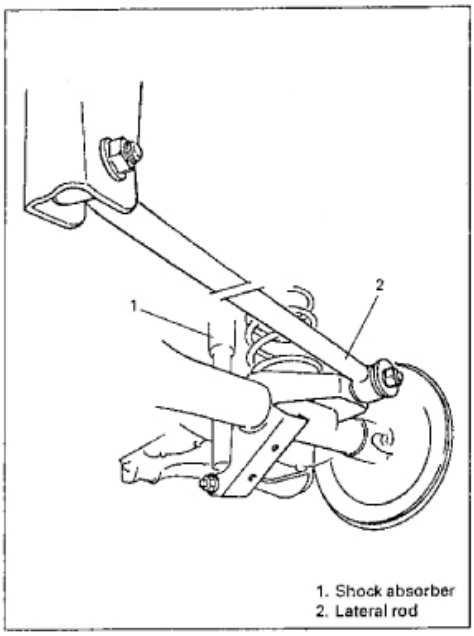


1. Shock absorber
2. Lateral rod

2) Install shock absorber lower mounting bolt, refer to step 1) of "REAR SHOCK ABSORBER INSTALLATION" in this section.
3) Remove floor jack from rear axle housing.
4) Install parking brake cable clamp bolt and brake flexible hose E-ring.
5) Install lateral rod to vehicle body, refer to step 1) of "LATERAL ROD INSTALLATION" in this section.

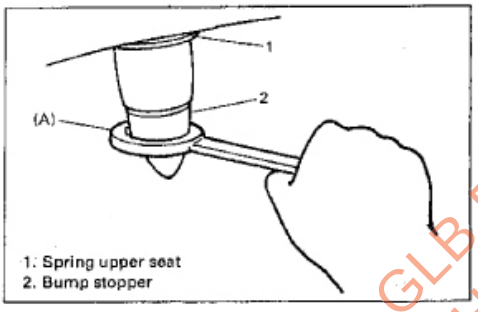
NOTE:
Nut should not be tightened.

6) Install wheel and tighten wheel nuts to specified torque.

Tightening Torque for wheel nuts
85 N·m (8.5 kg-m, 61.5 lb-ft)

7) Lower hoist and vehicle in non-loaded condition, tighten absorber lower mounting nut and lateral rod left mounting nut to specified torque.

Tightening Torque
(a): 80 N·m (8.0 kg-m, 58.0 lb-ft)



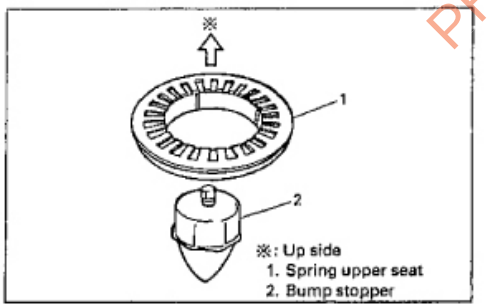
1. Spring upper seat
2. Bump stopper

BUMP STOPPER AND SPRING UPPER SEAT

REMOVAL

1) Removal coil spring. For details, refer to steps 1) to 8) of "COIL SPRING REMOVAL".
2) Remove spring upper seat.
3) Remove bump stopper by using special tool.

Special Tool
(A): 09941-66010



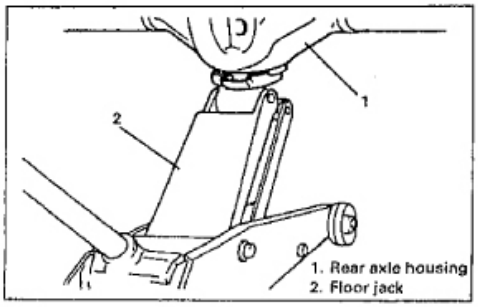
※: Up side
1. Spring upper seat
2. Bump stopper

INSTALLATION

1) Install bump stopper.

NOTE:
- **Before installing bushing, apply soap water on it.**
- **For proper installing direction of spring upper seat, refer to figure at left.**

2) Install spring upper seat.
3) Install coil spring. For details, refer to steps 1) to 7) of "COIL SPRING INSTALLATION".



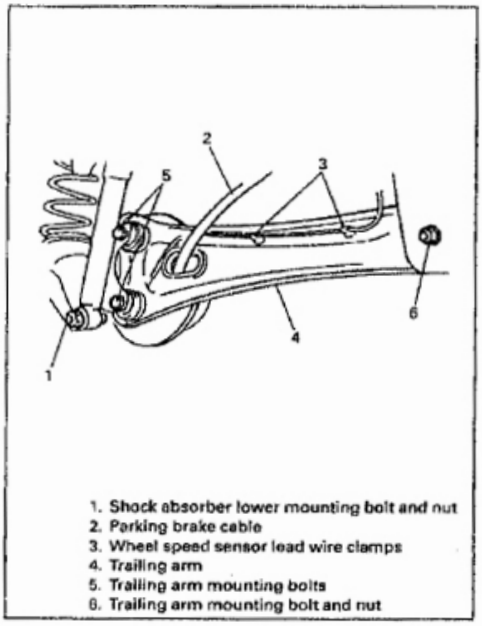
1. Rear axle housing
2. Floor jack

TRAILING ARM

REMOVAL

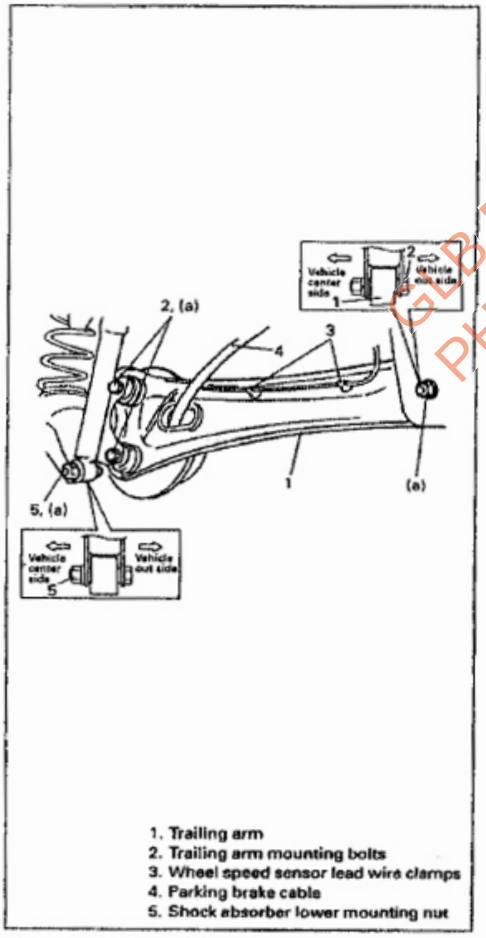
1) Hoist vehicle and remove rear wheel.
2) Support rear axle housing by using floor jack.

CAUTION:
Never apply floor jack against lateral rod as it may get deformed.



1. Shock absorber lower mounting bolt and nut
2. Parking brake cable
3. Wheel speed sensor lead wire clamps
4. Trailing arm
5. Trailing arm mounting bolts
6. Trailing arm mounting bolt and nut

3) Remove shock absorber lower mounting bolt and nut.
4) Remove brake drum and brake shoe and disconnect parking brake cable from brake back plate, refer to "PARKING BRAKE CABLE REMOVAL" of Section 5.
5) For ABS equipped vehicle, disconnect wheel speed sensor lead wire clamp from trailing arm.
6) Remove trailing arm mounting bolts and nut.



1. Trailing arm
2. Trailing arm mounting bolts
3. Wheel speed sensor lead wire clamps
4. Parking brake cable
5. Shock absorber lower mounting nut

INSTALLATION

1) Install trailing arm to vehicle body and rear axle housing, referring to figure for proper installing direction of bolts.

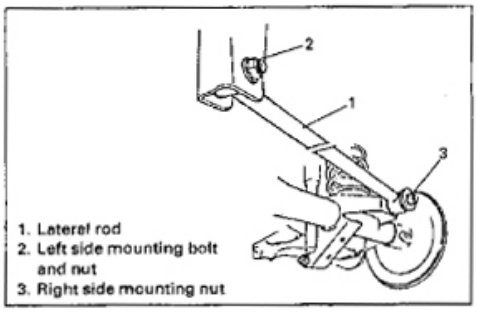
NOTE:
Nut and bolts should not be tightened.

2) Install wheel speed sensor lead wire clamp, if equipped.
3) Connect parking brake cable to brake back plate and install brake shoe and brake drum, refer to "PARKING BRAKE CABLE INSTALLATION" of Section 5.
4) Install shock absorber to rear axle housing.
5) Remove floor jack from rear axle housing.
6) Install wheel and tighten wheel nuts to specified torque.

Tightening Torque for wheel nuts
85 N·m (8.5 kg-m, 61.5 lb-ft)

7) Lower hoist and vehicle in non loaded condition, tighten trailing arm mounting bolts and nuts and shock absorber lower mounting nut to specified torque.

Tightening Torque
(a): 80 N·m (8.0 kg-m, 58.0 lb-ft)

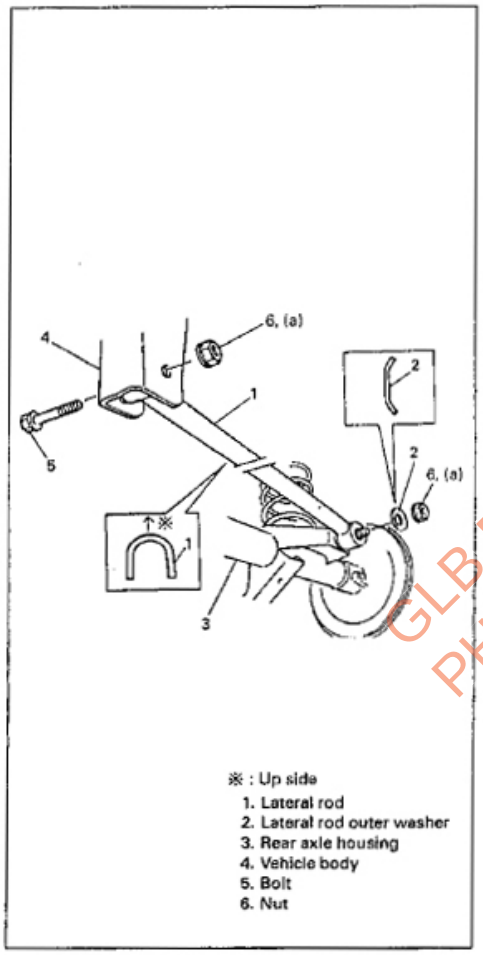


1. Lateral rod
2. Left side mounting bolt and nut
3. Right side mounting nut

LATERAL ROD

REMOVAL

1) Hoist vehicle.
2) Remove lateral rod mounting bolt and nuts.
3) Remove lateral rod.



※ : Up side
1. Lateral rod
2. Lateral rod outer washer
3. Rear axle housing
4. Vehicle body
5. Bolt
6. Nut

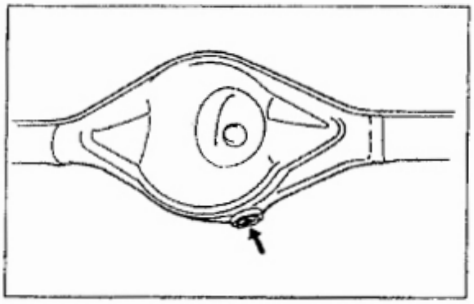
INSTALLATION

1) Install lateral rod to vehicle body and rear axle housing, referring to figure for proper installing direction.

   NOTE:
   Nut should not be tightened.

2) Lower hoist and with vehicle in non-loaded condition, tighten lateral rod bolt and nuts to specified torque.

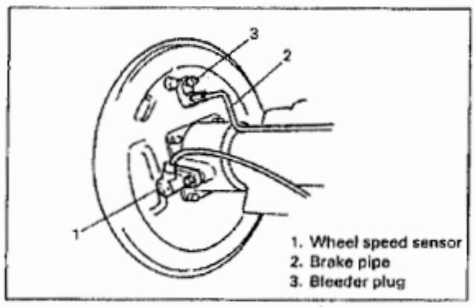
Tightening Torque
(a): 80 N·m (8.0 kg-m, 58.0 lb-ft)



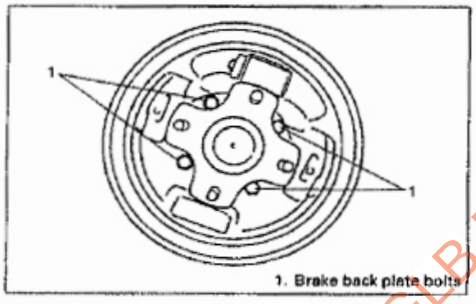
REAR AXLE SHAFT AND WHEEL BEARING

REMOVAL

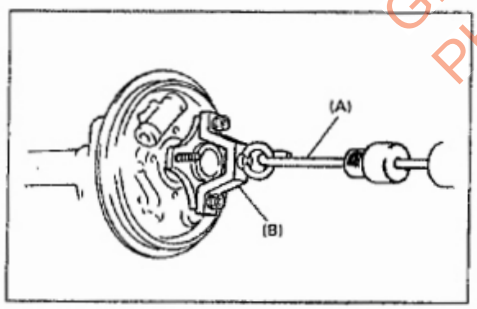
1) Hoist vehicle and remove rear wheel.
2) Drain gear oil from rear axle housing by loosening drain plug.
3) Remove brake drum and brake shoe and disconnect parking brake cable from brake back plate, refer to "PARKING BRAKE CABLE REMOVAL" of Section 5.



4) Remove wheel speed sensor (if equipped with ABS).
5) Disconnect brake pipe(s) from wheel cylinder and put wheel cylinder bleeder plug cap onto pipe to prevent fluid from spilling.

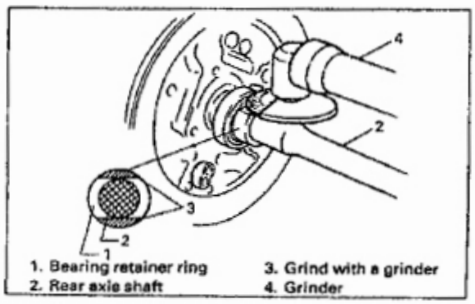


6) Remove brake back plate bolts.



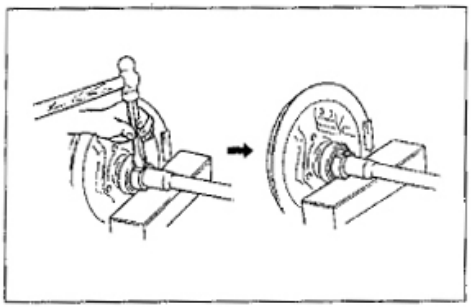
7) Using special tools indicated, draw out axle shaft with brake back plate.

Special Tool
(A): 09942-15510
(B): 09943-17912

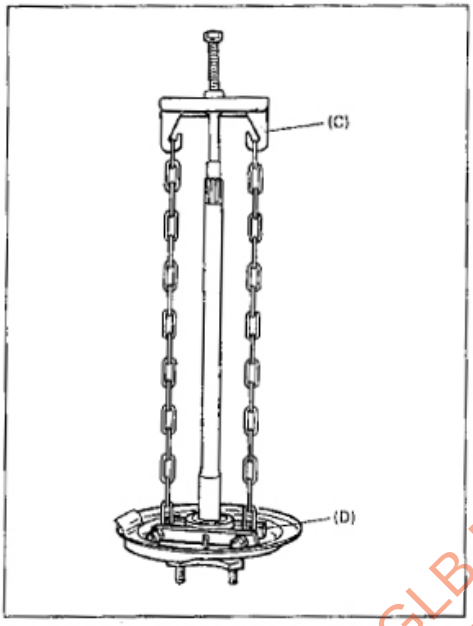


8) Remove wheel sensor ring (if equipped with ABS). Refer to "REAR WHEEL SENSOR RING REMOVAL" of Section 5E.
9) In order to remove the retainer ring from the shaft, grind with a grinder two parts of the bearing retainer ring as illustrated till it becomes thin.

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

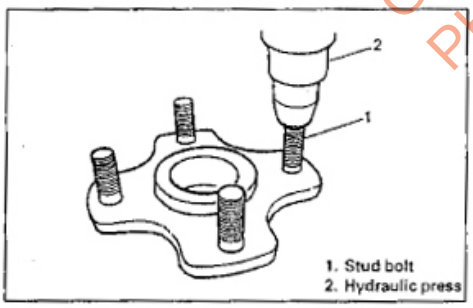


10) Break with a chisel the thin ground retainer ring, and it can be removed.

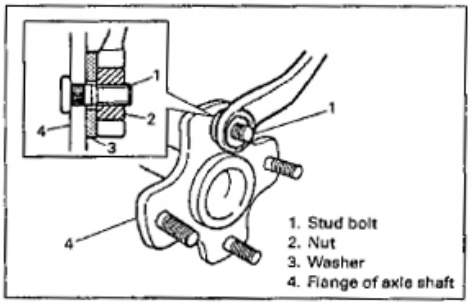


11) Using special tools, remove bearing from shaft and then remove brake back plate.

Special Tool
(C): 09927-18411
(D): 09921-57810

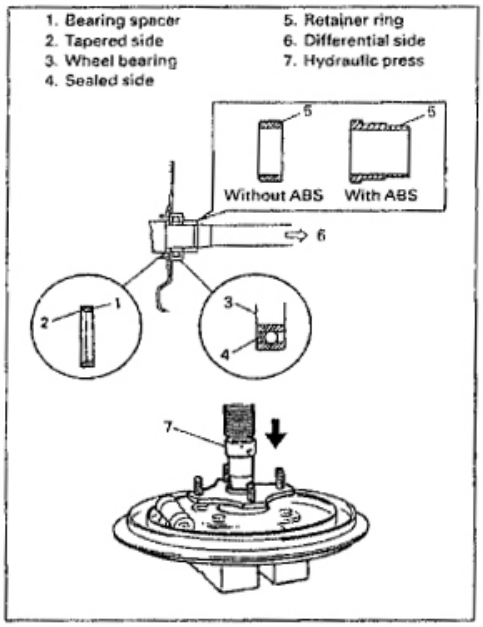


12) Remove stud bolts by using hydraulic press.



INSTALLATION

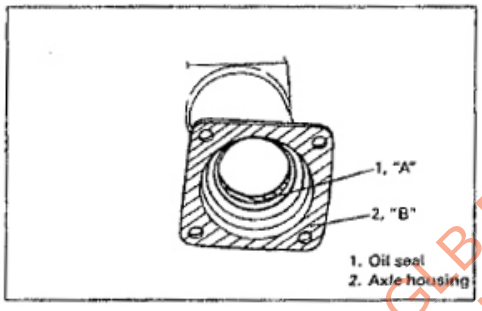
1) Aligning serrations between new stud bolt(s) and flange, install new stud bolt(s) by tightening nut as shown.



2) Press in a new bearing and retainer ring in order by using an oil hydraulic press.

NOTE:
- **Install wheel bearing spacer with the tapered side of its inner diameter directed toward outside, or brake drum side.**
- **Install wheel bearing with its sealed side directed toward brake drum side.**
- **Use care not to cause any damage to outside of retainer ring.**

3) Install wheel sensor ring (if equipped with ABS).
Refer to "REAR WHEEL SENSOR RING INSTALLATION" of Section 5E.



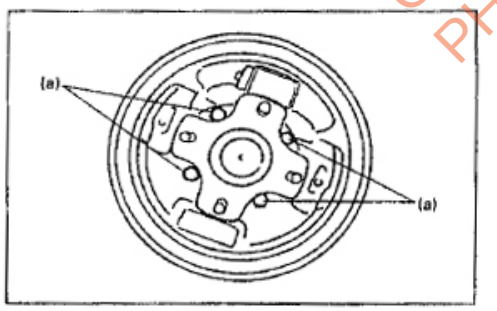
4) Apply grease to axle shaft oil seal lip as shown.

"A": Grease

5) Apply sealant to mating surface of axle housing with brake back plate.

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

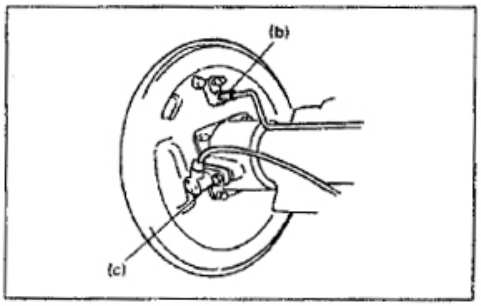
"B": Sealant 99000-31090



6) Install rear axle shaft to rear axle housing and tighten brake back plate bolts to specified torque.

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

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



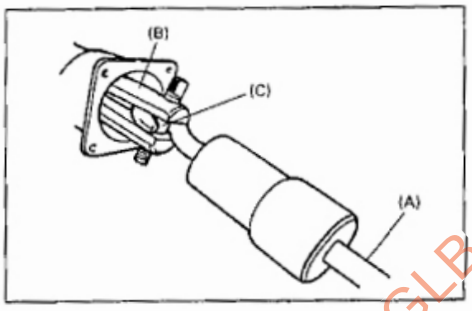
7) Connect brake pipe to wheel cylinder and tighten brake pipe flare nut to specified torque.

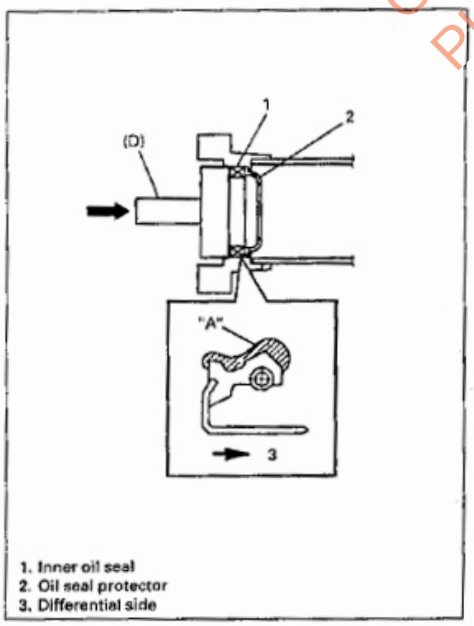
Tightening Torque
(b): 16 N·m (1.6 kg-m, 12.0 lb-ft)

8) Install wheel speed sensor (if equipped with ABS).

Tightening Torque
(c): 10 N·m (1.0 kg-m, 7.5 lb-ft)

9) Connect parking brake cable to brake back plate and install brake shoe and brake drum, refer to "PARKING BRAKE CABLE INSTALLATION" of Section 5.
10) Refill rear axle (differential) housing with new specified gear oil. Refer to Section 7E for refill.
11) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, see Section 5.)
12) Install wheel and tighten wheel nuts to specified torque.
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 Section 5 of this manual).
14) Check to ensure that brake drum is free from dragging and proper braking is obtained.
15) Perform brake test (foot brake and parking brake). (For brake test, see Section 5).
16) Check each installed part for oil leakage.





1. Inner oil seal
2. Oil seal protector
3. Differential side

REAR AXLE SHAFT INNER OIL SEAL

REMOVAL

1) Remove rear axle shaft. For details, refer to steps 1) to 7) of "REAR AXLE SHAFT REMOVAL" in this section.
2) Remove rear axle shaft inner oil seal, by using special tools.

Special Tool
(A): 09942-15510
(B): 09944-96010 (remover)
(C): 09921-26010 (collar)

INSTALLATION

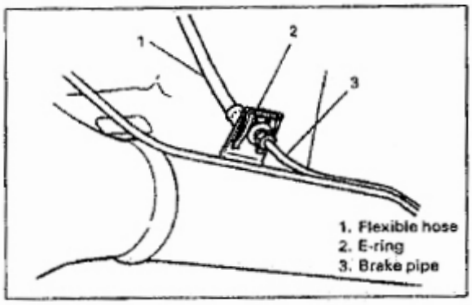
1) Using special tools drive in oil seal until it contacts oil seal protector in axle housing.

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

Special Tool
(D): 09913-75520

"A": Grease 99000-25010

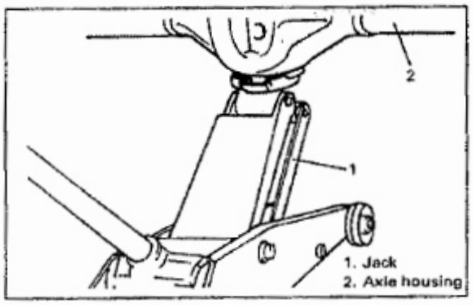
2) For procedure hereafter, refer to steps 4) to 16) of "REAR AXLE SHAFT INSTALLATION" in this section.



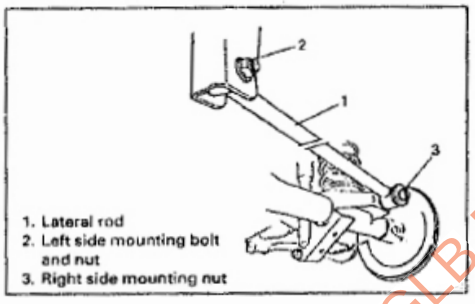
REAR AXLE HOUSING

REMOVAL

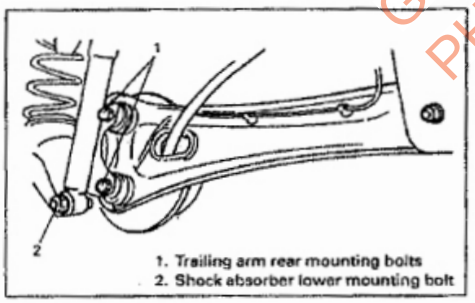
1) Hoist vehicle and remove rear wheels (right & left).
2) Remove rear axle shafts, refer to steps 2) to 7) of "REAR AXLE SHAFT REMOVAL" in this section.
3) Disconnect brake pipe from flexible hose and remove E-ring.
4) Remove brake pipe clamps and pipes from axle housing.
5) Remove wheel speed sensor harness clamps from axle housing (if equipped with ABS).



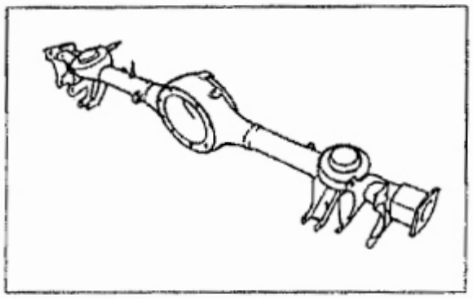
6) Remove differential carrier assembly, refer to Section 7F.
7) Disconnect LSPV spring from axle housing, refer to "LSPV REMOVAL" of Section 5 (if equipped with LSPV).
8) For jobs hereafter, support rear axle housing by using floor jack under axle housing.



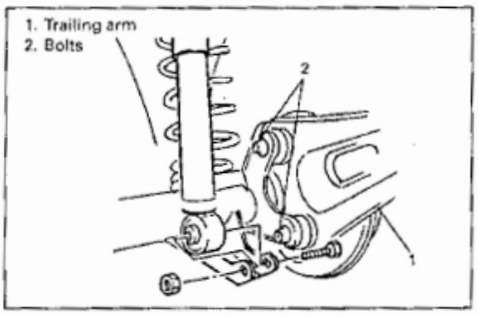
9) Remove lateral rod.



10) Loosen front and rear mounting bolts and nuts of trailing arm but don't remove bolts.
11) Remove shock absorber lower mounting nut and bolt.



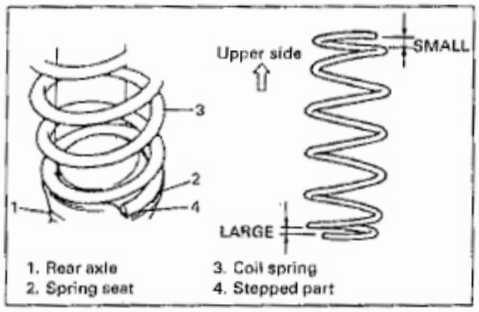
12) Lower floor jack until tension of suspension coil spring becomes a little loose and remove rear mount bolts of trailing arm.
13) Lower rear axle housing gradually.
14) Remove axle housing.



INSTALLATION

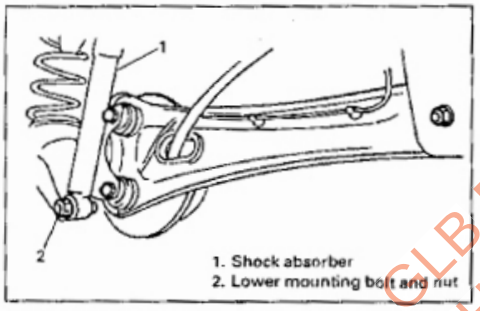
Install removed parts in reverse order of removal, noting the following points.

1) Place rear axle on floor jack. Then install trailing arm rear mounting bolts (right & left). At this time, mount bolts but don't tighten them.

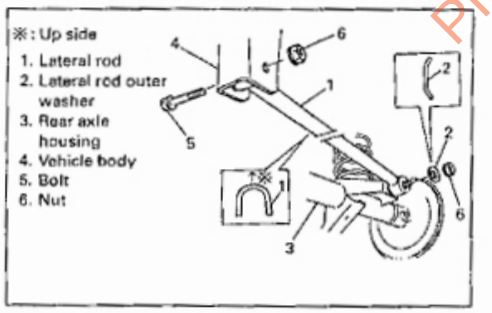


2) Install coil springs (right & left) on spring seat of rear axle as shown in figure and then raise rear axle.

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

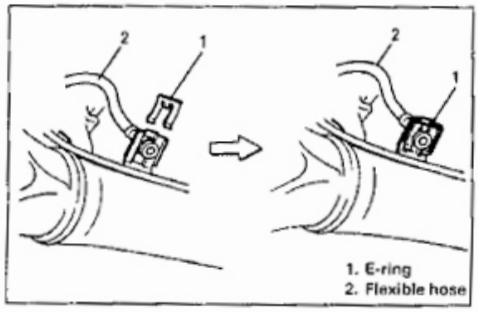


3) Install shock absorber lower mounting bolts and nuts (right & left).
4) Remove floor jack from rear axle housing.

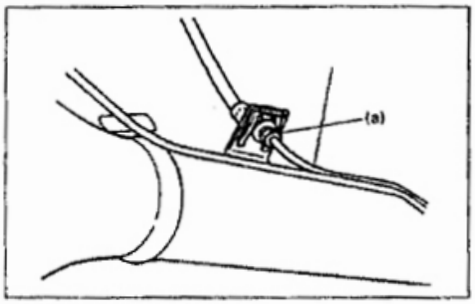


5) Install lateral rod to rear axle housing and vehicle body.

NOTE:
Nut should not be tightened.



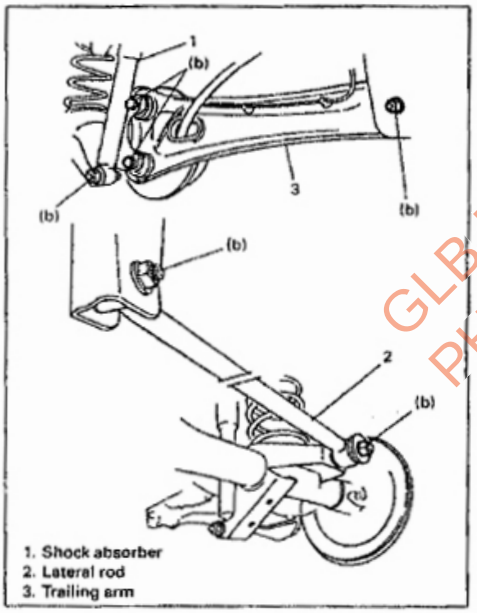
6) Install differential carrier assembly, refer to Section 7F.
7) Install wheel speed sensor harness clamps (if equipped with ABS).
8) Connect brake pipes onto axle housing and clamp them securely.
   For clamping positions, refer to Section 5 of this manual.
9) Connect brake flexible hose to bracket on axle housing and secure it with E-ring.



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

Tightening Torque
(a): 16 N·m (1.6 kg-m, 11.5 lb-ft)

11) Install rear axle shafts to rear axle housing, refer to steps 4) to 13) of "REAR AXLE SHAFT INSTALLATION" in this section.
12) Connect LSPV spring to axle housing, refer to "LSPV INSTALLATION and ADJUSTMENT" of Section 5.



1. Shock absorber
2. Lateral rod
3. Trailing arm

13) Lower hoist.
14) Tighten trailing arm front and rear mounting bolts and nuts, shock absorber lower mounting bolts and nuts to specified torque. Tighten lateral rod right and left mounting nuts to specified torque.

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

Tightening Torque
(b): 80 N·m (8.0 kg-m, 58.0 lb-ft)

15) Check to ensure that brake drum is free from dragging and proper braking is obtained.
16) Perform brake test (foot brake and parking brake). (For brake test, see Section 5.)
17) Check each installed part for oil leakage.

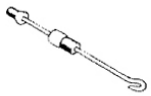
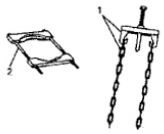
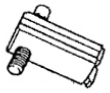
TIGHTENING TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Lateral rod right side mounting nut	80	8.0	58.0
Lateral rod left side mounting nut	80	8.0	58.0
Shock absorber upper mounting nut	55	5.5	40.0
Shock absorber lower mounting nut	80	8.0	58.0
Trailing arm front mounting nut	80	8.0	58.0
Trailing arm rear mounting bolt	80	8.0	58.0
Brake back plate bolt	23	2.3	17.0
Brake flare nut	16	1.6	12.0
Wheel nut	85	8.5	61.5

REQUIRED SERVICE MATERIALS

MATERIALS	USE
Brake fluid	Brake reservoir tank
Water tight sealant	Join seam of rear axle housing and brake back plate
Lithic wheel bearing grease	Oil seal lip

SPECIAL TOOLS

 09941-66010 Bump stopper wrench	 09942-15510 Sliding hammer	 09943-17912 Brake drum remover	 09913-75520 Bearing installer
 1. 09927-18411 Universal puller 2. 09921-57810 Bearing remover	 09944-96010 Bearing outer race remover 09921-26010 Bearing outer race remover collar		

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

This vehicle is equipped with following tire.
155R13
The tire is of tubeless type. The tire is designed to operate satisfactorily with loads up to the full rated load capacity when inflated to the recommended inflation pressures.
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 the following steel wheel.
13 x 4 1/2 J

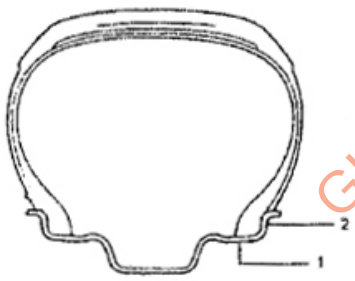
REPLACEMENT TIRES

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.

