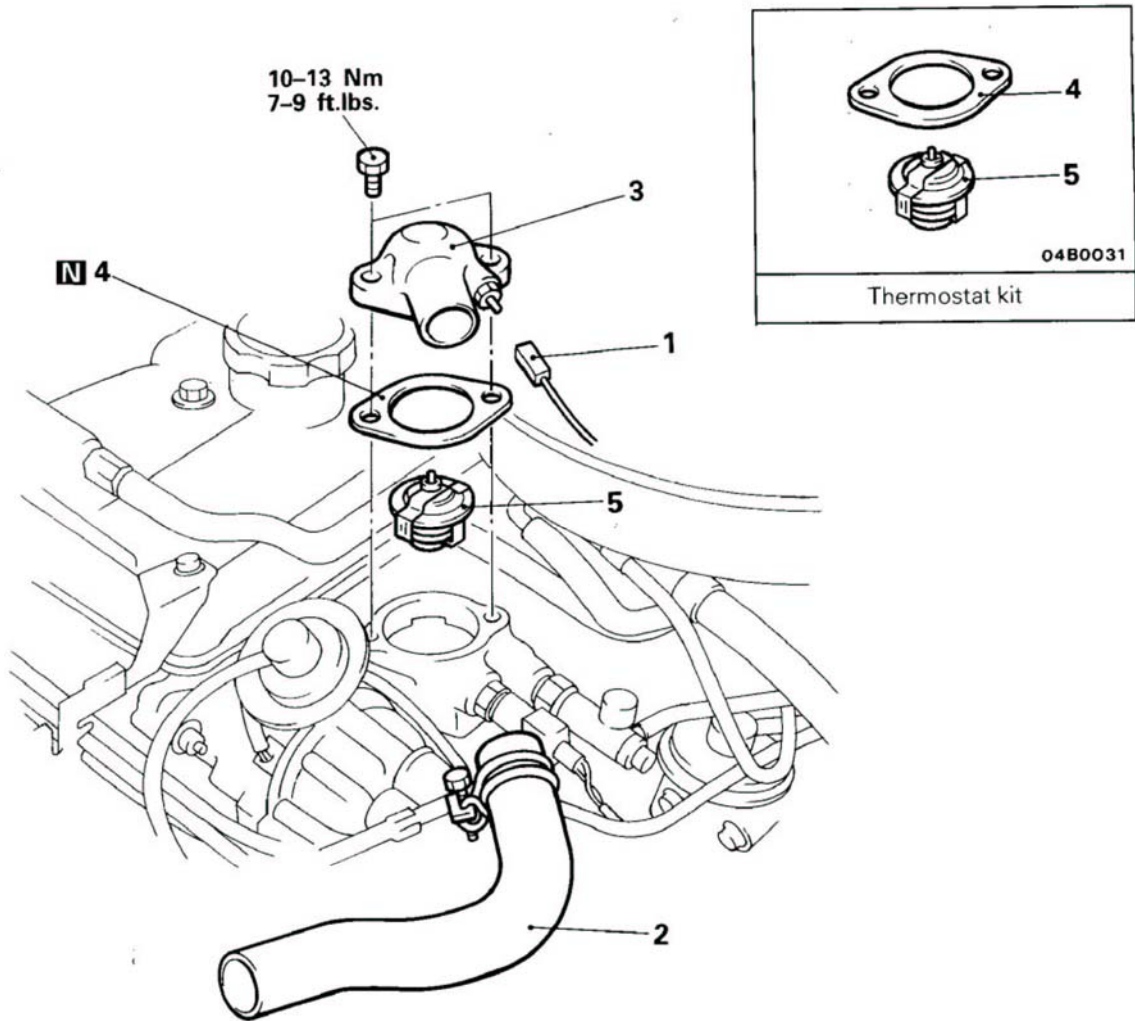
N07GB--

### Pre-removal Operation

- Draining of the Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE - Maintenance Service.)

### Post-installation Operation

- Supplying of the Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE - Maintenance Service.)



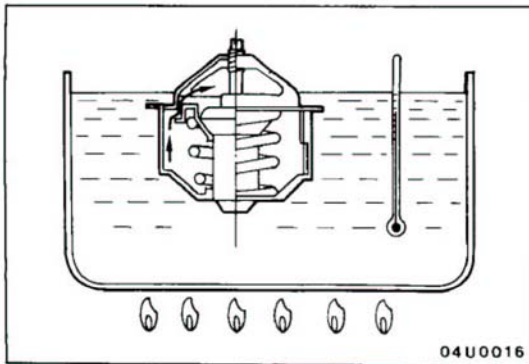
04B0030

### Removal steps

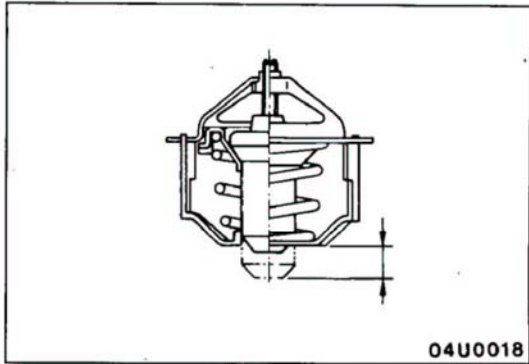
1. Connection of water temperature switch connector (Vehicles with an air conditioner)
2. Connection of radiator upper hose
3. Water outlet fitting
4. Water outlet fitting gasket
- ◆◆ 5. Thermostat

### NOTE

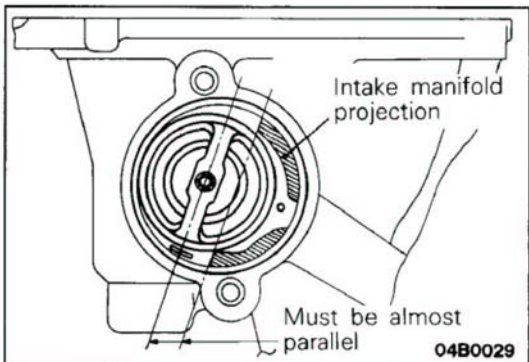
- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Installation"
- (3) **N** : Non-reusable parts



04U0016



04U0018



04B0029

**INSPECTION**

N07GDAC

1. If the valve opens at all at room temperature the part should be replaced.
2. An obviously malformed part or one with cracks or damage should be replaced.
3. Clean off any rust or encrustation on the valve.
4. Immerse the thermostat in a container filled with water. Raise the temperature of the water while stirring it checking to ensure that the temperatures at which the valve begins to open, and at which it is fully open [(the fully opened valve should be raised at least 8 mm (.31 in.))] are within the specified values.

**Standard values :**

<b>Opening temperature</b>	<b>88°C (190°F)</b>
<b>Fully open</b>	<b>100°C (212°F) or more</b>

**NOTE**

The height of the valve when fully opened should be calculated by first measuring its height when fully closed and determining the difference.

**SERVICE POINTS OF INSTALLATION**

N07GEAA

**5. INSTALLATION OF THERMOSTAT**

Install the thermostat to the intake manifold as illustrated.

**Caution**

The thermostat flange fits over the manifold seat; ensure that the thermostat is not installed at an angle.

## WATER PUMP

## REMOVAL AND INSTALLATION

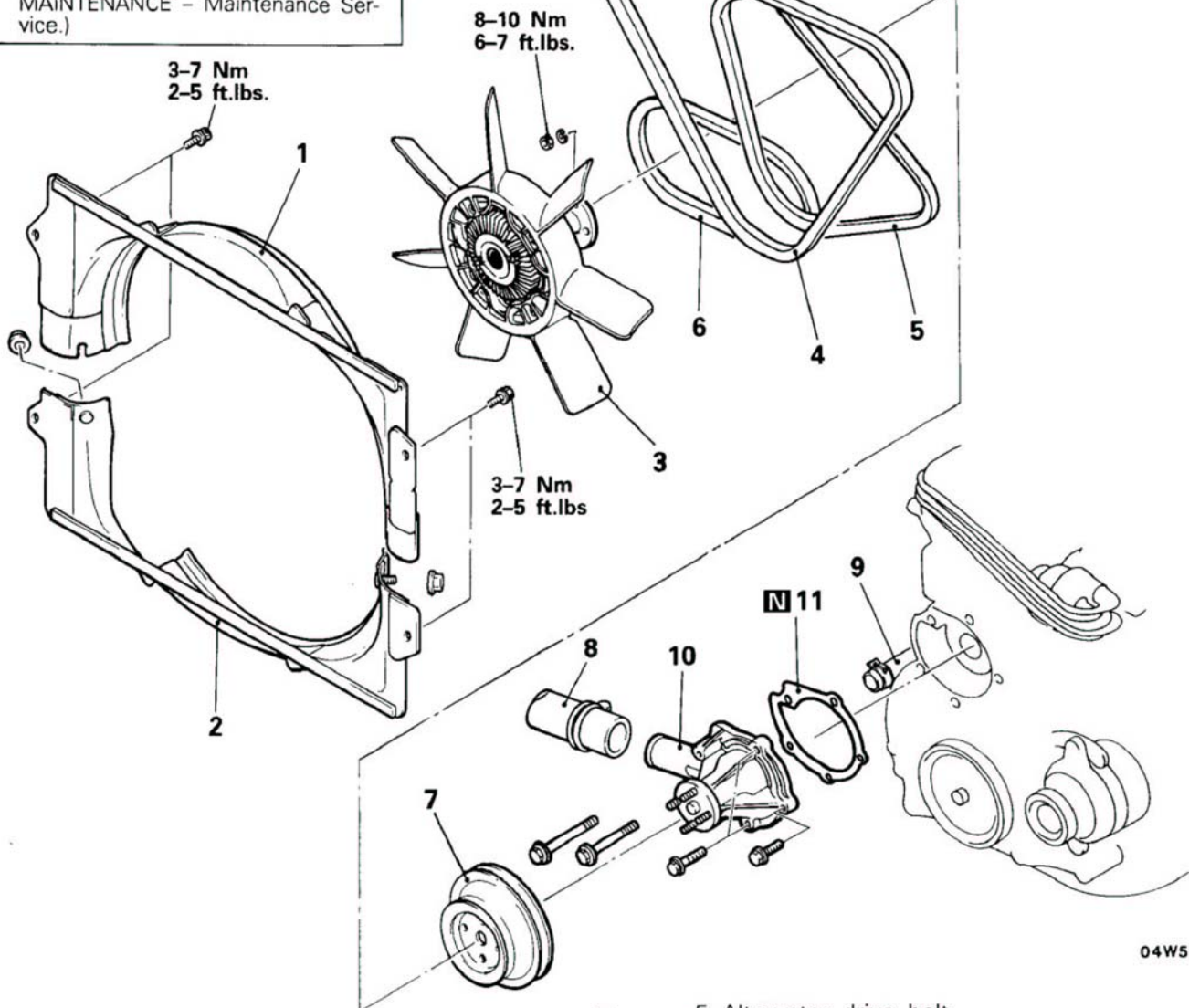
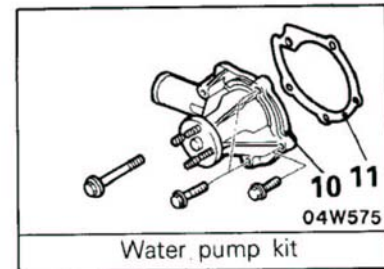
N07MB-

**Pre-removal Operation**

- Draining of the Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE – Maintenance Service.)

**Post-installation Operation**

- Supplying of the Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE – Maintenance Service.)



04W574

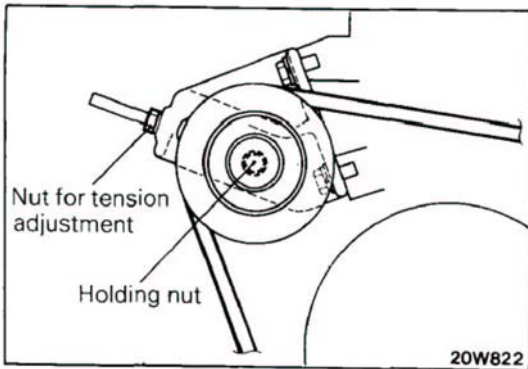
**Removal steps**

1. Radiator upper shroud
2. Radiator lower shroud
3. Cooling fan clutch assembly
- ◆◆ Adjustment of air conditioner compressor drive belt deflection
- ◆◆ 4. Air conditioner compressor drive belt (Vehicles with an air conditioner)
- ◆◆ Adjustment of alternator drive belt deflection

- ◆◆ 5. Alternator drive belt
- ◆◆ Adjustment of power steering oil pump drive belt deflection
- ◆◆ 6. Power steering oil pump drive belt
7. Water pump pulley
8. Connection of radiator lower hose
9. Connection of heater hose
- ◆◆ 10. Water pump
11. Water pump gasket

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆ : Refer to "Service Points of Installation".
- (4) [N] : Non-reusable parts

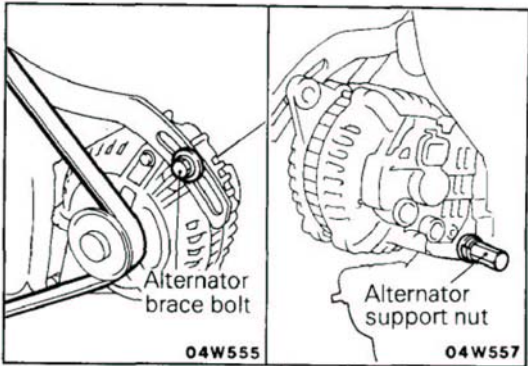


**SERVICE POINTS OF REMOVAL**

N07MCAC

**4. REMOVAL OF AIR CONDITIONER COMPRESSOR DRIVE BELT**

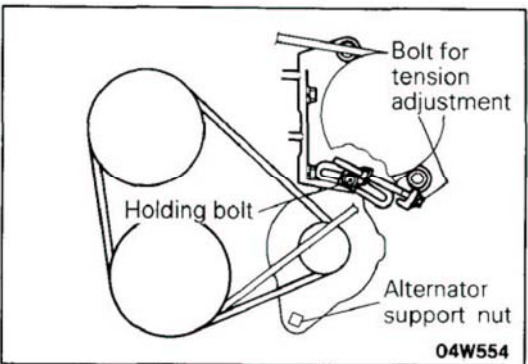
- (1) Loosen the nut holding the tension pulley.
- (2) Loosen the nut for tension adjustment, and then remove the drive belt.



**5. REMOVAL OF ALTERNATOR DRIVE BELT**

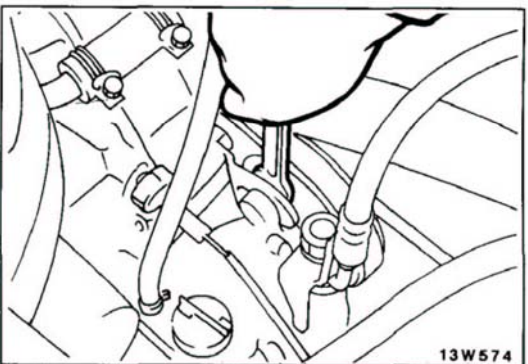
**Vehicles without an air conditioner**

Loosen the alternator brace bolt and the alternator support nut, and then remove the alternator drive belt.



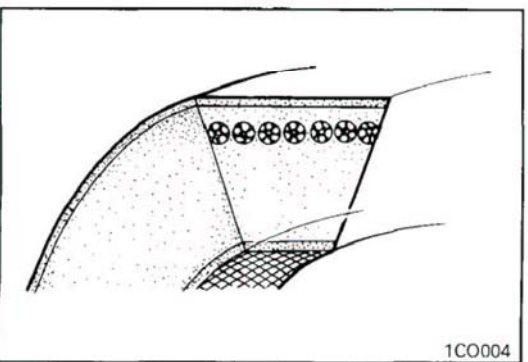
**Vehicles with an air conditioner**

- (1) Loosen the bolt holding the alternator and then loosen the alternator support nut.
- (2) Loosen the bolt for deflection adjustment, and then remove the alternator drive belt.



**6. REMOVAL OF POWER STEERING OIL PUMP DRIVE BELT**

Loosen the bolt holding the power steering oil pump, and then remove the drive belt.

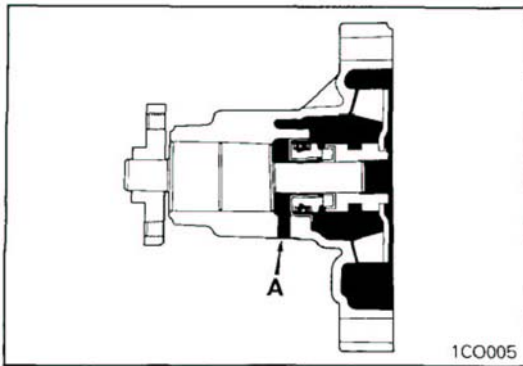


**INSPECTION**

N07MDAC

**BELT**

- Check surface for damage, peeling or cracks.
- Check surface for presence of oil or grease.
- Check rubber for wear or hardening.

**WATER PUMP**

- Check each part for cracks, damage or wear, and replace the water pump assembly if necessary.
- Check the bearing for damage, abnormal noise and sluggish rotation, and replace the water pump assembly if necessary.
- Check the seal unit for leaks, and replace the water pump assembly if necessary.
- Check for water leakage. If water leaks from hole "A" seal unit is faulty. Replace as an assembly.

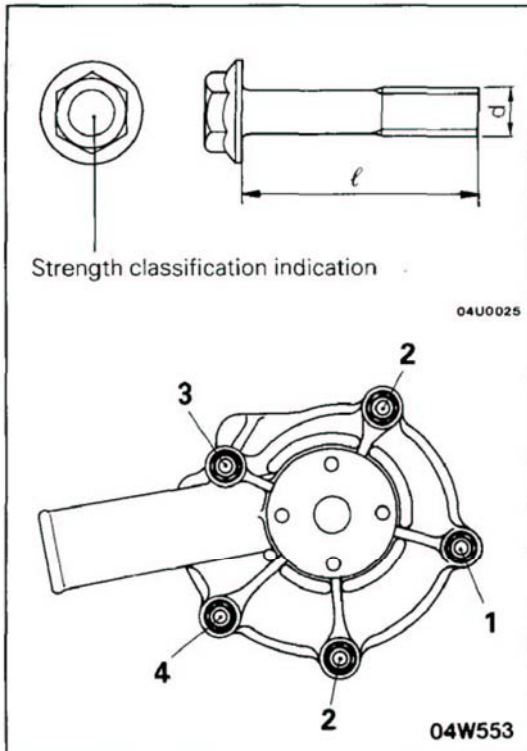
**SERVICE POINTS OF INSTALLATION**

N07MEAE

**10. INSTALLATION OF WATER PUMP**

The dimension of the water pump's installation bolt differs according to the installation location, so care must be taken to avoid incorrect installation.

No.	Strength classification (Head mark)	d x $\ell$ mm (in.)
1	4T	8 x 23 (.31 x .90)
2	4T	8 x 28 (.31 x 1.10)
3	4T	8 x 88 (.31 x 3.46)
4	4T	8 x 78 (.31 x 3.07)



- **ADJUSTMENT OF POWER STEERING OIL PUMP DRIVE BELT DEFLECTION**

Refer to GROUP 19 STEERING – Service Adjustment Procedures.

- **ADJUSTMENT OF ALTERNATOR DRIVE BELT DEFLECTION**

Refer to P.7-7.

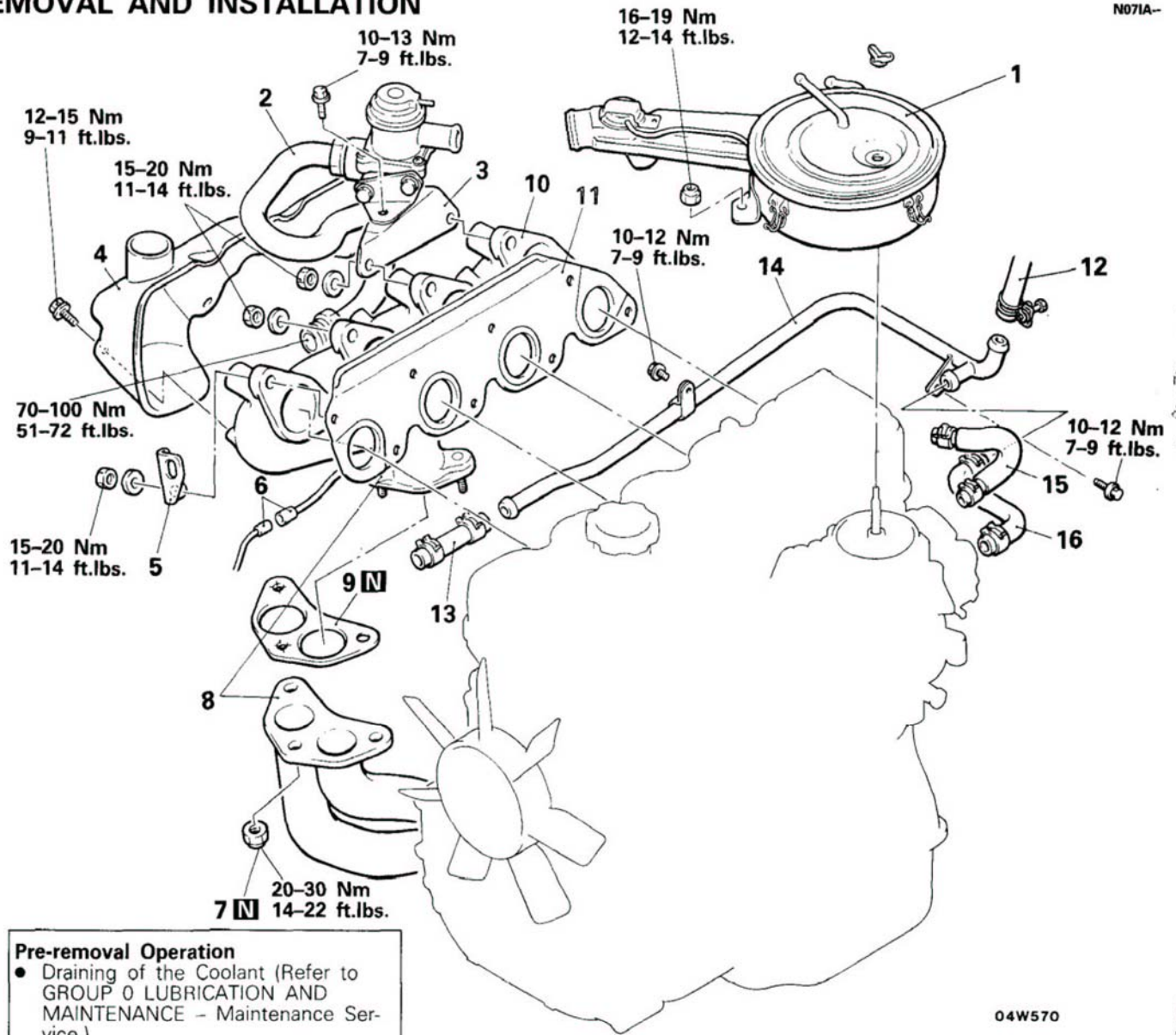
- **ADJUSTMENT OF AIR CONDITIONER COMPRESSOR DRIVE BELT DEFLECTION**

Refer to GROUP 24 HEATERS AND AIR-CONDITIONING – Service Adjustment Procedures.

# WATER HOSE AND PIPE

## REMOVAL AND INSTALLATION

N071A--



**Pre-removal Operation**

- Draining of the Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE – Maintenance Service.)

**Post-installation Operation**

- Draining of the Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE – Maintenance Service.)

**Water pipe removal steps**

- ◆◆◆◆ 1. Air filter
- 2. Reed valve and air pipe assembly
- 3. Reed valve bracket
- 4. Exhaust manifold cover
- 5. Engine hanger
- 6. Connection of oxygen sensor connector
- 7. Self-locking nut
- 8. Connection of exhaust manifold and exhaust pipe
- 9. Gasket
- 10. Exhaust manifold
- ◆◆ 11. Exhaust manifold gasket

- 12. Connection of heater hose
- 13. Heater hose
- 14. Water pipe

**Water hose removal steps**

- 15. Water hose
- 16. Water by-pass hose

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆ : Refer to "Service Points of Installation".
- (4) [N] : Non-reusable parts



**SERVICE POINTS OF REMOVAL**

N071B--

**1. REMOVAL OF AIR FILTER**

Refer to GROUP 11 INTAKE AND EXHAUST – Air Filter.

**SERVICE POINTS OF INSTALLATION**

N071DAD

**11. INSTALLATION OF EXHAUST MANIFOLD GASKET**

Replace the gasket if there is peeling, flaking of damage.

**1. INSTALLATION OF AIR FILTER**

Refer to GROUP 11 INTAKE AND EXHAUST – Air Filter.

# WATER TEMPERATURE GAUGE UNIT

## REMOVAL AND INSTALLATION

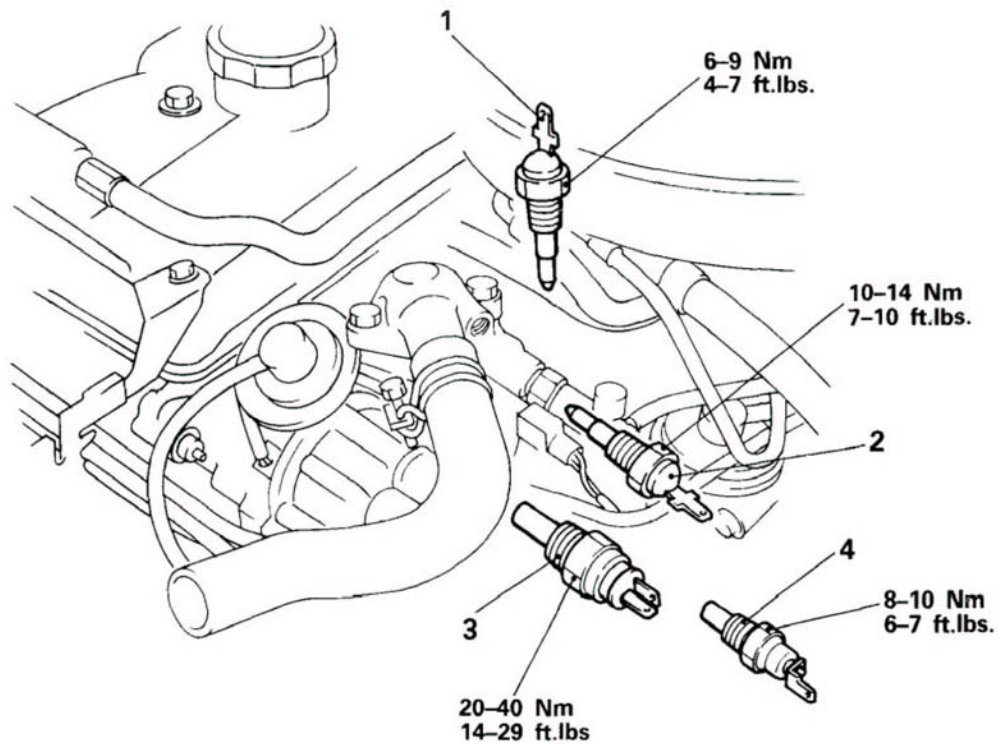
N070B-

### Pre-removal Operation

- Draining of the Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE – Maintenance Service.)

### Post-installation Operation

- Supplying of the Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE – Maintenance Service.)



04W573

- ◆◆ 1. Thermo switch  
(Vehicles with an automatic transmission)
- ◆◆ 2. Water temperature switch  
(Vehicles with an air conditioner)
- ◆◆ 3. Water temperature sensor
- ◆◆ 4. Water temperature gauge unit

NOTE

◆◆ : Refer to "Service Points of Installation".

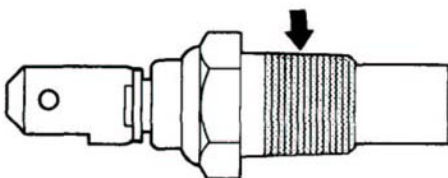
## SERVICE POINTS OF INSTALLATION

N070EAF

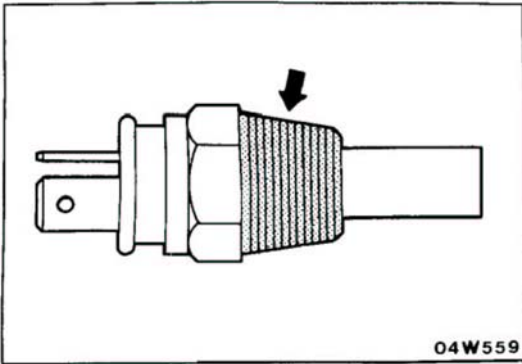
### 4. APPLICATION OF SEALANT TO WATER TEMPERATURE GAUGE UNIT

Apply a coating of specified sealant to the threaded part, and then tighten to the specified torque.

**Specified sealant : 3M ART Part No. 8660 or equivalent**



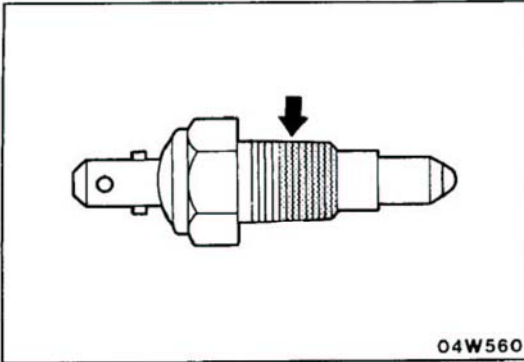
04W558



### 3. APPLICATION OF ADHESIVE TO WATER TEMPERATURE SENSOR

Apply a coating of specified adhesive to the threaded part, and then tighten to the specified torque.

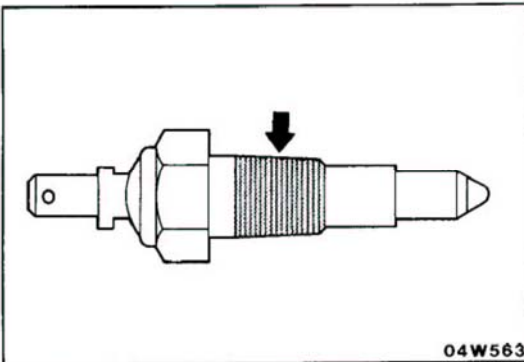
**Specified adhesive : 3M Adhesive Nut Locking 4171 or equivalent**



### 2. APPLICATION OF SEALANT TO WATER TEMPERATURE SWITCH

Apply a coating of specified sealant to the threaded part, and then tighten to the specified torque.

**Specified sealant : 3M ART No. 8660 or equivalent**



### 1. APPLICATION OF ADHESIVE TO THERMO SWITCH

Apply a coating of specified adhesive to the threaded part, and then tighten to the specified torque.

**Specified adhesive : 3M Adhesive Nut Locking 4171 or equivalent**

# ENGINE

## CONTENTS

N09AA--

<b>CRANKSHAFT, FLYWHEEL AND DRIVE PLATE</b> .....	<b>60</b>	Checking Compression Pressure .....	14
<b>CYLINDER BLOCK</b> .....	<b>64</b>	Replacement of Engine Oil .....	12
<b>CYLINDER HEAD</b> .....	<b>39</b>	Replacement of Engine Oil Filter .....	12
<b>CYLINDER HEAD GASKET</b> .....	<b>17</b>	Retorquing of Cylinder Head Bold .....	13
<b>ENGINE AND TRANSMISSION ASSEMBLY</b> ....	<b>23</b>	Silent Shaft Drive Chain Tension Adjustment Procedure .....	14
<b>ENGINE MOUNTING</b> .....	<b>20</b>	<b>SPECIAL TOOLS</b> .....	<b>10</b>
<b>FRONT CASE, OIL PUMP AND SILENT SHAFT</b> .....	<b>50</b>	<b>SPECIFICATIONS</b> .....	<b>4</b>
<b>GENERAL INFORMATION</b> .....	<b>2</b>	General Specifications .....	4
Sectional View .....	3	Service Specifications .....	4
<b>JET VALVE ASSEMBLY</b> .....	<b>48</b>	Torque Specifications .....	9
<b>OIL PAN AND OIL SCREEN</b> .....	<b>16</b>	Sealants and Adhesives .....	10
<b>PISTON AND CONNECTING ROD</b> .....	<b>54</b>	<b>TIMING CHAIN TRAIN</b> .....	<b>28</b>
<b>ROCKE ARM AND SHAFT ASSEMBLY</b> .....	<b>36</b>	<b>TROUBLESHOOTING</b> .....	<b>11</b>
<b>ROCKER ARMS, ROCKER ARM SHAFT AND CAMSHAFT</b> .....	<b>33</b>	Excessive Engine Rolling and Vibration	
<b>SERVICE ADJUSTMENT PROCEDURES</b> .....	<b>12</b>	Compression Too Low	
Adjustment of Valve Clearance .....	13	Connecting Rod Noise/Main Bearing Noise	
Checking Engine Oil .....	12	Noisy Valves	
		Oil Pressure Drop	
		Oil Pressure Too High	
		Timing Chain Noise	
		<b>VALVE AND VALVE SPRINGS</b> .....	<b>42</b>

## GENERAL INFORMATION

N09BACB

The 2.6L (157 cu.in.) displacement engine is a four cylinder overhead camshaft power plant with a cast iron cylinder block, an aluminum cylinder head and a silent shaft system.

The forged steel crankshaft is supported by five main bearings.

The cylinder block is a siamese type water jacket which ensures high cooling efficiency and uniform cooling of the cylinders.

Two counterbalance shafts (silent shafts) are incorporated in the cylinder block to reduce engine noise and vibration.

The pistons are made of aluminum alloy casting.

The piston pin is floating in the piston and pressed-in to the forged steel connecting rod. The piston pin is offset from the piston center toward the thrust side.

The oil pump is a gear type pump and also drives the right (front) silent shaft. The oil pump and left (rear) silent shaft are chain driven through sprockets by crankshaft.

The silent shaft system cancels the vertical vibration force of the engine and secondary vibrating forces such as the vibrating moment in the rolling direction. The silent shafts are located in the upper left (rearward side) and lower right (forward side) of the cylinder block. The left shaft rotates in the same direction as the crankshaft while the right shaft rotates in the opposite direction at twice crankshaft speed. Each silent shaft is supported by two aluminum bearings.

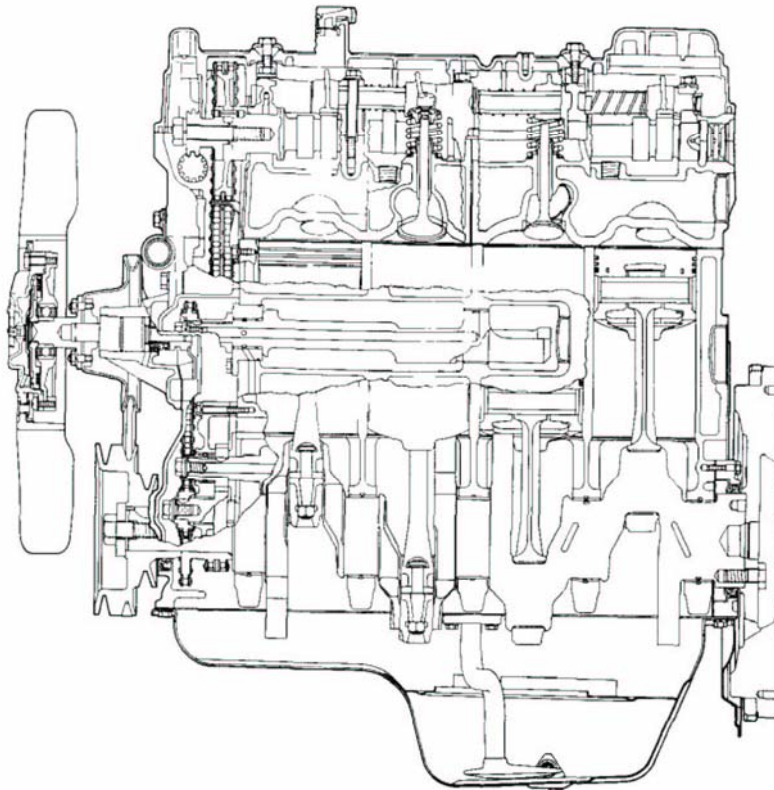
The cylinder head is an aluminum alloy casting with compact type combustion chambers. The intake and exhaust valves are made of heat resistant steel and arranged in a "V" with the camshaft on center. The jet valve assembly consisting of the jet valve, jet body, stem seal, spring, retainer and retainer lock, is screwed into the cylinder head.

The cast iron camshaft is supported by five bearing journals and is driven by the crankshaft sprocket and camshaft sprocket by the timing belt. The distributor drive gear is mounted on the front of the camshaft. The camshaft drive belt is a cogged type belt. To provide the belt with the proper tension and ensure quiet operation at all times, tensioner is installed on the slack side.

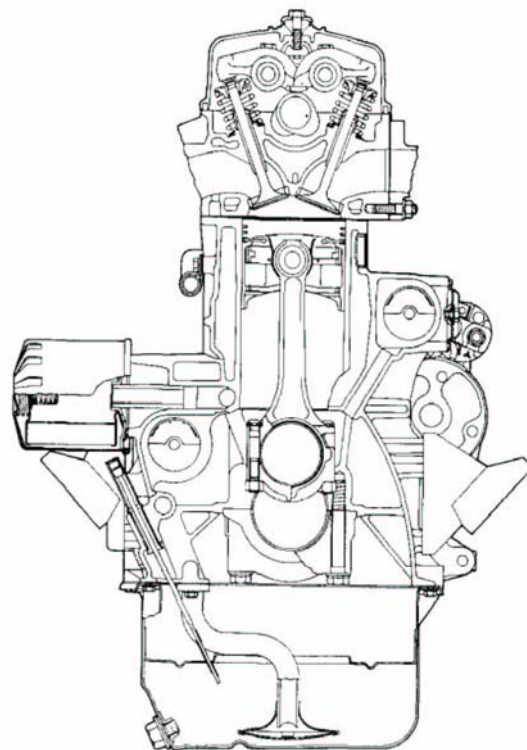
Two rocker arms are used with one actuating the exhaust valves and the other the intake valves and jet valves. The rocker arm is a die cast aluminum alloy part with carbide alloy slipper and auto-lash adjuster and does not require adjustment of intake and exhaust valve clearance. The oil pump is a internal/external involute gear type pump and is driven by crankshaft. The oil filter, a paper filter element cartridge type, is mounted on the front facing side of the engine.

SECTIONAL VIEW

N09BACB



5EN144



5EN145

STB Revision

## SPECIFICATIONS

## GENERAL SPECIFICATIONS

N09CA-B

Items	Specifications
Type	In-line OHC
Number of cylinders	4
Bore mm (in.)	91.1 (3.5866)
Stroke mm (in.)	98 (3.8583)
Piston displacement cc (cu.in.)	2555 (155.9)
Compression ratio	7.0
Firing order	1-3-4-2
Valve timing	
Intake valve	
Opens (BTDC)	25°
Closes (ABDC)	59°
Exhaust valve	
Opens (BBDC)	64°
Closes (ATDC)	20°
Jet valve	
Opens (BTDC)	25°
Closes (ABDC)	59°
Valve overlap	45°
Intake valve duration	264°
Exhaust valve duration	264°
Jet valve duration	264°

## SERVICE SPECIFICATIONS

N09CB--

Items	Specifications
Standard value	
Cylinder head	
Overall height mm (in.)	90.0 (3.5433)
Flatness of gasket surface mm (in.)	Max. 0.05 (0.020)
Flatness of manifold mounting surface mm (in.)	Max. 0.15 (.0059)
Oversize rework dimension of valve seat hole mm (in.)	
Intake 0.3 mm (.012 in) O.S.	47.300-47.325 (1.8622-1.8632)
0.6 mm (.024 in) O.S.	47.600-47.625 (1.8740-1.8750)
Exhaust 0.3 mm (.012 in) O.S.	40.300-40.325 (1.5866-1.5876)
0.6 mm (.024 in) O.S.	40.600-40.625 (1.5984-1.5994)
Oversize rework of valve guide hole (both intake and exhaust) mm (in.)	
0.05 mm (.002 in) O.S.	13.050-13.068 (.5138-.5145)
0.25 mm (.010 in) O.S.	13.250-13.268 (.5217-.5224)
0.50 mm (.020 in) O.S.	13.500-13.518 (.5315-.5422)
Timing chain	
No. of links	102
Pitch mm (in.)	9.5 (.3740)

Items	Specifications
Timing chain "B" for silent shaft drive	
No. of links	90
Pitch mm (in.)	8.0 (.3150)
Clearance between chain and chain guide mm (in.)	0.2–0.8 (.0079–.0315)
Camshaft	
Cam height mm (in.)	
Intake	42.4 (1.6693)
Exhaust	42.4 (1.6693)
Fuel pump drive cam O.D. mm (in.)	37 (1.4567)
Journal diameter mm (in.)	34 (1.3386)
Oil clearance mm (in.)	0.03–0.05 (.0012–.0020)
End play mm (in.)	0.1–0.2 (.004–.008)
Rocker arm	
I.D. mm (in.)	18.9 (.7441)
Clearance (Rocker arm-to-shaft) mm (in.)	0.01–0.04 (.0004–.0016)
Rocker arm shaft	
O.D. mm (in.)	18.9 (.7441)
Valve	
Valve length mm (in.)	
Intake	107.96 (4.2504)
Exhaust	105.86 (4.1677)
Stem O.D. mm (in.)	
Intake	8.0 (.3150)
Exhaust	8.0 (.3150)
Face angle	45°–45°30
Thickness of valve head (Margin) mm (in.)	
Intake	1.2 (.047)
Exhaust	2.0 (.079)
Valve stem to valve guide clearance mm (in.)	
Intake	0.03–0.06 (.0012–.0024)
Exhaust	0.05–0.09 (.0020–.0035)
Valve guide	
Length mm (in.)	
Intake	47 (1.8504)
Exhaust	52 (2.0474)
Oversize mm (in.)	0.05 (.0020) 0.25 (.010) 0.50 (.020)
Valve seat insert	
Width of seat contact mm (in.)	0.7–1.2 (.0276–.0472)
Seat angle	45°
Oversize rework of valve seat insert height mm (in.)	
Intake 0.3 mm (.012 in)	7.9–8.1 (.3110–.3189)
0.6 mm (.024 in)	8.2–8.4 (.3228–.3307)
Exhaust 0.3 mm (.012 in)	7.9–8.1 (.3110–.3189)
0.6 mm (.024 in)	8.2–8.4 (.3228–.3307)



Items	Specifications
Valve spring	
Free length mm (in.)	49.8 (1.961)
Load N (lbs.)	322.6 (72.5) at installed height
Installed height mm (in.)	40.4 (1.591)
Out of square	2°
Jet valve	
Length mm (in.)	91.58 (3.6055)
Stem O.D. mm (in.)	4.3 (.1693)
Seat angle	45°
Valve clearance-Hot engine mm (in)	0.25 (.010)
Valve clearance-Cold engine (reference) mm (in)	0.17 (.007)
Jet valve spring	
Free length mm (in.)	29.6 (1.1654)
Load N (lbs.)	34.3 (7.7) at Installed height
Installed height mm (in.)	21.5 (.846)
Out of squareness	Max 1.5°
Cylinder block	
Cylinder bore mm (in.)	91.1 (3.5866)
Out-of-roundness and taper of cylinder bore mm (in.)	Max. 0.02 (.0008)
Over height mm (in.)	316 (12.4409)
Flatness of gasket surface mm (in.)	Max 0.05 (.0020)
Right silent shaft	
Front journal diameter mm (in.)	21 (.8268)
Rear journal diameter mm (in.)	43 (1.6929)
Oil clearance mm (in.)	0.10–0.13 (.0039–.0053)
Rear	
Left silent shaft	
Front journal diameter mm (in.)	23 (.9055)
Rear journal diameter mm (in.)	43 (1.6929)
Oil clearance mm (in.)	
Front	0.02–0.06 (.0008–.0024)
Rear	0.10–0.13 (.0039–.0053)
Piston	
O.D. mm (in.)	91.1 (3.5866)
Clearance (Piston-to-cylinder) mm (in.)	0.02–0.04 (.0008–.0016)
Ring groove width mm (in.)	
No. 1 and No. 2	1.5 (.591)
Oil	4.0 (.1575)
Compression pressure kPa (psi)	1200 (170) 960 (136)
Pressure difference between cylinders kPa (psi)	Max. 100 (14)
Oversize mm (in.)	0.25 (.010) 0.50 (.020) 0.75 (.030) 1.00 (.039)
Piston ring	
Side clearance mm (in.)	
No. 1	0.05–0.09 (.0020–.0035)
No. 2	0.02–0.06 (.0008–.0024)

Items	Specifications
End gap mm (in.)	
No. 1	0.30–0.45 (.0112–.0177)
No. 2	0.25–0.40 (.0098–.0158)
Oil ring side rail	0.30–0.80 (.0118–.0315)
Oversize mm (in.)	0.25 (.010) 0.50 (.020) 0.75 (.030) 1.00 (.039)
Connecting rod	
Bend mm (in.)	0.05(.0020) or less per 100 (3.937)
Twist mm (in.)	0.10 (.0039) or less per 100 (3.937)
Connecting rod big end side clearance mm (in.)	0.1–0.25 (.0039–.0098)
Piston pin press-in load N(lbs.)	7350–17150 (1650–3860)
Connecting rod oil clearance	
Oil clearance mm (in.)	0.02–0.05 (.0008–.0020)
Under size mm (in.)	0.25 (.010) 0.50 (.020) 0.75 (.030)
Crankshaft main bearing	
Oil clearance mm (in.)	0.02–0.05 (.0008–.0020)
Under size mm (in.)	0.25 (.010) 0.50 (.020) 0.75 (.030)
Crankshaft	
Pin O.D. mm (in.)	53 (2.0866)
Journal O.D. mm (in.)	60 (2.3622)
Out-of-roundness and taper of journal and pin mm (in.)	Max. 0.01 (.0004)
End play mm (in.)	0.05–0.18 (.0020–.0071)
Undersize rework dimension of pin mm (in.)	
0.25 mm (.010 in.) U.S.	52.735–52.750 (2.0762–2.0763)
0.50 mm (.020 in.) U.S.	52.485–52.500 (2.0663–2.0669)
0.75 mm (.030 in.) U.S.	52.235–52.250 (2.0565–2.0571)
Undersize rework dimension of journal mm (in.)	
0.25 mm (.010 in.) U.S.	59.735–59.750 (2.3518–2.3524)
0.50 mm (.020 in.) U.S.	59.485–59.500 (2.3419–2.3425)
0.75 mm (.030 in.) U.S.	59.235–52.250 (2.3321–2.3327)
Oil pressure at curb idle speed [Conditions: Oil temperature is 75 to 90°C (167 to 194°F)] kPa (psi)	Min. 80 (11.4)
Oil pump	
Driven gear	
Tip clearance mm (in.)	0.11–0.15 (.0043–.0059)
Side clearance mm (in.)	0.04–0.10 (.0016–.0039)
Drive gear	
Tip clearance mm (in.)	0.11–0.15 (.0043–.0059)
Side clearance mm (in.)	0.05–0.11 (.0020–.0043)
Relief spring Free height mm (in.)	46.4 (1.8346)
Load N (lbs.)	60 (13.4) at 40.1 mm (1.5787 in.)
Limit	
Cylinder head	
Overall height mm (in.)	* –0.2 * (–.0079)
Flatness of gasket surface mm (in.)	0.2 (.0079)
Flatness of manifold mounting mm (in.)	0.3 (.0118)

\* Must be –0.2 mm (–.0079 in.) or less (combined with the amount of grinding of the cylinder block's gasket surface.)

Items	Specifications
Camshaft	
Cam height   mm (in.)	
Intake	41.9 (1.6496)
Exhaust	41.9 (1.6496)
End play   mm (in.)	0.4 (.016)
Valve	
Thickness of valve head (Margin)   mm (in.)	
Intake	0.7 (.028)
Exhaust	1.5 (.059)
Valve stem to valve guide clearance   mm (in.)	
Intake	0.1 (.0039)
Exhaust	0.15 (.0059)
Valve spring	
Free length   mm (in.)	48.8 (1.922)
Installed height   mm (in.)	41.40 (1.6299)
Out of squareness	4°
Cylinder block	
Over height   mm (in.)	* -0.2 * (-.0079)
Flatness of gasket surface   mm (in.)	0.1 (.0039)
Piston	
Compression pressure   kPa (psi)	960 (136)
Piston ring	
Side clearance   mm (in.)	
No. 1	0.12 (.005)
No. 2	0.1 (.004)
End gap   mm (in.)	
No. 1	0.8 (.031)
No. 2	0.8 (.031)
Oil ring side rail	1.0 (.039)
Connecting rod	
Connecting rod big end side clearance   mm (in.)	0.4 (.016)
Connecting rod oil clearance	
Oil clearance   mm (in.)	0.1 (.004)
Crankshaft main bearing	0.1 (.004)
Crankshaft	
End play   mm (in.)	0.4 (.016)
Fly wheel	
Runout   mm (in.)	0.13 (.0051)
Oil pump	
Driven gear	
Tip clearance   mm (in.)	0.2 (.0079)
Side clearance   mm (in.)	0.15 (.0006)
Drive gear	
Tip clearance   mm (in.)	0.2 (.0079)
Side clearance   mm (in.)	0.15 (.0006)

\* Must be -0.2 mm (-.0079 in.) or less (combined with the amount of grinding of the cylinder head's gasket surface.)

## TORQUE SPECIFICATIONS

N09CC

Items	Nm	ft.lbs.
Cylinder head bolts–Cold engine	90–100	65–72
Cylinder head bolts–Hot engine	100–110	73–79
Cylinder head bolts (M8 bolt)	15–22	11–15
Camshaft bearing cap bolts	19–21	14–15
Camshaft sprocket bolts	50–60	37–43
Rocker cover bolts	5–7	4–5
Jet valve assembly	18–22	13–15
Rocker arm adjusting nuts for jet valve	8–10	9–13
Main bearing cap bolts	75–85	55–61
Connecting rod cap nuts	45–48	33–34
Dumper pulley bolts	110–130	80–94
Oil pump driven gear bolt	60–70	44–50
Silent shaft sprocket bolt	60–70	44–50
Silent shaft chamber cover bolts	4–6	4–5
Flywheel bolts	130–140	94–101
Drive plate bolts	130–140	94–101
Engine support brackets bolts	50–60	37–43
Chain guide “B” bolt (Upper)	8–10	6–7
Chain guide “B” bolt (Lower)	15–22	11–15
Oil pump cover bolt	10–12	7.5–8.5
Oil pump body bolt	10–12	7.5–8.5
Oil pump assembly mounting bolt	10–12	7.5–8.5
Thrust plate bolt	10–12	7.5–8.5
Oil pan bolt	6–8	4.5–5.5
Oil pan drain plug	35–45	26–32
Oil screen bolt	15–22	11–15
Oil relief valve plug	30–45	22–32
Oil pressure switch	8–12	6–8
Air filter mounting nut	16–19	12–14
Exhaust manifold to front exhaust pipe	20–30	15–22
Engine mounting front insulator to body	30–40	22–29
Engine to engine mounting front insulator	13–20	9–15
No. 2 crossmember to body	55–75	40–54
Plate to body	18–25	13–18
Plate to transfer mounting insulator	18–25	13–18
Transfer mounting insulator to transfer mounting bracket	30–42	22–29
Transfer mounting bracket to transfer	18–25	13–18
No. 2 crossmember to engine mounting rear insulator	18–25	13–18
Engine mounting rear insulator to engine	18–25	13–18
Engine support rear bracket to engine	18–25	13–18
Engine mounting rear insulator to engine support rear bracket	18–25	13–18
Rear engine support member to No. 2 crossmember	18–25	13–18
Rear engine support member to engine mounting rear insulator	30–42	22–29
Radiator mounting bolts	8–11	6–8
Shroud mounting bolts	3–7	2–5

Items	Nm	ft.lbs.
Power steering pressure hose to oil pump	16–24	12–17
Control lever assembly to transfer	15–22	11–16
Cross shaft bracket to body	10–13	7–9
Clutch release cylinder to transmission	31–42	22–29
Rear propeller shaft to rear differential	50–60	36–43
Front propeller shaft to front differential	50–60	36–43
Air-conditioner compressor to discharge hose	20–25	15–18
Air-conditioner compressor to suction hose	30–35	22–25

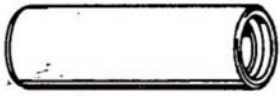

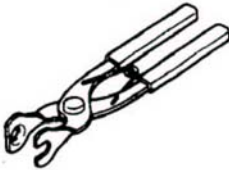
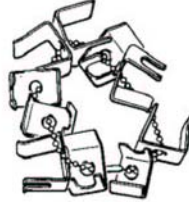
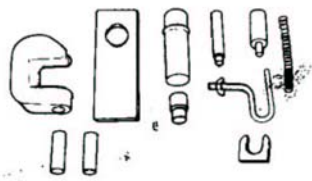
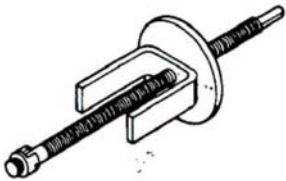
**SEALANTS AND ADHESIVES**

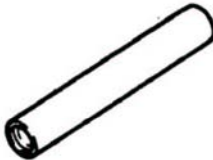
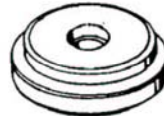



N09CE--

Items	Specified sealants and adhesives	Quantity
Semi-circular packing	3M ART Part No. 8660 or equivalent	As required
Cylinder block lower surface (4 places)	3M ART Part No. 8660 or equivalent	As required
Oil pressure switch	3M ART Part No. 8660 or equivalent	As required

**SPECIAL TOOLS**

N09DA-C

Tool (Number and name)	Use	Tool (Number and name)	Use
MD998377-01 Installer, valve stem seal 	Installing valve stem seals	MD998250-01 Installer, silent shaft bearing (For rear bearing) [Used with MB990938-01] 	Press-fitting of silent shaft bearing
MD998309 Prier, jet valve spring 	Assembling and disassembly of jet valve assembly	MD998443-01 Holder, auto-lash adjuster 	Auto-lash adjuster holding
MD998184-01 Setting tool, piston pin 	Removal and installation of piston pin	MIT304204 Remover, silent shaft front bearing 	Removal of silent shaft bearing

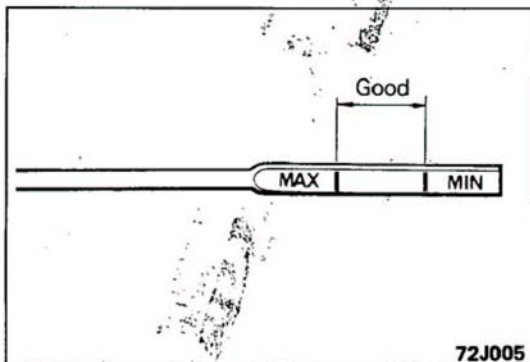
Tool (Number and name)	Use	Tool (Number and name)	Use
MD998308-01 Installer, jet valve stem seal 	Installation of jet valve stem seal	MD998376-01 Installer, crankshaft rear oil seal [Used with MB990938-01] 	Installation of crankshaft rear oil seal
MD998310 Wrench, jet valve 	Removal and installation of jet valve assembly	MB990938-01 Installer, right silent shaft front bearing 	Installation of silent shaft bearing
MD998251-01 Puller, silent shaft bearing (For rear bearing) [Used with MIT304204] 	Removal of silent shaft bearing		

**TROUBLESHOOTING**

N09EAAE

Symptom	Probable cause	Remedy	Reference page
Compression too low	Cylinder head gasket blown	Replace gasket	9-39
	Piston ring worn or damage	Replace rings	9-56
	Piston or cylinder worn	Repair or replace piston and/or cylinder block	9-54 9-65
	Valve seat worn or damage	Repair or replace valve and/or seat ring	—
Oil pressure drop	Engine oil level too low	Check engine oil level	9-12
	Oil pressure switch faulty	Replace oil pressure switch	9-64
	Oil filter clogged	Install new filter	9-50
	Oil pump gears or body worn	Replace gears and/or body	9-50
	Thin or diluted engine oil	Change engine oil to correct viscosity	9-50
	Oil relief valve stuck (opened)	Repair relief valve	9-50
	Excessive bearing clearance	Replace bearings	9-50

Symptom	Probable cause	Remedy	Reference page
Oil pressure too high	Oil relief valve stuck (closed)	Repair relief valve	9-50
Noisy valves	Incorrect auto-lash adjuster	Replace auto-lash adjuster	9-33
	Thin or diluted engine oil (low oil pressure)	Change engine oil	9-12
	Valve stem or valve guide worn or damage	Replace valve and/or guide	9-44
Connecting rod noise/ main bearing noise	Insufficient oil supply	Check engine oil level	9-12
	Low oil pressure	Refer to "Oil pressure drop"	9-11
	Thin or diluted engine oil	Change engine oil	9-12
	Excessive bearing clearance	Replace bearings	9-54
Timing chain noise	Incorrect chain tension	Adjust chain tension	9-28
Excessive engine rolling and vibration	Loose No. 2 member	Retighten	9-20, 21
	Broken mount insulator	Replace	9-20, 21



## SERVICE ADJUSTMENT PROCEDURES

N09FAAA1

### CHECKING ENGINE OIL

- (1) Check to ensure that the engine oil level is within the level range indicated on the oil level gauge.
- (2) Check to ensure that the oil is not noticeably dirty or mixed with coolant or gasoline, and that it has the proper viscosity.

### REPLACEMENT OF ENGINE OIL

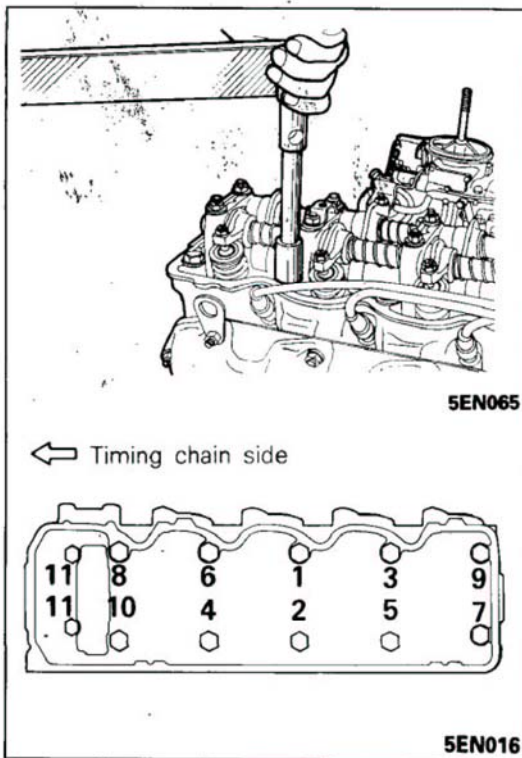
N09FBAA1

Refer to GROUP 0 LUBRICATION AND MAINTENANCE—Maintenance Service.

### REPLACEMENT OF ENGINE OIL FILTER

N09FCAA1

Refer to GROUP 0 LUBRICATION AND MAINTENANCE—Maintenance Service.

**RETORQUING OF CYLINDER HEAD BOLTS**

N09FDAD

- (1) Using torque wrench, first slightly loosen cylinder head bolts and then tighten to specified torque.

**Tightening torque****Cylinder head bolt (No. 1 to 10)**

Cold engine : 90–100 Nm (65–72 ft.lbs.)

Hot engine : 100–110 Nm (73–79 ft.lbs.)

**Cylinder head bolt (No. 11)**

Cold engine : 15–22 Nm (11–15 ft.lbs.)

Hot engine : 15–22 (11–15 ft.lbs.)

- (2) Be sure to follow the specific torquing sequence.

**NOTE**

Run engine until normal operating temperature is reached, allow it to cool down, and then retorque bolts to specification for best results.

**ADJUSTMENT OF VALVE CLEARANCE****CHECKING INTAKE AND EXHAUST VALVES**

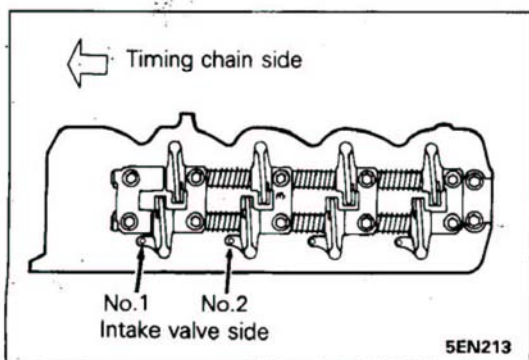
N09FEAB1

As the intake and exhaust valves are equipped with auto-lash adjustment mechanisms, there is no need for valve clearance adjustment. The proper functioning of the auto-lash mechanism may be determined by checking for tappet noise. When there is tappet noise or any unusual noise, check the the auto-lash by removing it.

**CHECKING AND ADJUSTING JET VALVE CLEARANCE**

N09FJAC

- (1) Idle the engine until radiator coolant reaches 80–90°C (176–194°F).
- (2) Remove all the spark plugs from the cylinder head.
- (3) Remove the rocker cover.



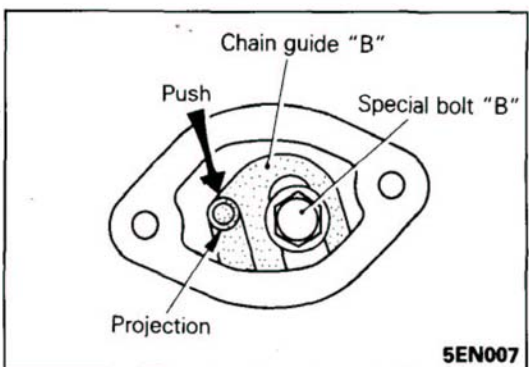
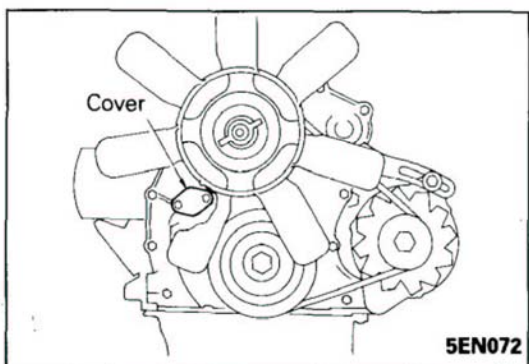
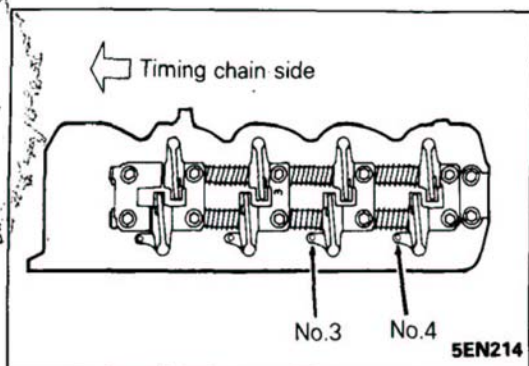
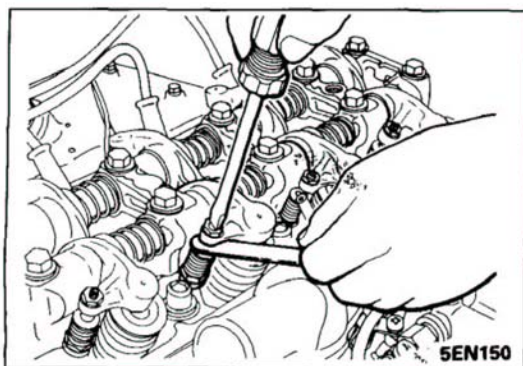
- (4) Rotate the crankshaft clockwise until the No. 1 cylinder is at compression TDC.
- (5) Measure jet valve clearance at the positions indicated by arrows in the illustration.

**Standard value : 0.25 mm (.010 in.) when warm.**

**Caution**

**As jet valve spring tension is low, be careful not to push the jet valve in.**





- (6) When out of specification, loosen the lock nut and adjust clearance with a feeler gauge while turning the adjusting screw.
- (7) Holding the adjusting screw with a screwdriver so that it won't turn, tighten the lock nut to the specified torque.

- (8) Turn the crankshaft 360° until the No. 4 cylinder is at compression top dead center.
- (9) Measure jet valve clearance where indicated by arrows in the illustration.

**Standard value : 0.25 mm (.010 in.) when warm**

- (10) When out of specification, adjust according to the procedures given in (6) and (7) above.

### SILENT SHAFT DRIVE CHAIN TENSION ADJUSTMENT PROCEDURE

N09FAA

When a loose silent shaft drive chain is suspected as the probable cause of abnormal noise, the tension must be readjusted. Tension of silent shaft drive chain can be adjusted without removing timing chain cover as follows:

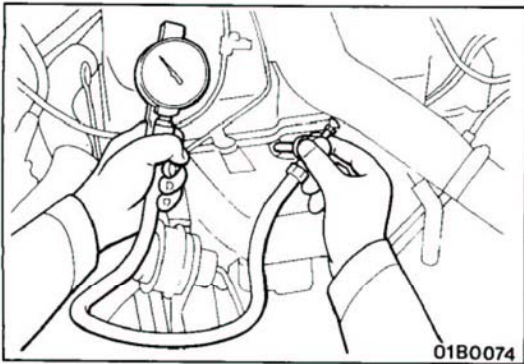
1. Remove cover from access hole provided at center of chain case (under water pump).
2. Loosen special bolt "B".
3. Using your finger push projection on chain guide "B" in direction of arrow. Do not push projection with a screwdriver or other tool. Improperly chain tension will cause abnormal noise.
4. Tighten special bolt "B".
5. Install cover. Do not reuse damaged gasket.

**Cover bolt tightening torque : 10–11 Nm (7.5–8.5 ft. lbs.)**

### CHECKING COMPRESSION PRESSURE

N09FFAA

- (1) Before checking compression, ensure that engine oil, the starter motor, and battery are all in normal operating condition.
- (2) Start the engine and wait until engine coolant temperature has risen to 80°–90°C (176–194°F).
- (3) Stop the engine and pull the spark plug cables.
- (4) Remove the spark plugs.
- (5) Crank the engine to remove any foreign objects in the cylinders.

**Caution**

Cover the spark plug holes with waste cloth, etc., in order to keep expelled foreign objects from flying out, and keep away from the holes. When measuring compression with water, oil, or fuel having entered the cylinder through a crack, etc., these will come flying out of the spark plug hole hot and fast, so to sure to take the proper precautions.

- (6) Set the compression gauge to the spark plug hole.
- (7) Holding the throttle valve full open, crank the engine and measure compression.

**Standard value : 1200 kPa (170 psi) [250-400]**

**Limit : 960 kPa (136 psi) [250-400 rpm]**

- (8) Perform (6) and (7) above for all the cylinders, ensuring that compression for each of the cylinders is within the specified limit.

**Limit : Max 100 kPa (14 psi)**

- (9) If a cylinder's compression or pressure differential exceeds the limit, add a small amount of oil through the spark plug hole and repeat steps (6) to (8).
  - ① If the addition of oil brings compression up, it is possible that there is harmful friction between the piston ring and cylinder wall.
  - ② If not compression up, valve seizure, poor valve seating, or a compression leak from the gasket are all possible.

## ON-VEHICLE SERVICE

### OIL PAN AND SCREEN

#### REMOVAL AND INSTALLATION

N09HA--

#### Pre-removal Operation

- Removal of the Undercover and the Under Skid Plate (Refer to GROUP 23 BODY - Under Cover)
- Draining of the Engine Oil (Refer to GROUP 0, LUBRICATION AND MAINTENANCE - Maintenance Service.)

#### Post-installation Operation

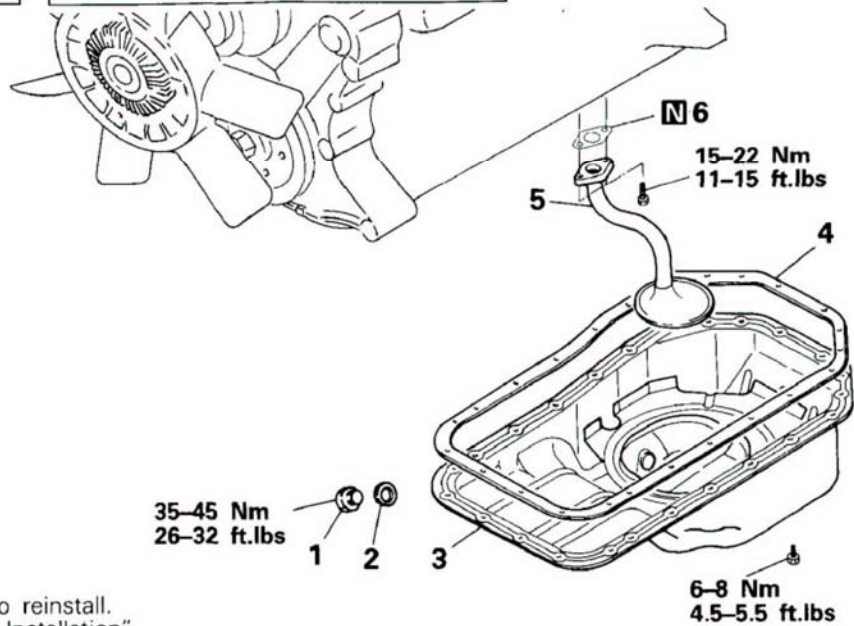
- Installation of the Undercover and the Under Skid Plate (Refer to GROUP 23 BODY - Under Cover.)
- Supplying of Engine Oil (Refer to GROUP 0 LUBRICATION AND MAINTENANCE - Maintenance Service)

#### Removal steps

1. Drain plug
2. Drain plug gasket
3. Oil pan
- ◆◆ 4. Oil pan gasket
5. Oil screen
6. Oil screen gasket

#### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Installation".
- (3) **N** : Non-reusable parts



#### INSPECTION

N09HCAB

- Check the oil pan for cracks.
- Check the oil pan fitting surface for damage and deformation.
- Check the oil screen for cracked, clogged or damaged wire net and pipe.

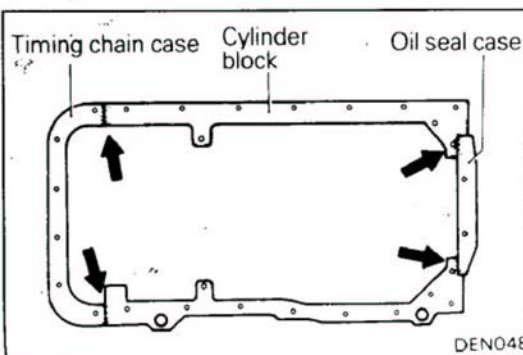
#### SERVICE POINTS OF INSTALLATION

N09HDAI

##### 4. INSTALLATION OF OIL PAN GASKET

Apply a coating of the specified sealant (where shown in the figure) to the lower surface (the surface where the oil pan is installed) of the cylinder block.

**Specified sealant : 3M ART Part No. 8660 or equivalent**



DEN048

# CYLINDER HEAD GASKET REMOVAL AND INSTALLATION

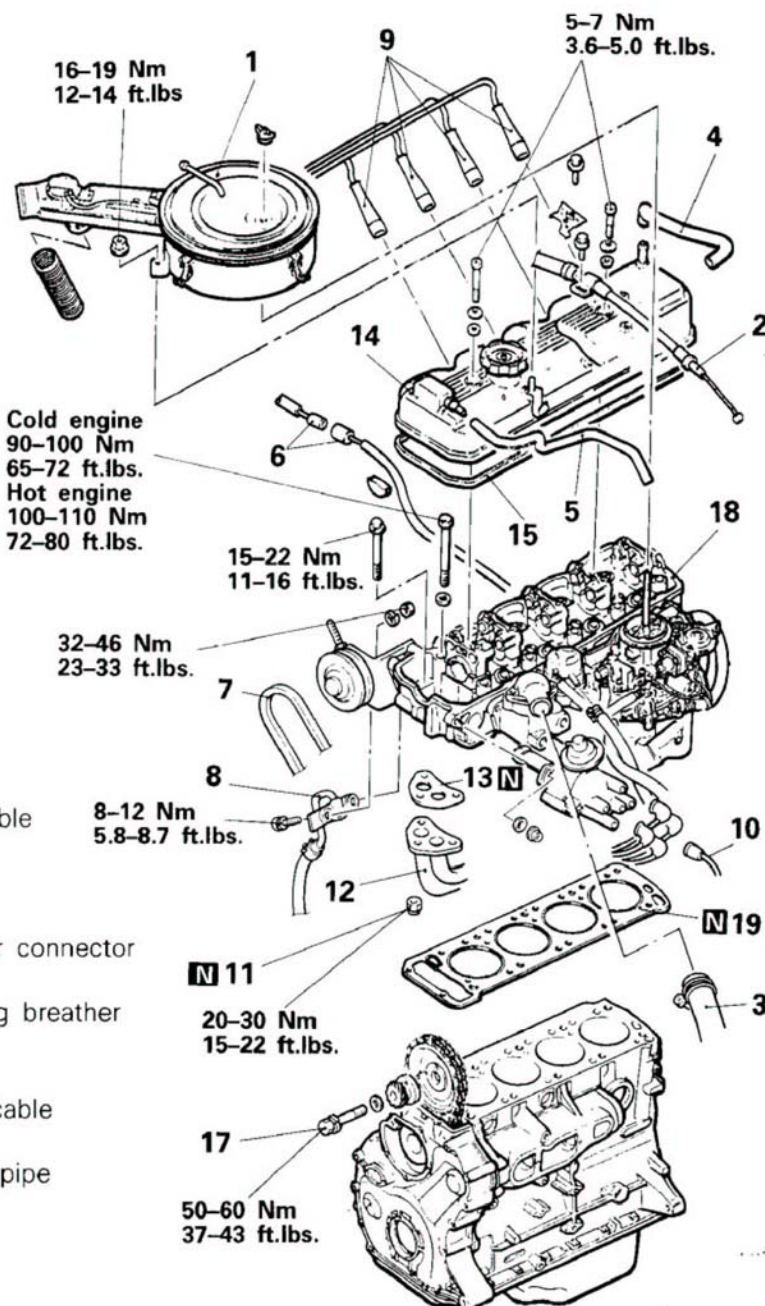
N09JA--

### Pre-removal Operation

- Draining of the Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE - Maintenance Service.)

### Post-installation Operation

- Supplying of Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE - Maintenance Service.)
- Adjustment of the Tension of the Air Conditioner Drive Belt (Refer to GROUP 24 HEATERS AND AIR-CONDITIONING - Drive Belt Tension Adjustment.)



### Removal steps

- ◆◆◆ 1. Air filter
- ◆◆ 2. Connection of accelerator cable
- ◆◆ 3. Radiator upper hose
- ◆◆ 4. Breather hose
- ◆◆ 5. P.C.V hose
- ◆◆ 6. Connection of oxygen sensor connector
- ◆◆ 7. Air-conditioner drive belt
- ◆◆ 8. Connection of power steering breather pipe
- ◆◆ 9. Spark plug cable
- ◆◆ 10. Connection of high tension cable
- ◆◆ 11. Self locking nut
- ◆◆ 12. Connection of front exhaust pipe
- ◆◆ 13. Gasket
- ◆◆ 14. Rocker cover assembly
- ◆◆ 15. Rocker cover gasket
- ◆◆ Fixing to No. 1 cylinder TDC
- ◆◆ 16. Distributor
- ◆◆◆ 17. Camshaft sprocket bolt
- ◆◆◆ 18. Cylinder head assembly
- ◆◆ 19. Cylinder head gasket

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆ : Refer to "Service Points of Installation".
- (4) [N] : Non-reusable parts

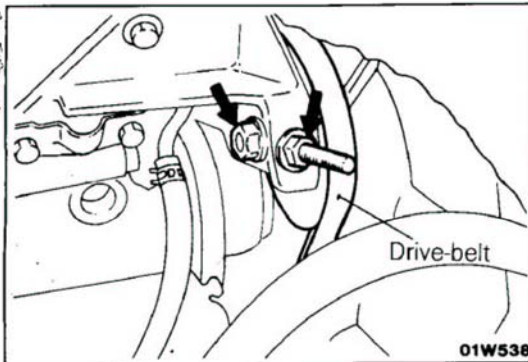
01W572

## SERVICE POINTS OF REMOVAL

N09JBAF

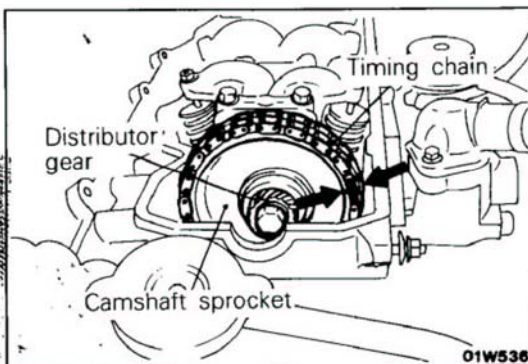
## 1. REMOVAL OF AIR FILTER

Refer to GROUP 11 INTAKE AND EXHAUST SYSTEM - Air Filter



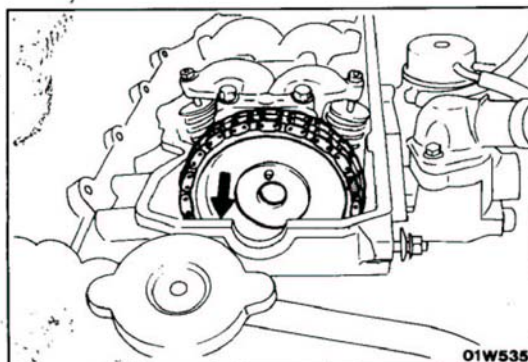
## 7. REMOVAL OF AIR-CONDITIONER DRIVE BELT

Loosen the tension-adjustment nuts of the air-conditioner drive belt and remove the air-conditioner drive belt from the tension pulley.



## ● FIXING TO NO. 1 CYLINDER TDC

Turn the crankshaft. Check to be sure that the camshaft sprocket's timing mark and the timing chain's timing mark (shiny white leaf plate) are aligned.

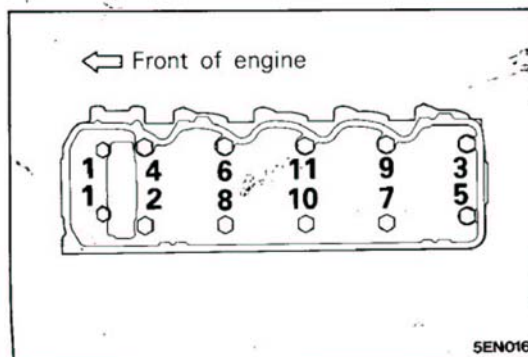


## 17. REMOVAL OF CAMSHAFT SPROCKET BOLT

Pull the camshaft sprocket (with the timing chain attached) out from the camshaft, and place it on top of the camshaft sprocket holder.

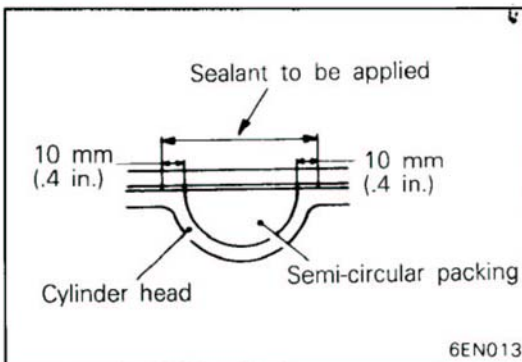
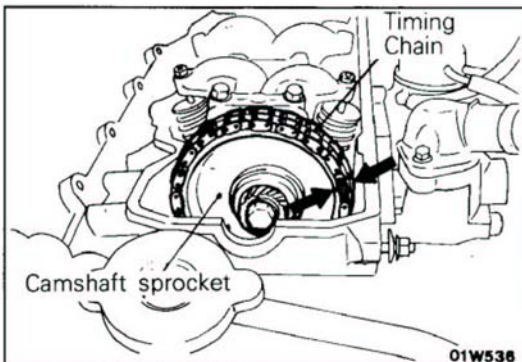
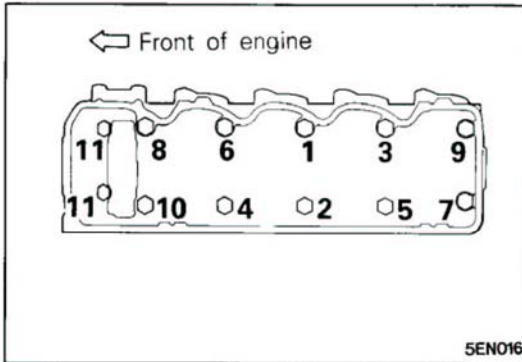
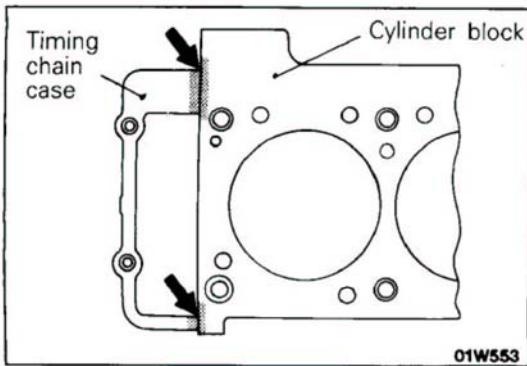
**Caution**

1. The crankshaft must not be rotated after the camshaft sprocket is pulled out from the camshaft.
2. Be careful not to allow the timing chain to come off from the camshaft sprocket.



## 18. REMOVAL OF CYLINDER HEAD ASSEMBLY

- (1) Disconnect the fuel hose, vacuum hose and wiring harness connected to the intake manifold and carburetor.  
Refer to GROUP 11 INTAKE AND EXHAUST - Intake Manifold and GROUP 14 FUEL SYSTEM-Carburetor.
- (2) Loosen the bolts (in the order indicated in the figure) in 2 or 3 steps, and remove from the cylinder head.

**SERVICE POINTS OF INSTALLATION**

N09JDCE

**19. INSTALLATION OF CYLINDER HEAD GASKET**

Before cylinder head gasket is installed, apply specified sealant to top surface of each butt joint between cylinder block and timing chain case.

**Specified sealant : 3M ART Part No. 8660 or equivalent**

**Caution**

**Be careful not to allow sealant to enter the oil hole in the cylinder block.**

**18. INSTALLATION OF CYLINDER HEAD ASSEMBLY**

- (1) Tighten the bolts (in the order indicated in the figure) in 2 or 3 steps, and finally tighten them at the specified torque.
  - (2) Connect the fuel hose, vacuum hose and wiring harness connected to the intake manifold and carburetor.
- Refer to GROUP 11 INTAKE AND EXHAUST - Intake Manifold and GROUP 14 FUEL SYSTEM - Carburetor.

**17. INSTALLATION OF CAMSHAFT SPROCKET BOLT**

Install the camshaft sprocket to the camshaft. Check to be sure that the timing chain's timing mark and the camshaft sprocket's timing mark are aligned.

**16. INSTALLATION OF DISTRIBUTOR**

Refer to GROUP 8 ELECTRICAL - Ignition System.

**14. INSTALLATION OF ROCKER COVER ASSEMBLY**

Apply a coating of the specified sealant to the semi-circular packing and the cylinder head top surfaces, and then tighten the rocker cover assembly at the specified torque.

**Specified sealant : 3M ART Part No. 8660 or equivalent**

**Caution**

**If they are overtorqued, a deformed rocker cover or oil leakage could result.**

**2. ADJUSTMENT OF ACCELERATOR CABLE**

Refer to GROUP 14 FUEL SYSTEM - Accelerator.

**1. INSTALLATION OF AIR FILTER**

Refer to GROUP 11 INTAKE AND EXHAUST - Air Filter.

# ENGINE MOUNTING

## REMOVAL AND INSTALLATION

Vehicles with a manual transmission

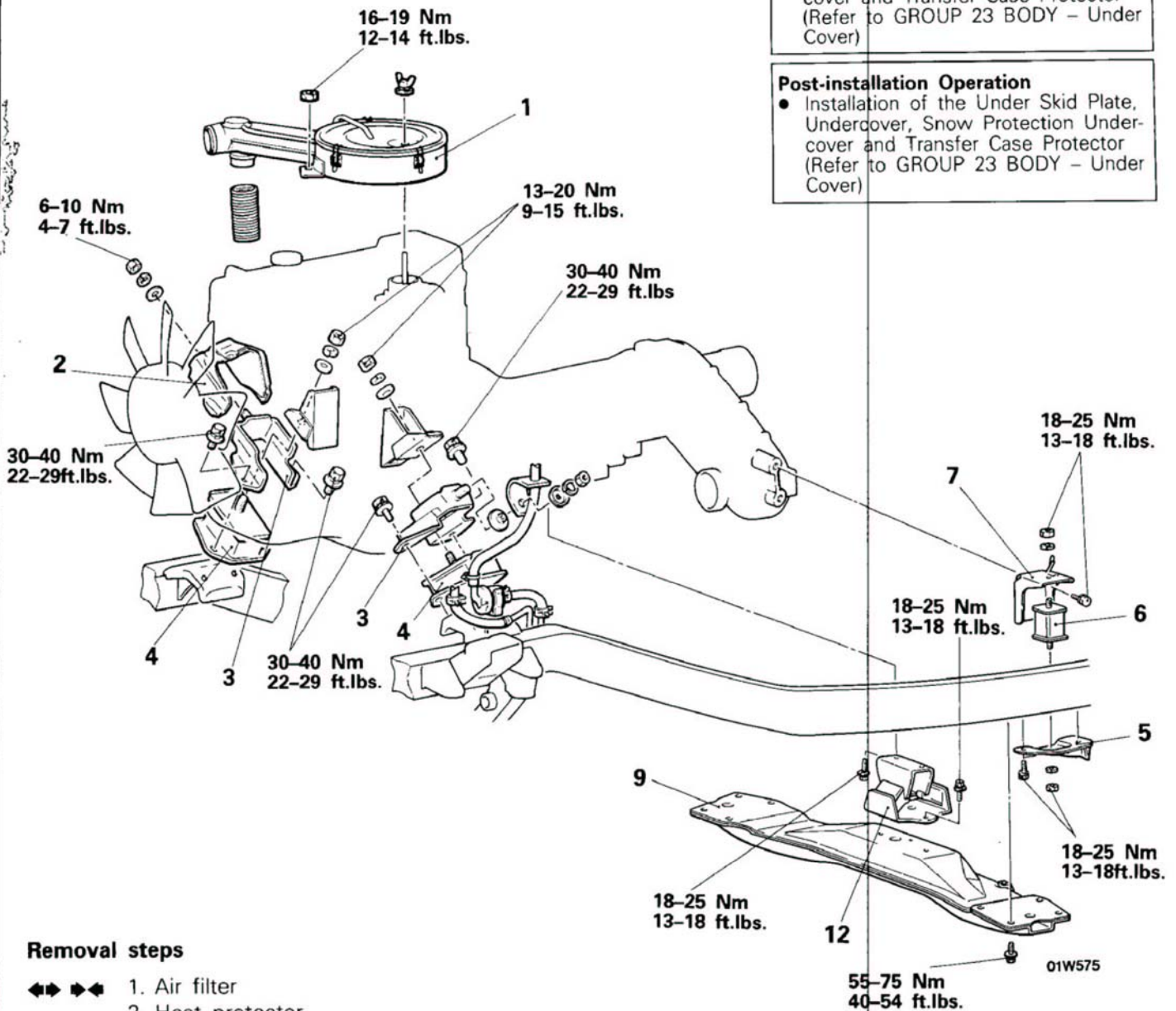
N09GA--

**Pre-removal Operation**

- Removal of the Under Skid Plate, Undercover, Snow Protection Undercover and Transfer Case Protector (Refer to GROUP 23 BODY - Under Cover)

**Post-installation Operation**

- Installation of the Under Skid Plate, Undercover, Snow Protection Undercover and Transfer Case Protector (Refer to GROUP 23 BODY - Under Cover)

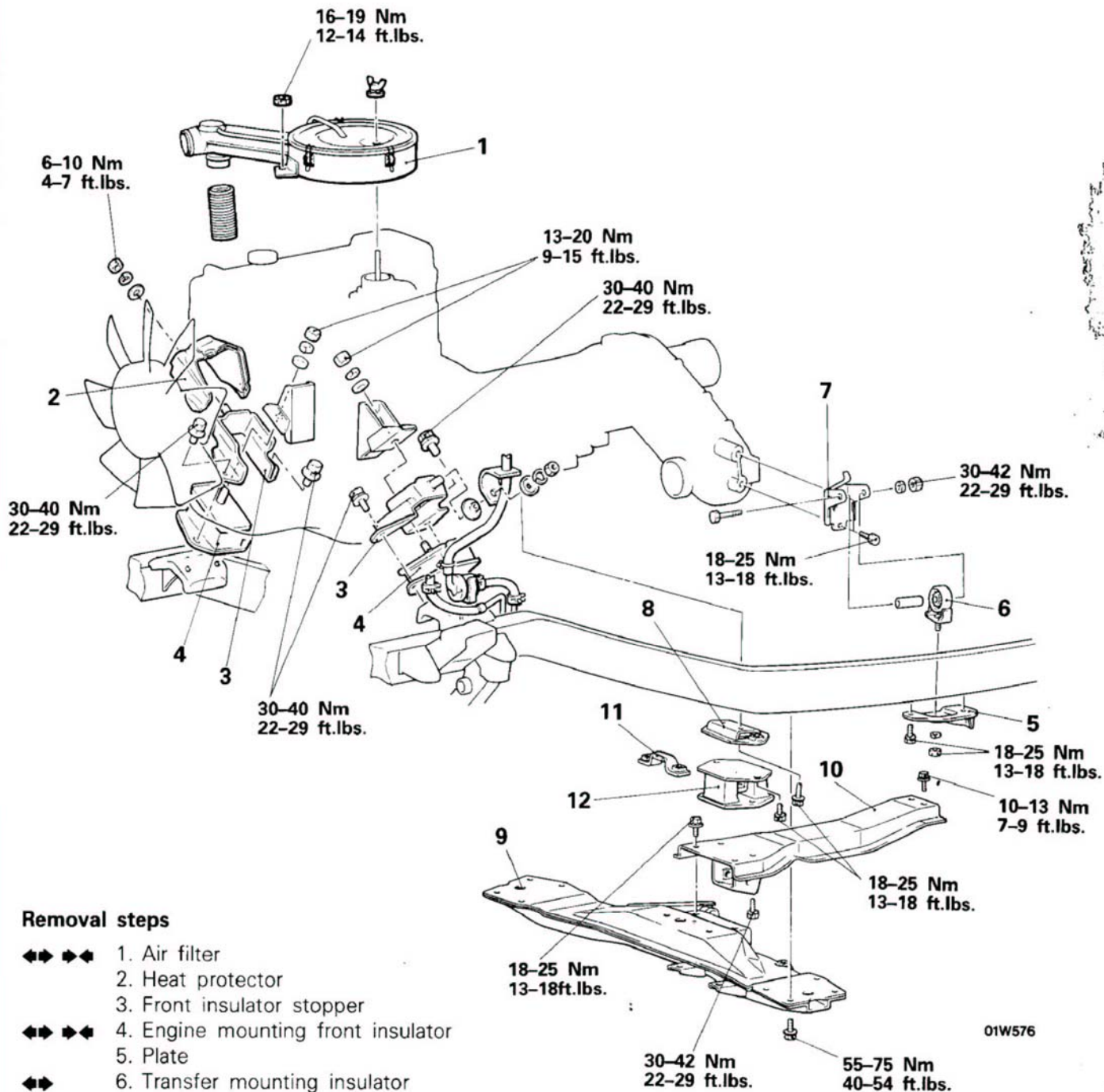
**Removal steps**

- ◆◆◆◆ 1. Air filter
- ◆◆◆◆ 2. Heat protector
- ◆◆◆◆ 3. Front insulator stopper
- ◆◆◆◆ 4. Engine mounting front insulator
- ◆◆◆◆ 5. Plate
- ◆◆◆◆ 6. Transfer mounting insulator
- ◆◆◆◆ 7. Transfer mounting bracket
- ◆◆◆◆ 9. No. 2 crossmember
- ◆◆◆◆ 12. Engine mounting rear insulator

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆◆ : Refer to "Service Points of Installation".

Vehicles with an automatic transmission



01W576

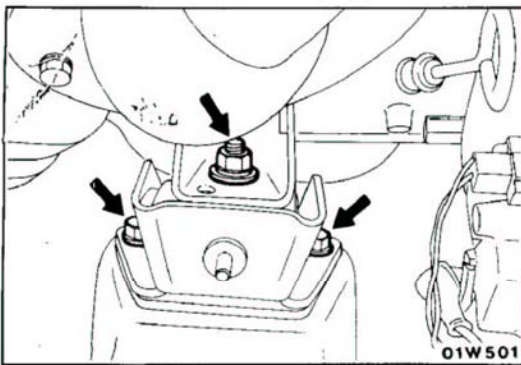
**Removal steps**

- ◆◆◆◆ 1. Air filter
- ◆◆◆◆ 2. Heat protector
- ◆◆◆◆ 3. Front insulator stopper
- ◆◆◆◆ 4. Engine mounting front insulator
- ◆◆◆◆ 5. Plate
- ◆◆◆◆ 6. Transfer mounting insulator
- ◆◆◆◆ 7. Transfer mounting bracket
- ◆◆◆◆ 8. Engine support rear bracket
- ◆◆◆◆ 9. No. 2 crossmember
- ◆◆◆◆ 10. Rear engine support member
- ◆◆◆◆ 11. Support plate
- ◆◆◆◆ 12. Engine mounting rear insulator

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆◆ : Refer to "Service Points of Installation".



**SERVICE POINTS OF REMOVAL**

N09GBAD

**1. REMOVAL OF AIR FILTER**

Refer to GROUP 11 INTAKE AND EXHAUST - Air Filter.

**4. REMOVAL OF ENGINE MOUNTING FRONT INSULATOR**

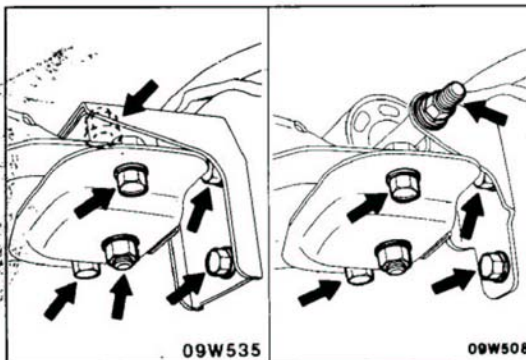
- (1) Attach a chain to the engine hangers.
- (2) Using a chain block-and-tackle, hang the engine slightly up so that the insulator is free of engine weight.
- (3) Remove the engine mounting front insulator.

**NOTE**

Hang the engine with a chain until installing the engine mounting front insulator.

**Caution**

**Avoid applying a strain on the radiator and fuel hoses and cables by raising the engine too high.**

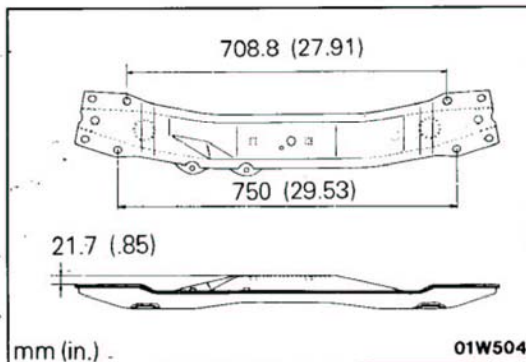
**6. REMOVAL OF TRANSFER MOUNTING INSULATOR**

- (1) Support the transfer with a jack.

**NOTE**

Support the transfer with a jack until installing the transfer mounting insulator.

- (2) Remove the transfer mounting insulator.

**INSPECTION**

N09GCAE

- Check the insulators for cracks, separation or deformation.
- Check the front insulator stoppers for deformation.
- Check the transfer mounting bracket for deformation or corrosion.
- Check the plate for deformation or corrosion.
- Check the No. 2 crossmember for deformation or corrosion.

**SERVICE POINTS OF INSTALLATION**

N09GDAG

**4. INSTALLATION OF ENGINE MOUNTING FRONT INSULATOR**

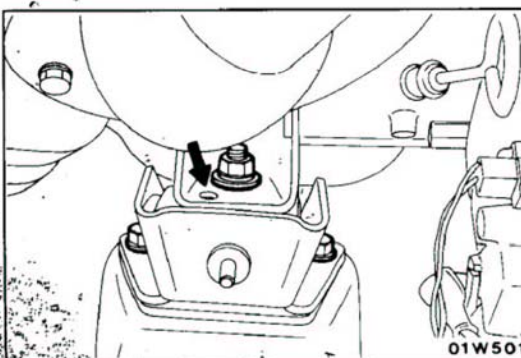
Make sure that the locating boss and hole are in alignment.

**Caution**

**Do not distort rubber portions, and never stain rubber portions with fuel or oil.**

**1. INSTALLATION OF AIR FILTER**

Refer to GROUP 11 INTAKE AND EXHAUST - Air Filter.



# ENGINE AND TRANSMISSION ASSEMBLY REMOVAL AND INSTALLATION

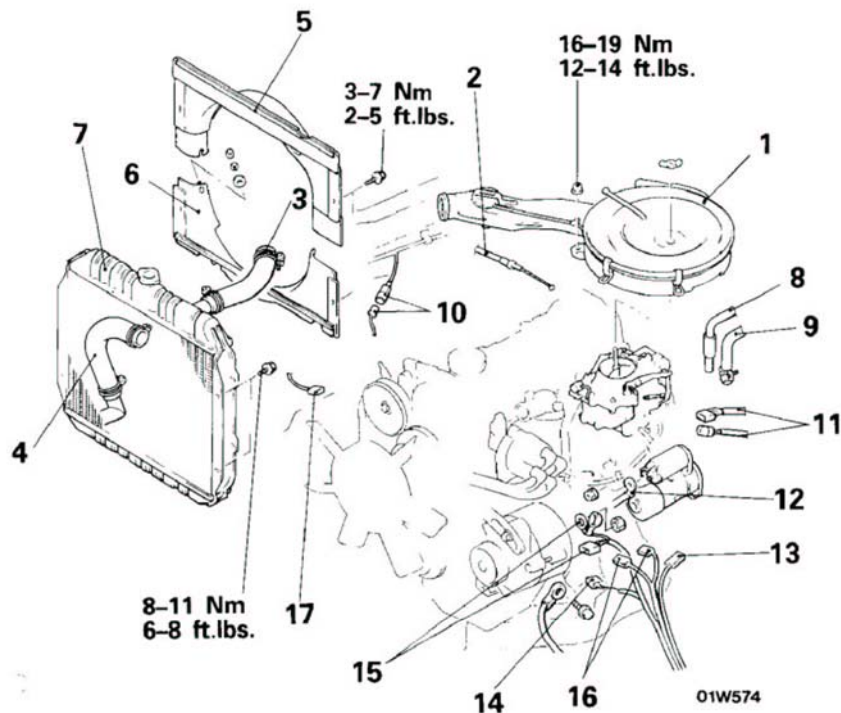
N09SA-B

## Pre-removal Operation

- Removal of the hood (Refer to GROUP 23 BODY – Hood.)
- Under Cover, Under Skid Plate, Transfer Case Protector, Cross Shaft Protector, Snow-protector (Refer to GROUP 23 BODY – Under Cover.)
- Draining of the Transmission Fluid or Oil and Transfer Case Oil (Refer to GROUP 21 TRANSMISSION – Transmission and Transfer Oil Change and Inspection.)
- Draining of the steering fluid (Refer to GROUP 19 STEERING – Replacement of fluid.)
- Draining of the Refrigerant (Refer to GROUP 24 HEATERS AND AIR-CONDITIONING – Refrigerant Leak Repair procedure.)

## Post-installation Operation

- Supplying of Transmission Fluid or Transfer Case Oil (Refer to GROUP 21 TRANSMISSION – Transmission and Transfer Oil Change and Inspection.)
- Supplying of Steering Fluid (Refer to GROUP 19 POWER STEERING – Replacement of Fluid.)
- Supplying of Refrigerant (Refer to GROUP 24 HEATERS AND AIR-CONDITIONING – Refrigerant Leak Repair Procedure.)
- Installation of the Undercover, Under Skid Plate, Transfer Case Protector, Cross-shaft Protector and Snow Protector. (Refer to GROUP 23 BODY – Under Cover.)
- Installation of the Hood (Refer to GROUP 23 BODY – Hood.)

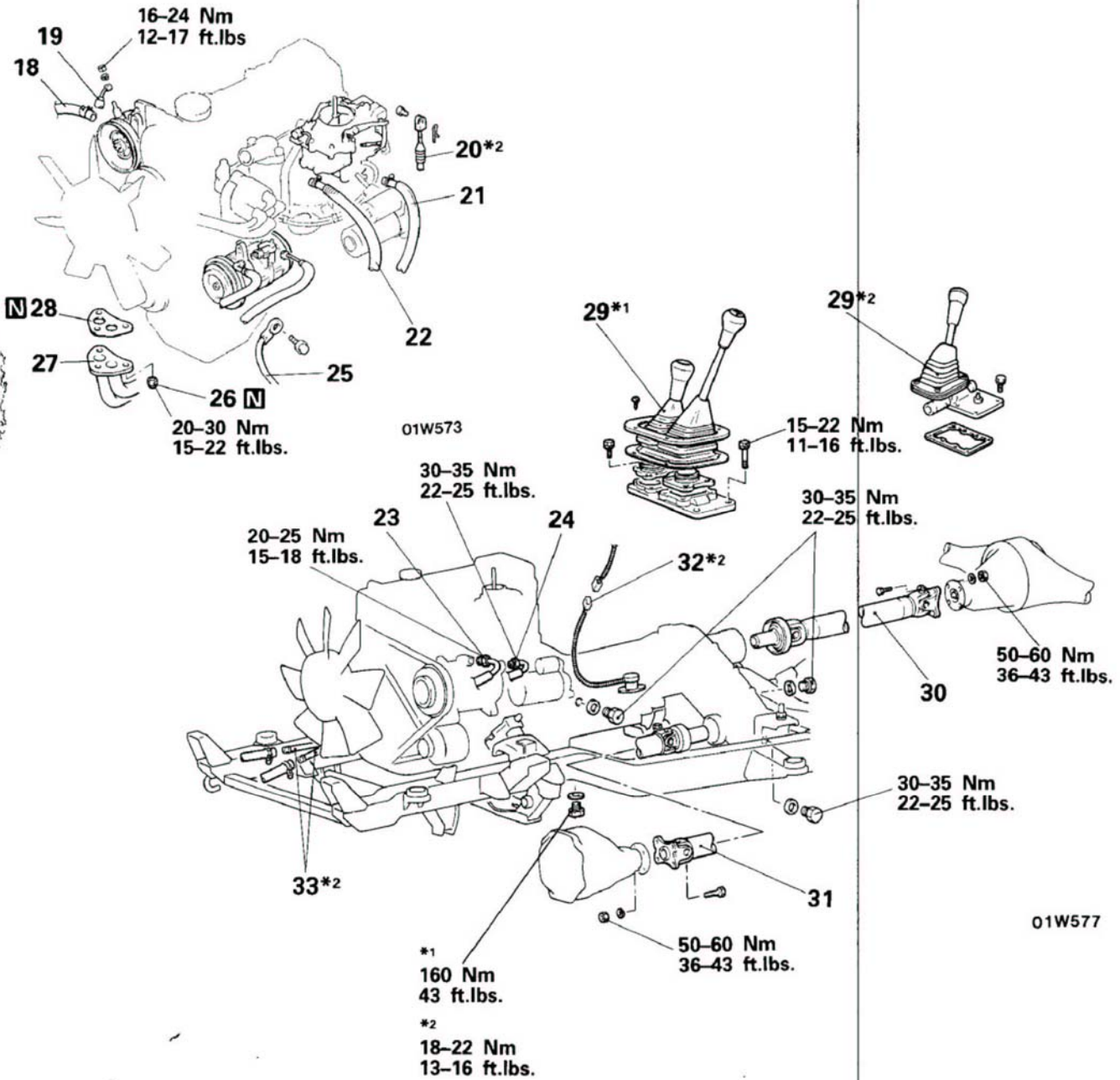


## Removal steps

- |      |  |  |
|------|--|--|
| ◆◆◆◆ | 1. Air filter  |  |
| ◆◆◆  | 2. Connection of accelerator cable   |  |
| ◆◆   | 3. Radiator upper hose   |  |
| ◆◆   | 4. Radiator lower hose   |  |
| ◆◆   | 5. Upper shroud  |  |
| ◆◆   | 6. Lower shroud  |  |
| ◆◆◆◆ | 7. Radiator  |  |
| ◆◆◆◆ | 8. Connection of brake booster vacuum hose   |  |
| ◆◆◆◆ | 9. Connection of heater hose   |  |
| ◆◆◆◆ | 10. Connection of oxygen sensor connector  |  |
| ◆◆◆◆ | 11. Connection of control harness connector  |  |
| ◆◆◆◆ | 12. Connection of battery positive cable   |  |
| ◆◆◆◆ | 13. Connection of starter motor connector  |  |
|      | 14. Connection of air conditioner harness connector (Vehicles with an air conditioner) |  |
|      | 15. Connection of alternator connector   |  |
|      | 16. Connection of water temperature gauge unit switch and sensor connector             |  |
|      | 17. Connection of oil pressure gauge unit connector.                                   |  |

## NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆◆ : Refer to "Service Points of Installation".

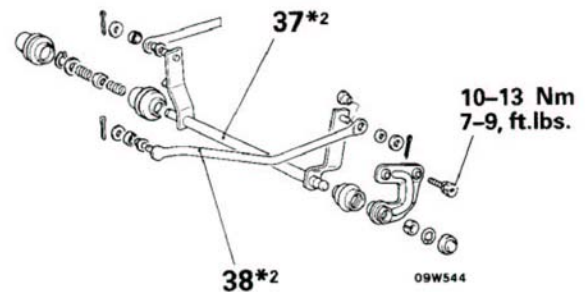
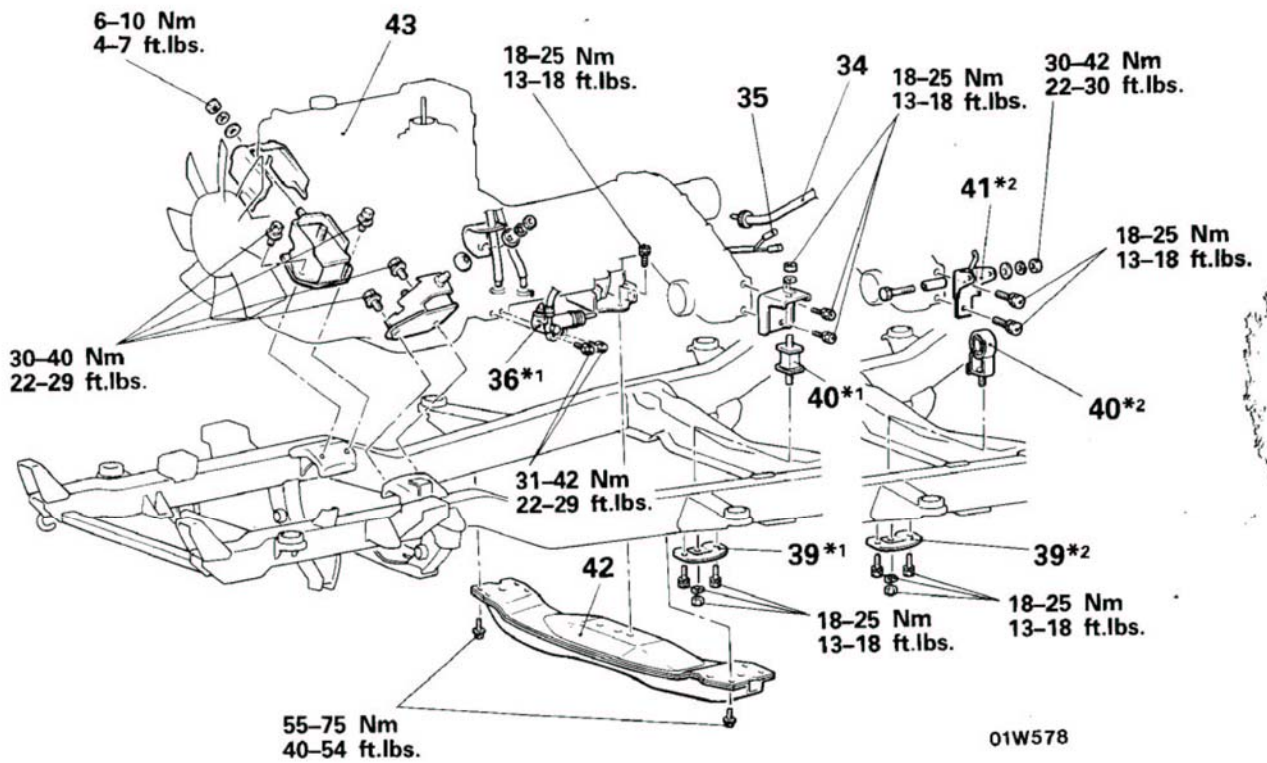


- 18. Connection of power steering return hose
- 19. Connection of power steering pressure hose
- ◆◆ 20. Connection of throttle control cable
- ◆◆ 21. Connection of fuel main hose
- ◆◆ 22. Connection of fuel return hose
- ◆◆ 23. Connection of the air conditioner compressor and discharge hose (vehicles with an air-conditioner)
- ◆◆ 24. Connection of the air conditioner compressor and suction hose (vehicles with an air-conditioner)
- ◆◆ 25. Connection of ground cable
- ◆◆ 26. Self locking nut
- ◆◆ 27. Connection of front exhaust pipe
- ◆◆ 28. Gasket

- ◆◆◆◆ 29. Control lever assembly
- ◆◆◆◆ 30. Rear propeller shaft
- ◆◆◆◆ 31. Front propeller shaft
- ◆◆◆◆ 32. Connection of the connector for the OD solenoid valve
- ◆◆◆◆ 33. Connection of oil cooler feed tube and return tube

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆ : Refer to "Service Points of Installation".
- (4) ◆ : Non-reusable parts.
- (5) \*1 : Vehicles with a manual transmission.
- (6) \*2 : Vehicles with an automatic transmission.



- ◆◆◆◆ 34. Connection of speedometer cable
- ◆◆◆◆ 35. Connection of 4WD indicator light switch
- ◆◆◆◆◆◆ 36. Clutch release cylinder
- ◆◆◆◆◆◆ 37. Select cross shaft
- ◆◆◆◆◆◆ 38. Transmission control rod
- ◆◆◆◆◆◆ 39. Plate
- ◆◆◆◆◆◆ 40. Transfer mounting insulator
- ◆◆◆◆◆◆ 41. Transfer mounting bracket
- ◆◆◆◆◆◆ 42. No. 2 crossmember
- ◆◆◆◆◆◆ 43. Engine and transmission assembly

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆◆◆◆ : Refer to "Service Points of Installation".
- (4) **N** : Non-reusable parts.
- (5) \*1 : Vehicles with a manual transmission.
- (6) \*2 : Vehicles with an automatic transmission.

**SERVICE POINTS OF REMOVAL**

N09SBCC

**1. REMOVAL OF AIR FILTER**

Refer to GROUP 11 INTAKE AND EXHAUST – Air Filter.

**7. REMOVAL OF RADIATOR**

Refer to GROUP 7 COOLING – Radiator.

**29. REMOVAL OF CONTROL LEVER ASSEMBLY**

Refer to GROUP 21 TRANSMISSION – Gearshift Lever Assembly (Manual transmission) or Transfer Control (Automatic transmission).

**30. REMOVAL OF REAR PROPELLER SHAFT/31. FRONT PROPELLER SHAFT**

Refer to GROUP 16 PROPELLER SHAFT AND UNIVERSAL JOINTS – Propeller shaft.

**36. REMOVAL OF CLUTCH RELEASE CYLINDER**

Refer to GROUP 6 CLUTCH – Clutch Release Cylinder.

**37. REMOVAL OF SELECT CROSS SHAFT/38. TRANSMISSION CONTROL ROD**

Refer to GROUP 21 TRANSMISSION – Transmission Control.

**43. REMOVAL OF ENGINE AND TRANSMISSION ASSEMBLY**

With the engine and transmission assembly tilted at an angle, slowly remove from the engine compartment.

**Caution**

**Check to be sure that all cables, harnesses, connectors, etc. are disconnected from the engine and transmission assembly.**

**SERVICE POINTS OF INSTALLATION**

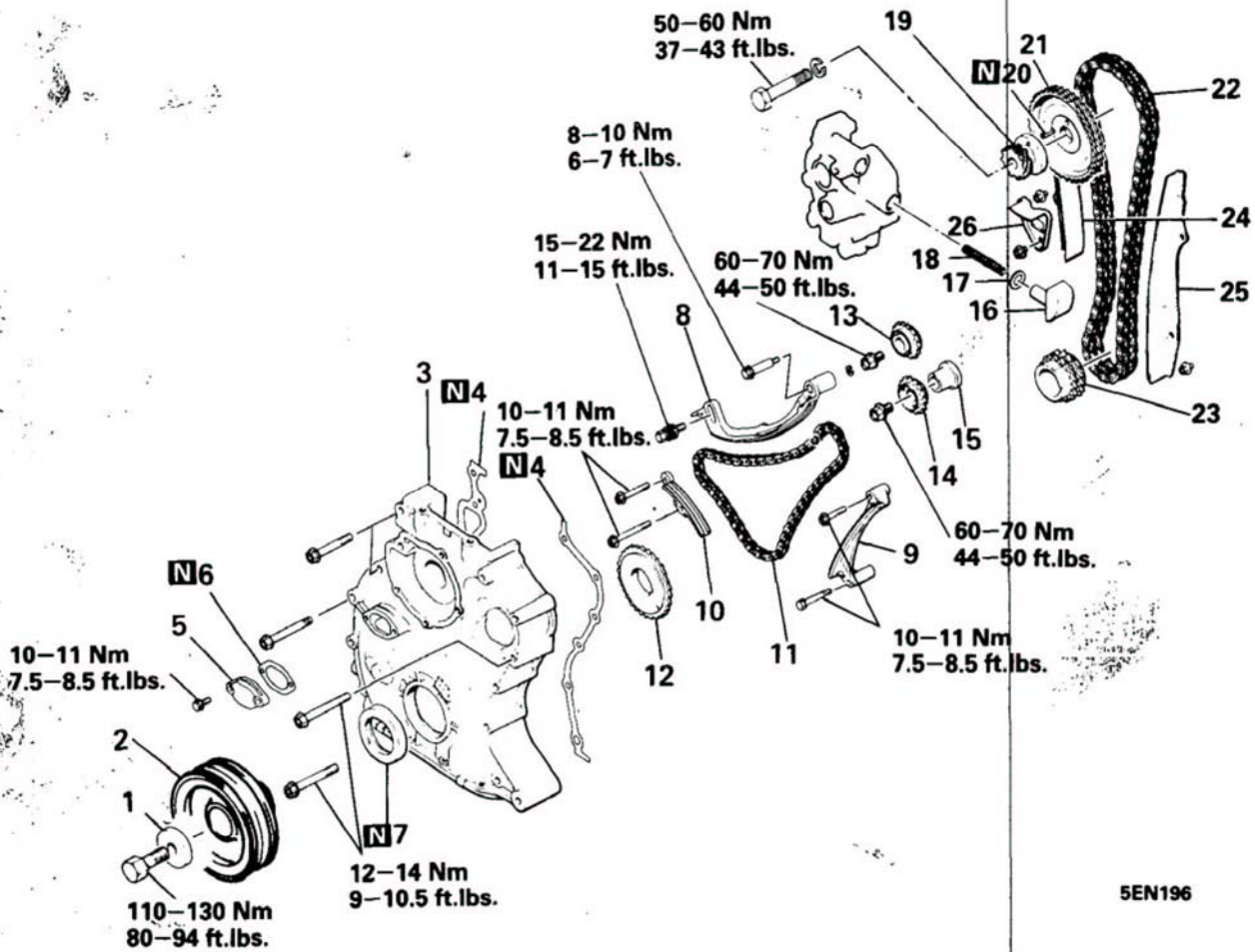
N09SDAG

**43. INSTALLATION OF ENGINE AND TRANSMISSION ASSEMBLY**

- (1) While checking the connections of the harnesses, pipes, hoses, etc., and making sure that none of them are being caught, damaged, etc., install the engine and transmission assembly.
- (2) Then, after the weight of the engine and transmission assembly has been put on each insulator, tighten to specified torque.

- 38. INSTALLATION OF TRANSMISSION CONTROL ROD/37.  
SELECT CROSS SHAFT**  
Refer to GROUP 21 TRANSMISSION – Transmission Control.
- 36. INSTALLATION OF CLUTCH RELEASE CYLINDER**  
Refer to GROUP 6 CLUTCH – Clutch Release Cylinder.
- 34. CONNECTION OF SPEEDOMETER CABLE**  
Refer to GROUP 21 TRANSMISSION – Replacement of the Speedometer Cable.
- 31. INSTALLATION OF FRONT PROPELLER SHAFT/30.  
REAR PROPELLER SHAFT**  
Refer to GROUP 16 PROPELLER SHAFT AND UNIVERSAL JOINTS – Propeller shaft.
- 29. INSTALLATION OF CONTROL LEVER ASSEMBLY**  
Refer to GROUP 21 TRANSMISSION – Gearshift Lever Assembly (Manual transmission) or Transfer Control (Automatic transmission).
- 20. CONNECTION OF THROTTLE CONTROL CABLE**  
Refer to GROUP 21 TRANSMISSION – Adjustment of Throttle Control Cable.
- 7. INSTALLATION OF RADIATOR**  
Refer to GROUP 7 COOLING – Radiator.
- 2. ADJUSTMENT OF ACCELERATOR CABLE**  
Refer to GROUP 14 FUEL SYSTEM – Accelerator
- 1. INSTALLATION OF AIR FILTER**  
Refer to GROUP 11 INTAKE AND EXHAUST – Air Filter.

# TIMING CHAIN TRAIN REMOVAL AND INSTALLATION



5EN196

**Removal steps**

1. Special washer
2. Crankshaft pulley
3. Timing chain case
4. Chain case gasket
5. Chain guide access hole cover
6. Chain guide access hole gasket
7. Oil seal
8. Chain guide "B"
9. Chain guide "A"
10. Chain guide "C"
11. Chain "B"
12. Crankshaft sprocket "B"
13. Oil pump sprocket
14. Left silent shaft sprocket
15. Spacer
16. Tension sleeve
17. Rubber sheet
18. Tensioner spring
19. Distributor gear
20. Spring pin
- ◆◆ 21. Camshaft sprocket
- ◆◆ 22. Timing chain
- ◆◆ 23. Crankshaft sprocket
24. Loose side chain guide
25. Tension side chain guide
26. Sprocket holder

**Installation steps**

26. Sprocket holder
25. Tension side chain guide
24. Loose side chain guide
- ◆◆ 18. Tensioner spring
- ◆◆ 17. Rubber sheet
- ◆◆ 16. Tension sleeve
23. Crankshaft sprocket
- ◆◆ 22. Timing chain
21. Camshaft sprocket
20. Spring pin
19. Distributor gear
15. Spacer
- ◆◆ 14. Left silent shaft sprocket
13. Oil pump sprocket
- ◆◆ 12. Crankshaft sprocket "B"
- ◆◆ 11. Chain "B"
10. Chain guide "C"
9. Chain guide "A"
8. Chain guide "B"
- ◆◆ 7. Oil seal
6. Chain guide access hole gasket
5. Chain guide access hole cover
4. Chain case gasket
- ◆◆ 3. Timing chain case
2. Crankshaft pulley
1. Special washer

**NOTE**

- (1) ◆◆ : Refer to "Service Points of Removal".  
 (2) ◆◆ : Refer to "Service Points of Installation".  
 (3) **N** : Non-reusable parts



**SERVICE POINTS OF REMOVAL**

N09WBAA

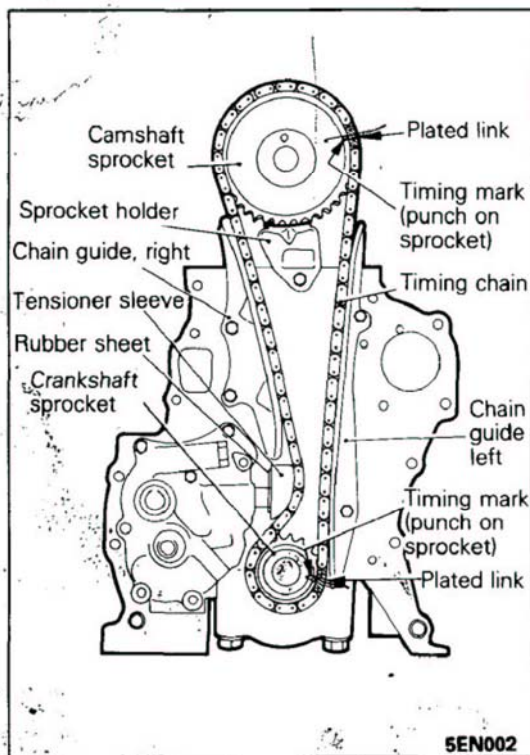
**21. REMOVAL OF CAMSHAFT SPROCKET/22. TIMING CHAIN/23. CRANKSHAFT SPROCKET**

Remove the timing chain combined with camshaft sprocket and crankshaft sprocket.

**INSPECTION**

N09WCAA

- Check the timing chain for roller play, wear, damage or disconnected links.  
Replace if necessary.
- Check the tensioner and chain guide rubber shoe for wear or damage.  
Replace if necessary.

**SERVICE POINTS OF INSTALLATION**

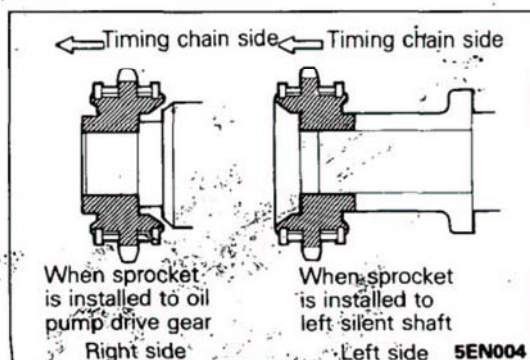
N09WDAA

**18. INSTALLATION OF TENSIONER SPRING/17. RUBBER SHEET/16. TENSIONER SLEEVE**

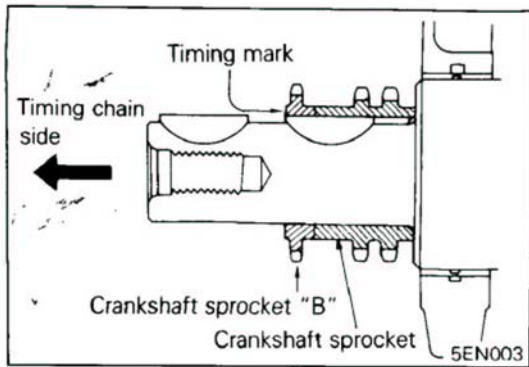
Install tensioner spring, sleeve and rubber sheet to oil pump, and then install the oil pump.

**22. INSTALLATION OF TIMING CHAIN**

- (1) Turn crankshaft until piston of No. 1 cylinder is at top dead center.
- (2) Line up plated links of timing chain and timing marks on sprockets as chain and sprockets are assembled.
- (3) While sliding crankshaft sprocket onto crankshaft, install chain and sprocket. Place camshaft sprocket on sprocket holder.

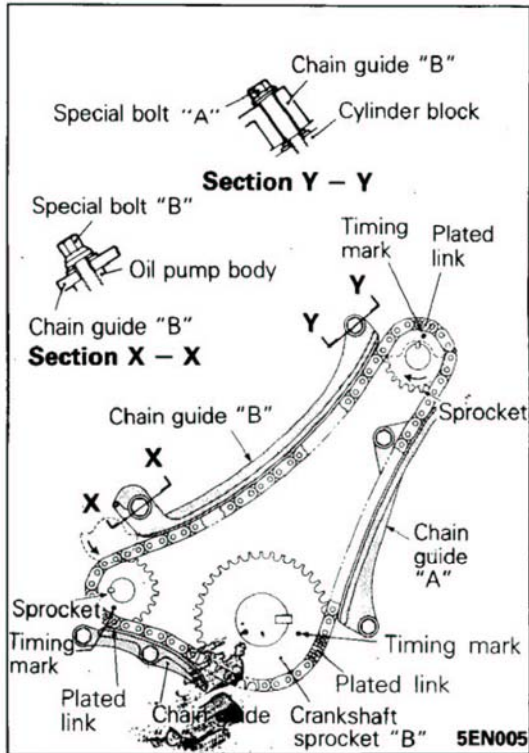
**14. INSTALLATION OF LEFT SILENT SHAFT SPROCKET**

- (1) Assemble silent shaft sprockets to chain "B". Make sure that timing marks are in alignment with plated links.
- (2) Use care not to confuse right and left sprockets, as they are installed in opposite directions.



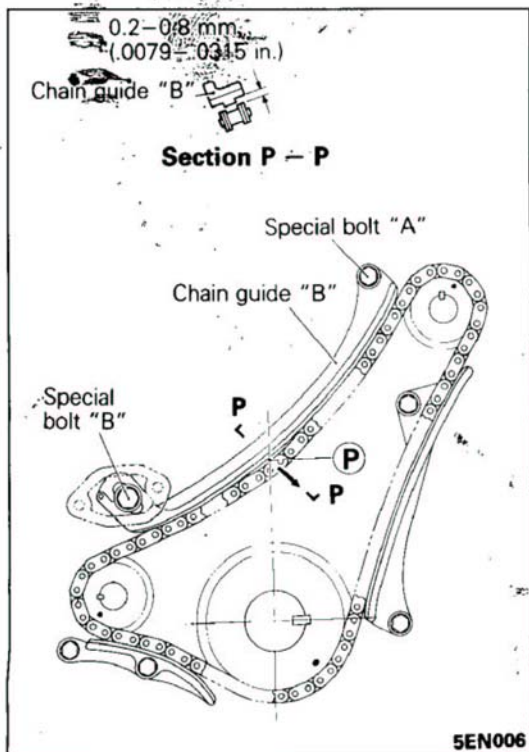
**12. INSTALLATION OF CRANKSHAFT SPROCKET "B"**

Install crankshaft sprocket "B" (for driving silent shafts) on crankshaft.



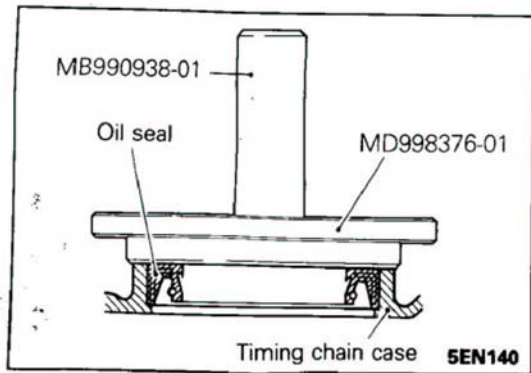
**11. INSTALLATION OF CHAIN "B"**

(1) Holding assembled sprockets and chain "B", align timing mark on crankshaft sprocket "B" with that on chain "B", and install sprockets to oil pump drive gear and left silent shaft. Partially tighten bolt.



- (2) Rotate both silent shaft sprockets slightly to position chain slack at point P.
- (3) Adjust position of chain guide "B" so that when chain is pulled in direction of arrow with finger tips, clearance between chain guide "B" and links of chain "B".

**Chain and chain guide "B" gap**  
**Standard value : 0.2-0.8 mm (.0079-.0315 in.)**



### 7. INSTALLATION OF OIL SEAL

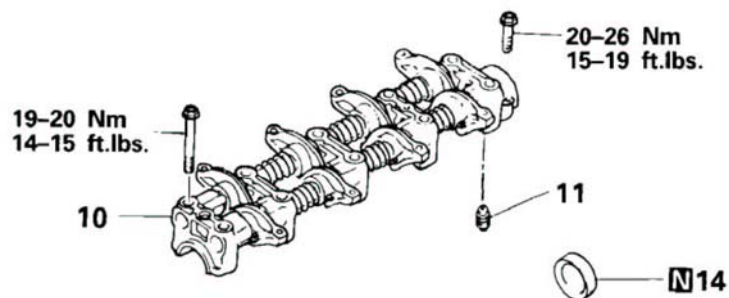
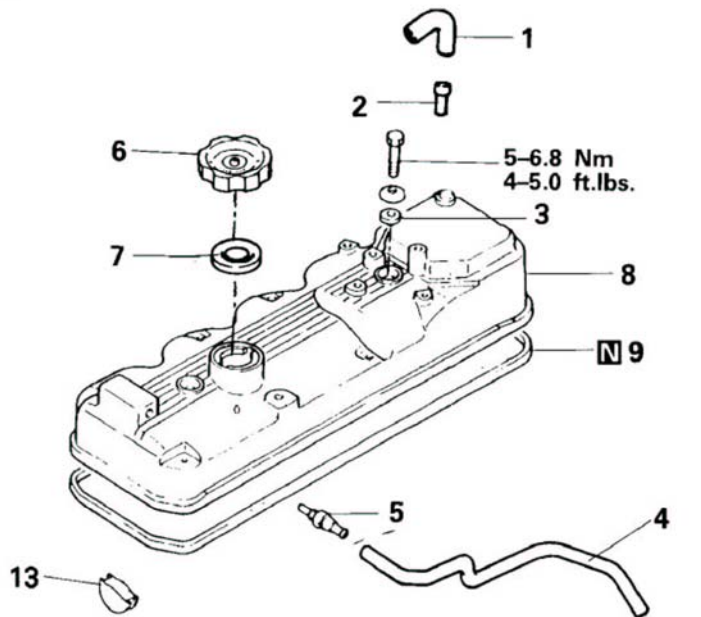
Using special tools, install the oil seal.

### 3. INSTALLATION OF TIMING CHAIN CASE

- (1) Clean the gasket surfaces of chain case and cylinder block.
- (2) Install the chain case gaskets and chain case to the cylinder block.

# ROCKER ARMS, ROCKER ARM SHAFTS AND CAMSHAFT REMOVAL AND INSTALLATION

N09LA--

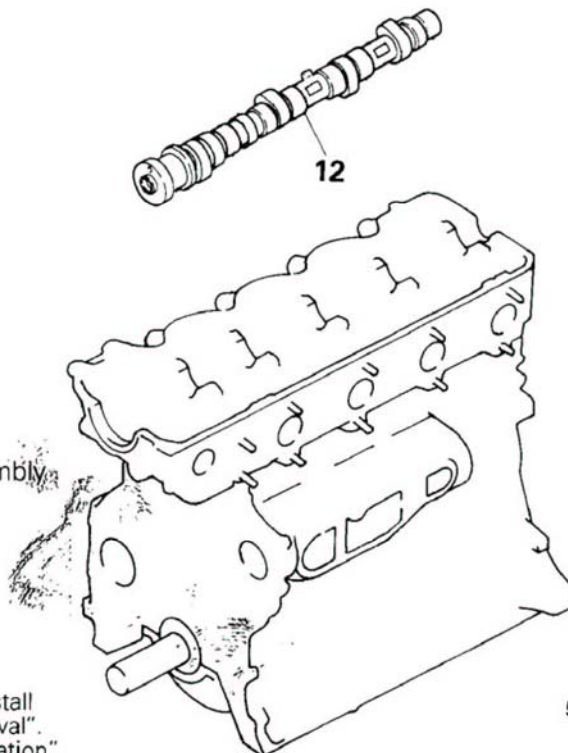


## Removal steps

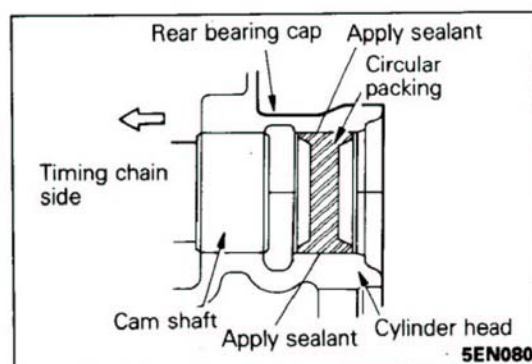
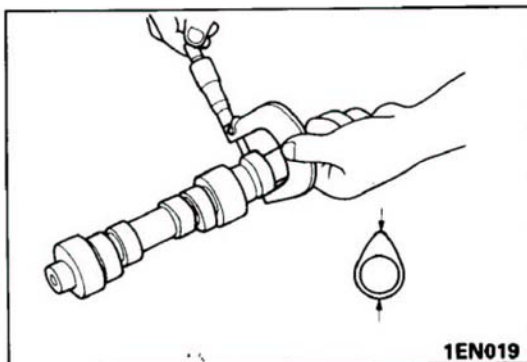
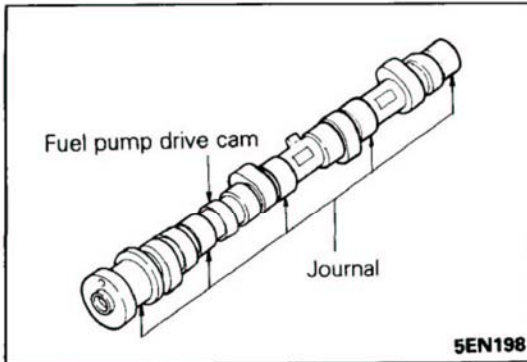
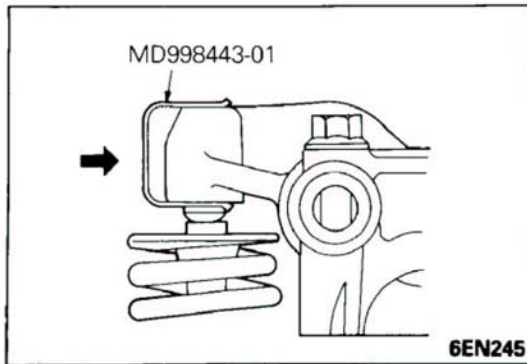
1. Breather hose
2. Pipe
3. Oil seal
4. P.C.V. hose
5. P.C.V. valve
6. Oil filler cap
7. Packing
8. Rocker cover
9. Rocker cover gasket
- ◆◆◆◆ 10. Rocker arm and shaft assembly
- ◆◆◆◆ 11. Auto-lash adjuster
- ◆◆◆◆ 12. Camshaft
- ◆◆◆◆ 13. Semi-circular packing
- ◆◆◆◆ 14. Circular packing

## NOTE

- (1) Reverse the removal procedures to reinstall
- (2) ◆◆◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆◆ : Refer to "Service Points of Installation".
- (4) **N**: Non-reusable parts



5EN197



## SERVICE POINTS OF REMOVAL

N09LBCA

### 10. REMOVAL OF ROCKER ARM AND SHAFT ASSEMBLY/11. AUTO-LASH ADJUSTER

Before removing the rocker arm and shaft assembly, use the special tool to ensure that the auto-lash adjuster doesn't fall out.

#### Caution

Put the rocker arms and auto-lash adjusters in order in cylinder No. separated places with clear distinction between the intake and exhaust ones to prevent confusion.

## INSPECTION

N09LCCA

- Check camshaft journals for wear or damage. Replace if necessary. If journals are damaged, also inspect camshaft bearings for wear or damage. If camshaft bearing is badly worn, replace cylinder head.
- Check the fuel pump drive cam and distributor drive gear teeth for wear or damage. Replace if necessary.

#### Camshaft

##### Standard value

Height of fuel pump drive cam : 37 mm (1.4567 in.)

Journal diameter : 34 mm (1.3386 in.)

Oil clearance : 0.03–0.05 mm (.0012–.0020 in.)

- Check for unusual cam face wear or damage, replace the part if required. Measure cam height (i.e., its diameter), replace the cam if outside of the limit.

#### Cam height

##### Standard value

Intake : 42.4 mm (1.6693 in.)

Exhaust : 42.4 mm (1.6693 in.)

##### Limit

Intake : 41.9 mm (1.6496 in.)

Exhaust : 41.9 mm (1.6496 in.)

#### End play

Standard value : 0.1–0.2 mm (.004–.008 in.)

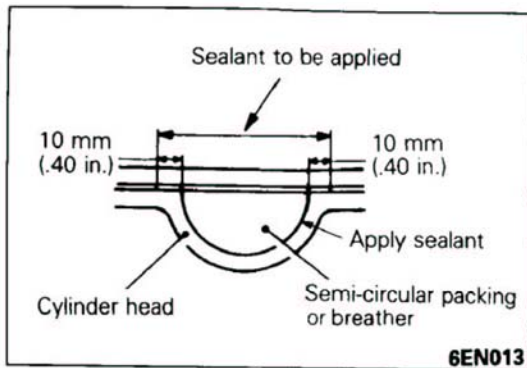
Limit : 0.4 mm (.016 in.)

## SERVICE POINTS OF INSTALLATION

N09LDCB

### 14. INSTALLATION OF CIRCULAR PACKING

Coat the sealant to the O.D. of circular packing and install the circular packing to cylinder head.

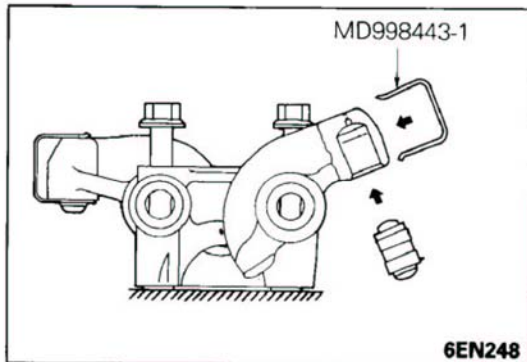
**13. APPLY SEALANT TO SEMI-CIRCULAR PACKING**

Apply sealant to the top of the packing and semi-circle.

**Specified sealant : 3M ART Part No. 8660 or equivalent**

**12. INSTALLATION OF CAMSHAFT**

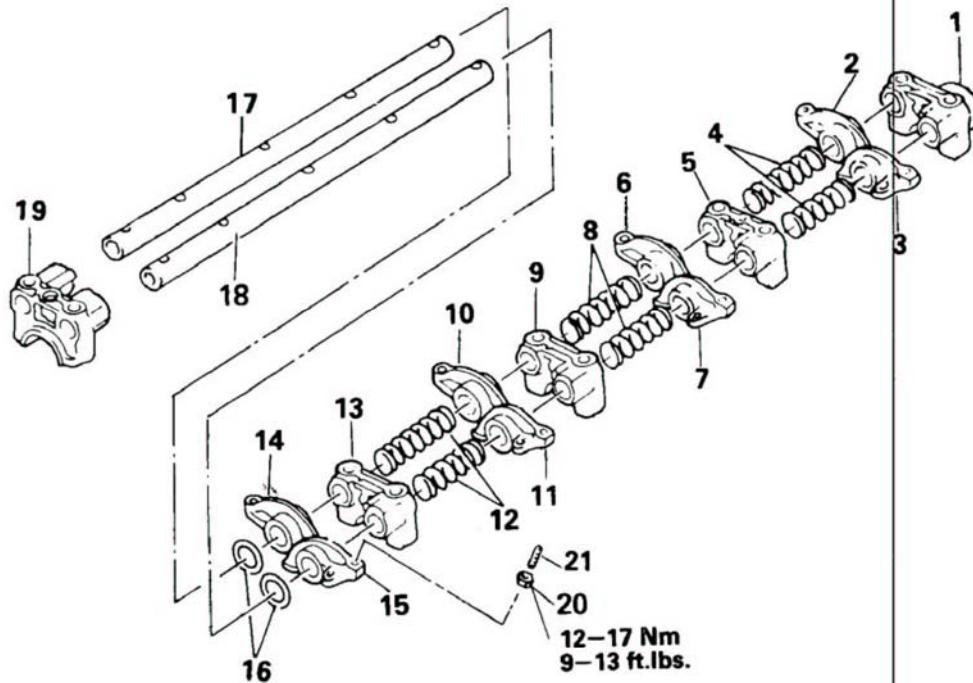
Apply engine oil to the journals of camshaft and install it to cylinder head.

**11. INSTALLATION OF AUTO-LASH ADJUSTER/10. ROCKER ARM AND SHAFT ASSEMBLY**

- (1) Insert the auto-lash adjuster from below as illustrated, being careful not to spill the diesel oil inside it. Then use the special tool to prevent adjuster from falling while installing it.
- (2) Place the rocker arm and shaft assembly on the cylinder head and tighten the bearing cap bolt.
- (3) Remove the special tool.

## ROCKER ARM AND SHAFT ASSEMBLY

## DISASSEMBLY AND REASSEMBLY



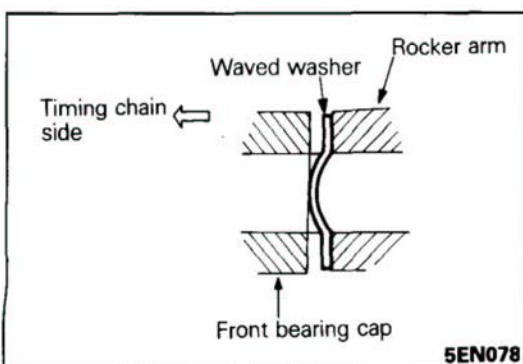
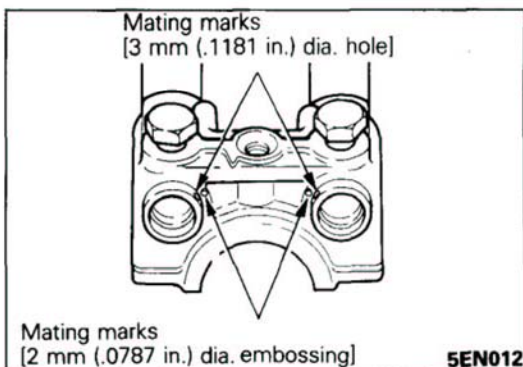
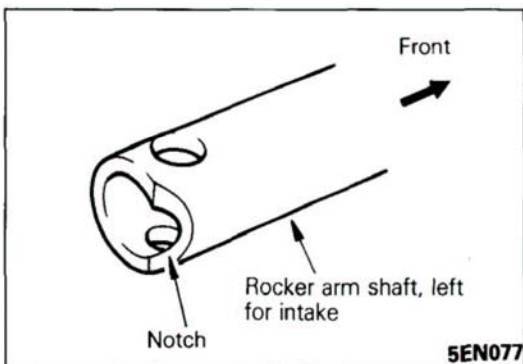
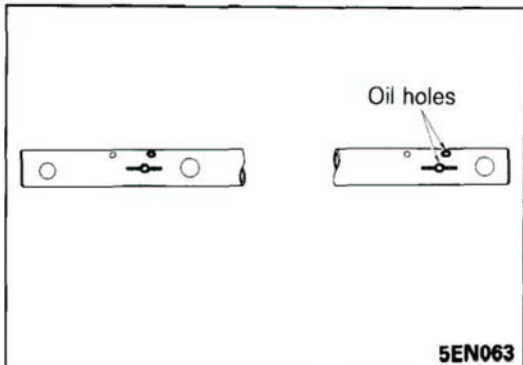
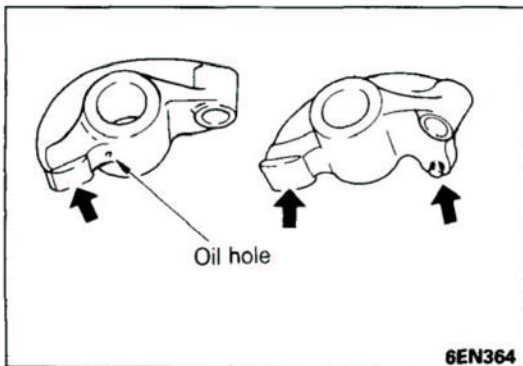
5EN199

## Disassembly steps

1. Rear bearing cap
2. Rocker arm "C"
3. Rocker arm "A"
4. Rocker shaft spring
- ◆◆ 5. Bearing cap No.4
6. Rocker arm "C"
7. Rocker arm "A"
8. Rocker shaft spring
- ◆◆ 9. Bearing cap No.3
10. Rocker arm "C"
11. Rocker arm "A"
12. Rocker shaft spring
- ◆◆ 13. Bearing cap No.2
14. Rocker arm "C"
15. Rocker arm "A"
- ◆◆ 16. Wave washer
- ◆◆ 17. Right rocker arm shaft
- ◆◆ 18. Left rocker arm shaft
- ◆◆ 19. Front bearing cap
20. Nut
21. Adjusting screw

## NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Reassembly".

**INSPECTION**

N09NGAD1

- **ROCKER ARM**

- (1) Check rocker arms for wear or damage. Replace if necessary.
- (2) Check to ensure that oil holes are clear.

- **ROCKER ARM SHAFT**

- (1) Check rocker arm mounting portions of rocker arm shaft for wear or damage. Replace as necessary.
- (2) Check to ensure that oil holes are clear.

**SERVICE POINTS OF REASSEMBLY**

N09NHCA

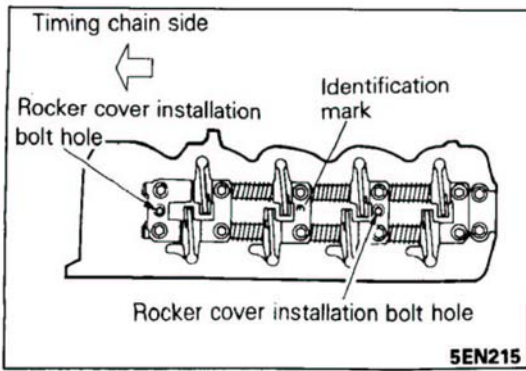
**19. INSTALLATION OF FRONT BEARING CAP/18. LEFT ROCKER ARM SHAFT/17. RIGHT ROCKER ARM SHAFT**

- (1) Insert the left and right rocker shafts into the front bearing cap. The rear end of left (intake) rocker arm shaft has a notch.
- (2) Align the mating mark of the rocker arm shaft front end to the mating mark of the front bearing cap. Then insert the bolts to hold shafts in bearing cap.
- (3) Assemble the rocker arm shaft so that the alignment mark at the front end matches the alignment mark of the front bearing cap.

**16. INSTALLATION OF WAVE WASHER**

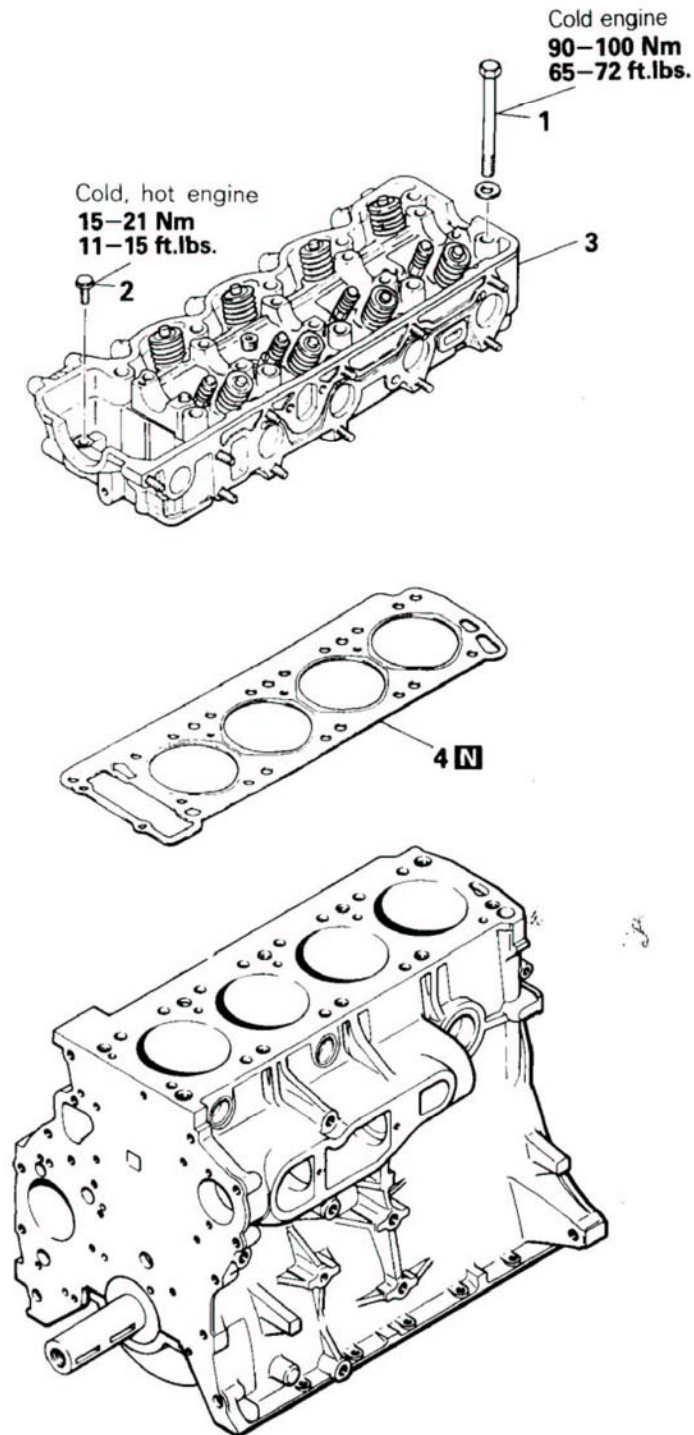
Install the waved washer in the direction shown in the illustration.





### 13.9.5. INSTALLATION OF BEARING CAP

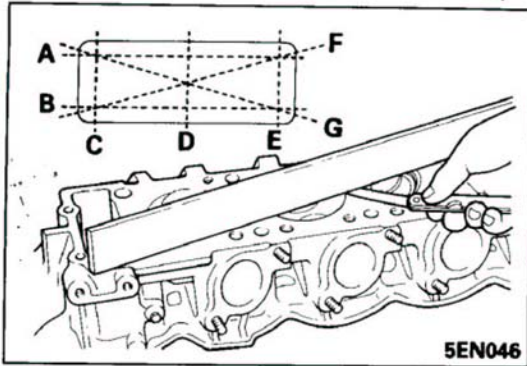
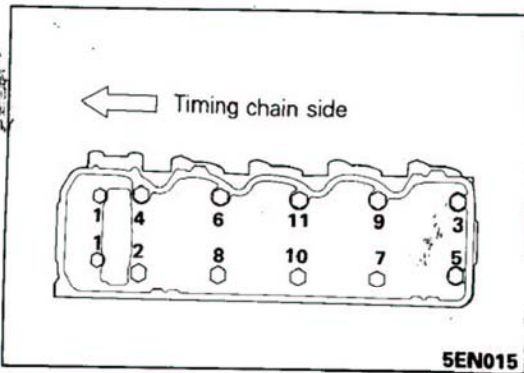
Caps 2, 3 and 4 are of similar shape and require attention to the cap number during assembly.

**CYLINDER HEAD****REMOVAL AND INSTALLATION****Removal steps**

- ◆◆◆◆ 1. Cylinder head bolt
- ◆◆◆◆ 2. Bolt
- ◆◆◆ 3. Cylinder head
- ◆◆ 4. Cylinder head gasket

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆ : Refer to "Service Points of Installation".
- (4) **N** : Non-reusable parts



## SERVICE POINTS OF REMOVAL

N090BAB

### 1. REMOVAL OF CYLINDER HEAD BOLT/2. BOLT

Remove cylinder head bolts in sequence shown in illustration.

## INSPECTION

N090CAE

- Remove scale, sealing compound and carbon deposits completely. After cleaning oil passages, apply compressed air to make certain that the passages are not clogged.
- Check the jet air passage and EGR gas passage for clogging.
- Visually check the cylinder head for cracks, damage and water leakage.
- Check cylinder head gasket surface for flatness with a straight edge as shown in illustration.
- If flatness exceeds limit in any direction, either replace cylinder head or lightly machine the cylinder head gasket surface.

### Flatness of cylinder head gasket surface

Standard value : Max. 0.05 mm (.002 in.)

Limit : 0.2 mm (.0079 in.)

### Overall height

Standard value : 90 mm (3.5433 in.)

Limit

(amount of cylinder head gasket surface grind) :

-0.2 mm (-.0079 in.)

### Caution

The cylinder head gasket surface should be ground to within 0.2 mm (.0079 in.) even with the grind of the cylinder block gasket surface.

## SERVICE POINTS OF INSTALLATION

N090DAB

### 4. INSTALLATION OF CYLINDER HEAD GASKET

- (1) Clean gasket surfaces of cylinder head and cylinder block.
- (2) Apply a sufficient amount of sealant or similar material to the two guides on the cylinder block and chain case as illustrated.

**Specified sealant : 3M ART Part No. 8660 or equivalent**

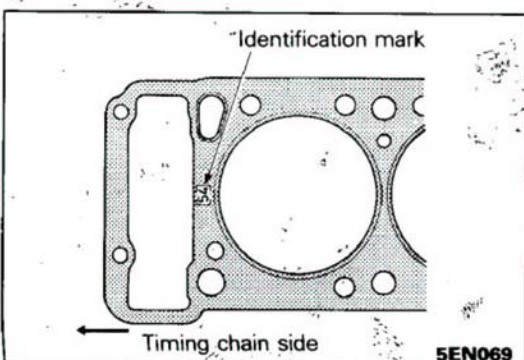
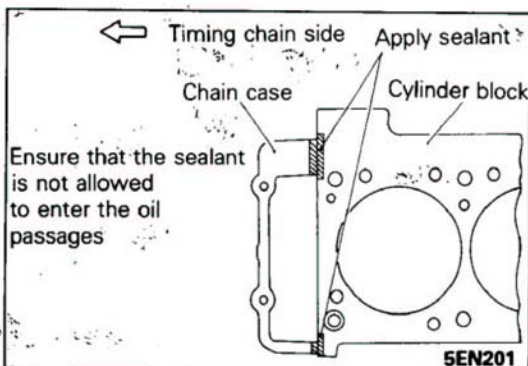
- (3) Be sure to position the gasket on the cylinder block with the identification mark up.

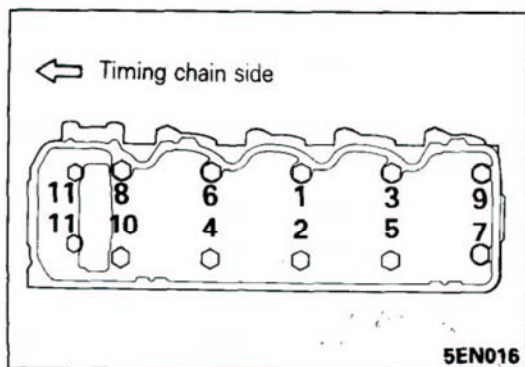
**Identification mark : "54"**

- (4) Align with the mark on the top of the cylinder head when installing.

### Caution

**Do not apply sealant to cylinder head gasket.**

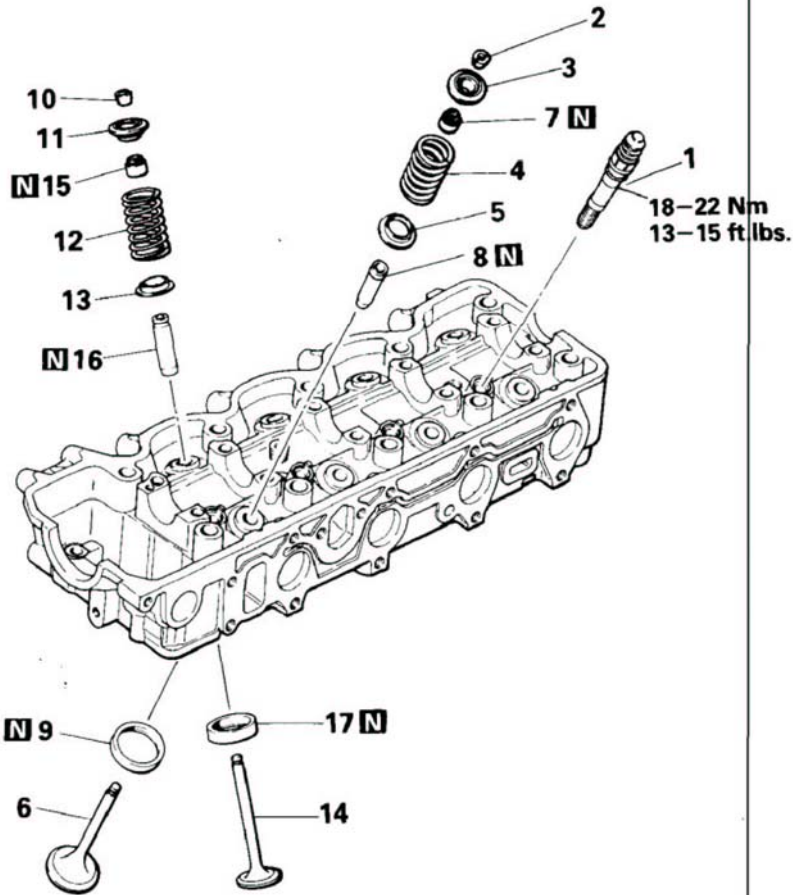


**2. INSTALLATION OF BOLT/1. CYLINDER HEAD BOLT**

Install cylinder head bolts. Starting at top center, tighten all cylinder head bolts to 1/2 of specified torque in sequence shown in illustration.

# VALVES AND VALVE SPRINGS

## DISASSEMBLY AND REASSEMBLY



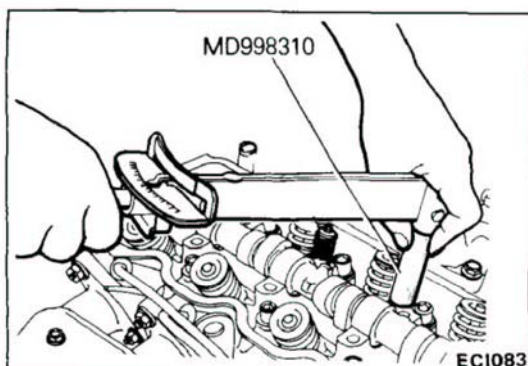
### Disassembly steps

- ◆◆◆◆ 1. Jet valve assembly
- ◆◆◆◆ 2. Retainer lock
- ◆◆◆◆ 3. Valve spring retainer
- ◆◆ 4. Valve spring
- ◆◆ 5. Valve spring seat
- ◆◆ 6. Intake valve
- ◆◆◆◆ 7. Valve stem seal
- ◆◆◆◆ 8. Intake valve guide
- ◆◆◆◆ 9. Intake valve seat
- ◆◆◆◆ 10. Retainer lock
- ◆◆◆◆ 11. Valve spring retainer
- ◆◆ 12. Valve spring
- ◆◆ 13. Valve spring seat
- ◆◆ 14. Exhaust valve
- ◆◆◆◆ 15. Valve stem seal
- ◆◆◆◆ 16. Exhaust valve guide
- ◆◆◆◆ 17. Exhaust valve seat

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆◆ : Refer to "Service Points of Reassembly".
- (4) N : Non-reusable parts

5EN212

**SERVICE POINTS OF DISASSEMBLY**

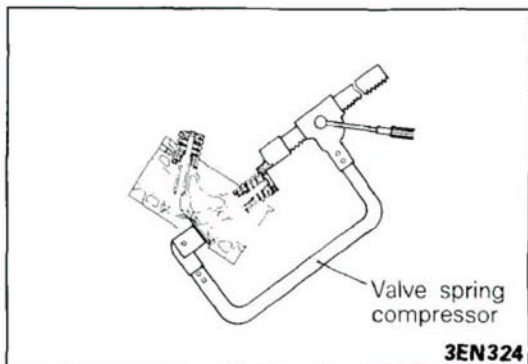
N09PFAB

**1. REMOVAL OF JET VALVE ASSEMBLY**

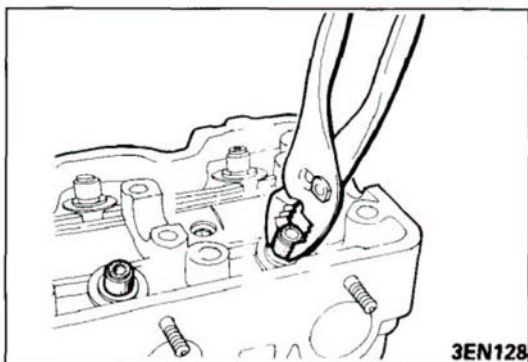
Using special tool, remove the jet valve assembly.

**Caution**

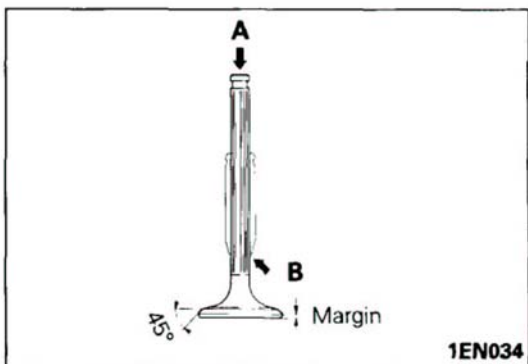
When special tool is used, make certain that the wrench is not tilted with respect to the center of the jet valve. If the tool is tilted, the valve stem might be bent by the force exerted on the valve spring retainer, resulting in defective jet valve operation.

**2.10. REMOVAL OF RETAINER LOCK**

- (1) Using valve spring compressor, remove the retainer lock.
- (2) Keep these parts in order so that they can be reinstalled in their original positions.

**7.15. REMOVAL OF VALVE STEM SEAL**

Remove the valve stem seals with pliers and discard them.

**INSPECTION**

N09PGAC1

**• VALVES**

- (1) Check each valve for wear, damage and deformation of head and stem at "B". Repair or replace excessively worn, damaged or deformed valves.
- (2) If stem tip "A" has been pitted, correct with oil stone or other means. This correction must be limited to a minimum. Also reface the valve.
- (3) Replace the valve if the face margin has decreased to less than limit.

**Margin****Standard value**

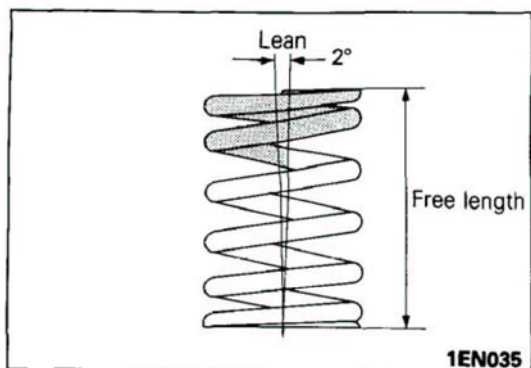
Intake : 1.2 mm (.047 in.)

Exhaust : 2.0 mm (.079 in.)

**Limit**

Intake : 0.7 mm (.028 in.)

Exhaust : 1.5 mm (.059 in.)



• **VALVE SPRINGS**

- (1) Check free length of each valve spring and replace if necessary.
- (2) Using a square, test squareness of each valve spring. If spring is excessively out of square, replace it.

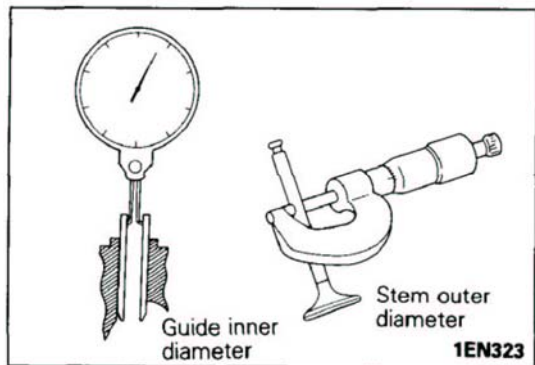
**Valve spring**

**Standard value**

Free length : 49.8 mm (1.961 in.)  
 Load : 322.6 N (72.5 lbs.) at installed height  
 Installed height : 40.4 mm (1.591 in.)  
 Out of squareness : Within 2°

**Limit**

Free length : 48.8 mm (1.922 in.)  
 Installed height : 41.40 mm (1.6299 in.)  
 Out of squareness : 4°



• **VALVE GUIDES**

N09PGCB

Check the valve stem-to-guide clearance. If the clearance exceeds the limit, replace the valve guide with new oversize part.

**Valve stem-to-guide clearance**

**Standard value**

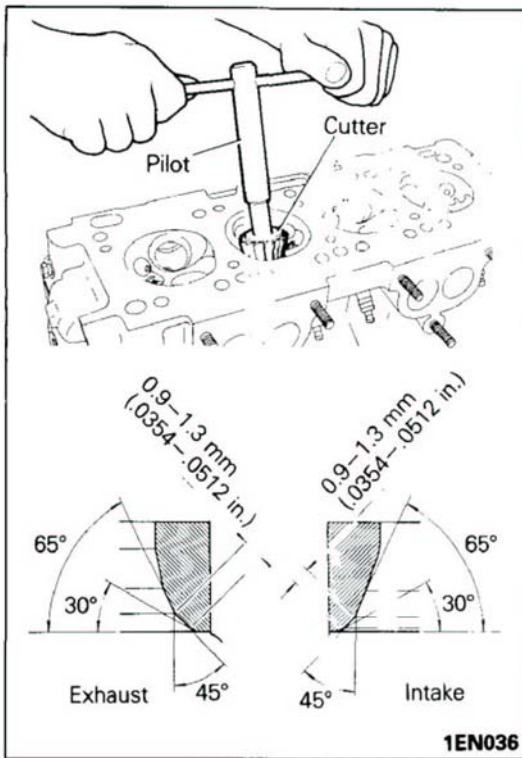
Intake : 0.03–0.06 mm (.0012–.0024 in.)  
 Exhaust : 0.05–0.09 mm (.0020–.0035 in.)

**Valve Guide Oversizes**

Size mm (in.)	Size mark	Cylinder head hole size mm (in.)
0.05 (.002) O.S.	5	13.050–13.068 (.5138–.5145)
0.25 (.010) O.S.	25	13.250–13.268 (.5217–.5224)
0.50 (.020) O.S.	50	13.500–13.518 (.5315–.5422)

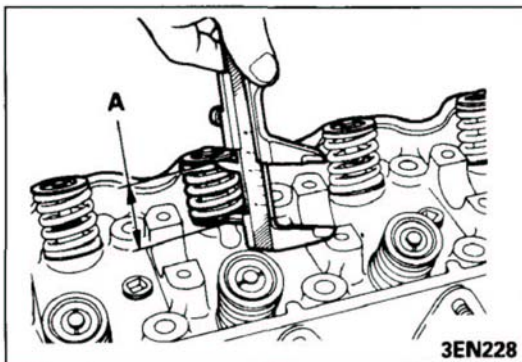
**Limit**

Intake : 0.1 mm (.0039 in.)  
 Exhaust : 0.15 mm (.0059 in.)

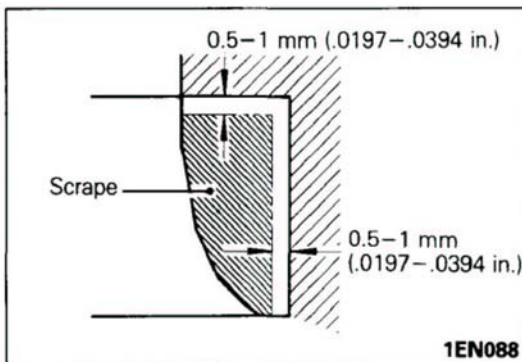
**VALVE SEAT RECONDITIONING PROCEDURES**

N09PHAC 1

- (1) Check the valve guide for wear. Replace the worn guide.
- (2) Recondition the valve seat with a seat grinder or cutter. The valve seat contact width should be of the specified size at the center of the valve face.
- (3) The valve and valve seat should be lapped lightly with a lapping compound.

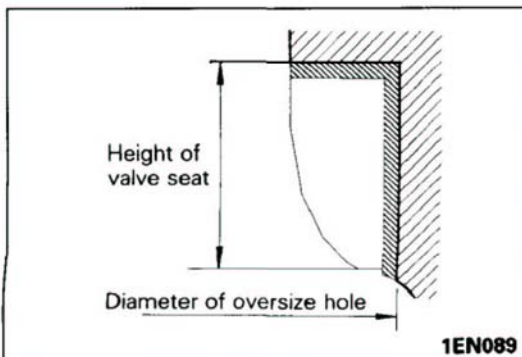


- (4) Check valve seat insert sinkage. If the sinkage exceeds the service limit, replace the insert with an oversize part as described below.
- (5) Measure the installed height of spring between the spring seat and the retainer with the valve spring seat, spring retainer and retainer lock installed. The amount of sinkage can be judged from the measured value.

**Installed height of spring A (both intake and exhaust)****Standard value : 40.4 mm (1.5905 in.)****Limit : 41.4 mm (1.6299 in.)****VALVE SEAT INSERT REPLACEMENT PROCEDURES**

N09PIAE

- (1) To replace : scrape the inner face of the valve seat to reduce the wall thickness, and remove.

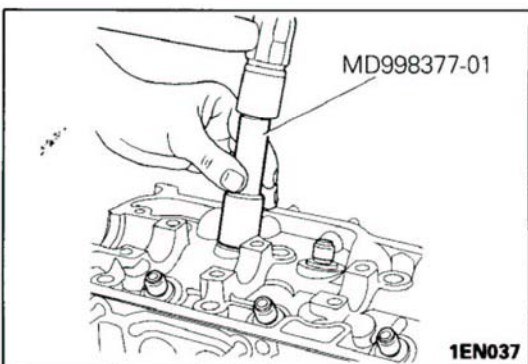
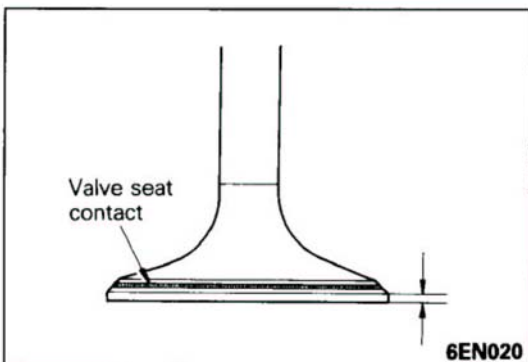
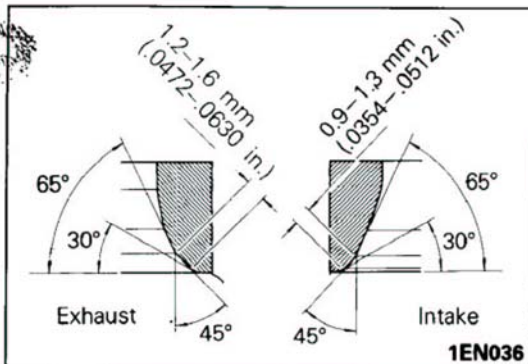


- (2) Adjust the press fit diameter of the valve seat on the cylinder head side so that it matches the diameter of the oversized valve seat.



## Valve Seat Insert Oversizes

Description	Size mm (in.)	Size mark	Insert height H mm (in.)	Cylinder head I.D. mm (in.)
Intake valve seat insert	0.3 (.012) O.S.	30	7.9–8.1 (.3110–.3189)	47.30–47.33 (1.8622–1.8632)
	0.6 (.024) O.S.	60	8.2–8.4 (.3228–.3307)	47.60–47.63 (1.8740–1.8750)
Exhaust valve seat insert	0.3 (.012) O.S.	30	7.9–8.1 (.3110–.3189)	40.30–40.33 (1.5866–1.5876)
	0.6 (.024) O.S.	60	8.2–8.4 (.3228–.3307)	40.60–40.63 (1.5984–1.5994)



- (3) Heat the cylinder head to about 250°C (480°F) and press in an oversize seat insert fit to the insert bore in the cylinder head at normal temperature.
- (4) Treat the valve seat in the way shown in the diagram.
- (5) Use the lapping compound, and lap the valve.

- (9) Ensure that the seat is properly centered on the valve face.

## SERVICE POINTS OF REASSEMBLY

N09PKDB

## 15.7. INSTALLATION OF VALVE STEM SEAL/13.5. VALVE SPRING SEAT

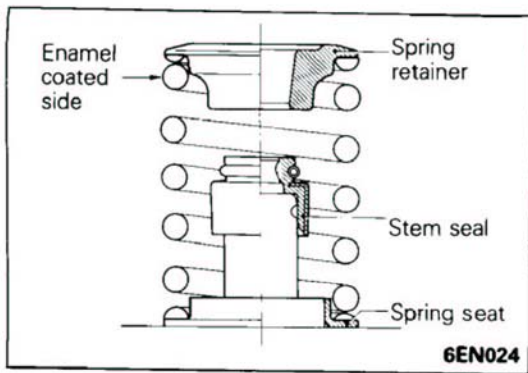
Install the spring seat, then using special tool, install the stem seal by lightly tapping the tool. Seal is installed in specified position, using the special tool.

**Caution**

1. **Incorrect installation of the seal without using special tool will result in poor sealing and cause oil leakage down valve guide.**
2. **Do not reuse stem seal.**

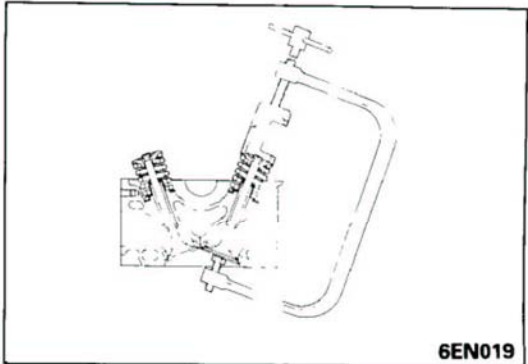
## 14. INSTALLATION OF EXHAUST VALVE/6. INTAKE VALVE

Apply engine oil to each valve, insert valves into the valve guides. Avoid inserting the valve into the seal with force. After insertion, check to see if the valve moves smoothly.



#### 12.4. INSTALLATION OF VALVE SPRING

Valve springs should be installed with the enamel coated side toward the valve spring retainer.



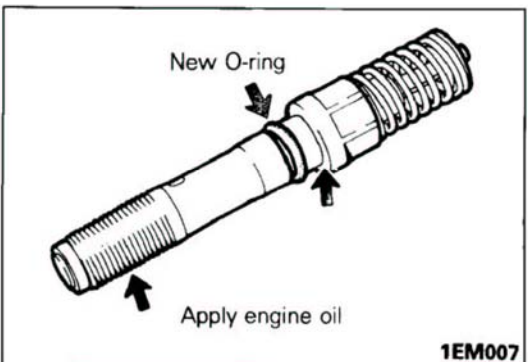
#### 10.2. INSTALLATION OF RETAINER LOCK

- (1) Using the valve spring compressor, compress the valve spring and install the retainer lock.

##### Caution

**When compressing the spring with the Valve Spring Compressor, check to see that the valve stem seal is not pressed to the bottom of the retainer. Then start installing the retainer lock.**

- (2) Make certain that retainer locks are positively installed.

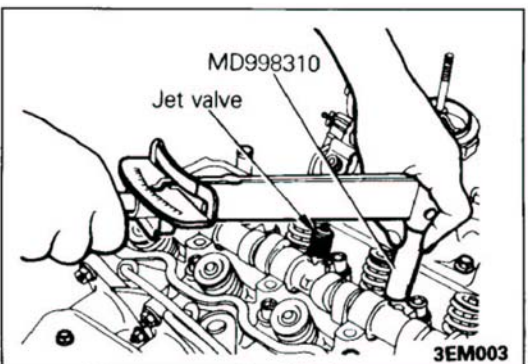


#### 1. INSTALLATION OF JET VALVE ASSEMBLY

- (1) Apply engine oil to the O-ring, jet body threads and seat surface.

##### Caution

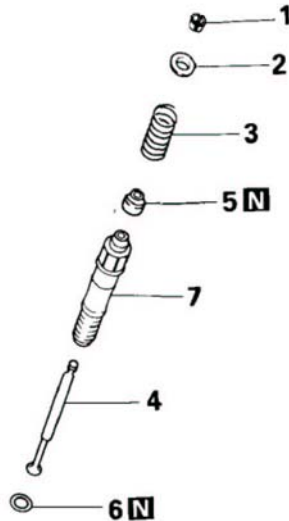
**Make sure that the O-ring is a new one.**



- (2) Screw the jet valve assembly into cylinder head by hand. Tighten the jet valve to the specified torque with Special Tool and a torque wrench while holding the special tool in line with the jet valve center line.

## JET VALVE ASSEMBLY

### DISASSEMBLY AND REASSEMBLY



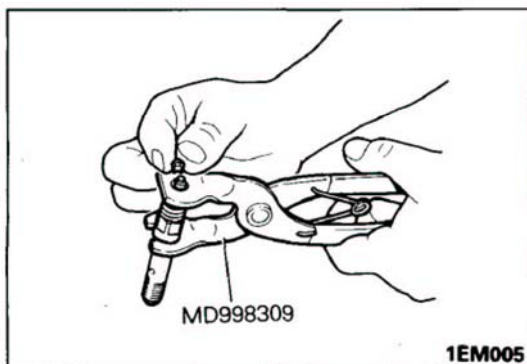
#### Disassembly steps

- ◆◆◆◆ 1. Retainer lock
- ◆◆ 2. Valve spring retainer
- ◆◆ 3. Valve spring
- ◆◆ 4. Jet valve
- ◆◆ 5. Stem seal
- 6. O-ring
- 7. Jet body

#### NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆ : Refer to "Service Points of Reassembly".
- (4) **N** : Non-reusable parts

1EM177



### SERVICE POINTS OF DISASSEMBLY

N09QFAA1

#### 1. REMOVAL OF RETAINER LOCK

Using special tool, remove the retainer lock.

### INSPECTION

N09QGAA1

- Make sure that the jet valve slides smoothly in the jet body and has no play.

#### Caution

**Combination of the jet valve and jet body should not be disturbed and the jet valve and jet body should be replaced as an assembly.**

- Check the valve head and valve seat for damage or seizure.
- Check the spring for sag, cracks or breakage.

**Standard value****Jet valve**

Length : 91.58 mm (3.6055 in.)

Stem O.D. : 4.3 mm (.1693 in.)

Seat angle : 45°

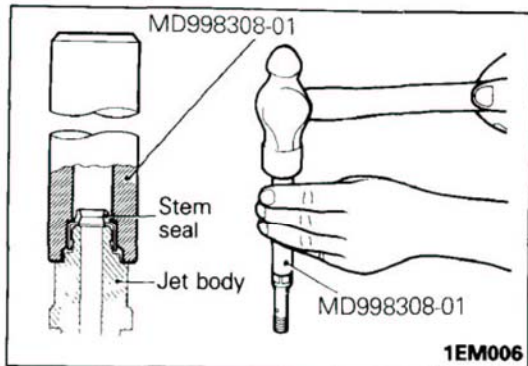
**Jet valve spring**

Free length : 29.60 mm (1.1654 in.)

Load : 34.3 N (7.7 lbs.) at installed height

Installed height : 21.5 mm (.846 in.)

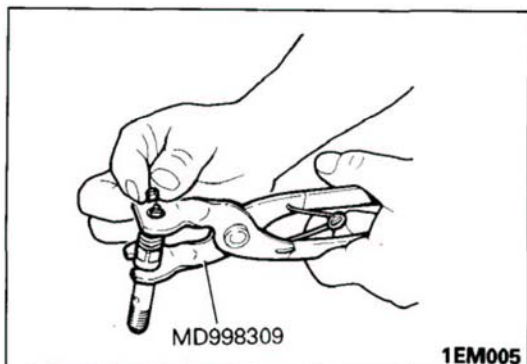
Out of squareness : Max.1.5°

**SERVICE POINTS OF REASSEMBLY****5. INSTALLATION OF STEM SEAL**

Using special tool, install the stem seal.

**4. INSTALLATION OF JET VALVE**

- (1) Apply engine oil to the stem of the jet valve.
- (2) Use care to prevent damage to the new seal lips.
- (3) Check to ensure that the valve slides smoothly.

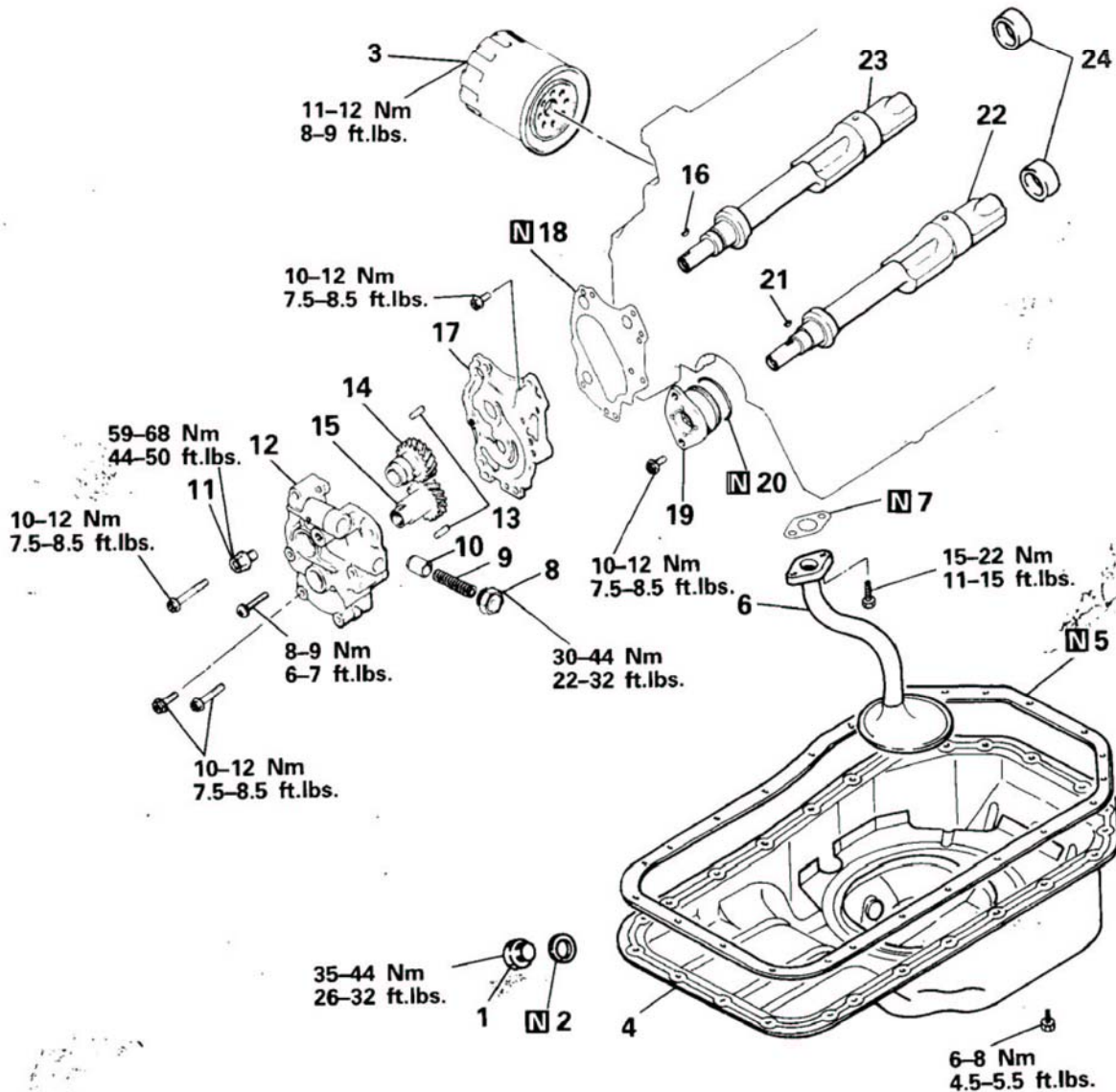
**3. INSTALLATION OF VALVE SPRING/2. VALVE SPRING RETAINER/1. RETAINER LOCK**

- (1) Mount the valve spring and valve spring retainer on jet body.
- (2) Compress the valve spring with special tool, using care not to damage the valve stem by the bottom of valve spring retainer.
- (3) While the spring being kept compressed, install the retainer lock.

# FRONT CASE, OIL PUMP AND SILENT SHAFT

## REMOVAL AND INSTALLATION

N09RA--



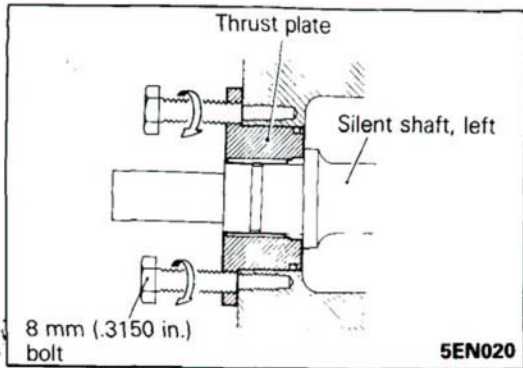
### Removal steps

- |                          |   |
|--------------------------|---|
| 1. Oil drain plug        | ◆◆ 14. Driven gear                          |
| 2. Oil drain plug gasket | ◆◆ 15. Drive gear                           |
| ◆◆ 3. Oil filter         | ◆◆ 16. Woodruff key                         |
| ◆◆ 4. Oil pan            | ◆◆ 17. Oil pump cover                       |
| 5. Gasket                | ◆◆ 18. Oil pump gasket                      |
| 6. Oil screen            | ◆◆ ◆◆ 19. Thrust plate (with front bearing) |
| 7. Oil screen gasket     | ◆◆ 20. O-ring                               |
| 8. Plug                  | ◆◆ 21. Woodruff key                         |
| 9. Relief spring         | ◆◆ 22. Left silent shaft                    |
| 10. Relief plunger       | ◆◆ 23. Right silent shaft                   |
| 11. Flange bolt          | ◆◆ 24. Rear bearing                         |
| ◆◆ 12. Oil pump body     |   |
| 13. Pin                  |   |

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal."
- (3) ◆◆◆ : Refer to "Service Points of Installation."
- (4) N : Non-reusable parts.

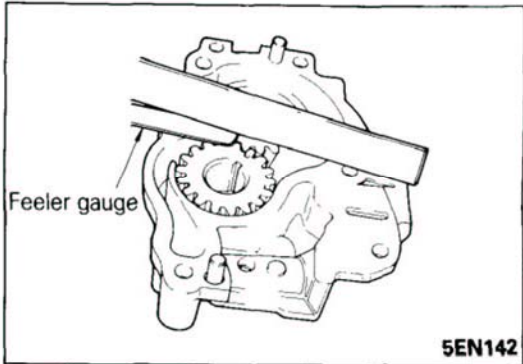
5EN205

**SERVICE POINTS OF REMOVAL**

N09RBAE

**19. REMOVAL OF THRUST PLATE**

Install 8 mm (.3150 in.) dia. bolts into threaded holes of flange and turn bolts in to remove the thrust plate.

**INSPECTION**

N09RCGB

● **OIL PUMP**

- (1) Check gear contacting surfaces of cover for step wear.
- (2) Check the clearance of drive and driven gears. If clearance is excessive, replace case and cover assembly and/or gears.

**Standard value****Driven gear**

Tip clearance : 0.11–0.15 mm (.0043–.0059 in.)

Side clearance : 0.04–0.10 mm (.0016–.0039 in.)

**Drive gear**

Tip clearance : 0.11–0.15 mm (.0043–.0059 in.)

Side clearance : 0.05–0.11 mm (.0020–.0043 in.)

**Limit****Driven gear**

Tip clearance : 0.2 mm (.0079 in.)

Side clearance : 0.15 mm (.0060 in.)

**Drive gear**

Tip clearance : 0.2 mm (.0079 in.)

Side clearance : 0.15 mm (.0060 in.)

● **RELIEF PLUNGER AND SPRING**

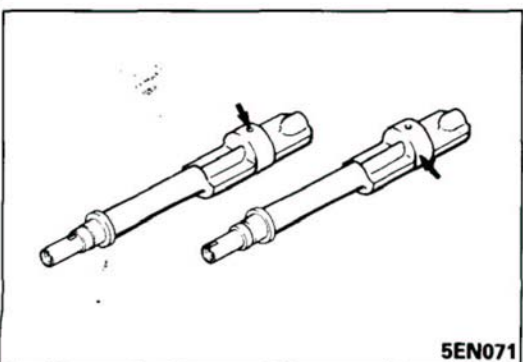
N09RCHA

- (1) Insert the relief plunger in the front case and check to see if it operates smoothly.
- (2) Check the relief spring for breakage or sagging.

**Standard value****Relief spring**

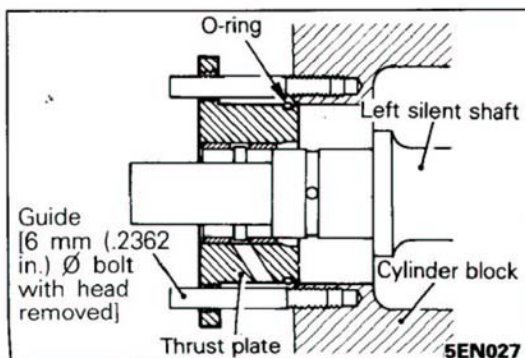
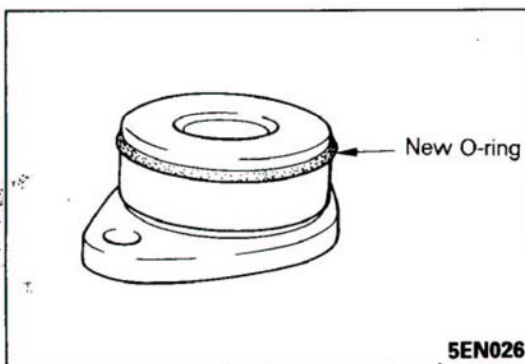
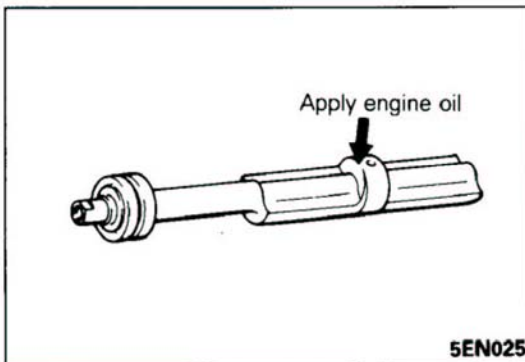
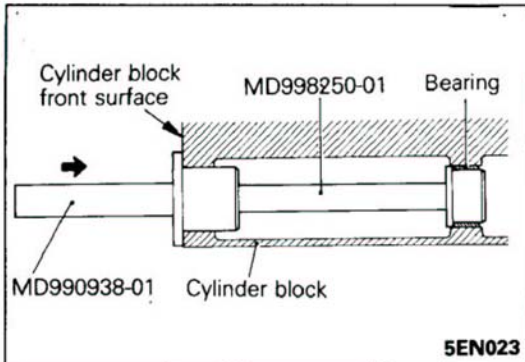
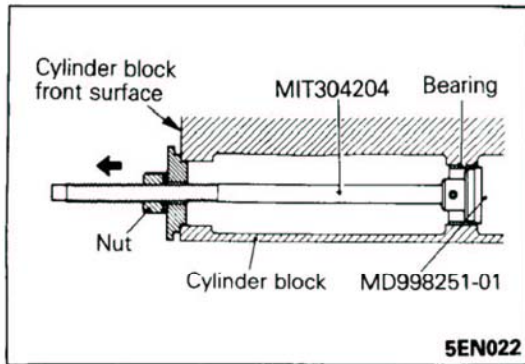
Free length : 46.4 mm (1.8346 in.)

Load : 60 N/40.1 mm (13.4 lbs./1.5787 in.)

● **SILENT SHAFT**

N09RCIA

- (1) Check journals for wear, damage and seizure. If excessive damage or seizure is evident, check bearing as well. If necessary, replace silent shaft or bearing or both.
- (2) Check oil hole (passage) for clogging. Clean or repair as necessary.

**SILENT SHAFT BEARING REPLACEMENT PROCEDURE** N09REAA

(1) Using special tool, remove silent shaft rear bearing.

(2) Apply engine oil to O.D. of bearing, using special tool, install silent shaft bearing to cylinder block.

**SERVICE POINTS OF INSTALLATION** N09RDCE**22. INSTALLATION OF LEFT SILENT SHAFT**

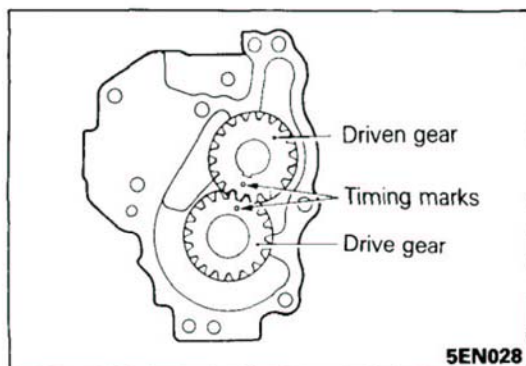
- (1) Apply engine oil to journal of left silent shaft.
- (2) Insert left silent shaft into cylinder block. Insert silent shaft carefully to prevent damage to the bearing.

**20. INSTALLATION OF O-RING**

- (1) Install o-ring in groove of thrust plate.
- (2) Apply engine oil around O-ring.

**19. INSTALLATION OF THRUST PLATE**

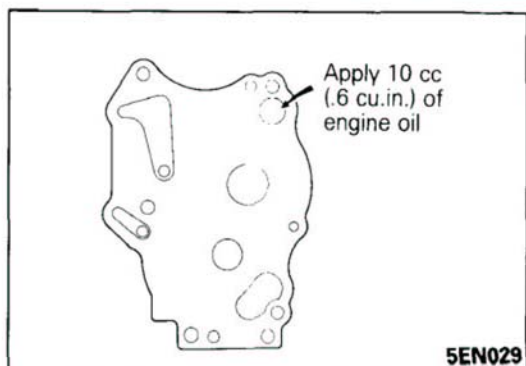
- (1) Install two guides in threaded holes for mounting thrust plate. Guides should be fabricated by cutting off hexagon heads of bolts 6 mm (.2362 in.) in diameter and 50 mm (1.9685 in.) long.
- (2) Install thrust plate into cylinder block along guides. Without use of guide, threaded holes will be hard to align.

**15. INSTALLATION OF DRIVE GEAR/14. DRIVEN GEAR**

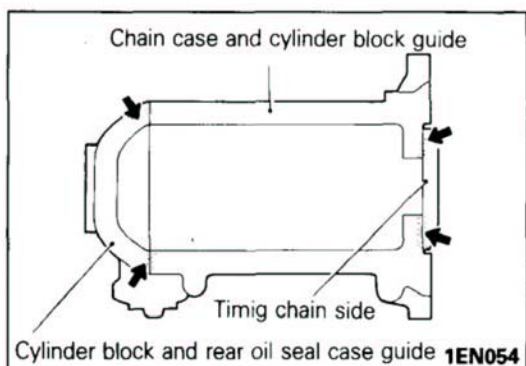
Install oil pump gears to oil pump body and align timing marks.

**Caution**

If timing marks are out of alignment, phase of silent shaft will change and vibration will result.

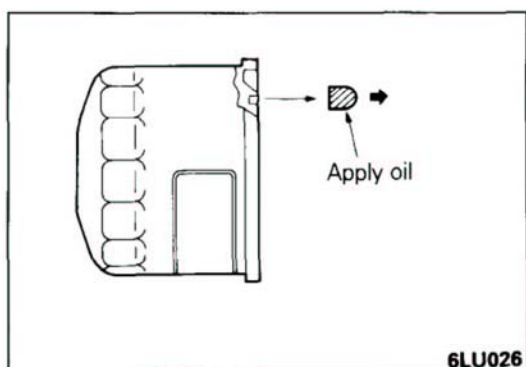
**12. INSTALLATION OF OIL PUMP BODY**

Place pump assembly in same position as it was installed on engine and put approx. 10 cc (.6 cu.in.) of clean engine oil in delivery port.

**4. INSTALLATION OF OIL PAN**

Apply sealant to four places on the cylinder block side of the hatched area.

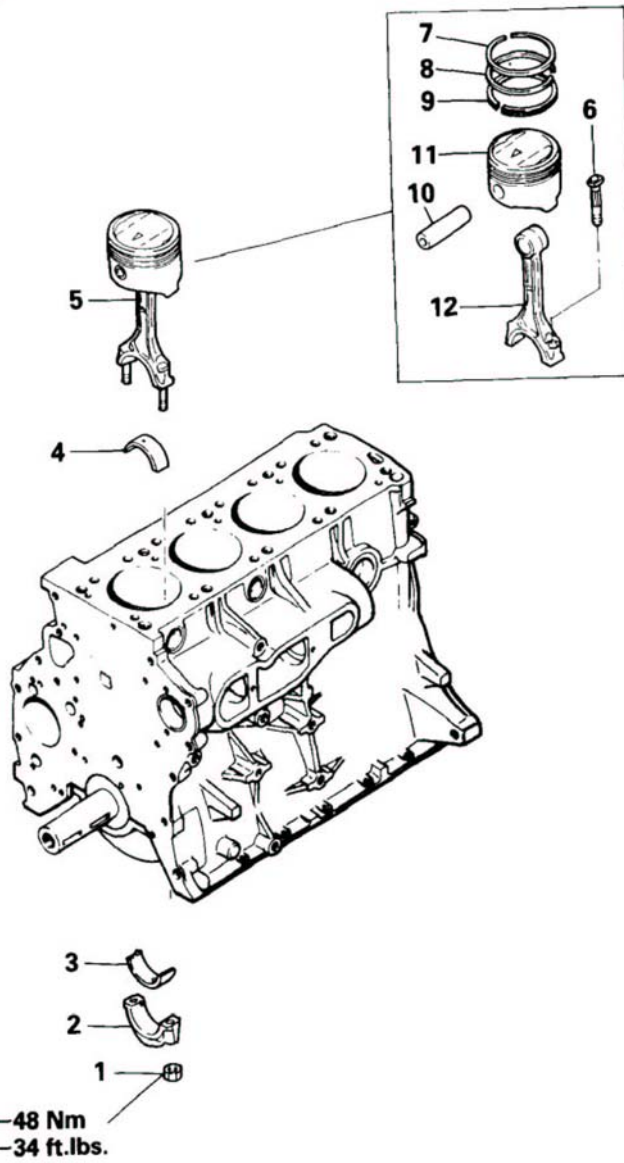
**Specified sealant : 3M ART Part No. 8660 or equivalent**

**3. APPLICATION OF ENGINE OIL TO OIL FILTER**

Apply engine oil to surface of packing. But must not protrude engine oil from case.



# PISTON AND CONNECTING ROD REMOVAL AND INSTALLATION



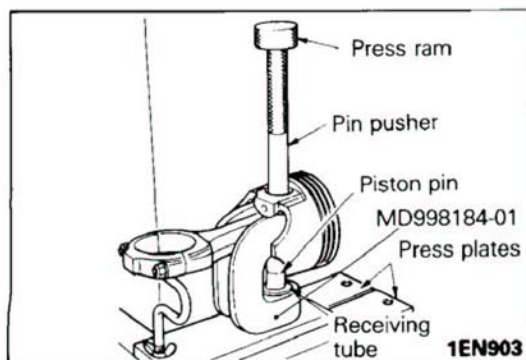
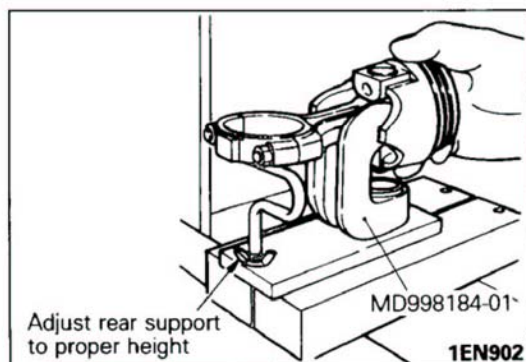
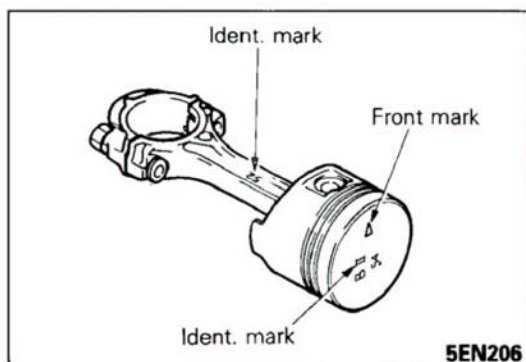
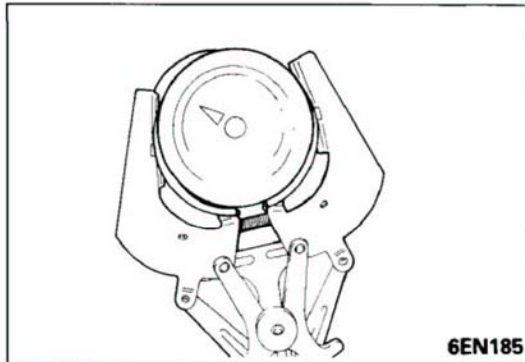
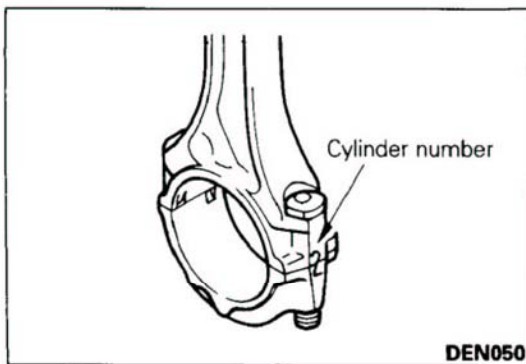
5EN030

### Removal steps

- 1. Nut
- ◆◆◆◆ 2. Connecting rod cap
- 3. Bearing
- 4. Bearing
- ◆◆ 5. Piston and connecting rod assembly
- 6. Bolt
- ◆◆◆◆ 7. No.1 piston ring
- ◆◆◆◆ 8. No.2 piston ring
- ◆◆◆ 9. Oil ring
- ◆◆◆◆ 10. Piston pin
- 11. Piston
- 12. Connecting rod

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆ : Refer to "Service Points of Installation".

**SERVICE POINTS OF REMOVAL**

N09TBDA1

**2. REMOVAL OF CONNECTING ROD CAP**

Mark the large end of the connecting rod with the cylinder number for use during reassembly.

**7. REMOVAL OF NO.1 PISTON RING/8. NO.2 PISTON RING**

Remove the piston rings with a piston ring expander.

**10. REMOVAL OF PISTON PIN**

- (1) Set piston and connecting rod assembly in tool body in such a way that front mark (arrow mark of piston or identification mark of connecting rod) will be faced upward.
- (2) Press plates must be used to provide adequate support to the base during pressing operations.
- (3) Place piston and connecting rod with arrow mark or identification mark upward over anvil so lip of insert in between connecting rod boss and inside surface of piston. The connecting rod boss should bear on as much of the insert surface as possible.
- (4) Adjust connecting rod rear support until rod is horizontal to press bed surface. Misalignment of pin and receiving tube may result if support adjustment is not correct.
- (5) Position piston pin pusher onto pin and remove pin with press ram.

**Caution**

**As piston pin is removed, it must pass through receiving tube.**

**Check alignment and adjust if necessary.**

**INSPECTION**

N09TCA01

- **PISTON**

When there are streaks or signs of seizure on the outer surface of the piston (especially on the thrust side), or if there are cracks in the outer surface, replace.

- **PISTON PIN**

- (1) The piston pin should be able to be inserted into the piston pin hole merely by pushing it in with your finger. If any resistance is noted or if the pin is loose, replace it.
- (2) Piston pins should be replaced as a set.

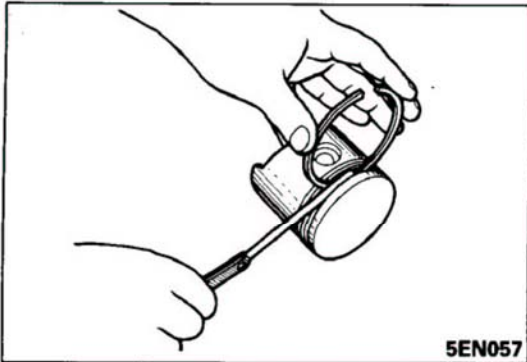
- **PISTON RING**

N09TCBE

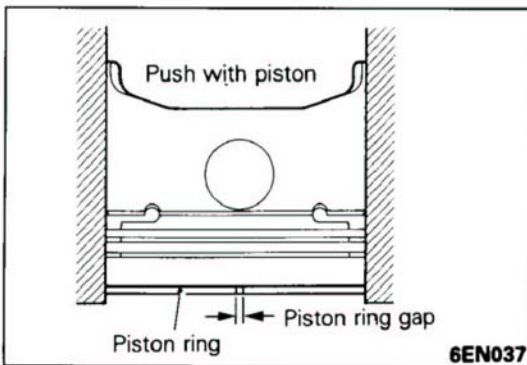
- (1) Check for piston ring damage, wear, and bends, replacing the rings if anything unusual is noted. Also be sure to change the piston rings when a new piston is installed.
- (2) Check the clearance between the piston ring and the ring groove. When it exceeds the limit, replace the rings, the piston, or both.

**Piston ring side clearance****Standard value****No.1 : 0.05–0.09 mm (.0020–.0035 in.)****No.2 : 0.02–0.06 mm (.0008–.0024 in.)****Limit****No.1 : 0.12 mm (.005 in.)****No.2 : 0.1 mm (.004 in.)**

- (3) Insert the piston ring into the cylinder bore putting it against the top of the piston head and pressing it in. When it makes a right angle, measure the piston ring gap with a feeler gauge. When the gap is too large, replace the piston ring.

**Piston ring end gap****Standard value****No.1 : 0.30–0.45 mm (.0112–.0177 in.)****No.2 : 0.25–0.40 mm (.0098–.0158 in.)****Oil ring side rail : 0.30–0.80 mm (.0118–.0315 in.)****Limit****No.1 : 0.8 mm (.031 in.)****No.2 : 0.8 mm (.031 in.)****Oil ring side rail : 1.0 mm (.039 in.)**

5EN057



6EN037

### ● BEARING

N09TCDB1

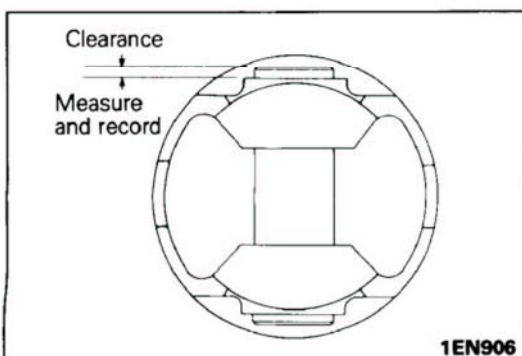
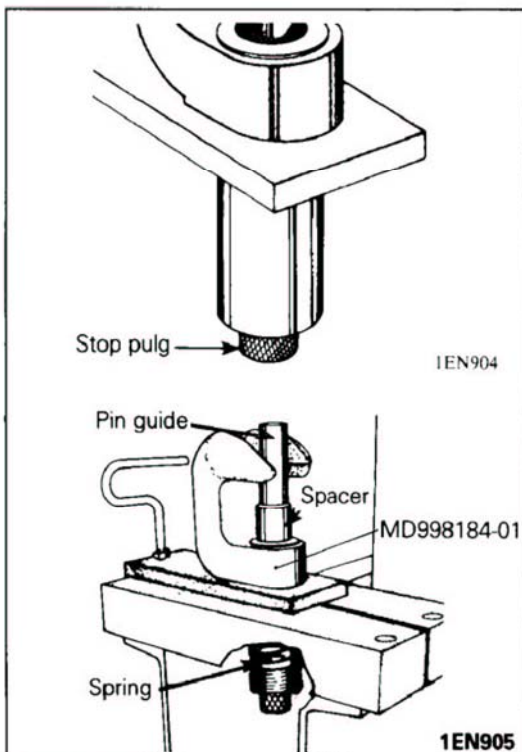
- (1) Visually check the surface of the bearing, replacing those which are lopsided, streaked, damaged, or show signs of seizure. When streaks or seizure are excessive, check the crankshaft. If damage is discovered on the crankshaft, either replace it or reuse it after undersize machining.
- (2) Measure the inner diameter of the connecting rod bearing and the outer diameter of the crankshaft pin. If the gap (oil clearance) exceeds limit, replace the bearing, and, if necessary, the crankshaft. Or, undersize machine the crankshaft and replace the bearings with an appropriate undersized type.

**Standard value : 0.02–0.05 mm (.0008–.0020 in.)**

**Limit : 0.1 mm (.004 in.)**

#### NOTE

For the method by which the oil clearance is measured using a plastigauge, refer to the item on the crankshaft.



### SERVICE POINTS OF INSTALLATION

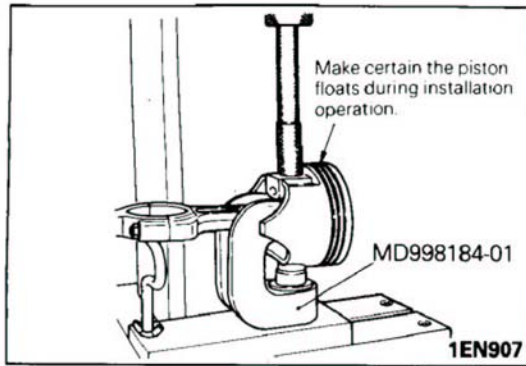
N09TDA1

#### 10. INSTALLATION OF PISTON PIN

- (1) Thread stop plug approximately half way into the bottom of the receiving tube.
- (2) Select the largest diameter piston pin guide that will pass through piston and rod. Install spring, spacer, and guide into receiving tube.
- (3) With connecting rod removed from piston, insert piston pin into piston bore. Carefully measure amount of pin that protrudes equally from both sides of piston. Record this measurement for future use.
- (4) Position connecting rod and piston over the anvil. The spring loaded piston guide will pass through piston and rod and align it. Lubricate pin and insert it into piston.
- (5) Place piston pin pusher on piston pin and push pin through connecting rod until the pin protrudes some distance measured and recorded above in step 3.

#### Caution

**The piston must be free to float during installation; check frequently.**

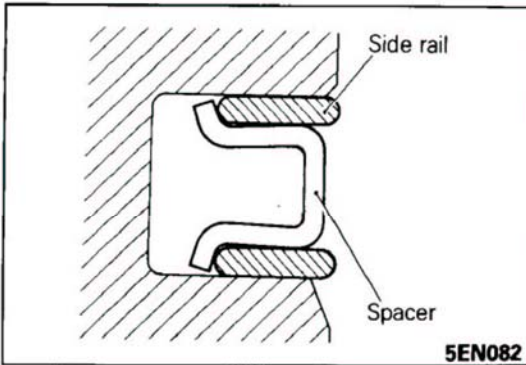


- (6) Apply hydraulic pressure to pin and adjust stop plug until stop plug comes in contact with spacer.
- (7) Remove piston and pin assembly from anvil and check piston pin to make sure it is centered. If it is not centered, adjust stop plug up or down to obtain proper centering. The pin stop is now set for any remaining pistons.

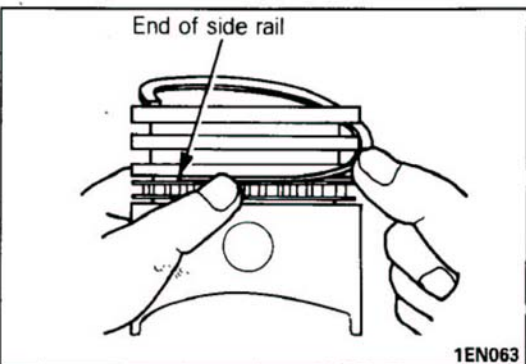
**Caution**

**If the required installation load is out of specification, replace piston pin and/or connection rod.**

Piston pin press in load : 7350–17150 N (1650–38 lbs.)

**9. INSTALLATION OF OIL RING**

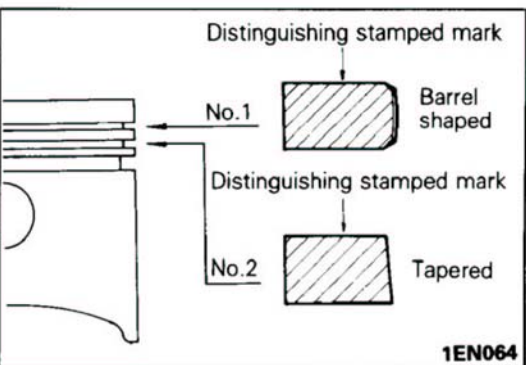
- (1) Assemble the oil ring spacer into the piston ring groove. Then, after assembling the upper side rail, assemble the lower side rail. There is no difference between the upper and lower side rails or spacers.



- (2) The side rail may be easily installed by pushing it in with your finger after fitting the end over the piston groove.

**Caution**

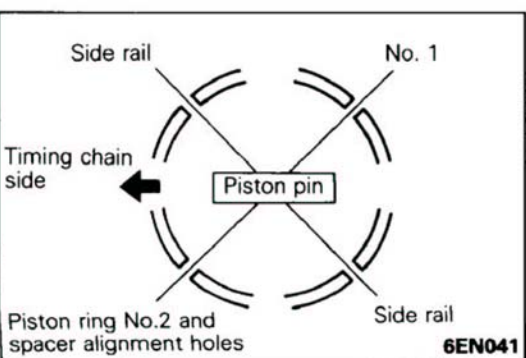
**Do not use piston ring expander when installing side rail.**

**8. INSTALLATION OF NO.2 PISTON RING/ 7. NO.1 PISTON RING**

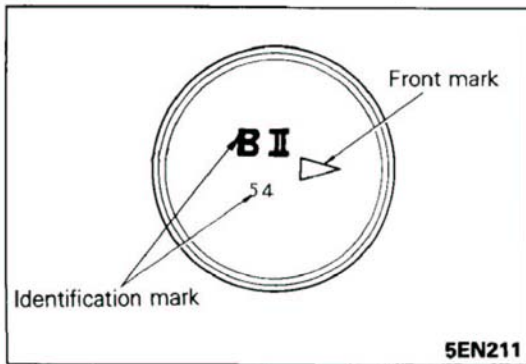
Using a piston ring expander, install No.2 and No.1 piston ring.

**Caution**

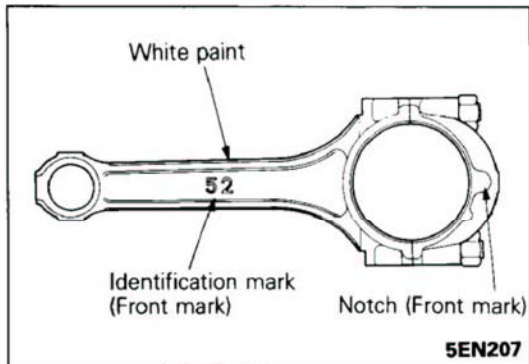
1. Pay close attention to the differences in shape between nos. 1 and 2 to avoid confusing them.
2. Install piston rings 1 and 2 with the maker and size marks facing up (toward the top of the piston).

**5. INSTALLATION OF PISTON AND CONNECTING ROD ASSEMBLY**

- (1) Apply plenty of engine oil to the outer piston surfaces, the piston ring and the oil ring.
- (2) Align the mating holes in the piston and oil rings (side rail, spacer) as illustrated.

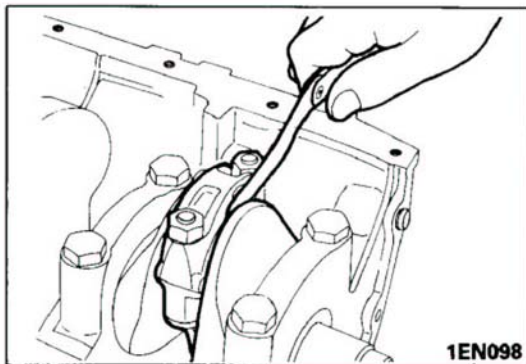


- (3) Orient the piston and connecting rod assembly so that the front mark on the top of the piston and the front mark on the connecting rod (distinguishing mark) face toward the front of the engine (the timing belt side) and insert it into the cylinder.



## 2. INSTALLATION OF CONNECTING ROD CAP

- (1) When the connecting rod is installed, make sure that identification mark and notch are on same side.



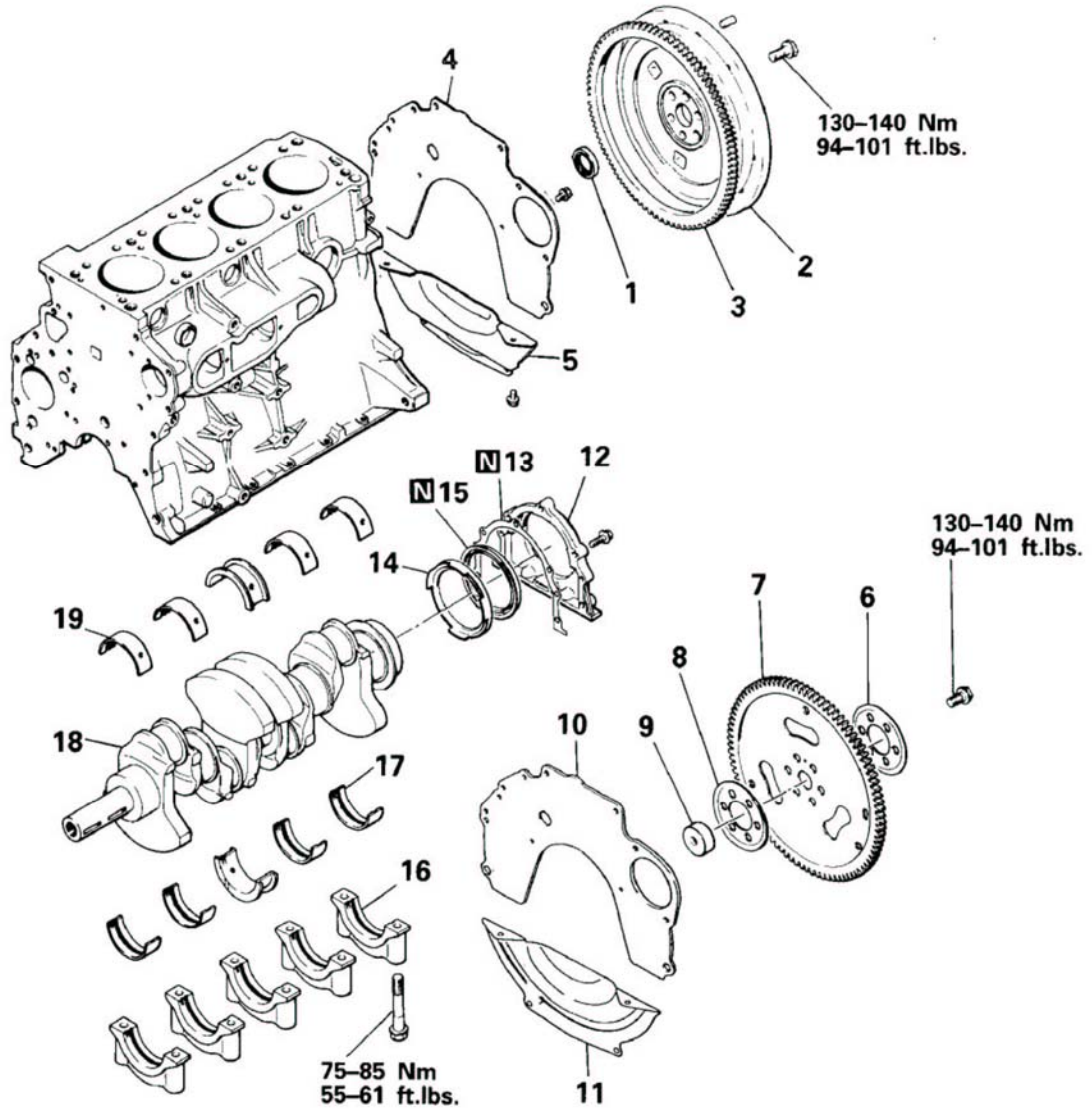
- (2) Check the connecting rod big end side clearance.

**Connecting rod big end side clearance**  
**Standard value : 0.1–0.25 mm (.0039–.0098 in.)**  
**Limit : 0.4 mm (.016 in.)**

**CRANKSHAFT, FLYWHEEL AND DRIVE PLATE**

**REMOVAL AND INSTALLATION**

N09UA--



5EN219

**Removal steps**

- 1. Ball bearing
- 2. Flywheel
- 3. Ring gear
- 4. Rear plate
- 5. Bell housing cover
- 6. Adapter plate
- 7. Drive plate
- 8. Crankshaft adapter
- 9. Crankshaft bushing
- 10. Rear plate
- 11. Bell housing cover

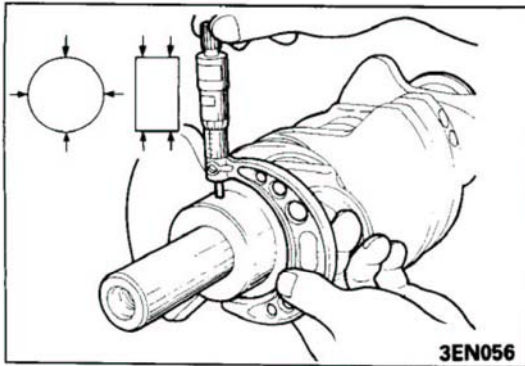
for vehicles  
with manual  
transmission

for vehicles  
with automatic  
transmission

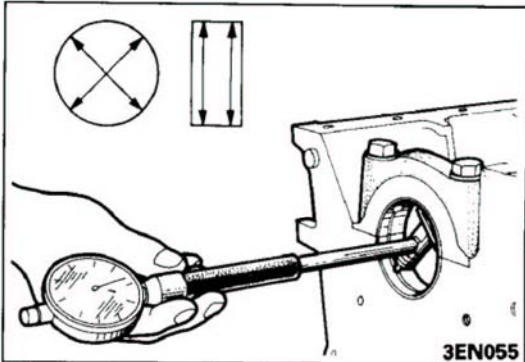
- 12. Oil seal case
- 13. Oil seal case gasket
- ◆◆ 14. Oil separator
- ◆◆ 15. Oil seal
- ◆◆ 16. Bearing cap
- ◆◆ 17. Lower bearing
- 18. Crankshaft
- ◆◆ 19. Upper bearing

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Installation".
- (3) [N] : Non-reusable parts



3EN056



3EN055

## INSPECTION

N09UCAC

### ● CRANKSHAFT

- (1) Check the crankshaft journals and pins for damage, uneven wear and cracks. Also check oil holes for clogging. Correct or replace any defective part.
- (2) Inspect out-of-roundness and taper of crankshaft journal and pin.

#### Standard value

**Crankshaft journal O.D. : 60 mm (2.3622 in.)**

**Crank pin O.D. : 53 mm (2.0866 in.)**

#### Limit

**Out-of-roundness of journal and pin :**

**0.01 mm (.0004 in.)**

**Taper of journal and pin : 0.01 mm (.0004 in.)**

### ● MAIN BEARINGS AND CONNECTING ROD BEARINGS

N09UCBA1

Visually inspect each bearing for peeling, melt, seizure and improper contact. Replace the defective bearings.

### ● OIL CLEARANCE MEASUREMENT

N09UCD1

To check the oil clearance, measure the outside diameter of the crankshaft journal and the crank pin and the inside diameter of the bearing. The clearance can be obtained by calculating the difference between the measured outside and inside diameters.

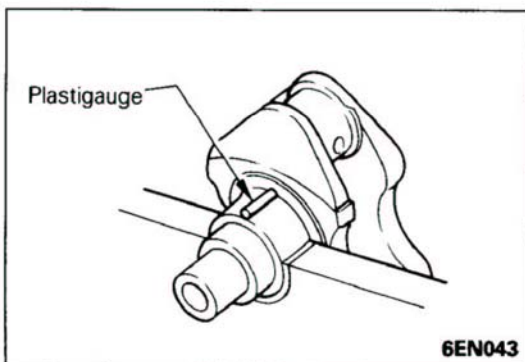
#### Standard value

**Crankshaft main bearing : 0.02–0.05 mm**

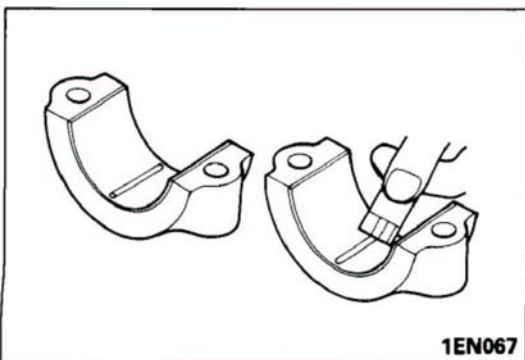
**(.0008–.0020 in.)**

**Connecting rod bearing : 0.02–0.05 mm**

**(.0008–.0020 in.)**



6EN043



1EN067

## PLASTIGAUGE METHOD

Plastigauge may be used to measure the clearance.

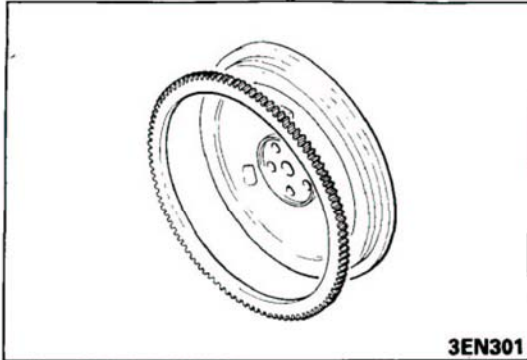
- (1) Remove oil and grease and any other dirt from bearings and journals.
- (2) Cut plastigauge to the same length as the width of the bearing and place it in parallel with the journal, off oil holes.
- (3) Install the crankshaft, bearings and caps and tighten them to the specified torques. During this operation, do NOT turn the crankshaft.
- (4) Remove the caps. Measure the width of the plastigauge at the widest part by using a scale printed on the plastigauge sleeve.
- (5) If the clearance exceeds the repair limit, the bearing should be replaced or an undersize bearing used. When installing a new crankshaft, be sure to use standard size bearings.
- (6) Should the standard clearance not be obtained even after bearing replacement, the journal should be ground to undersize and a bearing of the same size should be installed.



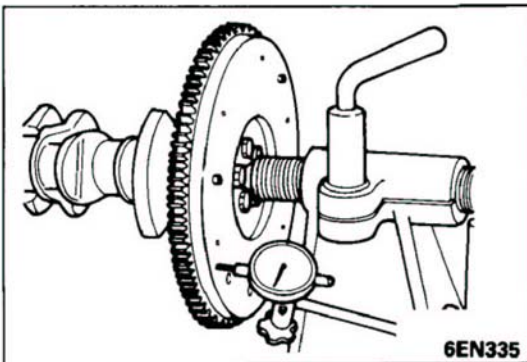
- **OIL SEAL**

N09UCDA 1

Check front and rear oil seals for damage or worn lips. Replace any seal that is defective.



3EN301



6EN335

- **RING GEAR (vehicles with manual transmission)** N09UCEC 1

When there is wear, cracks, or other damage to the ring gear teeth, replace the ring gear by the following procedure. Check the starter motor pinion.

Ring gear replacement procedure :

- (1) Tap around the ring gear to loosen and remove it from the fly wheel.

**Caution**

**The ring gear cannot be removed while it is hot.**

- (2) Heat the ring gear to 360–380°C (500–536°F) and put it into the flywheel

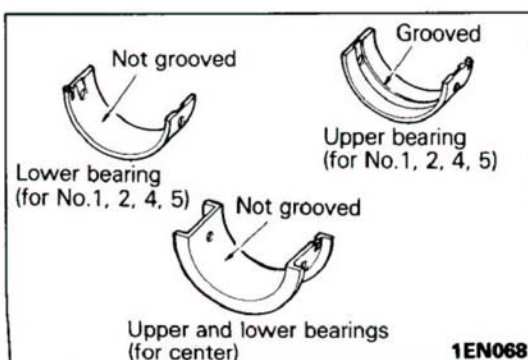
- **FLYWHEEL (vehicles with manual transmission)** N09UCFB 1

- (1) Make a visual inspection of the clutch disc. If stepped wear, streaking, or seizure are apparent, replace it.
- (2) If flywheel run out exceeds the limit, replace it.

**Limit : 0.13 mm (.005 in.)**

- **DRIVE PLATE (vehicles with automatic transmission)** N09UCGB 1

Replace deformed, damaged, or cracked drive plates.



1EN068

## SERVICE POINTS OF INSTALLATION

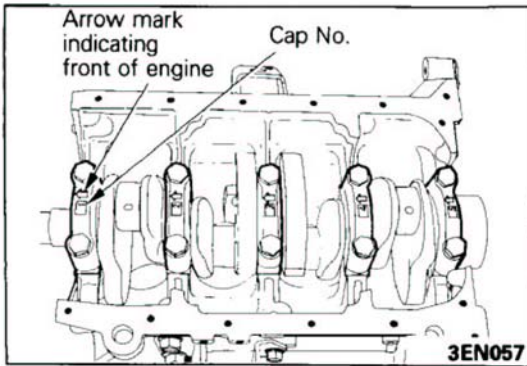
N09UDAE

### 19. INSTALLATION OF UPPER BEARING

When reusing the main bearings, remember to install them by referring to location marks made at the time of removal. Be sure oil holes in bearings align with oil hole in block.

### 17. INSTALLATION OF LOWER BEARING

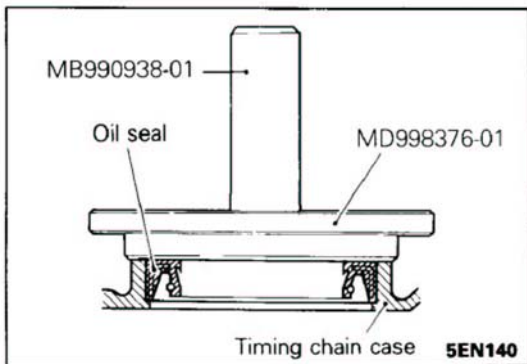
Check to ensure that the lower bearing has no oil groove.



### 16. INSTALLATION OF BEARING CAP

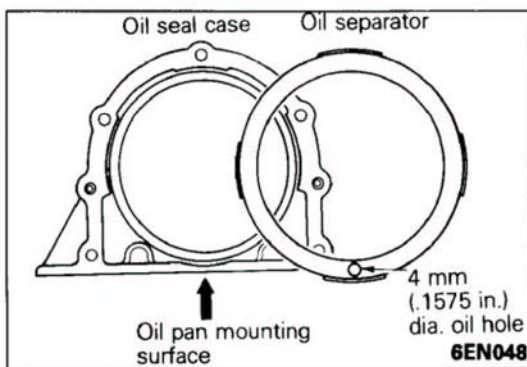
- (1) The caps should be installed with the arrow mark directed toward the crank pulley side of engine. Cap numbers must be in correct order.
- (2) Tighten cap bolts in sequence : Center, No.2, No.4, front and rear cap bolts.
- (3) Cap bolts should be tightened evenly in 2 to 3 stages before they are finally tightened.
- (4) Make certain that crankshaft turns freely and has the proper clearance between the center main bearing thrust flange and the connecting rod big end bearing.

**Standard value : 0.05–0.18 mm (.0020–.0071 in.)**  
**Limit : 0.4 mm (.016 in.)**



### 15. INSTALLATION OF OIL SEAL

Using Special Tool, press fit the oil seal all the way in without tilting it.

