SUZUKI

VITARA

SERVICE MANUAL

SUZUKI
Caring for Customers

99500-60A10-01E
（英）

IMPORTANT

WARNING/CAUTION/NOTE

Please read this manual and follow its instructions carefully. To emphasize special information, the words **WARNING, CAUTION,** and **NOTE** have, special meanings. Pay special attention to the messages highlighted by these signal words.

WARNING:
Indicates a potential hazard that could result in death or injury.

CAUTION:
Indicates a potential hazard that could result in vehicle damage.

NOTE:

Indicates special information to make maintenance easier or instructions clearer.

FOREWORD

This manual contains procedures for diagnosis, maintenance adjustments, minor service operations, replacement of components (Service) and for disassembly and assembly of major components (Unit Repair-Overhaul).

Applicable model:
VITARA 3 DOOR MODEL vehicles of and after following body No.

For European Market	For Other Markets
X JSAETA01C00160001 X –	TA01C–110001–
X JSAETA01V00140001 X –	TA01V–110001–

The contents are classified into sections each of which is given a section number as indicated in the "Table of Contents" on this page. And on the first page of each individual section is an index of that section.

This manual should be kept in a handy place for ready reference of the service work. Strict observance of the so specified items will enable one to obtain the full performance of the vehicle.

When replacing parts or servicing by disassembling, it is recommended to use SUZUKI genuine parts, tools, and service materials (lubricants, sealants, etc.) as specified in each description.

All information, illustrations, and specifications contained in this literature are based on the latest product information available at the time of publication approval. As this service manual is intended mainly for the left hand steering vehicle, it is possible that some illustrations do not correspond to the right hand steering vehicle. The right is reserved to make changes at any time without notice.

NOTE:
- **"CARBURETOR MODEL" as used in this manual means the vehicle equipped with a carburetor and "FUEL INJECTION MODEL" the vehicle equipped with an electronic fuel injection system.**
- **For related service manuals, refer to next page.**

SUZUKI MOTOR CORPORATION
TECHNICAL DEPARTMENT
AUTOMOBILE SERVICE DIVISION

TABLE OF CONTENTS	SECTION

RELATED SERVICE MANUAL

SERVICE MANUAL RELATED TO THIS MANUAL	99500-60A10	APPLICABILITY
VITARA Supplementary Service Manual for 5-door Model	99501-60A50	Vehicles equipped with 5-doors

For vehicles from the very beginning of the production up to body Nos. as listed in "FOREWORD", refer to VITARA Service Manual 99500-60A01.

SERVICE MANUAL RELATED TO VITARA S/M	99500-60A01	APPLICABILITY
VITARA Supplementary Service Manual for Fuel Injection model	99501-60A01	Vehicles equipped with electronic fuel injection system
VITARA Supplementary Service Manual for Body Service	99501-60A10	All vehicles This supplement has been prepared for anti-corrosion treatment of body service.
VITARA Supplementary Service Manual for Automatic Transmission	99501-60A21	Vehicles equipped with automatic transmission

SECTION 0A

GENERAL INFORMATION

CONTENTS

HOW TO USE THIS MANUAL

There is a table of contents for the whole manual on the first page of this manual, whereby you can easily find the section that offers the information you need.

TABLE OF CONTENTS	SECTION
GENERAL INFORMATION	
General Information	0A
Maintenance and Lubrication	0B
HEATING AND AIR CONDITIONING	
Heating and Ventilation	1A
BUMPERS AND SHEET METAL	2
STEERING, SUSPENSION, WHEELS AND TIRES	

Fig. 0A-1

Also, there is a table of contents on the first page of each section, where the main items in that section are listed.

MANUAL TRANSMISSION 7A-1

SECTION 7A

MANUAL TRANSMISSION

CONTENTS

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  Shift Control Levers 7A- 8
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REQUIRED SERVICE MATERIALS ...7A-35
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Fig. 0A-2

Each section of this manual has its own pagination. It is indicated at the top of each page along with the Section name.

7A-6 MANUAL TRANSMISSION

TRANSFER OIL SEALS
REAR CASE OIL SEAL
1 Lift up vehicle horizontally.
2 Remove 4 bolts from rear propeller shaft flange and remove propeller shaft.
3 Using screwdriver, remove oil seal.
4 Using special tool and plastic hammer, press-fit new oil seal up to case surface. Be sure to apply grease to oil seal lip.

CENTER CASE OIL SEAL (Front side)
In addition to the procedure for rear case oil seal, it is necessary to drain and refill gear oil of transfer. Refer to page 7A-5 for oil specification.

SHIFT CONTROL LEVERS
REMOVAL
1. Remove 2 screws at the front and 2 clips at the rear, and then take off console box.

NOTE:
To remove clip, push in its center pin first.

Fig. 0A-3

The torque specification is given as shown figure below or it is described at the end page of each section.

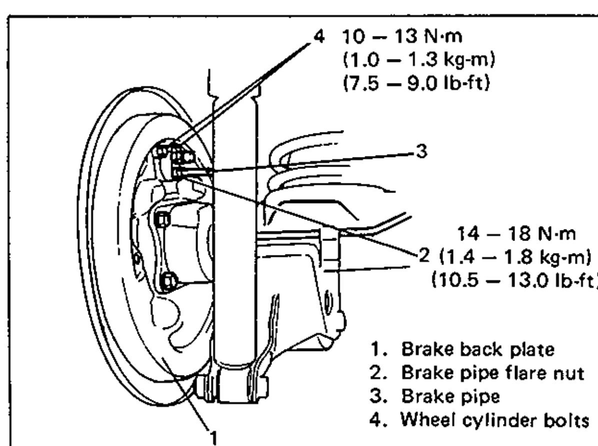


Fig. 0A-4

The SI, metric and foot-pound systems are used as units in this manual.

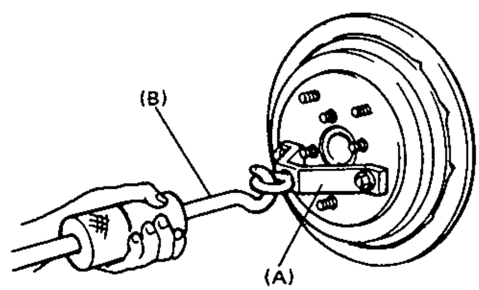
BRAKES 5-67

RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Brake caliper carrier bolt	70 – 100	7.0 – 10.0	51.0 – 72.0
2. Brake caliper pin bolt	22 – 32	2.2 – 3.2	16.0 – 23.0
3. Front brake flexible hose bolt	20 – 25	2.0 – 2.5	14.5 – 18.0
4. Rear brake nut (Brake back plate nut)	18 – 28	1.8 – 2.8	13.5 – 20.0
5. Master cylinder nut	10 – 16	1.0 – 1.6	7.5 – 11.5
6. Booster nut	10 – 16	1.0 – 1.6	7.5 – 11.5
7. Brake pipe 5-way joint bolt	8 – 12	0.8 – 1.2	6.0 – 8.5
8. LSP valve bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
9. Brake pipe flare nut	14 – 18	1.4 – 1.8	10.5 – 13.0
10. Brake pedal shaft nut	18 – 28	1.8 – 2.8	13.5 – 20.0
11. Rear brake drum nut	50 – 80	5.0 – 8.0	36.5 – 57.5

Fig. 0A-5

In each figure in the text, part names, special tool names and numbers and their usage are provided.



(A): Special tool (Brake drum remover 09943-35511)
(B): Special tool (Sliding hammer 09942-15510)

Fig. 0A-6

A number of abbreviations are used in the text. For their full explanations, refer to "**ABBREVIATIONS USED IN THIS MANUAL**" on the page 0A-3 of this section.

DIAGNOSIS and CORRECTION are included in each section as necessary.

IGNITION SYSTEM 6F-3

DIAGNOSIS

Condition	Possible cause	Correction
Engine cranks, but will not run	No spark	
	• Defective spark plug	Adjust the gap, or replace
	• Leaky high tension cords	Replace defective cords
	• Cracked rotor or cap	Replace
	• Defective generator assembly	Replace
	• Maladjusted signal rotor air gap	Adjust
	• Defective ignition coil	Replace
	• Loose connection or disconnection of high tension cords or lead wires	Connect securely
	• Blown fuse	Replace and repair
	• Defective noise suppressor	Replace
	Maladjusted ignition timing.	Adjust

Fig. 0A-7

At the end of each section, there are descriptions of SPECIAL TOOLS, REQUIRED SERVICE MATERIALS and RECOMMENDED TORQUE SPECIFICATIONS that should be used for the servicing work described in that section.

ABBREVIATIONS USED IN THIS MANUAL

A

ATDC : After Top Dead Center
API : American Petroleum Institute
ATF : Automatic Transmission Fluid
ALR : Automatic Locking Retractor
AC : Alternating Current
A/T : Automatic Transmission
A/C : Air-Conditioner
AFM : Air Flow Meter
AFS : Air Flow Sensor
ABDC : After Bottom Dead Center
A/F : Air Fuel mixture ratio
ALDL : Assembly Line Diagnostic Link
ADR : Australian Desine Rule
A-ELR : Automatic-Emergency Locking Retractor

B

BTDC : Before Top Dead Center
BBDC : Before Bottom Dead Center
BVSV : Bimetal Vacuum Switching Valve

C

CAS : Crank Angle Sensor
CPU : Central Prosessing Unit
CO : Carbon Monoxide
CB : Circuit Breaker
CMVSS : Canadian Motor Vehicle Safety Standard
CRS : Child Restraint System

D

DRL : Daytime Running Light
DERM : Diagnostic Energy Reserve Module
DC : Direct Current
DOJ : Double Offset Joint
DOT : Department of Transportation
DSPV : Deceleration Sensing Proportioning Valve

E

ECM : Electronic Control Module
EGR : Exhaust Gas Recirculation
ESA : Electronic Spark Advance
ECU : Electronic Control Unit
EPA : Environmental Protection Agency
ELR : Emergency Locking Retractor

F

FMVSS : Federal Motor Vehicle Safety Standard
4WD : 4 Wheel Drive Vehicles

H

HAC : High Altitude Compensator
HIC : Hot Idle Compensator
HC : Hydrocarbons

I

ISC : Idle Speed Control
IG : Ignition
ISO : International Standards Organization

L

LSD : Limited Slip Differential
LSPV : Load Sensing Proportioning Valve
LCD : Liquid Crystal Display
LH : Left Hand Steering Vehicle

M

M/T : Manual Transmission
Min : Minimum
Max : Maximum

N

NHTSA : National Highway Traffic Safety Organization
NOx : Nitrogen Oxides

O

OHC : Over Head Camshaft

P

PCV : Positive Crankcase Ventilation
P/S : Power Steering
PTC : Positive Temperature Coefficient
PWM : Pulse Width Modulation

R

REGTS : Recirculated Exhaust Gas Temperature Sensor
RWAL : Rear Wheel Anti Lock Brake
RH : Right Hand Steering Vehicle

S

SAE : Society of Automotive Engineers
SIR : Supplemental Inflatable Restraint
SOHC : Single Over Head Camshaft

T

TB : Throttle Body
TPS : Throttle Position Sensor
TS : Throttle Switch
TVSV : Thermal Vacuum Switching Valve
2WD : 2 Wheel Drive Vehicles

V

VSV : Vacuum Switching Valve
VIN : Vehicle Identification Number
VTV : Vacuum Transmitting Valve
VSS : Vehicle Speed Sensor

W

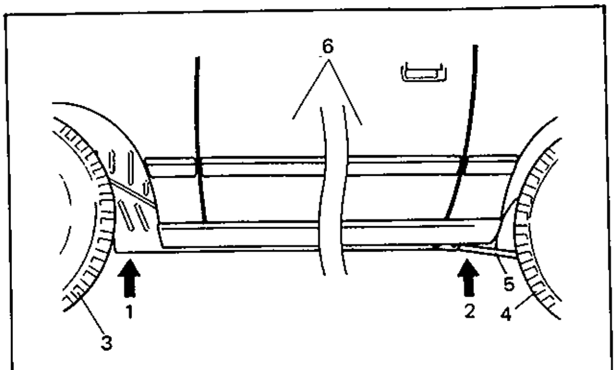
WTG : Water Temperature Gauge
WTS : Water Temperature Sensor
WOT : Wide Open Throttle

GENERAL PRECAUTIONS

The WARNING and CAUTION below describe some general precautions that you should observe when servicing a vehicle. These general precautions apply to many of the service procedures described in this manual, and they will not necessarily be repeated with each procedure to which they apply.

WARNING:

- **Whenever raising a vehicle for service, be sure to follow the instructions under "VEHICLE LIFTING POINTS" on page 0A-11 of this manual.**



1. Front lifting point
2. Rear lifting point
3. Front left tire
4. Rear left tire
5. Trailing arm
6. Left door

Fig. 0A-8

- **When it is necessary to do service work with the engine running, make sure that the parking brake is set fully and the transmission is in Neutral (for manual transmission vehicles) or Park (for automatic transmission vehicles), Keep hands, hair, clothing, tools, etc. away from the fan and belts when the engine is running.**
- **Do not perform service work in areas where combustible materials can come in contact with a hot exhaust system. When working with toxic or flammable materials (such as gasoline and refrigerant), make sure that the area you work in is well-ventilated.**
- **To avoid getting burned, keep away from hot metal parts such as the radiator, exhaust manifold, tailpipe, muffler, etc.**

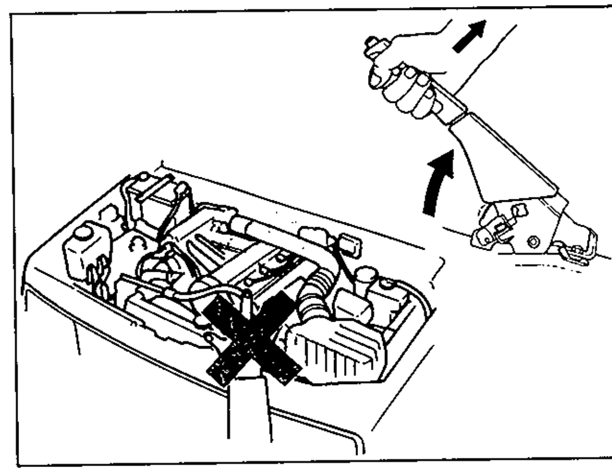


Fig. 0A-9

- **When it is necessary to run the engine indoors, make sure that the exhaust gas is forced outdoors.**

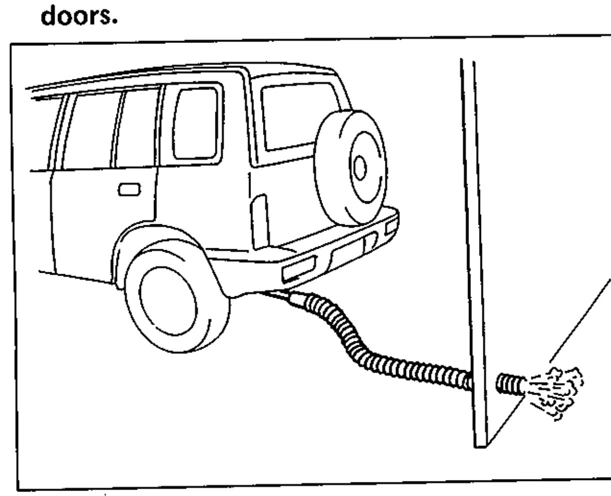


Fig. 0A-10

- **It is important to note that, during any vehicle maintenance procedures, replacement fasteners must have the same measurements as those removed.**
  Mismatched or incorrect fasteners can result in vehicle damage or malfunction, or possible personal injury.
  Therefore, fasteners removed from the vehicle should be saved for re-use whenever possible.
  Where the fasteners are not satisfactory for re-use, care should be taken to select a replacement that matches the original.
  Additional information concerning this subject will be found in METRIC INFORMATION of this section.

CAUTION:

- Before starting any service work, cover fenders, seats, and any other parts that are likely to get scratched or stained during servicing. Also, be aware that what you wear (e.g., buttons) may cause damage to the vehicle's finish.

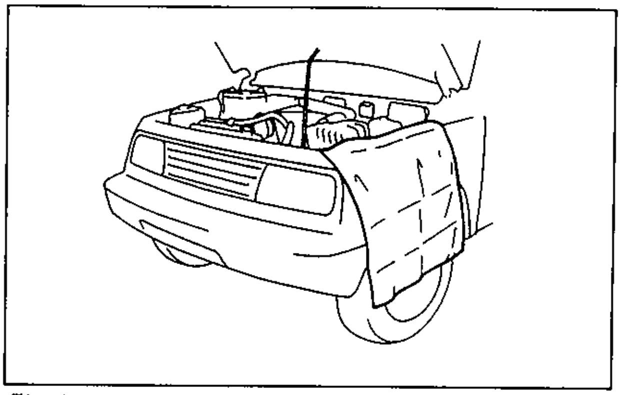


Fig. 0A-11

- When performing service to electrical parts that does not require use of battery power, disconnect the negative cable of the battery.

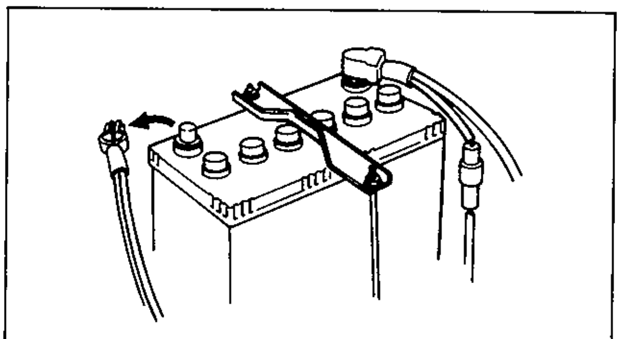


Fig. 0A-12

- When removing the battery, be sure to disconnect the negative cable first and then the positive cable. When reconnecting the battery, connect the positive cable first and then the negative cable, and replace the terminal covers.

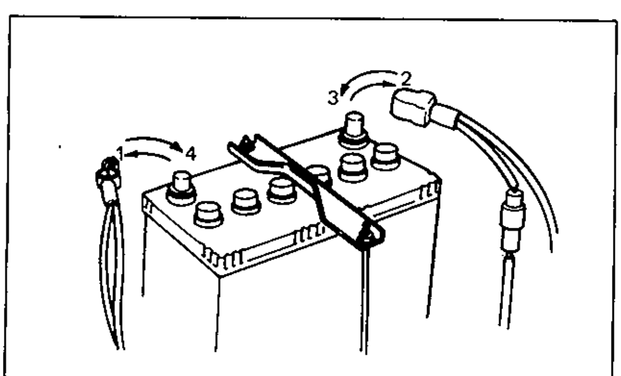


Fig. 0A-13

- When removing parts that are to be reused, be sure to keep them arranged in an orderly manner so that they may be reinstalled in the proper order and position.

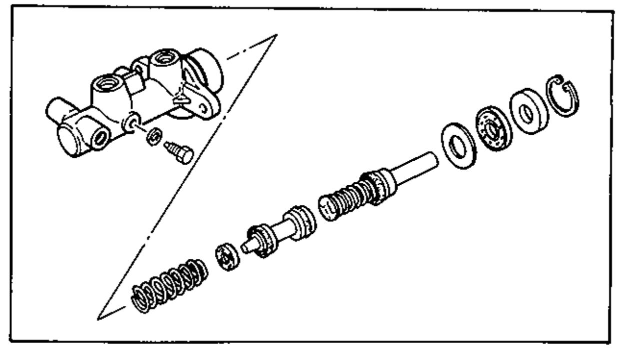


Fig. 0A-14

- Whenever you use oil seals, gaskets, packing, O-rings, locking washers, split pins, self-locking nuts, and certain other parts as specified, be sure to use new ones. Also, before installing new gaskets, packing, etc., be sure to remove any residual material from the mating surfaces.

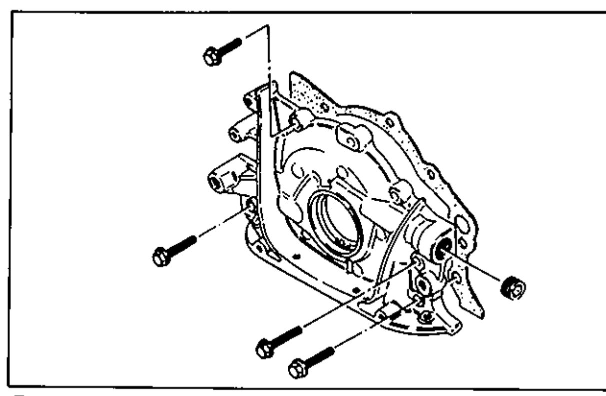


Fig. 0A-15

- Make sure that all parts used in reassembly are perfectly clean.
- When use of a certain type of lubricant, bond, or sealant is specified, be sure to use the specified type.

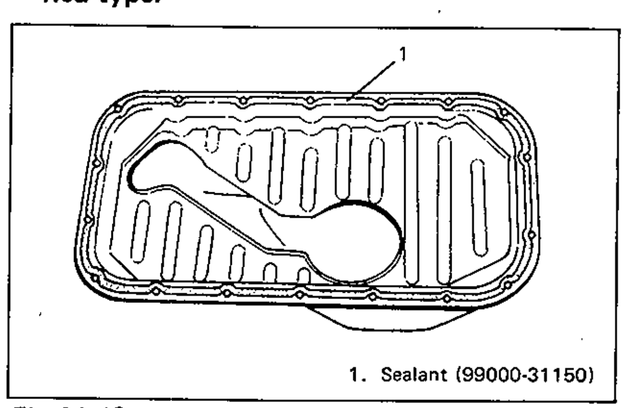


Fig. 0A-16

- Be sure to use special tools when instructed.

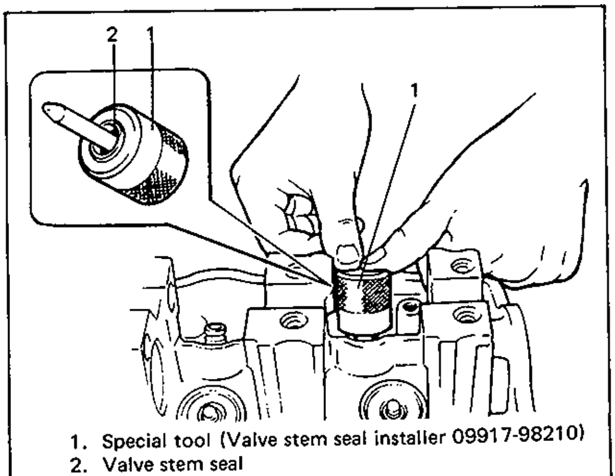


Fig. 0A-17

- When disconnecting vacuum hoses, attach a tag describing the correct installation position so that the hoses can be reinstalled correctly.

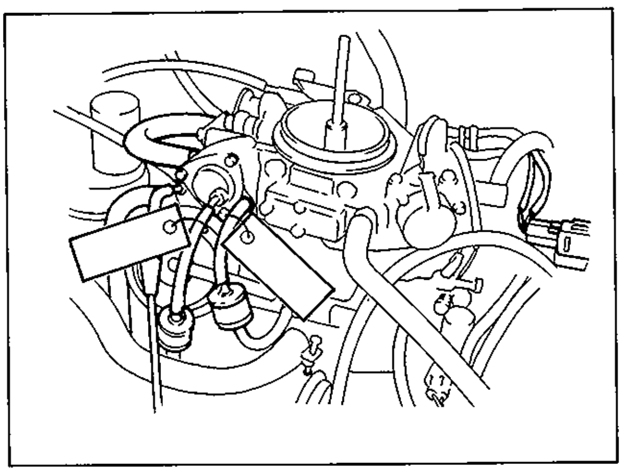


Fig. 0A-18

- After servicing fuel, oil, water, vacuum, exhaust, or brake systems, check all lines related to the system for leaks.

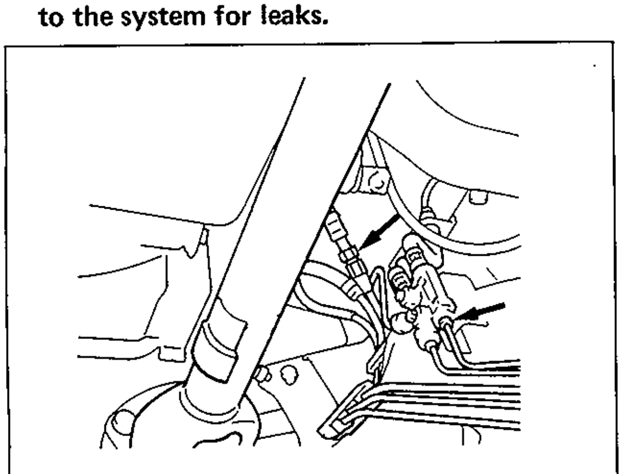


Fig. 0A-19

- Be careful not to touch the electrical terminals of parts which use microcomputers (e.g. electronic control unit). The static electricity from your body can damage these parts.

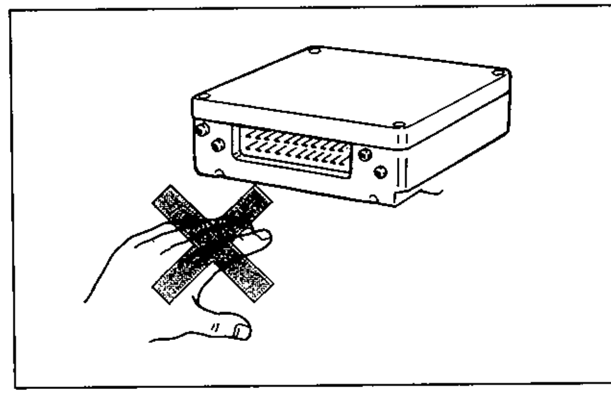


Fig. 0A-20

- When taking measurements at electrical connectors using a tester probe, be sure to insert the probe from the wire harness side (backside) of the connector.

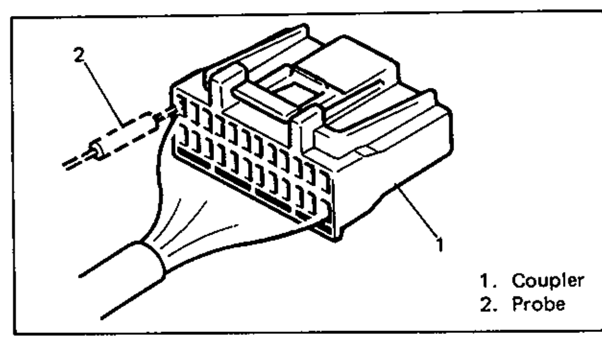


Fig. 0A-21

- For vehicles equipped with a catalytic converter, be careful not to let a large amount of unburned gasoline enter the converter or it can be damaged. Conduct a spark jump test only when necessary, make it as short as possible, and do not open the throttle.
  Conduct engine compression checks within the shortest possible time. Avoid situations which can result in engine misfire (e.g. starting the engine when the fuel tank is nearly empty).
- For vehicles equipped with fuel injection systems, never disconnect the fuel line between the fuel pump and injector without first releasing the fuel pressure, or fuel can be sprayed out under pressure.

IDENTIFICATION INFORMATION

BODY NUMBER

The vehicle body number is punched on the chassis inside the tire housing on the right front side.

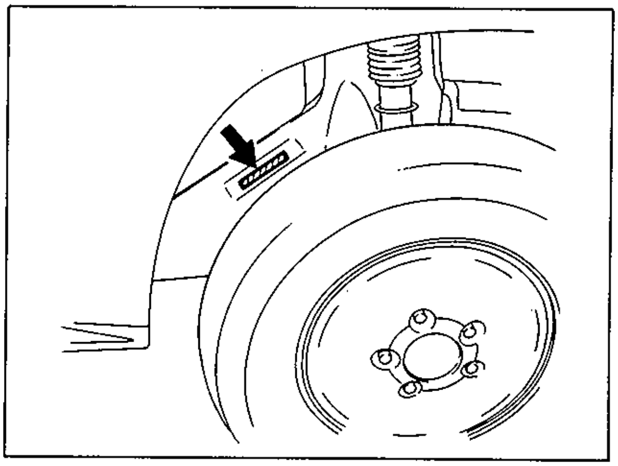


Fig. 0A-22 Vehicle Body Number Location

ENGINE IDENTIFICATION NUMBER

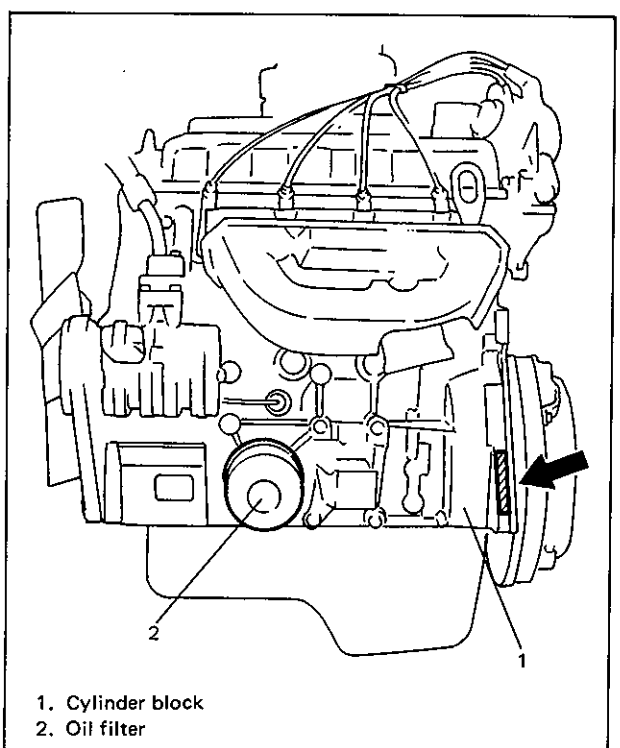


Fig. 0A-23 Engine Number Location

TRANSMISSION IDENTIFICATION NUMBER

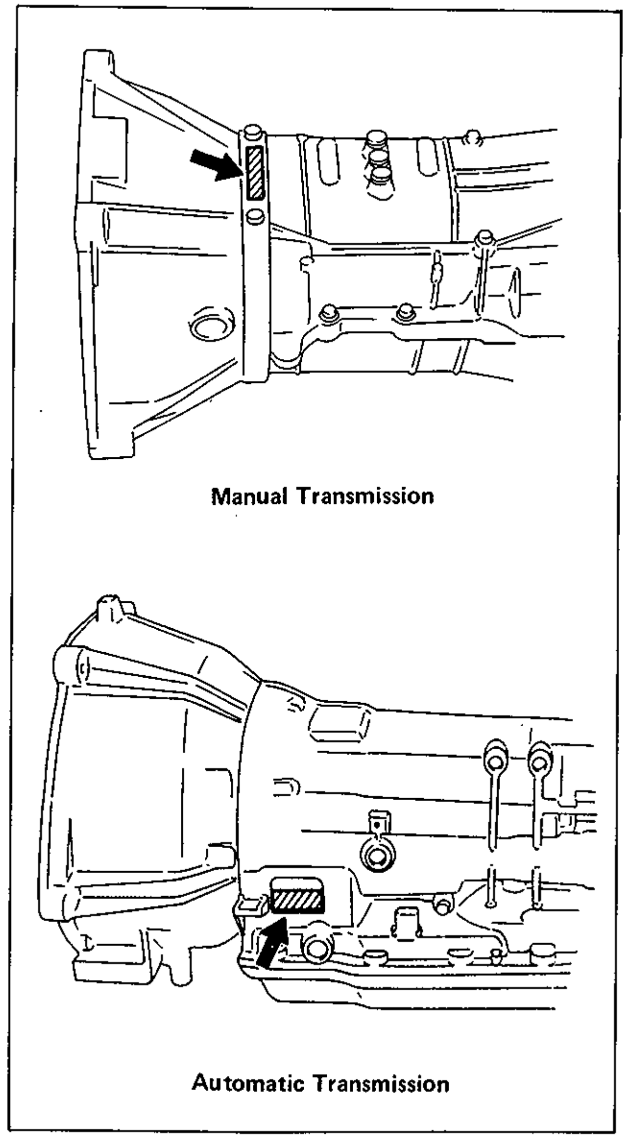


Fig. 0A-24 Transmission Number Location

METRIC INFORMATION

METRIC FASTENERS

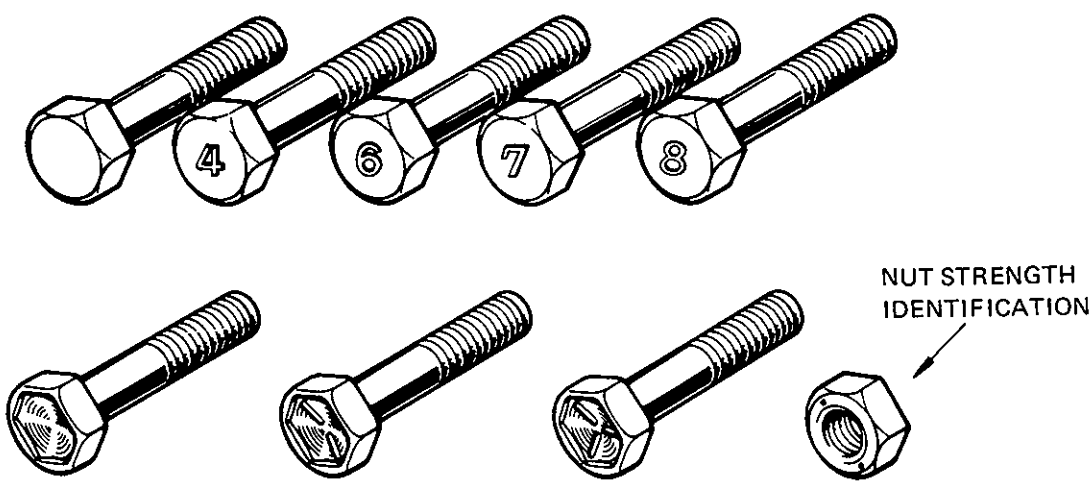
Most of the fasteners used for this vehicle are metric. When replacing any fasteners, it is most important that replacement fasteners be the correct diameter, thread pitch and strength.

NOTE:
However that the metric system is not used for the fasteners of the Automatic transmission. Their sizes are explaced in inches.

FASTENER STRENGTH IDENTIFICATION

Most commonly used metric fastener strength property classes are 4T, 7T and radial line with the class identification embossed on the head of each bolt. Some metric nuts will be marked with punch mark strength identification on the nut face. Fig. 0A-25 shows the different strength markings.

When replacing metric fasteners, be careful to use bolts and nuts of the same strength or greater than the original fasteners (the same number marking or higher). It is likewise important to select replacement fasteners of the correct size. Correct replacement bolts and nuts are available through the parts division.



METRIC BOLTS – IDENTIFICATION CLASS NUMBERS OR MARKS CORRESPOND TO BOLT STRENGTH – INCREASING NUMBERS REPRESENT INCREASING STRENGTH.

Fig. 0A-25 Bolt Strength Markings

STANDARD TIGHTENING TORQUE

Each fastener should be tightened to the torque specified in each section of this manual. If no description or specification is provided, refer to the following tightening torque chart for the applicable torque for each fastener. When a fastener of greater strength than the original one is used, however, use the torque specified for the original fastener.

NOTE:

- **For the flanged bolt and nut, add 10% to the tightening torque given in the chart below.**
- **The following chart is applicable only where the fastened parts are made of steel or light alloy.**

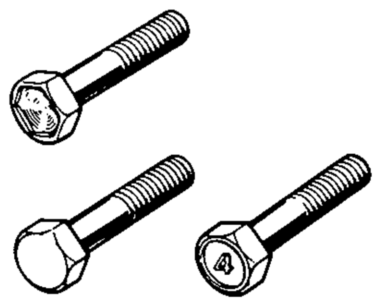
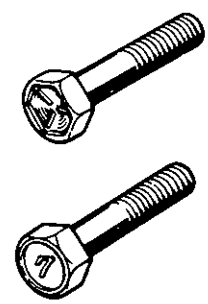
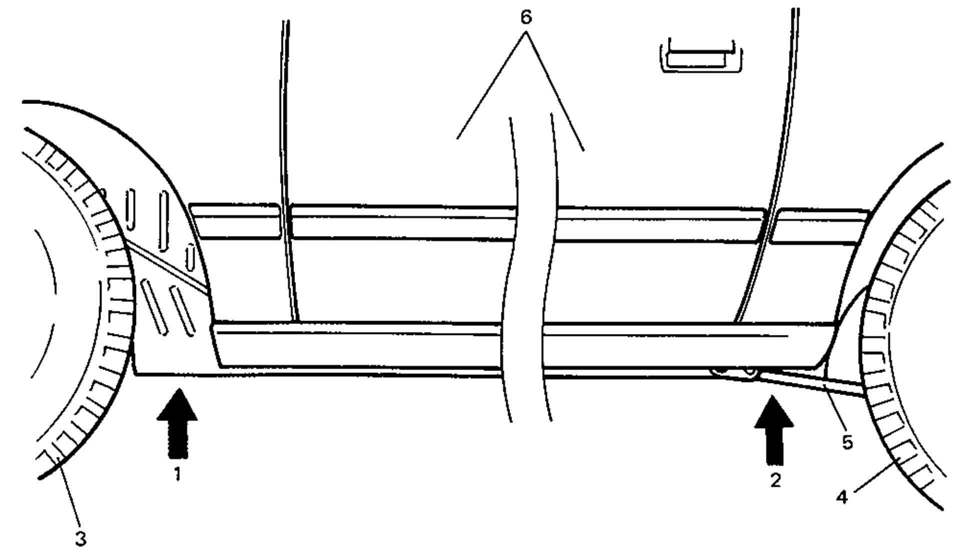
STRENGTH / THREAD DIAMETER (mm)	 Conventional bolt "4T" bolt			 "7T" bolt		
	N·m	kg-m	lb-ft	N·m	kg-m	lb-ft
4	1 – 2	0.1 – 0.2	0.7 – 1.5	1.5 – 3.0	0.15 – 0.30	1.0 – 2.2
5	2 – 4	0.2 – 0.4	1.5 – 3.0	3 – 6	0.3 – 0.6	2.0 – 4.5
6	4 – 7	0.4 – 0.7	3.0 – 5.0	8 – 12	0.8 – 1.2	6.0 – 8.5
8	10 – 16	1.0 – 1.6	7.0 – 11.5	18 – 28	1.8 – 2.8	13.0 – 20.0
10	22 – 35	2.2 – 3.5	16.0 – 25.0	40 – 60	4.0 – 6.0	29.0 – 43.5
12	35 – 55	3.5 – 5.5	25.0 – 40.0	70 – 100	7.0 – 10.0	50.5 – 72.5
14	50 – 80	5.0 – 8.0	36.0 – 58.0	110 – 160	11.0 – 16.0	79.5 – 116.0
16	80 – 130	8.0 – 13.0	57.5 – 94.5	170 – 250	17.0 – 25.0	122.5 – 181.0
18	130 – 190	13.0 – 19.0	94.0 – 137.5	200 – 280	20.0 – 28.0	144.5 – 203.0

Fig. 0A-26 Tightening Torque Chart

VEHICLE LIFTING POINTS



1. Front lifting point
2. Rear lifting point
3. Front left tire
4. Rear left tire
5. Trailing arm
6. Left door

Fig. 0A-27 Vehicle Lifting Points

The arrow marks shown in Fig. 0A-27 indicate vehicle lifing points.
Fig. 0A-28 and 0A-29 indicate the methods of lifting the vehicle using a hoist, and Fig. 0A-30 and 0A-31 show additional locations, for lifting with a floor jack.

> WARNING:
> - **When using frame contact hoist, apply hoist as shown below (right and left at the same position). Lift up the vehicle till 4 tires are a little off the ground and make sure that the vehicle will not fall off by trying to move vehicle body in both ways. Work can be started only after this confirmation.**
> - **Before applying hoist to underbody, always take vehicle balance throughout service into consideration. Vehicle balance on hoist may change depending of what part to be removed.**
> - **Make absolutely sure to lock hoist after vehicle is hoisted up.**

To perform service with either front or rear vehicle end jacked up, be sure to place safety stands under chassis frame so that body is securely supported. And then check to ensure that chassis frame does not slide on safety stands and the vehicle is held stable for safety's sake.

> WARNING:
> **Place chocks against both right and left wheels on the ground from both front and rear.**

When using frame contact hoist:

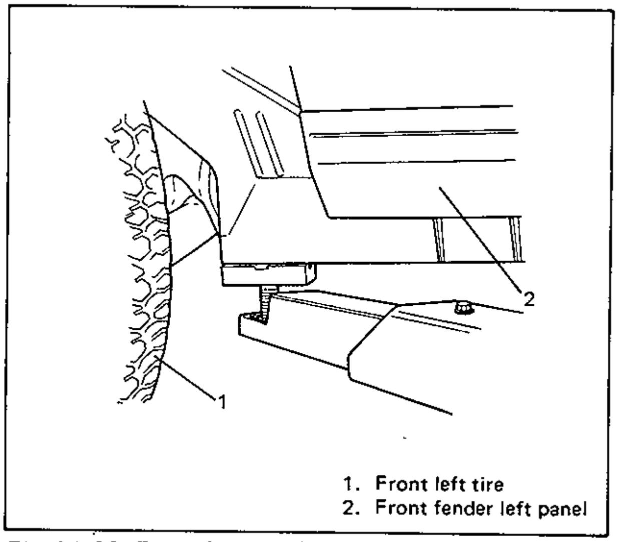


Fig. 0A-28 Front Support Location

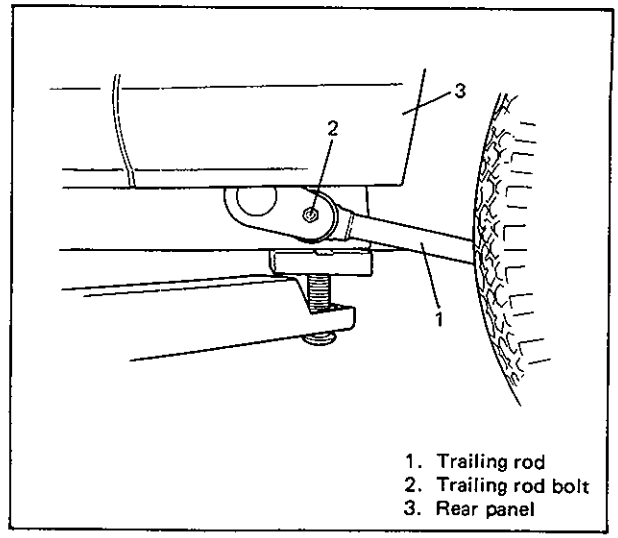


Fig. 0A-29 Rear Support Location

When using floor jack:

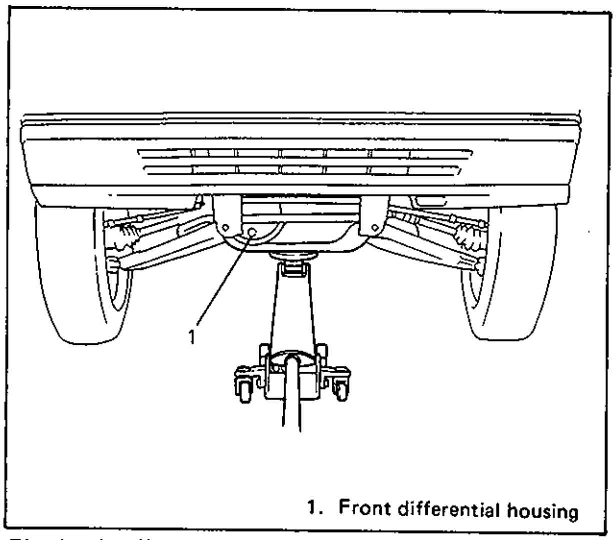


Fig. 0A-30 Front Support Location

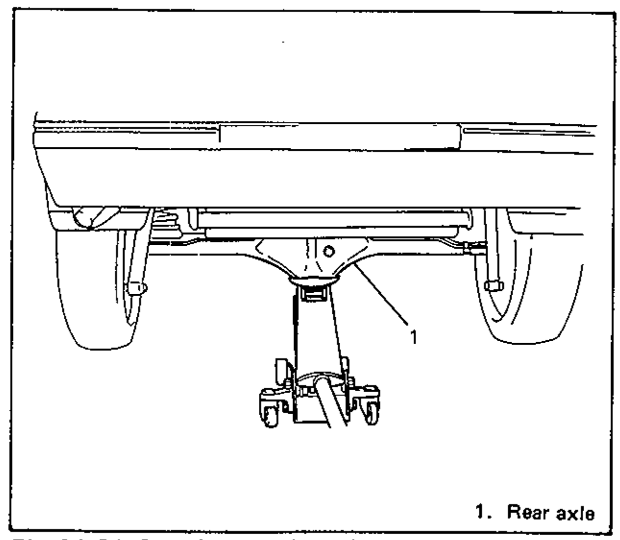


Fig. 0A-31 Rear Support Location

SECTION 0B

MAINTENANCE AND LUBRICATION

CONTENTS

MAINTENANCE SCHEDULE
(For Fuel Injection Model)

MAINTENANCE SCHEDULE UNDER NORMAL DRIVING CONDITIONS

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.								
	km (x 1,000)	10	20	30	40	50	60	70	80
	miles (x 1,000)	6	12	18	24	30	36	42	48
	months	6	12	18	24	30	36	42	48
ENGINE									
1-1. Water pump (fan) drive belt (tension, damage)		–	–	–	I	–	–	–	R
1-2. Camshaft timing belt		–	–	–	–	–	–	–	I
1-3. Valve lash (clearance)		–	I	–	I	–	I	–	I
1-4. Engine oil and oil filter		R	R	R	R	R	R	R	R
1-5. Cooling system hoses and connections		–	–	–	I	–	–	–	I
1-6. Engine coolant		–	–	–	R	–	–	–	R
1-7. Exhaust pipes and mountings (except catalyst)		–	–	–	I	–	–	–	I&(R)
IGNITION SYSTEM									
2-1. Ignition wiring (high tension cords)		–	–	–	–	–	–	–	R
2-2. Distributor cap and rotor (crack, wear)		–	–	–	I	–	–	–	I
2-3. Spark plugs		–	–	–	–	R	–	–	–
FUEL SYSTEM									
3-1. Air cleaner filter element		I	I	I	R	I	I	I	R
3-2. Fuel tank cap, fuel lines and connections		–	–	–	I	–	–	–	I&(R)
3-3. Fuel filter		–	–	–	**R	–	–	–	R
EMISSION CONTROL SYSTEM									
4-1. Oxygen sensor		Replace every 80,000 km or 60 months							
4-2. PCV valve		Inspect every 80,000 km or 60 months							
4-3. Fuel vapor storage (Evaporative emission control) system		Inspect every 80,000 km or 60 months							
ELECTRICAL SYSTEM									
5-1. Wiring harness connections and headlights		–	–	–	I	–	–	–	I

NOTES:
"R": Replace or change
"I" : Inspect and correct or replace if necessary

- *Item 1-7 (R) is applicable to exhaust mounting rubber only.*
- *Item 3-2 (R) is applicable to fuel tank cap only.*
- *Item 3-3 **R is recommended maintenance item.*
- *For Sweden, item 2-1, 4-1, 4-2 and 4-3 should be performed by odometer reading only.*

Interval: This interval should be judged by odometer reading or months, whichever comes first.		This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.							
	km (x 1,000)	10	20	30	40	50	60	70	80
	miles (x 1,000)	6	12	18	24	30	36	42	48
	months	6	12	18	24	30	36	42	48
CHASSIS AND BODY									
6- 1. Clutch (For manual transmission)		–	I	–	I	–	I	–	I
6- 2. Brake discs and pads (front) Brake drums and shoes (rear)		–	I	–	I	–	I	–	I
6- 3. Brake hoses and pipes		–	I	–	I	–	I	–	I
6- 4. Brake fluid		–	I	–	R	–	I	–	R
6- 5. Brake pedal		–	I	–	I	–	I	–	I
6- 6. Brake lever and cable		–	I	–	I	–	I	–	I
6- 7. Tires		I	I	I	I	I	I	I	I
6- 8. Wheel discs and free wheeling hubs (if equipped)		I	I	I	I	I	I	I	I
6- 9. Wheel bearings		–	I	–	*I	–	I	–	*I
6-10. Suspension system		*I	I	–	I	–	I	–	I
6-11. Propeller shafts		–	I	–	I	–	I	–	I
6-12. Manual transmission oil		R	I	I	R	I	I	I	R
6-13. Automatic transmission	Fluid level	I	I	I	I	I	I	I	I
	Fluid change	Replace every 160,000 km (100,000 miles)							
	Fluid hose	–	–	–	–	–	R	–	–
6-14. Transfer and differential oil		R	I	I	R	I	I	I	R
6-15. Steering system		I	I	I	I	I	I	I	I
6-16. Power steering (if equipped)		I	I	I	I	I	I	I	I
6-17. Door hinges		L	L	L	L	L	L	L	L

NOTES:

"R" : Replace or change

"I" : Inspect and correct or replace if necessary

"L" : Lubricate

"T" : Tighten to the specified torque

- *Item 6-9 *I is applicable to not only rattled wear but also their grease.*
- *Item 6-10 *I should be performed at 10,000 km only.*

MAINTENANCE RECOMMENDED UNDER SEVERE DRIVING CONDITIONS

If the vehicle is usually used under the conditions corresponding to any severe condition code given below, it is recommended that applicable maintenance operation be performed at the particular interval as given in the chart below.

Severe condition code

A — Towing a trailer
B — Repeated short trips
C — Driving on rough and/or muddy roads
D — Driving on dusty roads
E — Driving in extremely cold weather and/or salted roads
F — Repeated short trips in extremely cold weather

Severe Condition Code	Maintenance	Maintenance Operation	Maintenance Interval
— — C D — —	Water pump (fan) drive belt	I	Every 12,000 miles (20,000 km) or 12 months
		R	Every 24,000 miles (40,000 km) or 24 months
A — — D E F	Engine oil and oil filter	R	Every 3,000 miles (5,000 km) or 3 months
A B C — E —	Exhaust pipes and mountings	I	Every 6,000 miles (10,000 km) or 6 months
— — — D — —	Air cleaner filter element *1	I	Every 1,500 miles (2,500 km)
		R	Every 12,000 miles (20,000 km) or 12 months
A B C D — —	Brake discs and pads (Front) Brake drums and shoes (Rear)	I	Every 6,000 miles (10,000 km) or 6 months
A B C — — —	Propeller shafts	I	Every 6,000 miles (10,000 km) or 6 months
A — C — — —	Manual transmission, transfer and differential oil	R	Every 12,000 miles (20,000 km) or 12 months
— B C — — F	Automatic transmission fluid	R	Every 12,000 miles (20,000 km) or 12 months
— — C — — —	Drive axle shaft boots	I	Every 6,000 miles (10,000 km) or 6 months
— — C — — —	Bolts and nuts on chassis	T	Every 6,000 miles (10,000 km) or 6 months

NOTE:
"I" — Inspect and correct or replace if necessary
"T" — Tighten to the specified torque
"R" — Replace or change

- **1 Inspect or replace more frequently if the vehicle is used under dusty conditions.*

MAINTENANCE SCHEDULE
(For Carburetor Model)

MAINTENANCE SCHEDULE UNDER NORMAL DRIVING CONDITIONS

Interval: This interval should be judged by odometer reading or months, whichever comes first.		This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.								
		km (x 1,000)	10	20	30	40	50	60	70	80
		miles (x 1,000)	6	12	18	24	30	36	42	48
		months	6	12	18	24	30	36	42	48
ENGINE										
1-1. Water pump (fan) drive belt (tension, damage)			–	–	–	I	–	–	–	R
1-2. Engine bolts (All cylinder head and manifold fixings)			–	–	–	T	–	–	–	T
1-3. Valve lash (clearance)			–	I	–	I	–	I	–	I
1-4. Engine oil filter			R	R	R	R	R	R	R	R
1-4-1. Engine oil	API Grade SD, SE, SF or SG		Replace every 10,000 km (6,000 miles)							
	API Grade SC		Replace every 5,000 km (3,000 miles)							
1-5. Cooling system hoses and connections			–	I	–	I	–	I	–	I
1-6. Engine coolant			–	–	–	R	–	–	–	R
1-7. Exhaust pipes and mountings (leakage, damage, tightness)			–	I	–	I	–	I	–	I
IGNITION SYSTEM										
2-1. Ignition wiring (high tension cords)			–	I	–	I	–	I	–	I
2-2. Distributor cap and rotor (crack, wear)			–	I	–	I	–	I	–	I
2-3. Spark plugs	When unleaded fuel is used		–	R	–	R	–	R	–	R
	When leaded fuel is used, refer to "Severe Driving Condition" schedule									
2-4. Ignition timing			I	I	I	I	I	I	I	I
2-5. Distributor advance			–	I	–	I	–	I	–	I
FUEL SYSTEM										
3-1. Air cleaner filter element			I	I	I	R	I	I	I	R
3-2. Fuel tank cap, fuel lines and connections			–	–	–	I	–	–	–	I
3-3. Fuel filter			–	–	–	R	–	–	–	R
3-4. Carburetor choke system			I&L	I&L	I&L	I&L	I&L	I&L	I&L	I&L
3-5. Idle speed and idle mixture			–	I	–	I	–	I	–	I

Interval: This interval should be judged by odometer reading or months, whichever comes first.		This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.							
	km (x 1,000)	10	20	30	40	50	60	70	80
	miles (x 1,000)	6	12	18	24	30	36	42	48
	months	6	12	18	24	30	36	42	48
EMISSION CONTROL SYSTEM									
4-1. Crankcase ventilation hoses and connections		–	I	–	I	–	I	–	I
4-2. PCV valve		–	–	–	I	–	–	–	I
4-3. Fuel vapor storage system, hoses and connections		–	I	–	I	–	I	–	I
4-4. Canister (if equipped)		–	I	–	I	–	I	–	I
4-5. Fuel cut system (Australia only)		–	–	–	I	–	–	–	I
ELECTRICAL									
5-1. Wiring harness connections and headlights		–	I	–	I	–	I	–	I
CHASSIS AND BODY									
6- 1. Clutch (For manual transmission)		–	I	–	I	–	I	–	I
6- 2. Brake discs and pads (front) Brake drums and shoes (rear)		–	I	–	I	–	I	–	I
6- 3. Brake hoses and pipes		–	I	–	I	–	I	–	I
6- 4. Brake fluid		–	I	–	R	–	I	–	R
6- 5. Brake pedal		–	I	–	I	–	I	–	I
6- 6. Brake lever and cable		–	I	–	I	–	I	–	I
6- 7. Tires		I	I	I	I	I	I	I	I
6- 8. Wheel discs and free wheeling hubs (if equipped)		I	I	I	I	I	I	I	I
6- 9. Wheel bearings		–	I	–	*I	–	I	–	*I
6-10. Suspension system		*I	I	–	I	–	I	–	I
6-11. Propeller shafts		–	I	–	I	–	I	–	I
6-12. Manual transmission oil		R	I	I	R	I	I	I	R
6-13. Automatic transmission	Fluid level	I	I	I	I	I	I	I	I
	Fluid change	Replace every 160,000 km (100,000 miles)							
	Fluid hose	–	–	–	–	–	R	–	–
6-14. Transfer and differential oil		R	I	I	R	I	I	I	R
6-15. Steering system		I	I	I	I	I	I	I	I
6-16. Power steering (if equipped)		I	I	I	I	I	I	I	I
6-17. Door hinges		L	L	L	L	L	L	L	L

NOTES:
"R" : Replace or change
"I" : Inspect and correct or replace if necessary
"L" : Lubricate
"T" : Tighten to the specified torque

- *Item 6-9 *I is applicable to not only rattled wear but also their grease.*
- *Item 6-10 *I should be performed at 10,000 km only.*

MAINTENANCE RECOMMENDED UNDER SEVERE DRIVING CONDITIONS

If the vehicle is usually used under the conditions corresponding to any severe condition code given below, it is recommended that applicable maintenance operation be performed at the particular interval as given in the chart below.

Severe condition code

- **A — Towing a trailer**
- **B — Repeated short trips**
- **C — Driving on rough and/or muddy roads**
- **D — Driving on dusty roads**
- **E — Driving in extremely cold weather and/or salted roads**
- **F — Repeated short trips in extremely cold weather**
- **G — Leaded fuel use**

Severe Condition Code	Maintenance	Maintenance Operation	Maintenance Interval
A B C D – F G	Spark plugs	R	Every 6,000 miles (10,000 km) or 6 months
A – – D E F	Engine oil and oil filter	R	Every 3,000 miles (5,000 km) or 3 months
– – C D – –	Water pump (Fan) drive belt	I	Every 12,000 miles (20,000 km) or 12 months
		R	Every 24,000 miles (40,000 km) or 24 months
A B C – E –	Exhaust pipes and mountings	I	Every 6,000 miles (10,000 km) or 6 months
– – – D – –	Air cleaner filter element *1	I	Every 1,500 miles (2,500 km) or more frequently if necessary
		R	Every 12,000 miles (20,000 km) or 12 months or more frequently if necessary
A B C D – –	Brake discs and pads (Front) Brake drums and shoes (Rear)	I	Every 6,000 miles (10,000 km) or 6 months
A B C – – –	Propeller shafts	I	Every 6,000 miles (10,000 km) or 6 months
A – C – – –	Manual transmission, transfer and differential oil	R	Every 12,000 miles (20,000 km) or 12 months after first replacement at 6,000 miles
– B C – – F	Automatic transmission fluid	R	Every 12,000 miles (20,000 km) or 12 months
– – C – – –	Drive axle shaft boots	I	Every 6,000 miles (10,000 km) or 6 months
– – C – – –	Bolts and nuts on chassis	T	Every 6,000 miles (10,000 km) or 6 months

NOTE:
"I" — Inspect and correct or replace if necessary *"T" — Tighten to the specified torque*
"R" — Replace or change

- **1 Inspect or replace more frequently if the vehicle is used under dusty conditions.*

MAINTENANCE SERVICE

ENGINE

ITEM 1-1

Water Pump Belt Inspection and Replacement

> **WARNING:**
> **All inspection and replacement are to be performed with ENGINE NOT RUNNING.**

[Inspection]

1) Disconnect negative battery lead at battery.
2) Inspect belt for cracks, cuts, deformation, wear and cleanliness. If any defect exists, replace. Check belt for tension. The belt is in proper tension if it deflects 6 to 8 mm (0.24 – 0.32 in.) under thumb pressure (about 10 kg or 22 lb.).

Belt tension specification	6 – 8 mm (0.24 – 0.32 in.) as deflection

NOTE:
When replacing belt with a new one, adjust belt tension to 5 – 7 mm (0.20 – 0.27 in.).

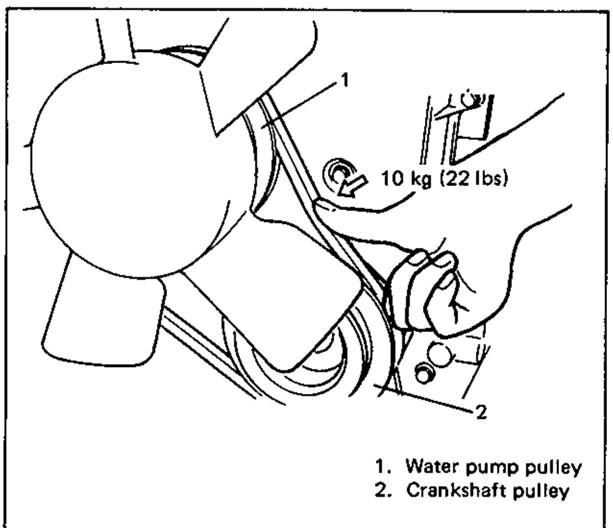


Fig. 0B-1

3) If the belt is too tight or too loose, adjust it to specification by adjusting alternator position.

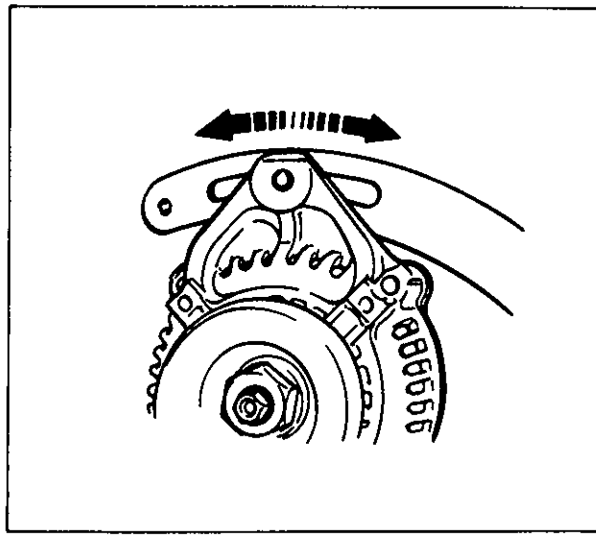


Fig. 0B-2

4) Tighten alternator adjusting bolt and pivot bolts.
5) Connect negative battery lead to battery.

[Replacement]

1) Disconnect negative battery lead at battery.
2) Loosen alternator adjusting bolt and pivot bolts.
3) Replace water pump belt.
4) Adjust belt tension to specification and tighten alternator adjusting bolt and pivot bolts.
5) Connect negative battery lead to battery.

A/C Compressor and/or Power Steering Pump Drive Belt (If equipped)

Inspect belt for wear, deterioration and tension.

A/C compressor or P/S pump drive belt tension	6.0 – 9.0 mm (0.24 – 0.35 in) deflection under 10 kg or 22 lb pressure

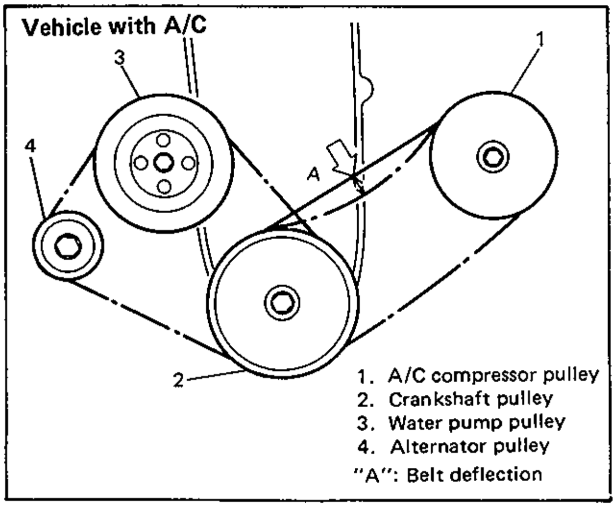


Fig. 0B-3

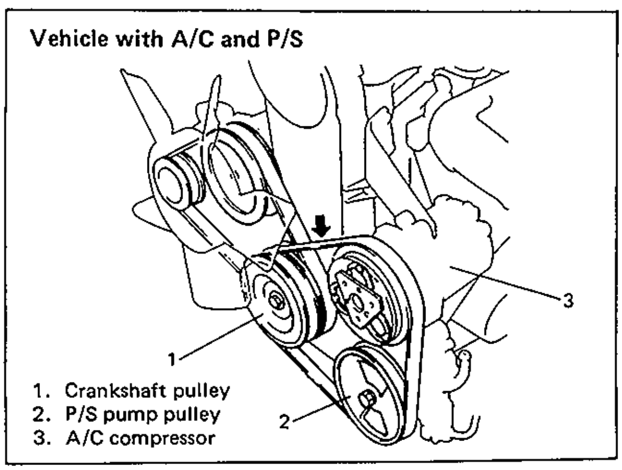


Fig. 0B-4

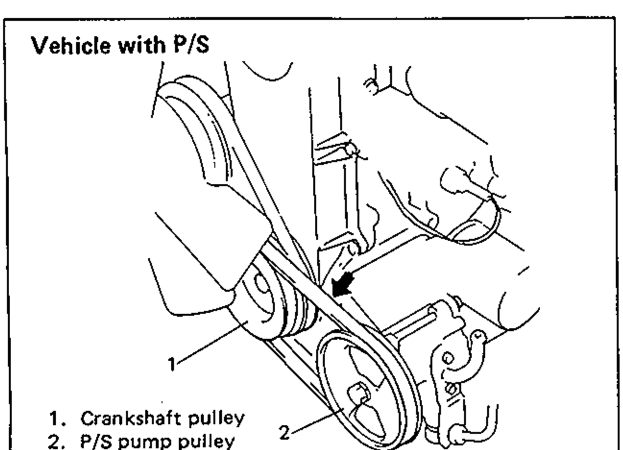


Fig. 0B-5

ITEM 1-2

Camshaft Timing Belt Inspection (Fuel Injection model only)

1) Remove timing belt outside cover, referring to p. 6A-18.
2) Inspect belt for wear or crack. If any wear or crack is found on belt, replace it.

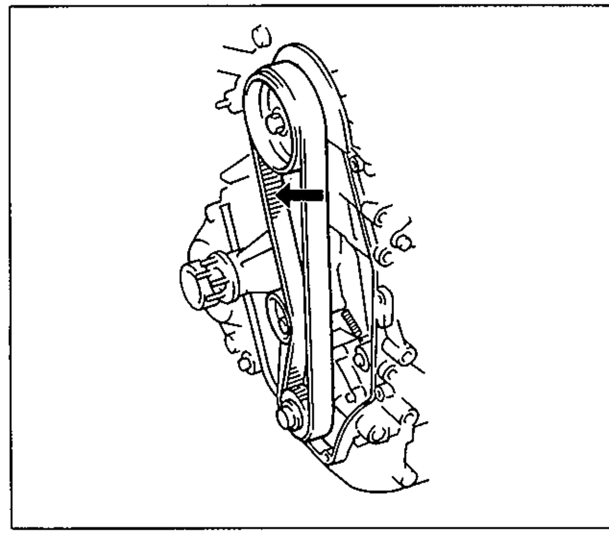


Fig. 0B-6

3) Install timing belt outside cover and other parts, referring to p. 6A-19.

ITEM 1-2

Engine Bolts Tightening (Carburetor model only)

1) To check cylinder head bolts, head cover must be removed. The tightening torque for the cylinder head bolts is as follows.

Tightening torque for cylinder head bolts	N·m	kg-m	lb-ft
	70 – 75	7.0 – 7.5	51.0 – 54.0

2) When securing cylinder head or when retightening these bolts, torque each bolt in such a way as to equalize the pressure throughout gasketed surface. The tightening sequence is referring to p. 6A-42.
3) Cylinder-head cover bolt should be tightened to the following torque:

Tightening torque for cylinder head cover bolts	N·m	kg-m	lb-ft
	4 – 5	0.4 – 0.5	3.0 – 3.5

ITEM 1-3

Valve Lash Inspection

1) Remove cylinder head cover.
2) Inspect intake and exhaust valve lash and adjust as necessary.

		When cold (Coolant temperature is 15 – 25°C or 59 – 77°F)	When hot (Coolant temperature is 60 – 68°C or 140 – 154°F)
Valve lash (gap A) specification	Intake	0.13 – 0.17 mm (0.0051 – 0.0067 in.)	0.23 – 0.27 mm (0.0091 – 0.0106 in.)
	Exhaust	0.15 – 0.19 mm (0.0059 – 0.0075 in.)	0.25 – 0.29 mm (0.0098 – 0.0114 in.)

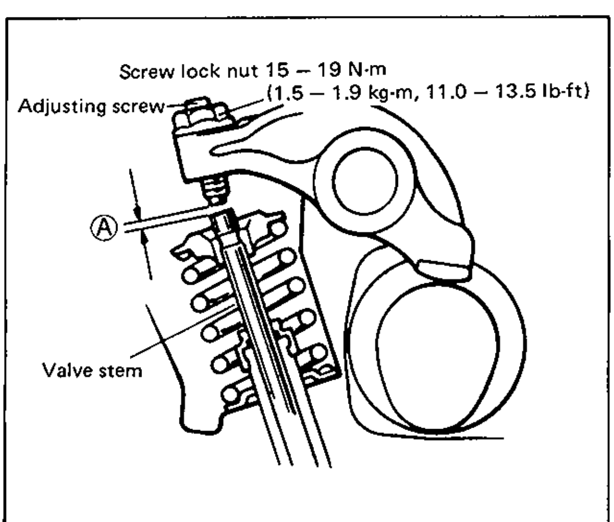


Fig. 0B-7

3) Refer to page 6A-7 of SECTION 6A for valve lash inspection and adjustment procedures.
4) Install cylinder head cover and tighten bolts to specification.

ITEM 1-4

Engine Oil and Filter Change

Before draining engine oil, check engine for oil leakage. If any evidence of leakage is found, make sure to correct defective part before proceeding to the following work.

1) Drain engine oil by removing drain plug.

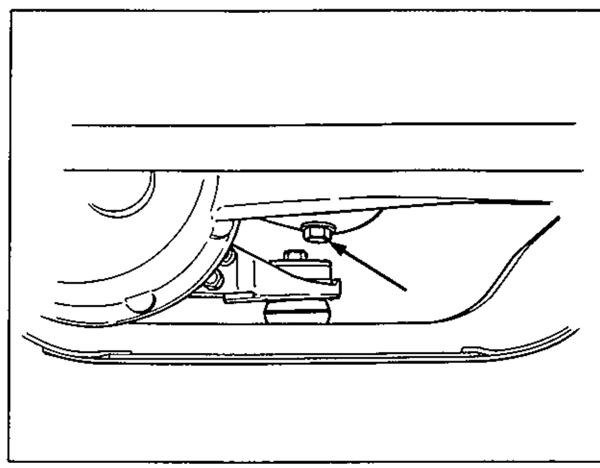


Fig. 0B-8

2) After draining oil, wipe drain plug clean. Reinstall drain plug, and tighten it securely as specified below.

Tightening torque for oil drain plug	N·m	kg-m	lb-ft
	30 – 40	3.0 – 4.0	22.0 – 28.5

3) Loosen oil filter by using oil filter wrench (special tool).

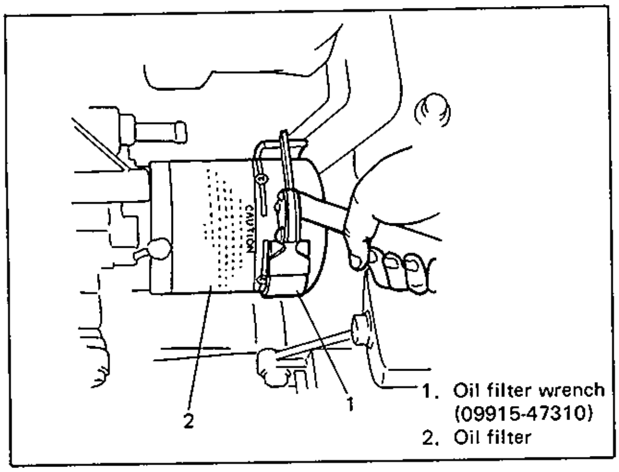


Fig. 0B-9

NOTE:
Before fitting new oil filter, be sure to oil its "O" ring. Use engine oil for this purpose.

4) Screw new filter on oil filter stand by hand until the filter "O" ring contacts the mounting surface.

CAUTION:
To tighten oil filter properly, it is important to accurately identify the position at which the filter "O" ring first contacts the mounting surface.

5) Tighten the filter 3/4 turn from the point of contact with the mounting surface using an oil filter wrench.

Oil filter tightening torque
12 – 16 N·m
1.2 – 1.6 kg-m
8.5 – 11.5 lb-ft

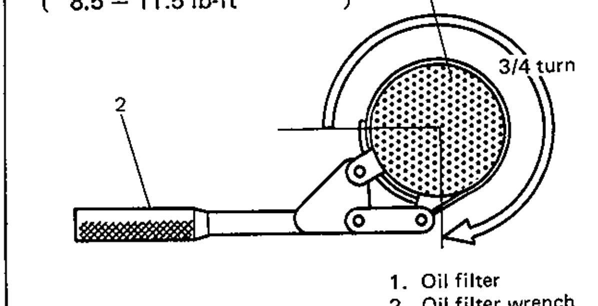


Fig. 0B-10

6) Replenish oil until oil level is brought to FULL level mark on dipstick. (about 4.2 liters or 8.9/7.4 US/Imp pt.). The filler inlet is atop the cylinder head cover.
7) Start engine and run it for three minutes. Stop it and wait another three minutes before checking oil level. Add oil, as necessary, to bring oil level to FULL level mark on dip stick.

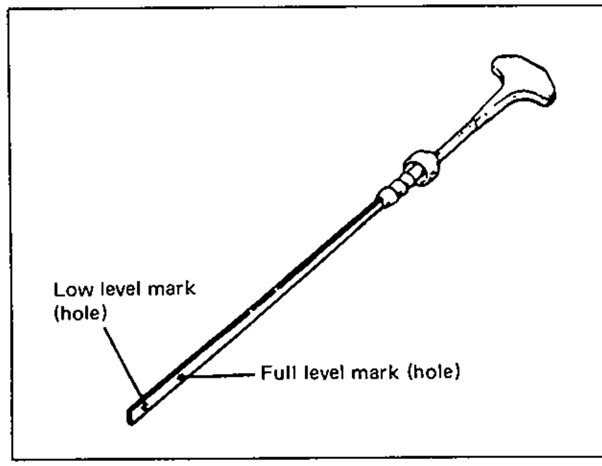


Fig. 0B-11

NOTE:
Steps 1) – 6) outlined above must be performed with ENGINE NOT RUNNING. For step 7), be sure to have adequate ventilation while engine is running.

It is recommended to use engine oil of SE, SF or SG class.

NOTE:
For temperature below 32° F (0° C), it is highly recommended to use SAE 5W –30 oil.

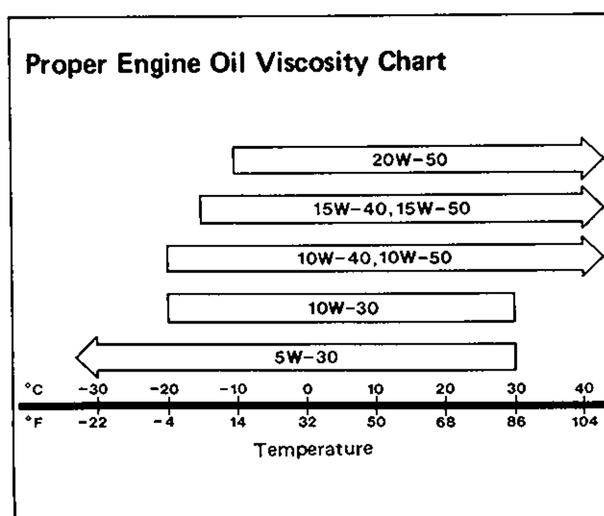


Fig. 0B-12 Engine Oil Viscosity Chart

Engine oil capacity

Oil pan capacity	about 4.0 liters (8.4/7.0 US/Imp pt.)
Oil filter capacity	about 0.2 liters (0.4/0.3 US/Imp pt.)
Others	about 0.3 liters (0.6/0.5 US/Imp pt.)
Total	about 4.5 liters (9.5/7.9 US/Imp pt.)

NOTE:
Engine oil capacity is specified as above. However, note that the amount of oil required when actually changing oil may somewhat differ from the data in the above table depending on various conditions (temperature, viscosity, etc.).

8) Check oil filter and drain plug for oil leakage.

ITEM 1-5

Cooling System Hoses and Connections Inspection

1) Visually inspect cooling system hoses for any evidence of leakage and cracks. Examine them for damage, and check connection clamps for tightness.

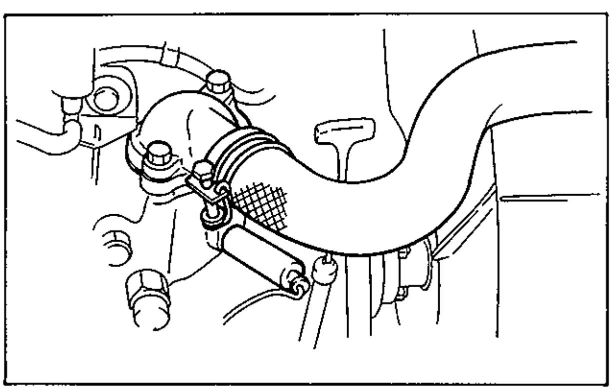


Fig. 0B-13

2) Replace all hoses which show evidence of leakage, cracks or other damage. Replace all clamps which cannot maintain proper tightness.

ITEM 1-6

Engine Coolant Change

> **WARNING:**
> **To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.**

1) Remove radiator cap when engine is cool.
2) Loosen radiator drain plug to drain coolant.
3) Remove reservoir tank, which is on the side of radiator, and drain.
4) Tighten plug securely. Also reinstall reservoir tank.

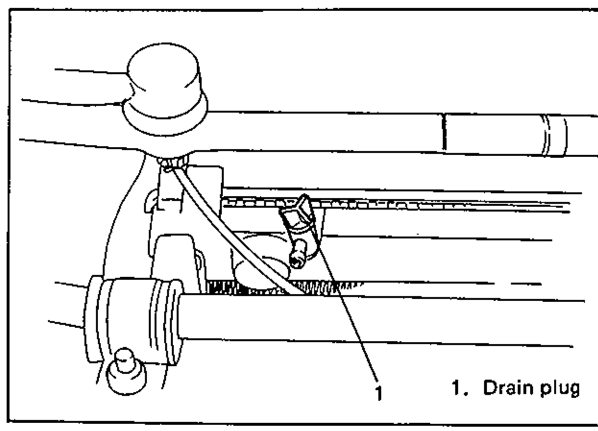


Fig. 0B-14

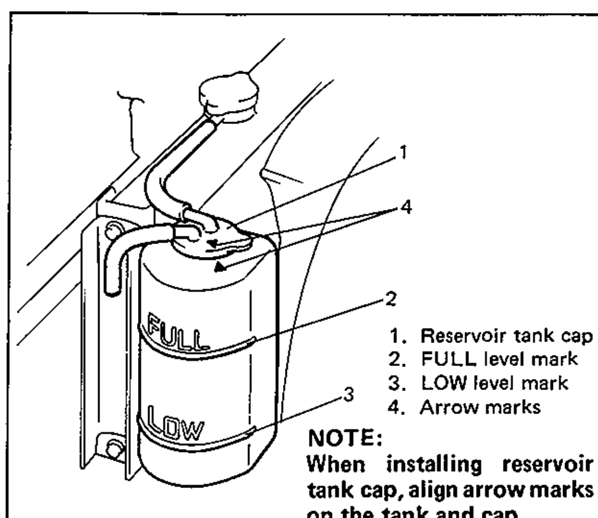


Fig. 0B-15

5) Fill radiator with specified amount of coolant, and run engine for 2 or 3 minutes at idle. This drives out any air which may still be trapped within cooling system. STOP ENGINE. Add coolant as necessary until coolant level reaches the filler throat of radiator. Reinstall radiator cap.
6) Add coolant to reservoir tank so that its level aligns with Full mark. Then, reinstall cap aligning arrow marks on the tank and cap.

> CAUTION:
> **When changing engine coolant, use mixture of 50% water and 50% ETHYLENE GLYCOL BASE COOLANT (ANTIFREEZE/ANTICORROSION COOLANT) for the market where ambient temperature falls lower than −16°C (3°F) in winter and mixture of 70% water and 30% ETHYLENE GLYCOL BASE COOLANT (ANTIFREEZE/ANTICORROSION COOLANT) for the market where ambient temperature doesn't fall lower than −16°C (3°F).**
> **Even in a market where no freezing temperature is anticipated, mixture of 70% water and 30% ETHYLENE GLYCOL BASE COOLANT (ANTIFREEZE/ANTICORROSION COOLANT) should be used for the purpose of corrosion protection and lubrication.**

ITEM 1-7

Exhaust Pipes and Mountings

Inspection

> WARNING:
> **To avoid danger of being burned, do not touch exhaust system when it is still hot. Any service on exhaust system should be performed when it is cool.**

When carrying out periodic maintenance, or the vehicle is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration, and out of position.
- Check exhaust system for leakage, loose connections, dents, and damages.
  If bolts or nuts are loose, tighten them to specification. Refer to SECTION 6K (page 6K-2) for torque specification of bolts and nuts.
- Check nearby body areas for damaged, missing, or mispositioned parts, open seams, holes, loose connections or other defects which could permit exhaust fumes to seep into the vehicle.
- Make sure that exhaust system components have enough clearance from the underbody to avoid overheating and possible damage to the floor carpet.
- Any defects should be fixed at once.

Mountings replacement

Replace muffler rubber mountings with new ones periodically.
Refer to SECTION 6K for installation.

IGNITION SYSTEM

ITEM 2-1

Ignition Wiring Replacement

1) Disconnect high tension cords from spark plugs, ignition coil and distributor.
2) Connect new high tension cords and clamp them securely. DO NOT push cords for connection. Push boots.

Ignition Wiring Inspection

1) Inspect high-tension cords for cracks and check that their connections are secure.
2) Measure resistance of high-tension cords by using a ohmmeter.

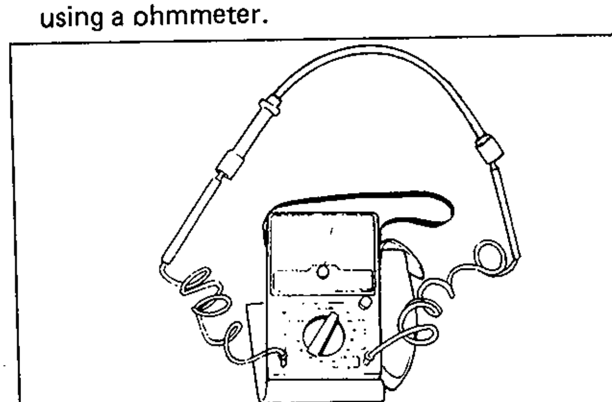


Fig. 0B-16

3) Replace high-tension cords that shown evidence of deterioration.

NOTE:
Check to make sure that each of the high-tension cord terminals and connections is secure and fully inserted into its mating component. Any burnt fitting must be replaced.

HIGH-TENSION CORD RESISTANCE	
Standard	16 kΩ/3.3 ft (1 m)
Service limit	20 kΩ/pc.

ITEM 2-2

Distributor Cap and Rotor Inspection

1) Inspect distributor cap and rubber caps for cracks.
2) Inspect center electrode and terminals for wear.

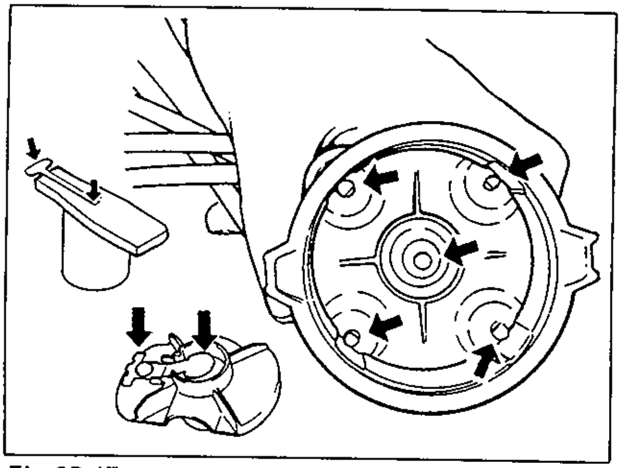


Fig. 0B-17

3) Inspect rotor for cracks, and its electrode for wear.
4) Repair or replace as necessary any component which is found to be in malcondition as described above.

NOTE:
Dust and stains found within distributor can be cleaned by using a dry, soft cloth.

ITEM 2-3

Spark plugs Replacement

1) Disconnect high-tension cords from spark plugs. Make sure to pull only on spark plug caps.

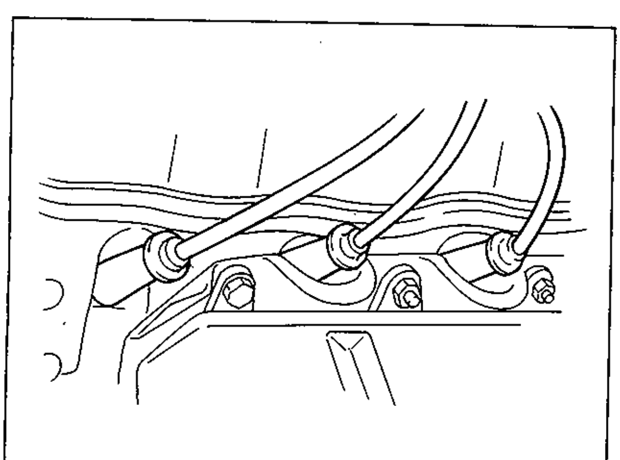


Fig. 0B-18

2) Using a spark plug wrench, loosen and remove plugs.

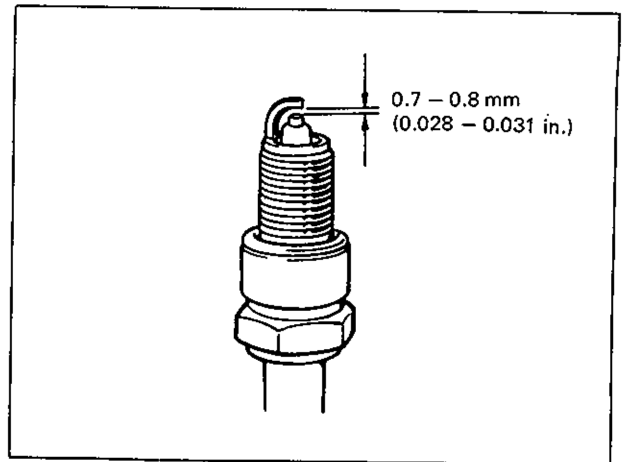


Fig. 0B-19

NOTE:
When replacing plugs, make sure to use new plugs of specified heat range and size.

PLUG SPECIFICATION

SPARK PLUG TYPE		
FUEL INJECTION MODEL	NGK	BPR5ES
	NIPPONDENSO	W16EXR-U
CARBURETOR MODEL	NGK	BP6ES (BPR6ES)
	NIPPONDENSO	W20EX-U (W20EXR-U)
	CHAMPION	N9YC

For carburetor model, there are two types of spark plugs, one without R included in its code and the other with R. Which one is used depends on countries. Look at the label attached to the vehicle. If originally equipped plug was with R included in its code, replacement plug should have R in its code, too.

3) Install new spark plugs. Tighten plugs to specification.
4) Connect high tension cords to spark plugs. DO NOT push cords for connection. Push boots.

Tightening torque for spark plug	N·m	kg-m	lb-ft
	20 – 30	2.0 – 3.0	14.5 – 21.5

ITEM 2-4 (Carburetor model only)
Ignition Timing Inspection

Check to make sure that ignition timing is set properly. If out of specification, adjust it.
Refer to page 6F-5 of SECTION 6F for inspection and adjustment procedure.

ITEM 2-5 (Carburetor model only)
Distributor Advancer Inspection

Check advancer for proper operation. Refer to page 6F-5 of SECTION 6F for checking procedure.
Check vacuum hose for pinhole, crack or breakage. Correct or replace if necessary.

FUEL SYSTEM

ITEM 3-1
Air Cleaner Element Replacement and Inspection

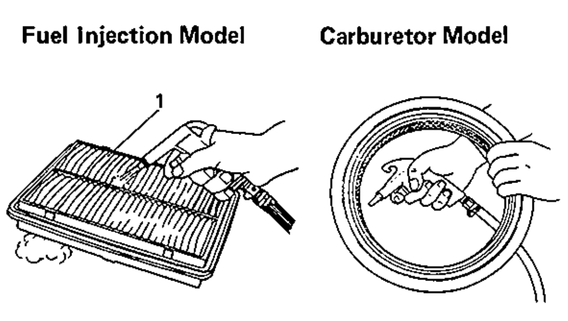
Replacement

1) Remove air cleaner cap.
2) Take cleaner element out of air cleaner case.
3) Install new cleaner element into cleaner case.

Inspection and cleaning

After driving in a dusty area, check element for dust. If found dusty, clean it as follows.

1) Blow off dust with compressed air from air outlet side of element.



1. Air outlet side
(i.e., the side facing up when installed in air cleaner case)

Fig. 0B-20

2) Install cleaner element into air cleaner case.

ITEM 3-2
Fuel Tank Cap, Fuel Lines and Connections Inspection

1) Visually inspect fuel lines and connections for evidence of fuel leakage, hose cracking, and damage. Make sure all clamps are secure.
Repair leaky joints, if any.
Replace hoses that are suspected of being cracked.
2) Visually inspect packing of fuel tank cap. If it is damaged or deteriorated, replace it with new one.

Fuel tank cap replacement
(Fuel injection model only)

Replace tank cap with new one periodically.

ITEM 3-3
Fuel Filter Replacement

> **WARNING:**
> **This work must be performed in a well ventilated area and away from any open flames (such as gas hot water heaters).**

Fuel filter is located in front of fuel tank, inside the right-hand side of chassis.

Replace fuel filter with new one periodically, referring to SECTION 6C for removal and installation.

> **WARNING:**
> **As fuel feed line of fuel injection model is still under high fuel pressure even after engine was stopped, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel to occur where loosened or disconnected. Before loosening or disconnecting fuel feed line, make sure to release fuel pressure according to "FUEL PRESSURE RELIEF PROCEDURE" in SECTION 6.**

ITEM 3-4 (Carburetor Model Only)

Carburetor Choke System Lubrication and Inspection

Manual choke type

1) Remove air cleaner case and lubricate rotating parts.
2) Check if choke valve operates smoothly to open and close fully when choke knob is pulled and pushed back respectively. Correct if it doesn't operate as described above.
3) With choke knob pulled, start engine and run it at idle speed. Then check choke valve. It should not be fully closed but a little open. If faulty, check choke opener or its jet.

Auto choke type

1) Remove air cleaner case, and lubricate rotating parts.
2) Check choke for proper operation, referring to ON VEHICLE SERVICE of SECTION 6D.

ITEM 3-5 (Carburetor Model Only)

Engine Idle Speed And Idle Mixture Inspection

Check idle speed and idle mixture, and adjust them as necessary. Refer to ON VEHICLE SERVICE of SECTION 6D for procedures to check and adjust idle speed/idle mixture.

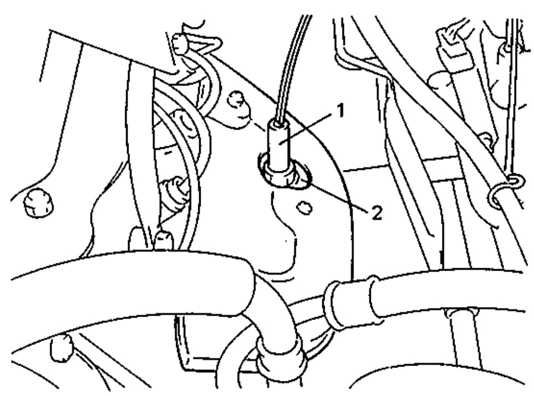
EMISSION CONTROL SYSTEM

ITEM 4-1 (Fuel Injection Model Only)

Oxygen Sensor Replacement

> **WARNING:**
> **To avoid danger of being burned, do not touch exhaust system when it is still hot. This work should be performed when it is cool.**

1) Disconnect battery negative cable from battery and disconnect oxygen sensor wire at its coupler.
2) Remove oxygen sensor from exhaust manifold.



1. Oxygen sensor
2. Exhaust manifold

Fig. 0B-22

3) Install oxygen sensor and tighten it to specification.

	N·m	kg-m	lb-ft
Tightening torque for oxygen sensor	40 – 50	4.0 – 5.0	29.0 – 36.0

4) Connect oxygen sensor wire at the coupler securely.
5) Connect negative cable to battery.
6) Start engine and check for gas leak.

ITEM 4-1 (Carburetor Model Only)

Crankcase Ventilation Hoses and Connections Inspection

Refer to following item 4-2, PCV VALVE INSPECTION.

ITEM 4-2

PCV (Positive Crankcase Ventilation) Valve Inspection

Check crankcase ventilation hoses and PCV hoses for leaks, cracks or clog, and PCV valve for stick or clog. Refer to ON VEHICLE SERVICE of SECTION 6J for PCV valve checking procedure.

ITEM 4-3 (Fuel Injection Model)

Fuel Vapor Storage System Inspection

1) Visually inspect hoses for cracks, damage or excessive bends. Inspect all clamps for damage and proper position.
2) Check canister purge control system for operation, referring to p. 6E-101.
3) Check charcoal canister for operation and clog, referring to p. 6E-103.

ITEM 4-3 (Carburetor Model)

Fuel Vapor Storage System, Hoses and Connections Inspection

1) Visually inspect hoses for cracks, damage, or excessive bends. Inspect all clamps for damage and proper position.
2) If any of these is defective, repair or replace.

ITEM 4-4 (Carburetor Model with Charcoal Canister)

Charcoal Canister Inspection

Check charcoal canister. Refer to ON VEHICLE SERVICE of SECTION 6J for procedures to check charcoal canister.

ITEM 4-5 (Australia Spec. Vehicle Only)

Fuel Cut System Inspection

Check fuel cut system. Refer to ON VEHICLE SERVICE of SECTION 6J for procedures to check fuel cut system.

ELECTRICAL

ITEM 5-1

Wiring Harness Connections and Headlights Inspection

Wiring harness and connections

1) Visually inspect all wires located in engine compartment for evidence of breakage. Inspect the condition of the insulation (cracks). All clips and clamps should have solid connections to wires.
2) Replace any wires in a deteriorated or otherwise defective condition.

Headlights

1) Check vertical beam alignment.
2) Check horizontal beam alignment.
   Refer to ON VEHICLE SERVICE of SECTION 8.

NOTE:

In the countries where statutory regulations define headlight alignments, adjust in conformity with such regulations.

CHASSIS AND BODY

ITEM 6-1

Clutch Pedal Inspection (if equipped with Manual Transmission)

1) Check clutch pedal free travel.
2) With left-hand steering wheel vehicle, clutch pedal height should exceed brake pedal height by 5 mm (0.2 in.).
   With right-hand steering wheel vehicle, clutch pedal height should be the same as brake pedal height.

Clutch pedal free travel	15 – 25 mm (0.6 – 1.0 in.)

For details of above steps 1) and 2), refer to ON-VEHICLE SERVICE (page 7C-4) of SECTION 7C.

ITEM 6-2

Brake Discs, Pads, Brake Drums and Shoes Inspection

Brake discs and pads

1) Remove wheel and caliper but don't disconnect brake hose from caliper.
2) Check front disc brake pads and discs for excessive wear, damage and deflection. Replace parts as necessary. For the details, refer to SECTION 5.
   Be sure to torque caliper pin bolts to specification reinstallation

Brake drums and shoes

1) Remove wheel and brake drum.
2) Check rear brake drums and brake linings for excessive wear and damage, while wheels and drums are removed. At the same time, check wheel cylinders for leaks. Replace these parts as necessary.
   For the details, refer to SECTION 5.

ITEM 6-3

Brake Hoses and Pipes Inspection

Check brake hoses and pipes for proper hook-up, leaks, cracks, chafing and other damage.
Replace any of these parts as necessary.

> **CAUTION:**
> **After replacing any brake pipe or hose, be sure to carry out air purge operation.**

ITEM 6-4

Brake Fluid Inspection and Change

[Inspection]

1) Check around master cylinder and reservoir for fluid leakage.
   If found leaky, correct.
2) Check fluid level
   If fluid level is lower than the minimum level of reservoir, refilling is necessary. Fill reservoir with specified brake fluid.

	Specification
Brake fluid	DOT3, or SAE J1703

For the details, refer to ON-VEHICLE SERVICE (page 5-50) of SECTION 5.

> **CAUTION:**
> **Since the brake system of this vehicle is factory-filled with glycol-base brake fluid, do not use or mix different type of fluid when refilling the system; otherwise serious damage will occur. Do not use old or used brake fluid, or one taken from unsealed container.**

[Change]

1) Change brake fluid as follows.
   Drain existing fluid from brake system completely, fill the system with above recommended fluid and carry out air purge operation.
   For air purging procedure, refer to page 5-23 and 5-24 of SECTION 5.

ITEM 6-5

Brake Pedal Inspection

Check brake pedal travel.
For checking procedure, refer to PEDAL TRAVEL CHECK of SECTION 5.

ITEM 6-6

Brake Lever and Cable Inspection

Parking brake lever

- Check tooth tip of each notch for damage or wear. If any damage or wear is found, replace parking brake lever.
- Check parking brake lever for proper operation and stroke, and adjust it if necessary.
  For checking and adjusting procedures, refer to PARKING BRAKE INSPECTION AND ADJUSTMENT (page 5-22) of SECTION 5.

Parking brake cable

Inspect brake cable for damage and smooth movement. Replace cable if it is in deteriorated condition.

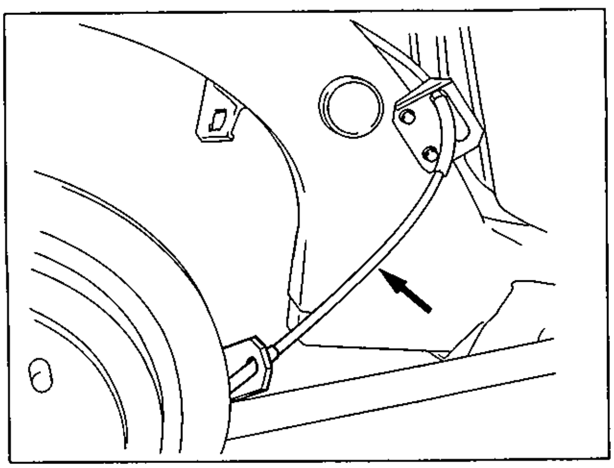


Fig. 0B-23

ITEM 6-7

Tire Inspection and Rotation

- Check tires for uneven or excessive wear, or damage. If defective, replace.
- Check inflating pressure of each tire and adjust pressure to specification as necessary.

NOTE:

- **Tire inflation pressure should be checked when tires are cool.**
- **Specified tire inflation pressure should be found on tire placard or in owner's manual which came with the vehicle.**

- Rotate tires.
  For the details of above steps, refer to SECTION 3F.

ITEM 6-8

Wheel Discs and Free Wheeling Hubs (if equipped) Inspection

Wheel disc

Inspect each wheel disc for dents, distortion and cracks. A disc in badly damaged condition must be replaced.

Free wheeling hub

[Manual type]

This is applicable to the vehicle equipped with manual type free wheeling hubs.

Check free wheeling hub for proper operation by moving free wheeling hub knob to LOCK and FREE positions. (The same check on both right and left wheels)

For checking procedure, refer to SECTION 3D.

[Automatic free wheeling hub]

This is applicable to the vehicle equipped with automatic free wheeling hubs.

Check to ensure that free wheeling hub moves properly to LOCK and FREE positions, referring to SECTION 3D.

(The same check on both right and left wheels)

ITEM 6-9

Wheel Bearing Inspection

[Inspection of wheel bearing]

1) Check front wheel bearing for wear, damage, abnormal noise or rattles. For the details, refer to FRONT SUSPENTION INSPECTION of SECTION 3D.
2) Check rear wheel bearing for wear, damage abnormal noise or rattles. For the details, refer to WHEEL BEARING INSPECTION of SECTION 3E.

[Inspection of front wheel bearing grease]

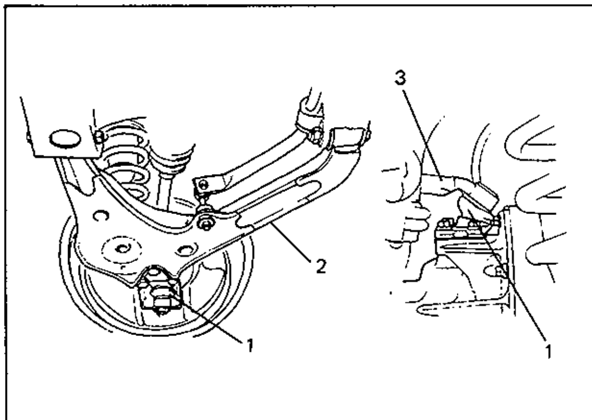
1) Remove wheel hub referring to FRONT WHEEL HUB REMOVAL of SECTION 3D.
2) Check grease around front wheel bearing rollers for deterioration and capacity.

If grease is deteriorated, remove grease thoroughly and apply enough amount of new wheel bearing grease. If grease is found insufficient, add some more.

3) For reinstallation, refer to WHEEL HUB INSTALLATION in SECTION 3D.

NOTE:
- **To reinstall bearing lock nut and lock plate, make sure to torque them to specification.**
- **Be sure to tighten each bolt and nut to specified torque when reinstalling them.**

4) Upon completion of reinstalling all parts, check to make sure that front wheel bearing is not loose and wheel turns smoothly.



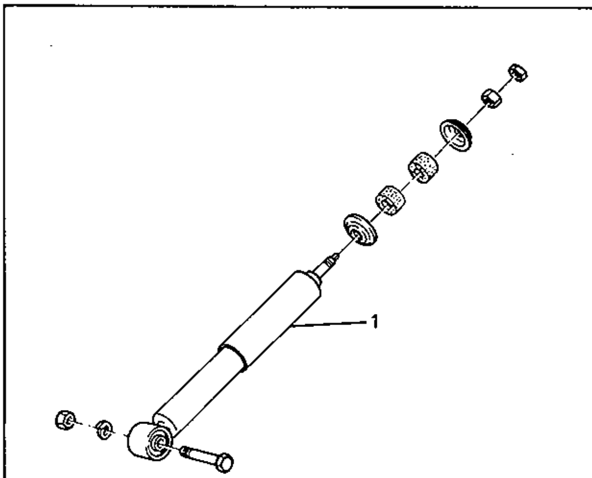
1. Ball joint stud dust seal (boot)
2. Suspension arm
3. Upper arm

Fig. 0B-25

ITEM 6-10

Suspension Inspection

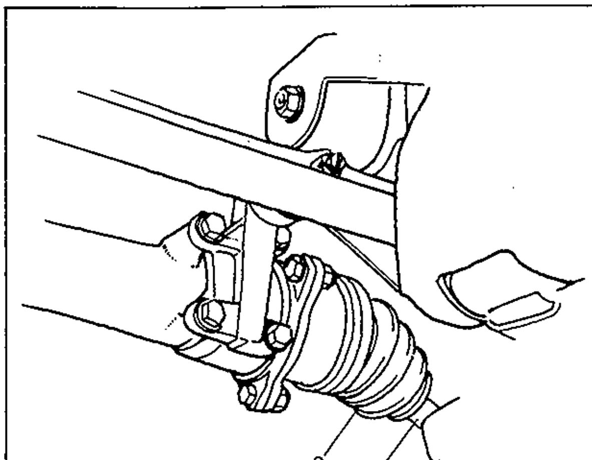
- Inspect absorbers for evidence of oil leakage, dents or any other damage on sleeves; and inspect anchor ends for deterioration.
  Depending on the results of above inspection, replace absorbers.



1. Shock absorber

Fig. 0B-24

- Check drive axle boots (wheel side and differential side) for leaks, detachment, tear or other damage.
  Replace boot as necessary.



1. Drive axle shaft
2. Boot

Fig. 0B-26

- Check front struts for leaks, dent or other damage.
  Replace defective parts, if any.
- Check front suspension arm and rear upper arm ball joint stud dust seals for leaks, detachment, tear, or other damage.
  Replace defective boot, if any.
- Check suspension system for damaged, loose or missing parts; also for parts showing signs of wear or lack of lubrication.
  Repair or replace defective parts, if any.
- Check suspension bolts and nuts for tightness and retighten them as necessary.
  Repair or replace defective parts, if any.

NOTE:
For the details of check points, refer to the table of TIGHTENING TORQUE SPECIFICATION in SECTION 3D and 3E.

ITEM 6-11

Propeller Shafts Inspection

1) Check universal joint and spline of propeller shaft for rattle. If rattle is found, replace defective part with a new one.

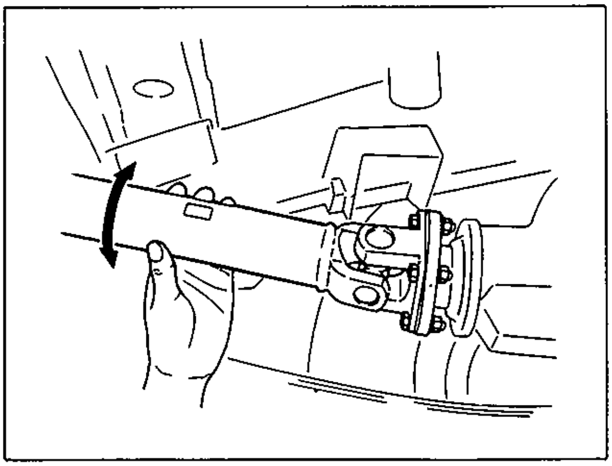


Fig. 0B-27

2) Check propeller shaft (front & rear) flange yoke bolts for tighteness, and retighten them as necessary:

	N·m	kg-m	lb-ft
Tightening torque	50 – 60	5.0 – 6.0	36.5 – 43.0

ITEM 6-12 (Manual Transmission)

Transmission Oil Inspection and Change

[Inspection]

1) Inspect transmission case for evidence of oil leakage.
   Repair leaky point if any.
2) Make sure that the vehicle is placed level for oil level check.
3) Remove level plug of transmission.
4) Check oil level.
   Oil level can be checked roughly by means of level plug hole. That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled.
   If oil is found insufficient, pour specified amount of specified oil, refering to viscosity chart in Fig. 0B-28.

[Change]

Place the vehicle level and drain oil by removing drain plug. Tighten drain plug to specified torque. Pour specified amount of specified oil and tighten filler plug to specified torque.

It is highly recommended to use SAE 75W – 90 gear oil.

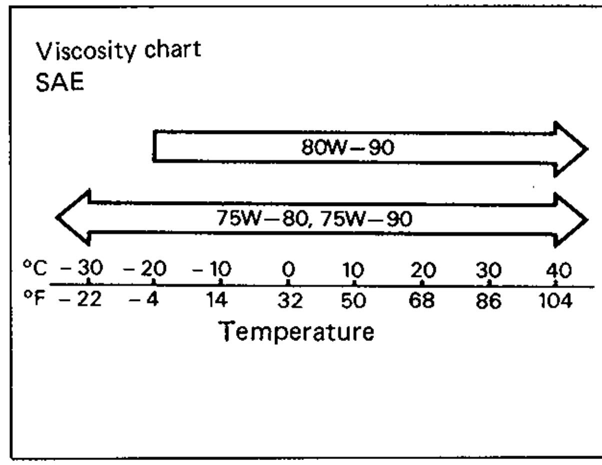


Fig. 0B-28

For oil level, location of drain plug and tightening torque data, refer to ON-VEHICLE SERVICE in SECTION 7A.

ITEM 6-13 (Automatic Transmission)

Fluid Level Inspection

1) Inspect transmission case for evidence of fluid leakage.
   Repair leaky point, if any.
2) Make sure that the vehicle is placed level for fluid level check.
3) Check fluid level.
   For fluid level checking procedure, refer to ON-VEHICLE SERVICE in SECTION 7B and be sure to perform it under specified conditions. If fluid level is low, replenish specified fluid.

Fluid Change

NOTE:
Brake band should be adjusted at every fluid change. Refer to p. 7B-51 for adjustment.

1) Perform steps 1) and 2) of above Fluid Level Inspection.
2) Change fluid. For its procedure, refer to ON-VEHICLE SERVICE IN SECTION 7B.

> CAUTION:
> **Use of specified fluid is absolutely necessary.**

Fluid Cooler Hose Change

Replace inlet and outlet hoses of cooler hose and their clamps. For replacement procedure, refer to ON-VEHICLE SERVICE in SECTION 7B.

ITEM 6-14

Transfer and Differential Oil Inspection and Change

[Inspection]

1) Inspect transfer case and differential housings for evidence of oil leakage.
   Pepair leaky point, if any.
2) Make sure that the vehicle is placed level for oil level check.
3) Remove each level plug of transfer and differential (front and rear). Oil level can be checked roughly by means of level plug hole. That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled.
   If oil is found insufficient, pour specified amount of specified oil as given in Fig. 0B-28.

[Change]

Place the vehicle level and drain oil by removing drain plug. Pour specified amount of specified oil as shown in Fig. 0B-28 and tighten drain plug and filler plug to specified torque.

For location of oil drain plug and level plug of transfer and their tightening torque, refer to ON-VEHICLE SERVICE in SECTION 7A.

For location of oil drain plug and level plug of differential and their tightening torque, refer to ON-VEHICLE SERVICE in SECTION 7E.

> CAUTION:
> **Use hypoid gear oil for front and rear differential oil.**

ITEM 6-15

Steering System Inspection

1) Check steering wheel for play and rattle, holding vehicle in straight forward condition on the ground.

Steering wheel play	10 – 30 mm (0.4 – 1.2 in.)

2) Check universal joints of steering shaft for rattle and damage. If rattle or damage is found, replace defective part with a new one.
3) Check bolts and nuts for tightness and retighten them as necessary. Repair or replace defective parts, if any.
   Refer to table of TIGHTENING TORQUE SPECIFICATION of SECTION 3B2 and 3C2 for particular check points.
4) Inspect steering gear box for evidence of oil leakage. If leakage is found, check oil level in gear box.

NOTE:
For the details of the above steps 1) to 4), refer to SECTION 3B2 and 3C2.

5) Check boots of steering linkage for damage (leaks, detachment, tear, etc.). If damage is found, replace defective boot with new one.
6) Check wheel alignment.

NOTE:
For the details of wheel alignment, refer to WHEEL ALIGNMENT (page 3A-1) of SECTION 3A.

ITEM 6-16
Power Steering (P/S) System Inspection (if equipped)

1) Visually check power steering system for leaks or damage.
   Repair or replace defective parts, if any.
2) Remove oil tank cap and check fluid level indicated on level gauge, which should be between MAX and MIN marks. If it is lower than MIN, fill fluid up to MAX mark.

NOTE:
- **Be sure to use DEXRON-II for P/S fluid.**
- **Fluid level should be checked when fluid is cool.**

3) Check power steering belt for tension, referring to Section 3B3.
   Also, visually check the belt for damage.
   If necessary, have the belt adjusted or replaced.

ITEM 6-17
Door Hinges Lubrication
Lubricate door hinges for smooth operation.

FINAL INSPECTION

Carry out road test in safe place.

> WARNING:
> **When carrying out the following road tests, select a safe place where no man or no running car is seen so as to prevent any accident.**

1) Engine start
Check engine start for readiness.

NOTE:
In the cold weather, start to operate engine by pulling choke control knob (if equipped).

2) Clutch (For Manual transmission)
Check the following:
- that clutch is completely released when depressing clutch pedal,
- that no slipping clutch occurs when releasing pedal and accelerating,
- and that clutch itself is free from any abnormal condition.

3) Gearshift Lever (Transmission and Transfer)
Check gearshift lever for smooth shifting to all positions and for good performance of transmission and transfer in any position.
With automatic transmission equipped vehicle, also check that shift indicator indicates properly according to which position shift lever is shifted to.

4) Brake
[Foot brake]
Check the following when depressing brake pedal while driving;
- that brake works properly,
- that it is free from noise,
- and that braking force is applied equally on all wheels.

[Parking brake]
Check to ensure that parking brake is fully effective when the vehicle is stopped on the slope and brake lever is pulled all the way.

5) **Steering**

Check to ensure that steering wheel is free from instability, or abnormally heavy feeling while driving.

6) **Engine**

- Check that engine responds readily at all speeds.
- Check that engine is free from abnormal noise and abnormal vibration.

7) **Body, Wheels and Power Transmitting System**

Check that body, wheels and power transmitting system are free from abnormal noise and abnormal vibration or any other abnormal condition.

8) **Meters and Gauge**

Check that speedometer, odometer, fuel meter, temperature gauge, etc. are operating accurately.

9) **Oil Pressure and Charging Indicator Lights**

Make sure that these lights stay off while engine is operating. If either of them comes on during engine operation, it means that something is wrong with engine lubrication system or charging system, and therefore immediate inspection is necessary.

10) **Seat Belt**

Inspect belt system, including webbing, buckles, latch plates, retractors and anchors. Check that seat belt is securely locked.

WARNING:
For this test, select a safe place without any running vehicle as to prevent any accident. And again make sure that no man or no other car is seen in front or behind and use great care to the surroundings when carrying out the test.

RECOMMENDED FLUIDS AND LUBRICANTS

Engine oil	SE, SF or SG, SAE 5W-30 (Refer to Fig. 0B-11)
Engine coolant (Ethylene glycol base coolant)	GOLDEN CRUISER 1200 "Antifreeze/Anticorrosion coolant"
Brake fluid	DOT3, or SAE J1703
Manual transmission oil	API GL-4 or SAE 75W-90 (Refer to Fig. 0B-28)
Transfer oil	
Differential oil (front & rear)	API GL-5 or SAE 75W-90 Hypoid gear oil (Refer to Fig. 0B-28)
Automatic transmission fluid	Automatic transmission fluid DEXRON-II
Power steering fluid	
Clutch linkage pivot points	Water resistance chassis grease (SUZUKI SUPER GREASE A 99000-25010)
Gear shift control lever and shaft	Water resistance chassis grease (SUZUKI SUPER GREASE A 99000-25010)
Door hinges	Engine oil
Hood latch assembly	Engine oil
Key lock cylinder	Spray lubricant

Fig. 0B-29

SECTION 1A

HEATER AND VENTILATION

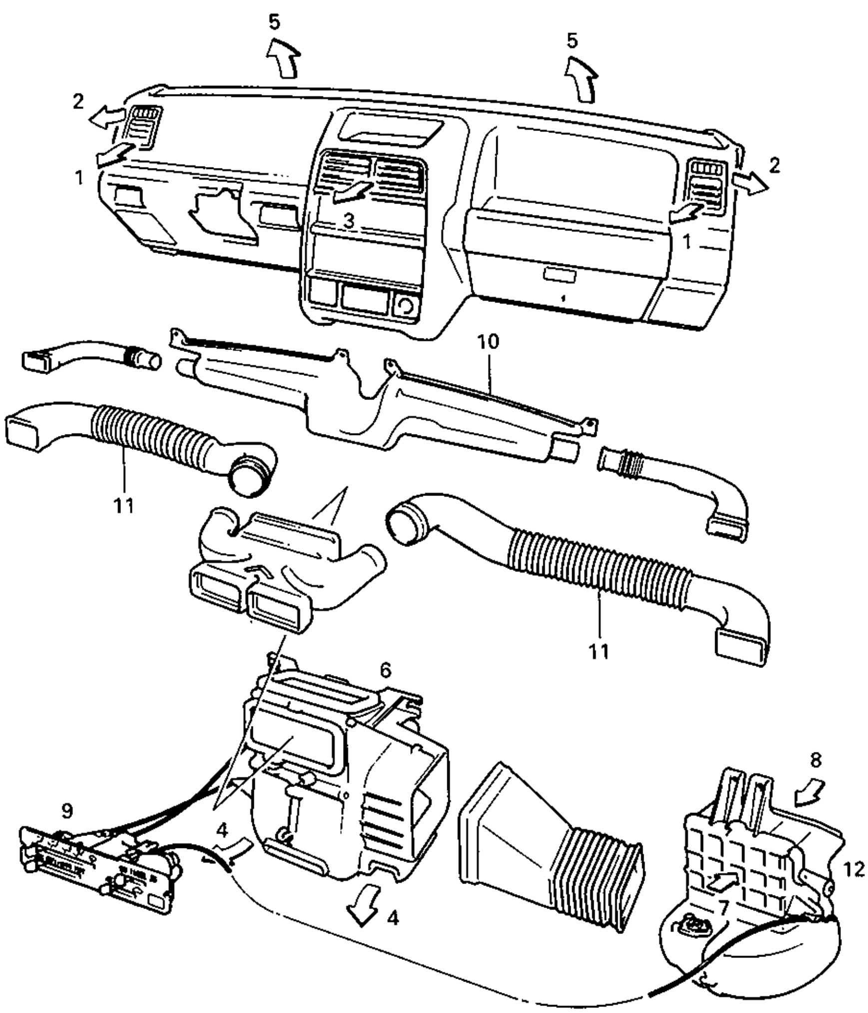
CONTENTS

NOTE:
Whether equipped with the heater unit or not depends on the vehicle specification.
The blower motor installing position is different between the right-hand steering veicle and the left-hand steering vehicle. In either vehicle, the motor is installed on the passenger side. The illustration in this manual shows the left-hand steering vehicle.

HEATER

GENERAL DESCRIPTION

The heater, an in and out air selectable-type hot water heater, is so constructed that it is possible to assure an agreeable ventilation at all times by providing the ventilator air outlets at the center and both sides (right, left) of the instrument panel, the hot air outlet at a place close to the feet of front passengers, and the defroster air outlets at places, right and left, along the windshield glass.



1. Side ventilator outlet
2. Side defroster outlet
3. Center ventilator outlet
4. Floor outlet
5. Front defroster outlet
6. Heater unit
7. Inside air
8. Outside air
9. Control lever
10. Defroster duct
11. Side ventilator duct
12. Blower motor

Fig. 1A-1

HEATER CONTROL OPERATION

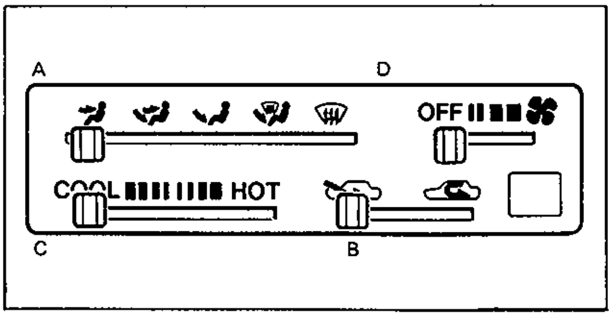
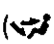


Fig. 1A-2

CONTROL LEVER A

	VENTILATION
	BI-LEVEL
	HEAT
	HEAT & DEFROSTER
	DEFROSTER

Fig. 1A-3

BI-LEVEL () is a position used to keep cooling the head and warming the feet.

CONTROL LEVER B

	CIRCULATION
	FRESH AIR

CONTROL LEVER C

A temperature control lever.
The temperature of air is controlled by this lever. To make the heater warmer, set it to the "HOT" position.

CONTROL LEVER D

A blower speed selecting lever. The blower speed is increased as the lever is moved from left to right.

A. FORCED VENTILATION

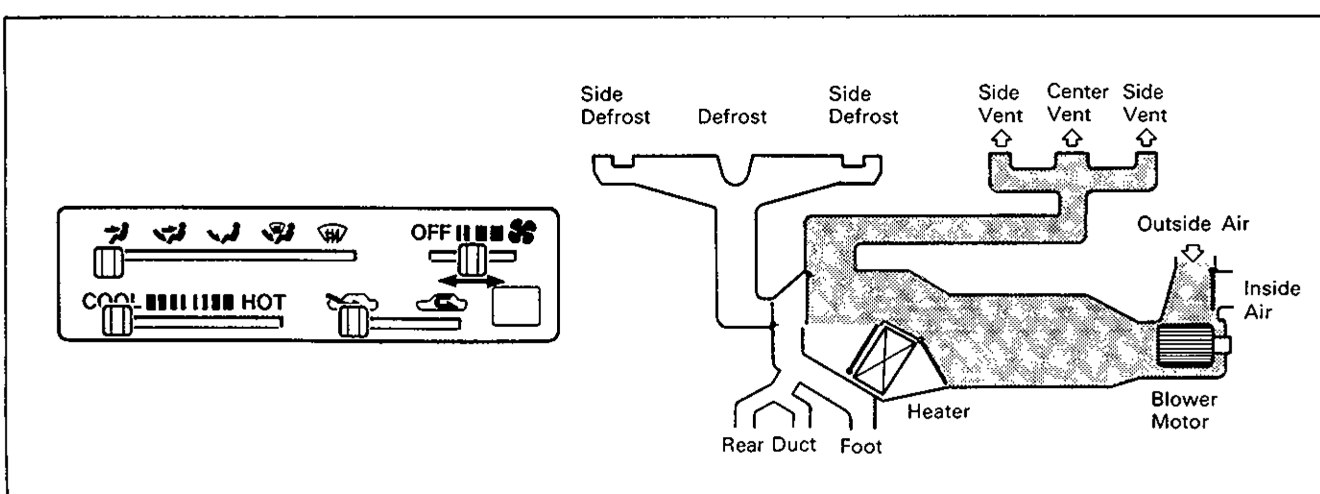


Fig. 1A-4

B. OUTSIDE AIR-INTRODUCED HEATING

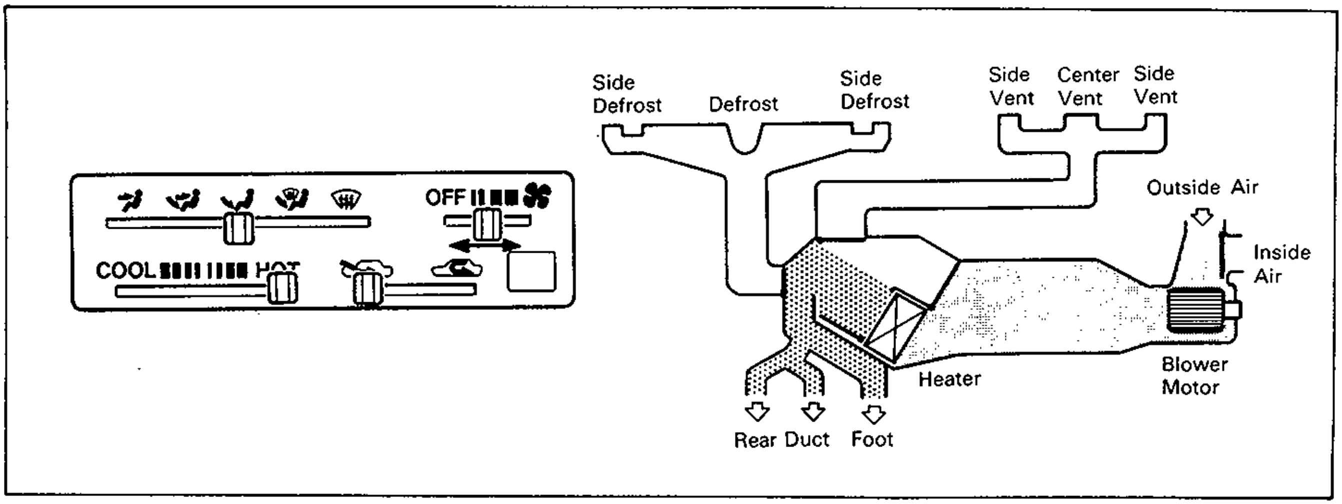


Fig. 1A-5

C. INSIDE AIR-CIRCULATED HEATING

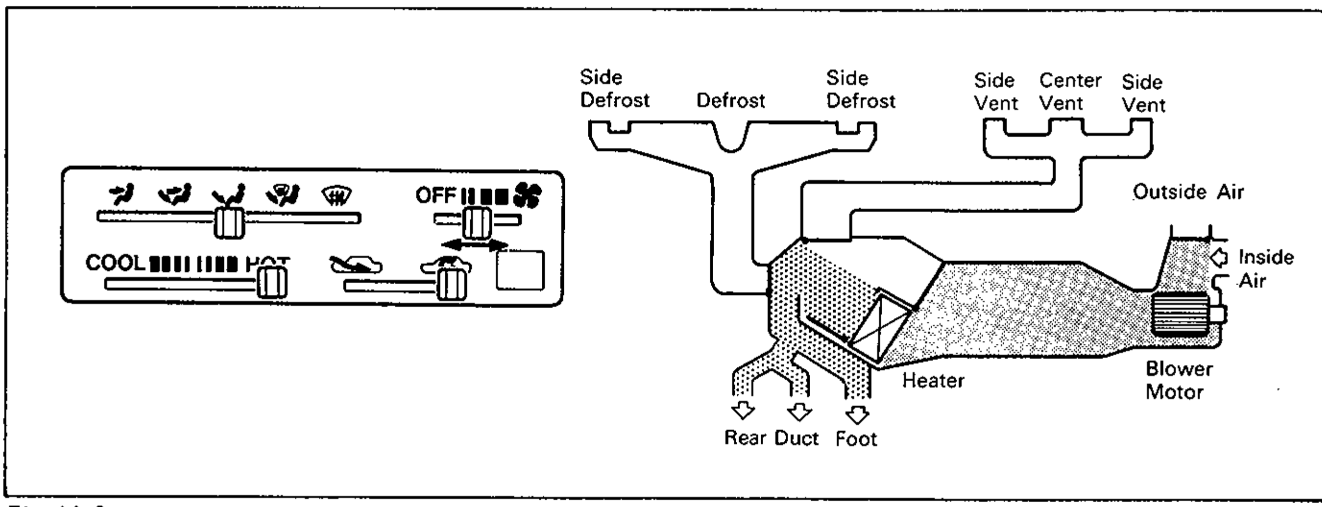


Fig. 1A-6

D. HEAD-COOLED/FEET-WARMED HEATING

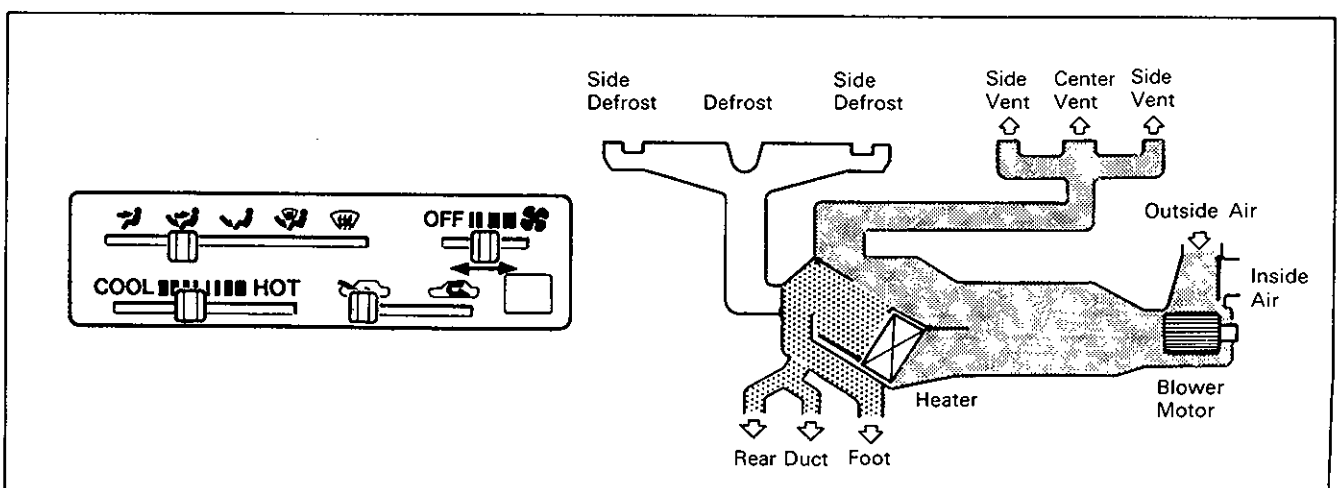


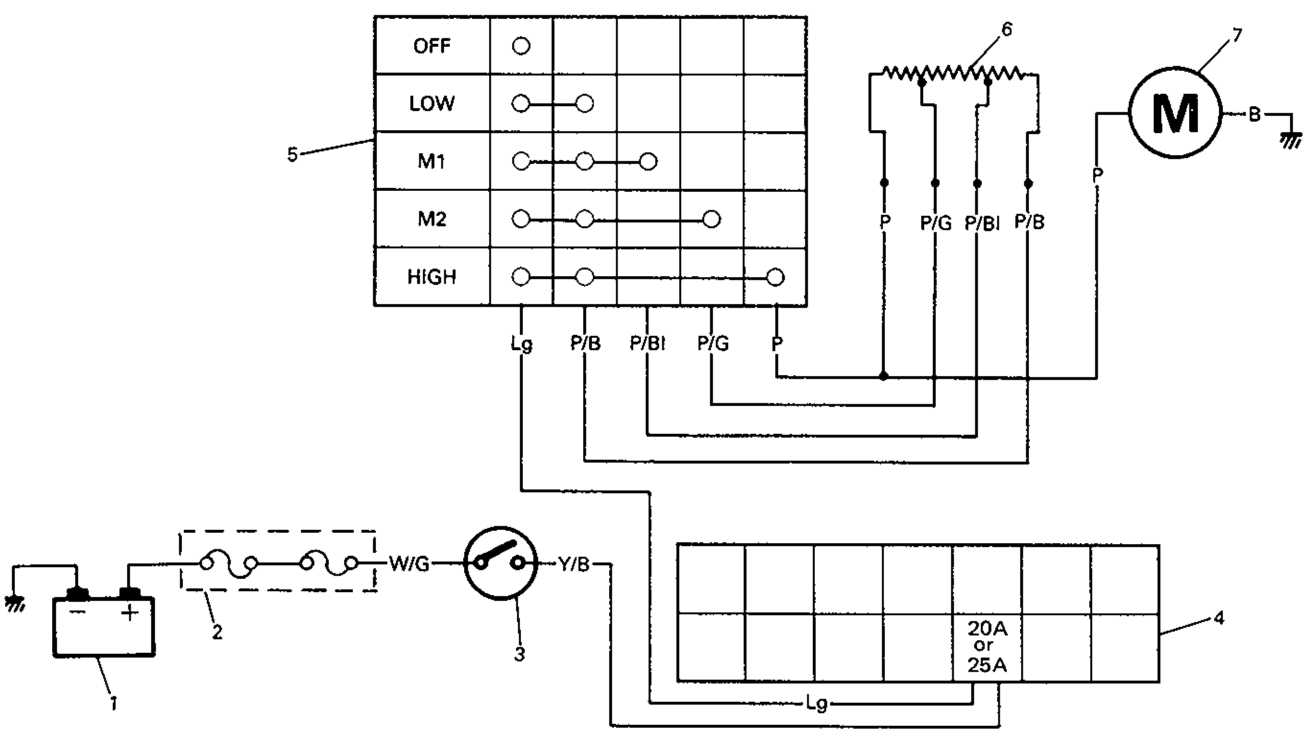
Fig. 1A-7

TROUBLE DIAGNOSIS

Trouble	Possible cause	Remedy
Heater blower won't work even when its switch is ON.	Blower fuse blown	Replace fuse to check for short.
	Blower registor faulty	Check registor.
	Blower motor faulty	Replace motor.
	Wiring or grounding faulty	Repair as necessary.
Incorrect temperature output.	Control cables broken or binding	Check cables.
	Air damper broken	Repair damper.
	Air ducts clogged	Repair air ducts.
	Heater radiator leaking or clogged	Replace radiator.
	Heater hoses leaking or clogged	Replace hoses.

SERVICING

WIRING CIRCUIT



1. Battery
2. Main fuse
3. Main switch
4. Fuse box
5. Blower motor switch
6. Heater registor
7. Blower motor

NOTE:
20A . . . . . For German specification vehicle only
25A . . . . . Except German specification vehicle

W/G : White/Green
Y/B : Yellow/Black
Lg : Light green
P/B : Pink/Black
P/Bl : Pink/Blue
P/G : Pink/Green
P : Pink
B : Black

Fig. 1A-8

HEATER BLOWER MOTOR

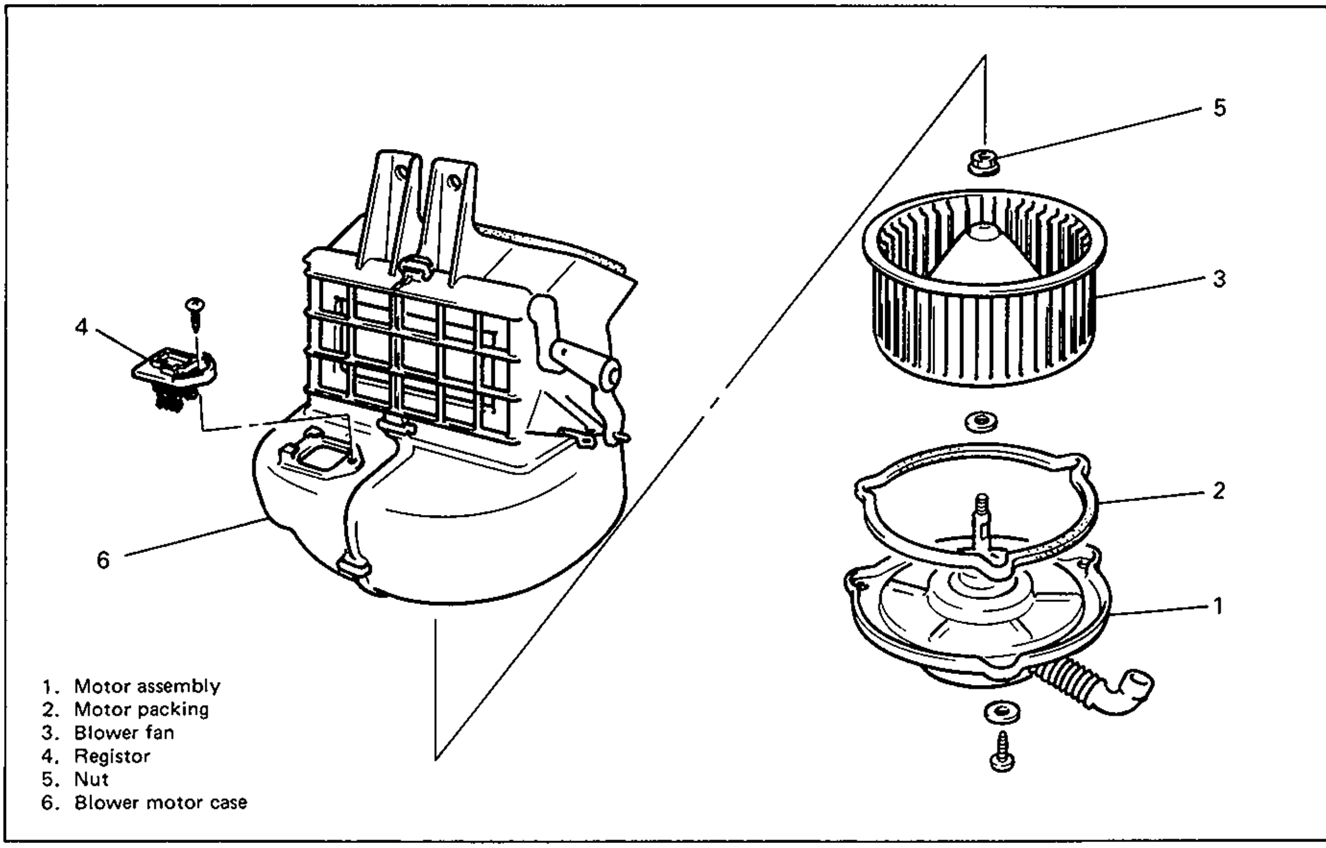


Fig. 1A-9

REMOVAL

1) Disconnect the negative battery cable.
2) Remove instrument glove box and instrument panel holder stay.
3) Disconnect blower motor and registor lead wires at couplers.
4) Disconnect fresh air control cable from blower motor case.
5) Loosen blower motor case fastening bolts.
6) Remove blower motor after removing 3 blower motor mounting screws.

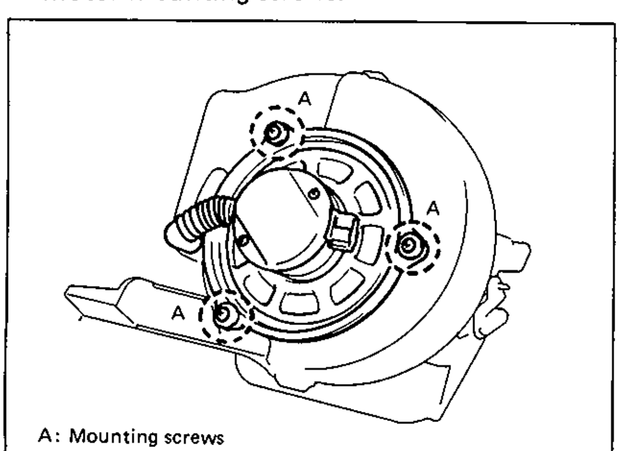


Fig. 1A-10

INSTALLATION

Reverse removal procedure to install blower motor.

HEATER BLOWER RESISTOR

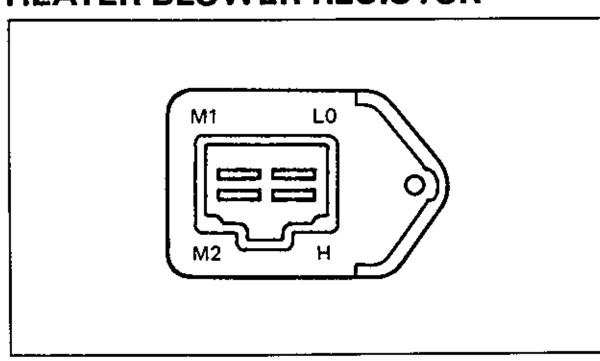


Fig. 1A-11

REMOVAL

Remove heater blower registor by loosening its fastening screw.

INSPECTION

Measure each terminal-to-terminal resistance on registor.

Terminal-to-terminal	Registance (Ω)
H – L0	Approx. 2.22
H – M1	Approx. 1.21
H – M2	Approx. 0.53

If measured resistance is incorrect, replace heater blower registor.

INSTALLATION
Install heater blower registor with screws.

	Lg	P/B	P/Bl	P/G	P
LOW	O—	—O			
M1	O—	—O—	—O		
M2	O—	—O—	—	—O	
HIGH	O—	—O—	—	—	—O

Lg : Light green
P/B : Pink/Black
P/Bl : Pink/Blue
P/G : Pink/Green
P : Pink

HEATER BLOWER MOTOR SWITCH

REMOVAL AND INSPECTION
1. Pull off control lever knobs.
2. Pull out heater control lever panel garnish.
3. Remove heater control lever panel.
4. Remove instrument glove box compartment.
5. Remove heater control lever assembly attaching screws.
6. Disconnect switch connector and remove switch.
7. Check heater blower motor switch for each terminal-to-terminal continuity.

INSTALLATION
Install in reverse order of removal. When installing switch, be sure to clamp its lead wire at the lower center of control lever assembly.

CONTROL CABLES

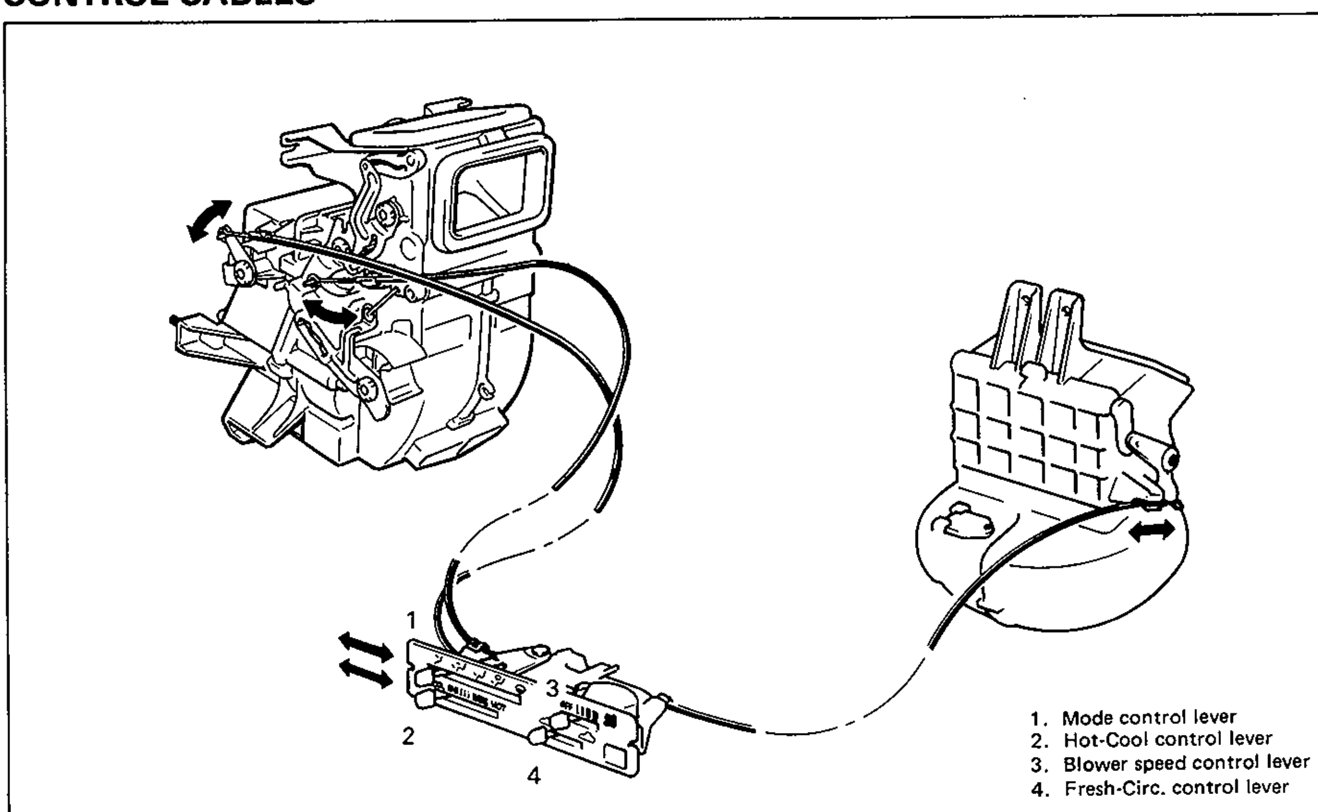


Fig. 1A-12

ADJUSTMENT

A. Air Control Cable

1. Move control lever to VENT position.

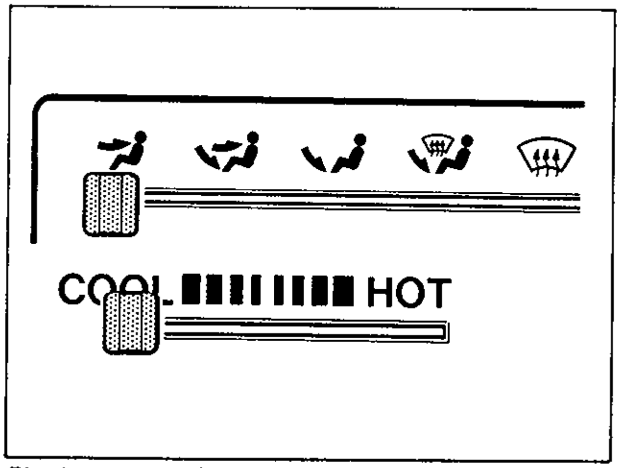


Fig. 1A-13

2. At its control lever-side, clamp outer cable with its end 0 to 1 mm projected from clamp.

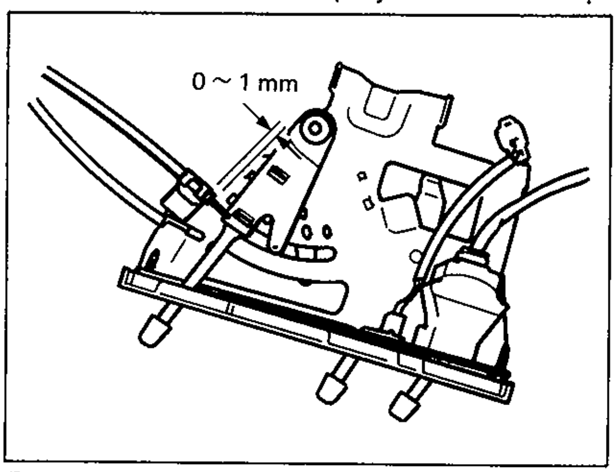


Fig. 1A-14

3. As shown below, push lever fully in arrow direction and fix cable with clamp in position.

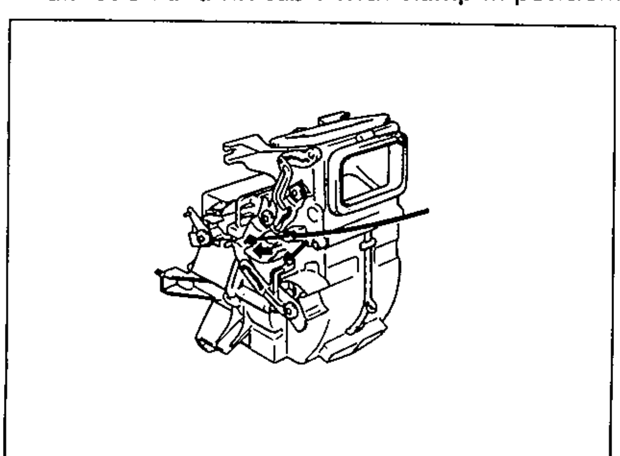


Fig. 1A-15

B. Heater Control (COOL-HOT Selector) Cable

1. Move control lever to COOL position.
2. Push lever fully in arrow direction and fix cable with clamp in position, as shown below.

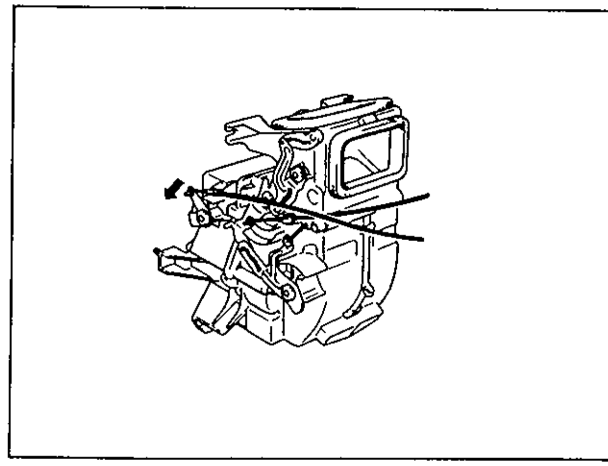


Fig. 1A-16

C. Fresh Air Control (FRESH-CIRC Selector) Cable

1. Move control lever to FRESH position.

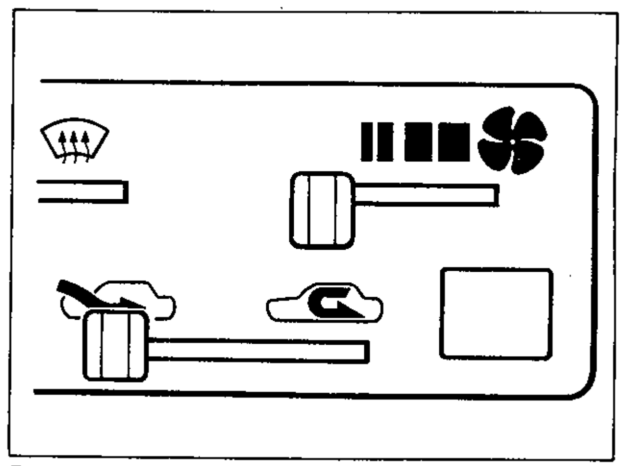


Fig. 1A-17

2. Push lever fully in arrow direction and fix cable with clamp in position as shown below.

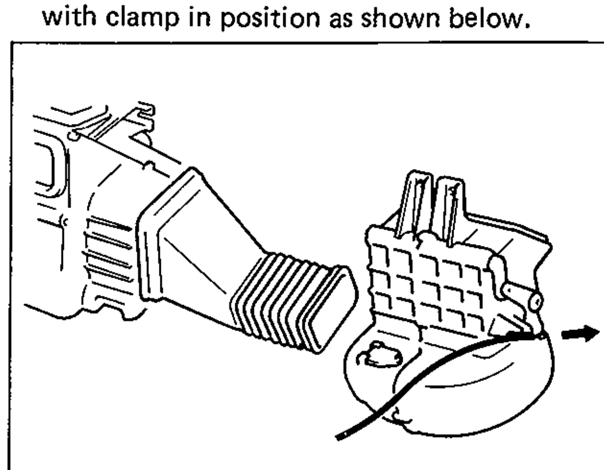
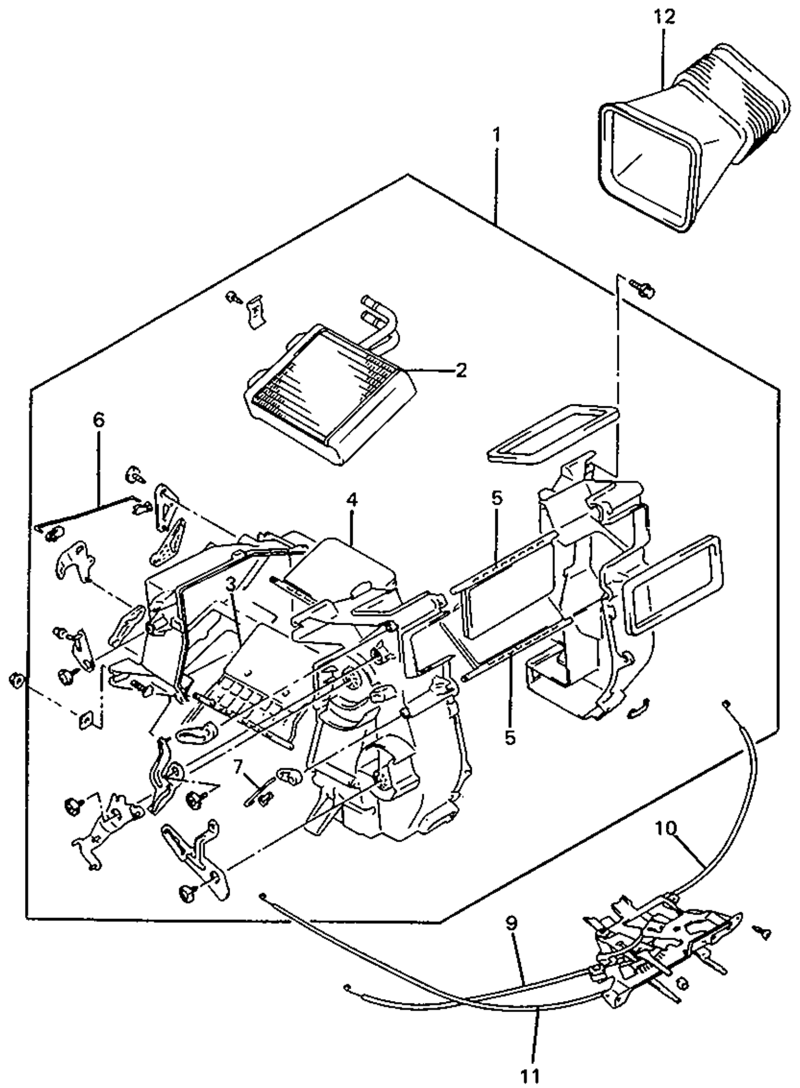


Fig. 1A-18

HEATER UNIT

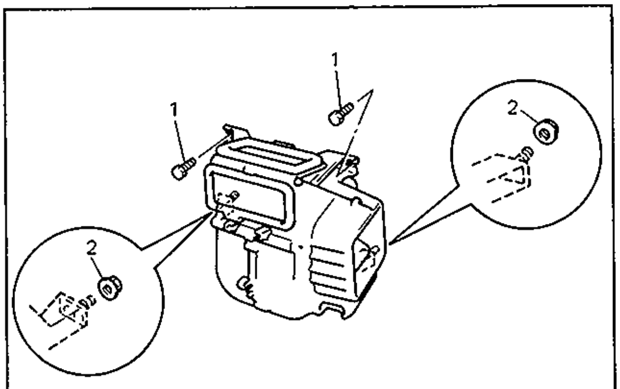


1. Heater ass'y
2. Radiator core
3. Damper
4. Damper
5. Damper
6. Shaft
7. Shaft
8. Shaft
9. Mode control cable
10. Fresh-circle control cable
11. Hot-cool control cable
12. Heater duct (without A/C)

Fig. 1A-19

REMOVAL

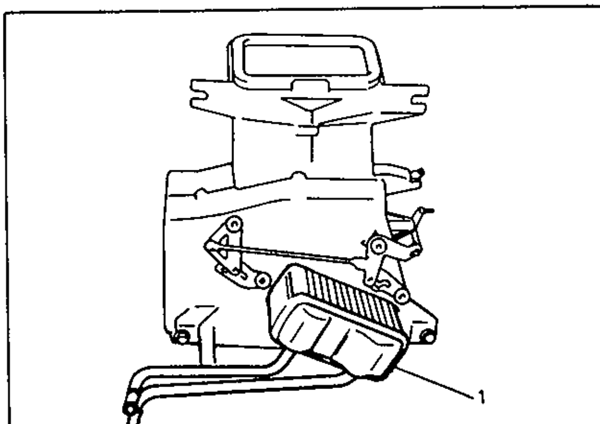
1. Drain radiator and disconnect two water hoses from heater unit.
2. Remove steering wheel.
3. Remove instrument panel and its related parts.
4. Disconnect wiring connectors.
5. Remove heater case fastening bolts and nuts.



1. Fastening bolts
2. Fastening nuts

Fig. 1A-20

6. Pull out radiator from heater unit.



1. Radiator (heater core)

Fig. 1A-21

INSTALLATION

Reverse removal procedure to install heater unit. Use special care for the following.

1. Adjustment of control cables.
2. Filling of specified coolant to radiator.

BODY VENTILATION

When fresh air control lever is at FRESH position, ventilating air is drawn into the interior from the intake grille and drawn out from the ventilator outlet provided at each side body outer panel.