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

WARNING:
Do not mix different types of tires on the same vehicle such as radial, bias and bias-belted tires except in emergencies, because 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 is usually printed in both kPa and psi on the Tire Placard.
Metric tire gauges are available from tool suppliers.
The chart, shown left table, converts commonly used inflation pressures from kPa to psi.



* TOTAL INDICATOR READING IGNORE INDICATOR "JUMP" DUE TO WELD SEAMS, PAINT RUNS, SCRATCHES, ETC.

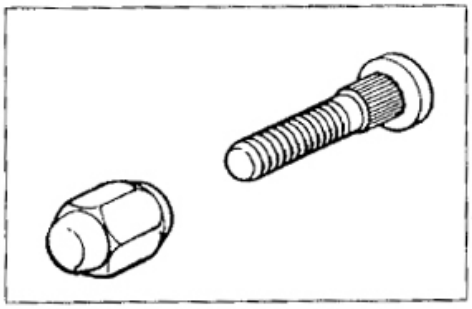
1. Radial runout
2. Lateral runout

WHEELS REPLACEMENT

Wheels must be replaced if they are bent, dented, have excessive lateral or radial runout, air leak 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 figure below may cause objectional vibrations.
Replacement wheels must be equivalent to the original equipment wheels in load capacity, diameter, rim with offset and mounting configuration. A wheel of improper size or type may affect wheel and bearing life, brake cooling, speedometer/odometer calibration, vehicle ground clearance and tire clearance to body and chassis.
To measure the wheel runout, it is necessary to use an accurate dial indicator. The tire may be on or off the wheel. The wheel should be installed to the wheel balancer of the like for proper measurement.
Take measurements of both lateral runout and radial runout at both inside and outside of the rim flange. With the dial indicator set in place securely, turn the wheel one full revolution slowly and record every reading of the indicator.

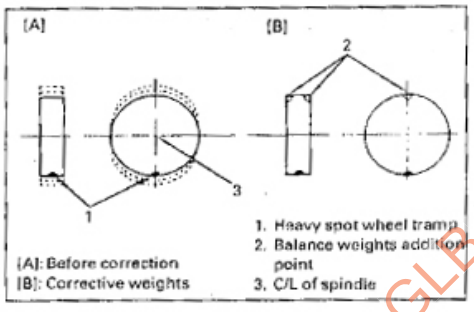
When the measured runout exceeds the specification and correction by the balancer adjustment is impossible, replace the wheel. If the reading is affected by welding, paint or scratch, it should be ignored.

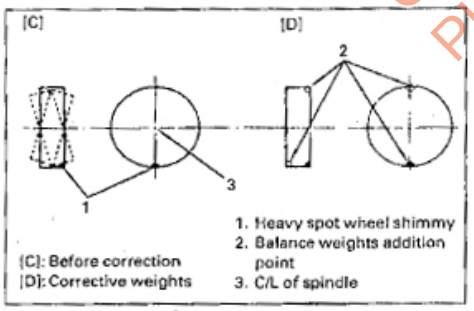
	Radial runout limit	Lateral runout limit
Steel wheel	1.14 mm (0.045 in.)	1.40 mm (0.055 in.)



METRIC LUG NUTS AND WHEEL STUDS

All models use metric lug nuts and wheel studs (size: M12 x 1.25).





DIAGNOSIS

DIAGNOSIS TABLE

Refer to SECTION 3.

BALANCING WHEELS

There are two types of wheel and tire balance: static and dynamic. Static balance, as shown in left figure, is the equal distribution of weight around the wheel. Wheels that are statically unbalanced cause a bouncing action called tramp. This condition will eventually cause uneven tire wear.

Dynamic balance, as shown in left figure, is the equal distribution of weight on each side of the 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.

GENERAL BALANCE PROCEDURES

Deposits of mud, etc. must be cleaned from inside of rim.

WARNING:
Stones should be removed from the 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 the 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.

WARNING:
Wheel spin should be limited to 35 mph (55 km/h) as indicated on speedometer.
This limit is necessary because speedometer only indicates one-half of actual wheel speed when one drive wheel is spinning and the other drive wheel is stopped.
Unless care is taken in limiting drive wheel spin, spinning wheel can reach excessive speeds. This can result in possible tire disintegration or differential failure, which could cause serious personal injury or extensive vehicle damage.

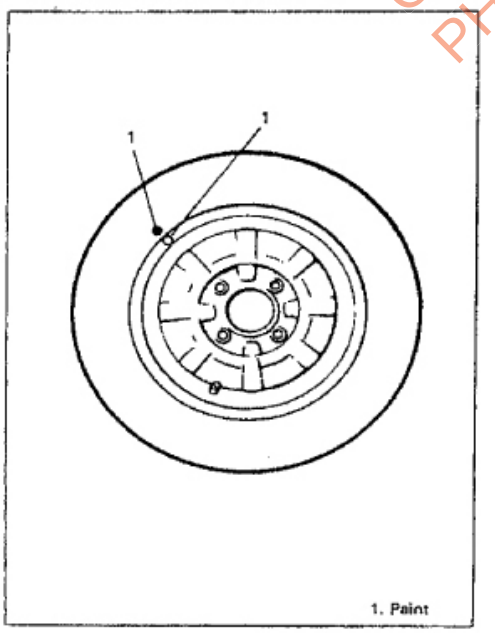
MAINTENANCE AND MINOR ADJUSTMENTS

WHEEL AND TIRE

Wheel repairs that use welding, heating, or peening are not approved. All damaged wheels should be replaced.

STUDS

If a broken stud is found, see Section 3E (rear) or Section 3D (front) for Note and Replacement procedure.



1. Paint

MATCHED TIRES AND WHEELS

Tires and wheels are matchmounted at the assembly plant. This means that the radially stiffest part of the tire, or "high spot", is matched to the smallest radius or "low spot" of the wheel.

This is done to provide the smoothest possible ride.

The "high spot" of the tire is originally marked by paint dot on the outboard sidewall. This paint dot will eventually wash off the tire.

The "low spot" of the wheel is originally marked by paint dot on the wheel rim-flange. Properly assembled, the wheel rims' paint dot should be aligned with the tires' paint dot as shown in left figure.

Whenever a tire is dismounted from its wheel, it should be remounted so that the tire and wheel are matched. If the tire's paint dot cannot be located, a line should be scribed on the tire and wheel before dismounting to assure that it is remounted in the same position.

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 left door (right door for right-hand side steering vehicle) lock pillar.

It is normal for tire pressure to increase to 28 kPa (4 psi) 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

Unequal pressure on same axle can cause:

1. Uneven braking
2. Steering lead
3. Reduced handling
4. Swerve on acceleration

Valve caps should be on the valves to keep dust and water out.

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 temperature
7. Reduced handling
8. High fuel consumption

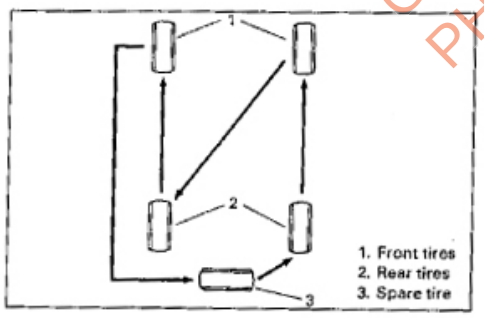
TIRE PLACARD

The tire placard is located on the left door (right door for right-hand side steering vehicle) lock pillar and should be referred to for tire information.

The placard lists the maximum load, tire size and cold tire pressure where applicable.

NOTE:

Whether rim size and/or maximum load are listed or not depends on regulations of each country.

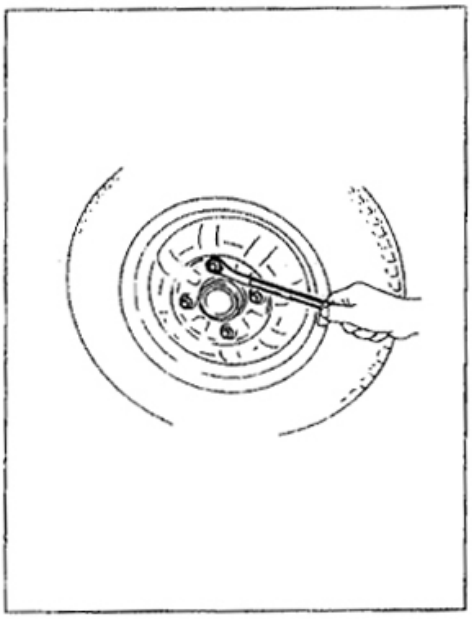


TIRE ROTATION

To equalize wear, rotate tires according to left figure. Radial tires should be rotated at the first 10,000 km (6,000 miles) and after that, tire rotation at least every 6,000 miles is recommended. Set tire pressure.

NOTE:

Due to their design, radial tires tend to wear faster in the shoulder area, particularly in front positions. This makes regular rotation especially necessary.



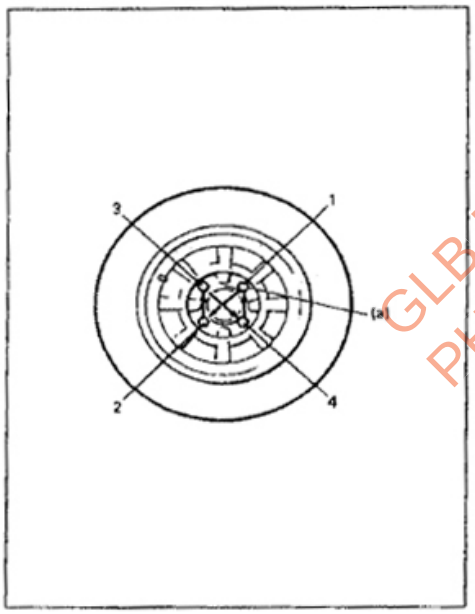
ON-VEHICLE SERVICE

WHEEL

REMOVAL

1) Loosen wheel nuts by approximately 180° (half a rotation).
2) Hoist vehicle.
3) Remove wheel.

CAUTION:
Never use heat to loosen tight wheel because application of heat to wheel can shorten life of wheel and damage wheel bearings.



INSTALLATION

Wheel nuts must be tightened in sequence and to proper torque to avoid bending wheel or brake disc, left figure.

NOTE:
Before installing wheels, remove any build-up of corrosion on wheel mounting surface and brake 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 a wheel to come off while vehicle is moving.

Tightening Torque
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)

TIRE

MOUNTING AND DEMOUNTING

Use a 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 a wire brush or coarse steel wool to remove lubricants, old rubber and light rust. Before mounting or demounting a tire, bead area should be well lubricated with approved tire lubricant.

After mounting, inflate to specified pressure shown on tire placard 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 specified pressure when inflating. If specified pressure will not seat beads, deflate, re-lubricate and re-inflate.
Over inflation may cause bead to break and cause serious personal injury.

Install valve core and inflate 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 each tire manufacturer.

TIGHTENING TORQUE SPECIFICATIONS

Fastening	Tightening torque		
	N·m	kg-m	lb-ft
Wheel nuts	85	8.5	61.5

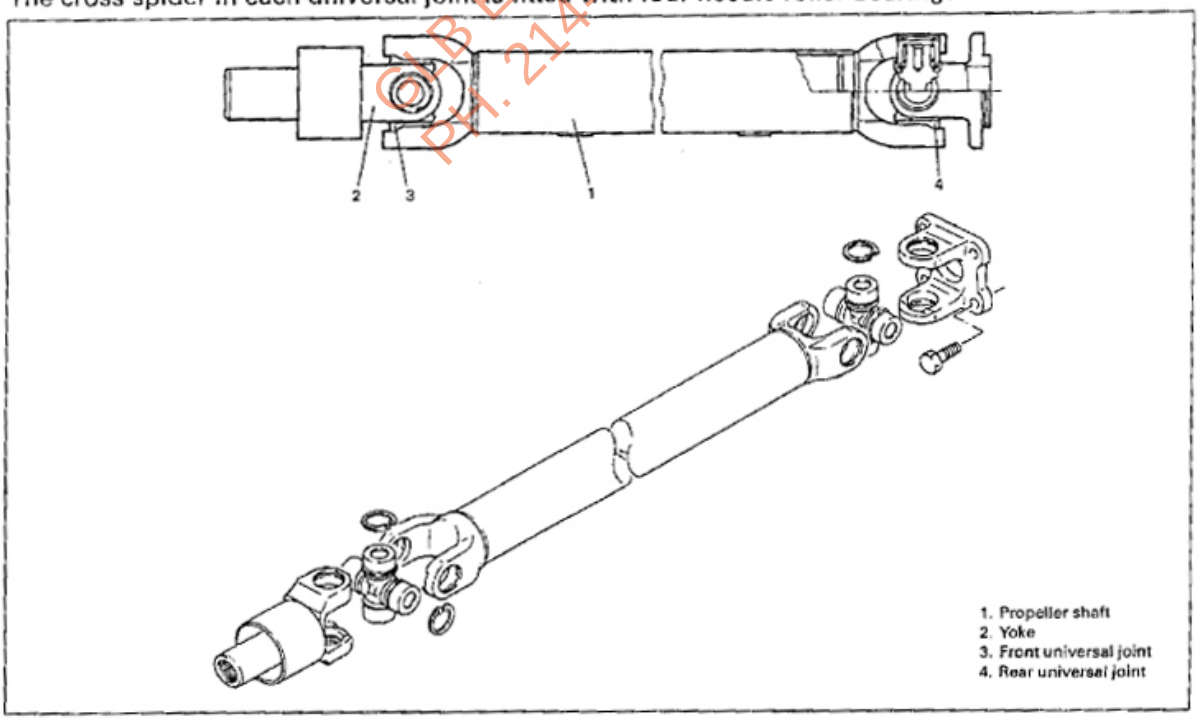
SECTION 4

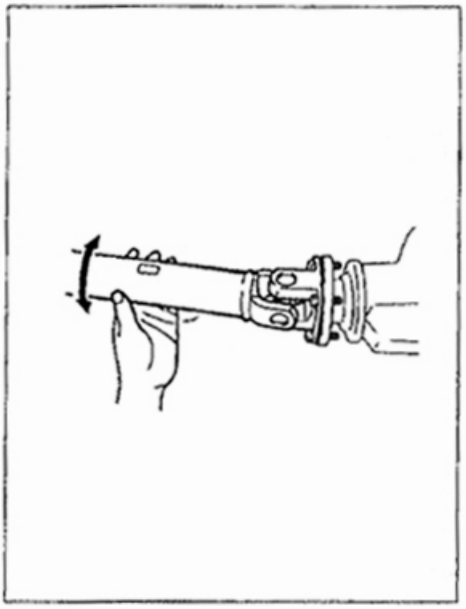
PROPELLER SHAFT

CONTENTS

GENERAL DESCRIPTION

The propeller shaft is a three-part combination consisting of a shaft two universal joints. It is connected to the differential pinion through flanged connection and to the transmission output (main) shaft through a sliding spline joint.
The yoke of the front universal joint has its shank internally splined. The splined end of transmission shaft fits into the shank. The outer yoke of the rear joint is flanged; this flange is bolted to the flange, which is splined onto the forward end of the differential pinion.
The cross spider in each universal joint is fitted with four needle roller bearings.





ON-VEHICLE SERVICE

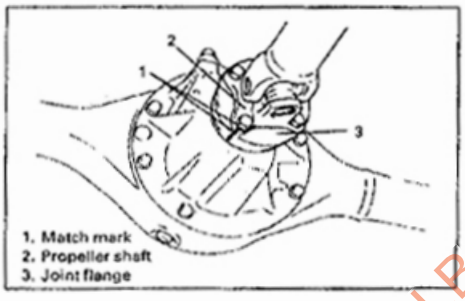
PROPELLER SHAFT

MAINTENANCE

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.

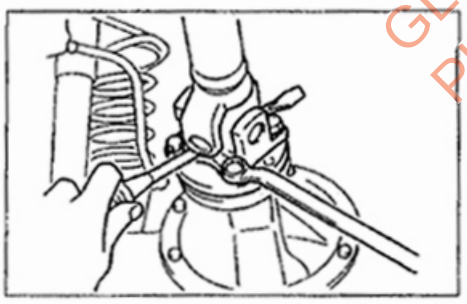
Noise coming from universal joint can be easily distinguished from other noises because rhythm of chattering or rattling is in step with cruising speed. Noise is pronounced particularly on standing start or in coasting condition (when braking effect of engine is showing in the drive line).



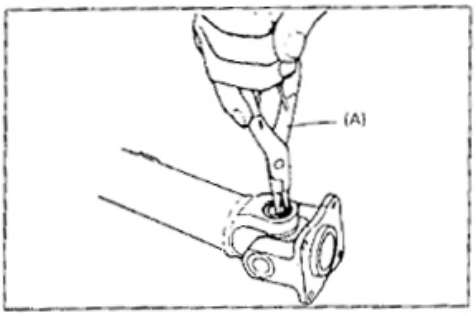
1. Match mark
2. Propeller shaft
3. Joint flange

REMOVAL

1) Hoist vehicle.
2) Drain transmission oil.
3) Before removing propeller shaft, give match marks on each joint flange and propeller shaft as shown.



4) Loosen propeller shaft bolts.
5) Remove propeller shaft.

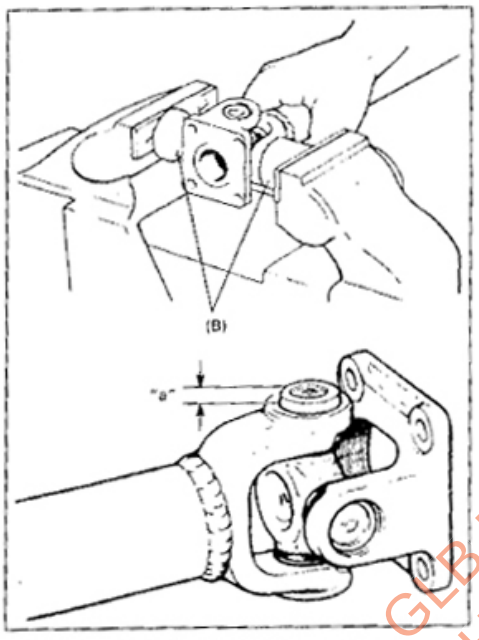


DISASSEMBLY

Disassembling on propeller shaft yoke side

1) Using special tool(A), remove 2 circlips.

Special Tool
(A): 09900-06108

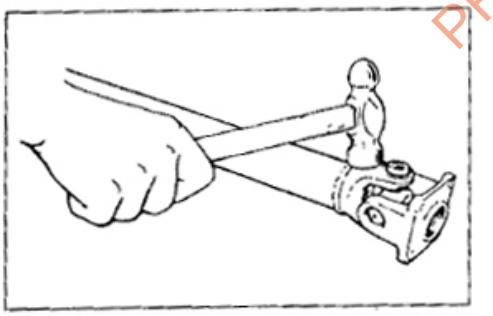


2) Using special tool(B), push spider bearing race out 3 – 4 mm (0.12 – 0.16 in.) from shaft yoke race.

NOTE:
Before pushing it out, apply penetrate lubricant between bearing race and yoke race.

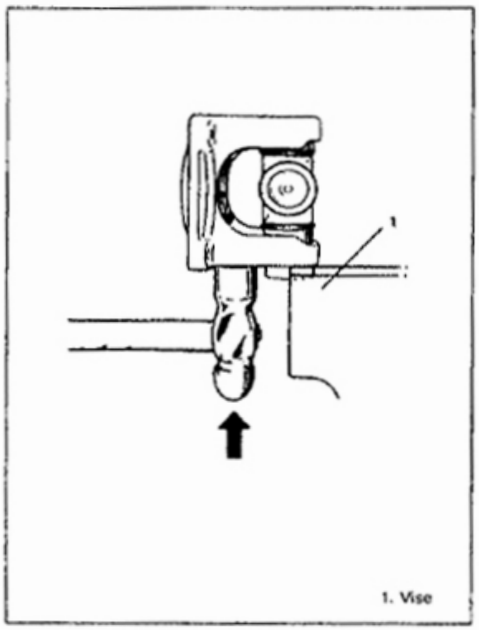
Special Tool
(B): 09926-48010

Length "a": 3 – 4 mm (0.12 – 0.16 in.)



3) Tapping yoke with a hammer, completely remove bearing race.

4) Take out bearing race on the other side in the same way as in 2) and 3).



1. Vise

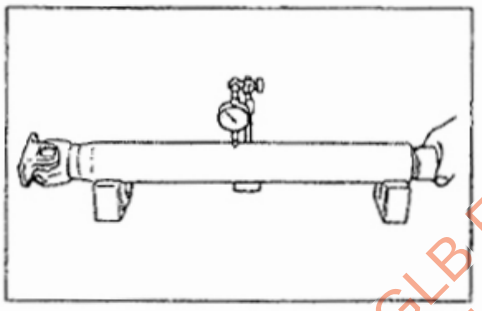
Disassembling on flange yoke side

Push out bearing race on flange yoke side as described in 1) and 2), and then, holding bearing race in a vise, tap flange yoke and take out race. (Refer to the figure.)

Remove bearing race on the opposite side in the same way.

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.**

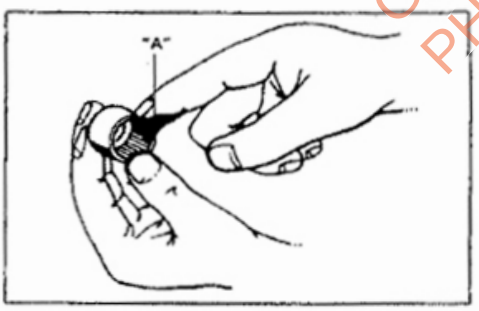


INSPECTION

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: 0.7 mm (0.028 in.)

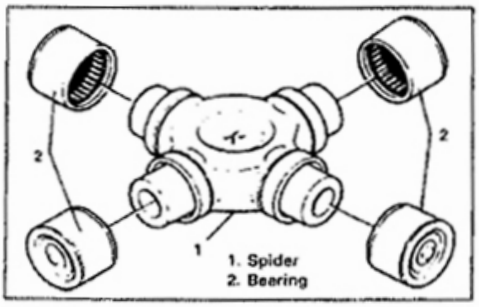


ASSEMBLY

NOTE:

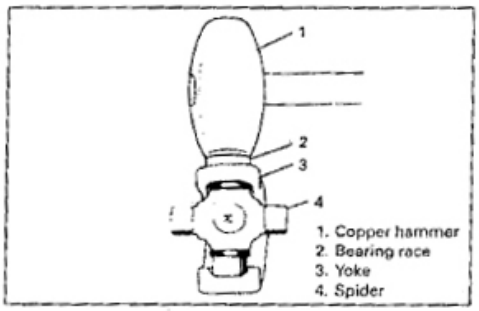
- **Make sure that rollers inside spider bearing race are all in place.**
- **Make sure to apply grease to spider bearing race.**

"A": Grease 99000-25030

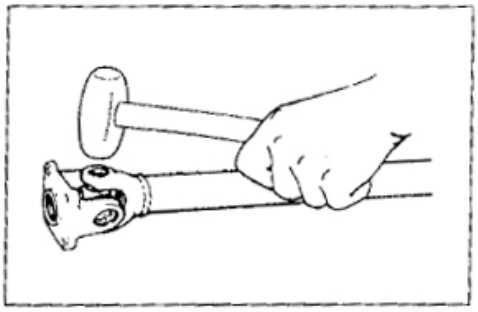


1. Spider
2. Bearing

CAUTION:
In reassembly, be sure to use new circlips, spider and bearings. Reuse of circlips, spider and bearings once disassembled is prohibited.



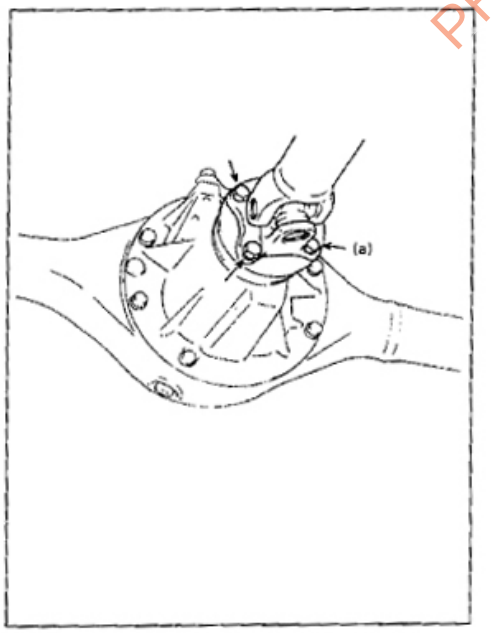
1) Insert bearing race into yoke, tapping it with a hammer, until it is flush with yoke face. When doing this, insert spider into bearing race to prevent rollers in bearing race from coming out.



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.

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.**



INSTALLATION

Install propeller shaft reversing removal procedure noting following points :

- When installing propeller shaft, align the match marks. Otherwise, vibration may occur during driving.
- Use following specification to torque universal joint flange.

Tightening Torque
(a): 50 N·m (5.0 kg-m, 36.5 lb-ft)

NOTE:
If transmission oil was drained for propeller shaft removal, pour specified gear oil into transmission case to specified level.

REQUIRED SERVICE MATERIAL

MATERIAL	USE
Lithium grease	To apply to spider bearing race.

SPECIAL TOOLS

	
09900-06108 Snap ring pliers (Closing type)	09926-48010 Universal joint disassembling tool set

SECTION 5

BRAKES

NOTE:

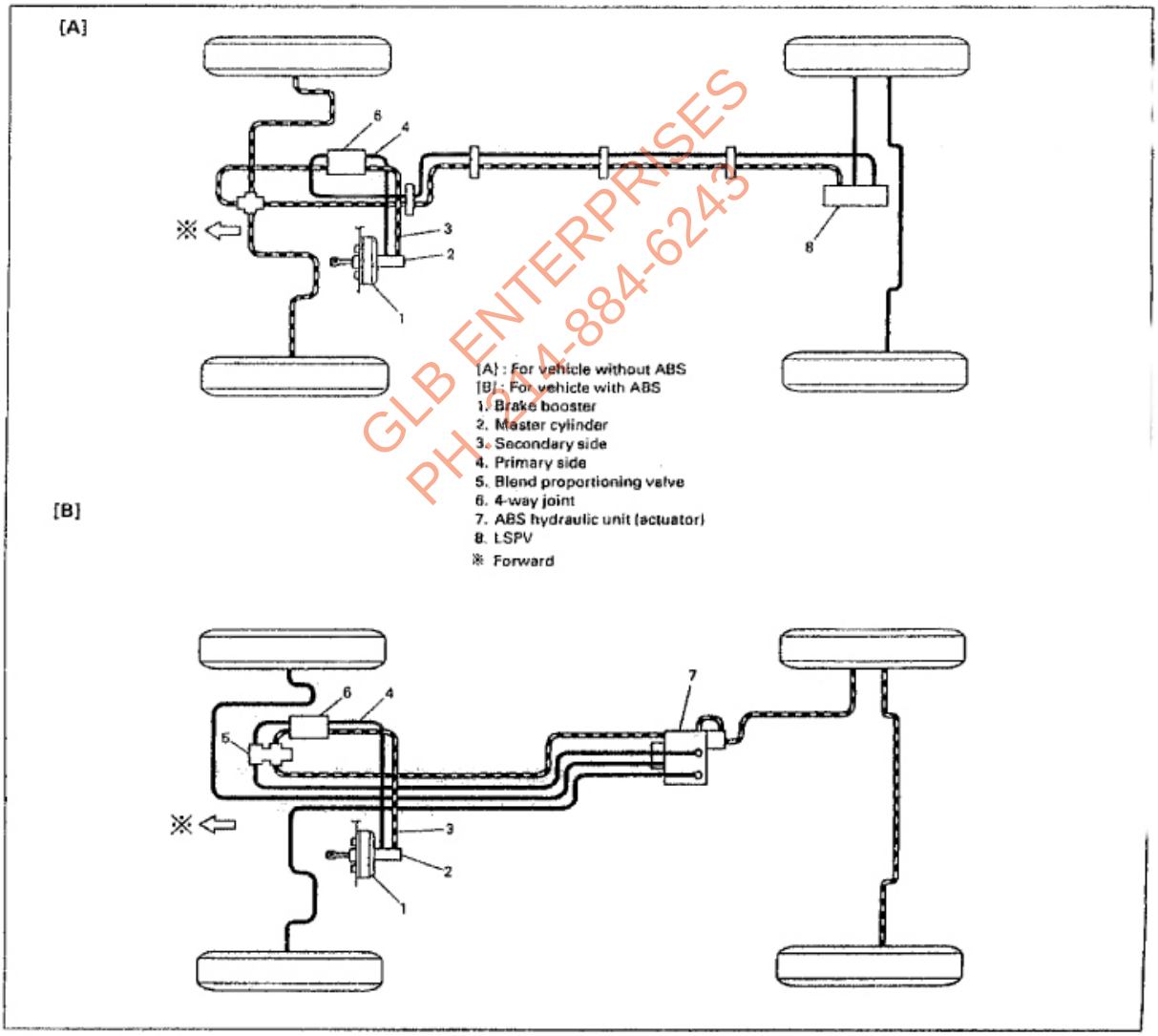
- **All brake fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement 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.**
- **When inspecting and servicing vehicle equipped with ABS, be sure to refer to Section 5E first.**

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 two in rear).
The master cylinder is a tandem master cylinder. The 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 blend proportioning valve (B.P. valve) or the load sensing proportioning valve (LSPV) is included in these circuits between the master cylinder and rear wheels. In brake system of this model, the disc brake type is used of 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.

NOTE:
"B.P." valve in circuit diagram is installed on vehicle which is equipped with ABS and "LSPV" is installed on vehicle not equipped with ABS.



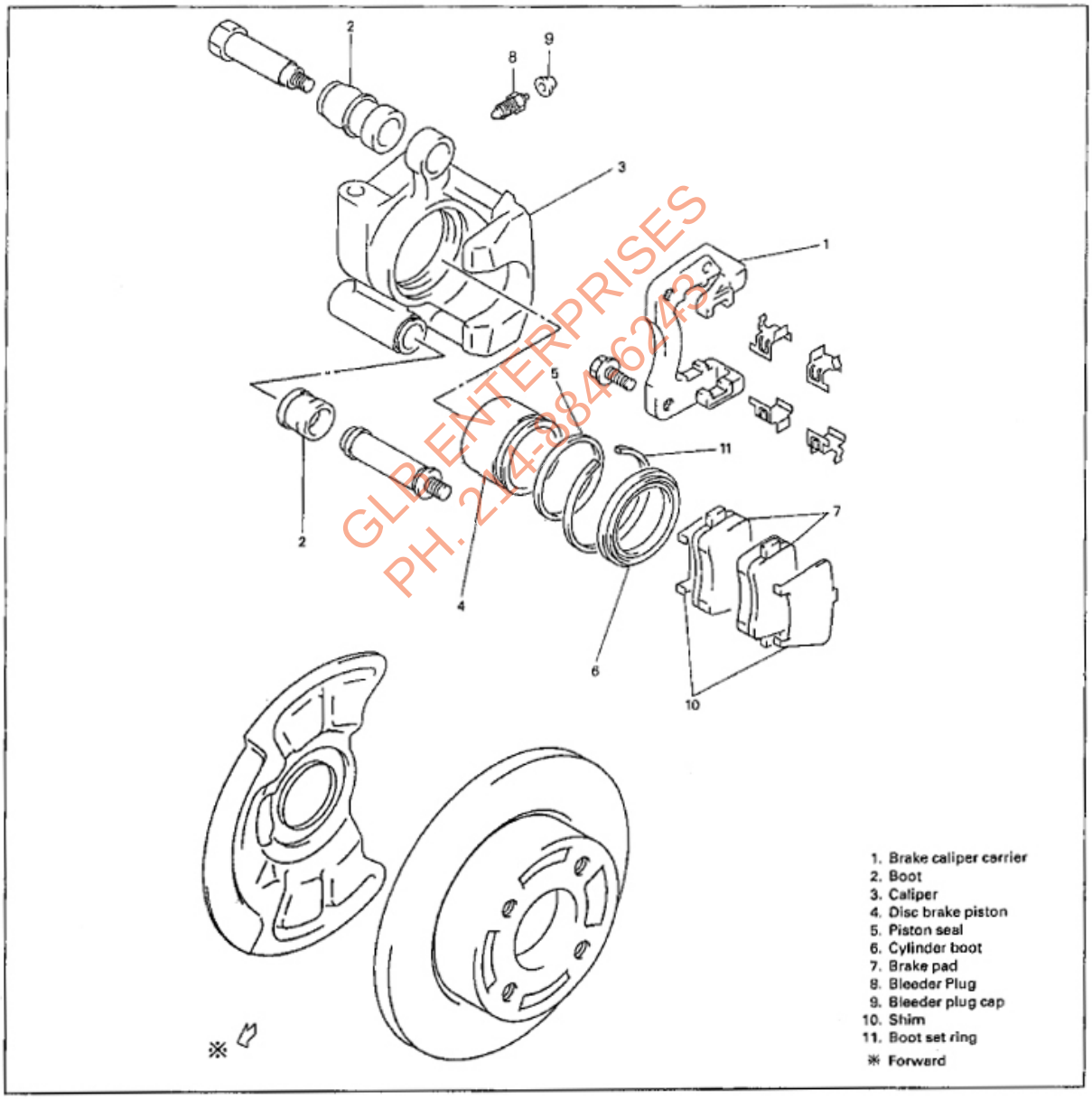
FRONT DISC BRAKE CALIPER ASSEMBLY

GENERAL DESCRIPTION

This caliper has a single bore. 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.

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.