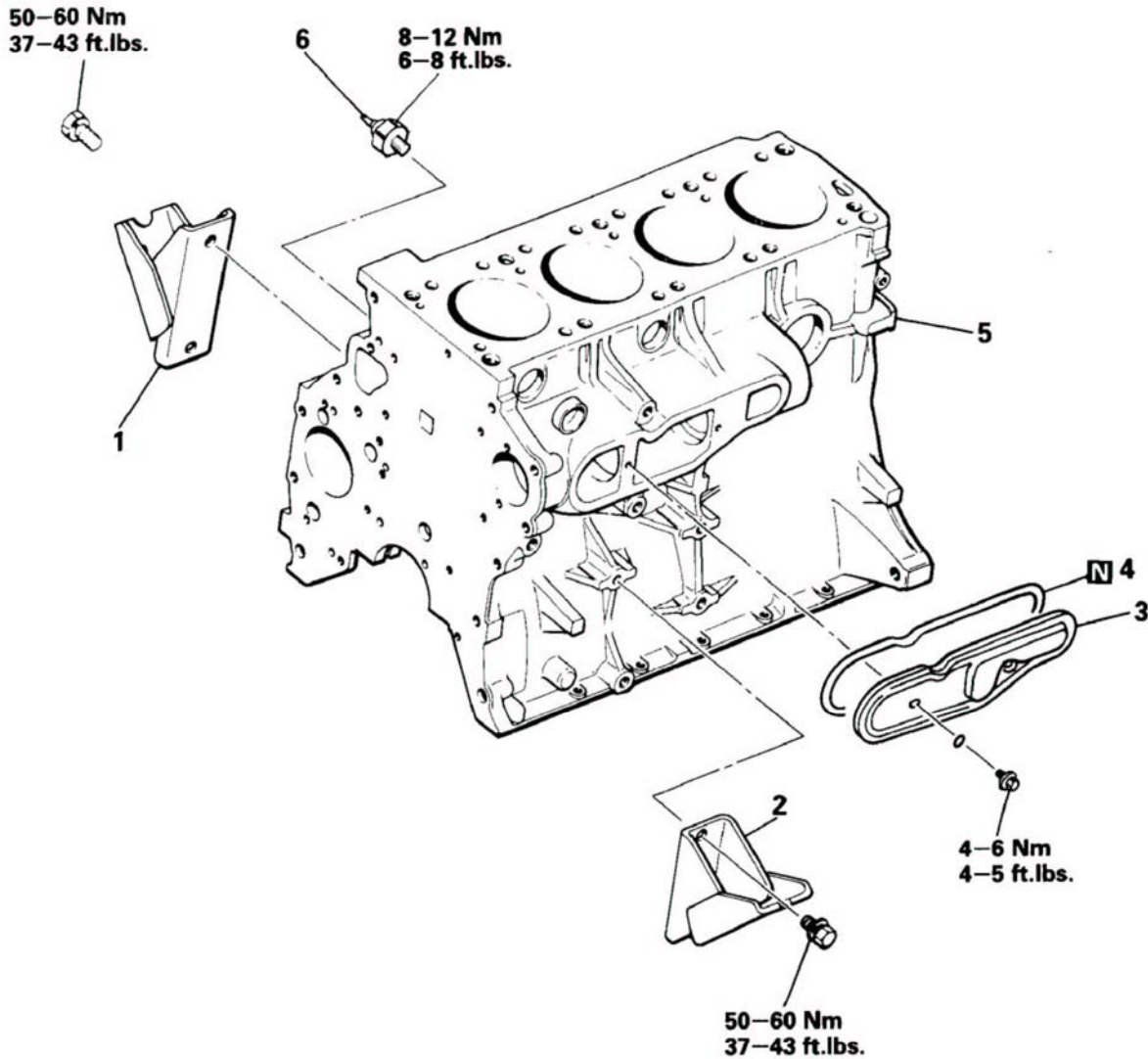


### 14. INSTALLATION OF OIL SEPARATOR

Press the oil separator into the oil seal case. Install it so that the separator oil hole is on the very bottom, as illustrated.

**CYLINDER BLOCK**

**REMOVAL AND INSTALLATION**



5EN210

- 1. Right engine support bracket
- 2. Left engine support bracket
- 3. Silent shaft chamber cover
- 4. Chamber cover gasket
- 5. Cylinder block
- ◆◆◆◆6. Oil pressure switch

**NOTE**

- (1) ◆◆ : Refer to "Service Points of Removal".
- (2) ◆◆ : Refer to "Service Points of Installation".

**SERVICE POINTS OF REMOVAL**

N09VBAD

**6. REMOVAL OF OIL PRESSURE SWITCH**

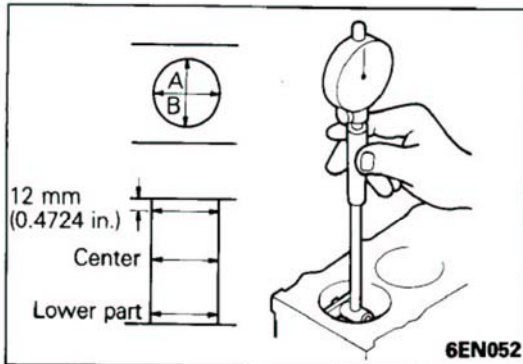
As sealant has been applied to the screw, remove it without bending it.

**INSPECTION**

NOSVCAD

- Visually check the cylinder block for scores, rust and corrosion. Also check for cracks or any other defects by using a flaw detecting agent (magnafluxing). Correct or replace the block if defective.
- Measure the cylinder bore with a cylinder gauge at three levels in the directions of A and B.
- If the cylinder bores show more than specified out-of-round or taper, or if the cylinder walls are badly scuffed or scored, the cylinder block should be rebored and honed, and new oversize pistons and rings fitted.

Measuring points are as shown.

**Standard value**

**Cylinder bore : 91.1 mm (3.5866 in.)**

**Out-of-roundness and taper of cylinder bore :  
Max. 0.02 mm (.0008 in.)**

- If cylinder top ridge is worn in stages, cut away with ridge reamer.
- Oversize pistons are available in four sizes.

**Piston service size and mark**

**0.25 mm (.010 in.) O.S.: 0.25**

**0.50 mm (.020 in.) O.S.: 0.50**

**0.75 mm (.030 in.) O.S.: 0.75**

**1.00 mm (.039 in.) O.S.: 1.00**

- To rebores the cylinder bore to oversize, keep the specified clearance between the oversize piston and the bore, and make sure that all pistons used are of the same oversize. The standard measurement of the piston outside diameter is taken at a level 2 mm (.0787 in.) above the bottom of the piston skirt and across the thrust faces.

**Standard value**

**Piston-to-cylinder wall clearance : 0.02–0.04 mm  
(.0008–.0016 in.)**

- Check for damage and cracks.
- Check top surface for flatness. If excessive flatness is evident grind to minimum limit or replace.

**Flatness of gasket surface**

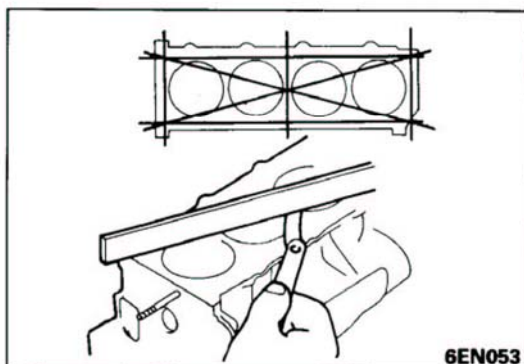
**Standard dimension : Less than 0.05 mm (.0020 in.)**

**Limit : 0.1 mm (.0039 in.)**

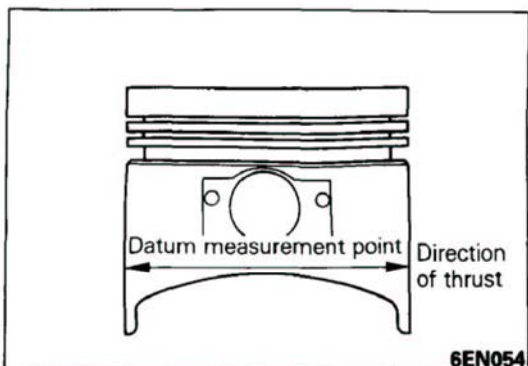
**Overall height**

**Standard value : 316 mm (12.4409 in.)**

**Limit (amount of cylinder block  
gasket surface grind) : -0.2 mm (-.0079 in.)**

**Caution**

**The cylinder block gasket surface should be ground to within 0.2 mm (.0079 in.) even with the grind of cylinder head gasket surface.**

**BORING THE CYLINDER**

N09VEDA

- (1) Based on the largest cylinder bore, determine the over sized piston to be used.
- (2) Measure with the outside diameter of the piston as the datum measurement points.

**NOTE**

There are four sizes of oversize piston: 0.25 mm (.010 in.), 0.50 mm (.020 in.), 0.75 mm (.030 in.), 1.00 mm (.039 in.)

- (3) Calculate the reground bore size based on the measured value of the outside piston diameter.
  - Bore size = outside piston diameter + 0.01–0.03 mm (.0004–.0012 in.) (gap between cylinder and piston) – 0.02 mm (1.0008 in.) (honing)
- (4) Hone each of the cylinders to the calculated measurement.

**Caution**

**In order to avoid uneven boring due to the rise in temperature, bore the cylinders in the following sequence: #2, #4, #1, and #3.**

- (5) Hone the cylinders, finishing them to the proper dimension (outside piston diameter + gap with cylinder).
- (6) Check the gap between the piston and cylinder.

**Standard value : 0.01–0.03 mm (.0004–.0012 in.)**

**SERVICE POINTS OF INSTALLATION**

N09VDAF

**6. INSTALLATION OF OIL PRESSURE SWITCH**

Apply sealant to the screws and install.

**Specified sealant : 3M ART Part No. 8660 or equivalent**

**Caution**

**Ensure that the sealant dose not extend beyond the screw tips.**

**Be sure not to tighten the screws too tight.**

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# INTAKE AND EXHAUST

## CONTENTS

N11AA--

<b>AIR FILTER .....</b>	<b>4</b>	<b>SPECIFICATIONS .....</b>	<b>2</b>
<b>EXHAUST MANIFOLD .....</b>	<b>11</b>	General Specifications .....	2
<b>EXHAUST PIPES AND MUFFLERS .....</b>	<b>13</b>	Sealants and Adhesives .....	3
<b>GENERAL INFORMATION .....</b>	<b>2</b>	Service Specifications .....	2
<b>INTAKE MANIFOLD .....</b>	<b>6</b>	Torque Specifications .....	3
		<b>TROUBLESHOOTING .....</b>	<b>4</b>
		Abnormal Noise	
		Exhaust Gas Leakage	



**GENERAL INFORMATION**

N11BAAD

Air filter is a dry type air filter.

The intake manifold, made of cast aluminum, functions to circulate engine coolant to the heat-riser (located at the carburetor installation part) and to facilitate the atomization of the air/ fuel mixture.

There are also passages for jet air and EGR (exhaust gas recirculation), and a thermostat housing is provided near the no. 1 port.

The exhaust system is a single consisting of four divisions: the front exhaust pipe, the under catalytic converter, the center exhaust pipe, and the main muffler.

The exhaust manifold, made of cast metal, is the dual type, and functions to reduce exhaust interference.

**SPECIFICATIONS****GENERAL SPECIFICATIONS**

N11CA--

Items	Specifications
Air filter	
Type	Dry type
Heated air intake	Vacuum motor type
Exhaust system	
Front exhaust pipe	Dual type
Muffler	Expansion resonance type
Coupling	Spherical coupling
Suspension system	Rubber hangers and suspenders

**SERVICE SPECIFICATIONS**

N11CB--

Items	Specifications
Standard value	
Intake and exhaust manifold	
Cylinder head installation surface distortion   mm (in.)	0.15 (.006) or less
Limit	
Intake and exhaust manifold	
Cylinder head installation surface distortion   mm (in.)	0.3 (.012) or less

**TORQUE SPECIFICATIONS**

N11CC-

Items	Nm	ft.lbs.
Air filter to rocker cover	16-19	12-14
Carburetor to intake manifold	15-20	11-14
Intake manifold to cylinder head	15-20	11-14
Water outlet fitting assembly to intake manifold	10-13	7-9
Thermo valve assembly to intake manifold	20-40	14-29
E.G.R. valve assembly to intake manifold	19-28	14-20
Vacuum connector joint	8-12	6-9
Air pipe assembly to bracket	12-15	9-11
Air pipe assembly to reed valve B bracket	10-13	7-9
Thermo switch to intake manifold	6-9	4-7
Water temperature gauge unit to intake manifold	8-10	6-7
Water temperature sensor to intake manifold	20-40	14-29
Joint to intake manifold	20-40	14-29
Exhaust manifold cover to exhaust manifold	12-15	9-11
Air pipe assembly to exhaust manifold	70-100	51-72
Exhaust manifold to cylinder head	15-20	11-14
Exhaust manifold to front exhaust pipe	20-30	14-22
Front exhaust pipe to exhaust pipe mounting bracket	20-30	14-22
Front exhaust pipe to under catalytic converter	15-25	11-18
Under catalytic converter to center exhaust pipe	40-60	29-43
Hanger bracket to suspender	8-12	6-9
Suspender to frame	8-12	6-9
Center exhaust pipe to main muffler	20-30	14-22
Main muffler to hanger	5-10	4-7
Hanger to frame	5-10	4-7
Oxygen sensor	40-50	29-36

**SEALANTS AND ADHESIVES**

N11CD-

Items	Specified sealant and adhesive	Quantity
Thermo switch (threaded part)	3M Adhesive Nut Locking 4171 or equivalent	As required
Water temperature gauge unit (threaded part)	3M Adhesive Nut Locking 4171 or equivalent	As required
Water temperature sensor (threaded part)	3M Adhesive Nut Locking 4171 or equivalent	As required
Thermo valve assembly (threaded part)	3M Adhesive Nut Locking 4171 or equivalent	As required
Joint (threaded part)	3M Adhesive Nut Locking 4171 or equivalent	As required
Water temperature switch (threaded part)	3M Adhesive Nut Locking 4171 or equivalent	As required



TROUBLESHOOTING

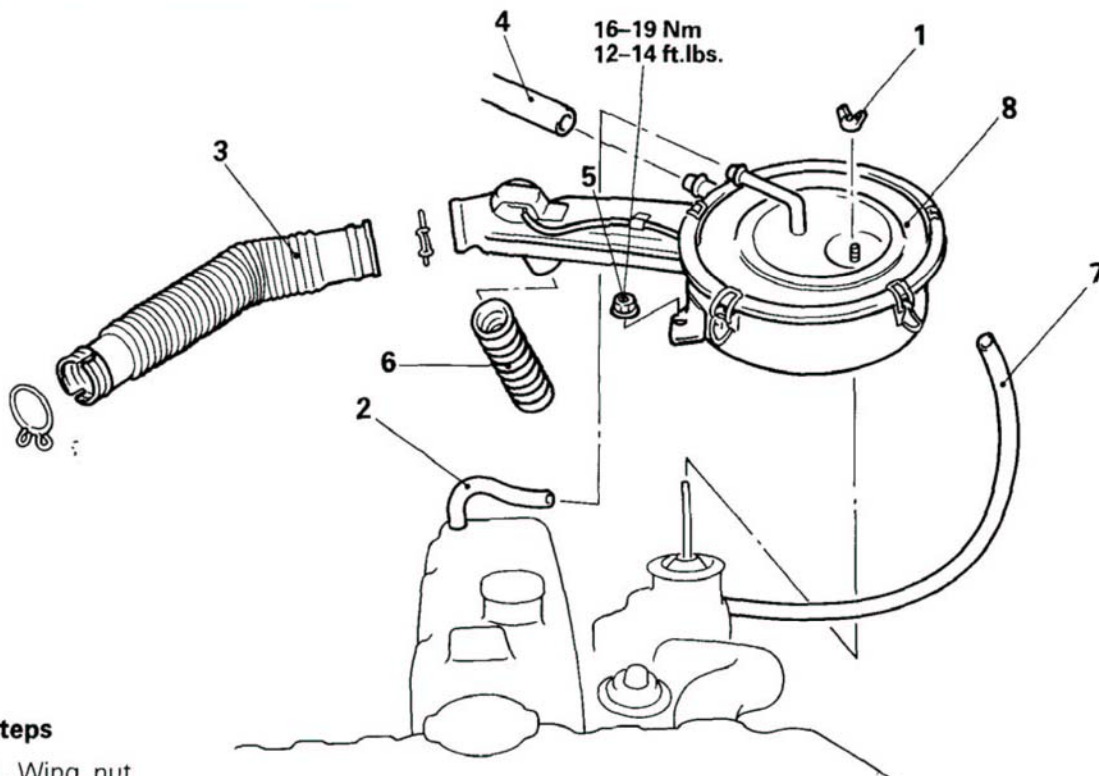
N11EAAA

Symptom	Probable cause	Remedy	Reference page
Exhaust gas leakage	Loose joints	Retighten	11-13
	Broken pipe or muffler	Repair or replace	11-13
Abnormal noise	Broken separator in muffler	Replace	11-13
	Broken rubber hangers or suspender	Replace	11-13
	Interference of pipe or muffler with vehicle body	Correct	11-13
	Broken pipe or muffler	Repair or replace	11-13

AIR FILTER

REMOVAL AND INSTALLATION

N11FA--



Removal steps

1. Wing nut
- ◆◆ 2. Connection of breather hose
3. Air duct
4. Connection of air hose
5. Air filter mounting nut
6. Heat duct
7. Connection of vacuum hose
8. Air filter

04W566

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Point of Installation".

SERVICE POINT OF INSTALLATION

N11FDAA

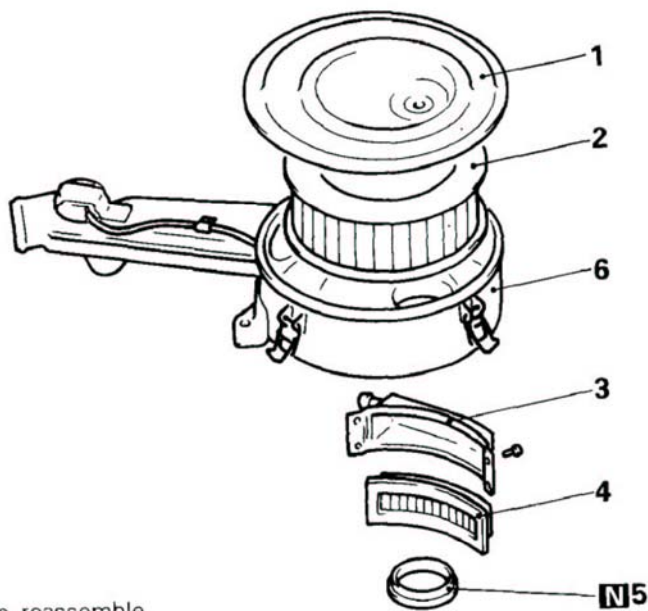
2. INSTALLATION OF BREATHER HOSE

NOTE

Be careful, when installing, not to apply oil etc. to the hose.

DISASSEMBLY AND REASSEMBLY

N11FEAA



**Disassembly steps**

1. Air filter cover
2. Air filter element
3. Secondary air case
4. Secondary air filter
5. Air filter gasket
6. Air filter body

**NOTE**

- (1) Reverse the disassembly procedures to reassemble.
- (2) **N**: Non-reusable parts

04W565

## INTAKE MANIFOLD

## REMOVAL AND INSTALLATION

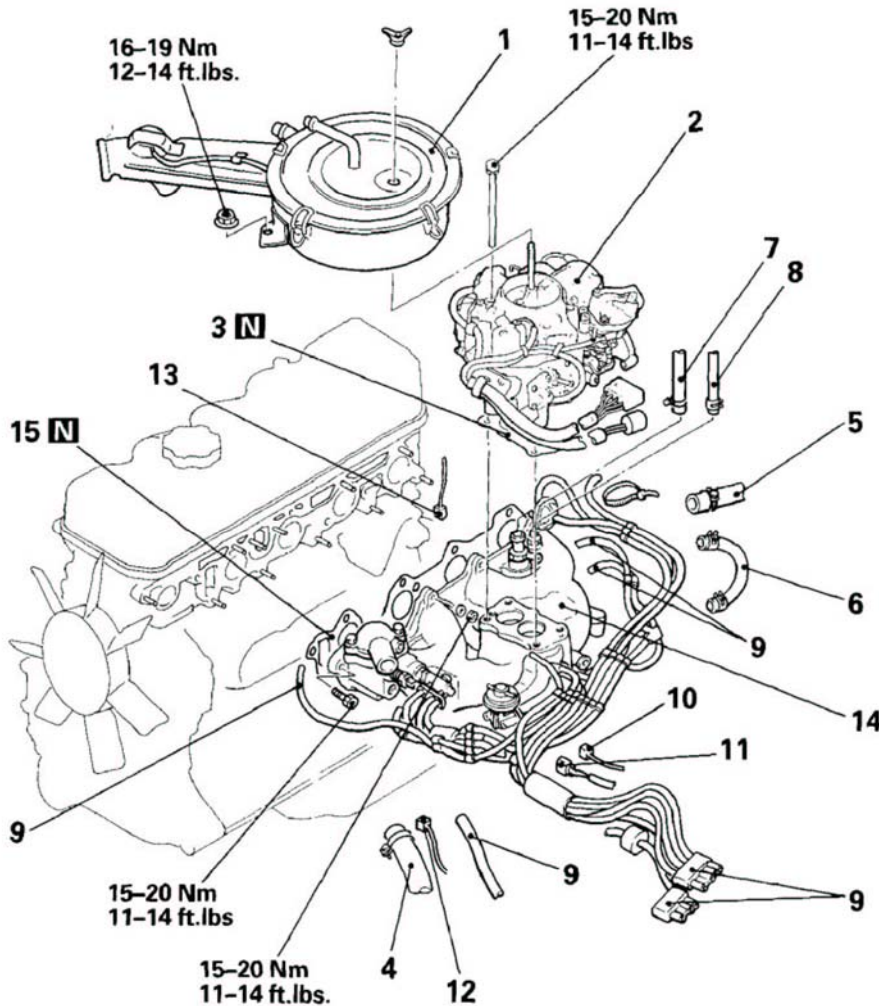
N11MA-

**Pre-removal Operation**

- Draining of Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE - Maintenance Service.)

**Post-installation Operation**

- Supplying of Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE - Maintenance Service.)
- Checking and adjustment of idling rpm and ignition timing (Refer to GROUP 9 ENGINE - Service Adjustment Procedures.)



04W569

**Removal steps**

- |      |   |   |
|------|---|---|
| ◆◆◆◆ | 1. Air filter   | 11. Connection of water temperature sensor connector                                |
| ◆◆◆◆ | 2. Carburetor assembly  | 12. Connection of water temperature gauge unit connector                            |
|      | 3. Gasket   | 13. Connection of thermo switch connector (Vehicles with an automatic transmission) |
|      | 4. Connection of radiator upper hose  | 14. Intake manifold   |
|      | 5. Connection of water by-pass hose   | 15. Intake manifold gasket  |
|      | 6. Water hose   |   |
|      | 7. Connection of heater hose  |   |
|      | 8. Connection of brake booster vacuum hose  |   |
|      | 9. Connection of vacuum hose  |   |
|      | 10. Connection of water temperature switch connector (Vehicles with an air conditioner) |   |

**NOTE**

- (1) Reverse the removal procedures to reinstall.  
 (2) ◆◆ : Refer to "Service Points of Removal".  
 (3) ◆◆◆ : Refer to "Service Points of Installation".  
 (4) **N** : Non-reusable parts

**SERVICE POINTS OF REMOVAL**

N11MBAD

**1. REMOVAL OF AIR FILTER**

Refer to P.11-4.

**2. REMOVAL OF CARBURETOR ASSEMBLY**

Refer to GROUP 14 FUEL SYSTEM – Carburetor.

**INSPECTION**

N11MCAD

Check the following points; replace the part if a problem is found.

**INTAKE MANIFOLD**

- (1) Check for damage or cracking of any part.
- (2) Check for obstruction of the negative pressure (vacuum) outlet port, and for obstruction of the water passage or gas passage.
- (3) Using a straight edge and a thickness gage, check for distortion of the cylinder head installation surface.

**Standard value : 0.15 mm (.006 in.) or less**

**Limit : 0.3 mm (.012 in.) or less**

**SERVICE POINTS OF INSTALLATION**

N11MDAC

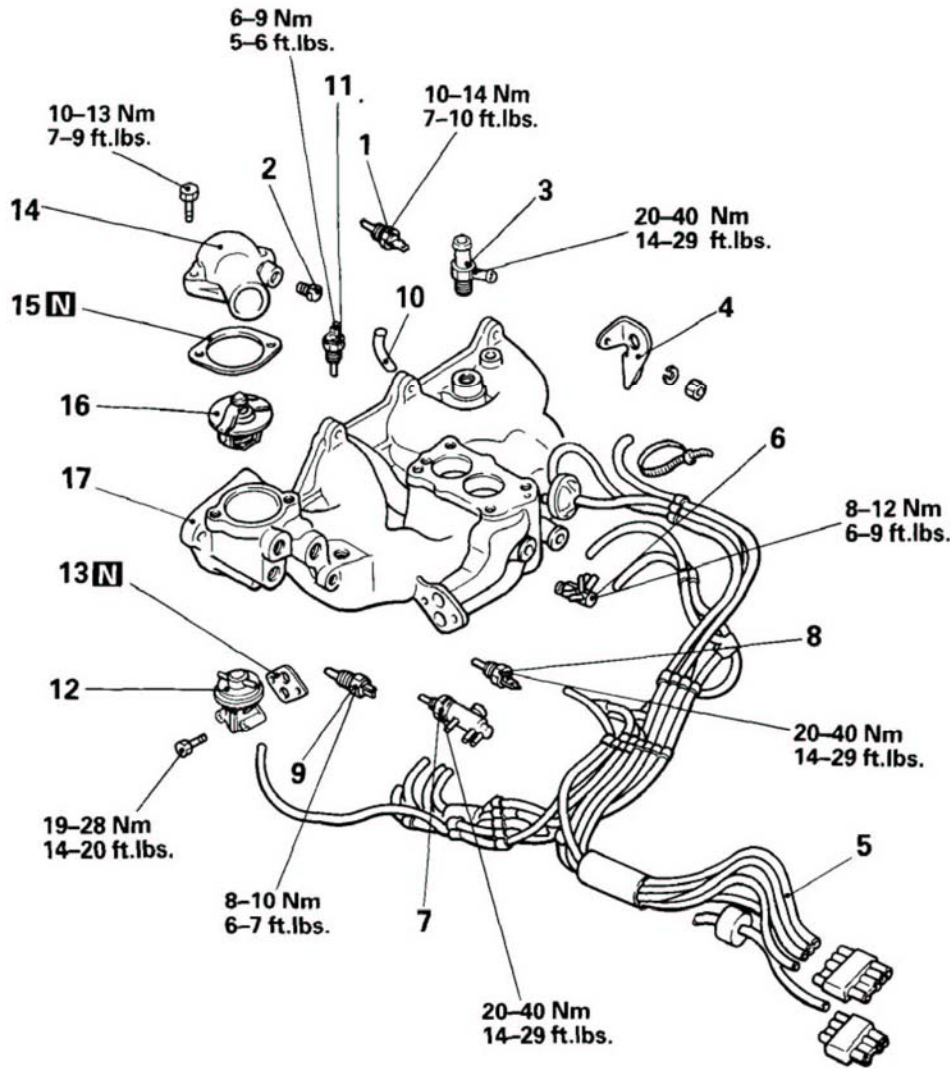
**2. INSTALLATION OF CARBURETOR ASSEMBLY**

Refer to GROUP 14 FUEL SYSTEM – Carburetor.

**1. INSTALLATION OF AIR FILTER**

Refer to P.11-4.

DISASSEMBLY AND REASSEMBLY



04W567

Disassembly steps

- ◆◆ 1. Water temperature switch (Vehicles with an air conditioner)
- 2. Plug (Vehicles without an air conditioner)
- ◆◆ 3. Joint
- 4. Engine hanger
- 5. Vacuum hose assembly
- ◆◆ 6. Joint
- ◆◆ 7. Thermo valve assembly
- ◆◆ 8. Water temperature sensor
- ◆◆ 9. Water temperature gauge unit
- 10. P.C.V. nipple
- ◆◆ 11. Thermo switch (Vehicles with an automatic transmission)
- 12. EGR valve assembly
- 13. EGR valve gasket
- 14. Water outlet fitting assembly
- 15. Gasket
- ◆◆ 16. Thermostat
- 17. Intake manifold

NOTE

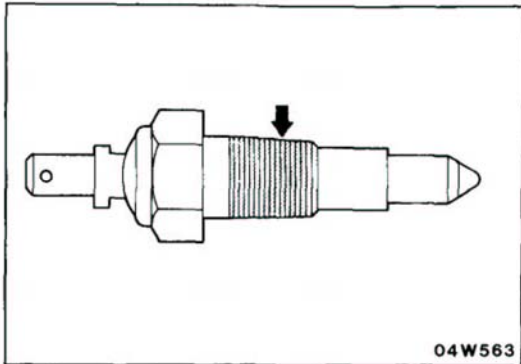
- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Reassembly."
- (3) **N** : Non-reusable parts

**SERVICE POINTS OF REASSEMBLY**

N11MHAB

**16. INSTALLATION OF THERMOSTAT**

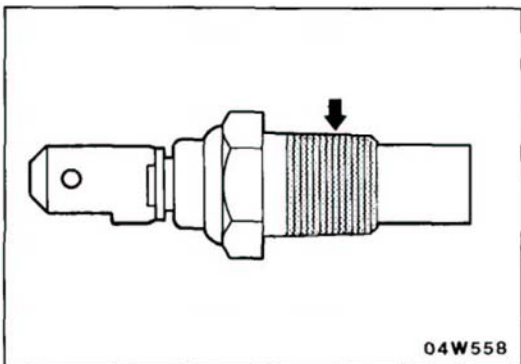
Refer to GROUP 7 COOLING – Thermostat



**11. APPLICATION OF ADHESIVE TO THERMO SWITCH**

Apply a coating of the specified adhesive to the threaded part, and then tighten at the specified torque.

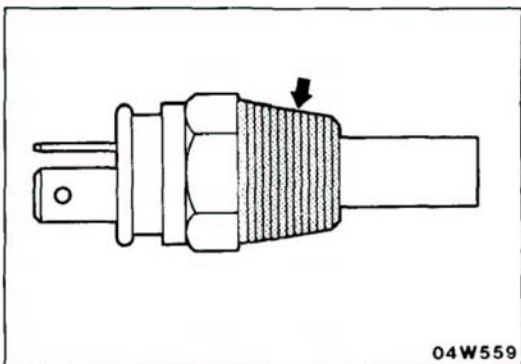
**Specified adhesive : 3M Adhesive Nut Locking 4171 or equivalent**



**9. APPLICATION OF ADHESIVE TO WATER TEMPERATURE GAUGE UNIT**

Apply a coating of the specified adhesive to the threaded part, and then tighten at the specified torque.

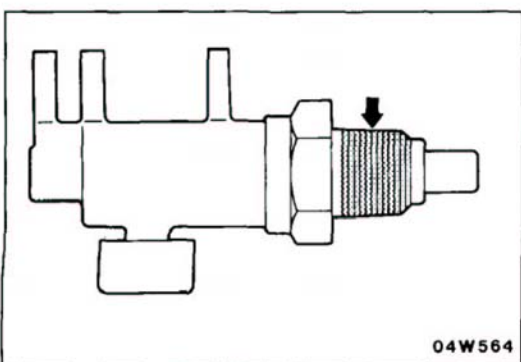
**Specified adhesive : 3M Adhesive Nut Locking 4171 or equivalent**



**8. APPLICATION OF ADHESIVE TO WATER TEMPERATURE SENSOR**

Apply a coating of the specified adhesive to the threaded part, and then tighten at the specified torque.

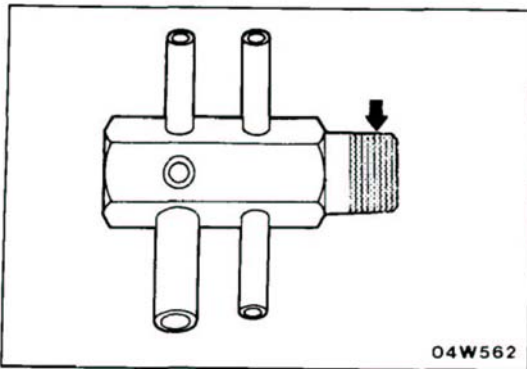
**Specified adhesive : 3M Adhesive Nut Locking 4171 or equivalent**



**7. APPLICATION OF SEALANT TO THERMO VALVE ASSEMBLY**

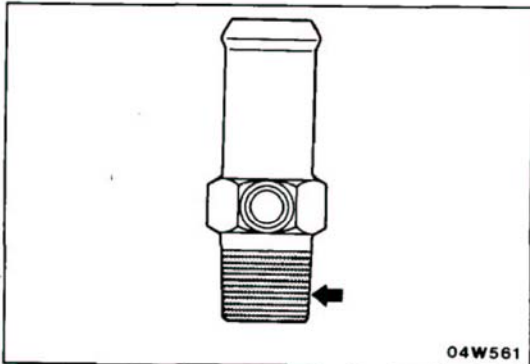
Apply a coating of the specified adhesive to the threaded part, and then tighten at the specified torque.

**Specified adhesive : 3M Adhesive Nut Locking 4171 or equivalent**

**6. APPLICATION OF ADHESIVE TO JOINT**

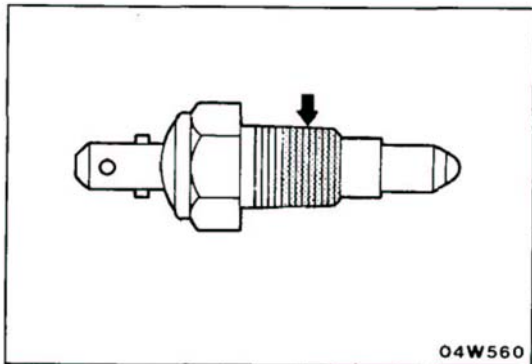
Apply a coating of the specified adhesive to the threaded part, and then tighten at the specified torque.

**Specified adhesive : 3M Adhesive Nut Locking 4171 or equivalent**

**3. APPLICATION OF ADHESIVE TO JOINT**

Apply a coating of the specified adhesive to the threaded part, and then tighten at the specified torque.

**Specified adhesive : 3M Adhesive Nut Locking 4171 or equivalent**

**1. APPLICATION OF ADHESIVE TO WATER TEMPERATURE SWITCH**

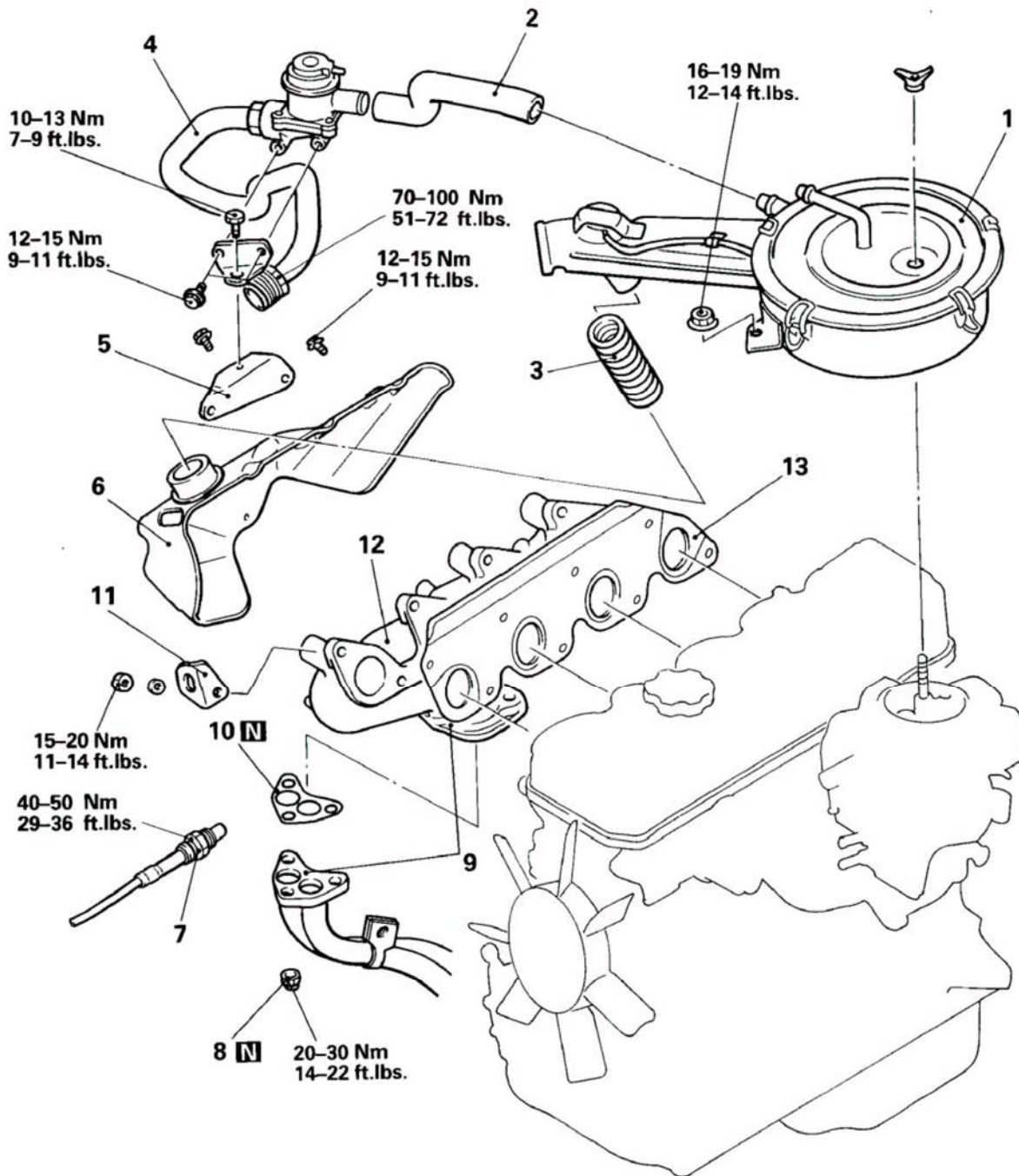
Apply a coating of the specified adhesive to the threaded part, and then tighten at the specified torque.

**Specified adhesive : 3M Adhesive Nut Locking 4171 or equivalent**

**EXHAUST MANIFOLD**

**REMOVAL AND INSTALLATION**

N11NA--



**Removal steps**

- ◄◄ ◄◄ 1. Air filter
- ◄◄ ◄◄ 2. Air duct
- ◄◄ ◄◄ 3. Heat duct
- ◄◄ ◄◄ 4. Air pipe assembly
- ◄◄ ◄◄ 5. Reed valve B bracket
- ◄◄ ◄◄ 6. Exhaust manifold cover
- ◄◄ ◄◄ 7. Oxygen sensor
- ◄◄ ◄◄ 8. Self-locking nut
- ◄◄ ◄◄ 9. Connection of exhaust manifold and front exhaust pipe

- 10. Gasket
- 11. Engine hanger
- 12. Exhaust manifold
- 13. Exhaust manifold gasket

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◄◄ ◄◄ : Refer to "Service Points of Removal".
- (3) ◄◄ ◄◄ : Refer to "Service Points of Installation".
- (4) **N** : Non-reusable parts

04W568

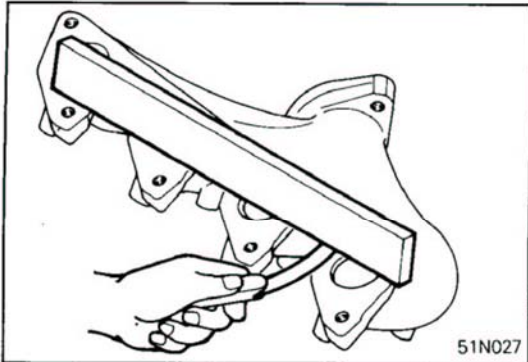


**SERVICE POINTS OF REMOVAL**

N11NBAA

**1. REMOVAL OF AIR FILTER**

Refer to P.11-4.

**INSPECTION**

N11NCAD

Check the following points; replace the part if a problem is found.

**EXHAUST MANIFOLD**

- (1) Check for damage or cracking of any part.
- (2) Check for obstruction of the negative pressure (vacuum) outlet port, and for obstruction of the water passage or gas passage.
- (3) Using a straight edge and a thickness gauge, check for distortion of the cylinder head installation surface.

**Standard value : 0.15 mm (.006 in.) or less**

**Limit : 0.3 mm (.012 in.) or less**

**EXHAUST MANIFOLD GASKET**

Check for flaking or damage of the gasket.

**SERVICE POINTS OF INSTALLATION**

N11NDAB

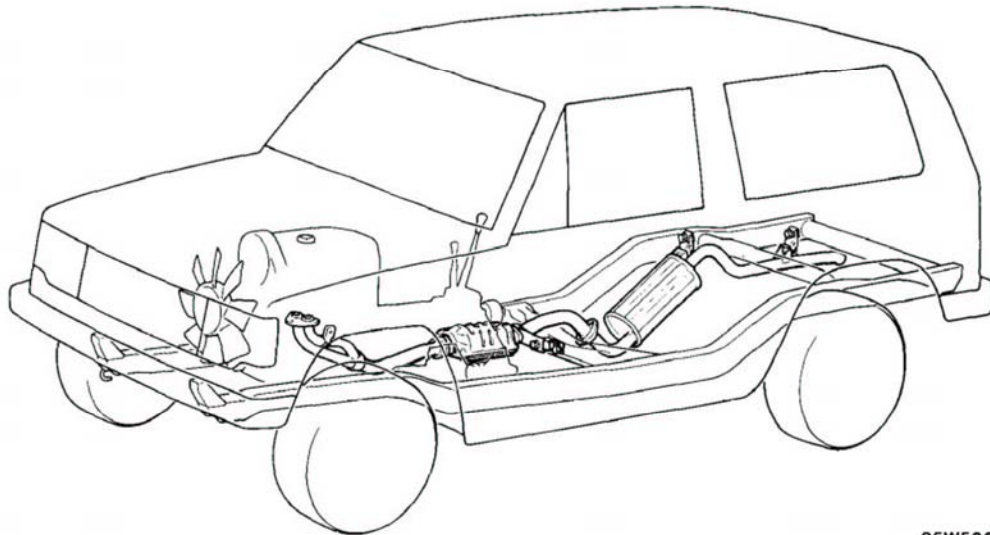
**1. INSTALLATION OF AIR FILTER**

Refer to P.11-4.

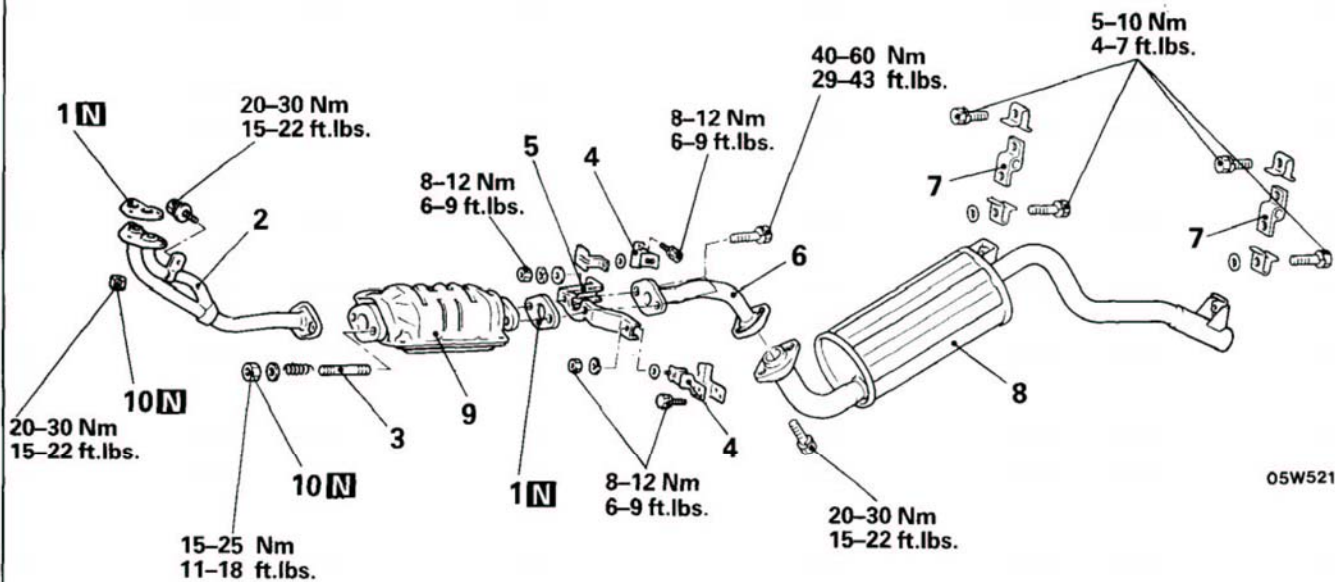
# EXHAUST PIPES AND MUFFLERS

## REMOVAL AND INSTALLATION

N11RA--



05W522



05W521

- 1. Gasket
- ◆◆ 2. Front exhaust pipe
- 3. Spring
- 4. Suspender
- 5. Hanger bracket
- ◆◆ 6. Center exhaust pipe
- 7. Hanger
- ◆◆ 8. Main muffler
- ◆◆ 9. Catalytic converter assembly
- 10. Self-locking nut

**NOTE**

- (1) ◆◆ : Refer to "Service Points of Installation".
- (2) **N** : Non-reusable parts

**INSPECTION**

N11RCAE

- Check the mufflers or pipes for corrosion or damage.
- Check the rubber hangers or suspenders for deterioration or damage.
- Check for gas leakage from mufflers or pipes.

**SERVICE POINTS OF INSTALLATION**

N11RDAE

**2. INSTALLATION OF FRONT EXHAUST PIPE/6. CENTER EXHAUST PIPE/8. MAIN MUFFLER /9. CATALYTIC CONVERTER ASSEMBLY**

- (1) Temporarily install the front exhaust pipe, the catalytic converter assembly, the center exhaust pipe, and the main muffler in that order.

**Caution**

**With temporarily tightened, check to be sure there is no distortion of the hangers.**

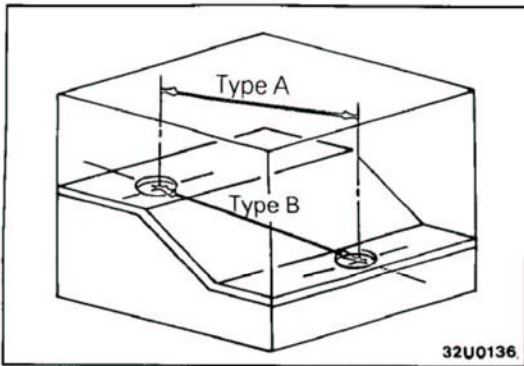
- (2) After fully tightening each exhaust pipe and main muffler, check to be sure there is no contact with the chassis at any place.

# BODY AND FRAME ALIGNMENT

## CONTENTS

N13AA-

<b>BODY DIMENSIONS AND MEASUREMENT METHODS</b> .....	<b>2</b>	<b>TYPE A (PROJECTED DIMENSIONS)</b> .....	<b>6</b>
Body Center Points .....	3	<b>TYPE B (ACTUAL-MEASUREMENT DIMENSIONS)</b> .....	<b>10</b>
How Body Dimensions Are Indicated .....	2	Engine Compartment .....	12
Indication of Reference Dimensions .....	2	Interior .....	16
Measurement Methods .....	3	Side Body .....	16
Measurement Points .....	2	Upper Body .....	12
<b>FRAME CENTERING GAGE INSTALLATION POSITIONS</b> .....	<b>4</b>		



32U0136

## BODY DIMENSIONS AND MEASUREMENT METHODS

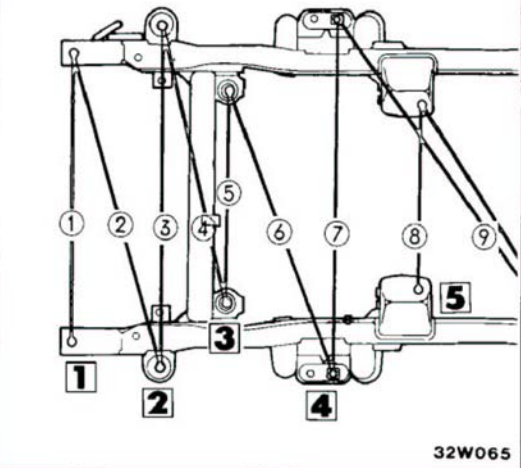
### HOW BODY DIMENSIONS ARE INDICATED N13GAAC

- (1) Type A (projected dimensions)  
These dimensions are the dimensions measured when the measurement points are projected into the reference plane. These dimensions are the reference dimensions used for body alterations.
- (2) Type B (actual-measurement dimensions)  
These dimensions indicate the actual linear distance between measurement points, and are the reference dimensions for use if a tracking gage is used for measurements.

#### NOTE

The units given for the dimensions of both types (A and B) are mm (in.).

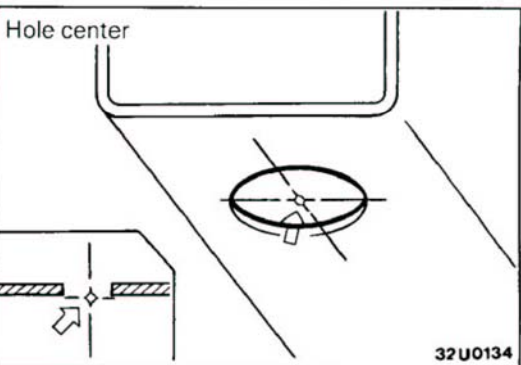
mm (in.)				
No.	①	②*	③	④*
Length	710 (27.95)	808 (31.83)	840 (33.07)	701 (27.59)



32W065

### INDICATION OF REFERENCE DIMENSIONS

If the reference dimension number (in a circle) shown on the top line of the dimension table at left is marked with \*, measurements are taken of this dimension and another which are symmetrical with respect to the car centerline.

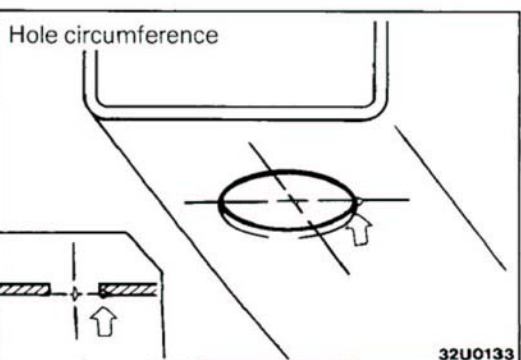


32U0134

### MEASUREMENT POINTS

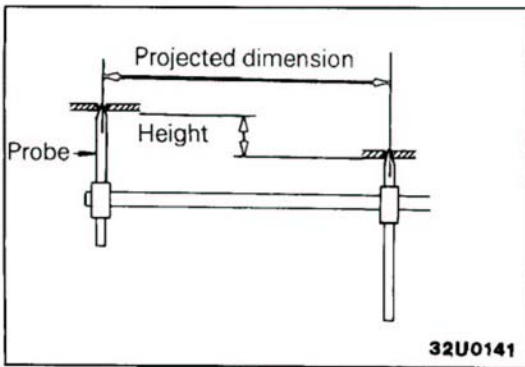
Measurement points are used to indicate the following:

- (1) **Hole centers**  
If a measurement is to be made at a hole center, the point of the surface from which the measuring instrument is applied is the measurement point.



32U0133

- (2) **Hole circumferences**  
If a measurement is to be made at the circumference of a hole, the point of the hole circumference of the surface from which the measuring instrument is applied is the measurement point.



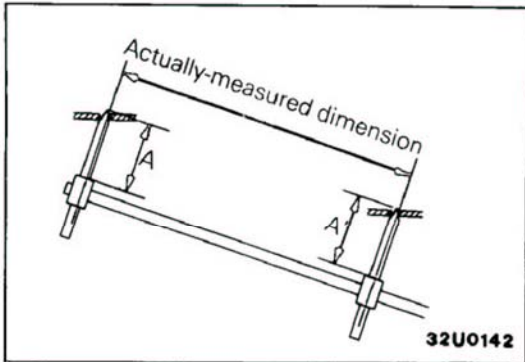
**MEASUREMENT METHODS (using a tracking gage)**

**NOTE**

Make sure that the tracking gage used is free from play between its body and probes.

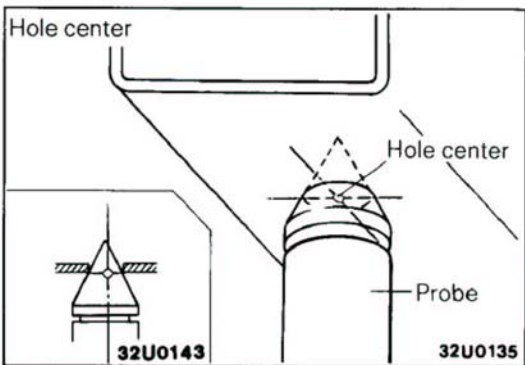
**(1) Type A (projected dimensions)**

If the length of the tracking gage probes are adjustable, make the measurement by lengthening one probe by the amount equivalent to the difference in height of the two surfaces.



**(2) Type B (actual-measurement dimensions)**

Measure by first adjusting both probes to the same length ( $A = A'$ )

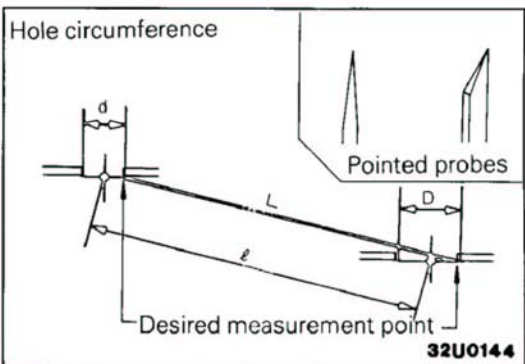


**(3) If hole diameters are same and the probes are conical**

For both Type A and Type B, insert the probes into the holes, and then make the measurement. This method of measurement should be used if the diameters of the holes in the location to be measured are the same.

**(4) If hole diameters are different, or the probes are pointed**

Because measurement at the hole centers is impossible, the circumferences must be used instead.



**How to Determine Dimensions**

Desired dimensions:  $L = l + \frac{D-d}{2}$

Example: mm (in.)

Reference dimensions:  $l = 600 (23.6)$

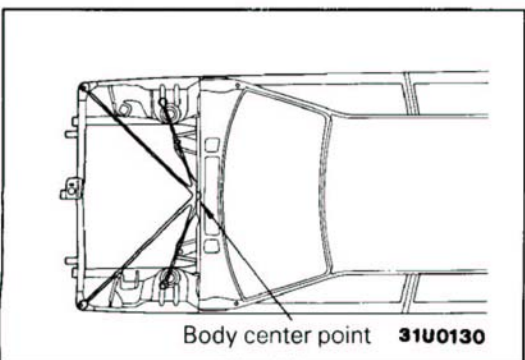
Measured hole diameters:  $D = 20 (.79)$

$d = 10 (.39)$

Desired dimensions:

$$L = 600 (23.6) + \frac{20 (.79) - 10 (.39)}{2}$$

$$= 605 (23.8)$$



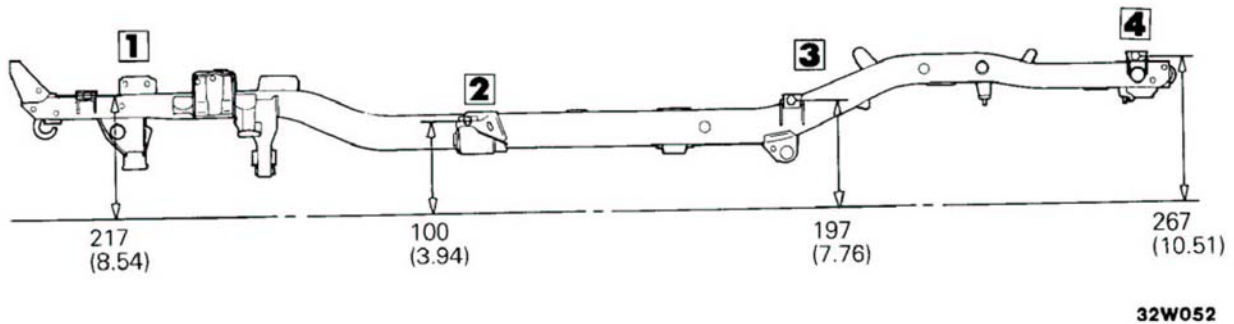
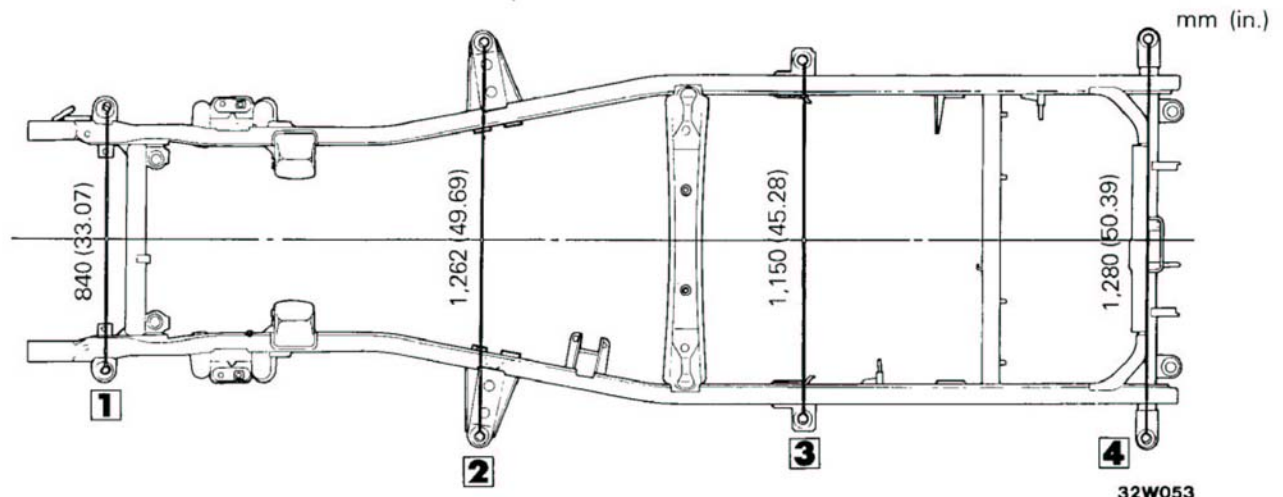
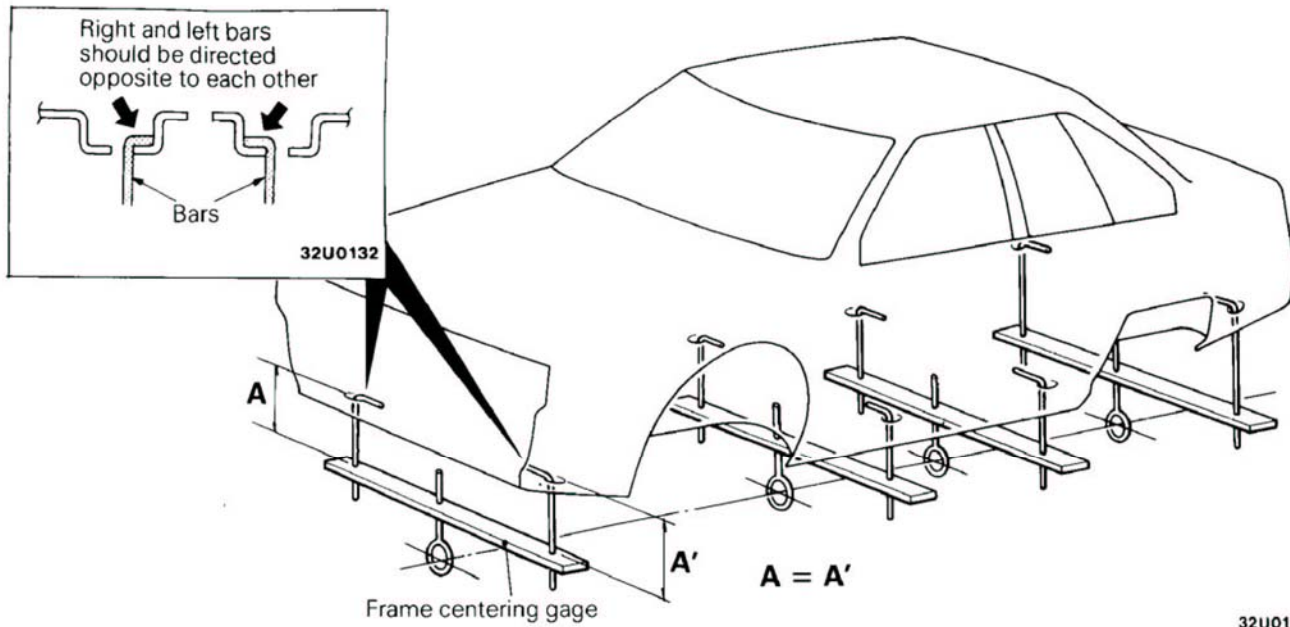
**BODY CENTER POINTS**

When measuring locations that should be symmetrical left and right and there are no specific instructions with regard to measurements in "Body Dimensions", the body center points should be used to confirm that the left and right measurements from these points are the same. One body center point is specified for the front of the body and another is specified for the rear.

# FRAME CENTERING GAGE INSTALLATION POSITIONS

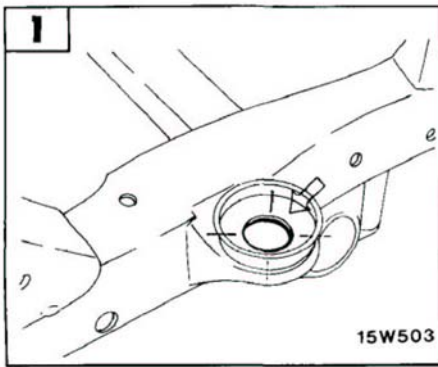
N13HA--

Mount the frame centering gages at locations indicated in illustration to check for horizontal and vertical bend and torsion of the body.

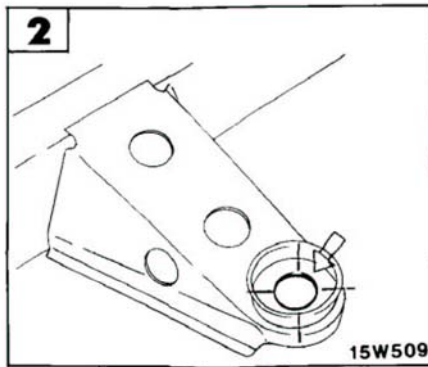


**NOTE**

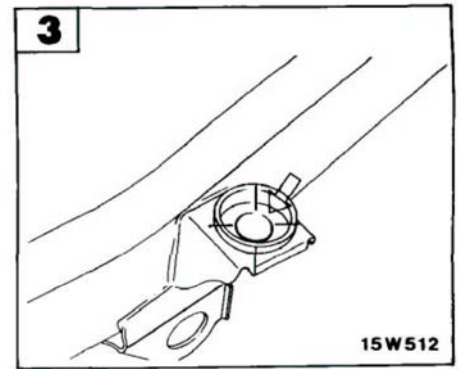
Dimensions shown in the side view are the distances from the bottom end of the panel at each measurement point, not including the panel thickness.



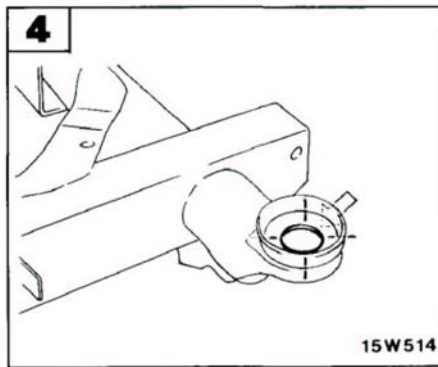
Center of body mounting hole [diameter : 30 mm (1.18 in.)]



Center of body mounting hole [diameter : 32 mm (1.26 in.)]



Center of body mounting hole [diameter : 32 mm (1.26 in.)]



Center of body mounting hole [diameter : 32 mm (1.26 in.)]

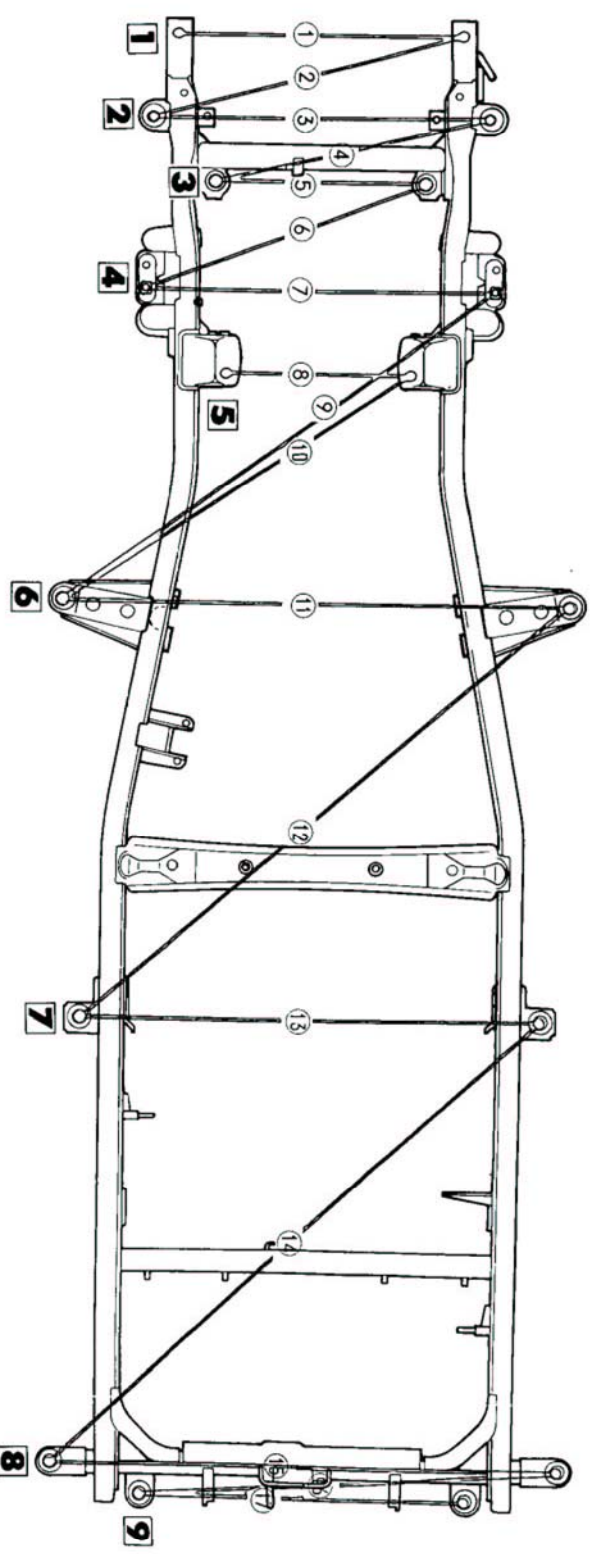


# TYPE A (PROJECTED DIMENSIONS) (1/2)

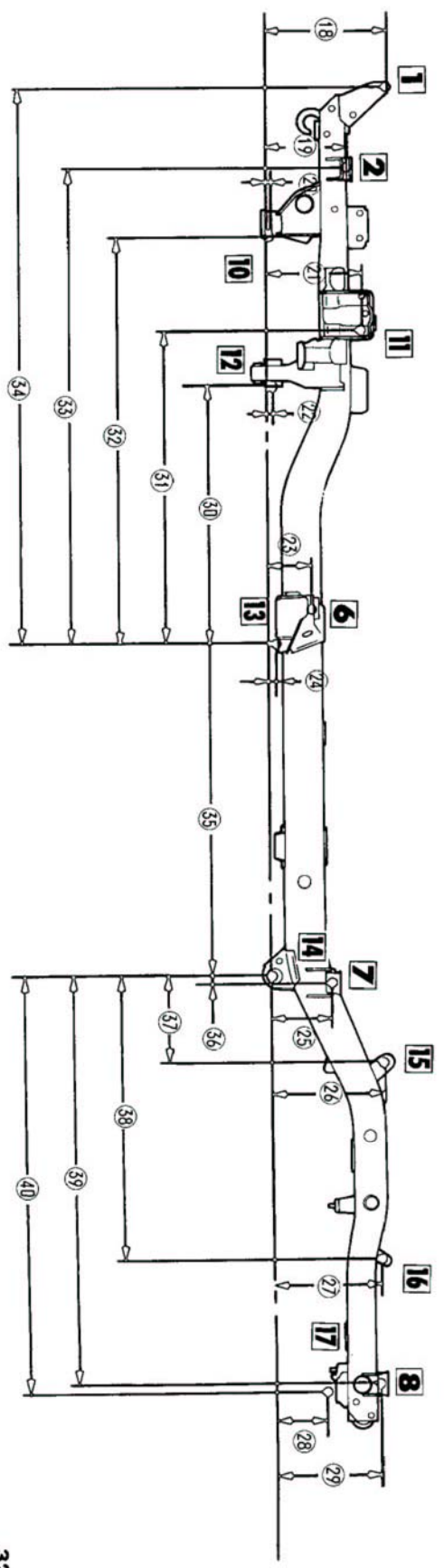
NISSA-

mm (in.)

No.	①	②*	③	④*	⑤	⑥*	⑦	⑧	⑨*	⑩*	⑪	⑫*	⑬	⑭*	⑮	⑯*	⑰	⑱	⑳	
Length	710 (27.95)	808 (31.83)	840 (33.07)	701 (27.59)	522 (20.55)	745 (29.32)	870 (34.25)	439 (17.28)	1,331 (52.40)	1,023 (40.29)	1,262 (49.68)	1,598 (62.90)	1,150 (45.28)	1,652 (65.06)	1,280 (50.39)	1,052 (41.42)	820 (32.28)	350 (13.79)	233 (9.19)	21 (.81)
No.	⑳	㉑	㉒	㉓	㉔	㉕	㉖	㉗	㉘	㉙	㉚	㉛	㉜	㉝	㉞	㉟	㊱	㊲	㊳	㊴
Length	268 (10.55)	21 (.81)	116 (4.57)	13 (.51)	163 (6.42)	310 (12.20)	300 (11.81)	160 (6.30)	283 (11.13)	734 (28.91)	880 (34.64)	1,148 (45.20)	1,332 (52.44)	1,562 (61.49)	923 (36.34)	20 (.79)	250 (9.84)	795 (31.30)	1,140 (44.88)	1,155 (45.47)

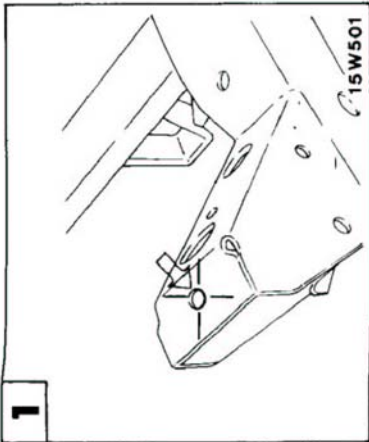


32W053



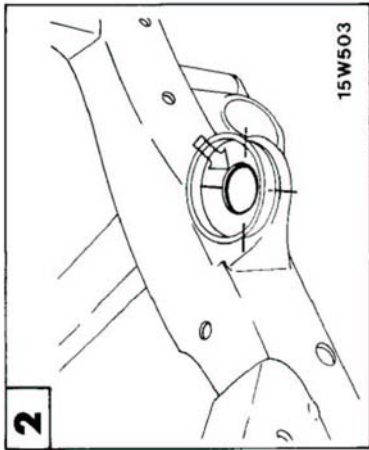
32W052

STB Revision



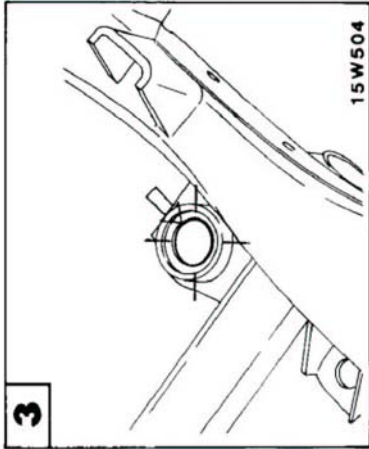
15W501

Center of front bumper mounting hole [diameter : 11 mm (.43 in.)]



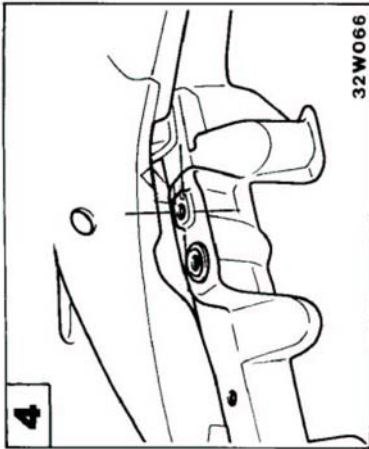
15W503

Center of body mounting hole [diameter : 30 mm (1.18 in.)]



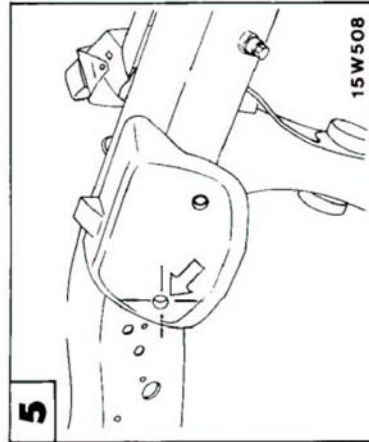
15W504

Center of differential mounting bracket hole [diameter : 34 mm (1.34 in.)]



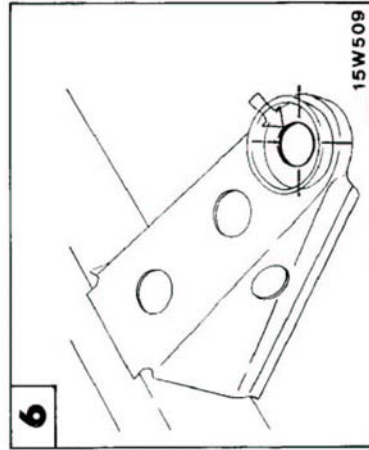
32W066

Center of brake hose mounting hole [diameter : 16 mm (.63 in.)]



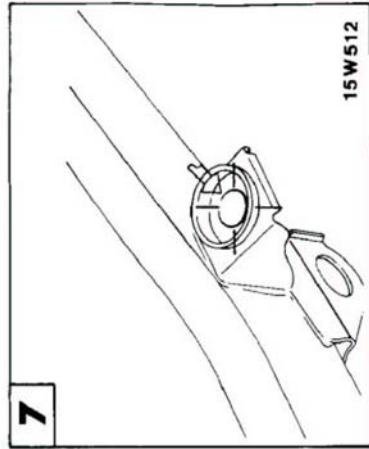
15W508

Center of engine mounting hole [diameter : 11 mm (.43 in.)]



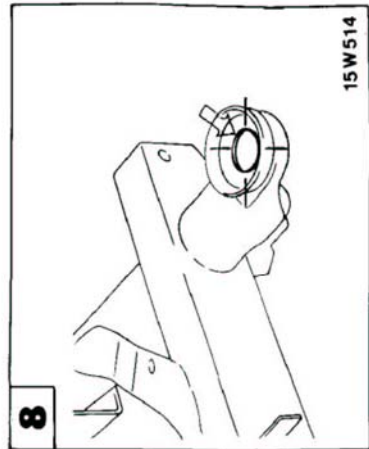
15W509

Center of body mounting hole [diameter : 32 mm (1.26 in.)]



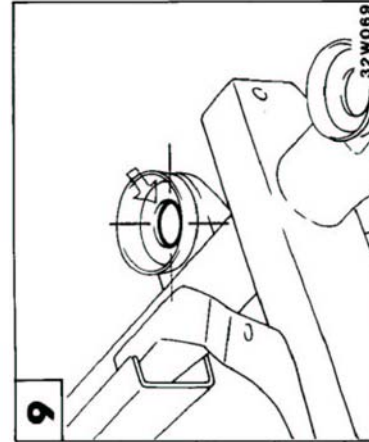
15W512

Center of body mounting hole [diameter : 32 mm (1.26 in.)]



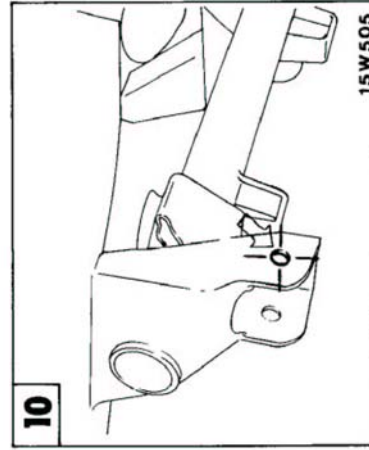
15W514

Center of body mounting hole [diameter : 32 mm (1.26 in.)]



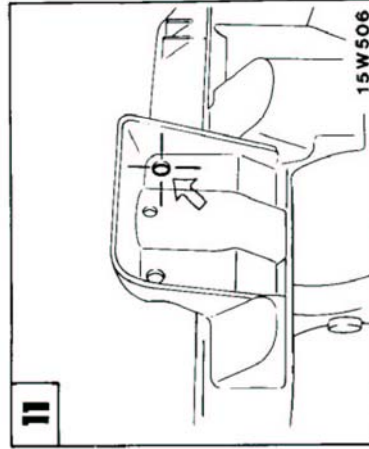
32W069

Center of body mounting hole [diameter : 30 mm (1.18 in.)]



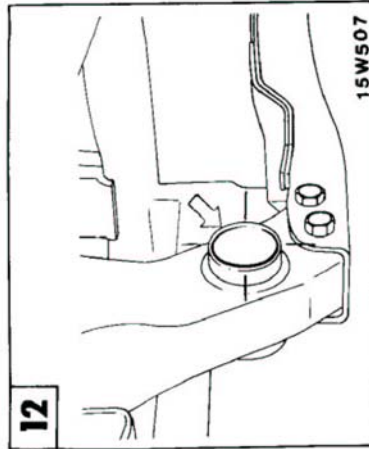
15W505

Center of lower arm (front) mounting hole [diameter : 15 mm (.59 in.)]



15W506

Center of upper arm mounting hole [diameter : 12.5 mm (.49 in.)]



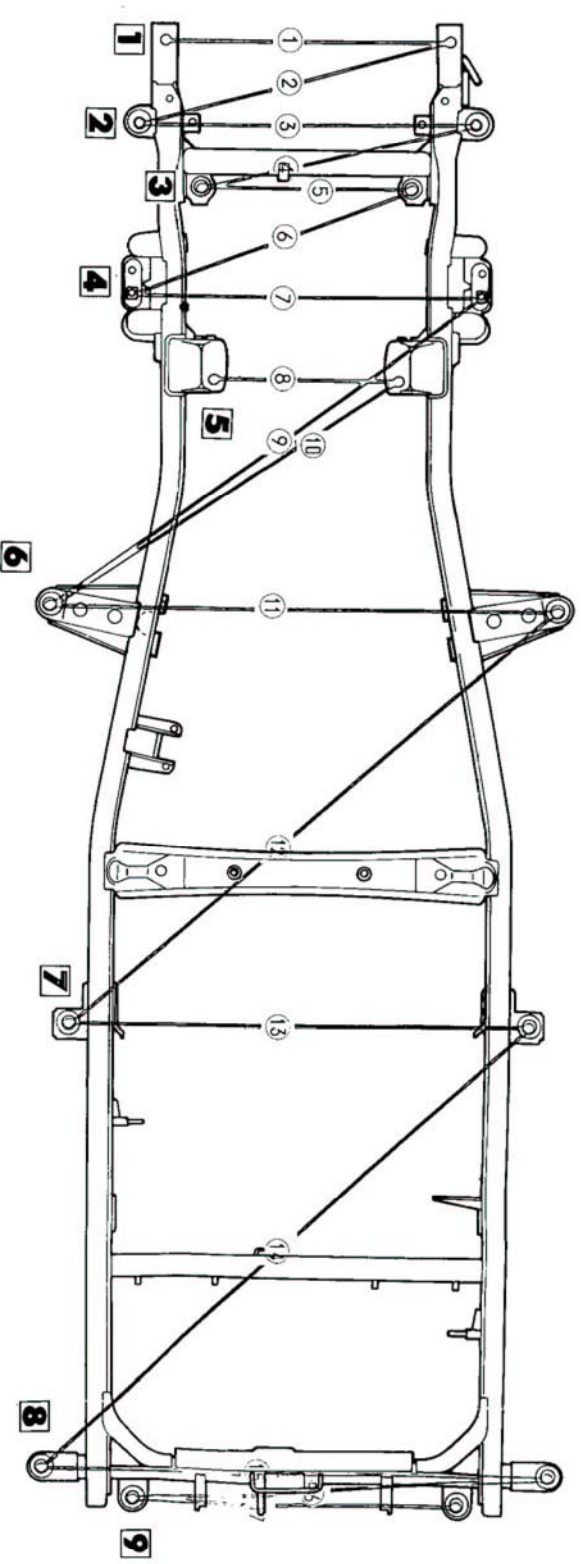
15W507

Center of lower arm (rear) mounting hole [diameter : 40 mm (1.57 in.)]

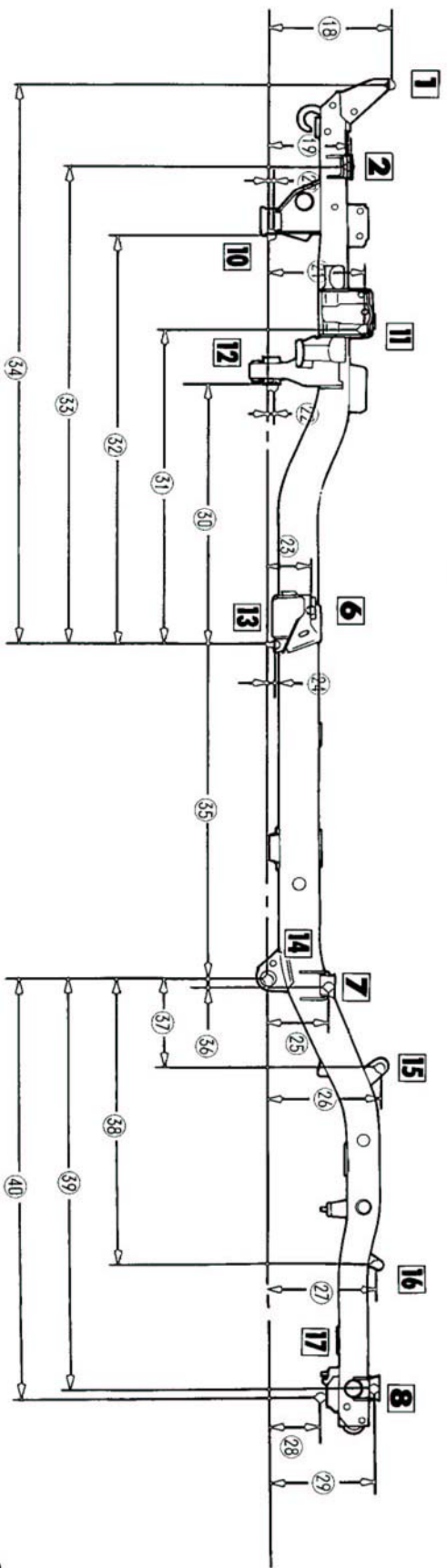
# TYPE A (PROJECTED DIMENSIONS) (2/2)

mm (in.)

No.	1	2*	3	4*	5	6*	7	8	9*	10*	11	12*	13	14*	15	16*	17	18	19	20
Length	710 (27.95)	808 (31.83)	840 (33.07)	701 (27.59)	522 (20.55)	745 (29.32)	870 (34.25)	439 (17.28)	1,331 (52.40)	1,023 (40.29)	1,262 (49.68)	1,598 (62.90)	1,150 (45.28)	1,652 (65.06)	1,280 (50.39)	1,052 (41.42)	820 (32.28)	350 (13.79)	233 (9.19)	21 (.81)
No.	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)
Length	268 (10.55)	21 (.81)	116 (4.57)	13 (.51)	163 (6.42)	310 (12.20)	300 (11.81)	160 (6.30)	283 (11.13)	734 (28.91)	880 (34.64)	1,148 (45.20)	1,332 (52.44)	1,562 (61.49)	923 (36.34)	20 (.79)	250 (9.84)	795 (31.30)	1,140 (44.88)	1,155 (45.47)

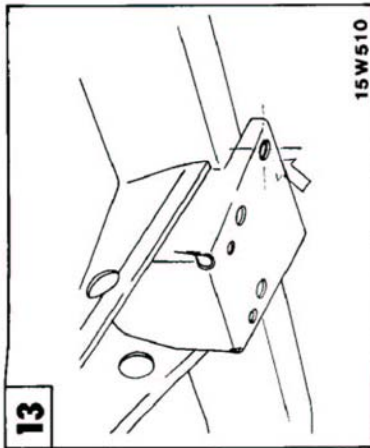


32W053

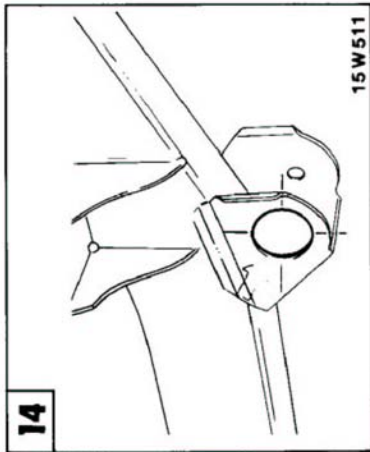


32W052

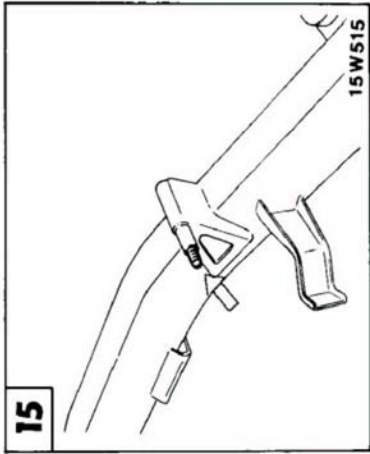
STB Revision



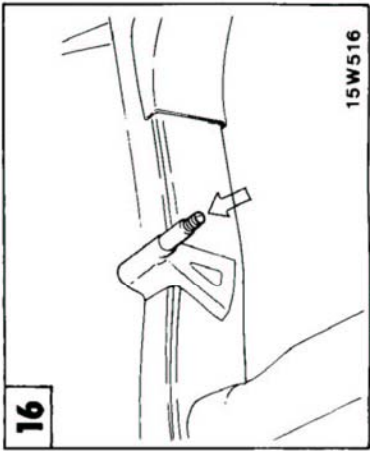
Center of No. 2 crossmember mounting hole [diameter : 14 mm (.55 in.)]



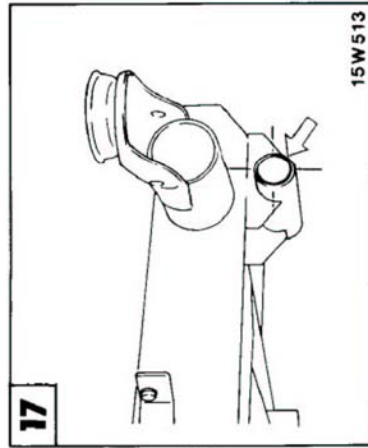
Center of rear spring (front) mounting hole [diameter : 48 mm (1.89 in.)]



Center of shock absorber mounting end (L.H.)



Center of shock absorber mounting end (R.H.)



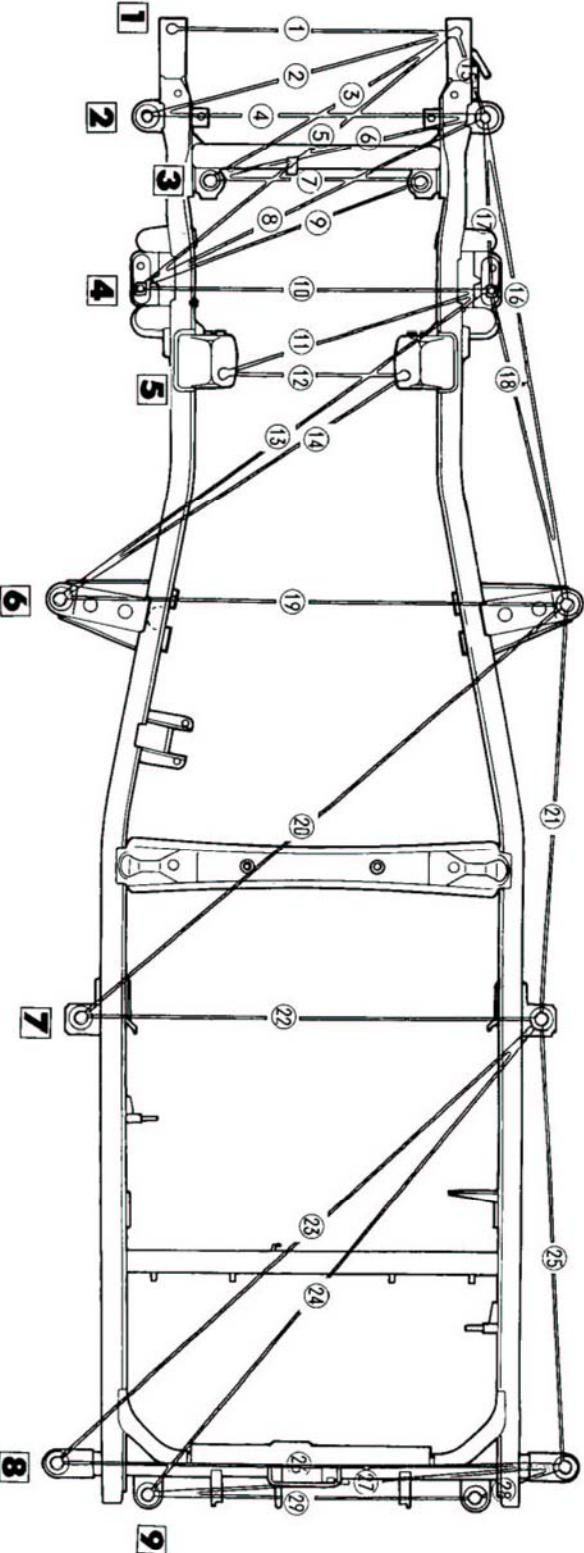
Center of rear spring shackle mounting hole [diameter : 28 mm (1.10 in.)]

**TYPE B (ACTUAL-MEASUREMENT DIMENSIONS)**

NITRKA...

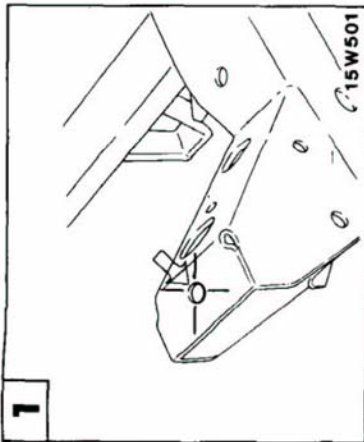
mm (in.)

No.	1	2*	3*	4	5*	6*	7	8*	9*	10	11*	12	13*	14*	15	16	17	18	19	20*
Length	710 (27.95)	817 (32.16)	762 (30.00)	840 (33.07)	1,031 (40.58)	707 (27.84)	522 (20.55)	959 (37.77)	758 (29.83)	870 (34.25)	695 (27.38)	439 (17.28)	1,344 (52.90)	1,031 (40.59)	266 (10.47)	1,251 (49.23)	435 (17.14)	841 (33.11)	1,262 (49.68)	1,598 (62.93)
No.	(21)	(22)	(23*)	(24*)	(25)	(26)	(27*)	(28*)	(29)											
Length	1,051 (41.36)	1,150 (45.28)	1,657 (65.23)	1,543 (60.75)	1,128 (44.42)	1,280 (50.39)	1,053 (41.44)	242 (9.53)	820 (32.28)											

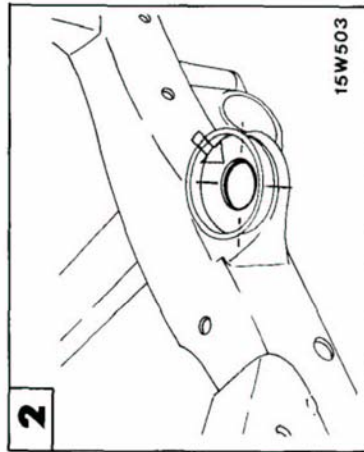


STB Revision

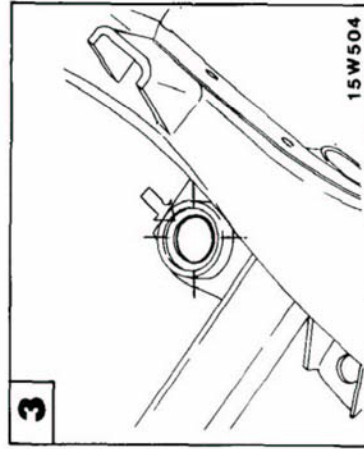
32W054



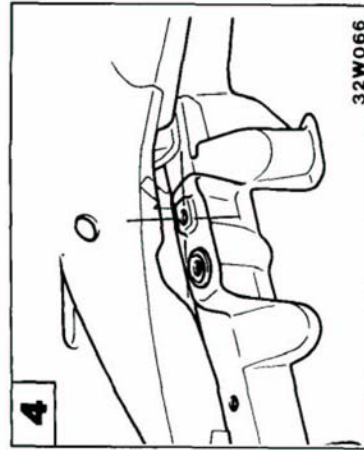
**1** Center of front bumper mounting hole [diameter : 11 mm (.43 in.)]



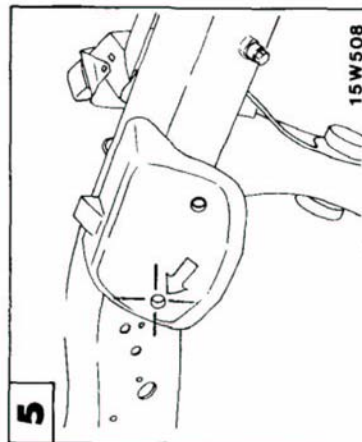
**2** Center of body mounting hole [diameter : 30 mm (1.18 in.)]



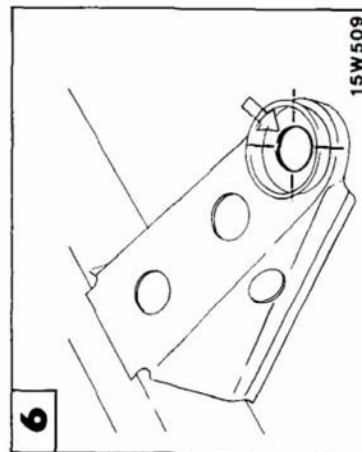
**3** Center of differential mounting bracket hole [diameter : 34 mm (1.34 in.)]



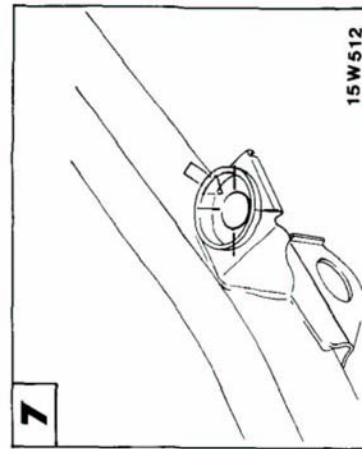
**4** Center of brake hose mounting hole [diameter : 16 mm (.63 in.)]



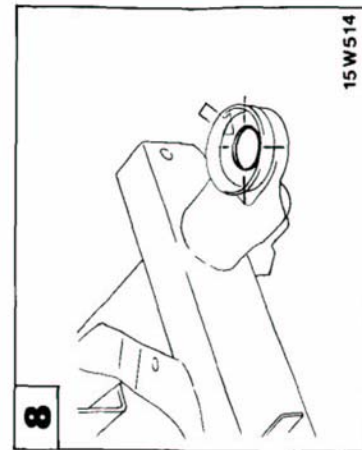
**5** Center of engine mounting hole [diameter : 11 mm (.43 in.)]



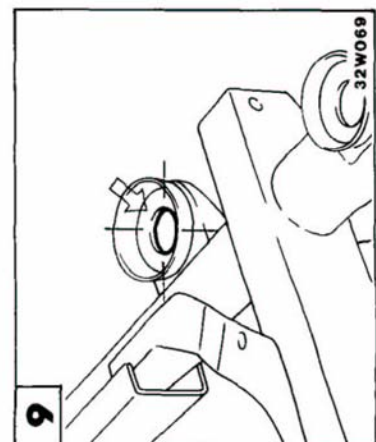
**6** Center of body mounting hole [diameter : 32 mm (1.26 in.)]



**7** Center of body mounting hole [diameter : 32 mm (1.26 in.)]



**8** Center of body mounting hole [diameter : 32 mm (1.26 in.)]

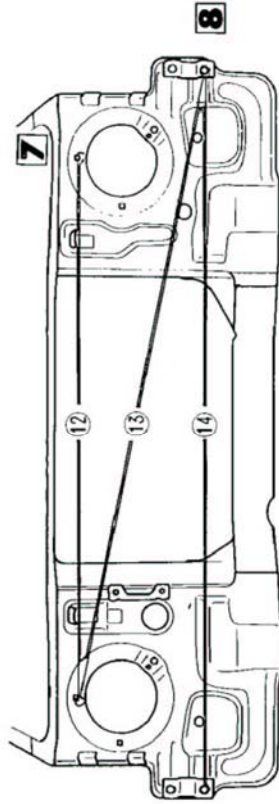
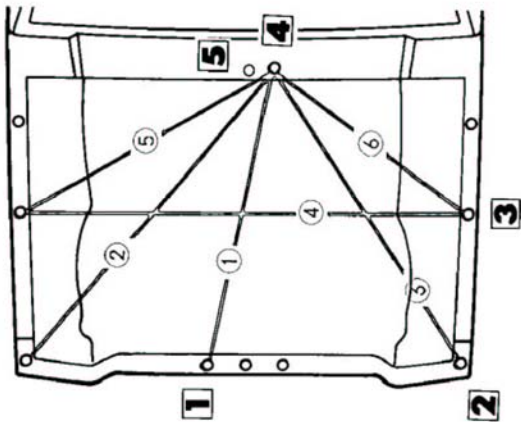


**9** Center of body mounting hole [diameter : 30 mm (1.18 in.)]

ENGINE COMPARTMENT (1/2)

mm (in.)

No.	①	②	③	④	⑤	⑥	⑦	⑧*	⑨*	⑩*	⑪	⑫	⑬*	⑭
Length	819	1,117	1,030	1,379	908	789	1,340	1,401	1,536	692	1,406	1,100	1,304	1,450
	(32.24)	(43.98)	(40.55)	(54.29)	(35.75)	(31.06)	(52.76)	(55.16)	(60.47)	(27.24)	(55.35)	(43.31)	(51.34)	(57.09)



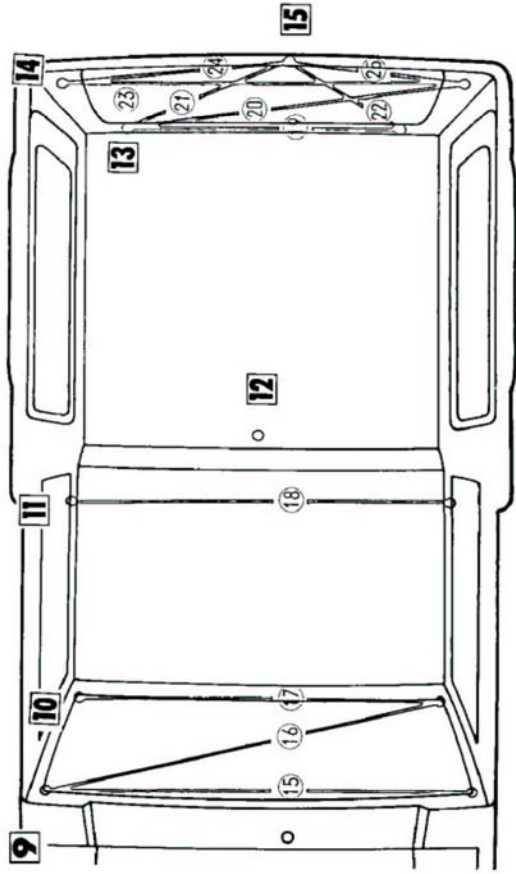
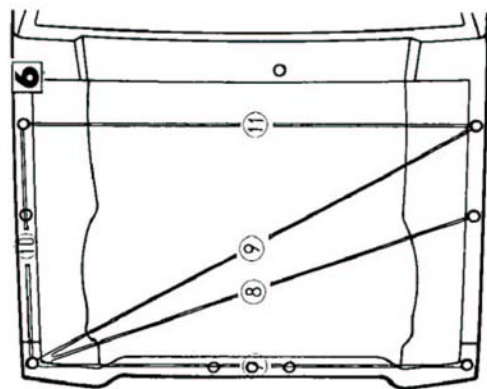
32W064

UPPER BODY

mm (in.)

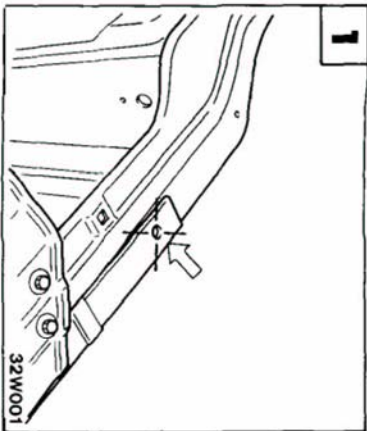
No.	⑮	⑯*	⑰	⑱	⑲*	⑳	㉑	㉒	㉓	㉔	㉕
Length	1,376	1,401	1,177	1,243	909	1,569	1,243	1,138	1,594	953	671
	(54.17)	(55.16)	(46.34)	(48.94)	(35.79)	(61.77)	(48.94)	(44.80)	(62.76)	(37.52)	(26.42)

32W049

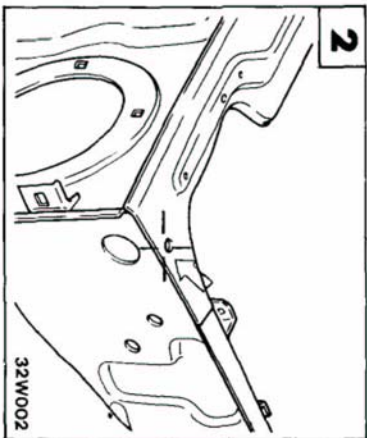


32W050

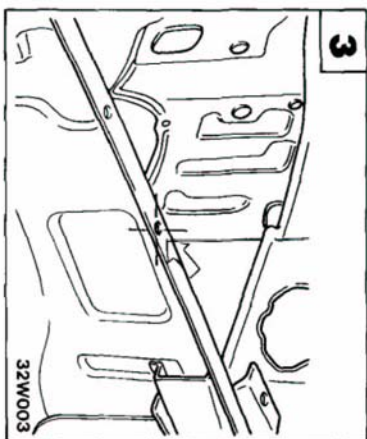
32W048



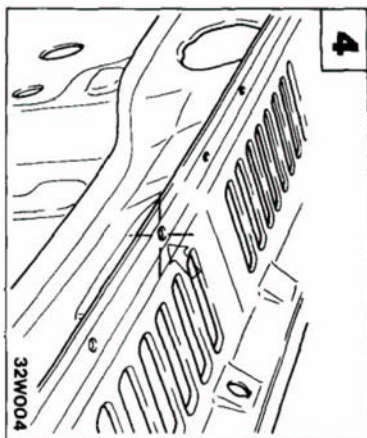
Hole in top of headlamp support (diameter : 6.6 mm (.26 in.))



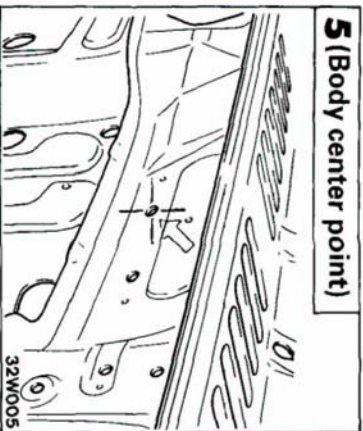
Center of fender mounting hole (diameter : 9 mm (.35 in.))



Center of fender mounting hole (diameter : 6.6 mm (.26 in.))

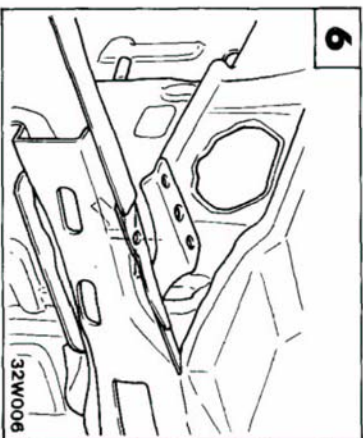


Center of weatherstrip mounting hole (diameter : 5.5 mm (.22 in.))

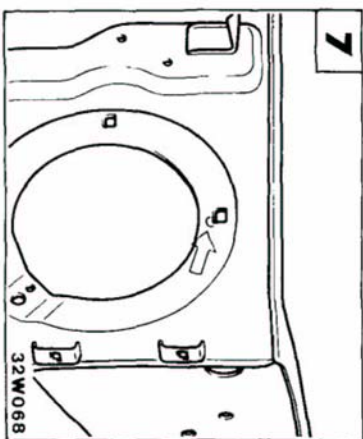


5 (Body center point)

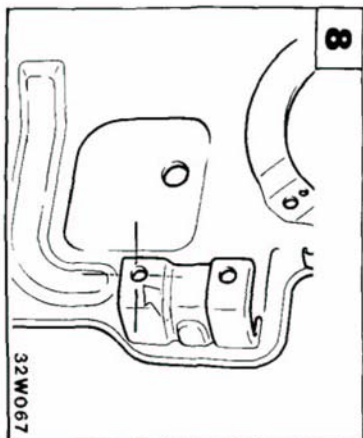
Center of accelerator cable mounting hole (diameter : 9 mm (.35 in.))



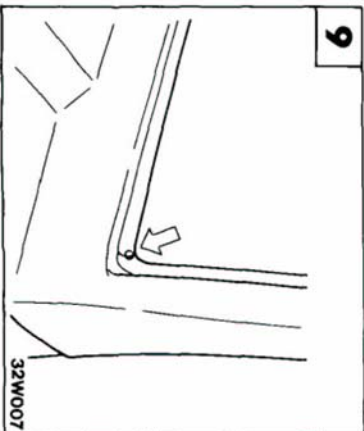
Center of fender mounting hole (diameter : 6.6 mm (.26 in.))



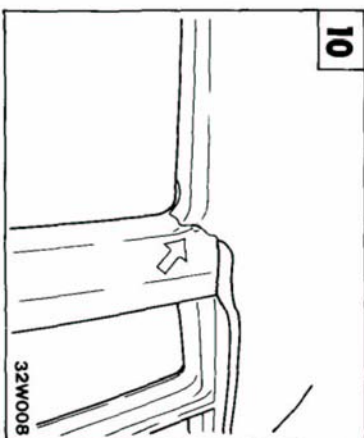
Headlight mounting hole



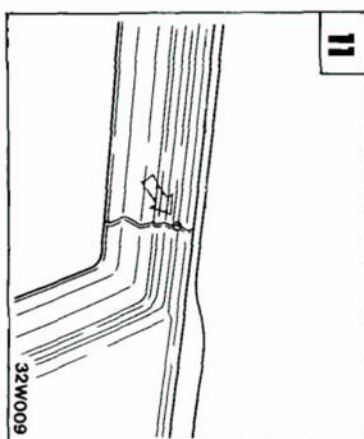
Center of front fender mounting hole (diameter : 10 mm (.39 in.))



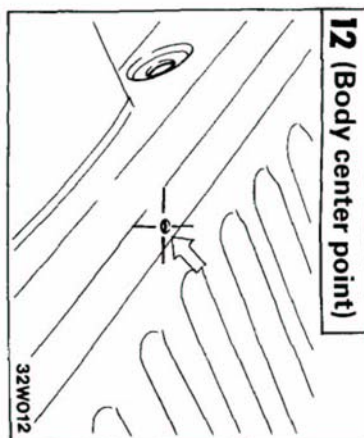
Front pillar lower part



Joint of roof and front pillar



Joint of side roof rail and quarter panel



12 (Body center point)

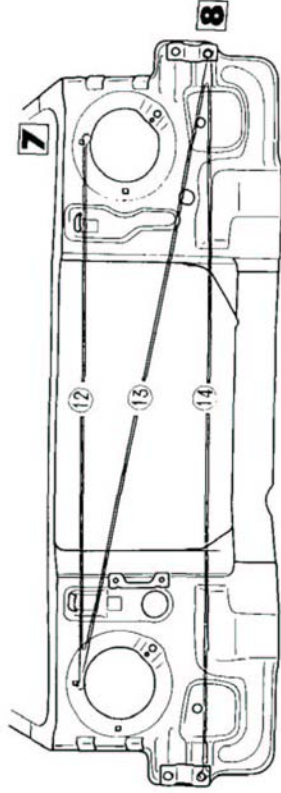
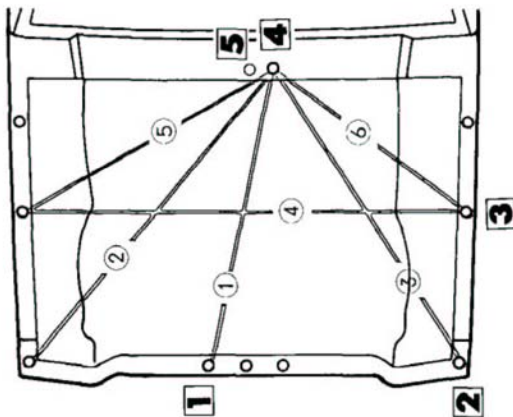
Body center point reference hole (diameter : 5 mm (.20 in.))



ENGINE COMPARTMENT (2/2)

mm (in.)

No.	①	②	③	④	⑤	⑥	⑦	⑧*	⑨*	⑩*	⑪	⑫	⑬*	⑭
Length	819 (32.24)	1,117 (43.98)	1,030 (40.55)	1,379 (54.29)	908 (35.75)	789 (31.06)	1,340 (52.76)	1,401 (55.16)	1,536 (60.47)	692 (27.24)	1,406 (55.35)	1,100 (43.31)	1,304 (51.34)	1,450 (57.09)



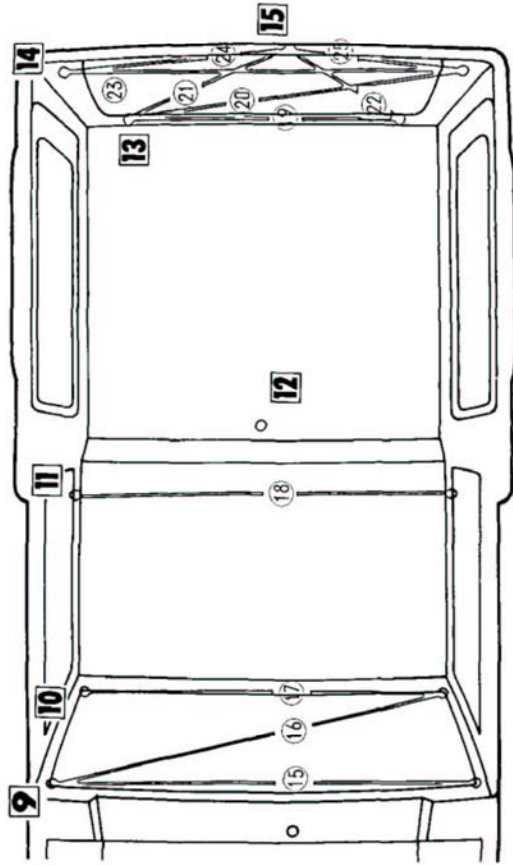
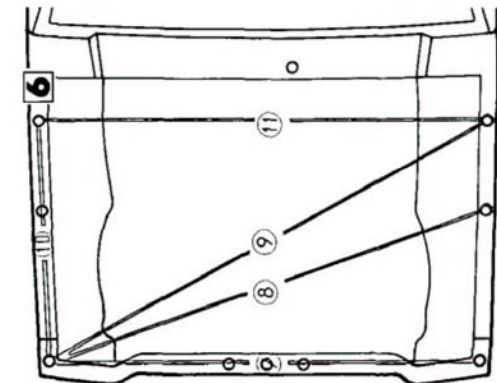
32W064

UPPER BODY

mm (in.)

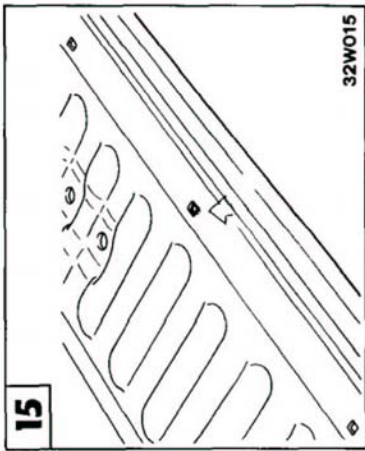
No.	⑮	⑯*	⑰	⑱	⑲	⑳*	㉑	㉒	㉓	㉔	㉕
Length	1,376 (54.17)	1,401 (55.16)	1,177 (46.34)	1,243 (48.94)	909 (35.79)	1,569 (61.77)	1,243 (48.94)	1,138 (44.80)	1,594 (62.76)	953 (37.52)	671 (26.42)

32W048

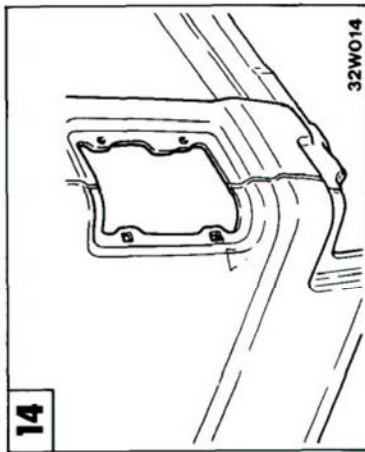


32W050

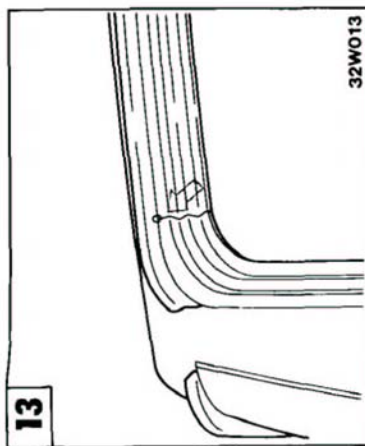
32W048



Rear scuff plate mounting hole



Rear combination lamp mounting hole



Joint of rear end panel and rear roof rail

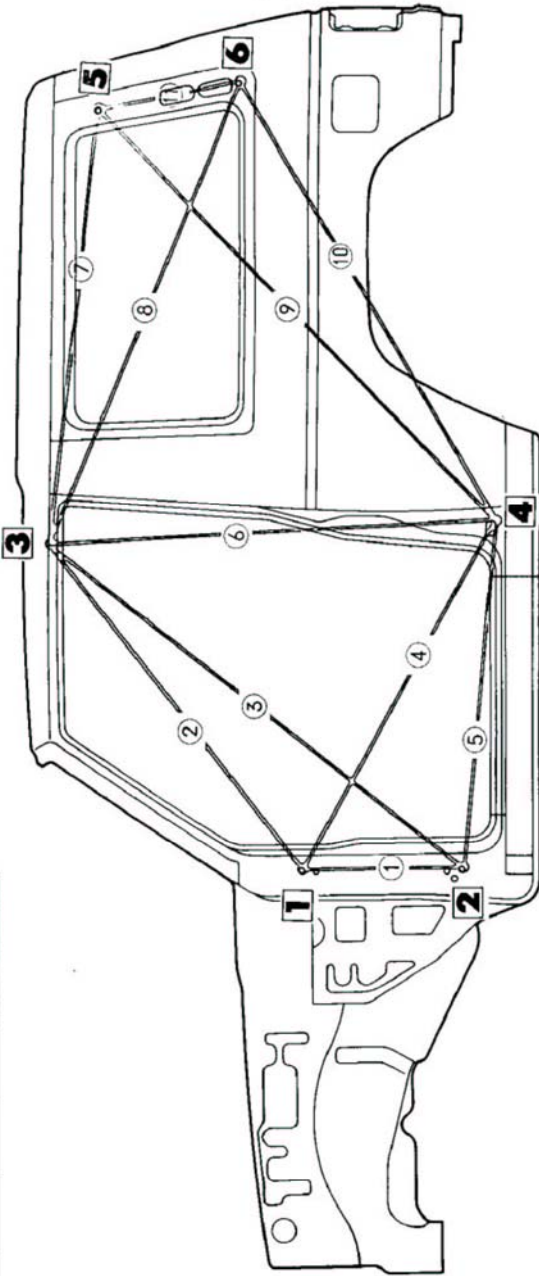
32W051

32W047

**SIDE BODY**

mm (in.)

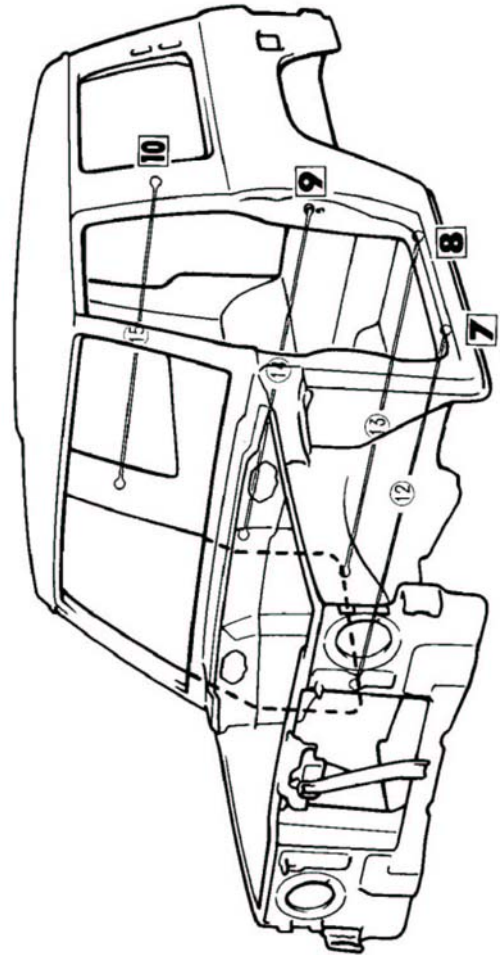
No.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪
Length	439 (17.28)	1,193 (46.97)	1,492 (58.74)	1,080 (42.52)	951 (37.44)	1,194 (47.01)	1,114 (43.86)	1,299 (51.14)	1,589 (62.56)	1,409 (55.47)	419 (16.50)

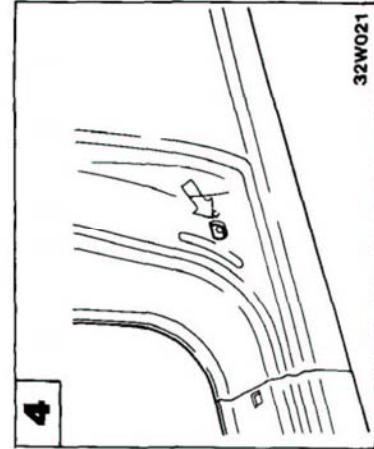


**INTERIOR**

mm (in.)

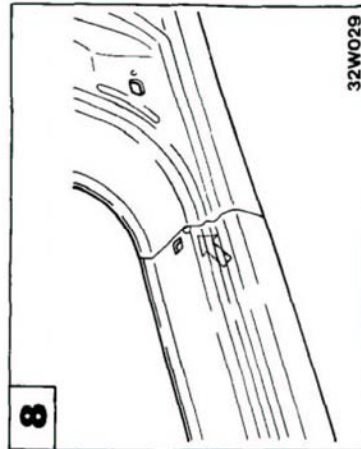
No.	⑫	⑬	⑭	⑮
Length	1,514 (59.61)	1,511 (59.49)	1,483 (58.39)	1,291 (50.83)





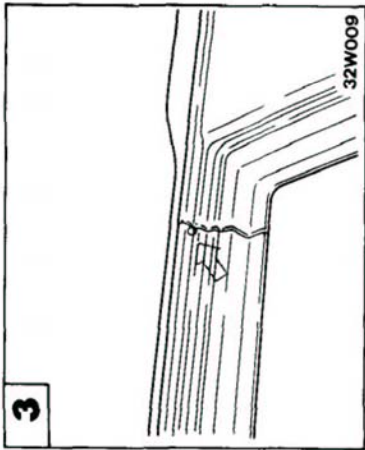
32W021

Door switch mounting hole



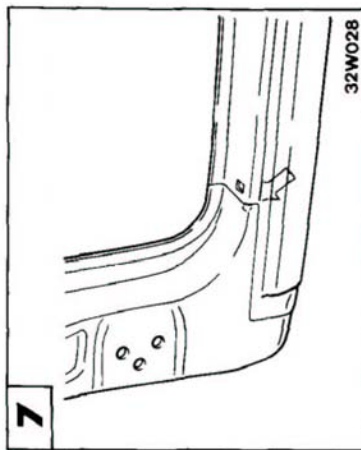
32W029

Joint of side sill and quarter panel



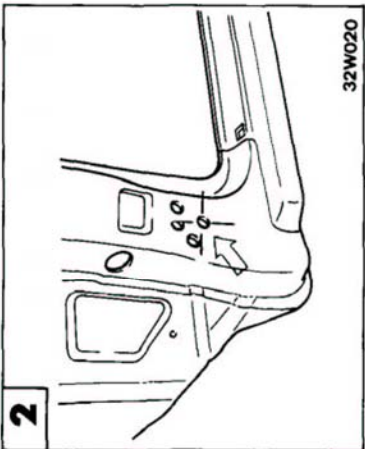
32W009

Joint of side roof rail and quarter panel



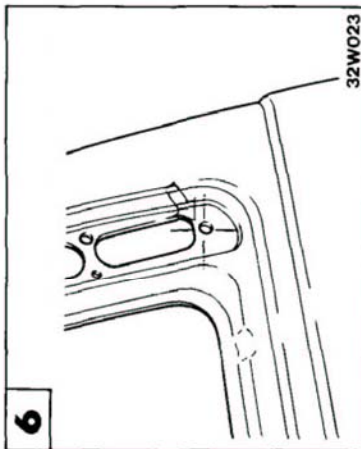
32W028

Joint of front pillar and side sill



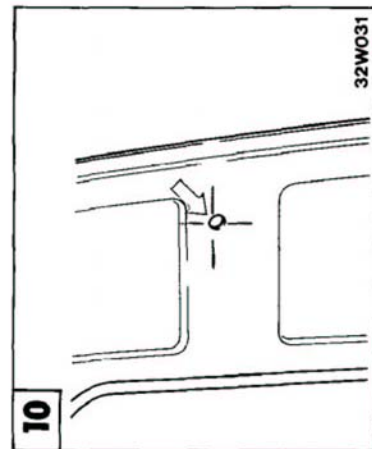
32W020

Center of front door hinge mounting hole [diameter : 11 mm (.43 in.)]



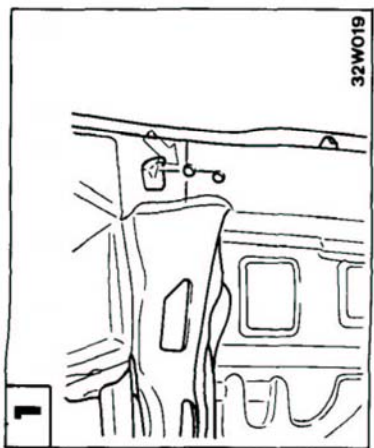
32W023

Air outlet garnish mounting hole [diameter : 9 mm (.35 in.)]



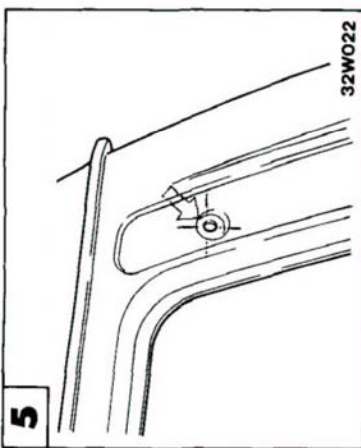
32W031

Center of front seat belt mounting hole [diameter : 15 mm (.59 in.)]



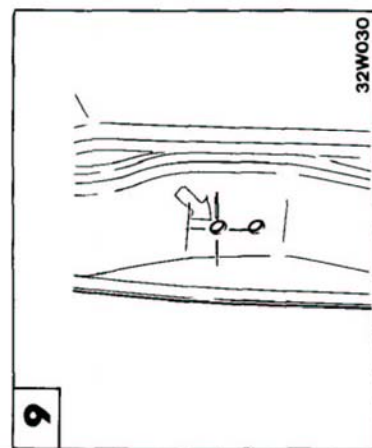
32W019

Center of front door hinge mounting hole [diameter : 11 mm (.43 in.)]



32W022

Air outlet garnish mounting hole [diameter : 9 mm (.35 in.)]



32W030

Center of door striker mounting hole [diameter : 14 mm (.55 in.)]

# FUEL SYSTEM

## CONTENTS

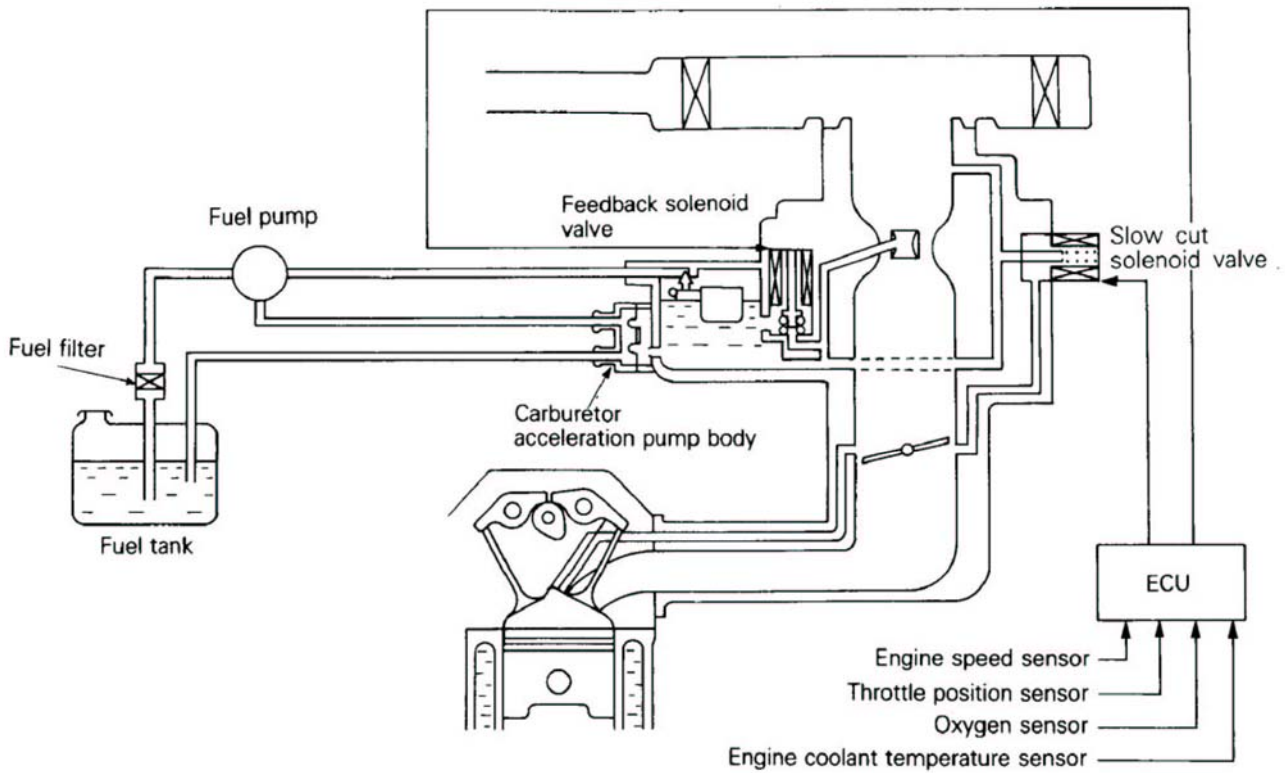
N14AA-

<b>ENGINE CONTROL</b> .....	<b>84</b>	Inspection of Carburetor Acceleration Pump .....	35
<b>ACCELERATOR CABLE AND PEDAL</b> .....	<b>84</b>	Inspection of Carburetor Bleed Air Passage for Clogging (Inspection of Carburetor High Altitude Compensation System) .....	33
<b>FBC SYSTEM</b> .....	<b>6</b>	Inspection of Carburetor Secondary Valve Operation .....	34
<b>CARBURETOR</b> .....	<b>61</b>	Inspection of Choke Breaker System .....	38
<b>FBC SYSTEM DIAGRAM</b> .....	<b>6</b>	Inspection of Choke Valve .....	35
<b>FUEL LINE AND VAPOR LINE</b> .....	<b>82</b>	Inspection of Distributor Advance Control Vacuum (D Vacuum) .....	30
<b>FUEL PUMP</b> .....	<b>77</b>	Inspection of EGR Valve Control Vacuum (E Vacuum) .....	31
<b>FUEL TANK</b> .....	<b>80</b>	Inspection of Electric Choke .....	35
<b>INSPECTION OF FBC SYSTEM</b> .....	<b>43</b>	Inspection of Electric Choke Relay .....	36
Cautions on Inspection .....	43	Inspection of Vacuum Switch Control Vacuum (F Vacuum) .....	32
Circuit Diagrams .....	44	Inspection of VRV Control Vacuum (A Vacuum) .....	32
Components Locations and Vacuum Hoses Layout .....	46	Replacement of Fuel Filter .....	42
Inspection of Throttle Opener Control System for Air Conditioner Load .....	53	Throttle Opener Adjustment for Air Conditioner .....	28
<b>INSPECTION OF FBC SYSTEM COMPONENTS</b> .....	<b>57</b>	Throttle Position Sensor (TPS) Adjustment .....	28
Checking the Vacuum Switch .....	58	<b>SPECIAL TOOLS</b> .....	<b>24</b>
Inspection of Engine Coolant Temperature Sensor .....	57	<b>TECHNICAL DESCRIPTION</b> .....	<b>9</b>
Inspection of Engine Speed Sensor (Ignition Coil Terminal) .....	58	Component of FBC System .....	9
Inspection of Oxygen Sensor .....	58	Operation of the FBC System .....	13
Inspection of Throttle Opener Control Solenoid Valve for Air Conditioner .....	59	<b>TROUBLESHOOTING</b> .....	<b>20</b>
Inspection of Throttle Position Sensor (TPS) .....	57	Carburetor .....	20
Simple Inspection of Feedback Solenoid Valve (FBCV) .....	59	Control Functions Table .....	23
Simple Inspection of Slow Cut Solenoid Valve (SCSV) .....	59	Fuel Tank and Fuel Line .....	24
<b>SERVICE ADJUSTMENT PROCEDURES</b> .....	<b>25</b>	<b>FUEL SYSTEM</b> .....	<b>2</b>
Carburetor External View .....	25	<b>GENERAL INFORMATION</b> .....	<b>2</b>
Checking the Auxiliary Acceleration Pump (AAP) .....	41	<b>SPECIFICATIONS</b> .....	<b>3</b>
Checking the Thermo Valve (for AAP Control) .....	42	General Specifications .....	3
Idle Speed Adjustment .....	26	Lubricant .....	5
Idle Speed and Mixture Adjustment .....	26	Sealants and Adhesives .....	5
Idle Speed Check Procedure .....	26	Service Specifications .....	4
Inspection and Adjustment of Choke Breaker Opening .....	39	Torque Specifications .....	5
Inspection and Adjustment of Dash Pot .....	30		
Inspection and Adjustment of Fast Idle .....	40		

GENERAL INFORMATION

N14BA--

- The fuel system consists of the fuel tank, the fuel lines (within the fuel return line), the vacuum lines, the fuel pump, the fuel filter, and the carburetor.
- The engine control is the suspended type, and is operated by the accelerator pedal and accelerator cable.
- The FBC (Feedback Carburetor) system is a system which functions to regulate the air/fuel mixture ratio. Input signals from the various sensors enable the electronic control unit (ECU) to determine the operating conditions of the engine, and, depending on the operating conditions, the air/fuel mixture ratio is regulated by the two solenoid valves (the feedback solenoid valve and the slow cut-off solenoid valve) equipped at the carburetor. The ECU also functions to control the electric choke, the throttle opener, etc.



01Z505

**SPECIFICATIONS**

**GENERAL SPECIFICATIONS**

N14CA--

Items	Specifications
Fuel	
Fuel tank capacity lit. (U.S.gal., Imp.gal.)	60 (15,9, 13,2)
Fuel return system	Provided
Fuel filter	Cartridge type
Fuel pump	
Type	Mechanical diaphragm type
Drive by	Camshaft
Discharge pressure kPa (psi)	19.6–29.4 (2.8–4.2) – 2500 rpm
Carburetor	
Type	Down-draft, 2-barrel feedback type
Choke type	Automatic (electric type)
Heater	PTC heater
Identification model No.	
for Federal	32–35 DIDEF–410 : M/T 32–35 DIDEF–411 : A/T
for California	32–35 DIDEF–412 : M/T 32–35 DIDEF–413 : A/T
Throttle bore – primary mm (in.)	32 (1.26)
secondary mm (in.)	35 (1.38)
Feedback solenoid valve (FBSV)	Duty cycle solenoid
Slow cut solenoid valve (SCSV)	Duty cycle solenoid
Throttle operer	Diaphragm type
Dash pot	Conventional type
Throttle position sensor (TPS)	Variable resister type
Bowl vent valve (BW)	Vacuum type
Mixture control valve (MCV)	Vacuum type : M/T only
Electronic control unit for FBC	
Identification model No.	
for Federal	E2T55071 : M/T E2T55075 : A/T
for California	E2T55071 : M/T E2T55075 : A/T
Input sensors	
Coolant temperature sensor	Thermistor type
Oxygen sensor	Zirconia sensor
Vacuum switch	Control-type switch
Output actuators	
Secondary air control solenoid valve	ON–OFF Solenoid valve
Throttle opener control solenoid valve	ON–OFF Solenoid valve

NOTE

M/T : Manual transmission

A/T : Automatic transmission

## SERVICE SPECIFICATIONS

N14CB-

Items	Specifications
Standard value	
Engine adjustments	
Basic ignition timing	7° ± 2° BTDC at curb idle
Actual ignition timing at high altitude – All U.S.A. (high altitude), California	Approx. 12° BTDC
Curb idle speed for M/T rpm	
For the first 500 km (300 miles)	725 + 150 – 100
After 500 km (300 miles)	800 ± 100
Curb idle speed for A/T rpm	
For the first 500 km (300 miles)	725 + 150 – 100
After 500 km (300 miles)	800 ± 100
Throttle opener adjustment	
Rpm for air conditioner load rpm (when air conditioner ON)	900–950
Dash pot touch rpm rpm	
for M/T	2000
for A/T	1500
Throttle-position sensor (TPS)	
Adjustment voltage (throttle valve completely closed) V	0.25
Carburetor	
Main jet – primary	# 107.5
secondary	# 190
Pilot jet – primary	# 55
secondary	# 70
Enrichment jet	# 65
Automatic choke heater	Continuity-approx. 6 Ω [at 20°C (68°F)]
Choke breaker opening degree	
1st stage mm (in.)	2.5–2.7 (.098 – .106)
2nd stage mm (in.)	3.2–3.4 (.126 – .133)
First idle rpm	
M/T rpm	Approx. 2,350
A/T rpm	Approx. 2,300 (no load, after warm-up, 2nd stage)
Feedback solenoid valve (FBSV) coil resistance Ω	54–66 [at 20°C (68°F)]
Slow cut-off solenoid valve (SCSV) coil resistance Ω	48–60 [at 20°C (68°F)]
Throttle-position sensor (TPS) resistance kΩ	3.5–6.5
Input sensor	
Coolant temperature sensor resistance kΩ	
20°C (68°F)	2.5
80°C (176°F)	0.3
Oxygen sensor output voltage V	Approx. 1
Vacuum switch	ON more than 40 kPa (5.8 psi) OFF less than 26 kPa (3.9 psi)

## NOTE

M/T : Manual transmission

A/T : Automatic transmission



Items	Specifications
Output actuator	
Secondary air solenoid valve resistance    Ω	38 – 44 [20°C (68°F)]
Throttle opener control solenoid valve resistance    Ω	38 – 44 [20°C (68°F)]

**TORQUE SPECIFICATIONS**

N14CC--

Items	Nm	ft.lbs.
Carburetor installation bolt	15 – 20	11 – 14
Coolant temperature sensor	20 – 40	14 – 29
Oxygen sensor	40 – 50	29 – 36
Throttle-position sensor installation screw	2,5 – 4,5	1,8 – 3,2
Thermo valve (2 nipples)	20 – 35	14 – 25
Drain plug	15 – 25	11 – 18
Fuel tank to body	25 – 30	18 – 22
Fuel gauge unit	1	0,7
Air cleaner to rocker cover	16 – 19	12 – 14

**LUBRICANT**

N14CD--

Item	Specified lubricant	Quantity
Grease for accelerator arm pin and return spring	Multipurpose grease SAE J310, NLGI No. 3	As required

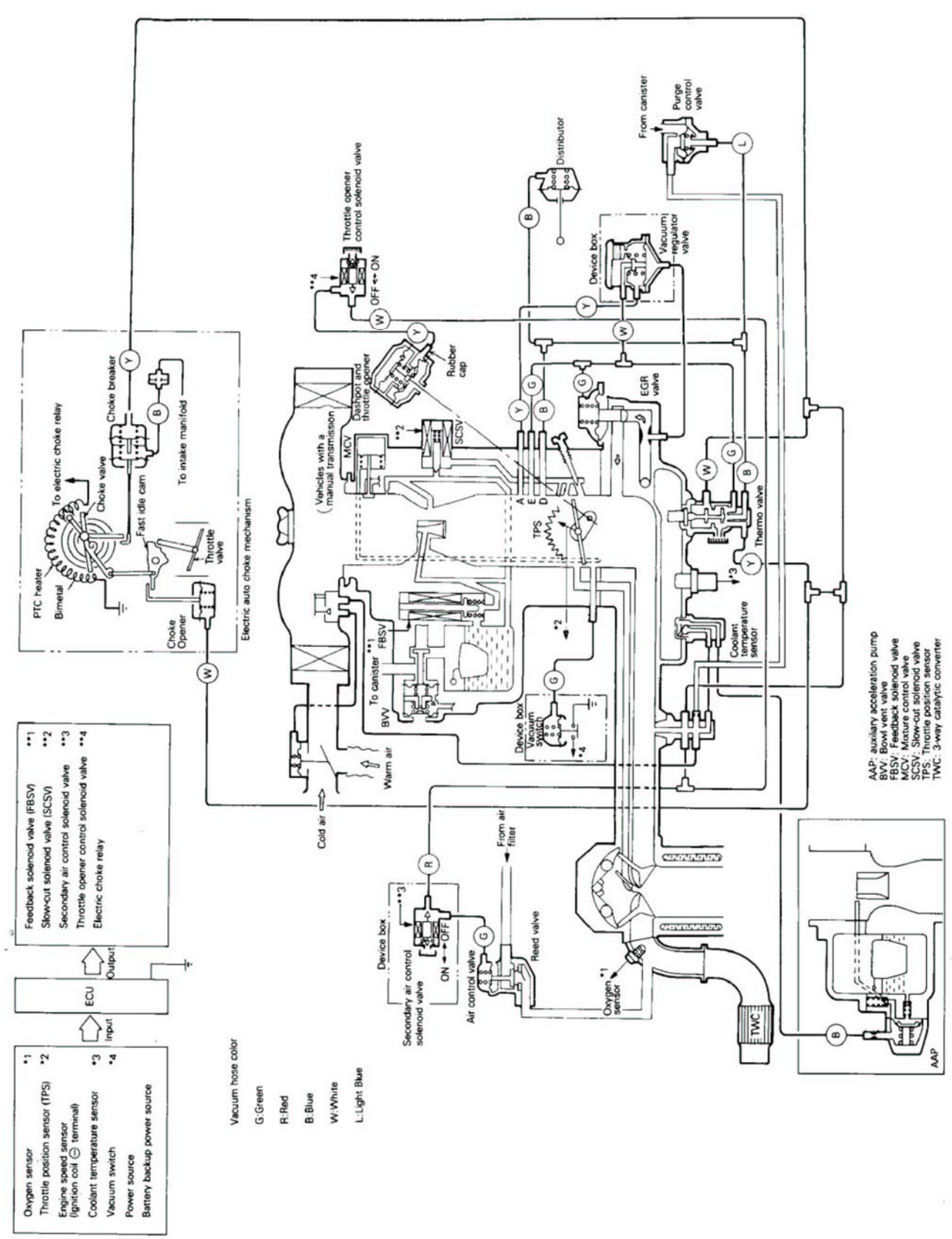
**SEALANTS AND ADHESIVES**

N14CE--

Items	Specified sealant and adhesive	Quantity
Thermo valve threads	3M Adhesive Nut Locking No. 4171 or equivalent	As required
Coolant temperature sensor threads	3M Adhesive Nut Locking No. 4171 or equivalent	As required

# FBC SYSTEM DIAGRAM

VEHICLES FOR THE 49 STATES OTHER THAN CALIFORNIA (EXCLUDING HIGH-ALTITUDE SPECIFICATIONS)



- 1 Feedback solenoid valve (FBSV)
- 2 Slow-out solenoid valve (SCSV)
- 3 Throttle opener control solenoid valve
- 4 Electric choke relay

ECU  
Input      Output

- \*1 Oxygen sensor
- \*2 Throttle position sensor (TPS)
- \*3 Engine speed sensor (ignition coil (-) terminal)
- \*4 Coolant temperature sensor
- Power source
- Battery backup power source

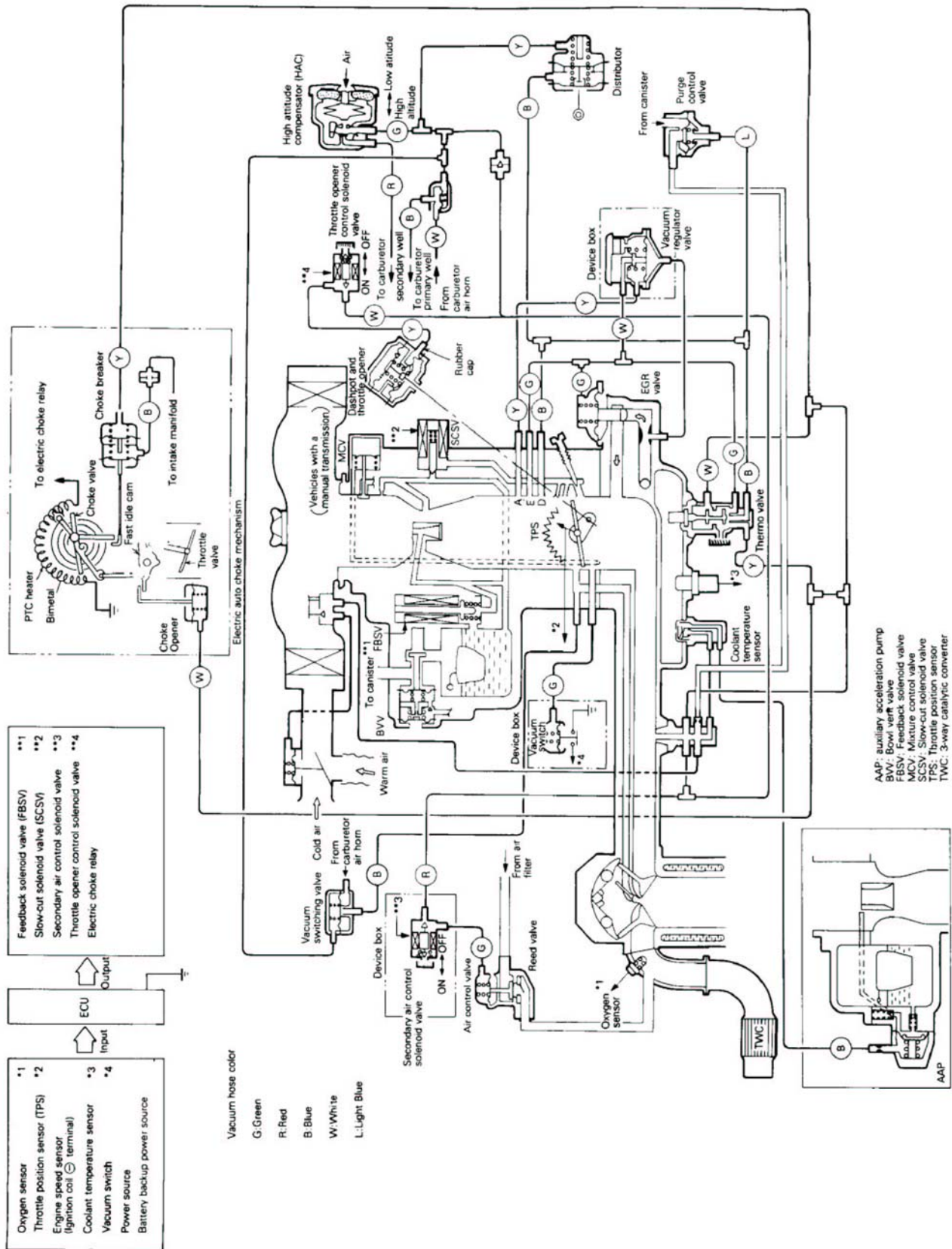
- Vacuum hose color
- G: Green
  - R: Red
  - B: Blue
  - W: White
  - L: Light Blue

- AAP: auxiliary acceleration pump
- BV: blow-by valve
- FBSV: Feedback solenoid valve
- MCV: Manifold control valve
- SCSV: Slow-out solenoid valve
- TPS: Throttle position sensor
- TWC: 3-way catalytic converter

5FU115

# FBC SYSTEM DIAGRAM

VEHICLES WITH HIGH-ALTITUDE SPECIFICATIONS FOR THE 49 STATES OTHER THAN CALIFORNIA

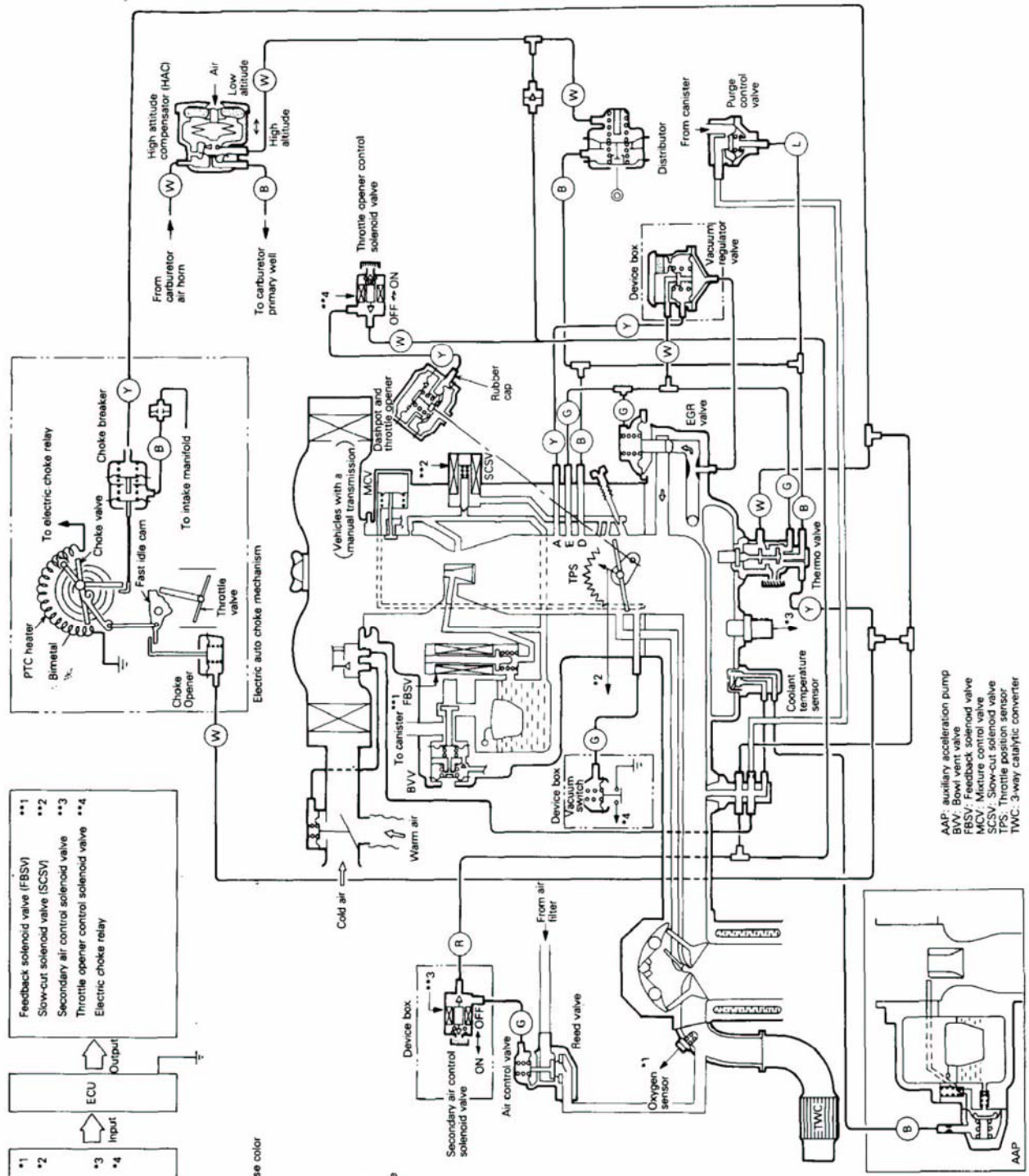


5FU116

# FBC SYSTEM DIAGRAM

## VEHICLES FOR CALIFORNIA

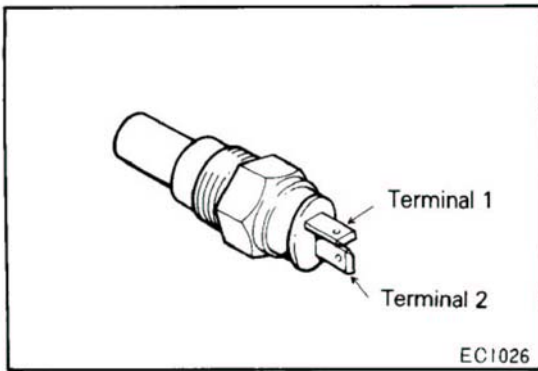
5FU117



- |   |   |
|---|---|
| 1 | Oxygen sensor                                     |
| 2 | Throttle position sensor (TPS)                    |
| 3 | Engine speed sensor<br>Ignition coil (- terminal) |
| 4 | Coolant temperature sensor                        |
|   | Vacuum switch                                     |
|   | Power source                                      |
|   | Battery backup power source                       |
- 
- |     |  |
|-----|--|
| **1 | Feedback solenoid valve (FBSV)         |
| **2 | Slow-cut solenoid valve (SCSV)         |
| **3 | Secondary air control solenoid valve   |
| **4 | Throttle opener control solenoid valve |
|     | Electric choke relay                   |

- Vacuum hose color
- G: Green
  - R: Red
  - B: Blue
  - W: White
  - L: Light Blue

- AAP: auxiliary acceleration pump
- BVV: Bowl vent valve
- FBSV: Feedback solenoid valve
- MCV: Manual choke valve
- SCSV: Slow-cut solenoid valve
- TPS: Throttle position sensor
- TWC: 3-way catalytic converter



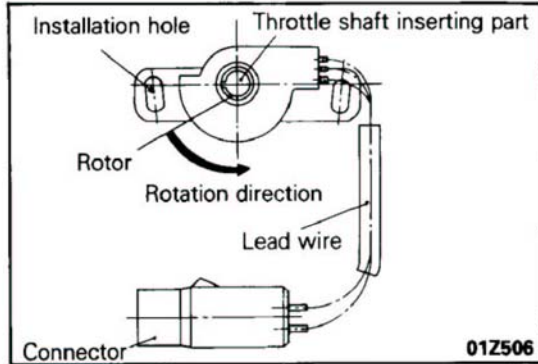
## TECHNICAL DESCRIPTION

N148BAA

### COMPONENT OF FBC SYSTEM

#### ENGINE COOLANT TEMPERATURE SENSOR

The engine coolant temperature sensor installed in the engine coolant passage of the intake manifold is a resistor-based sensor. The ECU judges engine warm-up state by the sensor output voltage and make a control to provide optimum fuel enrichment when the engine is cold.



#### THROTTLE POSITION SENSOR (TPS)

N148BBA

The TPS is a rotation type variable resistor that rotates together with the carburetor throttle shaft to sense the throttle valve angle. As the throttle shaft rotates, the TPS output voltage changes and the ECU detects the throttle valve opening based on the change of the voltage.

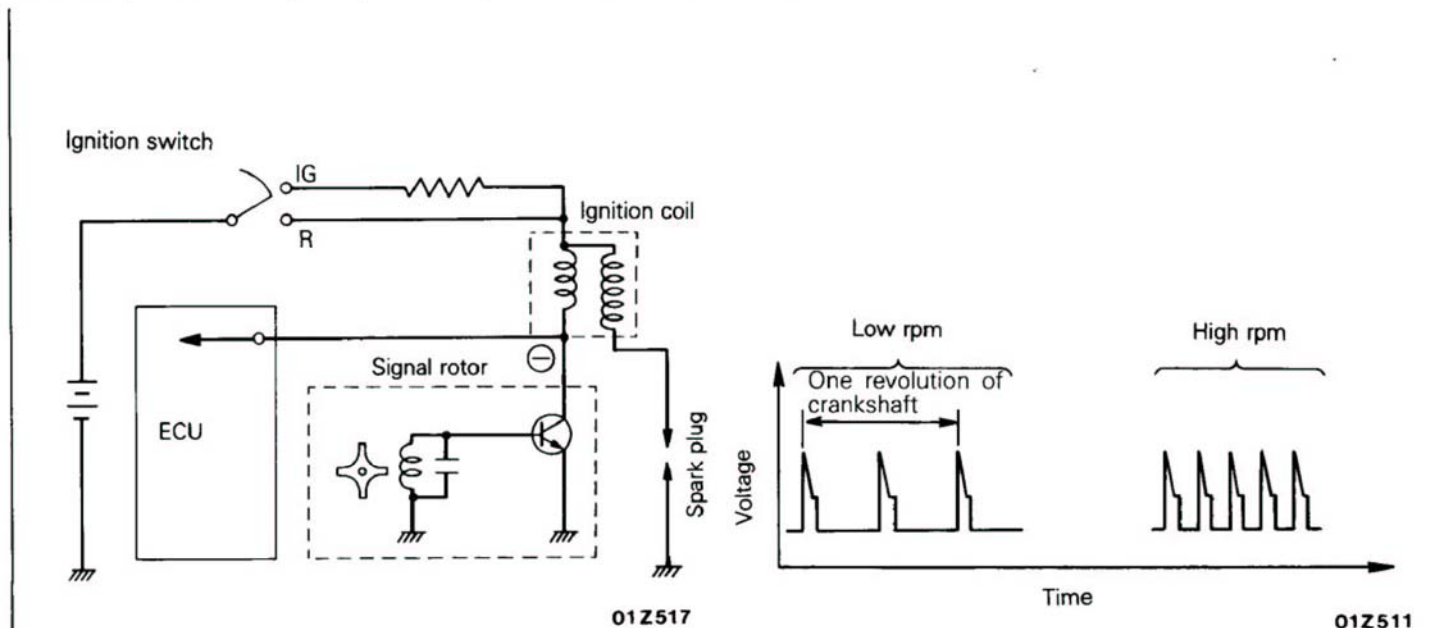
Using the TPS output signal, engine speed signal and other signals, the ECU judges the engine operating mode and controls the air-fuel ratio, etc. for an optimum air-fuel mixture in that mode.

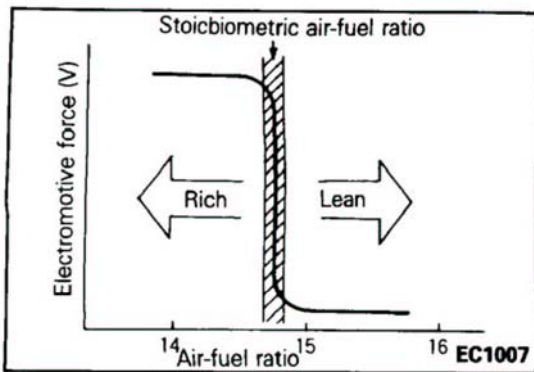
#### ENGINE SPEED SENSOR (IGNITION COIL NEGATIVE TERMINAL VOLTAGE SENSOR)

N148BHC

The ignition coil negative terminal voltage makes sudden increase twice per crankshaft revolution synchronously with ignition timing.

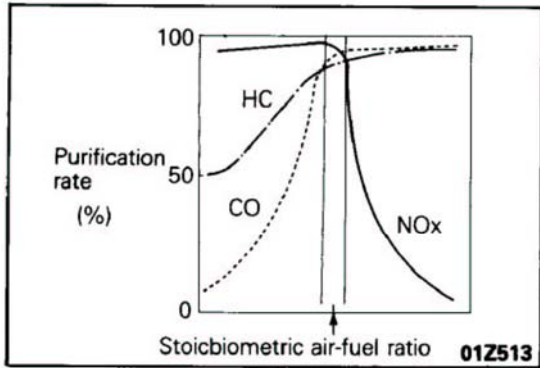
By sensing this ignition coil negative terminal voltage change and measuring the time between peak voltages, the ECU computes the engine speed, judges the engine operating mode and controls the air-fuel ratio.



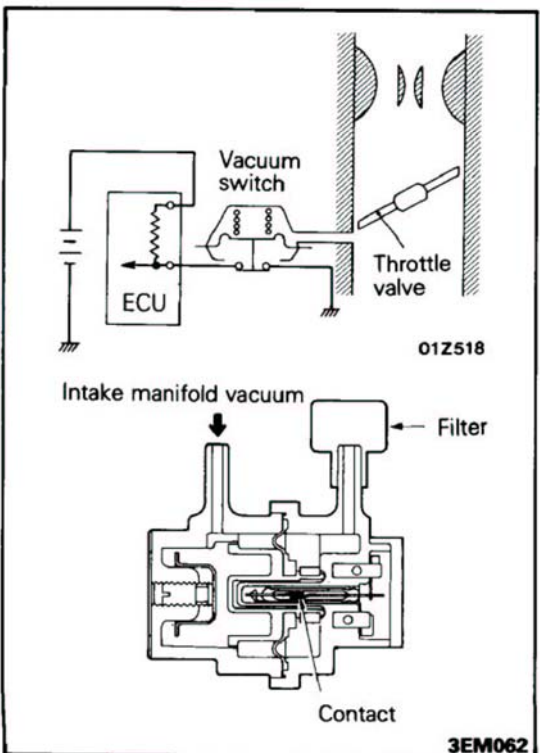
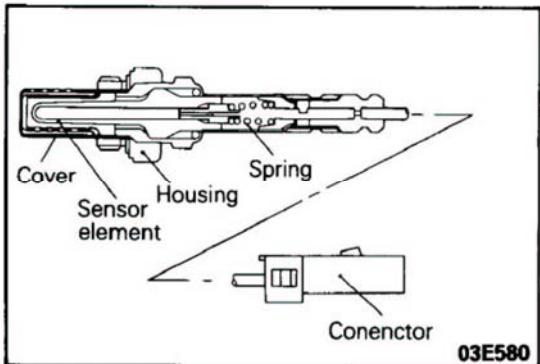


**OXYGEN SENSOR**

The oxygen sensor installed on the exhaust manifold makes use of the principles of solid electrolyte oxygen concentration cell. The oxygen concentration cell is characterized by sharp change of the output voltage in the vicinity of the stoichiometric air-fuel ratio.



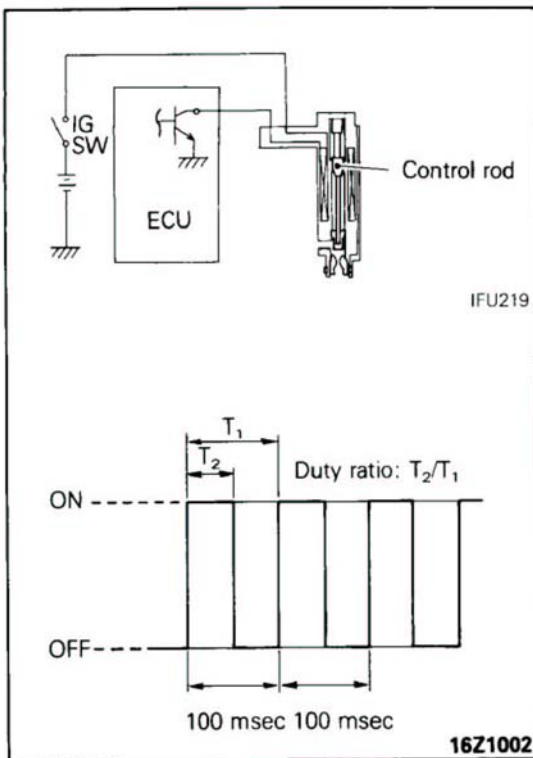
Using such characteristics, the oxygen sensor senses the oxygen concentration in the exhaust gas and feeds it to the ECU. The ECU then judges if the air-fuel ratio is richer or leaner as compared to the stoichiometric ratio and provides feedback control to adjust the air-fuel ratio to the stoichiometric ratio where the emission purification rate of the three-catalyst converter is the optimum.



**VACUUM SWITCH**

N1488KA

The vacuum switch is a contact type switch that is operated by intake manifold vacuum. When the throttle valve closes, the intake manifold vacuum acts on the vacuum switch to close its contact. By this action, the voltage on the ECU side is grounded and the ECU senses that the throttle valve opening is near the idle opening.



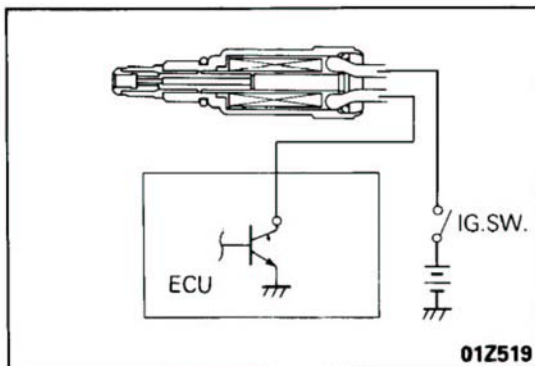
**FEEDBACK SOLENOID VALVE (FBSV)**

N14BCAA

The FBSV is installed on the carburetor float chamber cover. The ECU controls the air-fuel ratio by controlling the duty cycle of the FBSV. The higher is the duty ratio, the leaner becomes the air-fuel ratio.

**NOTE**

The duty cycle control means control of the solenoid valve energization rate by changing the ON time ratio  $T_2/T_1$  (called duty ratio) of 10 Hz pulse.



**SLOW CUT SOLENOID VALVE (SCSV)**

N14BCBA

The SCSV is installed on the carburetor float chamber cover. The ECU controls the carburetor slow system fuel flow by controlling the duty cycle of the SCSV.

**THROTTLE OPENER CONTROL SOLENOID VALVE**

N14BCIC

Refer to section "Throttle opener system for air Conditioning system" on page 14-14.

**ELECTRIC CHOKE RELAY**

Refer to section "Carburetor electric choke system." on page 14-18.

**SECONDARY AIR CONTROL SOLENOID VALVE**

N14BCJA

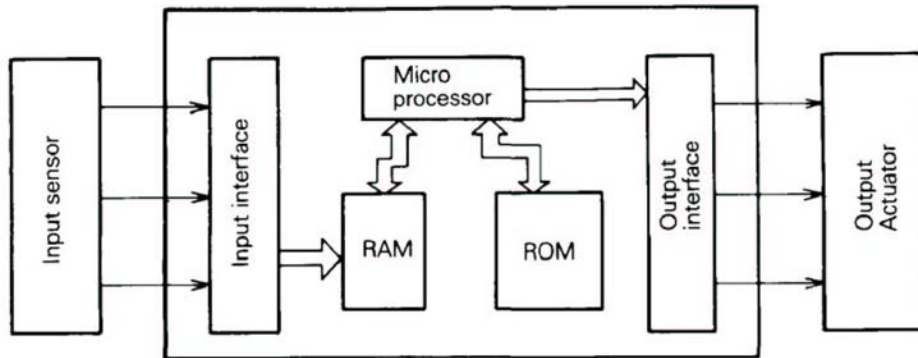
Refer to GROUP 25 EMISSION CONTROL SYSTEM-Secondary air supply system.

**ELECTRONIC CONTROL UNIT (ECU)**

N148DAA

Based on the information from various sensors, the ECU determines (computes) an optimum control for varying operating conditions constantly and accordingly drives the output actuators.

The ECU consists of an 8-bit microprocessor, random access memory (RAM), read only memory (ROM) and input/output (I/O) interface.

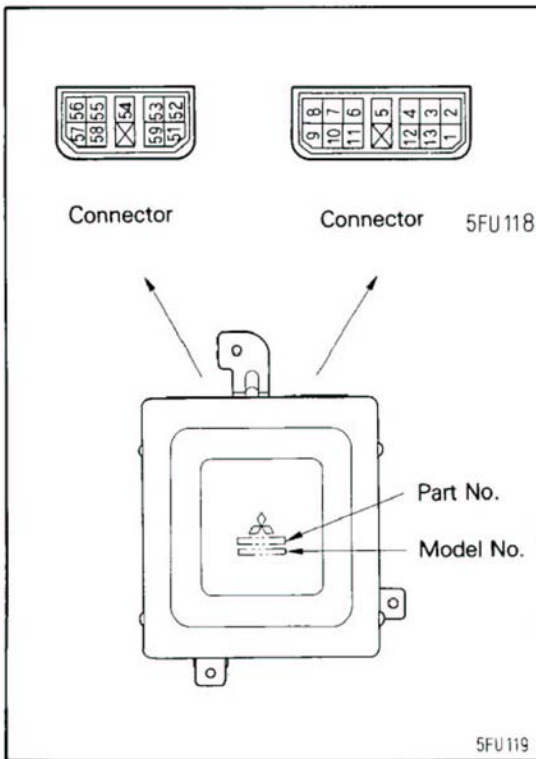


IFU350

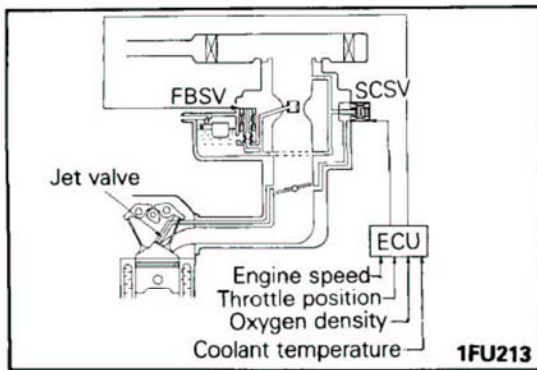
**ECU Connector I/O Pin Composition**

1. Oxygen sensor
2. Ground for sensor
3. Power supply for sensor
4. –
5. Vacuum switch
6. Ground
7. Power supply
8. Power supply
9. Power supply for back-up
10. Engine speed sensor (Ignition coil negative terminal)
11. Ground
12. Coolant temperature sensor
13. Throttle position sensor (TPS)

51. –
52. –
53. Slow cut solenoid valve
54. Throttle opener control solenoid valve
55. Secondary air control solenoid valve
56. Electric choke relay
57. Air conditioner relay
58. –
59. Feedback solenoid valve







**OPERATION OF THE FBC SYSTEM**

N14BEAA

**AIR-FUEL RATIO CONTROL SYSTEM**

The air-fuel ratio control is achieved by the following two kinds of control.

**Closed Loop Control (Feedback Control)**

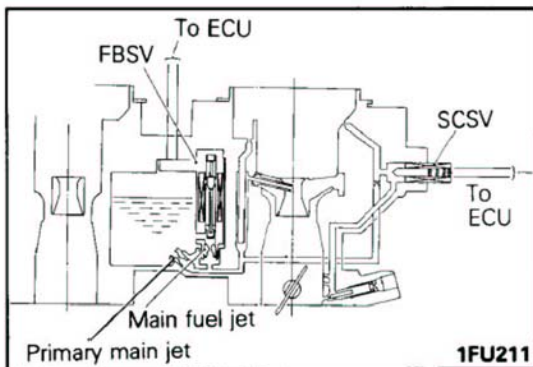
In the ordinary operating region after engine warm-up, the air-fuel ratio control is made by the feedback control based on the oxygen sensor signal.

The oxygen sensor has such characteristics that its output voltage changes sharply at the stoichiometric ratio. The control unit senses this oxygen sensor signal and accordingly provides feedback control of the FBSV duty ratio so that the stoichiometric ratio that will give the best purification rate of the 3-catalyst converter may be accurately kept. In this state, the SCSV is kept wide open (100% duty).

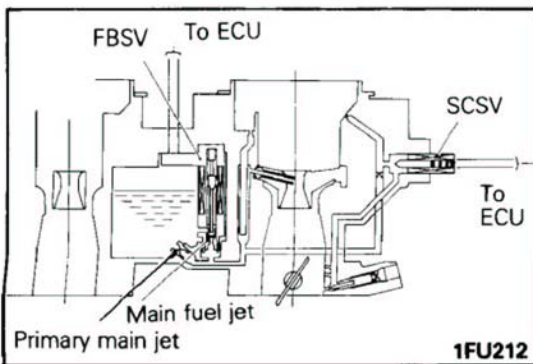
**Open Loop Control (No Feedback Control)**

During engine start, warm-up operation, high load operation and deceleration, the air-fuel ratio is open-loop controlled by the map values\* established previously for engine speed, throttle valve opening angle and engine coolant temperature, to improve startability and driveability. During deceleration, the control on SCSV limits fuel flow for better fuel economy and for prevention of overheating of the catalyts.

\* Map value is a value previously established and stored in ROM in ECU.



When the FBSV is energized, the main fuel jet is closed to leave the primary main jet passage as the only fuel passage. This will reduce the amount of fuel, resulting in leaner air-fuel mixture.



When FBSV is de-energized, the main fuel jet is opened to provide two fuel passages including the primary main jet passage. Since this will increase the amount of fuel, richer air-fuel mixture is obtained.

With the ON-OFF operation of SCSV, the slow fuel passage is opened and closed. The air-fuel ratio at deceleration is controlled in this manner.

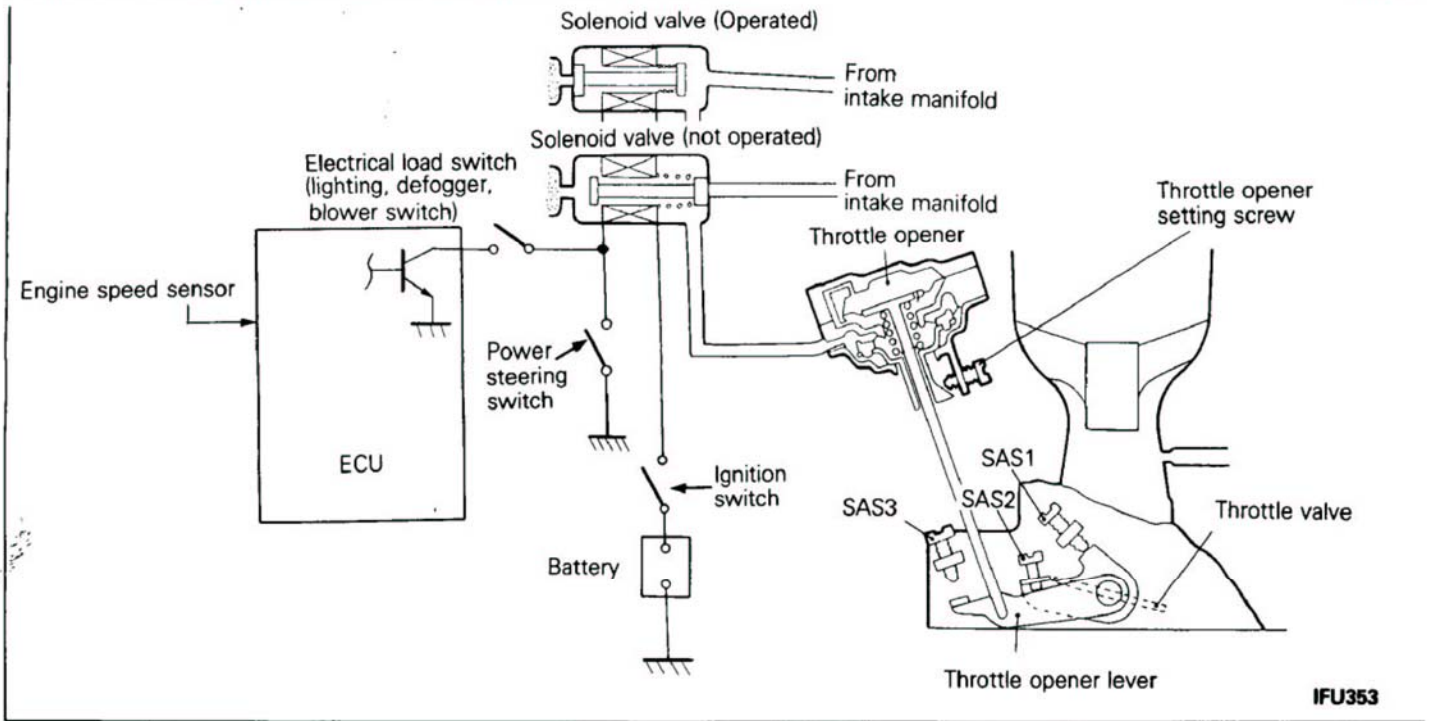
**SECONDARY AIR CONTROL SYSTEM**

N14BHAA

Refer to GROUP 25 EMISSION CONTROL SYSTEM-Secondary air supply system.

THROTTLE OPENER SYSTEM FOR AIR CONDITIONING

N14B1BB

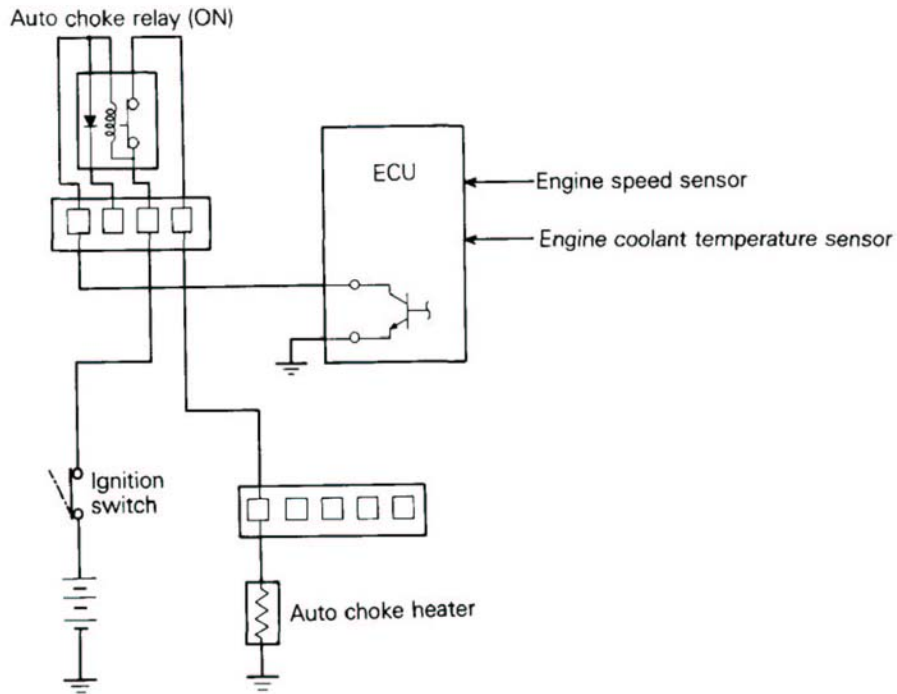
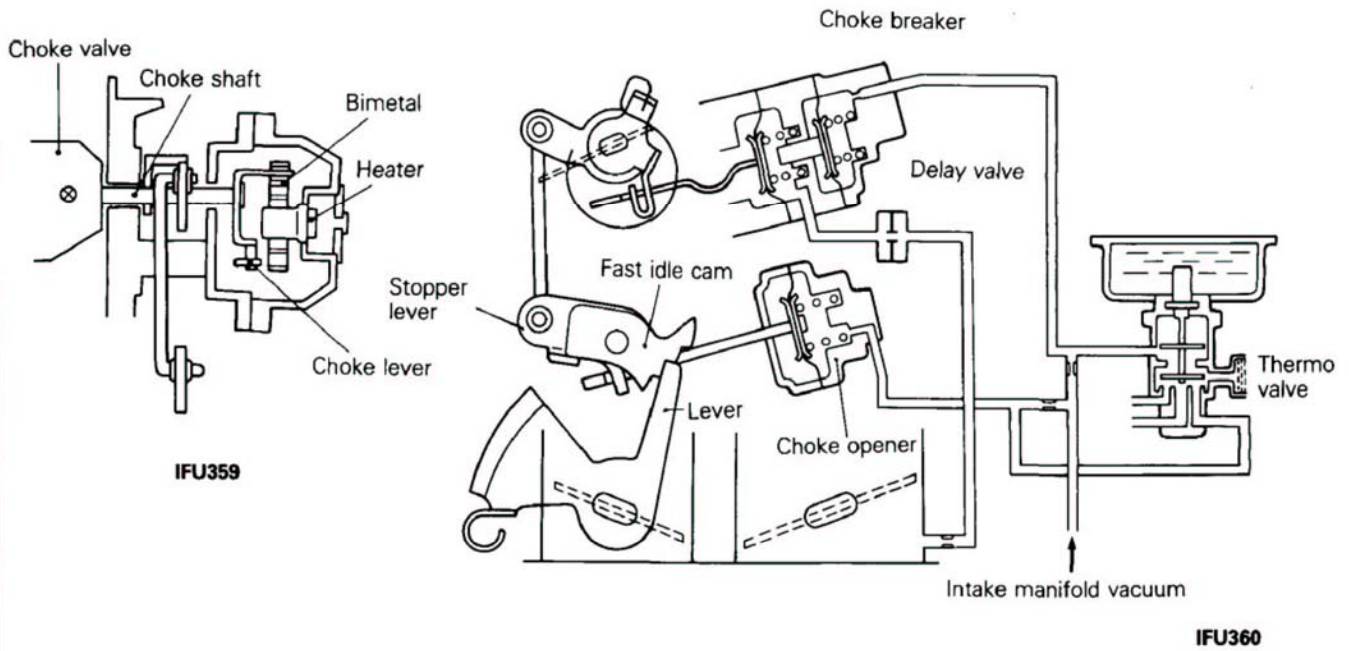


IFU353

When the engine speed is below the set speed (1,450 rpm), the ECU keeps the power transistor on. Therefore, when the air conditioner relay is turned on (the air compressor is driven by the engine), the throttle opener control solenoid valve is energized to introduce intake manifold vacuum to the throttle opener to open the throttle valve slightly, preventing engine speed drop that would otherwise be caused by air conditioner load.

CARBURETOR ELECTRIC CHOKE SYSTEM

N148PBB



In carburetor electric choke system, a bimetal which is heated by an electric heater (PTC heater\*) operates the choke valve and fast idle cam for proper engine warm-up control.

The lower the temperature when the engine is started, the tighter the bimetal closes the choke valve, thus improving startability at cold weather.

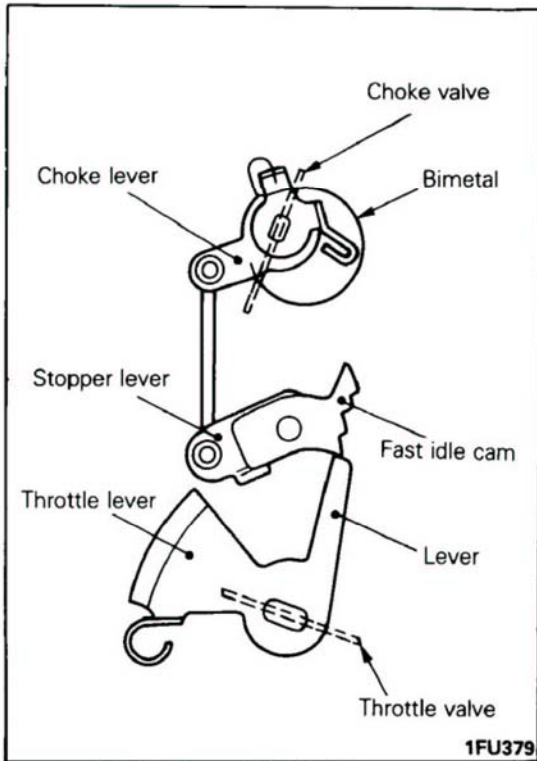
As the engine is heated by the heater after start up, the bimetal opens the choke valve gradually by thermal expansion and pushes down the stopper lever.

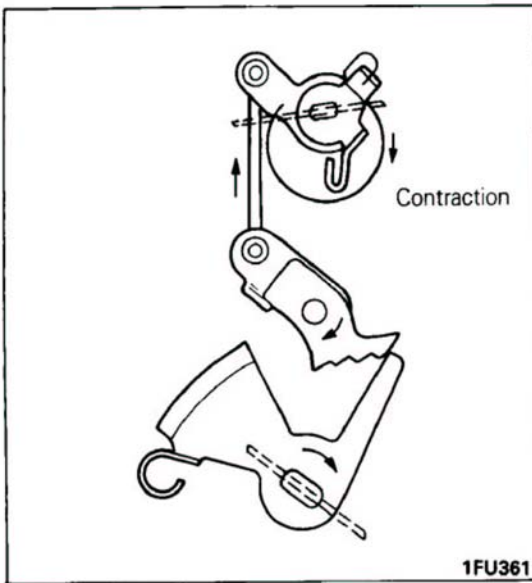
#### NOTE

PTC stands for Positive Temperature Coefficient and the PTC heater means a heater with positive temperature coefficient. Namely, as the heater generates heat, its resistance increases and hence limits the current to control heat generation.

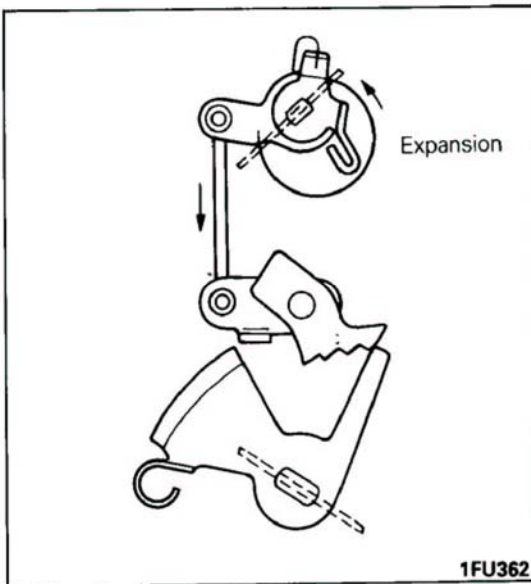
#### Choke Valve and Fast Idle Cam Operation

1. Before starting the engine, the throttle valve is in the normal idle opening state.

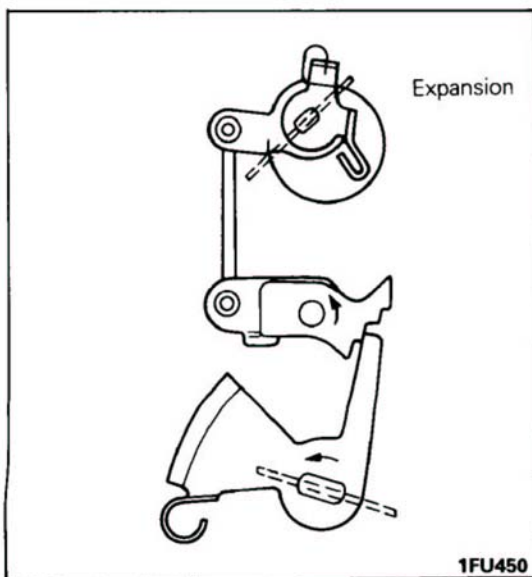




2. Before starting the engine, depress the accelerator pedal to the floor, and the fast idle cam will turn clockwise. Release the accelerator pedal, and the lever will ride on the fast idle cam and the throttle valve will open.
3. When the engine starts, the intake manifold vacuum is applied to the choke breaker to slightly open the choke valve, preventing formation of a too rich mixture of air and fuel.



4. Shortly after starting of engine, the bimetal is heated by the heater and expands to open the choke valve gradually and push down the stopper lever. At this time, the engine speed increase gradually.

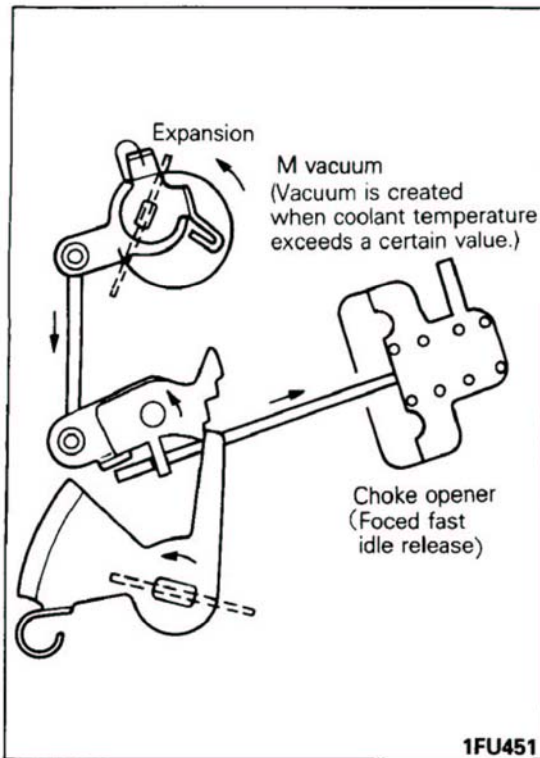


5. Depress the accelerator pedal, and the fast idle cam will turn counter-clockwise. Release the accelerator pedal and the lever will ride on the lower cam of fast idle cam and the throttle valve will close slightly, decreasing the engine speed. After warming up the engine for a while, depress the accelerator pedal and the throttle valve will be further closed. By repeating this procedure, the fast idle cam is released and the throttle valve comes to have a normal idle opening.

**Operation of Choke Opener**

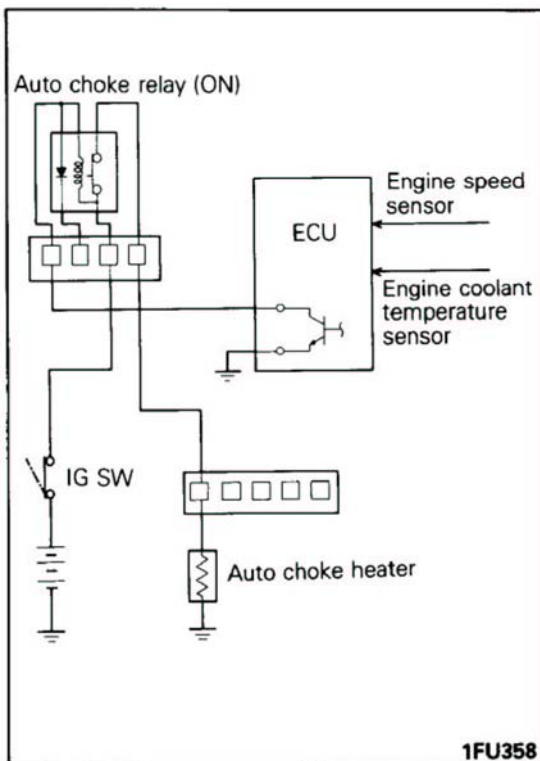
If the engine has been started with the throttle valve lever on the highest fast idle cam detent and left as it is, then the engine speed increases with the engine coolant temperature rises, and finally the engine overruns. In order to prevent such overrun, the choke opener is provided.

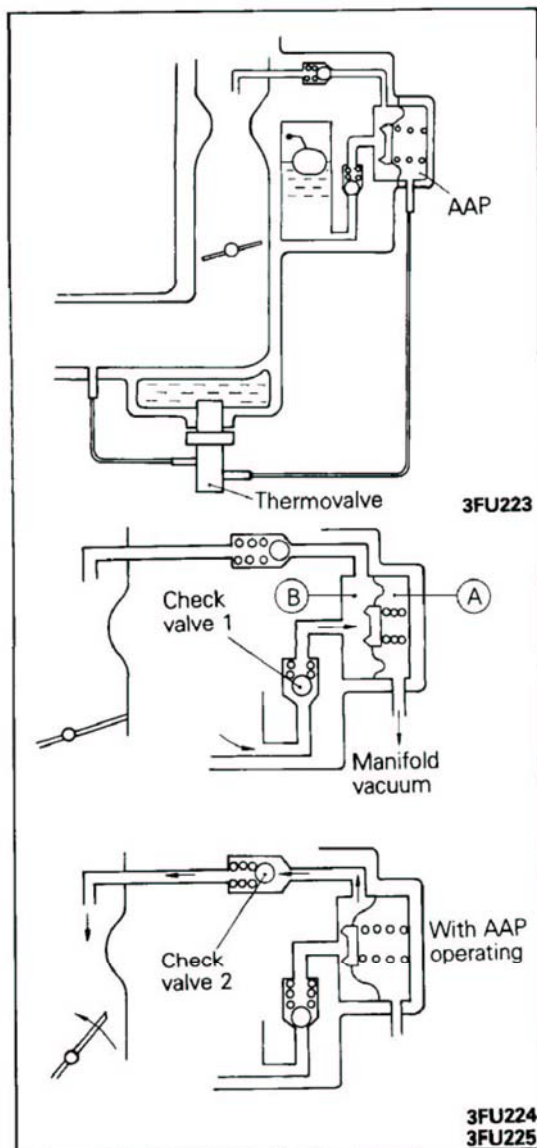
1. When the thermo valve closes as the engine coolant temperature rises [65°C (149°F)], the intake manifold vacuum acts on the fast idle breaker.
2. The fast idle breaker forces the fast idle cam to turn counter-clockwise so that the lever will rest on the lowest cam, closing the throttle valve to decrease the engine speed.

**Electric Choke Relay**

The electric choke relay is normally closed (ON) and it opens when its coil is energized.

During engine cranking the ECU turns on the power transistor to energize the electric choke relay coil. This prevents heating of the electric choke heater, improving engine startability.





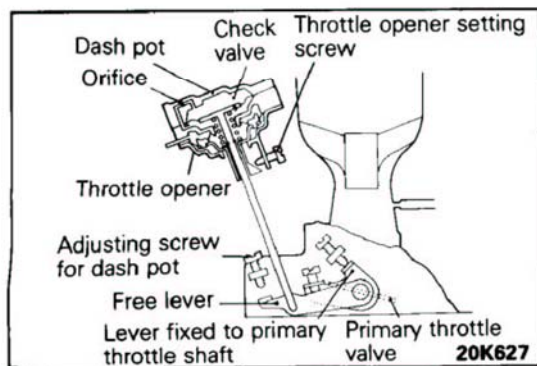
**Auxiliary Accelerator Pump (AAP)**

N148TAA

The Auxiliary Accelerator Pump is provided to improve driveability while the engine is still cold. AAP is controlled by a thermo-valve and intake manifold vacuum and operates in the high load range while the coolant temperature is low (approx. 45°C/113°F).

The thermo-valve is of the bi-metal type and is mounted on the intake manifold. The valve opens when the engine coolant temperature is below 45°C (113°F) and allows the manifold vacuum to affect AAP chamber [A]. The valve closes when the coolant temperature exceeds 45°C (113°F) to shut off the manifold vacuum and stop the operation of the AAP.

The manifold vacuum operates on AAP chamber [A]. When the diaphragm moves to the right, the fuel pushes check valve 1 open, flows into and fills chamber [B]. When the throttle valve opens quickly and the vacuum in chamber [A] lowers, the diaphragm is pushed to the left by spring pressure. As a result, the fuel in chamber [B] pushes open check valve 2 and jets into the carburetor, enriching the fuel mixture.



**DASH POT**

N148JAA

The dash pot delays closing of the throttle valve when it closes. This delay absorbs shock from the set opening to the idle opening. This delay absorbs shock at the time of deceleration for better driving comfort.

**TROUBLESHOOTING**

N14EBAA

When checking and correcting engine troubles, it is important to start with inspection of the basic systems. In case you have such troubles as (1) engine start failure, (2) unstable idling or (3) poor acceleration, therefore, you should first check the following basic systems.

- (1) Power supply
  - Battery
  - Fusible link
  - Fuse
- (2) Body ground
- (3) Fuel supply
  - Fuel line
  - Fuel filter
  - Fuel pump
- (4) Ignition system
  - Spark plug
  - High-tension cable
  - Distributor
  - Ignition coil
- (5) Emission control system
  - PCV system
  - EGR system
  - Vacuum leak
- (6) Others
  - Ignition timing
  - Idle speed

Troubles with the FBC system are often caused by poor contact of harness connector. It is, therefore, important to check harness connector contact.

**CARBURETOR**

Symptom	Probable cause	Remedy	Reference page
Engine will not start or start to hard (cranks OK)	Carburetor Choke valve remains open—cold engine	Clean choke bore and link	14-69
	Improper choke breaker operation	Check and adjust choke breaker	14-38
	Electric choke malfunction	Check electric choke body and choke valve operation	14-35
	Needle valve sticking or clogged	Repair and replace	14-66
	FBC system Engine coolant temperature sensor malfunction	Check by using checker (Check component and replace if faulty)	14-57
	Vacuum hose disconnected or damaged	Repair or replace	14-49
	Slow-cut solenoid valve malfunction	Check component	14-59
	Feedback solenoid valve malfunction	Check component	14-59
	Vacuum switch malfunction—cold engine	Check component	14-58
	Faulty ECU	Replace	14-53
Harness broken/short circuited or connector not connected securely	Repair or replace	—	
Rough idle or engine stalls	Carburetor Choke valve malfunction	Clean choke bore and link	14-69
	Improper fast idle—cold engine	Adjust fast idle speed	14-40
	Improper idle adjustment	Adjust idle speed	14-26
	Electric choke malfunction	Check choke body and choke valve operation	14-35
	Primary pilot jet clogged	Clean up or replace	14-68



Symptom	Probable cause	Remedy	Reference page
Rough idle or engine stalls	Dash pot malfunction	Adjust	14-30
	FBC system Slow-cut solenoid valve malfunction	Check drive signal by using checker. Check component	14-59
	Engine coolant temperature sensor malfunction	Check by using checker (Check component and replace if faulty)	14-57
	Vacuum hose disconnected or damaged	Repair or replace	14-49
	Throttle position sensor malfunction	Check component and adjust	14-28
	Engine speed sensor malfunction	Check by using checker Check harnesses for continuity	14-58
	Throttle opener control system malfunction	Check system. If faulty, check components	14-28
	Harness broken/short-circuited or connector not connected securely	Repair or replace	—
Engine hesitates or poor acceleration	Carburetor Acceleration pump malfunction	Check pump discharge rate	14-35
	Choke valve remains open—cold engine	Clean choke bore and link Check choke valve operation	14-69
	Choke valve remains closed—hot engine		
	Enrichment valve faulty	Repair or replace	14-68
	Main jet clogged	Clean up	14-68
	Enrichment jet clogged	Clean up	14-68
	Secondary valve operation abnormal	Check valve operation	14-36
	Auxiliary acceleration pump malfunction—cold engine	Check pump discharge rate	14-41
	FBC system Feedback solenoid valve malfunction	Check drive signal by using checker. Check component	14-59
	Vacuum switch malfunction	Check by using checker (Check component and replace if faulty)	14-58
	Engine coolant temperature sensor malfunction	Check by using checker (Check component and replace if faulty)	14-57
	Throttle position sensor malfunction	Check component and adjust	14-28
	Engine speed sensor malfunction	Check by using checker Check harnesses for continuity	14-58
	Harness broken/short-circuited or connector not connected properly	Repair or replace	—
Engine dieseling (runs after ignition switch is turned off)	Carburetor Engine idle speed too high	Adjust idle speed	14-26
	FBC system Slow cut solenoid valve malfunction	Check component	14-59

Symptom	Probable cause	Remedy	Reference page
Poor fuel mileage	Carburetor Choke valve operation abnormal	Check valve operation	14-69
	Engine idle speed too high	Adjust idle speed	14-26
	Electric choke malfunction	Check choke body and valve operation	14-35
	Enrichment valve kept open	Repair or replace	14-68
	Auxiliary acceleration pump is in operation – hot engine	Repair or replace	14-41
	FBC system Engine coolant temperature sensor malfunction	Check by using checker (Check component and replace if faulty)	14-57
	Oxygen sensor malfunction	Check by using checker (Check component and replace if faulty)	14-58
	Feedback solenoid valve malfunction	Check drive signal by using checker Check component	14-40
	Slow-cut solenoid valve malfunction	Check drive signal by using checker Check components	14-59
	Throttle position sensor malfunction	Check component and adjust	14-28
Engine speed sensor malfunction	Check by using checker check harnesses for continuity	14-58	
	Harness broken/short circuited or connector not connected properly	Repair or replace	–

# CONTROL FUNCTIONS TABLE

M14EE..

Related components	Function	Air/fuel mixture ratio control (*FBC)	Throttle opener control	Electric choke relay control	Secondary air control	Individual unit description (page)
Input	Power supply (ignition switch interlock)	X	X	X	X	--
	Power supply (battery back-up)	X	X	X	X	-
	Coolant temperature sensor	X		X	X	14-57
	Throttle-position sensor (TPS)	X				14-57
	Engine-speed sensor	X	X	X	X	14-58
	Oxygen sensor	X				14-58
	Vacuum switch	X			X	14-58
	Air conditioner switch			*X		GROUP 24 HEATERS AND AIR-CONDITIONING
	Feedback solenoid valve (FBSV)	X				14-59
	Slow-cut solenoid valve (SCSV)	X				14-59
Output	Throttle opener control solenoid valve (for air conditioner load)		X			14-59
	Electric choke relay			X		14-36
	Secondary air control solenoid valve				X	GROUP 25 EMISSION CONTROL SYSTEM

**NOTE**

The \* symbol indicates no direct relation to the control unit's control functions.

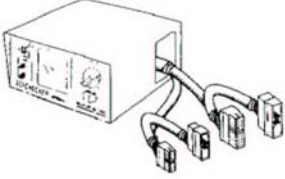
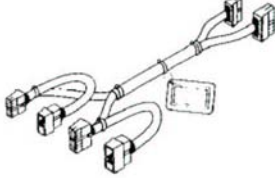
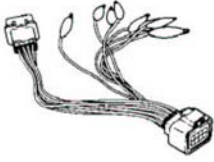
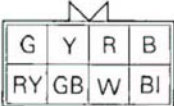
FUEL TANK AND FUEL LINE

N14EAAA

Symptom	Probable cause	Remedy	Reference page
Engine malfunctions due to insufficient fuel supply	Bent or kinked fuel pipe or hose	Repair or replace	–
	Clogged fuel pipe or hose	Clean or replace	–
	Clogged fuel filter or in-tank fuel filter	Replace	14-80
	Water in fuel filter	Replace the fuel filter or clean the fuel tank and fuel line	–
	Dirty or rusted fuel tank interior	Clean or replace	–
	Malfunctioning fuel pump (Clogged filter in the pump)	Replace	14-77
Evaporative emission control system malfunctions (When tank cap is removed, pressure releasing noise is heard)	Misrouting of vapor line	Correct	14-82
	Disconnect vapor line piping joint	Correct	14-82, 83
	Folded, bent, cracked or clogged vapor line	Replace	14-82, 83
	Faulty fuel tank cap	Replace	–
	Malfunctioning overfill limiter (two-way valve)	Replace	14-81

SPECIAL TOOLS

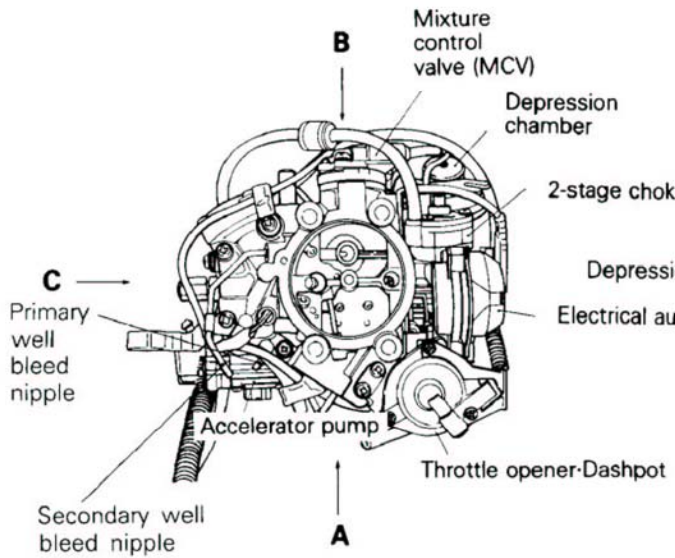
N14DA--

Tool (Number and name)	Use	Tool (Number and name)	Use
MD998406 ECI checker 	Diagnosis and inspection for ECI system and FBC system	MD 998438 Harness connector for FBC 	Inspection for FBC system Use with MD998406
MD998474 Harness connector (8-pin, square)  	Adjustment of TPS		

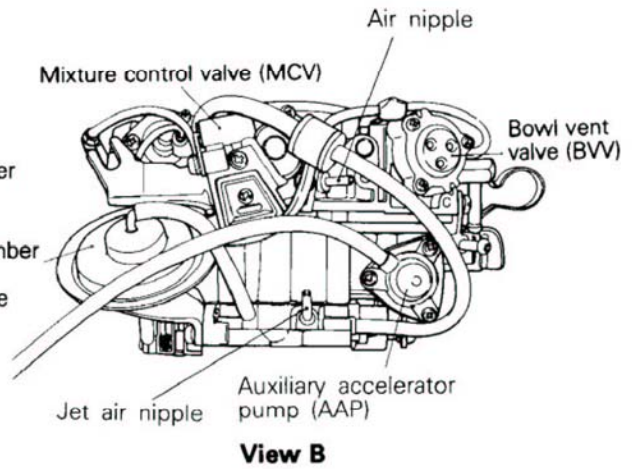
# SERVICE ADJUSTMENT PROCEDURES

## CARBURETOR EXTERNAL VIEW

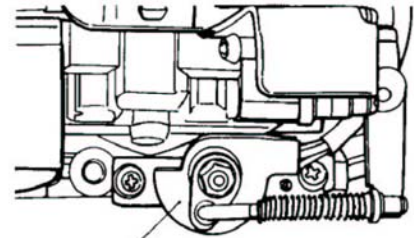
N14FJ--



5FU120



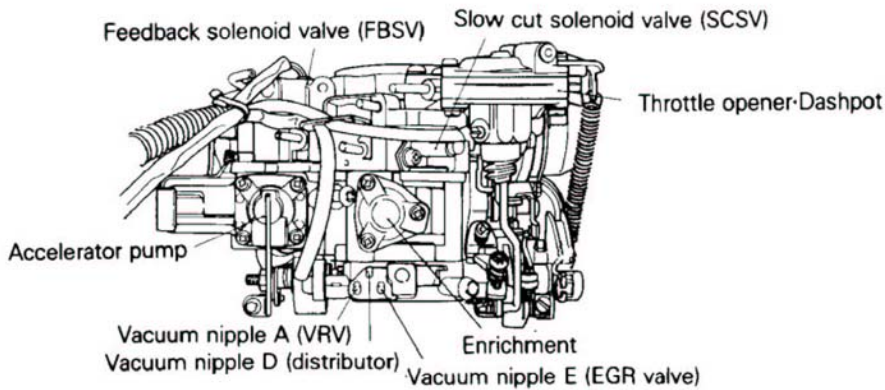
5FU121



Throttle position sensor (TPS)

**View C**

5FU123



**View A**

5FU122

**IDLE SPEED CHECK PROCEDURE**

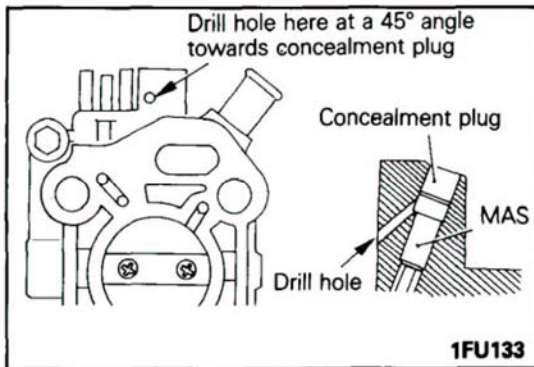
N14FHAA

Refer to GROUP 0 LUBRICATION AND MAINTENANCE—Checking and adjustment of the idling rpm

**IDLE SPEED ADJUSTMENT**

N14FHBA

Refer to GROUP 0 LUBRICATION AND MAINTENANCE—Idle Speed Inspection and Adjustment.

**IDLE SPEED AND MIXTURE ADJUSTMENT (For Un-scheduled Maintenance only)**

1. Remove carburetor from engine. (Refer to P.14-61.)
2. Clamp carburetor in a vice with idle mixture adjusting screw (MAS) facing up (protect gasket surface from vice jaws).
3. Drill a 2 mm (5/64 inch) pilot hole in the casting surrounding the idle mixture adjusting screw (MAX) then redrill the hole to 3 mm (1/8 inch).
4. Insert a blunt punch into the hole and drive out plug.
5. Reinstall carburetor on engine.
6. Run the cold engine at fast idle until the cooling water temperature is raised to 80 to 95°C (185 to 205°F).

**Inspection Conditions**

Engine coolant temperature : 85–95°C (185–205°F)

Light and accessory operation : off

Transmission : neutral (N or P for automatic transmission equipped vehicles)

Steering wheel : center position (power steering equipped vehicles)

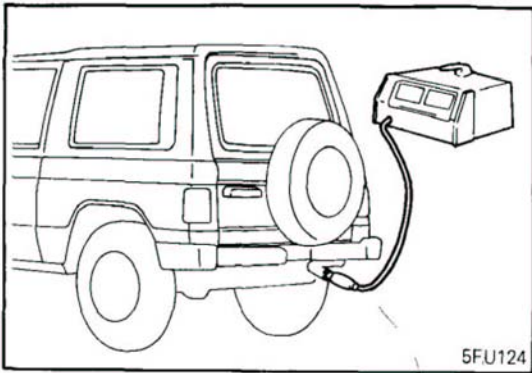
7. Prepare a timing light and tachometer.
8. Check the cycle of the timing light. Adjust if necessary.

**Timing light cycle : 7° BTDC ±2°**

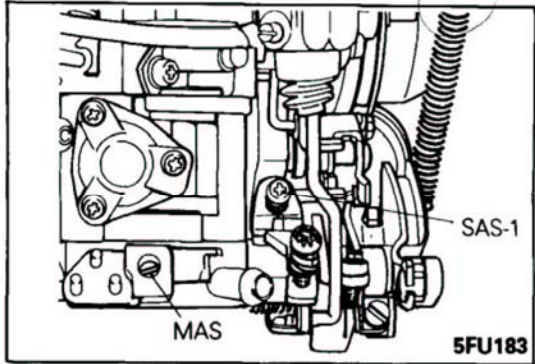
**NOTE**

Refer to GROUP 8 ELECTRICAL—Ignition System, for the timing cycle inspection and adjustment procedures.

9. Turn off the ignition key.
10. Disconnect the cable from the negative terminal of the battery for about 5 seconds. And then reconnect the cable to the original terminal.
11. Disconnect the connector of the exhaust oxygen sensor.
12. Run the engine for more than 5 seconds at the engine speed of 2000 to 3000 rpm.
13. Run the engine at idle for 2 minutes.



14. Set the CO-HC tester.



15. Set the idle CO and the engine speed to the specified value by adjusting the idle speed adjusting screw No. 1 (SAS-1) and the idle mixture adjusting screw (MAS).

**Idle CO : 0.1 to 0.3% at nominal curb idle speed**

**Curb idle speed :**

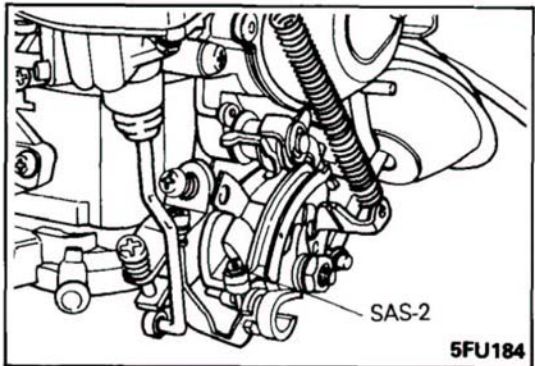
**\*<sup>1</sup> 725  $\begin{matrix} +150 \\ -100 \end{matrix}$  rpm / \*<sup>2</sup> 800  $\pm$ 100 rpm**

**NOTE**

1. \*<sup>1</sup> : For the first 500 km (300 miles)
2. \*<sup>2</sup> : After 500 km (300 miles)
3. If the idle CO adjustment fails, suction of secondary air is likely. Plug the secondary air hose and try again.

**Caution**

**DO NOT TOUCH SAS-2. The idle speed adjusting screw (SAS-2) is the preset screw that determines the relationship between the throttle valve and free lever, and has been accurately set at the factory. If this setting is disturbed, throttle opener adjustment and dash pot adjustment cannot be done accurately.**



16. Turn off the ignition switch.
17. Connect the oxygen sensor connector.
18. Install the concealment plug into the hole to seal the idle mixture adjusting screw.

## THROTTLE OPENER ADJUSTMENT FOR AIR CONDITIONER

N14FKBC

The throttle opener (idle-up actuator) described here controls the idle speed when the air conditioning is applied.

### NOTE

Check the ignition timing and idle speed before performing this adjustment.

### Inspection Conditions

Engine coolant temperature : 85 – 95°C (185 – 205°F)

Lights and accessories : Set to OFF

Transmission : Neutral

Steering wheel: Straightforward (vehicles with a power steering)

- (1) Start the engine.
- (2) Set the tachometer.
- (3) Turn on the air conditioner switch.

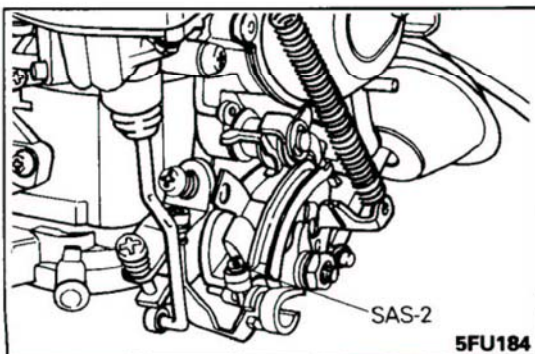
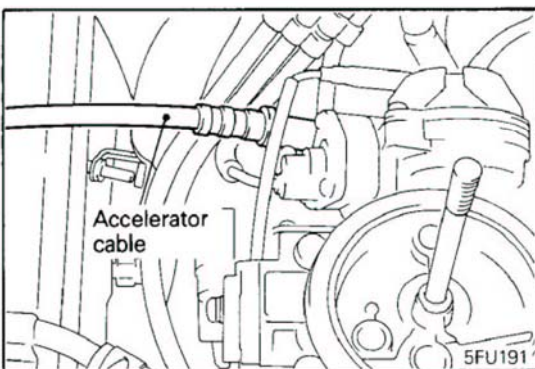
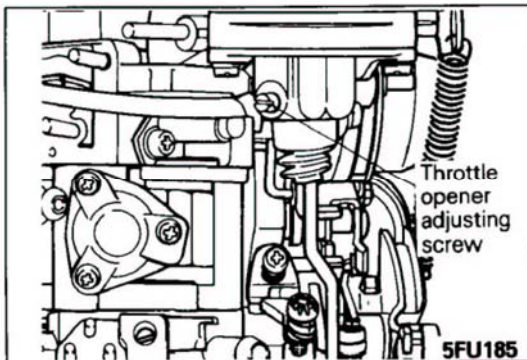
### NOTE

The solenoid valve will open and the intake manifold vacuum will act on the throttle opener to fully actuate it.

- (4) Check the engine speed during this operation.

**Standard value : 900–950 rpm**

If the engine speed is out of specification, adjust using the throttle opener (for air conditioner) adjusting screw.



## THROTTLE POSITION SENSOR (TPS) ADJUSTMENT

N14FIBC

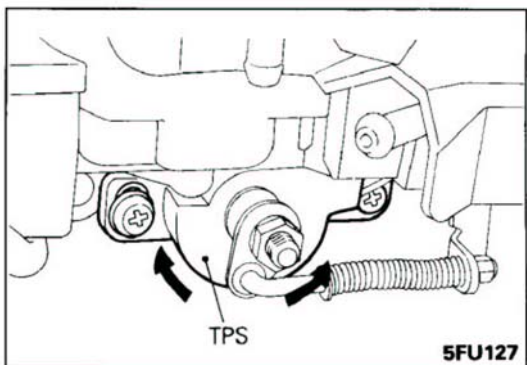
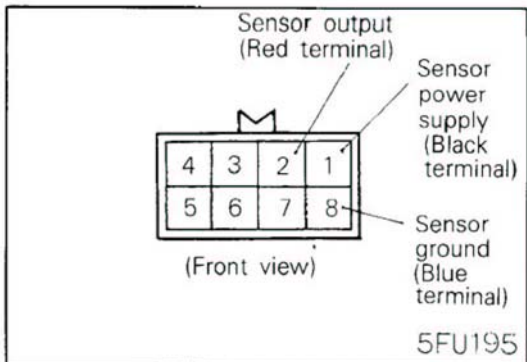
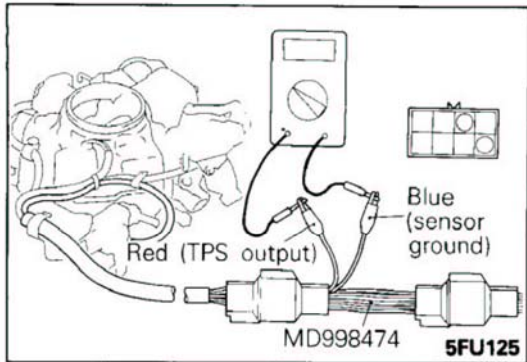
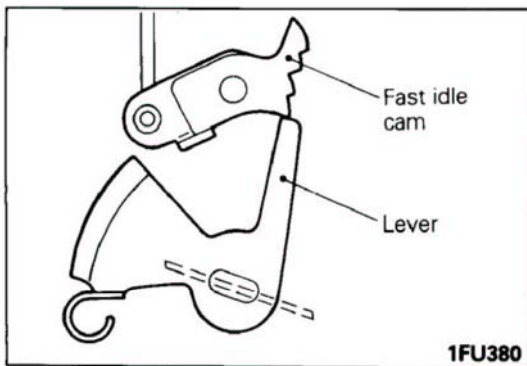
- (1) Loosen the accelerator cable enough.

- (2) Loosen the speed adjusting screw No. 1 (SAS1) and No. 2 (SAS2) sufficiently to close the throttle valve completely. Record the number of turns loosened.

### NOTE

1. Turning the screw counterclockwise closes the valve.





2. At this time, the fast idle control should have been released (the lever not resting on the fast idle cam).

- (3) Disconnect the carburetor connectors.
- (4) Connect the special tool (harness connector) between the disconnected connectors.
- (5) Connect a voltmeter between terminal ② (red: sensor output) and ⑧ (blue: sensor ground) of the carburetor's connectors.

**Caution**

**Use a good, finely calibrated digital type voltmeter.**

**NOTE**

Connection of FBC connector and special tool's terminal is as follows:

FBC connector	Special Tool
Terminal ② (sensor output)	Terminal Red
Terminal ⑧ (sensor ground)	Terminal Blue

- (6) Turn the ignition switch to ON (Don't start the engine).
- (7) Measure the voltage of the TPS output.

**Standard value : 0.250 V**

- (8) If it is out of specification, loosen the TPS attaching screw and adjust by turning the TPS to the standard value.

**NOTE**

Turning the TPS clockwise increases the output voltage.

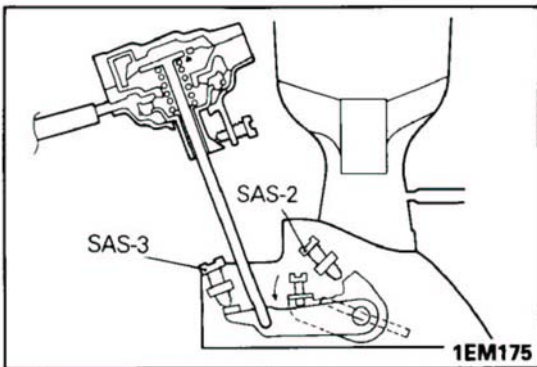
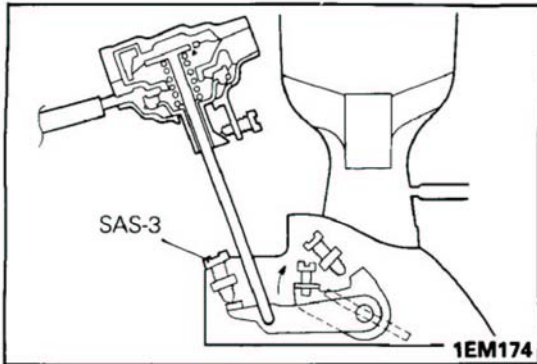
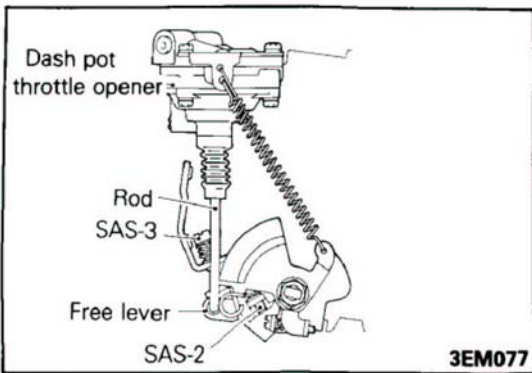
- (9) Turn the ignition switch to OFF.
- (10) Tighten the SAS1 and SAS2 for the amount recorded in step (2). (Return to the original position.)
- (11) Remove the voltmeter and the special tool (harness connector) and connect the carburetor's connectors.

- (12) Adjust play of the accelerator cable. (See P.14-84.)
- (13) Start the engine and check that the idle speed is as specified.

**Standard value :**

**Curb idle speed**

**For the first 500 km (300 miles) : 725 <sup>+150</sup> -100 rpm**  
**After 500 km (300 miles) : 800 ±100 rpm**



## INSPECTION AND ADJUSTMENT OF DASH POT

N14FMAB

### NOTE

Curb idle speed adjustment must be properly adjusted before inspecting dashpot.

### Inspection Conditions

Engine coolant temperature : 85 - 95°C (185 - 205°F)

Lights and accessories : Set to OFF

Transmission : Neutral

Steering wheel : Straightforward (vehicles with a power steering)

- (1) Start the engine and run at idle.
- (2) Open the throttle valve for full stroke of the rod until the free lever contacts SAS3.

- (3) Close the throttle valve until SAS2 contacts the free lever and check the engine speed at that moment.

### Standard value

**Vehicles with a manual**

**transmission : 2000 rpm**

**Vehicles with an automatic**

**transmission : 1500 rpm**

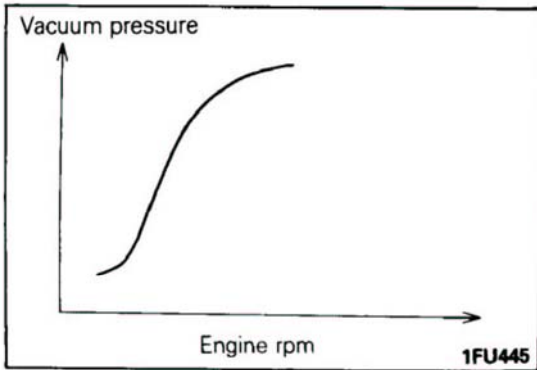
- (4) If engine speed is not as specified, adjust dashpot RPM by turning SAS-3.
- (5) Release the free lever and verify that the engine returns to idle speed slowly.

## INSPECTION OF DISTRIBUTOR ADVANCE CONTROL VACUUM (D VACUUM)

N14FUAA

### Inspection Condition

Engine coolant temperature : 85 - 95°C (185 - 205°F)



- (1) Disconnect the vacuum hose from the carburetor D vacuum nipple and connect a hand vacuum pump to the nipple.

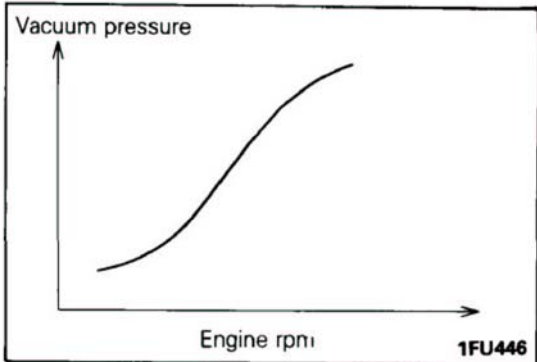
**NOTE**

For the location of the nipple, refer to the Appearance of Carburetor (P.14-25)

- (2) Start and race the engine to make sure that D vacuum increases with the engine speed.

**NOTE**

If abnormality is found in change of vacuum, blocked carburetor D port is suspected. Therefore, clean the port as necessary.



**INSPECTION OF EGR VALVE CONTROL VACUUM (E VACUUM)**

N14FVAA

**Inspection Condition**

Engine coolant temperature : 85-95°C (185-205°F)

- (1) Disconnect the vacuum hose from the carburetor E vacuum nipple and connect a hand vacuum pump to the nipple.

**NOTE**

For the location of the nipple, refer to the Appearance of Carburetor (P.14-25).

- (2) Start and race the engine to make sure that E vacuum increases with the engine speed.

**NOTE**

If abnormality is found in change of vacuum, blocked carburetor E port is suspected. Therefore, clean the port as necessary.

## INSPECTION OF VRV CONTROL VACUUM (A VACUUM)

N14FLAA

### Inspection Condition

Engine coolant temperature : 85–95°C (185– 205°F)

- (1) Disconnect the vacuum hose from the carburetor A vacuum nipple and connect a hand vacuum pump to the nipple.

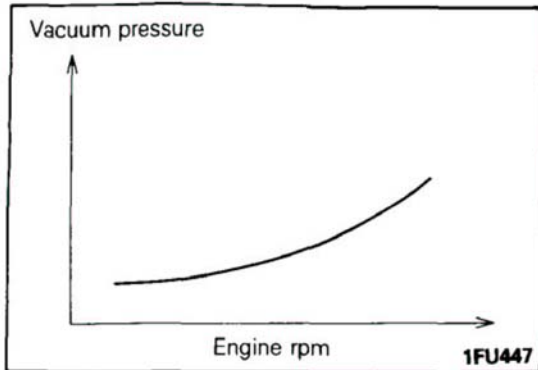
#### NOTE

For the location of the nipple, refer to the Appearance of Carburetor (P.14–25)

- (2) Start and race the engine to make sure that A vacuum increases gradually with the engine speed.

#### NOTE

If abnormality is found in change of vacuum, blocked carburetor A port is suspected. Therefore, clean the port as necessary.



1FU447

## INSPECTION OF VACUUM SWITCH CONTROL VACUUM (F VACUUM)

N14FWAA

### Inspection Condition

Engine coolant temperature : 85–95°C (185– 205°F)

- (1) Disconnect the vacuum hose from the carburetor vacuum nipple and connect a hand vacuum pump to the nipple.

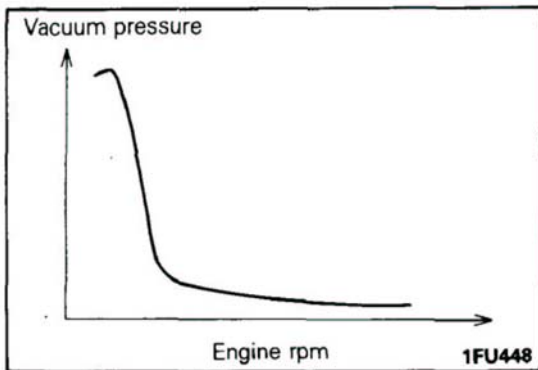
#### NOTE

For the location of the nipple, refer to the Appearance of Carburetor (P.14–25).

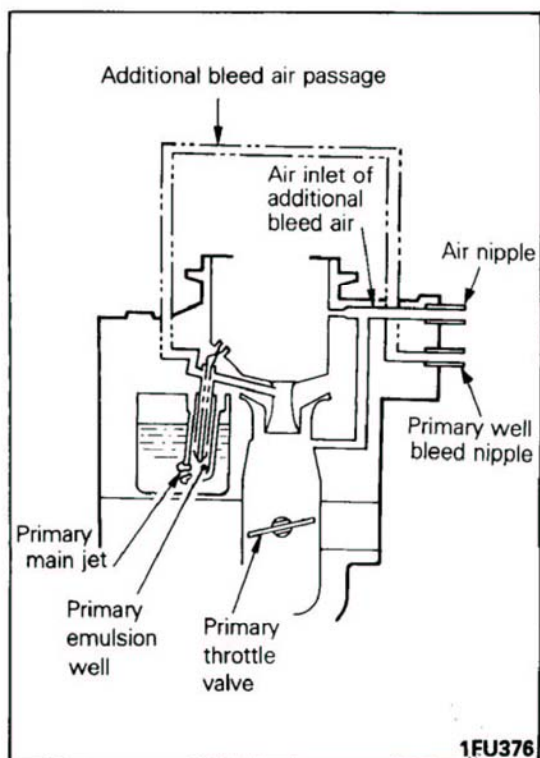
- (2) Start and race the engine to make sure that F vacuum drops rapidly.

#### NOTE

If abnormality is found in change of the vacuum, blocked carburetor F port and vacuum passage. Therefore, disassemble and check the carburetor.



1FU448



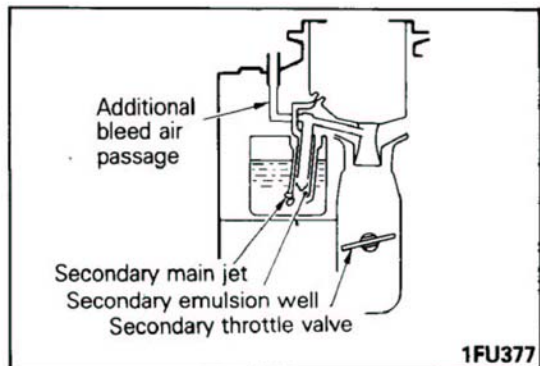
**INSPECTION OF CARBURETOR BLEED AIR PASSAGE FOR CLOGGING (INSPECTION OF CARBURETOR HIGH ALTITUDE COMPENSATION SYSTEM)**

**INSPECTION OF PRIMARY WELL BLEED NIPPLE FOR CLOGGING—for California and high altitude specifications for the 49 states**

**NOTE**

For the nipple position, refer to the Appearance of Carburetor (P.14-25).

- (1) Disconnect the vacuum hoses from the air nipple and connect a hand vacuum pump to the nipple.
- (2) Apply vacuum to see that it leaks and does not build up inside the carburetor.
- (3) Disconnect the vacuum hose from the primary well bleed nipple and connect a hand vacuum pump.
- (4) apply vacuum to see that it leaks and does not build up inside the carburetor.
- (5) If vacuum builds up, disassemble and check the carburetor. (Refer to P.14-63).

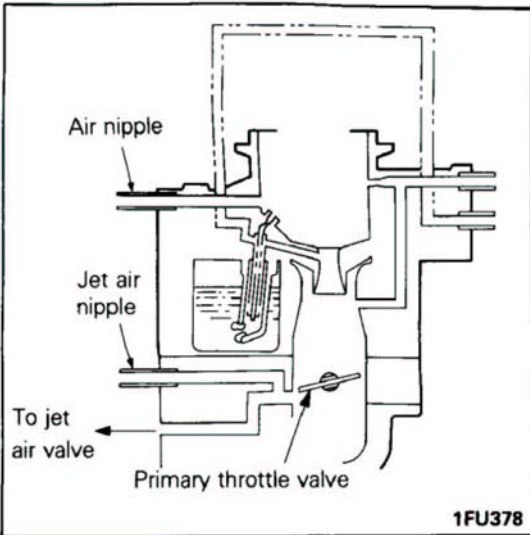


**INSPECTION OF SECONDARY WELL BLEED NIPPLE FOR CLOGGING—High altitude specifications for the 49 states only (excluding California)**

**NOTE**

for the nipple position, refer to the Appearance of Carburetor (P.14-25).

- (1) Disconnect the vacuum hose from the bleed nipple and connect a hand vacuum pump to the nipple.
- (2) Apply vacuum to see that it leaks and does not build up inside carburetor.
- (3) If vacuum builds up, disassemble and check the carburetor. (Refer to P.14-63).



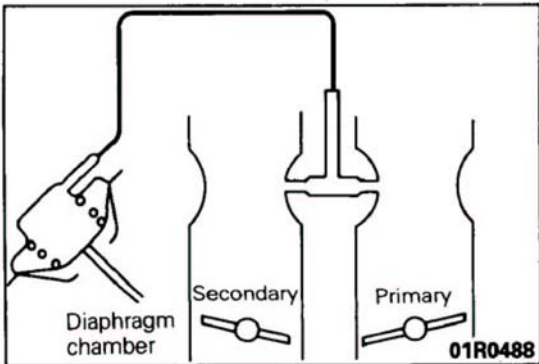
**INSPECTION OF JET AIR NIPPLE FOR CLOGGING—High altitude specifications for the 49 states (excluding California) only**

N14FRCA

**NOTE**

For the nipple position, refer to the Appearance of Carburetor (P.14-25).

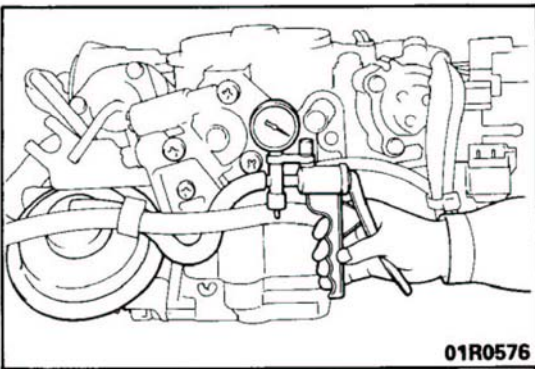
- (1) Disconnect the vacuum hoses from both air nipple and jet air nipple and connect a hand vacuum pump to the nipples.
- (2) Apply vacuum to see that it leaks and does not build up inside carburetor.
- (3) If vacuum builds up, disassemble and check the carburetor. (Refer to P.14-63).