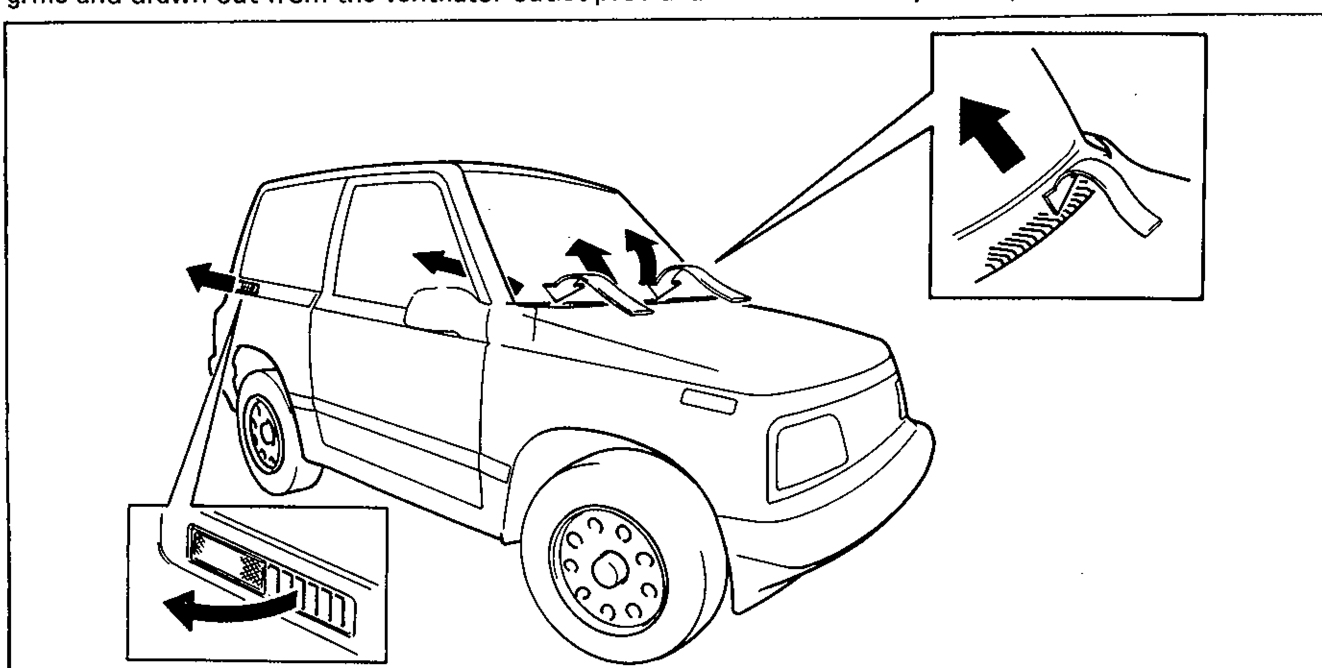
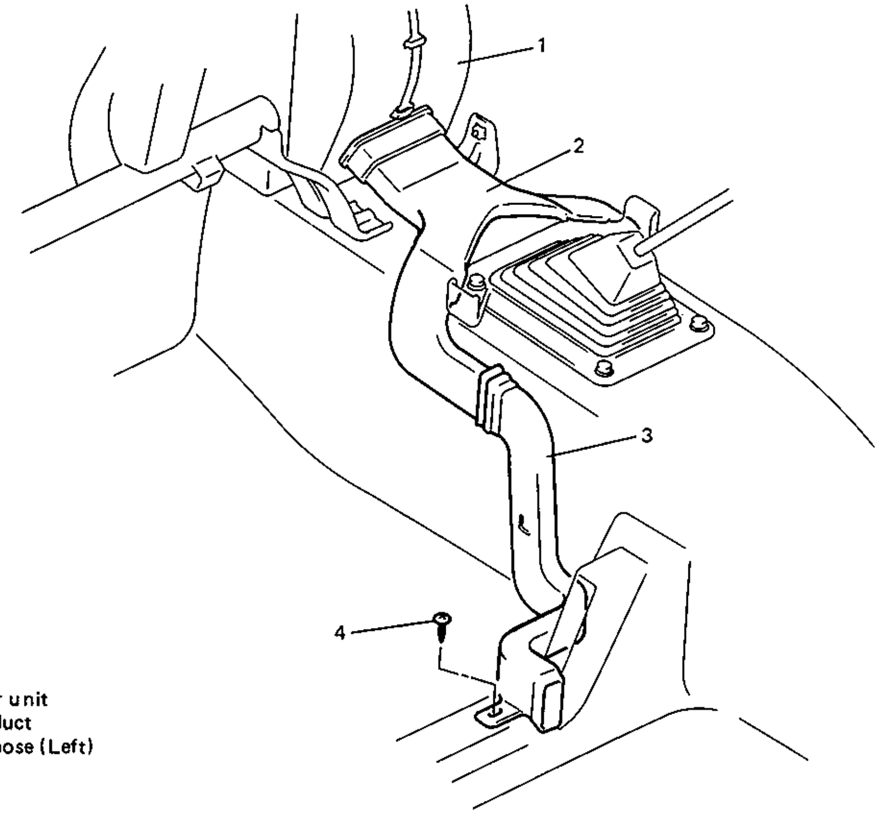


Fig. 1A-22

REAR DUCT



1. Heater unit
2. Rear duct
3. Rear hose (Left)
4. Screw

Fig. 1A-23

DESCRIPTION

Through the rear duct, air is drawn into the rear seat foot space.

REMOVAL

1) Remove front seat.
2) Remove console box.
3) Take off carpet till rear duct is totally exposed.

INSTALLATION

Reverse removal sequence to install rear duct.

SECTION 2

BUMPERS AND SHEET METAL

CONTENTS

NOTE:
Fasteners are important attaching parts in that they could affect the performance of vital components and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary.
Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.

FRONT BUMPER

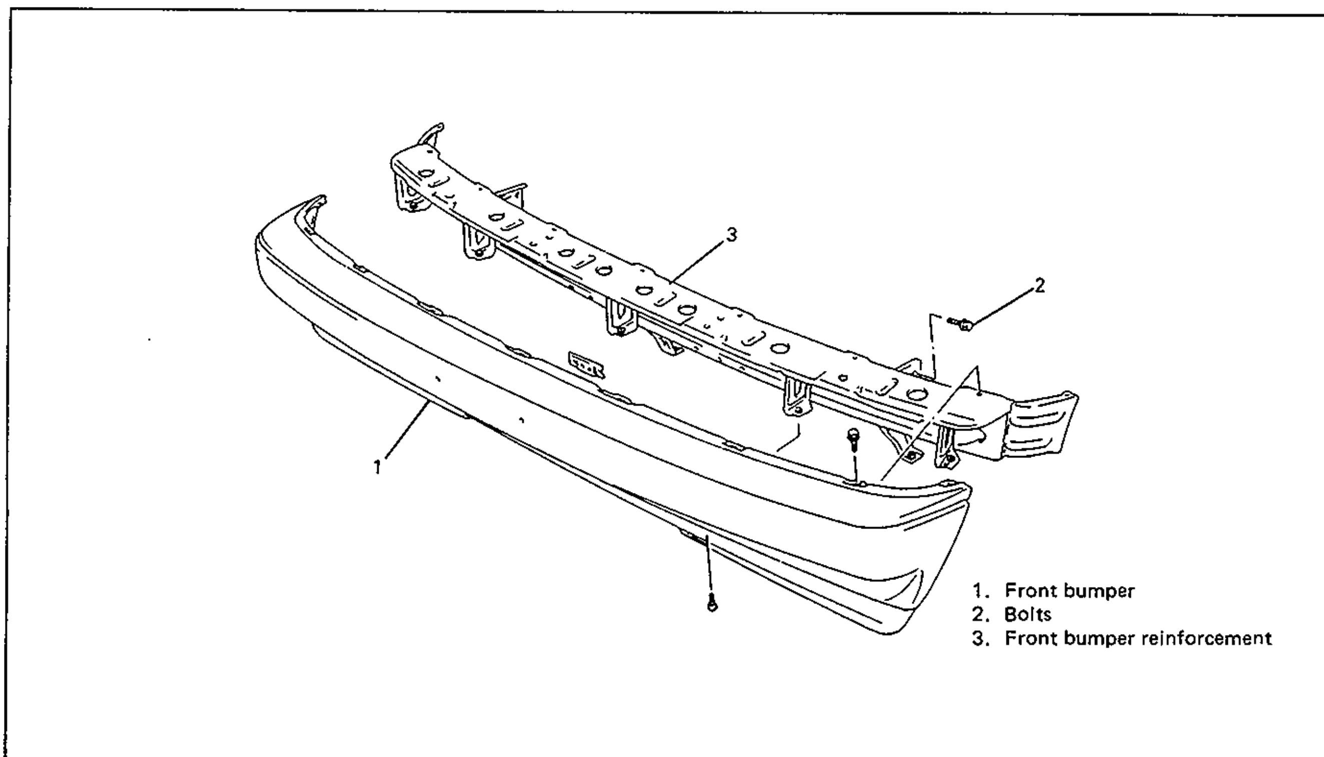


Fig. 2-1

REAR BUMPER

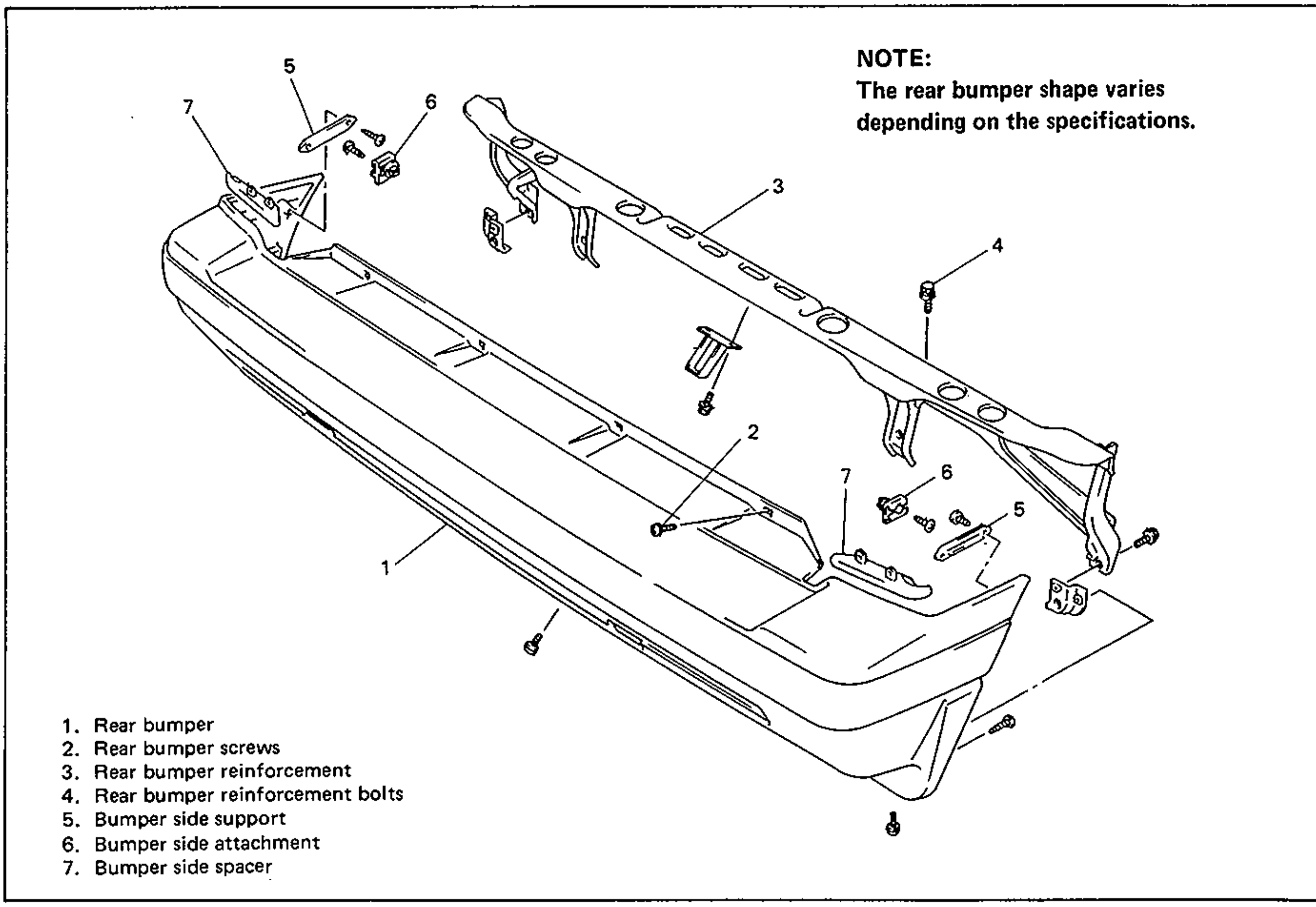


Fig. 2-2

HOOD

Remove four mounting bolts to detach hood.

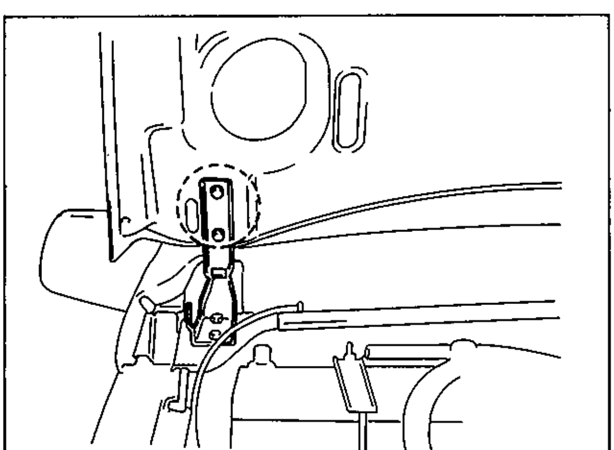


Fig. 2-3

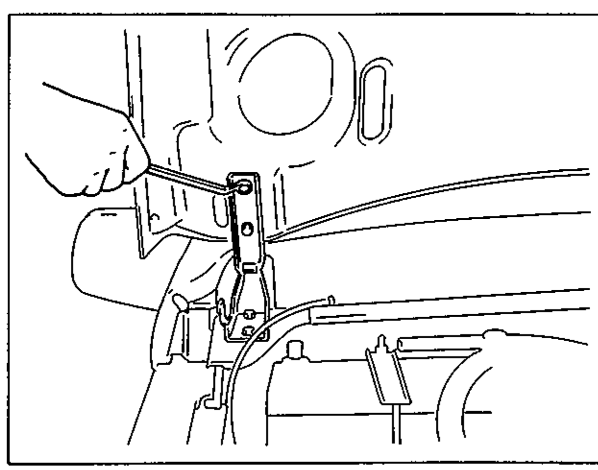


Fig. 2-4

ADJUSTMENT

A. Fore-and-aft and right-and-left adjustment
Loosen four mounting bolts for adjustment.

B. Vertical adjustment
If only one side (right or left) of hood is not level with front fender, make it level by tightening or loosening hood cushion.

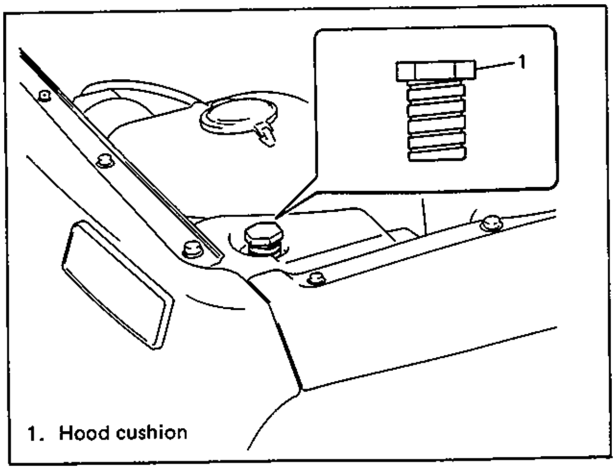


Fig. 2-5

C. Hood lock adjustment
Loosen hood lock bolts for hood locking adjustment.

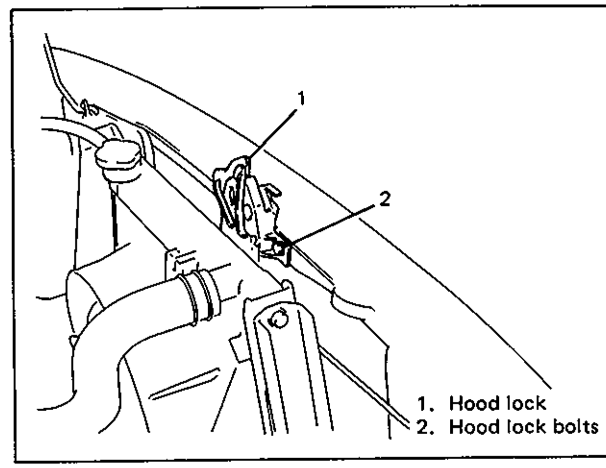


Fig. 2-6

FRONT FENDER

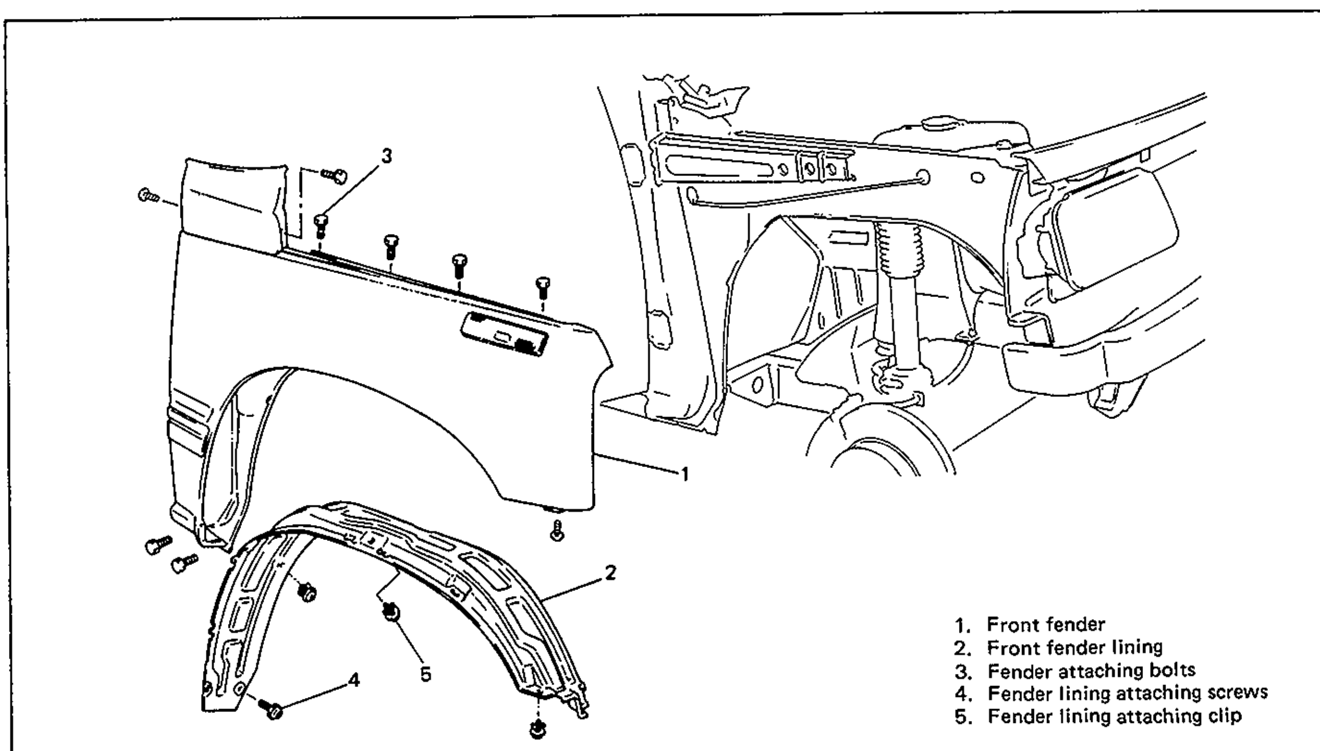


Fig. 2-7

REMOVAL

1. Remove front bumper.
2. Disconnect connector of side turn signal (or side marker) lamp.
3. Remove front fender lining.
4. Remove front fender.

INSTALLATION

1. Reverse removal procedure to install front fender.

SECTION 3

STEERING, SUSPENSION, WHEELS AND TIRES

CONTENTS

GENERAL DIAGNOSIS

Since the problems in steering, suspension, wheels and tires involve several systems, they must all be considered when diagnosing a complaint. To avoid using the wrong symptom, always road test the vehicle first. Proceed with the following preliminary inspections and correct any defects which are found.

1) Inspect tires for proper pressure and uneven wear.
2) Raise vehicle on a hoist and inspect front and rear suspension and steering system for loose or damaged parts.
3) Spin front wheel. Inspect for out-of-round tires, out-of-balance tires, bent rims, loose and/or rough wheel bearings.

GENERAL DIAGNOSIS CHART A

Condition	Possible Cause	Correction
Vehicle Pulls (Leads)	1. Mismatched or uneven tires.	Replace tire.
	2. Tires not adequately inflated.	Adjust tire pressure.
	3. Broken or sagging springs.	Replace spring.
	4. Radial tire lateral force.	Replace tire.
	5. Disturbed front end alignment.	Check front end alignment.
	6. Disturbed rear axle alignment.	Check rear axle alignment.
	7. Brake dragging in one road wheel.	Repair front brake.
	8. Loose, bent or broken front or rear suspension parts.	Tighten or replace suspension part.

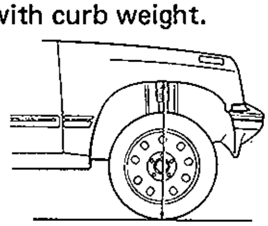
GENERAL DIAGNOSIS CHART B

Condition	Possible Cause	Correction
Abnormal or Excessive Tire Wear	1. Sagging or broken springs.	Replace spring.
	2. Tire out of balance.	Adjust balance or replace tire.
	3. Disturbed front end alignment.	Check front end alignment.
	4. Faulty shock absorber.	Replace shock absorber.
	5. Hard driving.	Replace tire.
	6. Overloaded vehicle.	Replace tire.
	7. Tires not rotating.	Replace or rotate tire.
	8. Worn or loose road wheel bearings.	Replace wheel bearing.
	9. Wobbly wheel or tires.	Replace wheel or tire.
	10. Tires not adequately inflated.	Adjust the pressure.
Wheel Tramp	1. Blister or bump on tire.	Replace tire.
	2. Improper shock absorber action.	Replace shock absorber.
Shimmy, Shake or Vibration	1. Tire or wheel out of balance.	Balance wheels or replace tire and/or wheel.
	2. Loose wheel bearings.	Replace wheel bearing.
	3. Worn tie rod ends.	Replace tie rod end.
	4. Worn lower ball joints.	Replace front suspension control arm.
	5. Excessive wheel runout.	Repair or replace wheel and/or tire.
	6. Blister or bump on tire.	Replace tire.
	7. Excessively loaded radial runout of tire/wheel assembly.	Replace tire or wheel.
	8. Disturbed front end alignment.	Check front end alignment.
	9. Loose or worn steering linkage.	Tighten or replace steering linkage.
	10. Loose steering gear case bolts.	Tighten case bolts.
Hard Steering	1. Bind in tie rod end ball studs or lower ball joints.	Replace tie rod end or front suspension control arm.
	2. Disturbed front end alignment.	Check front end alignment.
	3. Steering gear box adjustment.	Check and adjust steering gear box.
	4. Tire not adequately inflated.	Inflate tires to proper pressure.
	5. Bind in steering column.	Repair or replace.

GENERAL DIAGNOSIS CHART C

Condition	Possible Cause	Correction
Too Much Play in Steering	1. Wheel bearings worn.	Replace wheel bearing.
	2. Steering gear box attachments loose.	Tighten or repair.
	3. Steering gear box adjustments.	Check and adjust steering gear box.
	4. Worn steering shaft joints.	Replace joint.
	5. Worn tie rod ends or tie rod inside ball joints.	Replace tie rod end or tie rod.
	6. Worn lower ball joints.	Replace front suspension control arm.
Poor Returnability	1. Bind in tie rod end ball studs.	Replace tie rod end.
	2. Bind in ball joints.	Replace ball joint.
	3. Bind in steering column.	Repair or replace.
	4. Steering gear box needing lubricant.	Check, repair or lubricate steering gear box.
	5. Disturbed front end alignment.	Check and adjust front end alignment.
	6. Steering gear box not properly adjusted.	Check and adjust steering gear box torque.
	7. Tires not adequately inflated.	Adjust pressure.
Steering Noise (Rattle or Chuckle)	1. Loose bolts and nuts.	Retighten.
	2. Broken or otherwise damaged wheel bearings.	Replace.
	3. Worn or sticky tie rod ends.	Replace.
	4. Linkage joints needing grease.	Lubricate or replace.
Abnormal Noise, Front End	1. Worn, sticky or loose tie rod ends, lower ball joints, tie rod inside ball joints or drive shaft joints.	Replace tie rod end, control arm, tie rod or drive shaft joint.
	2. Damaged shock absorbers, struts or mountings.	Replace or repair.
	3. Worn control arm bushings.	Replace.
	4. Loose stabilizer bar.	Tighten bolts or replace bushes.
	5. Loose wheel nuts.	Tighten wheel nuts.
	6. Loose suspension bolts or nuts.	Tighten suspension bolts or nuts.
	7. Broken or otherwise damaged wheel bearings.	Replace wheel bearing.
	8. Broken suspension springs.	Replace spring.
	9. Poorly lubricated or worn strut bearings.	Lubricate or replace strut bearing.

GENERAL DIAGNOSIS CHART D

Condition	Possible Cause	Correction
Wander or Poor Steering Stability	1. Mismatched or uneven tires.	Replace tire or inflate tires to proper pressure.
	2. Loose ball joints and tie rod ends.	Repalce suspension control arm or tie rod end.
	3. Faulty shock absorbers/struts or mounting.	Replace absorber/strut or repair mounting.
	4. Loose stabilizer bar.	Tighten or replace stabilizer bar or bushes.
	5. Broken or sagging springs.	Replace spring.
	6. Steering gear box not properly adjusted.	Check or adjust steering gear box torque.
	7. Front end alignment.	Check front end alignment.
Erratic Steering when Braking	1. Worn wheel bearings.	Replace wheel bearing.
	2. Broken or sagging springs.	Replace spring.
	3. Leaking wheel cylinder or caliper.	Repair or replace wheel cylinder or caliper.
	4. Warped discs.	Replace brake disc.
	5. Badly worn brake linings.	Replace brake shoe lining.
	6. Drum is out of round in some brakes.	Replace brake drum.
	7. Wheel tires are inflated unequally.	Inflate tires to proper pressure.
	8. Defective wheel cylinders.	Replace or repair wheel cylinder.
	9. Disturbed front end alignment.	Check front end alignment.
Low or Uneven Trim Height	1. Broken or sagging springs.	Replace spring.
	2. Over loaded.	Check loading.
Right-to-left trim height (H) difference should be within 15 mm (0.6 in) with curb weight.  *Same with rear side.	3. Incorrect springs.	Replace spring.
Ride Too Soft	1. Faulty shock absorber or struts.	Replace shock absorber or strut.
Suspension Bottoms	1. Overloaded.	Check loading.
	2. Faulty shocks or struts.	Replace shock absorber or strut.
	3. Incorrect, broken or sagging springs.	Replace spring.

GENERAL DIAGNOSIS CHART E

Condition	Possible Cause	Correction
Body Leans or Sways in Corners	1. Loose stabilizer bar.	Tighten stabilizer bar bolts or replace bushes.
	2. Faulty shock absorbers, struts or mounting.	Replace shock absorber, strut or tighten mounting.
	3. Broken or sagging springs.	Replace spring.
	4. Overloaded.	Check loading.
Cupped Tires	1. Front struts defective.	Replace strut.
	2. Worn wheel bearings.	Replace wheel bearing.
	3. Excessive tire or wheel run-out.	Replace tire or wheel disc.
	4. Worn ball joints.	Replace front suspension control arm.
	5. Tire out of balance.	Adjust tire balance.

TIRE DIAGNOSIS

IREGULAR AND/OR PREMATURE WEAR

Irregular and premature wear has many possible causes. Some of them are: incorrect inflation pressures, lack of tire rotation, driving habits, improper alignment.
If the following conditions are noted, rotation is in order:

1. Front tire wear is different from rear.
2. Uneven wear exists across the tread of any tire.
3. Left front and right front tire wear is unequal.
4. Left rear and right rear tire wear is unequal.
5. There is cupping, flat spotting, etc.

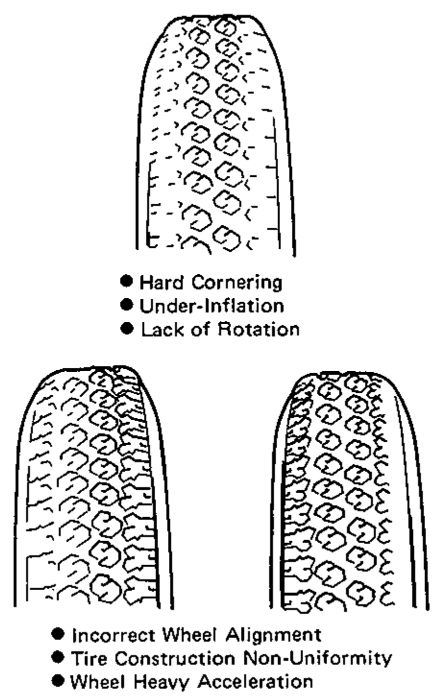


Fig. 3-1 Tire Wear Diagnosis

A wheel alignment check is in order if the following conditions are noted:

1. Left front and right front tire wear is unequal.
2. Wear is uneven across the tread of any front tire.
3. Front tire treads have scuffed appearance with "feather" edges on one side of tread ribs or blocks.

WEAR INDICATOR (Figure 3-2)

The orginal equipment tires have built-in tread wear indicators to show when tires need replacement. These indicators will appear as 12 mm (0.47 inch) wide bands when the tire tread depth becomes 1.6 mm (0.063 inch). When the indicators appear in 3 or more grooves at 6 locations, tire replacement is recommended.

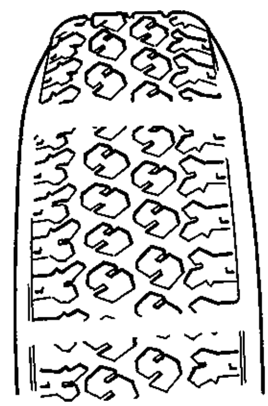


Fig. 3-2 Tire Wear Indicator

RADIAL TIRE WADDLE (Figure 3-3)

Waddle is side to side movement at the front and/or rear of the vehicle. It is caused by the steel belt not being straight within the tire. It is most noticeable at low speed, 5 to 30 mph.
It is possible to road test a vehicle and tell on which end of the vehicle the faulty tire is located. If the waddle tire is on the rear, the rear end of the vehicle will shake from side to side or "waddle". From the driver's seat it feels as though someone is pushing on the side of the vehicle.
If the faulty tire is on the front, the waddle is more visual. The front sheet metal appears to be moving back and forth and the driver feels as though he is at the pivot point in the vehicle.
Waddle can be quickly diagnosed by using a Tire Problem Detector (TPD) and following the equipment manufacturer's recommendations.
If a TPD is not available, the more time consuming method of substituting known good tire/wheel assemblies on the problem vehicle can be used as follows:

1. Ride vehicle to determine if the waddle is coming from the front or rear.
2. Install tires and wheels that are known to be good (on similar vehicle) in place of those on the offending end of the vehicle. If the waddle cannot be isolated to front or rear, substitute the rears.
3. Road test again. If improvement is noted, install originals one at a time until offender is found. If no improvement is noted, install known good tires in place of all four. Then install originals one at a time until offender if found.

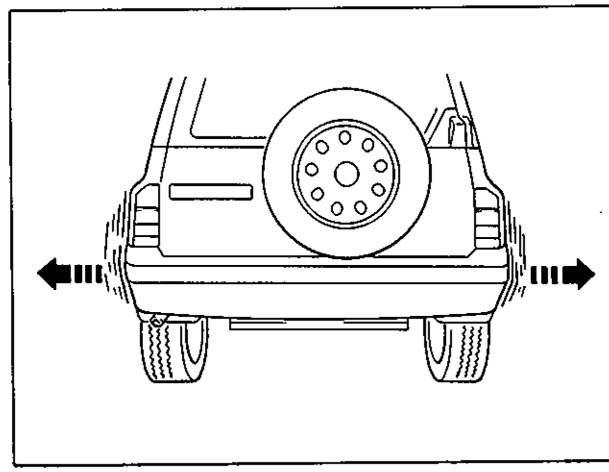


Fig. 3-3 Radial Tire Waddle

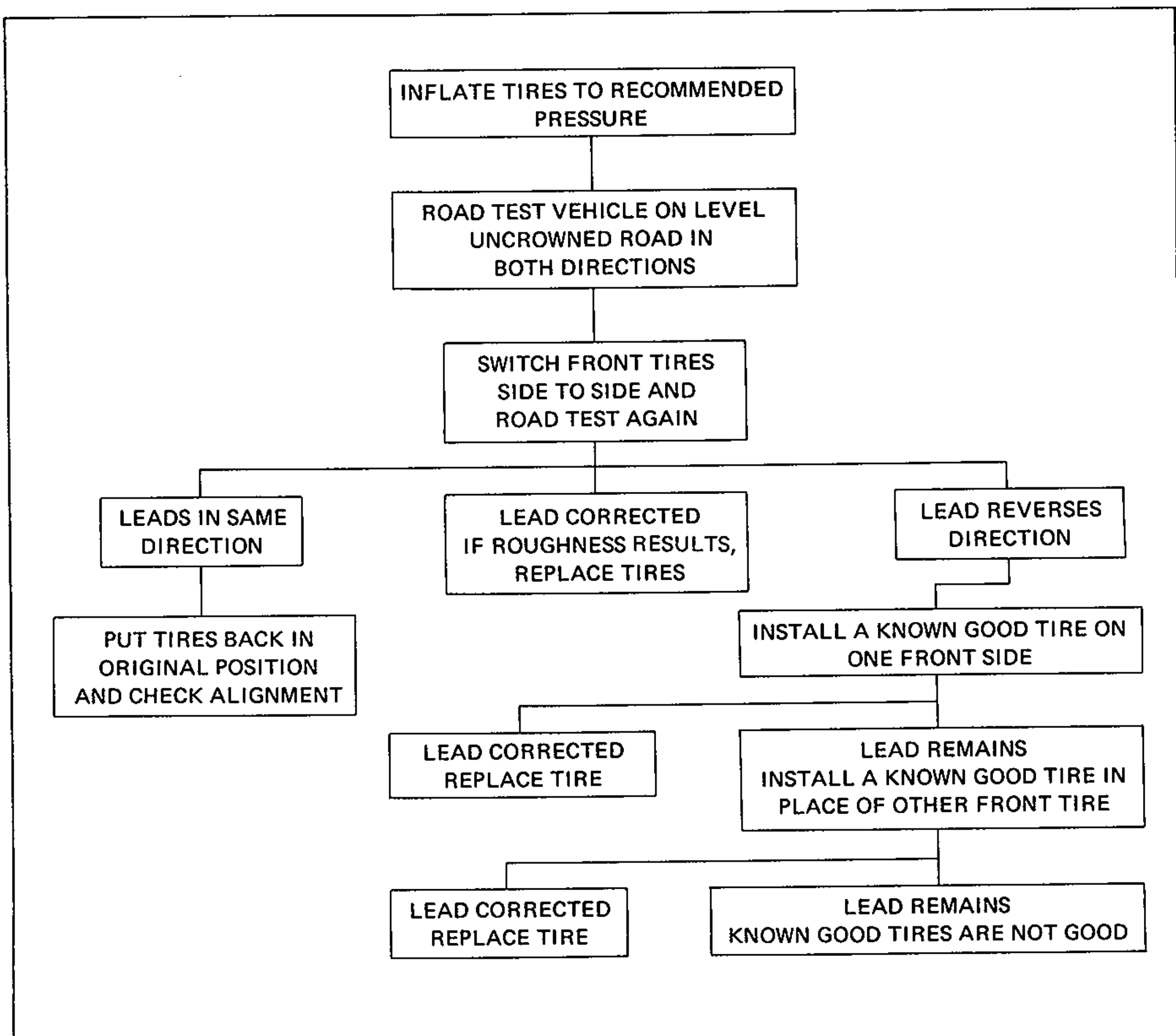


Fig. 3-4 Lead Dignosis

RADIAL TIRE LEAD

"Lead" is the deviation of the vehicle from a straight path on a level road with no pressure on the steering wheel.

Lead is usually caused by:

1) Incorrect alignment.
2) Uneven brake adjustment.
3) Tire construction.

The way in which a tire is built can produce lead in a vehicle. An example of this is placement of the belt. Off center belts on radial tires can cause the tire to develop a side force while rolling straight down the road. If one side of the tire is a little larger diameter than the other, the tire will tend to roll to one side. This will develop a side force which can produce vehicle lead.

The procedure in Fig. 3-4 should be used to make sure that front alignment is not mistaken for tire lead.

1) Part of the lead diagnosis procedure is different from the tire rotation pattern currently in the owner's and service manuals. If a medium to high mileage tire is moved to the other side of the vehicle, be sure to check that ride roughness has not developed.
2) Rear tires will not cause lead.

VIBRATION DIAGNOSIS

Wheel unbalance causes most of the highway speed vibration problems. If a vibration remains after dynamic balancing, it can be caused by three things. (Fig. 3-5)

1) Tire runout.
2) Wheel runout.
3) Tire stiffness variation.

Measuring tire and/or wheel free runout will uncover only part of the problem. All three causes, known as loaded radial runout, must be checked by using a Tire Problem Detector (TPD). If a TPD is not available, the more time consuming method of substituting known good tire and wheel assemblies on the problem vehicle can be used.

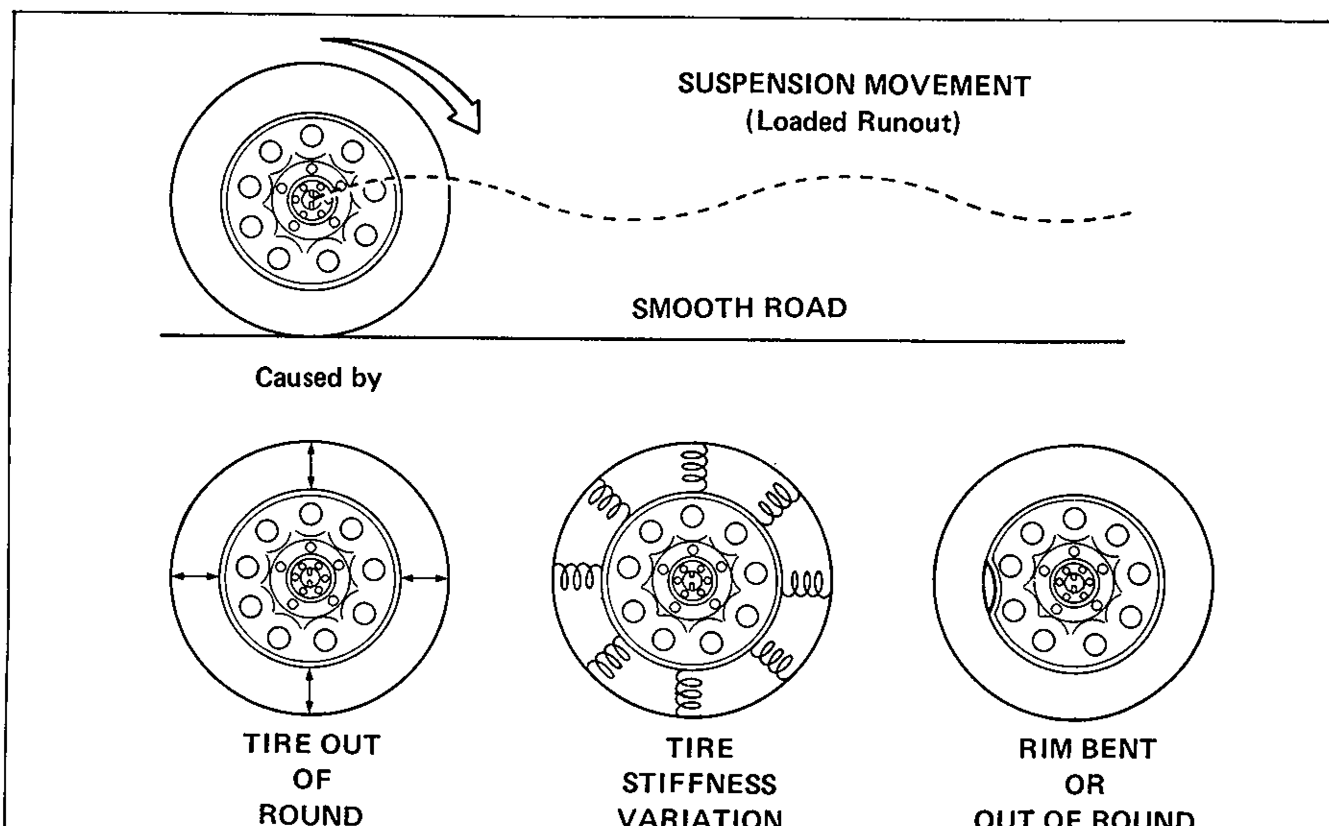


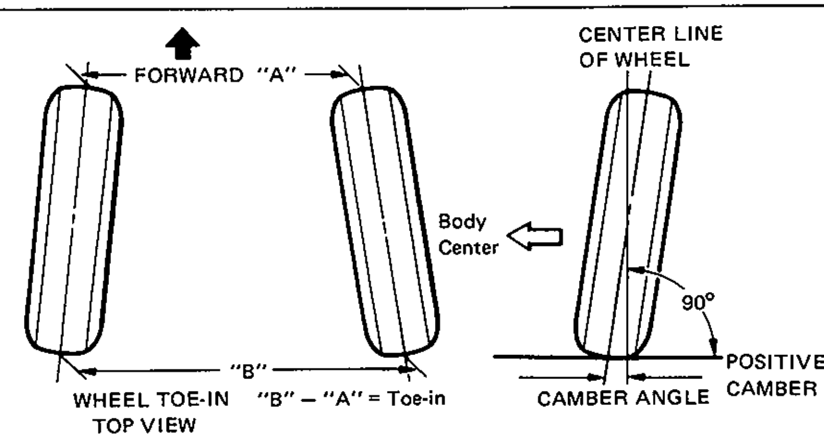
Fig. 3-5 Vibration

SECTION 3A

FRONT END ALIGNMENT

CONTENTS

GENERAL INFORMATION



Alignment service data (without load)	
Toe-in	2 – 6 mm (0.08 – 0.24 in.)
Camber	30′ ± 1°
Caster	1°30′ ± 1°

NOTE:
Toe-in value given above was measured by using a toe-in gauge.

Fig. 3A-1 Toe-in and Camber

Front alignment refers to the angular relationship between the front wheels, the front suspension attaching parts and the ground. Generally, the only adjustment required for front alignment is toe setting. Camber and caster can't be adjusted. Therefore, should camber or caster be out of specification due to the damage caused by hazardous road conditions or collision, whether the damage is in body or in suspension should be determined. If the body is damaged, it should be repaired and if suspension is damaged, it should be replaced.

TOE SETTING-FIGURE 3A-1

Toe is the turning in or out of the front wheels. The purpose of a toe specification is to ensure parallel rolling of the front wheels (Excessive toe-in or toe-out may increase tire wear).
Amount of toe can be obtained by subtracting "A" from "B" as shown in Fig. 3A-1 and therefore is given in mm (in.).

CAMBER-FIGURE 3A-1

Camber is the tilting of the front wheels from the vertical, as viewed from the front of the vehicle. When the wheels tilt outward at the top, the camber is positive. When the wheels tilt inward at the top, the camber is negative. The amount of tilt is measured in degrees.

PRELIMINARY CHECKS PRIOR TO ADJUSTING FRONT ALIGNMENT

Steering and vibration complaints are not always the result of improper alignment. An additional item to be checked is the possibility of tire lead due to worn or improperly manufactured tires. "Lead" is the deviation of the vehicle from a straight path on a level road without hand pressure on the steering wheel. Section 3 of this manual contains a procedure for determining the presence of a tire lead problem.

Before making any adjustment affecting toe setting, the following checks and inspections should be made to ensure correctness of alignment readings and alignment adjustments:

1) Check all tires for proper inflation pressures and approximately the same tread wear.
2) Check for loose ball joints. Check tie rod ends; if excessive looseness is noted, it must be corrected before adjusting.
3) Check for run-out of wheels and tires.
4) Check vehicle trim heights; if out of limits and a correction is to be made, it must be made before adjusting toe.
5) Check for loose control arms.
6) Check for loose or missing stabilizer bar attachments.
7) Consideration must be given to excess loads, such as tool boxes. If this excess load is normally carried in vehicle, it should remain in vehicle during alignment checks.
8) Consider condition of equipment being used to check alignment and follow manufacturer's instructions.
9) Regardless of equipment used to check alignment, vehicle must be on a level surface both fore and aft and transversely.

TOE ADJUSTMENT

Toe is adjusted by changing tie rod length. Loosen right and left tie rod end lock nuts first and then rotate right and left tie rods by the same amount to align toe-in to specification. In this adjustment, right and left tie rods should become equal in length.

After adjustment, tighten lock nuts to specified torque.

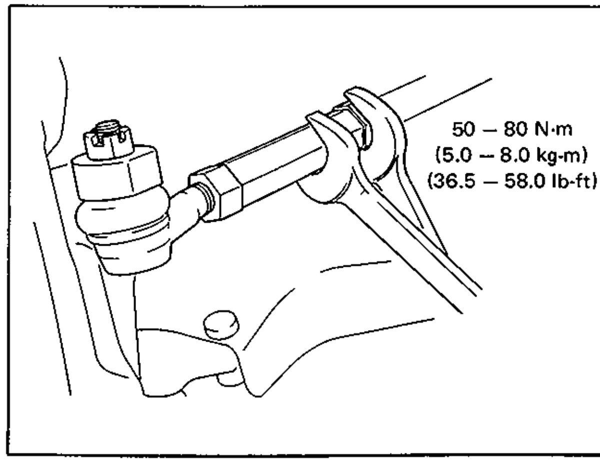


Fig. 3A-2 Toe-Adjustment

CAMBER AND CASTER ADJUSTMENT

Should camber or caster be found out of specifications upon inspection, locate its cause first. If it is in damaged, loose, bent, dented or worn suspension parts, they should be replaced. If it is in body, repair it so as to attain specifications.

To prevent possible incorrect reading of camber or caster, vehicle front end must be moved up and down a few fimes before inspection.

STEERING ANGLE

Steering angle	inside	32.5°
	outside	30.5°

When tie rod or tie rod end was replaced, check toe and then also steering angle with turning radius gauges.
If steering angle is not correct, check if right and left tie rods are equal in length ("A" in Fig. 3A-3), then adjust it by changing length of pitman arm stopper bolts.

NOTE:
If tie rod lengths were changed to adjust steering. angle, reinspect toe-in.

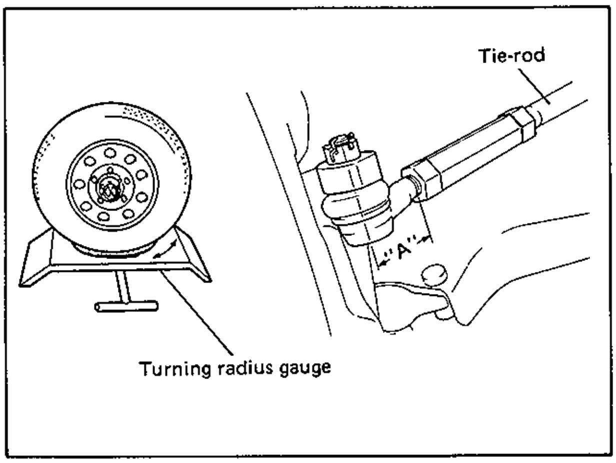


Fig. 3A-3 Steering Angle Inspection

Reference Information:

Side slip:
For inspecting front wheel side slip with side slip tester:

Side slip limit: Less than 3 mm/m (Less than 0.118 in/3 ft)

If side slip exceeds above limit, toe-in or front wheel alignment may not be correct.

SECTION 3B2

STEERING GEAR BOX AND LINKAGE

NOTE:
All steering gear fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.

CONTENTS

GENERAL DESCRIPTION

The rotary motion of the steering wheel is carried to the steering shaft upper, steering shaft lower, steering gear box and pitman arm. Then as the pitman arm moves, the center link is caused to move linearly, actuating the tie rod to turn the wheels, right and left, through their knuckle arms.
The steering system formed by the components named above is designed for easy steering, high durability and excellent steering reaction as well as reliable self-restoring action.

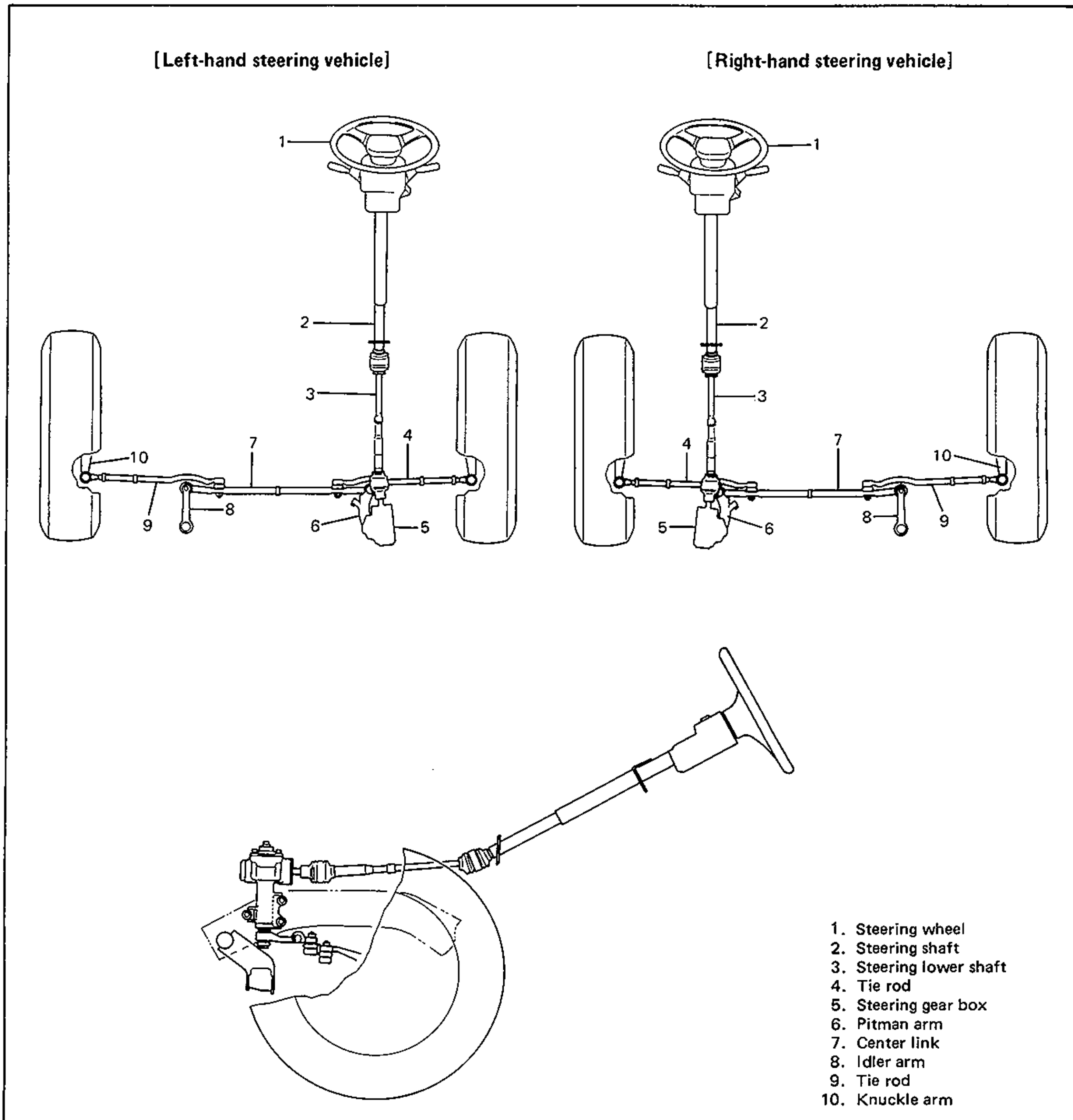


Fig. 3B2-1

STEERING GEAR BOX

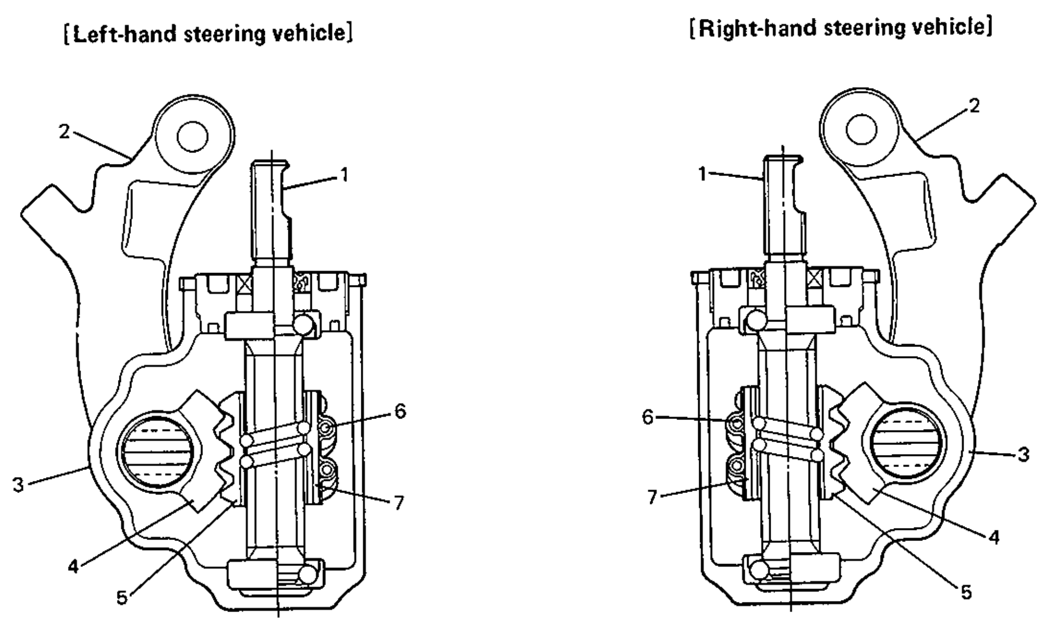
CONSTRUCTION AND OPERATION

The pitman arm is rigidly connected to the outer end of the shaft integral with the sector gear, which is inside the gear box and meshed with the teeth of the nut capable of sliding along the worm. Between the nut and the worm is a row of steel balls, which serves two purposes: to provide rolling contact between nut and worm and to keep the nut engaged with the worm as if the two were threadedly engaged. With the nut prevented from turning, the rotation of the worm causes the nut to move up or down the worm.

The worm is an extension of the steering shaft. As the steering wheel is turned, the steel balls roll along in the groove and the nut moves up or down. The steel ball that has reached the end of the groove in the nut enters the return guide. The guide sends the ball back to the other end of the same groove. In this way, the row of balls recirculates.

By so moving, the nut turns the sector gear and hence the pitman arm. It should be noted here that it is through the steel balls that a rotary motion of the worm is converted into a linear motion of the nut, which is then converted into another rotary motion of the sector gear.

The steering gear box is a precision-machined device, each part of it being machined to a closer tolerance for smooth conversion of motion, and is built sturdily for long service life. Special tools and instruments are needed in addition to specialized skill when the gear box is to be overhauled. For this reason, a gear box found to be in defective condition should be replaced with a new one; replacement is more economical and what is perhaps more important, safer.



Steering gear box	Recirculating ball-and nut type
Gear ratio	18.5 – 21
Steering angle, inside	32.5° ± 3°
Steering angle, outside	30.5° ± 3°

1. Worm shaft
2. Pitman arm
3. Gear case
4. Sector gear
5. Rack gear
6. Ball
7. Ball nut

Fig. 3B2-2

REMOVAL

1) Remove steering lower shaft fastening bolt.
2) Remove center link end from pitman arm.

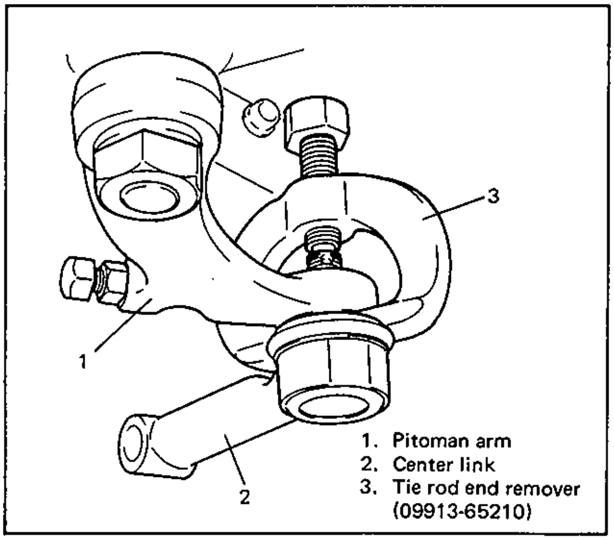


Fig. 3B2-3

3) Remove 3 steering gear box fastening bolts.

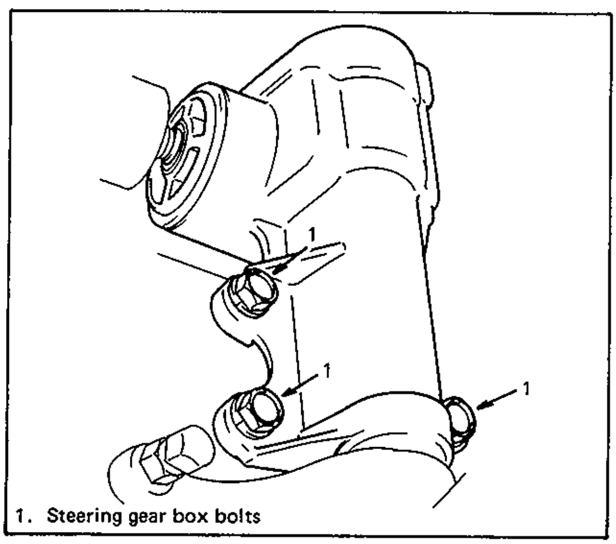


Fig. 3B2-4

4) Remove steering gear box, disconnecting steering lower shaft joint.

INSTALLATION

Reverse removal procedure to install steering gear box.

NOTE:

Align flat part of steering gear box shaft with bolt hole of lower shaft joint as shown. Then insert gear box shaft into lower shaft joint.

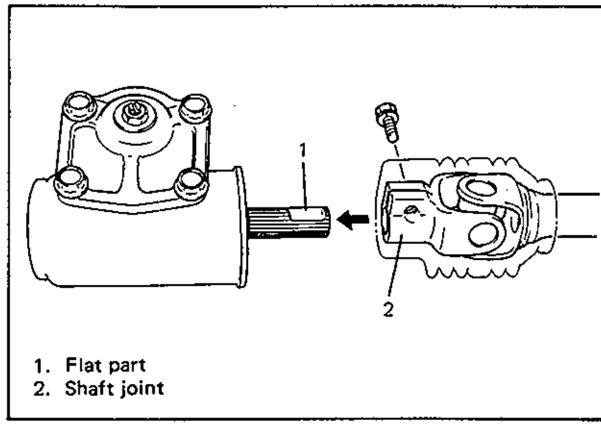


Fig. 3B2-5

- Tightening torque specification.

Steering gear box bolt (3 x 12 mm)	70 – 100 N·m 7.0 – 10.0 kg-m 50.5 – 72.0 lb-ft
Center link castle nut (12 mm)	30 – 70 N·m 3.0 – 7.0 kg-m 22.0 – 50.5 lb-ft
Steering lower shaft bolt (8 mm)	20 – 30 N·m 2.0 – 3.0 kg-m 14.5 – 22.0 lb-ft

- One of 3 steering gear box fastening bolts has guide as shown below.

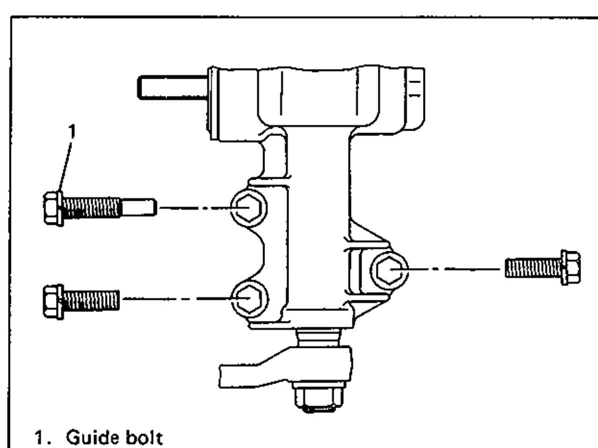


Fig. 3B2-6

TIE ROD END

REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove split pin and tie rod end castle nut from steering knuckle.

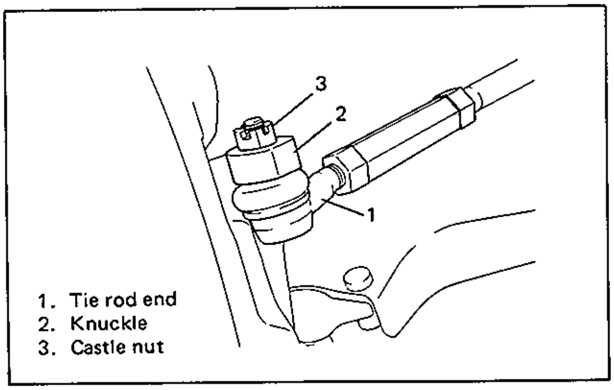


Fig. 3B2-7

3) Disconnect tie rod end from knuckle, using special tool (A).

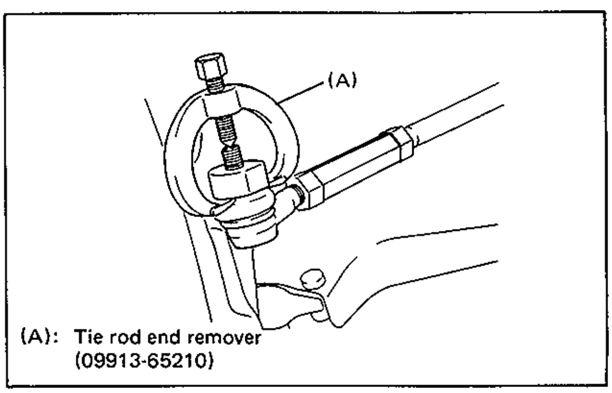


Fig. 3B2-8

4) For ease of adjustment after installation, make marking of tie rod end lock nut position on tie rod thread. Then loosen lock nut and remove tie rod end from tie rod.

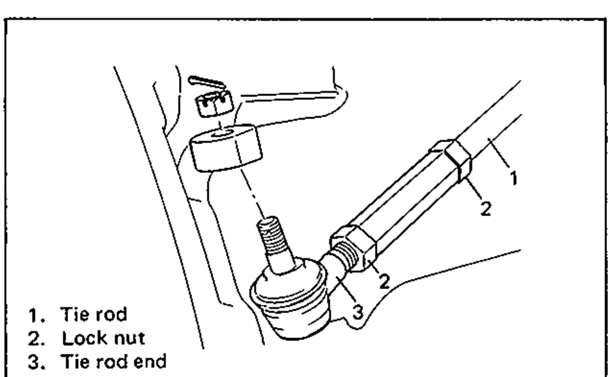


Fig. 3B2-9

INSTALLATION

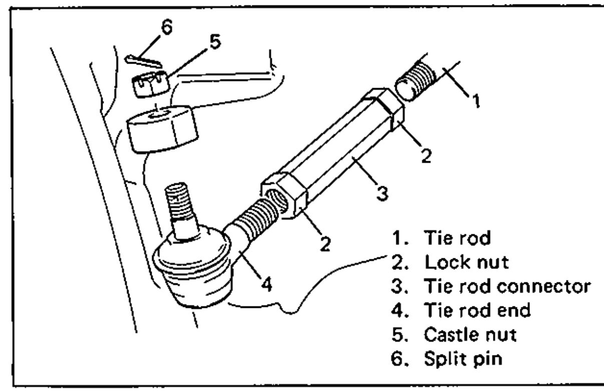


Fig. 3B2-10

1) Install tie rod end lock nut and tie rod end to tie rod. Align lock nut with mark on tie rod thread.
2) Connect tie rod end to knuckle. Tighten castle nut until holes for split pin are aligned, but only within specified torque.
3) Bend split pin as shown below.

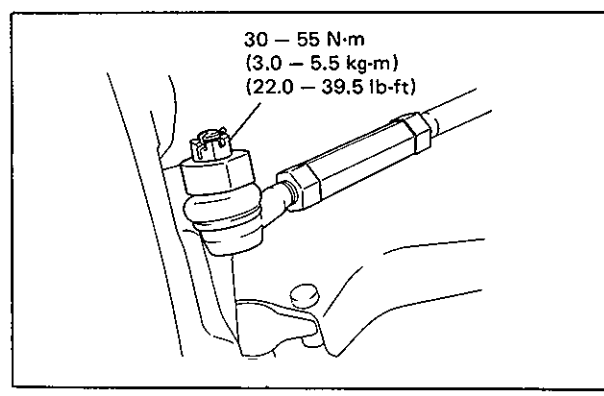


Fig. 3B2-11

4) Inspect for proper toe. (Refer to FRONT END ALIGNMENT.)
5) After confirming proper toe, tighten tie rod end lock nut to specified torque.

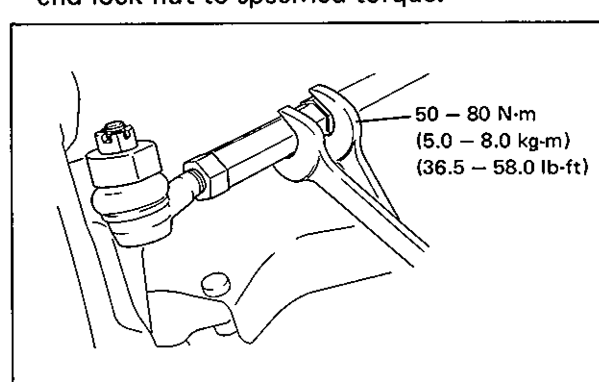


Fig. 3B2-12

6) Tighten wheel to specified torque and lower hoist.

IDLER ARM

REMOVAL

1) Hoist vehicle.
2) Remove split pin and idler arm castle nut from center link.

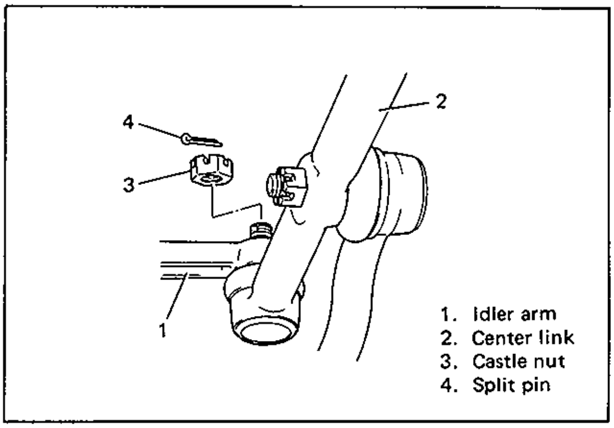


Fig. 3B2-13

3) Disconnect idler arm from center link, using special tool (A).

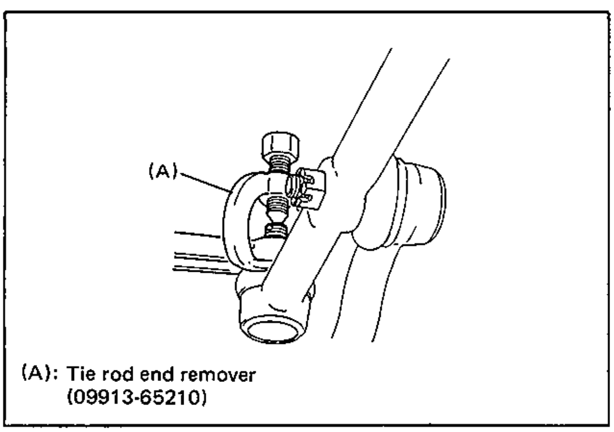


Fig. 3B2-14

4) Remove idler arm bush nut.

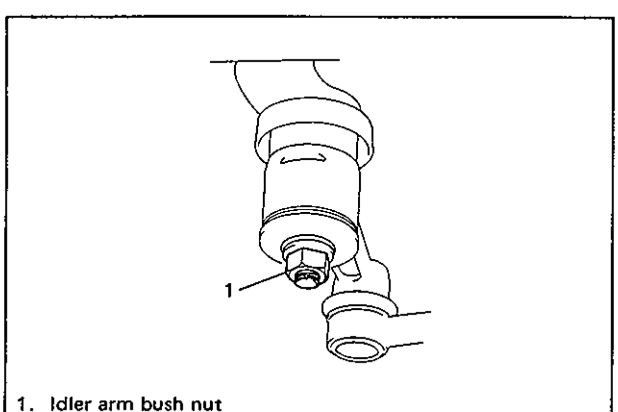


Fig. 3B2-15

5) Remove idler arm complete with its bush.
6) Remove idler arm bush using press and special tool (A).

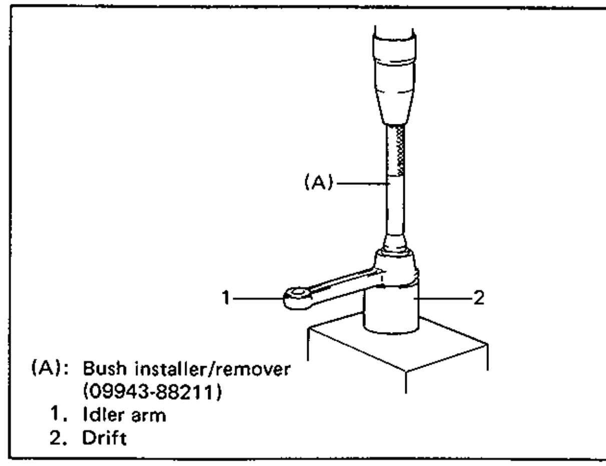


Fig. 3B2-16

INSTALLATION

1) Install bush into idler arm using specail tool (A) and special tool (B).

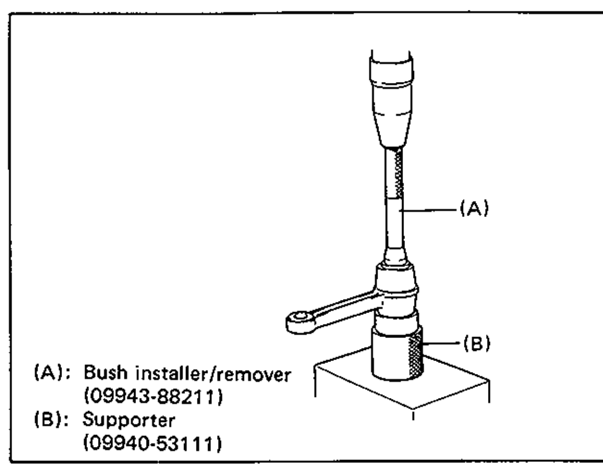


Fig. 3B2-17

2) Insert upper washer, arm and lower washer into idler arm shaft in that order and tighten lock nut to specified torque.

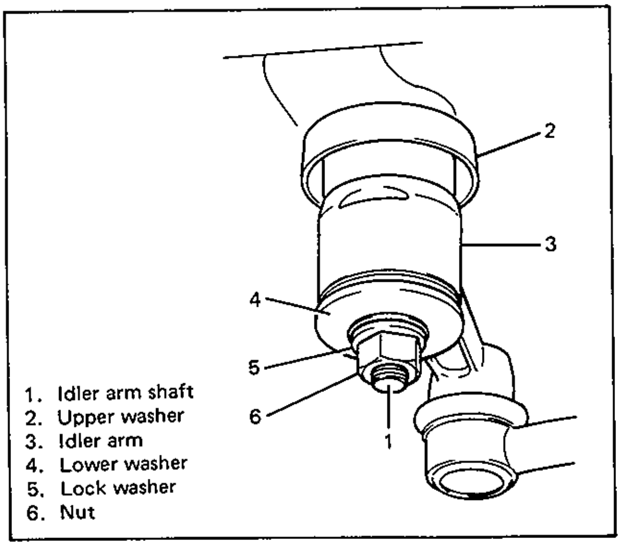


Fig. 3B2-18

Tightening torque of idler arm	N·m	kg-m	lb-ft
	70 – 80	7.0 – 8.0	50.5 – 57.5

3. Connect idler arm to center link. Tighten castle nut until holes for split pin are aligned but only within specified torque.

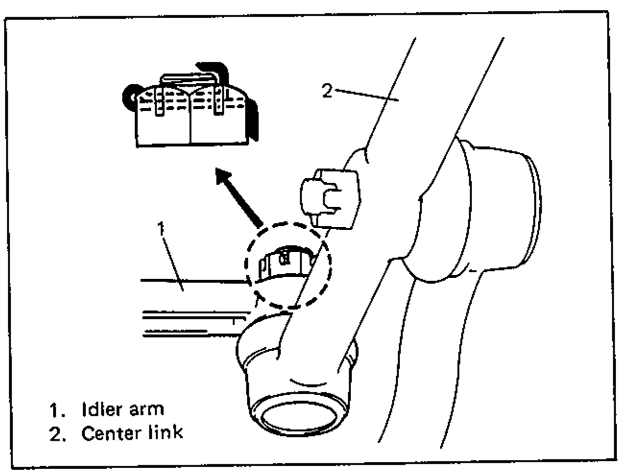


Fig. 3B2-19

4) Bend split pin as shown above.

INSPECTION

STEERING WHEEL

Check steering wheel for play and rattle, holding vehicle in straight forward condition on ground.

Steering wheel play (A)	10 – 30 mm (0.4 – 1.2 in.)

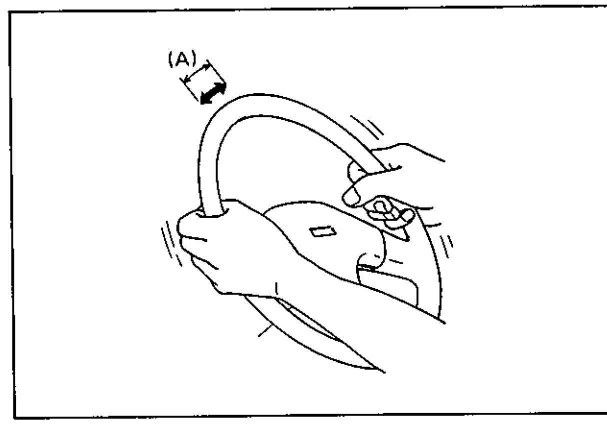


Fig. 3B2-20

If play is not within specification, inspect for the following. If found defective, replace.

- Wear of tie rod end ball stud.
- Wear of lower ball joint.
- Wear of steering shaft joint.
- Wear or damage of idler arm bush.
- Loosely intalled or joined parts.
- Wear of steering rack/sector gear.

STEERING GEAR BOX

OIL LEVEL

Oil surface should be up to the level as shown in below figure. If not, add prescribed gear oil, SAE 90.

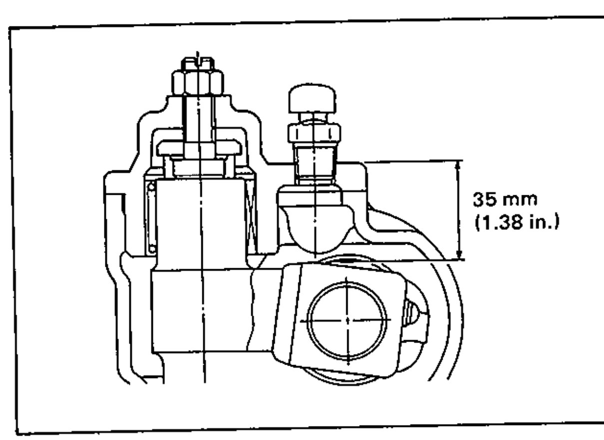
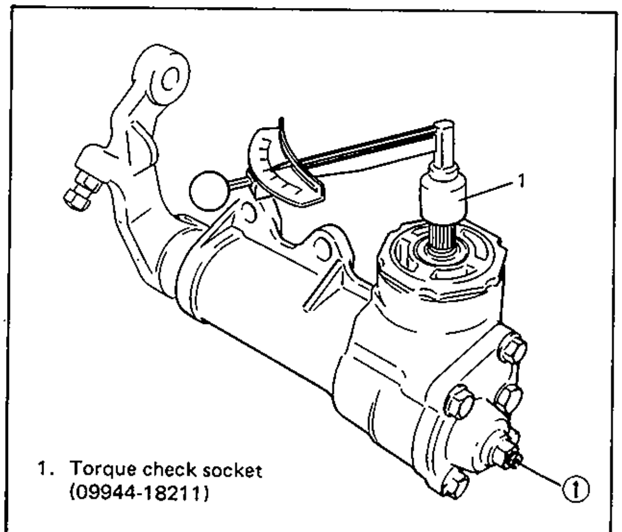


Fig. 3B2-21

ADJUSTMENT OF WORM SHAFT STARTING TORQUE

Steering gear box has adjusting bolt ① which gives preload to sector shaft.

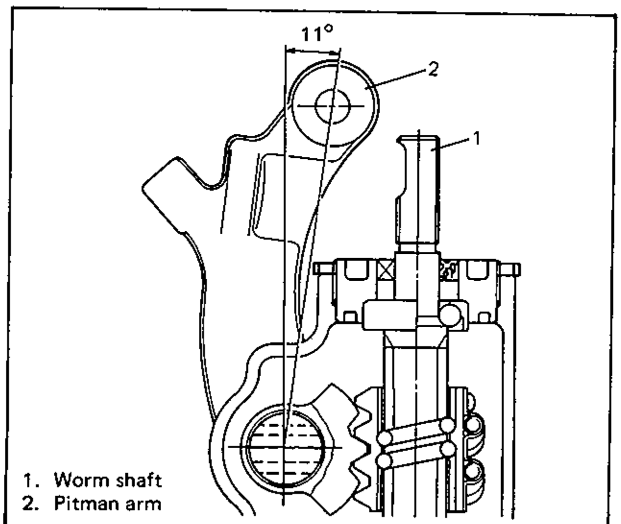


1. Torque check socket (09944-18211)

Fig. 3B2-22

Make adjustment according to following procedure.

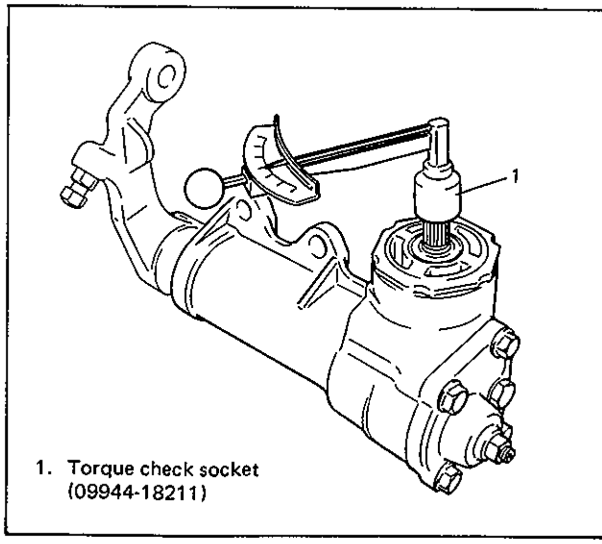
1) Check worm shaft to ensure that it is free from thrust play.
2) Position pitman arm in nearly parallel with worm shaft as shown below.
   (With pitman arm in this position, front wheels are in straightforward state.)



1. Worm shaft
2. Pitman arm

Fig. 3B2-23

3) Measure worm shaft starting torque from its position in starightforward state as described in 2).



1. Torque check socket (09944-18211)

Fig. 3B2-24

Starting torque	N·cm	kg-cm	lb-ft
	50 – 100	5.0–10.0	0.4 – 0.7

If measured torque is not within specification, carry out adjustment with adjusting bolt ① to meet specification and check to confirm it again.

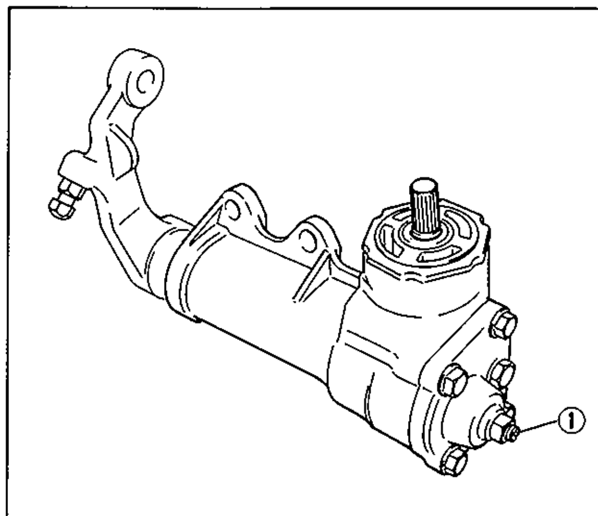


Fig. 3B2-25

4) If worm shaft starting torque is checked all right, another check should be carried out on worm shaft operating torque in its entire operating range (by turning worm shaft all the way to the right and left).

Worm shaft (including sector shaft) operating torque	Under 120 N·cm 12.0 kg-cm 0.9 lb-ft

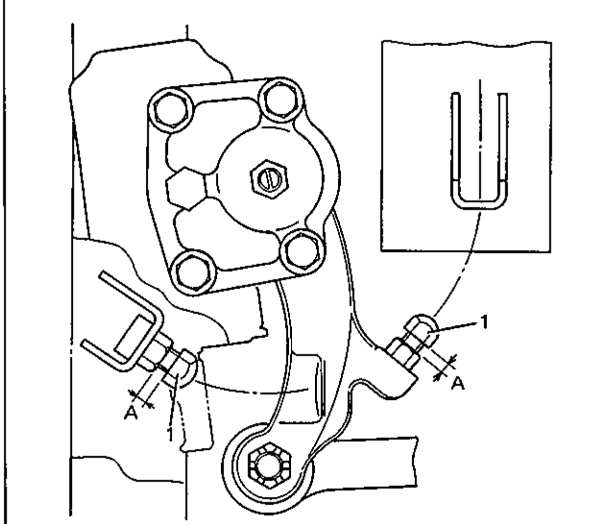
If measured torque does not conform to specification, readjust worm shaft starting torque in straightforward state by means of adjusting bolt ①, and then recheck worm shaft operating torque.

If specified value is not attained even after readjustment, it is advisable to replace gear box with new gear box assembly.

STEERING ANGLE

Inside	32.5°
Outside	30.5°

If steering angle is out of specification, adjust it by changing length of pitman arm stopper bolts.



1. Pitman arm stopper bolt
A. Approx. 5 mm (0.20 in.)

Fig. 3B2-26

TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Steering shaft joint bolt	20 – 30	2.0 – 3.0	14.5 – 22.0
2. Tie-rod end castle nut	30 – 55	3.0 – 5.5	22.0 – 39.5
3. Tie-rod end lock nut	50 – 80	5.0 – 8.0	36.5 – 58.0
4. Wheel nut	80 – 110	8.0 – 11.0	58.0 – 77.5
5. Steering gear box bolt	70 – 100	7.0 – 10.0	50.5 – 72.0
6. Idler arm nut	70 – 80	7.0 – 8.0	50.5 – 57.5
7. Pitman arm nut	140 – 180	14.0 – 18.0	101.0 – 129.5
8. Center link castle nut	30 – 70	3.0 – 7.0	22.0 – 50.5

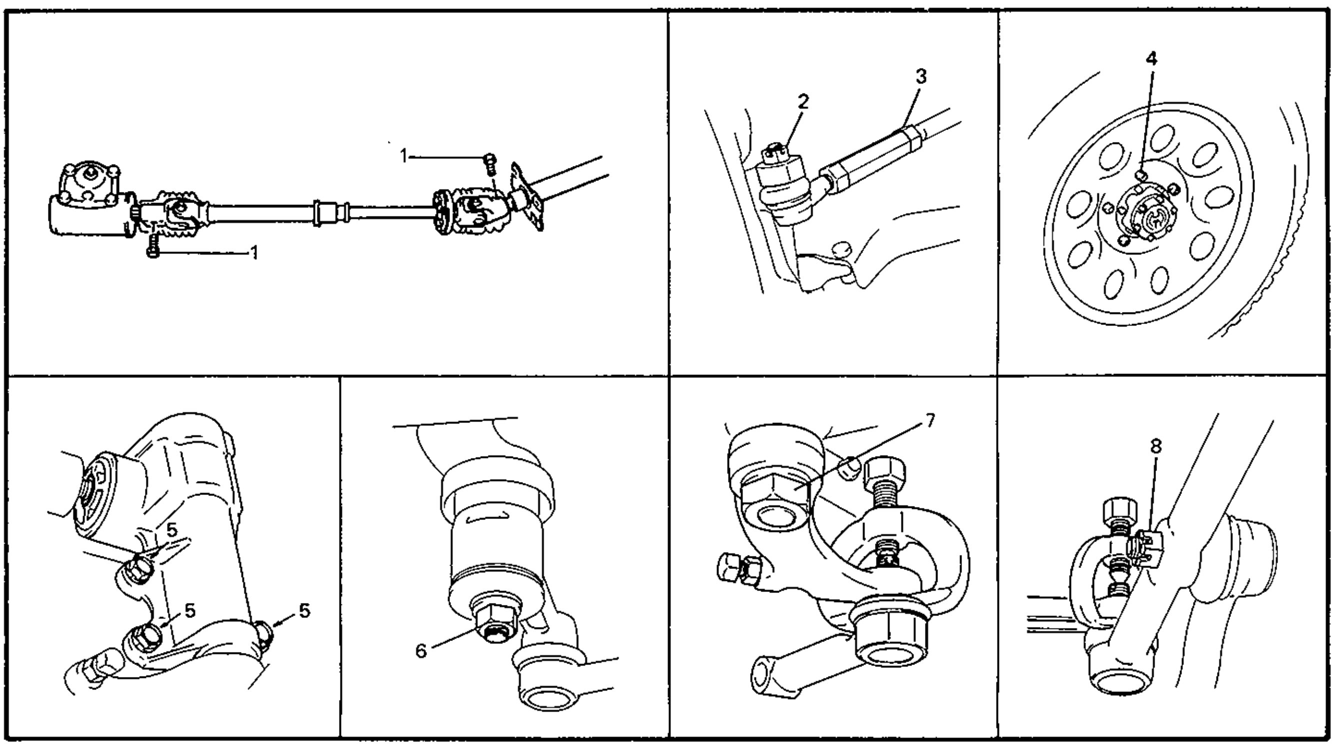


Fig. 3B2-27

SPECIAL TOOLS

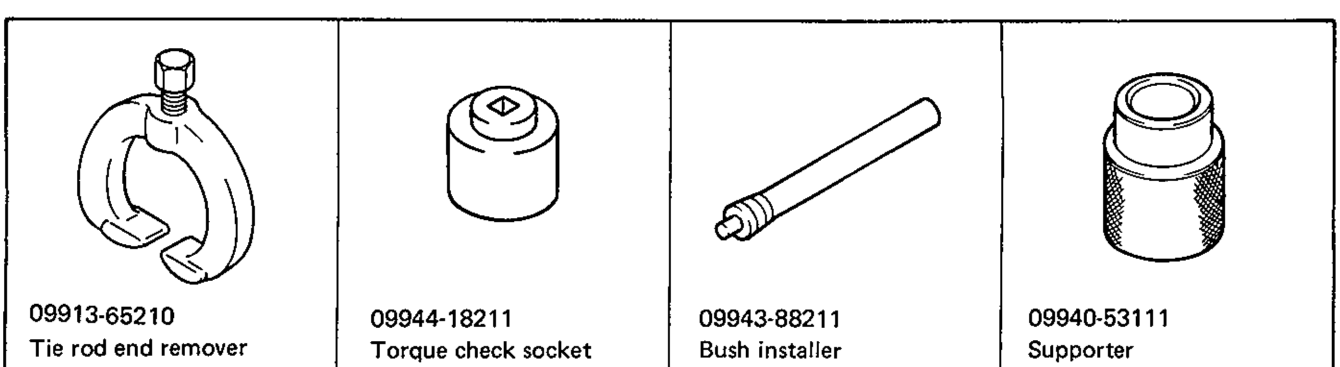


Fig. 3B2-28

SECTION 3B3

POWER STEERING (P/S) SYSTEM (OPTIONAL)

NOTE:
All steering gear fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.
For items related to the steering gear box and linkage, if not included in this section, refer to SECTION 3B2 STEERING GEAR BOX AND LINKAGE.

As this section is intended mainly for the left hand steering vehicle, it is possible that some illustrations do not correspond to the right hand steering vehicle.

CONTENTS

GENERAL DESCRIPTION

The power steering (P/S) system in this vehicle reduces the driver's effort needed in turning the steering wheel by unilizing the hydraulic pressure generated by the power steering (P/S) pump which is driven by the engine.
It is an integral type with the mechanical gear unit, hydraulic pressure cylinder unit and control valve unit all built in the gear box.

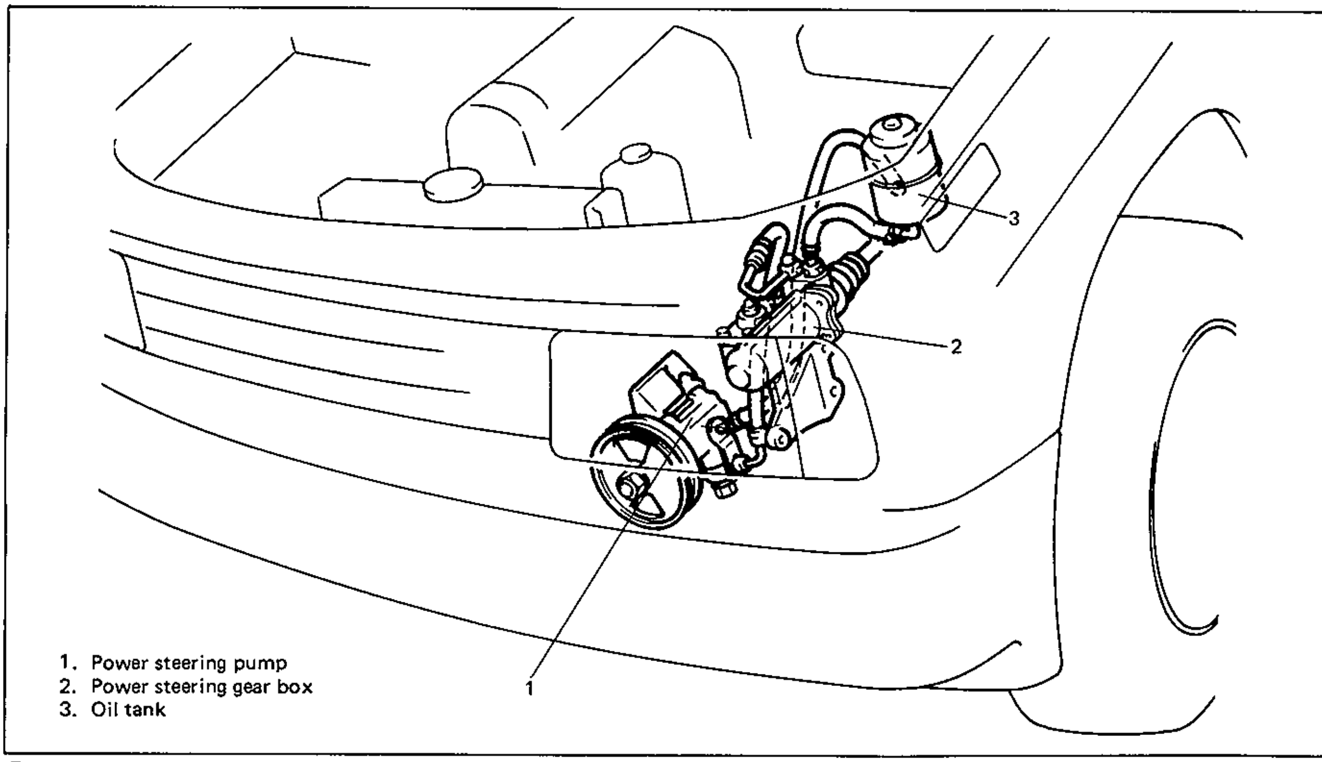


Fig. 3B3-1 Power Steering System Layout

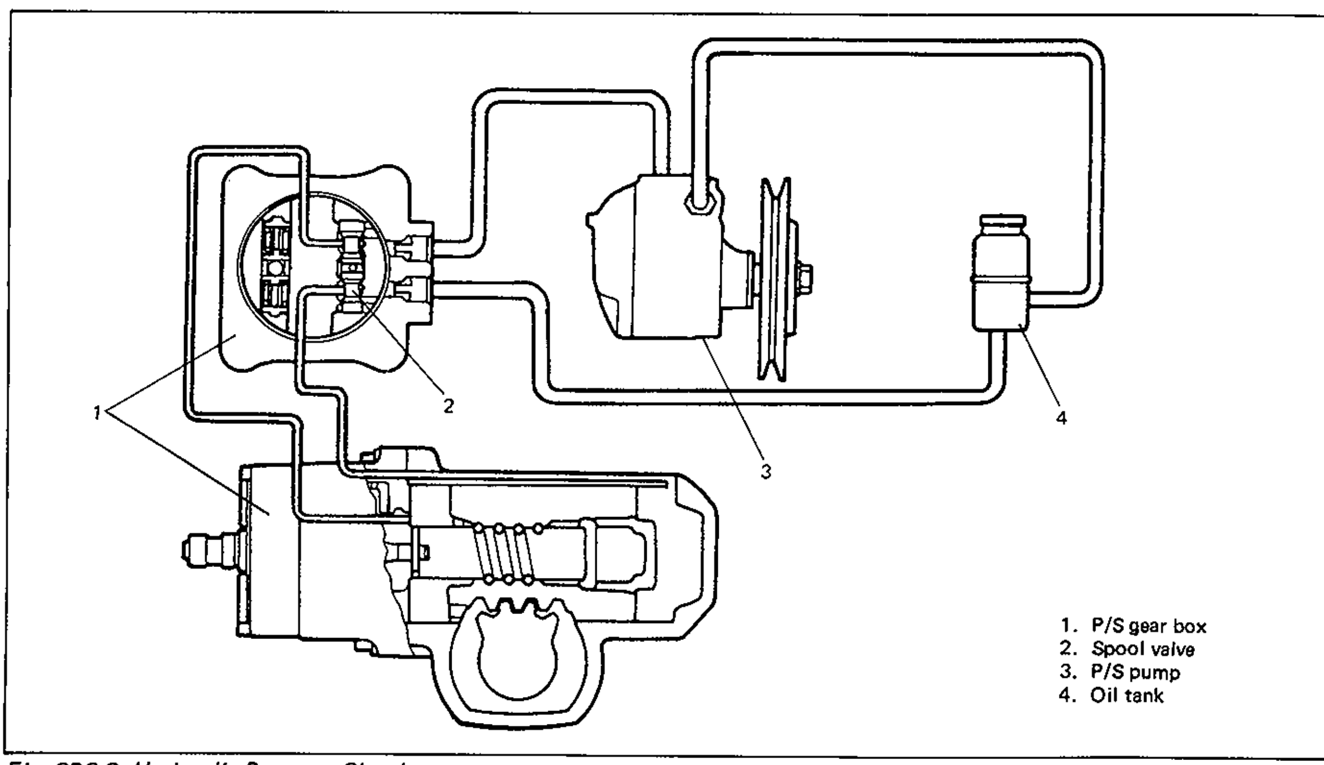


Fig. 3B3-2 Hydraulic Pressure Circuit

CONSTRUCTION AND OPERATION

STEERING GEAR BOX

Input shaft in gear box has a torsion bar (which connects input shaft and main shaft) and a pin. As steering wheel is turned, input shaft turns and its pin moves spool valve according to how much steering wheel is turned. Such valve movement allows fluid to flow so that hydraulic pressure is applied to piston which then provides assistance to steering wheel with steering effort.
Torsion bar is twisted as input shaft turns and pin moves spool valve according to how much it is twisted (i.e., how much steering wheel is turned). Then hydraulic pressure acts on main shaft to turn as much as input shaft has turned, thereby torsion bar becomes free from twist. Consequently, pin returns to its neutral position, so does spool valve and no hydraulic pressure is applied to cylinder or piston in this state.

When the steering wheel is in the straight-ahead position, the spool valve does not operate. Thus fluid from the P/S pump flows through the short-circuit back to the oil tank.

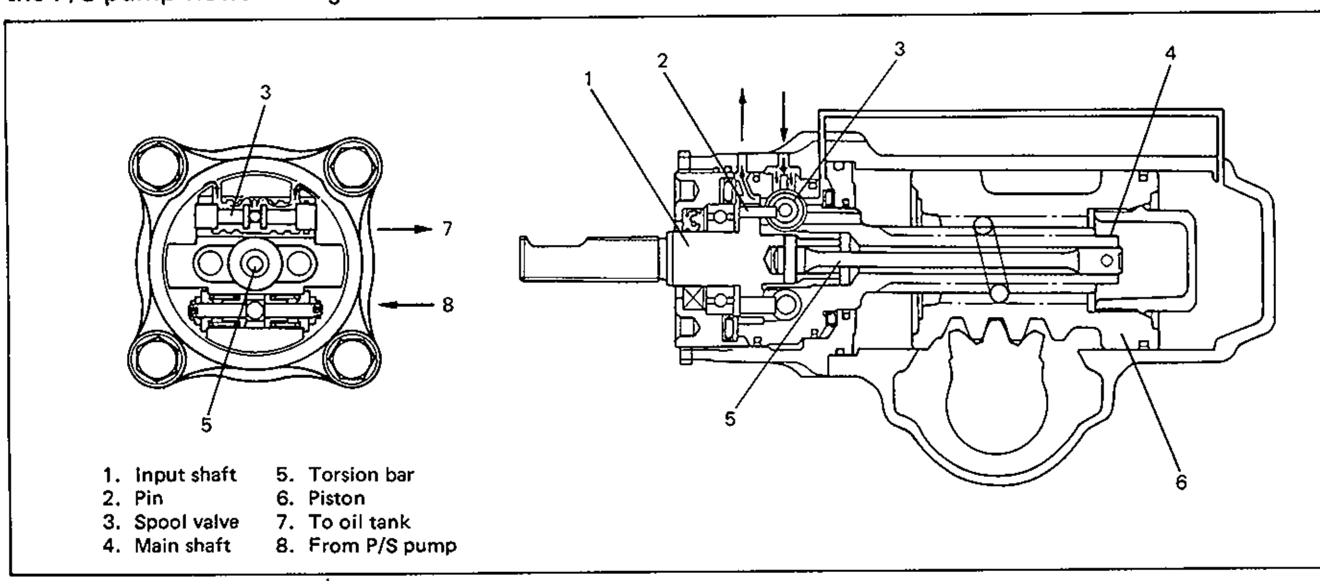


Fig. 3B3-3 Operation with Steering Wheel in Straight-Ahead Position

When the steering wheel is turned to the right, the pin interlocked with the input shaft pushes the spool valve to the right to allow the hydraulic pressure to be applied to the right side of the cylinder.

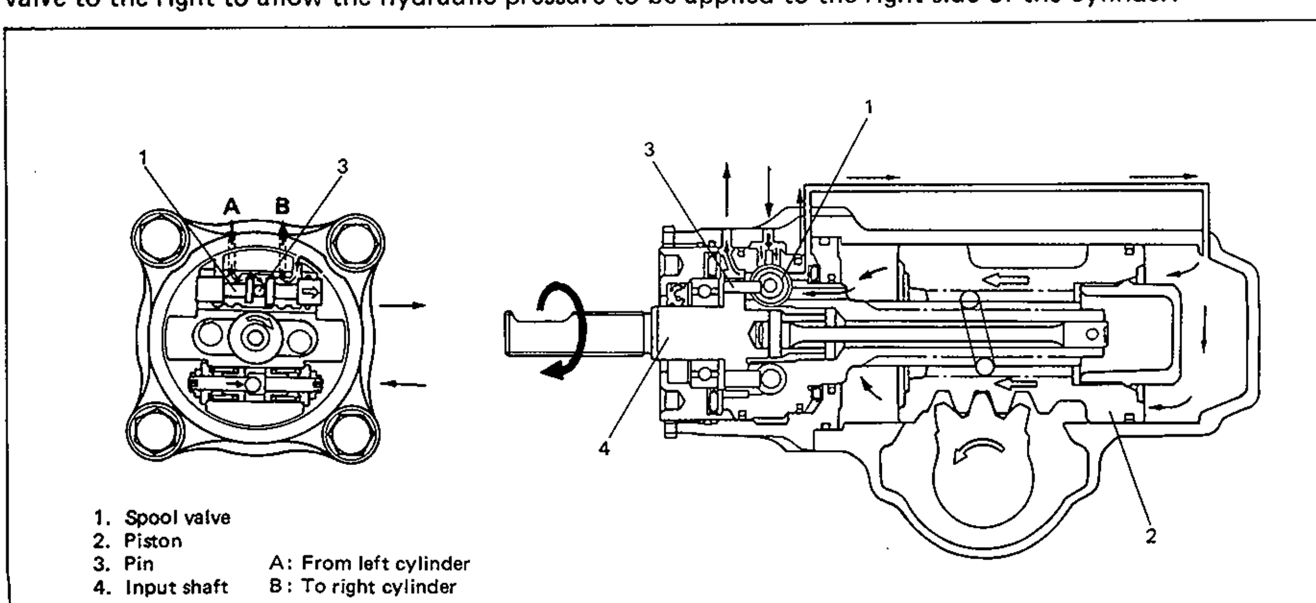
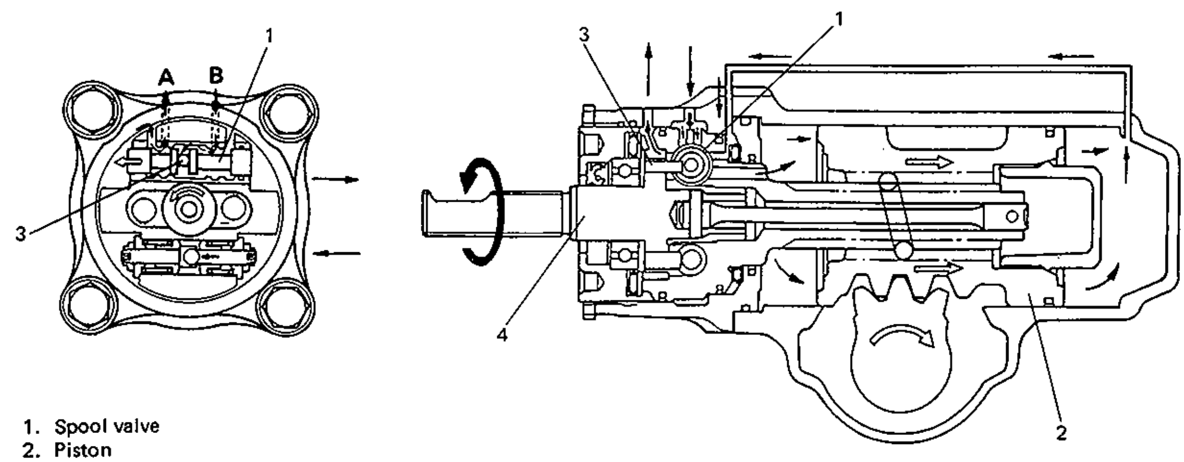


Fig. 3B3-4 Operation with Steering Wheel Turned to Right

When the steering wheel is turned to the left, the pin interlocked with the input shaft pushes the spool valve to the left to allow the hydraulic pressure to be applied to the left side of the cylinder.



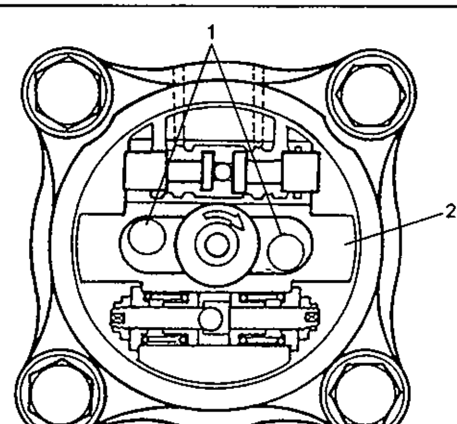
1. Spool valve
2. Piston
3. Pin
4. Input shaft

A: To left cylinder
B: From right cylinder

Fig. 3B3-5 Operation with Steering Wheel Turned to Left

VALVE UNIT

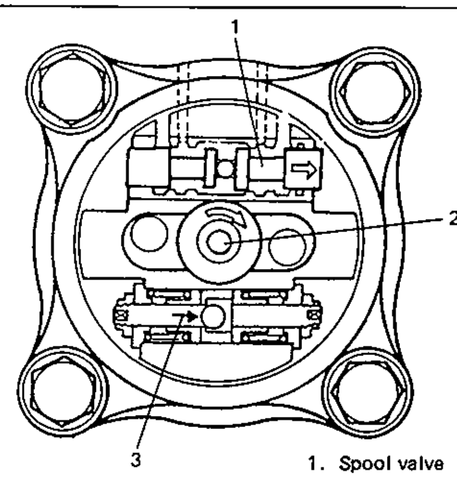
Should the hydraulic system fail, the stopper pin is directly come in contact with the big end of the main shaft and transmits steering force to allow manual steering.



1. Stopper pin
2. Main shaft big end

Fig. 3B3-6 Manual Steering

As the valve is returned smoothly by the reaction force of the torsion bar and spring when the steering wheel is turned, stable steering is assured at any speed, low or high.



1. Spool valve
2. Torsion bar
3. Spring reaction

Fig. 3B3-7 Spring Reaction Mechanism

POWER STEERING (P/S) PUMP

The power steering pump is a vane type and is driven by the V-ribbed belt from the crankshaft.

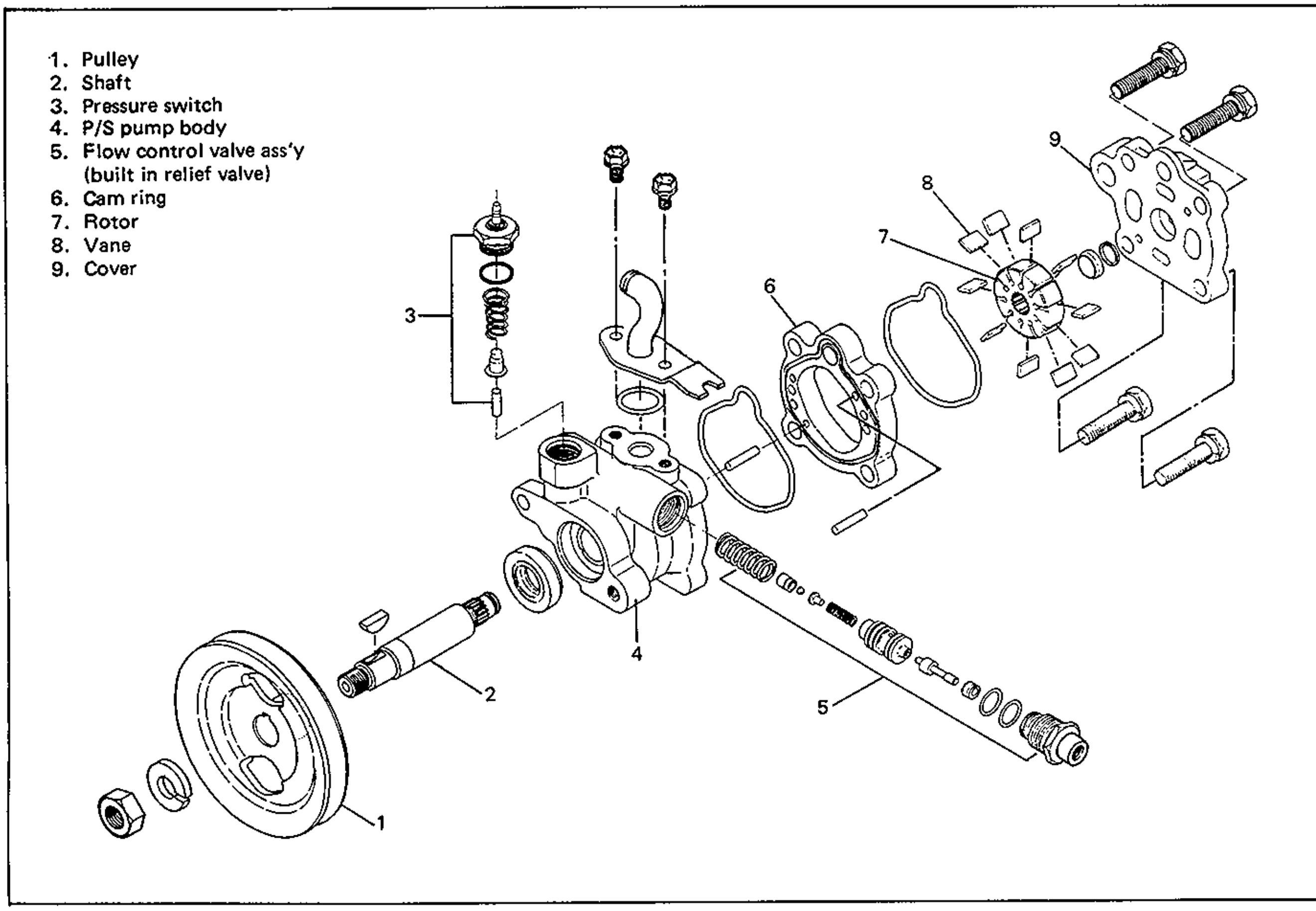


Fig. 3B3-8 Components of P/S Pump

Model		Vane type
Discharge rate		7.2 cm^3/rev
Hydraulic pressure control	Hydraulic pressure	70 kg/cm^2 (1000 psi)
	Control device	Flow control valve
		Relief valve
Specified fluid		DEXRON-II A/T fluid
Capacity		0.6 ℓ (1.26/1.05 US/Imp. pt) *0.72 ℓ (1.52/1.26 US/Imp. pt)
Idle-up system		When hydraulic pressure in P/S pump increases to 15 to 20 kg/cm^2 (215 to 285 psi), pressure switch turns ON to start idle-up operation.

*: For right hand steering vehicle

FLOW CONTROL VALVE

As the discharge rate of the P/S pump increases in proportion to the pump revolution speed, a flow control valve is added to control it so that the optimum amount of fluid for steering operation is supplied according to the engine speed (driving condition).

Described below is its operation at different engine speeds.

When Idling

The fluid discharged from the pump is supplied through the clearance around the rod in orifice A_1 to the gear box.

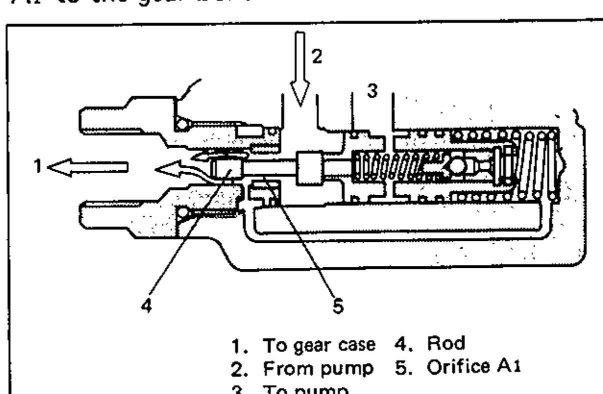


Fig. 3B3-9 Operation of Flow Control Valve (When Idling)

When Running at Low Speed

As the engine speed rises, the pump discharge rate increases and causes a pressure difference to occur between both ends of the orifice ($P_1 - P_2$). Thus the pressure exceeding the flow control spring force pushes the flow control valve to the right in the below figure, making the opening in the orifice narrower through which only a necessary amount of fluid is fed to the gear box and the excess fluid is returned to the pump.

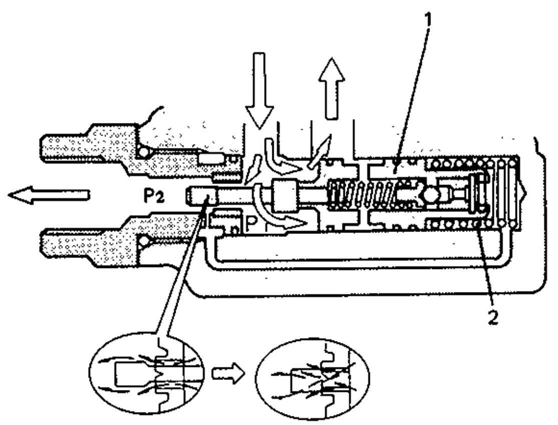


Fig. 3B3-10 Operation of Flow Control Valve (When Running at Low Speed)

When Running at High Speed

As the engine speed rises higher, opening in the orifice is made narrower and fluid flow to the gear box reduces. As a result, hydraulic pressure application is slow at the start of the steering wheel turn. This provides straight-ahead stability to suit the driving condition with the steering wheel operated near its neutral position.

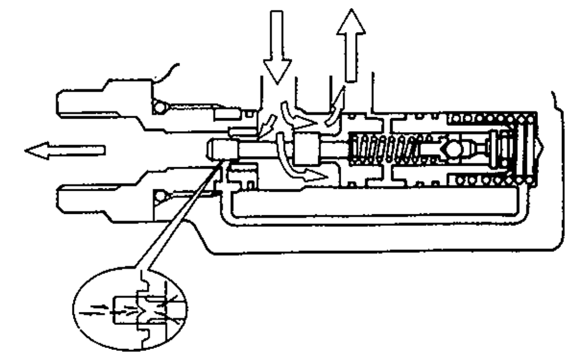


Fig. 3B3-11 Operation of Flow Control Valve (When Running at High Speed)

RELIEF VALVE

The relief valve located in the flow control valve controls the maximum hydraulic pressure.

The steel ball in the relief valve is under the hydraulic pressure in the circuit coming through orifice A_2. When the steering wheel is turned and the hydraulic pressure increases higher than 70 kg/cm^2 (1 000 psi), it compresses the relief spring to push the steel ball which then allows the fluid to flow to the P/S pump.

Such relief valve operation causes a pressure difference to occur between chambers A and B. Then the flow control valve moves to the right to make opening in orifice A_1 narrower, maintaining the hydraulic pressure constant.

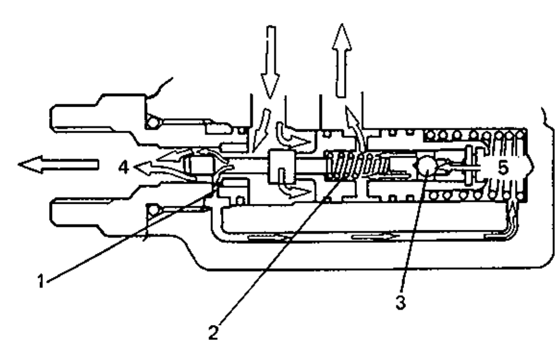


Fig. 3B3-12 Operation of Relief Valve

GENERAL DIAGNOSIS

Condition	Possible Cause	Correction
Steering wheel feels heavy (at low speed)	1. Fluid deteriorated, low viscocity, different type of fluid mixed	Replace fluid.
	2. Pipes or hoses deformed, air entering through joint	Replace defective port.
	3. Insufficient air purging from P/S circuit	Purge air.
	4. P/S belt worn, lacking in tension	Adjust belt tension or replace belt as necessary.
	5. Tire inflation pressure excessively low	Inflate tire.
	6. Front end alignment maladjusted	Check and adjust front end alignment.
	7. Steering wheel installed improperly (twisted)	Install steering wheel correctly.
	8. P/S pump hydraulic pressure fails to increase	Replace P/S pump.
	9. P/S pump hydraulic pressure increases but slowly	Replace P/S pump.
	NOTE: **Make sure to warm up engine fully before measuring hydraulic pressure from pump.**	
Steering wheel feels heavy momentarily when turning it to the left (right)	1. Air drawn in due to insufficient amount of fluid	Add fluid and purge air.
	2. Slipping P/S belt	Adjust belt tension or replace belt as necessary.
	3. Refer to check items 8 and 9 in above section	
No idle-up	1. P/S pump pressure switch defective	Replace switch.
Poor recovery from turns	**NOTE:** **To check steering wheel for recovery, with 35 km/h vehicle speed, turn it 90° and let it free. It should return more than 60°.**	
	1. Deformed pipes or hoses	Replace defective part.
	2. Steering column installed improperly	Install steering column correctly.
	3. Front end alignment maladjusted	Check and adjust front end alignment.
	4. Linkage or joints binding	Replace defective part.
	5. Refer to items 8 and 9 in above section	

Condition	Possible Cause	Correction
Vehicle pulls to one side during straight driving	1. Low or uneven tire inflation pressure	Inflate tires to proper pressure or adjust right & left tires inflation pressure.
	2. Front end alignment maladjusted	Check and adjust front end alignment.
	3. Malfunction of control valve in gear box	Replace gear box.
	4. Refer to check items 8 and 9 in previous page	
Steering wheel play is large and vehicle wanders	1. Loose steering shaft nut	Retighten.
	2. Loose linkage or joints	Retighten.
	3. Loose gear box fastening bolt	Retighten.
	4. Front wheel bearing worn	Replace wheel bearing.
Oil leakage	1. Loose joints of (hydraulic pressure) pipes and hoses	Retighten.
	2. Deformed or damaged pipes or hoses	Replace defective part.
Noise	**NOTE:** **Some sound may be heard through steering column when turning steering wheel with vehicle at a stop but it is not an abnormal noise but operating sound of valve in gear box.**	
	1. Air drawn in due to insufficient amount of fluid	Add fluid and purge air.
	2. Air mixed into fluid from pipes or hoses	Replace pipes or hoses.
	3. Slipping (loose) P/S belt	Adjust belt tension.
	4. Worn P/S belt	Replace belt.
	5. Loose gear box fastening bolt	Retighten bolts.
	6. Loose pitman arm nut	Retighten nut.
	7. Loose linkage or joints	Retighten.
	8. Pipes or hoses in contact with part of vehicle body	Install pipes and hoses correctly.
	9. Vanes of P/S pump defective	Replace pump.
	10. Malfunction of control valve in gear box	Replace gear box.
	11. Bearing of P/S pump shaft defective	Replace pump.

ON VEHICLE SERVICE

INSPECTION

STEERING WHEEL PLAY

- With engine OFF, check steering wheel play as follows. Move steering wheel from its straight-ahead position lightly in both directions and measure distance along its circumference it must be turned before wheels start to move. It should be within below specification.

Steering wheel play	10 – 30 mm (0.4 – 1.2 in)

- Check steering wheel for looseness or rattle by trying to move it in its shaft direction and lateral direction.

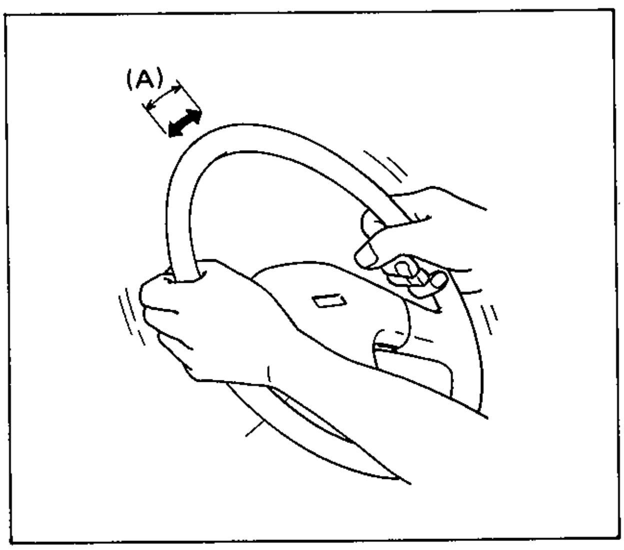


Fig. 3B3-13 Steering Wheel Play

STEERING FORCE

1) Place vehicle on level road and set steering wheel at straight-ahead position.
2) Check that tire inflation pressure is as specified. (Refer to tire placard).
3) Start engine and keep it running till power steering fluid is warmed to 50 to 60° C (122 to 140° F).

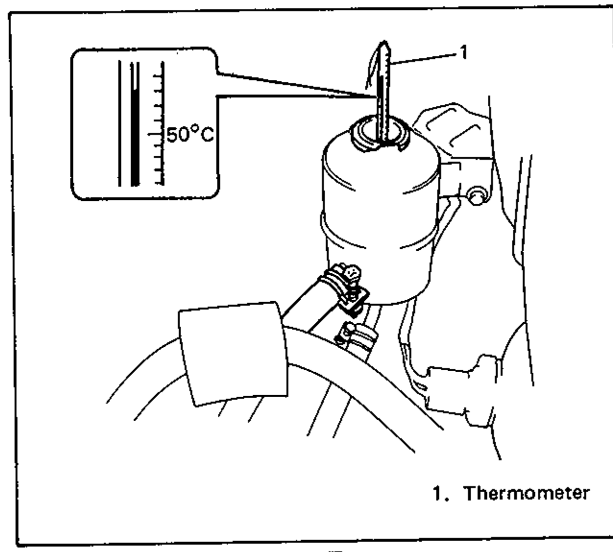


Fig. 3B3-14 Checking Fluid Temperature

4) With engine idling, measure steering force by pulling spring balancer hooked on steering wheel in tangential direction.

Steering force	Less than 5.0 kg (11.0 lb)

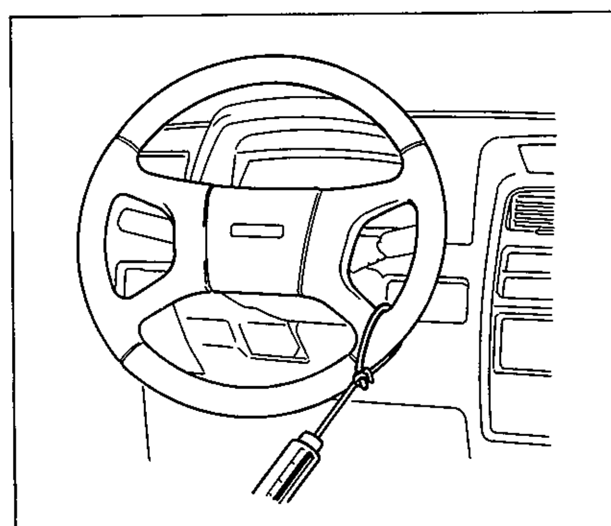


Fig. 3B3-15 Checking Steering Force

POWER STEERING BELT TENSION

- Check that belt is free from any damage and properly fitted in pulley groove.
- Check belt tension by measuring how much it deflects when pushed at intermediate point between P/S pump pulley and crank pulley with about 10 kg (22 lb) force.

Deflection of P/S belt	6 – 9 mm (0.24 – 0.35 in)

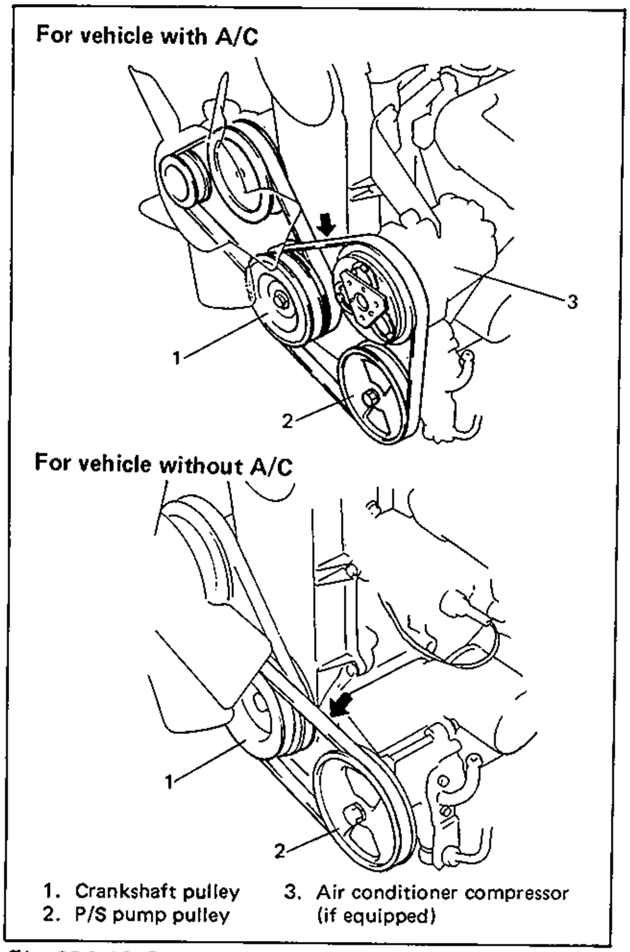


Fig. 3B3-16 Power Steering Belt Check

POWER STEERING BELT TENSION ADJUSTMENT

To adjust P/S belt tension, use adjusting bolt of compressor for A/C equipped vehicles and that of P/S pump for vehicles without A/C.
Adjust belt tension to above specification.
Then tighten adjusting and mounting bolts to specified torque.

POWER STEERING FLUID LEVEL

With engine stopped, remove oil tank cap and check fluid level indicated on level gauge, which should be between MAX and MIN marks.
If it is lower than MIN, fill fluid up to MAX mark.

NOTE:

- **Be sure to use A/T fluid DEXRON-II.**
- **Fluid level should be checked when fluid is cool.**

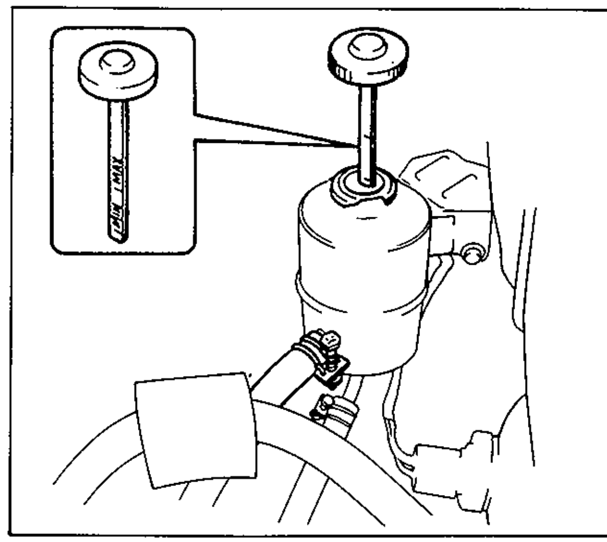


Fig. 3B3-17 Checking P/S Fluid Level

IDLE UP SYSTEM

With air conditioner OFF (if equipped), turn steering wheel and check that engine idling speed is not slowed down even when load is imposed on engine by P/S pump.

FLUID LEAKAGE

Start engine and turn steering wheel fully to the right and left so that maximum hydraulic pressure is provided. Then visually check gear box, P/S pump and oil tank themselves and each joint of their connecting pipes for leakage.

> **CAUTION:**
> **Never keep steering wheel turned fully for longer than 10 seconds.**

AIR BLEEDING PROCEDURE

1) Jack up the front end of vehicle and apply rigid rack.
2) Fill oil tank with fluid up to specified level.
3) After running engine at idling speed for 3 to 5 seconds, stop it and add fluid to satisfy specification.
4) With engine stopped, turn steering wheel to the right and left as far as it stops, repeat it a few times and fill fluid to specified level.
5) With engine running at idling speed, repeat stop-to-stop turn of steering wheel till all foams are gone.
6) Finally check to make sure that fluid is filled to specified level.

NOTE:
When air bleeding is not complete, it is indicated by forming fluid on level gauge or humming noise from P/S pump.

HYDRAULIC PRESSURE IN P/S CIRCUIT

1) Clean where pipe is connected thoroughly, then disconnect pressure hose from P/S pump and connect oil pressure gauge (special tool), its attachment and hose set (special tools) as shown below.

CAUTION:
When connecting special tools, be careful so that hose connecting P/S pump and gauge does not contact P/S belt and it does not hinder movement of center link.

2) Fill fluid up and bleed air.

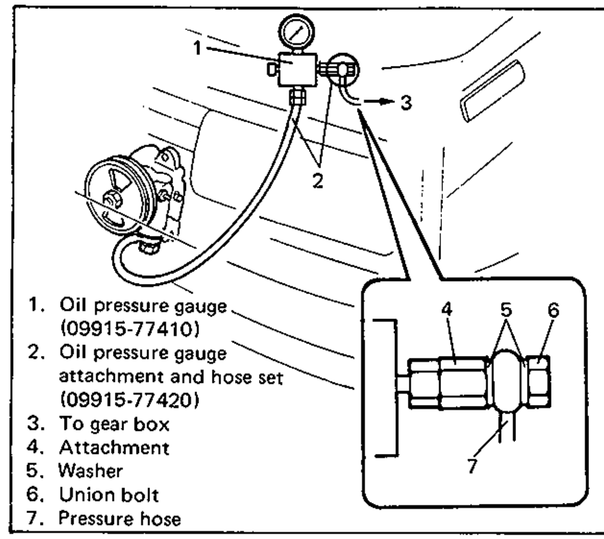


Fig. 3B3-19 Connecting Oil Pressure Gauge and its set

3) With engine running at idling speed, turn steering wheel to the right and left as far as it stops, repeat it and warm up fluid in oil tank to 50 to 60°C (122 to 140°F).

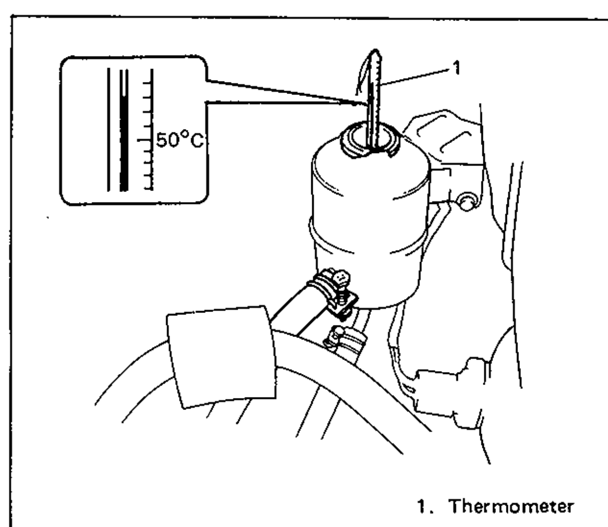


Fig. 3B3-20 Raising Fluid Temperature

4) Back pressure check
With straightforward state, while keeping engine running at idling speed and check hydraulic pressure.

Back pressure	Lower than 10 kg/cm² (142 psi)

If back pressure is higher than 10 kg/cm² (142 psi), check control valve and pipes for obstruction.

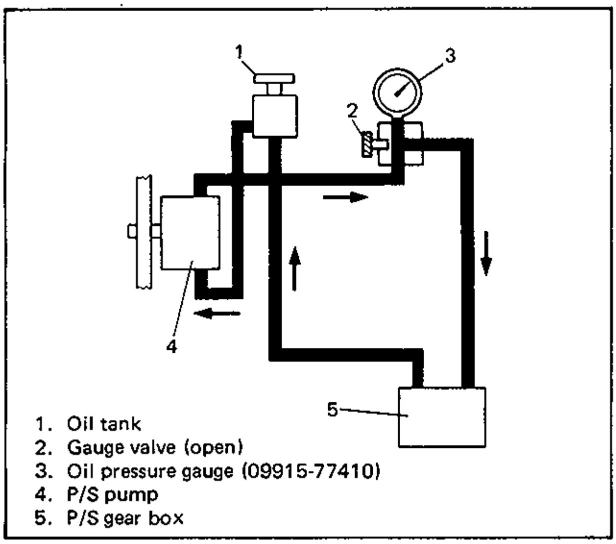


Fig. 3B3-21 Checking Back Pressure

5) Relief pressure check

- Increase engine speed to about 1,500 r/min (rpm). Close gauge valve gradually while watching pressure increase indicated by gauge and take reading of relief pressure (maximum hydraulic pressure).

Relief pressure	60 – 80 kg/cm² (850 – 1140 psi)

* When it is higher than 80 kg/cm² (1140 psi), possible cause is malfunction of relief valve. Replace P/S pump.

* When it is lower than 60 kg/cm² (850 psi), possible cause is either failure of P/S pump or settling of relief valve spring. Replace P/S pump.

CAUTION:
Be sure not to close gauge valve for longer than 10 seconds.

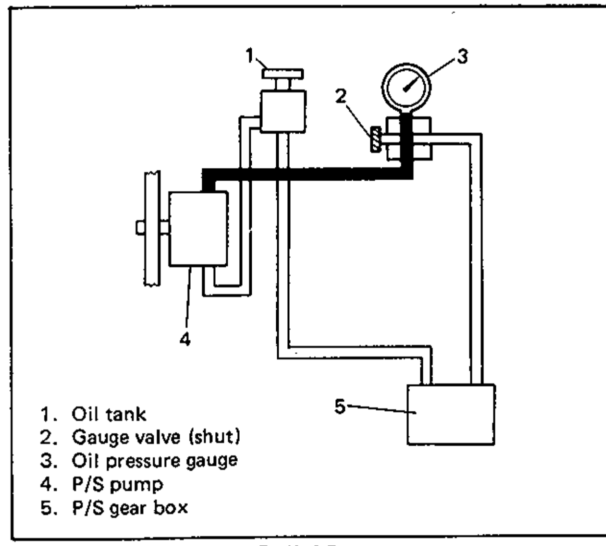


Fig. 3B3-22 Checking Relief Pressure

- Next, open gauge valve fully and increase engine speed to about 1,500 r/min. Then turn steering wheel to the left or right fully and take reading of relief pressure.

Relief pressure	60 – 80 kg/cm² (850 – 1140 psi)

* When it is lower than 60 kg/cm² (850 psi), possible cause is failure in steering gear box. Replace gear box.

CAUTION:
Be sure not to hold steering wheel at fully turned position for longer than 10 seconds.

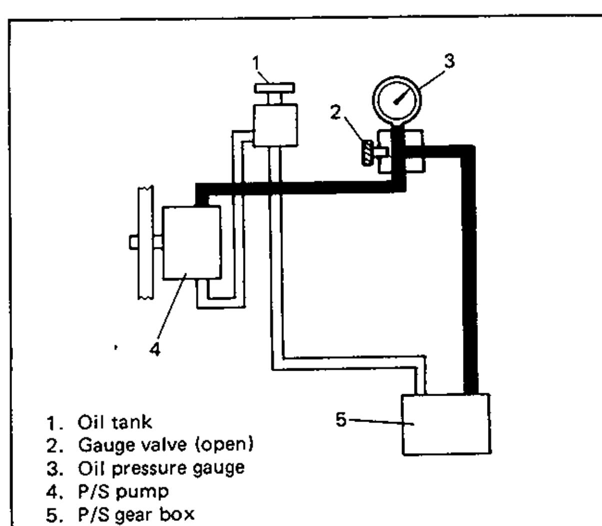


Fig. 3B3-23 Checking Relief Pressure

POWER STEERING (P/S) GEAR BOX

REMOVAL

(For left hand steering vehicle)

1) Disconnect cooling water reservoir tank from radiator.
2) Remove steering lower shaft fastening bolt.
3) Disconnect center link end from pitman arm.

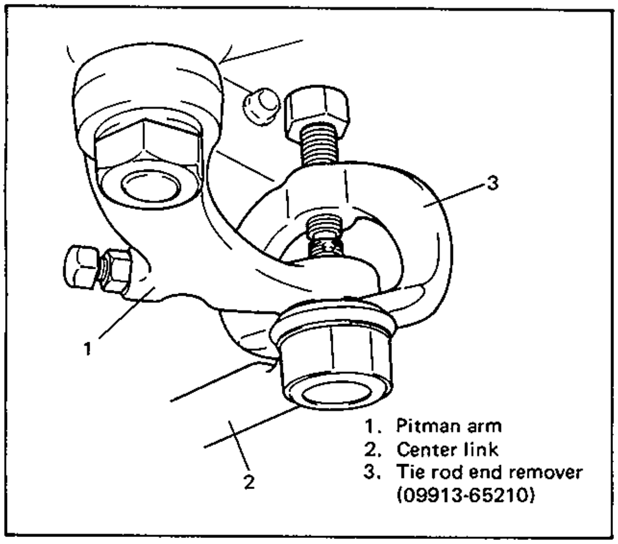


Fig. 3B3-24

4) Disconnect pressure hose from P/S gear box.

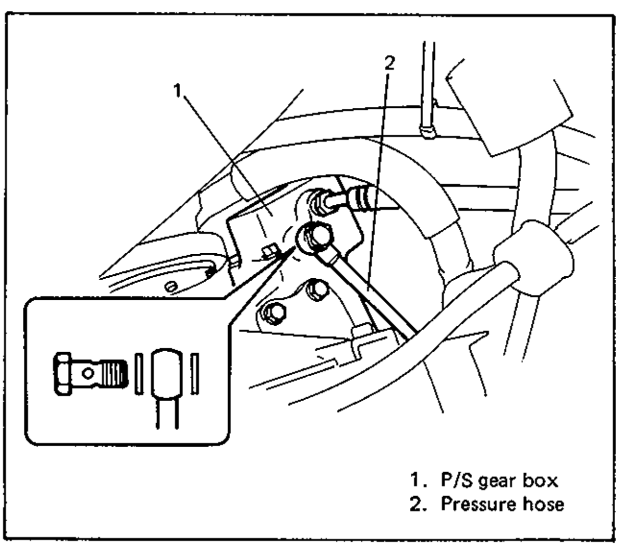


Fig. 3B3-25

5) Disconnect return hose from oil tank with a container placed under tank to receive fluid.

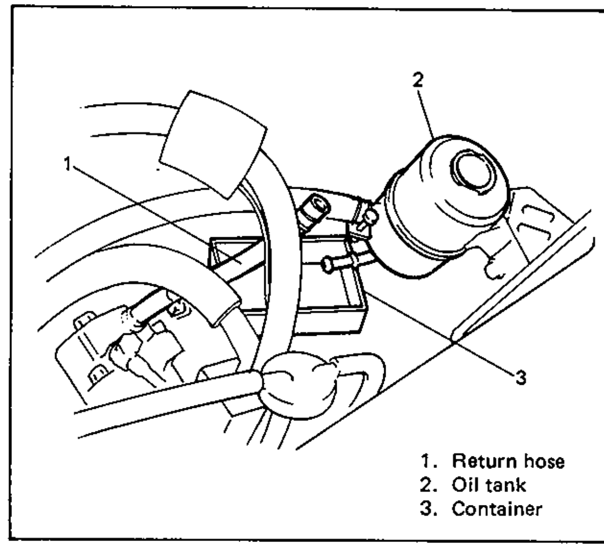


Fig. 3B3-26

6) Remove 3 steering gear box fastening bolts.

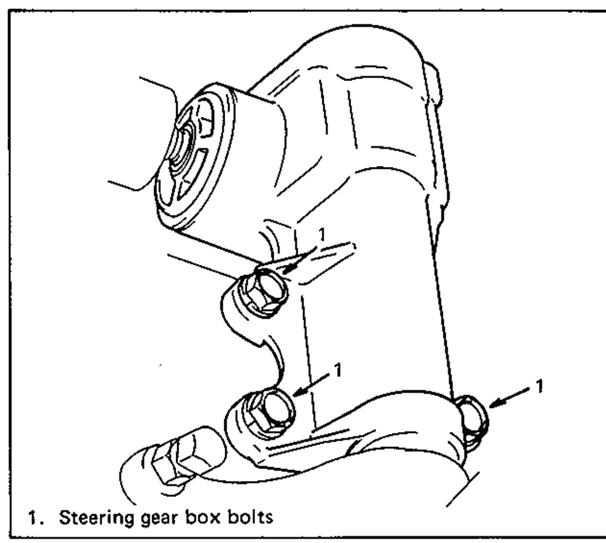


Fig. 3B3-27

7) Remove steering gear box, disconnecting steering lower shaft joint.
8) Remove pitman arm from P/S gear box.
   Gear box found to be in defective condition should be replaced with a new one.

NOTE:
Don't disassemble P/S gear box.

For adjustment of worm shaft starting torque, refer to p. 3B2-8.

INSTALLATION

(For left hand steering vehicle)

Reverse removal procedure to install P/S gear box.

1) Install pitman arm to sector shaft of P/S gear box with match marks "A" and "B" aligned as shown in figure below and torque to specification.

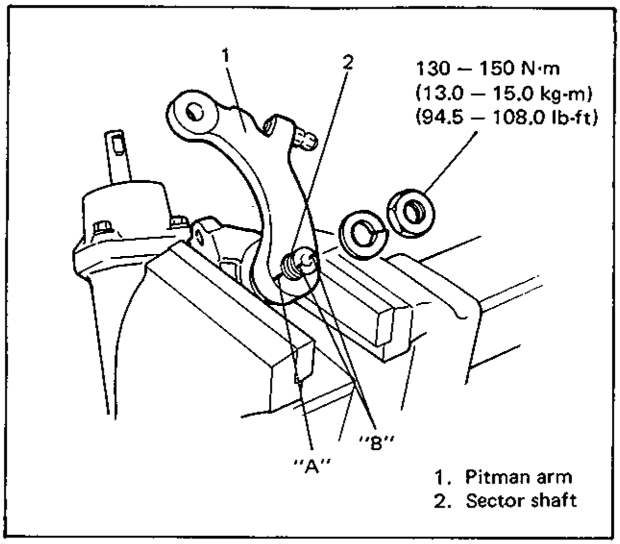


Fig. 3B3-28

2) Install steering gear box to shaft joint.

NOTE:
Align flat part of steering gear box shaft with bolt hole of lower shaft joint as shown. Then insert gear box shaft into lower shaft joint.

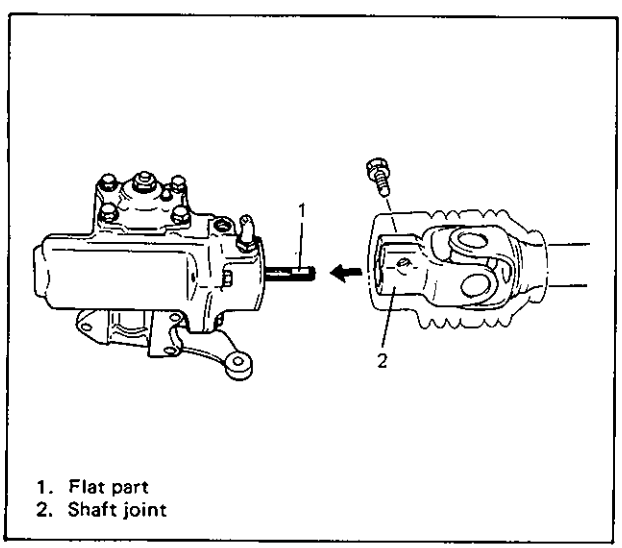


Fig. 3B3-29

3) Install steering gear box fastening bolts with guide bolt positioned as shown below.

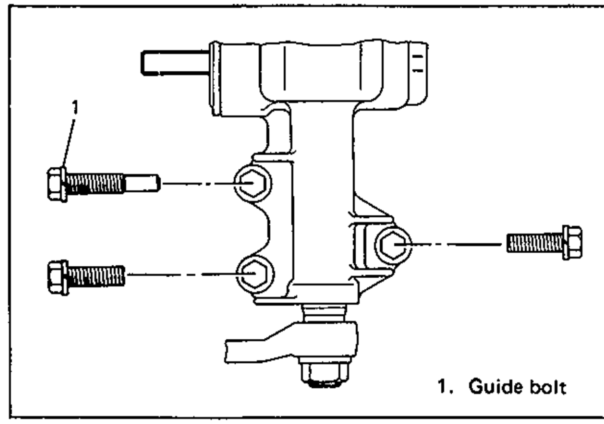


Fig. 3B3-30

4) Fasten each bolt and nut to specified torque.
Tightening torque specification.

Steering gear box bolt (3 x 12 mm)	70 – 100 N·m 7.0 – 10.0 kg-m 51.0 – 72.0 lb-ft
Center link castle nut (12 mm)	30 – 70 N·m 3.0 – 7.0 kg-m 22.0 – 50.5 lb-ft
Steering lower shaft bolt (8 mm)	20 – 30 N·m 2.0 – 3.0 kg-m 14.5 – 21.5 lb-ft
P/S gear box union bolt (14 mm)	30 – 40 N·m 3.0 – 4.0 kg-m 22.0 – 28.5 lb-ft

5) For manual transmission vehicle, clamp pressure hose and clutch cable securely.

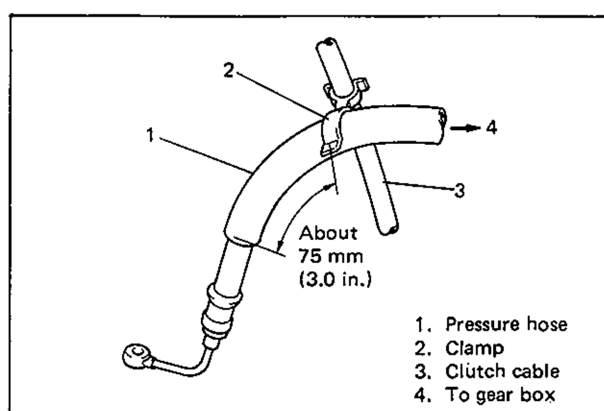


Fig. 3B3-30-1

6) Fill oil tank with specified P/S fluid.
7) Purge air in P/S circuit. For purging procedure, refer to p. 3B3-11.
8) Start engine and check P/S system for fluid leakage.

REMOVAL

(For right hand steering vehicle)

1) Remove canister. (if equipped)
2) Remove steering lower shaft bolts and pull out steering lower shaft.

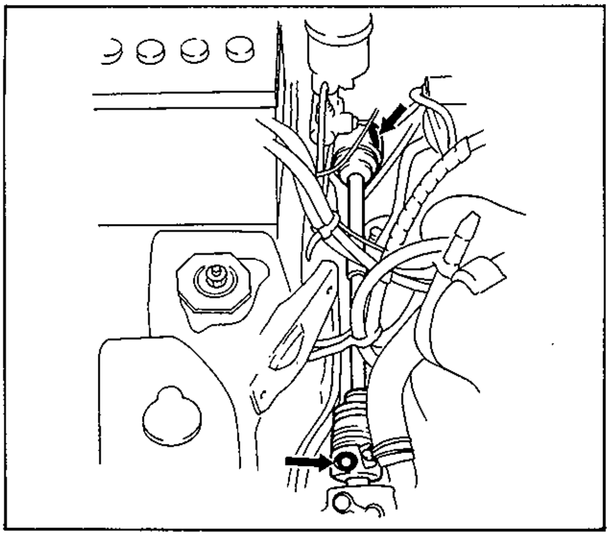


Fig. 3B3-30-2 Removing Steering Lower Shaft

3) Disconnect pressure pipe and return pipe from gear box.
4) Disconnect center link end from pitman arm.

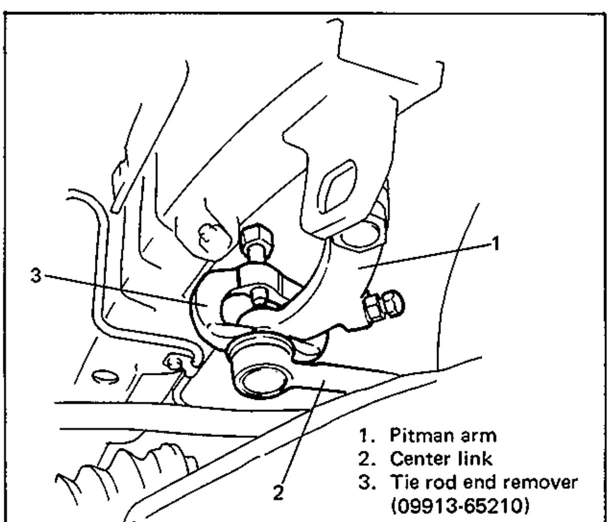


Fig. 3B3-30-3 Removing Center Link End

5) Remove radiator right stay.
6) Remove steering gear box fastening bolts.

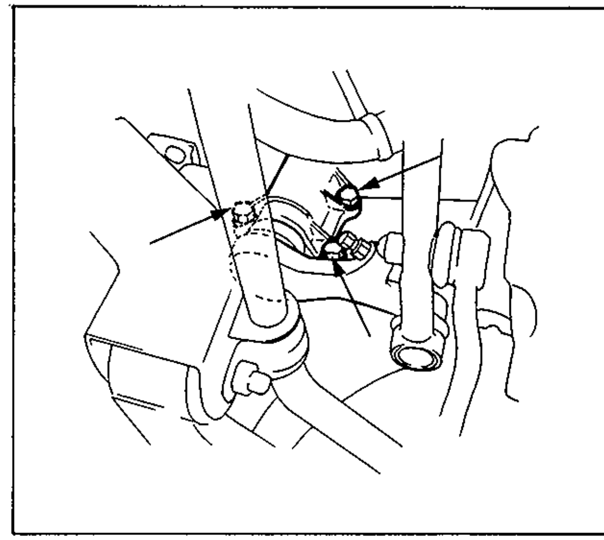


Fig. 3B3-30-4 Removing Steering Gear Box

Gear box found to be in defective condition should be replaced with a new one.

NOTE:
Don't disassemble P/S gear box.

For Adjustment of worm shaft starting torque, refer to p. 3B2-8.

INSTALLATION

(For right hand steering vehicle)

Reverse removal procedure for installation.

1) When installing steering gear box fastening bolts, start with guide bolt which is one of them.

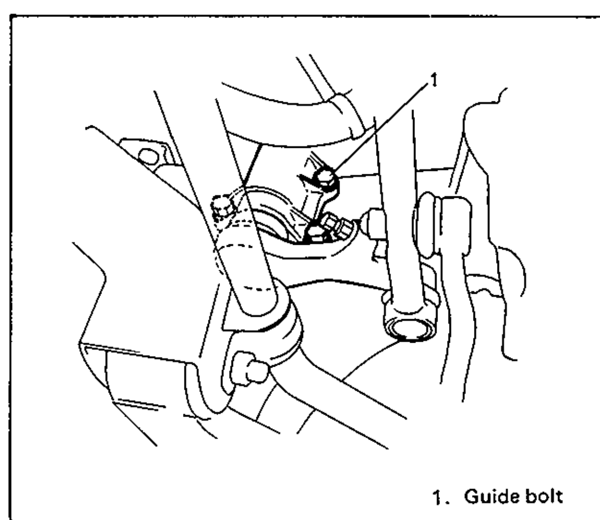


Fig. 3B3-30-5 Installing Steering Gear Box

2) Install steering gear box to shaft joint.

NOTE:

When installing steering lower shaft bolt, be sure to align bolt hole in lower shaft joint with flat part of gear box's worm shaft.

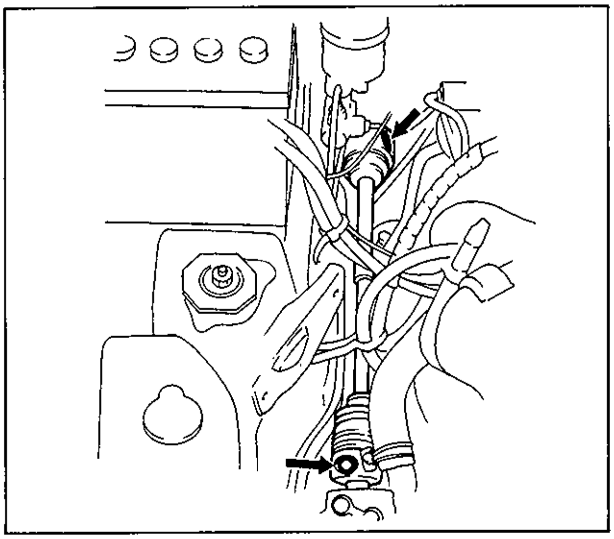


Fig. 3B3-30-6 Installing Steering Lower Shaft

3) Fasten each bolt and nut to specified torque. For tightening torque specification, refer to p. 3B3-14.
4) Fill oil tank with specified P/S fluid.
5) Purge air in P/S circuit. For purging procedure, refer to p. 3B3-11.
6) Start engine and check P/S system for fluid leakage.

NOTE:

When pressure hose has been replaced for any reason, be sure to tighten nut to specified torque after applying P/S fluid to "A" part as shown in figure below.

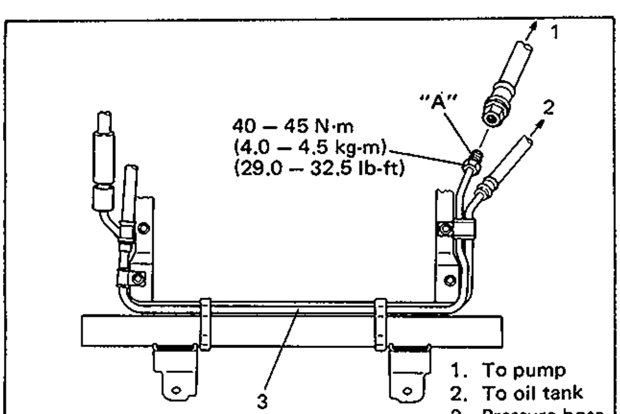


Fig. 3B3-30-7

POWER STEERING (P/S) PUMP

NOTE:

Before removing joints at inlet and outlet ports of P/S pump, make sure to clean dirt thoroughly.

REMOVAL

1) Disconnect battery negative cable.
2) Disconnect water reservoir tank from radiator.
3) Loosen air conditioner compressor adjusting bolt and pivot bolts (if equipped with A/C). Loosen P/S pump adjusting bolt and mounting bolt (if not equipped with A/C).
4) Remove power steering belt.
5) When removing union bolt, hold discharge connector with wrench or the like to prevent it from getting loose and drain P/S fluid.

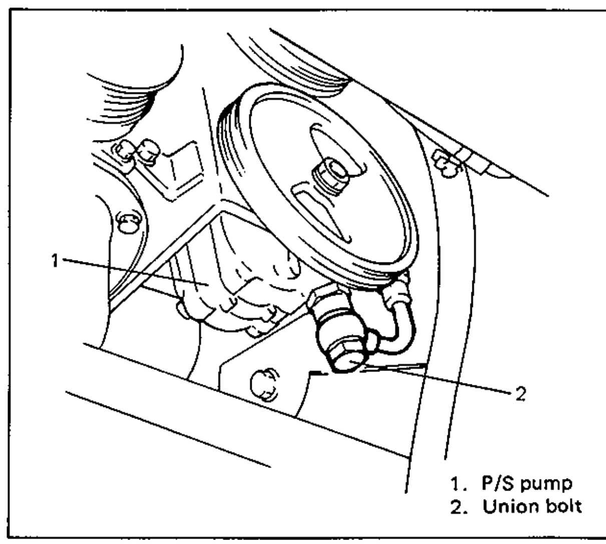


Fig. 3B3-31

6) Disconnect P/S pump suction hose from oil tank.
7) Disconnect P/S pump pressure switch lead wire at switch terminal.

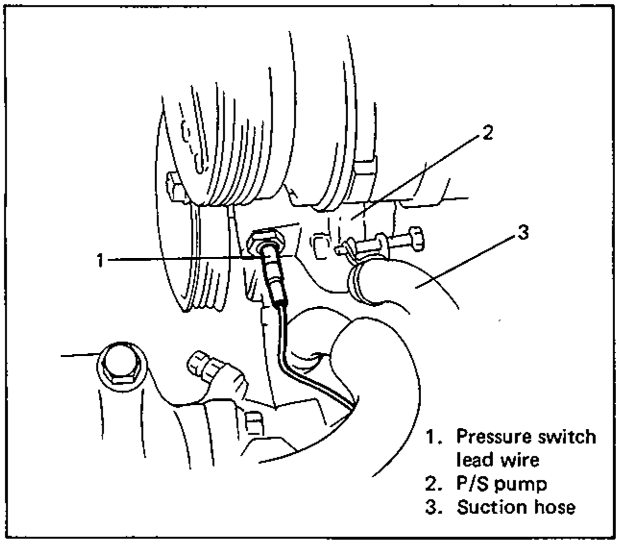


Fig. 3B3-32

8) Remove engine oil filter.
9) Remove P/S pump adjusting bolt and mounting bolt.