REAR DRUM BRAKE ASSEMBLY

GENERAL DESCRIPTION

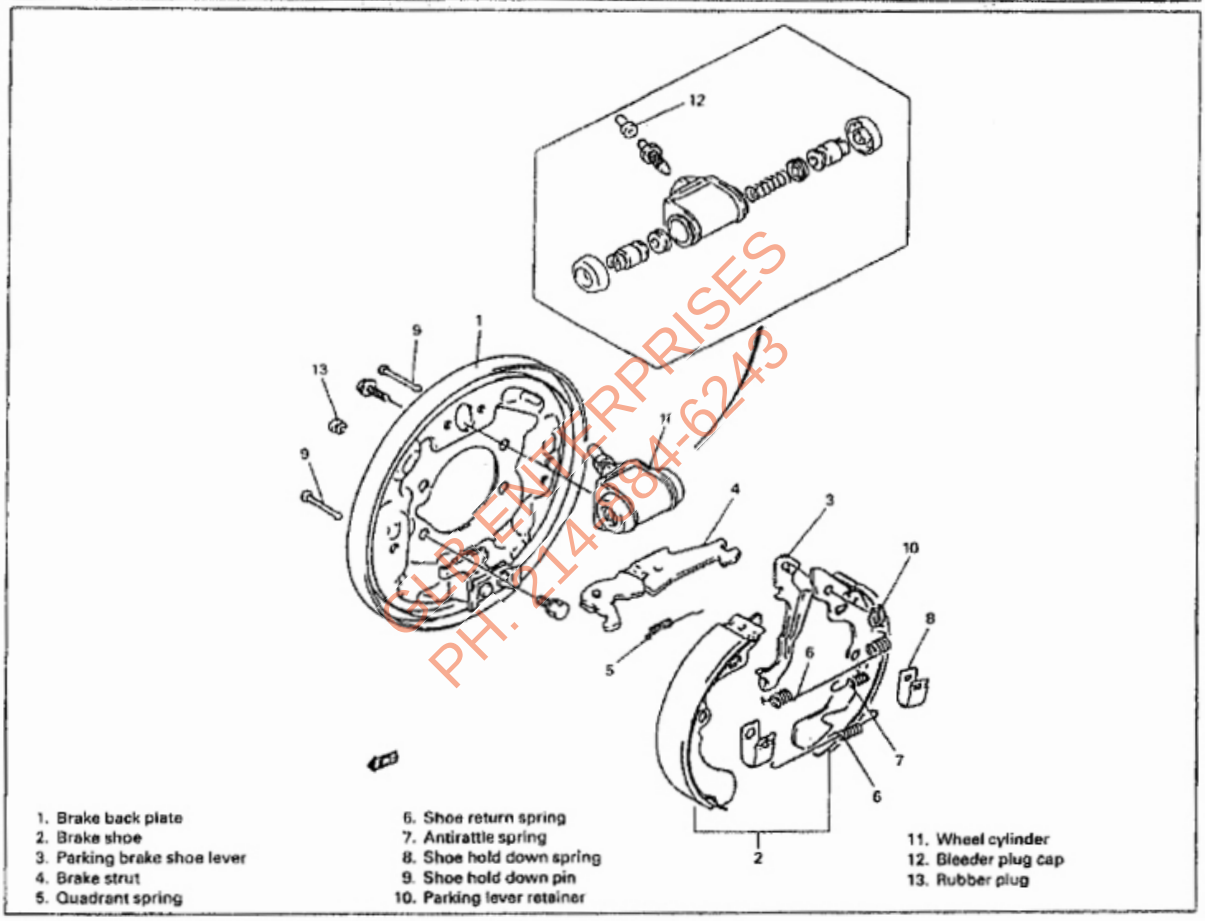
The drum brake assembly has a self shoe clearance adjusting system so that drum-to-shoe clearance is maintained appropriate at all times.

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. Parking brake shoe lever
4. Brake strut
5. Quadrant spring
6. Shoe return spring
7. Antirattle spring
8. Shoe hold down spring
9. Shoe hold down pin
10. Parking lever retainer
11. Wheel cylinder
12. Bleeder plug cap
13. Rubber plug

OPERATION

When the brake pedal is depressed, the piston and brake shoe move toward the brake drum side. As the brake shoe gets worn and the brake shoe clearance becomes larger, the force applied to the lever of brake strut at the time of such a contact becomes larger. When it exceeds specified value, the hole of the brake shoe web moves the lever of brake strut as much as the amount of the brake shoe lining wear toward the brake drum side.

Thus the shoe is forced against the drum and the brake force is produced.

The distance the lever moves corresponds to the amount of wear. In accordance with the lever movement, the fan-shaped ratchet also moves, for they are assembled as a unit. The lever and ratchet remain in the positions as they moved until the shoe-to-drum clearance becomes even larger.

In this way, the brake shoe-to-drum clearance is automatically adjusted constant every time the brake pedal is depressed.

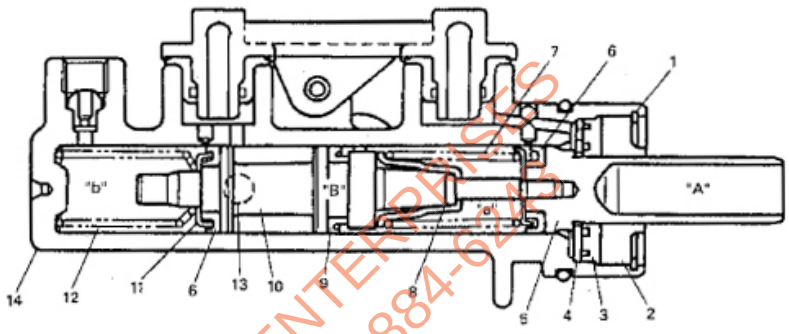
MASTER CYLINDER ASSEMBLY

GENERAL DESCRIPTION

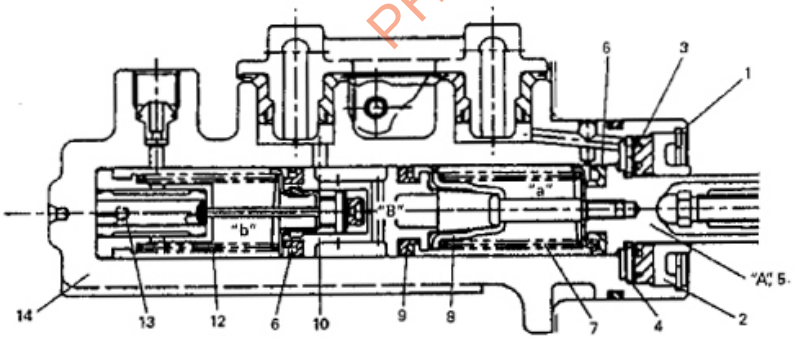
The master cylinder has two pistons and three piston cups. Its hydraulic pressure is produced in the primary ("a" in the figure below) and secondary ("b") chambers. The hydraulic pressure produced in the primary chamber ("a") acts on the rear wheel brakes (front wheel brakes for vehicle with ABS).
Also, the hydraulic pressure produced in the secondary chamber ("b") acts on the front wheel brakes (rear wheel brakes for vehicle with ABS).

CAUTION:
Replace all components included in repair kits to service this master cylinder. Lubricate rubber parts with clean, fresh brake fluid to ease assembly. Do no 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.

[A]



[B]



[A] : For vehicle without ABS
[B] : For vehicle with ABS
1. Piston stopper circlip
2. Piston stopper
3. Cylinder cup
4. Plate
5. Primary piston
6. Piston cup
7. Primary piston return spring
8. Primary spring retainer
9. Secondary piston pressure cup
10. Secondary piston
11. Return spring secondary seat
12. Secondary piston return spring
13. Secondary piston stopper bolt
14. Master cylinder body
"A" : Primary piston
"B" : Secondary piston

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. Its operation is as follows.

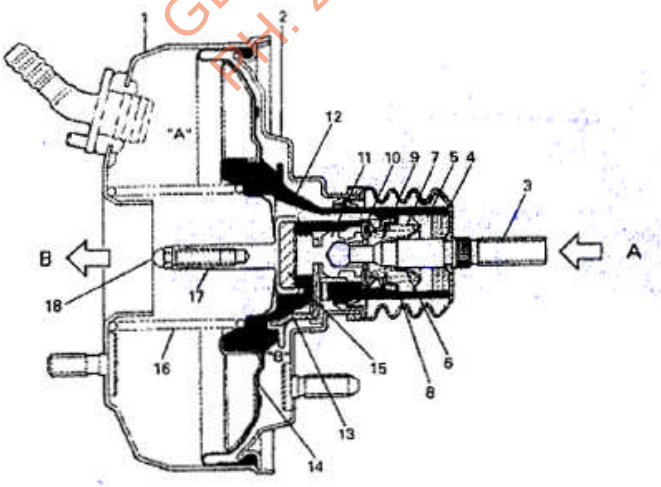
CAUTION:
When and after removing booster, never drop or deform it.

WARNING:
Never disassemble brake booster assembly. If it is found faulty, replace it with new assembly.

CAUTION:
The torque values specified are for dry, unlubricated fasteners. If any hydraulic component is removed or brake line disconnected, bleed the brake system.

OPERATION

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 figure below is added to it. Therefore, a small brake pedal depressing force is made into a strong push to the master cylinder push rod to produce high hydraulic pressure.
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.

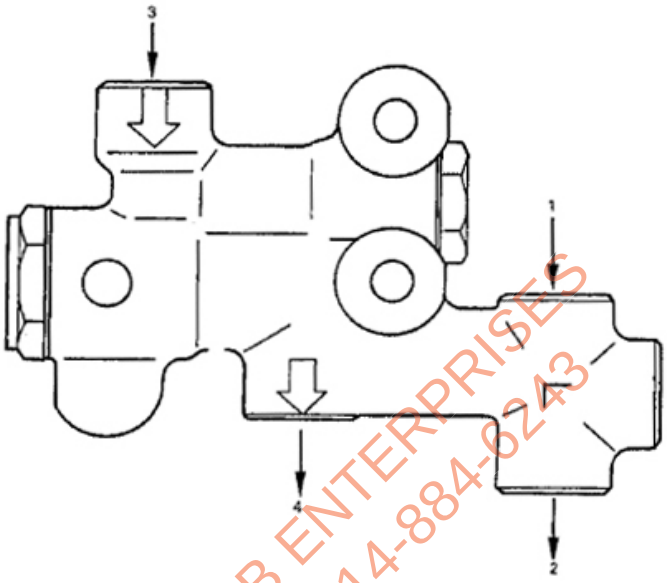


A. Brake pedal
B. Master cylinder
1. Booster No.1 body
2. Booster No.2 body
3. Valve operating rod
4. Air cleaner element
5. Air cleaner separator
6. Air valve spring retainer
7. Air valve return spring
8. Control valve spring retainer
9. Control valve spring
10. Booster control valve
11. Booster air valve
12. Booster piston
13. Valve stopper key
14. Booster diaphragm
15. Reaction disc
16. Booster piston return spring
17. Booster piston rod
18. Booster rod adjust screw

BLEND PROPORTIONING (B.P.) VALVE (If equipped with ABS)

The blend proportioning valve is included within the brake circuit which connects the master cylinder and the wheel brakes. It is installed on floor panel and controls the hydraulic pressure applied to the rear wheel brakes after predetermined pressure has been reached.

CAUTION:
Never disassemble proportioning valve. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.

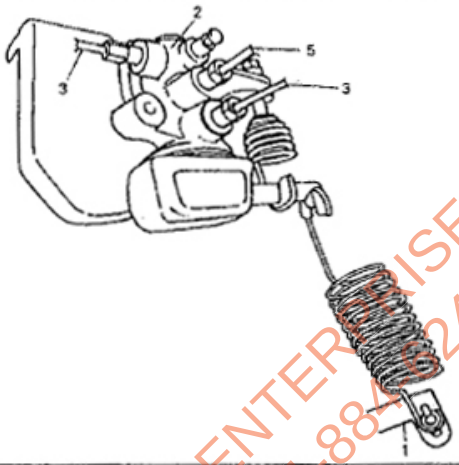


1. From master cylinder (Primary)
2. To ABS hydraulic unit
3. From master cylinder (Secondary)
4. To ABS hydraulic unit and rear wheel cylinders (right & left)

LSPV (Load Sensing Proportioning Valve) ASSEMBLY (If equipped)

As shown below, 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.

CAUTION:
Never disassemble LSPV. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.



1. LSPV spring bracket (Rear axle housing)
2. LSPV assembly
3. From master cylinder
4. To rear wheel brakes (Right and Left)
5. From master cylinder

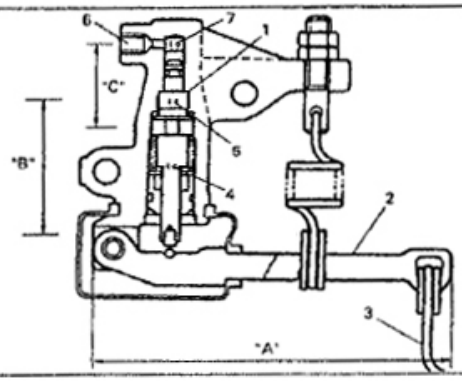
CONSTRUCTION

The LSPV components are grounded into 2 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 convert it into the load.

"B": Hydraulic pressure control section
Included in this section are a 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.



1. Plunger
2. LSPV lever
3. Sensor spring
4. From master cylinder primary chamber (Rear wheel brake)
5. To rear wheel brake
6. From master cylinder secondary chamber (Front wheel brake)
7. Bleeder plug

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 pads.

If master cylinder piston seals are satisfactory, check for leakage or excessive heat conditions. If condition is not found, drain fluid, flush with brake fluid, refill and bleed 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 TABLE

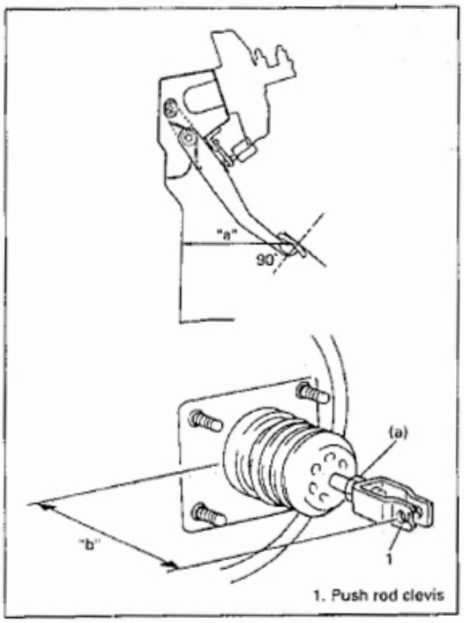
Condition	Possible Cause	Correction
Not enough braking force	• Brake oil leakage from brake lines.	Locate leaking point and repair.
	• Brake disc or pads stained with oil.	Clean or replace.
	• Overheated brakes.	Determine cause and repair.
	• Poor contact of shoes on brake drum.	Repair for proper contact.
	• Brake shoes linings stained with oil or wet with water.	Replace.
	• Badly worn brake pad linings.	Replace.
	• Defective wheel cylinders.	Repair or replace.
	• Malfunctioning caliper assembly.	Repair or replace.
	• Air in system.	Bleed system.
	• Maladjusted sensor spring length of LSPV (If equipped).	Check or adjust.
	• Broken sensor spring of LSPV (If equipped).	Replace.
	• Defective collar of LSPV (If equipped)	Replace.
	• Malfunctioning ABS (Anti-lock Brake System) (If equipped).	Check system referring to DIAGNOSIS of Section 5E.

Condition	Possible Cause	Correction
Brake pull (Brakes not working in unison)	• Pad linings and/or shoe linings are wet with water or stained with oil in some brakes.	Replace.
	• Drum-to-shoe clearance out of adjustment in some brakes. (Malfunctioning auto adjusting mechanism)	Check for inoperative auto adjusting mechanism.
	• Disc and/or drum is out of round in some brakes.	Replace.
	• Wheel tires are inflated unequally.	Inflate equally.
	• Malfunctioning wheel cylinders.	Repair or replace.
	• Disturbed front end alignment.	Adjust as prescribed.
	• Unmatched tires on same axle.	Tires with approximately the same amount of tread should be used on the same axle.
	• Restricted brake pipes or hoses.	Check for soft hoses and damaged lines. Replace with new hoses and new double-walled steel brake tubing.
	• Malfunctioning caliper assembly.	Check for stuck or sluggish pistons and proper lubrication of caliper slide bush. Caliper should slide.
	• Loose suspension parts. • Loose calipers.	Check all suspension mountings. Check and torque bolts to specifications.
Noise (high pitched squeak without brake applied)	• Front lining worn out.	Replace linings.
Rear brake locked prematurely (For vehicle equipped with LSPV)	• Maladjusted sensor spring length of LSPV. • Malfunctioning LSPV assembly.	Check or adjust. Replace assembly.
Brake locked (For vehicle equipped with ABS)	• Malfunctioning ABS (Anti-lock Brake System).	Check system referring to DIAGNOSIS of Section 5E.

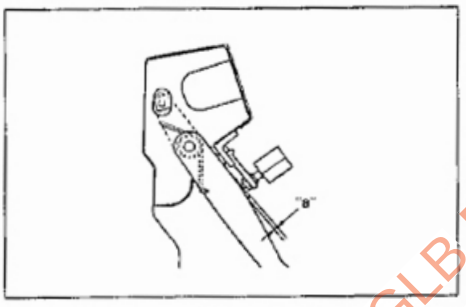
Condition	Possible Cause	Correction
Excessive pedal travel (Pedal stroke too large)	• Partial brake system failure.	Check brake systems and repair as necessary.
	• Insufficient fluid in master cylinder reservoirs.	Fill reservoirs with approved brake fluid. Check for leaks and air in brake systems. Check warning light. Bleed system if required.
	• Air in system (pedal soft/spongy).	Bleed system.
	• Rear brake system not adjusted (malfunctioning auto adjusting mechanism).	Repair auto adjusting mechanism. Adjust rear brakes.
	• Bent brake shoes.	Replace brake shoes.
	• Worn rear brake shoes.	Replace brake shoes.
Dragging brakes (A very light drag is present in all brakes immediately after pedal is released)	• Master cylinder pistons not returning correctly.	Repair master cylinder.
	• Restricted brake pipes or hoses.	Check for soft hoses or damaged pipes and replace with new hoses and/or new double-walled steel brake piping.
	• Incorrect parking brake adjustment on rear brakes.	Check and adjust to correct specifications.
	• Weakened or broken return springs in the brake.	Replace.
	• Sluggish parking brake cables or linkage.	Repair or replace.
	• Wheel cylinder or caliper piston sticking.	Repair as necessary.
	• Badly worn piston seal in the caliper.	Replace piston seal.
	• Malfunctioning ABS (Anti-lock Brake System).	Check system referring to DIAGNOSIS of Section 5E.
Pedal pulsation (Pedal pulsates when depressed for braking.)	• Damaged or loose wheel bearings.	Replace wheel bearings.
	• Distorted steering knuckle or rear wheel spindle.	Replace knuckle or rear wheel spindle.
	• Excessive disc lateral runout.	Check per instructions. If not within specifications, replace or machine the disc.
	• Parallelism not within specifications.	Check per instructions. If not within specifications, replace or machine the disc.
	• Rear drums out of round.	Check runout. Repair or replace drum as necessary.

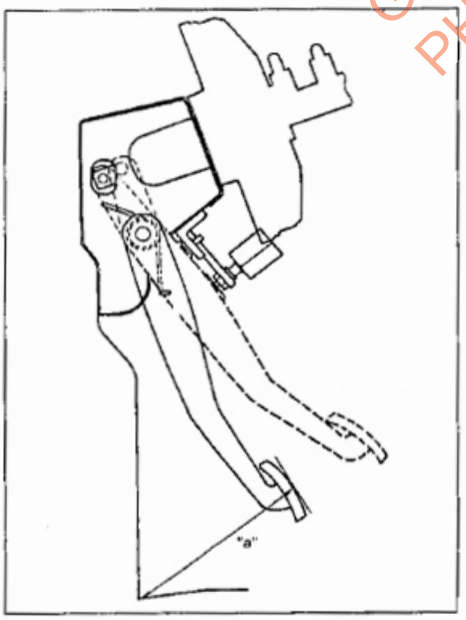
Condition	Possible Cause	Correction
Braking noise	• Glazed shoe linings, or foreign matters stuck to linings.	Repair or replace shoe linings.
	• Worn or distorted shoe linings.	Replace shoe linings (or pads).
	• Loose front wheel bearings.	Replace wheel bearing.
	• Distorted backing plates or loose mounting bolts.	Replace or retighten securing bolts.
Brake warning lamp turns on after engine start	• Parking brake applied.	Release parking brake and check that brake warning lamp turns off.
	• Insufficient amount of brake fluid.	Add brake fluid.
	• Brake fluid leaking from brake line.	Investigate leaky point, correct it and add brake fluid.
	• Brake warning lamp circuit faulty.	Repair circuit.
	• Malfunctioning ABS (Anti-lock Brake System) (If equipped).	Check system referring to DIAGNOSIS of Section 5E.
Brake warning lamp turns on when brake is applied	• Brake fluid leaking from brake line.	Investigate leaky point, correct it and add brake fluid.
	• Insufficient amount of brake fluid.	Add brake fluid.
Brake warning lamp fails to turn on even when parking brake is applied	• Brake warning light circuit faulty.	Replace bulb or repair circuit.
ABS warning lamp turns on after engine start (If equipped)	• Malfunctioning ABS (Anti-lock Brake System).	Check system referring to DIAGNOSIS of Section 5E.
ABS warning lamp turns on when brake is applied (If equipped)	• Malfunctioning ABS (Anti-lock Brake System).	Check system referring to DIAGNOSIS of Section 5E.

NOTE:
When ABS warning lamp is flashing, investigate faulty point and repair it, referring to "Diagnosis" in Section 5E.



1. Push rod clevis





CHECK AND ADJUSTMENT

BRAKE PEDAL FREE HEIGHT ADJUSTMENT

Check brake pedal free height (distance).
If it is not within specification, check and adjust following item 1) and 2).

Brake pedal free distance "a"
from dash panel : 210 – 216 mm (8.27 – 8.50 in.)

1) Check measurement between booster mounting surface and center of clevis pin hole. When booster push rod clevis has been reinstalled, it is important that the measurement is adjusted.

   Length "b": 99.5 – 100.5 mm (3.92 – 3.96 in.)

   Tightening Torque
   (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)

2) Check stop light switch position. Adjust it if it is out of specification.

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 is specified. Then tighten lock nut to specified torque.

Clearance "a": 1.5 – 2.0 mm (0.06 – 0.08 in.)

Tightening Torque
(a): 7.5 N·m (0.75 kg-m, 5.5 lb-ft)

EXCESSIVE PEDAL TRAVEL CHECK

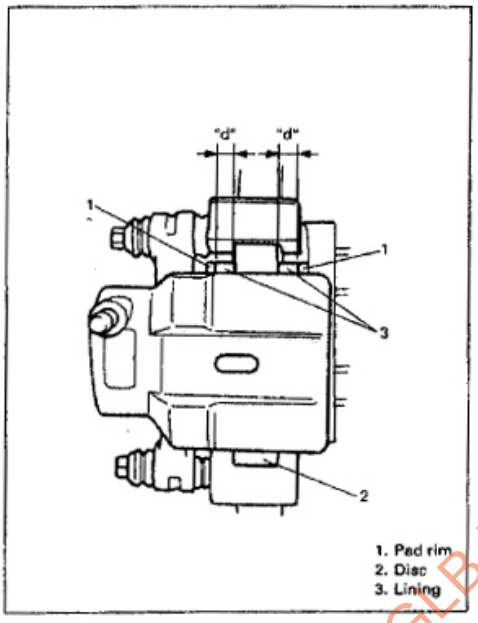
1) Start engine.
2) Depress brake pedal a few times.
3) With brake pedal depressed with approximately 30kg (66 lbs) load, measure brake pedal to wall clearance "a".

   Clearance "a": Over 155 mm (6.10 in.)

4) If clearance "a" is less than specification, the most possible cause is either rear brake shoes are worn out beyond limit or air is in lines.
   Should clearance "a" remain less than specification 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.
   - Refer to BLEEDING BRAKES for bleeding brake system.
   - Remove brake drums for adjuster inspection, (refer to BRAKE DRUM INSPECTION.) If defective, correct or replace.

FRONT BRAKE DISC CHECK

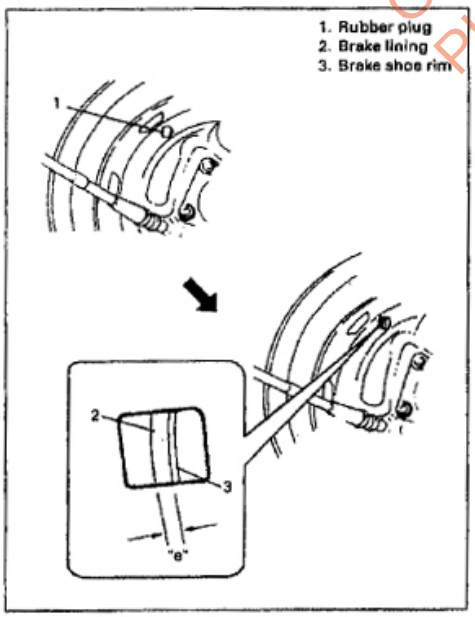
Refer to BRAKE PAD INSPECTION of this section for inspection point and procedure.



FRONT BRAKE PAD LINING CHECK

Inspect pad linings periodically according to maintenance schedule whenever wheels are removed (for tire rotation or other reason). Take a look through each end (or hole) of caliper and check lining thickness of outside and inside pads.
If lining is worn and its thickness ("d" in figure) is less than limit, all pads must be replaced at the same time.

Thickness "d"
Service limit: 1.0 mm (0.04 in.)

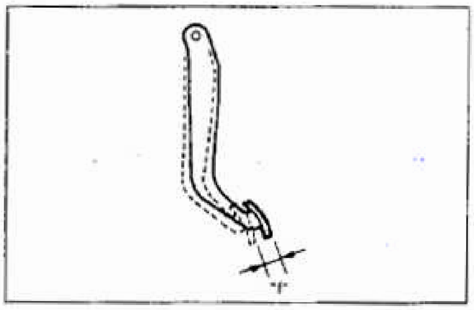


REAR BRAKE SHOE CHECK

Inspection should be carried out on following points after brake pedal travel (pedal to wall clearance) check, even when pedal travel is normal.
Amount of brake shoe wear can be checked as follows.

1) Hoist vehicle.
2) Remove rubber plug from brake back plate.
3) Through hole of back plate, visually check for thickness of brake shoe lining. If lining thickness "e" is found less than limit, replace all shoes with new ones at the same time.

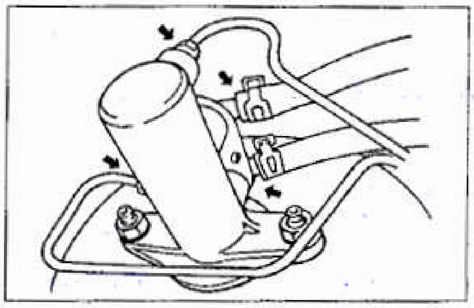
Thickness "e"
Service limit: 1.0 mm (0.04 in.)



BRAKE PEDAL PLAY CHECK

Pedal play should be within specification below.
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.

Pedal play "f": 1 – 8 mm (0.04 – 0.31 in.)

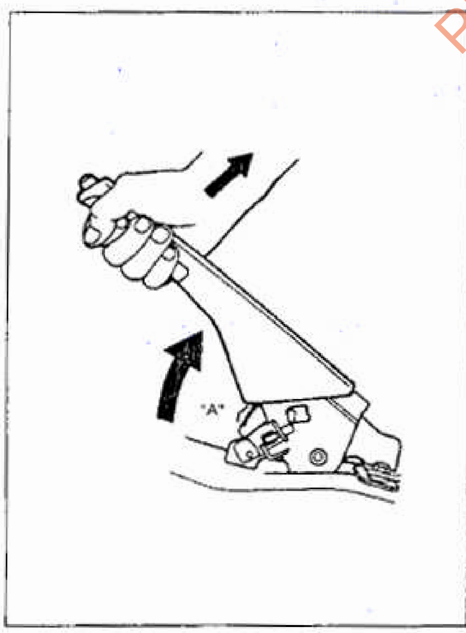


MASTER CYLINDER CHECK

Check for 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 normal.

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 30kg (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.



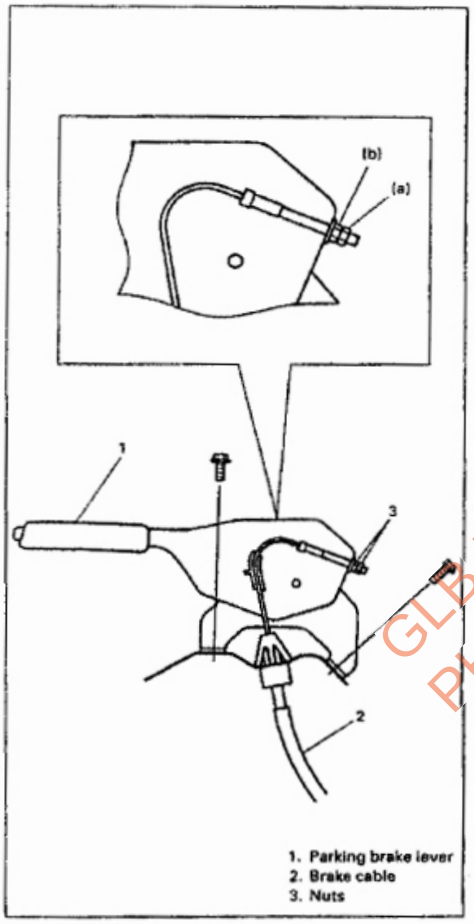
PARKING BRAKE CHECK AND ADJUSTMENT

CHECK

Hold center of parking brake lever grip and pull it up with 20 kg (44 lbs) force.
With parking brake lever pulled up as above, count ratchet notches in "A" as shown in figure.
There should be 4 to 7 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 level without pressing its button.
One click sound corresponds to one notch.

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.



1. Parking brake lever
2. Brake cable
3. Nuts

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.**

After confirming that above 5 conditions are all satisfied, adjust parking brake lever stroke by loosening or tightening parking brake nuts (3 in left figure).

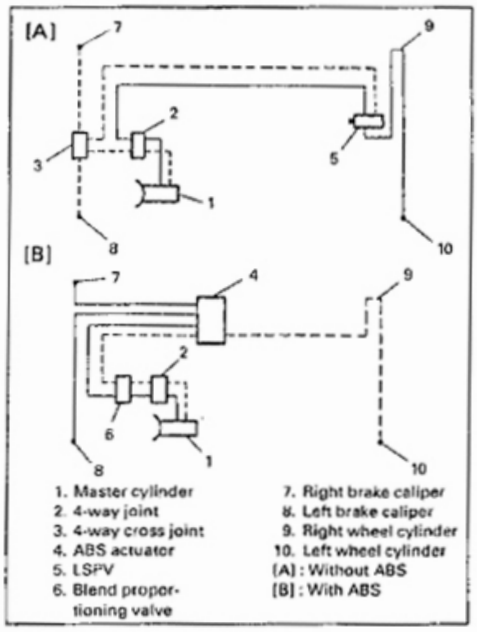
Tightening Torque
(a) : 20 N·m (2.0 kg-m, 14.5 lb-ft)
(b) : 11 N·m (1.1 kg-m, 8.0 lb-ft)

NOTE:
Check brake drum for dragging after adjustment.

Parking brake stroke: when lever is pulled up at 20 kg (44 lbs)	Within 4 – 7 notches

FLUSHING BRAKE HYDRAULIC SYSTEM

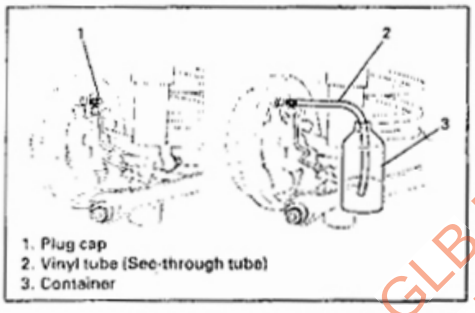
It is recommended that entire hydraulic system be thoroughly flushed with clean brake fluid whenever new parts are installed in hydraulic system.
Periodical change of brake fluid is also recommended.



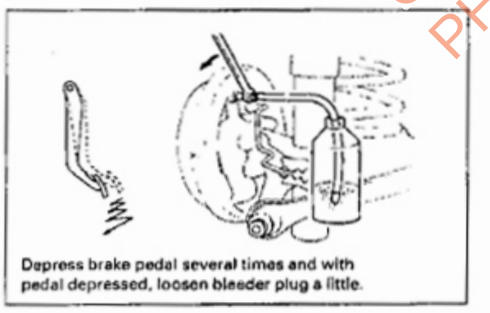
BLEEDING BRAKES

CAUTION:
Brake fluid is extremely damaging to paint. If fluid should accidentally touch painted surface, immediately wipe fluid from paint and clean painted surface.

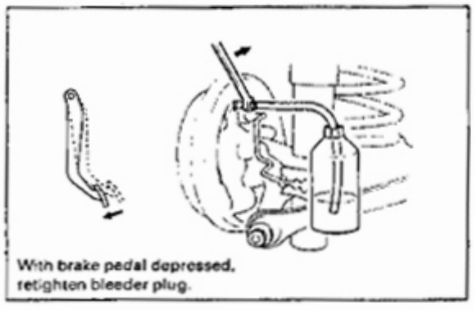
NOTE:
Before performing bleeding operation, make sure that ABS warning light turns off after ignition switch has turned on (for vehicle equipped with ABS).
Bleeding operation is necessary to remove air whenever it entered hydraulic brake system.
Hydraulic lines of brake system consists of two separate lines, one for front wheel brakes and the other for rear wheel brakes. When a brake pipe or hose was disconnected at the wheel, bleeding operation must be performed at both ends of the line of the removed pipe or hose. When any joint part of the master cylinder of other joint part between the master cylinder and each brake (wheel) was removed, the hydraulic brake system must be bled at right and left brake caliper, left wheel cylinder and LSPV (if equipped).



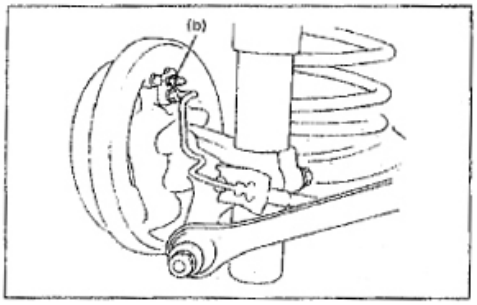
1) Fill master cylinder reservoir with brake fluid and keep at least one-half full of fluid during bleeding operation.
2) Remove bleeder plug cap.
   Attach a vinyl tube to bleeder plug, and insert the other end into container.


Depress brake pedal several times and with pedal depressed, loosen bleeder plug a little.

3) Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-third to one-half turn.


With brake pedal depressed, retighten bleeder plug.

