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DESCRIPTION

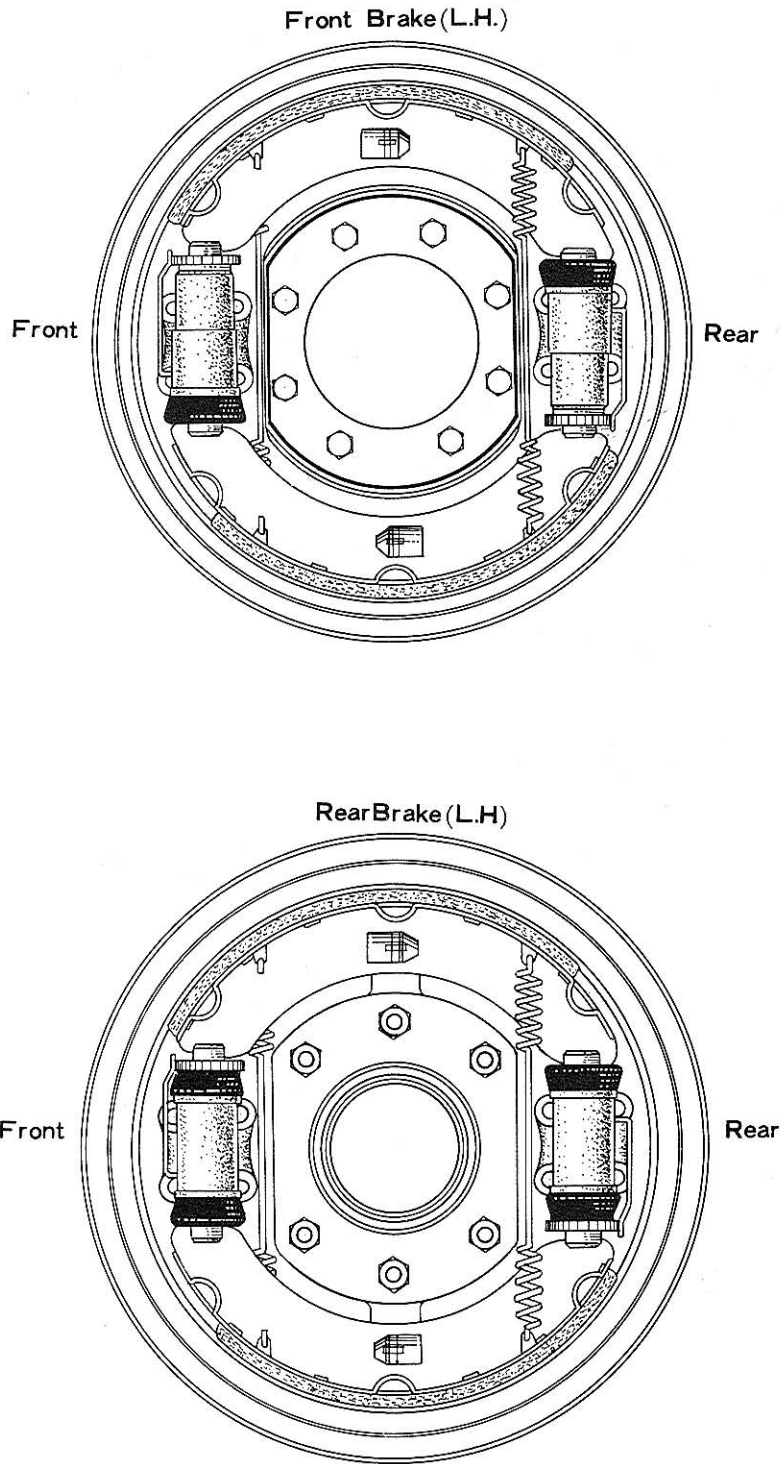


Fig.7-1 Brake Assembly

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The service brakes are of the internal expanding, hydraulically operated type acting on four wheels actuated by means of a brake pedal, connected to the brake master cylinder via the push rod.

The front brakes are of the two leading type with two brake wheel cylinders and the rear brakes are of the dual two-leading type with two brake wheel cylinders on each wheel. The front brake wheel cylinders have one piston and the rear have two pistons.

The vacuum assisted Brake Booster is able to be installed on the FJ55V to increase the braking force.

The parking brake is a mechanical internal expanding shoe type mounted at the rear of the transmission exerting a brake effect on the rear wheels through the drive line. The parking brake application is accomplished by the parking brake plunger through the flexible cable and onto the brake shoes then to the brake drum.