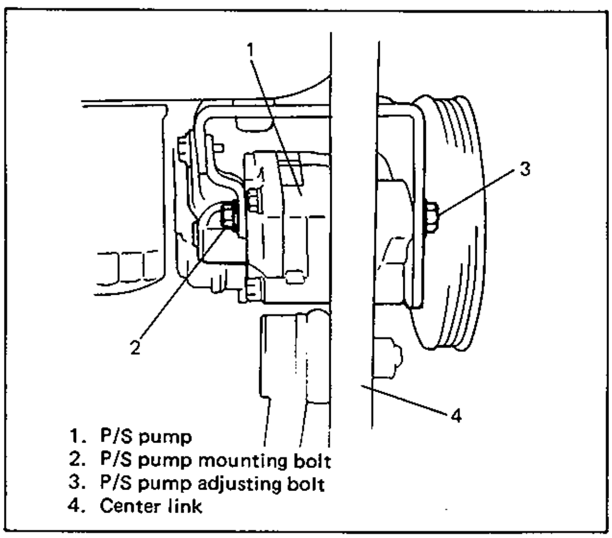


Fig. 3B3-33

10) Remove P/S pump.

NOTE:

Plug ports of removed pump to prevent dust and any foreign object from entering.

INSTALLATION

1) Connect pressure hose to P/S pump temporarily (by tightening pressure hose union bolt a little).
   Install power steering pump by using adjusting bolt and mounting bolt (if equipped with A/C).
   Install P/S pump by tightening adjusting bolt and mounting bolt lightly (if not equipped with A/C).
   Install P/S pump adjusting bolt as shown.

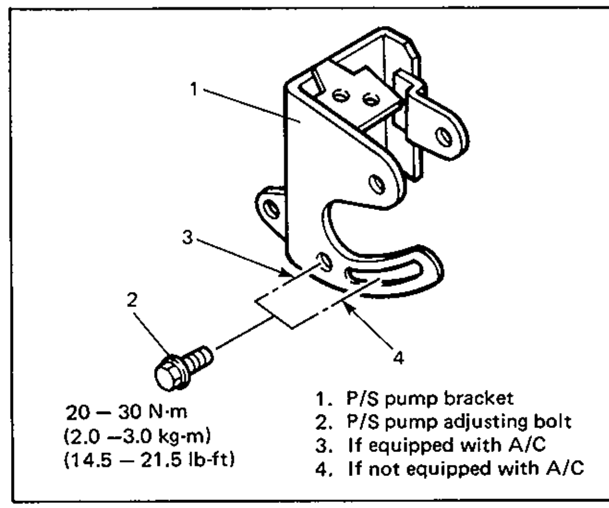


Fig. 3B3-34

2) Install engine oil filter to cylinder block. Refer to p. 0B-7 for installation procedure.
3) Connect P/S pump suction hose to oil tank and clamp the hose securely.

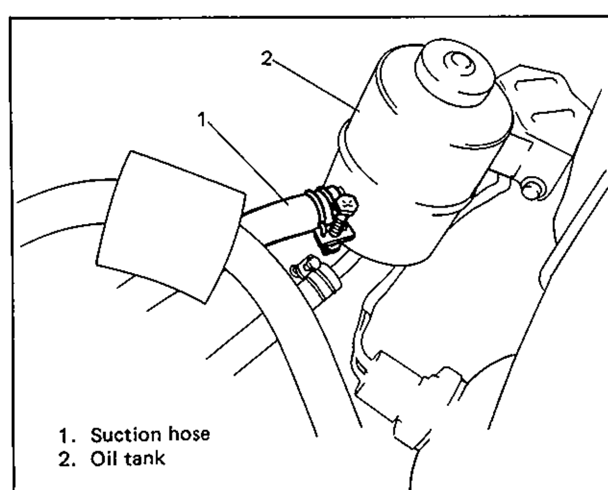


Fig. 3B3-35

4) Connect P/S pump pressure switch lead wire to switch terminal.
5) Clamp pressure switch lead wire securely.

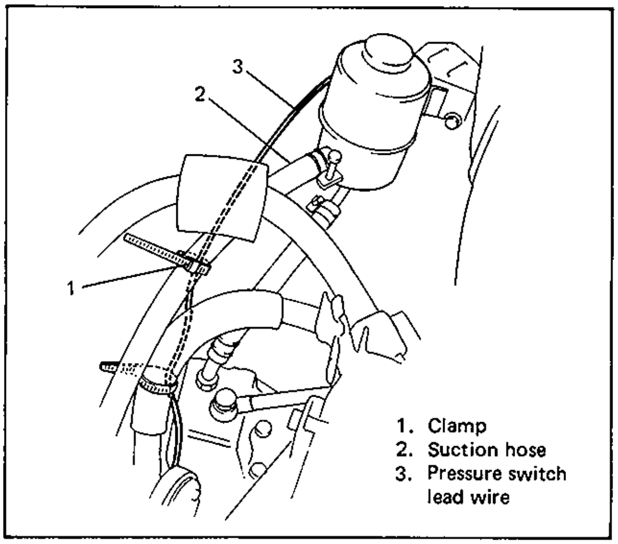


Fig. 3B3-36

6) Tighten pressure hose union bolt to specified torque.

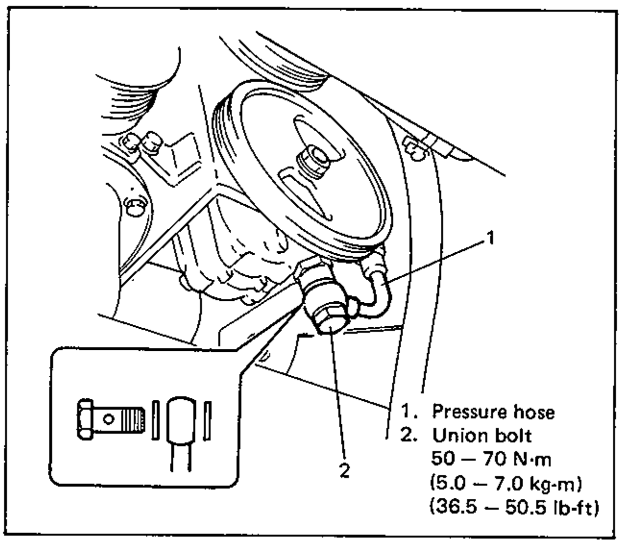


Fig. 3B3-37

7) Install P/S belt.
8) Adjust P/S belt tension to specification. Refer to p. 3B3-10 for belt tension specification.
9) Install reservoir tank to radiator.
10) Fill oil tank with specified P/S fluid.

Power steering fluid	DEXRON-II A/T fluid
	0.6 ℓ (1.26/1.05 US/Imp. pt) *0.72 ℓ (1.52/1.26 US/Imp. pt)

*: For right hand steering vehicle

11) Purge air in P/S circuit (Refer to p. 3B3-11).

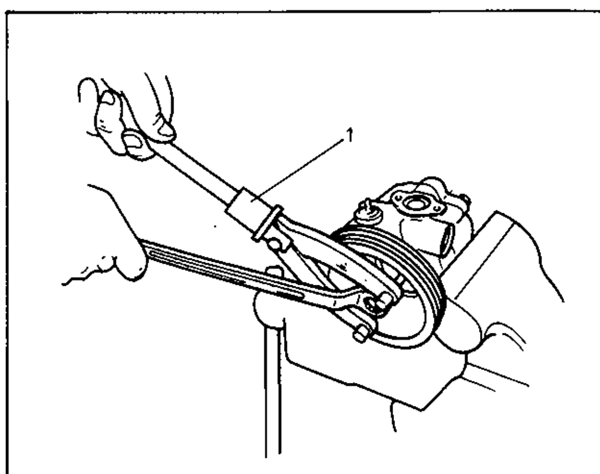
Tightening torque specification

P/S pump adjusting and mounting bolts	20 – 30 N·m 2.0 – 3.0 kg-m 14.5 – 21.5 lb-ft
P/S pump union bolt (16 mm)	50 – 70 N·m 5.0 – 7.0 kg-m 36.5 – 50.5 lb-ft
A/C compressor adjusting and pivot bolts	25 – 30 N·m 2.5 – 3.0 kg-m 18.5 – 22.0 lb-ft

12) Connect negative cable at battery terminal.
13) Start engine and check P/S system for fluid leakage.

DISASSEMBLY

1) Using special tool, remove P/S pump pulley.



1. Transfer flange lock holder (special tool 09930-40113)

Fig. 3B3-38 Removing P/S Pump Pulley

2) Remove suction connector bolts (M6).
3) Remove terminal assembly (pressure switch) and discharge connector.

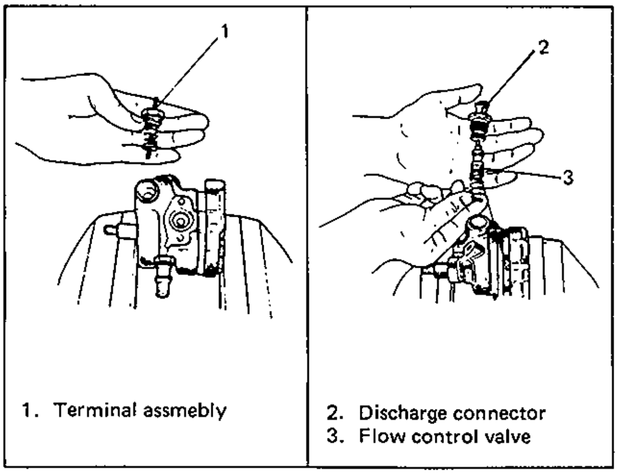


Fig. 3B3-39 Removing Terminal Assembly and Discharge Connector

4) Remove P/S pump cover bolts (M8).

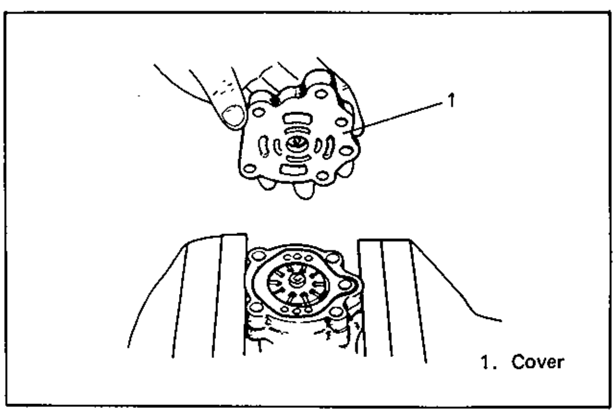


Fig. 3B3-40 Removing P/S Pump Cover

5) Remove cam ring.

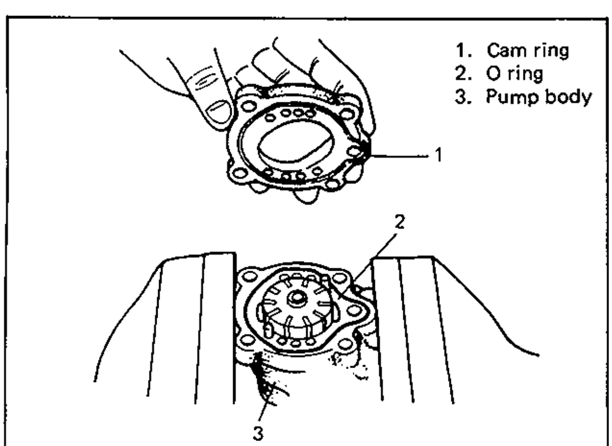


Fig. 3B3-41 Removing Cam Ring

6) Remove snap ring and pull out rotor.

NOTE:
When pulling rotor out of shaft, be careful not to lose vane.

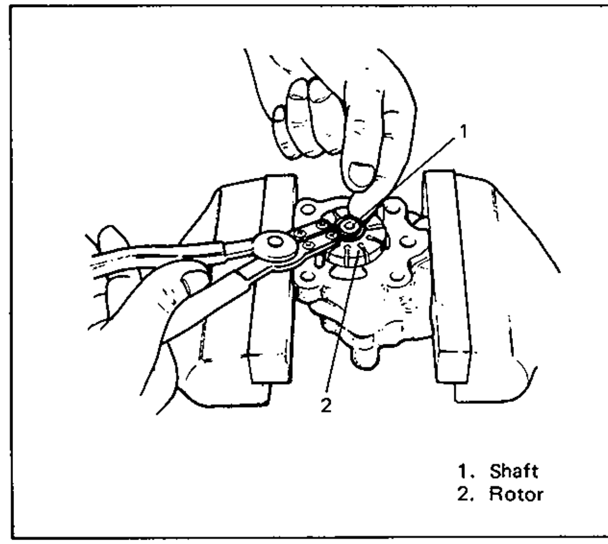


Fig. 3B3-42 Removing Rotor

7) Pull out shaft.
8) Remove oil seal.

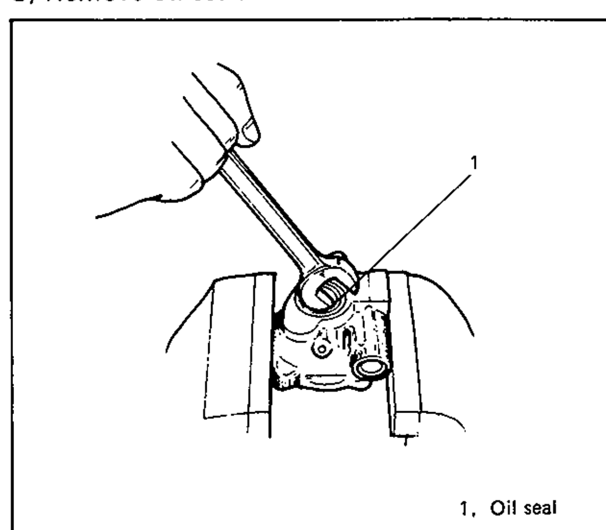


Fig. 3B3-43 Removing Oil Seal

ASSEMBLY

Reverse disassembly procedure for assembly, noting the following.

1) Apply DEXRON-II to shaft where bushing slides against and insert shaft from oil seal side.

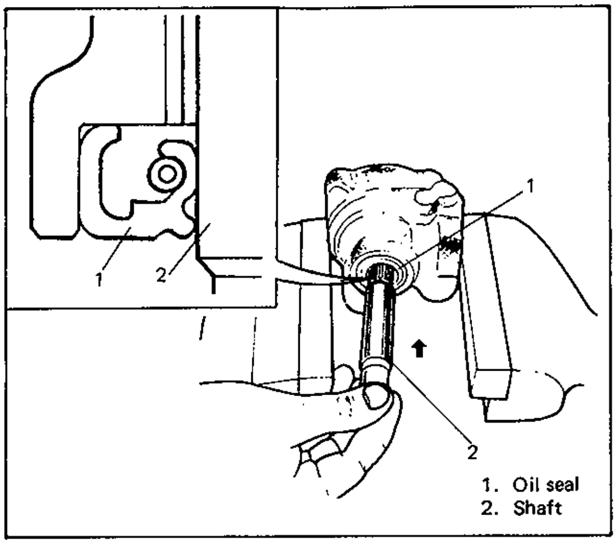


Fig. 3B3-44 Installing Shaft

2) Install rotor to shaft facing its splined part chamfered side up (to cover).

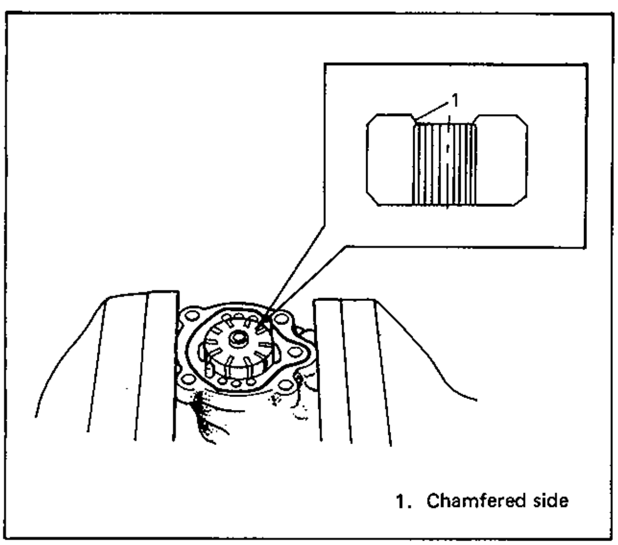


Fig. 3B3-45 Installing Rotor

3) Apply DEXRON-II to each vane and install it to rotor with its R part faced outward as shown below.

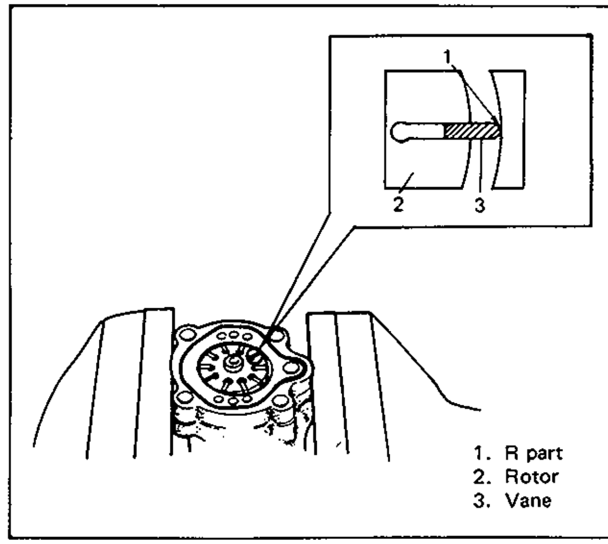


Fig. 3B3-46 Installing Vane

4) Apply DEXRON-II to O ring and install it to pump body securely.

5) Install cam ring.

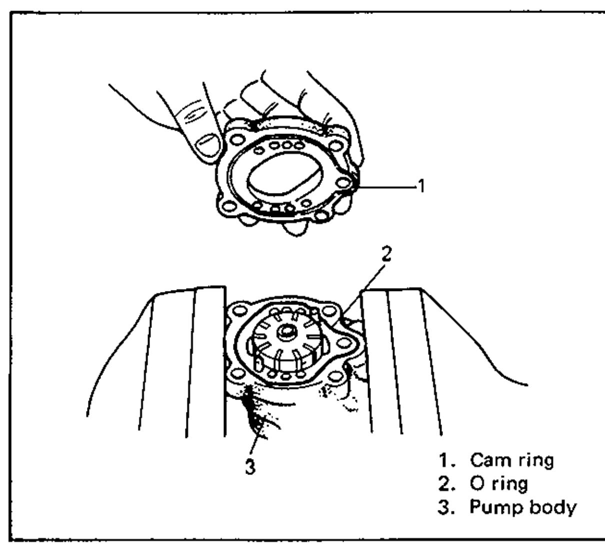


Fig. 3B3-47 Installing Cam Ring

6) Install snap ring to shaft.

7) Tighten cover bolts to specified torque.

Tightening torque for cover bolts	N·m	kg-m	lb-ft
	18 – 22	1.8 – 2.2	13.5 – 15.5

NOTE:
After installing cover, check to make sure that shaft can be turned by hand.

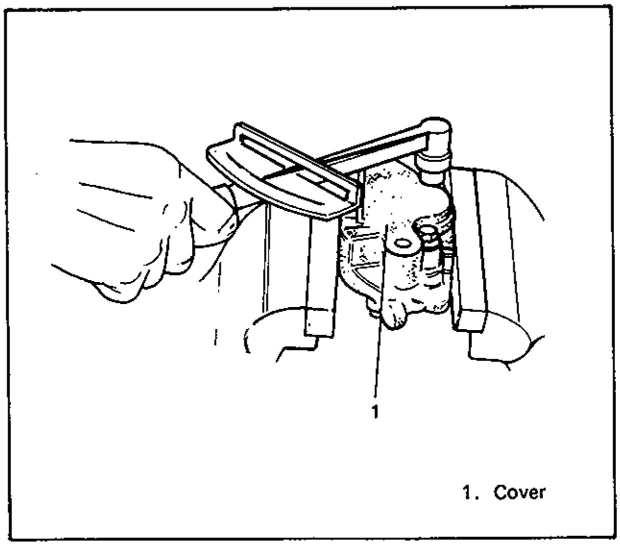


Fig. 3B3-48 Installing Cover

8) Check that flow control valve slides smoothly and tighten discharge (delivery) connector to specified torque.

Tightening torque for discharge connector	N·m	kg-m	lb-ft
	40 – 60	4.0 – 6.0	29.0 – 43.0

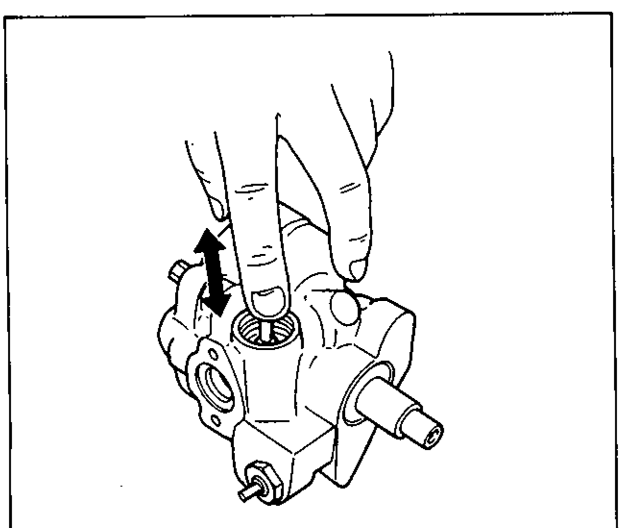


Fig. 3B3-49 Installing Flow Control Valve

9) Tighten terminal ass'y (pressure switch) to specified torque.

Tightening torque for terminal ass'y	N·m	kg-m	lb-ft
	25 – 30	2.5 – 3.0	18.5 – 21.5

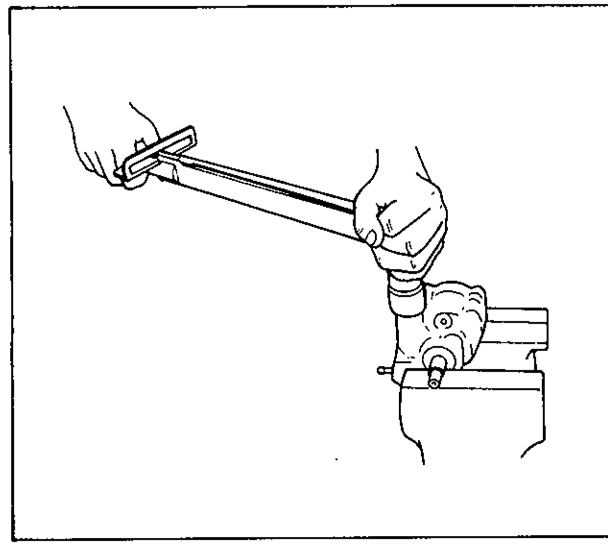


Fig. 3B3-50 Installing Terminal

10) Tighten suction connector bolts to specified torque.

Tightening torque for suction connector bolts	N·m	kg-m	lb-ft
	6 – 10	0.6 – 1.0	4.5 – 7.0

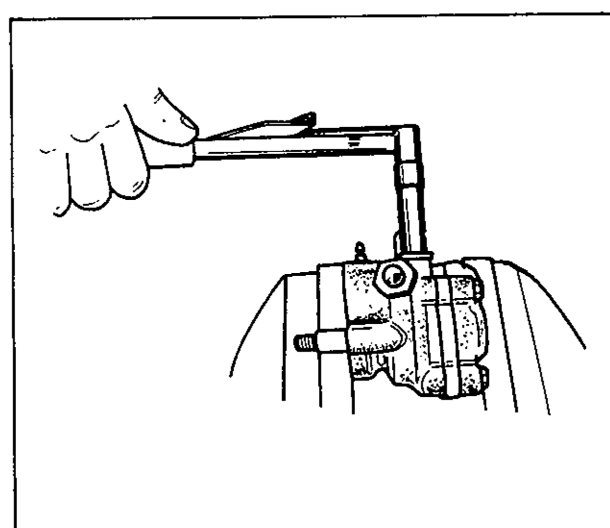


Fig. 3B3-51 Installing Suction Connector

INSPECTION

P/S Pump Body and Shaft

- Wear and damage of pump body sliding surface.
- Stepped wear and damage of shaft where bushing slides against.

  Replace P/S pump if any of the above is found.

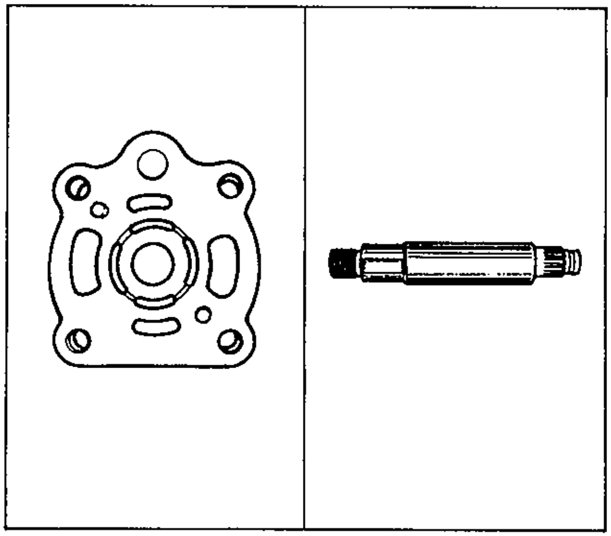


Fig. 3B3-52 Inspecting Pump Body and Shaft

Cam Ring

Inspect vane sliding surface of cam ring for wear and damage. Replace P/S pump if either of the above is found.

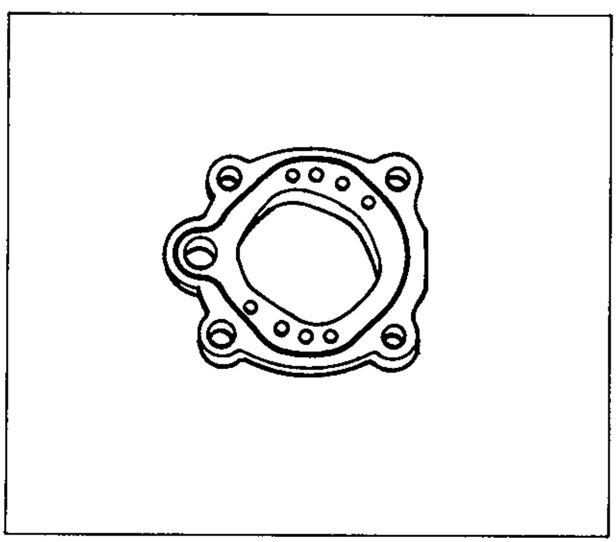


Fig. 3B3-53 Inspecting Cam Ring

Rotor Vane

- Wear and damage of rotor sliding surface against pump body.
- Wear and damage of vane sliding surface against cam ring.
- Vane to rotor clearance.

Standard	0.01 mm (0.0004 in.)
Limit	0.06 mm (0.0023 in.)

Replace P/S pump if any of the above is found.

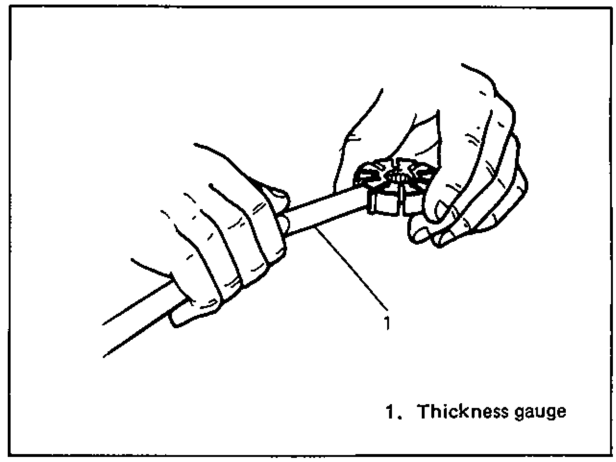


Fig. 3B3-54 Inspecting Rotor and Vane

Flow Control Valve

- Wear and damage on outside of valve.
- Obstruction in connector orifice.
- Free length of flow control spring.

Standard	36.5 mm (1.43 in.)
Limit	33.5 mm (1.32 in.)

Replace P/S pump if any of the above is found.

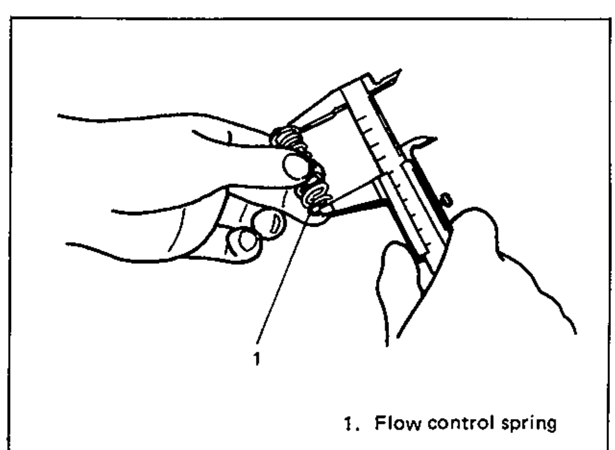
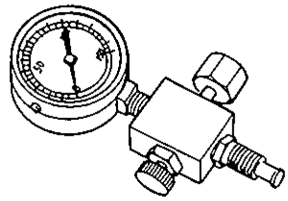
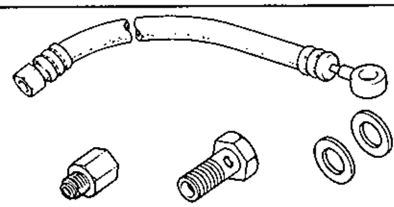


Fig. 3B3-55 Inspecting Flow Control Spring

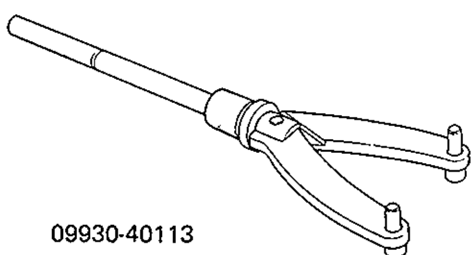
SPECIAL TOOLS



09915-77410
Oil pressure gauge



09915-77420
Oil pressure gauge attachment and hose set



09930-40113
Transfer flange lock holder

SECTION 3C2

STEERING WHEEL, COLUMN AND SHAFT

NOTE:
All steering wheel and column fasteners are important parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.

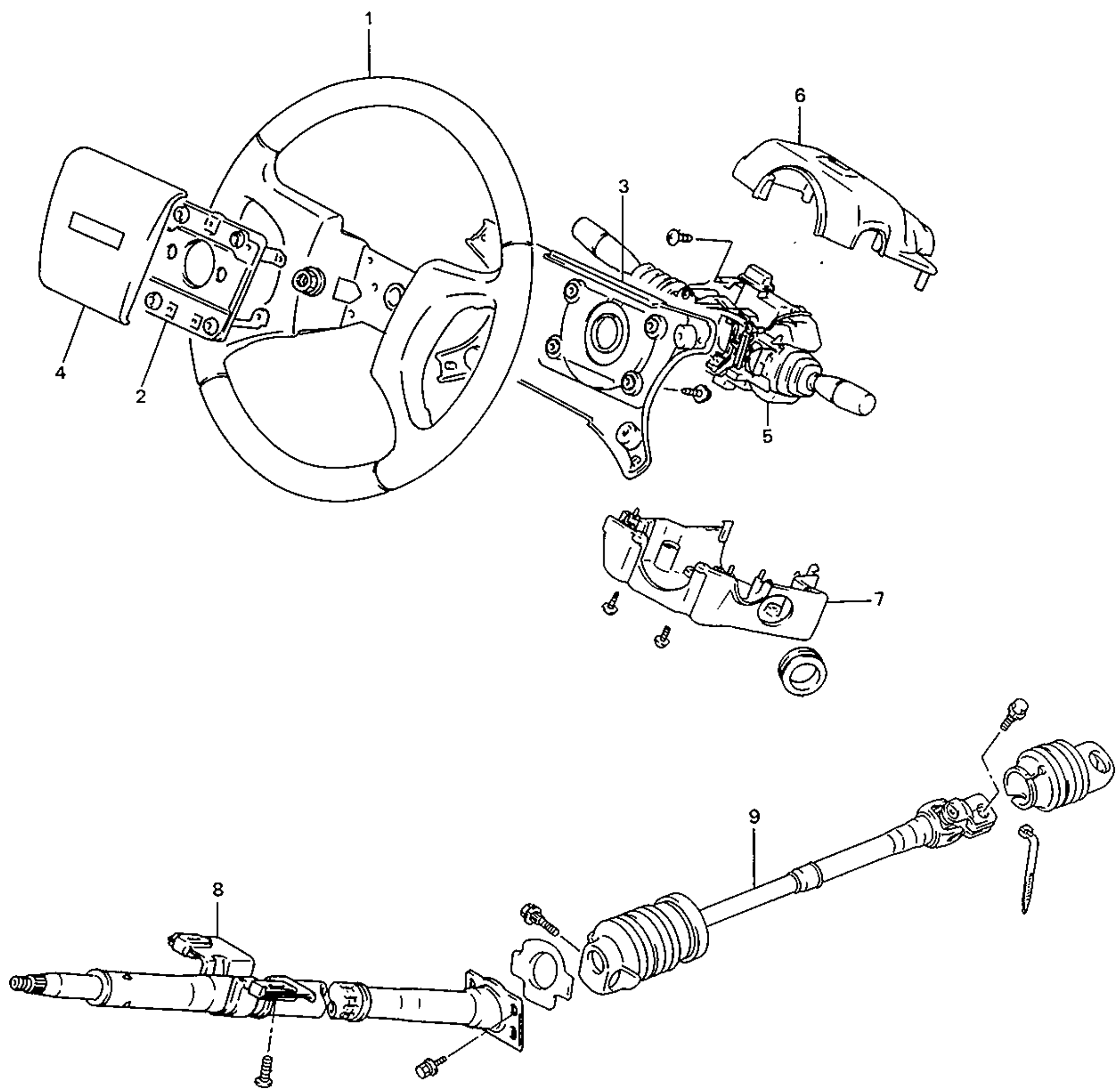
CONTENTS

DESCRIPTION

These are two types of steering column for this vehicle. They are collapsible type (with capsules) and rigid type (without capsules). Which type to be used varies with countries.
Illustrations show collapsible type only, but the same removal and installation procedures are used for rigid type.

This column may be easily removed and installed. To insure the energy absorbing action, it is important that only the specified screws, and bolts be used as designated and that they are tightened to the specified torque.
When the column assembly is removed from the vehicle, special care must be taken in handling it. Use of a steering wheel puller other than the one recommended in this manual or a sharp blow on the end of the steering shaft leaning on the assembly, or dropping the assembly could shear the plastic shear pins which maintain column length.

The tilt type steering column has been used in some vehicles, depending on specifications.



1. Steering wheel
2. Horn button contact plate
3. Steering wheel cover
4. Horn button
5. Combination switch ass'y
6. Steering column upper cover
7. Steering column lower cover
8. Steering column ass'y
9. Steering lower shaft

Fig. 3C2-1

STEERING WHEEL

REMOVAL

1) Disconnect negative battery cable.
2) Remove steering wheel pad.
3) Remove steering shaft nut.
4) Make match marks on steering wheel and on shaft, for a guide during reinstallation.

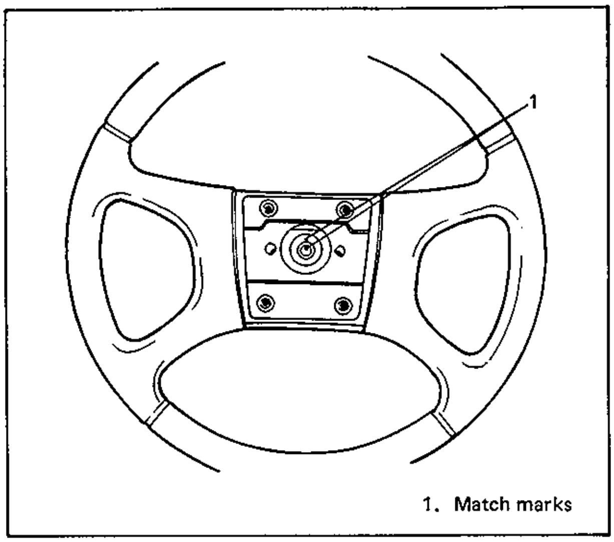


Fig. 3C2-2

5) Remove steering wheel with special tool (A).

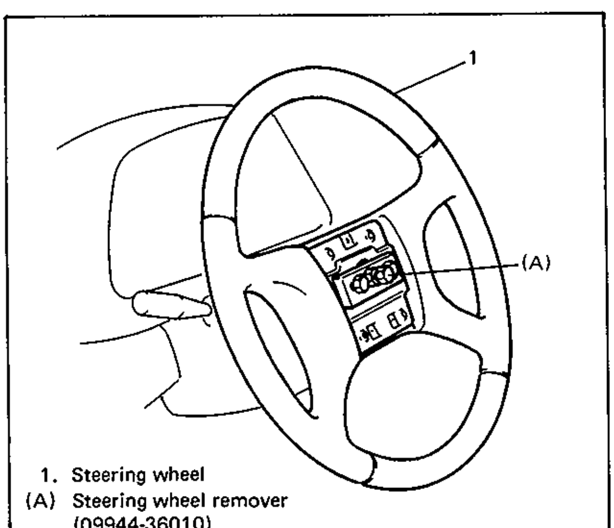


Fig. 3C2-3

INSTALLATION

1) Install steering wheel onto shaft, aligning them by match marks.
2) Torque steering shaft nut to specification as given below.

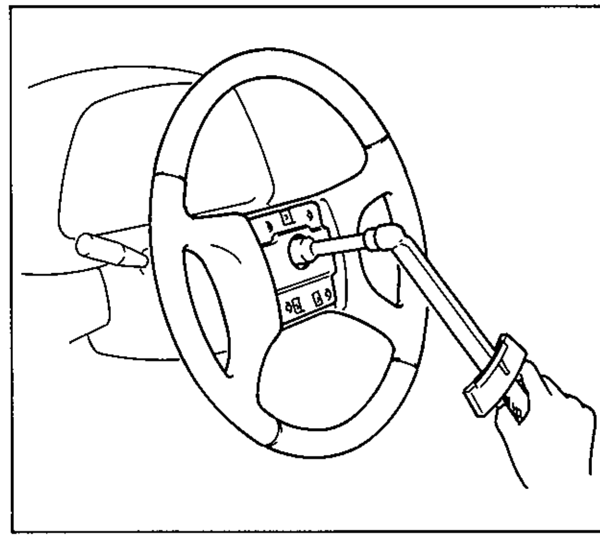


Fig. 3C2-4

N·m	kg-m	lb-ft
25 – 40	2.5 – 4.0	18.5 – 28.5

3) Install pad.
4) Connect negative battery cable.

TURN SIGNAL/DIMMER SWITCH

REMOVAL

1) Disconnect negative battery cable.
2) Before removing this switch, remove steering wheel. Refer to STEERING WHEEL Removal on previous page.
3) Remove column covers.

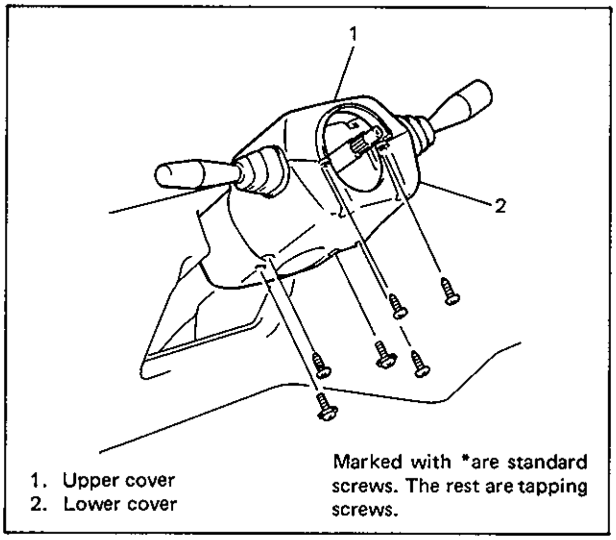


Fig. 3C2-5

4) Disconnect lead wire from turn signal/dimmer switch at coupler.
5) Remove turn signal/dimmer switch assembly from steering column.

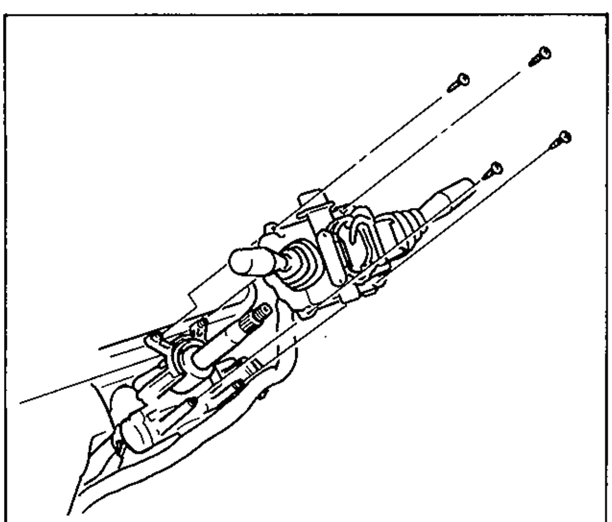


Fig. 3C2-6

INSTALLATION

Reverse removal procedure to install turn signal/dimmer switch.

STEERING COLUMN

REMOVAL

1) Disconnect negative battery cable.
2) Before removing steering column, remove steering wheel. Refer to STEERING WHEEL Removal on previous page.
3) Remove turn signal/dimmer switch. Refer to TURN SIGNAL/DIMMER SWITCH Removal at the left of this page.
4) Disconnect lead wires from ignition switch at coupler.
5) Disconnect steering joint by removing joint bolt.

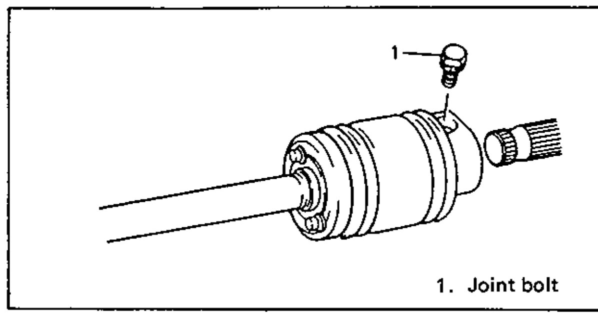


Fig. 3C2-7

6) Remove steering column fastening bolts

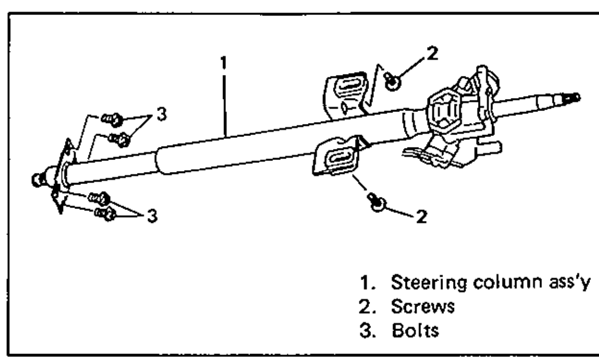


Fig. 3C2-8

7) Remove steering column assembly.

NOTE:

Don't separate steering column assembly into steering column and shaft. If column or shaft is defective, replace as an assembly.

INSTALLATION

1) Install steering joint cover and insert steering shaft into steering joint.

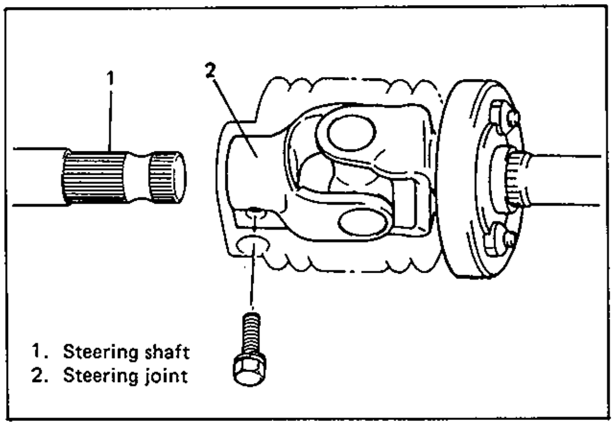


Fig. 3C2-9

2) Install steering column assembly to lower and upper brackets. Torque steering column nuts and screws to specifications as given below.

NOTE:
After tightening column nuts, bolt "A" should be tightened.

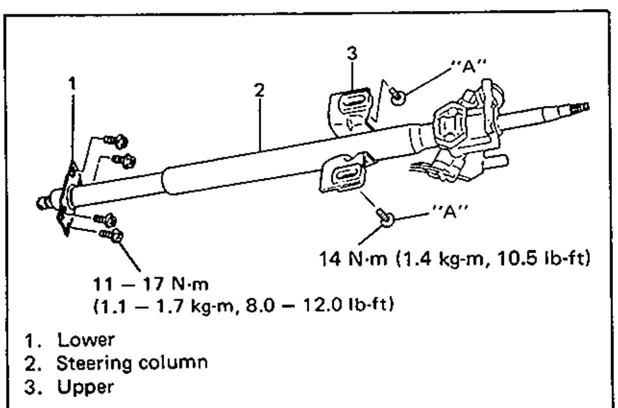


Fig. 3C2-10

3) Install bolt to steering shaft upper joint and tighten it to specified torque.

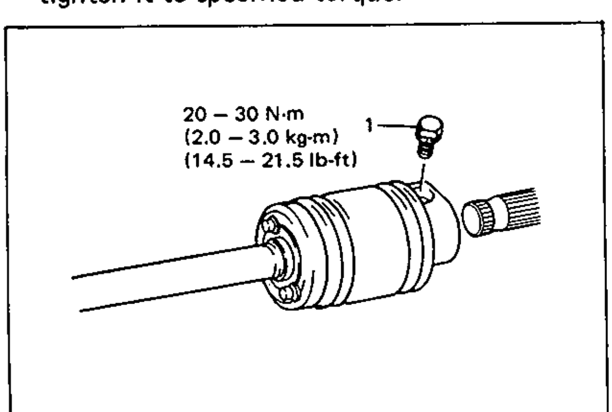


Fig. 3C2-11

4) Connect lead wire from ignition switch at coupler.
5) Install turn signal/dimmer switch. Refer to TURN SIGNAL/DIMMER SWITCH Installation on previous page.
6) Install steering wheel. Refer to STEERING WHEEL Installation.

STEERING LOCK (if equipped)

REMOVAL

1) Remove steering column. Refer to STEERING COLUMN Removal.

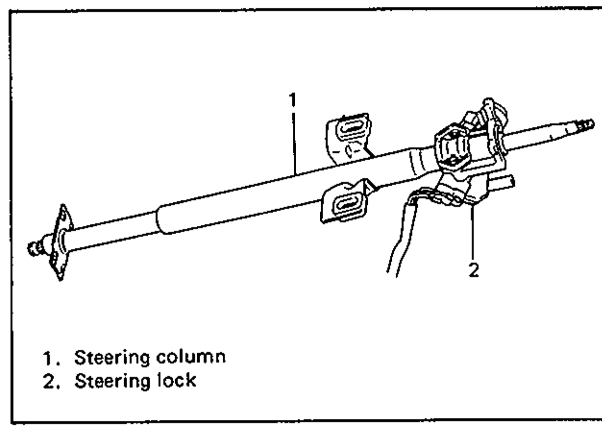


Fig. 3C2-12

2) Using center punch as shown, loosen and remove steering lock mounting bolts.

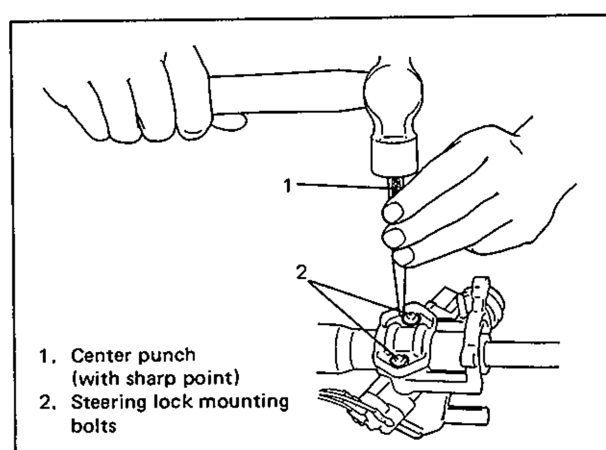


Fig. 3C2-13

3) Turn ignition key to "ACC" or "ON" position and remove steering lock assembly from steering column.

INSTALLATION

1) Position oblong hole of steering shaft in the center of hole in column.

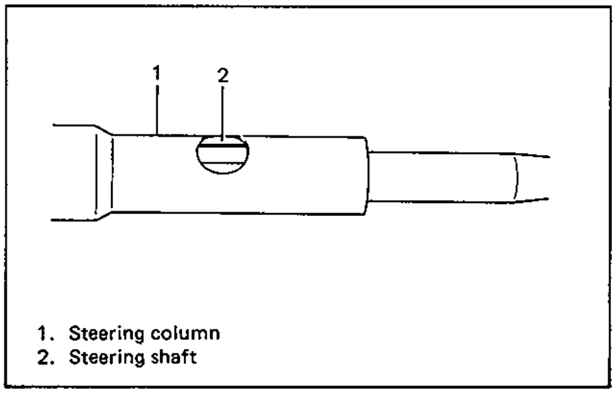


Fig. 3C2-14

2) Turn ignition key to "ACC" or "ON" position and install steering lock assembly onto column.
3) Now turn ignition key to "LOCK" position and pull it out.
4) Align hub on lock with oblong hole of steering shaft and rotate shaft to assure that steering shaft is locked.

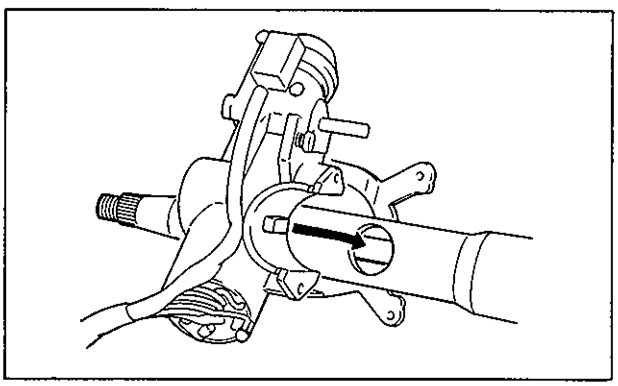


Fig. 3C2-15

5) Tighten two new bolts until head of each bolt is broken off.

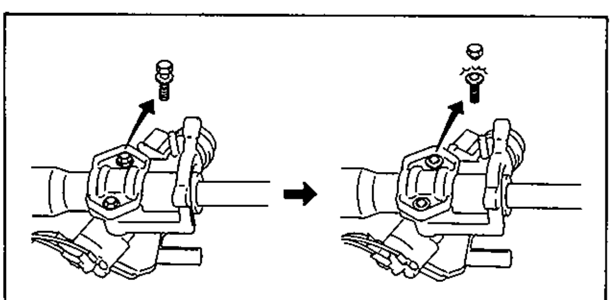


Fig. 3C2-16

6) Turn ignition key to "ACC" or "ON" position and check to be sure that steering shaft rotates smoothly. Also check for lock operation.
7) Install steering column. Refer to STEERING COLUMN Installation.

STEERING LOWER SHAFT

REMOVAL

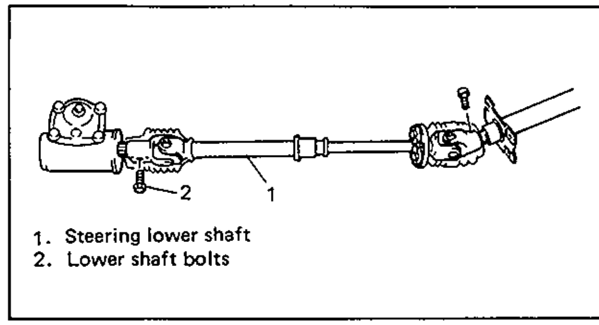


Fig. 3C2-17

1) Remove lower shaft joint bolts.
2) Loosen steering column fastening screws (2 pcs) and bolts (4 pcs). Then move steering column rearward.
3) Remove steering lower shaft.

INSTALLATION

1) Align flat part of steering gear box shaft with bolt hole in lower joint as shown. Then insert lower joint onto steering gear box shaft.

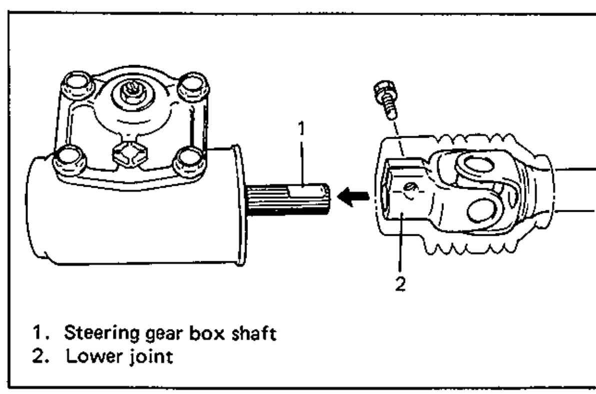


Fig. 3C2-18

2) Be sure that front wheels and steering wheel are in straightforward state and insert upper joint onto steering shaft.
3) Torque steering shaft joint bolts to specification.

N·m	kg-m	lb-ft
20 – 30	2.0 – 3.0	14.5 – 21.5

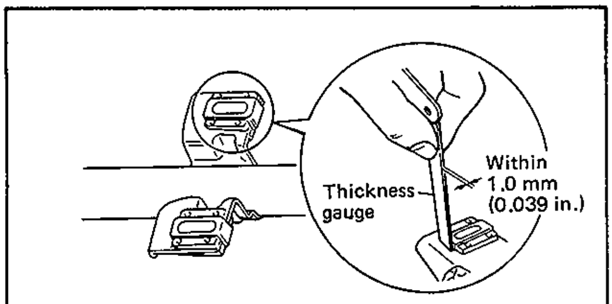
CHECKING STEERING COLUMN FOR ACCIDENT DAMAGE

NOTE:
Vehicles involved in accidents resulting in body damage or where steering column has been impacted may also have a damaged or misaligned steering column.

In such a case, following steps 1) through 5) should be performed for collapsible type steering column (with capsules) and 4) through 6) for rigid type steering column (without capsules).

CHECKING PROCEDURE

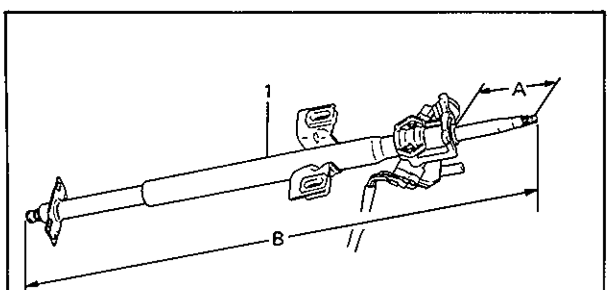
1) Check capsules on steering column bracket; both should be within 1.0 mm (0.039 in) from bottom of slots. If not, steering column assembly should be replaced. Use thickness gauge for convenience.



Each capsule should be within 1.0 mm (0.039 in) from bottom of slot. If not, replace coulumn assembly.

Fig. 3C2-19

2) Take measurement "A" as shown. If it is shorter than specified (limit) length, replace column assembly with new one.



1. Steering column

A: Limit 99 mm (3.90 in)
B: Limit 778 mm (30.63 in)

Fig. 3C2-20

3) Check steering lower shaft for specified (limit) length.
   If it is shorter than specified (limit) length, replace lower shaft assembly with new one.

Specified length "A"
For left hand steering vehicle:
328 mm (12.91 in)
*287 mm (11.30 in)

For right hand steering vehicle
339 mm (13.34 in)
*298 mm (11.73 in)

*For vehicle with power steering system

WARNING:
Never disassemble steering lower shaft assembly.
If it is found faulty, replace it with new assembly.

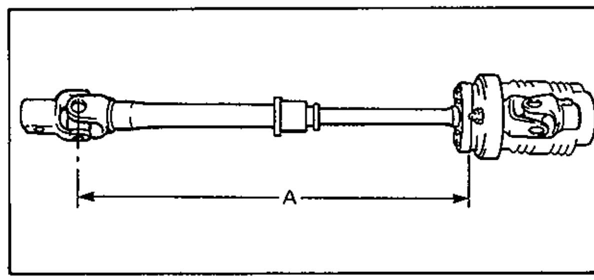


Fig. 3C2-21

4) Check steering shaft for smooth rotation. If found defective, replace as column assembly.
5) Check steering shaft joints and shaft for any damages such as crack, breakage, malfuncition or excessive play. If anything is found faulty, replace as shaft assembly.

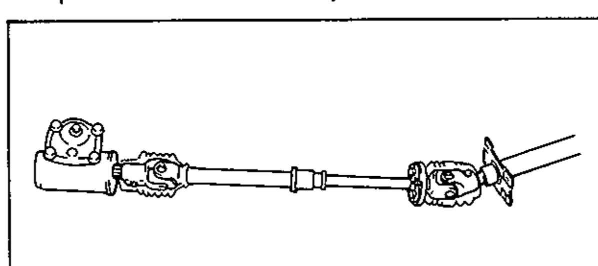


Fig. 3C2-22

6) Check steering shaft and column for bend, cracks or deformation.
   If found defective, replace.

CHECKING TILT STEERING COLUMN (If equipped)

Check to make sure the following.

- Steering column moves smoothly when tilt lever is at lower position (i.e., steering column is unlocked).
- Steering column is fixed securely when tilt lever is at higher position (i.e., steering column is locked).

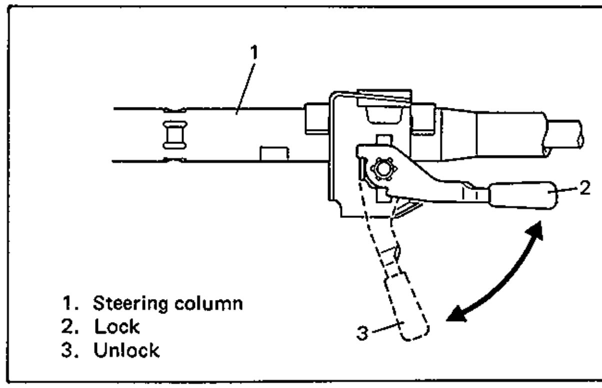


Fig. 3C2-22-1

TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Steering shaft nut	25 – 40	2.5 – 4.0	18.5 – 28.5
2. Steering shaft joint bolts	20 – 30	2.0 – 3.0	14.5 – 21.5
3. Steering column bolts (lower side)	11 – 17	1.1 – 1.7	8.0 – 12.0
4. Steering column screws (upper side)	14	1.4	10.5

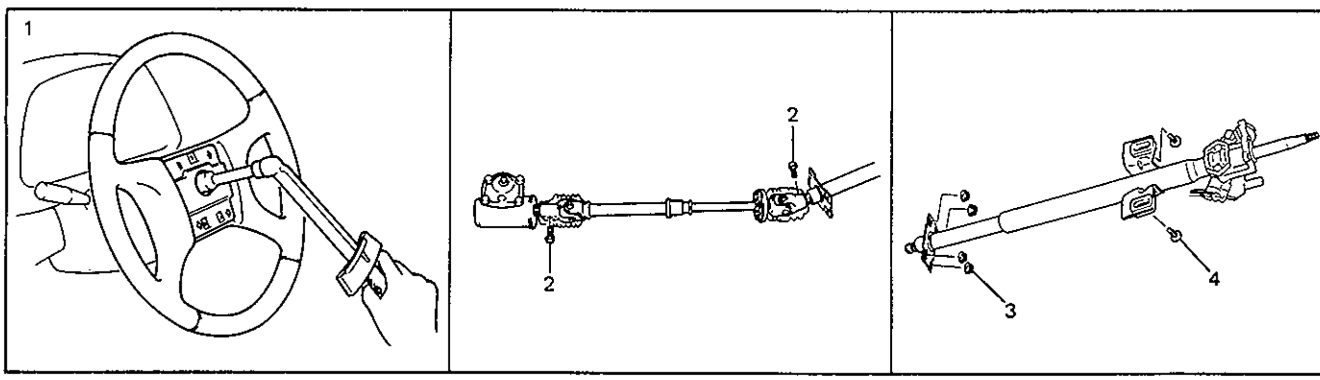
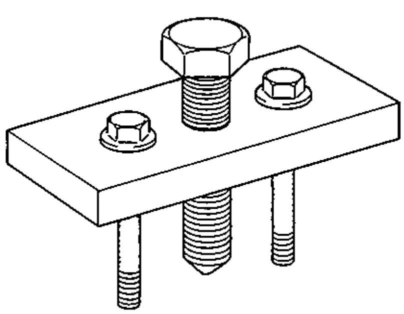


Fig. 3C2-23

SPECIAL TOOL



09944-36010
Steering wheel remover

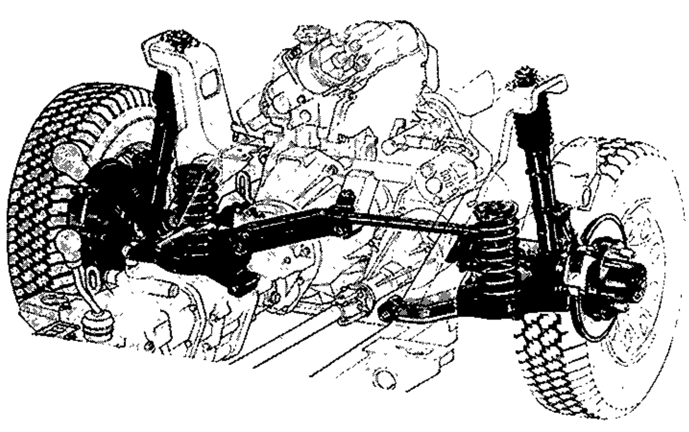
Fig. 3C2-24

SECTION 3D

FRONT SUSPENSION

NOTE:
- All front suspension fasteners are an important attaching part in that it could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.
- Never attempt to heat, quench or straighten any front suspension part. Replace it with a new part or damage to the part may result.

CONTENTS



GENERAL DESCRIPTION

The front suspension is the strut type independent suspension. The upper end of a strut is anchored to the body by a strut support. The strut and strut support are isolated by a rubber mount.

The lower end of the strut is connected to the upper end of a steering knuckle and lower end of knuckle is attached to the stud of a ball joint which is incorporated in a unit with a suspension control arm. And this steering knuckle is connected to the tie rod end.

Thus, movement of the steering wheel is transmitted to the tie rod end and then to the knuckle, eventually causing the wheel-and-tire to move.

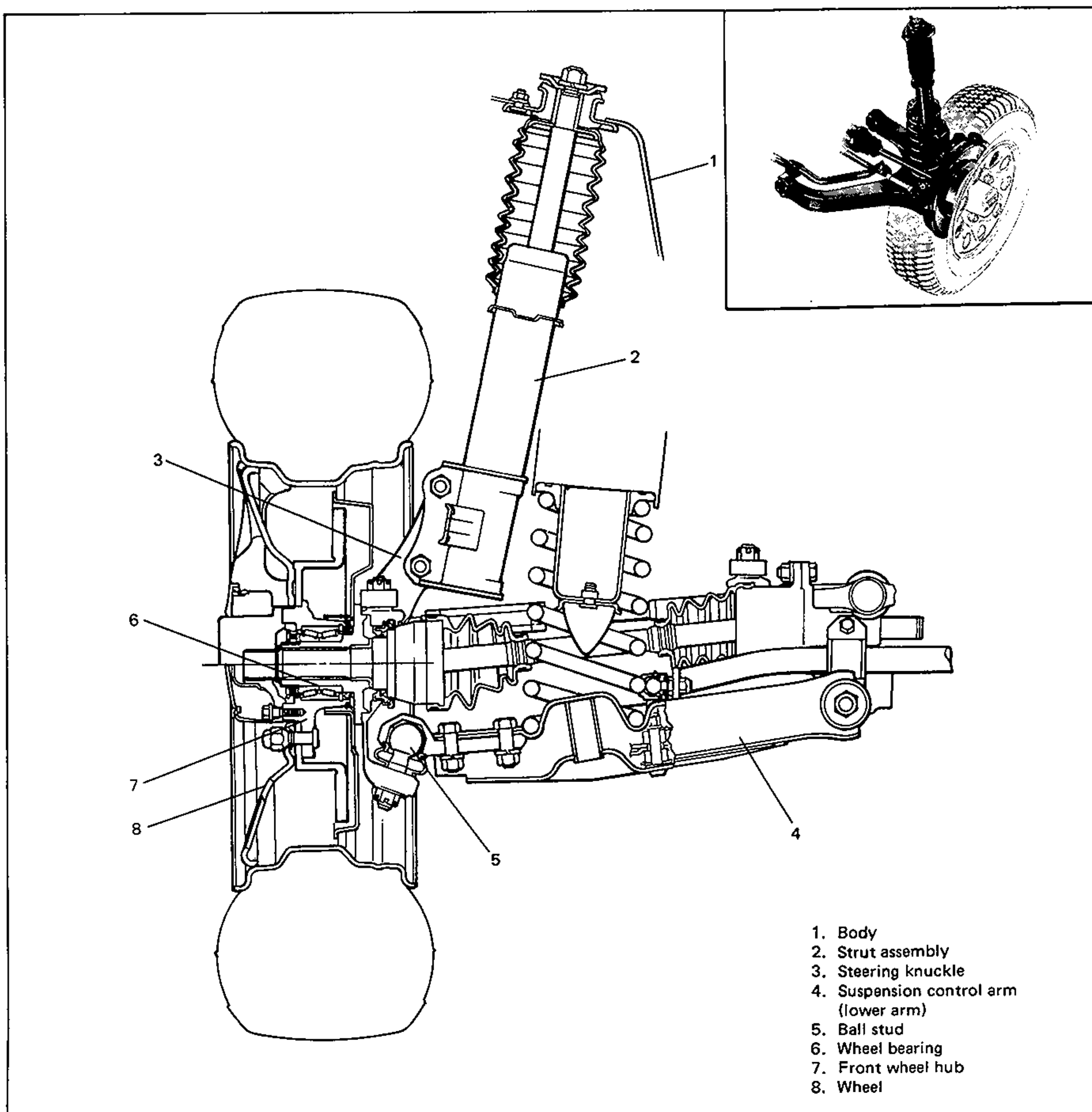


Fig. 3D-1

ON VEHICLE SERVICE

STABILIZER BAR/BUSHINGS

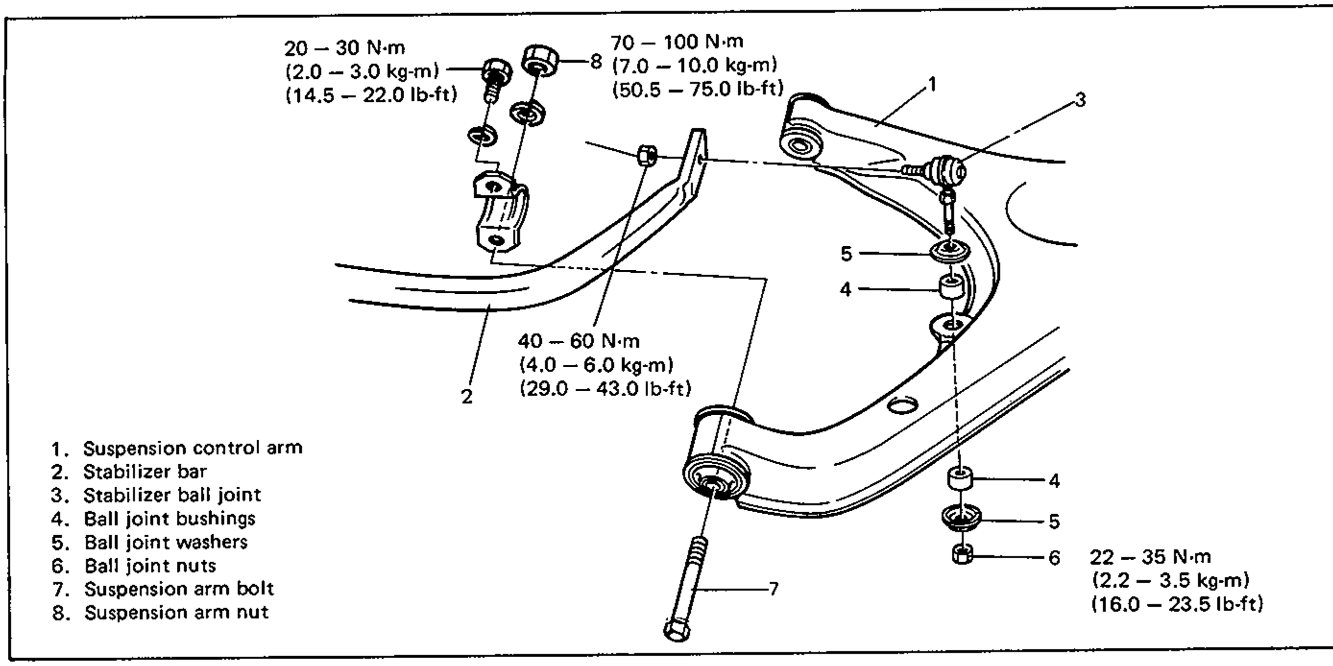


Fig. 3D-2

REMOVAL

1) Hoist vehicle.
2) Disconnect stabilizer ball joint from front suspension arms (right & left).
3) Remove stabilizer bar mount bush bracket bolts.
4) Remove stabilizer bar and its ball joint.

INSTALLATION

NOTE:
For correct installation of stabilizer bar, side-to-side, be sure that color paint on stabilizer bar aligns with mount bush, both right and left, as shown.

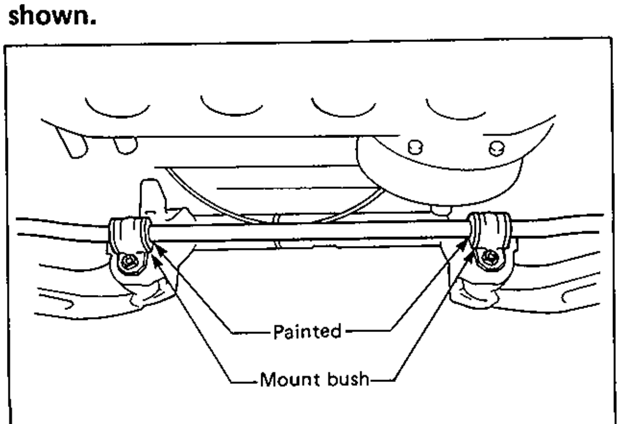


Fig. 3D-3

1) When installing stabilizer, loosely assemble all components while insuring that stabilizer is centered, side-to-side.
2) Tighten stabilizer brackets and stabilizer ball joint to specified torque.

STRUT DAMPER

REMOVAL

1) Hoist vehicle, allowing front suspension to hang free.
2) Remove wheel.
3) Remove E ring securing brake hose and take brake hose off strut bracket as shown.

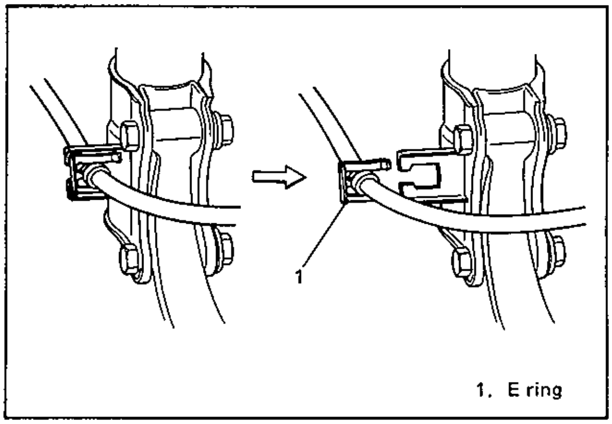


Fig. 3D-4

4) Remove strut bracket bolts.

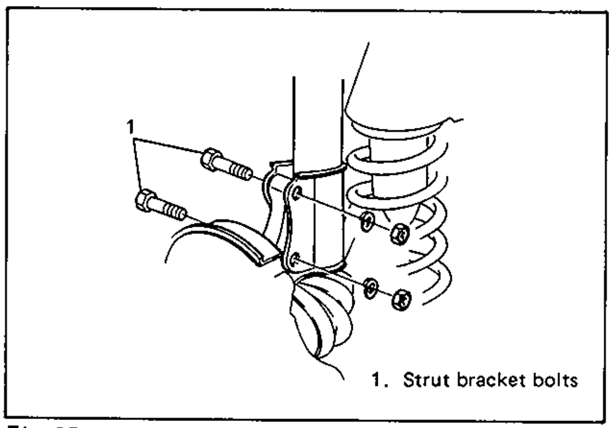


Fig. 3D-5

5) Remove strut support nuts.
   Hold strut by hand so that it will not fall off.

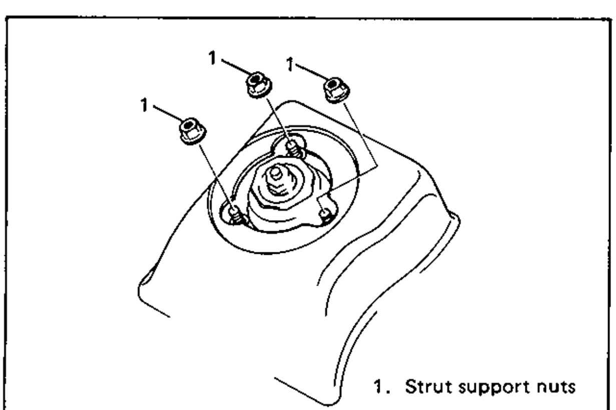


Fig. 3D-6

6) Remove strut.

INSTALLATION

1) Install strut by reversing Removal steps 1) – 6). Insert bolts in such a direction as shown.
2) Torque all fasteners to specifications.

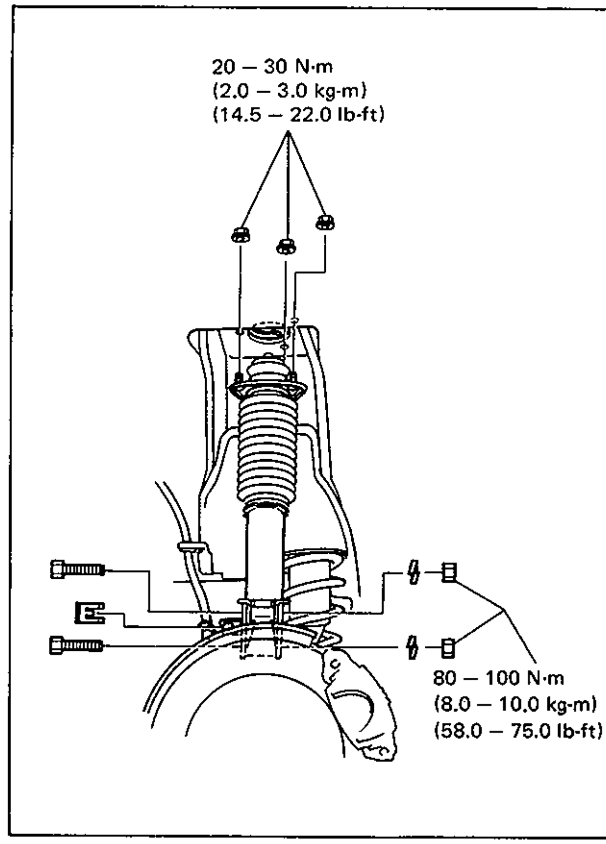


Fig. 3D-7

NOTE:
Brake hose instrallation
Don't twist hose when installing it. Install E ring as far as bracket end surface as shown.

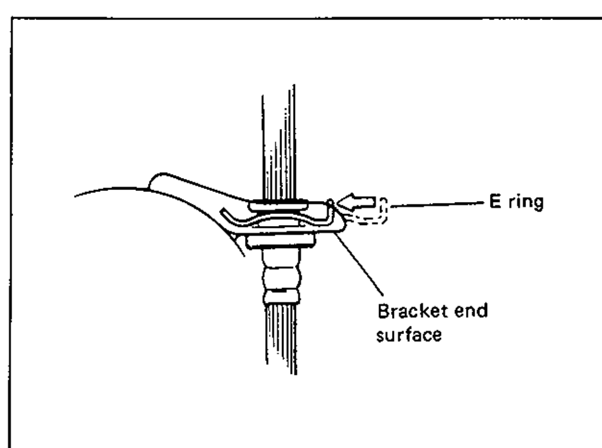


Fig. 3D-8

COIL SPRING/BUMP STOPPER/SPRING RUBBER SEAT

REMOVAL

1) Hoist vehicle, allowing front suspension to hang free.
2) Remove wheel.
3) Remove locking hub.
4) Remove front axle shaft circlip and washer.

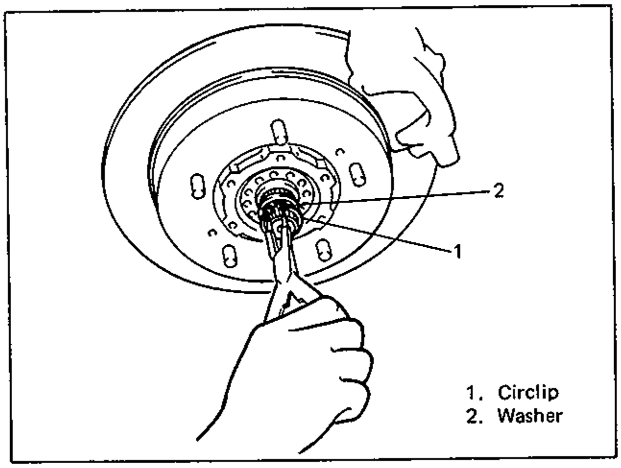


Fig. 3D-9

5) Remove caliper bolts and suspend caliper with a wire hook.

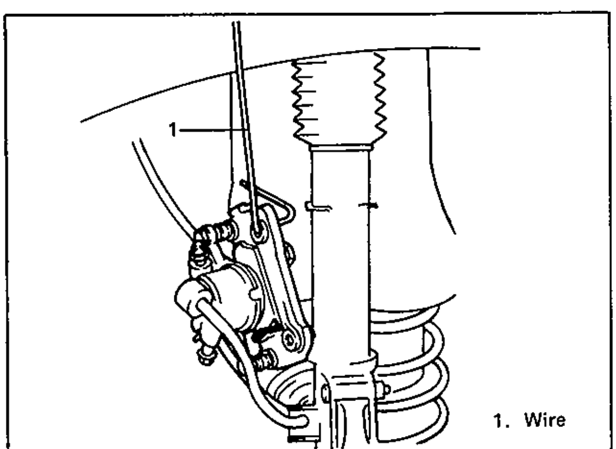


Fig. 3D-10

6) Remove brake disc.

NOTE:
If brake disc can not be removed by hand, use 8 mm bolts as shown below.

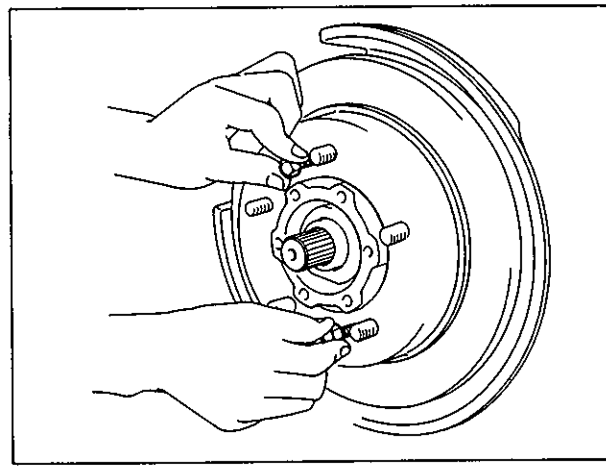


Fig. 3D-11

7) Disconnect stabilizer ball joint, by loosening its nut.
8) Disconnect tie rod end using special tool.

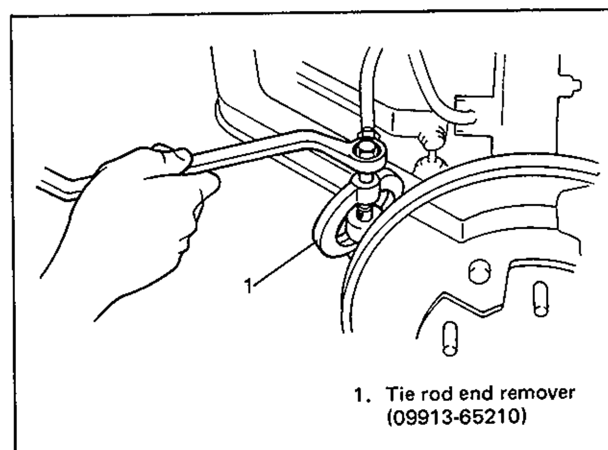


Fig. 3D-12

9) Support lower arm, using jack as shown.

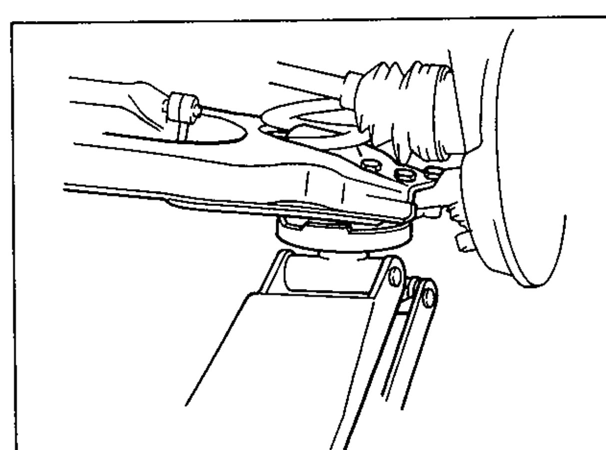


Fig. 3D-13

10) Remove strut bracket bolts.

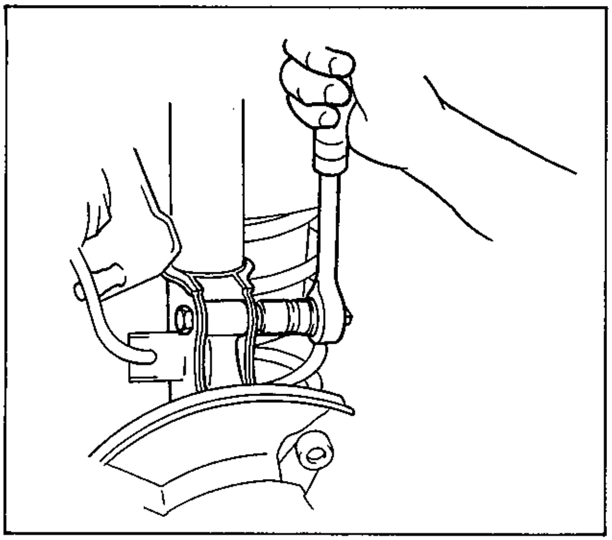


Fig. 3D-14

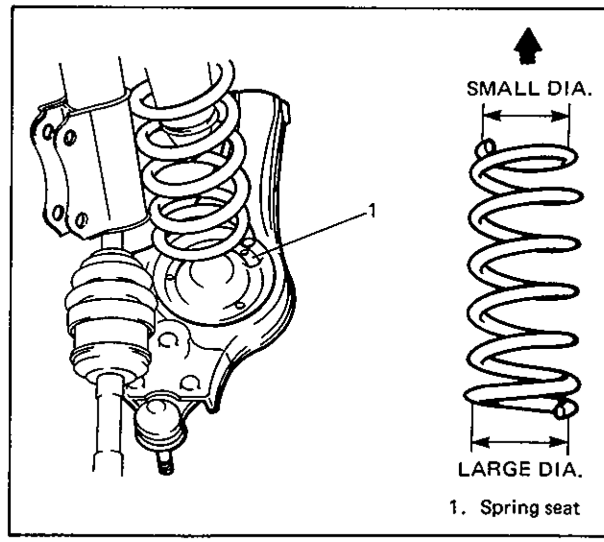


Fig. 3D-16

11) Remove ball stud castle nut.
12) Remove knuckle and wheel hub comp, while lowering jack.
13) Remove coil spring.

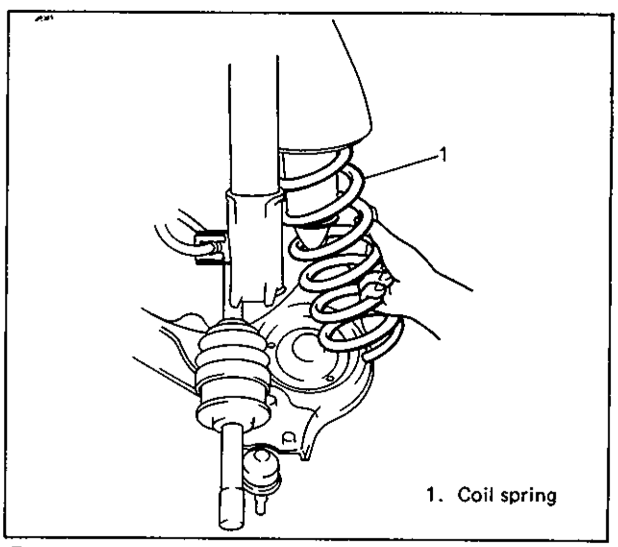


Fig. 3D-15

INSTALLATION

Reverse removal procedure to install coil spring.

NOTE:

Upper and lower diameters of coil spring are different. Bring larger diameter end at bottom and set its open end in place on spring seat.

- Be sure to use specified torque for tightening each fastener.
- Refer to torque specification chart at the end of this section.
- As for tie-rod end castle nut, be sure to insert split pin and bend it after tightening it.
- Apply lithium grease to front axle shaft washer.
  LITHIUM GREASE
  SUZUKI SUPER GREASE A (99000-25010)
- When installing circlip to drive shaft, utilize screw hole in drive shaft to pull it out and bring large diameter of circlip at right as shown below.

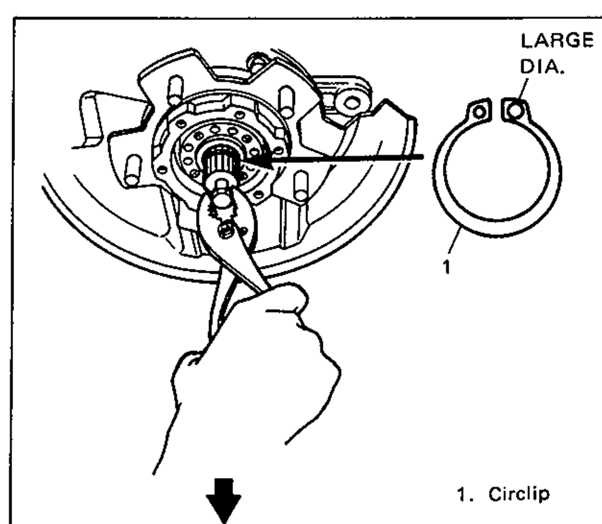


Fig. 3D-17

BUMP STOPPER/SPRING RUBBER SEAT

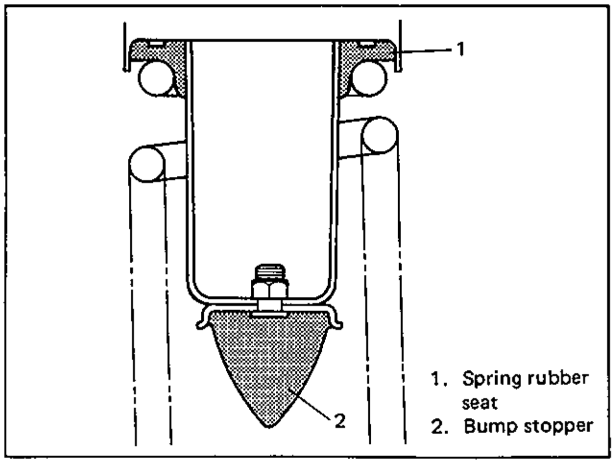


Fig. 3D-18

REMOVAL

Remove bump stopper, using special tool.

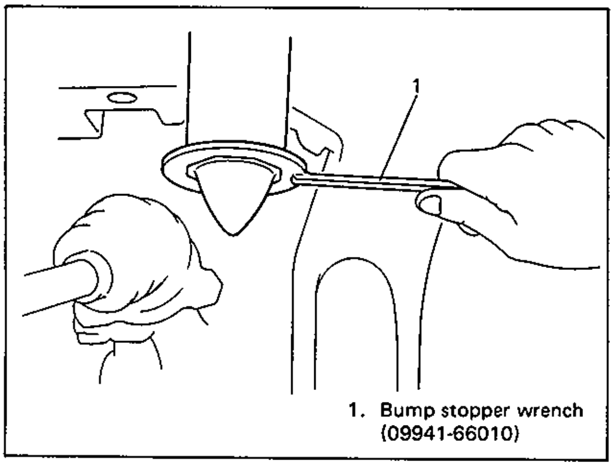


Fig. 3-19

INSTALLATION

Tighteing torque of bump stopper	N·m	kg-m	lb-ft
	40 – 60	4.0 – 6.0	29.0 – 43.0

WHEEL HUB/BEARING/OIL SEAL

REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove locking hub.
3) Remove caliper bolt and suspend caliper.
4) Remove brake disc.

NOTE:

If brake disc can not be removed by hand, use 8 mm bolts as shown below.

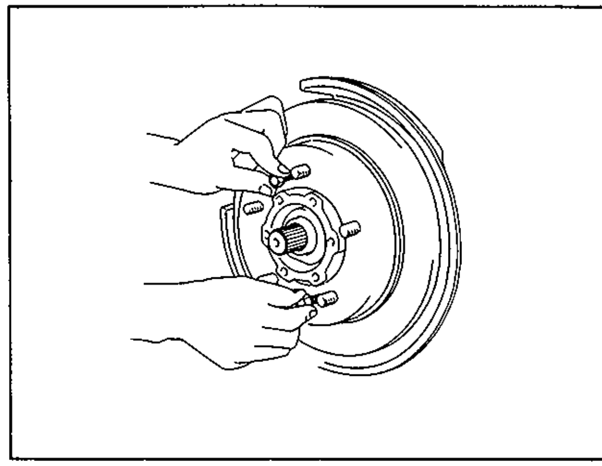


Fig. 3D-20

5) Remove front wheel bearing lock plate by loosening 4 screws.

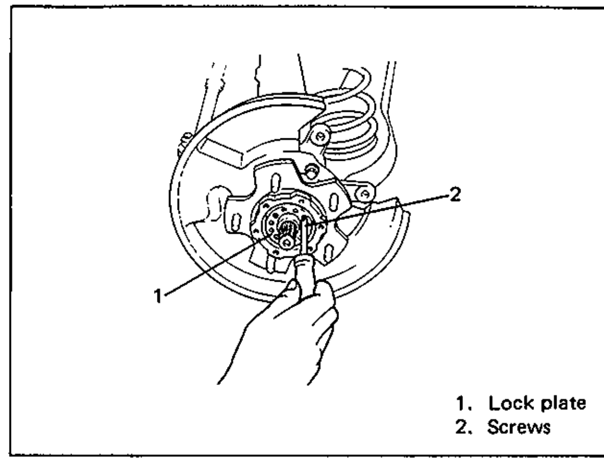


Fig. 3D-21

6) Remove front wheel bearing lock nut by using special tool.

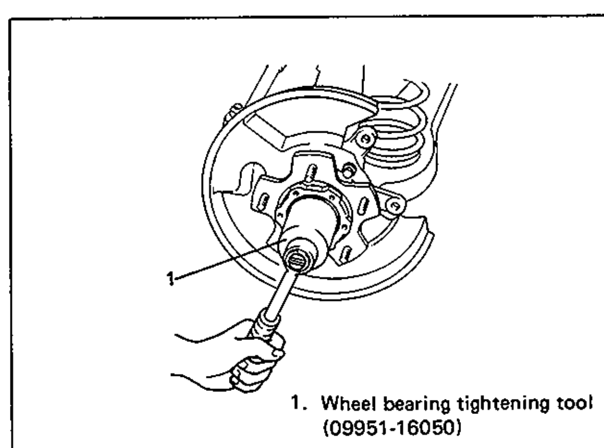


Fig. 3D-22

7) Remove front wheel bearing lock washer.
8) Remove wheel hub complete with bearings and oil seals.

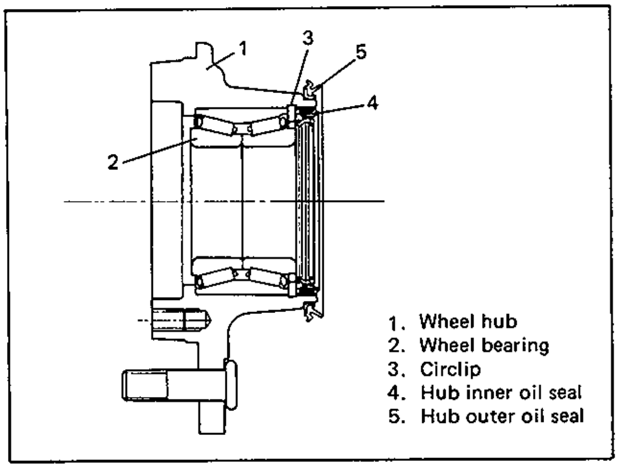


Fig. 3D-23

NOTE:
If wheel hub can not be removed by hand, use special tools as shown below.

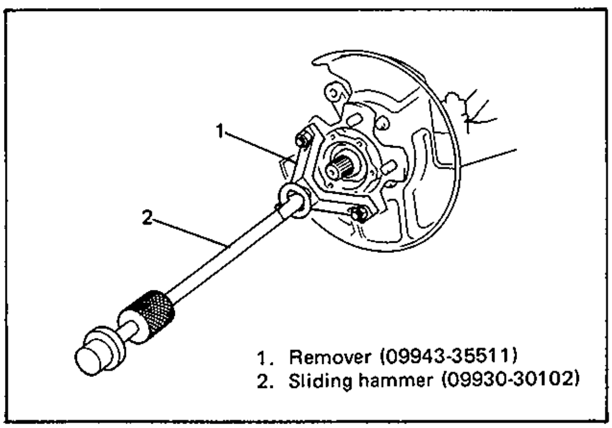


Fig. 3D-24

9) Remove wheel bearing oil seal.
10) Remove bearing circlip.

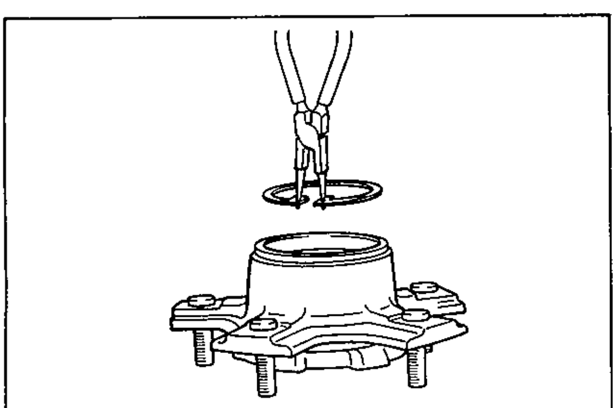


Fig. 3D-25

11) Remove bearing outer race by tapping with hammer.

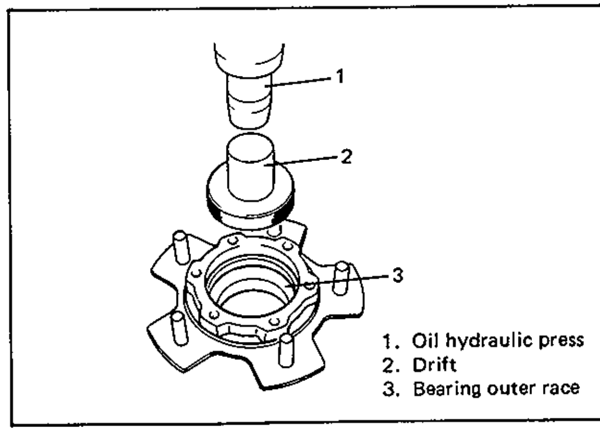


Fig. 3D-26

12) Remove hub bolts from hub.

INSTALLATION

1) Insert new stud in hub hole. Rotate stud slowly to assure serrations are aligned with those made by original bolt.

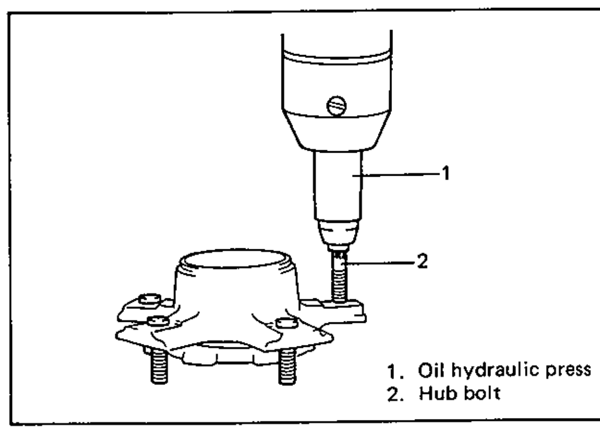


Fig. 3D27

2) Using special tools, press-fit bearing outer race until its end contacts stepped surface of wheel hub.

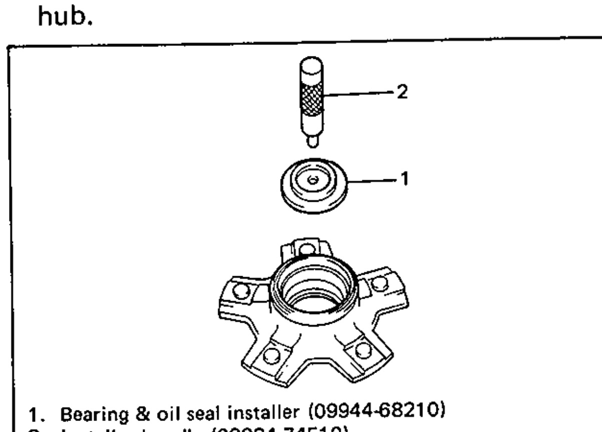


Fig. 3D-28

NOTE:

- **As front wheel bearing is cassette type double taper roller bearing, it must be replaced as whole unit when replacement becomes necessary.**
- **Cassette type double taper roller bearing is so designed as to provide proper pre-load as long as it is tightened to specified torque. Therefore, it requires no pre-load check after installation, unlike conventional taper roller bearing.**

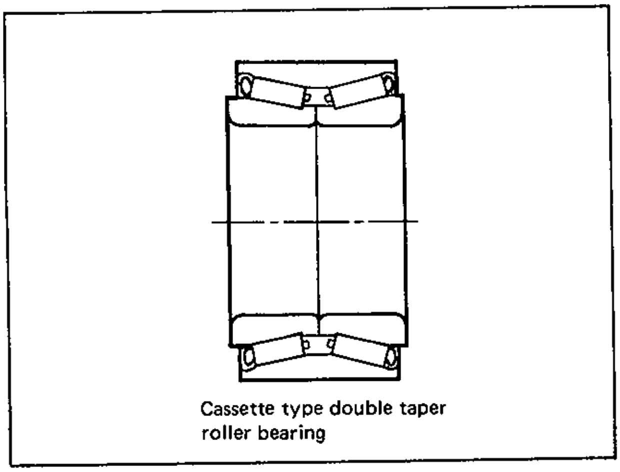


Fig. 3D-29

- **Apply wheel bearing grease between bearings.**
  LITHIUM BEARING GREASE
  SUZUKI SUPER GREASE A (99000-25010)

3) Install bearing circlip.
4) Drive in wheel bearing oil seal by using special tools.

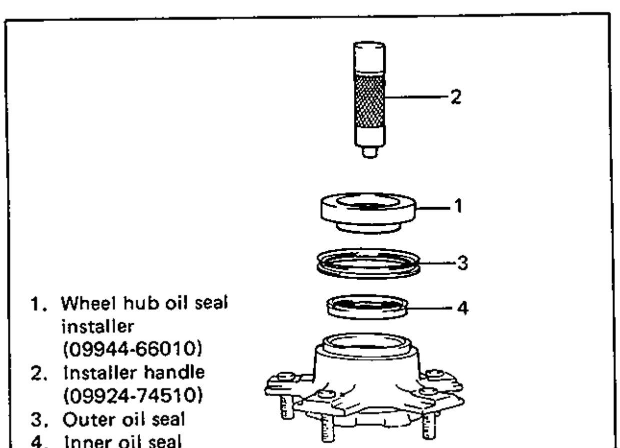


Fig. 3D-30

5) Apply lithium grease to lip portion and hollow of oil seal.
   LITHIUM GREASE
   SUZUKI SUPER GREASE A (99000-25010)

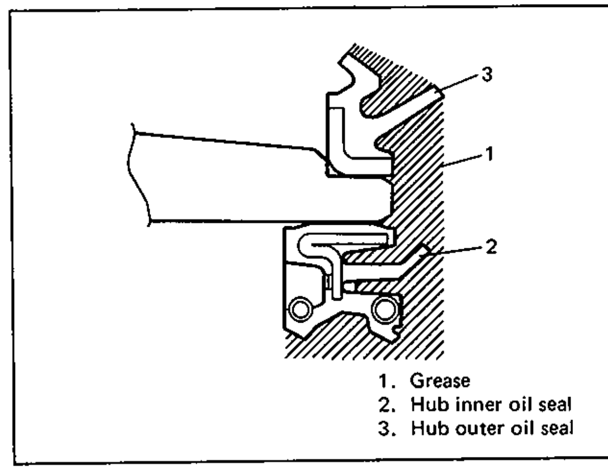


Fig. 3D-31

NOTE:

Amount of grease applied to hollow in oil seal should be more than 60% of its vacant space.

6) Apply lithium grease inside wheel bearing thin.
   LITHIUM GREASE
   SUZUKI SUPER GREASE A (99000-25010)
7) Install wheel hub complete with bearings and oil seals onto front wheel spindle.
8) Install bearing washer.

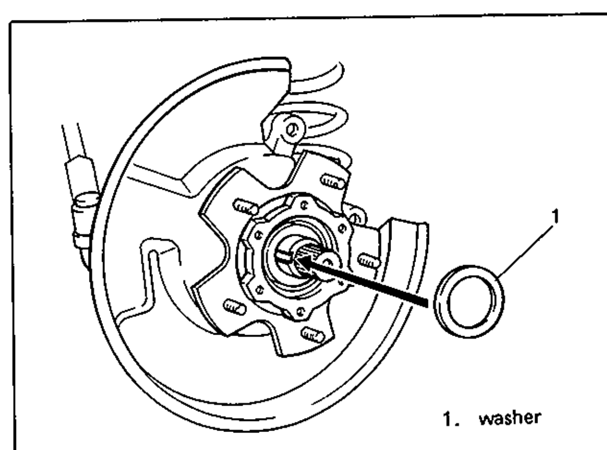


Fig. 3D-32

9) Tighten wheel bearing lock nut to specified torque while turning wheel hub by hand.

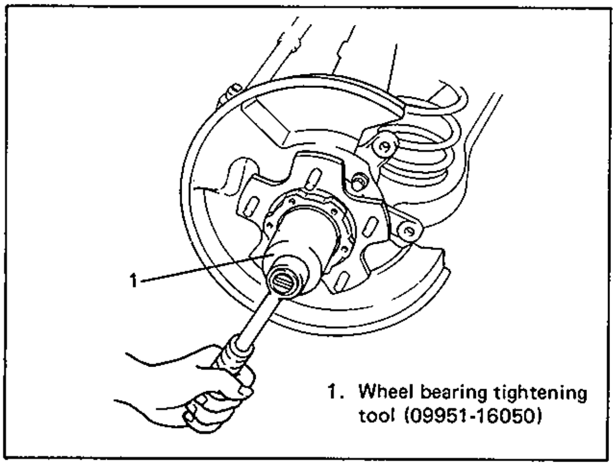


Fig. 3D-33

Wheel bearing nut tightening torque	N·m	kg-m	lb-ft
	170–250	17.0–25.0	123.0–180.0

10) Using lock plate, lock bearing lock nut. If lock screw hole is not aligned with screw hole in lock nut, turn lock nut in tightening direction till they align.

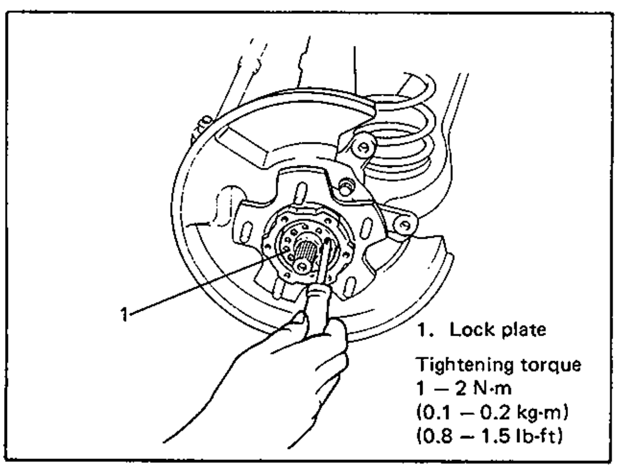


Fig. 3D-34

11) Install brake disc and caliper assembly.

Caliper bolt tightening torque	N·m	kg-m	lb-ft
	70 – 100	7.0–10.0	50.5 – 75.0

12) Install wheel.
13) Install locking hub.

KNUCKLE/WHEEL SPINDLE

REMOVAL

1) Hoist vehcile and remove wheel.
2) Remove wheel hub. Refer to WHEEL HUB Removal in this section.
3) Support lower arm with jack.
4) Remove tie rod end.

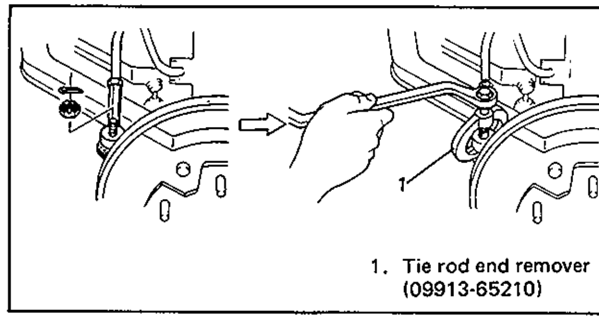


Fig. 3D-35

5) Remove ball stud nut.
6) Remove strut bracket bolts from strut bracket.

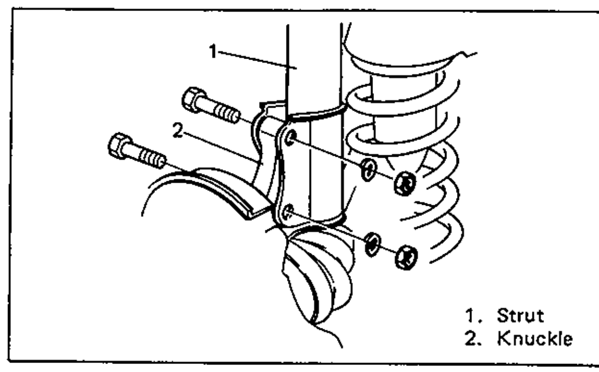


Fig. 3D-36-1

7) By tapping knuckle on its end with hammer or using bearing puller, disconnect knuckle from ball stud.

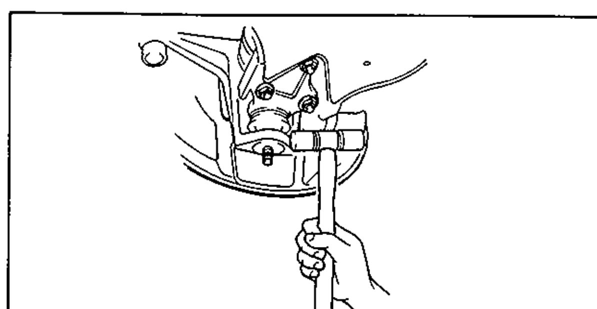


Fig. 3D-36-2

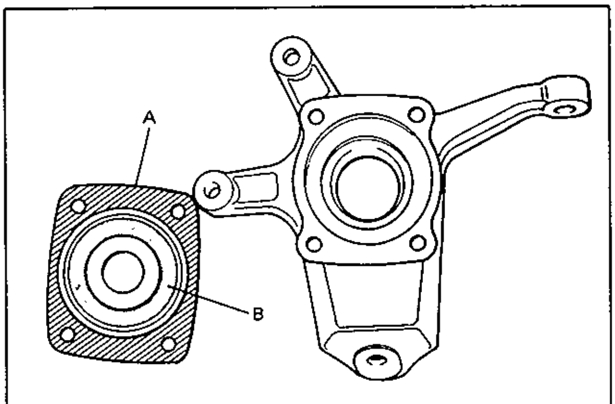
8) While lowering jack, remove knuckle/wheel spindle comp.
9) Remove knuckle oil seal, dust cover and wheel spindle.

INSTALLATION

Reverse removal sequence to install knuckle, wheel spindle and oil seal.

NOTE:

- **When installing wheel spindle to knuckle, coat their mating surfaces with sealant.**
  SEALANT
  SUZUKI BOND NO. 1215 (99000-31110)
- **Also, fill recess in wheel spindle with about 10 g lithium grease.**
  LITHIUM GREASE
  SUZUKI SUPER GREASE A (99000-25010)



Fg Fig. 3D-37

Wheel spindle tightening torque	N·m	kg-m	lb-ft
	40 – 60	4.0 – 6.0	29.0 – 43.0

- Apply lithium grease to oil seal lip and into its hollow to fill more than 60% of its vacant space.

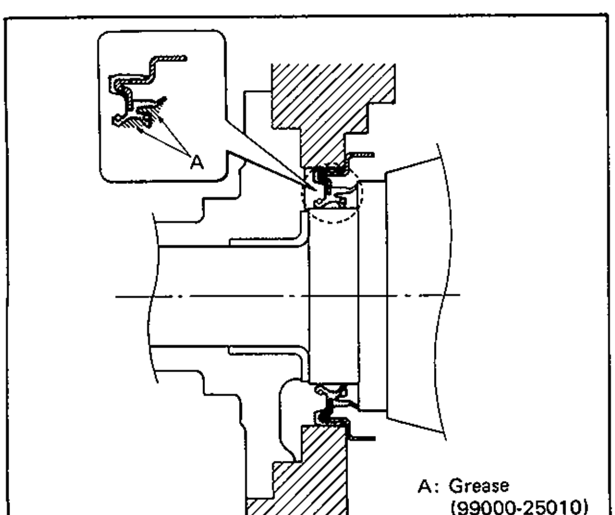


Fig. 3D-38

- Press-fitting knuckle oil seal
  Drive in knuckle oil seal until its end contacts stepped surface of knuckle using special tools.

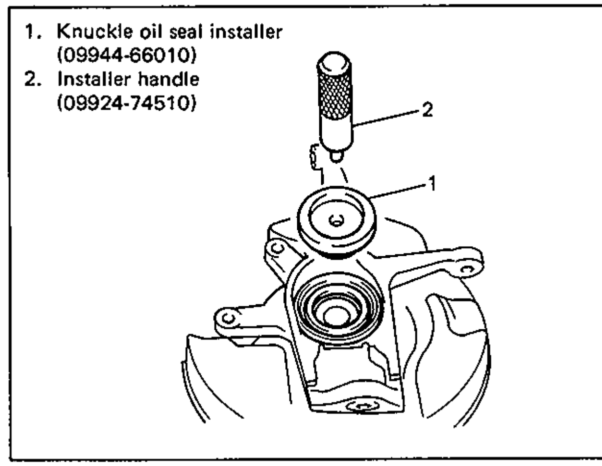


Fig. 3D-39

- Bending ball stud split pin
  After tightening ball stud castle nut, bend split pin so that it is in close contact with stud head or castle nut as shown below. Also, be sure to insert its bent end so that its projection ("A" in figure) is made as small as possible.

Ball stud castle nut tightening torque	N·m	kg-m	lb-ft
	45 – 70	4.5 – 7.0	33.0 – 50.5

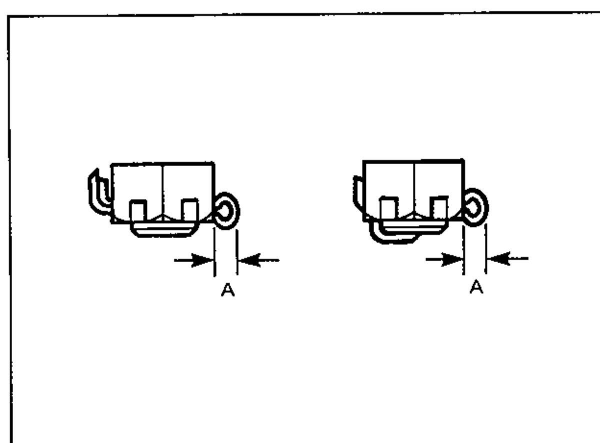


Fig. 3D-40

- Tightening torque
  For any tightening torque other than those specified in text, refer to torque specification table at the end of this section.

SUSPENSION CONTROL ARM/BALL STUD/BUSHINGS

REMOVAL

1) To remove suspension control lower arm, use the same procedure as that for COIL SPRING Removal described previously. Then proceed as follows.
2) Remove lower arm bracket bolts.
3) Remove lower arm.
4) Remove ball stud comp. by loosening 3 nuts.

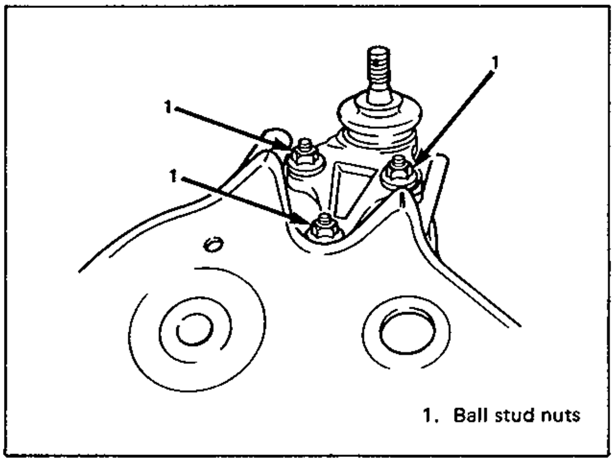


Fig. 3D-41-1

5) Remove front bushing.
   Cut off about 5 mm of bushing flange with handsaw as shown below.

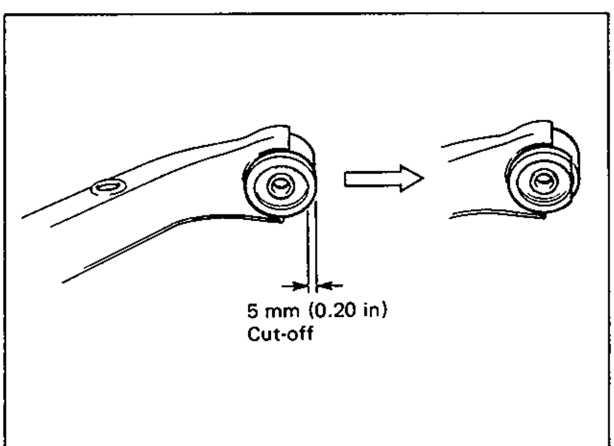


Fig. 3D-41-2

Using hydraulic press and special tools, pull out bushing.

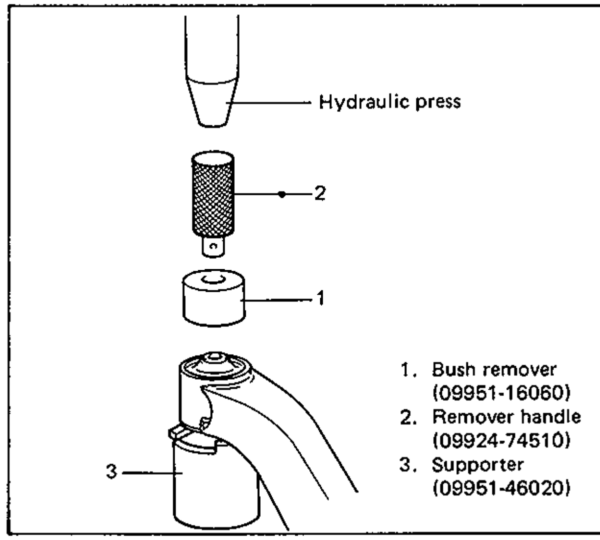


Fig. 3D-42

6) Remove rear bushing.
   Cut off bushing flange surface with knife as shown.

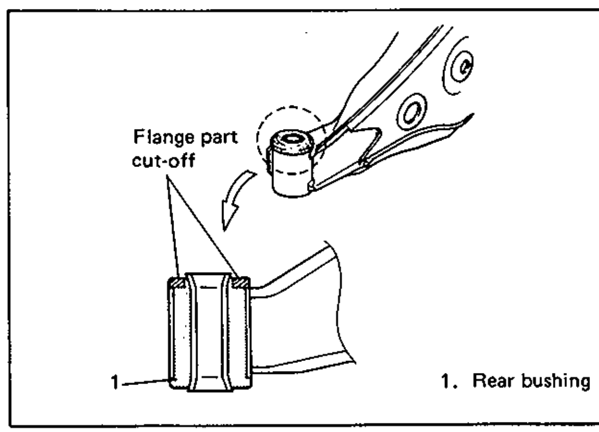


Fig. 3D-43

Using hydraulic press and special tools, pull out bushing.

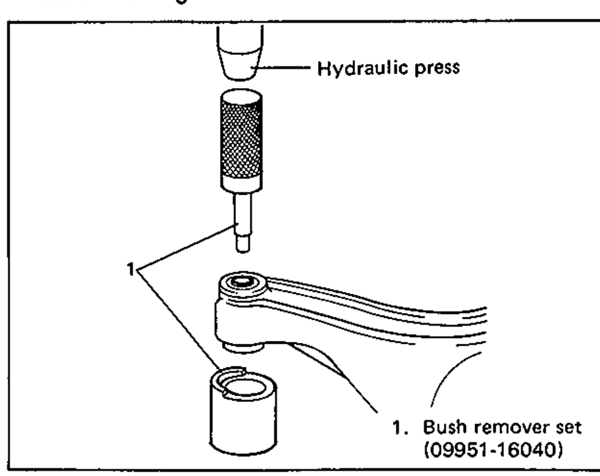


Fig. 3D-44

INSTALLATION

1) Front bushing
   Press-fit front bushing until its flange contacts housing edge of lower arm, use drifts as shown below.

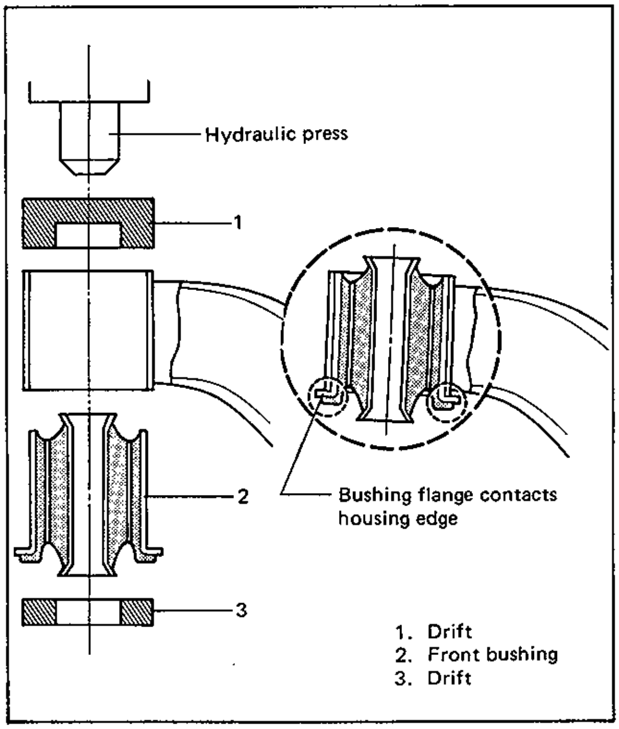


Fig. 3D-45

NOTE:

- **When press-fitting bushing, set it in such way that its hollows are in row along lateral direction.**

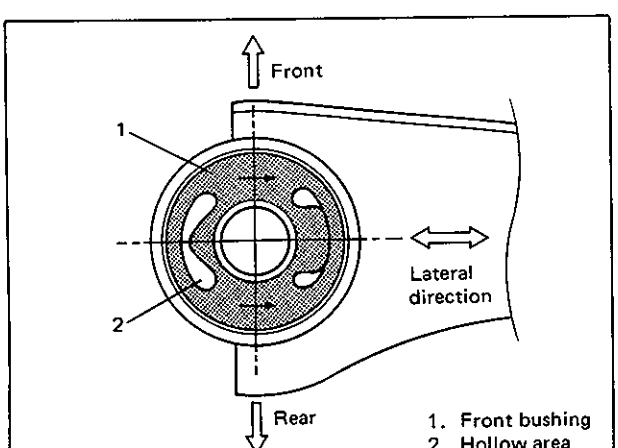


Fig. 3D-46

- **When press-fitting bushing, grease applied to inside of control arm housing will facilitate work.**

2) Rear bushing
   Using special tool, press-fit rear bushing so that lower arm housing is held between its flanges as shown below.

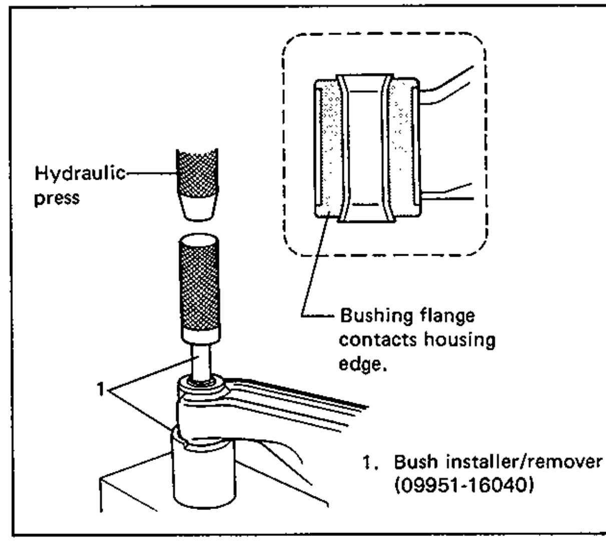


Fig. 3D-47

NOTE:
When press-fitting bushing, soap water applied to outside of bushing will facilitate work.

3) Install ball stud comp. to lower arm.

Ball stud bolt tightening torque (3 – 12 mm)	N·m	kg-m	lb-ft
	70 – 100	7.0–10.0	50.5 – 75.0

4) Install lower arm to chassis.

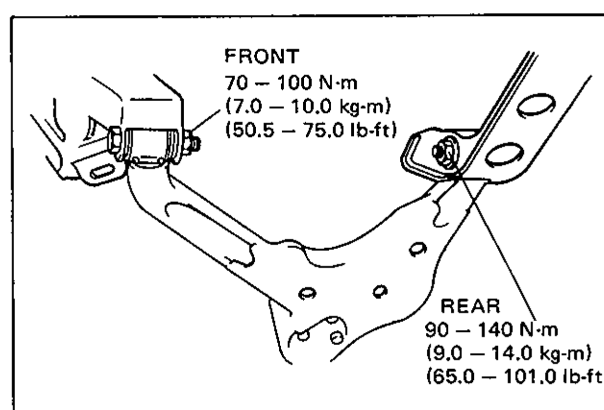


Fig. 3D-48

5) As installation procedure hereafter is the same as that for coil spring, refer to that section.

NOTE:
For any tightening torque other than those specified in text, refer to torque specification table at the end of this section.

FRONT FREE WHEELING HUB (OPTIONAL)

GENERAL DESCRIPTION

There are two types of the front free wheeling hub, one is manual type and the other is automatic type. This section describes operation, installation and maintenance of each type. Be sure to refer to this section carefully for proper service of the front free wheeling hub.

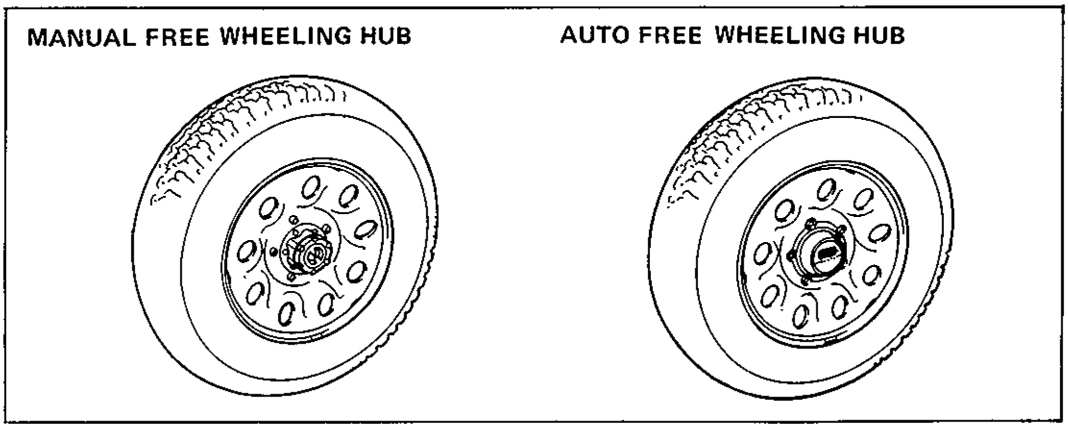


Fig. 3D-49

MANUAL FREE WHEELING HUB

OPERATION

A free wheeling hub should be fitted onto each of the right and left front wheel hubs. The free wheeling hub has a knob and two embossed marks, "FREE" and "LOCK". When the knob is set to the "FREE" position, the axle shaft and wheel are disconnected and the revolution of the front wheels becomes free. When it is set to the "LOCK" position, the axle and wheel are connected.

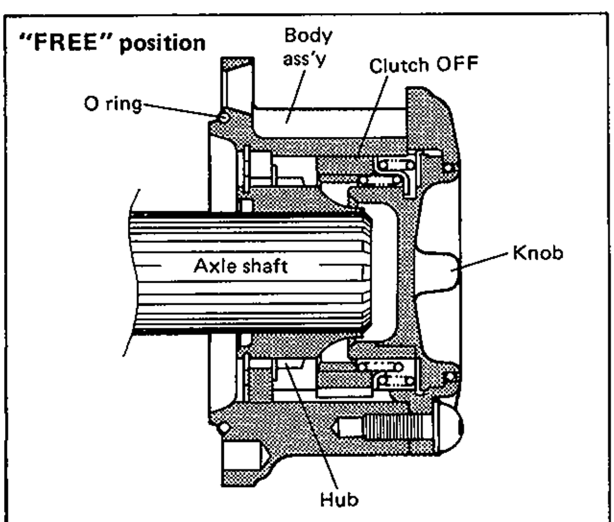


Fig. 3D-50

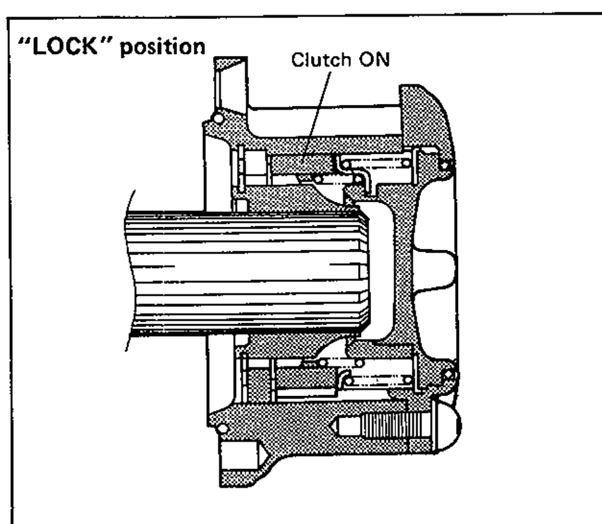


Fig. 3D-51

For their usage, refer to Owner's Manual supplied with the vehicle.

CAUTION:
Both of the right and left wheeling hub knobs must be set to the same position (either FREE or LOCK). Don't set one to "FREE" and the other to "LOCK" positions.

INSTALLATION INSTRUCTION

After removing front axle shaft drive flange, install parts (shown in below figure) according to following procedure.

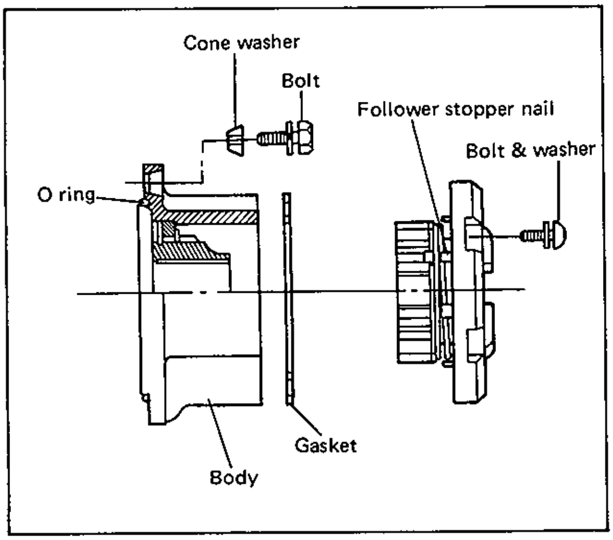


Fig. 3D-52

1) After aligning "O" mark on knob of free wheeling hub cover with "FREE" position, separate free wheeling cover assembly from body assembly.
2) Install free wheeling hub body assembly on front wheel hub.

Tightening torque	N·m	kg-m	lb-ft
	20 – 30	2.0 – 3.0	14.5 – 21.5

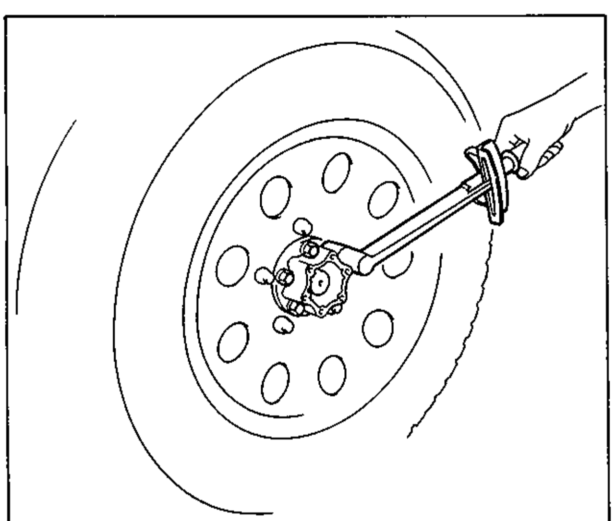


Fig. 3D-53

3) Install cover assembly to body assembly so that follower stopper nail is fitted into groove of body assembly.

NOTE:
Before installing cover assembly, make sure following points.
- **"◯" mark on knob is at "FREE" position.**
- **Clutch is lifted to cover side, if not (as shown in below figure) it may cause malfunction.**
- **Gasket is set justly.**

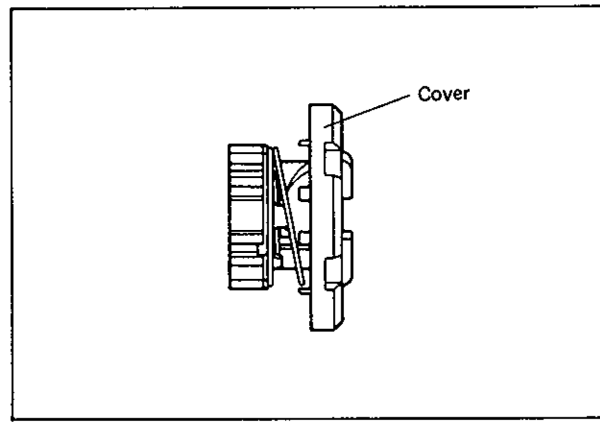


Fig. 3D-54

There are two follower stopper nails and two grooves which can be fitted freely.

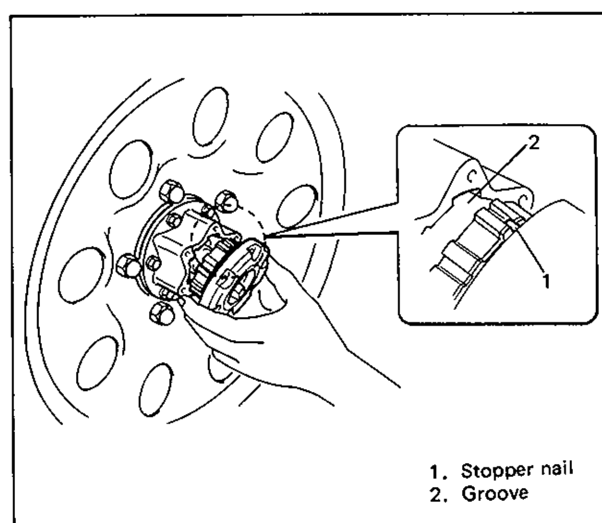


Fig. 3D-55

4) Fix cover assembly to body assembly with cover bolts.

Cover bolts tightening torque	N·m	kg-m	lb-ft
	8 – 12	0.8 – 1.2	6.0 – 8.5

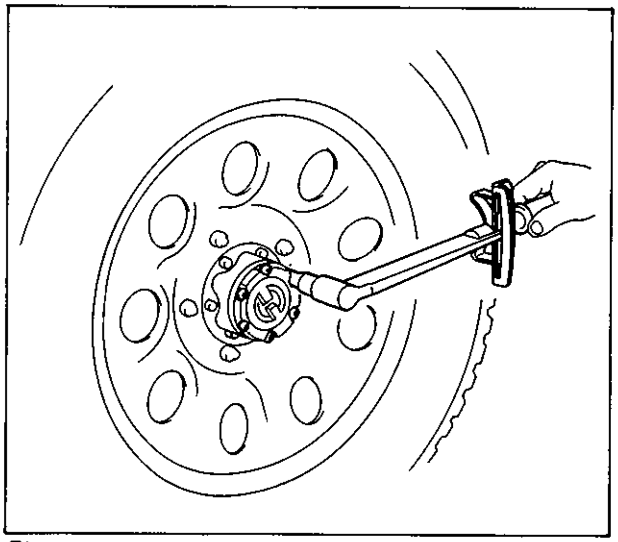


Fig. 3D-56

5) To check free wheeling hub operation, jack up front end, move knob of free wheeling hub between "FREE" and "LOCK" positions and check for smoothness. Also check if wheel operates correctly with knob at "FREE" and "LOCK" positions and by rotating wheel by hand.

MAINTENANCE SERVICE

Vehicles equipped with free wheeling hubs are subject to following periodical checks.

To check free wheeling hubs for operation, jack up front end, move knob of free wheeling hub between "FREE" and "LOCK" positions and check for smoothness. Also check if wheel operates correctly with knob at "FREE" and "LOCK" positions and by rotating wheel by hand.

Should check result be unsatisfactory, remove free wheeling hub cover and grease each sliding surface with lithium grease or multipurpose grease after cleaning each sliding part.

LITHIUM GREASE
SUZUKI SUPER GREASE A (99000-25010)

If faulty operation is still noted even after greasing, correct defective part or replace it with new one.

> **CAUTION:**
> **Hubs should not be packed with grease.**

For installation, refer to "**Installation Instruction**" in this section.

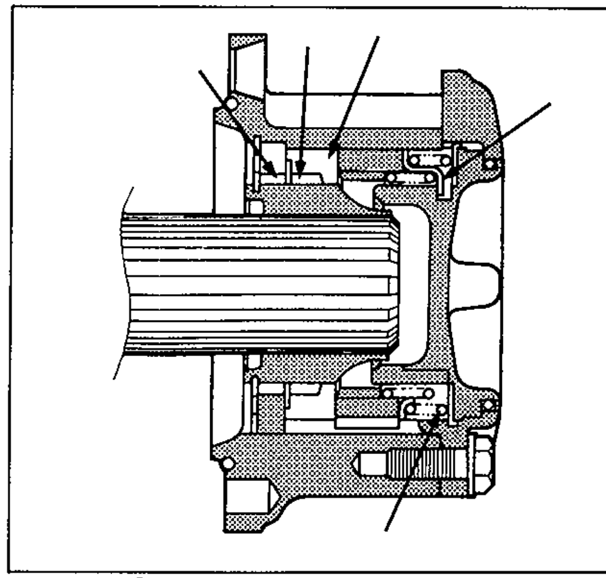


Fig. 3D-57 Greasing Points

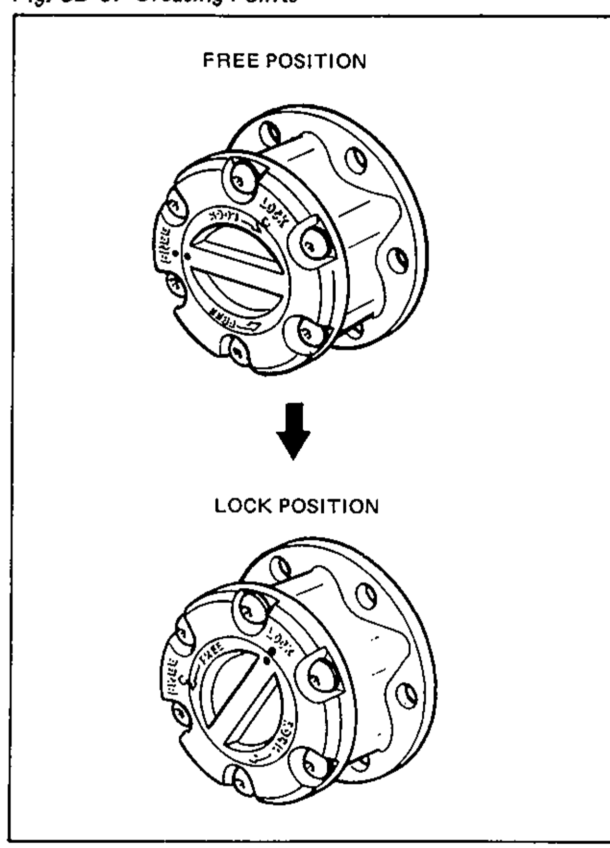


Fig. 3D-58

AUTOMATIC FREE WHEELING HUB

OPERATION

An automatic free wheeling hub is equipped in the right and left front wheel hubs in similar manner to that of the manual type.
When the car equipped with these automatic free wheeling hubs is started out with the gear shift lever shifted from 2H to 4H or 4L, the drive power as shown in the diagram below is transmitted to the hub, slide gear and cam. The cam lobe then disengages from the retainer slot and rides on the retainer lobe. As a result, the cam shifts the slide gear to the right as shown in the figure. This shift causes the slide gear to mesh with gear at inner side of free wheeling hub body installed on the drive axle housing resulting in automatically creating 4WD with axle shaft drive power being transmitted to wheel hub (wheel).

When the transfer gear shift lever is shifted from 4H or 4L to 2H and slowly started to advance in the opposite direction (that is, reverse if advancing forward or advance ahead if reversing), at the same time, the car movement causes the front wheel and front free wheeling hub body to revolve in the direction reverse to previous revolution. As a result, the gear at inner side of free wheeling hub body and its meshed slide gear together with the cam fixed to the slide gear all start to rotate in reverse direction. When the cam lobe is rotated to the retainer slot position, the return spring causes the cam lobe to return to slot position from its former lobe position on the retainer. The slide gear fixed on the cam shifts to the left as shown in the figure. The gear maintained at inner side of free wheeling hub body then becomes disengaged so that the front wheeling hub becomes free. This operation (4WD → 2WD) is completed within 2 meters of vehicle advance distance.

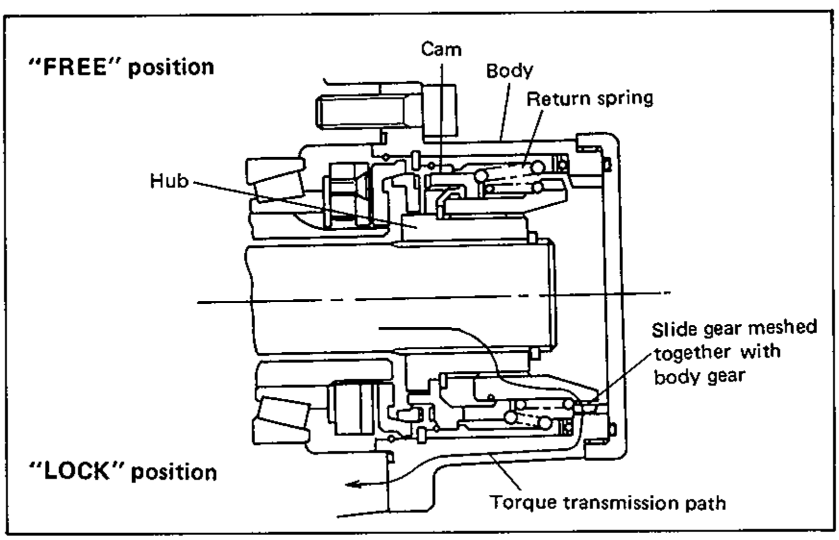


Fig. 3D-59

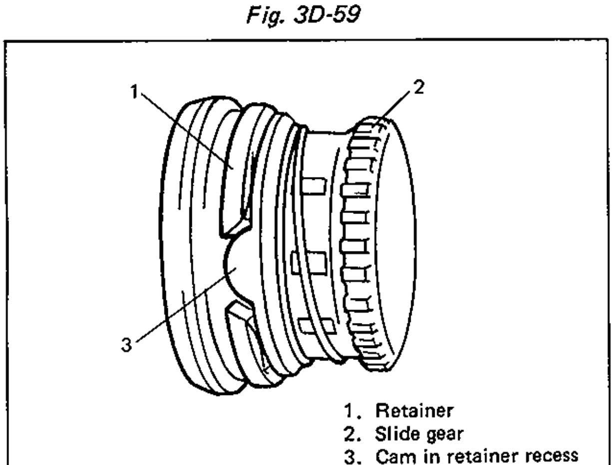


Fig. 3D-60

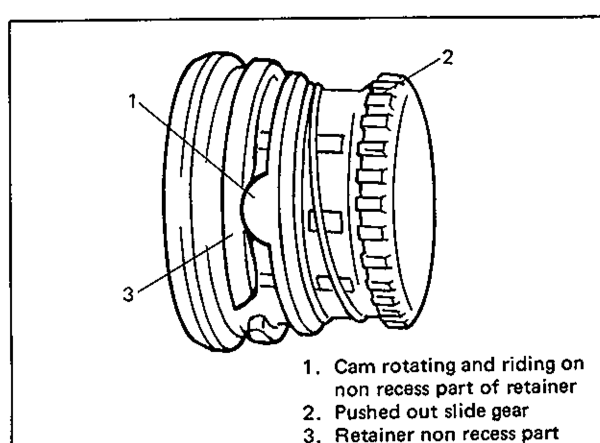


Fig. 3D-61

INSTALLATION INSTRUCTION

After removing front axle shaft drive flange, install parts (shown in below figure) according to following procedure.

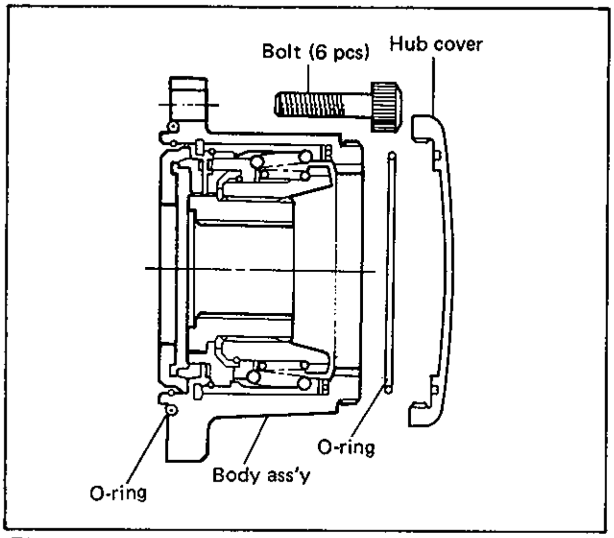


Fig. 3D-62

> **CAUTION:**
> **Hub body ass'y should not be disassembled.**

1) Make sure O-ring ① is securely inserted into the hub body groove, and fit hub body ass'y key Ⓓ to steering knuckle spindle key groove Ⓒ. Thus, install hub body ass'y onto front axle shaft. Then, ensure that fitting surfaces Ⓐ and Ⓑ of hub body ass'y and wheel hub are closely fitted to each other when body ass'y is pushed lightly to wheel hub. In case the close fitting is not obtained, rotate wheel hub to obtain close fitting.

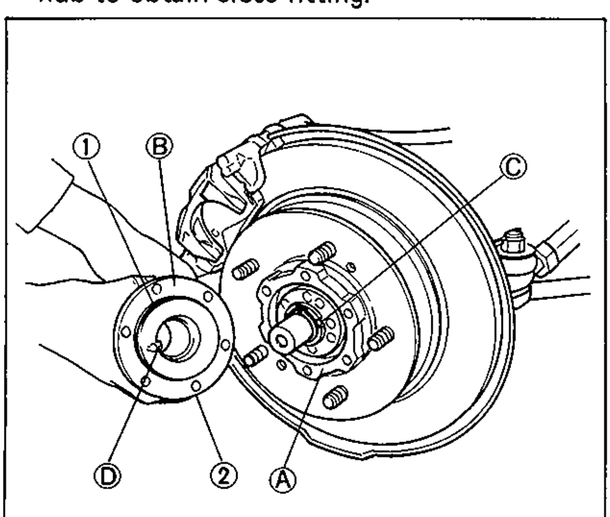
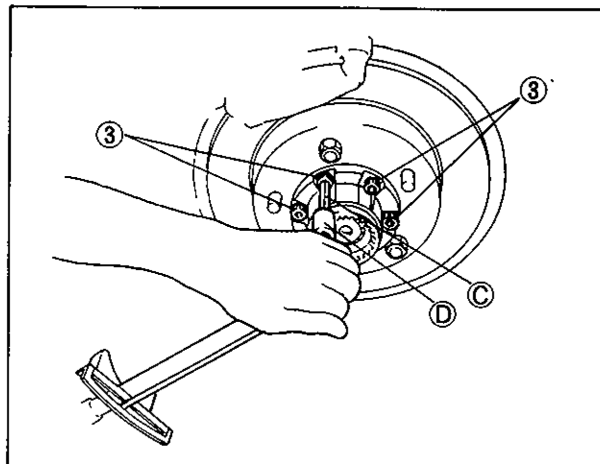


Fig. 3D-63

2) Using special tools, Ⓒ and Ⓓ, tighten bolts ③ specified torque.

Tightening torque for bolt ③	N·m	kg-m	lb-ft
	30 – 35	3.0 – 3.5	22.0 – 25.0



C : Special tool (Hexagon bit 6 mm 09900-00414)
D : Special tool (Hexagon socket 09900-00411)

Fig. 3D-64

3) Install O-ring correctly in the groove provided inside the cover.
   Tighten cover to hub body ass'y by hand.

NOTE:
Upon completion of operation check mentioned in the next item "post-assembly confirmation", be sure to firmly tighten this cover using an oil filter wrench, etc.

4) Install front wheels and tighten wheel nuts to specified torque.

Tightening torque for wheel (hub) nuts	N·m	kg-m	lb-ft
	80–110	8.0–11.0	58.0–79.5

5) Dismount the vehicle from the lift, and be sure to carry out the operation check of free wheeling hub mentioned in the next item "post-assembly confirmation".

Post-assembly confirmation

Confirm automatic free wheeling hub for proper operation in the sequence described below.

1) Set transfer gear shift lever to 4H or 4L position, and move the car 2 m (6.5 ft) or more forward slowly.
2) Remove each free wheeling hub cover at right and left, and confirm that hub body spline is properly engaged with the slide gear spline positioned just inside the hub body (i.e., that automatic free wheeling hub is in locked condition).

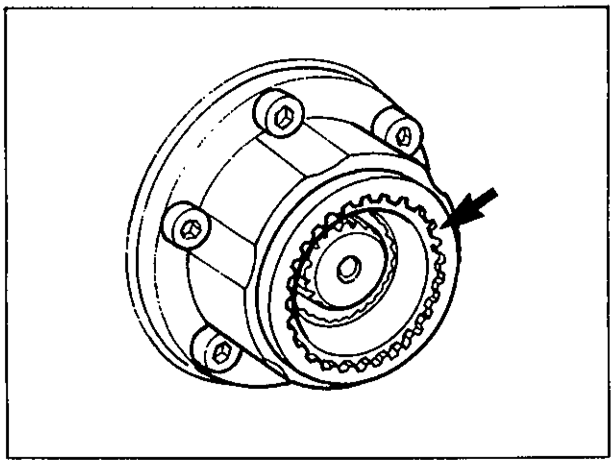


Fig. 3D-65

3) Set transfer gear shift lever to 2H position, and move the car 2 m (6.5 ft) or more backward slowly.
4) Confirm that slide gear of each automatic free wheeling hub at right and left is slided toward hub body-inside so that slide gear spline is completely disengaged from hub body spline (i.e., each automatic free wheeling hub is in the free condition).

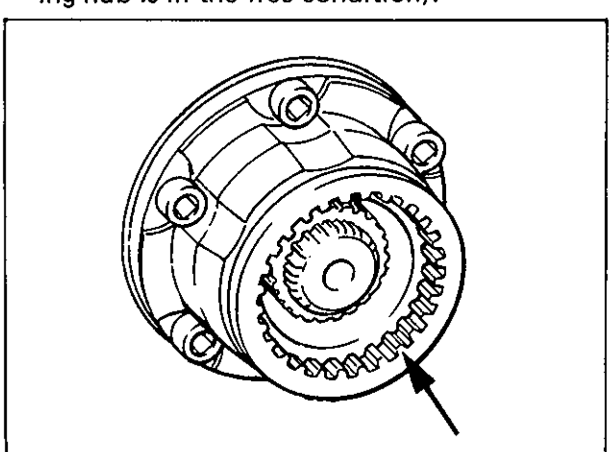


Fig. 3D-66

5) Check to ensure that free wheeling hub locks and unlocks properly by reversing car moving directions described in steps 1 to 4. (It should lock when moving backward and unlock when moving forward.)

   If any malfunction is found as to the confirmation in the above steps 1 through 5, the method of assembly is responsible for the malfunction. Therefore, conduct assembly again.

6) Make sure the automatic free wheeling hub cap has an O-ring correctly installed, and assemble this cap firmly to the free wheeling hub body using an oil filter wrench, etc. (The cap should not be able to be loosened by hand.)

NOTE:

While the automatic free wheeling hub cap is removed, strict care should be taken that foreign matters, such as dust, mud, etc., do not get into the free wheeling hub interior.

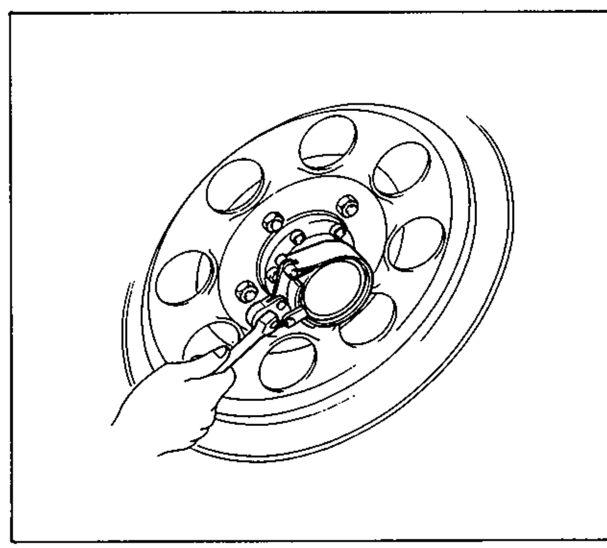


Fig. 3D-67

MAINTENANCE SERVICE

Confirm automatic free wheeling hub for proper operation periodically according to the procedure described previously in "post-assembly comfirmation". If automatic free wheeling hub shows any malfunction, replace it with new one.

FRONT SUSPENSION INSPECTION

BAR
Inspect for damage or deformation. If defective, replace.

BUSHING
Inspect for damage, wear or deterioration. If defective, replace.

STRUT DAMPER AND/OR COIL SPRING
1) Inspect strut for oil leakage. If strut is found faulty, replace it as an assembly unit, because it can not be disassembled.
2) Strut function check
   Check and adjust tire pressures as specified. Bounce body three or four times continuously by pushing front end on the side with strut to be checked. Apply the same amount of force at each push and note strut resistance both when pushed and rebounding.
   Also, note how many times car body rebounds before coming to stop after hands are off. Do the same for strut on the other side.
   Compare strut resistance and number of rebound on the right with those on the left. And they must be equal in both. With proper strut, body should come to stop the moment hands are off or after only one or two small rebounds. If struts are suspected, compare them with known good vehicle or strut.
3) Inspect for damage or deformation.
4) Inspect strut boot for damage or crack.
5) Inspect for cracks or deformation in spring seat.
6) Inspect for deterioration of bump stopper.
7) Inspect strut mount for wear, cracks or deformation.

Replace any parts found defective in steps 2)–7).

SUSPENSION ARM/KNUCKLE ARM
Inspect for cracks, deformation or damage.

SUSPENSION CONTROL ARM JOINT
1) Check for smoothness of rotation.
2) Inspect ball stud for damage.
3) Inspect dust cover for damage.

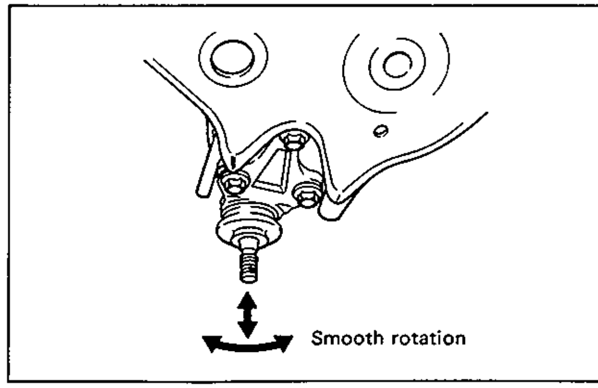


Fig. 3D-68

SUSPENSION CONTROL ARM BUSHING
Inspect for damage, wear or deterioration.

WHEEL DISC, NUT & BEARING
1) Inspect each wheel disc for dents, distortion and cracks. Disc in badly damaged condition must be replaced.
2) Check wheel nuts for tightness and, as necessary, retighten them to specification.

	N·m	kg-m	lb-ft
Tightening torque for wheel nuts	80–110	8.0–11.0	58.0 – 79.5

3) Check wheel bearing for wear. After retightening lock nut to specified torque, apply dial gauge to wheel hub center and measure thrust play.

Thrust play limit	0.05 mm (0.002 in.)