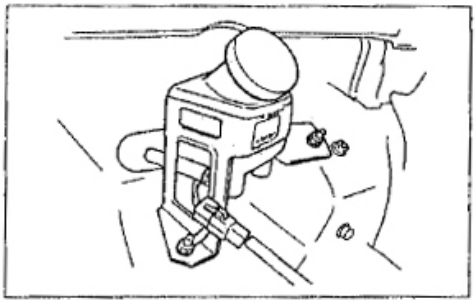
4) When fluid pressure in the cylinder is almost depleted, retighten bleeder plug.
5) Repeat this operation until there are no more air bubbles in hydraulic line.



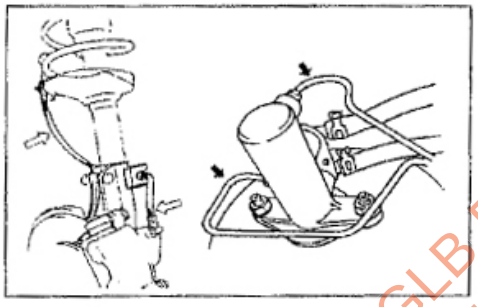
6) When bubbles stop, depress and hold brake pedal and tighten bleeder plug.

Tightening Torque
(b): 8 N·m (0.8 kg-m, 6.0 lb-ft) .. For Rear brake, LSPV
11 N·m (1.1 kg-m, 8.0 lb-ft) .. For Front brake

7) Then attach bleeder plug cap.
8) After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.



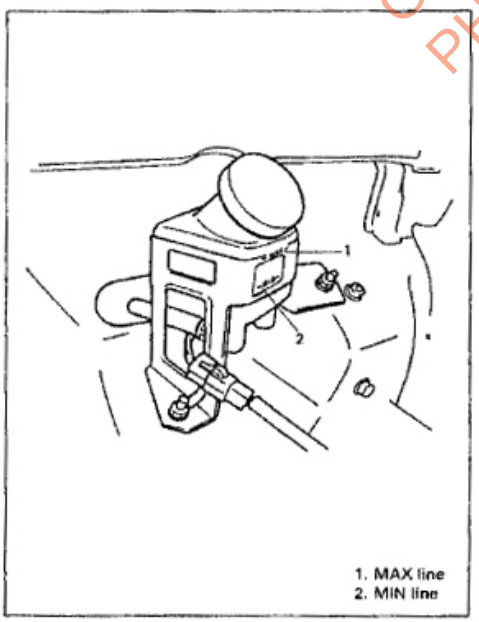
9) Replenish fluid into reservoir up to specified level.
10) Check brake pedal for "sponginess". If found spongy, repeat entire procedure of bleeding.



BRAKE HOSE AND PIPE CHECK

The brake hose assembly should be checked for road hazard damage, for cracks and chafing of the outer cover, for leaks and blisters. A light and mirror may be needed for an adequate inspection. If any of the above conditions are observed on the brake hose, it is necessary to replace it.

Inspect the pipe for damage, cracks, dents and corrosion. If any defect is found, replace it.



1. MAX line
2. MIN line

BRAKE FLUID LEVEL CHECK

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.

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.

BOOSTER OPERATION CHECK

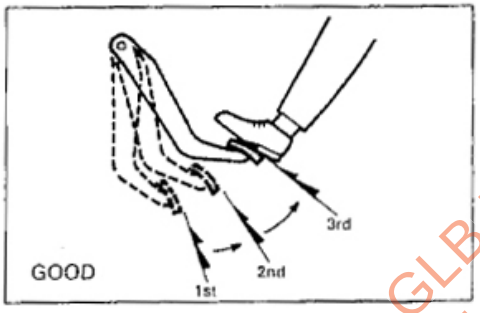
There are two ways to perform this inspection, with and without a tester. Ordinarily, it is possible to roughly determine its condition without using a tester.

NOTE:
For this check, make sure that no air is in hydraulic line.

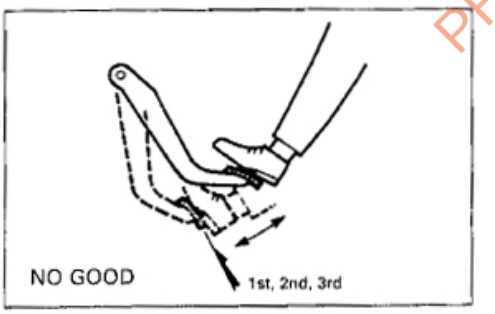
INSPECTION (WITHOUT TESTER)

Check Air Tightness

1) Start engine.
2) Stop engine after running for 1 to 2 minutes.

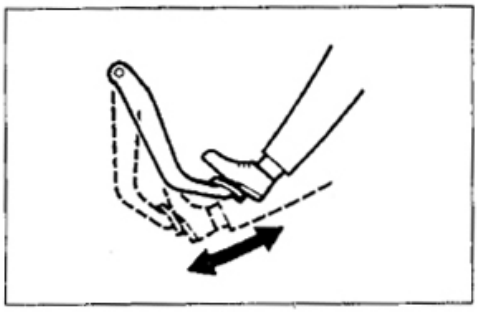


3) Depress brake pedal several times with the same load as in ordinary braking and observe pedal travel. If pedal goes down deep the first time but its travel decreases as it is depressed the second and more times, air tightness is obtained.



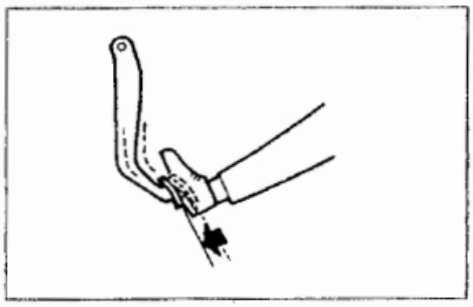
4) If pedal travel doesn't change, air tightness isn't obtained.

NOTE:
If defective, inspect vacuum lines and sealing parts, and replace any faulty part.
When this has been done, repeat the entire test.

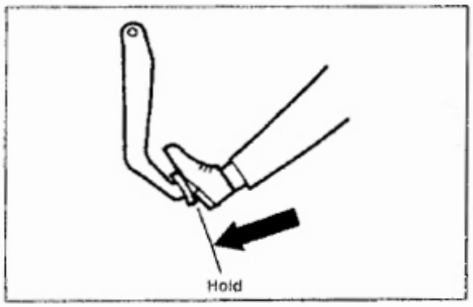


Check Operation

1) With engine stopped, depress brake pedal several times with the same load and make sure that pedal travel doesn't change.

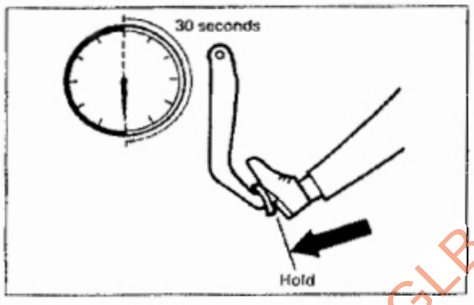


2) Start engine while depressing brake pedal. If pedal travel increases a little, operation is satisfactory. But no change in pedal travel indicates malfunction.

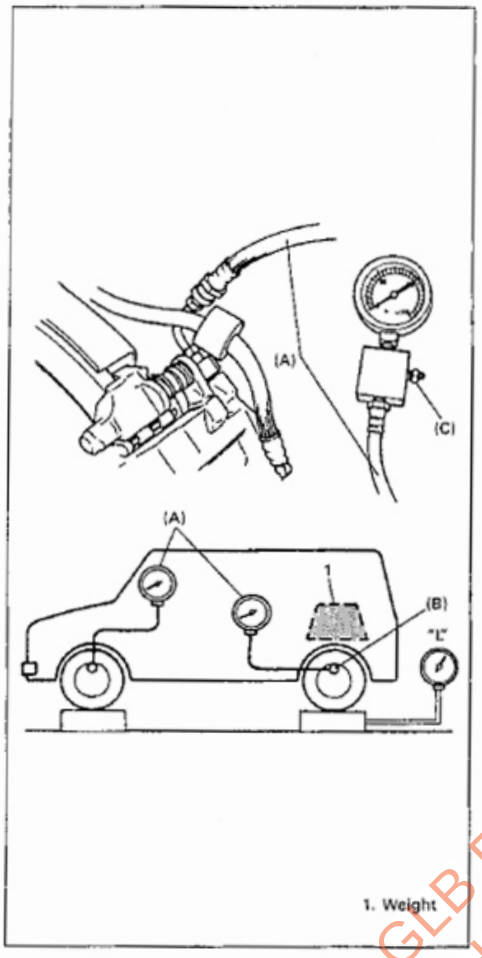


Check Air Tightness Under Load

1) With engine running, depress brake pedal. Then stop engine while holding brake pedal depressed.



2) Hold brake pedal depressed for 30 seconds. If pedal height does not change, condition is good. But it isn't if pedal rises.



FLUID PRESSURE TEST (if equipped with LSPV)

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 and set weight slowly on axle housing center so that rear axle weights 660 kg (1455 lb).

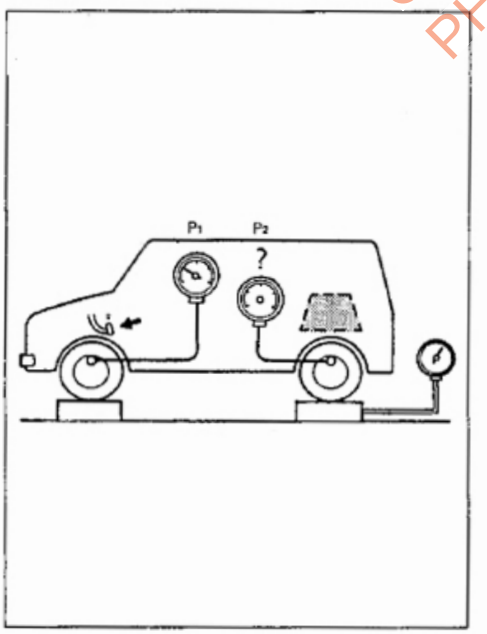
Rear axle weight "L": 660 kg (1455 lb)

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.

Special Tool
Front brake
(A) : 09956-02310
Rear brake
(A) : 09956-02310
(B) : 09952-36310 (Fluid pressure gauge attachment)
(C) : 55473-82030 (Bleeder plug (10 mm) as a spare part)

NOTE:
Special tool (B) is used instead of thread diameter 10mm attachment of special tool (A). So remove the attachment from (A) and install (B).

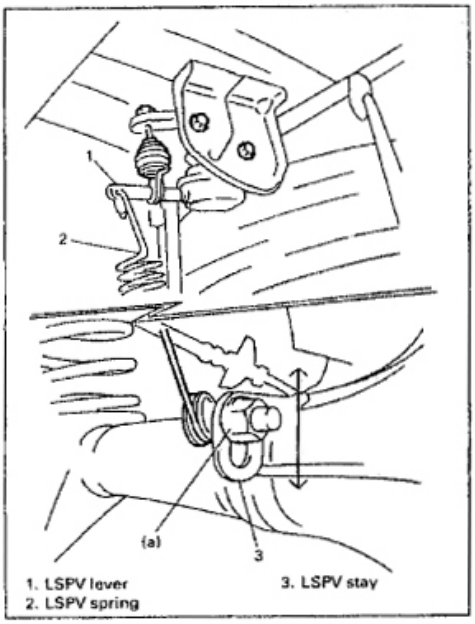


3) Depress brake pedal gradually till fluid pressure of front brake becomes as specified below and check corresponding pressure of rear brake then. It should be within specification given below.

Front brake "P_1"	Rear brake "P_2"
8000 kPa 80 kg/cm^2 1138 psi	4200 – 5600 kPa 42 – 56 kg/cm^2 597 – 797 psi

As done above, apply 100 kg/cm^2 pressure to front brake and check that rear brake pressure then is within specification as given below.

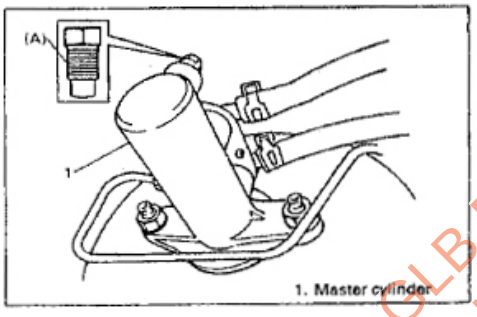
Front brake "P_1"	Rear brake "P_2"
10000 kPa 100 kg/cm^2 1422 psi	4800 – 6200 kPa 48 – 62 kg/cm^2 682 – 882 psi



1. LSPV lever
2. LSPV spring
3. LSPV stay

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) downward and if it is lower, upward.
- Repeat steps 3) and 4) until rear brake pressure is within specification.
- After adjustment, be sure to torque nut to specification.

Tightening Torque
(a) : 23 N·m (2.3 kg-m, 17 lb-ft)



1. Master cylinder

5) Disconnect brake pipe (connecting between master cylinder and 4-way cross joint) from master cylinder.
Tighten plug (special tool) to master cylinder as shown below.

Special Tool
(A) : 09956-02210

Depress brake pedal. If rear brake pressure is 95 – 100 kg/cm^2 when front brake pressure is 100 kg/cm^2, it means that front fail-safe system functions properly.

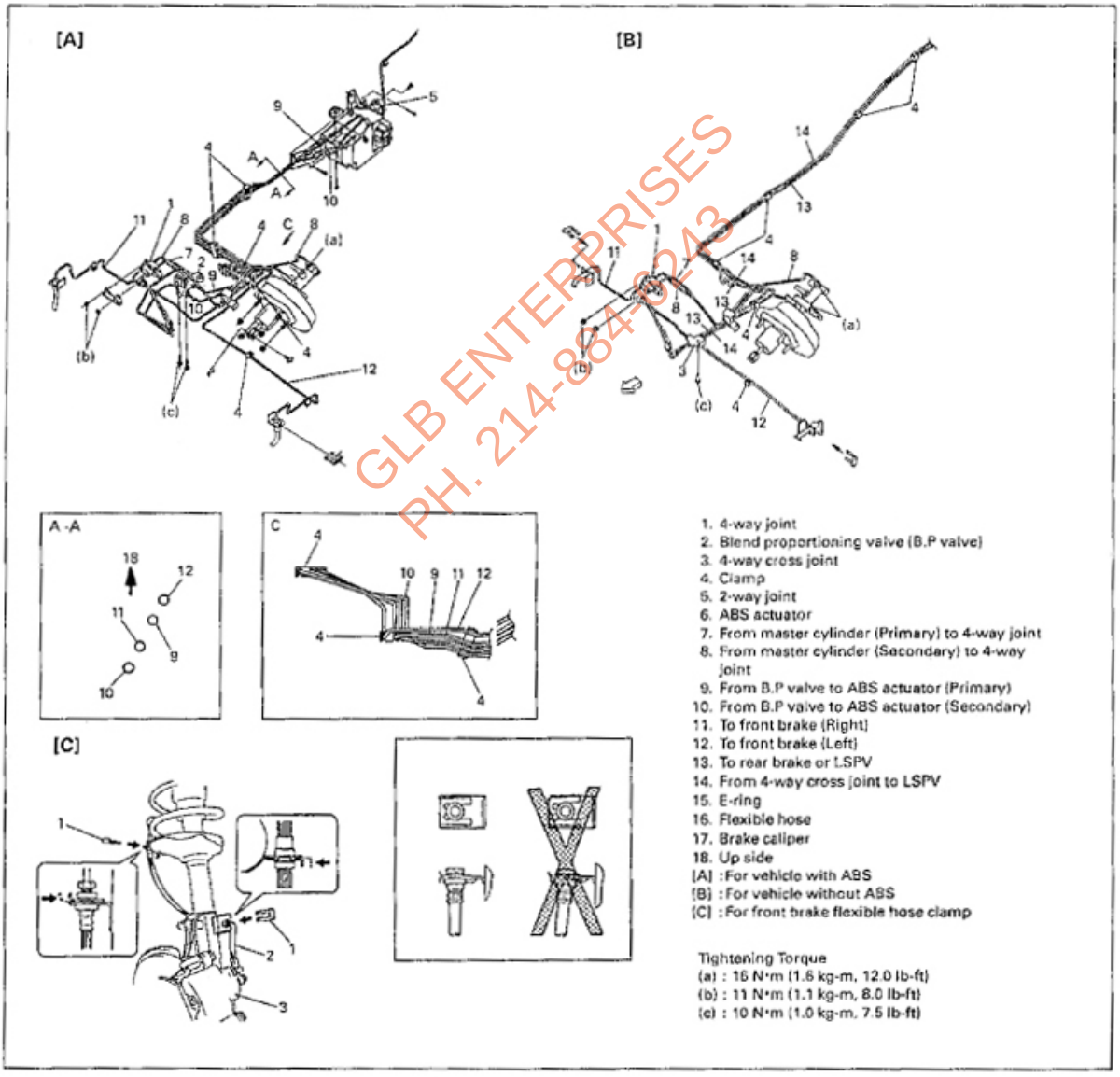
Front brake	Rear brake
10000 kPa 100 kg/cm^2 1422 psi	9500 – 10000 kPa 95 – 100 kg/cm^2 1350 – 1422 psi

6) Upon completion of fluid pressure test, bleed brake system and perform brake test.

ON-VEHICLE SERVICE

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 P valve.
2) Clean dirt and foreign material from both flexible hose end and pipe end fittings. Remove brake flexible hose or pipe.
3) Reverse brake flexible hose installation procedure.
   For installation, make sure that steering wheel is in straightforward position and flexible hose has not twist or kink. Check to make sure that flexible 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.
4) Perform brake test and check installed part for fluid leakage.

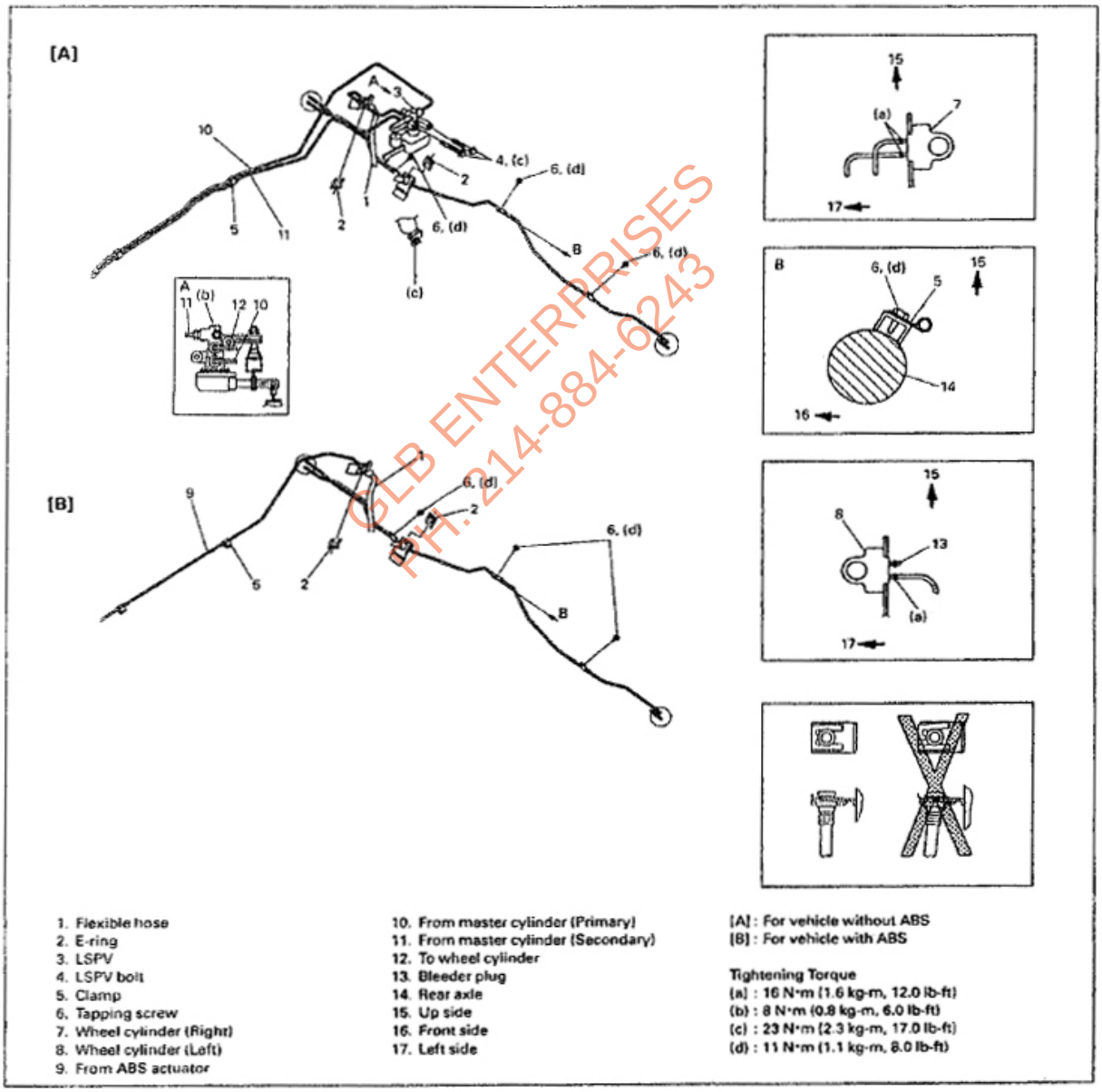


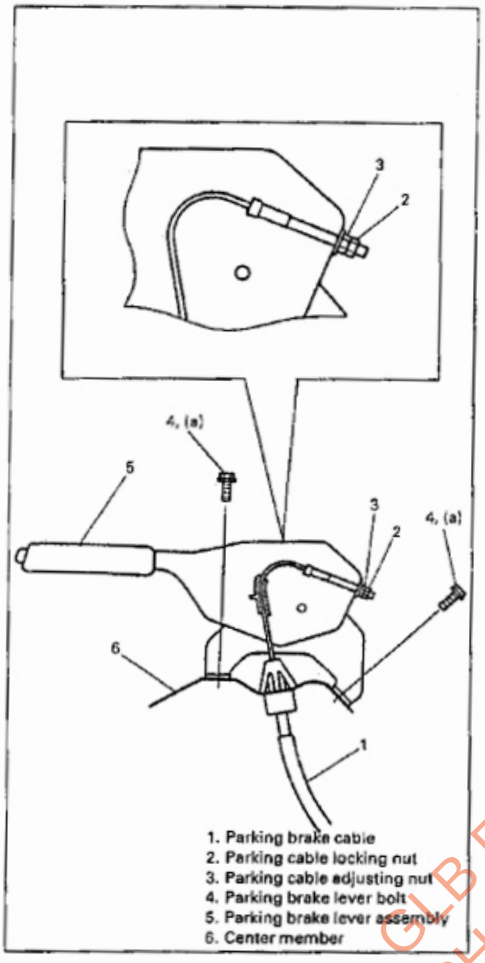
REAR BRAKE HOSE/PIPE

1) Raise and support vehicle properly. Remove tire and wheel.
2) Clean dirt and foreign material from both flexible hose end and pipe end fittings. Remove brake flexible hose or pipe.
3) Reverse brake flexible hose installation procedure. Fill and maintain brake fluid level in reservoir. Bleed brake system.
4) Perform brake test and check each installed part for fluid leakage.

PRECAUTION FOR INSTALLATION

- Never reuse protector nut once removed. Be sure to use a new one.
- Install clamps properly referring to figure below and tighten bolts.
- When installing hose, make sure that it has no twist or kink.





1. Parking brake cable
2. Parking cable locking nut
3. Parking cable adjusting nut
4. Parking brake lever bolt
5. Parking brake lever assembly
6. Center member

PARKING BRAKE LEVER

REMOVAL

1) Remove console box.
2) Disconnect lead wire of parking brake switch at coupler.

NOTE:
Don't disassemble parking brake lever switch. It must be removed and installed as a complete switch assembly.

3) Remove parking brake cable nuts.
4) Remove parking brake lever bolts.

INSTALLATION

1) Install in reverse order of steps 2) to 4) of REMOVAL.

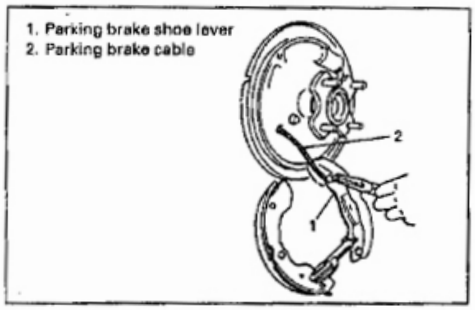
Tightening Torque
(a): 20 N·m (2.0 kg-m, 14.5 lb-ft)

2) Adjust parking brake lever. Refer to PARKING BRAKE CHECK AND ADJUSTMENT in this section.
3) Check rear brakes for dragging and brake system for proper performance.
4) Install console box.

PARKING BRAKE CABLE

REMOVAL

1) Remove cable from parking brake lever. (Refer to steps 1) to 3) of PARKING BRAKE LEVER REMOVAL.)
2) Remove brake drum. (Refer to steps 1) to 5) of BRAKE DRUM REMOVAL of this section.)

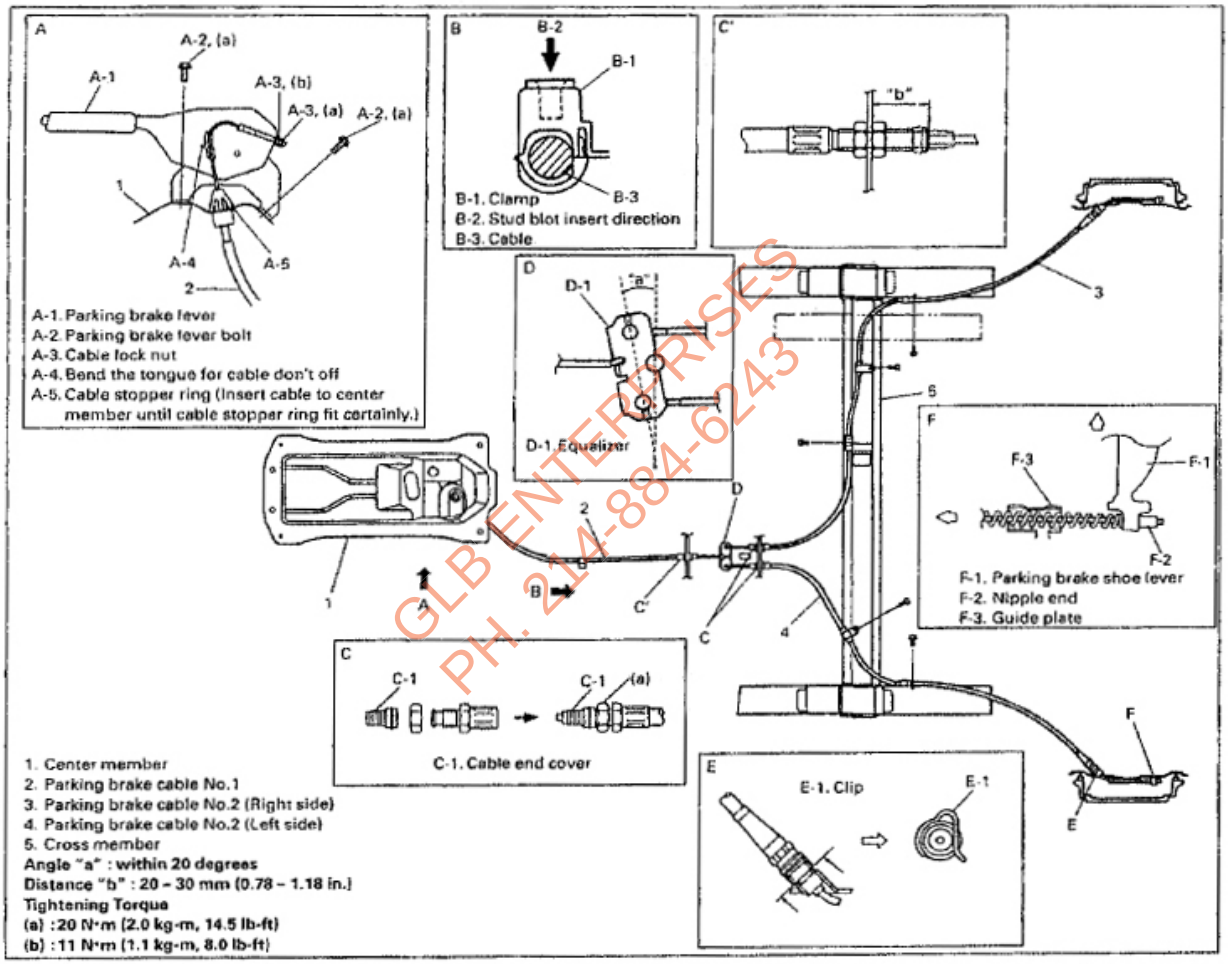


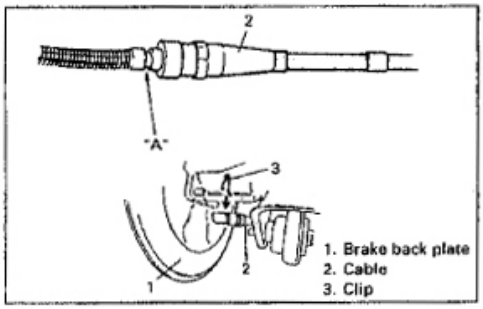
1. Parking brake shoe lever
2. Parking brake cable

3) Disconnect parking brake cable from brake shoe lever. (Refer to step 2) & 4) of BRAKE SHOE REMOVAL of this section.)
4) Disconnect brake cable from brake back plate. (Refer to step 4) of BRAKE BACK PLATE REMOVAL.)

NOTE:
When it is necessary to remove both right and left parking brake cable, repeat above steps 2) to 4) on right and left wheels.

5) Remove cable from vehicle body.





INSTALLATION

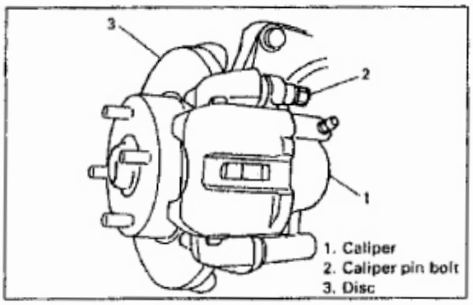
1) Apply water tight sealant "A" around cable at indicated position in figure and connect it to back plate with clip.

"A" : Sealant 99000-31090

2) Connect cable to brake shoe lever and install brake shoes to back plate. (Refer to steps 1) to 2) of BRAKE SHOE INSTALLATION of this section.)
3) Install brake drum. (Refer to steps 1) to 2) of BRAKE DRUM INSTALLATION of this section.)
4) Connect cable to parking brake lever (Refer to step 1) of BRAKE LEVER INSTALLATION of this section.
Don't make lever adjustment at this point yet.

NOTE:
Above steps 1) to 3) must be performed on both right and left wheels.

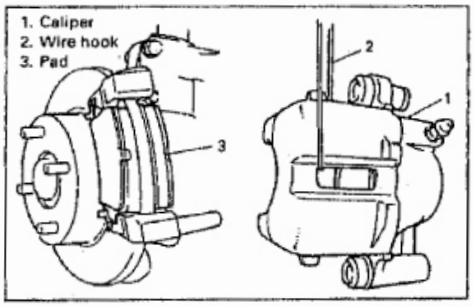
5) Clamp cable securely referring to figure.
6) Upon completion of installation, adjust cable.
(Refer to PARKING BRAKE CHECK AND ADJUSTMENT of this section.)
Then check brake drum for dragging and brake system for proper performance. After removing vehicle from hoist, brake test should be performed.



BRAKE PAD

REMOVAL

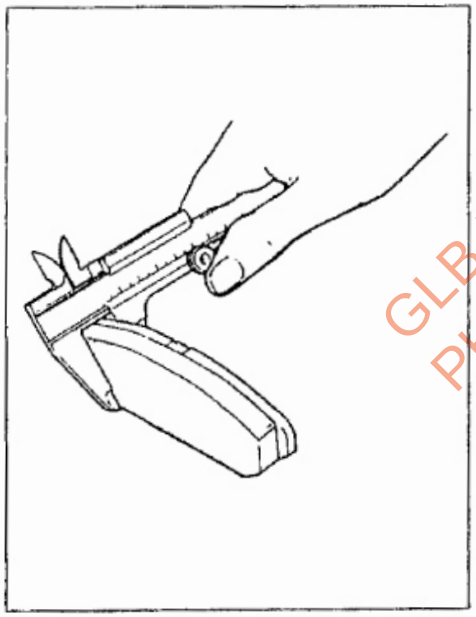
1) Hoist vehicle and remove wheel.
2) Remove E-ring securing brake hose and take brake hose off from strut bracket.
3) Remove caliper pin bolt.



4) Remove caliper from caliper carrier.

NOTE:
Hang removed caliper with a wire hook or the like so as to prevent brake flexible hose from bending and twisting excessively or being pulled.
Don't operate brake pedal with pads removed.

5) Remove pads.



INSPECTION

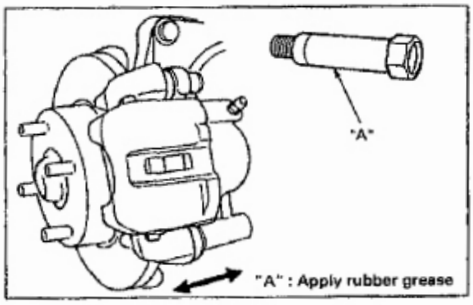
Brake Pad

Check pad lining for wear. When wear exceeds limit, replace with new one.

CAUTION:
Never polish pad lining with sandpaper. If lining is polished 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.

Pad thickness (lining + pad rim)
Standard : 15 mm (0.59 in.)
Limit : 6 mm (0.24 in.)

NOTE:
When pads are removed, visually inspect caliper for brake fluid leak. Correct leaky point, if any.

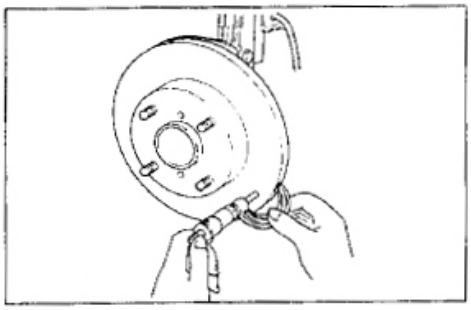


Cylinder Slide Pin/Caliper pin bolt

Check slide pin for smooth movement as shown.
If it is found faulty, correct or replace. Apply rubber grease to slide pin and caliper pin bolt outer surface. Rubber grease should be the one whose viscosity is less affected by such low temperature as – 40°C (– 40°F).