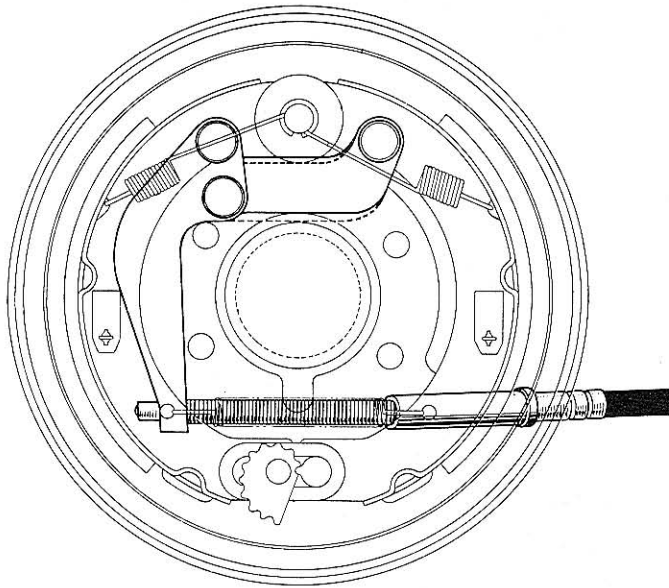


Fig.7-2 Parking Brake

G2462

TROUBLE SHOOTING

<u>Symptoms & Probable Causes</u>	<u>Remedies</u>
1. Pedal spongy.	
a. Air in hydraulic lines	Bleed the brake system
2. Excessive pedal travel	
a. Worn lining or improperly adjusted brake shoe clearance	Replace lining or adjust clearance
b. Leak in hydraulic system	Repair or replace necessary part/s
c. Excessive pedal free travel	Adjust free travel
3. Brake does not release or drags	
a. Faulty master cylinder	Overhaul master cylinder
b. No pedal free travel	Adjust brake pedal
c. Brake shoe distorted or improperly adjusted	Replace shoe or correctly adjust brakes
d. Faulty brake booster	Overhaul booster
4. One brake drags (pulls to one side)	
a. Loose or worn wheel bearings	Replace or adjust bearing/s
b. Weak or unhooked brake shoe spring/s	Replace or repair
c. Improperly adjusted brake shoe clearance	Adjust shoe clearance
d. Faulty brake wheel cylinder	Repair or replace
5. Brake pulls to one side	
a. Abnormal wear of brake drum or lining	Replace drum or lining
b. Loose brake backing plate attaching bolts	Retighten
c. Distorted brake shoe	Replace brake shoe
d. Oil on lining or drum	Clean and replace lining
e. Loosen or damaged wheel bearing	Adjust or replace bearing
f. Improperly adjusted brake shoe clearance	Adjust shoe clearance
g. Front end misalignment	Adjust front end alignment
h. Tires improperly inflated	Inflate tires to correct pressure
i. Axle off-set from spring seat	Correct axle seating on spring
6. Noisy brakes	
a. Worn or glazed lining	Dress or replace lining
b. Loose brake backing plate attaching bolts	Retighten
c. Loose wheel bearing	Tighten and adjust

Symptoms & Probable Causes

Remedies

- | | |
|--|--------------------------------|
| d. Grease, mud or water on lining | Clean or replace lining |
| e. Scored brake drum | Repair or replace drum |
| f. Excessive friction between shoe and brake backing plate | Fill and lubricate with grease |
| 7. Pedal counter-acts when depressed | |
| a. Damaged hydraulic piston cup | Replace piston cup |
| b. Distortion of brake drum | Replace drum |
| c. Improperly installed brake drum | Correct drum installation |
| d. Faulty brake booster | Overhaul booster |
| 8. Poor brake effectiveness | |
| a. Poor contact of brake lining | Correct brake contact |
| b. Air in brake lines | Bleed brake system |
| c. Faulty brake booster | Overhaul booster |

* * * * *

ADJUSTMENT

Brake Pedal

1. Adjust the brake pedal height with height of 170 mm (6.69") for only FJ55V series or 245 mm (9.65") for others from the dash board to the top center of the pedal pad.
2. After adjusting the brake pedal height, adjust the clearance between the master cylinder push rod and the master cylinder piston. To obtain the clearance of 0.5 mm (0.02"), turn the master cylinder push rod after loosening the lock nut.

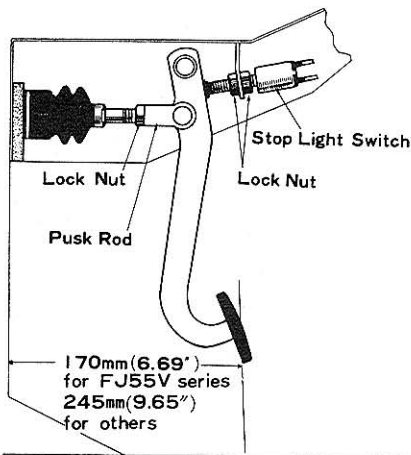


Fig. 7-3 Brake Pedal Adjustment G2463

3. If the distance from toe-board to the brake pedal is less than 25 mm (1 in.) when depressed, the brake lining should be checked for wear.

Brake Shoe Clearance

Brake shoe adjustment re-establishes the brake lining to drum clearance, and compensates for lining wear. The hydraulic brakes are adjusted by The brake wheel cylinder adjusting nut through the service holes of the brake backing plate. The brake drums should be at normal room temperature when the brake shoes are adjusted.

If the shoes are adjusted when the drums are hot and expanded, the shoes may drag as the drum cool and contract.

1. Raise the vehicle until the wheels clear the floor.
2. Release the parking brake plunger completely and check the rear wheels to turn freely.
3. Remove the shoe adjusting hole plugs from the brake backing plate.
4. Expand the brake shoe by turning the wheel cylinder adjusting nut with the adjusting tool until the shoe is tight against the drum. At this time, pump the brake pedal a few times to make sure that the shoes contact the drum onto the entire surface. If the wheel still turns after removing the foot from the brake pedal, turn the adjusting nut further until the wheel is locked completely.
5. Back off the adjusting nut 5 notches if the shoe still drags lightly on the drum, then back off the adjusting nut 1 ~ 2 additional notches. Check if the wheel rotates freely. Re-install the shoe adjusting hole plugs.

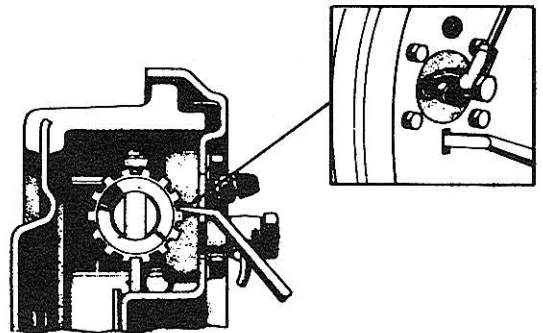


Fig. 7-4 Brake Shoe Clearance Adjustment G2464

For the wheel with two wheel cylinders, never adjust the shoes with the two adjusting nuts at the same time.

6. Perform the same operations on each brake shoe.

After all brake shoes have been properly adjusted, lower the vehicle.

Road test the vehicle on a level road and check the following items. Perform the road test only to determine whether the brake will apply properly, and the vehicle can be stopped safely.

- a. All wheels should lock.
- b. The brake effectiveness is well balanced on both the right and left.
- c. Check if the brakes are noisy.

Parking Brake

1. Place the parking brake plunger in fully retarded position, then jack up the rear of the vehicle, and position the stands.
2. Turn the parking brake adjuster located on the lower position of the parking brake plate counterclockwise until the shoes seat against the drum.
Next, loosen the adjuster one notch.
3. After the adjustment of the parking brake shoe clearance, pull the parking brake plunger, and check if the drum is locked.
Next, releasing the plunger, check if the drum rotates freely.
If the rotation is still tight, the adjuster should be loosened one additional notch.
4. Adjust the parking brake cable by adjusting the effective stroke of the plunger with the turn-buckle on the intermediate lever pull rod No.1 and No.2 and the adjusting nuts on the parking brake cable end. The effective stroke of the parking brake plunger should be 6 ~ 9 notches.
5. Test the parking brake effective-

ness on a brake tester if available or on a slope.