   When measurement exceeds limit, replace bearing.
4) By rotating wheel actually, check wheel bearing for noise and smooth rotation. If defective, replace bearing.

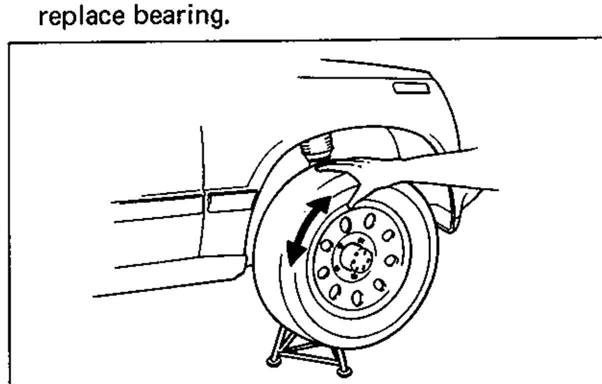


Fig. 3D-69

TORQUE SPECIFICATIONS

Fastening parts		Tightening torque		
		N·m	kg-m	lb-ft
1. Strut bracket nut		80 – 100	8.0 – 10.0	58.0 – 75.0
2. Strut nut		70 – 100	7.0 – 10.0	50.5 – 75.0
3. Strut support nut		20 – 30	2.0 – 3.0	14.5 – 22.0
4. Control arm front nut		70 – 100	7.0 – 10.0	50.5 – 75.0
5. Control arm rear nut		90 – 140	9.0 – 14.0	65.0 –101.0
6. Ball joint stud castle nut		45 – 70	4.5 – 7.0	32.5 – 50.5
7. Ball joint bolt (3 x 12 mm diameter)		70 – 100	7.0 – 10.0	50.5 – 75.0
8. Wheel bearing lock nut		170 – 250	17.0 – 25.0	123.0 – 180.0
9. Wheel bearing lock washer screw		1 – 2	0.1 – 0.2	0.7 – 1.4
10. Locking hub bolt	manual	20 – 30	2.0 – 3.0	14.5 – 22.0
	auto	30 – 35	3.0 – 3.5	22.0 – 25.0
11. Locking hub cover bolt		8 – 12	0.8 – 1.2	6.0 – 8.5
12. Tie-rod end castle nut		30 – 55	3.0 – 5.5	22.0 – 39.5
13. Stabilizer ball joint nut A		22 – 35	2.2 – 3.5	16.0 – 25.5
Stabilizer ball joint nut B		40 – 60	4.0 – 6.0	29.0 – 43.0
14. Bump stopper		40 – 60	4.0 – 6.0	29.0 – 43.0
15. Wheel nut		80 – 110	8.0 – 11.0	58.0 – 79.5

NOTE:
Refer to the standard tightening torque specification if no description or specification is provided.

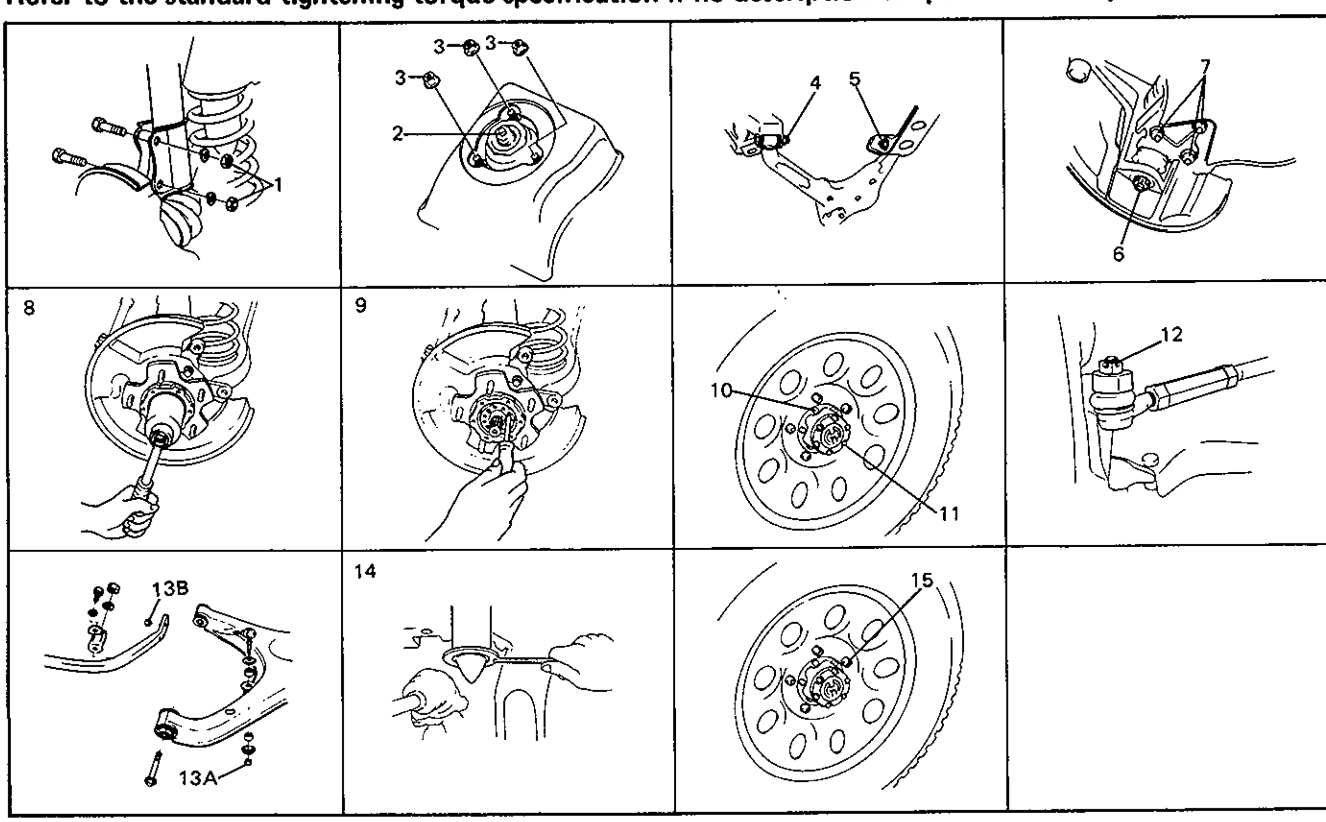


Fig. 3D-70

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE	NO.
Lithium grease	SUZUKI SUPER GREASE (A) (99000-25010)	Knuckle oil seal/drive axle oil seal Recess of wheel spindles Wheel hub oil seal Wheel bearing/oil seal Spindle thrust washer Spindle part of drive axle Spindle bush (inside and flange part) Front axle shaft washer	① ② ③ ④ ⑤ ⑥ ⑦ ⑩
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	Mating surfaces of wheel spindle and knuckle Matching surfaces of wheel hub and flange	⑧ ⑪
Sealing compound	SUZUKI SEALING COMPOUND 366E (99000-31090)	Front axle cap (Except free wheel hub)	⑨

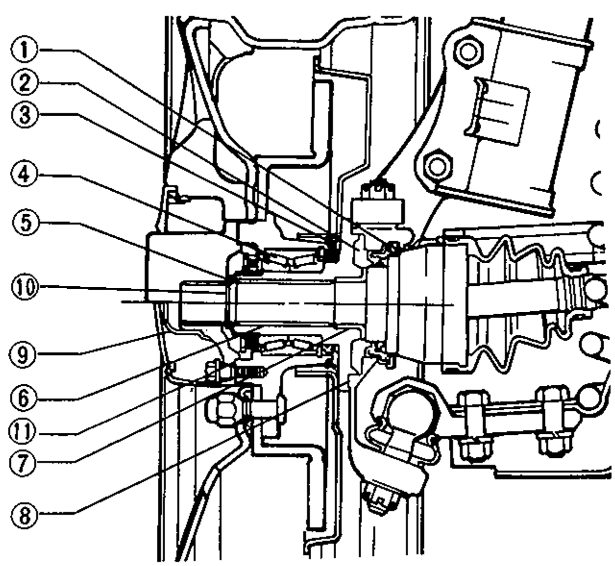


Fig. 3D-71

SPECIAL TOOLS

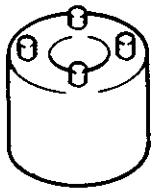
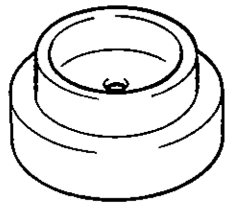
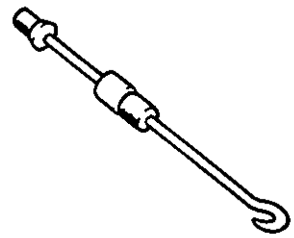
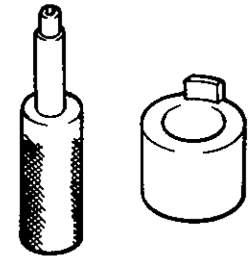
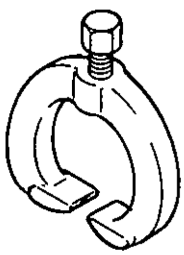
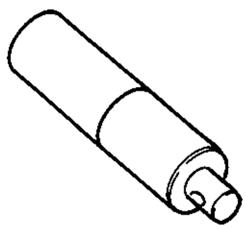
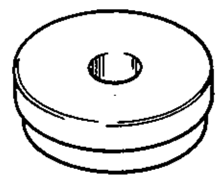
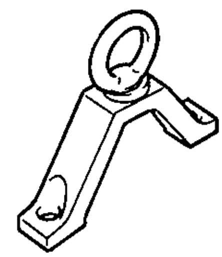
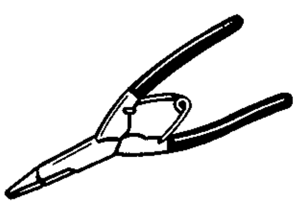
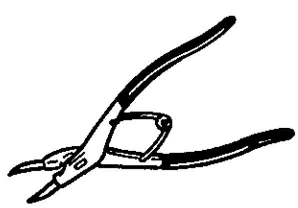
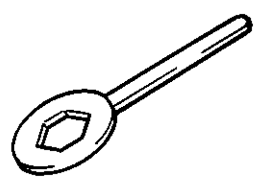
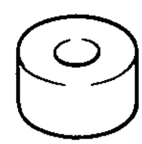
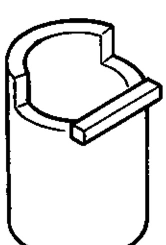
 09951-16050 Wheel bearing tightening tool	 09944-66010 Wheel hub/knucle oil seal installer	 09942-15510 Sliding hammer	 09951-16040 Control arm bush installer/remover
 09913-65210 Tie rod end remover	 09924-74510 Bearing installer handle	 09944-68210 Bearing & oil seal installer	 09943-35511 Brake drum remover
 09900-06107 Snap ring pliers (opening type)	 09900-06108 Snap ring pliers (closing type)	 09941-66010 Bump stopper wrench	 09951-16060 Control arm bush remover (front)
 09951-46020 Control arm remover support			

Fig. 3D-72

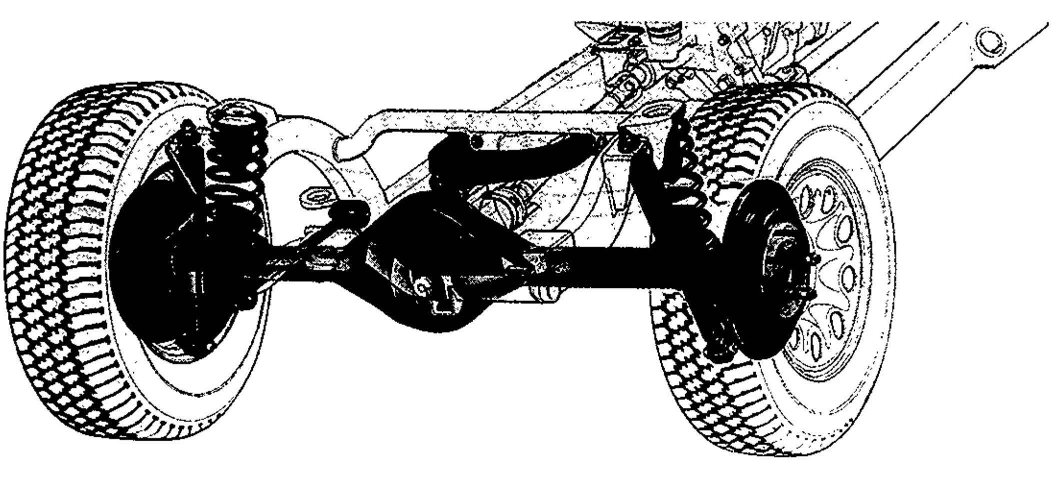
SECTION 3E

REAR SUSPENSION

NOTE:

- All suspension fasteners are an important attaching part in that it could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.
- Never attempt to heat, quench or straighten any suspension part. Replace it with a new part, or damage to the part may result.

CONTENTS



GENERAL DESCRIPTION

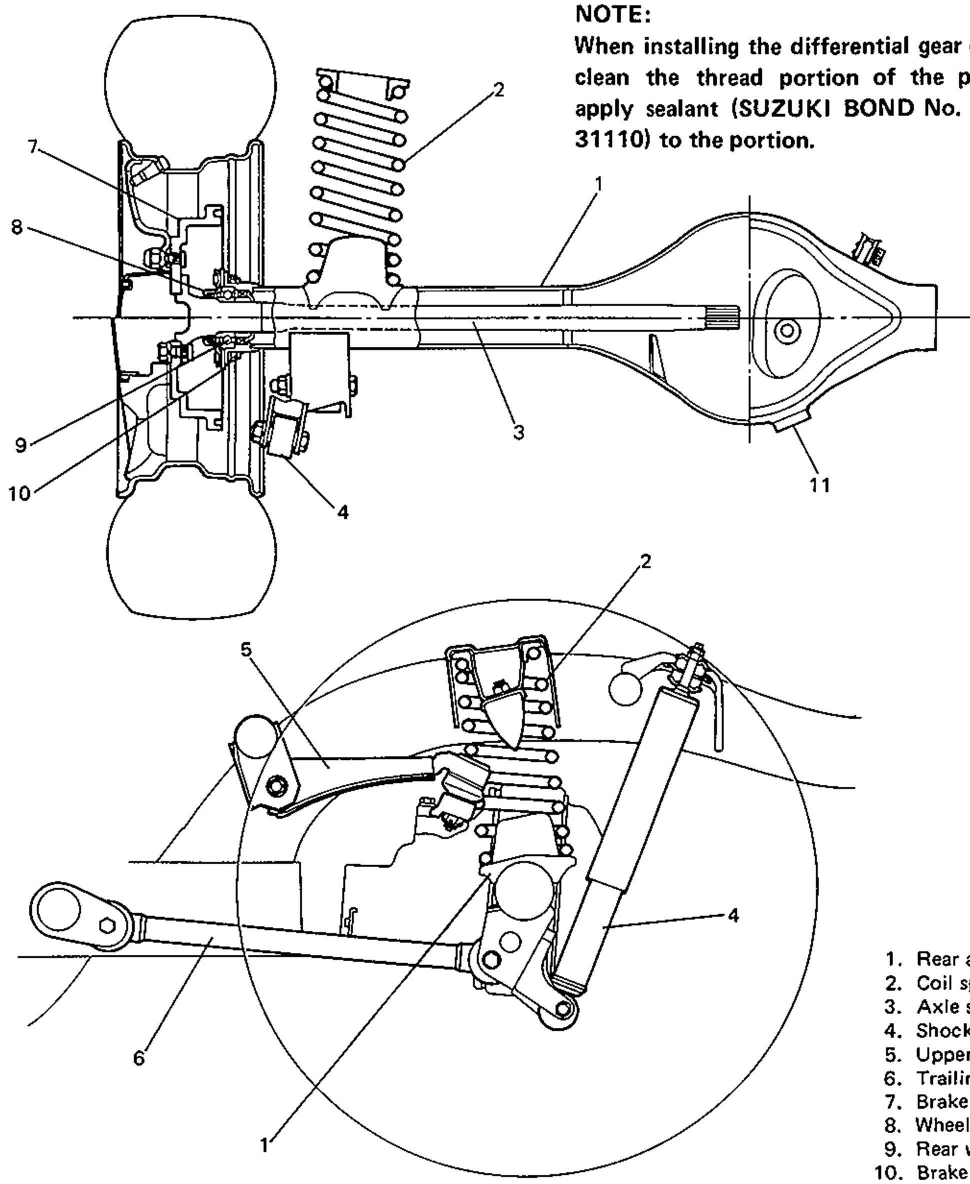
Rear suspension is coil spring type of rigid axle which consists of coil springs, rear axle, shock absorbers, upper arm and trailing rods.

The trailing rod is connected with the axle and body by using bushes so that axle moves up and down with bushes as their supporting points.

The upper arm is installed to the body and the axle (differential carrier) by using bushes and ball joint so as to prevent axle movement in the lateral direction.
It also prevents axle from turning in forward and backward direction, which occurs due to reaction when brake is applied and when engine is driven.

The shock absorber is installed between the body and axle to absorb up-and-down movement of the vehicle body.

NOTE:
When installing the differential gear oil drain plug, clean the thread portion of the plug and then apply sealant (SUZUKI BOND No. 1215, 99000-31110) to the portion.



1. Rear axle housing
2. Coil spring
3. Axle shaft
4. Shock absorber
5. Upper arm
6. Trailing rod
7. Brake drum
8. Wheel bearing retainer
9. Rear wheel bearing
10. Brake back plate
11. Oil drain plug

Fig. 3E-1

ON VEHICLE SERVICE

REAR SHOCK ABSORBER

The shock absorber is non-adjustable, non-refillable, and cannot be disassembled. The only service the shock absorber requires is replacement when it has lost its resistance, is damaged, or leaking fluid.

REMOVAL

1) Hoist vehicle.
2) Support rear axle housing by using floor jack to prevent it from lowering.

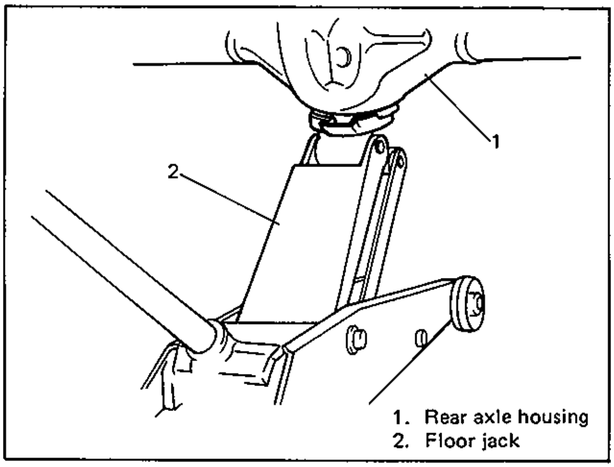


Fig. 3E-2

3) Remove upper mounting lock nut and absorber nut.
4) Remove lower mounting bolt.
5) Remove shock absorber

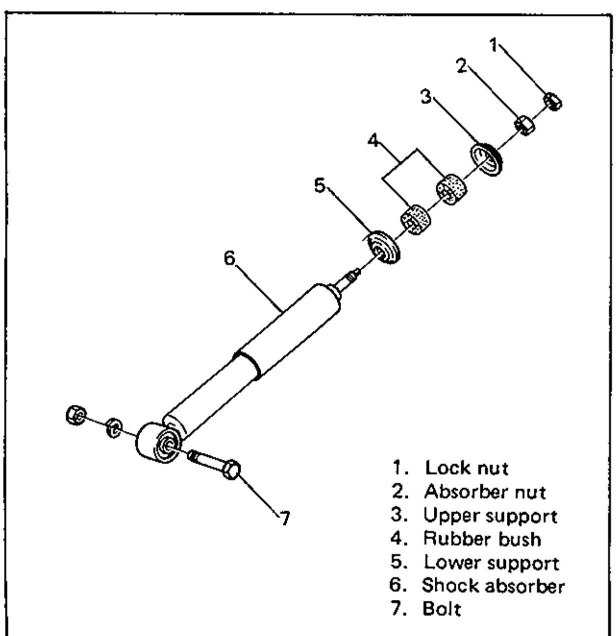


Fig. 3E-3

INSTALLATION

1) Install shock absorber. Refer to figure below for proper installing direction of lower mounting bolt.

NOTE:
Absorber nut is thicker than lock nut.

2) Remove floor jack.
3) Lower hoist.
4) Tighten nuts to specified torque.

NOTE:
Tighten lower nut with vehicle off hoist and in non-loaded condition.

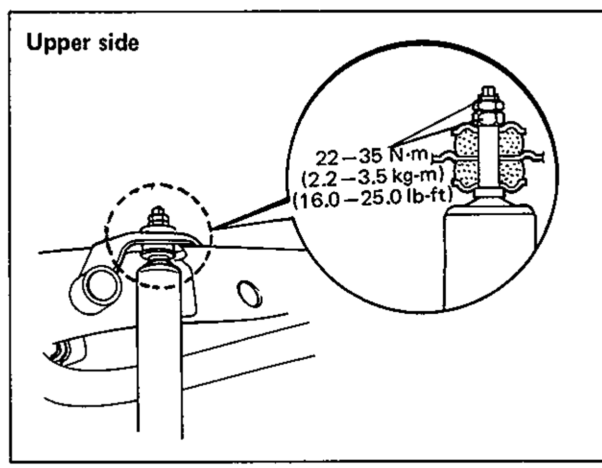


Fig. 3E-4

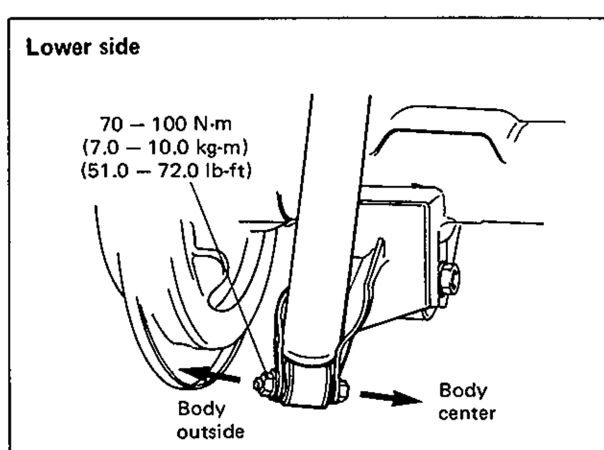


Fig. 3E-5

COIL SPRING

REMOVAL

1) Hoist vehicle and remove rear wheel.
2) Support rear axle housing by using floor jack.

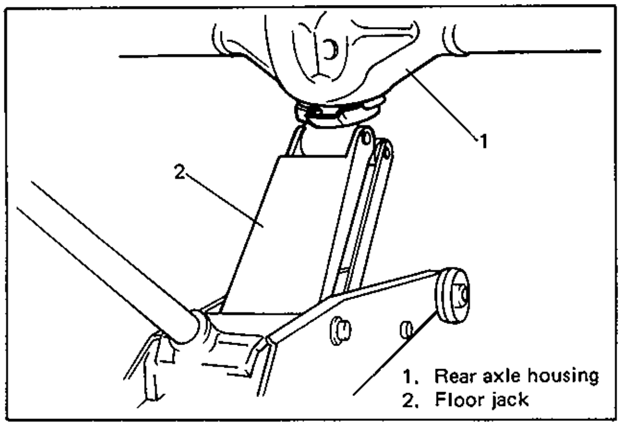


Fig. 3E-6

3) Disconnect parking brake cable hangers from trailing rod and chassis body.
   Remove shock absorber lower mounting bolt.

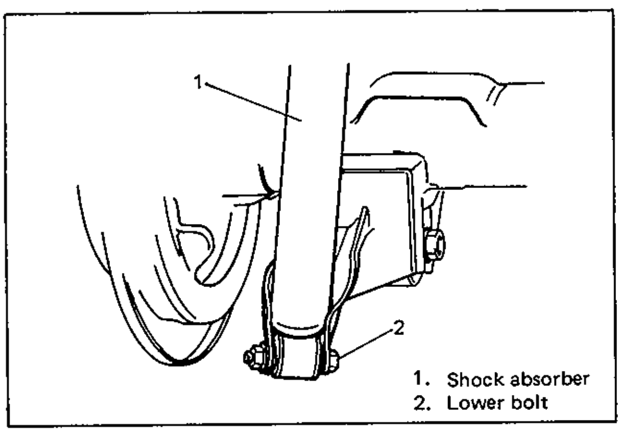


Fig. 3E-7

4) Lower rear axle housing gradually as far down as where coil spring can be removed.
5) Remove coil spring.

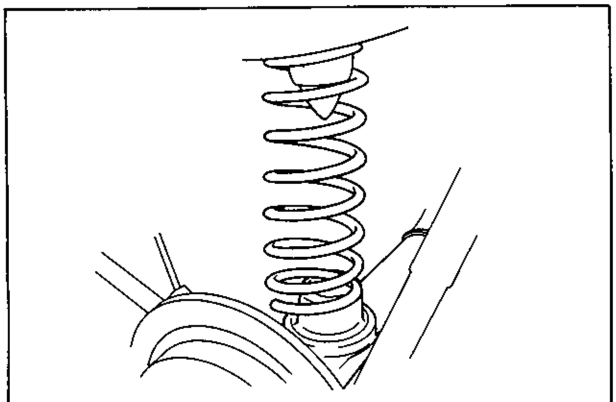


Fig. 3E-8

INSTALLATION

1) Install coil spring on spring seat of axle housing and then raise axle housing.

NOTE:
When seating coil spring, mate spring end with stepped part of rear axle spring seat as shown.

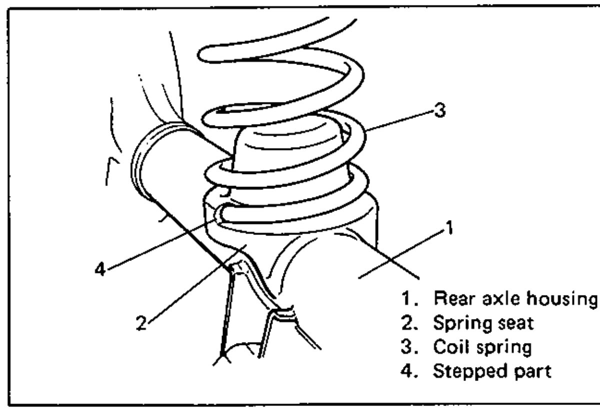


Fig. 3E-9

2) Install shock absorber lower bolt. For its proper installing direction, refer to figure below. Nut should not be tightened.

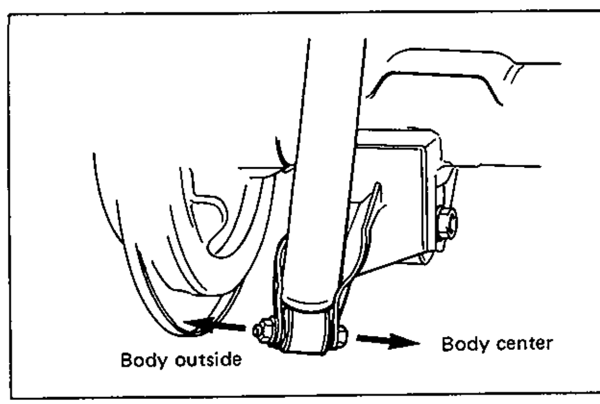


Fig. 3E-10

3) Connect cable hangers to trailing rod and chassis body.
   Remove floor jack from axle housing.
4) Install wheel and tighten wheel nuts to specified torque.

Tightening torque for wheel nuts	N·m	kg-m	lb-ft
	80–110	8.0–11.0	58.0 – 79.5

5) Lower hoist and tighten absorber lower nut to specified torque.

NOTE:
For tightening of lower nut, refer to NOTE given under SHOCK ABSORBER INSTALLATION on page 3E-3.

TRAILING ROD AND BUSH

REMOVAL

1) Hoist vehicle and remove rear wheel.
2) Disconnect parking brake cable hanger from trailing rod.

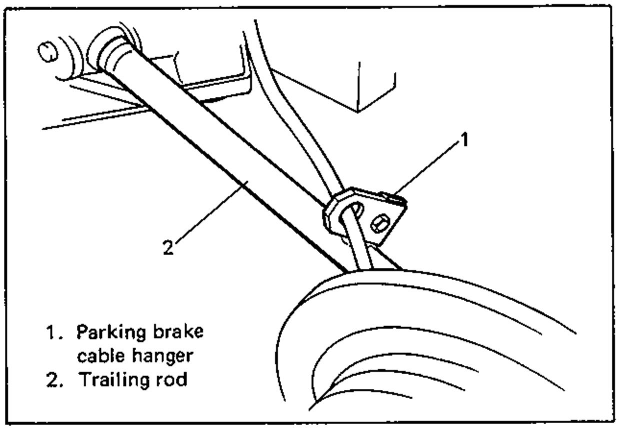


Fig. 3E-11

3) Support rear axle housing by using floor jack.

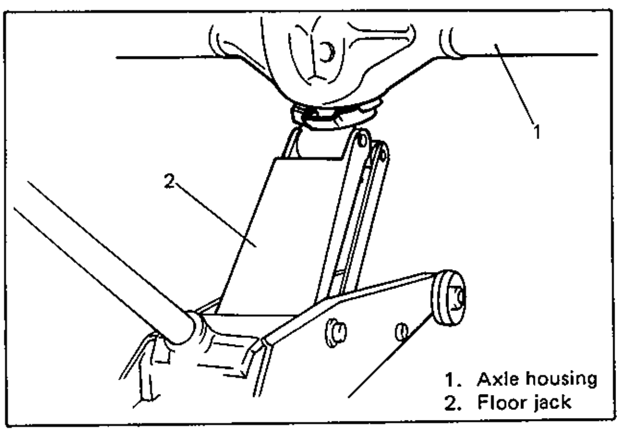


Fig. 3E-12

4) Remove trailing rod rear mount bolt.

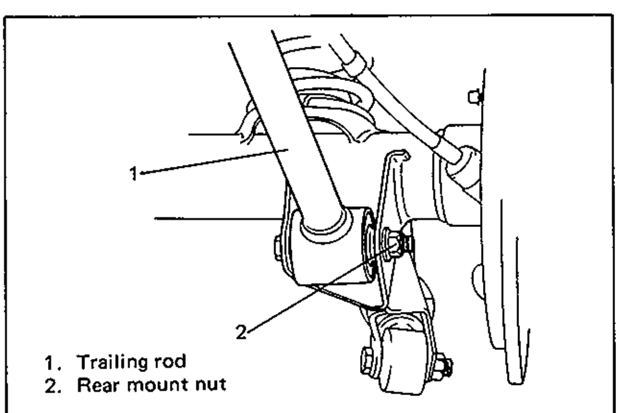


Fig. 3E-13

5) Remove trailing rod front mount bolt.

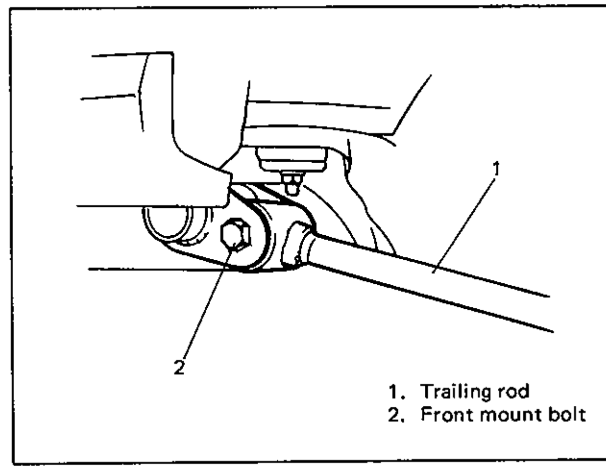


Fig. 3E-14

6) Remove trailing rod bush by using oil hydraulic press and special tools (A, B & C).

NOTE:
When placing special tool "C" under trailing rod as shown below, make sure that bush will not contact special tool when it is pushed out.

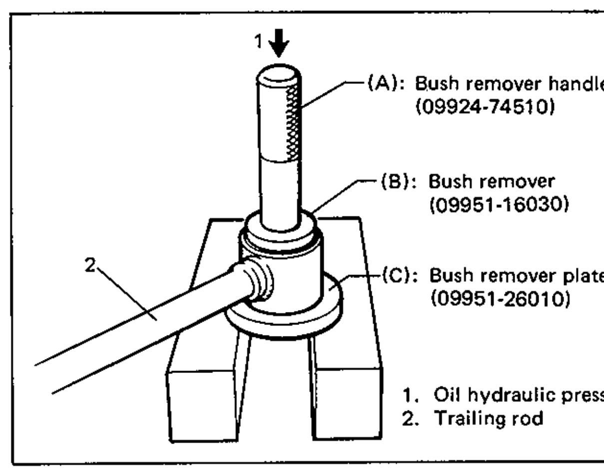


Fig. 3E-15

INSTALLATION

1) Press-fit trailing rod bush by using oil hydraulic press and special tools (A, B & C).

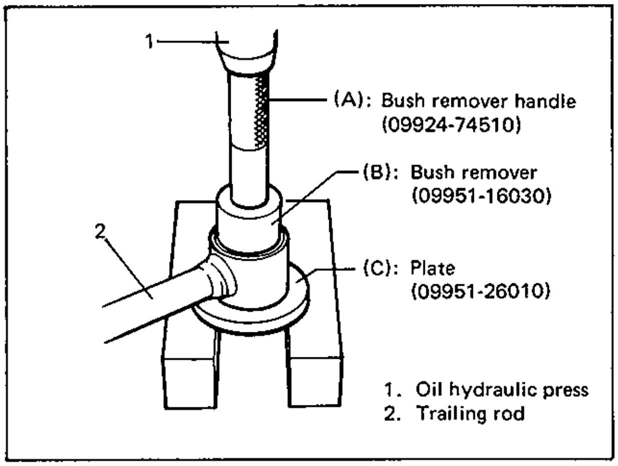


Fig. 3E-16

NOTE:
When press-fitting bush, use care so that distance between trailing rod end and bush end is the same at both ends.

2) See figure below for distinction between right and left trailing rods.

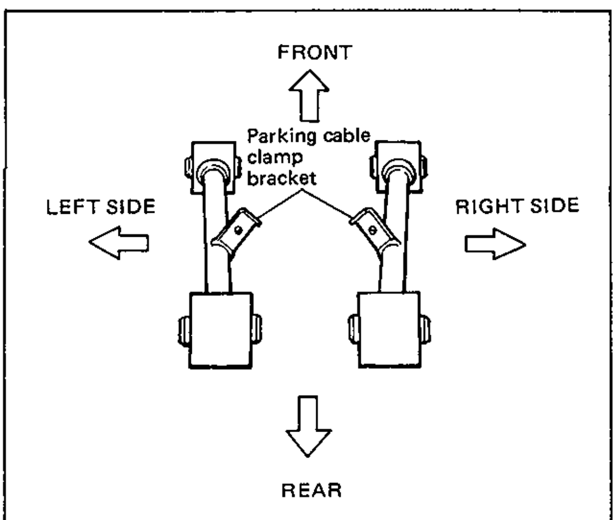


Fig. 3E-17

3) Install trailing rod to vehicle body and axle housing, referring to figure below for proper installing direction of bolts.
Nuts should not be tightened.
4) Remove floor jack from rear axle housing.

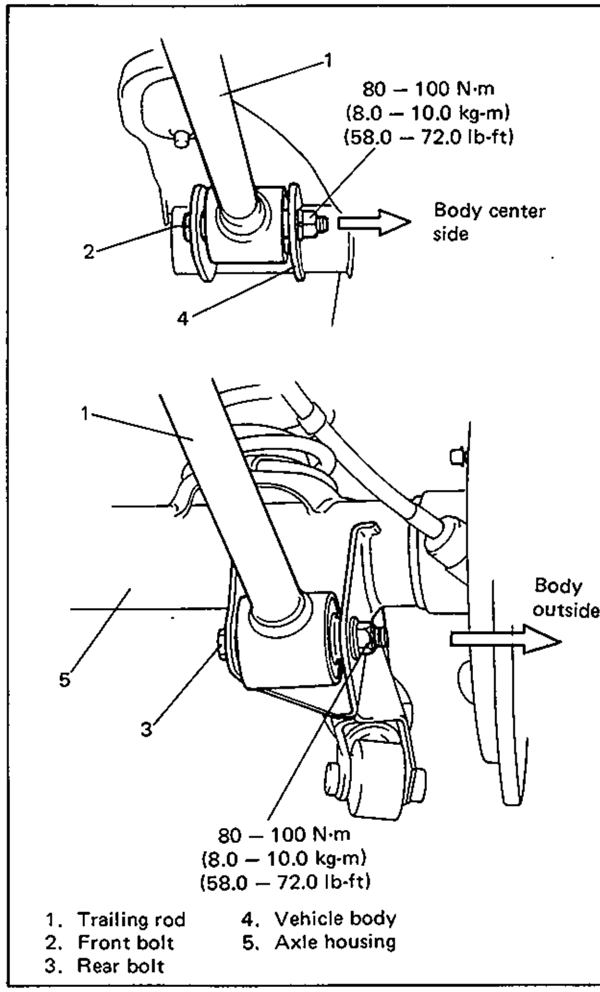


Fig. 3E-18

5) Connect parking brake cable clamp to trailing rod.
6) Install wheel and tighten wheel nuts to specified torque.

Tightening torque for wheel nuts	N·m	kg-m	lb-ft
	80–110	8.0–11.0	58.0–79.5

7) Lower hoist and with vehicle in non loaded condition, tighten front and rear nuts of trailing rod to specified torque. Their torque data are given in above figure.

REAR UPPER ARM

REMOVAL

1) Hoist vehicle and remove wheels.
2) Remove bracket from upper arm as shown below.

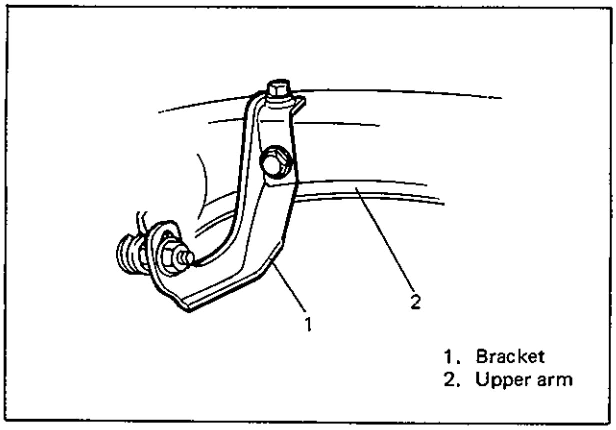


Fig. 3E-19

3) Support axle housing by using floor jack.

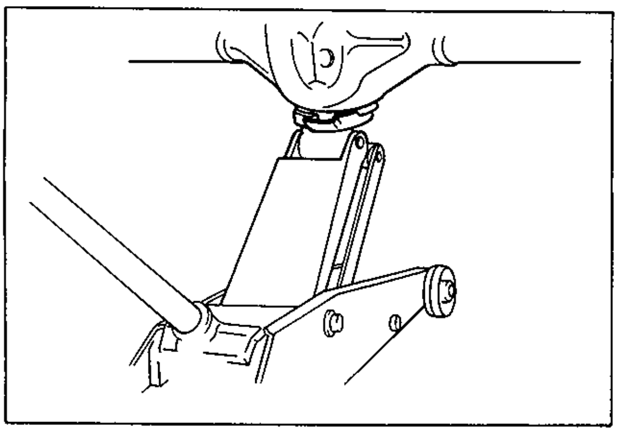


Fig. 3E-20

4) Remove upper arm ball joint bracket from differential carrier.

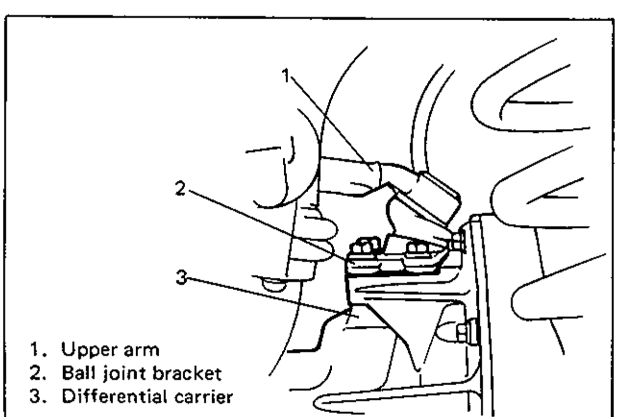


Fig. 3E-21

5) Remove upper arm front bolts and upper arm.

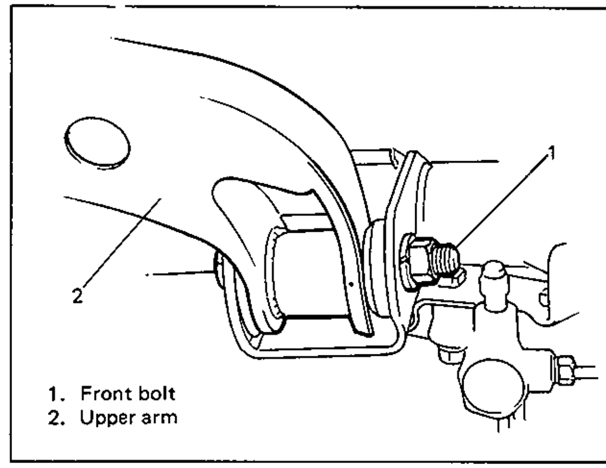


Fig. 3E-22

6) Remove split pin.

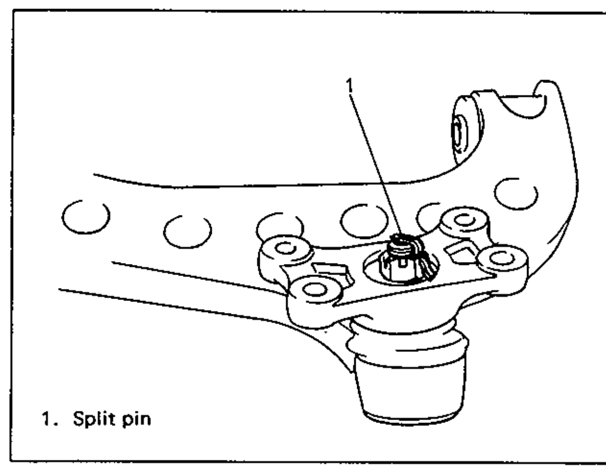


Fig. 3E-23

7) Remove ball joint castle nut as shown below.

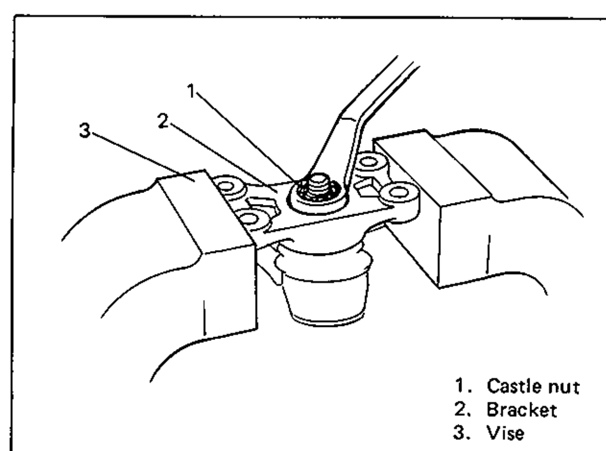


Fig. 3E-24

8) Using bearing puller, remove bracket from ball joint stud bolt.

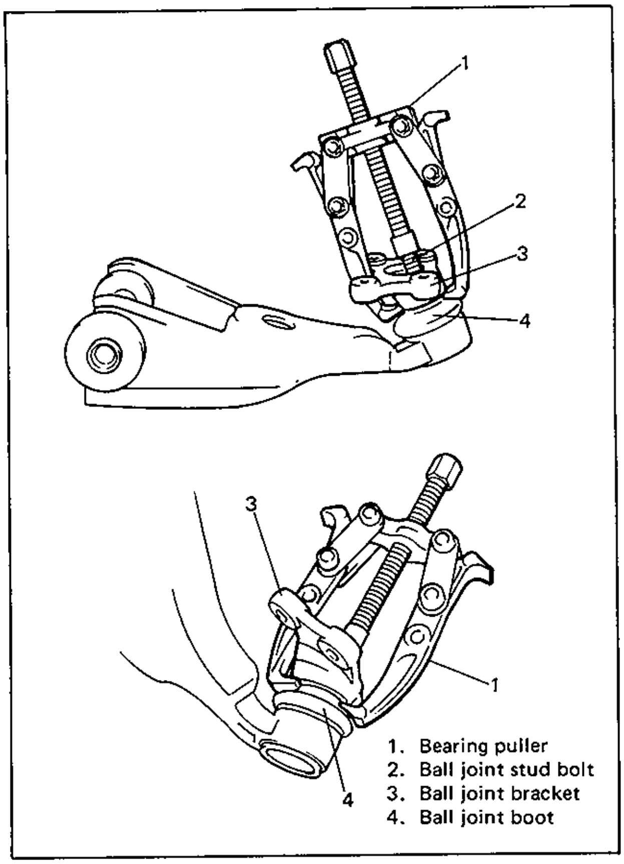


Fig. 3E-25

9) Remove ball joint boot set ring and ball joint boot.

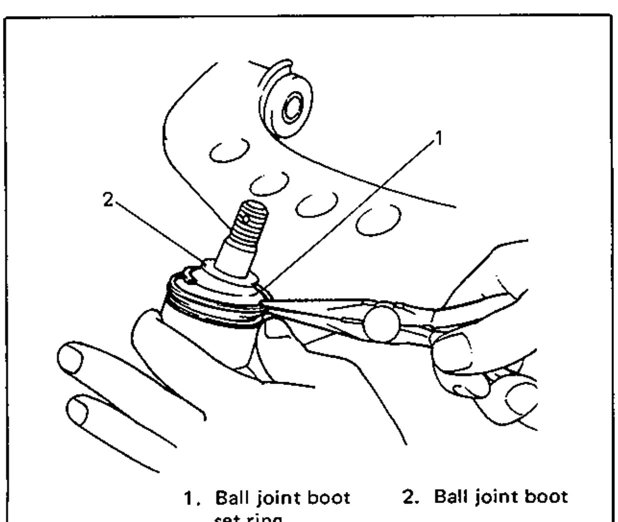


Fig. 3E-26

10) To replace upper arm front bush, remove flange (made of rubber) inside of it by cutting all around it with knife.

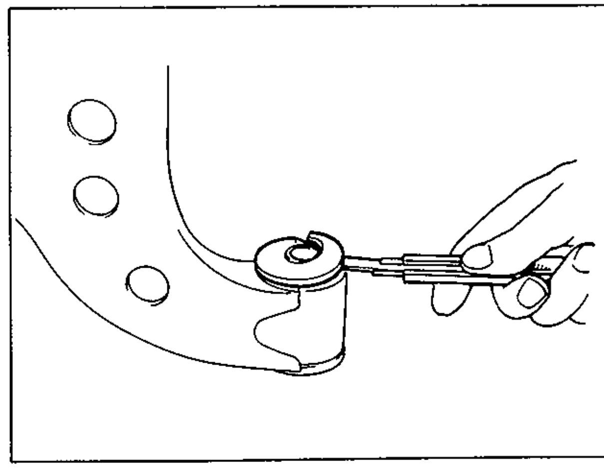


Fig. 3E-27

Then remove bush by using oil hydraulic press and special tool (A).

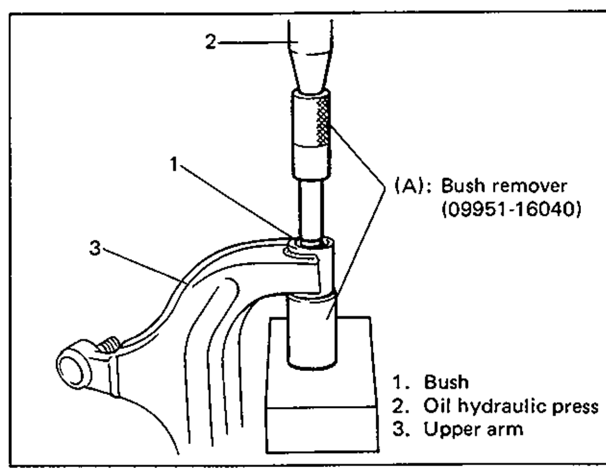


Fig. 3E-28

INSTALLATION

Install in reverse order of removal procedure, taking note of following items.

1) To facilitate work, apply water or soap water around bush before installing it. Then press-fit it into upper arm by using special tools as in removal.

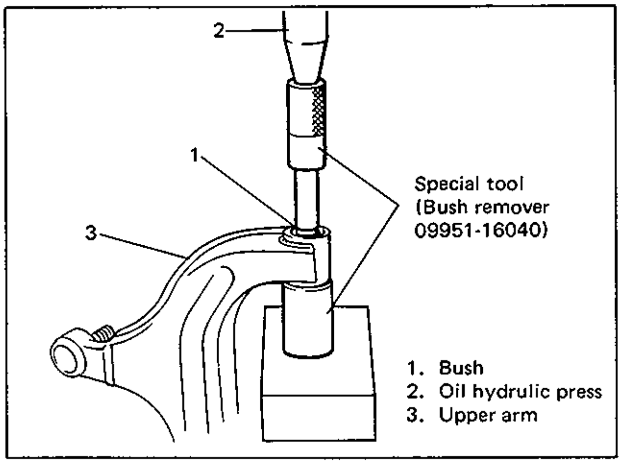


Fig. 3E-29

2) When installing ball joint boot, be sure to fit boot set wire into ring groove in boot.

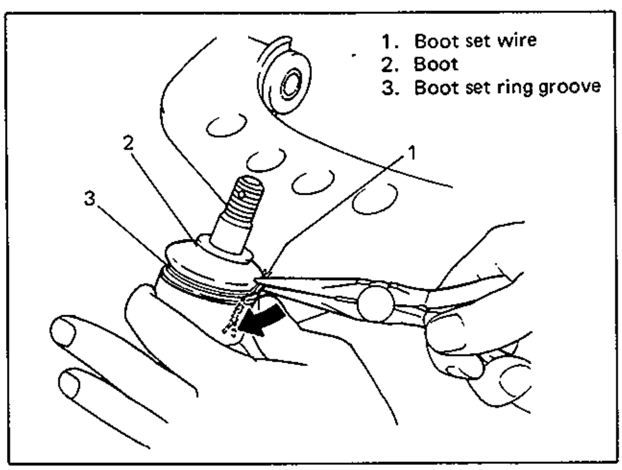


Fig. 3E-30

3) After installing ball joint bracket to ball joint stud bolt, tighten castle nut till split pin hole in stud bolt aligns with slot in nut but within range of specified torque.

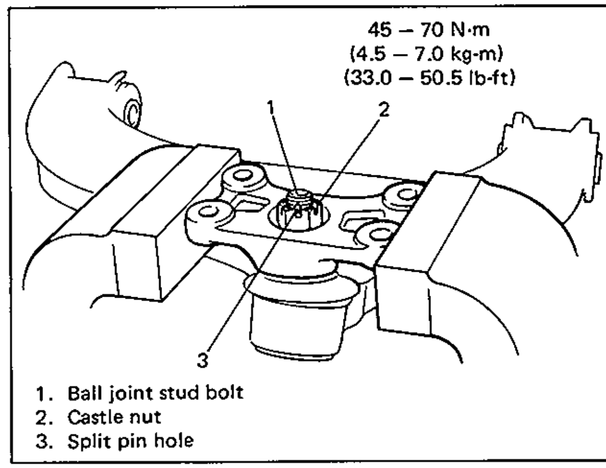


Fig. 3E-31

4) Install new split pin and bend split pin securely as shown.

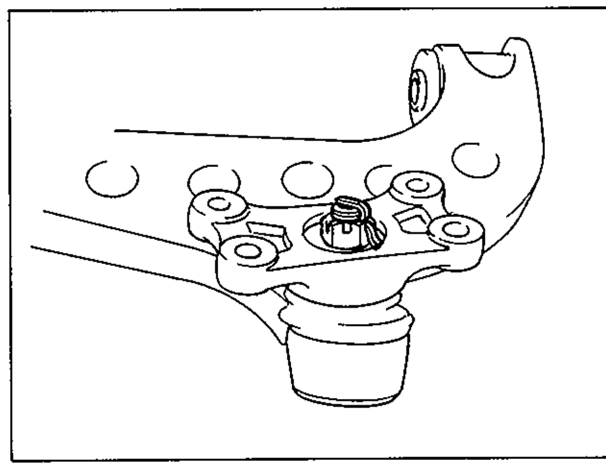


Fig. 3E-32

5) Install front side of upper arm to vehicle body. Refer to figure below for proper installing direction of right and left bolts. Nuts should not be tightened.

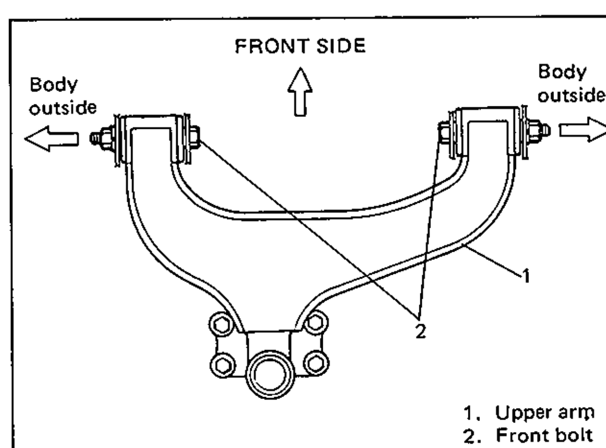


Fig. 3E-33

6) Use floor jack under differential carrier to support axle housing and facilitate job in step 7).
7) Install ball joint bracket to differential carrier and tighten bolts to specified torque.

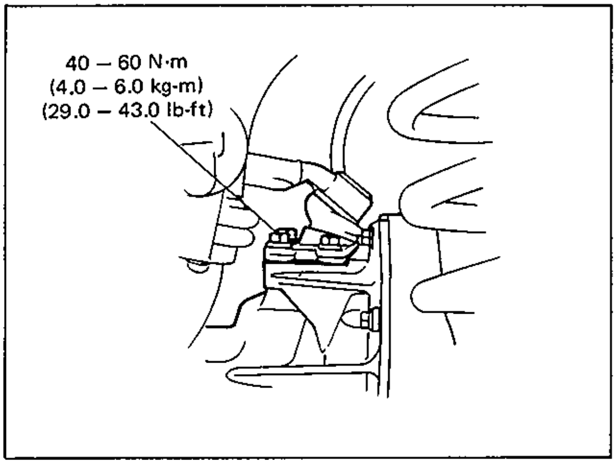


Fig. 3E-34

8) Remove floor jack from differential carrier.
9) With vehicle hoisted, tighten upper arm front nuts (right & left) to specified torque.

NOTE:
Be sure that no load is applied to suspension when tightening front nuts.

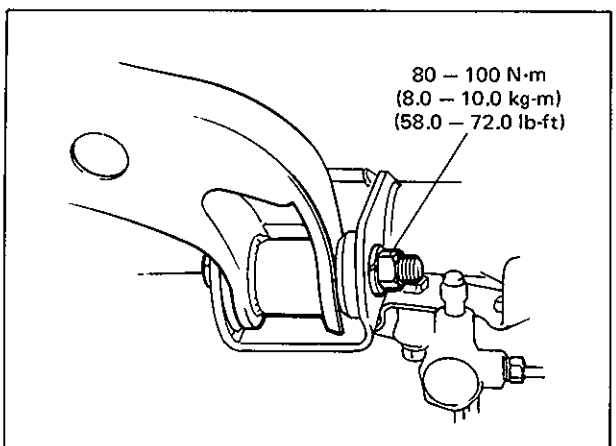


Fig. 3E-35

10) Install bracket to upper arm and tighten bracket bolts to specified torque.

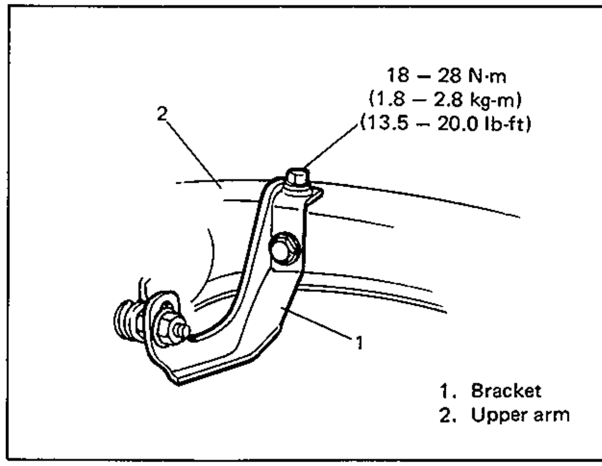


Fig. 3E-36

11) Install wheels and tighten wheel nuts to specified torque.

Tightening torque for wheel nuts	N·m	kg-m	lb-ft
	80–110	8.0–11.0	58.0–79.5

12) Lower hoist.
13) With vehicle off hoist and in non loaded condition, measure length of coil spring of LSPV (Load Sensing Proportioning Valve). It should be within specification.
For details, refer to page 5-52 of this manual.

REAR AXLE SHAFT AND WHEEL BEARING

REMOVAL

1) Remove rear brake drum. For details, refer to steps 1) to 6) of REAR BRAKE DRUM REMOVAL on page 5-38.

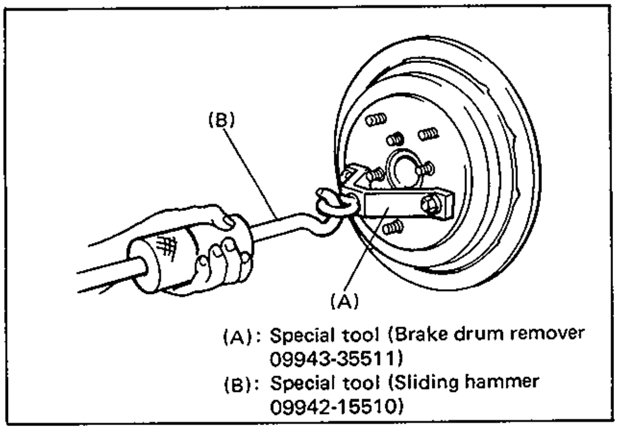


Fig. 3E-37

2) Drain gear oil from rear axle housing by loosening drain plug.

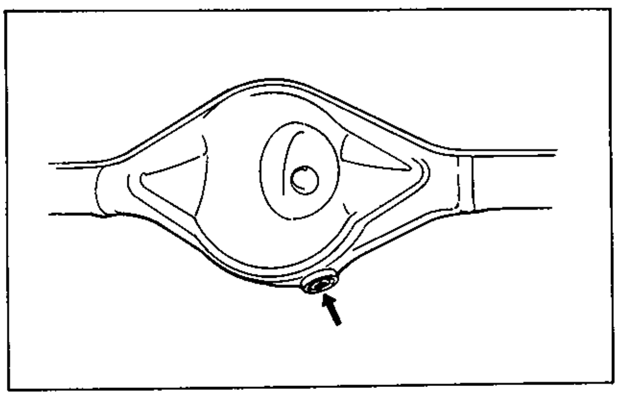


Fig. 3E-38

3) Remove rear wheel bearing retainer nuts from axle housing.

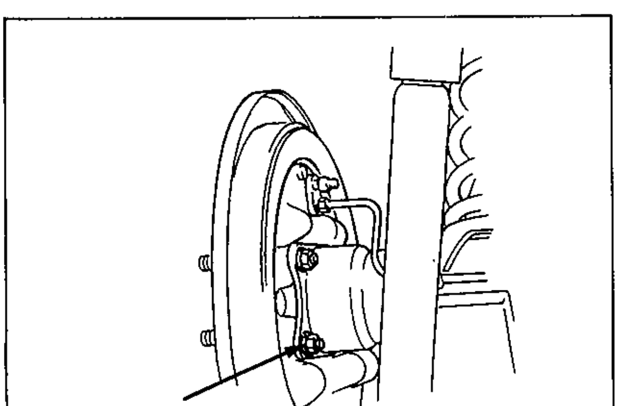


Fig. 3E-39

4) Check to ensure that there is clearance between rear wheel bearing retainer and parking brake shoe lever. If no clearance is found, loosen cable locking nut further to obtain clearance. Also, pull brake shoe hold down pin stopper plate again.

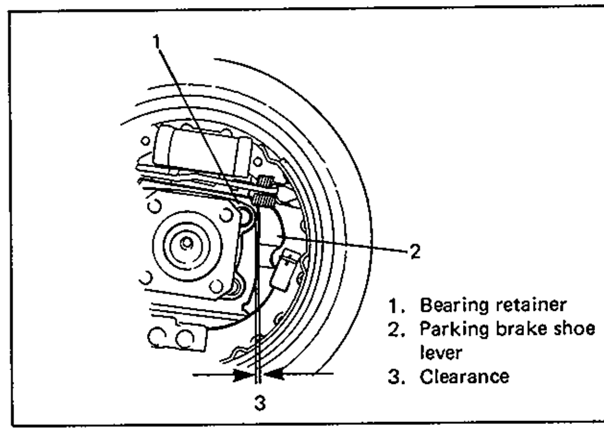


Fig. 3E-40

5) Using special tools (A & B) indicated below, draw out axle shaft.

NOTE:
Use care not to pull brake back plate along with shaft.

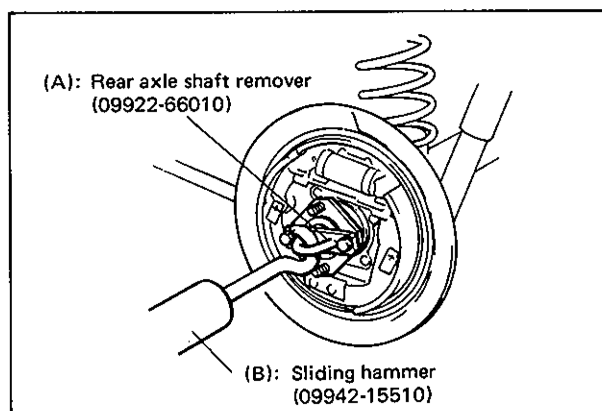
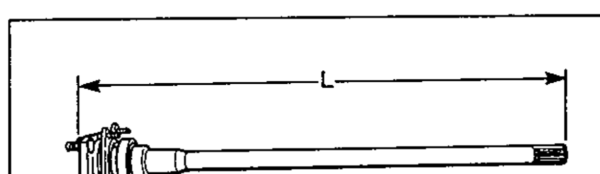


Fig. 3E-41

6) Rear axle shaft that was drawn out.



Shaft length "L"	
Left side	679.5 mm (26.8 in)
Right side	722.5 mm (28.4 in)

Fig. 3E-42

7) In order to remove the retainer ring from the shaft, grind with a grinder two parts of the bearing retainer ring as illustrated till it becomes thin.

> **CAUTION:**
> **Be careful not to go so far as to grind the shaft.**

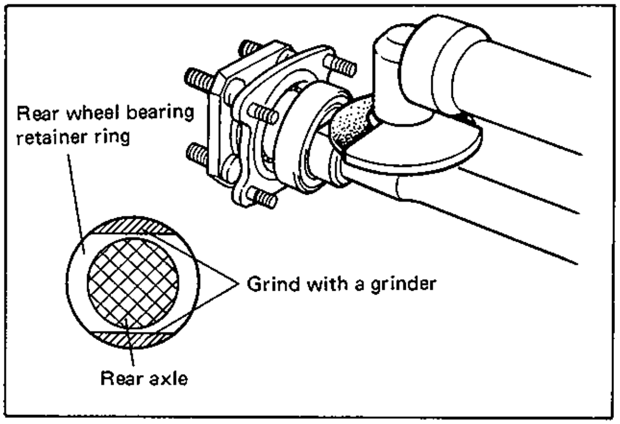


Fig. 3E-43

8) Break with a chisel the thin ground retainer ring, and it can be removed.

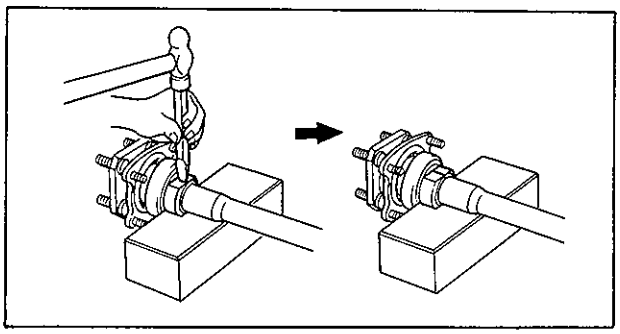


Fig. 3E-44

9) Remove bearing from shaft by using oil hydraulic press.

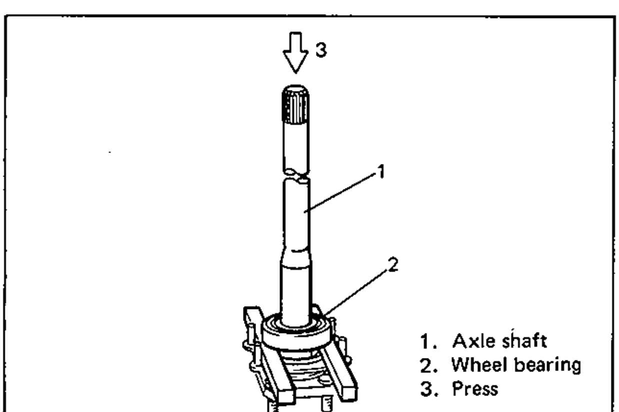


Fig. 3E-45

INSTALLATION

Install removed parts in reverse order of removal procedure, noting the following.

1) To install bearing retainer oil seal, be sure to apply small amount of grease to its periphery and press-fit it by using special tools (A & B). Be careful so that it is press-fit in proper direction, to proper extent and evenly. For its proper installing direction and extent, refer to figure below.
   Apply grease to oil seal lip as shown below and install it to axle shaft.

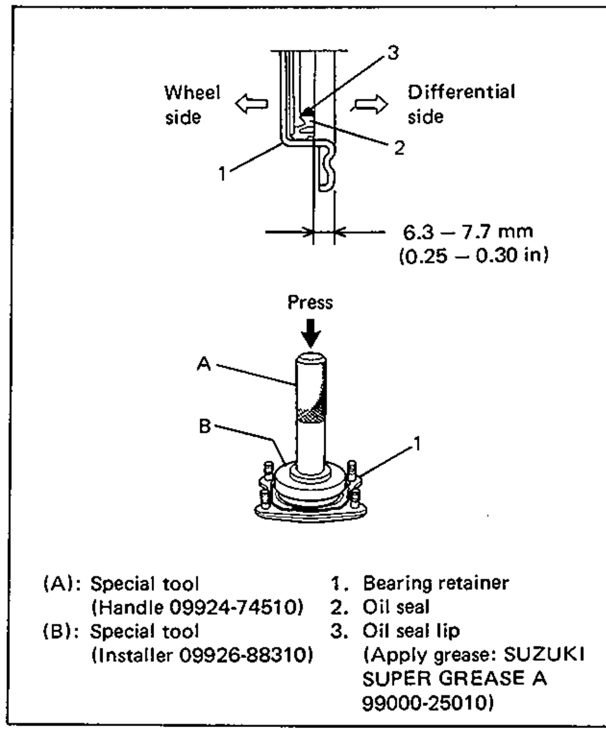


Fig. 3E-46

2) Install bearing retainer to shaft.

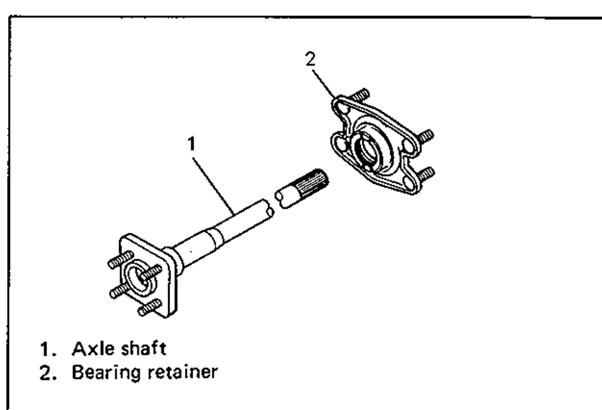


Fig. 3E-47

3) Press-fit wheel bearing and retainer ring as shown.

NOTE:
Use care not to cause any damage to outside of retainer ring.

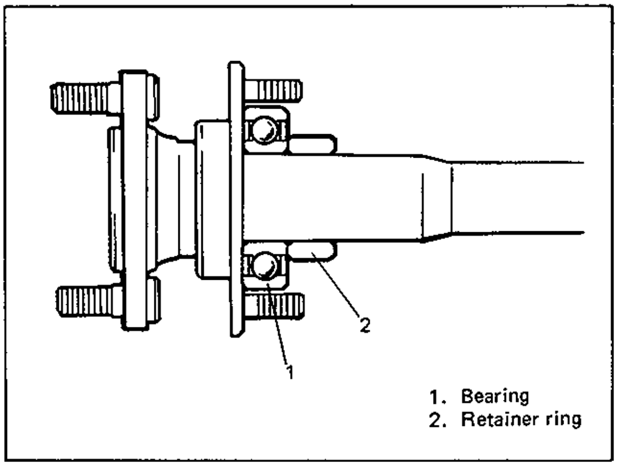


Fig. 3E-48

4) Apply grease to axle shaft inner oil seal lip as shown below.

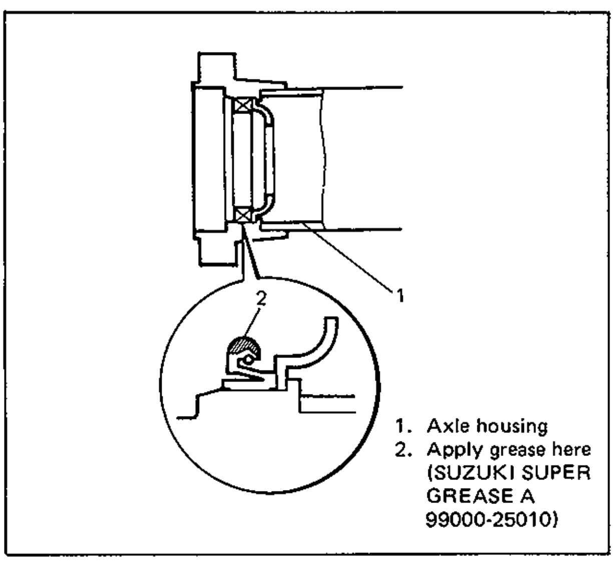


Fig. 3E-49

5) Apply sealant to mating surface of bearing retainer with brake back plate.

NOTE:
Make sure to remove old sealant before applying it anew.

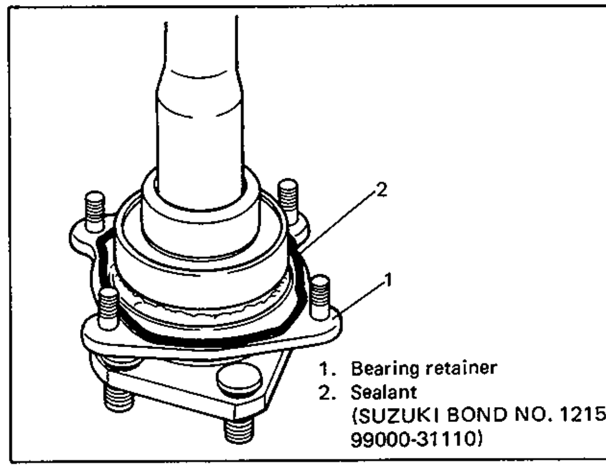


Fig. 3E-50

6) Install rear axle shaft to rear axle housing and tighten bearing retainer nuts to specified torque.

NOTE:
When installing rear axle shaft, be careful not to cause damage to oil seal lip in axle housing.

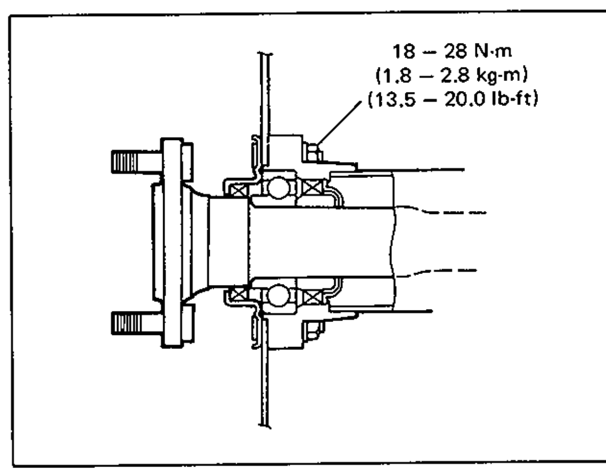


Fig. 3E-51

7) Refill rear axle (defferential) housing with new specified gear oil. Refer to SECTION 7E (page 7E-5) for refill.
8) Install brake drum. (For details, refer to steps 1) to 7) of BRAKE DRUM INSTALLATION on page 5-40.)

REAR AXLE SHAFT INNER OIL SEAL

REMOVAL

1) Remove rear axle shaft. For details, refer to steps 1) to 6) of REAR AXLE SHAFT REMOVAL on page 3E-11.
2) Remove rear axle shaft inner oil seal.

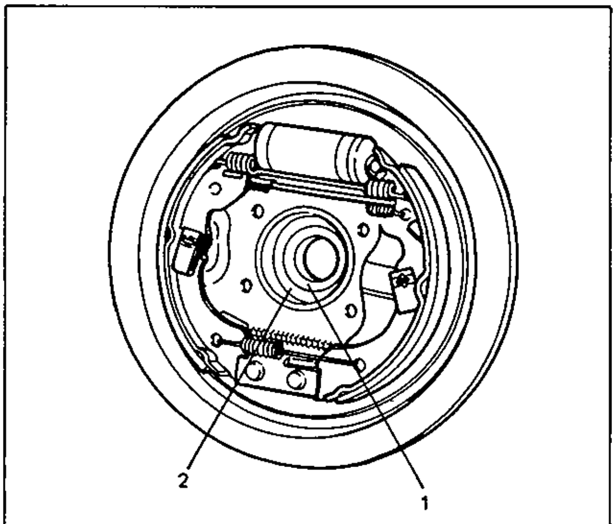


Fig. 3E-52

INSTALLATION

1) Using special tools (A & B), drive in oil seal until it contacts oil seal protector in axle housing.

NOTE:

- **Make sure that oil seal is free from inclination as it is installed.**
- **Refer to figure below so that oil seal is installed in proper direction.**

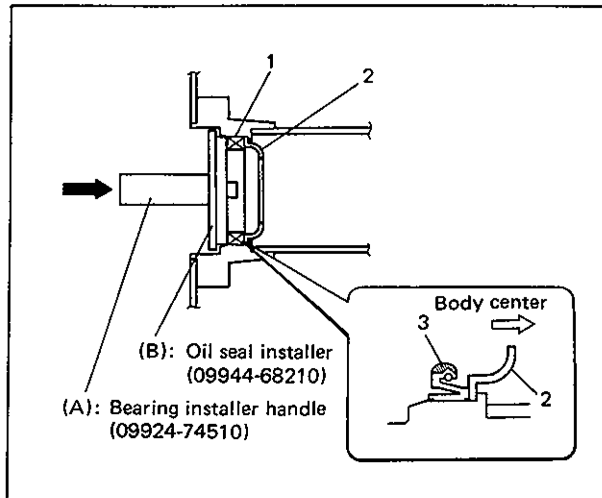


Fig. 3E-53

2) For procedure hereafter, refer to steps 4) to 8) of REAR AXLE SHAFT INSTALLATION on page 3E-13.

REAR AXLE HOUSING

REMOVAL

1) Drain differential gear oil.
   Carry out steps 2) to 6) and 14) to 16) on both right and left wheels.
   Note that left wheel and its related parts are used in illustrations in this section.
2) Remove rear brake drum. (Refer to steps 1) to 6) of BRAKE DRUM REMOVAL, page 5-38.)
3) Disconnect brake pipe from wheel cylinder. With right side wheel cylinder, disconnect 2 brake pipes.

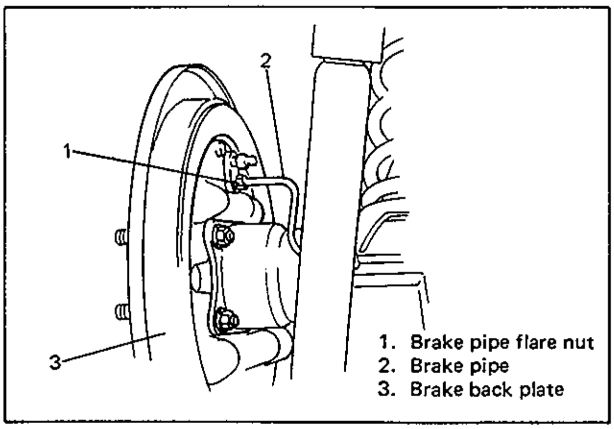


Fig. 3E-54

4) Remove rear wheel bearing retainer nuts from rear axle housing.

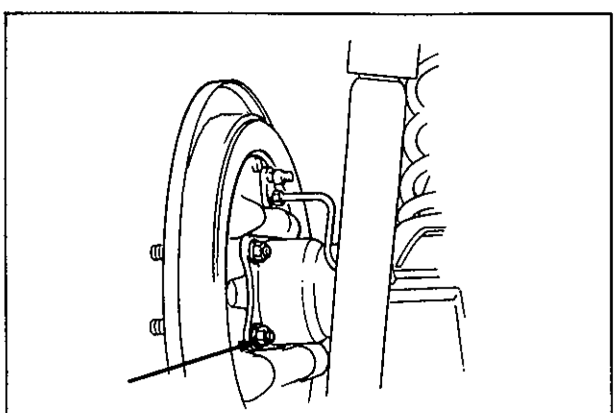


Fig. 3E-55

5) Check to make sure that there is clearance between rear wheel bearing retainer and parking brake shoe lever. If no clearance is found, loosen parking cable adjusting nut further to obtain clearance. Also push brake shoe hold down spring through brake back plate hole. (Refer to DRUM AND COMPONENTS R & I in SECTION 5.)

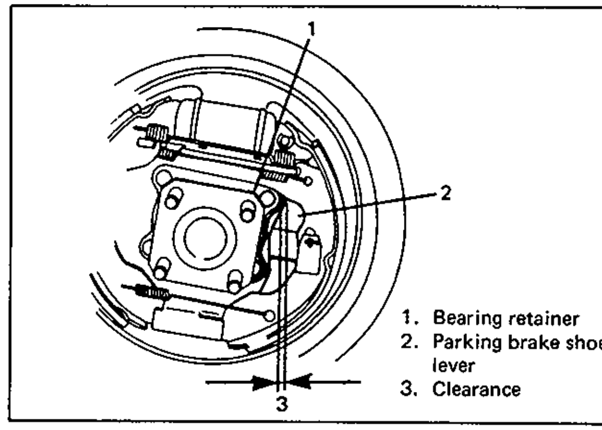


Fig. 3E-56

6) Using special tools (A & B) indicated below, draw out axle shaft.

   NOTE:
   Use care not to pull brake back plate along with shaft.

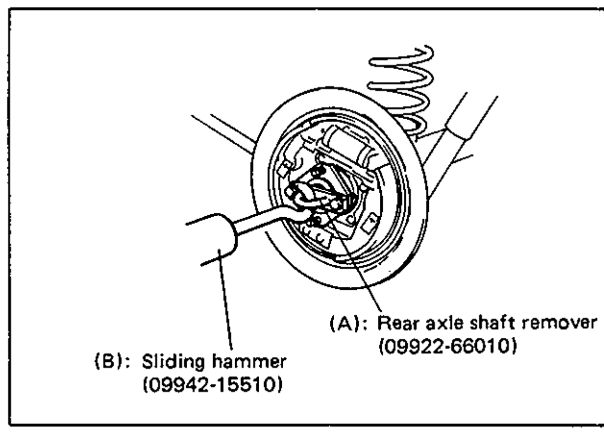


Fig. 3E-57

7) Disconnect brake pipe from flexible hose and remove E-ring.

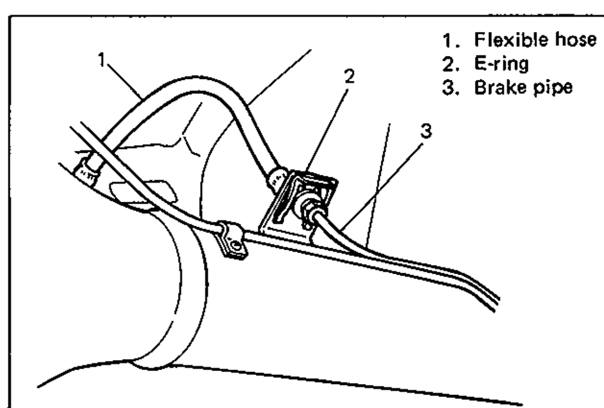


Fig. 3E-58

8) Remove brake pipe clamps and pipes from axle housing.
9) Disconnect breather hose from axle housing.

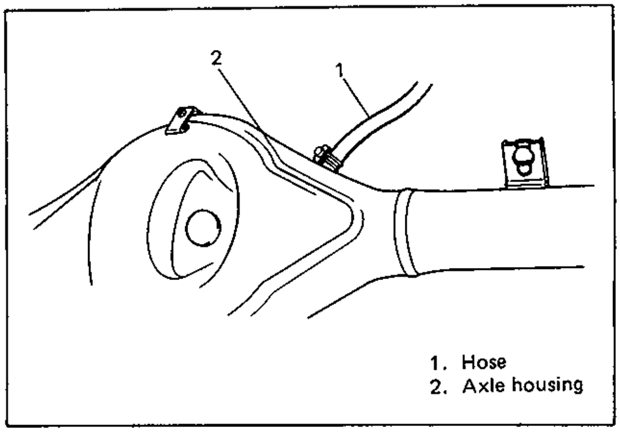


Fig. 3E-59

10) Before removing propeller shaft, give match marks on joint flange and propeller shaft as shown below.
Remove propeller shaft.

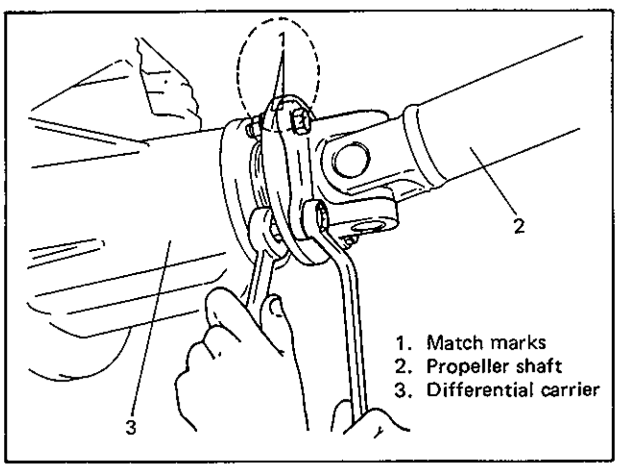


Fig. 3E-60

11) For jobs hereafter, support rear axle housing by using floor jack under axle housing.

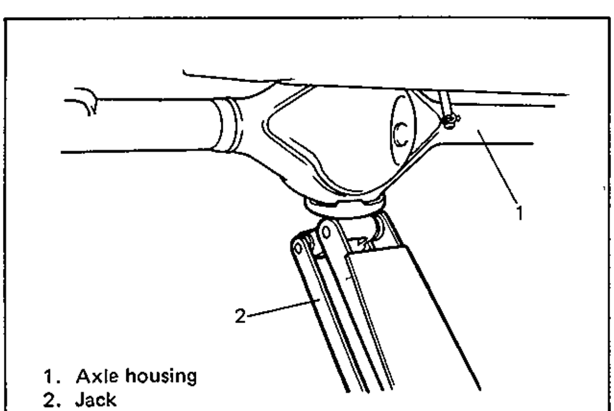


Fig. 3E-61

12) Detach ball joint bracket from differential carrier.

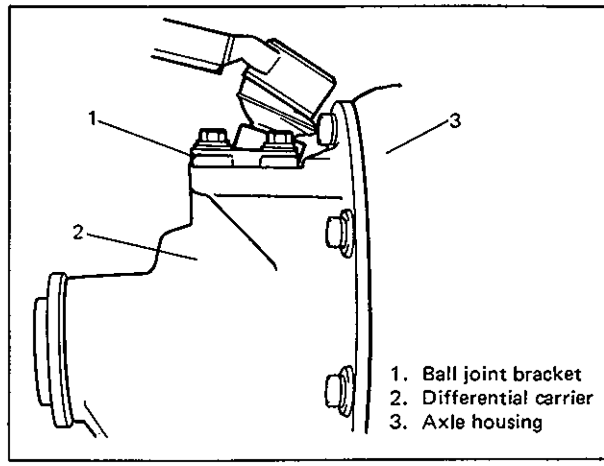


Fig. 3E-62

13) Remove differential carrier assembly.

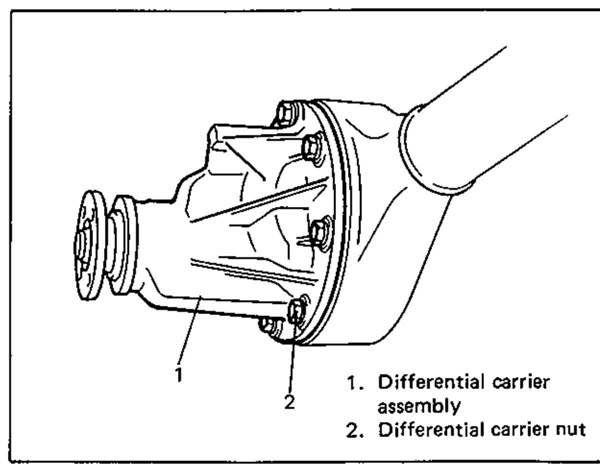


Fig. 3E-63

14) Loosen rear mount nut of trailing rod but don't remove bolt.

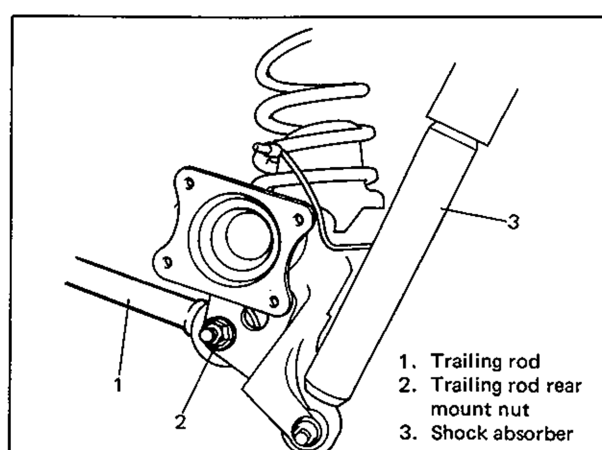


Fig. 3E-64

15) Remove shock absorber lower mount bolt.

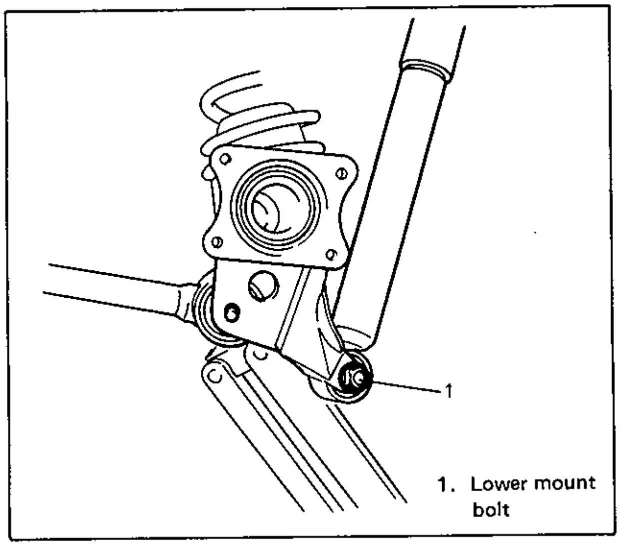


Fig. 3E-65

16) Lower floor jack until tension of suspension coil spring becomes a little loose and remove rear mount bolt of trailing rod.
17) Lower rear axle housing gradually.
18) Remove axle housing.

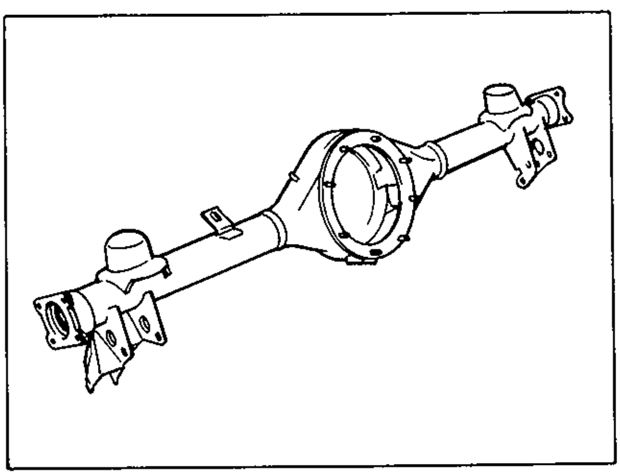


Fig. 3E-66

INSTALLATION

Install removed parts in reverse order of removal, noting the following.

1) Place rear axle housing on floor jack. Then install trailing rod rear mounting bolts (right & left) in proper direction as shown below. At this time, mount nuts but don't tighten them.

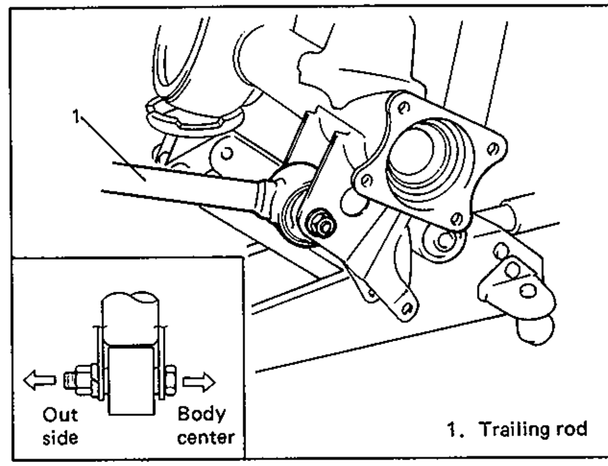


Fig. 3E-67

2) Install coil spring (right & left) on spring seat of axle housing and raise axle housing.

NOTE:
When seating coil spring, mate spring end with stepped part of rear axle spring seat as shown.

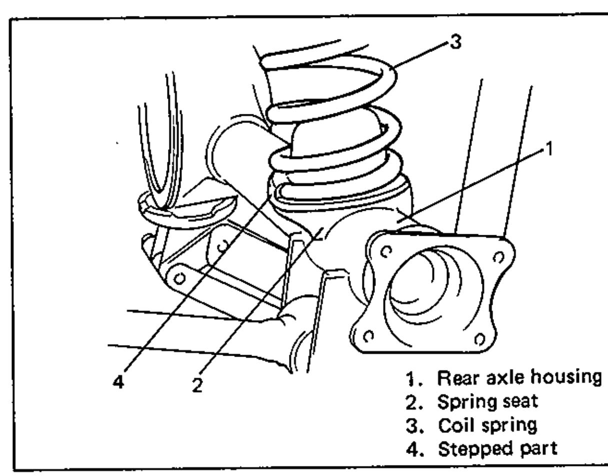


Fig. 3E-68

3) Install lower part of shock absorber to right and left sides of axle housing and install bolts in proper direction as shown in following figure. At this time, mount nuts but don't tighten them.

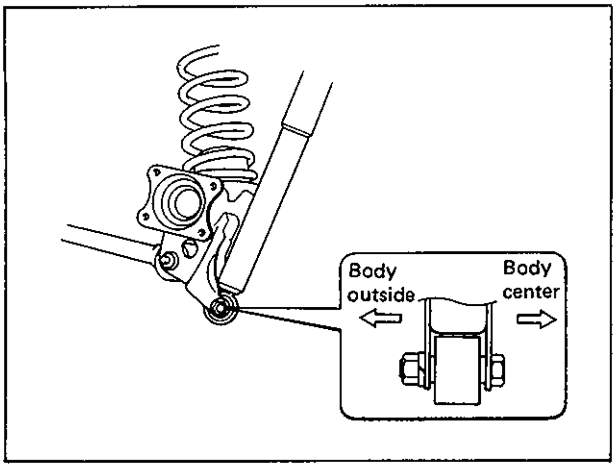


Fig. 3E-69

4) Clean mating surfaces of axle housing and differential carrier and apply sealant to housing side.

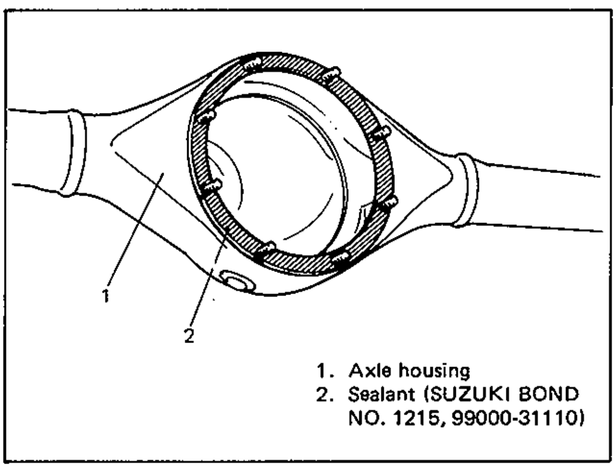


Fig. 3E-70

5) Install differential carrier assembly to axle housing and tighten carrier nuts to specified torque.

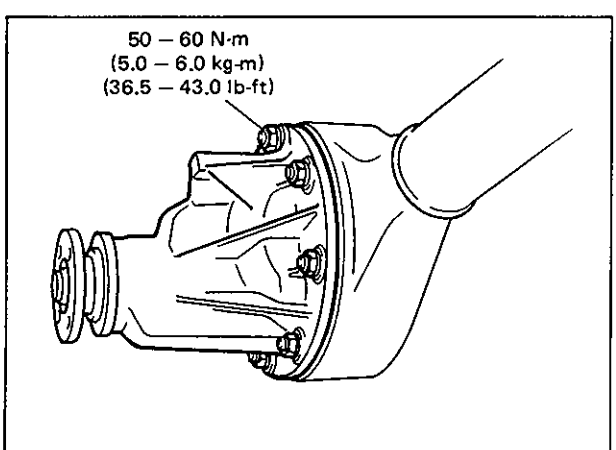


Fig. 3E-71

6) Install rear upper arm ball joint bracket onto differential carrier and tighten bolts to specified torque.
If it is difficult to install bracket bolts, raising or lowering floor jack supporting axle housing will help.

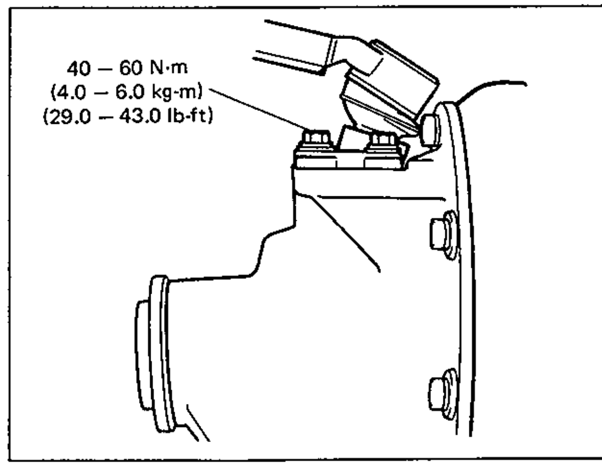


Fig. 3E-72

7) Install propeller shaft with match marks aligned and torque nuts to specification.

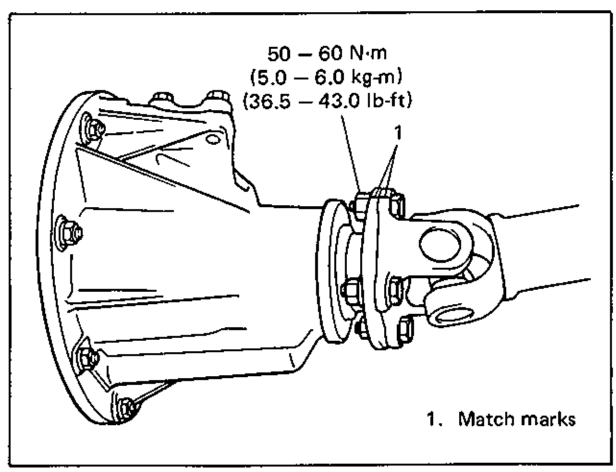


Fig. 3E-73

8) Remove floor jack from axle housing.

9) Connect breather hose onto axle housing and clamp it securely.
10) Connect brake pipes onto axle housing and clamp them securely.
For clamping positions, refer to page 5-27 of this manual.
11) Connect brake flexible hose to bracket on axle housing and secure it with E-ring.

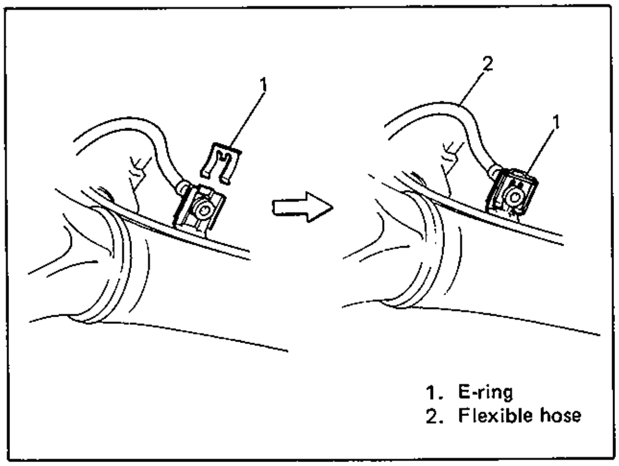


Fig. 3E-74

12) Connect brake pipe to brake flexible hose and tighten brake pipe flare nut to specified torque.

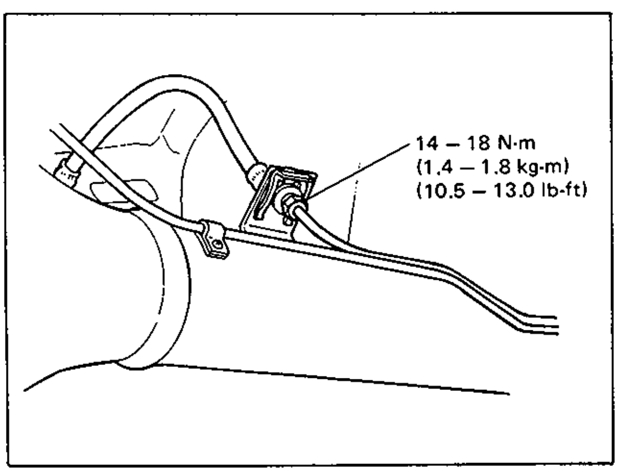


Fig. 3E-75

13) Clean mating surface of axle housing (right & left) with brake back plate and apply sealant as shown below.

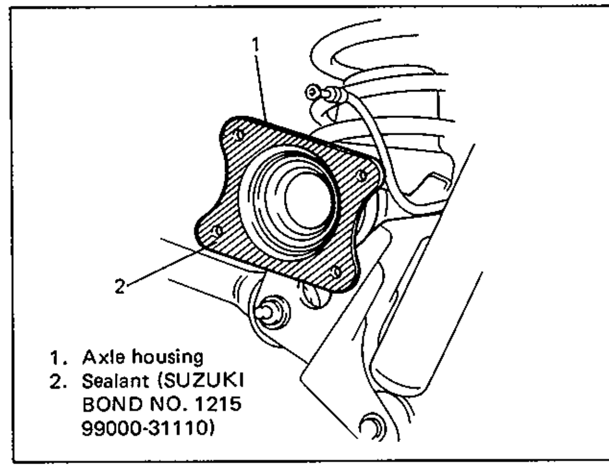


Fig. 3E-76

14) Apply sealant to mating surfaces of retainer (right & left) and brake back plate as shown below.

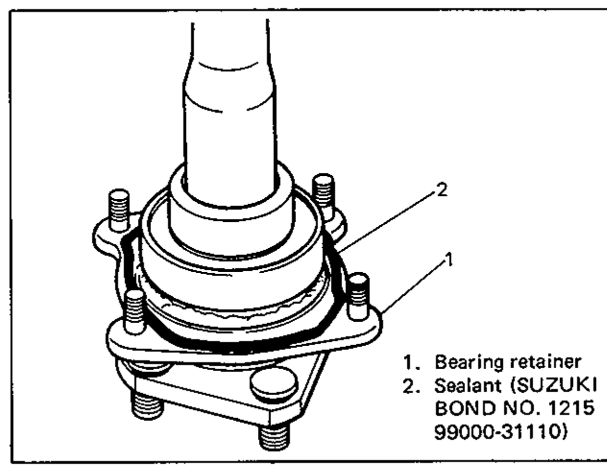


Fig. 3E-77

15) Apply grease to axle shaft inner oil seals lip (right & left) as shown below.

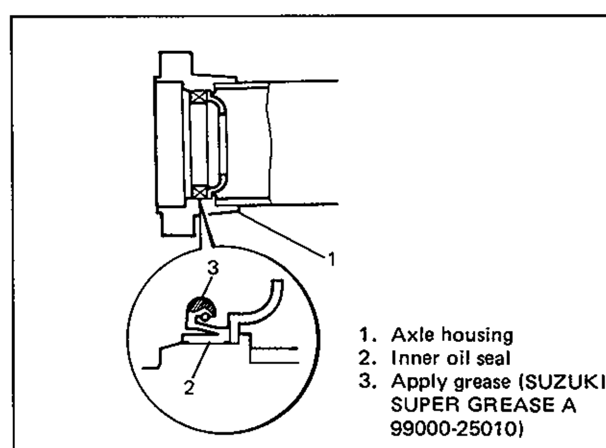


Fig. 3E-78

16) Install rear axle shaft (right & left) to rear axle housing and tighten bearing retainer nuts to specified torque.

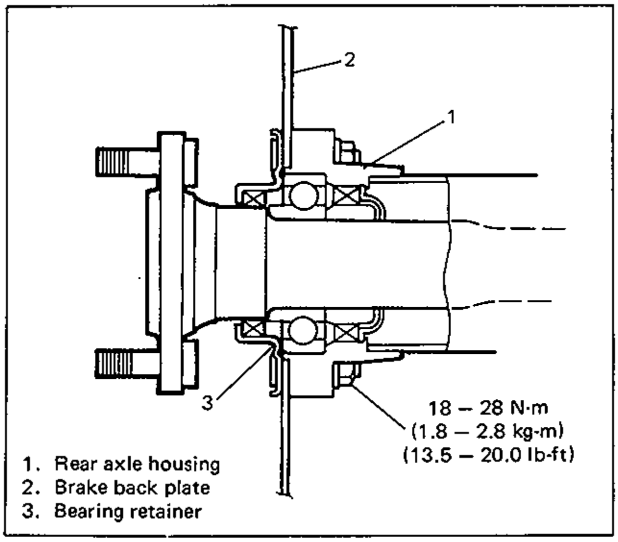


Fig. 3E-79

17) Connect brake pipes to wheel cylinders (right & left) and tighten brake pipe flare nuts to specified torque.

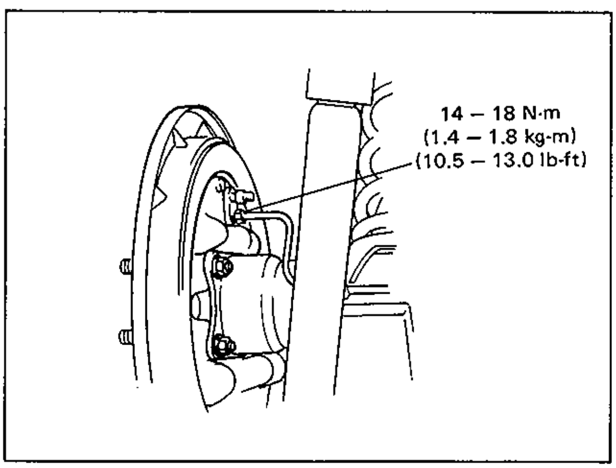


Fig. 3E-80

18) Install brake drum (right & left). For details, refer to steps 1) to 3) of BRAKE DRUM INSTALLATION on page 5-40.
19) Refill differential gear housing with new specified gear oil. Refer to "ON-VEHICLE SERVICE" in SECTION 7E for refill.
20) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, see page 5-23.)
21) Install wheel and tighten wheel nuts to specified torque.

Tightening torque for wheel nuts	N·m	kg-m	lb-ft
	80–110	8.0–11.0	58.0–79.5

22) Upon completion of all jobs, depress brake pedal with about 30 kg (66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance.
    Adjust parking brake cable (for adjustment, see page 5-22.)
23) Tighten parking brake lever cover screws.
24) Lower hoist.
25) Tighten right and left trailing rod nuts and shock absorber nuts to specified torque.

    NOTE:
    When tightening these nuts, be sure that vehicle is off hoist and in non loaded condition.

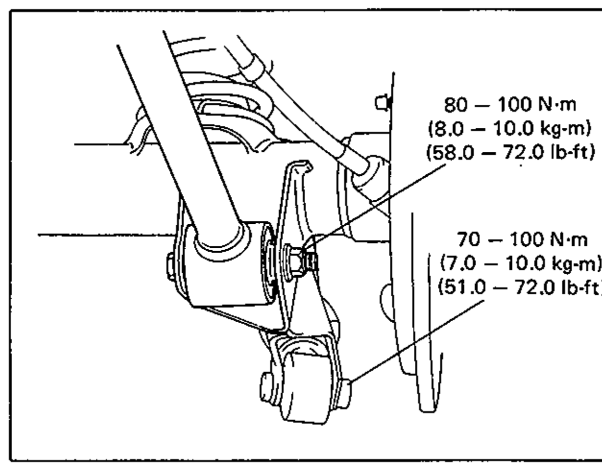


Fig. 3E-81

26) Check to ensure that brake drum is free from dragging and proper braking is obtained.
27) Perform brake test (foot brake and parking brake).
28) Check each installed part for oil leakage.

REAR SUSPENSION INSPECTION

REAR SHOCK ABSORBER

- Inspect for deformation or damage.
- Inspect bushings for wear or damage.
- Inspect for evidence of oil leakage.

Replace any defective part.

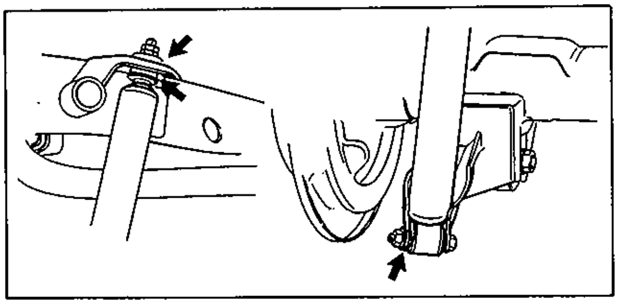


Fig. 3E-82

WARNING:
When handling rear shock absorber in which high-pressure gas is sealed, make sure to observe the following precautions.
1) Don't disassemble it.
2) Don't put it into the fire.
3) Don't store it where it gets hot.
4) Before disposing it, be sure to drill a hole in it where shown by an arrow in the figure below and let gas and oil out. Lay it down sideways for this work.

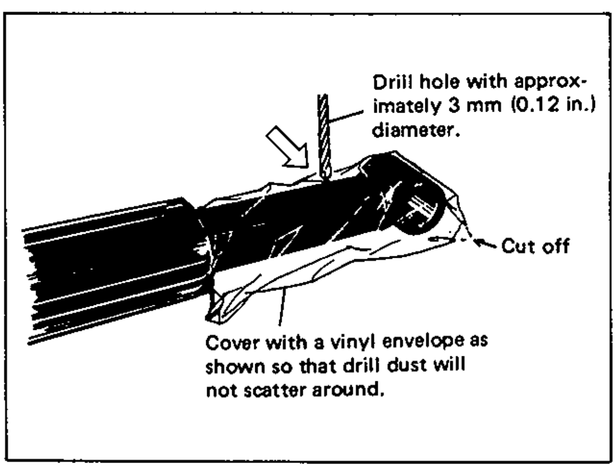


Fig. 3E-82-1

TRAILING ROD, UPPER ARM, AXLE HOUSING AND COIL SPRING

Inspect for cracks, deformation or damage.
Replace any defective part.

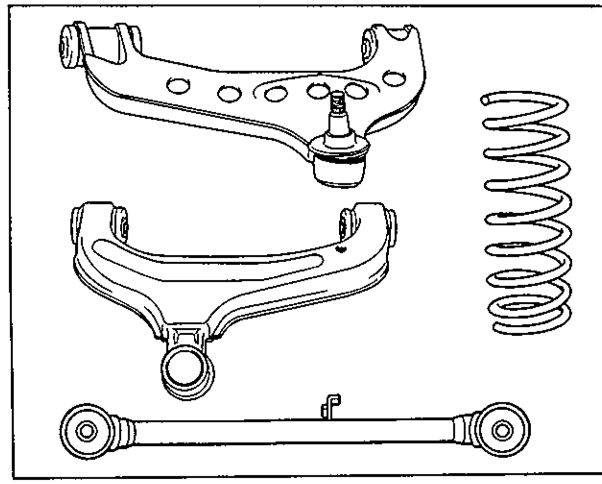


Fig. 3E-83

REAR SUSPENSION FASTENERS

Check each bolt and nut fastening suspension parts for tightness. Tighten loose one, if any, to specified torque, referring to page 3E-23 of this section.

UPPER ARM BALL JOINT

- Check joint boot for breakage or damage. Replace damaged joint boot.

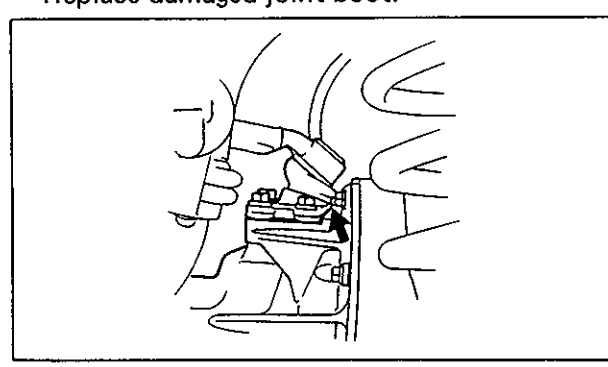


Fig. 3E-84

- Check ball stud for smoothness of rotation.
- Inspect for play in ball joint.

NOTE:
Upper arm and ball joint cannot be separated. If there is any damage to eigher, upper arm assembly must be replaced as a complete unit.

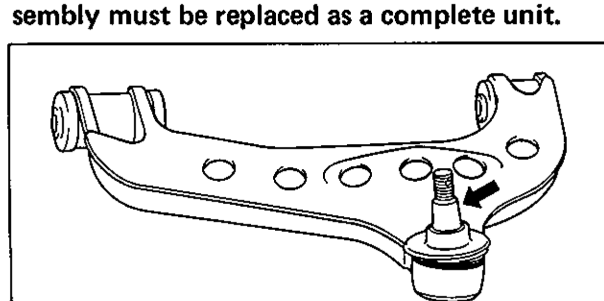


Fig. 3E-85

BEARING RETAINER AND AXLE SHAFT INNER OIL SEAL

- When brake drum has been removed, check inside of brake drum for gear oil leakage.
- Also, check backside of brake back plate for oil leakage.

If oil leakage is found, replace defective oil seal.

- Whenever it is possible to check oil seal during disassembly, check its lip for wear.

If oil leakage or worn lip is found, replace defective oil seal.

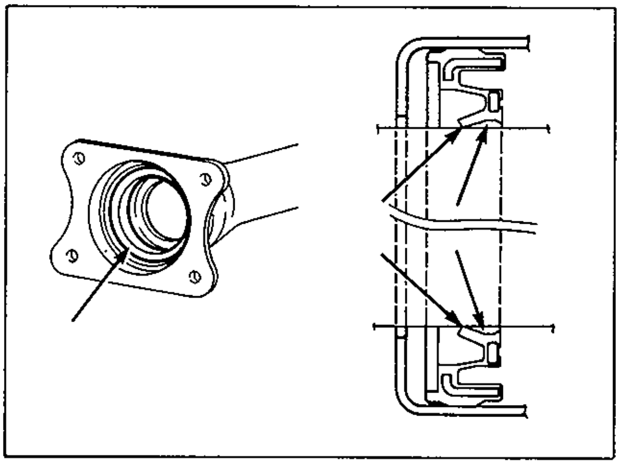


Fig. 3E-86

TRAILING ROD AND UPPER ARM BUSH

Inspect wear and breakage. If found defective, replace.

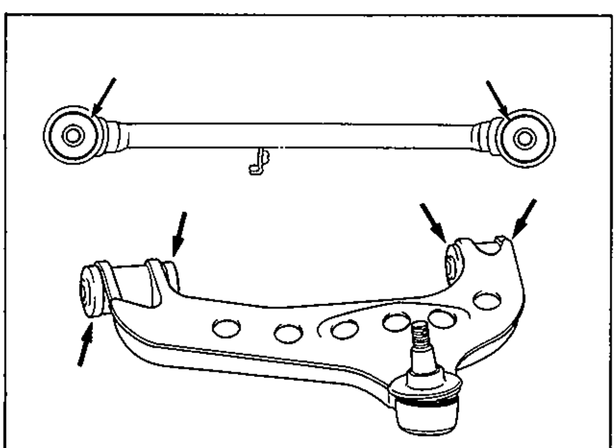


Fig. 3E-87

WHEEL DISC, NUT & BEARING

- Inspect each wheel disc for dents, distortion and cracks. A disc in badly damaged condition must be replaced.
- Check wheel hub nuts for tightness and, as necessary, retighten to specification.

Tightening torque for wheel nuts	N·m	kg-m	lb-ft
	80–110	8.0–11.0	58.0–79.5

- Check wheel bearings for wear. When measuring thrust play, apply a dial gauge to axle shaft center after removing wheel center cap from wheel disc.

Thrust play limit	Rear	0.8 mm (0.03 in)

When measurement exceeds limit, replace bearing.

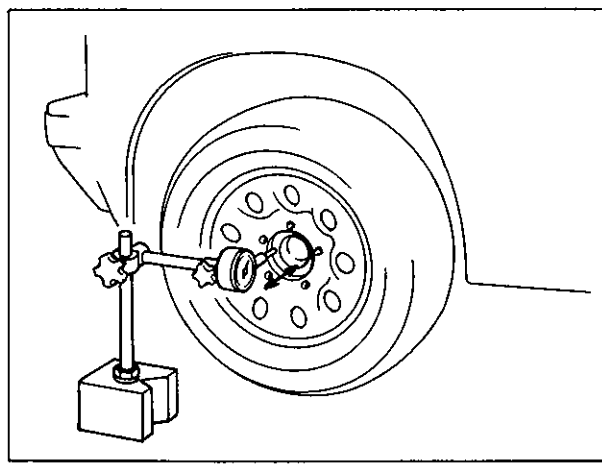


Fig. 3E-88

- By rotating wheel actually, check wheel bearing for noise and smooth rotation. If it is defective, replace bearing.

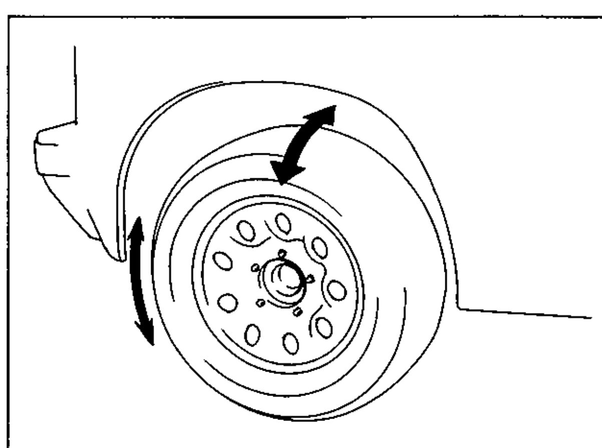


Fig. 3E-89

RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts		Tightening torque		
		N·m	kg-m	lb-ft
1. Shock absorber lock nut		22 – 35	2.2 – 3.5	16.0 – 25.0
2. Shock absorber nut		22 – 35	2.2 – 3.5	16.0 – 25.0
3. Shock absorber lower nut		70 – 100	7.0 – 10.0	51.0 – 72.0
4. Trailing rod nut (Front) (Rear)		80 – 100	8.0 – 10.0	58.0 – 72.0
5. Ball joint bracket bolt		40 – 60	4.0 – 6.0	29.0 – 43.0
6. Upper arm front nut		80 – 100	8.0 – 10.0	58.0 – 72.0
7. Differential carrier nut		50 – 60	5.0 – 6.0	36.5 – 43.0
8. Propeller shaft nut				
9. Brake pipe flare nut		14 – 18	1.4 – 1.8	10.5 – 13.0
10. Bearing retainer nut		18 – 28	1.8 – 2.8	13.5 – 20.0
11. Ball joint castle nut		45 – 70	4.5 – 7.0	33.0 – 50.5
12. Differential gear oil filler & drain plug	Filler plug	35 – 50	3.5 – 5.0	25.5 – 36.0
	Drain plug	18 – 25	1.8 – 2.5	13.5 – 18.0
13. Brake drum nut		50 – 80	5.0 – 8.0	36.5 – 57.5
14. Wheel nut		80 – 110	8.0 – 11.0	58.0 – 79.5

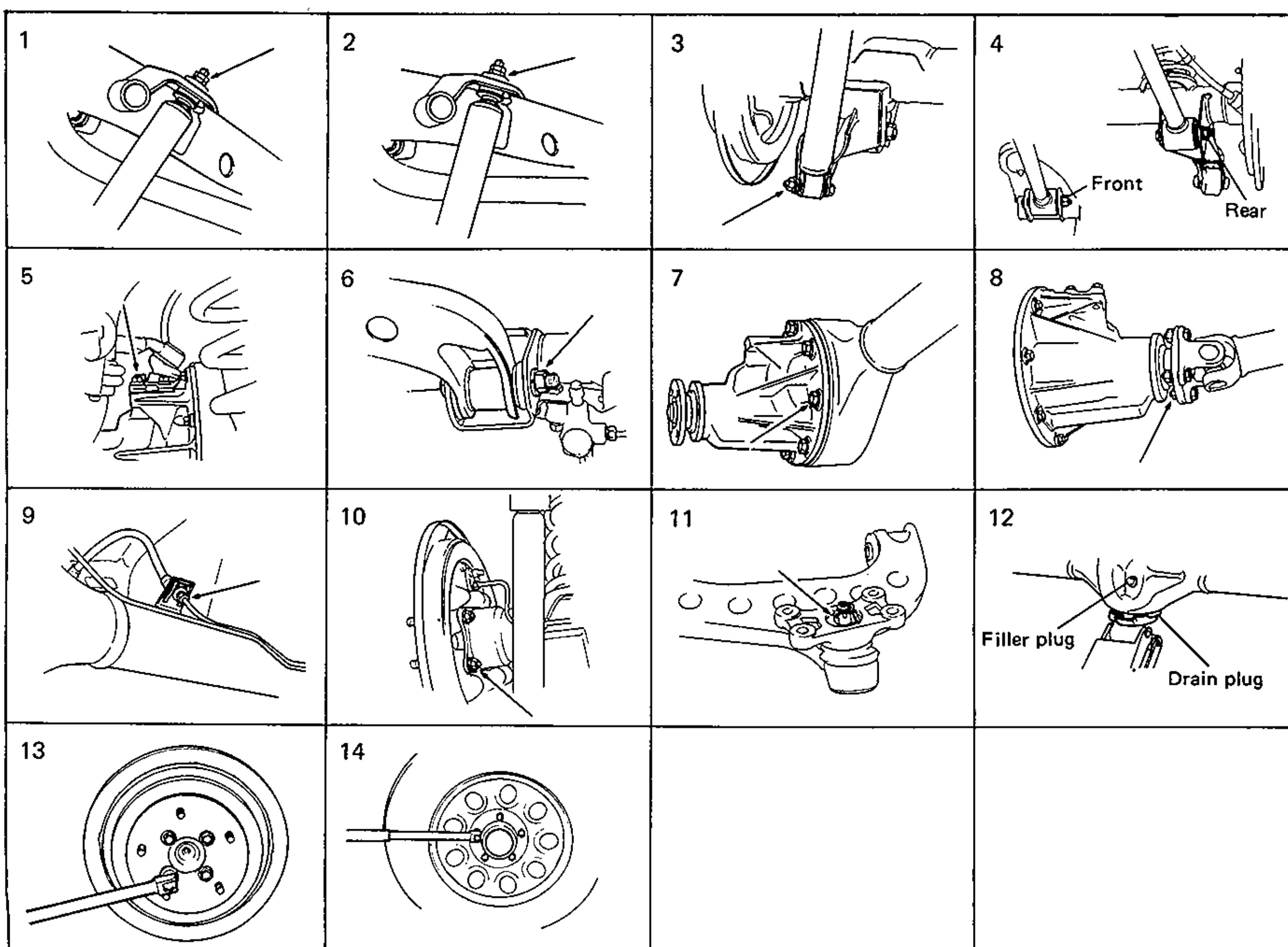


Fig. 3E-90

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	Oil seal lip
Brake fluid	DOT 3 or SAE J 1703	Brake reservoir tank
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	• Joint seam of axle and brake back plate • Joint seam of bearing retainer and brake back plate • Joint seam of differential carrier and axle housing • Drain plug
Gear oil	For gear oil information, refer to SECTION 7E of this manual.	Diffelential gear (Rear axle housing)

SPECIAL TOOLS

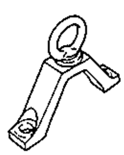
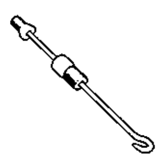
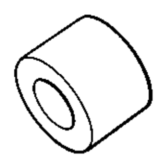
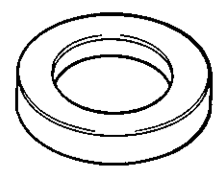
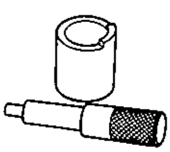
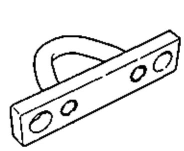
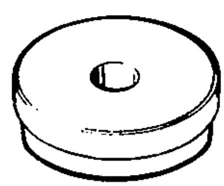
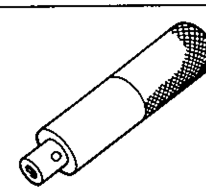
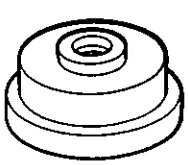
1  09943-35511 Brake drum remover	2  09942-15510 Sliding hammer	3  09951-16030 Bush remover	4  09951-26010 Bush remover plate
5  09951-16040 Bush remover	6  09922-66010 Axle shaft remover	7  09944-68210 Oil seal installer	8  09924-74510 Bush remover handle
9  09926-88310 Oil seal installer			

Fig. 3E-91

SECTION 3F

WHEELS AND TIRES

NOTE:
All wheel fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts.
There is to be no welding as it may result in extensive damage and weakening of the metal.

CONTENTS

GENERAL DESCRIPTION

TIRES

As for tire size which should be used to this vehicle, refer to owner's manual. The tires are of tubeless type. The tires are designed to operate satisfactorily with loads up to the full rated load capacity when inflated to the recommended inflation pressure.
Correct tire pressures and driving habits have an important influence on tire life. Heavy cornering, excessively rapid acceleration, and unnecessary sharp braking increase tire wear.

WHEELS

Standard equipment wheels are 15 x 5½ JJ steel wheels.

REPLACEMENT TIRES

When replacement is necessary, the original equipment type tire should be used. Refer to the Tire Placard.
Replacement tires should be of the same size, load range and construction as those originally on the vehicle. Use of any other size or type tire may affect ride, handling, speedometer/odometer calibration, vehicle ground clearance and tire or snow chain clearance to the body and chassis.

NOTE:
Do not mix different types of tires on the same vehicle such as radial, bias and bias-belted tires except in emergencies, because vehicle handling may be seriously affected and may result in loss of control.

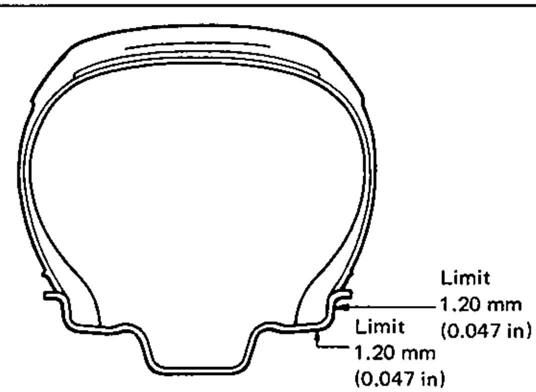
It is recommended that new tires be installed in pairs on the same axle. If necessary to replace only one tire, it should be paired with the tire having the most tread, to equalize braking traction.
The metric term for tire inflation pressure is the kilopascal (kPa). Tire pressures will usually be printed in both kPa and psi on the Tire Placard. Metric tire gauges are available from tool suppliers. The chart, Fig. 3F-1, converts commonly used inflation pressures from kPa to psi.

kPa	kgf/cm^2	psi
160	1.6	23
180	1.8	26
200	2.0	29
220	2.2	32
240	2.4	35
260	2.6	38
280	2.8	41
300	3.0	44
320	3.2	47
340	3.4	50
Conversion: 1 psi = 6.895 kPa 1 kgf/cm^2 = 98.066 kPa		

Fig. 3F-1 Tire Pressure Conversion Chart

WHEELS FOR REPLACEMENT

Wheels must be replaced if they are bent, dented, have excessive lateral or radial runout, leak air through welds, have elongated bolt holes, if lug nuts won't stay tight, or if they are heavily rusted. Wheels with greater runout than shown in Fig. 3F-2 may cause objectional vibrations.
Wheels for replacement must be equivalent to the originally equipped wheels in load capacity, diameter, rim width, offset and mounting configuration. A wheel of improper size or type may affect wheel and bearing life, brake cooling, speedometer/odometer calibration, ground clearance to the body and chassis.



*TOTAL INDICATOR READING
IGNORE INDICATOR "JUMPS"
DUE TO WELD SEAMS, PAINT
RUNS, SCRATCHES, ETC.

Fig. 3F-2 Wheel Runout

MAINTENANCE AND MINOR ADJUSTMENTS

WHEEL MAINTENANCE

Wheel repairs that use welding, heating, or peening are not approved. All damaged wheels should be replaced.

WHEEL ATTACHING STUDS

If a broken stud is found, see Section 3E (rear) or Section 3D (front) for Note and Replacement procedure.

INFLATION OF TIRES

The pressure recommended for any model is carefully calculated to give a satisfactory ride, stability, steering, tread wear, tire life and resistance to bruises.
Tire pressure, with tires cold, (after vehicle has set for three hours or more, or driven less than one mile) should be checked monthly or before any extended trip. Set to the specifications on the tire placard located on the side of instrument panel.
It is normal for tire pressure increase when the tires become hot during driving. **Do not** bleed or reduce tire pressure after driving. Bleeding reduces the "Cold Inflation Pressure".

Higher than Recommended Pressure Can Cause:

1. Hard ride
2. Tire bruising or carcass damage
3. Rapid tread wear at center of tire

Lower than Recommended Pressure Can Cause:

1. Tire squeal on turns
2. Hard steering
3. Rapid and uneven wear on the edges of the tread
4. Tire rim bruises and rupture
5. Tire cord breakage
6. High tire temperatures
7. Reduced handling
8. High fuel consumption

Unequal Pressure on Same Axle Can Cause:

1. Uneven braking
2. Steering lead
3. Reduced handling
4. Swerve on acceleration

Valve caps should be kept on valves to keep dust and water out.

TIRE PLACARD
The tire placard is located on the driver's side door lock pillar and should be referred to for tire information. The placard lists cold tire pressure.

TIRE ROTATION
To equalize wear, rotate tires periodically as shown in Fig. 3F-3.

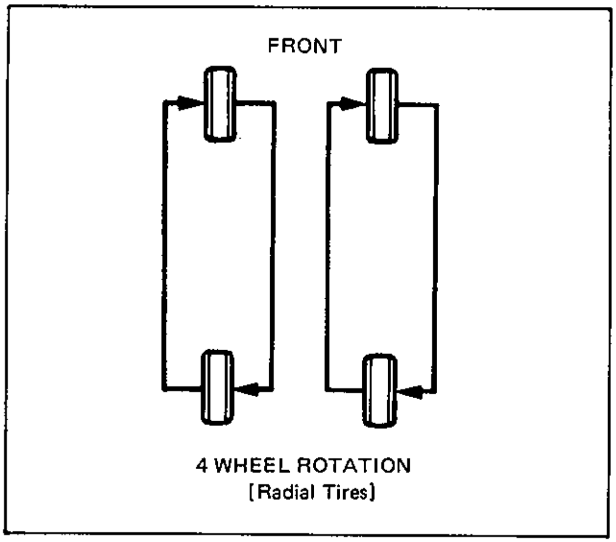


Fig. 3F-3 Tire Rotation

SERVICE OPERATIONS

METRIC LUG NUTS AND WHEEL STUDS
All models use metric lug nuts and wheel studs (size M12 x 1.25).

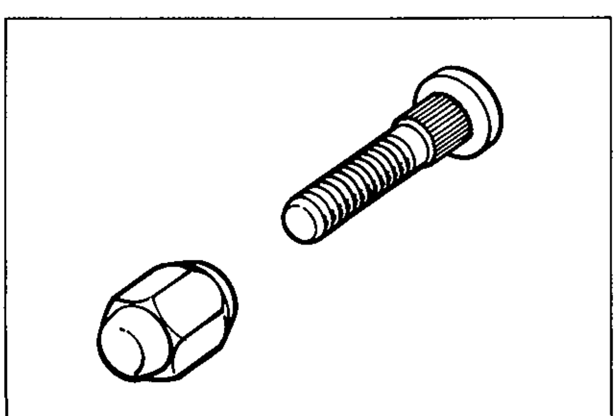


Fig. 3F-4 Metric Stud and Nut

WHEEL REMOVAL
1) Loosen wheel nuts by approximately 180° (half a rotation).
2) Hoist vehicle.
3) Remove wheel.

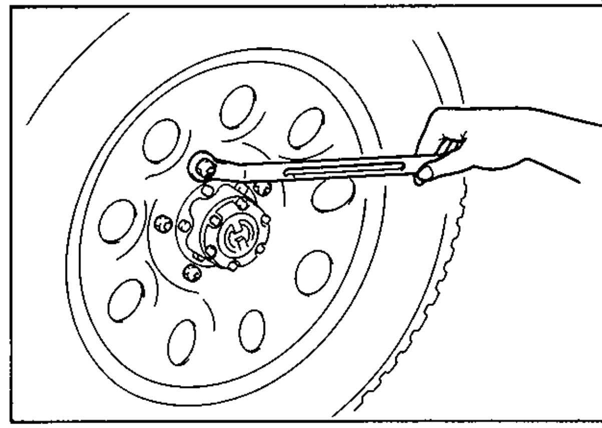


Fig 3F-5

NOTE:
Never use heat to loosen tight wheel because application of heat to wheel can shorten life of wheel and damage wheel bearings.

Wheel nuts nust be tightened in sequence and to proper torque to avoid bending wheel or brake drum or disc as in Fig. 3F-6.

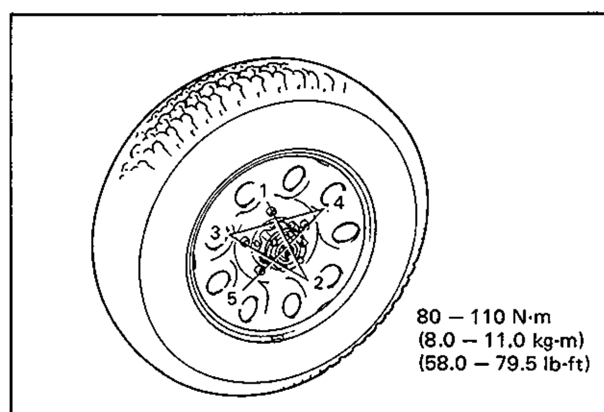


Fig. 3F-6 Wheel Nut Tightening Sequence

NOTE:
Before installing wheels, remove any build-up of corrosion on wheel mounting surface and brake drum or disc mounting surface by scraping and wire brushing. Installing wheels without good metal-to-metal contact at mounting surfaces can cause wheel nuts to loosen, which can later allow wheel to come off while vehicle is moving.

TIRE MOUNTING AND DEMOUNTING

Use tire changing machine to mount or demount tires. Follow equipment manufacturer's instructions. Do not use hand tools or tire irons alone to change tires as they may damage tire beads or wheel rim.

Rim bead seats should be cleaned with wire brush or coarse steel wool to remove lubricants, old rubber and light rust. Before mounting or demounting tire, bead area should be well lubricated with approved tire lubricant.

After mounting, inflate to 240 kPa (35 psi) so that beads are completely seated.

WARNING:
Do not stand over tire when inflating. Bead may break when bead snaps over rim's safety hump and cause serious personal injury.
Do not exceed 240 kPa (35 psi) pressure when inflating. If 240 kPa (35 psi) pressure will not seat beads, deflate, re-lubricate and reinflate. Over inflation may cause bead to break and cause serious personal injury.

Install valve core and inflare to proper pressure.

TIRE REPAIR

There are many different materials and techniques on the market to repair tires. As not all of these work on all types of tires, tire manufacturers have published detailed instructions on how and when to repair tires. These instructions can be obtained from the tire manufacturer.

BALANCING WHEELS

There are two types of wheel and tire balance: static and dynamic. Static balance, Fig. 3F-7, is equal distribution of weight around wheel. Wheels that are statically unbalanced cause bouncing action called tramp. This condition will eventually cause uneven tire wear.

Dynamic balance, Fig. 3F-8, is equal distribution of weight on each side of wheel centerline so that when the tire spins there is no tendency for the assembly to move from side to side. Wheels that are dynamically unbalanced may cause shimmy.

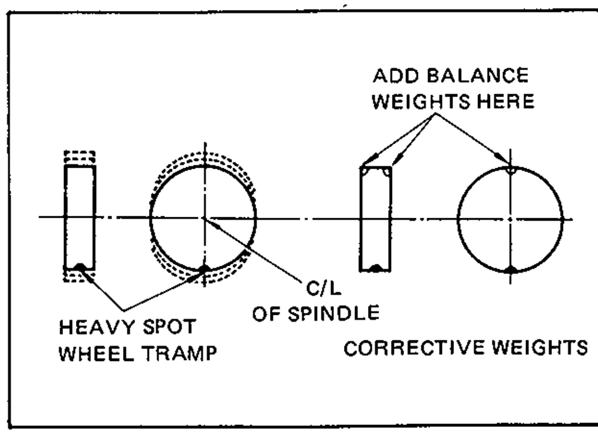


Fig. 3F-7 Static Unbalance Correction

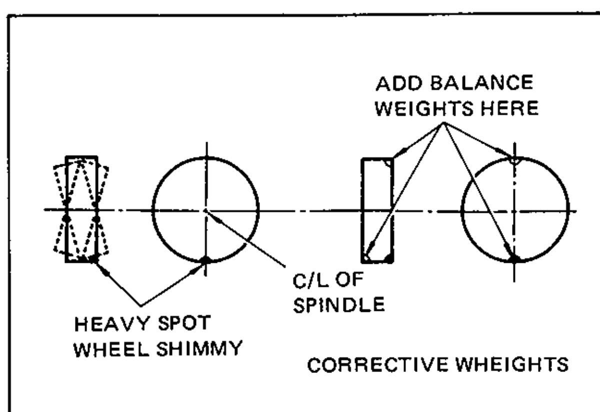


Fig. 3F-8 Dynamic Unbalance Correction

GENERAL BALANCE PROCEDURE

Deposits of mud, etc. must be cleaned from inside of rim.

> WARNING:
> **Stones should be removed from tread in order to avoid operator injury during spin balancing and to obtain good balance.**

Tire should be inspected for any damage, then balanced according to equipment manufacturer's recommendation.

OFF-VEHICLE BALANCING

Most electronic off-vehicle balancers are more accurate than on-vehicle spin balancers. They are easy to use and give a dynamic (two plane) balance. Although they do not correct for drum or disc unbalance as does on-vehicle spin balancing, this is overcome by their accuracy, usually to within 1/8 ounce.

ON-VEHICLE BALANCING

On-vehicle balancing methods vary with equipment and tool manufacturers. Be sure to follow each manufacturer's instructions during balancing operation.

TORQUE SPECIFICATIONS

Wheel nut: 80–110 N·m (8.0–11.0 kg-m, 58.0–79.5 lb-ft)

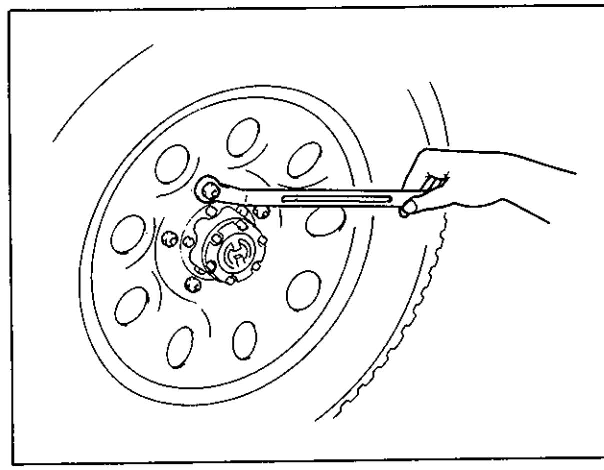


Fig. 3F-9

SECTION 4

FRONT DRIVE AXLE/AXLE BEARING, OIL SEAL

CONTENTS

DRIVE AXLE

GENERAL DESCRIPTION

The drive shaft joint is a constant velocity joint (C.V. joint) which slides in the axial direction. The joint is composed of an outer race, cage, inner race and balls. In the turning direction, the joint rotates in the same way as a ball bearing. The 6 balls lock rotation completely and transmit drive. In addition this vehicle is also characterized by a function that the shaft can slide through the balls in the grooves of the outer race in the extension/contraction direction of the drive shaft.

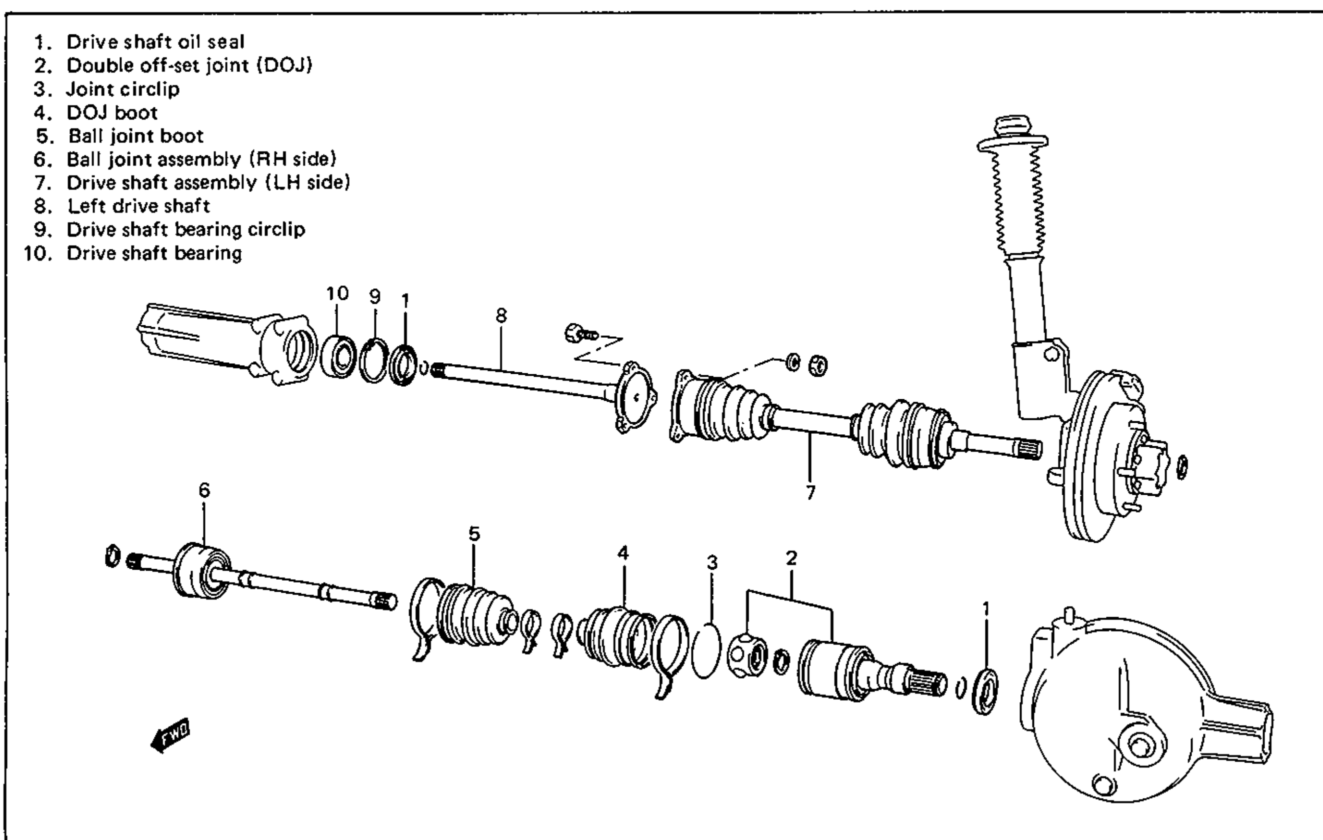


Fig. 4-1

ON VEHICLE SERVICE

REMOVAL

1) Hoist vehicle and remove wheel.
2) Drain transaxle oil.
3) Locking hub.
4) Drive shaft circlip.
5) Stabilizer ball joint nut.
6) Tie-rod end castle nut.
7) Caliper bolt.
8) Caliper from disc, and suspend with a wire hook.
9) Remove knuckle ball joint stud nut.
10) Support lower arm with jack.

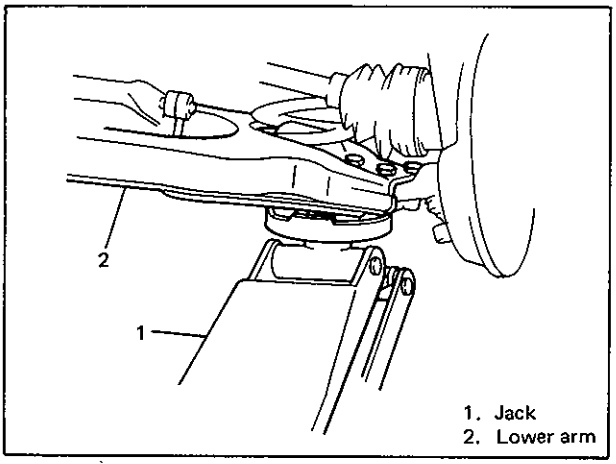


Fig. 4-2

11) Remove strut bracket bolts.
12) Remove knuckle and wheel hub comp. by lowering jack.
    Right side:
    To detach snap ring fitted on the spline of differential side joint (inboard joint) from differential side gear, pull inboard joint by using a tire lever.

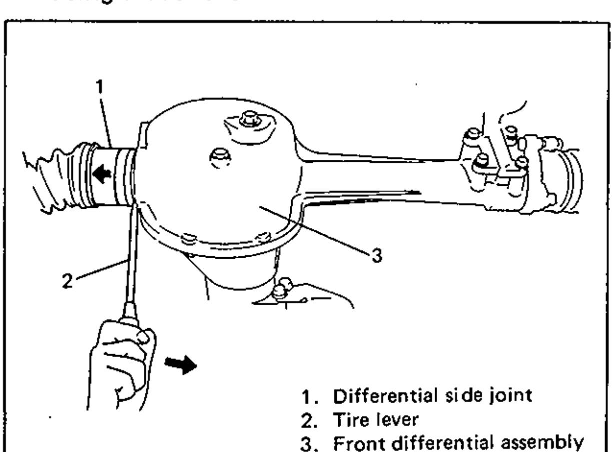


Fig. 4-3 Detaching Snap Ring from Differential Side Gear

    Left side:
    Disconnect driveshaft bolts. (3 – 10 mm.)
13) Remove driveshaft.

NOTE:
To prevent breakage of boots (wheel side and differential side), be careful not to bring them into contact with other parts when removing drive axle assembly.

DISASSEMBLY (Drive Axle)

1) Remove boot band of differential side joint.

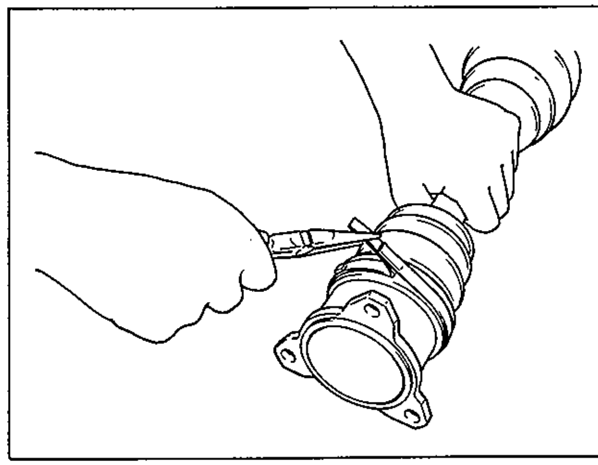


Fig. 4-4

2) Remove circlip.
3) Remove housing of differential side joint.

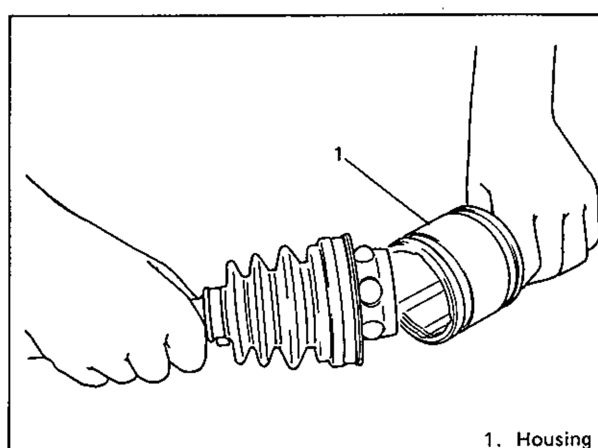


Fig. 4-5 Removing Housing of Differential Side Joint

4) Remove circlip and then ball joint.

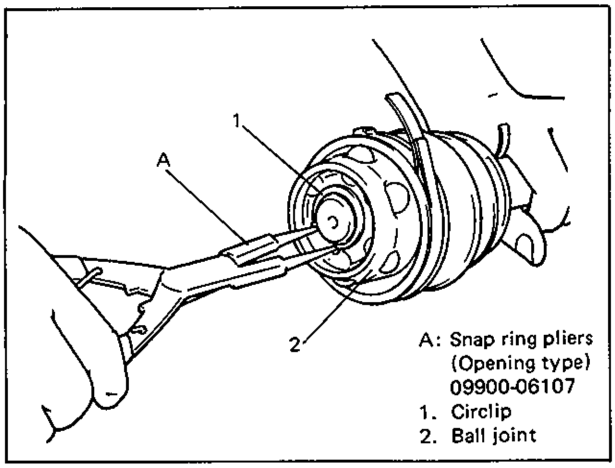


Fig. 4-6 Snap Ring and Spider

5) Remove inside and outside boots from shaft.

NOTE:

- **Do not disassemble wheel side joint (outboard joint). If any malcondition is found in joint, replace it as assembly.**
- **Do not disassemble ball joint of differential side joint. If any malcondition is found in ball joint, replace differential side joint assembly.**

INSPECTION

- Check boots for breakage or deterioration. Replace them as necessary.
- Check circlip, snap ring and boot bands for breakage or deformation. Replace as necessary.

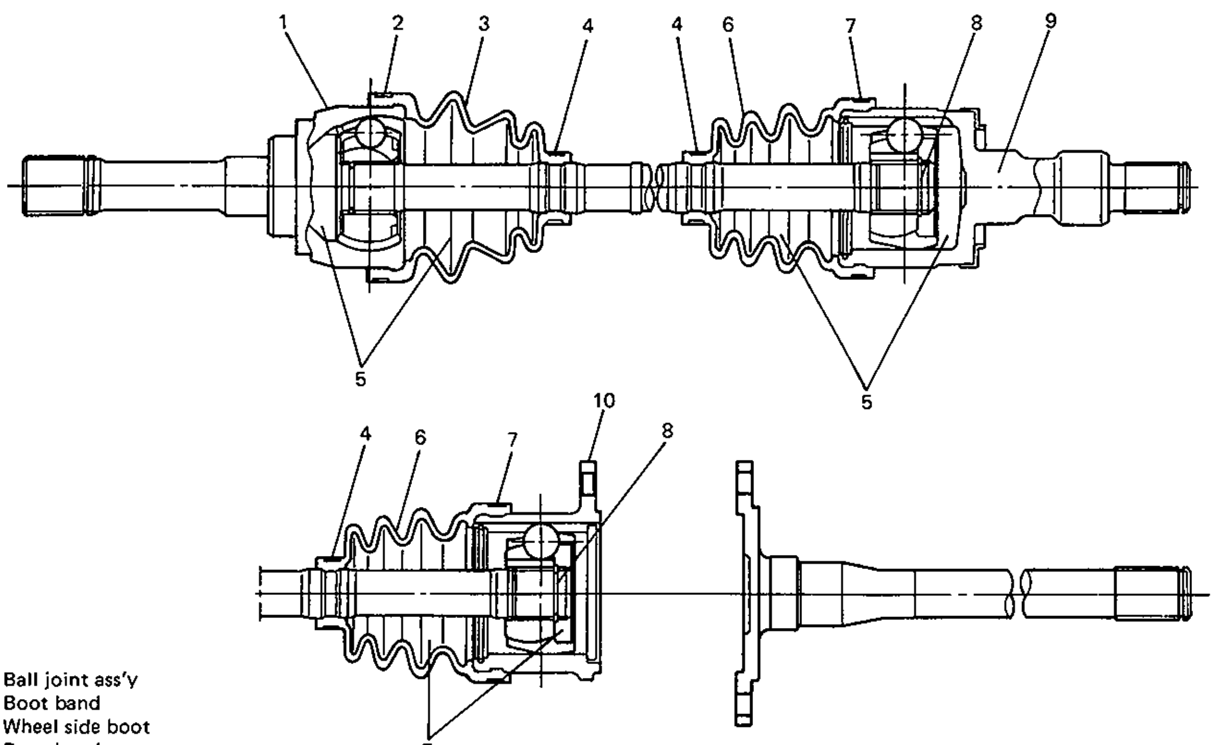
CLEANING

- Wash disassembled parts (except boots) in degreaser. After washing, dry parts completely by blowing air.
- Clean boots with cloth. DO NOT wash boots in degreaser, such as gasoline or kerosene, etc..

  Washing in degreaser causes deterioration of boot.

ASSEMBLY (Drive Axle)

1. Fully apply joint grease to wheel side joint. Use joint grease in the tube included in wheel side boot set or wheel side joint assembly of spare parts.
2. Fit wheel side boot on shaft. Fill up inside of boot with joint grease of about 90 gram and then fix boot bands.
3. Fit differential side boot on shaft.
4. Fully apply joint grease to differential side joint. Use joint grease in the tube included in differential side boot set or differential side joint assembly of spare parts.
5. Install ball joint differential side ball joint on shaft, facing its flush side to wheel side joint as shown below.
6. After installing ball joint, fit snap ring in groove of shaft.
7. Fill inside of differential side boot with joint grease and then install housing. Fix boot to housing with a boot band. When clamping boot band, bend its end in reverse direction against drive shaft rotating direction (when driven forward).
8. Check boots for distortion or dent. If distorted or dented, correct it.



1. Ball joint ass'y
2. Boot band
3. Wheel side boot
4. Boot band
5. Grease (about 90 gram)
6. Diff. side boot
7. Boot band
8. Circlip
9. Double off-set joint ass'y (RH side)
10. Double off-set joint ass'y (LH side)

Fig. 4-7 Assembling Drive Axle

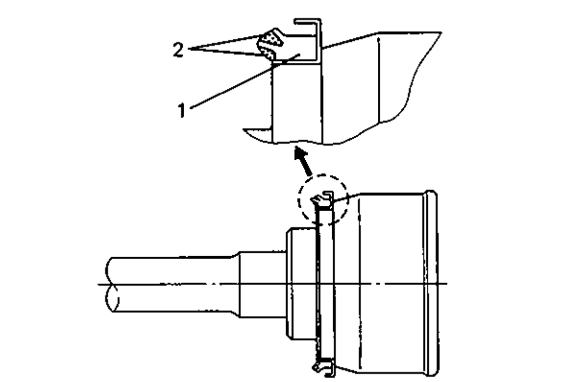
INSTALLATION

Reverse removal procedure.

1) Clean front driveshaft oil seal and then apply lithium grease to it.

   SUZUKI SUPER GREASE A (99000-25010)

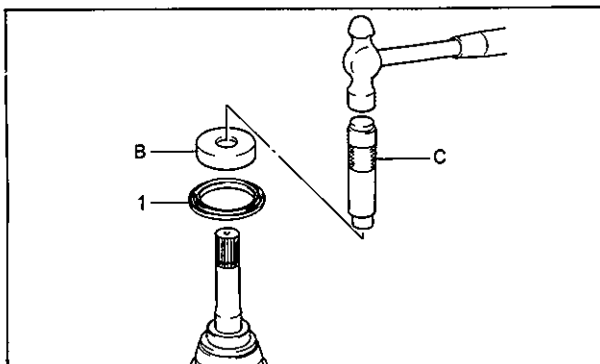
2) Check oil seal for breakage or deterioration. Replace it as necessary.



1. Drive shaft oil seal
2. Grease SUZUKI SUPER GREASE A: 99000-25010

Fig. 4-8

3) Drive in oil seal until its end contacts stopped surface of drive axle, using special tools B and C.



B: Drive shaft oil seal installer (09951-46010)
C: Installer attachment (09925-18010)
1. Drive shaft oil seal

Fig. 4-9

4) RH Side
   Push differential side joint by hand until it is positioned by snap ring fitted to its spline.
   LH Side
   Connect driveshaft bolts (3 – 10 mm).