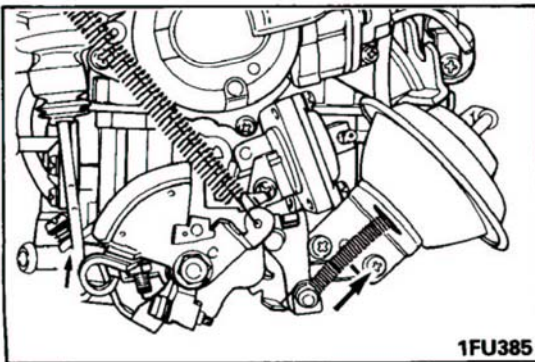
**INSPECTION OF CARBURETOR SECONDARY VALVE OPERATION**

N14FOAA

- (1) Remove the air filter assembly.

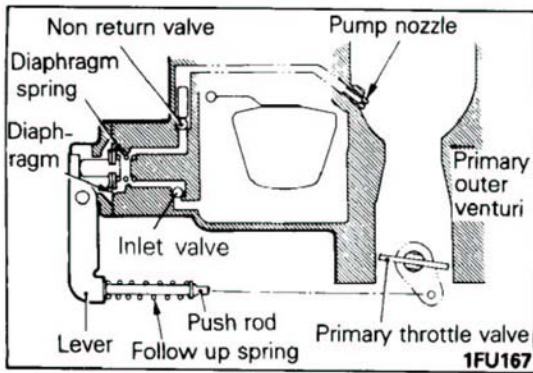


- (2) Remove the secondary valve vacuum hose from the carburetor throttle body and connect a hand vacuum pump to the disconnected end of hose.



- (3) With a vacuum of 13.3 kPa (1.9 psi) applied by the vacuum pump, fully open the primary throttle valve and check that the secondary throttle valve also opens fully.

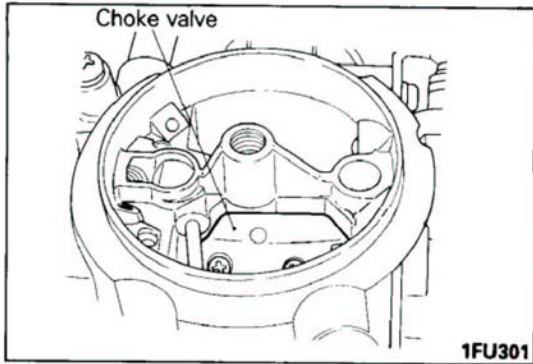
Vacuum is not held in depression chamber (vacuum leaks)	Replace depression chamber
Vacuum is held but secondary valve does not operate	Clean secondary throttle valve and related parts



**INSPECTION OF CARBURETOR ACCELERATION PUMP**

N14FPAA

- (1) Remove the air filter assembly cover.
- (2) While opening the choke valve, open the throttle valve and check that fuel is injected from the pump nozzle. If fuel is not injected, clean the carburetor fuel passage.



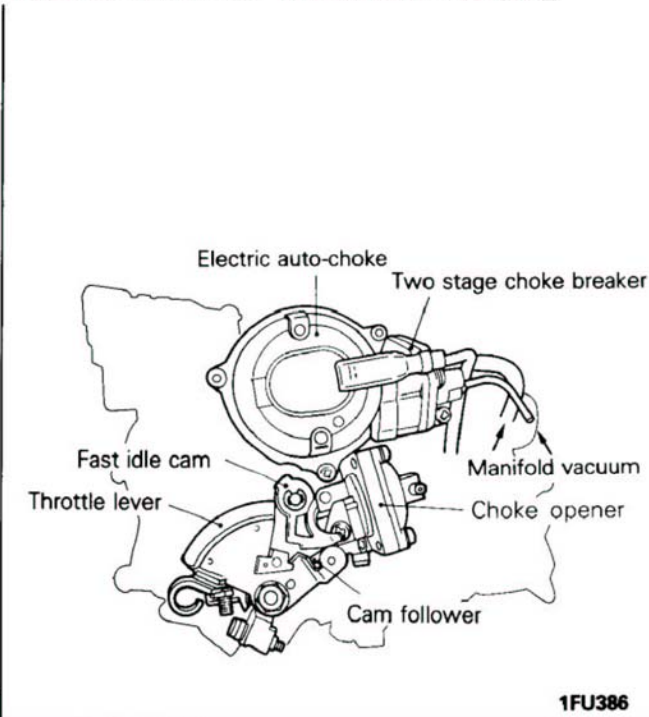
**INSPECTION OF CHOKE VALVE**

N14FQAA

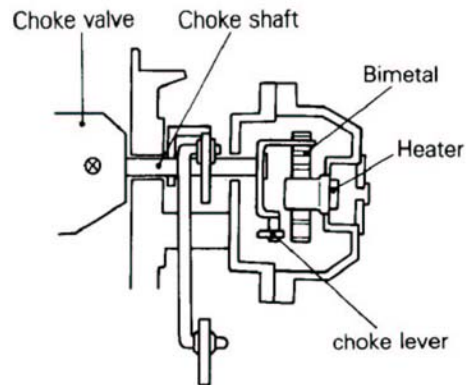
Refer to GROUP 0 LUBRICATION AND MAINTENANCE—Maintenance Service

**INSPECTION OF ELECTRIC CHOKE**

N14FQBB



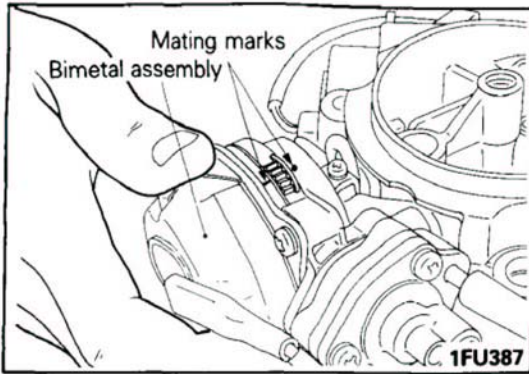
1FU386



1FU359

**Caution**

All carburetors have a tamper-proof choke. The choke-related parts are factory adjusted. The choke adjustment is not required during service, except when major carburetor overhaul or choke carburetor related parts adjustments are needed by state or local inspections.



- (1) Check that the alignment marks on the electric choke and bimetal assembly are lined up. If not, align the marks.

## NOTE

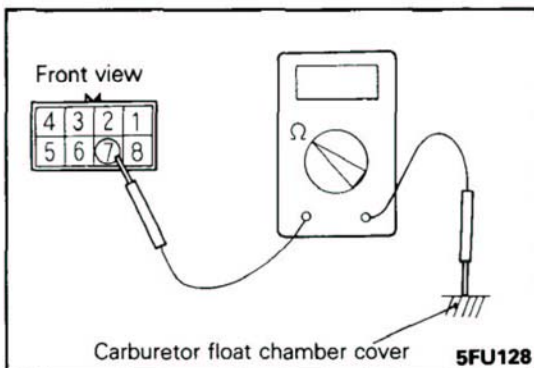
1. For removal of the bimetal assembly, refer to DISASSEMBLY AND REASSEMBLY (P.14-67).
2. Misalignment and resultant symptom

Misalignment	Symptom
Clockwise deviation	Better startability but plugs more likely to be sooty
Counterclockwise deviation	Poorer startability and more likely to stall

- (2) Check that engine coolant temperature is below 10°C (50°F).
- (3) Start the engine and check operation of the choke valve and fast idle cam, with hand on the electric choke body.

Electric choke body	Gets gradually hotter after engine start
Choke valve	Opens as bimetal temperature rises
Fast idle cam	Fast idle control is released as engine coolant temperature rises and fast idle breaker operates

- (4) If the electric choke body remains cool even after the engine is started, check the electric choke.



## INSPECTION OF ELECTRIC CHOKE

N14FQCA

- (1) Disconnect the carburetor connector and check continuity of the heater.

**Normal state : Should be conductive [approx. 6 Ω at 20°C (68°F)]**

- (2) If the heater is not conductive, replace the electric choke body (bimetal assembly).

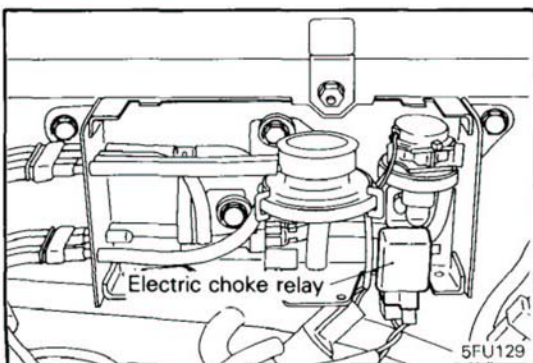
## NOTE

For replacement procedures, refer to DISASSEMBLY AND REASSEMBLY OF CARBURETOR (P.14-67).

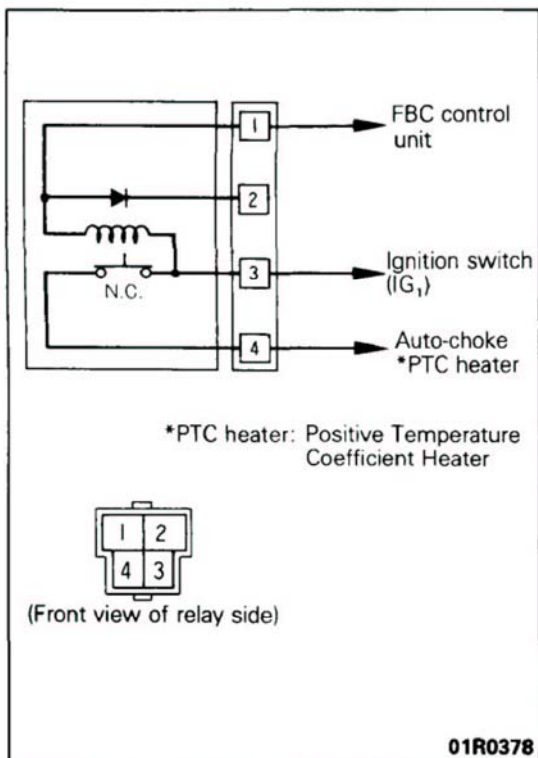
## CHECKING THE ELECTRIC CHOKE RELAY

N14FQDA

- (1) Remove the cover of the device box and remove the electric choke relay.







(2) Check for continuity between terminals when there is and is not current flow to the relay coil.

Item	Measured terminals	Continuity
No power flow	Between terminals ① - ②	Yes (0Ω)
	Between terminals ① - ②	No (∞Ω)
	Between terminals ① - ③	Yes (approx. 100Ω)
	Between terminals ③ - ④	Yes (0Ω)
Power flow	Between terminals ③ - ④	No (∞Ω)

**NOTE**

1. → indicates the current flow direction.
2. Inspect after checking the infinity of tester.
3. To energize the relay coil, apply battery voltage directly to terminals ①-③.
4. Use care as application of battery voltage to incorrect terminals can cause damage to the relay.

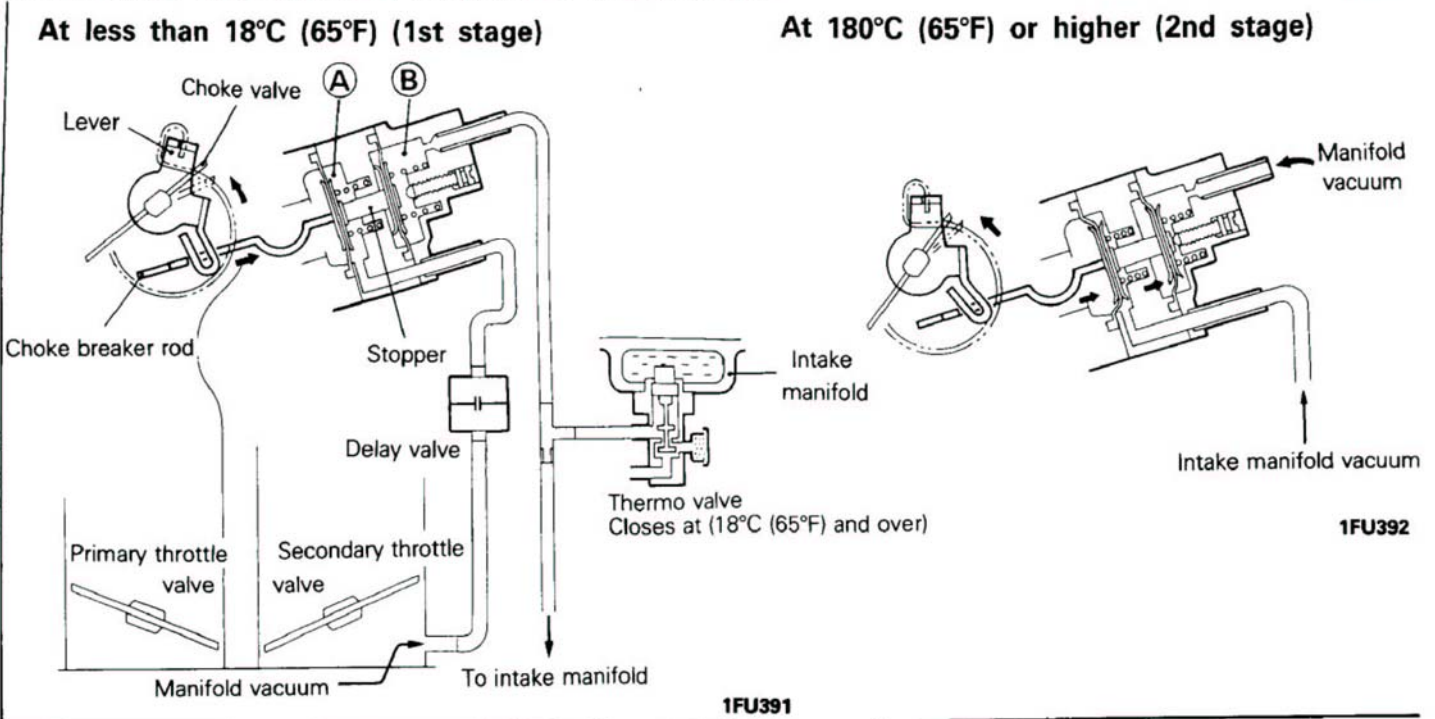
(3) If the continuity test fails, replace the electric choke relay.

**NOTE**

If the electric choke body remains cool after engine start although the electric choke heater (PTC heater) and electric choke relay are normal, check the vehicle body harness circuit.

CHECKING THE CHOKE BREAKER MECHANISM

N14FOEC

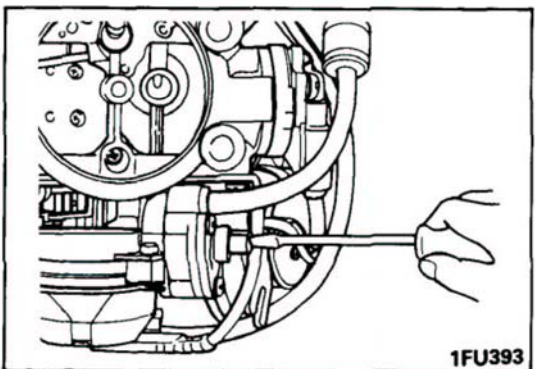
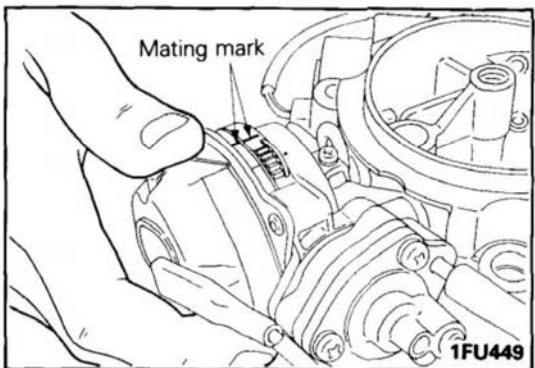
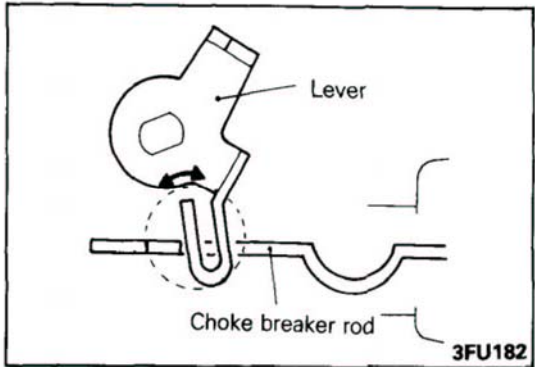
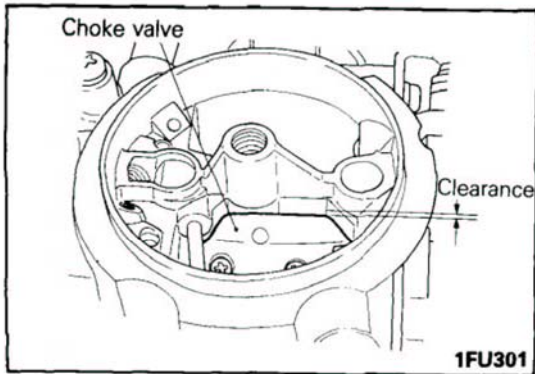


- (1) Remove the air cleaner.
- (2) Check conditions of the choke valve according to the procedures given in the table below

Step	Engine coolant temperature	Check conditions	Choke valve when normal	Presumed cause when abnormal
1	10°C (50°F) or lower	Before starting engine	Fully closed	Malfunction of bimetal assembly Malfunction of link
2	10°C (50°F) or lower	Engine idling after start (Start after first fully depressing accelerator pedal one time.)	Slowly open slightly immediately after starting (Clearance: 2.5–2.7 mm (.098–.106 in.))	Delay valve clogged Diaphragm damaged (chamber A)
3	10°C (50°F) or lower	Disconnect the vacuum hose (yellow stripe) from the choke breaker during idling.	No movement	Malfunction of thermo valve
4	25°C (77°F) or higher	Connect the vacuum hose (yellow stripe) and let the engine idle.	When the choke valve is lightly closed by a finger, stops at a position open more than step 2. (Clearance: approx. 3 mm (.12 in.))	Malfunction of thermo valve Diaphragm damaged (chamber B)

NOTE

For information concerning the checking of the thermo valve, refer to GROUP 25, EMISSION CONTROL SYSTEM – Exhaust Gas Emission Control System.



## INSPECTION AND ADJUSTMENT OF CHOKE BREAKER OPENING

N14FQFC

- (1) After inspection of the choke breaker system, disconnect the vacuum hose (yellow stripe) from the choke breaker and make the following check.
- (2) With the engine idling, close the choke valve lightly with a finger until the choke valve stops. Then, measure the choke valve to choke bore clearance.

**Standard value : 2.5–2.7 mm (.098–.106 in.)**

- (3) If the clearance is not as specified, stop the engine, remove the bimetal assembly and adjust the rod end opening for standard clearance.

### NOTE

For removal of the bimetal assembly, refer to DISASSEMBLY AND REASSEMBLY (P.14-67).

When removing the bimetal assembly, put a mark on the electric choke body.

### NOTE

Rod end opening	Valve clearance	Expected result
Large	Large	Poorer startability and stall more likely
Small	Small	Plug likely to get sooty

- (4) Reconnect the removed yellow stripe vacuum hose and measure the choke valve to choke bore clearance as in step (2).

**Standard value : 3.2–3.4 mm (.126–.133 in.)**

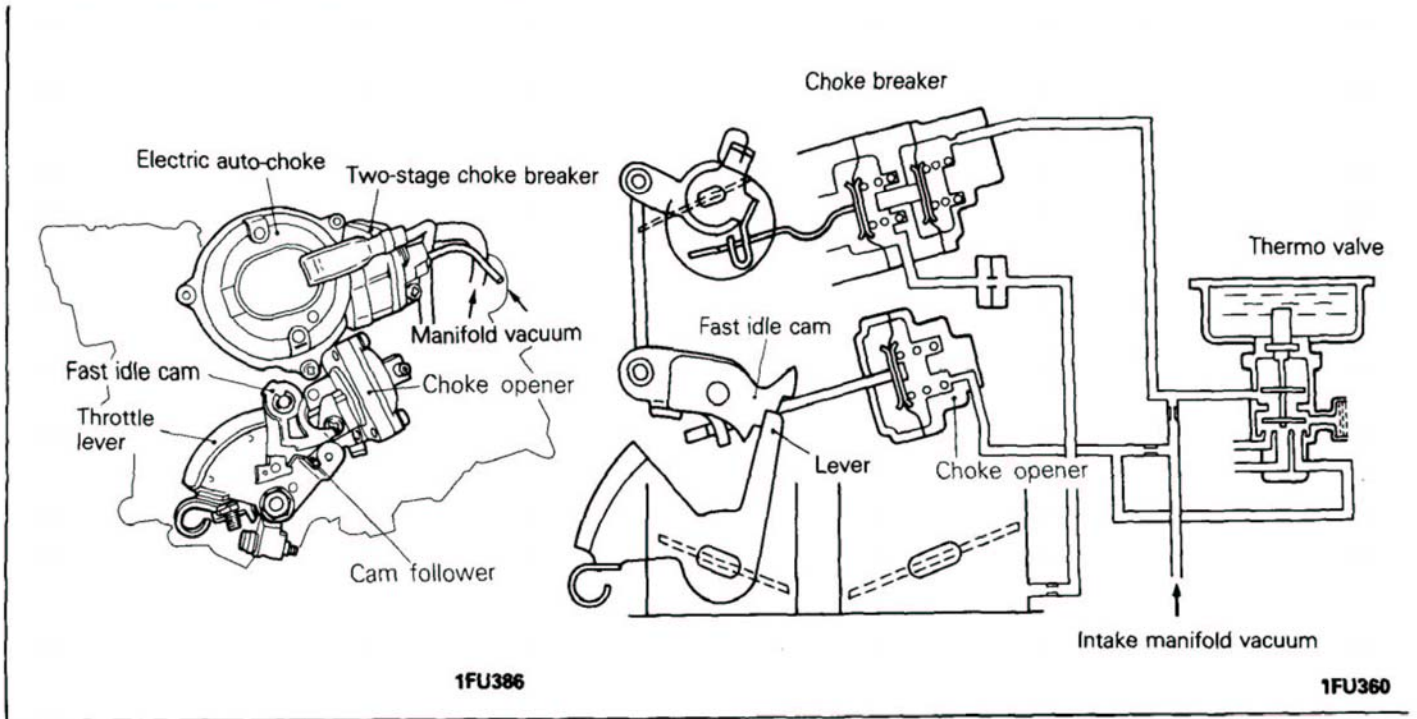
- (5) If the clearance is out of specification, adjust by the adjusting screw.

### NOTE

Adjusting screw turning direction	Valve clearance	Expected result
Clockwise	Small	Better startability but plug more likely to get sooty
Counter clockwise	Large	Poor startability and stall more likely

INSPECTION AND ADJUSTMENT OF FAST IDLE

N14FQGB

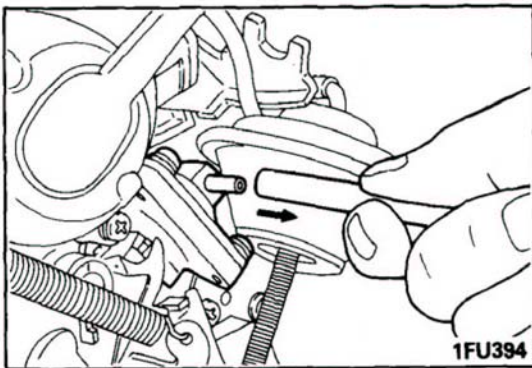


**Inspection Conditions**

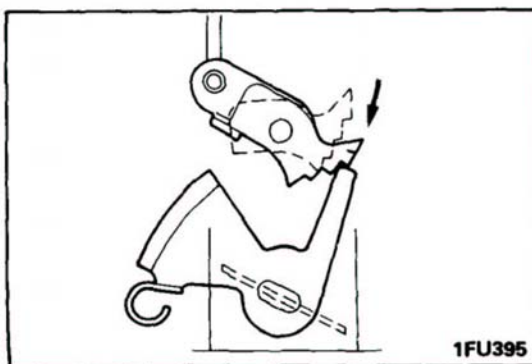
- Engine coolant temperature: 85 - 95°C (185 - 205°F)
- Lights and accessories: Set to OFF.
- Transmission: Neutral (N or P for vehicles with an automatic transmission)
- Steering wheel: Straightforward (vehicles with a power steering)

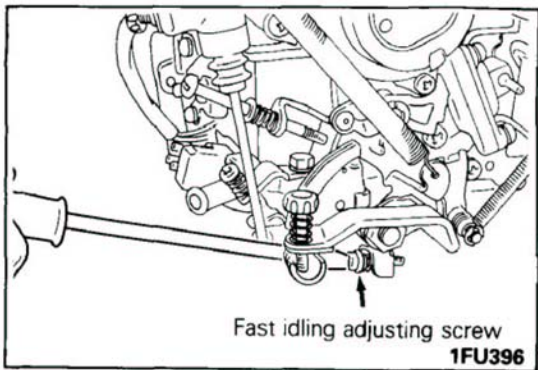
- (1) Remove the air filter.
- (2) Install the tachometer.

- (3) Disconnect the vacuum hose (white stripe) from the choke opener.



- (4) Set the lever on the second highest detent of fast idle cam.





(5) Start the engine and check the fast idle speed.

**Standard value :**

**2350rpm**

**[Vehicles with a manual transmission]**

**2300rpm**

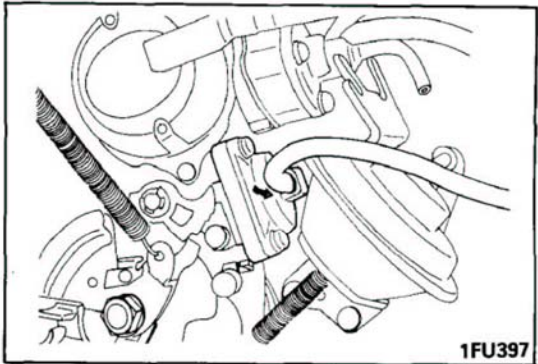
**[Vehicles with an automatic transmission]**

(6) If the fast idle speed is out of specification, adjust with the fast idle adjusting screw.

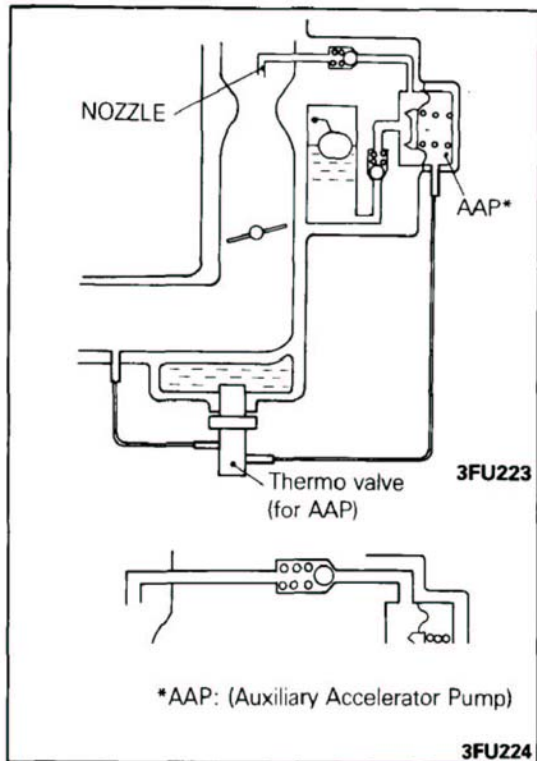
**NOTE**

Rotation direction of adjusting screw and fast idle speed

Adjusting screw direction	Valve opening	Fast idle speed
Clockwise	Large	Increases
Counter-clockwise	Small	Decreases



(7) Connect the vacuum hose removed in step (3) to the choke opener and check that the choke opener cancels fast idle.



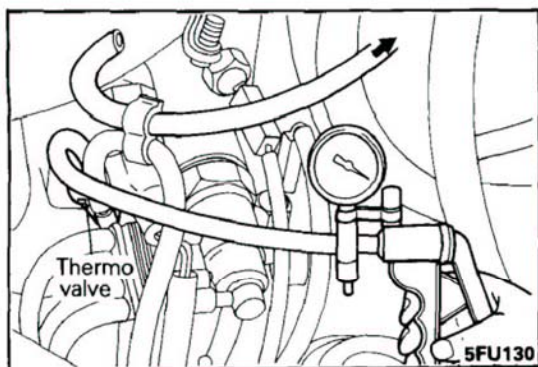
**CHECKING THE AUXILIARY ACCELERATION PUMP (AAP)**

N14FYAA

- (1) Remove the air filter cover.
- (2) Check to be sure that the engine coolant temperature is 30°C (86°F) or lower, and then check according to the steps in the table below.

Step	Check conditions	Vacuum hose negative pressure	Pump nozzle
1	With the engine idling, disconnect the black vacuum hose from the carburetor AAP.	Negative pressure is felt when the hose end is covered by a finger.	Fuel is sprayed from the nozzle when the hose is disconnected.
2	Warm-up the engine until the temperature of the engine coolant reaches 50°C (122°F) or higher.	Negative pressure cannot be felt by the finger.	—

- (3) If the change of the vacuum negative pressure is incorrect, check the thermo valve for the APP. If the negative pressure is normal but fuel is not sprayed from the nozzle, clean the carburetor's fuel passage.



### CHECKING THE THERMO VALVE (FOR AAP CONTROL)

N14FZAB

- (1) Disconnect the vacuum hose (black) from the thermo valve and connect a manual vacuum pump to the thermo valve.
- (2) Apply a negative pressure of 66 kPa (10.0 psi) to the thermo valve.

When engine is cold [coolant temperature 30°C (86°F) or lower]	Negative pressure is not applied (leakage).
After engine warm-up [coolant temperature 50°C (122°F) or higher]	Negative pressure is applied (no leakage).

- (3) If incorrect, replace the thermo valve.

#### Caution

1. Do not use a wrench or similar tool at the resin part when removing or installing the thermo valve.
2. When installing, apply a coating of the specified adhesive to the threaded part, and then tighten at a torque of 20–35 Nm (14–25 ft.lbs.).

Specified adhesive : 3M Adhesive Nut Locking No. 4171 or equivalent

### REPLACEMENT OF FUEL FILTER

N14FCAB

Refer to GROUP 0 LUBRICATION AND MAINTENANCE-Fuel Filter (Replace)

## INSPECTION OF FBC SYSTEM

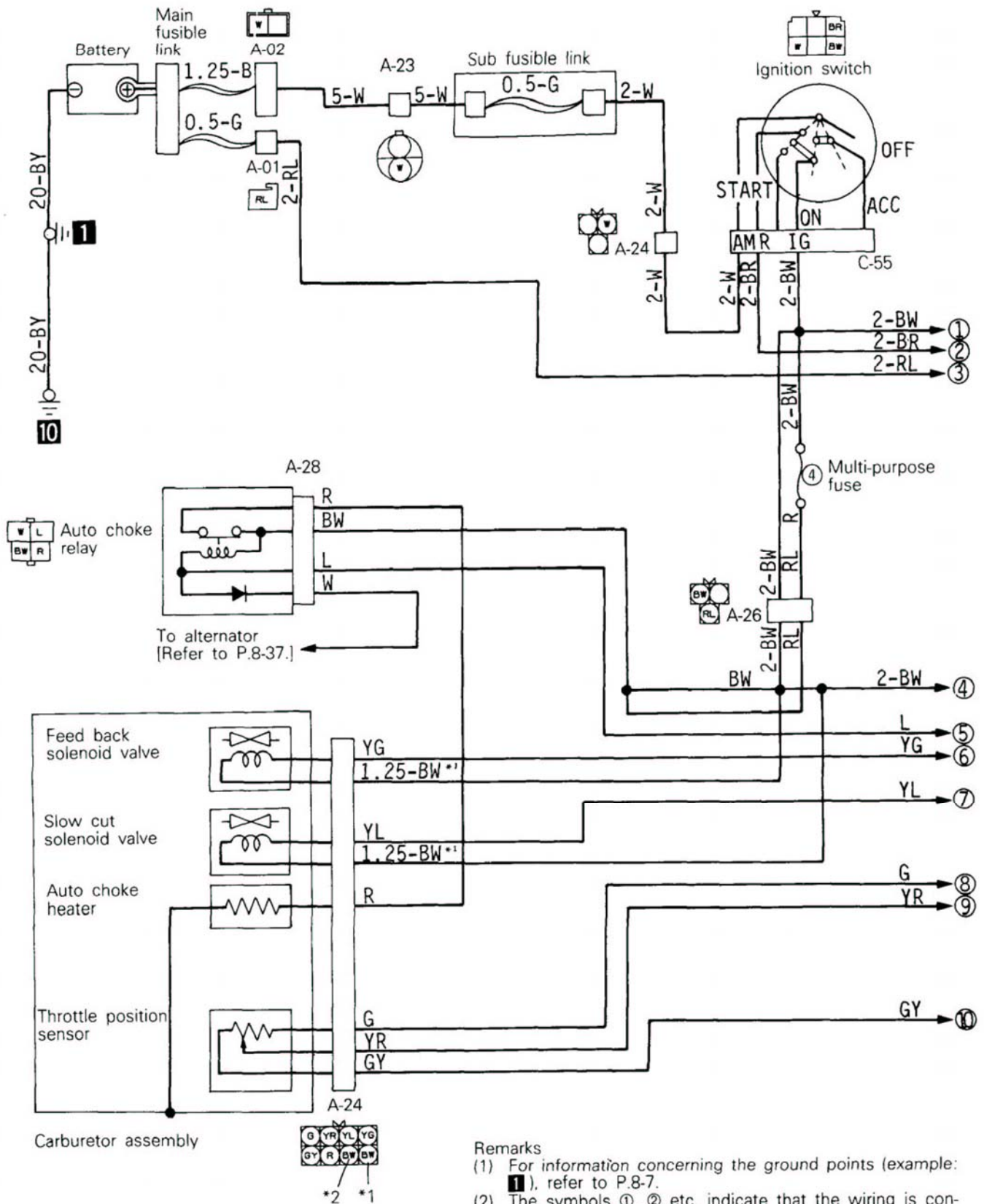
### CAUTIONS ON INSPECTION

N14PAAC

1. Before removing or installing a part, disconnect the battery  $\ominus$  terminal.
2. Before disconnecting battery terminals, turn off the ignition switch. Removal or connection of battery terminals during engine operation or with the ignition switch ON could cause erroneous operation of the ECU or damage to semiconductors.
3. The control harnesses between ECU and ignition coil [  $\ominus$  terminal] and between ECU and oxygen sensor are shielded wires with shield grounded to the vehicle body in order to prevent ignition noises and radio interference. When the shielded wire is faulty, therefore, the control harness must be replaced.
4. When ECI checker is handled, pay attention to the following points.
  - Avoid rough operation of switches.
  - Do not subject ECI checker to shock and other external forces, heat, etc.
  - Keep away water and oil.
  - Store ECI checker in a moisture- and dust-free place and take steps to protect the checker from heat and vibration.

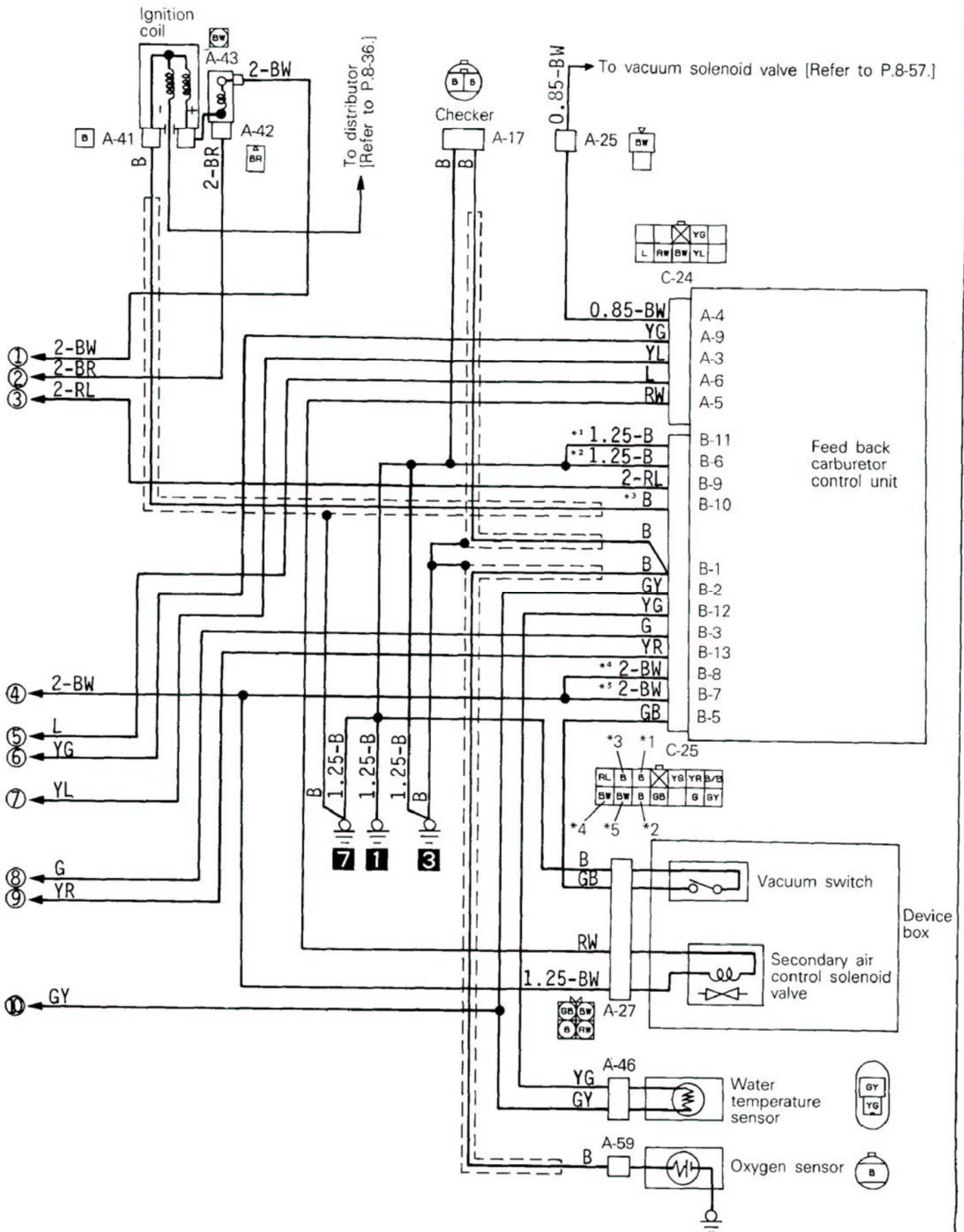
CIRCUIT DIAGRAMS

FEED BACK CARBURETOR CIRCUIT



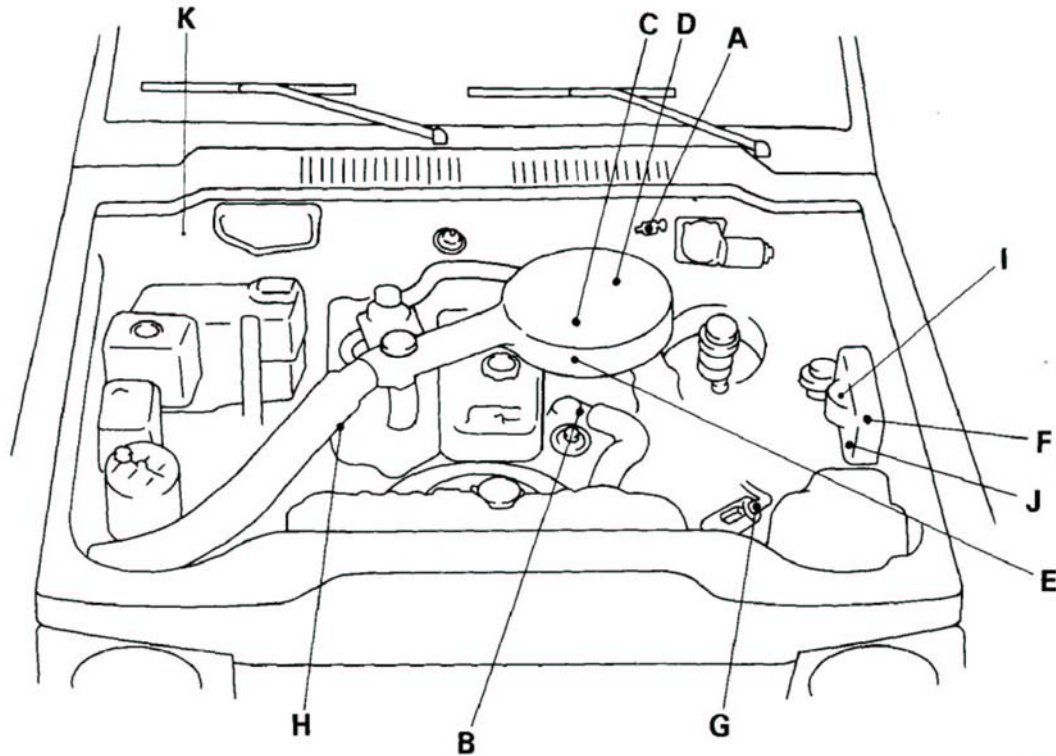
- Remarks
- (1) For information concerning the ground points (example: 1), refer to P.8-7.
  - (2) The symbols ①, ② etc. indicate that the wiring is connected (using the same numerical symbol) to the facing page. (In other words, ① on the right page is connected to ① on the left page.)





COMPONENTS LOCATIONS AND VACUUM HOSES LAYOUT

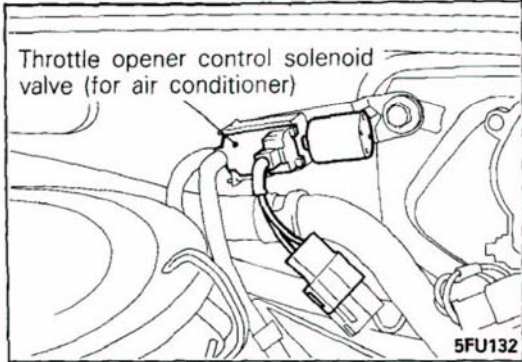
COMPONENTS LOCATIONS



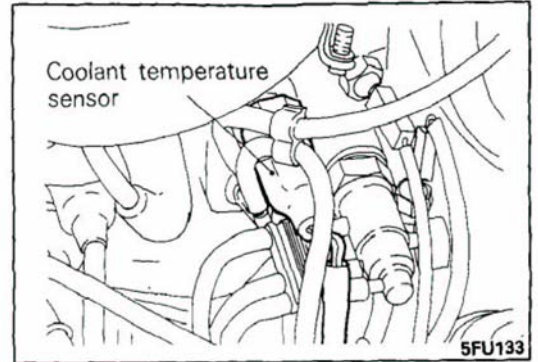
5FU131

Name	Symbol	Name	Symbol
Throttle opener control solenoid valve (for air conditioner)	A	Engine-speed sensor (ignition coil ⊖)	G
Coolant temperature sensor	B	Oxygen sensor	H
Feedback solenoid valve	C	Secondary air control solenoid valve	I
Slow-cut solenoid valve	D	Electric choke relay	J
Throttle-position sensor	E	Electronic control unit (ECU)	K
Vacuum switch	F	—	—

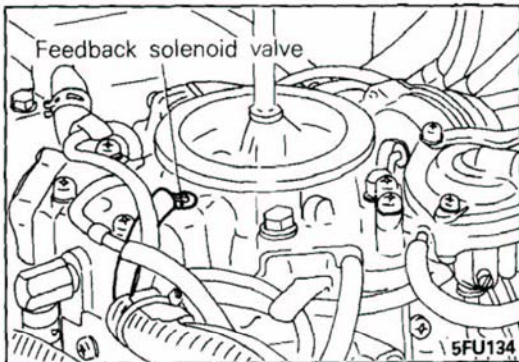
**A Throttle Opener Control Solenoid Valve (for air conditioner)**



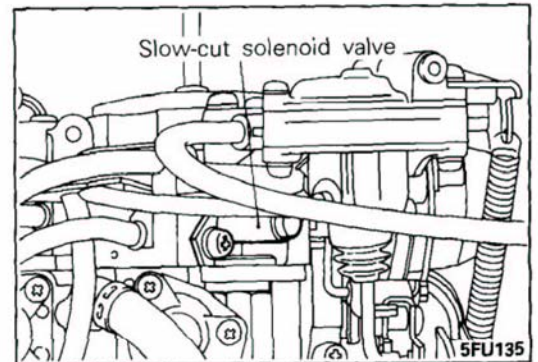
**B Coolant Temperature Sensor**



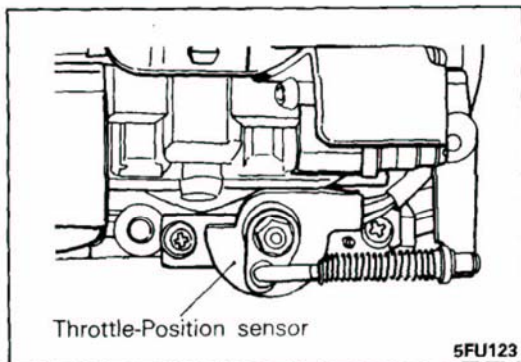
**C Feedback Solenoid Valve**



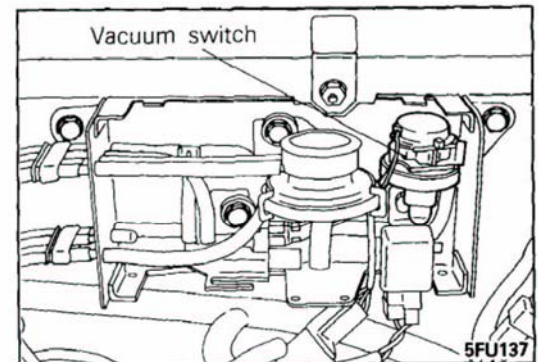
**D Slow-cut Solenoid Valve**



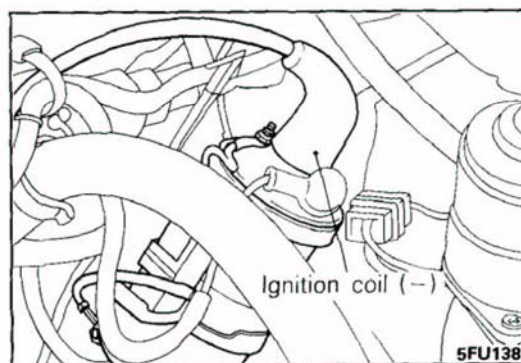
**E Throttle-Position Sensor**



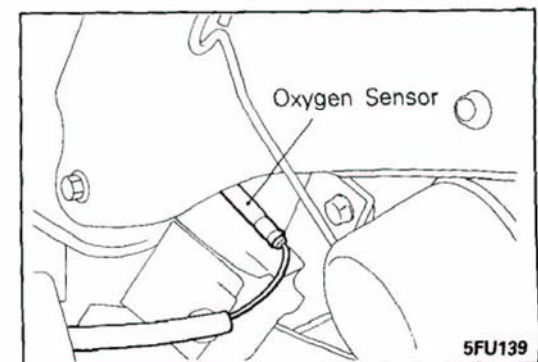
**F Vacuum Switch**



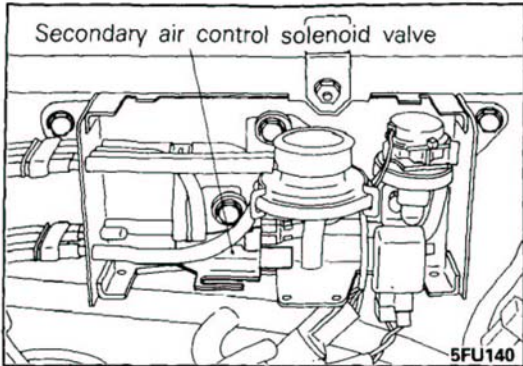
**G Ignition Coil (-)**



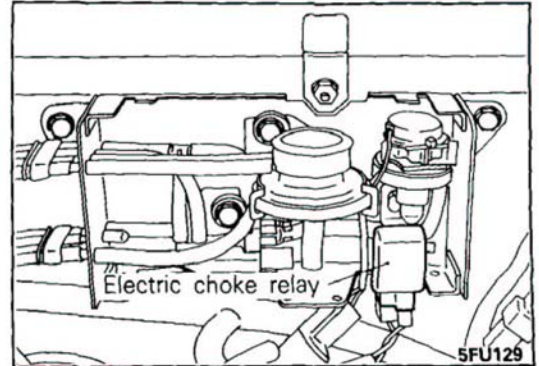
**H Oxygen Sensor**



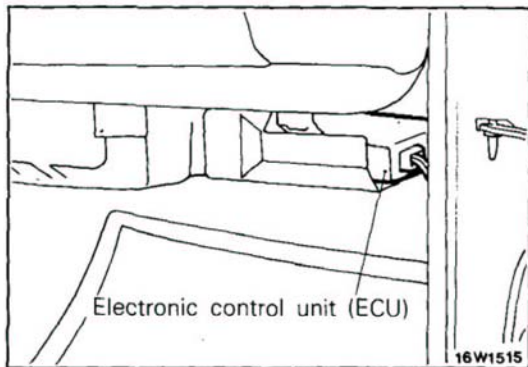
**I Secondary Air Control Solenoid Valve**



**J Electric Choke Relay**

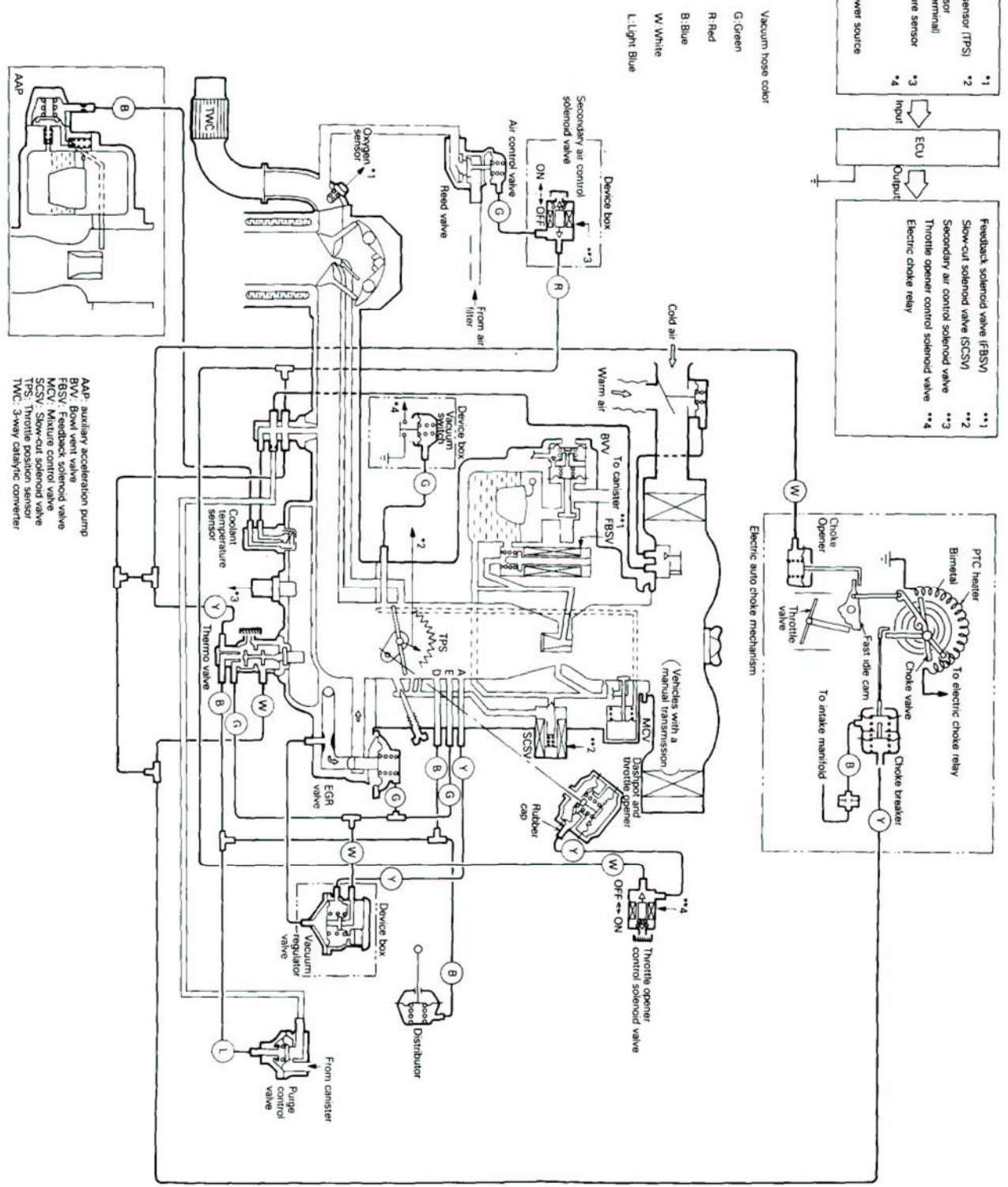


**K Electronic Control Unit (ECU)**



5FU115

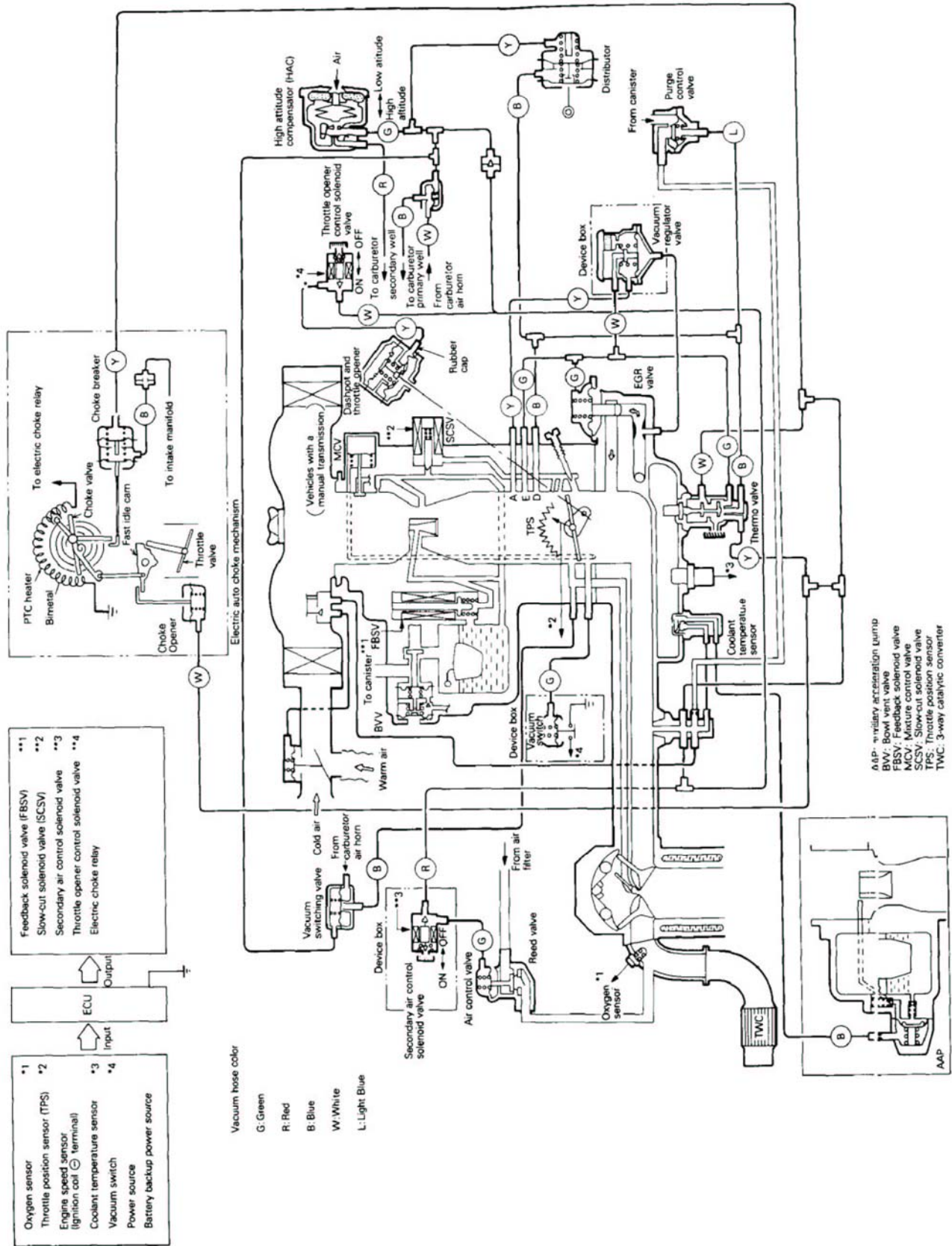
N14E-B



5FU115

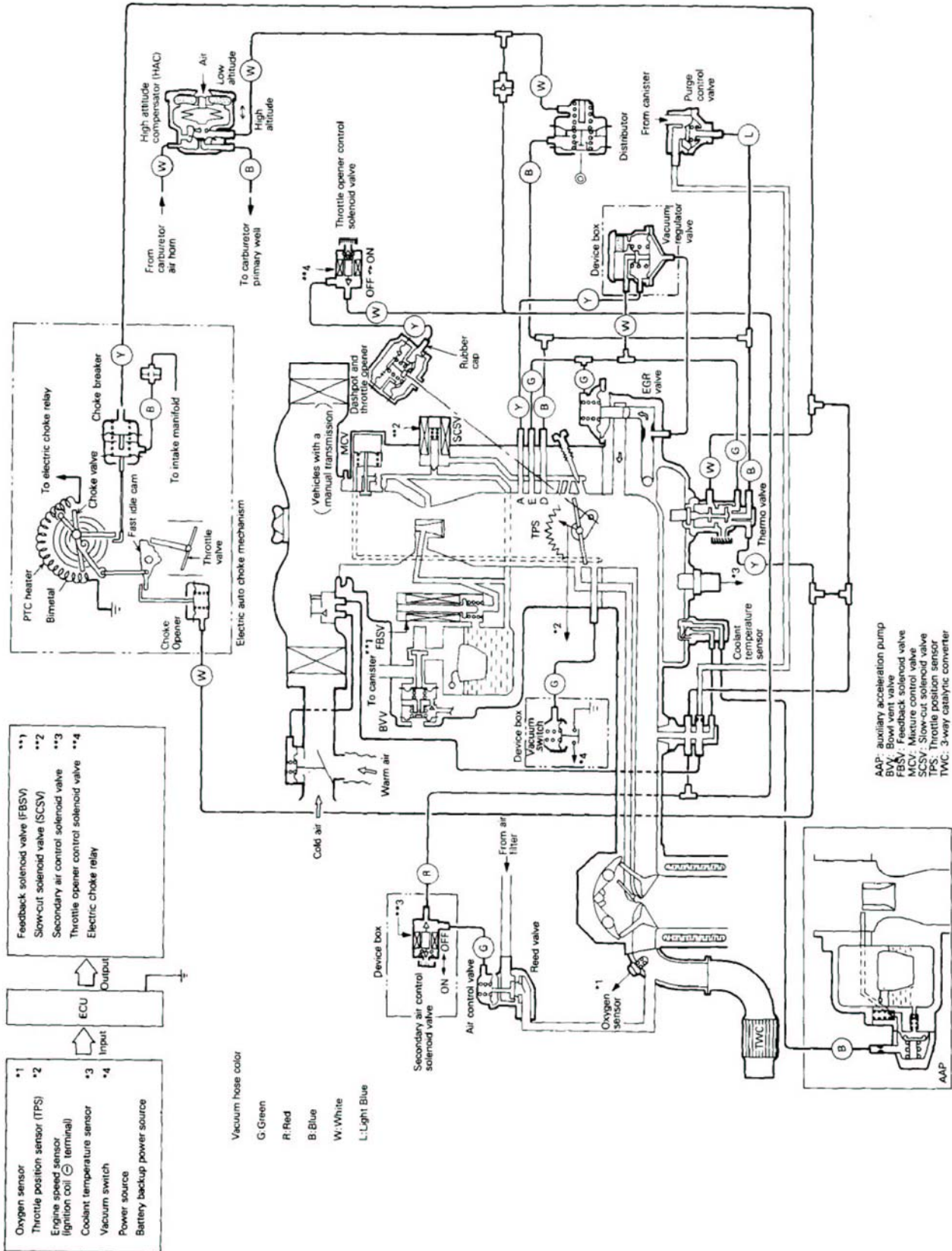
N14E-B

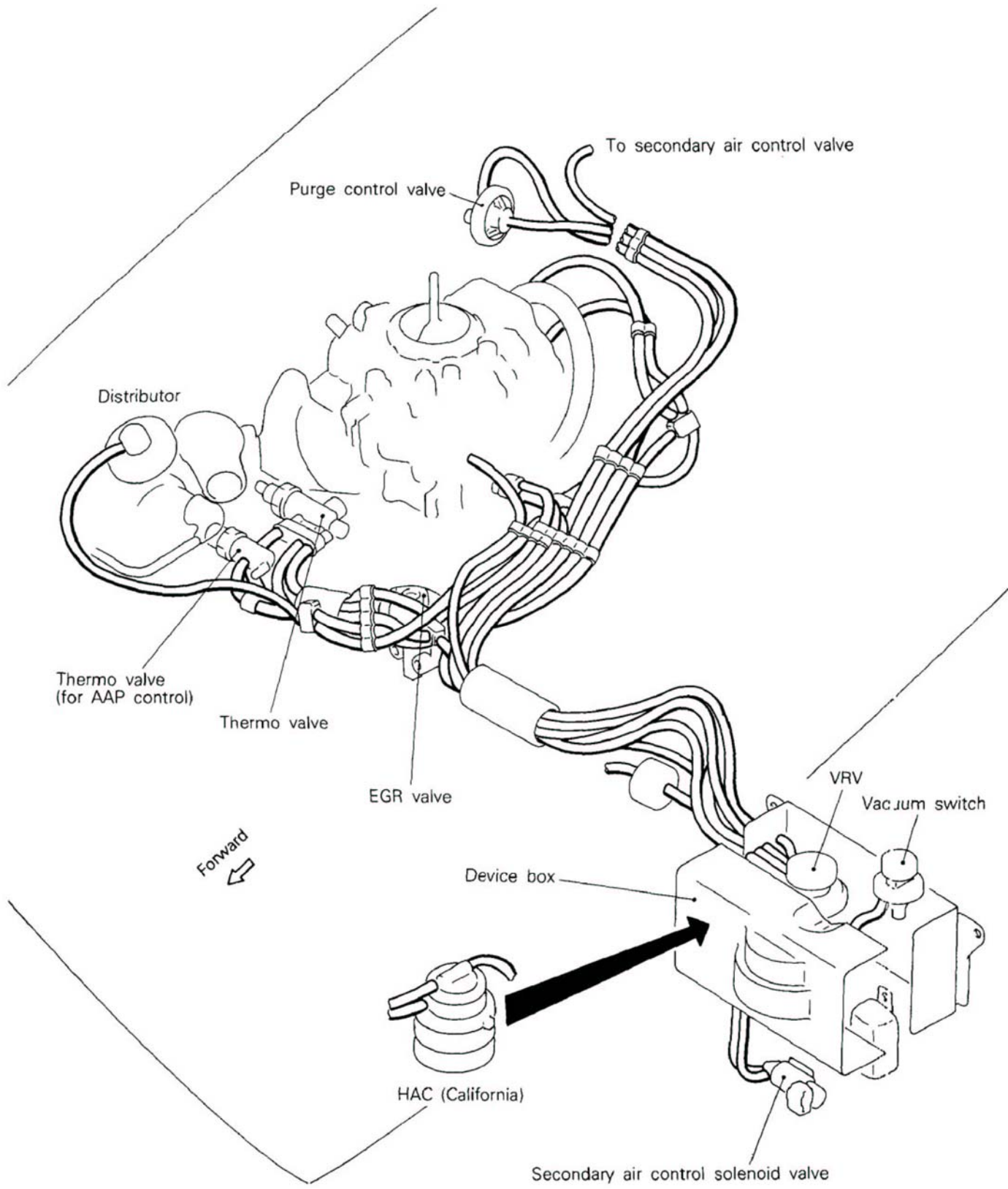
Vacuum Hose Layout...vehicles with high-altitude specifications for the 49 states other than California



Vacuum Hose Layout ...vehicles for California

5FU117







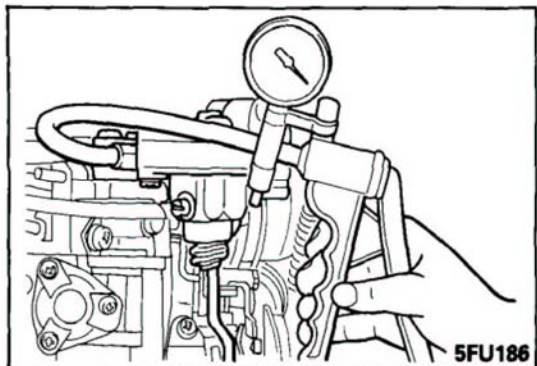
**INSPECTION OF THROTTLE OPENER CONTROL SYSTEM FOR AIR CONDITIONER LOAD**

N14PGBB

Inspection Condition

Engine coolant temperature : 85–95°C (185–205°F)

- (1) Disconnect the vacuum hose (yellow stripe) from the throttle opener installed on the carburetor and connect a hand vacuum pump to the nipple.
- (2) Check that the throttle opener rod is pulled up when vacuum is applied
- (3) Apply 67 kPa (10.0 psi) vacuum and check air tightness.
- (4) Start the engine and close the vacuum hose (yellow stripe) end with a finger to check vacuum when the air conditioner switch is turned on and off.



Air conditioner switch	Engine speed	Hose end vacuum
OFF	Idle	Absent
ON		Present
		1,200 rpm or more

**ELECTRONIC CONTROL UNIT (ECU) CONNECTOR REMOVAL AND INSTALLATION PROCEDURES**

N14PBAA

- (1) Disconnect the battery negative (–) terminal connection.
- (2) Remove the ECU cover.

- (3) Unlocking the computer unit connector, pull out the harness connectors.

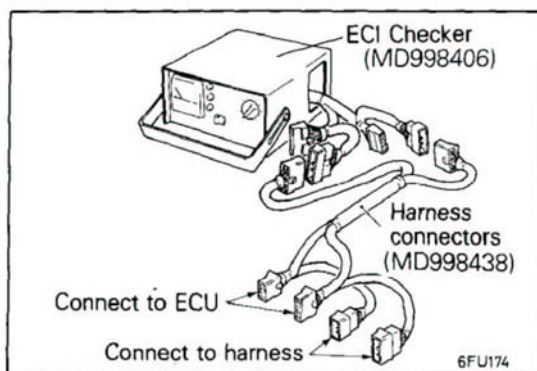
**NOTE**

For installation, reverse the removal steps.

**INSPECTION OF ELECTRONIC CONTROL UNIT (ECU) INPUT AND OUTPUT ELECTRIC SIGNALS**

N14PDAB

Inspection and maintenance of electric system in the FBC system can be made quickly by inspecting the ECU input and output electric signals with the ECI checker and then by inspecting the component whose signal is abnormal and the harness between the component and the ECU.

**CHECK PROCEDURE (METHOD USING ECI CHECKER)**

N14PDAC

Using the special tools (FBC Harness Connector and ECI Checker), check the FBC system by the following procedure.

Inspection Procedure:

- (1) Turn ignition switch to "Lock".
- (2) Remove the Large harness connector and Small harness connector from the ECU.
- (3) Set check switch of the ECI checker to OFF.
- (4) Set select switch of the ECI checker to A.
- (5) Connect the FBC HARNESS CONNECTOR to the connectors of the ECI checker, and then connect the FBC HARNESS CONNECTOR to the ECU and harness connectors.
- (6) Perform checks according to the FBC System Check Procedure chart.
- (7) If checker shows any variance from specifications, check the corresponding sensor and related electrical wiring then repair or replacement.
- (8) After repair or replacement, recheck with the ECI checker to confirm that the repair has corrected the problem.
- (9) Set check switch of the ECI checker to OFF.
- (10) Set ignition switch to "Lock".
- (11) Disconnect connectors of the ECI checker and the FBC HARNESS CONNECTOR from the ECU and the body side harness connectors.
- (12) Connect the body side harness connectors to the ECU.
- (13) After completion of the above test make certain that the trouble has been eliminated on the road test.

FBC SYSTEM CHECK PROCEDURE CHART  
(Use FBC Harness Connector MD998438)

ECI Checker Operation		Check Item	ECU Terminal # Checked	Condition	Test Specification	
Select Switch	Check Switch					
Set to "A"	1	Power supply	7	Ignition switch "LOCK → ON"	11V to 13V	
	2	Ignition pulse	10	Ignition switch "LOCK → ON"	2V to 8V	
	3					
	4	Coolant temperature sensor	12	Ignition switch "LOCK → ON"	0 °C (32 °F)	3.4V to 3.6V
					20 °C (68 °F)	2.4V to 2.7V
					40 °C (104 °F)	1.5V to 1.8V
					80 °C (176 °F)	0.5V to 0.7V
	5	Power supply for sensor	3	Ignition switch "LOCK → ON"		4.5V to 5.5V
	6	Throttle position sensor (TPS)	13	Ignition switch "LOCK ON" (warm engine)	Accelerator fully closed	0.4V to 0.7V
					Accelerator fully opened	4.5V to 5.5V
	7	Vacuum switch for dile position	5	Ignition switch "LOCK → ON"		9V to 13V
					Idling (warm engine)	0V to 0.6V
8						
9	Feed back solenoid valve (FBS)	59	Ignition switch "LOCK → ON"		11V to 13V	
				Idling (warm engine)	2V to 12V	
10	Slow cut-off solenoid valve (SCS)	53	Idling		0V to 0.6V	
				Quick deceleration from above 4000 rpm to idling with "N" position	Momentarily 13V to 15V	
11						
12						

FBC SYSTEM CHECK PROCEDURE CHART  
(Use FBC Harness Connector MD998438)

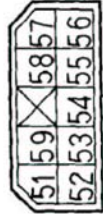
ECI Checker Operation		Check Item	ECU Terminal # Checked	Test Result	Condition	Test Specification
Select Switch	Check Switch					
	1	Idle up control solenoid valve	54	Idling 2000 rpm	A/C switch ON*1	0V to 0.6V 9V to 15V
	2	A/C cut-off relay	57	Ignition switch "LOCK → ON" and A/C switch "ON" **1	Accelerator fully closed Accelerator fully opened	0V to 0.6V 0V to 0.6V
	3					
	4	Secondary air control solenoid valve	55	Start the warmed up engine and keep it running at idling for more than 70 seconds Quick deceleration from above 2000 rpm to idling with "N"		0V to 0.6V then 13V to 15V Momentarily drop
	5					
	6					
	7					
	8	Oxygen sensor	1	Hold rpm constant above 1300 rpm, after 70 seconds from start of warm engine		0V to 1V ↑ (pulsates) ↓ *2V to 3V
	9					
	10					
	11					
	12					

Set to "B"

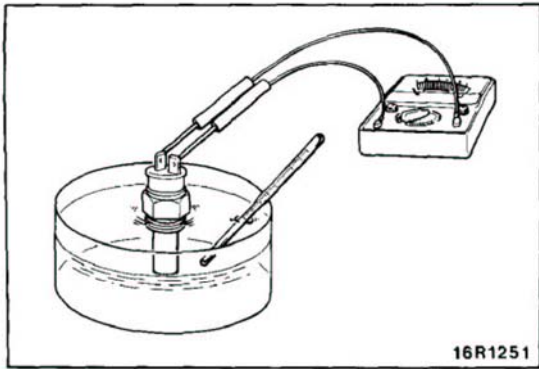
NOTE: \*1 ON means compressor clutch engaged.

\*2 Failure of parts other than the oxygen sensor can also cause deviation from the specifications. Also check other parts related to air-fuel ratio control, which are listed on page 14-13.

ECU Terminal



View from front as installed in ECU



16R1251

## INSPECTION OF FBC SYSTEM COMPONENTS

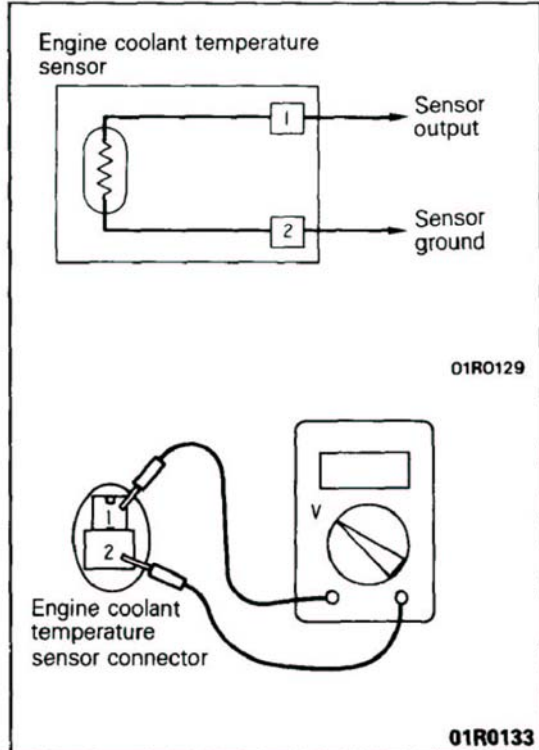
N14QAAA

### INSPECTION OF ENGINE COOLANT TEMPERATURE SENSOR

#### INSPECTION

- (1) Remove engine coolant temperature sensor from the intake manifold.
- (2) With temperature sensing portion of engine coolant temperature sensor immersed in hot water, check electrical resistance. The sensor should be held with its housing 3 mm (.12 in.) away from the surface of the hot water.

Temperature °C (°F)	Resistance (kΩ)
0 (32)	5.9
20 (68)	2.5
40 (104)	1.1
80 (176)	0.3



01R0129

01R0133

- (3) If the resistance deviates greatly from the standard value, replace the engine coolant temperature sensor.

#### INSTALLATION

- (1) Apply specified adhesive to threaded portion.

**Specified adhesive : 3M Adhesive Nut Locking No. 4171 or equivalent**

- (2) Install engine coolant temperature sensor and tighten it to specified torque.

**Sensor tightening torque : 20–40 Nm (14–29 ft.lbs.)**

- (3) Fasten harness connectors securely.

### INSPECTION OF THROTTLE POSITION SENSOR (TPS)

N14QBAB

- (1) Disconnect the carburetor connector.
- (2) Measure resistance between terminal 1 (sensor power) and terminal 8 (sensor ground).

**Standard value : 3.5 – 6.5 kΩ**

- (3) Connect an ohmmeter (pointer type) between terminal 8 (sensor ground) and terminal 2 (sensor-output).
- (4) Operate the throttle valve slowly from idle position to the full open position and check that the resistance makes a smooth change proportionally with the throttle valve opening.

#### NOTE

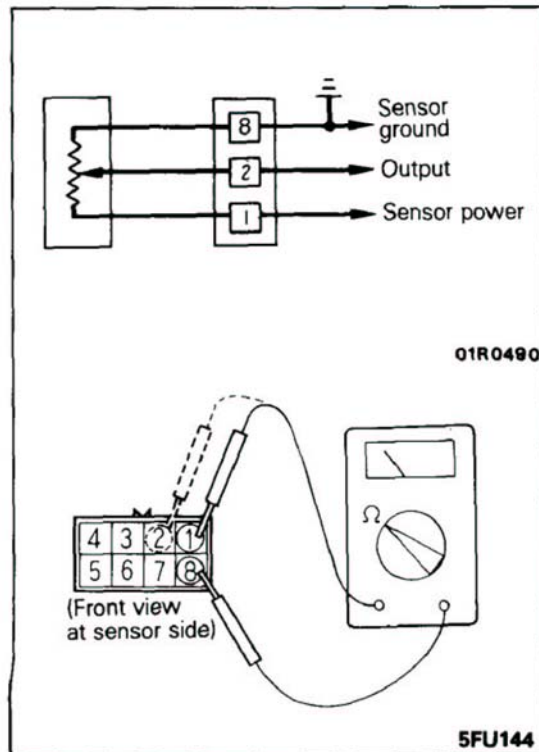
The resistance changes within the range from approx.0.5 kΩ to the value measured at step (2).

- (5) If the resistance is out of specification or fails to change smoothly, replace the TPS.

**TPS installation torque : 2.5 – 4.5 Nm (1.8 – 3.3 ft. lbs.)**

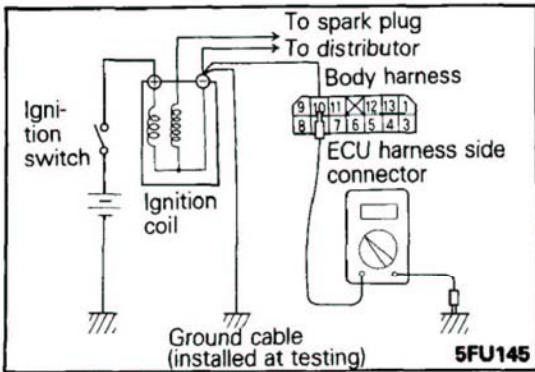
#### NOTE

Refer to P.14-28 for the throttle position sensor adjusting procedure.



01R0490

5FU144



**INSPECTION OF ENGINE SPEED SENSOR (IGNITION COIL ⊖ TERMINAL)**

N14QCAB

Check that there is continuity between the ignition coil ⊖ terminal and the electronic control unit (ECU) terminal 10.

**NOTE**

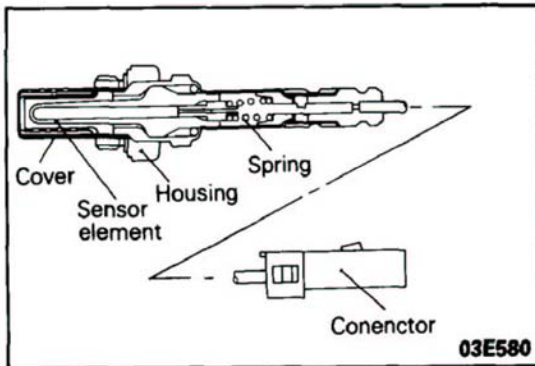
Shake the harness connector to check for lurking open circuit.

**INSPECTION OF OXYGEN SENSOR**

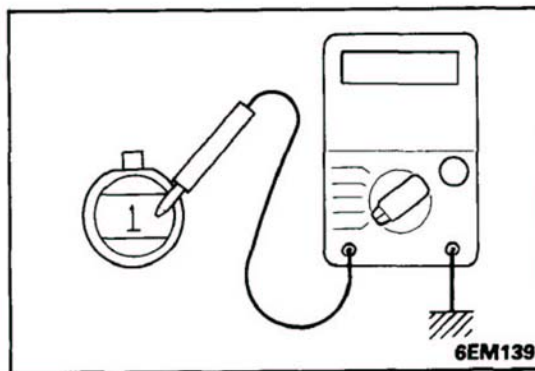
N14QDAA

**Caution**

1. Before checking, warm up the engine until engine coolant temperature reaches 85 to 95° (185 to 205°F).
2. Use an accurate digital voltmeter.
  - (1) Separate the oxygen sensor connector and connect a voltmeter to the oxygen sensor connector.
  - (2) While repeating engine racing, measure the oxygen sensor output voltage.



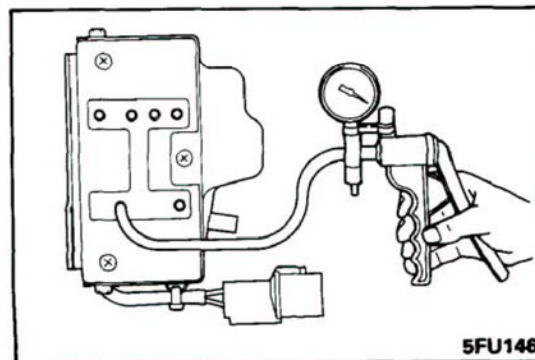
Engine	Oxygen sensor output voltage	Remarks
Racing	Approx. 1 V	Make air-fuel mixture richer by accelerator operation



**NOTE**

For removal and installation of the oxygen sensor, refer to GROUP 11 INTAKE AND EXHAUST SYSTEM -Exhaust Manifold.

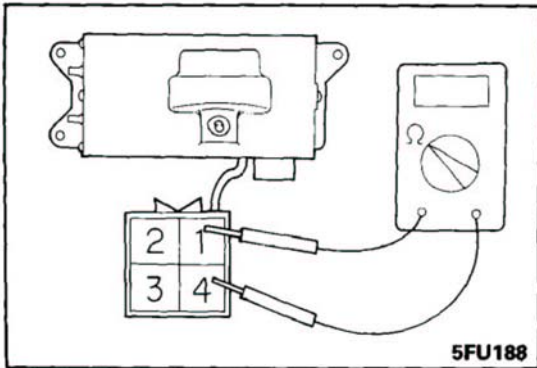
**Oxygen sensor installation torque : 40 – 50 Nm  
(30 –36 ft. lbs.)**



**CHECKING THE VACUUM SWITCH**

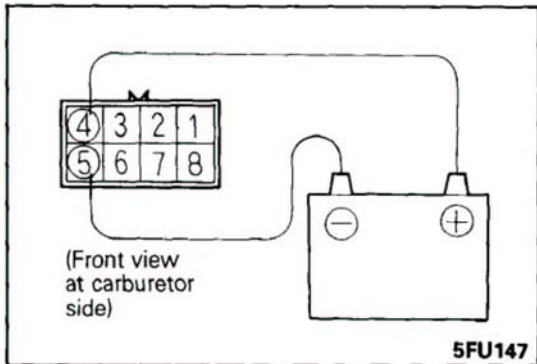
N14QIAA

- (1) Disconnect the vacuum hose (green stripe) from the device box, and connect a manual vacuum pump to the device box nipple.
- (2) Detach the vacuum switch connector.
- (3) Apply negative pressure (vacuum) and check whether or not there is continuity between the switch terminals.



Vacuum gauge	Measured terminals	Continuity
26 kPa (3.9 psi) or lower	① - ④	No ( $\infty\Omega$ )
40 kPa (5.8 psi) or higher	① - ④	Yes (0 $\Omega$ )

(4) If there is a problem, remove the device box cover, and replace the vacuum switch assembly.



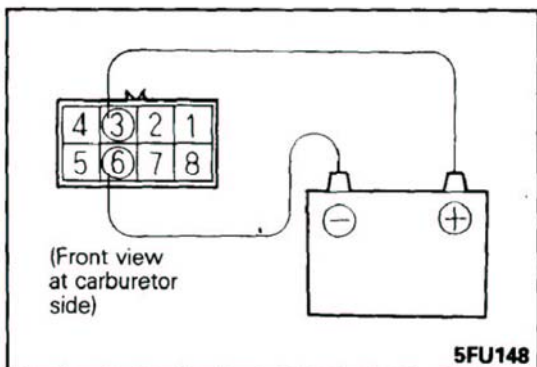
**SIMPLE INSPECTION OF FEEDBACK SOLENOID VALVE (FBSV)**

N14QOAB

- (1) Disconnect the carburetor connector.
- (2) Apply battery voltage (approx. 12V) between the solenoid valve terminals and check that the solenoid valve operates with a click.  
If no click is heard, replace the solenoid valve.

**NOTE**

For the feedback solenoid valve removal and inspection procedures, refer to CARBURETOR DISASSEMBLY AND REASSEMBLY, P.14-63.



**SIMPLE INSPECTION OF SLOW CUT SOLENOID VALVE (SCSV)**

N14QPAB

- (1) Disconnect the carburetor connector.
- (2) Apply battery voltage (approx. 12V) between the solenoid valve terminals and check that the solenoid valve operates with a click.  
If no click is heard, replace the solenoid valve.

**NOTE**

For the slow cut solenoid valve removal and inspection procedures, refer to CARBURETOR DISASSEMBLY AND REASSEMBLY, P.14-63.

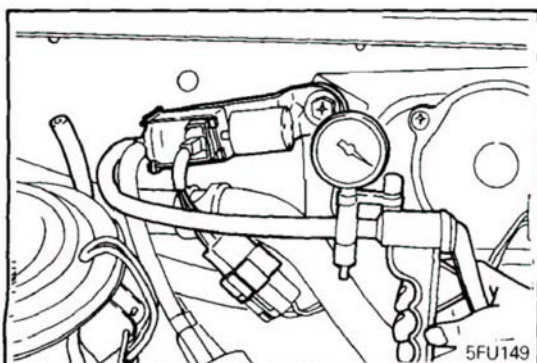
**INSPECTION OF THROTTLE OPENER CONTROL SOLENOID VALVE FOR AIR CONDITIONER**

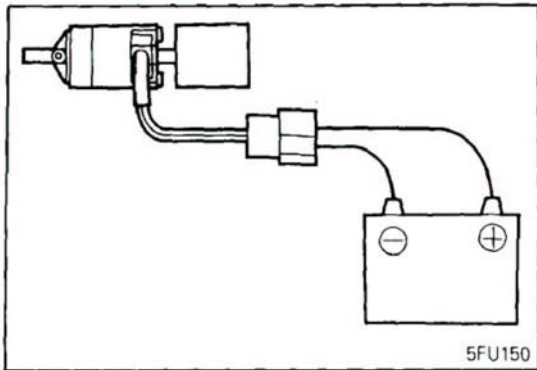
N14QXBA

**NOTE**

When removing the vacuum hoses from the solenoid valve, put marks on the hoses for correct installation.

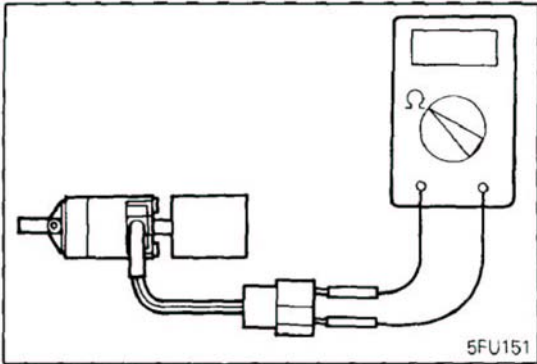
- (1) Remove the vacuum hoses (white stripe, yellow stripe) from the solenoid valve.
- (2) Disconnect the harness connector.
- (3) Connect a hand vacuum pump to the nipple to which the white stripe vacuum hose has been connected.





(4) Apply vacuum and check air tightness for both when battery voltage is directly applied to the solenoid valve terminal and when no voltage is applied.

Battery voltage	The other nipple of solenoid valve	Normal state
Applied	Open	Vacuum leaks
	Closed with finger	Vacuum is held
Not applied	Open	Vacuum is held



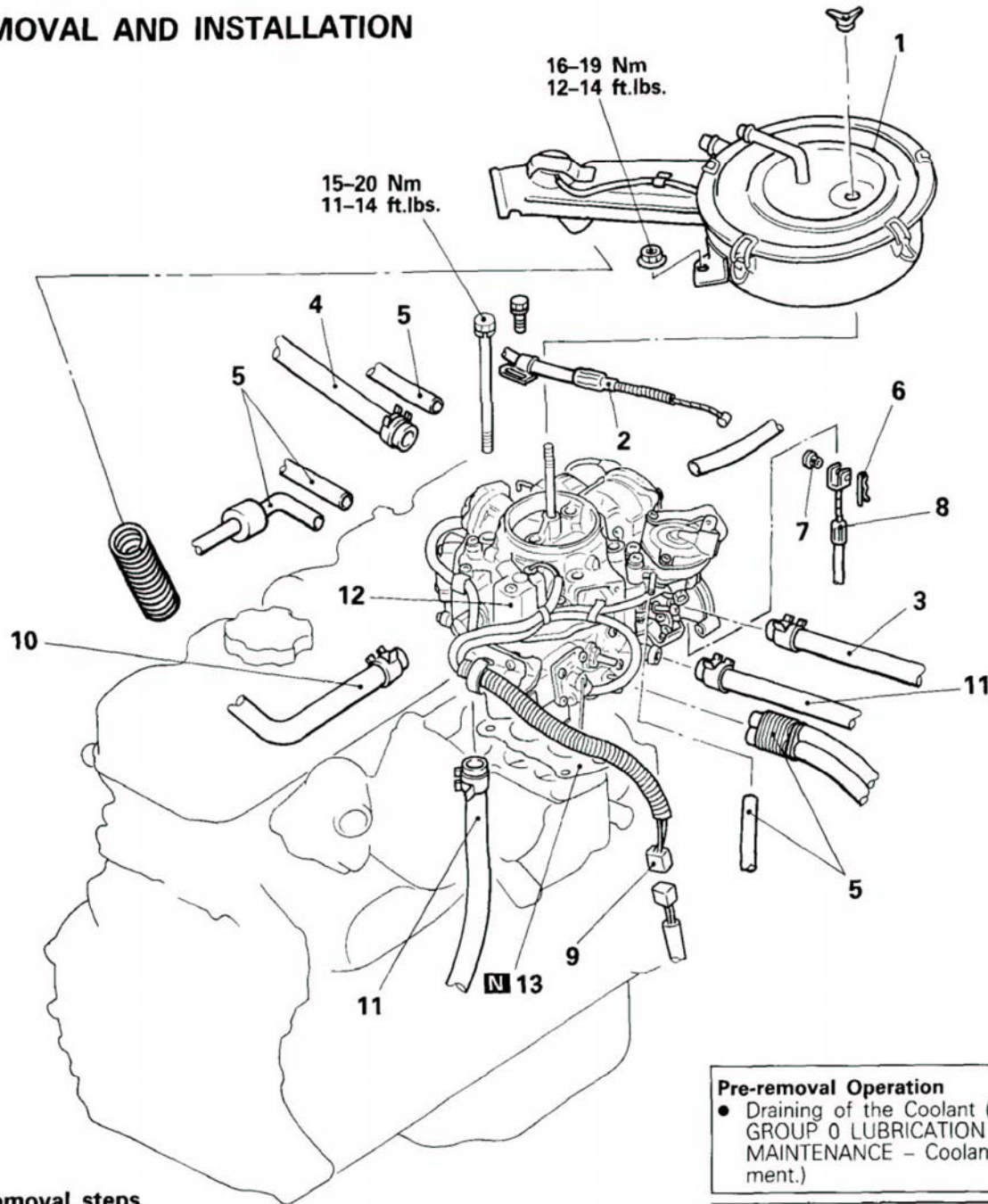
(5) Measure the solenoid coil resistance.

**Standard value : 38 – 44Ω [at 20°C (68°F)]**



# CARBURETOR REMOVAL AND INSTALLATION

N14MA--



### Removal steps

- ◄◄ 1. Air filter
  - ◄◄ Adjustment of accelerator cable
  - ◄◄ 2. Connection of accelerator cable
  - ◄◄ 3. Connection of water hose
  - ◄◄ 4. Connection of fuel vapor hose
  - ◄◄ 5. Connection of vacuum hoses
  - ◄◄ Adjustment of throttle cable
  - ◄◄ 6. Snap pin
  - ◄◄ 7. Pin
  - ◄◄ 8. Connection of throttle cable
  - ◄◄ 9. Connection of control harness connector
  - ◄◄ 10. Connection of main hose
  - ◄◄ 11. Connection of return hose
  - ◄◄ 12. Carburetor
  - ◄◄ 13. Gasket
- } Vehicles with an automatic transmission

### Pre-removal Operation

- Draining of the Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE - Coolant Replacement.)

### Post-installation Operation

- Supplying of Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE - Coolant Replacement.)
- Checking and Adjustment of the Idling rpm (Refer to GROUP 0 LUBRICATION AND MAINTENANCE - Checking and Adjustment of the Idling rpm.)

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◄◄ : Refer to "Service Points of Removal".
- (3) ◄◄ : Refer to "Service Points of Installation".
- (4) N : Non-reusable parts

**SERVICE POINTS OF REMOVAL**

N14MBAC

**1. REMOVAL OF AIR FILTER**

Refer to GROUP 11 INTAKE AND EXHAUST SYSTEM – Air Filter.

**11. DISCONNECTION OF RETURN HOSE/10. MAIN HOSE**

- (1) Before disconnection of the fuel hose, remove the fuel tank cap to lower the pressure in the fuel tank.
- (2) With the receiver placed under the fuel inlet fitting to receive fuel left in the hose, remove fuel hose from the carburetor inlet nipple.

**12. REMOVAL OF CARBURETOR****NOTE**

When the carburetor is removed, keep it horizontally so as not to spill fuel from the carburetor.

**SERVICE POINTS OF INSTALLATION**

N14MDAB

**● ADJUSTMENT OF THROTTLE CABLE**

Refer to GROUP 21 TRANSMISSION – Adjustment of Throttle Cable.

**● ADJUSTMENT OF ACCELERATOR CABLE FREE PLAY**

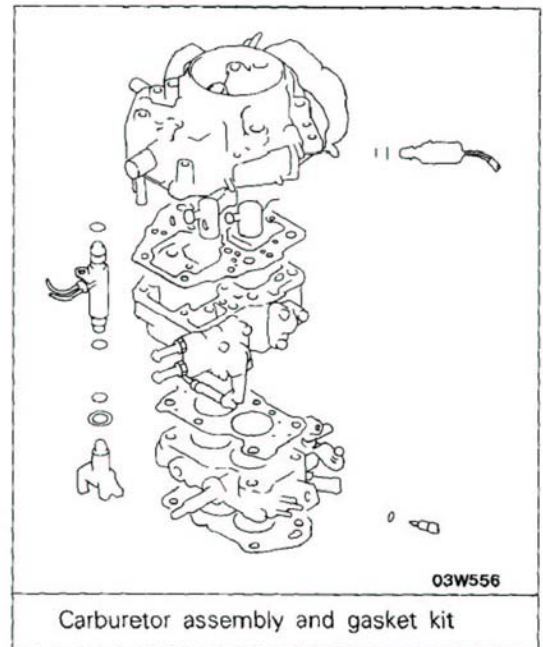
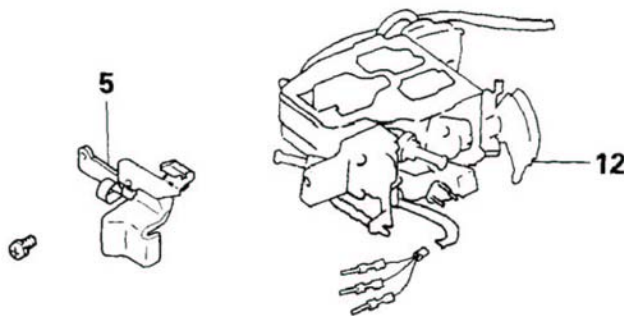
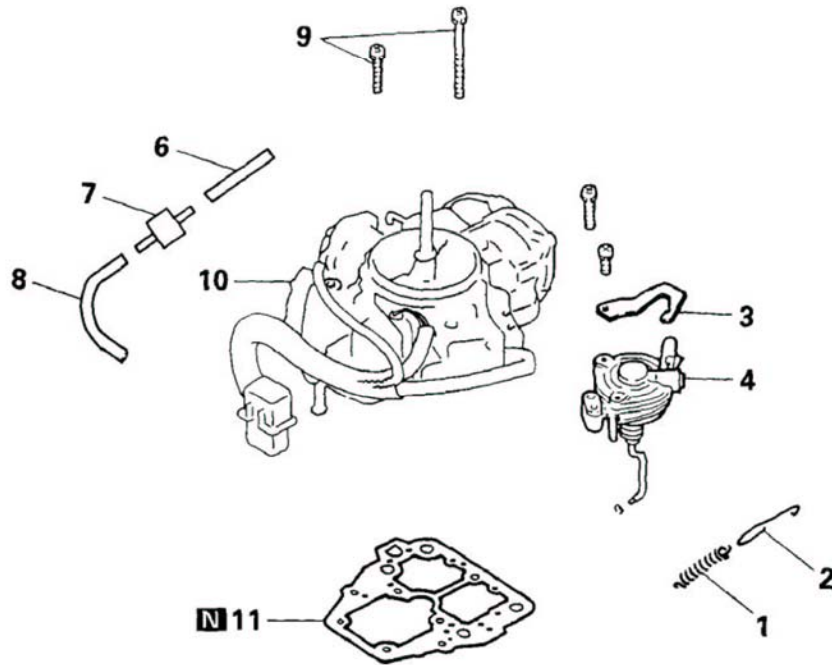
Refer to P.14-84.

**1. INSTALLATION OF AIR FILTER**

Refer to GROUP 11 INTAKE AND EXHAUST SYSTEM - Air Filter.

DISASSEMBLY AND REASSEMBLY

N14ME--

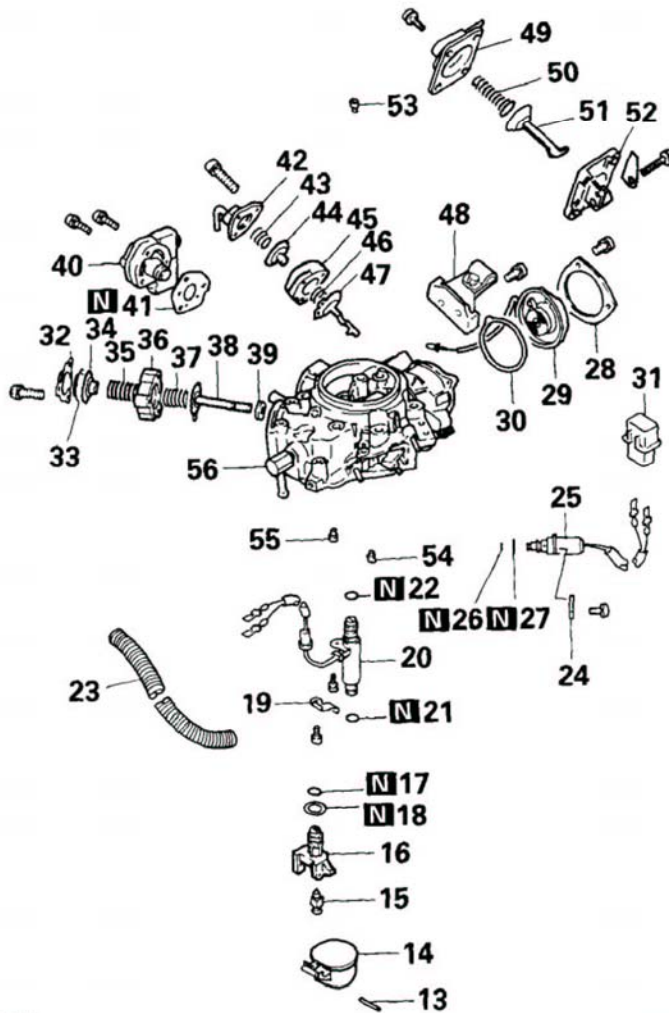


Disassembly steps

1. Throttle-return spring
2. Damper spring
3. Throttle-return spring bracket
4. Throttle opener/Dash pot
5. Bracket
6. Hose
7. Vacuum-delay valve
8. Hose
9. Screw
10. Float chamber cover assembly
11. Float chamber cover gasket
12. Mixing body and throttle body assembly

NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2) : Refer to "Service Points of Disassembly".
- (3) **N** : Non-reusable parts



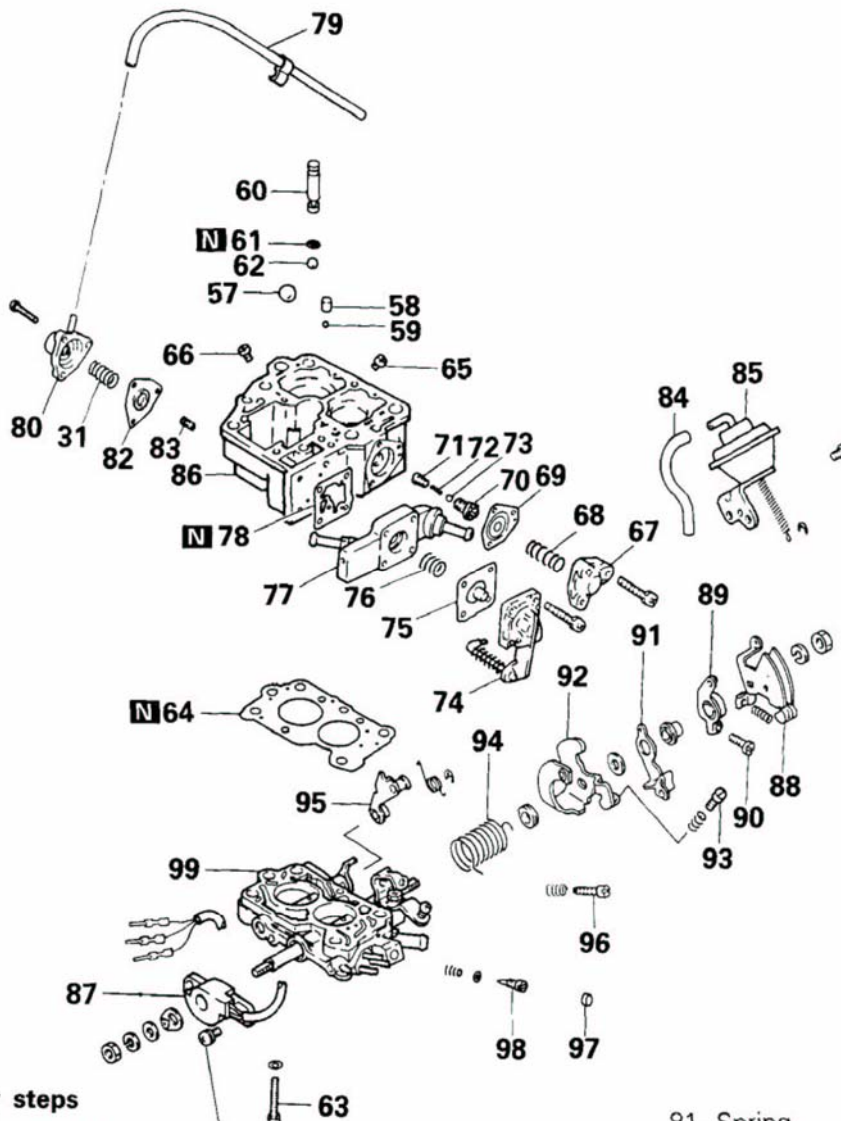
**Disassembly steps**

- 13. Pin
- ◄◄ 14. Float
- ◄◄ 15. Needle valve
- ◄◄ 16. Needle valve seat
- 17. O-ring
- 18. Packing
- 19. Retainer
- ◄◄ ◄◄ 20. Feedback solenoid valve (FBSV)
- 21. O-ring
- 22. O-ring
- 23. Tube
- 24. Retainer
- ◄◄ ◄◄ 25. Slow-cut solenoid valve (SCSV)
- 26. O-ring
- 27. O-ring
- 28. Plate
- ◄◄ ◄◄ 29. Bimetal assembly
- 30. Packing
- 31. Connector
- 32. Cover
- 33. Diaphragm
- 34. Spring seat
- 35. Spring
- 36. Body

- 37. Spring
- 38. Diaphragm
- 39. Valve
- 40. Mixture control valve (MCV) assembly
- 41. Gasket
- 42. Cover
- 43. Spring
- 44. Diaphragm
- 45. Body
- 46. Spring
- 47. Diaphragm
- 48. Bracket
- 49. Cover
- 50. Spring
- 51. Diaphragm
- 52. Body
- ◄◄ ◄◄ 53. Main air jet (primary)
- ◄◄ ◄◄ 54. Pilot jet (primary)
- ◄◄ ◄◄ 55. Pilot jet (secondary)
- 56. Float chamber cover

**NOTE**

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◄◄ : Refer to "Service Points of Disassembly".
- (3) ◄◄ : Refer to "Service Points of Reassembly".
- (4) **N** : Non-reusable parts



**Disassembly steps**

- ◆◆ 57. Steel ball
- ◆◆ 58. Weight
- ◆◆ 59. Ball
- ◆◆ 60. Plug
- ◆◆ 61. O-ring
- ◆◆ 62. Ball
- ◆◆ 63. Screw
- ◆◆ 64. Gasket
- ◆◆ ◆◆ 65. Main jet (primary)
- ◆◆ ◆◆ 66. Main jet (secondary)
- 67. Cover
- 68. Spring
- 69. Diaphragm
- ◆◆ 70. Enrichment jet valve
- 71. Enrichment jet
- 72. Spring
- 73. Ball
- 74. Pump cover assembly
- 75. Diaphragm
- 76. Spring
- 77. Pump body
- 78. Gasket
- 79. Hose
- 80. Auxiliary acceleration pump cover

2.5-4.5 Nm  
1.8-3.2 ft.lbs

- 81. Spring
- 82. Diaphragm
- 83. Check valve
- 84. Mixing body
- 85. Vacuum hose
- 86. Depression chamber
- 87. Throttle-position sensor (TPS)
- 88. Throttle lever
- 89. Cam follower
- 90. Fast-idle adjustment screw
- 91. Free lever
- 92. Apartment plate
- 93. Idle-speed adjustment screw (SAS-2)
- 94. Spring
- 95. Secondary lever
- 96. Idle-speed adjustment screw (SAS-1)
- ◆◆ 97. Plug
- 98. Mixture-adjustment screw (MAS)
- 99. Throttle body

**NOTE**

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆ : Refer to "Service Points of Reassembly".
- (4) N : Non-reusable parts

## SERVICE POINTS OF DISASSEMBLY

N14MFAA

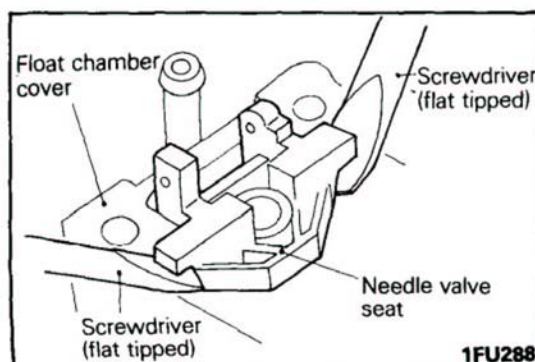
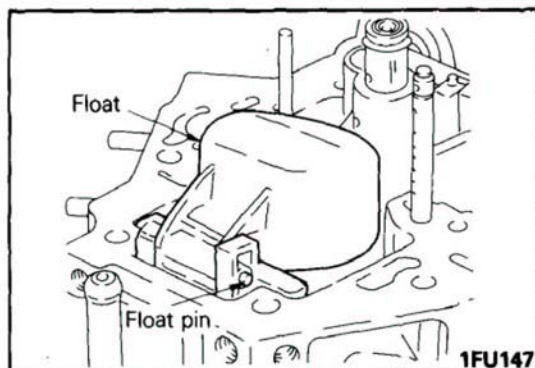
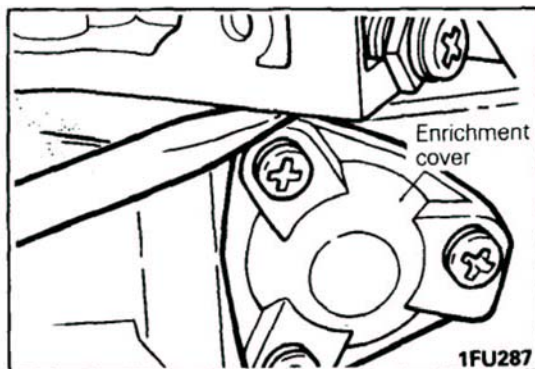
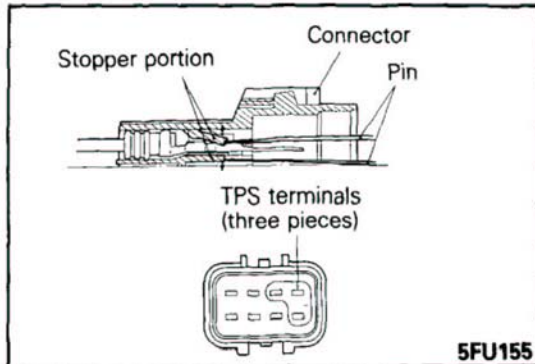
**Caution**

1. Do not disassemble the following components at the time of disassembly.
  - (1) Choke valve, choke shaft and automatic choke device
  - (2) Inner venturi
  - (3) Throttle valve and throttle shaft
  - (4) Fuel inlet nipple
2. When loosening a Philips screw which has been firmly tightened, use a Philips screwdriver that is an exact fit for the screw.

**10. REMOVAL OF FLOAT CHAMBER COVER ASSEMBLY****Caution**

Ensure that the terminal is not bent during removal of the connector.

- (1) With a pin or the like push the stopper portion to remove each of the three TPS terminals from the rear of the connectors.



- (2) Do not attempt to remove the cover at a time as it is held in position firmly by gasket. Insert a screwdriver blade between the enrichment cover and the float chamber cover as illustrated and lightly pry and lift up lightly.

**Caution**

Do not apply excessive force.

**14. REMOVAL OF FLOAT / 15. NEEDLE VALVE**

Remove the pin and then remove the float and needle valve.

**Caution**

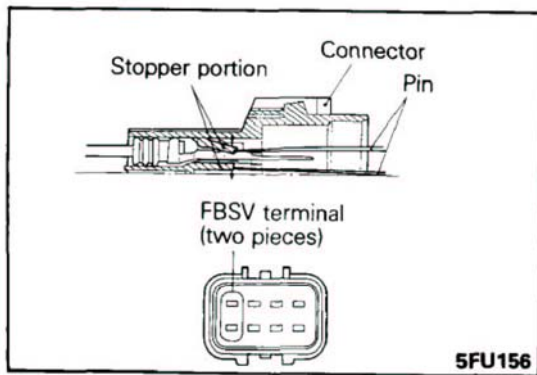
1. Do not let the float drop or apply collapsing load.
2. Use care not to damage the end of the needle valve.

**16. REMOVAL OF NEEDLE VALVE SEAT**

Using flat blade screwdrivers, pry up the needle valve seat at both edges to remove.

**Caution**

Use care not to damage the float chamber cover when pushing up the needle valve seat.



**20. REMOVAL OF FEEDBACK SOLENOID VALVE (FBSV)**

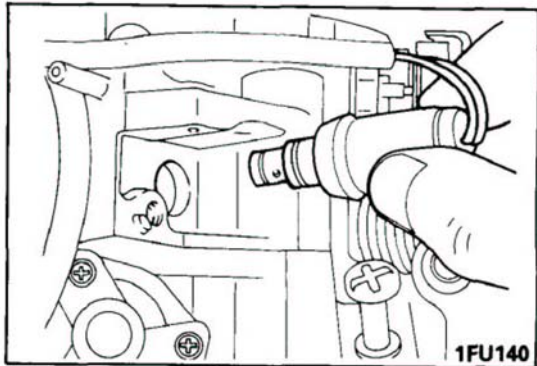
Using a screwdriver or other tool with a thin flat end, push the stopper portion and remove the two terminals from behind the connector.

**Caution**

**Ensure that the terminal is not bent during removal of the connector.**

**NOTE**

Unless the terminals are removed from the connector, the feedback solenoid valve cannot be removed from the float chamber cover.

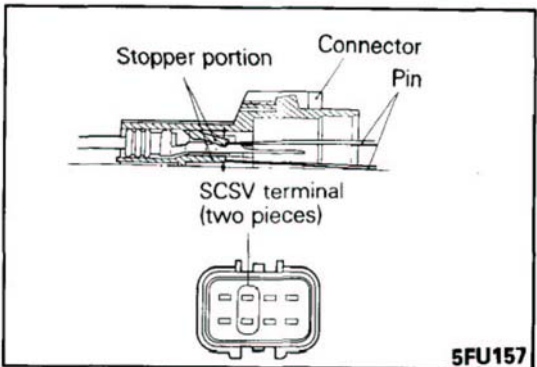


**25. REMOVAL OF SLOW CUT SOLENOID VALVE (SCSV)**

- (1) Remove the retainer and pull out the slow cut solenoid valve.

**Caution**

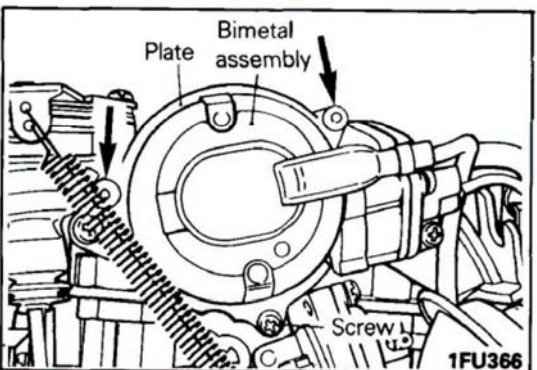
**When removing the valve, do not hold the leads but hold the body.**



- (2) Using a screwdriver or other tool with a thin flat end, push the stopper section and remove the two terminals from behind the connector.

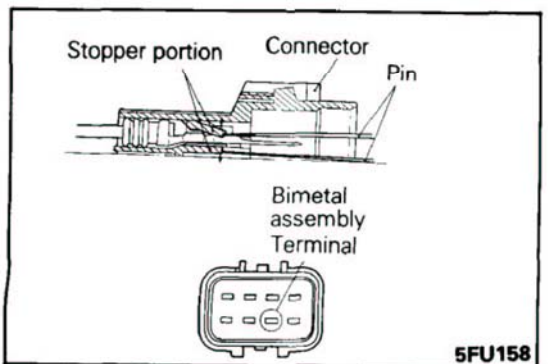
**Caution**

**Ensure that the terminal is not bent during removal of the connector.**



**29. REMOVAL OF BIMETAL ASSEMBLY**

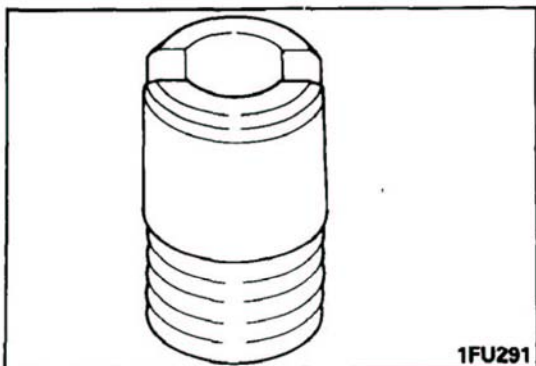
- (1) Grind away the head of the two rivets of the bimetal assembly using an hand grinder or other tool. Remove the screw.
- (2) Remove the plate, the bimetal assembly and the packing.
- (3) Remove the remaining rivet bodies using a pin punch etc..



- (4) Using a screwdriver or other tool with a thin flat end, push the stopper section and remove the terminal from behind the connector.

**Caution**

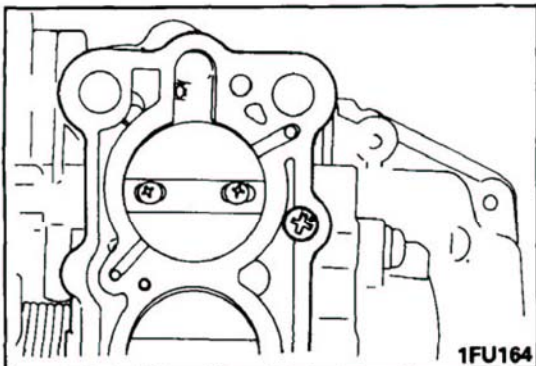
**Ensure that the terminal is not bent during removal of the connector.**



1FU291

### 53. REMOVAL OF MAIN AIR JET (PRIMARY)/54. PILOT JET (PRIMARY)/55. PILOT JET (SECONDARY)

- (1) When removing the jets, use a screwdriver that is an exact fit for their slot and work carefully to prevent damage.



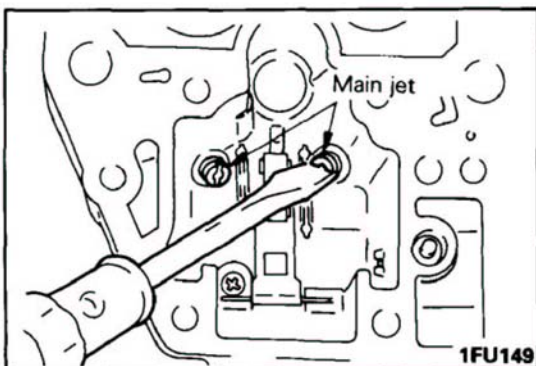
1FU164

### 63. REMOVAL OF SCREW

- (1) Use a Phillips screwdriver that is an exact fit and work carefully to prevent damage.

#### Caution

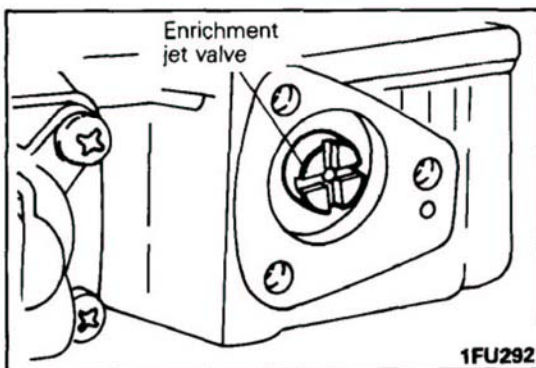
**Do not cause burrs to the recess in screw head as they could produce gap between throttle body and the manifold surface.**



1FU149

### 65. REMOVAL OF MAIN JET (PRIMARY)/66. MAIN JET (SECONDARY)

- When removing the jets, use a screwdriver that is an exact fit and work carefully to prevent damage.



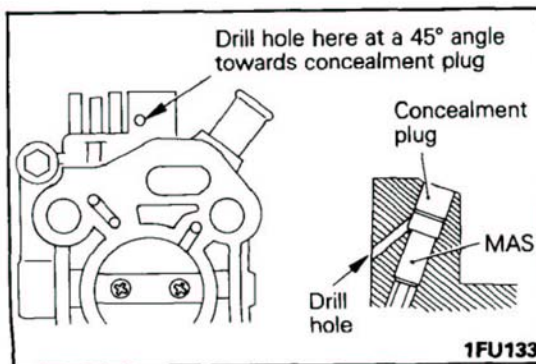
1FU292

### 70. REMOVAL OF ENRICHMENT JET VALVE

#### Caution

**The valve has many small parts. Do not lose them.**

- (1) When removing the enrichment jet valve from the mixing body, use a screwdriver that is an exact fit for its screwdriver slots and work carefully to prevent damage.
- (2) Using a screwdriver, loosen the enrichment jet and take out the spring and ball from the enrichment jet valve.



1FU133

### 97. REMOVAL OF PLUG

- (1) Clamp carburetor in a vice with idle mixture adjusting screw (MAS) facing up (protect gasket surface from vice jaws).
- (2) Drill a 2 mm (5/64 in.) pilot hole in the casting surrounding the idle mixture adjusting screw (MAS) then redrill the hole to 3 mm (1/8 in.).
- (3) Insert a blunt punch into the hole and drive out plug.



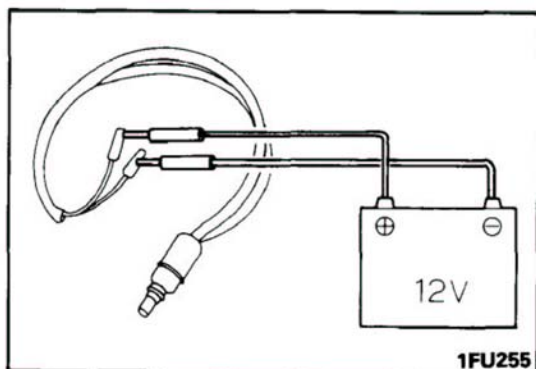
**INSPECTION**

N14MGAA

**GENERAL INSPECTION**

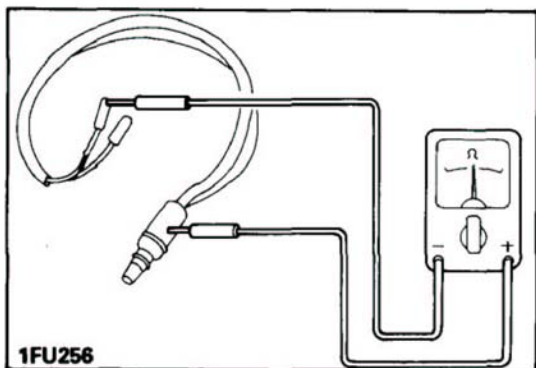
Check the following and repair or replace parts if necessary.

- (1) Check the fuel paths (jets) and air paths (jets or orifices) for clogging. If clogged, wash thoroughly with cleaning solvent or detergent and blow by compressed air. Do not use metal wire or other metal pieces.
- (2) Check the diaphragms for damage and cracks.
- (3) Check that the needle valve operates lightly. If the valve is hard to slide or is binding, repair or replace. If there is overflow, poor valve to seat contact is suspected. Check thoroughly.
- (4) Check the fuel inlet filter (located above the needle valve) for clogging and damage.
- (5) Check the float operation. Check the float and lever for deformation and damage and replace if necessary.
- (6) Check operation of the throttle valve, choke valve and link. If they do not operate lightly, wash well and apply engine oil sparingly to their shaft.
- (7) Check the float chamber and main body for damage and cracks.

**INSPECTION OF SLOW CUT SOLENOID VALVE (SCSV) OPERATION**

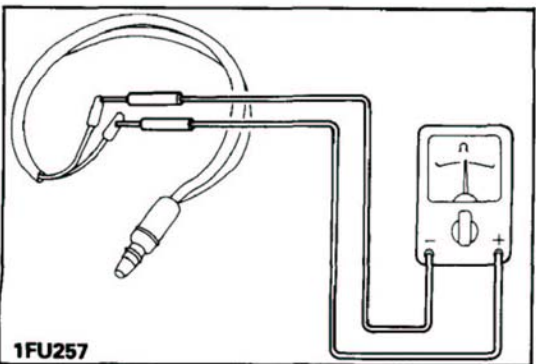
N14MGBA

- (1) Apply battery voltage directly to the slow cut solenoid valve terminals.
- (2) Check that the valve operates with a click.

**MEASUREMENT OF SLOW CUT SOLENOID VALVE (SCSV) RESISTANCE**

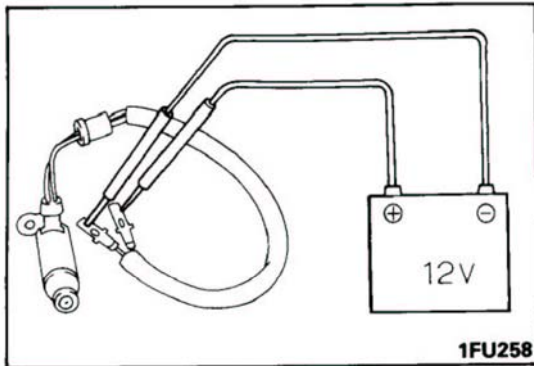
N14MGCA

- (1) Using a circuit tester, check that there is no continuity between the solenoid valve body and terminals.



- (2) Measure resistance between the terminals.

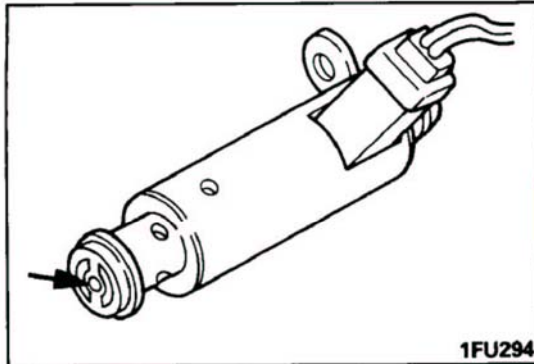
**Standard value : 48 – 60Ω [at 20°C (68°F)]**



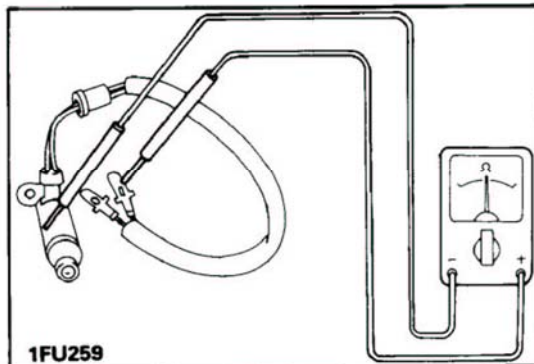
### INSPECTION OF FEEDBACK SOLENOID VALVE (FBSV) OPERATION

N14MGDA

- (1) Apply battery voltage directly to the feedback solenoid valve terminals.
- (2) Check that the valve operates with a click.



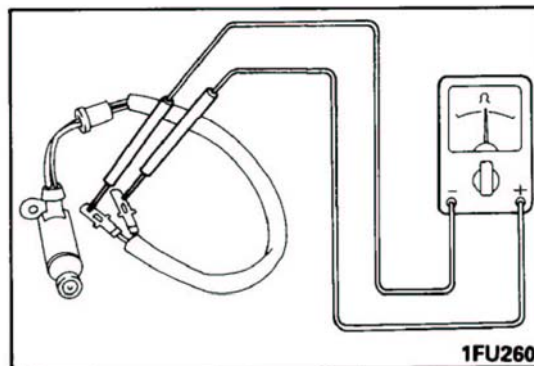
- (3) Check that the jet is free from clogging.



### MEASUREMENT OF FEEDBACK SOLENOID VALVE (FBSV) RESISTANCE

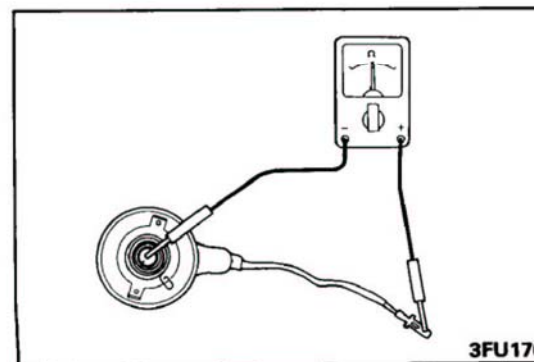
N14MGEA

- (1) Using a circuit tester, check that there is no continuity between the solenoid valve body and terminals.



- (2) Measure resistance between the terminals.

**Standard value : 54 – 66Ω [at 20°C (68°F)]**

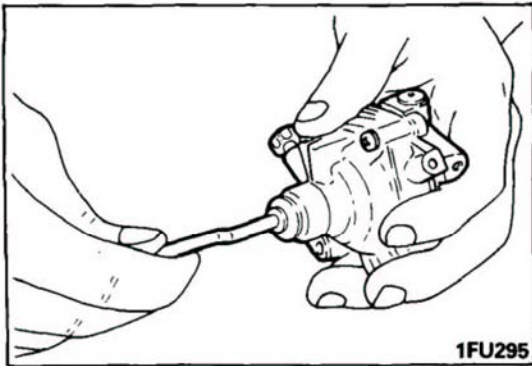


### MEASUREMENT OF BIMETAL ASSEMBLY RESISTANCE

N14MGFA

Using a circuit tester, measure resistance between the terminal and body.

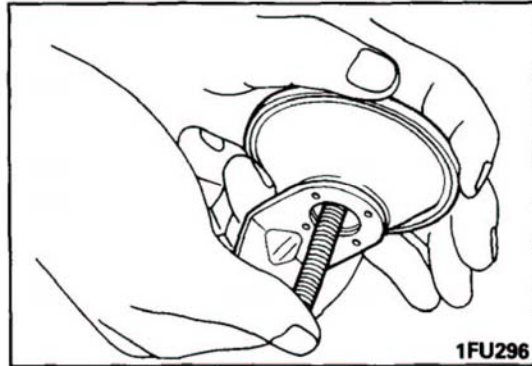
**Standard value : Approx. 6Ω [at 20°C (68°F)]**



**INSPECTION OF DASH POT**

N14MGGA

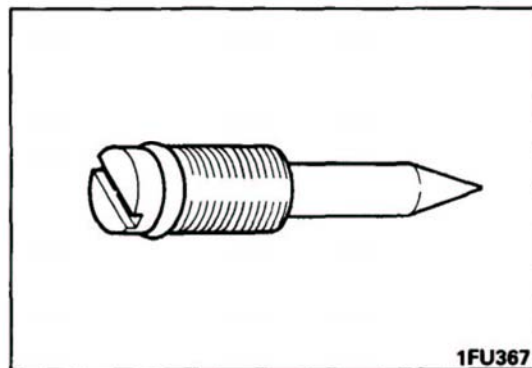
Check that the dash pot operates normally. Resistance must be felt when the dash pot rod is pulled. When the rod is released, it must return quickly to the original position. If no resistance is felt when it is pulled, the diaphragm or the check valve is broken. If the rod returns slowly, the check valve is binding. In either case, replace the dash pot.



**INSPECTION OF DEPRESSION CHAMBER**

N14MGHA

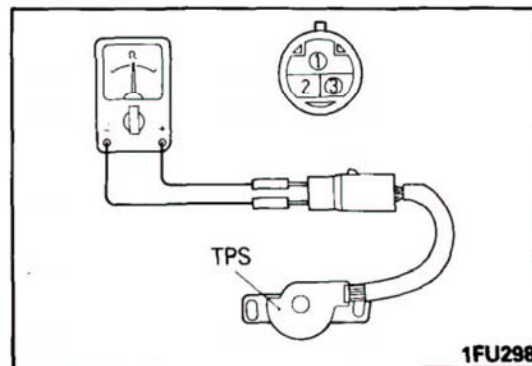
Check the depression chamber diaphragm for damage. First, push up the rod fully and closing tightly the nipple with a finger, release the rod. The diaphragm is intact if the rod does not return to the initial position while the nipple is held closed with a finger. If the rod returns, the diaphragm is broken. Replace the depression chamber.



**MIXTURE ADJUSTING SCREW (MAS)**

N14MGIA

Check the mixture adjusting screw (MAS) for damage caused to its taper end by overtightening etc..



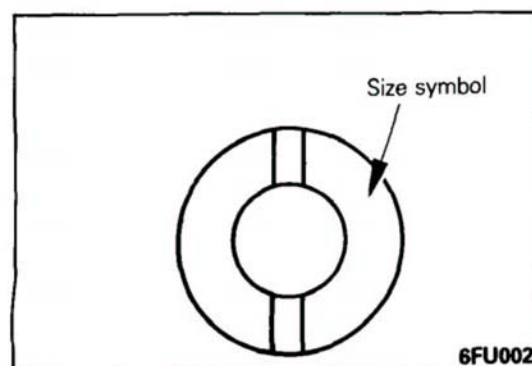
**THROTTLE POSITION SENSOR (TPS)**

N14MGJA

1. Measure resistance between terminals 1 and 3 of the throttle position sensor.

**Standard value : 3.5 – 6.5 kΩ**

2. Check the body for crack and damage.



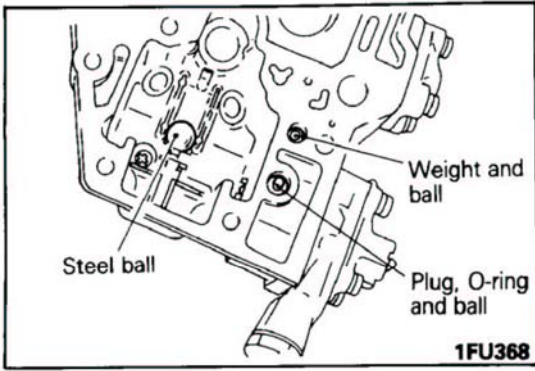
**SERVICE POINTS OF REASSEMBLY**

N14MHAB

**66. 65. IDENTIFICATION OF MAIN JETS**

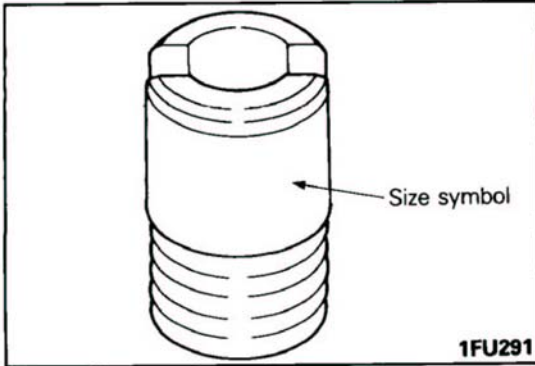
Make sure that correct jets are installed at correct positions. Note the size symbol stamed on each jet for identification.

- Primary : #107.5**
- Secondary : #190**



**62. INSTALLATION OF BALL/61. O-RING/60. PLUG/59. BALL/58. WEIGHT/57. STEEL BALL**

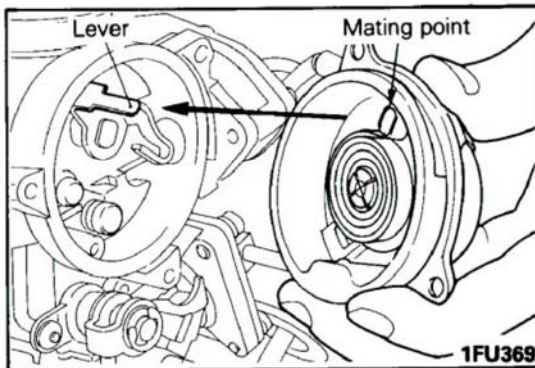
Install in correct sequence and at correct positions.



**55. INSTALLATION OF PILOT JET (SECONDARY)/54. PILOT JET (PRIMARY)/53. MAIN AIR JET (PRIMARY)**

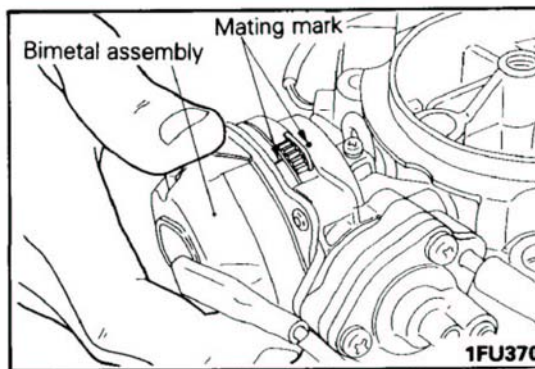
(1) Make sure that correct jets are installed at correct positions. Note the size symbol stamped on each jet for identification.

- Main air jet (primary) : #70**
- Pilot jet (primary) : #55**
- Pilot jet (secondary) : #70**

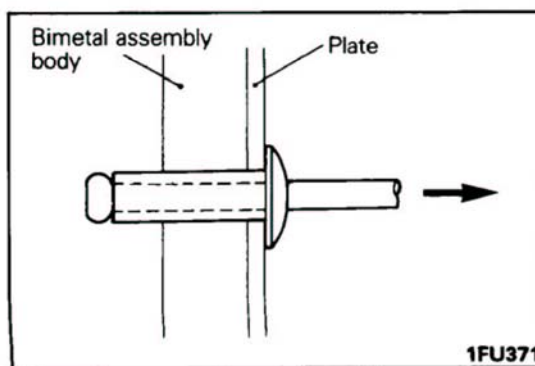


**29. INSTALLATION OF BIMETAL ASSEMBLY**

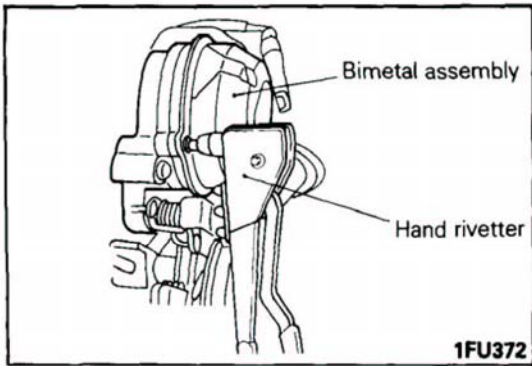
(1) Fit the bimetal end over the choke valve lever.



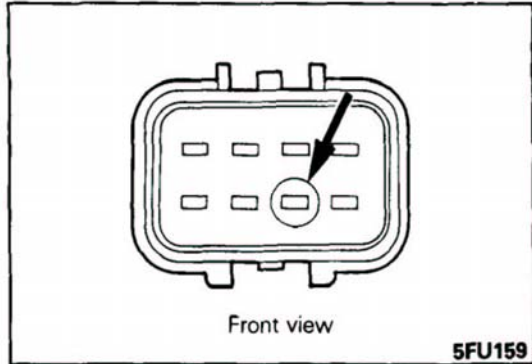
(2) Install the plate and temporarily tighten the screw.  
 (3) Align the mating marks.



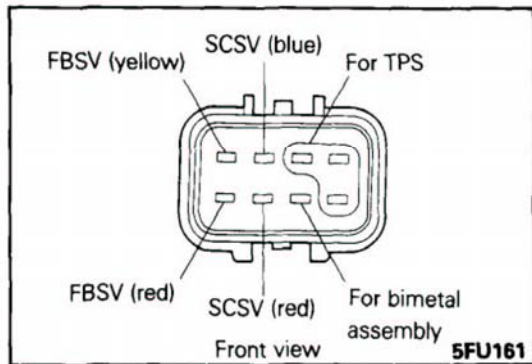
(4) Set the rivet as illustrated.



- (5) Install the bimetal assembly using a hand rivetter or similar tool with the mating marks aligned correctly.
- (6) Tighten the screw.

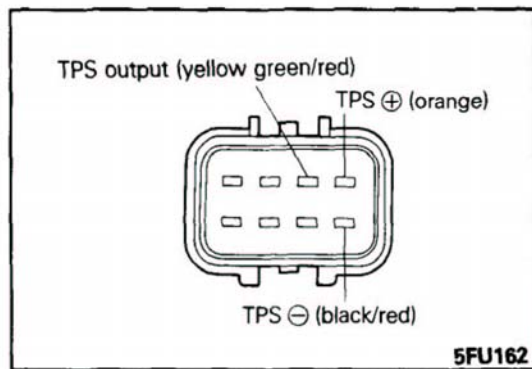


- (7) Install terminal to the connector at correct position.



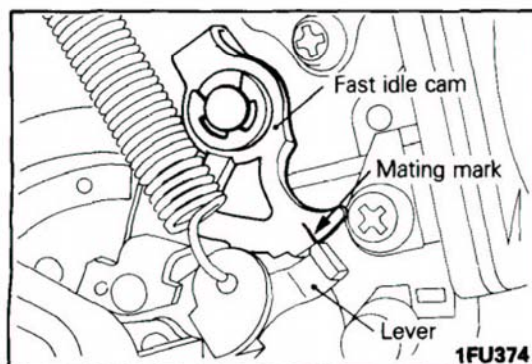
**25. INSTALLATION OF SLOW CUT SOLENOID VALVE (SCSV)/20. FEEDBACK SOLENOID VALVE (FBSV)**

Install terminals to the connector at correct positions.



**10. INSTALLATION OF FLOAT CHAMBER COVER ASSEMBLY**

- (1) After installing the float chamber cover, install the throttle position sensor (TPS) terminals (3) to the connector, paying close attention to their positions.

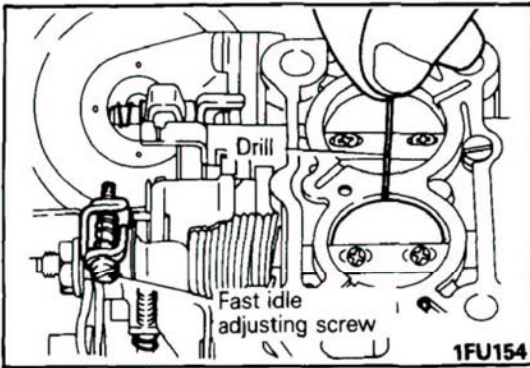


**INSPECTION AND ADJUSTMENT AFTER ASSEMBLY**

N14MIAB

**FAST IDLE OPENING**

- (1) Set lever on the first highest cam of the fast idle cam.



(2) Measure the primary valve to throttle bore clearance.

**Standard value :**

**Vehicles with a manual transmission**

**1.21 mm (.0476 in.)**

**Vehicles with an automatic transmission**

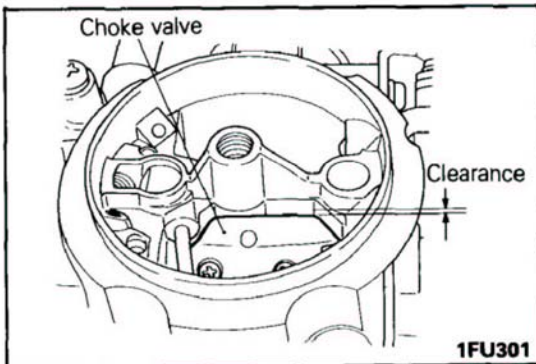
**1.32 mm (.0520 in.)**

(3) If the clearance is out of specification, adjust using the fast idle adjusting screw for the standard value.

**NOTE**

Adjusting screw direction of rotation vs. idle rpm

Adjusting screw	Valve opening	Fast idle rpm
Clockwise	Larger	Increases
Counter clockwise	Smaller	Decreases

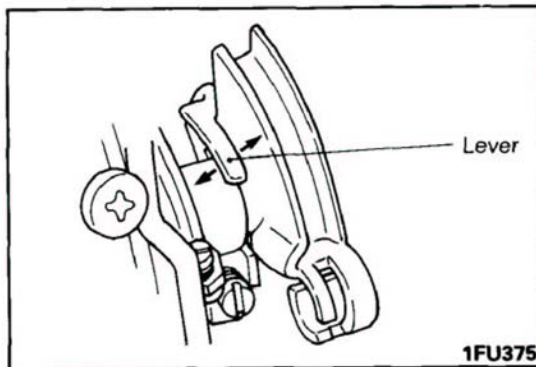


**UNLOADER OPENING**

N14MIBA

- (1) Lightly press the choke valve with a finger to fully close it.
- (2) In this state, fully open the throttle valve and measure the choke valve to choke bore clearance.

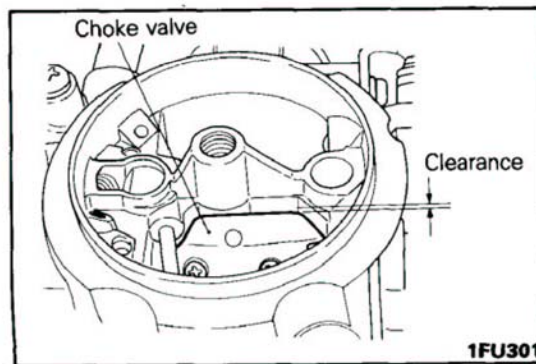
**Standard value : 1.9 – 2.1 mm (.075 – .083 in.)**



- (3) If the clearance is out of specification, bend the throttle lever at illustrated portion to adjust the clearance to the standard value.

**NOTE**

Lever bending direction	Clearance	Remarks
Up	Larger	Poor response
Down	Smaller	Lower output Plug likely to get sooty



**CHOKE BREAKER**

N14MICB

**Caution**

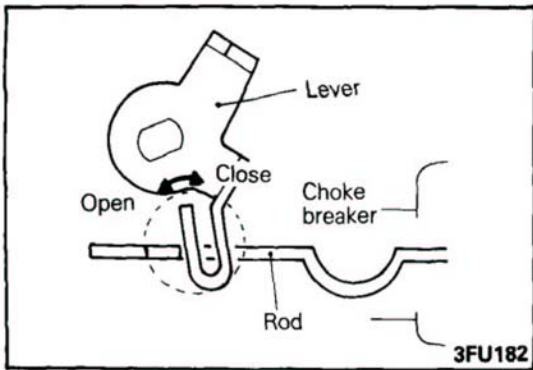
**Check and adjust with the bimetal assembly removed.**

- (1) Lightly press the choke valve with a finger to fully close it.
- (2) Push the choke breaker rod toward the diaphragm and measure the choke valve to choke bore clearance.

**Standard value :**

**1st stage : 2.5 – 2.7 mm (.098 – .106 in.)**

**2st stage : 3.2 – 3.4 mm (.126 – .133 in.)**



- (3) If the clearance is out of specification, adjust by bending the throttle lever at illustrated portion.

NOTE

Lever bending direction	Clearance	Remarks
Open	Larger	Poorer startability, more likely to stall
Close	Smaller	Plug likely to get sooty

**OPERATION OF CHOKE VALVE**

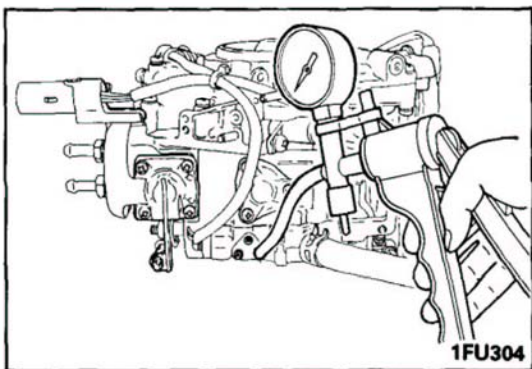
N14MIDA

- (1) Operate the choke valve with a finger and check for play, incorrect operation and binding.
- (2) If the choke fails to operate smoothly and lightly, wash around the choke valve.
- (3) If the play is excessively large, replace the float chamber cover.

**OPERATION OF SECONDARY THROTTLE VALVE**

N14MIEA

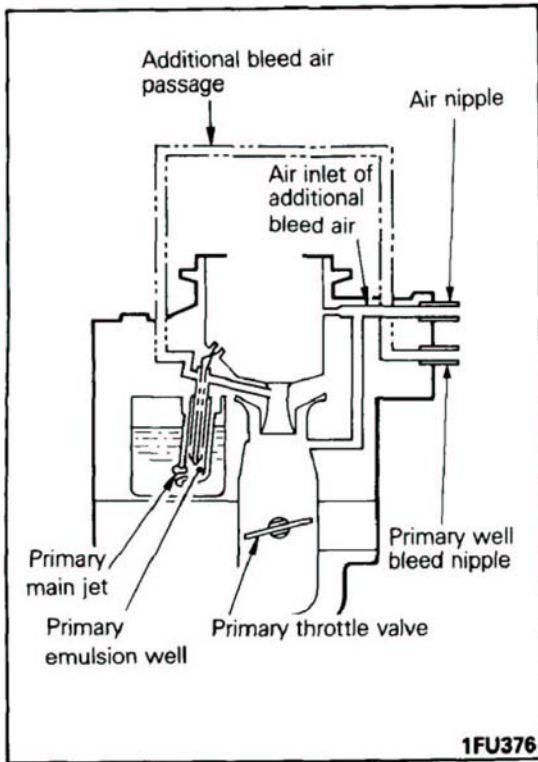
- (1) Fully open the throttle valve and operate the secondary throttle valve lever with a finger to check for play, incorrect operation and binding.
- (2) If it fails to operate smoothly and lightly, wash and apply thin coat of engine oil to the shaft.
- (3) If the play is excessively large, replace the throttle body.



**PORTS**

N14MIFA

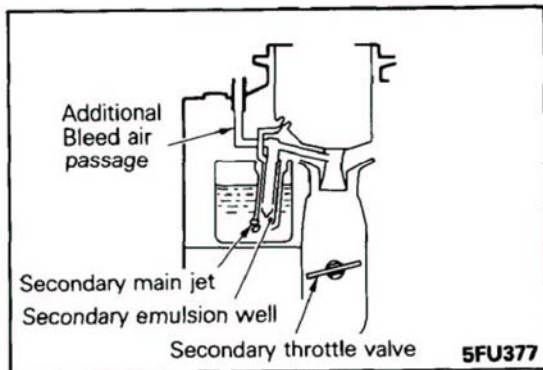
- (1) Connect a hand vacuum pump to each port and check for clogging of the passage.
- (2) If there is clogging, clean the port and then blow compressed air into the port.

**INSPECTION OF HAC BLEED AIR PASSAGE**

N14MIGB

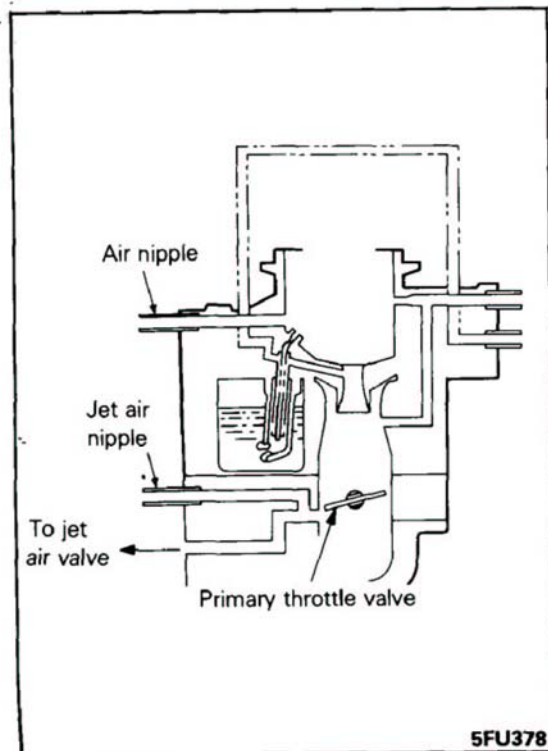
**Inspection for Clogging of Primary Well Bleed Nipple – High altitude specifications for the 49 states, California**

- (1) Connect a hand vacuum pump to the nipple.
- (2) Apply vacuum to see that vacuum leaks and does not build up.
- (3) If vacuum builds up, disassemble and check the carburetor as incorrect installation of gasket etc. is suspected.

**Inspection for Clogging of Secondary Well Bleed Nipple – High altitude specifications for the 49 states**

N14MIIB

- (1) Connect a hand vacuum pump to the nipple.
- (2) Apply vacuum to see that vacuum leaks and does not build up.
- (3) If vacuum builds up, disassemble and check the carburetor as incorrect installation of gasket etc. is suspected.

**Inspection for Clogging of Jet Air Nipple – High altitude specifications for the 49 states**

N14MIIB

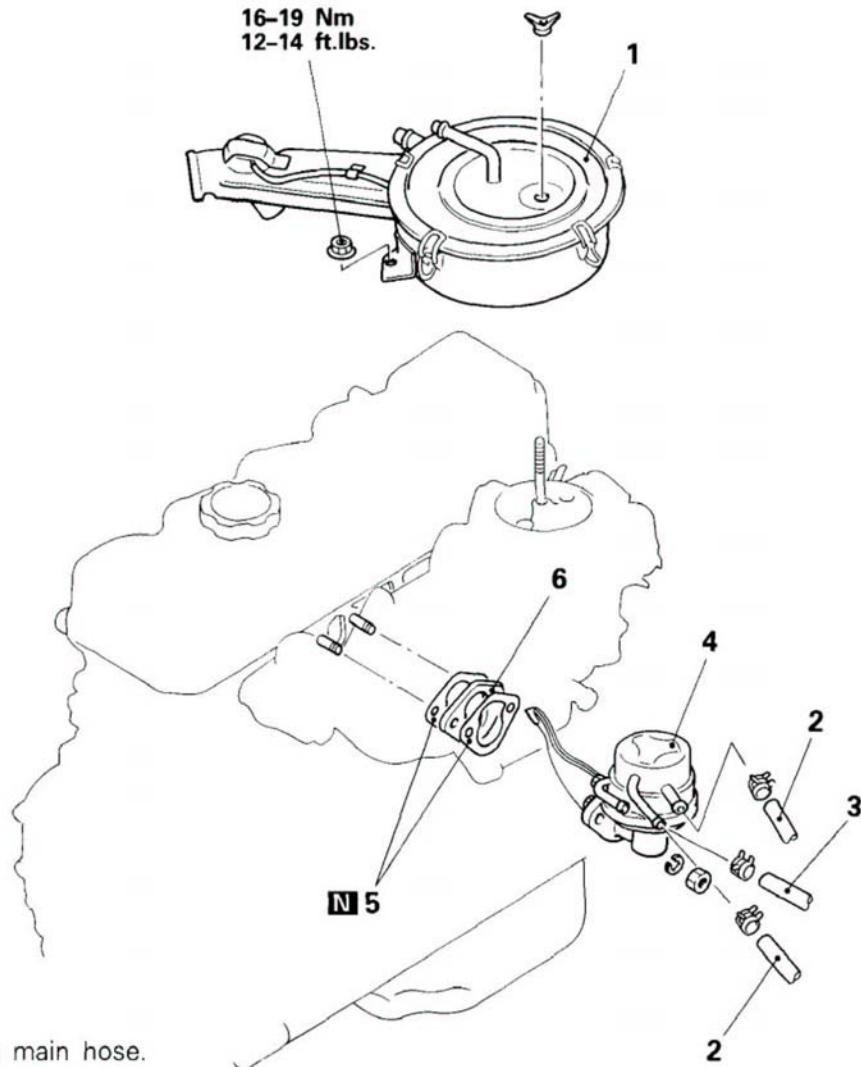
- (1) Connect a hand vacuum pump to the nipple.
- (2) Apply vacuum to see that vacuum leaks and does not build up.
- (3) If vacuum builds up, disassemble and check the carburetor as incorrect installation of gasket etc. is suspected.



**FUEL PUMP**

**REMOVAL AND INSTALLATION**

N14HA-



03W551

**Removal steps**

- ◄◄ ◄◄ 1. Air filter
- ◄◄ 2. Connection of the main hose.
- ◄◄ 3. Connection of the return hose.
- ◄◄ ◄◄ 4. Fuel pump
- 5. Gasket
- 6. Insulator

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◄◄ : Refer to "Service Points of Removal".
- (3) ◄◄ : Refer to "Service Points of Installation".
- (4) **N** : Non-reusable parts

**SERVICE POINTS OF REMOVAL**

N14HBAC

**1. REMOVAL OF AIR FILTER**

Refer to GROUP 11 INTAKE AND EXHAUST SYSTEM – Air Filter.

**2. DISCONNECTION OF MAIN HOSE/3. RETURN HOSE**

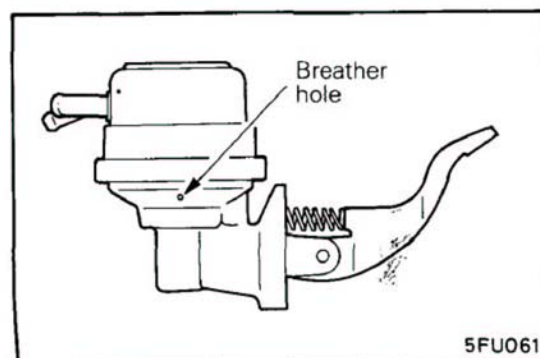
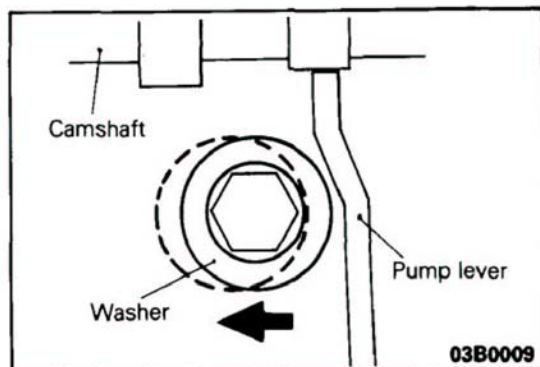
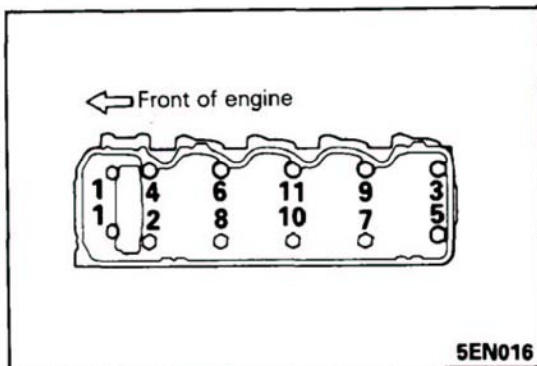
Before disconnection of the fuel hose, remove the fuel tank cap to lower the pressure in the fuel tank.

**4. REMOVAL OF FUEL PUMP**

- (1) Turn the crankshaft to place No. 1 cylinder at top dead center on compression stroke.

**NOTE**

The above operation places the lift of fuel pump stroke at the minimum position, resulting in ease of fuel pump removal.



- (2) If interference of pump lever occurs in the cylinder head, the washer on the cylinder head bolt may be interfering with the pump lever. Therefore, proceed as follows:

- ① Remove the rocker cover.
- ② Loosen cylinder head bolts in the sequence shown in the illustration.
- ③ Move the washer interfering with the pump lever in the direction shown in the illustration and remove the fuel pump.

**INSPECTION**

N14HCAC

**FUEL PUMP**

Make the following checks and replace as necessary. Note that the fuel pump is a non-maintainable assembly and must be replaced as an assembly.

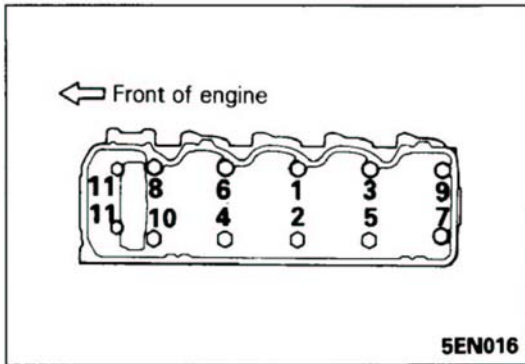
- Oil or fuel leaks from breather hole
- Damage, cracks on parts
- Rocker arm for wear

**SERVICE POINTS OF INSTALLATION**

N14HDAC

**4. INSTALLATION OF FUEL PUMP**

- (1) Make sure that piston in No. 1 cylinder is in the top dead center on compression stroke.
- (2) If the washer is moved after loosening of cylinder head bolt proceed to the following items.
  - ① Reinstall the washer in position.



- ② Tighten the cylinder head bolts to specified torque in the sequence shown in the illustration.
- ③ Install the rocker cover.

**1. INSTALLATION OF AIR FILTER**

Refer to GROUP 11 INTAKE AND EXHAUST SYSTEM – Air Filter.

## FUEL TANK

## REMOVAL AND INSTALLATION

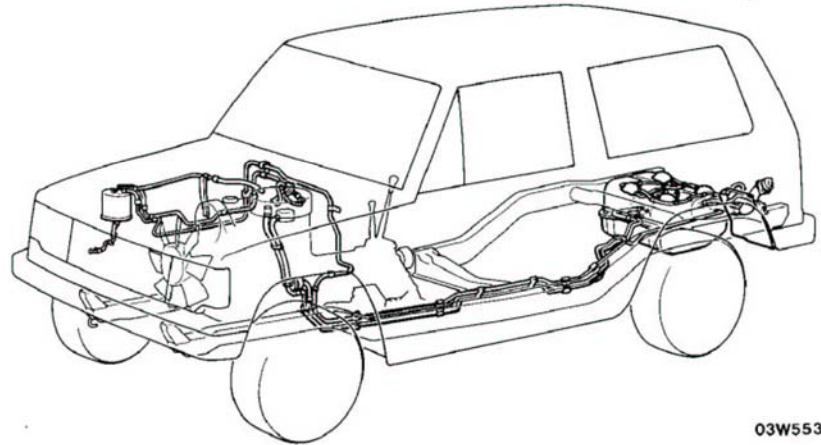
N14GA--

**Pre-removal Operation**

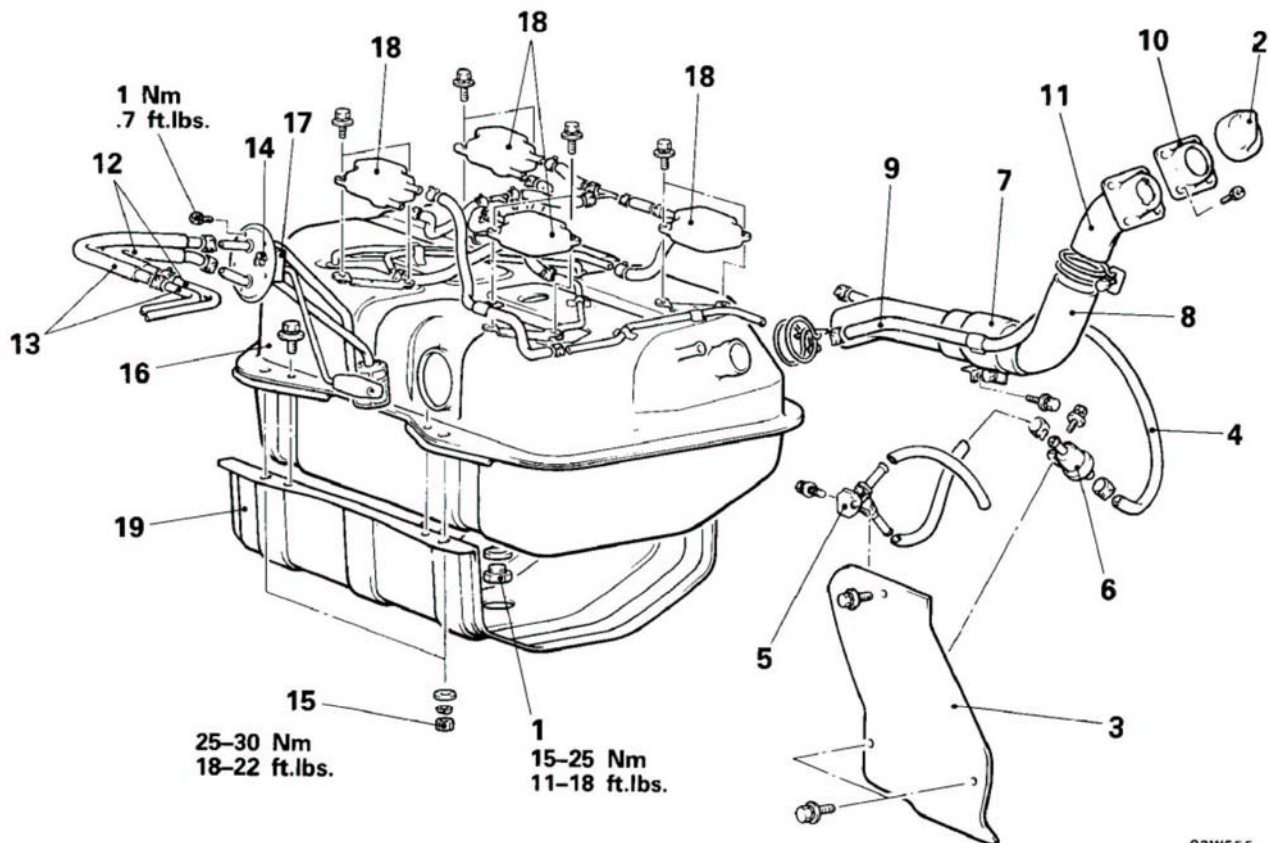
- Draining of the Fuel.

**Post-installation Operation**

- Supplying of the Fuel.



03W553



03W555

**Removal steps**

1. Drain plug
2. Fuel filler cap
3. Fuel filler hose protector
- ◆◆ 4. Vapor hose
- ◆◆ 5. Check valve
6. Overfill limiter (Two-way valve)
7. Clamp assembly
- ◆◆ 8. Fuel filler hose
- ◆◆ 9. Breather hose
10. Packing
11. Fuel filler neck
- ◆◆ 12. Main hose
- ◆◆ 13. Return hose
14. Fuel gauge unit connector connection
15. Fuel tank assembly mounting nuts
16. Fuel tank
17. Pipe assembly
18. Separator tanks
19. Fuel tank protector

**NOTE**

- (1) Reverse the removal procedures to reinstall.  
 (2) ◆◆ : Refer to "Service Points of Installation".

**INSPECTION**

N14GCAC

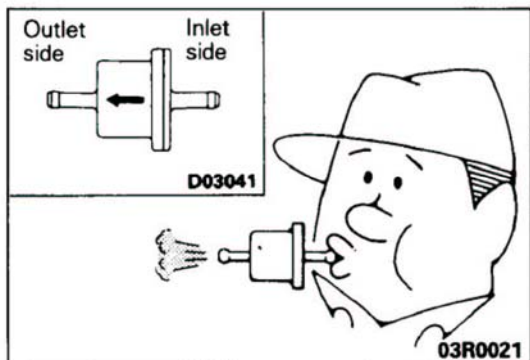
- Check the hoses and the pipes for crack or damage.
- Check the fuel tank cap for malfunction.
- Check the fuel tank for deformation, corrosion or crack.
- Check the fuel tank for dust or foreign material.

NOTE

If the inside of the fuel tank is to be cleaned, use any one of the following:

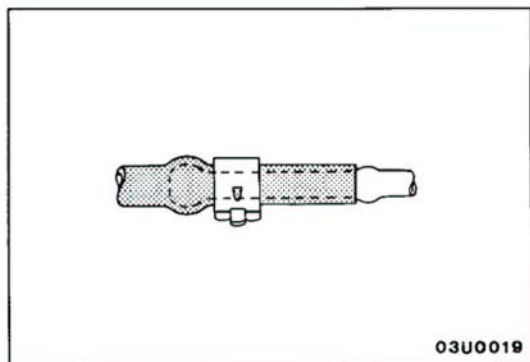
- (1) Kerosene
- (2) Trichloroethylene
- (3) A neutral emulsion type detergent

- Check the in-tank fuel filter for damage or clogging.
- Check the check valve for malfunction.



**CHECKING OVERFILL LIMITER (TWO-WAY VALVE)**

A simple way of inspection, however, may be adopted in which the overfill limiter is removed and then air is lightly blown into either the inlet or outlet by mouth. If the air passes after a slight resistance, overfill limiter is in good condition.

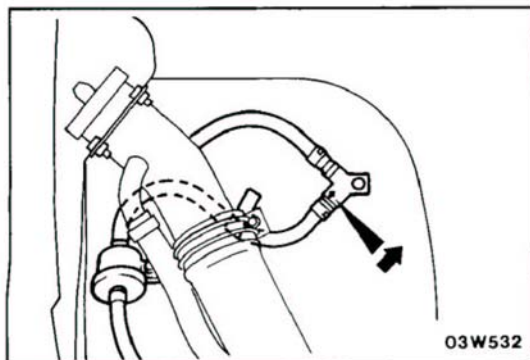


**SERVICE POINTS OF INSTALLATION**

N14GDAE

**13. INSTALLATION OF RETURN HOSE/12. MAIN HOSE/4. VAPOR HOSE**

When attaching the hoses to the pipes, be sure that the hose is attached until its end comes in touch with the bulge of the pipe as shown in the illustration.



**9. INSTALLATION OF BREATHER HOSE/8. FUEL FILLER HOSE**

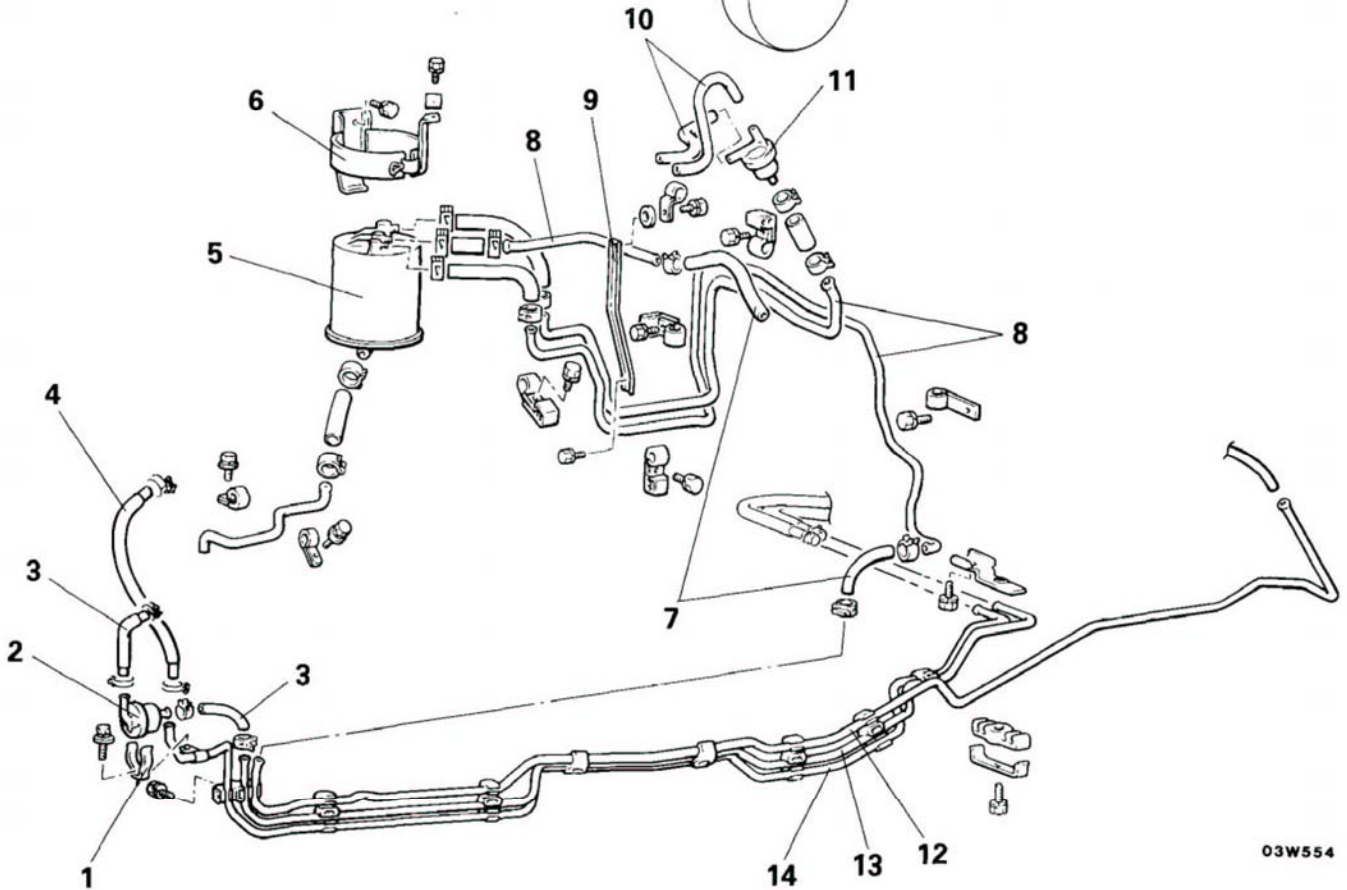
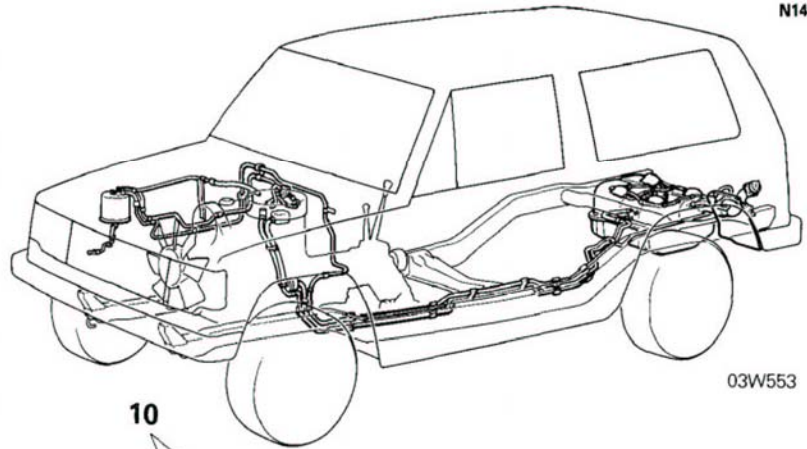
Insert the hoses until their ends contact the fuel tank.

**5. INSTALLATION OF CHECK VALVE**

Install the check valve to the fuel filler hose protector so that the check valve's arrow faces as shown in the figure.

**FUEL LINE AND VAPOR LINE  
REMOVAL AND INSTALLATION**

N14KA--



- |                      |                         |
|----------------------|-------------------------|
| 1. Fuel filter clamp | 10. Fuel purge hose     |
| 2. Fuel filter       | 11. Purge control valve |
| ◆◆ 3. Main hose      | 12. Fuel vapor pipe     |
| ◆◆ 4. Return hose    | 13. Fuel main pipe      |
| 5. Canister          | 14. Fuel return pipe    |
| 6. Canister holder   |                         |
| ◆◆ 7. Vapor hose     |                         |
| 8. Fuel vapor pipe   |                         |
| 9. Stay              |                         |

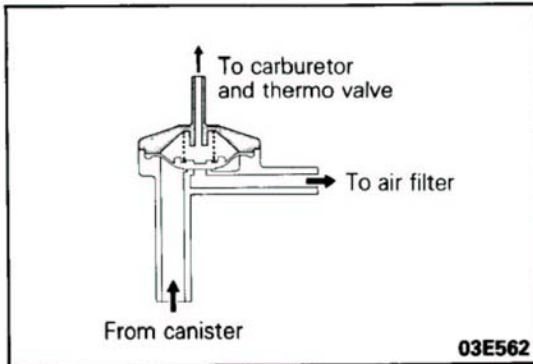
**NOTE**

◆◆ : Refer to "Service Points of Installation".

**INSPECTION**

N14KCAB

- Check the fuel hoses and pipes for cracks, bends, deformation, deterioration or clogging.
- Check the fuel filter for clogging or damage.
- Check the canister for clogging or damage.

**CHECKING PURGE CONTROL VALVE**

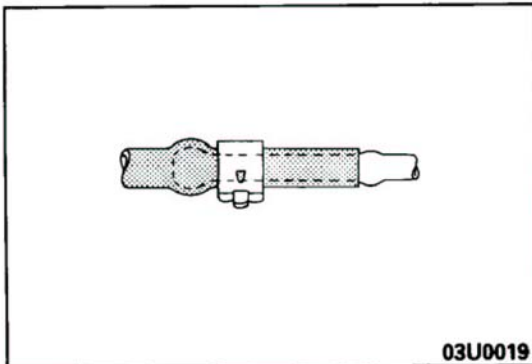
- (1) Make sure that the cooling water is at a temperature between 80 and 90°C (180 and 190°F).
- (2) Disconnect the purge control hose from the air filter and blow into the purge hose. If the valve is not open, its operation is normal. Then start the engine and increase the engine speed to 1,500 to 2,000 rpm and blow into the purge hose. If the valve is not open, check for clogged or broken vacuum hose, or malfunctioning thermo valve.

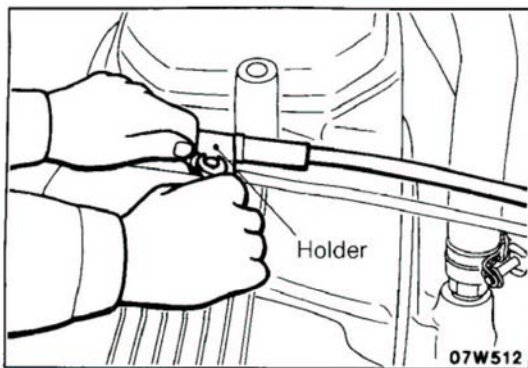
**SERVICE POINTS OF INSTALLATION**

N14KDAD

**7. INSTALLATION OF VAPOR HOSE/4. RETURN HOSE/3. MAIN HOSE**

When attaching the hose to the pipes, be sure that the hose is attached until its end comes in touch with the bulge of the pipe as shown in the illustration.





## ACCELERATOR CABLE AND PEDAL

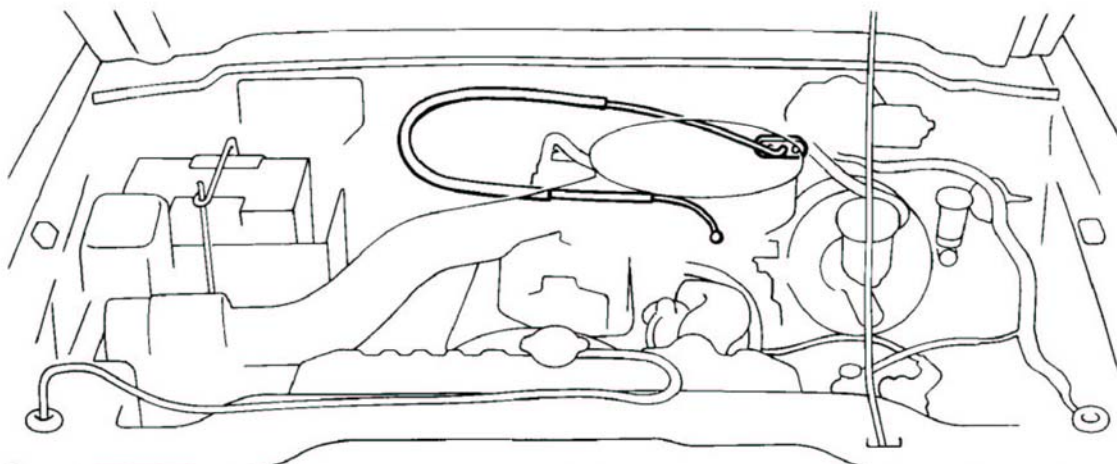
### ADJUSTMENT OF ACCELERATOR CABLE FREE PLAY

1. Run the engine until it reaches the specified idle speed level.
2. Loosen the locking bolt or adjusting nut at the cable adjusting portion so that the throttle lever is free.
3. Move the holder to the position just before the throttle lever begins to operate, and then return it far enough so that there is an appropriate amount of slack in the inner cable and secure it at this position.
4. Operate the accelerator arm and confirm that the throttle valve changes from fully closed to fully open.



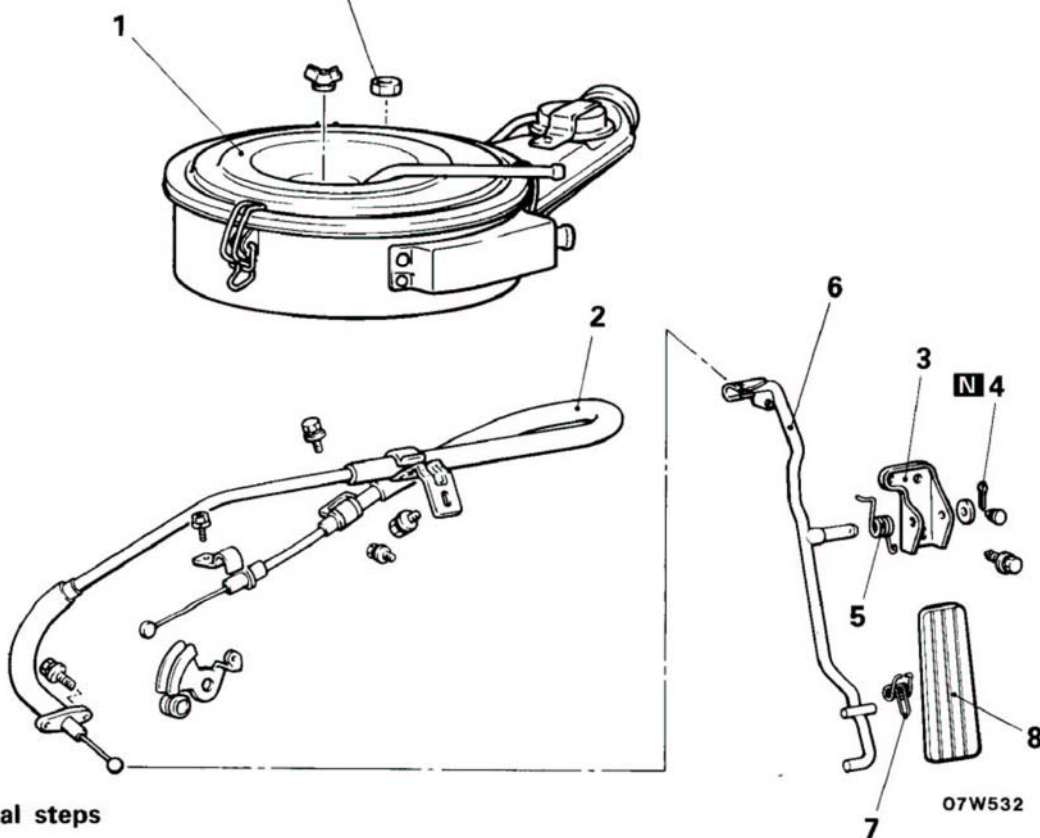
REMOVAL AND INSTALLATION

N140A--



16-19 Nm  
12-14 ft.lbs.

07W533



**Accelerator cable removal steps**

- ◆◆◆◆ 1. Air filter
- ◆◆◆ Adjustment of accelerator cable free play
- ◆◆ 2. Accelerator cable

**Accelerator pedal removal steps**

- ◆◆ 3. Accelerator arm bracket
- ◆◆ 4. Cotter pin
- ◆◆ 5. Return spring
- ◆◆ 6. Accelerator arm
- ◆◆ 7. Spring
- ◆◆ 8. Pedal

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆ : Refer to "Service Points of Installation".
- (4) **N** : Non-reusable parts

**SERVICE POINTS OF REMOVAL**

N140BAA

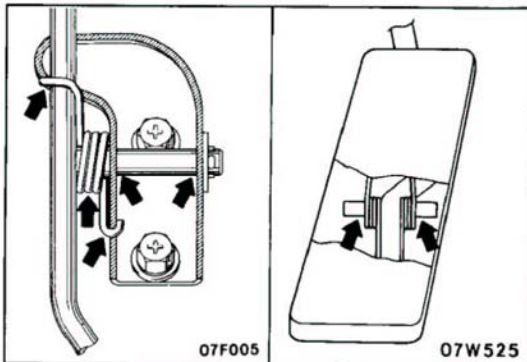
**1. REMOVAL OF AIR FILTER**

Refer to GROUP 11 INTAKE AND EXHAUST SYSTEM – Air Filter.

**INSPECTION**

N140CAB

- Check the cable for damage.
- Check the cable outer casing for damage.
- Check the cable for unsmooth movement.
- Check the accelerator arm for bend.
- Check the return spring for deterioration.
- Check the connection of accelerator cable and end fitting.

**SERVICE POINTS OF INSTALLATION**

N140DAI

**8. APPLICATION OF GREASE TO PEDAL/7. SPRING/6. ACCELERATOR ARM/5. RETURN SPRING/3. ACCELERATOR ARM BRACKET**

Apply the specified grease around the each moving point of the pedal.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 3**

**2. INSTALLATION OF ACCELERATOR CABLE**

Make sure that the accelerator cable is laid without sharp bends.

- **ADJUSTMENT OF ACCELERATOR CABLE FREE PLAY**

Refer to P.14-84.

**1. INSTALLATION OF AIR FILTER**

Refer to GROUP 11 INTAKE AND EXHAUST SYSTEM – Air Filter.

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# PROPELLER SHAFT AND UNIVERSAL JOINTS

## CONTENTS

N16AA--

<b>GENERAL INFORMATION</b> .....	<b>2</b>	Lubricants .....	2
<b>PROPELLER SHAFT</b> .....	<b>3</b>	Service Specifications .....	2
<b>SPECIAL TOOL</b> .....	<b>3</b>	Torque Specification .....	2
<b>SPECIFICATIONS</b> .....	<b>2</b>	<b>TROUBLESHOOTING</b> .....	<b>3</b>
General Specifications .....	2	Noise and Vibration at High Speed	
		Noise at Start	



## 16-2 PROPELLER SHAFT AND UNIVERSAL JOINTS – General Information / Specifications

### GENERAL INFORMATION

N16BAAB

The 2-joint type propeller shaft has been adopted. The universal joint includes a grease nipple for easy lubrication.

### SPECIFICATIONS

#### GENERAL SPECIFICATIONS

N16CA--

Items	Vehicles with a manual transmission	Vehicles with an automatic transmission
Propeller shaft		
Type	2-joint type	2-joint type
Length × O.D. mm (in.)		
Front	665 × 50.8 (26.2 × 2.0)	741 × 50.8 (29.2 × 2.0)
Rear	598 × 71.8 (23.5 × 3.0)	522 × 71.8 (20.6 × 3.0)
Universal joint		
Type	Cross type	Cross type
Bearing	Oiled needle roller bearing	Oiled needle roller bearing
Journal O.D. mm (in.)	14.7 (.58)	14.7 (.58)

#### SERVICE SPECIFICATIONS

N16CB--

Items	Specifications
Standard value	
Journal end play mm (in.)	0.06 (.0024)
Limits	
Propeller shaft runout (Dial indicator reading) mm (in.)	
Front	0.5 (.020)
Rear	0.6 (.024)

#### TORQUE SPECIFICATION

N16CC--

Item	Nm	ft. lbs.
Flange yoke attaching bolts	50–60	36–43


#### LUBRICANTS

N16CD--

Items	Specified lubricant	Quantity
Universal joint	Multipurpose grease SAE J310, NLGI No. 2	As required
Sleeve yoke surface	Hypoid gear oil SAE80, 75W-85W conforming to API GL-4 or higher	As required

**SPECIAL TOOL**

N16DA--

Tool (Number and name)	Use
MB990840-01 Universal joint remover and installer set  	Removal and installation of journal bearing

**TROUBLESHOOTING**

N16EAAA

Symptom	Probable cause	Remedy	Reference page
Noise at start	Worn journal bearing Worn sleeve yoke spline	Replace	16-6
	Loose propeller shaft installation	Retighten	16-4
Noise and vibration at high speed	Unbalanced propeller shaft	Replace	16-4
	Improper snap ring selection	Adjust the clearance	16-8
	Worn journal bearing	Replace	16-6

# PROPELLER SHAFT

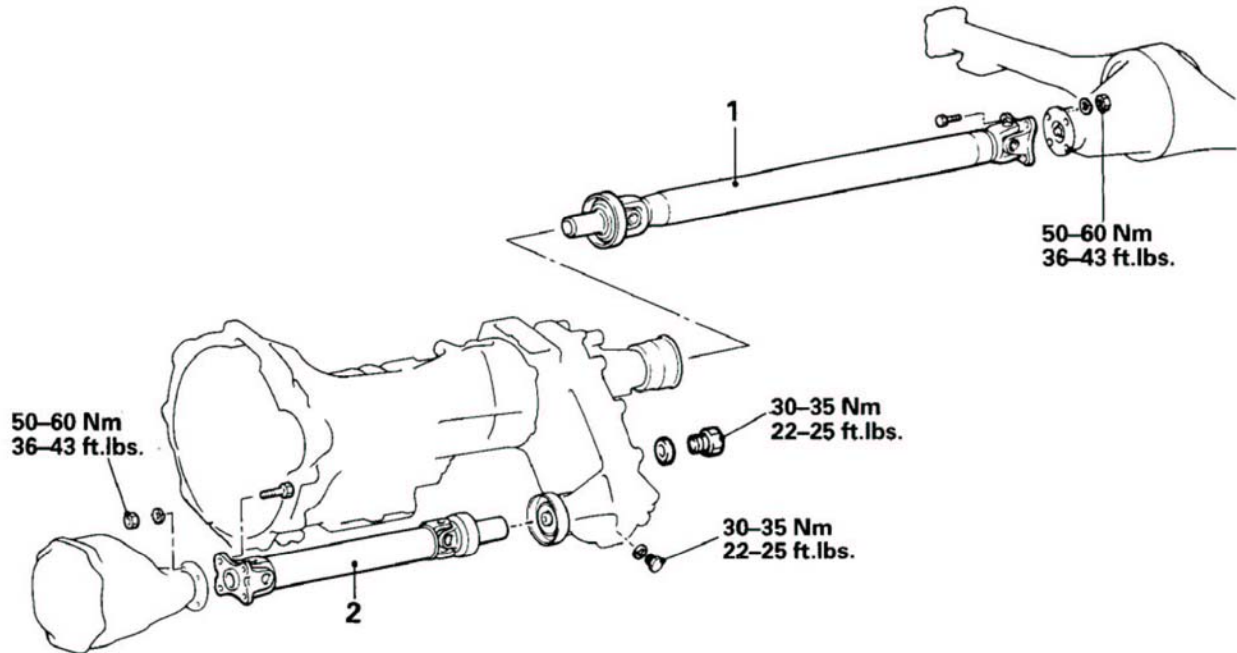
## REMOVAL AND INSTALLATION

**Pre-removal Operation**

- Draining of the Transfer Gear Oil

**Post-installation Operation**

- Supplying the Transfer Gear Oil (Refer to GROUP 21 TRANSMISSION - Transmission and Transfer Case.)



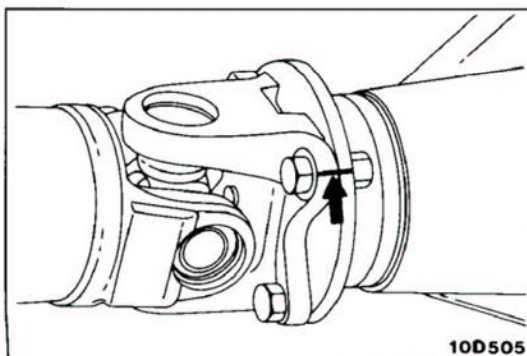
10G0004

**Removal steps**

- ◆◆◆◆ 1. Rear propeller shaft
- ◆◆◆◆ 2. Front propeller shaft

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆ : Refer to "Service Points of Installation".



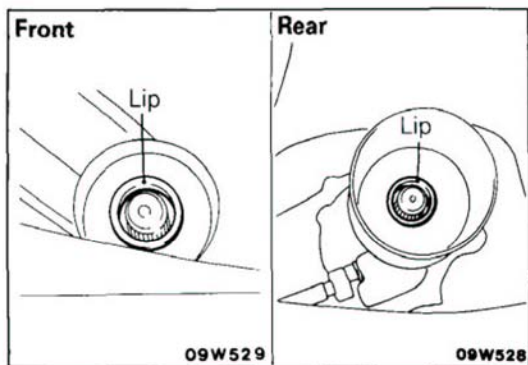
10D505

### SERVICE POINTS OF REMOVAL

N16GBAB

#### 1. REMOVAL OF REAR PROPELLER SHAFT/2. FRONT PROPELLER SHAFT

- (1) Place the free wheel hubs in the FREE position and set the transfer lever to "2H".
- (2) Make mating marks on the flange yoke and the differential companion flange.



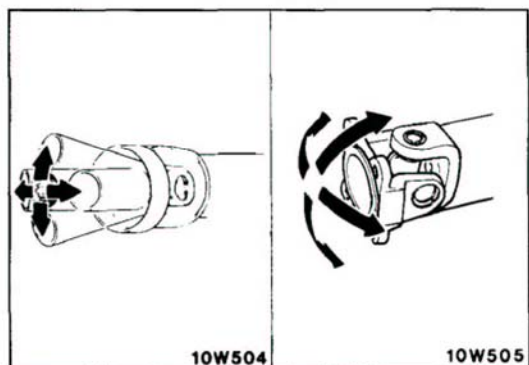
**Caution**

1. Be careful not to damage the lip of the transmission oil seal or the lip of the transfer case oil seal.
2. Do not allow foreign matter to enter the transmission or transfer.

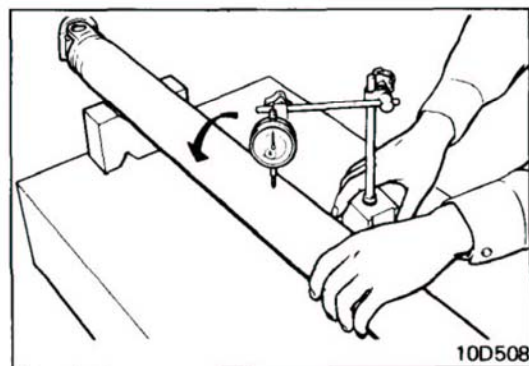
**INSPECTION**

N16GCAB

- Check the sleeve yoke and flange yoke for wear, damage or cracks.
- Check the propeller shaft yokes for wear, damage or cracks.
- Check the propeller shaft for bends, twisting or damage.



- Check the universal joints for smooth operation in all directions.

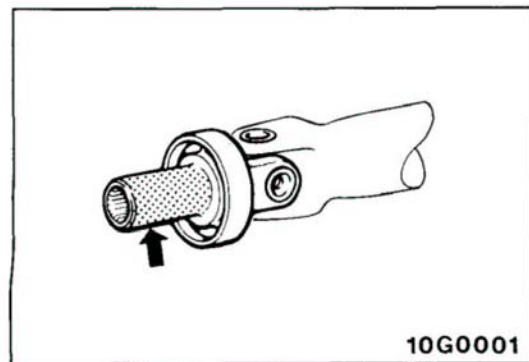


**CHECKING PROPELLER SHAFT RUNOUT**

Measure propeller shaft runout with a dial indicator.

**Limits**

<b>Front propeller shaft</b>	<b>0.5 mm (.020 in.)</b>
<b>Rear propeller shaft</b>	<b>0.6 mm (.024 in.)</b>



**SERVICE POINTS OF INSTALLATION**

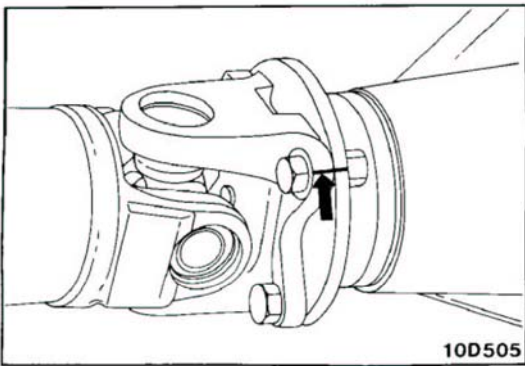
N16GDAC

**2. INSTALLATION OF FRONT PROPELLER SHAFT/1. REAR PROPELLER SHAFT**

- (1) Apply the specified hypoid gear oil to the sleeve yoke.

**Specified gear oil : Hypoid gear oil API classification GL-4 or higher/SAE viscosity 80W, 75W-85W**

# 16-6 PROPELLER SHAFT AND UNIVERSAL JOINTS – Propeller Shaft



- (2) With the mating marks in alignment, install the propeller shaft to the companion flange.

**Caution**

Degrease the thread of the mounting bolts and nuts before tightening these parts. Otherwise, they could become loose.

## DISASSEMBLY AND REASSEMBLY

N16GE--

**Front propeller shaft**

**Rear propeller shaft**

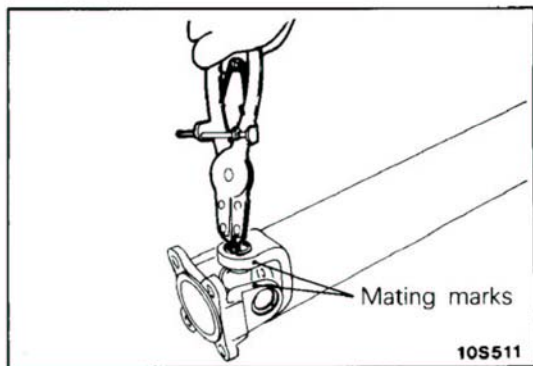
**Disassembly steps**

- ◆◆ Adjustment of journal end play
- ◆◆ 1. Snap ring
- ◆◆ 2. Grease nipple
- ◆◆◆ 3. Journal bearing
- ◆◆ 4. Journal
- ◆◆ 5. Flange yoke
- ◆◆ 6. Sleeve yoke

10W501

**NOTE**

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆◆ : Refer to "Service Points of Reassembly".



## SERVICE POINTS OF DISASSEMBLY

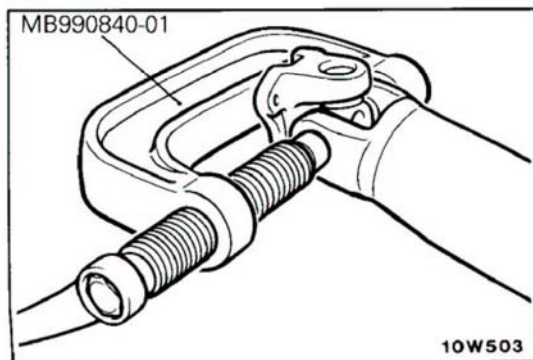
N16GFAC

### 1. REMOVAL OF SNAP RING

- (1) Make mating marks on the yokes of the universal joint that is to be disassembled.
- (2) Remove the snap rings from the yoke with snap ring pliers.

**Caution**

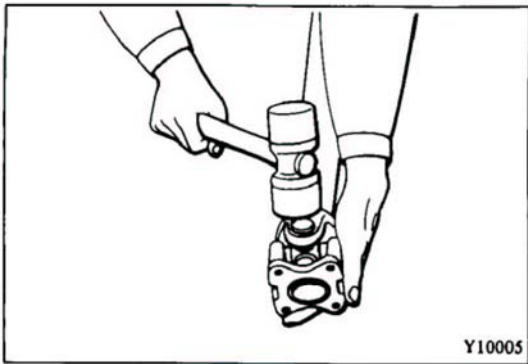
When disassembling, note the positions of snap rings so that they may be reinstalled in the same positions.



### 3. REMOVAL OF JOURNAL BEARING

- (1) Remove the journal bearing from the propeller shaft yoke with special tool.

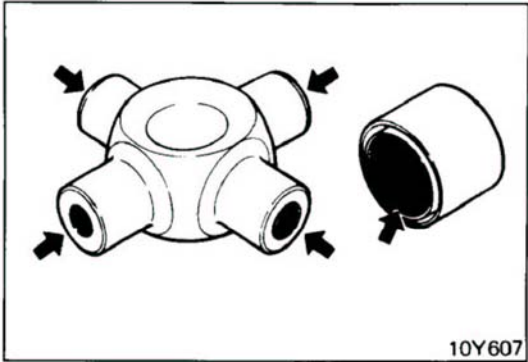




- (2) Remove the other journal bearing in the same manner as described above.

NOTE

If the journal bearing is hard to remove, strike the yoke with a plastic hammer as illustrated.



SERVICE POINTS OF REASSEMBLY

N16GHAC

4. INSTALLATION OF JOURNAL/3. JOURNAL BEARING

- (1) Apply the specified grease to the following parts;

- ① Shafts and grease sumps of journal
- ② Dust seal lips
- ③ Needle roller bearings

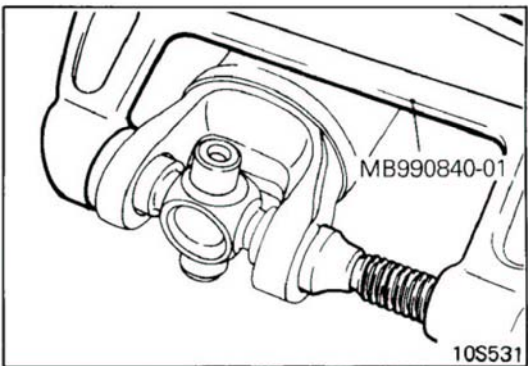
**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

Caution

**Use of excessive amounts of grease may result in difficulty in assembling unit and incorrect selection of snap rings.**

NOTE

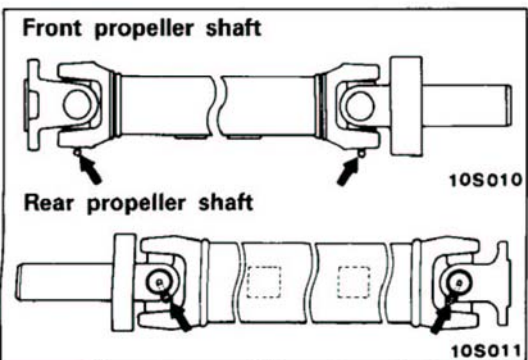
When the journal and journal bearing are replaced, obtain the universal joint kit.



- (2) Press the journal bearing to the yoke with special tool as illustrated.

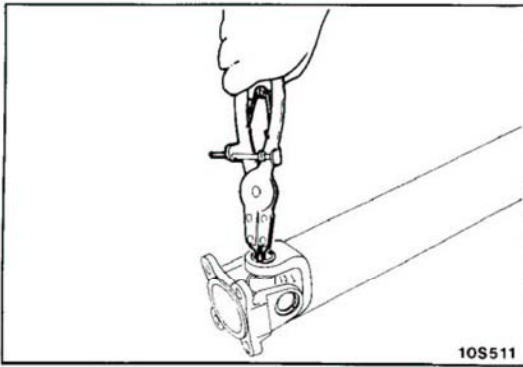
NOTE

Be sure to align the mating marks on the yokes.



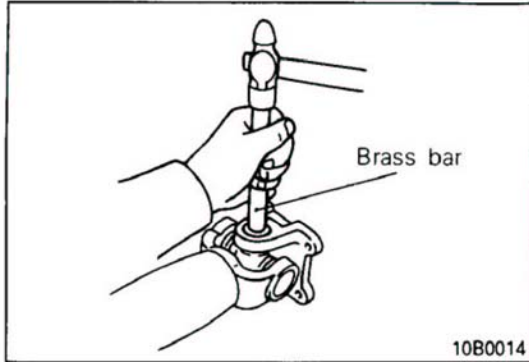
2. INSTALLATION OF GREASE NIPPLE

With the grease nipple directed as shown in the illustration, install it properly.

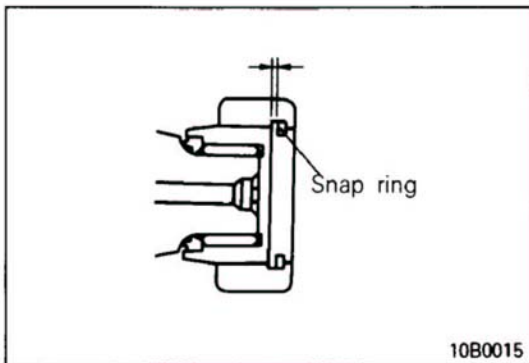


- **ADJUSTMENT OF JOURNAL END PLAY**

- (1) Install snap rings of the same thickness onto both sides of each yoke with snap ring pliers.



- (2) Press the bearing and journal into one side with the brass bar.



- (3) Measure the clearance shown in the illustration with a feeler gauge. If the clearance exceeds the standard value, the snap rings should be replaced.

**Standard value : 0.06 mm (.0024 in.)**

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# REAR SUSPENSION

## CONTENTS

N17AA--

<b>GENERAL INFORMATION</b> .....	<b>2</b>	<b>SPECIFICATIONS</b> .....	<b>2</b>
<b>REAR SUSPENSION ASSEMBLY</b> .....	<b>4</b>	General Specifications .....	2
<b>SERVICE ADJUSTMENT PROCEDURES</b> .....	<b>3</b>	Service Specifications .....	3
Inspection of Rear Wheel Alignment .....	3	Torque Specifications .....	3

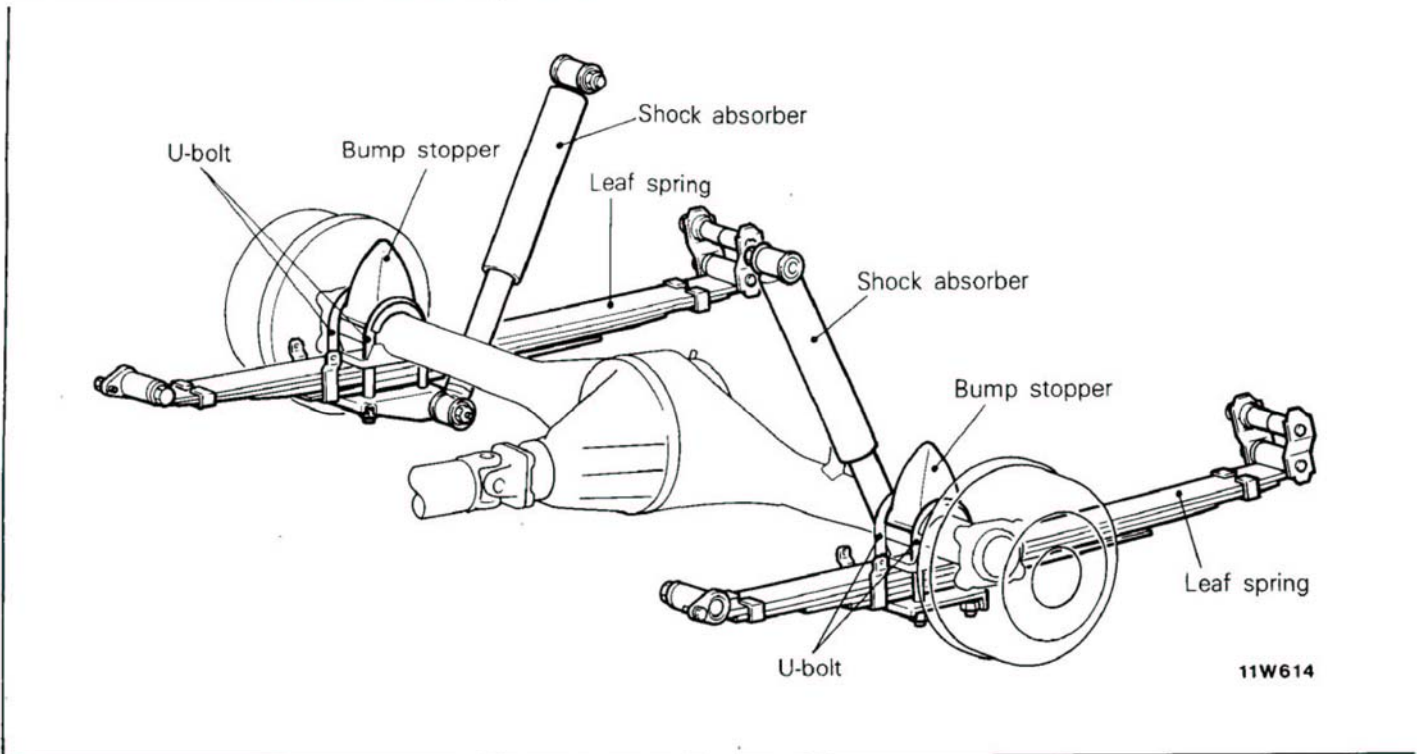


## GENERAL INFORMATION

N17BAAB

The leaf spring type of rear suspension has been adopted. The leaf spring is secured to the rear axle housing by U-bolts, so that the vibration and noise transmitted to the body during off-road driving are reduced by the bump stopper.

The shock absorbers have a bias arrangement.



## SPECIFICATIONS

## GENERAL SPECIFICATIONS

N17CA-

Items	Specifications
Suspension system	Asymmetrical semielliptic leaf springs
Leaf springs	
Number of leaf springs	4
Straight span mm (in.)	1,196.5-1,203.5 (47.106-47.382)
Camber (unladen) mm (in.)	73.5-82.5 (2.894-3.248)
Spring constant N/mm (lbs./in.)	
- as installed	
at load of 1,000-2,500 N (220-551 lbs.)	22 (123)
at load of 4,670-8,870 N (1,030-1,955 lbs.)	50 (280)
Shock absorbers	
Type	Hydraulic cylinder, double-acting type
Max. length mm (in.)	545-548 (21.5-21.6)
Min. length mm (in.)	325-328 (12.8-12.9)
Stroke mm (in.)	220 (8.7)
Damping force [at 0.3 m/sec. (0.984 ft./sec.)]	
Expansion N (lbs.)	1,580-2,100 (348-463)
Compression N (lbs.)	590-850 (130-187)

**SERVICE SPECIFICATIONS**

N17CB--

Items	Specifications
Standard value	
Toe-in mm (in.)	0 (Non adjustable)
Camber	0° (Non adjustable)

**TORQUE SPECIFICATIONS**

N17CC--

Items	Nm	ft.lbs.
Shackle assembly attaching nut	45-60	33-43
Front pin assembly attaching nut	45-60	33-43
Shock absorber attaching nut	18-25	13-18
Front pin assembly attaching bolt	14-20	10-14
U-bolt attaching nut	85-110	61-80

**SERVICE ADJUSTMENT PROCEDURES**

N17FAAB

**INSPECTION OF REAR WHEEL ALIGNMENT**

The rear suspension assembly must be free of worn, loose or damaged parts prior to measurement of rear wheel alignment.

**Standard value : Toe-in 0 mm (0 in.)  
Camber 0°**

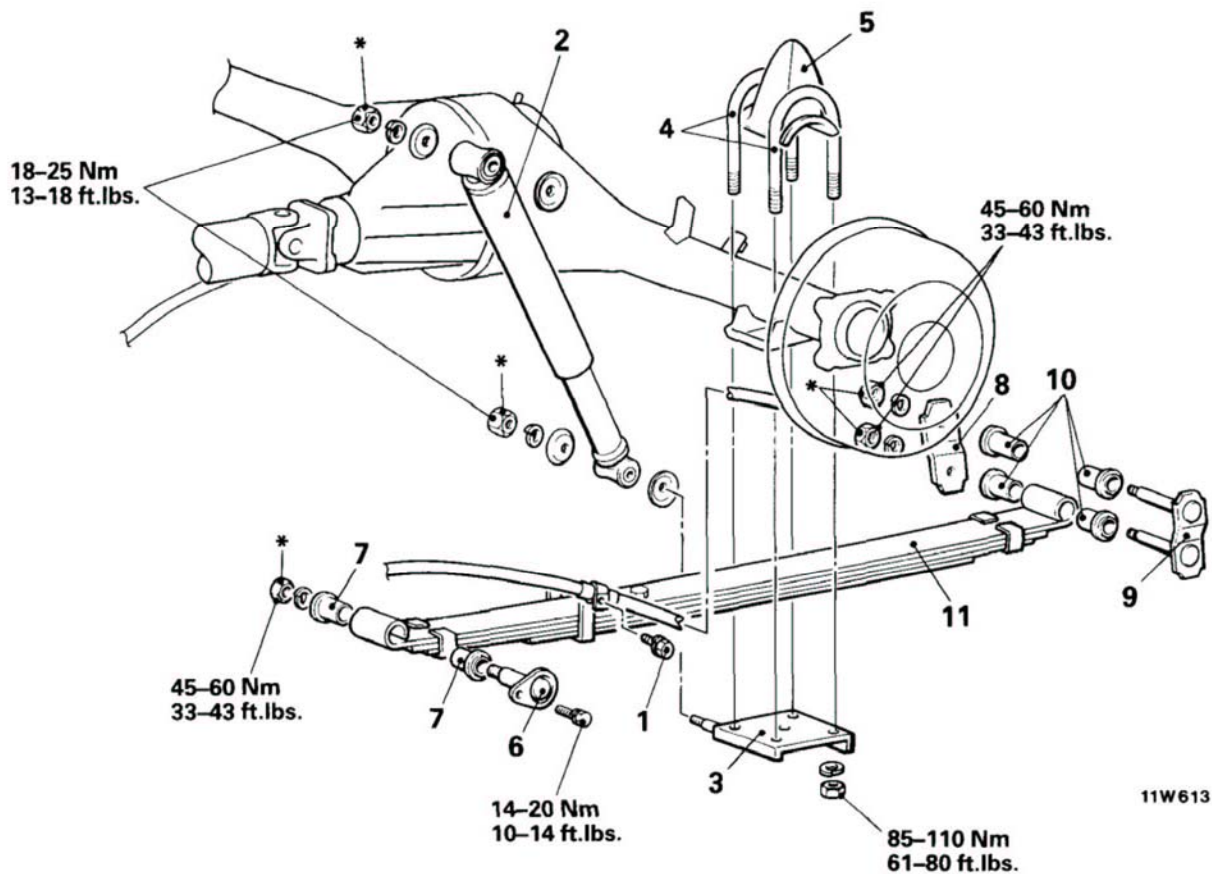
**NOTE**

Toe-in and camber are set at the factory and cannot be adjusted.

If toe-in or camber is not within the standard value, check and replace bent or damaged parts.

## REAR SUSPENSION ASSEMBLY

## REMOVAL AND INSTALLATION



11W613

**Post-installation Operation**

- Inspection of Rear Wheel Alignment (Refer to P.17-3.)

**Removal steps**

1. Parking brake cable attaching bolt
2. Shock absorber
- ◆◆ 3. U-bolt seat
- ◆◆ 4. U-bolts
5. Bump stopper
- ◆◆ 6. Front pin assembly
7. Rubber bushings
8. Shackle plate
- ◆◆ 9. Shackle assembly
10. Rubber bushings
- ◆◆ 11. Rear spring

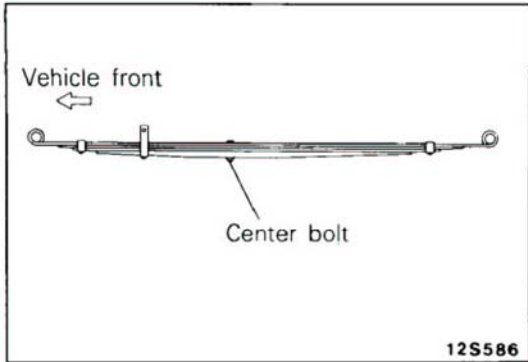
**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Installation".
- (3) \* : Tighten when the vehicle is unloaded.

**INSPECTION**

N17GCAB

- Check the shock absorbers for oil leakage, noise or malfunction.
- Check the leaf springs for damage or deterioration.
- Check the U-bolt for cracks or bends.
- Check the rubber parts for cracks or deterioration.



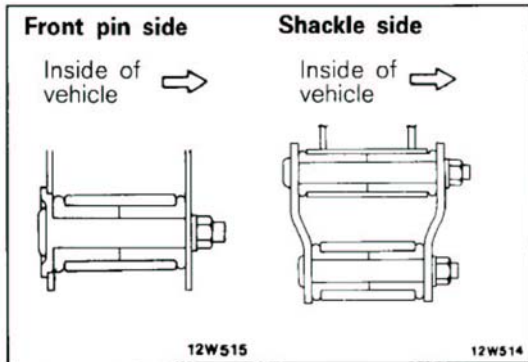
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**SERVICE POINTS OF INSTALLATION**

N17GDAE

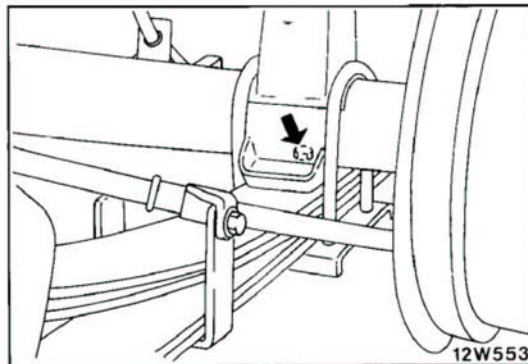
**11. INSTALLATION OF REAR SPRING**

Install the spring assembly to vehicle. Make sure the front end (front pin side) to center bolt distance is shorter than the rear end to center bolt distance.



**9. INSTALLATION OF SHACKLE ASSEMBLY/6. FRONT PIN ASSEMBLY**

- (1) Install the front pin assembly from the outside toward the inside of vehicle.
- (2) Install the shackle assembly from the outside toward the inside of vehicle.



12W553

**4. INSTALLATION OF U-BOLT/3. U-BOLT SEAT**

Before the U-bolts are tightened to specified torque, confirm the relative position of the center bolt and axle housing and that of the center bolt and the hole in the U-bolt seat.

# POWER STEERING

## CONTENTS

N19AA--

<b>GENERAL INFORMATION</b> .....	<b>2</b>	Replacement of Fluid .....	11
<b>OIL PUMP</b> .....	<b>33</b>	Steering Wheel Centering .....	14
<b>POWER STEERING GEAR BOX</b> .....	<b>23</b>	<b>SPECIAL TOOLS</b> .....	<b>8</b>
<b>SERVICE ADJUSTMENT PROCEDURES</b> .....	<b>9</b>	<b>SPECIFICATIONS</b> .....	<b>2</b>
Air Bleeding .....	12	General Specifications .....	2
Checking Fluid Level .....	11	Lubricants .....	5
Checking Stationary Steering Effort .....	10	Sealants and Adhesives .....	5
Checking Steering Angle .....	10	Service Specifications .....	2
Checking Steering Gear Backlash .....	9	Torque Specifications .....	3
Checking Steering Wheel Free Play .....	9	<b>STEERING COLUMN AND SHAFT</b> .....	<b>16</b>
Checking Steering Wheel Return to Center ...	11	<b>STEERING HOSES</b> .....	<b>38</b>
Checking Drive-Belt Tension .....	11	<b>STEERING LINKAGE</b> .....	<b>39</b>
Measuring Ball Joint End Play .....	10	<b>TROUBLESHOOTING</b> .....	<b>6</b>
Pressure Test of Oil Pump .....	13		



## GENERAL INFORMATION

N19BAB

A tilt steering system in which the steering column can be adjusted in four steps of 3° each for the most suitable driving position has been adopted.

A ball-and-nut type (variable-ratio gear) manual steering gear box has been adopted; it features excellent wear resistance and withstand resistance to impact shocks from the road surface, and assures excellent operation of the steering system.

In addition, an integral type of power steering gear box has been adopted which reduces the required steering force during full-angle turns and during low-speed driving.

## SPECIFICATIONS

### GENERAL SPECIFICATIONS

N19CA--

Items	Specifications
Steering wheel diameter mm (in.)	380 (14.9)
Power steering gear box	
Steering gear type	Ball and nut, torsion bar type (integral type)
Steering gear ratio	16.4
Oil pump	
Oil pump type	Vane type
Displacement cc/rev. (cu.in./rev.)	9.6 (.59)

### SERVICE SPECIFICATIONS

N19CB--

Items	Specifications
Standard value	
Steering wheel free play mm (in.)	25 (.98) or less
Steering angle	
Inner wheel	32°30' <sup>0</sup> / <sub>-3</sub>
Outer wheel	29°00'
Steering gear oil level mm (in.)	25 (.98)
Stationary steering effort N (lbs.)	37 (8.2)
Drive belt tension mm (in.)	9–12 (.35–.47)
Oil pump pressure kPa (psi)	
Gauge hose valve closed	7,500–8,200 (1,067–1,166)
Gauge hose valve opened	980 (142) or less
Mainshaft starting torque Ncm (in.lbs.)	25–65 (2–6)
Cross-shaft end play mm (in.)	0.05 (.0020)
Mainshaft total starting torque Ncm (in.lbs.)	50–90 (4–8)
Backlash between ball groove of rack piston and balls mm (in.)	0.05–0.1 (.0020–.004)
Ball joint starting torque Ncm (in.lbs.)	100–300 (8.9–26)
Idler arm turning torque Ncm (in.lbs.)	300–900 (26–78)
Spring balance reading N (lbs.)	25–75 (5.5–16.5)

Items	Specifications
Limit	
Steering wheel free play mm (in.)	50 (2.0)
Steering gear backlash mm (in.)	0.5 (.02)
Ball joint end play mm (in.)	1.5 (.06)
Oil pump pressure kPa (psi)	
Gauge hose valve closed	1,500 (218)
Backlash between ball groove of rack piston and balls mm (in.)	0.2 (.008)
Clearance between oil pump drive shaft and bushing mm (in.)	0.1 (.004)

**TORQUE SPECIFICATIONS**

N19CC--

Items	Nm	ft.lbs.
Steering column and shaft		
Steering wheel lock nut	35–45	25–33
Steering column A to steering column B	20–25	14–18
Column tube clamp	8–10	6–7
Dash panel cover	3–5	2–4
Steering shaft A to steering shaft B	15–20	11–15
Steering shaft B to joint assembly	30–35	22–25
Joint assembly to steering gear box	30–35	22–25
Plate	18–25	13–18
Power steering gear box		
Gear box installation	55–65	40–47
Gear box to joint assembly	30–35	22–25
Pitman arm to relay rod	45	33
Gear box to pressure hose	40–50	29–36
Gear box to return hose	30–40	22–29
Side cover	45–55	33–40
Adjusting bolt lock nut	30–45	22–33
Breather plug	3–4	2–3
Pitman arm installation	130–150	94–108
Circulators installation	3.5–4.5	2.5–3.2
Valve housing	45–55	33–40
Lock nut*	180–230*	130–166*

## NOTE

\* If the special tool is used to measure the tightening torque, the measurement is 135–175 Nm (98–127 ft.lbs.).

Items	Nm	ft.lbs.
Oil pump		
Oil pump bracket to engine		
Front	14-21	10-15
Right side		
Front	14-21	10-15
Rear	27-41	20-30
Oil pump to pressure hose	16-24	12-17
Oil reservoir assembly		
Reservoir to reservoir bracket	6-10	4-7
Reservoir to oil pump body	18-22	13-16
Oil pump body to oil pump bracket	25-33	18-24
Connector	40-60	29-43
Suction plate	6-10	4-7
Pump cover	18-22	13-16
Steering hoses		
Under skid plate		
Front	18-25	13-18
Rear	10-13	7-9
Pressure hose		
Oil pump side	16-24	12-17
Gear box side	30-40	21-29
Return tube	40-50	29-36
Clip	8-10	6-7
Pressure hose clip	8-12	6-9
Return hose clip	8-12	6-9
Tube stay	16-24	12-17
Tube clip	8-12	6-9
Breather pipe	8-12	6-9
Steering linkage		
Underskid plate		
Front	18-25	13-18
Rear	10-13	7-9
Tie rod end to knuckle	45	33
Tie rod end to relay rod	45	33
Tie rod end to pipe	65-80	47-58
Relay rod to pitman arm	45	33
Relay rod to idler arm	45	33
Idler arm to idler arm support	40-60	29-43
Idler arm support to frame	55-65	40-47

**LUBRICANTS**

N19CD--

Items	Specified lubricant	Quantity
Between the cap and stop bolt for steering angle adjustment, and the head of the stop bolt	Multipurpose grease SAE J310, NLGI No. 2	As required
Steering shaft C and D	Multipurpose grease SAE J310, NLGI No. 2	As required
Surface of lever cam which contacts steering column B	Multipurpose grease SAE J310, NLGI No. 2	As required
Surface of plate clevis pin which contacts steering column B	Multipurpose grease SAE J310, NLGI No. 2	As required
Between plate clevis pin and return spring	Multipurpose grease SAE J310, NLGI No. 2	As required
Dash panel cover grommet	Multipurpose grease SAE J310, NLGI No. 2	As required
Installation location of steering shaft A bushing	Multipurpose grease SAE J310, NLGI No. 2	As required
Installation locations of steering column A bushings	Multipurpose grease SAE J310, NLGI No. 2	As required
Power steering fluid	Automatic transmission fluid DEXRON type	900 cc (54.9 cu.in.)
Oil seal lip of mainshaft	Multipurpose grease SAE J310, NLGI No. 2	As required
U-packing of side cover	Multipurpose grease SAE J310, NLGI No. 2	As required
Needle bearing of side cover	Multipurpose grease SAE J310, NLGI No. 2	As required
Oil seal lip of cross-shaft	Multipurpose grease SAE J310, NLGI No. 2	As required
Lip portion of dust cover	Multipurpose grease SAE J310, NLGI No. 2	As required
Inside of dust cover	Multipurpose grease SAE J310, NLGI No. 2	As required
Inside surface of idler arm bushing and shaft of idler arm support	Multipurpose grease SAE J310, NLGI No. 2	As required

**SEALANTS AND ADHESIVES**

N19CE--

Items	Specified sealant
Dash panel cover bolt installation hole	3M ART Part No. 8663, or equivalent
Inside steering column B nut	3M Stud locking 4170, or equivalent
Installation surface of dust cover	3M ART Part No. 8663, or equivalent

## TROUBLESHOOTING

N19EABB

Symptom	Probable cause	Remedy	Reference page
Excessive play of steering wheel	Excessive play in steering gear box	Repair	19-25, 28
	Loose steering gear mounting bolts	Retighten	19-23
	Loose or worn stud of tie rod end	Retighten or replace as necessary	19-39
Steering wheel operation is hard (insufficient power assist)	Loose belt	Adjust the belt tension	19-11
	Damaged belt	Replace the belt	–
	Low fluid level	Refill with fluid	19-11
	Air in fluid line	Bleed the system	19-12
	Twisted or damage hoses	Correct the hose routing or replace the hoses	19-38
	Fluid leakage	Check the fluid leakage	–
	Malfunction of gear box	Check and replace the gear box if necessary	19-23
	Malfunction of oil pump	Check the oil pump pressure and repair oil pump	19-13
Rattling noise	Loose installation of oil pump or gear box	Retighten the oil pump or gear box	19-23, 33
	Interference around column or between pressure hose and other parts	Correct or replace the pressure hose and the parts around the column	19-38
	Abnormal noise inside of gear box and oil pump	Replace the gear box or oil pump	19-23, 33
Shrill noise	Air sucked into oil pump	Check the oil level and hose clips, bleed the system or replace the oil pump	19-11, 38, 19-33
	Oil pump seizure	Replace the oil pump	19-33
Squealing noise	Loose belt	Adjust the belt tension	19-11
	Oil pump seizure	Replace the oil pump	19-33
Hissing noise	Air sucked into oil pump	Check the oil level and hose clips; bleed the system	19-11, 38
	Damage to the olive of the gear box port section	Replace the gear box	19-23
	Malfunction of return hose	Replace the hose	19-38
Whistling noise	Malfunction of gear box port section	Replace the gear box	19-23

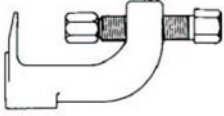



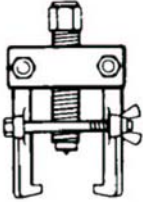
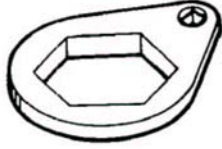






Symptom	Probable cause	Remedy	Reference page
Droning noise	Loose mounting bolt on oil pump or oil pump bracket	Retighten the pump bracket or pump mounting bolt	19-33
	Poor condition of oil pump body*	Replace the oil pump	19-33
Squeaking noise	Malfunction of steering stopper contact	Check and adjust the steering stopper	19-10
	Interference of wheel with vehicle body	Adjust the steering angle	19-10
	Malfunction of gear box	Replace the gear box	19-23
Vibration**	Air suction	Bleed the system	19-12
	Malfunction of gear box	Replace the gear box	19-23
Oil leakage from hose connection	Improperly tightened flare nut Incorrectly inserted hose Improperly clamped hose	Check, and repair or replace	19-38
Oil leakage from hose assembly	Damaged or clogged hose Hose connector malfunction	Replace	19-38
Oil leakage from oil reservoir	Improperly welded pipe	Weld the pipes or replace	19-33
	Overflow	Bleed the system or adjust the oil level	19-11, 12
Oil leakage from oil pump	Malfunction oil pump housing	Replace the oil pump	19-33
	Malfunction of O-ring and/or oil seal	Replace the O-ring and oil seal	19-34
Oil leakage from gear box	Malfunction of gear box housing (including leakage from air hole)	Replace the gear box	19-23
	Malfunction of O-ring and/or oil seal	Replace the O-ring and oil seal	19-25, 28

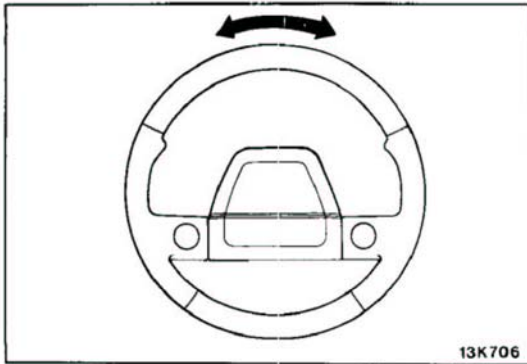
## NOTE

- \* A slight "beat noise" is produced by the oil pump; this is not a malfunction. (This noise occurs particularly when a stationary steering effort is made.)
- \*\* A slight vibration may be felt when the stationary steering effort is made due to the condition of the road surface. To check whether the vibration actually exists or not, test-drive the vehicle on a dry concrete or asphalt surface. Moreover, a very slight amount of vibration is not a malfunction.

SPECIAL TOOLS

N19DA--

Tool (Number and name)	Use	Tool (Number and name)	Use
<p>MB990635-01 Steering linkage puller</p>  <p>MB990778-01 Ball joint remover</p> 	<p>Disconnection of the steering linkage</p>	<p>MB990925-01 Bearing and oil seal installer set</p>  <p>MB990938-01 Handle</p> 	<p>Installation of the oil seal and the ball bearing (Refer to GROUP 3)</p>
<p>MB990809-01 Pitman arm puller</p> 	<p>Removal of the pitman arm</p>	<p>MB990852-01 Housing lock nut special spanner</p> 	<p>Removal and installation of the housing lock nut</p>
<p>MB990228-01 Preload socket</p> 	<p>Measurement of the mainshaft starting torque</p>	<p>MB990853-01 Top cover remover</p> 	<p>Removal and installation of the top cover</p>
<p>MB990662-01 Oil pressure gage</p> 	<p>Measurement of the oil pump pressure</p>	<p>MB990854-01 Snap ring installer</p> 	<p>Installation of the snap ring</p>
<p>MB990993-01 (pump side) Oil pressure gage adapter</p>  <p>MB990994-01 (hose side) Oil pressure gage adapter</p> 	<p>Connection of oil pressure gage</p>		



13K706

## SERVICE ADJUSTMENT PROCEDURES

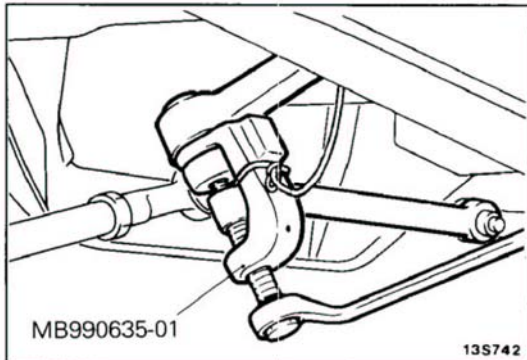
### CHECKING STEERING WHEEL FREE PLAY N19FABD

1. With the engine stationary and the steering wheel in the straight-ahead position, apply a force of 5N (1.1 lbs.) to the steering wheel in the peripheral direction. Measure the play on the circumference of the steering wheel.

**Standard value : 25 mm (.98 in.) or less**

**Limit : 50 mm (2.0 in.)**

2. If the measured value exceeds the repair limit, check the steering gear backlash and linkage ball joint end play.



MB990635-01

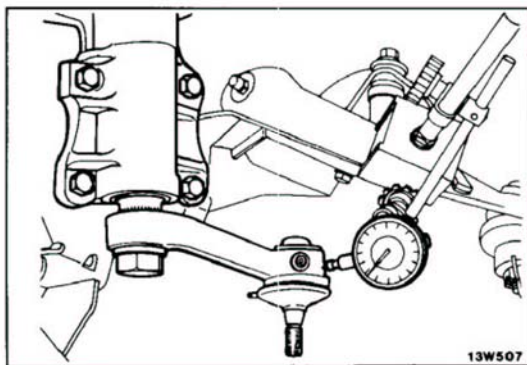
13S742

### CHECKING STEERING GEAR BACKLASH N19FOAB

1. Jack up to the vehicle front and hold the steering wheel in the straight ahead position.
2. Apart the pitman arm and the relay rod.

#### Caution

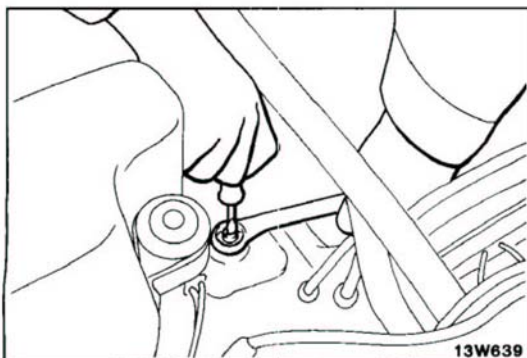
1. Use cord to bind the special tool closely so it won't become separated.
2. The nut should be loosened only, not removed.



13W507

3. Measure the steering gear backlash at the pitman arm top end with a dial indicator.

**Limit : 0.5 mm (.02 in.)**



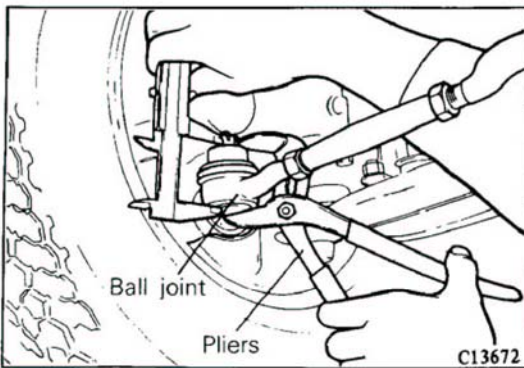
13W639

4. If the measured value exceeds the limit, screw in the steering gear box adjusting bolt until steering wheel free play is within the range of standard value.