Air Bleeding

When any part of the hydraulic system has been disconnected or presence of air in the system is detected, the system must be bled.

1. Remove the dirt from the area around the top of the master cylinder, and fill the master cylinder with clean brake fluid, and keep the reservoir at least half full of fluid at all times during the operation.

Caution:

Never re-use the brake fluid that has been bled from the hydraulic system.

Do not spill any brake fluid on the painted surface during the operation.

2. Remove the bleeder plug cap from the bleeder plug of the wheel cylinder, and connect a vinyl tube to the plug.

Submerge the other end of the tube into a container half filled with clean brake fluid.

Note:

Air bleeding operation should be performed first from the bleeder plugs on the hydraulic cylinder plug and the top of the end plate if the brake booster is installed. Bleed the wheel cylinder with the longest hydraulic lines first.

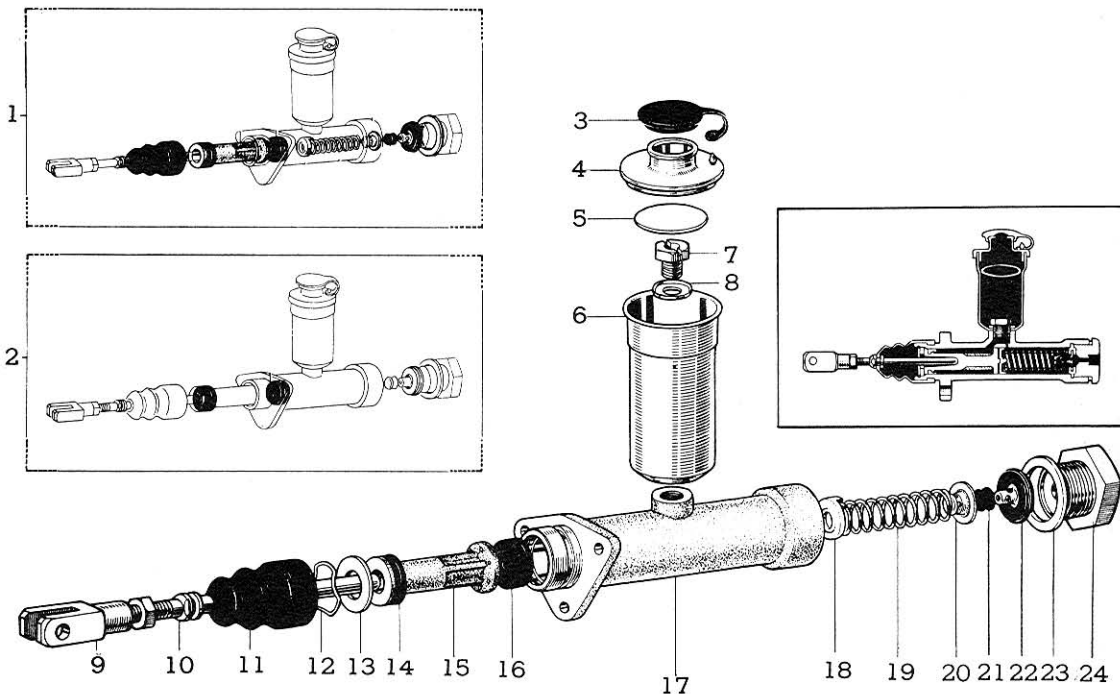
3. Depress the brake pedal slowly several times to bleed the air, and with the brake pedal depressed, loosen the bleeder plug 1/3 to 1/2 of a turn, then close the plug immediately.
4. Repeat this operation until the brake fluid flows into the container without any trace of air.
5. Install the bleeder plug cap onto the plug, and replenish the brake fluid

into the reservoir up-to the specified level.

BRAKE PEDAL

As the brake pedal is almost identical with that used for the clutch pedal, refer to the Clutch Pedal section for details on page 1-5.

BRAKE MASTER CYLINDER



- | | |
|---|-----------------------------|
| 1. Brake master cylinder kit | 13. Washer |
| 2. Brake master cylinder piston cup kit | 14. Cylinder cup |
| 3. Reservoir filler cap | 15. Master cylinder piston |
| 4. Reservoir cap | 16. Cylinder cup |
| 5. Float | 17. Master cylinder body |
| 6. Master cylinder reservoir | 18. Return spring retainer |
| 7. Reservoir set bolt | 19. Piston return spring |
| 8. Washer | 20. Outlet check valve seat |
| 9. Push rod clevis | 21. Outlet check valve |
| 10. Master cylinder push rod | 22. Seat gasket |
| 11. Boot | 23. Gasket |
| 12. Hole snap ring | 24. Master cylinder plug |

Fig.7-5 Brake Master Cylinder Components

Removal & Disassembly

Do not spill any brake fluid on painted surface during the operation.

1. Plug the reservoir inlet, then disconnect the brake tube from the master cylinder.
2. Loosen and remove the master cylinder mounting bolts, and remove the master cylinder assembly.
3. Remove the reservoir cap and the reservoir float, and drain the brake fluid.
4. Loosen and remove the master cylinder reservoir set bolt, and remove the reservoir from the master cylinder body.
5. Pull out the master cylinder boot. Remove the hole snap ring, then remove the piston stopper plate, piston with the cylinder cup, cylinder cup spring retainer and the piston return spring from the master cylinder body in above sequence.

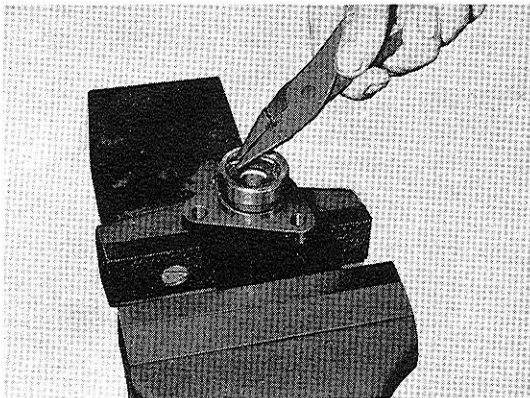


Fig.7-6 Removing Hole Snap Ring V5159

6. Clamp the master cylinder plug in a vise, then loosen and remove the master cylinder plug from the cylinder body with a pipe wrench. Next, remove the outlet check valve seat gasket, check valve and the check valve seat.