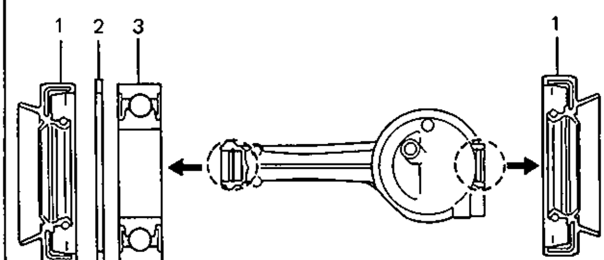
NOTE:

- **To prevent breakage of boots (wheel side and differential side), be careful not to bring them into contact with other parts when installing drive axle assembly.**
- **Do not pull housing of differential side joint. If housing is pulled, it may be detached from drive axle.**
- **Apply chassis grease to spline of sliding yoke.**

AXLE BEARING/OIL SEAL

REMOVAL

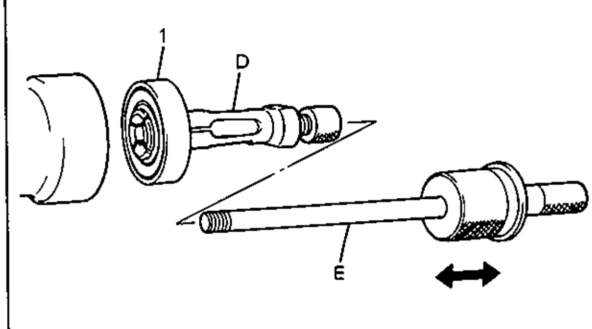
1) Remove drive axle.
   Refer to drive axle removal of this section.



1. Axle oil seal
2. Circlip
3. Axle bearing

Fig. 4-10

2) Remove oil seal, using plain screw driver.
3) Remove circlip.
4) Remove bearing, using special tools D and E.



D: Bearing remover (09941-64510)
E: Sliding shaft (09930-30102)
1. Axle bearing

Fig. 4-11

INSTALATION

1) Clean drive axle oil seal and then apply lithium grease.
   SUZUKI SUPER GREASE A (99000-25010).
   Check oil seal for breakage or deterioration. Replace it as necessary.
2) Drive in drive axle bearing with special tool F (on left hand side).

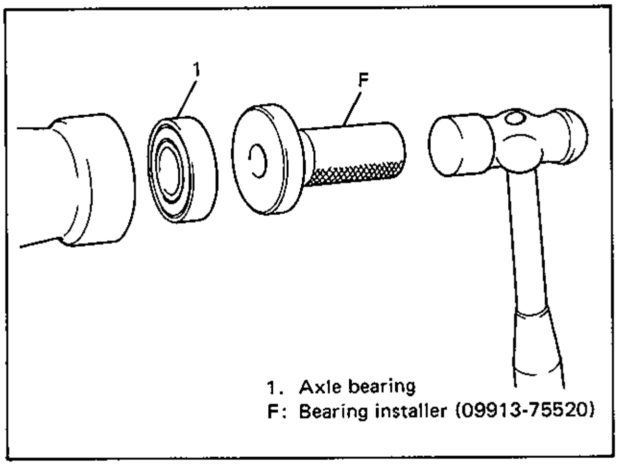


Fig. 4-12

3) Install circlip.
4) Drive in oil seal with special tools G and H.

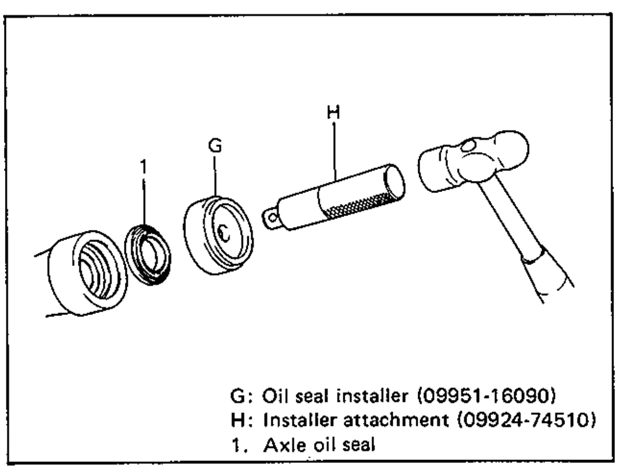


Fig. 4-13

NOTE:
As depth to which oil seal should be driven into axle housing is different between the left and right, be sure to check stamped marks on special tool G and drive each oil seal to corresponding mark.

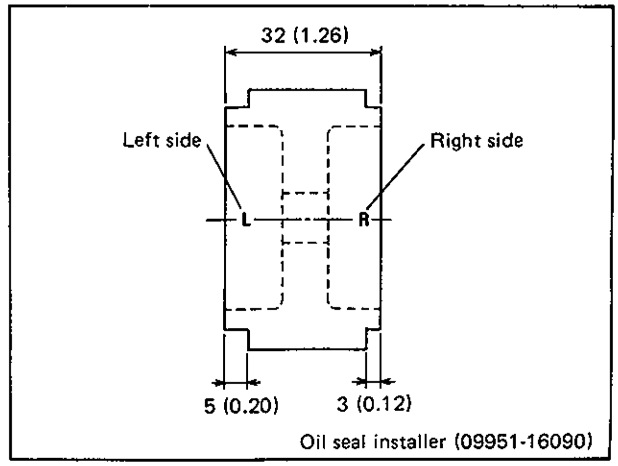


Fig. 4-14

TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Drive shaft bolt (3 — 10 mm)	40 – 60	4.0 – 6.0	29.0 – 43.0
2. Strut bracket bolt	80 – 100	8.0 – 10.0	58.0 – 72.0
3. Ball joint stud castle nut	45 – 70	4.5 – 7.0	33.0 – 50.5
4. Caliper bolts	70 – 100	7.0 – 10.0	33.0 – 72.0
5. Tie-rod end castle nut	30 – 55	3.0 – 5.5	22.0 – 39.5
6. Ball joint nut	22 – 35	2.2 – 3.5	16.0 – 25.5
7. Wheel nut	80 – 110	8.0 – 11.0	58.0 – 79.5
8. Drain plug	35 – 50	3.5 – 5.0	25.5 – 36.0

NOTE:
Refer to standard tightening torque specifications, if no description or specification is provided.

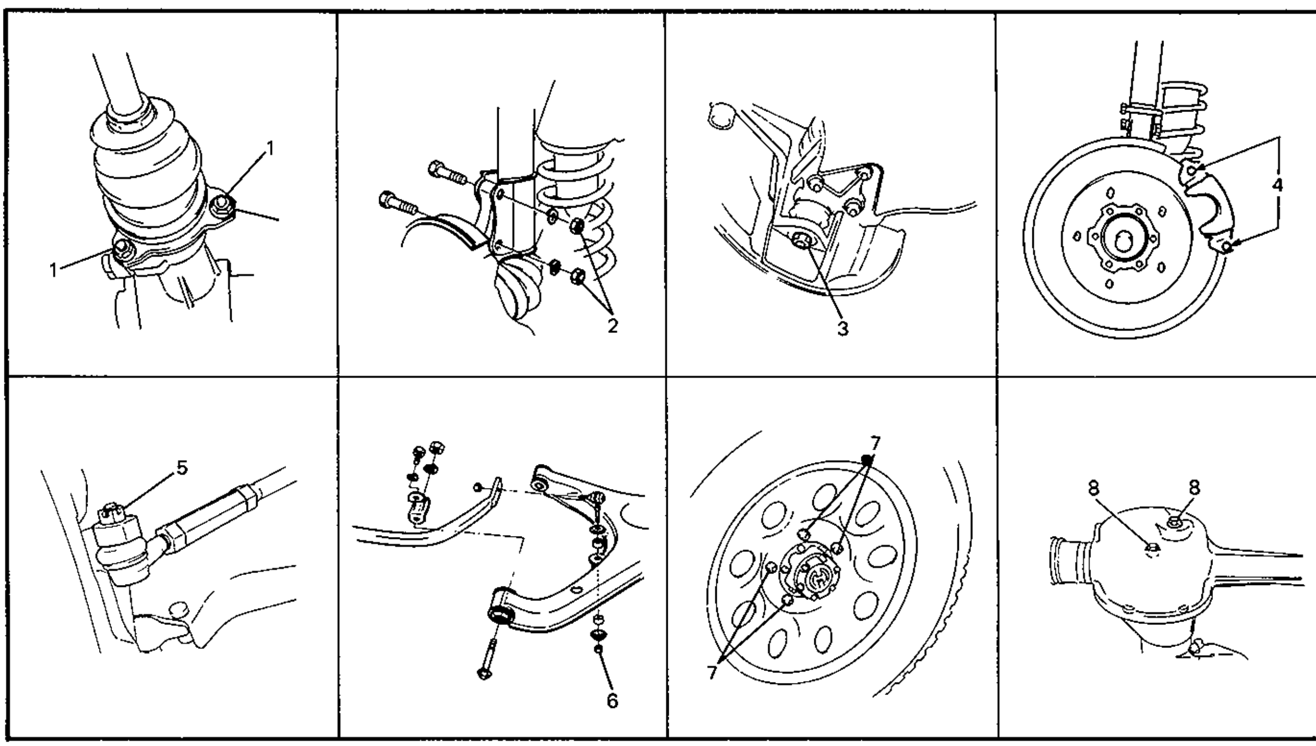


Fig. 4-15

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	Drive axle oil seal

SPECIAL TOOLS

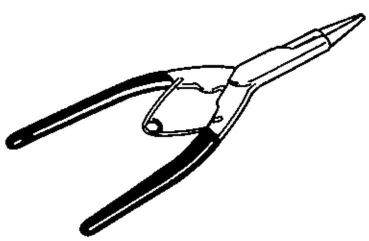
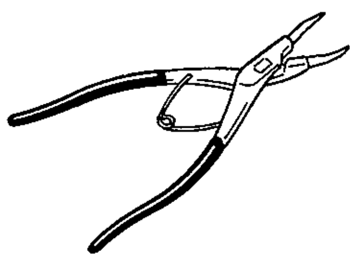
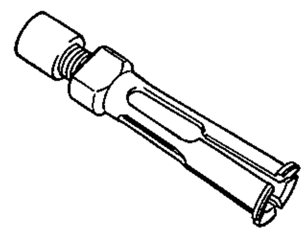
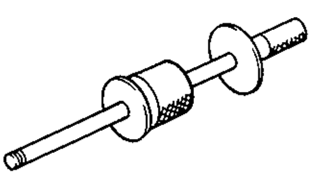
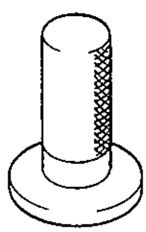
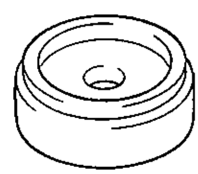
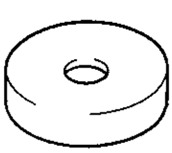
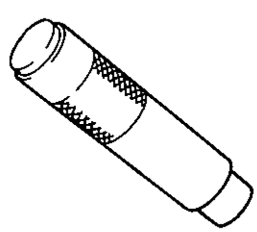
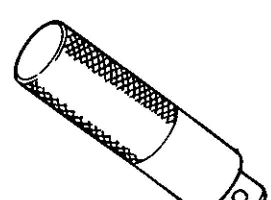
1  09900-06107 Snap ring pliers (opening type)	2  09900-06108 Snap ring pliers (closing type)	3  09941-64510 Bearing remover
4  09930-30102 Sliding shaft	5  09913-75520 Bearing installer	6  09951-16090 Oil seal installer
7  09951-46010 Drive shaft oil seal installer	8  09925-18010 Installer attachment	9  09924-74510 Installer attachment

Fig. 4-16

SECTION 4B

PROPELLER SHAFTS

CONTENTS

GENERAL DESCRIPTION

Most universal joints require no maintenance. They are lubricated for life and can not be lubricated on the vehicle. If a universal joint becomes noisy or worn, it must be replaced.
The propeller shaft is a balanced unit. Handle it carefully so that balance can be maintained.

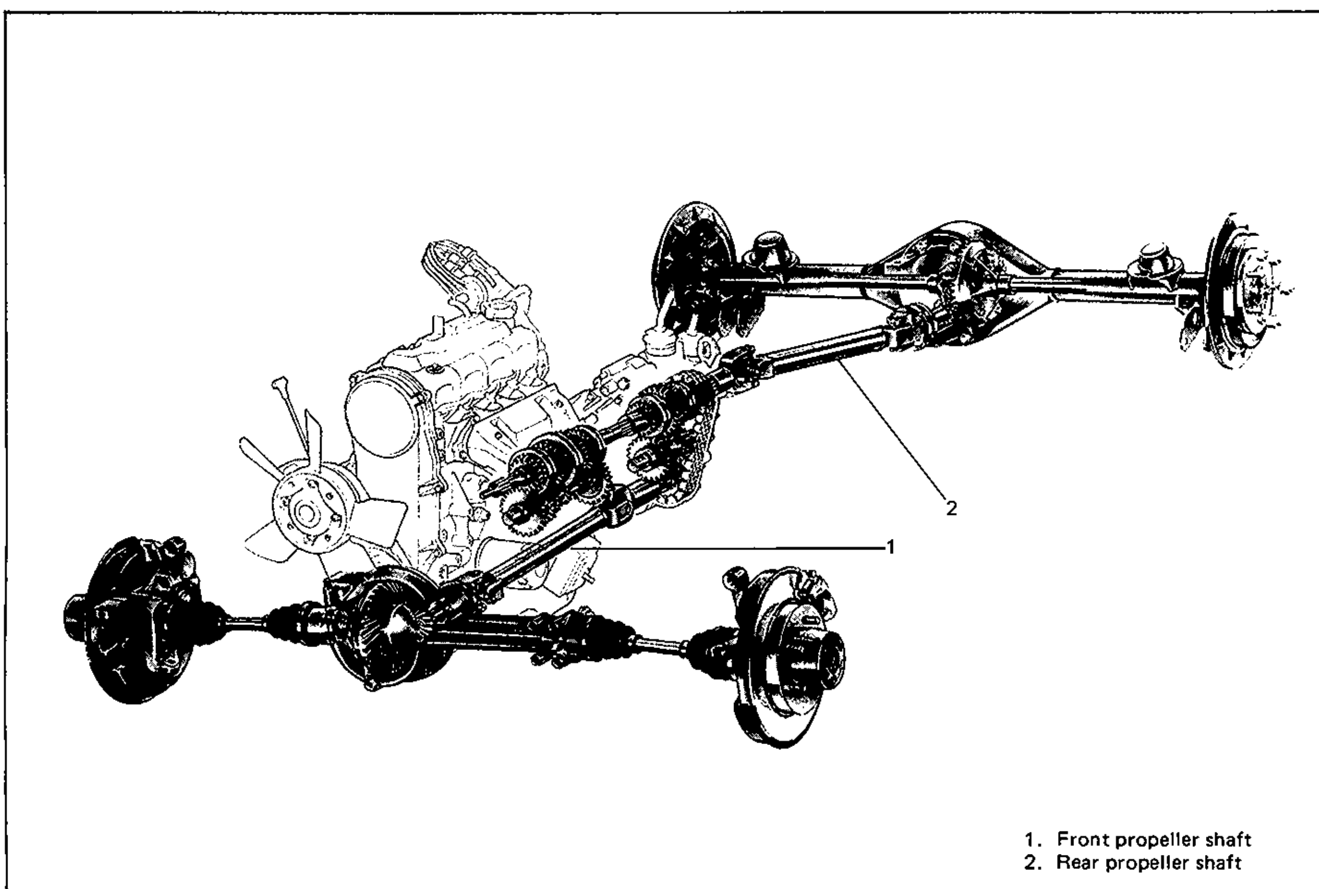


Fig. 4B-1

ON VEHICLE SERVICE

REMOVAL

1) Hoist vehicle.
2) Drain transfer oil only when servicing front propeller shaft.
3) Before removing propeller shaft, make match marking on joint flange and propeller shaft to facilitate their installation as shown below.
4) Remove propeller shaft.

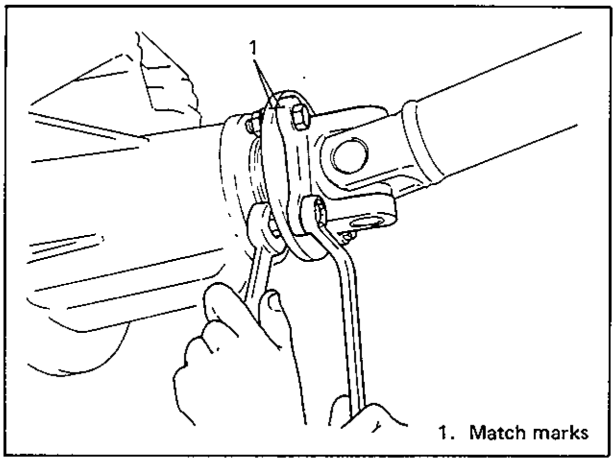


Fig. 4B-2

INSTALLATION

1) Reverse removal to install propeller shaft.
   - Use following specification to torque universal joint flange.

Tightening torque for universal joint flange bolts & nuts	N·m	kg-m	lb-ft
	50 – 60	5.0 – 6.0	36.5 – 43.0

   - When installing propeller shaft, align this match mark.

NOTE:

If transfer oil was drained for front propeller shaft removal, pour specified gear oil into transfer case to specified level.

UNIVERSAL JOINT NOISE

If universal joints are suspected of producing chattering or rattling noise, inspect them for wear. Check to see if cross spider rattles in yokes or if splines are worn down and replace defective propeller shaft with new one.

Noise coming from universal joint can be easily distinguished from other noises because rhythm of chattering or rattling is in step with cruising speed. Noise is pronounced particularly on standing start or in coasting condition (when braking effect of engine is showing in the drive line).

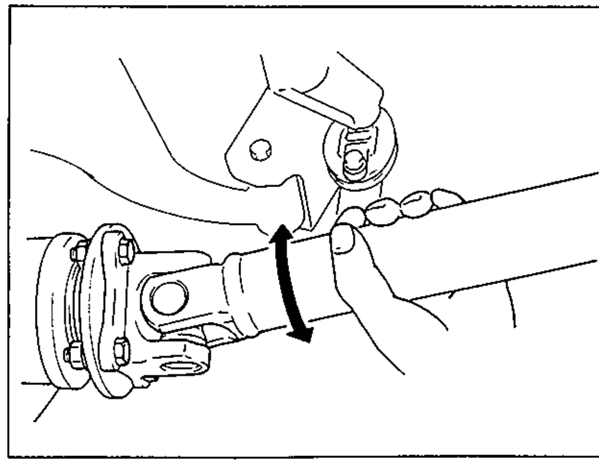


Fig. 4B-3

DISASSEMBLY OF UNIVERSAL JOINT

DISASSEMBLING ON PROPELLER SHAFT YOKE SIDE

1) Using special tool A, remove 2 circlips.

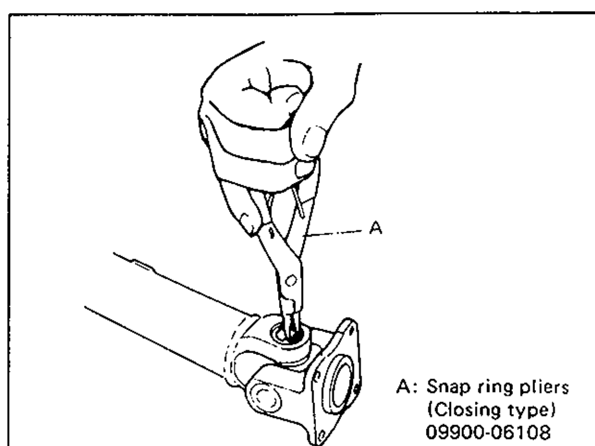


Fig. 4B-4

2) Using special tool B, push spider bearing race out 3 – 4 mm (0.12 – 0.16 in.) from shaft yoke race.

NOTE:
Before pushing it out, apply penetrate lubricant between bearing race and yoke race.

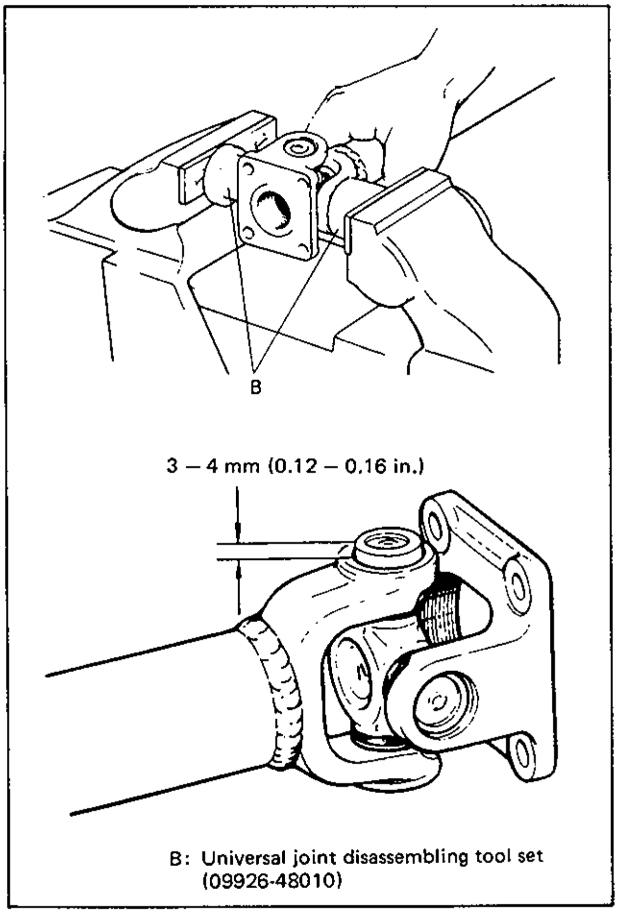


Fig. 4B-5

3) Tapping yoke with a hammer, completely remove bearing race.

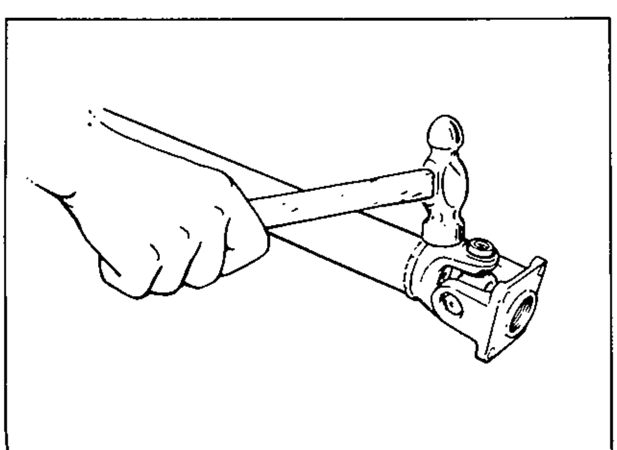


Fig. 4B-6

4) Take out bearing race on the other side in the same way as in 2) and 3).

DISASSEMBLING ON FLANGE YOKE SIDE

Push out bearing race on flange yoke side as described in 1) and 2), and then, holding bearing race in a vice, tap flange yoke and take out race. (Refer to the below figure.)
Remove bearing race on the opposite side in the same way.

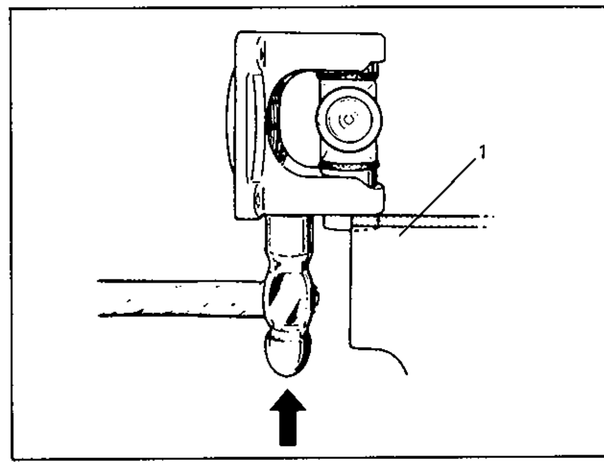


Fig. 4B-7

NOTE:
- **Take care not to lose rollers in spider bearing race when removing it.**
- **Fit removed bearings temporarily in spider so that they can be reinstalled in their original positions.**

REASSEMBLY OF UNIVERSAL JOINT

NOTE:
- **Make sure that rollers inside spider bearing race are all in place.**
- **Make sure to apply grease to spider bearing race.**

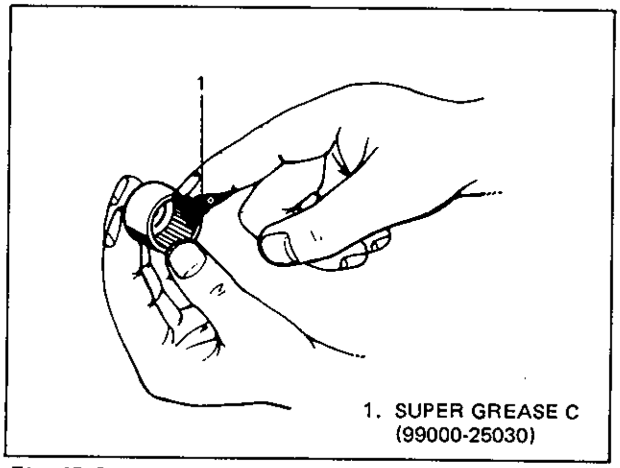


Fig. 4B-8

> **CAUTION:**
> **In reassembly, be sure to use new circlips, spider and bearings. Reuse of circlips, spider and bearings once reassembled is prohibited.**

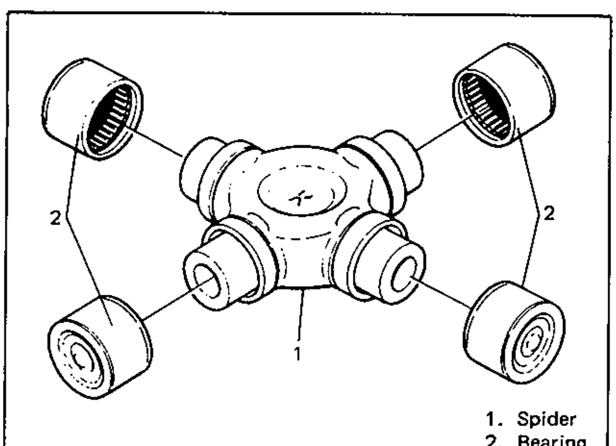


Fig. 4B-9

1) Insert bearing race into yoke, tapping it with a hammer, until it is flush with yoke face. When doing this, insert spider into bearing race to prevent rollers in bearing race from coming out.

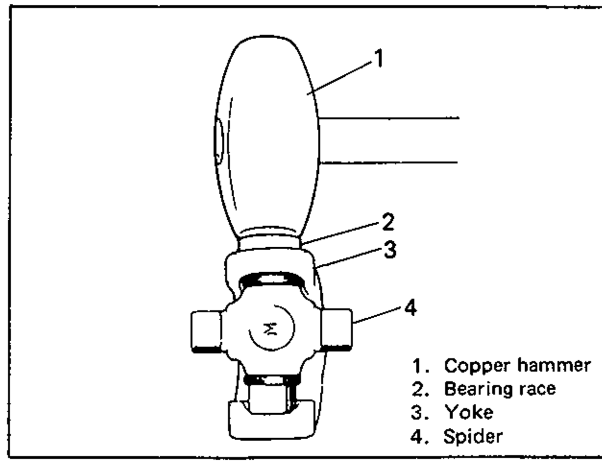


Fig. 4B-10

2) Insert the other bearing race on the opposite side into yoke, tapping with a hammer until it is flush with yoke face.
3) Insert bearing races on the flange yoke side in the same way as described in 1) and 2) above.

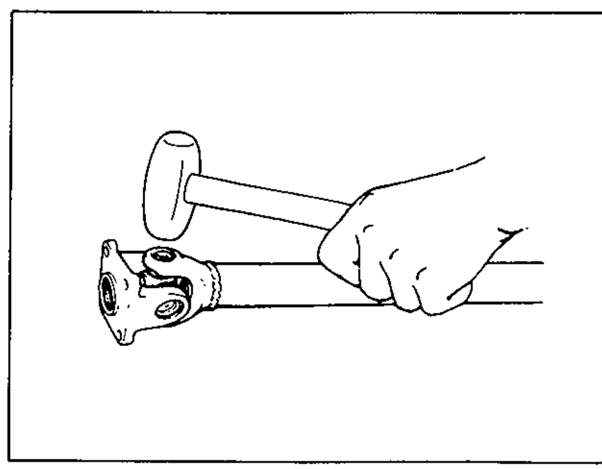


Fig. 4B-11

4) Place a metal plate on bearing races when tapping them in to avoid damaging yoke.
5) Securely fit 4 circlips to shaft and flange yoke.

NOTE:
- **After reassembly, check to ensure that both shaft yoke and flange yoke move smoothly.**
- **Make sure that each circlip is fitted in groove securely.**

6) Inspect propeller shaft and flange yoke for damage, and propeller shaft for runout.
If damage is found or shaft runout exceeds its limit, replace.

Runout limit	0.8 mm (0.031 in.)

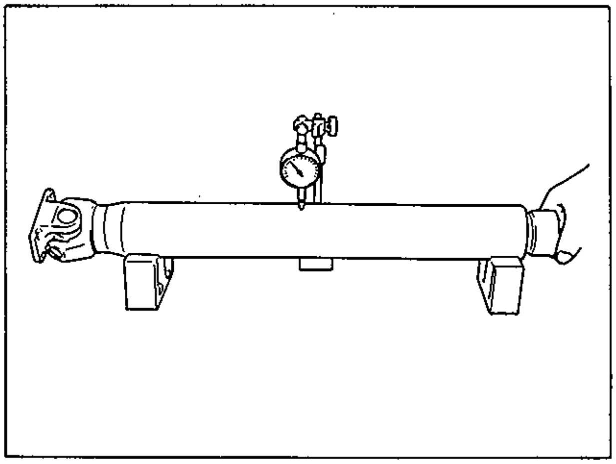


Fig. 4B-12

7) Install propeller shaft with scribed match marks aligned.

Tightening torque for propeller shaft bolts and nuts	N·m	kg-m	lb-ft
	50 – 60	5.0 – 6.0	36.5 – 43.0

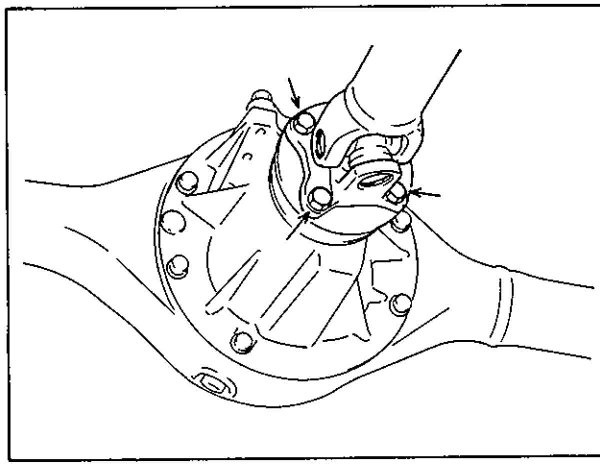
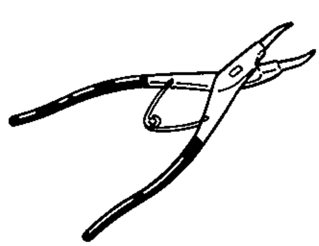


Fig. 4B-13

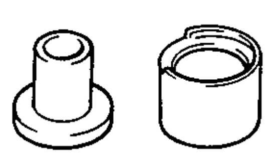
REQUIRED SERVICE MATERIAL

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUPER GREASE C (99000-25030)	To apply to spider bearing race.

SPECIAL TOOLS



09900-06108
Snap ring pliers
(Closing type)



09926-48010
Universal joint disassembling tool set

Fig. 4B-14

SECTION 5

BRAKE

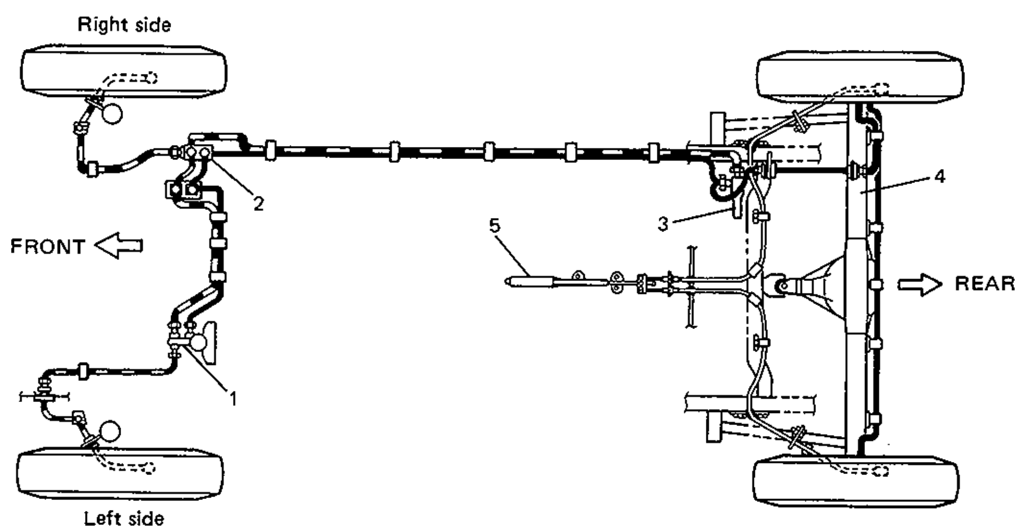
NOTE:
All brake fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts. There is to be no welding as it may result in extensive damage and weakening of the metal.

CONTENTS

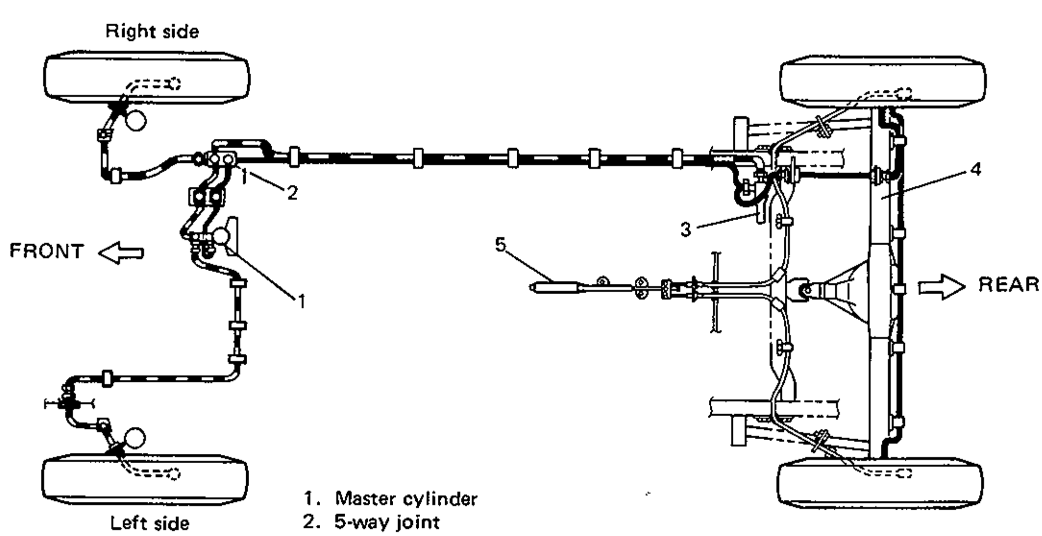
GENERAL DESCRIPTION

When the foot brake pedal is depressed, hydraulic pressure is developed in the master cylinder to actuate pistons (two in front and four in rear).
The master cylinder is a tandem master cylinder. Three brake pipes are connected to the master cylinder and they make two independent circuits. One connects front brakes (right and left) and the other connects rear brakes (right and left).
The load sensing proportioning valve (LSPV) is included in these circuits between the master cylinder and rear brakes.
In this brake system, the disc brake type is used for the front wheel brake and a drum brake type (leading/trailing shoes) for the rear wheel brake.
The parking brake system is mechanical. It applies brake force to only rear wheels by means of the cable and mechanical linkage system. The same brake shoes are used for both parking and foot brakes.

[FOR LEFT STEERING WHEEL VEHICLE]



[FOR RIGHT STEERING WHEEL VEHICLE]



1. Master cylinder
2. 5-way joint
3. LSPV (Load Sensing Proportioning Valve)
4. Rear axle housing
5. Parking brake lever

Fig. 5-1

DISC BRAKE CALIPER ASSEMBLY

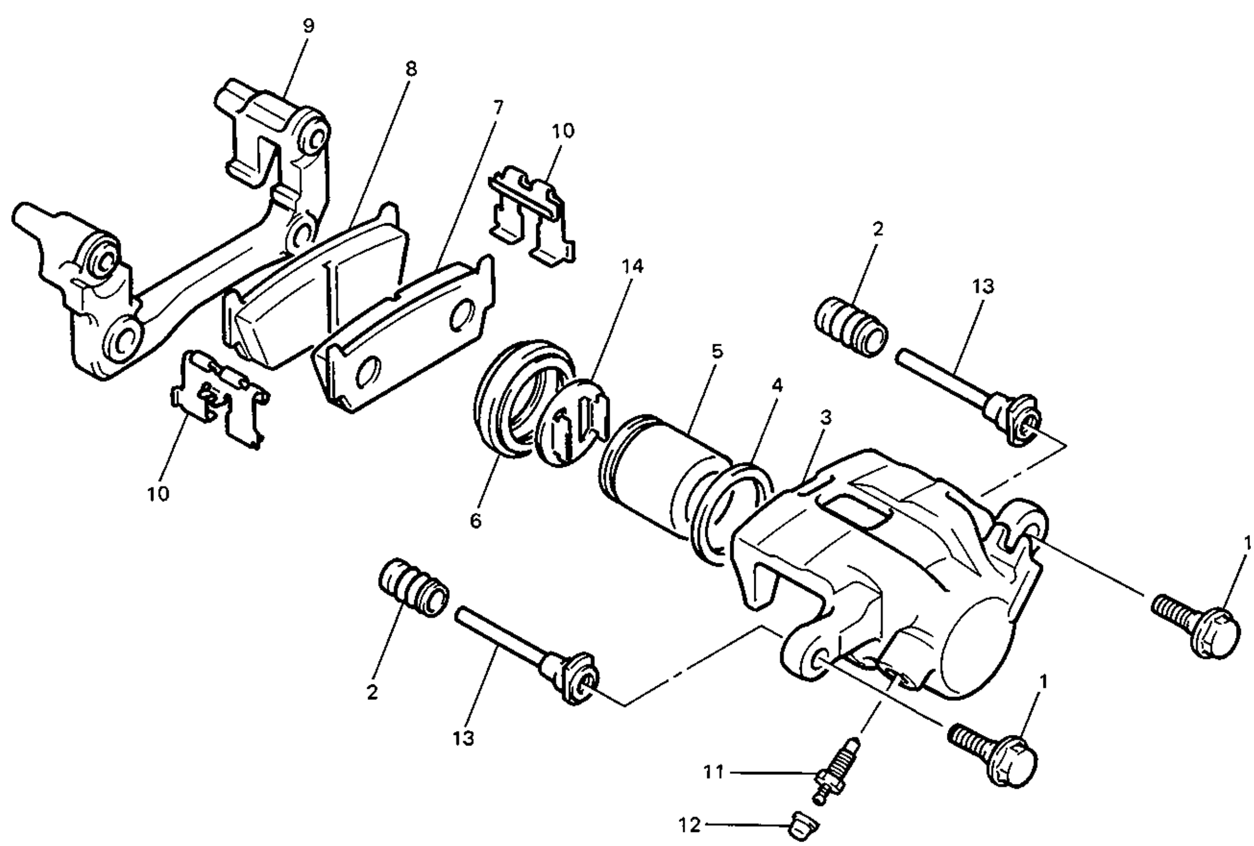
GENERAL DESCRIPTION

This caliper has a single 48.1 mm (1.894 in.) bore and is mounted to the brake caliper carrier with two caliper pin bolts. Hydraulic force, created by applying force to the brake pedal, is converted by the caliper to friction. The hydraulic force acts equally against the piston and the bottom of the caliper bore to move the piston outward and to move (slide) the caliper inward, resulting in a clamping action on the disc. This clamping action forces the pads (linings) against the disc, creating friction to stop the vehicle.

For details, refer to OPERATION in the next page.

NOTE:

Lubricate parts as specified. Do not use lubricated shop air on brake parts as damage to rubber components may result. If any component is removed or line disconnected, bleed the brake system. Replace pads in axle sets only. The torque values specified are for dry, unlubricated fasteners.



1. Caliper pin bolt
2. Boot
3. Disc brake caliper (Disc brake cylinder)
4. Piston seal
5. Disc brake piston
6. Cylinder boot
7. Disc brake inner pad
8. Disc brake outer pad
9. Brake caliper carrier
10. Pad spring
11. Bleeder plug
12. Bleeder plug cap
13. Caliper pin
14. Anti noise shim

Fig. 5-2 Front Caliper Assembly

Caliper OPERATION

Single piston floating caliper type

The single piston floating caliper type brake is employed in this model. One cylinder and one piston are used for this type. (The cylinder is constructed as a monoblock with the caliper.) Fluid pressure generated in the cylinder causes the pad (1) on the piston side to press against the disc. At the same time, the floating type caliper body is moved to the right by the cylinder pressure, as shown in below figure, which pulls pad (2) against the disc and so brakes the wheel.

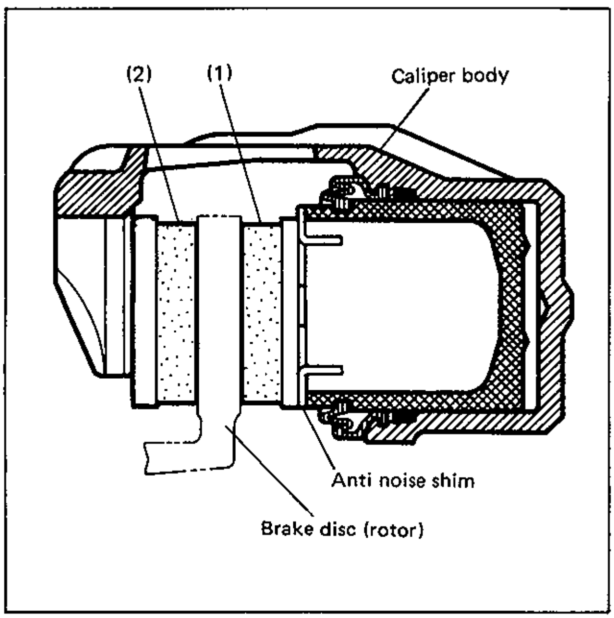


Fig. 5-3

The disc brake has no servo assistance as in drum braking, and it is necessary to increase the working pressure of the piston and pad. For this purpose, the wheel cylinder has a large bore. Even only a little change in clearance between the disc and pad has therefore a large influence on the brake pedal stroke. It is necessary to keep the clearance adjusted to the minimum at all times, by means of the piston (rubber) seal.

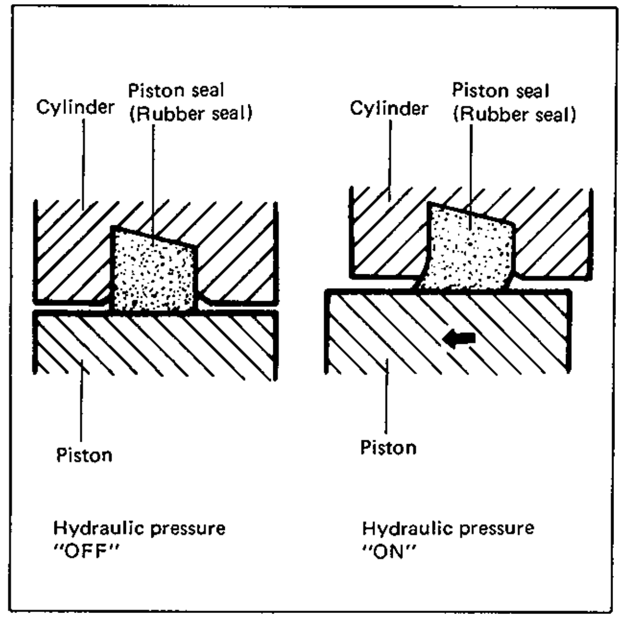


Fig. 5-4

Clearance correction

When oil pressure is applied to the piston, the piston moves forward. The rubber seal, which exerts considerable pressure against the piston, moves with the cylinder. However, as a part of the rubber seal has been fixed into a groove in the cylinder, the shape of the rubber seal is distorted toward internal end of the cylinder, as shown in above figure. When pressure is taken off from the foot brake pedal and fluid pressure is released from the piston, a restoring force is generated at the seal and pushes the piston back. As the pads wear away and the clearance between the disc and pads becomes larger, the piston moves a larger distance. The seal then could change in shape further but, since the end of the seal is fixed into the groove in the cylinder, the distortion is limited to the same amount as previously described. The piston moves further to cover the distance of clearance. The piston returns by the same distance and the rubber seal recovers its shape as described above and thus the clearance between the disc and pads is maintained in adjustment.

DRUM BRAKE ASSEMBLY

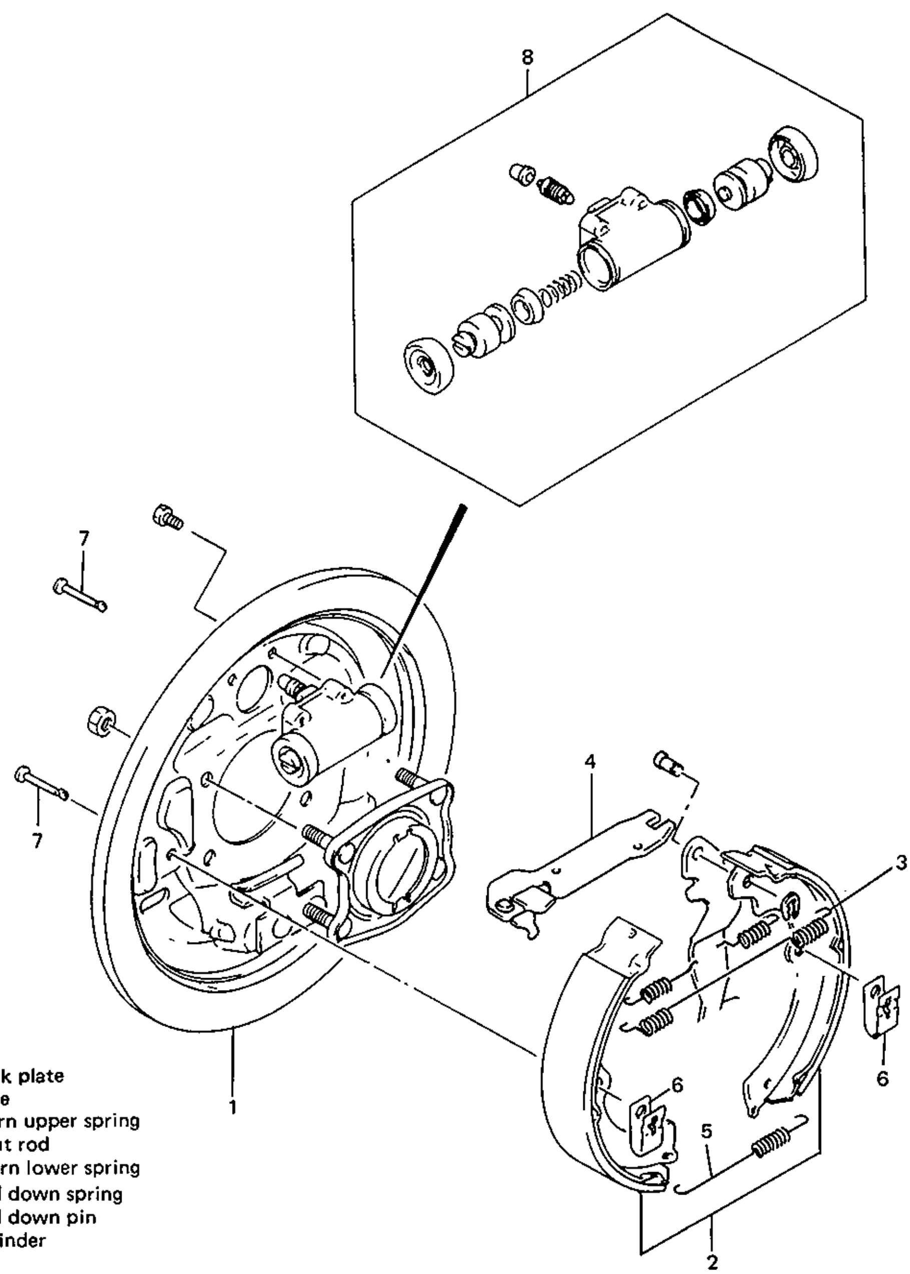
GENERAL DESCRIPTION

The drum brake assembly has a self shoe clearance adjusting system so that drum-to-shoe clearance is maintained appropriate at all times. For details, refer to OPERATION in the next page.

NOTE:

Replace all components included in repair kits to service this drum brake. Lubricate parts as specified.

> WARNING:
> **If any hydraulic component is removed or brake line disconnected, bleed the brake system. The torque values specified are for dry, unlubricated fasteners.**



1. Brake back plate
2. Brake shoe
3. Shoe return upper spring
4. Brake strut rod
5. Shoe return lower spring
6. Shoe hold down spring
7. Shoe hold down pin
8. Wheel cylinder

Fig. 5-5

Rear Brake OPERATION

With the general drum brake type, when the brake pedal is depressed, two pistons in the wheel cylinder force the brake shoes outward, restraining the turn of the drum.

The more the brake shoes get worn, the longer distance the pistons must move. As a result, the brake pedal travel (pedal-to-wall clearance) increases. Then the shoe clearance must be adjusted by the shoe adjusting screws. Thus periodical adjustment is required for the drum brake type in general.

This rear brake is provided with a self-adjusting system which automatically adjusts the shoe-to-drum clearance (pedal-to-wall clearance) caused by such brake shoe wear.

Clearance correction

In each rear wheel cylinder, pistons, piston cups, and a piston spring (1) are installed. When the brake pedal is depressed, fluid pressure is applied to the inside of the chamber on the pistons (2) and (3).

Being actuated by this pressure, the piston (2) moves to the left (piston (3) moves to the right) in the following figure and presses the brake shoe against the brake drum, thus producing brake force.

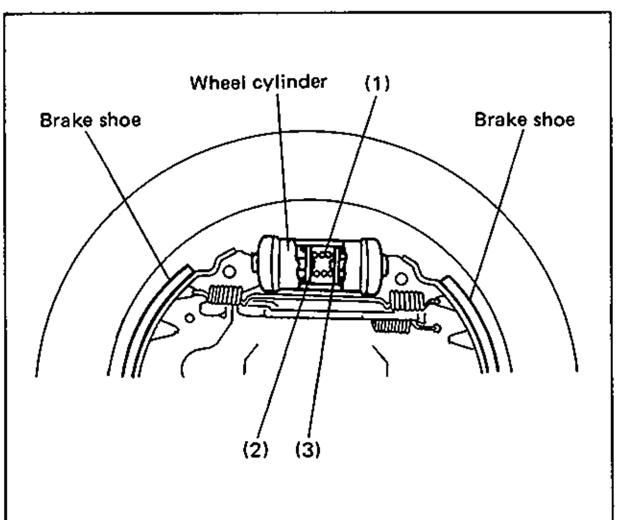


Fig. 5-6

At this time, the distance the brake shoe moves is "B", that is, the distance that "A" (the end of the long hole made in the brake shoes web) moves till it contacts the lever (1) which is fitted in the long hole.

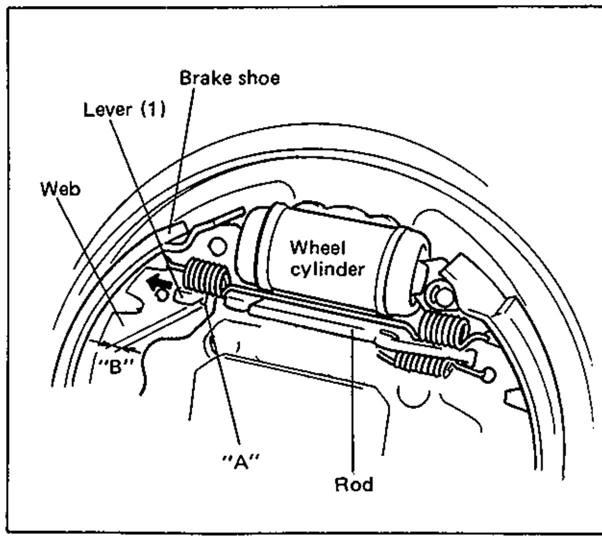


Fig. 5-7

When the brake pedal is depressed, the piston and brake shoe move toward the brake drum side by the aforementioned distance "B" and "A" of the brake shoe web contacts the lever (1). As the brake shoe gets worn and the brake shoe clearance becomes larger, the force applied to the lever (1) at the time of such a contact becomes larger. When it exceeds 10 – 12 kg (22 – 26 lbs), the "A" of the brake shoe web moves the lever (1) as much as the amount of the brake shoe lining wear toward the direction as shown with an arrow in the figure. Thus the shoe is forced against the drum and the brake force is produced.

The distance the lever (1) moves corresponds to the amount of wear. In accordance with the lever (1) movement, the fan-shaped ratchet (2) also moves, for they are assembled as a unit. The lever (1) and ratchet (2) remain in the positions as they moved until the shoe-to-drum clearance becomes even larger.
When the brake pedal is released, the brake shoe is allowed to move back by the amount of clearance "B" by means of the return spring. In this way, the brake shoe-to-drum clearance is automatically adjusted constant every time the brake pedal is depressed.

The brake shoe-to-drum clearance "B" corresponds to 0.5 – 0.6 mm (0.020 – 0.024 in.) in terms of the brake drum diameter A ⟷ A'. And the amount adjusted by one notch of the ratchet corresponds to 0.20 mm (0.0079 in.) in terms of the brake drum diameter A ⟷ A'.

The spring provided in the wheel cylinder prevents the piston from moving back more than the specified brake shoe-to-drum clearance.

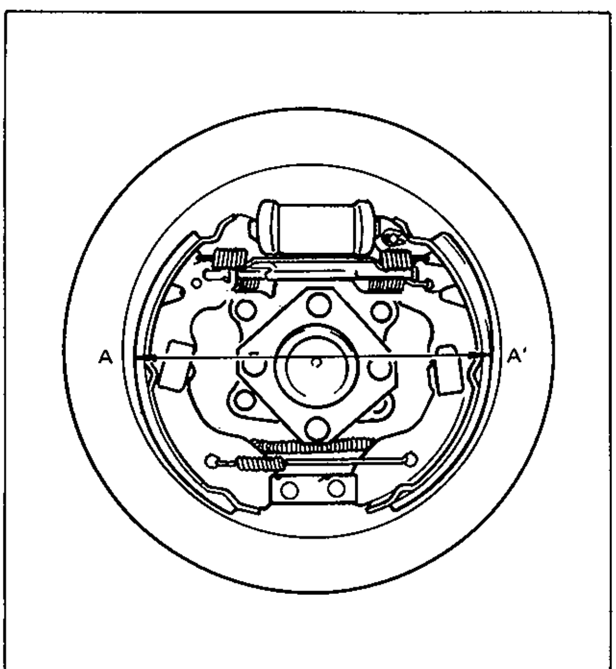


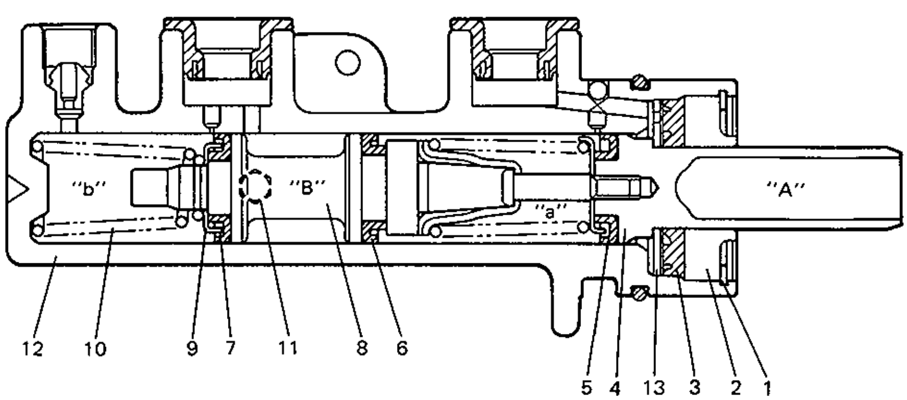
Fig. 5-8

MASTER CYLINDER ASSEMBLY

GENERAL DESCRIPTION

The master cylinder has two pistons and three piston cups. Its hydraulic pressure is produced in the primary ("a" in the below figure) and secondary ("b") chambers. The hydraulic pressure produced in the primary chamber ("a") acts on the rear wheel brakes (left and right).
Also, the hydraulic pressure produced in the secondary chamber ("b") acts on the front wheel brakes (left and right).

NOTE:
Replace all components included in repair kits to service this master cylinder. Lubricate rubber parts with clean, fresh brake fluid to ease assembly. Do not use lubricated shop air on brake parts as damage to rubber components may result. If any hydraulic component is removed or brake line disconnected, bleed the brake system. The torque values specified are for dry, unlubricated fasteners.



1. Piston stopper circlip
2. Piston stopper
3. Cylinder cup
4. Primary piston
5. Piston cup
6. Secondary piston pressure cup
7. Piston cup
8. Secondary piston
9. Return spring secondary seat
10. Secondary piston return spring
11. Secondary piston stopper bolt
12. Master cylinder body
13. Plate

A: Primary piston
B: Secondary piston

Fig. 5-9

Master Cylinder Operation

Normal operation

Depressing the brake pedal forces the primary piston "A" to move to the left in the below figure and consequently the hydraulic pressure is produced in the chamber "a".
By means of this pressure and the return spring force, the secondary piston "B" is also pushed to the left and thus the hydraulic pressure is produced in the chamber "b".

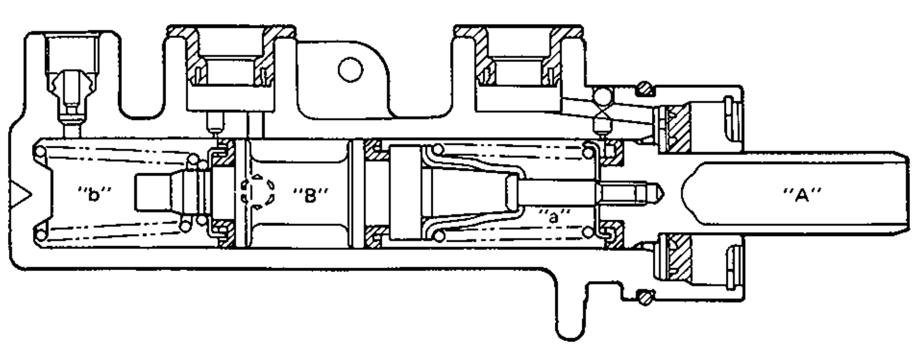


Fig. 5-10

One-circuit operation (Primary chamber "a" circuit failure)

Depressing the brake pedal forces the primary piston "A" to move as described previously, but since the brake circuit connected to the chamber "a" cannot hold the pressure, no pressure is produced in the fluid immediately ahead of the piston "A". The piston "A" keeps moving while compressing the spring and when it reaches the retainer, the piston "B" is pushed and begins to move. This causes the pressure to rise in the chamber "b" and the pressure acts on the front wheel brakes (right and left).

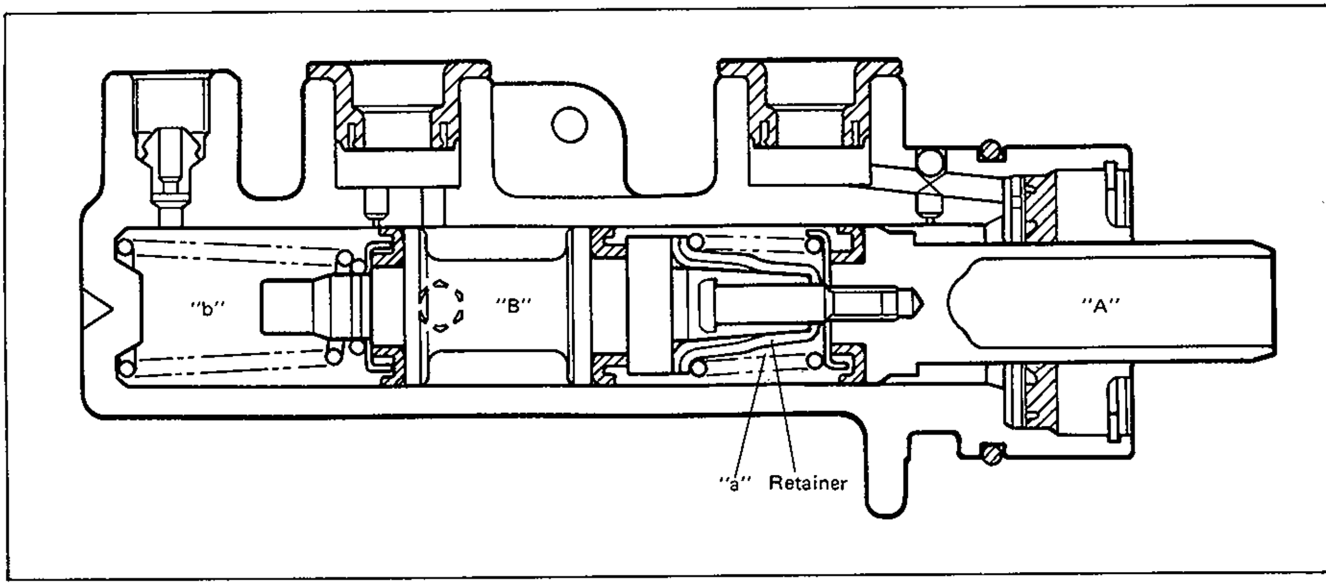


Fig. 5-11

One-circuit operation (Secondary chamber "b" circuit failure)

In this case, the leftward movement of the piston "A" has but little effect in causing the fluid pressure to rise in the chamber "a" in the beginning, because the initial rise of the fluid pressure causes the piston "B" to promptly yield and move to the left. However, when the forward end of the piston "B" comes to the head of the cylinder and stops there, the leftward movement of the piston "A" becomes effective. Thus the fluid pressure is produced in the chamber "a" and it acts on the rear wheel brakes (right and left).
The below figure shows secondary piston "B" at halt.

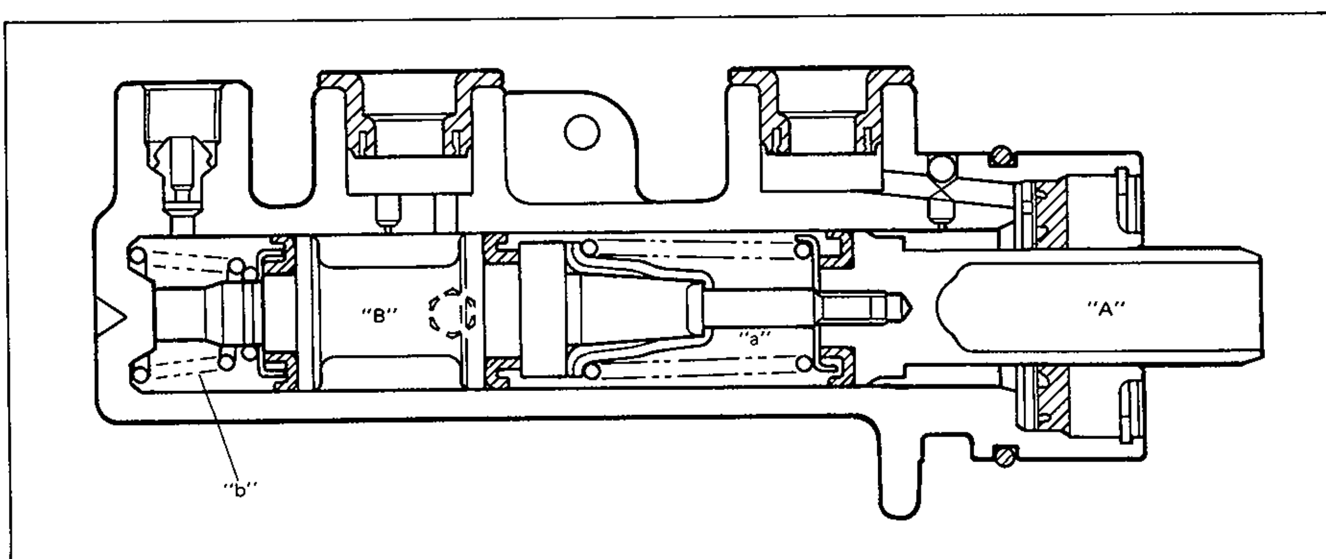


Fig. 5-12

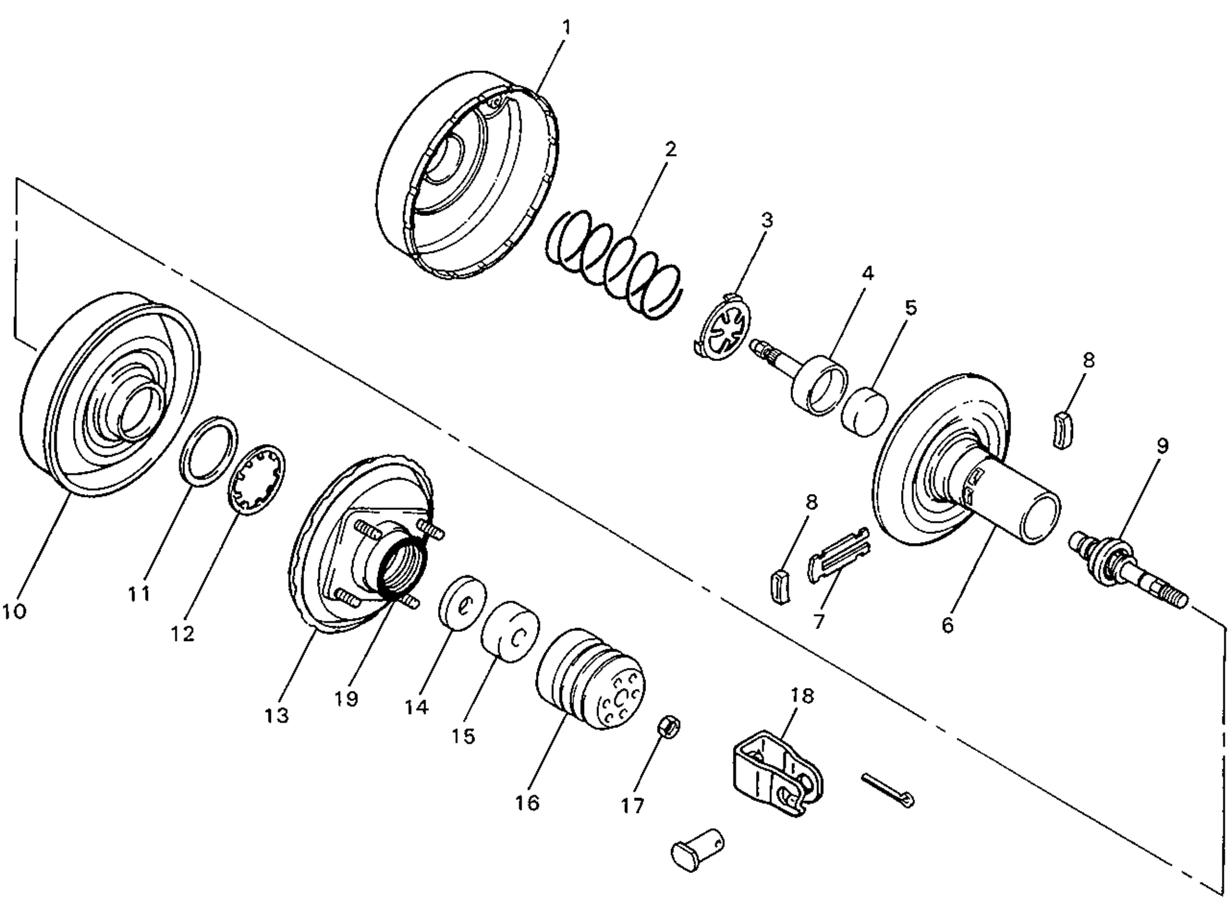
BOOSTER ASSEMBLY

GENERAL DESCRIPTION

The booster is located between the master cylinder and the brake pedal. It is so designed that the force created when the brake pedal is depressed is mechanically increased combined with the engine vacuum. The booster has a diaphragm of ϕ 8 in. (203 mm) effective diameter. Its operation is described in the following pages.

NOTE:

- **Use all components included in repair kits to service this booster. Lubricate rubber parts, where indicated, with silicone grease provided in kits. The torque values specified are for dry, unlubricated fasteners. If any hydraulic component is removed or brake line disconnected, bleed the brake system.**
- **Never lubricate any hydraulic component with silicone grease.**



1. Booster No. 1 body
2. Booster piston return spring
3. Rod retainer
4. Piston rod
5. Reaction disc
6. Booster piston
7. Valve stopper key
8. Key cushion
9. Booster air valve assembly
10. Diaphragm
11. Diaphragm retainer
12. Diaphragm stopper ring
13. Booster No. 2 body
14. Air cleaner separator
15. Air cleaner element
16. Body boot
17. Nut
18. Push rod clevis
19. No. 2 body oil seal

Fig. 5-13

Booster OPERATION

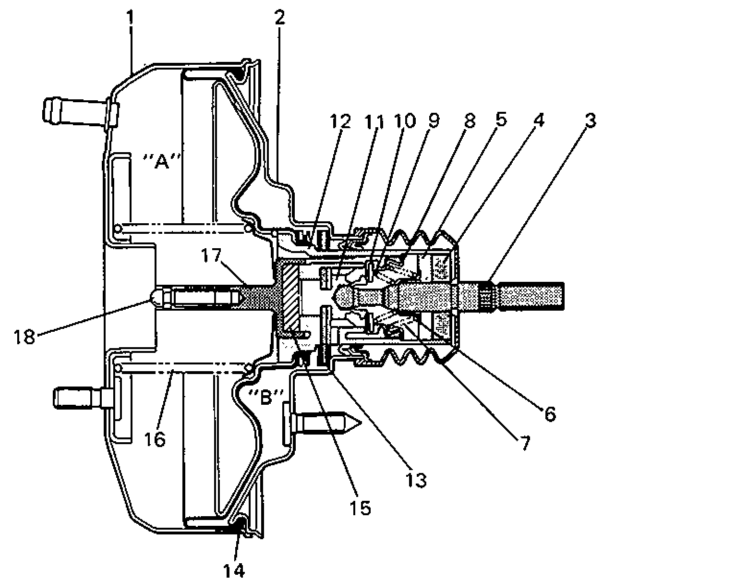


Fig. 5-14 Vacuum Booster Assembly

When the brake pedal is depressed, the force is transmitted to the piston of the master cylinder through the valve operating rod, booster air valve, reaction disc and piston rod. At the same time, the force of the booster piston developed due to the pressure difference between the two chambers "A" and "B" in the above figure is added to it.
The end of the booster control valve has a double function of a vacuum valve and air valve. That is, as shown in the figure, the booster control valve closes between the "A" and "B" chambers as its outer end "C" contacts the booster piston seat and opens as "C" leaves the booster piston seat (vacuum valve function). Also it closes between the "B" chamber and outside air as its inner end "D" contacts the air valve seat and opens as "D" leaves the air valve seat (air valve function).

When foot brake pedal is not depressed

The valve operating rod is pushed to the right by the spring force as shown. The air valve is also enough to the right to contact the valve stopper key as shown. In this state, the vacuum valve (control valve "C") is open and the air valve (control valve "D") is closed. Thus the chambers "A" and "B" conduct and share the same negative pressure (because of no pressure difference) which allows the return spring to push the booster piston to the right.

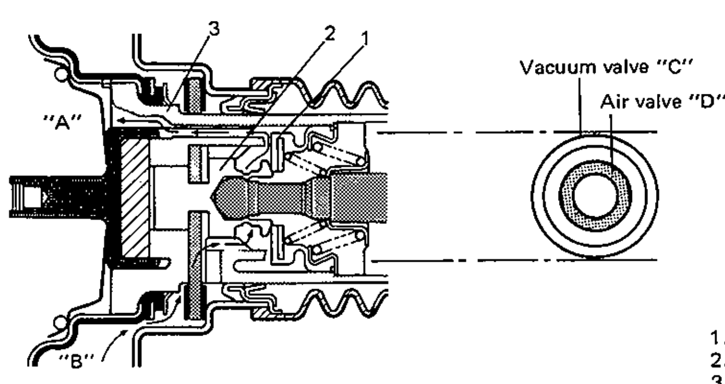


Fig. 5-15

When foot brake pedal is depressed
Being pushed by the operating rod, the booster air valve moves to the left as shown. Then the control valve is pushed against the booster piston seat closely by the valve spring force. Thus the vacuum valve (control valve "C") is closed to cut off between the chambers "A" and "B". At this time the air valve (control valve "D") is still closed.

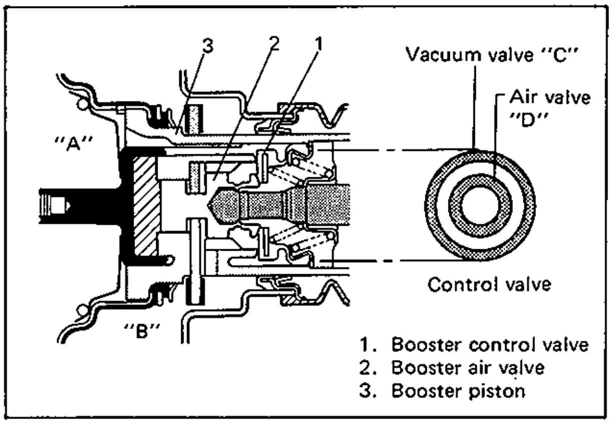


Fig. 5-16

As the booster air valve moves further to the left, it leaves the control valve and the air valve (control valve "D") opens to allow the air to flow into the chamber "B". The entry of air causes a difference in pressures between the chambers "A" and "B". When this pressure difference grows greater than the piston return spring force, the booster piston moves to the left and the booster control valve also moves to the left. The resulting air valve (control valve "D") closure stops the air flow into the chamber "B" and its pressure remains as it is. In this way, a small brake pedal depressing force is made into a strong push to the master cylinder push rod to produce high hydraulic pressure.

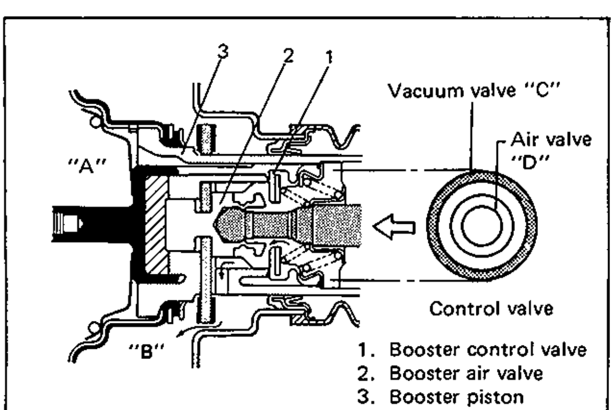


Fig. 5-17

When foot brake pedal is released
When the brake pedal is released, the booster air valve returns to the right by the master cylinder piston return force and the air valve return spring force as shown. Then the vacuum valve (control valve "C") opens and causes negative pressure in the chamber "B". The result is that the master cylinder piston and booster piston return to their original positions. This is the same state as described under **"When foot brake pedal is not depressed".**

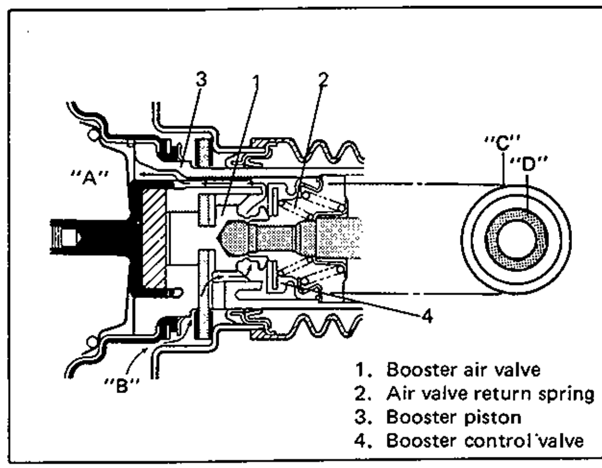


Fig. 5-18

Reference
Should any of the vacuum related parts in the booster be faulty, the brake force is not increased. Even then, however, the brake depressing force is transmitted to the valve operating rod, booster air valve, valve stopper key and booster piston in that order, to push the master cylinder push rod. Thus, the braking operation itself will not fail.

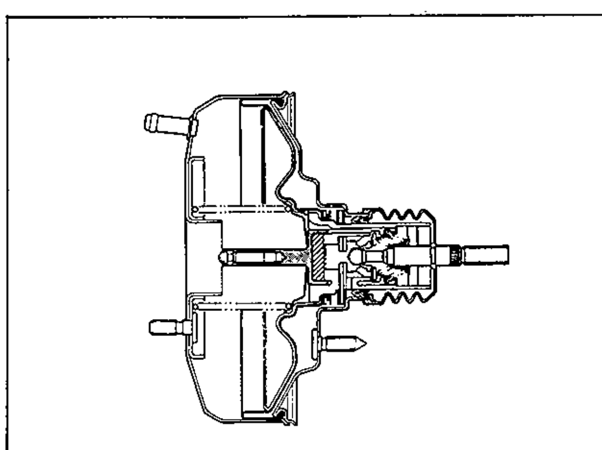


Fig. 5-19

LSPV (Load Sensing Proportioning Valve) ASSEMBLY

GENERAL DESCRIPTION

As shown in Fig. 5-1, LSPV is included within the brake circuit which connects the master cylinder and the rear wheel brake. It controls the hydraulic pressure applied to the rear wheel brake according to the loaded state of the vehicle (or weight of the load), whereby preventing the rear wheels from getting locked prematurely.

Also, it releases the above described control over the hydraulic pressure applied to the rear wheel brake, should any failure occur in the hydraulic circuit of the front wheel brake so that the hydraulic pressure produced in the master cylinder is applied to the rear wheel brake directly to operate it.

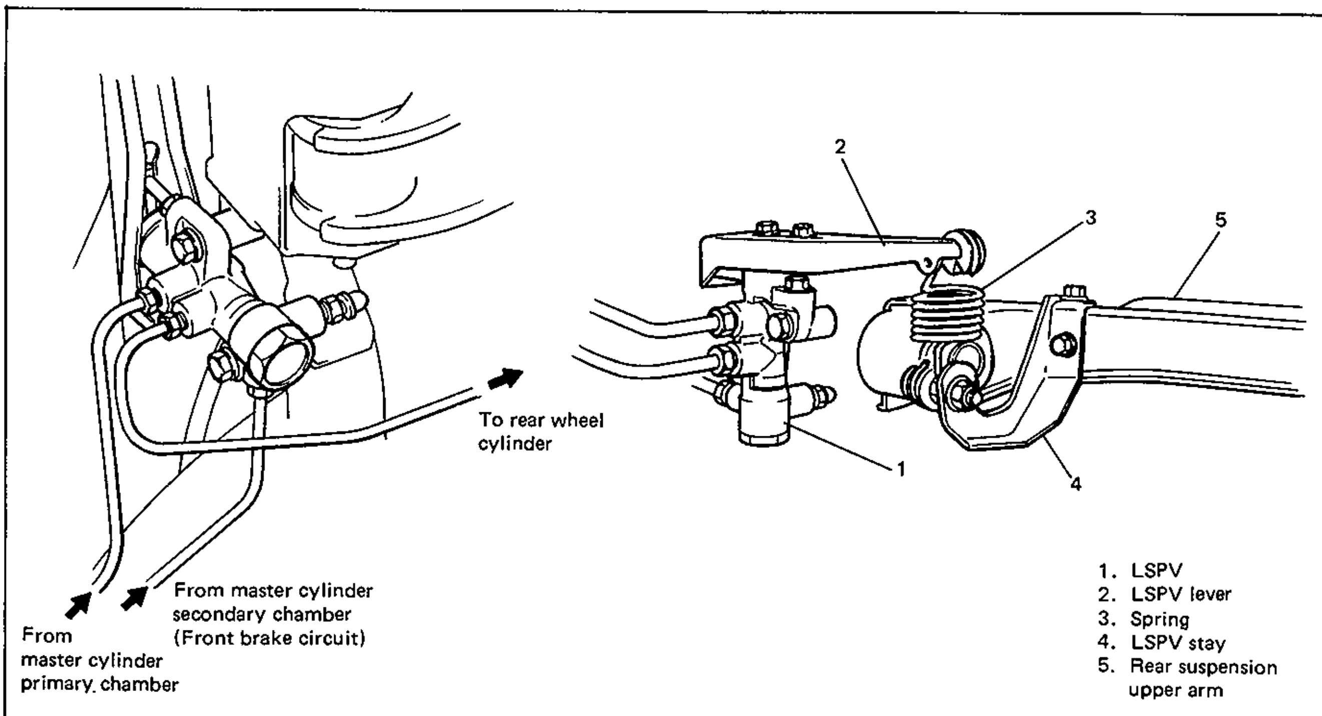


Fig. 5-20

CONSTRUCTION

The LSPV components are grouped into three sections as follows.

"A": Sensor section

The main parts in this section are a lever and a spring which senses variation in the vehicle height as affected by the loaded condition and converts it into the load.

"B": Hydraulic pressure control section

Included in this section are a stepped plunger and valve mechanism to execute proportional control.

"C": Fail-safe section

The main parts in this section are a chamber which draws in the hydraulic pressure from the front wheel brake system and a fail-safe piston which releases the valve mechanism in the control section connected to the rear wheel brake, should any failure occur in the front wheel brake system.

For the details, refer to Fig. 5-20-1.

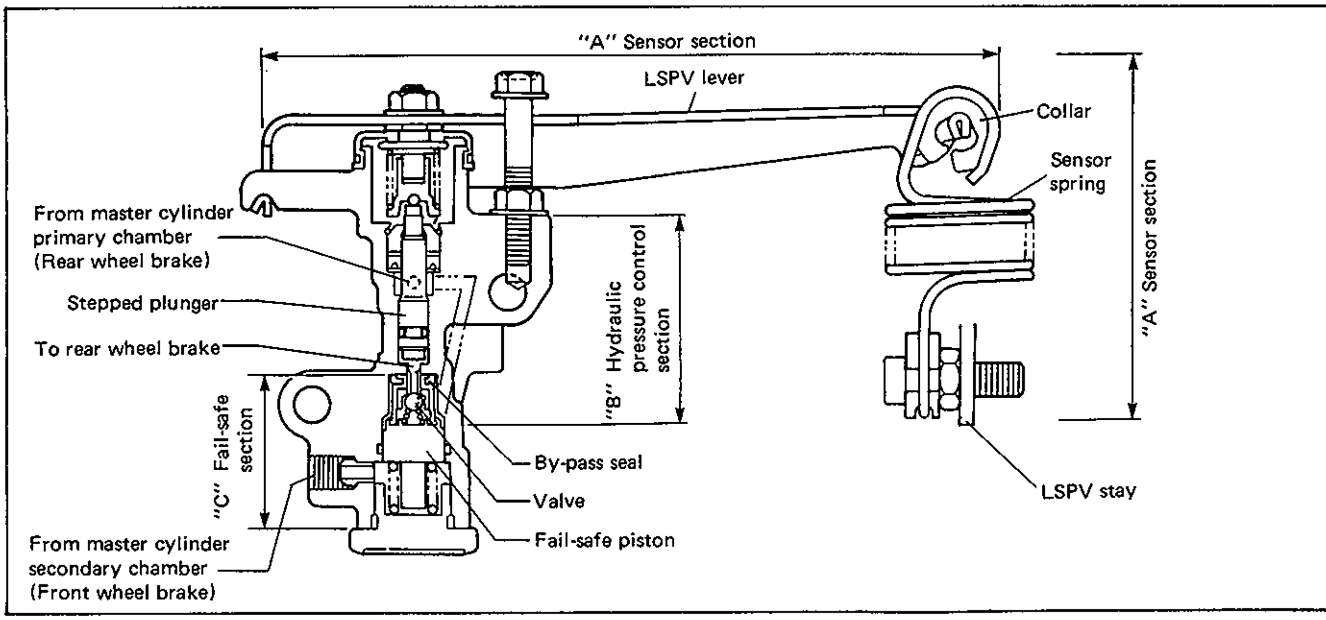


Fig. 5-20-1

OPERATION

As shown in Fig. 5-20, LSPV is installed to the vehicle body, with the end of the lever at its top connected to the upper arm of the rear suspension by way of the sensor spring and the LSPV stay.
When some load is placed on the vehicle, the distance between the axle housing of the rear suspension and the vehicle body (chassis) (i.e. coil spring height) changes, whereby the sensor spring length also changes.
As the sensor spring length changes, the force affecting the plunger in LSPV by way of the lever changes so that the hydraulic characteristic suitable for the load weight becomes available.

When empty

As the sensor spring is pulled by comparatively weak force, the force applied to the plunger is also small and the hydraulic characteristic takes a low bend point as shown in the graph below.

When loaded

As the sensor spring is pulled by comparatively strong force, a larger force is applied to the plunger so that the hydraulic characteristic takes a higher bend point in the graph below.

The relationship between the force applied to the plunger and the bend point in the hydraulic characteristic graph is described under 2. Operation of hydraulic pressure control section on the following page.

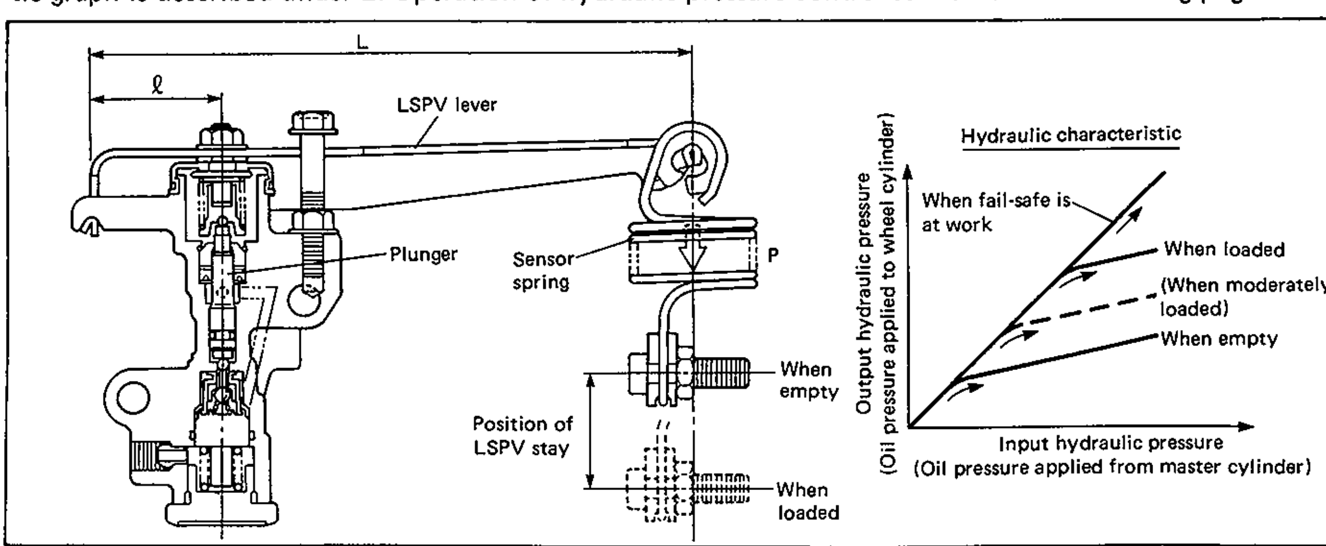


Fig. 5-20-2

1. Operation of sensor section (Refer to Fig. 5-20-2.)
   One end of the sensor spring is installed to the rear suspension upper arm and the other end is to the LSPV lever.
   The spring power P is applied to the plunger by way of the lever. The force on the plunger then is expressed as $F = \frac{L}{\ell} P$.

2. Operation of hydraulic pressure control section

1) Operation from the inoperative state till the input hydraulic pressure (fluid pressure from the master cylinder) reaches the bend point Pc in the graph as shown in Fig. 5-20-3:
   The input hydraulic pressure passes between the ball and seat (valve) and without receiving any control, it is discharged through the outlet port.

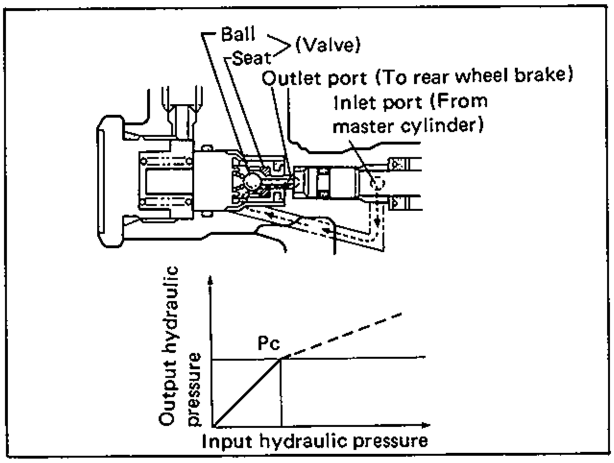
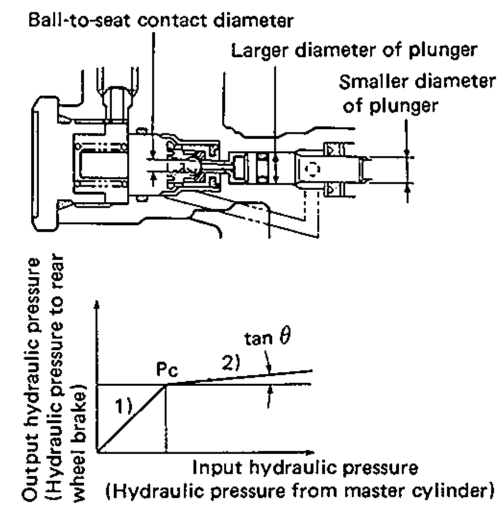


Fig. 5-20-3

2) As the input hydraulic pressure increases, the force applied to the plunger grows stronger than the sensor spring power and moves the plunger to the right in the figure and as a result, the valve closes the fluid passage. The hydraulic pressure then is represented by the bend point Pc in the graph.
   As the incoming hydraulic pressure rises even higher, the plunger opens and closes between the ball and the seat (valve) so as to keep a good balance among the forces applied to itself. (i.e. forces from sensor spring, input hydraulic pressure and output hydraulic pressure). Thus the output hydraulic pressure is controlled according to the valve opening and therefore its characteristic is repressented as a line with a certain gradient.



Reference:
The bend point Pc and gradient tan θ are obtained by using the following equations.

$$Pc = \frac{F}{S_B} \qquad \tan\theta = \frac{S_A - S_B - S_C}{S_A - S_C}$$

F : Force from sensor spring
S_A : Larger diameter sectional area of plunger
S_B : Smaller diameter sectional area of plunger
S_C : Sectional area of ball-to-seat contact

Fig. 5-20-4

3. Operation when fail-safe is at work
   Should it occur that no hydraulic pressure is generated in the front wheel brake due to some fault in its system, the fail-safe piston, usually under the hydraulic pressure of the front and rear wheel brakes, moves to the left as shown in the figure below by the hydraulic pressure from the rear wheel brake.
   The piston, as it moves, opens the valve seal to allow the hydraulic pressure to pass through it. Then the hydraulic pressure is fed through the outlet port to the wheel cylinders of the rear wheel brake without being controlled.

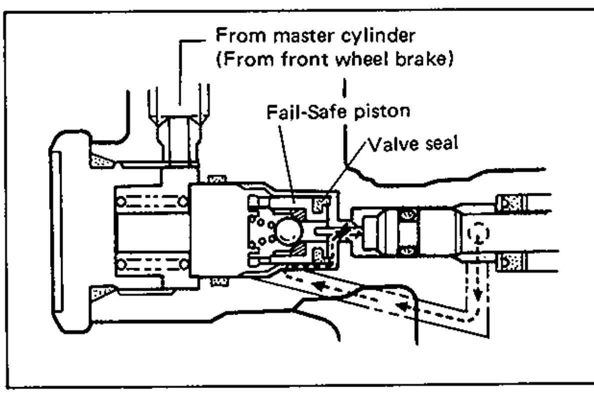


Fig. 5-20-5

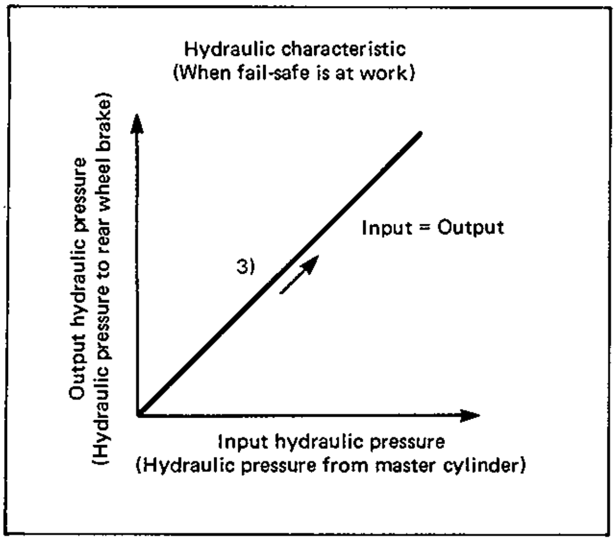

Hydraulic characteristic
(When fail-safe is at work)
Output hydraulic pressure
(Hydraulic pressure to rear wheel brake)
Input = Output
3)
Input hydraulic pressure
(Hydraulic pressure from master cylinder)

Fig. 5-20-6

DIAGNOSIS

ROAD TESTING BRAKES

Brakes should be tested on dry, clean, smooth and reasonably level roadway which is not crowned. Road test brakes by making brake applications with both light and heavy pedal forces at various speeds to determine if the vehicle stops evenly and effectively.
Also drive vehicle to see if it leads to one side or the other without brake application. If it does, check the tire pressure, front end alignment and front suspension attachments for looseness. See diagnosis chart for other causes.

BRAKE FLUID LEAKS

Check the master cylinder fluid levels. While a slight drop in reservoir level does result from normal lining wear, an abnormally low level indicates a leak in the system. In such a case, check the entire brake system for leakage. If even a slight evidence of leakage is noted, the cause should be corrected or defective parts should be replaced.

SUBSTANDARD OR CONTAMINATED BRAKE FLUID

Improper brake fluid, mineral oil or water in the fluid may cause the brake fluid to boil or the rubber components in the hydraulic system to deteriorate.

If primary piston cups are swollen, then rubber parts have deteriorated. This deterioration may also be evidenced by swollen wheel cylinder piston cups on the drum brake wheels.

If deterioration of rubber is evident, disassemble all hydraulic parts and wash with alcohol. Dry these parts with compressed air before assembly to keep alcohol out of the system. Replace all rubber parts in the system, including hoses. Also, when working on the brake mechanisms, check for fluid on the linings. If excessive fluid is found, replace the linings.

If master cylinder piston seals are satisfactory, check for leakage or excessive heat conditions. If no such condition is found, drain fluid, flush with brake fluid, refill and bleed the system.

The system must be flushed if there is any doubt as to the grade of fluid in the system or if fluid has been used which contained parts that have been subjected to contaminated fluid.

BRAKE DIAGNOSIS CHART A		
Condition	**Possible Cause**	**Correction**
Not enough braking force	1. Brake oil leakage from brake lines.	Locate leaking point and repair.
	2. Brake disc or pads stained with oil.	Repalce.
	3. Overheated brakes.	Determine cause and repair.
	4. Poor contact of shoes on brake drum.	Repair for proper contact.
	5. Brake shoes linings stained with oil	Replace.
	6. Badly worn brake shoe linings.	Replace.
	7. Defective wheel cylinders.	Repair or replace.
	8. Malfunctioning caliper assembly.	Repair or replace.
	9. Air in system.	Bleed system.
	10. Maladjusted sensor spring length of LSPV.	Check or adjust.
	11. Broken sensor spring of LSPV.	Replace.
	12. Defective collar of LSPV.	Replace.
Brake pull (Brakes not working in unison)	1. Shoe linings are wet with water or stained with oil in some brakes.	Replace.
	2. Drum-to-shoe clearance out of adjustment in some brakes. (Malfunctioning auto adjusting mechanism).	Check for inoperative auto adjusting mechanism.
	3. Drum is out of round in some brakes.	Replace.
	4. Wheel tires are inflated unequally.	Inflate equally.
	5. Malfunctioning wheel cylinders.	Repair or replace.
	6. Disturbed front end alignment.	Adjust as prescribed.
	7. Unmatched tires on same axle.	Tires with approximately the same amount of tread should be used on the same axle.
	8. Restricted brake tubes or hoses.	Check for soft hoses and damaged lines. Replace with new hoses and new double-walled steel brake tubing.
	9. Malfunctioning caliper assembly.	Check for stuck or sluggish pistons and proper lubrication of caliper slide bush. Caliper should slide.
	10. Loose suspension parts.	Check all suspension mountings.
	11. Loose calipers.	Check and torque bolts to specifications.
Noise (high pitched squeak without brake applied)	1. Front lining worn out.	Replace linings.
Rear brake locked prematurely	1. Maladjusted sensor spring length of LSPV.	Check or adjust.
	2. Malfunctioning LSPV assembly.	Replace assembly.

BRAKE DIAGNOSIS CHART B

Condition	Possible Cause	Correction
Excessive pedal travel (Pedal stroke too large)	1. Partial brake system failure.	Check brake systems and repair as necessary.
	2. Insufficient fluid in master cylinder reservoirs.	Fill reservoirs with approved brake fluid. Check for leaks and air in brake systems. Check warning light. Bleed system if required.
	3. Air in system. (pedal soft/spongy).	Bleed system.
	4. Rear brake system not adjusted (malfunctioning auto adjusting mechanism).	Repair auto adjusting mechanism. Adjust rear brakes.
	5. Bent brake shoes.	Replace brake shoes.
	6. Worn rear brake shoes.	Replace brake shoes.
Dragging brakes (A very light drag is present in all disc brakes immediately after pedal is released)	1. Master cylinder pistons not returning correctly.	Repair master cylinder.
	2. Restricted brake tubes or hoses.	Check for soft hoses or damaged tubes and replace with new hoses and/or new double-walled steel brake tubing.
	3. Incorrect parking brake adjustment on rear brakes.	Check and adjust to correct specifications.
	4. Weakened or broken return springs in the brake.	Replace.
	5. Sluggish parking-brake cables or linkage.	Repair or replace.
	6. Wheel cylinder or caliper piston sticking.	Repair as necessary.
Pedal pulsation (Pedal pulsates when depressed for braking.)	1. Damaged or loose wheel bearings.	Replace wheel bearings.
	2. Distorted steering knuckle or rear axle shafts.	Replace knuckle or rear axle shaft.
	3. Excessive disc lateral runout.	Check per instructions. If not within specifications, replace or machine disc.
	4. Parallelism not within specifications.	Check per instructions. If not within specifications, replace or machine disc.
	5. Rear drums out of round.	Check runout. Repair or replace drum as necessary.
Braking noise	1. Glazed shoe linings, or foreign matters stuck to linings.	Repair or replace shoe lining.
	2. Worn or distorted shoe linings.	Replace shoe lining (or pad).
	3. Loose front wheel bearings.	Replace wheel bearing.
	4. Distorted backing plates or loose mounting bolts.	Replace or retighten securing bolts.

ON VEHICLE SERVICE

1. BRAKE PEDAL FREE HEIGHT ADJUSTMENT

1) When booster push rod clevis has been reinstalled, it is important that measurement between booster mounting surface (with a gasket attached) and center of clevis pin hole is adjusted within 126.1 – 127.1 mm (4.965 – 5.004 in.). (See page 5-62.)
2) When stop light switch has been removed, refer to the following STOP LIGHT SWITCH ADJUSTMENT for proper installation.
   Services in above steps 1) and 2) may affect brake pedal height.

2. STOP LIGHT SWITCH ADJUSTMENT

Adjustment should be made as follows when installing switch.
Pull up brake pedal toward you and while holding it there, adjust switch position so that clearance between end of thread and brake pedal return cushion (shown as "A" in fugure) is within 0.5 – 1.0 mm (0.02 – 0.04 in.). Then tighten lock nut to specified torque.

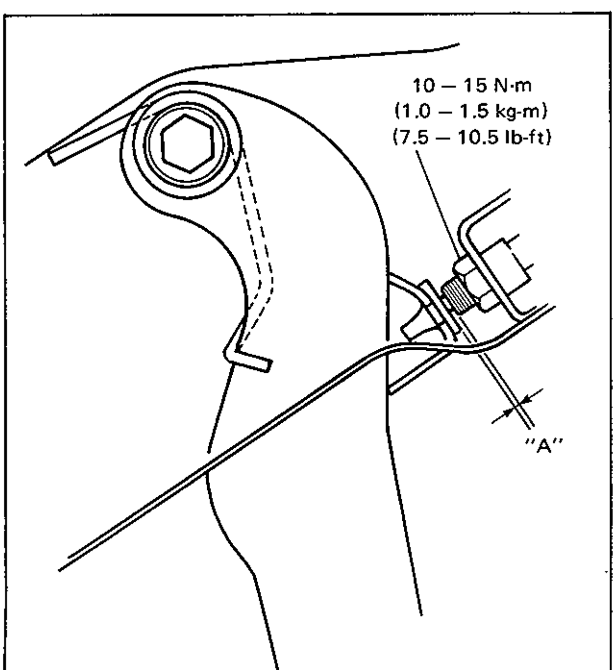


Fig. 5-20-7

3. EXCESSIVE PEDAL TRAVEL CHECK

1) Start engine.
2) Depress brake pedal a few times.
3) With brake pedal depressed with approximately 30 kg (66 lbs) load, measure pedal arm to wall clearance "B". It mustn't be less than 130 mm (5.12 in.).

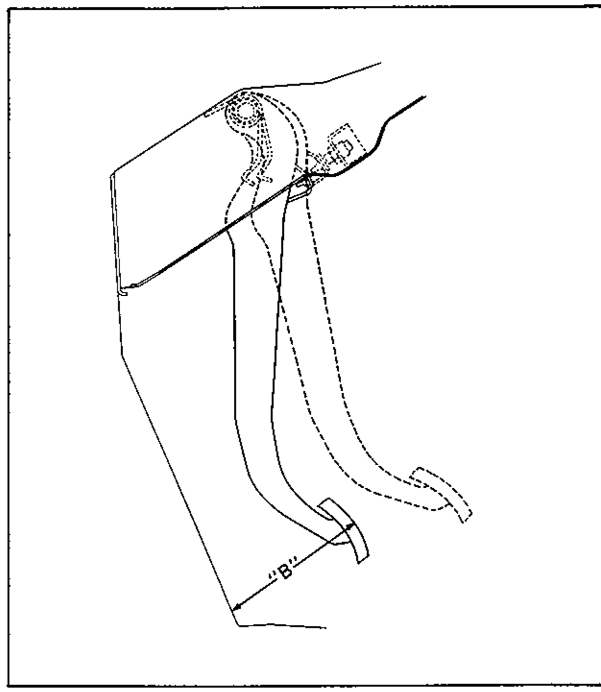


Fig. 5-21

4) If clearance "B" is less than 130 mm (5.12 in.), the most possible cause is either rear brake shoes are worn out beyond limit or air is in lines.
   Should clearance "B" remain less than 130 mm (5.12 in.) even after replacement of brake shoes and bleeding of system, other possible but infrequent cause is malfunction of rear brake shoe adjusters or booster push rod length out of adjustment for the vehicle with brake booster.

- See page 5-45 for brake shoe inspection.
- See page 5-23 for bleeding brake system.
- Remove brake drums for adjuster inspection. (See page 5-38.). If defective, correct or replace.

4. BRAKE PEDAL PLAY INSPECTION

Pedal play should be within below specification. If out of specification, check stop light switch for proper installation position and adjust if necessary.
Also check pedal shaft bolt and master cylinder pin installation for looseness and replace if defective.

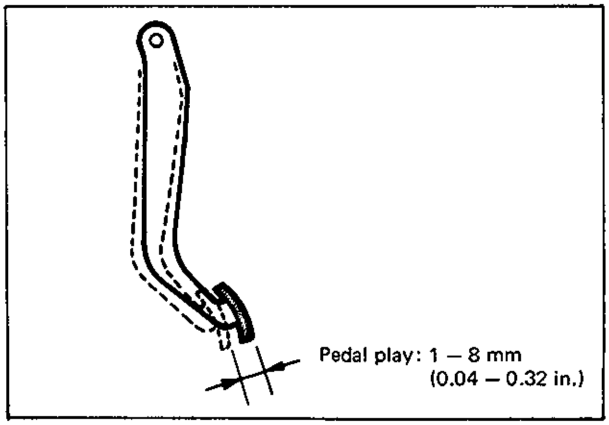


Fig. 5-23

5. REAR DRUM BRAKE SHOE ADJUSTMENT

Rear brake has self-adjusting mechanism but it does require adjustment for proper drum to shoe clearance when brake shoe has been replaced or brake drum has been removed for some other service.
Adjustment is automatically accomplished by depressing brake pedal 3 to 5 times with approximately 30 kg (66 lbs) load after all parts are installed.
Then check brake drum for dragging and brake system for proper performance. After lowering vehicle from hoist, brake test should be performed.

6. MASTER CYLINDER INSPECTION

Check for a cracked master cylinder casting or brake fluid around the master cylinder. Leaks are indicated only if there is at least a drop of fluid. A damp condition is not abnormal.

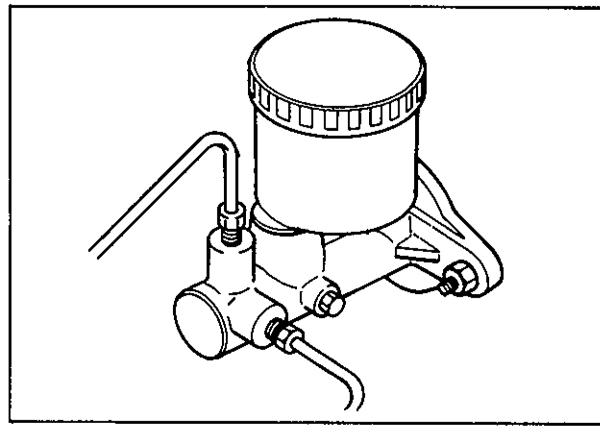


Fig. 5-24

7. DISC INSPECTION

Refer to page 5-37 of this section for inspection point and procedure.

8. PAD LINING INSPECTION

Inspect pad linings periodically according to maintenance schedule whenever wheels are removed (for tire rotation or other reason). Take a look through hole of caliper and check lining thickness of outside and inside pads.
If lining is worn and its thickness ("C" in figure) is less than 3 mm (0.12 in.), all pads must be replaced at the same time.

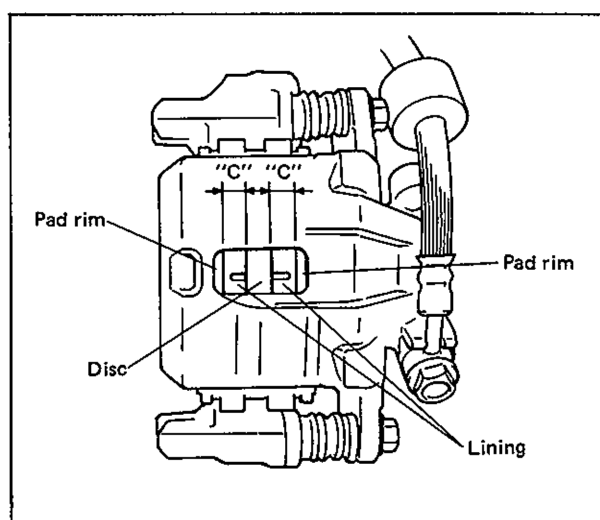


Fig. 5-25

9. PARKING BRAKE INSPECTION AND ADJUSTMENT

a) Inspection

Hold center of parking brake lever grip and pull it up with 20 to 25 kg (44 to 55 lbs) force.
With parking brake lever pulled up as above, count ratchet notches in "A" as shown in figure. There should be 7 to 9 notches.
Also, check if both right and left rear wheels are locked firmly.
To count number of notches easily, listen to click sounds that ratchet makes while pulling parking brake lever without pressing its button. One click sound corresponds to one notch.

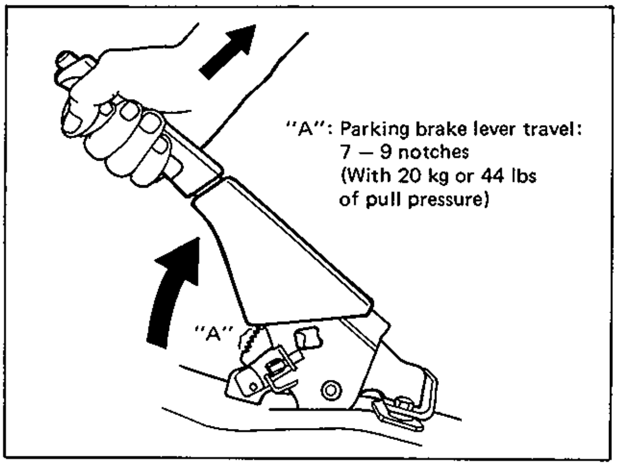


Fig. 5-26

If number of notches is out of specification, adjust cable by referring to adjustment procedure described on the following step b) so as to obtain specified parking brake stroke.

NOTE:
Check tooth tip of each notch for damage or wear. If any damage or wear is found, replace parking brake lever.

b) Adjustment

NOTE:
Make sure for following conditions before cable adjustment.

- **No air is trapped in brake system.**
- **Brake pedal travel is proper.**
- **Brake pedal has been depressed a few times with about 30 kg (66 lbs) load.**
- **Parking brake lever has been pulled up a few times with about 20 kg force.**
- **Rear brake shoes are not worn beyond limit, and self adjusting mechanism operates properly.**
- **To slacken parking brake cable, loosen self-locking nuts as far as end of bolt. Then depress brake pedal a few times with about 30 kg (66 lbs) load.**

After confirming that above 6 conditions are all satisfied, adjust parking brake lever stroke by loosening or tightening self locking nut (3 in figure below.)

NOTE:
Check brake drum for dragging after adjustment.

Parking brake stroke; when lever is pulled up at 20 kg (44 lbs)	Within 7 – 9 notches

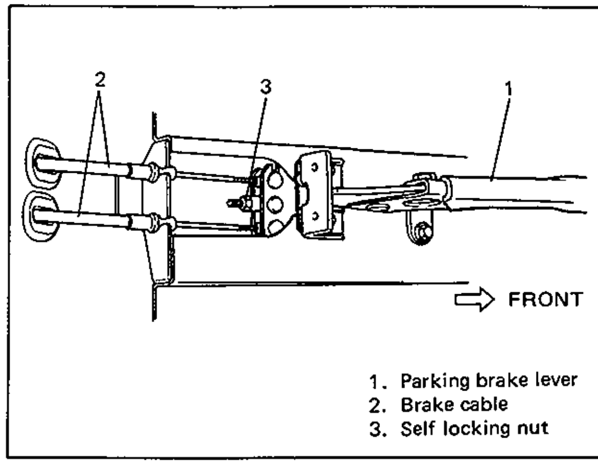


Fig. 5-27

10. FLUSHING BRAKE HYDRAULIC SYSTEM

It is recommended that entire hydraulic system be thoroughly flushed with clean brake fluid whenever new parts are installed in hydraulic system.
Periodical change of brake fluid is also recommended.

11. BLEEDING BRAKES

NOTE:

- **Brake fluid is extremely damaging to paint. If fluid should accidentally get on painted surface, immediately wipe fluid from paint and clean painted surface.**
- **When master cylinder has been removed or disassembled, or brake pipe has been disconnected from master cylinder, bleed air from master cylinder to facilitate bleeding air of brake system. (Refer to item 12 BLEEDING AIR FROM MASTER CYLINDER.) Then proceed to following operation.**

Bleeding operation is necessary to remove air whenever it entered hydraulic brake system.
Hydraulic lines of brake system consists of two separate lines, one for front wheel brakes and the other for rear wheel brakes. Air bleeding is necessary at right and left front wheel brakes, left rear wheel brake and LSPV, i.e. 4 places in all.
Be sure to bleed air of brake system according to following procedure when its oil hydraulic circuit has been disconnected.

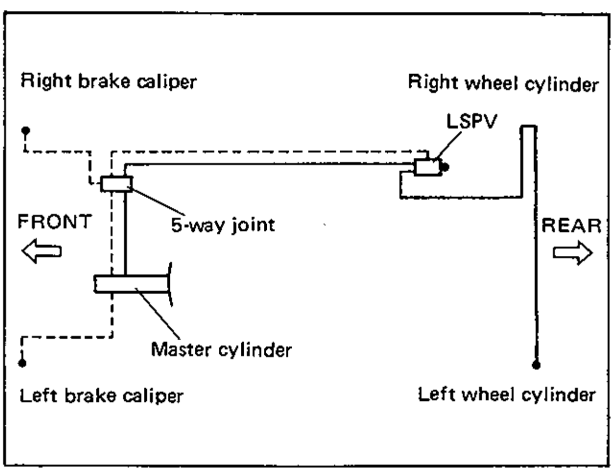


Fig. 5-28

1) Fill master cylinder reservoir with brake fluid and keep at least one-half full of fluid during bleeding operation.
2) Remove bleeder plug cap.
   Attach a vinyl tube to bleeder plug of wheel cylinder, and insert the other end into container.

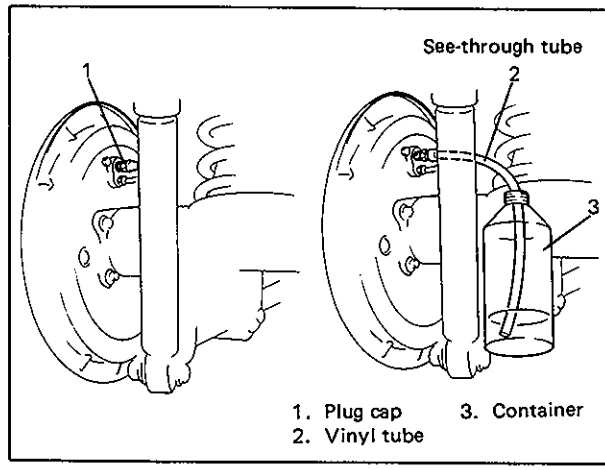


Fig. 5-29

3) Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-third to one-half turn.

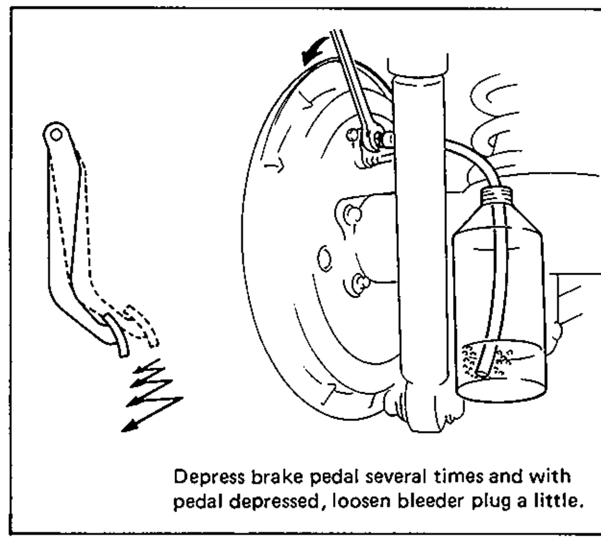


Fig. 5-30

4) When fluid pressure in the cylinder is almost depleted, retighten bleeder plug.

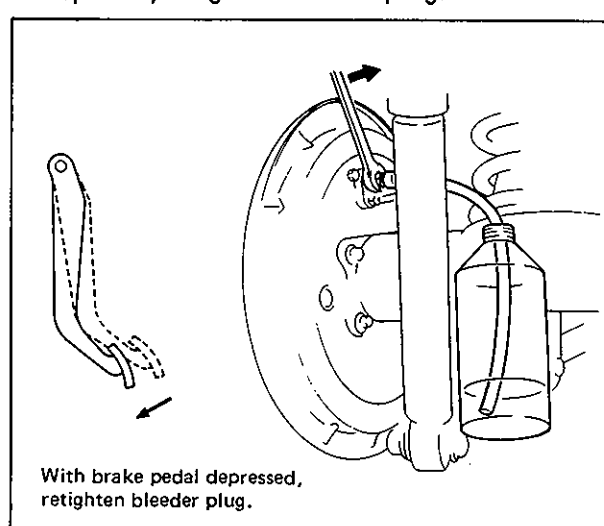


Fig. 5-31

5) Repeat this operation until there are no more air bubbles in hydraulic line.
6) When bubbles stop, depress and hold brake pedal and tighten bleeder plug.
(For tightening torque specification of air bleeder plug, see page 5-67.)
7) Then attach bleeder plug cap.

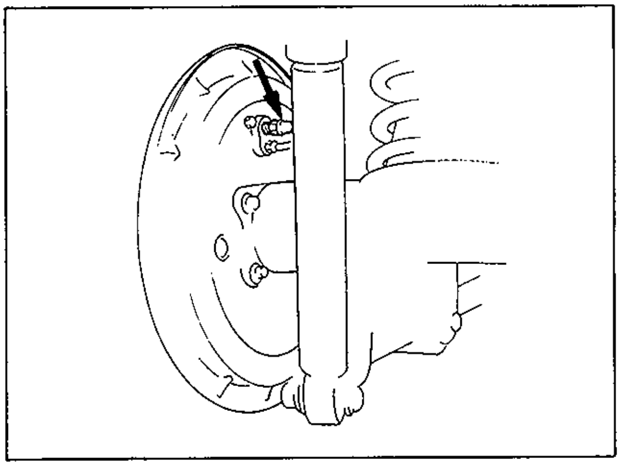


Fig. 5-32

8) After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.
9) Replenish fluid into reservoir up to specified level.

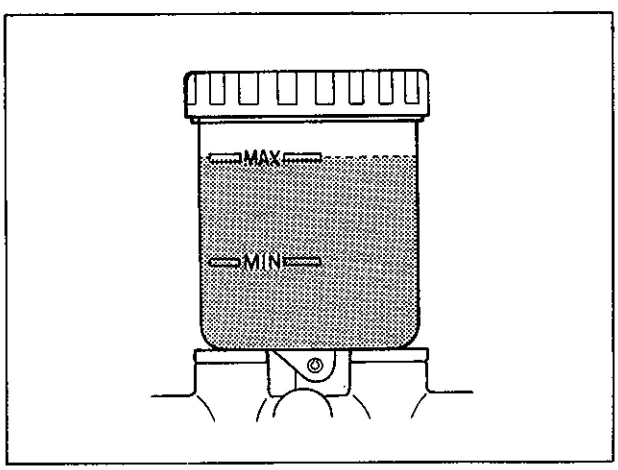


Fig. 5-33

10) Check brake pedal for "sponginess". If found spongy, repeat entire procedure of bleeding.

12. BLEEDING AIR FROM MASTER CYLINDER

NOTE:
Brake fluid is extremely damaging to paint. If fluid should accidentally get on painted surface, immediately wipe fluid from paint and clean painted surface.

When master cylinder has been removed or disassembled, or brake pipe has been disconnected from master cylinder, bleed air from master cylinder first to facilitate bleeding air of brake system.

Bleeding air from master cylinder

1) Fill master cylinder reservoir with specified brake fluid and wait for at least 1 minute.
2) Disconnect brake pipe from primary side (for rear brake).
3) With discharge port opened, depress brake pedal gradually. Then with discharge port closed with finger, release brake pedal gradually and keep it closed for about 5 seconds before depressing brake pedal again.
4) Repeat what is described in above 3) till liquid comes out of discharge port. After that, repeat still the same procedure at least 3 times and then connect primary side brake pipe.
5) Disconnect 2 brake pipes from secondary side (for front brake).
6) With 2 discharge ports closed with fingers, repeat the same procedure as descriped in above 3) till liquid comes out of discharge port. After that repeat still the same procedure at least 3 times and then reconnect 2 brake pipes.
7) Upon completion of above steps, proceed to operation as described under item 11. BLEEDING BRAKES.

13. BRAKE HOSE AND PIPE INSPECTION

HOSE

Brake hose assembly should be checked for road hazard damage, for cracks and chafing of outer cover, for leaks and blisters. A light and mirror may be needed for adequate inspection. If any of the above conditions are observed on brake hose, it is necessary to replace it.

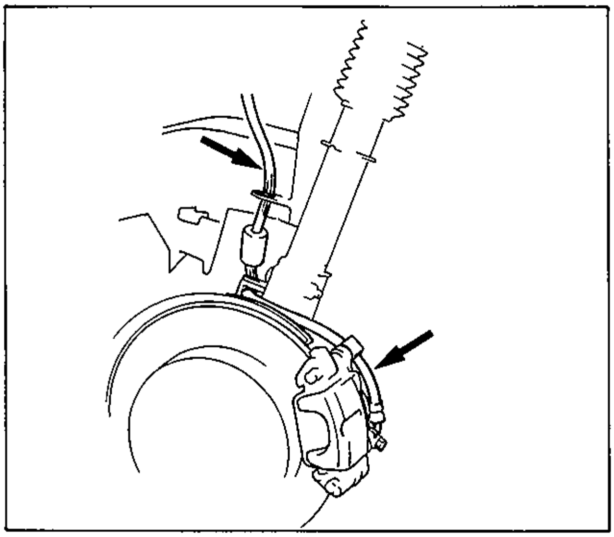


Fig. 5-34

PIPE

Inspect the tube for damage, cracks, dents and corrosion. If any defect is found, replace.

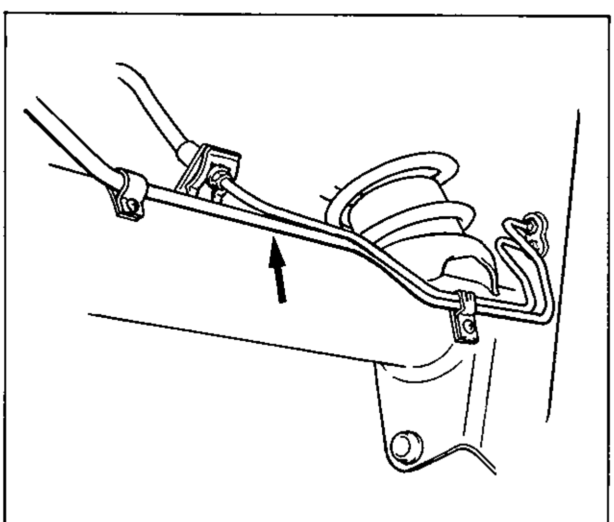


Fig. 5-35

14. BRAKE FLUID LEVEL INSPECTION

Be sure to use particular brake fluid either as indicated on reservoir cap of that vehicle or recommended in owner's manual which comes along with that vehicle.
Use of any other fluid is strictly prohibited.
Fluid level should be between MIN and MAX lines marked on reservoir.
When warning light lights sometimes during driving, replenish fluid to MAX line.
When fluid decreases quickly, inspect brake system for leakage. Correct leaky points and then refill to specified level.

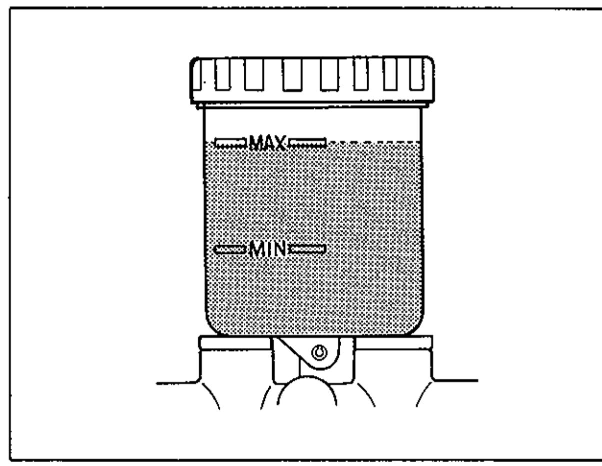


Fig. 5-36

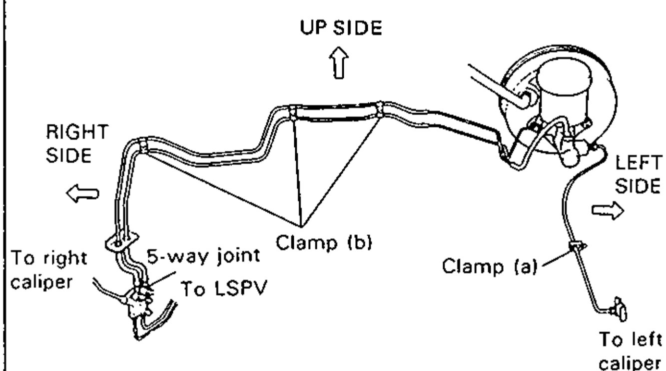
CAUTION:
Do not use shock absorber fluid or any other fluid which contains mineral oil. Do not use a container which has been used for mineral oil or a container which is wet from water. Mineral oil will cause swelling and distortion of rubber parts in hydraulic brake system and water mixed into brake fluid will lower fluid boiling point. Keep all fluid containers capped to prevent contamination.

BRAKE HOSE/PIPE R & I

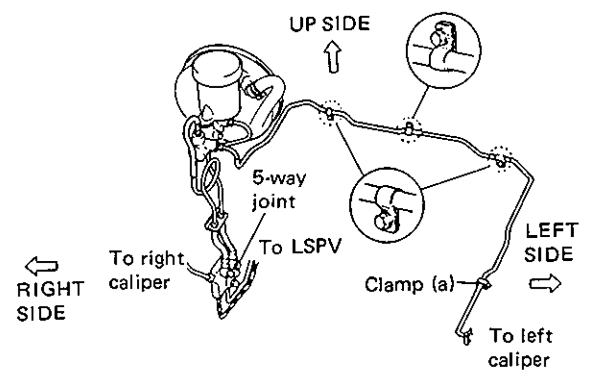
1. REMOVE AND INSTALL FRONT BRAKE HOSE/PIPE

1) Raise and support vehicle properly. Remove tire and wheel.
   This operation is not necessary when removing pipes connecting master cylinder and flexible hose.
2) Clean dirt and foreign material from both hose end and pipe end fittings. Remove brake hose or pipe.
3) Reverse removal procedure for brake hose or pipe installation.
   For installation, make sure that steering wheel is in straightforward position and hose has no twist or kink. Check to make sure that hose doesn't contact any part of suspension, both in extreme right and extreme left turn conditions. If it does at any point, remove and correct. Fill and maintain brake fluid level in reservoir. Bleed brake system.

[Left hand steering vehicle]

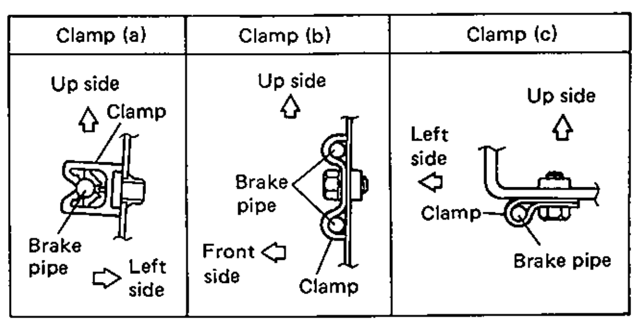


[Right hand steering vehicle]



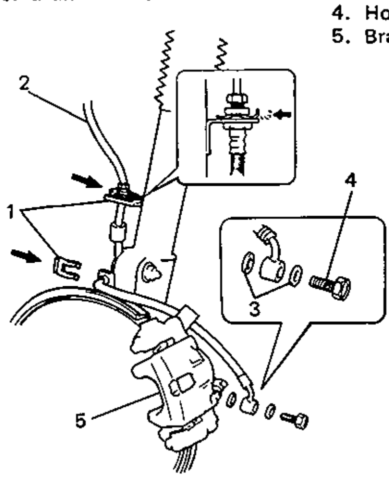
Viewed from arrow "A" in lower right figure

	N·m	kg-m	lb-ft
Tightening torque for brake pipe flare nuts	14 – 18	1.4 – 1.8	10.5 – 13.0
Tightening torque for 5-way joint bolt	8 – 12	0.8 – 1.2	6.0 – 8.5



NOTE:
Insert E-ring till its end surface is flush with or lower than bracket end surface.

1. E-ring
2. Flexible hose
3. Hose washer
4. Hose bolt
5. Brake caliper



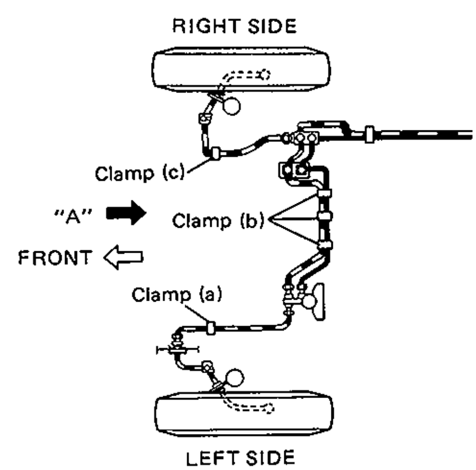


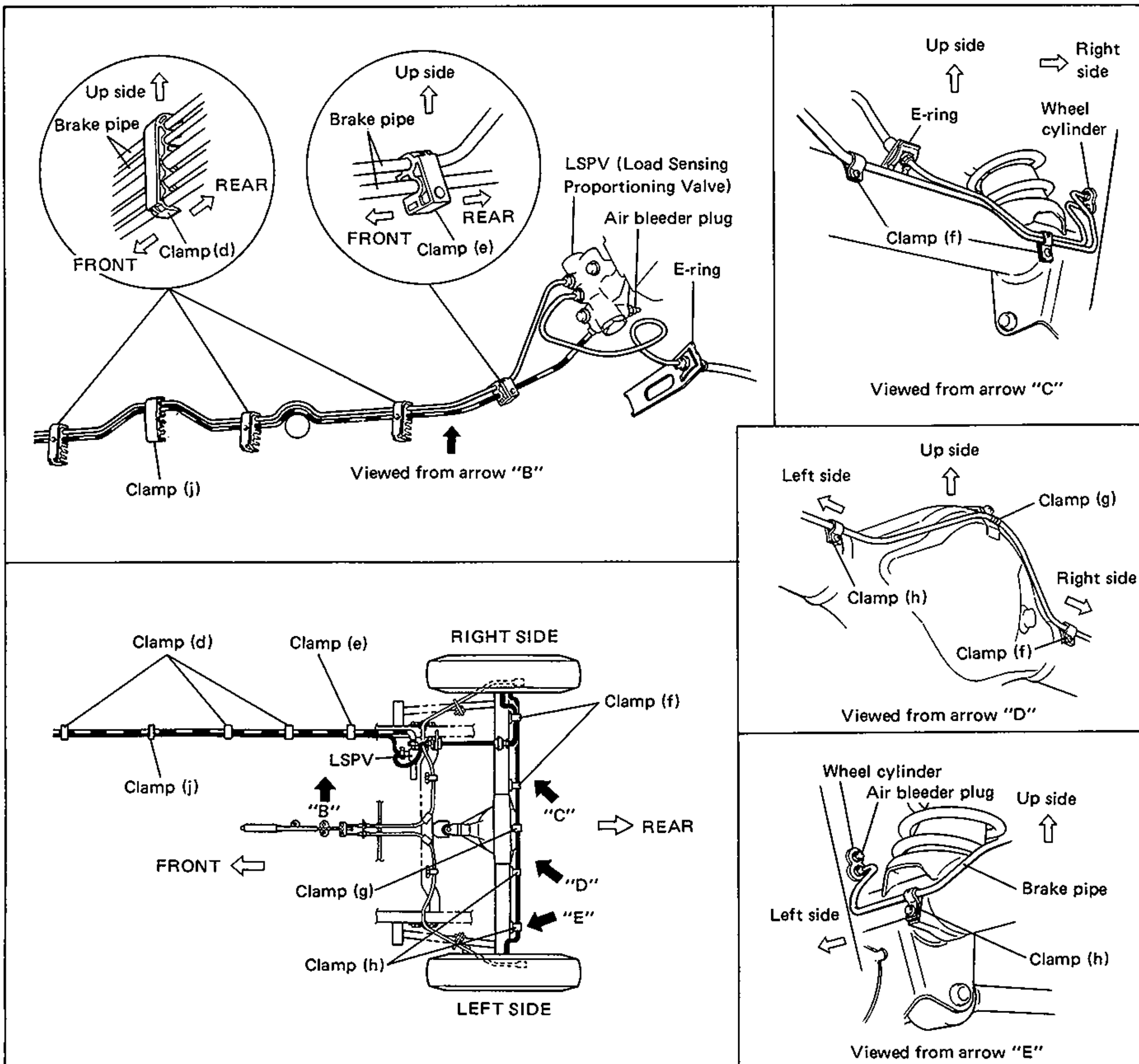
Fig. 5-37 Front Brake Hose/Pipe R & I

2. REMOVE AND INSTALL REAR BRAKE HOSE/PIPE

1) Raise and support vehicle properly. Remove tire and wheel.
2) Clean dirt and foreign material from both hose end or pipe end fittings. Remove brake hose or pipe.
3) Reverse removal procedure for brake hose or pipe installation. Fill and maintain brake fluid level in reservoir. Bleed brake system.

PRECAUTIONS FOR INSTALLATION

- Position clamps(d) to white marks on two brake pipes.
- Be sure to allow more than 3 mm (0.118 in.) clearance between axle housing and brake pipe.
- Install clamps properly referring to figure below and tighten bolts.
- When installing hose, make sure that it has no twist or kink.



Tightening torque for brake flare nut	N·m	kg-m	lb-ft
	14 – 18	1.4 – 1.8	10.5 – 13.0

Fig. 5-38 Rear Brake Hose/Pipe R & I

PARKING BRAKE LEVER/CABLE R & I

1. REMOVE AND INSTALL PARKING BRAKE LEVER

REMOVAL

1) Remove parking brake lever cover. To remove rivet in its front part, push pin in the center of rivet into cover.
2) Disconnect lead wire of parking brake switch at coupler.
3) Remove parking brake cable locking nut.
4) Remove parking brake lever bolts and then remove parking brake lever assembly from equalizer.
5) Remove equalizer from parking brake cable.

NOTE:
Don't disassemble parking brake lever switch. It must be removed and installed as a complete switch assembly.

INSTALLATION

1) Install in reverse order of REMOVAL procedure.
2) After all parts are installed, parking brake lever needs to be adjusted. Refer to PARKING BRAKE INSPECTION AND ADJUSTMENT in this section (page 5-22).
3) Check brake drum for dragging and brake system for proper performance.

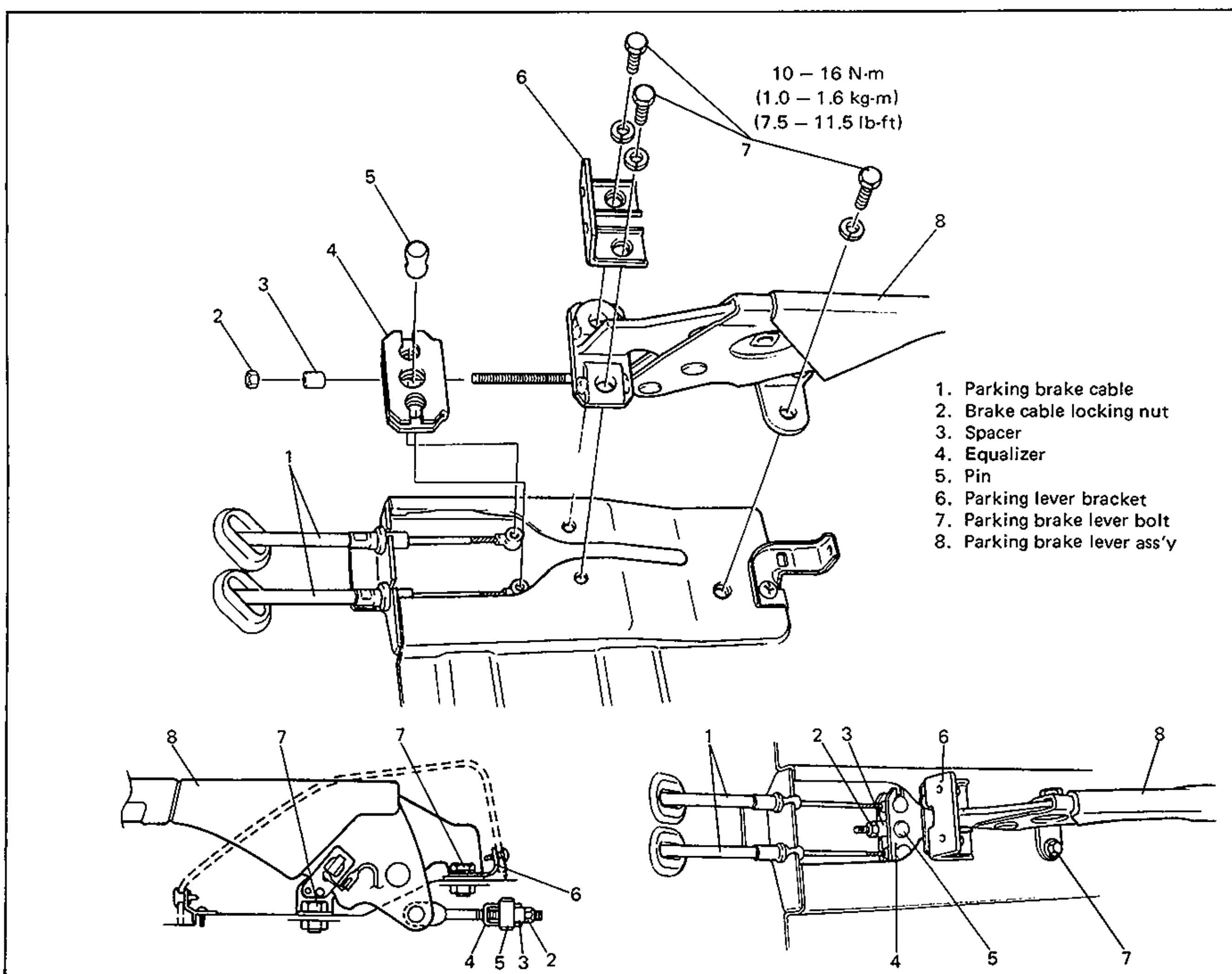


Fig. 5-39

2. REMOVE AND INSTALL PARKING BRAKE CABLE

REMOVAL

1) Remove brake drum. (Refer to steps 1) to 6) of BRAKE DRUM REMOVAL of this section, page 5-38.)
2) Disconnect parking brake cable from brake shoe lever. (Refer to steps 2) & 3) of BRAKE SHOE REMOVAL of this section, page 5-41.)
3) Disconnect brake cable from brake back plate. (Refer to step 4) of BRAKE BACK PLATE REMOVAL section, page 5-43.)

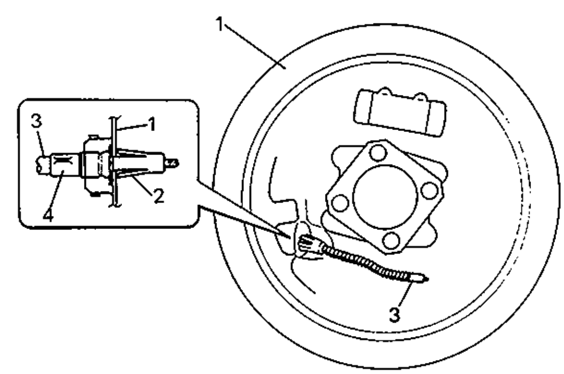
NOTE:
When it is necessary to remove both right and left parking brake cables, repeat above steps 1) to 3) on right and left wheels.

4) Remove cable from parking brake lever. (Refer to steps 1), 2) & 3) of PARKING BRAKE LEVER REMOVAL of this section, page 5-28.)

INSTALLATION

Install parts in reverse order of removal procedure, noting the following.

1) Install brake cable stopper ring to brake back plate securely as shown in figure below.

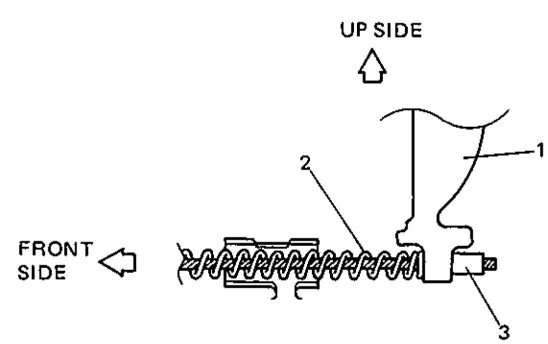


1. Brake back plate
2. Cable stopper ring
3. Brake cable
4. White (Blue) ring

Fig. 5-40

NOTE:
White ring on brake cable is for the purpose of identification. Use cable with it for left side. (For details, refer to Fig. 5-42.)

2) Install brake cable spring and nipple end to parking brake shoe lever securely as shown below.



1. Parking brake shoe lever
2. Spring
3. Nipple end

Fig. 5-41

3) For brake shoe installation, refer to steps 1) and 2) of BRAKE SHOE INSTALLATION of this section, page 5-41.
4) For brake drum installation, refer to steps 1) and 3) of BRAKE DRUM INSTALLATION of this section, page 5-40.
5) For proper routing and secure clamping of parking brake cable, refer to figure below.
6) For installation of cable to parking brake lever, refer to PARKING BRAKE CABLE INSTALLATION of this section, page 5-28.
7) Upon completion of installation, adjust cable. (Refer to PARKING BRAKE INSPECTION AND ADJUSTMENT of this section, page 5-22.) Then check brake drum for dragging and brake system for proper performance. After removing vehicle from hoist, brake test should be performed.

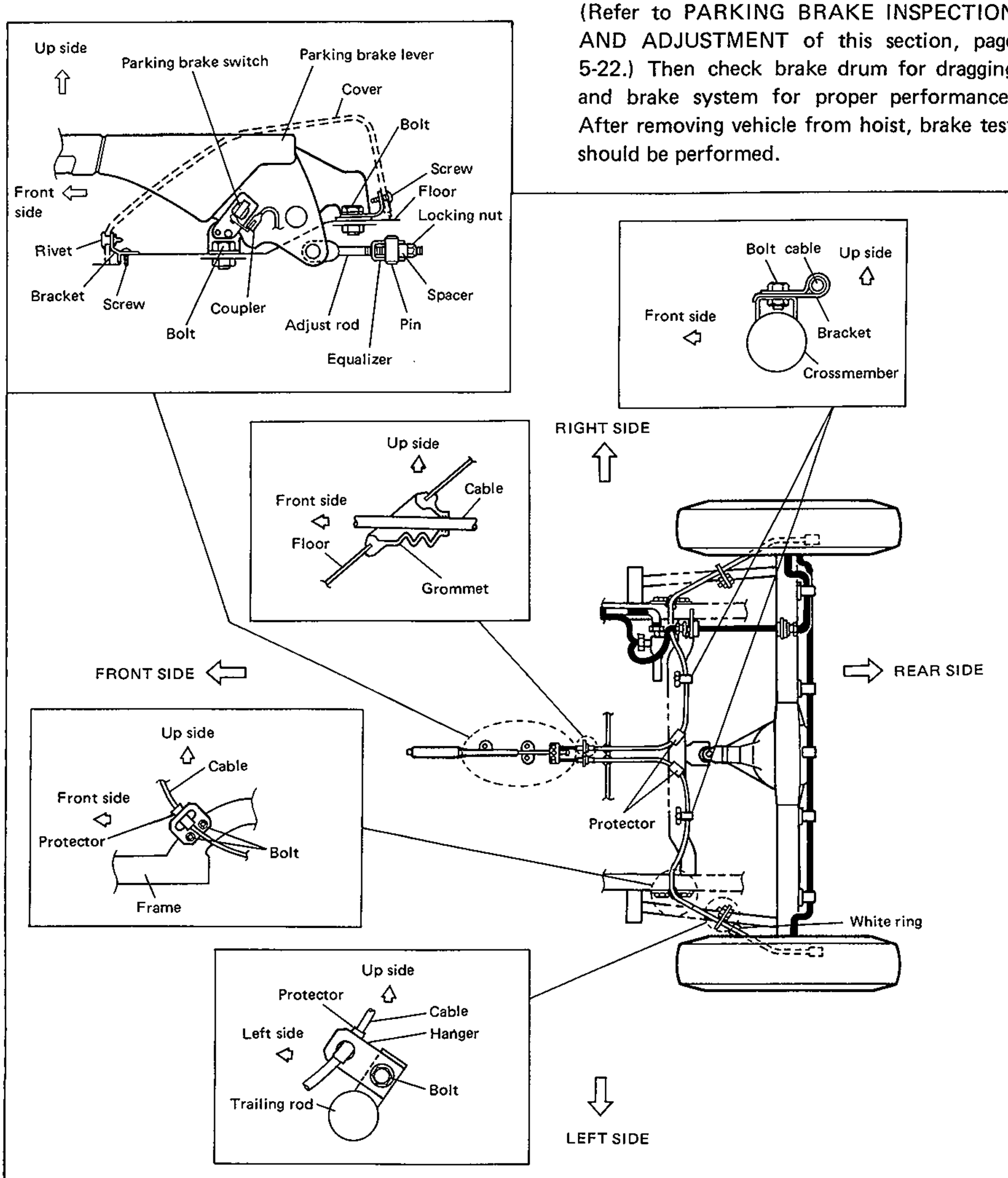


Fig. 5-42

DISC BRAKE R & I

1. REMOVE AND INSTALL PAD (SHOE & LINING)

REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove caliper pin bolts.

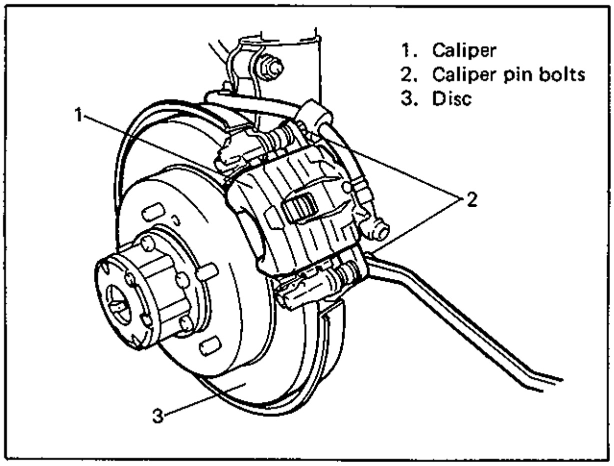


Fig. 5-43

3) Remove caliper from caliper carrier.

NOTE:
Hang removed caliper with a wire hook or the like so as to prevent brake hose from bending and twisting excessively or being pulled.
Don't operate brake pedal with pads removed.

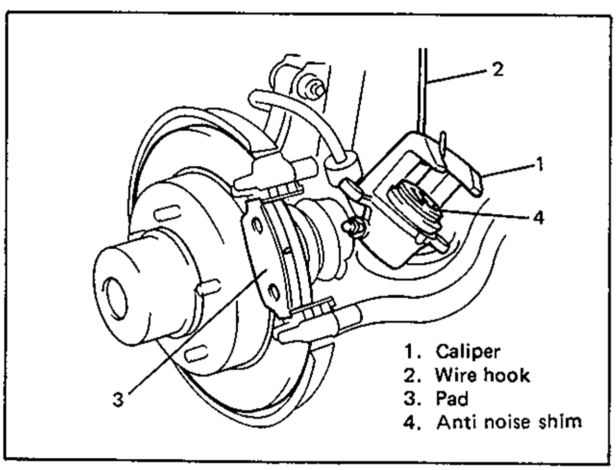


Fig. 5-44

4) Remove pads.

INSTALLATION

NOTE:
See NOTE at the beginning of this section.

1) Install pad clips and pads.

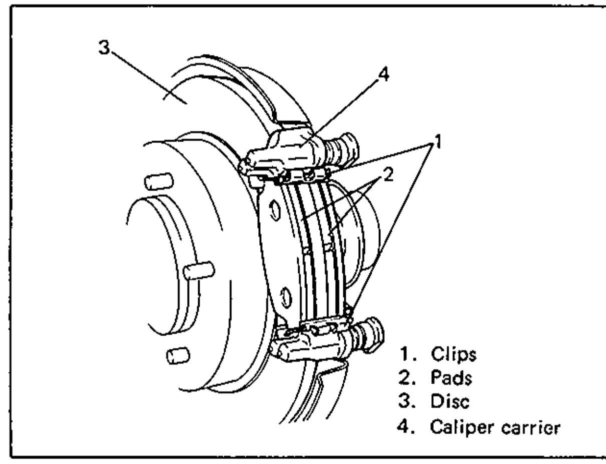


Fig. 5-45

2) Install caliper and torque caliper pin bolts to specification.

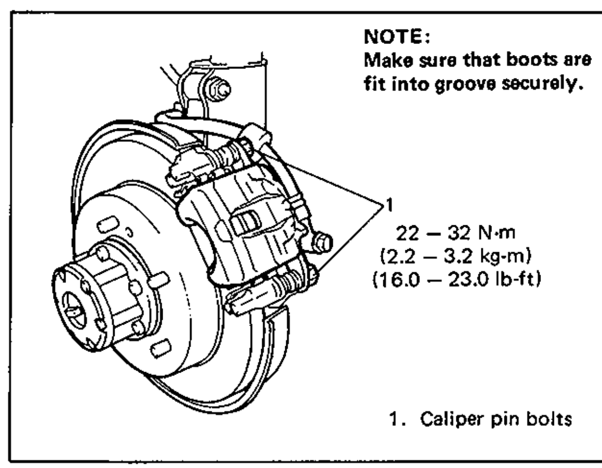


Fig. 5-46

3) Torque front wheel nuts to specification.

N·m	kg-m	lb-ft
80 – 110	8.0 – 11.0	58.0 – 79.5

4) Upon completion of installation, perform brake test.

2. REMOVE AND INSTALL CALIPER ASSEMBLY

REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove brake flexible hose mounting bolt from caliper. As this will allow fluid to flow out of hose, have a container ready beforehand.

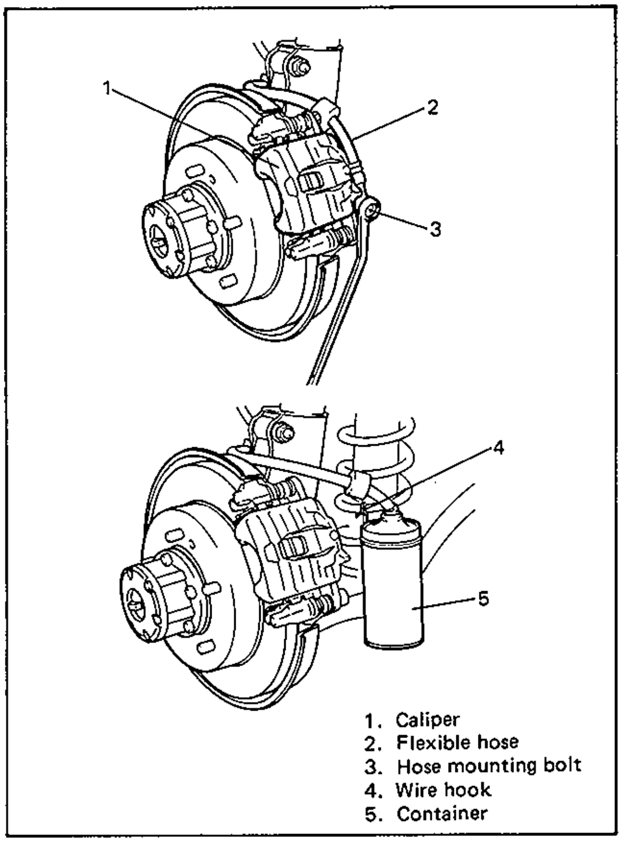


Fig. 5-47

3) Remove caliper pin bolts.

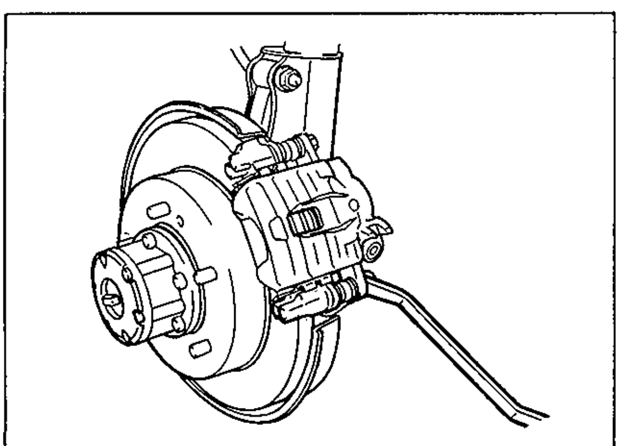


Fig. 5-48

4) Remove caliper.

INSTALLATION

1) Install caliper to caliper carrier.
2) Torque caliper pin bolts to specification.

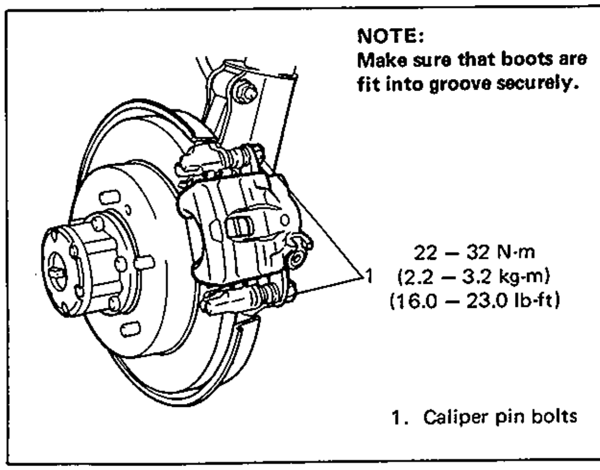


Fig. 5-49

3) Install brake flexible hose as shown and torque hose mounting bolt to specification.

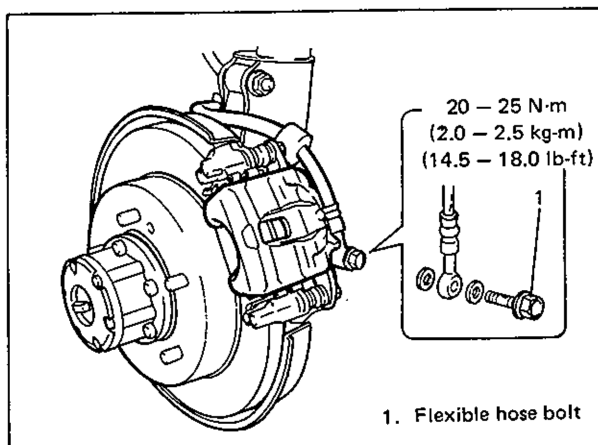


Fig. 5-50

4) Torque wheel nuts to specification.