Bush Dust Boot and Pin Slide Bush

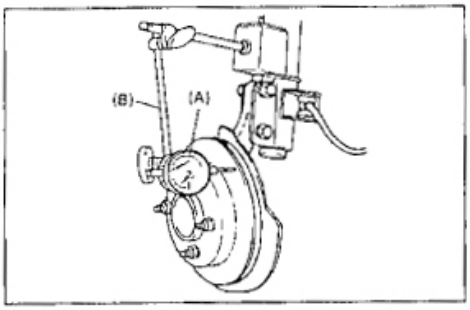
Check boot and bush for breakage, crack and damage. If defective, replace



Brake Disc

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, polish and correct that side.

Disc thickness
Standard : 12.0 mm (0.472 in.)
Limit : 10.0 mm (0.394 in.)

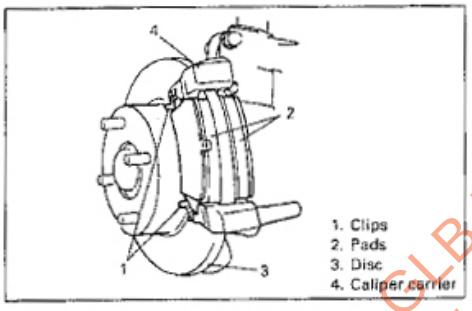


Use wheel nuts to hold the disc securely against the hub, then mount a dial indicator as shown.
To measure deflection of disc, take measurement at 2 points on its periphery and center with dial gauge while rotating it.

Limit on disc deflection: 0.15 mm (0.006 in.)

Special Tool
(A): 09900-20606
(B): 09900-20701

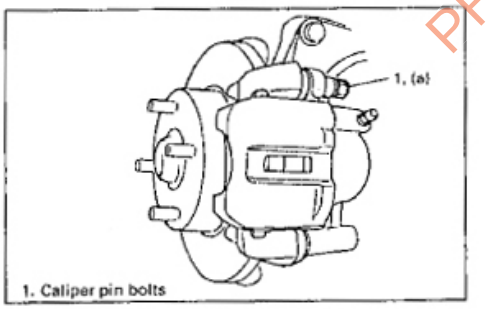
NOTE:
Check front wheel bearing for looseness before measurement.



INSTALLATION

NOTE:
See NOTE at the beginning of this section.

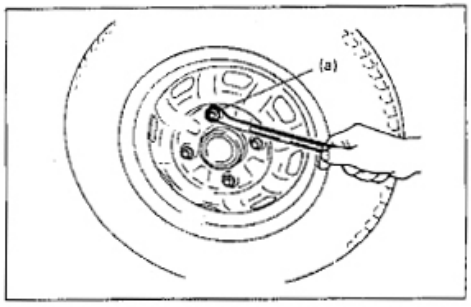
1) Install shims to pads, then pad clips and pads to caliper carrier.



2) Install caliper and torque caliper pin bolt to specification.

NOTE:
Make sure that boots are fit into groove securely.

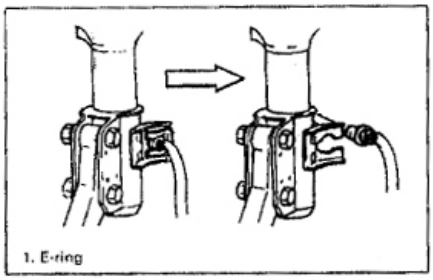
Tightening Torque
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



3) Install E-ring to strut securely.
4) Tighten front wheel nuts to specified torque.

Tightening Torque
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)

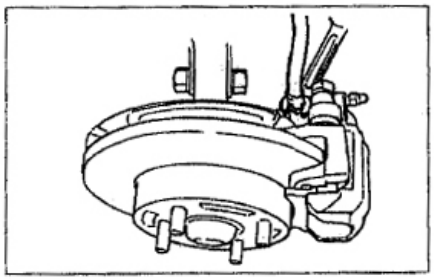
5) Upon completion of installation, perform brake test.


1. E-ring

CALIPER ASSEMBLY

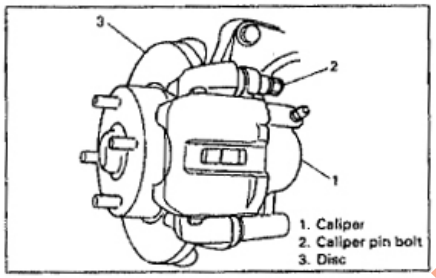
REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove E-ring.



3) Loosen flexible hose joint bolt a little at caliper.

> **CAUTION:**
> **Be careful not to twist flexible hose while loosening the bolt.**

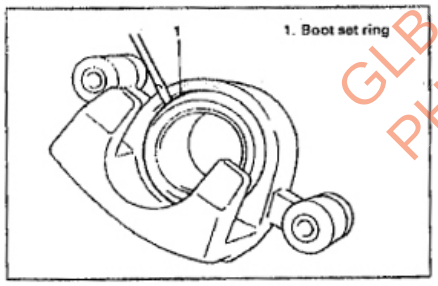

1. Caliper
2. Caliper pin bolt
3. Disc

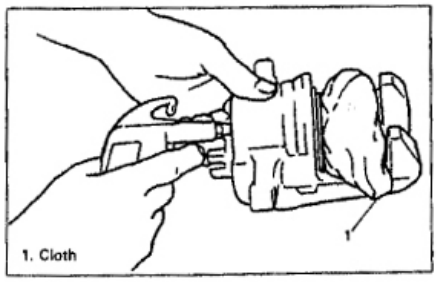
4) Remove caliper pin bolt.
5) Remove caliper from carrier.
6) Disconnect flexible hose from caliper using care not to twist it. As this will allow fluid to flow out of flexible hose, have a container ready beforehand.

DISASSEMBLY

Before disassembly, clean all around caliper with brake fluid.

1) Remove piston boot set ring and boot from caliper, pry off with a flat-bladed tool. Be careful not to damage boot.

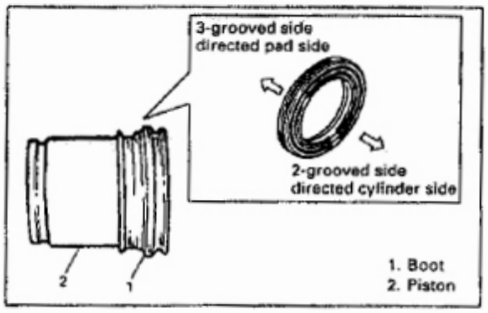

1. Boot set ring


1. Cloth

2) Blow compressed air into cylinder through bolt hole where flexible hose was fitted. With this air pressure, piston can be pushed out of cylinder.

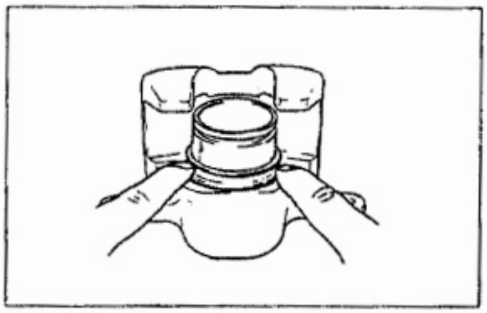
> **WARNING:**
> **Do not apply too highly compressed air which will cause piston to jump out of cylinder. It should be taken out gradually with moderately compressed air. Do not place your fingers in front of piston when using compressed air.**

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.

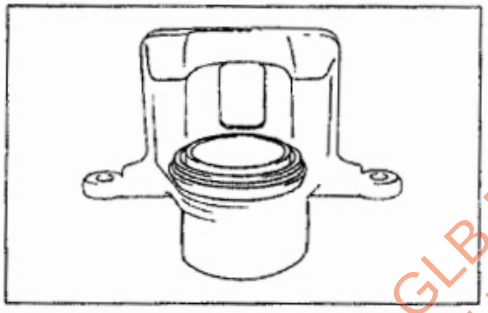


Piston and Boot

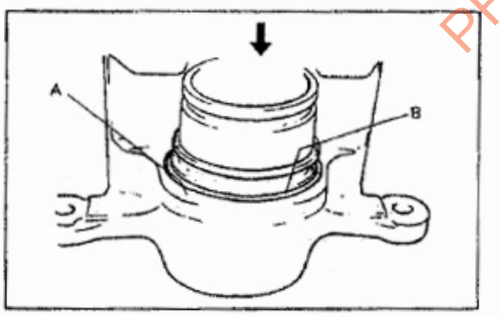
1) Before inserting piston into cylinder, install boot onto piston as shown.



2) Fit boot as it is in figure into boot groove in cylinder with fingers.



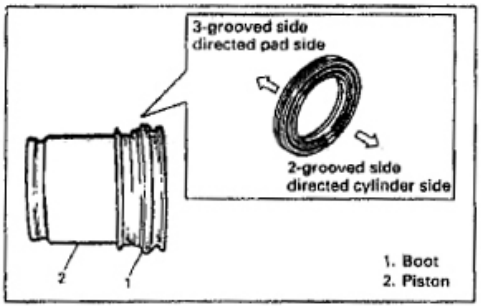
3) Insert piston into cylinder by hand and fit boot in boot groove in piston.



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.

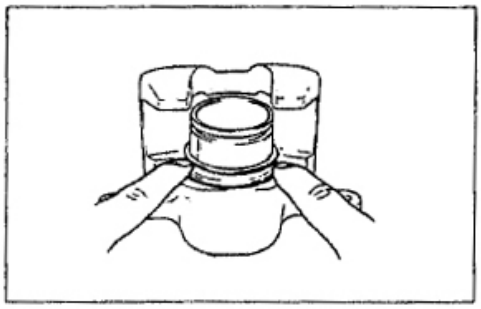
NOTE:
Boot's face B should be at the same level from cylinder's face A all around.

5) Insert piston into cylinder by hand.
6) Install boot set ring securely.

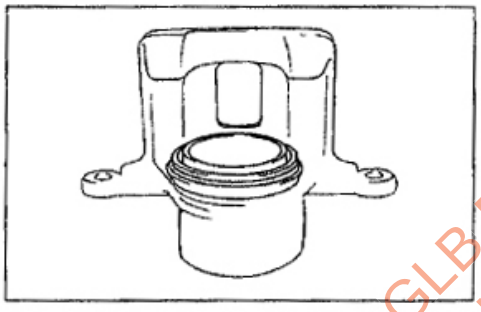


Piston and Boot

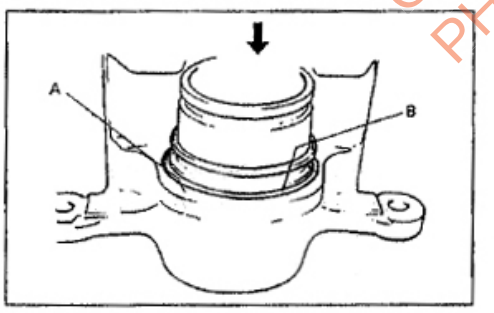
1) Before inserting piston into cylinder, install boot onto piston as shown.



2) Fit boot as it is in figure into boot groove in cylinder with fingers.



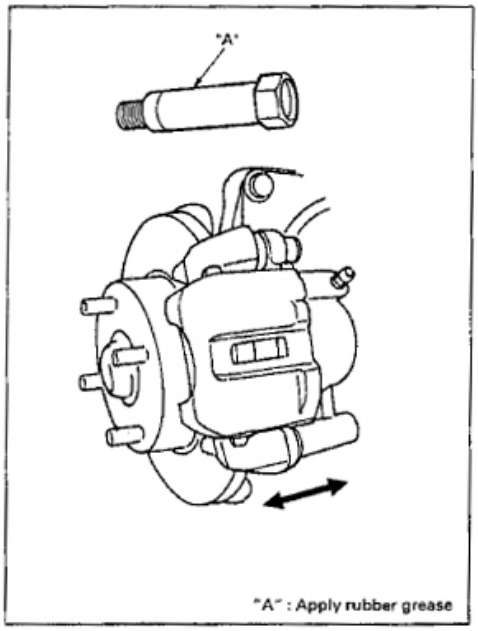
3) Insert piston into cylinder by hand and fit boot in boot groove in piston.



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.

NOTE:
Boot's face B should be at the same level from cylinder's face A all around.

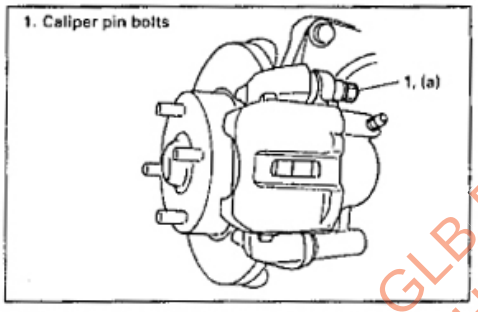
5) Insert piston into cylinder by hand.
6) Install boot set ring securely.



Caliper

Before installing caliper (cylinder body) to carrier, check to ensure that caliper can be moved smoothly in thrust direction.

NOTE:
Where temperature gets as low as – 30°C (– 22°F) in cold weather, use rubber grease whose viscosity varies very little even at – 40°C (– 40°F).



INSTALLATION

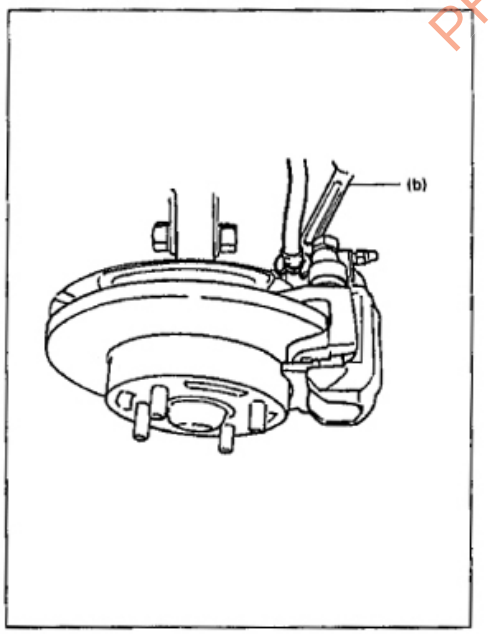
1) Connect caliper to flexible hose.
2) Apply grease to caliper pin bolt and slide pin, then install caliper to caliper carrier.
3) Tighten caliper pin bolt to specified torque.

NOTE:
Make sure that boots are fit into groove securely.

Tightening Torque
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)

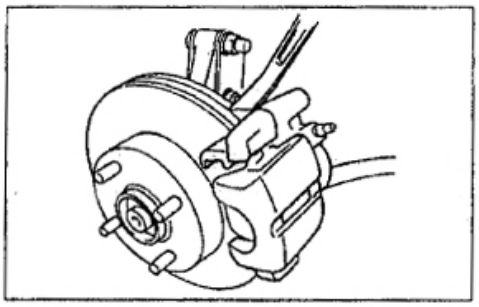
4) Tighten flexible hose joint bolt to specified torque.

Tightening Torque
(b): 16 N·m (1.6 kg-m, 12.0 lb-ft)



WARNING:
Make sure that flexible hose is not twisted when tightening joint bolt. If it is twisted, reconnect it using care not to twist it.

5) Install E-ring to strut securely.
6) Lower hoist.
7) Tighten wheel nuts to specified torque.
8) After completing installation, fill reservoir with brake fluid and bleed air from brake system. Perform brake test and check each installed part for oil leakage.

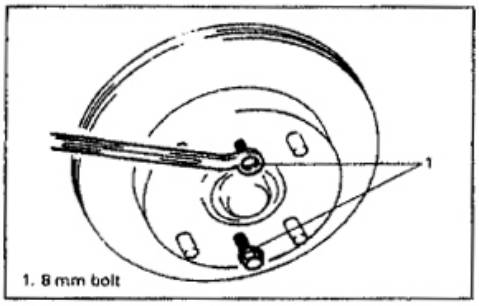


BRAKE DISC

REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove caliper assembly by loosening carrier bolts (2 pcs).

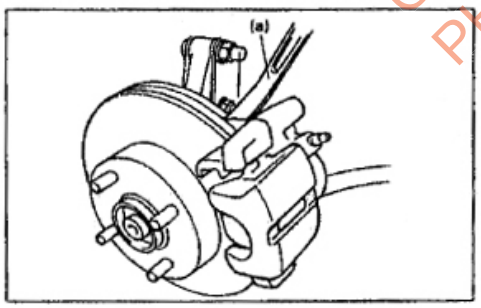
CAUTION:
During removal, be careful not to damage brake flexible hose and not to depress brake pedal.



3) Pull brake disc off by using 8 mm bolts (2 pcs).

INSPECTION

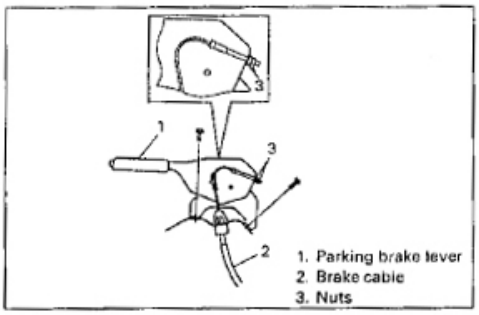
Refer to BRAKE PAD INSPECTION



INSTALLATION

NOTE:
See NOTE at the beginning of this section.

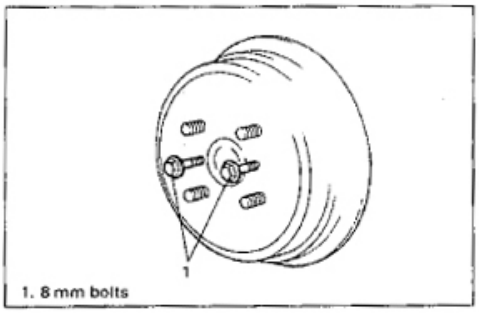
1) Install disc to wheel hub.
2) Install caliper assembly to steering knuckle.
3) Tighten caliper carrier bolts to specified torque.
   Tightening Torque
   (a): 95 N·m (9.5 kg-m, 69.0 lb-ft)
4) Tighten front wheel nuts to specified torque.
5) Upon completion of installation, perform brake test.



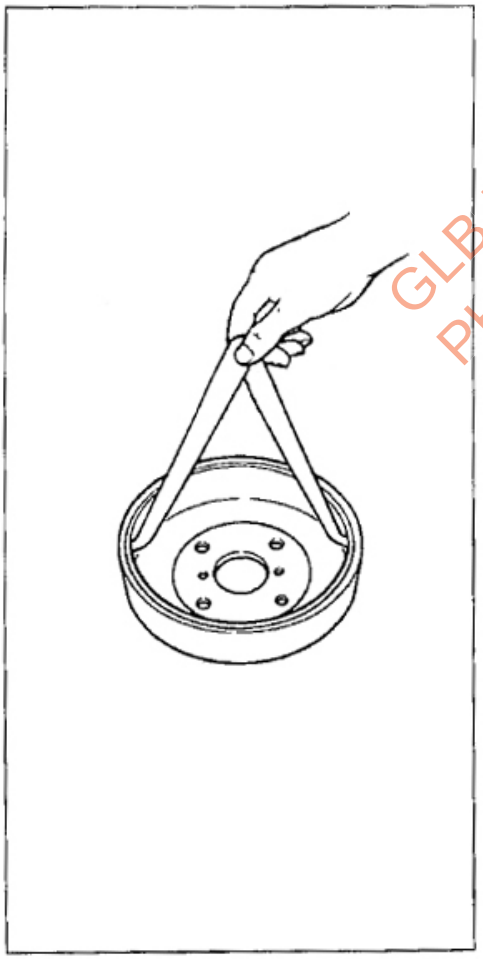
BRAKE DRUM

REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove console box.
3) Release parking brake lever.
4) Loosen parking brake cable nuts.



5) Pull brake drum off by using 8 mm bolts.



INSPECTION

Brake Drum

Inspect drum for cleanliness. Check wear of its braking surface by measuring its inside diameter.

Brake drum ID

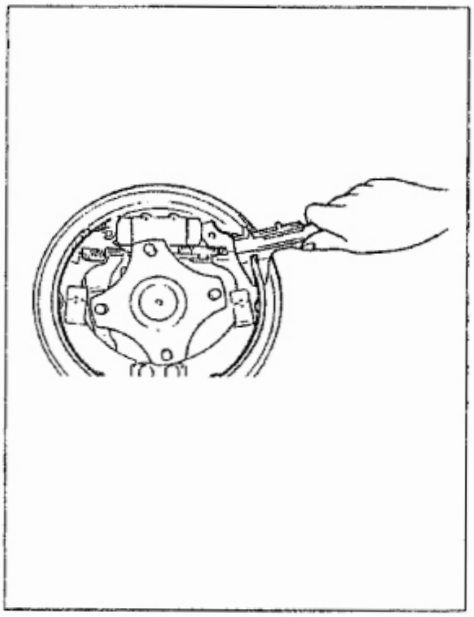
Standard : 220 mm (8.66 in.)
Service limit : 222 mm (8.74 in.)

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.



Brake Shoe

Where lining is worn out beyond service limit, replace shoe.

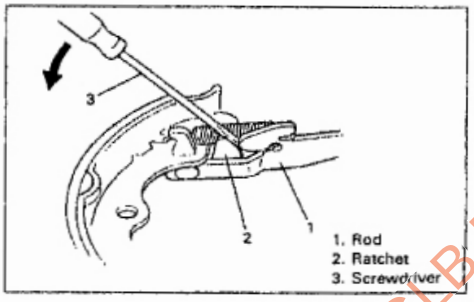
Brake lining thickness (lining + shoe rim)

Standard : 6.9 mm (0.27 in.)

Service limit : 3.6 mm (0.14 in.)

If one of brake linings is worn to service limit, all linings must be replaced at the same time.

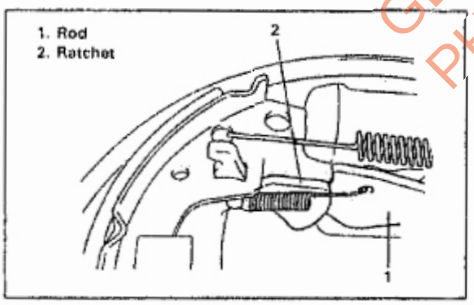
CAUTION:
Never polish lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage drum. When it is required to correct lining, replace it with a new one.



INSTALLATION

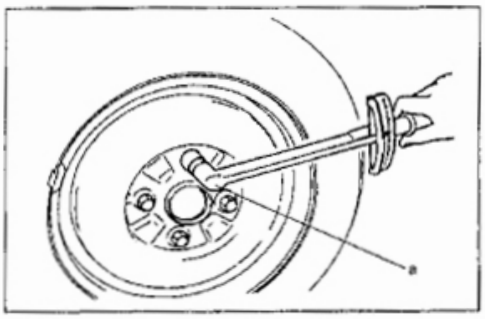
NOTE:
See NOTE at the beginning of this section.

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.



NOTE:
Left figure shows ratchet position where brake shoe-to-drum clearance is maximum.

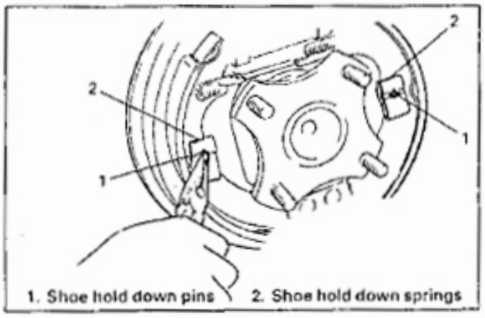
2) Install brake drum after making sure that inside of brake drum and brake shoes are free from dirt and oil.
3) Upon completion of all jobs, depress brake pedal with about 30 kg (66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance.
   Adjust parking brake cable. (For adjustment, refer to PARKING BRAKE CHECK AND ADJUSTMENT.)
4) Install console box.



5) Install wheel and tighten wheel nuts so specified torque.

Tightening Torque
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)

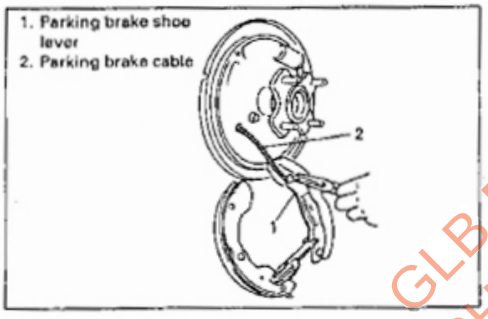
6) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and preform brake test (foot brake and parking brake).



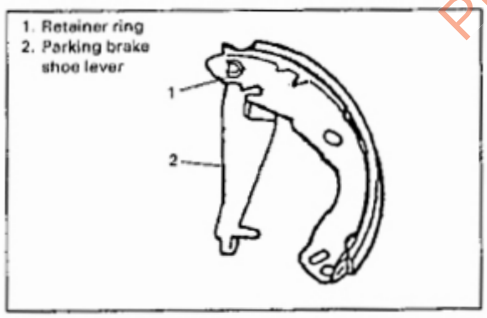
BRAKE SHOE

REMOVAL

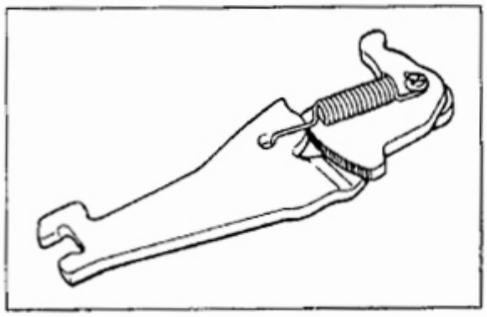
1) Perform steps 1) to 5) of BRAKE DRUM REMOVAL.
2) Remove shoe hold down springs by turning shoe hold down pins as shown.
3) Remove brake shoes.



4) Disconnect parking brake shoe lever from parking brake cable.
5) Remove strut and springs.



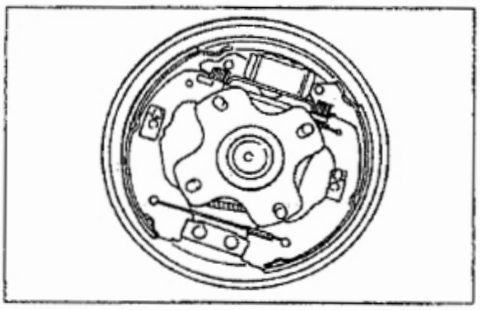
6) Remove retainer ring and disconnect parking brake shoe lever from shoe rim.



INSPECTION

Brake Strut

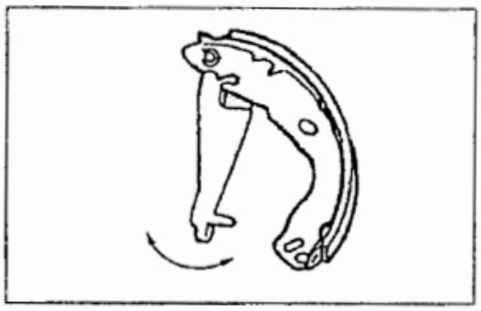
Inspect ratchet of strut for wear or damage.



Springs

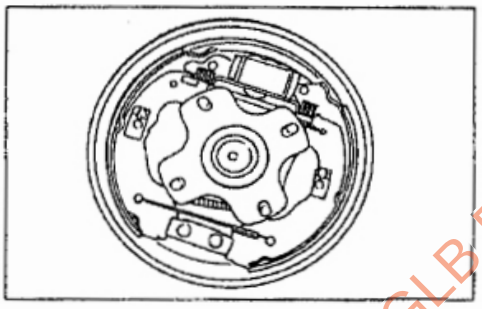
Inspect for damage, corrosion or weakening.

Inspect each part with arrow for rust. If found defective, replace.



Parking Shoe Lever

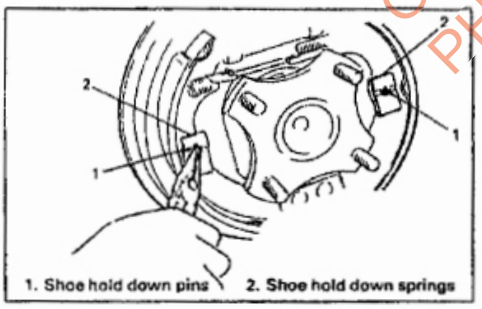
Inspect brake shoe lever for smooth movement along shoe rim. If defective, correct or replace.



INSTALLATION

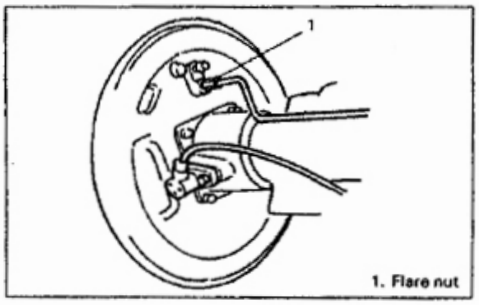
1) Assemble parts as shown in reverse order of removal.

NOTE:
Removed retainer ring should be replaced with new one.



1. Shoe hold down pins 2. Shoe hold down springs

2) Install shoe hold down springs by pushing them down in place and turning hold down pins.
3) For procedure hereafter, refer to steps 1) to 6) of BRAKE DRUM INSTALLATION.

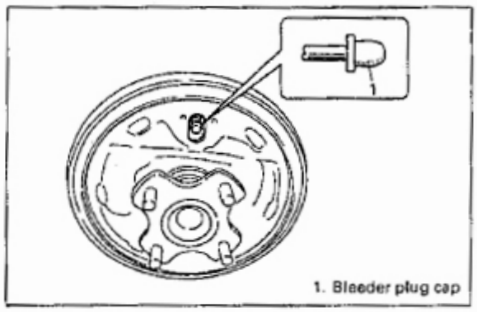


1. Flare nut

WHEEL CYLINDER

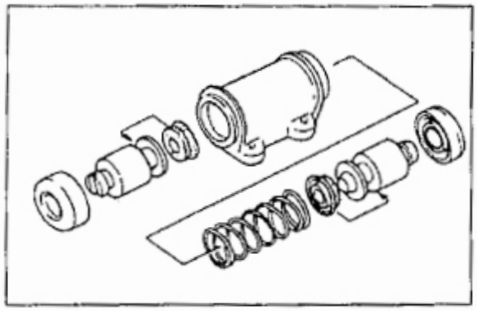
REMOVAL

1) Perform steps 1) to 5) of BRAKE DRUM REMOVAL.
2) Perform steps 2) to 4) of BRAKE SHOE REMOVAL.
3) Loosen brake pipe flare nut but only within the extent that fluid does not leak.



1. Bleeder plug cap

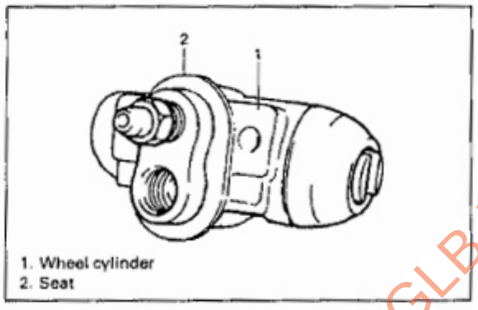
4) Remove wheel cylinder mounting bolts. Disconnect brake pipe from wheel cylinder and put bleeder plug cap onto pipe to prevent fluid from spilling.



INSPECTION

Inspect wheel cylinder disassembled parts for wear, cracks, corrosion or damage.

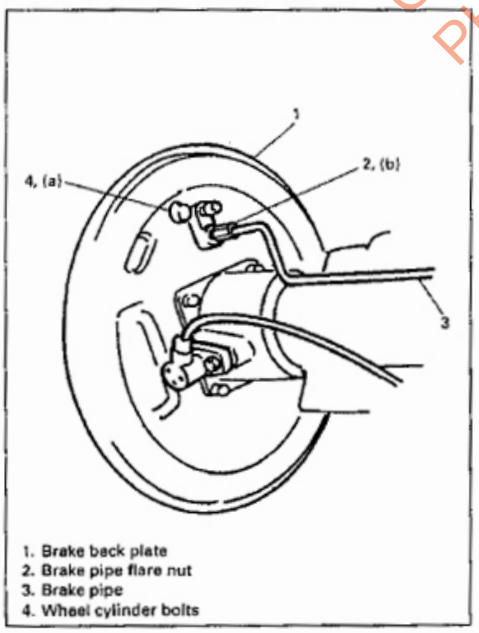
NOTE:
Clean wheel cylinder components with brake fluid.



1. Wheel cylinder
2. Seat

INSTALLATION

1) Install seat to wheel cylinder. Then take off bleeder plug cap from brake pipe and connect pipe to wheel cylinder just enough to prevent fluid from leaking.



1. Brake back plate
2. Brake pipe flare nut
3. Brake pipe
4. Wheel cylinder bolts

2) Tighten wheel cylinder to brake back plate to specified torque.

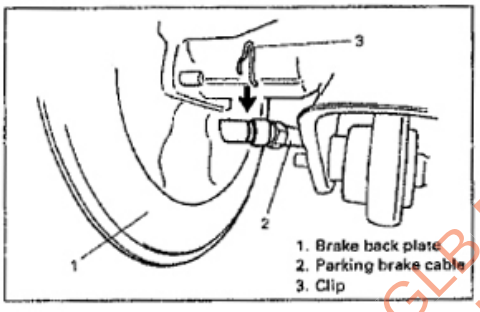
Tightening Torque
(a): 12 N·m (1.2 kg-m, 9.0 lb-ft)

3) Torque flare nut of brake pipe which was connected in step 1) to specification.

Tightening Torque
(b): 16 N·m (1.6 kg-m, 12.0 lb-ft)

4) Install bleeder plug cap taken off from pipe back to bleeder plug.

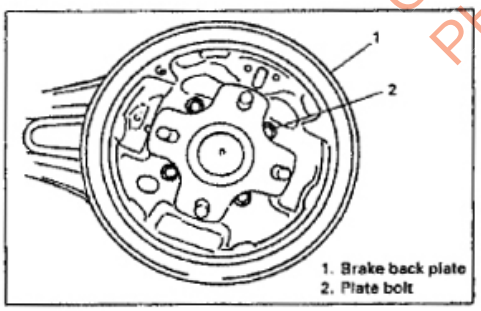
5) Install brake shoes, referring to steps 1) and 2) of BRAKE SHOE INSTALLATION.
6) Install brake drum. (Refer to steps 1) and 2) of BRAKE DRUM INSTALLATION of this section.
7) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, refer to BLEEDING BRAKES.)
8) Upon completion 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, refer to PARKING BRAKE CHECK AND ADJUSTMENT.)
9) Install console box.
10) Install wheel and tighten wheel nuts to specified torque. (Refer to TIGHTENING TORQUE SPECIFICATIONS.)
11) 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).
12) Check each installed part for oil leakage.