#### Caution

1. Be sure to make the adjustment with the steering wheel in the straight-ahead position.
2. If the adjusting bolt is overtightened, more steering effort will be required, and return of the wheel will be adversely affected.



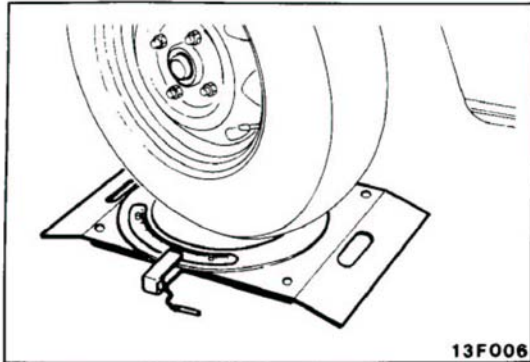
**MEASURING BALL JOINT END PLAY**

N19FPAA

1. Hold the ball joint with pliers.
2. Set a caliper gauge as shown in left figure and measure the displacement with the ball stud compressed.

**Limit : 1.5 mm (.06 in.)**

3. If the measured displacement is over the limit, replace the ball joint.

**CHECKING STEERING ANGLE**

N19FDAC

1. Place the front wheel on a turning radius gauge and measure the steering angle.

**Standard value : Inner wheel  $32^{\circ}30'_{-3}$   
Outer wheel  $29^{\circ}00'$**

2. Adjust the steering angle of each wheel by turning the stop bolt of the knuckle arm.

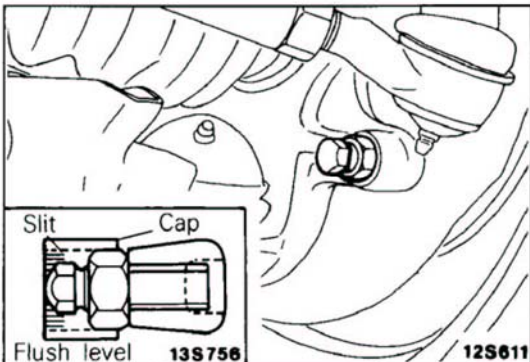
**NOTE**

After adjusting the steering angle, mount the cap onto the jam bolt so that the edge of the slit side of the cap and the head of the stop bolt are flush and face in the same direction, and then pack the head of the stop bolt with the specified grease.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

**Caution**

**Be sure that the toe-in is properly adjusted before adjusting the steering angle.**

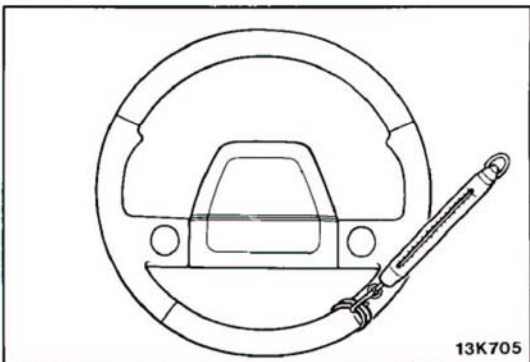
**CHECKING STATIONARY STEERING EFFORT**

N19FFAD

1. Place the vehicle on a level surface and place the steering wheel in the straight-ahead position.
2. Set the engine speed to 1,000 r/min.
3. Measure the tangential force with a spring balance by turning the steering wheel clockwise and counterclockwise one and a half turns.

**Standard value : 37 N (8.21 lbs.) or less**

4. If the stationary steering effort exceeds the standard value, check for belt slackness, damage, insufficient oil, air mixed into oil, collapsed or twisted hoses, etc., and repair if found.



**CHECKING STEERING WHEEL RETURN TO CENTER**

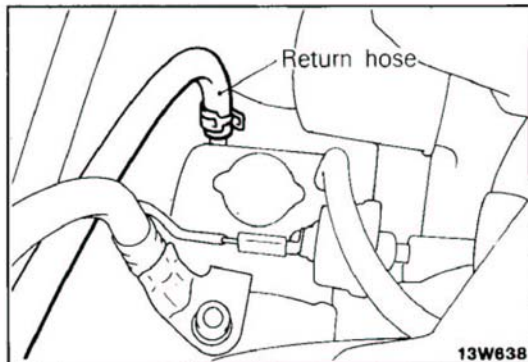
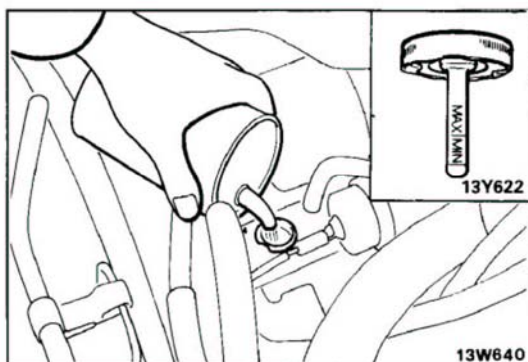
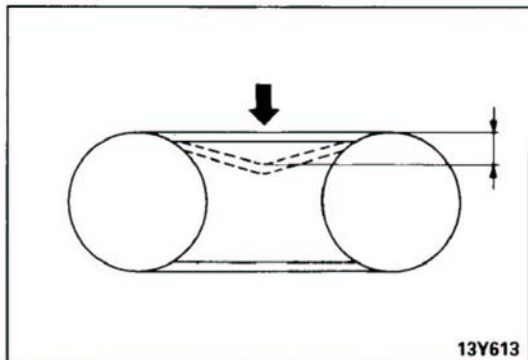
N19FGAD

To check for the return of steering wheel to center, carry out drive test and check the following points.

1. Make gentle and sharp turns and check to get a feel for that there is no appreciable difference in steering effort and return to center between right and left turns.
2. Drive at a speed of about 35 km/h (22 mph), turn the steering wheel 90° clockwise or counterclockwise, and release the wheel a second or two later. If the wheel returns more than 70°, the return may be considered good.

**NOTE**

When the steering wheel is turned abruptly, momentary hard steering might result, but this does not mean any problem. It is caused by low oil pump delivery during idling.

**CHECKING DRIVE-BELT TENSION**

N19FHAD

1. Check the belt for slackness by applying pressure of 100N (22lbs.) to the center of the belt.

**Standard value : 9–12mm (.35–.47 in.)**

2. If the measured tension is different from the standard value, adjust the drive belt tension.

**CHECKING FLUID LEVEL**

N19FIAF

1. Start the engine on a level surface, and turn the steering wheel several times fully to the right and left while the engine is idling.
2. Replace the fluid if it has bubbles or has become white.
3. Fill the reservoir with specified automatic transmission fluid to the MAX level.

**Specified fluid : Automatic transmission fluid DEXRON Type**

**REPLACEMENT OF FLUID**

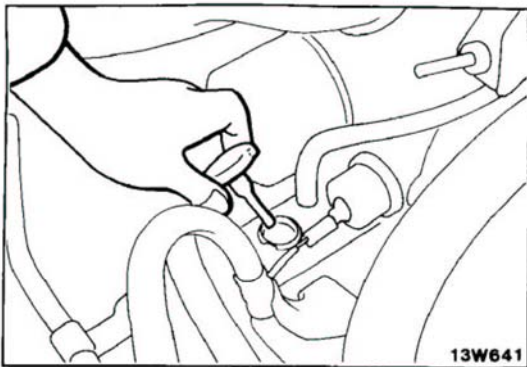
N19FJAF

Check for contamination in the fluid reservoir. Foamy or cloudy fluid should be replaced.

1. Remove the reservoir cap.
2. Disconnect the return hose from the reservoir tank and remove the fluid.
3. Disconnect the high tension cable.
4. Run the engine intermittently several times with the starting motor, and remove the fluid from the gear box.
5. Attach the return hose and supply the specified fluid.

**Specified fluid : Automatic transmission fluid DEXRON Type**

6. Bleed the system and check the fluid pressure.



## AIR BLEEDING

N19FKAD

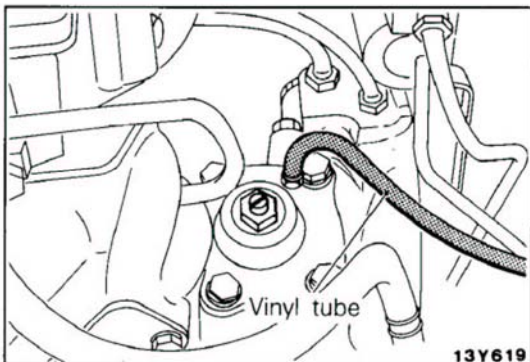
Check stationary steering effort. If it is different from the standard value, air in the system is suspected. Bleed the system.

1. Make certain the reservoir is filled up.
2. Jack up the front wheels.
3. Remove the high tension cable.

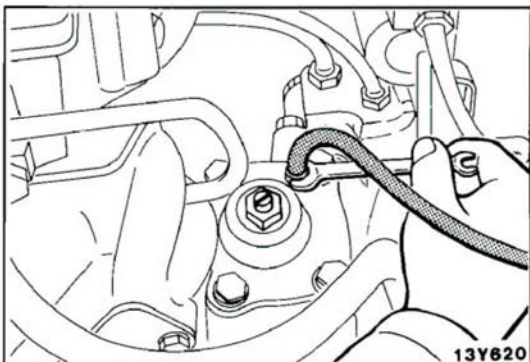
4. While turning the steering wheel completely to the right and to the left, turn the engine over by using the starting motor. Repeat this several times.

### Caution

**Do not carry out bleeding with the engine running, high speed rotation of the oil pump mixes the power steering fluid with air, making it impossible to thoroughly bleed the system.**



5. Lower the front wheels.
6. Connect one end of a vinyl tube of suitable length to the breather plug of the gear box, and place its other end in a container.
7. Start the engine and idle it.

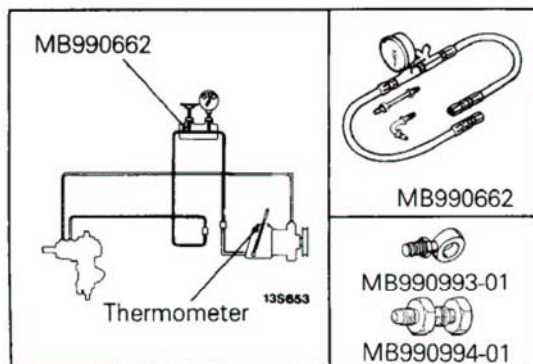


8. Loosen the breather plug, and then turn the steering wheel completely to the right and left continuously until air bubbles no longer appear in the fluid coming out of the tube.

### Caution

**Do not hold the steering completely to the left or right for 10 seconds or more.**

9. After completion of the bleeding, tighten the breather plug. Check the fluid level, and refill if necessary.
10. When turning the steering wheel right and left fully, check that the fluid level variation is less than 4 mm (.16 in.)

**PRESSURE TEST OF OIL PUMP**

N19FLAD

1. Disconnect the pressure hose from the oil pump and connect the special tool as illustrated.

**NOTE**

Use the adapter to connect the special tool to the pump.

2. Bleed the power steering system.
3. Start the engine and operate it until the fluid temperature reaches about 55°C (131°F).
4. Run the engine at 1,000 r/min.
5. Completely close the shut-off valve of the special tool and read the gauge pressure.

**Caution**

**Do not close the shut-off valve of the special tool for more than 3 seconds.**

**Standard value :**

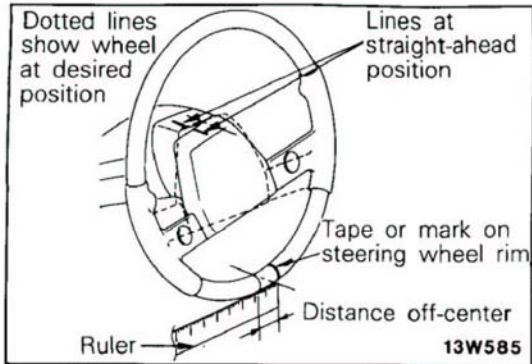
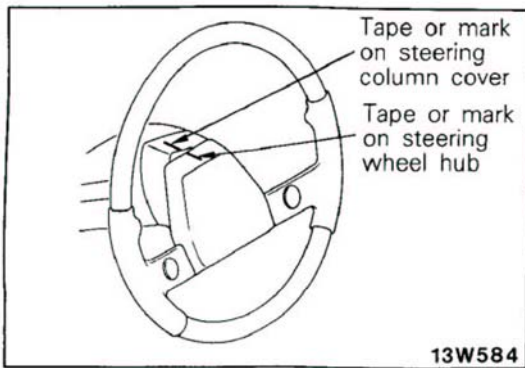
**Valve closed 4,900–7,800 kPa (711–1,138 psi.)**

**Valve opened 980 kPa (142 psi)**

**Limit :**

**Valve opened 1,500 kPa (218 psi)**

6. If the hydraulic pressure is not within the range of the standard value, replace the oil pump.
7. Completely open the shut-off valve of the special tool and read the gauge pressure. If the hydraulic pressure is not within the range of the standard value, check for a clogged or collapsed oil line, or for a clogged oil passage inside the gear box.
8. With the shut-off valve of the special tool completely open, and turn the steering wheel completely to the right or left, then measure the maximum oil pressure in this condition. If the maximum oil pressure is not within the range of the standard value, (valve closed) the valve of the gear box is faulty, and the gear box must be replaced.



## STEERING WHEEL CENTERING

### SIMPLIFIED STEERING WHEEL CENTERING

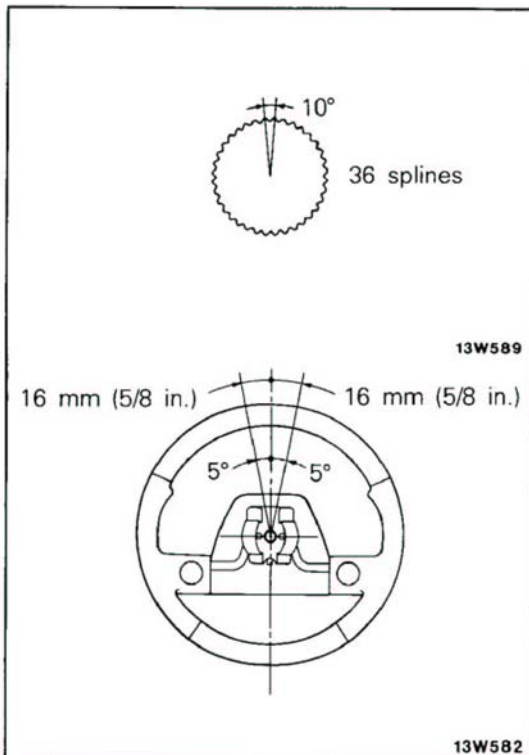
#### DETERMINING STEERING WHEEL'S OFF CENTER

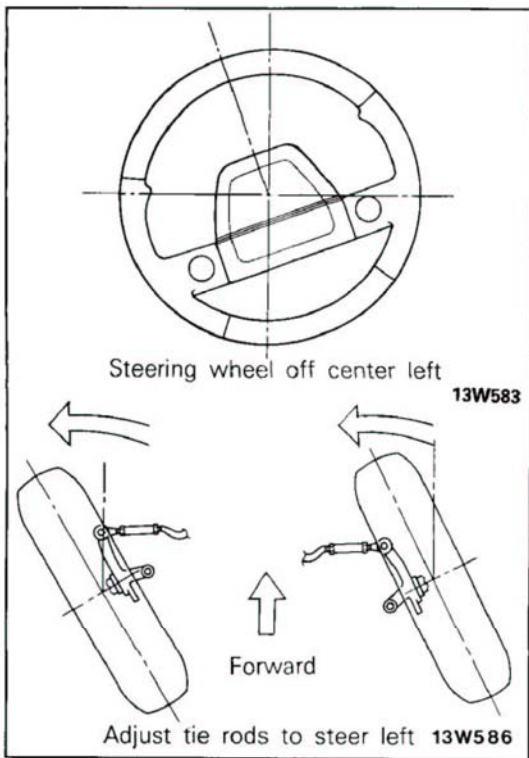
1. For the road test, take along chalk or tape and a ruler.
2. Drive straight ahead on an uncambered level surface.
3. When the vehicle's wheels are pointing straight ahead, mark the steering wheel hub and column cover with a chalk or tape line.
4. Stop the vehicle and line up the marks on the hub and column cover.
5. Place a tape strip or mark on the steering wheel rim.
6. Hold a ruler next to the rim as shown in the illustration, and then steer the steering wheel until it is in the desired centered position.
7. Record the distance the strip or mark on the rim has moved. This is how far the steering wheel is off center. If it is more than 16 mm (5/8 in.) off center, it can be centered by indexing it ten degrees towards the center.

#### INDEXING STEERING WHEEL TO CENTER IT

The steering wheel shaft has 36 splines, allowing the steering wheel to be indexed in ten-degree increments.

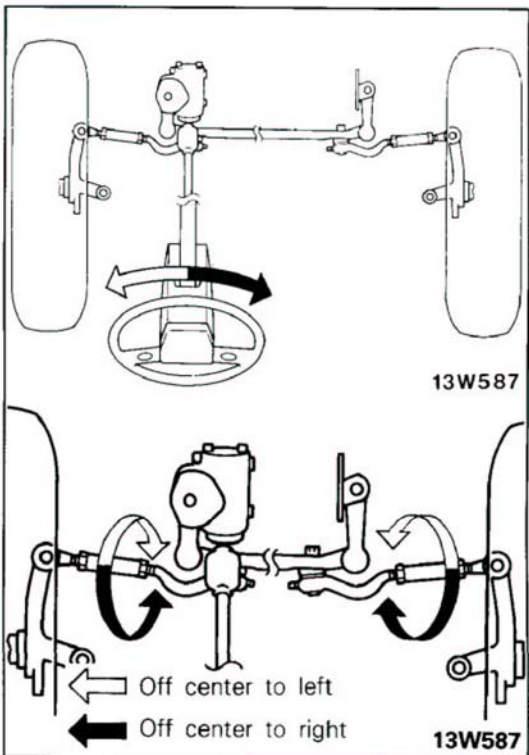
1. Remove the steering wheel.
2. Without disturbing the position of the steering wheel shaft, re-install the wheel as near on-center as possible.





**PRECISION STEERING WHEEL CENTERING**

In general, the tie rods are adjusted to steer the front wheels in the same direction that the steering wheel is off center. If the steering wheel is off center to the left, center it by adjusting the tie rods to make the front wheels steer toward the left, and vice versa.



1. Hold the tie rods with a wrench while loosening the locking nuts at least 1/4 turn.
2. Hold the tie rod end with a wrench and turn the tie rod the desired number of turns. Adjust both tie rods equally in the same direction to center the steering wheel.

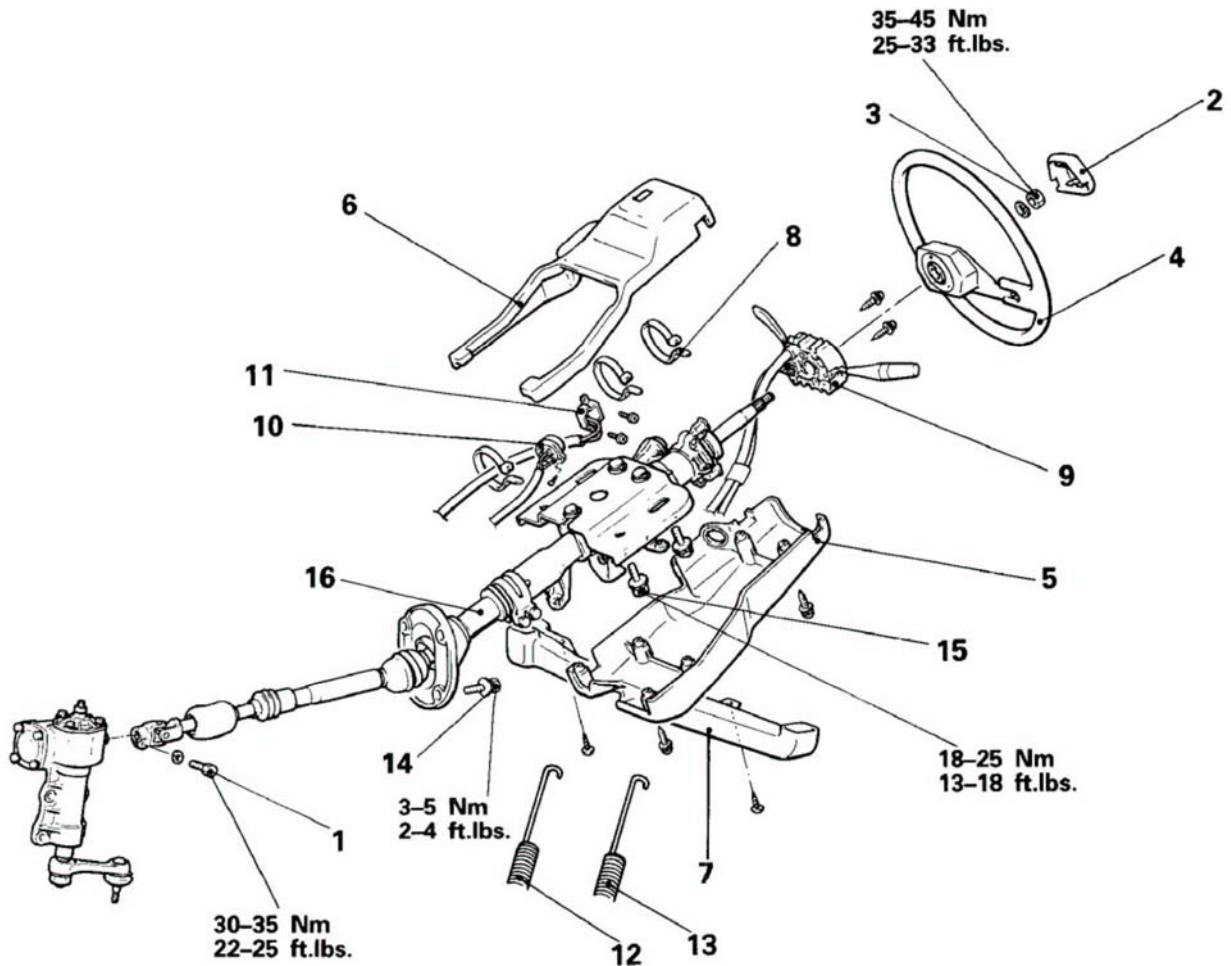
**NOTE**

By turning the tie rods 1/6 of a turn, an adjustment of 2° (at the steering wheel center) or 6 mm (.25 in.) (at the steering wheel rim) can be made.

# STEERING COLUMN AND SHAFT

## REMOVAL AND INSTALLATION

N19GA-



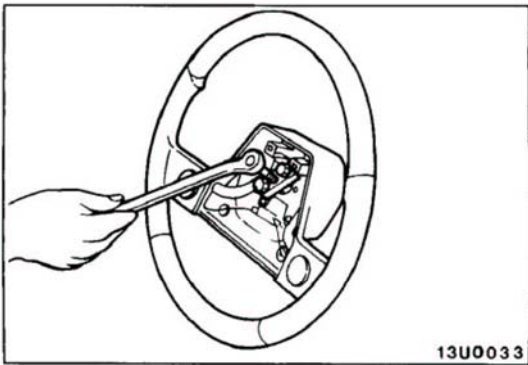
### Removal steps

13W644

- |                                  |  |
|----------------------------------|--|
| 1. Bolt                          | 11. Key remained switch                |
| 2. Horn pad                      | ◆◆ 12. Brake pedal return spring       |
| 3. Jam nut                       | ◆◆ 13. Clutch pedal return spring      |
| ◆◆ ◆◆ 4. Steering wheel assembly | ◆◆ 14. Washer bolts                    |
| 5. Lower column cover            | 15. Bolts                              |
| 6. Upper column cover            | 16. Steering column and shaft assembly |
| 7. Lap heater duct               |  |
| 8. Cable band                    |  |
| 9. Column switch                 |  |
| 10. Ignition switch              |  |

### NOTE

- (1) Reverse the removal procedures to reinstall.  
 (2) ◆◆ : Refer to "Service Points of Removal".  
 (3) ◆◆ : Refer to "Service Points of Installation".



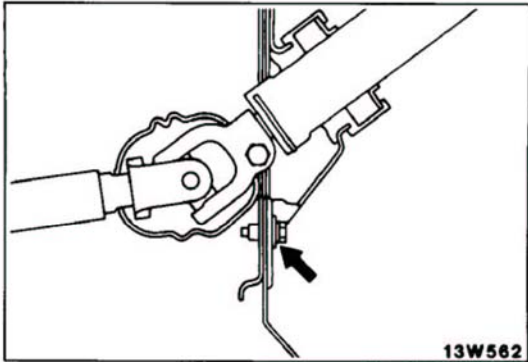
13U0033

**SERVICE POINTS OF REMOVAL**

N19GBAH

**4. REMOVAL OF STEERING WHEEL ASSEMBLY**

Remove the steering wheel.



13W562

**SERVICE POINTS OF INSTALLATION**

N19GDAE

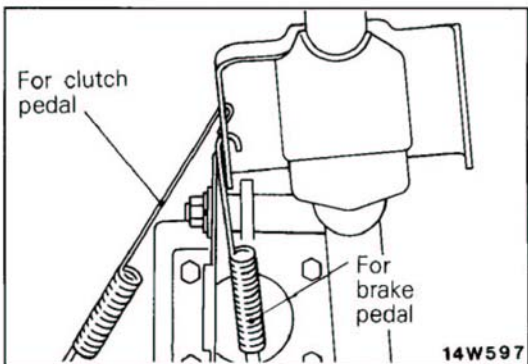
**13. APPLICATION OF SEALANT TO WASHER BOLTS**

Attach the dash panel cover and apply a coating of the specified sealant in the bolt installation hole from inside the vehicle.

**Specified sealant : 3M ART Part No. 8663 or equivalent**

**Caution**

**Do not loosen the column tube clamp bolts. If the clamp bolts should be loosened, retighten them securely while pulling the steering shaft out fully toward the interior side.**



14W597

**13. INSTALLATION OF CLUTCH PEDAL RETURN SPRING /12.BRAKE PEDAL RETURN SPRING**

Install the return spring to the position as shown in the figure.

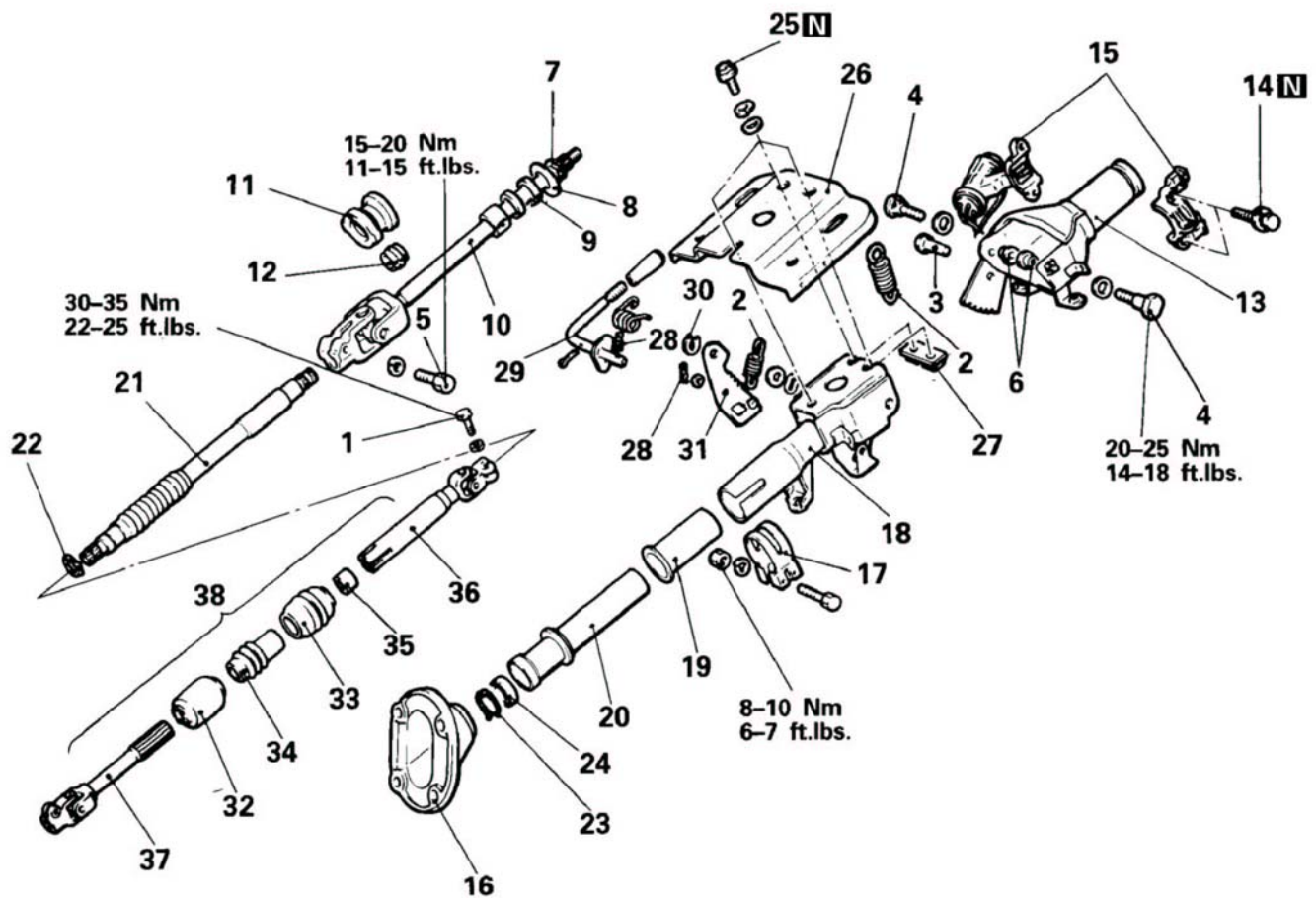
**4. INSTALLATION OF STEERING WHEEL ASSEMBLY**

Position the front wheels in the straight-ahead position and install the steering wheel.

If the center of the steering wheel is not in alignment, make the steering wheel centering adjustment. (Refer to 19-14.)



DISASSEMBLY AND REASSEMBLY



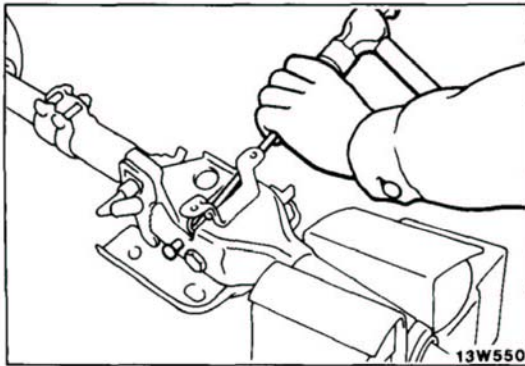
13W612

Disassembly steps

- ◆◆ 1. Bolt
- ◆◆ 2. Return springs
- ◆◆◆◆ 3. Clevis pin
- ◆◆ 4. Bolts
- ◆◆ 5. Bolt
- ◆◆ 6. Bushings
- ◆◆◆ 7. Snap ring
- 8. Stopper
- 9. Spacer
- ◆◆◆ 10. Steering shaft A
- ◆◆◆ 11. Dust seal
- ◆◆◆ 12. Bushing
- ◆◆◆◆ 13. Steering column A
- ◆◆◆◆ 14. Special bolts
- ◆◆◆◆ 15. Steering lock assembly
- ◆◆◆ 16. Dash panel cover
- ◆◆◆◆ 17. Column tube clamp
- ◆◆◆◆ 18. Steering column B
- ◆◆◆◆ 19. Column bushing
- ◆◆◆◆ 20. Column tube
- ◆◆◆◆ 21. Steering shaft B
- ◆◆◆◆ 22. Snap ring
- ◆◆◆◆ 23. Clip
- ◆◆◆◆ 24. Bearing
- ◆◆◆◆ 25. Special bolts
- ◆◆◆◆ 26. Plate
- ◆◆◆◆ 27. Nut plate
- ◆◆◆◆ 28. Snap pin
- ◆◆◆◆ 29. Lever assembly
- ◆◆◆◆ 30. Snap ring
- ◆◆◆◆ 31. Plate assembly
- ◆◆◆◆ 32. Lower boot
- ◆◆◆◆ 33. Upper boot
- ◆◆◆◆ 34. Dust cover
- ◆◆◆◆ 35. Spring
- ◆◆◆◆ 36. Steering shaft C
- ◆◆◆◆ 37. Steering shaft D
- ◆◆◆◆ 38. Joint assembly

NOTE

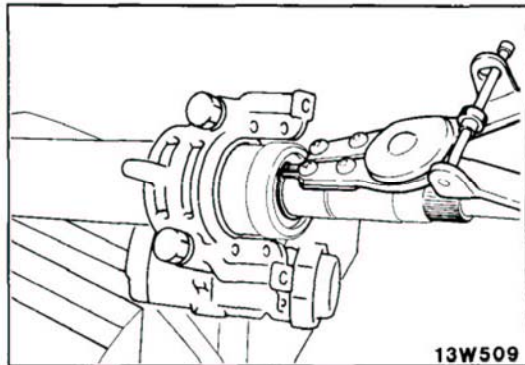
- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆◆◆ : Refer to "Service Points of Reassembly".
- (4) [N] : Non-reusable parts

**SERVICE POINTS OF DISASSEMBLY**

N19GFAF

**3. REMOVAL OF CLEVIS PIN**

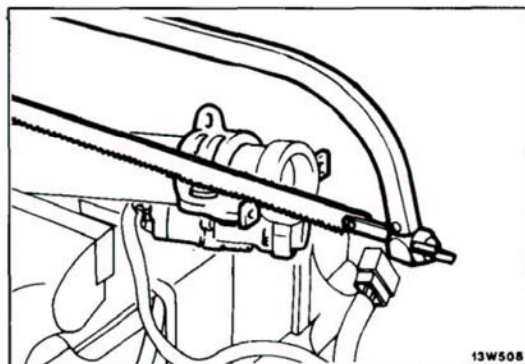
Knock the clevis pin out from the inside of the steering column.

**7. REMOVAL OF SNAP RING**

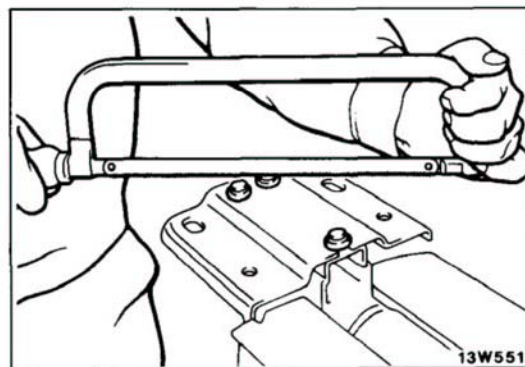
Using the snap ring pliers, remove the snap ring from steering shaft A and extract steering shaft A from the bottom of steering column A.

**NOTE**

Release the steering lock to extract steering shaft A.

**14. REMOVAL OF SPECIAL BOLTS/15. STEERING LOCK ASSEMBLY**

If it is necessary to remove the steering lock, cut a groove on the head of each special bolt with a metal saw, and remove the steering lock with a screwdriver.

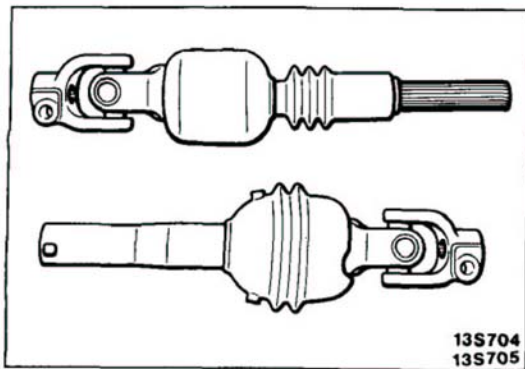
**25. REMOVAL OF SPECIAL BOLTS/26. PLATE**

If it is necessary to remove the plate of steering column B, cut a groove on the head of each special bolt with a metal saw, and remove the plate with a screwdriver.

**INSPECTION**

N19GGAF

- Check the plate for cracks or damage.
- Check the column bushing for damage.
- Check the dash panel cover for damage.
- Check the steering shaft bearing for wear.
- Check the steering shaft for damage and deformation.
- Check the teeth of the plate assembly for wear.
- Check the steering shaft joint for play or faulty operation.
- Check the dust seal and bushing for damage or unusual wear.



## SERVICE POINTS OF REASSEMBLY

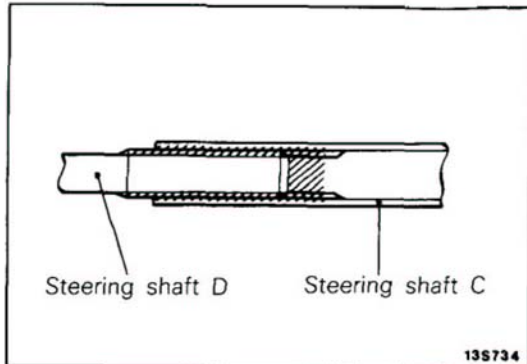
N19GHAK

## 38. INSTALLATION OF JOINT ASSEMBLY

- (1) Plate the upper boot over steering shaft C assembly and the lower boot and dust cover over steering shaft D.

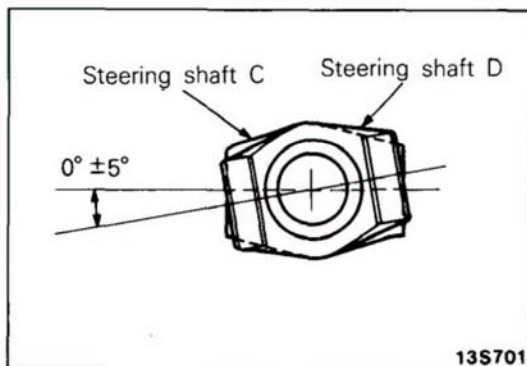
## NOTE

Leave the upper and lower boots on the shafts without assembling them to the universal joint.



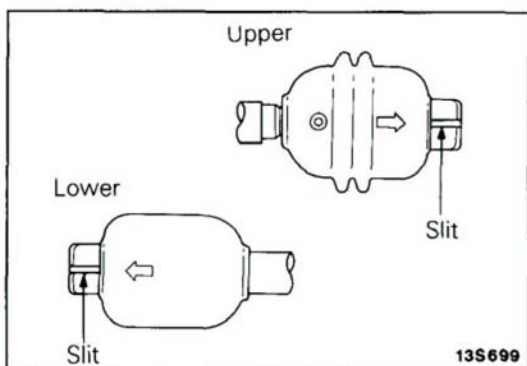
- (2) Apply the specified grease to the steering shaft C and D.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**



## Caution

After inserting steering shaft D make sure that the tilt of the yoke of steering shaft D in relation to the yoke of steering shaft C is within the angle measurement shown in the illustration.



- (3) Assemble the upper and lower boots and the dust cover.

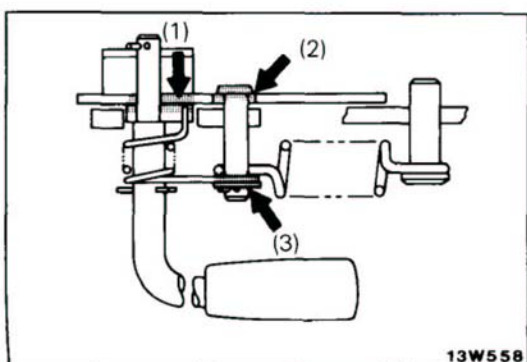
## NOTE

Align the arrows on the upper and lower boots to the slits on the yokes in order to assemble.

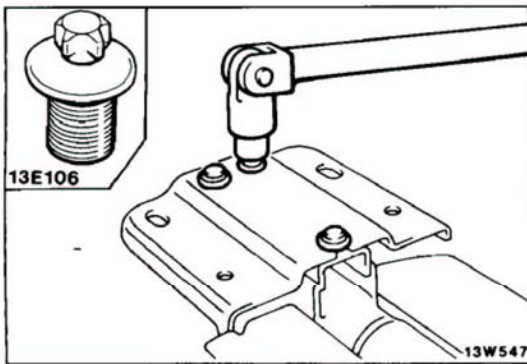
## 31. APPLICATION OF GREASE TO PLATE ASSEMBLY/29. LEVER ASSEMBLY

When installing the lever assembly and the plate assembly, apply the specified grease to the following locations:

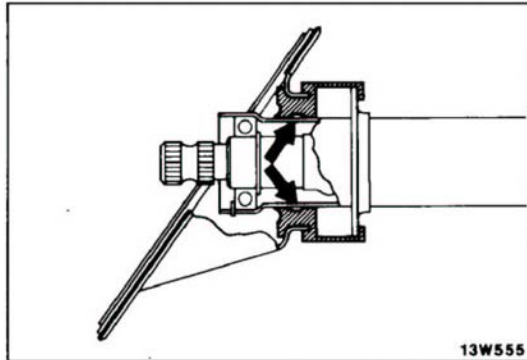
**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**



- (1) The surface of the cam part of the lever which contact steering column B.
- (2) The surface of the plate's clevis pin which contact steering column B.
- (3) The space between the plate's clevis pin and return spring.

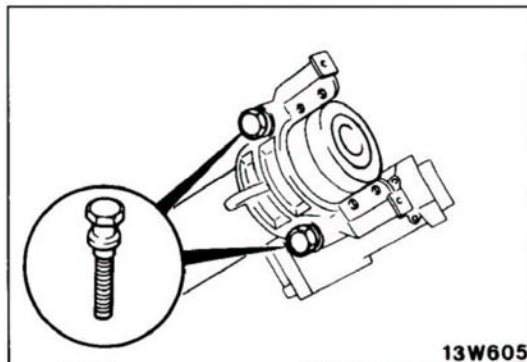
**26. INSTALLATION OF PLATE/25.SPECIAL BOLTS**

When mounting the plate onto the steering column B, tighten the special bolts until the heads twist off.

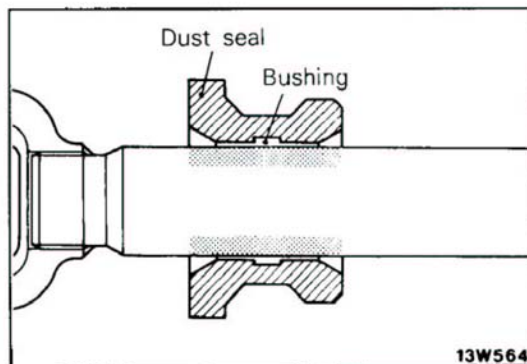
**16. APPLICATION OF GREASE TO DASH PANEL COVER**

Apply the specified grease to the dash panel cover grommet.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

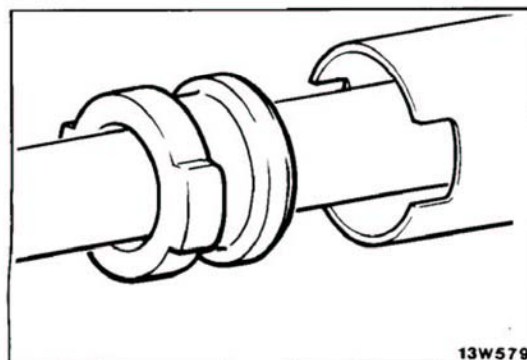
**15. INSTALLATION OF STEERING LOCK ASSEMBLY/14. SPECIAL BOLTS**

- (1) When installing the steering lock onto steering column A, install it loosely in alignment with the column boss and check that it works properly.
- (2) Then tighten the special bolts until the heads twist off.

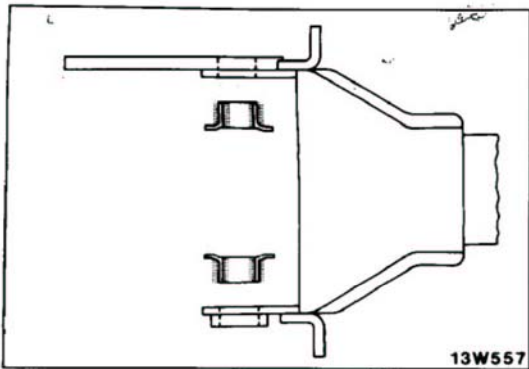
**12. APPLICATION OF GREASE TO BUSHING/11.DUST SEAL**

Apply a coating of specified grease to the bushing of the dust seal and steering shaft A contact surfaces.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

**10. INSTALLATION STEERING SHAFT A**

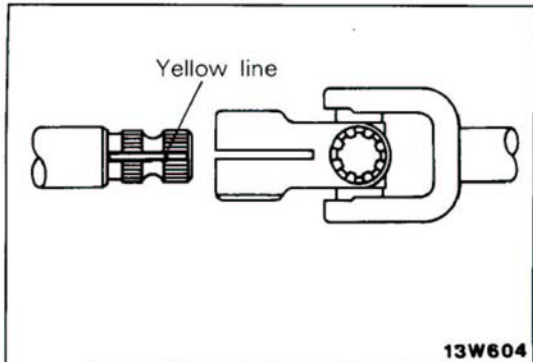
Align the projection of the dust seal and the notch of steering column A, and then install steering shaft A to steering column A.



#### 6. APPLICATION OF GREASE TO BUSHINGS

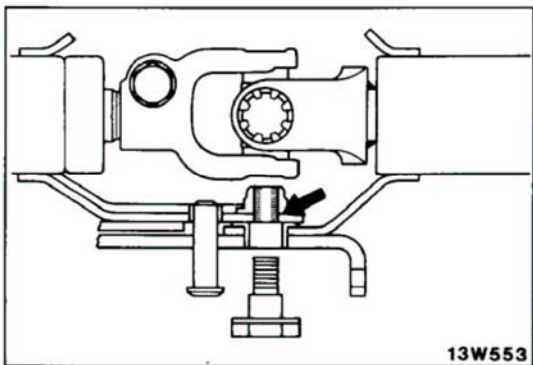
Apply the specified grease to the bushings and install steering column A.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**



#### 5. INSTALLATION OF BOLT

Assemble steering column A and steering column B by aligning the yellow line on the serrated part of steering shaft B with the yoke groove in steering shaft A.



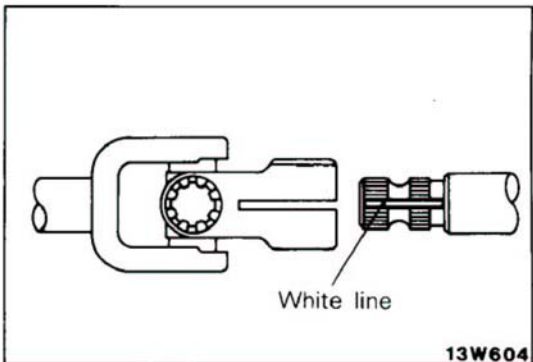
#### 4. APPLICATION OF ADHESIVE TO BOLTS

Apply specified adhesive to the nut of steering column B and tighten the bolt.

**Specified adhesive : 3M Adhesive stud locking 4170 or equivalent**

#### Caution

**If there is any adhesive hardened inside the nut, use a tap to remove it before applying the adhesive.**



#### 3. INSTALLATION OF CLEVIS PIN

Insert a new clevis pin until the tip of the pin is flush with steering column B.

#### 1. INSTALLATION OF BOLT

Align the white line on steering shaft B and the yoke groove in steering shaft C, and then tighten at the specified torque.

**POWER STEERING GEAR BOX  
REMOVAL AND INSTALLATION**

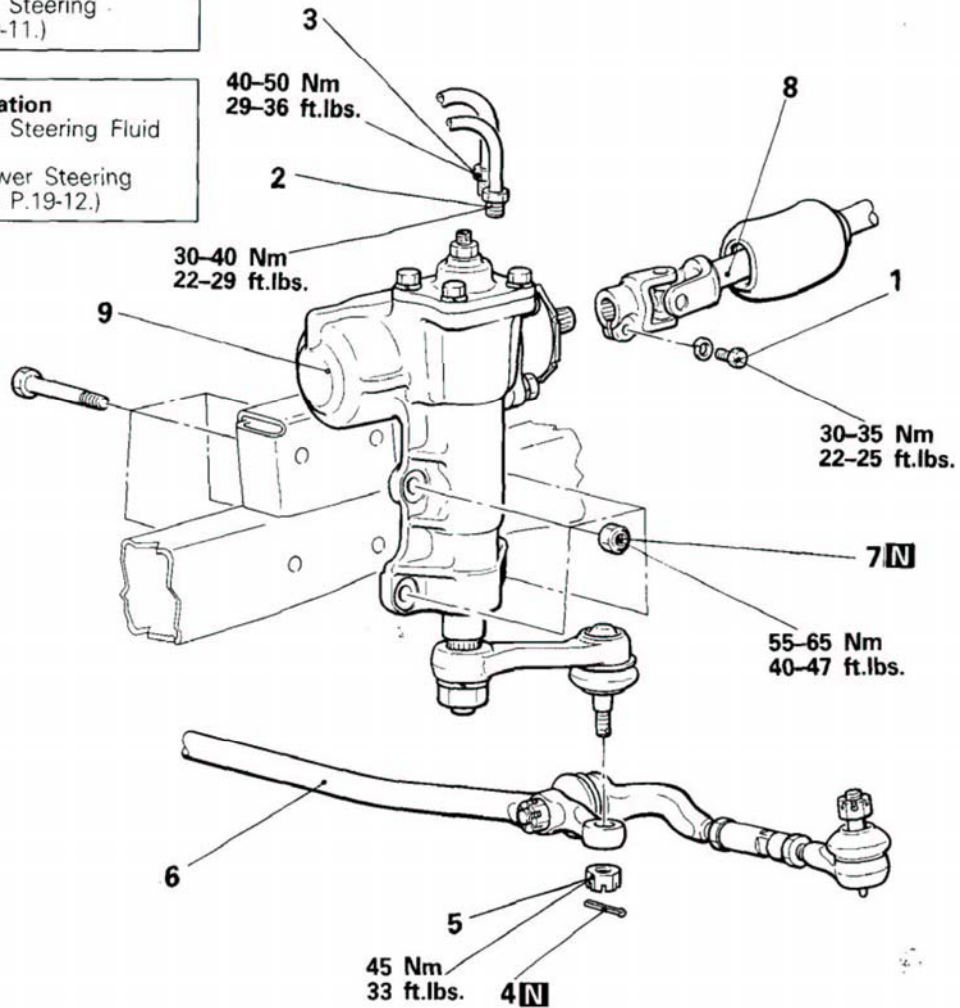
N19NA--

**Pre-removal Operation**

- Drain of the Power Steering Fluid (Refer to P.19-11.)

**Post-installation Operation**

- Supplying of Power Steering Fluid (Refer to P.19-11.)
- Bleeding of the Power Steering Fluid Line (Refer to P.19-12.)



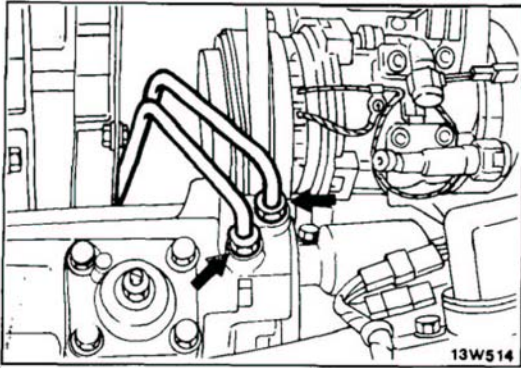
13W642

**Removal steps**

1. Bolt
- ↔ 2. Connection of pressure hose
- ↔ 3. Connection of return hose
4. Cotter pin
5. Slotted nut
- ↔ 6. Connection of relay rod
7. Self-locking nuts
8. Connection of joint assembly
- ↔ 9. Power steering gear box

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ↔ : Refer to "Service Points of Removal".
- (3) ↔ : Refer to "Service Points of Installation".
- (4) N : Non-reusable parts

**SERVICE POINTS OF REMOVAL**

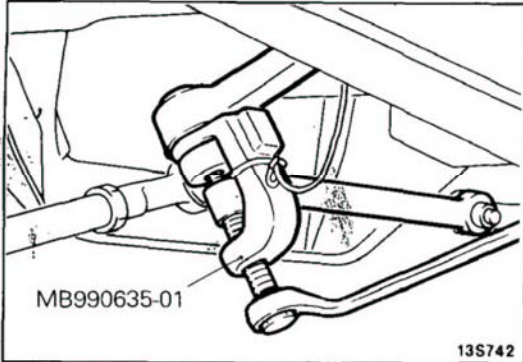
N19NBAC

**2. DISCONNECTION OF PRESSURE HOSE/3. RETURN HOSE**

Disconnect the pressure hose and return hose from the gear box.

**Caution**

Use waste cloth to close the end of each hose in order to prevent escape of fluid and entrance of dirt and other foreign material.

**6. DISCONNECTION OF RELAY ROD**

Disconnect the pitman arm from the relay rod by using the special tool.

**Caution**

1. Use cord to bind the special tool closely so it won't become separated.
2. The nut should be loosened only, not removed.

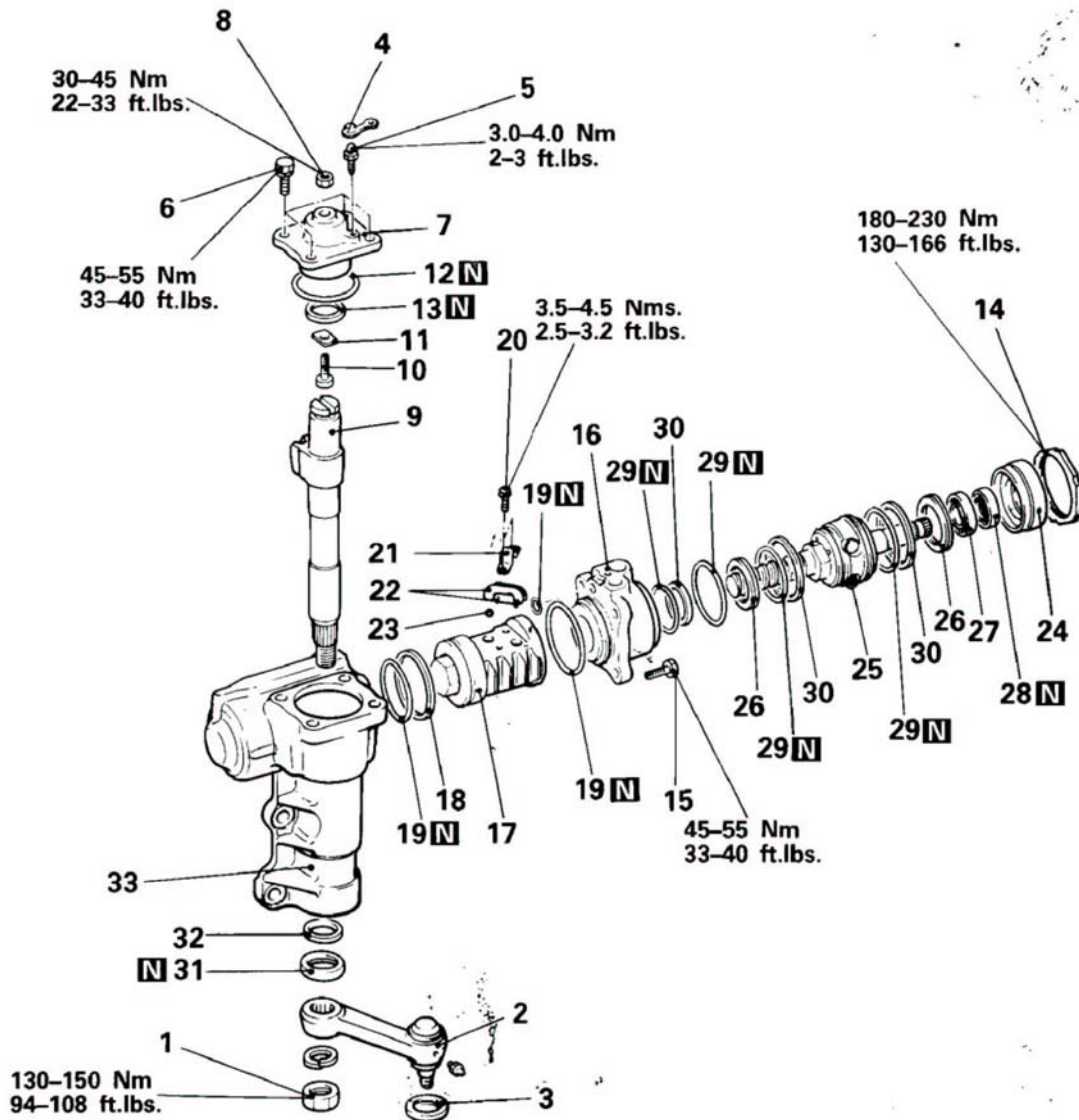
**SERVICE POINTS OF INSTALLATION**

N19NDAB

**9. INSTALLATION OF POWER STEERING GEAR BOX**

Install the power steering gear box to the frame after inserting the power steering gear box mainshaft into the joint assembly.

DISASSEMBLY



13W609

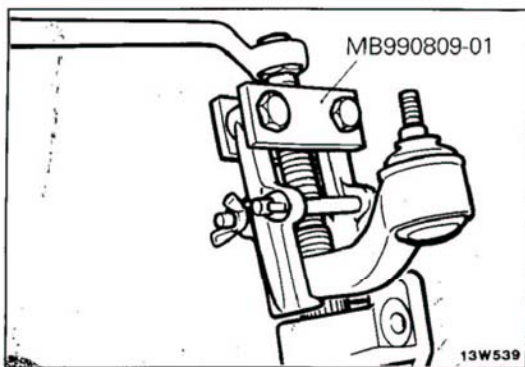
Disassembly steps

- |                              |                              |
|------------------------------|------------------------------|
| 1. Jam nut                   | 19. O-rings                  |
| ↔ 2. Pitman arm              | 20. Screws                   |
| 3. Dust cover                | 21. Circulator holder        |
| ↔ 4. Breather plug cap       | 22. Circulators              |
| ↔ 5. Breather plug           | 23. Balls                    |
| 6. Washer bolts              | ↔ 24. Top cover              |
| 7. Side cover                | 25. Main shaft               |
| ↔ 8. Adjusting bolt lock nut | ↔ 26. Thrust needle bearings |
| ↔ 9. Cross-shaft             | ↔ 27. Ball bearing           |
| ↔ 10. Adjusting bolt         | ↔ 28. Oil seal               |
| 11. Adjusting plate          | 29. O-rings                  |
| 12. O-ring                   | 30. Seal rings               |
| ↔ 13. U-packing              | 31. Oil seal                 |
| ↔ 14. Valve housing lock nut | 32. U-packing                |
| 15. Bolts                    | 33. Gear box housing         |
| ↔ 16. Valve housing          |                              |
| ↔ 17. Rack piston            |                              |
| 18. Seal ring                |                              |

NOTE

- (1) ↔ : Refer to "Service Points of Disassembly"  
 (2) N : Non-reusable parts



**SERVICE POINTS OF DISASSEMBLY**

N19NFAC

**2. REMOVAL OF PITMAN ARM**

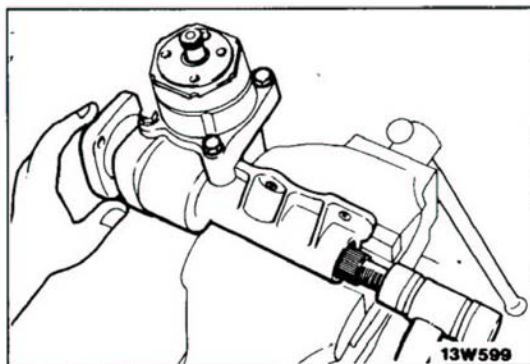
Remove the pitman arm from the gear box assembly by using the special tool.

**5. REMOVAL OF BREATHER PLUG**

Remove the breather plug, and drain the steering gear oil.

**8. REMOVAL OF ADJUSTING BOLT LOCK NUT**

Loosen the lock nut of the adjusting bolt and screw in the adjusting bolt so that the side cover raises slightly.

**9. REMOVAL OF CROSS-SHAFT**

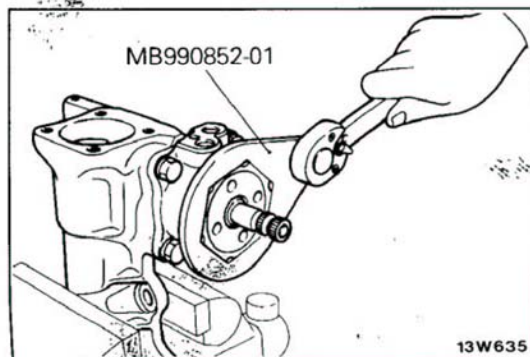
With the mainshaft and cross-shaft placed in the straight ahead position, tap the bottom of the cross-shaft with a plastic hammer to take out the cross-shaft together with the side cover.

**10. REMOVAL OF ADJUSTING BOLT**

Remove the side cover by turning the adjusting bolt.

**13. REMOVAL OF U-PACKING**

Do not remove the U-packing at the rear of the needle bearing unless there is fluid leakage from the threads of the adjusting bolt. If there is leakage, replace the U-packing with a new one.

**14. REMOVAL OF VALVE HOUSING LOCK NUT**

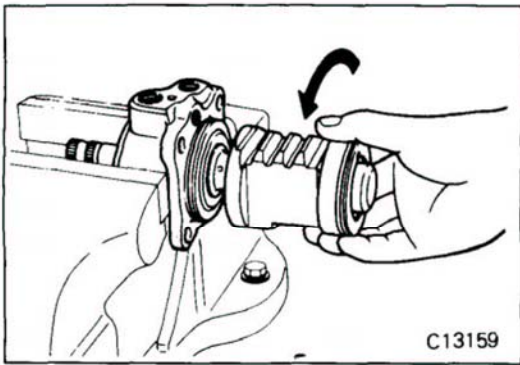
Remove the valve housing lock nut by using the special tool.

**16. REMOVAL OF VALVE HOUSING**

Remove the valve housing together with the rack piston.

**Caution**

**Use care not to drop the rack piston.**

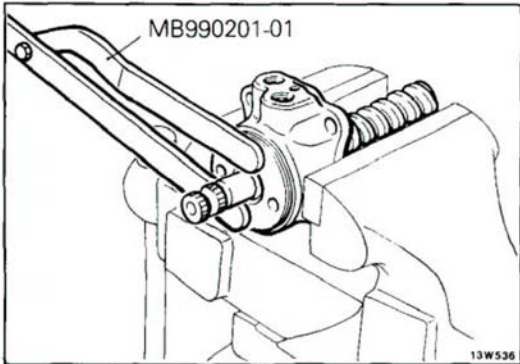


**17. REMOVAL OF RACK PISTON**

Remove the rack piston from the mainshaft by turning it counterclockwise.

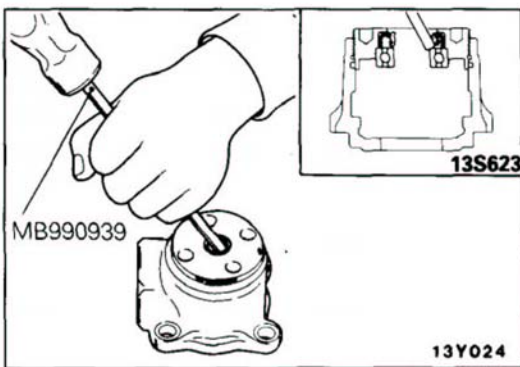
**Caution**

Be careful not to lose the 26 balls inside the rack piston.



**24. REMOVAL OF TOP COVER**

Remove the top cover by using the special tool, and take out the mainshaft, together with the top cover, from the valve housing.



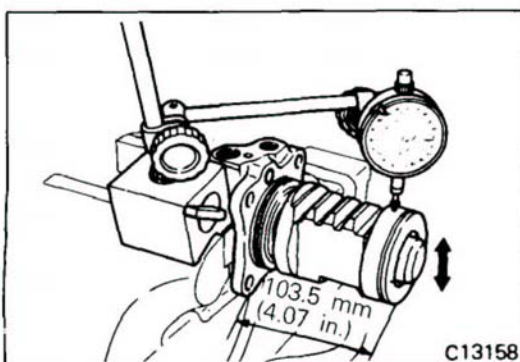
**27. REMOVAL OF BALL BEARING/OIL SEAL**

- (1) Temporarily attach the top cover to the valve housing.
- (2) Drive out the ball bearing and the oil seal.

**INSPECTION**

N19NGAA

- Check the mainshaft for wear and damage.
- Check the tooth surface of cross shaft and the rack piston for wear and damage.
- Check the contact part of adjusting bolt for uneven wear.
- Check the dust seal and the oil seal for wear and damage.
- Check the O-rings for damage.



**CHECKING BACKLASH BETWEEN BALL GROOVE OF RACK PISTON AND BALLS**

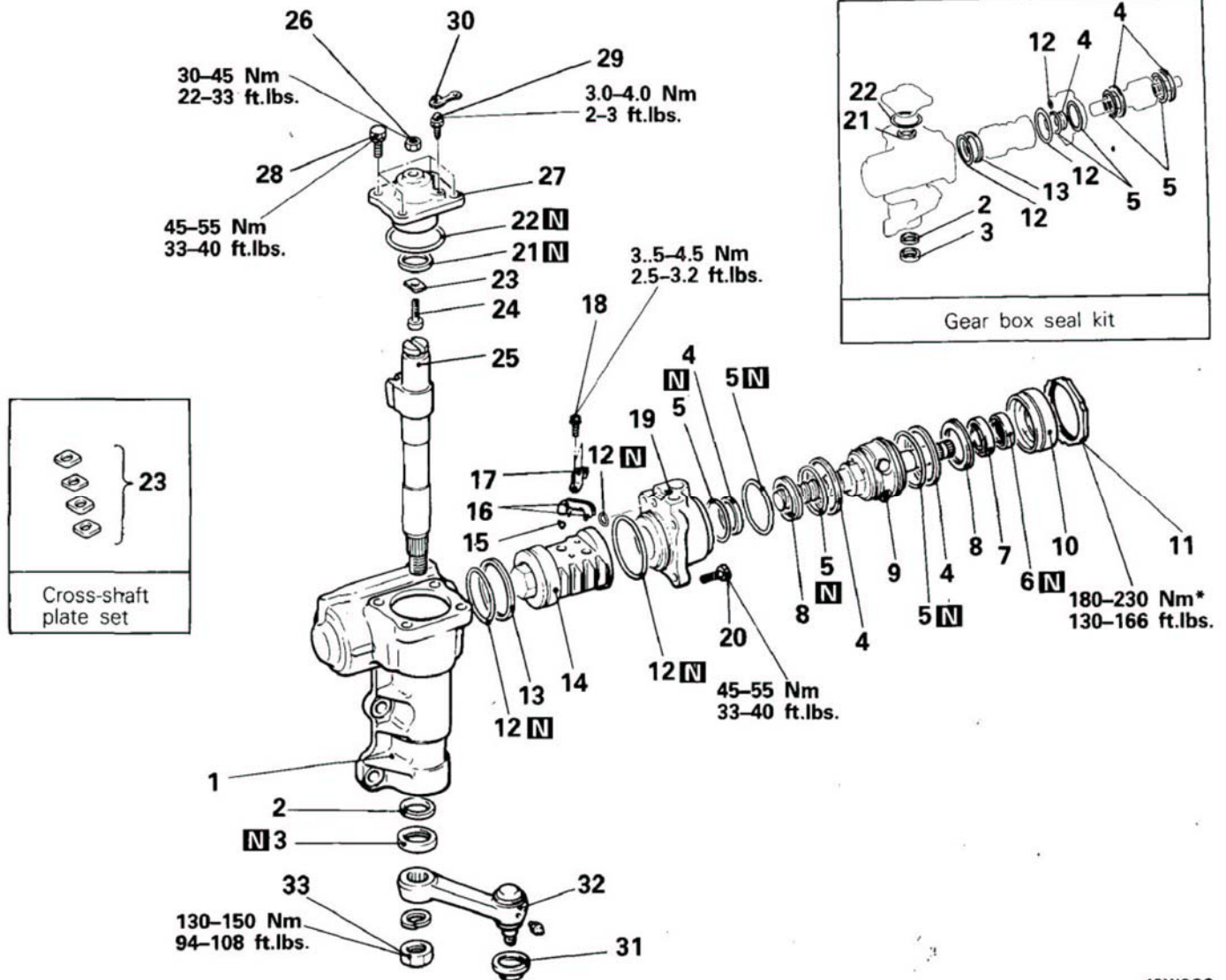
Set the rack piston to the position shown in the figure, and then measure the backlash by using a dial gauge.

Standard value : 0.05–0.1 mm (.0020–.004 in.)

Limit : 0.2 mm (.008 in.)

REASSEMBLY

N19NE--



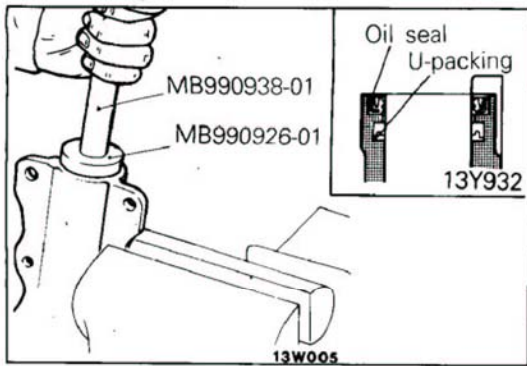
13W609

Reassembly steps

- ◆◆ 1. Gear box housing
- ◆◆ 2. U-packing
- ◆◆ 3. Oil seal
- ◆◆ 4. Seal rings
- ◆◆ 5. O-rings
- ◆◆ 6. Oil seal
- ◆◆ 7. Ball bearing
- ◆◆ 8. Thrust needle bearings
- ◆◆ 9. Main shaft
- ◆◆ Adjustment of main shaft starting torque
- ◆◆ 10. Top cover
- ◆◆ 11. Valve housing lock nut
- ◆◆ 12. O-rings
- ◆◆ 13. Seal ring
- ◆◆ 14. Rack piston
- ◆◆ 15. Balls
- ◆◆ 16. Circulators
- ◆◆ 17. Circulator holder
- ◆◆ 18. Screws
- ◆◆ 19. Valve housing
- ◆◆ 20. Bolt
- ◆◆ 21. U-packing
- ◆◆ 22. O-ring
- ◆◆ Adjustment of cross-shaft end play
- ◆◆ 23. Adjusting plate
- ◆◆ 24. Adjusting bolt
- ◆◆ 25. Cross-shaft
- ◆◆ 26. Adjusting bolt lock nut
- ◆◆ 27. Side cover
- ◆◆ Adjustment of main shaft total starting torque
- ◆◆ 28. Washer bolts
- ◆◆ 29. Breather plug
- ◆◆ 30. Breather plug cap
- ◆◆ 31. Dust cover
- ◆◆ 32. Pitman arm
- ◆◆ 33. Jam nut

NOTE

- (1) ◆◆ : Refer to "Service Points of Reassembly"
- (2) N : Non-reusable parts
- (3) \* : If the special tool is used to measure the tightening torque, the measurement is 135-175 Nm. (98-127 ft.lbs.)

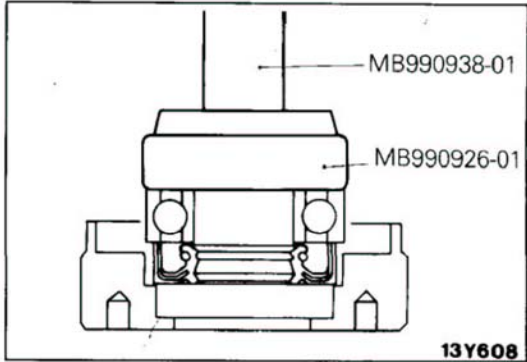


**SERVICE POINTS OF REASSEMBLY**

N19NHAB

**2. INSTALLATION OF U-PACKING/3. OIL SEAL**

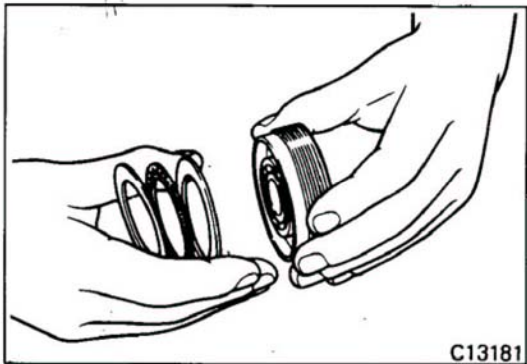
Install the U-packing on the gear box, and press-fit the oil seal.



**6. INSTALLATION OF OIL SEAL/7. BALL BEARING**

- (1) Press-fit the ball bearing and oil seal into the top cover.
- (2) Apply specified grease to the oil seal of the top cover.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

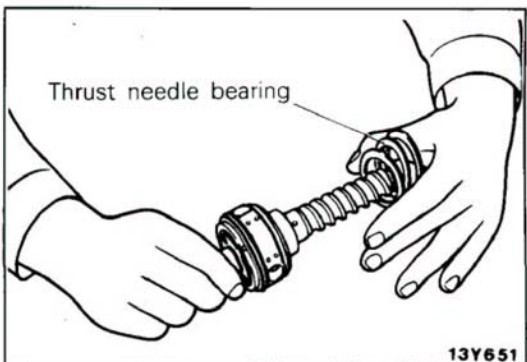


**8. INSTALLATION OF THRUST NEEDLE BEARING**

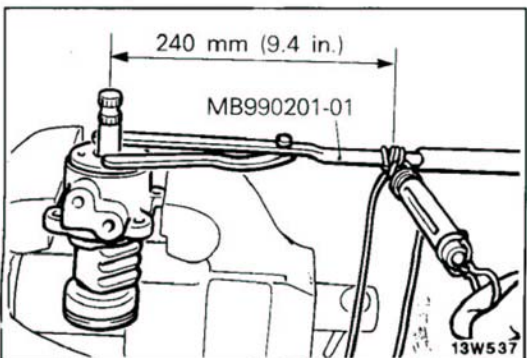
- (1) Install the thinner thrust plate, thrust needle bearing and thicker thrust plate to the top cover in that order as shown in the illustration.
- (2) Attach the top cover to the valve housing.

**Caution**

**Be careful that the thrust plates and the thrust needle bearing do not come off the top cover.**



- (3) Install the thinner thrust plate, thrust needle bearing and thicker thrust plate to the mainshaft in that order as shown in the illustration.

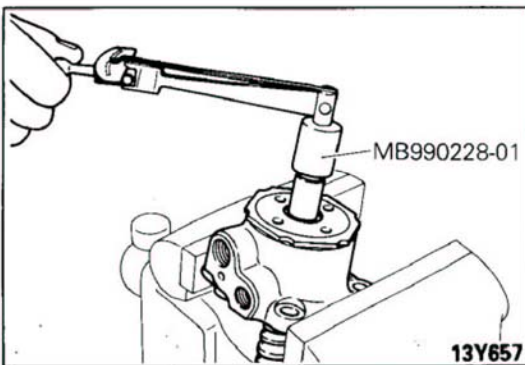
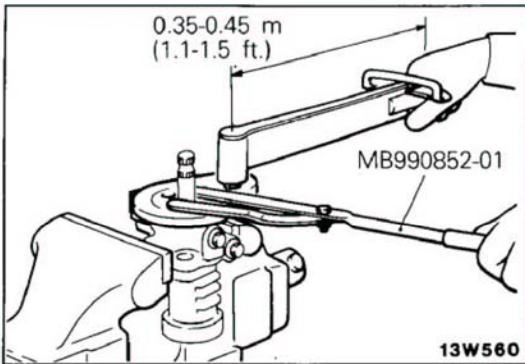
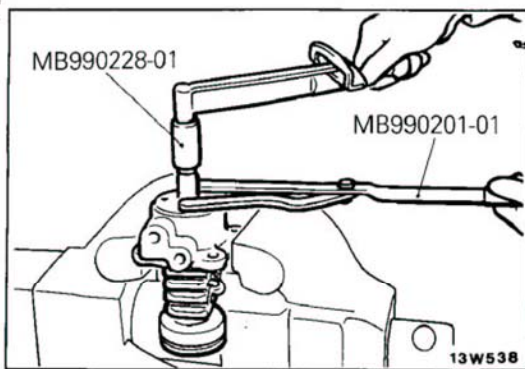


**• ADJUSTMENT OF MAINSHAFT STARTING TORQUE**

- (1) In order to fit in the assembly parts, use the special tool and a spring balance, and tighten the top cover until the tangest force becomes 62-83 N (14-19 lbs.). Then return the top cover until the tightening torque is 0 N (0 ft.)

**Caution**

**After tightening the top cover, rotate the mainshaft to confirm that there is no torque fluctuation or abnormal noise.**



- (2) Measure the mainshaft starting torque by using the special tools.
- (3) Tighten the top cover until the mainshaft starting torque is 20-30 Ncm (1.8-2.7 in.lbs.) greater than the previously mentioned measurement value.

**NOTE**

Tighten the top cover gradually while measuring the starting torque.

- (4) Tighten the valve housing lock nut to the specified torque by using the special tool.

**Caution**

**Be sure that the top cover does not turn together with the lock nut at this time.**

- (5) Measure the mainshaft starting torque by using the special tools.

**Standard value : 25–65 Ncm (2–6 in.lbs.)**

- (6) If the measured mainshaft starting torque does not comply with the standard value, remove the valve housing lock nut and adjust the tightening of the top cover.

**14. INSTALLATION OF RACK PISTON**

Install the rack piston until it comes in contact with the edge of the mainshaft.

Rotate the mainshaft to align the ball raceway with the ball insertion hole.

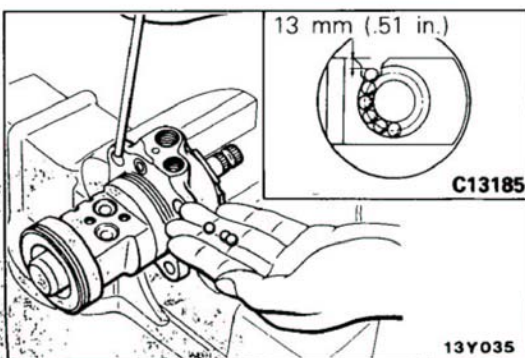
**15. INSTALLATION OF BALLS**

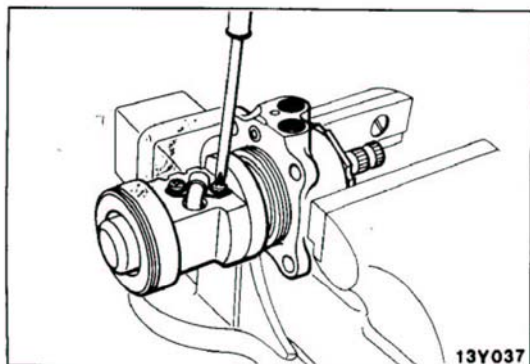
- (1) Insert 19 balls into the ball-insertion hole, pushing them gently with a brass bar.

**Caution**

**Do not rotate the rack piston while inserting the balls.**

- (2) Measure, by using calipers, the distance from the surface of the rack piston to the ball top point at both holes.
- (3) If the distance differs from the value shown in the figure, remove the rack piston and reinsert the 19 balls.
- (4) Insert 7 balls into the circulators.



**16. INSTALLATION OF CIRCULATORS**

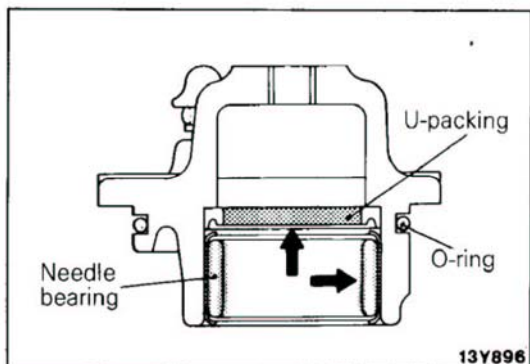
Install the circulators of the rack piston.

**19. INSTALLATION OF VALVE HOUSING**

- (1) Apply specified automatic transmission fluid to the seal ring of the rack piston.

**Specified fluid : Automatic transmission fluid DEXRON Type**

- (2) Insert the valve housing.
- (3) Rotate the mainshaft until the rack piston moves to the neutral position (center).

**21. APPLICATION OF GREASE TO U-PACKING**

Apply specified grease to the seal surface of U-packing and the needle bearing.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

**22. APPLICATION OF AUTOMATIC TRANSMISSION FLUID TO O-RING**

Apply specified automatic transmission fluid to the O-ring, and attach it to the side cover.

**Specified fluid : Automatic transmission fluid DEXRON Type**

**• ADJUSTMENT OF CROSS SHAFT END PLAY**

- (1) Insert the adjusting bolt and the adjusting plate into the T-groove in the top of the cross shaft.

**NOTE**

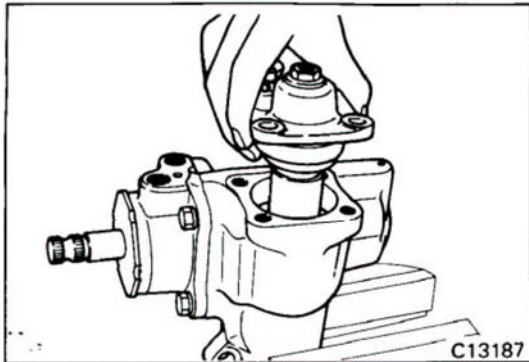
Install the adjusting plate so that the bevelled side faces the contact surface of the cross-shaft.

- (2) Measure the end play of the adjusting bolt with a feeler gauge.

**Standard value : 0.05 mm (.0020 in.) or less**



- (3) If the end play exceeds the standard value, select a suitable adjusting plate from the table, install it, and then measure the end play once again.



## 25. INSTALLATION OF CROSS SHAFT/26. ADJUSTING BOLT LOCK NUT

Install the cross-shaft to the side cover, and then temporarily tighten the adjusting bolt lock nut.

## 27. INSTALLATION OF SIDE COVER

Install the side cover assembly (with the cross-shaft) to the gear box.

### NOTE

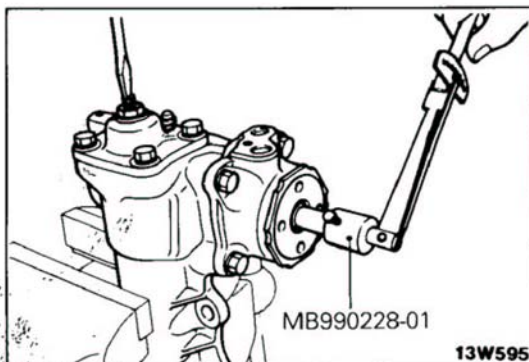
Apply specified automatic transmission fluid to the teeth and shaft areas of the rack piston, and apply specified grease to the oil seal lip.

**Specified fluid : Automatic transmission fluid DEXRON Type**

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

### Caution

**Do not rotate the side cover during installation. Take care not to damage the cross-shaft oil seal.**



## • ADJUSTMENT OF MAINSHAFT TOTAL STARTING TORQUE

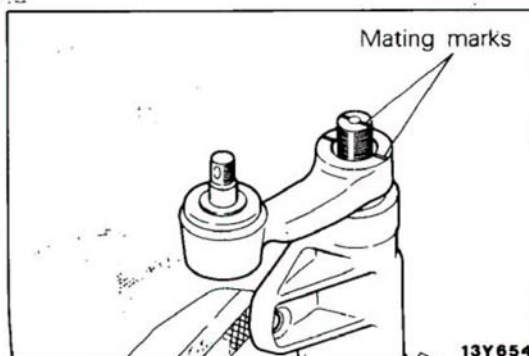
- (1) While turning the adjusting bolt, measure the mainshaft total starting torque by using the special tools.

**Standard value : 50-90 Ncm (4-8 in.lbs.)**

### NOTE

Position the mainshaft in the center position during measurement.

- (2) Tighten the adjusting bolt lock nut to the specified torque.



## 32. INSTALLATION OF PITMAN ARM

Install the pitman arm to the gear box with the mating marks aligned.

# OIL PUMP

## REMOVAL AND INSTALLATION

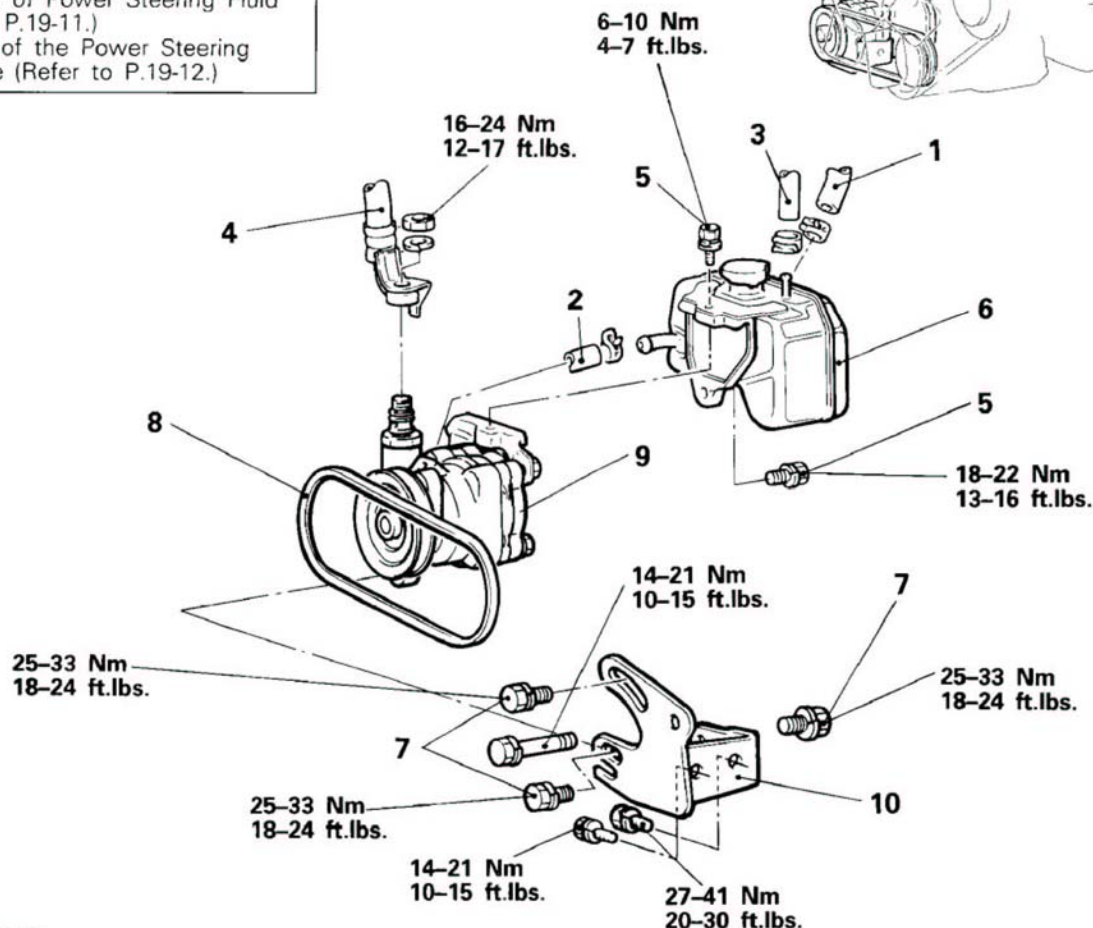
N19RA--

### Pre-removal Operation

- Drain of the Power Steering Fluid (Refer to P.19-11.)

### Post-installation Operation

- Supplying of Power Steering Fluid (Refer to P.19-11.)
- Bleeding of the Power Steering Fluid Line (Refer to P.19-12.)



13W634

13W648

### Removal steps

1. Connection of return hose
2. Suction tube
3. Connection of breather hose
4. Connection of pressure hose
5. Bolts
6. Oil reservoir assembly
7. Bolts

- 8. Drive belt
- 9. Oil pump
- 10. Oil pump bracket

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2)  $\blacktriangleleft\blacktriangleright$  : Refer to "Service Points of Removal".
- (3)  $\blacktriangleright\blacktriangleleft$  : Refer to "Service Points of Installation".

## SERVICEPOINTS OF REMOVAL

### 8. REMOVAL OF DRIVE BELT

When removing the drive belts, remove the air conditioner compressor drive belt (models equipped with air conditioner) and the alternator drive belt.

## SERVICEPOINTS OF INSTALLATION

### 8. ADJUSTMENT OF DRIVE BELT TENSION

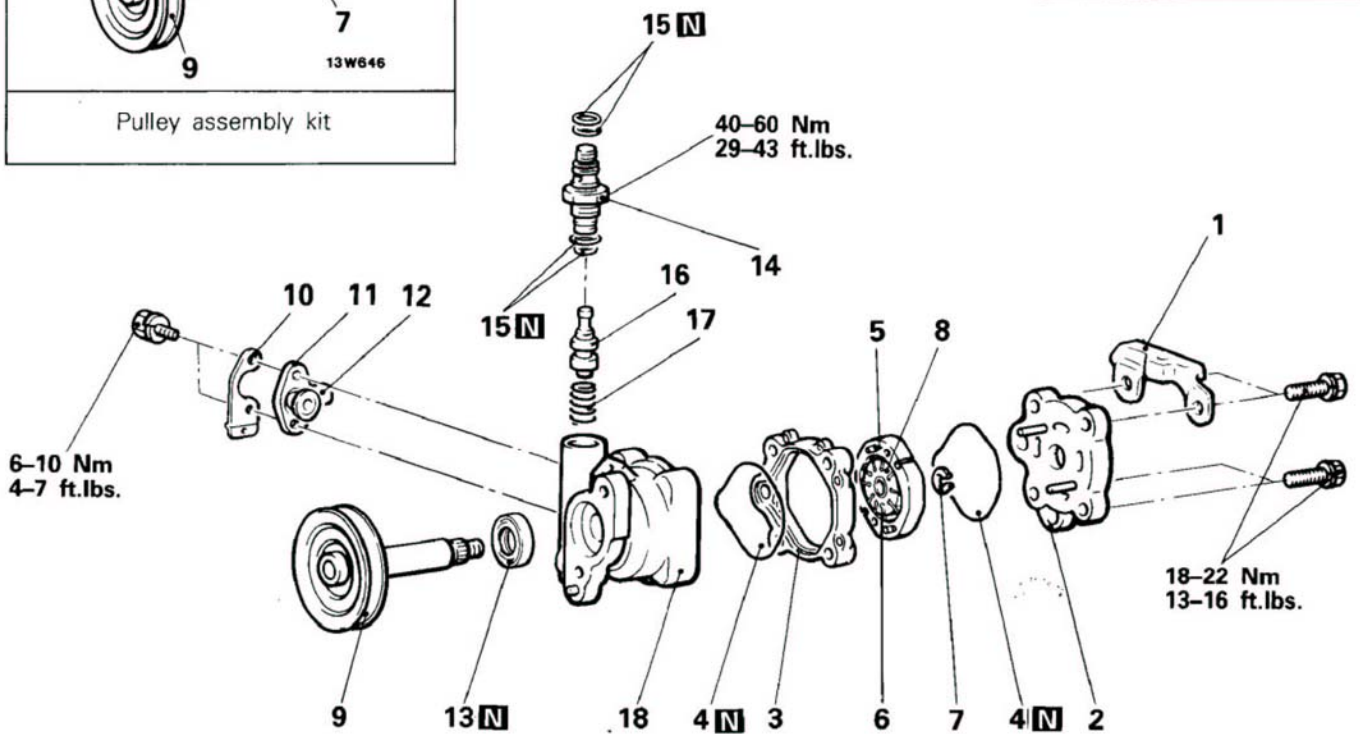
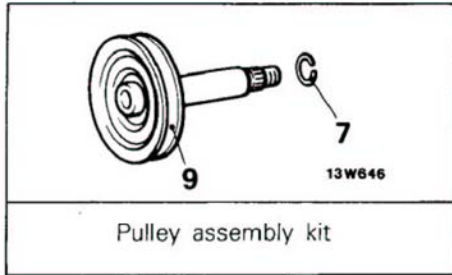
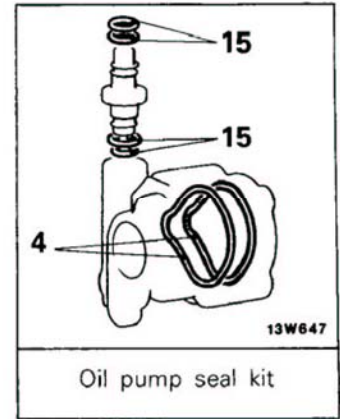
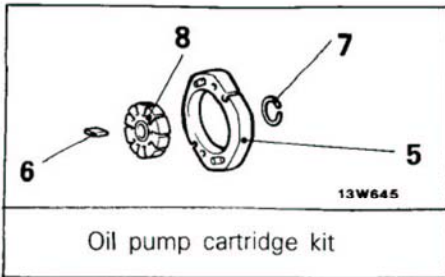
Refer to P.19-11.

N19RBAD

N19RDAD



DISASSEMBLY AND REASSEMBLY



13W636

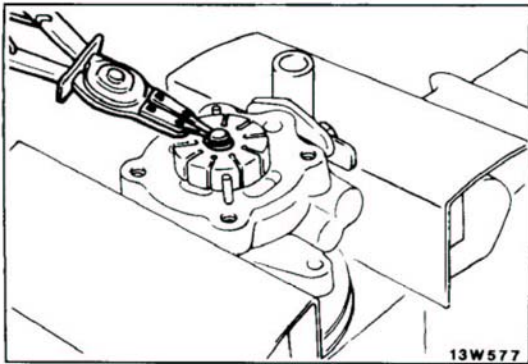
Disassembly steps

- 1. Reservoir bracket
- 2. Pump cover
- ◆◆ 3. Cam case
- ◆◆ 4. O-ring
- ◆◆ 5. Cam ring
- 6. Vanes
- ◆◆◆ 7. Snap ring
- ◆◆ 8. Rotor
- ◆◆ 9. Pulley assembly
- 10. Plate
- 11. Suction plate
- 12. Suction tube

- ◆◆ 13. Oil seal
- 14. Connector
- 15. O-ring
- ◆◆◆ 16. Flow control valve
- ◆◆ 17. Flow control spring
- ◆◆ 18. Oil pump body

NOTE

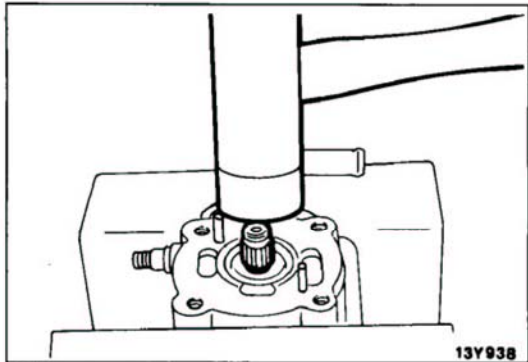
- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆◆ : Refer to "Service Points of Reassembly".
- (4) N : Non-reusable parts.

**SERVICE POINTS OF DISASSEMBLY**

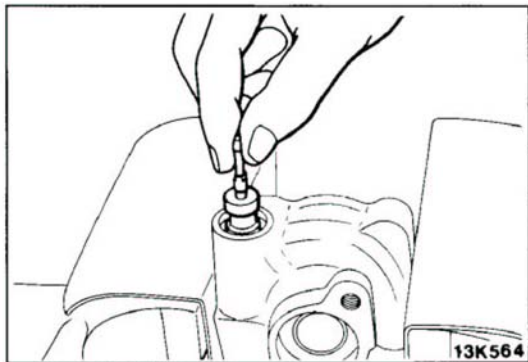
N19RFÆ

**7. REMOVAL OF SNAP RING**

Remove the snap ring from the shaft (pulley assembly) with snap ring pliers and separate the rotor from the shaft.

**9. REMOVAL OF PULLEY ASSEMBLY**

Tap the rotor side of the shaft lightly with a plastic hammer, and take out the pulley assembly.

**16. REMOVAL OF FLOW CONTROL VALVE/17.FLOW CONTROL SPRING**

Remove the flow-control valve and the flow-control spring from the oil pump body.

**Caution**

**Do not disassemble the flow control valve.**

**INSPECTION**

N19RGAD

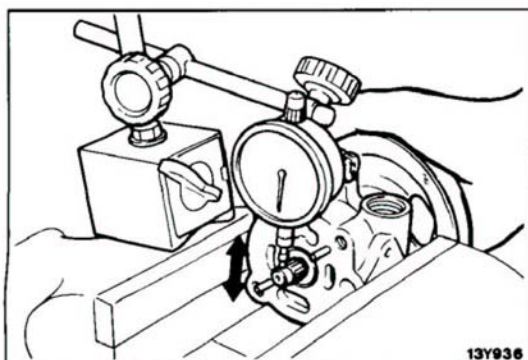
- Check the flow control valve for clogging.
- Check the pulley assembly for wear or damage.
- Check the drive belt for cracks and deterioration.
- Check the groove of rotor and vane for "Stepped" wear.
- Check the contact surface of cam ring and vanes for "stepped" wear.
- Check the vanes for damage.
- Check the contact surface of pump body, and pump cover with rotor for streak-like abrasion.

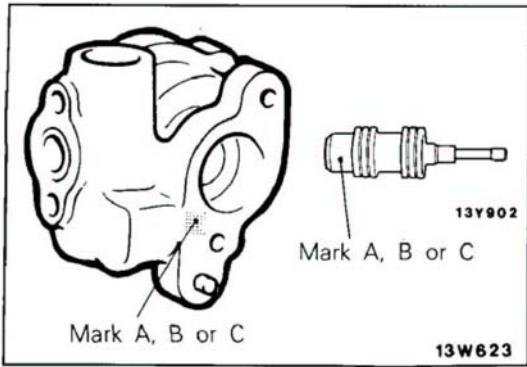
**CHECKING CLEARANCE BETWEEN SHAFT AND PUMP BODY**

Check the clearance between pulley assembly's shaft and the pump body.

- (1) Place the dial gauge against the end of the pulley assembly's shaft.
- (2) Move the pulley assembly up and down and measure the play.

**Limit : 0.1 mm (.004 in.)**





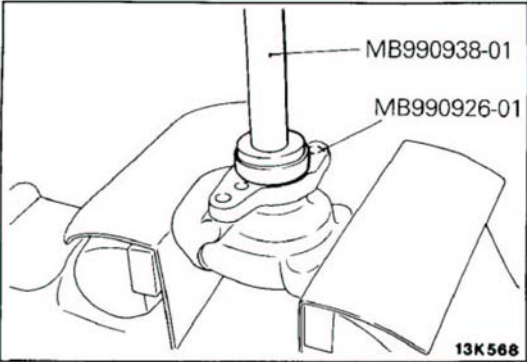
**SERVICE POINTS OF REASSEMBLY**

N19RHAH

**18. INSTALLATION OF OIL PUMP BODY/16.FLOW CONTROL VALVE**

- (1) If the flow control valve is to be replaced, install the flow control valve to the oil pump body corresponding with the body identification mark (A, B, C).
- (2) Apply specified automatic transmission fluid to the outside of the flow control valve.

**Specified fluid : Automatic transmission fluid DEX-RON Type**



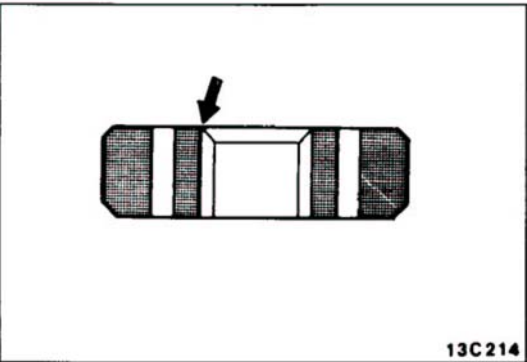
- (3) Install the flow control spring, flow control valve and connector into the pump body.

**13. INSTALLATION OF OIL SEAL**

Drive the oil seal into the pump body with the special tools.

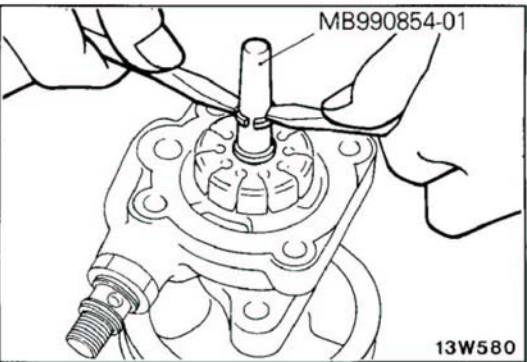
**Caution**

**Do not disassemble the flow control valve.**



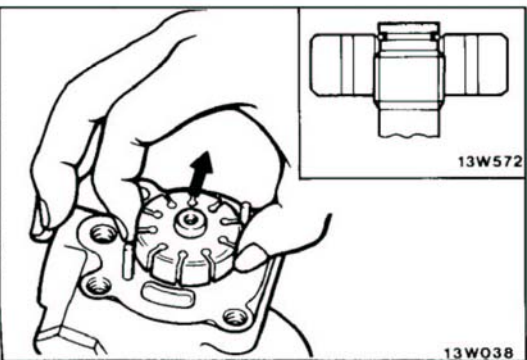
**8. INSTALLATION OF ROTOR**

Install the rotor to the pulley assembly. When the rotor is to be installed, face the countersunk portion to the pump cover side.

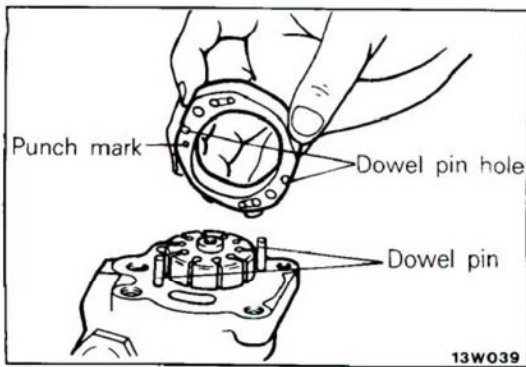


**7. INSTALLATION OF SNAP RING**

- (1) Install the snap ring with the special tool.



- (2) Lift the rotor and check to be sure that the snap ring has entered the countersunk part.



#### 5. INSTALLATION OF CAM RING

When installing the cam ring, align the dowel pins of the pump body with the dowel holes of the cam ring, and then install so that the cam ring's punch mark is at the pump body side.

#### 4. APPLICATION OF FLUID TO O-RING

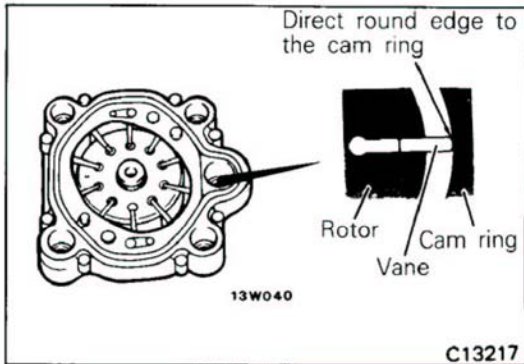
Apply the specified automatic transmission fluid to the O-ring, and then install it to the cam case.

**Specified fluid : Automatic transmission fluid DEXRON Type**

#### 3. INSTALLATION OF CAM CASE

- (1) Mount the cam case onto the pump body.
- (2) Apply specified automatic transmission fluid to the vanes and install the vanes on the rotor, paying close attention to the installation direction.

**Specified fluid : Automatic transmission fluid DEXRON Type**



## STEERING HOSES

## REMOVAL AND INSTALLATION

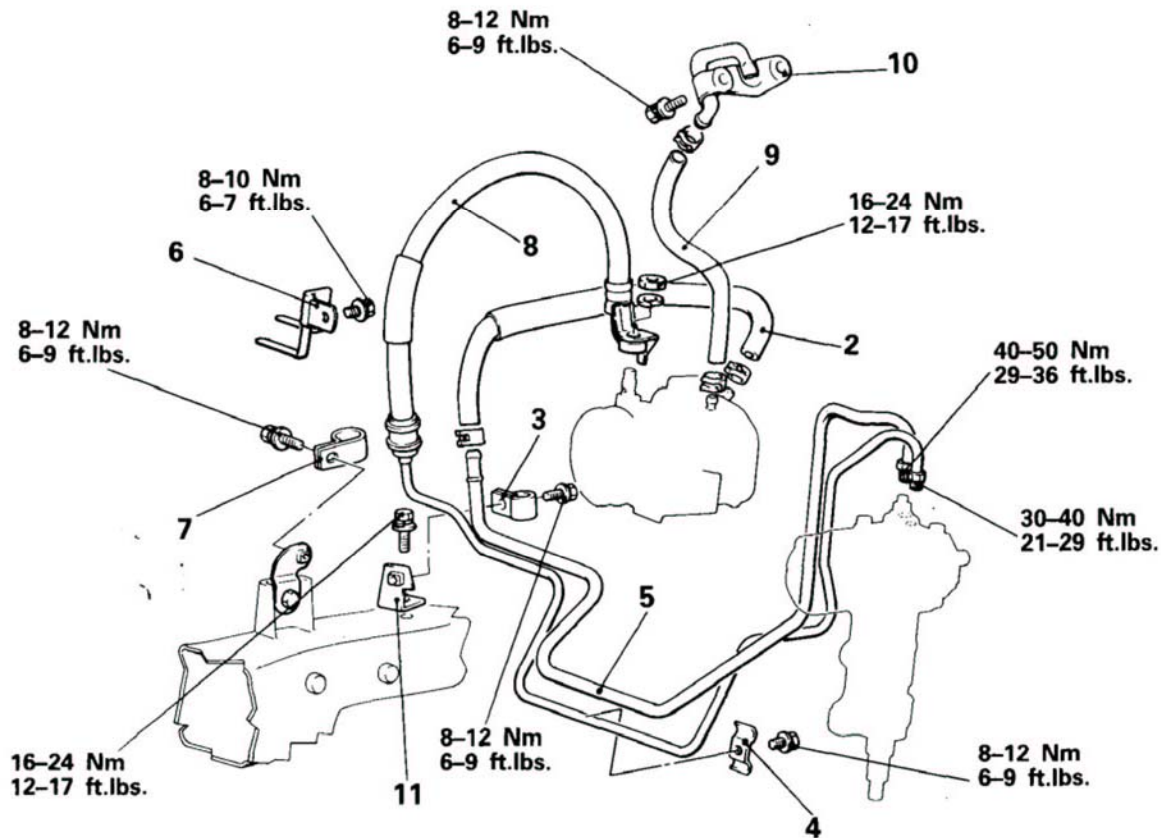
N19TA--

**Pre-removal Operation**

- Drain of the Power Steering Fluid (Refer to P.19-11.)

**Post-installation Operation**

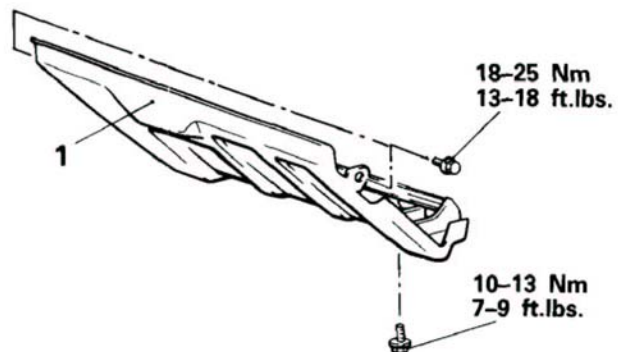
- Supplying of Power Steering Fluid (Refer to P.19-11.)
- Bleeding of the Power Steering Fluid Line (Refer to P.19-12.)



13W617

**Removal steps**

1. Under skid plate
2. Return hose
3. Return hose clip
4. Tube clip
5. Return tube
6. Clip
7. Pressure hose clip
8. Pressure hose
9. Breather hose
10. Breather pipe
11. Tube stay

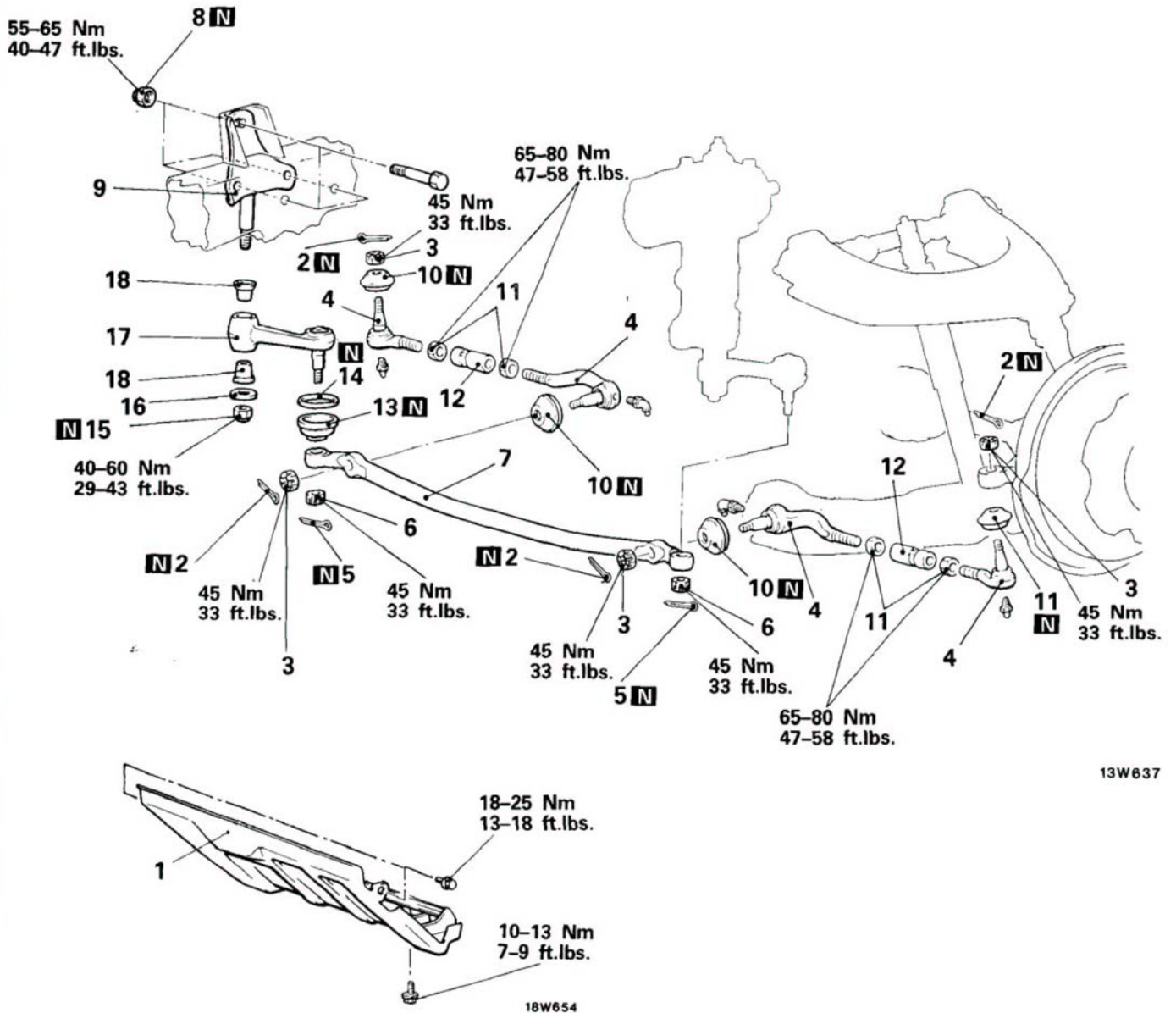


18W654

NOTE  
Reverse the removal procedures to reinstall.

**STEERING LINKAGE  
REMOVAL AND INSTALLATION**

N19VA--



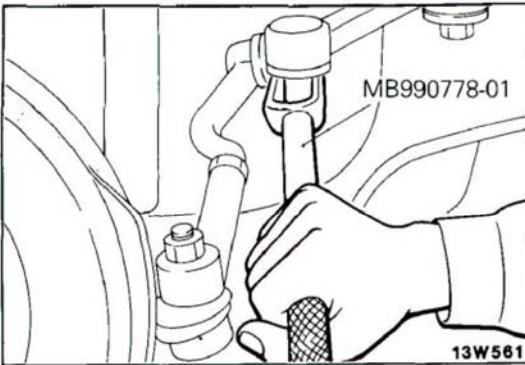
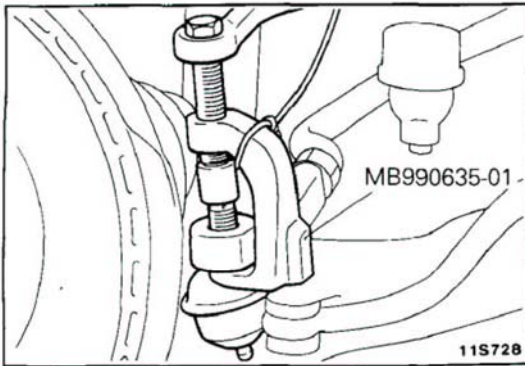
13W637

**Removal steps**

- |                       |                      |
|-----------------------|----------------------|
| 1. Under skid plate   | 13. Dust cover       |
| 2. Cotter pins        | 14. O-ring           |
| 3. Slotted nuts       | 15. Self-locking nut |
| ◄◄ ◄◄ 4. Tie rod ends | 16. Washer           |
| 5. Cotter pins        | 17. Idler arm        |
| 6. Slotted nuts       | 18. Bushings         |
| ◄◄ 7. Relay rod       |                      |
| 8. Self-locking nuts  |                      |
| 9. Idler arm support  |                      |
| 10. Dust covers       |                      |
| 11. Nuts              |                      |
| 12. Pipes             |                      |

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◄◄ : Refer to "Service Points of Removal".
- (3) ◄◄ : Refer to "Service Points of Installation".
- (4) **N** : Non-reusable parts

**SERVICE POINTS OF REMOVAL**

N19VBAC

**4. DISCONNECTION OF THE ROD ENDS**

Using the special tool, disconnect the tie rod ends, and then remove the tie rod assembly.

**Caution**

Use cord to bind the special tool closely so it won't become separated.

The nut should be loosened only, not removed.

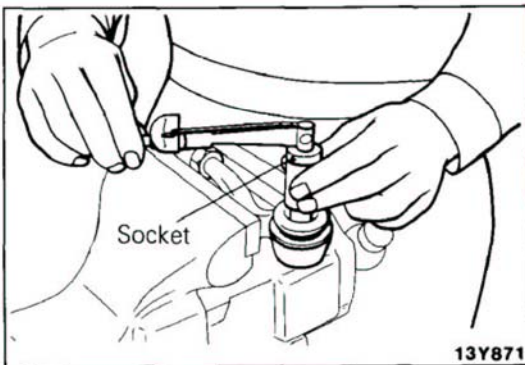
**7. DISCONNECTION OF RELAY ROD**

Using the special tool, disconnect the connecting portions of the idler arm and the steering gear box, and then remove the relay rod.

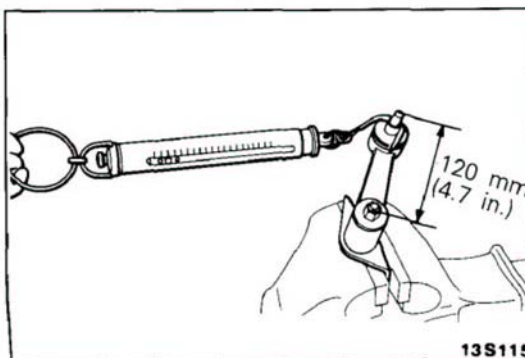
**INSPECTION**

N19VCAB

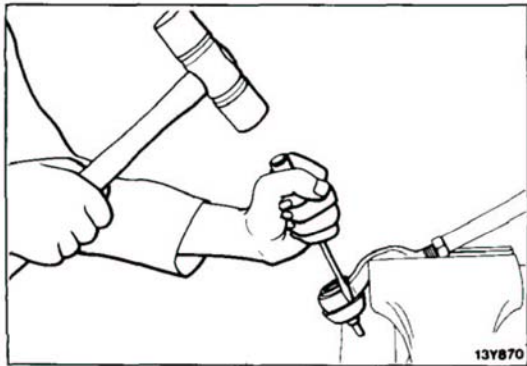
- Check the idler arm support for damage and deformation.
- Check the idler arm for damage and deformation.
- Check the dust covers for damage and cracks.
- Check the tie rods for damage and deformation.
- Check the relay rod for bends and damage.
- Check the grease nipples for clogging and looseness.

**CHECKING BALL JOINT STARTING TORQUE**

Standard value : 100-300 Ncm (8.9-26 in.lbs.)

**CHECKING IDLER ARM STARTING TORQUE**

Standard value : 300-900 Ncm (26-78 in.lbs.) [25-75 N (5.5-16.5 lbs.)]



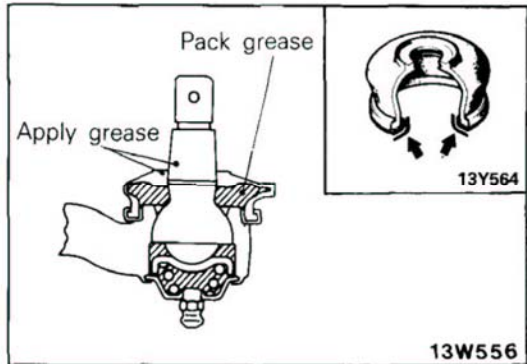
**REPLACEMENT OF DUST COVER**

N19VEAB

- (1) Remove the dust cover from the tie rod end or the idler arm

**NOTE**

For the idler arm, also remove the O-ring.



- (2) Apply the specified grease to the lip portion of the dust cover.

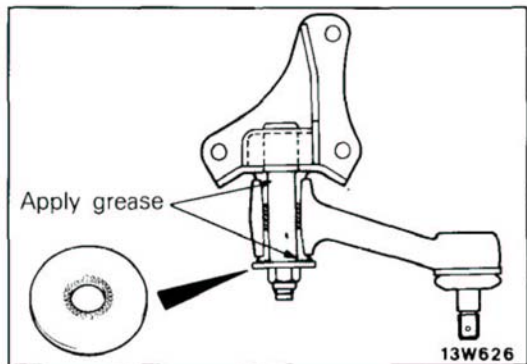
**Specified grease : Multipurpose grease SEA J310, NLGI No. 2**

- (3) Use the specified grease inside the dust cover.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

- (4) Apply the specified sealant to the dust cover installation surface, and then press in.

**Specified sealant : 3M ART Part No. 8663 or equivalent**



**REPLACEMENT OF IDLER ARM BUSHING**

N19VFAB

- (1) Apply the specified grease to the inside surface of the bushing and the idler arm support shaft.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

- (2) Insert the bushing into the idler arm.
- (3) Insert the idler arm support into the idler arm.
- (4) Install so that the knurled surface of the washer is facing the bushing side.
- (5) Tighten the self-locking nut at the specified torque.

**SERVICE POINTS OF INSTALLATION**

N19VDAA

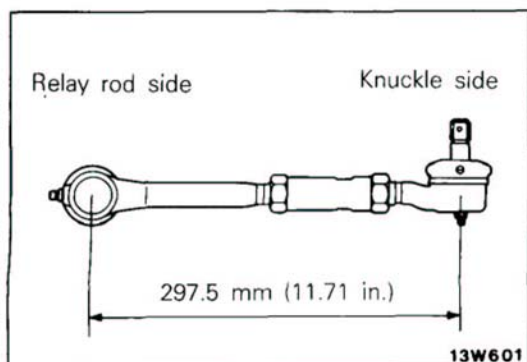
**4. INSTALLATION OF TIE ROD ENDS**

- (1) Apply the specified anti-corrosion agent to the threaded portion of the tie rod end.
- (2) Temporarily tighten the tie rod so that the distance between stud bolts of the tie rod is the value shown in the figure.

**Caution**

**Tie rod end tightness, left and right, should be uniform.**

- (3) Install the tie rod assembly after first confirming which side is the relay rod side and which side is the knuckle side.





# TRANSMISSION MANUAL AND AUTOMATIC

## CONTENTS

N21AA--

<b>AUTOMATIC TRANSMISSION</b> .....	<b>48</b>	General .....	98
<b>ADAPTER</b> .....	<b>172</b>	Governor Pressure Test .....	102
<b>BRAKE NO. 3</b> .....	<b>158</b>	Inhibitor Switch .....	99
<b>CENTER SUPPORT</b> .....	<b>150</b>	Line Pressure Test .....	103
<b>DIRECT CLUTCH</b> .....	<b>148</b>	Manual Linkage .....	99
<b>FORWARD CLUTCH</b> .....	<b>144</b>	Road Test .....	99
<b>GENERAL INFORMATION</b> .....	<b>48</b>	Selector Lever .....	99
<b>GOVERNOR</b> .....	<b>170</b>	Throttle Control Cable .....	99
<b>MANUAL VALVE LEVER</b> .....	<b>171</b>	<b>VALVE BODY</b> .....	<b>160</b>
<b>OIL PUMP</b> .....	<b>137</b>	<b>MANUAL TRANSMISSION</b> .....	<b>2</b>
<b>ONE-WAY CLUTCH NO. 2 AND FRONT PLANETARY GEAR SET</b> .....	<b>153</b>	<b>CONTROL LEVER ASSEMBLY</b> .....	<b>46</b>
<b>OVERDRIVE BRAKE</b> .....	<b>142</b>	<b>COUNTER SHAFT ASSEMBLY</b> .....	<b>30</b>
<b>OVERDRIVE CLUTCH AND PLANETARY GEAR SET</b> .....	<b>139</b>	<b>GEARSHIFT LEVER ASSEMBLY</b> .....	<b>43</b>
<b>PARKING SYSTEM</b> .....	<b>171</b>	<b>GENERAL INFORMATION</b> .....	<b>2</b>
<b>REAR PLANETARY GEAR AND OUTPUT SHAFT</b> .....	<b>155</b>	<b>INPUT SHAFT ASSEMBLY</b> .....	<b>41</b>
<b>SERVICE ADJUSTMENT PROCEDURES</b> .....	<b>106</b>	<b>MAIN DRIVE GEAR ASSEMBLY</b> .....	<b>26</b>
<b>SPECIAL TOOLS</b> .....	<b>96</b>	<b>MAIN SHAFT ASSEMBLY</b> .....	<b>27</b>
<b>SPECIFICATIONS</b> .....	<b>90</b>	<b>OUTPUT SHAFT ASSEMBLY</b> .....	<b>38</b>
General Specifications .....	90	<b>SERVICE ADJUSTMENT PROCEDURES</b> .....	<b>10</b>
Lubricants .....	95	<b>SPECIAL TOOLS</b> .....	<b>8</b>
Sealants and Adhesives .....	95	<b>SPECIFICATIONS</b> .....	<b>3</b>
Service Specifications .....	92	General Specifications .....	3
Torque Specifications .....	93	Lubricants .....	7
<b>THROTTLE CONTROL CABLES</b> .....	<b>171</b>	Sealants and Adhesives .....	7
<b>THRUST BEARINGS AND THRUST WASHERS</b> .....	<b>172</b>	Service Specifications .....	4
<b>TRANSFER</b> .....	<b>173</b>	Torque Specifications .....	5
<b>TRANSFER CONTROL</b> .....	<b>115</b>	<b>SPEEDOMETER SLEEVE ASSEMBLY</b> .....	<b>42</b>
<b>TRANSMISSION AND TRANSFER ASSEMBLY</b> .....	<b>119</b>	<b>TRANSFER ASSEMBLY</b> .....	<b>31</b>
<b>TRANSMISSION CASE</b> .....	<b>171</b>	<b>TRANSMISSION AND TRANSFER ASSEMBLY</b> .....	<b>11</b>
<b>TRANSMISSION CONTROL</b> .....	<b>109</b>	<b>TRANSMISSION ASSEMBLY</b> .....	<b>18</b>
<b>TRANSMISSION OIL COOLER</b> .....	<b>117</b>	<b>TROUBLESHOOTING</b> .....	<b>9</b>
<b>TROUBLESHOOTING</b> .....	<b>98</b>	Gears slip out .....	
Circuit Diagram .....	104	Noise, Vibration .....	
Converter Stall Test .....	101	Oil is leaking .....	
Fluid Level and ATF Condition .....	98	Shifting gears is hard or troublesome .....	

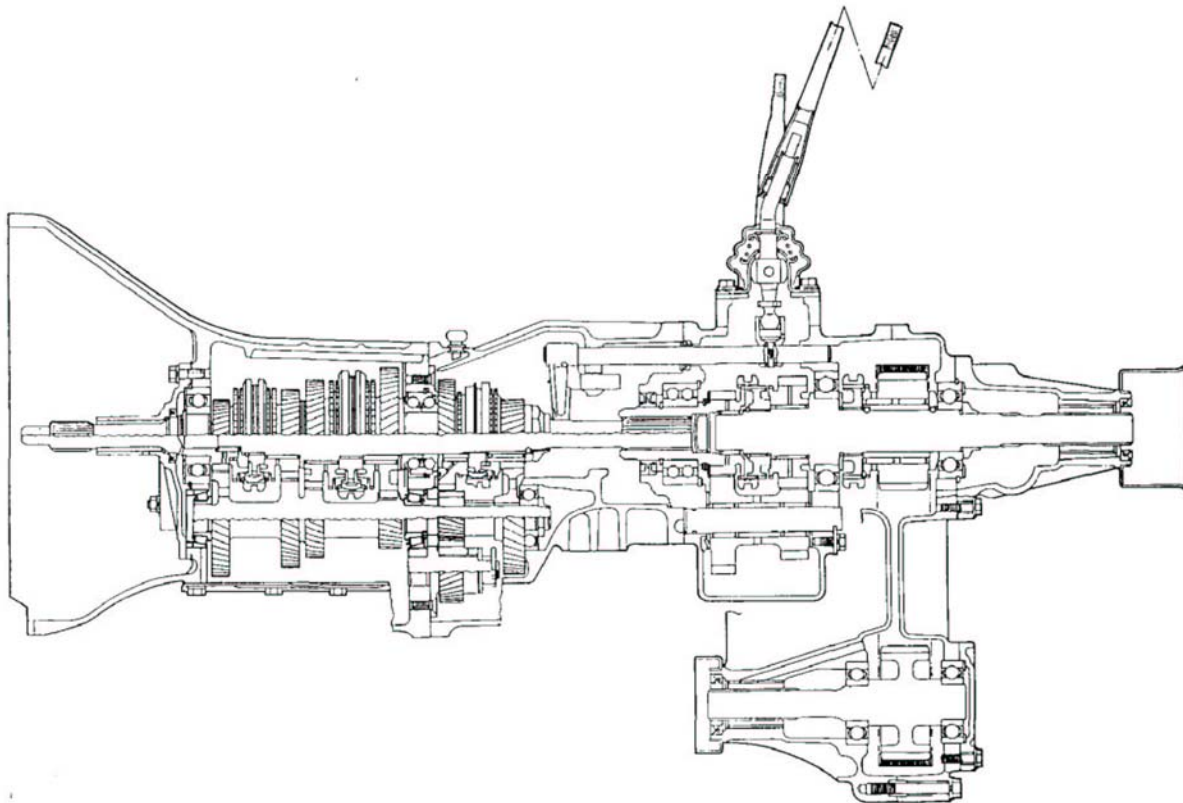
**GENERAL INFORMATION**

N21BAAF

The KM-145 5-speed transmission is composed of the 4WD transmission and the transfer. For the manual transmission, the shifting mechanism is coupled to unit 1, and is housed within an aluminum-diecast housing.

For the gear train, forward and reverse are the constantly engaged type.

The transfer is the part-time system; 2WD, 4WD-HIGH and 4WD-LOW can be selected.



145110

**SPECIFICATIONS**

**GENERAL SPECIFICATIONS**

N21CA--

Items	Specifications
Model	KM145
Transmission	
Type	5-speed 4-wheel drive
Gear ratio 1st	3.967
2nd	2.136
3rd	1.360
4th	1.000
5th	0.856
Reverse	3.578
Final gear ratio	4.625 4.875 (Option)
Speedometer gear ratio	26/8 ... Final gear ratio 4.625 27/8 ... Final gear ratio 4.875 (Option)
Transfer case	
Type	Constant mesh type
Gear ratio High	1.000
Low	1.944
Drive system Front wheel	Chain drive
Rear wheel	Direct drive
Adjustment spacer and snap ring	
Snap ring for main drive gear	
Thickness   mm (in.)-Ident. color-Part No.	2.30 (.091)-White-MD701729 2.35 (.093)-Brown-MD701730 2.40 (.094)-None-MD701731 2.45 (.096)-Blue-MD701732 2.50 (.098)-Yellow-MD701733
Spacer for main drive gear bearing to front retainer	
Thickness   mm (in.)-Ident. color-Part No.	0.84 (.033)-Black-MD701845 0.93 (.037)-None-MD701839 1.02 (.040)-Red-MD701840 1.11 (.044)-White-MD701841 1.20 (.047)-Yellow-MD701842 1.29 (.051)-Blue-MD701843 1.38 (.054)-Green-MD701844
Snap ring for mainshaft front end	
Thickness   mm (in.)-Ident. color-Part No.	2.15 (.085)-Blue-MD701761 2.22 (.087)-None-MD701762 2.29 (.090)-Brown-MD701763 2.36 (.093)-White-MD701764

Items	Specifications
Snap ring for input gear assembly Thickness mm (in.)-color	2.70 (.106)-Purple 2.75 (.108)-Pink 2.80 (.110)-Yellow 2.85 (.112)-White 2.90 (.114)-Blue
Snap ring for H-L clutch hub Thickness mm (in.)-color	2.14 (.084)-None 2.21 (.087)-Yellow 2.28 (.090)-White 2.35 (.093)-Blue 2.42 (.095)-Red
Snap ring for input gear bearing Thickness mm (in.)-color	2.30 (.091)-None 2.35 (.093)-Red 2.40 (.094)-White 2.45 (.096)-Blue 2.50 (.098)-Green
Spacer for rear output shaft bearing Thickness mm (in.)-color	0.84 (.033)-Black 0.93 (.037)-None 1.02 (.040)-Red 1.11 (.044)-White 1.20 (.047)-Yellow 1.29 (.051)-Blue 1.38 (.054)-Green

## SERVICE SPECIFICATIONS

N21CB--

Items	Specifications
Standard value	
Front bearing retainer and bearing clearance mm (in.)	0-0.1 (0-.004) ... Adjustment by spacer
Main drive gear end play mm (in.)	0-0.06 (0-.002) ... Adjustment by snap ring
Counter gear end play mm (in.)	0-0.05 (0-.002) ... Adjustment by spacer
Input gear end play mm (in.)	0-0.06 (0-.002) ... Adjustment by snap ring
Output shaft end play mm (in.)	0-0.1 (0-.004) ... Adjustment by spacer
Limit	
Synchronizer ring and gear clearance mm (in.)	0.5 (.020)

**TORQUE SPECIFICATIONS**

N21CC--

Items	Nm	ft.lbs.
Manual transmission		
Transmission mounting bolts	43-55	32-39
Starting motor mounting bolts	22-32	16-23
Mainshaft lock nut	250-270	181-195
Idler shaft lock nut	20-60	15-43
Under cover attaching bolt	8-10	5.8-7.2
Countershaft gear lock nut	160-190	116-137
Reverse idler gear shaft nut	20-60	15-43
Backup light switch	30	22
Oil drain plug	60	43
Oil filler plug	30-35	22-25
Rear bearing retainer attaching bolts	15-22	11-16
Reverse idler gear shaft attaching bolts	15-22	11-16
Front bearing retainer installation bolt	10-13	7.2-9.4
Bell housing attaching bolts	10-12	7-9
Stopper bracket assembly attaching bolt	15-22	11-16
Transfer adaptor and transmission case coupling bolt	15-22	11-16
Transmission control lever mounting bolt	15-22	11-16
Rear propeller shaft to rear differential	50-60	36-43
Front exhaust pipe mounting bolt	20-30	15-22
No. 2 crossmember to body	55-75	40-54
Clutch release cylinder mounting bolt	31-42	22-29
Engine mounting rear insulator to No. 2 crossmember	18-25	13-18
Engine mounting rear insulator to transmission	18-25	13-18
Transmission to engine A, B	43-55	31-40
D, E	20-27	15-20

Items	Nm	ft.lbs.
Transfer case		
Pulse rotor installation bolt	15–22	11–16
Pulse generator bolt	10–13	7.2–9.4
Adapter to transfer case mounting bolts and nuts	30–42	22–30
Chain cover bolt	30–42	22–30
Side cover bolt	8–10	5.8–7.2
Rear cover bolt	15–22	11–16
Cover bolt	15–22	11–16
Control housing bolt	15–22	11–16
Oil filler plug	30–35	22–25
Drain plug	30–35	22–25
Select plunger plug	30–35	22–25
Lock plate bolt	15–22	11–16
Rear output shaft lock nut	100–130	72–94
Speedometer sleeve clamp bolt	15–22	11–16
Seal plug	30–42	22–30
4WD indicator light switch	30	22
Transfer control lever assembly	10–13	7–9
Front propeller shaft to front differential	50–60	36–43
Transfer mounting bracket to transmission	18–25	13–18
Transfer mounting bracket to body	18–25	13–18

**LUBRICANTS**

N21CD--

Items	Specified lubricant	Quantity
Transmission	Hypoid Gear Oil API classification GL-4 or higher SAE viscosity 80W, 75W-85W	2.2 lit. (4.7 U.S. pints, 3.9 Imp. pints)
Transfer case	Hypoid Gear Oil API classification GL-4 or higher SAE viscosity 80W, 75W-85W	2.2 lit. (4.7 U.S. pints, 3.9 Imp. pints)
Sliding parts of the transmission control lever	Multipurpose grease SAE J310, NLGI No. 2	As required
Sliding parts of the transfer control lever	Multipurpose grease SAE J310, NLGI No. 2	As required


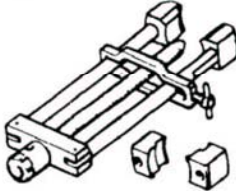
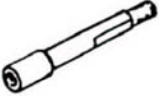
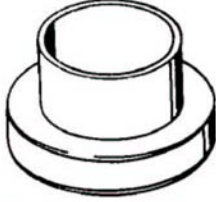
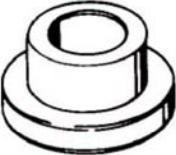
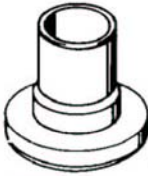
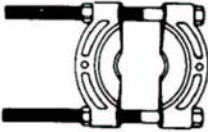
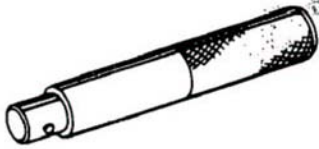

**SEALANTS AND ADHESIVES**

N21CE--

Items	Specified sealants and adhesives	Quantity
Control housing	3M ART Part No. 8001 or equivalent	As required
Control lever gasket	3M ART Part No. 8001 or equivalent	As required
Housing cover gasket	3M ART Part No. 8001 or equivalent	As required
Stopper bracket installation bolt	3M ART Part No. 8660 or equivalent	As required
Stopper bracket installation bolt (threads)	3M Scotch Grip No. 2353 or equivalent	As required
Extension gasket	3M ART Part No. 8001 or equivalent	As required
Adapter gasket	3M ART Part No. 8001 or equivalent	As required
Front bearing retainer	3M ART Part No. 8001 or equivalent	As required
Chain cover gasket	3M ART Part No. 8001 or equivalent	As required
Cover gasket	3M ART Part No. 8001 or equivalent	As required
Cover installation bolt (threads)	3M Adhesive Nut Locking 4171 or equivalent	As required
Rear cover gasket	3M ART Part No. 8001 or equivalent	As required

## SPECIAL TOOLS

N21DA--

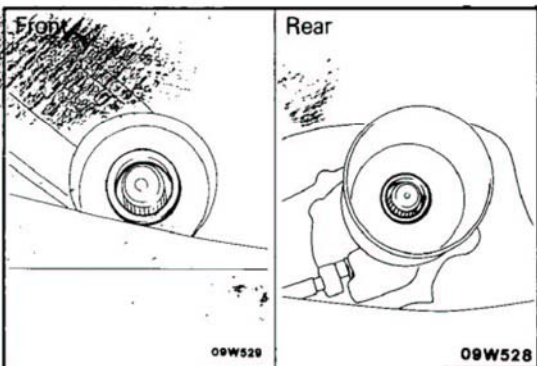
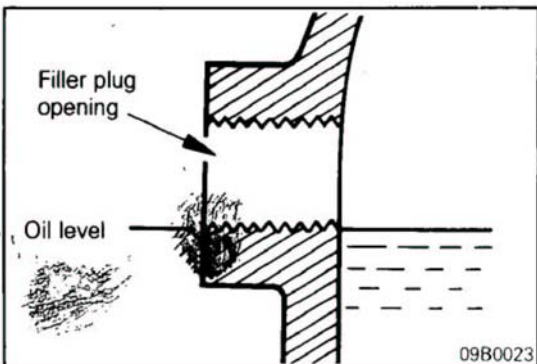
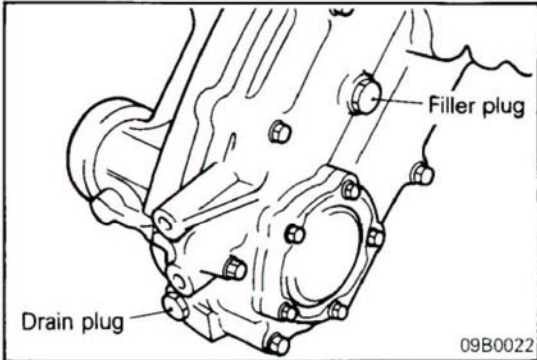
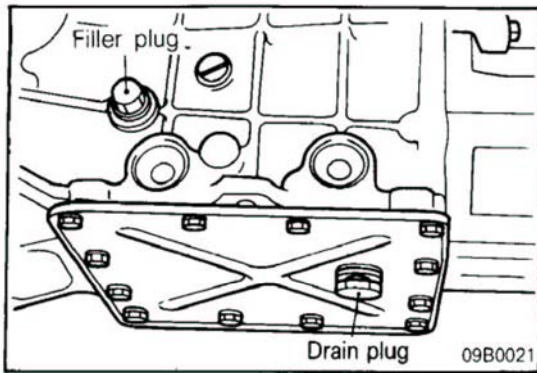
Tool (Number and name)	Use	Tool (Number and name)	Use
MD998245-01 Lock pin installer 	Driving in of lock pin and spring pin	MD998020 Bearing puller 	Removal of main drive gear and mainshaft bearing
MD998028 Bearing puller adapter 	Use with MD998020 Removal of mainshaft bearing	MD998067-01 Mainshaft bearing installer 	Driving in of mainshaft bearing
MD998029-01 Main drive gear bearing installer 	Driving in of main drive gear bearing	MD998200-01 Front bearing retainer oil seal installer 	Driving in of front oil seal
MD998348-01 Taper bearing puller 	Removal of counter shaft bearing	MB990938-01 Handle 	Use with MD998200 Driving in of front oil seal
MIT4336 Bearing driver handle 	Use with MD998067-01, MD998029-01 Driving in of main drive gear and mainshaft bearing		



**TROUBLESHOOTING**

N21EAAC

Trouble	Cause	Service Operation	Page
Noise, Vibration	The transmission and engine mount is loose or damaged.	Tighten or replace the mount.	21-11
	The end play of each shaft is not proper.	Correct the end play.	–
	Gears are worn or damaged.	Replace the gears.	–
	The oil grade is improper.	Replace with the specified oil.	21-10
	The oil level is low.	Add oil.	21-10
	The engine's idling speed is not proper.	Adjust the idling speed.	–
Oil is leaking	The oil seal or O-ring is damaged.	Replace the oil seal or O-ring.	–
Shifting gears is hard or troublesome	The synchronizer ring and gear cones mesh poorly or are worn.	Repair or replace.	–
	The synchronizer spring is fatigued.	Replace the synchronizer ring.	–
	The oil grade is improper.	Replace with the specified oil.	21-10
Gears slip out	The gear shift forks are worn or the poppet spring is broken.	Replace the shift forks or poppet spring.	–
	The clearance between the synchronizer hub and sleeve is too large.	Replace the synchronizer hub and spring.	–



## SERVICE ADJUSTMENT PROCEDURES

N21FFAA

### CHANGING AND INSPECTION OF TRANSMISSION AND TRANSFER OIL

1. Raise vehicle on hoist
2. Remove the filler plug from the transmission or transfer and check that the transmission oil is up to the oil level. If it is lower, replenish specified transmission oil to the oil level and if it is higher, drain transmission oil as described below.
3. Remove drain plug to let oil drain.
4. Tighten the drain plug completely.
5. Replenish the specified transmission oil to the level.

#### Specified transmission oil :

**Hypoid Gear Oil API classification GL-4 or higher  
SAE viscosity 80W, 75W-85W**

#### Quantity :

Transmission	2.2 lit. (4.7 U.S. pints, 3.9 Imp. pints)
Transfer case	2.2 lit. (4.7 U.S. pints, 3.9 Imp. pints)

6. Tighten the filler plug.

## REPLACEMENT OF PROPELLER SHAFT OIL SEALS

N21FGABO

- (1) Using a screwdriver or a similar tool, remove the oil seals.
- (2) Install the oil seals.

#### Caution

**Use a new oil seal.**

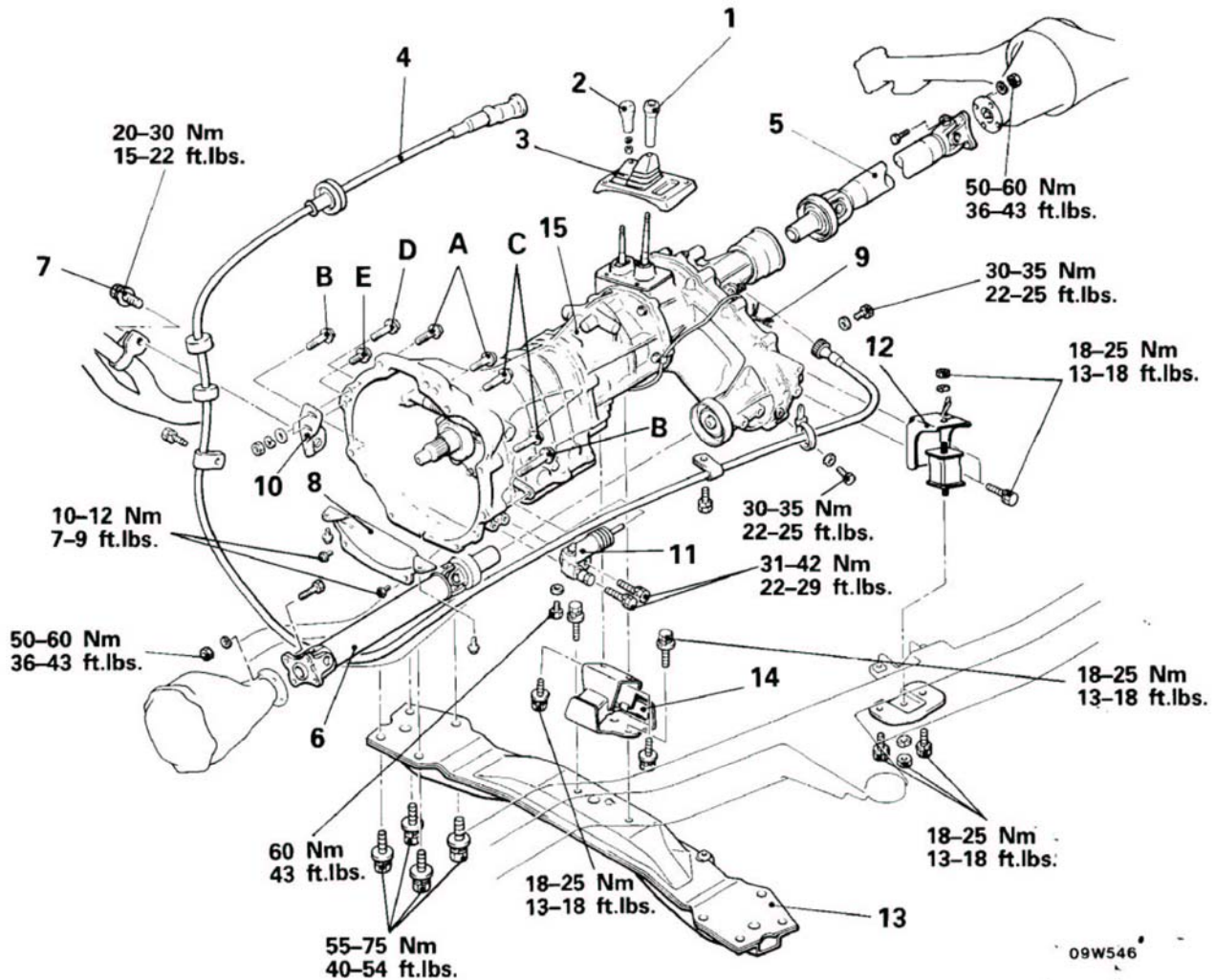
- (3) Apply a coating of the specified grease to the lip of the oil seals.

**Specified Grease : Multipurpose grease SAE J310,  
NLGI No. 2**

# TRANSMISSION AND TRANSFER ASSEMBLY

## REMOVAL AND INSTALLATION

N21MA--



09W546

### Removal steps

1. Transmission shift lever knob
- ◆◆ 2. Transfer shift lever knob
3. Front floor console
4. Speedometer cable
- ◆◆◆◆ 5. Rear propeller shaft
- ◆◆◆◆ 6. Front propeller shaft
7. Front exhaust pipe mounting bolt
8. Bell housing cover
9. Connection of 4WD indicator light switch
- ◆◆◆◆ 10. Exhaust pipe mounting bracket
- ◆◆◆◆ 11. Clutch release cylinder
12. Transfer mounting bracket
13. No. 2 crossmember
14. Engine mounting rear insulator
- ◆◆◆◆ 15. Transmission and transfer assembly

### Pre-removal Operation

- Removal of Transfer Case Protector
- Bleeding of Transmission Oil and Transfer Oil (Refer to P.21-10.)

### Post-installation Operation

- Installation of Transfer Case Protector
- Supplying of Transmission Oil and Transfer Oil (Refer to P.21-10.)

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆ : Refer to "Service Points of Installation".

	Nm	ft.lbs.	O.D. x Length	mm (in.)	Bolt identification
A	43-55	31-40	⌀ 10 x 40	(.4 x 1.6)	 ⌀ D x L
B	43-55	31-40	⌀ 10 x 65	(.4 x 2.6)	
C	27-34	20-25	⌀ 10 x 60	(.4 x 2.4)	
D	20-27	15-20	⌀ 8 x 55	(.3 x 2.2)	
E	20-27	15-20	⌀ 8 x 25	(.3 x 1.0)	

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**SERVICE POINTS OF REMOVAL**

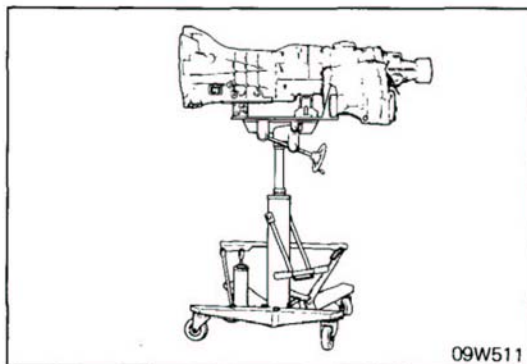
N21MBAG

**5. REMOVAL OF REAR PROPELLER SHAFT/6. FRONT PROPELLER SHAFT**

Refer to GROUP 16 PROPELLER SHAFT AND UNIVERSAL JOINTS – Propeller Shaft

**11. REMOVAL OF CLUTCH RELEASE CYLINDER**

Refer to GROUP 6 CLUTCH – Clutch Release Cylinder.

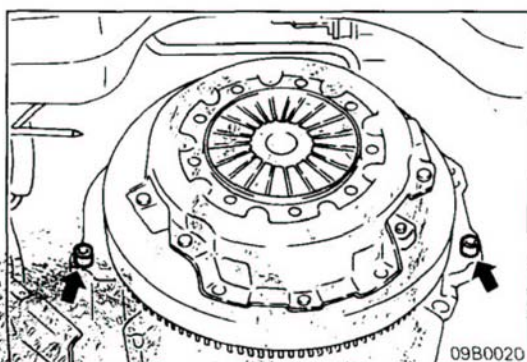


**15. REMOVAL OF TRANSMISSION AND TRANSFER**

**Caution**

When removing the transmission from the engine, care must be taken not to shake or rock with force, because to do so might cause damage to the end of the main drive gear, the pilot bearing, or the clutch disc, etc.

- (1) Disconnect the transmission and transfer assembly from the engine by pulling it slowly toward the rear of the vehicle.
- (2) When the transmission and transfer assembly are lowered, tilt the front of the transmission downward and slowly lower forward, while using care to make sure that the rear of the transmission does not interfere with the No. 4 crossmember.



**SERVICE POINTS OF INSTALLATION**

N21MDAH

**15. INSTALLATION OF TRANSMISSION AND TRANSFER ASSEMBLY**

On the engine side, there are two centering locations. Make sure that the transmission mounting bolt holes are aligned with them before mounting the transmission and transfer assembly to the engine.

**11. INSTALLATION OF CLUTCH RELEASE CYLINDER**

Refer to GROUP 6 CLUTCH – Clutch Release Cylinder.

**6. INSTALLATION OF FRONT PROPELLER SHAFT/5. REAR PROPELLER SHAFT**

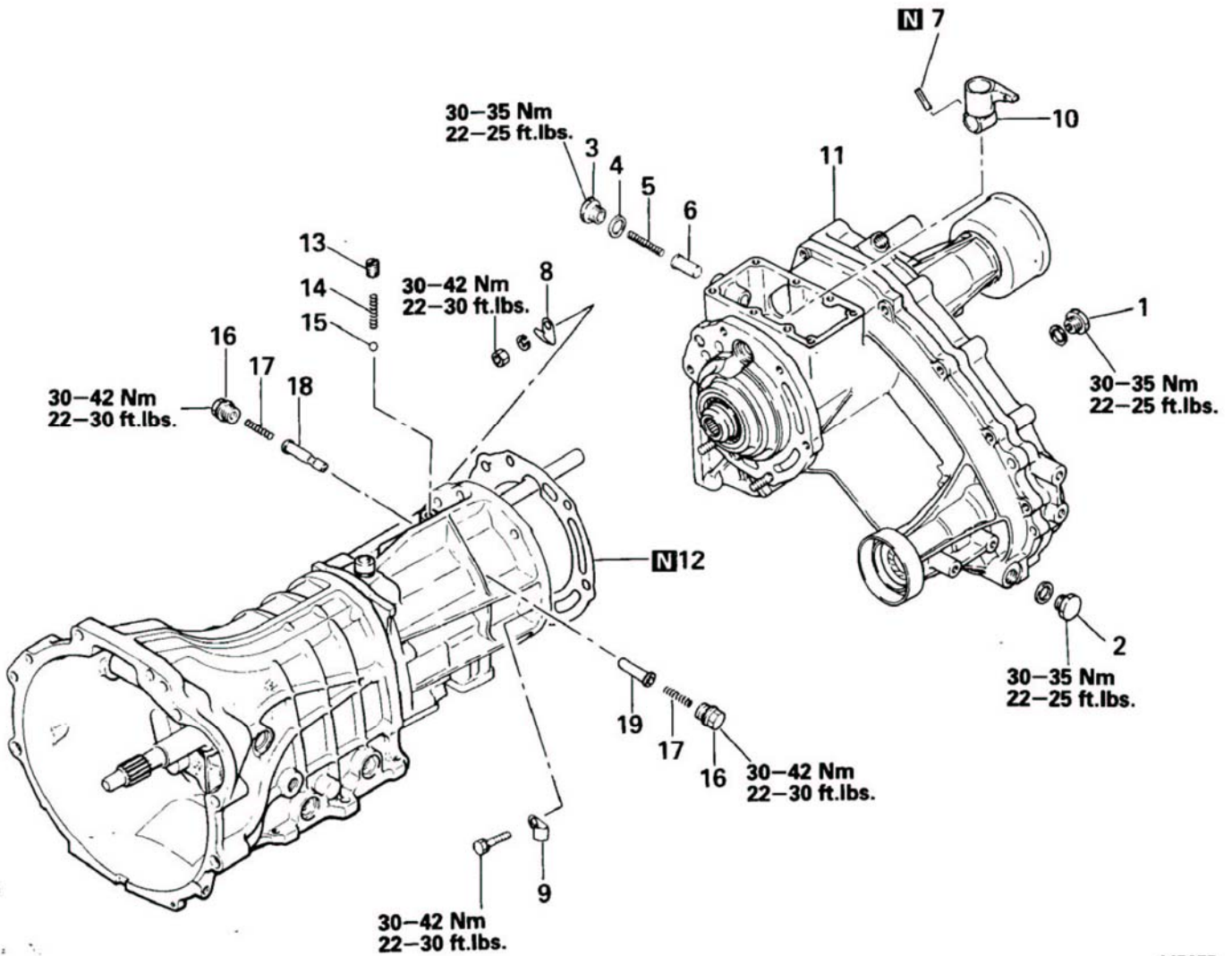
Refer to GROUP 16 PROPELLER SHAFT AND UNIVERSAL JOINTS – Propeller Shaft.

**2. INSTALLATION OF TRANSFER SHIFT LEVER KNOB**

Refer to P.21-43.

**TRANSMISSION AND TRANSFER ASSEMBLY**  
**DISASSEMBLY AND REASSEMBLY**

N21ME-C



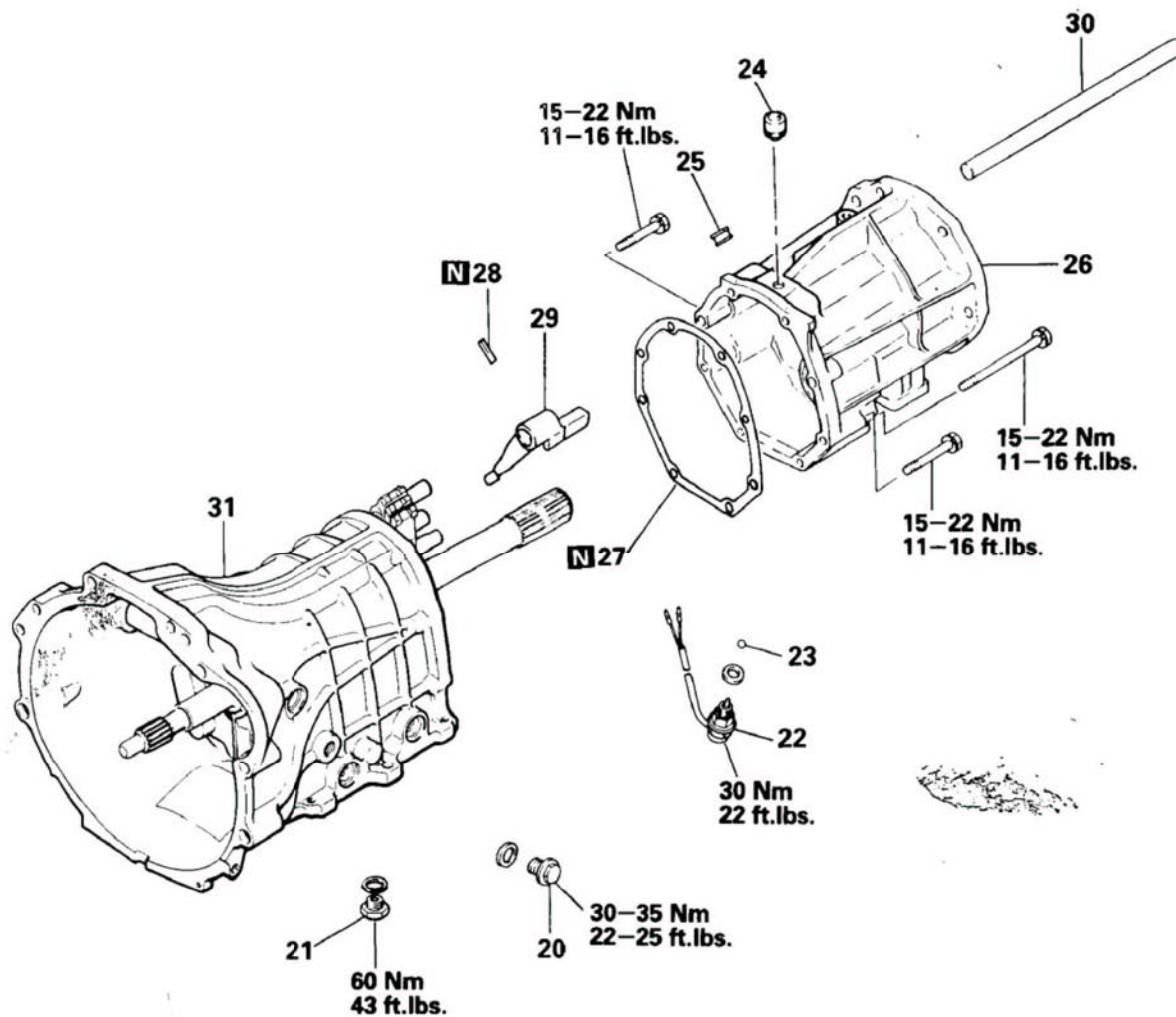
145075

**Disassembly steps**

- |                          |                                |
|--------------------------|--------------------------------|
| 1. Oil filler plug       | 15. Steel ball                 |
| 2. Oil drain plug        | 16. Seal plug                  |
| 3. Select plunger plug   | 17. Neutral return spring      |
| 4. Gasket                | 18. Neutral return plunger (B) |
| 5. Select spring         | 19. Neutral return plunger (A) |
| 6. Select plunger        |                                |
| ◆◆ 7. Spring pin         |                                |
| 8. Cord fastener         |                                |
| 9. Cord fastener         |                                |
| ◆◆ 10. Change shifter    |                                |
| ◆◆ 11. Transfer assembly |                                |
| ◆◆ 12. Adapter gasket    |                                |
| 13. Plug                 |                                |
| 14. Spring               |                                |

**NOTE**

- (1) Reverse the disassembly procedures to reassemble.  
 (2) ◆◆ : Refer to "Service Points of Reassembly".  
 (3) N : Non-reusable parts



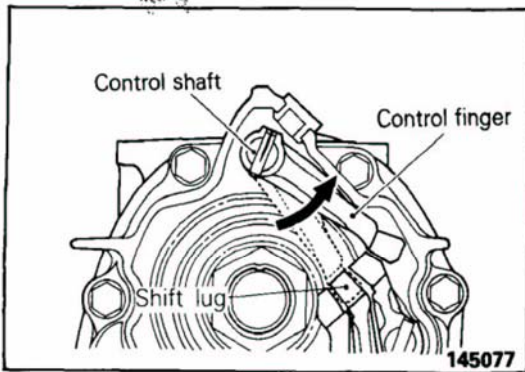
145076

**Disassembly steps**

- 20. Oil filler plug
- 21. Oil drain plug
- 22. Backup light switch
- 23. Steel ball
- ◆◆24. Breather
- ◆◆25. Plug
- ◆◆◆26. Transfer adapter
- ◆◆27. Extension gasket
- ◆◆◆28. Lock pin
- ◆◆◆29. Control finger
- 30. Control shaft
- 31. Transmission assembly

**NOTE**

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆◆ : Refer to "Service Points of Reassembly".
- (4) N : Non-reusable parts



## SERVICE POINTS OF DISASSEMBLY

N21MFBD

### 26. REMOVAL OF TRANSFER ADAPTER

Turn the control shaft to the left and remove the control finger from the groove in the shift lug, then remove the transfer adapter from the transmission.

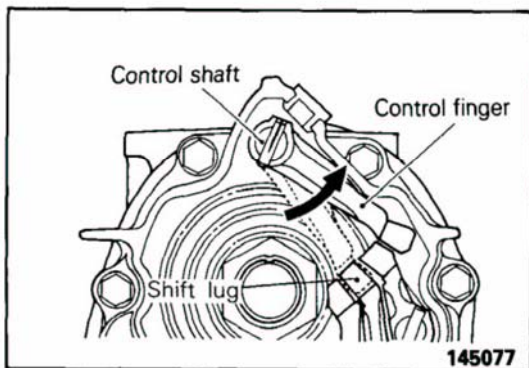
## SERVICE POINTS OF REASSEMBLY

N21MGBG

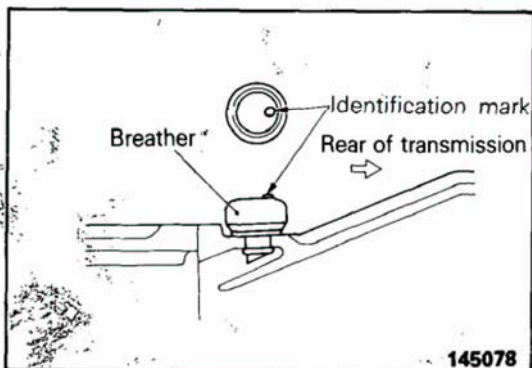
### 27. INSTALLATION OF EXTENSION GASKET/26. TRANSFER ADAPTER

- (1) Apply sealant to both sides of the extension gasket and affix the gasket to the rear surface of the transmission case.

**Specified sealant : 3M ART Part No. 8001 or equivalent**



- (2) Turn the control shaft to the left and install the transfer adapter.
- (3) Turn the control shaft to the right and insert the control finger in the groove of the shift lug.



### 24. INSTALLATION OF BREATHER

Install the breather with the identification mark toward the rear.

### 12. ASSEMBLY OF ADAPTER GASKET/11. TRANSFER CASE ASSEMBLY/10. CHANGE SHIFTER

- (1) Apply sealant to both sides of the gasket and affix it to the rear surface of the adapter.

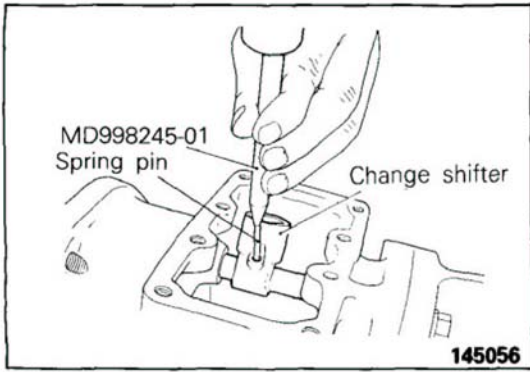
**Specified sealant : 3M ART Part No. 8001 or equivalent**

- (2) Install the transfer case installing the change shifter to the control shaft.



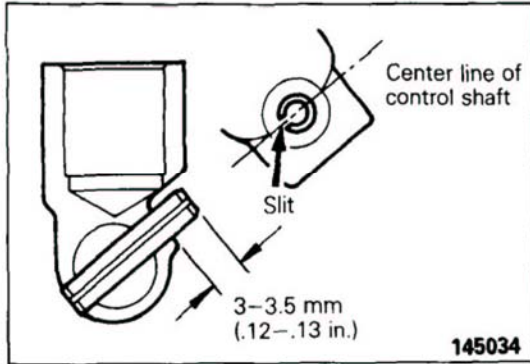
**7. DRIVING IN OF SPRING PIN**

(1) Use the special tool to drive in the spring pin.



(2) Drive the spring pin in with the slit in the spring pin parallel to the shaft center of the shift rail, so that the dimensions are as shown in the illustration.

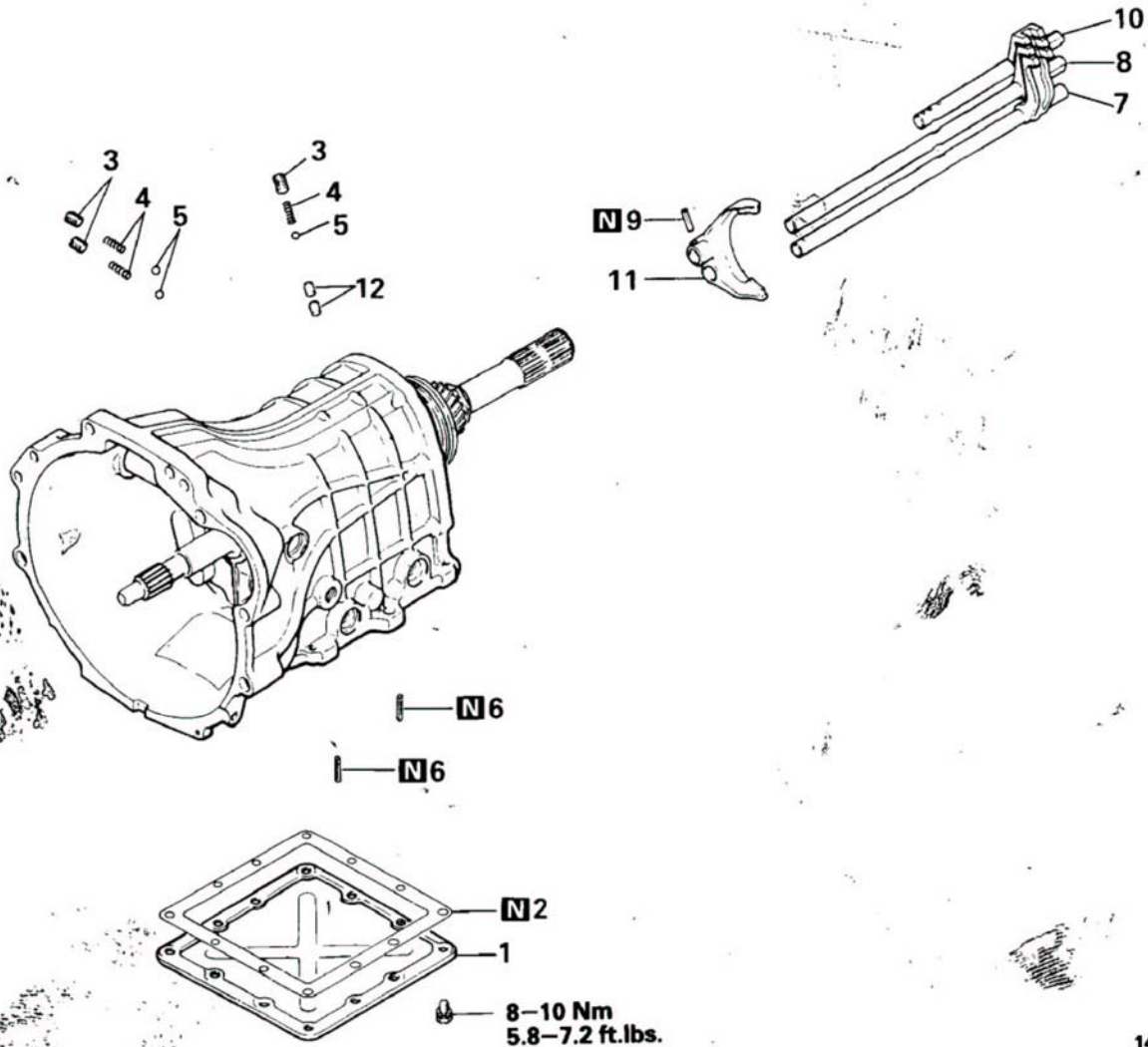
**NOTE**  
Do not reuse spring pin.



# TRANSMISSION ASSEMBLY

## DISASSEMBLY AND REASSEMBLY

N21ME-D



145079

### Disassembly steps

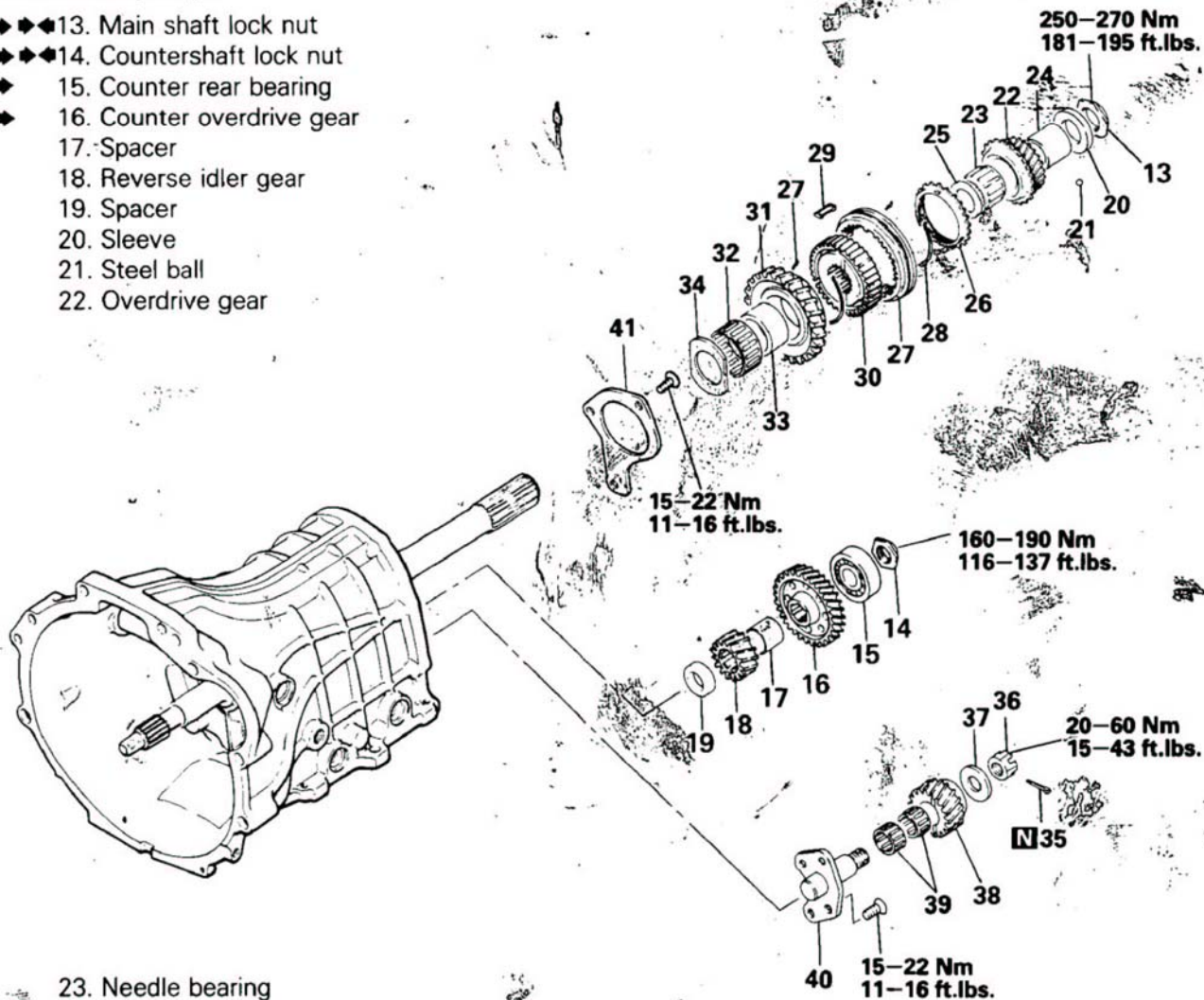
1. Under cover
2. Under cover gasket
3. Plug
- ◆◆ 4. Poppet spring
- ◆◆ 5. Steel ball
- ◆◆◆◆ 6. Spring pin
7. 1-2 speed shift rail
8. 3-4 speed shift rail
- ◆◆◆◆ 9. Spring pin
10. OD-R shift rail
11. OD-R shift fork
12. Interlock plunger

### NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆◆ : Refer to "Service Points of Reassembly".
- (4) [N] : Non-reusable parts

**Disassembly steps**

- ◆◆◆◆13. Main shaft lock nut
- ◆◆◆◆14. Countershaft lock nut
- ◆◆ 15. Counter rear bearing
- ◆◆ 16. Counter overdrive gear
- 17. Spacer
- 18. Reverse idler gear
- 19. Spacer
- 20. Sleeve
- 21. Steel ball
- 22. Overdrive gear

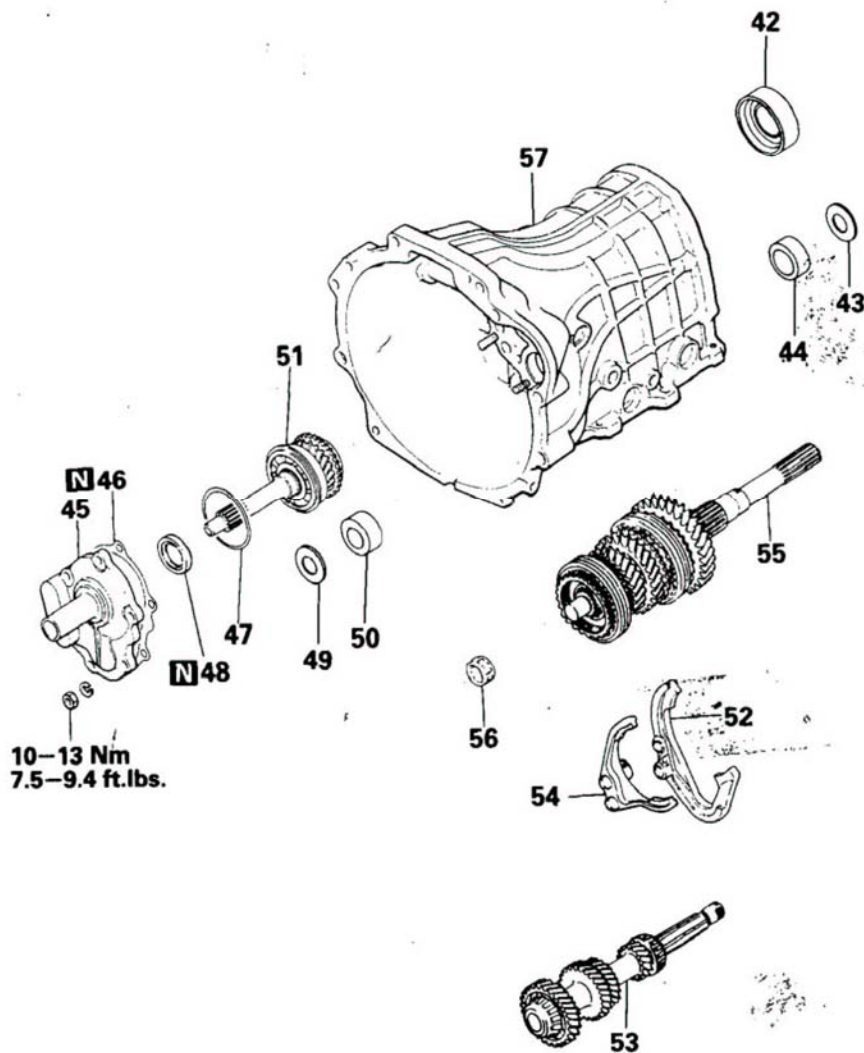


- 23. Needle bearing
- 24. Bearing sleeve
- 25. Bearing spacer
- ◆◆◆◆26. Synchronizer ring
- ◆◆◆◆27. OD-R synchronizer sleeve
- ◆◆◆◆28. Synchronizer spring
- ◆◆◆◆29. Synchronizer key
- ◆◆◆◆30. Synchronizer hub
- 31. Reverse gear
- 32. Needle bearing
- 33. Bearing sleeve
- 34. Spacer
- 35. Cotter pin
- 36. Slotted nut
- 37. Thrust washer
- 38. Reverse idler gear
- 39. Needle bearing
- ◆◆◆◆40. Reverse idler gear shaft
- 41. Rear bearing retainer

**NOTE**

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Disassembly"
- (3) ◆◆◆ : Refer to "Service Points of Reassembly"
- (4) [N] : Non-reusable parts

145080



### Disassembly steps

- ◆◆◆◆ 42. Main shaft bearing
- ◆◆◆ 43. Spacer
- ◆◆◆ 44. Counter rear bearing outer race
- ◆◆◆ 45. Front bearing retainer
- ◆◆◆ 46. Front bearing retainer gasket
- ◆◆◆ 47. Spacer
- ◆◆◆ 48. Oil Seal
- ◆◆◆ 49. Spacer
- ◆◆◆ 50. Counter front bearing outer race
- ◆◆◆◆ 51. Main drive gear assembly
- ◆◆◆ 52. 1-2 speed shift fork
- ◆◆◆ 53. Counter shaft assembly
- ◆◆◆ 54. 3-4 speed shift fork
- ◆◆◆ 55. Main shaft assembly
- ◆◆◆ 56. Needle bearing
- ◆◆◆ 57. Transmission case

145099

### NOTE

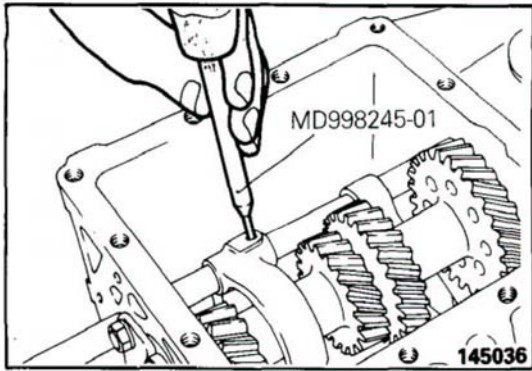
- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆◆ : Refer to "Service Points of Reassembly".
- (4) **N** : Non-reusable parts

N21MFBE

**SERVICE POINTS OF DISASSEMBLY**

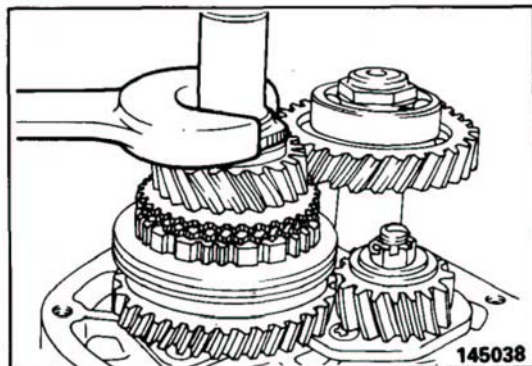
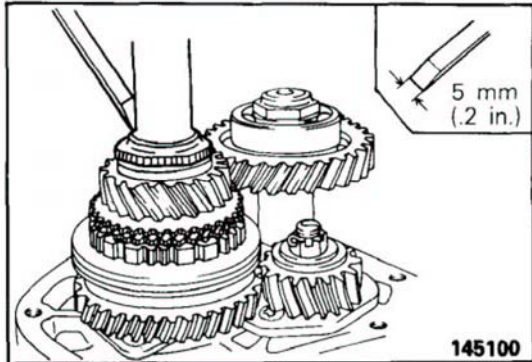
**6. /9. REMOVAL OF SPRING PIN**

Drive the spring pin out using the special tool.



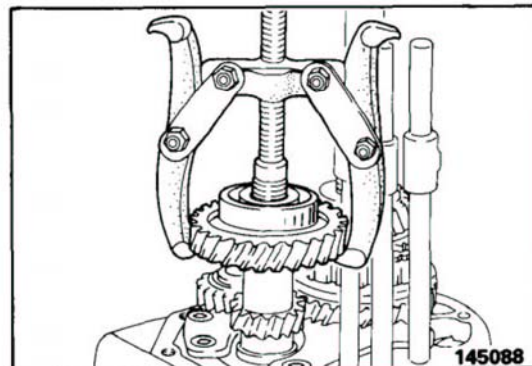
**13. REMOVAL OF MAIN SHAFT LOCK NUT/14. COUNTER SHAFT LOCK NUT**

- (1) As shown in the illustration, use the front edge of the blade of a chisel or a blunt punch to loosen the baffle on the main shaft and counter shaft lock nuts.
- (2) Shift the OD-R synchronizer sleeve to the reverse side, then shift the 1-2 synchronizer sleeve to the 2nd speed side.
- (3) Remove the main shaft lock nut and the counter shaft lock nut.



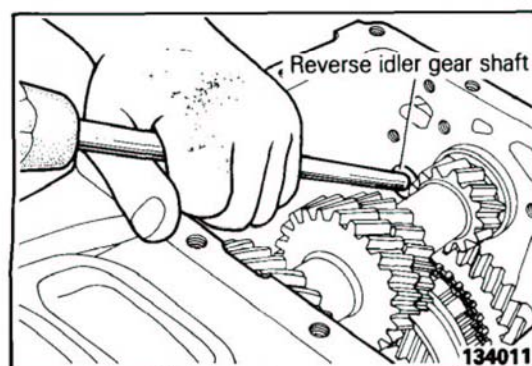
**15. REMOVAL OF COUNTER REAR BEARING/16. COUNTER OVERDRIVE GEAR**

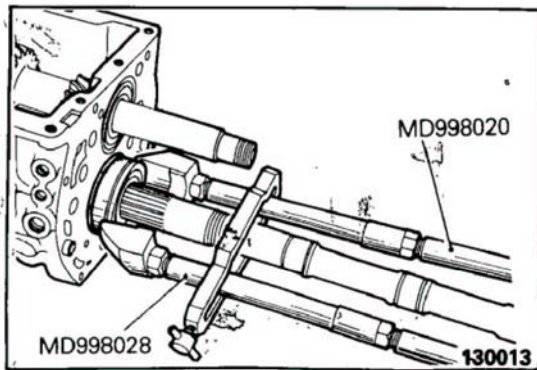
Pull off counter overdrive gear and ball bearing by using a suitable puller.



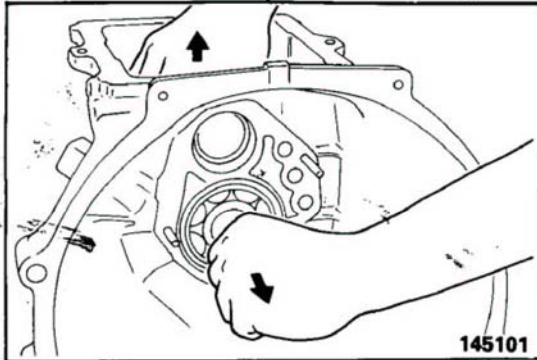
**40. REMOVAL OF REVERSE IDLER GEAR SHAFT**

- (1) Remove four reverse idler gear shaft mounting bolts.
- (2) Drive reverse idler gear shaft from inside of case.

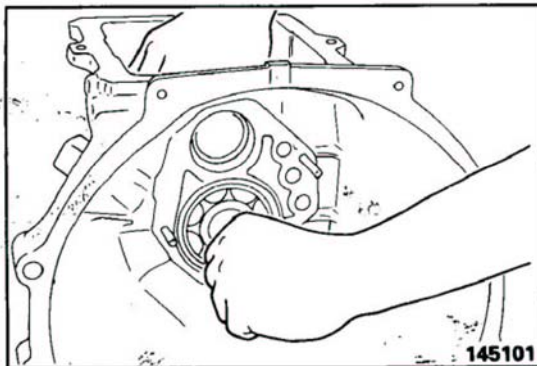


**42. REMOVAL OF MAIN SHAFT CENTER BEARING**

- (1) Remove main shaft bearing snap ring.
- (2) Using Special Tools remove main shaft rear bearing.

**51. REMOVAL OF MAIN DRIVE GEAR ASSEMBLY**

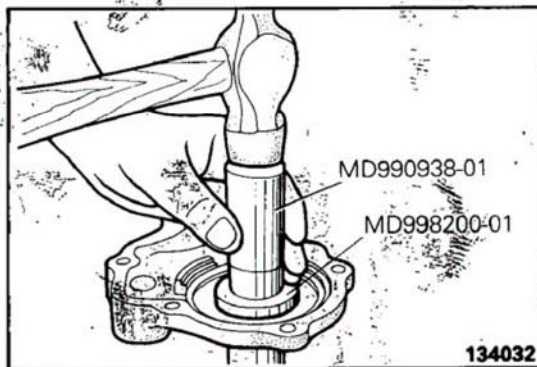
Pull the counter gear up in the case and remove the main drive gear with bearing toward front of case.

**SERVICE POINTS OF REASSEMBLY**

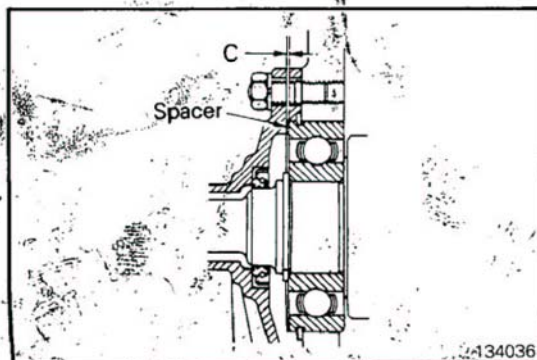
N21MGBH

**51. INSTALLATION OF MAIN DRIVE GEAR ASSEMBLY**

Hold the counter gear upward in the case and install the main drive gear assembly.

**48. INSTALLATION OF OIL SEAL**

Apply transmission oil to the lip of the oil seal, then drive the oil seal into the front bearing retainer using the special tool.

**47. INSTALLATION OF SPACER/46. FRONT BEARING RETAINER GASKET/45. FRONT BEARING RETAINER**

- (1) Before installing the front bearing retainer, select a spacer which will bring the clearance (c) to the standard value.

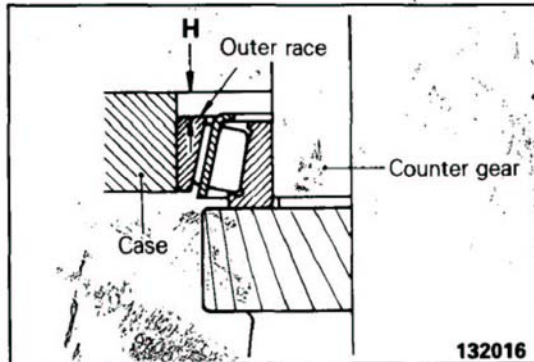
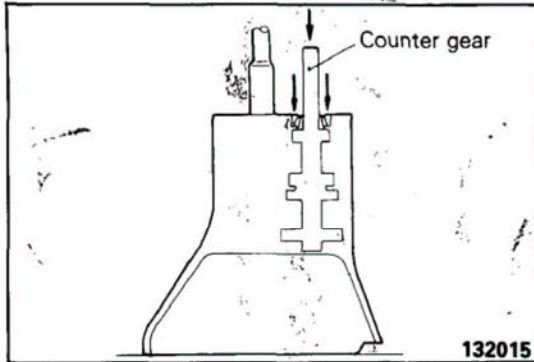
**Standard value : 0–0.1 mm (0–.004 in.)**

- (2) Apply sealant to both sides of the front bearing retainer gasket and affix it to the case. Then immediately set the spacer selected in (1) in place and install the bearing retainer.

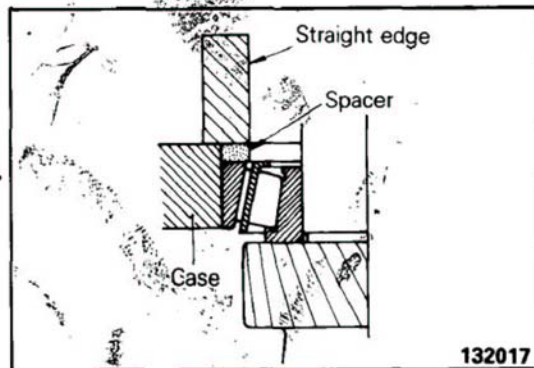
**Specified sealant : 3M ART Part No. 8001 or equivalent**

**43. INSTALLATION OF SPACER**

- (1) Hold down counter gear and bearing outer race (in the direction of arrow shown in illustration).



- (2) Put a spacer of proper thickness (slightly thinner than dimension "H" shown in illustration) on outer race.

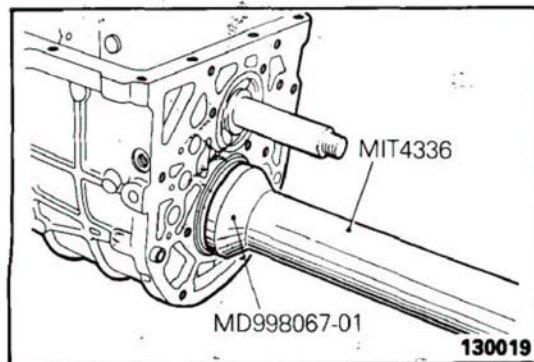


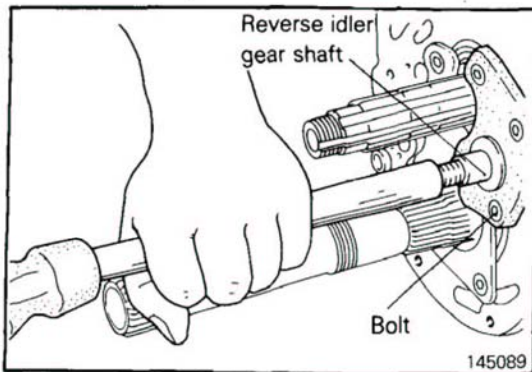
- (3) Put straight edge on spacer and try to turn spacer by index finger. If spacer turns lightly, replace it with spacer one rank [0.03 mm (.0012 in.)] thicker, and similarly turn this spacer. In this manner, choose and install a spacer which makes clearance between straight edge and spacer closest to 0. Make sure that the bearings are NOT preloaded.

**Standard value : 0–0.05 mm (0–.0020 in.)**

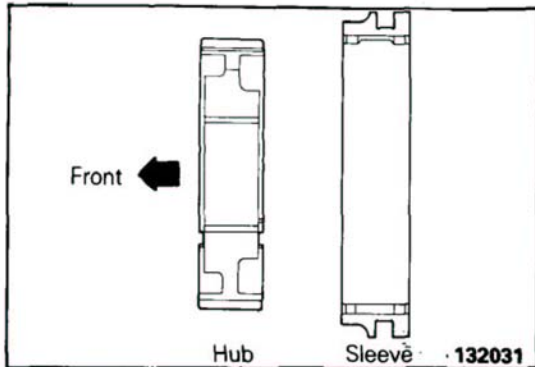
**42. INSTALLATION OF MAIN SHAFT BEARING**

After installing the snap ring on the main shaft bearing, drive the main shaft bearing into the transmission case using the special tool.

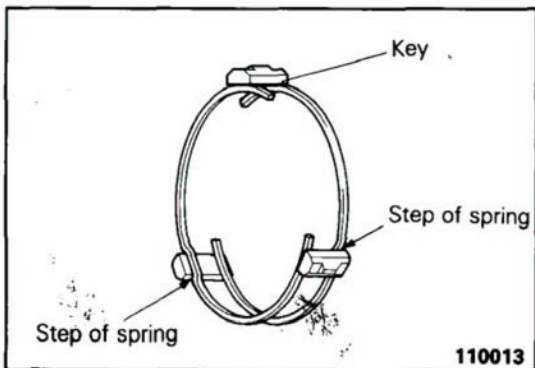


**40. INSTALLATION OF REVERSE IDLER GEAR SHAFT**

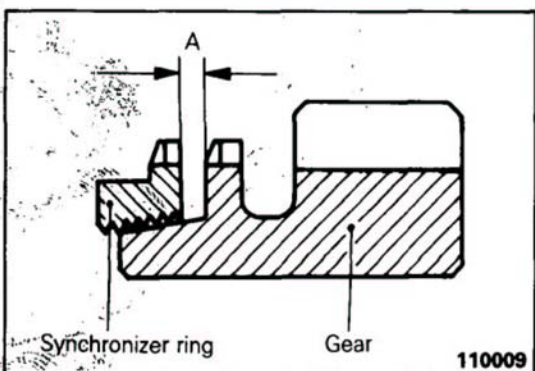
Position the reverse idler gear shaft with bolts and drive it in.

**30. INSTALLATION OF SYNCHRONIZER HUB/29. SYNCHRONIZER KEY/28. SYNCHRONIZER SPRING/27. OD-R SYNCHRONIZER SLEEVE**

- (1) Assemble synchronizer hub and sleeve. Make sure that hub and sleeve slide smoothly.
- (2) Insert three keys into groove of hub. Assemble hub and keys as shown in illustration since they have a definite direction to be assembled.



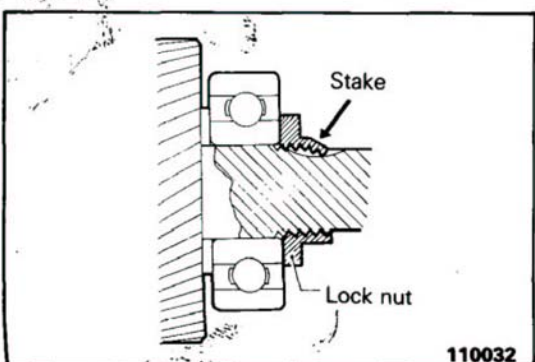
- (3) Install two synchronizer springs. When installing springs, make sure that steps of front and rear springs are positioned on synchronizer key, but not on the same key.

**26. INSTALLATION OF SYNCHRONIZER RING**

Engage synchronizer ring to OD gear as shown in illustration before installing OD gear and ensure that there is certain clearance "A".

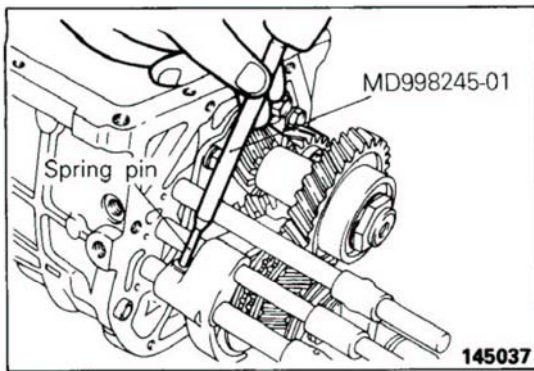
If dimension "A" exceeds the limit, replace the ring and/or gear.

**Limit : 0.5 mm (.020 in.)**

**14. INSTALLATION OF COUNTER SHAFT LOCK NUT/13. MAIN SHAFT LOCK NUT**

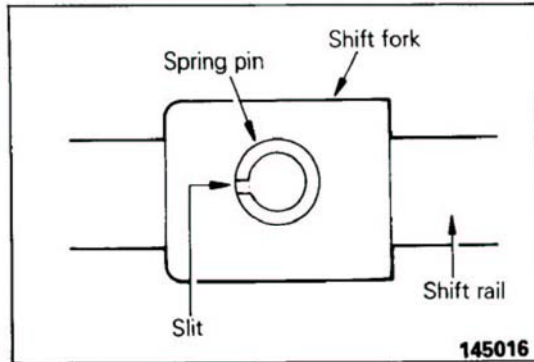
- (1) Tighten main shaft and counter gear lock nut to specified torque.
- (2) Stake the area as shown in illustration without fail to prevent lock nut from loosening.
- (3) Ensure that OD gear rotates smoothly.





**9. INSTALLATION OF SPRING PIN/6. SPRING PIN**

(1) Use the special tool to drive in OD-R shift fork spring pin.



(2) Drive in spring pin so as to place slit in direction of center line of shift rail. Drive in spring pin for 3–4 and 1–2 shift forks in the same manner.

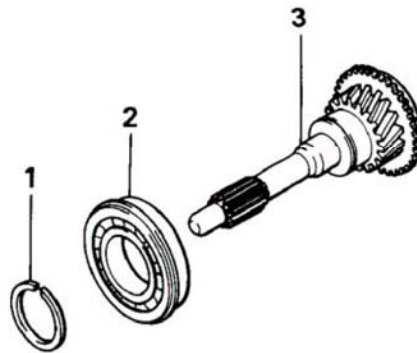
**NOTE**

Do not reuse spring pin.

# MAIN DRIVE GEAR ASSEMBLY

N21MQAB

## DISASSEMBLY AND REASSEMBLY



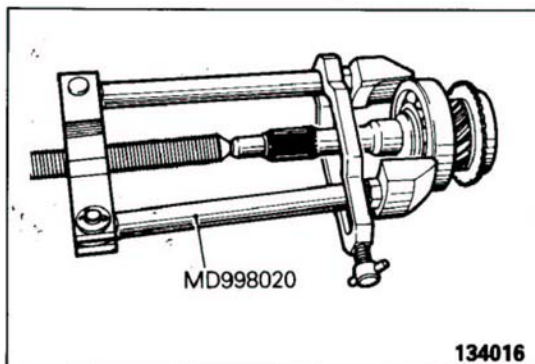
110038

### Disassembly steps

- ◆◆1. Snap ring
- ◆◆◆2. Bearing
- 3. Main drive gear

### NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆ : Refer to "Service Points of Reassembly".

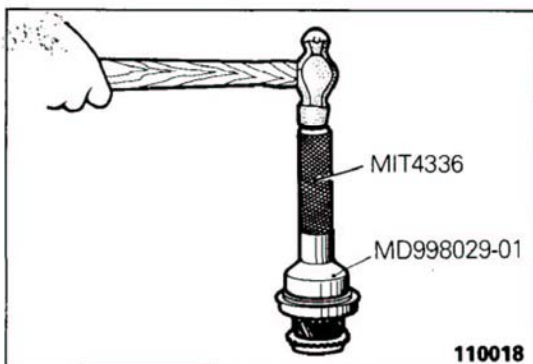


134016

### SERVICE POINTS OF DISASSEMBLY

#### 2. REMOVAL OF BEARING

- (1) Remove main drive gear snap ring.
- (2) Using Special Tool, pull ball bearing from main drive gear.

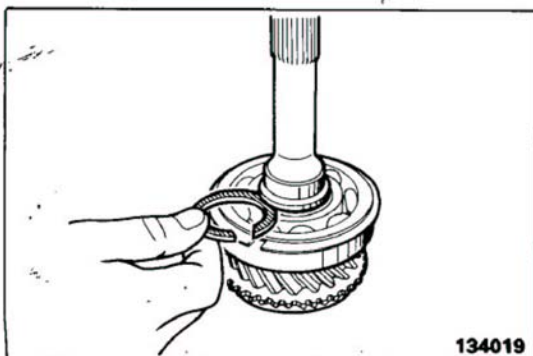


110018

### SERVICE POINTS OF REASSEMBLY

#### 2. INSTALLATION OF BEARING

With Special Tool, applied to main drive gear press bearing in by means of a hammer or a press.



134019

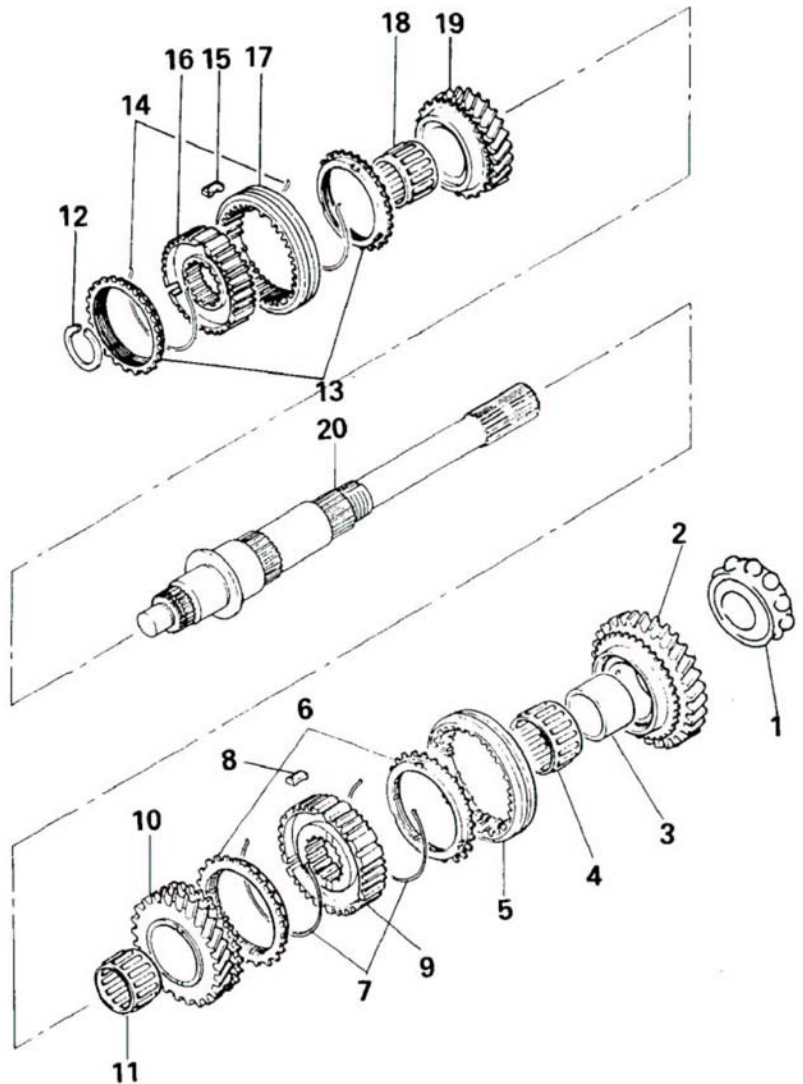
#### 1. INSTALLATION OF SNAP RING

Select and install main drive gear snap ring of such thickness that will minimize clearance between snap ring and bearing. In other words, install the thickest snap ring that can fit in snap ring groove.

**Standard value : 0–0.06 mm (0–.002 in.)**

**MAIN SHAFT ASSEMBLY  
DISASSEMBLY AND REASSEMBLY**

N21PE-C



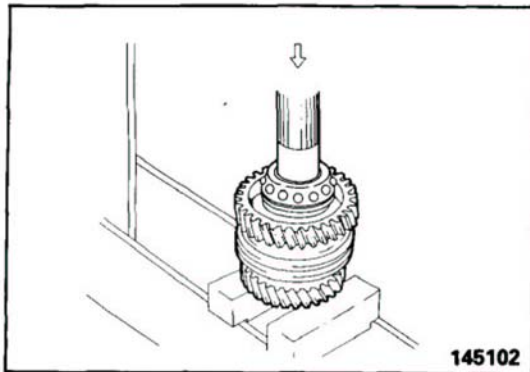
**Disassembly steps**

- ◆◆ 1. Ball bearing inner race
- 2. First speed gear
- 3. Bearing sleeve
- 4. Needle bearing
- ◆◆ 5. 1-2 speed synchronizer sleeve
- 6. Synchronizer ring
- ◆◆ 7. Synchronizer spring
- ◆◆ 8. Synchronizer key
- ◆◆ 9. 1-2 speed synchronizer hub
- ◆◆ 10. Second speed gear
- 11. Needle bearing
- ◆◆ 12. Snap ring
- 13. Synchronizer ring
- ◆◆ 14. Synchronizer spring
- ◆◆ 15. Synchronizer key
- ◆◆ 16. 3-4 speed synchronizer hub
- ◆◆ 17. 3-4 speed synchronizer sleeve
- 18. Needle bearing
- 19. Third speed gear
- 20. Main shaft

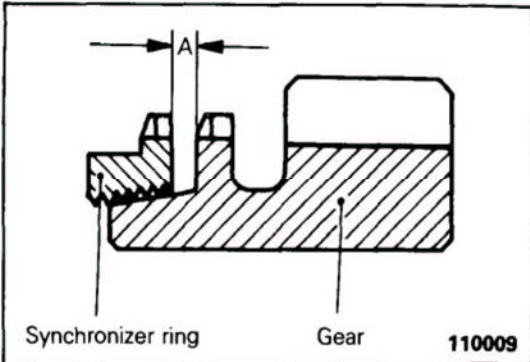
**NOTE**

- (1) Reverse the disassembly procedures to reassemble.
- (2)◆◆ : Refer to "Service Points of Disassembly".
- (3)◆◆ : Refer to "Service Points of Reassembly".

145103



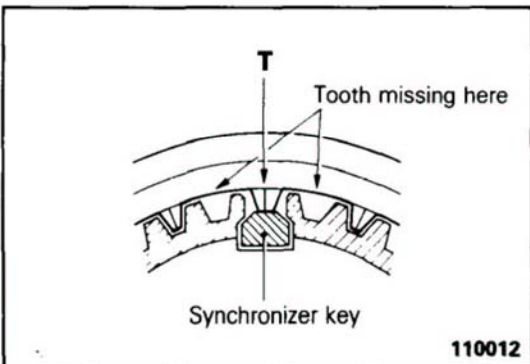
145102



Synchronizer ring

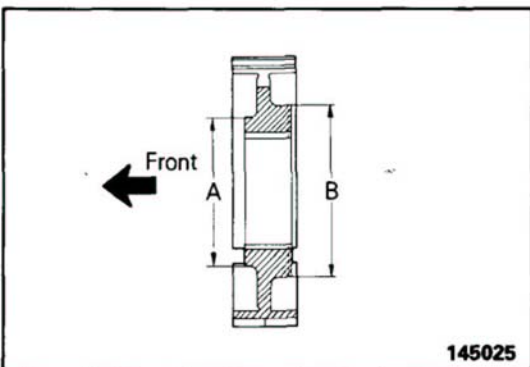
Gear

110009



Synchronizer key

110012

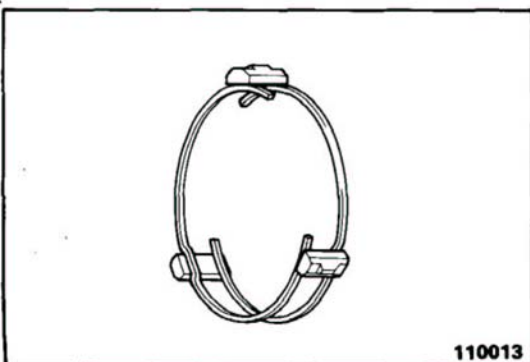


Front

A

B

145025



110013

**SERVICE POINTS OF DISASSEMBLY**

N21PFAA2

**1. INSTALLATION OF BALL BEARING INNER RACE/10. SECOND SPEED GEAR**

Holding second speed gear on press base, push rear end of main shaft to remove bearing inner race (double bearing only), gear bearing sleeve, first speed gear, 1-2 speed synchronizer and second speed gear.

**INSPECTION**

N21PGA2

- Check synchronizer ring for worn and damaged internal threads.
- With synchronizer assembled to cone of each gear check dimension "A". If dimension "A" exceeds the limit, replace the synchronizer ring and/or gear.

**Limit : 0.5 mm (.020 in.)**

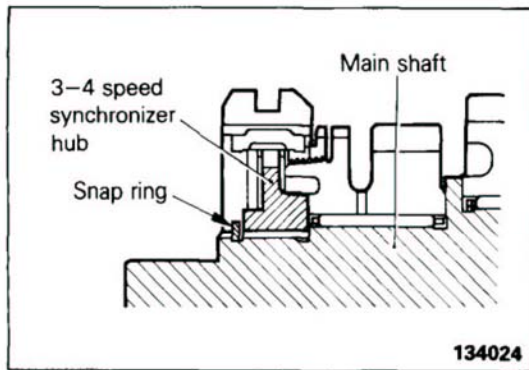
**SERVICE POINTS OF REASSEMBLY**

N21PHAA2

**17. ASSEMBLY OF 3-4 SPEED SYNCHRONIZER SLEEVE/16. 3-4 SPEED SYNCHRONIZER HUB/15. SYNCHRONIZER KEY/14. SYNCHRONIZER SPRING**

- (1) Mate synchronizer hub with sleeve using mark made at disassembly. Make sure that hub and sleeve slide smoothly. If they slide unsmoothly, replace hub and sleeve assembly.
- (2) 3-4 synchronizer sleeve has teeth missing at six portions. Assemble hub to sleeve in such a way that center tooth T between two missing teeth will touch synchronizer key.
- (3) Use care when installing 3-4 synchronizer hub since only 3-4 synchronizer is directional. Smaller diameter side "A" of center boss is front of 3-4 synchronizer hub.

- (4) Insert three keys into groove of synchronizer hub.
- (5) Install two synchronizer springs to synchronizer. When synchronizer springs are installed, make sure that front and rear ones are not faced in same direction.

**16. INSTALLATION OF 3-4 SYNCHRONIZER HUB/12. SNAP RING**

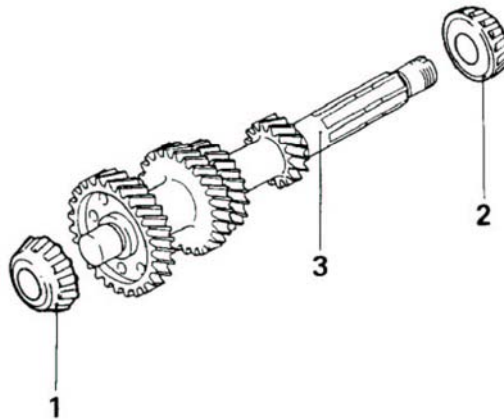
- (1) Assemble 3-4 synchronizer positioning hub toward correct direction.
- (2) As for main shaft front end snap ring, select and install one of such thickness that will minimize clearance between snap ring hub. In other words, install the thickest snap ring that fits in snap ring groove.
- (3) Make sure that 3rd speed gear turns smoothly.

**9. ASSEMBLY OF 1-2 SPEED SYNCHRONIZER HUB/8. SYNCHRONIZER KEY/7. SYNCHRONIZER SPRING/5. 1-2 SPEED SYNCHRONIZER SLEEVE**

Assemble the 1-2 synchronizer by the same procedure as for the 3-4 synchronizer in the previous item.

**COUNTER SHAFT ASSEMBLY**

N21XE-B

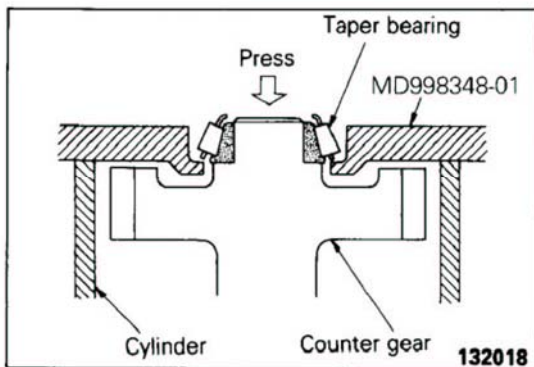
**DISASSEMBLY AND REASSEMBLY****Disassembly steps**

- ◆◆◆◆1. Counter front bearing
- ◆◆◆◆2. Counter center bearing
- 3. Counter shaft gear

**NOTE**

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆ : Refer to "Service Points of Reassembly".

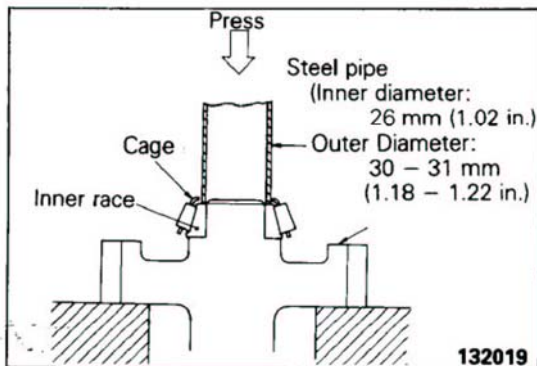
132069

**SERVICE POINTS OF DISASSEMBLY**

N21XFAB

**1. REMOVAL OF COUNTER FRONT BEARING/2. COUNTER CENTER BEARING**

Remove the taper roller bearing from the end of the counter shaft gear using the special tool.

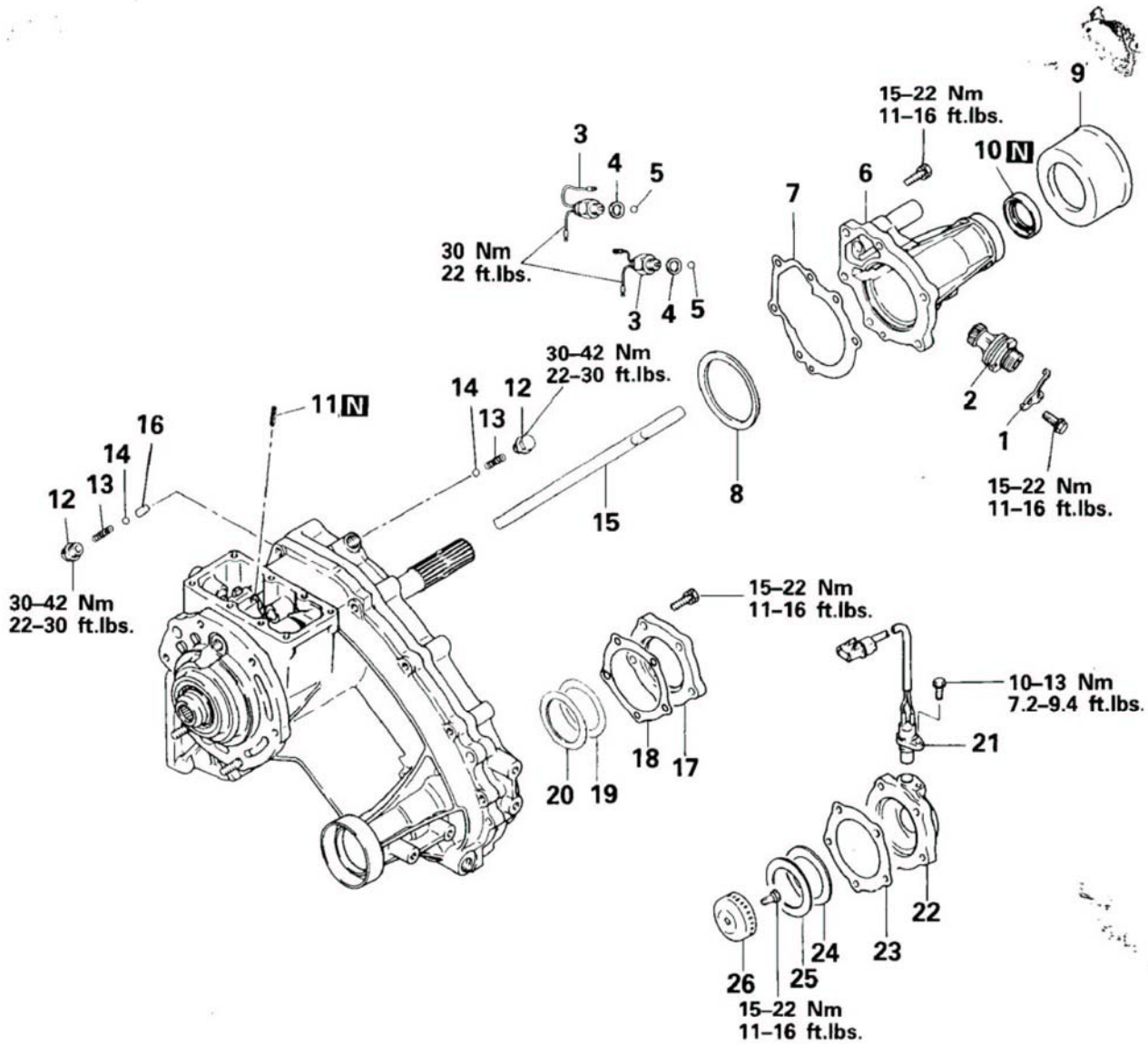
**SERVICE POINTS OF REASSEMBLY**

N21XHAA1

**1. PRESSURE INSERTION OF COUNTER FRONT BEARING/2. COUNTER CENTER BEARING**

Pressure insert the taper roller bearing using a steel pipe with the dimensions shown in the illustration. Set the steel pipe so that it presses on the inner race only and doesn't contact the bearing cage.

**TRANSFER ASSEMBLY**  
**DISASSEMBLY AND REASSEMBLY**

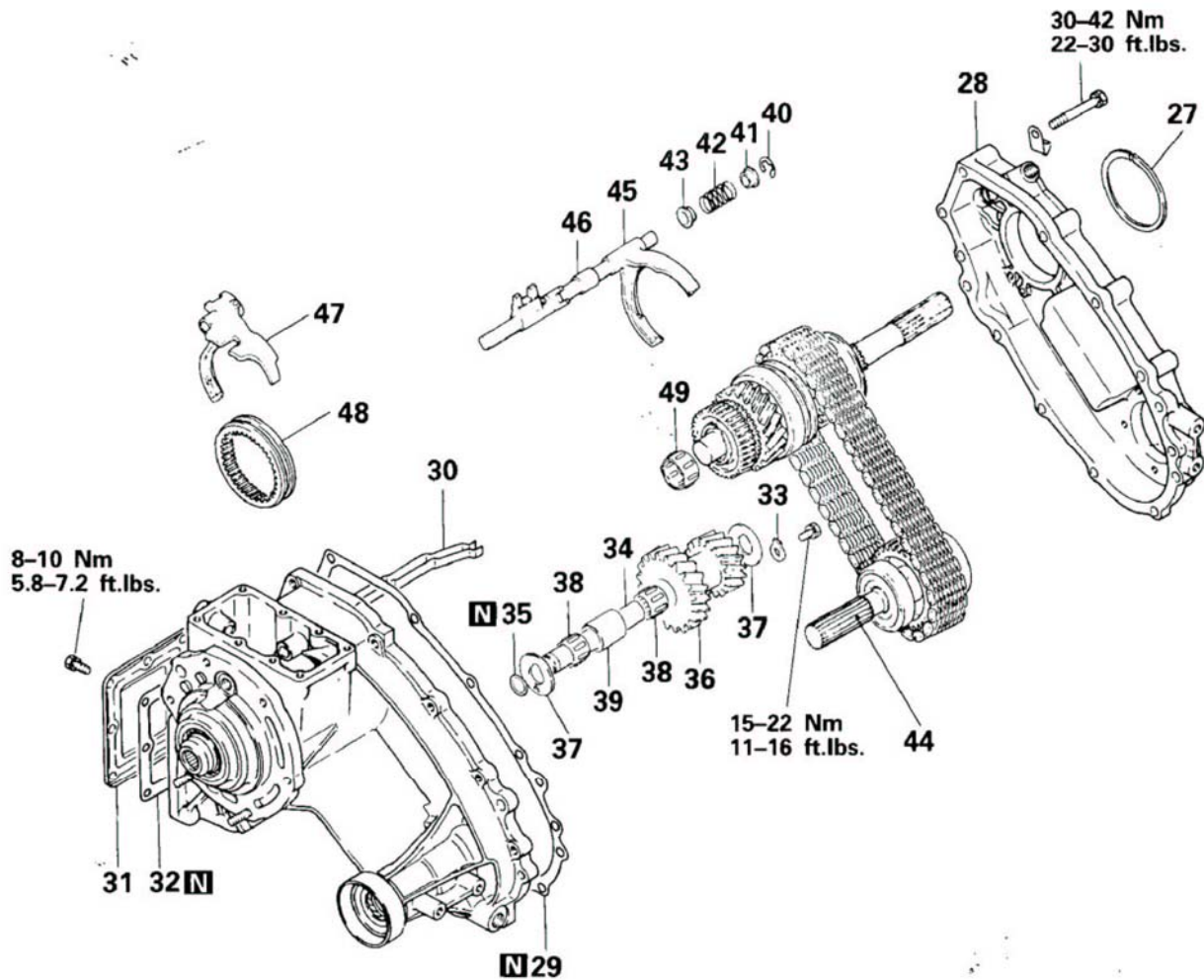


**Disassembly steps**

- |    |                               |    |                       |
|----|-------------------------------|----|-----------------------|
| ◆◆ | 1. Sleeve clamp               | ◆◆ | 16. Interlock plunger |
| ◆◆ | 2. Speedometer gear assembly  | ◆◆ | 17. Cover             |
|    | 3. 4WD indicator light switch | ◆◆ | 18. Cover gasket      |
|    | 4. Gasket                     | ◆◆ | 19. Spacer            |
|    | 5. Steel ball                 | ◆◆ | 20. Wave spring       |
| ◆◆ | 6. Rear cover                 | ◆◆ | 21. Pulse generator   |
| ◆◆ | 7. Rear cover gasket          | ◆◆ | 22. Cover             |
| ◆◆ | 8. Spacer                     | ◆◆ | 23. Cover gasket      |
|    | 9. Dust seal guard            | ◆◆ | 24. Spacer            |
| ◆◆ | 10. Oil seal                  | ◆◆ | 25. Wave spring       |
| ◆◆ | 11. Spring pin                | ◆◆ | 26. Pulse rotor       |
| ◆◆ | 12. Seal plug                 |    |                       |
|    | 13. Poppet spring             |    |                       |
|    | 14. Steel ball                |    |                       |
|    | 15. H-L shift rail            |    |                       |
- } KM145-9-FL (parts 17-20)  
 } KM145-9-FSL (parts 21-26)

**NOTE**

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Reassembly".
- (3) N : Non-reusable parts



145083

**Disassembly steps**

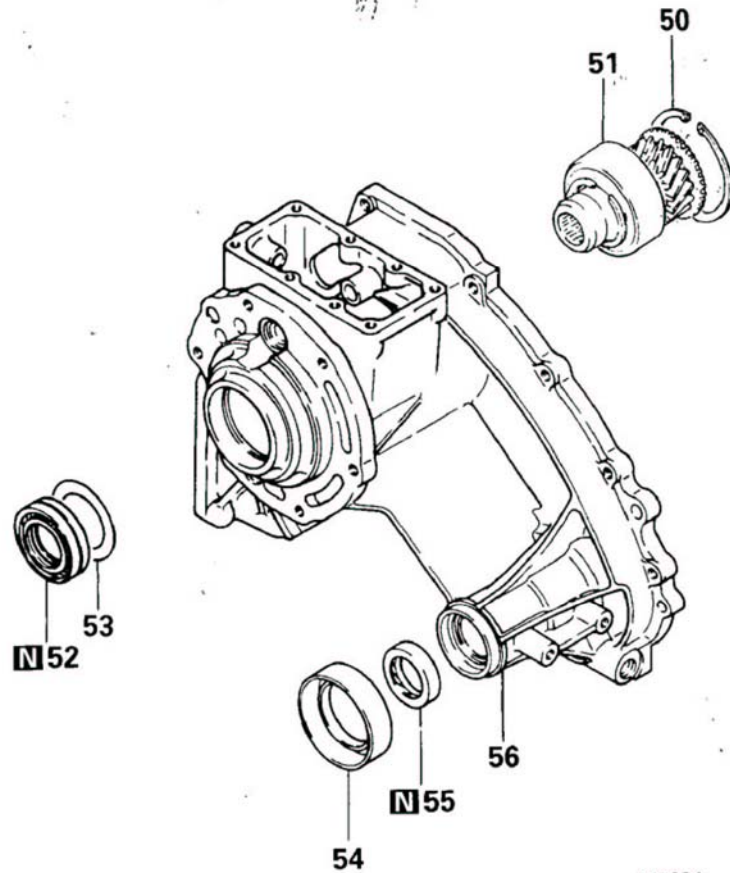
- 27. Snap ring
- ◆◆ 28. Chain cover
- ◆◆ 29. Chain cover gasket
- ◆◆ 30. Oil guide
- 31. Side cover
- 32. Side cover gasket
- ◆◆ ◆◆ 33. Lock plate
- ◆◆ ◆◆ 34. Counter gear shaft
- 35. O-ring
- ◆◆ ◆◆ 36. Counter gear
- ◆◆ ◆◆ 37. Thrust washer
- ◆◆ ◆◆ 38. Needle bearing
- ◆◆ ◆◆ 39. Bearing spacer
- 40. Snap ring

- 41. Spring retainer
- 42. Spring
- 43. Spring retainer
- ◆◆ ◆◆ 44. Output shaft assembly
- 45. 2-4WD shift fork
- 46. 2-4WD shift rail
- ◆◆ 47. H-L shift fork
- ◆◆ 48. H-L clutch sleeve
- 49. Needle bearing

**NOTE**

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆◆◆ : Refer to "Service Points of Reassembly".
- (4) **N** : Non-reusable parts





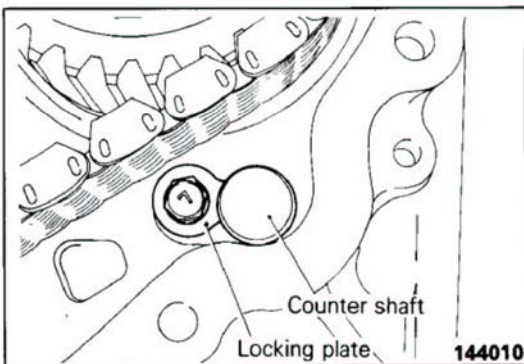
145084

**Disassembly steps**

- ◆◆ 50. Snap ring
- ◆◆ 51. Input gear assembly
- ◆◆ 52. Oil seal
- 53. Baffle plate
- 54. Dust seal guide
- ◆◆ 55. Oil seal
- 56. Transfer case

**NOTE**

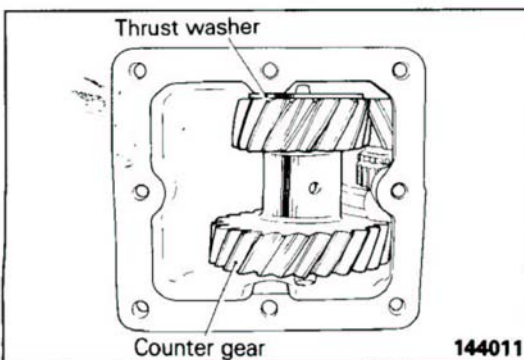
- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Reassembly".
- (3) N : Non-reusable parts



**SERVICE POINTS OF DISASSEMBLY**

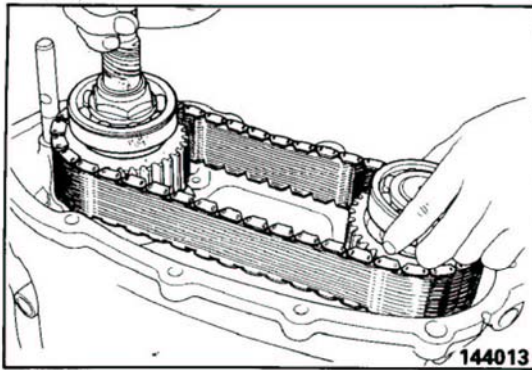
**33. REMOVAL OF LOCK PLATE/34. COUNTER GEAR SHAFT**

Remove the lock plate and pull out the counter gear shaft.

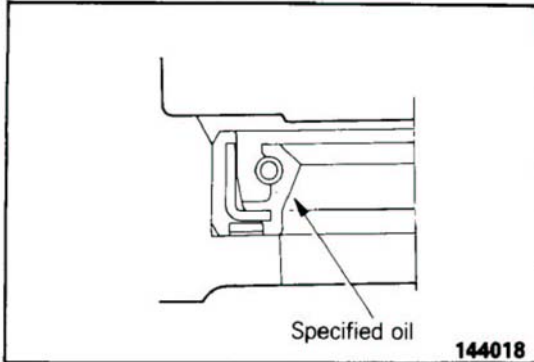


**36. REMOVAL OF COUNTER GEAR/37. THRUST WASHER/38. NEEDLE BEARING/39. BEARING SPACER**

Remove the counter gear, two thrust washers, two needle bearings and the spacer, through the side cover opening.

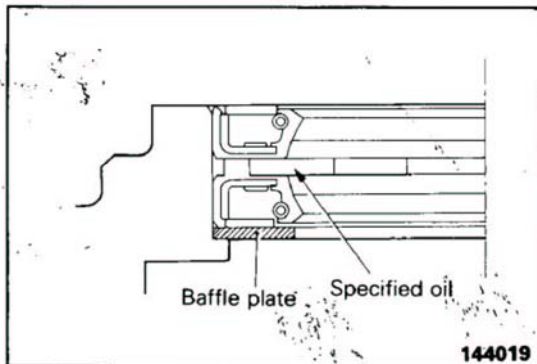
**44. REMOVAL OF OUTPUT SHAFT ASSEMBLY**

Remove the front output shaft, rear output shaft and chain together.

**SERVICE POINTS OF REASSEMBLY****55. INSTALLATION OF OIL SEAL (FRONT OUTPUT SHAFT)**

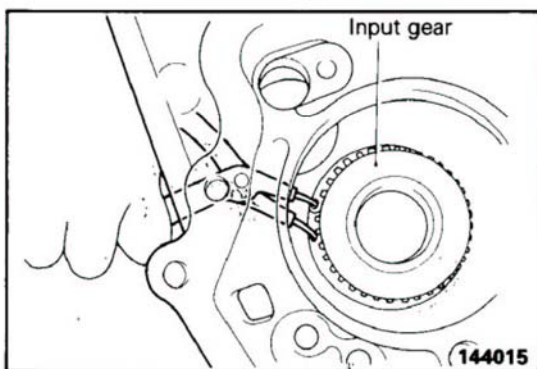
Apply the specified oil to the lip of the oil seal and pressure insert it.

**Specified oil : Hypoid Gear Oil API classification GL-4 or higher SAE viscosity 80W, 75W-85W**

**52. INSTALLATION OF OIL SEAL (INPUT GEAR)**

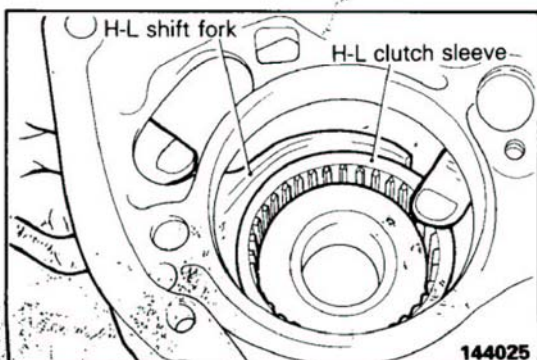
Apply the specified oil to the lip of the oil seal and pressure insert it.

**Specified oil : Hypoid Gear Oil API classification GL-4 or higher SAE viscosity 80W, 75W-85W**

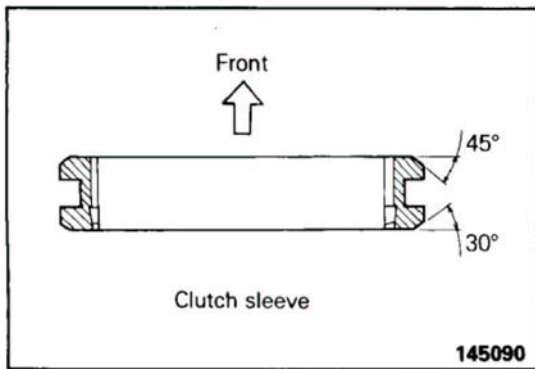
**51. INSTALLATION OF INPUT GEAR/50. SNAP RING**

- (1) Insert the input gear assembly into the transfer case and fasten it with the snap ring.
- (2) Select the thickest snap ring that will fit into the groove and install it.

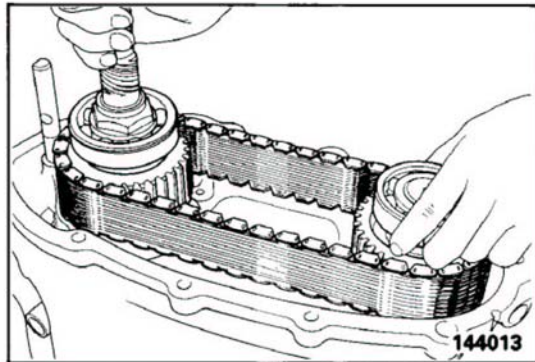
**Standard value : 0 – 0.06 mm (0 – .002 in.)**

**48. INSTALLATION OF H-L CLUTCH SLEEVE/47. H-L SHIFT FORK**

- (1) Install the H-L clutch sleeve and H-L shift fork.