N·m	kg-m	lb-ft
80 – 110	8.0 – 11.0	58.0 – 79.5

5) After completing installation, fill reservoir with brake fluid and bleed brake system. Perform brake test and check each installed part for oil leakage.

3. REMOVE AND INSTALL SEAL, PISTON, DUST BOOT AND BLEEDER SCREW

REMOVAL

Before disassembly, clean all around caliper with brake fluid.

1) Remove anti-noise shim and blow compressed air into cylinder through bolt hole where flexible hose was fitted. With this air pressure, piston can be pushed out of cylinder.

> WARNING:
> **Do not apply too highly compressed air which will cause piston to jump out of cylinder. It should be taken out gradually with moderately compressed air. Do not place your fingers in front of piston when using compressed air.**

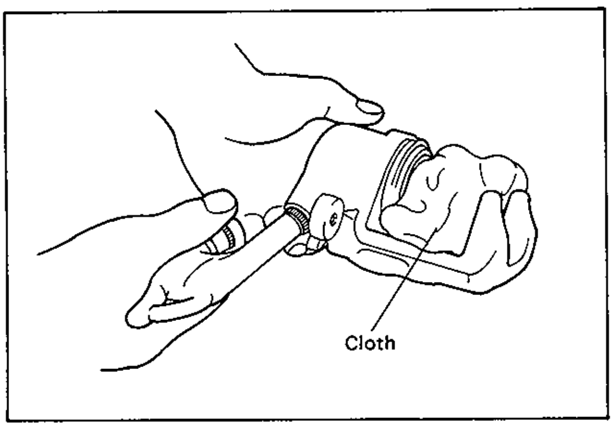


Fig. 5-51

2) Remove piston seal using a thin blade like a thickness gauge, etc.

NOTE:
Be careful not to damage inside (bore side) of cylinder.

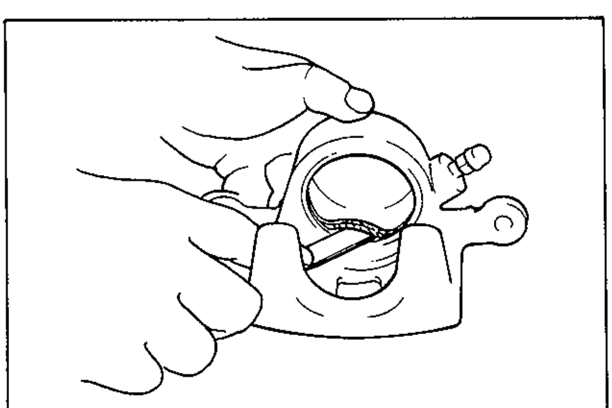


Fig. 5-52

INSTALLATION

Reassemble front brake in reverse order of disassembly, noting following points.

> CAUTION:
> - **Wash each part cleanly before installation in the same fluid as the one used for master cylinder reservoir.**
> - **Never use other fluid or thinner.**
> - **Before installing piston and piston seal to cylinder, apply fluid to them.**
> - **After reassembling brake lines, bleed air from them.**

Piston Seal

Piston seal is used to seal piston and cylinder and to adjust clearance between pad and disc. Replace with a new one at every overhaul. Fit piston seal into groove in cylinder taking care not to twist it.

Piston and Boot

1) Before inserting piston into cylinder, install boot onto piston as shown below.

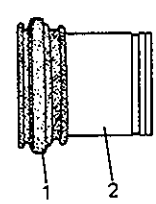


Fig. 5-53

2) Fit boot as it is in above figure into boot groove in cylinder with fingers.

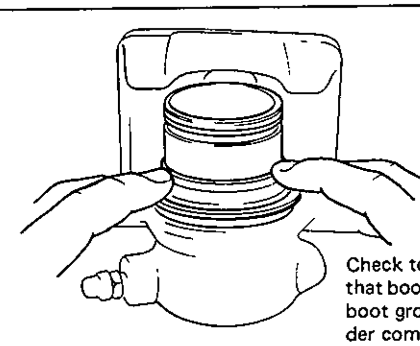


Fig. 5-54

3) Insert piston into cylinder by hand and fit boot in boot groove in piston.

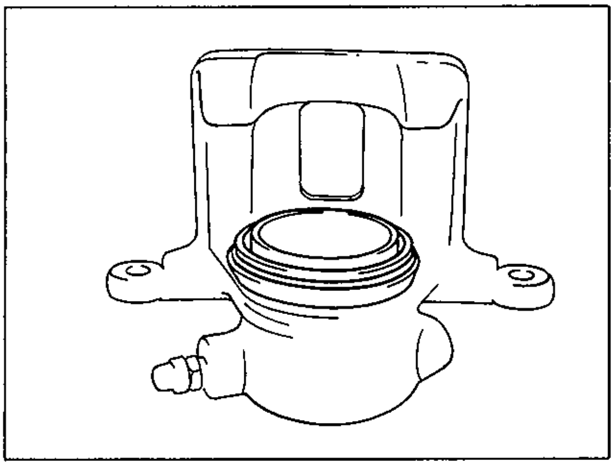


Fig. 5-55

4) To confirm that boot is fitted in its groove in cylinder properly, pull piston out of cylinder a little but do not take it all out.

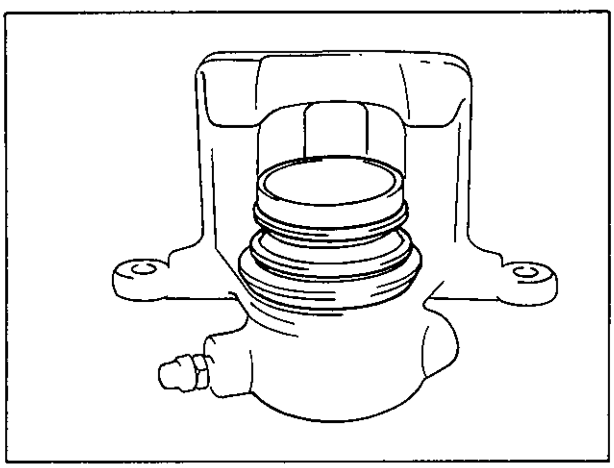


Fig. 5-56

5) Insert piston into cylinder by hand.
6) Install anti noise shim.

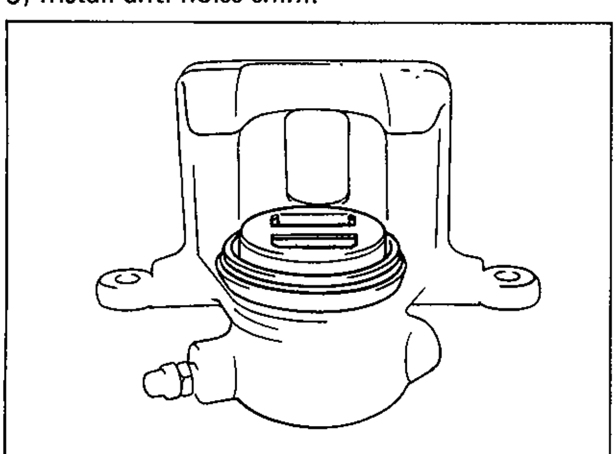


Fig. 5-56-1

Caliper

Before installing caliper (cylinder body) to carrier, check to ensure that guide pin inserted in each caliper carrier hole can be moved smoothly in thrust direction.

NOTE:

Where temperature gets as low as –30°C in cold weather, use rubber grease whose viscosity varies very little even at –40°C (–40°F).

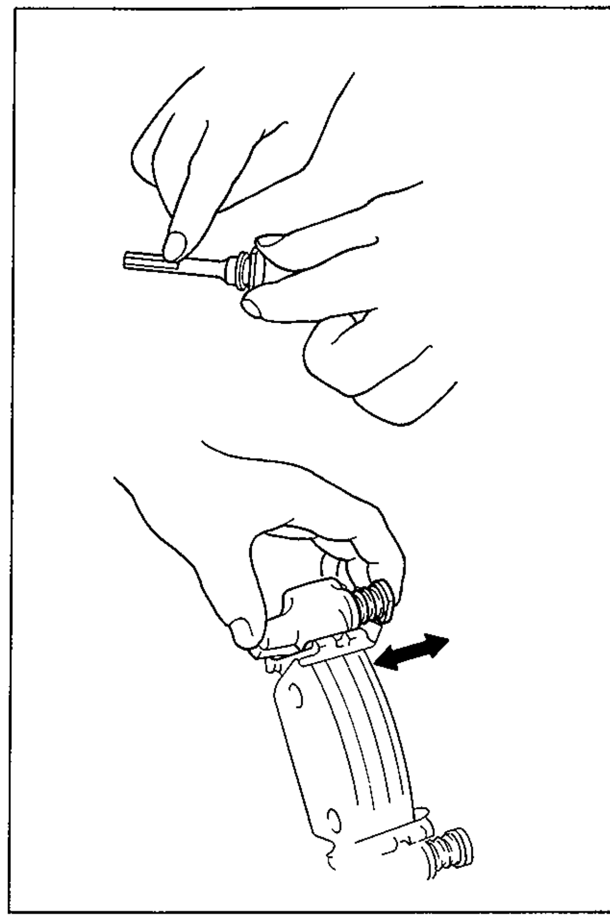


Fig. 5-57

4. REMOVE AND INSTALL DISC

REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove caliper assembly by loosening carrier bolts (2 pcs).

> **CAUTION:**
> **During removal, be careful not to damage brake flexible hose and not to depress brake pedal.**

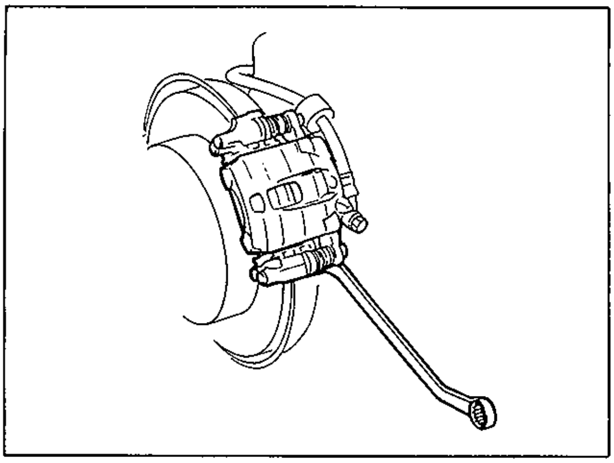


Fig. 5-58

3) Remove disc by using 8 mm bolts (2 pcs).

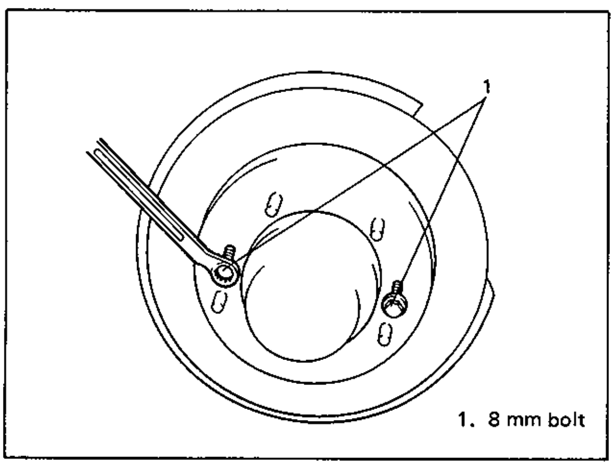


Fig. 5-59

INSTALLATION

NOTE:
See NOTE at the beginning of this section.

1) Install disc to wheel hub.
2) Install caliper assembly to steering knuckle.
3) Torque caliper carrier bolts to specification.

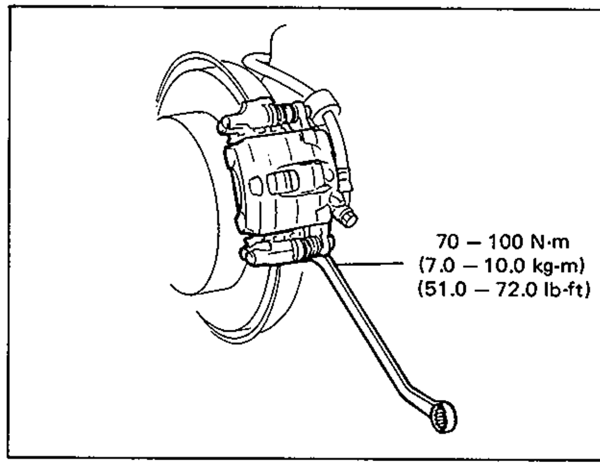


Fig. 5-60

4) Torque front wheel nuts to specification.

N·m	kg-m	lb-ft
80 – 110	8.0 – 11.0	58.0 – 79.5

5) Upon completion of installation, perform brake test.

DISC BRAKE INSPECTION

1. INSPECT BRAKE PAD LINING

Check pad lining for wear. When wear exceeds limit, replace with new one.

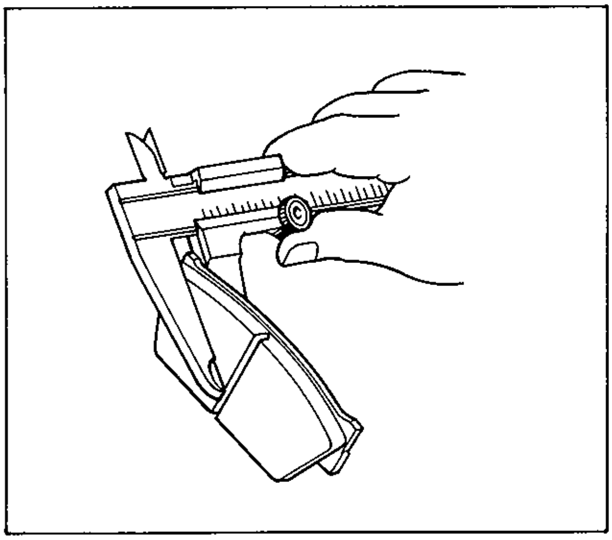


Fig. 5-61

CAUTION:
Never grind pad lining with sandpaper. If lining is ground with sandpaper, hard particles of sandpaper will be deposited in lining and may damage disc. When pad lining requires correction, replace it with a new one.

	Standard	Limit
Pad thickness (lining + pad rim)	15.0 mm (0.590 in.)	8.0 mm (0.315 in.)

NOTE:
When pads are removed, visually inspect caliper for brake fluid leak. Correct leaky point, if any.

2. INSPECT BRAKE CALIPER INNER PARTS

Cylinder Slide Guide Pin

Check guide pin for smooth movement as shown. If it is found faulty, correct or replace. Apply rubber grease to guide pin outer surface. Rubber grease should be the one whose viscosity is less affected by such low temperature as −40°C (−40°F).

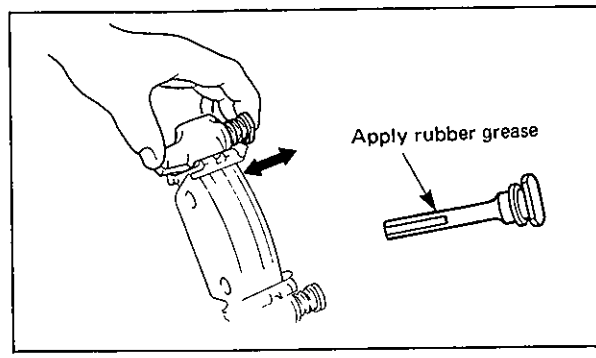


Fig. 5-62

Bush Dust Boot and Cylinder Boot

Check boots for breakage, crack and damage. If defective, replace.

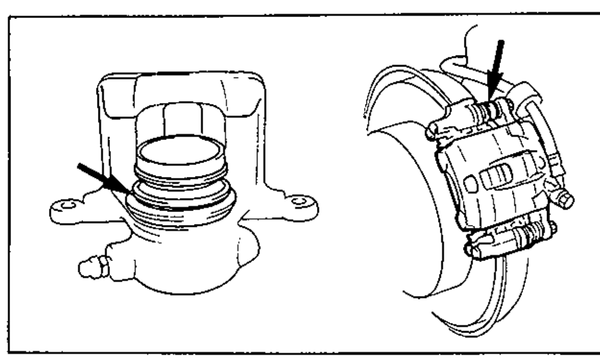


Fig. 5-63

Piston Seal

Excessive or uneven wear of pad lining may indicate unsmooth return of piston. In such a case, replace rubber seal.

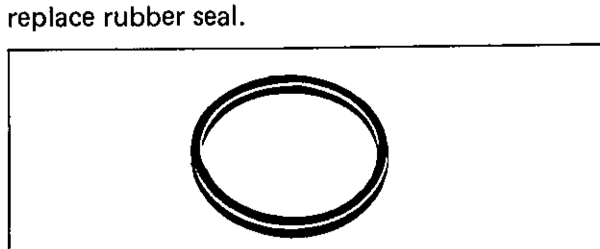


Fig. 5-64

3. INSPECT BRAKE DISC

Before this inspection, brake pads must be removed (according to steps 1) to 4) on page 5-31).

Check disc surface for scratches in wearing parts. Scratches on disc surface noticed at the time of specified inspection or replacement are normal and disc is not defective unless they are serious. But when there are deep scratches or scratches all over disc surface, replace it. When only one side is scratched, grind and correct that side.

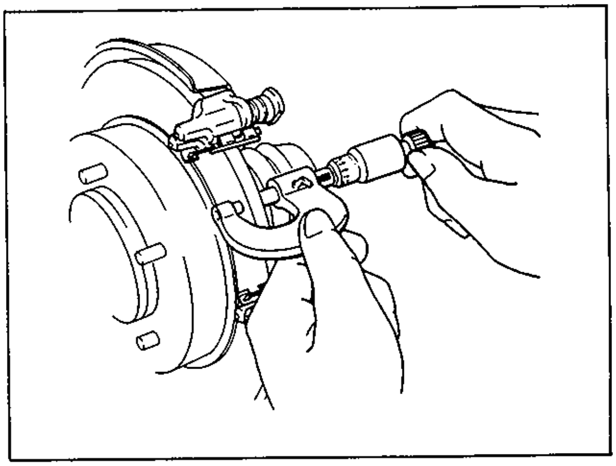


Fig. 5-65

	Standard	Limit
Disc thickness	10 mm (0.394 in.)	8.0 mm (0.315 in.)

Use lug nuts and suitable plain washers to hold the disc securely against the hub, then mount a dial indicator as shown and measure the runout at 10 mm (0.39 in.) from the outer edge of the disc.

Limit on disc deflection	0.15 mm (0.006 in.)

NOTE:
Check front wheel bearing for looseness before measurement.

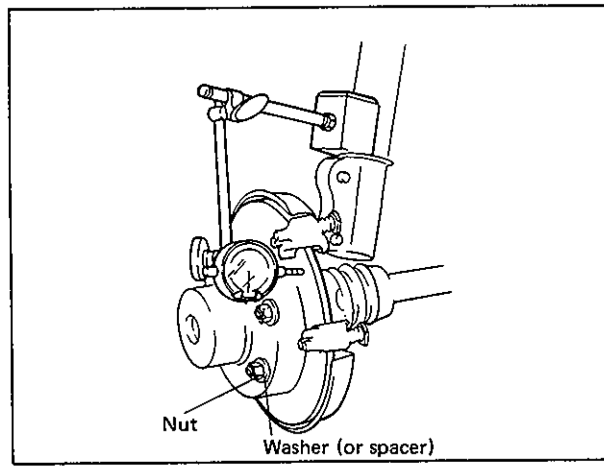


Fig. 5-66

Inspection for Front Brake After Installation
Mount tires and make certain that they rotate smoothly, with a force of less than 3.0 kg (6.6 lb).

NOTE:
For above check, the following must be observed.
1) Jack up front wheels, both right and left, off the ground.
2) Set free wheeling hubs of both right and left wheels to "LOCK", if equipped.
3) Shift transfer shift lever to 2H (rear wheel) position.
4) Below figure shows outer periphery of tire.
5) Be careful not to depress brake pedal when checking tire for rotation.

If tire rotation is heavy, check the following:
- Wheel bearings for breakage.
- Disc for flatness (Improper flatness brings disc into contact with lining during rotation and makes rotation heavy).

To check this, measure disc deflection.

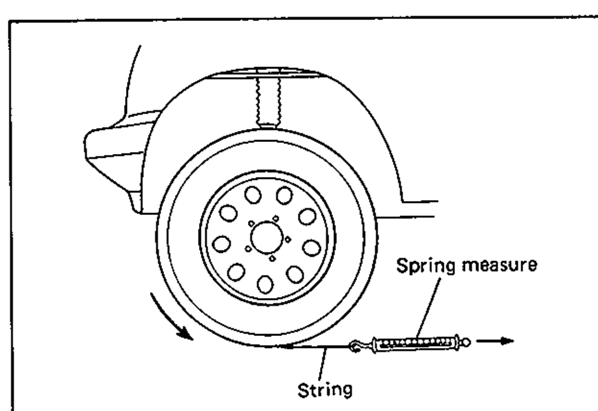


Fig. 5-67

DRUM AND COMPONENTS R & I

1. REMOVE AND INSTALL BRAKE DRUM

REMOVAL

1) Hoist vehicle and pull up parking brake lever.
2) Remove wheel and brake drum nuts.

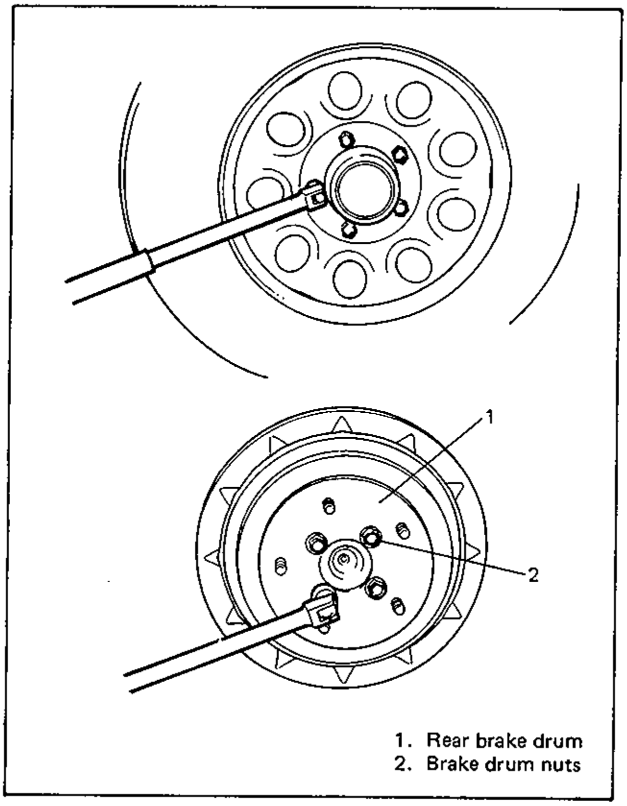


Fig. 5-68

3) Release parking brake lever.
4) Remove parking brake lever cover screws and with rear part of brake lever cover lifted a little, loosen parking brake cable locking nut.

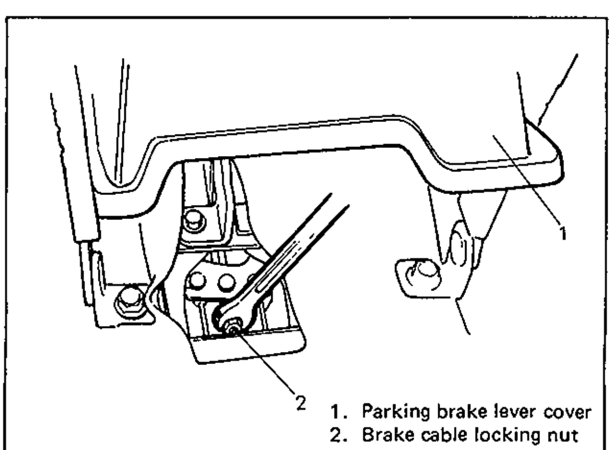


Fig. 5-69

5) Remove back plate plug attached to the back side of brake back plate so as to increase clearance between brake shoe and brake drum. Insert screwdriver into plughole till its tip contacts shoe hold down spring and push it in arrow direction.
With this push, hold down spring is pushed up and releases parking shoe lever from hold down spring, resulting in larger clearance.

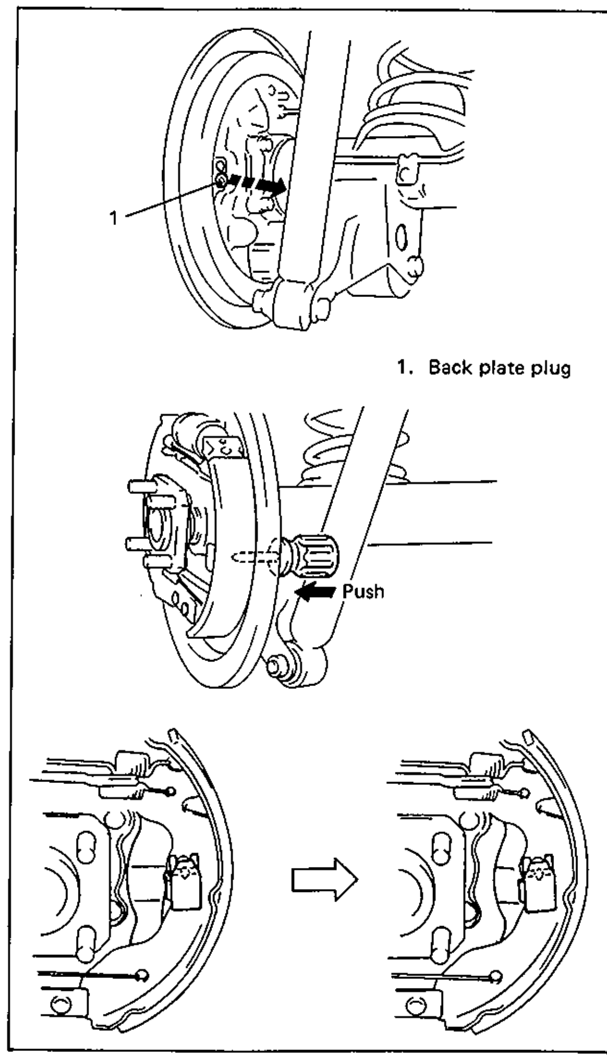


Fig. 5-70

6) Pull brake drum off by using special tools.

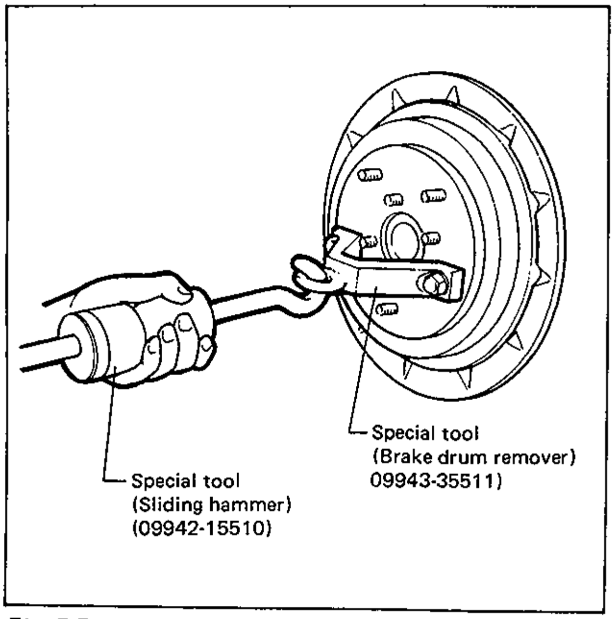


Fig. 5-71

7) Remove wheel stud bolt by using hydraulic press.

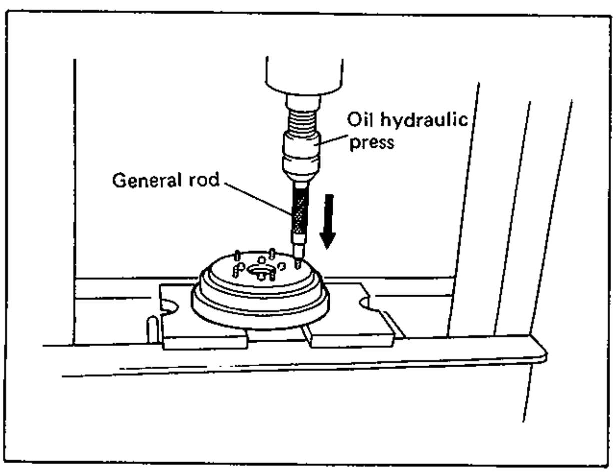


Fig. 5-72

8) Insert new stud in drum hole and rotate it slowly to assure serrations are aligned with those made by replaced bolt.

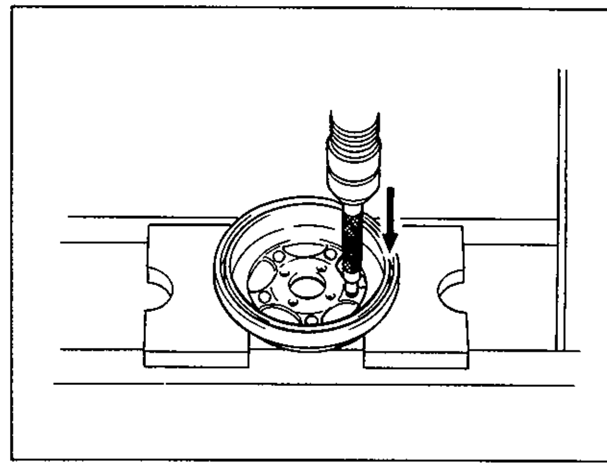


Fig. 5-73

INSTALLATION

NOTE:
See NOTE at the beginning of this section.

1) Before installing brake drum, to maximize brake shoe-to-drum clearance, put screwdriver between rod and ratchet and push down ratchet as shown in figure.

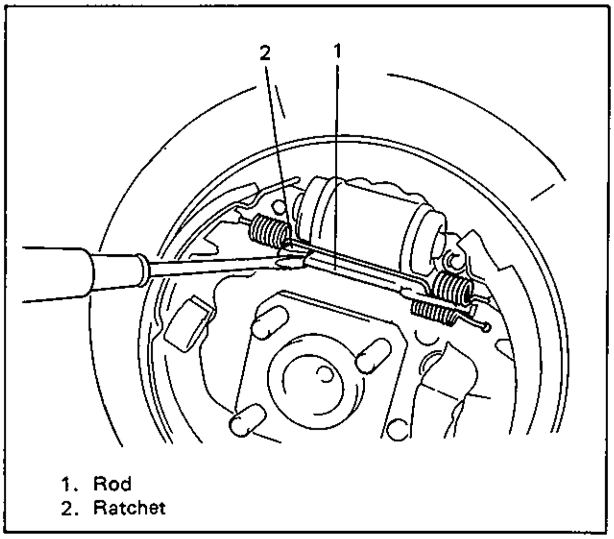


Fig. 5-74

2) Put brake shoe hold down spring back to its original position as shown. (Put shoe hold down spring in place by moving shoe lever so that shoe lever comes to the side of shoe hold down spring.)

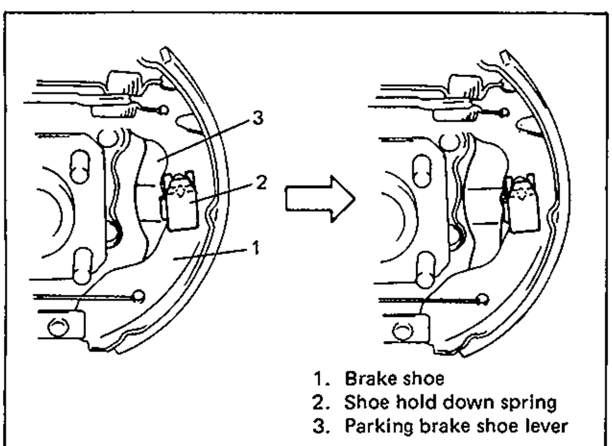


Fig. 5-74-1

3) Install brake drum after making sure that inside of brake drum and brake shoes are free from dirt and oil.

4) Torque brake drum nuts to specification.

Tightening torque for brake drum nuts	N·m	kg-m	lb-ft
	50 – 80	5.0 – 8.0	36.5 – 57.5

5) Install brake back plate plug. (Refer to Fig. 5-70.)
6) Upon completion of all jobs, depress brake pedal with about 30 kg (66 lbs) loat three to five times so as to obtain proper drum-to-shoe clearance.
   Adjust parking brake cable. (For adjustment, see page 5-22.)
7) Tighten parking brake lever cover screws.
8) Install wheel and tighten wheel nuts to specified torque.

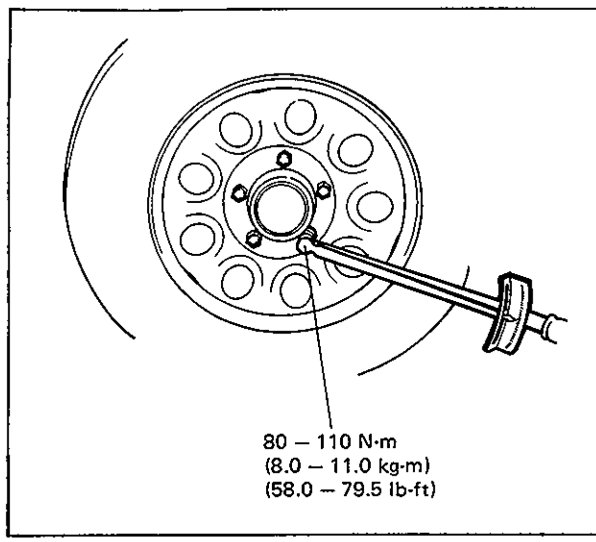


Fig. 5-75

9) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and perform brake test (foot brake and parking brake).

2. REMOVE AND INSTALL BRAKE SHOE

REMOVAL

1) Perform steps 1) to 6) of brake drum REMOVAL on page 5-38.
2) Remove shoe hold down springs by turning shoe hold down pins as shown.

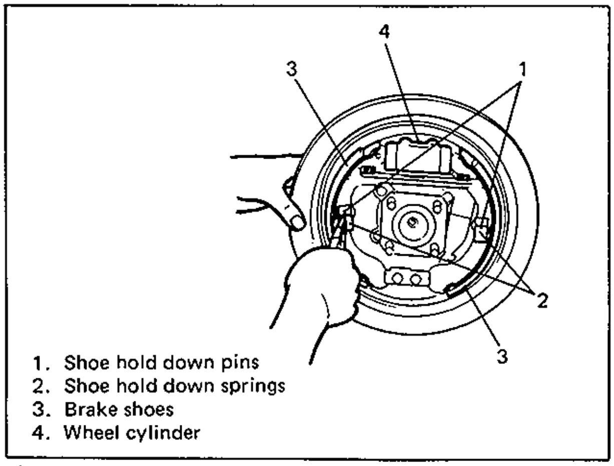


Fig. 5-76

3) Disconnect parking brake cable from parking brake shoe lever and remove brake shoes.

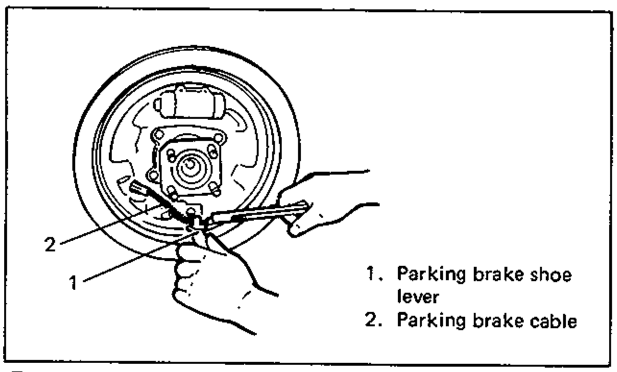


Fig. 5-77

4) Remove strut and springs.
5) Remove parking brake shoe lever from shoe rim.

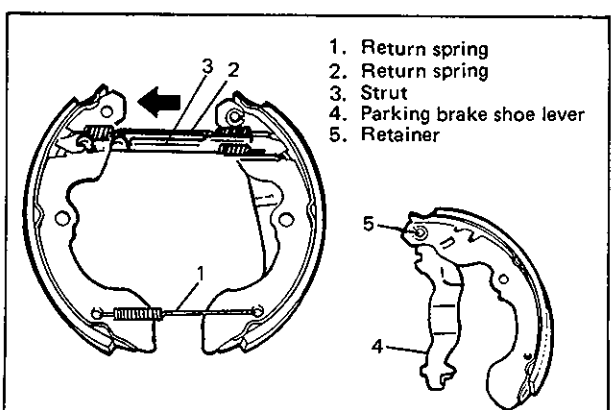


Fig. 5-78

INSTALLATION

1) Assemble parts as shown in reverse order of removal.

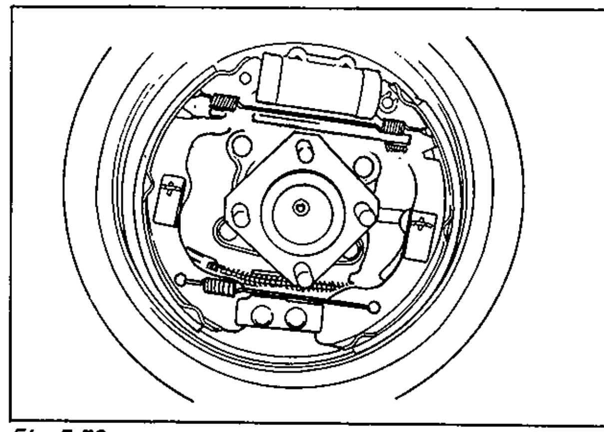


Fig. 5-79

2) Install shoe hold down springs by pushing them down in place and turning hold down pins.

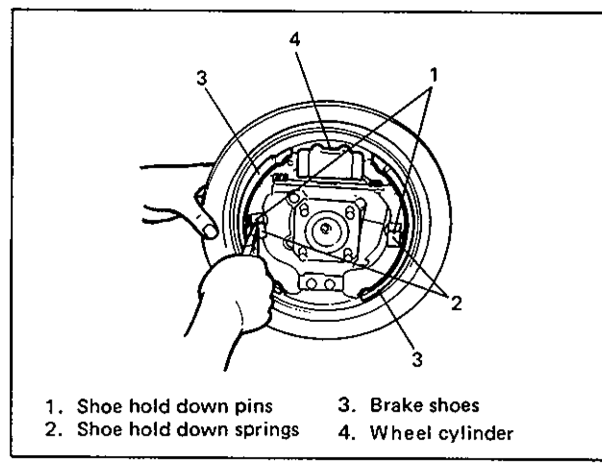


Fig. 5-80

3) For procedure hereafter, refer to steps 1) to 7) of BRAKE DRUM INSTALLATION on page 5-40.

3. REMOVE AND INSTALL WHEEL CYLINDER

REMOVAL

1) Perform steps 1) to 6) of brake drum REMOVAL.
2) Perform steps 2) and 3) of brake shoe REMOVAL.
3) Loosen brake pipe flare nut (or nuts) but only within the extent that fluid does not leak.

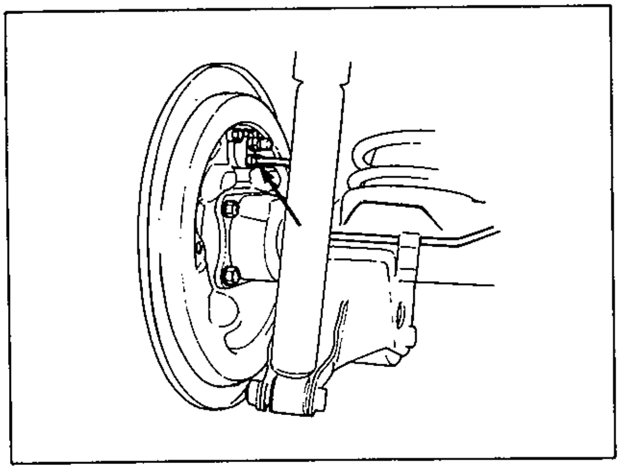


Fig. 5-81

4) Remove wheel cylinder mounting bolts. Disconnect brake pipe (or pipes) from wheel cylinder and put wheel cylinder bleeder plug cap onto pipe to prevent fluid from spilling.

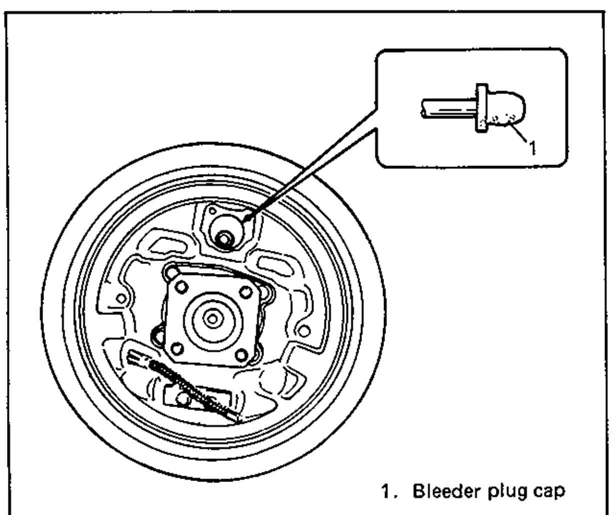


Fig. 5-82

INSTALLATION

1) Install O-ring. Then take off bleeder plug cap from brake pipe and connect pipe (or pipes) to wheel cylinder just enough to prevent fluid from leaking.

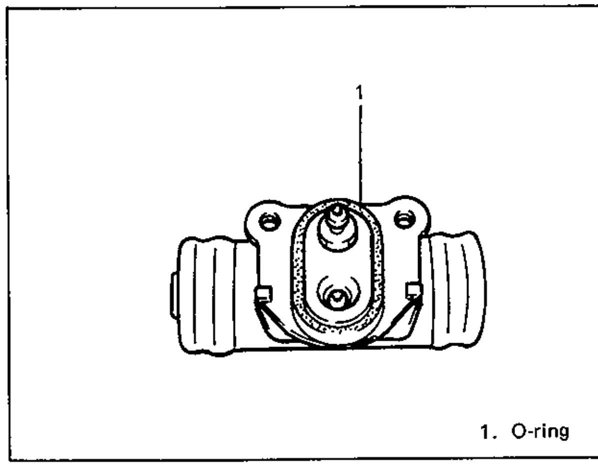


Fig. 5-83

2) Tighten wheel cylinder to brake back plate to specified torque.
3) Torque flare nut (or nuts) of brake pipe which was connected in step 1) to specification.

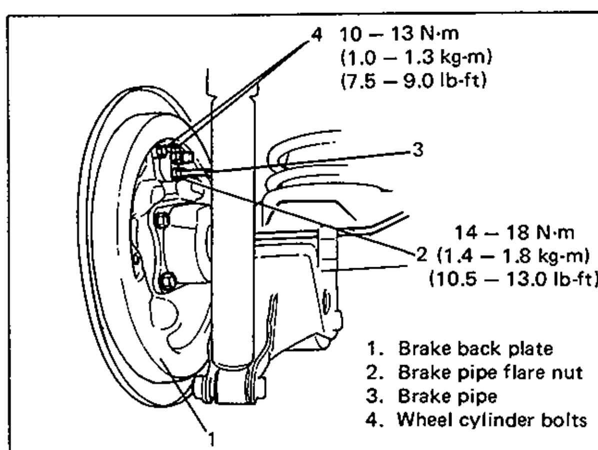


Fig. 5-83-1

4) Install bleeder plug cap taken off from pipe back to bleeder plug.
5) For procedure hereafter, refer to steps 1) to 3) of BRAKE SHOE INSTALLATION on page 5-41.

NOTE:
Be sure to bleed brake system. (for bleeding operation, see page 5-23.)

4. REMOVE AND INSTALL BRAKE BACK PLATE

REMOVAL

1) Perform steps 1) to 6) of BRAKE DRUM REMOVAL on page 5-38.
2) Perform steps 2) and 3) of BRAKE SHOE REMOVAL on page 5-41.
3) Perform steps 3) and 4) of WHEEL CYLINDER REMOVAL on page 5-42.
4) Remove cable from brake back plate by squeezing parking brake cable stopper ring.

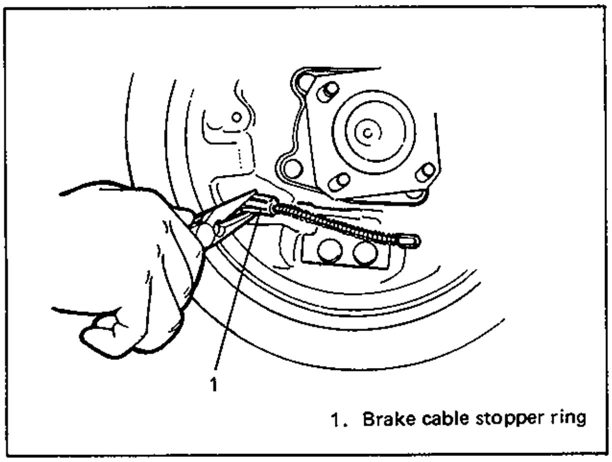


Fig. 5-84

5) Drain rear defferential gear oil.
6) Remove wheel bearing retainer nuts from rear axle housing.

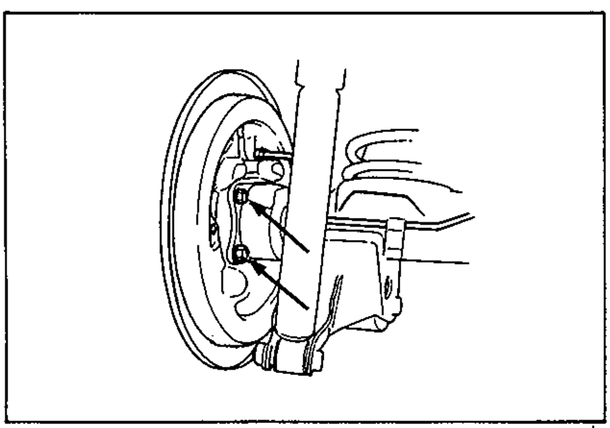


Fig. 5-85

7) Using special tools, draw out rear axle shaft with brake back plate.

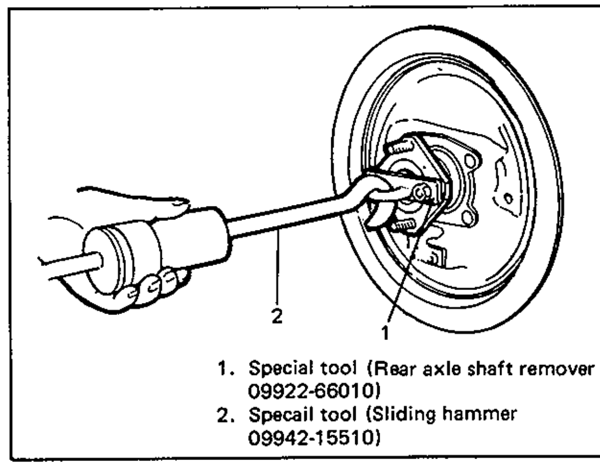


Fig. 5-86

8) Remove brake back plate from rear axle shaft.

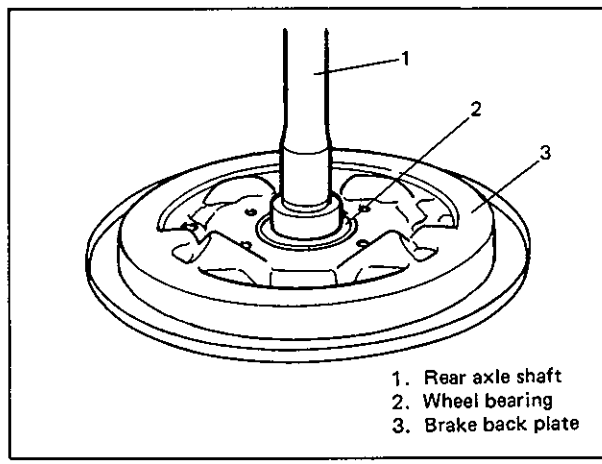


Fig. 5-87

INSTALLATION

1) Apply sealant to mating surface of bearing retainer with brake back plate.

NOTE:
Make sure to remove old sealant before applying it anew.

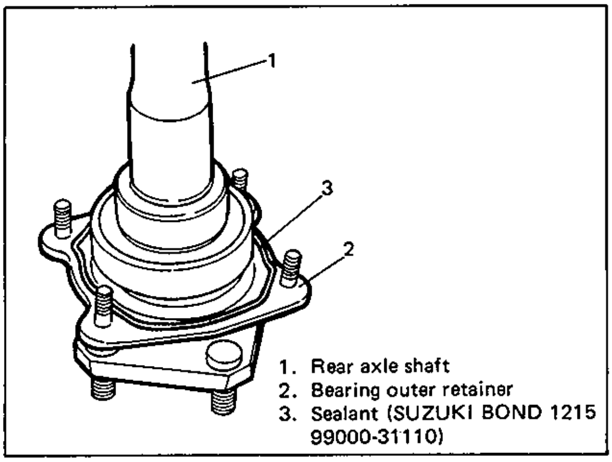


Fig. 5-88

2) Install brake back plate to rear axle shaft.

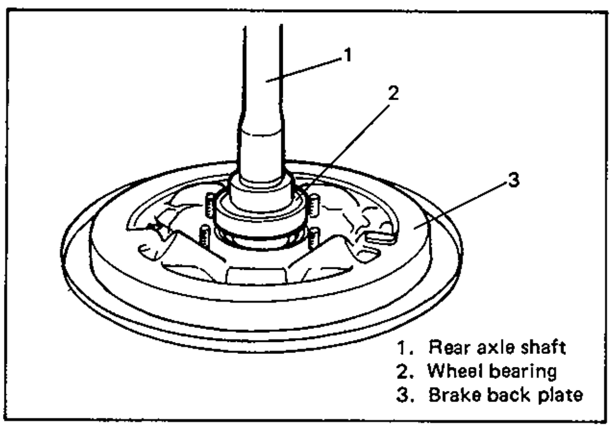


Fig. 5-89

3) Apply sealant to joint seam of rear axle housing and brake back plate.

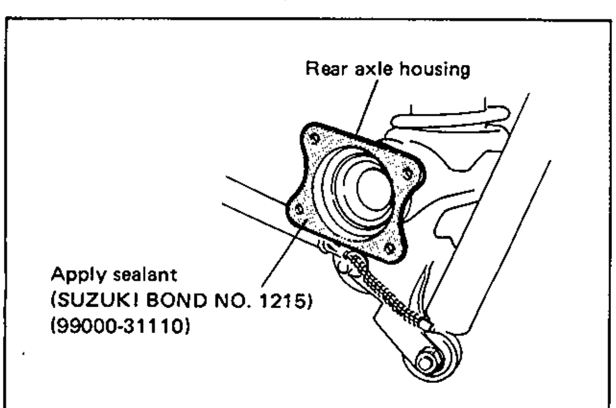


Fig. 5-90

4) Install rear axle shaft to rear axle housing.
5) Tighten brake back plate nuts to specified torque.

Tightening torque for brake back plate nuts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

6) Install wheel cylinder, and tighten wheel cylinder bolts and brake pipe flare nut (or nuts) to specified torque. (Refer to steps 1) to 4) of wheel cylinder INSTALLATION on page 5-42 of this section.)
7) Install parking brake cable to brake back plate.

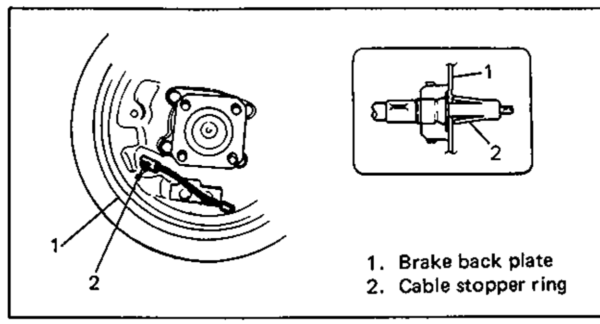


Fig. 5-91

8) Install brake shoes, referring to steps 1) and 2) of its INSTALLATION on page 5-41.
9) Install brake drum. (Refer to steps 1) to 3) of its INSTALLATION on page 5-40 of this section.
10) Refill differential housing with new specified gear oil. Refer to "ON-VEHICLE SERVICE" in SECTION 7E for refilling procedure.
11) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, see page 5-23.)
12) Install wheel and tighten wheel nuts to specified torque.

Tightening torque for wheel nuts	N·m	kg-m	lb-ft
	80–110	8.0–11.0	58.0–79.5

13) Upon completion of all jobs, depress brake pedal with about 30 kg (66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance.
Adjust parking brake cable. (For adjustment, see page 5-22.)
14) Tighten parking brake lever cover screws.
15) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and perform brake test (foot brake and parking brake).
16) Check each installed part for oil leakage.

BRAKE DRUM AND COMPONENTS INSPECTION

1. INSPECT BRAKE DRUM

Inspect drum for cleanliness. Check wear of its braking surface by measuring its inside diameter.

Item	Standard	Service limit
Brake drum ID	220 mm (8.66 in.)	222 mm (8.74 in.)

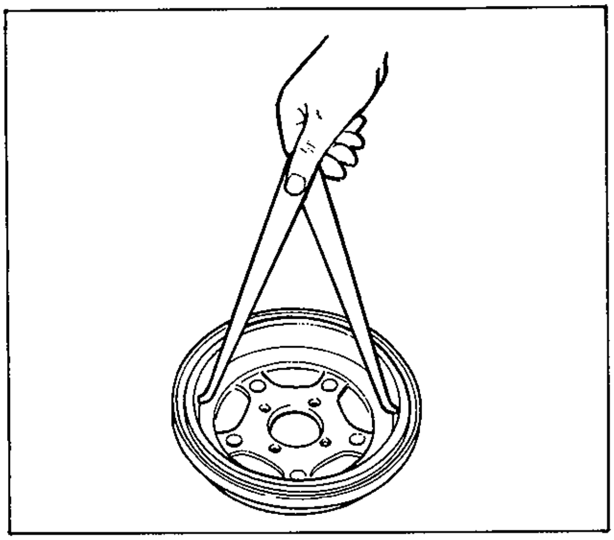


Fig. 5-92

Whenever brake drums are removed, they should be thoroughly cleaned and inspected for cracks, scores, deep grooves.

Cracked, Scored, or Grooved Drum

A cracked drum is unsafe for further service and must be replaced. Do not attempt to weld a cracked drum.

Smooth up any slight scores. Heavy or extensive scoring will cause excessive brake lining wear and it will probably be necessary to resurface drum braking surface.

If brake linings are slightly worn and drum is grooved, drum should be polished with fine emery cloth but should not be turned.

NOTE:

When drum is removed, visually inspect wheel cylinder for brake fluid leakage. Correct leaky point, if any.

2. INSPECT BRAKE SHOE & LINING

Inspect all linings for thickness.

Brake lining	Standard	Service limit
Thickness (lining + shoe rim)	7.5 mm (0.30 in.)	3.0 mm (0.12 in.)

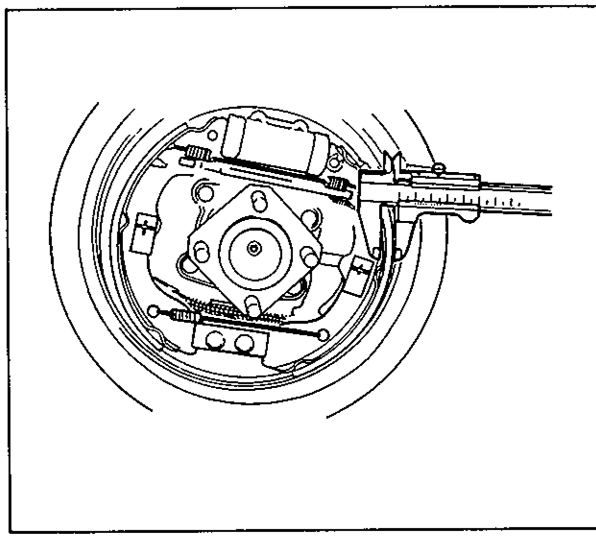


Fig. 5-93

If one of brake linings is worn to service limit, all linings must be replaced at the same time.

NOTE:

Never grind lining with sandpaper. If lining is ground with sandpaper, hard particles of sandpaper will be deposited in lining and may damage drum. When it is required to correct lining, replace it with a new one.

3. INSPECT WHEEL CYLINDER

Inspect wheel cylinder disassembled parts for wear, cracks, corrosion or damage.

NOTE:
Clean wheel cylinder components with brake fluid.

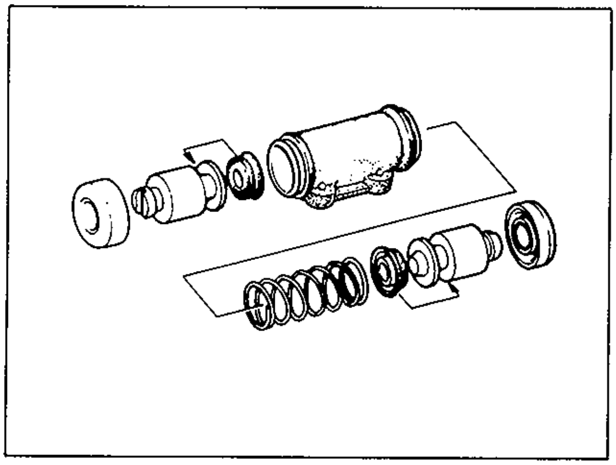


Fig. 5-94

4. INSPECT BRAKE STRUT

Inspect ratchet of strut for wear or damage.

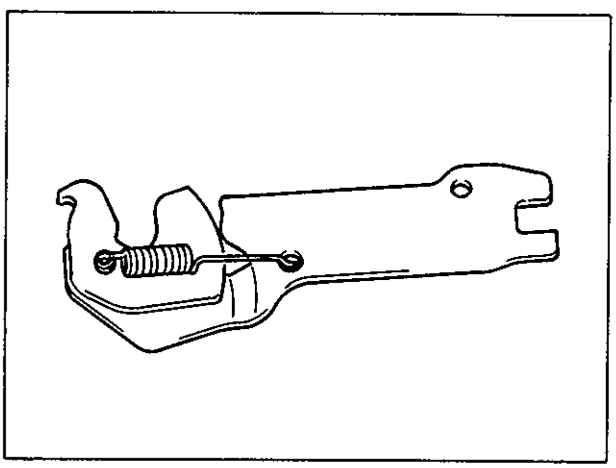


Fig. 5-95

5. INSPECT SPRINGS

Inspect for damage or weakening.
Inspect each part with arrow for rust. If found defective, replace.

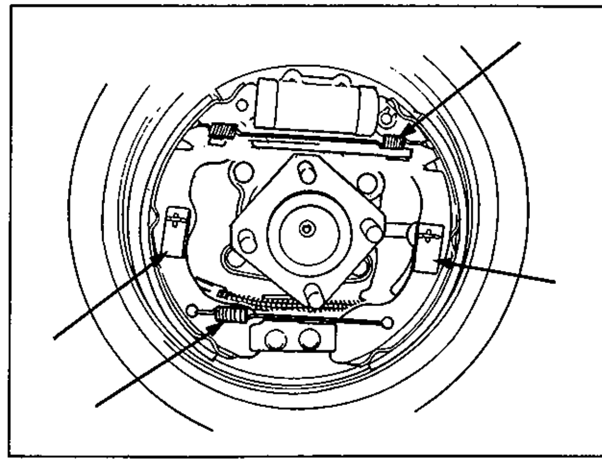


Fig. 5-96

6. INSPECT PARKING SHOE LEVER

Inspect brake shoe lever for free movement against brake shoe web. If defective, correct or replace.

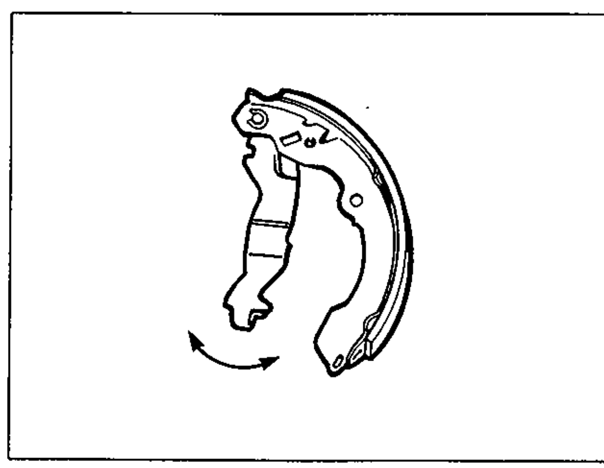


Fig. 5-97

MASTER CYLINDER REPAIR

1. REMOVE AND INSTALL MASTER CYLINDER RESERVOIR

REMOVAL

1) Remove air cleaner case. (If necessary)
2) Disconnect reservoir lead wire at coupler.
3) Clean outside of reservoir.
4) Take out fluid with syringe or such.
5) Remove reservoir connector pin by using special tool.

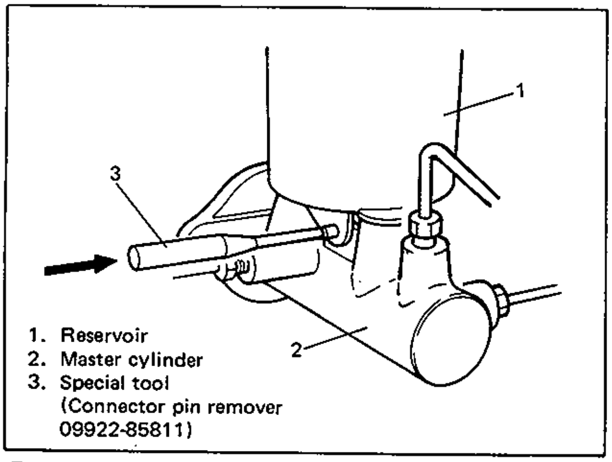


Fig. 5-98

6) Remove reservoir.

NOTE:
Do not allow brake fluid to get on painted surfaces.

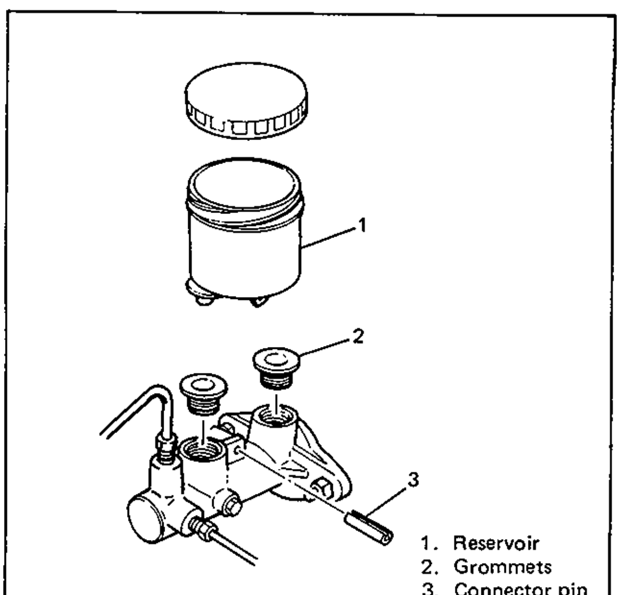


Fig. 5-99

INSTALLATION

NOTE:
See NOTE at the beginning of this section.

1) When using new grommets, lubricate them with the same fluid as the one to fill reservoir with. Then press-fit grommets to master cylinder. Grommets must be seated in place.
2) Install reservoir and drive in reservoir pin.

NOTE:
Drive in reservoir pin till both of its ends at the right and left of reservoir become the same length.

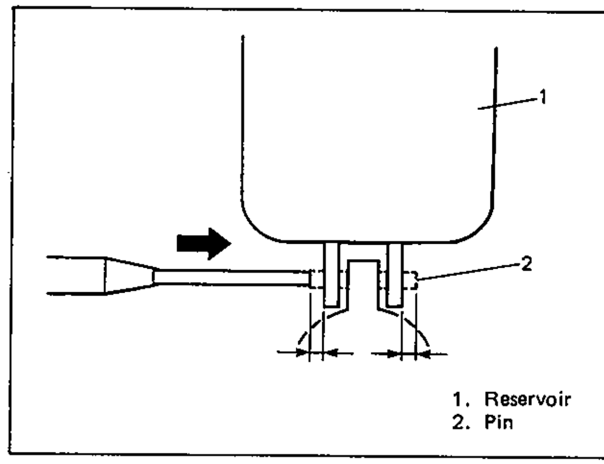


Fig. 5-100

3) Connect reservoir lead wire.
4) Fill reservoir with specified fluid.
5) Upon completion of installation, check for fluid leakage.

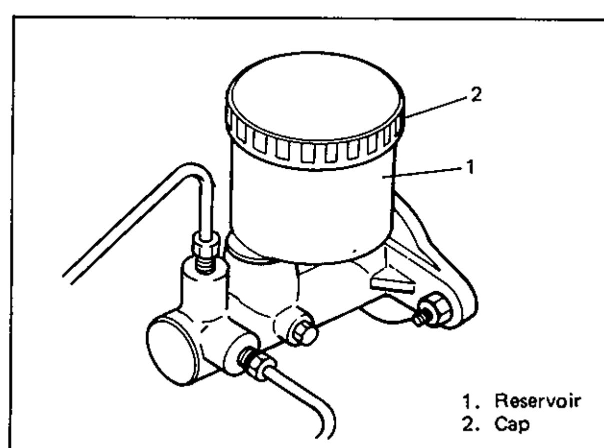


Fig. 5-101

2. REMOVE AND INSTALL MASTER CYLINDER ASSEMBLY

REMOVAL

1) Remove air cleaner case. (If necessary)
2) Remove battery and battery tray. (For right hand steering vehicle.)
3) Disconnect reservoir lead wire at coupler.
4) Clean around reservoir cap and take out fluid with syringe or such.
5) Disconnect three brake pipes from master cylinder.

NOTE:
Do not allow brake fluid to get on painted surfaces.

6) Remove two attaching nuts/washers.
7) Remove master cylinder.

INSTALLATION

NOTE:
- **See NOTE at the beginning of this section.**
- **Adjust clearance between booster piston rod and primary piston with special tool (See page 5-63).**

1) Install master cylinder as shown and torque attaching nuts to specification.
2) Attach three hydraulic lines and torque flare nuts to specification.
3) Connect reservoir lead wire.
4) Fill reservoir with specified brake fluid.
5) Install battery tray and battery.
6) Install air cleaner case.
   After installing, check brake pedal play and bleed air from system (See pages 5-23 and 5-24).

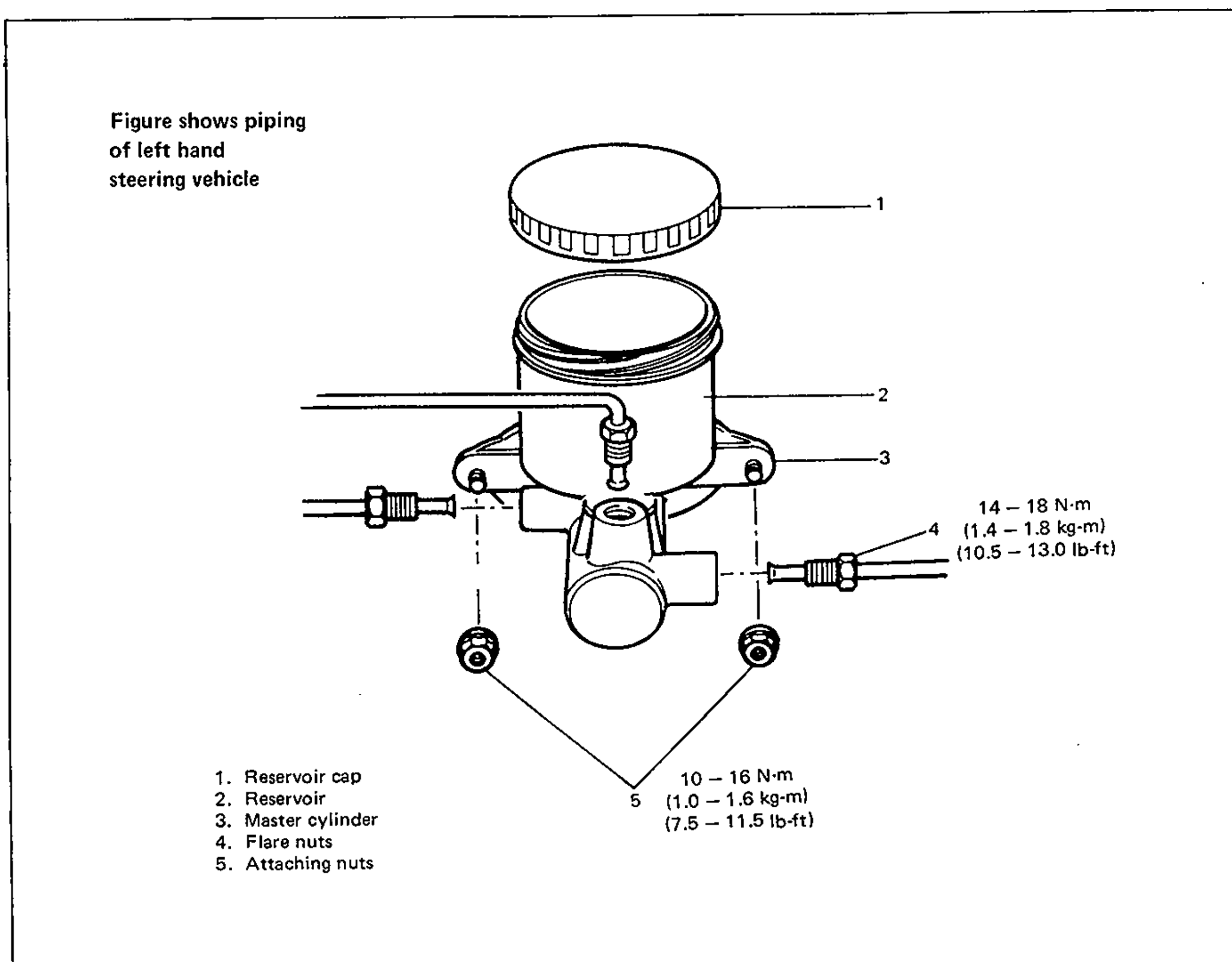


Fig. 5-102 Master Cylinder Repair - A

3. DISASSEMBLE AND ASSEMBLE MASTER CYLINDER

DISASSEMBLY

1) Remove circlip.
2) Remove primary piston.

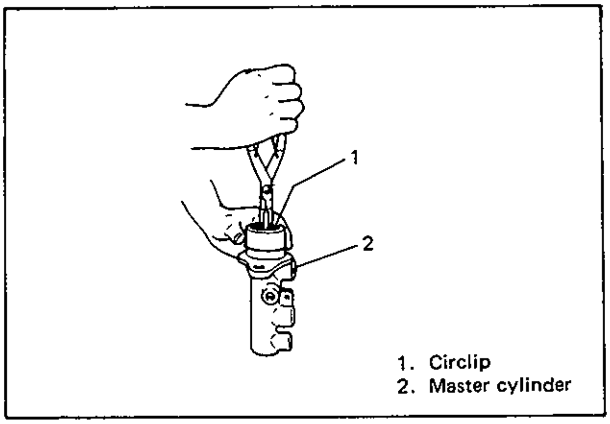


Fig. 5-103

3) Remove piston stopper bolt. Then remove secondary piston by blowing compressed air into hole from which piston stopper bolt was removed.
Be cautious during removal as secondary piston jumps out.

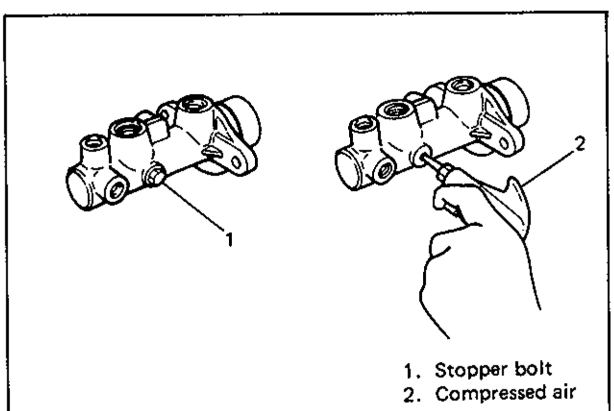


Fig. 5-104

ASSEMBLY

NOTE:
- **See NOTE at the beginning of this section.**
- **Before assembling, wash each part in fluid recommended to use for that vehicle.**

1) Assemble secondary piston as shown below.
2) Install secondary piston assembly into cylinder.
3) Install primary piston in cylinder.
4) Depress, and install circlip.

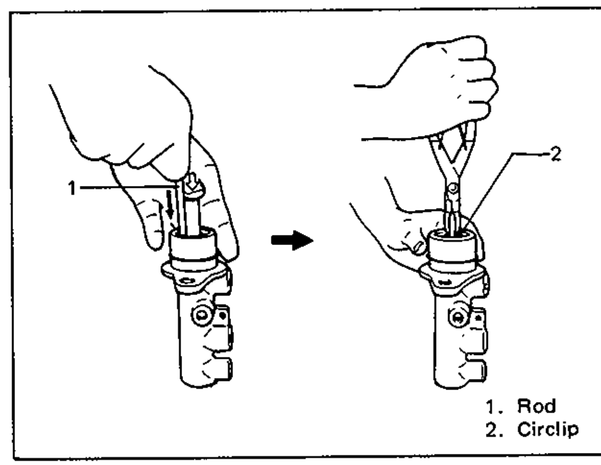


Fig. 5-105

5) Install piston stopper bolt with pistons pushed in all the way and tighten it to specified torque.
6) For installation on vehicle, refer to INSTALLATION on page 5-48.

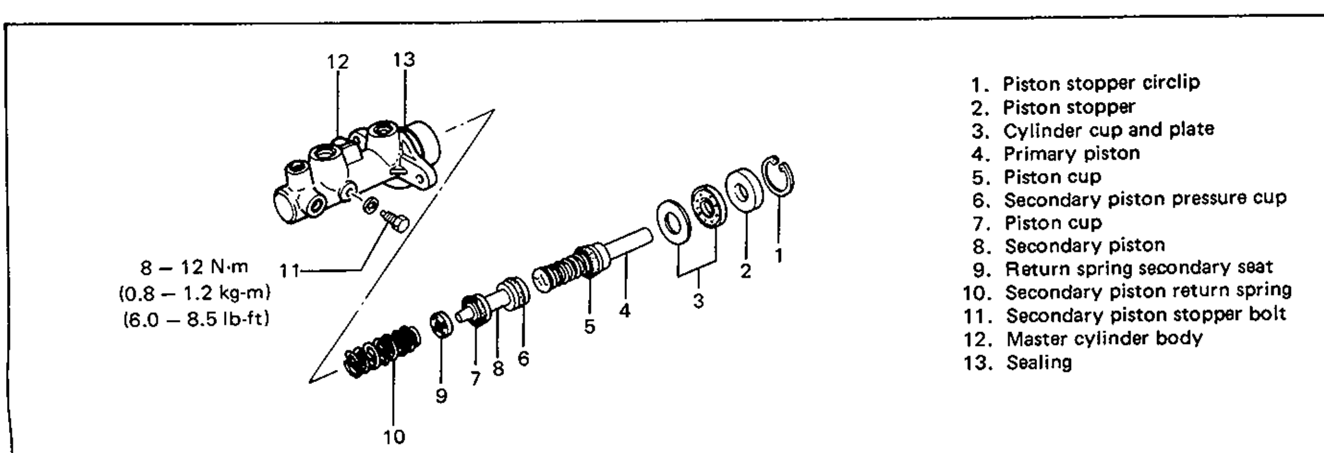


Fig. 5-106 Master Cylinder Repair – B

MASTER CYLINDER INSPECTION

1. INSPECT MASTER CYLINDER

Inspect all disassembled parts for wear or damage, and replace parts if necessary.

NOTE:
- **Wash disassembled parts with brake fluid.**
- **Do not reuse piston cups.**

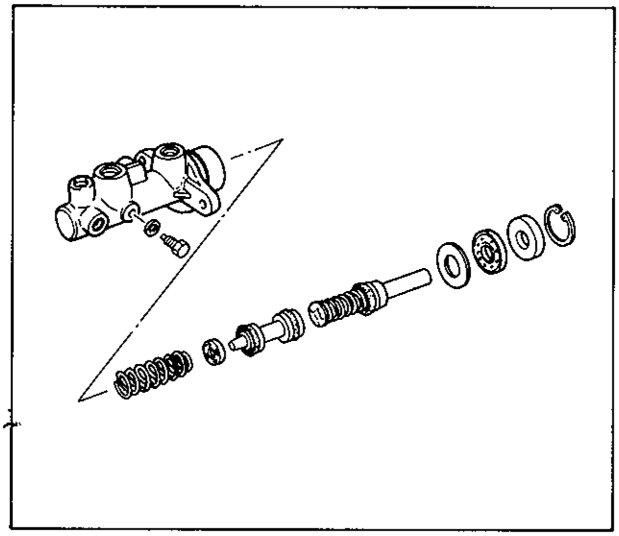


Fig. 5-107

Inspect master cylinder bore for scoring or corrosion. It is best to replace corroded cylinder. Corrosion can be identified as pits or excessive roughness.

NOTE:
Grinding bore of master cylinder with cast aluminum body with anything abrasive is prohibited, as damage to cylinder bore may occur.

Rinse cylinder in clean brake fluid. Shake off excess rinsing fluid from cylinder. Do not use a cloth to dry cylinder, as lint from cloth cannot be kept away from cylinder bore surfaces.

2. FILL RESERVOIR

CAUTION:
Do not use shock absorber fluid or any other fluid which contains mineral oil. Do not use container which has been used for mineral oil or which is wet from water. Mineral oil will cause swelling and distortion of rubber parts in hydraulic brake system and water will mix with brake fluid, lowering fluid boiling point. Keep all fluid containers capped to prevent contamination.

Fluid to fill reservoir with is indicated on reservoir cap of that vehicle with embossed letters or in owner's manual supplied with it.
Add fluid up to MAX line.

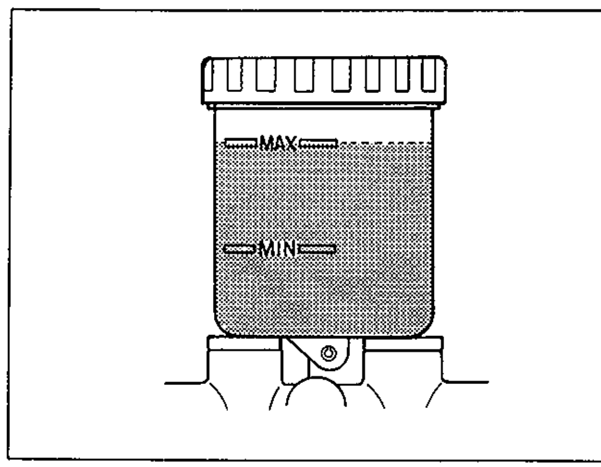


Fig. 5-108

LSPV (Load Sensing Proportioning Valve) R & I

1. REMOVE AND INSTALL LSPV

REMOVAL

1) Clean around reservoir cap and take out fluid with syringe or such.
2) Hoist vehicle.
3) Disconnect brake pipes from LSPV.

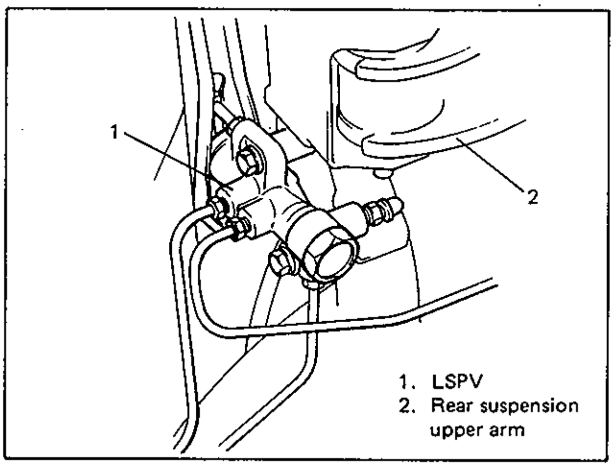


Fig. 5-108-1

4) Remove LSPV assembly from vehicle body.

NOTE:
As shown in figure below, LSPV assembly should be removed together with its spring and stay installed as they are.

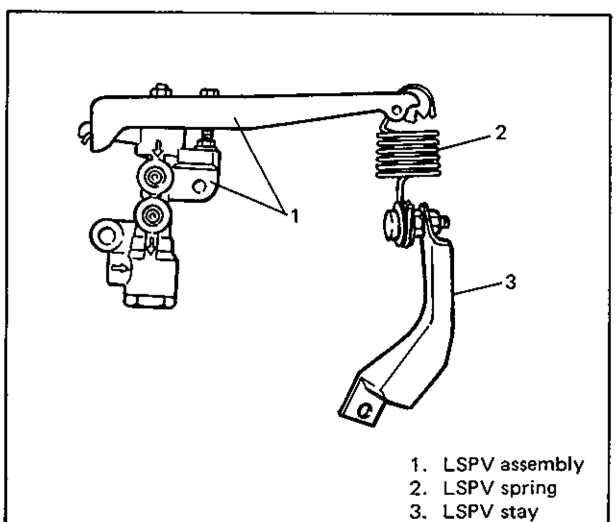


Fig. 5-108-2

5) Remove spring and stay from lever.

CAUTION:
- **None of below indicated nuts and bolt of LSPV assembly should be loosened or tightened.**
- **LSPV assembly must not be disassembled. Replace with new one if defective.**

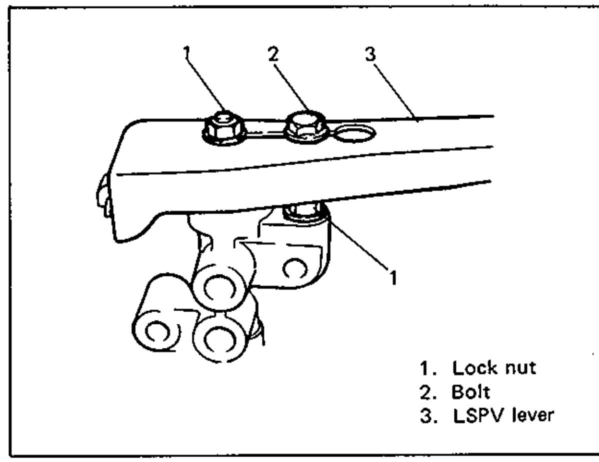


Fig. 5-108-3

INSTALLATION

CAUTION:
Refer to above CAUTION.

Install by reversing removal procedure, noting the following.

1) Apply multi-purpose grease to upper and lower joint of coil spring.

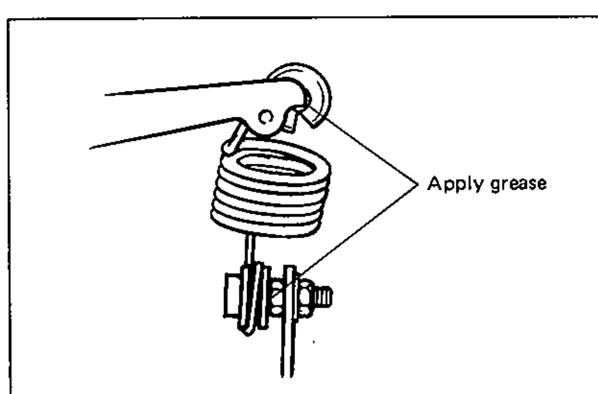


Fig. 5-108-4

2) Torque each bolt and nut to specification as indicated respectively in figure below.

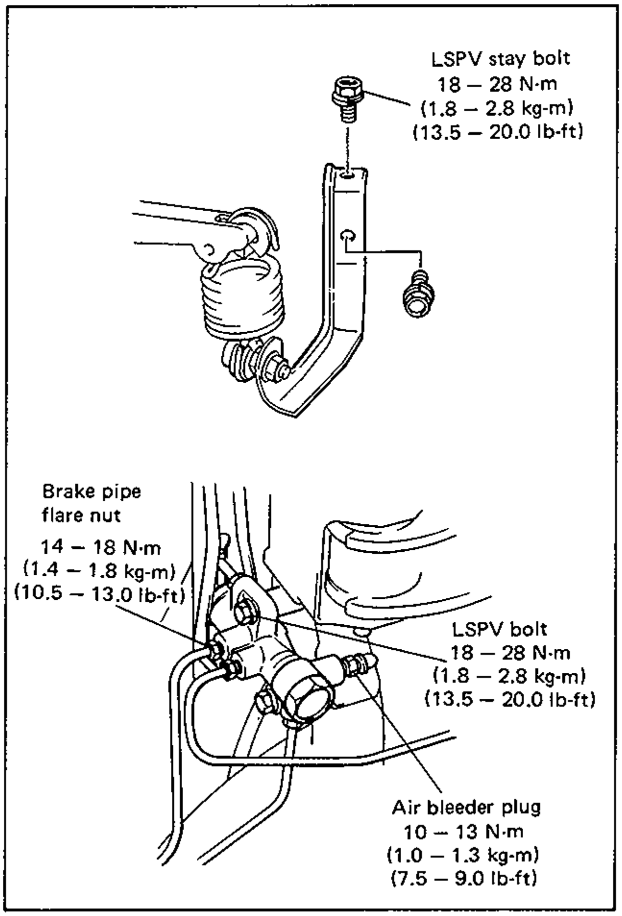


Fig. 5-108-5

3) Upon completion of installation, fill reservoir tank with specified fluid and bleed air from brake system.

NOTE:
Make sure to bleed air from LSPV bleeder without fail.

4) After bleeding air, check that LSPV is installed properly, referring to following INSPECTION & ADJUSTMENT section.

2. AFTER–INSTALLATION INSPECTION & ADJUSTMENT

Confirm the following before inspection and adjustment.

- Fuel tank is filled with fuel fully.
- Vehicle is equipped with spare tire, tools, jack and jack handle.
- Vehicle is free from any other load.

With vehicle in above conditions;

1) Place it on level floor.
2) Push up LSPV lever with finger till it contacts stopper bolt and measure length of coil spring ("L" in below figure) as it is pulled.

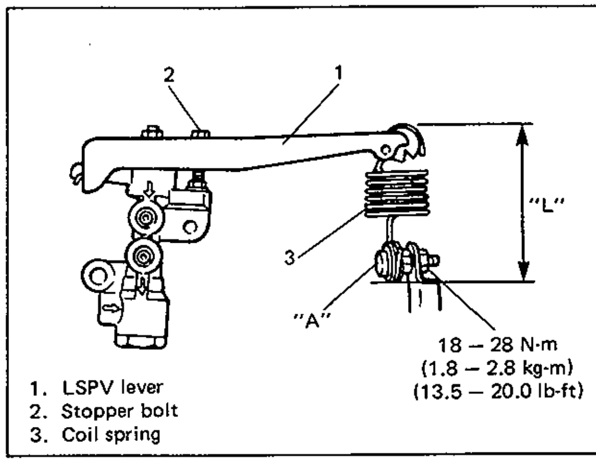


Fig. 5-108-6

3) Spring length "L" should be as specified below.

Spring length "L"	99 mm (3.897 in.)

4) If it isn't, adjust it to specification by changing bolt "A" tightening positions as shown in Fig. 5-108-6. After adjustment, tighten nut to specified torque.
For details, refer to Fig. 5-108-6.

NOTE:
Check to make sure that LSPV body and brake pipe joints are free from fluid leakage. Replace defective parts, if any.

3. FLUID PRESSURE TEST

Test procedure for LSPV assembly is as follows.

Before testing, confirm the following.

- Fuel tank is filled with fuel fully.
- Vehicle is equipped with spare tire, tools, jack and jack handle.

1) Place vehicle on level floor and set 100 kg (221 lbs) weight slowly on axle housing center.
2) Install pressure gauge to front and rear brake.

NOTE:
Pressure gauge should be connected to bleeder of front (left side brake) and rear brakes.

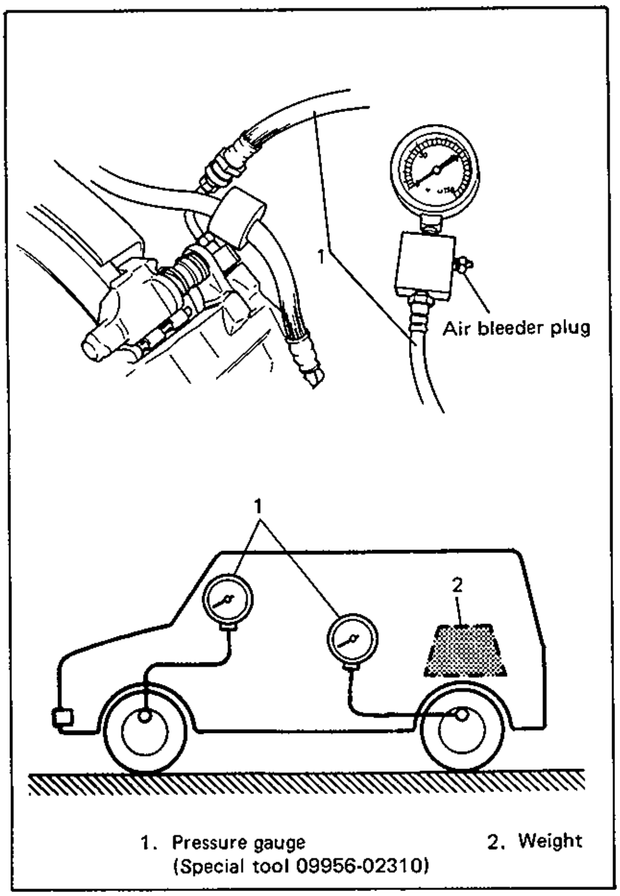


Fig. 5-108-7

3) Depress brake pedal gradually till fluid pressure of front brake becomes as specified below and check corresponding pressure of rear brake then. It should be within specification given below.

Front brake	Rear brake
5000 kPa 50 kg/cm² 711 psi	2000 – 3200 kPa 20 – 32 kg/cm² 285 – 455 psi

As done above, apply 100 kg/cm² pressure to front brake and check that rear brake pressure then is within specification as given below.

Front brake	Rear brake
10.000 kPa 100 kg/cm² 1422 psi	3000 – 4400 kPa 30 – 44 kg/cm² 427 – 625 psi

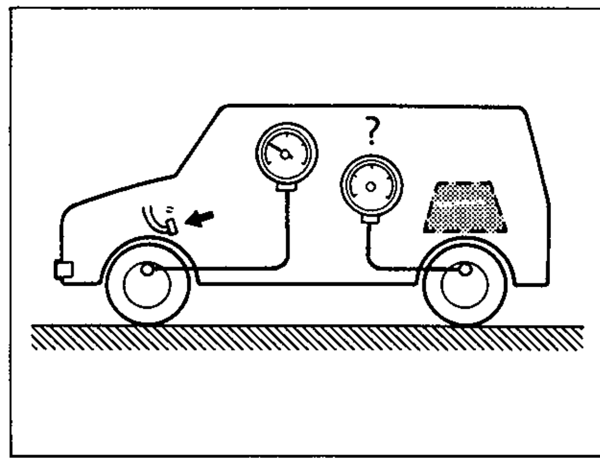


Fig. 5-108-8

4) If rear brake pressure is not within specification, adjust it by changing bolt "A" tightening position as follows.
   - If rear brake pressure is higher than specification, move bolt "A" upward and if it is lower, downward.
   - Repeat steps 3) and 4) until rear brake pressure is within specification.

NOTE:
1 mm of bolt movement will result in about 2.4 kg/cm² difference in hydraulic pressure.

- After adjustment, be sure to torque nut to specification.

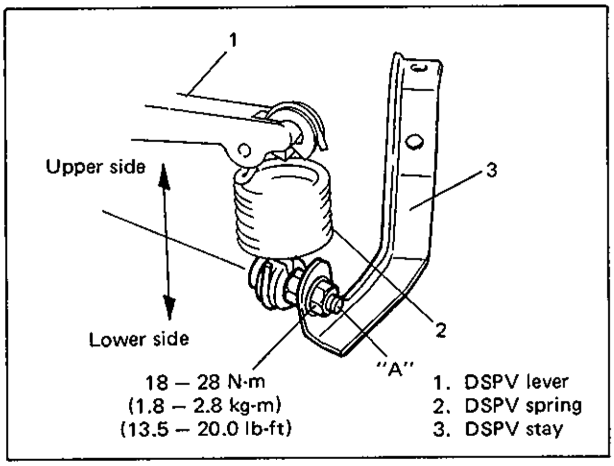


Fig. 5-108-9

5) Disconnect brake pipe (connecting between master cylinder and right front brake) from master cylinder.
   Tighten plug (special tool) to master cylinder as shown below.

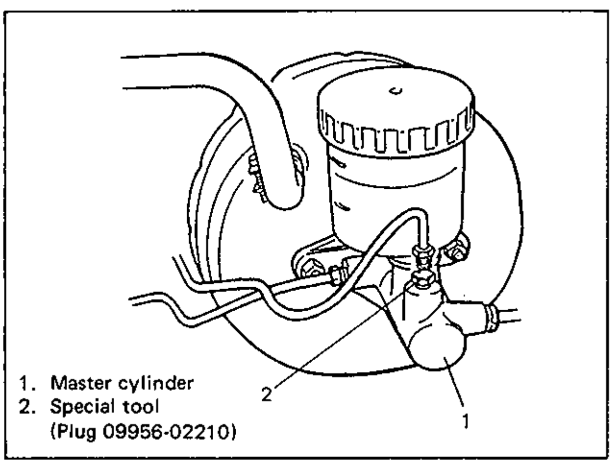


Fig. 5-108-10

Depress brake pedal. If rear brake pressure is 95 – 100 kg/cm² when front brake pressure is 100 kg/cm², it means that front fail-safe system functions properly.

Front brake	Rear brake
10000 kPa 100 kg/cm² 1422 psi	9500 – 10000 kPa 95 – 100 kg/cm² 1350 – 1422 psi

6) Upon completion of fluid pressure test, bleed brake system and perform brake test.

BRAKE BOOSTER REPAIR

1. REMOVE AND INSTALL BOOSTER

REMOVAL

1) Remove master cylinder assembly, referring to steps 1) to 6) of its REMOVAL on page 5-48.
2) Disconnect vacuum hose from booster.
3) Disconnect push rod clevis from brake pedal arm.
4) Remove attaching nuts and then booster as shown.

INSTALLATION

NOTE:

- **See NOTE at the beginning of this section.**
- **Adjust clearance between booster piston rod and master cylinder piston with special tool. (See page 5-63.)**
- **Check length of push rod clevis. (See page 5-62.)**

1) Install booster to dash panel as shown. Then connect booster push rod clevis to pedal arm with clevis pin and split pin.
2) Torque booster attaching nuts to specification.
3) Install master cylinder to booster and torque attaching nuts to specification.
4) Connect three brake pipes and torque flare nuts to specification. (See page 5-48.)
5) Connect booster vacuum hose.
6) Connect reservoir lead wire at coupler.
7) Install air cleaner case.
8) Fill reservoir with specified fluid.
9) Bleed air from brake system. (See air bleeding section, pages 5-23 and 5-24.)
10) After installing, check pedal height and play. (See pages 5-20 and 5-21.)
11) Perform brake test and check each installed part for fluid leakage.

1. Vacuum hose
2. Booster
3. Push rod clevis lock nut
4. Split pin
5. Gasket
6. Dash panel
7. Attaching nut
8. Master cylinder
9. Push rod clevis
10. Clevis pin
11. Attaching nut

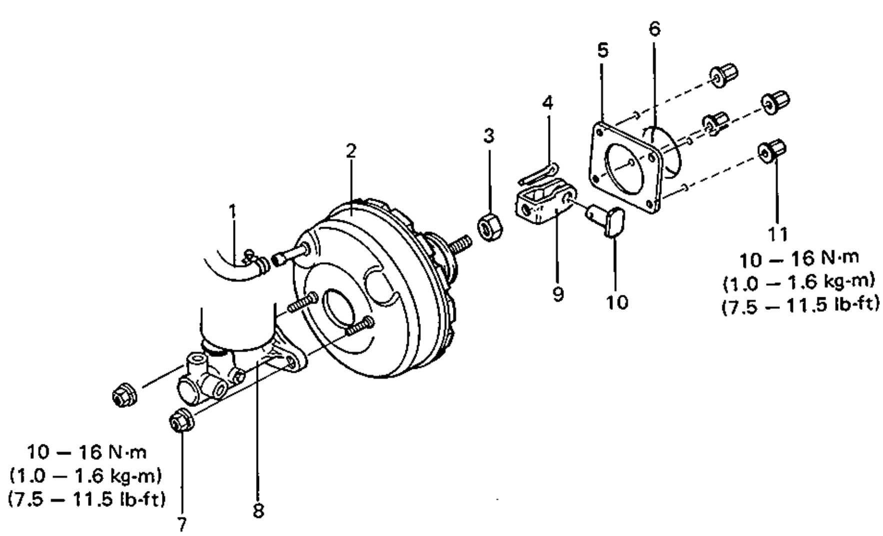
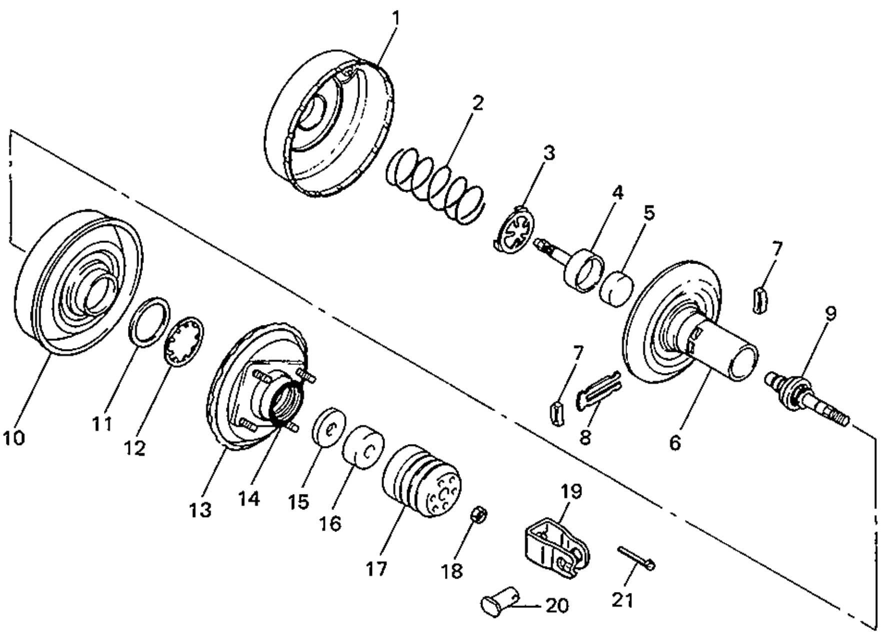


Fig. 5-109

2. DISASSEMBLE AND ASSEMBLE BOOSTER



1. Booster No. 1 body
2. Booster piston return spring
3. Piston rod retainer
4. Piston rod
5. Reaction disc
6. Booster piston
7. Key cushion
8. Valve stopper key
9. Booster air valve assembly
10. Diaphragm
11. Diaphragm retainer
12. Circular ring
13. Booster No. 2 body
14. No. 2 body oil seal
15. Air cleaner separator
16. Air cleaner element
17. Body boot
18. Nut
19. Push rod clevis
20. Clevis pin
21. Split pin

Fig. 5-110

DISASSEMBLY

1) Remove push rod clevis and nut.

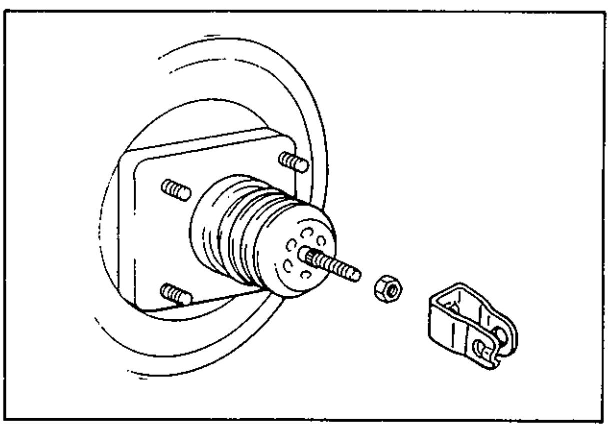


Fig. 5-111

2) Attach booster to special tool (A) as shown and install special tool (B) to booster as shown.

NOTE:

- **When attaching, check to be sure that booster vacuum pipe is not in faulty contact with base of special tool (A).**
- **Be careful not to over-tighten nuts, or booster body will be deformed.**

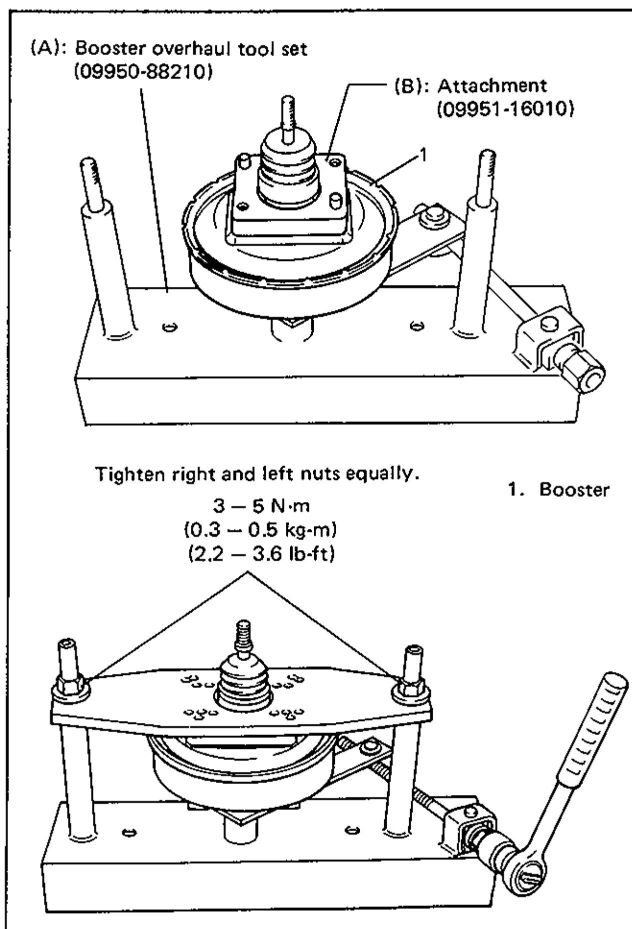


Fig. 5-112

3) Turn special tool bolt clockwise until No. 1 body projecting part and No. 2 body depressed part fit each other.
Once they are matched, make match marking on No. 1 and No. 2 bodies to facilitate their installation.

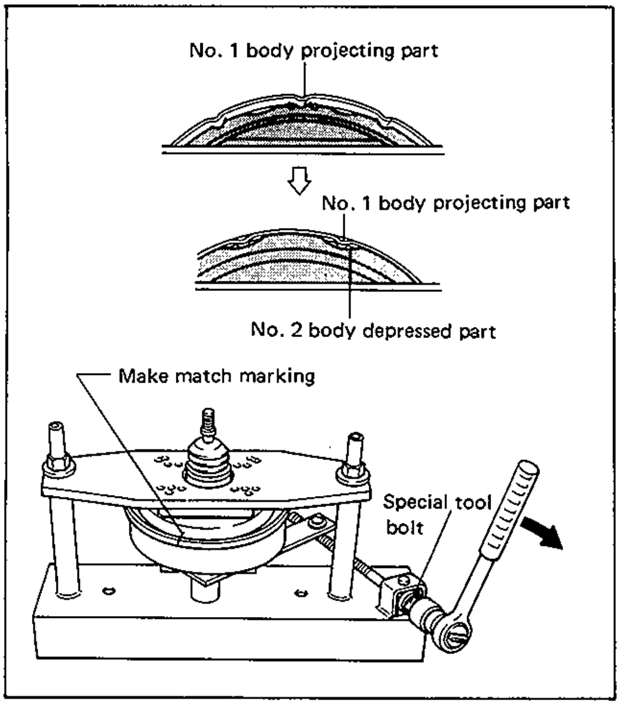


Fig. 5-113

4) Detach booster from special tool and separate No. 1 body and No. 2 body. Remove piston return spring.

> **WARNING:**
> **When separating two bodies, carefully hold both bodies to prevent either body from jumping off by spring force.**

5) From booster No. 2 body, remove piston rod, boot, air cleaner element and air cleaner separator in this order.

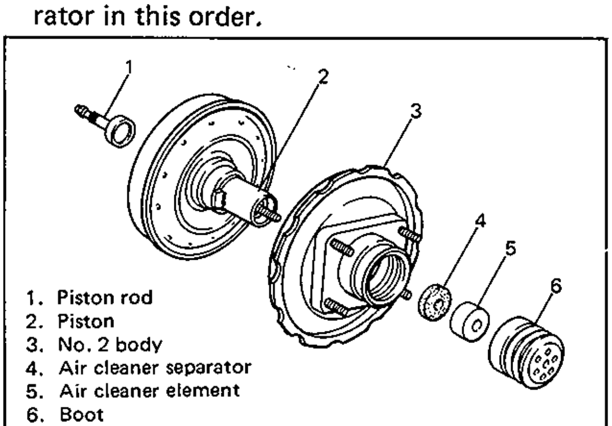


Fig. 5-114

6) Remove valve stopper key cushion from stopper key.

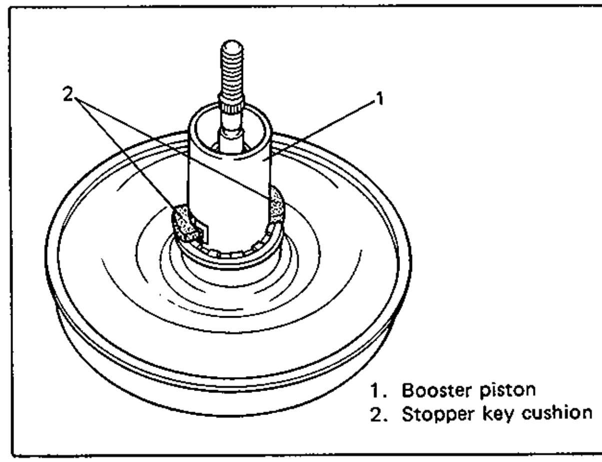


Fig. 5-115

7) While compressing air valve spring (by moving rod up and down as shown), remove valve stopper key. Then remove booster air valve assembly from booster piston.

NOTE:
Booster air valve assembly can't be disassembled.

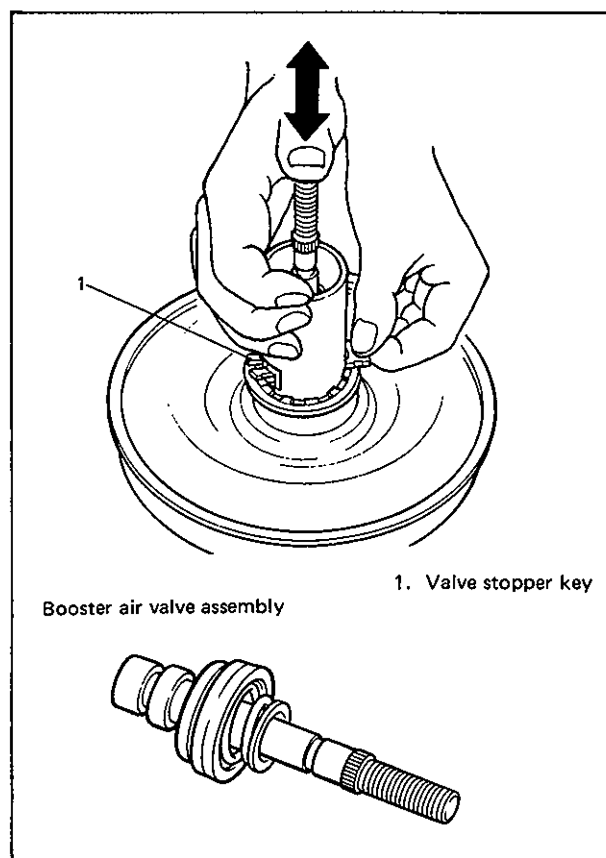


Fig. 5-116

8) Remove diaphragm circular ring from booster piston.

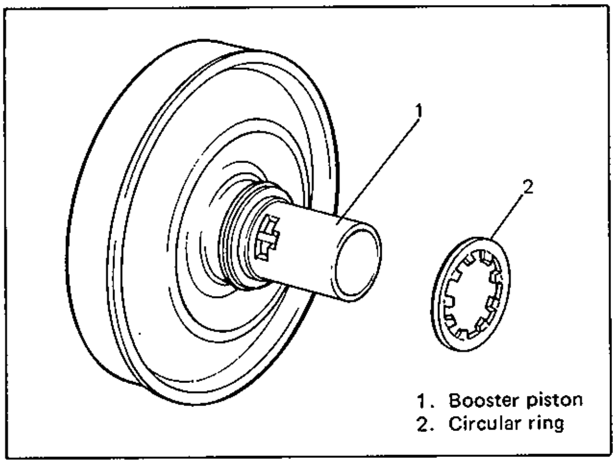


Fig. 5-117

9) Remove diaphragm from booster piston.

NOTE:
Don't use screwdriver or any other tool for removal. Pull it off by hand carefully handling piston groove area where diaphragm is fitted.

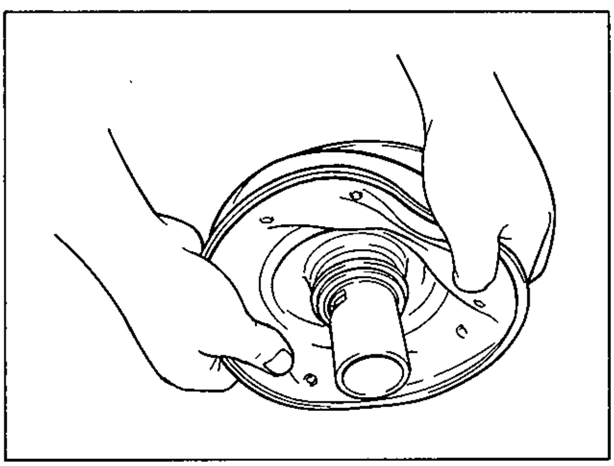


Fig. 5-118

10) Remove reaction disc from booster piston rod.

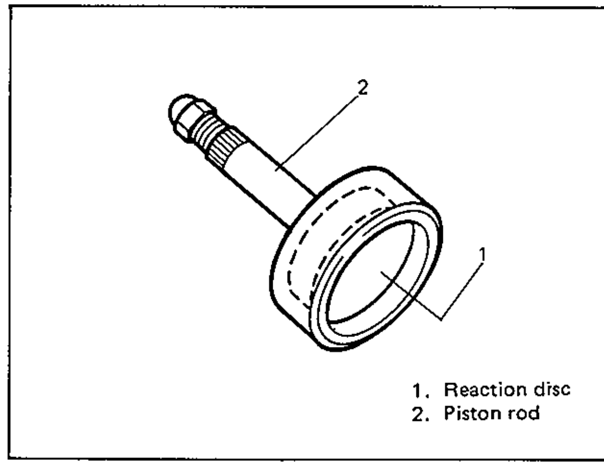


Fig. 5-119

11) Remove oil seal from booster No. 2 body with special tools as shown.

NOTE:
Removed oil seal must not be reused.

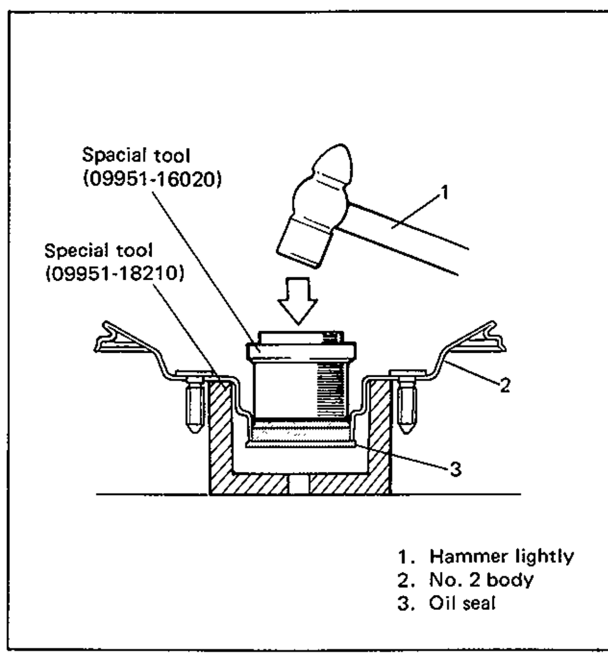


Fig. 5-120

ASSEMBLY

NOTE:
- **See NOTE at the beginning of this section.**
- **Be sure to use silicon grease wherever application of grease is instructed during assembly.**

1) Apply grease to new oil seal outer surface and oil seal lip as shown.
   Press-fit new oil seal to booster No. 2 body by using special tools (C) and (D).

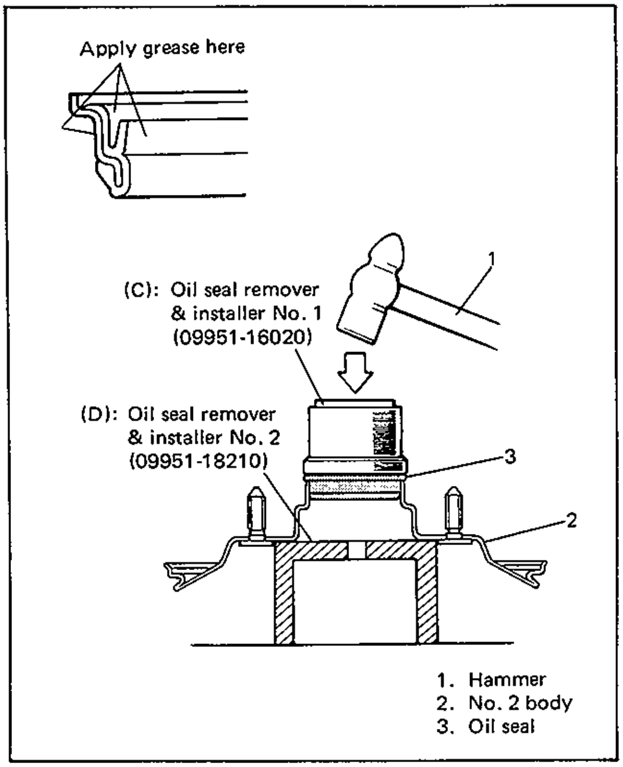


Fig. 5-121

2) Install retainer to diaphragm.

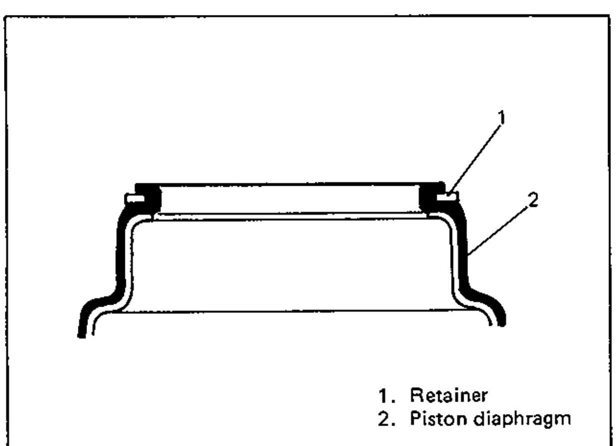


Fig. 5-122

3) Install diaphragm to booster piston by hand.

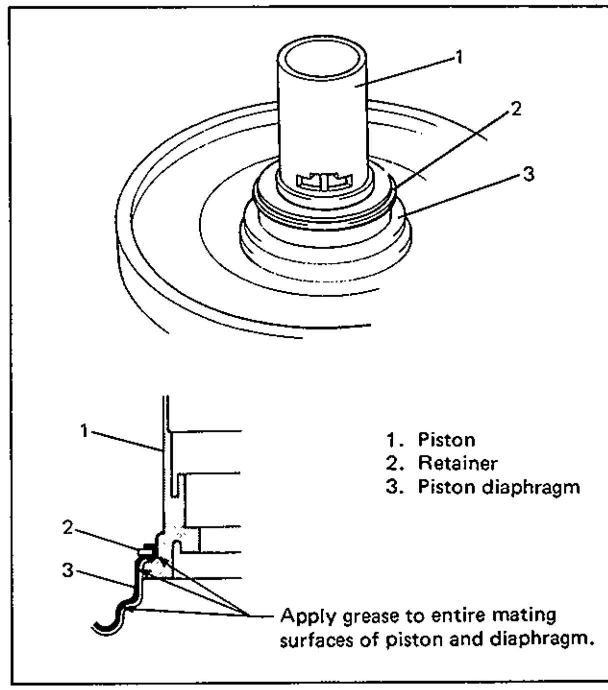


Fig. 5-123

4) Install new diaphragm circular ring, referring to figure below for its proper installing direction.

NOTE:
Be careful not to cause damage to piston when installing.

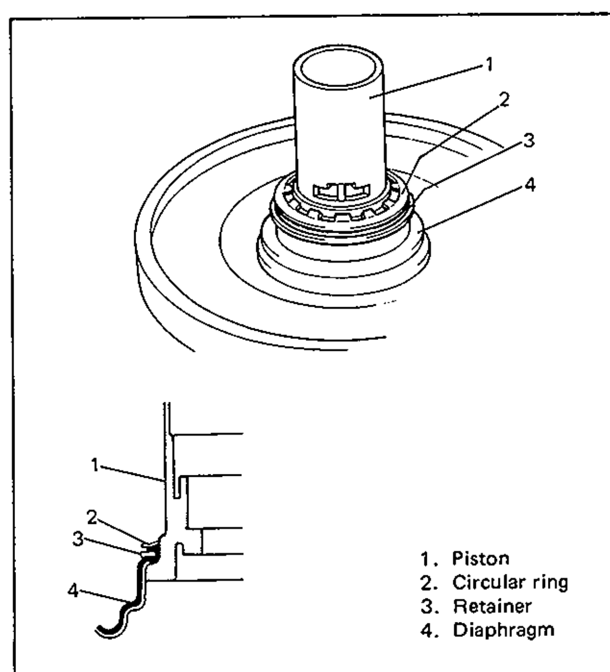


Fig. 5-124

5) Install booster air valve assembly to booster piston. Before installation, apply grease as shown.

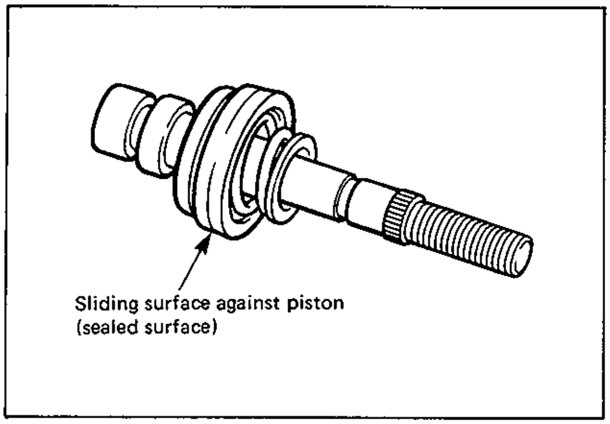


Fig. 5-125

6) Compress air valve assembly and insert valve stopper key.

NOTE:
Don't compress air valve assembly forcibly.

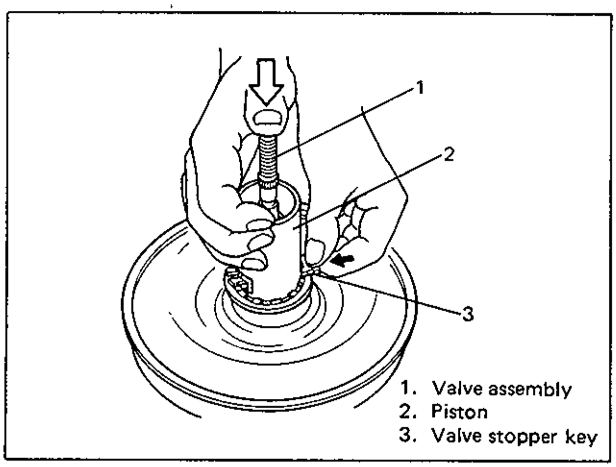


Fig. 5-126

7) Install valve stopper key cushions.

NOTE:
Make sure that it is installed in proper direction and cushion is fitted to notch in key.

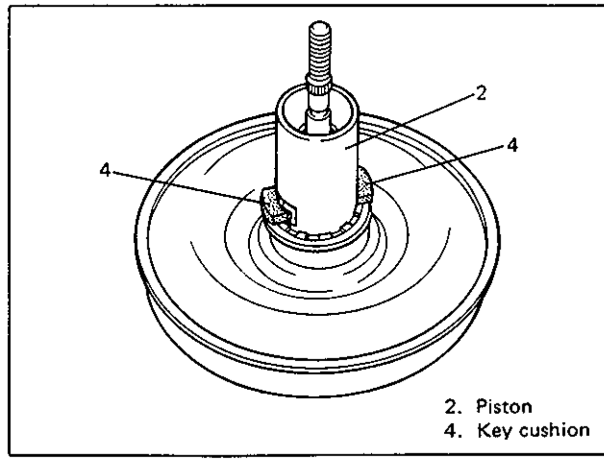


Fig. 5-127

8) Install booster piston to booster No. 2 body.

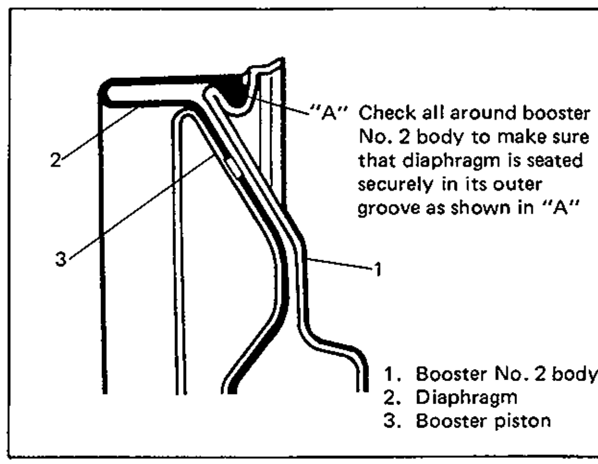


Fig. 5-128

9) Install air cleaner separator and then element to rod of air valve assembly.

10) Install body boot to booster No. 2 body. Both ends of boot must be fitted securely as shown.

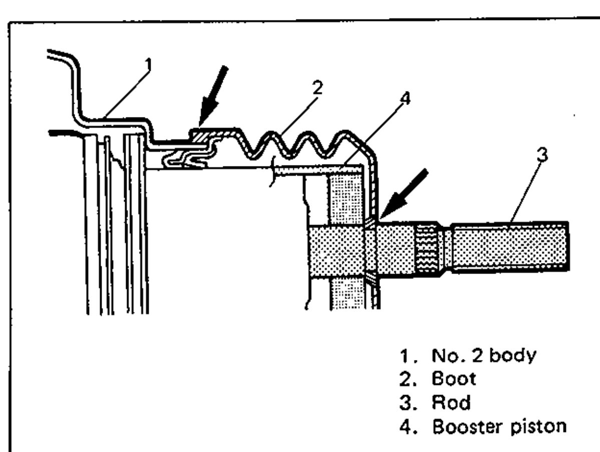


Fig. 5-129

11) Install reaction disc to booster piston rod after greasing its outer face.

NOTE:
Make sure that no air exists between piston rod and reaction disc.

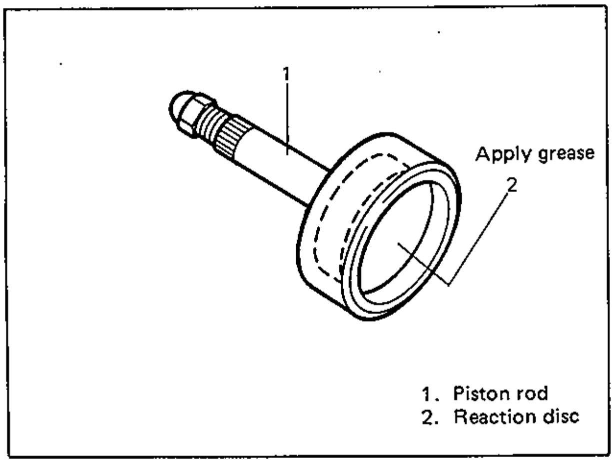


Fig. 5-130

12) Place No. 1 body on special tool (A).

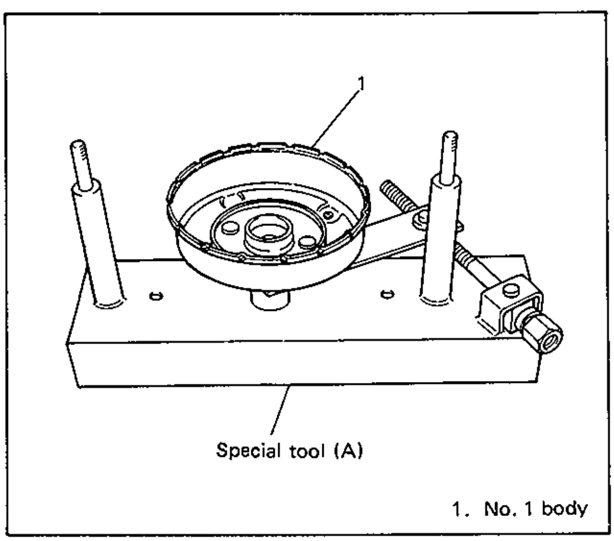


Fig. 5-131

13) Install piston rod, rod retainer and piston return spring to booster piston as shown below. Then install them to booster No. 1 body.

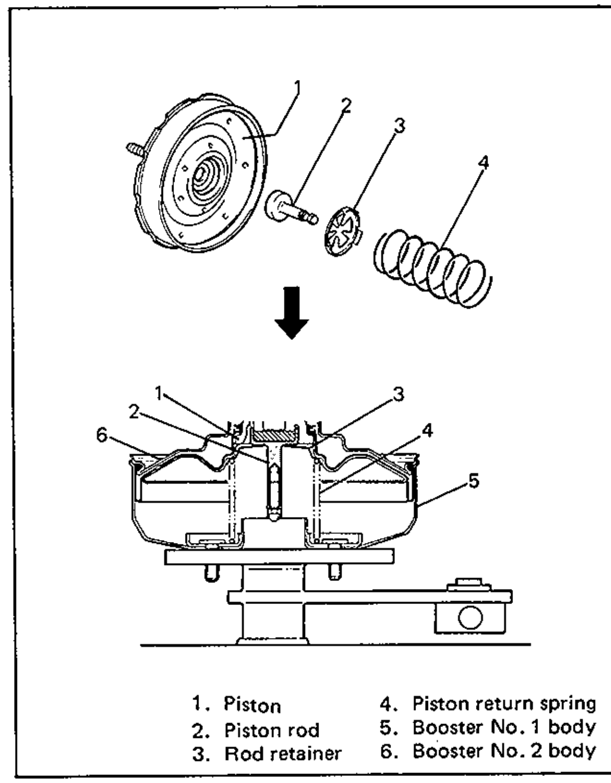


Fig. 5-132

14) Put No. 1 and No. 2 bodies together by aligning markings made before disassembly.
Holding No. 2 body with upper plate (special tool) as shown, torque two nuts equally to specification.

Special tool nuts tightening torque	N·m	kg-m	lb-ft
	3 – 5	0.3 – 0.5	2.2 – 3.6

NOTE:
When holding No. 2 body, use care so that diaphragm is not caught by projections at 16 locations around No. 1 body.

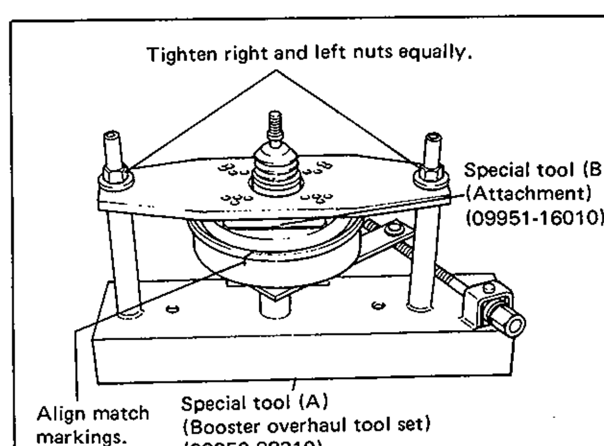


Fig. 5-133

15) Turn special tool bolt counterclockwise until No. 1 body projecting part comes to mid-position of No. 2 body depressed parts as shown.

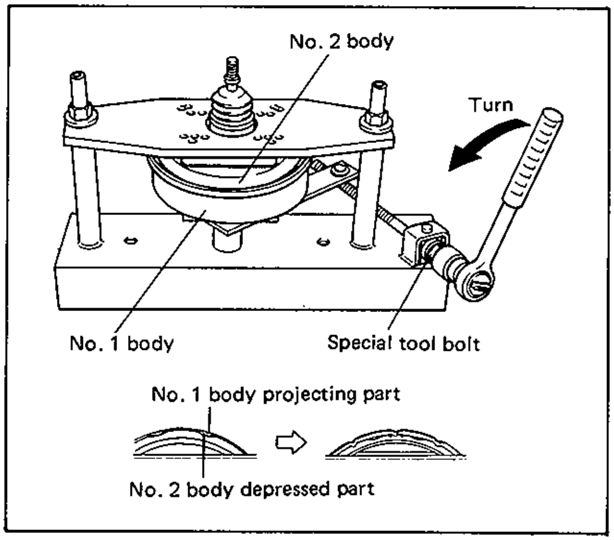


Fig. 5-134

16) Install push rod clevis so that below measurement "A" is obtained and torque nut to specification.

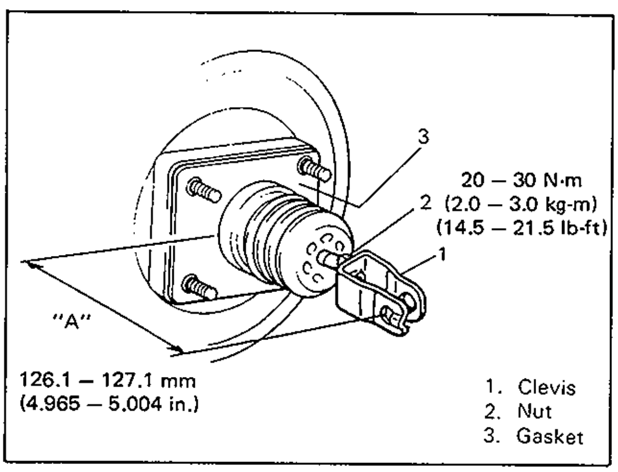


Fig. 5-135

17) Remove booster from special tool.

NOTE:
Whenever booster was disassembled, make sure to check clearance between piston rod and master cylinder piston after reassembly. (For details, refer to page 5-63.)

18) For installation of booster, see steps 1) to 11) of its INSTALLATION on page 5-55.

BRAKE BOOSTER INSPECTION AND ADJUSTMENT

1. INSPECT BOOSTER INNER PARTS

NOTE:

After disassembly, soak all metal parts in ethyl alcohol. Wipe rubber diaphragm and plastic parts with a clean cloth. Use ethyl alcohol damped cloth to wipe out heavy dirt. Application of much ethyl alcohol especially to rubber parts is prohibited.

RUBBER PARTS

Wipe fluid from rubber parts and carefully inspect each rubber part for cuts, nicks or other damage. These parts are key to air flow control. If there is any question as to serviceability of rubber parts, **REPLACE** them.

METAL PARTS

Badly damaged items, or those which would take extensive work or time to repair, should be replaced. In case of doubt, install new parts.

2. INSPECT/ADJUST CLEARANCE BETWEEN BOOSTER PISTON ROD AND MASTER CYLINDER PISTON

The length of booster piston rod is adjusted to provide specified clearance between piston rod end and master cylinder piston.

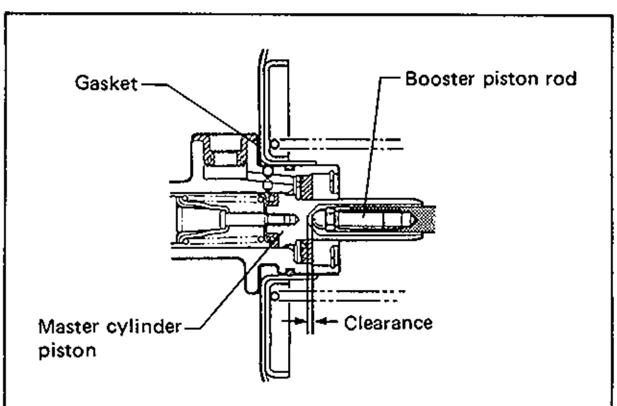


Fig. 5-136

- Before measuring clearance, push piston rod several times so as to make sure reaction disc is in place.
- Take measurement with gasket installed to master cylinder.
- Keep inside of booster at atmospheric pressure for measurement.

1) Set special tool (E) on master cylinder and push pin until contacts piston.

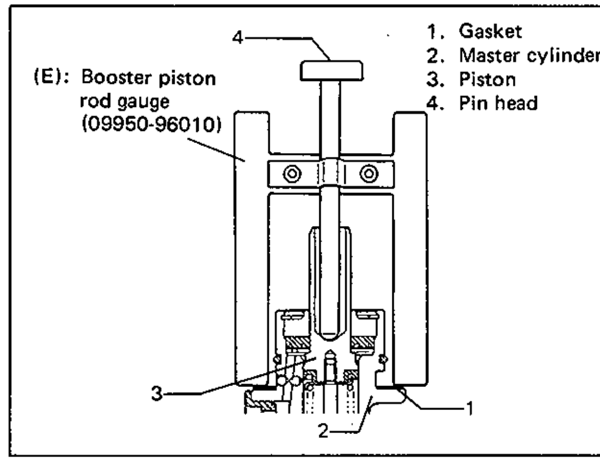


Fig. 5-137

2) Turn special tool upside down and place it on booster. Adjust booster piston rod length until rod end contacts pin head.
3) Adjust clearance by turning adjusting screw of piston rod.

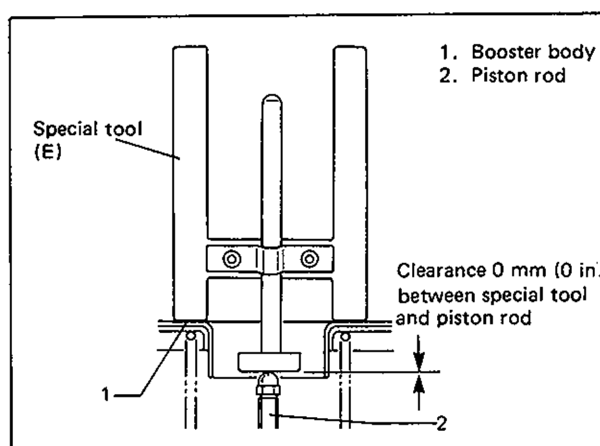


Fig. 5-138

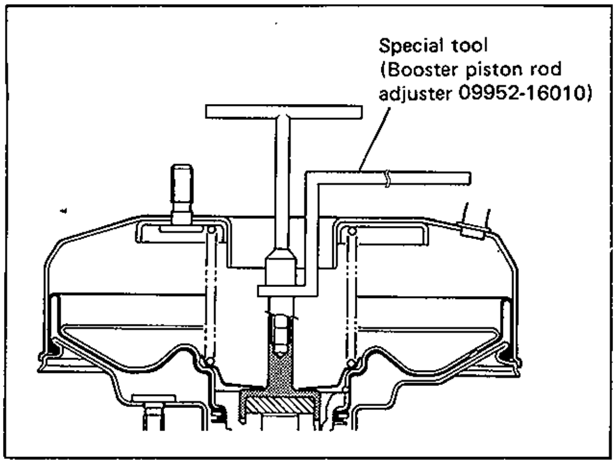


Fig. 5-138-1

Reference
When adjusted as above, if negative pressure is applied to booster with engine at idle, piston to piston rod clearance should become 0.25 – 0.5 mm (0.010 – 0.020 in.).

3. INSPECT BOOSTER OPERATION

There are two ways to perform this inspection, with and without a tester. Ordinarily, it is possible to roughly determine its condition without using a tester.

NOTE:
For this check, make sure that no air is in hydraulic line.

INSPECTION WITHOUT TESTER

Check Air Tightness

1) Start engine.
2) Stop engine after running for 1 to 2 minutes.
3) Depress brake pedal several times with the same load as in ordinary braking and observe pedal travel. If pedal goes down deep the first time but its travel decreases as it is depressed the second and more times, air tightness is obtained.

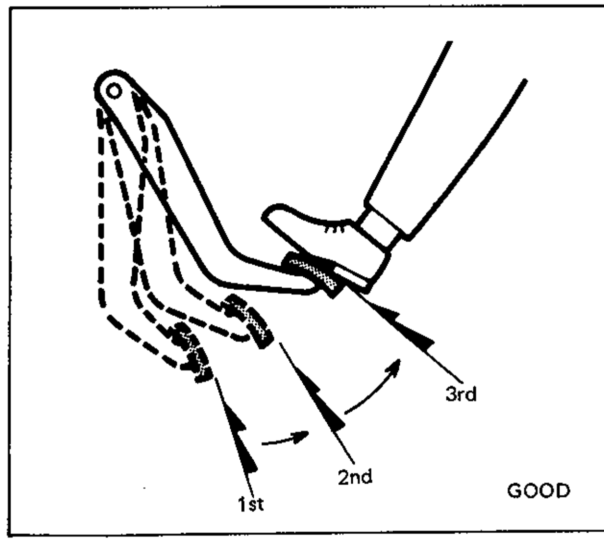


Fig. 5-139

4) If pedal travel doesn't change, air tightness isn't obtained.

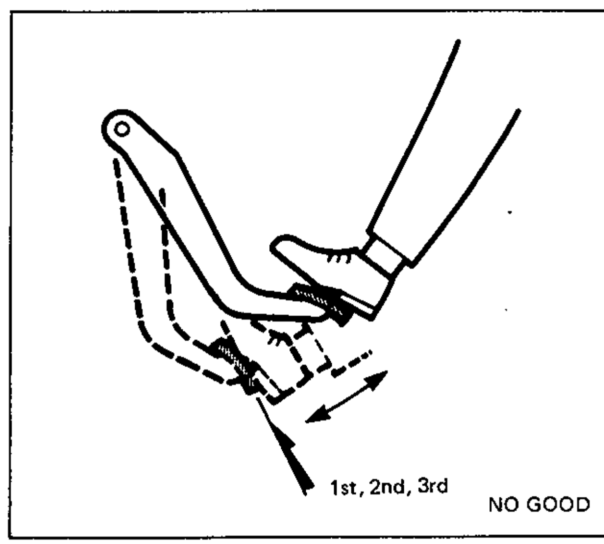


Fig. 5-140

NOTE:
If defective, inspect vacuum lines and sealing parts, and replace any faulty part.
When this has been done, repeat the entire test!

Check Operation

1) With engine stopped, depress brake pedal several times with the same load and make sure that pedal travel doesn't change.

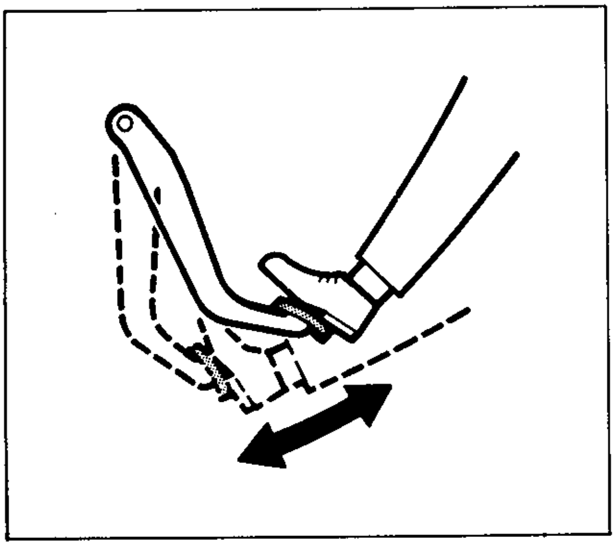


Fig. 5-141

2) Start engine while depressing brake pedal. If pedal travel increases a little, operation is satisfactory. But no change in pedal travel indicates malfunction.

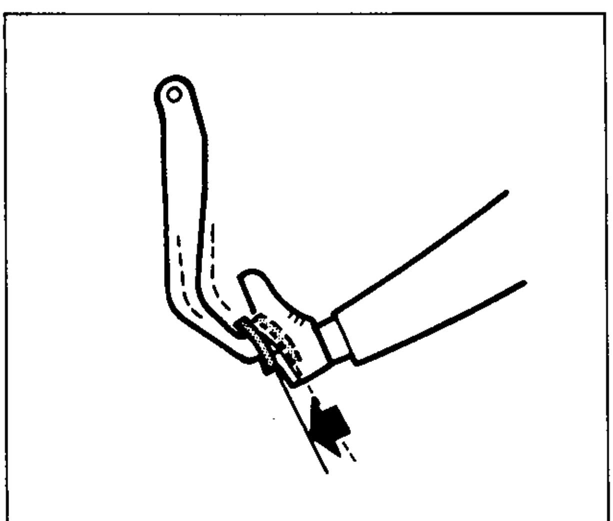


Fig. 5-142

Check Air Tightness Under Load

1) With engine running, depress brake pedal. Then stop engine while holding brake pedal depressed.

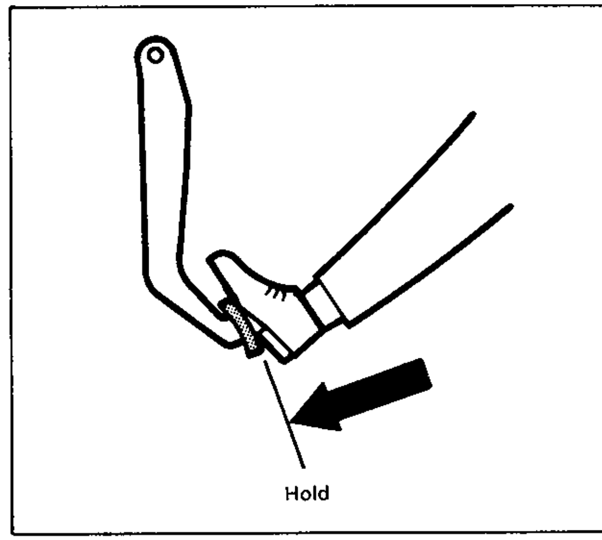


Fig. 5-143

2) Hold brake pedal depressed for 30 seconds. If pedal height does not change, condition is good. But it isn't if pedal rises.

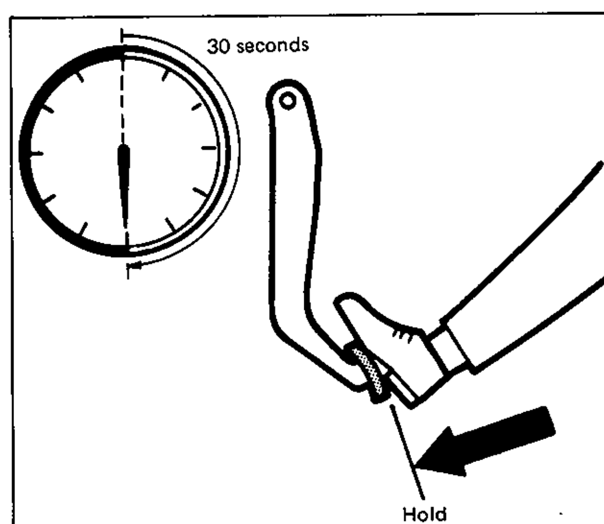


Fig. 5-144

4. BOOSTER INSPECTION TABLE

Part	Inspect For	Corrective Action
1. Booster piston	Cracks, distortion or damage.	Replace.
2. Air valve ass'y (Control valve and spring)	Damaged or worn seal surfaces.	Replace.
3. Reaction disc	Damage or wear.	Replace.
4. Diaphragm, boot and rubber	Damage.	Replace.
5. Piston rod	Damage or bend.	Replace.
6. Booster No. 1 & No. 2 body	1. Scratches, scores, pits, dents, or other damage affecting rolling or sealing of diaphragm or other seals.	Replace, unless easily repaired.
	2. Cracks, damage at ears, damaged threads on studs.	Replace, unless easily repaired.
	3. Bent or nicked locking lugs.	Replace, unless easily repaired.
	4. Loose studs.	Replace.
7. Air filters and separator	Dirt.	Replace.

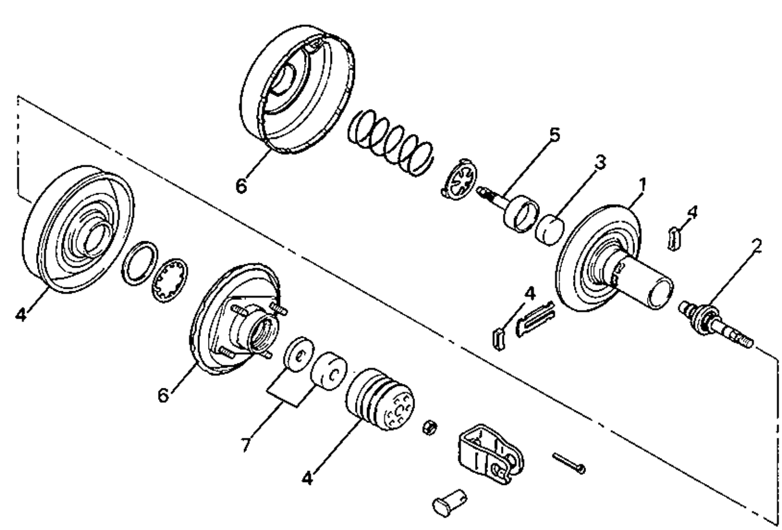


Fig. 5-145

RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts		Tightening torque		
		N·m	kg-m	lb-ft
1. Brake caliper carrier bolt		70 – 100	7.0 – 10.0	51.0 – 72.0
2. Brake caliper pin bolt		22 – 32	2.2 – 3.2	16.0 – 23.0
3. Front brake flexible hose bolt		20 – 25	2.0 – 2.5	14.5 – 18.0
4. Rear brake nut (Brake back plate nut)		18 – 28	1.8 – 2.8	13.5 – 20.0
5. Master cylinder nut		10 – 16	1.0 – 1.6	7.5 – 11.5
6. Booster nut		10 – 16	1.0 – 1.6	7.5 – 11.5
7. Brake pipe 5-way joint bolt		8 – 12	0.8 – 1.2	6.0 – 8.5
8. LSP valve bolt		18 – 28	1.8 – 2.8	13.5 – 20.0
9. Brake pipe flare nut		14 – 18	1.4 – 1.8	10.5 – 13.0
10. Brake pedal shaft nut		18 – 28	1.8 – 2.8	13.5 – 20.0
11. Rear brake drum nut		50 – 80	5.0 – 8.0	36.5 – 57.5
12. Brake bleeder plug	(Front caliper)	9 – 10	0.9 – 1.0	6.5 – 7.5
	(Rear cylinder)	9 – 10	0.9 – 1.0	6.5 – 7.5
	(LSPV)	10 – 13	1.0 – 1.3	7.5 – 9.0
13. Brake LSPV stay bolt		18 – 28	1.8 – 2.8	13.5 – 20.0
14. Wheel nut		80 – 110	8.0 – 11.0	58.0 – 79.5

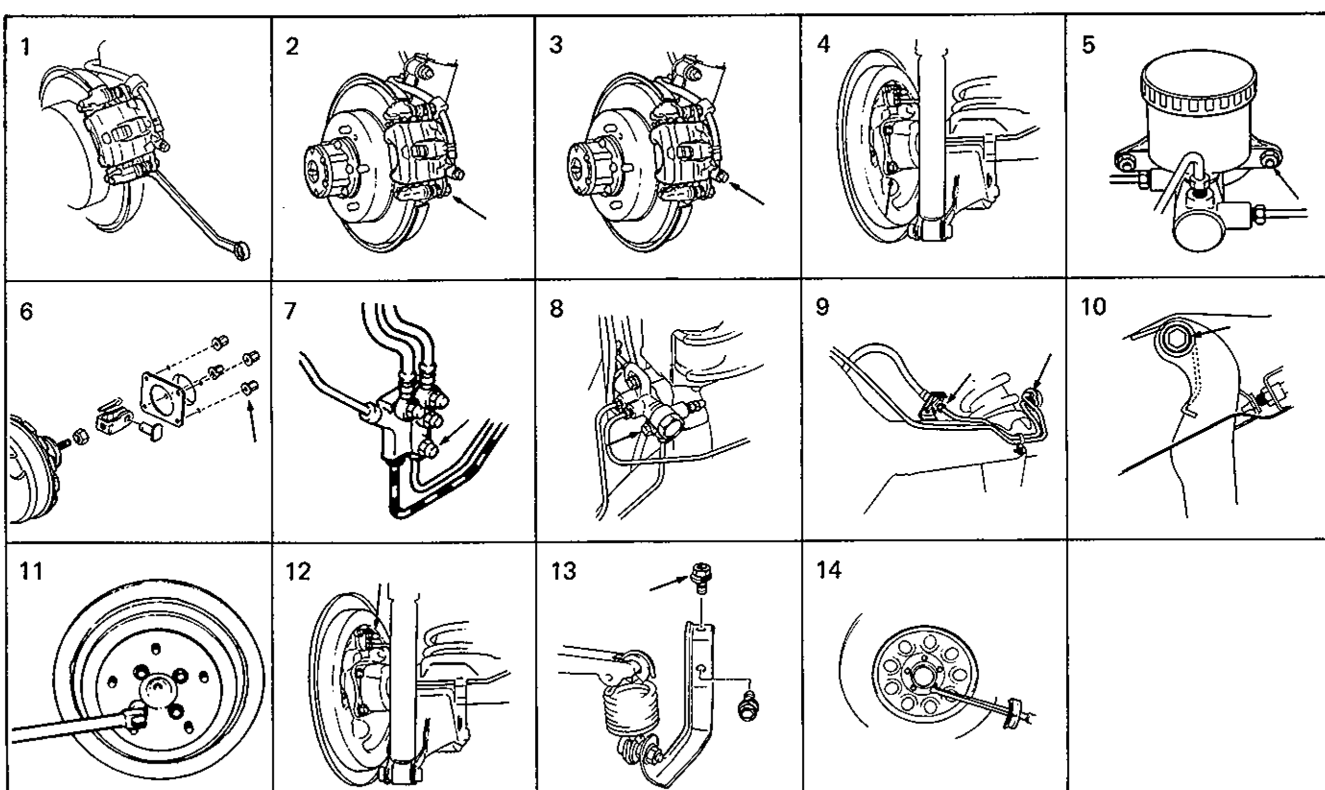
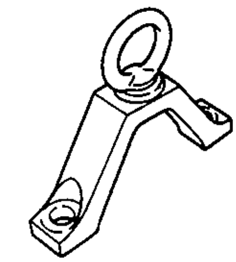
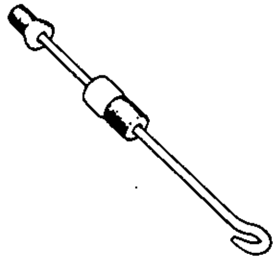
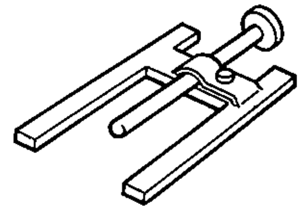
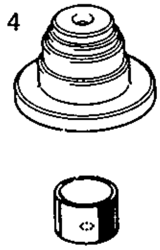
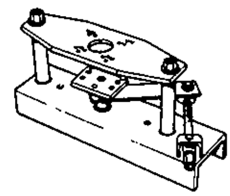
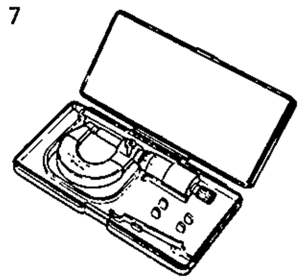
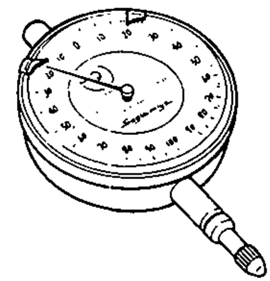
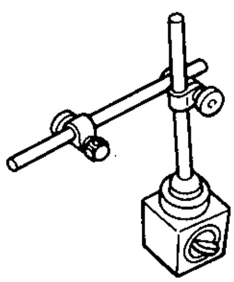
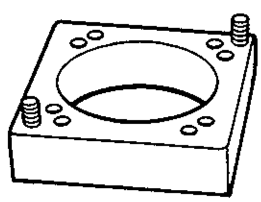
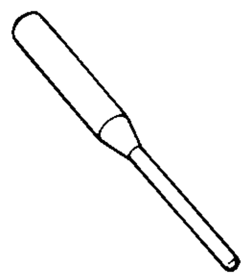
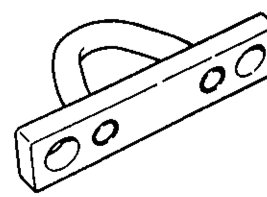
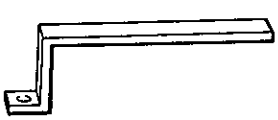
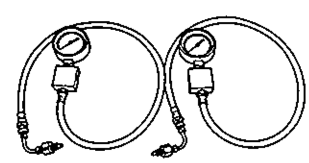


Fig. 5-146

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Brake fluid	Indicated on reservoir tank cap or described in owner's manual of vehicle	• To fill master cylinder reservoir. • To clean and apply to inner parts of master cylinder caliper and wheel cylinder when they are disassembled.
Silicone grease	Furnished in repair kit	• To apply to brake booster inner parts where application is instructed in this manual.
Water tight sealant	SEALING COMPOUND 366E 99000-31090	• To apply to mating surfaces of brake back plate and rear wheel cylinder.
Sealant	SUZUKI BOND NO. 1215 99000-31110	• To apply to mating surfaces of brake back plate and rear axle housing. • To apply to mating surfaces of brake back plate and rear wheel bearing retainer.