BRAKE BACK PLATE

REMOVAL

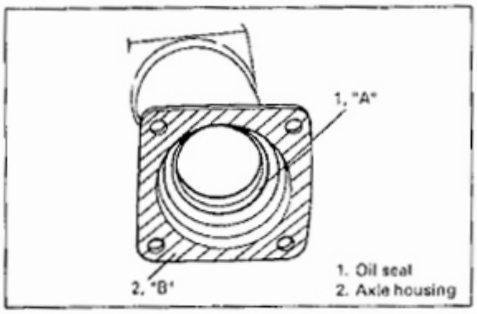
1) Perform steps 1) to 5) of BRAKE DRUM REMOVAL.
2) Perform steps 2) to 4) of BRAKE SHOE REMOVAL.
3) Perform steps 3) to 4) of WHEEL CYLINDER REMOVAL.
4) Remove parking brake cable clip and disconnect parking brake cable from brake back plate.



5) Drain rear differential gear oil.
6) Remove brake back plate bolts.
7) Draw out rear axle shaft with brake back plate, refer to step 7) of REAR AXLE SHAFT REMOVAL in Section 3E.
8) Remove wheel bearing, refer to steps 8) to 11) of WHEEL BEARING REMOVAL in Section 3E.
9) Remove brake back plate from axle shaft.

INSTALLATION

1) Install brake back plate to axle shaft.
2) Press-fit wheel bearing and retainer ring, refer to steps 2) to 3) of WHEEL BEARING INSTALLATION in Section 3E.



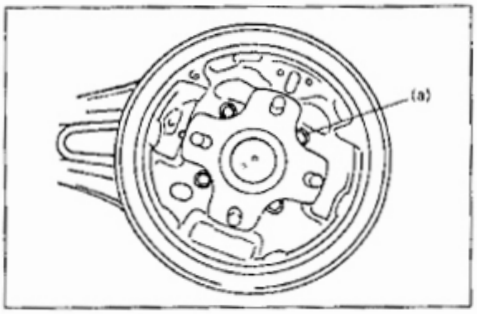
3) Apply grease to axle shaft oil seal lip as shown.

"A": Grease 99000-25010

4) Apply sealant to mating surface of axle housing with brake back plate.

NOTE:
Make sure to removed old sealant before applying it new.

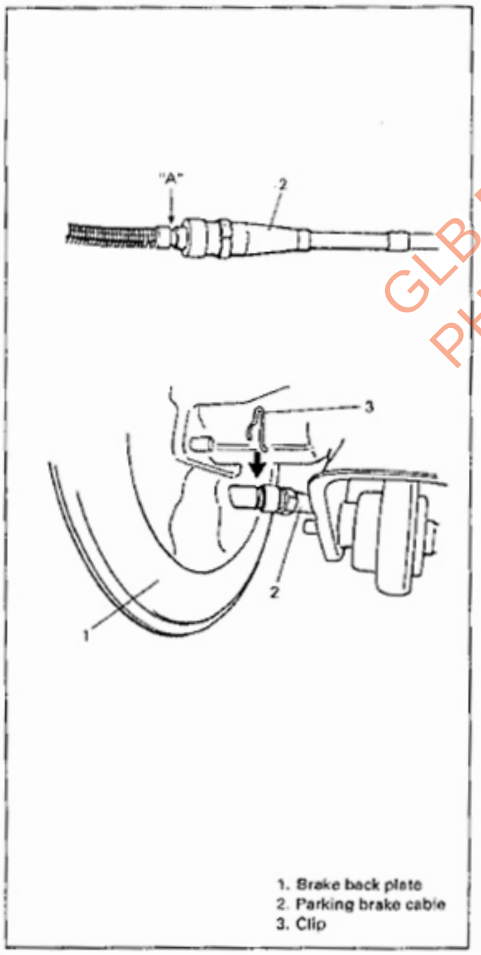
"B": Sealant 99000-31110 or 99000-31090



5) Install rear axle shaft to rear axle housing.
6) Tighten brake back plate bolts to specified torque.

Tightening Torque
(a): 23 N·m (2.3 kg-m,17.0 lb-ft)

7) 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).

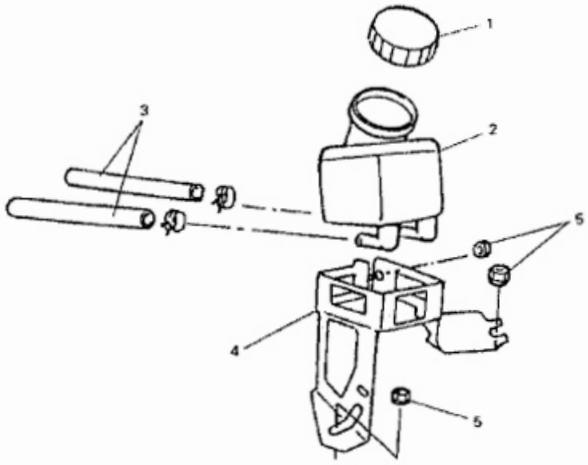


8) Apply water tight sealant where plate and cable contact, and run parking brake cable through brake back plate and secure it with clip.

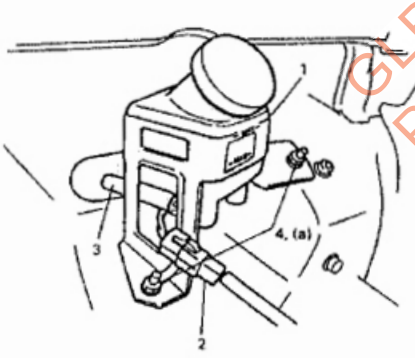
"A": Sealant 99000-31090

9) Install brake shoes, referring to steps 1) and 2) of BRAKE SHOE INSTALLATION.
10) Install brake drum. (Refer to steps 1) to 2) of BRAKE DRUM INSTALLATION.
11) Refill differential housing with new specified gear oil. Refer to "ON-VEHICLE SERVICE" in SECTION 7E for refill.
12) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, refer to BLEEDING BRAKES.)
13) Install wheel and tighten wheel nuts to specified torque.
14) 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, refer to PARKING BRAKE CHECK AND ADJUSTMENT.)
15) Install console box.
16) 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).
17) Check each installed part for oil leakage.

MASTER CYLINDER RESERVOIR



1. Reservoir cap
2. Reservoir
3. Reservoir hose
4. Reservoir bracket
5. Nuts



1. Reservoir
2. Wire coupler
3. Brake master hose
4. Nuts

REMOVAL

1) Disconnect reservoir lead wire at coupler.
2) Clean outside of reservoir.
3) Take out fluid with syringe or such.
4) Disconnect brake master hose from reservoir.
5) Remove reservoir bracket nuts.
6) Remove reservoir.

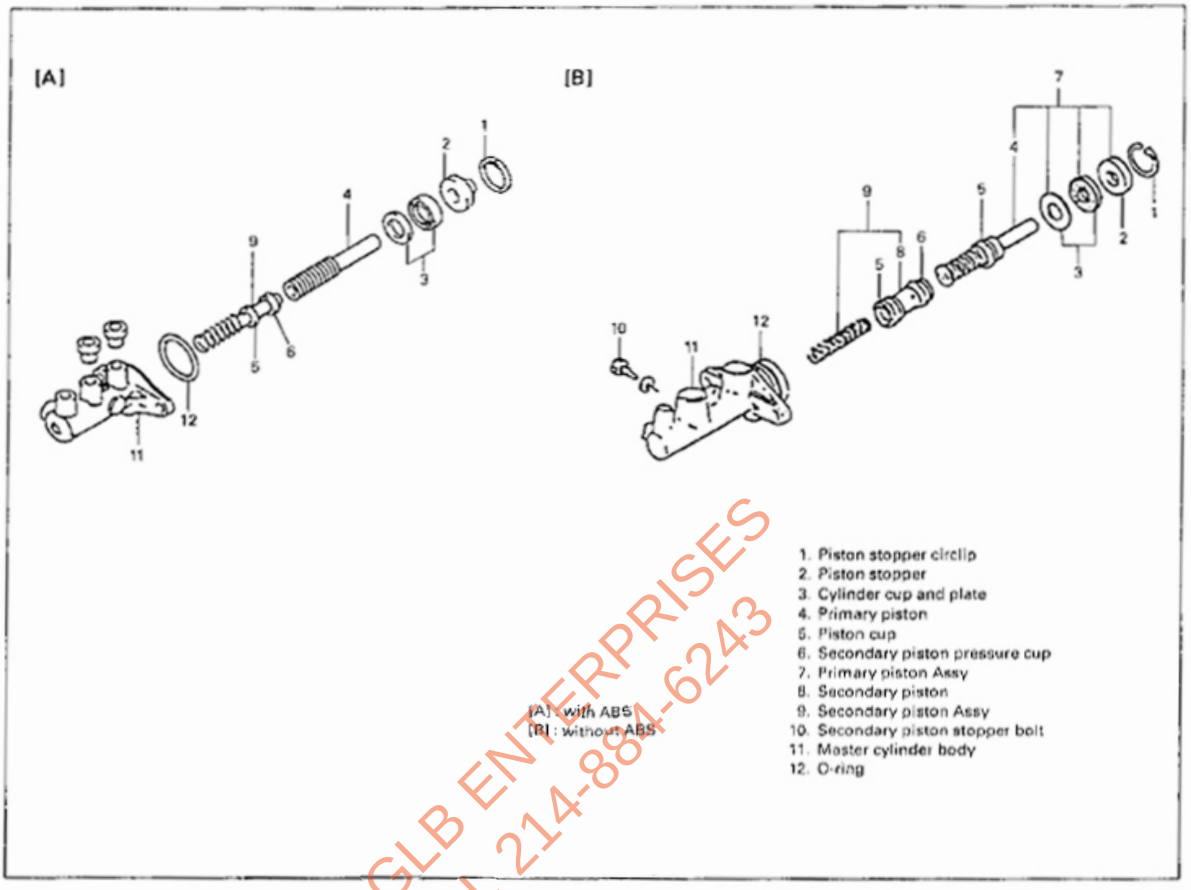
INSTALLATION

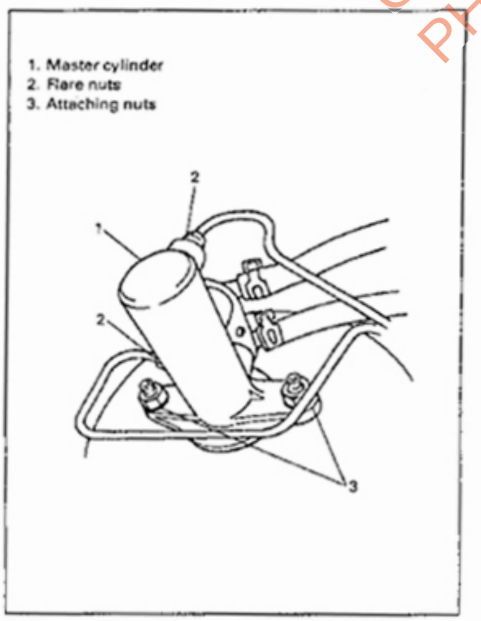
1) Install reservoir and tighten nuts to specified torque.

   Tightening Torque
   (a) : 11N·m (1.1 kg-m, 8.0 lb-ft)

2) Connect reservoir hose to reservoir.
3) Install clamp to reservoir lead wire.
4) Fill brake fluid up to MAX line.
5) Perform air bleeding, referring to BLEEDING BRAKES, and check for fluid leakage.

MASTER CYLINDER ASSEMBLY



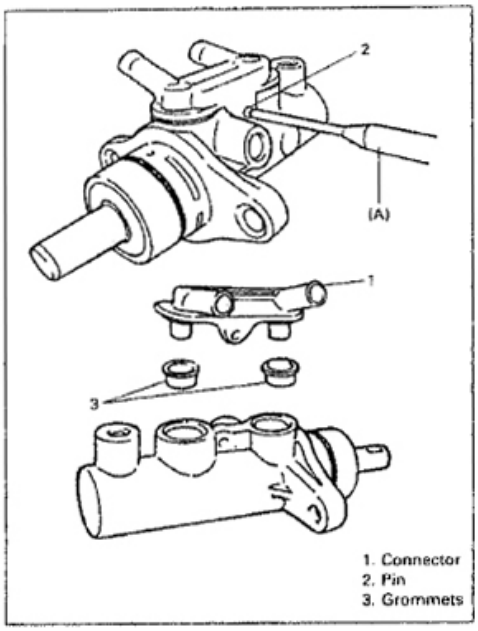


REMOVAL

1) Clean around reservoir cap and take out fluid with syringe or such.
2) Disconnect reservoir hose.
3) Disconnect brake pipes from master cylinder.

CAUTION:
Do not allow brake fluid to get on painted surfaces.

4) Remove two attaching nuts.
5) Remove master cylinder.



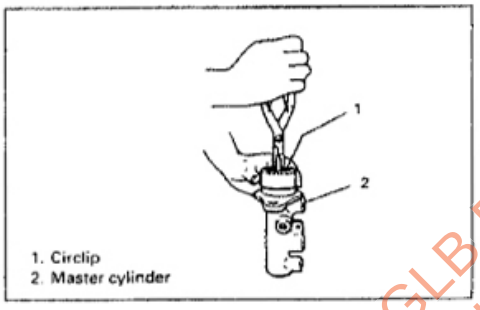
1. Connector
2. Pin
3. Grommets

DISASSEMBLY

1) Remove the pin that fixes cylinder body and connector by using special tool.

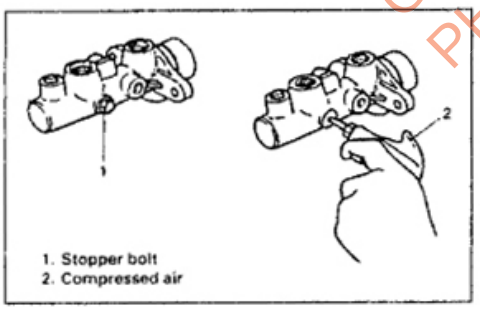
Special Tool
(A): 09922-85811

2) Remove connector and 2 grommets.



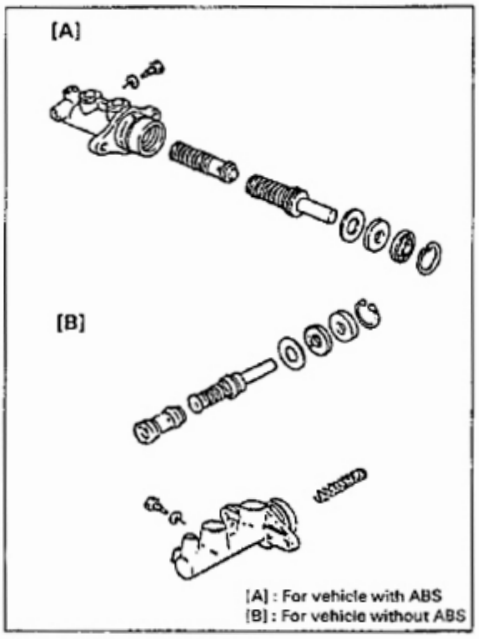
1. Circlip
2. Master cylinder

3) Remove circlip.



1. Stopper bolt
2. Compressed air

4) Remove primary piston.
Remove piston stopper bolt. Then remove secondary piston by blowing compressed air into hole from which piston stopper bolt was removed.
Be cautions during removal as secondary piston jumps out.



INSPECTION

Inspect all disassembled parts for wear or damage, and replace parts if necessary.

NOTE:

- **Wash disassembled parts with brake fluid.**
- **Do not reuse piston assembly.**

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:

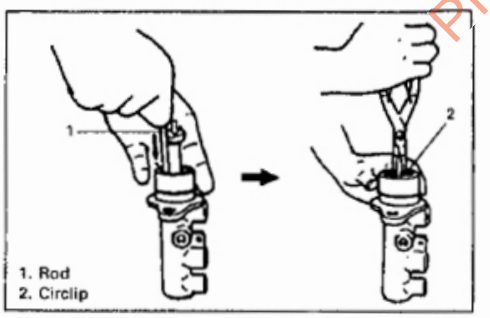
Polishing bore of master cylinder with cast aluminum body with anything abrasive is prohibited, as damage to cylinder bore may occur.

Rinse cylinder in clean brake fluid. Shake excess rinsing fluid from cylinder. Do not use a cloth to dry cylinder, as lint from cloth cannot be kept from cylinder bore surfaces.

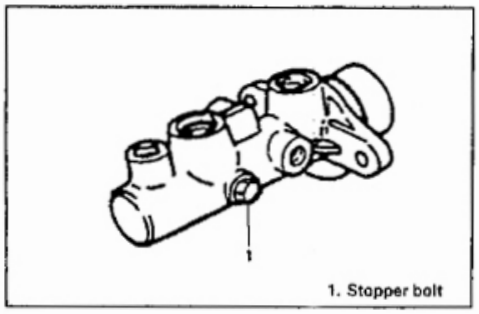
ASSEMBLY

CAUTION:

- **Never use any mineral oil such as kerosene oil and gasoline when washing and assembling parts.**
- **Check inside of cylinder wall, pistons and cup seals are free from any foreign objects such as dust and dirt and use care not to cause any damage with a tool during assembly.**
- **Do not drop parts. Do not use any part which has been dropped.**

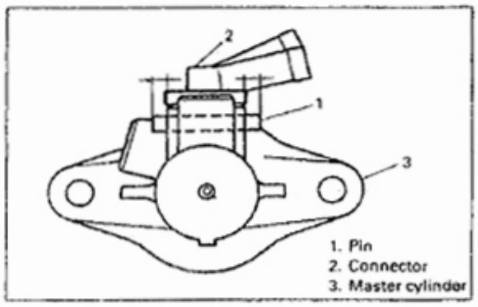


1) Apply brake fluid to inside of cylinder and contact surface of piston ass'y and insert secondary piston ass'y into cylinder body.
   Be sure to install piston cup in correct installation direction and straight into cylinder so that it is not caught.
   Install secondary piston assembly into cylinder.
2) Install primary piston in cylinder.
3) Depress, and install circlip.

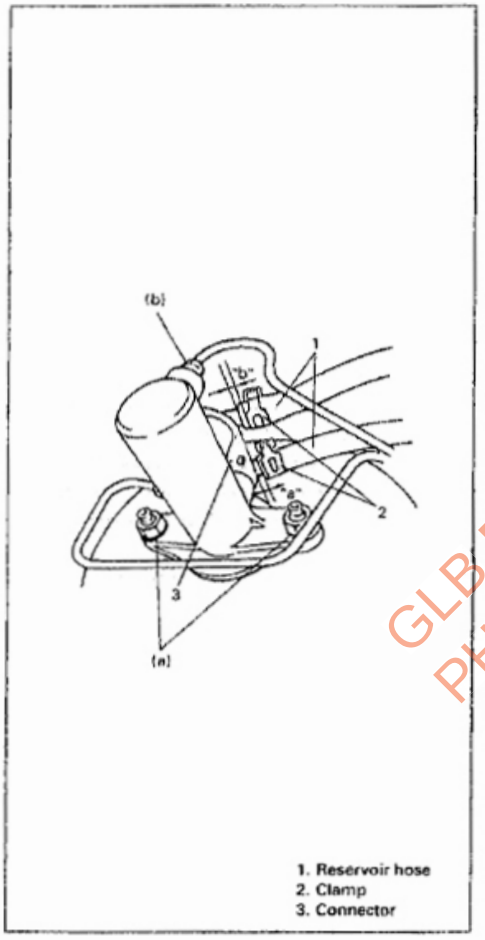


4) Install piston stopper bolt with pistons pushed in all the way and tighten it to specified torque.

Tightening Torque
(a) : 10N·m (1.0 kg-m, 7.5 lb-ft)



5) Apply thin coat of brake fluid to all around new grommets (2pcs.) and install them to cylinder body, then install reservoir.
6) Set a new pin in connector hole and drive it in. At this time, make end of pin and end face margin of connector equal.



INSTALLATION

NOTE:

- **See NOTE at the beginning of this section.**
- **Check clearance between booster piston rod and master cylinder piston (Refer to BRAKE BOOSTER INSPECTION AND ADJUSTMENT).**
- **Adjust booster piston rod length with special tool (Refer to BRAKE BOOSTER INSPECTION AND ADJUSTMENT).**

1) Install master cylinder as shown and torque attaching nuts to specification.

   Tightening Torque
   (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)

2) Attach hydraulic lines and torque flare nuts to specification.

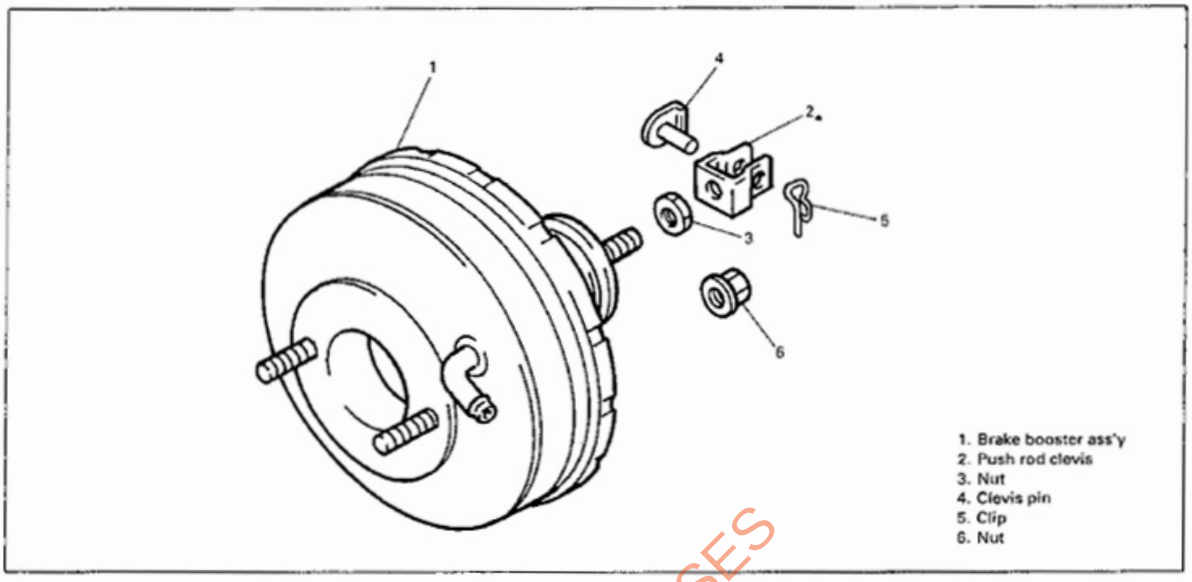
   Tightening Torque
   (b): 16 N·m 1.6 kg-m, 12.0 lb-ft)

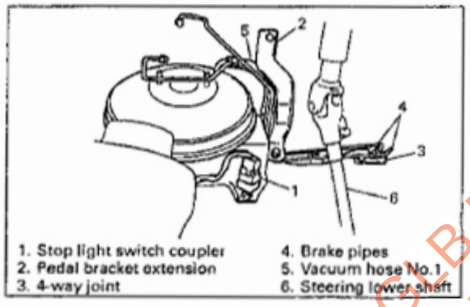
3) Connect reservoir hose.

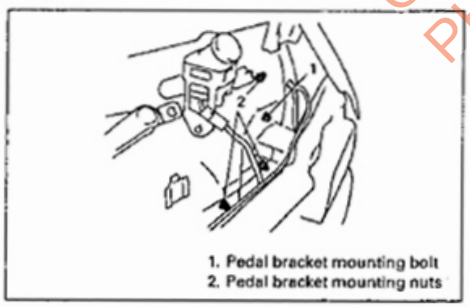
   Distance
   "a" : less than 5 mm (0.20 in.)
   "b" : 4 - 10 mm (0.16 - 0.39 in.)

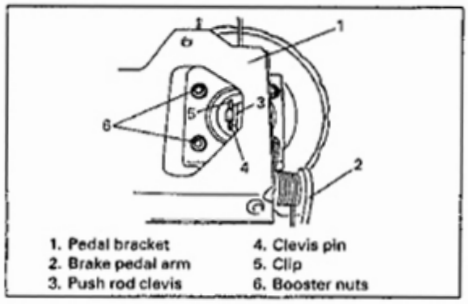
4) Fill reservoir with specified brake fluid.
5) After installing, check brake pedal play and bleed air from system (refer to BRAKE PEDAL PLAY CHECK and BLEEDING BRAKES).
6) Perform brake test and check each installed part for fluid leakage.

BRAKE BOOSTER





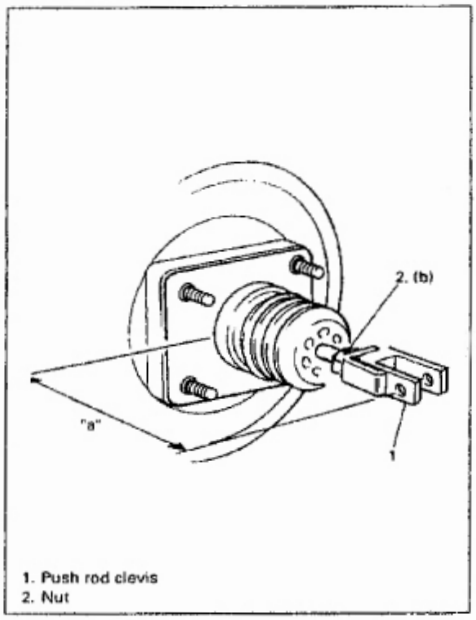




REMOVAL

1) Remove master cylinder assembly, referring to step 1) to 5) of MASTER CYLINDER REMOVAL.
2) Disconnect stop light switch lead wire at coupler.
3) Remove pedal bracket extension (For vehicle with ABS).
4) Disconnect flare nuts from 4-way joint and remove brake pipes.
5) Disconnect vacuum hose No.1 from booster and vacuum hose No.2 at dash panel and remove pipe with hose.
6) Disconnect clutch cable from clutch pedal arm.
6') Remove steering lower shaft.
7) Remove pedal bracket mounting bolt and nuts at dash panel.
8) Remove pedal bracket with brake booster.
9) Disconnect push rod clevis from brake pedal arm.
10) Remove brake booster attaching nuts and disconnect brake booster from pedal bracket.

CAUTION:
Never disassemble brake booster. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.



1. Push rod clevis
2. Nut

INSPECTION AND ADJUSTMENT

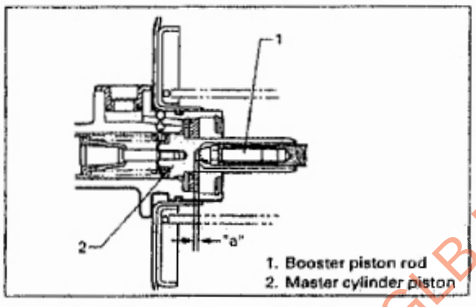
Push Rod Clevis Length

Check that dimension "a" as shown is within 99.5 – 100.5 mm (3.92 – 3.99 in.) and torque nut to specification.

Dimension "a": 99.5 – 100.5 mm (3.92 – 3.99 in.)

Tightening Torque
(b): 25 N·m 2.5 kg-m, 18.0 lb-ft)

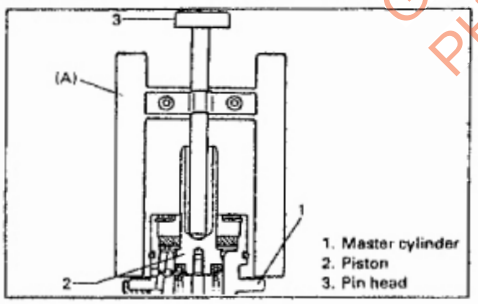
NOTE:
Whenever booster was removed, make sure to check clearance between piston rod and master cylinder piston. (For details, refer to following procedure.)



1. Booster piston rod
2. Master cylinder piston

Booster Piston Rod and Master Cylinder Piston Clearance

The length of booster piston rod is adjusted to provide specified clearance "a" between piston rod end and master cylinder piston.

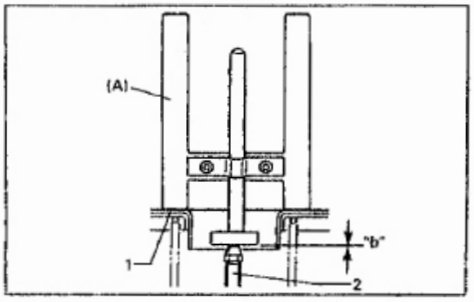


1. Master cylinder
2. Piston
3. Pin head

- Before measuring clearance, push piston rod several times so as to make sure reaction disc is in place.
- Keep inside of booster at atmospheric pressure for measurement.

1) Set special tool (A) on master cylinder and push pin until contacts piston.

Special Tool
(A) : 09950-96010

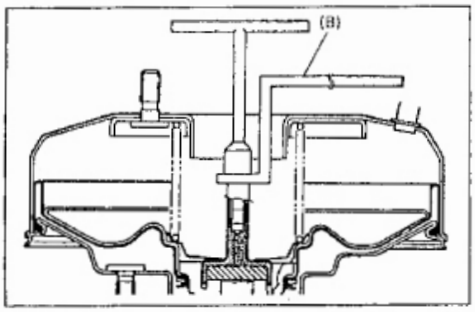


2) Turn special tool upside down and place it on booster. Adjust booster piston rod length until rod end contacts pin head.

Special Tool
(A) : 09950-96010

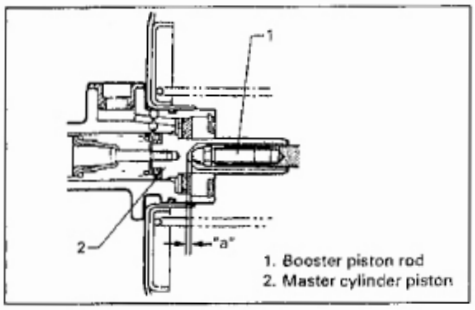
Clearance "b" : 0 mm (0 in.)

NOTE:
Take measurement with booster set vertically and rod at the center, or with piston rod fixed by screw driver.



3) Adjust clearance by turning adjusting screw of piston rod.

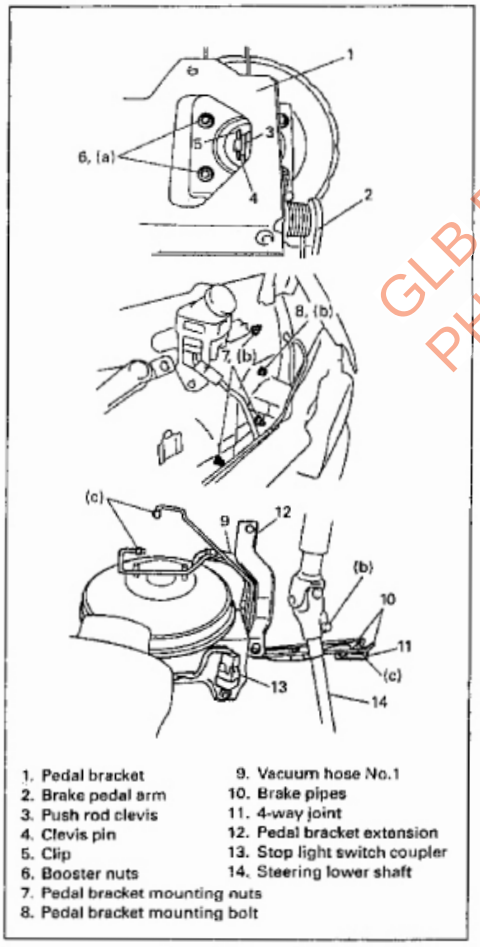
Special Tool
(B) : 09952-16010



Reference

When adjusted as above, its negative pressure is applied to booster with engine at idle, piston to piston rod clearance "a" should become below.

Clearance "a" : 0.25 - 0.5 mm (0.010 - 0.020 in.)



INSTALLATION
NOTE:

- **See NOTE at the beginning of this section.**
- **Adjust clearance between booster piston rod and master cylinder piston with special tool. (Refer to INSPECTION AND ADJUSTMENT.)**
- **Check length of push rod clevis. (Refer to INSPECTION AND ADJUSTMENT.)**

1) Install booster to pedal bracket. Then connect booster push rod clevis to pedal arm with clevis pin and clip.
2) Tighten booster attaching nuts to specified torque.

Tightening Torque
(a): 13 N·m (1.3 kg-m, 9.5 lb-ft)

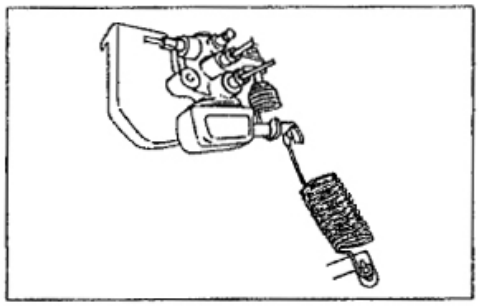
3) Install pedal bracket to dash panel.
Tighten pedal bracket bolt and nuts to specified torque.

Tightening Torque
(b): 25 N·m (2.5 kg-m, 18.5 lb-ft)

4) Connect clutch cable to clutch pedal arm, refer to CLUTCH CABLE INSTALLATION of Section 7C.
5) Connect vacuum hose No.1 to booster and vacuum hose to vacuum hose No.2.
6) Connect brake pipes to 4 way joint. Flare nuts should not be tightened.
6') Install steering lower shaft.
For detail, refer to Section 3C COMBINATION SWITCH, STEERING COLUMN AND STEERING LOWER SHAFT INSTALLATION.
7) Install pedal bracket extension (For vehicle with ABS).
8) Connect stop light switch lead wire at coupler.
9) Install master cylinder to booster. (Refer to MASTER CYLINDER ASSEMBLY INSTALLATION of this section.)
10) Tighten brake pipes flare nuts to specified torque.