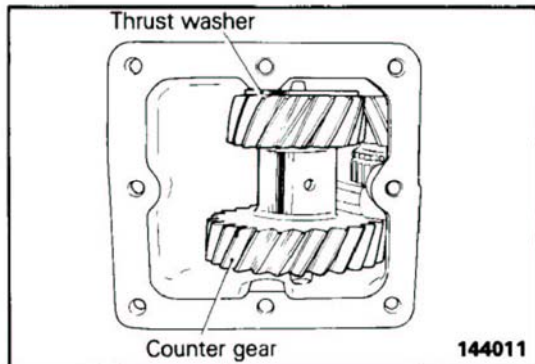


- (2) Make sure the direction of the sleeve is correct. The direction of the sleeve is the same for both 2WD and 4WD.



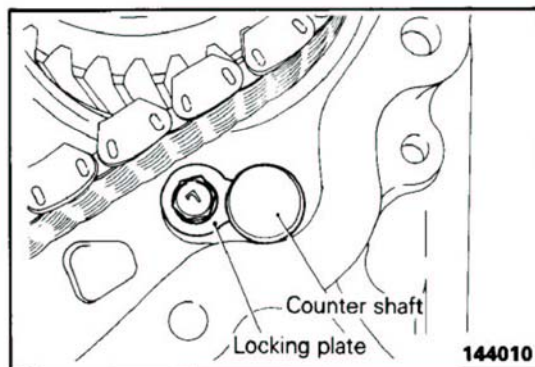
**44. INSTALLATION OF OUTPUT SHAFT ASSEMBLY**

- (1) Engage the chain precisely with the sprockets of the rear output shaft and the front output shaft.
- (2) Install the 2-4WD shift fork on the 2-4WD clutch sleeve. While passing them along the 2-4WD shift rail, install the rear and front output shaft and chain.



**39. INSTALLATION OF BEARING SPACER/38. NEEDLE BEARING/37. THRUST WASHER/36. COUNTER GEAR**

- (1) Assemble the needle bearings (2 pcs) in the counter gear, then after inserting the spacer, install the counter gear inside the transfer case.
- (2) Place thrust washers on the front and rear of the counter gear.



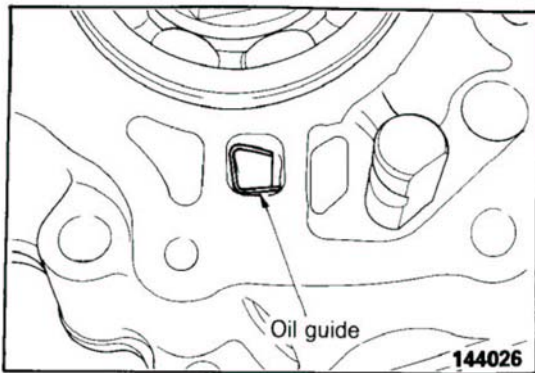
**34. INSTALLATION OF COUNTER GEAR SHAFT/33. LOCK PLATE**

- (1) Insert the counter shaft, being careful of the direction of the groove in the locking plate
- (2) Install the lock plate.

**30. INSTALLATION OF OIL GUIDE/29. CHAIN COVER GASKET/28. CHAIN COVER**

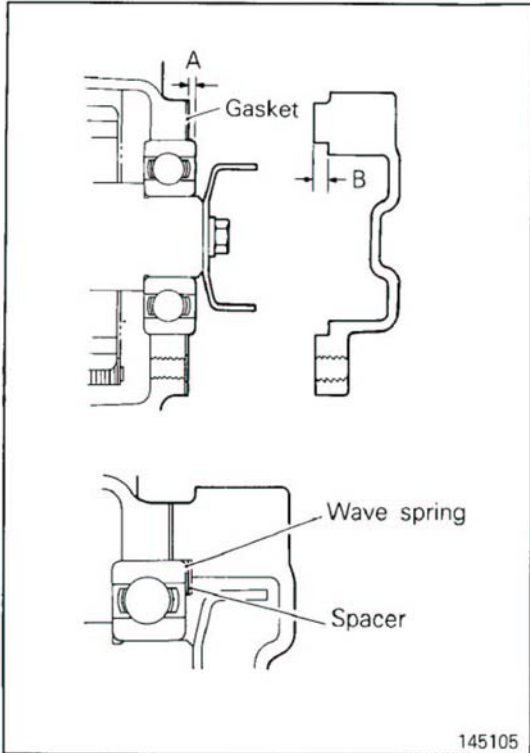
- (1) Install the oil guide.
- (2) Apply sealant to the gasket, then affix it to the transfer case.

**Specified sealant : 3M ART Part No. 8001 or equivalent**



- (3) Install the chain cover so that the end of the oil guide enters the window in the chain cover.

## 25. INSTALLATION OF THE WAVE SPRING/24. SPACER/23. COVER GASKET/22. COVER



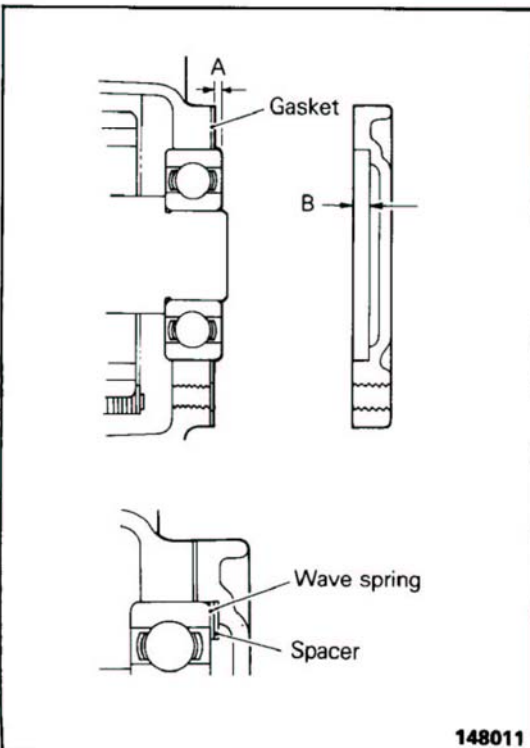
- (1) Measure the amount of front output shaft rear bearing thrust ("A") and the cover's indentation ("B"). If the clearance exceeds 2 mm (.08 in.), insert a spacer at the place shown in the figure.
- (2) Apply a coating of sealant to both surfaces of the cover gasket, and attach it to the chain cover.

**Specified sealant : 3M ART Part No. 8001 or equivalent**

- (3) Apply a coating of adhesive to the threaded part of the cover installation bolt, and then tighten it.

**Specified adhesive : 3M Adhesive Nut Locking 4171 or equivalent**

## 20. INSTALLATION OF WAVE SPRING/19. SPACER/18. COVER GASKET/17. COVER

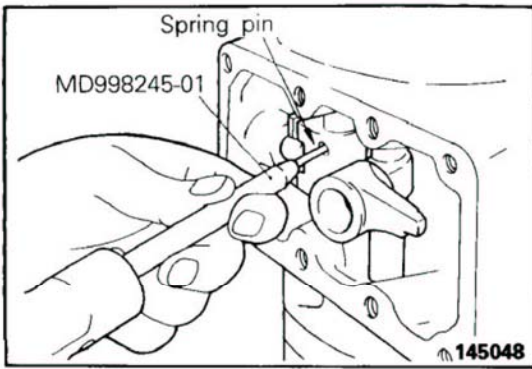


- (1) Measure the amount of protrusion of the front output shaft rear bearing "A" and the amount of inset in the cover "B". If the clearance is greater than 2 mm (.08 in.), insert a spacer in the location shown in the illustration.
- (2) Apply sealant to both sides of the cover gasket and affix the cover gasket to the chain cover.

**Specified sealant : 3M ART Part No. 8001 or equivalent**

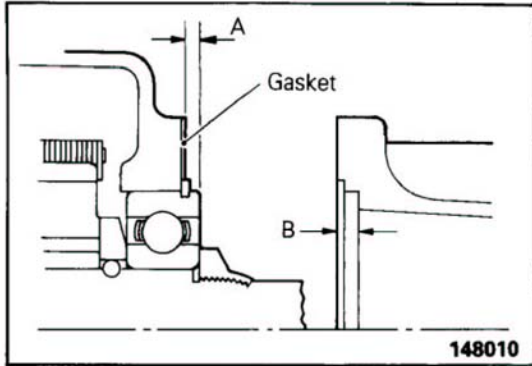
- (3) Apply adhesive to the threads of the cover installation bolts and tighten them.

**Specified adhesive : 3M Adhesive Nut Locking 4171 or equivalent**



**11. INSTALLATION OF SPRING PIN**

- (1) Align the H-L shift fork and shift rail spring pin hole, and then use the special tool to drive it in.
- (2) Drive in so that the slit is parallel with the axial direction of the shift rail.



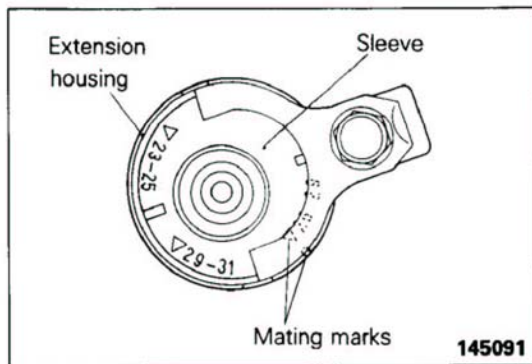
**8. INSTALLATION OF SPACER/7. REAR COVER GASKET/6. REAR COVER**

- (1) Measure the amount of protrusion of the rear output shaft rear bearing "A" and the amount of inset in the cover "B". Select a spacer which adjusts the end play to the standard value.

**Standard value : 0 – 0.1 mm (0 – .004 in.)**

- (2) Apply sealant to both sides of the rear cover gasket and affix the rear cover gasket to the chain cover.

**Specified sealant : 3M ART Part No. 8001 or equivalent**

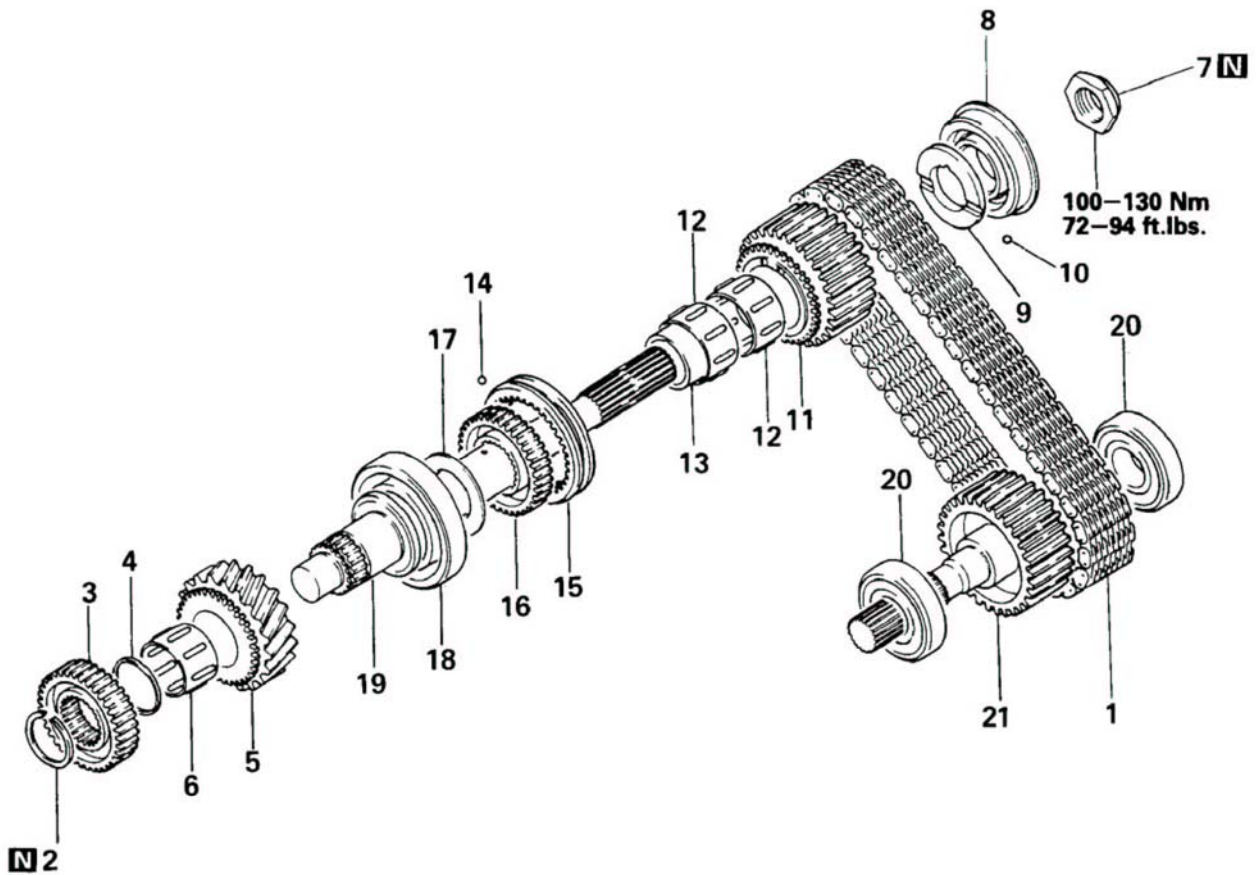


**2. INSTALLATION OF SPEEDOMETER GEAR ASSEMBLY**

Match the mating marks to the number of teeth on the speedometer driven gear and install the speedometer gear assembly.

# OUTPUT SHAFT ASSEMBLY

## DISASSEMBLY AND REASSEMBLY



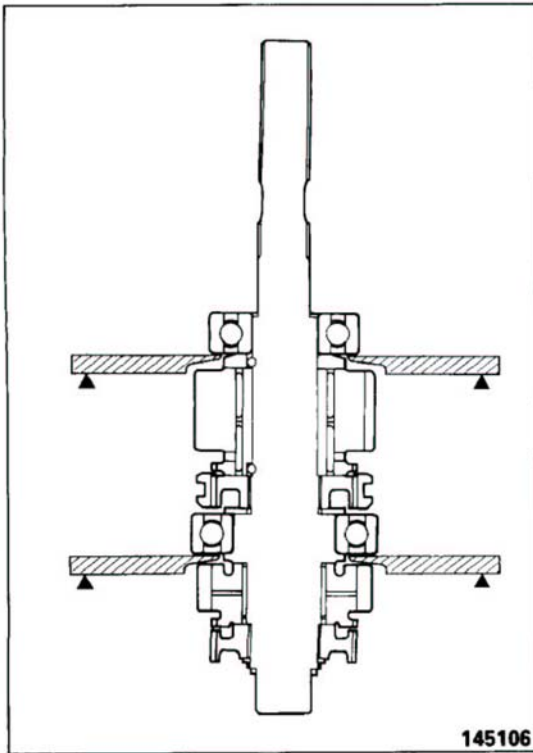
145085

### Disassembly steps

- |                           |                          |
|---------------------------|--------------------------|
| 1. Chain                  | ◆◆16. Clutch hub (2-4WD) |
| ◆◆ 2. Snap ring           | 17. Stopper plate        |
| ◆◆ 3. Clutch hub (H-L)    | ◆◆ 18. Bearing           |
| 4. Bearing spacer         | 19. Rear output shaft    |
| 5. Low speed gear         | ◆◆ 20. Bearing           |
| 6. Needle bearing         | 21. Front output shaft   |
| ◆◆ 7. Lock nut            |                          |
| ◆◆ 8. Radial ball bearing |                          |
| 9. Sprocket spacer        |                          |
| 10. Steel ball            |                          |
| 11. Drive sprocket        |                          |
| 12. Needle bearing        |                          |
| 13. Sprocket spacer       |                          |
| 14. Steel ball            |                          |
| ◆◆15. Clutch sleeve       |                          |

### NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆ : Refer to "Service Points of Reassembly".
- (4) **N** : Non-reusable parts

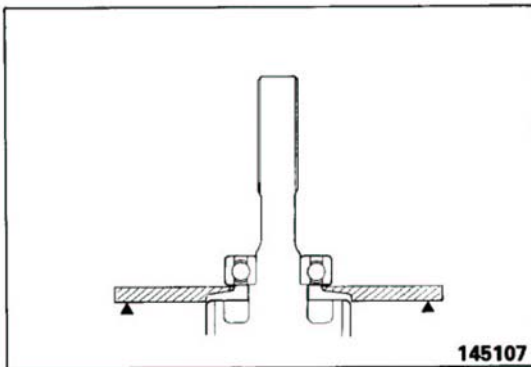


145106

**SERVICE POINTS OF DISASSEMBLY**

**8. REMOVAL OF RADIAL BALL BEARING/18. BEARING**

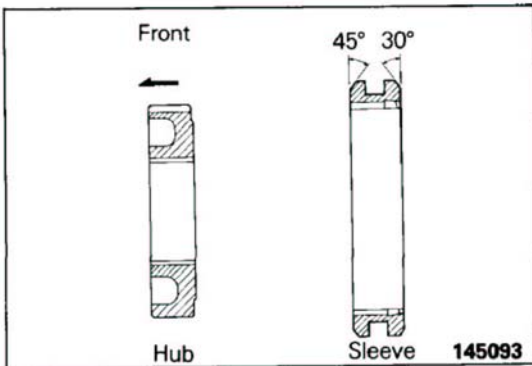
Pull the bearing out using a press.



145107

**20. REMOVAL OF BEARING**

Pull out the bearing using a press.

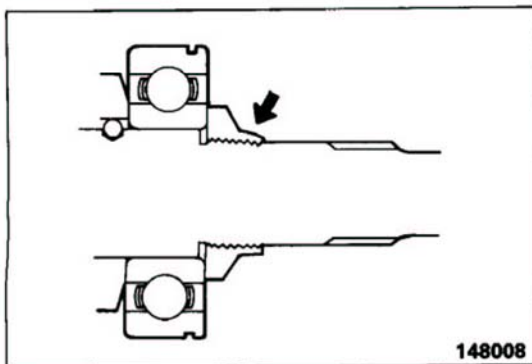


145093

**SERVICE POINTS OF REASSEMBLY**

**16. INSTALLATION OF CLUTCH HUB (2-4WD)/15. CLUTCH SLEEVE**

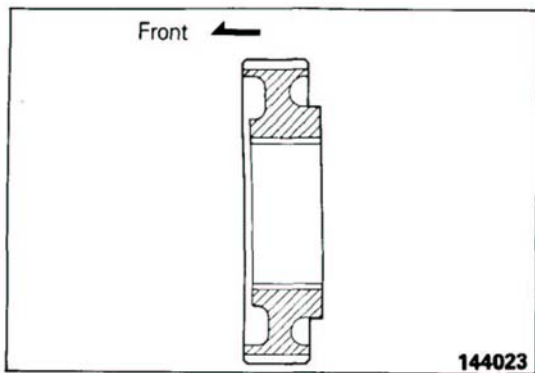
Assemble the hub and sleeve as shown in the illustration.



148008

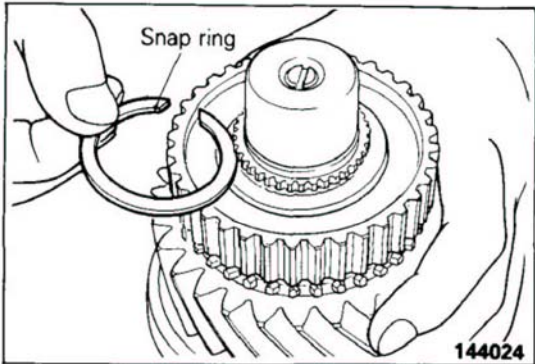
**7. INSTALLATION OF LOCK NUT**

After tightening the lock nut at the proper torque, crimp the lock nut in the groove in the output shaft at the location shown in the illustration.



### 3. INSTALLATION OF CLUTCH HUB (H-L)/2. SNAP RING

- (1) Install the clutch hub in the direction shown in the illustration.

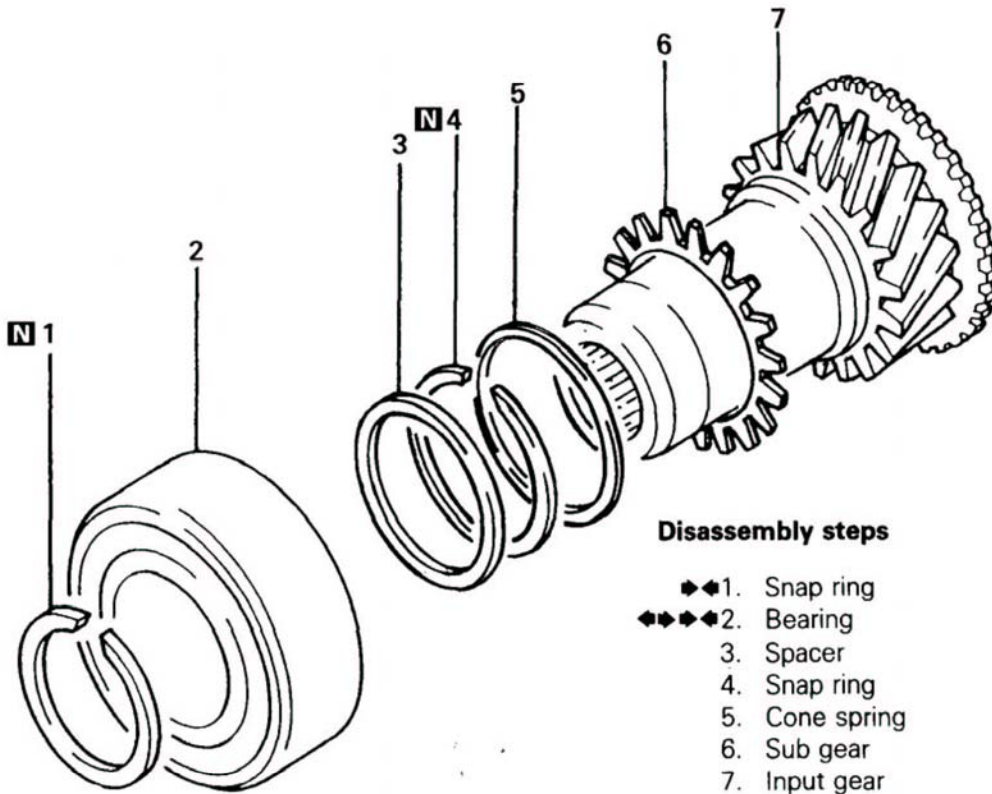


- (2) Select the thickest snap ring that will fit into the groove in the front end of the rear output shaft and install it.



**INPUT SHAFT ASSEMBLY**

**DISASSEMBLY AND REASSEMBLY**



**Disassembly steps**

- ◆◆1. Snap ring
- ◆◆◆◆2. Bearing
- 3. Spacer
- 4. Snap ring
- 5. Cone spring
- 6. Sub gear
- 7. Input gear

**NOTE**

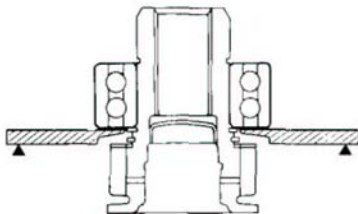
- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆◆ : Refer to "Service Points of Reassembly".
- (4) **N** : Non-reusable parts

145109

**SERVICE POINTS OF DISASSEMBLY**

**2. REMOVAL OF BEARING**

Support the bearing on a press, then press on the front of the input gear and pull out the bearing.



145108

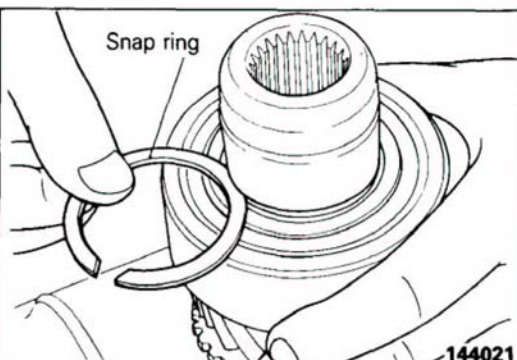
**SERVICE POINTS OF REASSEMBLY**

**2. PRESSURE INSERTION OF BEARING**

- (1) Pressure insert the bearing into the input gear. Be sure to press the inner-face.
- (2) After pressure insertion, make sure that the bearing turns smoothly.

**1. INSTALLATION OF SNAP RING**

Select the thickest snap ring that will fit into the groove in the front end of the input gear and install it.



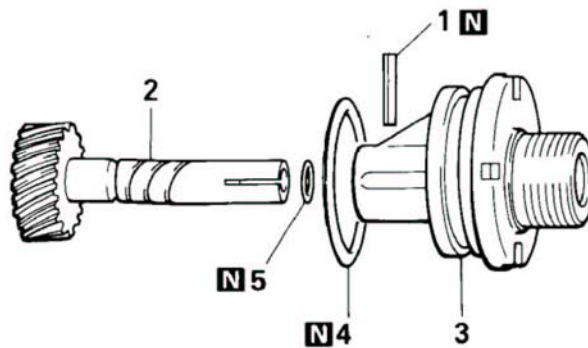
144021

**SPEEDOMETER SLEEVE ASSEMBLY**

N21RE-C

**DISASSEMBLY AND REASSEMBLY****Disassembly steps**

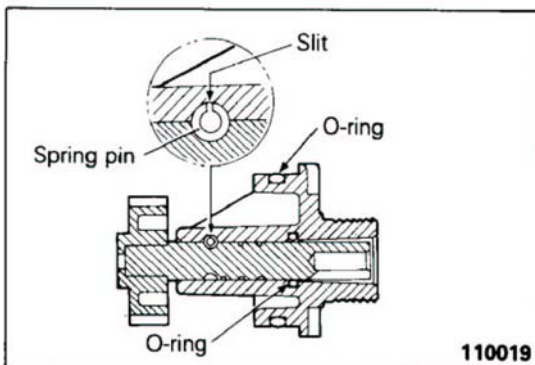
- ◆◆ 1. Spring pin
- 2. Driven gear
- 3. Sleeve
- 4. O-ring
- 5. O-ring



110008

**NOTE**

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Reassembly".
- (3) N : Non-reusable parts

**SERVICE POINTS OF REASSEMBLY**

N21RHA2

**1. INSTALLATION OF SPRING PIN**

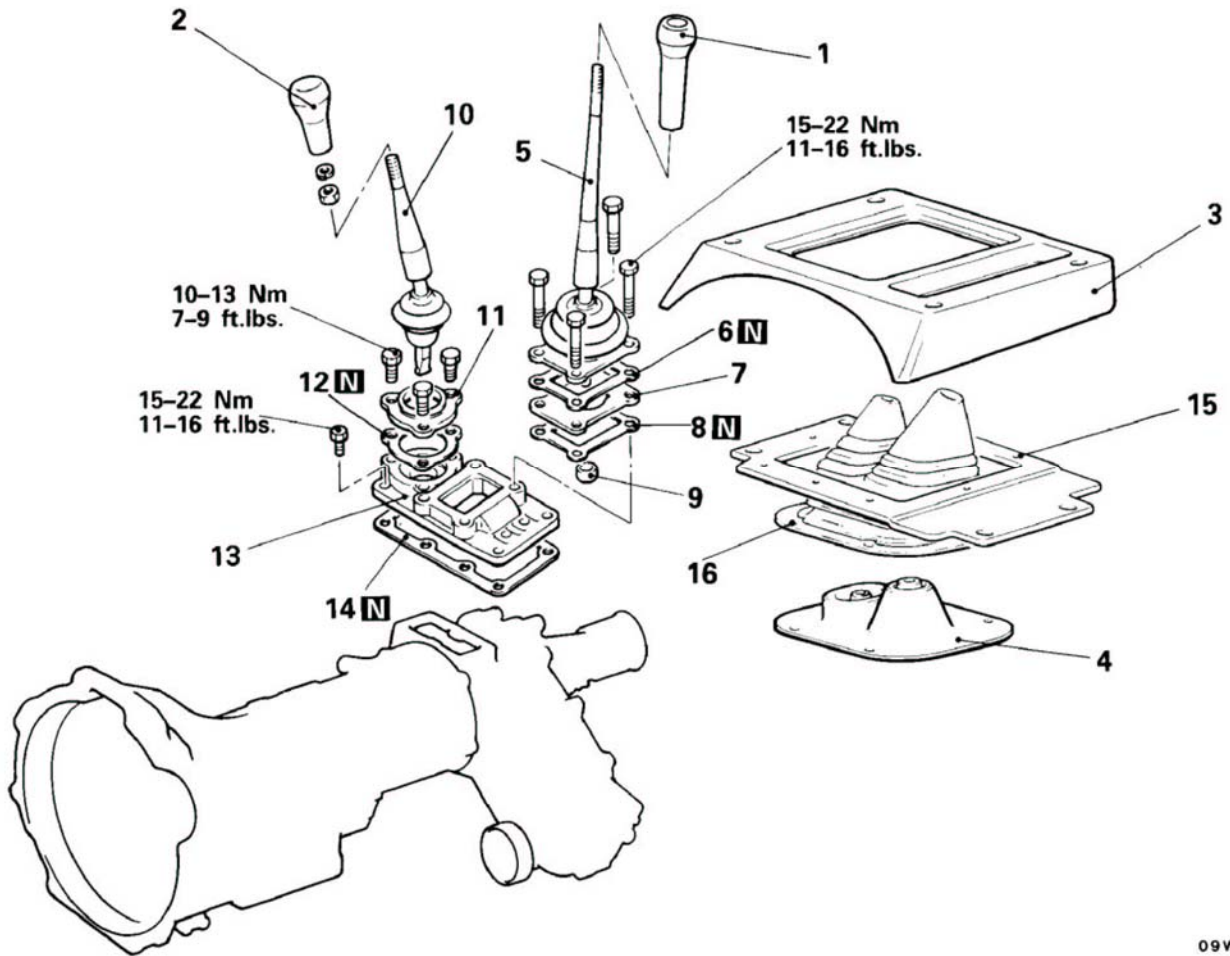
Drive spring pin in while making sure that slit does not face gear shaft.

**NOTE**

Do not reuse spring pin.

**GEARSHIFT LEVER ASSEMBLY  
REMOVAL AND INSTALLATION**

N21GA--



09W541

**Removal steps**

- 1. Transmission shift lever knob
- ◆◆ 2. Transfer shift lever knob
- 3. Front floor console
- 4. Control lever cover
- ◆◆◆◆ 5. Transmission control lever assembly
- 6. Gasket
- 7. Stopper plate
- 8. Gasket
- 9. Control lever bush
- ◆◆◆◆ 10. Transfer control lever assembly
- 11. Control housing cover
- 12. Gasket
- 13. Control housing
- 14. Gasket
- 15. Front floor console reinforcement
- 16. Shift lever boot

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆ : Refer to "Service Points of Installation".
- (4) **N** : Non-reusable parts

## SERVICE POINTS OF REMOVAL

N21GBAD

## 5. REMOVAL OF TRANSMISSION CONTROL LEVER ASSEMBLY/10. TRANSFER CONTROL LEVER ASSEMBLY

Remove the control lever attaching bolts and detach the control lever assembly.

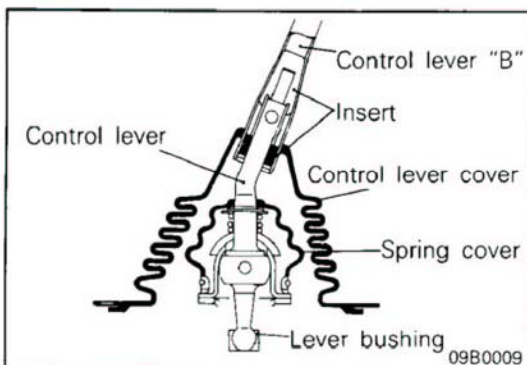
**Caution**

When the control lever assembly is removed, keep the transmission control lever and the transfer control lever in the following positions.

Transmission control lever – Neutral position

Transfer control lever – 2H (2-wheel drive – high range) position

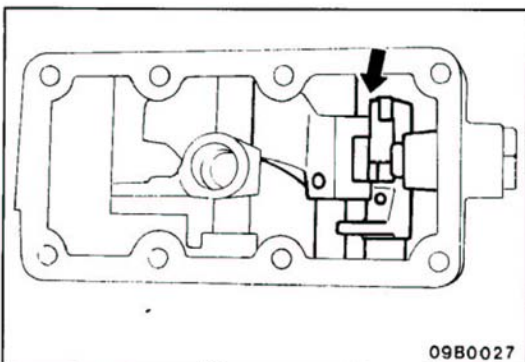
After the control lever assembly has been removed, cover with a cloth to prevent entry of foreign substances into the extension housing.



## INSPECTION

N21GCAA1

- Check for play between control lever and control lever "B". If play is evident, replace lever assembly.
- Push control lever in and check to ensure that it moves smoothly up and down.
- Check the cover for damage and replace if necessary. To remove cover, cut away with knife. To install new cover, first apply thin coat of oil to periphery of control lever "B". Then install by sliding it down from top of lever "B".
- Check the lever bushing for wear and replace if necessary.

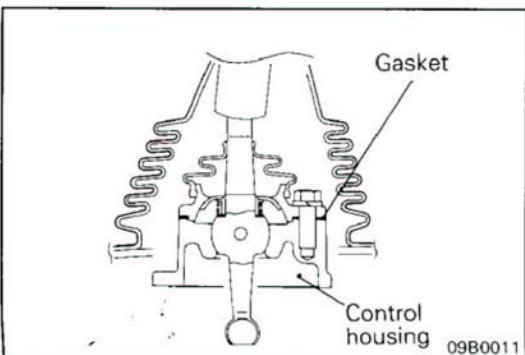


## SERVICE POINTS OF INSTALLATION

N21GDAF

## 10. INSTALLATION OF TRANSFER CONTROL LEVER ASSEMBLY

- (1) Check to be sure that the transfer lever assembly installation part (transmission side) is at the position shown in the illustration.

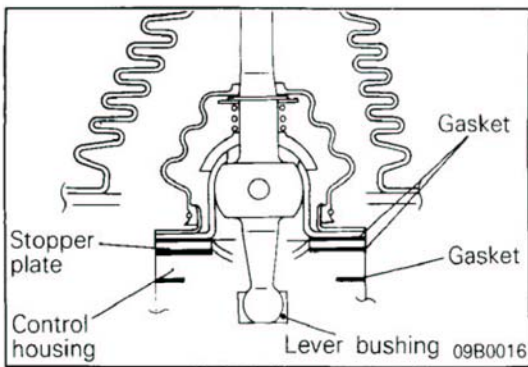


- (2) When assembling, replace the gaskets. Apply the specified sealant to both sides of gasket.

**Specified sealant : 3M ART Part No. 8001 or equivalent**

- (3) Apply the specified grease generously to transfer control lever sliding surface.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**



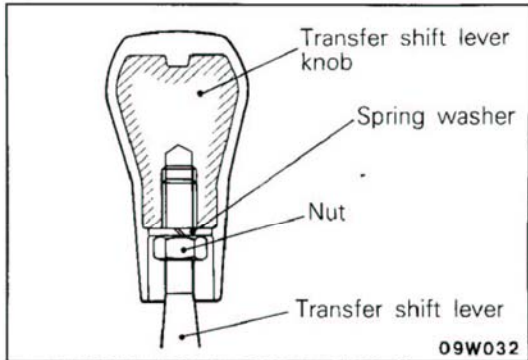
**5. INSTALLATION OF TRANSMISSION CONTROL LEVER ASSEMBLY**

- (1) When assembling, replace the gaskets.  
Apply specified sealant to both sides of each gasket.

**Specified sealant : 3M ART Part No. 8001 or equivalent**

- (2) Apply the specified grease generously to both inside and outside surfaces of lever bushing and control lever sliding surface.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**



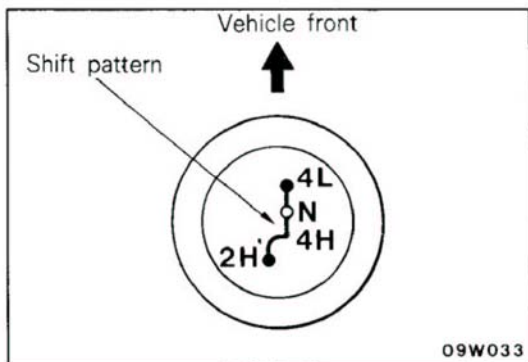
**2. INSTALLATION OF TRANSFER SHIFT LEVER KNOB**

- (1) After manually screwing the nut all the way to the end of the threaded part of the shift lever, return it about a half turn and install the spring washer.

- (2) After turning the shift lever knob about one turn beyond where the spring washer begins to yield, screw in further and adjust until the shift pattern on the knob faces the front of the vehicle.

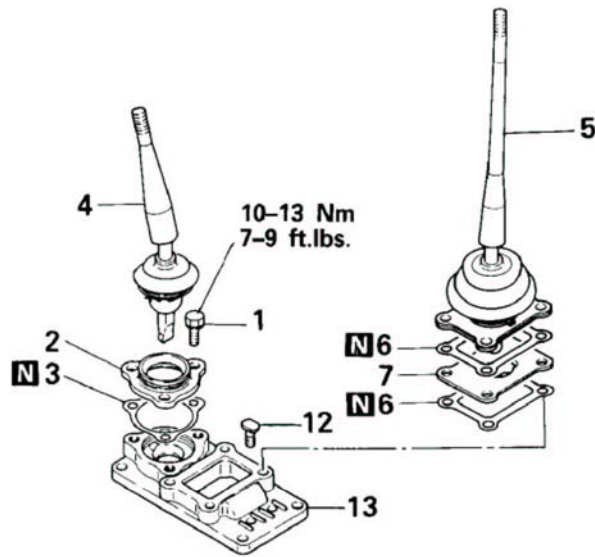
**NOTE**

If the adjustment cannot be made as described in (2) above, first screw the shift lever all the way in, and then return about one turn to make the adjustment.



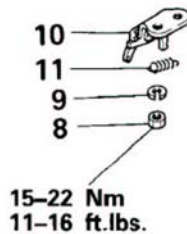
## CONTROL LEVER ASSEMBLY

### DISASSEMBLY AND REASSEMBLY



#### Disassembly steps

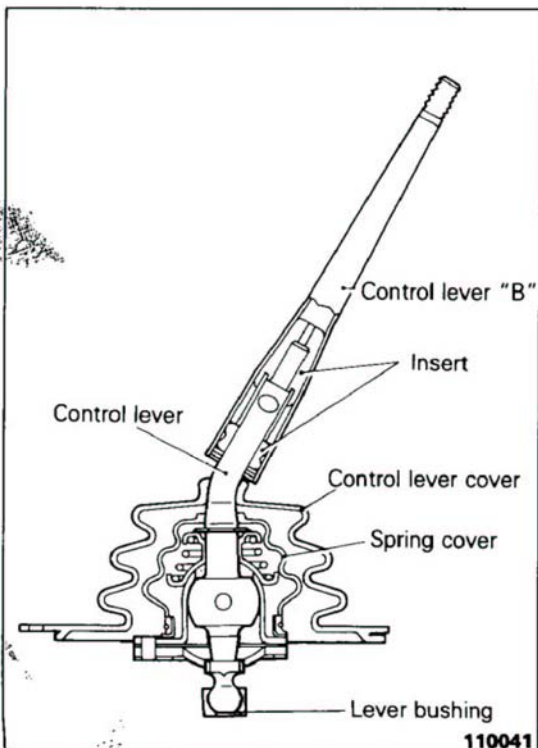
1. Bolt
2. Control housing cover
- ◆◆ 3. Control housing cover gasket
- ◆ 4. Transfer control lever
5. Transmission control lever
- ◆◆ 6. Gasket
7. Stopper plate
8. Nut
9. Spring washer
- ◆◆ 10. Stopper bracket assembly
11. Return spring
- ◆◆ 12. Special bolt
13. Control housing



145042

#### NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Reassembly".
- (3) **N** : Non-reusable parts

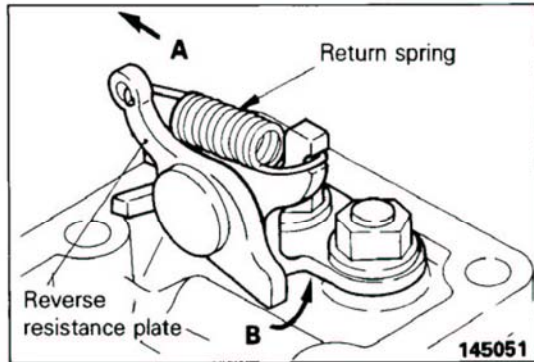
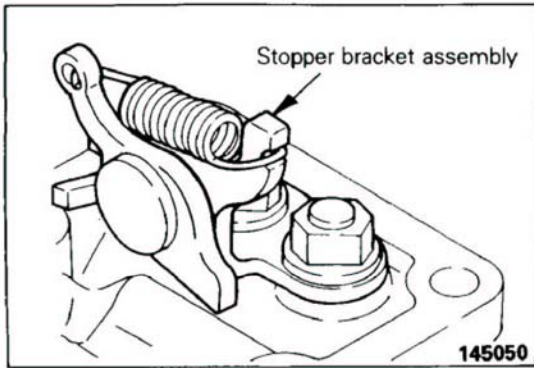


110041

## INSPECTION

N21GGAC

- Check for play between control lever and control lever "B". If play is evident replace lever assembly.
- Push control lever in and check to ensure that it moves smoothly up and down.
- Check cover for damage and replace if necessary. To remove cover, cut away with knife. To install new cover, first apply thin coat of oil to periphery of control lever "B". Then install by sliding it down from top of lever "B".
- Check lever bushing for wear and replace if necessary.



**SERVICE POINTS OF REASSEMBLY**

N21GHAF

**12. INSTALLATION OF SPECIAL BOLT/10. STOPPER BRACKET ASSEMBLY**

- (1) Apply sealant to peripheries (except threaded portions) of two special bolts and install them to cover. Do not wipe away excess sealant from cover.

**Specified sealant : 3M ART Part No. 8660 or equivalent**

- (2) Mount stopper bracket assembly and apply sealant to threaded portions of special bolts.

**Specified sealant : 3M Scotch Grip No. 2353 or equivalent**

- (3) Check to ensure that reverse resistance plate moves smoothly in directions A and B shown in illustration and is brought back by return spring.

**6. INSTALLATION OF GASKET/3. CONTROL HOUSING COVER GASKET**

- (1) Apply specified sealant to both surfaces of the gaskets.

**Specified sealant : 3M ART Part No. 8001 or equivalent**

## GENERAL INFORMATION

N21BABE

**Safety goggles should be worn at all times when working on these transmissions.**

Model KM148 automatic transmission combine a torque converter and fully automatic 4-speed transmission.

The transmission control lever and transfer control lever are located on the floor.

The overdrive switch is provided on the selector handle part of the transmission control lever.

When the vehicle is driven in the "D" range while the overdrive switch is ON (the switch is unpressed), shifting within the range from 1st gear to 4th gear is automatic; when the overdrive switch is OFF (the switch is pressed) and the vehicle is driven in the "D" range, shifting within the range from 1st gear to 3rd gear is automatic.

The transfer control lever can be used to select either rear-wheel drive or four-wheel drive, in order to thereby obtain the most appropriate drive power according to the road surface conditions.

In addition, four-wheel drive has both the HIGH range and the LOW range.

The torque converter, transmission area and transfer area are housed in an integral aluminum die casting.

**The transmission oil sump and the transfer oil sump of model KM148-4WD transmission are separated.**

**Accordingly, the filling of oil is necessary to perform separately to the transmission and to the transfer.**

The torque converter is attached to the crankshaft through a flexible driving plate. Cooling of the converter is accomplished by circulating the transmission fluid through an oil-to-water type cooler, located in bottom of the radiator. The torque converter assembly is a sealed unit that cannot be disassembled.

The transmission fluid is filtered by an interval filter attached to the lower side of the valve body assembly.

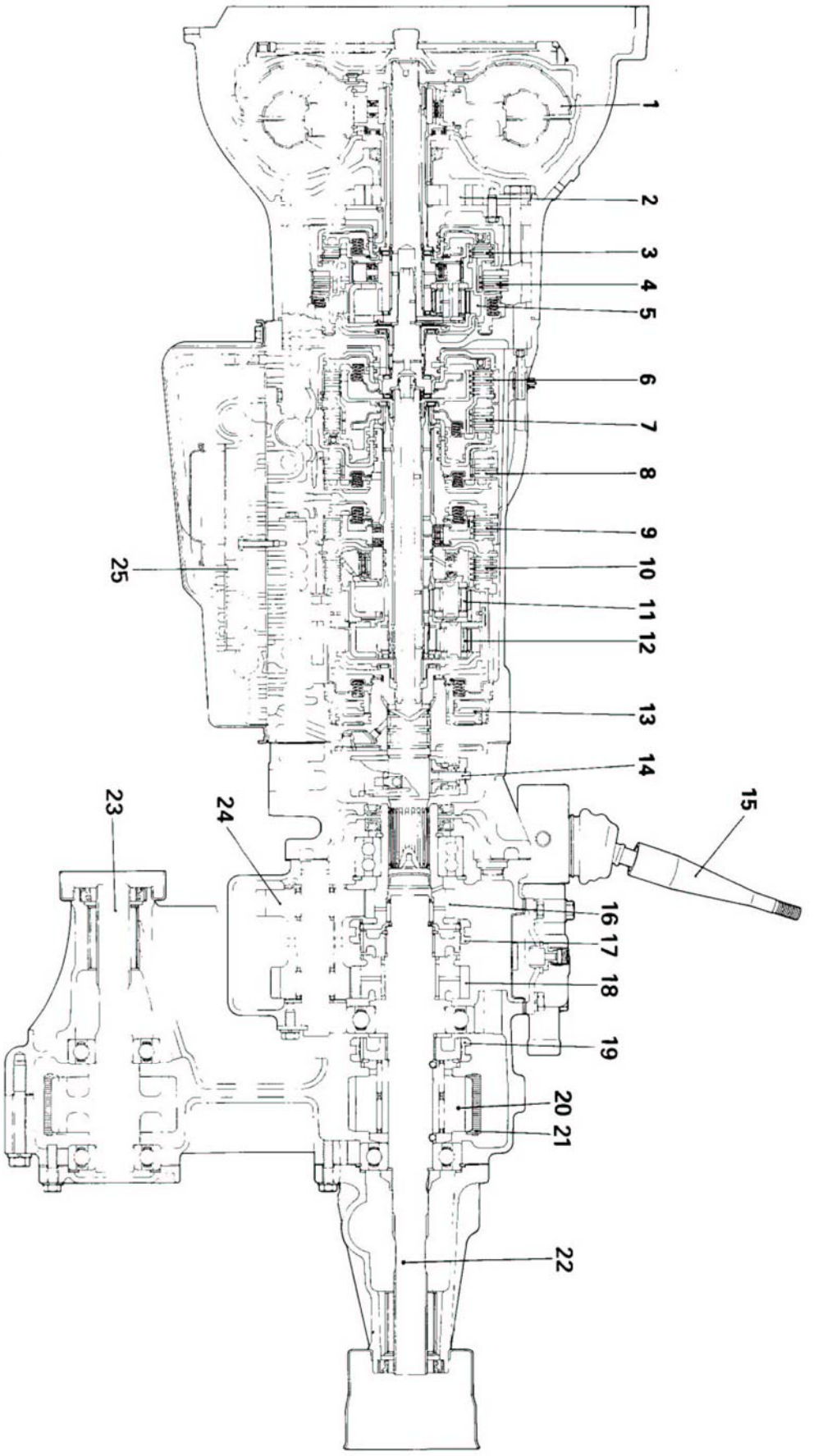
Engine torque is transmitted to the torque converter then, through the input shaft to the multiple-disc clutches in the transmission. The power flow depends on the application of the clutches and brakes. Refer to "TABLE FOR OPERATION ELEMENTS AT EACH POSITION OF SELECTOR LEVER " chart in this section.

The transmission consists of three multiple-disc clutches, three one-way clutches, four multiple-disc brakes, and two planetary gear sets to provide four forward ratios and a reverse ratio.

The hydraulic control circuits show the position of the various valves with color coded passages to indicate those under hydraulic pressure for all operation of transmission.

The transfer has a high/low selection and a 2WD/4WD selection. By operating the transfer control lever, the running at 2WD high (2H), 4WD high (4H) or 4WD low (4L) can be selected freely.

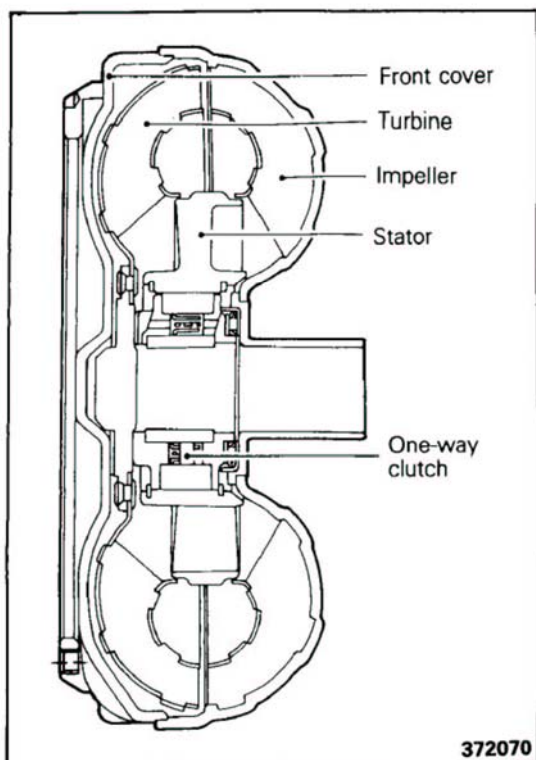




- 1. Torque converter
- 2. Oil pump
- 3. Over drive clutch
- 4. Over drive brake
- 5. Over drive planetary gear
- 6. Forward clutch
- 7. Direct clutch
- 8. Brake No.1
- 9. Brake No.2

- 10. Brake No.3
- 11. Front planetary gear
- 12. Rear planetary gear
- 13. Brake No.3 piston
- 14. Governor
- 15. Transfer control lever
- 16. Input gear
- 17. High-low clutch
- 18. Low speed gear

- 19. 2WD-4WD clutch
- 20. Drive sprocket
- 21. Chain
- 22. Rear output shaft
- 23. Front output shaft
- 24. Counter gear
- 25. Valve body

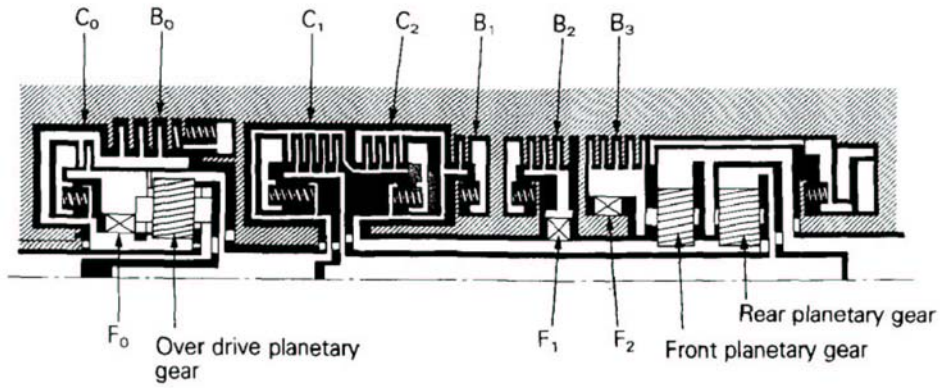


### TORQUE CONVERTER

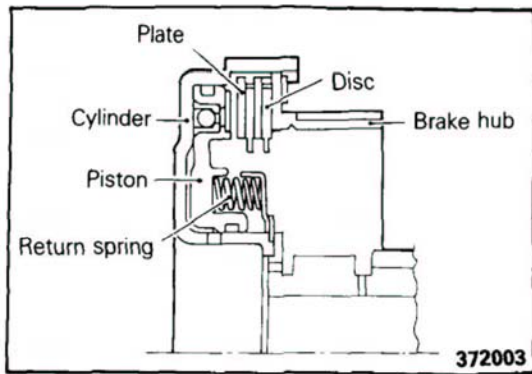
The torque converter consists of an impeller (rear cover), turbine, stator, one-way clutch, front cover, and other parts. It is a non-maintainable assembly with a sealed construction, in which outer surfaces of shell (front and rear covers) are welded together. Since the torque converter is connected to the engine crankshaft via the drive plate, the shell (front cover and impeller) always rotates together with the engine. This means that the transmission oil pump is also driven at the same speed as the engine by the hub welded at the center of the shell's rear part. The boss provided in the front part of the shell is fitted into the hole located at the rear end of the crankshaft to support the torque converter.

### TRANSMISSION POWER TRAIN

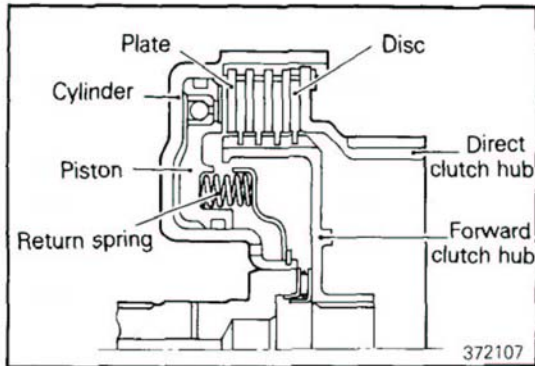
The transmission power train consists of three sets of multiple disc clutches, four sets of multiple disc brakes, three sets of one-way clutches, and a single-row and a double-row Simpson planetary gear set. The three sets of clutches are an element that controls the input to the planetary gear set, while the four sets of brakes and three sets of one-way clutches act to hold some of the elements of the planetary gear set stationary or prevent them from turning. An appropriate gear ratio for each driving condition can thus be obtained through the operation of these elements which select the point from which the driving force is input and points to be held stationary in the planetary gear set. The following Table "TABLE FOR OPERATION ELEMENTS AT EACH POSITION OF SELECTOR LEVER" shows particular elements in action in different selector lever positions.



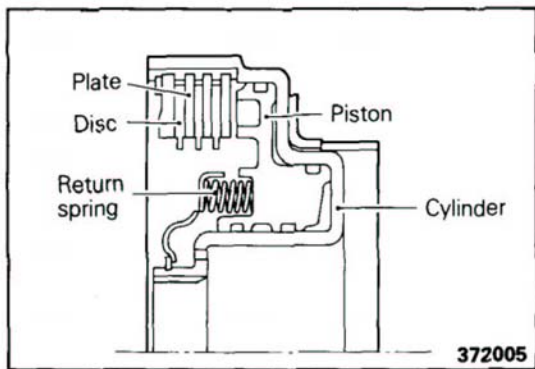
- C<sub>0</sub>: Over drive clutch
- C<sub>1</sub>: Forward clutch
- C<sub>2</sub>: Direct clutch
- B<sub>0</sub>: Over drive brake
- B<sub>1</sub>: Brake No. 1
- B<sub>2</sub>: Brake No. 2
- B<sub>3</sub>: Brake No. 3
- F<sub>0</sub>: Over drive one-way clutch
- F<sub>1</sub>: One-way clutch No. 1
- F<sub>2</sub>: One-way clutch No. 2

**OVERDRIVE CLUTCH**

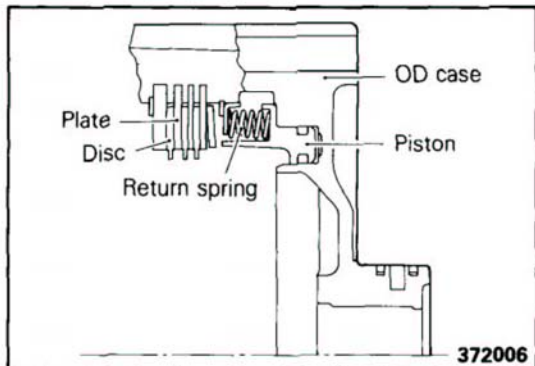
The overdrive clutch, of the multiple-disc type, is actuated when the shift is in a position other than the 4th speed or overdrive. It couples the sun gear to carrier of the overdrive on planetary gear set, thus imparting the input from the carrier to the forward clutch cylinder via the ring gear.

**FORWARD CLUTCH**

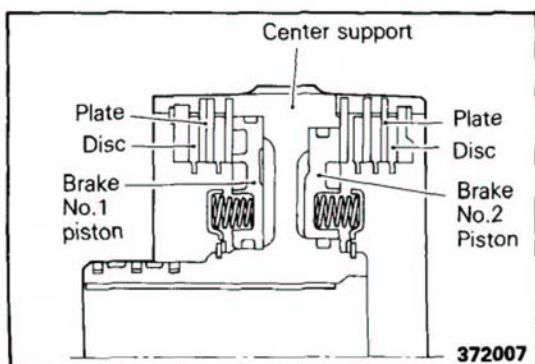
Of the multiple-disc type, the forward clutch is actuated whenever the vehicle is in the forward motion. It imparts the input to the ring gear of the rear planetary gear set via the intermediate shaft.

**DIRECT CLUTCH**

The multiple-disc direct clutch, actuated in the 3rd and 4th speeds and in reverse, transmits the input force to the sun gear, driving the pinions of the front planetary gear set.

**OVERDRIVE BRAKE**

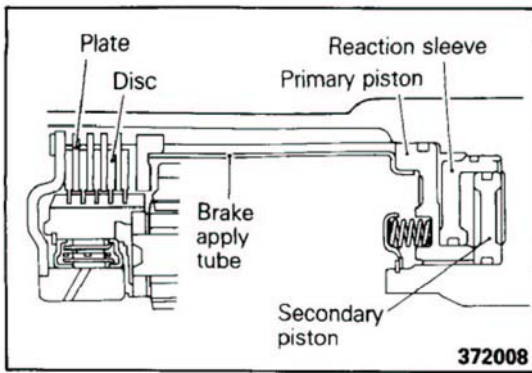
The overdrive (OD) brake, of the multiple-disc type, is installed in the OD case. Actuated in the 4th speed (overdrive), the brake holds the sun gear of the OD planetary gear set.

**BRAKE NO.1**

The brake No.1, actuated in the 2nd speed of the "2" range, holds the sun gear stationary.

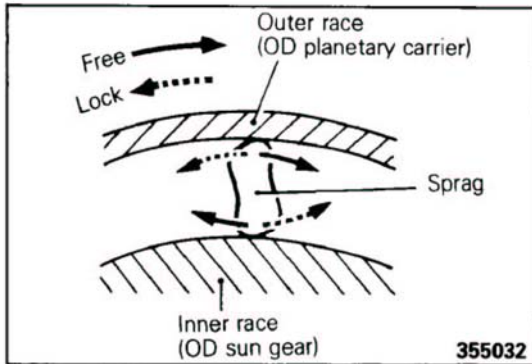
**BRAKE NO.2**

The brake No.2, actuated in the 2nd, 3rd, and 4th speeds of the "D" range and in the 2nd speed of the "2" range, holds the outer race of one-way clutch No.1 stationary, allowing the one-way clutch No.1 to act as an overrunning clutch.



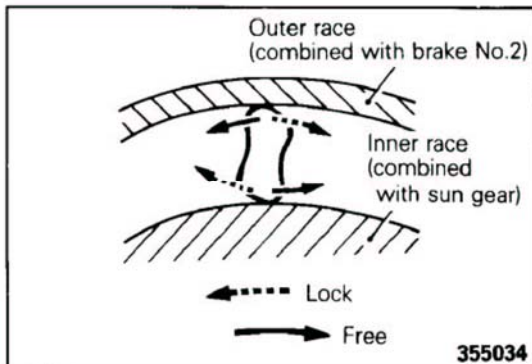
**BRAKE NO.3**

The brake No.3, operated in the "L" and "R" ranges, brakes the carrier of the front planetary gear set to a standstill.

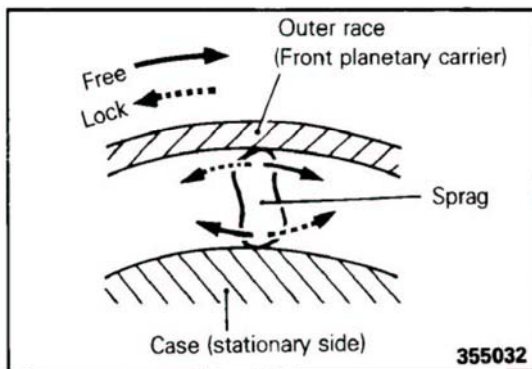


**ONE-WAY CLUTCH**

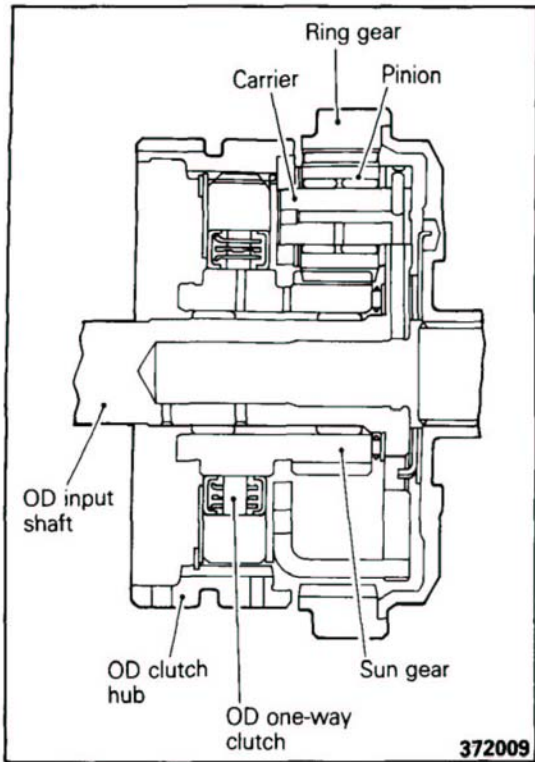
The three sets of one-way clutches are of the sprag type. The overdrive (OD) one-way clutch is operated during gearshifting between 3rd and 4th (OD) speeds, ensuring smooth selection between the OD clutch and OD brake. It is in free state when the carrier of the OD planetary gear set rotates clockwise and locks when the sun gear turns clockwise.



The one-way clutch No.1 functions as an overrunning clutch only when the brake No.2 is actuated and prevents the sun gear from turning counterclockwise. This means that no engine braking is given in the 2nd speed of the "D" range. In the 2nd speed of the "2" range, however, engine braking is given since the brake No.1 holds the sun gear stationary.

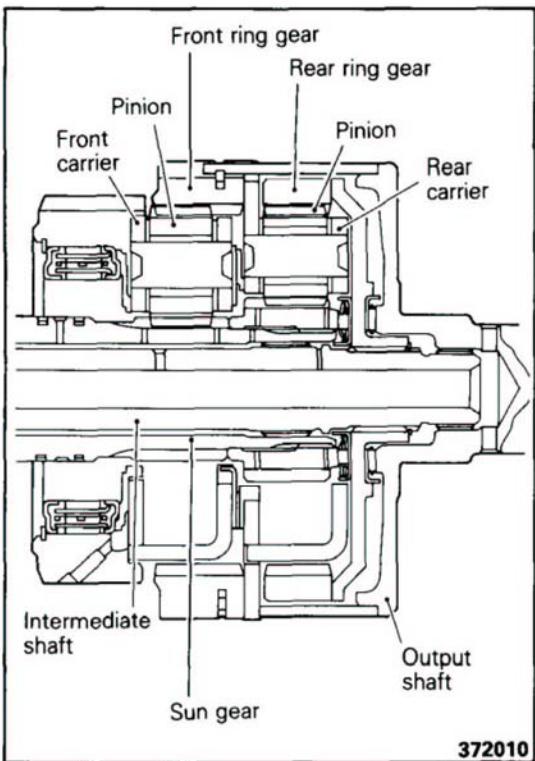


The one-way clutch No.2 prevents the front planetary carrier from turning counterclockwise, actuated in the 1st speed. So, no engine braking is given in the 1st speed of the "D" as well as "2" range. Engine braking is, however, given in the "L" range in which the carrier is held stationary by the brake No. 3.



**OVERDRIVE PLANETARY GEAR**

The planetary gear, of a single-row type, consists of the sun gear, pinion, carrier, and ring gear. The input from the OD input shaft is imparted to the carrier.



**PLANETARY GEAR SET**

This planetary gear set called the Simpson type is made up of two planetary gear sets, each consisting of pinions, carrier, and sun gear. The sun gear is connected to the direct clutch, front carrier to brake No.3, and the rear ring gear to forward clutch. The front ring gear and rear carrier are coupled to the output shaft.

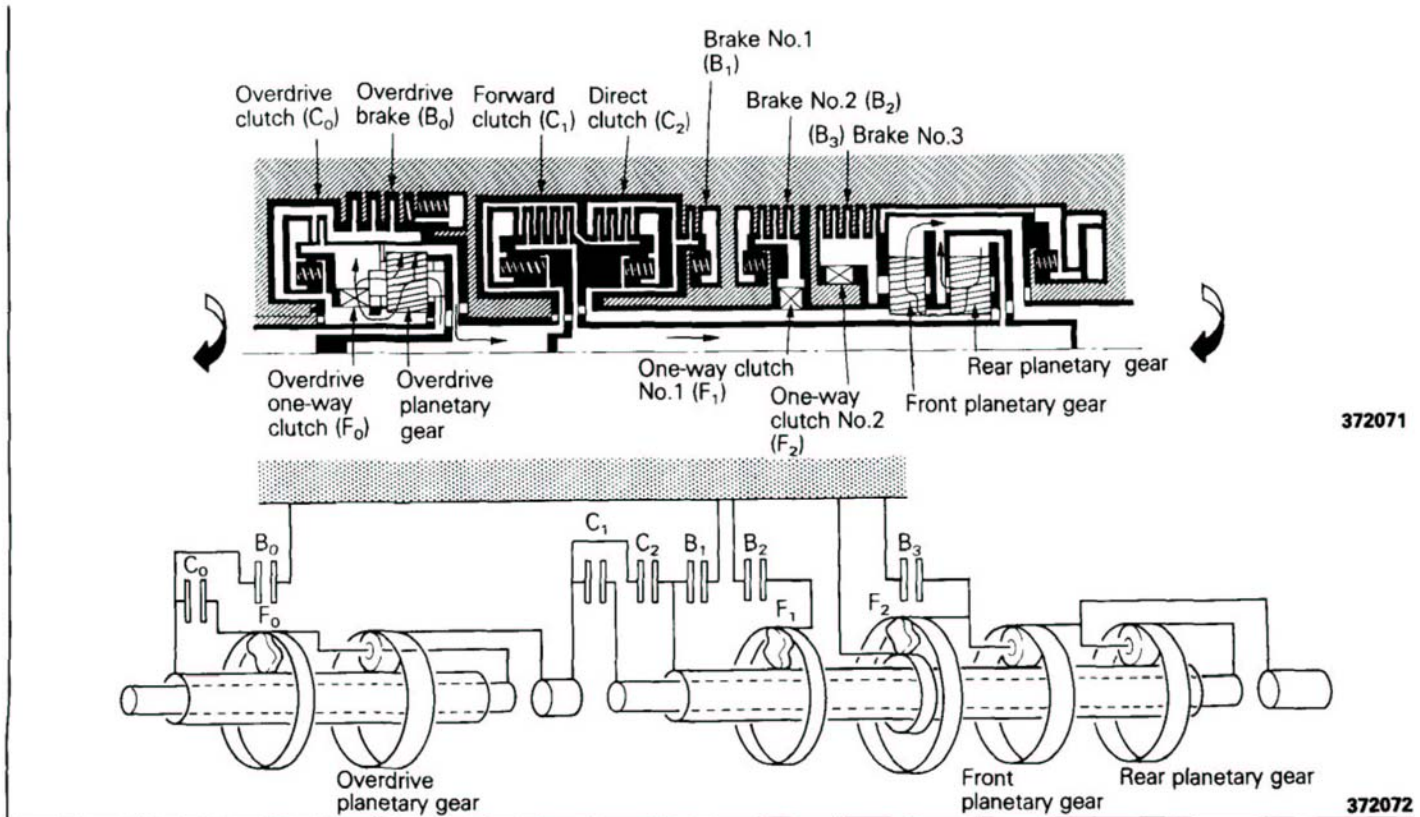
TABLE FOR OPERATION ELEMENTS AT EACH POSITION OF SELECTOR LEVER

REMARKS: IP=Inner Piston, OP=Outer Piston

Selector lever position	OD-OFF switch	Gear shift stage	Gear ratio	Engine start	Parking mechanism	Clutch				Brake			One-way clutch				
						C <sub>0</sub>	C <sub>1</sub>	C <sub>2</sub>		B <sub>0</sub>	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>		F <sub>0</sub>	F <sub>1</sub>	F <sub>2</sub>
								IP	OP				IP	OP			
P	–	Neutral	–	OK	○	○											
R	–	Reverse	2.703	–		○		○	○				○	○	○		
N	–	Neutral	–	OK		○											
D	ON	1st	2.826	–		○	○								○		○
		2nd	1.493	–		○	○				○				○	○	
		3rd	1.000	–		○	○		○		○				○		
		4th	0.688	–			○		○	○							
D	OFF	1st	2.826	–		○	○							○		○	
		2nd	1.493	–		○	○				○			○	○		
		3rd	1.000	–		○	○			○				○			
2	–	1st	2.826	–		○	○							○		○	
		2nd	1.493	–		○	○			○	○			○	○		
L	–	1st	2.826	–		○	○							○	○	○	○

POWER FLOW

The following is the description of the element operation and the power transmission at each gear shift stage. As for the element operation at each gear shift stage, it is summarized on the above table.



**First in "D" range**

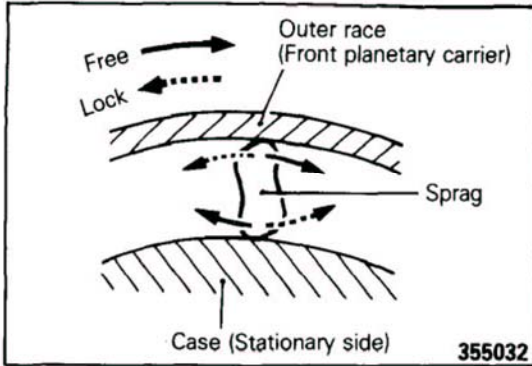
When the vehicle speed is relatively low with a greater throttle valve opening angle, which requires a greater acceleration, the OD clutch ( $C_0$ ), OD one-way clutch ( $F_0$ ), forward clutch ( $C_1$ ), and one-way clutch No.2 ( $F_2$ ) operate to shift gears into the 1st speed position, the output shaft turning clockwise at a gear ratio of 2.826.

In the forward (excluding 4th speed of "D" range) and reverse ranges,  $C_0$  and  $F_0$  are actuated to transmit the input to the forward clutch cylinder via the OD input shaft. As  $C_0$  and  $F_0$  are actuated, the OD planetary carrier and sun gear are locked together to rotate bodily. This causes the turning force of the OD input shaft to be transmitted to the planetary carrier, allowing the carrier to rotate clockwise together with the sun gear, thus holding the pinion to a standstill. Now, the entire planetary gear set rotates bodily, which couples the OD input shaft directly to the forward clutch cylinder to allow them to rotate clockwise.

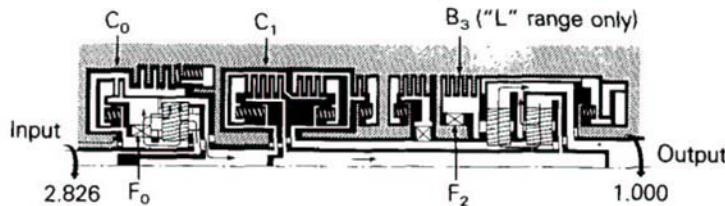
In the 1st speed,  $C_1$  is also actuated allowing the turning force of forward clutch cylinder to be transmitted via the intermediate gear to the rear planetary carrier (output shaft), which turns the carrier clockwise. The sun gear (rotating counterclockwise) in mesh with the pinion of the rear planetary gear set, on the other hand, tends to turn the front planetary carrier counterclockwise; however,  $F_2$  acts to prevent the carrier from rotating, hence the turning force in the clockwise direction is transmitted to the output shaft.

Though acting to prevent the front planetary carrier from rotating counterclockwise,  $F_2$  is driven from the axle shaft end during engine braking, thus allowing its outer race to rotate in the direction to free the clutch. Hence, no engine braking. This also applies when the shift is in the 1st speed of "2" range.  $F_1$  functions in the same manner in the 2nd speed of "D" range.

In the "L" range, the brake No.3 ( $B_3$ ) is actuated to hold the front planetary carrier stationary, thus providing engine braking.

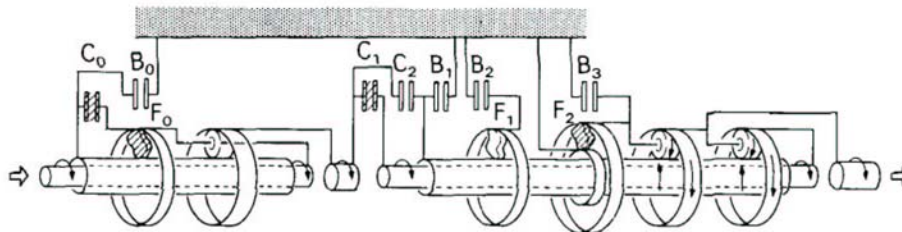


"D" or "2" Range-1st



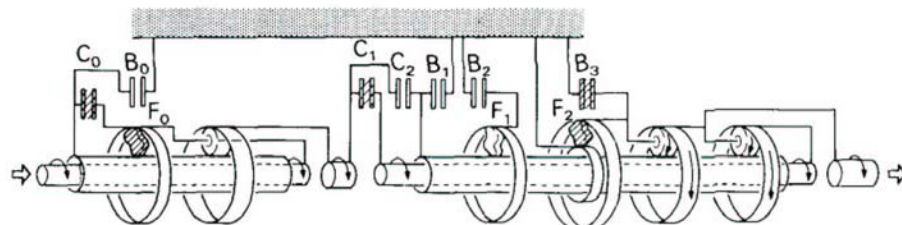
372073

"D" Range-1st



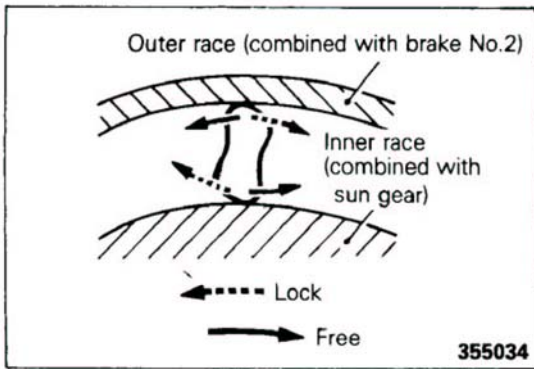
372074

"L" Range-1st



372075

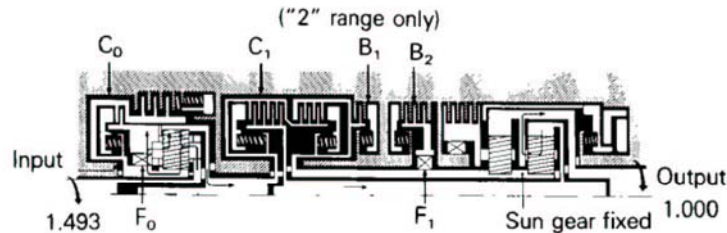




**Second in "D" range**

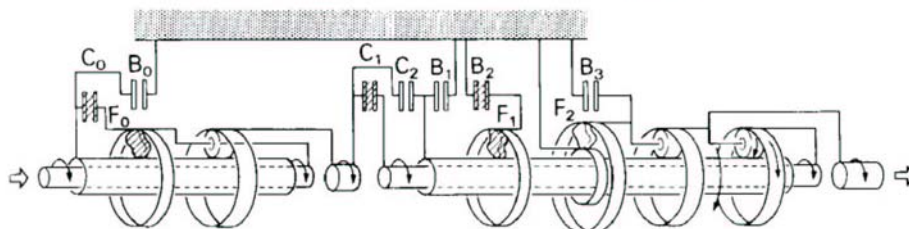
As the vehicle speed is accelerated from the 1st speed, the brake No.2 ( $B_2$ ) is actuated to shift into the 2nd gear, allowing the output shaft to rotate clockwise at a gear ratio of 1.493. The OD planetary gear set operates in the same way as in the 1st speed. In 2nd speed,  $C_1$  is actuated, which causes the turning force of forward clutch cylinder to be transmitted via the intermediate shaft and rear planetary ring gear to the pinion. Then, the sun gear, which is in mesh with the pinion, receives a turning force in the counter-clockwise direction; however, since  $F_1$ , activated by  $B_2$ , prevents the sun gear from rotating, the pinion moves around the sun gear. This motion causes the carrier to rotate, transmitting a rotating force in the clockwise direction to the output shaft. No rotating force is transmitted to the front planetary gear as the sun gear does not turn. In the 2nd speed of "2" range, the brake No.1 ( $B_1$ ) is actuated to hold the sun gear stationary, thus providing engine braking.

"D" or "2" RANGE-2nd



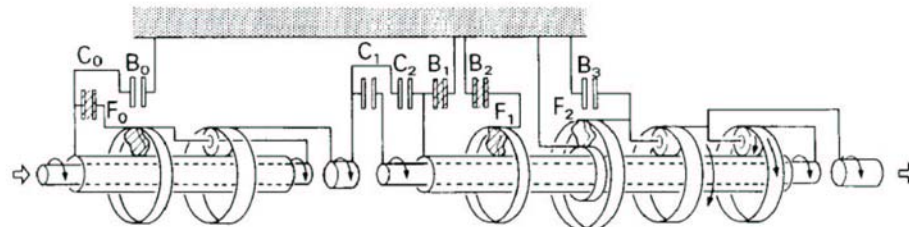
372076

"D" RANGE-2nd



372077

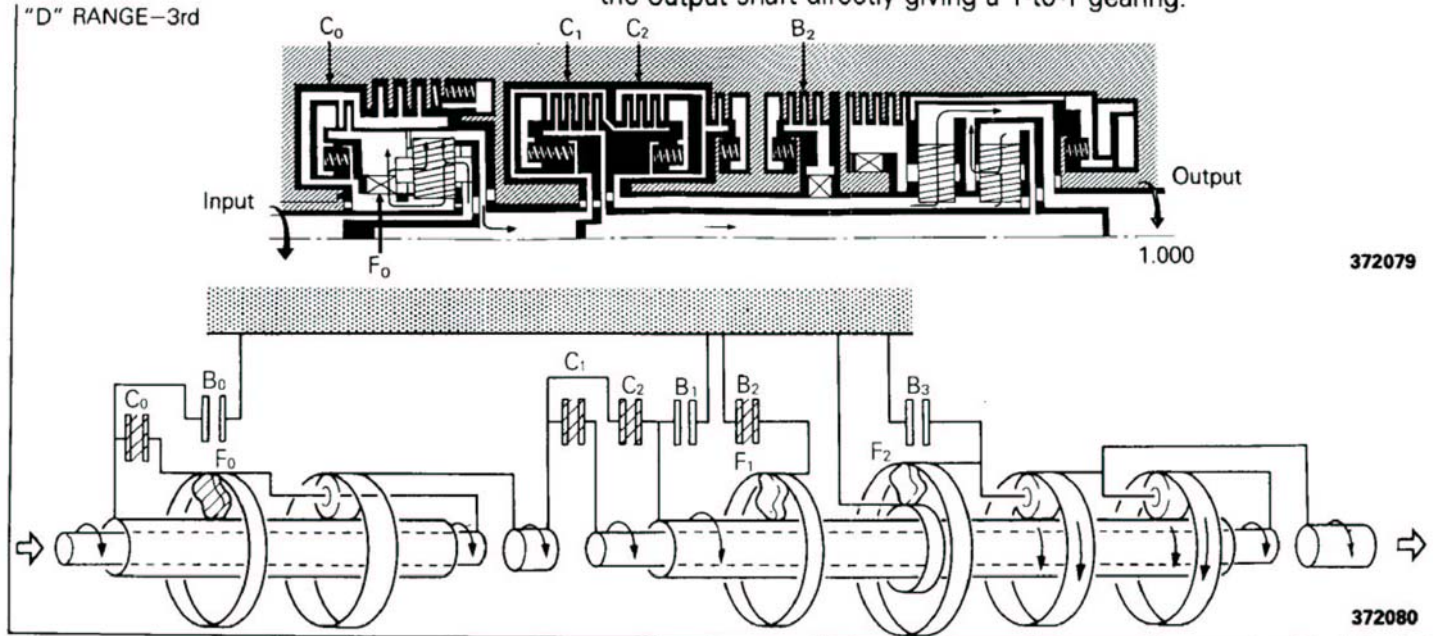
"2" RANGE-2nd



372078

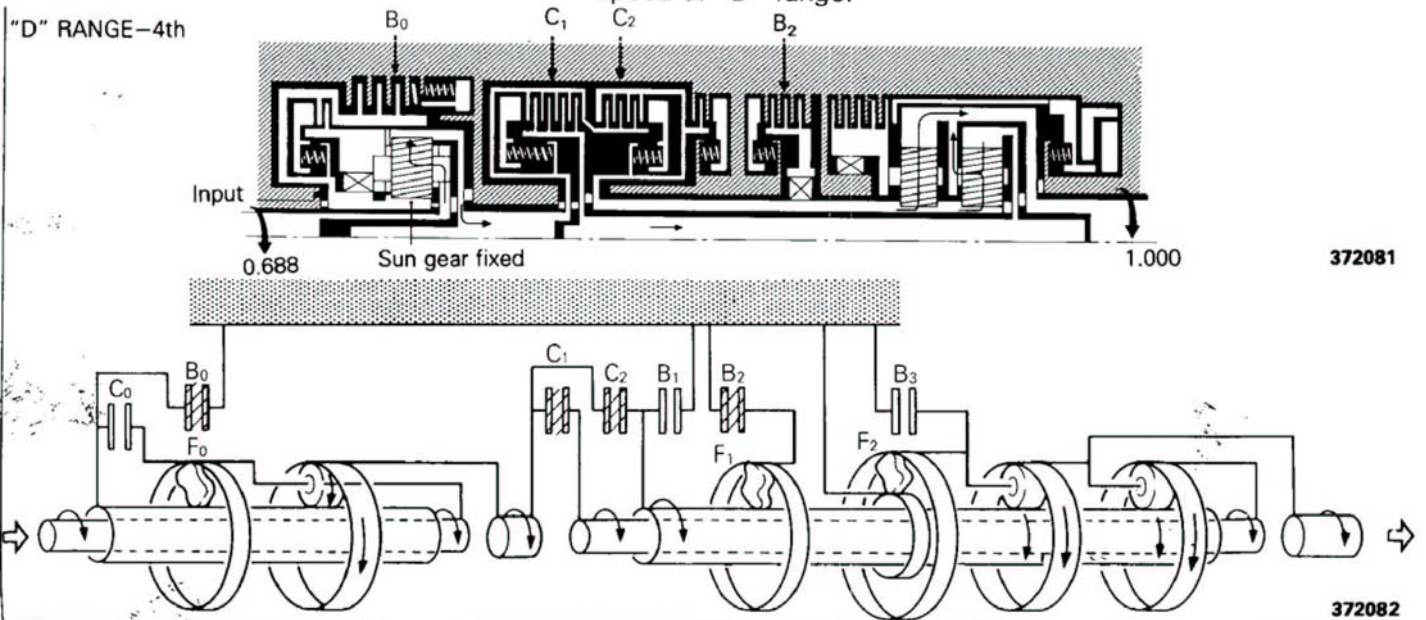
**Third in "D" range**

As the vehicle is further accelerated, the direct clutch ( $C_2$ ) comes into play to shift into the 3rd speed. In 3rd speed, both  $C_1$  and  $C_2$  operate, allowing the intermediate shaft and sun gear to rotate in the same direction. So, the pinion is locked causing the entire planetary gear set to rotate bodily. This couples the input shaft to the output shaft directly giving a 1-to-1 gearing.

**Fourth (overdrive) in "D" range**

When the vehicle is further accelerated with the OD-OFF switch turned ON, the OD clutch ( $C_0$ ) is released and, at the same time, the OD brake ( $B_0$ ) is actuated to shift into the 4th speed, allowing the output shaft to rotate in the clockwise direction at a ratio of 0.688.

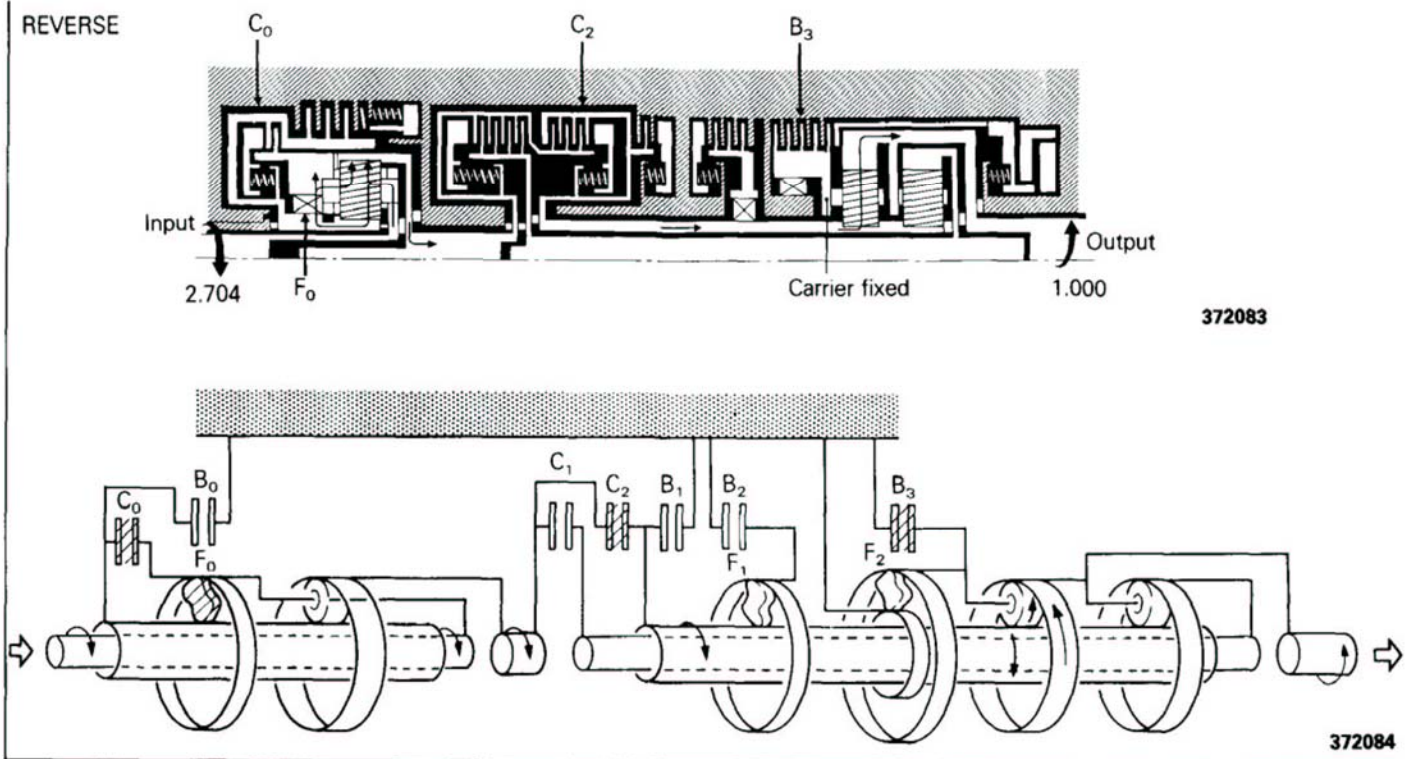
In this gear position,  $B_0$  holds the OD sun gear stationary. The rotating force of the OD input shaft is therefore transmitted via the OD planetary gear pinion to the ring gear and the forward clutch cylinder, which is accelerated in reference to the OD input shaft, rotates clockwise. The rotating force of the forward clutch cylinder is transmitted to the output shaft in the same way as in the 3rd speed of "D" range.



**Reverse**

When the shift is in reverse gear, the OD clutch ( $C_0$ ), OD one-way clutch ( $F_0$ ), direct clutch ( $C_2$ ), and brake No.3 ( $B_3$ ) are actuated and the rear output shaft rotates counterclockwise at a ratio of 2.703. The operation of the OD planetary gear set is the same as in the 1st speed of "D" range.

Since  $C_2$  is activated, the rotating force of the input shaft is transmitted to the front planetary gear pinion via the sun gear. As the front planetary carrier is held stationary by  $B_3$ , the rotating force of the sun gear is transmitted to the ring gear via pinion, turning the output shaft in the counterclockwise direction.



**SELECT PATTERN**

Select pattern refers to the indication of transmission positions to be manually selected by the driver. This transmission is provided with six positions; P-R-N-D-2-L.

The following text explains the function of each position selected.

**P-Parking**

All elements do not operate at all, and the engine output is not transmitted to the output shaft.

The output shaft is mechanically locked and the vehicle does not move either in the forward or reverse direction.

The engine can be started.

**R-Reverse**

The vehicle is in the reverse range.

The engine cannot be started.

**N-Neutral**

The engine output is not transmitted to the output shaft as in the case of "P".

The engine can be started.

**D-Drive**

Corresponding to the degree that the accelerator pedal is pressed down (throttle valve opening angles) and vehicle speed, "D" automatically shifts between the four forward speeds, or three forward speeds when the OD-OFF switch is in OFF position.

The automatic shifting is performed according to the shift pattern shown on P.21-61.

The vehicle is started with the gear in first speed position.

Kickdown refers downshifting accomplished when the accelerator pedal is depressed while the vehicle is in motion in 2nd, 3rd, or 4th speed. In the shift pattern, it occurs when the load exceeds the downshift point.

This function is useful when the driver is accelerating to pass another vehicle.

No engine braking is given when the shift is in 1st speed.

**2-Second**

The "2" automatically shifts between the 1st and 2nd speeds, and no shifting into 3rd will be performed.

The vehicle is started with the gear in 1st speed position.

When the "2" range is selected while the vehicle is in motion in the 3rd or 4th speed of "D" range, gear is downshifted to 2nd or 3rd speed as the vehicle speed reaches predetermined levels.

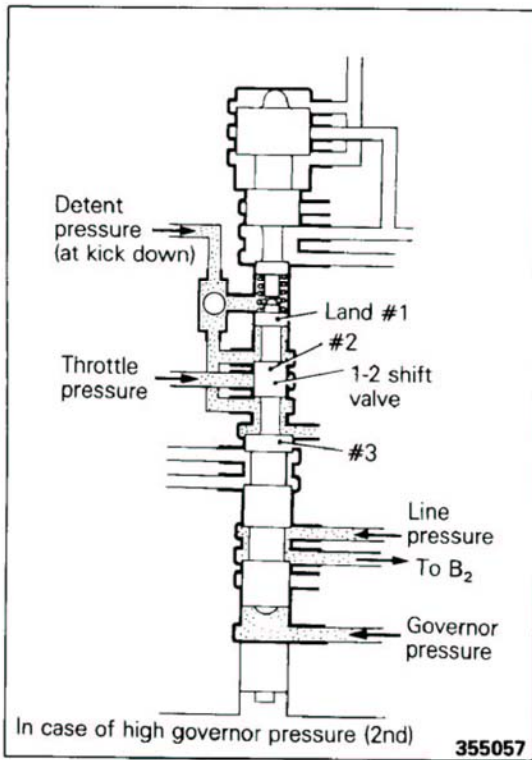
As in the case of "D" range, no engine braking is given when the shift is in 1st speed position.

**L-Lockup**

While "L" performs downshifting from 2nd to 1st, it does not shift into high, from 1st to 2nd or to 3rd. This is what we call the "1st gear holding".

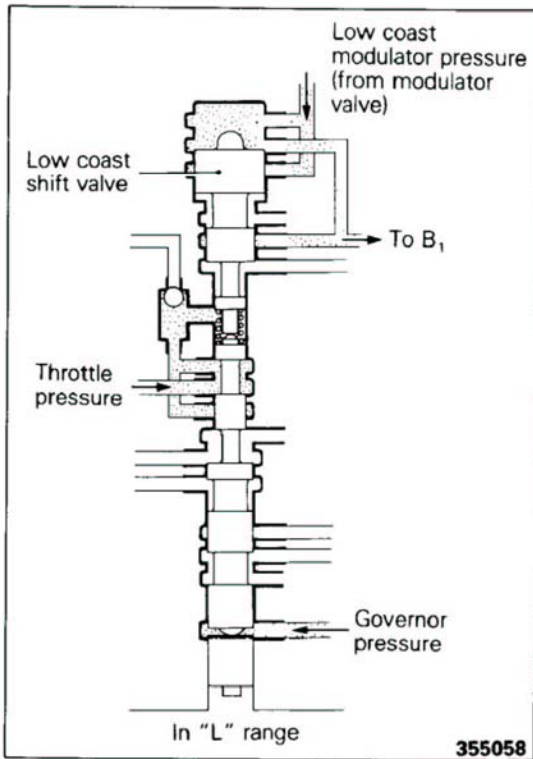
The vehicle is started with the gear in 1st speed position, when the engine braking is given.

If the "L" range is selected while the vehicle is in motion in "D" or "2" range, downshifting from 4th to 3rd, 3rd to 2nd, or 2nd to 1st is performed as the vehicle reaches the respective speeds predetermined for each gear.

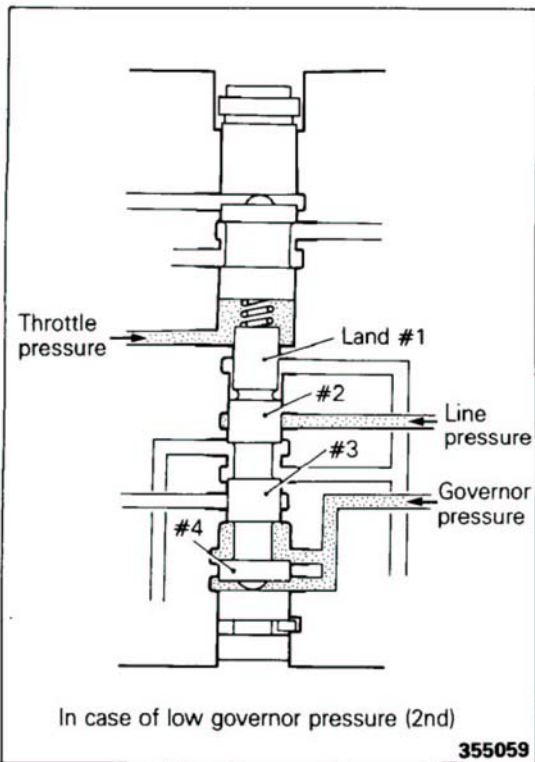


When the governor pressure is greater than the combined downward pressure of throttle pressure and spring tension, the 1-2 shift valve is pushed up, opening the circuit to B<sub>2</sub> to set the 2nd speed. Hysteresis (difference in vehicle speed) of the shift timing between 1st and 2nd speed occurs when the land #2 closes the passage to throttle pressure as the 1-2 shift valve is pushed down in 2nd speed. In other words, the closed throttle pressure circuit provides for a downshift to 1st speed taking place involving only the spring tension and governor pressure. Hence, a downshift at a constant vehicle speed.

Kickdown is provided when the detent pressure from the kickdown valve is applied to the top of 1-2 shift valve (land #1) to push down the valve.



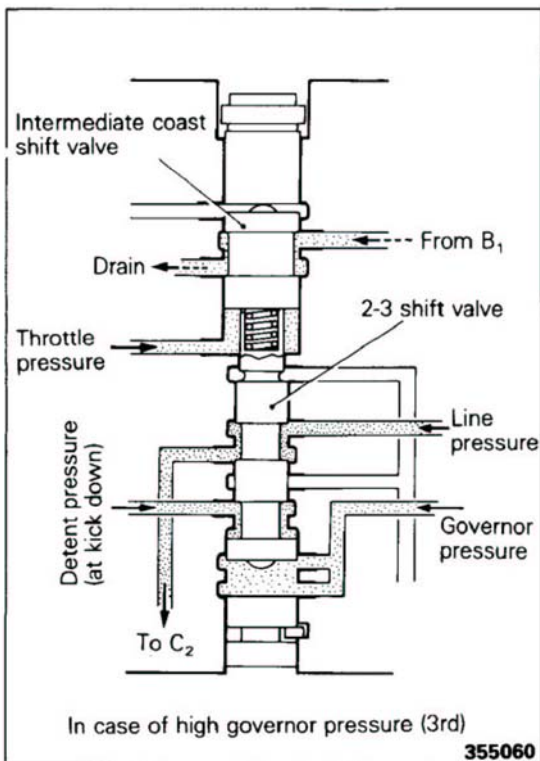
With the shift in "L" range, the low-coast modulator pressure is applied to the low-coast shift valve, keeping the low-coast shift valve and 1-2 shift valve down. This sets the 1st speed and no upshift to 2nd will not take place. The low-coast shift valve also opens the circuit to brake No.3 (B<sub>3</sub>), thus providing for engine braking.



**2-3 Shift Valve**

The 2-3 shift valve automatically selects between the 2nd and 3rd speed according to the governor and throttle pressure. The throttle pressure is applied to the top of 2-3 shift valve (land #1), which forms, together with the spring tension, a downward pressure to the valve.

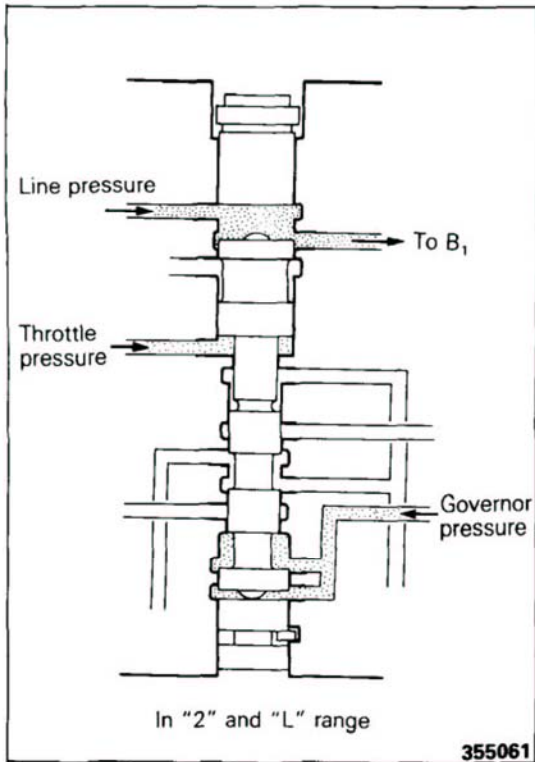
Applied to the bottom of the valve is the upward governor pressure. When the governor pressure is smaller than the combined force of the throttle pressure and spring tension, the valve is pushed down, closing the circuit to the direct clutch ( $C_2$ ) to set the 2nd speed.



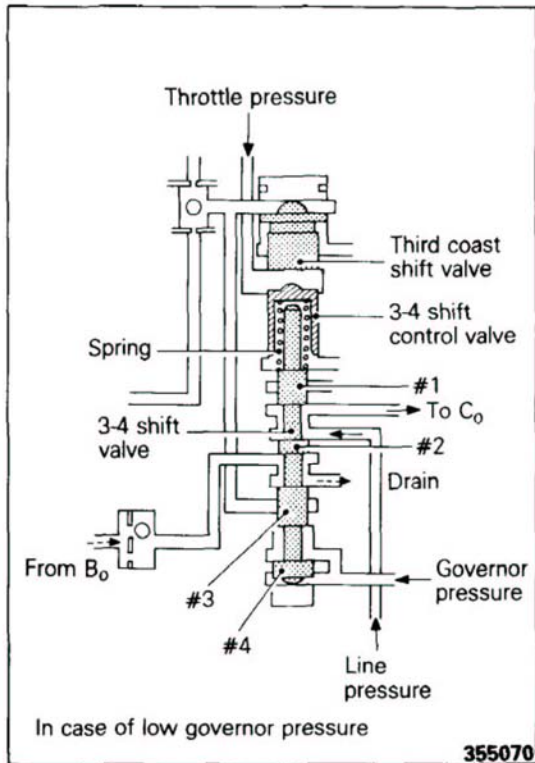
When the governor pressure is greater than the downward pressure of throttle pressure and spring tension, the valve is pushed up, opening the circuit to  $C_2$  to set the 3rd speed

The difference in vehicle speed at the point at which the gear shift occurs when changing up from 2nd to 3rd and down from 3rd to 2nd (Hysteresis) is due to the difference in areas of the valve to which governor pressure is applied. The area in downshift (land #4) is greater than that (land #3) in upshift and downshift takes place at a lower speed (governor pressure).

Kickdown is provided when the detent pressure from the kickdown valve is applied to the valve, pushing it down.

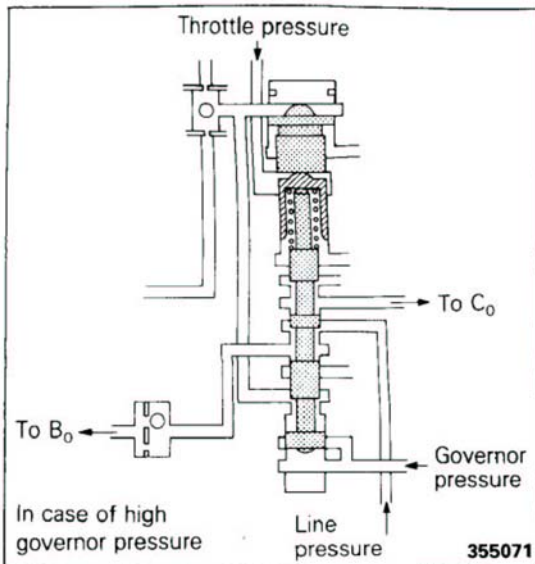


In "2" and "L" range, the line pressure from the manual valve is applied to the intermediate shift valve, keeping the intermediate shift valve as well as 2-3 shift valve down. This sets the 2nd speed and no upshift will not take place. The intermediate low-coast shift valve also opens the circuit to brake No.1 (B<sub>1</sub>), allowing for engine braking.



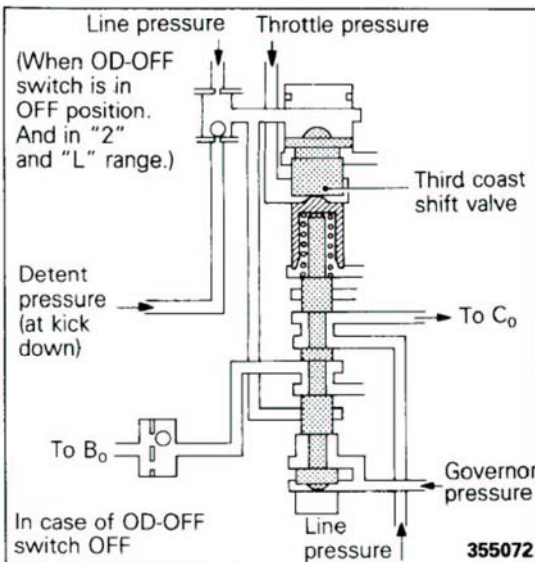
**3-4 Shift Valve**

The 3-4 shift valve automatically selects between the 3rd and 4th (OD) speed according to the governor and throttle pressure. The throttle pressure is applied to the top of the 3-4 shift valve and line pressure to the middle part of the valve. These form a downward pressure applied to the valve, together with the spring tension. Applied to the bottom of the valve is the upward governor pressure. When the upward governor pressure is smaller than the combined downward pressure of throttle pressure, line pressure, and spring tension, the valve is pushed down opening the circuit to the OD clutch and, at the same time, releasing the circuit to OD brake to set the 3rd speed.



When the governor pressure is greater than the downward combined pressure, the valve is pushed up opening the circuit to OD brake to set the 4th speed.

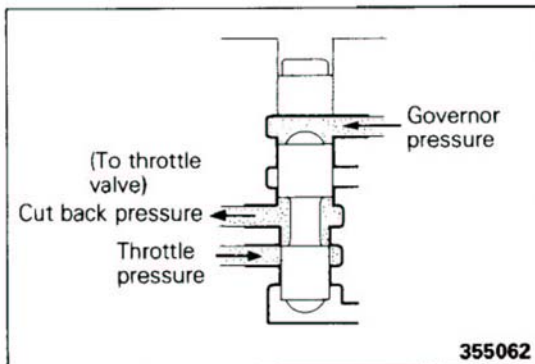
Hysteresis (difference in vehicle speed) of the shift timing between 3rd and 4th speed occurs because of the following reason. In 4th speed, since no line pressure is applied, the area of land in downshift (#4) is greater than that in upshift (#3) and downshift takes place at a lower speed (governor pressure).



When the OD-OFF switch is in the OFF position, the solenoid valve is also OFF closing the drain circuit of the OD solenoid valve. This causes the line pressure to be applied to the third coast shift valve, pushing down the third coast shift valve and 3-4 shift valve, hence no upshift to 4th speed taking place.

In "2" and "L" range, the line pressure from manual valve is applied to the third coast shift valve.

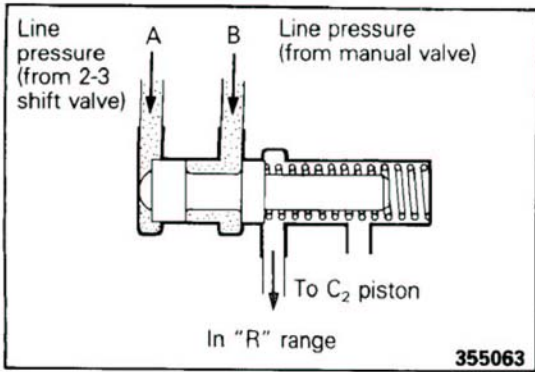
Kickdown is provided when the detent pressure from the kickdown valve is applied to the third coast shift valve and 3-4 shift valve, pushing the 3-4 shift valve down.



### Cut-Back Valve

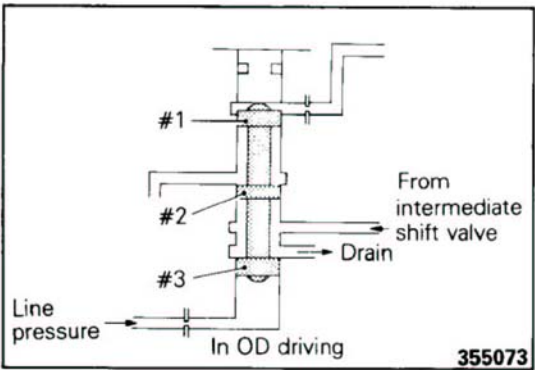
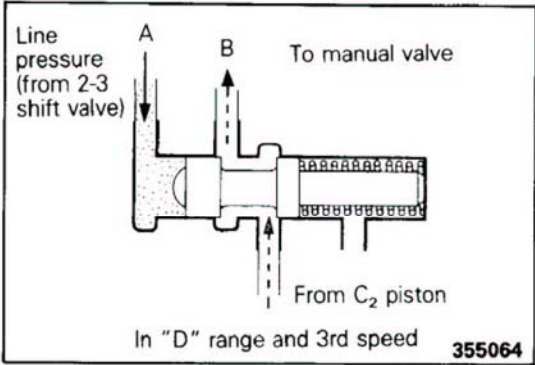
The cut-back valve regulates the cut-back pressure which provides the throttle valve with the effects of vehicle speed. It applies the cut-back pressure to the throttle valve to reduce the throttle pressure. It also applies the throttle pressure to the primary regulator valve to reduce the line pressure. By so doing, it helps eliminate the power loss caused by the oil pump. When the governor pressure is applied to the top of valve, it causes the valve to be pushed down. This opens the circuit from the throttle valve causing the throttle pressure to be applied to push up the valve because of the difference in valve diameters. The cut-back pressure is the pressure when this upward pressure balances with the downward pressure of the governor pressure. While the throttle pressure remains low, there is no force involved to push up the valve and the circuit from the throttle valve is always open. So, the throttle pressure is applied as the cut-back pressure.





**Reverse Clutch Sequence Valve**

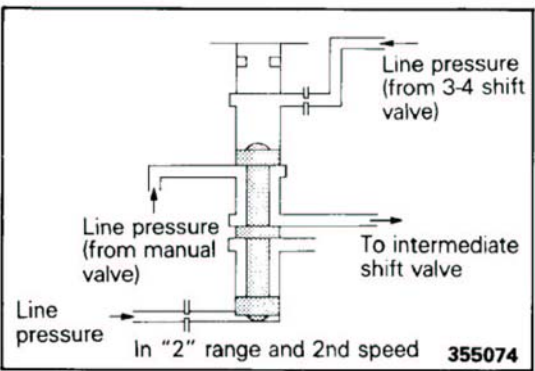
The reverse clutch sequence valve, acting to dampen shocks generated when the gear is shifted into "R" range, is controlled by the line pressure applied to the inner piston of direct clutch (C<sub>2</sub>). With the shift in "R" range, the line pressure is applied both to the circuits A and B; however, since the circuit B does not open before the pressure A being applied to this valve, i.e. the line pressure applied to the inner piston, overcomes the spring tension, the outer piston operates with a lag behind the inner piston. With the shift in 3rd speed in "D" range, the circuit B is closed by the manual valve, allowing only the inner piston to apply pressure. At the time, the circuit B acts to release hydraulic pressure to be applied to the outer piston.

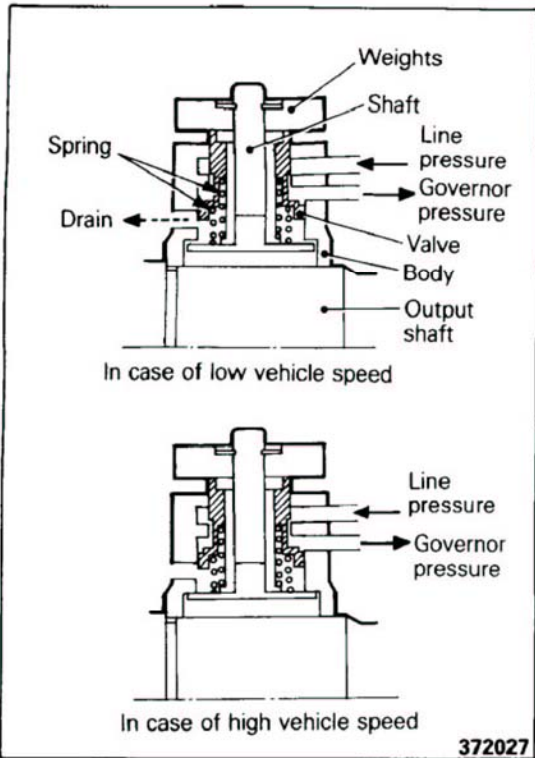


**D-2 Down Timing Valve**

The D-2 down timing valve ensures that engine braking is given mildly when the select lever is shifted into the "2" range during 4th speed (OD) mode. Gear is shifted from OD to 3rd and to 2nd, instead of directly from OD into 2nd.

While the vehicle is in motion in 4th speed, this valve is located on the top end. When gear is shifted into "2" range, the line pressure from the manual valve pushes down the 3-4 shift valve setting the 3rd speed. At the same time, the line pressure is also applied to the top of D-2 down timing valve, pushing the valve down because of the difference in land diameters (#1=#2>#3). This opens the circuit to the intermediate shift valve, allowing the line pressure to be applied to push down the 2-3 shift valve, thus setting the 2nd speed.

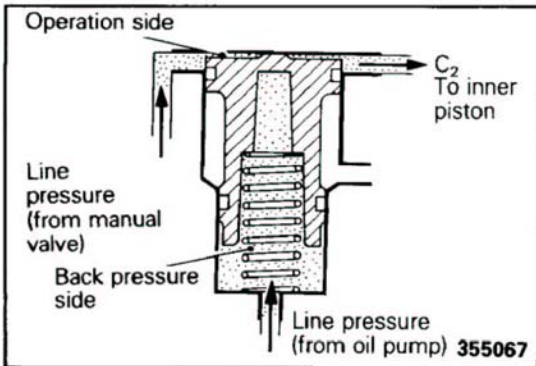




**GOVERNOR**

Installed on the output shaft, the governor counterbalances the line pressure from the primary regulator valve with the centrifugal force applied to the governor weights, thus providing the governor pressure in proportion to the output-shaft speed, or the vehicle speed. As the output shaft rotates, the governor weights, shaft, valve, and spring move bodily outward, allowing the line pressure, which has been blocked off by the governor valve, to enter the governor valve. This causes the governor valve to move inward cutting off the line pressure. The governor pressure thus refers to the one produced when the outward force of the governor weight centrifugal force and spring tension balances with the inward pressure applied to the governor valve by the line pressure.

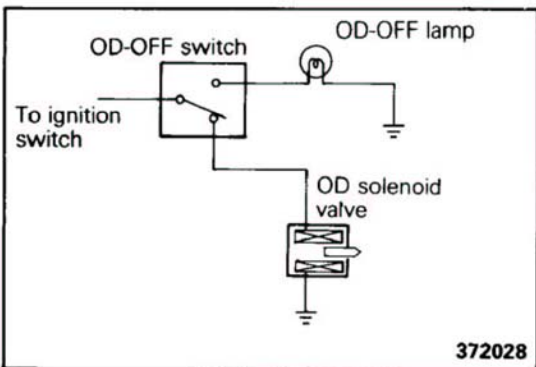
As the output-shaft speed further increases, the governor weights and shaft are blocked by the governor body. After that, the governor pressure is obtained when the centrifugal force of the governor valve balances with the spring tension.



**ACCUMULATOR**

Accumulators are provided for C<sub>1</sub>, C<sub>2</sub>, and B<sub>2</sub>, respectively, to dampen shocks when each is actuated.

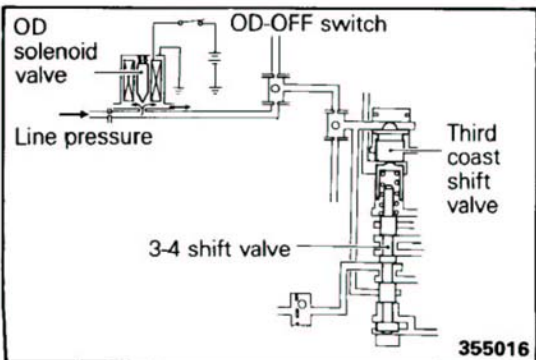
The area of the pressure receiving side of the accumulator piston is made greater than that of the back pressure side. The line pressure is always applied to the back pressure side, keeping the piston in up position. When the circuit to the pressure receiving side opens causing the line pressure to be applied to the piston, the piston is slowly pushed downward, thus dampening shocks when each device is operated.



**FOURTH (OD) CONTROL SYSTEM**

A solenoid valve is used to electrically select the hydraulic circuit to shift into the 4th speed. When the OD-OFF switch on the select lever is turned ON, the OD solenoid is energized to select a circuit to set the 4th speed.

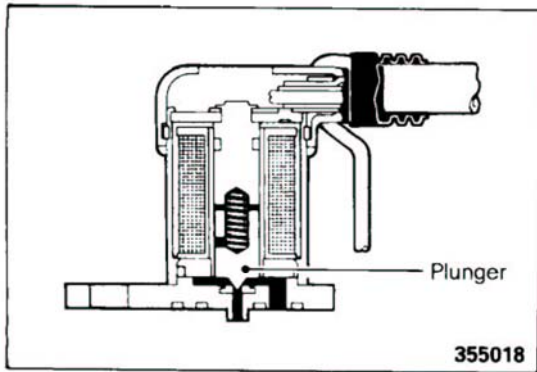
When the OD-OFF switch is turned OFF, the OD-OFF indicator on the meter panel comes on.



**OD-OFF Switch**

The OD-OFF switch is located on the select lever on the driver's seat. It turns ON or OFF the OD solenoid valve to control the shift into 4th speed (OD).

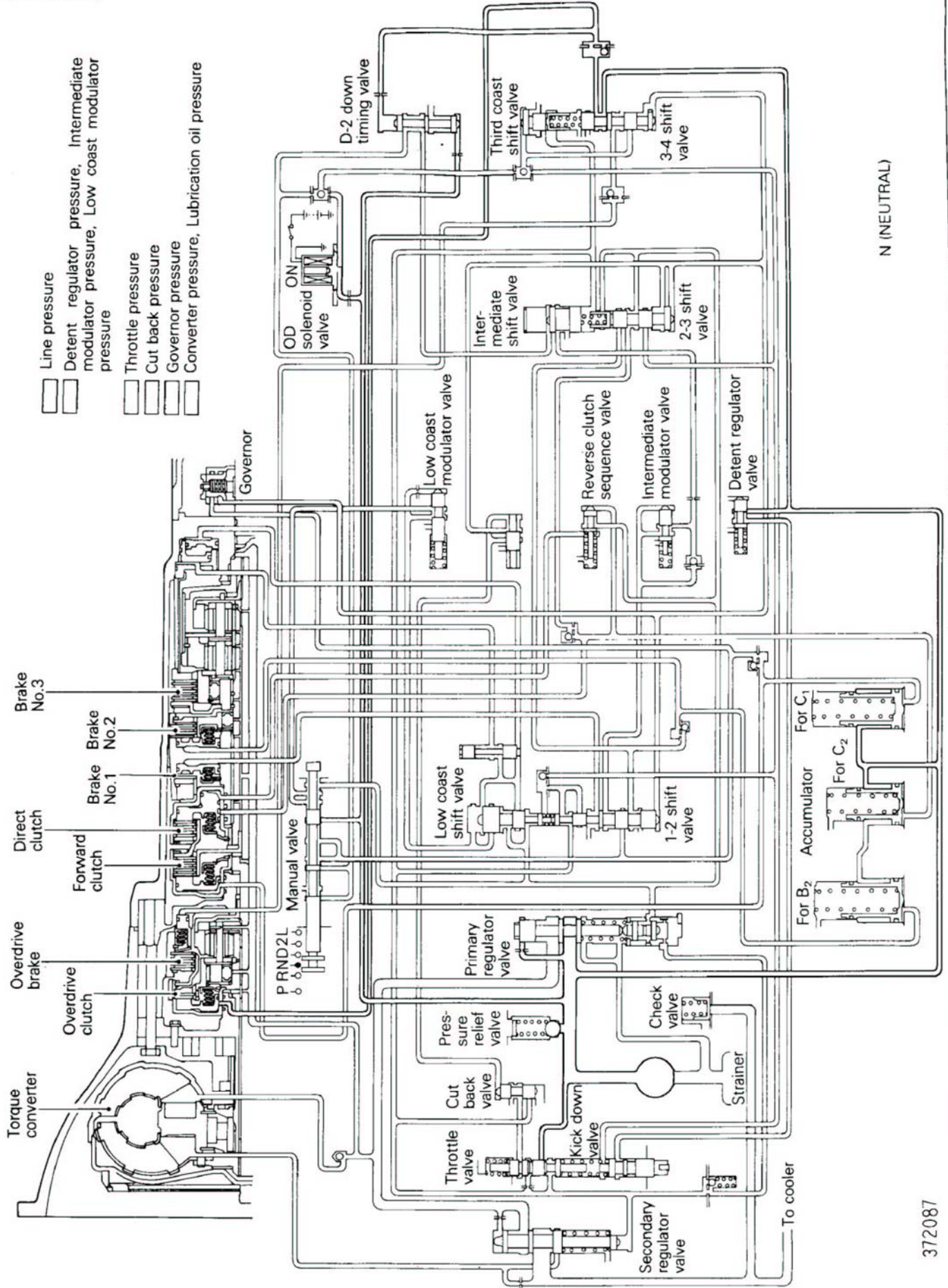
When this switch is turned ON, the OD solenoid is energized to turn ON the solenoid valve, allowing for shift into 4th speed. When the switch is OFF, the solenoid valve is OFF and no shift into 4th speed takes place.



### OD Solenoid Valve

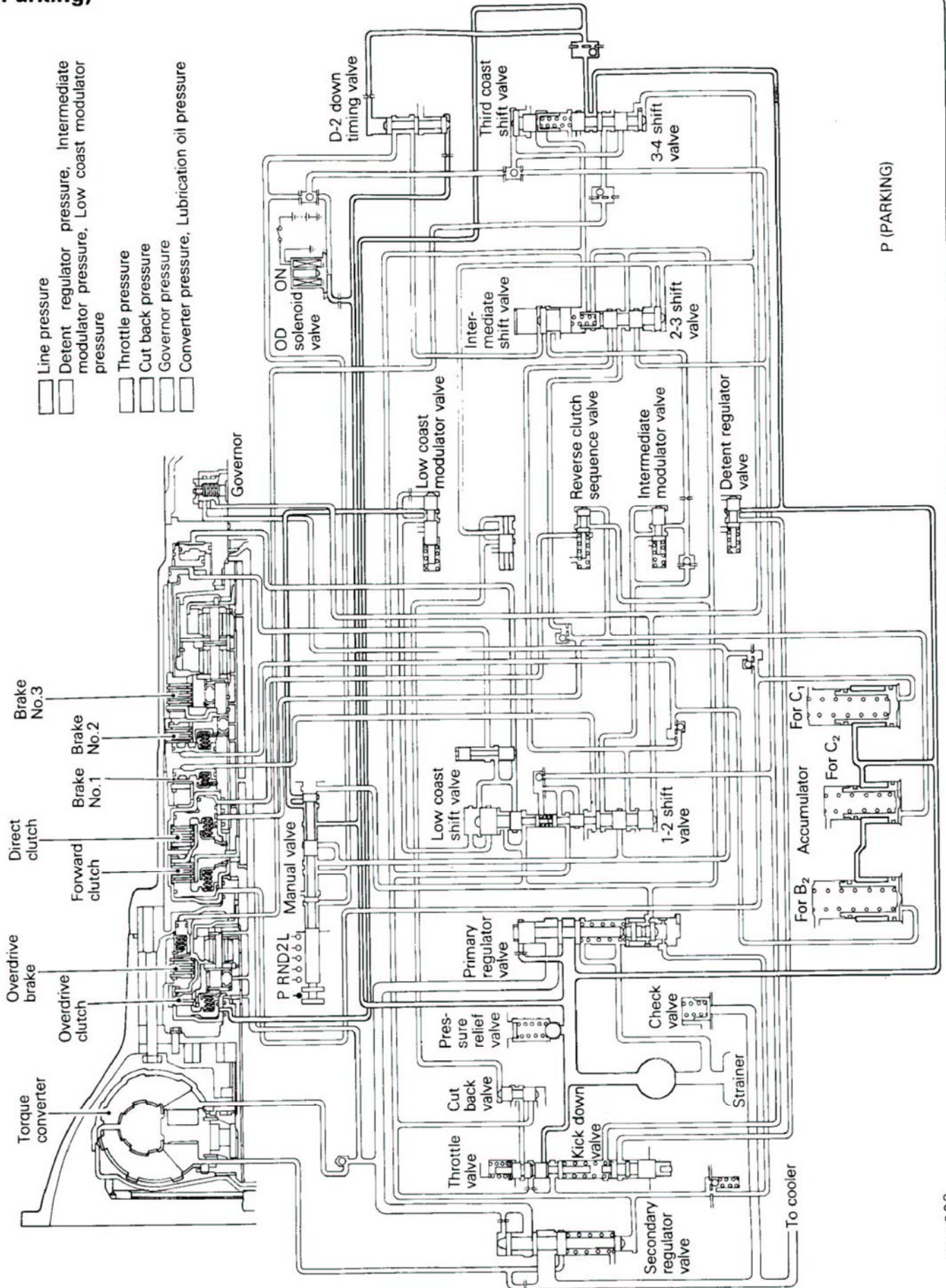
The OD solenoid valve, installed to the left of the transmission case, turns ON or OFF by the operation of the OD-OFF switch to select the hydraulic circuit. When the solenoid valve turns ON, the plunger is pulled, releasing the line pressure to be applied to the third coast shift valve. This positions the third coast shift valve in the up side, allowing shift into 4th speed. When the solenoid valve is OFF, the plunger is pushed down by spring tension, closing the release circuit, which causes the line pressure to be applied to the third coast shift valve. This causes the third coast shift valve and 3-4 shift valve to be pushed down, and no shift into 4th speed takes place.

N (Neutral)



N (NEUTRAL)

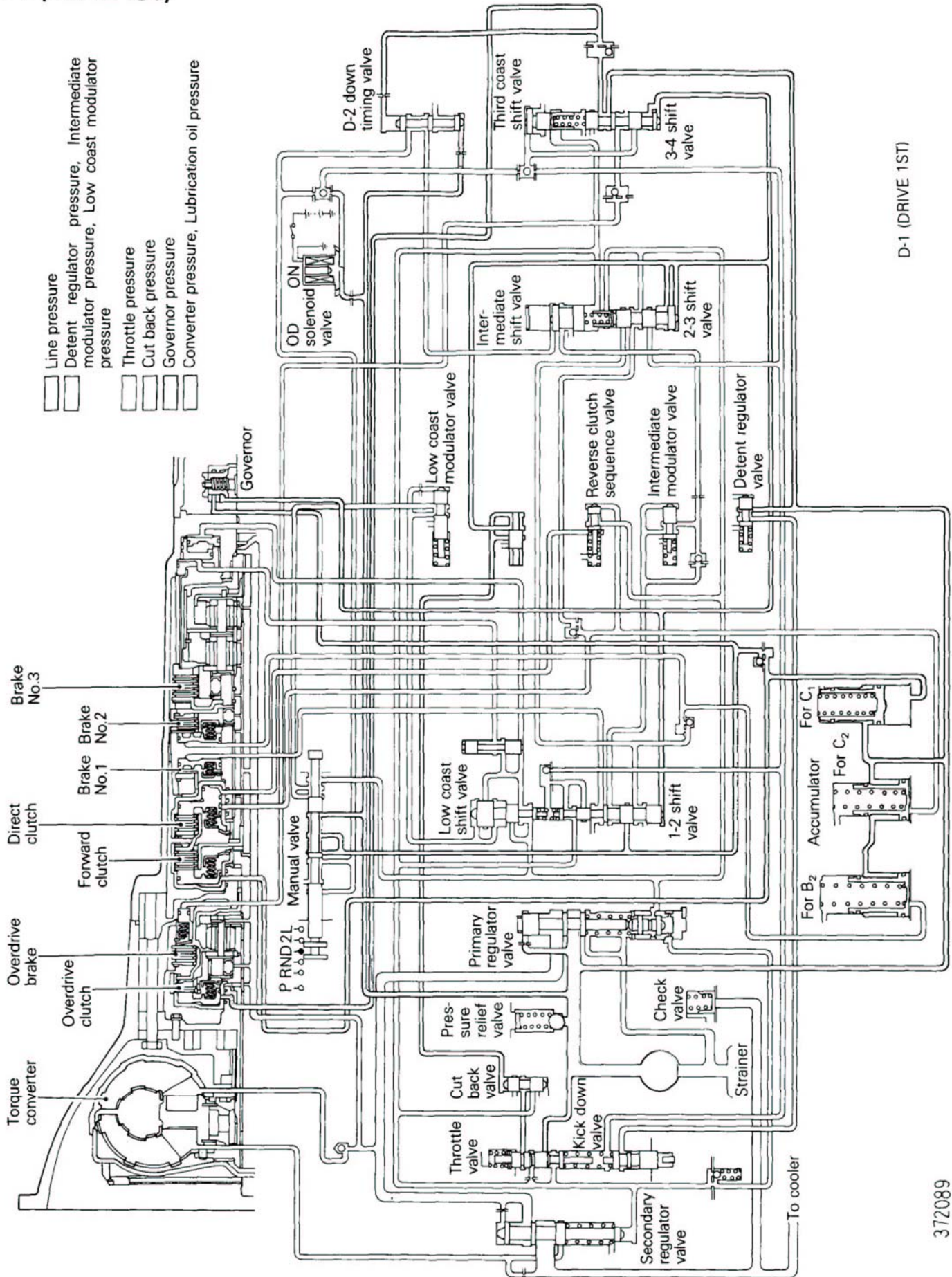
P (Parking)



- Line pressure
- Detent regulator pressure, Intermediate modulator pressure, Low coast modulator pressure
- Throttle pressure
- Cut back pressure
- Governor pressure
- Converter pressure, Lubrication oil pressure

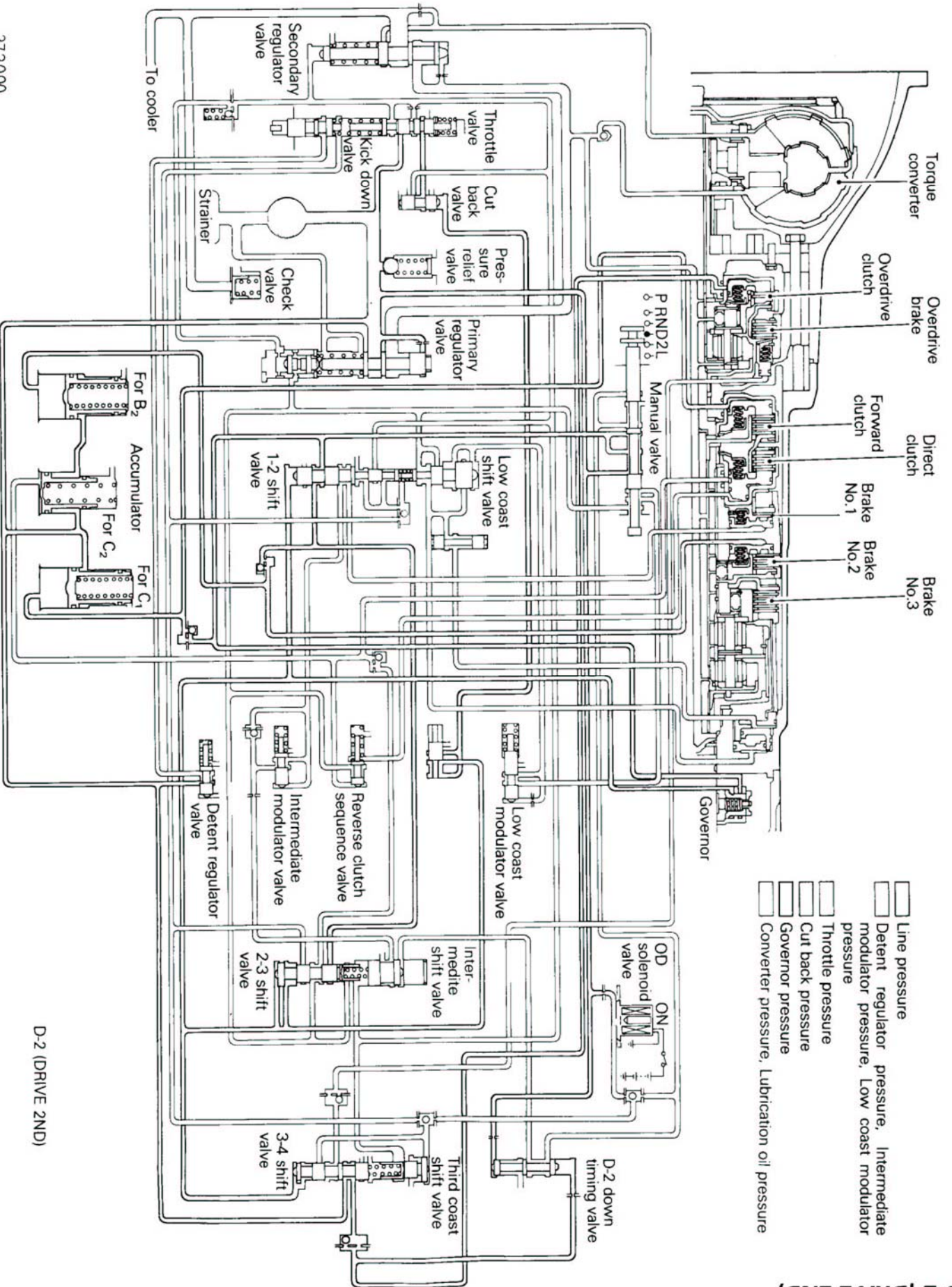
P (PARKING)

D-1 (DRIVE 1ST)



D-1 (DRIVE 1ST)

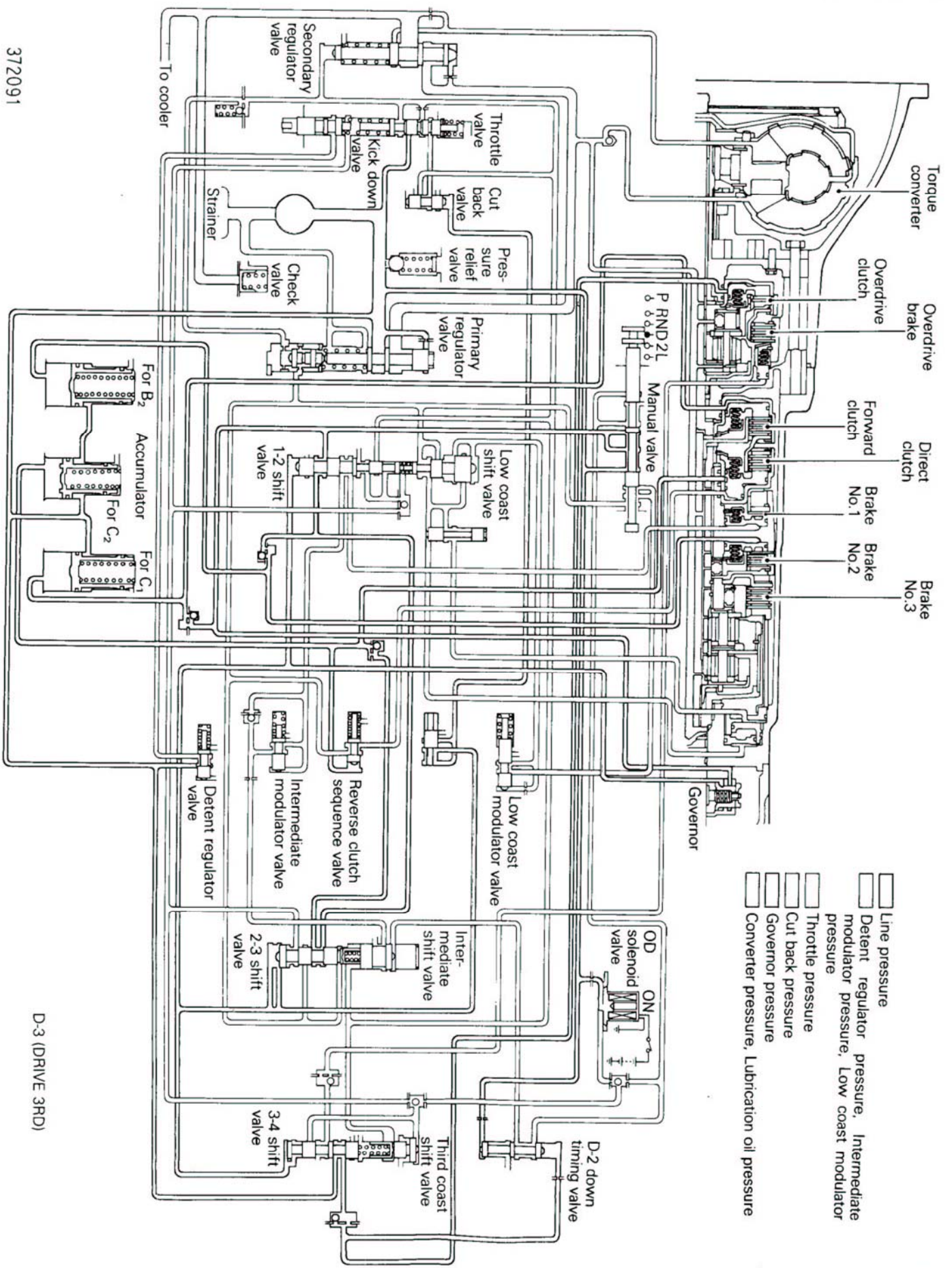
- Line pressure
- Detent regulator pressure, Intermediate modulator pressure, Low coast modulator pressure
- Throttle pressure
- Cut back pressure
- Governor pressure
- Converter pressure, Lubrication oil pressure



D-2 (DRIVE 2ND)

372090

D-3 (DRIVE 3RD)

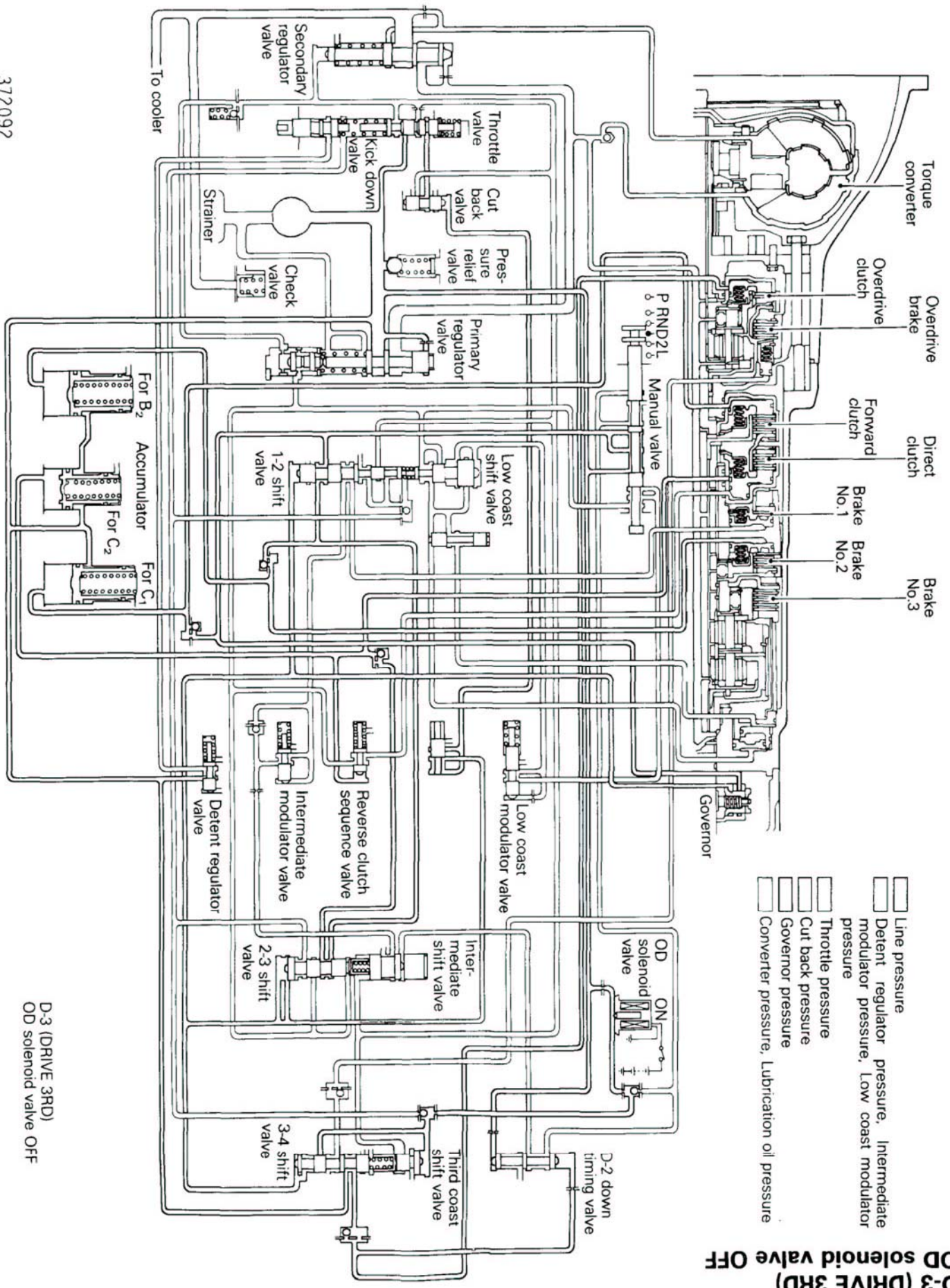


D-3 (DRIVE 3RD)

372091



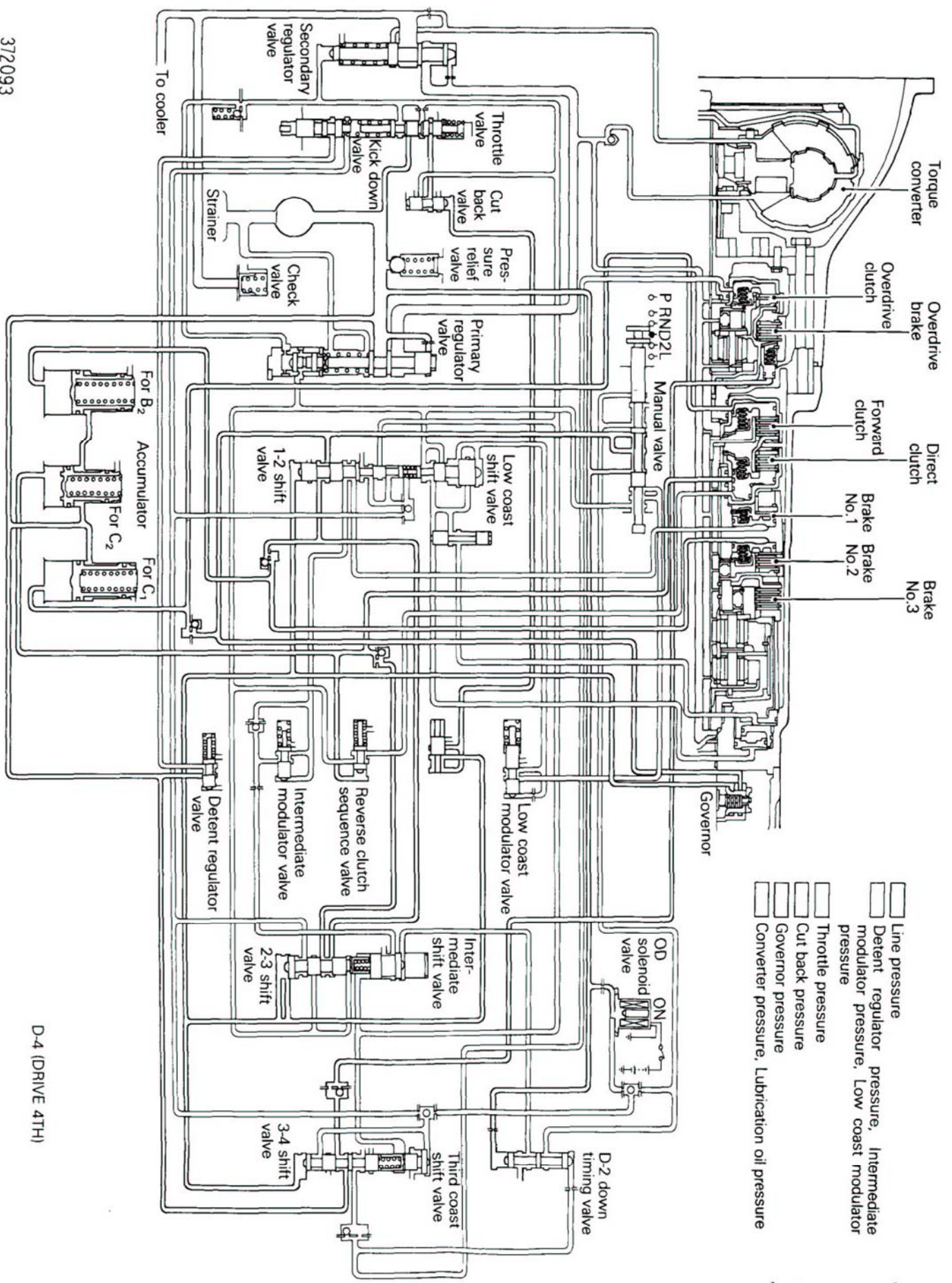
372092



- Line pressure
- Detent regulator pressure, Intermediate modulator pressure, Low coast modulator pressure
- Throttle pressure
- Cut back pressure
- Governor pressure
- Converter pressure, Lubrication oil pressure

D-3 (DRIVE 3RD)  
OD solenoid valve OFF

D-3 (DRIVE 3RD)  
OD solenoid valve OFF

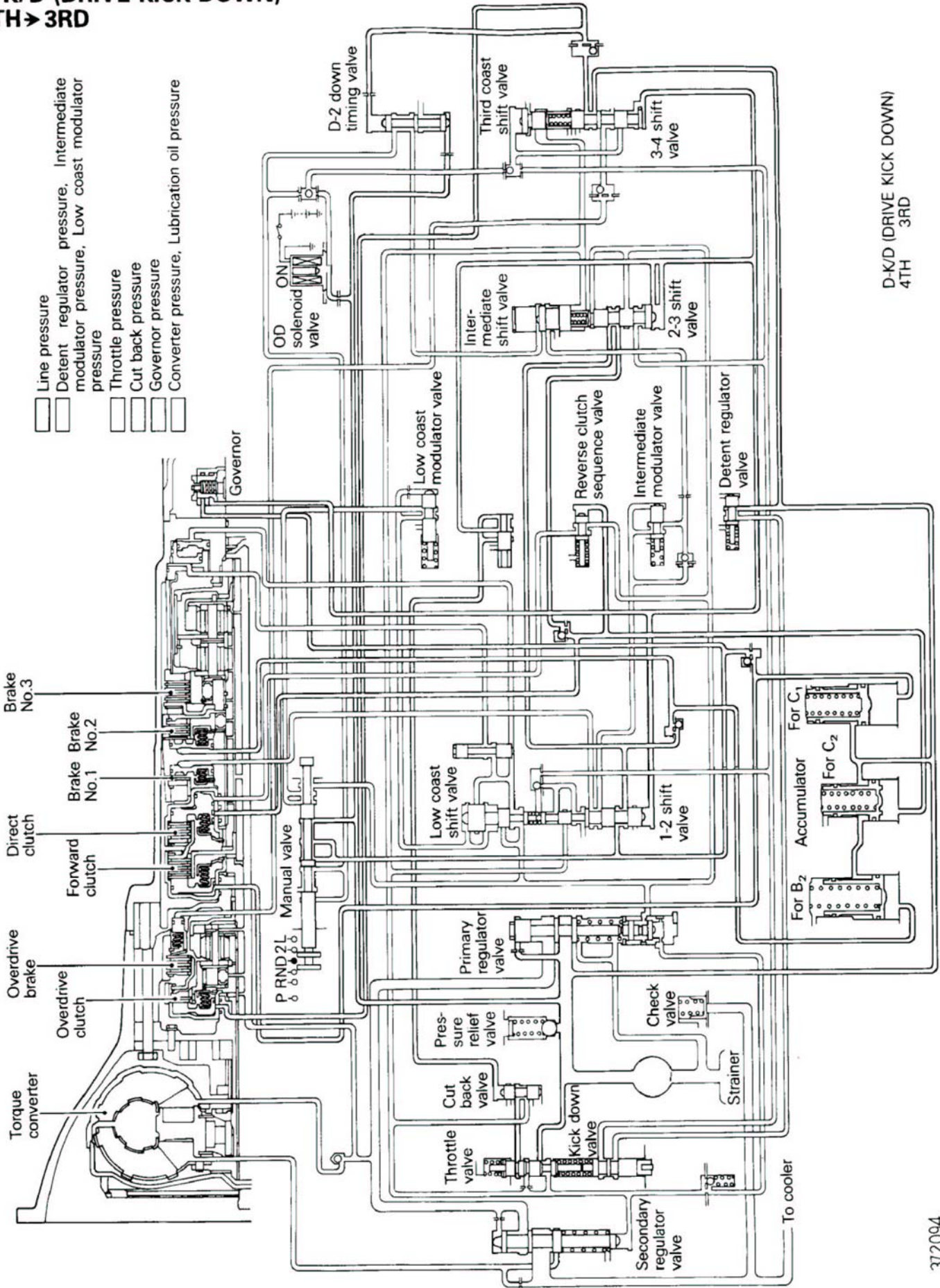


- Line pressure
- Detent regulator pressure, Intermediate modulator pressure, Low coast modulator pressure
- Throttle pressure
- Cut back pressure
- Governor pressure
- Converter pressure, Lubrication oil pressure

D-4 (DRIVE 4TH)

312093

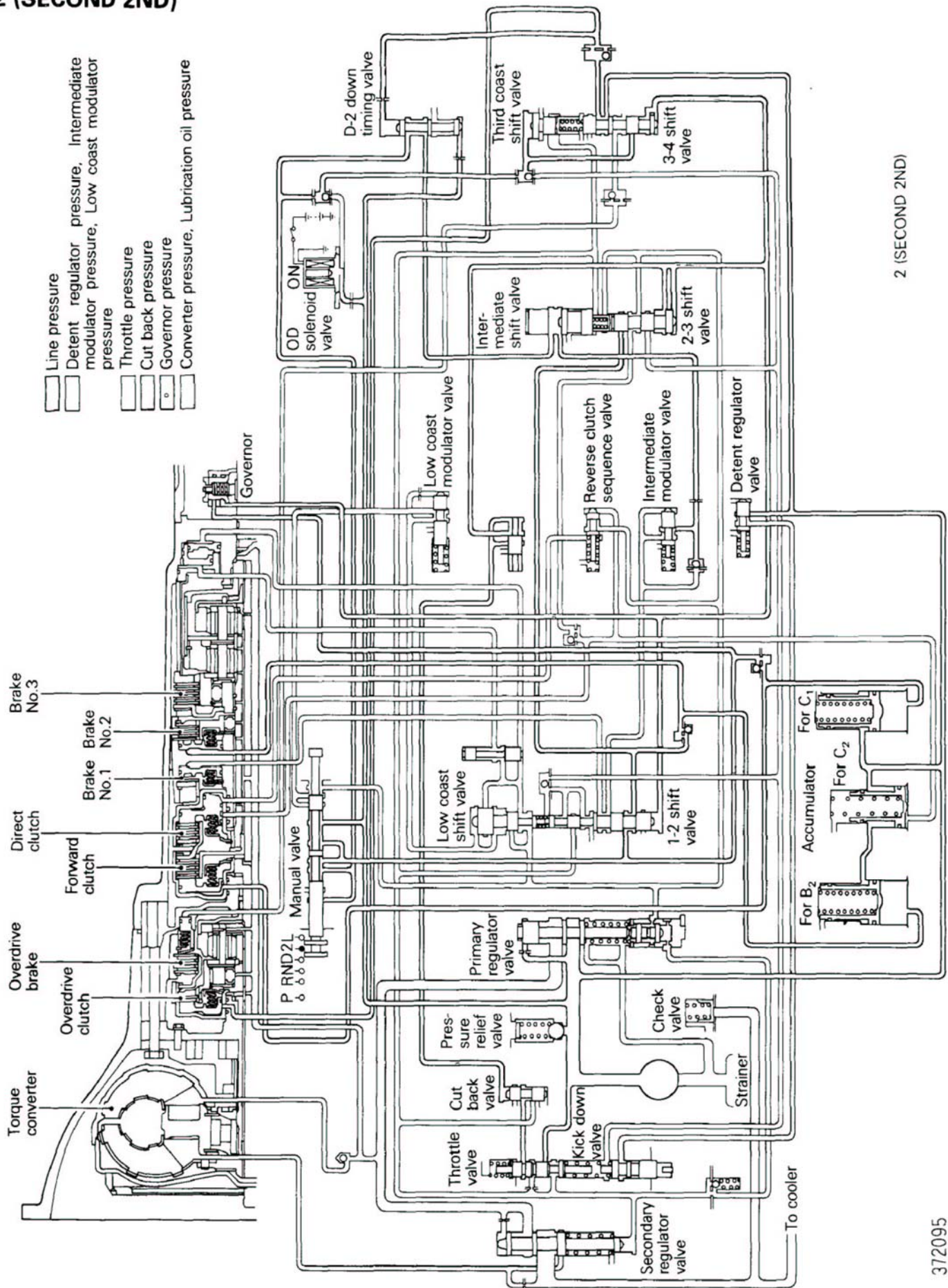
D-K/D (DRIVE KICK DOWN)  
4TH → 3RD



- Line pressure
- Detent regulator pressure, Intermediate modulator pressure, Low coast modulator pressure
- Throttle pressure
- Cut back pressure
- Governor pressure
- Converter pressure, Lubrication oil pressure

D-K/D (DRIVE KICK DOWN)  
4TH → 3RD

2 (SECOND 2ND)

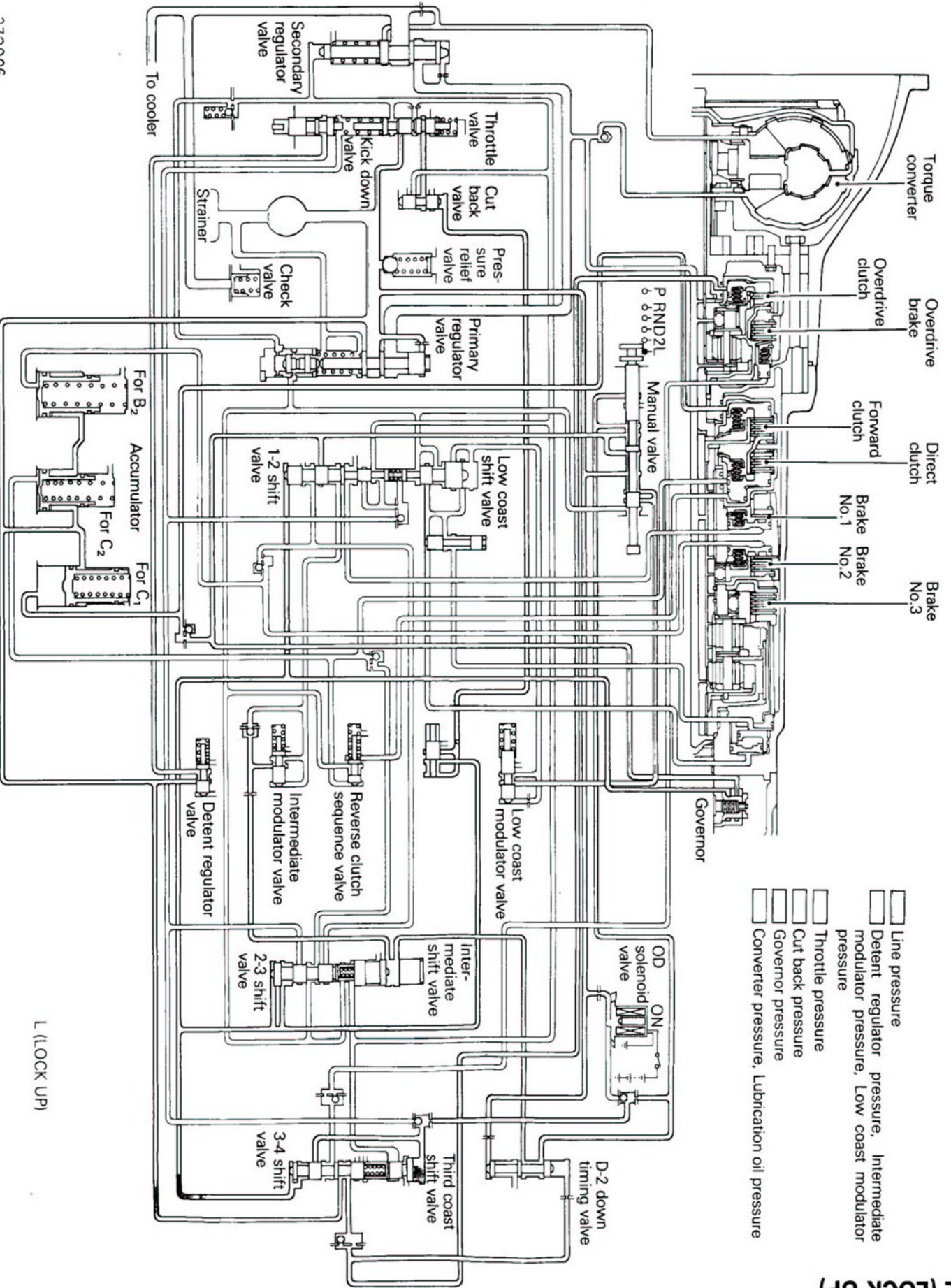


- Line pressure
- Detent regulator pressure, Intermediate modulator pressure, Low coast modulator pressure
- Throttle pressure
- Cut back pressure
- Governor pressure
- Converter pressure, Lubrication oil pressure

2 (SECOND 2ND)

L (LOCK UP)

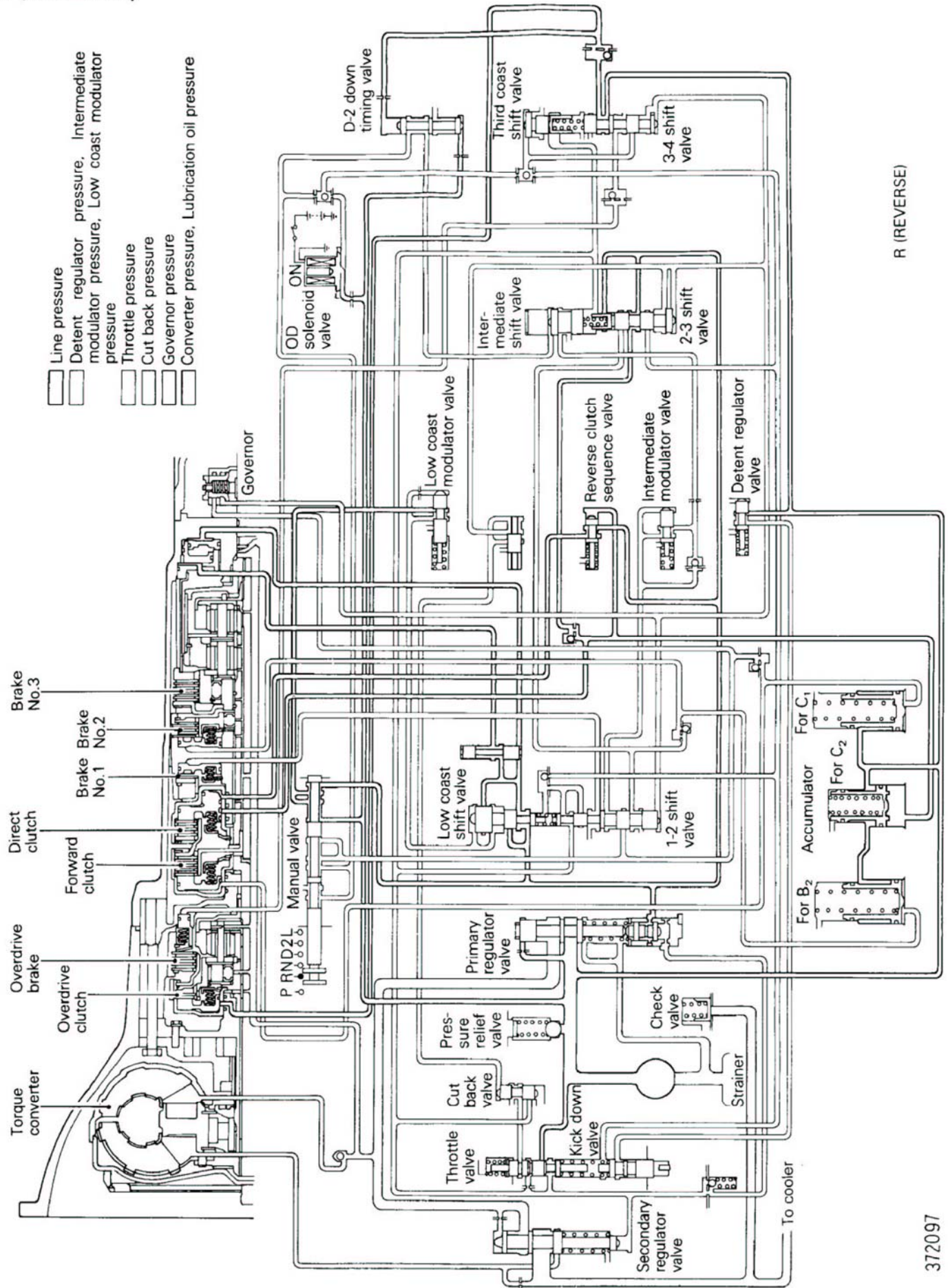
- Line pressure
- Detent regulator pressure, Intermediate modulator pressure, Low coast modulator pressure
- Throttle pressure
- Cut back pressure
- Governor pressure
- Converter pressure, Lubrication oil pressure



L (LOCK UP)

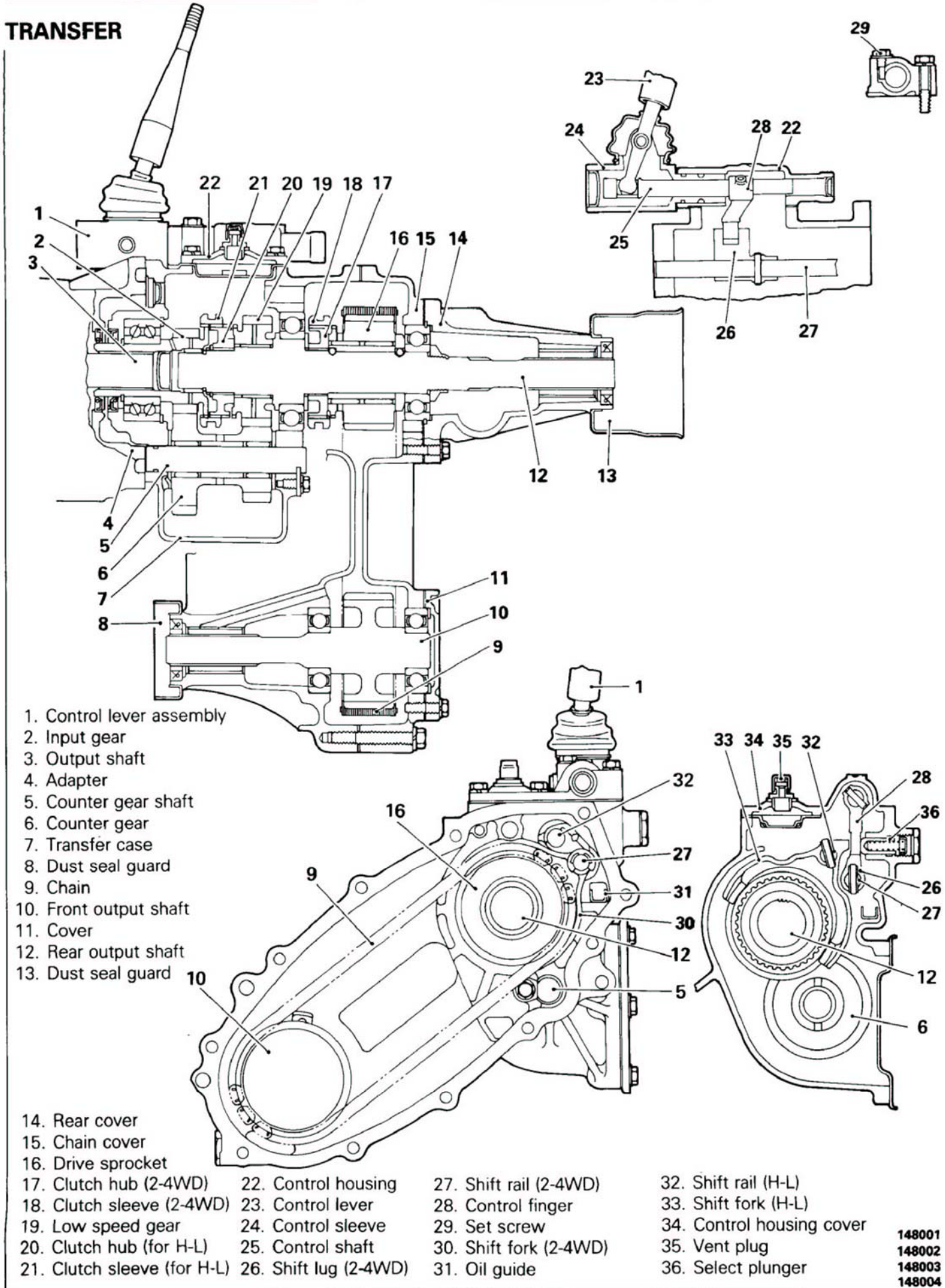
372096

R (REVERSE)



R (REVERSE)

TRANSFER



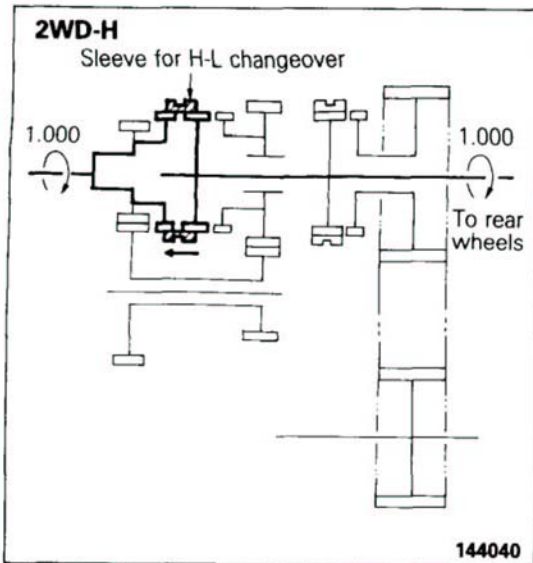
- 1. Control lever assembly
- 2. Input gear
- 3. Output shaft
- 4. Adapter
- 5. Counter gear shaft
- 6. Counter gear
- 7. Transfer case
- 8. Dust seal guard
- 9. Chain
- 10. Front output shaft
- 11. Cover
- 12. Rear output shaft
- 13. Dust seal guard

- 14. Rear cover
- 15. Chain cover
- 16. Drive sprocket

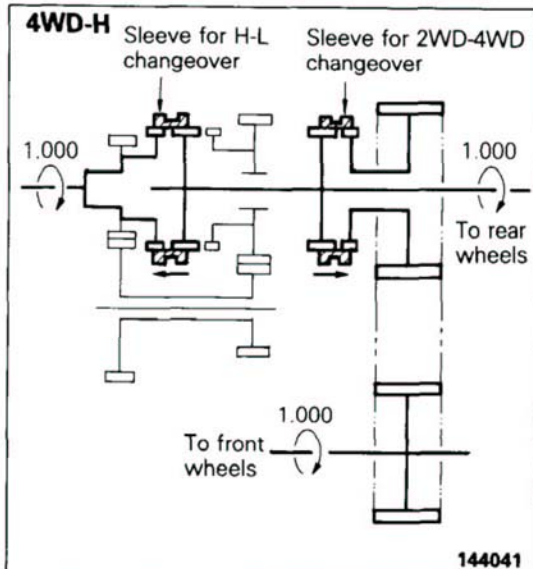
- 17. Clutch hub (2-4WD)
- 18. Clutch sleeve (2-4WD)
- 19. Low speed gear
- 20. Clutch hub (for H-L)
- 21. Clutch sleeve (for H-L)
- 22. Control housing
- 23. Control lever
- 24. Control sleeve
- 25. Control shaft
- 26. Shift lug (2-4WD)
- 27. Shift rail (2-4WD)
- 28. Control finger
- 29. Set screw
- 30. Shift fork (2-4WD)
- 31. Oil guide

- 32. Shift rail (H-L)
- 33. Shift fork (H-L)
- 34. Control housing cover
- 35. Vent plug
- 36. Select plunger

148001  
148002  
148003  
148004

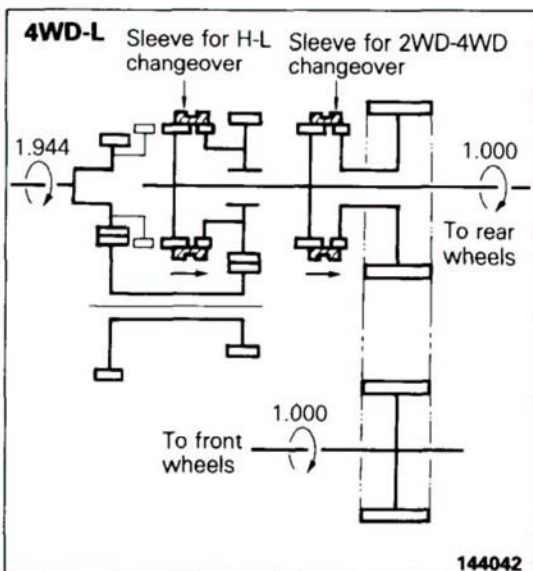
**POWER FLOW****2WD-H**

When the H-L selector sleeve is shifted forward and engaged with the clutch gear of input gear, the input gear is directly coupled to the rear output shaft, thus transmitting power to the rear wheels. This is the power transmission of 2WD-H, which involves no other gears, making for quiet driving.

**4WD-H**

When the 2WD-4WD selector sleeve is shifted to the rear and in mesh with the clutch gear of the drive sprocket, power is transmitted from the drive sprocket to the front output shaft via the chain, thus driving the front wheels.

If the H-L selector sleeve is in the forward position at the time, the mode is 4WD-H.

**4WD-L**

When the H-L selector sleeve is shifted toward rear, power is imparted from the input gear to counter gear and to low speed gear and the rear and front wheels are driven by the rear and front output shaft, respectively. This mode is 4WD-L.



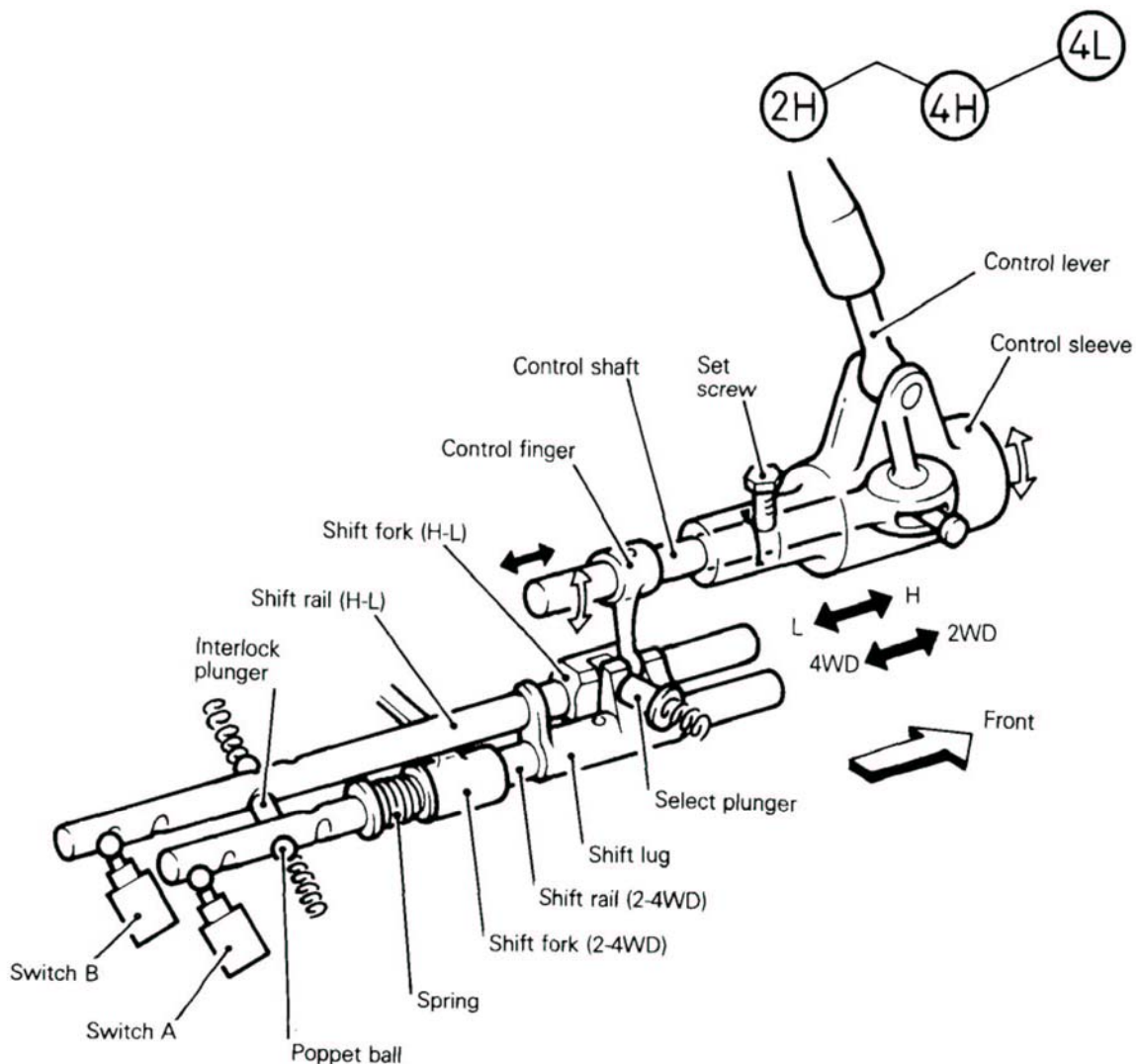
**TRANSFER CONTROL MECHANISM**

The transfer control mechanism employs the floor shift control as in manual transmission model. As shown below, the mechanism uses the control lever, shift rails, shift forks, and related parts to provide a direct-change control. The only difference from that of the manual transmission models is the control lever. With the introduction of four-speed automatic transmission model, the position of the transfer has to be moved backward as compared with the conventional manual transmission-4WD model. To locate the control lever in the same position as before, the control sleeve and shaft are used and, as a result, the lever is now located ahead the transfer.

**H-L Shift Mechanism**

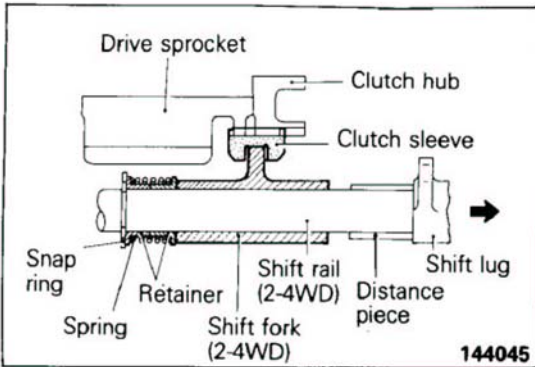
A shift fork with a shift lug is used to directly operate the H-L selector clutch sleeve according to the movement of the control finger interlocking the control lever.

The shift rail is secured to the shift fork with a spring pin. Provided on the rear end of rail are the dents for interlock, poppet, and 4WD indicator light switch ON-OFF.

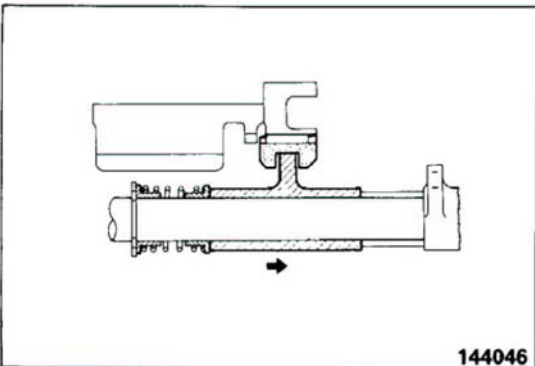


**2WD-4WD Shift Mechanism**

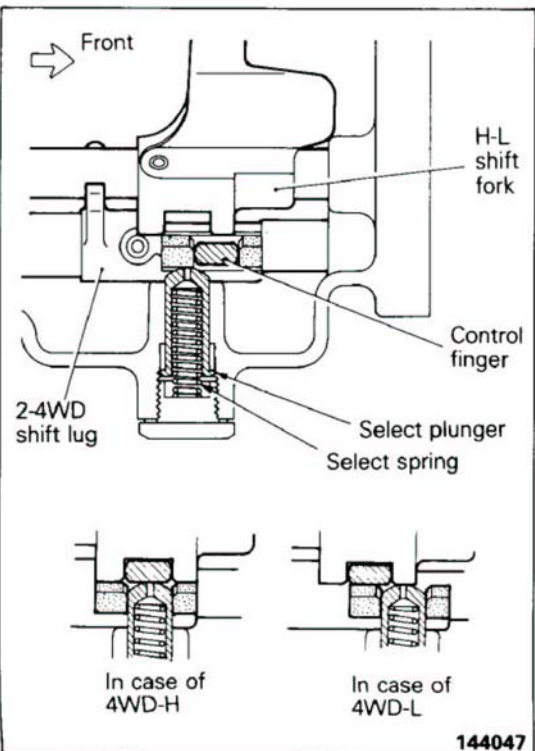
In the 2WD-4WD shift mechanism, the shift lug and shift fork are separate. The shift lug is fastened to the shift rail with a spring pin, while the shift fork is not secured but can slide over the shift rail, which ensures smooth shifting from 4WD-H into 2WD-H.



When shifting into 2WD-H while the vehicle is in motion in 4WD-H mode, the clutch hub and drive sprocket clutch gear tend to encounter torque in the rotating direction, impeding the clutch sleeve's sliding motion. In such cases, the shift rail is first shifted to the 2WD-H position, the shift fork and clutch sleeve being in the 4WD position.

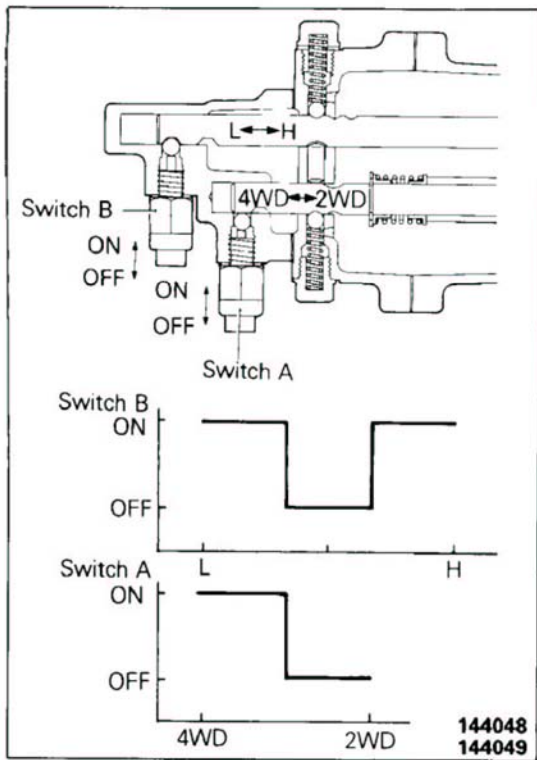


As the vehicle receives road shocks and as torque fluctuates, and when the clutch sleeve gets loose on the clutch hub and drive sprocket, the shift fork is shifted by the spring force into 2WD position, allowing the clutch sleeve to be off drive sprocket clutch gear, thus setting 2WD mode.



**Select Plunger**

The select plunger and select spring push the control finger tightly against the H-L shift fork when the control lever is in the 4WD-H position, thereby preventing the lever from oscillating or coming off position. They also provides a resistance when shifting into 2WD-H.



**4WD Indicator Light Switch**

There are two switches installed that control the 4WD indicator light which tells the driver that the vehicle is in 4WD mode. When shift is made from 2WD-H to 4WD-H or between 4WD-H and 4WD-L, the 4WD indicator light comes on. When shifting from 4WD-H to 4WD-L, or vice versa, the switch B causes the light to go off in the mid shift motion, allowing the driver to know that a selection has been completed.

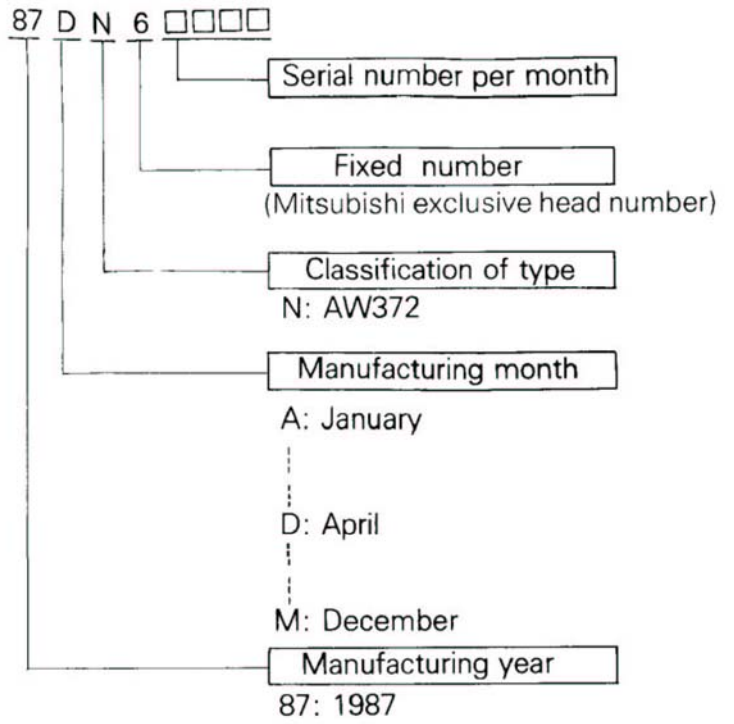
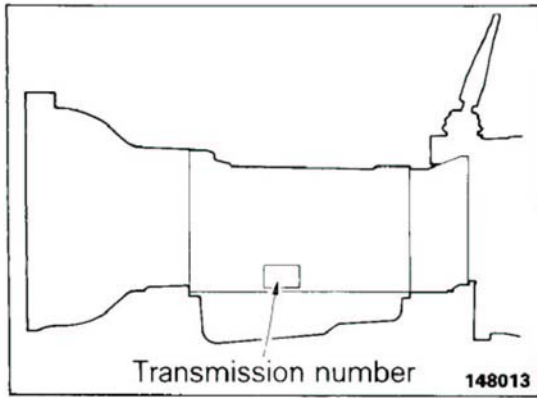
## SPECIFICATIONS

## GENERAL SPECIFICATIONS

N21CA--

Items	Specifications
Automatic transmission and transfer case model	KM148
Torque converter	
Type	3 elements, 1-step 2-phase system
Stall torque ratio	1.96
One-way clutch	Sprag type
Transmission	
Type	Forward 4 gears, reverse 1 gear, single-line planetary gear and Simpson planetary gear
Control elements	
Clutch	Multiple disc type   3 pairs
Brake	Multiple disc type   4 pairs
One-way clutch	Sprag type   3 pairs
Gear ratios	
1st gear	2.826
2nd gear	1.493
3rd gear	1.000
4th gear	0.688
Reverse	2.703
Shift control method	Floor shift type
Select pattern	P-R-N-D-2-L and overdrive switch
Oil pump	
Type	Gear type
Drive system	Directly coupled to engine via torque converter
Hydraulic control system	Throttle opening and vehicle speed detection
Oil-cooling system	Air-cooled system + water-cooled system oil cooler (secondary cooling method)
Transfer	
Type	Always-engaged type
Shift control method	Single-lever floor-shift type
Shift ratios	
LOW	1.944
HIGH	1.000
Speedometer gear ratio	26/8

TRANSMISSION NUMBER MARKING POSITION AND DESIGNATION



## SERVICE SPECIFICATIONS

N21CB--

Items	Specifications
Standard value	
Stall speed rpm	2100-2400
Governor pressure kPa (psi)	
1000 rpm	138-166 (20-24)
2000 rpm	246-284 (36-41)
3200 rpm	402-460 (59-66)
Line pressure kPa (psi)	
"D" range	
When idling	452-529 (66-76)
During stall	991-1166 (144-169)
"R" range	
When idling	687-804 (100-116)
During stall	1471-1863 (214-270)
Input shaft end play mm (in.)	0.3-0.9 (.012-.035)
Overdrive brake clearance mm (in.)	0.35-1.6 (.0143-.062)
Overdrive clutch return spring	
Free length mm (in.)	14.9 (.587)
Overdrive brake return spring	
Free length mm (in.)	16.1 (.634)
Sleeve and selector lever clearance	15.2-15.9 (.60-.62)
Transfer	
H-L clutch hub end play mm (in.)	0-0.08 (0-.003)
Input gear bearing end play mm (in.)	0-0.06 (0-.002)
Input gear end play mm (in.)	0-0.06 (0-.002)
Limit	
Overdrive clutch return spring	
Free length mm (in.)	14.5 (.571)
Overdrive brake return spring	
Free length mm (in.)	15.7 (.618)

**TORQUE SPECIFICATIONS**

N21CC--

Items	Nm	ft.lbs.
Transmission		
Converter housing installation bolt		
10 mm (.39 in.) dia. bolt	27-42	20-30
12 mm (.47 in.) dia. bolt	48-68	35-49
Oil pump assembly installation bolt	18-25	13-18
Oil pump body and cover-tightening bolt	6-9	4.3-6.5
Center support installation bolt	24-28	17-20
Adapter installation bolt	27-42	20-30
Cover plate installation screw	6-9	4.3-6.5
All bolts of valve body	5-6	3.6-4.3
Throttle cam installation bolt	6-9	4.3-6.5
Valve body assembly installation bolt	8-12	5.8-9
Oil screen installation bolt	5-6	3.6-4.3
Parking cam plate installation bolt	6-9	4.3-6.5
Oil pan installation bolt	4-5	2.9-3.6
Union	20-30	14-22
Elbow connector	20-30	14-22
Plug (for hydraulic test)	6-9	4.3-6.5
Oil pan drain plug	18-23	13-17
<i>Overdrive solenoid valve installation bolt</i>	10-16	7-12
Plug	10-16	7-12
Manual lever installation nut	14-18	10-13
Transmission control rod (B) to pin	10-13	7-9
Cross shaft bracket (A) to body	10-13	7-9
Transmission control arm to bracket	18-24	13-17
Transmission oil cooler eye bolts	30-35	22-25
Oil filler tube to transmission	20-27	14-20
Rear propeller shaft to rear differential	50-60	36-43
Front exhaust pipe mounting bolt	20-30	15-22
Bell housing cover to transmission	10-12	7-9
No. 2 crossmember to body	55-75	40-54
Rear engine support member to body	10-13	7-9
No. 2 crossmember to transmission	18-25	13-18
Transmission to starter motor	43-55	31-40
Transmission to engine    A, B	43-55	31-40
D	20-27	14-20
Torque converter to drive plate	35-42	25-30
Selector handle mounting screw	2	0.4
Transmission oil cooler tube flare nut	40-50	29-36

Items	Nm	ft.lbs.
Transfer		
Transfer case installation bolt	30-42	22-30
Transfer case installation nut	30-42	22-30
Chain cover bolt	31-42	22-30
Side cover bolt	8-10	5.8-7
Rear cover bolt	15-22	11-16
Cover bolt	15-22	11-16
Control housing bolt	15-22	11-16
Oil filler plug	30-35	22-25
Drain plug	30-35	22-25
Select plug	30-35	22-25
Locking plate bolt	15-22	11-16
Rear output shaft lock nut	100-130	72-94
Speedometer sleeve clamp bolt	1.5-2.2	1.1-1.6
Seal plug	30-42	22-30
4WD switch	30	22
Control shaft set screw	8-10	5.8-7
Control lever assembly to control housing	8-10	5.8-7
Front propeller shaft to front differential	50-60	36-43
Transfer mounting bracket to transfer	18-25	13-18
Transfer mounting bracket to pipe	30-42	22-29



**LUBRICANTS**

N21CD--

Items	Specified lubricants	Quantity
Automatic transmission fluid	Automatic transmission fluid "DEXRON II" type	Approx. 7.2 lit. (15.2 U.S. pints, 12.7 Imp. pints)
Transfer oil	MOPAR Hypoid Gear Oil Part No. 3744994 or equivalent	Approx. 2.2 lit. (4.7 U.S. pints, 3.9 Imp. pints)
Propeller shaft oil seal lip	MOPAR Multi-Mileage lubricant Part No. 2525035 or equivalent	Small quantity
Transmission control sliding part	MOPAR Multi-Mileage Lubricant Part No. 2525035 or equivalent	Small quantity
Transfer control lever assembly O-ring	MOPAR Hypoid Gear Oil Part No. 3744994 or equivalent	Small quantity




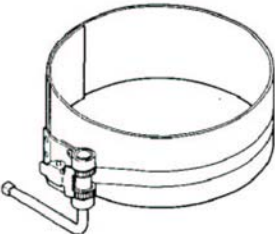

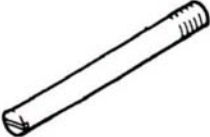


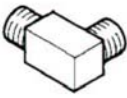
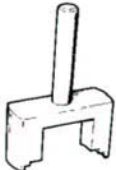
**SEALANTS AND ADHESIVES**


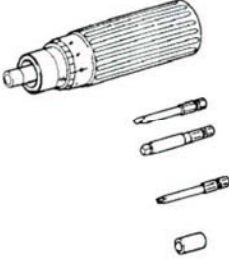

N21CE--

Items	Specified sealants and adhesives	Quantity
Oil pump installation bolt (threads)	SH 780 (TORAY SILICONE)	as required
Adaptor gasket (both sides)	MOPAR Part No. 4318025 or equivalent	as required
Air breather (press-in circumference)	MOPAR Part No. 4318025 or equivalent	as required
Chain cover gasket (both sides)	MOPAR Part No. 4318025 or equivalent	as required
Rear cover gasket (both sides)	MOPAR Part No. 4318025 or equivalent	as required
Cover gasket (both sides)	MOPAR Part No. 4318025 or equivalent	as required
Control housing gasket (cover side surface only)	MOPAR Part No. 4318025 or equivalent	as required
Bolt (threads)	3M Adhesive Nut Locking 4171 or equivalent	as required
Speedometer cable grommet	MOPAR Part No. 4318025 or equivalent	as required

## SPECIAL TOOLS

N21DA--

Tool (Number and name)	Use	Tool (Number and name)	Use
MD998218 Wrench 	Inspection of torque converter	MD998212 Oil pump puller 	Removal of oil pump
MD998219 Stopper 	Inspection of torque converter	MD998335 Oil pump band 	Assembly of oil pump
MD998330 (includes MD998331) Oil pressure gage (3000 kPa) (427 psi) 	Measurement of oil pressure	MD998412 Guide 	Installation of oil pump
MD999563 (includes MD998331) Oil pressure gage (1000 kPa) (142 psi) 	Measurement of oil pressure	MD998217 Gage 	Check of quality of assembly condition
MD998206 Adapter 	Connection of oil pressure gage	MD998207 Spring compressor 	Disassembly and assembly of clutch and brake

Tool (Number and name)	Use	Tool (Number and name)	Use
<p>MD998210 Bolt</p> 	<p>Disassembly and assembly of No. 3 brake spring</p>	<p>MD998353 Torque driver set</p> 	<p>Tightening of valve body screw</p>
<p>MD998211 Retainer</p> 	<p>Disassembly and assembly of No. 3 brake spring</p>		

## TROUBLESHOOTING

N21EBAE

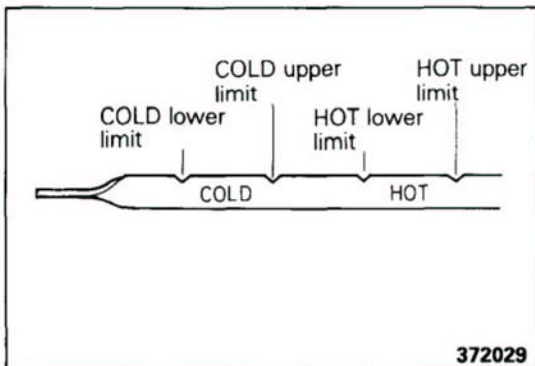
### GENERAL

Automatic transmission malfunctions may be caused by the following conditions:

- (1) Improper maintenance and adjustment
- (2) Mechanical malfunctions
- (3) Hydraulic malfunctions
- (4) Poor engine performance

Troubleshooting in the event of any such malfunctions should begin by checking fluid level, ATF condition, manual linkage adjustment, throttle control cable adjustment and other conditions whose deviation from standards can be readily known.

Then, road test shall be performed to determine whether or not the problem has been corrected or more diagnosis is necessary. If the problem still persists after these tests and corrections, hydraulic tests should be performed for further troubleshooting.



### FLUID LEVEL AND ATF CONDITION

- (1) Place the vehicle on a level surface.
- (2) Before removing the dipstick, wipe all dirt from area around the dipstick.
- (3) With the selector lever in the "P" position and the parking brake applied, start the engine.
- (4) The engine should be running at idle and the transmission should be warmed up sufficiently.
- (5) Move the selector lever through all positions to fill the torque converter and hydraulic circuit with fluid. Then, place the lever in the "N" or "P" position.
- (6) Check to see that the fluid level is within the range between "COLD" upper limit and the "HOT" lower limit on the dipstick. If the fluid level is low, top up until the level rises to within the range between the "HOT" lower and upper limits.

Low fluid level can allow the oil pump to take in air together with fluid, leading to various troubles. Air trapped in hydraulic circuit forms bubbles which make the fluid spongy. This lowers pressure and slows down pressure buildup.

If the transmission has too much fluid, gears churn up foam and cause same conditions as when the fluid level is low, resulting in premature deterioration of ATF. In either case, air bubbles can cause overheating and fluid oxidation and varnishing, which can interfere with normal valve, clutch and servo operation. Foaming can also result in fluid escaping from the transmission vent where it may be mistaken for a fluid leak.

Along with the fluid level, it is equally important to check condition of fluid. When fluid smells burned, it is contaminated with metal bushing or friction material particles and hence a complete overhaul of the transmission is needed. Be sure to examine fluid on the dipstick closely.

After fluid has been checked, insert the dipstick until it is seated fully to seal out water and dirt.

**TORQUE SPECIFICATIONS**

N21CC--

Items	Nm	ft.lbs.
Transmission		
Converter housing installation bolt		
10 mm (.39 in.) dia. bolt	27-42	20-30
12 mm (.47 in.) dia. bolt	48-68	35-49
Oil pump assembly installation bolt	18-25	13-18
Oil pump body and cover-tightening bolt	6-9	4.3-6.5
Center support installation bolt	24-28	17-20
Adapter installation bolt	27-42	20-30
Cover plate installation screw	6-9	4.3-6.5
All bolts of valve body	5-6	3.6-4.3
Throttle cam installation bolt	6-9	4.3-6.5
Valve body assembly installation bolt	8-12	5.8-9
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Parking cam plate installation bolt	6-9	4.3-6.5
Oil pan installation bolt	4-5	2.9-3.6
Union	20-30	14-22
Elbow connector	20-30	14-22
Plug (for hydraulic test)	6-9	4.3-6.5
Oil pan drain plug	18-23	13-17
Overdrive solenoid valve installation bolt	10-16	7-12
Plug	10-16	7-12
Manual lever installation nut	14-18	10-13
Transmission control rod (B) to pin	10-13	7-9
Cross shaft bracket (A) to body	10-13	7-9
Transmission control arm to bracket	18-24	13-17
Transmission oil cooler eye bolts	30-35	22-25
Oil filler tube to transmission	20-27	14-20
Rear propeller shaft to rear differential	50-60	36-43
Front exhaust pipe mounting bolt	20-30	15-22
Bell housing cover to transmission	10-12	7-9
No. 2 crossmember to body	55-75	40-54
Rear engine support member to body	10-13	7-9
No. 2 crossmember to transmission	18-25	13-18
Transmission to starter motor	43-55	31-40
Transmission to engine		
A, B	43-55	31-40
D	20-27	14-20
Torque converter to drive plate	35-42	25-30
Selector handle mounting screw	2	0.4
Transmission oil cooler tube flare nut	40-50	29-36

Items	Nm	ft.lbs.
Transfer		
Transfer case installation bolt	30-42	22-30
Transfer case installation nut	30-42	22-30
Chain cover bolt	31-42	22-30
Side cover bolt	8-10	5.8-7
Rear cover bolt	15-22	11-16
Cover bolt	15-22	11-16
Control housing bolt	15-22	11-16
Oil filler plug	30-35	22-25
Drain plug	30-35	22-25
Select plug	30-35	22-25
Locking plate bolt	15-22	11-16
Rear output shaft lock nut	100-130	72-94
Speedometer sleeve clamp bolt	1.5-2.2	1.1-1.6
Seal plug	30-42	22-30
4WD switch	30	22
Control shaft set screw	8-10	5.8-7
Control lever assembly to control housing	8-10	5.8-7
Front propeller shaft to front differential	50-60	36-43
Transfer mounting bracket to transfer	18-25	13-18
Transfer mounting bracket to pipe	30-42	22-29

**LUBRICANTS**

N21CD--

Items	Specified lubricants	Quantity
Automatic transmission fluid	Automatic transmission fluid "DEXRON II" type	Approx. 7.2 lit. (15.2 U.S. pints, 12.7 Imp. pints)
Transfer oil	Hypoid gear oil API classification GL-4 or higher SAE viscosity No. 80W or 75W-85W	Approx. 2.2 lit. (4.7 U.S. pints, 3.9 Imp. pints)
Propeller shaft oil seal lip	Multipurpose grease SAE J310, NLGI No. 2	Small quantity
Transmission control sliding part	Multipurpose grease SAE J310, NLGI No. 2	Small quantity
Transfer control lever assembly O-ring	Hypoid gear oil API classification GL-4 or higher SAE viscosity No. 80W, 75W-85W	Small quantity




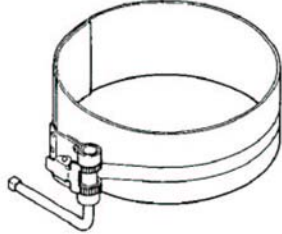

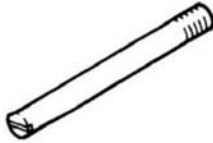


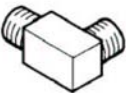
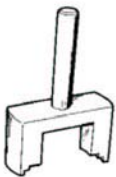
**SEALANTS AND ADHESIVES**

N21CE--


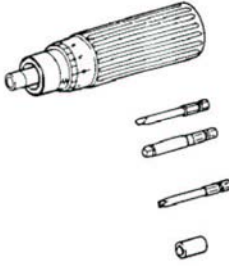

Items	Specified sealants and adhesives	Quantity
Oil pump installation bolt (threads)	SH 780 (TORAY SILICONE)	As required
Adaptor gasket (both sides)	3M ART Part No. 8001 or equivalent	As required
Air breather (press-in circumference)	3M ART Part No. 8001 or equivalent	As required
Chain cover gasket (both sides)	3M ART Part No. 8001 or equivalent	As required
Rear cover gasket (both sides)	3M ART Part No. 8001 or equivalent	As required
Cover gasket (both sides)	3M ART Part No. 8001 or equivalent	As required
Control housing gasket (cover side surface only)	3M ART Part No. 8001 or equivalent	As required
Bolt (threads)	3M Adhesive Nut Locking 4171 or equivalent	As required
Speedometer cable grommet	3M ART Part No. 8001 or 8011, or equivalent	As required

SPECIAL TOOLS

N21DA--

Tool (Number and name)	Use	Tool (Number and name)	Use
MD998218 Wrench  	Inspection of torque converter	MD998212 Oil pump puller  	Removal of oil pump
MD998219 Stopper  	Inspection of torque converter	MD998335 Oil pump band  	Assembly of oil pump
MD998330 (includes MD998331) Oil pressure gage (3000 kPa) (427 psi)  	Measurement of oil pressure	MD998412 Guide  	Installation of oil pump
MD999563 (includes MD998331) Oil pressure gage (1000 kPa) (142 psi)  	Measurement of oil pressure	MD998217 Gage  	Check of quality of assembly condition
MD998206 Adapter  	Connection of oil pressure gage	MD998207 Spring compressor  	Disassembly and assembly of clutch and brake



Tool (Number and name)	Use	Tool (Number and name)	Use
<p>MD998210 Bolt</p> 	<p>Disassembly and assembly of No. 3 brake spring</p>	<p>MD998353 Torque driver set</p> 	<p>Tightening of valve body screw</p>
<p>MD998211 Retainer</p> 	<p>Disassembly and assembly of No. 3 brake spring</p>		

## TROUBLESHOOTING

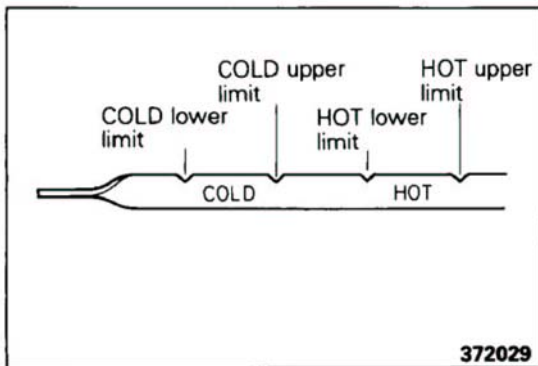
### GENERAL

Automatic transmission malfunctions may be caused by the following conditions:

- (1) Improper maintenance and adjustment
- (2) Mechanical malfunctions
- (3) Hydraulic malfunctions
- (4) Poor engine performance

Troubleshooting in the event of any such malfunctions should begin by checking fluid level, ATF condition, manual linkage adjustment, throttle control cable adjustment and other conditions whose deviation from standards can be readily known.

Then, road test shall be performed to determine whether or not the problem has been corrected or more diagnosis is necessary. If the problem still persists after these tests and corrections, hydraulic tests should be performed for further troubleshooting.



### FLUID LEVEL AND ATF CONDITION

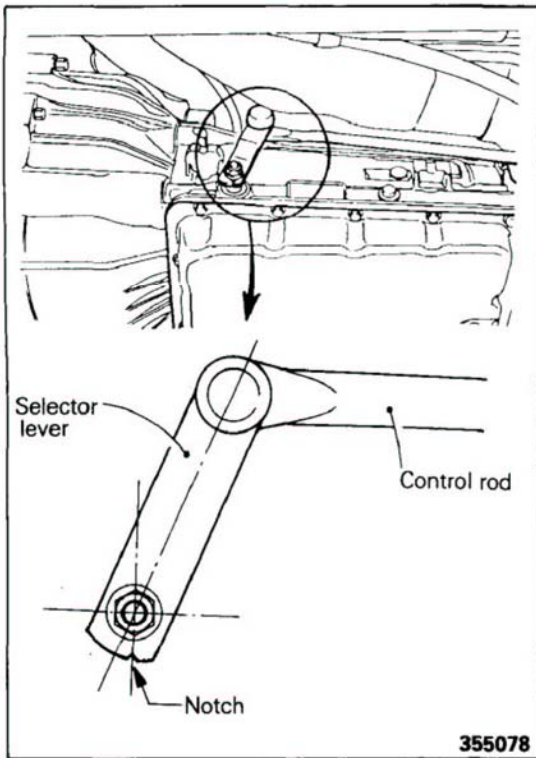
- (1) Place the vehicle on a level surface.
- (2) Before removing the dipstick, wipe all dirt from area around the dipstick.
- (3) With the selector lever in the "P" position and the parking brake applied, start the engine.
- (4) The engine should be running at idle and the transmission should be warmed up sufficiently.
- (5) Move the selector lever through all positions to fill the torque converter and hydraulic circuit with fluid. Then, place the lever in the "N" or "P" position.
- (6) Check to see that the fluid level is within the range between "COLD" upper limit and the "HOT" lower limit on the dipstick. If the fluid level is low, top up until the level rises to within the range between the "HOT" lower and upper limits.

Low fluid level can allow the oil pump to take in air together with fluid, leading to various troubles. Air trapped in hydraulic circuit forms bubbles which make the fluid spongy. This lowers pressure and slows down pressure buildup.

If the transmission has too much fluid, gears churn up foam and cause same conditions as when the fluid level is low, resulting in premature deterioration of ATF. In either case, air bubbles can cause overheating and fluid oxidation and varnishing, which can interfere with normal valve, clutch and servo operation. Foaming can also result in fluid escaping from the transmission vent where it may be mistaken for a fluid leak.

Along with the fluid level, it is equally important to check condition of fluid. When fluid smells burned, it is contaminated with metal bushing or friction material particles and hence a complete overhaul of the transmission is needed. Be sure to examine fluid on the dipstick closely.

After fluid has been checked, insert the dipstick until it is seated fully to seal out water and dirt.



## MANUAL LINKAGE

The inhibitor switch is installed on the selector lever. After checking normal operation of this switch, place the selector lever in the "N" position. If the notch of the selector lever on the transmission side faces directly down, the linkage has been adjusted correctly.

## THROTTLE CONTROL CABLE

Throttle control cable adjustment is very important to assure normal operation of the transmission. Shift speed control, shift feeling and transmission slip depend greatly on this adjustment.

If the throttle outer cable is set too long (namely, the inner cable is too tight), the throttle valve is already in operating state and consequently, presence of hydraulic pressure higher than specified is suspected. The throttle pressure acts on each shift valve and when upshifting, the governor pressure that counteracts against the throttle pressure is higher than normal. Namely, if the outer cable is set too long, upshift takes place at vehicle speed higher than normal.

On the other hand, if the outer cable is set too short (the inner cable is slack), upshift takes at vehicle speed lower than normal.

## INHIBITOR SWITCH

Check to see that the engine starts only when the selector lever is in the "N" or "P" position and that it does not start when the selector lever is in other positions.

## SELECTOR LEVER

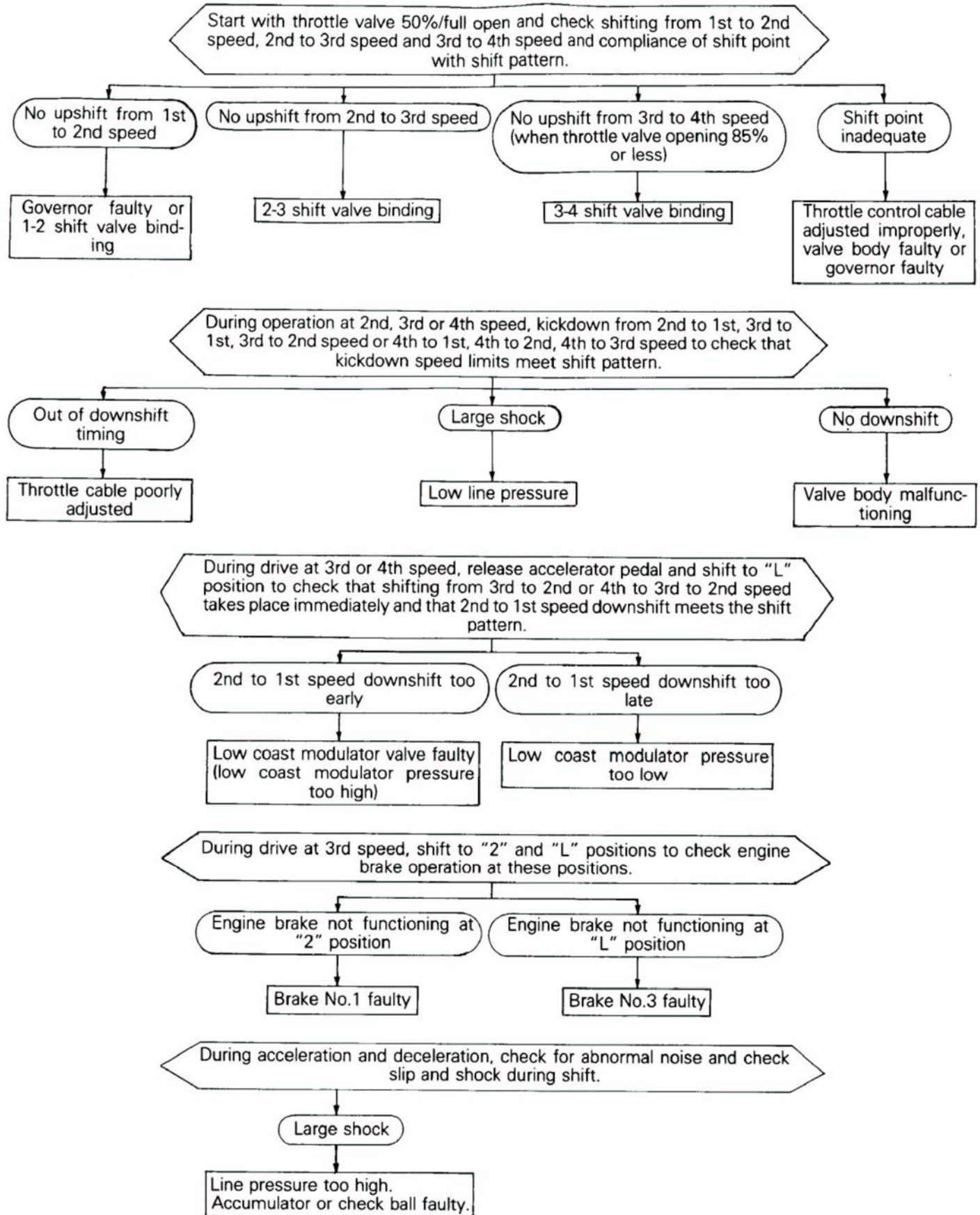
- (1) Check to see that the vehicle moves forward when the selector lever is shifted from the "N" position to the "D" range and that the vehicle reverses when the lever is shifted to the "R" range.
- (2) Stop the engine.
- (3) Shift the selector lever from the "N" position to the "D" range and then to the "2" position to check that the lever can be operated smoothly and engage at each position with reasonable firmness.
- (4) Check to see that shifting to each of the "P", "R", "2" and "L" positions can take place only when the selector lever is pushed in.

## ROAD TEST

Prior to performing road test, be sure to make basic checks including check and adjustment of fluid level and condition and adjustment of the throttle cable. For road test, the transfer must be placed in the 2H (2WD-high) position.

In road test, various changes such as slips in transmission and shifting conditions are checked and hence the transmission operation at each shift position must have been checked.

## "D" RANGE TEST



**NOTE**

Drive at "D" range 3rd speed and check for abnormal noise and vibration. Check carefully as abnormal noise and vibration are sometimes caused by unbalanced propeller shaft, differential, tires, torque converter, engine, etc.

**"2" RANGE TEST**

- (1) Shift to "2" position and start with throttle valve 50%/full open and check if 1st to 2nd speed upshift point at these throttle openings meets the shift pattern.
- (2) Kickdown at 2nd speed in "2" range to check that 2nd to 1st kickdown speed limits meet shift pattern.
- (3) Check for abnormal noise during acceleration/deceleration and check for shock during up/downshift.

**"L" RANGE TEST**

- (1) Drive at the "L" range and check that upshift to 2nd speed does not take place.
- (2) Check for abnormal noise during acceleration/deceleration.

**"R" RANGE TEST**

- (1) Shift to the "R" range and start forward with full throttle to check for slip.
- (2) While the vehicle is running, lightly depress the accelerator pedal to check for slip.

**"P" RANGE TEST**

With the vehicle parked on a slope (about 5 degrees or steeper), shift to the "P" range and release the parking brake to check to see that the parking brake system functions to keep the vehicle stationary.

**CONVERTER STALL TEST**

In this test, the engine maximum speed when the torque converter stalls with the shift lever in the "D" or "R" range is measured to check operation of the torque converter, stator and one-way clutch and check holding performance of the transmission clutch (including brake).

**Caution**

**Do not stand in front or at rear of the vehicle during this test.**

- (1) Check the transmission fluid level. The fluid temperature should be at the level after normal operation [50 to 80°C (120 to 180°F)]. The engine coolant temperature should also be at the level after normal operation [80 to 90°C (180 to 195°F)].
- (2) Apply checks to the rear wheels (right and left).
- (3) Mount an engine tachometer.
- (4) Apply fully the parking and service brakes.
- (5) Start the engine.
- (6) With the selector lever in the "D" range, fully depress the accelerator pedal and read off the engine maximum speed. When doing so, do not keep the engine running with throttle full open for more than necessary duration (8 seconds or more). If two or more stall tests are needed, place the selector lever in the "N" position and run the engine at about 1,000 rpm to allow the transmission fluid to cool before another stall test.

**Standard value : 2100–2400 rpm**

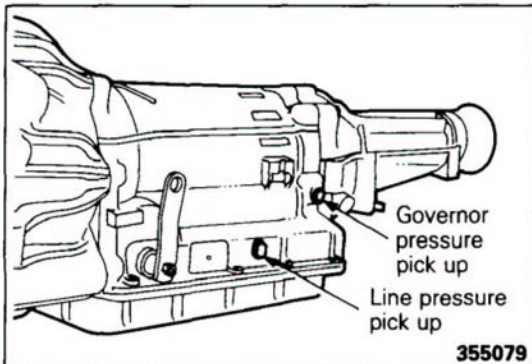
- (7) Place the selector lever in the "R" range and perform the test as above.

**Judgement of Stall Test Results**

Stall speed in "D" and "R" range is equal to each other but lower than the nominal value.	(1) Engine output is low. (2) Stator one-way clutch is faulty. (Faulty torque converter is suspected if it is lower than nominal by more than 600 rpm.)
Stall speed in "D" range is higher than nominal.	(1) O.D. clutch slipping. (2) O.D. one-way clutch faulty (3) Forward clutch slipping (4) One-way clutch No.2 faulty (5) Low line pressure
Stall speed in "R" range is higher than nominal.	(1) O.D. clutch slipping. (2) O.D. one-way clutch faulty (3) Direct clutch slipping (4) Brake No.3 slipping (5) Low line pressure

Hydraulic pressure testing is one of the most important steps in troubleshooting. These tests usually reveal causes of most transmission problems.

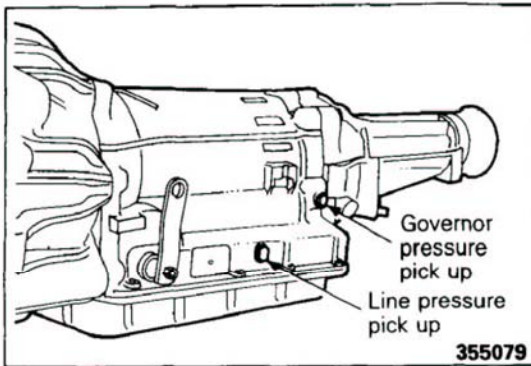
Before performing pressure tests, perform basic checks and adjustment including fluid level and condition check and throttle cable adjustment. Prior to pressure tests, the engine and transmission must have been warmed up enough [engine coolant temperature 80 to 90°C (180 to 195°F)] and the transfer must be at 2H (2WD-High).

**GOVERNOR PRESSURE TEST**

- (1) Place the vehicle on a chassis dynamometer.
- (2) Remove the plug from the governor pressure takeoff port.
- (3) Connect an oil pressure gauge using Adapter MD998206 (special tool) and bring the gauge into the inside of the vehicle.
- (4) Apply the parking brake.
- (5) Start the engine.
- (6) Release the parking brake.
- (7) Place the selector lever in the "D" range and measure the governor pressure.

If the governor pressure is not nominal, incorrect line pressure, oil leaks from the governor pressure circuit or faulty governor is suspected.

Output shaft speed	Governor pressure
1000 rpm	138–166 kPa (20–24 psi)
2000 rpm	246–284 kPa (36–41 psi)
3200 rpm	402–460 kPa (59–66 psi)



**LINE PRESSURE TEST**

- (1) Place the vehicle on a chassis dynamometer.
- (2) Remove the plug from the line pressure takeoff port.
- (3) Connect an oil pressure gauge using Adapter MD998206 (special tool) and bring the gauge into the inside of the vehicle.
- (4) Apply the parking brake.
- (5) Start the engine.
- (6) Place the selector lever in the "D" range.
- (7) Depress the brake pedal firmly by the left foot and operates the accelerator pedal by the right foot to measure the line pressure at each engine rpm. If the measured pressure is not nominal, check adjustment of the throttle cable and readjust if necessary before conducting the test again.
- (8) Place the selector lever in the "R" range and test as above.

Standard value	Line pressure	
	"D" range	"R" range
At idle	452–529 kPa 66–76 psi	687–804 kPa 100–116 psi
At stall	991–1166 kPa 144–169 psi	1471–1863 kPa 214–270 psi

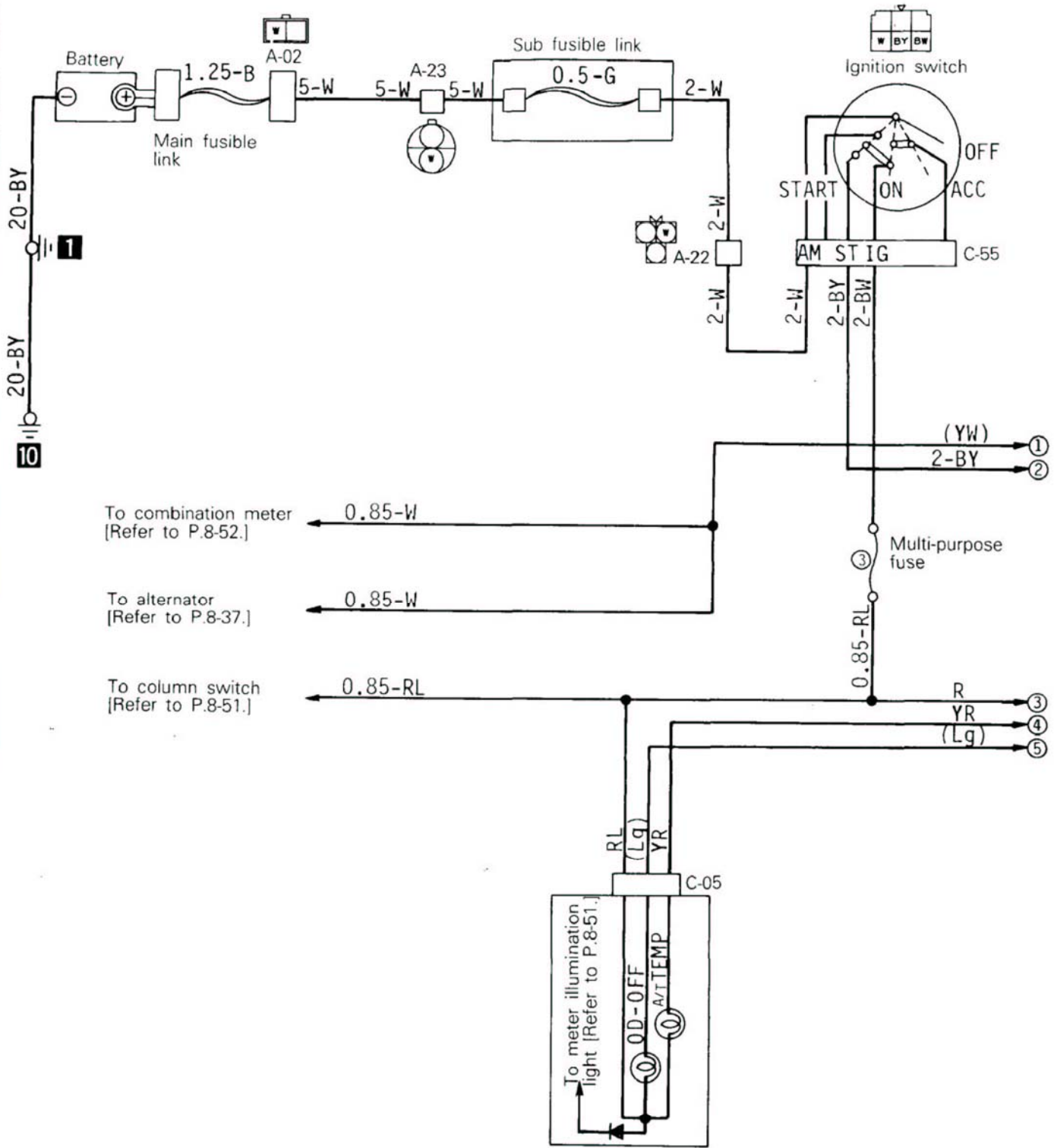
**Judgement by Line Pressure**

Hydraulic pressure higher than nominal in all ranges	(1) Regulator valve faulty (2) Throttle valve faulty (3) Throttle control cable incorrectly adjusted
Hydraulic pressure lower than nominal in all ranges	(1) Oil pump faulty (2) Regulator valve faulty (3) Throttle valve faulty (4) Throttle control cable incorrectly adjusted (5) O.D. clutch faulty
Hydraulic pressure lower than nominal in "D" range	(1) Large fluid leaks in "D" range hydraulic circuit (2) Forward clutch faulty (3) O.D. clutch faulty
Hydraulic pressure lower than nominal in "R" range	(1) Large fluid leaks in "R" range hydraulic circuit (2) Brake No.3 faulty (3) Direct clutch faulty (4) O.D. clutch faulty

CIRCUIT DIAGRAMS

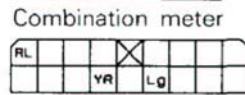
N21EC--

OVERDRIVE CONTROL SYSTEM CIRCUIT

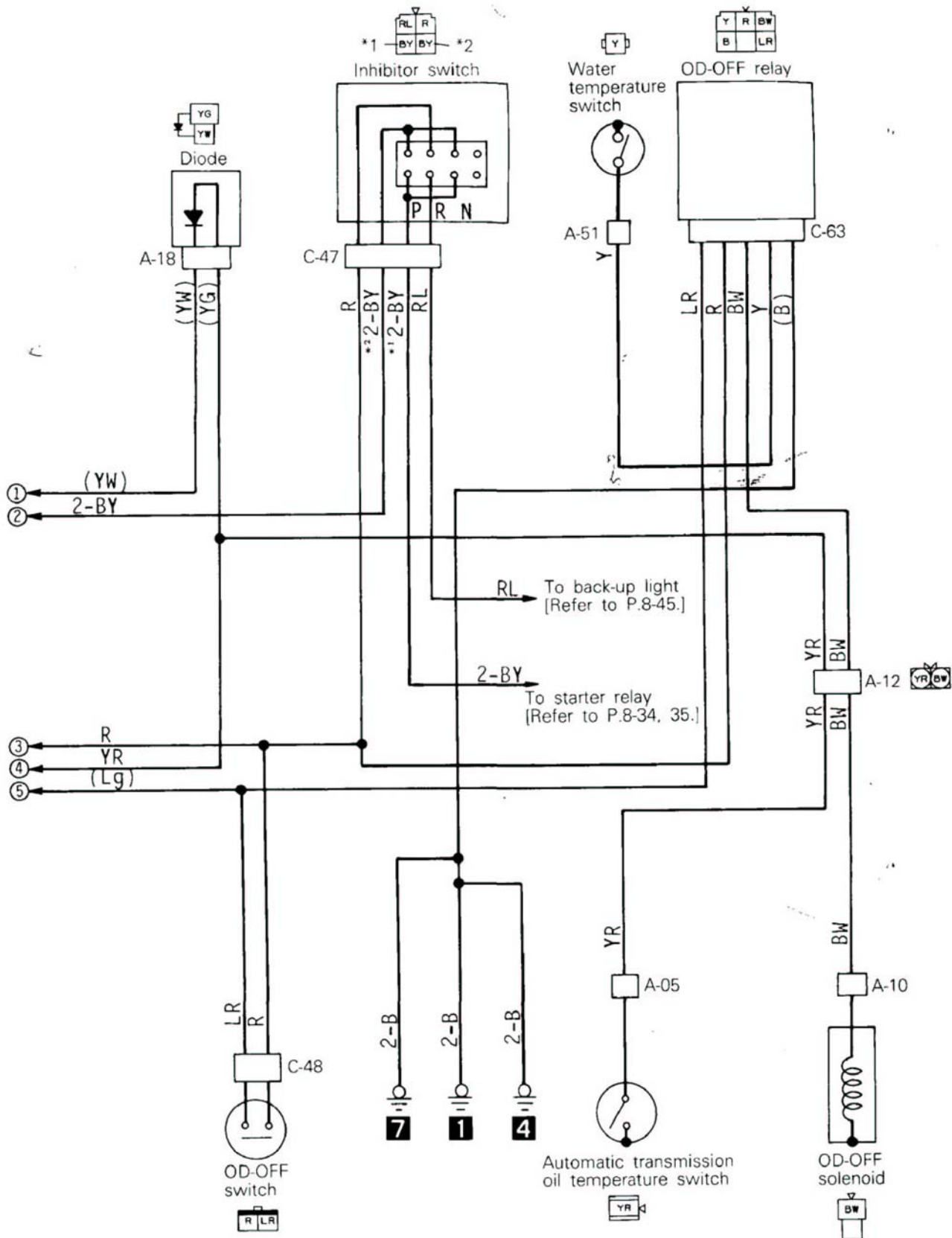


Remarks

- (1) For information concerning the ground points (example: **1**), refer to P.8-7.
- (2) The symbols ①, ②, etc. indicate that the wiring is connected (using the same numerical symbol) to the facing page.  
(In other words, ① on the right page is connected to ① on the left page.)





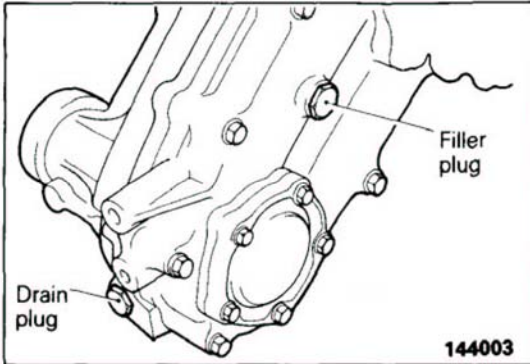


Wiring color code  
 B: Black Br: Brown G: Green Gr: Gray L: Blue Lg: Light green  
 Ll: Light blue O: Orange P: Pink R: Red Y: Yellow W: White

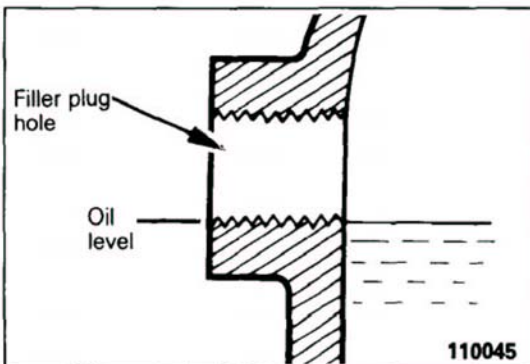
37W619

**SERVICE ADJUSTMENT PROCEDURES**  
N21FA--  
**CHECKING TRANSMISSION FLUID LEVEL AND CHANGING FLUID**

- (1) Check the fluid level (automatic transmission and transfer case) every year or after 20,000 km (12,500 miles) of operation.
- (2) For the checking procedures of automatic transmission fluid (ATF), see following.



- (3) Check the transfer case oil level with the filler plug removed.



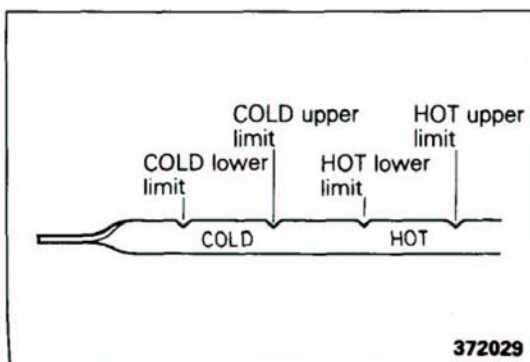
- (4) The fluid level is okay if it is at the same level as the lowest point of the filler plug hole.

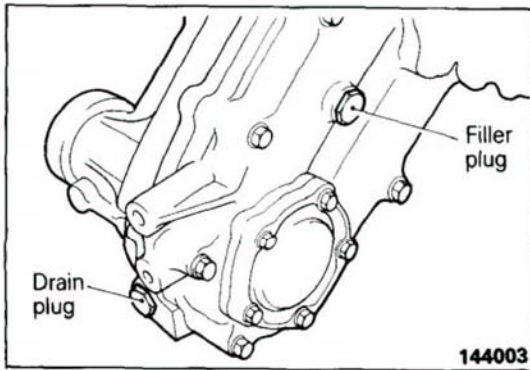
**ATF CHANGING PROCEDURES**

**Caution**

**If ATF change is required due to damage to the transmission, be sure to clean the cooler system.**

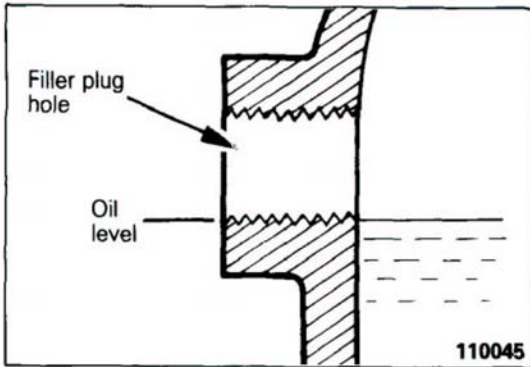
- (1) Raise the vehicle on hoist. Place a drain container with large opening under the drain plug (located in bottom of the oil pan).
- (2) Remove the drain plug to let ATF drain
- (3) Refit the drain plug and gasket.
- (4) Pour ATF through the oil level gauge hole until its level reaches the COLD lower limit of the level gauge.
- (5) Start the engine and allow to idle for at least two minutes. Then, with the parking brake and service brake applied, move the selector lever through all positions and finally place in the "N" or "P" position.
- (6) After the transmission is warmed up to the normal operating temperature, recheck the fluid level, which must be between the HOT upper limit and HOT lower limit marks.
- (7) Insert the dipstick fully to prevent dirt from entering the transmission.



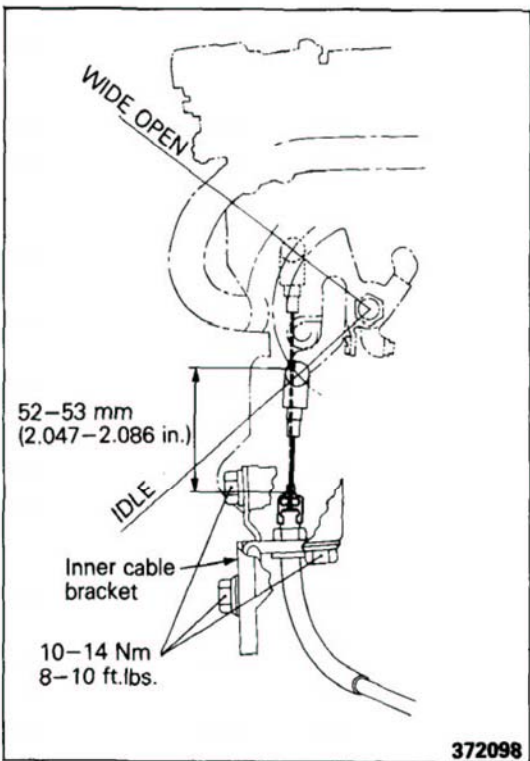


**TRANSFER CASE OIL CHANGING PROCEDURES**

- (1) Remove the filler plug.
- (2) Place a drain container with large opening under the drain plug.
- (3) Remove the drain plug to let oil drain.
- (4) Refit the drain plug and gasket.



- (5) Pour specified transfer case oil up to specified level.
- (6) Refit the filler plug and gasket.



**ADJUSTMENT OF THE THROTTLE CONTROL CABLE**

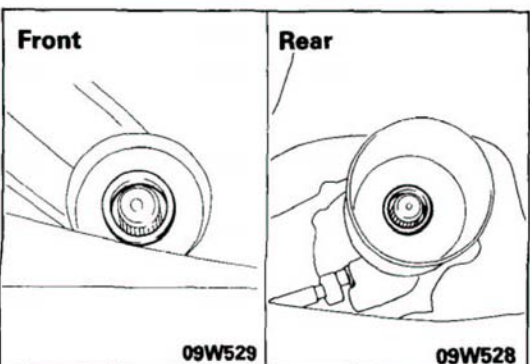
- (1) Check the engine idle adjustment. If necessary, readjust.

**Caution**

**When engine adjustment (idle adjustment) has been performed, always adjust the throttle control cable.**

- (2) Make sure that no bending or deformation exists on the carburetor throttle lever and throttle cable bracket.
- (3) Measure the length between the inner cable stopper and the cover end with the carburetor throttle valve full open. If it does not satisfy the standard value, adjust the inner cable bracket moving upward or downward.