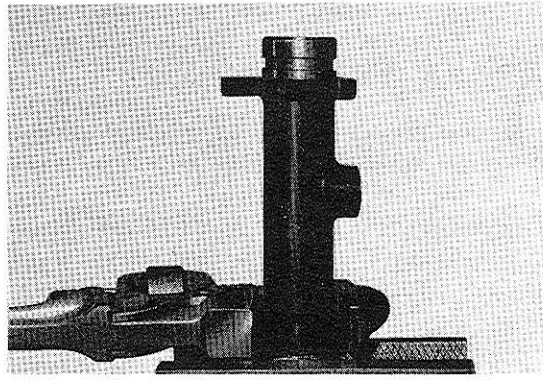


Fig.7-7 Removing Master Cylinder Plug V5160

7. Remove the cylinder cup from the master cylinder piston.

Inspection

Clean all disassembled parts in clean brake fluid or alcohol, and dry with compressed air.

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

1. Inspect the master cylinder bore for wear, scores or rust.
2. Inspect the piston exterior for abnormal wear or scores.
3. Inspect the cylinder bore to piston clearance, and if the clearance exceeds the limit of 0.15 mm or 0.006", replace the piston and/or the cylinder body.

Master cylinder bore diameter:
25.400 ~ 25.452 mm
(1.000 ~ 1.002")

Piston diameter:
25.327 ~ 25.360 mm
(0.997 ~ 0.998")

Cylinder to piston clearance:
0.040 ~ 0.125 mm
(0.002 ~ 0.005")

5. Check the piston return spring for rust and excessive weakness.
6. Inspect the reservoir for scores and deformation at the base.

Assembly

It is recommended that the cylinder cups and the gasket should be replaced upon assembly.

Dip all internal parts of the brake master cylinder in clean brake fluid before assembly.

1. Install the cylinder cup onto the piston with the lip facing towards the front of the piston.
2. Insert the piston into the piston body, then install the piston stopper plate and the hole snap ring.
3. Insert the cylinder cup, spring retainer, piston return spring and the outlet check valve with the check valve seat and the valve seat gasket into the master cylinder.
4. Install the master cylinder plug with the gasket.
5. Position the master cylinder reservoir, and tighten the reservoir set bolt to 1.4 ~ 1.8 m-kg (10 ~ 13 ft-lb) torque.
6. Place the float into the reservoir and install the cap onto the reservoir.
7. Install the master cylinder boot onto the master cylinder body.

Installation

Follow the removal procedures in the reverse order.

1. Fill the reservoir with clean brake fluid up-to the specified level, first, bleed the air from the master cylinder, then bleed the other hydraulic system.
Refer to Air Bleeding on page 7-6.
2. Adjust the master cylinder push rod to master cylinder piston clearance.
Refer to Brake Pedal Adjustment on page 7-5.

BRAKE LINE

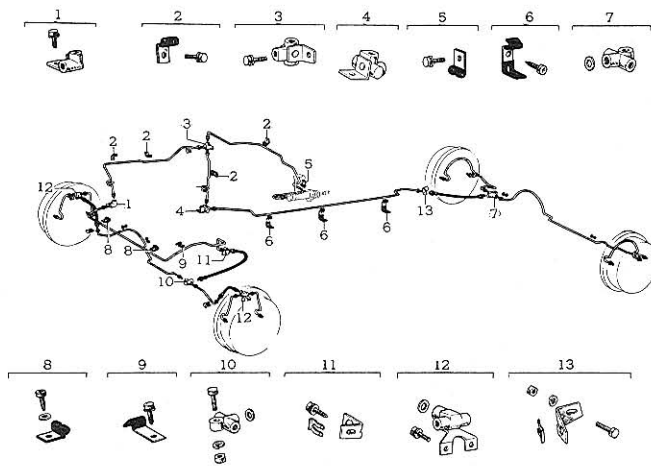


Fig.7-8 Brake Line Components, FJ40(L)(V)