Tightening Torque
(c) : 16 N·m (1.6 kg-m 12.0 lb-ft)

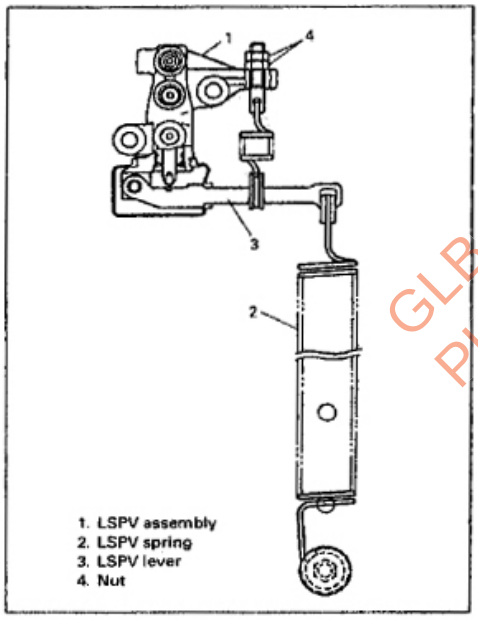
11) Fill reservoir with specified fluid.
12) Bleed air from brake system (refer to BLEEDING BRAKES).
13) After installing, check pedal height and play, refer to EXCESSIVE PEDAL TRAVEL CHECK and BRAKE PEDAL PLAY CHECK.
14) Perform brake test and check each installed part for fluid leakage.



LSPV (Load Sensing Proportioning Valve)

REMOVAL

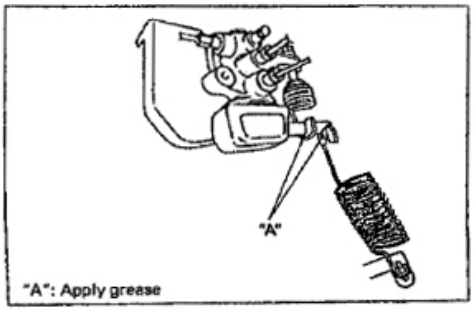
1) Clean around reservoir cap and take out fluid with syringe or such.
2) Hoist vehicle.
3) Disconnect brake pipes from LSPV.



1. LSPV assembly
2. LSPV spring
3. LSPV lever
4. Nut

4) Remove LSPV assembly from LSPV bracket.
5) Remove spring from LSPV lever.

CAUTION:
- **Nuts of LSPV assembly should not be loosened or tightened.**
- **LSPV assembly must not be disassembled. Replace with new one if defective.**

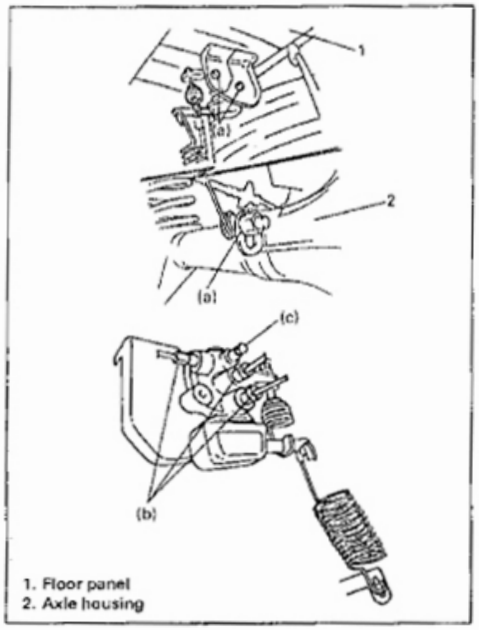


"A": Apply grease

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.



1. Floor panel
2. Axle housing

2) Torque each bolt and nut to specification as indicated respectively in figure.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)
(b): 16 N·m (1.6 kg-m, 12.0 lb-ft)
(c): 8.0 N·m (0.8 kg-m, 6.0 lb-ft)

3) Upon completion of installation, fill reservoir tank with specified fluid and bleed air from brake system.

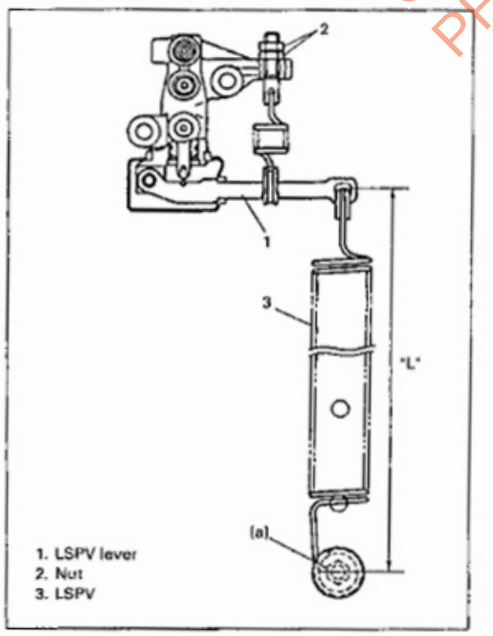
NOTE:
Make sure to bleed air from LSPV bleeder without fail.

4) After bleeding air, check that LSPV in installed properly, referring to following INSPECTION & ADJUSTMENT section.

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 stops and measure length of coil spring ("L" in figure) as it is pulled.



1. LSPV lever
2. Nut
3. LSPV

3) Spring length "L" should be as specified below.

Spring length "L" : 312 mm (12.28 in.)

NOTE:
Don't depress brake pedal, when measuring spring length.

4) If it isn't, adjust it to specification by changing bolt (a) tightening positions as shown in left figure. After adjustment, tighten nut to specified torque.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

NOTE:
Check to make sure that LSPV body and brake pipe joints are free from fluid leakage. Replace defective parts, if any.

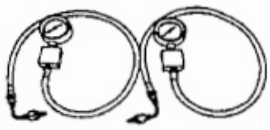
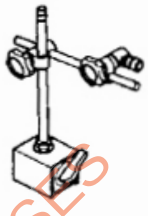
TIGHTENING TORQUE SPECIFICATIONS

Fastening parts		Tightening torque		
		N·m	kg-m	lb-ft
Brake caliper pin bolt		85	8.5	61.5
Brake caliper carrier bolt		95	9.5	69.0
Front brake flexible hose joint bolt		16	1.6	12.0
Rear brake bolt (Brake back plate bolt)		23	2.3	17.0
Master cylinder nut or booster nut		13	1.3	9.5
Brake booster push rod nut		25	2.5	18.5
Brake pipe 4-way joint nut		11	1.1	8.0
Blend proportioning valve bolt/4-way cross joint bolt		10	1.0	7.5
Brake pipe flare nut		16	1.6	12.0
Brake pedal bracket bolt and nut		25	2.5	18.5
Brake bleeder plug	(Front caliper)	11	1.1	8.0
	(Rear cylinder/LSPV)	8	0.8	6.0
Wheel nut		85	8.5	61.5
Wheel cylinder bolt		12	1.2	9.0
Parking brake lever bolt		20	2.0	14.5
LSPV bolt		23	2.3	17.0
LSPV nut				

REQUIRED SERVICE MATERIALS

MATERIALS	USE
Brake fluid	• To fill master cylinder reservoir. • To clean and apply to inner parts of master cylinder caliper and wheel cylinder when they are disassembled.
Water tight sealant	• To apply to mating surfaces of brake back plate and rear axle housing. • To apply to mating surfaces of brake back plate and parking brake cable
Sealant	• To apply to mating surfaces of brake back plate and rear axle housing.

SPECIAL TOOLS

 09922-85811 Pin remover	 09956-02210 Brake circuit plug	 09950-78210 Flare nut wrench (10 mm)	 09956-02310 Fluid pressure gauge
 09952-16010 Booster piston rod adjuster	 09900-20606 Dial gauge	 09900-20701 Magnetic stand	 09952-36310 Fluid pressure gauge

SECTION 6

ENGINE

CONTENTS

Description

1) **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 (S. O. H. C.) is mounted over the cylinder head; it is driven from crankshaft through timing belt. Unlike conventional overhead valve (O. H. V.) engine, this engine has no pushrods. Thus, drive for valves is more direct and enables the valves to follow the crankshaft without any delay.

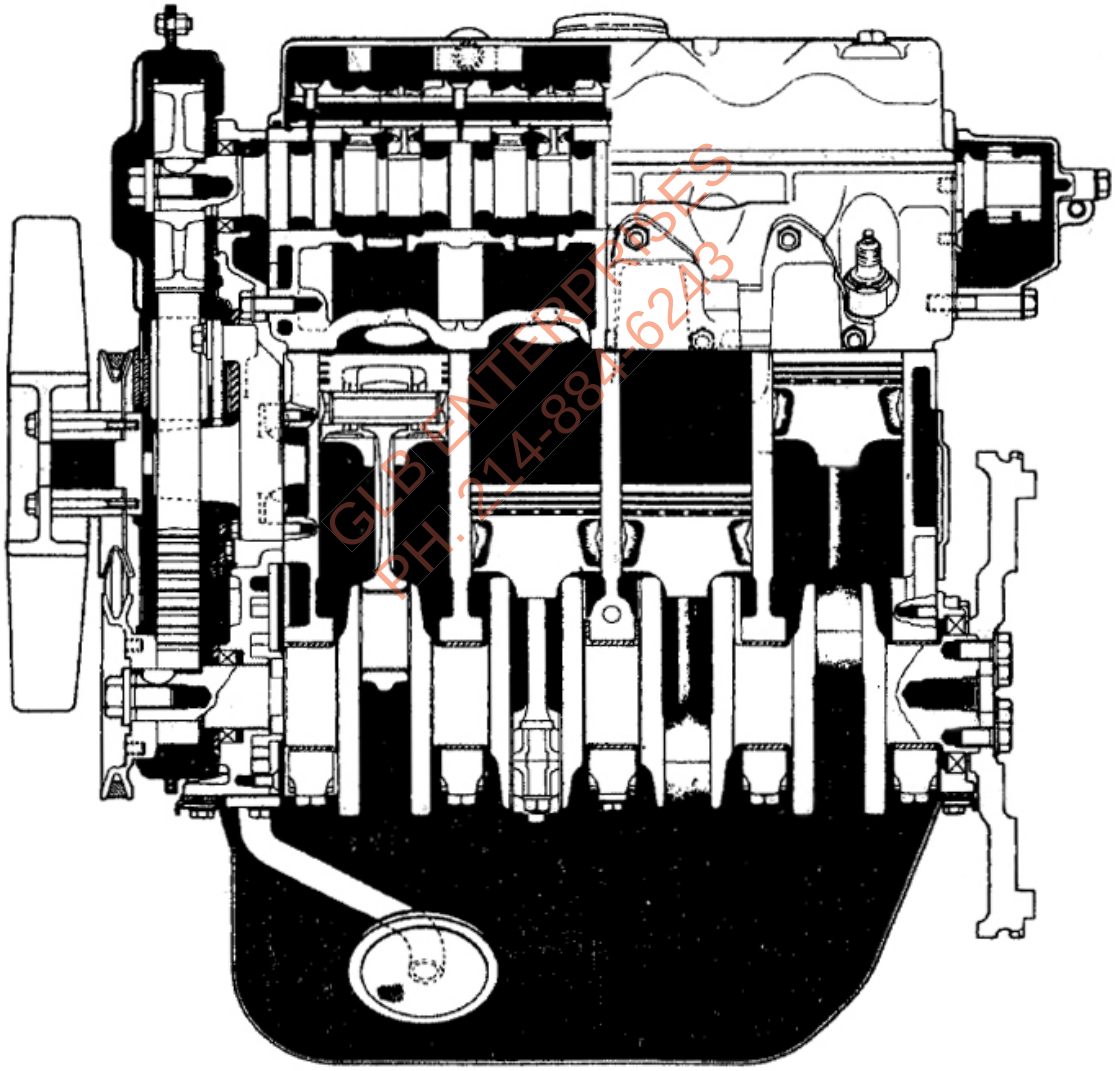


Fig. 3-1

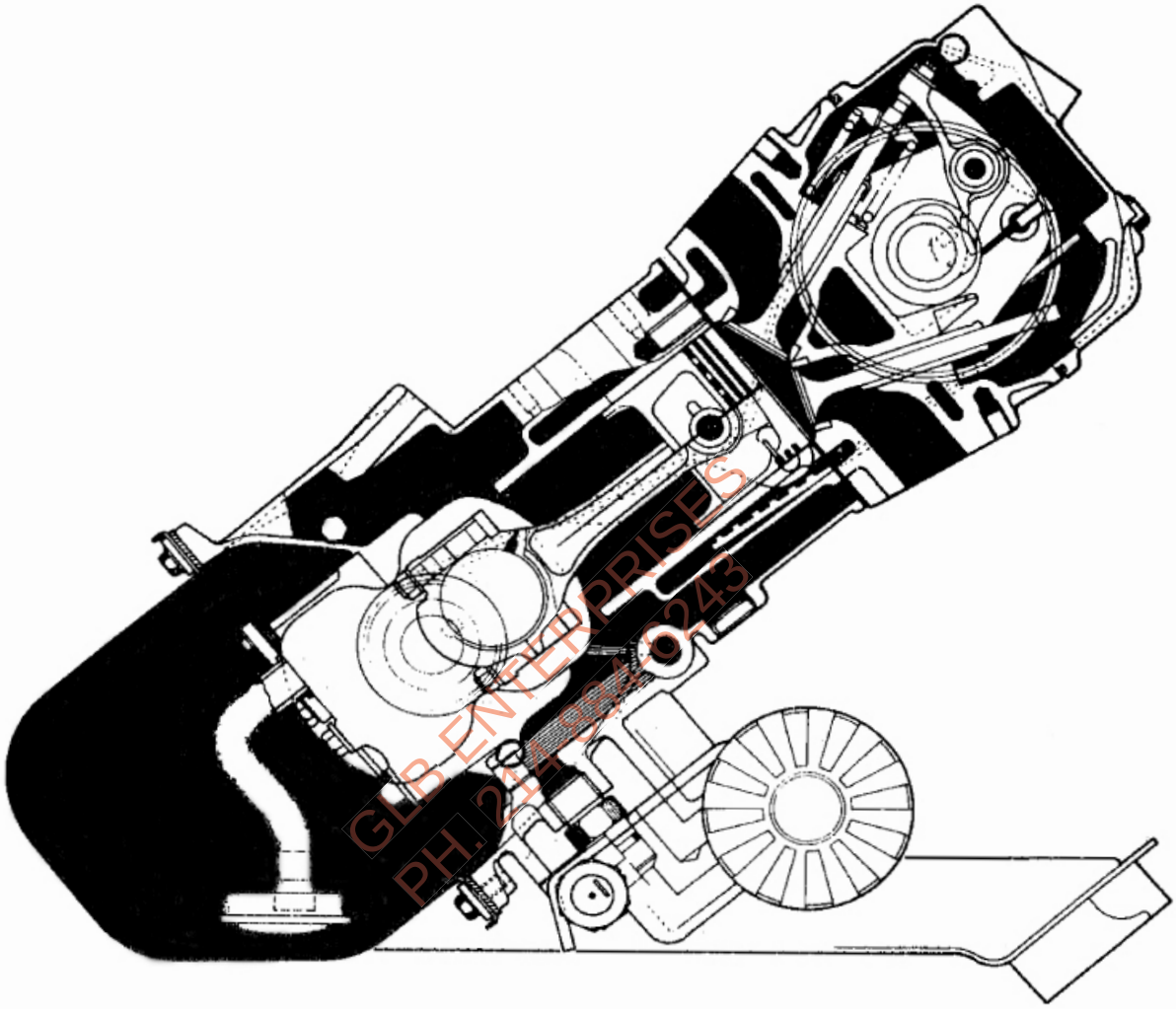


Fig. 3-1-1

2)The distinctive features of this engine may be summarized as follows:

1. Because of inlet and exhaust ports arranged for cross-flow pattern, with valves located in "V"-type configuration, both volumetric and scavenging efficiencies are very high.

2. The combustion chamber formed between piston crown and cylinder head is of a multi-spherical type shaped to provide squish. This feature is calculated to make available greater horsepower from a lesser amount of fuel.

3. The supports for camshaft and rocker shafts are integral with the cylinder head, so that the valve mechanism noise is markedly reduced by the structural rigidity and, moreover, that the number of valve mechanism parts is reduced, let alone a more compact size of the engine.

4. The timing belt for driving the camshaft runs quiet and is light in weight.

5. A high-grade cast iron is used for the material of the cylinder block. The block is shaped to present deep skirts and retain greater rigidity.

6. The crankshaft is a one-piece forging, and is supported by five bearings for vibration-free running.

7. Heating by hot water is employed for the inlet manifold in order to facilitate fuel carburetion and ensure that uniform distribution of the mixture. The higher combustion efficiency of this engine is largely explained by this inlet manifold feature.

3) Blowby gas recycling system

Blowby gas passage is provided in the cylinder block to pass the blowby gases from crankcase to cylinder head. In the head cover, an oil separator removes oil particles from the gases before the gases are drawn into the air cleaner.

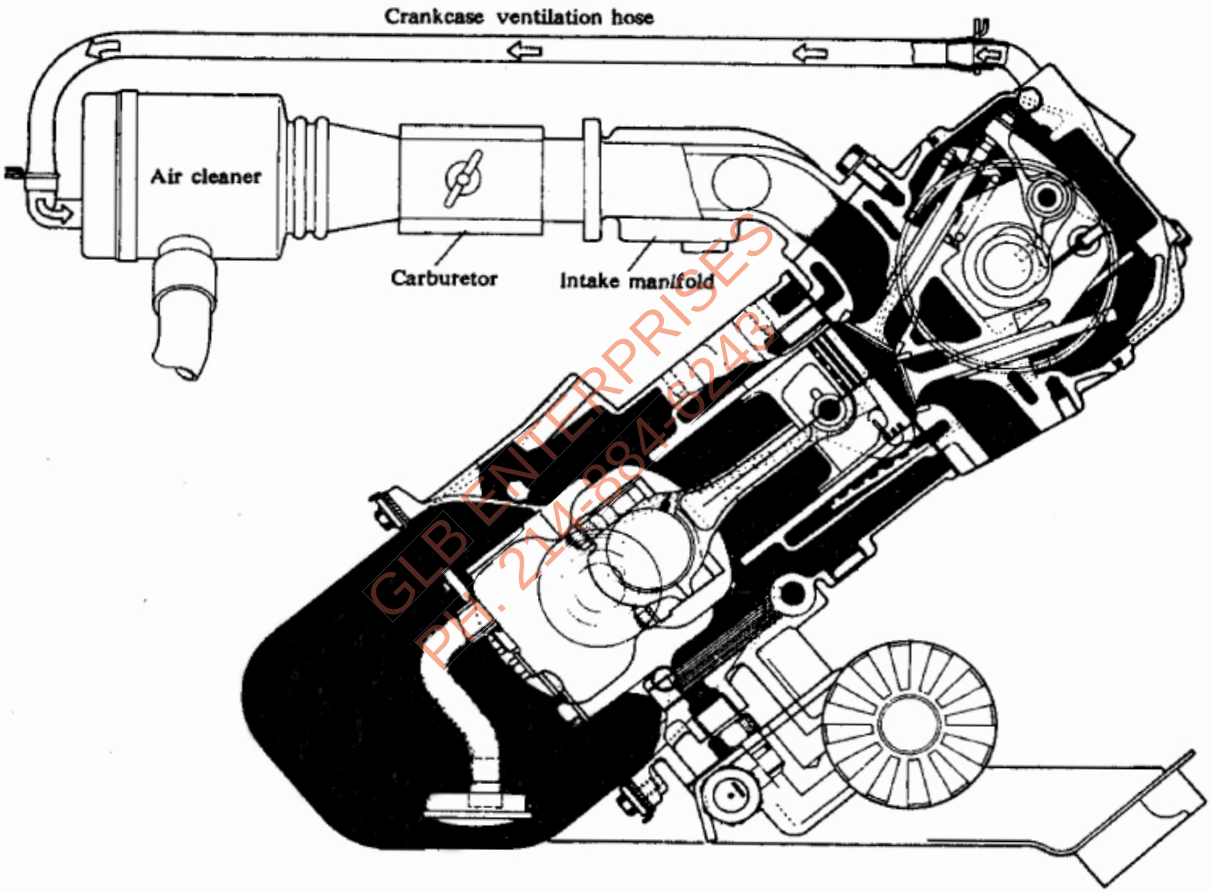


Fig. 3-2

Engine Services Not Requiring Engine Removal

The following parts or components do not require engine removal to receive services (replacement, inspection or adjustment):

Part or Component	Nature of Service
1. Spark plug	Replacement or inspection
2. Distributor	Replacement, inspection or adjustment
3. Exhaust manifold	Replacement or inspection
4. Oil filter	Replacement
5. Oil pressure sensor unit	Replacement
6. Cylinder head cover	Replacement
7. Rocker shaft	Replacement or inspection
8. Rocker-arm	Replacement or inspection
9. Rocker-arm spring	Replacement or inspection
10. Camshaft (needing cylinder head removal)	Replacement or inspection
11. Cylinder head	Replacement or inspection
12. Radiator	Replacement or inspection
13. Cooling fan	Replacement
14. Camshaft timing belt pulley	Replacement or inspection
15. Cranshaft timing belt pulley	Replacement or inspection
16. Timing belt	Replacement or inspection
17. Fuel pump	Replacement
18. Carburetor	Replacement, inspection or adjustment
19. Intake manifold	Replacement
20. Alternator	Replacement or inspection
21. Starter motor	Replacement or inspection
22. Fan belt	Replacement, inspection or tension adjustment
23. Water pump	Replacement
24. Pulleys (crank, generator, fan)	Replacement
25. Timing belt cover	Replacement
26. Water hose	Replacement or inspection
27. Oil pump, piston, piston ring and connecting rod	Replacement or inspection

Dismounting the Engine

1. Remove the engine service cover panel on the bed floor.
2. Remove the engine under cover.
3. Loosen two drain plugs, one on the bottom of radiator and one on the cylinder block, to drain the cooling water.
4. Disconnect negative (—) and positive (+) cords from the battery terminals.
5. Disconnect the lead wire from the water temperature gauge.
6. Disconnect the harness coupler from the alternator terminals.
7. Disconnect the primary wire (white/black) from the distributor terminal.
8. Remove the distributor cap and rotor from the distributor.
9. Disconnect the fuel hoses from the fuel pump body.
10. Disconnect the warm air hose (optional), if one is attached.
11. Disconnect the accelator cable from the carburetor body.
12. Disconnect the choke cable from the carburetor body.
13. Take out the crankcase ventilation hose from the cylinder head cover.
14. In case of machine equipped with optional car-heater, disconnect the inlet and outlet heater hoses at the joining part.
15. Disconnect the radiator inlet hose from the thermostat cap.
16. Remove the air cleaner case ass' y.
17. Disconnect the fuel return hose from the carburetor body.
18. Disconnect the radiator outlet hose from the water inlet pipe.
19. Disconnect the lead wire (brown/green) from the oil pressure unit, and remove the lead wire clamps.
20. Disconnect the clutch cable from the engine mounting member and clutch lever.
21. Remove the muffler from the exhaust pipe and then from the chassis.
22. Remove the propeller shaft.
23. Disconnect the speedometer cable from the transmission case (extension case).
24. Disconnect the back up lamp switch lead wire at the coupler.
25. Disconnect the gear shift and select control rods from the joints on the extension case.
26. Disconnect the lead wire (white /brown) and (+) cord from the starter motor.
27. Disconnect the battery ground (—) cord from the transmission case.
28. Remove the radiator lower shroud.
29. Jack up the body placing the jack between the engine and transmission.
30. Remove the transmission mounting bracket from the chassis frame.
31. Remove the engine mounting brackets from the chasssis frame.

CAUTION:
Before starting to take down the engine check around once again to be sure that there is no connection left undone.

33. Take down the engine.

CAUTION:
Make sure to avoid the engine cooling fan from touching against the shroud panel in removing the engine.

Throughout this MANUAL, the four cylinders of the engine are identifie_ y numbers; No. 1, No. 2, No. 3 and No. 4 as counted from front end.

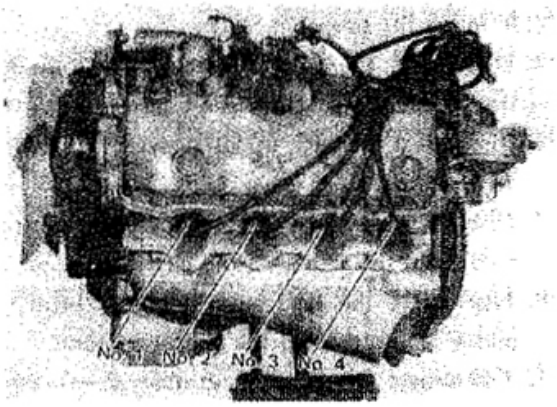


Fig. 3-3

Engine Disassembly

NOTES:

- Observe critically before starting to remove a component or part by loosening bolts, nuts and the like. What you may find before and during disassembly is valuable information necessary for successful reassembly.
- Be careful in handling aluminum-alloy parts. They are softer than steel or cast-iron parts and their finished surfaces more easily take scratch marks.
- Have trays and pans ready for setting aside the disassembled parts in an orderly manner. place the parts in the trays and pans in such a way that they can be readily identified. Put match marks or tags on them, as necessary, so that they will go back to where they came from.

Carry out engine disassembly in the following sequence;

Loosen drain plug and drain out engine oil.

Fig. 3-4

Remove clutch cover.

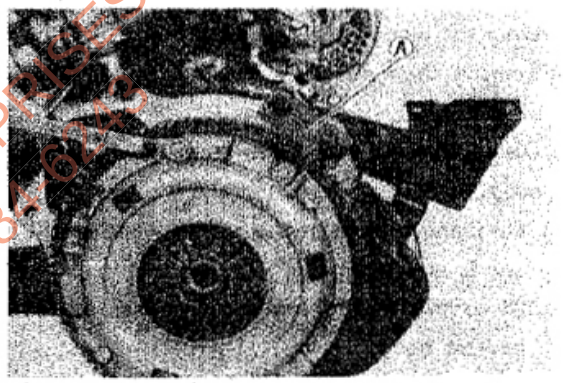


Fig. 3-5 Ⓐ Flywheel stopper

Remove distributor assembly.

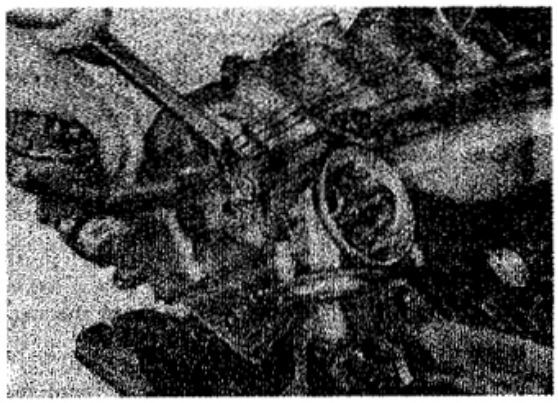


Fig. 3-6

Remove fuel pump.

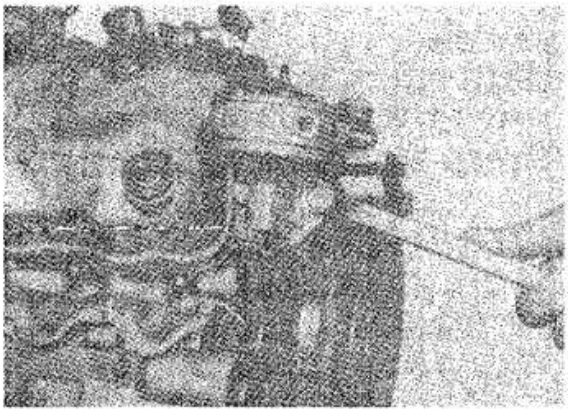


Fig. 3-7

Take down distributor case.

Fig. 3-8

Remove cooling fan.

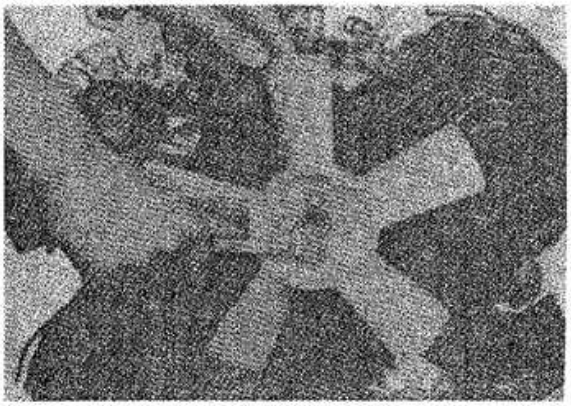


Fig. 3-9

Take down alternator.

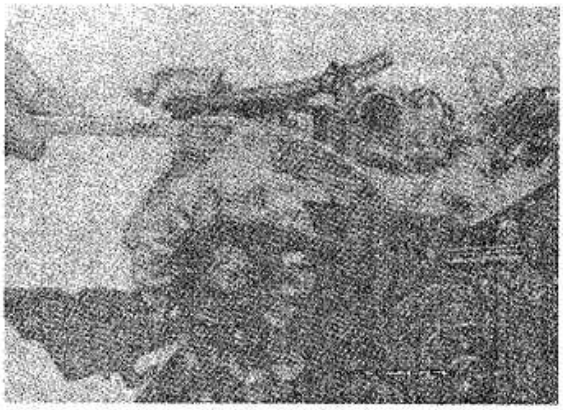


Fig. 3-10

Remove alternator mounting stay.

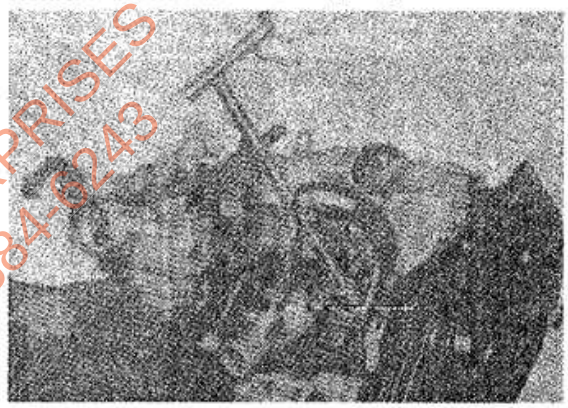


Fig. 3-11

Remove thermostat cap.

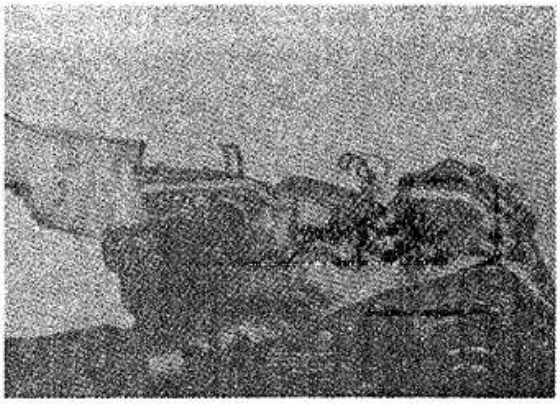


Fig. 3-12

Remove crank pulley similarly, with special tool Ⓐ (flywheel stopper) hitched to flywheel so that crankshaft will not turn.

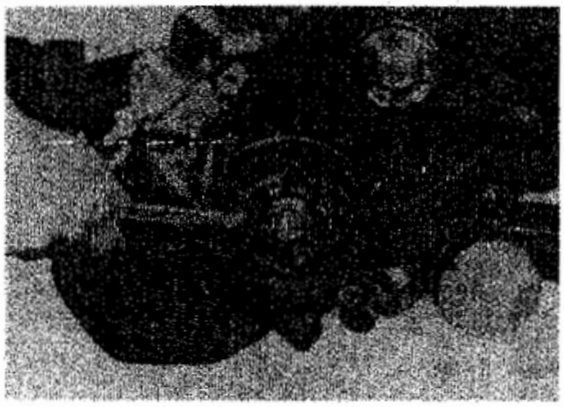


Fig. 3-13

Fig. 3-14

Remove outside cover on timing belt.

Fig. 3-15

Remove timing belt tensioner.

CAUTION:
Before removing the tensioner, turn over the crankshaft to bring its keyway ① to a point between 80°and 100° on the left side of mark ② provided on the timing belt inside cover. See Fig. 3-16. This positioning is necessary in order to prevent the piston crown from coming into contact with the valve. The valve could be damaged if this contact should occur. Never rotate camshaft or crankshaft before the cylinder head or rocker arms are removed.

Fig. 3-16

Remove timing belt.

Fig. 3-17

Remove the camshaft timing belt pulley, with special tool (camshaft lock holder) attached, as shown, to lock the camshaft.

CAUTION:
Do not rotate camshaft when removing the pulley.

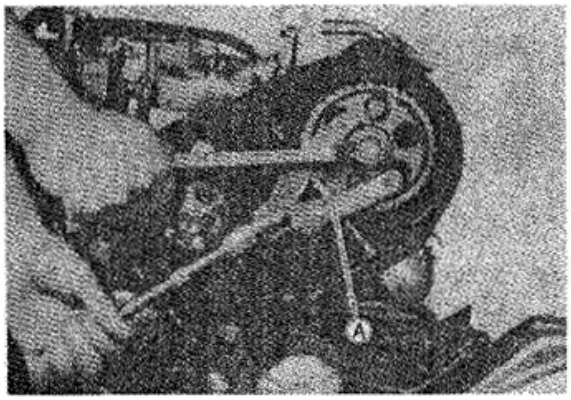


Fig. 3-18

Similarly remove the crankshaft timing belt pulley.

Fig. 3-19

After removing the pulley key, take out timing belt guide.

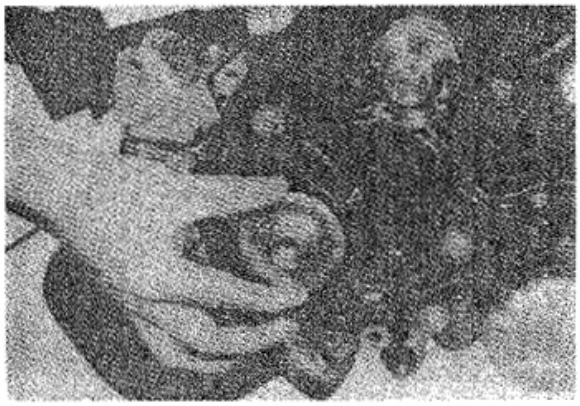


Fig. 3-20

Take down timing belt inside cover.

Fig. 3-21

Remove cylinder head front side case.

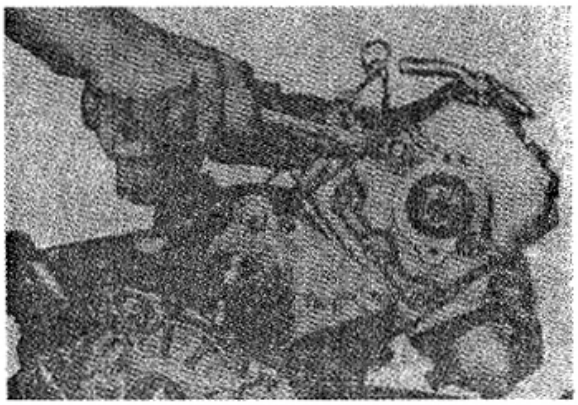


Fig. 3-22

Remove water pump case.