**Standard value: 52-53 mm (2.047-2.086 in.)**



**REPLACEMENT OF THE PROPELLER SHAFT OIL SEALS**

N21FGAB1

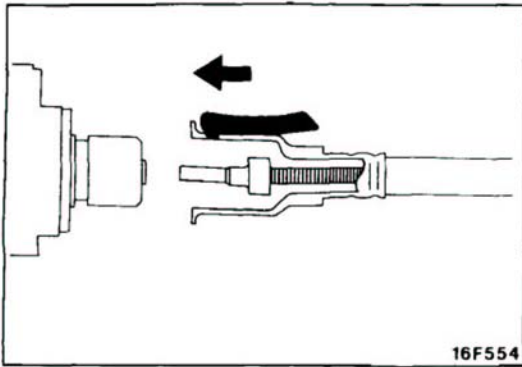
- (1) Using a screwdriver or a similar tool, remove the oil seals.
- (2) Install the oil seals.

**Caution**

**Use a new oil seal.**

- (3) Apply a coating of the specified grease to the lip of the oil seals.

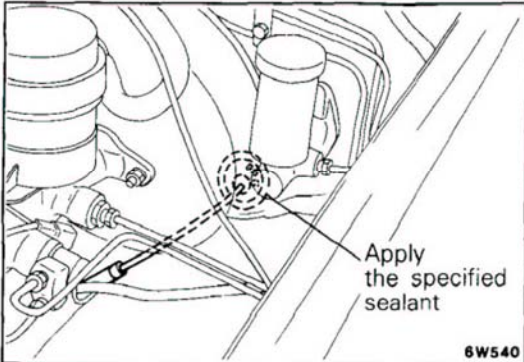
**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**



### REPLACEMENT OF THE SPEEDOMETER CABLE

N21FEAD

- (1) Replace the cable assembly if there is a malfunction.
- (2) When connecting the cable to the meter, insert the cable until its stopper properly fits to the meterside groove.



- (3) After installing the speedometer, pull the speedometer cable through the grommet in the toe-board until the cable marking is visible from the engine compartment side.
- (4) Apply the specified sealant to the outside surface of the grommet.

**Specified sealant : 3M ART Part No. 8001 or 8011, or equivalent**

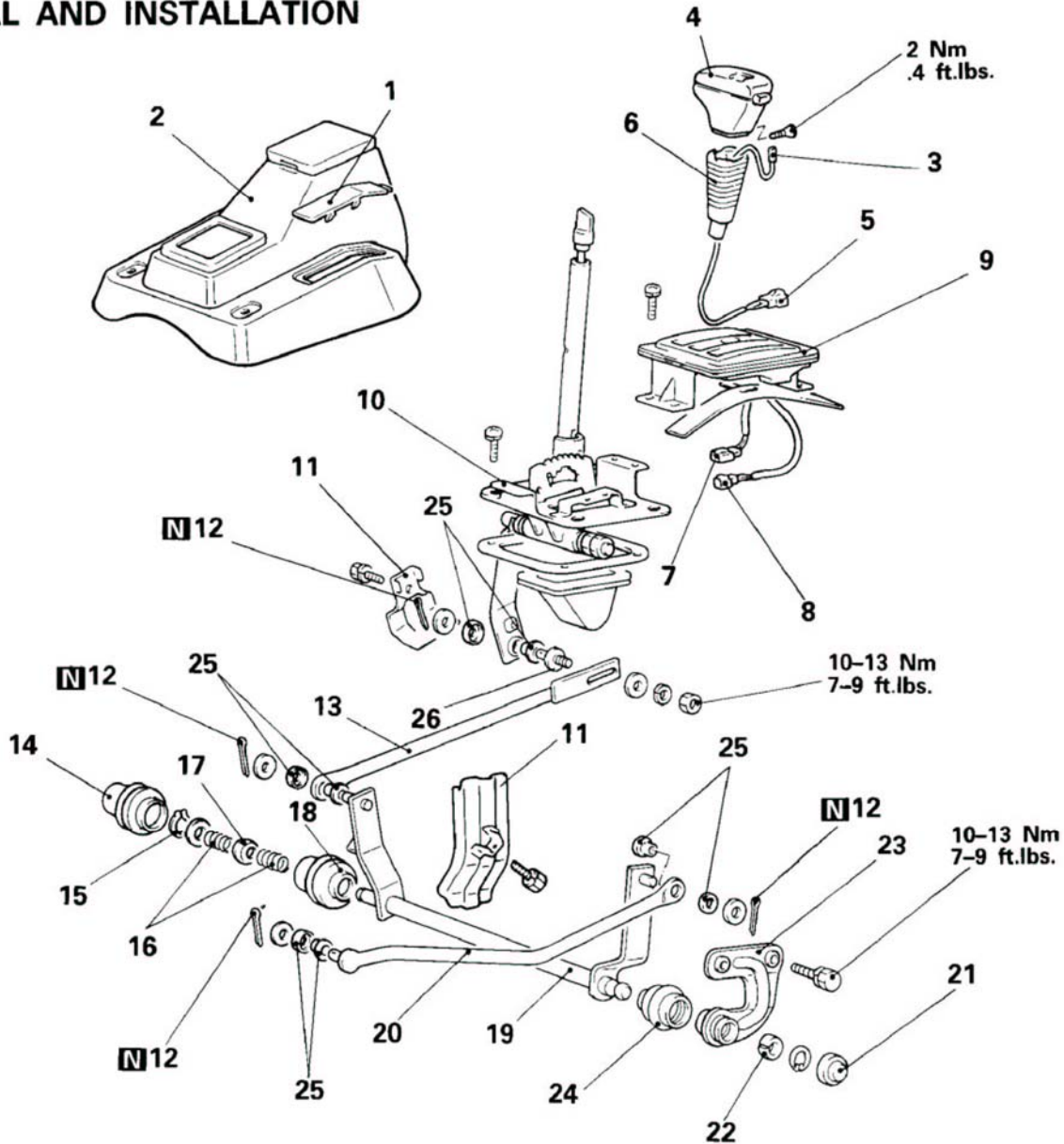
- (5) Securely clamp the transmission side marking (L.H. drive vehicles; green, R.H. drive vehicles; yellow) of speedometer cable to the frame side clip.

#### Caution

**Poor installation of the cable may cause a fluctuating meter pointer, or noise and a damaged harness inside the instrument panel.**

# TRANSMISSION CONTROL REMOVAL AND INSTALLATION

N21A--

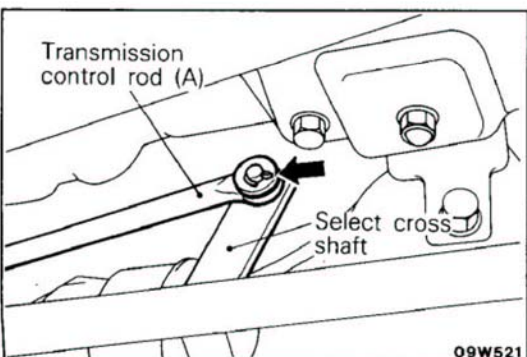
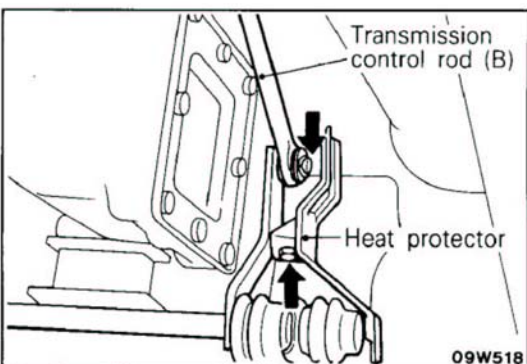
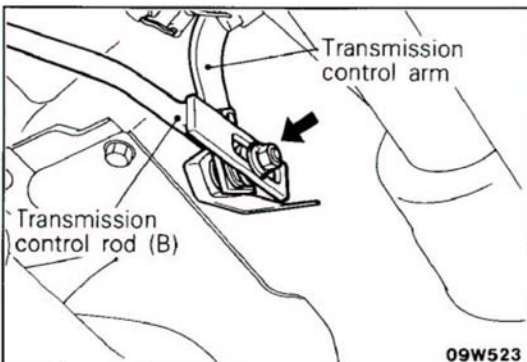
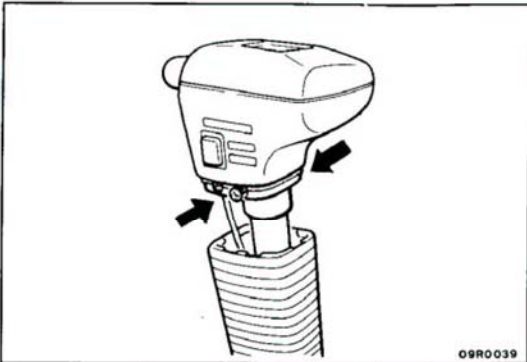
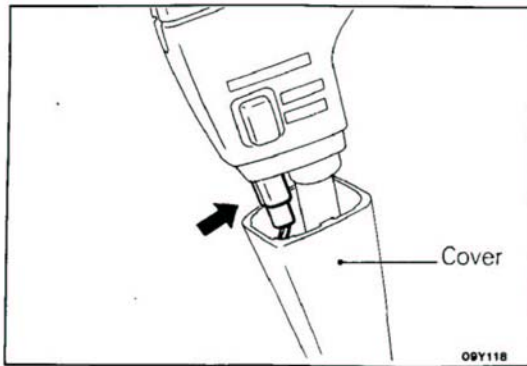


**Removal steps**

- |   |  |
|---|--|
| 1. Plate B  | 15. Snap ring                          |
| 2. Floor console  | ◆◆ 16. Spring                          |
| 3. Overdrive switch connection                                  | ◆◆ 17. Cross shaft bushing             |
| ◆◆ 4. Selector handle   | ◆◆ 18. Cross shaft boot (B)            |
| 5. Overdrive switch harness and front wiring harness connection | ◆◆ ◆◆ 19. Select cross shaft           |
| 6. Cover  | ◆◆ ◆◆ 20. Transmission control rod (A) |
| 7. Inhibitor switch and front wiring harness connection         | ◆◆ ◆◆ 21. Cap                          |
| 8. Position indicator light and front wiring harness connection | ◆◆ 22. Bushing                         |
| 9. Indicator panel  | ◆◆ 23. Cross shaft bracket (A)         |
| 10. Bracket assembly  | ◆◆ 24. Cross shaft boot                |
| 11. Heat protector  | ◆◆ 25. Bushing                         |
| 12. Cotter pin  | ◆◆ 26. Pin                             |
| ◆◆ ◆◆ 13. Transmission control rod (B)                          |  |
| 14. Dust cover  |  |

**NOTE**  
 (1) Reverse the removal procedures to reinstall.  
 (2) ◆◆ : Refer to "Service Points of Removal".  
 (3) ◆◆◆◆ : Refer to "Service Points of Installation".  
 (4) **N** : Non-reusable parts

09W542

**SERVICE POINTS OF REMOVAL****4. REMOVAL OF SELECTOR HANDLE**

- (1) Press the cover downward.
- (2) Disconnect the overdrive switch connector from the selector handle.

- (3) Remove the selector handle from the shift lever.

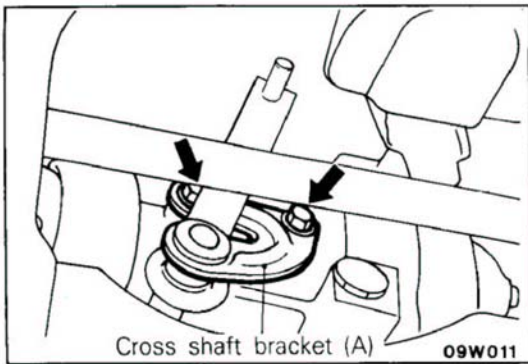
**13. DISCONNECTION OF TRANSMISSION CONTROL ROD (B)**

- (1) Disconnect the transmission control rod (B) from the transmission control arm by loosening the nut from under the floor.

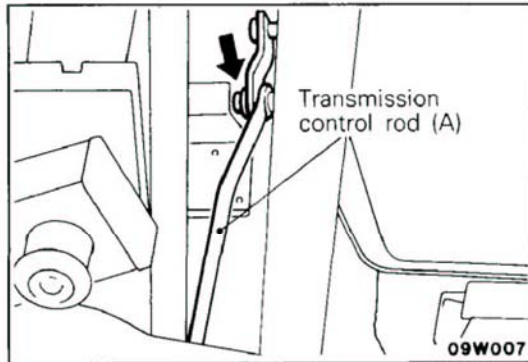
- (2) Disconnect the select cross shaft from the heat protector.
- (3) Disconnect the select cross shaft from transmission control rod B.

**19. REMOVAL OF SELECT CROSS SHAFT/20. TRANSMISSION CONTROL ROD (A)**

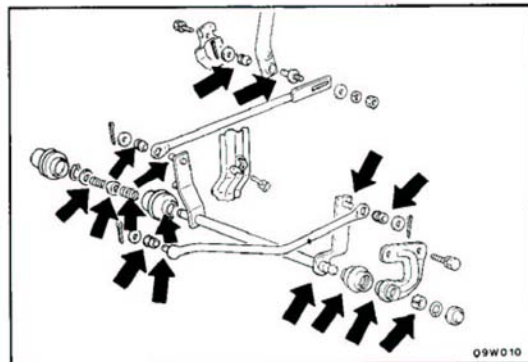
- (1) Disconnect the select cross shaft from transmission control rod A.



- (2) Remove the dust cover, and then remove the snap ring that holds the spring.
- (3) Remove the cross shaft bracket mounting bolts from the transfer assembly.
- (4) Detach the cross shaft bracket from the bracket on the No. 1 crossmember side.



- (5) Remove transmission control rod A from the transmission.



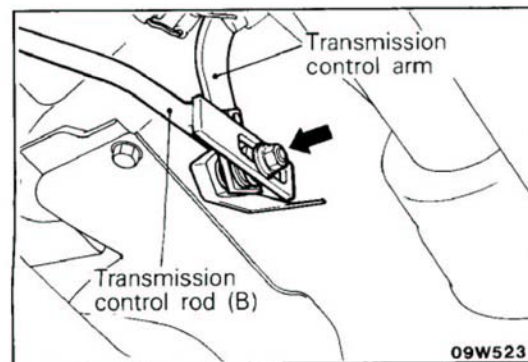
**SERVICE POINTS OF INSTALLATION**

N21DAH

- 26. APPLICATION OF GREASE TO PIN/25. BUSHING/24. CROSS SHAFT BOOT/23. CROSS SHAFT BRACKET (A)/22. BUSHING/20. TRANSMISSION CONTROL ROD (A)/19. SELECT CROSS SHAFT/18. CROSS SHAFT BOOT (B)/17. CROSS SHAFT BUSHING/16. SPRING**

Apply a coating of the specified grease to the bushing inner surface and the sliding parts shown in the figure.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

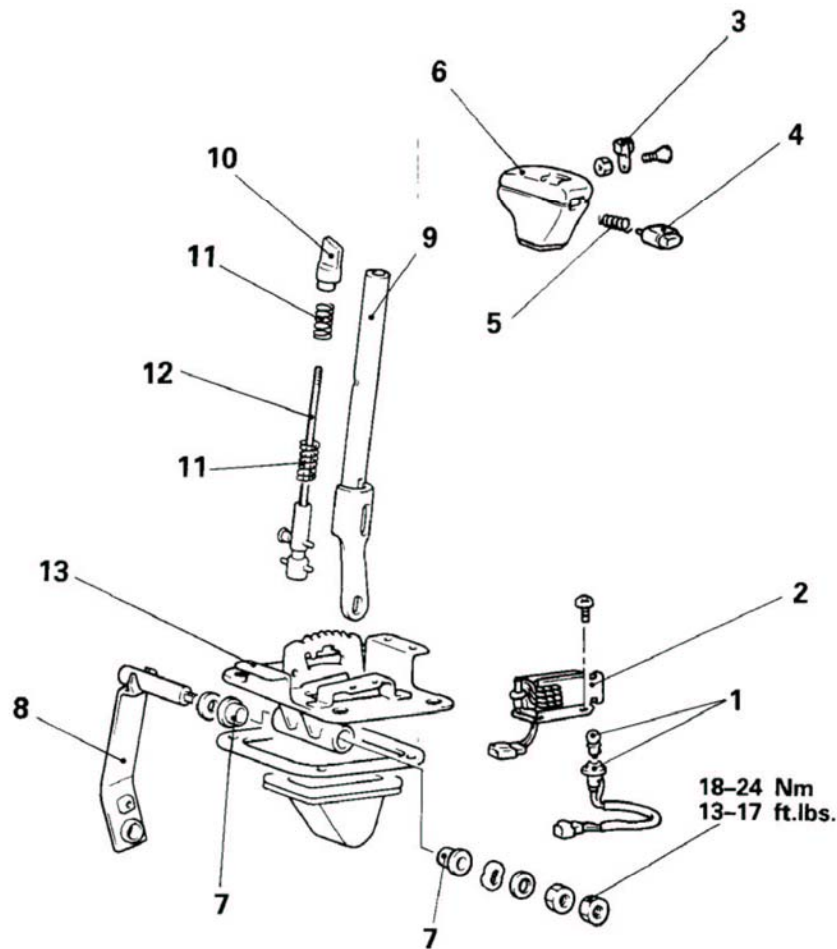


**13. INSTALLATION OF TRANSMISSION CONTROL ROD (B)**

- (1) Move the transmission and shift lever to the "N" position, and then install the transmission control arm and transmission control rod (B) as shown in the figure.
- (2) Check, while driving, to be sure that the transmission is set to each range when the selector lever is shifted to each position.
- (3) Check, while driving, to be sure that the overdrive is activated and cancelled correctly when the overdrive switch is used.

## DISASSEMBLY AND REASSEMBLY

N211E--



09W543

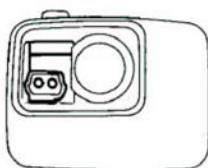
## Removal steps

- |                                |                     |
|--------------------------------|---------------------|
| ◆◆ 1. Position indicator light | 9. Shift lever      |
| ◆◆ 2. Inhibitor switch         | ◆◆ 10. Sleeve       |
| ◆◆ 3. Overdrive switch         | ◆◆ 11. Spring       |
| ◆◆ 4. Pushbutton               | ◆◆ 12. Rod assembly |
| ◆◆ 5. Spring                   | ◆◆ 13. Bracket      |
| ◆◆ 6. Selector handle          |                     |
| ◆◆ 7. Bushings                 |                     |
| ◆◆ 8. Transmission control arm |                     |

## NOTE

- (1) Reverse the disassembly procedures to reassemble.  
 (2) ◆◆ : Refer to "Service Points of Reassembly".

Overdrive switch



09Y115

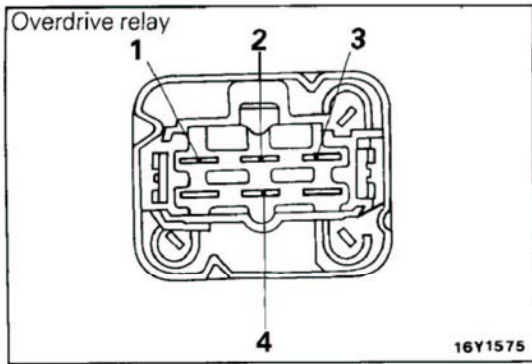
## INSPECTION

N211GAA

- Check for unusual wear of the bracket's detent plate part.
- Check for unusual wear of the rod end pin.
- Check for unusual wear of the pushbutton and sleeve contact surface.
- Check for unusual wear of each bushing.
- Check for weakness of the spring.
- Check the operation of the overdrive switch. (Check the continuity.)

When the overdrive switch is OFF: continuity  
 When the overdrive switch is ON: non-continuity

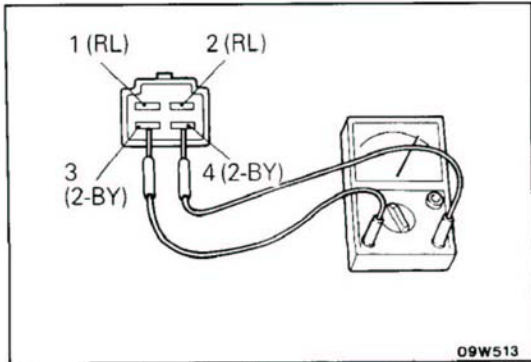




**Overdrive relay**

Check the continuity between terminals during no current flow and during current flow.

During no current flow	Between terminals 1 and 3	Continuity
	Between terminals 2 and 4	Continuity
During current flow (between terminals 2 and 4)	Between terminals 1 and 3	Non-continuity



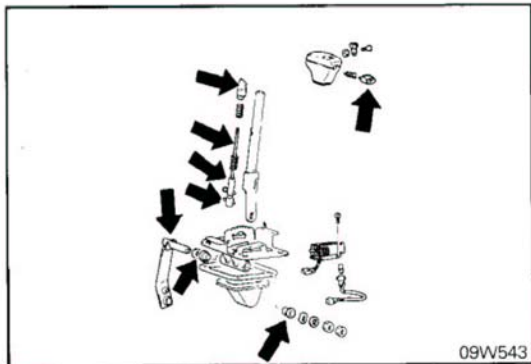
**Inhibitor switch**

Check the continuity with the select lever at each position.

Select lever position \ Terminals	1	2	3	4
P			○—○	
R	○—○			
N			○—○	

**NOTE**

○—○ indicates that there is continuity between the terminals.



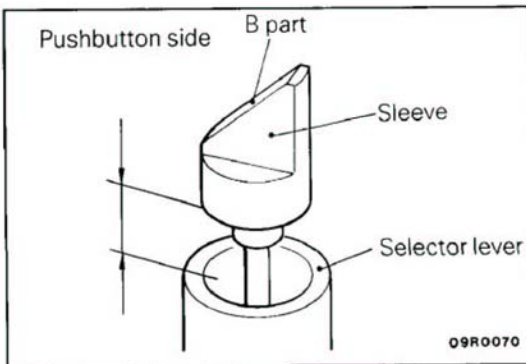
**SERVICE POINTS OF REASSEMBLY**

N21HAB

**12. APPLICATION OF GREASE TO ROD ASSEMBLY/11. SPRING/10. SLEEVE/8. TRANSMISSION CONTROL ARM/7. BUSHINGS/4. PUSHBUTTON**

Apply the specified grease to each sliding part of the lever.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**



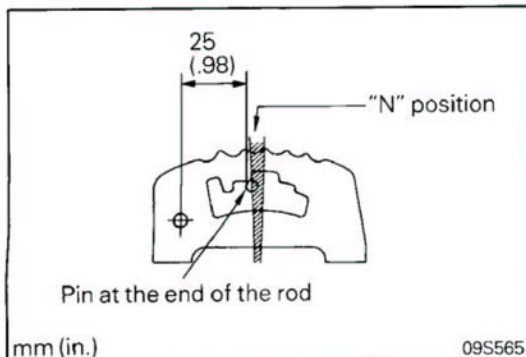
**10. INSTALLATION OF SLEEVE**

Move the selector lever to the "N" position, and turn the sleeve so that the angled surface of the sleeve is at the pushbutton side. At this time, adjust the clearance between the sleeve and the selector lever so that it is the standard value.

**Standard value : 15.2–15.9 mm (.60–.62 in.)**

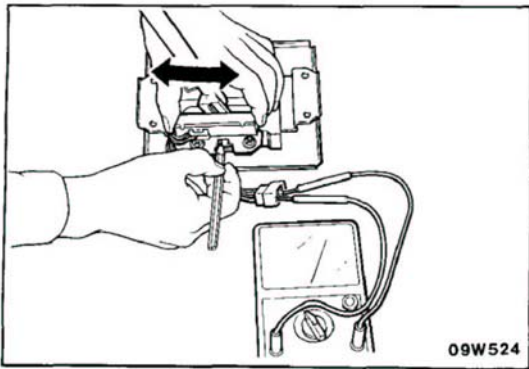
**NOTE**

Move the B part of the sleeve to the pushbutton side (driver's seat side).

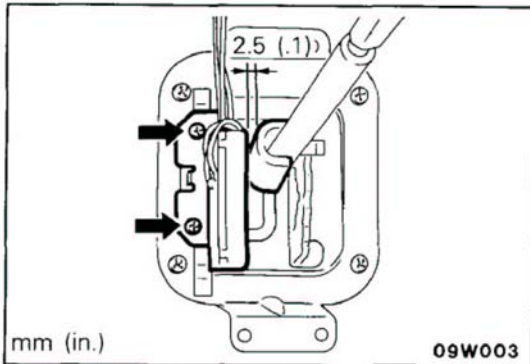


**2. INSTALLATION OF INHIBITOR SWITCH**

- (1) Temporarily install the inhibitor switch.
- (2) Set the shift lever so that the pin at the end of the rod is at the position shown in the figure.



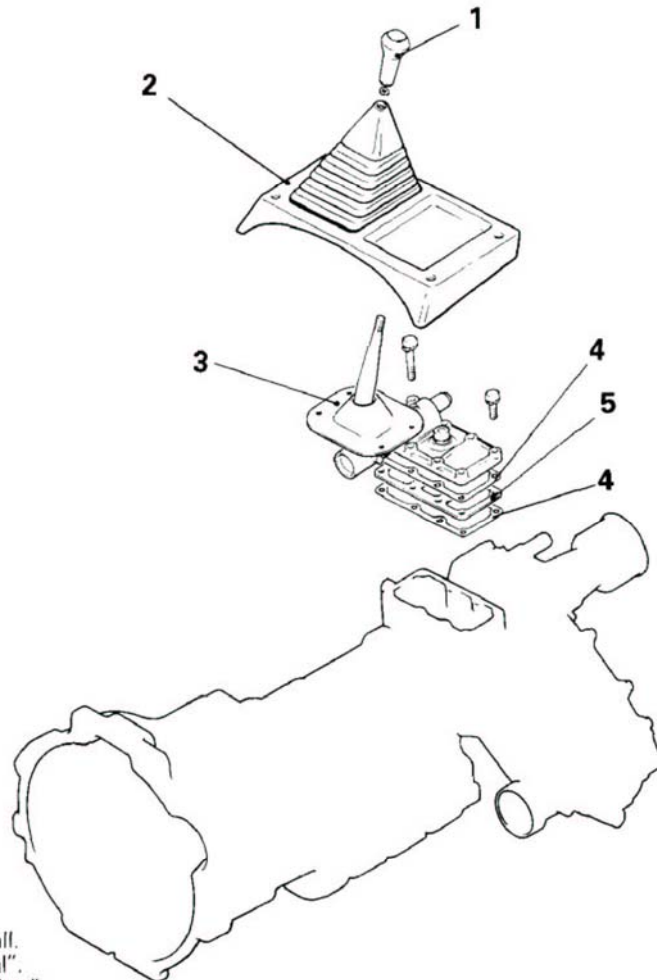
- (3) Using a circuit tester between 2-BY and 2-BY of the inhibitor switch connector, check the continuity when the inhibitor switch is moved back and forth, and mark the bracket.



- (4) Tighten the inhibitor switch mounting screws at the position where the clearance between the inhibitor switch and the selector lever is the specified distance.

**TRANSFER CONTROL  
REMOVAL AND INSTALLATION**

N21KA--



**Removal steps**

- 1. Transfer shift lever knob
- 2. Front floor console
- ◄◄ 3. Control lever assembly
- ◄◄ 4. Control housing gasket
- ◄◄ 5. Control housing cover

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◄◄ : Refer to "Service Points of Removal".
- (3) ◄◄ : Refer to "Service Points of Installation".

09W548

**SERVICE POINTS OF REMOVAL**

N21KBAA

**3. REMOVAL OF CONTROL LEVER ASSEMBLY**

Move the control lever to the "2H" position and remove the control lever assembly.

**SERVICE POINTS OF INSTALLATION**

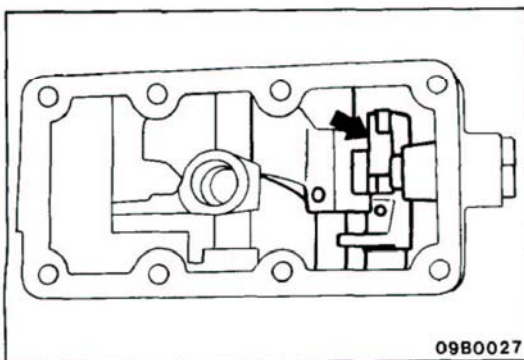
N21KDAA

**4. APPLICATION OF SEALANT TO CONTROL HOUSING GASKET**

Apply semi-drying sealant to both surfaces of the control housing gasket.

**3. INSTALLATION OF CONTROL LEVER ASSEMBLY**

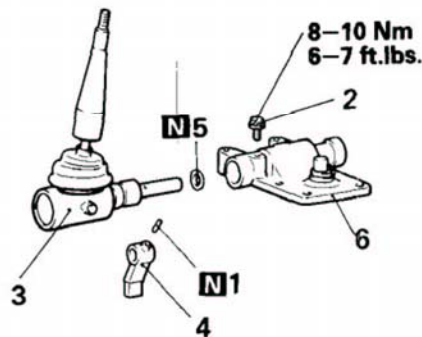
Check to be sure that the control lever assembly installation (transmission side) part is at the position shown in the illustration.



09B0027

## DISASSEMBLY AND REASSEMBLY

N21KE--



## Disassembly steps

- ◆◆ 1. Spring pin
- ◆◆ 2. Set screw
3. Control lever assembly
4. Control finger
5. O-ring
6. Control housing

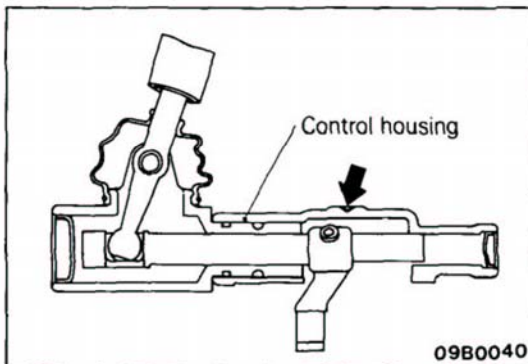
## Reassembly steps

3. Control lever assembly
- ◆◆ 5. O-ring
6. Control housing
4. Control finger
- ◆◆ 1. Spring pin
2. Set screw

## NOTE

- (1) ◆◆ : Refer to "Service Points of Disassembly".  
 (2) ◆◆ : Refer to "Service Points of Reassembly".  
 (3) N : Non-reusable parts

09B0045



## SERVICE POINTS OF DISASSEMBLY

N21KFAA

## 1. REMOVAL OF SPRING PIN

- (1) Drill 12 mm (.47 in.) diameter hole in the center of the boss 16 mm (.63 in.) diameter on the control housing not to damage the control finger and control lever assembly.
- (2) Draw out the spring pin using a punch.

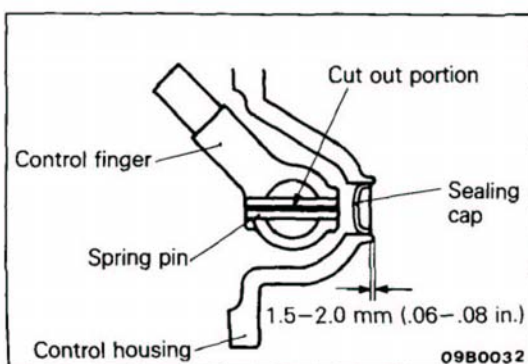
## SERVICE POINTS OF REASSEMBLY

N21KHAA

## 5. APPLICATION OF LUBRICANT TO O-RING

Install the O-ring to the control lever assembly and apply a small amount of the specified oil on the O-ring.

**Specified oil : Hypoid Gear Oil API Classification GL-4 or higher SAE viscosity No. 80W, 75W-85W**



## 1. INSTALLATION OF SPRING PIN

- (1) Drive the spring pin using a punch so that the cut out portion of the spring pin is in the axial direction of the control lever assembly.
- (2) Apply the sealant in the inner surface of the worked hole and drive the sealing cap up to the dimension shown in the figure.

# TRANSMISSION OIL COOLER

## REMOVAL AND INSTALLATION

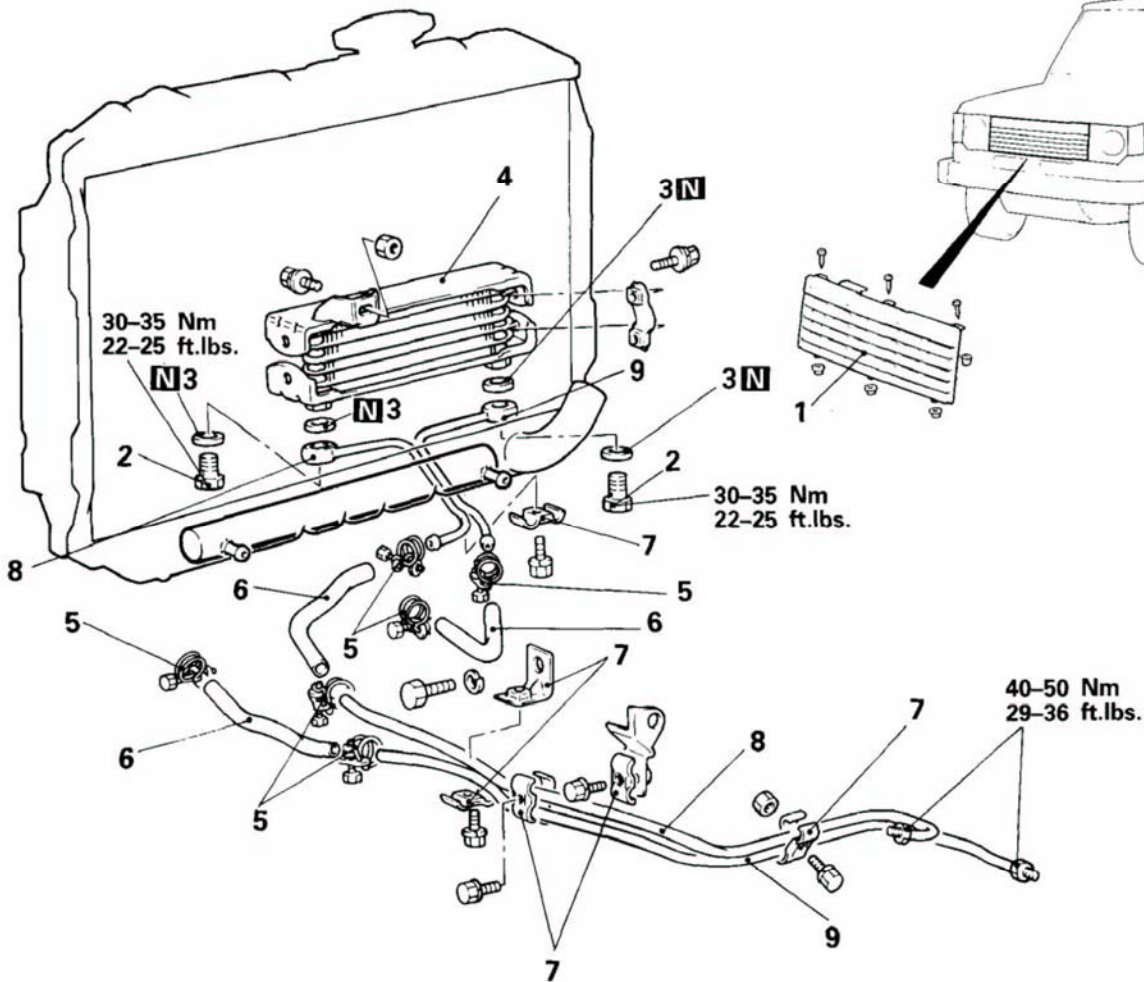
N21SA--

### Pre-removal Operation

- Removal of Under Cover and Under Skid Plate (Refer to GROUP 23 BODY-Under Guard)
- Bleeding of the automatic transmission fluid. (Refer to GROUP 0 LUBRICATION AND MAINTENANCE-Maintenance Service)

### Post-installation Operation

- Installation of Under Cover and Under Skid Plate (Refer to GROUP 23 BODY-Under Guard)
- Supplying of Automatic Transmission Fluid. (Refer to GROUP 0 LUBRICATION AND MAINTENANCE-Maintenance Service)

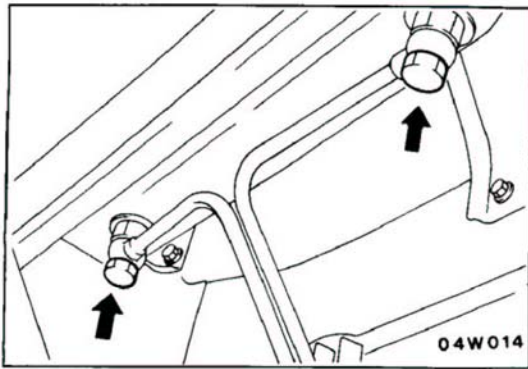


### Removal steps

- 1. Radiator grille
- ↔ 2. Eye bolts
- 3. Gaskets
- 4. Oil cooler assembly
- 5. Hose clamp
- 6. Hose
- 7. Oil cooler tube clamp
- ↔ 8. Feed tube
- ↔ 9. Return tube

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ↔ : Refer to "Service Points of Removal".
- (3) ↔ : Refer to "Service Points of Installation".
- (4) N : Non-reusable parts



## SERVICE POINTS OF REMOVAL

N21SBAB

### 2. REMOVAL OF EYE BOLTS

Remove the eye bolts and disconnect the oil cooler tubes from the oil cooler.

#### Caution

Loosen the eye bolts while tightening the weld nut of the oil cooler.

## INSPECTION

N21SCAD

- Check the oil cooler fins for bend, damage and foreign matters caught between fins.
- Check the oil cooler tubes for crack, damage, clogging and deterioration.
- Check the gaskets for damage and deformation.
- Check the eye bolts for clogging and deformation.

## SERVICE POINTS OF INSTALLATION

N21SDAA

### 9. INSTALLATION OF RETURN TUBE/8. FEED TUBE

For installation of the feed tube and return tube to the transmission, first loosely tighten each coupling and clamp, and then make the final tightening in sequence from the feed tube and return tube coupling.

**TRANSMISSION AND TRANSFER ASSEMBLY**

**REMOVAL AND INSTALLATION**

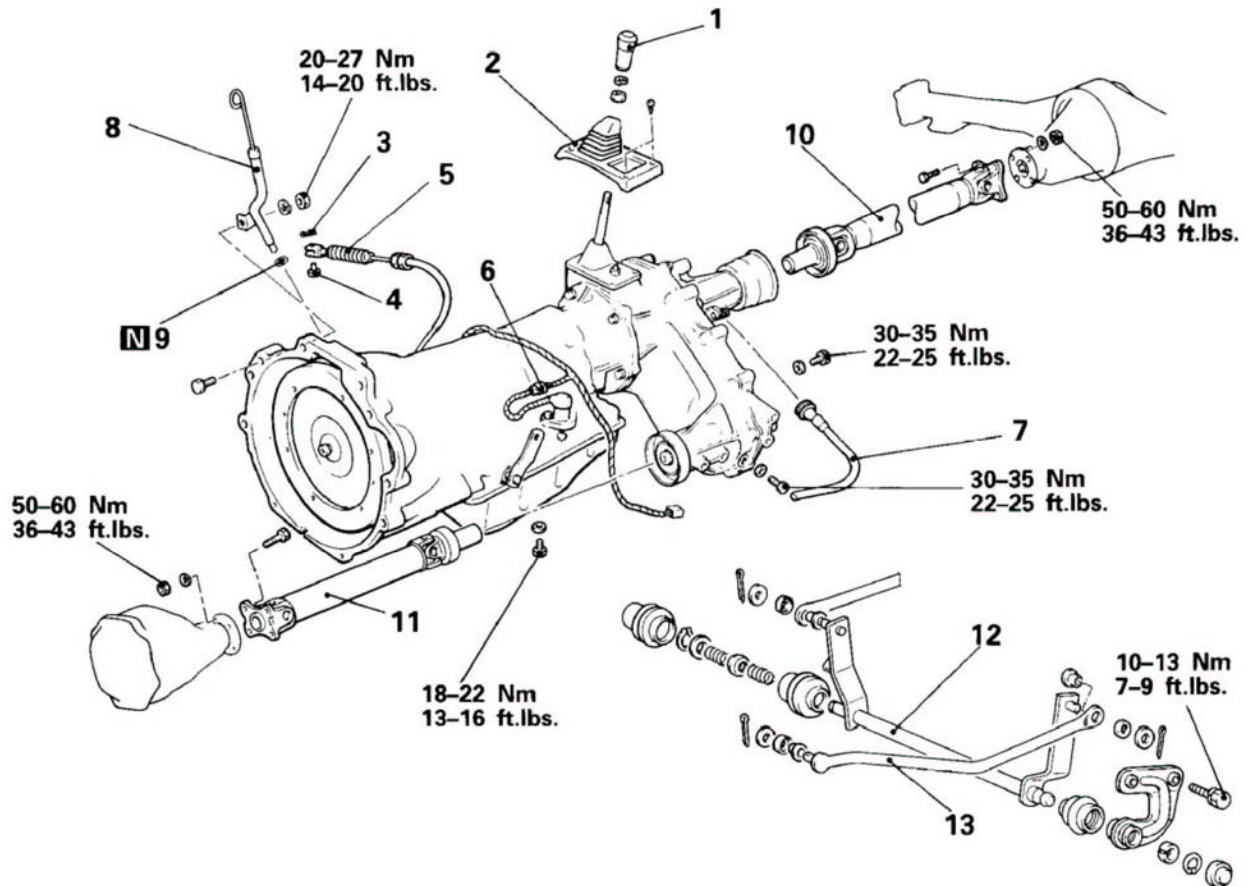
N21LA--

**Pre-removal Operation**

- Removal of Cross Shaft Protector
- Removal of Transfer Case Protector
- Bleeding of Automatic Transmission Fluid and Transfer Oil (Refer to GROUP 0 LUBRICATION AND MAINTENANCE-Maintenance Service)

**Post-installation Operation**

- Installation of Cross Shaft Protector
- Installation of Transfer Case Protector
- Supplying of Automatic Transmission Fluid and Transfer Oil (Refer to GROUP 0 LUBRICATION AND MAINTENANCE-Maintenance Service)

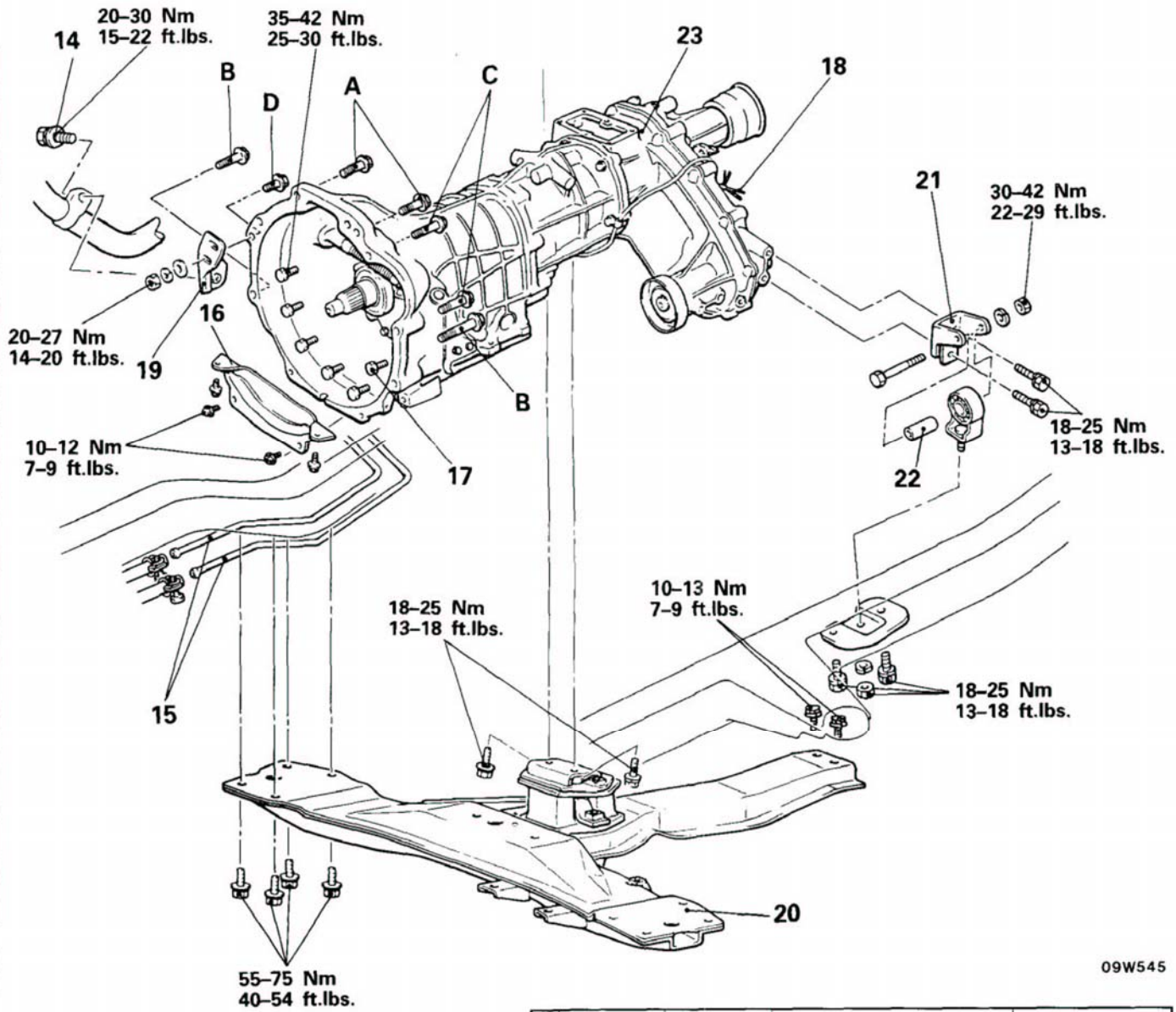


**Removal steps**

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>1. Transfer shift lever knob</li> <li>2. Front floor console</li> <li>3. Snap pin</li> <li>4. Clevis pin</li> <li>◆◆ 5. Throttle control cable</li> <li>◆◆ 6. Connection of overdrive solenoid valve connector</li> <li>◆◆ 7. Speedometer cable</li> <li>8. Oil filler tube</li> <li>◆◆ 9. O-ring</li> </ul> | <ul style="list-style-type: none"> <li>◆◆◆◆ 10. Rear propeller shaft</li> <li>◆◆◆◆ 11. Front propeller shaft</li> <li>◆◆◆◆ 12. Select cross shaft</li> <li>◆◆◆◆ 13. Transmission control rod</li> </ul> <p>NOTE</p> <ul style="list-style-type: none"> <li>(1) Reverse the removal procedures to reinstall.</li> <li>(2) ◆◆ : Refer to "Service Points of Removal".</li> <li>(3) ◆◆◆ : Refer to "Service Points of Installation".</li> <li>(4) <b>N</b> : Non reusable parts</li> </ul> |
|---|---|

09W544

# 21-120 AUTOMATIC TRANSMISSION - Transmission and Transfer Assembly



09W545

	Nm	ft.lbs.	O.D. x Length	mm (in.)	Bolt identification
A	43-55	31-40	⌘ 10 x 40 (.4 x 1.6)		
B	43-55	31-40	⌘ 10 x 65 (.4 x 2.6)		
C	27-34	20-25	⌘ 10 x 65 (.4 x 2.6)		
D	20-27	15-20	⌘ 8 x 25 (.3 x 1.0)		

- 14. Front exhaust pipe mounting bolt
- 15. Connection of oil cooler feed tube and return tube
- 16. Bell housing cover
- ◀▶ 17. Special bolts
- 18. Connection of 4WD indicator light switch
- 19. Exhaust pipe mounting bracket
- 20. Rear engine support member and No. 2 crossmember.
- 21. Transfer mounting bracket
- 22. Pipe
- ◀▶▶▶ 23. Transmission and transfer assembly

NOTE  
 (1) Reverse the removal procedures to reinstall.  
 (2) ◀▶ : Refer to "Service Points of Removal".  
 (3) ▶▶▶▶ : Refer to "Service Points of Installation".



## SERVICE POINTS OF REMOVAL

N21LBAG

### 10. REMOVAL OF REAR PROPELLER SHAFT/11. FRONT PROPELLER SHAFT

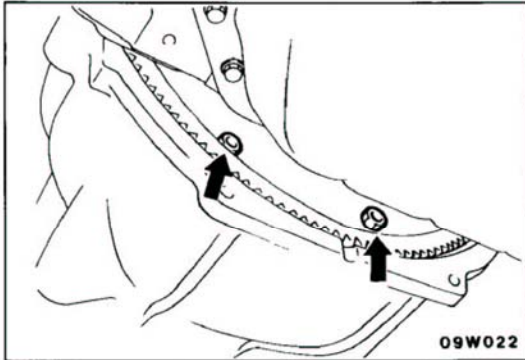
Refer to GROUP 16 PROPELLER SHAFT AND UNIVERSAL JOINTS – Propeller Shaft.

### 12. REMOVAL OF SELECT CROSS SHAFT/13. TRANSMISSION CONTROL ROD

Refer to P.21-110.

### 17. REMOVAL OF SPECIAL BOLTS

Remove the special bolts (six) coupling the torque converter and drive plate.

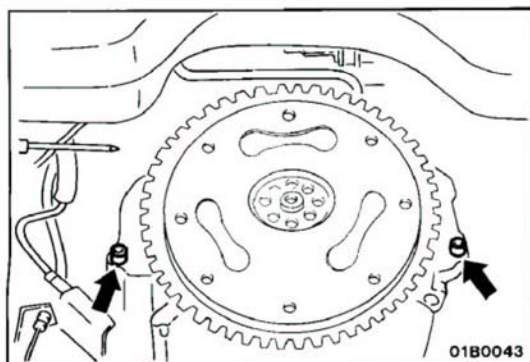


### 23. REMOVAL OF TRANSMISSION AND TRANSFER ASSEMBLY

- (1) Disconnect the transmission and transfer assembly from the engine by pulling it slowly toward the rear of the vehicle.
- (2) When lowering the transmission and transfer assembly, tilt the front of the transmission downward and slowly lower forward, while using care to make sure that the rear of the transmission does not hit the No. 4 crossmember.

#### NOTE

Detach so that the torque converter does not remain at the engine side.



## SERVICE POINTS OF INSTALLATION

N21LDAG

### 23. INSTALLATION OF TRANSMISSION AND TRANSFER ASSEMBLY

On the engine side, there are two centering locations. Make sure that the transmission mounting bolt holes are aligned with them before mounting the transmission and transfer assembly to the engine.

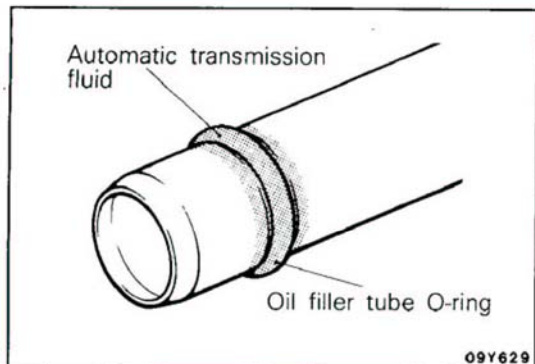
## **21-122 AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly**

### **13. INSTALLATION OF TRANSMISSION CONTROL ROD/12. SELECT CROSS SHAFT**

Refer to P.21-111.

### **11. INSTALLATION OF FRONT PROPELLER SHAFT/10. REAR PROPELLER SHAFT**

Refer to GROUP 16 PROPELLER SHAFT AND UNIVERSAL JOINTS – Propeller Shaft.



### **9. APPLICATION OF LUBRICANT TO O-RING**

Apply a small amount of the specified automatic transmission fluid to the O-ring and then install.

**Specified transmission fluid : ATF DEXRON II Type**

### **7. CONNECTION OF SPEEDOMETER CABLE**

Refer to P.21-108.

### **5. CONNECTION OF THROTTLE CONTROL CABLE**

Refer to P.21-107.

## DISASSEMBLY

N21LE--

### Caution

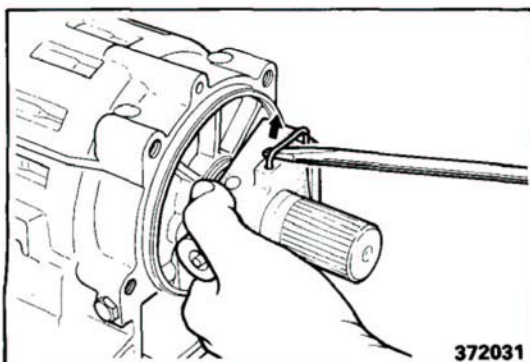
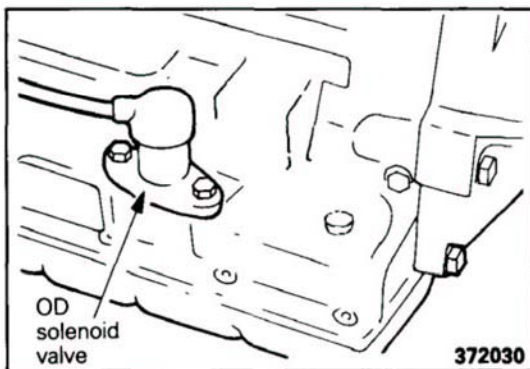
1. When removing the transmission assembly from the vehicle, use care so that the oil pan is not hit by the transmission jack.
2. The automatic transmission is built of accurately machined parts which should be handled during disassembly with utmost care to prevent damage.
3. When separating light alloy metal parts such as the case, do not pry with a screwdriver but tap lightly with a soft headed hammer (plastic hammer).
4. Place rubber mat on the work bench and keep it clean.
5. During disassembly, do not wear cloth gloves or use rags. If necessary, use nylon cloth or paper towel.
6. Clean all parts that have been disassembled. Ordinary detergent may be used for cleaning metallic parts but after washing, be sure to dry with air.
7. Wash the clutch disc, brake disc, resin and rubber parts in ATF (automatic transmission fluid) and keep them free from dust.
8. If the transmission itself is damaged, disassemble and clean the cooler system.

- (1) Remove sand and dirt from the outside of the transmission.
- (2) Remove the transfer (P.21-174).
- (3) Place the transmission assembly on a bench with the oil pan down.

### Caution

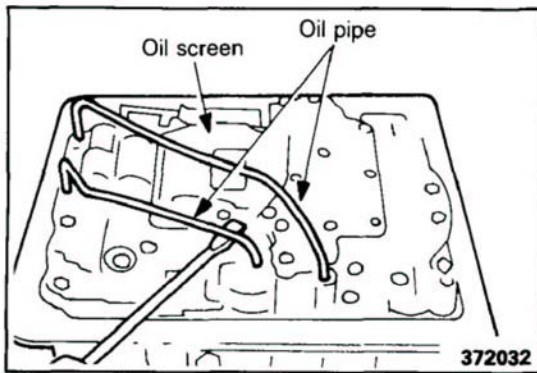
**Do not place the assembly with the oil pan up before the oil pan is removed. This is necessary to prevent foreign matter in the oil pan from entering the valve body.**

- (4) Remove the torque converter.
- (5) Remove the O.D. solenoid valve.

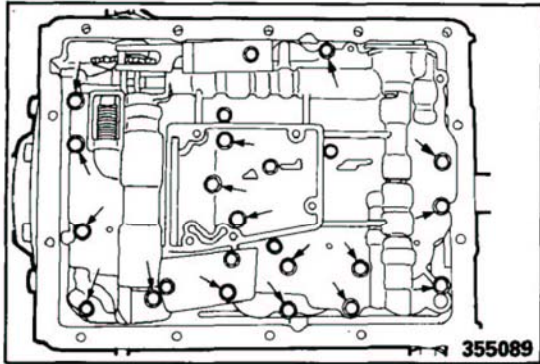


- (6) Remove the adapter and gasket.
- (7) Remove the governor mounting bolt.
- (8) Lift up the governor retaining ring lightly by a screwdriver and remove the governor assembly from the output shaft.

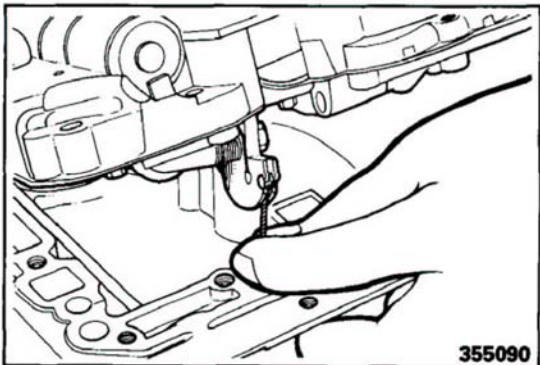
## 21-124 AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly



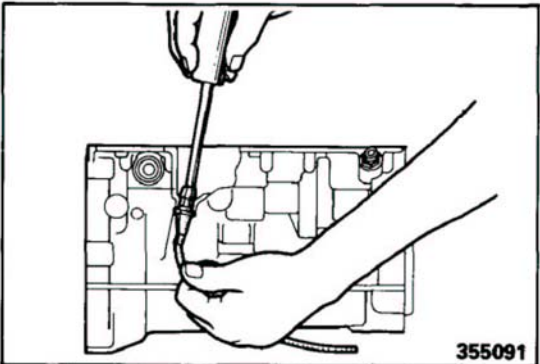
- (9) With the oil pan down, remove the oil pan bolts and then remove the oil pan and gasket.
- (10) Place the assembly with the valve body up.
- (11) Remove the oil pipe, prying with a screwdriver and using care not to cause deformation.
- (12) Remove the oil screen.



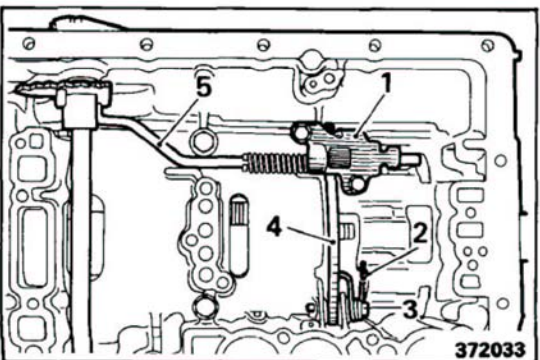
- (13) Remove 17 bolts attaching the valve body assembly.



- (14) Raise the valve body assembly slowly and remove the throttle inner cable from the throttle cam. Then, remove the valve body assembly.

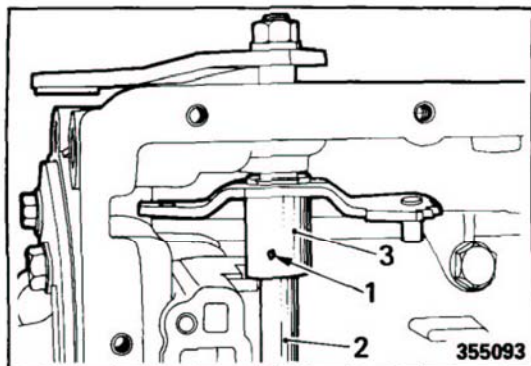


- (15) Push the throttle cable adapter to disconnect the throttle cable from the case.

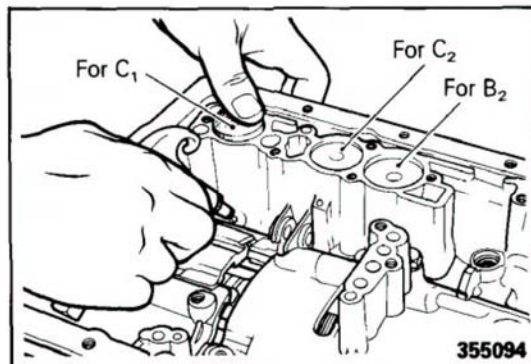


- (16) Remove the plate 1 and parking pawl torsion spring 2. Then, pull out pivot pin 3 and remove parking pawl 4. Remove parking rod 5 from the manual valve detent lever.

## AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly 21-125



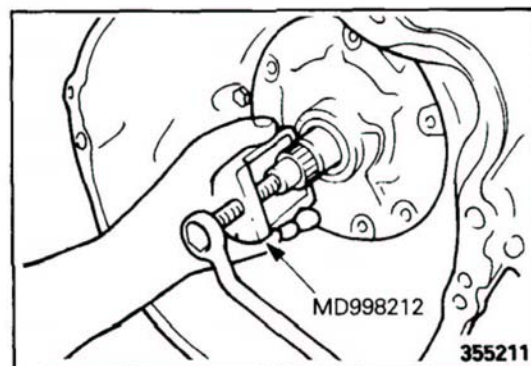
- (17) Drive out spring pin 1 and remove shaft 2 and manual valve lever 3.
- (18) Remove the oil seal from the manual valve shaft using a screwdriver.  
When installing the oil seal, do so evenly.



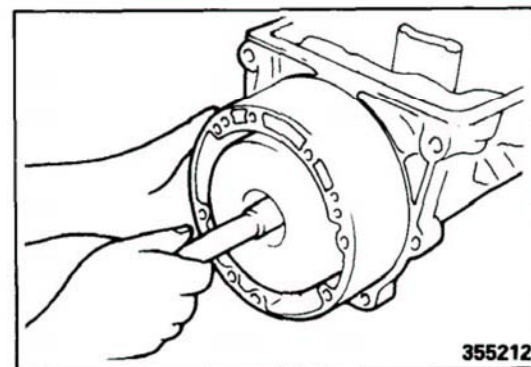
- (19) Remove the accumulator piston by blowing air from the illustrated position.

### Caution

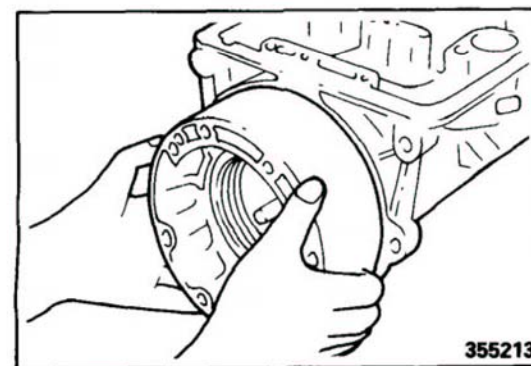
**Use care as the piston and fluid pops and gushes out. Pistons for B<sub>2</sub>, C<sub>2</sub>, and C<sub>1</sub> have been installed from the front to rear in the order shown. Store the removed pistons and springs arranged in this order.**



- (20) Remove the oil pump attaching bolts.
- (21) Remove the oil pump by using the special tool.
- (22) Remove the converter housing attaching bolts.
- (23) Holding the O.D. input shaft by hand, remove the converter housing.

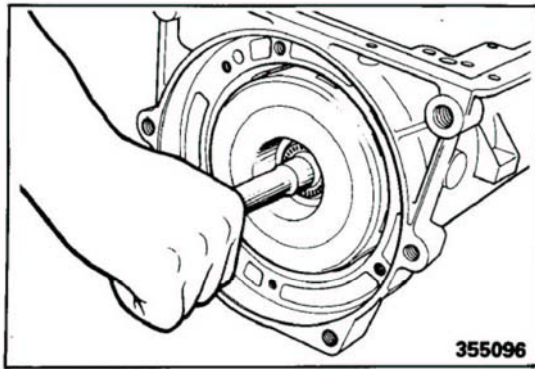


- (24) Remove the O.D. input shaft, planetary gear and O.D. clutch assembly from the O.D. case.

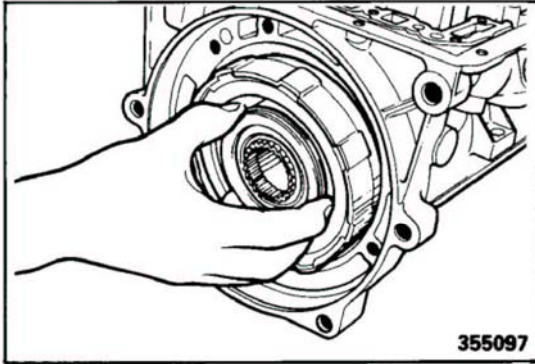


- (25) Remove the O.D. case assembly.

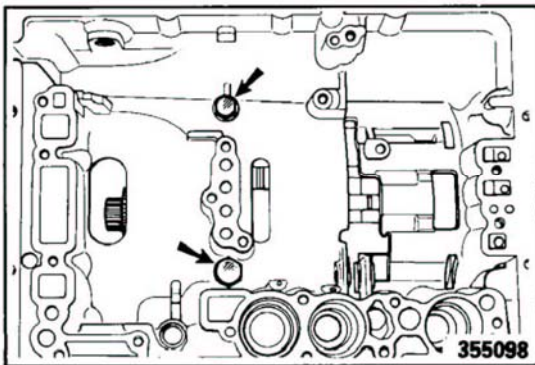
## 21-126 AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly



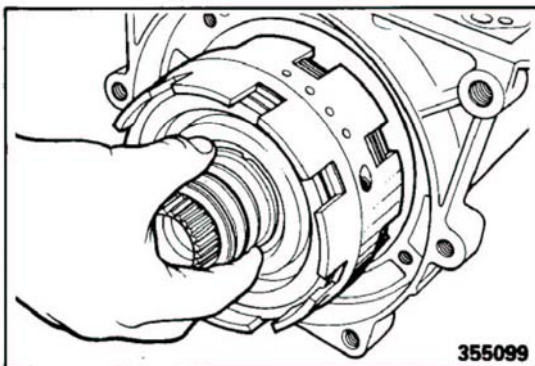
(26) Remove the forward clutch assembly.



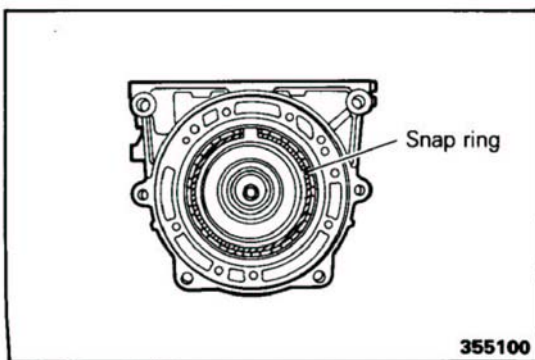
(27) Remove the direct clutch assembly.



(28) Remove the two center support attaching bolts.

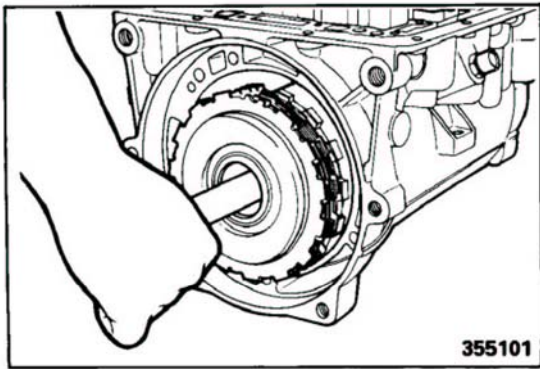


(29) Remove the center support and sun gear assembly together from the case.

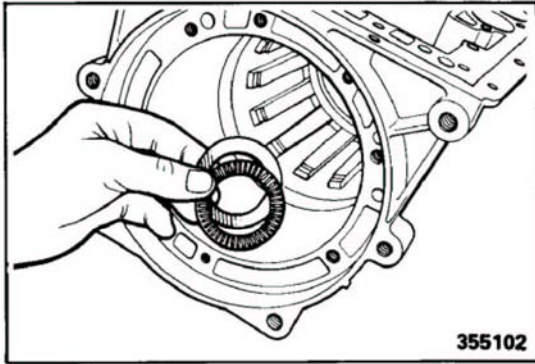


(30) Remove the snap ring from the front planetary carrier by using a screwdriver.

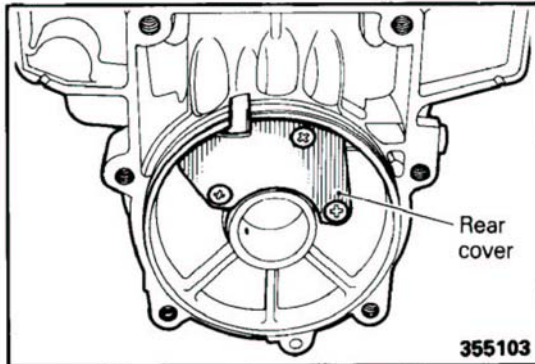
# AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly 21-127



(31) Holding the intermediate shaft, remove the carrier assembly from the case.



(32) Remove the output shaft thrust bearing and race from the case.



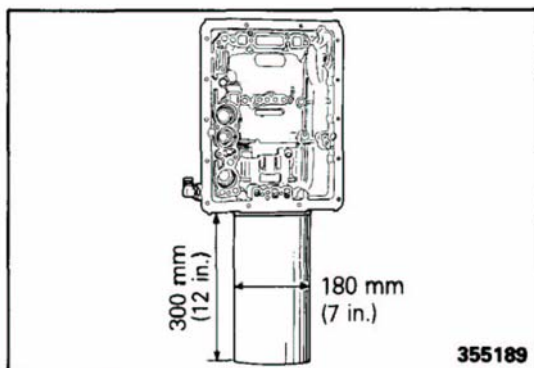
(33) Remove the rear cover and gasket.

## REASSEMBLY

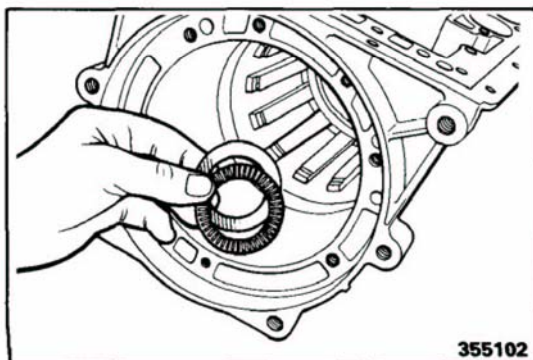
N21LF--

### Caution

1. The automatic transmission is built of accurately machined parts which should be handled during reassembly with utmost care to prevent damage. Damaged parts could cause fluid leaks or affect performance. Check the parts carefully before reassembly.
2. Clean all parts that are to be reassembled. Ordinary detergent may be used for cleaning metallic parts but after washing, be sure to dry well with air.
3. Wash the clutch disc, resin thrust plate and rubber parts in ATF and keep them free from dust.
4. Do not reuse gasket, oil seal and other rubber parts. At reassembly, replace them with new ones.
5. Never use grease other than petrolatum or industrial petrolatum.
6. Apply ATF to friction elements, rotating parts and sliding parts before installation.
7. New clutch disc and brake disc should be immersed in ATF for more than two hours before installation.
8. Do not apply sealer or adhesive to gaskets.
9. When bushing must be replaced, replace assembly which includes it.
10. Tighten parts to specified torque.



- (1) Place the transmission case on a cylinder as illustrated. Use of a cylinder measuring 300 mm (12 in.) long and 180 mm (7 in.) in diameter is recommended. Place shock absorbing material between the case and the cylinder to prevent damage to the case.



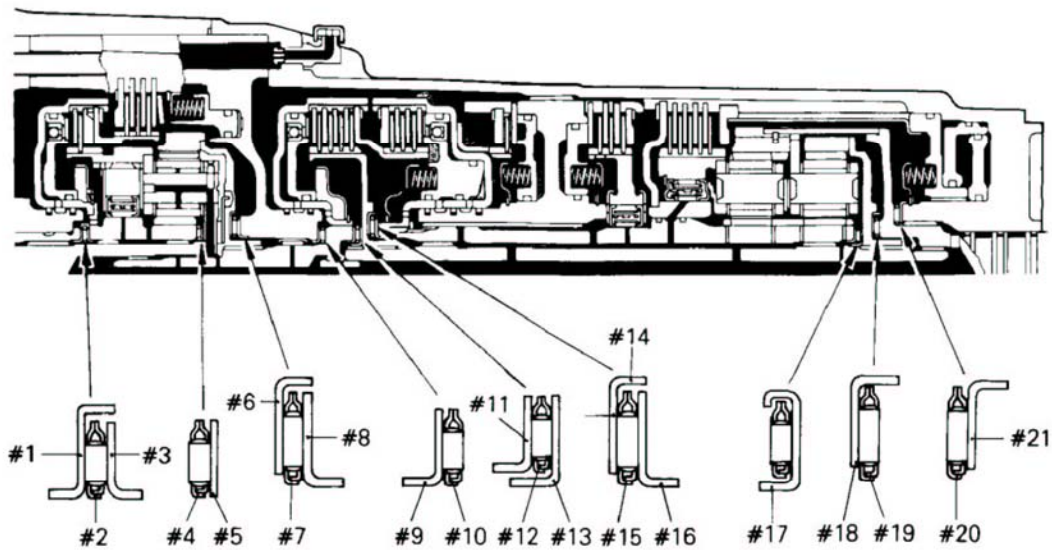
- (2) Install output shaft thrust bearing race #21 and thrust bearing #20 in the case.

### Caution

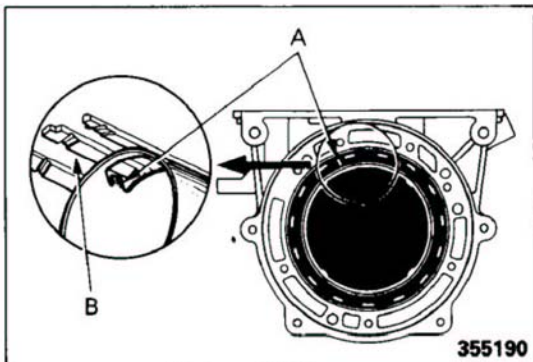
When installing the thrust bearing and race, note their direction, referring to the illustration.



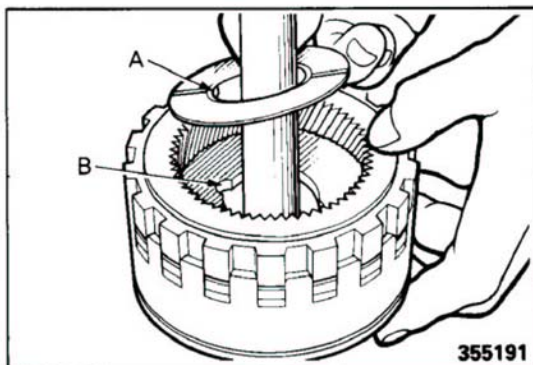
# AUTOMATIC TRANSMISSION - Transmission and Transfer Assembly 21-129



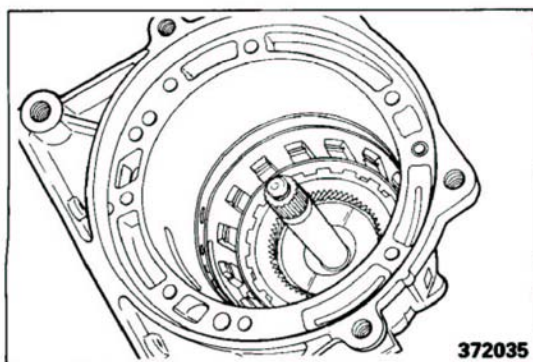
372034



- (3) Install the apply tube in the case. Make sure that the pawl at the end of the tube is inserted to inside of the piston.

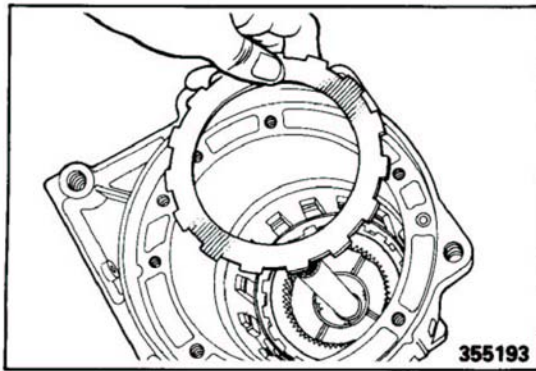


- (4) Install the thrust washer on the planetary carrier, seating its pawl (A) securely in the (B) of the carrier.

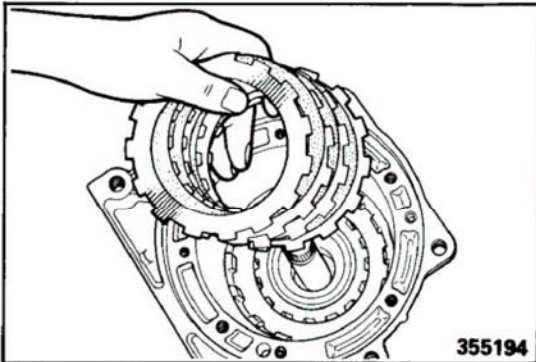


- (5) Install the rear planetary gear and output shaft assembly in the case. Insert slowly and taking care not to hit at the bearing.

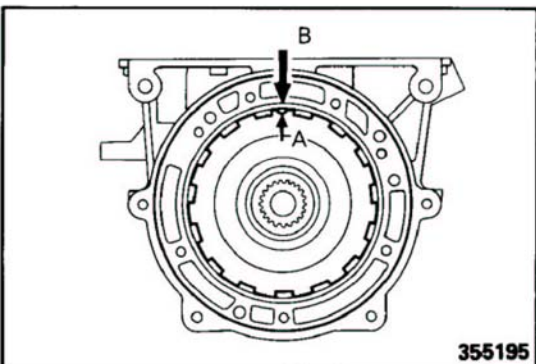
## 21-130 AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly



- (6) Install the backing plate in the case. Insert firmly until it comes into contact with the apply tube.



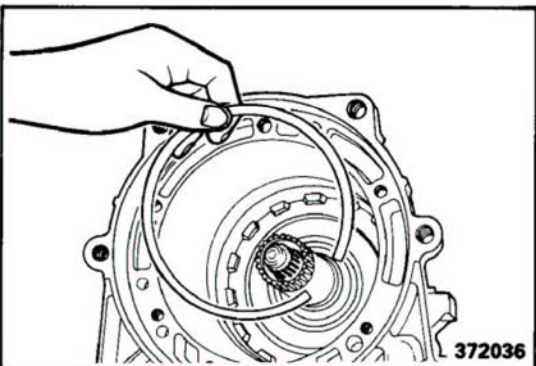
- (7) Apply grease to the thrust washer and attach it to the front planetary gear carrier. Then install the front planetary gear assembly in the ring gear.  
(8) Install the clutch discs and plates alternately in this order on the backing plate.



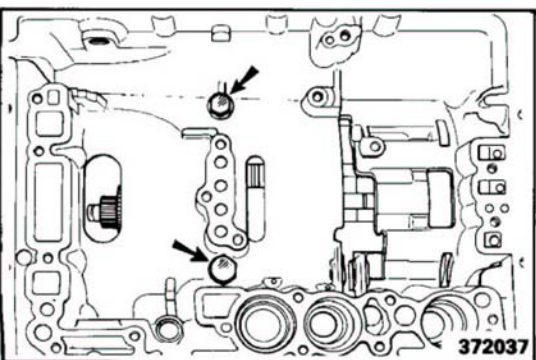
- (9) Plate the transmission case on a bench with the oil pan mounting surface up.  
(10) Insert the sun gear in the one-way clutch inner race and install the assembly in the case, aligning (A) of the one-way clutch inner race with (B) of the case. If the inner race is hard to engage, turn the sun gear while holding the front planetary ring gear. Then, holding the one-way clutch inner race, remove the sun gear. Fit the removed sun gear to the center support.

### Caution

**Check the snap ring end gap position to make sure that the carrier is seated completely.**

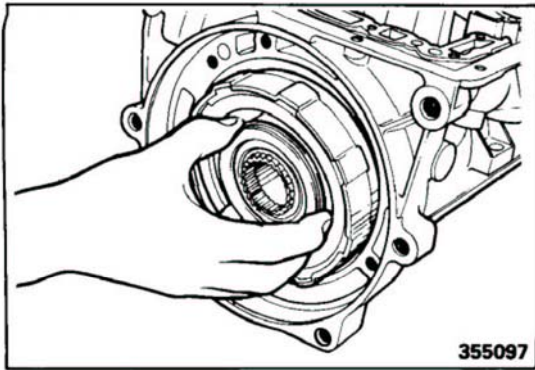


- (11) Install the snap ring.

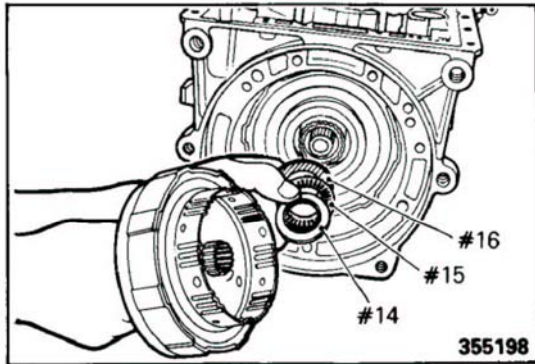


- (12) Install the center support assembly in the case, checking correct seating of the one-way clutch on the center support and pushing the center support while pulling the sun gear. The center support will not be installed completely in the case if the one-way clutch is floating.  
(13) Pushing the center support backward, tighten the bolts alternately on side (A) in about 7 Nm (5 ft.lbs.) increments. Finally tighten to specified torque.

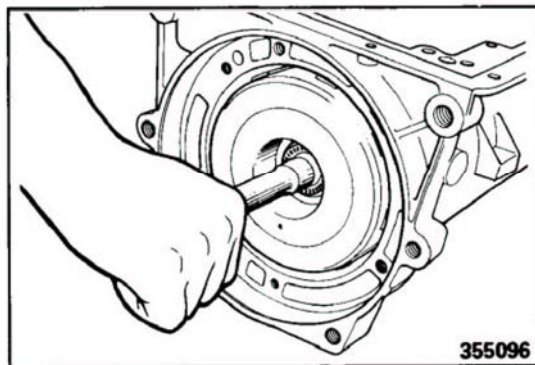
# AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly 21-131



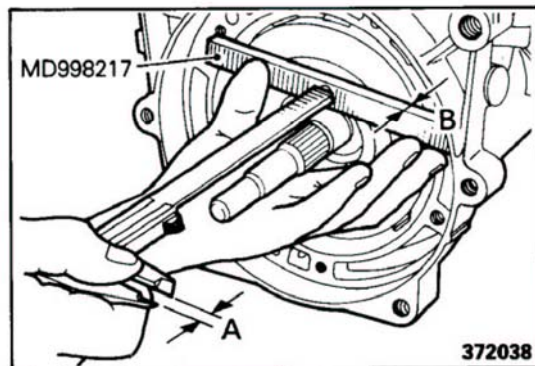
(14) Install the direct clutch assembly.



(15) Attach thrust race #14, bearing #15 and thrust race #16 onto the rear of the forward clutch hub using petrolatum and noting the direction of the thrust bearing race.

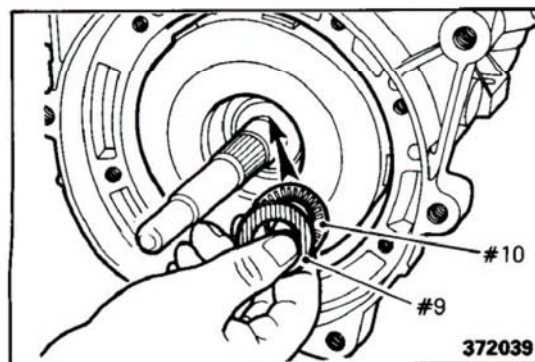


(16) Install the forward clutch assembly, using care not to drop the thrust bearing attached in the step above.



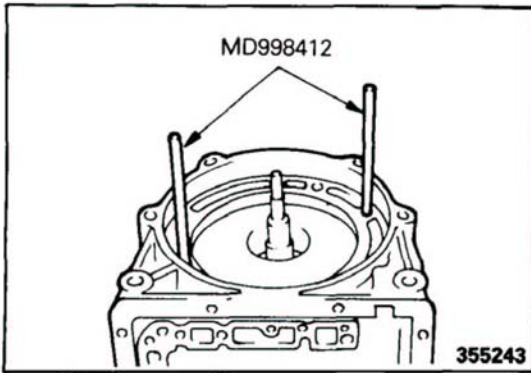
(17) Check that the forward clutch has been installed completely by using the special tool.  
Measured value (A) - gauge thickness (B) = forward clutch installation height

**Standard value : Approx. 1.5 mm (.059 in.)**

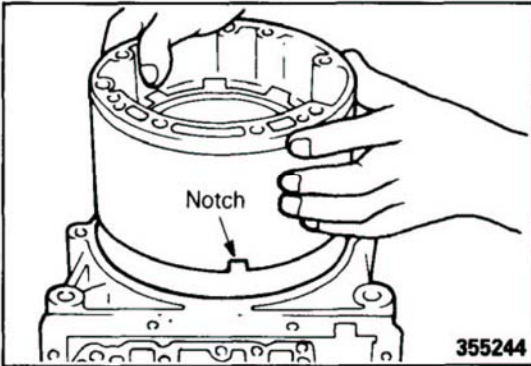


(18) Attach thrust bearing #10 and race #9 to the forward clutch using petrolatum and noting the direction of the thrust bearing race.

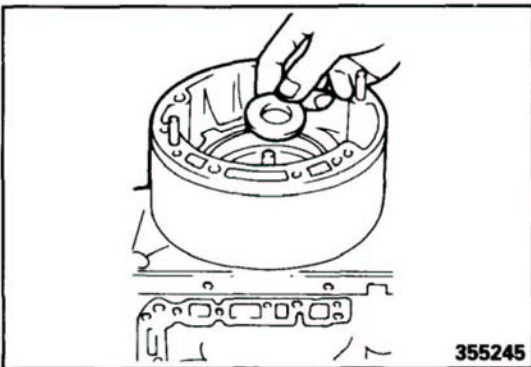
## 21-132 AUTOMATIC TRANSMISSION - Transmission and Transfer Assembly



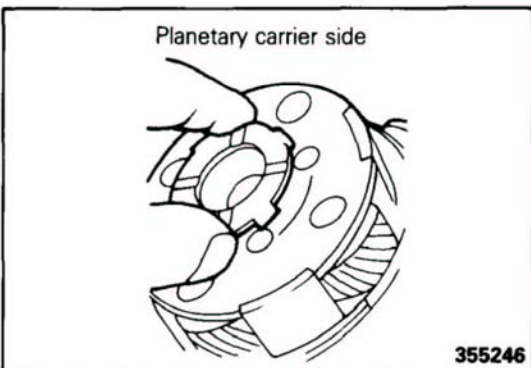
(19) Install special tool in the transmission case.



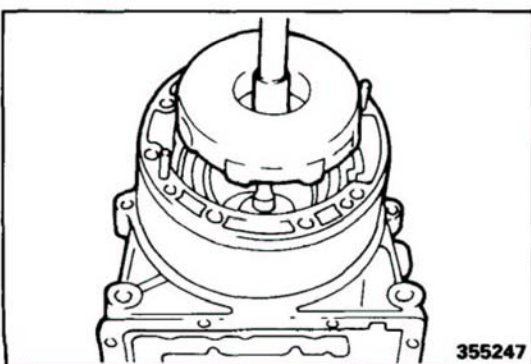
(20) Along the guides, install the O.D. case assembly in the transmission case, positioning the O.D. case notch as illustrated.



(21) Install the thrust washer on the O.D. planetary gear.



(22) Apply petrolatum to the rear of the O.D. planetary carrier and attach the thrust washer thereon.

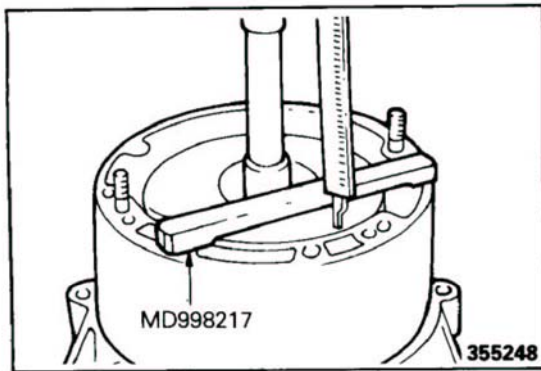


(23) Install the O.D. clutch and planetary gear assembly with the thrust washer in the case slowly.

### NOTE

Align the O.D. case clutch disc lugs.

## AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly 21-133

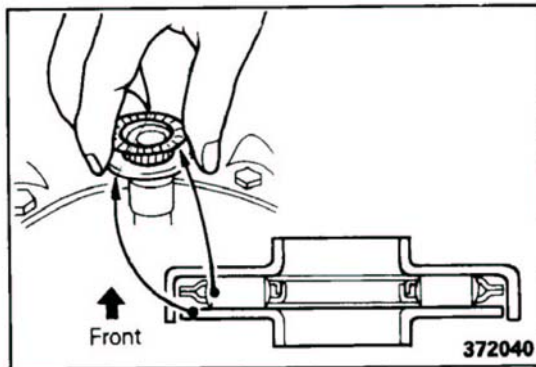


- (24) Check that the O.D. clutch and planetary gear set assembly has been installed completely by using the special tool. Measured value - gauge thickness = O.D. clutch assembly installed height

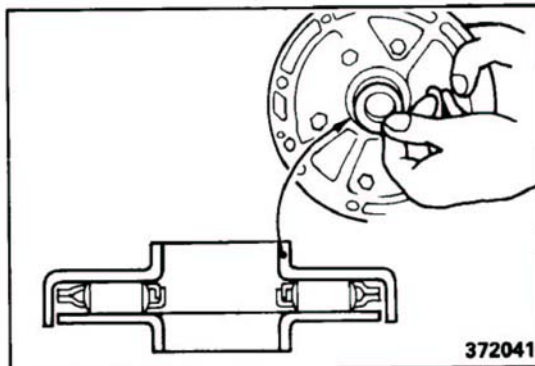
**Standard value : Approx. 2 mm (.08 in.)**



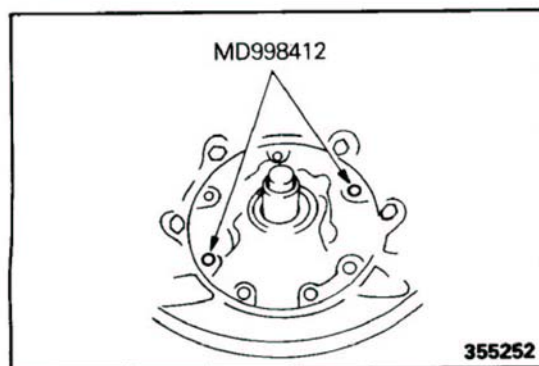
- (25) Install the O-ring at illustrated position and then install the converter housing.



- (26) Install race #3 and bearing #2 over the O.D. input shaft.



- (27) Apply petrolatum to the oil pump and install thrust race #1.



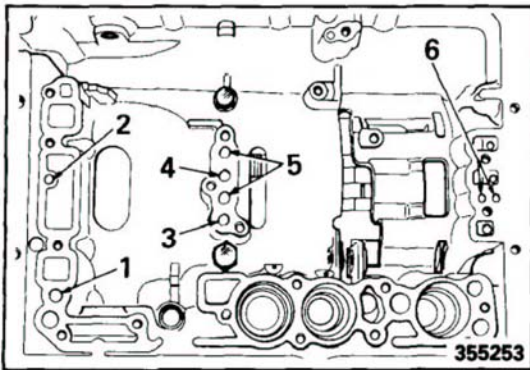
- (28) Install the oil pump slowly by using the special tools.  
(29) Apply sealer to the set bolts and tighten them uniformly and little by little. Check input shaft end play and check that the shaft turns lightly.

**Specified sealant : SH700 (Toray)**

- (30) Tighten the oil pump attaching bolts to specified torque and check the input shaft end play.

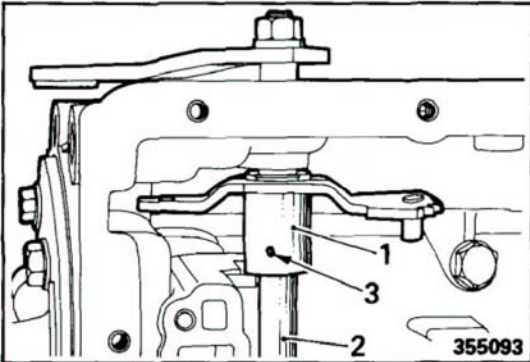
**Standard value : 0.3–0.9 mm (.012–.035 in.)**

## 21-134 AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly



(31) Supply low pressure air to each circuit and check operation by operating noise.

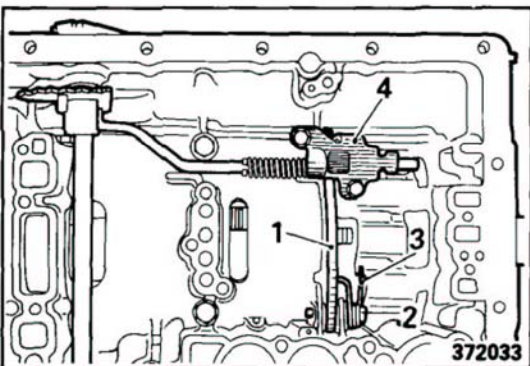
1. O.D. clutch
2. Forward clutch
3. Brake No.1
4. Brake No.2
5. Direct clutch
6. Brake No.3



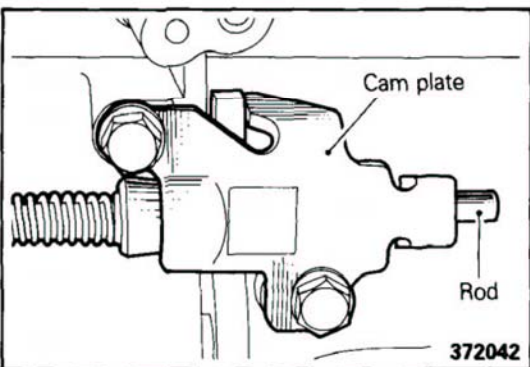
(32) Install the parking rod assembly on manual valve lever 1 and insert manual valve lever shaft 2 in the case. Then, drive in slotted spring pin 3.

### Caution

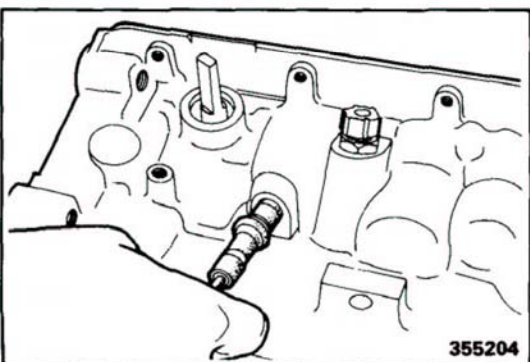
1. Be sure to use a new slotted spring pin.
2. Install the slotted spring pin in such a way that its end protrudes approx. 1 mm from the lever.



(33) Place parking pawl 1 in the case and install pivot pin 2 and spring 3.

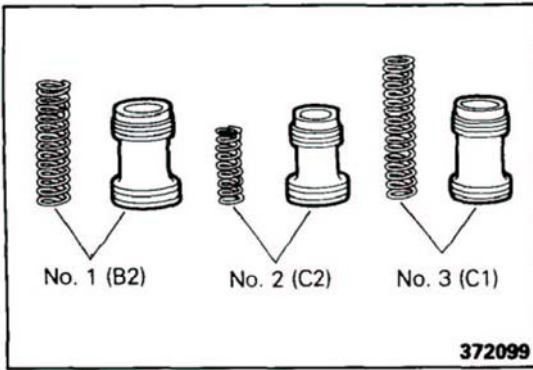


(34) Install the cam plate, making sure that the parking rod assembly protrudes from the cam plate.



(35) Insert the throttle cable in the case, using care not to damage the O-ring.

# AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly 21-135



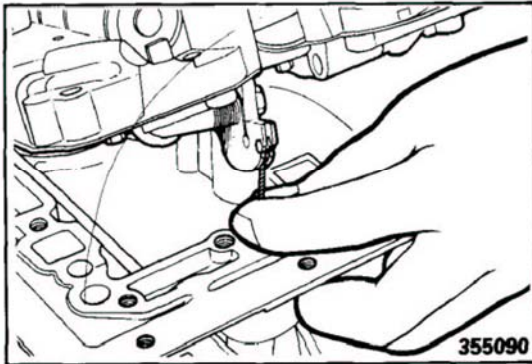
(36) Install accumulator pistons and springs; No.1 (B2), No.2 (C2) and No.3 (C1) from front side.

## Accumulator Pistons Identification

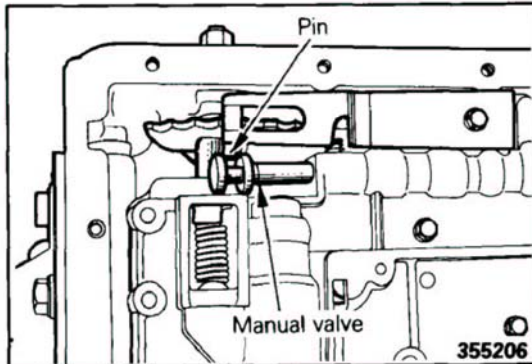
	O.D.	Length
No. 1	34.8 mm (1.370 in.)	48.5 mm (1.909 in.)
No. 2	31.8 mm (1.252 in.)	45 mm (1.772 in.)
No. 3	31.8 mm (1.252 in.)	49.5 mm (1.949 in.)

## Accumulator Springs Identification

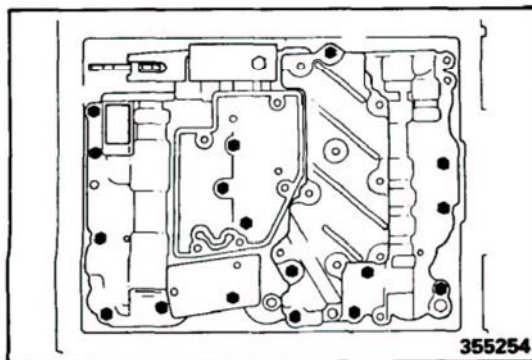
	Free length	O.D.	Wire diameter	Ident. color
No. 1	66.7 mm (2.626 in.)	17.3 mm (.681 in.)	2.8 mm (.110 in.)	Red
No. 2	55.2 mm (2.173 in.)	16.4 mm (.646 in.)	2.3 mm (.091 in.)	-
No. 3	64.7 mm (2.547 in.)	17.5 mm (.689 in.)	2.0 mm (.079 in.)	-



(37) Install throttle cable to the throttle cam of the valve body assembly.

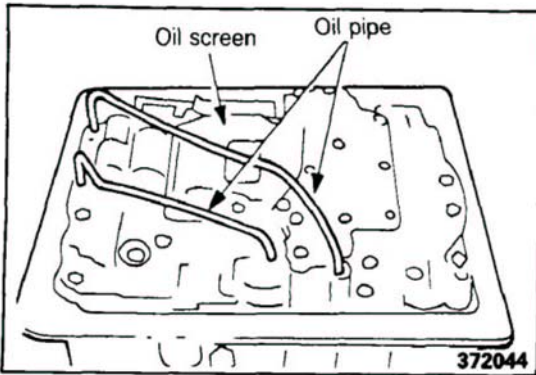


(38) Install two or three valve body attaching bolts temporarily and place the manual valve lever pin in the manual valve groove.



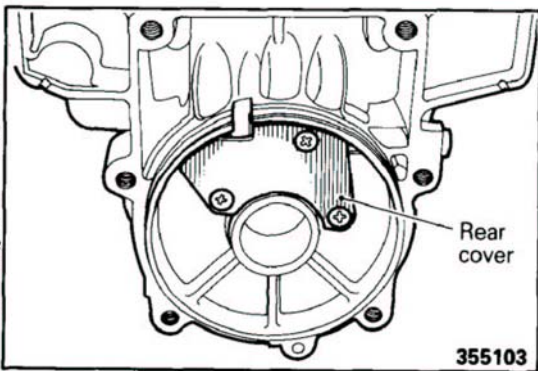
(39) Install 17 valve body attaching bolts and tighten uniformly to specified torque.

## 21-136 AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly

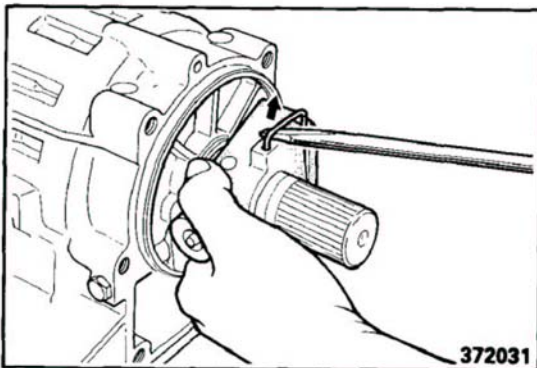


- (40) Install the oil screen.
- (41) Shift to "L" and "P" to check that the *detent spring roller* is completely seated in each portion of the detent lever.
- (42) Install the oil pipe.

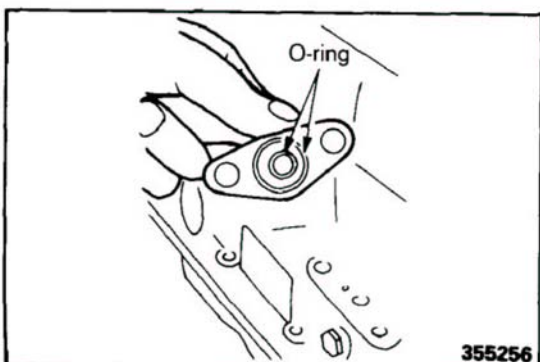
- (43) Attach the magnet to the oil pan (to area directly below the oil screen).
- (44) Install the oil pan with oil pan gasket attached. First tighten 14 bolts temporarily and then tighten to specified torque uniformly.



- (45) Install the rear cover on the transmission rear with a gasket.



- (46) Insert a slot screwdriver between the governor retaining ring and governor body and install the governor to the output shaft.
- (47) Install the adapter and gasket.



- (48) Install the O.D. solenoid.

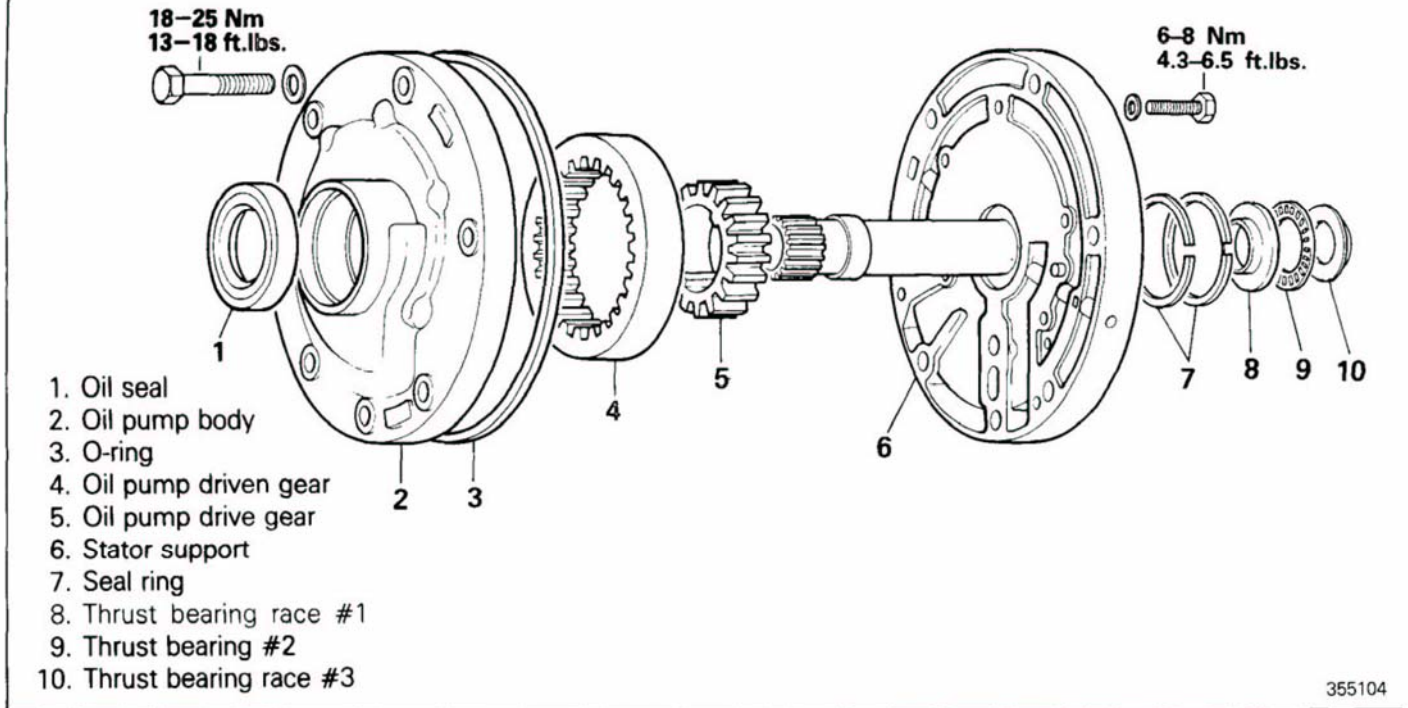
**Caution**  
**Be sure to use two O-rings.**

- (49) Install torque converter to transmission.
- (50) Install the transfer assembly (P.21-178).



**OIL PUMP**

N21LG--



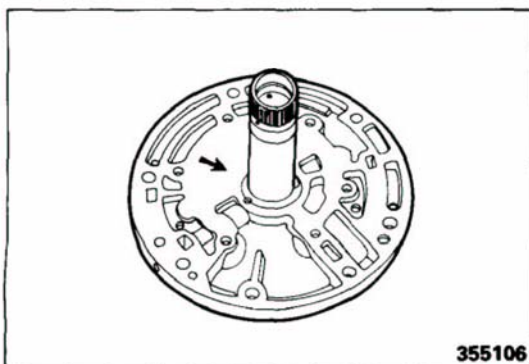
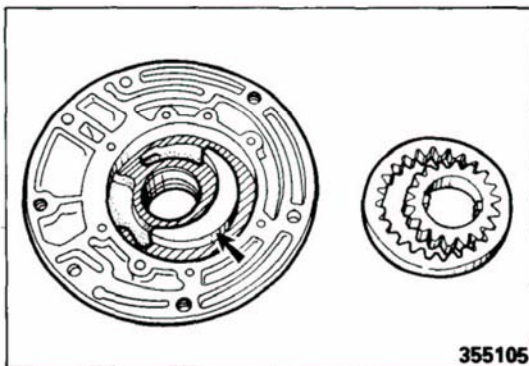
**DISASSEMBLY**

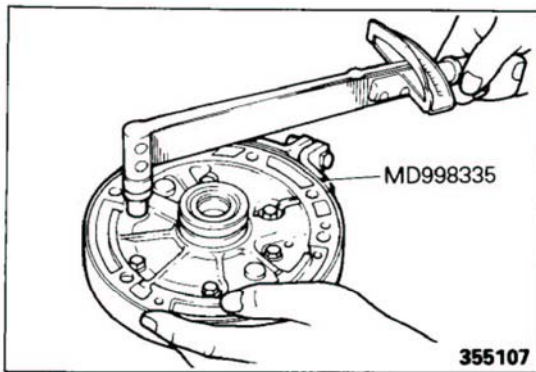
- (1) Remove six screws and remove the stator support from the oil pump body.
- (2) Take out the oil pump drive gear and driven gear from the pump body. Put mating marks on the side of removed gears for their reassembly in correct direction. (Use a felt marker or equivalent.)
- (3) Remove the seal ring from the stator support.

**INSPECTION**

Wash the parts and dry with air. Then, check the following and replace if faulty.

- (1) Oil seal damage
- (2) Ridged wear on body and drive gear contact surfaces and damage to the body crescent portion (indicated by arrow)
- (3) Damage or wear of the stator support surface in contact with the oil pump gear (indicated by arrow)
- (4) Wear of the oil pump bushing
- (5) Wear of the stator support bushing (both front and rear sides)
- (6) Smooth insertion of the stator support into the torque converter and without abnormally large play. If faulty, replace.
- (7) Wear or damage of the stator support seal ring groove and seal ring



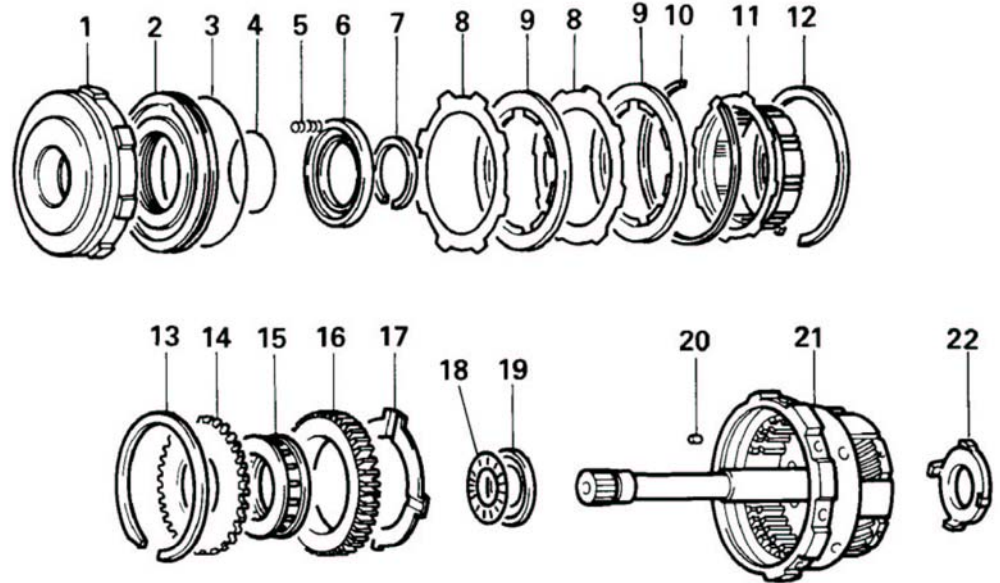
**REASSEMBLY**

- (1) Apply ATF to the drive and driven gears and install them in the body.
- (2) Assemble the body and stator support and tighten the six bolts finger-tight.
- (3) Tighten outside of the cover and support by using the special tool.
- (4) Tighten the bolts to specified torque.
- (5) After reassembly, check with a screwdriver that the drive gear turns lightly.

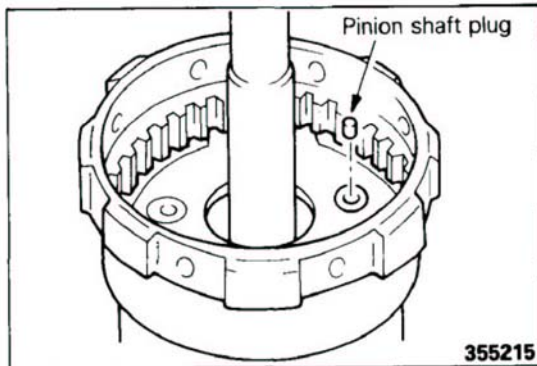
**OVERDRIVE CLUTCH AND PLANETARY GEAR SET**

N21LHEA

1. OD clutch cylinder
2. OD clutch piston
3. O-ring
4. O-ring
5. Return spring
6. Spring retainer
7. Snap ring
8. Clutch plate
9. Clutch disc
10. Snap ring No.1
11. OD brake hub
12. Snap ring No.2
13. Snap ring No.3
14. One-way clutch retainer
15. One-way clutch assembly
16. One-way clutch outer race
17. Thrust washer
18. Thrust bearing #4
19. Thrust bearing race #5
20. Pinion shaft plug
21. OD planetary gear
22. Thrust washer

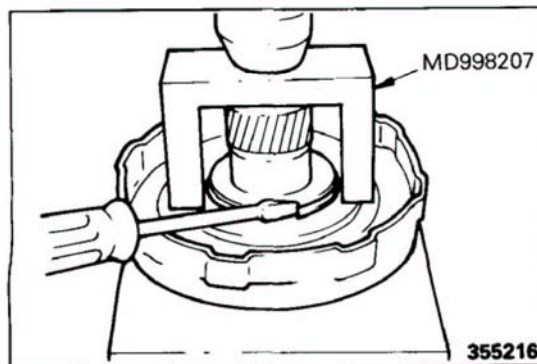


372045

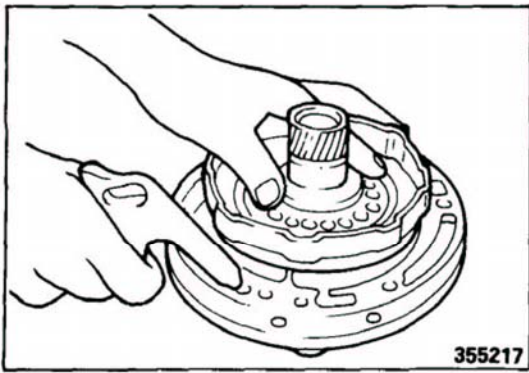


**DISASSEMBLY**

- (1) Remove snap ring No.2 and remove the O.D. brake hub. Then, disassemble the O.D. planetary gear set and O.D. clutch assembly.
- (2) Remove snap ring No.3 from the O.D. planetary gear assembly and remove the thrust washer, O.D. one-way clutch, outer race, thrust bearing and four pinion shaft plugs.



- (3) Remove snap ring No.1 from the O.D. clutch assembly and remove the clutch flange, clutch discs and plates.
- (4) Compress the spring and remove the snap ring by using the special tool.
- (5) Remove the spring seat and return spring.



- (6) Install the O.D. clutch cylinder on the oil pump and blow air into the oil pump oil hole to remove the piston.

**Caution**

**Hold down the piston with hand to prevent it from popping out.**

**INSPECTION**

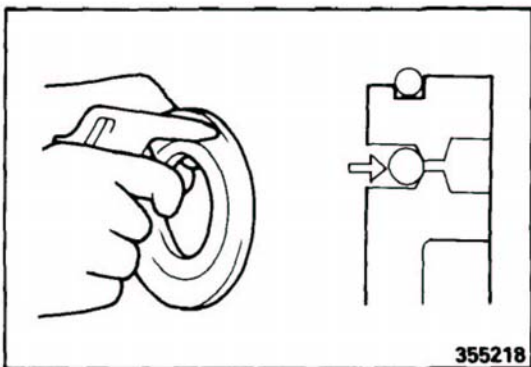
Wash the disassembled parts and dry with air before checking the following. Replace parts that are found faulty.

- (1) Check the O.D. planetary gear for pinion wear, damage, turning condition, spline wear and damage.
- (2) Check the O.D. one-way clutch for wear and damage of spring, ribbon spring and outer race.
- (3) Check the O.D. clutch cylinder for wear and damage of the O.D. sun gear and piston sliding surface (cylinder). Also check for wear and damage of the thrust washer and one-way clutch contact surfaces and seal ring sliding surface.
- (4) Check the clutch disc and plate for wear and damage of the friction surfaces and of cylinder to hub engaging portions.
- (5) Check the clutch piston for wear and damage of its outside and inside surfaces.
- (6) Check the spring for damage and deterioration.

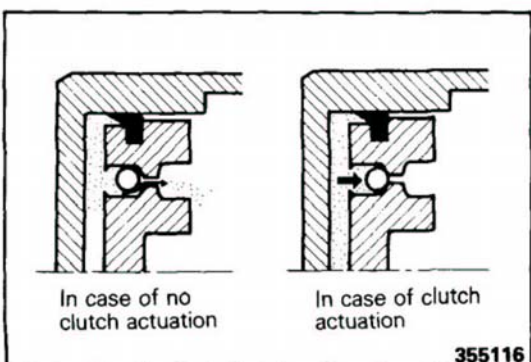
**Free length**

**Standard value : 14.9 mm (.587 in.)**

**Limit : 14.5 mm (.571 in.)**

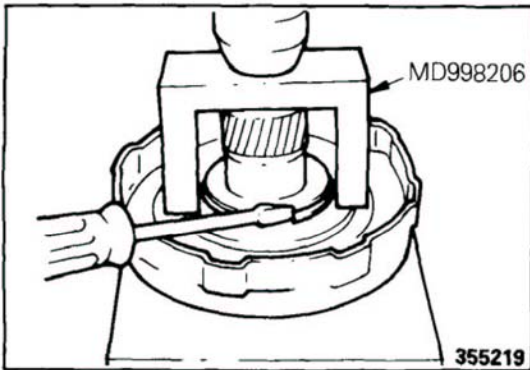


- (7) Shake the piston to check that the check ball is not binding. Also apply air pressure to the piston to see that it is free from leaks. Apply air pressure to the piston inside.



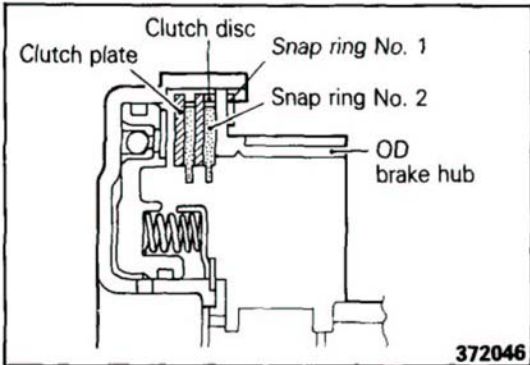
The O.D. clutch, forward clutch and direct clutch have a check ball installed inside as illustrated. This is to prevent oil remaining in the cylinder from working to actuate the clutch by centrifugal force that develops when the clutch cylinder is rotated at high speed. Namely, the centrifugal force developed at high speed rotation causes the ball to separate from the seat, thus opening the oil path to release oil pressure that would otherwise actuate the clutch.

- (8) Check the O.D. brake hub for abnormal tooth wear and damage.
- (9) Check the bearings, races and thrust washers for wear and damage.

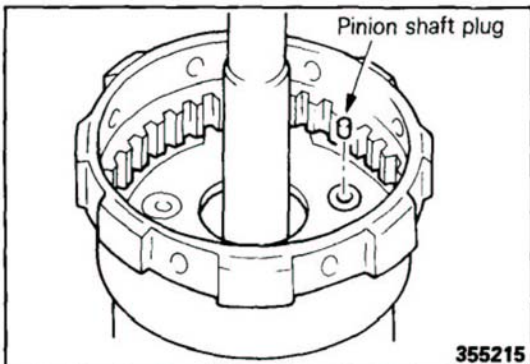


**REASSEMBLY**

- (1) Fit new O-rings in inside and outside grooves of the piston.
- (2) Apply ATF to the O-rings and insert the piston into the O.D. clutch cylinder using care not to damage the O-rings.
- (3) Install the return spring and spring seat in the clutch cylinder. Then, place the clutch assembly on a press bench and install the snap ring by using the special tool.



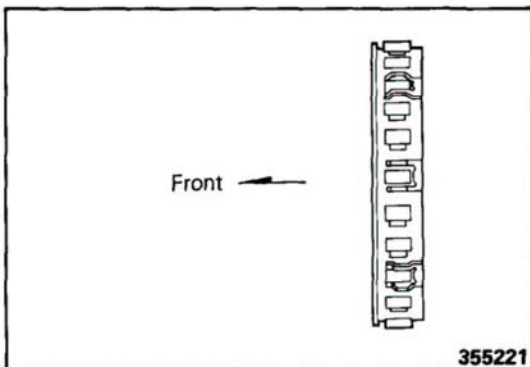
- (4) Install the clutch plates and clutch discs in the clutch cylinder and fit snap ring No.1 (narrower one).
- (5) Install the O.D. brake hub and then fit snap ring No.2 (wider one).



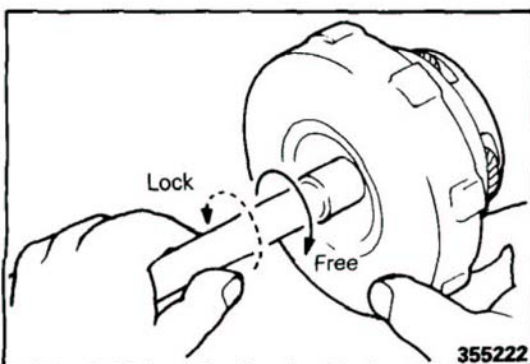
- (6) Install the pinion shaft plug in the shaft portion of the O.D. planetary gear set and install the thrust bearing race, thrust bearing and thrust washer in the order shown.

**NOTE**

Install the thrust washer directing its oil groove to the front side.

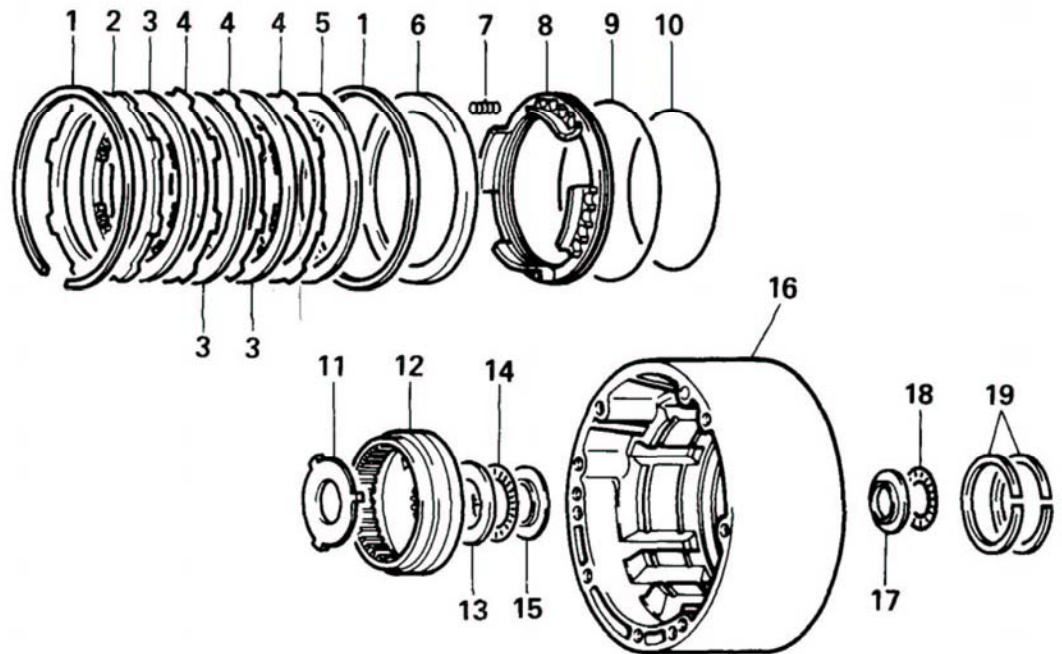


- (7) Assemble the one-way clutch outer race to the one-way clutch assembly and then install the assembly in the planetary gear, noting the mounting direction.
- (8) Install the one-way clutch retainer and snap ring.
- (9) Install the O.D. planetary gear set on the O.D. clutch assembly.



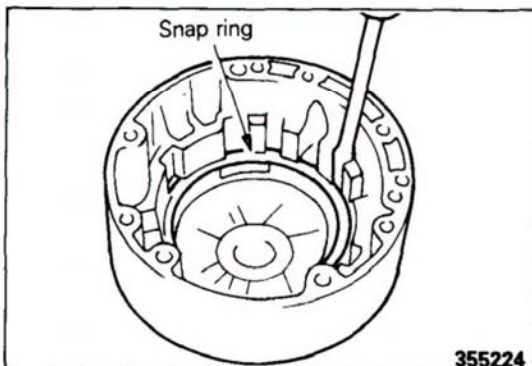
- (10) Check operation of the one-way clutch. With the clutch cylinder held by hand, turn the input shaft clockwise to see that the shaft turns smoothly and turn it counter-clockwise to see that the shaft is locked.

## OVERDRIVE BRAKE



1. Snap ring
2. Backing plate
3. Brake disc
4. Brake plate
5. Cushion plate
6. Spring retainer
7. Return spring
8. Brake piston
9. O-ring
10. O-ring
11. Thrust race
12. Planetary ring gear
13. Thrust bearing race #6
14. Thrust bearing #7
15. Thrust bearing race #8
16. OD case
17. Thrust bearing race #9
18. Thrust bearing #10
19. Seal ring

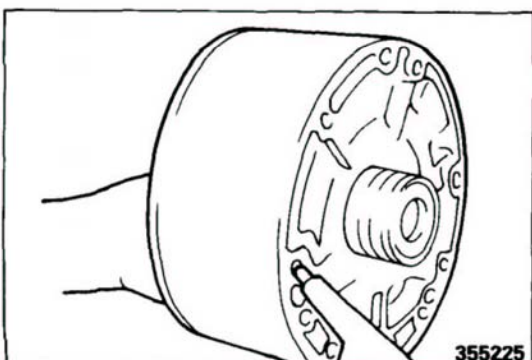
355223



355224

**DISASSEMBLY**

- (1) Remove the snap ring and take out the backing plate, brake discs, brake plates, cushion plate, thrust washer, planetary ring gear, bearing and race from the O.D. case.
- (2) Remove the snap ring and take out the spring retainer and return spring.



355225

- (3) Blow air into the O.D. case through the oil hole to remove the piston.
- (4) Remove the O-ring from the piston.

**INSPECTION**

Wash the removed parts and dry with air. Then, check the following and replace faulty parts.

- (1) Check the O.D. case for wear and damage of the piston sliding surfaces, seal ring and ring groove.
- (2) Check the piston for wear and damage of its outside (surface in contact with the case).
- (3) Check the spring for damage and deterioration.

**Free length**

**Standard value : 16.1 mm (.634 in.)**

**Limit : 15.7 mm (.618 in.)**

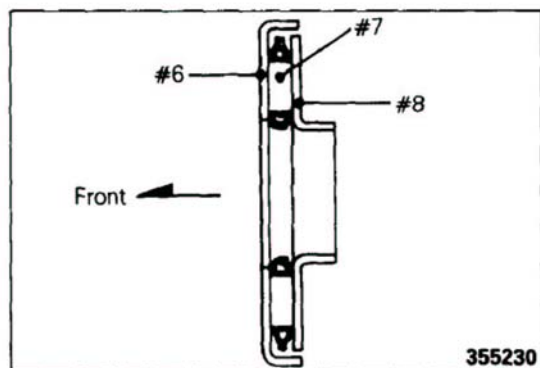
- (4) Check the discs and plates for wear and damage of the friction surfaces. Also check the case and hub engagement for wear and damage.
- (5) Check the planetary ring gear for wear and damage of tooth surfaces and splines.
- (6) Check the bearings, races and thrust washers for wear and damage.

**REASSEMBLY**

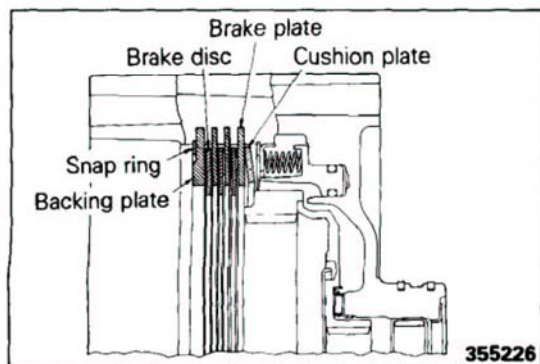
- (1) Install new O-rings in the piston outside and inside grooves.
- (2) Apply a light coat of ATF to the O-rings and install the piston in the case, using care not to damage O-rings.
- (3) Install the return spring and spring retainer and fit the snap ring.

**Caution**

1. **Make sure that the springs is installed without inclination.**
2. **Make sure that the snap ring is seated in the groove correctly.**



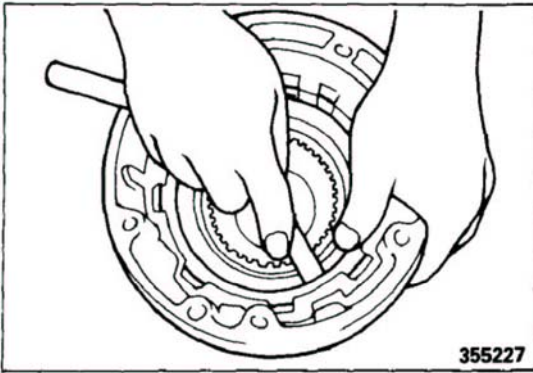
- (4) Install bearing races #6 and #8, thrust bearing #7, planetary ring gear and thrust washer in the O.D. case. Thrust bearing races #6 and #8 should be installed in the illustrated direction.



- (5) Install the cushion plate and then install the brake plates and brake discs alternately. Then, install the backing plate and fit the snap ring.

**Caution**

**Note the direction of installation of the cushion plate.**



355227

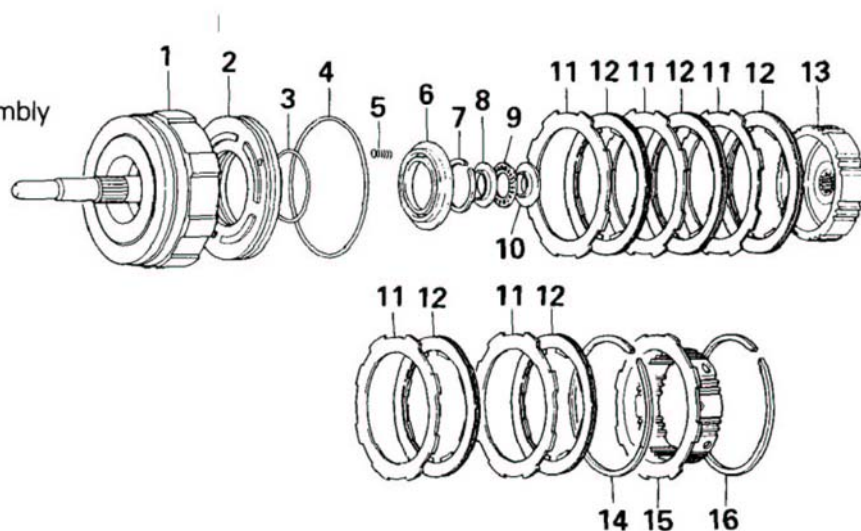
- (6) Measure the brake clearance.  
Measure the backing plate to snap ring clearance. If it is larger than nominal, replace the clutch disc or plate. If it is smaller than nominal, incorrect installation is suspected. Disassemble and reinstall.

**Standard value : 0.35–1.6 mm (.04–.062 in.)**

## FORWARD CLUTCH

N21LHD8

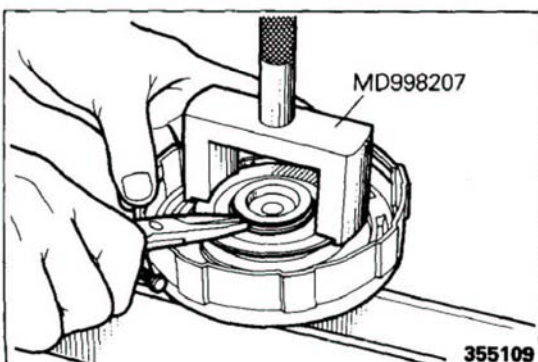
1. Forward clutch cylinder assembly
2. Forward clutch piston
3. O-ring
4. O-ring
5. Clutch return spring
6. Spring retainer
7. Snap ring
8. Thrust bearing race
9. Thrust bearing
10. Thrust bearing race
11. Clutch plate
12. Clutch disc
13. Forward clutch hub
14. Snap ring
15. Direct clutch hub
16. Snap ring



372100

## DISASSEMBLY

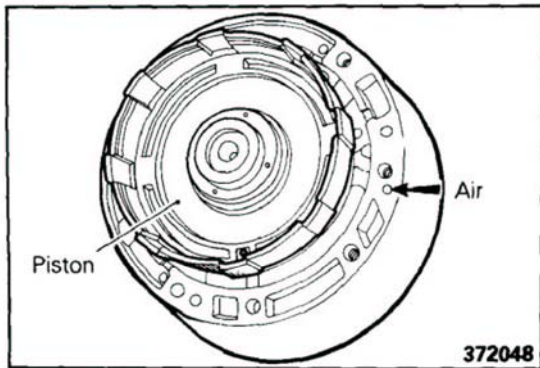
- (1) Remove the snap ring (for installation of the direct clutch hub) and remove the direct clutch hub, forward clutch hub and clutch disc from the clutch cylinder.
- (2) Remove the needle bearing and thrust bearing races.
- (3) Remove the snap ring and remove the clutch plates and clutch discs.



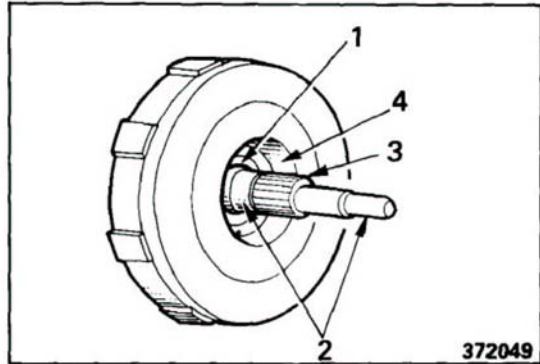
355109

- (4) Place the front clutch cylinder on a press bench and compress the clutch return spring by using the special tool. Remove the snap ring.
- (5) Remove the spring retainer and return spring.





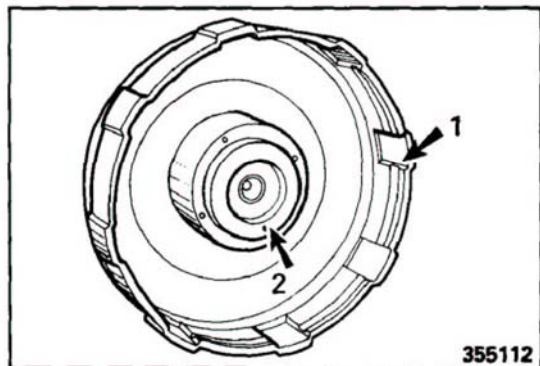
- (6) Install the clutch cylinder in the O.D. case and blow air into the O.D. case through the oil hole to remove the piston from the clutch cylinder.
- (7) Remove the O-ring from the piston.



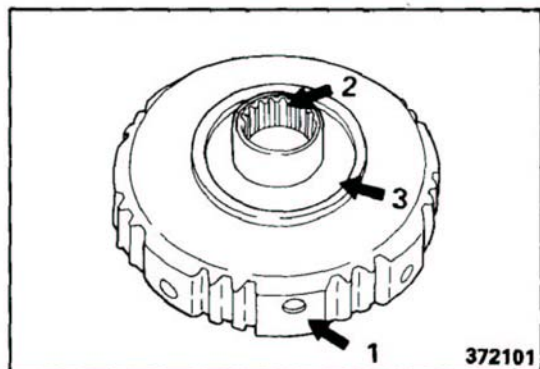
**INSPECTION**

Wash the removed parts and dry with air. Then, check the following and replace faulty parts.

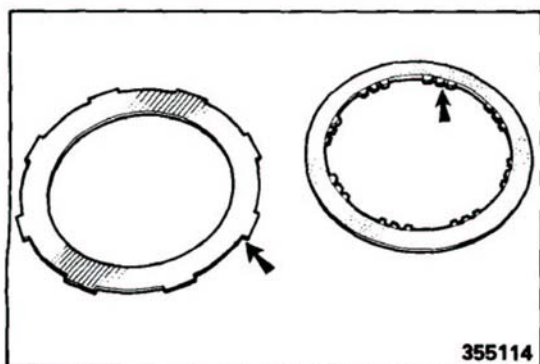
- (1) Check the input shaft and clutch cylinder for excessive wear and binding of thrust bearing contact surface 1 and bushing sliding surface 2, for damage of splines 3 and for wear of O.D. case seal ring contact surface 4.



- (2) Check the forward clutch cylinder for wear and damage of clutch drum teeth 1, for wear and binding of piston sliding surface and for damage and binding of thrust bearing seating surface 2.



- (3) Check the front clutch for abnormal wear and damage of teeth 1 and splines 2 and for wear, binding and damage of hub thrust surface 3.



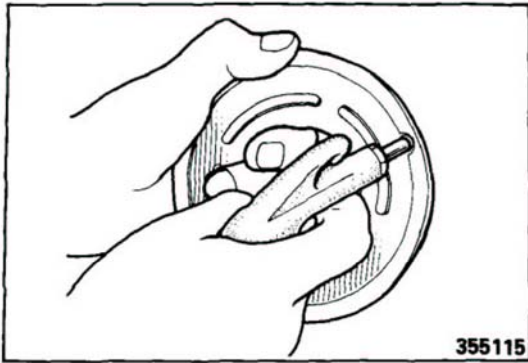
- (4) Check the clutch disc and clutch plate for wear and binding of friction surfaces and for wear and damage of engagement with the cylinder and hub (indicated by arrows).
- (5) Check the clutch return spring for damage and cracks. Also check for spring outside wear and deterioration.

**Coil O.D.**

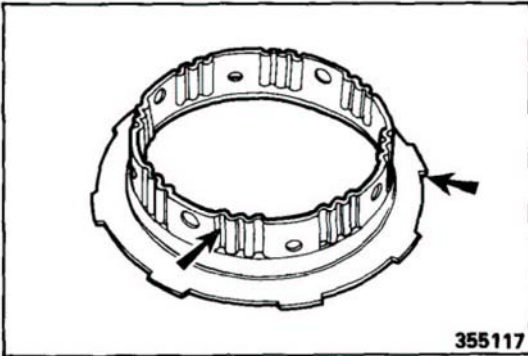
**Standard value : 8.0 mm (.315 in.)**

**Free length**

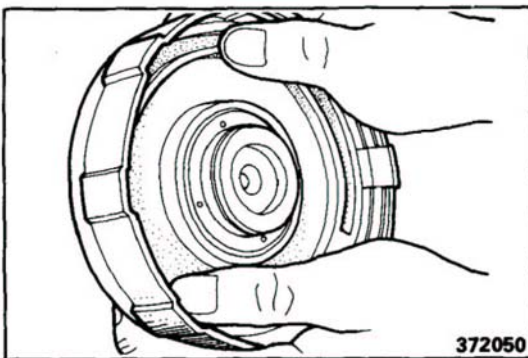
**Standard value : 15.1 mm (.594 in.)**



- (6) Check the clutch piston for wear and damage of the outside (surface in contact with the cylinder). Shake the piston to check for binding check ball. Also apply air pressure to the piston inside to check for air leaks.

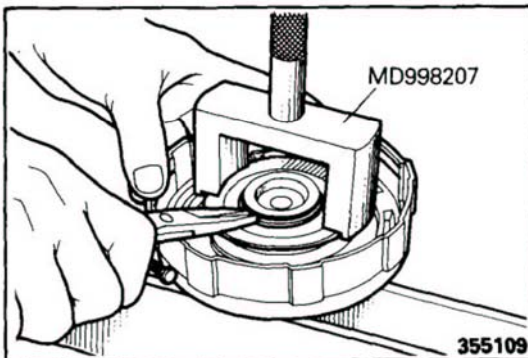


- (7) Check the direct clutch hub for abnormal wear and damage of the key ways (indicated by arrows).

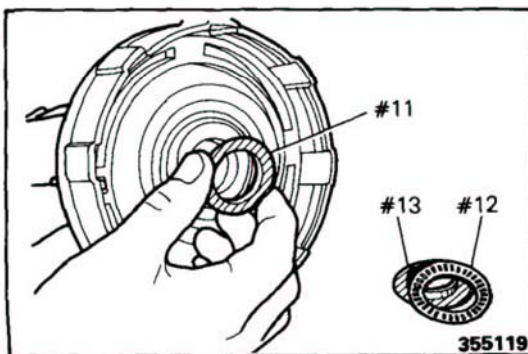


### REASSEMBLY

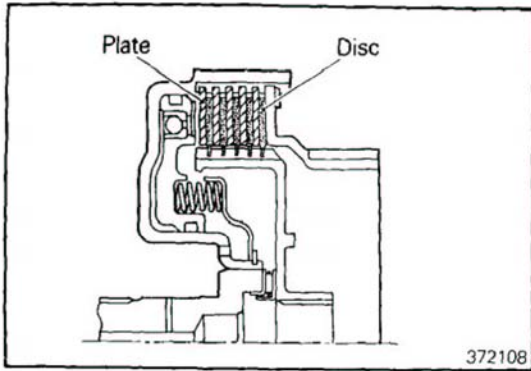
- (1) Install new O-ring in the piston outside and inside grooves.
- (2) Apply a light coat of ATF to the O-rings and install the piston in the case, using care not to damage O-rings.



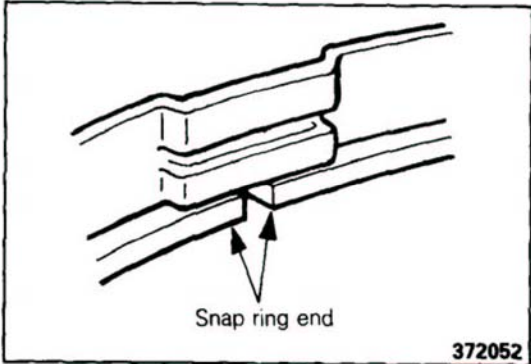
- (3) Install the return spring and spring retainer in the clutch cylinder and compress the spring by using the special tool. Fit the snap ring.



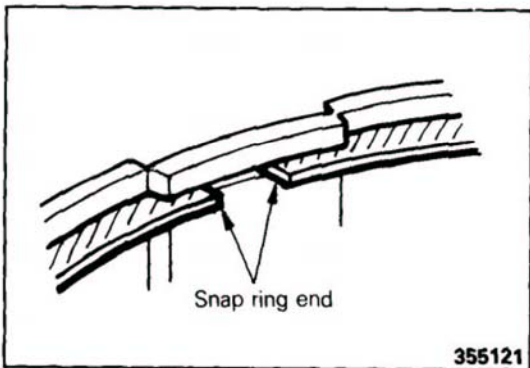
- (4) Using vaseline, attach thrust bearing race #11, bearing #12 and race #13 in the order shown onto the input shaft rear end.



- (5) Install the forward clutch hub in the clutch cylinder.
- (6) Install the clutch plates and clutch discs alternately in the clutch cylinder and fit the snap ring (narrower one) in the cylinder ring groove.



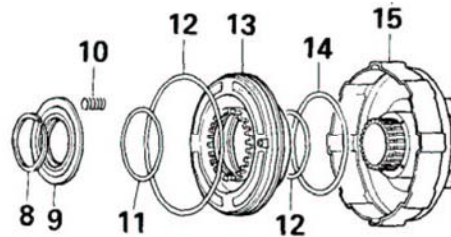
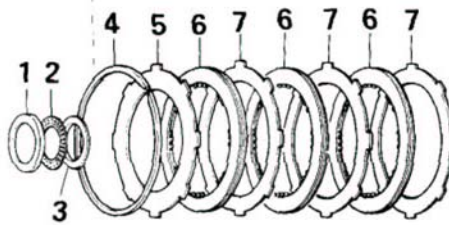
- (7) The snap ring should be located with its ends as illustrated.



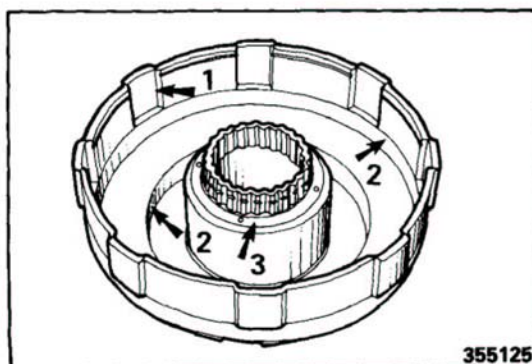
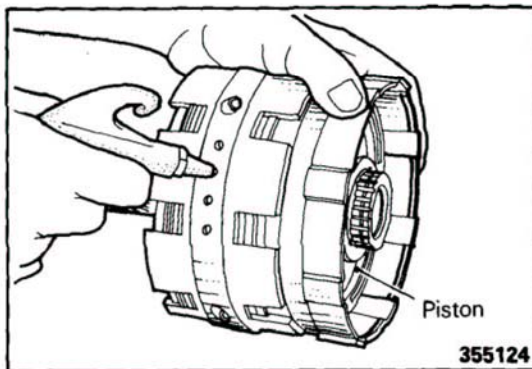
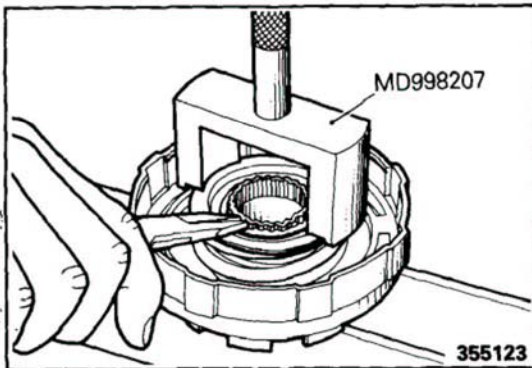
- (8) Install one clutch disc and then install the direct clutch hub and fit the snap ring (wider one) at illustrated location.

**DIRECT CLUTCH**

1. Thrust bearing race
2. Thrust bearing
3. Thrust bearing race
4. Snap ring
5. Clutch backing plate
6. Clutch disc
7. Clutch plate
8. Snap ring
9. Spring retainer
10. Piston return spring
11. O-ring
12. O-ring
13. Direct clutch piston
14. O-ring
15. Direct clutch cylinder



372053

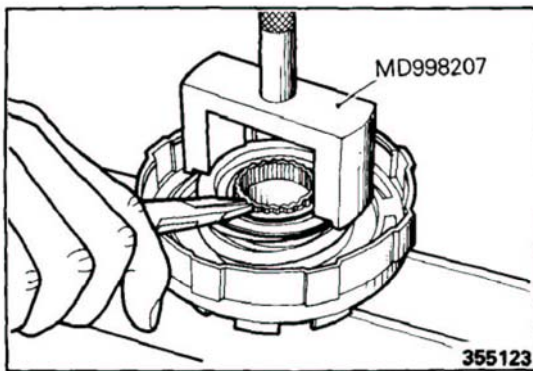
**DISASSEMBLY**

- (1) Remove the snap ring and remove the clutch backing plate, clutch discs and clutch plates from the direct clutch cylinder.
- (2) Place the rear clutch on a press bench by using the special tool, compress the return spring to remove the snap ring. Then, remove the spring retainer and piston return spring.
- (3) Install the clutch cylinder in the center support and blow air through the oil hole of the center support to remove the piston from the cylinder.
- (4) Remove the O-rings from the piston.

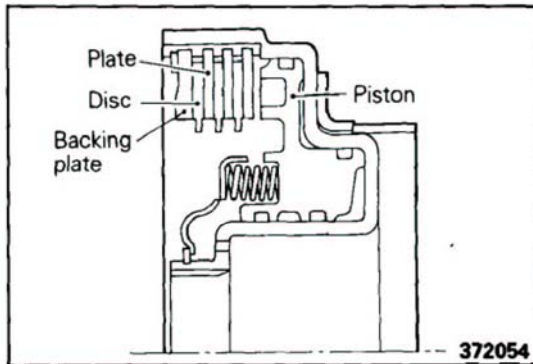
**INSPECTION**

Wash the removed parts and dry with air. Then, check the following and replace faulty parts.

- (1) Check the clutch cylinder for wear and damage of grooves 1 and piston sliding surface 2, for wear and damage of thrust bearing surface and for wear and damage of seal ring sliding surface.
- (2) For inspection of the clutch disc, plate, piston and spring, see FRONT CLUTCH.

**REASSEMBLY**

- (1) Fit new O-rings in inside and outside grooves of the piston.
- (2) Apply a light coat of ATF to the O-rings and insert the piston into the cylinder using care not to damage the O-rings.
- (3) Place the clutch cylinder on a press bench and install the clutch return spring and spring retainer.
- (4) Compress the return spring, fit the snap ring by using the special tool.

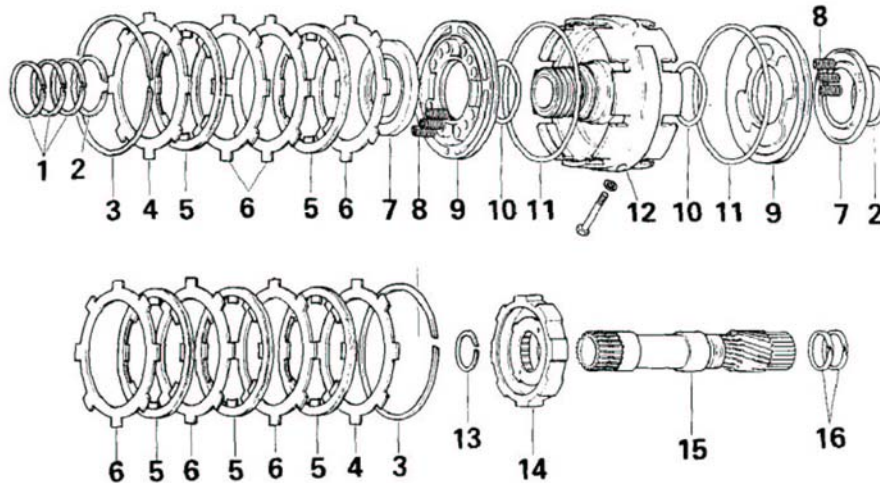


- (5) Install the clutch plates, clutch discs and clutch backing plate in the clutch cylinder and fit the snap ring.

**Caution**

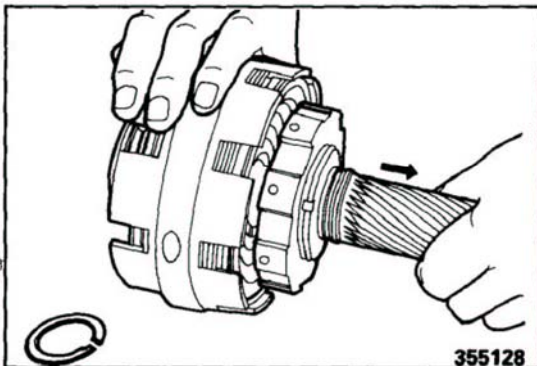
**Note the direction of installation of the backing plate.**

## CENTER SUPPORT



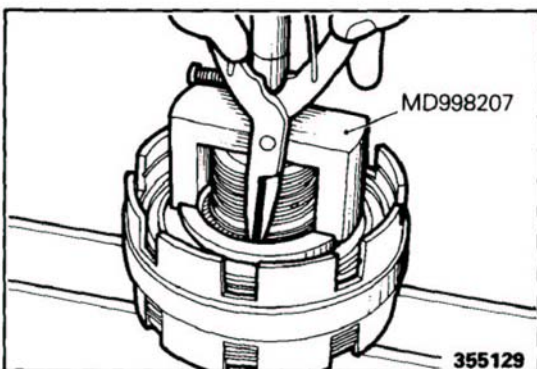
- |                         |                        |  |
|-------------------------|------------------------|--|
| 1. Seal ring            | 7. Spring retainer     | 13. Snap ring                                      |
| 2. Snap ring            | 8. Brake return spring | 14. Brake No.2 hub one-way clutch<br>No.1 assembly |
| 3. Snap ring            | 9. Brake piston        | 15. Planetary sun gear                             |
| 4. Clutch backing plate | 10. O-ring             | 16. Seal ring                                      |
| 5. Clutch disc          | 11. O-ring             |  |
| 6. Clutch plate         | 12. Center support     |  |

372055

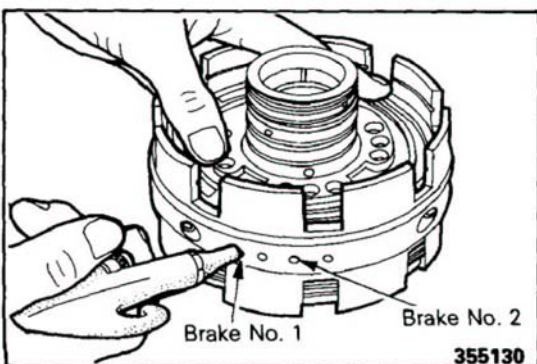


## DISASSEMBLY OF BRAKE NO.1

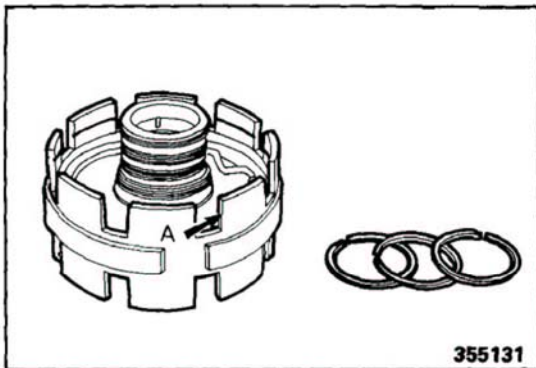
- (1) Remove the snap ring from the front of the sun gear and remove the sun gear (with one-way clutch) from the center support.
- (2) Remove the snap ring from the center support and remove the backing plate, clutch discs and clutch plates.



- (3) Plate the center support on a press bench by using the special tool. Compress the spring, remove the snap ring. Then, remove the spring retainer and 12 brake return springs.



- (4) Blow air into the oil way of the center support to remove the brake No.1 piston.
- (5) Remove the O-rings from the piston.
- (6) Remove the seal rings from the center support.

**INSPECTION**

Wash the removed parts and dry with air. Then, check the following and replace faulty parts.

- (1) Check the center support for damage and deterioration of the seal rings, for abnormal wear and ridge wear of seal ring groove, for abnormal wear and binding of bushing and for wear of clutch plate slot (section A).
- (2) Check the brake piston for damage of its outside (surface in contact with the center support cylinder). For inspection of the disc and plate, see FRONT CLUTCH.
- (3) Check the brake return spring for damage, squareness and for compliance with the spring specifications.

**Coil O.D.**

**Standard value : 8.0 mm (.315 in.)**

**Free length**

**Standard value : 16.1 mm (.634 in.)(reference)**

**Load at height**

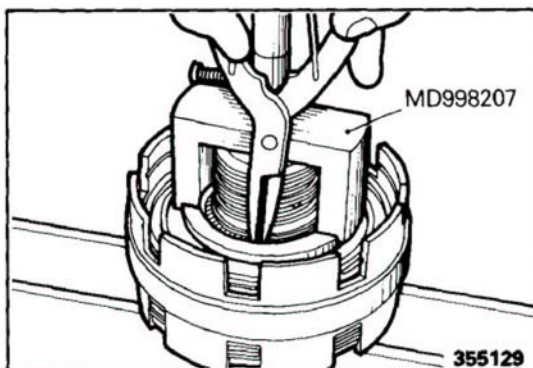
**Standard value 11.5 mm (.453 in.) : 21–23N (4.7–5.2 lbs.)(reference)**

**REASSEMBLY OF BRAKE NO.1**

- (1) Install three seal rings on the center support.
- (2) Install new O-rings on outside and inside of the No.1 brake piston.
- (3) Apply a light coat of ATF to the O-rings and insert the piston in the cylinder, using care not to damage the O-rings.
- (4) Place the center support on a press bench and fit 12 brake return springs in recesses of the piston. Then place the spring retainer thereon.
- (5) Compress springs by using the special tool and fit the snap ring.
- (6) Install the clutch plates, clutch discs and backing plate in the support and fit the snap ring.

**Caution**

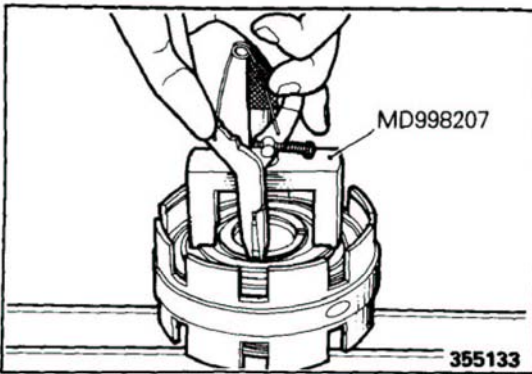
**Note the direction of installation of the backing plate.**

**DISASSEMBLY AND INSPECTION OF BRAKE NO.2**

For disassembly and inspection, see BRAKE NO.1.

**REASSEMBLY OF BRAKE NO.2**

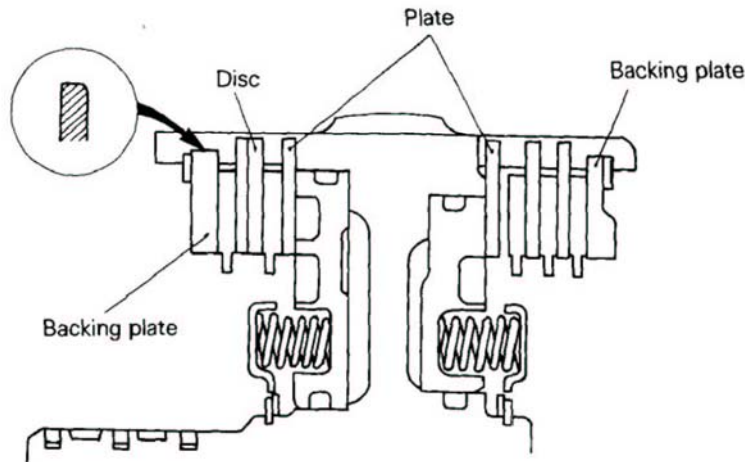
- (1) Install new O-rings on outside and inside of the No.2 brake piston.
- (2) Apply a light coat of ATF to the O-rings and insert the piston in the cylinder, using care not to damage the O-rings.
- (3) Place the center support on a press bench and fit 12 brake return springs in recesses of the piston. Then place the spring retainer thereon.



- (4) Compress the springs and fit the snap rings by using the special tool.
- (5) Install the clutch plates, clutch discs and backing plate in the support and fit the snap ring.

**Caution**

**Note the direction of installation of the backing plate.**



372102

**INSPECTION**

Wash the removed parts and dry with air. Then, check the following and replace faulty parts.

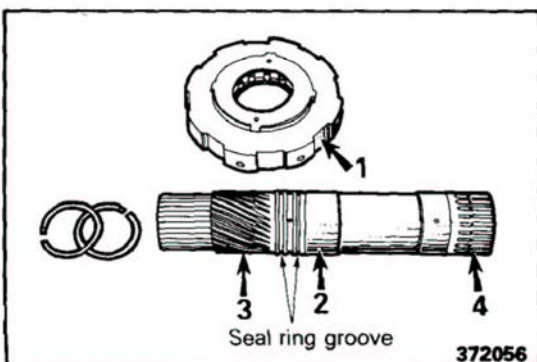
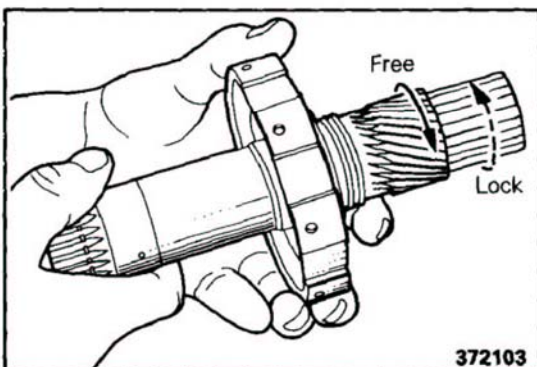
**Caution**

**When drying the one-way clutch by air, use care as the sprag is likely to pop out.**

- (1) Fix the brake No.2 hub (outer race) and check that the sun gear (inner race) turns smoothly when rotated clockwise and that it locks securely when rotated counter-clockwise.  
If the one-way clutch is found faulty, replace the brake No.2 hub and one-way clutch assembly.
- (2) Remove the sun gear from the one-way clutch 1 and check for wear and damage of its surface contacting with the one-way clutch springs. Also check for wear and damage of the seal ring and ring groove and for damage of the sun gear teeth 3 and splines 4.

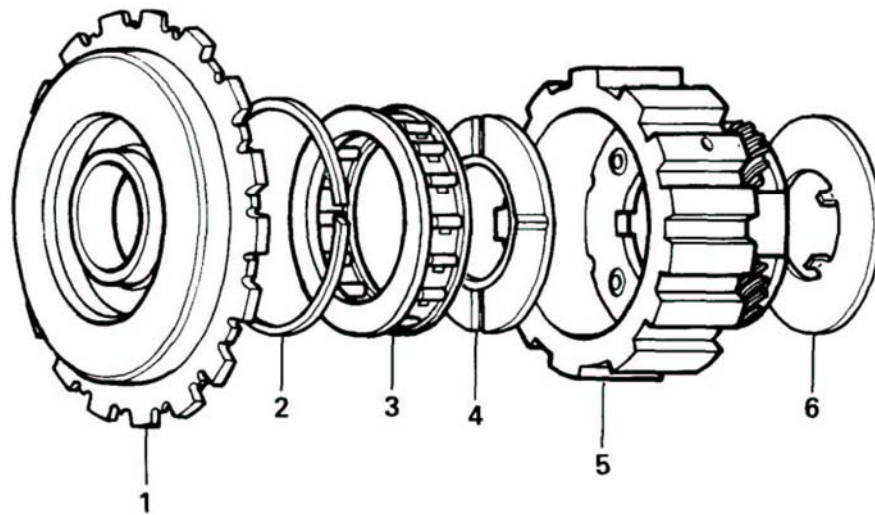
**REASSEMBLY**

- (1) Install two seal rings in sun gear grooves.
- (2) Insert the sun gear in the one-way clutch No.1 and check rotation.





**ONE WAY CLUTCH NO. 2 AND FRONT PLANETARY GEAR SET** N21LK-



- |                              |                         |
|------------------------------|-------------------------|
| 1. One-way clutch inner race | 4. Thrust washer        |
| 2. Retaining ring            | 5. Front planetary gear |
| 3. One-way clutch No.2       | 6. Thrust washer        |

355136



**DISASSEMBLY**

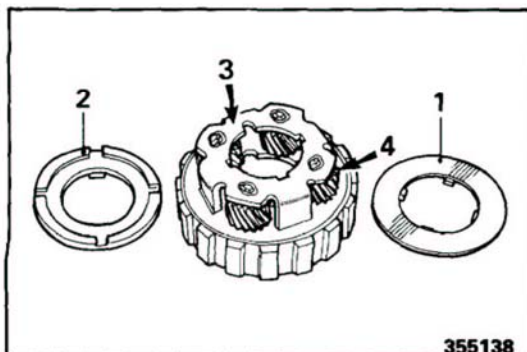
- (1) Disassemble the one-way clutch inner race and front planetary carrier.
- (2) Remove the retaining ring from the front planetary carrier and remove the one-way clutch No.2 assembly and thrust washers.

**INSPECTION**

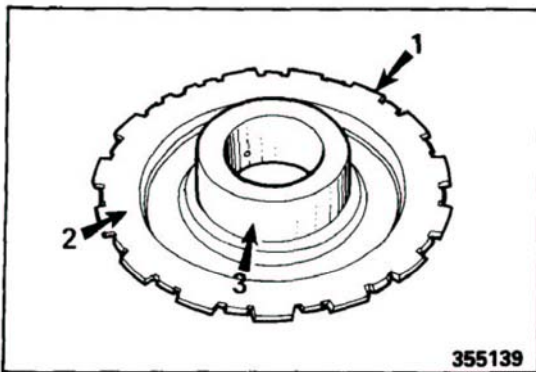
Wash the removed parts and dry with air. Then, check the following and replace faulty parts.

**Caution**

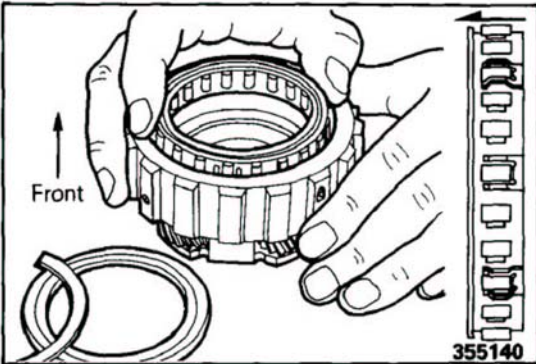
**When drying the one-way clutch by air, use care as the sprag is likely to pop out.**



- (1) Check the thrust washers 1 and 2 for wear, bend and binding.
- (2) Check the front planetary gear for wear of carrier thrust surface 3, for wear and damage of pinion 4 and for wear of the one-way clutch outer race surface.
- (3) Check one-way clutch No.2 for wear and damage of springs, ribbon and sprag.

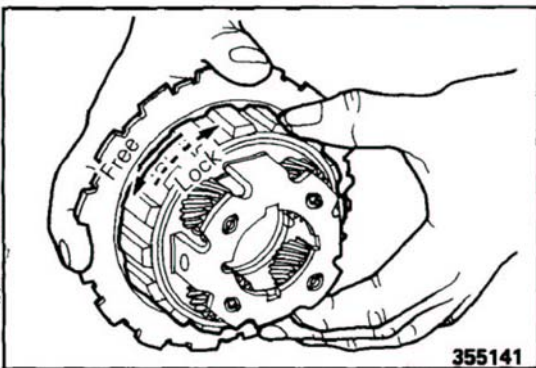


- (4) Check the one-way clutch inner race for wear and damage of teeth 1 and disc sliding surface 2 and for wear and damage of inner race surface 3.



### REASSEMBLY

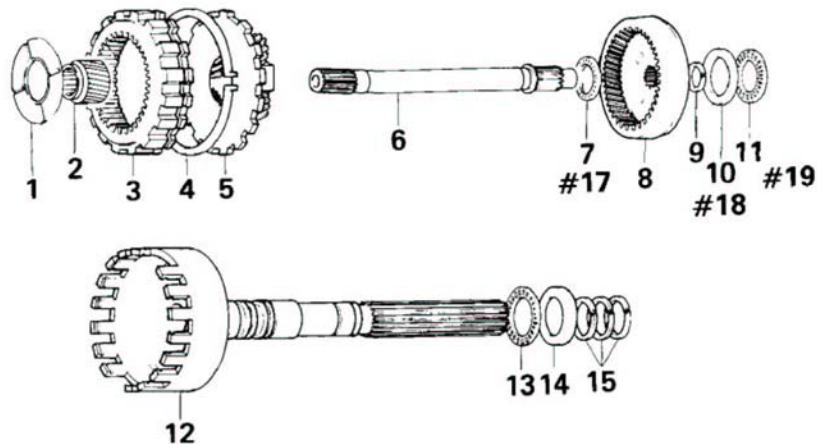
- (1) Install the thrust washer (front) on the planetary gear.
- (2) Install two end bearings on the one-way clutch and noting the direction, install the clutch on the front planetary gear and fix with the retaining ring.
- (3) Install the one-way clutch inner race on the front planetary carrier.



- (4) Fix the inner race and check that the outer race (planetary gear carrier) turns smoothly when rotated counter-clockwise and that it locks securely when rotated clockwise.
- (5) Apply vaseline to the thrust washer (rear) and attach it to the front planetary gear carrier.

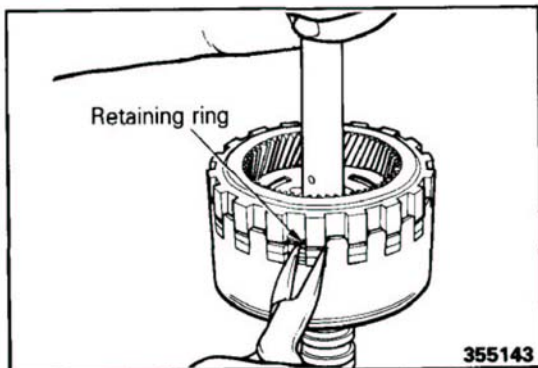
REAR PLANETARY GEAR AND OUTPUT SHAFT

N21LZ--



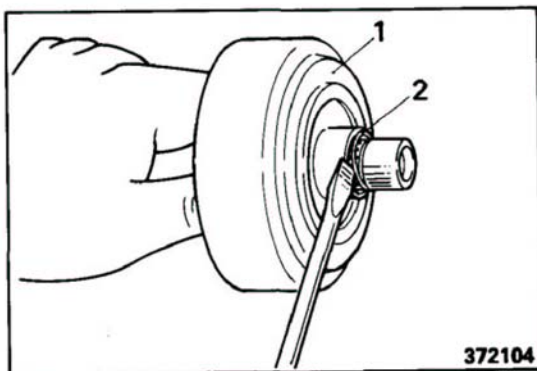
372057

- |                              |                             |                           |
|------------------------------|-----------------------------|---------------------------|
| 1. Thrust washer             | 6. Intermediate shaft       | 11. Thrust bearing #19    |
| 2. Planetary sun gear        | 7. Thrust bearing #17       | 12. Output shaft assembly |
| 3. Front planetary ring gear | 8. Rear planetary ring gear | 13. Thrust bearing        |
| 4. Retaining ring            | 9. Retaining ring           | 14. Thrust bearing race   |
| 5. Rear planetary gear       | 10. Thrust bearing race #18 | 15. Seal ring             |

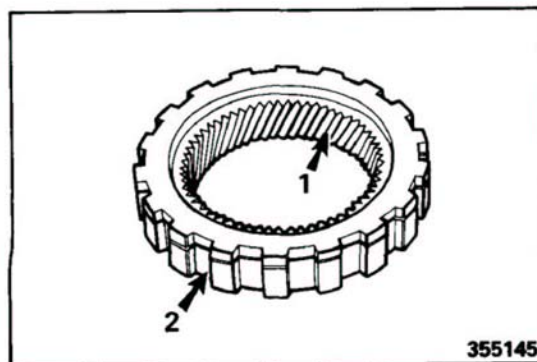


DISASSEMBLY

- (1) Loosen the retaining ring and remove the intermediate shaft (front planetary ring gear and rear planetary gear) from the output shaft assembly.
- (2) Remove the front planetary ring gear, thrust washer and rear planetary gear from the intermediate shaft.



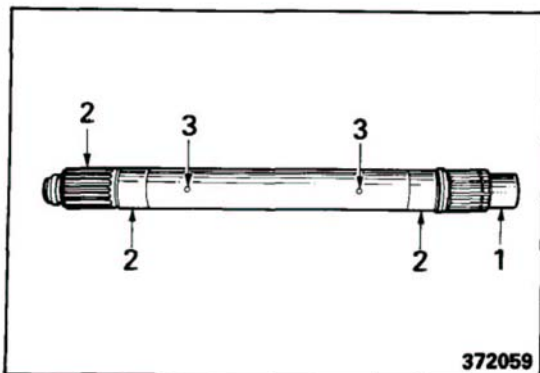
- (3) Remove retaining ring 1 from the rear of the intermediate shaft and remove rear planetary ring gear 2 and thrust bearing #17.



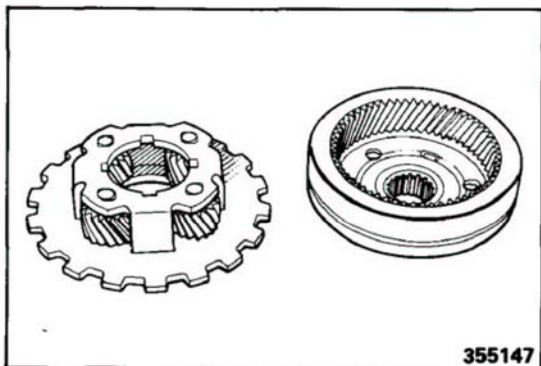
INSPECTION

Wash the removed parts and dry with air. Then, check the following and replace faulty parts.

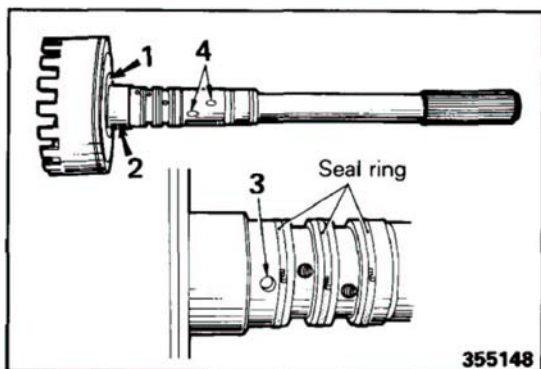
- (1) Check the front planetary ring gear for wear and damage of internal gear teeth 1 and parking pawl teeth 2.



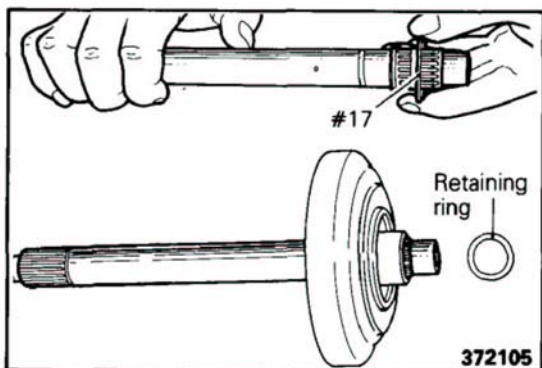
- (2) Check the intermediate shaft for wear and damage of splines 1 and bushing seating surfaces 2 and for clogging of oil holes 3 in shaft.



- (3) Check the rear planetary gear for wear of the carrier thrust surface, for wear, damage and play in thrust direction of the pinion.
- (4) Check the rear planetary ring gear for wear and damage of the internal gear teeth and internal splines.

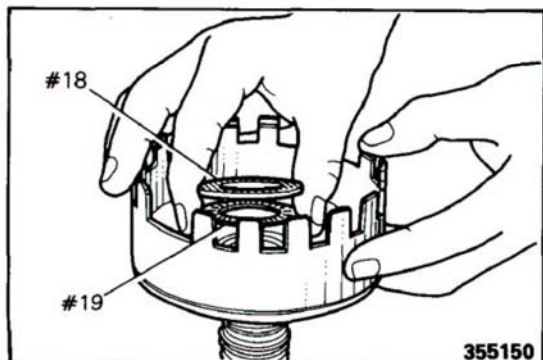


- (5) Check the output shaft for wear and damage of flange thrust bearing surface 1 and shaft bushing seating surface 2 and for clogging of shaft oil hole 3 and governor oil way 4.
- (6) Check the thrust washer and thrust race for wear and binding of the bearing surfaces.
- (7) Check the seal ring for wear and damage. Also check the groove.

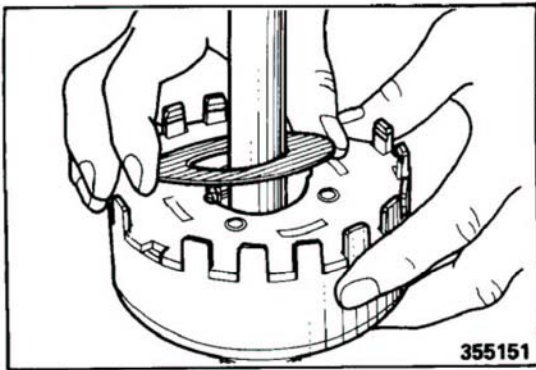


### REASSEMBLY

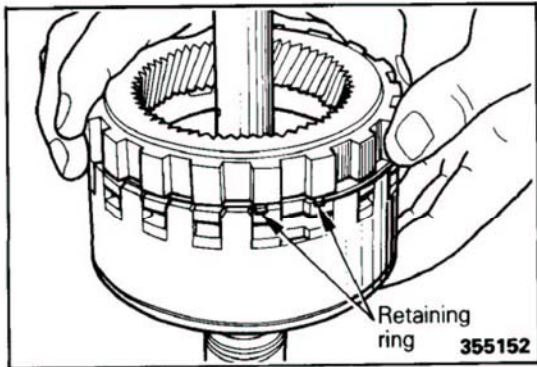
- (1) Install thrust bearing #17 on the intermediate shaft and then install the rear planetary ring gear and fix with the retaining ring.



- (2) Install thrust bearing #19 and bearing race #18 on the output shaft.



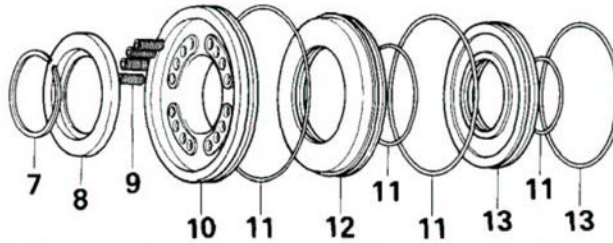
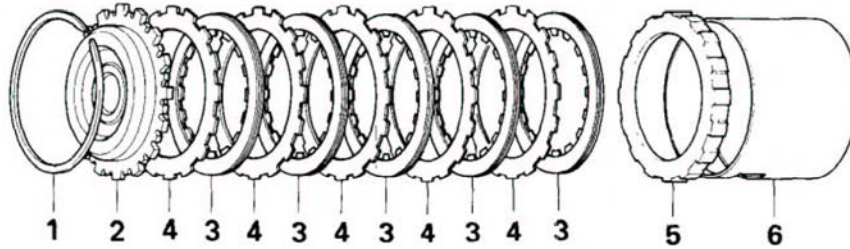
- (3) Install the intermediate shaft together with the rear planetary ring gear on the output shaft flange.
- (4) Install the rear planetary gear set and thrust washer.



- (5) Install the retaining ring on the front planetary ring gear and install the ring gear on the output flange while compressing the retaining ring.

**Caution**  
**Pay attention to location of retaining ring ends.**

**BRAKE NO. 3**

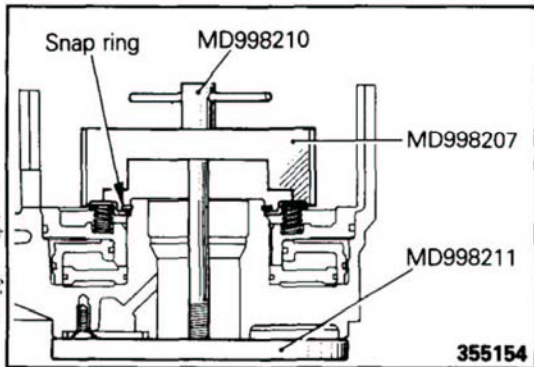


- 1. Retaining ring
- 2. One-way clutch inner race
- 3. Clutch disc
- 4. Clutch plate
- 5. Backing plate

- 6. Brake apply tube
- 7. Snap ring
- 8. Spring retainer
- 9. Brake return spring
- 10. Brake No.3 primary piston

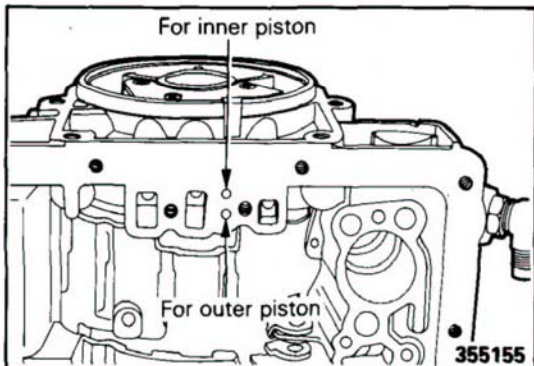
- 11. O-ring
- 12. Reaction sleeve
- 13. Brake No.3 secondary piston

372060

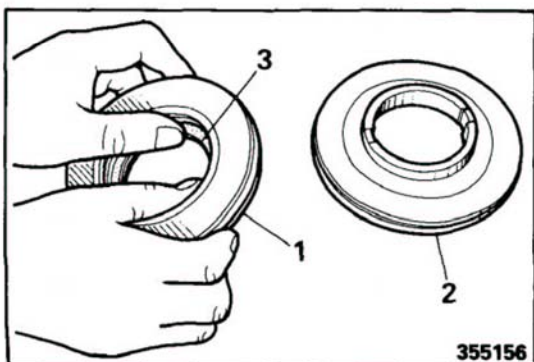


**DISASSEMBLY**

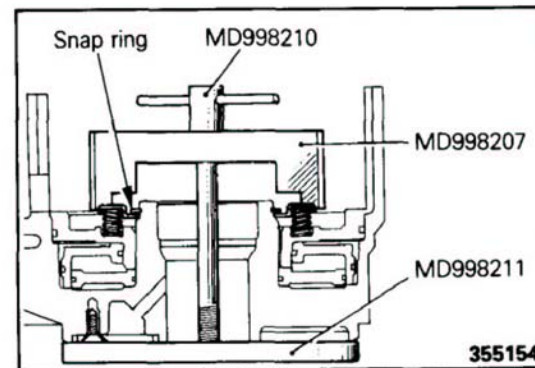
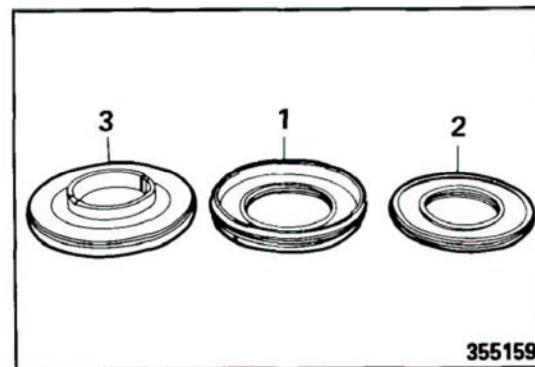
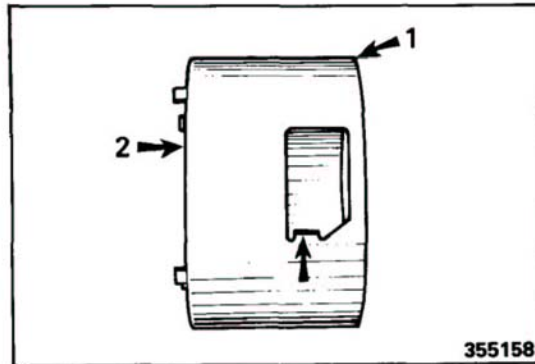
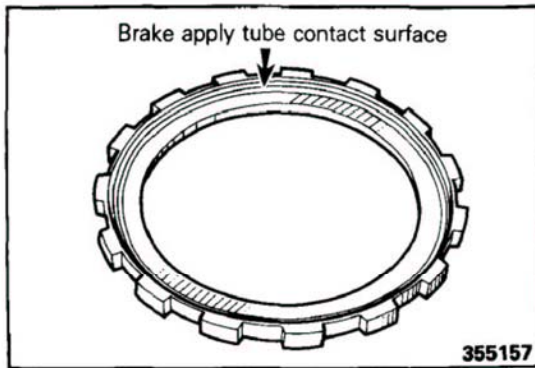
- (1) Compress the spring and remove the snap ring by using the special tools.
- (2) Remove the spring retainer and 16 piston return springs.



- (3) Place the transmission case with the front end down and using two air guns, blow air into inside through the inner and outer piston oil holes simultaneously to remove the inner and outer pistons and reaction sleeve as an assembly. Place rag below the case to protect the pistons.



- (4) Remove primary piston 2 and secondary piston 3 from reaction sleeve 1.
- (5) Remove O-rings from the pistons and reaction sleeve.



**INSPECTION**

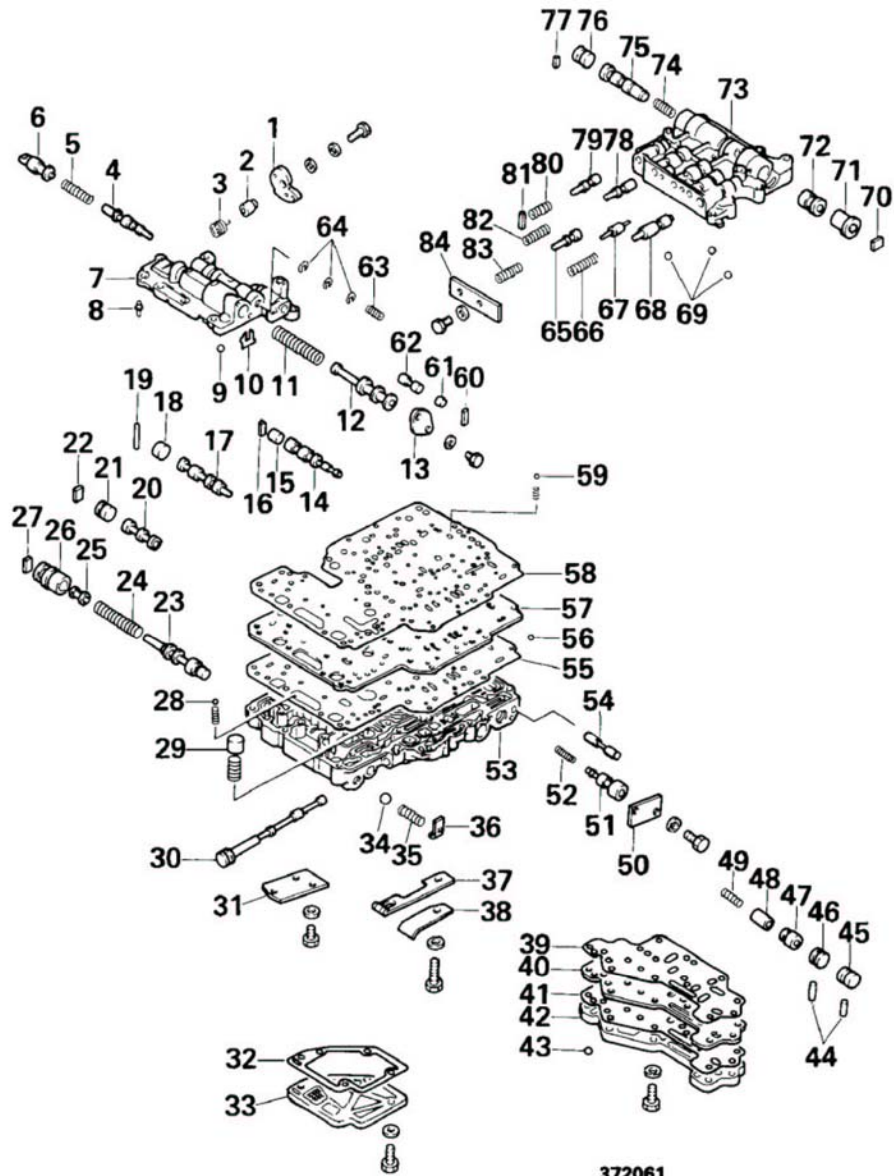
Wash the removed parts and dry with air. Then, check the following and replace faulty parts.

- (1) Check the clutch discs and clutch plates for wear and binding of the friction surfaces and for wear of parts in engagement with the transmission case and hub.
- (2) Check the backing plate for wear and binding of disc friction surface and for wear and damage of brake apply tube contact surface.
- (3) Check the brake apply tube for deformation and damage, for wear and damage of backing plate contact surface 1 and piston contact surface 2 and for wear and deformation of tube detent lug 3.
- (4) Check the brake piston and reaction sleeve for damage and wear of their outside in contact with the cylinder.
- (5) For inspection of the brake return springs, see the paragraph on inspection of brake No.1 springs.

**REASSEMBLY**

- (1) Install new O-rings on the primary and secondary pistons and reaction sleeve.
- (2) Apply ATF to the O-rings and push inner piston 2 into reaction sleeve 1 and then install outer piston 3.
- (3) Slide the pistons and reaction sleeve assembled in the step above into the cylinder, using care not to damage the O-rings.
- (4) Apply grease to 16 brake return springs and install them on the outer piston. Then, install the spring retainer.
- (5) Compress the springs and fit the snap ring by using the special tools.

VALVE BODY



372061



1. Throttle cam
2. Cam spacer
3. Return spring
4. Throttle valve
5. Throttle valve primary spring
6. Kickdown valve
7. Upper front valve body
8. Check valve
9. Check ball
10. Throttle valve keep plate
11. Secondary regulator valve spring
12. Secondary regulator valve
13. Front valve end cover
14. 1-2 shift valve
15. 1-2 shift valve plug
16. Valve retainer
17. 3-4 shift valve
18. 3-4 shift valve plug
19. Locating pin
20. D-2 down timing valve
21. D-2 down timing valve plug
22. Valve retainer
23. Primary regulator valve
24. Primary regulator valve spring
25. Primary regulator valve plunger
26. Primary regulator valve sleeve
27. Valve retainer
28. Check valve
29. Check valve
30. Manual valve
31. Plate
32. Oil screen gasket
33. Oil screen
34. Pressure relief valve
35. Pressure relief valve spring
36. Retainer
37. Detent spring
38. Detent spring plate
39. Lower valve body cover gasket (upper)
40. Lower valve body cover plate
41. Lower valve body cover gasket (lower)
42. Lower valve body cover
43. Check valve
44. Locating pin
45. Manual plug
46. Third coast shift valve plug
47. Third coast shift valve
48. 3-4 shift control valve
49. 3-4 shift control valve spring
50. Low coast shift valve cover
51. Low coast shift valve
52. 1-2 shift valve spring
53. Lower valve body
54. Plug
55. Lower valve body gasket
56. Check valve
57. Separate plate
58. Valve body gasket
59. Check valve
60. Valve retainer
61. Cut back plug
62. Cut back valve
63. Throttle valve secondary spring
64. E-ring
65. Reverse brake sequence valve
66. Low coast modulator valve spring
67. Plug
68. Low coast modulator valve
69. Check valve
70. Valve retainer
71. Intermediate coast shift valve plug
72. Intermediate coast shift valve
73. Upper rear valve body
74. 2-3 shift valve spring
75. 2-3 shift valve
76. 2-3 shift valve plug
77. Valve retainer
78. Intermediate coast modulator valve
79. Detent regulator valve
80. Detent regulator valve spring
81. Valve retainer
82. Intermediate coast modulator valve spring
83. Reverse clutch sequence valve spring
84. Rear valve cover

**DISASSEMBLY**

For disassembly, observe the precautions given below.

- (1) Keep the disassembled parts orderly for efficient reassembly operation. Attach tags to springs for identification.
- (2) When disassembling the valve, do not attempt to remove the valve with undue force. The valve and valve hole could be damaged or burred, leading to faulty valve operation.
- (3) When removing the front upper and rear valve bodies from the lower valve body, use care not to lose check balls and springs.

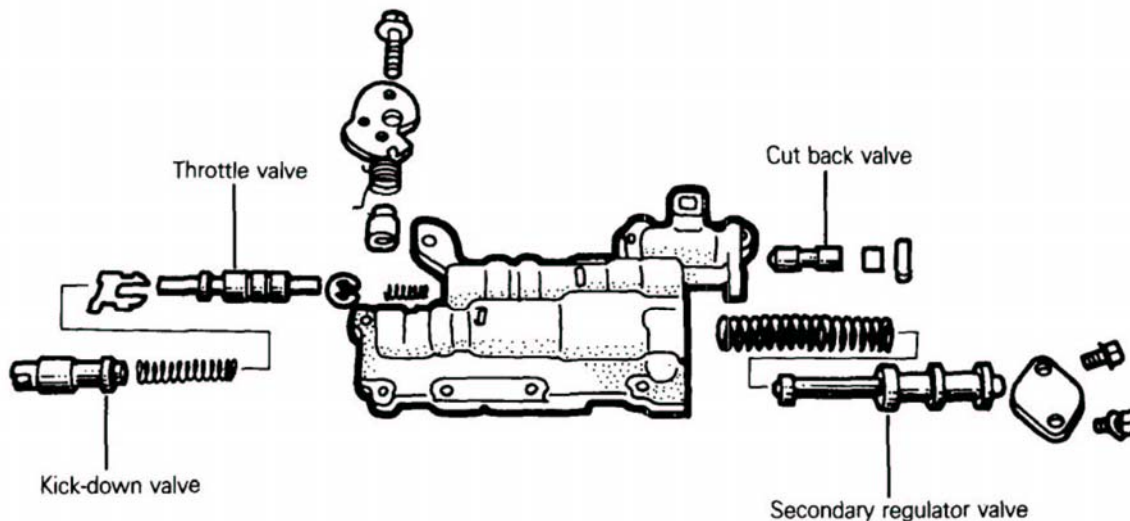
**INSPECTION**

Wash the removed parts and dry with air. Then, make the following checks.

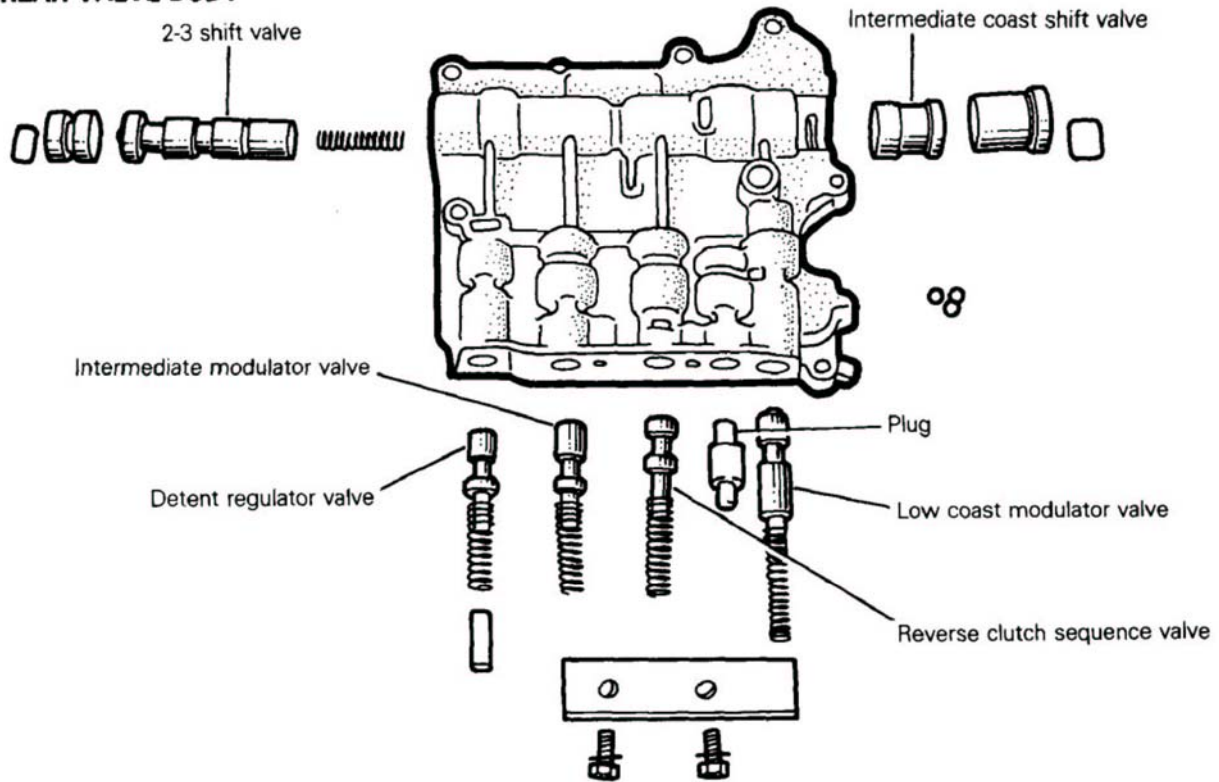
**Caution**

**When making checks, use care not to damage valve land outside and valve body holes.**

- (1) Check the valves for damage and wear.
- (2) Insert the valves in the valve body and check smooth rotation and sliding.
- (3) Check the valve body for damage and wear of valve hole bores and for clogging of oil holes and oil ways.
- (4) Check for damage of the valve body plate wear and damage of check balls.
- (5) Check for clogging of the oil strainer.

**UPPER FRONT VALVE BODY**

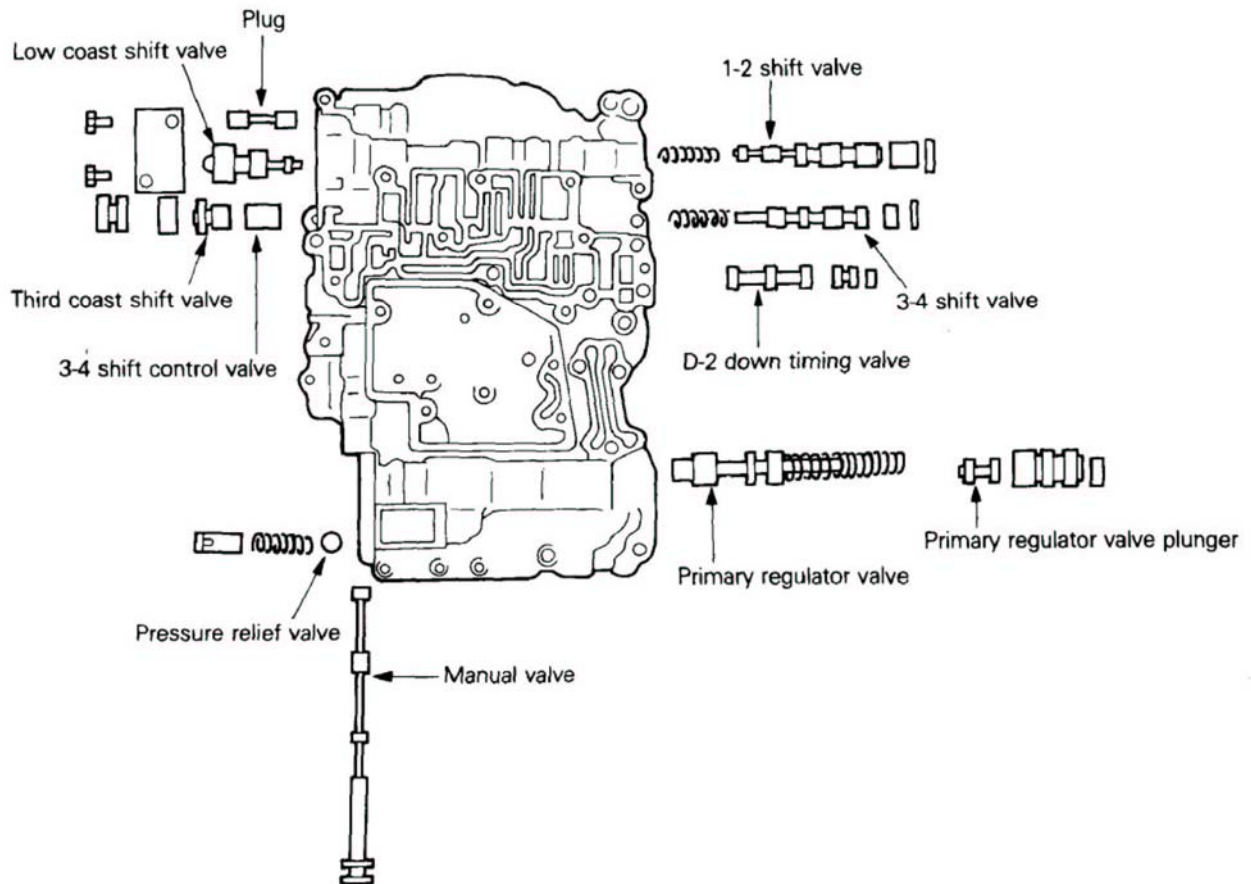
UPPER REAR VALVE BODY



372062

(6) Check the springs and replace if broken or excessively deteriorated. (See the table on page 21-164.)

LOWER VALVE BODY



372063

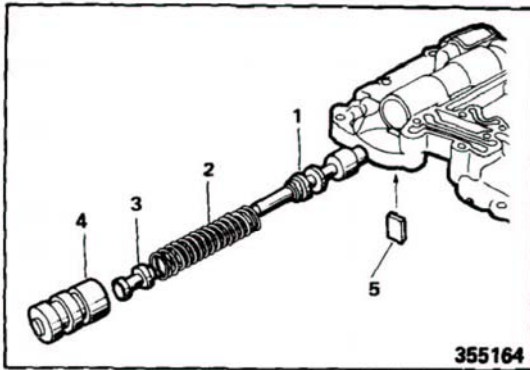
## Valve Spring Identification

	Name	Spring outer di- ameter mm (in.)	Free length (refer- ence mm value)(in.)	Number of turns	Wire diameter mm (in.)	Identification color
Upper front valve body	Spring (for throttle valve)	8.58 (.338)	19.24 (.757)	8	0.71 (.028)	-
	Spring (for kickdown valve)	10.87 (.428)	43.44 (1.710)	15.5	1.20 (.047)	Orange
	Spring (for secondary regulator valve)	17.43 (.686)	71.27 (2.806)	15	1.93 (.076)	Green
Upper rear valve body	Spring (for intermediate modulator valve)	9.04 (.356)	27.26 (1.073)	9.5	1.10 (.043)	Green
	Spring (for sequence valve)	9.32 (.367)	33.72 (1.327)	13	1.32 (.052)	Yellow
	Spring (for low coast modulator valve)	9.24 (.364)	42.35 (1.667)	15	0.84 (.033)	-
	Spring (for 2-3 shift valve)	8.96 (.353)	35.10 (1.382)	12.5	0.76 (.030)	White
	Spring (for detent regulator valve)	8.90 (.350)	30.43 (1.198)	13	0.90 (.035)	Green
Lower valve body	Spring (for 1-2 shift valve)	7.56 (.298)	34.62 (1.363)	13	0.56 (.022)	-
	Spring (for 3-4 shift valve)	10.60 (.417)	35.18 (1.385)	14.5	1.10 (.043)	Green
	Spring (for pressure relief valve)	13.14 (.517)	32.14 (1.265)	9	2.03 (.080)	-
	Spring (for check valve)	13.82 (.544)	33.32 (1.312)	7	1.32 (.052)	Yellow
	Spring (for primary regulator valve)	17.20 (.677)	61.20 (2.409)	13	1.80 (.071)	White
	Spring (for primary regulator valve damp- ing)	4.97 (.196)	20.00 (.787)	16	0.40 (.016)	-

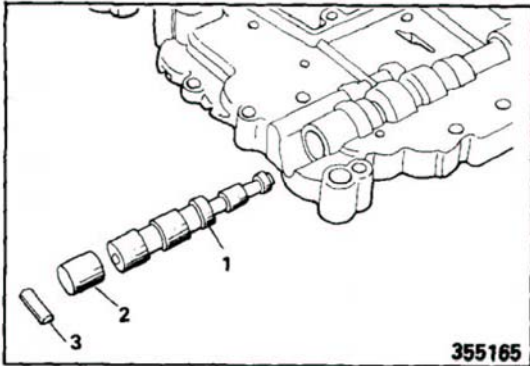
**REASSEMBLY**

**Caution**

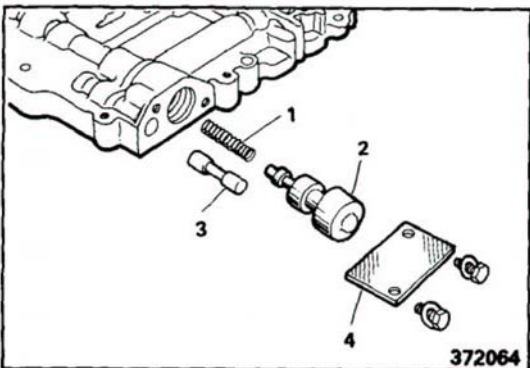
**Before reassembly, wash the parts in a clean detergent and dry with air. Do not wipe with rags for drying. Entry of dust could cause faulty valve operation.**



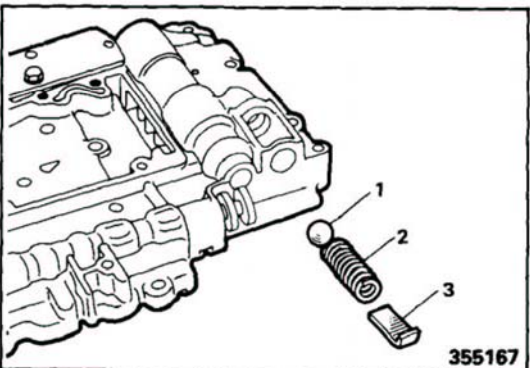
- (1) Install primary regulator valve 1, spring 2, plunger 3 and sleeve 4 in the lower valve body in the order shown and insert retainer 5 to prevent the valve and other parts from coming loose.



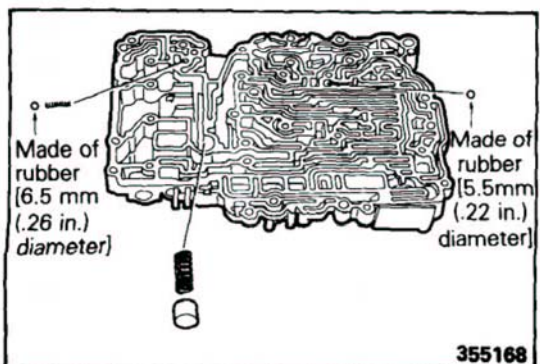
- (2) Install 1-2 shift valve 1 and valve plug and insert retainer 3 to prevent the valve from coming loose.



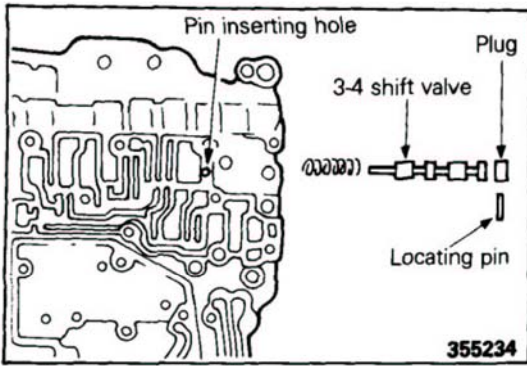
- (3) Install 1-2 shift valve spring 1, low coast shift valve 2 and plug 3 and fit low coast shift valve cover 4.



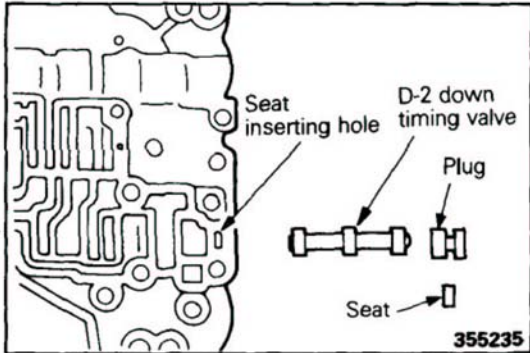
- (4) Install pressure relief valve 1, spring 2 and retainer 3.



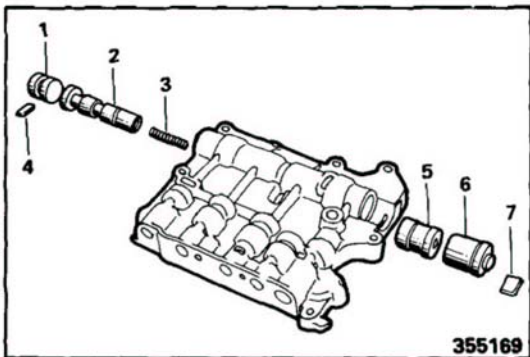
- (5) Install spring, check valve and check valve spring at illustrated locations.



(6) Install the spring, 3-4 shift valve and plug and then insert the locating pin.

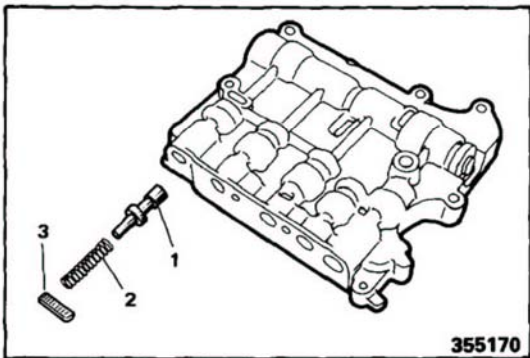


(7) Install the D-2 down timing valve and plug and insert the seat.

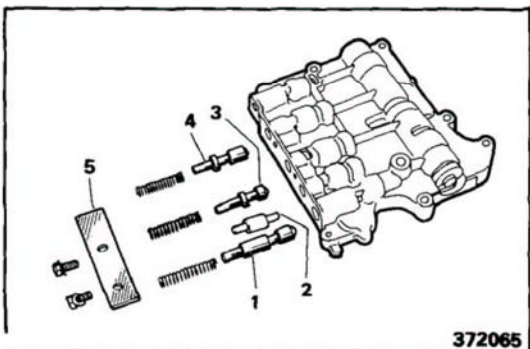


(8) Install 2-3 shift valve spring 1, 2-3 shift valve 2, 2-3 shift valve plug 3 and retainer 4 in the upper rear valve body.

(9) Install intermediate coast shift valve 5, plug 6 and retainer 7.



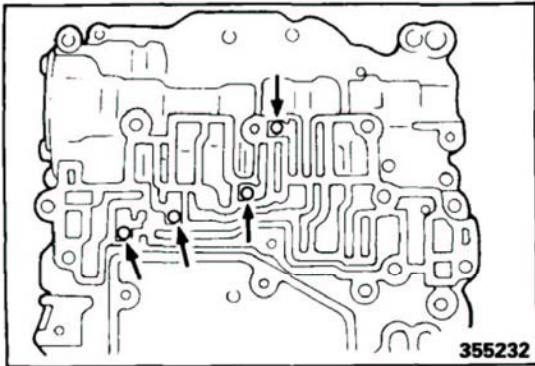
(10) Install detent regulator valve 1, spring 2 and retainer 3 in the order shown.



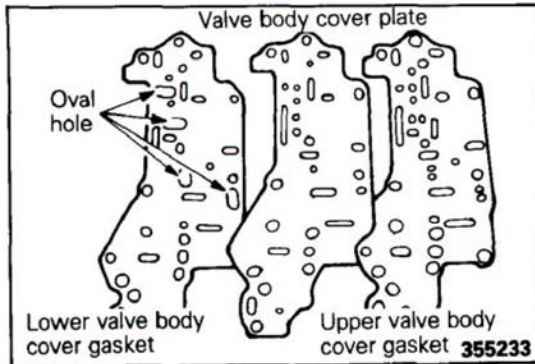
(11) Install low coast modulator valve 1, plug 2, reverse brake sequence valve 3 and intermediate coast modulator valve 4.

(12) Install valve springs.

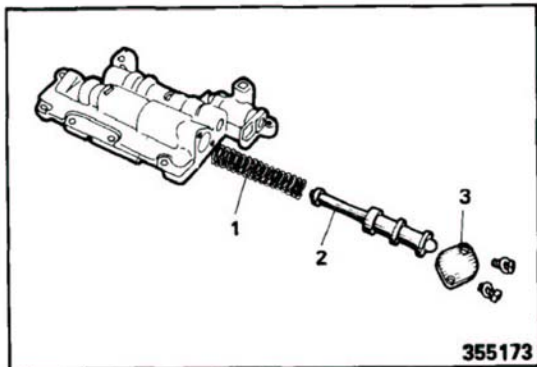
(13) Install rear valve cover 5.



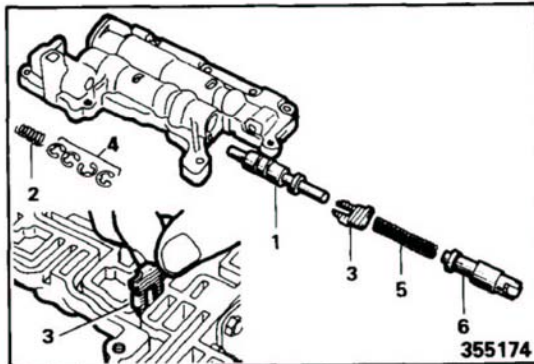
(14) Place check balls (rubber) at illustrated locations in oil ways in the bottom of the lower valve body.



(15) When installing the lower valve body cover, use the correct gasket. One with oval holes for check balls is for the lower valve body.



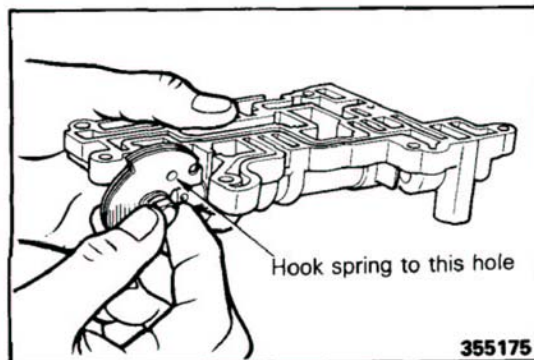
(16) Insert secondary regulator valve spring 1 and secondary regulator valve 2 in the front upper valve body and install front valve end cover 3.



(17) Insert throttle valve 1, throttle valve secondary spring 2 and E rings 4 in the order shown and fit key plate 3 in the oil way at illustrated location. Then, install throttle valve primary spring 5 and kickdown valve 6.

**Caution**

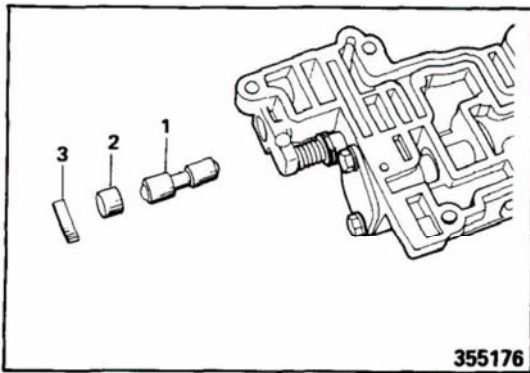
1. Install same number of E rings as before disassembly for not disturbing throttle valve adjustment.
2. Insertion of the throttle valve key plate at incorrect location could cause faulty valve operation.



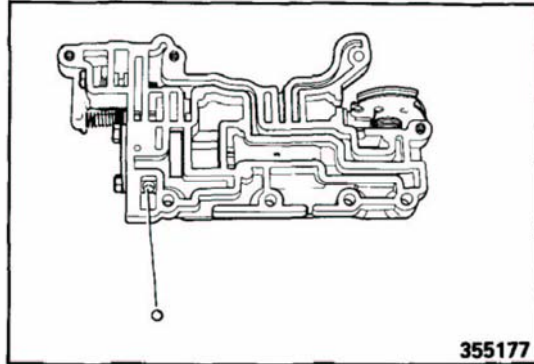
(18) Install the throttle cam and spring on the upper front valve body and tighten bolts temporarily. When installing, note the location of the spring end on the body side. Then, hook the other end of the spring to the cam and bolt the cam to the valve body. After installation, check that the throttle cam turns through full stroke smoothly.

**Caution**

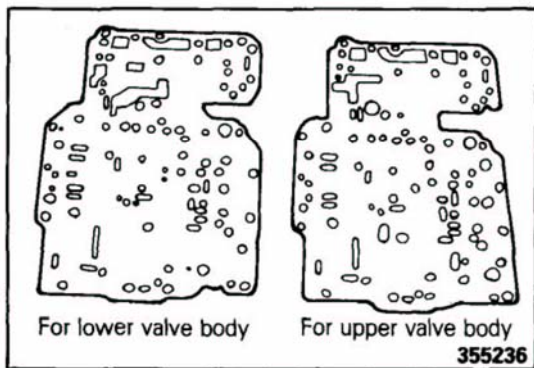
**Hook the spring to the correct hole.**



(19) Install cut back valve 1, valve plug 2 and retainer 3. Install the cut back plug with the larger land end facing out.



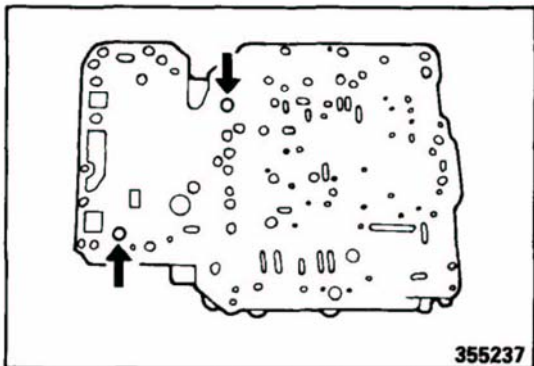
(20) Install the check ball (rubber) at the illustrated location.



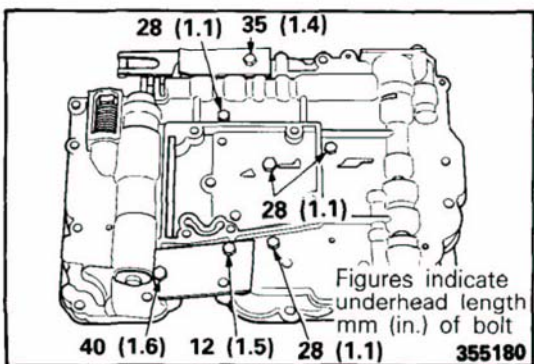
(21) Place a new lower valve body gasket on the lower valve body.

NOTE

Do not use gasket for the upper valve body.



(22) Install the separator plate and tighten bolts at illustrated locations temporarily.



(23) Place a gasket for upper valve body, aligning with the separator plate.

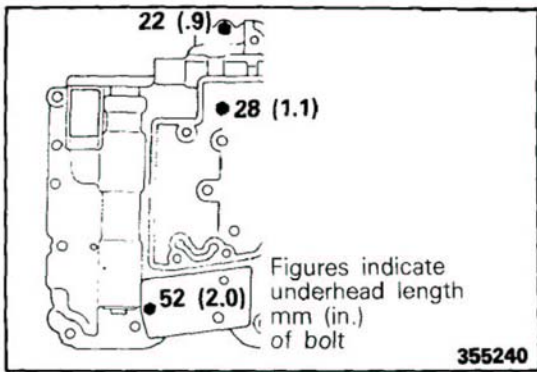
(24) While using care not to disturb check valve position on the rear upper valve body, install the lower valve body onto the rear upper valve body and tighten the bolts (indicated by (A)) temporarily from the lower valve body side.

(25) Remove the two bolts tightened in step (22).

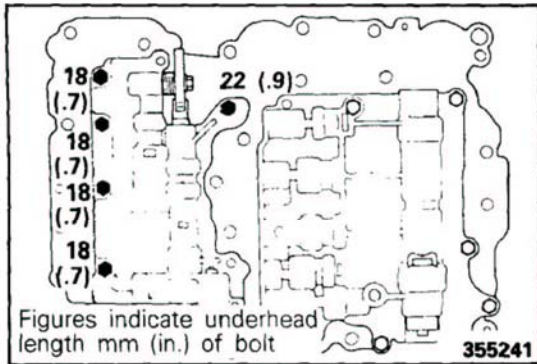
(26) Install the lower valve body onto the rear upper valve body and tighten the bolts (indicated by (B)) temporarily from the lower valve body side.

(27) Install the detent plate.

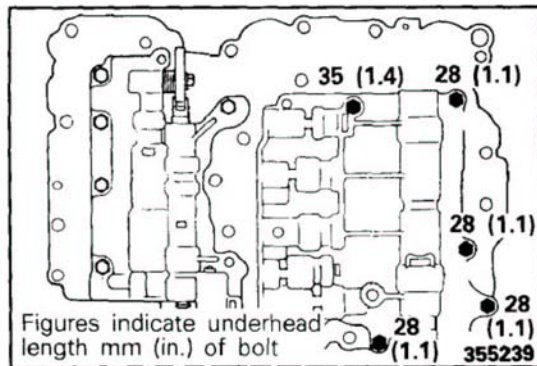




(28) Install the lower valve body onto the upper front valve body and temporarily tighten the bolts shown at left from the lower valve body side.



(29) Turn the valve body upside down and temporarily tighten the illustrated bolts from the upper valve body side.



(30) Then, temporarily tighten the remaining valve body bolts as illustrated.

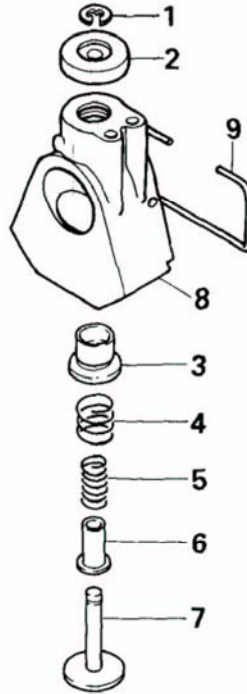
(31) Tighten all bolts of the valve body to specified torque.

(32) Install the manual valve.

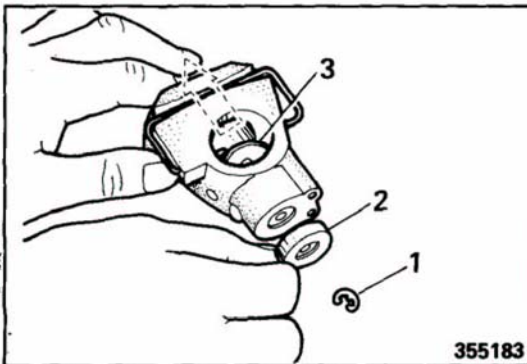
## GOVERNOR

N21NA--

1. E-ring
2. Governor weight
3. Governor valve
4. Outer governor spring
5. Inner governor spring
6. Secondary weight
7. Governor valve shaft
8. Governor body
9. Governor retaining ring



372066

**DISASSEMBLY**

- (1) Remove the E-ring 1 and remove governor weight 2.
- (2) Remove governor shaft 3, spring and governor valve in the direction of arrow. Remove the governor valve from the output shaft hole.

**INSPECTION**

Wash removed parts and dry with air. Then, make the following checks.

- (1) Check the governor valve for damage and wear and check that it slides smoothly while rotating it in the body.
- (2) Check the governor body for damage and wear of the valve sliding surface and for clogging of the oil hole and oil way.
- (3) Check the governor spring.

		Outer	Inner
Coil outer diameter	mm (in.)	15.34 (.604)	11.55 (.455)
Free length	mm (in.)	12.76 (.520)	11.49 (.452)
Wire diameter	mm (in.)	0.85 (.034)	0.85 (.034)
Identification color		White	White

**REASSEMBLY**

Reassemble the governor following the disassembly steps in reverse order.

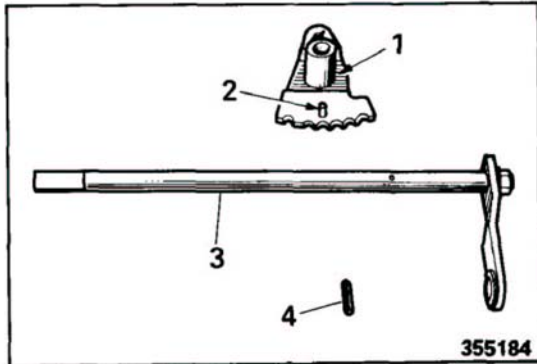
## TRANSMISSION CASE

N21NB--

### INSPECTION

Make the following checks and replace faulty parts.

- (1) Check the bushing for wear and binding.
- (2) Check the accumulator bore surface for damage.
- (3) Check the brake No.3 cylinder surface for damage.
- (4) Check the case inside splines for excessive wear or damage.
- (5) Check mating surfaces with other parts for damage.



## MANUAL VALVE LEVER

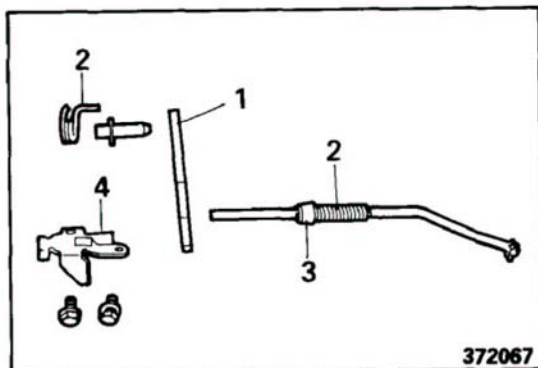
### INSPECTION

Make the following checks and replace faulty parts.

- (1) Check the lever detent spring collar contact surface 1 for wear and damage.
- (2) Check manual valve lever pin 2 for wear.
- (3) Check shaft 3 for wear.
- (4) Check slotted spring pin 4 for wear.

#### Caution

**When disassembled, do not reuse the slotted spring pin.**

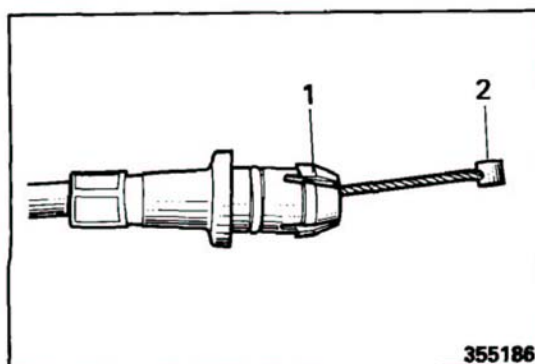


## PARKING SYSTEM

### INSPECTION

Make the following checks and replace faulty parts.

Check parking lock pawl 1, spring 2, cam collar 3 and cam plate 4 for wear and damage.



## THROTTLE CONTROL CABLES

### INSPECTION

Make the following checks and replace faulty parts.

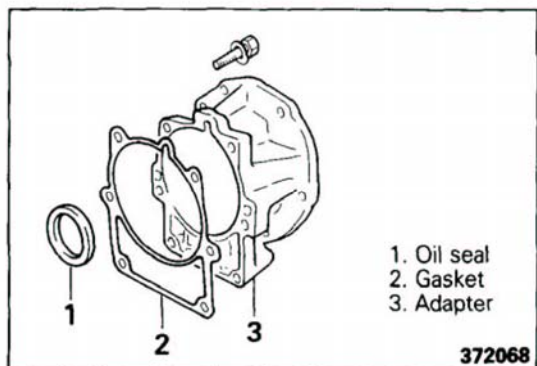
- (1) Check the outer cable for cracks and damage.
- (2) Check motion of the inner cable in the outer cable.
- (3) Check adapter 1 and nipple 2 for wear and deformation.
- (4) Check the boot for damage.

## THRUST BEARING AND THRUST WASHERS

N21NC--

### INSPECTION

- (1) Check the thrust bearings and thrust washers for wear and binding and replace if faulty.



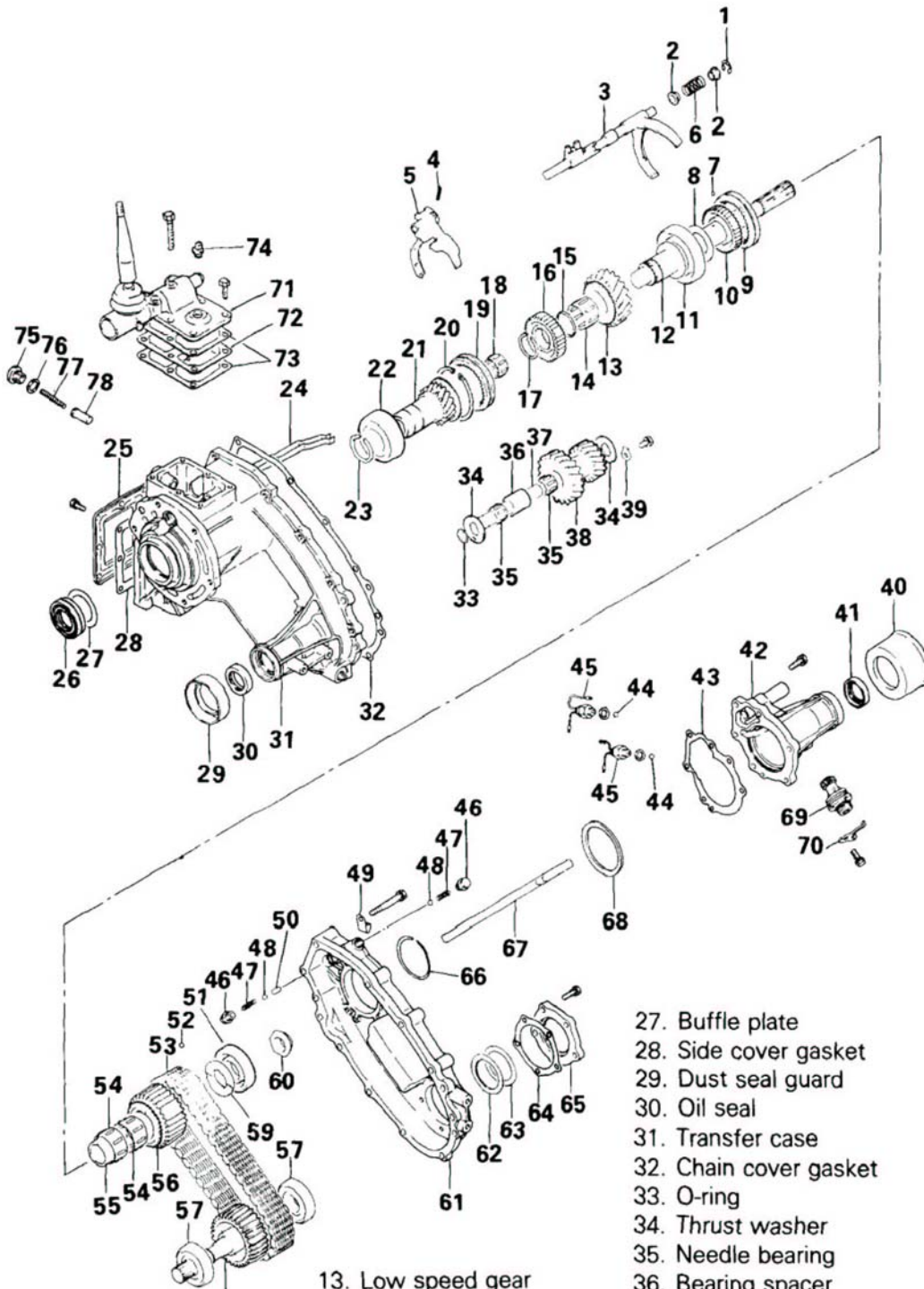
### ADAPTER

#### INSPECTION

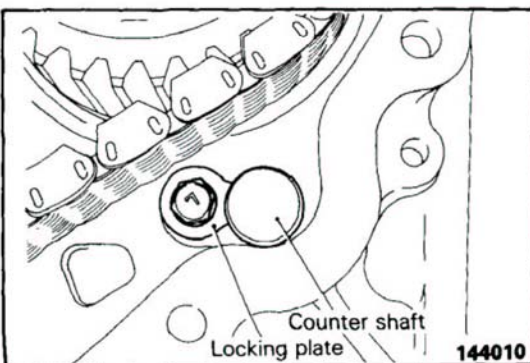
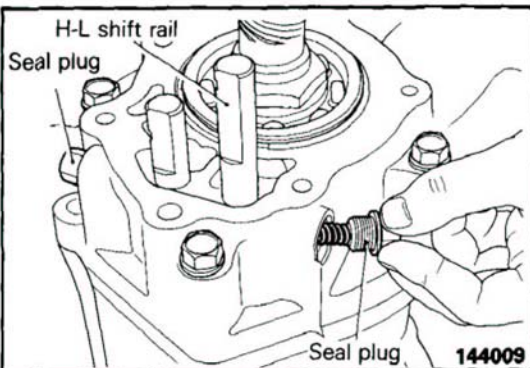
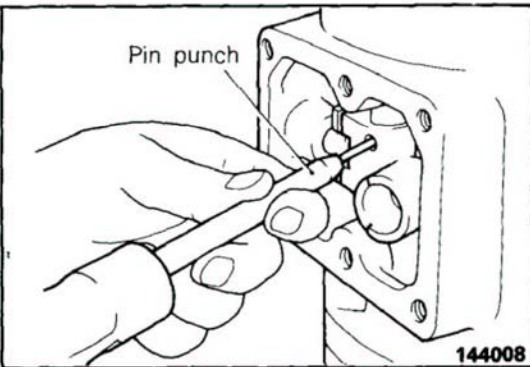
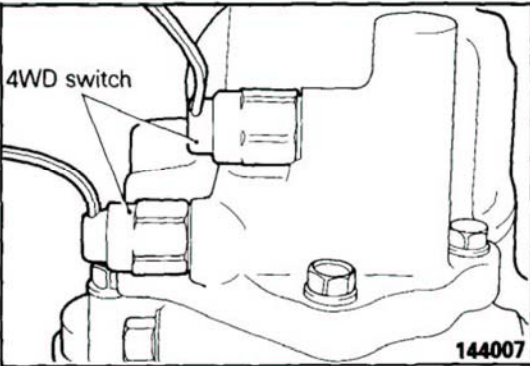
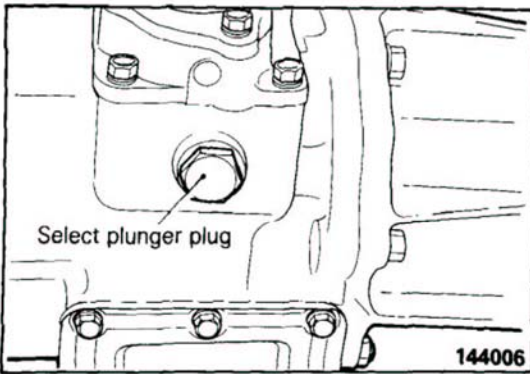
- (1) Check the adapter rear end for leaks and check the oil seal lip for damage and replace the oil seal if faulty.  
When installing the oil seal, apply grease to its lip.