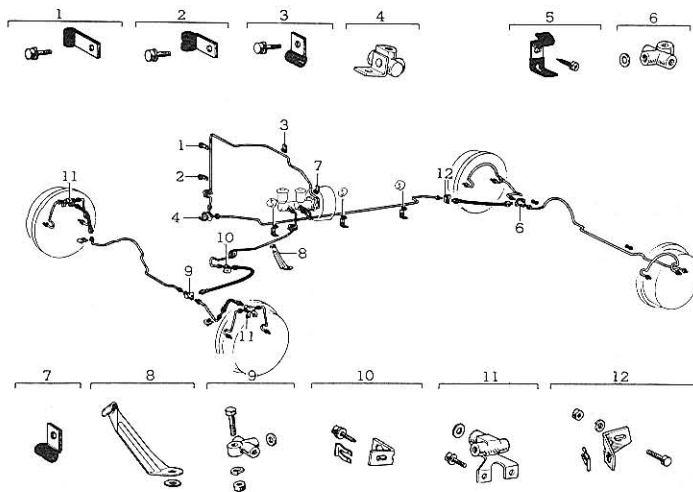


Fig.7-9 Brake Line Components, FJ40(L)(V)-OPT

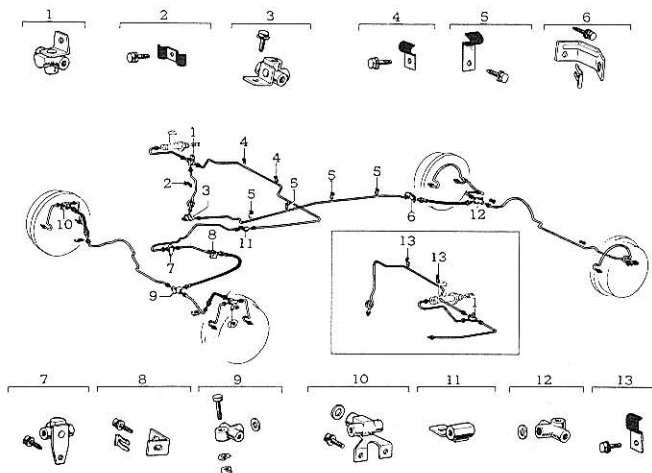


Fig.7-10 Brake Line Components, FJ55(L)V

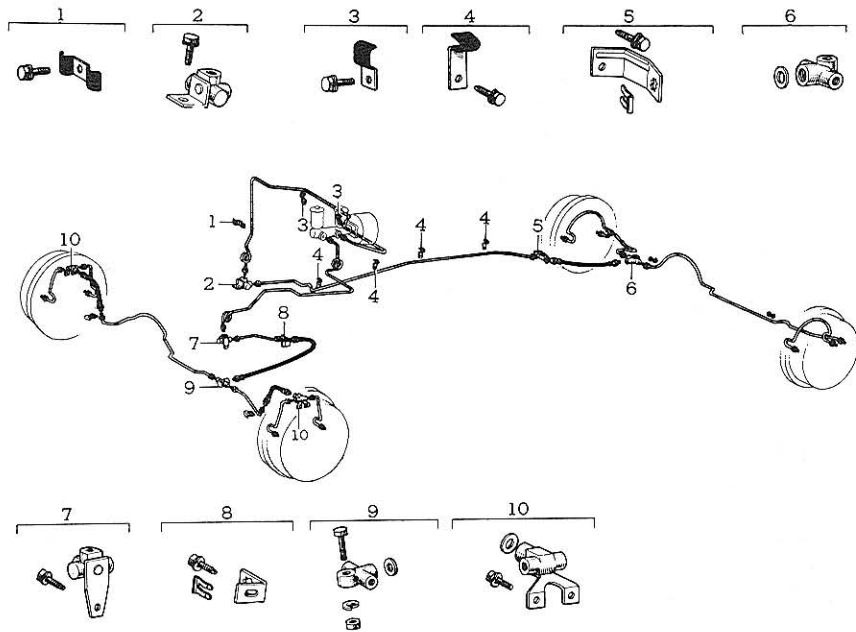


Fig.7-11 Brake Line Components, FJ55(L)(V)-OPT

Flexible Hoses

The flexible hoses require no service other than periodic inspection for damage from road hazards or other like sources.

The hoses showing signs of softening, cracking, swelling or other damage should be replaced.

When installing a new hose, position the hose to avoid contact with other vehicle parts.

Never twist the hose unduly during the operation as its natural curvature is absolutely necessary to maintain proper hose-to-suspension clearance through full movement of the suspension and the steering parts.

Brake Tubes

Steel tube is used for all brake tubes which resist corrosion and have the physical strength to withstand under high pressure when the brake is applied.

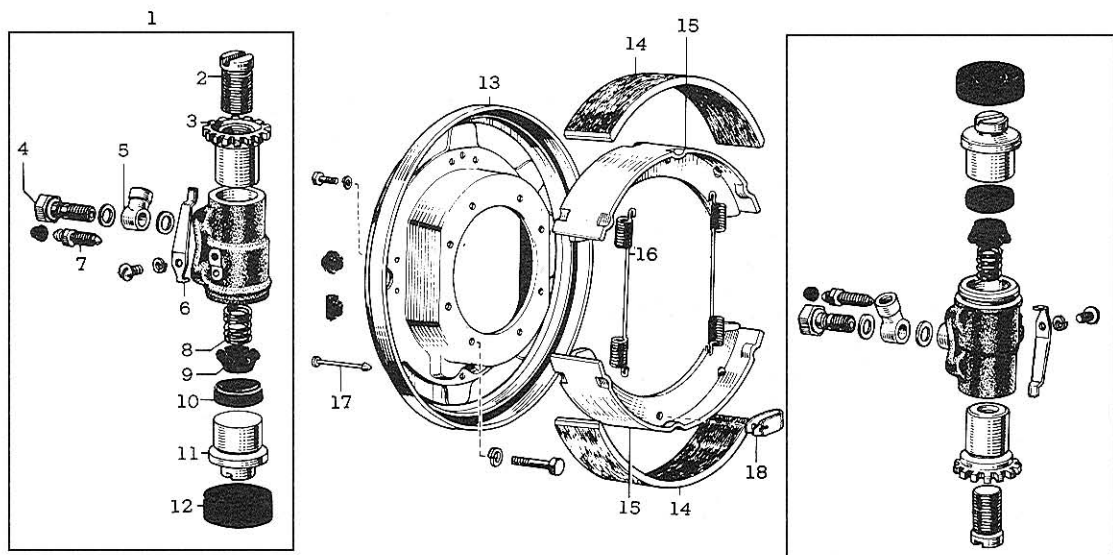
If a section of the brake tube becomes damaged due to unexpected external force, the entire section should be replaced with the new one.

Copper tube should not be used in the hydraulic system.

When replacing the brake tube, hose/s or connection/s, tighten all connections securely.

After the replacement, bleed the brake system at the wheel cylinders and at the brake booster if so equipped.

FRONT BRAKE



1. Brake wheel cylinder assembly
2. Wheel cylinder adjusting bolt
3. Wheel cylinder adjusting nut
4. Union bolt
5. Union
6. Adjuster lock spring
7. Bleeder plug
8. Compression spring
9. Spring seat

10. Cylinder cup
11. Cylinder piston
12. Wheel cylinder boot
13. Brake backing plate
14. Brake lining
15. Brake shoe
16. Brake shoe return spring
17. Shoe hold down spring pin
18. Shoe hold down spring

Fig.7-12 Front Brake Components

G2468

Removal

1. Pry off the wheel cap and loosen the hub nuts.
Raise the front end of the vehicle and support the front axle housing with stands, then remove the front wheel.
2. Plug the brake master cylinder reservoir inlet.

3. Loosen and remove the brake drum set screws, tap the drum lightly with a mallet and remove the drum. Do not depress the brake pedal after the drum has been removed. Back off the adjusting nuts if the drum cannot be removed. Remove the shoe hold down springs.
- 4.. Remove the upper and lower brake shoes by pulling out the shoe end while pushing it up or down.

Do not allow the oil or grease to touch the brake linings. Place the brake shoes in order, and do not change the upper shoe with the lower shoe.

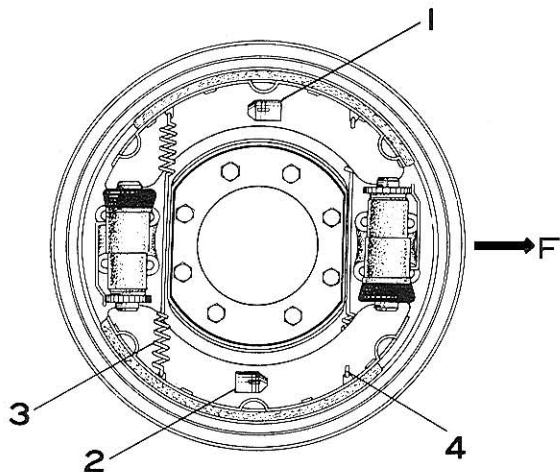


Fig.7-13 Brake Shoe G2469 Removal

5. Loosen and remove the union bolt connecting the union of the wheel cylinder brake tube to the brake wheel cylinder.
6. Remove the wheel cylinder mounting bolts and remove the wheel cylinder assembly. Remove the other wheel cylinder in the same manner.
7. If necessary, remove the brake backing plate after removing the front axle hub. To remove, refer to Steering Knuckle & Axle Shaft.