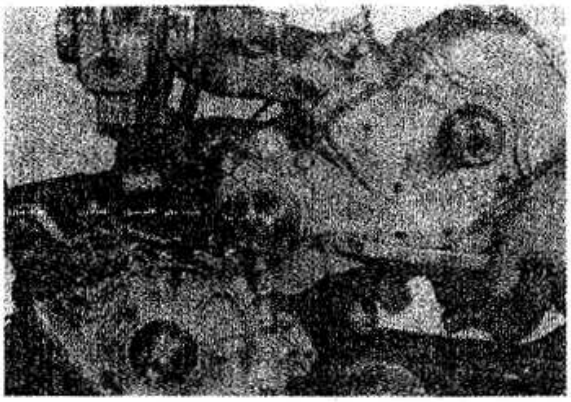


Fig. 3-23

Remove exhaust manifold cover.

Fig. 3-24

Take off exhaust manifold and its gasket.

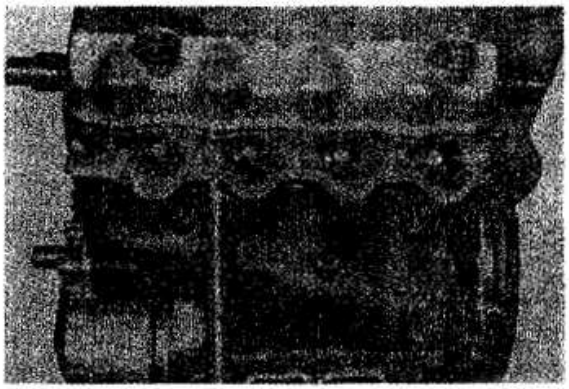


Fig. 3-25

Using special tool (oil filter wrench Ⓐ), to remove oil filter.

NOTE:

Be careful not to spill the oil when removing the filter.

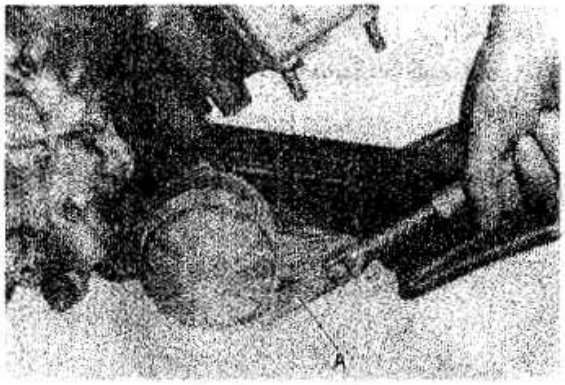


Fig. 3-26

Draw bypass hose off inlet manifold.

Fig. 3-27

Take down inlet manifold.

Fig. 3-28

Remove water inlet pipe.

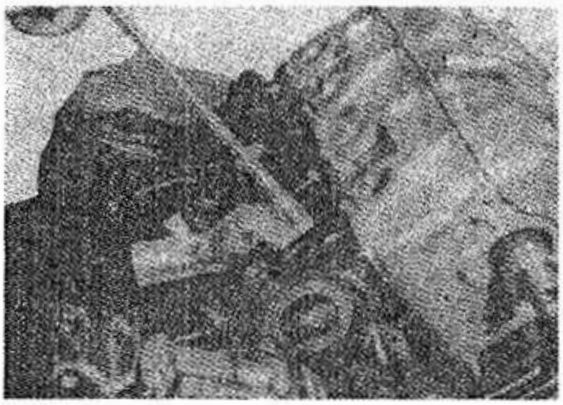


Fig. 3-29
Take off cylinder head cover.

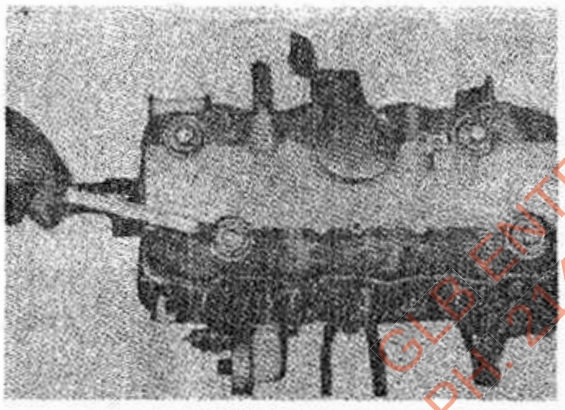


Fig. 3-30
Loosen the *8* valve adjusting screws fully. Leave the screws in place.

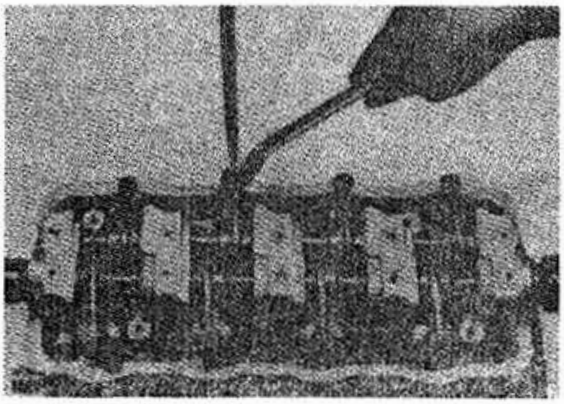


Fig. 3-31
Loosen rocker arm shaft securing screws : there are *10* screws.

Fig. 3-32
While drawing out rocker arm shaft, separate valve rocker arms and rocker arm springs.

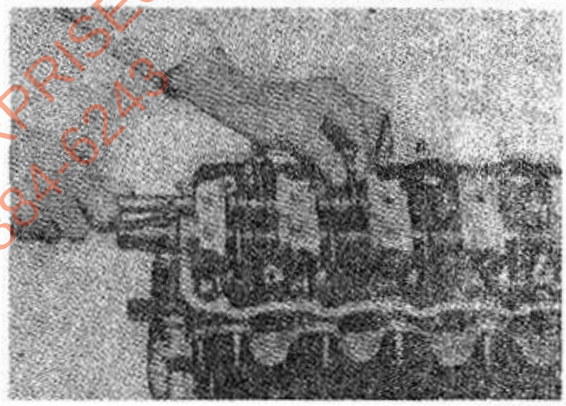


Fig. 3-33
Remove camshaft thrust plate, and draw camshaft out toward front end.

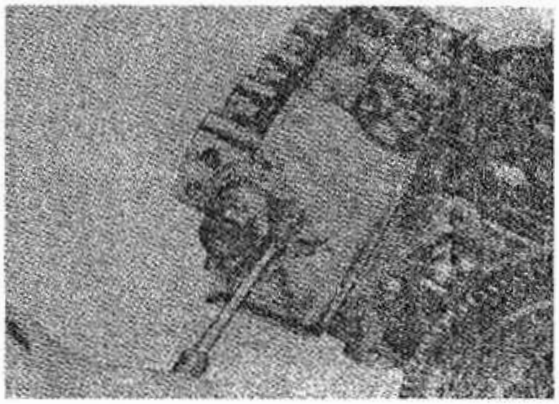


Fig. 3-34

Remove cylinder head.

Fig. 3-35

Use valve lifter Ⓐ (*09916-14510*) to compress the valve spring in order to free valve cotter pieces for removal. In this way, remove valve spring and valves.

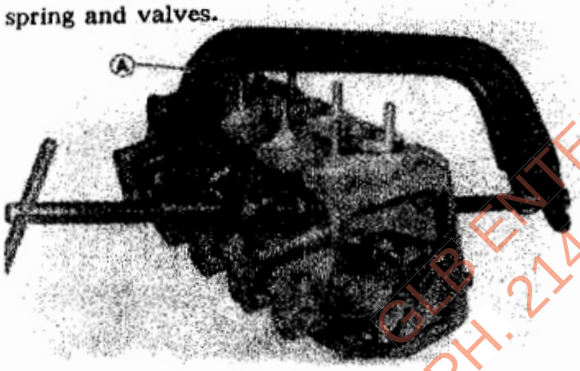


Fig. 3-36

Remove flywheel, using special tool Ⓐ (*09916-97910*) as shown.

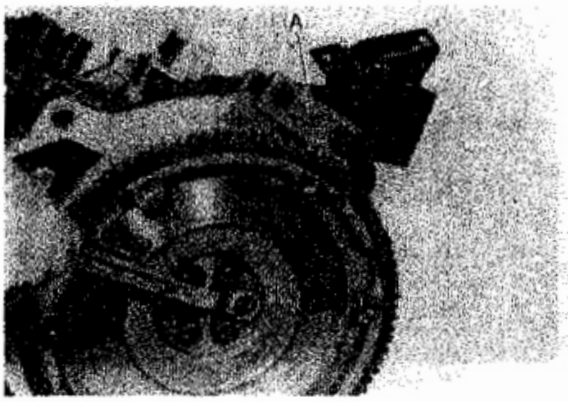


Fig. 3-37

Remove alternator bracket.

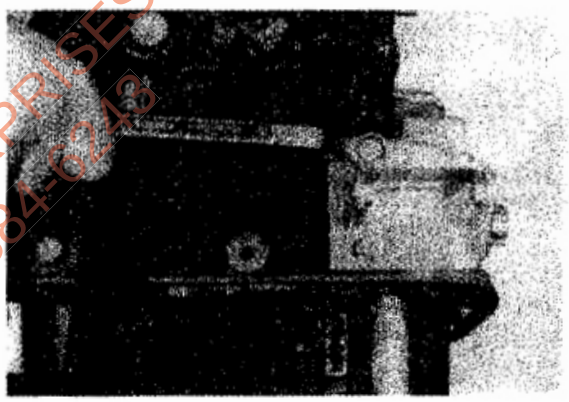


Fig. 3-38

Remove engine mounting bracket from cylinder block. (R, L)

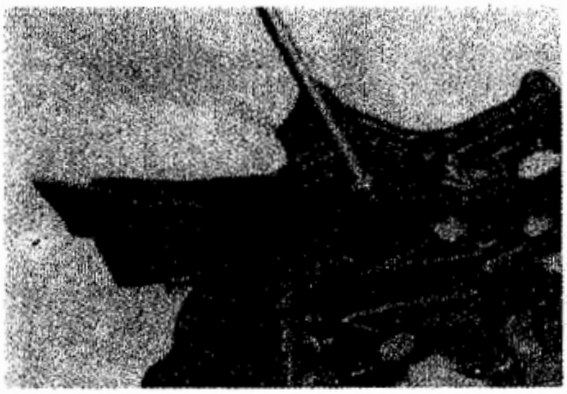


Fig. 3-39

Take down oil pan.

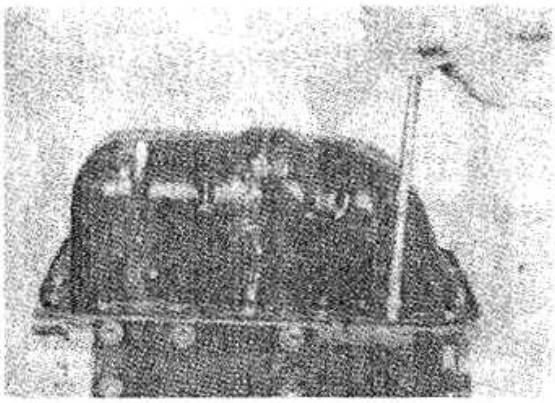


Fig. 3-40

Remove oil pump strainer.

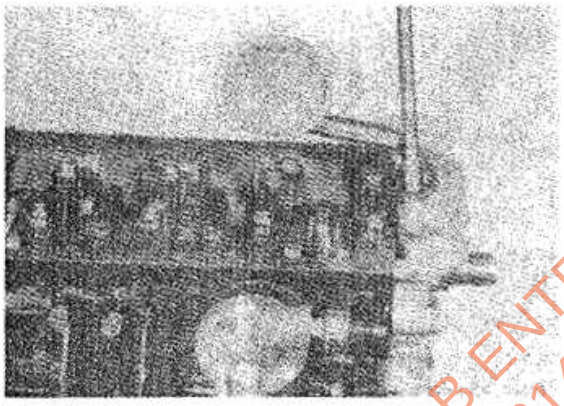


Fig. 3-41

As the first step of crankshaft removal, remove the connecting rod caps for No. 2 and No. 3 cylinders, and take out pistons, each complete with its connecting rod, from cylinder head side.

CAUTIONS:

- **Before pulling the piston out, scribe the cylinder number on its crown.**
- **Never drive on the big end in an attempt to force the piston out. If driving is necessary to ease the big end off crankpin, run stud bolts into the big end and drive on the bolts with a mallet handle.**
- **Be sure to identify each bearing cap for its connecting rod by using the cylinder number. Set the cap and rod aside in combination.**

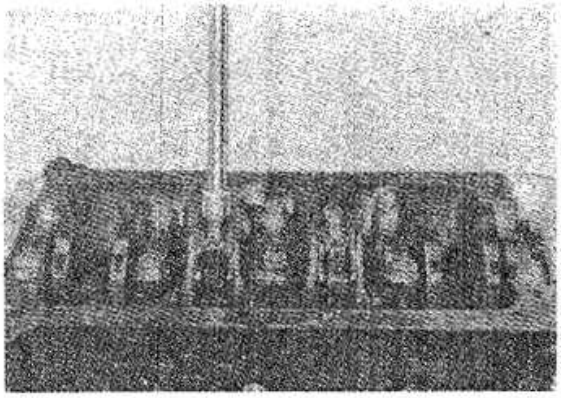


Fig. 3-42

Remove the connecting rod caps for No. *1* and No. *4* cylinders and, as mentioned above, take out the pistons and connecting rods.

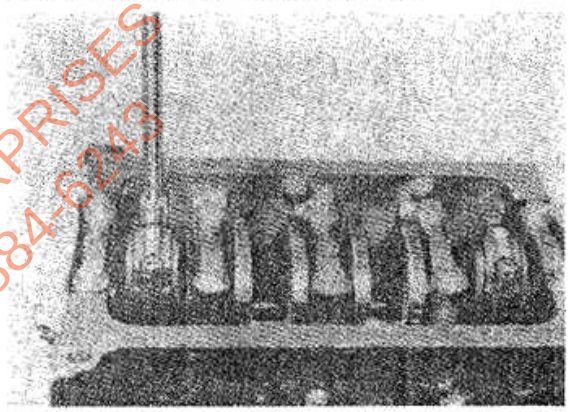


Fig. 3-43

Remove crankshaft rear oil seal assy.

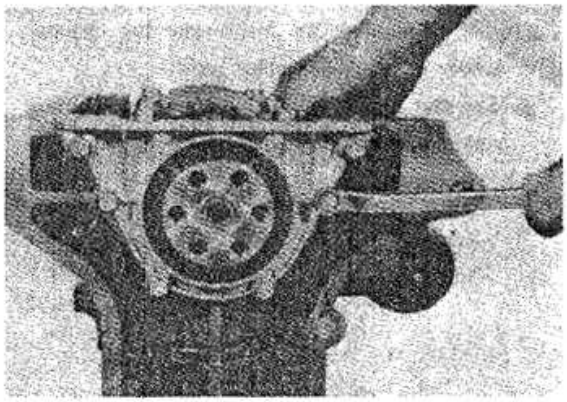


Fig 3-44

Remove crankshaft bearing caps, and take out crankshaft.

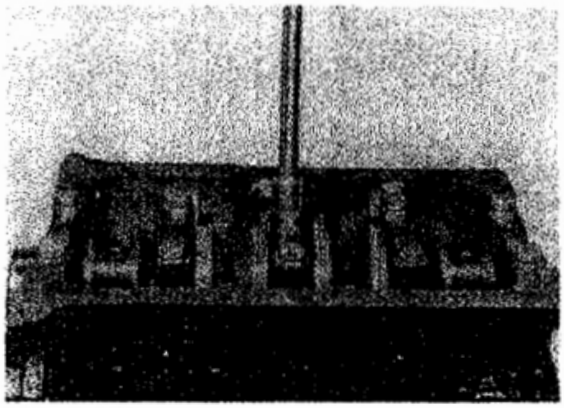


Fig. 3-45

From each piston, ease out piston pin circlips, as shown.

Fig. 3-46

Force piston pin out.

CAUTIONS:

- Before removing the pin, scribe the cylinder number on the connecting rod.
- Set the piston, piston pin and connecting rod, together with cap, in the tray or pan as a combination.

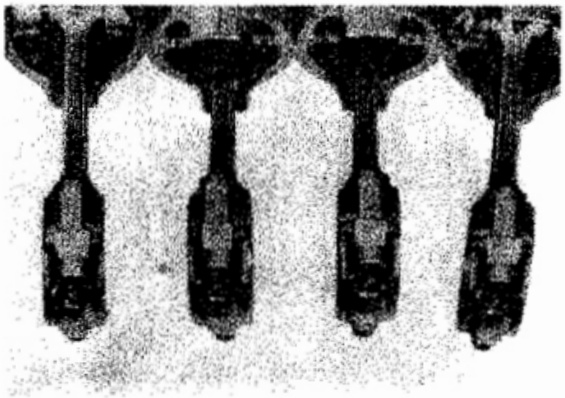


Fig. 3-47

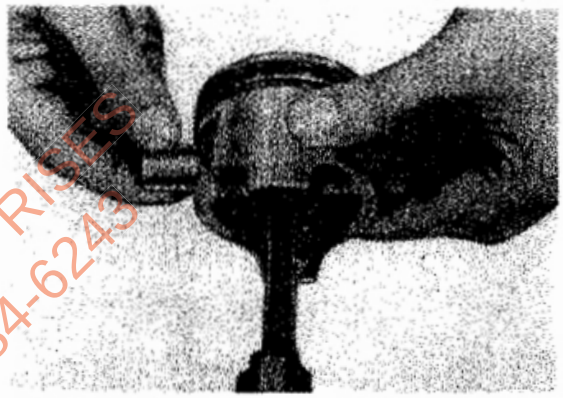


Fig. 3-48

Engine Maintenance Service

NOTES:

- During and immediately after disassembly, inspect the cylinder block and head for evidence of water leakage or damage and, after washing them clean, inspect more closely.
- Wash all disassembled parts clean, removing grease, slime, carbon and scales, before inspecting them to determine whether repair is necessary or not.
  Be sure to de-scale the water jackets.
- Use compressed air to clear internal oil holes and passages.
- Do not disturb the set combinations of valves, bearings and bearing caps, etc. Have the sets segregated and identified.

Cylinder head

●De-carbon the cylinder head;

Deposits of carbon will be found on its combustion chamber surfaces and exhaust ports. Remember, overheating tendency and loss of output are often due to excessive carbon accumulation. De-carbon the valves, too.

NOTE:
Do not use any sharp-edged tool to scrape off the carbon. Be careful not to scuff or nick the metal surfaces when de-carboning.

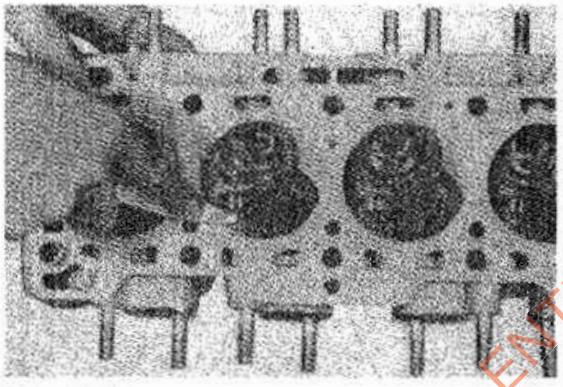


Fig. 3-49

●Flatness of gasketed surface;

Using a straightedge and thickness gauge, check the flatness at a total of *6* locations. If the limit, stated below, is exceeded, correct the gasketed surface with a surface plate and sandpaper of about # *400*; place the sandpaper on and over the surface plate and rub the gasketed surface against the sandpaper to grind off high spots. Should this fail to reduce the thickness gauge readings to within the limit, replace the cylinder head.

Leakage of combustion gases from this gasketed joint is often due to a warped gasketed surface; such leakage results in reduced power output and hence a higer cost of fuel per kilometer.

Limit on flatness	under 0. 05mm (0. 002in.)

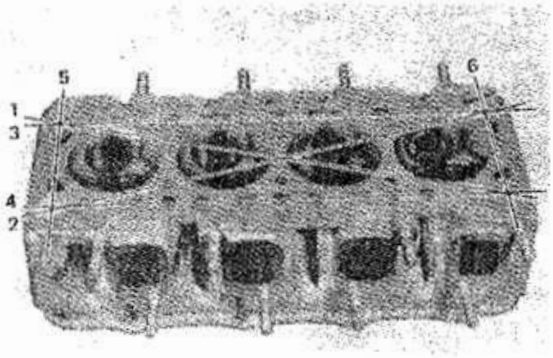


Fig. 3-50

Fig. 3-51

●Flatness of manifold seating faces;

Check the seating faces of cylinder head for manifolds, using a straightedge and thickness gauge, in order to determine whether these faces should be corrected or the cylinder head replaced.

Limit on flatness	under 0. 10mm (0. 004in.)

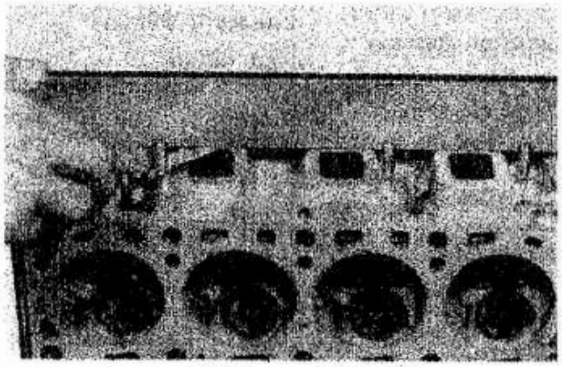


Fig. 3-52 Checking exhaust manifold seating face for flatness

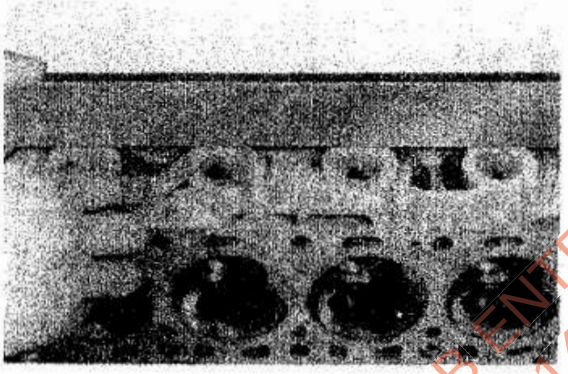


Fig. 5-53 Checking inlet manifold seating face for flatness

(The checking method of the flatness of exhaust manifold seating faces is the same above.)

Rocker-arm shaft and rocker arms

●Wear:

Check these parts for wear and, as necessary, replace them. The extent of wear is determined on the basis of two readings, one on rocker arm I. D. and the other on shaft diameter.

NOTE:
Use a micrometer on rocker-arm shaft and a caliper on rocker arm. The difference between the two readings is the arm-to-shaft clearance on which a limit is specified. If the limit is exceeded, replace shaft or arm, or both.

Item		Standard	Limit
Rocker arm I. D.		14. 985-15. 005mm (0. 590-0. 591in.)	-
Rocker-arm shaft dia.		14. 965-14. 980mm (0. 589-0. 590in.)	-
Arm-to-shaft clearance	Inlet	0. 005-0. 040mm (0. 0002-0. 0016in.)	0. 07mm (0. 0027in.)
	Exhaust	0. 005-0. 040mm (0. 0002-0. 0016in.)	0. 07mm (0. 0027in.)

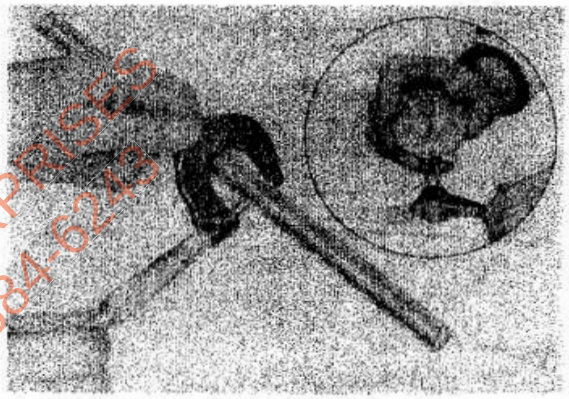


Fig. 3-54

●Rocker-arm shaft deflection:

Using "V" blocks and a dial gauge as shown in Fig. 3-55, check the shaft for straightness in terms of deflection. If the limit is exceeded, correct it by cold-working with a wooden mallet or replace it.

Deflection limit	under 0. 06mm (0. 0023in.)

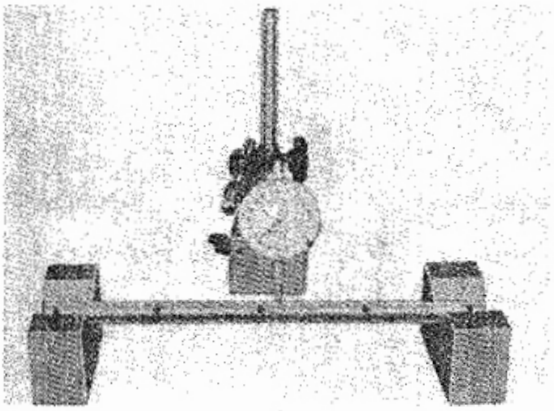


Fig. 3-55

●If the tip ① of adjusting screw ② is badly worn, replace the screw. The arm must be replaced if its cam-riding face ③ is badly worn.

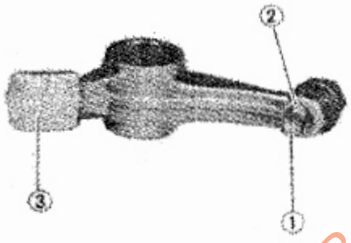


Fig. 3-56

●Visually examine each rocker-arm spring for evidence of breakage or weakening. Be sure to replace springs found in bad condition.

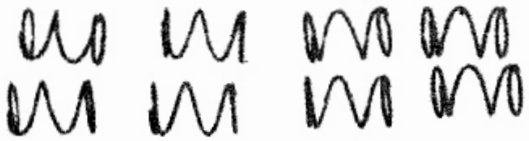


Fig. 3-57

Valve guides

●Using a micrometer and caliper, take diameter readings on valve stems and guides to determine the stem clearance in the guide. Be sure to take a reading at three places along the length of each stem and guide, as shown in Fig. 3-58.

Item		Standard	Limit
Valve stem diameter	Inlet	6.965-6.980mm (0.2742-0.2748in.)	-
	Exhaust	6.955-6.970mm (0.2738-0.2744in.)	-
Valve guide I.D.	Inlet	7.000-7.015mm (0.2755-0.2761in.)	-
	Exhaust	7.000-7.015mm (0.2755-0.2761in.)	-
Stem-to-guide clearance	Inlet	0.020-0.050mm (0.0008-0.0019in.)	0.07mm (0.0027in)
	Exhaust	0.030-0.060mm (0.0012-0.0023in.)	0.09mm (0.0035in.)

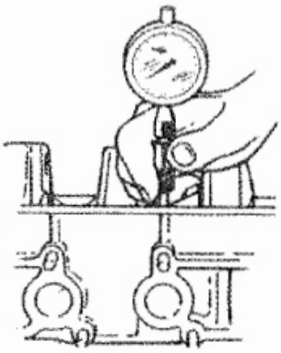


Fig. 3-58

If the caliper like the one shown in Fig. 3-58 is not available, check the end deflection of the valve stem in place with a dial gauge rigged as shown in Fig. 3-59. Move the stem end in the directions ④ ⑤ and determine whether replacement is necessary or not, by referring to these limiting values:

Valve stem end deflection	Inlet	0. 12mm (0. 0047in.)
	Exhaust	0. 16mm (0. 0063in.)

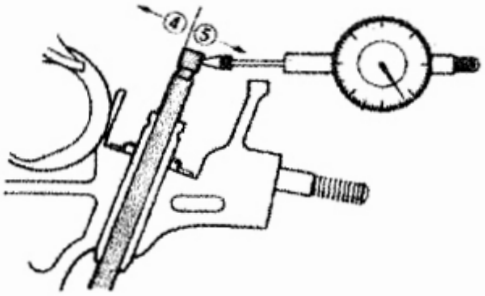


Fig. 3-59

●Valve guide replacement;

Valve guides are shrink-fitted. The method of removal and installation is as follows;

1) Using the guide remover (valve guide remover)drive the valve guide out to remove it from the top side of cylinderhead. After driving the guide out, ream the guide hole with a 12 mm (0. 472 in.)reamer (Special tool -valve guide reamer) to remove burrs, making sure that the hole diameter after reaming comes within this range;

Valve guide hole diameter	Inlet	12. 030-12. 048mm (0. 4736-0. 4743in.)
	Exhaust	

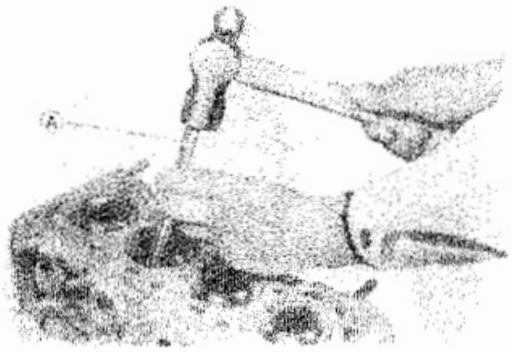


Fig. 3-60

2) Heat the cylinder head uniformly to anywhere between 80℃ and 100℃ (176°F-212°F) so that the head will not distort, and drive the oversize guide into the hole with the valve guide installer set Ⓑ . See Fig. 3-61. Be sure to carry out this step speedily so that all guides will go into the cylinder head in steady temperature state.

Valve guide oversize	0. 03mm(0. 0012in.)
Valve guide protrusion 1	16. 5mm(0. 649in.)

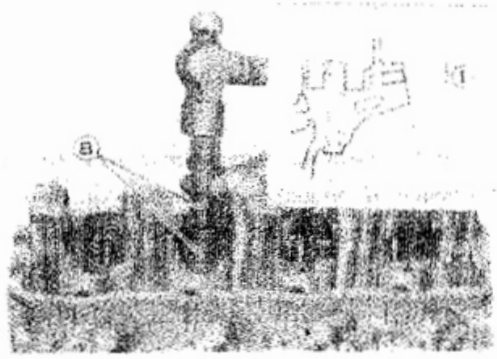


Fig. 3-61

NOTE;
Valve guide length both for INLET and EXHAUST is the same. It is 48 mm.

3) Check all valve guides and, stems in place for I. D. and, if the clearance reading indicates too small, ream the guide I. D. with the reamer Ⓒ as shown in Fig. 3-62.

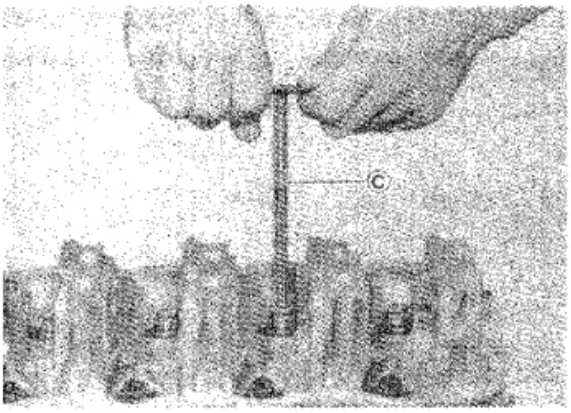


Fig. 3-62

Valves

- Inspect each valve for wear, burn or distortion at its face and stem and, as necessary, replace it.
- Measure the thickness ② of valve head. If the limit given to this thickness is exceeded, the valve must be replaced.

Valve head thickness ②

Standard	Limit	
0. 8-1. 2mm (0. 031-0. 047in.)	Inlet	0. 6mm(0. 0236in.)
	Exhaust	0. 7mm(0. 0275in.)

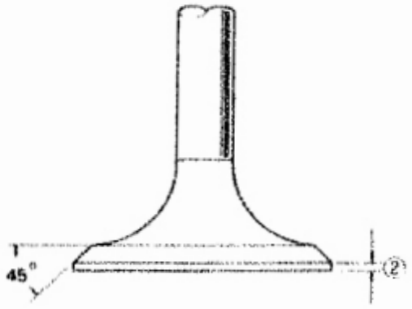


Fig. 3-63

- Check the end face of each valve stem for wear. This face meets the rocker arm intermittently in operation, and might become concaved or otherwise irregular. As necessary, smoothen the end face with an oil stone and, if this grinding removes the end stock by as much as 0. 5 mm (0. 0196 in.)(as measured from the original face), replace the valve.
  Replacement valves have their stems machined to the follwowing diameter ranges.

Standard valve stem diameter	Inlet	6. 965-6. 980 mm (0. 2742-0. 2748in.)
	Exhaust	6. 955-6. 970mm (0. 2738-0. 2744in.)

- Check each valve for radial runout with a dial gauge and "V" block, as shown in Fig. 3-64. The object of this check is to determine whether the valve stem is concentric relative to the head.

Limit on valve head radial runout	0. 03mm(0. 0012in.)

If the limit is exceeded, do not attempt to correct the stem; replace the valve, instead.

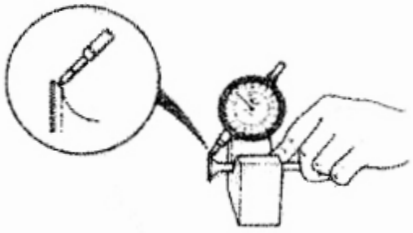


Fig. 3-64

Valve seats

CAUTION:
The valves to be checked and serviced for seating width and contact pattern must be those found satisfactory in regard to stem clearance in the guide and also the requirements stated in the preceding part titled VALVES.

- Seating contact width:

Produce a contact pattern on each valve in the usual manner, namely, by giving a uniform coat of red-lead paste to the valve seat and by rotatingly tapping the seat with the valve head. The valve lapper (the tool used in valve lapping) must be used.

The pattern produced on the seating face of the valve must be a continuous ring without any break, and the width ⓦ of the pattern must be within the stated range.

Standard seating width revealed by contact pattern on valve face: ⓦ	Intake	1. 3-1. 5mm (0. 0512-0. 0590in.)
	Exhaust	