TRANSFER

N21ND--



- |                        |                          |                                 |
|------------------------|--------------------------|---------------------------------|
| 1. Snap ring           | 13. Low speed gear       | 50. Interlock plunger           |
| 2. Spring retainer     | 14. Needle bearing       | 51. Ball bearing                |
| 3. Shift rail assembly | 15. Bearing spacer       | 52. Steel ball                  |
| 4. Cotter pin          | 16. H-L clutch hub       | 53. Chain                       |
| 5. H-L shift fork      | 17. Snap ring            | 54. Needle bearing              |
| 6. Spring              | 18. Needle bearing       | 55. Sprocket sleeve             |
| 7. Steel ball          | 19. Clutch sleeve        | 56. Drive sprocket              |
| 8. Stopper plate       | 20. Snap ring (optional) | 57. Bearing                     |
| 9. Clutch sleeve       | 21. Input gear           | 58. Front output shaft          |
| 10. Clutch hub         | 22. Bearing              | 59. Sprocket spacer             |
| 11. Bearing            | 23. Snap ring            | 60. Lock nut                    |
| 12. Rear output shaft  | 24. Oil guide            | 61. Chain cover                 |
|                        | 25. Side cover           | 62. Wave spring                 |
|                        | 26. Oil seal             | 63. Spacer (if required)        |
|                        |                          | 64. Gasket                      |
|                        |                          | 65. Cover                       |
|                        |                          | 66. Snap ring                   |
|                        |                          | 67. H-L shift rail              |
|                        |                          | 68. Wave spring                 |
|                        |                          | 69. Speedometer sleeve assembly |
|                        |                          | 70. Sleeve clamp                |
|                        |                          | 71. Control lever assembly      |
|                        |                          | 72. Control housing cover       |
|                        |                          | 73. Gasket                      |
|                        |                          | 74. Breather                    |
|                        |                          | 75. Plug                        |
|                        |                          | 76. Gasket                      |
|                        |                          | 77. Select spring               |
|                        |                          | 78. Select plunger              |



## REMOVAL

- (1) Remove the plug from the right side of the transfer case and take out the select spring and select plunger.
- (2) Remove the control lever housing assembly, cover and gasket.
- (3) Remove the transfer case to adapter attaching bolts and nuts.
- (4) Pull the transfer case back to separate from the adapter.

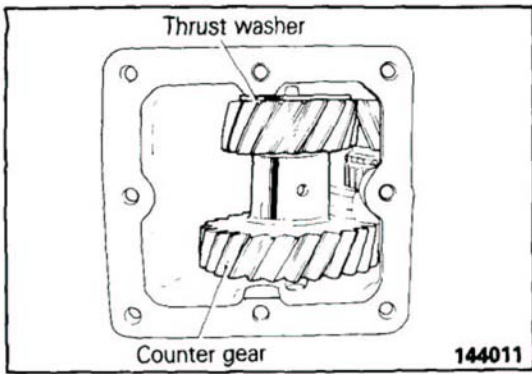
## DISASSEMBLY

- (1) Remove two 4WD light switches. Take out two steel balls.
- (2) Remove the speedometer sleeve clamp and remove the speedometer sleeve assembly.
- (3) Remove the rear cover attaching bolts and remove the spacer and gasket.
- (4) Remove the cover (front output shaft portion) and take out the wave spring, spacer (if inserted) and gasket.
- (5) Remove the side cover and gasket.

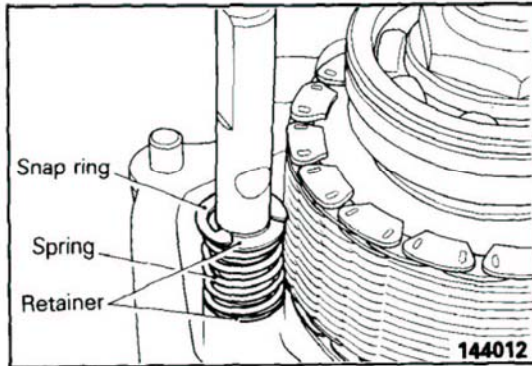
- (6) Drive out the spring pin from the H-L shift fork by using the special tool or a pin punch (commercially available).

- (7) Remove the two seal plugs and take out the two poppet springs and balls.
- (8) Pull out the H-L shift rail rearward.
- (9) Take out the interlock plunger.
- (10) Remove the snap ring from the rear output shaft rear bearing.
- (11) Remove the chain cover.
- (12) Remove the oil guide.

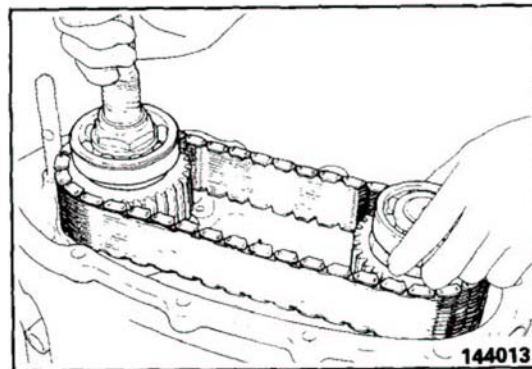
- (13) Remove the countershaft locking plate and pull out the countershaft.



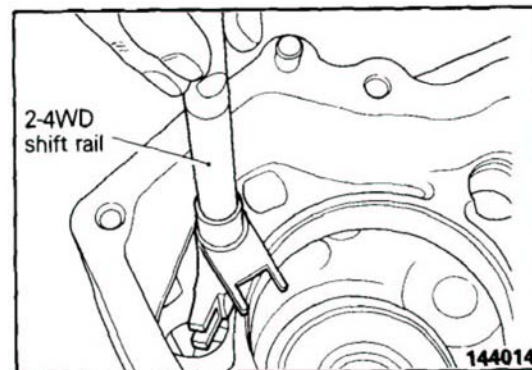
(14) Take out the counter gear, two thrust washers and needle bearings and spacer from the side cover hole.



(15) Remove the snap ring from the 2-4WD shift rail and remove the two spring retainers and spring from the shift rail.



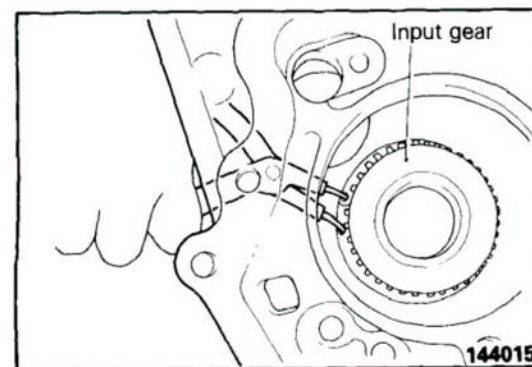
(16) Take out the front output shaft, rear output shaft and chain together from the transfer case.



(17) Remove the 2-4WD shift rail.

(18) Remove the H-L shift fork and clutch sleeve.

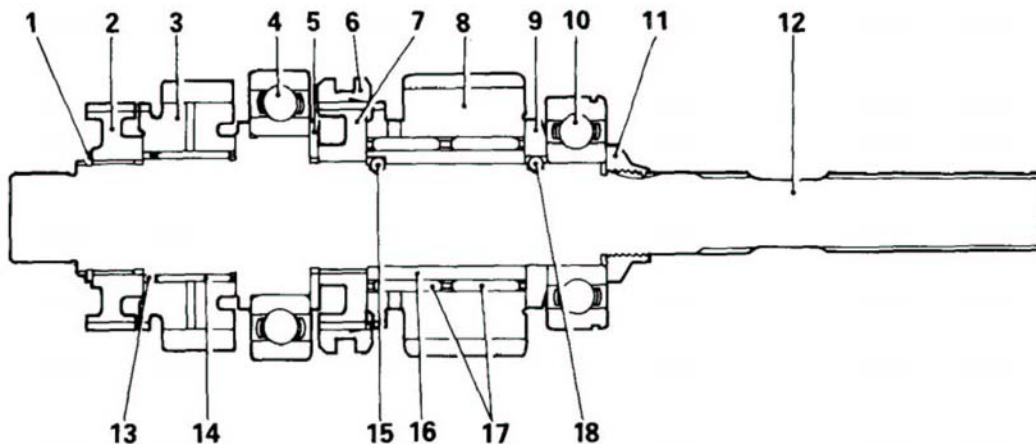
(19) Remove the needle bearing from the input gear.



(20) Remove the snap ring and then remove the input gear assembly.

**DISASSEMBLY OF REAR OUTPUT SHAFT**

- (1) Remove the snap ring from the rear output shaft front end and remove the H-L clutch hub, low speed gear, thrust washer and needle bearing.
- (2) Pry up the staked portion of the rear output shaft lock nut and loosen and remove the lock nut.
- (3) Remove the ball bearing from the rear end using a bearing puller (commercially available) or a press.
- (4) Remove the sprocket spacer and steel ball.
- (5) Remove the drive sprocket, two needle bearings, sprocket sleeve and steel ball.
- (6) Remove the 2-4WD clutch sleeve, hub and stop plate and pull out the ball bearing using a puller or press.



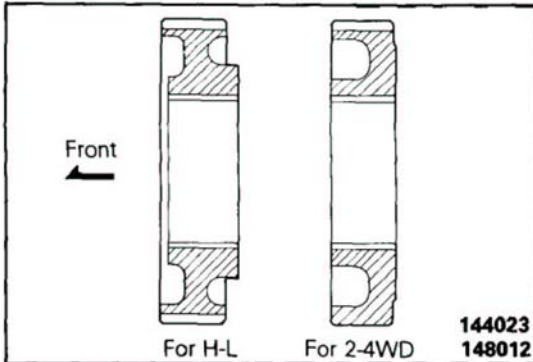
- |                        |                       |                     |
|------------------------|-----------------------|---------------------|
| 1. Snap ring           | 7. 2-4WD clutch hub   | 13. Thrust washer   |
| 2. H-L clutch hub      | 8. Drive sprocket     | 14. Needle bearing  |
| 3. Low speed gear      | 9. Sprocket spacer    | 15. Needle ball     |
| 4. Ball bearing        | 10. Ball bearing      | 16. Sprocket sleeve |
| 5. Stop plate          | 11. Lock nut          | 17. Needle bearing  |
| 6. 2-4WD clutch sleeve | 12. Rear output shaft | 18. Steel ball      |



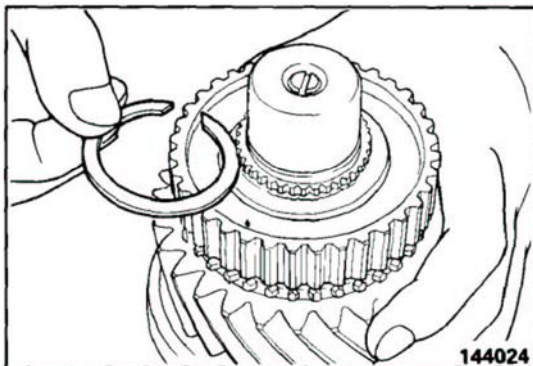
**REASSEMBLY OF REAR OUTPUT SHAFT**

For reassembly, follow the disassembly steps in reverse order, paying attention to the following.

- (1) Prior to reassembly, wash parts and check sliding and rotating parts for damage. Replace parts if excessively worn or damaged.
- (2) Apply transmission oil to rotating and sliding parts before reassembly.



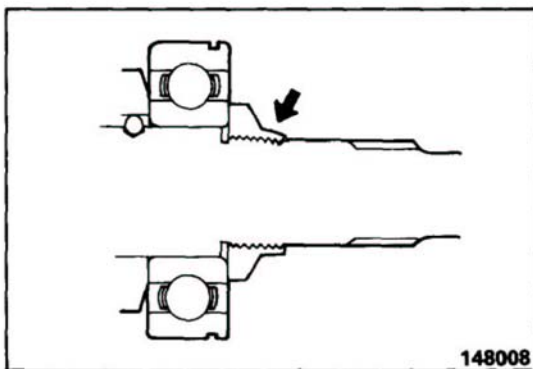
- (3) When installing the clutch hub, note the direction. Also check that the sleeve slides smoothly when installed. The clutch sleeve may be installed in either direction.



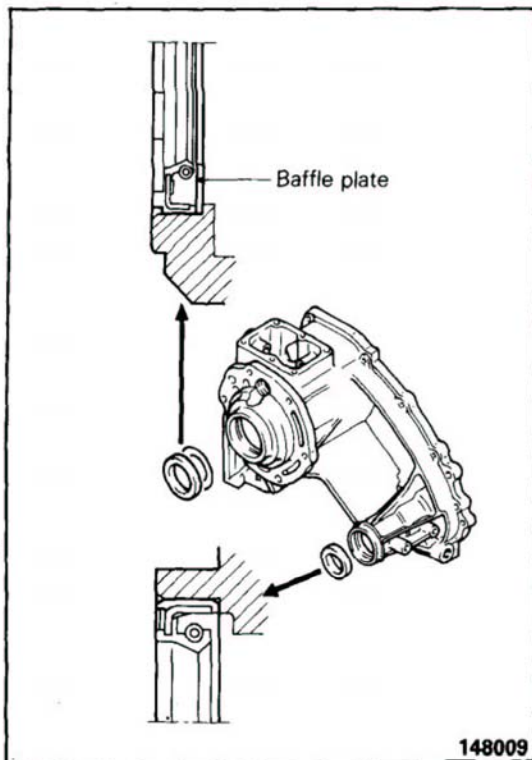
- (4) Install a snap ring for H-L clutch hub on the front end of the rear output shaft. Use the thickest snap ring that fits in the groove.

**H-L clutch hub end play**

**Standard value: 0–0.08 mm (0–.003 in.)**

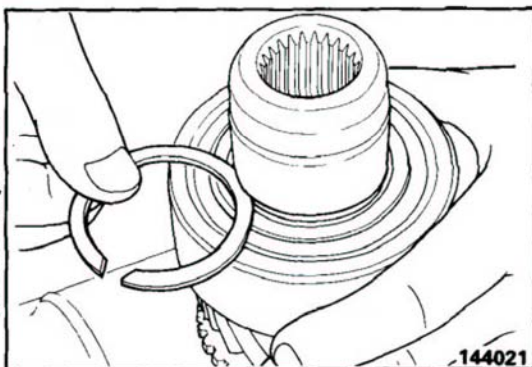


- (5) Tighten the lock nut to specified torque and then stake at the illustrated location, aligning with the groove.
- (6) Check that the low speed gear and drive sprocket ball bearing rotate smoothly.

**REASSEMBLY**

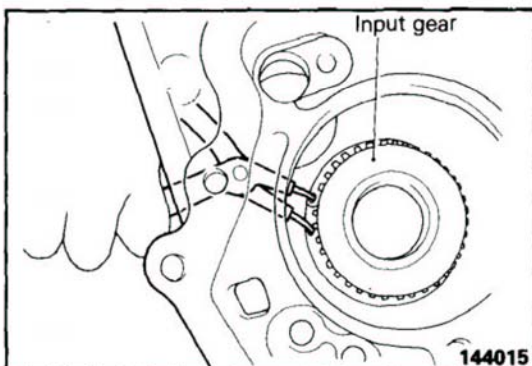
- (1) Press fit new oil seals in the input gear portion and front output shaft portion of the transfer case. Fit the baffle plate on the input shaft side. Apply specified oil to the oil seal lips.

**Specified gear oil : Hypoid Gear Oil API Classification GL-4 or higher SAE viscosity No. 80W, 75W-85W**



- (2) Press fit the ball bearing to the input gear, pushing the inner race. Check that the bearing rotates smoothly.
- (3) Fit a snap ring on the front end of the input gear. Use the thickest one that fits in the groove.

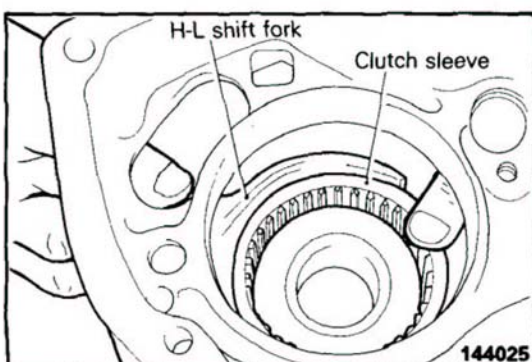
**Standard value : 0 – 0.06 mm (0–.002 in.)**



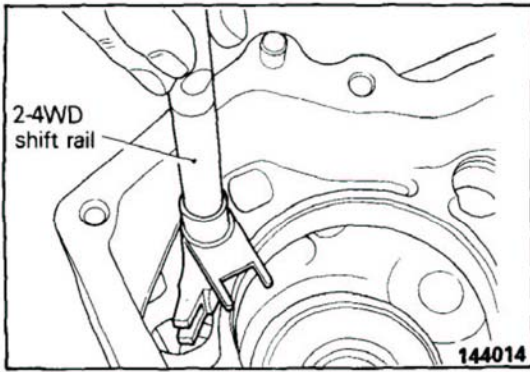
- (4) Insert the input gear assembly in the transfer case and fit a snap ring. Use the thickest one that fits in the groove.

**Standard value : 0 – 0.06 mm (0–.002 in.)**

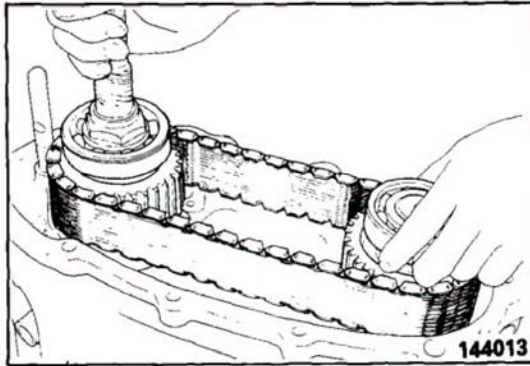
- (5) Insert the needle bearing in the input gear.



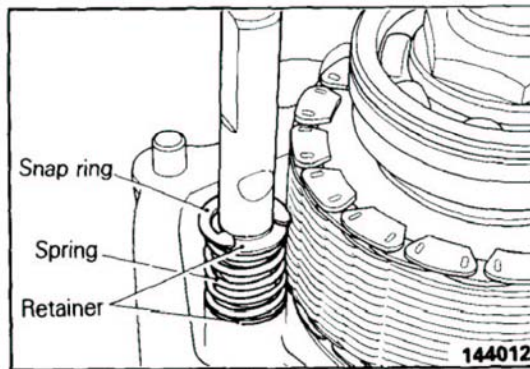
- (6) Install the H-L clutch sleeve and shift fork.



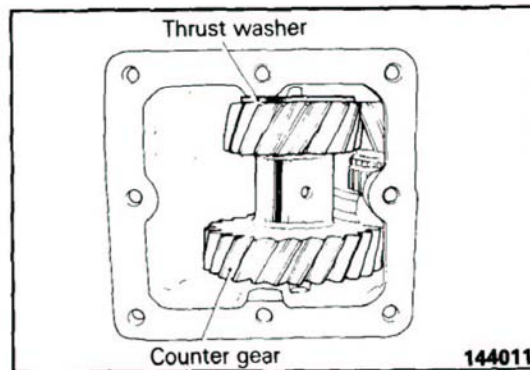
(7) Install the 2-4WD shift rail.



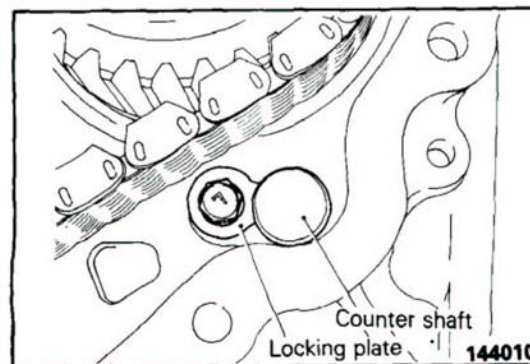
(8) Engage chain securely with the rear output shaft and front output shaft sprockets. Then, install the rear and front output shafts and chain together, while sliding the 2-4WD shift fork with the clutch sleeve attached over the 2-4WD shift rail.



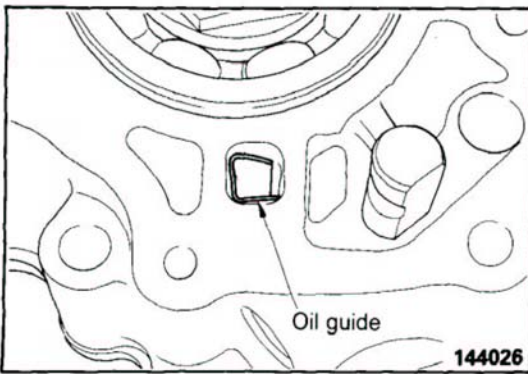
(9) Install two spring retainers and spring over the 2-4WD shift rail and fit a snap ring.



(10) Insert two needle bearings and spacer in the counter gear and install the assembly in the transfer case. Install a thrust washer on each of the counter gear.



(11) Insert the countershaft and fit the locking plate.



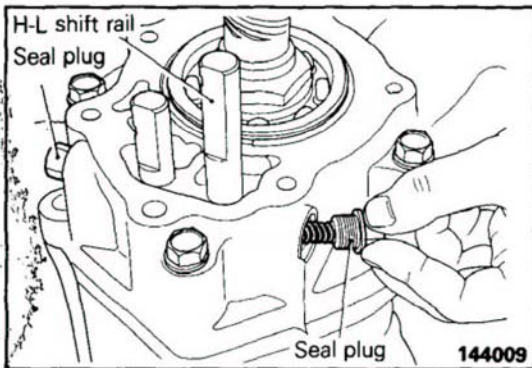
- (12) Install the oil guide.  
 (13) Install the chain cover and gasket, making sure that the oil guide edge is in the chain cover window. Apply sealer to the gasket.

**Specified sealant : 3M ART Part No. 8001 or equivalent**

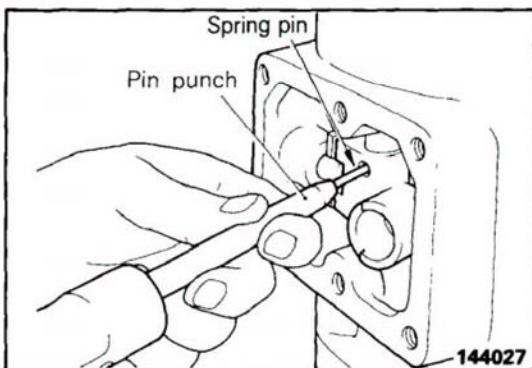
- (14) Tighten the chain cover bolts to specified torque. Apply adhesive to threads of bolts fitted in holes that go through the case.

**Specified adhesive : 3M Adhesive Nut Locking 4171 or equivalent**

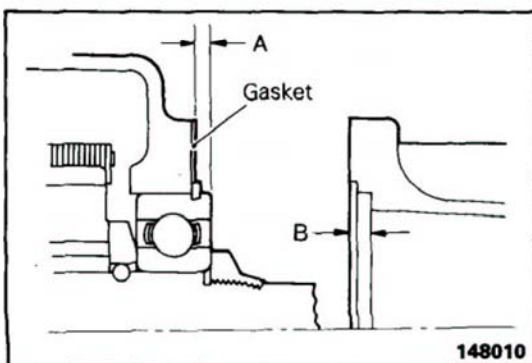
- (15) Fit a snap ring in the groove of the bearing at the rear end of the rear output shaft.



- (16) Insert the interlock plunger in the hole of the chain cover.  
 (17) Insert the H-L shift rail through the H-L shift fork. The H-L shift rail cannot be inserted unless the 2-4WD shift rail is shifted to the 4WD side.  
 (18) Install poppet balls and springs two each and fit the seal plugs. Face the smaller end of poppet springs toward the ball.



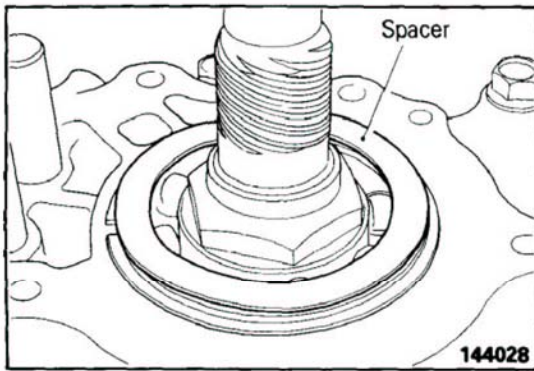
- (19) Aligning the spring pin holes of the H-L shift fork and shift rail, drive in the spring pin by using the special tool or a pin punch (commercially available). When installing the spring pin, face its slit toward the shift rail center.



- (20) Measure the output shaft rear bearing protrusion A and rear cover recess B to calculate the end play. Select the spacer that gives specified end play.

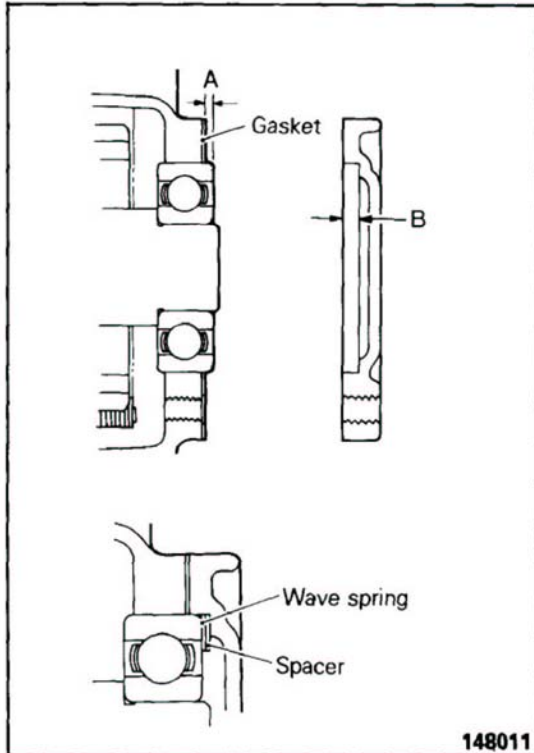
- (21) Apply sealer to a new rear cover gasket and attach it to the chain cover side.

**Specified sealant : 3M ART Part No. 8001 or equivalent**



- (22) Install the selected spacer on the rear of the output shaft rear bearing.
- (23) Install the rear cover and tighten the bolts to specified torque. Apply adhesive to threads of bolts fitted in holes that go through the case.

**Specified adhesive : 3M Adhesive Nut Locking 4171 or equivalent**



- (24) Measure protrusion A of the front output shaft rear bearing and recess B of the cover and calculate the clearance. If it is more than nominal, place a spacer at illustrated location.

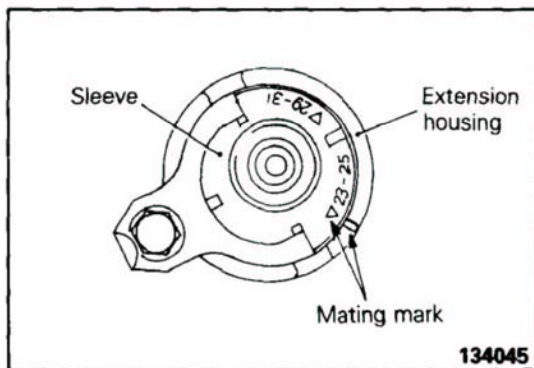
**Standard value : 2 mm (.078 in.)**

- (25) Apply sealer to a new cover gasket and attach it to the chain cover.

**Specified sealant : 3M ART Part No. 8001 or equivalent**

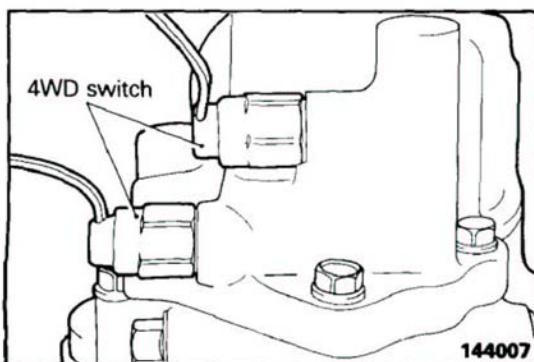
- (26) Install the wave spring spacer (if necessary) on the rear of the bearing.
- (27) Install the cover and tighten the bolts to specified torque. Apply adhesive to threads of bolts.

**Specified adhesive : 3M Adhesive Nut Locking 4171 or equivalent**



- (28) Insert the speedometer sleeve assembly in the rear cover. Line up the mating mark on the extension housing with the mark corresponding to the speedometer driven gear tooth number range put on the sleeve.

- (29) Install the sleeve clamp and tighten the bolt.



- (30) Install the two 4WD light switches, making sure that steel balls are fitted.

**REASSEMBLY**

For reassembly, follow the removal steps in reverse order, paying attention to the following.

1. Apply sealer to one side of the two control housing gaskets and attach them to both sides of the control housing cover.

**Specified sealant : 3M ART Part No. 8001 or equivalent**

2. Apply sealer to the adapter gasket.

**Specified sealant : 3M ART Part No. 8001 or equivalent**

# WHEELS AND TIRES

## CONTENTS

N22AA--

<b>GENERAL INFORMATION</b> .....	<b>2</b>	<b>TROUBLESHOOTING</b> .....	<b>3</b>
<b>SERVICE ADJUSTMENT PROCEDURES</b> .....	<b>4</b>	Bald Spots	
Checking Tire Inflation Pressure .....	4	Cracked Treads	
Checking Tire Wear .....	4	Feathered Edge	
Checking Wheel Runout .....	4	Rapid Wear at Center	
<b>SPARE TIRE CARRIER</b> .....	<b>6</b>	Rapid Wear at Shoulders	
<b>SPECIFICATIONS</b> .....	<b>2</b>	Scalloped Wear	
General Specifications .....	2	Wear on One Side	
Sealant and Adhesive .....	2	<b>WHEELS AND TIRES</b> .....	<b>4</b>
Service Specifications .....	2		
Torque Specifications .....	2		

**GENERAL INFORMATION**

N22BAAD

All models are equipped with tubeless radial tires and styled wheels.

**SPECIFICATIONS****GENERAL SPECIFICATIONS**

N22CA--

Items	Specifications
Wheel	
Tire size	P225/75R-15
Wheel type	Steel type
Wheel size	6JJ x 15
Amount of wheel offset mm (in.)	22 (.87)
Tire inflation pressure kPa (psi)	
Front wheels	180 (26)
Rear wheels	240 (34), *180 (26)

**NOTE**

\*Minimum tire inflation pressure for improving ride comfort when driving with no cargo.

**SERVICE SPECIFICATIONS**

N22CB--

Items	Specifications
Limit	
Wheel runout	
Radial mm (in.)	3 (.12)
Lateral mm (in.)	3 (.12)
Tread depth of tire mm (in.)	1.6 (.06)

**TORQUE SPECIFICATIONS**

N22CC--

Items	Nm	ft.lbs.
Hub nuts for steel wheel	100-120	72-87
Spare tire bracket to body	8-10	6-7

**SEALANT AND ADHESIVE**

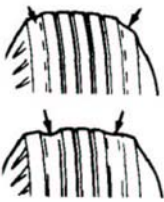
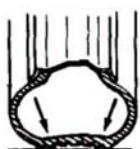

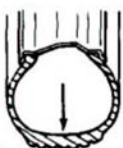


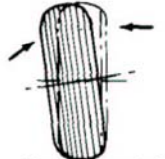

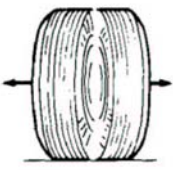

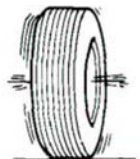

N22CD--

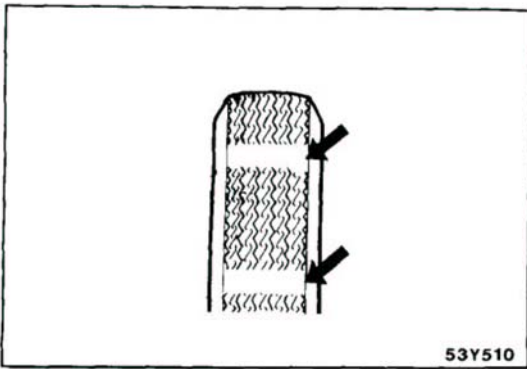
Item	Specified sealant and adhesive	Quantity
Spare tire bracket mounting bolts	3M ART Part No. 8634 or equivalent	As required



**TROUBLESHOOTING**

N22EA--

Symptom	Probable cause	Remedy	Reference page
Rapid wear at shoulders 	Under-inflation or lack of rotation 	Adjust the tire pressure	22-2
Rapid wear at center 	Over-inflation or lack of rotation 		
Cracked treads 	Under-inflation		
Wear on one side 	Excessive camber 	Inspect the camber	2-15
Feathered edge 	Incorrect toe 	Adjust the toe-in	2-15
Bald spots 	Unbalanced wheel 	Adjust the imbalanced wheels	-
Scalloped wear 	Lack of rotation of tires or worn or out-of-alignment suspension	Rotate the tires Inspect the front suspension alignment	22-6, 2-15



## SERVICE ADJUSTMENT PROCEDURES

### CHECKING TIRE INFLATION PRESSURE N22FDAA

Check the inflation pressure of the tires.  
If it is not within the standard value, make the necessary adjustment.

### CHECKING TIRE WEAR N22FBAB

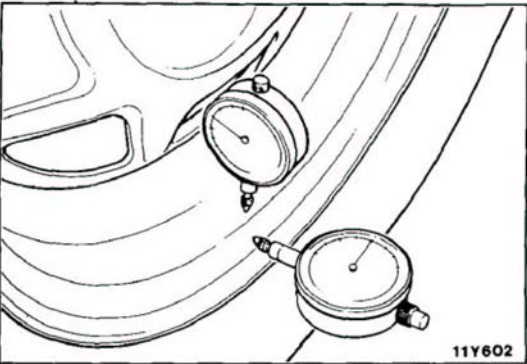
Measure the tread depth of tires

**Limit : 1.6 mm (.06 in.)**

If the remaining tread depth is less than the limit, replace the tire.

**NOTE**

When the tread depth of tires is reduced to 1.6 mm (.06 in.) or less, wear indicators will appear.



### CHECKING WHEEL RUNOUT N22FCAB

Jack up the vehicle so that the wheels are clear of the floor.  
While slowly turning the wheel, measure wheel runout with a dial indicator.

**Limit : Radial 3.0 mm (.12 in.)  
Lateral 3.0 mm (.12 in.)**

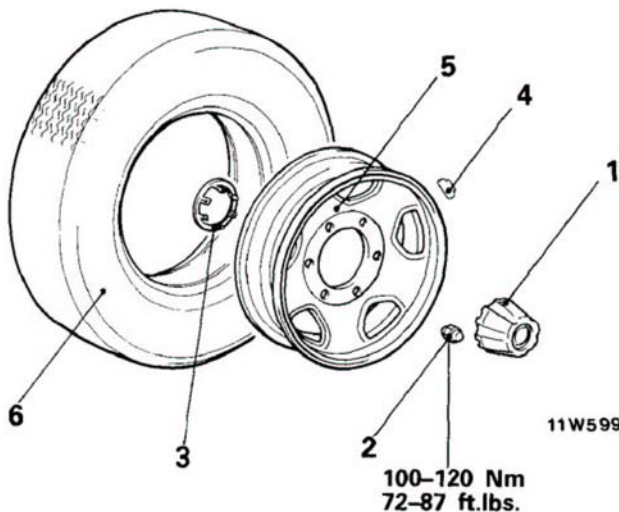
If wheel runout exceeds the limit, replace the wheel.

## WHEELS AND TIRES REMOVAL AND INSTALLATION

N22GA--

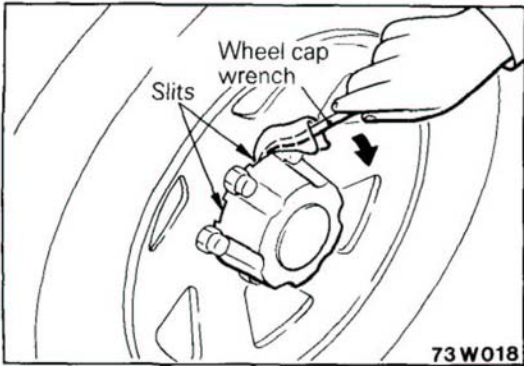
**Removal steps**

- ◄◄ 1. Center cap
- 2. Hub nut
- ◆◆ 3. Center cap holder
- 4. Balance weight
- 5. Steel wheel
- 6. Tire



**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◄◄ : Refer to "Service Points of Removal".
- (3) ◆◆ : Refer to "Service Points of Installation".



**SERVICE POINTS OF REMOVAL**

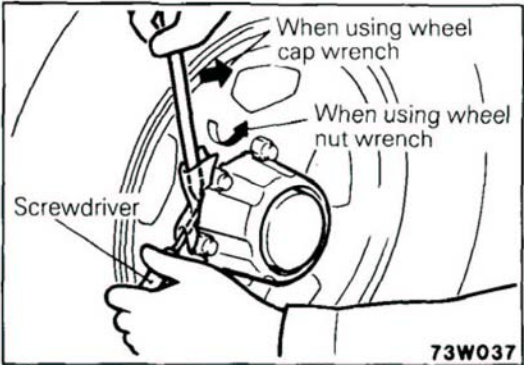
N22GBAB

**1. REMOVAL OF CENTER CAP**

- (1) Using the vehicle equipped tool (wheel cap wrench or wheel nut wrench), remove the center cap.

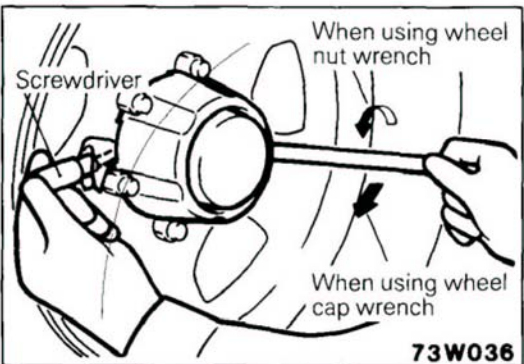
**Caution**

Use a piece of cloth or other, similar material to prevent scratching the wheel when the wheel cap wrench or wheel nut wrench is used.



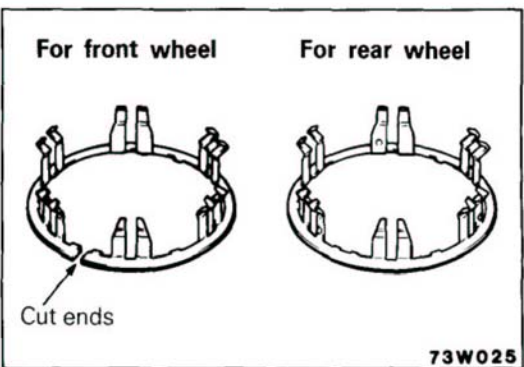
- (2) For vehicles with manual free-wheel hubs, remove the wheel caps as described below.

- ① Move the wheel cap wrench or wheel nut wrench as shown in the figure so as to slightly lift the wheel cap so that there is a space. Insert a screwdriver in this space.



- ② Remove the wheel cap wrench or wheel nut wrench and use it at the opposite side.

- ③ Move each tool as shown in the figure so as to remove the wheel cap.



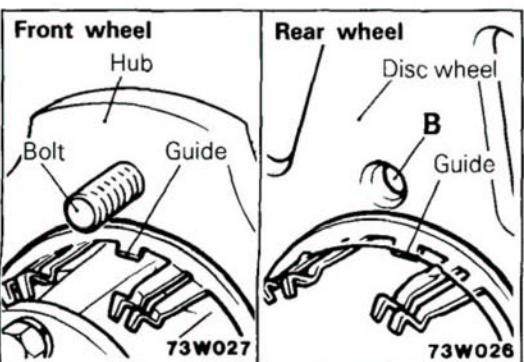
**SERVICE POINTS OF INSTALLATION**

N22GDAA

**3. INSTALLATION OF CENTER CAP HOLDER**

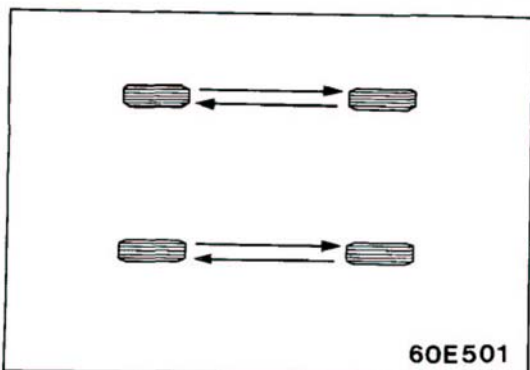
**NOTE**

Note that the center cap attaching metal fittings for the front and rear wheels are different in shape.



- (1) Align any of the guides (three projections) inside the fitting with a bolt position, and install the fitting on the hub, while using care to make sure that the cut ends are not opened. (Front wheel)

- (2) Align any of the guides (three projections) inside the fitting with the position of a wheel attaching hole (B) and install the fitting properly to the disc wheel from inside the disc wheel. (Rear wheel)

**WHEEL ROTATION**

N22GE--

Rotate the wheels in order to equalize tire wear in the patterns illustrated.

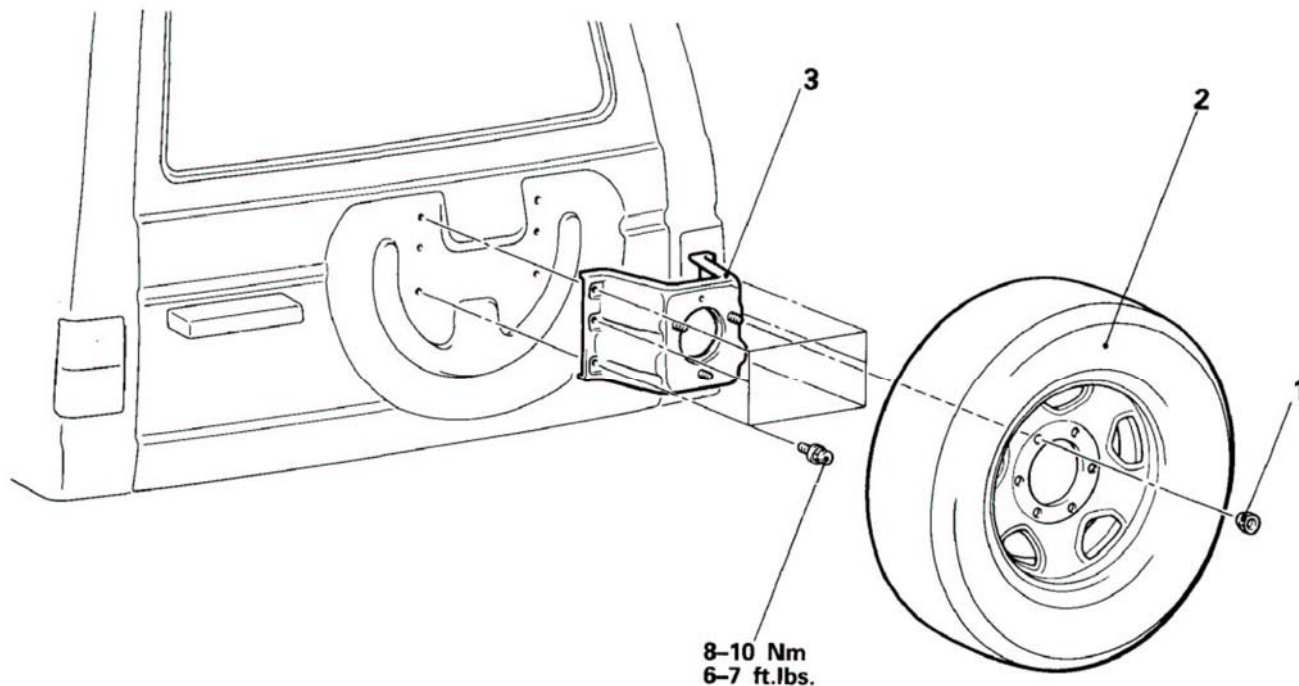
**TIRE CHAINS AND SNOW TIRES**

N22GGAB

1. Use tire chains only on rear wheels. Do not use tire chain on front wheels.
2. When using snow tires, use them on all four wheels for maneuverability and safety.

**SPARE TIRE CARRIER****REMOVAL AND INSTALLATION**

N22HA--

**Removal steps**

1. Hub nut
2. Spare tire
- ➡➡ 3. Spare tire bracket

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ➡➡ : Refer to "Service Points of Installation".

**SERVICE POINTS OF INSTALLATION**

N22HDAC

**3. APPLICATION OF SEALANT TO SPARE TIRE BRACKET**

Apply a coat of the specified sealant around the spare tire bracket mounting bolts.

**Specified sealant : 3M ART Part No. 8634 or equivalent**

# BODY

## CONTENTS

N23AA--

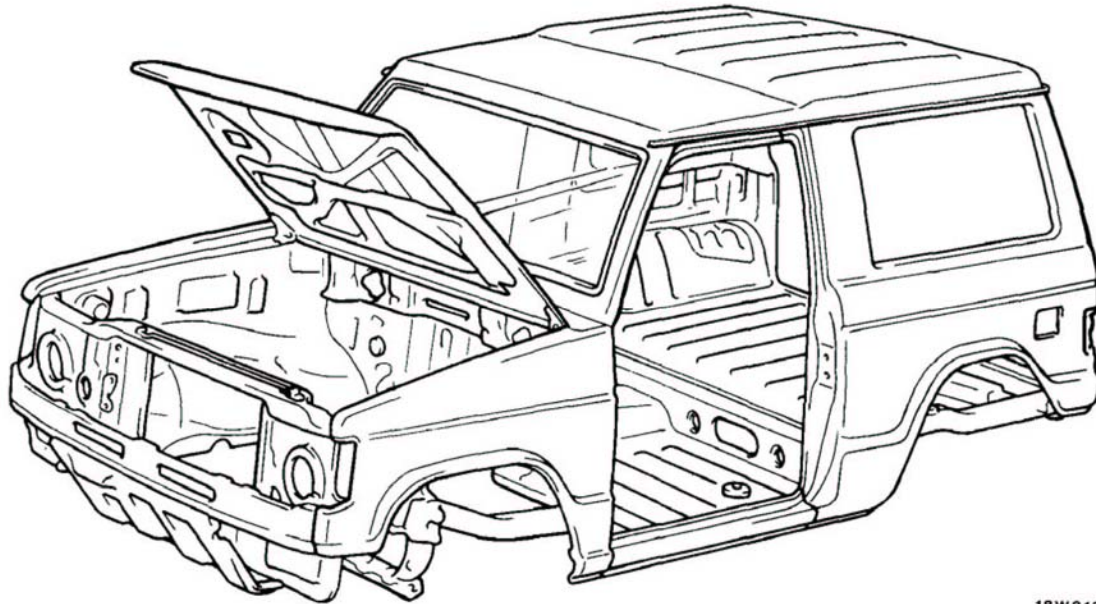
<b>BACK DOOR ASSEMBLY</b> .....	<b>47</b>	Adjustment of Inside Handle .....	16
<b>BACK DOOR HANDLE AND LATCH</b> .....	<b>50</b>	Adjustment of Outside Handle .....	16
<b>BACK DOOR LOCK SWITCH</b> .....	<b>52</b>	Adjustment of Ventilator Window .....	16
<b>BACK DOOR TRIM</b> .....	<b>49</b>	<b>SPECIAL TOOLS</b> .....	<b>8</b>
<b>BACK DOOR WINDOW GLASS</b> .....	<b>31</b>	<b>SPECIFICATIONS</b> .....	<b>6</b>
<b>BODY MOUNTING</b> .....	<b>18</b>	General Specifications .....	6
<b>BUMPERS</b> .....	<b>57</b>	Lubricants .....	7
<b>CENTER CONSOLE</b> .....	<b>66</b>	Sealants and Adhesives .....	8
<b>DOOR ASSEMBLY</b> .....	<b>32</b>	Service Specifications .....	6
<b>DOOR HANDLE AND LATCH</b> .....	<b>44</b>	Torque Specifications .....	7
<b>DOOR TRIM AND WATERPROOF FILM</b> .....	<b>33</b>	<b>TRIMS</b> .....	<b>71</b>
<b>FENDERS</b> .....	<b>24</b>	<b>TROUBLESHOOTING</b> .....	<b>9</b>
<b>FLOOR CONSOLE</b> .....	<b>67</b>	Back Door .....	9
<b>FRONT DOOR GLASS AND REGULATOR</b> .....	<b>35</b>	Hard back door operation, abnormal noise from hinges	
<b>FRONT SEATS</b> .....	<b>75</b>	Back Door Locking System .....	11
<b>FUEL FILLER DOOR</b> .....	<b>22</b>	Back door fails to unlock or lock	
<b>GENERAL INFORMATION</b> .....	<b>2</b>	Back door is locked but cannot be unlocked	
<b>GRILLE, GARNISH</b> .....	<b>59</b>	Back door is unlocked but cannot be locked	
<b>HEADLINING AND ASSIST STRAP</b> .....	<b>68</b>	Front Door .....	9
<b>HOOD</b> .....	<b>20</b>	Hard door glass operation	
<b>INSTRUMENT PANEL</b> .....	<b>61</b>	No door glass operation	
<b>LOOSE PANEL</b> .....	<b>55</b>	Power Windows .....	14
<b>MUD GUARD</b> .....	<b>54</b>	Door windows cannot be operated	
<b>OUTSIDE MIRROR</b> .....	<b>60</b>	Door windows do not operate smoothly	
<b>QUARTER WINDOW GLASS</b> .....	<b>29</b>	Front door windows cannot be operated	
<b>REAR SEAT</b> .....	<b>77</b>	None of the windows can be operated	
<b>SEAT BELTS</b> .....	<b>78</b>	Wind Noises .....	9
<b>SERVICE ADJUSTMENT PROCEDURES</b> .....	<b>15</b>	Wind noise from around the door	
Adjustment of Back Door Installation .....	17	Wind noise from back door	
Adjustment of Door Glass .....	16	<b>UNDER GUARD</b> .....	<b>53</b>
Adjustment of Door Installation .....	15	<b>WINDOW GLASS RUNCHANNEL AND DOOR</b>	
Adjustment of Fuel Filler Door Hook Fit .....	15	<b>OPENING WEATHERSTRIP</b> .....	<b>45</b>
Adjustment of Hood Fit .....	15	<b>WINDSHIELD</b> .....	<b>26</b>

# GENERAL INFORMATION

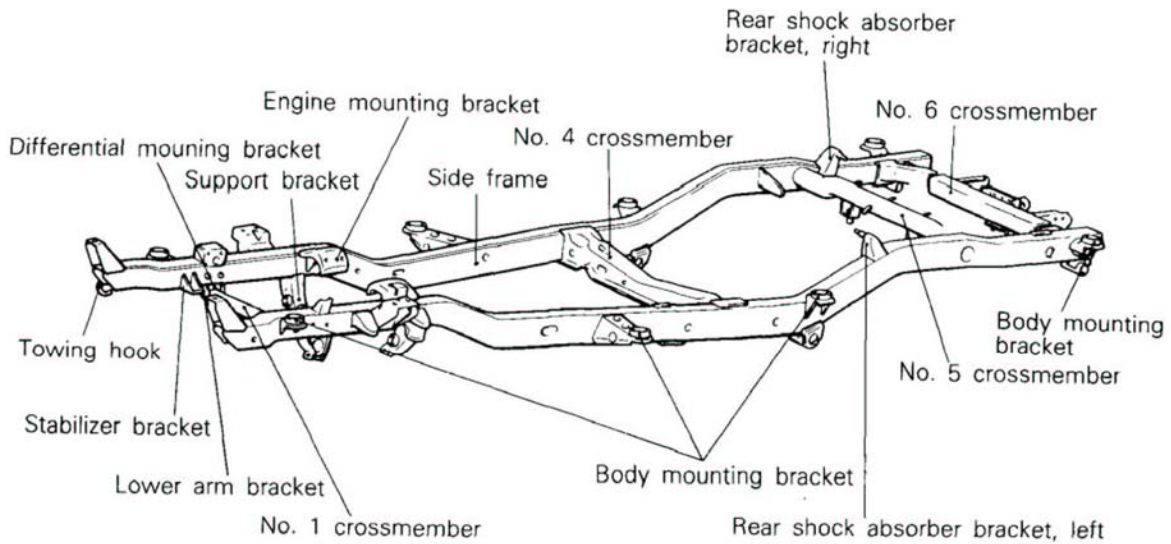
## BODY

N23BAAB

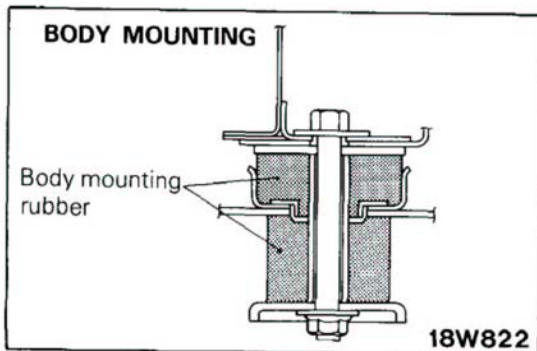
The body and frame construction is the independent division type. The body form is the tumble type, and the frame is the ladder type. For body mounts, the compression type, with two body mount rubber pieces fit between the body and frame, is employed.



18W813



15W519

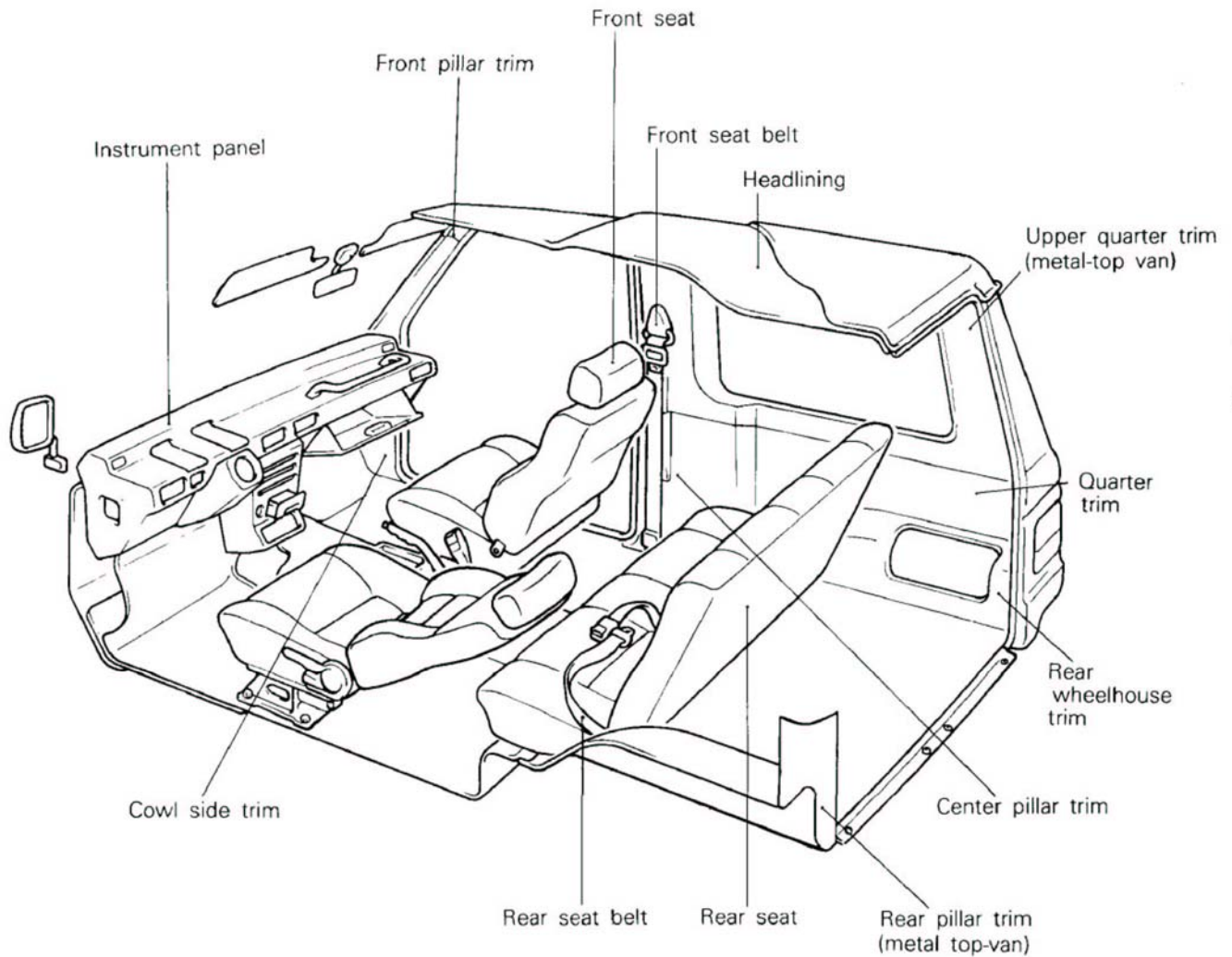


18W822

**SHEET METAL**

N23BAAC

The instrument panel is made of sheet metal to which urethane padding is attached. The adhesive-type of headlining is used. The injection-type of trim is used. Separate, low-back front seats are equipped; suspension seats are available as an option. For the metal-top van, the rear seat is a front-facing seat for two passengers. The front seat belts are 3-point seat belts with E.L.R. The rear seat belts for the metal-top van are 2-point retractable seat belts.



19W685

## SUSPENSION SEAT

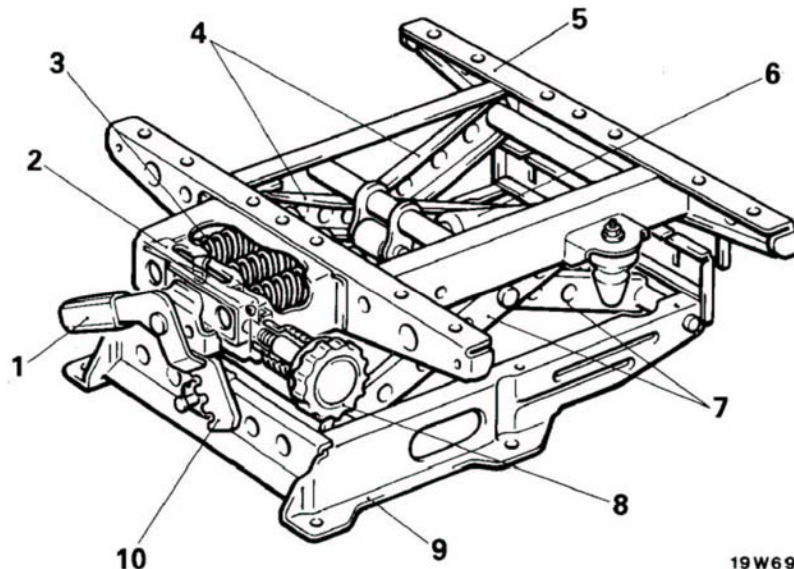
The suspension seat has a special suspension mechanism in the base frame and is installed on the driver's seat side.

When the vehicle travels on an uneven ground surface or rough road, the seat absorbs the body vibration the vehicle takes from the road surface, reducing driver fatigue and assuring a more comfortable ride.

The seat offers the following features:

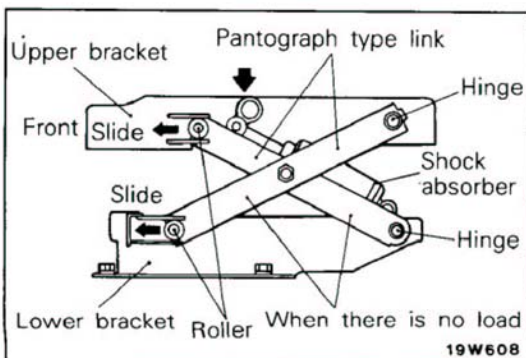
- (1) Pantograph type link mechanism
- (2) Optimum combination of coil spring and shock absorber
- (3) More comfortable ride by adjust body weight meter to driver's weight
- (4) Fixed position of seat can be adjusted in three height levels

The components of the suspension seat are as follows:



1. Lock lever
2. Guide B
3. Coil spring
4. Link
5. Upper bracket
6. Shock absorber
7. Link
8. Handle
9. Lower bracket
10. Guide A

19W698



## OPERATION

### Suspension Mechanism

The suspension mechanism is constructed as shown.

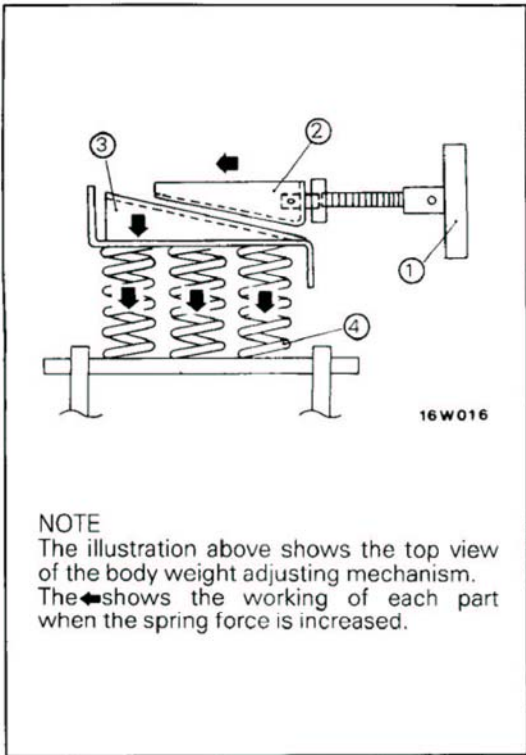
The lower and upper brackets of the link are coupled by hinges at one end and by rollers at the other, allowing forward and backward sliding. If a force in the direction of the arrow is exerted to the link (pantograph), the upper bracket is moved downward, so the shock absorbers hinge-coupled to the lower and upper brackets absorb vibration.



**Body Weight Adjusting Mechanism**

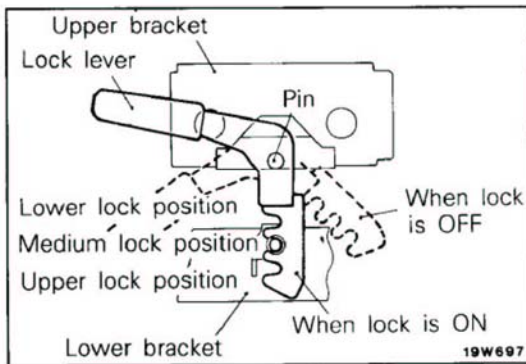
The configuration of the body weight adjusting mechanism of the suspension seat is as shown in the illustration.

When the handle (1) is turned in the clockwise direction, guide A (2) moves along the slope of guide B (3), pushing guide B (3) as it moves. The coil spring (4) is thus compressed, increasing the spring force and resulting in a harder suspension. When the handle is turned in the counterclockwise direction, the spring force is weakened, resulting in a softer suspension.



**Suspension Lock Mechanism**

The suspension lock mechanism is constructed as shown in the illustration at left. The seat lock position can be selected in three levels by a lock lever.



**SPECIFICATIONS****GENERAL SPECIFICATIONS**

N23CA--

Items	Specifications
Hood	
Type	Rear hinged, front opening type
Front door	
Construction	Front hinged, sash construction
Regulator system	X-arm type
Locking system	Pin-fork type
Back door	
Construction	Right hinged, sash construction
Locking system	Pin-fork type
Glass installation method	
Windshield	Weatherstrip type
Quarter window	Weatherstrip type
Front door window	Weatherstrip type
Back door window	Weatherstrip type
Glass thickness   mm (in.)	
Windshield	5.7 (.22)
Quarter window glass	4.0 (.16)
Front door glass	4.0 (.16)
Back door window glass	4.0 (.16)
Ventilator window glass	4.0 (.16)
Frame Type	Ladder type
Sectional form	Box type
Suspension seat	
Suspension mechanism	Coil spring type with shock absorber
Up-and-down movement stroke   mm (in.)	70 (2.76)
Body weight adjustment   kg (lbs.)	50–100 (110.2–220.5)
Seat height adjustment	3 levels

**SERVICE SPECIFICATIONS**

N23CB--

Items	Specifications
Standard values	
Front door glass holder mounting position   mm (in.)	
Distance between the glass holder (A) and (B)	466.5–467.5 (18.367–18.406)
Distance between the glass holder (B) and the glass edge	76.5–77.5 (3.012–3.051)
Door outside handle play   mm (in.)	5–10 (.20–.40)
Door inside handle play   mm (in.)	4–10 (.16–.40)

**TORQUE SPECIFICATIONS**

23CC--

Item	Nm	ft.lbs.
Body to frame	28-32	20-23
Hood hook to hood	4.0-6.0	2.9-4.3
Hood latch to body	4.0-6.0	2.9-4.3
Hood latch release cable	3.5-4.0	2.5-2.9
Under skid plate to frame	18-25	13-18
Under cover installation bolts	10-13	7-9
Snow-protection under cover installation bolts	10-13	7-9
Transfer case protector to No. 2 crossmember	18-25	13-18
Transfer case protector to frame	10-13	7-9
Cross shaft protector installation bolts	10-13	7-9
Front door hinge to door panel	17-26	12-19
Front door hinge to body	35-55	25-40
Ventilator window assembly to door panel	6	4.3
Window regulator to door panel	6	4.3
Door lower sash to door panel	6	4.3
Back door hinge to body	35-55	25-40
Spare tire bracket to back door	8-10	6-7
Air duct to body	4-6	3-4
Seat anchor bolts		
Head marked 8	9-14	6.5-10
Head marked 10	35-55	25-40
Front seat cushion to seat adjuster	9-14	6.5-10
Front seatback to seat cushion (Reclining adjuster side)	45-60	33-43
Front seatback to seat cushion	10-15	7-11
Rear seat leg bracket to body	9-14	6.5-10
Rear seatback to seat cushion	45-60	33-43
All seat belt tightening bolts	35-55	25-40

**LUBRICANTS**

23CD-

Items	Specified lubricants	Quantity
Back door hinges	Multipurpose grease SAE J310, NLGI No. 3	As required
Sliding parts of front seat adjuster	Multipurpose grease SAE J310, NLGI No. 2	As required
Sliding parts of rear seat leg bracket, rear seat stopper striker	Multipurpose grease SAE J310, NLGI No. 2	As required



## SEALANTS AND ADHESIVES

23CE--

Items	Specified sealants and adhesives	Quantity
Hood rear weatherstrip	3M ART Part No. 8513 or equivalent	As required
Front fender and front shield	3M ART Part No. 8531 or No. 8646, or equivalent	As required
Front fender and splash shield	3M ART Part No. 8626 or 3M Adhesive EC-5310, or equivalent	As required
Windshield weatherstrip and windshield glass	3M ART Part No. 8001 or No. 8011, or equivalent	As required
Windshield weatherstrip and body flange	3M ART Part No. 8626 or 3M Adhesive EC-5310, or equivalent	As required
Quarter window weatherstrip and quarter window rear glass	3M ART Part No. 8001 or No. 8011, or equivalent	As required
Quarter window weatherstrip and body flange	3M ART Part No. 8001 or No. 8011, or equivalent	As required
Back door window weatherstrip and back door window glass	3M ART Part No. 8001 or No. 8011, or equivalent	As required
Waterproof film	3M ART Part No. 8626 or 3M Adhesive EC-5310, or equivalent	As required
Door window runchannel	3M Adhesive EC-870 or equivalent	As required
Door window runchannel and ventilator sash assembly	3M ART Part No. 8080 or 3M Adhesive EC-1368, or equivalent	As required
Ventilator window glass, ventilator sash and ventilator window pad	3M ART Part No. 8001 or No. 8011, or equivalent	As required
Ventilator sash assembly and ventilator window weatherstrip	3M ART Part No. 8080 or 3M Adhesive EC-1368, or equivalent	As required
Ventilator sash assembly and ventilator window weatherstrip	3M ART Part No. 8001 or No. 8011, or equivalent	As required
Back door opening weatherstrip and back door	3M ART Part No. 8001 or No. 8011, or equivalent	As required
Waterproof pad and fender	3M ART Part No. 8001 or No. 8011, or equivalent	As required
Headlining and roof panel	3M ART Part No. 8080 or 3M Adhesive EC-1368, or equivalent	As required

## SPECIAL TOOLS

23DA--

Tool (Number and name)	Use	Tool (Number and name)	Use
MB990900-01 Door adjusting wrench	Adjustment of door fit	MB990449 Windshield moulding remover	Removal of windshield moulding Removal of back door lock switch Removal of cowl side trim Removal of upper quarter trim
			

## TROUBLESHOOTING

### FRONT DOOR

N23EAAC

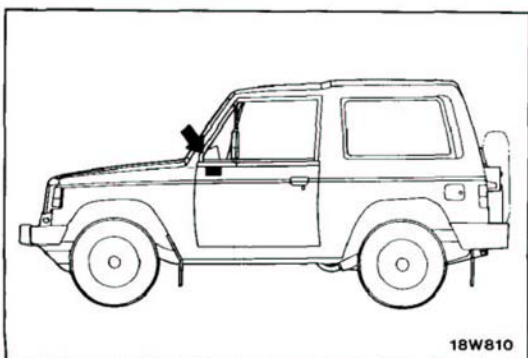
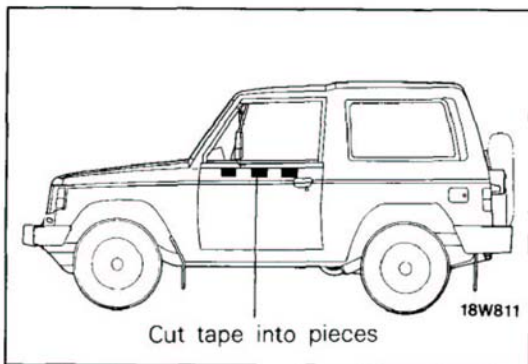
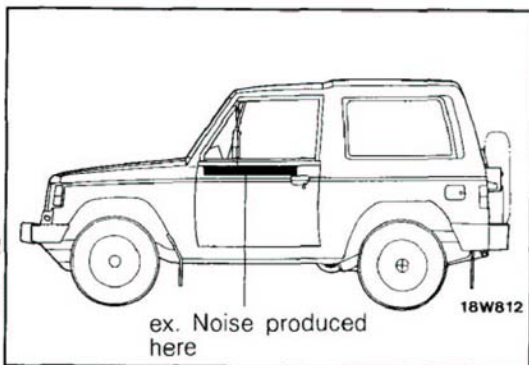
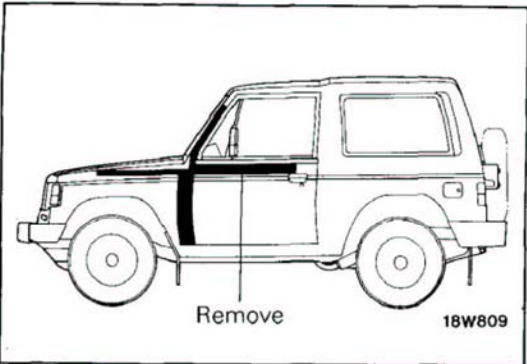
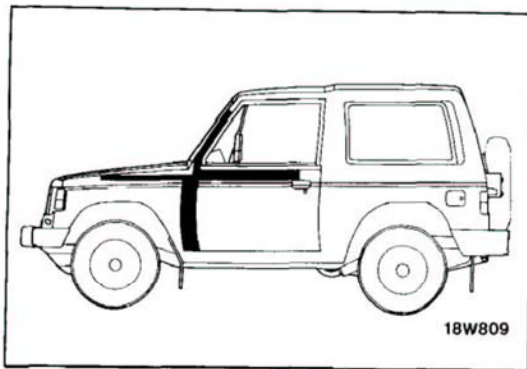
Symptom	Probable cause	Remedy	Reference page
Door glass fails to operate up and down	Dismount window glass regulator	Adjust	–
	Detached sash	Attach	–
	Broken sash	Replace	–
	Collapsed sash	Repair or replace	–
	Collapsed window glass regulator arm	Repair or replace	–
	Broken window glass regulator	Replace	–
Door glass operates up and down hardly	Improper window glass position	Adjust	23-16
	Collapsed sash	Repair or replace	–
	Collapsed window regulator arm	Repair or replace	–
	Broken window regulator handle	Replace	–

### BACK DOOR

Symptom	Probable cause	Remedy	Reference page
Back door is "hard" when opened/closed; abnormal noise is heard from hinges	Insufficient grease on hinges	Apply chassis grease	23-48

### WIND NOISES

Symptom	Probable cause	Remedy	Reference page
Wind noise from around the door	Insufficient weatherstrip holding force	Adjust the door installation	23-15
	Weatherstrip improperly installed, or deteriorated	Repair or replace	23-45
	Door fails closing	Adjust	–
	Improper door position	Adjust	23-15
	Uneven clearance between door glass and runchannel	Adjust	–
	Deformation of the door	Repair or replace	–
Wind noise from back door	Insufficient weatherstrip holding force	Adjust the back door installation	23-17
	Weatherstrip improperly installed, or deteriorated	Repair or replace	23-47
	Uneven clearance between the body and back door	Adjust	23-17
	Deformation of the back door	Repair or replace	–



### HOW TO LOCATE WIND NOISES

(1) Attach cloth tape to every place which might conceivably be the source of wind noise, such as panel seams, projections, moulding seams, glass and body seams, etc.

(2) Then make a road test in order to determine that the places not covered by tape are not sources of wind noise.

(3) Then remove the strips of tape one by one, making a road test after each is removed, until a wind noise source is discovered.

(4) When such a place is found, cover it again and continue with the procedure so as to determine if there are any other noise sources.

(5) If no others are found, the last remaining tape is the only source.

(6) Cut the remaining piece of tape into smaller pieces, attach it again as it was before, and then remove the pieces one by one in the same way so as to narrow down the source.

(7) Check to confirm that wind noise occurs when the last remaining tape is removed, and that noise does not occur when it is re-attached.

(8) When the source(s) of the wind noise is finally located, attach butyl tape, body sealer or similar material to obstruct this source as much as possible.

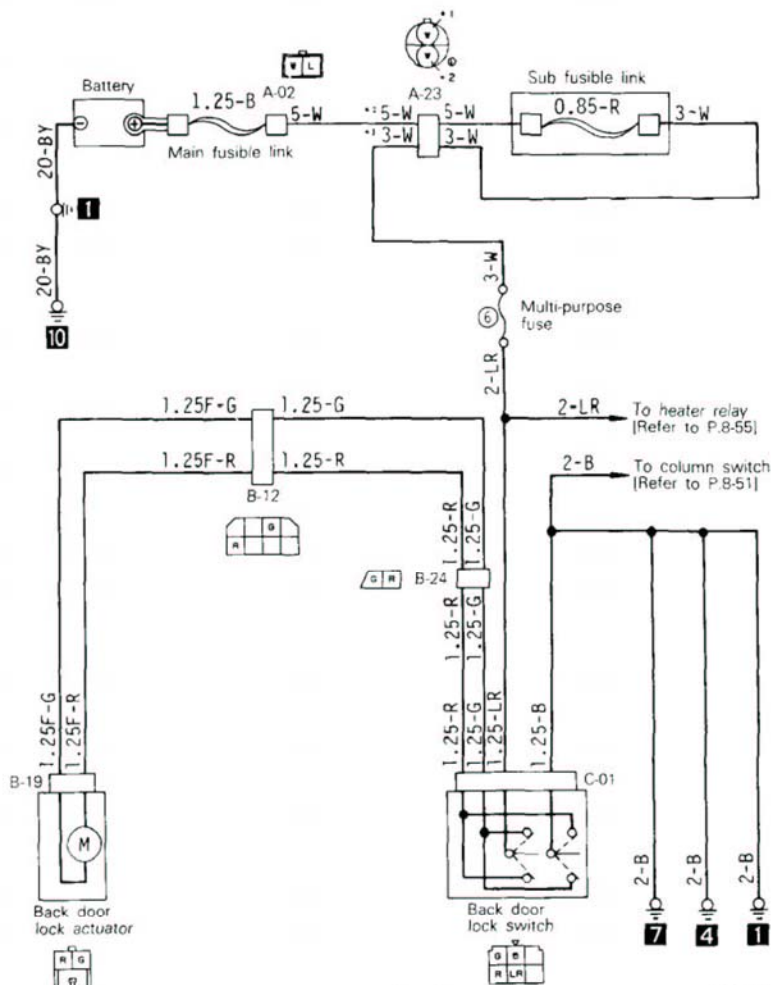
**BACK DOOR LOCKING SYSTEM**

Inspection items					
Symptom	Fuse No. 6	Poor connector connection	Break in wiring harness	Back door lock switch	Back door lock actuator
When the switch is operated, the back door fails to unlock or lock.	①	②	⑤		④
The back door is locked but cannot be unlocked.				①	②
The back door is unlocked but cannot be locked.				①	②

**NOTE**

Number in circle indicates inspection sequence.

**CIRCUIT DIAGRAM**



Remark  
For information concerning the ground points (example ①) refer to P.8-7.

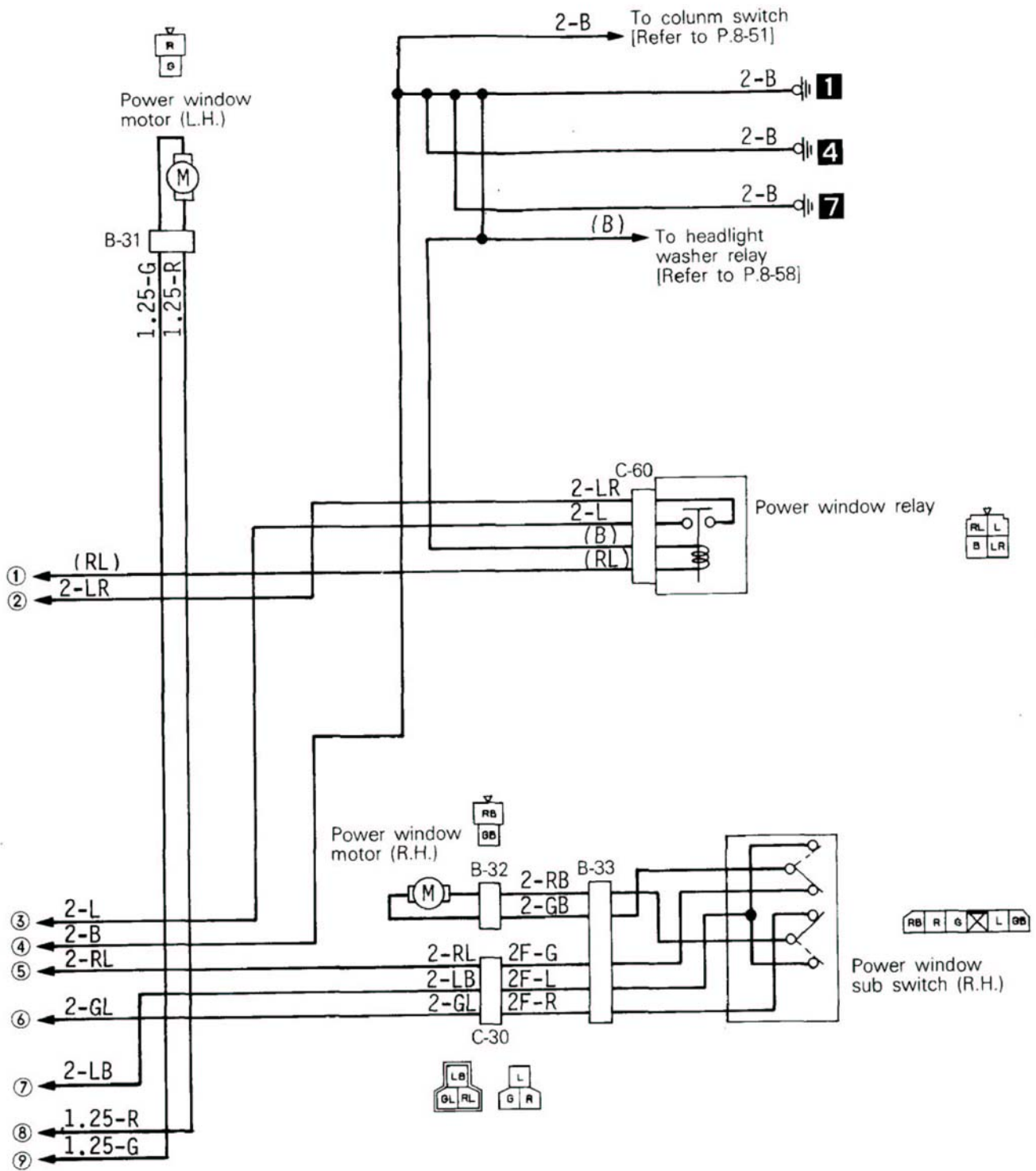
37W802

**Wiring color code**

B: Black    Br: Brown    G: Green    Gr: Gray    L: Blue    Lg: Light green  
 Ll: Light blue    O: Orange    P: Pink    R: Red    Y: Yellow    W: White







37W603

Wiring color code  
B: Black  
Ll: Light blue

Br: Brown  
O: Orange

G: Green  
P: Pink

Gr: Gray  
R: Red

L: Blue  
Y: Yellow

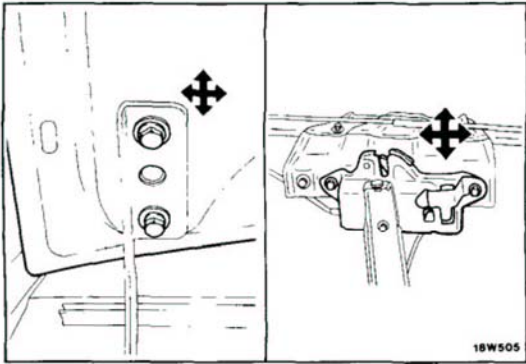
Lg: Light green  
W: White

POWER WINDOWS

23EAAD

Symptom	Fuse No. 3	Power window relay	Main switch	Main switch lock	Sub switch	Power window motor	Poor connector connection	Break in wiring harness	Improper adjustment of regulator and glass
None of the door windows can be operated.	①	③	④				②	⑥	
The front door windows cannot be operated by using the main switches			①			②	③		
The door windows can be operated by using the main switches, but cannot be operated by using the sub switches.				③	②		①		
The door windows can be operated (by using the sub switches) even though the lock switch is at "ON".				①					
The door windows do not operate smoothly.									①

NOTE  
Number in circle indicates inspection sequence.



## SERVICE ADJUSTMENT PROCEDURES

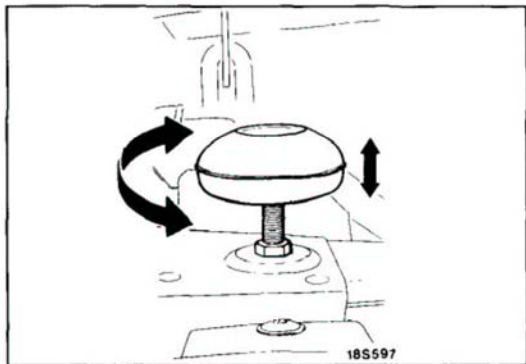
### ADJUSTMENT OF HOOD FIT

N23FAAC

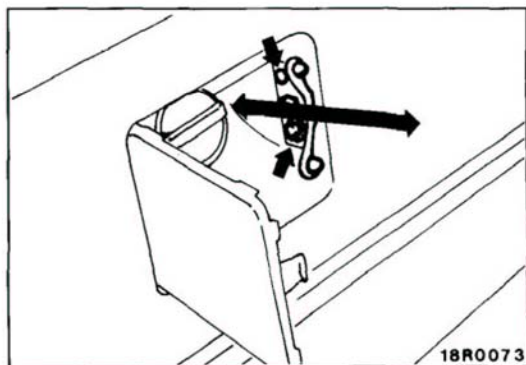
1. Adjust the fit of hood with the hood adjusting bolts, hood latch adjusting bolts and hood bumper while they are installed. Loosen the hood adjusting bolts and adjust the hood laterally with reference to the hood latch.
2. After lateral adjustment of hood, adjust the hood vertically with the hood adjusting bolts and hood latch adjusting bolts.  
Make sure that the hood hook is properly engaged with the hood latch.

#### NOTE

Apply chassis grease to the sliding portion, the rotating portion and the spring of the hood latch.



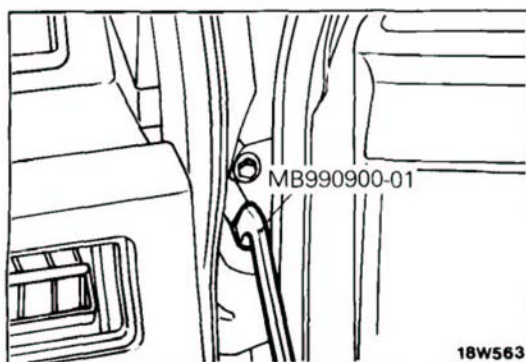
3. Turn the hood bumper and adjust the vertical position of the hood by adjusting the hood bumper either up or down.



### ADJUSTMENT OF FUEL FILLER DOOR HOOK FIT

N23FDAB

Loosen the fuel filler door hook mounting screws and move the fuel filler door hook to the left and right so that the door is flush with the body.



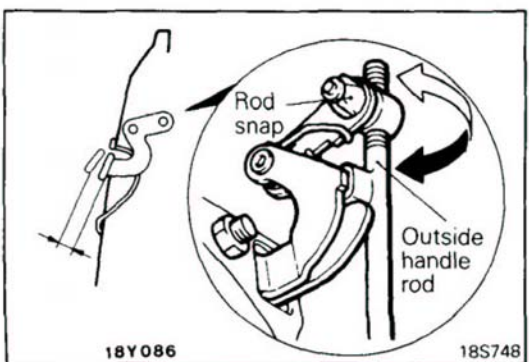
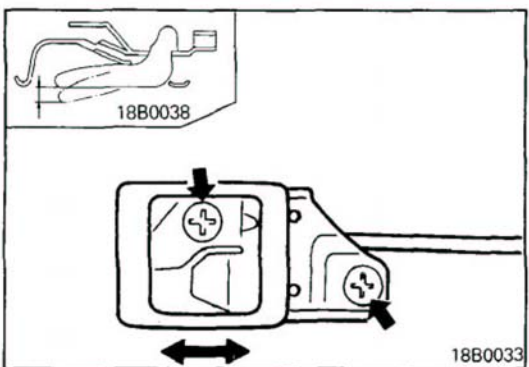
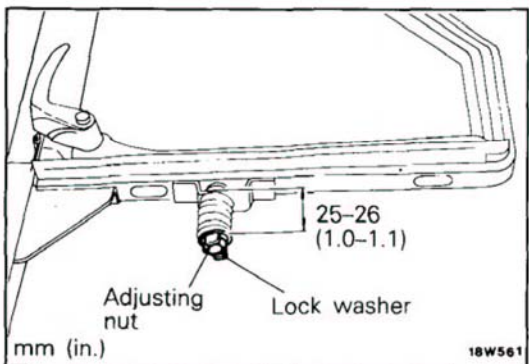
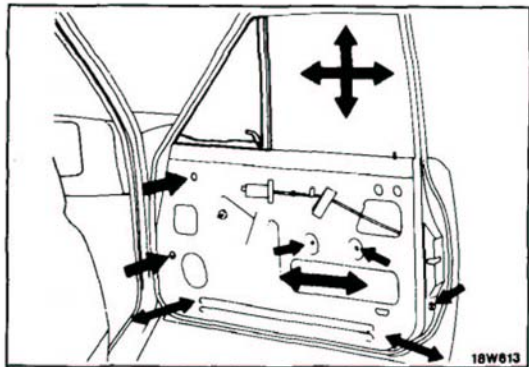
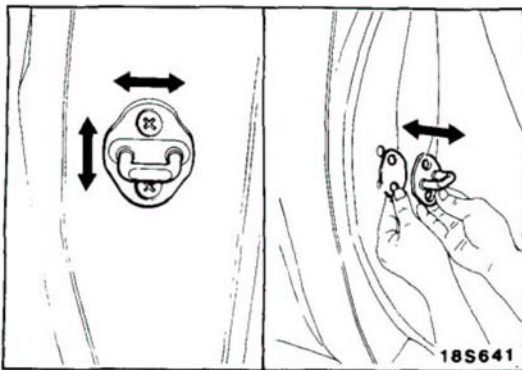
### ADJUSTMENT OF DOOR INSTALLATION

N23FEAC

1. Use the special tool to loosen the hinge mounting bolts on the body side, and then adjust so that the clearance around the door is uniform on all sides.

#### Caution

Attach protection tape to the fender edges near the place where the hinge is installed.



- At the facing surface of the front fender and door panel, loosen the installation bolts at the door side, and then adjust by increasing or decreasing the number of shims.
- At the facing surfaces of the door and rear pillar outer panel, adjust by loosening the striker installation screws.
- Adjust the engagement of the striker and door latch by increasing or decreasing the number of striker shims, and/or by moving the striker.

### ADJUSTMENT OF DOOR GLASS

N23FFAB

- Remove the door trim and waterproof film. (Refer to P.23-33.)
- Raise the door glass fully, and then adjust the following items so that the door glass fits evenly into the window glass runchannel all the way around. Loosen the screws and/or bolts securing the window and rear lower sash. Move the window, rear lower sash and the sub roller guide (vehicles without ventilator window) of the window regulator to adjust the door glass position.

### ADJUSTMENT OF VENTILATOR WINDOW

N23FJAA

- Remove the door trim and waterproof film. (Refer to P.23-33.)
- Remove the ventilator window. (Refer to P.23-35.)
- Adjust the ventilator window by turning the adjusting nut so that the ventilator window can be operated smoothly.

#### NOTE

Fix the adjusting nut by bending the lock washer after the adjustment.

### ADJUSTMENT OF INSIDE HANDLE

N23FGAB

- Remove the door trim and waterproof film. (Refer to P.23-33.)
- Move the mounting position of the inside handle longitudinally in order to adjust the play of the inside handle.

**Standard value : 4-10 mm (.16-.40 in.)**

### ADJUSTMENT OF OUTSIDE HANDLE

N23FHAB

#### FRONT DOOR

- Remove the door trim and waterproof film. (Refer to P.23-33.)
- Disconnect the outside handle from the outside handle rod, and turn it right to left to adjust the outside handle play.

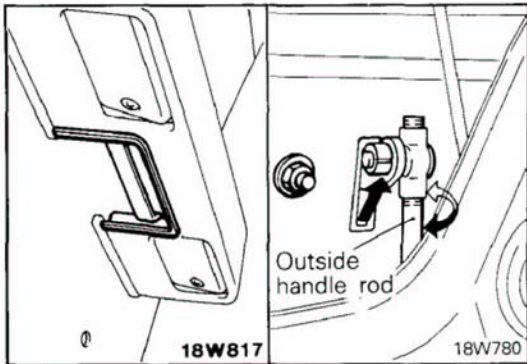
#### Caution

**The rod snap must be replaced.**

**Standard value : 5-10 mm (.20-.40 in.)**

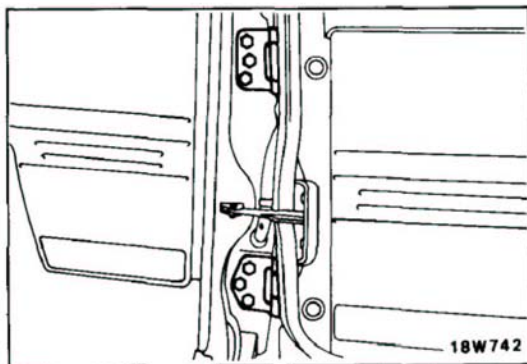
**BACK DOOR**

1. Remove the back door trim and waterproof film. (Refer to P.23-49.)



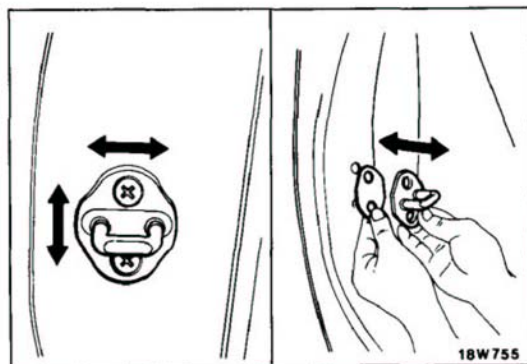
2. Disconnect the outside handle from the outside handle rod, and turn it right to left to adjust the outside handle play.

**Standard value : 5–10 mm (.20–.40 in.)**



**ADJUSTMENT OF BACK DOOR INSTALLATION**  
N23FCAB

- (1) To loosen the hinge mounting bolts on the body side, and then adjust so that the clearance around the back door is uniform on all sides.
- (2) At the facing surface of the right side quarter panel and the back door, adjust by loosening the installation bolts.

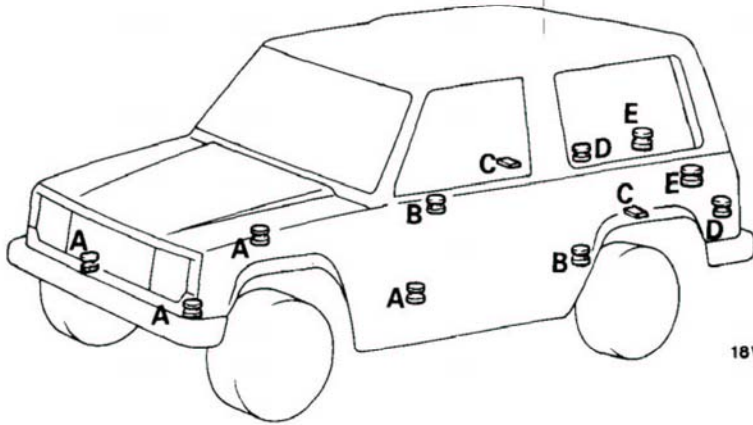


- (3) At the facing surface of the left side quarter panel and back door, adjust by loosening the striker installation screws.
- (4) Adjust the engagement of the striker and the back door latch by increasing or decreasing the number of striker shims, and/or by moving the striker.

**BODY MOUNTING**

**REMOVAL AND INSTALLATION**

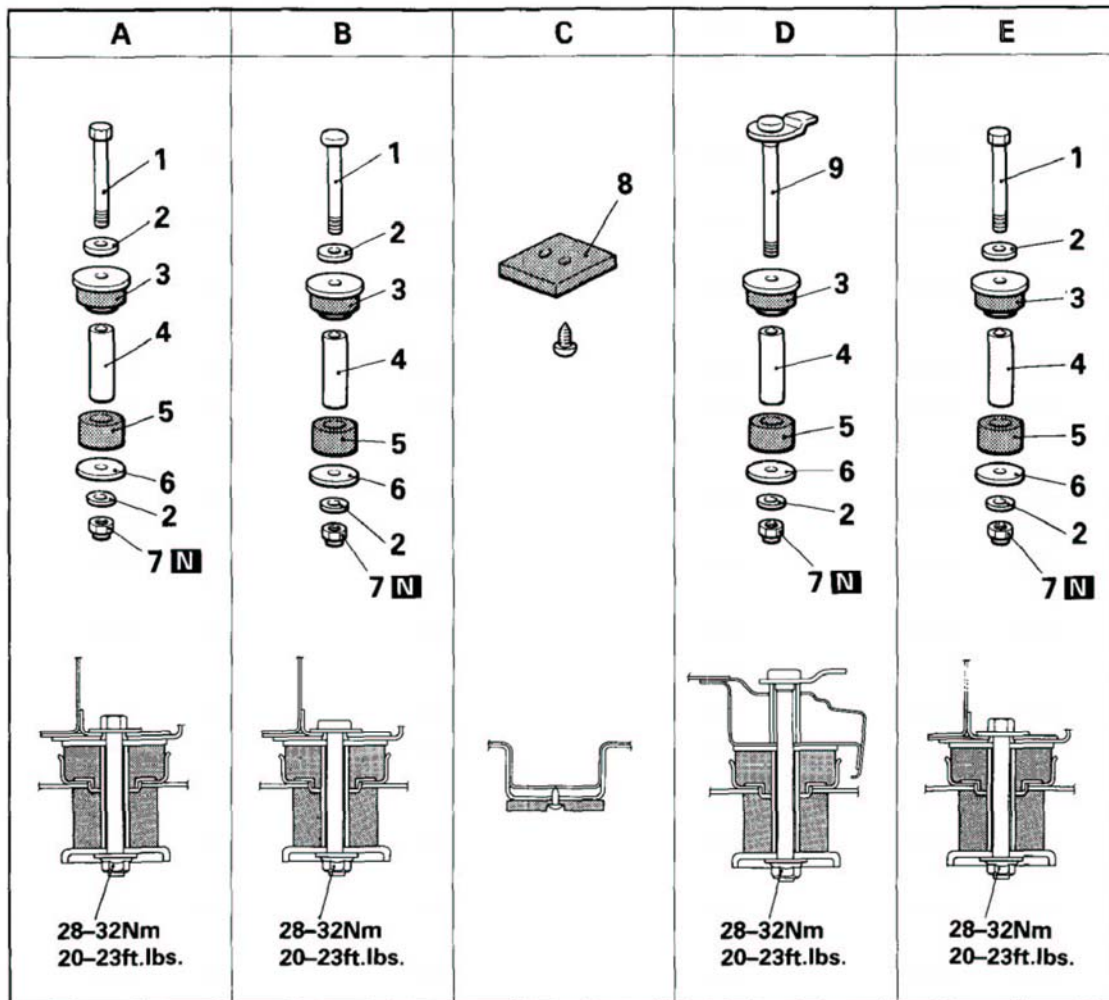
N23GAAA



1. Special bolt
2. Plain washer
3. Body mounting rubber (A)
4. Spacer
5. Body mounting rubber (B)
6. Washer
7. Self locking nut
8. Body shim
9. Mounting bolt

NOTE

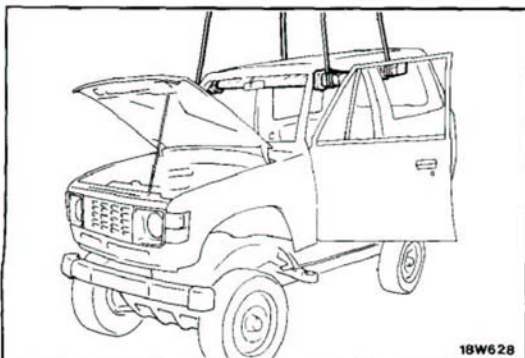
**N** :Non-reusable parts



**REMOVAL**

(1) Remove or disconnect the following parts:

- Air filter
- Accelerator cable
- Vapor hose
- Heater hoses
- Brake booster vacuum hose
- Starter motor wiring harness
- Alternator wiring harness
- Engine ground (on body side)
- Steering shaft joint
- Fuel cut solenoid valve connector
- E.S.S. solenoid valve connector
- High-tension cable
- Water temperature gage connector
- Power steering pump
- Oil pressure switch harness
- Transmission oil cooler
- Radiator assembly
- Oxygen sensor connector
- Hydraulic clutch hoses
- Brake pipes
- Speedometer cable (transmission side)
- Carburetor control wiring harness
- Air temperature sensor connector
- Water temperature sensor connector
- Backup light switch connector
- 4WD indicator light switch connector
- Pulse generator connector
- Fuel pipe
- Filler hose protector
- 2-way valve
- Rear combination light connector
- Filler neck
- Transmission gearshift lever
- Transfer gearshift lever
- Parking brake cable
- Front and rear seats
- Door opening trim



18W628

(2) After removing the body mounting bolts and the body shims, insert wood blocks into the body and gently lift with a crane.

**Caution**

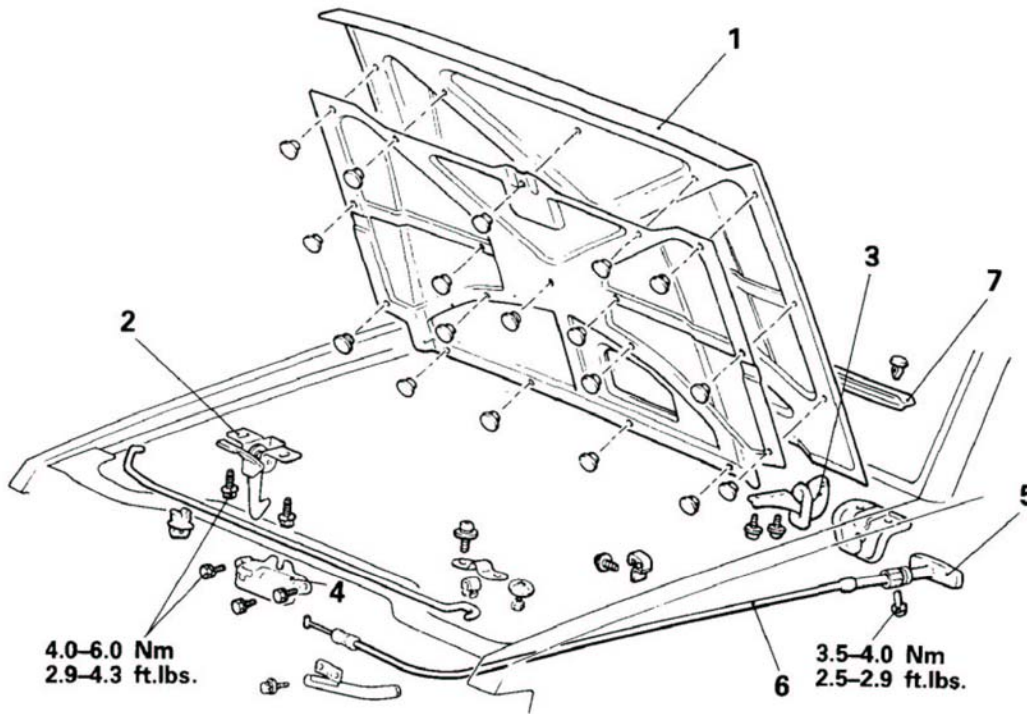
**Hoist the body carefully after assuring that all the connections between body and frame and engine are separated.**

**Sling wires with a suitable bar or frame used and with good protection made by fitting coverings at necessary points.**

**HOOD**

**REMOVAL AND INSTALLATION**

N23HAAC



18W731

**Hood removal steps**

- ◆◆ 1. Hood
- ◆◆ 2. Hood hook
- ◆◆ 3. Hood hinge

**Hood latch release cable removal steps**

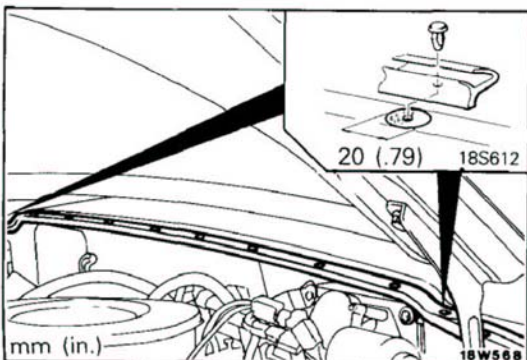
- ◆◆ 4. Hood latch
- ◆◆ 5. Hood latch release handle
- ◆◆ 6. Hood latch release cable

**Hood rear weatherstrip removal**

- ◆◆ 7. Hood rear weatherstrip

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Installation".



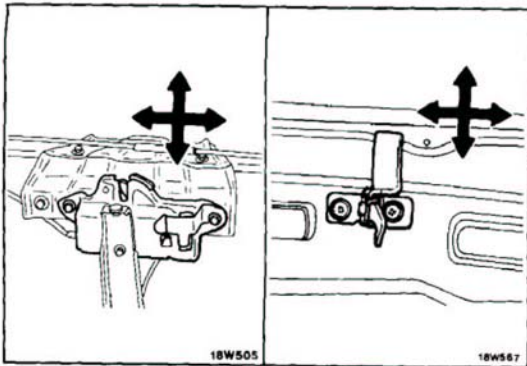
**SERVICE POINTS OF INSTALLATION**

**7. APPLICATION OF SEALANT TO HOOD REAR WEATHER-STRIP**

Apply the specified sealant to and around the two hood rear weatherstrip attaching holes at the right and left ends of the front deck.

**Specified sealant : 3M ART Part No. 8513 or equivalent**



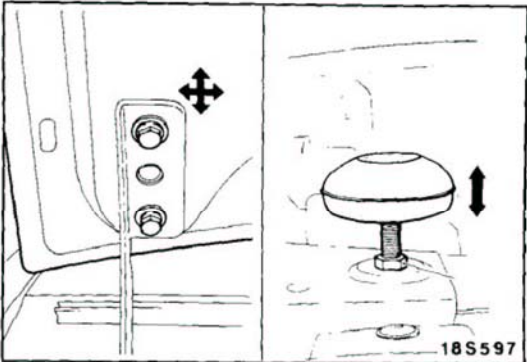


**4. ADJUSTMENT OF HOOD LATCH /2. HOOD HOOK**

- (1) Loosen the hood latch and hood catch stay attaching bolts.
- (2) Adjust the position of the hood latch and hood hook to align the lock with the hook.

**NOTE**

Apply chassis grease to the sliding portion, the rotating portion of the hood hook and hood latch.



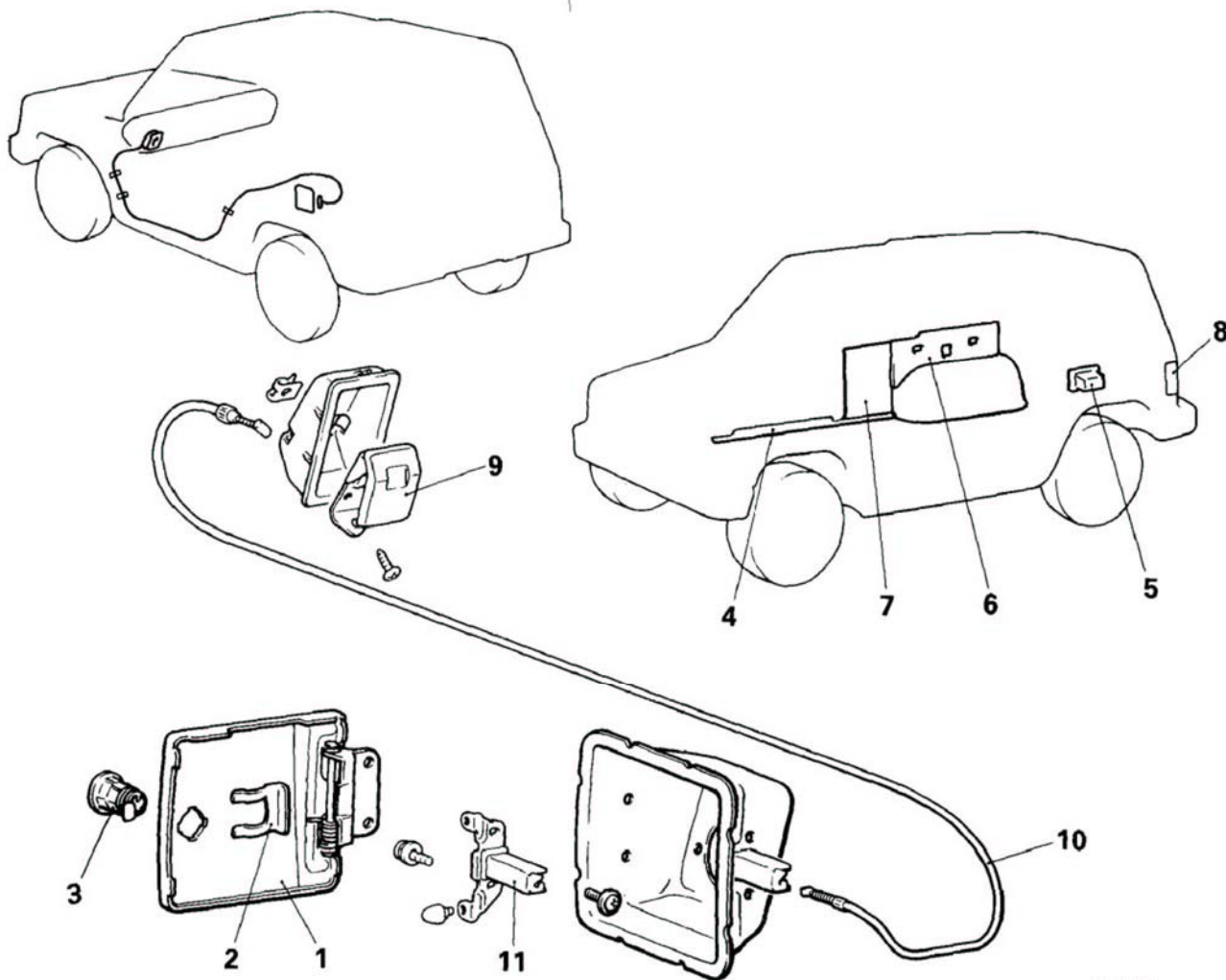
**1. ADJUSTMENT OF HOOD**

- (1) Adjust the longitudinal and lateral positions of the hood by utilizing the oblong holes in the hinge.
- (2) Adjust the vertical position of the hood by adjusting the hood bumper either up or down.

## FUEL FILLER DOOR

## REMOVAL AND INSTALLATION

N23JAAD



18W825

**Fuel filler door panel**

- ◆◆ 1. Fuel filler door panel

**Lock cylinder assembly removal steps**

- 2. Cylinder lock retainer
- 3. Lock cylinder assembly

**Fuel filler door lock release cable removal steps**

- 4. Front scuff plate (L.H.)
- 5. Ashtray (L.H.) [metal top-van]
- 6. Quarter trim (L.H.)
- 7. Center pillar trim
- 8. Rear combination light
- 9. Lock release handle
- ◆◆ 10. Fuel filler door lock release cable

**Fuel filler door hook removal steps**

- 8. Rear combination light
- ◆◆ 10. Fuel filler door lock release cable connection
- ◆◆ 11. Fuel filler door hook

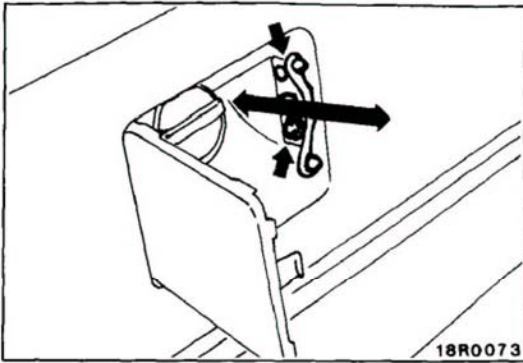
## NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Installation".

**SERVICE POINTS OF INSTALLATION**

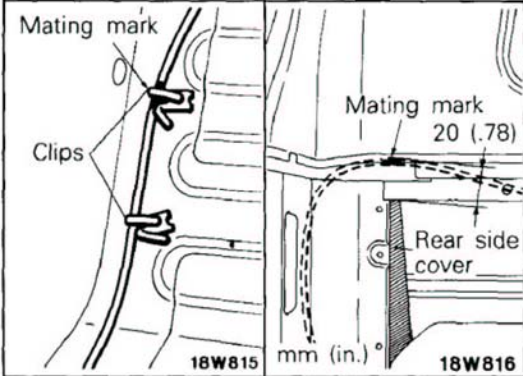
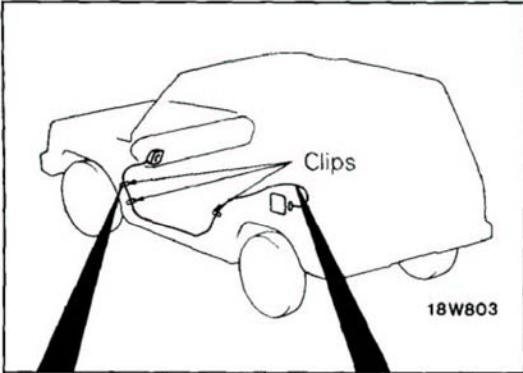
**11. ADJUSTMENT OF FUEL FILLER DOOR HOOK**

Loosen the fuel filler door hook mounting screws and move the fuel filler door hook to the left and right so that the door is flush with the body.



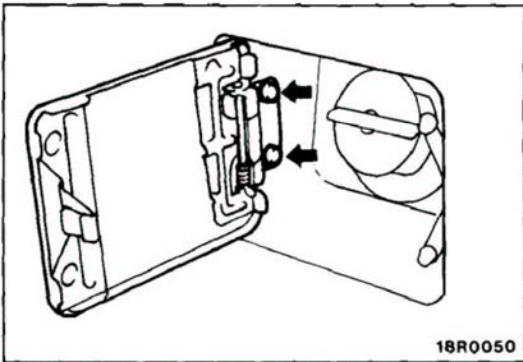
**10. INSTALLATION OF FUEL FILLER DOOR LOCK RELEASE CABLE**

Install so that the installation position mating mark (yellow paint) on the release cable is aligned with the position shown in the figure.



**1. ADJUSTMENT OF FUEL FILLER DOOR PANEL**

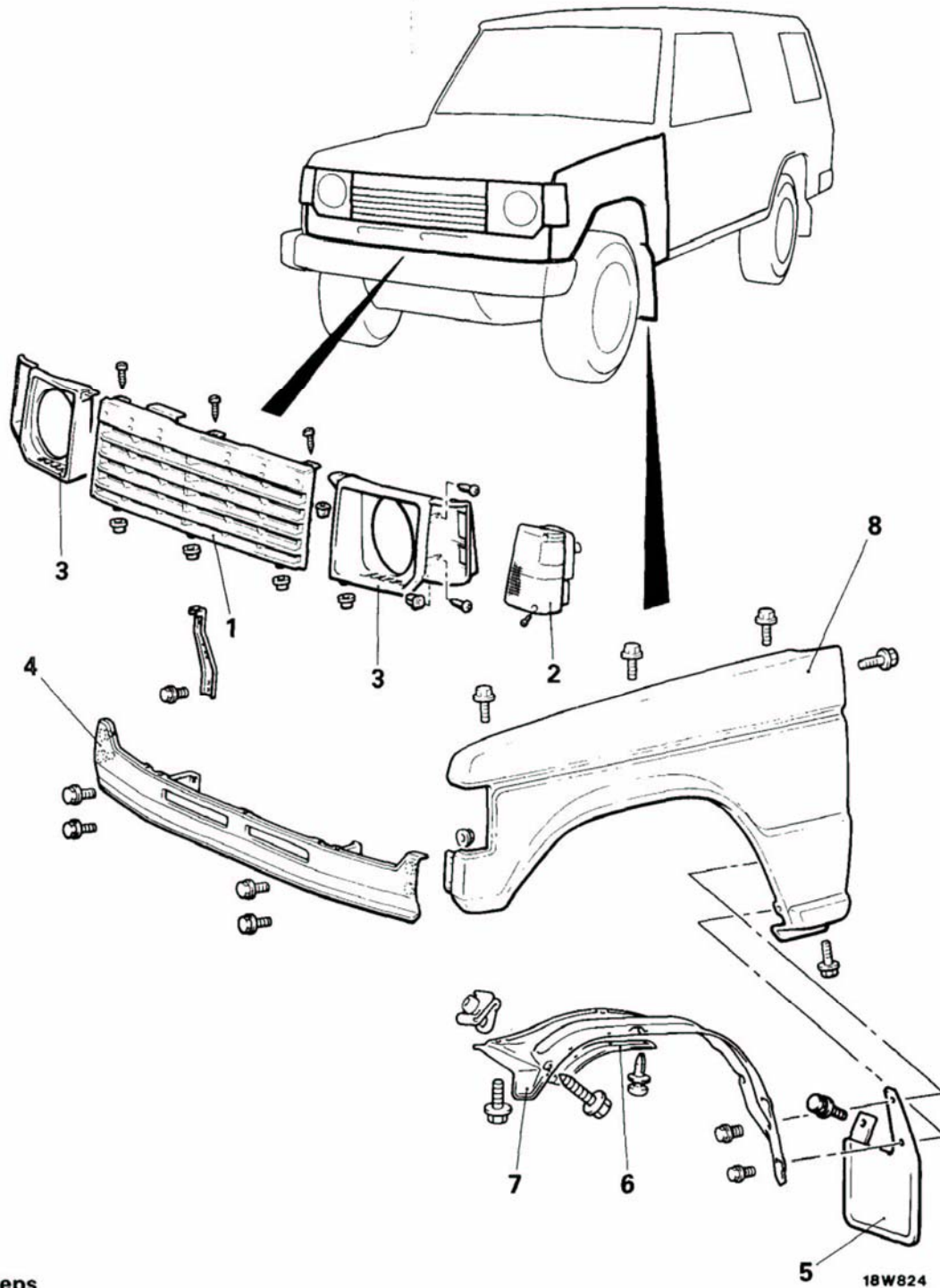
Loosen the fuel filler door mounting screws and adjust so that the upper and lower clearances are equal and the door is flush with the body.



## FENDERS

## REMOVAL AND INSTALLATION

N23KAAE

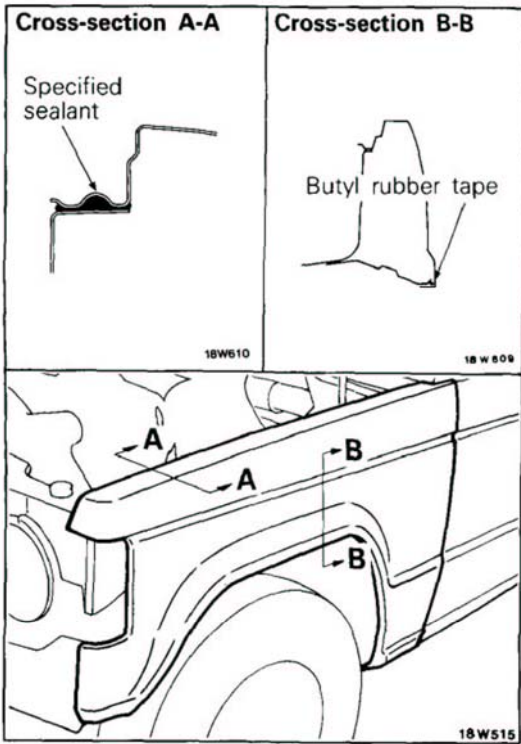


## Removal steps

1. Radiator grille
2. Front combination light
3. Headlight bezel
4. Grille filler panel
5. Front mud guard
6. Partial wheel lip
7. Splash shield
- ◆◆ 8. Front fender

## NOTE

- (1) Reverse the removal procedures to reinstall.  
 (2) ◆◆ : Refer to "Service Points of Installation".



**SERVICE POINTS OF INSTALLATION**

**8. INSTALLATION OF FRONT FENDER**

- (1) Apply the specified sealant fully to the top part of fender up to the ends.

**Specified sealant : 3M ART No. 8531 or No. 8646, or equivalent**

- (2) Apply butyl rubber tape to the flange part of the fender when installing the splash shield.

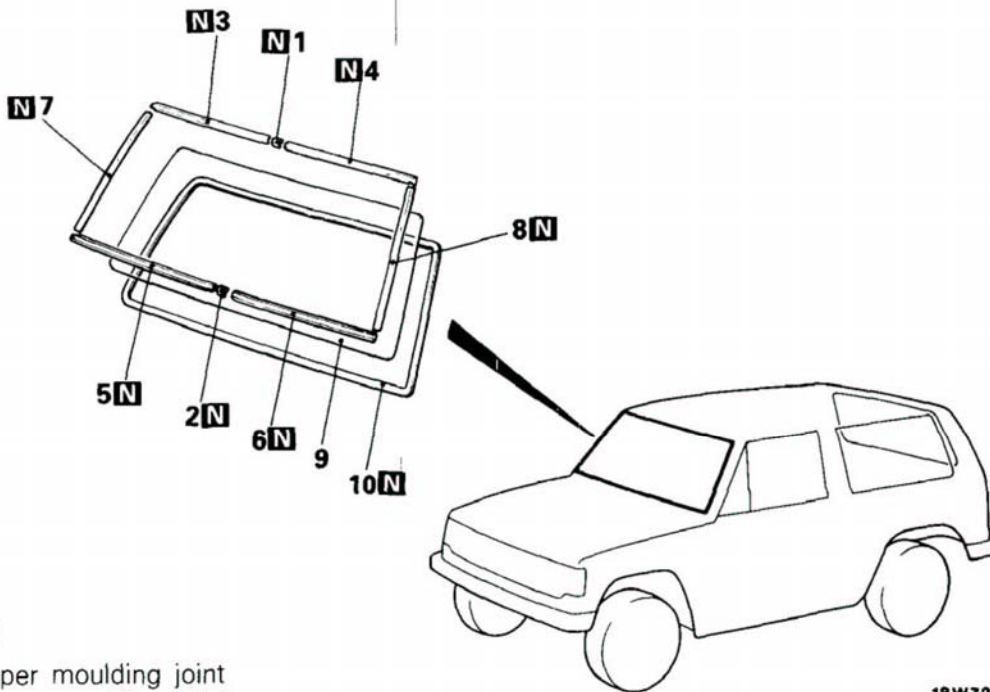
**Specified adhesive : 3M ART Part No. 8626 or 3M Adhesive EC-5310, or equivalent**

- (3) Fasten the fender temporarily in position, make sure that clearance is uniform at all points, and then fasten completely.

**WINDSHIELD**

**REMOVAL AND INSTALLATION**

N23LBAD

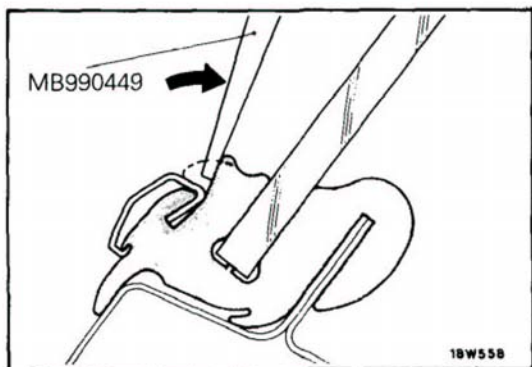


**Removal steps**

- ◄◄ 1. Upper moulding joint
- ◄◄ 2. Lower moulding joint
- ◄◄ 3. Upper moulding, R.H.
- ◄◄ 4. Upper moulding, L.H.
- ◄◄ 5. Lower moulding, R.H.
- ◄◄ 6. Lower moulding, L.H.
- ◄◄ 7. Side moulding, R.H.
- ◄◄ 8. Side moulding, L.H.
- ◄◄◄ 9. Windshield
- ◄◄◄ 10. Windshield weatherstrip

**NOTE**

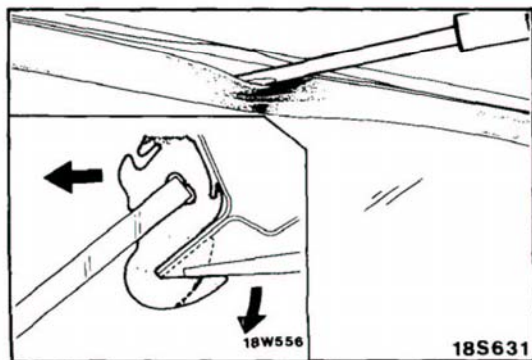
- (1) Reverse the removal procedures to reinstall.
- (2) ◄◄ : Refer to "Service Points of Removal".
- (3) ◄◄◄ : Refer to "Service Points of Installation".
- (4) **N**: Non-reusable parts



**SERVICE POINTS OF REMOVAL**

**1. REMOVAL OF UPPER MOULDING JOINT/2. LOWER MOULDING JOINT/3. TO 8. MOULDINGS**

On vehicles equipped with mouldings, remove the moulding with the weatherstrip straightened with a special tool after sliding the moulding joint.



**9. REMOVAL OF WINDSHIELD/10. WINDSHIELD WEATHERSTRIP**

Push the windshield out from the inside of the cabin with the lip of the weatherstrip straightened along the entire periphery with a screwdriver.

**INSPECTION**

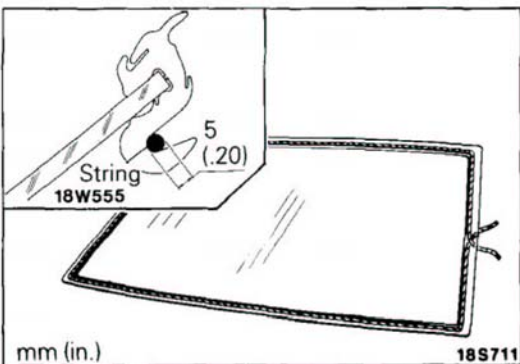
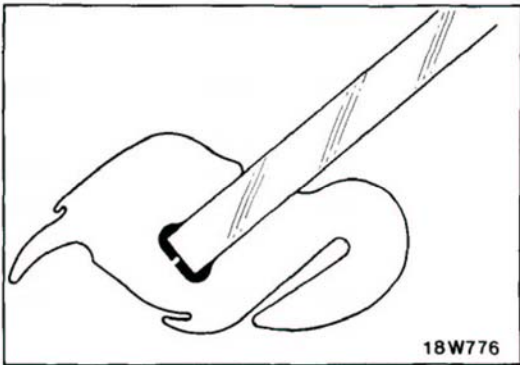
- Check the body flange for deformation.

**SERVICE POINTS OF INSTALLATION**

**10. INSTALLATION OF WINDSHIELD WEATHERSTRIP/9. WINDSHIELD**

- (1) Fill the weatherstrip with the specified adhesive and fit it to the windshield.

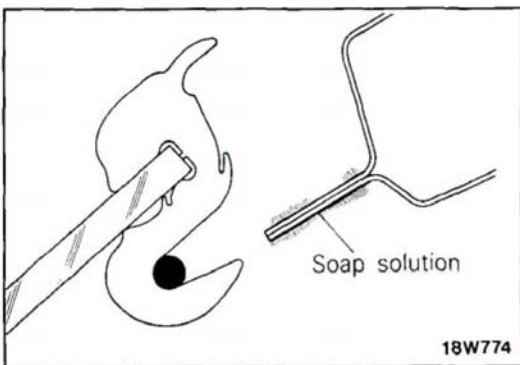
**Specified adhesive : 3M ART Part No. 8001 or No. 8011, or equivalent**



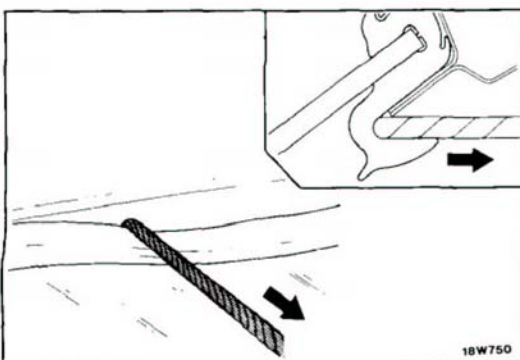
- (2) Set round strings in the weatherstrip groove.

**NOTE**

Make certain that the strings overlap each other at both ends.



- (3) Apply soap solution to the entire surface of the body flange.
- (4) Place the windshield in position from outside with the strings placed inside the cabin.



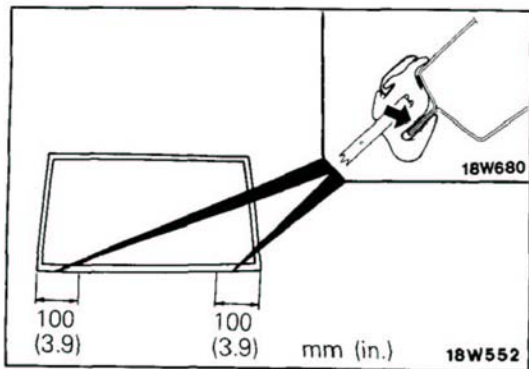
- (5) With the aid of an assistant to push the windshield from outside, slowly pull one end of the string at right angles to the windshield and fit the lips of the weatherstrip correctly on the windshield flange.

**NOTE**

Pull the strings, working from both sides of the windshield toward the center and pushing from the outside of the glass.

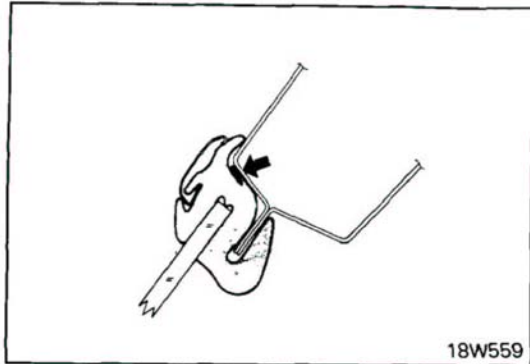
**Caution**

**Press lightly to hold the glass against the body flange surface.**



- (6) Apply specified adhesive between the weatherstrip and the body flange at the locations indicated in the illustration.

**Specified adhesive : 3M ART Part No. 8626 or 3M Adhesive EC-5310, or equivalent**



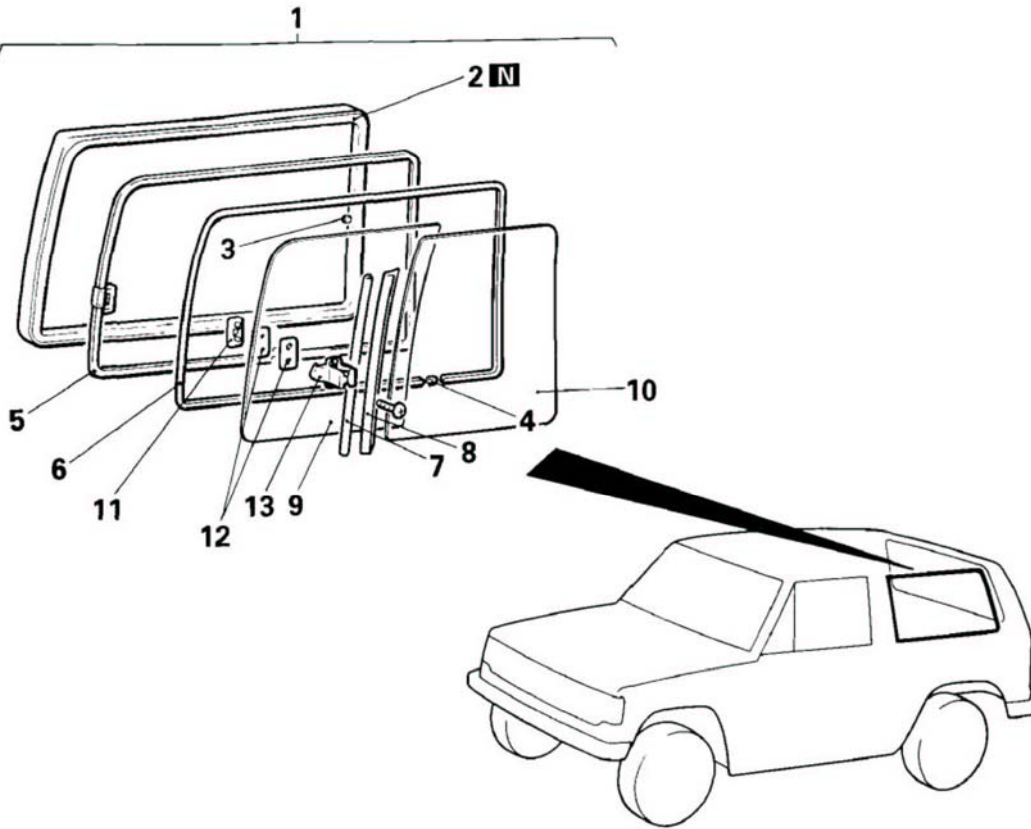
- (7) Apply an ample amount of the specified adhesive all around the weatherstrip between it and the body flange.

**Specified adhesive : 3M ART Part No. 8001 or No. 8011, or equivalent**



**QUARTER WINDOW GLASS  
REMOVAL AND INSTALLATION**

N23LEBB



18W773

**Removal steps**

- ◄◄ ◄◄ 1. Glass and weatherstrip assembly (parts of step No. 2-10)
- 2. Quarter window weatherstrip
- 3. Stopper
- 4. Stopper
- 5. Quarter window sash
- 6. Quarter window runchannel
- 7. Holder
- 8. Rubber seal
- ◄◄ 9. Quarter window front glass
- ◄◄ 10. Quarter window rear glass

**Slide glass lock removal steps**

- 11. Connector
- 12. Packing
- 13. Slide glass lock

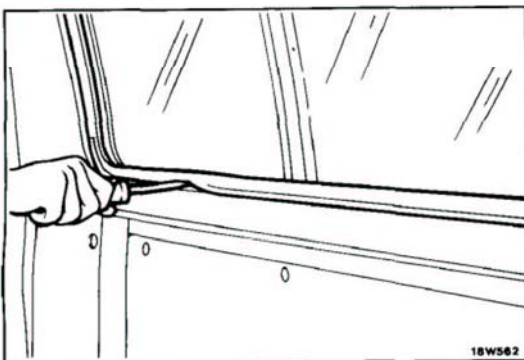
**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◄◄ : Refer to "Service Points of Removal".
- (3) ◄◄ : Refer to "Service Points of Installation".
- (4) [N] : Non-reusable parts

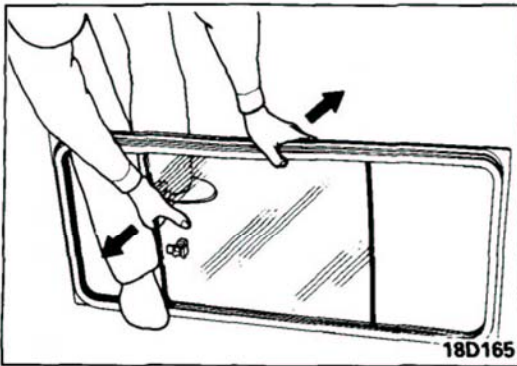
**SERVICE POINTS OF REMOVAL**

**1. REMOVAL OF GLASS AND WEATHERSTRIP ASSEMBLY**

With the glass in position, push the quarter window assembly outward while raising the lip of the weatherstrip along the periphery.

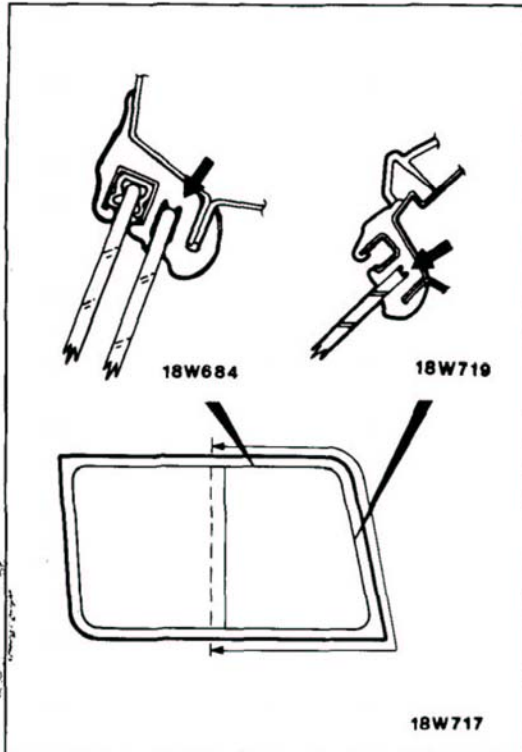


18W562



### 9. REMOVAL OF QUARTER WINDOW FRONT GLASS/10. QUARTER WINDOW REAR GLASS

Move the quarter window glass to the middle position and remove it by opening the weatherstrip up and down.

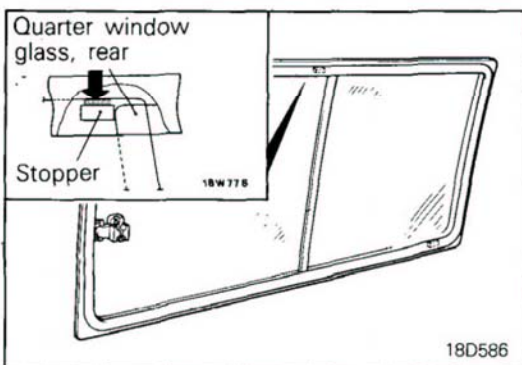


### SERVICE POINTS OF INSTALLATION

#### 1. APPLICATION OF ADHESIVE TO GLASS AND WEATHERSTRIP ASSEMBLY

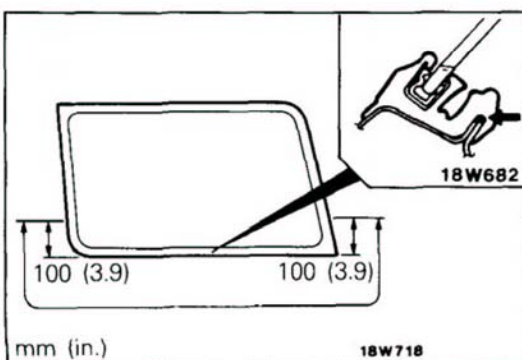
- (1) Apply the specified adhesive to the weatherstrip at the location indicated in the illustration.

**Specified adhesive : 3M ART Part No. 8001 or No. 8011, or equivalent**



- (2) After the quarter window rear glass has been installed, install the stopper by applying the specified adhesive.

**Specified adhesive : 3M Adhesive EC-870 or equivalent**

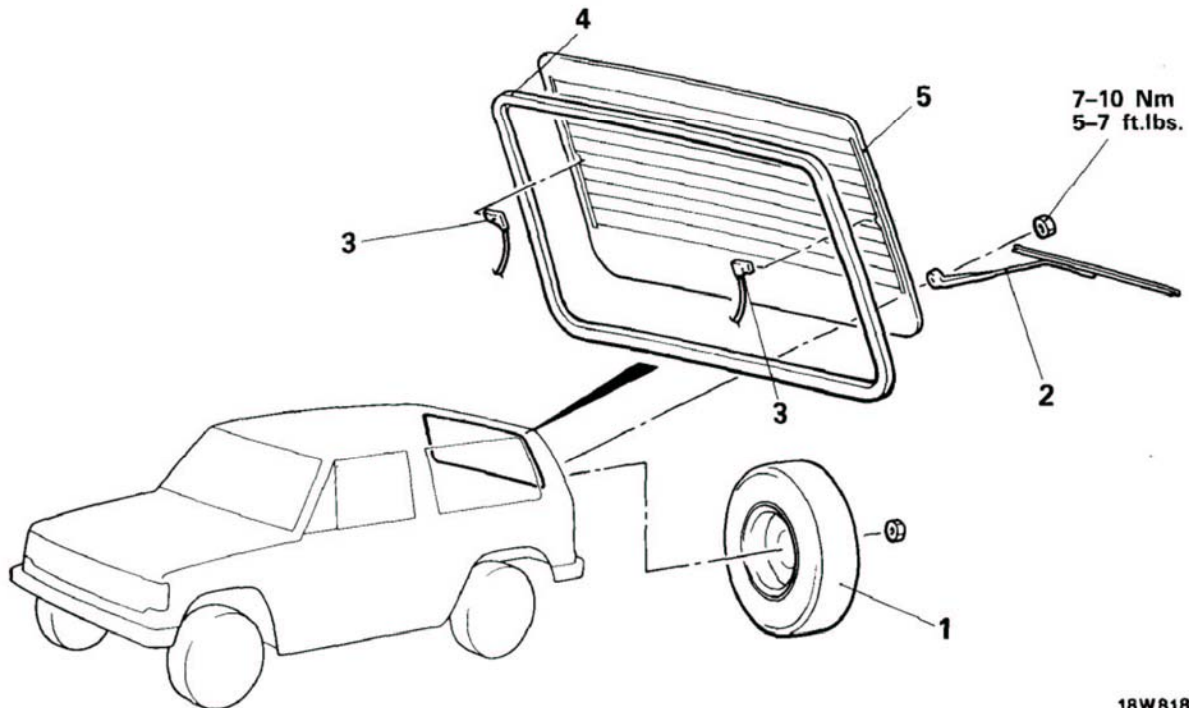


- (3) Apply the specified adhesive between the weatherstrip and the body flange at the location indicated in the illustration.

**Specified adhesive : 3M ART Part No. 8001 or No. 8011, or equivalent**

**BACK DOOR WINDOW GLASS  
REMOVAL AND INSTALLATION**

N23LDAD



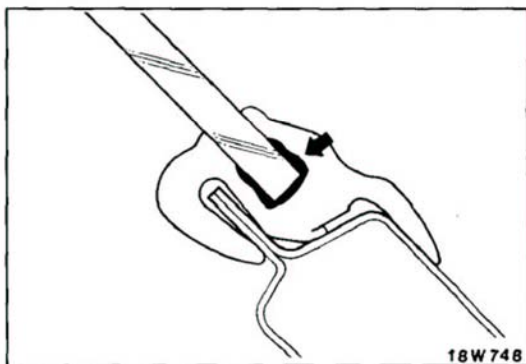
18W818

**Removal steps**

- 1 Spare tire
- 2 Wiper arm and blade assembly (Vehicles with a rear wiper)
- 3 Rear defogger terminal (Vehicles with a rear defogger)
- ◆◆ 4 Back door window weatherstrip
- 5 Back door window glass

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Installation".



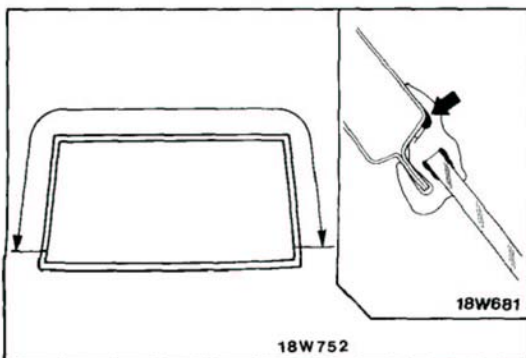
18W748

**SERVICE POINTS OF INSTALLATION**

**4. APPLICATION OF ADHESIVE TO BACK DOOR WINDOW WEATHERSTRIP**

- (1) Apply the specified adhesive to the weatherstrip.

**Specified adhesive : 3M ART Part No. 8001 or No. 8011, or equivalent**



18W681

18W752

- (2) As shown in the figure, attach butyl tape between the weatherstrip and the body flange.

**DOOR ASSEMBLY**

**REMOVAL AND INSTALLATION**

N23MAAF

**Post-installation Operation**  
 • Adjustment of Door Installation  
 (Refer to 23-15)

**Removal steps**

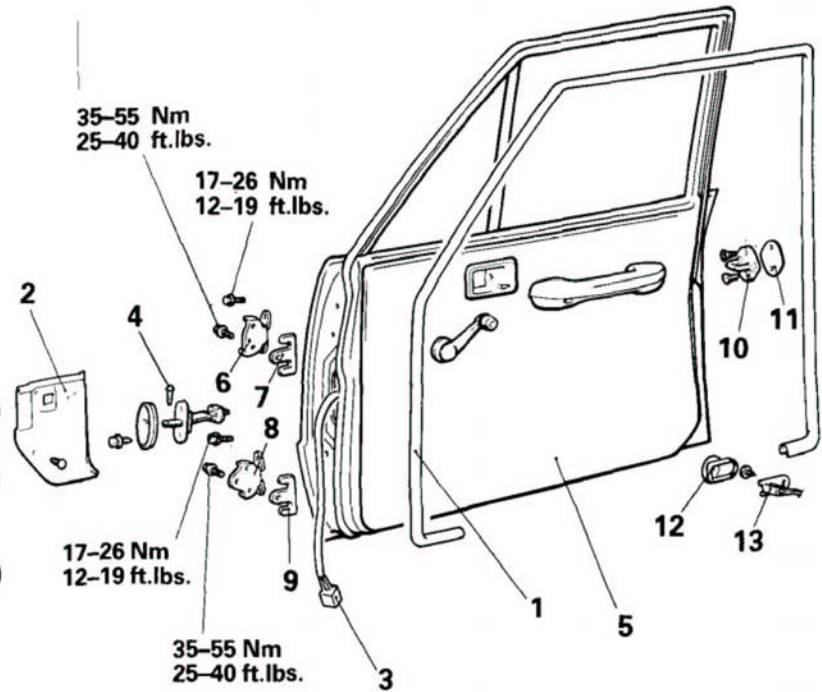
1. Door opening trim  
(Vehicles with a Power Window)
2. Cowl side trim  
(Vehicles with a Power Window)
3. Connection of door wiring harness connector  
(Vehicles with a Power Window)
4. Spring pin
5. Door
- ◆◆ 6. Door upper hinge
7. Door upper hinge shim
- ◆◆ 8. Door lower hinge
9. Door lower hinge shim

**Striker removal steps**

10. Striker
11. Striker shim

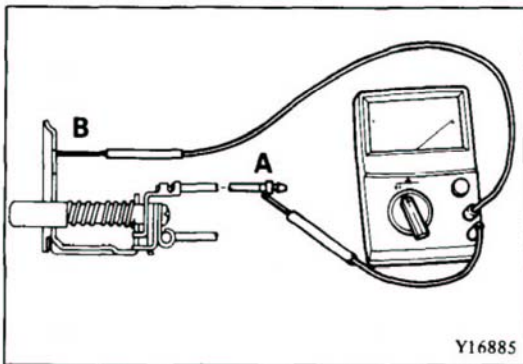
**Door switch removal steps**

12. Door switch cap
13. Door switch



**NOTE**  
 (1) Reverse the removal procedures to reinstall.  
 (2) ◆◆ : Refer to "Service Points of Installation".

18W792



Y16885

**INSPECTION**

- Check the door hinges for cracks, damage or abnormal noise.

**DOOR SWITCH**

Operate the switch, and check the continuity between the terminals.

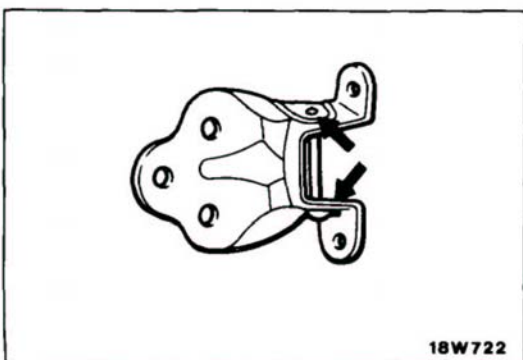
Switch	Test probe	A	B
		Release	○—○
Push			

**NOTE**  
 ○—○ indicates that there is continuity between the terminals.

**SERVICE POINTS OF INSTALLATION**

**8. APPLICATION OF GREASE TO DOOR LOWER HINGE/6. DOOR UPPER HINGE**

Apply the chassis grease to the sliding part of the door hinges.



18W722

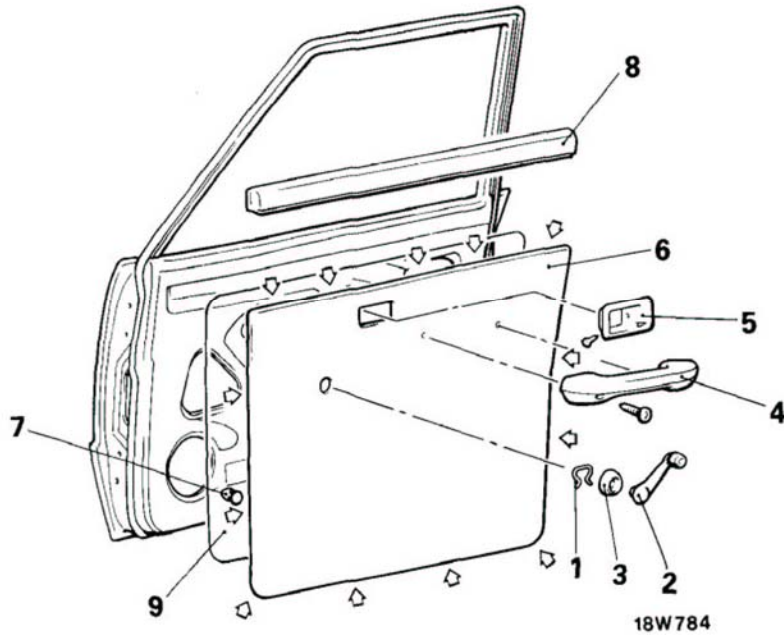
# DOOR TRIM AND WATERPROOF FILM

## REMOVAL AND INSTALLATION (Vehicles without a Power Window)

N23MBAE

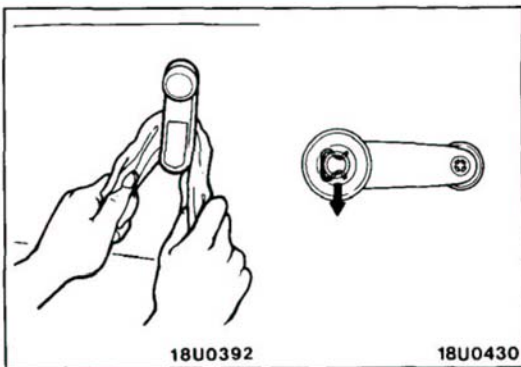
### Removal steps

- ◄► 1. Clip
- 2. Regulator handle
- 3. Escutcheon
- 4. Armrest
- 5. Inside handle cover
- 6. Door trim
- ◄► 7. Trim clip
- 8. Door upper trim
- ◄◄ 9. Waterproof film



### NOTE

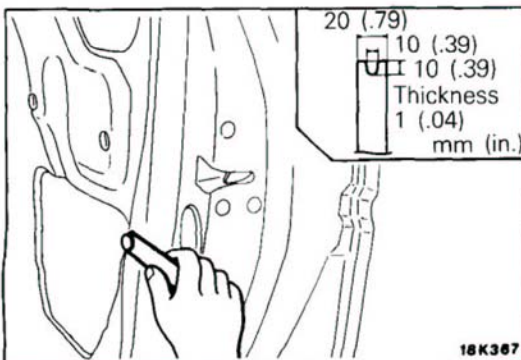
- (1) Reverse the removal procedures to reinstall.
- (2) ◄► : Refer to "Service Points of Removal".
- (3) ◄◄ : Refer to "Service Points of Installation".
- (4) ◇ : Clipping position



### SERVICE POINTS OF REMOVAL

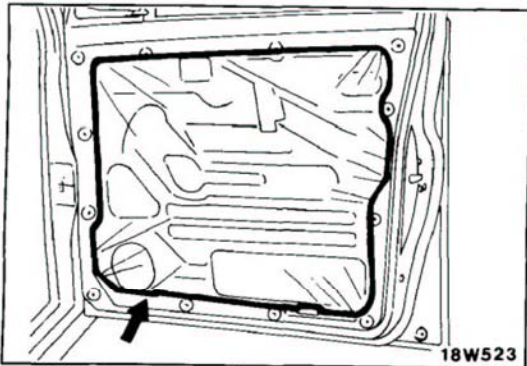
#### 1. REMOVAL OF CLIP

Remove the clip by using a rag, and then remove the regulator handle.



#### 7. REMOVAL OF TRIM CLIP

If trim clips remain at the door side when the door trim is removed, improvise a tool (such as shown in the figure) to remove them.



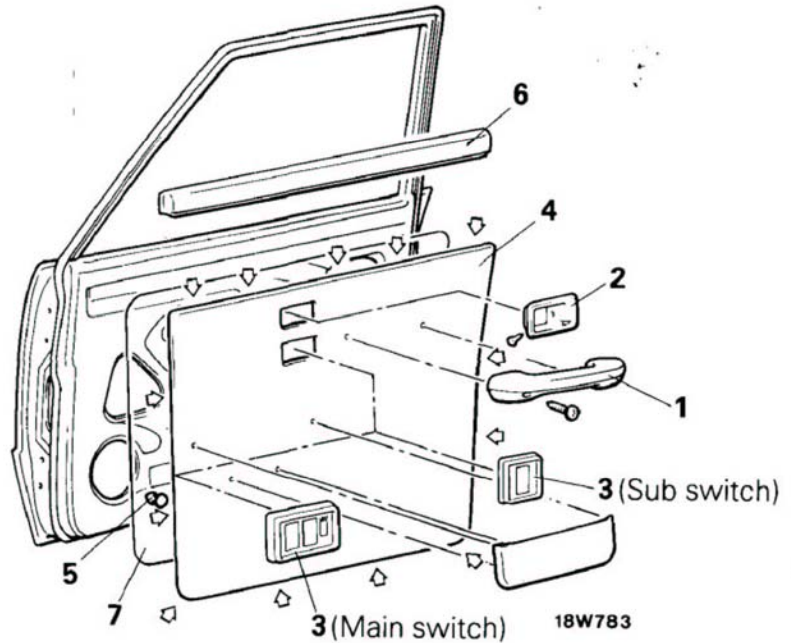
**SERVICE POINTS OF INSTALLATION**

**9. APPLICATION OF ADHESIVE TO WATERPROOF FILM**

Apply a coating of specified adhesive to the position shown in the illustration, and then attach the waterproof film.

**Specified adhesive : 3M ART Part No. 8626 or 3M Adhesive EC-5310, or equivalent**

**REMOVAL AND INSTALLATION (Vehicles with a Power Window)**

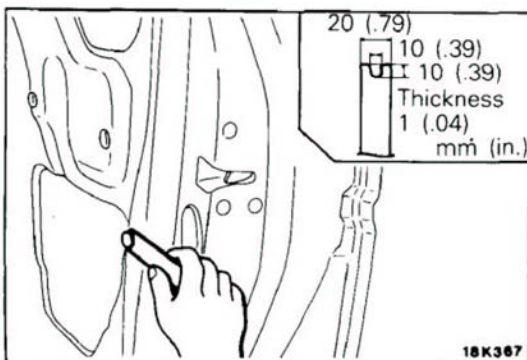


**Removal steps**

1. Armrest
2. Inside handle cover
3. Power window switch cover
4. Door trim
- ◆◆ 5. Trim clip
- ◆◆ 6. Door upper trim
- ◆◆ 7. Waterproof film

**NOTE**

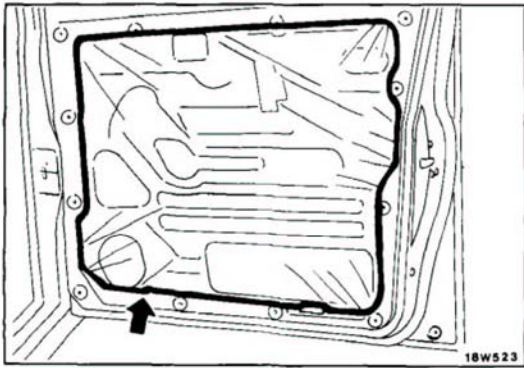
- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆ : Refer to "Service Points of Installation".
- (4) ◇ : Clipping position



**SERVICE POINTS OF REMOVAL**

**5. REMOVAL OF TRIM CLIP**

If trim clips remain at the door side when the door trim is removed, improvise a tool (such as shown in the figure) to remove them.



**SERVICE POINTS OF INSTALLATION**

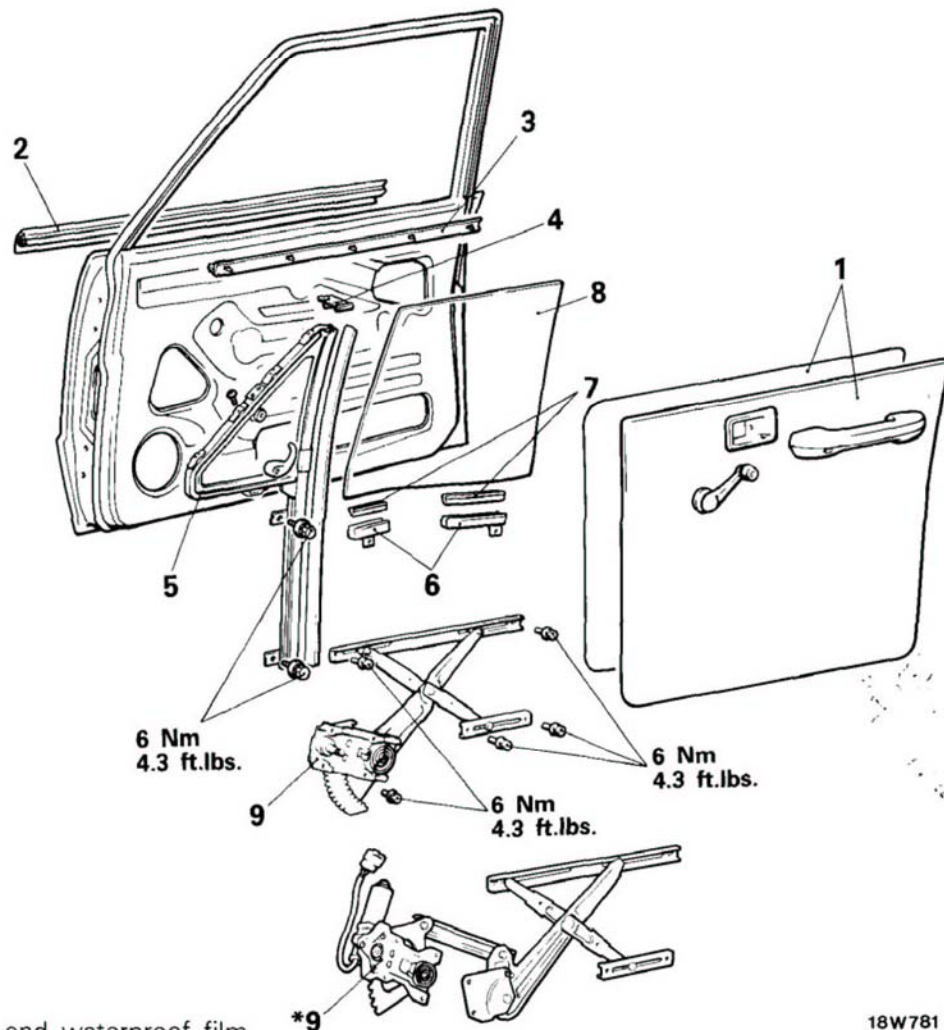
**7. APPLICATION OF ADHESIVE TO WATERPROOF FILM**

Apply a coating of specified adhesive to the position shown in the illustration, and then attach the waterproof film.

**Specified adhesive : 3M ART Part No. 8626 or 3M Adhesive EC-5310, or equivalent**

**FRONT DOOR GLASS AND REGULATOR  
REMOVAL AND INSTALLATION**

N23MCAE



**Removal steps**

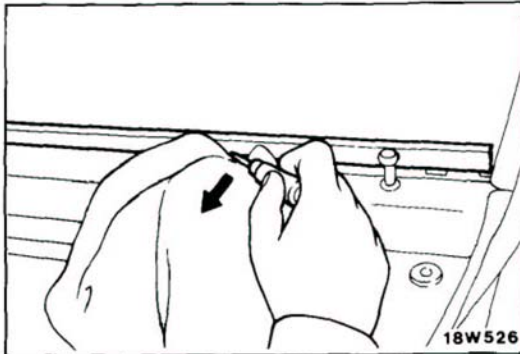
- ◆◆◆◆ 1. Door trim and waterproof film
- ◆◆ Adjustment of door window glass
- ◆◆ 2. Outer weatherstrip
- 3. Inner weatherstrip
- 4. Center sash protector
- ◆◆ Adjustment of ventilator window assembly
- ◆◆ 5. Ventilator window assembly
- 6. Glass holder
- 7. Door glass pad
- ◆◆◆◆ 8. Door window glass
- ◆◆◆◆ 9. Window regulator

**NOTE**

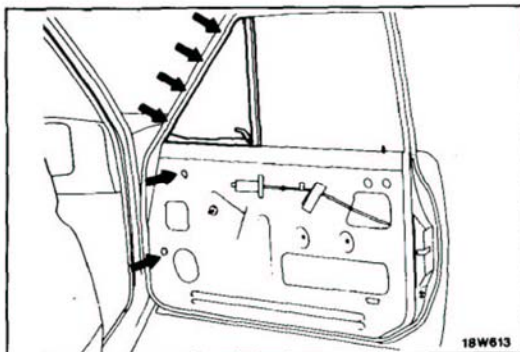
- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆◆ : Refer to "Service Points of Installation".
- (4) \* : Vehicles with a power window

**SERVICE POINTS OF REMOVAL****1. REMOVAL OF DOOR TRIM AND WATERPROOF FILM**

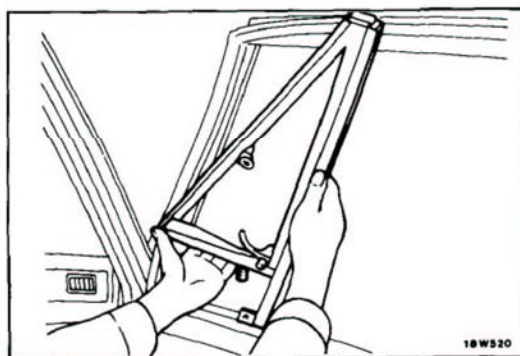
Refer to P.23-33.

**2. REMOVAL OF OUTER WEATHERSTRIP**

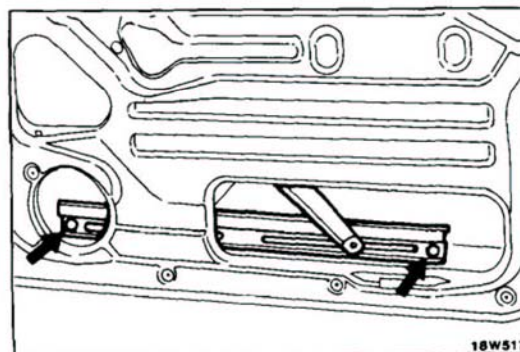
- (1) Remove the outer weatherstrip from the fixing clips by prying upward with a screwdriver.
- (2) Remove the outer weatherstrip rearward.

**5. REMOVAL OF VENTILATOR WINDOW ASSEMBLY**

- (1) Remove the screws and bolts mounting the ventilator window assembly.



- (2) Pull out the ventilator window assembly upward.

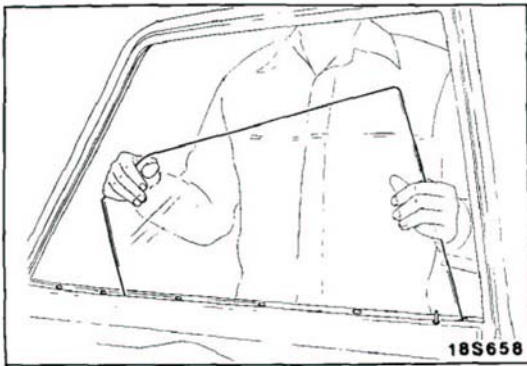
**8. REMOVAL OF DOOR WINDOW GLASS**

- (1) Lower the door glass to the access hole position.
- (2) Peel the waterproof film off with care not to damage it.
- (3) Remove the glass mounting bolts from the glass holder.

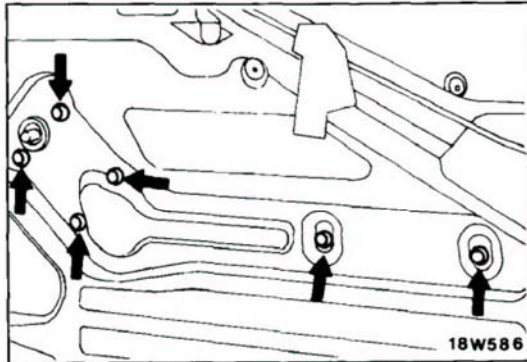
**NOTE**

When removing the glass mounting bolts, support the glass to avoid dropping it.





- (4) Gently pull out the door glass upward while tilting it so that the rear end of the glass comes up to the top.



**9. REMOVAL OF WINDOW REGULATOR**

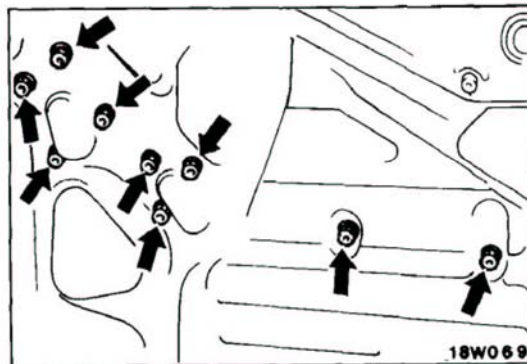
**Vehicles without a Power Window**

- (1) Remove the window regulator mounting bolts.

**NOTE**

Hold the regulator assembly so that it does not drop off when bolts are removed.

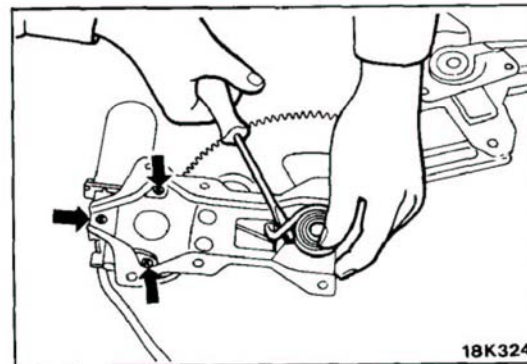
- (2) Take out the window regulator through the access hole.



**Vehicles with a Power Window**

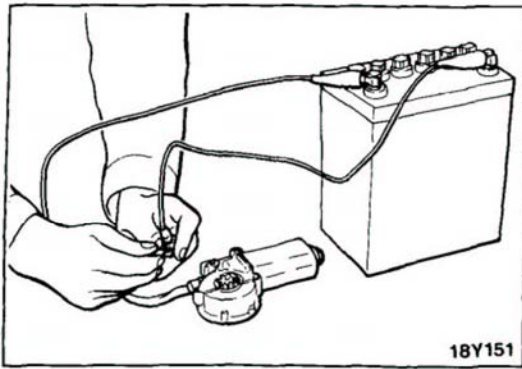
- (1) Remove the regulator mounting bolts and nut, and then remove regulator from the access hole.

- (2) Disconnect the power window motor from the regulator.



**Caution**

Because the force of the regulator spring may cause the regulator arm to jump up when the screws attaching the motor to the window regulator are removed, remove the regulator spring before removing the screws.



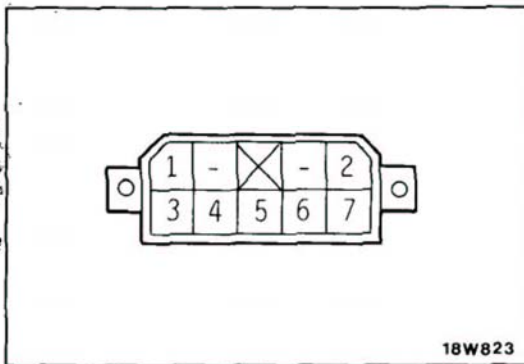
**INSPECTION**

**POWER WINDOW MOTOR**

(1) Connect the motor terminals directly to the battery and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction.

(2) Check the circuit breaker incorporated in the motor, as described below, after installing the motor and regulator to the body.

- ① Press the UP switch to fully close the window glass, and continue to press the switch for 10 to 20 seconds.
- ② At the moment that the UP switch is released, press the DOWN switch. The circuit breaker can be considered good if at this time the door window glass begins to open within 60 seconds.



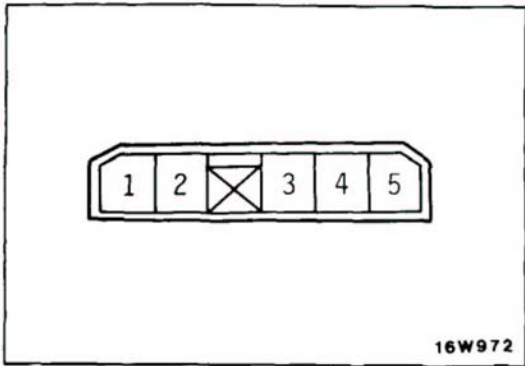
**MAIN SWITCH**

Operate the switch, and check the continuity between the terminals.

Switch		Terminal	L.H. side				R.H. side				LOCK	
			1	4	3	6	2	4	7	6	4	5
Power window switch (manual)	UP		○—○		○—○		○—○		○—○			
	OFF		○		○—○		○		○—○			
	DOWN		○	○—○			○	○—○				
Lock switch	ON (LOCK)											
	OFF (FREE)									○—○		

**NOTE**

○—○ indicates that there is continuity between the terminals.



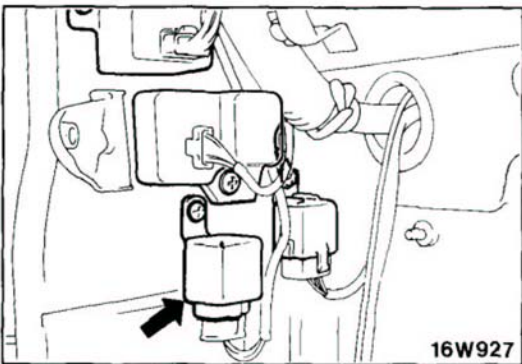
**SUB SWITCH**

Operate the switch, and check the continuity between the terminals.

Switch \ Terminal	2	1	5	4	3
UP	○—○		○—○		
OFF		○—○		○—○	
DOWN	○—○		○—○		

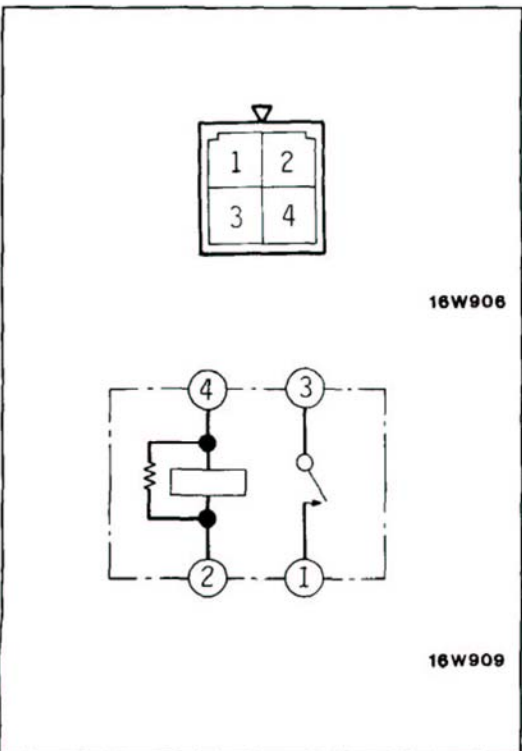
**NOTE**

○—○ indicates that there is continuity between the terminals.



**POWER WINDOW RELAY**

(1) After removing the cowl side trim, remove the power window relay.



(2) Check for continuity between the terminal.

Terminal	1	2	3	4
Battery voltage not applied		○—○		
Battery voltage applied	⊕	○—○		⊖

**NOTE**

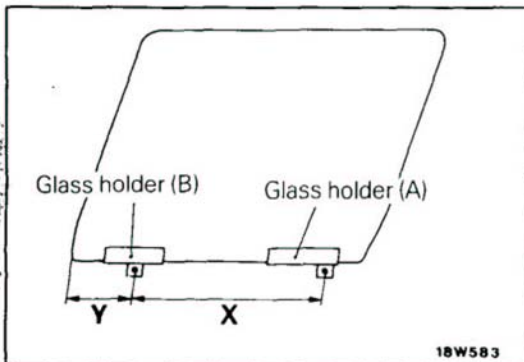
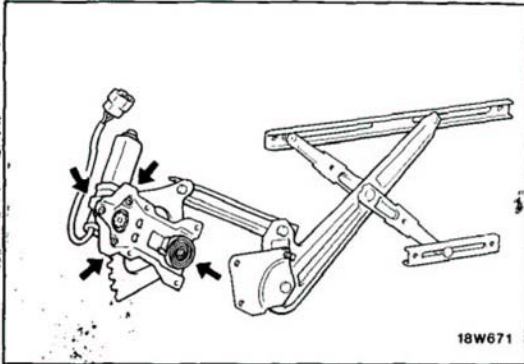
- (1) ○—○ indicates that there is continuity between the terminals.
- (2) ⊕---⊖ indicates the connection with the power supply.

**SERVICE POINTS OF INSTALLATION****9. INSTALLATION OF WINDOW REGULATOR****Vehicles without a Power Window**

Apply a coating chassis grease to the sliding parts and rotating parts of the window regulator.

**Vehicles with a Power Window**

When assembling the window regulator and power window motor, first install the regulator spring, and then proceed with assembly.

**8. INSTALLATION OF DOOR WINDOW GLASS**

When the door glass has been removed from the glass holder, install to the position shown in illustration.

**Standard value :**

**Distance X 466.5–467.5 mm (18.366–18.406 in.)**

**Distance Y 76.5–77.5 mm (3.012–3.051 in.)**

- **ADJUSTMENT OF VENTILATOR WINDOW**

Refer to P.23-16.

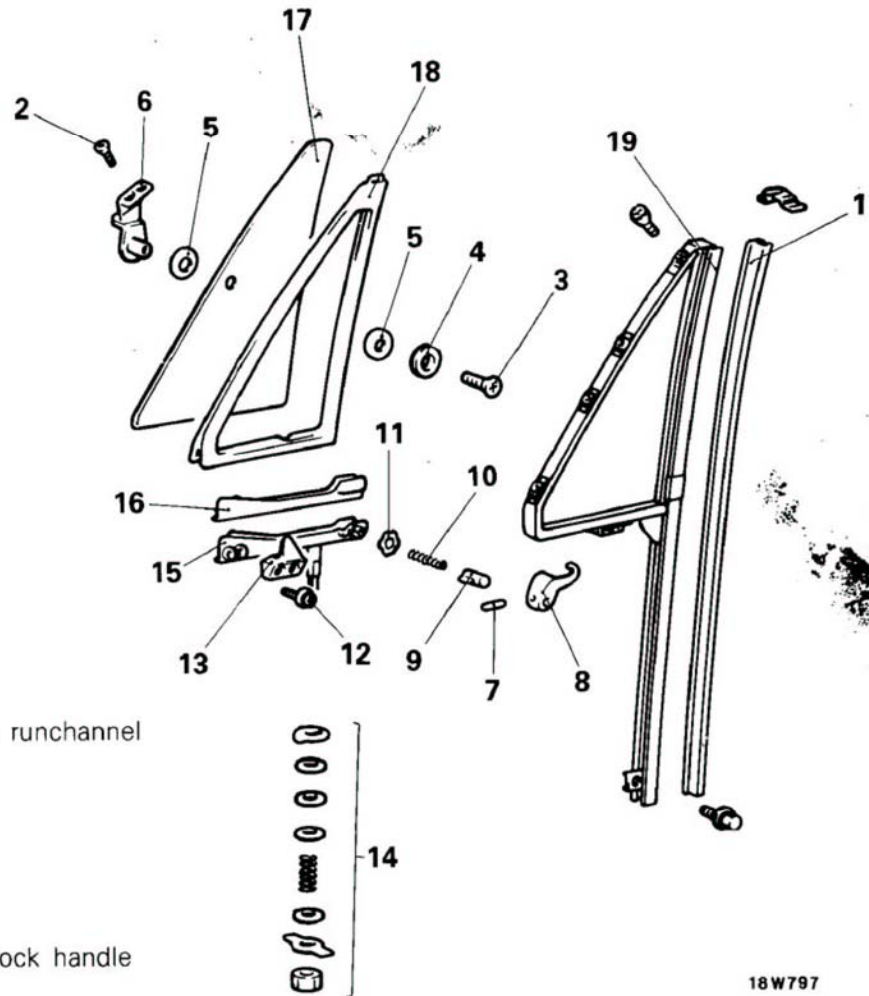
- **ADJUSTMENT OF DOOR WINDOW GLASS**

Refer to P.23-16.

- 1. INSTALLATION OF DOOR TRIM AND WATERPROOF FILM**

Refer to P.23-33, 34.

**DISASSEMBLY AND REASSEMBLY  
(Ventilator Window Assembly)**



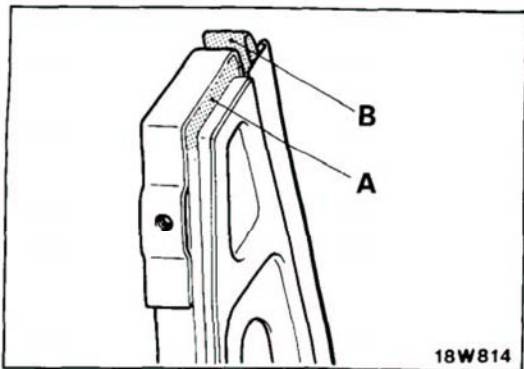
**Disassembly steps**

- ◆◆ 1. Door window glass runchannel
- ◆◆ 2. Screw
- ◆◆ 3. Screw
- ◆◆ 4. Washer
- ◆◆ 5. Packing
- ◆◆ 6. Hinge
- ◆◆ 7. Pin
- ◆◆ 8. Ventilator window lock handle
- ◆◆ 9. Push button
- ◆◆ 10. Push button spring
- ◆◆ 11. Wave washer
- ◆◆ 12. Screw
- ◆◆ 13. Ventilator open handle
- ◆◆ Adjustment of ventilator window
- ◆◆ 14. Ventilator sash spring kit
- ◆◆ 15. Ventilator sash
- ◆◆ 16. Ventilator window glass pad
- ◆◆ 17. Door ventilator window glass
- ◆◆ 18. Ventilator window weatherstrip
- ◆◆ 19. Ventilator sash assembly

**NOTE**

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Reassembly".

18W797



### SERVICE POINTS OF REASSEMBLY

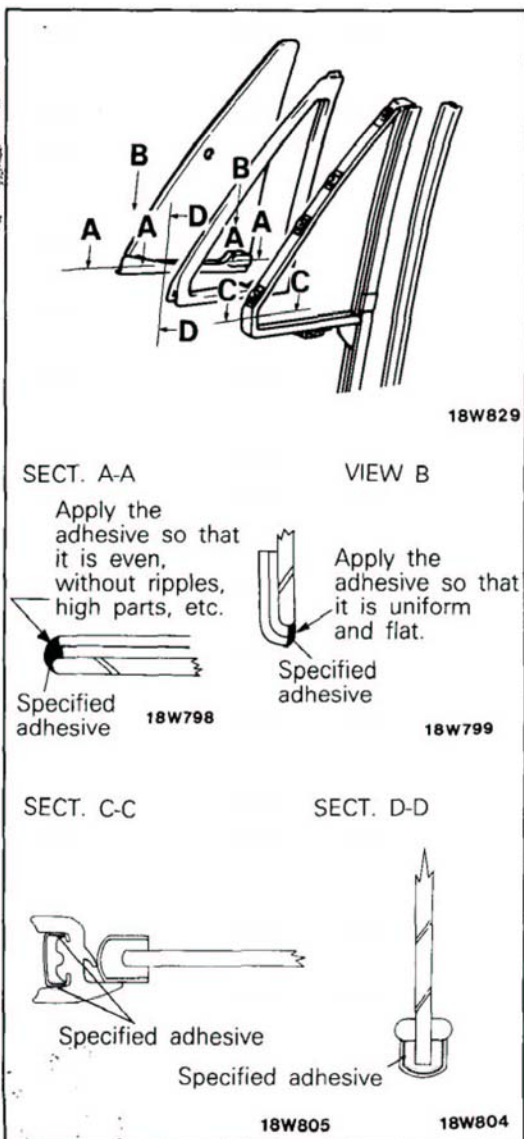
#### 19. APPLICATION OF ADHESIVE TO VENTILATOR SASH ASSEMBLY/18. VENTILATOR WINDOW WEATHERSTRIP

- (1) Apply the specified adhesive to the place marked "A" in the figure, between the ventilator sash assembly and the ventilator window weatherstrip.

**Specified adhesive : 3M Super Weatherstrip Adhesive 8001 or 8011 or equivalent**

- (2) Apply the specified adhesive to the place marked "B" in the figure.

**Specified adhesive : 3M ART Part No. 8080 or 3M Adhesive EC-1368, or equivalent**



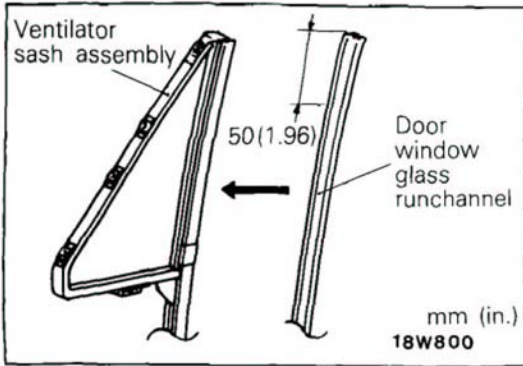
#### 17. APPLICATION OF ADHESIVE TO DOOR VENTILATOR WINDOW GLASS/16. VENTILATOR WINDOW GLASS PAD/15. VENTILATOR SASH

- (1) The SECT. A-A and VIEW B parts in the illustration are to be coated with the specified adhesive.

**Specified adhesive : 3M Super Weatherstrip Adhesive 8001 or 8011 or equivalent**

- (2) The SECT. C-C and SECT. D-D parts in the illustration are to be coated with the specified adhesive.

**Specified adhesive : 3M ART Part No. 8080 or 3M Adhesive EC-1368, or equivalent**



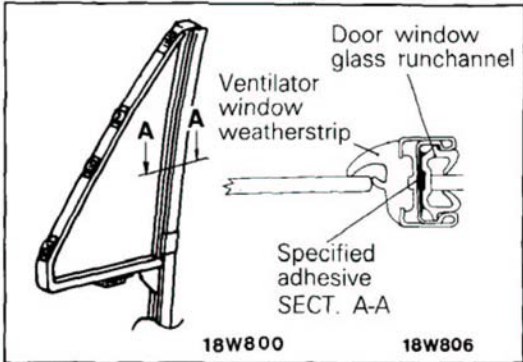
● **ADJUSTMENT OF VENTILATOR WINDOW**

Refer to P.23-16.

**1. APPLICATION OF ADHESIVE TO DOOR WINDOW GLASS RUNCHANNEL**

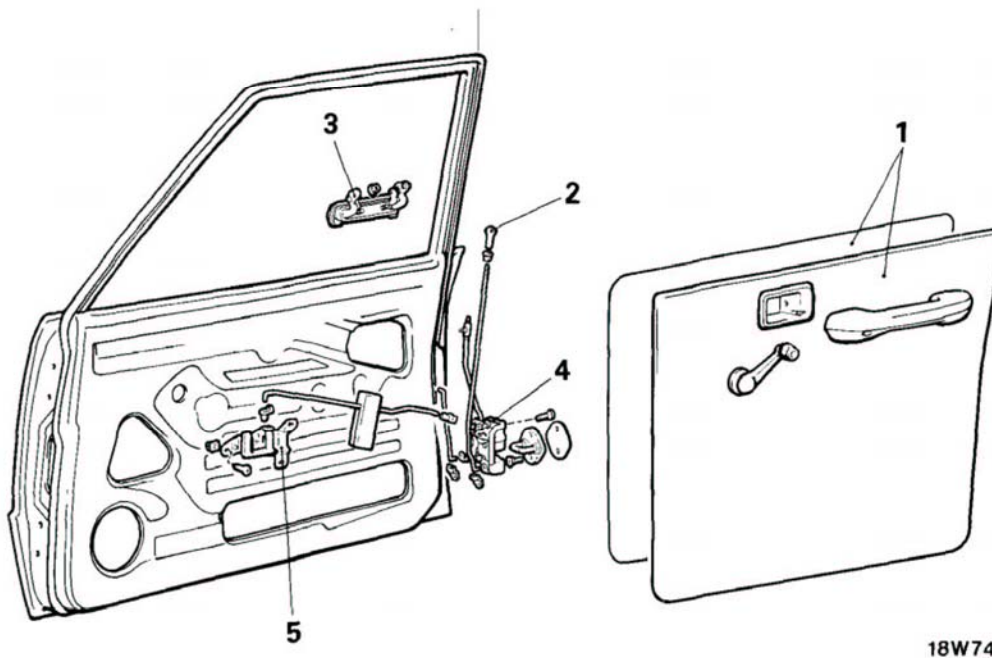
Apply the specified adhesive between the door window glass runchannel and the ventilator sash assembly at the location indicated in the illustration.

**Specified adhesive : 3M ART Part No. 8080 or 3M Adhesive EC-1368, or equivalent**



## DOOR HANDLE AND LATCH REMOVAL AND INSTALLATION

N23MDAD



18W741

### Removal steps

- ◄◄ ◄◄ 1. Door trim and waterproof film
- ◄◄ ◄◄ Adjustment of outside handle
- ◄◄ ◄◄ Adjustment of inside handle
- 2. Inside lock knob
- 3. Outside handle
- 4. Door latch
- 5. Inside handle

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◄◄ : Refer to "Service Points of Removal".
- (3) ◄◄ : Refer to "Service Points of Installation".

## SERVICE POINTS OF REMOVAL

1. REMOVAL OF DOOR TRIM AND WATERPROOF FILM  
Refer to P.23-33.

## SERVICE POINTS OF INSTALLATION

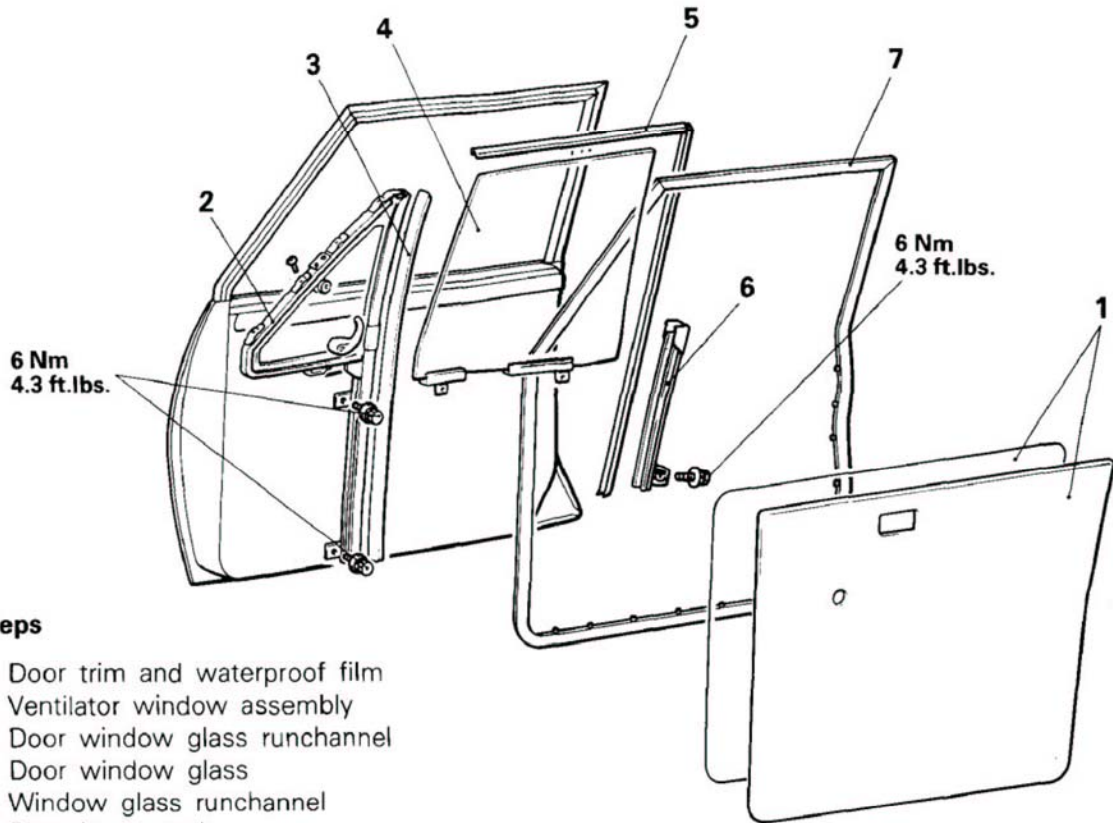
- ADJUSTMENT OF INSIDE HANDLE  
Refer to P.23-16.
- ADJUSTMENT OF OUTSIDE HANDLE  
Refer to P.23-16.
- 1. INSTALLATION OF DOOR TRIM AND WATERPROOF FILM  
Refer to P.23-33, 34.



# WINDOW GLASS RUNCHANNEL AND DOOR OPENING WEATHER-STRIP

## REMOVAL AND INSTALLATION

N23MEAD



### Removal steps

- ◄◄ ◄◄ 1. Door trim and waterproof film
- ◄◄ ◄◄ 2. Ventilator window assembly
- ◄◄ ◄◄ 3. Door window glass runchannel
- ◄◄ ◄◄ 4. Door window glass
- ◄◄ ◄◄ 5. Window glass runchannel
- ◄◄ ◄◄ 6. Door lower sash
- ◄◄ 7. Door opening weatherstrip

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◄◄ : Refer to "Service Points of Removal".
- (3) ◄◄ : Refer to "Service Points of Installation".

18W785

## SERVICE POINTS OF REMOVAL

### 1. REMOVAL OF DOOR TRIM AND WATERPROOF FILM

Refer to P.23-33.

### 2. REMOVAL OF VENTILATOR WINDOW ASSEMBLY

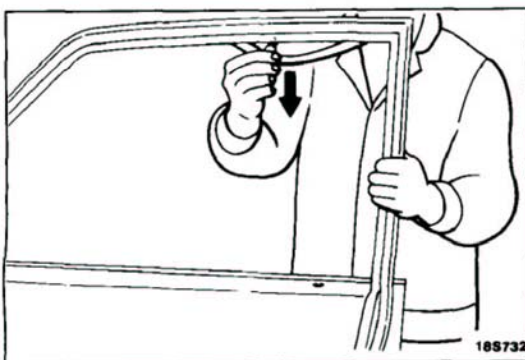
Refer to P.23-36.

### 4. REMOVAL OF DOOR WINDOW GLASS

Refer to P.23-36.

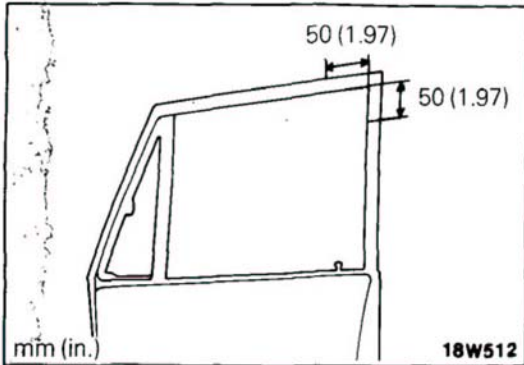
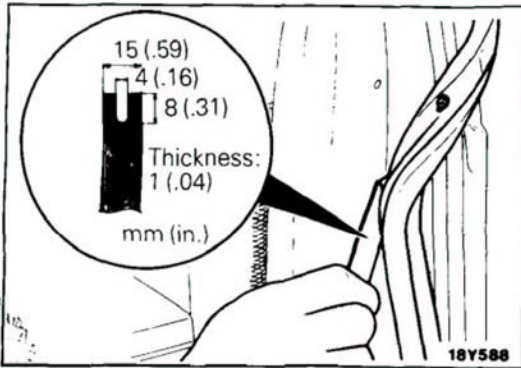
### 5. REMOVAL OF WINDOW GLASS RUNCHANNEL

Remove the window glass runchannel by pressing both sides with your fingers.



185732

## 23-46 BODY – Window Glass Runchannel and Door Opening Weatherstrip



### 7. REMOVAL OF DOOR OPENING WEATHERSTRIP

Remove the door opening weatherstrip with the tool shown in the illustration.

### SERVICE POINTS OF INSTALLATION

#### 5. APPLICATION OF ADHESIVE TO WINDOW GLASS RUNCHANNEL

Apply the specified adhesive to the positions shown in illustration and install the window glass runchannel.

**Specified adhesive : 3M Adhesive EC-870 or equivalent**

#### 4. INSTALLATION OF DOOR WINDOW GLASS

Refer to P.23-40.

#### 2. INSTALLATION OF VENTILATOR WINDOW ASSEMBLY

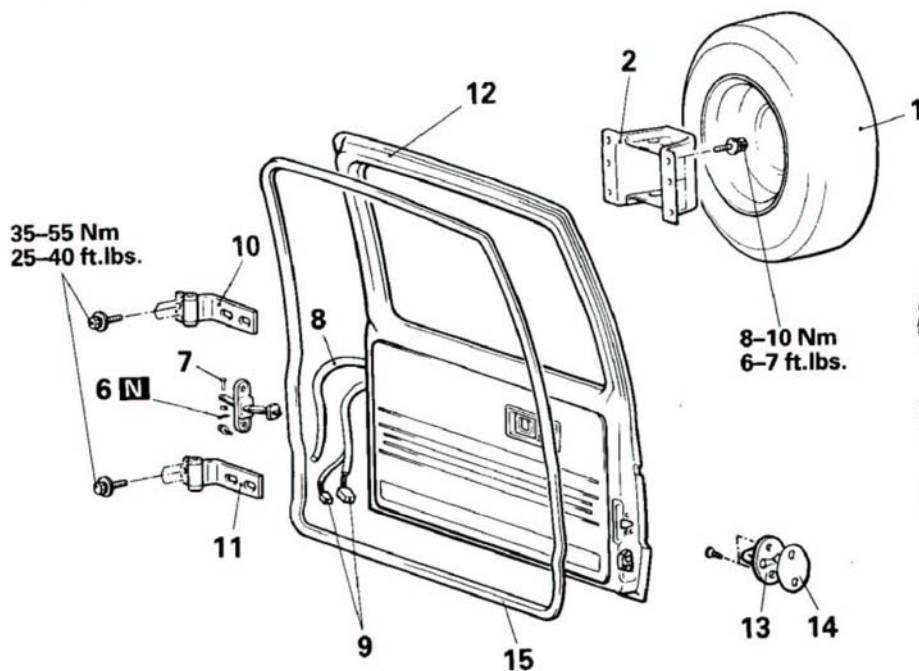
Refer to P.23-35.

#### 1. INSTALLATION OF DOOR TRIM AND WATERPROOF FILM

Refer to P.23-33, 34.

**BACK DOOR ASSEMBLY  
REMOVAL AND INSTALLATION**

N230AAE



**Back door removal steps**

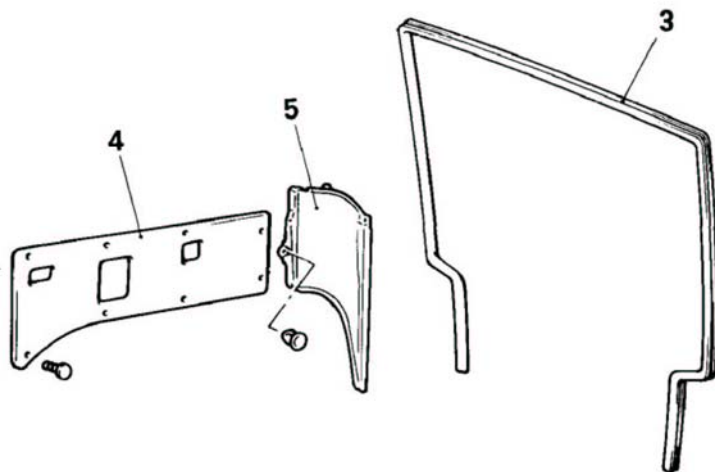
- 1. Spare tire
- ◆◆ 2. Spare tire carrier
- 3. Rear opening trim
- ◆◆ 4. Quarter trim
- ◆◆ 5. Rear pillar lower trim
- ◆◆ Adjustment of back door installation
- 6. Cotter pin
- 7. Clevis pin
- 8. Connection of rear washer tube (Vehicles with a rear wiper)
- 9. Connection of back door wiring harness connectors
- ◆◆ 10. Door upper hinge
- ◆◆ 11. Door lower hinge
- 12. Back door

**Striker removal steps**

- 13. Striker
- 14. Striker shim

**Door opening weatherstrip**

- ◆◆◆◆ 15. Door opening weatherstrip



18W793

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆ : Refer to "Service Points of Installation".
- (4) [N] : Non-reusable parts

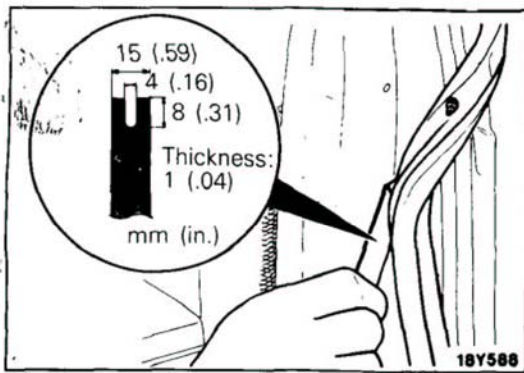
**SERVICE POINTS OF REMOVAL**

**4. REMOVAL OF QUARTER TRIM**

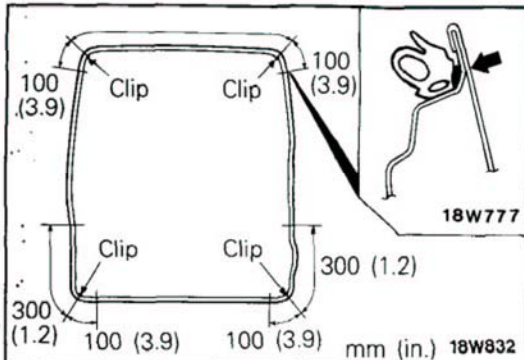
Refer to P.23-73.

**5. REMOVAL OF REAR PILLAR LOWER TRIM**

Refer to P.23-74.

**15. REMOVAL OF DOOR OPENING WEATHERSTRIP**

Remove the door opening weatherstrip with the tool shown in the illustration.

**SERVICE POINTS OF INSTALLATION****15. APPLICATION OF ADHESIVE TO DOOR OPENING WEATHERSTRIP**

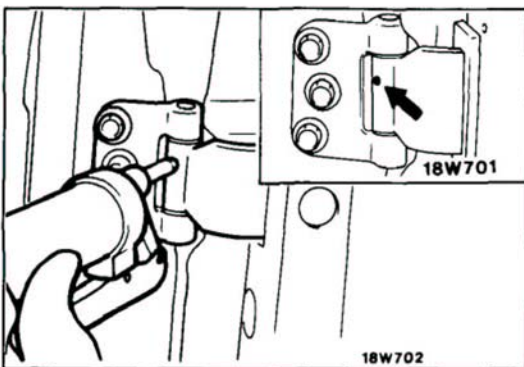
Apply a coating of specified adhesive at the position shown in the illustration, and then attach the door opening weatherstrip.

**Specified adhesive : 3M ART Part No. 8001 or No. 8011, or equivalent**

**11. APPLICATION OF GREASE TO DOOR LOWER HINGE / 10. DOOR UPPER HINGE**

Supply specified grease from the grease holes of the door hinges.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 3**

**NOTE**

The nozzle of the grease gun should have a small-diameter tip.

- **ADJUSTMENT OF BACK DOOR INSTALLATION**

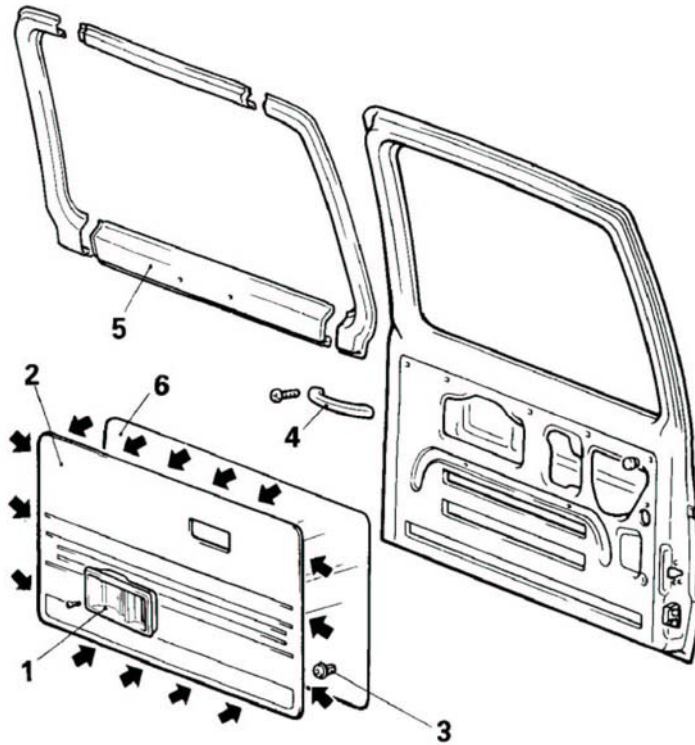
Refer to P.23-17.

- **2. INSTALLATION OF SPARE TIRE CARRIER**

Refer to GROUP 22 WHEELS AND TIRES - Spare Tire Carrier.

# BACK DOOR TRIM REMOVAL AND INSTALLATION

N230BAB



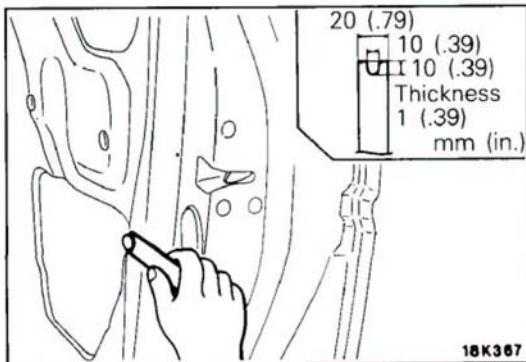
### Removal steps

1. Inside handle cover
2. Back door trim
- ↔ 3. Trim clip
4. Armrest
5. Tailgate trim (metal top-van)
- ↔ 6. Waterproof film

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ↔ : Refer to "Service Points of Removal".
- (3) ↔ : Refer to "Service Points of Installation".
- (4) ◀ : Clipping position

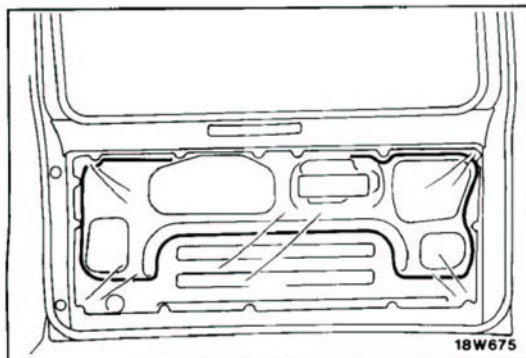
18W794



### SERVICE POINTS OF REMOVAL

#### 3. REMOVAL OF TRIM CLIP

If trim clips remain at the door side when the back door trim is removed, improvise a tool (such as shown in the figure) to remove them.



### SERVICE POINTS OF INSTALLATION

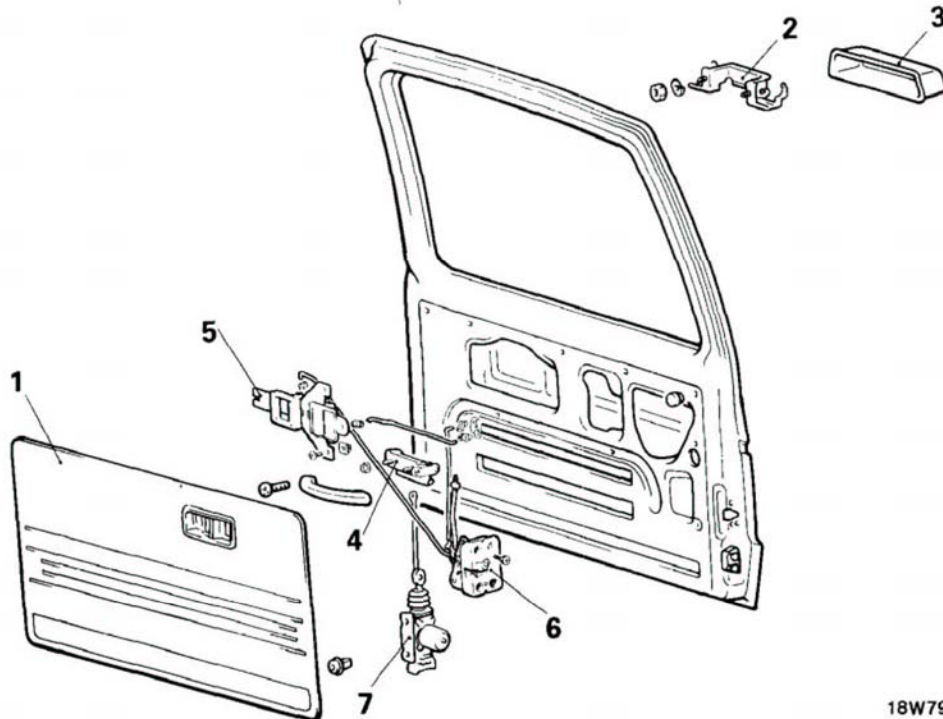
#### 6. APPLICATION OF ADHESIVE TO WATERPROOF FILM

Apply specified adhesive at the positions shown in the illustration, and then attach the waterproof film.

**Specified adhesive : 3M ART Part No. 8626 or 3M Adhesive EC-5310, or equivalent**

## BACK DOOR HANDLE AND LATCH REMOVAL AND INSTALLATION

N230CAA



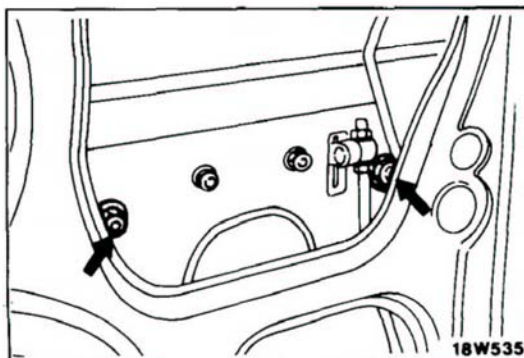
18W795

### Removal steps

- ◆◆ ◆◆ 1. Back door trim and waterproof film
- ◆◆ Adjustment of outside handle
- ◆◆ 2. Back door garnish bracket
- ◆◆ 3. Back door garnish
- ◆◆ 4. Outside handle
- ◆◆ 5. Inside handle
- ◆◆ 6. Back door latch
- ◆◆ 7. Back door lock actuator

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆ : Refer to "Service Points of Installation".



18W535

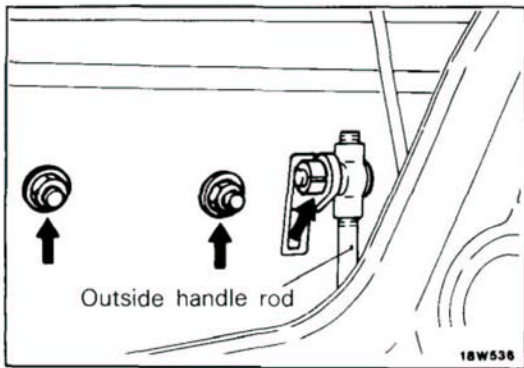
### SERVICE POINTS OF REMOVAL

#### 1. REMOVAL OF BACK DOOR TRIM AND WATERPROOF FILM

Refer to P.23-49.

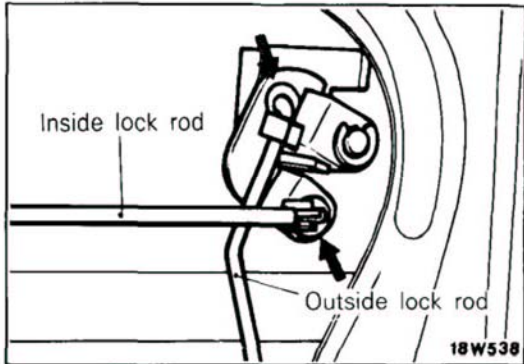
#### 2. REMOVAL OF BACK DOOR GARNISH BRACKET/3. BACK DOOR GARNISH

Remove the back door garnish installation nuts and bolts, and then remove the back door garnish.



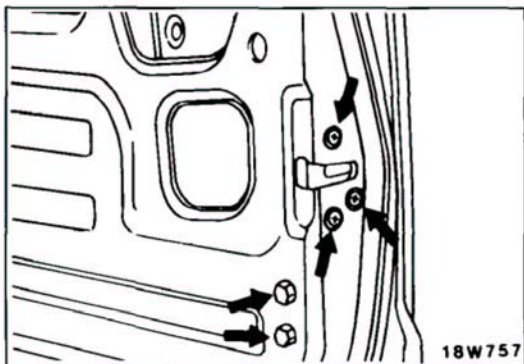
**4. REMOVAL OF OUTSIDE HANDLE**

Disconnect the outside handle rod from the outside handle, and then remove the outside handle.

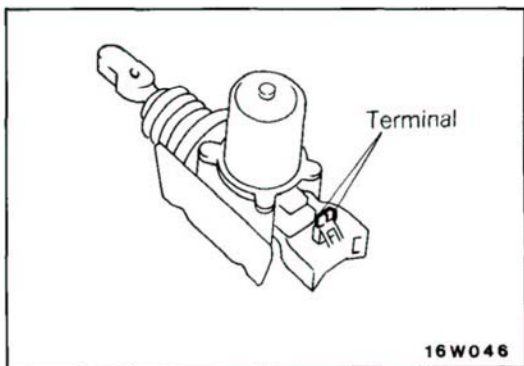


**6. REMOVAL OF BACK DOOR LATCH/7. BACK DOOR LOCK ACTUATOR**

- (1) Disconnect the outside lock rod and the inside lock rod from the lock cylinder.
- (2) Disconnect the actuator rod from the outside lock rod.



- (3) Remove the back door latch together with the rods.
- (4) Remove the back door lock actuator.



**INSPECTION**

**BACK DOOR LOCK ACTUATOR**

Connect the battery source to the actuator terminal, and check the shaft for operation. If the shaft moves in opposite direction when the connection polarity is changed, the actuator should be considered to be in normal condition.

**SERVICE POINTS OF INSTALLATION**

● **ADJUSTMENT OF OUTSIDE HANDLE**

Refer to P.23-16.

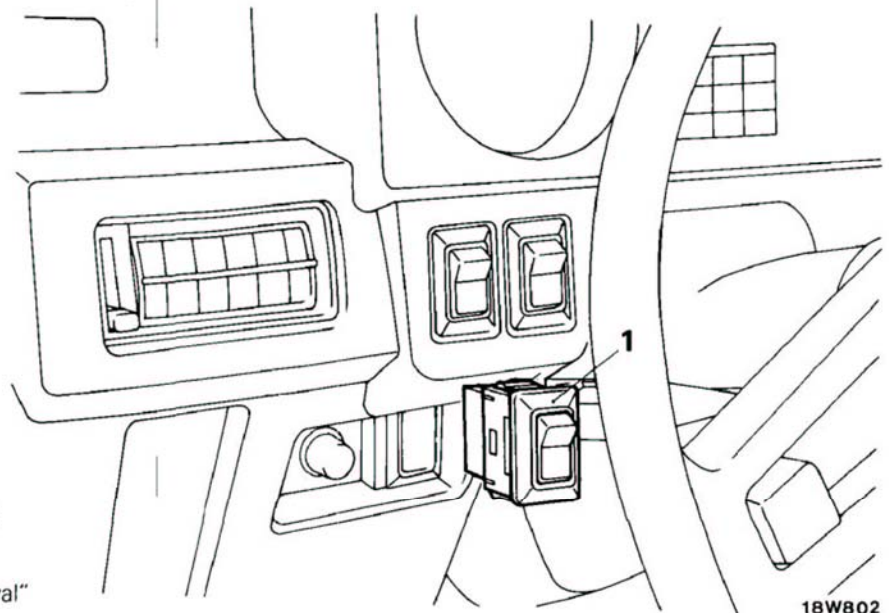
**1. INSTALLATION OF BACK DOOR TRIM AND WATER-PROOF FILM**

Refer to P.23-49.

# BACK DOOR LOCK SWITCH

## REMOVAL AND INSTALLATION

N230EAA



◆◆ 1. Back door lock switch

**NOTE**

◆◆ : Refer to "Service Points of Removal"

18W802



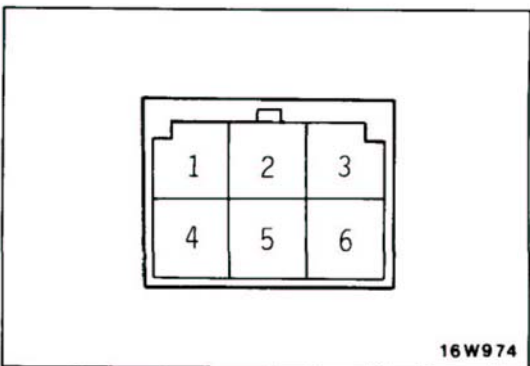
MB990449

18W830

### SERVICE POINTS OF REMOVAL

#### 1. REMOVAL OF BACK DOOR LOCK SWITCH

- (1) Pry off the switch by using the special tool and pull out the switch from the meter hood.
- (2) Disconnect the connector from the back of the switch and take out the switch.



16W974

### INSPECTION

#### BACK DOOR LOCK SWITCH

Operate the switch, and check the continuity between the terminals.

Terminal	5	6	3	2
Position				
UNLOCK	○	○	○	○
OFF				
LOCK	○	○	○	○

**NOTE**

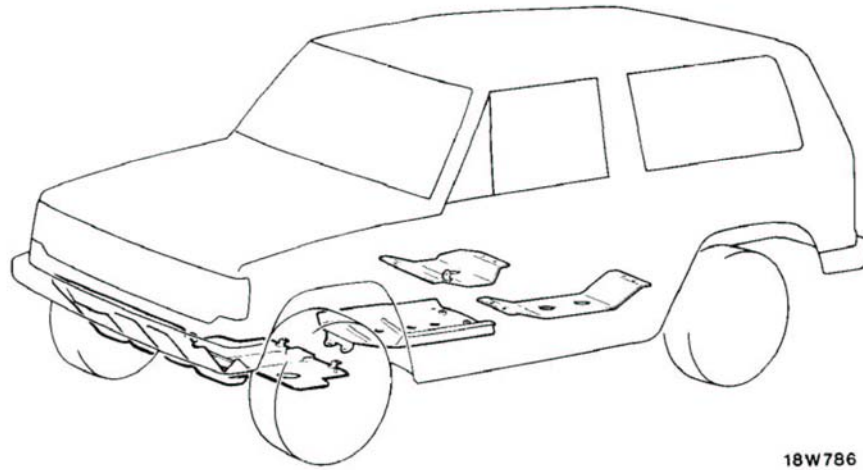
○—○ indicates that there is continuity between the terminals.



**UNDER GUARD**

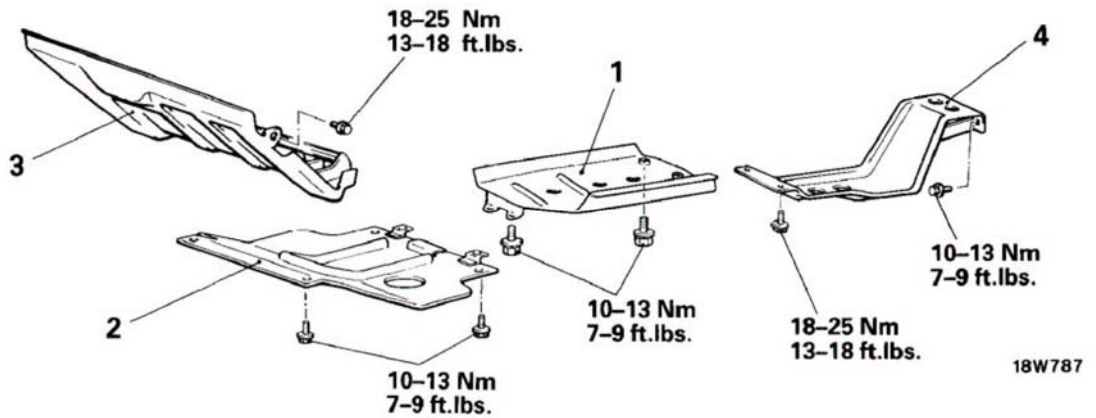
**REMOVAL AND INSTALLATION**

N23WAAA



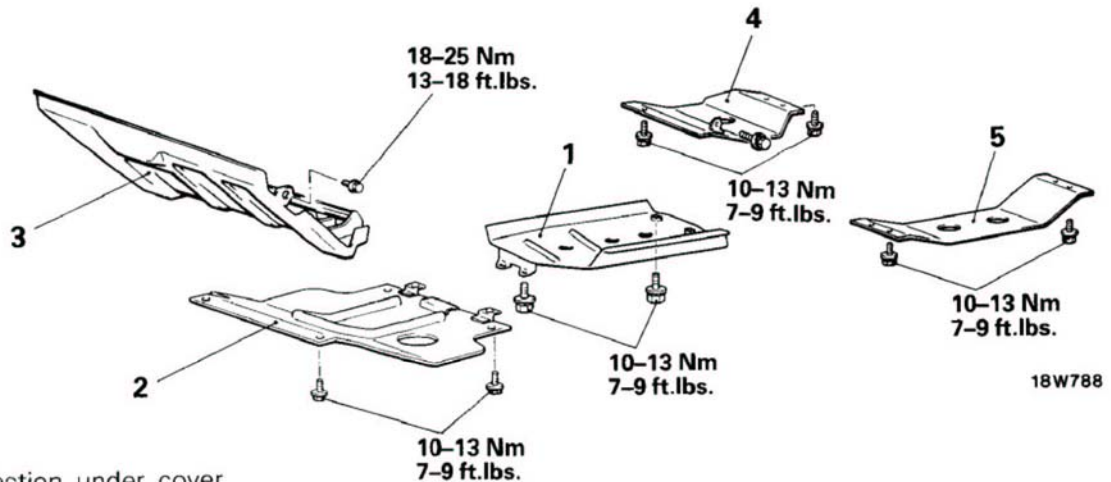
18W786

**Vehicles with a manual transmission**



18W787

**Vehicles with an automatic transmission**

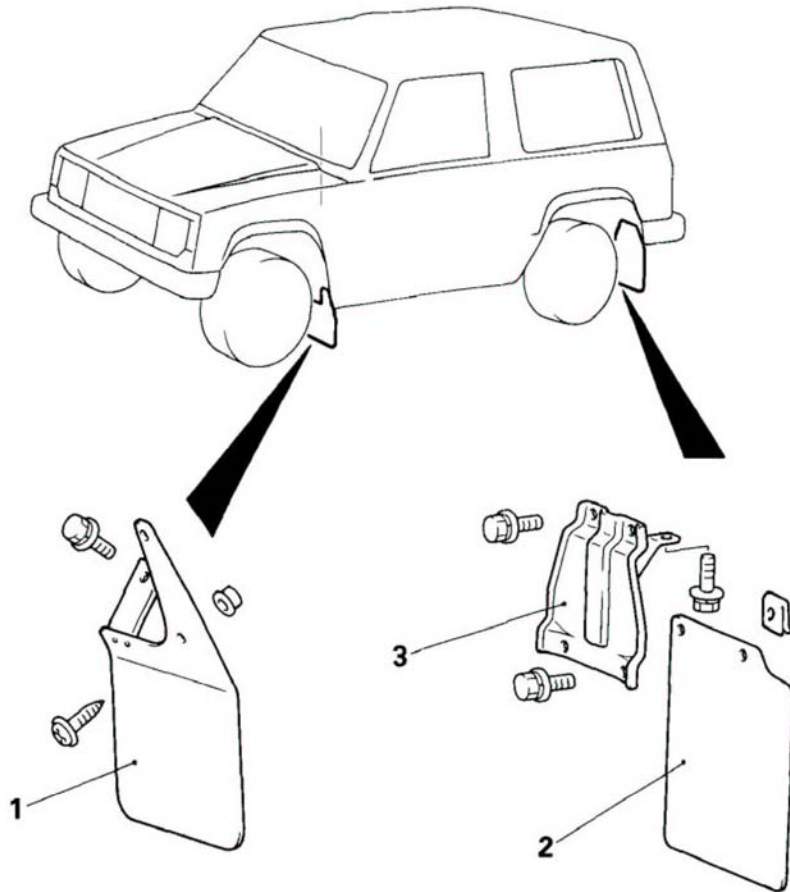


18W788

- 1. Snow-protection under cover
- 2. Under cover
- 3. Under skid plate
- 4. Transfer case protector
- 5. Cross shaft protector

**MUD GUARD****REMOVAL AND INSTALLATION**

N23WBAA



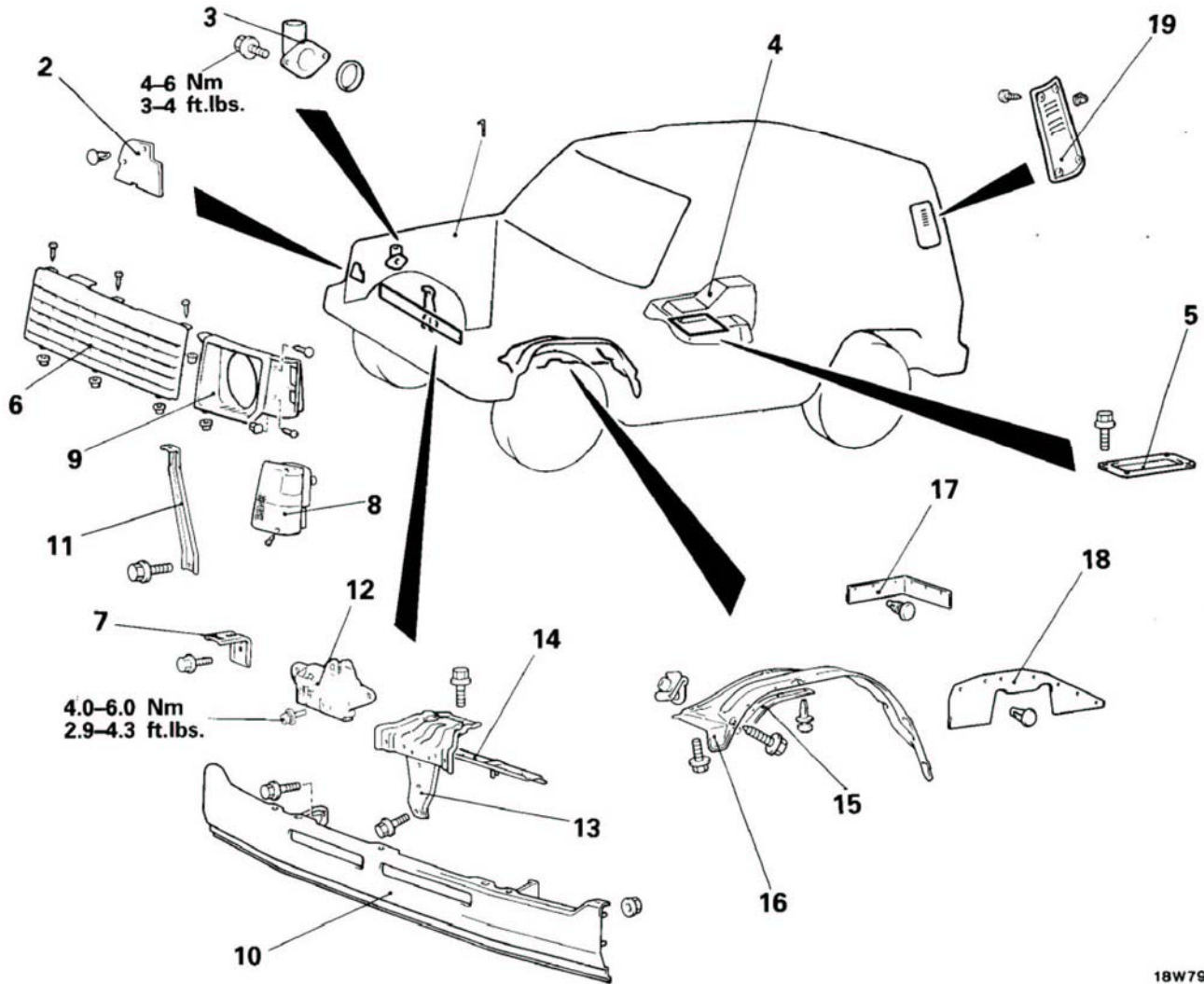
1. Front mud guard
2. Rear mud guard
3. Mud guard bracket

18W779

**LOOSE PANEL**

**REMOVAL AND INSTALLATION**

N23SAAC



18W791

**Waterproof pad and air duct removal steps**

- ◆◆◆◆ 1. Front fender
- ◆◆◆ 2. Waterproof pad
- ◆◆ 3. Air duct

- ◆◆ 12. Hood latch
- ◆◆ 13. Hood catch bracket assembly
- ◆◆ 14. Bridge panel cover assembly

**Front floor cover removal steps  
(Vehicles with a manual transmission)**

- ◆◆ 4. Floor console
- ◆◆ 5. Front floor cover

**Splash shield removal steps**

- ◆◆ 15. Partial wheel lip
- ◆◆ 16. Splash shield

**Radiator grille bracket removal steps**

- 6. Radiator grille
- 7. Radiator grille bracket

**Shield rubbers**

- 17. Shield rubber (Vehicles with an automatic transmission)
- 18. Shield rubber

**Bridge panel cover assembly removal steps**

- 6. Radiator grille
- 8. Front combination light
- 9. Head light bezel
- 10. Grille filler panel assembly
- 11. Hood catch stay

**Rear ventilator cover**

- 19. Rear ventilator cover (Vehicles without a rear seat)

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆ : Refer to "Service Points of Installation".

**SERVICE POINTS OF REMOVAL****1. REMOVAL OF FRONT FENDER**

Refer to P.23-24.

**4. REMOVAL OF FLOOR CONSOLE**

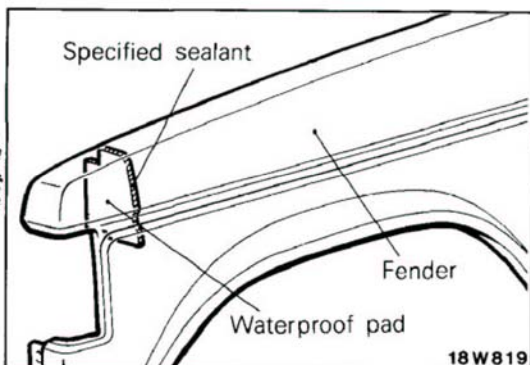
Refer to P.23-67.

**SERVICE POINTS OF INSTALLATION****16. INSTALLATION OF SPLASH SHIELD**

Refer to P.23-24.

**12. INSTALLATION OF HOOD LATCH**

Refer to P.23-20.

**2. APPLICATION OF SEALANT TO WATERPROOF PAD**

Apply the specified sealant to the places marked in the figure.

**Specified sealant : 3M ART Part No. 8001 or No. 8011, or equivalent**

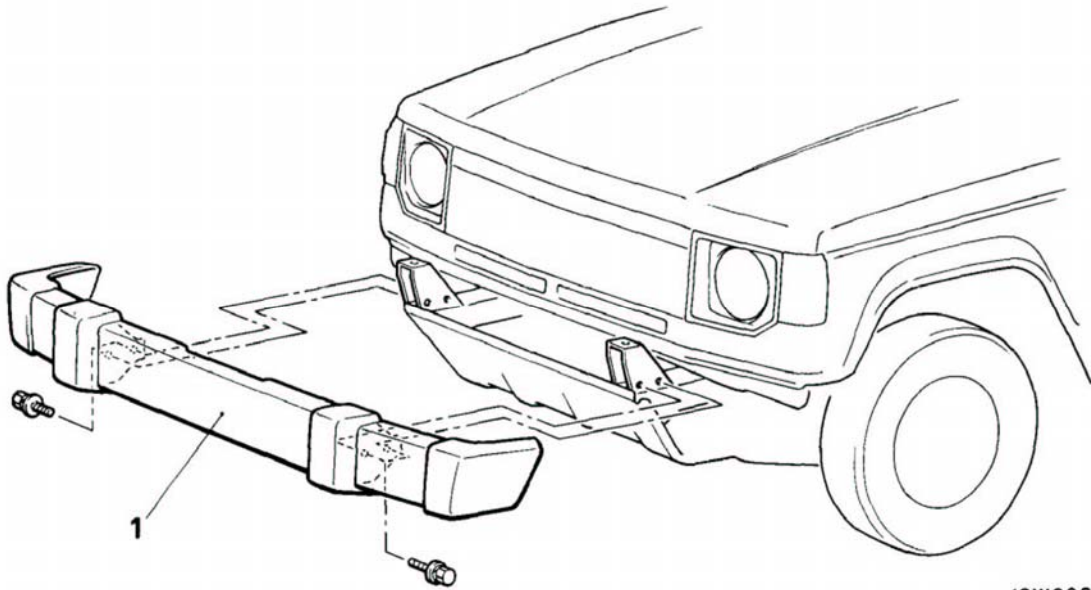
**1. INSTALLATION OF FRONT FENDER**

Refer to P.23-25.