SPECIAL TOOLS

1  09943-35511 Brake drum remover (Front wheel hub remover)	2  09942-15510 Sliding hammer	3  09950-96010 Booster piston rod gauge	4  No. 1 09951-16020 No. 2 09951-18210 Booster No. 2 body Oil seal remover & Installer No. 1, No. 2
5  09950-88210 Booster overhaul tool set	6  09950-78210 Flare nut wrench (10 mm)	7  09900-20205 Micrometer (0 – 25 mm)	8  09900-20602 Dial gauge (1/1000 mm)
9  09900-20701 Magnetic stand	10  09951-16010 Booster overhaul attachment	11  09922-85811 Connector pin remover	12  09922-66010 Rear axle remover
13  09952-16010 Booster piston rod adjuster	14  09956-02310 Fluid pressure gauge	15  09956-02210 Brake circuit plug	

SECTION 6

ENGINE

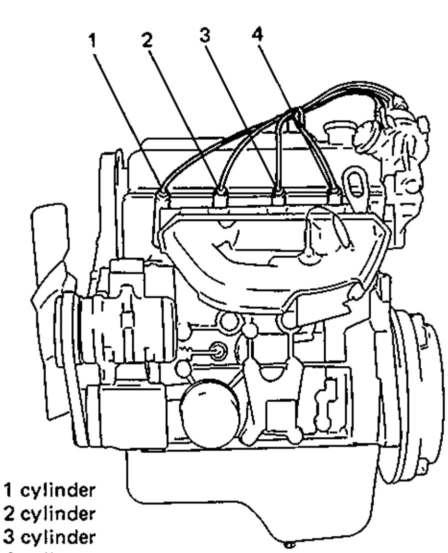
CONTENTS

GENERAL INFORMATION

STATEMENT ON CLEANLINESS AND CARE

An automobile engine is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in the thousands of an millimeter (ten thousands of inch). Accordingly, when any internal engine parts are serviced, care and cleanliness are important. Throughout this section, it should be understood that proper cleaning and protection of machined surfaces and friction areas is part of the repair procedure. This is considered standard shop practice even if not specifically stated.

- A liberal coating of engine oil should be applied to friction areas during assembly to protect and lubricate the surfaces on initial operation.
- Whenever valve train components, pistons, piston rings, connecting rods, rod bearings, and crankshaft journal bearings are removed for service, they should be retained in order.
  At the time of installation, they should be installed in the same locations and with the same mating surfaces as when removed.
- Battery cables should be disconnected before any major work is performed on the engine. Failure to disconnect cables may result in damage to wire harness or other electrical parts.
- Throughout this manual, the four cylinders of the engine are identified by numbers; No. 1, No. 2, No. 3 and No. 4 as counted from crankshaft pulley side to flywheel side.
  Refer to Fig. 6-1.



1. No. 1 cylinder
2. No. 2 cylinder
3. No. 3 cylinder
4. No. 4 cylinder

Fig. 6-1 Cylinder Numbers

GENERAL INFORMATION ON ENGINE SERVICE

THE FOLLOWING INFORMATION ON ENGINE SERVICE SHOULD BE NOTED CAREFULLY, AS IT IS IMPORTANT IN PREVENTING DAMAGE, AND IN CONTRIBUTING TO RELIABLE ENGINE PERFORMANCE.

- When raising or supporting engine for any reason, do not use a jack under oil pan. Due to small clearance between oil pan and oil pump strainer, jacking against oil pan may cause it to be bent against strainer resulting in damaged oil pick-up unit.
- It should be kept in mind, while working on engine, that 12-volt electrical system is capable of violent and damaging short circuits. When performing any work where electrical terminals could possibly be grounded, ground cable of the battery should be disconnected at battery.
- Any time the carburetor or intake manifold is removed, the intake opening should be covered. This will protect against accidental entrance of foreign material which could follow intake passage into cylinder and cause extensive damage when engine is started.
- When disconnecting couplers, don't pull wire harness but make sure to hold coupler itself. With lock type coupler, be sure to unlock before disconnection. Attempt to disconnect coupler without unlocking may result in damage to coupler.
  When connecting lock type coupler, insert it till clicking sound is heard and connect it securely.

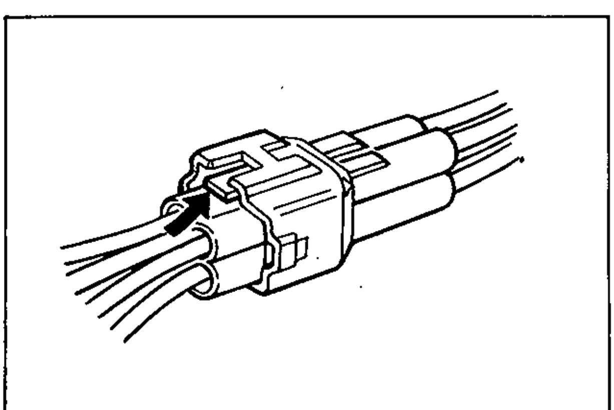
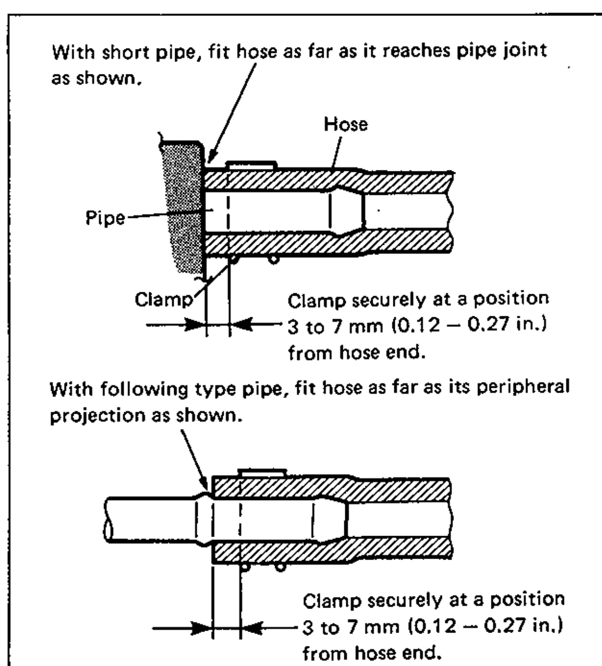


Fig. 6-2

PRECAUTION ON FUEL SYSTEM SERVICE

- Work must be done with no smoking, in a well-ventilated area and away from any open flames.
- As fuel feed line (between fuel pump and fuel pressure regulator) is still under high fuel pressure even after engine was stopped, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel to occur where loosened or disconnected.
  Before loosening or disconnecting fuel feed line, make sure to release fuel pressure according to "FUEL PRESSURE RELIEF PROCEDURE".
  A small amount of fuel may be released after the fuel line is disconnected.
  In order to reduce the chance of personal injury, cover the fitting to be disconnected with a shop cloth. Put that cloth in an approved container when disconnection is completed.
- Never run engine with fuel pump relay disconnected when engine and exhaust system are hot.
- Fuel or fuel vapor hose connection varies with each type of pipe. When reconnecting fuel or fuel vapor hose, be sure to connect and clamp each hose correctly referring to Fig. 6-3 Hose Connection.
  After connecting, make sure that it has no twist or kink.



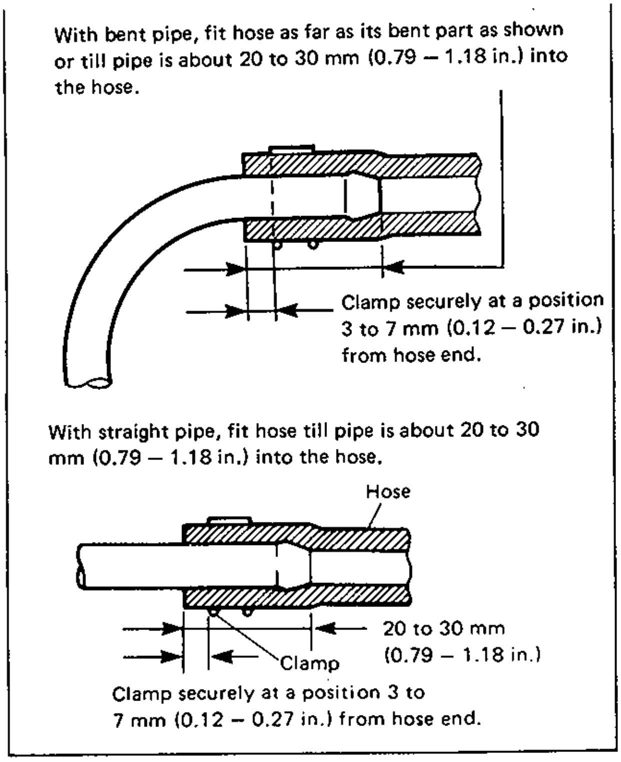


Fig. 6-3 Hose Connection

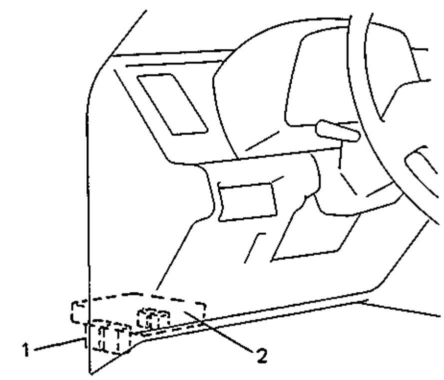
- When installing fuel filter union bolt or plug bolt on union bolt, always use new gasket and tighten it to specified torque. See Section 6C for specified torque.
- When installing injector, fuel feed pipe or fuel pressure regulator, lubricate its O ring with spindle oil or gasoline.
- When connecting fuel pipe flare nut, first tighten flare nut by hand and then tighten it to specified torque.

FUEL PRESSURE RELIEF PROCEDURE

> **CAUTION:**
> **This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst.**

After making sure that engine is cold, relief fuel pressure as follows.

1. Place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T vehicle), set parking brake, and block drive wheels.
2. Disconnect coupler from fuel pump relay.
3. Remove fuel filler cap to release fuel vapor pressure in fuel tank and then reinstall it.
4. Start engine and run it till it stops for lack of fuel. Repeat cranking engine 2 – 3 times of about 3 seconds each time to dissipate fuel pressure in lines. Fuel connections are now safe for servicing.
5. Upon completion of servicing, connect coupler to fuel pump relay.



1. Fuel pump relay (Relay with Pink wire)
2. ECM

Fig. 6-4 Fuel Pump Relay

FUEL LEAKAGE CHECK PROCEDURE

After performing any service on fuel system, check to make sure that there are no fuel leakages as follows.

1. Turn ON ignition switch for 3 seconds (to operate fuel pump) and then turn it OFF. Repeat this (ON and OFF) 3 or 4 times and apply fuel pressure to fuel line (till fuel pressure is felt by hand placed on fuel return hose).
2. In this state, check to see that there are no fuel leakages from any part of fuel system.

ENGINE DIAGNOSIS

Condition	Possible Cause	Correction
Hard Starting (Engine cranks OK)	**Ignition system out of order.**	
	• Blown fuse	Repair or replace.
	• Faulty spark plug	Clean and adjust plug gap or replace.
	• Leaky high-tension cord	Replace.
	• Loose connection or disconnection of high-tension cords or lead wires	Repair or replace.
	• Maladjusted signal rotor air gap	Adjust.
	• Defective generator assembly in distributor	Replace.
	• Improper ignition timing	Adjust.
	• Faulty ignition coil	Replace.
	• Cracked rotor or cap in distributor	Replace.
	• Faulty igniter (power unit)	Replace.
	• Faulty noise suppressor	Replace.
	• Faulty CAS (in distributor) (FUEL INJECTION MODEL)	Replace.
	• Faulty ECM (FUEL INJECTION MODEL)	Replace.
	Fuel system out of order.	
	• Lack of fuel in fuel tank	Refill.
	• Dirty fuel filter	Replace.
	• Dirty or clogged fuel hose or pipe	Clean.
	• Malfunctioning fuel pump	Replace.
	• Carburetor choke not working properly	Check and adjust.
	• Air inhaling from intake system	Repair or replace.
	• Improper adjustment of float level (CARBURETOR MODEL)	Adjust
	• Malfunctioning fuel cut solenoid valve (CARBURETOR MODEL)	Check solenoid valve for operation. Replace if necessary.
	• Carburetor out of adjustment (CARBURETOR MODEL)	Adjust.
	Electronic Fuel Injection system out of order. (FUEL INJECTION MODEL)	Refer to SECTION 6E.

Condition	Possible Cause	Correction
	Low compression.	
	• Poor spark plug tightening or faulty gasket	Tighten to specified torque or replace gasket.
	• Incorrect valve lash	Adjust.
	• Compression leak from valve seat	Remove cylinder head and lap valves.
	• Sticky valve stem	Correct or replace valve and valve guide.
	• Weak or damaged valve springs	Replace valve springs.
	• Compression leak at cylinder head gasket	Repair or replace.
	• Sticking or damaged piston ring	Replace piston rings.
	• Worn piston, ring or cylinder	Replace ring and piston. Rebore or replace cylinder.
	Others	
	• Brocken valve timing belt	Replace.
	• Malfunctioning PCV valve	Replace.
	• Loose connection or disconnection of vacuum hoses	Connect securely.
Engine has no power.	**Low compression.**	Previously outlined.
	Ignition system out of order.	
	• Incorrect ignition timing	Adjust.
	• Defective spark plug	Adjust or replace.
	• Worn distributor terminals	Dress or replace. Also check rotor.
	• Leaks, loose connection or disconnection of high tension cord	Connect or replace as necessary.
	• Faulty ESA system (FUEL INJECTION MODEL)	Refer to SECTION 6F1.
	• Malfunctioning ignition timing advancers (CARBURETOR MODEL)	Replace.
	Fuel system out of order.	
	• Clogged fuel hose or pipe	Clean.
	• Dirty or clogged fuel filter	Replace.
	• Clogged air cleaner element	Clean or replace.
	• Air inhaling from intake manifold gasket	Replace gasket.
	• Malfunction of choke system (CARBURETOR MODEL)	Adjust or replace.
	• Fuel pump not working properly (CARBURETOR MODEL)	Replace.
	• Clogged carburetor jets (CARBURETOR MODEL)	Clean.
	Electronic Fuel Injection system out of order. (FUEL INJECTION MODEL)	Refer to SECTION 6E.

Condition	Possible Cause	Correction
	Others	
	• Malfunctioning EGR valve	Check and replace as necessary.
	• Dragging brakes	Repair or replace.
	• Slipping clutch	Adjust or replace.
	• Loose connection or disconnection of vacuum hoses	Connect securely.
Improper engine idling.	**Fuel system out of order.**	
	• Shortage of fuel in fuel tank	Refill
	• Clogged air cleaner element	Clean or replace.
	• Leaky manifold throttle body (carburetor), or cylinder head gasket	Replace.
	• Clogged carburetor jets	Clean.
	• Improper float level	Adjust.
	• Malfunctioning of choke system	Adjust or replace.
	• Malfunctioning fuel cut solenoid valve	Replace.
	Ignition system out of order.	
	• Defective spark plug	Adjust or replace.
	• Leaky or disconnected high-tension cord	Connect or replace.
	• Worn distributor terminals	Replace.
	• Improper ignition timing	Adjust.
	• Cracked cap in distributor, there being leakage inside	Replace.
	• Faulty ESA system (FUEL INJECTION MODEL)	Refer to SECTION 6F1.
	Engine overheating.	Refer to "Overheating" section.
	Electronic Fuel Injection system out of order.	Refer to SECTION 6E.
	Low compression.	Previously outlined.
	Others	
	• Loose connection or disconnection of vacuum hoses	Connect.
	• Malfunctioning EGR valve	Check and replace as necessary.
	• Malfunctioning PCV valve	Check and replace as necessary.

Condition	Possible Cause	Correction
Engine hesitates (Momentary lack of response as accelerator pedal is depressed. Can occur at all vehicle speeds. Usually most severe when first trying to make vehicle move, as from a stop signal.)	**Ignition system out of order**	
	• Improper ignition timing	Adjust.
	• Defective spark plug or plug gap out adjustment	Replace or adjust gap.
	• Leaky high tension cord	Replace.
	Fuel system out of order.	
	• Clogged air cleaner element	Clean or replace.
	• Clogged fuel filter hose or pipe	Clean or replace.
	• Leaky manifold or throttle (carburetor) body gasket	Replace.
	• Improper adjustment of float level (CARBURETOR MODEL)	Adjust.
	• Clogged carburetor jets (CARBURETOR MODEL)	Clean.
	• Loose manifold and carburetor bolts and nuts (CARBURETOR MODEL)	Retighten.
	• Malfunctioning accelerator pump (CARBURETOR MODEL)	Check and replace as necessary.
	Engine overheating.	Refer to "Overheating" section.
	Electronic Fuel Injection system out of order.	Refer to SECTION 6E.
	Low compression.	Previously outlined.
	Others	
	• Malfunctioning EGR valve	Check and replace as necessary.
Surges (Engine power variation under steady throttle or cruise. Feels like vehicle speed up and down with no change in accelerator pedal.)	**Fuel system out of order.**	
	• Clogged fuel filter	Replace.
	• Kinky or damaged fuel hose and lines	Check and replace as necessary.
	• Leaky manifold or throttle (carburetor) gaskets	Replace.
	• Malfunctioning fuel pump	Check and replace as necessary.
	• Improper float level (CARBURETOR MODEL)	Adjust.
	Ignition system out of order.	
	• Improper ignition timing	Adjust.
	• Malfunctioning ignition timing advancers (mechanical and vacuum) (CARBURETOR MODEL)	Check or replace.
	• Leaky or loosely connecte high tension cord.	Check and repair or replace.
	• Defective spark plug (excess carbon deposits, improper gap, and burned electrodes, etc.)	Check and clean, adjust or replace.
	• Cracked rotor or cap in distributor	Replace.
	• Faulty ESA system (FUEL INJECTION MODEL)	Refer to SECTION 6F1.

Condition	Possible Cause	Correction
	Others	
	• Leaky vacuum hoses	Repair or replace.
	• Malfunctioning EGR valve	Check and replace as necessary.
Excessive detonation (Engine makes sharp metallic knocks that change with throttle opening. Sounds like pop corn popping.)	**Engine overheating.**	Refer to "Overheating" section.
	Ignition system out of order.	
	• Defective spark plug	Replace.
	• Improper ignition timing	Adjust.
	• Loose connection of high tension cord	Connect securely.
	Fuel system out of order.	
	• Clogged fuel filter and fuel lines	Replace or clean.
	• Air inhaling from intake manifold or throttle body (carburetor) gasket	Replace.
	• Clogged carburetor jets (CARBURETOR MODEL)	Clean.
	• Improper adjustment of float level (CARBURETOR MODEL)	Adjust.
	• Malfunctioning fuel pump	Replace.
	Electronic Fuel Injection system out of order.	Refer to SECTION 6E.
	Others	
	• Excessive combustion chamber deposits	Remove carbon.
	• Malfunctioning EGR valve	Check and replace as necessary.
Overheating	• Insufficient coolant	Replanish.
	• Loose water pump belt	Adjust.
	• Inoperative thermostat	Replace.
	• Poor water pump performance	Replace.
	• Improper ignition timing	Adjust.
	• Clogged or leaky radiator	Flush, repair or replace.
	• Improper engine oil grade	Replace with proper grade oil.
	• Clogged oil filter or oil strainer	Replace or clean (oil strainer).
	• Not enough oil	Replenish.
	• Poor oil pump performance	Repair or replace.
	• Oil leakage	Repair.
	• Dragging brakes	Repair or replace.
	• Slipping clutch	Adjust or repair.
	• Blown cylinder head gasket	Replace.

Condition	Possible Cause	Correction
Poor gasoline mileage.	**Fuel system out of order.**	
	• Fuel leakage from fuel tank, throttle body (carburetor) and lines	Repair or replace.
	• Clogged air cleaner element	clean or replace.
	• Malfunctioning carburetor choke system (CARBURETOR MODEL)	Repair or replace.
	• Improper float level (CARBURETOR MODEL)	Adjust.
	• Dirty or clogged carburetor jets. (CARBURETOR MODEL)	Clean.
	Ignition system out of order.	
	• Improper ignition timing	Adjust.
	• Leaks or loose connection of high tension cord	Repair or replace.
	• Defective spark plug (improper gap, heavy deposits, and burned electrodes, etc.)	Clean, adjust or replace.
	• Malfunctioning mechanical and vacuum advancers in distributor (CARBURETOR MODEL)	Check and repair or replace.
	• Faulty ESA system	Refer to SECTION 6F1.
	Electronic Fuel Injection system out of order.	Refer to SECTION 6E.
	Low compression.	Previously outlined.
	Others	
	• Poor valve seating	Repair or replace.
	• Dragging brakes	Repair or replace.
	• Slipping clutch	Adjust or replace.
	• Thermostat out of order	Replace.
	• Improper tire pressure	Adjust.
	• Malfunctioning EGR valve	Check and replace as necessary.
Excessive engine oil consumption	**Oil leakage**	
	• Loose oil drain plug	Tighten.
	• Loose oil pan bolts	Tighten.
	• Deteriorated or broken oil pan sealant	Replace sealant.
	• Leaky crankshaft oil seals	Replace.
	• Leaky cylinder head cover gasket	Replace.
	• Improper tightening of oil filter	Tighten.
	• Loose oil pressure switch	Tighten.
	• Blown cylinder head gasket	Replace.
	• Leaky camshaft oil seals	Replace.

Condition	Possible Cause	Correction
	Oil entering combustion chamber	
	• Sticky piston ring	Remove carbon and replace rings.
	• Worn piston and cylinder	Replace or rebore cylinder, and replace piston.
	• Worn piston ring groove and ring	Replace piston and ring.
	• Improper location of piston ring gap	Reposition ring gap.
	• Worn or damaged valve stem seal	Replace.
	• Worn valve stem	Replace.
Low oil pressure	• Improper oil viscosity	Use oil of proper viscosity.
	• Malfunctioning oil pressure switch	Replace.
	• Not enough oil	Replenish.
	• Clogged oil strainer	Clean.
	• Funcional deterioration of oil pump	Replace.
	• Worn oil pump relief valve	Replace.
	• Excessive clearance in various sliding parts	Replace worn parts.
Engine noise Note: Before checking mechanical noise, make sure that: • Ignition timing is properly adjusted. • Specified spark plug is used. • Specified fuel is used.	**Valve noise**	
	• Improper valve lash	Adjust.
	• Worn valve stem and guide	Replace.
	• Weak or broken valve spring	Replace.
	• Warped or bent valve	Replace.
	Piston, ring and cylinder noise	
	• Worn piston, ring and cylinder bore	Rebore or replace cylinder. Replace piston and ring.
	Connecting rod noise	
	• Worn rod bearing	Replace.
	• Worn crank pin	Repair by grinding or replace crankshaft.
	• Loose connecting rod nuts	Tighten nuts to specification.
	• Low oil pressure	Previously outlined.
	Crankshaft noise	
	• Low oil pressure	Previously outlined.
	• Worn bearing	Replace.
	• Worn crankshaft journal	Repair by grinding, or replace crankshaft.
	• Loose bearing cap bolts	Tighten bolts to specification.
	• Excessive crankshaft thrust play	Replace thrust bearing.

Condition	Possible Cause	Correction
Dieseling (Engine continues to run after ignition switch is turned off. It runs unevenly and may make knocking noise.)	Malfunctioning fuel cut solenoid valve in carburetor (CARBURETOR MODEL)	Check valve for proper operation, and replace as necessary.

SECTION 6A

ENGINE MECHANICAL

CONTENTS

GENERAL DESCRIPTION

ENGINE

The engine is a water-cooled, in line 4 cylinders, 4 stroke cycle gasoline unit with its S.O.H.C. (Single overhead camshaft) valve mechanism arranged for "V"-type valve configuration.

The single overhead camshaft is mounted over the cylinder head; it is driven from crankshaft through timing belt, and no push rods are provided in the valve train system.

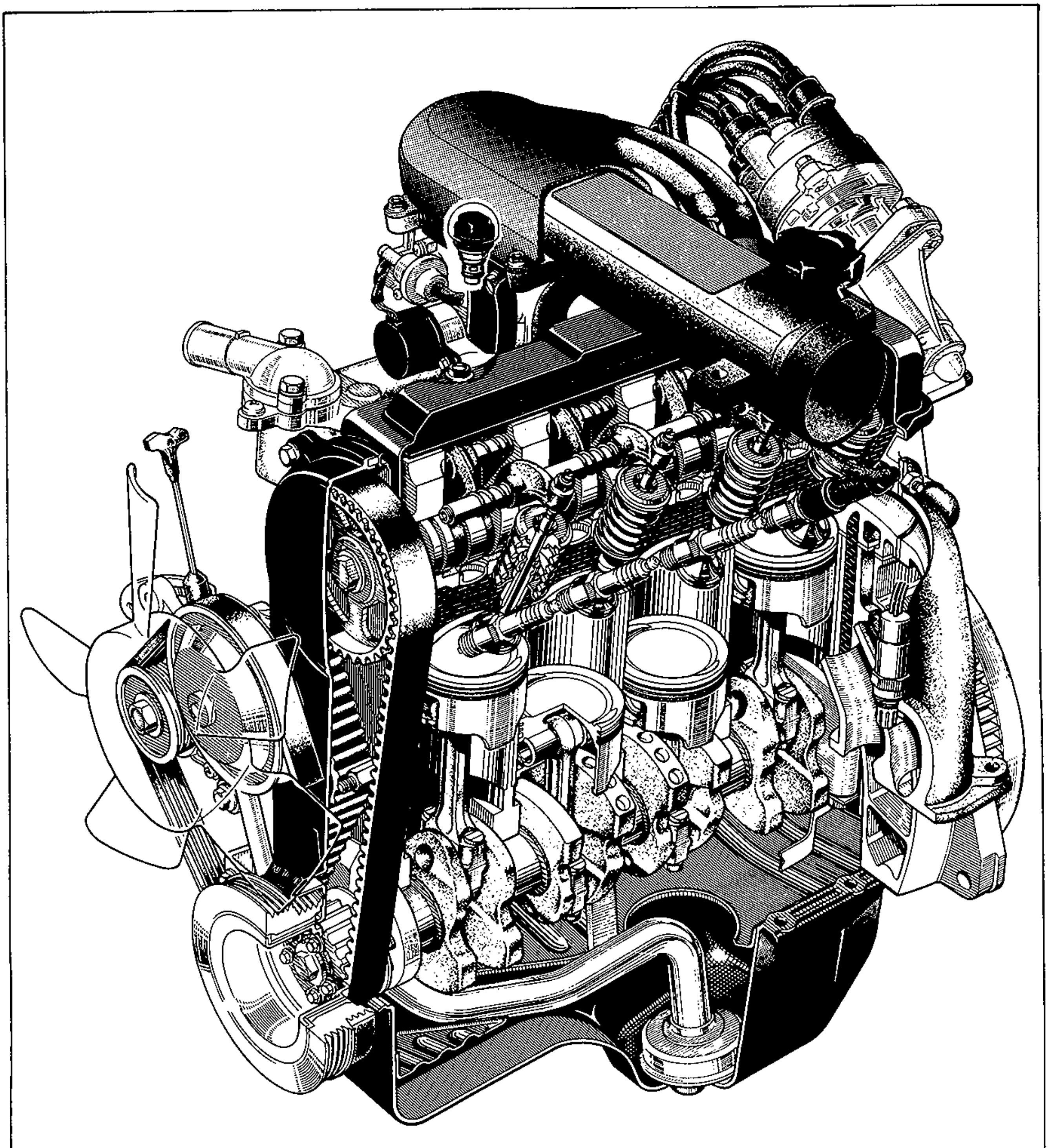


Fig. 6A-1 Engine Construction

ENGINE LUBRICATION

The oil pump is of a trochoid type, and mounted on the crankshaft at the crankshaft pulley side.
Oil is drawn up through the oil pump strainer and passed through the pump to the oil filter.
The filtered oil flows into two paths in cylinder block.
In one path, oil reaches the crankshaft journal bearings. Oil from the crankshaft journal bearings is supplied to the connecting rod bearings by means of intersecting passages drilled in the crankshaft, and then injected from a small hole provided on the big end of connecting rod to lubricate piston, rings, and cylinder wall.

In another path, oil goes up to the cylinder head and lubricates rocker arms, valves and camshaft, etc., after passing through the internal oilway of rocker arm shafts.

An oil relief valve is provided on the oil pump. This valve starts relieving oil pressure when the pressure comes over about 4.0 kg/cm^2 (56.9 psi, 400 kPa). Relieved oil drains back to the oil pan.

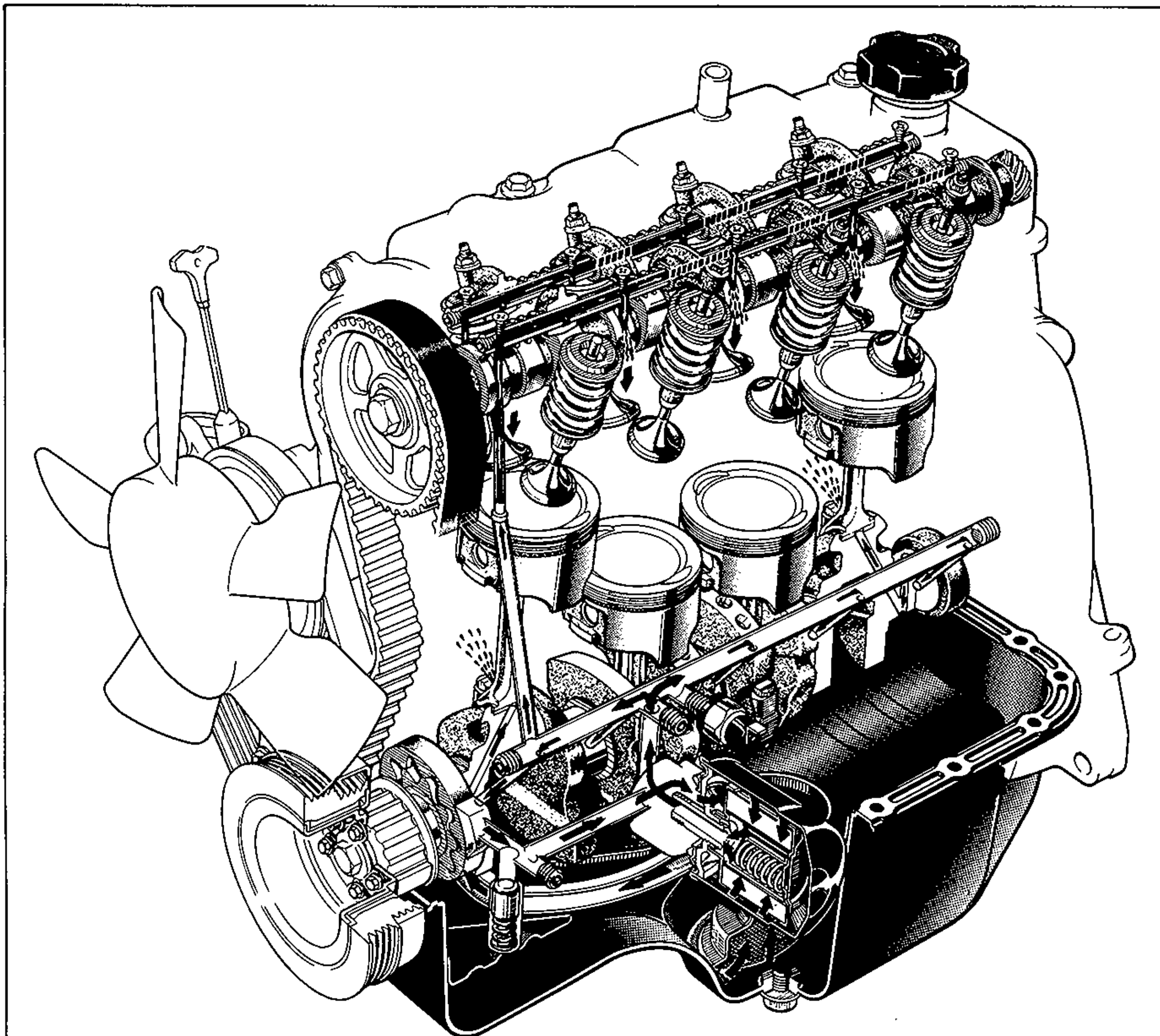


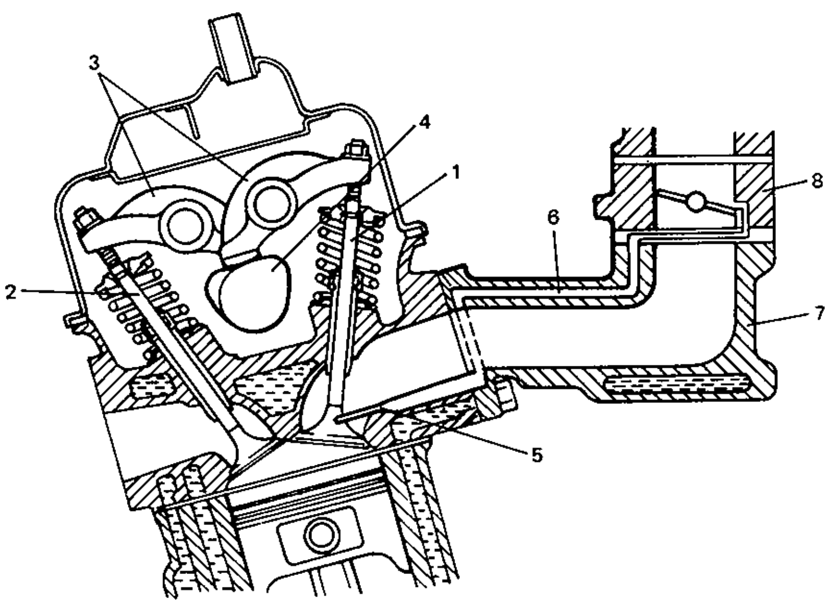
Fig. 6A-2 Engine Lubrication

CYLINDER HEAD AND VALVE TRAIN

The cylinder head is made of cast aluminum alloy and has four combustion chambers arranged in-line. Each combustion chamber has an intake and an exhaust ports.
Moreover, as shown in Fig. 6A-3, the air induction nozzle is provided near each intake valve. During intake stroke of the engine, air/fuel mixture enters into the combustion chamber from throttle body (carburetor) through intake manifold and intake valve. At the same time, air flows to the air induction nozzle through throttle body and air induction passage in the intake manifold, and jets into the combustion chamber.

The air jetted into the combustion chamber accelerates the mixture swirl to improve the combustion efficiency.

A single overhead camshaft driven by the crankshaft through the timing belt is mounted on the cylinder head.
The camshaft has eight cams, and each cam operates the intake or exhaust valve through rocker arm. The valve lash can be adjusted by turning the adjusting screw on the rocker arm after loosening the lock nut.



1. Intake valve
2. Exhaust valve
3. Rocker arms
4. Camshaft
5. Air induction nozzle
6. Air induction passage
7. Intake manifold
8. Throttle body (Carburetor)

Fig. 6A-3 Cylinder Head and Valve Train

CYLINDER BLOCK

The cylinder block is made of cast aluminum alloy and has 4 cylinders arranged "In-Line". A cylindrical cast iron sleeve is installed in each cylinder.

CRANKSHAFT AND MAIN BEARINGS

A monoblock casting crankshaft is supported by 5 main bearings which are of precision insert type. And it has 8-piece type counter weight which is incorporated with balance weight. Four crankpins on the crankshaft are positioned 180° apart. Also bearing cap stiffeners are added.

PISTONS, RINGS, PISTON PINS AND CONNECTING RODS

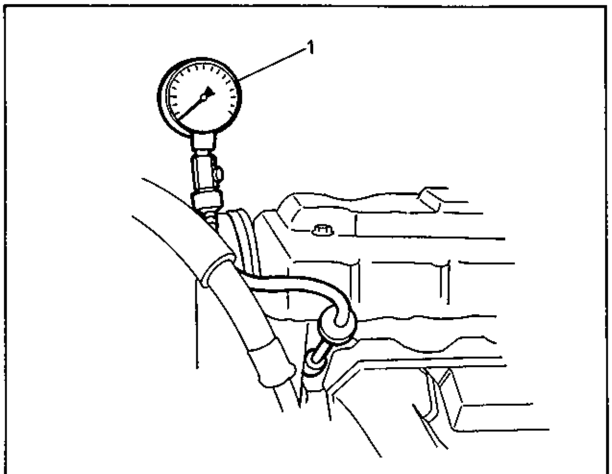
The piston is cast aluminum alloy, and has two compression rings and one oil ring.
Among two compression rings (top and 2nd rings), the outer surface of the top ring is plated with hard chromium for improvement in abrasion resistance.
The oil ring consists of two rails and one spacer.
The piston pin is offset 0.5 mm towards the major thrust side. This allows a gradual change in thrust pressure against the cylinder wall as the piston travels its path. Pins are chromium steel and have a floating fit in the pistons and in partially the connecting rods. The connecting rods are made of forged steel, and the rod bearings are of precision insert type.

ON VEHICLE SERVICE

COMPRESSION CHECK

Check compression pressure on all four cylinders as follows:

1. Warm up engine.
2. Stop engine after warming up.
3. Remove all spark plugs and disconnect distributor lead wires at coupler.
4. Install special tool (Compression gauge) into spark plug hole.



1. Special tool (Compression gauge 09915-64510)

Fig. 6A-4 Installing Compression Gauge

5. Disengage clutch (to lighten starting load on engine) for MT vehicle, and depress accelerator pedal all the way to make throttle fully open.
6. Crank engine with fully charged battery, and read the highest pressure on compression gauge.

	Compression pressure
Standard	14.0 kg/cm² (199.0 psi, 1400 kPa)/400 r/min
Limit	12.0 kg/cm² (170.0 psi, 1200 kPa)/400 r/min
Max. difference between any two cylinders	1.0 kg/cm² (14.2 psi, 100 kPa)/400 r/min

7. Carry out steps 4 through 6 on each cylinder to obtain four readings.

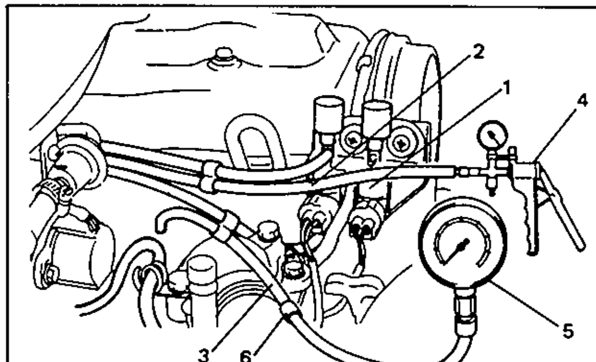
ENGINE VACUUM CHECK

The engine vacuum that develops in the intake line is a good indicator of the condition of the engine. The vacuum checking procedure is as follows:

1. Warm up engine to normal operating temperature and make sure that engine idle speed is within specification.

[Fuel Injection model]

2. Stop engine and disconnect vacuum hoses from throttle opener VSV.
3. Connect vacuum pump to vacuum hose of opener side.
4. Connect special tools (vacuum gauge and hose joint) to vacuum hose of intake manifold side.



1. Throttle opener VSV
2. Vacuum hose of opener side
3. Vacuum hose of intake manifold side
4. Vacuum pump (09917-47910)
5. Vacuum gauge (09915-67310)
6. Hose joint (09918-08210)

Fig. 6A-5 Installing Vacuum Gauge

5. Start engine and apply −40 cmHg vacuum to throttle opener to run engine at specified idle speed, and read vacuum gauge. Vacuum should be within specification.

Vacuum specification (sea level)	40 – 50 cm Hg (15.7 – 19.7 in. Hg) at 800 r/min

6. After checking, remove vacuum pump, vacuum gauge and hose joint.
7. Connect vacuum hoses to throttle opener VSV.

[Carburetor model]
2. Stop engine and disconnect vacuum hose from idel up VSV.
3. Connect special tools (vacuum gauge and hose joint) to vacuum hose of intake manifold side.

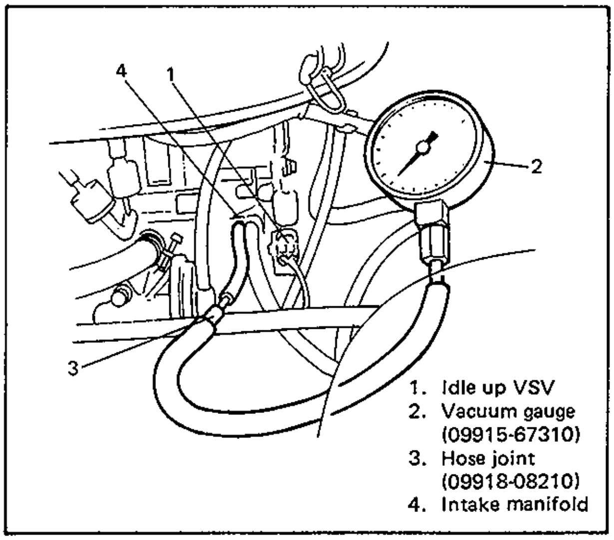


Fig. 6A-5-1 Installing Vacuum Gauge

4. Run engine at specified idle speed with no electric load, and read vacuum gauge. Vacuum should be within specification.

Vacuum specification (sea level)	40 – 50 cm Hg (15.7 – 19.7 in. Hg) at 800 r/min

5. After checking, remove vacuum gauge and hose joint.
6. Connect vacuum hoses to idle up VSV.

OIL PRESSURE CHECK

NOTE:

Prior to checking oil pressure, check the followings.

- **Oil level in oil pan.**
  If oil level is low, add oil up to Full level hole on oil level gauge.
- **Oil quality.**
  If oil is discolored, or deteriorated, change it. For particular oil to be used, refer to the table on p. 0B-11.
- **Oil leaks.**
  If leak is found, repair it.

1. Remove oil pressure switch from cylinder block.

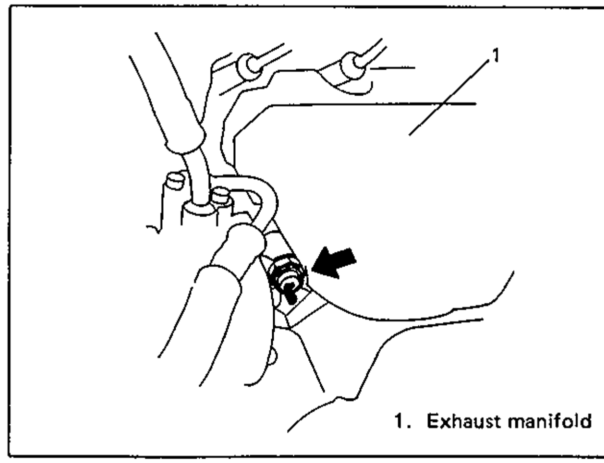


Fig. 6A-6 Oil Pressure Switch

2. Install special tool (Oil pressure gauge) to vacated threaded hole.

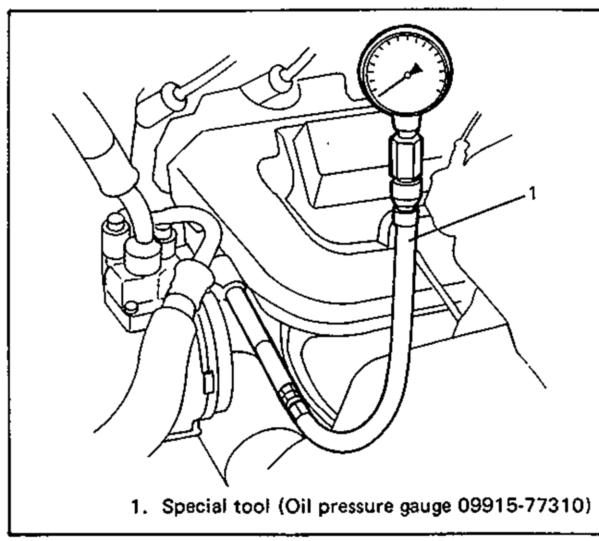


Fig. 6A-7 Installing Oil Pressure Gauge

3. Start engine and warm it up to normal operating temperature.
4. After warming up, raise engine speed to 4,000 r/min and measure oil pressure.

Oil pressure specification	3.3 – 4.3 kg/cm^2 (47.0 – 61.1 psi) at 4,000 r/min (rpm)

5. After checking oil pressure, stop engine and remove oil pressure gauge.

6. Before reinstalling oil pressure switch, be sure to wrap its screw threads with sealing tape and tighten switch to specified torque.

Tightening torque for oil pressure switch	N·m	kg-m	lb-ft
	12 – 15	1.2–1.5	9.0 –10.5

NOTE:
If sealing tape edge is bulged out from screw threads of switch, cut it off.

7. Start engine and check oil pressure switch for oil leakage.

VALVE LASH

VALVE LASH SPECIFICATIONS

Valve lash refers to the gap between rocker arm adjusting screw and valve stem. Use a thickness gauge to measure this gap Ⓐ.

Valve lash (gap A) specification		When cold (Coolant temperature is 15 – 25°C or 59 – 77°F)	When hot (Coolant temperature is 60 – 68°C or 140 – 154°F)
	Intake	0.13 – 0.17 mm (0.0051 –0.0067 in)	0.23 – 0.27 mm (0.0091–0.0106 in)
	Exhaust	0.15 – 0.19 mm (0.0059–0.0075 in)	0.25 – 0.29 mm (0.0098–0.0114 in)

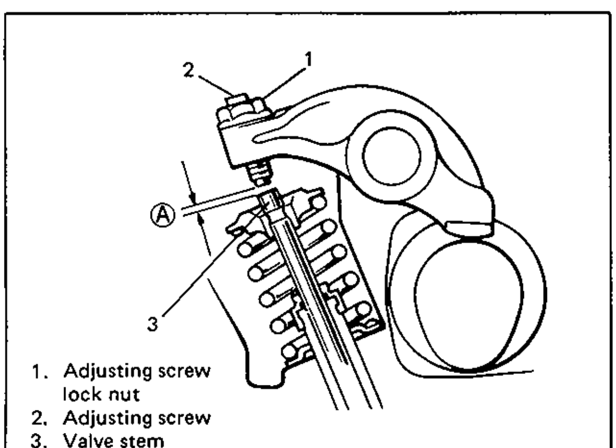


Fig. 6A-8 Valve Lash

CHECKING AND ADJUSTING PROCEDURES

1. Remove cylinder head cover, referring to item "Cylinder head cover" in p. 6A-16.
2. Turn crankshaft pulley clockwise until "V" mark (in white paint) on pulley aligns with "0" (zero) calibrated on timing belt cover.

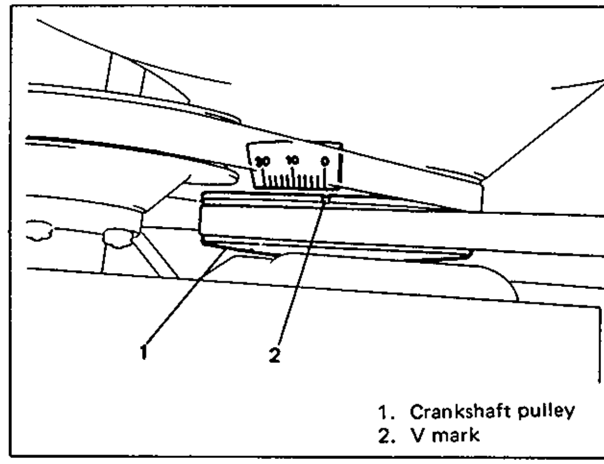


Fig. 6A-9 Aligning Marks

3. Remove distributor cap, and check if rotor is positioned as shown in figure. (i.e. No. 1 piston is at TDC of compression stroke). If rotor is out of place, turn crankshaft clockwise once (360°).
   In this state, check valve lashes at valves ①, ②, ⑤, and ⑦.

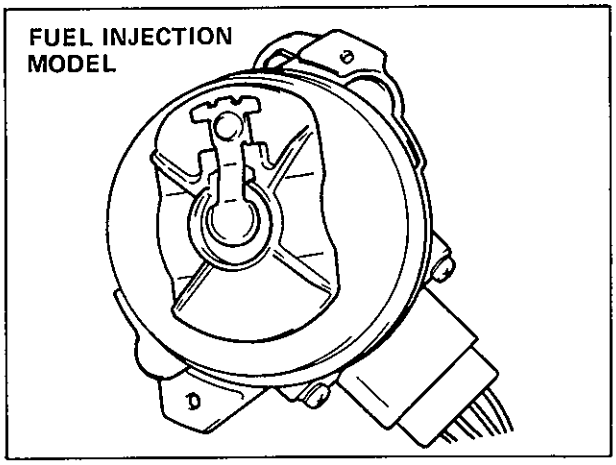


Fig. 6A-10 Checking Rotor Position

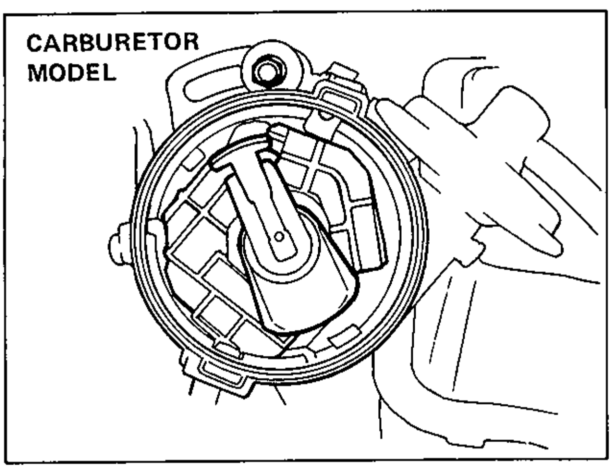


Fig. 6A-10-1 Checking Rotor Position

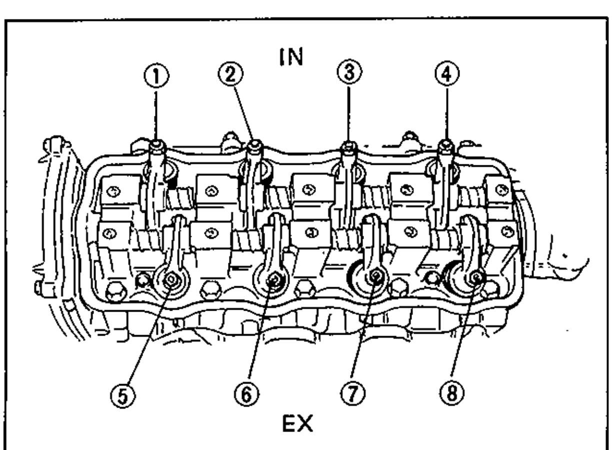


Fig. 6A-11 Valve Identification

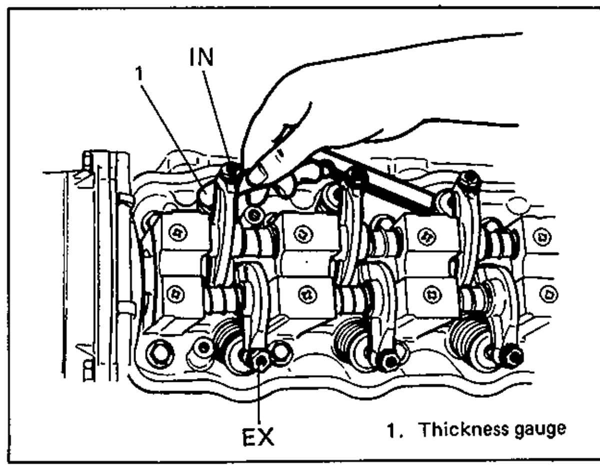


Fig. 6A-12 Checking Valve Lashes

4. If valve lash is out of specification, adjust it to specification by turning adjusting screw after loosening lock nut. After adjustment, tighten lock nut to specified torque while holding adjusting screw stationary with screwdriver, and then make sure again that valve lash is within specification.

Tightening torque for adjusting screw lock nut	N·m	kg-m	lb-ft
	15 – 19	1.5 – 1.9	11.0 – 13.5

5. After checking and adjusting valve lashes at valves ①, ②, ⑤ and ⑦, rotate crankshaft exactly one full turn (360°), and check the same at valves ③, ④, ⑥ and ⑧. Adjust them as necessary.
6. After checking and adjusting all valves, install cylinder head cover, distributor cap and air cleaner case.

AIR CLEANER ELEMENT

[Fuel Injection model]

This air cleaner element is of dry type. Note that it needs cleaning according to the following method.

REMOVE

1. Air cleaner cap securing screws.
2. Air cleaner element.

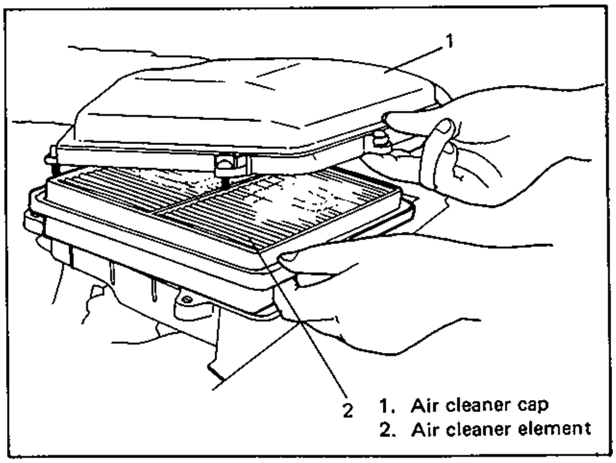


Fig. 6A-13 Removing Air Cleaner Element

INSPECT

Check element for dirt.

CLEAN

Blow off dust by blowing compressed air from air outlet side of element (i.e., the side facing up when installed in air cleaner case).

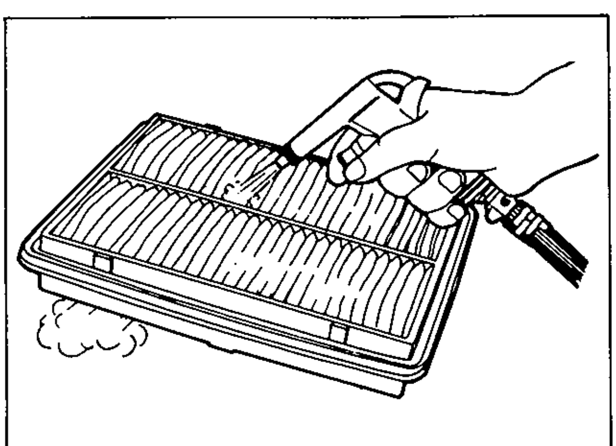


Fig. 6A-14 Cleaning Air Cleaner Element

INSTALL OR CONNECT

1. Element to air cleaner.
2. Air cleaner cap.

AIR CLEANER ELEMENT

[Carburetor model]

This air cleaner element is of dry type. Note that it needs cleaning according to the following method.

REMOVE

1. Air cleaner case cap.
2. Air cleaner element.

INSPECT

Check element for dirt.

CLEAN

Blow off dust by blowing compressed air from inside of element.

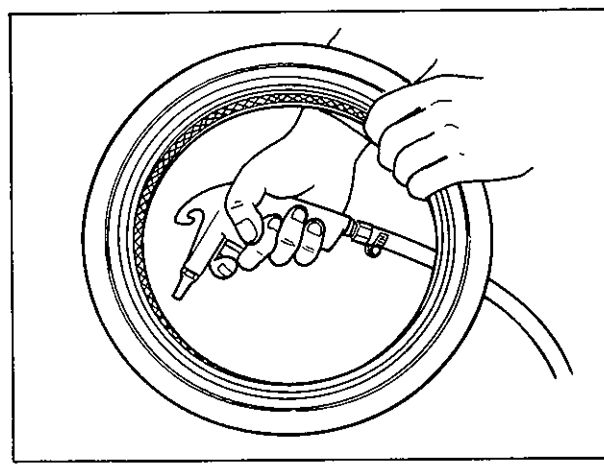


Fig. 6A-15 Cleaning Air Cleaner Element

INSTALL OR CONNECT

1. Element to air cleaner.
2. Air cleaner cap.

AIR INTAKE CASE [Fuel Injection model]

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Remove air intake case cover.
3. Remove air intake case bolts.
4. PCV hose from intake case.
5. Intake case from throttle body.

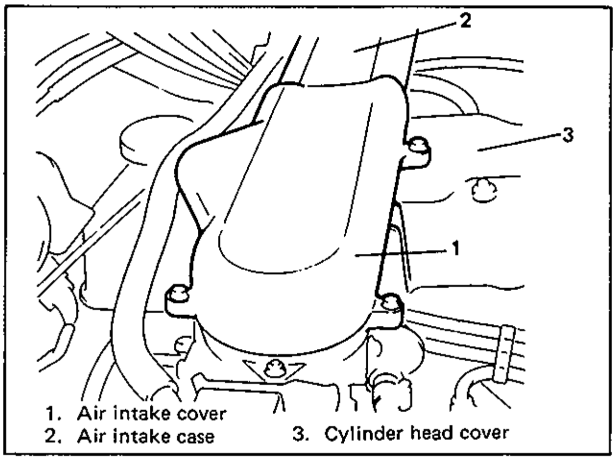


Fig. 6A-16 Air Intake Case

DISTRIBUTOR GEAR CASE

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Distributor from distributor gear case. Refer to Section 6F for removal procedure.
3. Disconnect earth wires from distributor gear case.
4. Distributor gear case from cylinder head. Place waste or receiver under gear case because engine oil in cylinder head may come out.

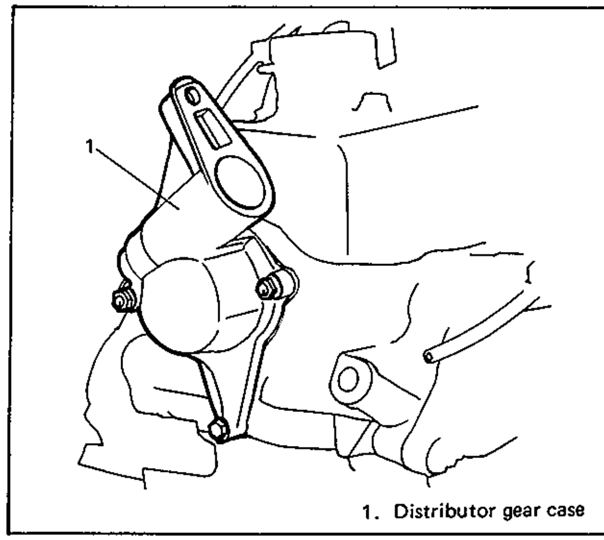


Fig. 6A-17 Distributor Gear Case

INSTALL OR CONNECT

Install in reverse order of removal, noting the following.

- Lubricate a new O ring with engine oil and then install it to gear case.
- About 30 cc (1.01/1.05 US/Imp oz) of engine oil must be fed into gear case after installing it.
- Install distributor and adjust ignition timing according to procedure described in Section 6F or 6F1.

THROTTLE BODY AND INTAKE MANIFOLD [Fuel Injection model]

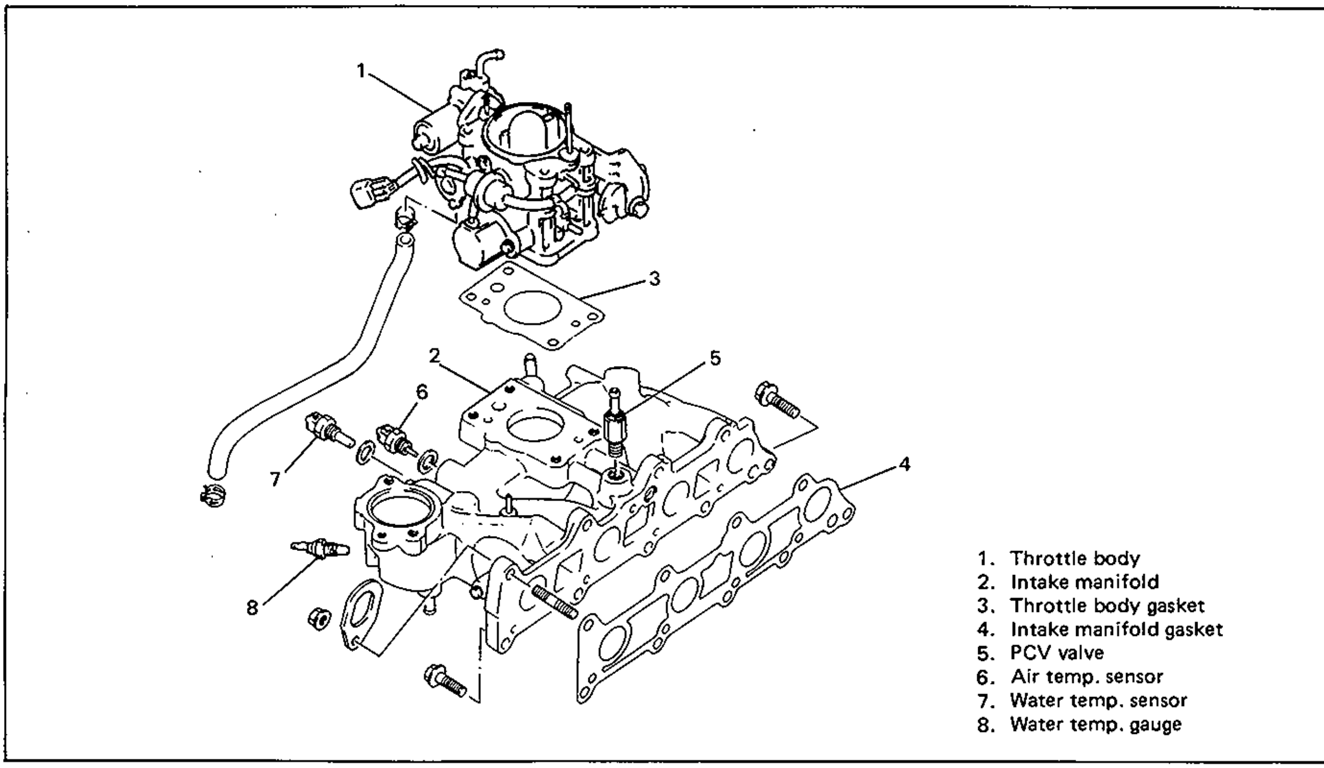


Fig. 6A-18 Throttle Body and Intake Manifold

REMOVE OR DISCONNECT

1. Release fuel pressure in fuel feed line by referring to Section 6.

> **CAUTION:**
> **This work must not be done when engine is hot. If done, it may cause adverse effect to catalyst.**

2. Negative cable at battery.
3. Drain coolant.

> **WARNING:**
> **To help avoid danger of being burned, do not remove drain plug and radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if plug and cap are taken off too soon.**

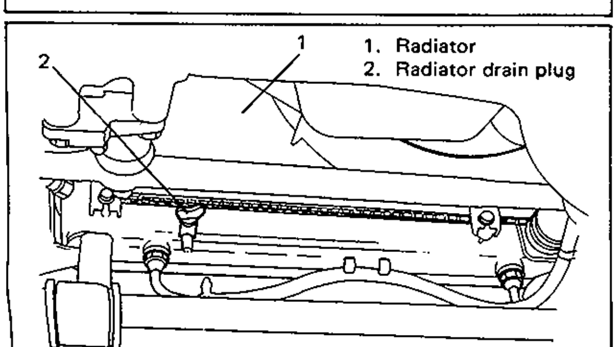


Fig. 6A-19 Radiator Drain Plug

4. Air intake case as previously outlined.
5. Accelerator cable and A/T kick-down cable (For A/T vehicle) from throttle body.
   Disconnect cable joint from lever by sliding joint.

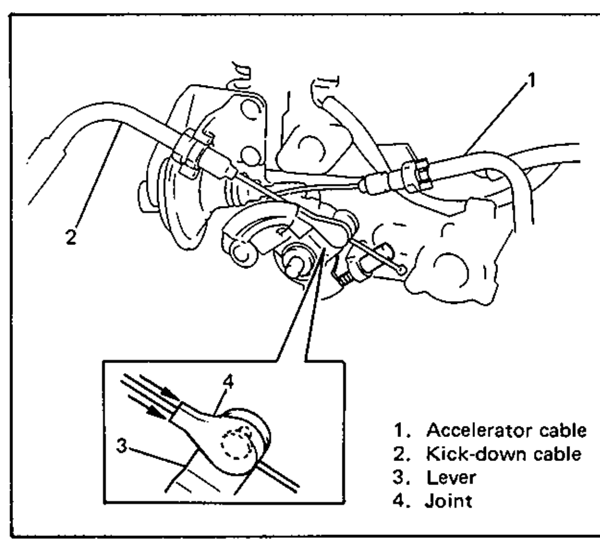


Fig. 6A-20 Disconnecting Cable

6. Couplers of injector, throttle position sensor, EGR sensor (if equipped) and idle speed control solenoid valve lead wires.

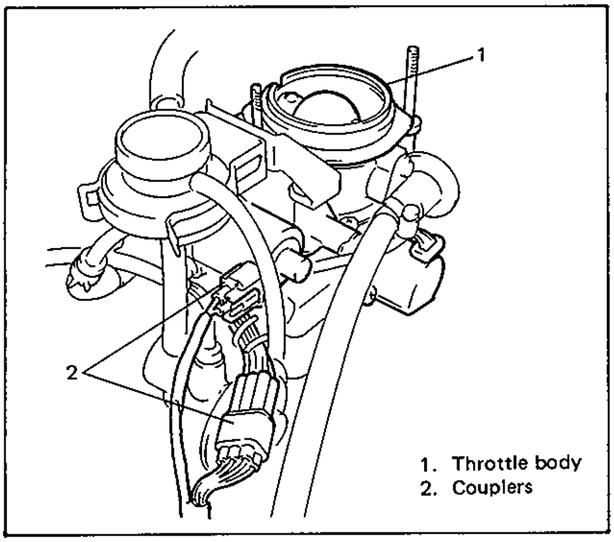


Fig. 6A-21 Disconnecting Couplers

7. Vacuum hoses from throttle body and throttle opener.

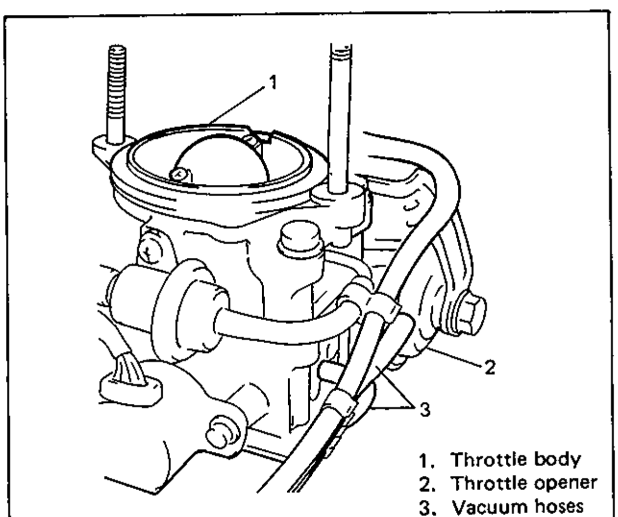


Fig. 6A-22 Disconnecting Vacuum Hoses

8. Water hose from ISC solenoid valve.
9. ISC air hose from its valve.
10. Fuel feed pipe from throttle body and intake manifold with throttle valve lever held at valve full open position, loosen its bolt and disconnect pipe from throttle body.
11. Fuel return hose from fuel pressure regulator.

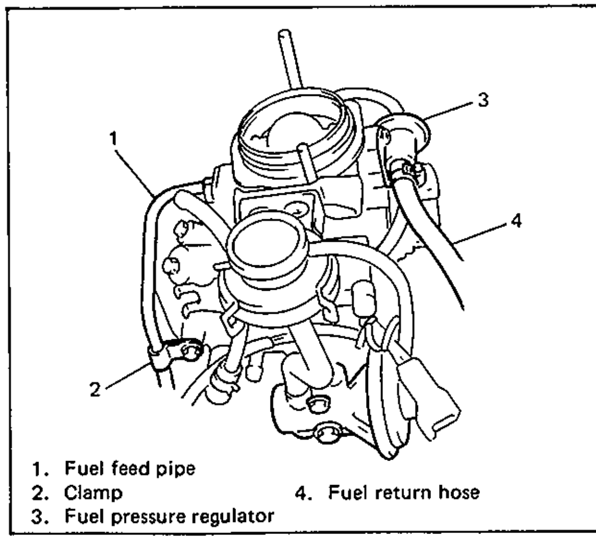


Fig. 6A-23 Disconnecting Fuel Pipe and Hose

12. Throttle body from intake manifold.
13. PCV hose from PCV valve.
14. Pressure sensor hose from intake manifold.
15. Brake booster hose from intake manifold.

15-1. Vacuum hose for A/T from intake manifold (for A/T vehicle).

16. VSV (for throttle opener and canister purge) hoses from intake manifold.
17. Water hose from thermostat cap, heater inlet hose and water bypass hose from intake manifold.

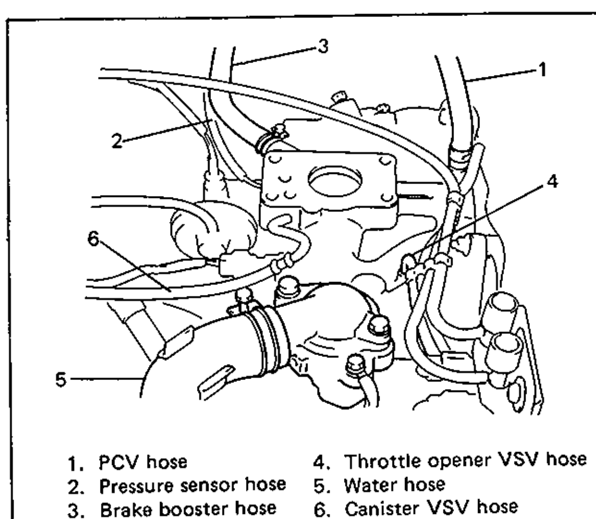


Fig. 6A-24 Disconnecting Hoses

18. EGR valve hoses from EGR valve.
19. Earth wires from intake manifold and couplers from air temperature sensor, water (coolant) temperature sensor, water temperature gauge, etc..

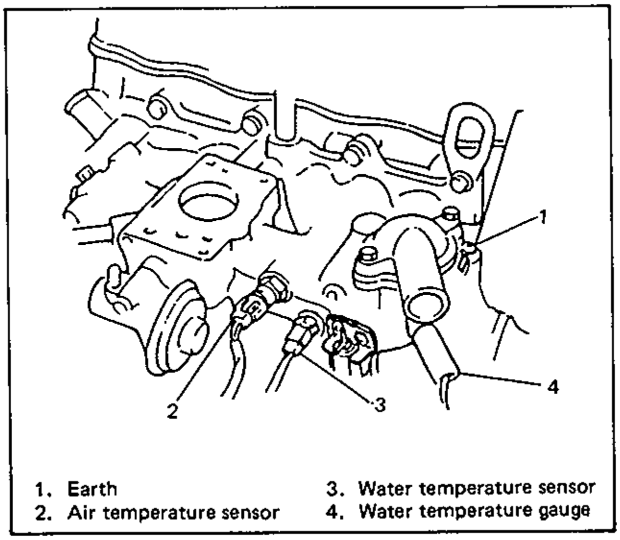


Fig. 6A-25 Disconnecting Wire Harnesses

20. Release wire harnesses from their clamps.
21. Other jointed parts from intake manifold, if any.
22. Intake manifold with PCV valve, EGR valve, sensors, switch and gauge from cylinder head.

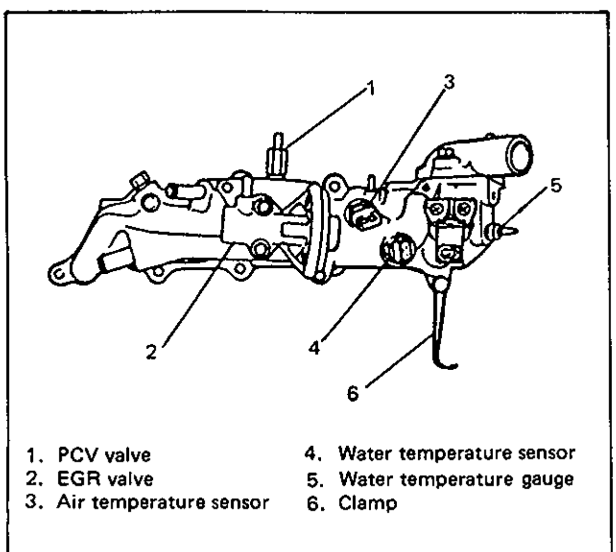


Fig. 6A-26 Intake Manifold

23. PCV valve, EGR valve, thermostat, sensors, switch and gauge from intake manifold.

INSTALL OR CONNECT

1. PCV valve, EGR valve, thermostat, sensors, switch, gauge, etc. to intake manifold.
   - Use new gasket, if equipped.
   - If gasket was not used, apply sealant to thread.
   - Tighten them to specified torque. Refer to Section 6E.
2. Intake manifold gasket to cylinder head. Before installing gasket, check it for deterioration or damage, and replace as necessary.
3. Intake manifold to cylinder head.
   - Install clamps as shown in figure and tighten bolts and nuts to specification.

Tightening torque for intake manifold bolts and nuts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

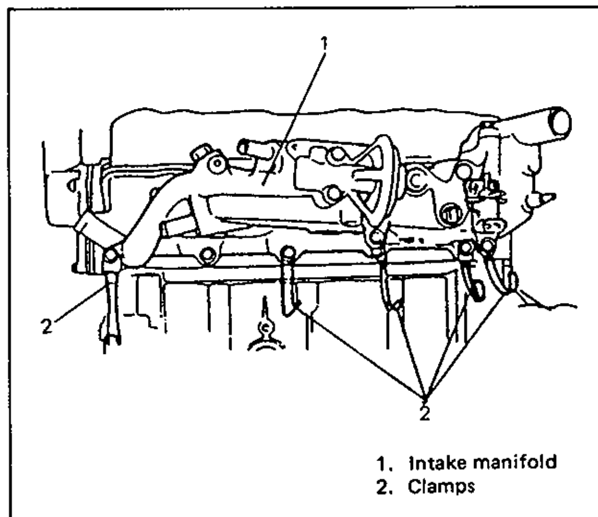


Fig. 6A-27 Intake Manifold Installation

4. Earth wires to intake manifold, and couplers of air temperature sensor, water temperature sensor, water temperature gauge, etc..
5. Fix wire harness with clamps.

6. Water hose, bypass hose, heater inlet hose, pressure sensor hose, VSV hose (for throttle opener), brake booster hose, EGR valve hose, canister purge hose, vacuum hose for A/T (if equipped) and PCV hose.
7. Throttle body gasket to intake manifold.

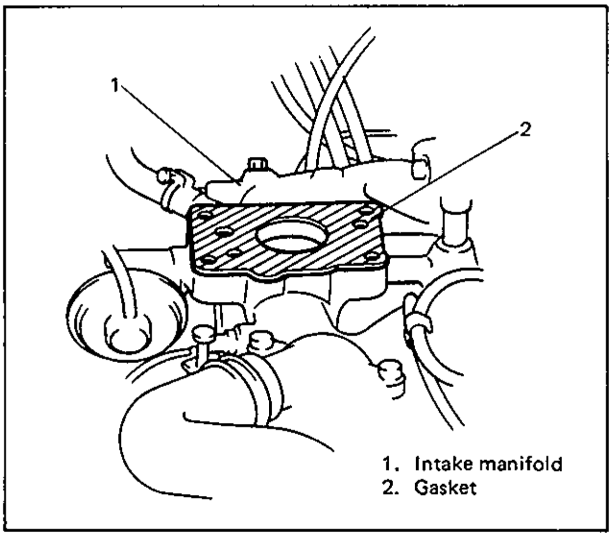


Fig. 6A-28 Gasket Installation

8. Throttle body to intake manifold and EGR modulator bracket to throttle body.
   Tighten 4 throttle body bolts to specified torque.

Tightening torque for throttle body bolts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

9. Water hose to ISC solenoid valve.
10. Fuel return hose to fuel pressure regulator.
11. Fuel feed pipe to throttle body after applying thin coat of spindle oil or gasoline to O ring. Use new O ring.
    Tighten pipe bolts to specified torque and pipe clamp bolt.

Tightening torque for fuel feed pipe bolts	N·m	kg-m	lb-ft
	8 – 12	0.8 – 1.2	6.0 – 8.5

12. Couplers of injector, throttle position sensor, EGR sensor (if equipped) and idle speed control solenoid valve lead wires.
13. Vacuum hoses to throttle body and throttle opener.

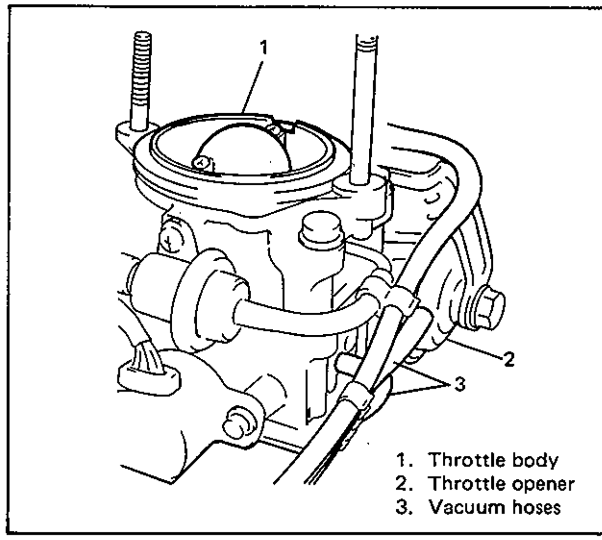


Fig. 6A-29 Connecting Vacuum Hoses

14. Accelerator cable to throttle valve lever.
    Adjust cable play to specification according procedure described in SECTION 6E.
15. For A/T vehicle, kick-down cable to throttle valve lever according to procedure described in SECTION 6E.

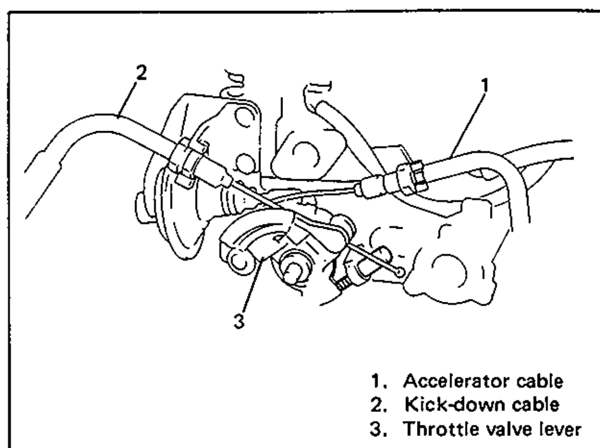


Fig. 6A-30 Accelerator Cable and Kick-Down Cable (For A/T Vehicle)

16. Air intake case as previously outlined.
17. Check to ensure that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.
18. Refill cooling system, referring to Section 6B.
19. Negative cable at battery.
20. Upon completion of installation, verify that there is no fuel leakage at each connection according to procedure described in p. 6-3.

EXHAUST MANIFOLD

WARNING:
To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system cools down.

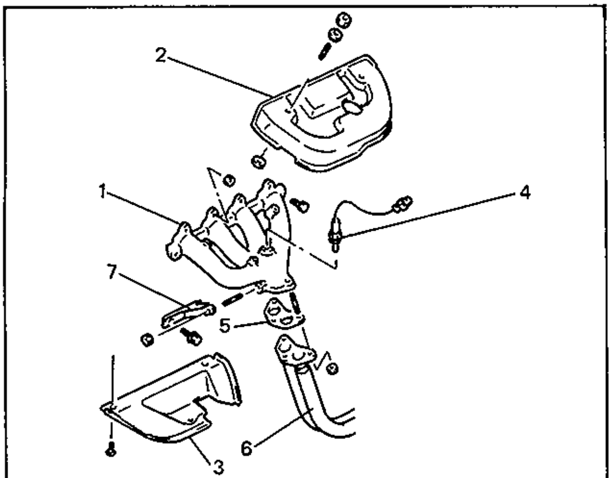


Fig. 6A-31 Exhaust Manifold, Center Pipe, etc.

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Air intake pipe with bracket and air cleaner outlet hose. (Fuel Injection model)
3. Oxygen sensor lead wire at coupler.
(Fuel Injection model)
4. Exhaust manifold stiffener.
5. Exhaust manifold upper cover from exhaust manifold.

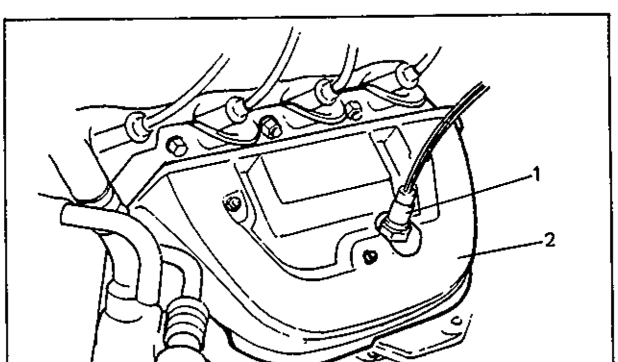


Fig. 6A-32 Exhaust Manifold Cover

6. Exhaust center pipe nuts.

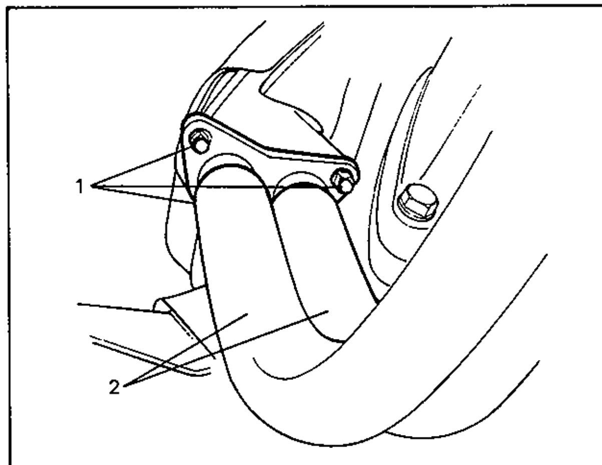


Fig. 6A-33 Exhaust Center Pipe

7. Exhaust manifold mounting nuts and bolts.
(Fuel Injectin model)
8. Exhaust manifold and its gasket from cylinder head.

INSTALL OR CONNECT

1. Manifold gasket to cylinder head and center pipe gasket to exhaust center pipe. Before installing gaskets, check them for deterioration or damage, and replace as necessary.
2. Exhaust manifold.
Tighten manifold bolts, nuts, and center pipe nuts to specified torque.

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Exhaust manifold bolts and nuts	18 – 28	1.8 – 2.8	13.5 – 20.0
Exhaust center pipe nuts	40 – 60	4.0 – 6.0	29.0 – 43.0

3. Exhaust manifold stiffener.

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Engine front mounting LH bracket bolts	50 – 60	5.0 – 6.0	36.5 – 43.0
Stiffener nut	40 – 60	4.0 – 6.0	29.0 – 43.0

4. Exhaust manifold upper cover.
5. Oxygen sensor lead wire coupler.
(Fuel Injection model)
Be sure to clamp its lead wire.
6. Negative cable to battery.
7. Upon completion of installation, start engine and check that no exhaust gas leakage exists.

CYLINDER HEAD COVER

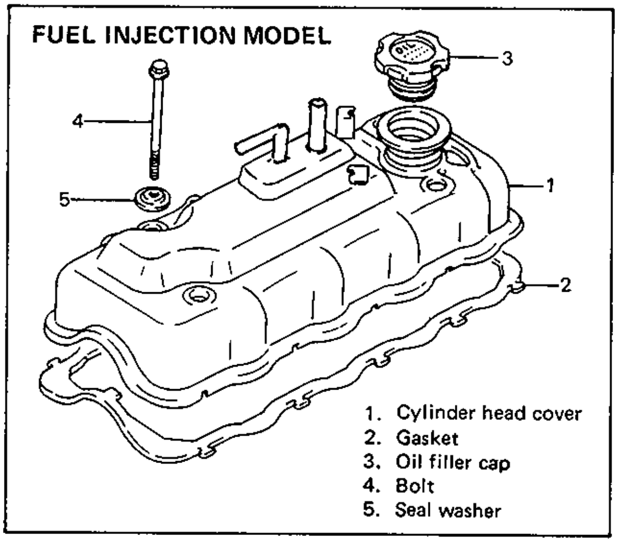


Fig. 6A-34 Cylinder Head Cover, Gasket etc.

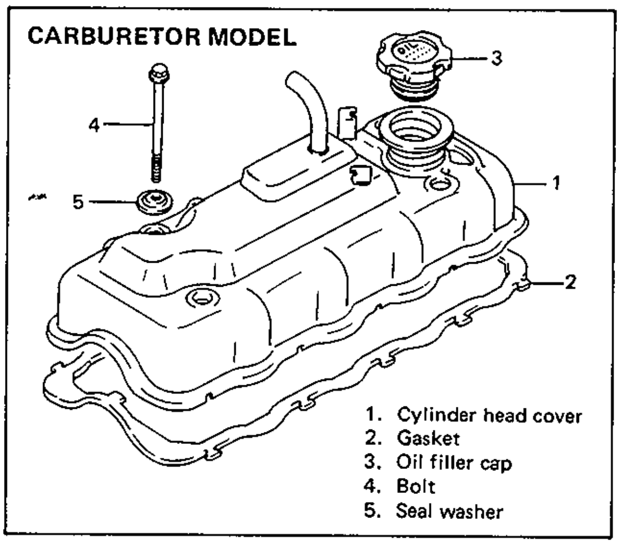


Fig. 6A-34-1 Cylinder Head Cover, Gasket etc.

REMOVE OR DISCONNECT

(Fuel Injection model)

1. Battery negative cable at battery.
2. Air intake case, pipe and air cleaner outlet hose.
3. PCV hose at cover.
4. Release high-tension cords and accelerator cable from clamps.
5. Cylinder head cover.

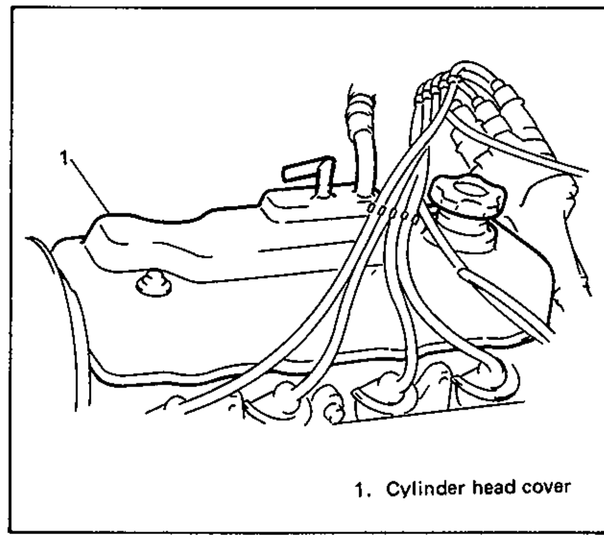


Fig. 6A-35 Removing Cylinder Head Cover

(Carburetor model)

1. Battery negative cable at battery.
2. Air cleaner case.
3. PCV hose at cover.
4. Release high-tension cords from clamp bracket.
5. Cylinder head cover.

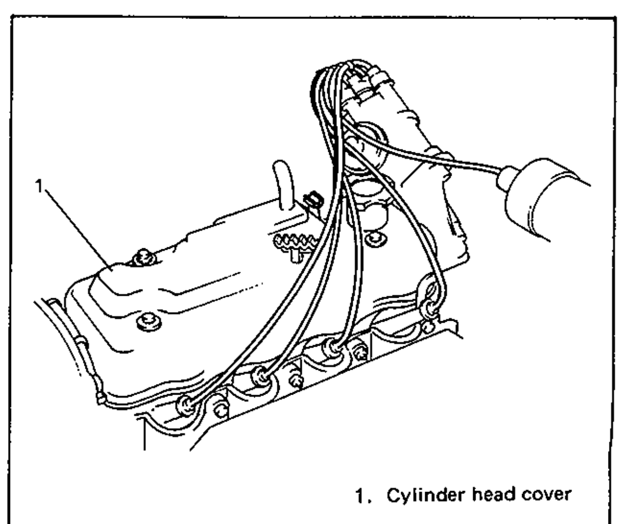


Fig. 6A-35-1 Removing Cylinder Head Cover

INSTALL OR CONNECT

1. Clean sealing surfaces on cylinder head and cover.
2. Install in reverse order of removal.
   - Use new gasket and tighten cover bolts to specified torque.

Tightening torque for cylinder head cover bolts	N·m	kg-m	lb-ft
	4 – 5	0.4 – 0.5	3.0 – 3.5

- Clamp high-tension cords.

TIMING BELT AND BELT TENSIONER

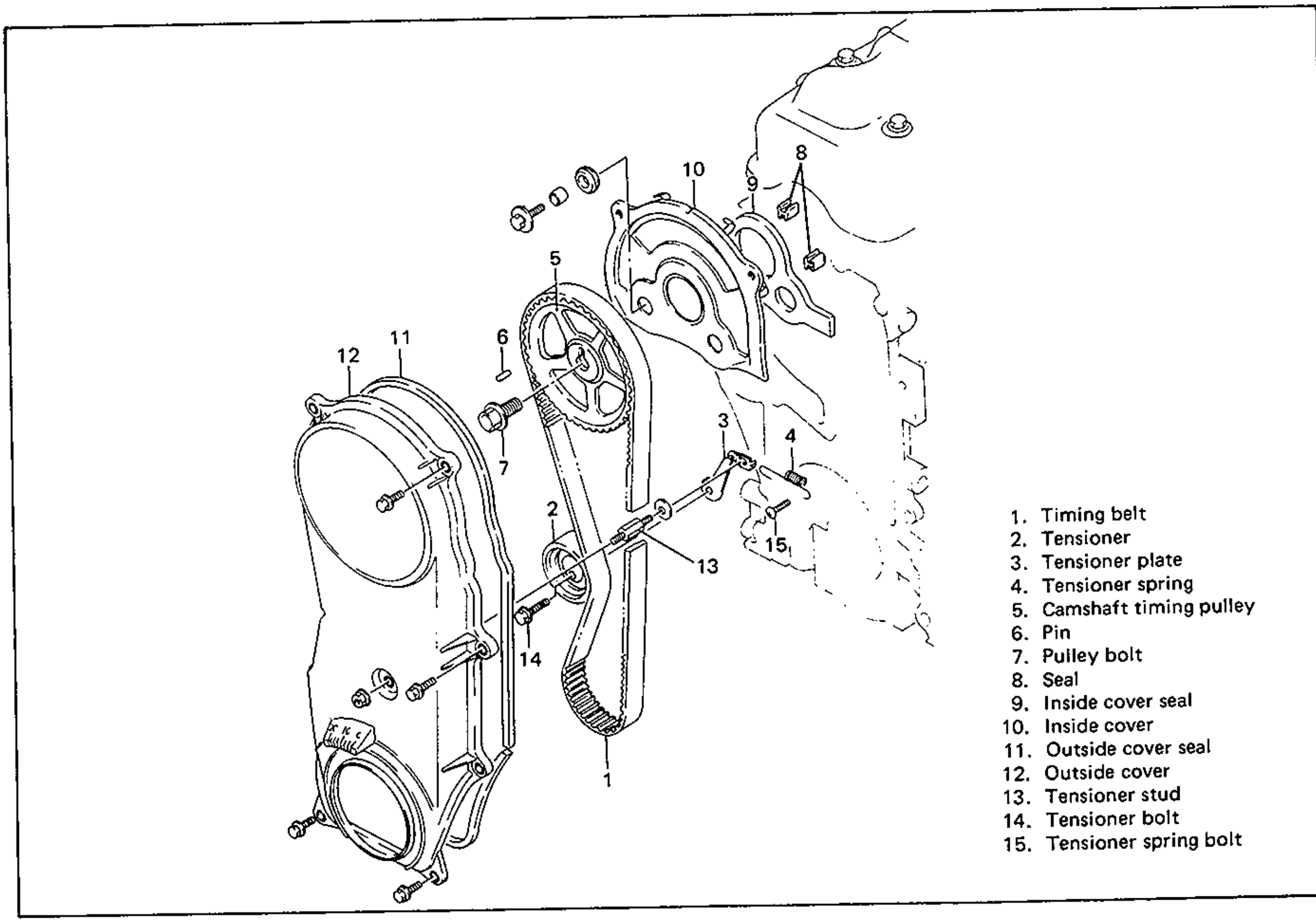


Fig. 6A-36 Timing Belt, Tensioner, Timing Belt Cover, etc.

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Coolant reservoir tanl, radiator cooling fan and fan shroud.
3. Radiator cooling fan and fan shroud.
4. Air conditioner-compressor drive belt (if equipped).
5. Loosen 3 bolts securing generator in place, and remove water pump drive belt and water pump pulley.
6. Crankshaft pulley by removing 5 pulley bolts. It is not necessary to loosen crankshaft timing belt pulley bolt at the center.

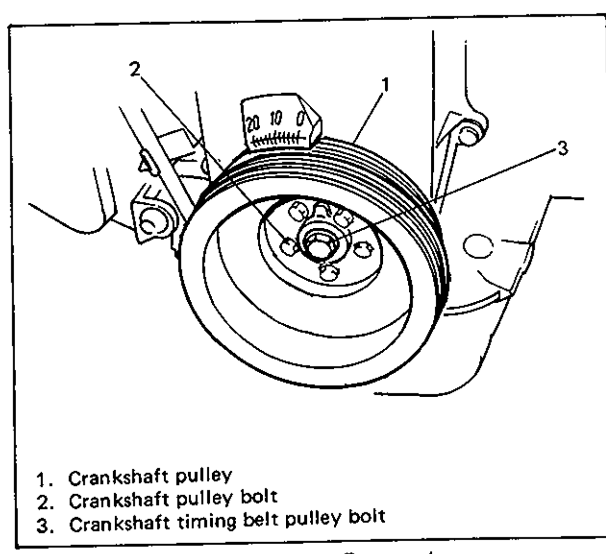


Fig. 6A-37 Crankshaft Pulley Removal

7. Timing belt outside cover.
8. Remove tensioner spring and tensioner stud bolt, and loosen tensioner bolt. Remove belt from crank timing belt pulley and camshaft pulley after pushing up tensioner plate by finger.

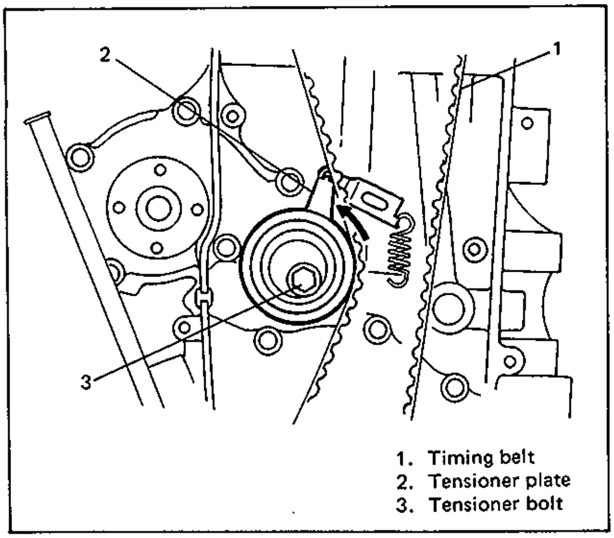


Fig. 6A-38 Removing Timing Belt

CAUTION:
After timing belt is removed, never turn camshaft and crankshaft independently more than such an extent as shown below. If turned, interference may occur between piston and valves and valves themselves, and parts related to piston and valves may be damaged.

9. Tensioner and tensioner plate.

INSPECT

- Timing belt for wear or crack. Replace as necessary.
- Tensioner for smooth rotation.

INSTALL OR CONNECT

1. Tensioner plate to tensioner.
   Insert lug of tensioner plate into hole in tensioner.

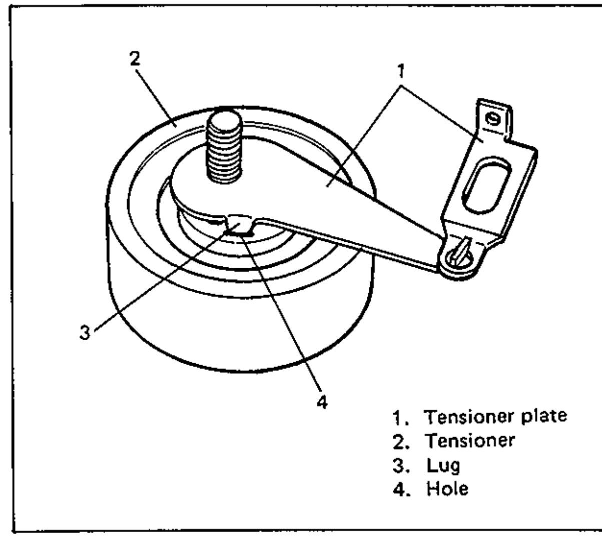


Fig. 6A-39 Lug and Hole

2. Tensioner and tensioner plate.
   Do not tighten tensioner bolt by using wrench yet. Hand tighten only at this time.
   Be sure that plate movement in arrow direction as shown in figure below causes the same directional movement of tensioner. If no associated movement between plate and tensioner occurs, remove tensioner and plate again and reinsert plate lug into tensioner hole.

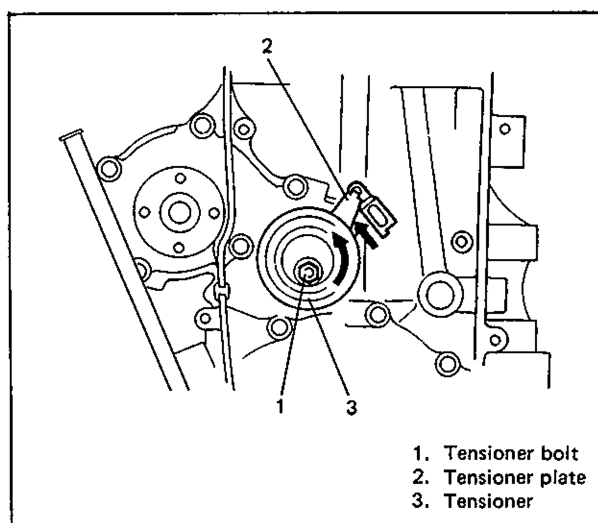


Fig. 6A-40 Tensioner Installation

3. Before installing timing belt to camshaft pulley and crank timing belt pulley, remove cylinder head cover.
   After removing cylinder head cover, loosen all valve adjusting screws on intake and exhaust rocker arms all the way after loosening each lock nut.
   This is to permit free rotation of camshaft and the reason is; when installing timing belt to both pulleys, belt should be correctly tensed by tensioner spring force. If camshaft does not rotate freely, belt will not be correctly tensed by tensioner.

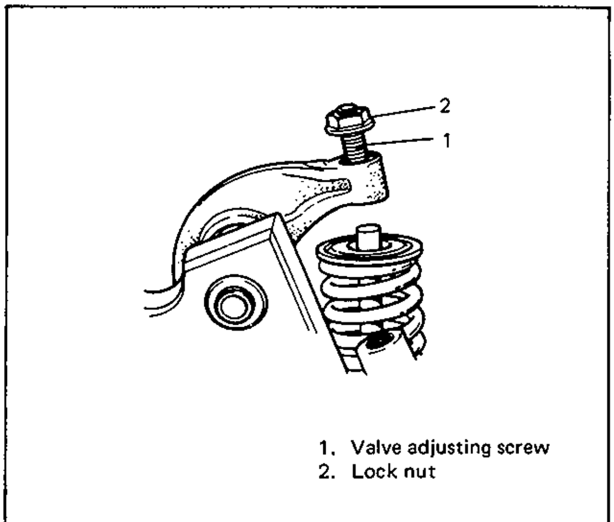


Fig. 6A-41 Valve Adjusting Screw and Lock Nut

4. After loosening all valve adjusting screws all the way, turn camshaft pulley clockwise and align timing mark on camshaft pulley with "V" mark on belt inside cover as shown in figure below.

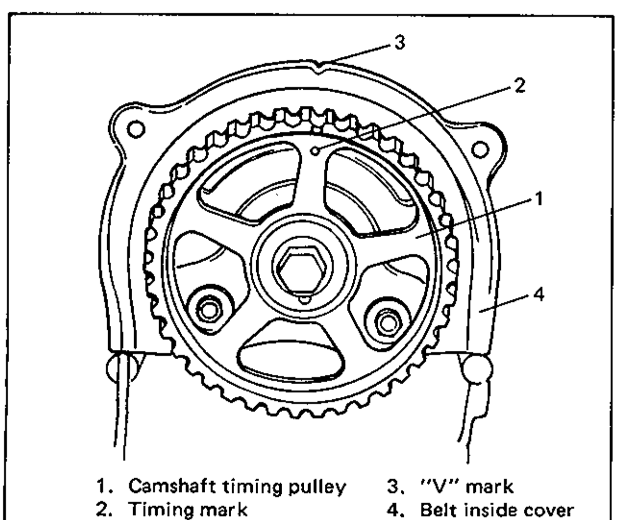


Fig. 6A-42 Timing Marks

5. Turn crankshaft clockwise, fitting 17 mm wrench to crank timing belt pulley bolt, and align punch mark on timing belt pulley with arrow mark on oil pump as shown in figure below.

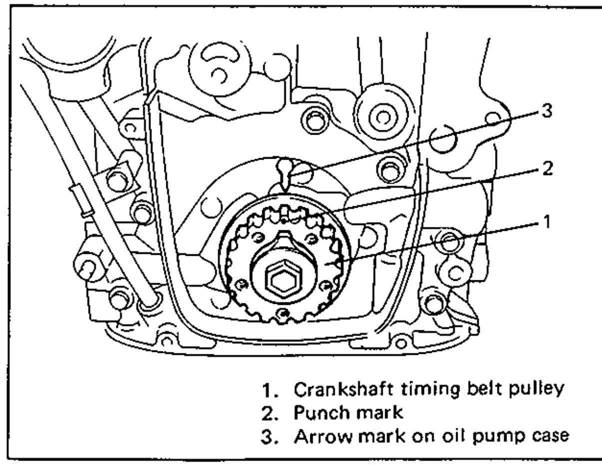


Fig. 6A-43 Timing Marks

6. With 4 marks aligned, install timing belt on two pulleys in such a way that drive side of belt is free from any slack.
   And then tense timing belt by hooking tensioner spring to tensioner plate and bolt, and install tensioner stud and hand-tighten only at this time.

NOTE:

- **When installing timing belt, match arrow mark (⇨) on timing belt with rotating direction of crankshaft.**
- **In this state, No. 4 piston should be at top dead center of compression stroke.**

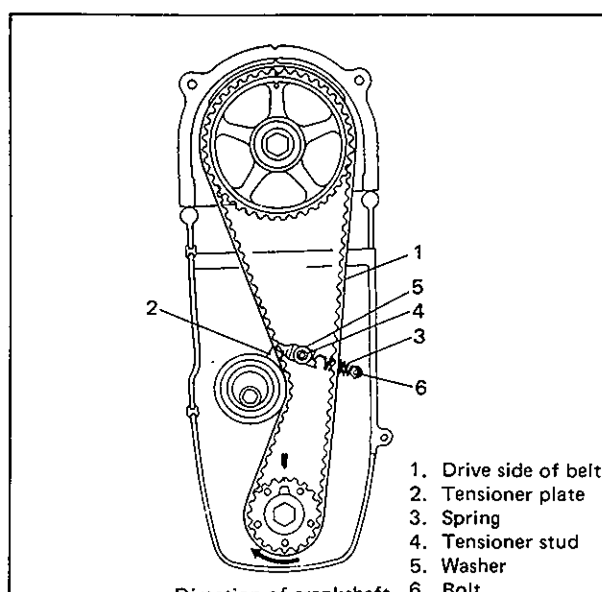


Fig. 6A-44 Installing Timing Belt

7. To remove slack from belt, turn crankshaft two rotations in clockwise direction after installing belt. After removing belt slack, tighten tensioner stud first and then tensioner bolt to each specified torque.
   Then confirm again that 4 marks are matched.

Tightening torque	N·m	kg-m	lb-ft
Tightening torque for tensioner stud	9 – 12	0.9 – 1.2	7.0 – 8.5
Tightening torque for tensioner bolt	24 – 30	2.4 – 3.0	17.5 – 21.5

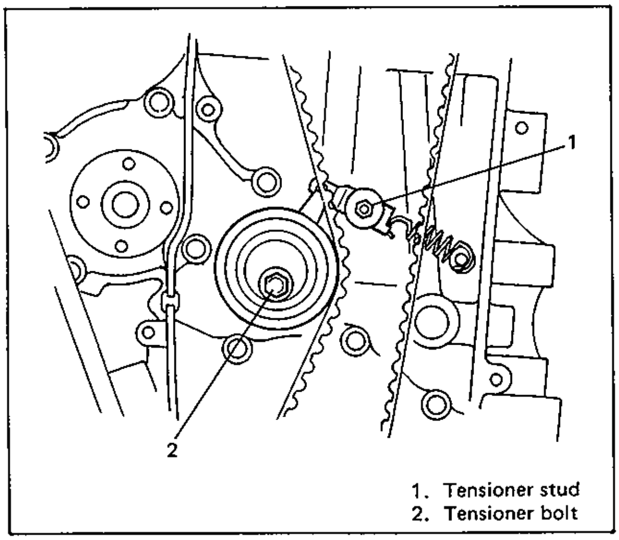


Fig. 6A-45 Tightening Tensioner Stud and Bolt

8. Timing belt outside cover.
9. Crankshaft pulley.
   Fit keyway of pulley to key on crank timing belt pulley, and tighten 5 bolts to specified torque.

Tightening torque	N·m	kg-m	lb-ft
Tightening torque for pulley bolts	14 – 18	1.4 – 1.8	10.5 – 13.0

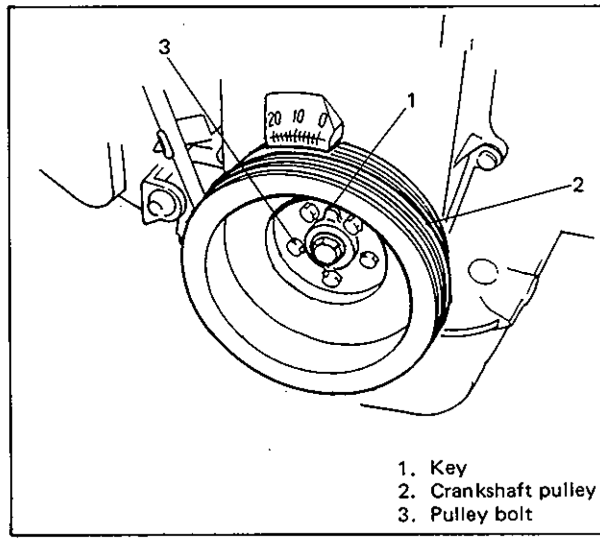


Fig. 6A-46 Installing Crankshaft Pulley

10. Water pump pulley, water pump drive belt and air conditioner compressor drive belt (if equipped).
11. Radiator cooling fan and fan shround.
12. Connect air conditioner compressor suction flexible hose and pipe (if equipped).
13. Adjust water pump drive belt tension to specification. Refer to Section 6B for procedure to adjust belt tension.
14. Adjust air conditioner compressor drive belt tension to specification (if equipped). Refer to Section 0B.
15. Adjust intake and exhaust valve lashes.
    Refer to item "Valve Lash" in this section for procedure to adjust valve lash.
16. Cylinder head cover and air cleaner case.
17. Negative cable at battery.
18. If air conditioner is equipped, charge refrigerant.

OIL PAN AND OIL PUMP STRAINER

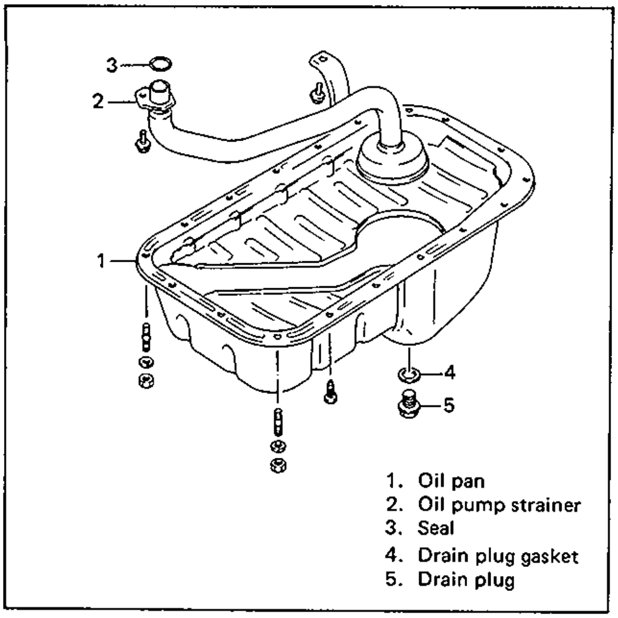


Fig. 6A-47 Oil Pan and Oil Pump Strainer

REMOVE OR DISCONNECT

1. Raise vehicle.
2. Front differential housing with differential from chassis. Refer to Section 7E for removal.

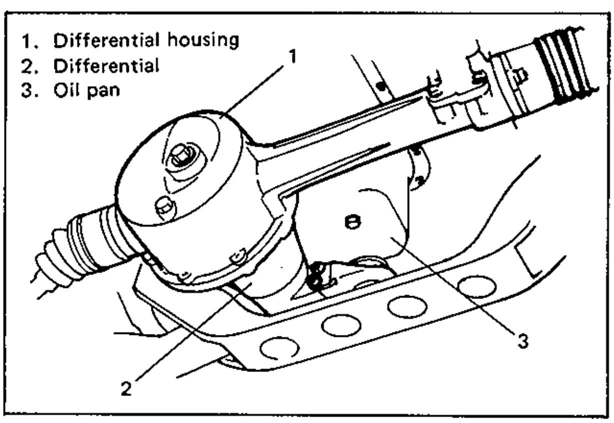


Fig. 6A-48 Differential Housing Removal

3. Drain engine oil by removing drain plug.

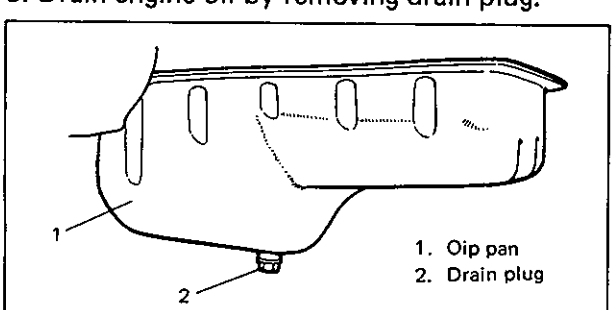


Fig. 6A-49 Draining Engine Oil

4. Clutch housing lower plate.
5. Oil pan and then oil pump strainer.

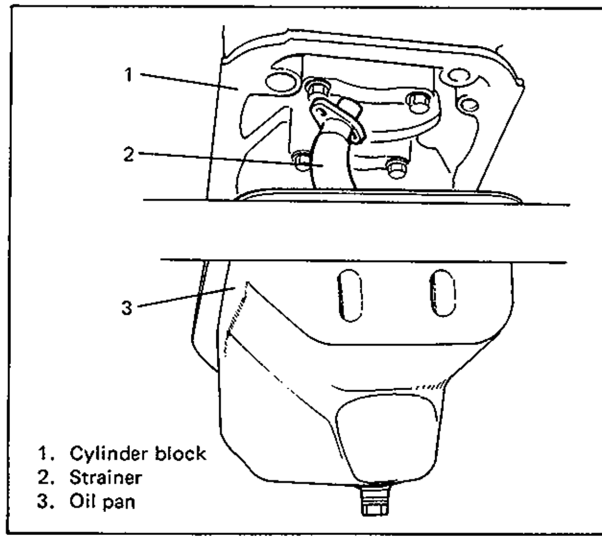


Fig. 6A-50 Oil Pan and Oil Pump Strainer Removal

CLEAN

- Inside of oil pan and oil pump strainer screen.

INSTALL OR CONNECT

1. Clean mating surfaces of oil pan and cylinder block. Remove oil, old sealant, and dusts from mating surfaces.
   After cleaning, apply silicone type sealant to oil pan mating surface continuously as shown in figure below.

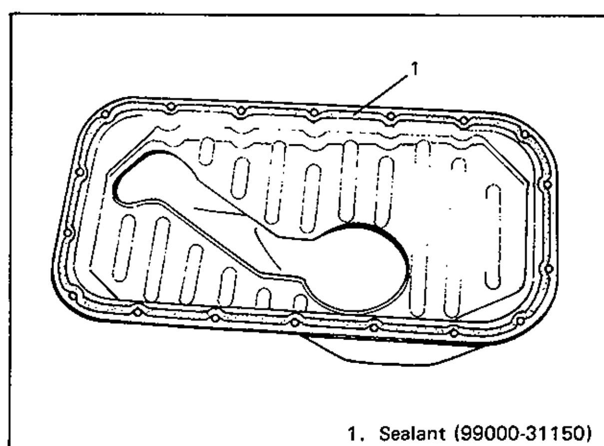


Fig. 6A-51 Applying Sealant to Oil Pan

2. Oip pump strainer and oil pan.
   Install seal in the position as shown in figure below. With oil pump strainer inserted into oil pan, install strainer to cylinder block. Tighten strainer bolt first and then bracket bolt to specified torque.

Tightening torque for strainer and its bracket bolts	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

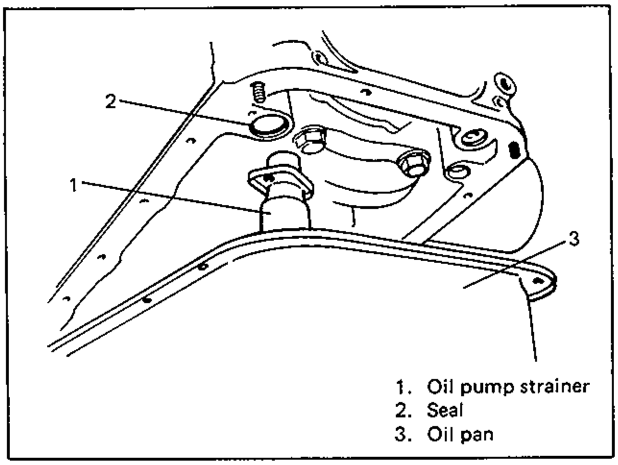


Fig. 6A-52 Oil Pump Strainer and Oil Pan Installation

After fitting oil pan to cylinder block, run in securing bolts and start tightening at the center: move wrench outward, tightening one bolt at a time.
Tighten bolts to specified torque.

Tightening torque for oil pan bolts	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

3. Gasket and drain plug to oil pan.
   Tighten drain plug to specified torque.

Tightening torque for drain plug	N·m	kg-m	lb-ft
	30 – 40	3.0 – 4.0	22.0 – 28.5

4. Clutch (torque converter) housing lower plate.
5. Front differential housing with differential according to installation procedure described in Section 7E.
6. Refill front differential housing with gear oil, referring to Section 7E.
7. Refill engine with engine oil, referring to item "ENGINE OIL CHANGE" in Section 0B.

OIL PUMP

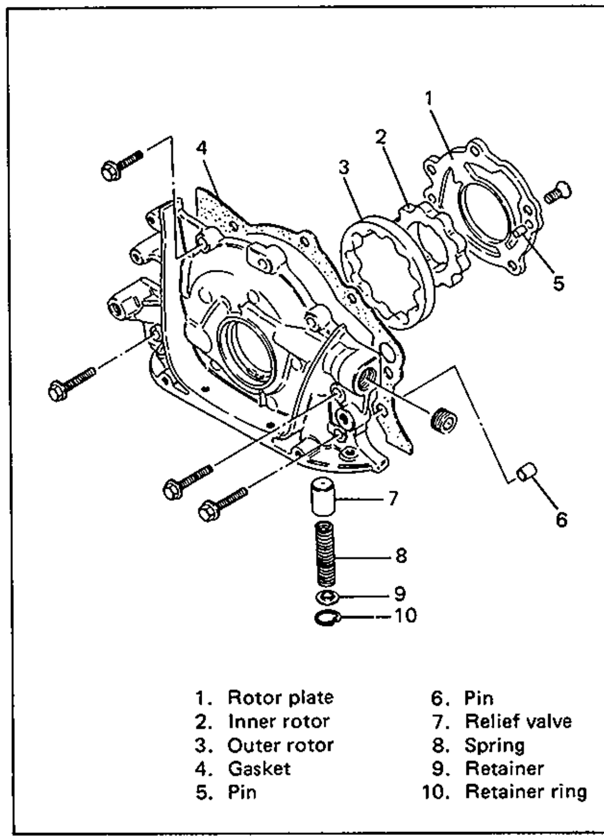


Fig. 6A-53 Oil Pump

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Radiator cooling fan, shroud, water pump drive belt, water pump pulley, timing belt outside cover, timing belt and tensioner as previously outlined.
3. Generator and its bracket.
4. Air conditioner compressor bracket bolts (if equipped).
5. Raise vehicle.
6. Drain engine oil and front differential oil.
7. Clutch (torque converter) housing lower plate.
8. Crankshaft timing belt pully and timing belt guide.
   To lock crankshaft, engage special tool (gear stopper) with flywheel ring gear (drive plate ring gear for A/T) as shown in Fig. 6A-54. With crankshaft locked, remove crankshaft timing belt pulley bolt.

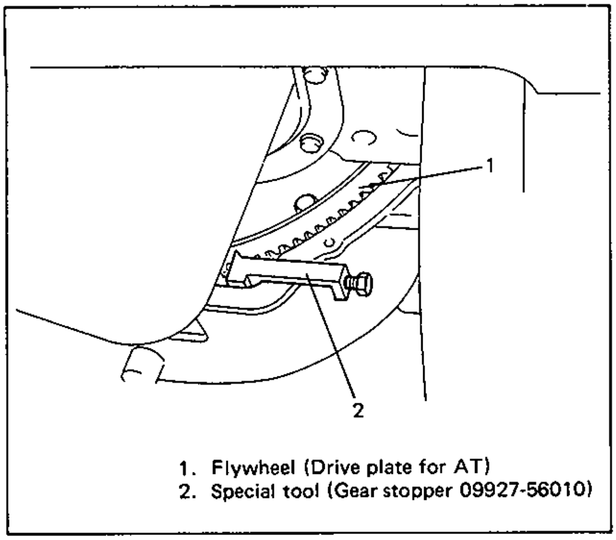


Fig. 6A-54 Locking Crankshaft

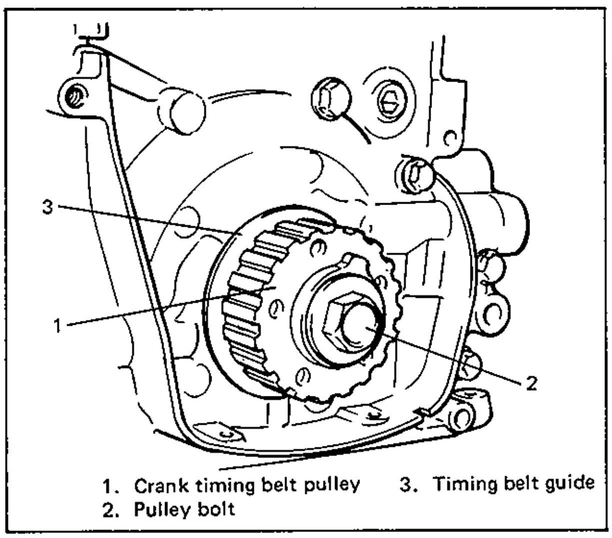


Fig. 6A-55 Crank Timing Belt Pulley Bolt

9. Oil pan and oil pump strainer as previously outlined.
10. Oil pump assembly after removing 7 bolts securing pump.

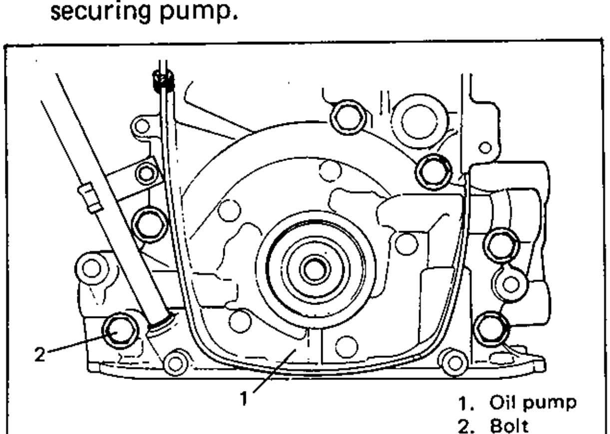


Fig. 6A-56 Oil Pump Assembly

DISASSEMBLE

1. Oil level gauge guide from oil pump.
   After removing guide bolt, pull out guide from oil pump.

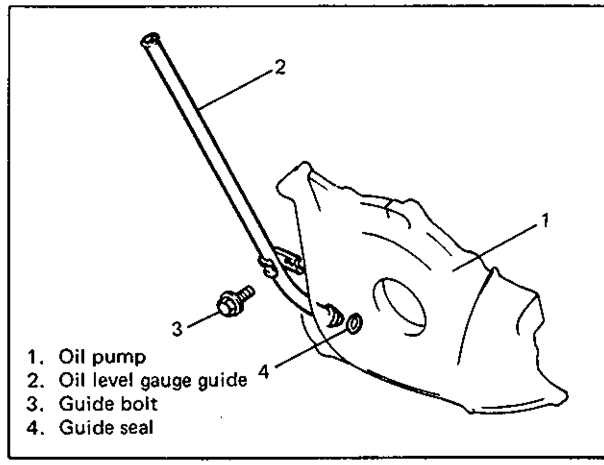


Fig. 6A-57 Oil Level Gauge Guide

2. Rotor plate:

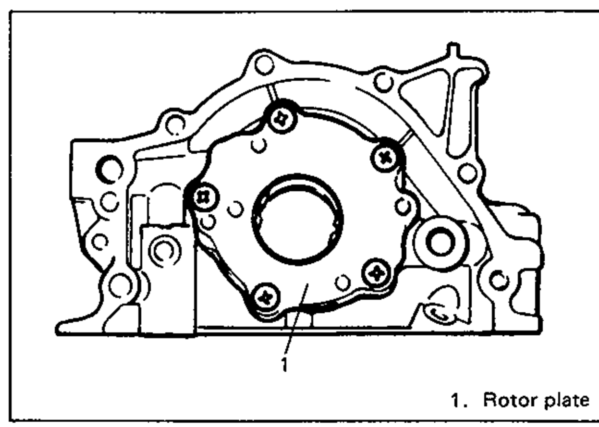


Fig. 6A-58 Rotor Plate

3. Outer rotor and inner rotor:

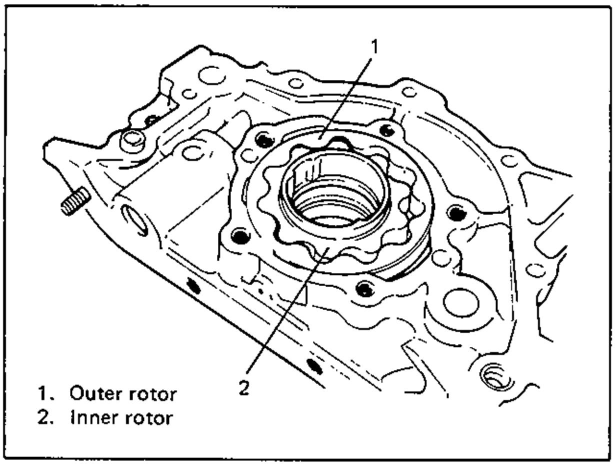


Fig. 6A-59 Outer Rotor and Inner Rotor

INSPECT

- Oil seal lip for fault or other damage. Replace as necessary.
- Outer and inner rotors, rotor plate, and oil pump case for excessive wear or damage.

MEASURE

Radial Clearance

Check radial clearance between outer rotor and case, using thickness gauge.
If clearance exceeds its limit, replace outer rotor or case.

Radial clearance between:	Limit on radial clearance
Outer rotor and case	0.310 mm (0.0122 in.)

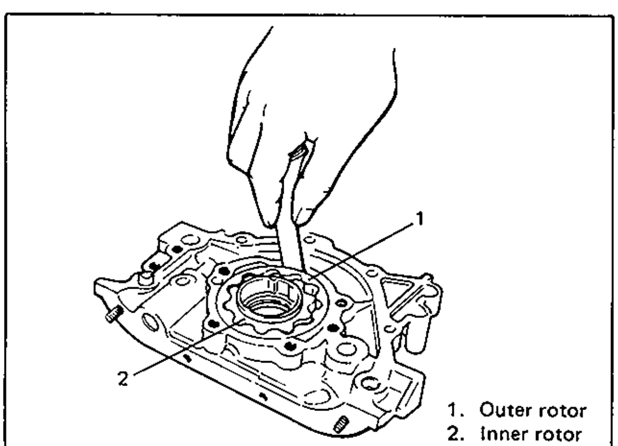


Fig. 6A-60 Radial Clearance Measurement

Side Clearance

Using straight edge and thickness gauge, measure side clearance as shown below.

Limit on side clearance	0.15 mm (0.0059 in.)

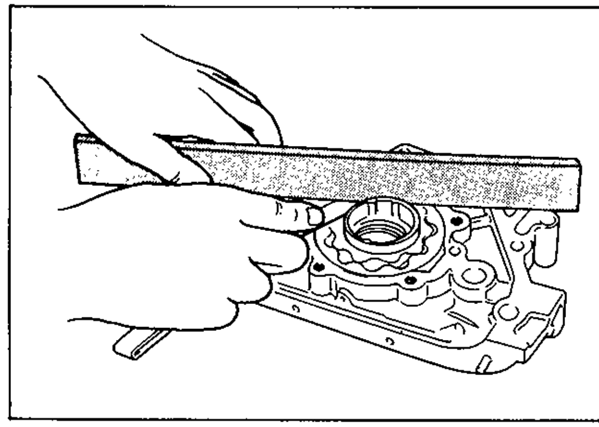


Fig. 6A-61 Side Clearance Measurement

ASSEMBLE

1. Wash, clean and then dry all disassembled parts.
2. Apply thin coat of engine oil to inner and outer rotors, oil seal lip portion, and inside surfaces of oil pump case and plate.
3. Outer and inner rotors to pump case.
4. Rotor plate. Tighten 5 screws securely.
   After installing plate, check to be sure that rotors turn smoothly by hand.
5. Guide seal to pump case and then oil level gauge guide. Refer to Fig. 6A-57 for guide seal.

INSTALL OR CONNECT

1. Two oil pump pins and oil pump gasket to cylinder block. Use new gasket.
2. To prevent oil seal lip from being damaged or upturned when installing oil pump to crankshaft, fit special tool (Oil seal guide) to crankshaft, and apply engine oil to special tool.

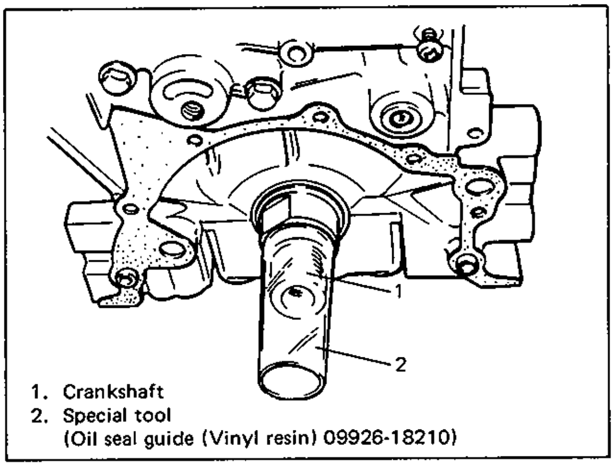


Fig. 6A-62 Special Tool (Oil Seal Guide) Installation

3. Oil pump to crankshaft and cylinder block:
   Among 7 oil pump bolts, 4 No. 1 bolts are shorter than 3 No. 2 bolts in length. Install No.1 and No.2 bolts as indicated in figure below, and tighten them to specified torque.
   After installing oil pump, check to be sure that oil seal lip is not upturned, and then remove special tool.

Tightening torque for No. 1 and No. 2 bolts	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

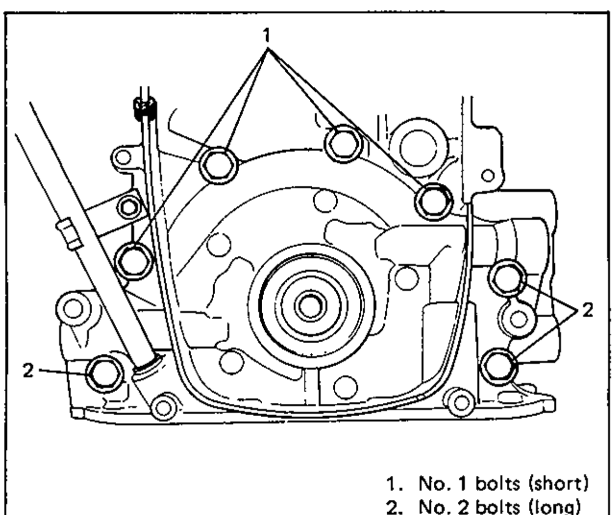


Fig. 6A-63 Oil Pump Bolts

4. Rubber seal between oil pump and water pump.

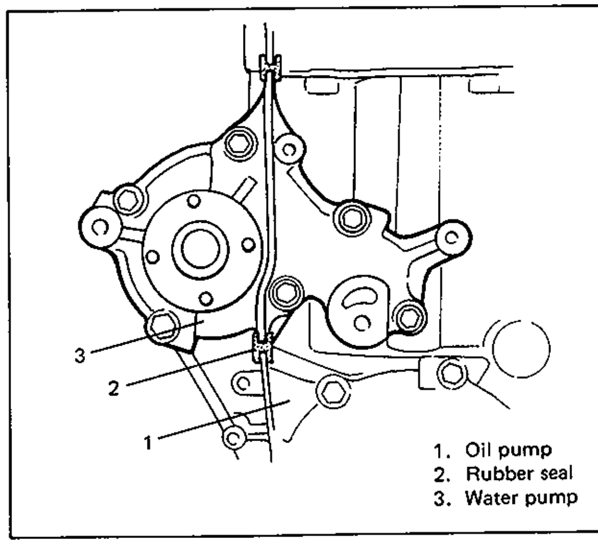


Fig. 6A-64 Rubber Seal Installation

5. Edge of oil pump gasket might bulge out: if it does, cut it off with a sharp knife, making edge smooth and flush with end faces of pump case and cylinder block.

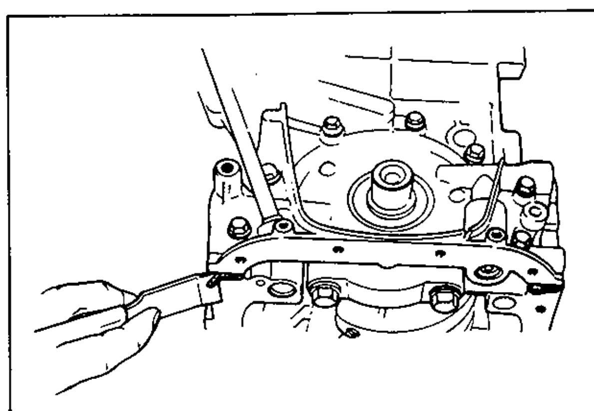


Fig. 6A-65 Cutting Edge of Gasket

6. Timing belt guide, key, and crank timing belt pulley. Refer to Fig. 6A-49 for proper installation of these parts.
   Install timing belt guide in such a way that its concave side faces oil pump.
   With crankshaft locked, tighten crank timing belt pulley bolt to specified torque.

Tightening torque for timing belt pulley bolt	N·m	kg-m	lb-ft
	125–135	12.5–13.5	90.5–97.5

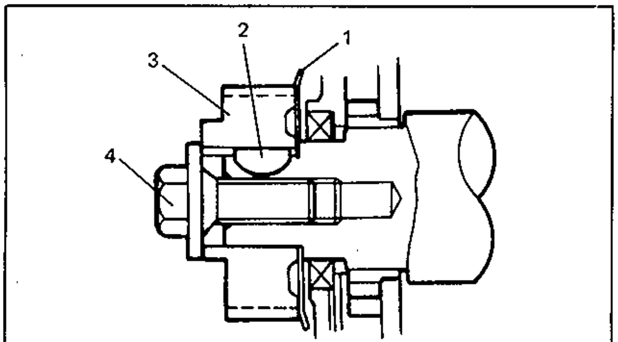


Fig. 6A-66 Installing Guide, Key and Pulley

7. Timing belt, tensioner, oil pump strainer, oil pan and other parts as previously outlined.
8. Check to ensure that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.
9. Adjust water pump drive belt tension and air conditioner compressor drive belt tension (if equipped). Refer to p. 0B-9.
10. Adjust intake and exhaust valve lashes.
11. Refill engine with engine oil, referring to item "ENGINE OIL CHANGE" in Section 0B.
12. Refill front differential housing with gear oil, referring to Section 7E.
13. Negative cable at battery.
14. After completing installation, check oil pressure by running engine.
15. If air conditioner is equipped, charge refrigerant.

ROCKER ARMS AND ROCKER ARM SHAFTS

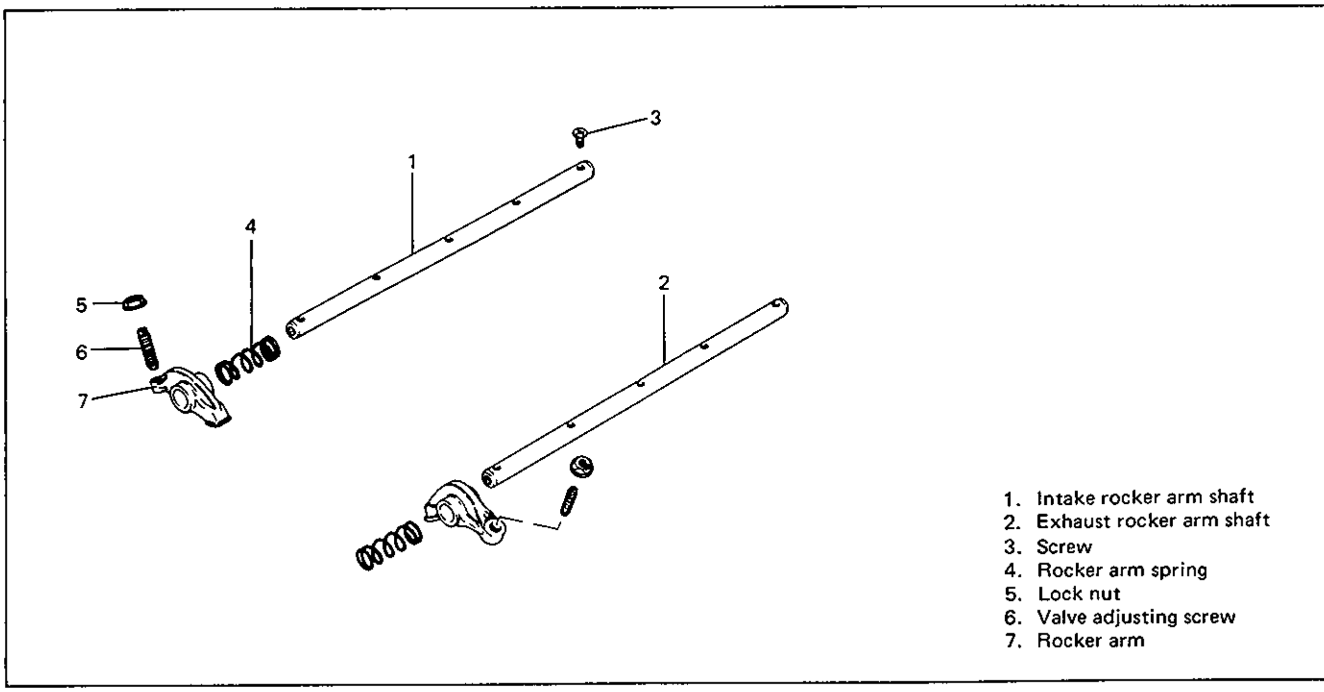


Fig. 6A-67 Rocker Arms, Springs and Rocker Arm Shafts

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Engine hood.
3. Front grille.
   Remove 3 screws and each clip (right & left) by pushing center pin of clip.

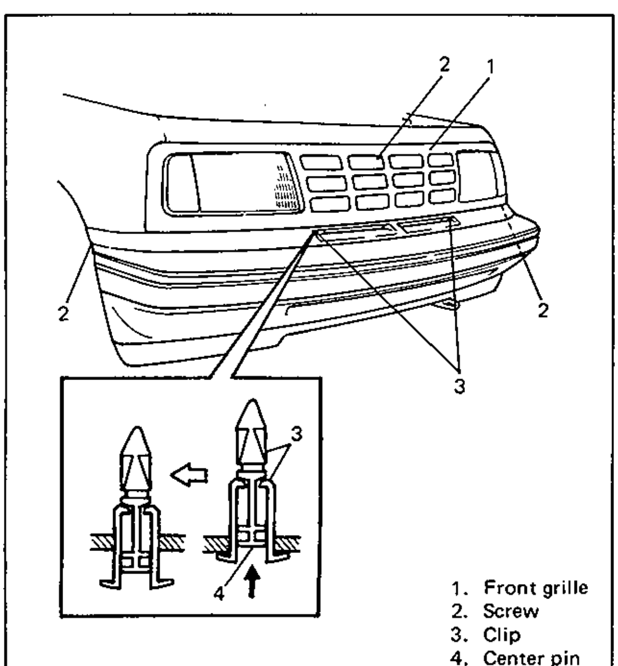


Fig. 6A-68 Removing Front Grille

4. Engine hood lock from front upper member and then front upper member.
5. Drain cooling system.
6. Radiator cooling fan and fan shroud.
7. Radiator. Refer to Section 6B for removal.
8. Water pump drive belt, water pump pulley, timing belt outside cover, timing belt and tensioner as previously outlined.
9. Air intake case and cylinder head cover. (Fuel Injection model)
10. Air cleaner case and cylinder head cover. (Carburetor model)

11. Camshaft timing belt pulley and timing belt inside cover.
    Insert proper size rod into hole (9.0 mm, 0.35 in.) of camshaft to lock camshaft, and loosen pulley bolt.

CAUTION:
After timing belt is removed, never turn camshaft and crankshaft independently more than such an extent as shown below. If turned, interference may occur between piston and valves and valves themselves, and parts related to piston and valves may be damaged.

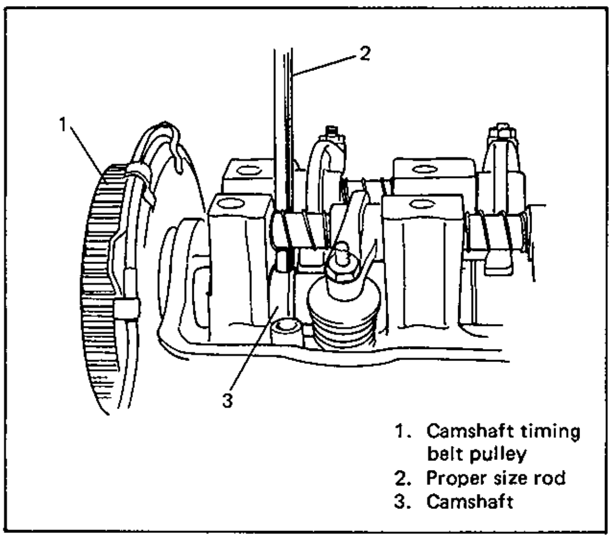


Fig. 6A-69 Locking Camshaft

12. After loosening all valve adjusting screw lock nuts, turn adjusting screws back all the way to allow all rocker arms to move freely.

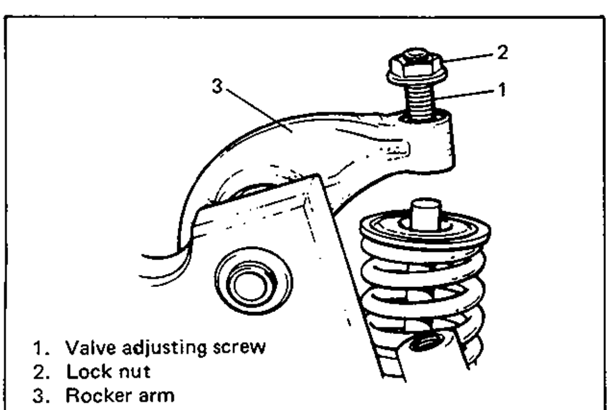


Fig. 6A-70 Valve Adjusting Screw and Lock Nut

13. Rocker arm shaft screws.

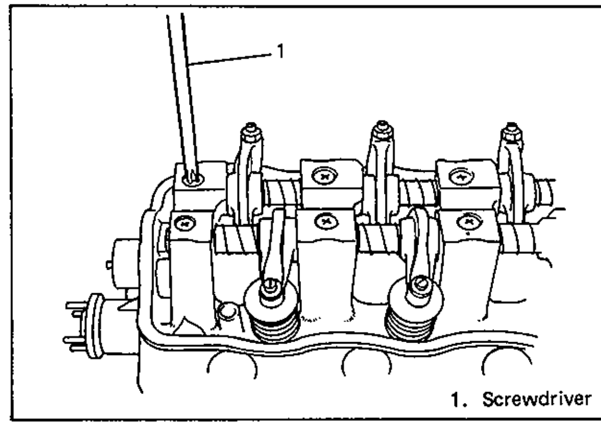


Fig. 6A-71 Rocker Arm Shaft Screws Removal

14. Intake and exhaust rocker arm shafts, and then, rocker arms and springs.

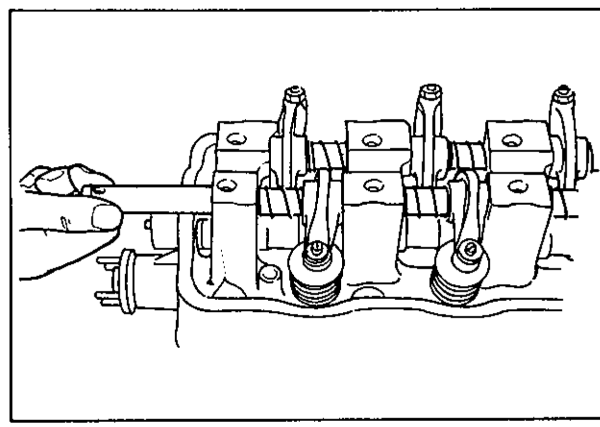


Fig. 6A-72 Rocker Arm Shaft Removal

INSPECT

Adjusting Screw and Rocker Arm

If tip of adjusting screw is badly worn, replace screw.

Rocker arm must be replaced if its cam-riding face is badly worn.

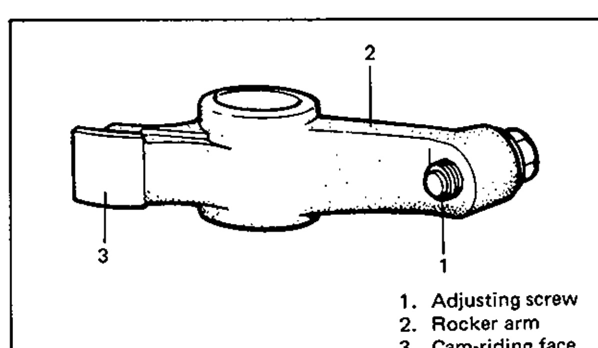


Fig. 6A-73 Adjusting Screw and Rocker Arm

Rocker Arm Shaft Runout

Using "V" blocks and dial gauge, check runout. If runout exceeds its limit, replace rocker arm shaft.

Runout limit	0.12 mm (0.004 in.)

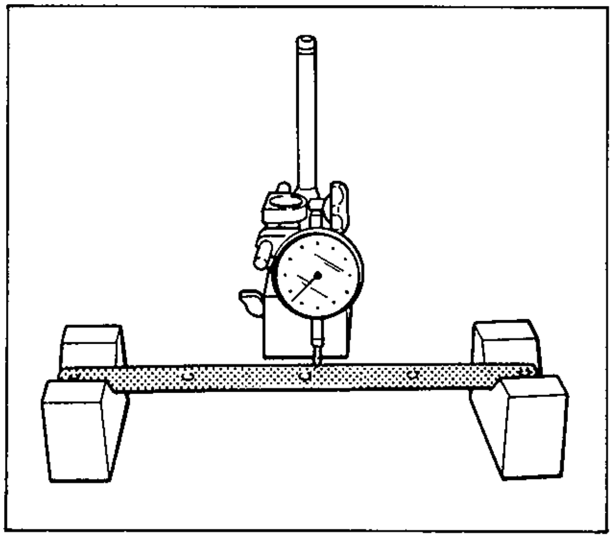


Fig. 6A-74 Measuring Runout

Rocker Arm-To-Rocker Arm Shaft Clearance [In & Ex]

Using a micrometer and a bore gauge, measure rocker shaft dia. and rocker arm I.D..
Difference between two readings is arm-to-shaft clearance on which limit is specified.
If limit is exceeded, replace shaft or arm, or both.

Item	Standard	Limit
Rocker arm I.D.	16.000 – 16.018 mm (0.629 – 0.630 in.)	———
Rocker arm Shaft dia.	15.973 – 15.988 mm (0.628 – 0.629 in.)	———
Arm-to-Shaft clearance	0.012 – 0.045 mm (0.0005 – 0.0017 in.)	0.09 mm (0.0035 in.)

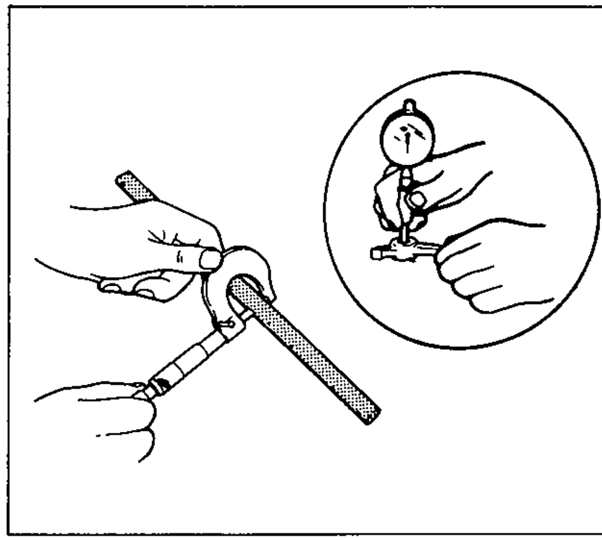
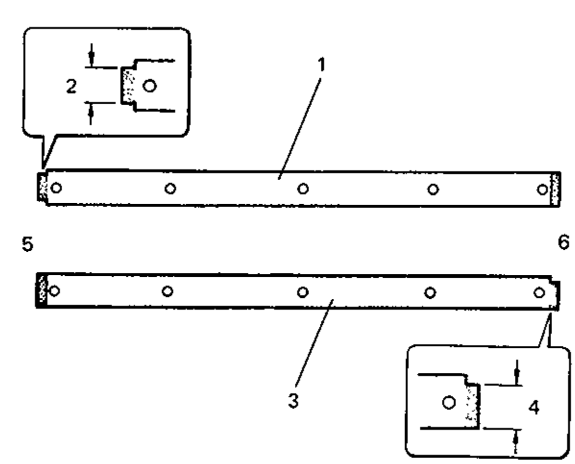


Fig. 6A-75 Measuring Shaft Dia. and Arm I.D.

INSTALL OR CONNECT

1. Apply engine oil to rocker arms and rocker arm shafts.
2. Rocker arms, springs and rocker arm shafts.
   Two rocker arm shafts are different.
   To distinguish between the two, dimensions of their stepped ends differ as shown in Fig. 6A-76. Install intake rocker arm shaft, facing its stepped end to camshaft pulley side, and exhaust rocker arm shaft, facing its stepped end to distributor side.



1. Intake rocker arm shaft
2. 14 mm (0.55 in.)
3. Exhaust rocker arm shaft
4. 15 mm (0.59 in.)
5. Camshaft pulley side
6. Distributor side

Fig. 6A-76 Rocker Arm Shaft Installation

3. After installing rocker arms, springs, and rocker arm shafts as shown in figure below, tighten rocker arm shaft screws to specified torque.

Tightening torque for rocker arm shaft screws	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

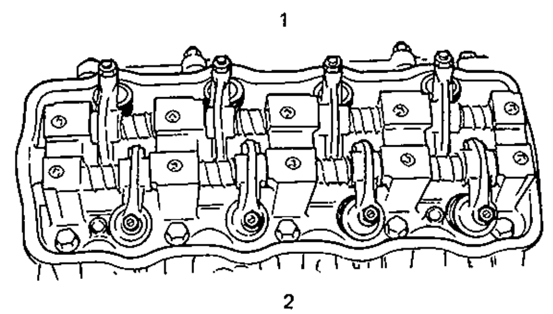


Fig. 6A-77 Rocker Arms, Springs and Rocker Arm Shafts Installation

4. Timing belt inside cover and camshaft pulley. Fit pulley pin on camshaft into slot on camshaft pulley. With locking camshaft as shown in Fig. 6A-78, tighten pulley bolt to specified torque.

Tightening torque for pulley bolt	N·m	kg-m	lb-ft
	56 – 64	5.6 – 6.4	41.0 – 46.0

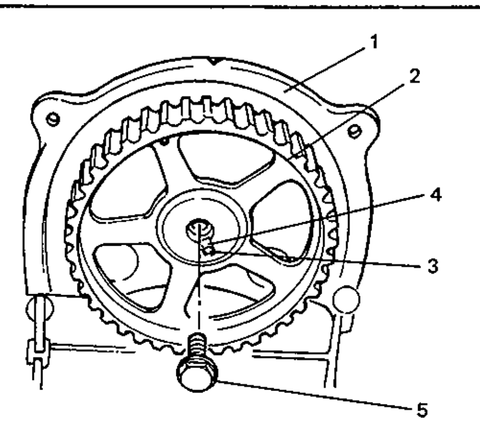


Fig. 6A-78 Camshaft Timing Belt Pulley Installation

5. Timing belt tensioner, timing belt, timing belt outside cover, crankshaft pulley, etc., as previously outlined.
6. Radiator, rediator cooling fan shroud and fan.
7. Adjust water pump drive belt tension. Refer to Section 6B for adjusting procedure.
8. Adjust air conditioner compressor drive belt tension (if equipped). Refer to Section 0B.
9. Adjust intake and exhaust valve lashes as previously outlined.
10. Cylinder head cover and air cleaner case as previously outlined.
11. Front upper member, front grille and engine food.
12. Refill cooling system, referring to Section 6B.
13. For A/T vehicle, refill A/T fuluid referring to Section 7B.
14. Negative cable at battery.
15. Upon completion of installation, verify that there is no water leakage at each connection.
16. If air conditioner is equipped, charge refrigerant.

CAMSHAFT, VALVES AND CYLINDER HEAD

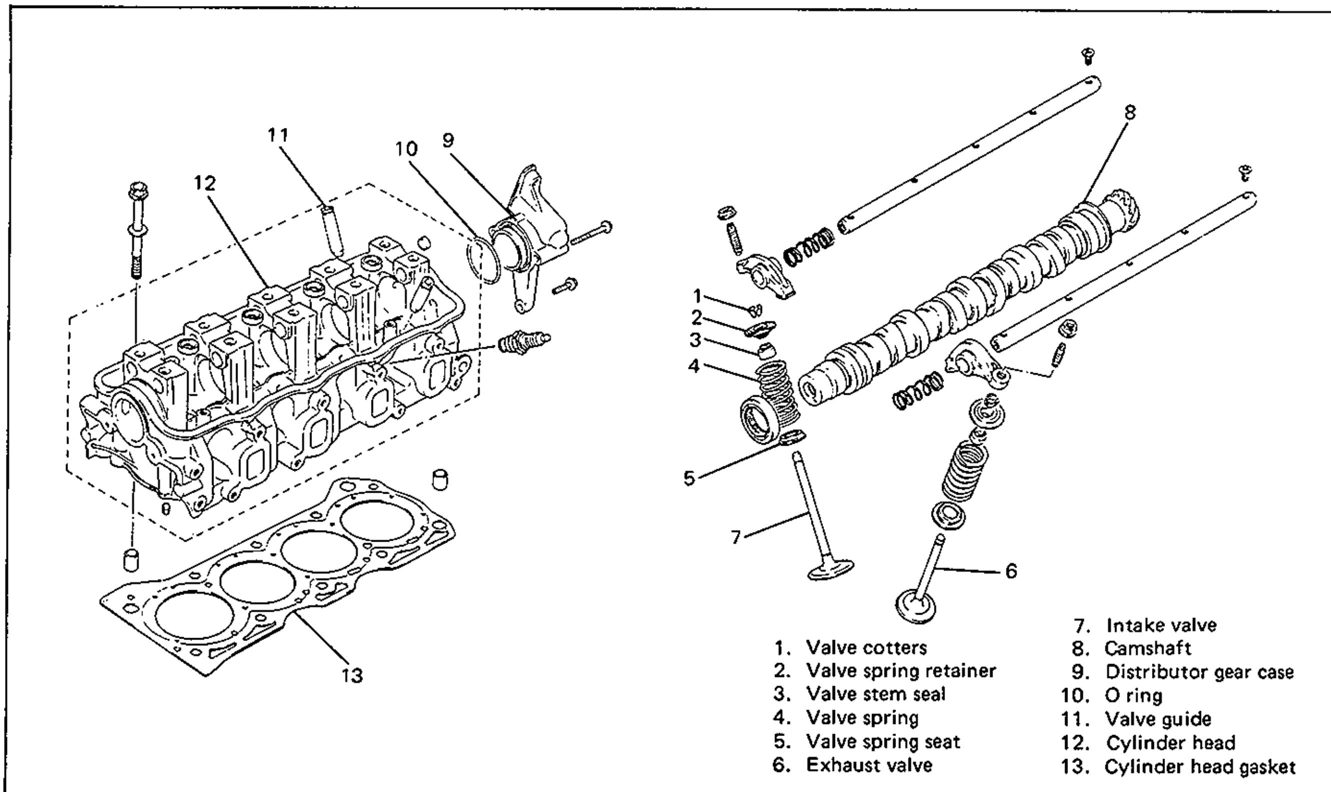


Fig. 6A-79 Camshaft, Valves, Valve Springs and Cylinder Head

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Drain coolant.
3. Air intake case. (Fuel Injection model)
4. Air cleaner case. (Carburetor model)
5. Accelerator cable and A/T kick-down cable (for A/T vehicle) from throttle body. (Fuel Injection model)
6. Accelerator cable and choke cable (no choke cable for automatic choke type) from carburetor. (Carburetor model)
7. Following vacuum hoses and water hoses.
   - Brake booster hose from intake manifold.
   - Heater inlet hose from intake manifold.
   - Canister purge hose from canister, if equipped.
   - Radiator inlet hose from thermostat cap.
   - Water bypass hose from intake manifold.
   - Float chamber vapor hose from carburetor, if equipped.
   - Thermo-wax outlet hose from carburetor (auto choke type carburetor model).
   - Pressure sensor hose from intake manifold. (Fuel Injection model)
   - Air valve water hose from air valve (throttle body). (Fuel Injection model)
   - Vacuum hose for A/T from intake manifold (for A/T vehicle).
8. Following electric lead wires:
   - High-tension cord from ignition coil.
   - Distributor wires at coupler.
   - EGR VSV coupler from VSV.
   - Earth wires from intake manifold and distributor gear case.
   - Throttle opener VSV (Vacuum Switching Valve) coupler from VSV. (Fuel Injection model)
   - Throttle position sensor, injector and idle speed control solenoid valve wires at their couplers. (Fuel Injection model)
   - Air temperature sensor wire at coupler. (Fuel Injection model)
   - Couplers from water temperature sensor (Fuel Injection model) and water temperature gauge.