Inspection & Repair

Brake Drum

1. Clean all dirt out of the drum, and check for cracks, scores, roughness, deep grooves and out-of-round. If any of these conditions exists,

replace or correct as these can impair the efficiency of brake operation and also cause premature failure of the brake linings.

2. Smoothen any slight scores by polishing with fine emery cloth. Heavy or extensive scoring will probably be necessary to rebore in order to true up the braking surface.

If the drum is to be rebored, use a drum lathe with the front axle hub attached onto the drum. The refinished braking surface must be smooth and free from chatter or tool marks.

Brake drum inside diameter:
290 mm (11.42")
Serviceable limit of inside diameter:
293 mm (11.54")

Wheel Cylinder

After the disassembly, wash the parts thoroughly in clean brake fluid.

1. Inspect the piston and cylinder bore for scores, wear, deep scratches or corrosion. Replace if defective.
2. Inspect the wheel cylinder to piston clearance, and if the clearance exceeds the limit, replace the wheel cylinder and/or the piston.

	FJ40, 43, 45, 55V	F40L-A, 55L-G, OPT
Wheel cylinder dia.	28.550-28.552 mm (1.122-1.124")	31.750-31.802 mm (1.250-1.252")
Piston dia.	28.427-28.460 mm (1.118-1.120")	31.686-31.725 mm (1.247-1.249")
Specified clearance	0.04-0.125 mm (0.002-0.005")	
Clearance limit	0.15 mm (0.006")	

3. Inspect the wheel cylinder adjusting nut and the adjusting bolt for wheel or abnormal rotation.

If necessary, replace as a set.

4. Inspect the cylinder cup for scores, cracks, wear or swelling due to improper brake fluid. Replace if necessary.

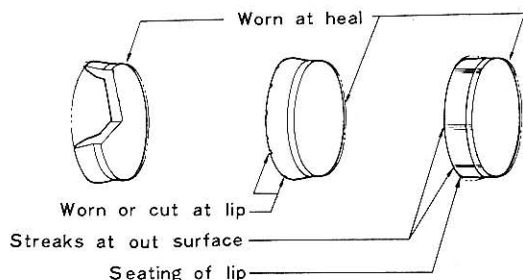


Fig.7-14 Cylinder Cup G2470
Inspection

Brake Shoe Return Springs

Inspect the spring for weakness and deformation.

Free length:	189.5 mm (7.46")
Installed length:	205.0 mm (8.07")
Installed load:	15 kg (33 lb)

Brake Backing Plate

Inspect the backing plate for distortion. Check the plate contacting surfaces with the shoes for any nicks or burrs.

Brake Shoe

1. Inspect the brake shoes for wear, deformation, rust and damage. Inspect the brake linings for scores and excessive wear, and if the thickness of the lining is less than 4 mm (0.16"), replace the brake shoe assembly or reline the lining.
2. Inspect the lining and drum for proper contact. If the contact between them is improper, repair the lining with the

brake shoe grinder or replace the brake shoe assembly.

When any lining requires replacement, it should be replaced in sets of two—both front wheels to maintain effective brakes.

Brake Lining Replacement

1. Lining removal.

Heat the brake shoe to about 250°C (480°F) for about 20 minutes, then peel off the lining from the brake shoe without deforming the brake shoe.

2. Lining installation

a. Dress the brake shoe surface with a suitable sander, and remove the bonding material, rust or any rough spot.

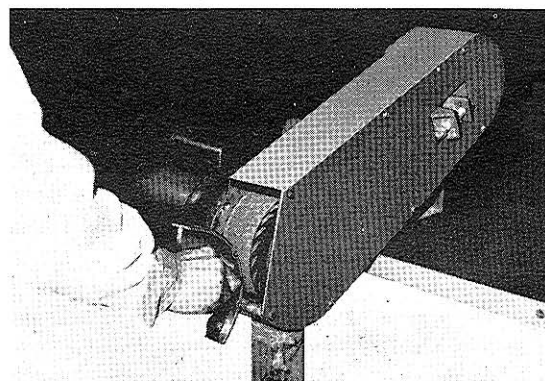


Fig.7-15 Dressing Brake V1023
Shoe Surface

b. Coat the brake shoe surface, and the inner surface of the brake lining with a reliable bonding material.

For application of the bonding material, refer to the inspection furnished with the material.

Note:

The bonding material of Toyota (Part No.08814-00010) is available which is heat hardening type adhesive.

Dry the adhesive sufficiently before bonding the brake lining onto the brake shoe.

c. The lining should be positioned as illustrated.

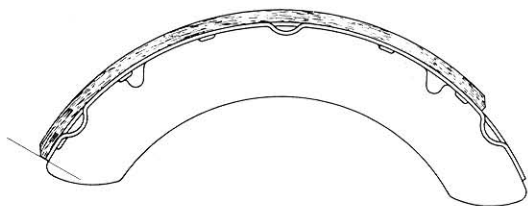


Fig.7-16 Brake Lining G2471
Installation Position

d. Bond the brake lining onto the brake shoe with a shitable bonding machine.

There are several bonding machine available, and the instructions furnished by each manufacturer for the operation of the machine must be followed.

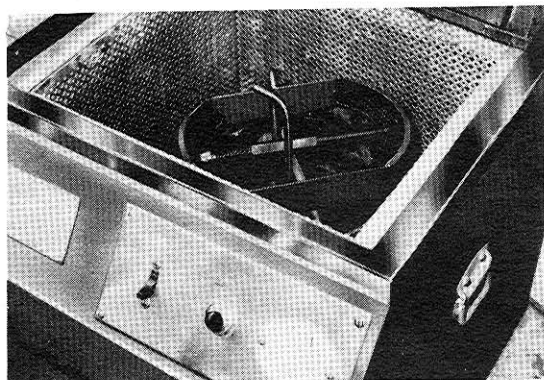


Fig.7-17 Bonding Brake V2629
Lining

e. Inspect the new brake lining, and confirm that there are no nicks or burrs on the shoe edge where it contacts with the brake backing plate or other contacting surface.

f. Test the brake lining bonding condition with a bonding tester. Hold the brake shoe and apply the pressure of 7 kg/cm² (99 psi) on the side of the brake lining, and if the brake lining does not peel, the bonding is satisfactory.