**BUMPERS**

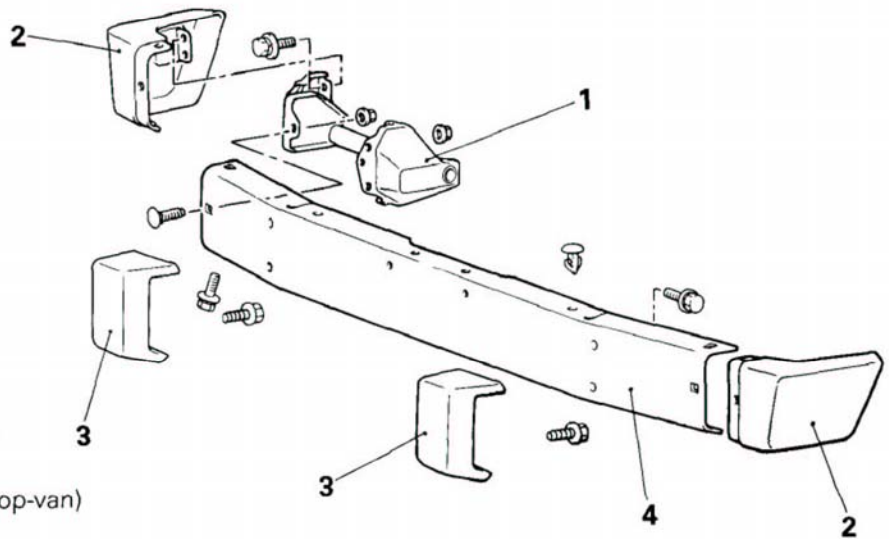
**REMOVAL AND INSTALLATION (Front Bumper)**

N23ZBAB



1. Front bumper assembly

**DISASSEMBLY AND REASSEMBLY**



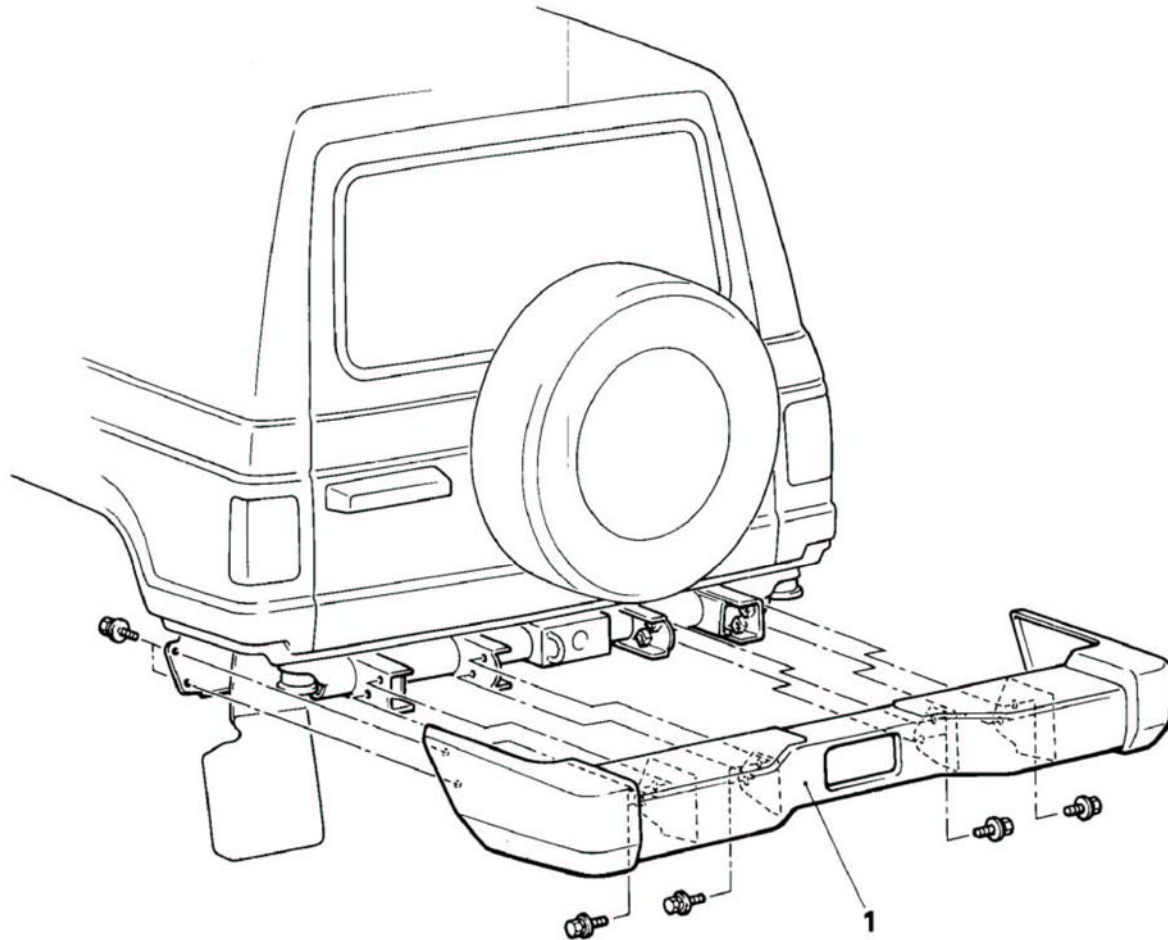
**Disassembly steps**

1. Bumper stay assembly
2. Front bumper side
3. Bumper guard (metal top-van)
4. Front bumper center

**NOTE**  
Reverse the disassembly procedures to reassemble.

18W771

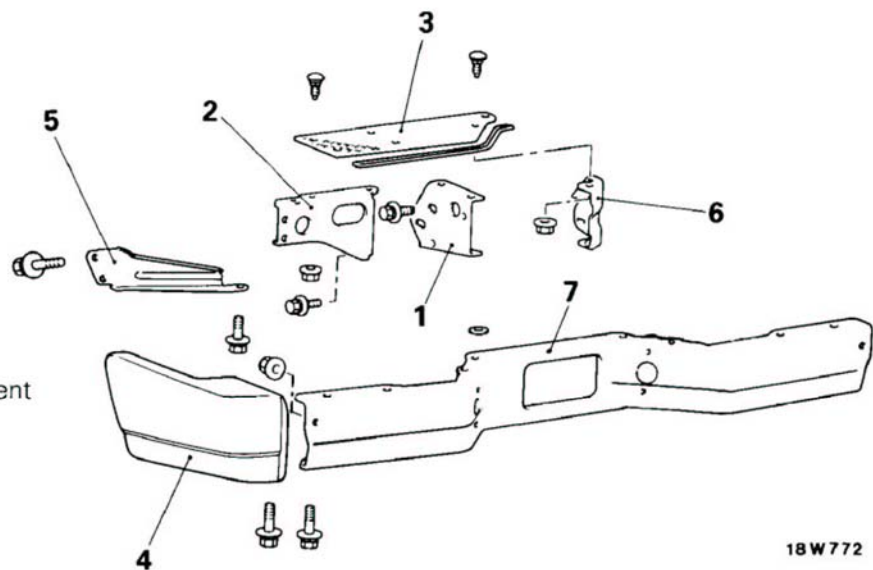
## REMOVAL AND INSTALLATION (Rear Bumper)



18W821

1. Rear bumper assembly

## DISASSEMBLY AND REASSEMBLY



18W772

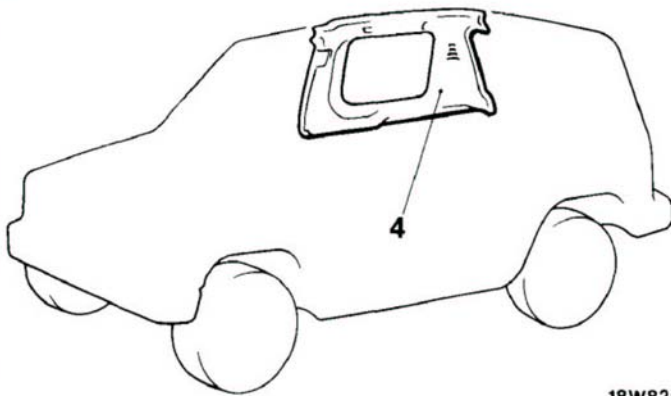
## Disassembly steps

1. Rear bumper stay
2. Rear bumper reinforcement
3. Rear bumper plate
4. Rear bumper side
5. Side bumper stay
6. Rear bumper stay
7. Rear bumper face

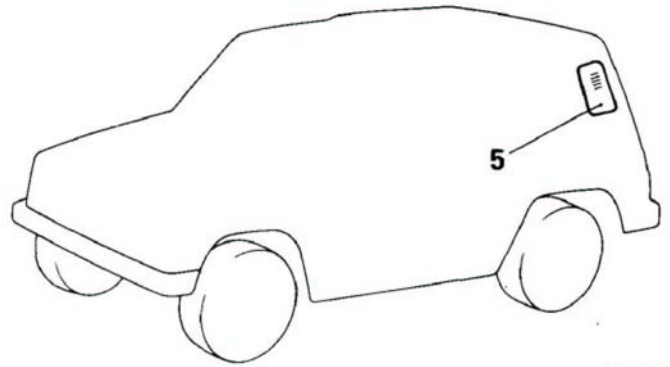
NOTE  
Reverse the disassembly procedures to reassemble.

**GRILLE, GARNISH  
REMOVAL AND INSTALLATION**

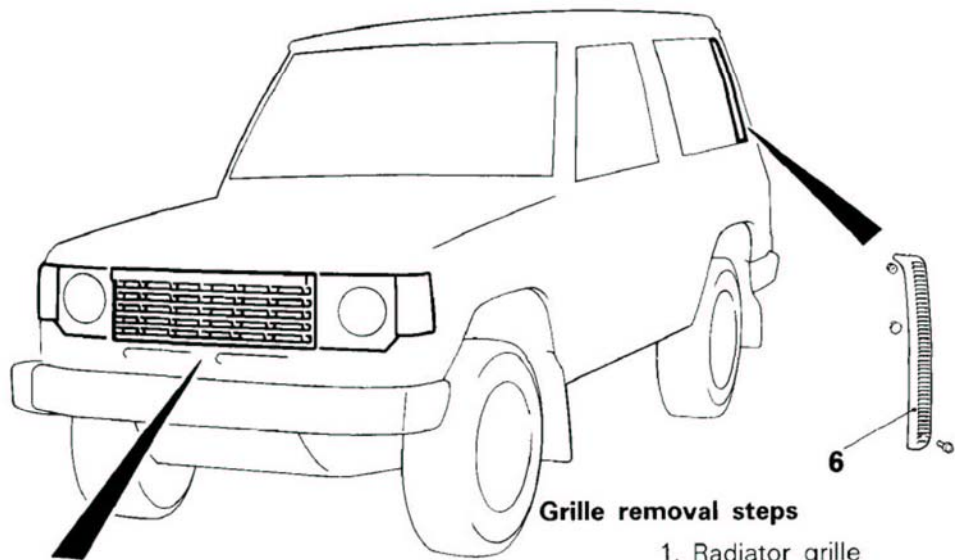
N23RAAF



18W826



18W828



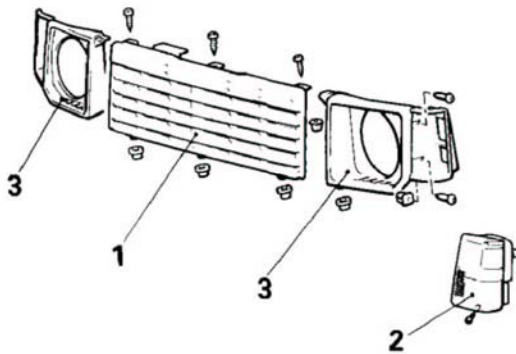
18W827

**Grille removal steps**

1. Radiator grille
2. Front combination light
3. Headlight bezel

**Air outlet garnish removal**

- ◆◆◆◆ 4. Upper quarter trim (metal top-van)
- ◆◆◆◆ 5. Rear ventilator cover (except for metal top-van)
- ◆◆◆◆ 6. Air outlet garnish



**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆◆ : Refer to "Service Points of Installation".

**SERVICE POINTS OF REMOVAL**

**4. REMOVAL OF UPPER QUARTER TRIM**

Refer to P.23-73.

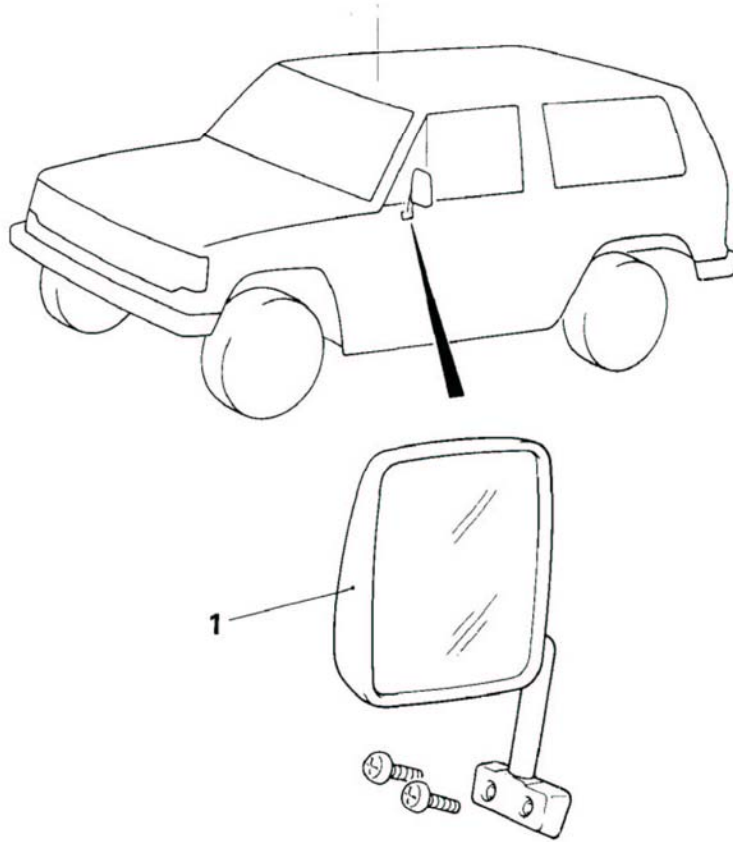
**SERVICE POINTS OF INSTALLATION**

**4. INSTALLATION OF UPPER QUARTER TRIM**

Refer to P.23-74.

**OUTSIDE MIRROR  
REMOVAL AND INSTALLATION**

N23QBAB



1. Rearview mirror



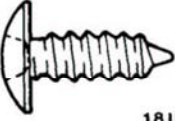





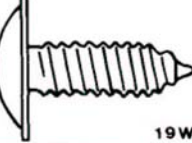

18W789



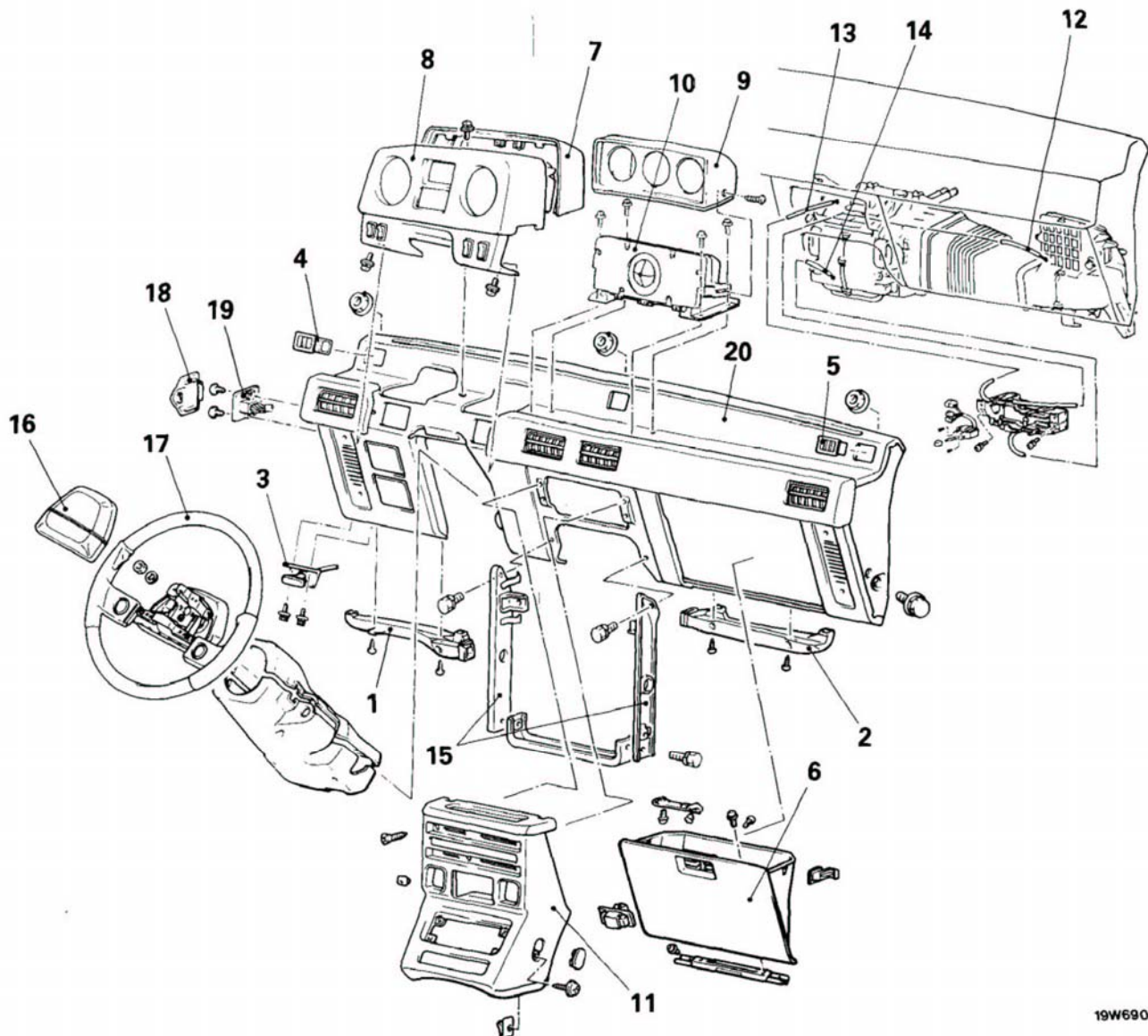
**INSTRUMENT PANEL**

N23UAAE

For installation of the instrument panel, the bolts, screws and nut described below are used. They are indicated by symbols in the illustration in the section "SERVICE POINTS OF REMOVAL".

Symbol	Name and shape	Dimensions mm (in.)	Symbol	Name and shape	Dimensions mm (in.)
A	Washer assembled screw  19W654	O.D. = 6 (.24) L = 12 (.47)	F	Washer assembled bolt  19W651	O.D. = 6 (.24) L = 12 (.47)
B	Tapping screw  18U0418	O.D. = 5 (.20) L = 12 (.47)	G	Washer assembled bolt  19W653	O.D. = 6 (.24) L = 16 (.63)
C	Washer assembled screw  19W654	O.D. = 5 (.20) L = 12 (.47)	H	Washer assembled bolt  19W651	O.D. = 8 (.31) L = 20 (.79)
D	Washer assembled screw  19W654	O.D. = 5 (.20) L = 16 (.63)	I	Washer assembled bolt  19W655	O.D. = 8 (.31) L = 20 (.79)
E	Tapping screw  19W652	O.D. = 5 (.20) L = 16 (.63)	J	Nut  19W656	I.D. = 8 (.31)

## REMOVAL AND INSTALLATION



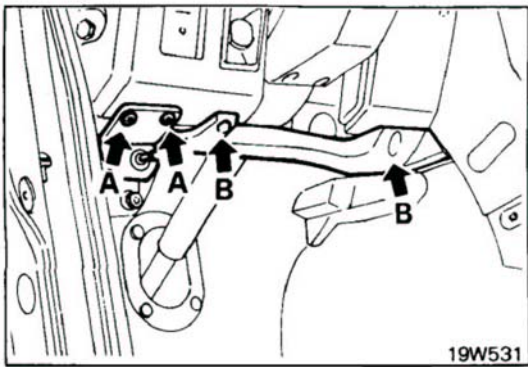
19W690

**Removal steps**

- |   |                               |   |                          |
|---|-------------------------------|---|--------------------------|
| ↔ | 1. Lap heater duct (B)        | 12. Connection of recirculation/fresh air changeover control wire |                          |
| ↔ | 2. Lap heater duct (C)        | 13. Connection of mode selection control wire                     |                          |
| ↔ | 3. Hood release cable bracket | 14. Connection of water valve control wire                        |                          |
| ↔ | 4. Demister grille (L.H.)     | ↔   | 15. Center reinforcement |
| ↔ | 5. Demister grille (R.H.)     | ↔   | 16. Horn pad             |
| ↔ | 6. Glove box                  | ↔   | 17. Steering wheel       |
| ↔ | 7. Meter cover                | ↔   | 18. Fuse box cover       |
| ↔ | 8. Meter case                 | ↔   | 19. Fuse box assembly    |
| ↔ | 9. Combination meter pad      | ↔ ↔ ↔   | 20. Instrument panel     |
| ↔ | 10. Combination meter case    |   |                          |
| ↔ | 11. Center panel              |   |                          |

**NOTE**

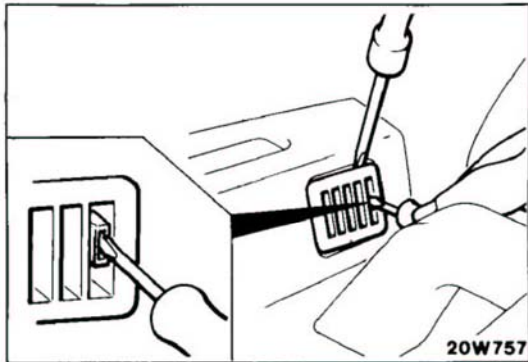
- (1) Reverse the removal procedures to reinstall.  
 (2) ↔ : Refer to "Service Points of Removal".  
 (3) ↔ ↔ ↔ : Refer to "Service Points of Installation".



**SERVICE POINTS OF REMOVAL**

**1. REMOVAL OF LAP HEATER DUCT (B)/3. HOOD RELEASE CABLE BRACKET**

Remove the lap heater duct B and hood release cable bracket.

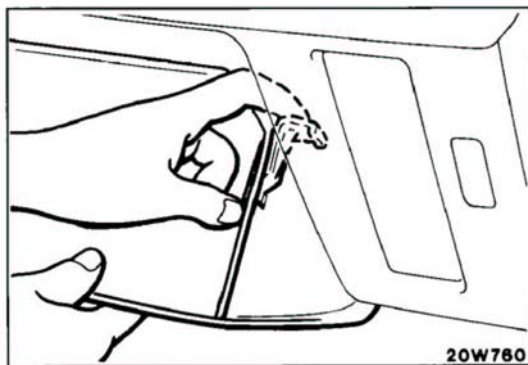


**4. REMOVAL OF DEMISTER GRILLE (L.H.) /5. DEMISTER GRILLE (R.H.)**

Remove the right and left demister grilles by raising the attaching projections with a screwdriver.

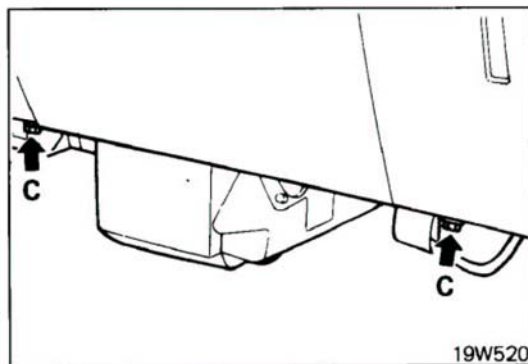
**Caution**

Use care not to break the projections.

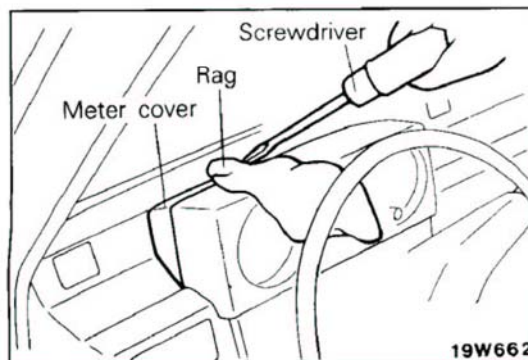


**6. REMOVAL OF GLOVE BOX**

- (1) Remove the glove box stopper.
- (2) Remove side lap heater duct (C) on the assistant's seat.

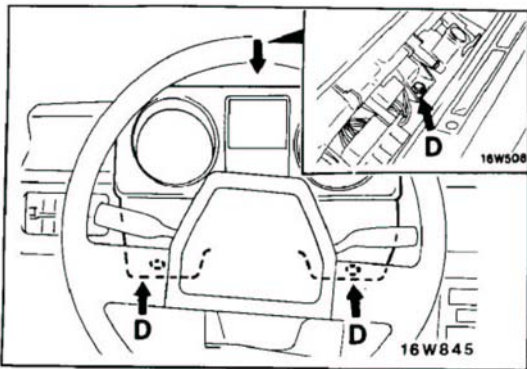


- (3) Remove the glove box frame attaching screws from the instrument panel and remove the glove box.



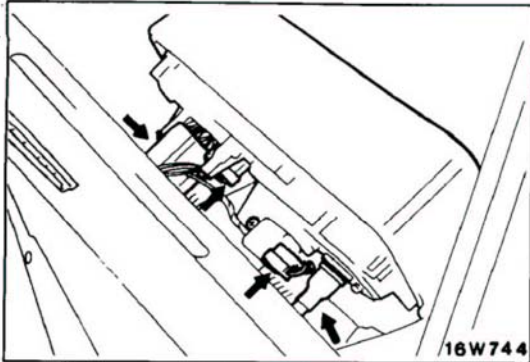
**7. REMOVAL OF METER COVER**

Remove the meter cover with a screwdriver.

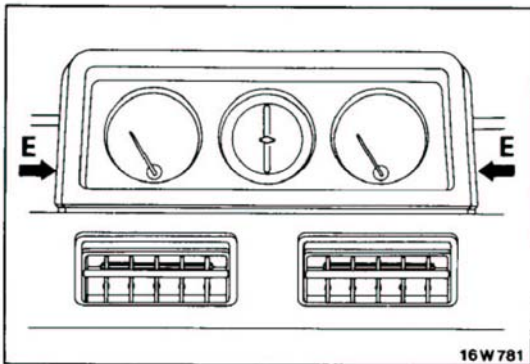


### 8. REMOVAL OF METER CASE

- (1) Remove the screws from the bottom of the case.
- (2) Remove the bolt from the upper part of the case.

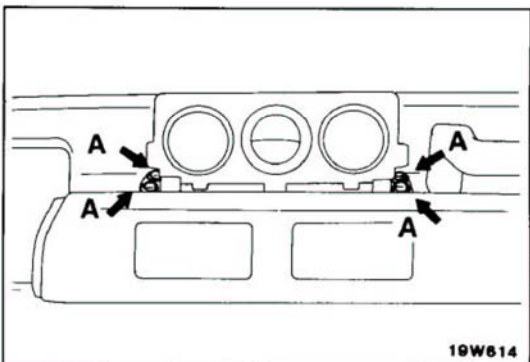


- (3) Disconnect the speedometer cable from the meter case by pushing the stopper of the plug on the speedometer cable side of the connection.
- (4) Disconnect the connectors of the meter harness and also of the body harness.
- (5) Disconnect the connectors (all located behind the meter case at the bottom) of the hazard switch, the rear window defogger, rear fog lamp switch, electric tailgate locking switch, and the rear wiper/washer switch, and then remove the meter case.



### 9. REMOVAL OF COMBINATION METER PAD

Remove the combination meter pad.

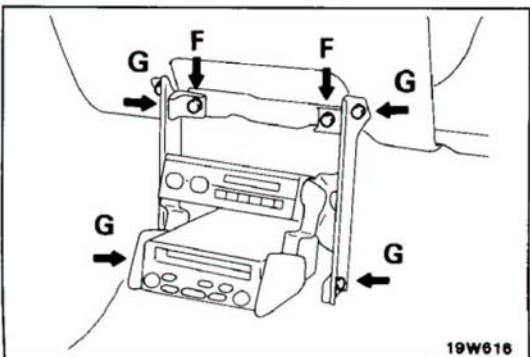


### 10. REMOVAL OF COMBINATION METER CASE

- (1) Remove the meter case attaching screws.
- (2) Disconnect the connectors of the meter harness located behind the meter case.

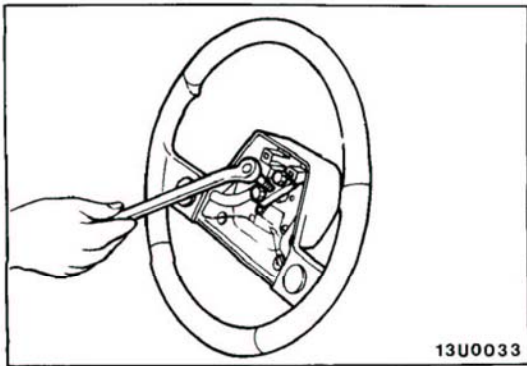
#### Caution

To prevent internal trouble, the meter must not be dropped or subjected to shock or must not be abruptly inclined to the extent that the maximum indication angle is exceeded.



### 15. REMOVAL OF CENTER REINFORCEMENT

- (1) Remove the center console. (Refer to P.23-66.)
- (2) Remove the center reinforcement attaching screws.
- (3) Remove the center reinforcement, radio and car stereo player as a unit.
- (4) Disconnect the radio and car stereo player from the front harness and feeder wire.



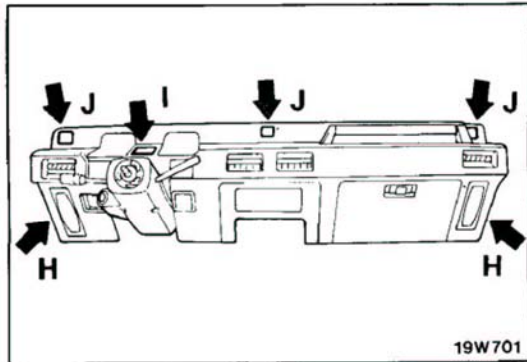
**17. REMOVAL OF STEERING WHEEL**

N23UAAE

Remove the steering wheel.

**NOTE**

Before removal, make the mating marks on both steering shaft and steering wheel.



**20. REMOVAL OF INSTRUMENT PANEL**

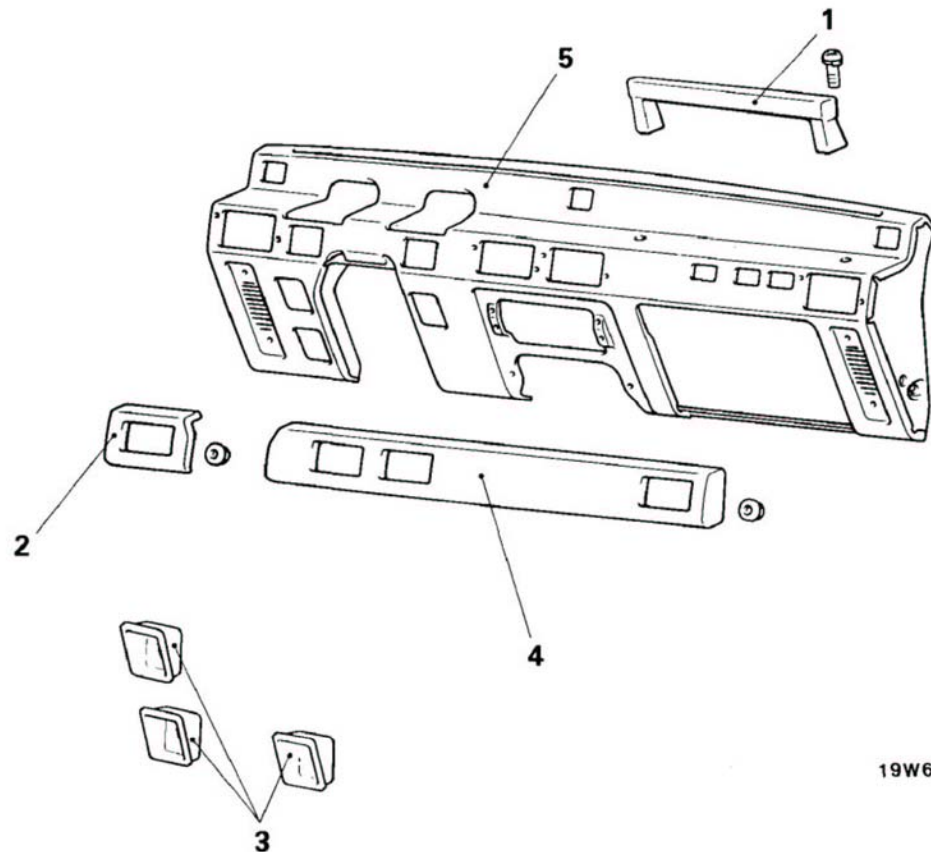
Remove the instrument panel attaching bolts and nuts, and withdraw and remove the instrument panel toward you.

**SERVICE POINTS OF INSTALLATION**

**20. INSTALLATION OF INSTRUMENT PANEL**

- (1) Connect all of the connectors securely.
- (2) Make sure that any of the wiring harnesses are not pinched.

**DISASSEMBLY AND REASSEMBLY**



19W692

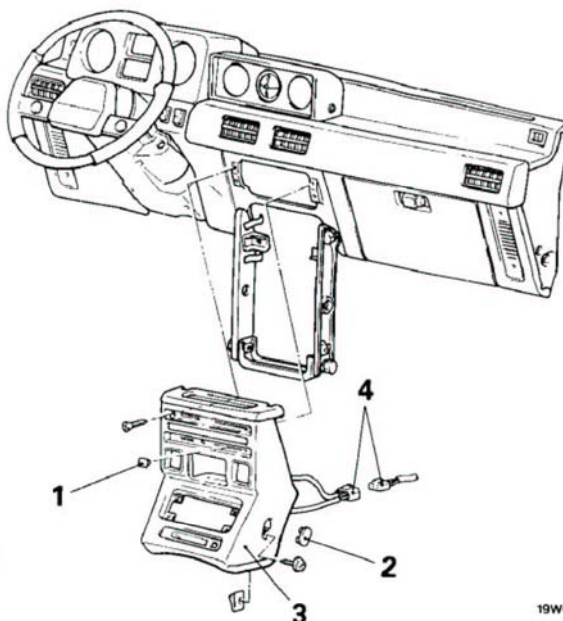
1. Assist grip
2. Instrument pad B
3. Switch holder
4. Instrument pad A
5. Instrument panel

## CENTER CONSOLE REMOVAL AND INSTALLATION

N23UBAD

### Removal steps

1. Knob
2. Plug
3. Center panel
4. Connection of center panel wiring harness to front wiring harness connector

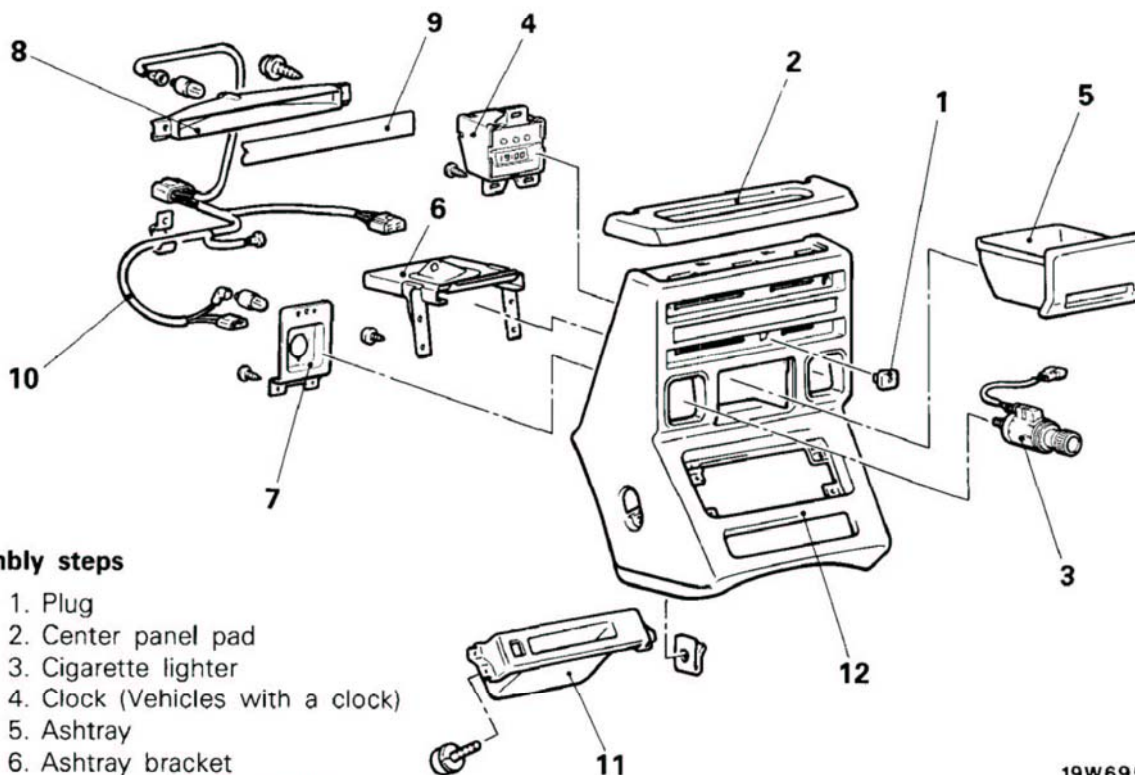


NOTE  
Reverse the removal procedures to reinstall.

19W691

## DISASSEMBLY AND REASSEMBLY

N23UBAE



### Disassembly steps

1. Plug
2. Center panel pad
3. Cigarette lighter
4. Clock (Vehicles with a clock)
5. Ashtray
6. Ashtray bracket
7. Cigarette lighter bracket
8. Lamp holder
9. Heater control panel
10. Center panel wiring harness
11. Box panel
12. Center panel

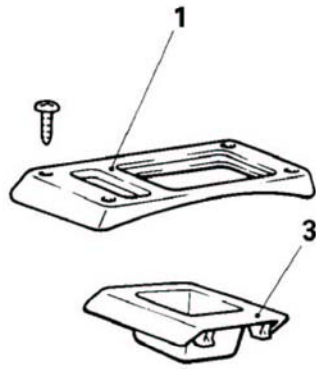
NOTE  
Reverse the disassembly procedures to reassemble.

19W695

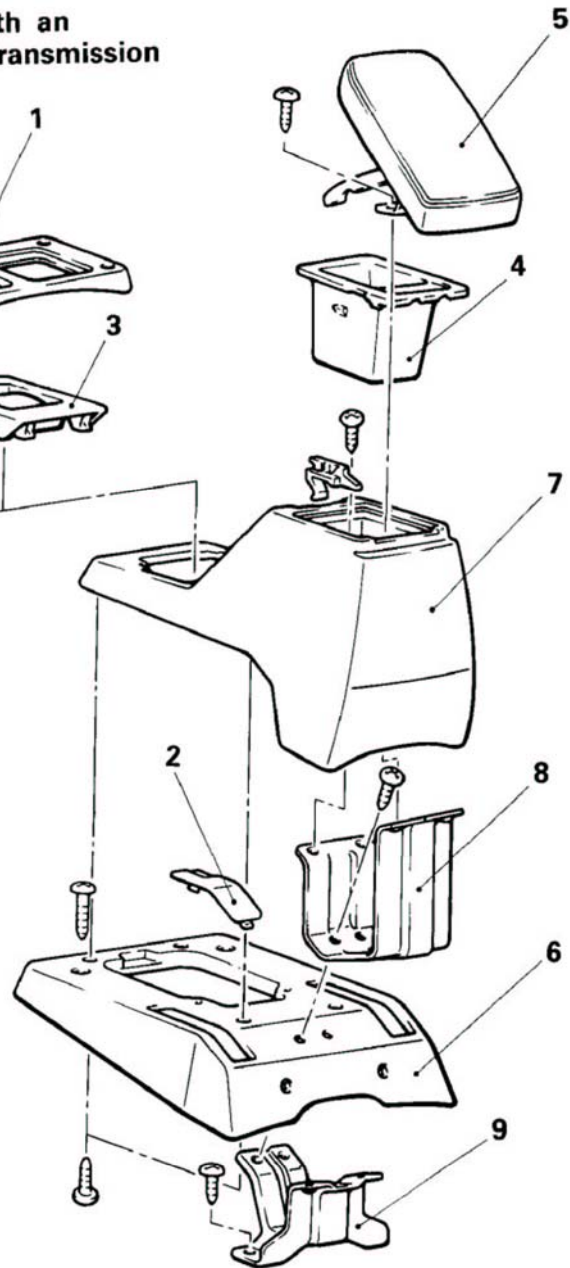
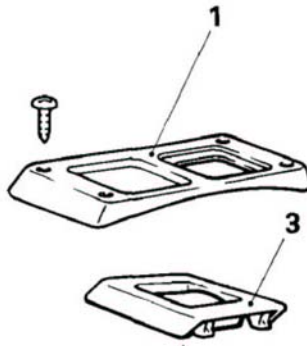
# FLOOR CONSOLE

## REMOVAL AND INSTALLATION

Vehicles with a manual transmission



Vehicles with an automatic transmission



### Removal steps

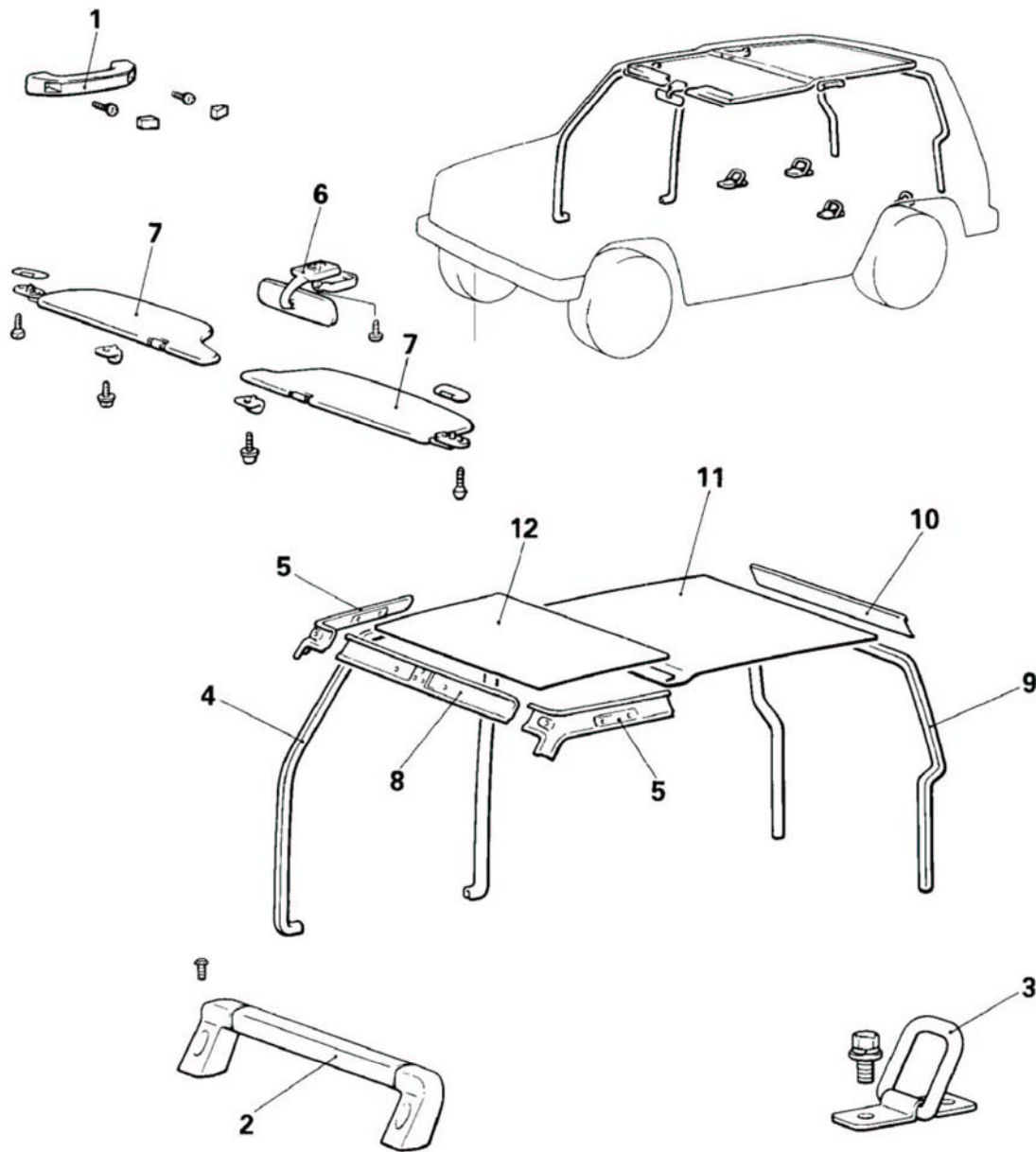
1. Front floor console
2. Plate B
3. Rear console panel
4. Inner box
5. Lid assembly
6. Floor console
7. Rear floor console
8. Console inner bracket
9. Floor console bracket

**NOTE**  
Reverse the removal procedures to reinstall.

19W696

**HEADLINING AND ASSIST STRAP  
REMOVAL AND INSTALLATION**

N23UDAF



19W689

**Assist strap**

- 1. Assist strap
- 2. Assist grip
- 3. Hook

- ◄◄ 10. Rear roof rail trim (metal top-van)
- ◄◄ ◄◄ 11. Rear headlining
- ◄◄ ◄◄ 12. Front headlining

**Headlinings removal steps**

- 1. Assist strap
- 4. Door opening trim
- ◄◄ 5. Front side roof rail trim (metal top-van)
- 6. Inside rear view mirror
- 7. Sun visor
- ◄◄ 8. Front roof rail trim (metal top-van)
- 9. Rear opening trim

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◄◄ : Refer to "Service Points of Removal".
- (3) ◄◄ ◄◄ : Refer to "Service Points of Installation".



**SERVICE POINTS OF REMOVAL****5. REMOVAL OF FRONT SIDE ROOF RAIL TRIM**

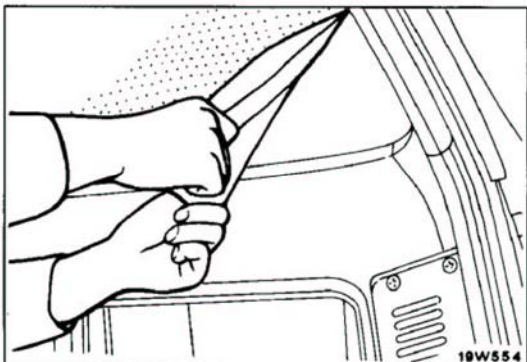
Refer to P.23-72.

**8. REMOVAL OF FRONT ROOF RAIL TRIM**

Refer to P.23-72.

**10. REMOVAL OF REAR ROOF RAIL TRIM**

Refer to P.23-73.

**11. REMOVAL OF REAR HEADLINING/12. FRONT HEADLINING**

- (1) Remove the dome light.
- (2) Slowly peel the headlining away, beginning with the corner of the roof panel.

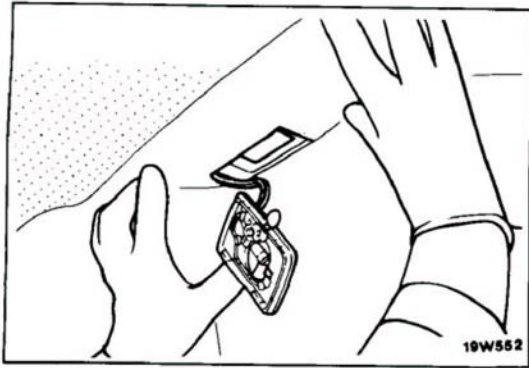
**Caution**

**Make sure that the headlining is removed slowly; as the sponge portion of the headlining is left behind on the roof panel.**

- (3) Thoroughly remove the drying sealant and sponge left behind on the roof panel by using a toluol solution, etc.

**Caution**

**Make sure that all remaining sealant and sponge are thoroughly removed, as they produce uneven surfaces when the headlining is bonded to the roof panel.**

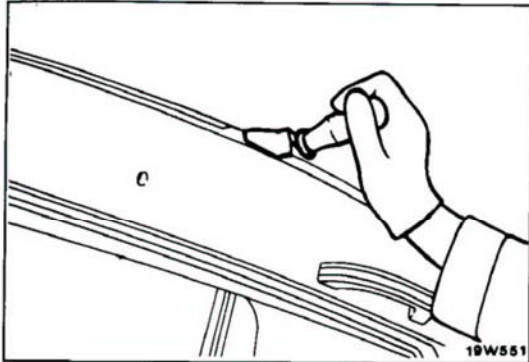


**SERVICE POINTS OF INSTALLATION**

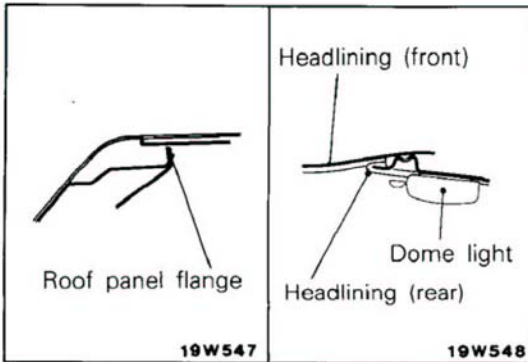
**12.APPLICATION OF SEALANT TO FRONT HEADLINING/  
11.REAR HEADLINING**

- (1) Evenly apply the specified sealant to the roof panel. When the headlining (rear) is installed, couple the room dome light connector, put it through the cut hole in the lining, and bond the lining so that the lining cut hole matches the dome light attaching hole.

**Specified sealant : 3M ART Part No. 8080 or 3M Adhesive EC-1368, or equivalent**



- (2) Using care to prevent wrinkles and slackness, bond the headlining and insert the edges securely into the roof panel flange by using a spatula, etc.

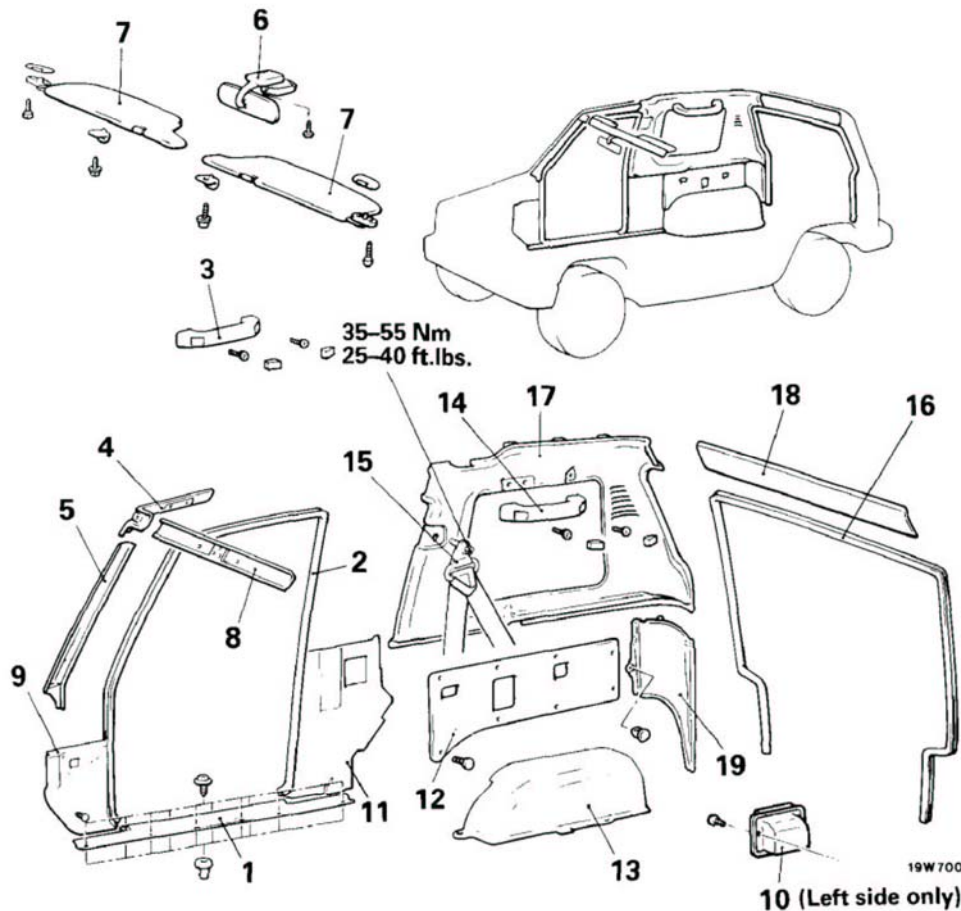


- (3) Bond the headlining edges as shown.

**TRIMS**

**REMOVAL AND INSTALLATION**

N23UCAF



**Front pillar trim and roof rail trim removal steps**

- 1. Front scuff plate
- 2. Door opening trim
- 3. Assist grip
- ◄◄ 4. Front side roof rail trim
- ◄◄ ◄◄ 5. Front pillar trim (metal top-van)
- 6. Inside rear view mirror
- 7. Sun visor
- ◄◄ 8. Front roof rail trim

**Cowl side trim removal steps**

- 1. Front scuff plate
- 2. Door opening trim
- ◄◄ 9. Cowl side trim

**Center pillar trim removal steps**

- 1. Front scuff plate
- 2. Door opening trim
- ◄◄ 10. Ashtray (metal top-van)
- ◄◄ 11. Center Pillar trim

**Quarter trim removal steps**

- ◄◄ 10. Ashtray (metal top-van)
- ◄◄ 12. Quarter trim

**Rear wheelhouse trim**

- ◄◄ ◄◄ 13. Rear wheelhouse trim (metal top-van)

**Upper quarter trim removal steps**

- 2. Door opening trim
- 12. Quarter trim
- 14. Assist grip
- 15. Front seat belt anchor plate
- 16. Rear opening trim
- ◄◄ ◄◄ 17. Upper quarter trim (metal top-van)

**Rear roof rail trim**

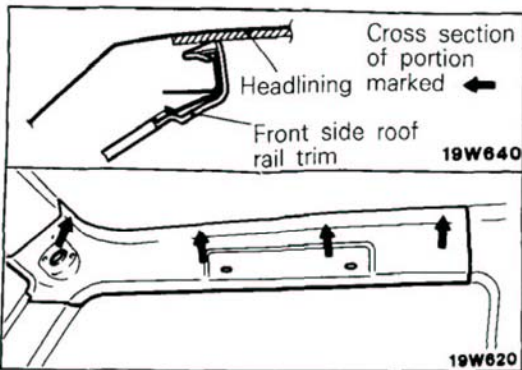
- ◄◄ 18. Rear roof rail trim

**Rear pillar lower trim removal steps**

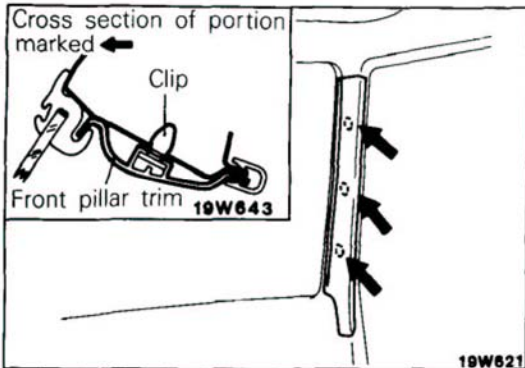
- 12. Quarter trim
- 16. Rear opening trim
- ◄◄ 19. Rear pillar lower trim (metal top-van)

**NOTE**

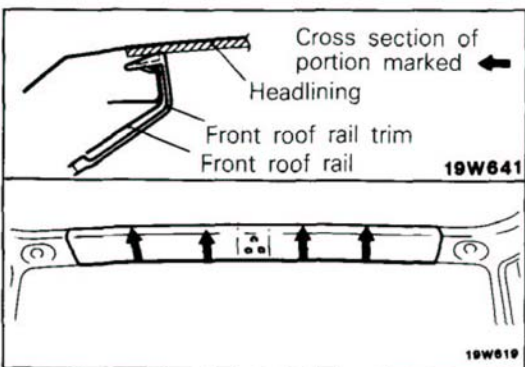
- (1) Reverse the removal procedures to reinstall.
- (2) ◄◄ : Refer to "Service Points of Removal".
- (3) ◄◄ ◄◄ : Refer to "Service Points of Installation".

**SERVICE POINTS OF REMOVAL****4. REMOVAL OF FRONT SIDE ROOF RAIL TRIM**

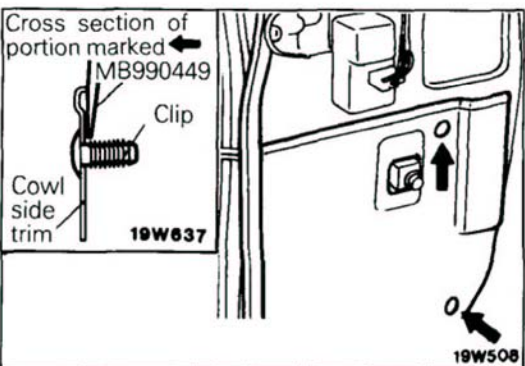
Remove the front side roof rail trim

**5. REMOVAL OF FRONT PILLAR TRIM**

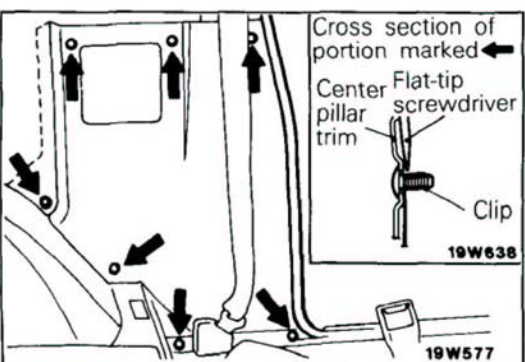
Remove the front pillar trim.

**8. REMOVAL OF FRONT ROOF RAIL TRIM**

Remove the front roof rail trim

**9. REMOVAL OF COWL SIDE TRIM**

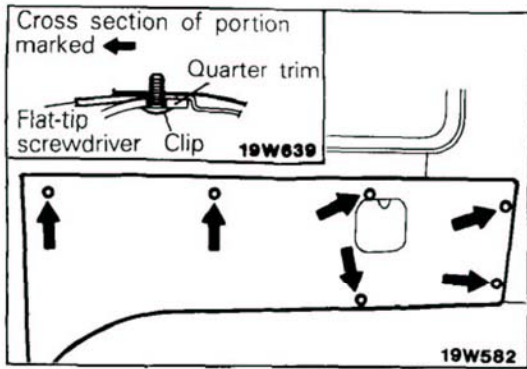
- (1) Insert a special tool under the cowl side trim and remove the clips.
- (2) Remove the cowl side trim.

**11. REMOVAL OF CENTER PILLAR TRIM**

- (1) On vehicles with cassette stereo player, remove the rear speaker. (Refer to GROUP 8 ELECTRICAL-Radio and Stereo.)
- (2) Remove the clips at two places (upper and lower) at the foremost part of the quarter trim.
- (3) Insert the tip of a flat-tip (-) screwdriver or similar tool beneath the center pillar trim and cut the top part of the clips.

**NOTE**

When cutting the clips, be careful not to scratch the body panel.



**12. REMOVAL OF QUARTER TRIM**

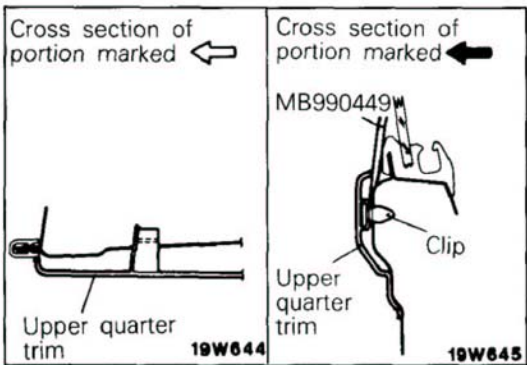
Insert the tip of a flat-tip (-) screwdriver or similar tool beneath the quarter trim and cut the top part of the clips.

**NOTE**

When cutting the clips, be careful not to scratch the body panel.

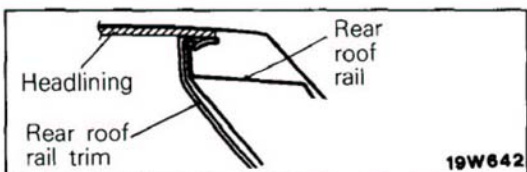
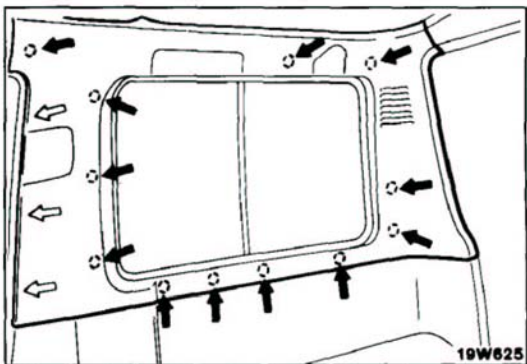
**13. REMOVAL OF REAR WHEELHOUSE TRIM**

- (3) Remove the rear seat. (Rear to P.23-77.)
- (2) Remove the hooks and the rear wheelhouse trim.



**17. REMOVAL OF UPPER QUARTER TRIM**

- (1) Insert the special tool under the upper quarter trim and remove the clips.
- (2) Remove the upper quarter trim.



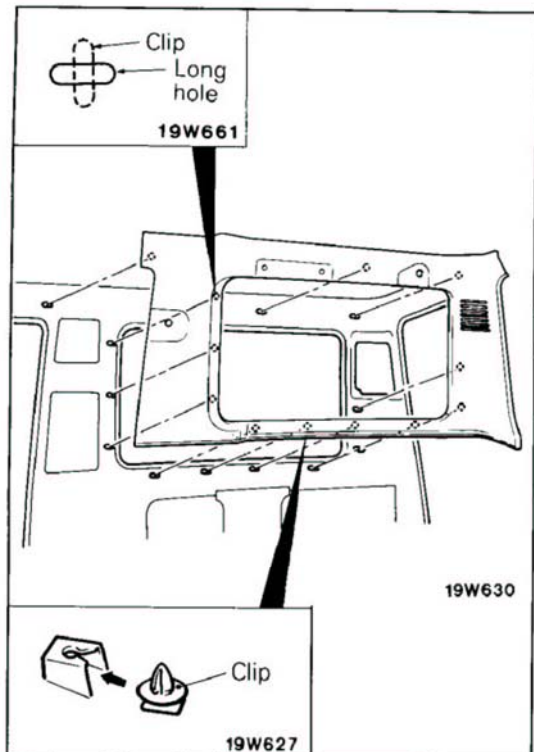
**18. REMOVAL OF REAR ROOF RAIL TRIM**

Remove the rear roof rail trim.



**19. REMOVAL OF REAR PILLAR LOWER TRIM**

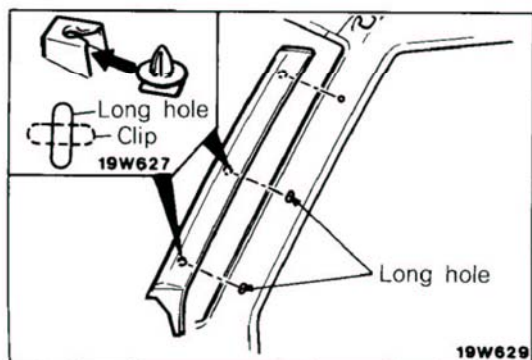
- (1) Remove the clips at 2 places at the rear part of the quarter trim and the 2 clips at the rear pillar part of the upper quarter trim.
- (2) Remove the clip to remove the rear pillar lower trim.

**SERVICE POINTS OF INSTALLATION****17. INSTALLATION OF UPPER QUARTER TRIM**

When attaching clips to the upper quarter trim, attach so that the clip is at a right angle relative to the long hole of the body panel.

**13. INSTALLATION OF REAR WHEELHOUSE TRIM**

Install the rear wheelhouse trim with the cargo floor mat on top of it.

**5. INSTALLATION OF FRONT PILLAR TRIM**

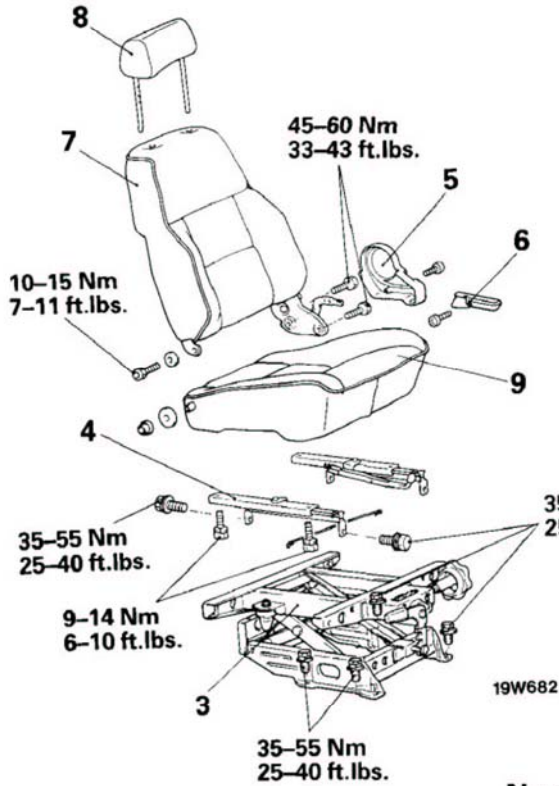
When attaching clips to the front pillar trim, attach so that the clip is at a right angle relative to the long hole of the front pillar.

# FRONT SEATS

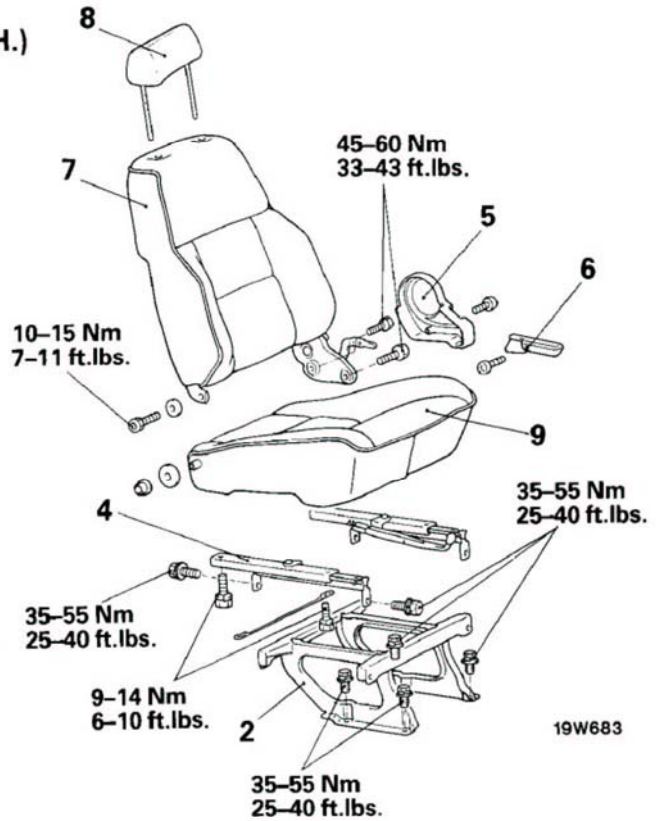
## DISASSEMBLY AND REASSEMBLY

N23UEAD

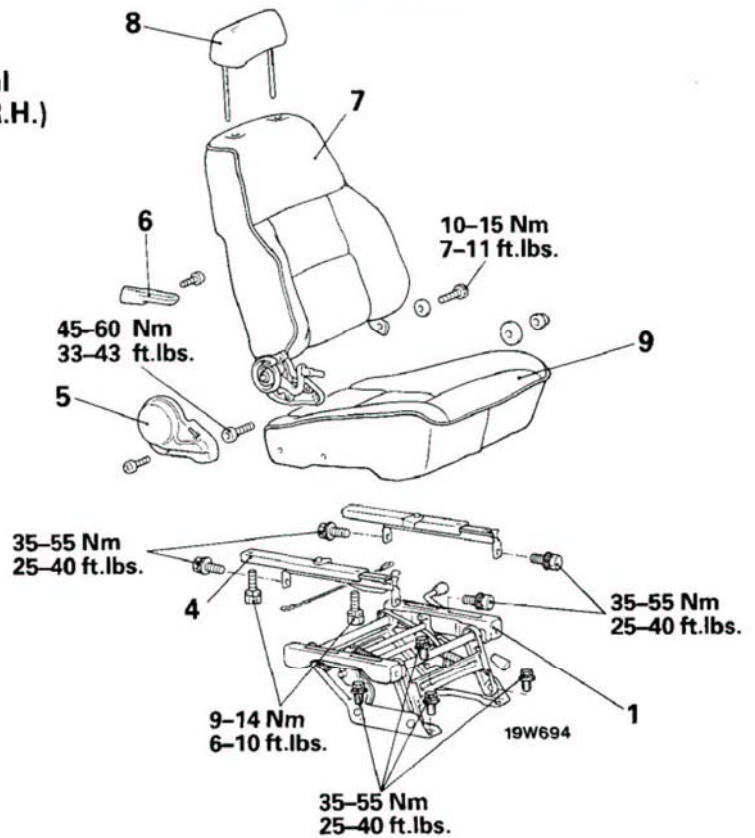
### Suspension seat



### Normal seat (L.H.)



### Normal seat (R.H.)

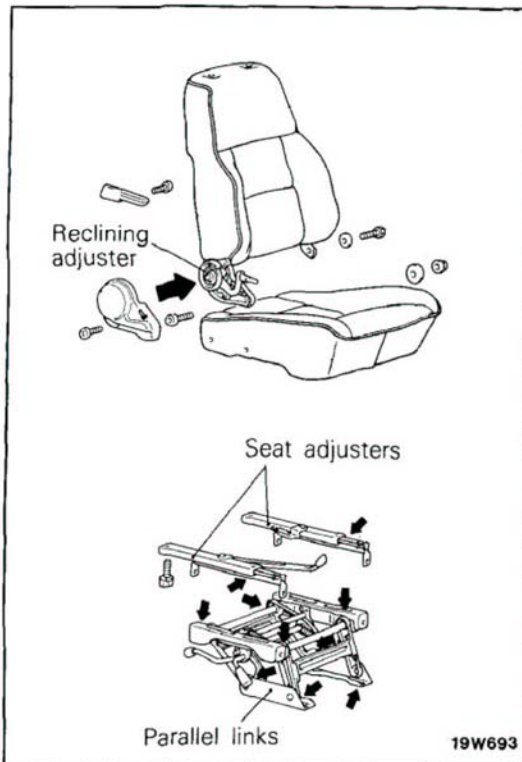


### Disassembly steps

- ◆◆ 1. Parallel link assembly
- ◆◆ 2. Seat support bracket
- ◆◆ 3. Suspension seat assembly
- ◆◆ 4. Seat adjuster
- ◆◆ 5. Adjuster cover
- ◆◆ 6. Reclining lever knob
- ◆◆ 7. Front seatback
- ◆◆ 8. Head restraint
- ◆◆ 9. Front seat cushion

### NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Reassembly".



## SERVICE POINTS OF REASSEMBLY

### 4. APPLICATION OF GREASE TO SEAT ADJUSTER/1. PARALLEL LINK ASSEMBLY

(1) Apply the specified grease to the following points.

**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

- ① Sliding parts of seat adjusters
  - ② Sliding parts of parallel links
  - ③ Sliding parts of reclining adjusters
- (2) After the seat has been installed, check to ensure that the seat adjusters lock at all lock positions when the seatback is moved slowly.
- (3) Check to ensure that the forward folding and return mechanisms of the parallel links operate smoothly and lock securely.

## INSPECTION

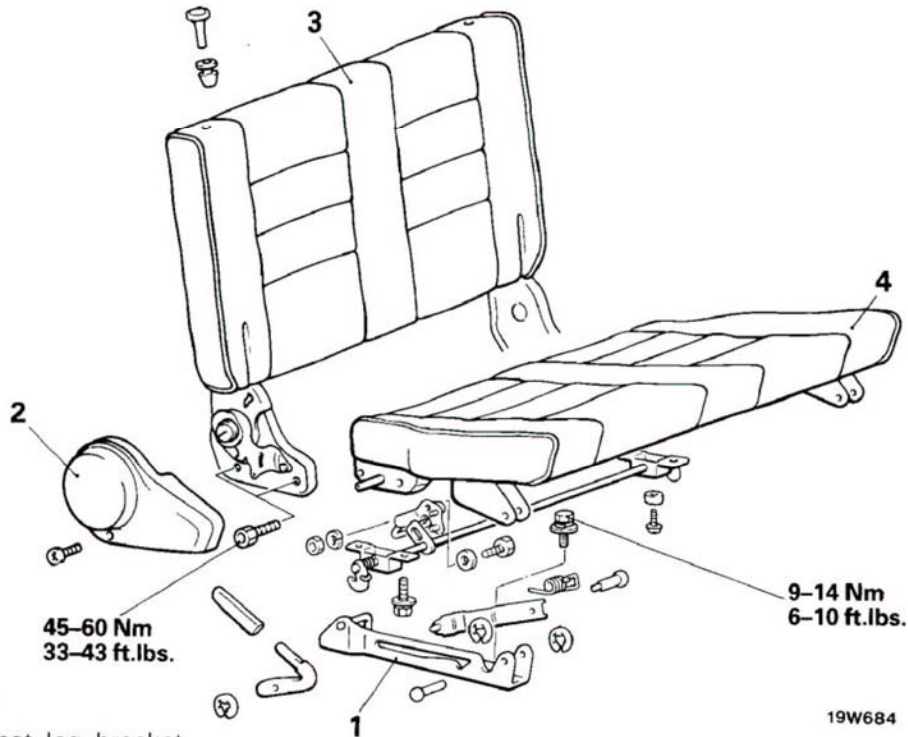
- Check the springs for damage and deterioration.
- Check the shock absorber for noise and fluid leaks.
- Check the all tightened points for looseness.
- Check the rollers for noise and damage.
- Check the links for cracks, bending or dents.
- Check the body weight adjusting handle for bends, damage or looseness.
- Check the lock lever for bends and damage.
- Check the damper rubber for cracks and damage.



# REAR SEAT

## DISASSEMBLY AND REASSEMBLY

N23UFAF

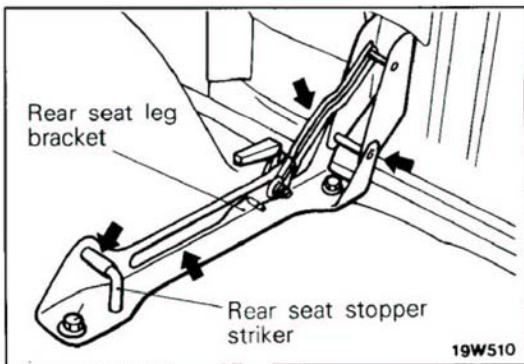


### Disassembly steps

- ◆◆ 1. Rear seat leg bracket
- 2. Reclining cover
- 3. Rear seatback
- 4. Rear seat cushion

### NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Reassembly".



## SERVICE POINTS OF REASSEMBLY

### 1. APPLICATION OF GREASE TO REAR LEG BRACKET

- (1) Apply the specified grease to the following place.

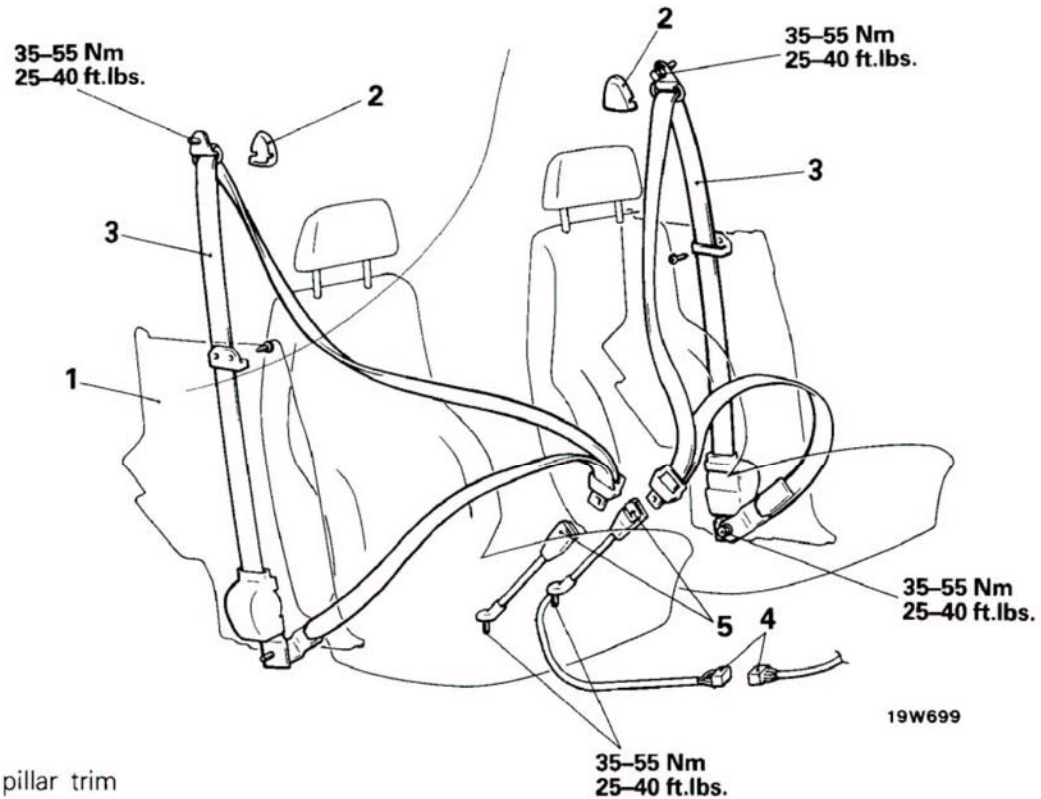
**Specified grease : Multipurpose grease SAE J310, NLGI No. 2**

- ① Sliding part of rear seat leg bracket
  - ② Contacting part of rear seat stopper
- (2) After the seat has been installed, check to ensure that the lock release, forward-down, folding and return mechanisms all operate smoothly.
  - (3) Check to ensure that when the seat cushion is folded, the leg bracket locks securely.

## SEAT BELTS

## REMOVAL AND INSTALLATION (Front seat belts)

N23UGAD



## Removal steps

- ◆◆ 1. Center pillar trim
- ◆◆ 2. Sash guide cover
- ◆◆ ◆◆ 3. Front seat belt assembly
- ◆◆ ◆◆ 4. Connection of seat belt switch connector
- ◆◆◆◆ 5. Buckle stalk

## NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆◆ : Refer to "Service Points of Installation".

## SERVICE POINTS OF REMOVAL

## 1. REMOVAL OF CENTER PILLAR TRIM

Refer to P.23-72.

## 3. REMOVAL OF FRONT SEAT BELT ASSEMBLY

## Caution

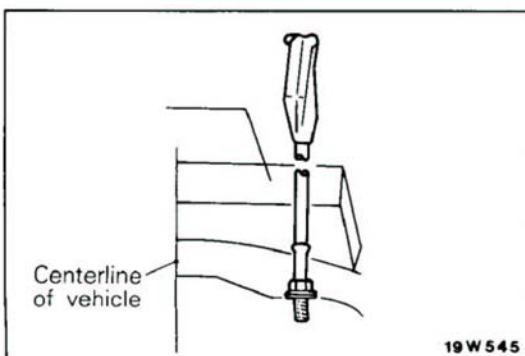
Special bolts (1-in. bolts) are used for the seat belt mounting bolts.

Do not disassemble the retractor.

## SERVICE POINTS OF INSTALLATION

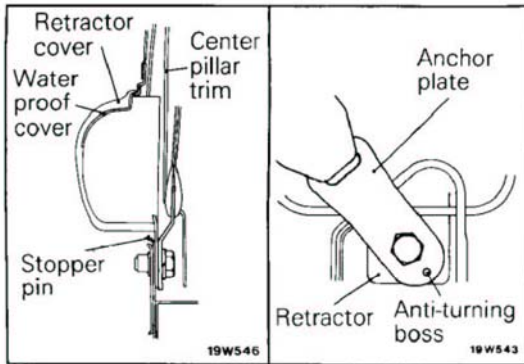
## 5. INSTALLATION OF BUCKLE STALK

Install the seat belt buckle stalk in parallel with the center line of the vehicle.



19W545

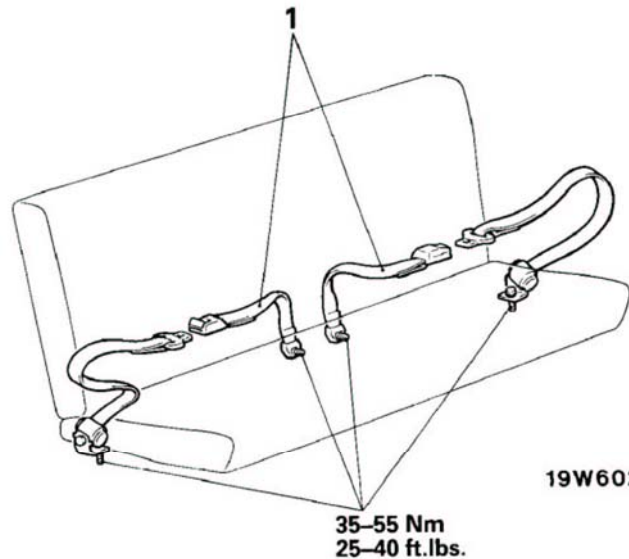
STB Revision



**3. INSTALLATION OF FRONT SEAT BELT ASSEMBLY**

- (1) Fit the anti-rotation stopper pin of the webbing into the hole of the side sill.
- (2) Fit the anchor plate anti-turning boss positively in the retractor side hole and jointly tighten the retractor and anchor plate.

**REMOVAL AND INSTALLATION (Rear seat belts)**



◆◆ 1. Rear seat belt

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Installation".

**SERVICE POINTS OF INSTALLATION**

**1. INSTALLATION OF REAR SEAT BELT**

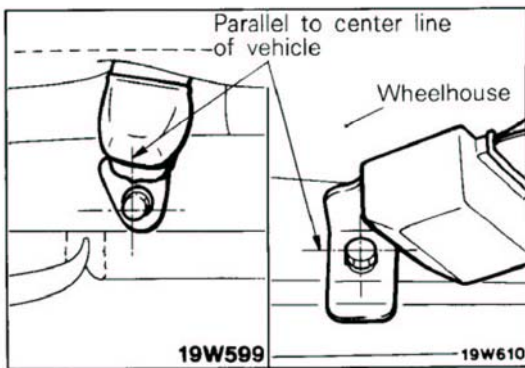
Position the anchor plates at the center of the vehicle so that the belts are parallel to the vehicle center line, and then secure the plates with the bolts.

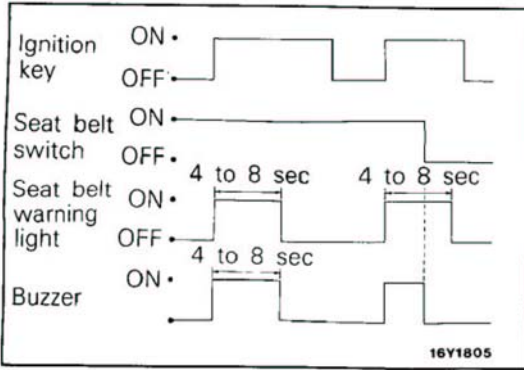
**NOTE**

After tightening the bolts, securely mount the anchor covers for the inner end of the seat belts.

**Caution**

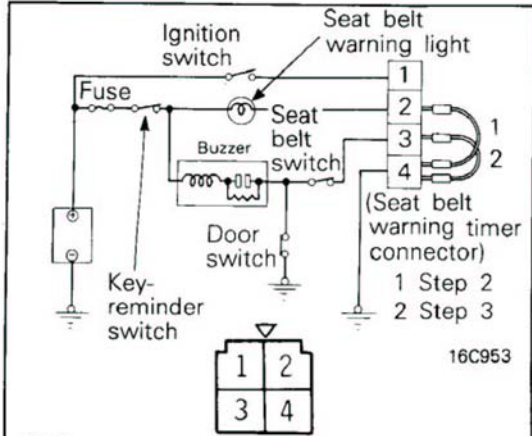
**Special bolts (1-in. bolts) are used for the seat belt mounting bolts.**





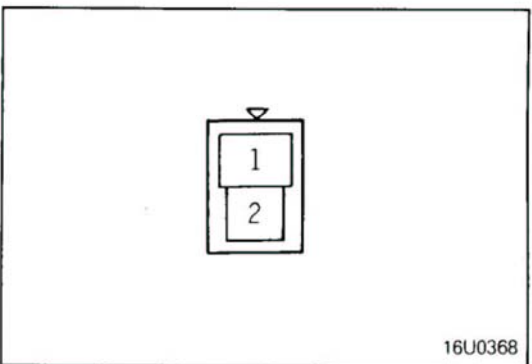
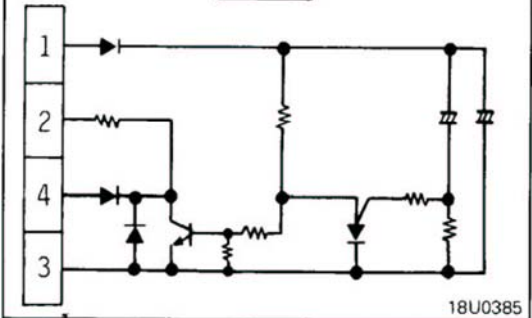
**SEAT BELT WARNING SYSTEM**

When the seat belt switch in ON (seat belts not buckled) with the ignition key in the ON position, the seat belt warning timer causes the seat belt warning light to illuminate and the buzzer to sound for 4 to 8 seconds. If the seat belts switch is set to OFF (the seat belts buckled) during the seat belt warning timer interval, only the buzzer is cancelled.



**SYSTEM INSPECTION**

1. Disconnect the seat belt warning timer connector.
2. When the YG wire (terminal 2) and B wire (terminal 3) are connected with a jumper wire, the seat belt warning light should illuminate. If it fails to illuminate, check the bulb, key-reminder switch and fuse.
3. Also the buzzer should sound when the RB wire (terminal 4) and B wire (terminal 3) are connected with a jumper wire. In this condition, fasten the buckle; if the buzzer stops sounding, the seat belt switch is good.



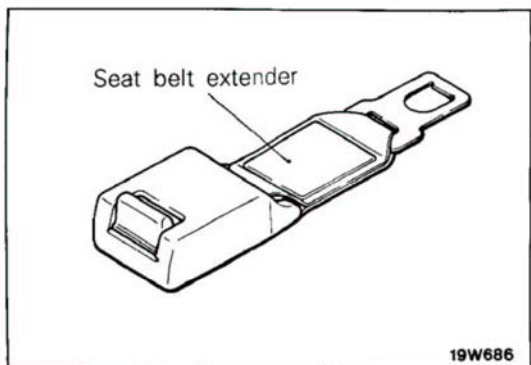
4. If the buzzer does not sound when terminal 3 and terminal 4 are connected with a jumper wire, check continuity of the seat belt switch. If there is continuity in the seat belt switch, replace the buzzer.

Terminal	1	2
Buckle unlock	○	○
Buckle lock		

**NOTE**

○—○ indicates that there is continuity between the terminal.

5. After performing the above inspections, reconnect the seat belt warning timer.
6. With the ignition switch turned to IG, verify the function of the seat belt warning system.



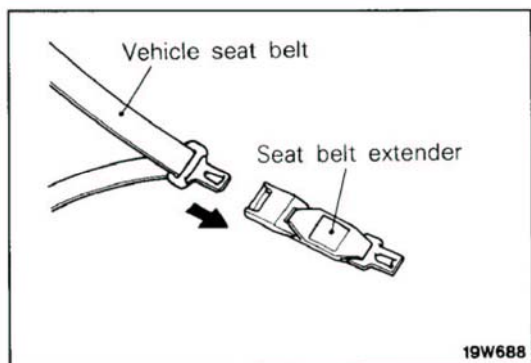
**SEAT BELT EXTENDER**

The seat belt extender as described below will provide additional seat belt length that the vehicle seat belt is not long enough for a person.

Seat belt extender	
Type	B
Part number	MB544777

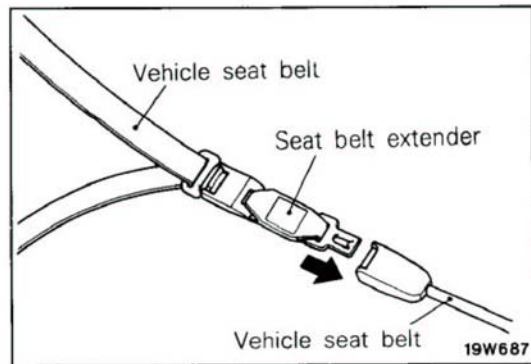
**Caution**

- 1. The seat belt extender is intended for use only when the seat belt is not long enough to fit around an occupant. It must be removed and stowed when not required by that occupant.**
- 2. Incorrect use of seat belt extender or other extender which is not specified may result in serious injury.**



**SEAT BELT EXTENDER INSTRUCTIONS**

1. To use the extender, insert and latch the tip of the vehicle seat belt in the buckle of the extender.



2. The tip of the extender is then inserted and latched in the buckle end of the vehicle seat belt.

# EMISSION CONTROL SYSTEM

## CONTENTS

N25AA--

<b>COMPONENT LAYOUT AND VACUUM HOSE PIPING</b> .....	<b>20</b>	INSPECTION OF HIGH ALTITUDE COMPENSATOR (HAC) [High altitude specifications for the 49 states (excluding California)] .....	36
COMPONENT LAYOUT .....	20	INSPECTION OF HIGH ALTITUDE COMPENSATOR (HAC) (Vehicles for California) .....	40
VACUUM HOSE PIPING DIAGRAM .....	23	INSPECTION OF INTAKE AIR TEMPERATURE CONTROL SYSTEM .....	41
<b>CRANKCASE EMISSION CONTROL SYSTEM</b> .....	<b>27</b>	INSPECTION OF MIXTURE CONTROL VALVE (MCV) .....	42
INSPECTION OF POSITIVE CRANKCASE VENTILATION (PCV) VALVE .....	27	INSPECTION OF SECONDARY AIR CONTROL SOLENOID VALVE .....	32
<b>EVAPORATIVE EMISSION CONTROL SYSTEM</b> .....	<b>27</b>	INSPECTION OF SECONDARY AIR CONTROL VALVE .....	31
INSPECTION OF BOWL VENT VALVE (BVV) .....	27	INSPECTION OF SECONDARY AIR SUPPLY SYSTEM .....	30
INSPECTION OF OVERFILL LIMITER (TWO-WAY VALVE) .....	30	INSPECTION OF THERMO VALVE .....	33
INSPECTION OF PURGE CONTROL SYSTEM .....	28	INSPECTION OF THREE CATALYST CONVERTER .....	30
INSPECTION OF PURGE CONTROL VALVE (PCV) .....	28	INSPECTION OF VACUUM REGULATOR VALVE (VRV) .....	34
INSPECTION OF THERMO VALVE .....	29	INSPECTION OF VACUUM SWITCH .....	33
<b>EXHAUST EMISSION CONTROL SYSTEM</b> ..	<b>30</b>	INSPECTION OF VACUUM SWITCHING VALVE (VSV) [High altitude specifications for the 49 states (excluding California)] .....	37
INSPECTION OF AIR CONTROL VALVE AND THERMO SENSOR .....	41	INSPECTION OF VRV CONTROL VACUUM .....	34
INSPECTION OF AIR FUEL RATIO CONTROL (FBC) SYSTEM .....	30	<b>GENERAL INFORMATION</b> .....	<b>2</b>
INSPECTION OF CARBURETOR BLEED AIR PASSAGE CLOGGING .....	38	<b>SPECIFICATIONS</b> .....	<b>17</b>
INSPECTION OF CHECK VALVE .....	37	GENERAL SPECIFICATIONS .....	17
INSPECTION OF EGR VALVE .....	33	SERVICE SPECIFICATIONS .....	17
INSPECTION OF EGR VALVE CONTROL VACUUM .....	34	TORQUE SPECIFICATIONS .....	17
INSPECTION OF ENGINE COOLANT TEMPERATURE SENSOR .....	33	SEALANTS AND ADHESIVES .....	18
INSPECTION OF ENGINE SPEED SENSOR .....	33	<b>TECHNICAL DESCRIPTION</b> .....	<b>6</b>
INSPECTION OF EXHAUST GAS RECIRCULATION (EGR) SYSTEM .....	33	CRANKCASE EMISSION CONTROL SYSTEM .....	6
INSPECTION OF HIGH ALTITUDE COMPENSATION SYSTEM [High altitude specifications for the 49 states (excluding California)] .....	34	EVAPORATIVE EMISSION CONTROL SYSTEM .....	7
INSPECTION OF HIGH ALTITUDE COMPENSATION SYSTEM (Vehicles for California) .....	38	EXHAUST EMISSION CONTROL SYSTEM .....	9
		<b>TROUBLESHOOTING</b> .....	<b>18</b>

## GENERAL INFORMATION

The emission control system has the following three major systems.

- (1) Crankcase emission control system
- (2) Evaporative emission control system
- (3) Exhaust emission control system

The crankcase emission control system is a system adopting a closed-type crankcase ventilation to prevent blow by gas from escaping into the atmosphere. The blow by gas generated in the crankcase is instead led to the combustion chamber for combustion.

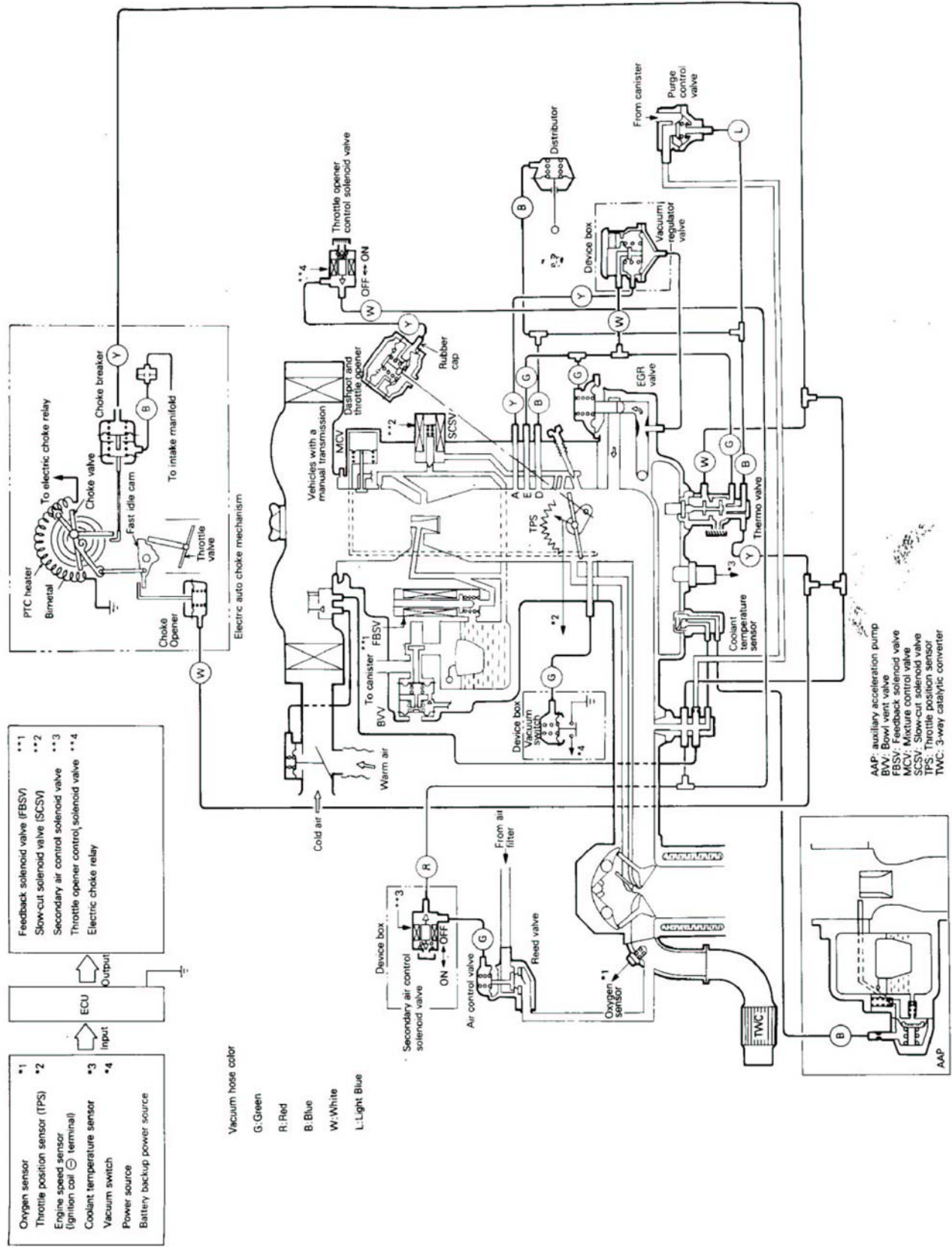
The evaporative emission control system for preventing the emission of fuel vapor from the fuel tank, carburetor, etc. into the atmosphere consists of various components (a canister, purge control valve, 2-way valve and so on) which collect and lead generated fuel vapor to the combustion chamber for combustion.

The exhaust emission control system consists of an air-fuel ratio control unit (FBC system), three catalyst converter, exhaust gas recirculation system, secondary air supply system and so on to reduce emission of CO, HC and NOx.

FBC: Feed Back Carburetor

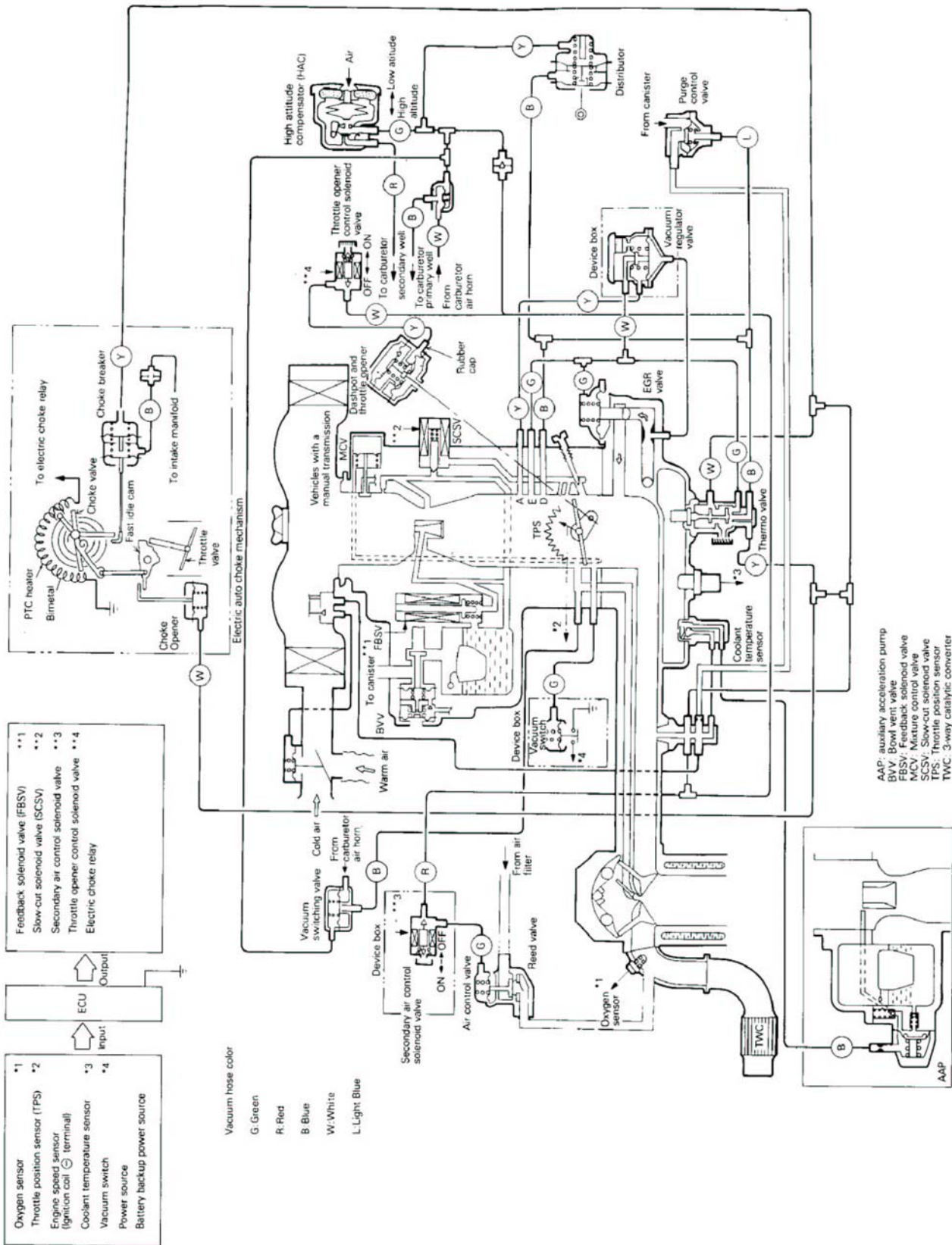
FBC SYSTEM DIAGRAM-vehicles for the 49 states other than California (excluding high-altitude specification)

5FU115





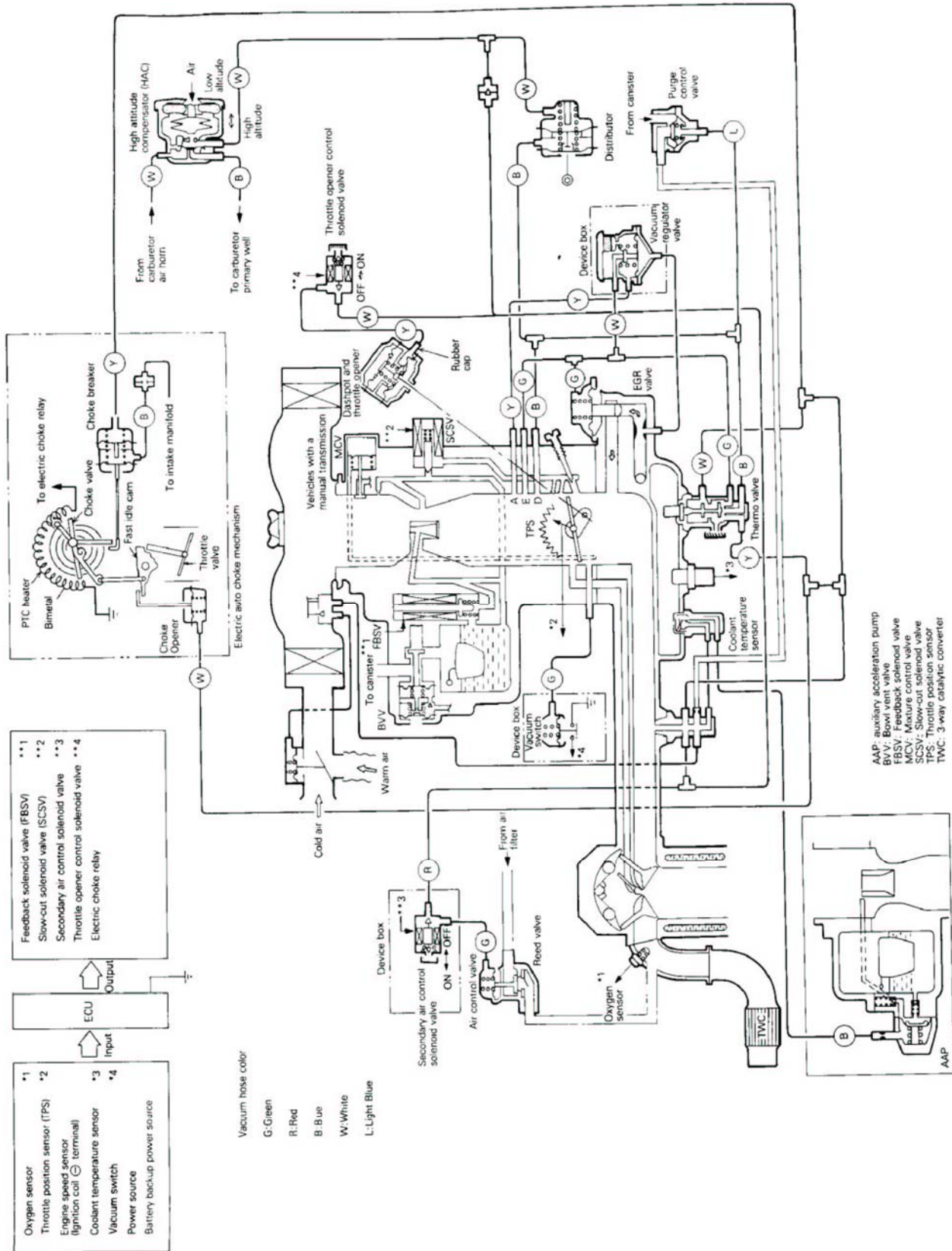
FBC SYSTEM DIAGRAM-vehicles with high-altitude specifications for the 49 states other than California



5FU116

FBC SYSTEM DIAGRAM-vehicles for California

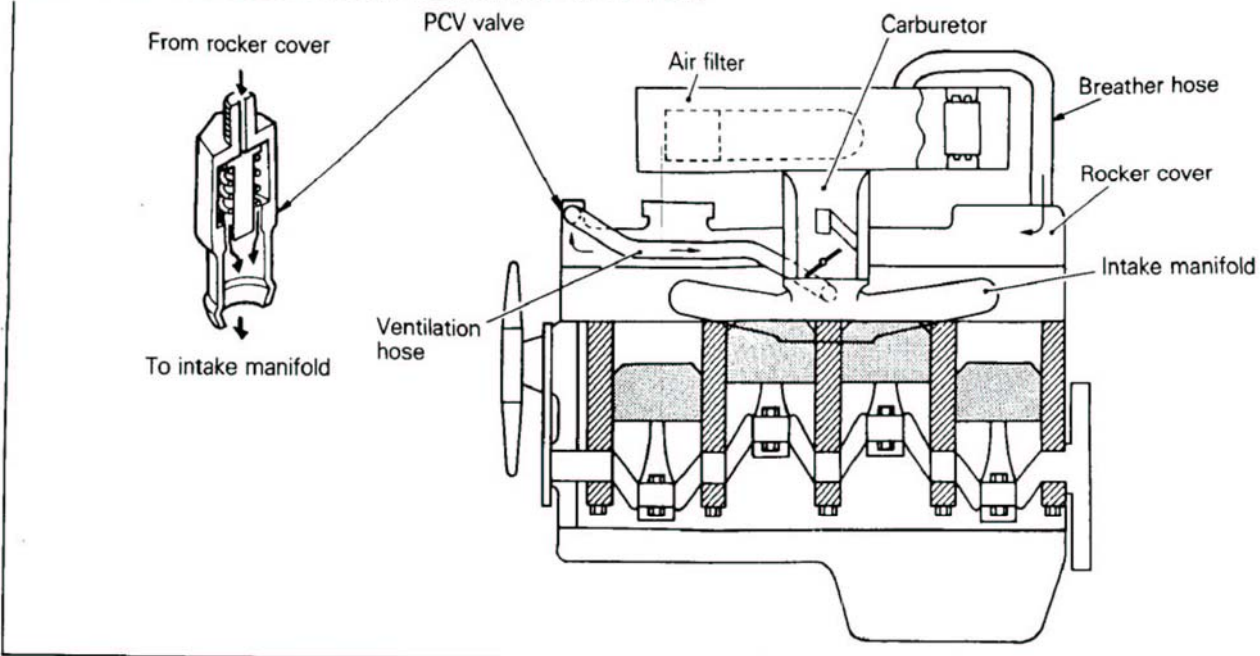
5FU117



## TECHNICAL DESCRIPTION

### CRANKCASE EMISSION CONTROL SYSTEM

N25HAAA

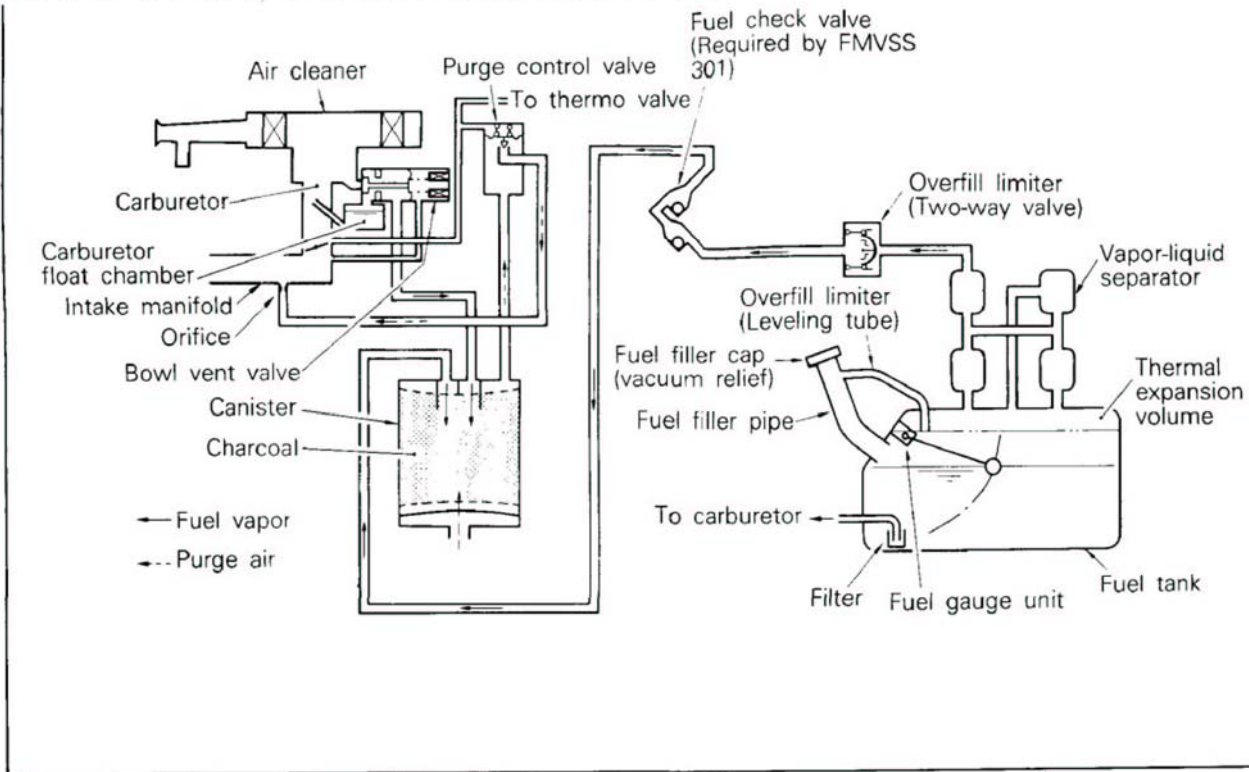


5EM081

A closed-type crankcase ventilation system is utilized to prevent the blow-by gas from escaping into the atmosphere. This system has a positive crankcase ventilation valve (PCV valve) at the rocker cover. This system supplies fresh air to the crankcase through the air filter. Inside the crankcase, the fresh air is mixed with blow-by gases, and this mixture passes through the PCV valve into the intake manifold. The PCV valve has a metered orifice through which the mixture of fresh air and blow-by gases is drawn into the intake manifold in response to the intake manifold vacuum. The valve capacity is adequate for all normal driving conditions.

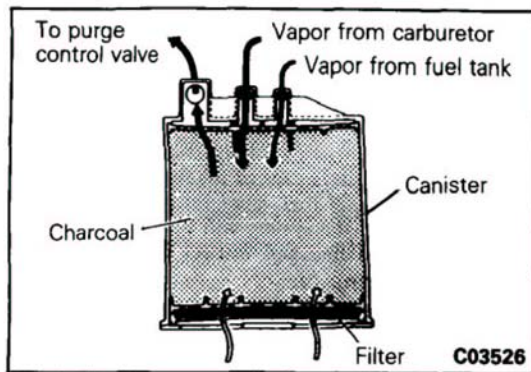
EVAPORATIVE EMISSION CONTROL SYSTEM

N25HBAA



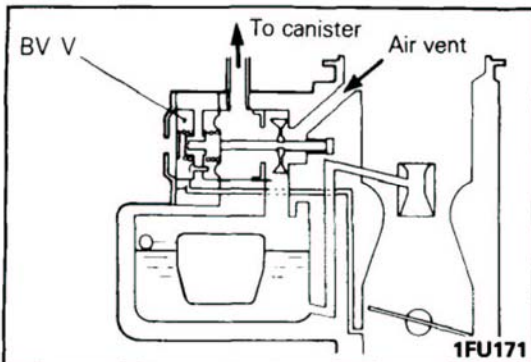
03W527

In order to prevent the loss of fuel vapor from the fuel system into the atmosphere, the evaporative emission control system consists of charcoal canister, a bowl vent valve, a purge control valve, etc.

**CANISTER**

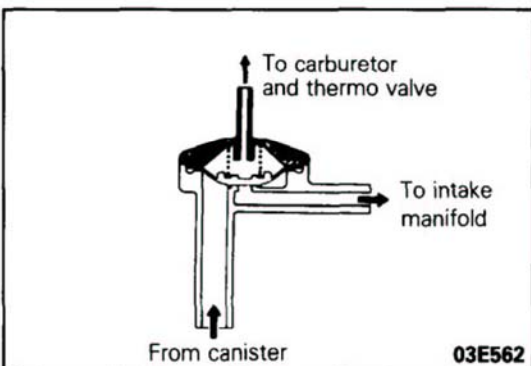
N25HBBA

While the engine is inoperative, fuel vapors generated inside the fuel tank and the carburetor float chamber are absorbed and stored in canister. When the engine is running, the fuel vapors absorbed in canister are drawn into the intake manifold through the purge control valve, and an orifice. And the carburetor bowl vapors flow into the carburetor through the bowl vent valve.

**BOWL VENT VALVE**

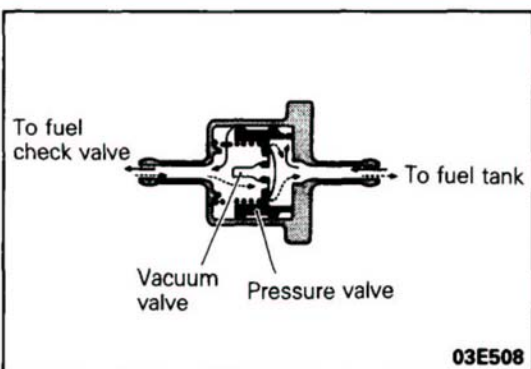
N25HBCA

The bowl vent valve controls vapor in the carburetor bowl. While the engine is running, the intake manifold vacuum acts on the diaphragm to close the bowl vent valve so that the carburetor bowl connects to the air vent. When the engine stops, the bowl vent valve opens to connect the carburetor bowl to the canister, causing fuel vapor to be adsorbed by the canister.

**PURGE CONTROL VALVE**

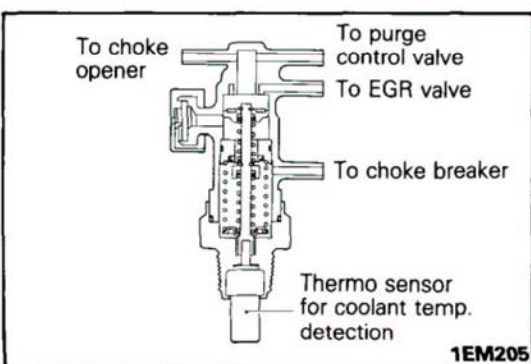
N25HBDA

The purge control valve is kept being closed during idling to prevent vaporized fuel from entering into the intake manifold for positive control of high-idle CO emission, which is a particular problem under high ambient temperatures condition and once the throttle ported vacuum working on the diaphragm of the valve exceeds the pre-set value, the purge control valve is opened.

**OVERFILL LIMITER (TWO-WAY VALVE)**

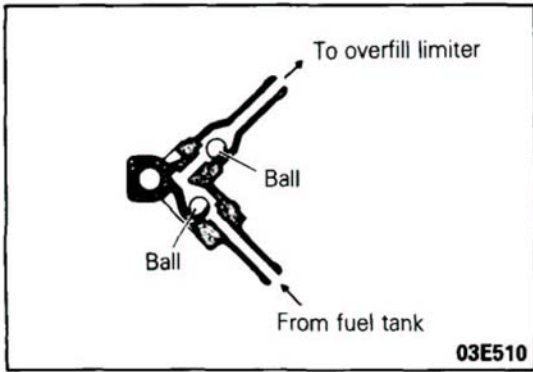
N25HBEA

The overfill limiter consists of a pressure valve and a vacuum valve. The pressure valve is designed to open when the fuel tank internal pressure has increased over the normal pressure and the vacuum valve opens when a vacuum has been produced in the tank.

**THERMO VALVE**

N25HBFA

The thermo valve, for sensing the coolant temperature at the intake manifold, closes the purge control valve when the coolant temperature is lower than the pre-set value in order to reduce CO and HC emissions under engine warm-up conditions, and opens the purge control valve when the coolant temperature is above the pre-set temperature.

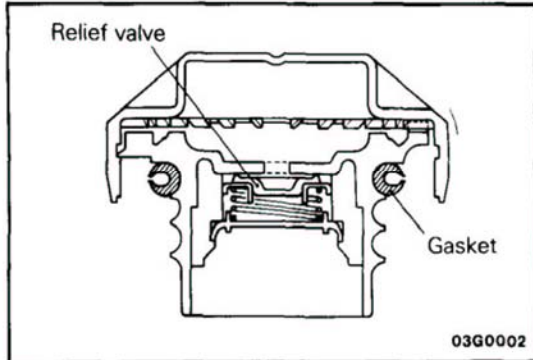


**FUEL CHECK VALVE**

N25HBGA

The fuel check valve is used to prevent fuel leaks when the car suddenly rolls over. This valve is connected in the fuel vapor line (between fuel tank and overfill limiter) and is installed on the fuel tank.

The fuel check valve contains two balls as shown in the illustration. Under normal conditions, the gasoline vapor passage in the valve is opened, but if roll-over occurs one of the balls closes the fuel passage, thus preventing fuel leaks.



**FUEL FILLER CAP**

N25HBHA

Fuel filler cap is equipped with relief valve to prevent the escape of fuel vapor into the atmosphere.

**EXHAUST EMISSION CONTROL SYSTEM**

N25HCAA

Exhaust emissions (CO, HC, NO) are controlled by a combination of engine modifications and the addition of special control components.

Modifications to the combustion chamber, intake manifold, camshaft, carburetor and ignition system form the basic control system.

Additional control devices include a jet air system, an exhaust gas recirculation (EGR) system, a catalytic converter, a secondary air supply system, a dash pot, a heated air intake system.

These systems have been integrated into a highly effective system which controls exhaust emissions while maintaining good driveability and economy.

**JET AIR SYSTEM**

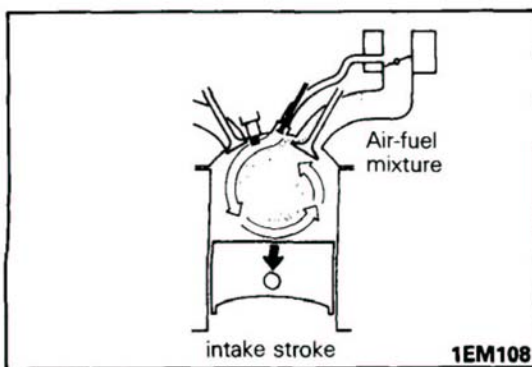
N25HCBA

In addition to the intake valve and exhaust valve, a jet valve has been provided for drawing jet air (super lean mixture or air) into the combustion chamber.

A jet air passage is provided in the carburetor, intake manifold and cylinder head. Air flows through the intake openings provided near the primary throttle valve of the carburetor, goes through the passage in the intake manifold and cylinder head, and flows through the jet valve and the jet opening into the combustion chamber.

The jet valve is actuated by the same cam as the intake valve and by a common rocker arm so that the jet valve and intake valve open and close simultaneously.

The jet air flowing out of the jet opening scavenges the residual gases around the spark plug and creates a good ignition condition. It also produces a strong swirl in the combustion chamber which continues throughout the compression stroke and improves flame propagation after ignition, assuring high combustion efficiency.



**AIR FUEL RATIO CONTROL SYSTEM  
[FEED BACK CARBURETOR (FBC) SYSTEM]**

N25HCCA

The FBC system is essentially an emissions control system which utilizes an electronic signal, generated by an exhaust gas oxygen sensor to precisely control the air-fuel mixture ratio in the carburetor. This in turn allows the engine to produce exhaust gases of the proper composition to permit the use of a three-way catalyst. The three-way catalyst is designed to convert the three pollutants (1) hydrocarbons (HC), (2) carbon monoxide (CO), and (3) oxides of Nitrogen (NOx) into harmless substances.

There are two operating modes in the FBC system:

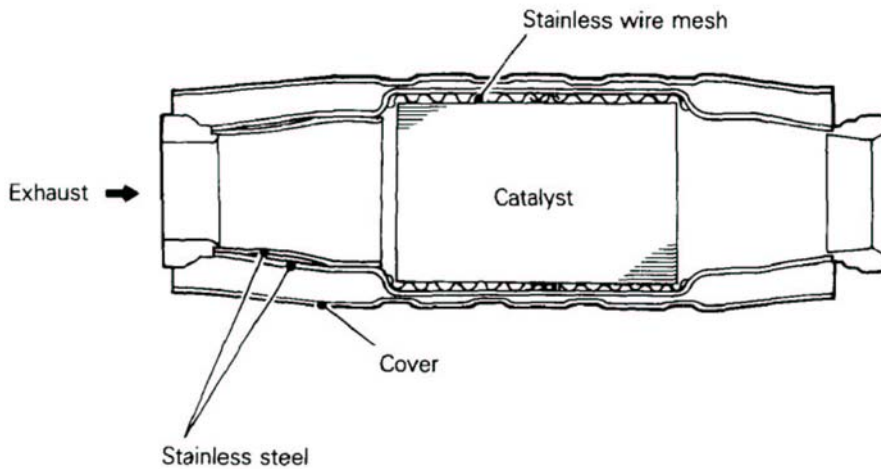
- (1) Open Loop-air fuel ratio is controlled by information programmed into the ECU at manufacture.
- (2) Closed Loop-air fuel ratio is varied by the ECU based on information supplied by the oxygen sensor.

**NOTE**

Refer to GROUP 14 FUEL SYSTEM – General Information for detailed description of the FBC system.

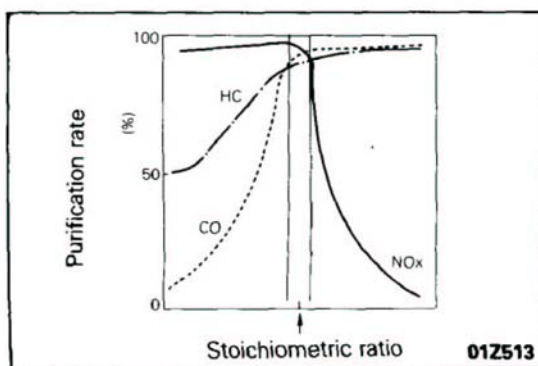
**CATALYTIC CONVERTER**

N25HCDA



1EM127

The three catalyst converter which is a monolithic type with catalytic compositions applied to the integrally constructed honeycomb carrier surface is installed in the center of the exhaust pipe. The converter working in combination with the air fuel ratio feedback control oxidizes CO and HC and reduce NOx.



01Z513

**Function**

The three catalytic converter removes CO, HC and NOx most effectively in the vicinity of the stoichiometric ratio. The air fuel ratio feedback control by oxygen sensor controls the air fuel mixture to the stoichiometric ratio and the catalytic converter promotes both oxidation and reduction of resultant exhaust gas to make it clean before it is released to atmosphere.

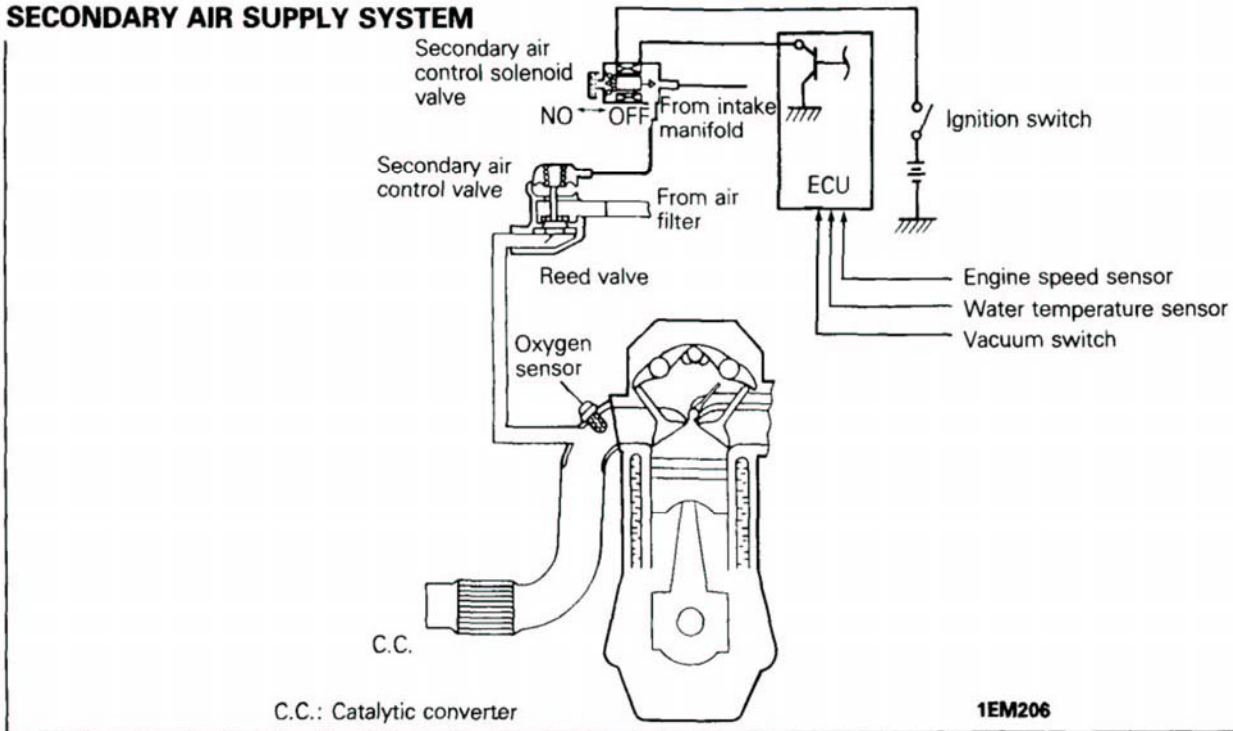
**Caution**

The catalytic converters require the use of unleaded gasoline only. Leaded gasoline will destroy the effectiveness of the catalysts as an emission control device.

Under normal operating conditions, the catalytic converters will not require maintenance. However, it is important to keep the engine properly tuned. If the engine is not kept properly tuned, engine misfiring may cause overheating of the catalysts. This may cause heat damage to the converters or vehicle components. This situation can also occur during diagnostic testing if any spark plug cables are removed and the engine is allowed to idle for a prolonged period of time.

**SECONDARY AIR SUPPLY SYSTEM**

N25HCEC



C.C.: Catalytic converter

1EM206

The reed valve supplies secondary air into the exhaust manifold for the purpose of promoting oxidation of exhaust emissions. The reed valve is actuated by exhaust vacuum being generated from pulsation in the exhaust manifold, and additional air is supplied into the exhaust manifold through the secondary air control valve.

**Contents of Control**

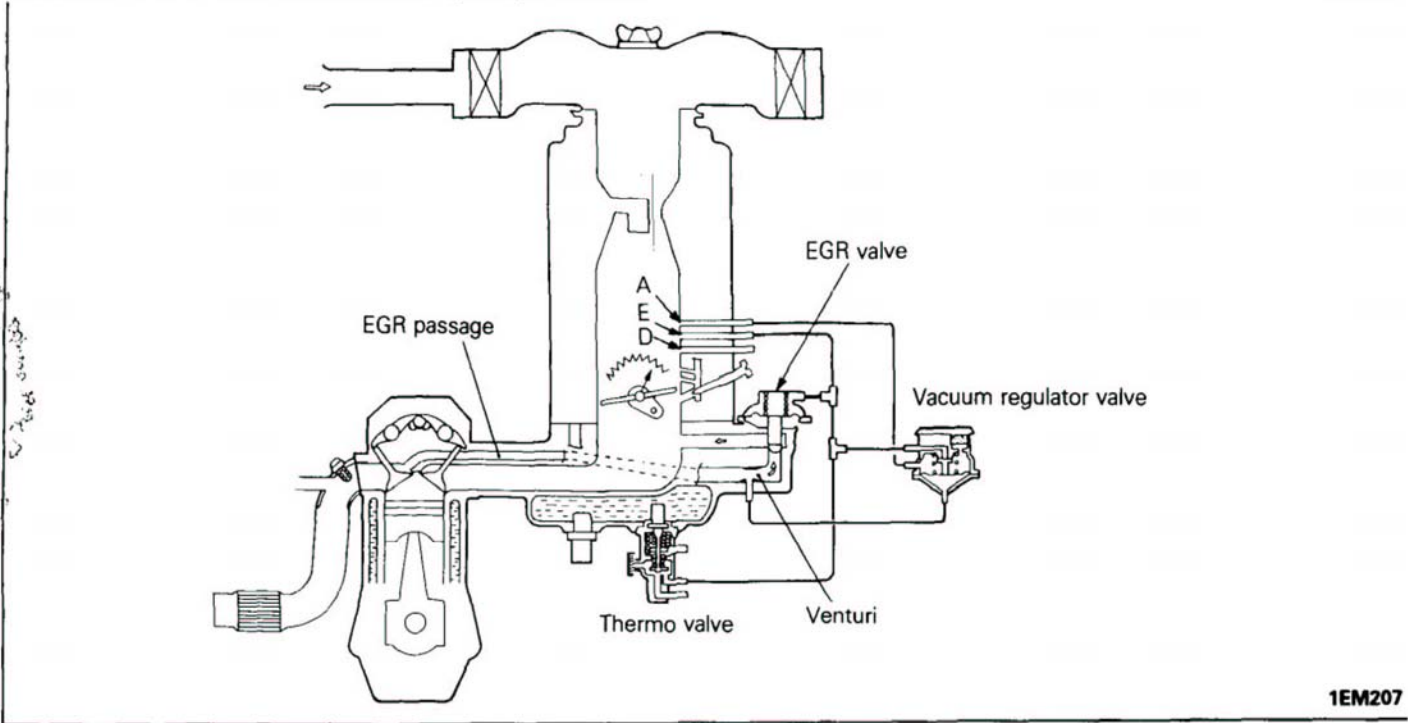
When the engine coolant is cold [18 – 52°C (65 – 125°F)] or when the vehicle is decelerating, the ECU turns on the power transistor to energize the secondary air control solenoid valve.

As a result, the intake manifold vacuum is introduced to the secondary air control valve and the secondary air is supplied to the exhaust manifold.



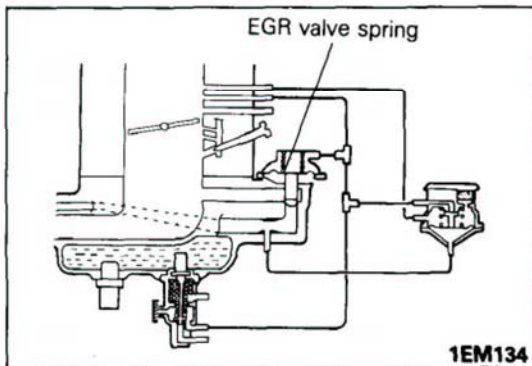
EXHAUST GAS RECIRCULATION (EGR) SYSTEM

N25HCFA



1EM207

Exhaust Gas Recirculation (EGR) system is designed to reduce oxides of nitrogen in the vehicle exhaust. In this system, the exhaust gas is partially recirculated from an exhaust port at the cylinder head into a port located at the intake manifold while the EGR flow is controlled by an EGR control valve, a vacuum regulator valve (VRV), and a thermo valve.



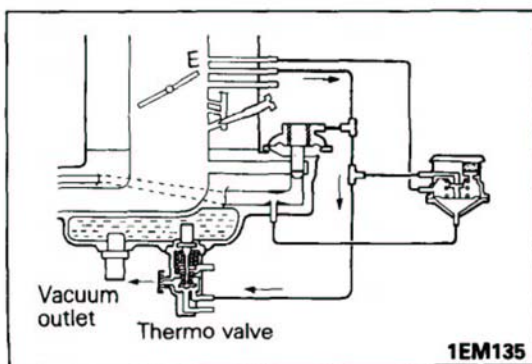
**Operation**

**During Idling or Throttle Wide Open Operation**

In this case, the E port vacuum is low and the EGR valve is closed by spring force. As a result, EGR gas does not flow.

**NOTE**

The EGR is not made to ensure stable idling operation.

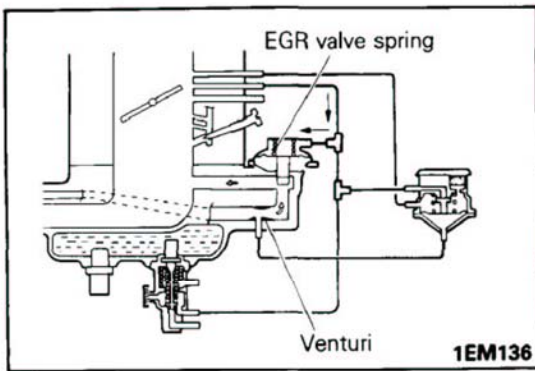


**When Engine Coolant is Cold**

In this case, the thermo valve opens to allow the E port vacuum to escape to atmosphere. As a result, the EGR valve does not operate.

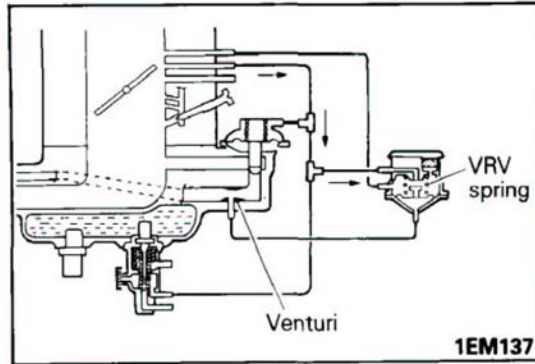
**NOTE**

The EGR is shut off to secure driveability when the engine is cold.



**During Low to Middle Load Operation**

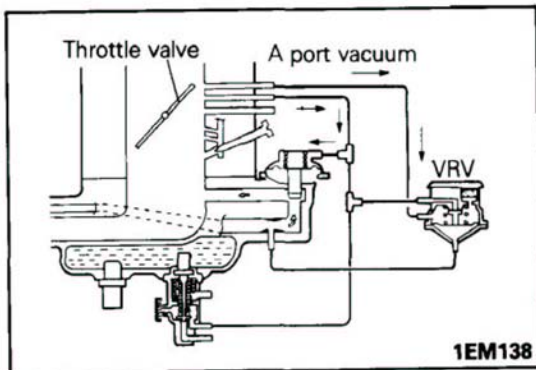
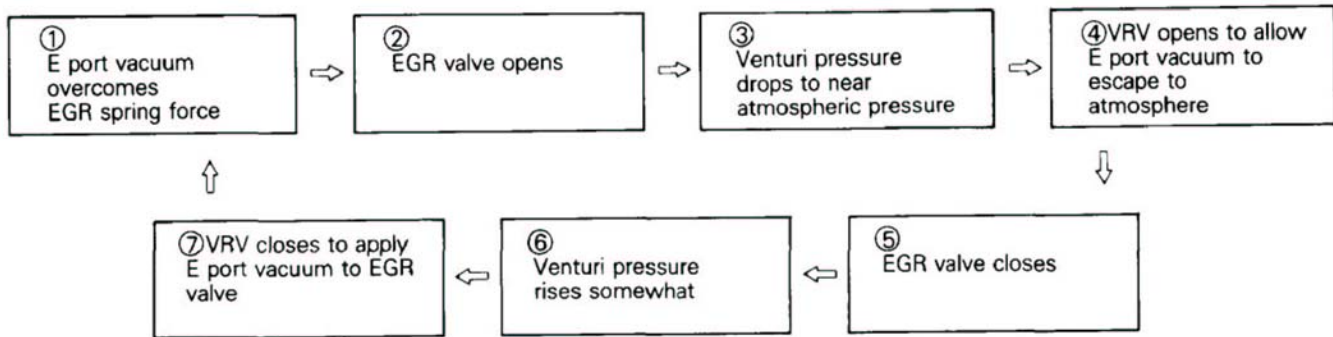
As the throttle valve is opened, the E port vacuum increases to overcome the spring force of the EGR valve. As a result, the EGR valve opens to cause the exhaust gas to recirculate to the intake manifold, causing drop of the venturi pressure.



When the venturi pressure drops to near the atmospheric pressure, the VRV opens to allow the E port vacuum to escape to atmosphere. Then, the EGR valve closes. By repeating this cycle (closed loop control), EGR flow rate proportional to the intake air volume can be obtained.

**NOTE**

By controlling the EGR rate to optimum level, exhaust emission (NO<sub>x</sub>) is minimized without loss of driveability.

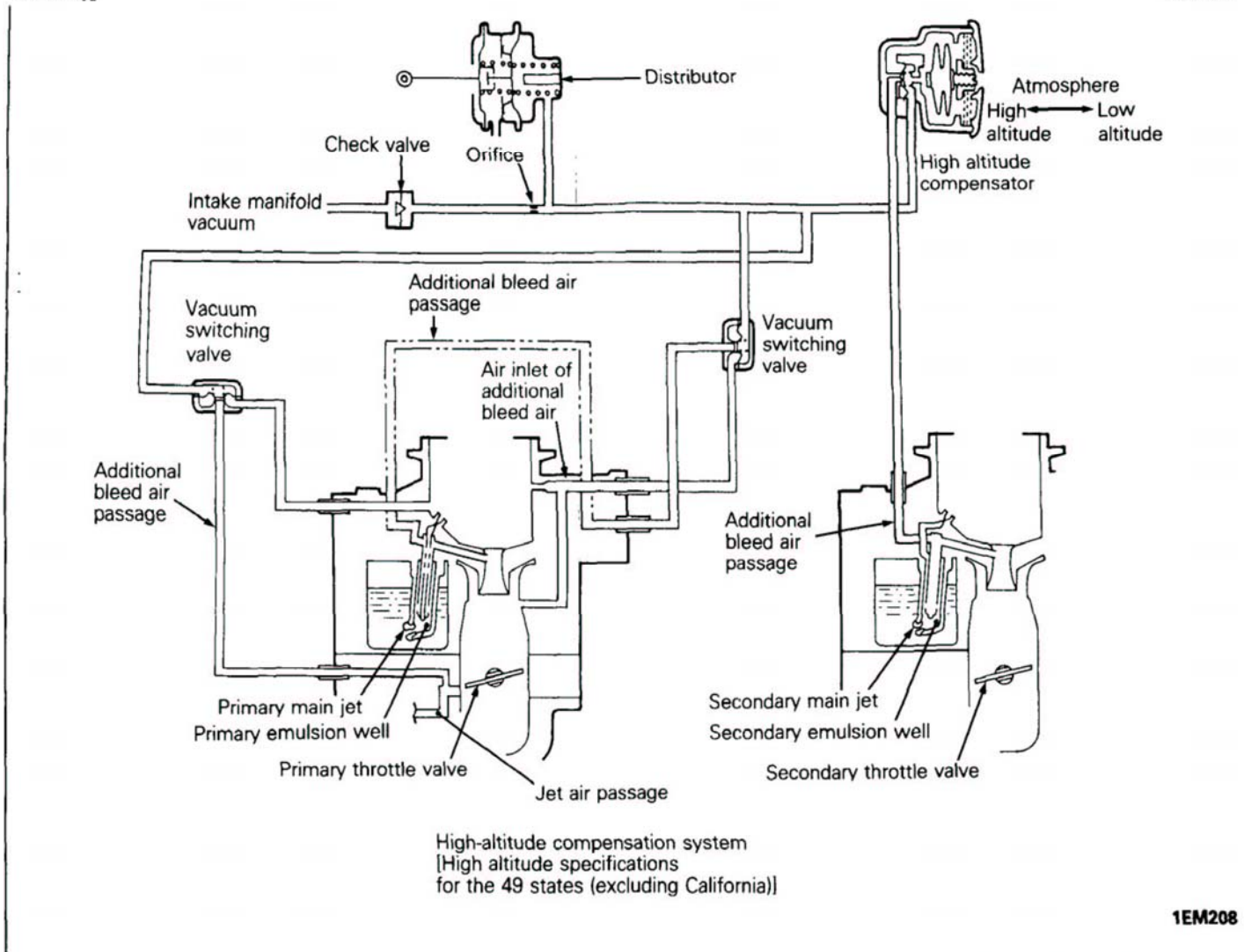


**During High Load Operation**

During high load operation, acceleration or other conditions in which much NO<sub>x</sub> is produced, A port vacuum is made to act on the VRV to shut off E vacuum's escape passage to atmosphere and to stop EGR exhaust pressure control action. As a result, the EGR valve is controlled by E vacuum only and the EGR flow rate increases.

**HIGH-ALTITUDE COMPENSATION SYSTEM [High altitude specifications for the 49 states (excluding California)]**

N25HCGC



1EM208

In order to meet the high-altitude requirements for the 49 states (ex. California), all the high-altitude specification carburetor vehicles are equipped with high altitude compensation system in addition to feedback carburetor system.

The carburetor meters fuel according to the volumetric flow rate of air and supplies the resultant mixture to the engine. Therefore, even if the carburetor is set for optimum air-fuel rate at low altitude, the mixture becomes too thick at high altitude since air is less dense at high altitude.

At high altitude, this high altitude compensation system supplies additional bleed air to the carburetor emulsion well and jet air passage to dilute fuel, preventing overrich air-fuel mixture that could otherwise be caused by drop of air density at high altitude.

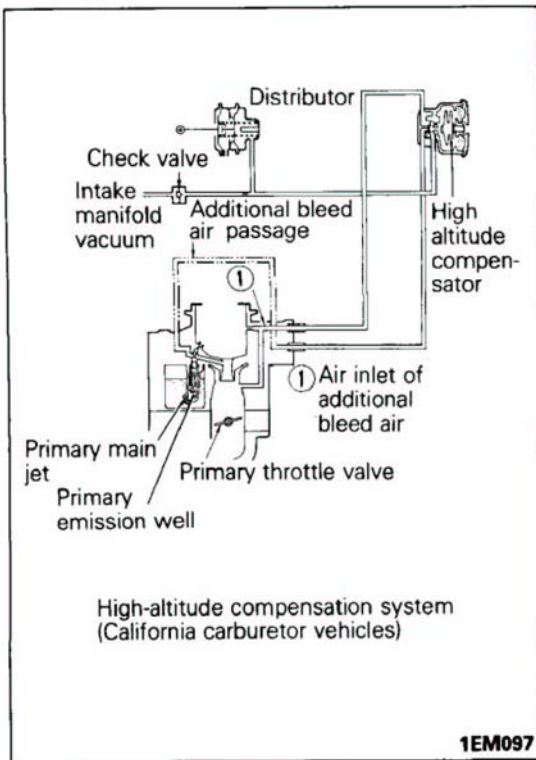
The system also advances the ignition timing by a fixed amount to reduce CO and HC emission and to secure driveability at high altitude.

### Operation

At low altitude, the HAC opens to allow the intake manifold vacuum to escape from the HAC to atmosphere. Therefore, the vacuum switching valve and HAC's additional bleed air passage remain closed and bleed air is not supplied to the carburetor.

At high altitude, the HAC closes and the intake manifold vacuum is applied to the vacuum switching valve, HAC's additional bleed air passage and distributor.

As a result, the vacuum switching valve and HAC's additional bleed air passage are opened to supply bleed air to the carburetor. At the same time, the distributor advances the ignition timing.



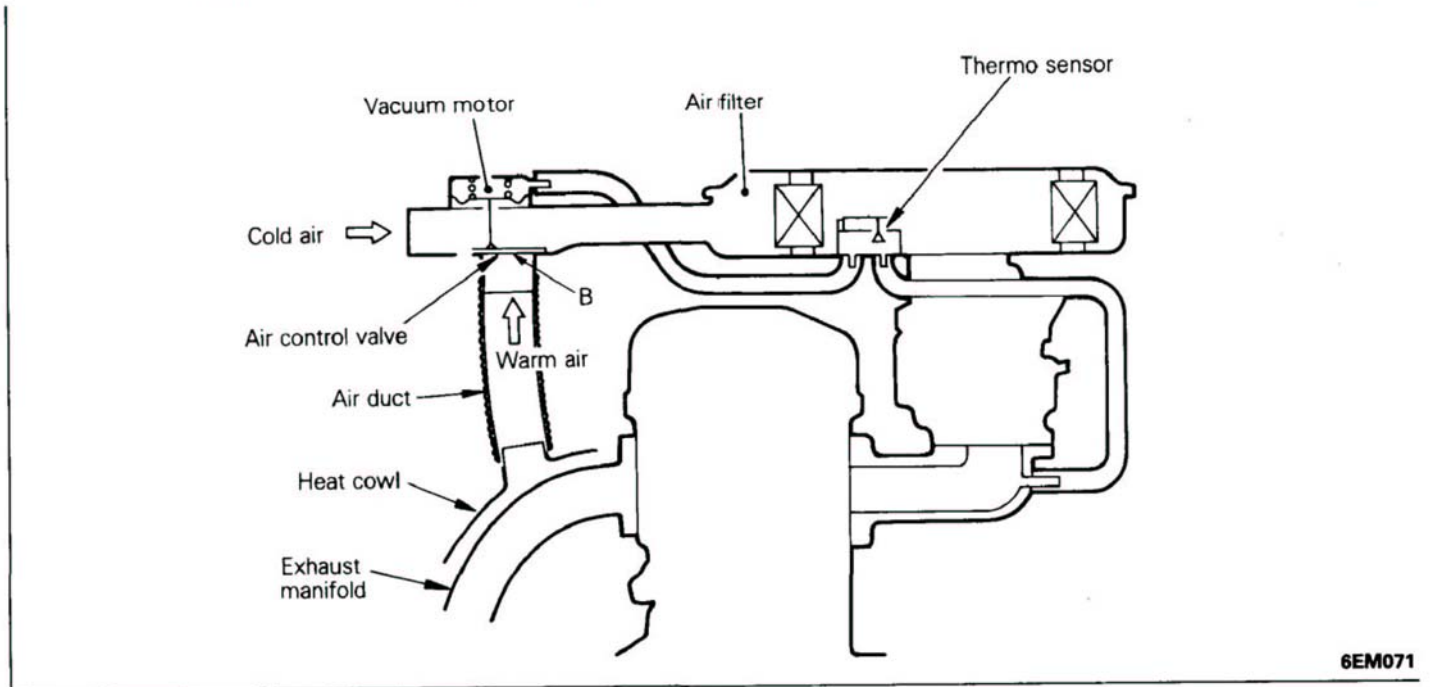
**HIGH ALTITUDE COMPENSATION SYSTEM FOR CALIFORNIA VEHICLES**

N25HCGD

In order to meet the California high-altitude requirements all the California carburetor vehicles are equipped with high altitude compensation system in addition to feedback carburetor system. Refer to HIGH ALTITUDE COMPENSATION SYSTEM [High altitude specifications for the 49 states (excluding California)], P.25-14 for the contents of the system.

**INTAKE AIR TEMPERATURE CONTROL SYSTEM**

N25HCHA



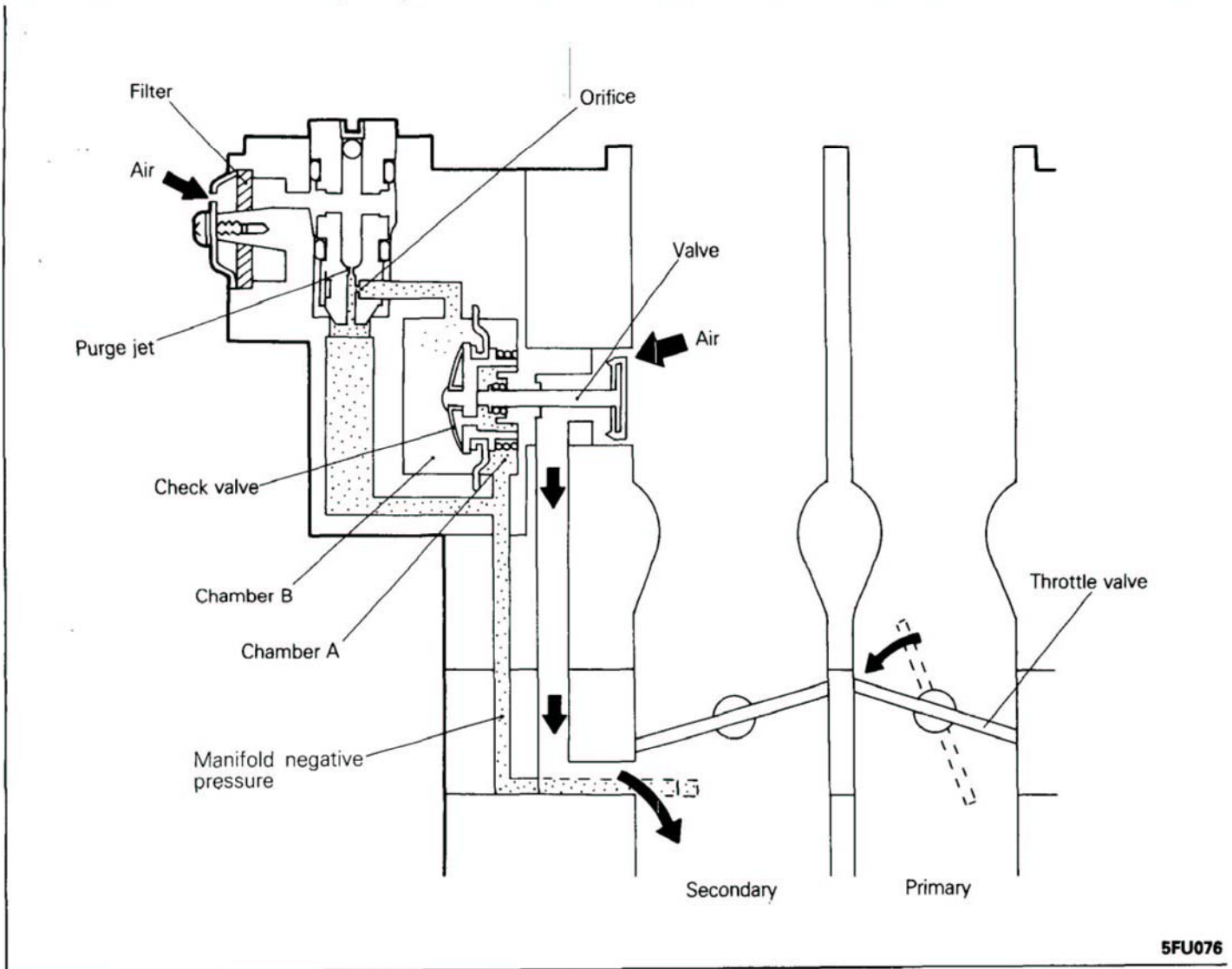
All vehicles are equipped with a temperature regulated air filter, as shown in illustration, so that the carburetor can be calibrated leaner to reduce CO and HC emissions and improved engine warm-up characteristics and minimized carburetor icing can be attained. The air filter is provided with an air control valve, inside the snorkel, to modulate temperature of carburetor intake air which flows through two routes. The air control valve is operated by a bi-metal which responds to the intake air temperature, or controlled by a vacuum motor/temperature sensor combination system which responds to the intake manifold vacuum and temperature inside the air filter.

**Operation**

- When the bi-metal senses the temperature inside air filter of below about 30°C (86°F) the air bleed valve of temperature sensor assembly remains closed. Then, the intake manifold vacuum is applied to the diaphragm of vacuum motor, which in turn, opens the air control valve so as to let the pre-heated intake air flow through the heat cowl and air duct into the air filter.
- When the bi-metal senses the temperature inside air filter of above about 45°C (113°F) the air bleed valve is fully opened. As a result, the intake air to the carburetor comes directly through the fresh air duct, since the air control valve is positioned at B, regardless of the intake manifold vacuum.
- At intermediate temperatures, the air entering the carburetor is a blend of fresh air and pre-heated air as regulated by the thermostatically actuated air control valve.

**MIXTURE CONTROL VALVE (MCV)—VEHICLES WITH A MANUAL TRANSMISSION**

N25HC1B



When the throttle is closed suddenly during deceleration or shifting, the fuel remaining in the inlet manifold causes an over rich mixture temporarily. In order to prevent this, air is supplied temporarily from another passage so as to keep correct air fuel ratio and reduce emission (HC).

**Operation**

When the throttle is closed suddenly, the manifold vacuum increases sharply. This increased manifold vacuum acts on the chamber A of the MCV to open the valve so that air is supplied to the inlet manifold. The vacuum is also supplied to chamber B but with some delay due to the orifice. When the vacuum is supplied to both chambers B and A, they are at vacuum and hence the spring causes the valve to close, stopping supply of air. The check valve located at the diaphragm is to prevent high vacuum from remaining in chamber B when acceleration/deceleration is repeated successively. (If a high vacuum remains in chamber B, the valve may fail to operate when vacuum acts on chamber A.)

**SPECIFICATIONS**

**GENERAL SPECIFICATIONS**

N25CA--

Items		Specifications
Crankcase emission control system	Positive crankcase ventilation (PCV) valve	Variable flow rate type (Purpose: Control of HC emission)
Evaporative emission control system	Canister 2-way valve Purge control valve (PCV) Bowl vent valve (BVV)	Equipped Equipped Single diaphragm type Vacuum type (Purpose: Control of HC emission)
Exhaust emission control	Jet control combustion type system	Jet swirl type (Purpose: Control of CO emission)
	Air fuel ratio control system – FBC system	Oxygen sensor feedback type (Purpose: Control of CO, HC, NOx emission)
	Three catalyst converter	Monolithic type (Purpose: Control of CO, HC, NOx emission)
	Secondary air supply system Reed valve Secondary air control solenoid valve	With air control valve (Purpose: Control of On-off solenoid valve CO, HC emission)
	Exhaust gas recirculation system EGR valve Vacuum regulator valve (VRV) Thermo valve	Single type With vacuum control (Purpose: Control of Wax type NOx emission)
	High altitude compensation system – High altitude specifications for the 49 states and California High altitude compensator (HAC)	(Purpose: Control of CO, HC emission)
	Intake air temperature control system	Bellows type
	Mixture control valve (MCV) – Vehicles with a manual transmission	Vacuum control type (Purpose: Control of CO, HC emission)  Differential pressure type valve (Purpose: Control of CO, HC emission)

**SERVICE SPECIFICATIONS**

N25CB--

Items	Specifications
Secondary air control solenoid valve coil resistance $\Omega$	38 – 44 [at 20°C (68°F)]
Thermo valve opening temperature °C (°F)	18 (64) 65 (149)
High altitude compensator operating altitude m (ft.)	Approx. 1,200 (3,900)

**TORQUE SPECIFICATIONS**

N25CC--

Items	Nm	ft.lbs.
Secondary air pipe control valve side joint	50 – 60	37 – 44
Secondary air pipe exhaust manifold side joint	70 – 100	52 – 74
EGR valve attaching bolt	19 – 28	14 – 20
Thermo valve (for nipples)	20 – 40	15 – 30

## 25-18 EMISSION CONTROL SYSTEM - Specifications / Troubleshooting

### SEALANTS AND ADHESIVES

N25CE--

Items	Specified sealants and adhesives	Quantity
Thermo valve	3M Adhesive Nut Locking 4171 or equivalent	As required

### TROUBLESHOOTING

N25EA--

Symptom	Probable cause	Remedy	Reference page
Engine will not start or is hard to start (Cranking possible)	Vacuum hose disconnected or damaged	Repair or replace	—
	Mixture control valve kept open	Replace	—
	EGR valve kept open	Repair or replace	25-33
Rough idle or engine stalls	Vacuum hose disconnected or damaged	Repair or replace	—
	High altitude compensation system faulty – High altitude specifications for the 49 states, and California	Troubleshoot the system and check components under suspicion	25-36
	EGR valve kept open	Repair or replace	25-33
	Faulty purge control system	Troubleshoot the system and check components under suspicion	25-28
	Faulty bowl vent valve	Replace	25-27
	Mixture control valve kept open	Replace	25-42
	Faulty PCV valve	Replace	25-28
Engine hesitates or poor acceleration	Exhaust gas recirculation system faulty	Troubleshoot the system and check each component under suspicion	25-33
	High altitude compensation system faulty – High altitude specifications for the 49 states, and California	Troubleshoot the system and check components under suspicion	25-36
	Thermo valve faulty – cold engine	Replace	25-29
	Intake air temperature control system faulty	Troubleshoot the system and check components under suspicion	25-41
Excessive oil consumption	Positive crankcase ventilation line clogged	Check positive crankcase ventilation system	Refer to GROUP 0.
Poor fuel mileage	Intake air temperature control system faulty	Troubleshoot the system and check components under suspicion	25-41
	Exhaust gas recirculation system faulty	Troubleshoot the system and check components under suspicion	25-33
	High altitude compensation system faulty – High altitude specifications for the 49 states, and California	Troubleshoot the system and check components under suspicion	25-36

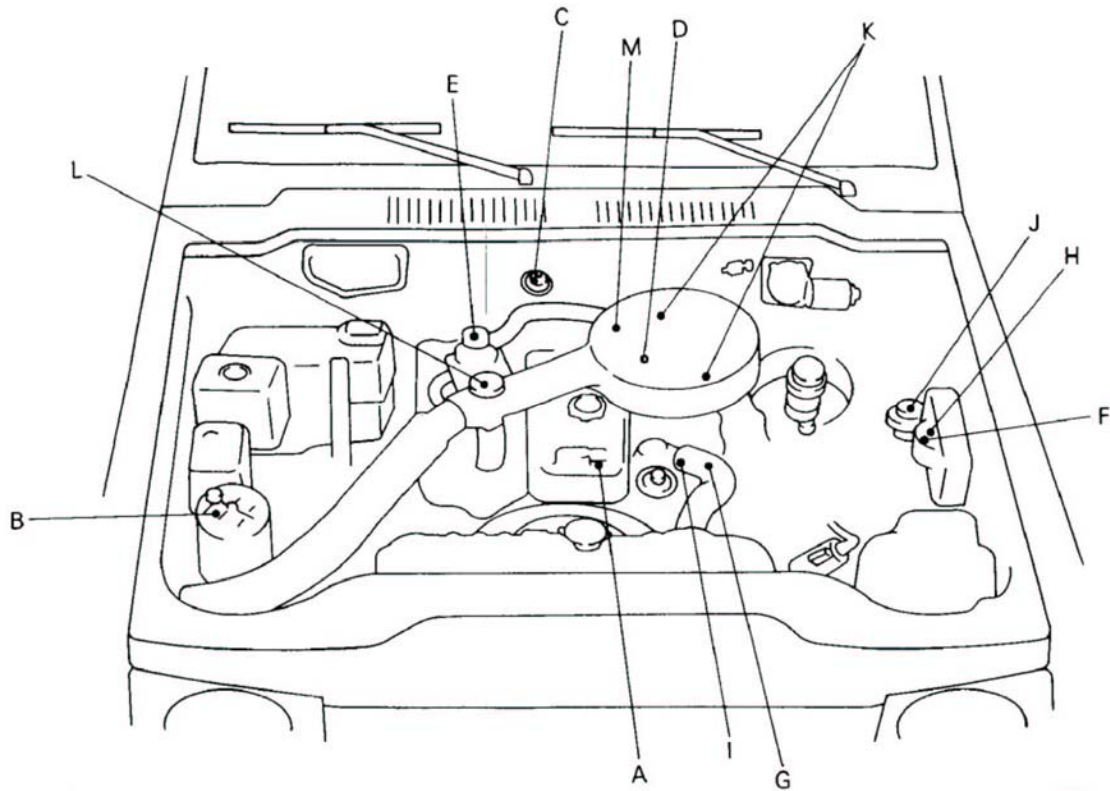
Emission control system	Crankcase emission control system	Evaporative emission control system	Jet air system	Air fuel ratio control system	Three catalyst converter	Secondary air supply system	Exhaust gas recirculation (EGR) system	High-altitude compensation system	Intake air temperature control system	Transmission	Reference page for each part inspection
Related parts	X										Maintenance (Group 0)
PCV valve		X									25-27
Bowl vent valve		X									25-28
Purge control valve		X					X				25-29
Thermo valve		X									25-8
Canister		X									25-30
Overflow limiter (2-way valve)		X									Engine (Group 9)
Jet valve			X								Fuel (Group 14)
FBC system component				X		X					25-30
Three catalyst converter					X						25-31
Secondary air control valve (with reed valve)						X					25-32
Secondary air control solenoid valve							X				25-33
EGR valve							X				25-34
Vacuum regulator valve								X			25-36
High altitude compensator [High altitude specifications for the 49 states (excluding California)]								X			25-40
High altitude compensator....California								X			25-41
Vacuum switching valve [High altitude specifications for the 49 states (excluding California)]								X			25-37
Check valve									X		25-37
Air control valve									X		25-41
Thermo sensor									X		25-42
Mixture control valve....M/T*										X	25-42

\*M/T: Vehicles with a manual transmission



# COMPONENT LAYOUT AND VACUUM HOSE PIPING

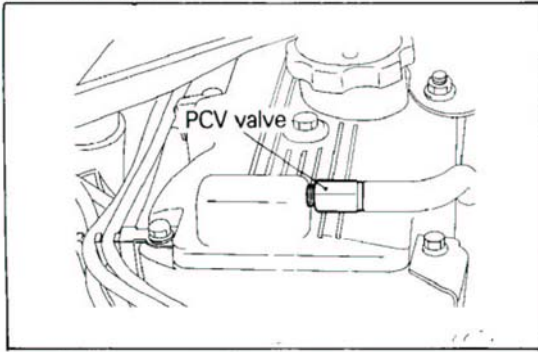
## COMPONENT LAYOUT



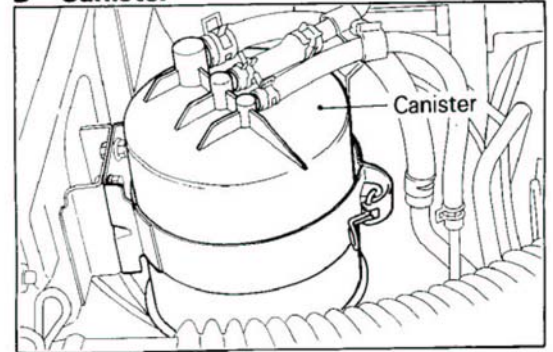
5EM082

- |   |                                      |   |  |
|---|--------------------------------------|---|--|
| A | PCV valve                            | I | Thermo valve   |
| B | Canister                             | J | High-altitude compensator<br>[High-altitude specifications for the 49 states<br>(ex. California), vehicles for California] |
| C | Purge control valve                  | K | Vacuum switching valve [High-altitude<br>specifications for the 49 states]   |
| D | Bowl vent valve                      | L | Air control valve  |
| E | Reed valve                           | M | Mixture control valve<br>(Vehicles with manual transmission)   |
| F | Secondary air control solenoid valve |   |  |
| G | EGR valve                            |   |  |
| H | Vacuum regulator valve               |   |  |

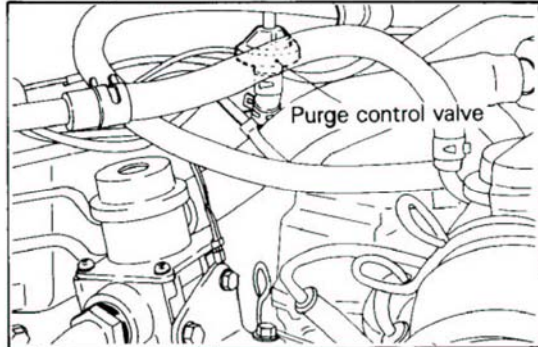
**A PCV valve**



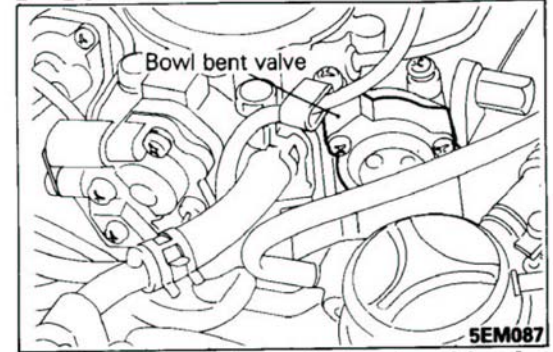
**B Canister**



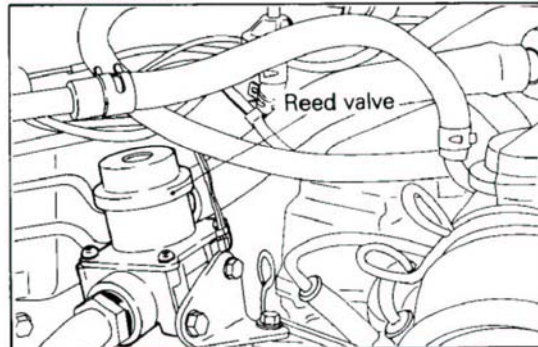
**C Purge control valve**



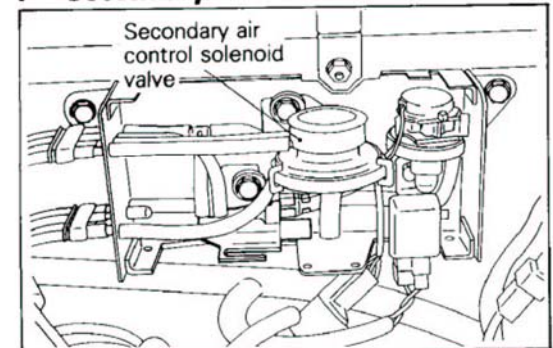
**D Bowl vent valve**



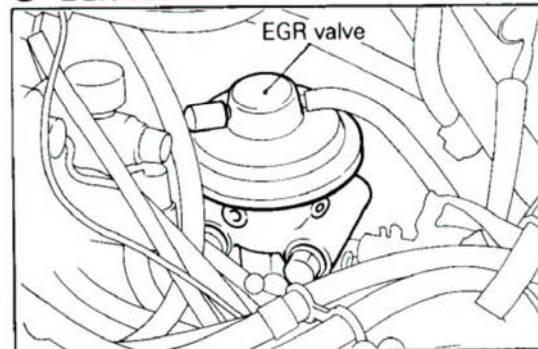
**E Reed valve**



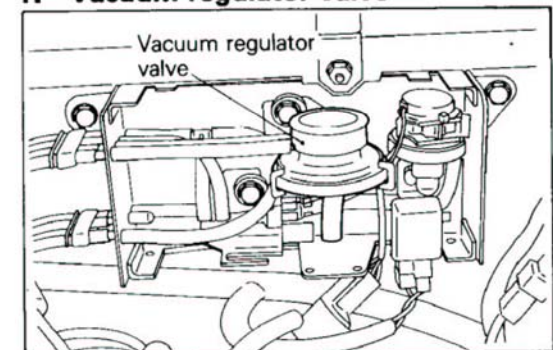
**F Secondary air control solenoid valve**



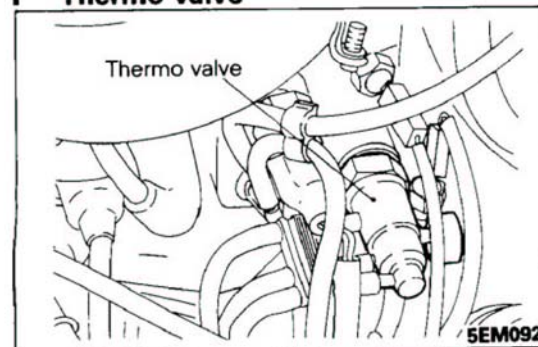
**G EGR valve**



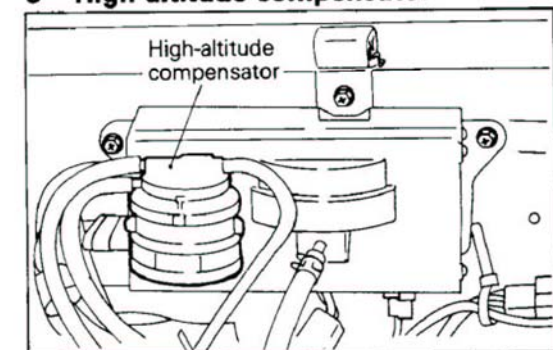
**H Vacuum regulator valve**



**I Thermo valve**

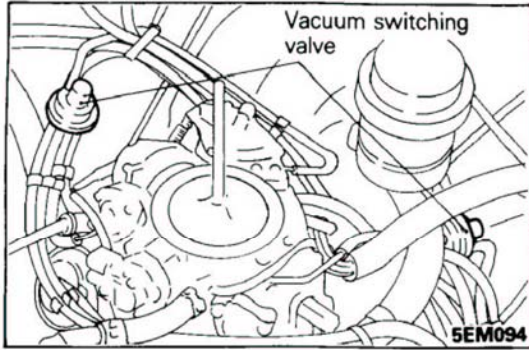


**J High-altitude compensator**

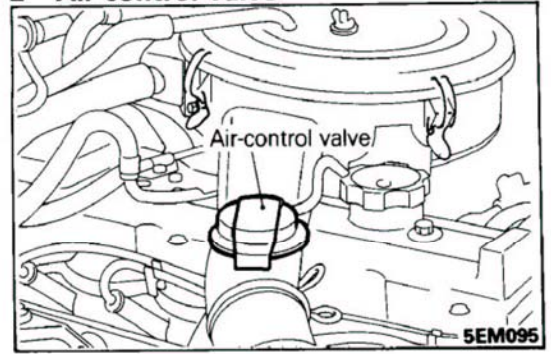


## 25-22 EMISSION CONTROL SYSTEM—Component Layout and Vacuum Hose Piping

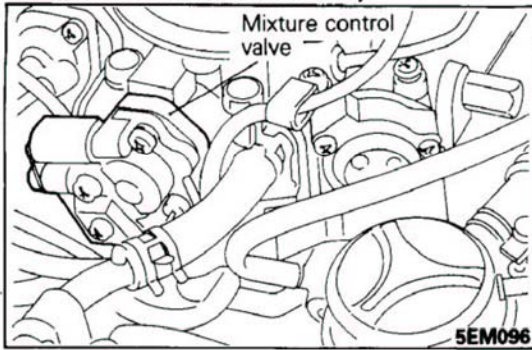
### K Vacuum switching valve



### L Air control valve

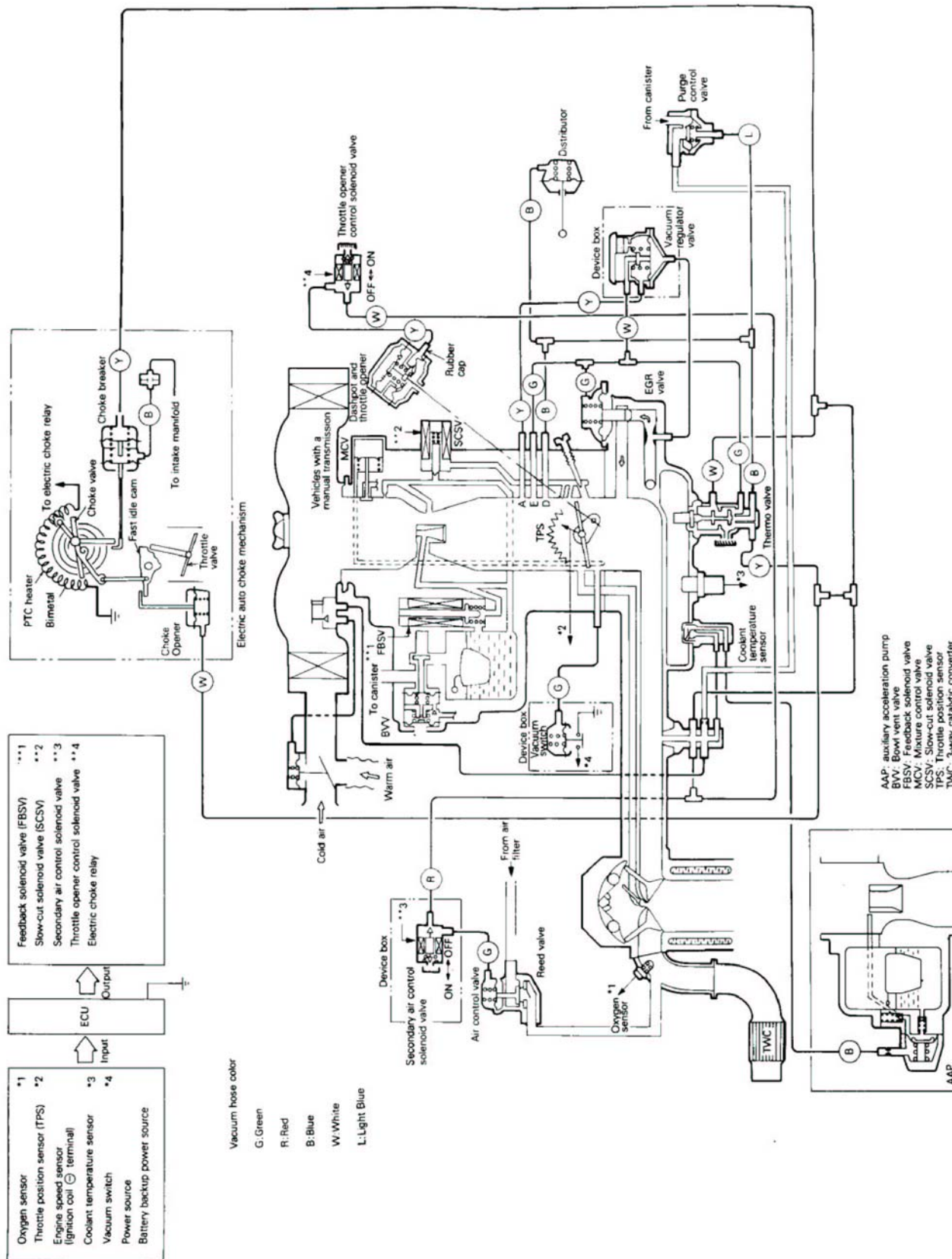


### M Mixture control valve (Vehicles with a manual transmission)

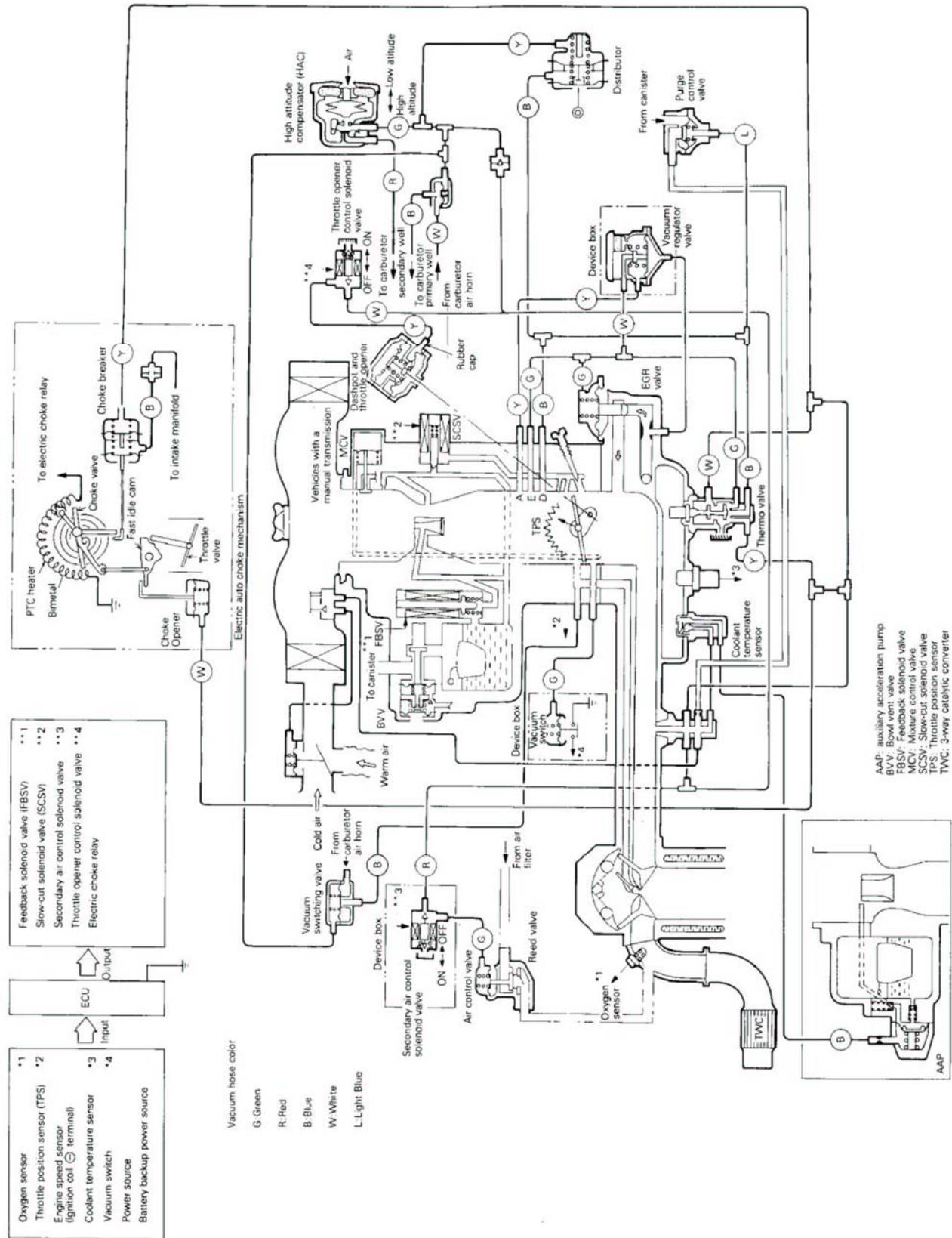


VACUUM HOSE PIPING DIAGRAM-vehicles for the 49 states other than California (excluding high-altitude specification)

5FU115

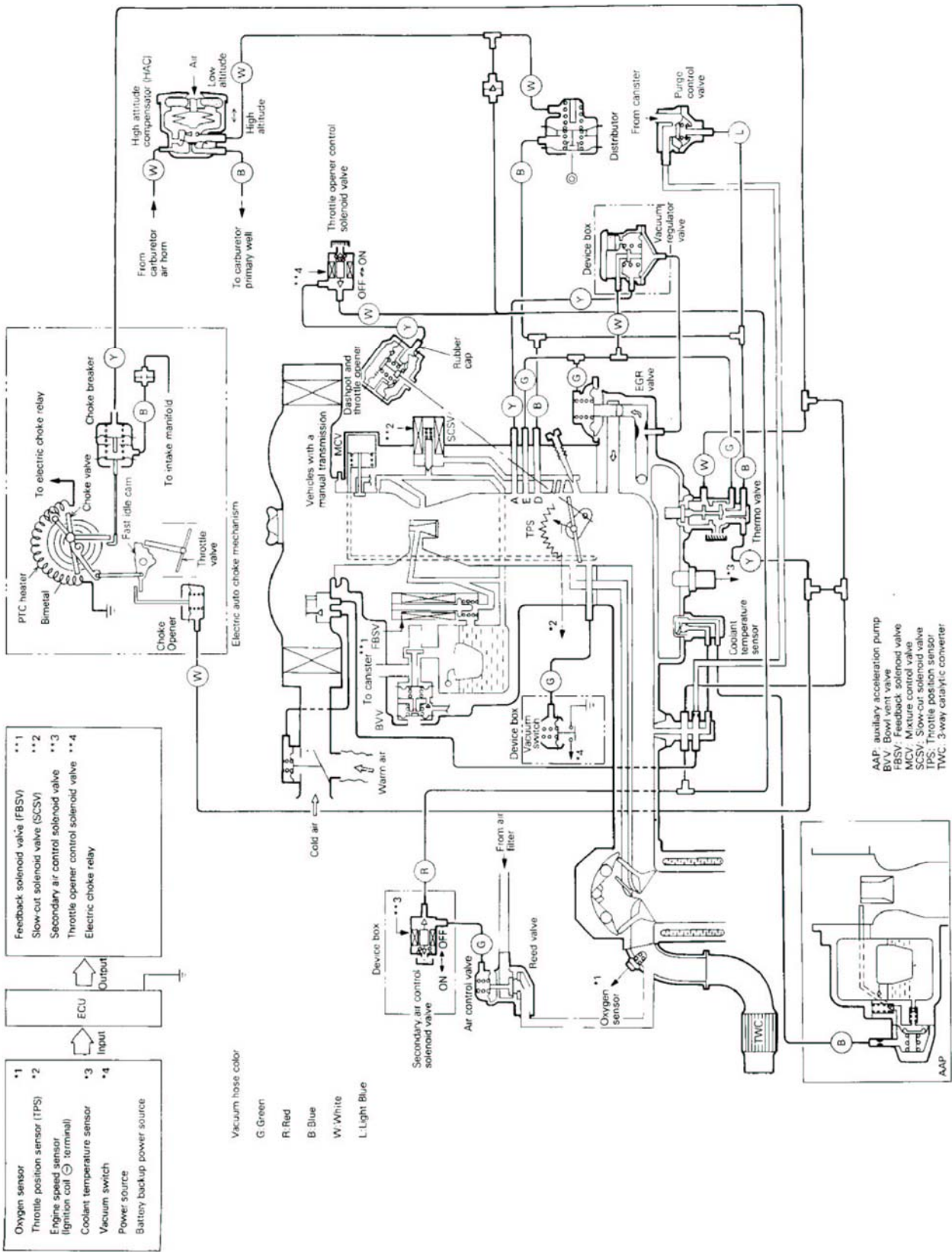


VACUUM HOSE PIPING DIAGRAM-vehicles with high-altitude specifications for the 49 states other than California

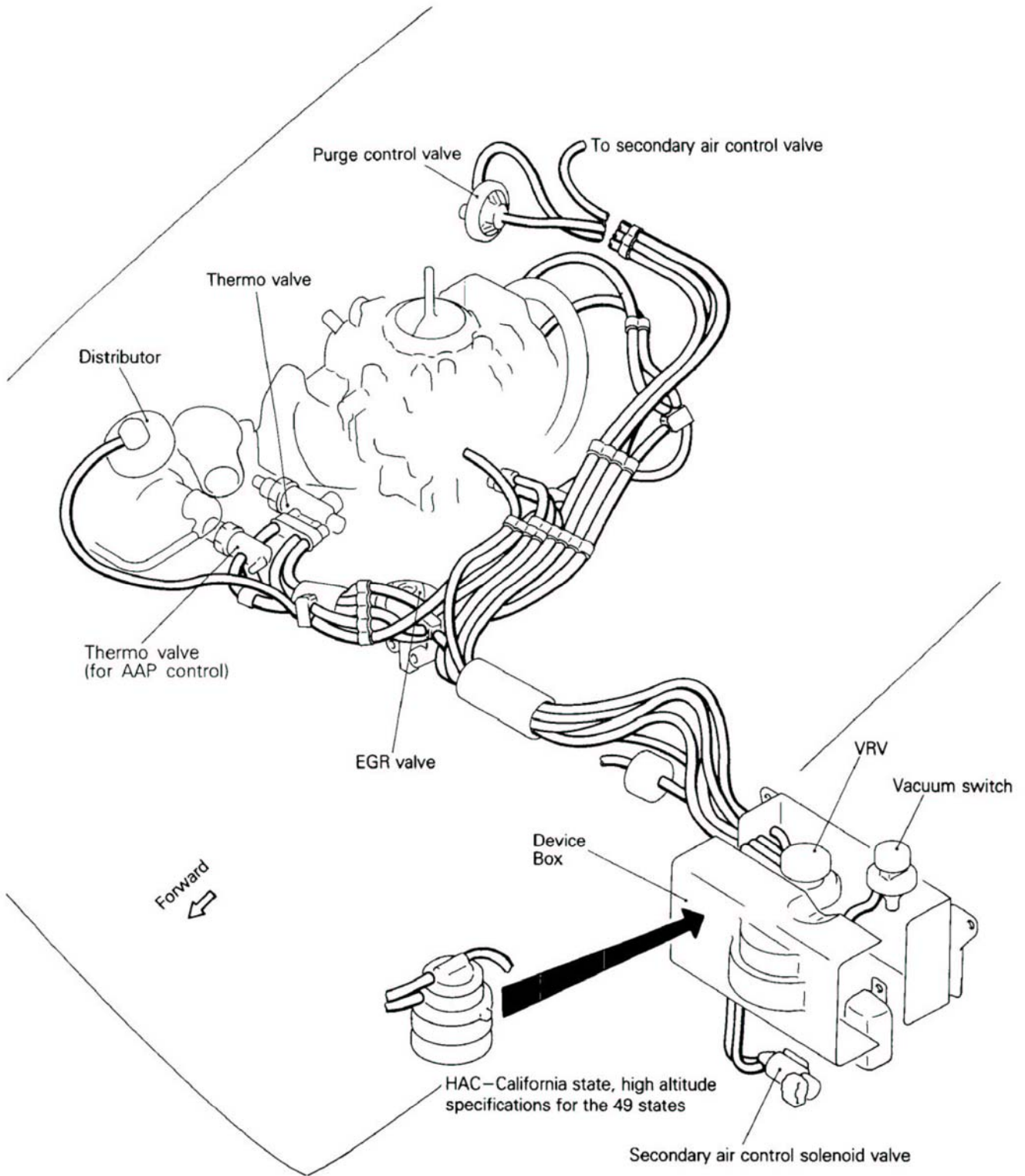


5FU116

VACUUM HOSE PIPING DIAGRAM-vehicles for California



SFU117



**CAUTIONS ON INSPECTION**

N25GALA

1. Adjust the engine before checking the system components.
2. Check hose connections (disengagement, looseness, etc.) and check for break, incorrect piping and damage.
3. Check hoses, pipes and ports for clogging and check hoses and pipes for cracks and damage.
4. When hoses are replaced, be sure to connect to original position (and in original direction).
5. After service, check piping connections referring to service label or service manual.

**CRANKCASE EMISSION CONTROL SYSTEM**

N25IAAA

**INSPECTION OF POSITIVE CRANKCASE VENTILATION (PCV) VALVE**

Refer to GROUP 0 LUBRICATION AND MAINTENANCE—Maintenance Service

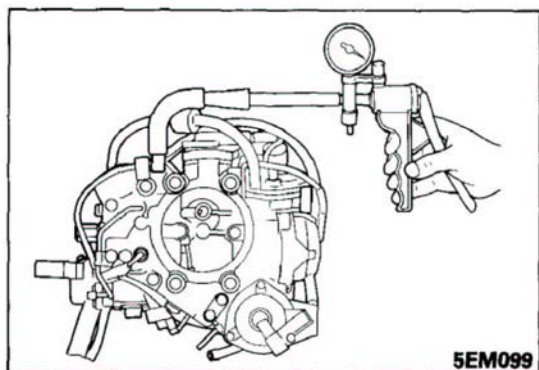
**EVAPORATIVE EMISSION CONTROL SYSTEM**

N25IBAA

**INSPECTION OF BOWL VENT VALVE (BVV)**

**Caution**

**Check after the engine is allowed to cool enough. If the engine is not cold, fuel could gush out from the BVV.**

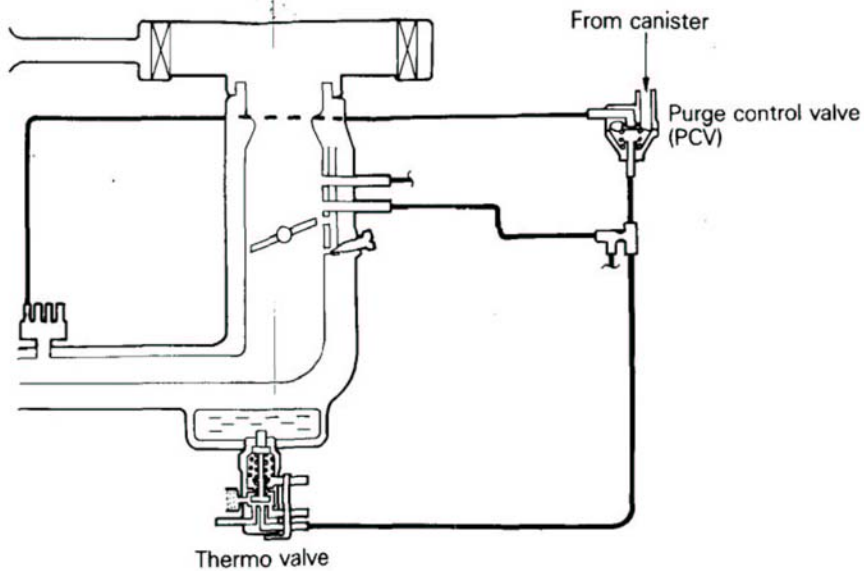


- (1) Remove the air filter.
- (2) Disconnect the bowl vapor hose from the bowl vent valve (BVV) nipple and connect a hand vacuum pump to the BVV nipple.
- (3) Apply a vacuum of 20 kPa (3.0 psi) to the BVV to check the condition as follows.

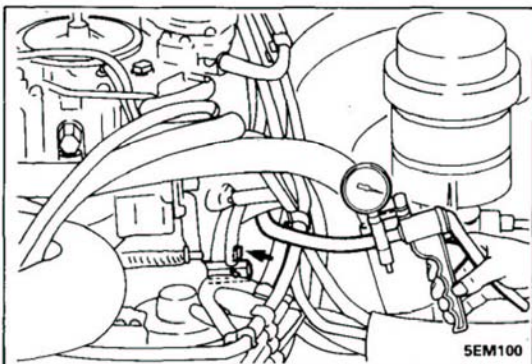
Engine state	Normal condition
Stopped	Vacuum leaks
Idling	Vacuum holds



## INSPECTION OF PURGE CONTROL SYSTEM



5EM030



5EM100

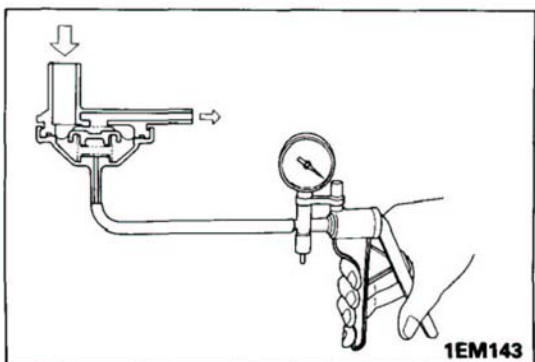
- (1) Disconnect the black vacuum hose from the intake manifold nipple and plug the nipple. Then, connect a hand vacuum pump to the disconnected black vacuum hose.
- (2) Check the following both when the engine is cold [engine coolant temperature 50°C (122°F) or less] and when it is hot [engine coolant temperature 85 to 95°C (185 to 205°F)]

### When engine is cold

Vacuum	Engine state	Normal condition
53 kPa (7.7 psi)	2,500 rpm	Vacuum is held

### When engine is hot

Vacuum	Engine state	Normal condition
53 kPa (7.7 psi)	Idling	Vacuum is held
53 kPa (7.7 psi)	2,500 rpm	Vacuum leaks



1EM143

## INSPECTION OF PURGE CONTROL VALVE (PCV)

NZ5IBCA

- (1) Remove the purge control valve.
- (2) Connect a hand vacuum pump to the vacuum nipple of the PCV.

- (3) Apply a vacuum of 53 kPa (7.7 psi) to check air tightness.
- (4) Blow in air lightly from the canister side nipple to check conditions as follows.

Hand vacuum pump vacuum	Normal condition
0 kPa (No vacuum is applied)	Air does not blow through
27 kPa (3.9 psi) or more	Air blows through

## INSPECTION OF THERMO VALVE

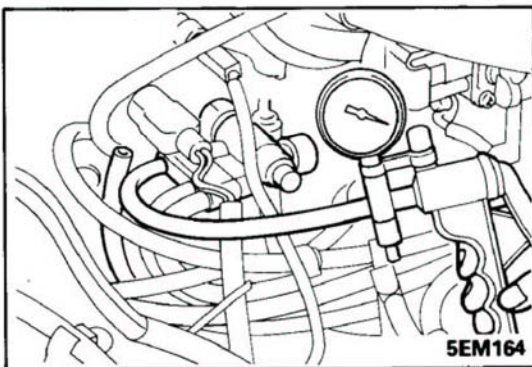
N25IBDA

### NOTE

This thermo valve also controls the choke breaker, EGR and choke opener.

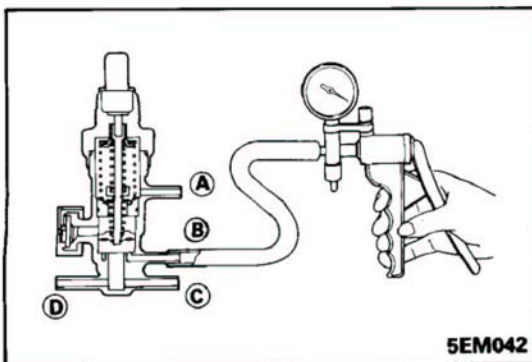
### Caution

1. When removing or installing the thermo valve, do not use wrenches or other tools on the resin part.
2. When installing, apply 3M Adhesive Nut Locking 4171 or equivalent to the threads and tighten to 20 to 40 Nm (15 to 30 ft.lbs.).
3. When disconnecting the vacuum hose, put a mark on the hose so that it may be reconnected at original position.



- (1) Disconnect the vacuum hose (white stripe) from the thermo valve and connect a hand vacuum pump to the thermo valve.
- (2) Apply vacuum to check thermo valve condition as follows.

Engine coolant	Normal condition
10°C (50°F) or less	Vacuum leaks
25°C (77°F) or more	Vacuum holds



- (3) Disconnect all vacuum hoses from the thermo valve.
- (4) Connect a hand vacuum pump to nipples (B), (C) and (D) and apply vacuum to check thermo valve condition as follows.

### NOTE

Plug nipples other than one to which the hand vacuum pump is connected.

Engine coolant temperature	Normal condition
40°C (104°F) or less	Vacuum leaks
80°C (176°F) or more	Vacuum holds

**INSPECTION OF OVERFILL LIMITER (TWO-WAY VALVE)**

N25IBEA

Refer to GROUP 14 FUEL SYSTEM-Fuel Tank.

**EXHAUST EMISSION CONTROL SYSTEM**

N25ICAA

**INSPECTION OF AIR FUEL RATIO CONTROL (FBC) SYSTEM**

Refer to GROUP 14 FUEL SYSTEM-Inspection of FBC System.

**INSPECTION OF THREE CATALYST CONVERTER**

N25ICBA

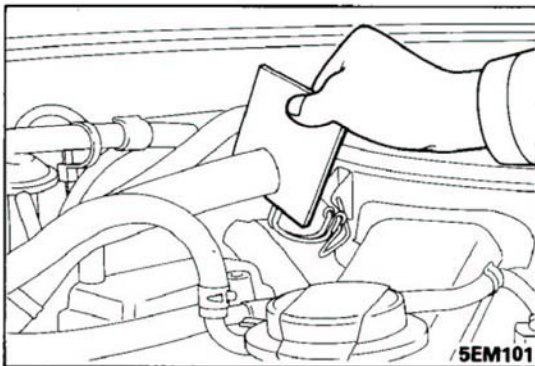
For removal and installation procedures, refer to GROUP 11 INTAKE AND EXHAUST-Exhaust Pipes and Main Muffler.

**INSPECTION**

Check for damage, cracks or fusion and replace if faulty.

**Caution**

1. Operation of any type, including idling, should be avoided if engine misfiring occurs. Under this condition the exhaust system will operate at abnormally high temperature, which may cause damage to the catalyst or under-body parts of the vehicle.
2. Alteration or deterioration of ignition or fuel system, or any type of operating condition which results in engine misfiring must be corrected to avoid overheating the catalytic converters.
3. Proper maintenance and tuneup according to manufacturer's specifications should be made to correct the conditions as soon as possible.

**INSPECTION OF SECONDARY AIR SUPPLY SYSTEM**

N25ICCA

- (1) Disconnect the air supply hose from the air filter and hold a small steel plate at the disconnected hose end to check air suction.

Engine coolant temperature	Engine state	Air suction
20-40°C (68-104°F)	Idling	Yes
70°C (158°F) or more		Yes (within 70 seconds after start)
		No (70 seconds or more after start)
	Rapid deceleration from 4,000 rpm	Yes

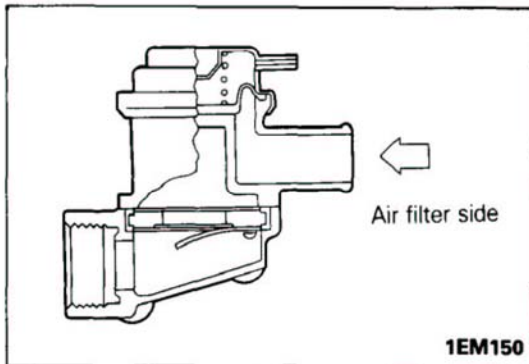
**Caution**

Note that if secondary air control valve is broken, emission may blow back.

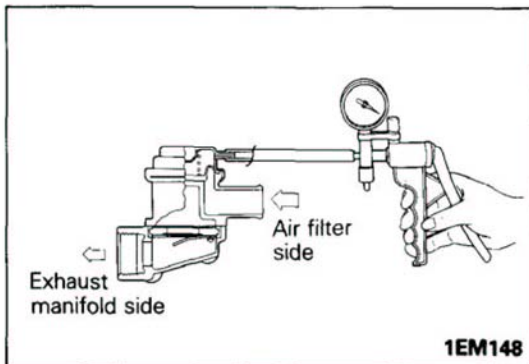
**INSPECTION OF SECONDARY AIR CONTROL VALVE**

N251CFA

- (1) Remove the secondary air control valve.



- (2) Blow in air from the air filter side to check that air does not blow through.



- (3) Connect a hand vacuum pump to the secondary air control valve nipple.  
 (4) Apply a vacuum of 67 kPa (9.7 psi) and check air tightness.

- (5) Apply a vacuum of 20 kPa (3.0 psi) and blow in air to check condition as follows.

Air blow direction	Normal condition
Air filter side to exhaust manifold side	Air blows through
Exhaust manifold side to air filter side	Air does not blow through

- (6) If any fault is found in above checks, replace the secondary air control valve.

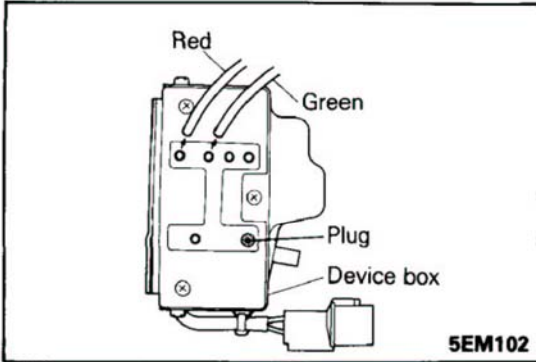
**Secondary air control valve tightening torque :**  
**50-60 Nm (37-44 ft.lbs.)**

**INSPECTION OF SECONDARY AIR CONTROL SOLENOID VALVE**

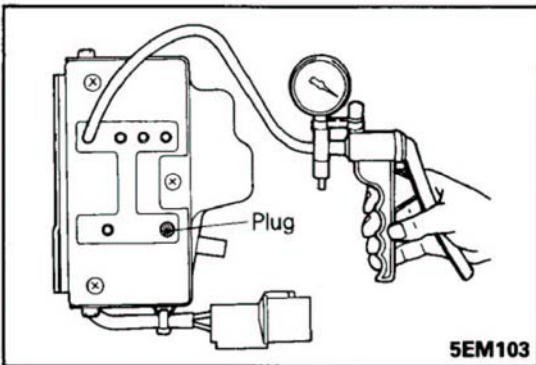
N25KCGC

**NOTE**

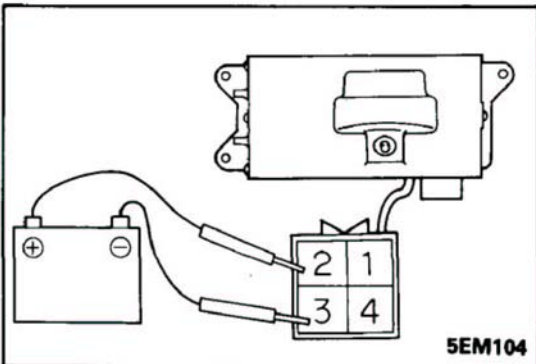
When disconnecting the vacuum hose, put a mark on the hose so that it may be reconnected at original position.



- (1) Disconnect the vacuum hoses, (red stripe, green stripe) from the device box.
- (2) Separate the harness connector.

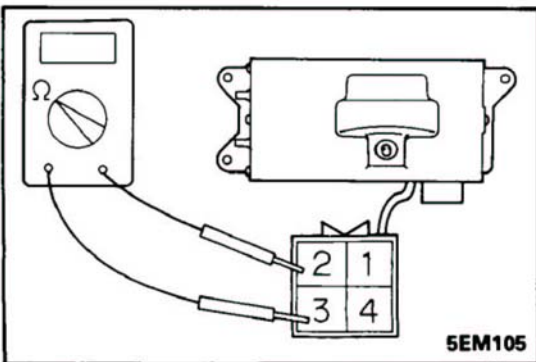


- (3) Connect a hand vacuum pump to the nipple to which red stripe vacuum hose has been connected.



- (4) Apply vacuum and check air tightness both when the battery voltage is applied directly to the solenoid valve terminal and when not applied

Battery voltage	Other nipple of device box	Normal condition
When applied	Open	Vacuum leaks
	Closed with finger	Vacuum holds
When not applied	Open	Vacuum holds



- (5) Measure solenoid coil resistance.

**Standard value : 38 – 44 [at 20°C (68°F)]**

**INSPECTION OF ENGINE COOLANT TEMPERATURE SENSOR**

N251CHA

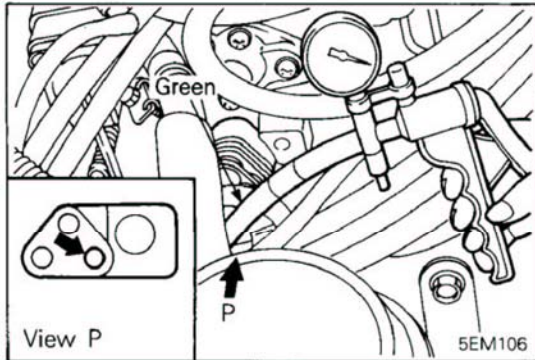
**INSPECTION OF ENGINE SPEED SENSOR**

**INSPECTION OF VACUUM SWITCH**

Refer to GROUP 14 FUEL SYSTEM – Service Adjustment Procedures.

**INSPECTION OF THERMO VALVE**

Refer to PURGE CONTROL SYSTEM, P.25-28.



**INSPECTION OF EXHAUST GAS RECIRCULATION (EGR) SYSTEM**

N251CA

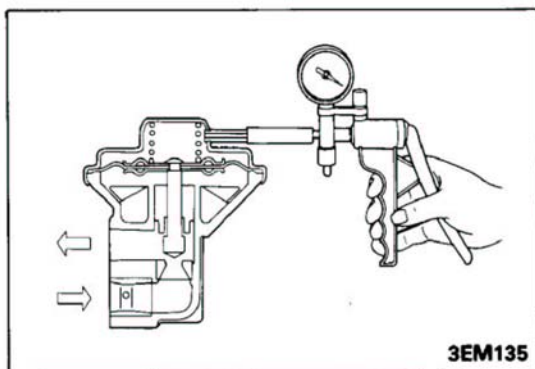
- (1) Disconnect the vacuum hose (green stripe) from the carburetor throttle body and connect a hand vacuum pump to the vacuum hose.
- (2) Check the following both when the engine is cold [engine coolant temperature 45°F (113°F) or less] and when it is hot [engine coolant temperature 85 to 95°C (185 to 205°F)]

**When engine is cold**

Vacuum	Engine state	Normal condition
Apply vacuum	3,500 rpm	Vacuum leaks - from thermo valve into atmosphere

**When engine is hot**

Vacuum	Engine state	Normal condition
Apply vacuum	Idling	Vacuum leaks
	3,500 rpm	Leaks until vacuum reaches about 11 kPa (1.5 psi)



**INSPECTION OF EGR VALVE**

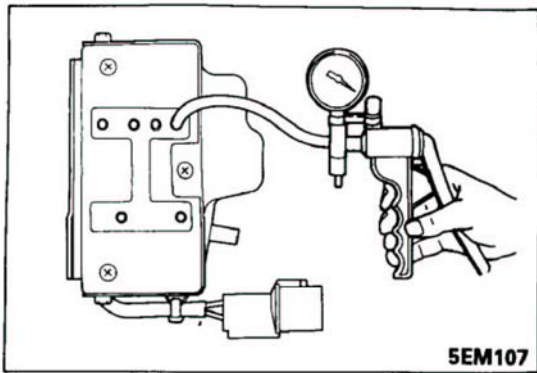
N251CA

- (1) Remove the EGR valve and check it for sticking, deposit of carbon, etc. If such condition exists, clean with adequate solvent to ensure tight valve seat contact.
- (2) Connect a hand vacuum pump to the EGR valve.
- (3) Apply a vacuum of 67 kPa (9.7 psi) and check air tightness.
- (4) Blow in air from one passage of the EGR to check condition as follows.

Vacuum	Normal condition
8 kPa (1.2 psi) or less	Air does not blow through
23 kPa (3.3 psi) or more	Air blows through

**Caution**

**When installing the EGR, use a new gasket and tighten to 7 to 11 Nm (5 to 8 ft.lbs.).**



**INSPECTION OF VACUUM REGULATOR VALVE (VRV)**

N25ICLA

- (1) Disconnect the vacuum hose (white stripe) from the device box and connect a hand vacuum pump to the device box.
- (2) Apply a vacuum of 53 kPa (7.7 psi) and check VRV condition as follow.

Engine state	Normal condition
Stopped	Vacuum leaks
3,500 rpm	Vacuum holds

**INSPECTION OF EGR VALVE CONTROL VACUUM**

N25ICMA

**INSPECTION OF VRV CONTROL VACUUM**

Refer to GROUP 14 FUEL SYSTEM – Service Adjustment Procedures.

**INSPECTION OF THERMO VALVE**

N25ICNA

Refer to PURGE CONTROL SYSTEM, P.25-28.

**INSPECTION OF HIGH ALTITUDE COMPENSATION SYSTEM – High altitude specifications for the 49 states (excluding California)**

N25ICOE

**INSPECTION AT ALTITUDE BELOW 1,200 m (3,900 ft.)**

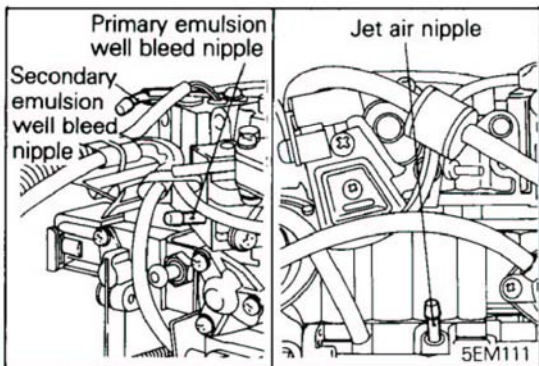
**NOTE**

When disconnecting the vacuum hose, put a mark on the hose so that it may be reconnected at original position.

**Inspection Condition**

Engine coolant temperature: 85 - 95°C (185 - 205°F)

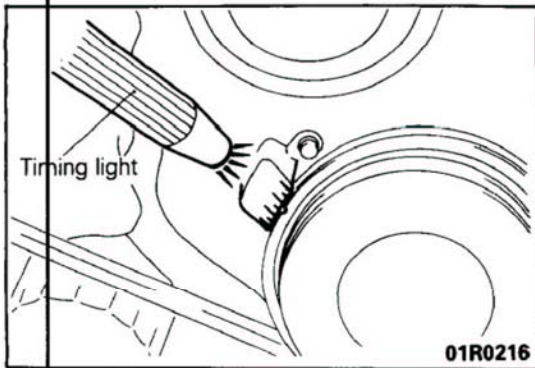
- (1) Set the timing light.
- (2) Remove the air filter.



- (3) Disconnect the vacuum hoses (black, red stripe, black) from the carburetor primary emulsion well bleed nipple, secondary emulsion well bleed nipple and jet air nipple and plug the nipples.

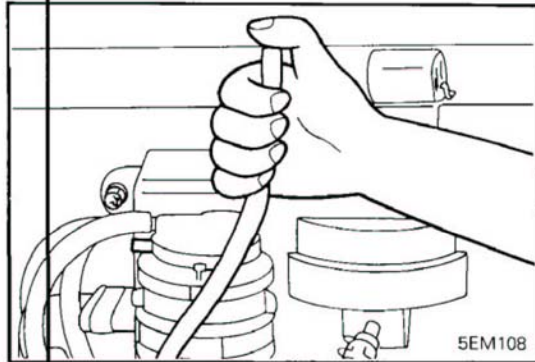
- (4) Connect a hand vacuum pump to the vacuum hoses, one hose at a time, and check air tightness while running the engine at idle.

Step	vacuum hose	Normal condition
1	Primary emulsion well (black)	Vacuum holds
2	Secondary emulsion well (red stripe)	
3	Jet air (black)	



- (5) Connect the disconnected vacuum hoses to original position.
- (6) Run the engine at idle and check ignition timing.

**Standard value : 7°BTDC ± 2°**



- (7) While running the engine at idle, disconnect the vacuum hose (yellow stripe) from the HAC and put a finger at the hose end to check that vacuum is felt.

**INSPECTION AT ALTITUDE ABOVE 1,200 m (3,900 ft.)**

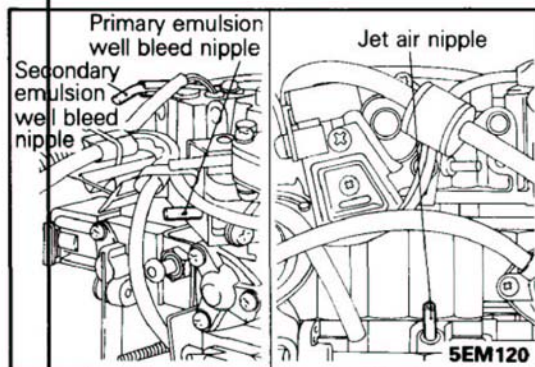
**NOTE**

When disconnecting the vacuum hose, put a mark on the hose so that it may be reconnected at original position.

**Inspection Condition**

Engine coolant temperature : 85 - 95°C (185 - 205°F)

- (1) Set the timing light.
- (2) Remove the air filter.



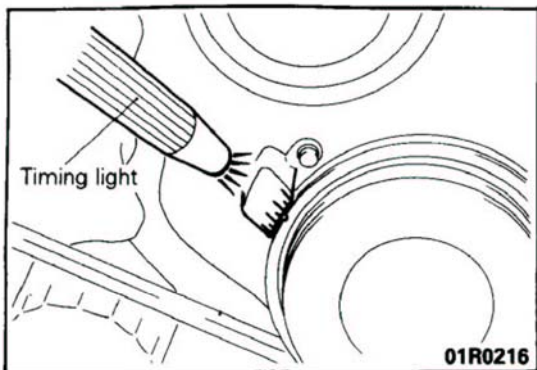
- (3) Disconnect the vacuum hoses (black, red stripe, black) from the carburetor primary emulsion well bleed nipple, secondary emulsion well bleed nipple and jet air nipple.

- (4) Connect a hand vacuum pump to the vacuum hoses, one hose at a time, and check air tightness while running the engine at idle.

Step	Vacuum hose	Normal condition
1	Primary emulsion well (black)	Vacuum leaks
2	Secondary emulsion well (red stripe)	
3	Jet air (black)	

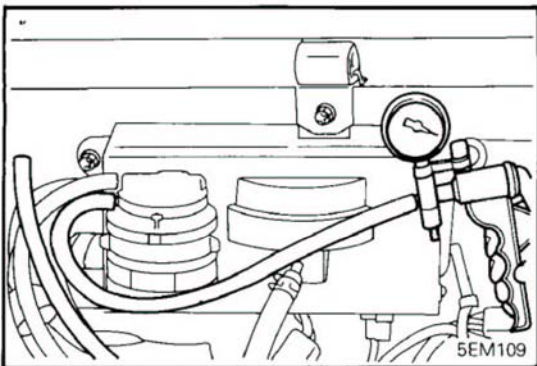
- (5) Connect the disconnected vacuum hoses to original position.





(6) Run the engine at idle and check ignition timing.

Standard value : Approx. 12°BTDC

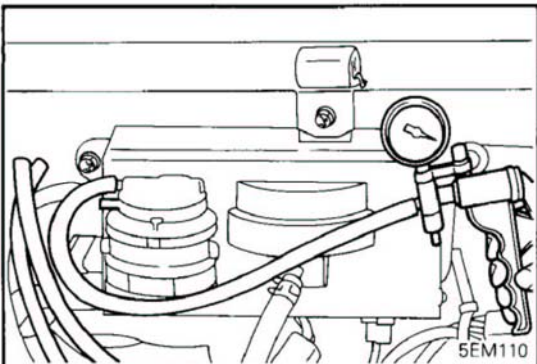


**INSPECTION OF HIGH ALTITUDE COMPENSATOR (HAC) – High altitude specifications for the 49 states (excluding California)**

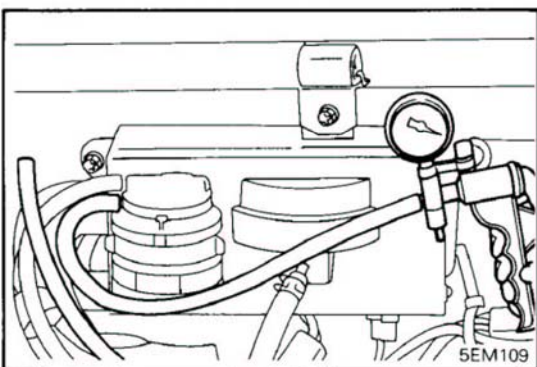
N251CPC

**INSPECTION AT ALTITUDE BELOW 1,200 m (3,900 ft.)**

- (1) Disconnect the vacuum hose (yellow stripe) from the HAC and connect a hand vacuum pump to the HAC nipple.
- (2) Apply vacuum and check that it leaks and does not hold.

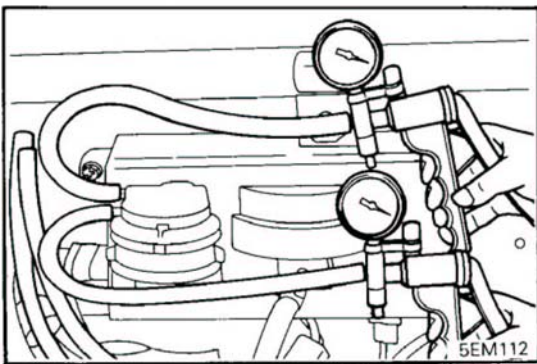


- (3) Disconnect the vacuum hose (red stripe) from the HAC and connect a hand vacuum pump to the HAC nipple.
- (4) Check that vacuum holds when applied.



**INSPECTION AT ALTITUDE ABOVE 1,200 m (3,900 ft.)**

- (1) Disconnect the vacuum hose (yellow stripe) from the HAC and connect a hand vacuum pump to the HAC nipple.
- (2) Check that vacuum holds when applied.



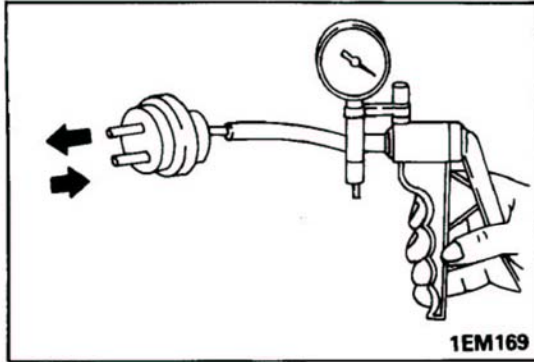
- (3) Disconnect the vacuum hose (red stripe) from the HAC and connect another hand vacuum pump to the HAC nipple.
- (4) With vacuum held as in step (2), check that vacuum leaks and does not hold.

**INSPECTION OF VACUUM SWITCHING VALVE (VSV) – High altitude specifications for the 49 states (excluding California)**

N25KCB

NOTE

When disconnecting the vacuum hose, put a mark on the hose so that it may be reconnected at original position.



- (1) Remove the vacuum switching valve (VSV).
- (2) Connect a hand vacuum pump to the black vacuum nipple of the VSV.
- (3) Apply a vacuum of 53 kPa (7.7 psi) and check air tightness.

- (4) Blow in air lightly from the carburetor air bleed side nipple and check condition as follows.

Hand vacuum pump vacuum	Normal condition
27 kPa (3.9 psi) or less	Air does not blow through
34 kPa (4.8 psi) or more	Air blows through

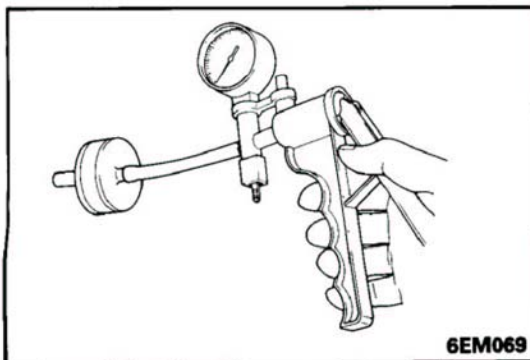
**INSPECTION OF CHECK VALVE – High altitude specifications for the 49 states (excluding California), and vehicles for California**

N25K1C

NOTE

When disconnecting the vacuum hose, put a mark on the hose so that it may be reconnected at original position.

- (1) Remove the check valve.



- (2) Connect a hand vacuum pump to the check valve and check air tightness.

Color of nipple to which hand vacuum pump is connected	Normal condition
Dark blue	Vacuum leaks
White	Vacuum holds

**INSPECTION OF CARBURETOR BLEED AIR PASSAGE CLOGGING (INSPECTION OF CARBURETOR HIGH ALTITUDE COMPENSATION FUNCTION)**

N251CVA

Refer to GROUP 14 FUEL SYSTEM—Service Adjustment Procedures.

**INSPECTION OF HIGH ALTITUDE COMPENSATION SYSTEM – Vehicles for California**

N251COF

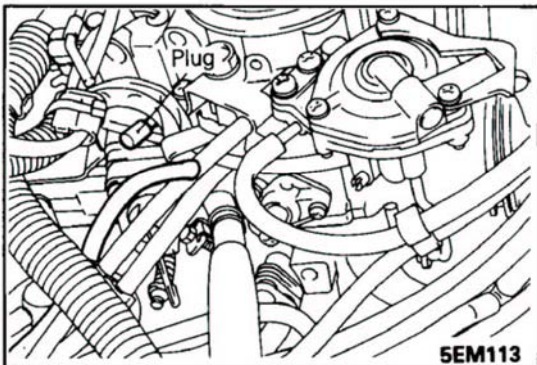
**INSPECTION AT ALTITUDE BELOW 1,200 m, (3,900 ft.)**

**NOTE**

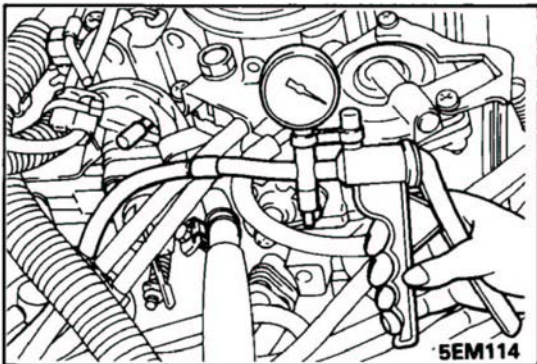
When disconnecting the vacuum hose, put a mark on the hose so that it may be reconnected at original position.

**Inspection Condition**

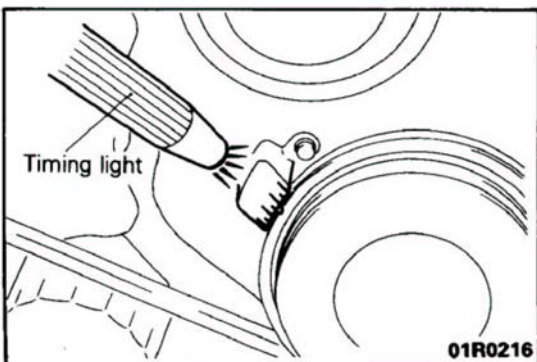
Engine coolant temperature : 85 – 95°C (185 – 205°F)



- (1) Set the timing light.
- (2) Remove the air filter.
- (3) Disconnect the vacuum hose (black) from the carburetor primary emulsion well bleed nipple and plug the nipple.

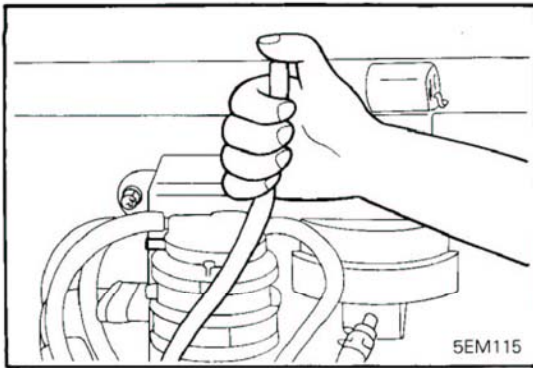


- (4) Connect a hand vacuum pump to the vacuum hose and check that vacuum is held when applied while running the engine at idle.



- (5) Connect the disconnected vacuum hose to original position.
- (6) Run the engine at idle and check ignition timing.

**Standard value : 7°BTDC ± 2°**



- (7) While running the engine at idle, disconnect the vacuum hose (white stripe, two nipples side) from the HAC and hold a finger at the hose end to check that vacuum is felt.

**INSPECTION AT ALTITUDE ABOVE 1,200 m (3,900 ft.)**

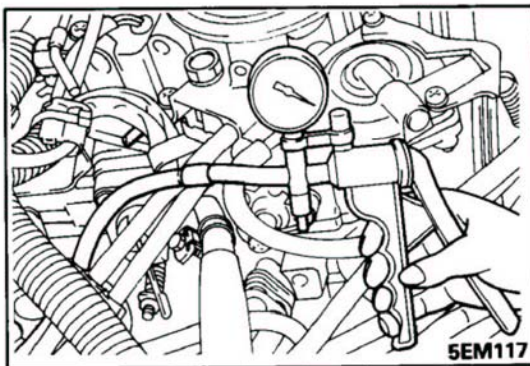
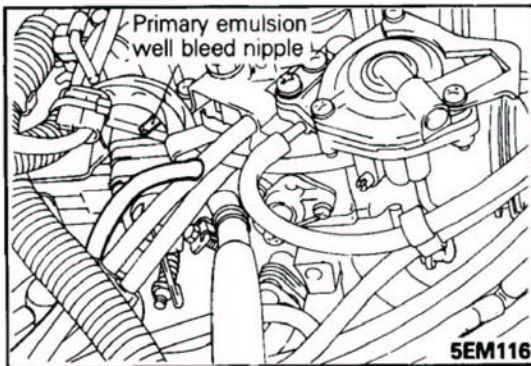
**NOTE**

When disconnecting the vacuum hose, put a mark on the hose so that it may be reconnected at original position.

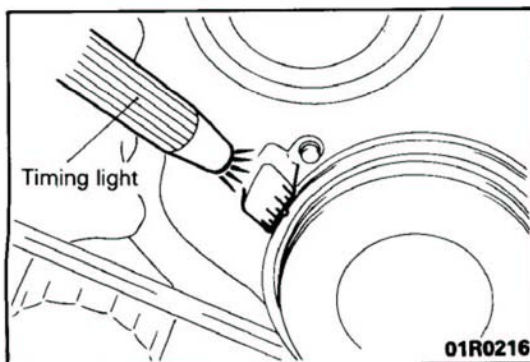
**Inspection Condition**

Engine coolant temperature : 85–95°C(185 –205°F)

- (1) Set the timing light.
- (2) Remove the air filter.
- (3) Disconnect the vacuum hose (black) from the carburetor primary emulsion well bleed nipple.



- (4) Connect a hand vacuum pump to the vacuum hose and while running the engine at idle, apply vacuum to check the pressure leaks and does not build up.



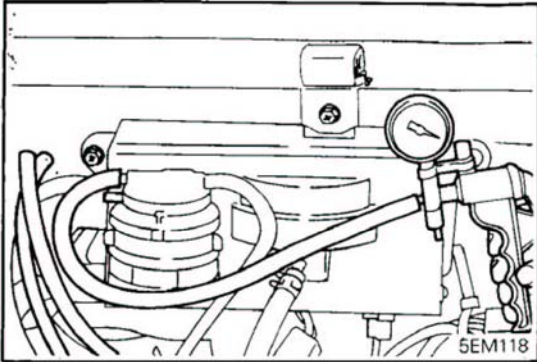
- (5) Connect the disconnected vacuum hose to original position.
- (6) Run the engine at idle and check ignition timing.

**Standard value : Approx. 12°BTDC**

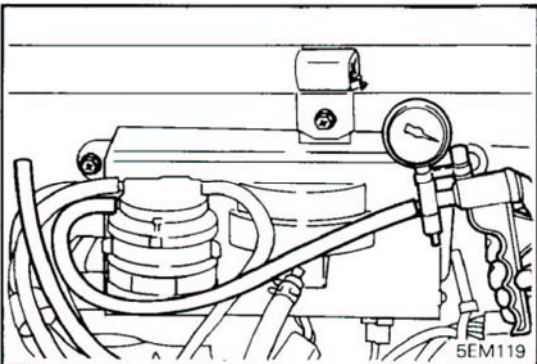
**INSPECTION OF HIGH ALTITUDE COMPENSATOR (HAC) - Vehicles for California**

N25ICPD

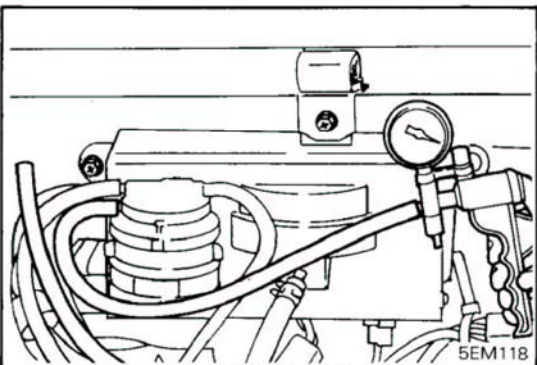
**INSPECTION AT ALTITUDE BELOW 1,200 m (3,900 ft.)**



- (1) Disconnect the vacuum hose (white stripe, two nipples side) from the HAC and connect a hand vacuum pump to the HAC nipple.
- (2) Apply vacuum and check that it leaks and does not hold.

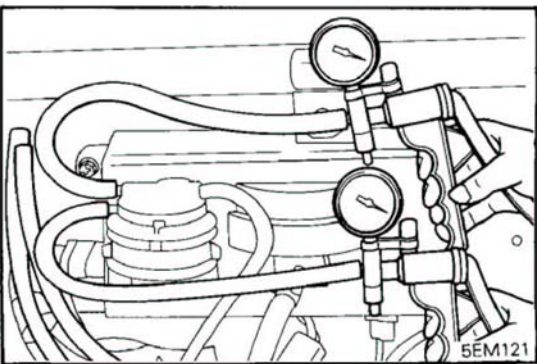


- (3) Disconnect the vacuum hose (black) from the HAC and connect a hand vacuum pump to the HAC nipple.
- (4) Check that vacuum holds when applied.

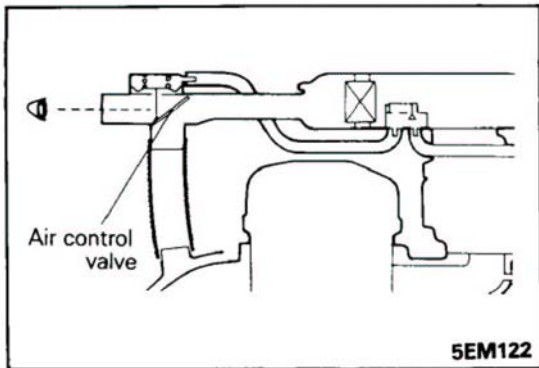


**INSPECTION AT ALTITUDE ABOVE 1,200 m (3,900 ft.)**

- (1) Disconnect the vacuum hose (white stripe, two nipples side) from the HAC and connect a hand vacuum pump to the HAC nipple.
- (2) Check that vacuum holds when applied.



- (3) Disconnect the vacuum hose (black) from the HAC and connect another hand vacuum pump to the HAC nipple.
- (4) Holding the vacuum applied in procedure 2, apply vacuum and check that it leaks and does not hold.

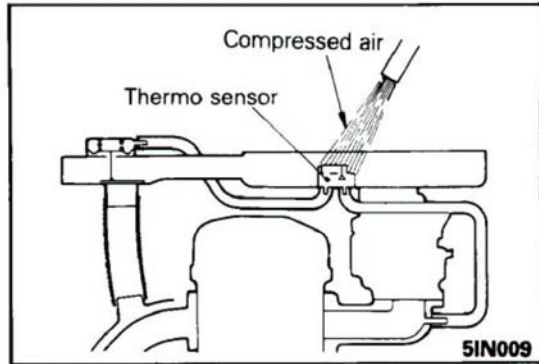


**INSPECTION OF INTAKE AIR TEMPERATURE CONTROL SYSTEM**

N25KCSA

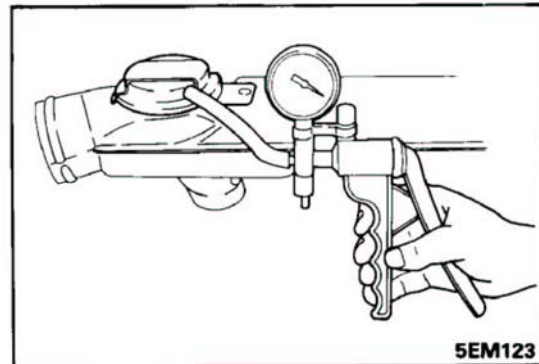
- (1) Remove the air filter cover and air duct.
- (2) Run the engine at idle and check air control valve condition.

Thermo sensor temperature	Normal condition
30°C (86°F) or less	Cold air side inlet closes
45°C (113°F) or more	Cold air side inlet opens



**NOTE**

If necessary, apply compressed air to cool or apply hot air using a hair dryer, etc. to heat.

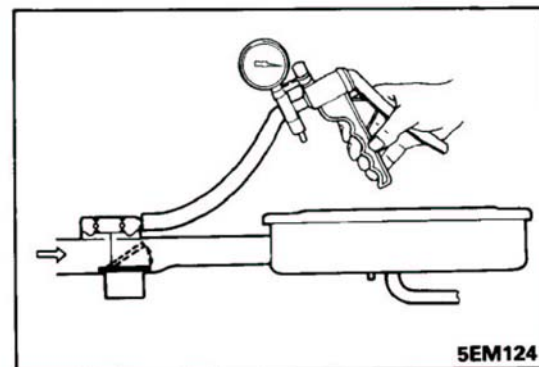


**INSPECTION OF AIR CONTROL VALVE AND THERMO SENSOR**

N25ICTA

**INSPECTION OF AIR CONTROL VALVE**

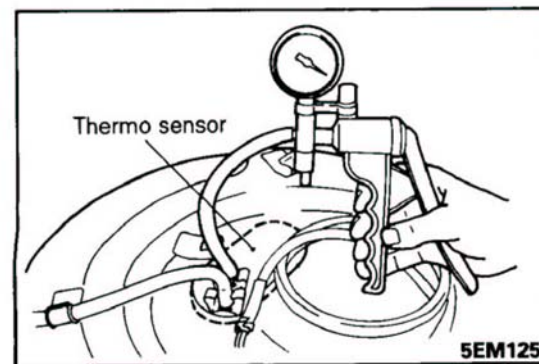
- (1) Remove the air filter.
- (2) Disconnect the vacuum hose from the air control valve and connect a hand vacuum pump to the valve nipple.
- (3) Apply a vacuum of 67 kPa (9.7 psi) and check air tightness.



- (4) Check air control valve operation.

Vacuum	Normal condition
9 kPa (1.4 psi) or less	Cold air side inlet opens
25 kPa (3.7 psi) or more	Cold air side inlet closes

- (5) Connect the disconnected vacuum hose to the original position.

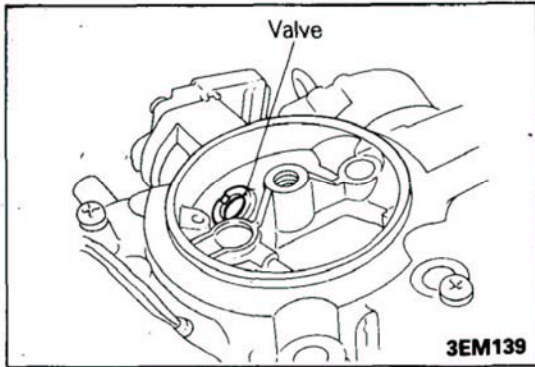


**INSPECTION OF THERMO SENSOR**

- (1) Connect a hand vacuum pump to the thermo sensor nipple and check air tightness.

Thermo sensor temperature	Normal condition
30°C (86°F) or less	Vacuum holds
45°C (113°F) or more	Vacuum leaks

(2) If any fault is found in above checks, replace the air filter body.



**INSPECTION OF MIXTURE CONTROL VALVE (MCV)  
– Vehicles with a manual transmission** N251CUB

**Caution**

**Check the valve after warming up the engine.**

- (1) Remove the air filter.
- (2) Start the engine and open and close the throttle valve quickly to check MCV operation and air suction noise.

Engine speed	Normal condition	
	MCV valve operation	Air suction noise
Throttle lever in operation	Pops out once and quickly closes	Heard
Idling	Remains closed	Not heard