- Idle up VSV coupler from VSV. (Carburetor model)
- Fuel cut solenoid wire at coupler. (Carburetor model)

9. Fuel filler cap to release fuel vapor pressure in fuel tank. After releasing, reinstall its cap.
10. Release fuel pressure in fuel feed line by referring to p. 6-3. (Fuel Injection model)
11. Fuel feed pipe from throttle body and fuel refurn hose from fuel pressure regulator. (Fuel Injection model)
12. Fuel feed and return hoses from fuel pump. (Carburetor model)
13. Radiator cooling fan, cooling fan shroud, water pump drive belt, water pump pulley, crankshaft pulley, timing belt outside cover, timing belt as previously outlined.
14. Release oil pressure switch lead wire from clamp.
15. Oxygen sensor wire at its coupler. (Fuel Injection model)
16. Exhaust center pipe from exhaust manifold.
17. Air conditioner compressor adjusting arm from cylinder head, if equipped.
18. Cylinder head cover.
    After loosening all valve adjusting screw lock nuts, turn adjusting screws back all the way to allow all valves to close.
19. Cylinder head bolts.
20. Other jointed parts, hoses and electric wires, if any.
21. Cylinder head with distributor, exhaust manifold and intake manifold, using lifting device.

DISASSEMBLE

1. For ease in servicing cylinder head, remove distributor gear case, intake manifold, and exhaust manifold.
2. Remove camshaft timing belt pulley, timing belt inside cover, rocker shafts, rocker arms and springs as previously outlined.
3. Remove camshaft from cylinder head.

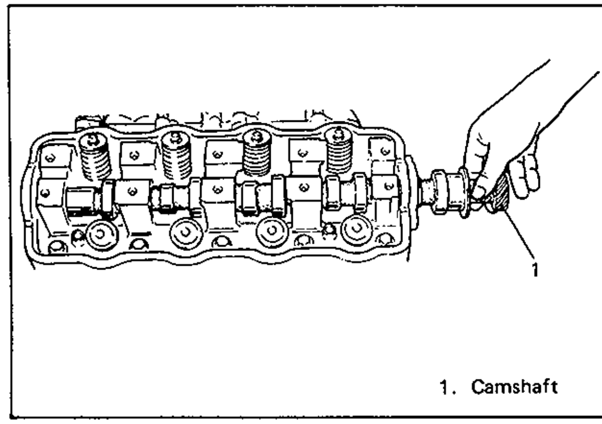


Fig. 6A-80 Camshaft Removal

4. Using special tool (Valve lifter), compress valve springs and then remove valve cotters by using special tool (Forceps). Refer to figures below.

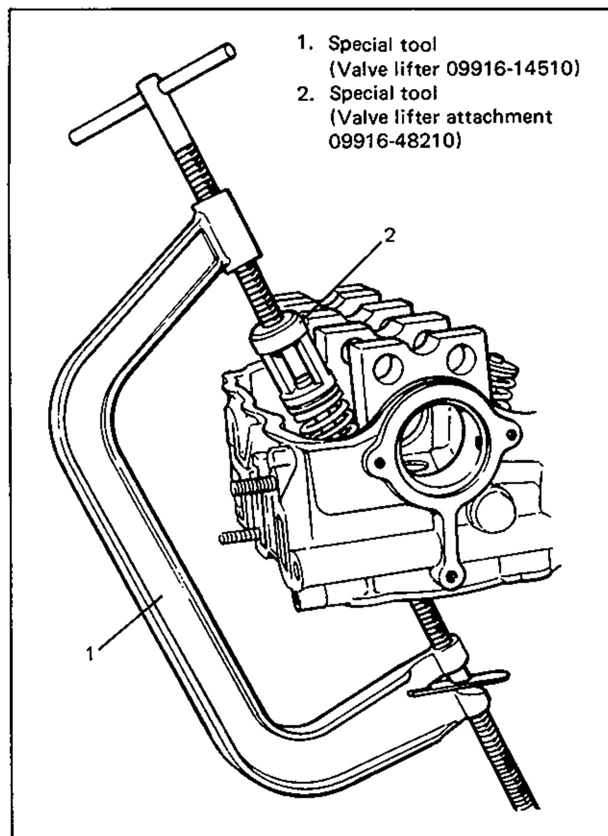


Fig. 6A-81 Special Tool (Valve Lifter) Installation

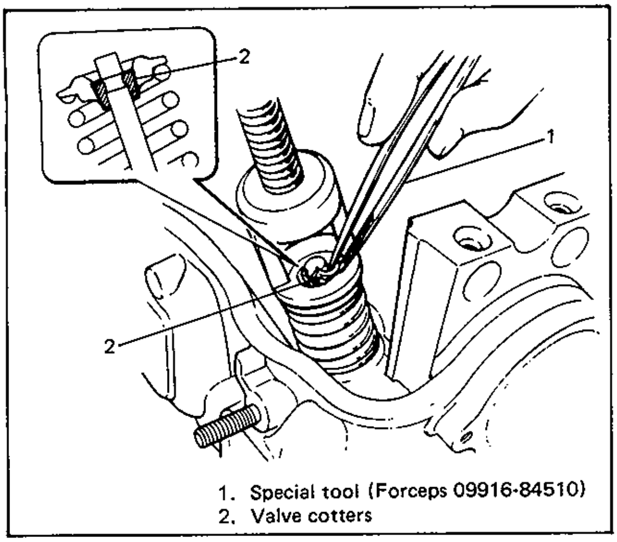


Fig. 6A-82 Valve Cotters Removal

5. Release valve lifter, and remove spring retainer and valve spring.
6. Remove valve from combustion chamber side.
7. Remove valve stem oil seal from valve guide, and then valve spring seat.

NOTE:
Do not reuse oil seal once disassembled. Be sure to use new oil seal when assembling.

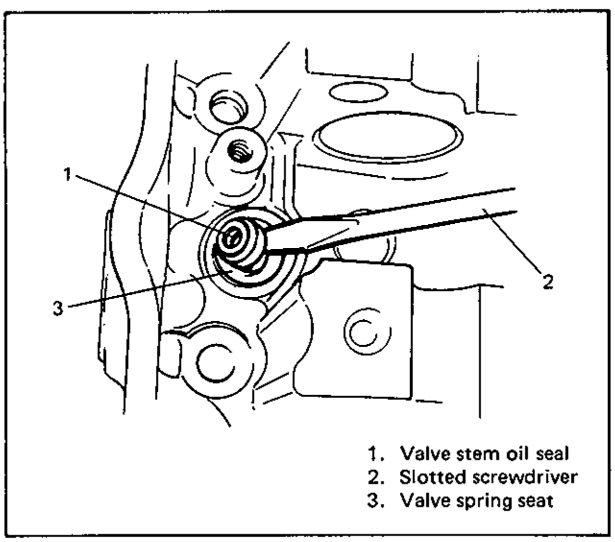


Fig. 6A-83 Valve Stem Oil Seal Removal

8. Using special tool (Valve guide remover), drive valve guide out from combustion chamber side to valve spring side.

NOTE:
Do not reuse valve guide once disassembled. Be sure to use new valve guide (Oversize) when assembling.

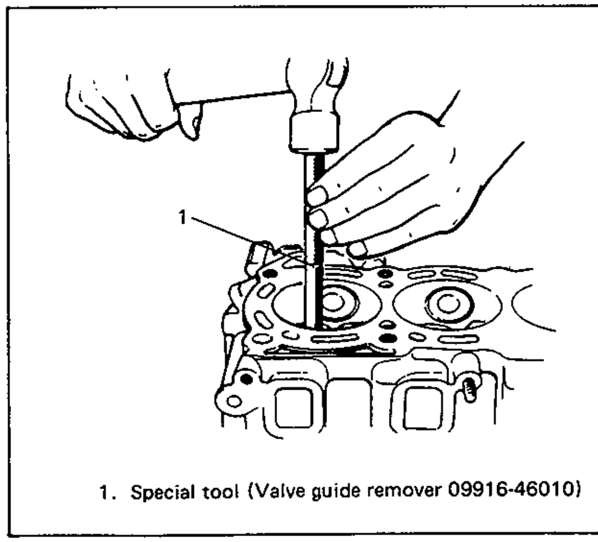


Fig. 6A-84 Valve Guide Removal

9. Place disassembled parts except valve stem seal and valve guide in order, so that they can be installed in their original positions.

INSPECT

Camshaft

Cam wear:
Using micrometer, measure height of cam. If measured height is below its limits, replace camshaft.

Cam height	Standard	Limit
Intake cam	37.536 mm (1.4763 in.)	37.400 mm (1.4724 in.)
Exhaust cam	37.501 mm (1.4763 in.)	37.400 mm (1.4724 in.)

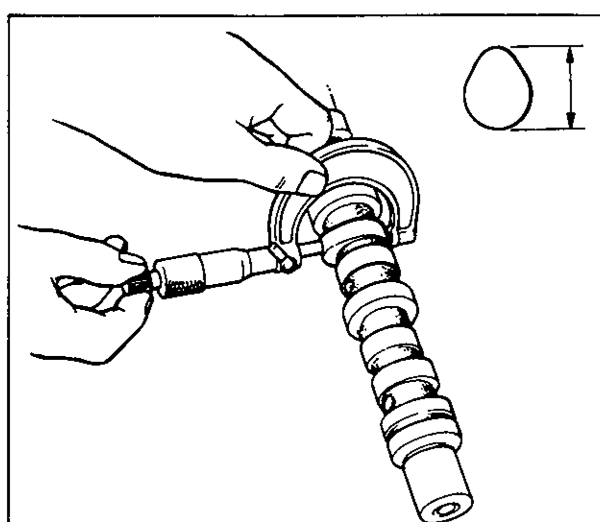


Fig. 6A-85 Measuring Cam Height

Camshaft runout:
Hold camshaft between two "V" blocks, and measure runout by using a dial gauge.
If measured runout exceeds its limit, replace camshaft.

Runout limit	0.10 mm (0.0039 in.)

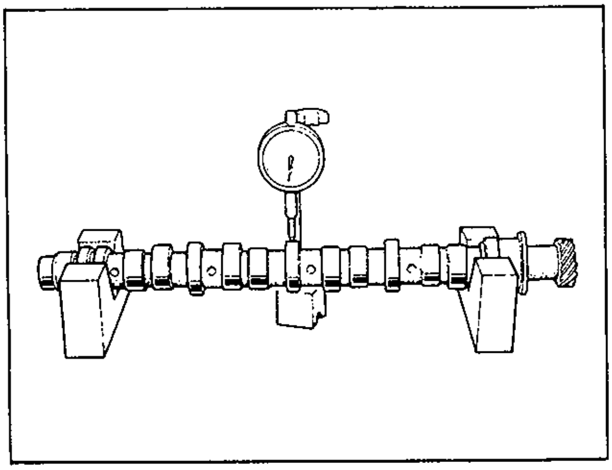


Fig. 6A-86 Camshaft Runout Measurement

Camshaft journal wear:
Measure journal diameter at four places to obtain four readings on each journal (Fig. 6A-87), and measure journal bores in cylinder head with bore gauge, producing four readings on each (Fig. 6A-88).
Subtract journal diameter measurement from journal bore measurement to determine journal clearance.
If journal clearance exceeds its limit, replace camshaft, and as necessary, cylinder head, too.

Item	Standard	Limit
Journal clearance	0.050 – 0.091 mm (0.0020 – 0.0036 in.)	0.15 mm (0.0059 in.)

	Camshaft journal dia.	Journal bore dia.
Ⓐ	44.125 – 44.150 mm (1.7372 – 1.7381 in.)	44.200 – 44.216 mm (1.7402 – 1.7407 in.)
Ⓑ	44.325 – 44.350 mm (1.7451 – 1.7460 in.)	44.400 – 44.416 mm (1.7480 – 1.7486 in.)
Ⓒ	44.525 – 44.550 mm (1.7530 – 1.7539 in.)	44.600 – 44.616 mm (1.7560 – 1.7565 in.)
Ⓓ	44.725 – 44.750 mm (1.7609 – 1.7618 in.)	44.800 – 44.816 mm (1.7638 – 1.7644 in.)
Ⓔ	44.925 – 44.950 mm (1.7687 – 1.7697 in.)	45.000 – 45.016 mm (1.7716 – 1.7723 in.)

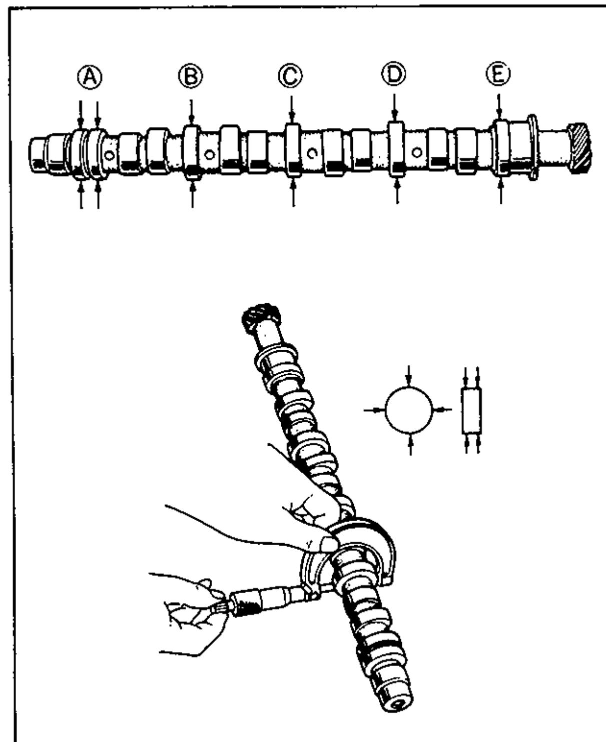


Fig. 6A-87 Camshaft Journal Dia. Measurement

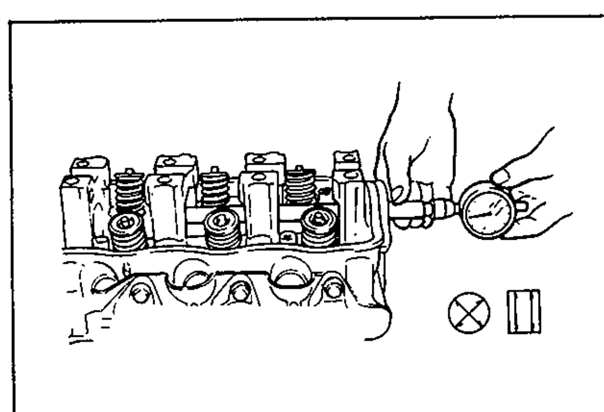


Fig. 6A-88 Journal Bore Dia. Measurement

Valve Guides

Using a micrometer and bore gauge, take diameter readings on valve stems and guides to determine stem clearance in guide. Be sure to take a reading at more than one place along length of each stem and guide.

Item		Standard	Limit
Valve stem diameter	In	6.965 – 6.980 mm (0.2742 – 0.2748 in.)	———
	Ex	6.950 – 6.965 mm (0.2737 – 0.2742 in.)	———
Valve guide I.D.	In	7.000 – 7.015 mm (0.2756 – 0.2761 in.)	———
	Ex	7.000 – 7.015 mm (0.2756 – 0.2761 in.)	———
Stem-to-guide clearance	In	0.020 – 0.050 mm (0.0008 – 0.0019 in.)	0.07 mm (0.0027 in.)
	Ex	0.035 – 0.065 mm (0.0014 – 0.0025 in.)	0.09 mm (0.0035 in.)

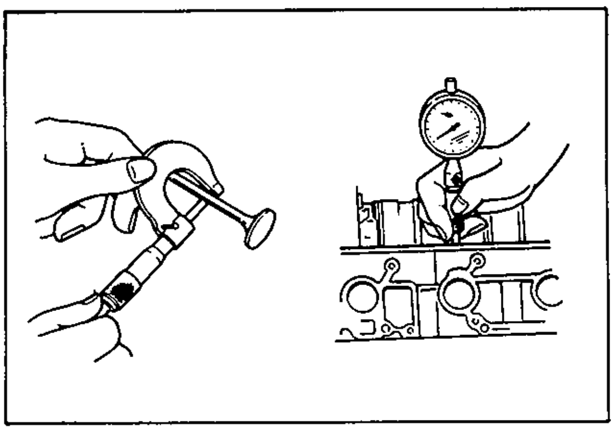


Fig. 6A-89 Valve Stem Dia. and Valve Guide I.D. Measurement

If bore gauge is not available, check end deflection of valve stem in place with dial gauge rigged. Move stem end in directions ① and ② to measure end deflection.

If deflection exceeds its limit, replace valve stem and valve guide.

Valve stem end deflection limit	In	0.14 mm (0.005 in.)
	Ex	0.18 mm (0.007 in.)

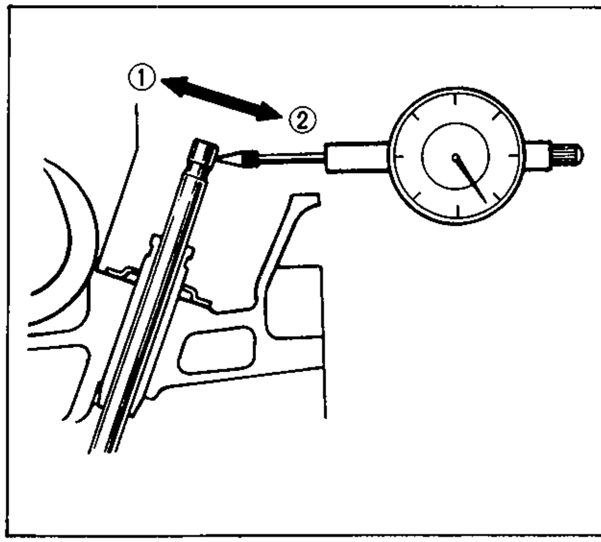


Fig. 6A-90 Valve Stem End Deflection Measurement

Valves

- Remove all carbon from valves.
- Inspect each valve for wear, burn or distortion at its face and stem and, as necessary, replace it.
- Measure thickness of valve head. If limit given to this thickness is exceeded, valve must be replaced.

Valve head thickness		
Standard	Limit	
1.0 mm (0.039 in.)	In	0.6 mm (0.023 in.)
	Ex	0.7 mm (0.027 in.)

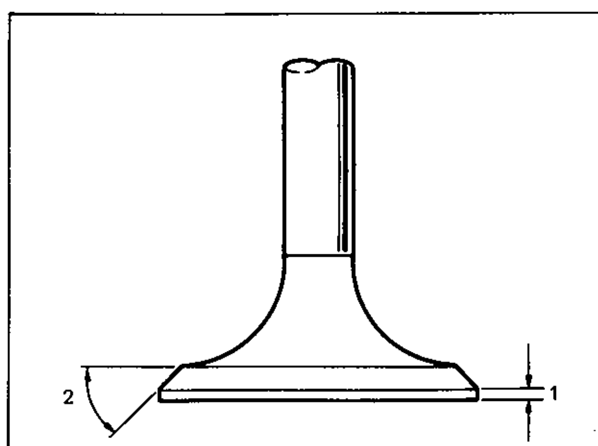


Fig. 6A-91 Valve Head Thickness

- Check end face of each valve stem for wear. This face meets rocker arm intermittently in operation, and might become concaved or otherwise irregular. As necessary, smoothen end face with oil stone and, if this grinding removes end stock by as much as 0.5 mm (0.0196 in.) (as measured from original face), replace valve.

Limit on stock allowance of valve stem end face	0.5 mm (0.019 in.)

- Check each valve for radial runout with dial gauge and "V" block. To check runout, rotate valve slowly. If runout exceeds its limit, replace valve.

Limit on valve head radial runout	0.08 mm (0.003 in.)

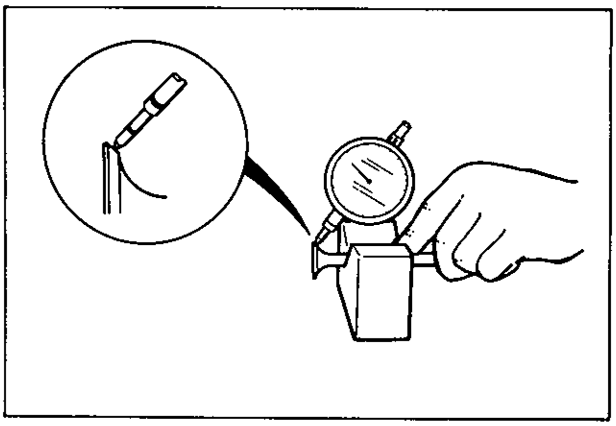


Fig. 6A-92 Radial Runout Measurement

- Seating contact width:
  Create contact pattern on each valve in the usual manner, i.e., by giving uniform coat of marking compound to valve seat and by rotatingly tapping seat with valve head. Valve lapper (tool used in valve lapping) must be used.

  Pattern produced on seating face of valve must be a continuous ring without any break, and width of pattern must be within specified range.

Standard seating width revealed by contact pattern on valve face	In	1.3 – 1.5 mm (0.0512 – 0.0590 in.)
	Ex	

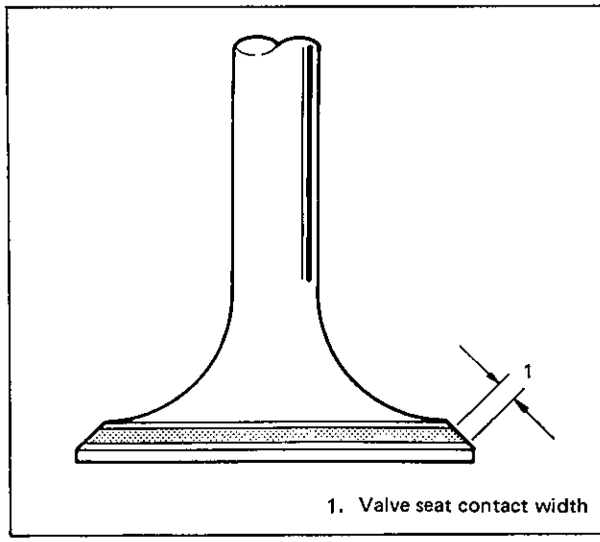


Fig. 6A-93 Valve Seating Contact Width

- Valve seat repair:
  Valve seat not producing a uniform contact with its valve or showing width of seating contact that is out of specified range must be repaired by regrinding or by cutting and regrinding and finished by lapping.

  1. EXHAUST & INTAKE VALVE SEAT:
     Use valve seat cutters to make three cuts in the order illustrated in Fig. 6A-95. Three cutters must be used: the first for making 15° angle, the second for making 60° angle and the last for making 45° seat angle. The third cut must be made to produce desired seat width.

Seat width for exhaust and intake valve seat	1.3 – 1.5 mm (0.0512 – 0.0590 in.)

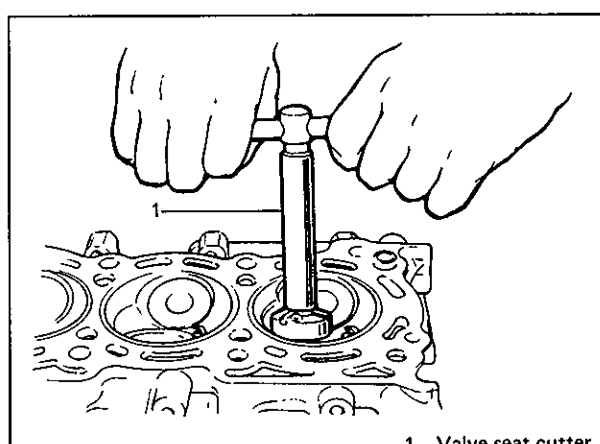


Fig. 6A-94 Valve Seat Cutting

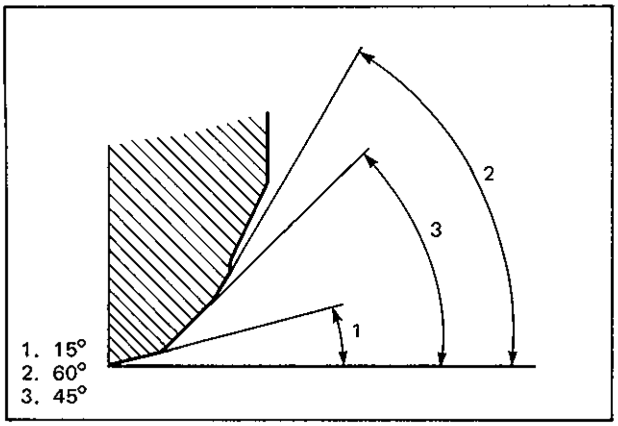


Fig. 6A-95 Valve Seat Angles for Exhaust and Intake Valves

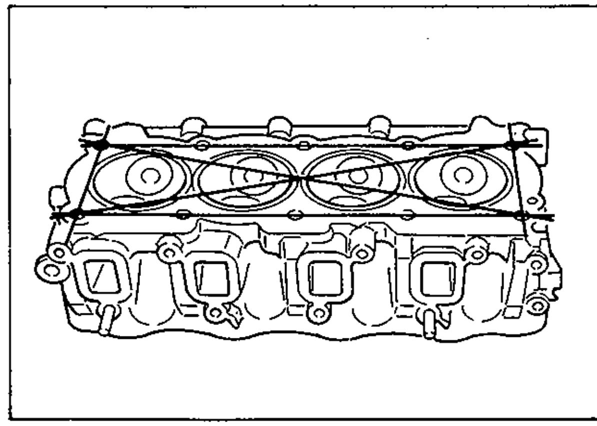


Fig. 6A-96 Locations for Measurement of Distortion

2. VALVE LAPPING: Lap valve on seat in two steps, first with coarse-size lapping compound applied to face and the secondly with fine-size compound, each time using valve lapper according to usual lapping method.

Cylinder Head

- Remove all carbon from combustion chambers.

NOTE:

Do not use any sharp-edged tool to scrape off carbon. Be careful not to scuff or nick metal surfaces when decarboning. This applies to valves and valve seats, too.

- Check cylinder head for cracks in its intake and exhaust ports, combustion chambers, and head surface.
- Flatness of gasketed surface:
  Using straightedge and thickness gauge, check flatness at a total of 6 locations. If limit, given below, is exceeded, correct gasketed surface with surface plate and abrasive paper of about # 400: place abrasive paper on and over surface plate, and rub gasketed surface against it to grind off high spots. Should this fail to reduce thickness gauge readings to within limit, replace cylinder head. (Waterproof silicon carbide abrasive paper).
  Leakage of combustion gases from this gasketed joint is often due to warped gasketed surface; such leakage results in reduced power output.

Limit of distortion	0.05 mm (0.002 in,)

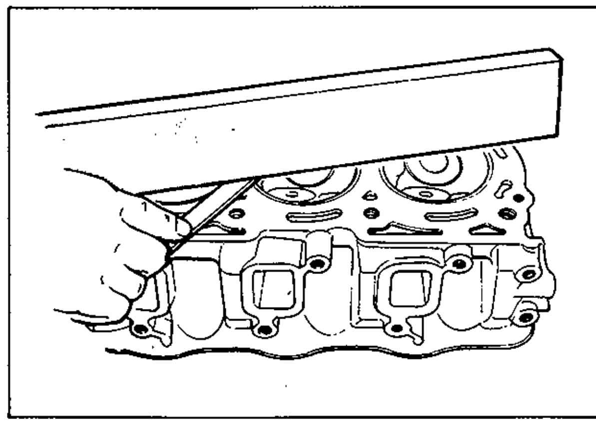


Fig. 6A-97 Surface Measurement

- Distortion of manifold seating faces:
  Check seating faces of cylinder head for manifolds, using straightedge and thickness gauge, in order to determine whether these faces should be corrected or cylinder head should be replaced.

Limit of distortion	0.10 mm (0.004 in.)

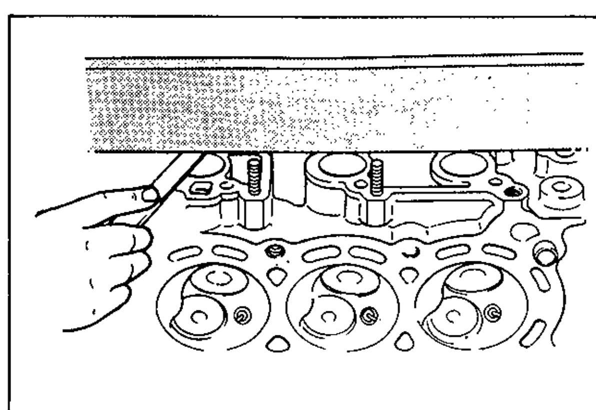


Fig. 6A-98 Measuring Surface of Intake Manifold Seating Face

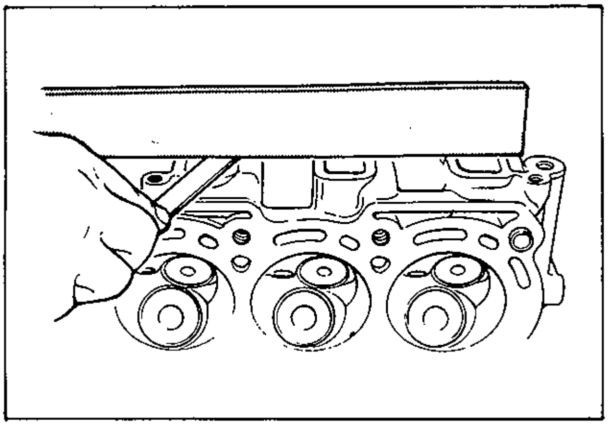


Fig. 6A-99 Measuring Surface of Exhaust Manifold Seating Face

Valve Springs

- Referring to reference data given below, check to be sure that each spring is in sound condition, free from any evidence of breakage or weakening. Remember, weakened valve springs can cause chatter, not to mention possibility of reducing power output due to gas leakage caused by decreased seating pressure.

Item	Standard	Limit
Valve spring free length	50.46 mm (1.9866 in.)	48.50 mm (1.9094 in.)
Valve spring preload	24.8 – 29.2 kg for 41.5 mm (54.7 – 64.3 lb/1.63 in.)	22.8 kg for 41.5 mm 50.2 lb/ 1.63 in.)

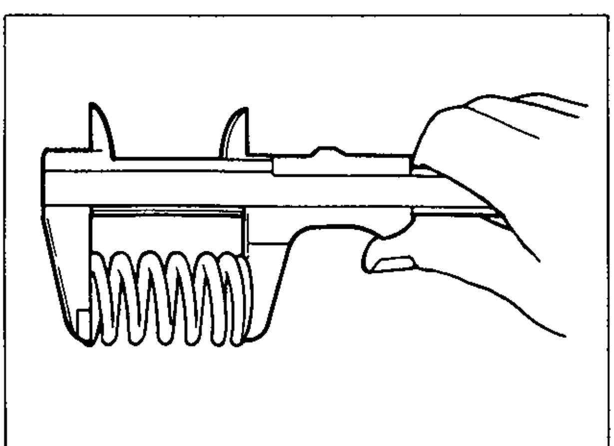


Fig. 6A-100 Measuring Free Length of Spring

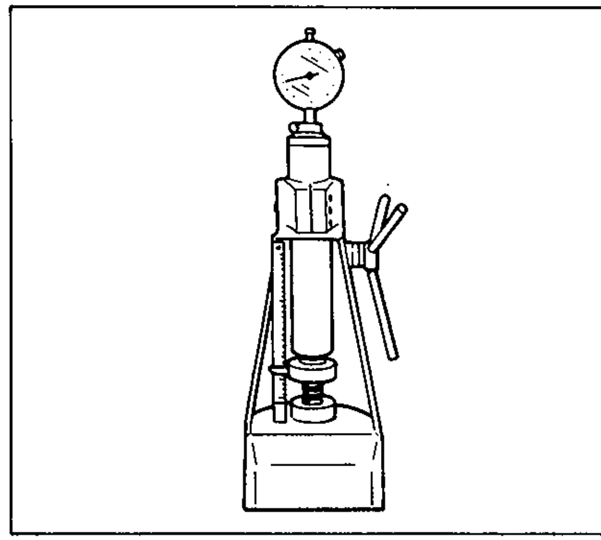


Fig. 6A-101 Measuring Spring Preload

- Spring squareness:
  Use a square and surface plate to check each spring for squareness in terms of clearance between end of valve spring and square as shown below. Valve spring found to exhibit a larger clearance than limit must be replaced.

Valve spring squareness limit	2.0 mm (0.079 in.)

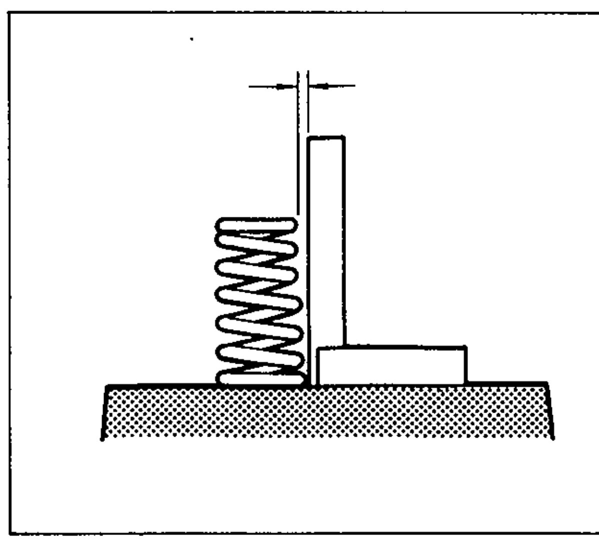
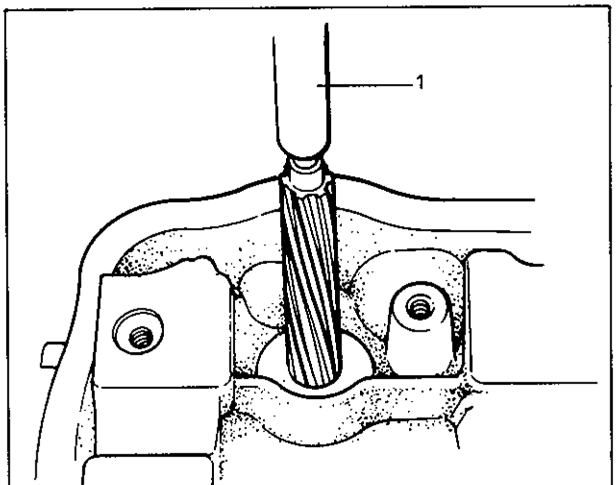


Fig. 6A-102 Measuring Spring Squareness

ASSEMBLE

1. Before installing valve guide into cylinder head, ream guide hole with special tool (12 mm reamer) to remove burrs and make it truly round.



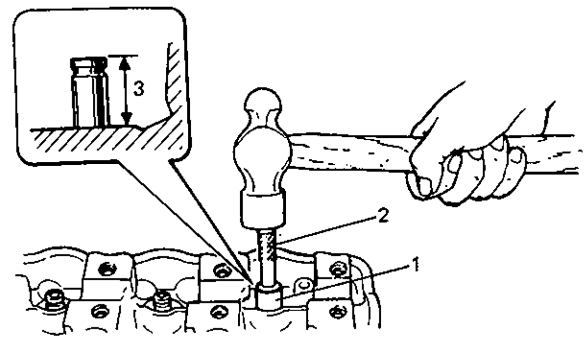
1. Special tool (12 mm reamer 09916-37310)

Fig. 6A-103 Reaming Guide Hole

2. Valve guide to cylinder head.
   Heat cylinder head uniformly at temperature of 80° to 100°C (176° to 212°F) so that head will not be distorted, and drive new valve guide into hole with special tools. Refer to Fig. 6A-104.
   Drive in new valve guide until special tool (Valve guide installer) contacts cylinder head.
   After installing, make sure that valve guide protrudes by 14 mm from cylinder head (Fig. 6A-104).

NOTE:
- **Do not reuse valve guide once disassembled. Install new valve guide (Oversize).**
- **Intake and exhaust valve guides are identical.**

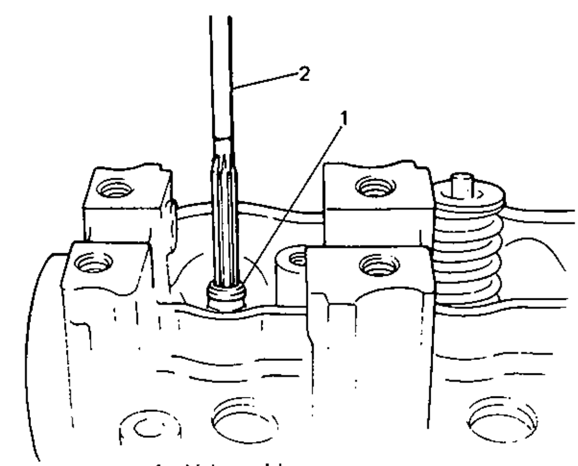
Valve guide oversize	0.03 mm (0.0012 in.)
Valve guide protrusion (In and Ex)	14 mm (0.55 in.)



1. Special tool (Valve guide installer attachment 09917-88210)
2. Special tool (Valve guide installer handle 09916-57321)
3. Valve guide protrusion (14 mm)

Fig. 6A-104 Valve Guide Installation

3. Ream valve guide bore with special tool (7 mm reamer).
   Clean bore after reaming.



1. Valve guide
2. Special tool (7 mm reamer 09916-34520)

Fig. 6A-105 Reaming Valve Guide Bore

4. Valve spring seat to cylinder head.
5. New valve stem seal to valve guide.
   After applying engine oil to seal and spindle of special tool (valve stem seal installer), fit oil seal to spindle, and then install seal to valve guide by pushing special tool by hand.
   After installing, check to be sure that seal is properly fixed to valve guide.

NOTE:

- **Do not reuse oil seal once disassembled. Be sure to install new oil seal.**
- **When installing, never tap or hit special tool with a hammer or else. Install seal to guide only by pushing special tool with hand. Tapping or hitting special tool may cause damage to seal.**

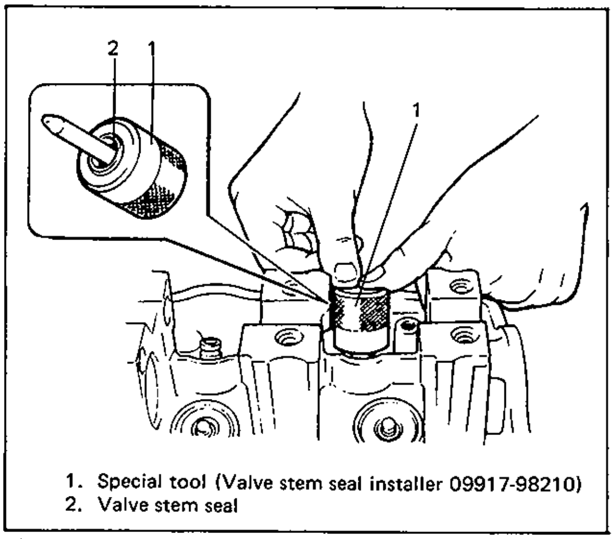


Fig. 6A-106 Valve Stem Seal Installation

6. Valve to valve guide.
   Before installing valve to valve guide, apply engine oil to stem seal, valve guide bore, and valve stem.

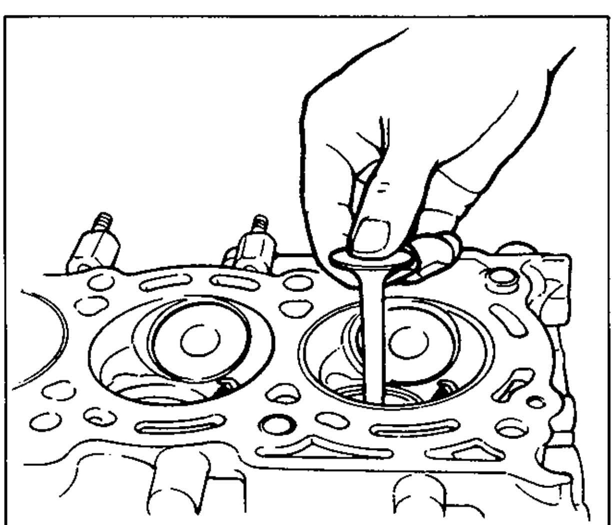


Fig. 6A-107 Valve Installation

7. Valve spring and spring retainer.
   Each valve spring has top end (large-pitch end) and bottom end (small-pitch end). Be sure to position spring in place so that its bottom end (small-pitch end) comes to the bottom (Valve spring seat side).

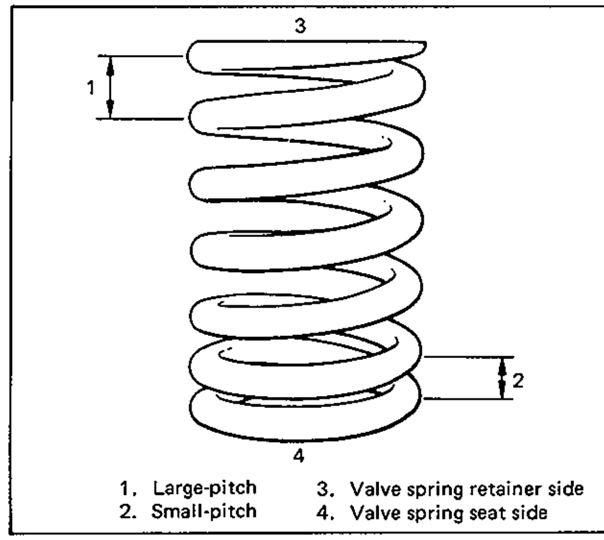


Fig. 6A-108 Valve Spring Installation

8. Using special tool (Valve lifter), compress valve spring and fit two valve cotters to groove provided in valve stem.

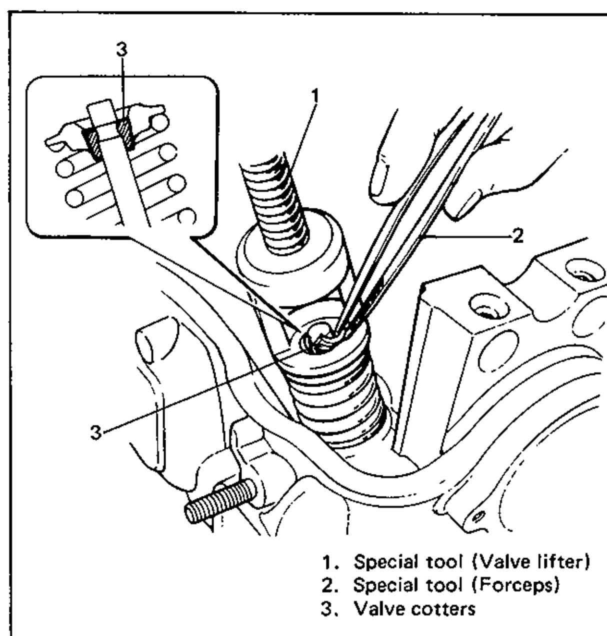


Fig. 6A-109 Valve Cotter Installation

9. Apply engine oil to cams and journals on camshaft, and oil seal on cylinder head.
10. Camshaft to cylinder head from transmission case side.

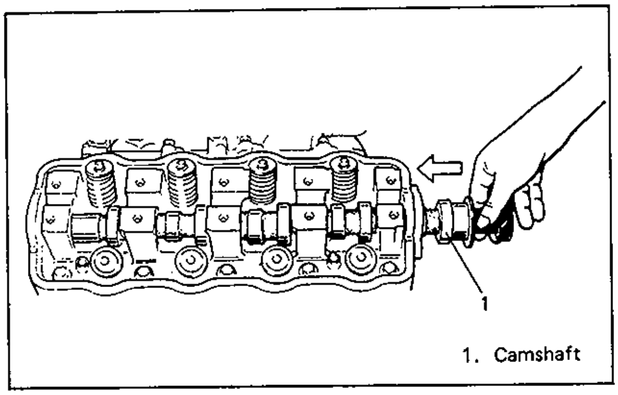


Fig. 6A-110 Camshaft Installation

11. Rocker arm shafts, rocker arms, rocker arm springs, timing belt inside cover and camshaft timing belt pulley as previously outlined.
12. Exhaust manifold, intake manifold and distributor gear case as previously outlined.

INSTALL OR CONNECT

1. Cylinder head gasket:
   Install new head gasket as shown in Fig. 6A-111, that is, "TOP" mark provided on gasket comes to crankshaft pulley side, facing up (toward cylinder head side).

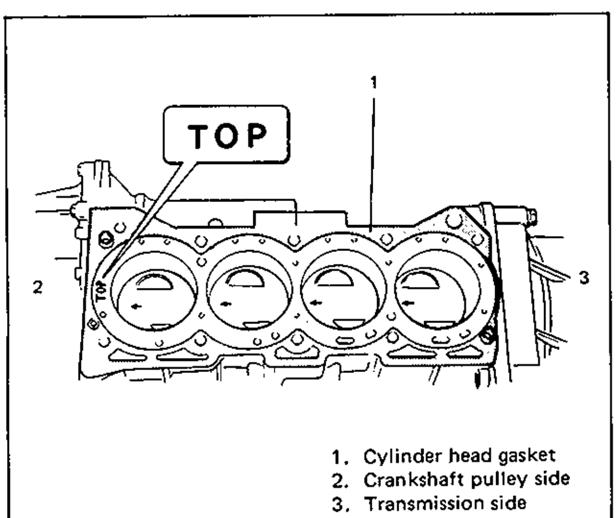


Fig. 6A-111 Cylinder Head Gasket Installation

2. Cylinder head:
   After applying engine oil to cylinder head bolts, tighten them gradually with torque wrench, following sequence in Fig. 6A-112. Finally tighten bolts to specified torque.

Tightening torque for cylinder head bolts	N·m	kg-m	lb-ft
	70 – 75	7.0 – 7.5	51.0 – 54.0

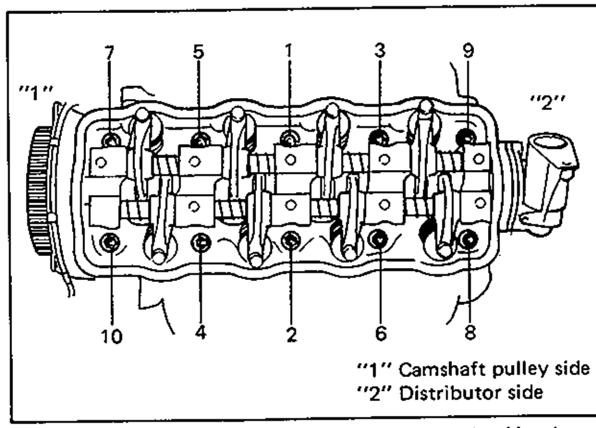


Fig. 6A-112 Tightening Sequence of Cylinder Head Bolts

3. Reverse removal procedures for installation of remainder.
   For timing belt installation, refer to item "TIMING BELT AND BELT TENSIONER" in Section 6A.
   For distributor installation, refer to Section 6F (Carburetor model) or 6F1 (Fuel Injection model).
4. Adjust water pump drive belt tension. Refer to Section 6B for adjusting procedure.
5. Adjust air conditioner compressor drive belt tension (if equipped). Refer to Section 0B for belt tension.
6. Adjust intake and exhaust valve lashes as previously outlined.
7. Cylinder head cover and air cleaner case as previously outlined.
8. Adjust accelerator cable play and A/T kicidown cable (for A/T vehicle) according to procedure described in Section 6E. (Fuel Injection model).
9. Adjust accelerator and choke (manual choke type) cable plays. Refer to Section 6D. (Carburetor model)
10. Refill cooling system, referring to Section 6B.
11. Negative cable at battery.

12. Adjust ignition timing. Refer to Section 6F (Carburetor model) 6F1 (Fuel Injection model) for adjustment.
13. Upon completion of installation, verify that there is no fuel leakage, water leakage and exhaust gas leakage at each connection.
14. If air conditioner is equipped, charge refrigerant.

PISTONS, PISTON RINGS, CONNECTING RODS AND CYLINDERS

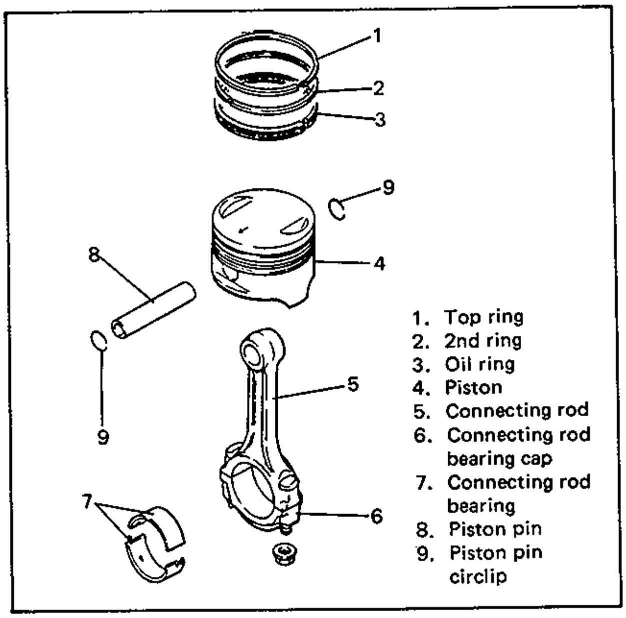


Fig. 6A-113 Piston, Connecting Rod, etc.

REMOVE OR DISCONNECT

1. Cylinder head from cylinder block as previously outlined.
2. Drain engine oil.
3. Oil pan and oil pump strainer as previously outlined.
4. Mark cylinder number on all pistons, connecting rods and rod bearing caps, using silver pencil or quick drying paint.
5. Rod bearing caps.
6. Install guide hose over threads of rod bolts. This is to prevent damage to bearing journal and rod bolt threads when removing connecting rod.

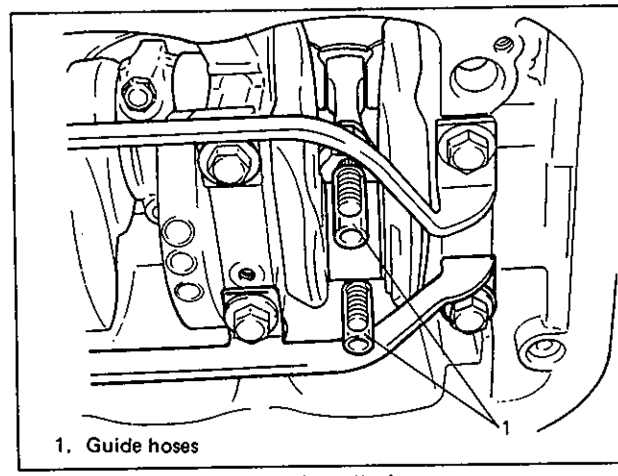


Fig. 6A-114 Guide Hoses Installation

7. Decarbon top of cylinder bore, before removing piston from cylinder.
8. Push piston and connecting rod assembly out through the top of cylinder bore.

DISASSEMBLE

1. Using piston ring expander, remove two compression rings (Top and 2nd) and oil ring from piston.
2. Piston pin from connecting rod.
   - Ease out piston pin circlips, as shown.

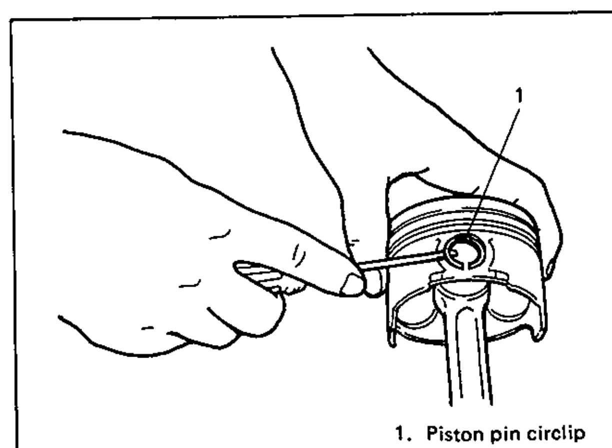


Fig. 6A-115 Removing Piston Pin Circlips

- Force piston pin out.

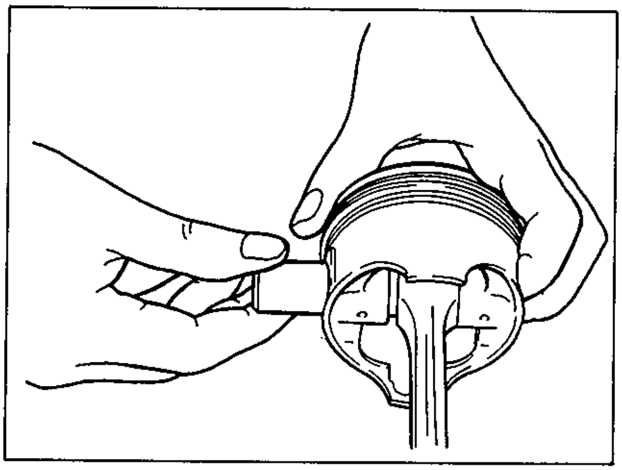


Fig. 6A-116 Removing Piston Pin

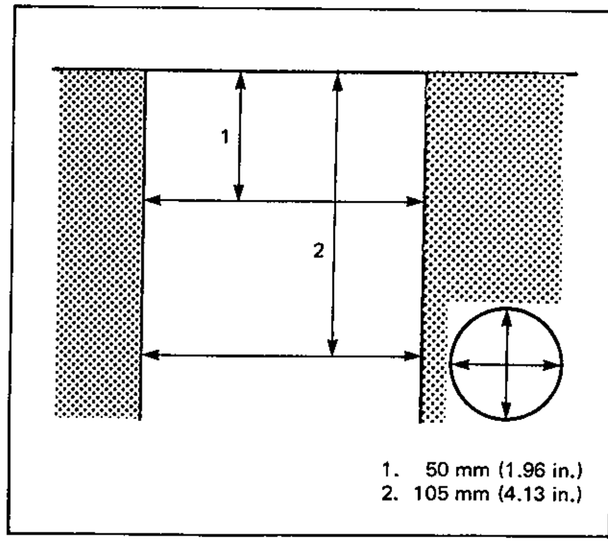


Fig. 6A-117 Position to be Measured

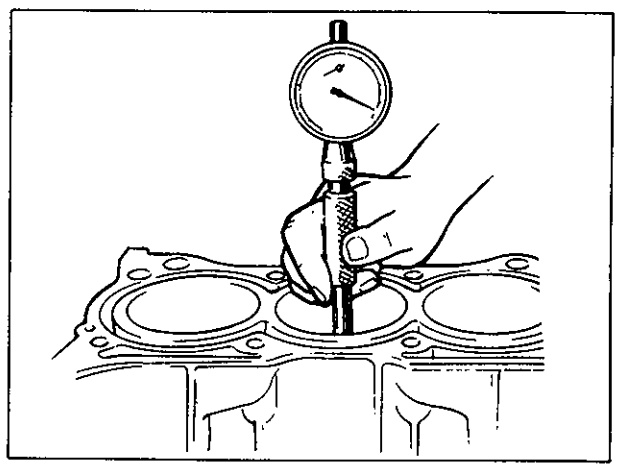


Fig. 6A-118 Measuring Cylinder Bore with Cylinder Gauge

CLEAN
Clean carbon from piston head and ring grooves, using a suitable tool.

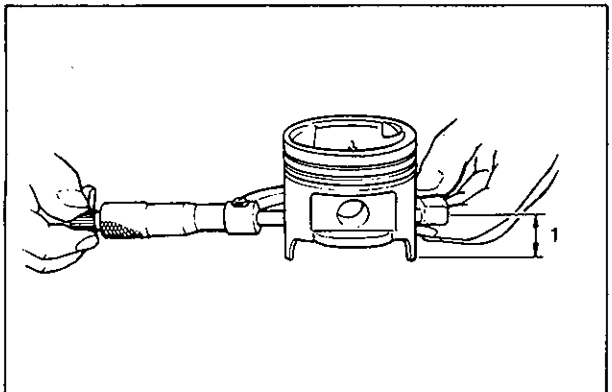
INSPECT
Cylinders
- Inspect cylinder walls for scratches, roughness, or ridges which indicate excessive wear. If cylinder bore is very rough or deeply scratched, or ridged, rebore cylinder and use oversize piston.
- Using a cylinder gauge, measure cylinder bore in thrust and axial directions at two positions as shown in Fig. 6A-117.
  If any of following conditions apply, rebore cylinder.
  1. Cylinder bore dia. exceeds the limit.
  2. Difference of measurements at two positions exceeds taper limit.
  3. Difference between thrust and axial measurements exceeds out-of-round limit.

Cylinder bore dia. limit	75.15 mm (2.9586 in.)
Taper and out-of-round limit	0.10 mm (0.0039 in.)

NOTE:
If any one of four cylinders has to be rebored, rebore all four to the same next oversize. This is necessary for the sake of uniformity and balance.

Pistons
- Inspect piston for faults, cracks or other damage. Damaged or faulty piston should be replaced.
- Piston diameter:
  As indicated in Fig. 6A-119, piston diameter should be measured at such position 16 mm (0.63 in.), 15 mm (0.59 in) (Piston with 4 recess) from piston skirt end in the direction perpendicular to piston pin.

Piston diameter	Standard	74.970 – 74.990 mm (2.9516 – 2.9524 in.)
	Oversize: 0.25 mm (0.0098 in.)	75.220 – 75.230 mm (2.9614 – 2.9618 in.)
	0.50 mm (0.0196 in.)	75.470 – 75.480 mm (2.9713 – 2.9716 in.)



1. 16 mm (0.63 in.), 15 mm (0.59 in.) (Piston with 4 recess)

Fig. 6A-119 Measuring Piston Diameter with Micrometer

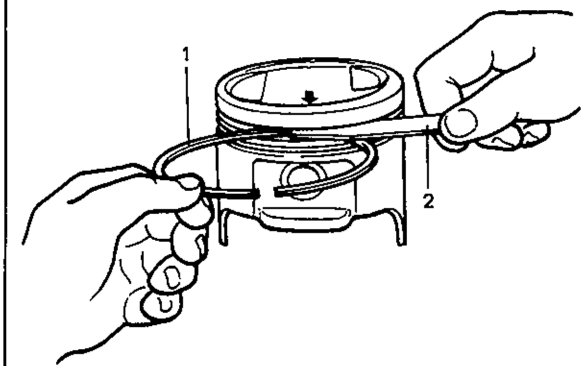
- Piston clearance:
  I o calculate piston clearance, measure cylinder bore diameter and piston diameter. Piston clearance is difference between cylinder bore diameter and piston diameter. It should be within specification given below.
  If it is out of specification, rebore cylinder and use oversize piston.

Piston clearance	0.02 – 0.04 mm (0.0008 – 0.0015 in.)

NOTE:
Cylinder bore diameters measured in thrust direction at two positions as shown in Fig. 6A-117 should be used for calculation of piston clearance.

- Ring groove clearance:
  Before checking, piston grooves must be clean, dry and free of carbon.
  Fit new piston ring into piston groove, and measure clearance between ring and ring land by using thickness gauge.
  If clearnace is out of specification, replace piston.

Ring groove clearance	Top	0.03 – 0.07 mm (0.0012 – 0.0027 in.)
	2nd	0.02 – 0.06 mm (0.0008 – 0.0023 in.)



1. Piston ring
2. Thickness gauge

Fig. 6A-120 Measuring Ring Groove Clearance

Piston Pin

- Piston pin must be fitted into piston bore with easy finger push at normal room temperature.
- Check piston pin, connecting rod small end bore and piston bore for wear or damage, paying particular attention to condition of small end bore bush. If pin, connecting rod small end bore or piston bore is badly worn or damaged, replace pin, connecting rod or piston.
- Piston pin clearance:
  Check piston pin clearance in small end. Replace connecting rod if its small end is badly worn or damaged or if clearance checked exceeds the limit.

Item	Standard	Limit
Pin clearance in small end	0.003 – 0.016 mm (0.0001 – 0.0006 in.)	0.05 mm (0.0020 in.)

Small-end bore	19.003 – 19.011 mm (0.7481 – 0.7484 in.)
Piston pin dia.	18.995 – 19.000 mm (0.7478 – 0.7480 in.)

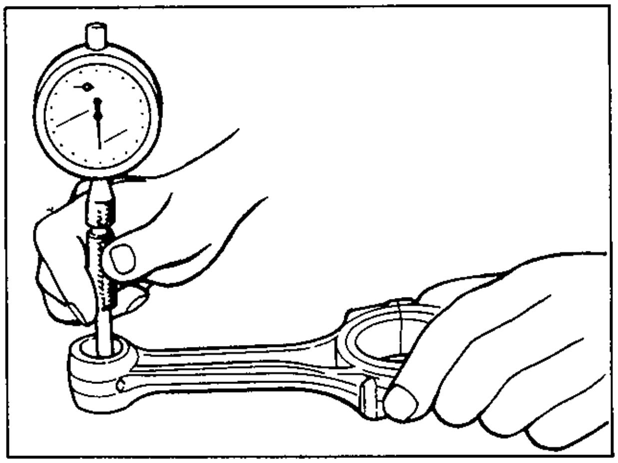


Fig. 6A-120-1 Measuring Small End Bore

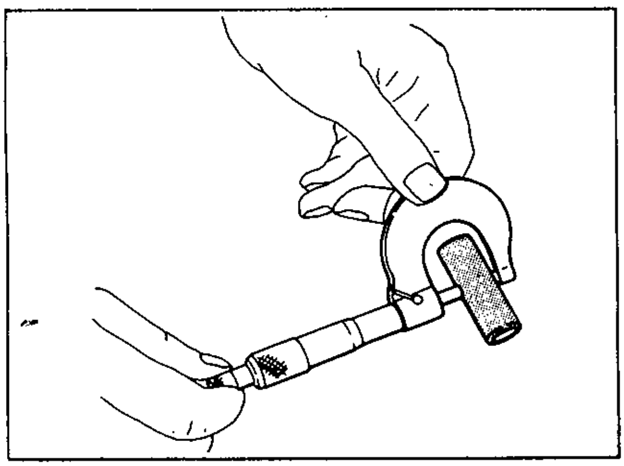


Fig. 6A-120-2 Measuring Piston Pin Diameter

- Check piston pin and piston bore for wear or damage. If pin or piston bore is badly worn or damaged, replace pin or piston, or both.

Piston Rings

To measure end gap, insert piston ring into cylinder bore, locating it at the lowest part of bore and holding it true and square; then use feeler gauge to measure gap.
If measured gap is out of specification, replace ring.

NOTE:
Decarbon and clean top of cylinder bore before inserting piston ring.

Item		Standard	Limit
Piston ring end gap	Top ring	0.20 – 0.35 mm (0.0079 – 0.0137 in.)	0.7 mm (0.0275 in.)
	2nd ring	0.20 – 0.35 mm (0.0079 – 0.0137 in.)	0.7 mm (0.0275 in.)
	Oil ring	0.20 – 0.70 mm (0.0079 – 0.0275 in.)	1.8 mm (0.0708 in.)

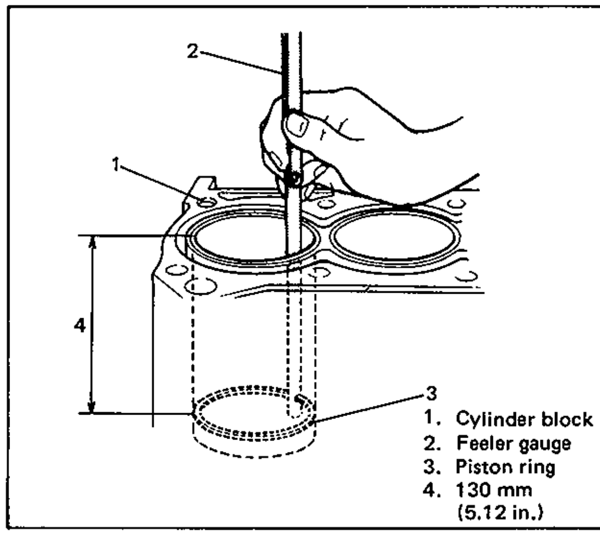


Fig. 6A-121 Measuring Piston Ring End Gap

Connecting Rod

- Big-eng side clearance:
  Check big end of connecting rod for side clearance, with rod fitted and connected to its crank pin in the normal manner. If measured clearance is found to exceed its limit, replace connecting rod.

Item	Standard	Limit
Big-end side clearance	0.10 – 0.20 mm (0.0039 – 0.0078 in.)	0.35 mm (0.0137 in.)

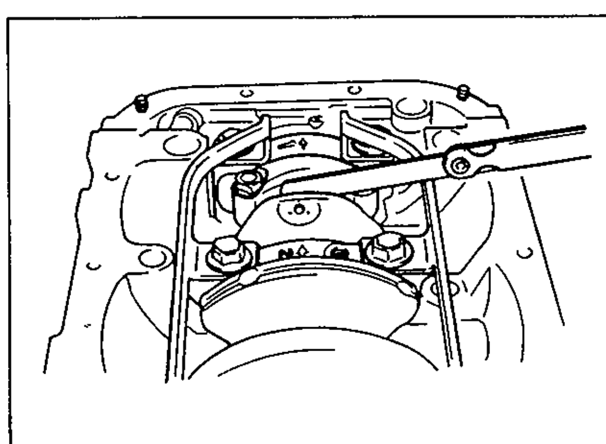


Fig. 6A-122 Measuring Side Clearance

- Connecting rod alignment:
  Mount connecting rod on aligner to check it for bow and twist and, if limit is exceeded, replace it.

Limit on bow	0.05 mm (0.0020 in.)
Limit on twist	0.10 mm (0.0039 in.)

Crank Pin and Connecting Rod Bearings

- Inspect crank pin for uneven wear or damage. Measure crank pin for out-of-round or taper with a micrometer. If crank pin is damaged, or out-of-round or taper is out of limit, replace crankshaft or regrind crank pin to undersize and use undersize bearing.

Connecting rod bearing size	Crank pin diameter
Standard	43.982 – 44.000 mm (1.7316 – 1.7323 in.)
0.25 mm (0.0098 in) undersize	43.732 – 43.750 mm (1.7217 – 1.7224 in.)

Out-of-round and taper limit	0.01 mm (0.0004 in.)

- Rod bearing:
  Inspect bearing shells for signs of fusion, pitting, burn or flaking and observe contact pattern. Bearing shells found in defective condition must be replaced.
  Two kinds of rod bearing are available; standard size bearing and 0.25 mm undersize bearing. To distinguish them, 0.25 mm undersize bearing has stamped number (US025) on its backside as indicated in Fig. 6A-123, but standard size one has no number.

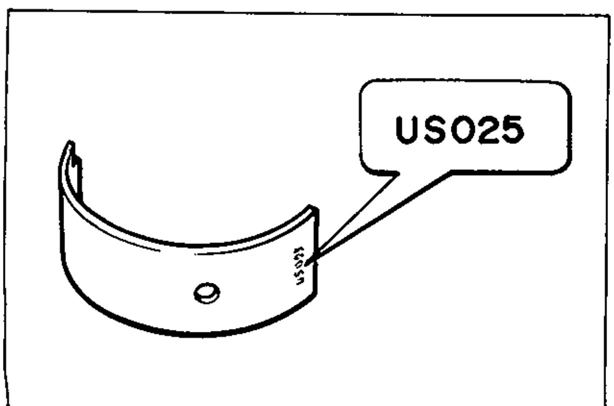


Fig. 6A-123 0.25 mm Undersize Bearing

- Rod bearing clearance:
  1. Before checking bearing clearance, clean bearing and crank pin.
  2. Install bearing in connecting rod and bearing cap.
  3. Place a piece of gaging plastic to full width of crankpin (parallel to crankshaft), avoiding oil hole.
  4. Install rod bearing cap to connecting rod. When installing cap, be sure to point arrow mark on cap to crankshaft pulley side, as shown in Fig. 6A-124. After applying engine oil to rod bolts, tighten cap nuts to specified torque. DO NOT turn crankshaft with gaging plastic installed.

Tightening torque for rod bearing cap nut	N·m	kg-m	lb-ft
	33 – 37	3.3 – 3.7	24.0 – 26.5

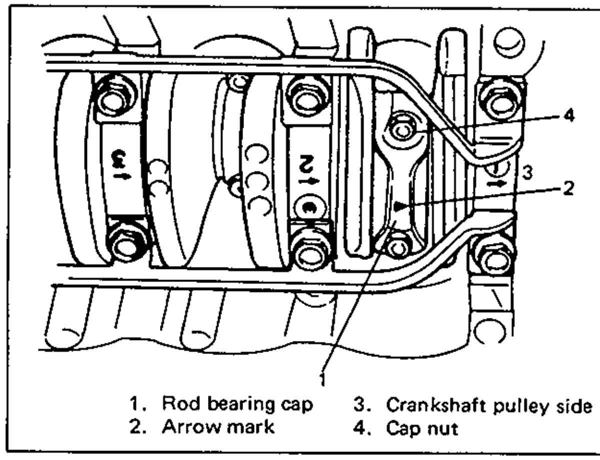


Fig. 6A-124 Installing Bearing Cap

  5. Remove cap and using a scale on gaging plastic envelope, measure gaging plastic width at the widest point (clearance).
     If clearance exceeds its limit, use new standard size bearing and remeasure clearance.

Item	Standard	Limit
Bearing clearance	0.020 – 0.050 mm (0.0008 – 0.0019 in.)	0.080 mm (0.0031 in.)

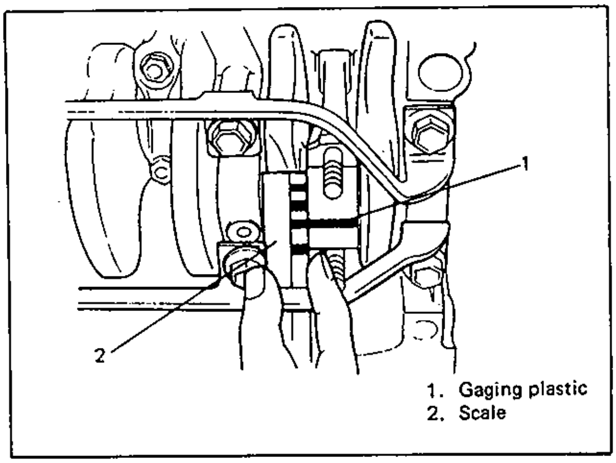


Fig. 6A-125 Measuring Rod Bearing Clearance

6. If clearance can not be brought to within its limit even by using new standard size bearing, regrind crankpin to undersize and use 0.25 mm undersize bearing.

ASSEMBLE

NOTE:

Two sizes of piston are available as standard size spare part so as to ensure proper piston-to-cylinder clearance. When installing standard size piston, meke sure to match piston with cylinder as follows.

a) Each piston has stamped number 1 or 2 as shown. It represents outer diameter of piston.

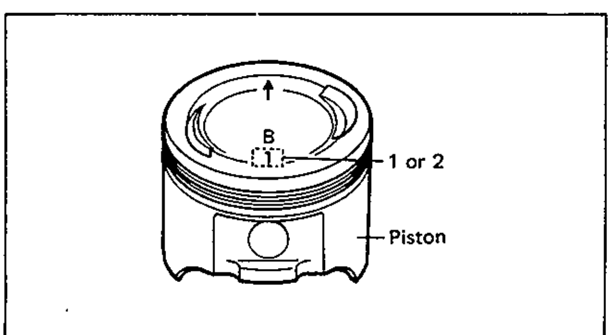


Fig. 6A-126 Piston Identification

b) There are also stamped numbers of 1 and 2 on cylinder block as shown below. The first number indicates inner diameter of No. 1 cylinder, the second number of No. 2 cylinder, the third number of No. 3 cylinder and the fourth number of No. 4 cylinder.

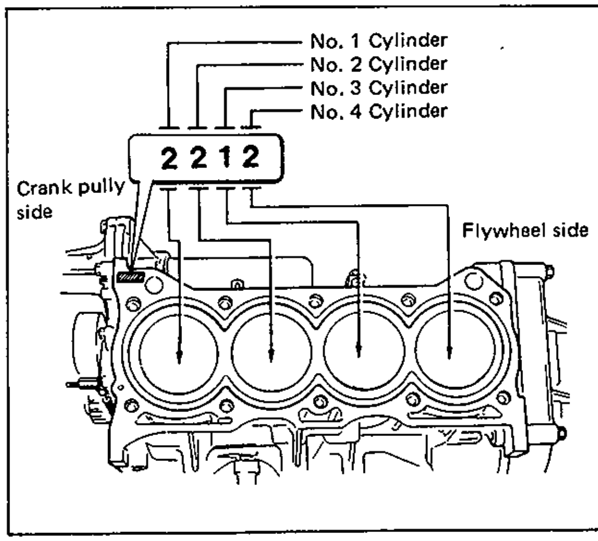


Fig. 6A-127 Cylinder Identification

c) Stamped number on piston and that on cylinder block should correspond. That is, install a number 2 stamped piston to cylinder which is identified with number 2 and a number 1 piston for cylinder with number 1.

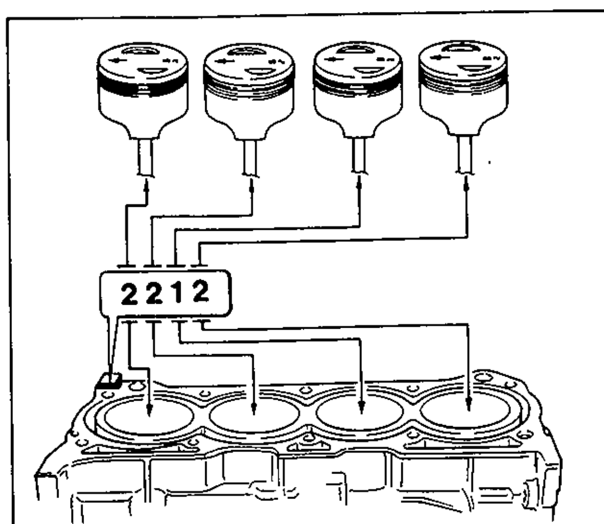


Fig. 6A-128 Piston to Cylinder Orientation

Piston		Cylinder		Piston-to-Cylinder Clearance
Number at the top (mark)	Outside diameter	Number (mark)	Bore diameter	
1	74.98–74.99 mm (2.9520–2.9524 in.)	1	75.01–75.02 mm (2.9531–2.9535 in.)	0.02–0.04 mm (0.0008–0.0015 in.)
2	74.97–74.98 mm (2.9516–2.9520 in.)	2	75.00–75.01 mm (2.9528–2.9531 in.)	0.02–0.04 mm (0.0008–0.0015 in.)

Also, a letter A, B or C is stamped on piston head but ordinarily it is not necessary to discriminate each piston by this letter.

1. Piston pin to piston and connecting rod:
   After applying engine oil to piston pin and piston pin holes in piston and connecting rod, fit connecting rod to piston as indicated in below figure and insert piston pin to piston and connecting rod, and install piston pin circlip.

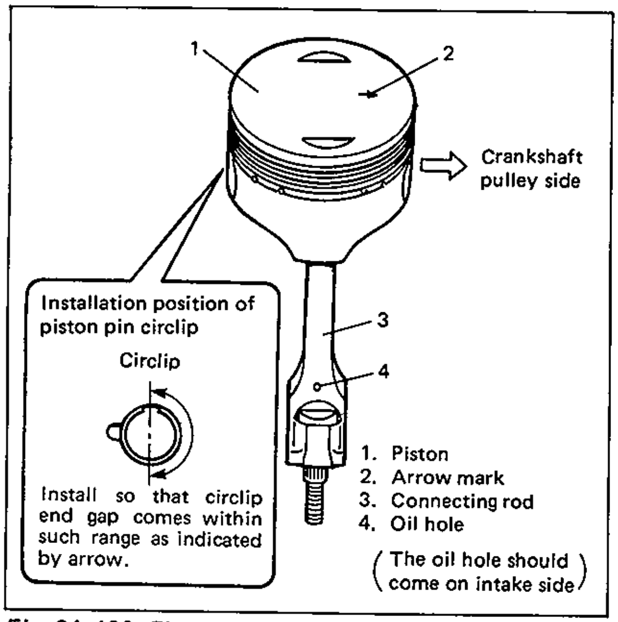


Fig. 6A-129 Fitting Connecting Rod to Piston

2. Piston rings to piston:
- As indicated in Fig. 6A-130, 1st and 2nd rings have "R," "RN" or "T" mark. When installing these piston rings to piston, direct marked side of each ring toward top of piston.
- 1st ring differs from 2nd ring in thickness, shape and color of surface contacting cylinder wall.
  Distinguish 1st ring from 2nd ring by referring to Fig. 6A-130.
- When installing oil ring, install spacer first and then two rails.

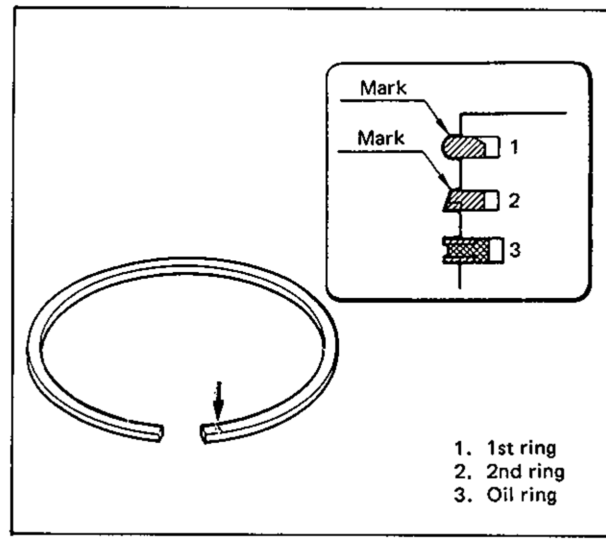


Fig. 6A-130 Piston Rings Installation

4. After installing three rings (1st, 2nd and oil rings), distribute their end gaps as indicated in Fig. 6A-131.

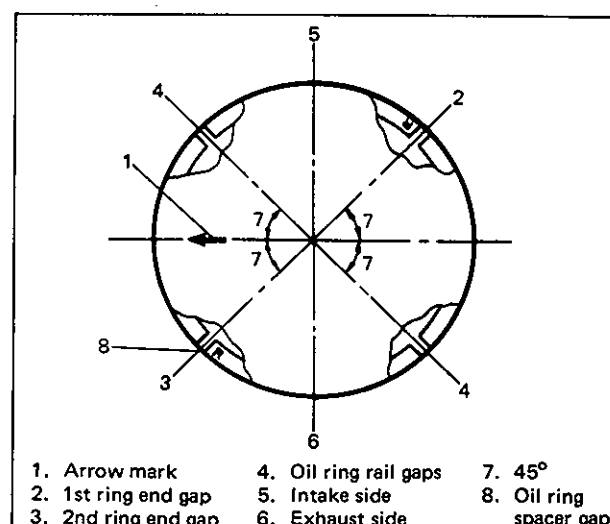


Fig. 6A-131 Piston Ring End Gaps Positions

INSTALL OR CONNECT

1. Apply engine oil to pistons, rings, cylinder walls, connecting rod bearings and crankpins.
2. Guide hoses over connecting rod bolts. These guide hoses protect crankpin and threads of rod bolt from damage during installation of connecting rod and piston assembly. Refer to Fig. 6A-114 for installation of guide hoses.
3. When installing piston and connecting rod assembly into cylinder bore, point arrow mark on piston head to crankshaft pulley side.

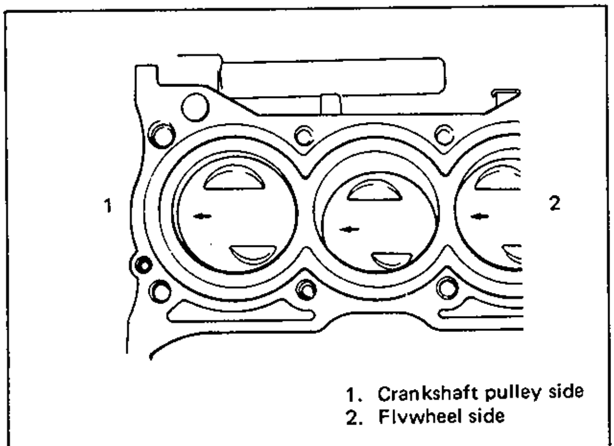


Fig. 6A-132 Direction of Arrow Mark on Piston Head

4. Piston and connecting rod assembly into cylinder bore. Use special tool (Piston ring compressor) to compress rings. Guide connecting rod into place on crankshaft. Using hammer handle, tap piston head to install piston into bore. Hold ring compressor firmly against cylinder block until all piston rings have entered cylinder bore.

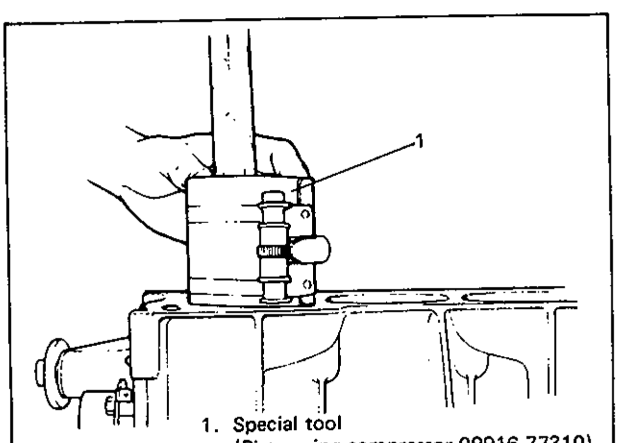


Fig. 6A-133 Installing Piston to Cylinder

5. Bearing cap: When installing cap to rod, point arrow mark on cap to crankshaft pulley side. Tighten cap nuts to specification.

Tightening torque for rod bearing cap nuts	N·m	kg-m	lb-ft
	33 – 37	3.3 – 3.7	24.0 – 26.5

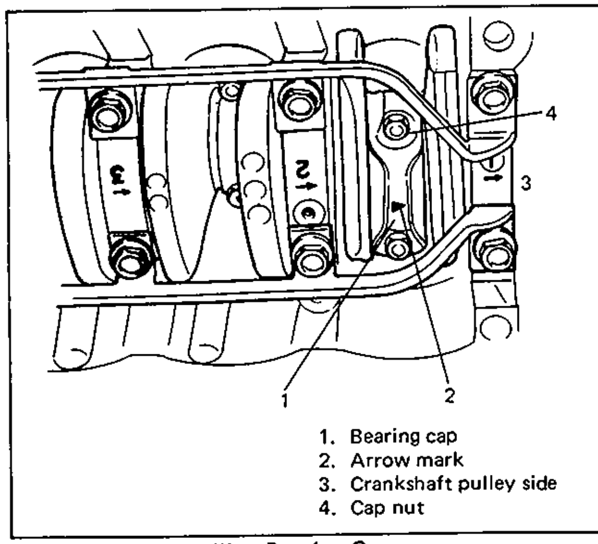


Fig. 6A-134 Installing Bearing Cap

6. Reverse removal procedures for installation of remainder. For timing belt installation, refer to item "TIMING BELT AND BELT TENSIONER" in Section 6A. For oil pan installation, refer to item "OIL PAN AND OIL PUMP STRAINER" in Section 6A.
7. Adjust water pump drive belt tension. Refer to Section 6B for adjusting procedure.
8. Adjust air conditioner compressor drive belt tension (if equipped). Refer to Section 0B for belt tension.
9. Adjust intake and exhaust valve lashes as previously outlined.
10. Cylinder head cover and air cleaner case as previously outlined.
11. Adjust accelerator cable play and A/T kick-down cable for A/T vehicle) according to procedure described in Section 6E. (Fuel Injection model), Section 6D. (Carburetor model).
12. Adjust accelerator and choke (manual choke type) cable plays. Refer to Section 6D. (Carburetor model)

13. Refill engine with engine oil, referring to item "ENGINE OIL CHANGE" in Section 0B.
14. Refill cooling system, referring to Section 6B.
15. Refill front differential housing with gear oil, referring to Section 7E.
16. Negative cable at battery.
17. Check ignition timing and adjust as necessary, referring to item "IGNITION TIMING" in Section 6F.
18. Check again to ensure that all parts once disassembled or disconnected are back in place securely.
19. Upon completion of installation, verify that there is no fuel leakage, water leakage or exhaust gas leakage at each connection.
20. If air conditioner is equipped, charge refrigerant.

UNIT REPAIR OVERHAUL

ENGINE ASSEMBLY

REMOVE OR DISCONNECT

1. Battery cable at battery.
2. Engine hood.
3. Drain cooling system.
4. Radiator reservoir tank, radiator fan shround and radiator. Refer to Section 6B for radiator removal. If vehicle has air conditioner, remove air conditioner condensor.
5. Air cleaner outlet hose. (Fuel Injection model)
6. Air cleaner case. (Carburetor model)
7. Accelerator cable and A/T kick-down cable (A/T vehicle with Fuel Injection model) from throttle body.
8. Choke cable (no choke cable for automatic choke type) from carburetor.
9. Following electric lead wires:
   - EGR VSV wire.
   - Earth wire from intake manifold.
   - Oil pressure gauge wire.
   - Water temperature gauge wire.
   - Throttle opener VSV wire. (Fuel Injection model)
   - Idle up VSV coupler from VSV. (Carburetor model)
   - Fuel cut solenoid wire at coupler. (Carburetor model)
   - Alternator wires.
   - Starter motor wires.
   - Water temperature sensor wire. (Fuel Injection model)
   - Air temperature sensor wire. (Fuel Injection model)
   - Injector, throttle position sensor and idle speed control solenoid valve wires at their couplers. (Fuel Injection model)

   and release above wire harnesss from clamps.
   - Oxygen sensor wire. (Fuel Injection model)
   - Distributor wires at coupler and high-tension cord from ignition coil.
   - Earth wires from distributor gear case.
10. Starter motor.
11. Fuel filler cap to release fuel vapor pressure in fuel tank. After releasing, reinstall cap.
12. Release fuel pressure in fuel feed line by referring to p. 6-3. (Fuel Injection model)
13. Following hoses:
    - Fuel feed pipe from throttle body. (Fuel Injection model)
    - Fuel return hose from fuel pressure regulator. (Fuel Injection model)
    - Fuel feed and return hoses from carburetor. (Carburetor model)
    - Canister purge hose from canister, if equipped.
    - Pressure sensor hose from intake manifold. (Fuel Injection model)
    - Brake booster hose from intake manifold.
    - Float chamber vapor hose from carburetor, if equipped.
    - Vacuum hose for A/T from intake manifold (A/T model).
    - Water inlet hose from water inlet pipe.
    - Heater outlet hose from water inlet pipe.
    - Heater inlet hose from intake manifold.

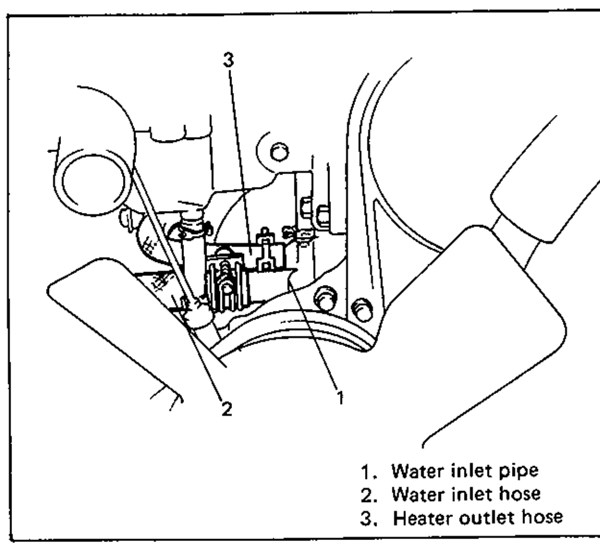


Fig. 6A-135 Disconnecting Water Hoses

14. Raise vehicle.
15. Drain engine oil.
16. Exhaust center pipe from exhaust manifold and muffler.

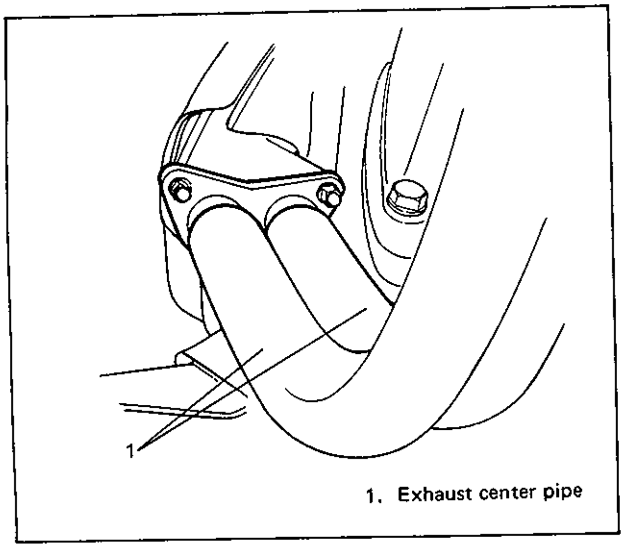


Fig. 6A-136 Exhaust Center Pipe

17. Clutch cable from clutch release arm and bracket (M/T model).

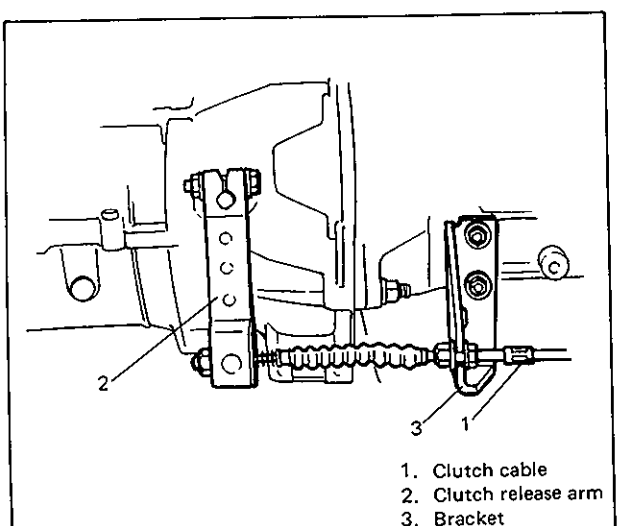


Fig. 6A-137 Clutch Cable

18. A/T fluid hoses from clamps (A/T model).
19. Clutch (torque converter) housing lower plate.
20. Using special tool, lock drive plate (A/T model).
21. Torque converter bolts (A/T model) with locking drive plate.

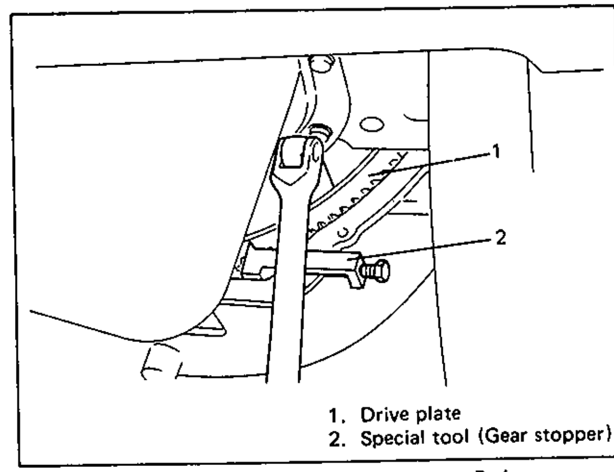


Fig. 6A-138 Removing Torque Converter Bolt (For A/T Vehicle)

22. Lower vehicle.
23. Bolts and nuts fastening cylinder block and transmission.
24. Support transmission.
    For A/T vehicle, don't jack under A/T oil pan to support transmission.
25. Install lifting device.
26. Engine mountings (left & right) with chassis side mounting brackets.
27. Before lifting engine, check to ensure all hoses, electric wires and cables are disconnected from engine.
28. Engine assembly from chassis and transmission by sliding towards the front side, and then, carefully hoist engine assembly.

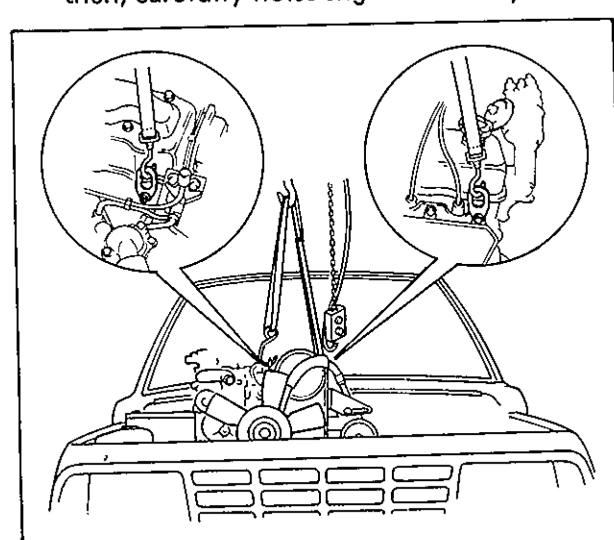
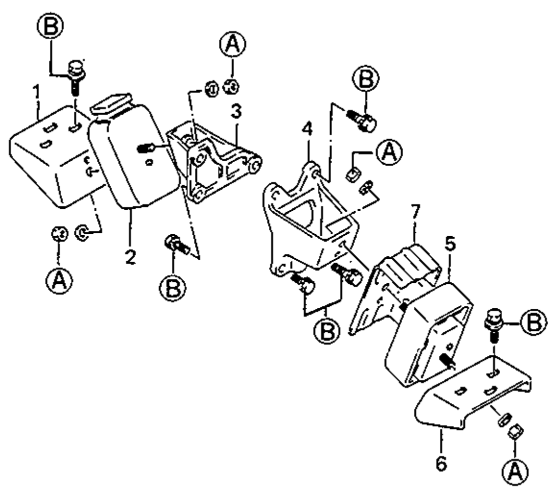


Fig. 6A-139 Hoisting Engine Assembly

INSTALL OR CONNECT

1. Lower engine assembly into engine compartment and connect engine to transmission.
2. Engine mountings (left & right) with chassis side mounting brackets. Tighten mounting nuts and bracket bolts to specified torque.



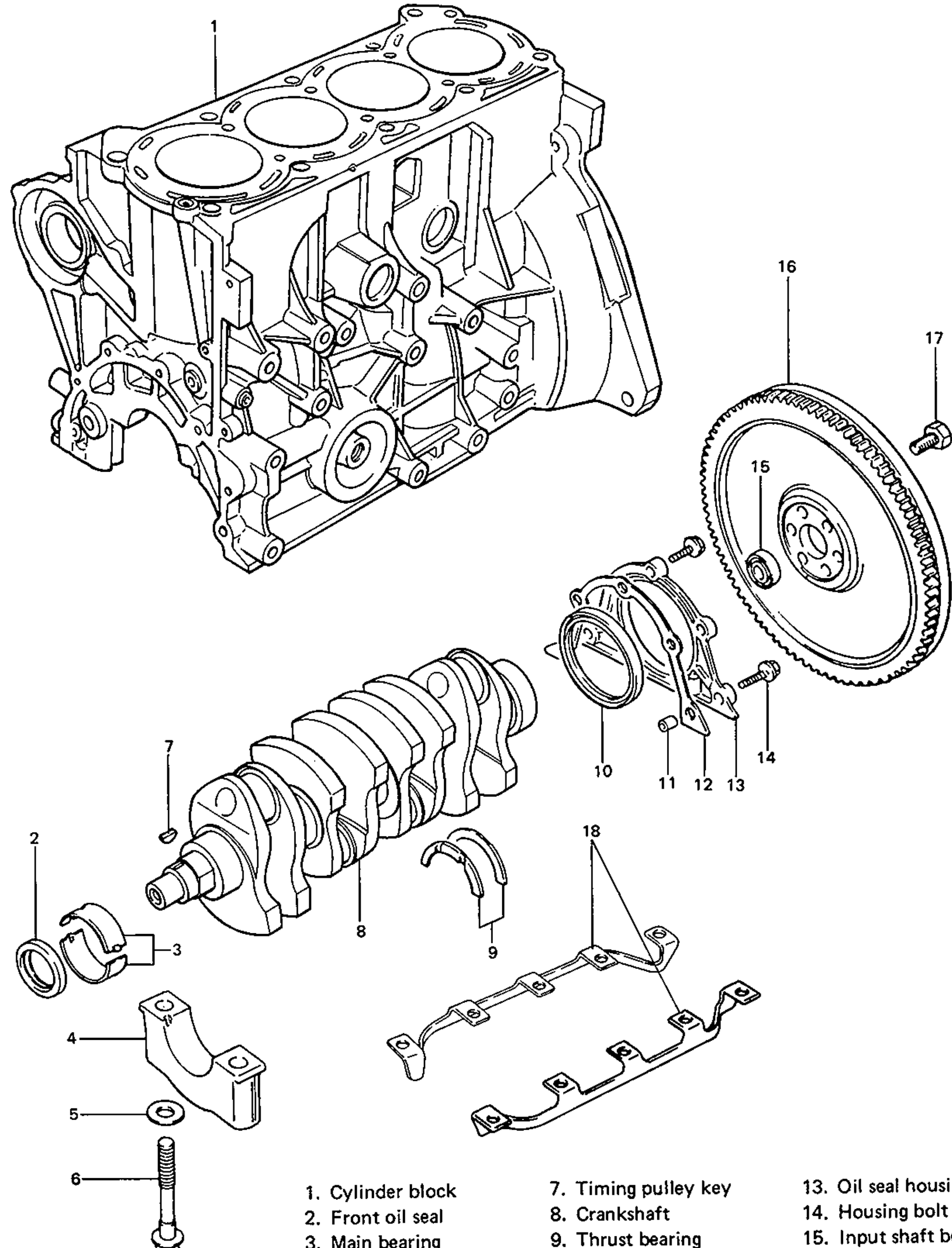
1. Chassis side mounting bracket (Right side)
2. Mounting (Right side)
3. Engine side mounting bracket (Right side)
4. Engine side mounting bracket (Left side)
5. Mounting (Left side)
6. Chassis side mounting bracket (Left side)
7. Front mounting LH cover

Tightening torque:
Ⓐ : 40 – 50 N·m
4.0 – 5.0 kg-m
29.0 – 36.0 lb-ft
Ⓑ : 50 – 60 N·m
5.0 – 6.0 kg-m
36.5 – 43.0 lb-ft

Fig. 6A-140 Engine Mounting

3. Remove lifting device.
4. Tighten torque converter bolts (A/T model) to specification, referrint to torque table on p. 6A-67.
5. Reverse removal procedures for installation of remainder.
6. Adjsut clutch pedal free travel. Refer to Section 7C for adjustment (M/T model).
7. Adjust accelerator cable and kick-down cable according to procedure described in Section 6E. (Fuel Injection model) 6D (Carburetor model)
8. Adjust choke cable (no choke cable for automatic choke type). Refer to Section 6D.
9. Refill engine with engine oil referring to item "ENGINE OIL CHANGE" in Section 0B.
10. Refill cooling system, referring to Section 6B.
11. For A/T vehicle, refill automatic transmission with A/T fluid referring to Section 7B.
12. Check to ensure all fasteners and clamps are tightened.
13. Upon completion of installation, verify that there is no fuel leakage, water leakage or exhaust gas leakage at each connection.
14. If vehicle has air conditioner, charge refrigerant.

MAIN BEARINGS, CRANKSHAFT AND CYLINDER BLOCK



1. Cylinder block
2. Front oil seal
3. Main bearing
4. Bearing cap
5. Cap washer
6. Cap bolt
7. Timing pulley key
8. Crankshaft
9. Thrust bearing
10. Rear oil seal
11. Pin
12. Oil seal housing gasket
13. Oil seal housing
14. Housing bolt
15. Input shaft bearing
16. Flywheel
17. Flywheel bolt
18. Bearing cap stiffener

Fig. 6A-141 Main Bearing, Crankshaft and Cylinder Block

REMOVE OR DISCONNECT

1. Engine assembly from vehicle as previously outlined.
2. Clutch and flywheel (M/T model) or drive plate (A/T model). For clutch removal, refer to Section 7C.
3. Water pump belt, generator bracket, crankshaft pulley, timing belt, crank timing belt pulley, etc..
4. Cylinder head assembly.
5. Oil pan and oil pump strainer.
6. Pistons and connecting rods.
7. Oil pump and oil seal housing.
8. Main bearing caps, bearing cap stiffeners and crankshaft.

INSPECT

Crankshaft

Crankshaft runout

Using dial guage, measure runout at center journal. Rotate crankshaft slowly. If runout exceeds its limit, replace crankshaft.

Limit on runout	0.06 mm (0.0023 in.)

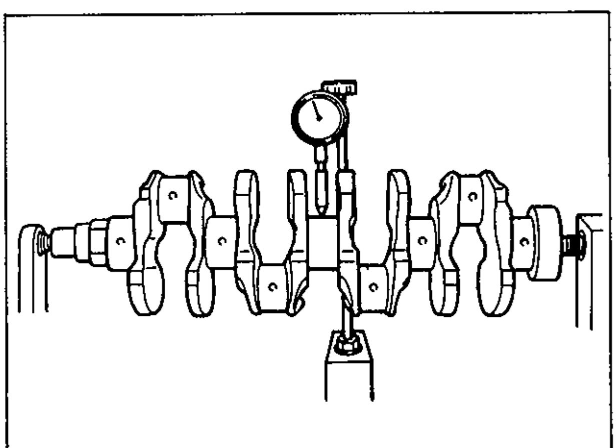


Fig. 6A-142 Measuring Runout

Crankshaft thrust play

Measure this play with crankshaft set in cylinder block in the normal manner, that is, with thrust bearing and journal bearing caps installed. Tighten bearing cap bolts to specified torque.

Use dial gauge to read displacement in axial (thrust) direction of crankshaft.

If its limit is exceeded, replace thrust bearing with new standard one or oversize one to obtain standard thrust play.

Tightening torque for main bearing cap bolts	N·m	kg-m	lb-ft
	50 – 57	5.0 – 5.7	36.5 – 41.0

Item	Standard	Limit
Crankshaft thrust play	0.11 – 0.31 mm (0.0044 – 0.0122 in.)	0.38 mm (0.0149 in.)

Thickness of crankshaft thrust bearing	Standard		2.500 mm (0.0984 in.)
	Oversize:	0.125 mm (0.0049 in.)	2.563 mm (0.1009 in.)

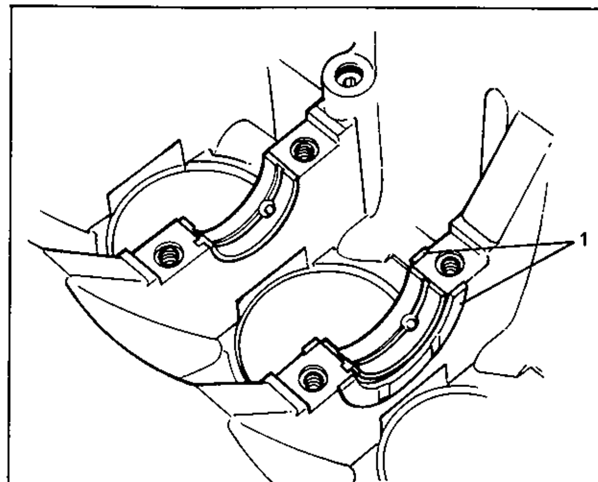


Fig. 6A-143 Thrust Bearings

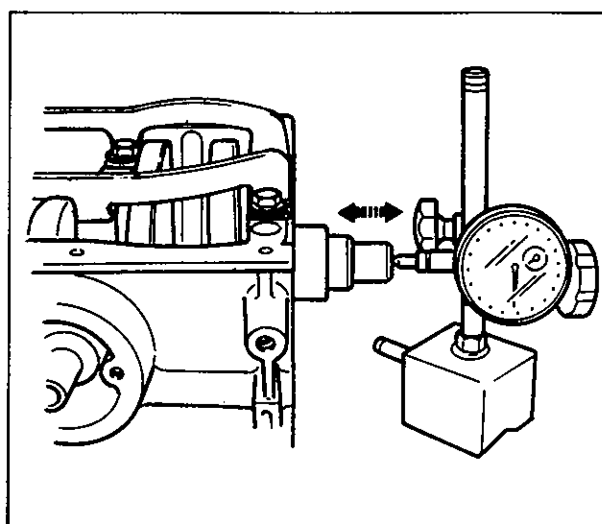


Fig. 6A-144 Measuring Thrust Play of Crankshaft

Out-of-round and taper (uneven wear) of journals
An unevenly worn crankshaft journal shows up as a difference in diameter at a cross section or along its length (or both). This difference, if any, is determined by taking micrometer readings.
If any one of journals is badly damaged or if amount of uneven wear in the sense explained above exceeds its limit, regrind or replace crankshaft.

Limit on out-of-round and taper	0.01 mm (0.0004 in.)

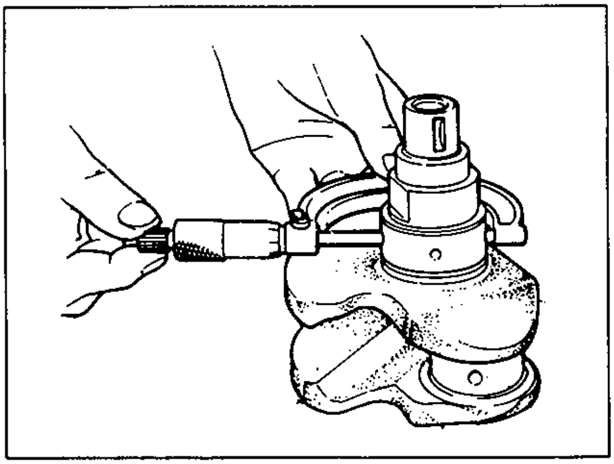


Fig. 6A-145 Checking Uneven Wear

Main Bearings
General information

- Service main bearings are available in standard-size and 0.25 mm (0.0098 in.) undersize, and each of them has 5 kinds of bearings differing in tolerance.
- Upper half of bearing has oil groove as shown in Fig. 6A-146. Install this half with oil groove to cylinder block.

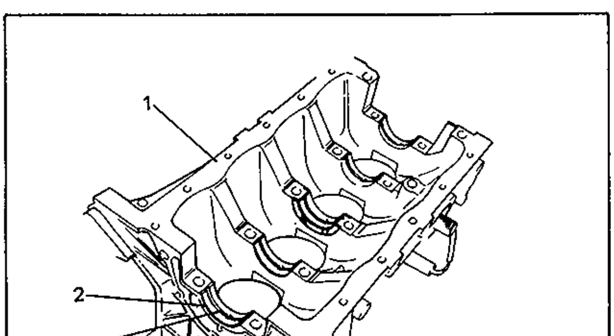


Fig. 6A-146 Upper Half of Bearing Installation

- On each main bearing cap, arrow mark and number are embossed as indicated in Fig. 6A-147.
  When installing each bearing cap to cylinder block, point arrow mark toward crankshaft pulley side and install each cap from that side to flywheel side in ascending order of numbers "1", "2", "3", "4" and "5". Tighten cap bolts to specified torque.

Tightening torque for main bearing cap bolts	N·m	kg-m	lb-ft
	50 – 57	5.0 – 5.7	36.5 – 41.0

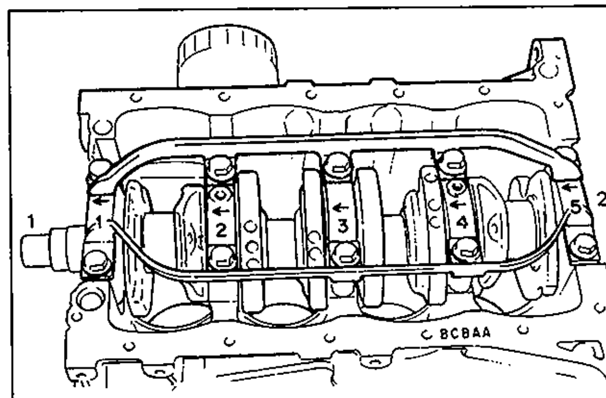


Fig. 6A-147 Bearing Caps Installation

Inspect
Check bearings for pitting, scratches, wear or damage.
If any malcondition is found, replace both upper and lower halves. Never replace one half without replacing the other half.

Main bearing clearance
Check clearance by using gaging plastic according to following procedure.

1. Remove bearing caps.
2. Clean bearings and main journals.
3. Place a piece of gaging plastic to full width of bearing (parallel to crankshaft) on journal, avoiding oil hole.
4. Install bearing cap as previously outlined and evenly torque cap bolts to specified torque. Bearing cap MUST be torqued to specification in order to assure proper reading.

NOTE:
Do not rotate crankshaft while gaging plastic is installed.

5. Remove cap, and using scale on gaging plastic envelope, measure gaging plastic width at its widest point. If clearance exceeds its limit, replace bearing. Always replace both upper and lower inserts as a unit.
   A new standard bearing may produce proper clearance. If not, it will be necessary to regrind crankshaft journal for use of 0.25 mm undersize bearing.
   After selecting new bearing, recheck clearance.

	Standard	Limit
Bearing clearance	0.020 – 0.040 mm (0.0008 – 0.0016 in.)	0.060 mm (0.0023 in.)

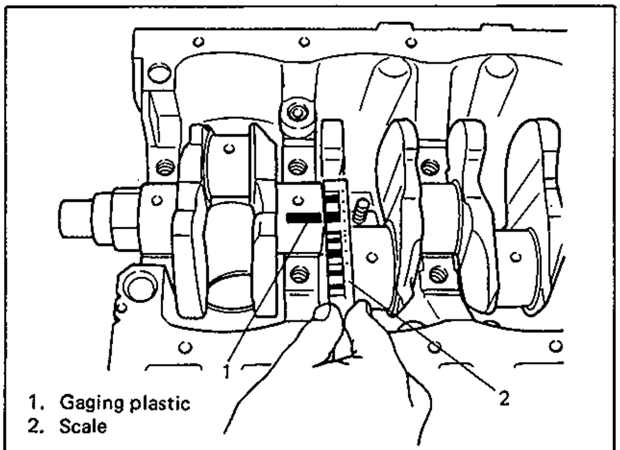


Fig. 6A-148 Measuring Main Bearing Clearance

Selection of main bearings

STANDARD BEARING:

If bearing is in malcondition, or bearing clearance is out of specification, select a new standard bearing according to following procedure and install it.

1. First check journal diameter by using following procedure.
   As shown in Fig. 6A-149, crank webs of No. 2 and No. 3 cylinders have five stamped numerals.
   The three kinds of numerals ("1", "2" and "3") represent following journal diameters.

Numeral stamped	Journal diameter
1	51.994 – 52.000 mm (2.0470 – 2.0472 in.)
2	51.988 – 51.994 mm (2.0468 – 2.0470 in.)
3	51.982 – 51.988 mm (2.0465 – 2.0468 in.)

The first, second, third, fourth and fifth (left to right) stamped numerals represent journal diameters at bearing caps "1", "2", "3", "4" and "5" respectively.
For example, in Fig. 6A-149, the first (leftmost) numeral "3" indicates that journal dia. at bearing cap "1" is within 51.982 – 51.988 mm, and second one "1" indicates that journal dia. at cap "2" is within 51.994 – 52.000 mm.

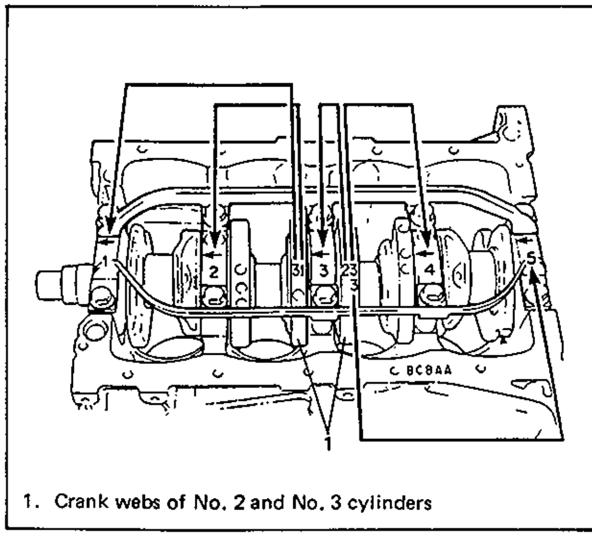


Fig. 6A-149 Stamped Numerals on Crank Webs of No. 2 and No. 3 Cylinders

2. Next, check bearing cap bore diameter without bearing.
   On mating surface of cylinder block, five alphabets are stamped as shown in Fig. 6A-150.
   Three kinds of alphabets ("A", "B" and "C") represent following cap bore diameters.

Alphabet stamped	Bearing cap bore diameter (without bearing)
A	56.000 – 56.006 mm (2.2047 – 2.2050 in.)
B	56.006 – 56.012 mm (2.2050 – 2.2052 in.)
C	56.012 – 56.018 mm (2.2052 – 2.2054 in.)

The first, second, third, fourth and fifth (left to right) stamped alphabets represent cap bore diameters of bearing caps "1", "2", "3" "4" and "5" respectively.
For example, in Fig. 6A-150, the first (leftmost) alphabet "B" indicates that cap bore dia. of bearing cap "1" is within 56.006 – 56.012 mm, and the fifth (rightmost) alphabet "A" indicates that cap bore dia. of cap "5" is within 56.000 – 56.006 mm.

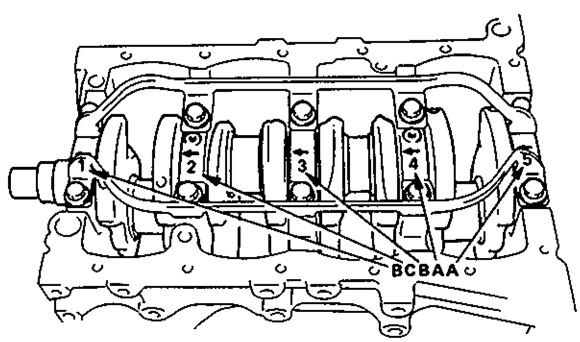


Fig. 6A-150 Stamped Alphabets on Cylinder Block

3. There are five kinds of standard bearings differing in thickness. To distinguish them, they are painted in following colors at the position as indicated in Fig. 6A-151.
   Each color indicates following thickness at the center of bearing.

Color painted	Bearing thickness
Green	1.996 – 2.000 mm (0.0786 – 0.0787 in.)
Black	1.999 – 2.003 mm (0.0787 – 0.0788 in.)
Colorless (no paint)	2.002 – 2.006 mm (0.0788 – 0.0789 in.)
Yellow	2.005 – 2.009 mm (0.0789 – 0.0790 in.)
Blue	2.008 – 2.012 mm (0.0790 – 0.0791 in.)

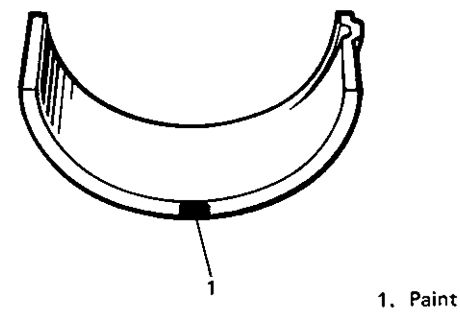


Fig. 6A-151 Paint on Standard Bearing

4. From numeral stamped on crank webs of No. 2 and No. 3 cylinders and the alphabets stamped on mating surface of cylinder block, determine new standard bearing to be installed to journal, by referring to table shown below.
   For example, if numeral stamped on crank webs is "1" and alphabet stamped on mating surface is "B", install a new standard bearing painted in "Black" to its journal.

		Numeral stamped on crank web (Journal diameter)		
		1	2	3
Alphabet stamped on mating surface	A	Green	Black	Colorless
	B	Black	Colorless	Yellow
	C	Colorless	Yellow	Blue
		New standard bearing to be installed.		

5. Using gaging plastic, check bearing clearance with newly selected standard bearing.
   If clearance still exceeds its limit, use next thicker bearing and recheck clearance.
6. When replacing crankshaft or cylinder block due to any reason, select new standard bearings to be installed by referring to numerals stamped on new crankshaft or alphabets stamped on mating surface of new cylinder block.

UNDERSIZE BEARING (0.25 mm):

- 0.25 mm undersize bearing is available in five kinds varying in thickness.
  To distinguish them, each bearing is painted in following colors at the position as indicated in Fig. 6A-152.
  Each color indicates following thicknesses at the center of bearing.

Color painted	Bearing thickness
Green & Red	2.121 – 2.125 mm (0.0835 – 0.0836 in.)
Black & Red	2.124 – 2.128 mm (0.0836 – 0.0837 in.)
Red only	2.127 – 2.131 mm (0.0837 – 0.0838 in.)
Yellow & Red	2.130 – 2.134 mm (0.0838 – 0.0839 in.)
Blue & Red	2.133 – 2.137 mm (0.0839 – 0.0840 in.)

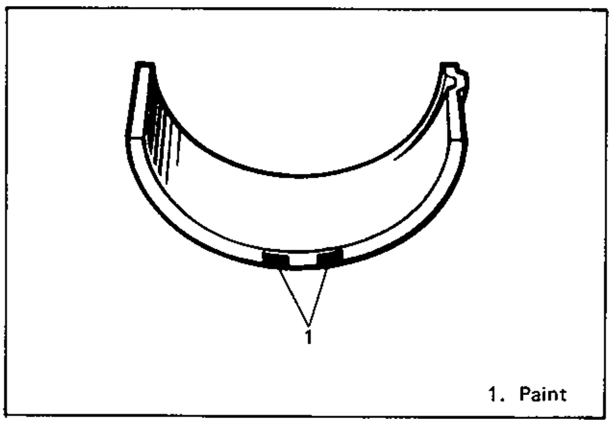


Fig. 6A-152 Paint on Undersize Bearing

- If it is necessary to regrind crankshaft journal to undersize, regrind it and select undersize beaing to be used as follows.

1. Regrind journal to the following finished diameter.

Finished diameter	51.732 – 51.750 mm (2.0367 – 2.0373 in.)

2. Using micrometer, measure reground journal diameter. The measurement should be taken in two directions perpendicular to each other in order to check for out-of-round.
3. Using journal diameter measured above and alphabets stamped on mating surface of cylinder block, select undersize bearing to be installed by referring to table given below.
   Check bearing clearance with newly selected undersize bearing.

		Measured journal diameter		
		51.744 – 51.750 mm (2.0371 – 2.0373 in.)	51.738 – 51.744 mm (2.0369 – 2.0371 in.)	51.732 – 51.738 mm (2.0367 – 2.0369 in.)
Alphabets stamped on mating surface of cylinder block	A	Green & Red	Black & Red	Red only
	B	Black & Red	Red only	Yellow & Red
	C	Red only	Yellow & Red	Blue & Red
		Undersize beraing to be installed.		

Rear Oil Seal

Carefully inspect oil seal for wear or damage. If lip portion is worn or damaged, replace oil seal.

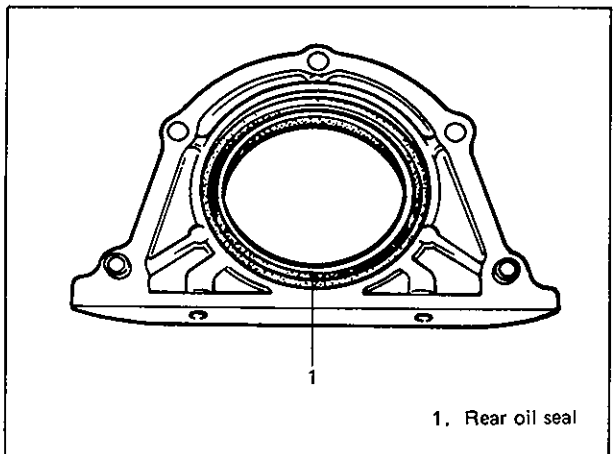


Fig. 6A-153 Rear Oil Seal

Flywheel

- If ring gear is damaged, cracked or worn, replace flywheel.
- If the surface contacting clutch disc is damaged, or excessively worn, replace flywheel.
- Check flywheel for face runout with dial gauge.
  If runout exceeds its limit, replace flywheel.

Limit on runout	0.2 mm (0.0078 in.)

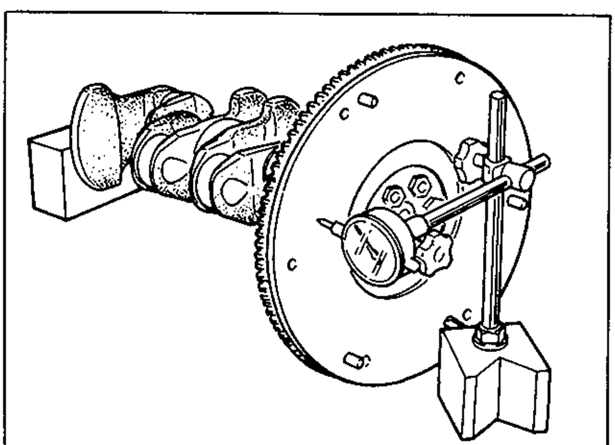


Fig. 6A-154 Measuring Runout

Cylinder Block

Distortion of gasketed surface

Using straightedge and thickness gauge, check gasketed surface for distortion and, if flatness exceeds its limit, correct it.

Item	Standard	Limit
Flatness	0.03 mm (0.0012 in.)	0.06 mm (0.0024 in.)

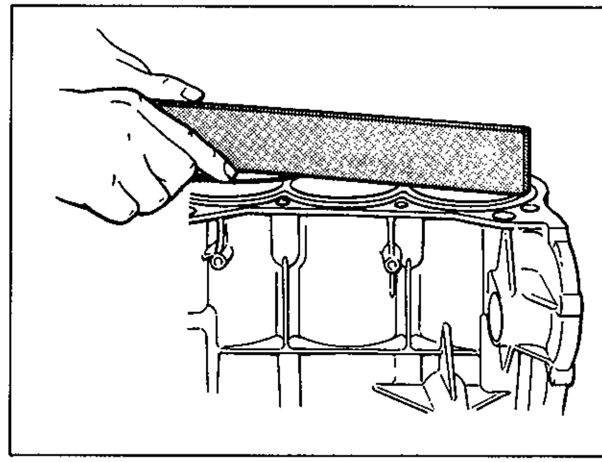


Fig. 6A-155 Checking Surface

Honing or reboring cylinders

1. When any cylinder needs reboring, all other cylinders must also be rebored at the same time.
2. Select oversized piston according to amount of cylinder wear.

Size	Piston diameter
O/S 0.25	75.220 – 75.230 mm (2.9614 – 2.9618 in.)
O/S 0.50	75.470 – 75.480 mm (2.9712 – 2.9716 in.)

3. Using micrometer, measure the piston diameter.

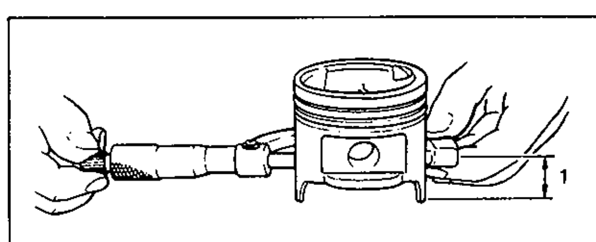


Fig. 6A-156 Measuring Piston Diameter

4. Calculate cylinder bore diameter to be rebored.

   D = A + B − C

   D : Cylinder bore diameter to be rebored.
   A : Piston diameter as measured.
   B : Piston clearance = 0.02 – 0.04 mm (0.0008 – 0.0015 in.)
   C : Allowance for honing = 0.02 mm (0.0008 in.)

5. Rebore and hone cylinder to calculated dimension.

NOTE:
Before reboring, install all main bearing caps in place and tighten to specification to avoid distortion of bearing bores.

6. Measure piston clearance after honing.

INSTALL OR CONNECT

NOTE:

- **All parts to be installed must be perfectly clean.**
- **Be sure to oil crankshaft journals, journal bearings, thrust bearings, crankpins, connecting rod bearings, pistons, piston rings and cylinder bores.**
- **Journal bearings, bearing caps, connecting rods, rod bearings, rod bearing caps, pistons and piston rings are in combination sets. Do not disturb combination and try to see that each part goes back to where it came from, when installing.**

1. Main bearings to cylinder block:
   Among two halves of main bearing, one half has oil groove. Install this half with oil groove to cylinder block, and another half without oil groove to bearing cap.
   Make sure that two halves are painted in the same color.

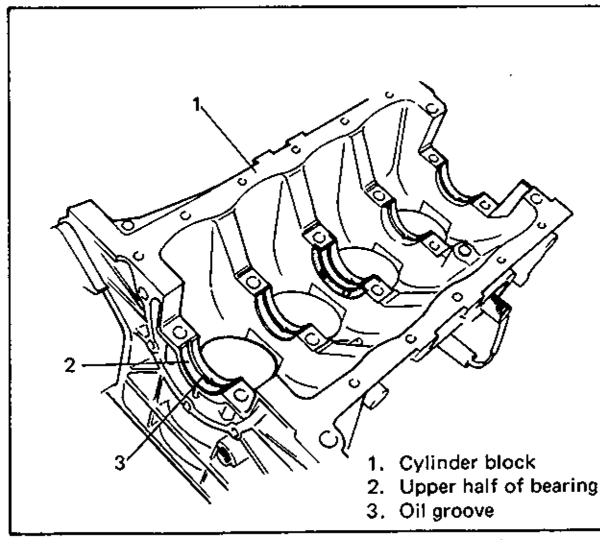


Fig. 6A-157 Installing Bearing Half with Oil Groove

2. Thrust bearings to cylinder block between No. 2 and No. 3 cylinders. Face oil groove sides to crank webs.

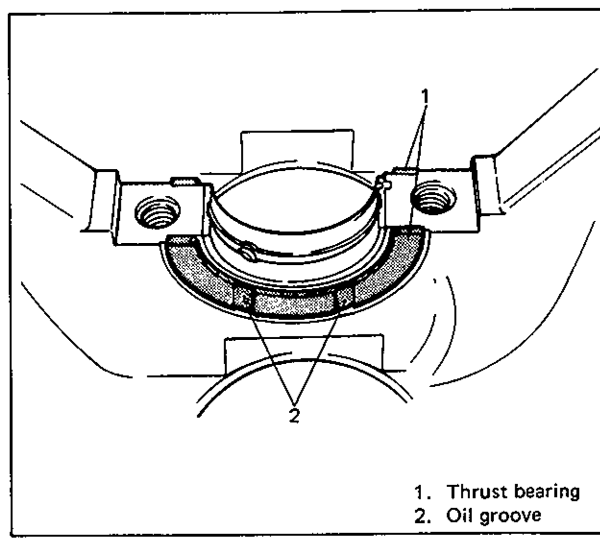


Fig. 6A-158 Installing Thrust Bearings

3. Crankshaft to cylinder block.
4. When fitting bearing caps to journals after setting crankshaft in place, be sure to point arrow mark (on each cap) to crankshaft pulley side. Fit them sequentially in ascending order, 1, 2, 3, 4 and 5, starting from pulley side.

Tightening torque for main bearing cap bolts	N·m	kg-m	lb-ft
	50 – 57	5.0 – 5.7	36.5 – 41.0

Gradual and uniform tightening is important for bearing cap bolts. Make sure that five caps become tight equally and progressively till specified torque is attained.

NOTE:
After tightening cap bolts, check to be sure that crankshaft rotates smoothly when turned by hand.

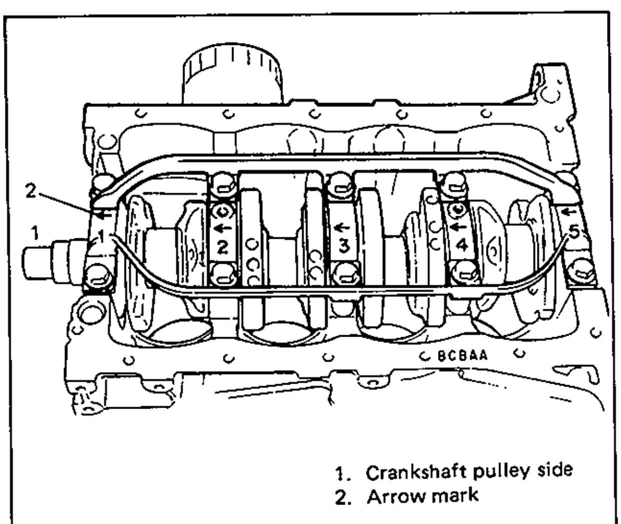


Fig. 6A-159 Installing Main Bearing Caps

5. Oil seal housing and its gasket
Install new gasket. Do not reuse gasket removed in disassembly. Oil lip portion of oil seal, before installing. Tighten housing bolts to specification.
After installing oil seal housing, gasket edges might bulge out; if so, cut them off to make them flush with cylinder block and oil seal housing.

Tightening torque for housing bolts	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

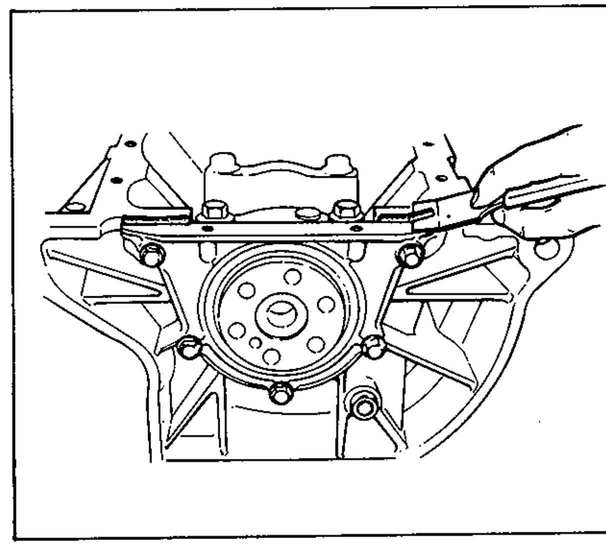


Fig. 6A-160 Cutting Off Edges of Gasket

6. Oil pump
Refer to Item "Oil pump" for installation of oil pump.
7. Flywheel
Using special tool, lock flywheel or drive plate, and tighten flywheel or drive plate bolts to specification.

Tightening torque for flywheel bolts	N·m	kg-m	lb-ft
	75 – 80	7.5 – 8.0	54.5 – 57.5

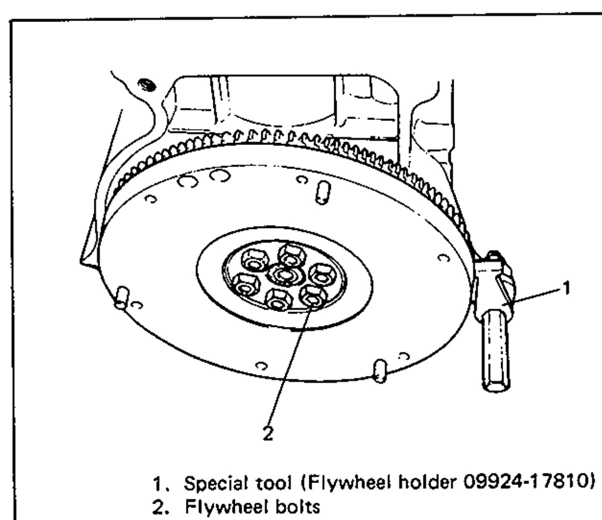


Fig. 6A-161 Flywheel

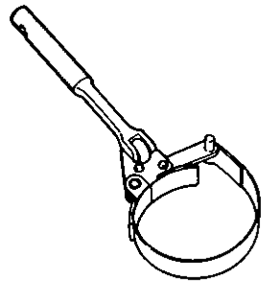
8. Pistons and connecting rods as previously outlined.
9. Oil pump strainer and oil pan.
10. Cylinder head assembly to cylinder block.

NOTE:
Tighten cylinder head bolts to specified torque as previously outlined.
Whenever installing cylinder head to new cylinder block, use following procedure to tighten cylinder head bolts.

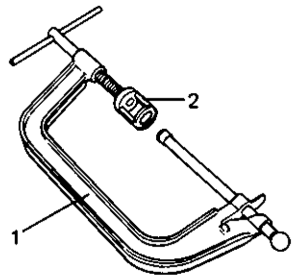
- **Tighten cylinder head bolts to specified torque as previously outlined and loosen them once till tightening torque becomes "zero". And then torque them to specification again.**

11. Crankshaft timing belt pulley, timing belt, crankshaft pulley, water pump pulley, etc., as previously outlined.
12. Clutch to flywheel. For clutch installation, refer to Section 7C.
13. Engine assembly to vehicle as previously outlined.

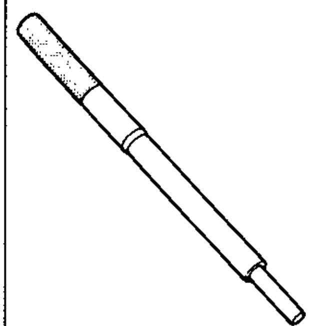
SPECIAL TOOLS



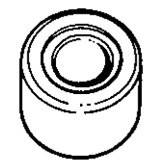
09915-47310
Oil filter wrench



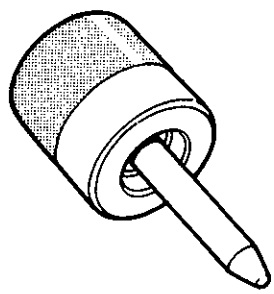
1. 09916-14510
   Valve lifter
2. 09916-48210
   Valve lifter attach-
   ment



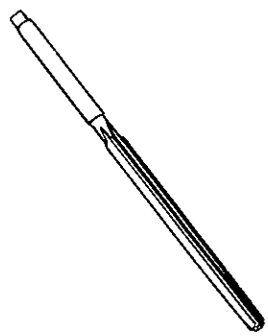
09916-46010
Valve guide remover



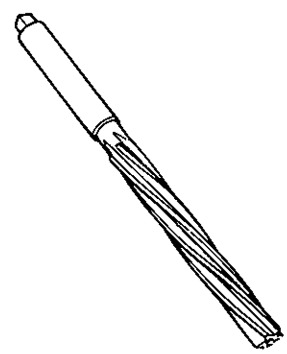
09917-88210
Valve guide installer



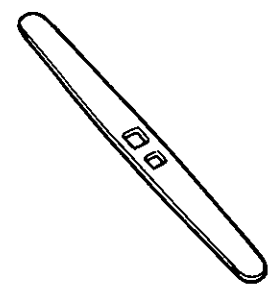
09917-98210
Valve stem seal installer



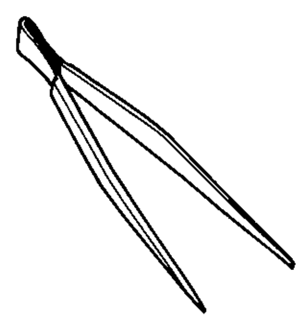
09916-34520
Reamer (7 mm)



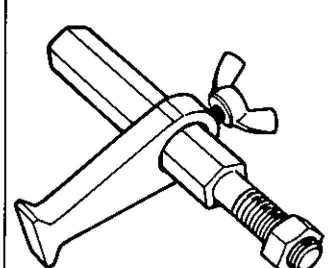
09916-37310
Reamer (12 mm)



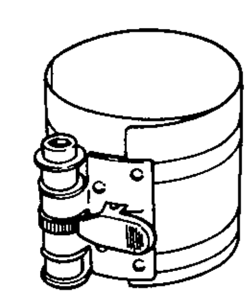
09916-34541
Reamer handle



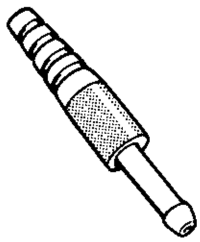
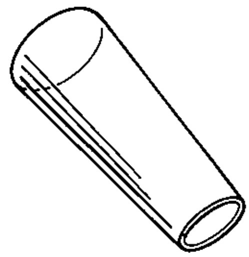
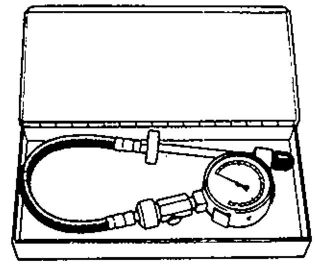
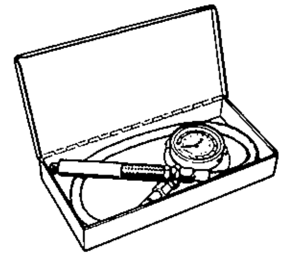
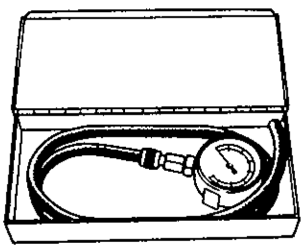
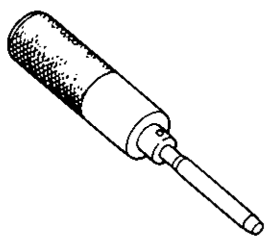
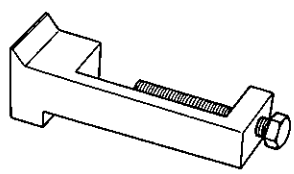
09916-84510
Forceps



09924-17810
Flywheel holder



09916-77310
Piston ring compressor

 09918-08210 Vacuum gauge hose joint	 09926-18210 Oil seal guide (Vinyl resin)	 09915-64510 Compression gauge	 09915-77310 Oil pressure gauge
 09915-67310 Vacuum gauge	 09916-57321 Valve guide installer handle	 09927-56010 Gear stopper	

REQUIRED SERVICE MATERIALS

RECOMMEND SUZUKI PRODUCT	USE
Sealant 1207C 99000-31150	• To apply to mating surfaces of cylinder block and oil pan.

RECOMMENDED TORQUE SPECIFICATIONS

System	Fastening parts	Tightening torque		
		N·m	kg-m	lb-ft
Engine	Cylinder head bolt	70 – 75	7.0 – 7.5	51.0 – 54.0
	Spark plug	20 – 30	2.0 – 3.0	14.5 – 21.5
	Intake & exhaust manifold bolt and nut	18 – 28	1.8 – 2.8	13.5 – 20.0
	Exhaust manifold stiffener nut	40 – 60	4.0 – 6.0	29.0 – 43.0
	Camshaft timing pulley bolt	56 – 64	5.6 – 6.4	41.0 – 46.0
	Valve adjusting screw lock nut	15 – 19	1.5 – 1.9	11.0 – 13.5
	Timing belt cover bolt and nut	9 – 12	0.9 – 1.2	7.0 – 8.5
	Crankshaft pully bolt	14 – 18	1.4 – 1.8	10.5 – 13.0
	Connecting rod bearing cap nut	33 – 37	3.3 – 3.7	24.0 – 26.5
	Crankshaft main bearing cap bolt	50 – 57	5.0 – 5.7	36.5 – 41.0
	Flywheel bolt (drive plate bolt for A/T)	75 – 80	7.5 – 8.0	54.5 – 57.5
	Oil pressure switch	12 – 15	1.2 – 1.5	9.0 – 10.5
	Oil filter Ass'y	12 – 16	1.2 – 1.6	9.0 – 11.5
	Oil filter stand	20 – 25	2.0 – 2.5	14.5 – 18.0
	Oil pan bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
	Oil drain plug	30 – 40	3.0 – 4.0	22.0 – 28.5
	Cylinder head cover bolt	4 – 5	0.4 – 0.5	3.0 – 3.5
	Rocker arm shaft screw	9 – 12	0.9 – 1.2	7.0 – 8.5
	Throttle body bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
	Exhaust center pipe nut	40 – 60	4.0 – 6.0	29.0 – 43.0
	Oil pump strainer and bracket bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
	Oil pump case bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
	Oil pump rotor plate screw	9 – 12	0.9 – 1.2	7.0 – 8.5
	Crankshaft timing belt pulley bolt	125–135	12.5–13.5	90.5–97.5
	Timing belt tensioner bolt	24 – 30	2.4 – 3.0	17.5 – 21.5
	Timing belt tensioner stud	9 – 12	0.9 – 1.2	7.0 – 8.5
	Water pump bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
	Cooling fan nut	9 – 12	0.9 – 1.2	7.0 – 8.5
	Crankshaft oil seal housing bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
	Engine mounting nut (Right & Left)	40 – 50	4.0 – 5.0	29.0 – 36.0
	Engine mounting chassis side bracket bolt (Right & Left)	50 – 60	5.0 – 6.0	36.5 – 43.0
	Engine mounting engine side bracket bolt (Right & Left)	50 – 60	5.0 – 6.0	36.5 – 43.0
	Torque converter bolt (For A/T vehicle)	60 – 70	6.0 – 7.0	43.5 – 50.5

SECTION 6B

ENGINE COOLING

CONTENTS

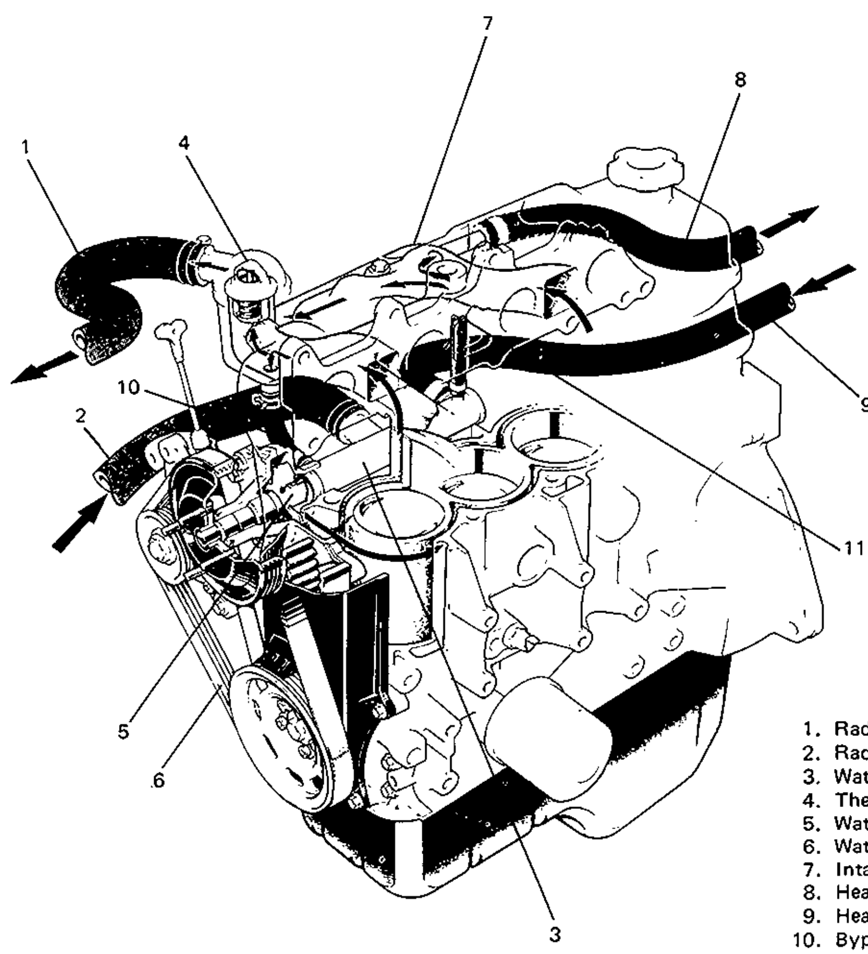
GENERAL DESCRIPTION

The cooling system consists of the radiator cap, radiator, water reservoir tank, hoses, water pump, cooling fan & clutch, termostat. The radiator is of tube-and-fin type.

COOLING SYSTEM CIRCULATION

During engine warm-up (thermostat closed), the water pump discharges coolant into the water jacket chamber adjacent to No. 1 cylinder. Coolant then flows through the cylinder block and the cylinder head. Coolant then returns to the water pump through intake manifold, heater inlet hose, heater unit, heater outlet hose, and water intake pipe.

During normal temperatures (thermostat open), coolant takes the same basic route but is now allowed to flow past the thermostat, the inlet hose and the radiator, and then back to the water pump through the outlet hose and the water intake pipe.



1. Radiator inlet hose
2. Radiator outlet hose
3. Water intake pipe
4. Thermostat
5. Water pump
6. Water pump drive belt
7. Intake manifold
8. Heater inlet hose
9. Heater outlet hose
10. Bypass hose
11. From carburetor

Fig. 6B-1

RADIATOR CAP

A pressure-vent cap is used on the radiator. The cap contains a pressure valve and vacuum valve. The pressure valve is held against its seat by a spring of pre-determined strength which protects the cooling system by relieving the pressure if the pressure in cooling system rises by 0.9 kg/cm^2 (12.8 psi, 90 kPa). The vaccum valve is held against its seat by a light spring which permits opening of the valve to relieve vacuum created in the system when it cools off and which otherwise might cause the radiator to collapse.
The cap has its face marked 0.9, which means that its pressure valve opens at 0.9 kg/cm^2 (12.8 psi, 90 kPa).

NOTE:
Do not remove radiator cap to check engine coolant level; check coolant visually through see-through water reservoir tank.
Coolant should be added only to reservoir tank as necessary.

> WARNING:
> **As long as there is pressure in the cooling system, the temperature can be considerably higher than the boiling temperature of the solution in the radiator without causing the solution to boil. Removal of the radiator cap while engine is hot and pressure is high will cause the solution to boil instantaneously and possibly with explosive force, spewing the solution over engine, fenders and person removing cap. If the solution contains flammable anti-freeze such as alcohol (not recommended for use at any time), there is also the possibility of causing a serious fire.**

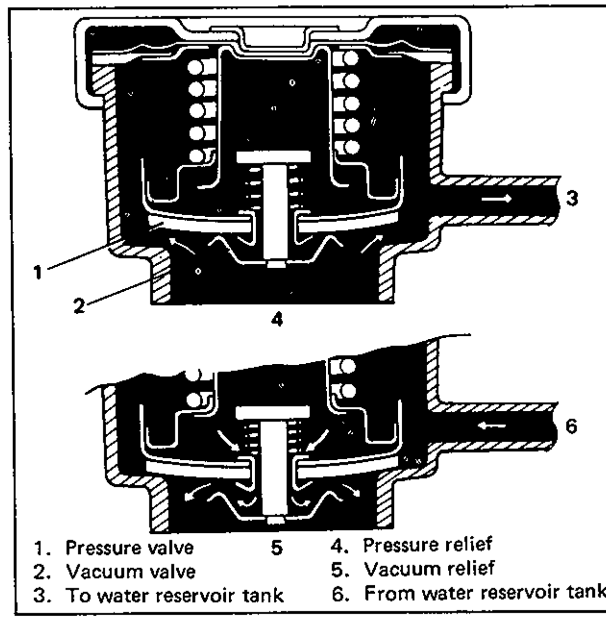


Fig. 6B-2 Pressure Type Radiator Cap

WATER RESERVOIR TANK

A "see-through" plastic reservoir tank is connected to the radiator by a hose. As the vehicle is driven, the coolant is heated and expands. The portion of the coolant displaced by this expansion flows from the radiator into the reservoir tank.
When the vehicle is stopped and the coolant cools and contracts, the displaced coolant is drawn back into the radiator by vacuum.
Thus, the radiator is kept filled with coolant to the desired level at all times, resulting in increased cooling efficiency.
Coolant level should be between "FULL" and "LOW" marks on the reservoir tank.
Coolant should be added only to the reservoir tank as necessary.

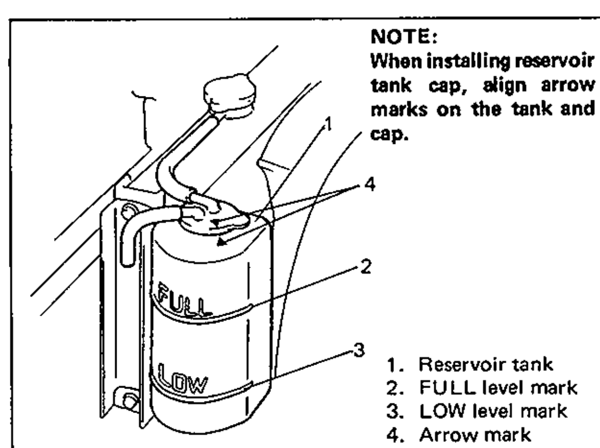


Fig. 6B-3 Water Reservoir Tank

WATER PUMP

The centrifugal type water pump is used in the cooling system. The pump impeller is supported by a totally sealed bearing. The water pump can not be disassembled.

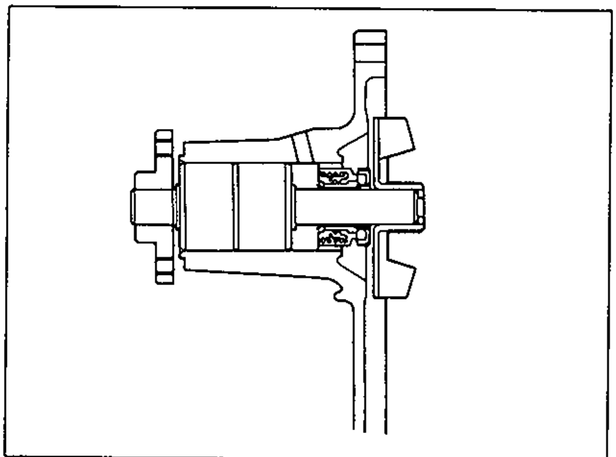


Fig. 6B-4 Water Pump

THERMOSTAT

A wax pellet type thermostat is used in the coolant outlet passage to control the flow of engine coolant, to provide fast engine warm up and to regulate coolant temperatures.
A wax pellet element is hermetically contained in a metal case, and expands when heated and contracts when cooled.
When the pellet is heated and expands, the metal case pushes down the valve to open it.
As the pellet is cooled, the contraction allows the spring to close the valve.
Thus, the valve remains closed while the coolant is cold, preventing circulation of coolant through the radiator.

At this point, coolant is allowed to circulate only throughout the engine to warm it quickly and evenly.
As the engine warms, the pellet expands and the thermostat valve opens, permitting coolant to flow through the radiator.

In the top portion of the thermostat, an air bleed valve is provided; this valve is for venting out the gas or air, if any, that is accumulated in the circuit.

There are two types of thermostat, A and B, as given below. Either one is used depending on vehicle specifications. The temperature at which the valve begins to open is stamped on each thermostat. Be sure to note this stamped temperature for replacement.

Thermostat functional spec. ± 1.5°C (± 2.7°F)		
	Thermostat "A"	Thermostat "B"
Temp. at which valve begins to open	82°C (179°F)	88°C (190°F)
Temp. at which valve become fully open	95°C (203°F)	100°C (212°F)
Valve lift	More than 8 mm at 95°C	More than 8 mm at 100°C

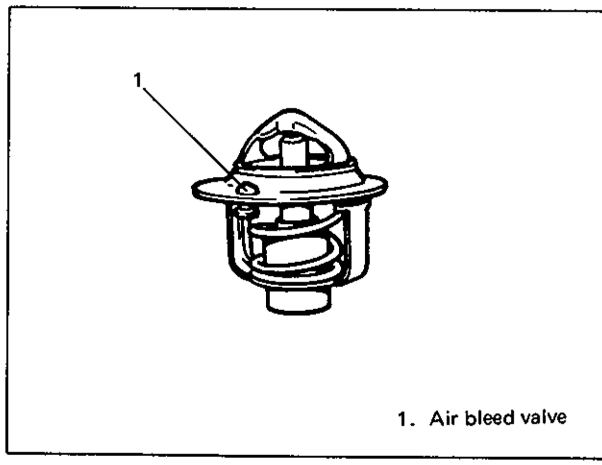


Fig. 6B-5 Thermostat

COOLING FAN CLUTCH

(Applicable to vehicle with clutch equipped cooling fan)

Fluid is enclosed in the cooling fan clutch and at its center front, there is a bimetal whose thermal reaction and the engine speed control the cooling fan speed.

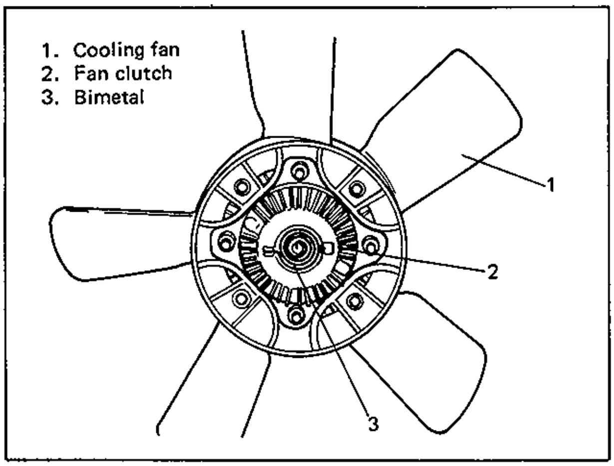


Fig. 6B-6

The clutch is installed to the water pump shaft, so that the cooling fan operates at approximately the same speed as the water pump shaft regardless of the air temperature at the front of the clutch when the water pump shaft turns at low speed (when the engine running at idle speed).

When the air temperature at the front of the clutch exceeds 55°C (131°F) and the engine speed increases gradually, the clutch slippage increases. Thus even when revolution speed of the water pump shaft increases that of the cooling fan does not as much.

When the engine speed increases further at over 55°C (131°F) air temperature and revolution speed of the water pump shaft exceeds 4,000 r/min (rpm), that of the cooling fan becomes almost constant (2,800 to 3,100 r/min) independently of the water pump shaft.

NOTE:
Do not disassemble clutch assembly.

WATER TEMP GAUGE

A water temp gauge is located at intake manifold. This gauge activates a temp. meter gauge in the instrument cluster.

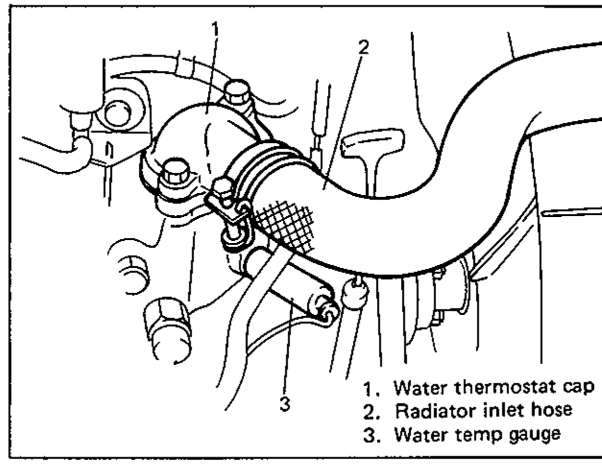


Fig. 6B-7 Water Temp Gauge