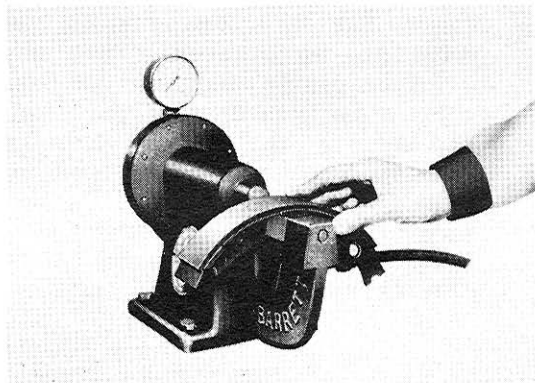


Fig.7-18 Testing Bonding V2632
Condition

Installation

Coat all points of contact between the brake shoe and the other brake assembly parts with grease.

Lubricate the adjusting bolt threads.

1. Apply clean brake fluid into the wheel cylinder bore, cylinder cup and the piston, and install the spring, piston spring seat, cylinder cup and the piston into the wheel cylinder in order. Next, install the wheel cylinder boot.

2. Assemble the wheel cylinder adjusting nut with the bolt into the wheel cylinder.

Caution:

The adjusting nuts and the bolts are of two kinds; the adjusting bolt of left-hand threads is on the right side of the front brake, and the right-hand threads one is on the left side of the front brake.

3. Install the wheel cylinder assemblies onto the brake backing plate as illustrated in the figure 7-17 and 7-18.

4. Hook the brake shoe return springs onto the brake shoes.

Note:

Hook the front spring from the shoe back side, and hook the rear spring from the shoe face side.

First, fit the lower brake shoe ends into the grooves of the wheel cylinder piston, and the adjusting bolt, then push up the upper brake shoe and fit the brake shoe ends into the grooves of the piston and the adjusting bolt.

Each brake shoe ends must be properly fitted into the grooves of the pistons and the adjusting bolts.

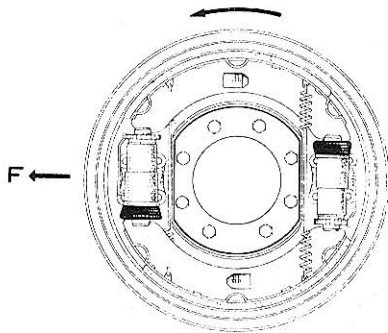


Fig.7-19 Front Brake G2469
Assembly (Left)

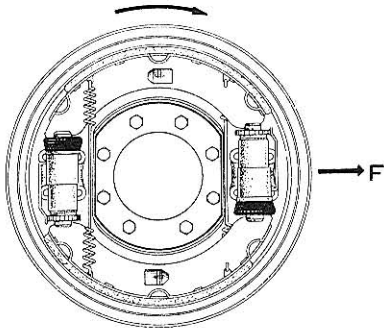
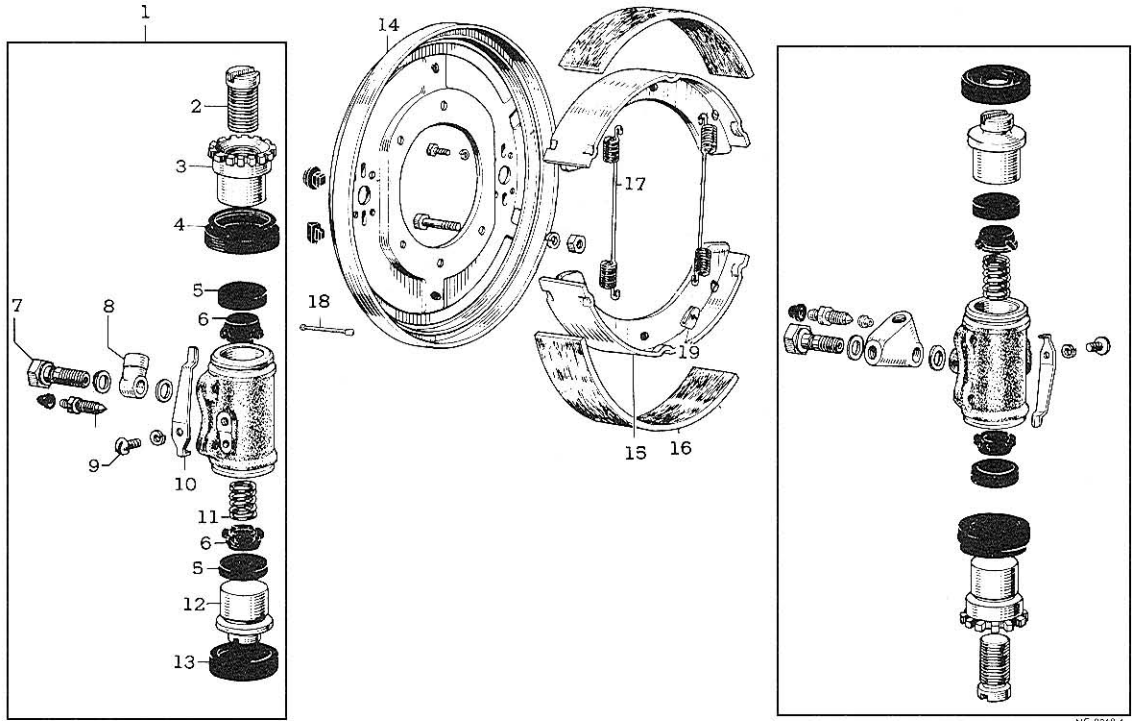


Fig.7-20 Front Brake G2472
Assembly (Right)

5. Install the shoe hold down spring pins and shoe hold down springs.
6. Install the brake drum and secure with the drum set screws.
7. Connect the unions of the brake tubes with new gaskets onto the wheel cylinders.
8. Bleed the hydraulic system. Refer to Air Bleeding on page 7-6.
9. Adjust the brake shoe clearance. Refer to Brake Shoe Clearance on page 7-5.
10. Install the front wheel, and tighten the hub nuts securely. Install the wheel cap.
11. Remove the stands.
Road test the vehicle on a level road to determine whether the vehicle can stop safely.

REAR BRAKE



- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Brake wheel cylinder assembly 2. Wheel cylinder adjusting bolt 3. Wheel cylinder adjusting nut 4. Wheel cylinder boot 5. Cylinder cup 6. Spring seat 7. Union bolt 8. Union 9. Bleeder plug 10. Adjuster lock spring | <ol style="list-style-type: none"> 11. Compression spring 12. Cylinder piston 13. Wheel cylinder boot 14. Brake backing plate 15. Brake shoe 16. Brake lining 17. Brake shoe return spring 18. Shoe hold down spring pin 19. Shoe hold down spring |
|--|---|

Fig.7-21 Rear Brake Components

G2473

Removal

1. Pry off the wheel cap and loosen the hub nuts.
Raise the rear end of the vehicle and support the rear axle housing with stand, then remove the rear wheel.
2. Plug the brake master cylinder

reservoir inlet.

3. Loosen and remove the brake drum set screws, tap the brake drum lightly with a mallet, and remove the drum.
Do not depress the brake pedal after the drum has been removed. Back off the adjusting nuts if the drum cannot be removed. Remove the shoe hold down spring pins.

- Remove the upper and lower brake shoes by pulling out the shoe end while pushing it up or down. Do not let oil or grease touch the brake linings. Place the brake shoes in order so as not to change the upper shoe with the lower shoe.

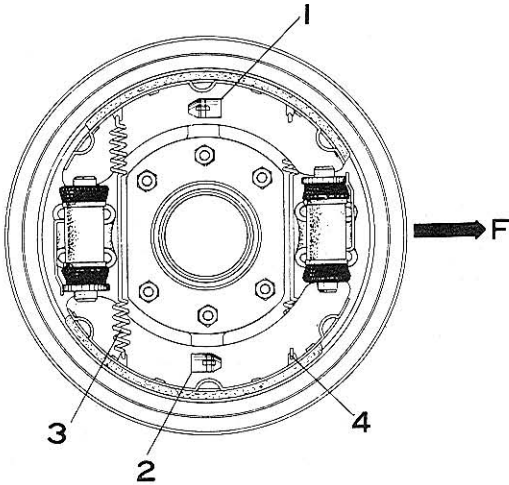


Fig.7-22 Brake Shoe G2474
Removal

- Loosen and remove the union bolt connecting the union of the wheel cylinder brake tube to the brake wheel cylinder.
- Remove the wheel cylinder mounting bolts, and remove the wheel cylinder assembly.
- If necessary, remove the brake backing plate after the rear axle shaft removal. To remove, refer to Rear Axle Shaft section.

Inspection & Repair

Refer to Inspection & Repair in the Front Brake section.

Installation

Coat all points of contact between the brake shoes and the other brake assembly parts with grease. Lubricate the adjusting bolt threads.

- Apply clean brake fluid into the wheel cylinder bore, cylinder cups and the piston, and install the spring, piston spring seats, cylinder cups, piston cup seat, piston and the adjusting nut with the bolt into the wheel cylinder in order. Next, install the wheel cylinder bolts.

Caution:

There are two kinds of adjusting nuts and the bolts. The adjusting bolt of the left-hand threads is on the right side of the rear brake, and the right-hand threads bolt is on the left side of the rear brake.

- Install the wheel cylinder assemblies onto the brake backing plate as illustrated in the figure 7-21 and 7-22.

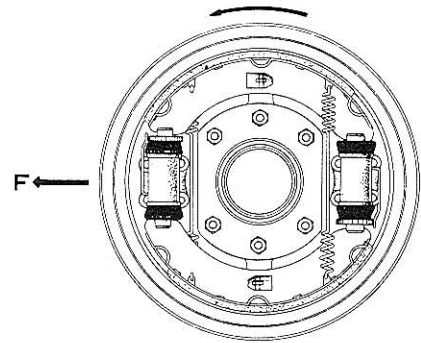


Fig.7-23 Rear Brake G2474
Assembly (Left)

- Hook the brake shoe return spring onto the brake shoes.

Rear Brake Wheel Cylinder Specifications

	FJ40(L)	FJ40L-A, 40(L)-OPT	FJ43, 45P-B, 55V	FJ55LC, 55(L)V-OPT
Wheel cylinder dia	25.400~25.452 mm (1.000-1.002")	22.220~22.272 mm (0.875-0.877")	28.500~28.552 mm (1.122-1.124")	23.800~23.862 mm (0.937-0.939")
Piston dia	25.327~25.360 mm (0.997-0.998")	22.167~22.200 mm (0.873-0.874")	28.427~28.460 mm (1.119-1.120")	23.757~23.790 mm (0.935-0.937")
Specified clearance	0.04-0.125 mm (0.002-0.005")			
Clearance limit	0.15 mm (0.006")			

First, fit the lower brake shoe ends into the grooves of the piston and the adjusting bolt, then push up the upper brake shoe and fit the brake shoe ends into the grooves of the piston and the adjusting bolt.

Each brake shoe ends must be properly fitted into the grooves of the pistons and the adjusting bolts.

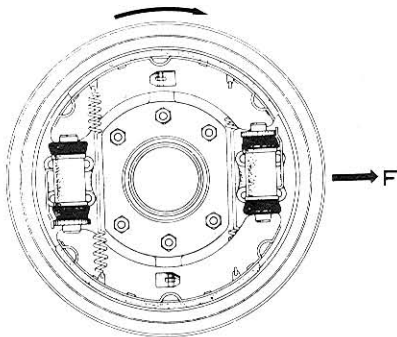


Fig.7-24 Rear Brake Assembly (Right) G2475

4. Back off the adjusting nuts, and install the brake drum, and secure with the drum set screws.
5. Connect the unions of the brake tubes with new gaskets to the wheel cylinders.
6. Bleed the hydraulic system. Refer to Air Bleeding on page 7-6.
7. Adjust the brake shoe clearance. Refer to Brake Shoe Clearance on page 7-5.
8. Install the rear wheel, and tighten the hub nuts securely. Install the wheel cap.
9. Remove the stand. Road test the vehicle on a level road to determined that the vehicle will stop safely.

Removal & Disassembly

1. Disconnect the throttle and choke rods from the carburetor, and remove them from the instrument panel.
2. Remove the heater air duct No.1.
3. Disconnect the tension spring from the parking brake link lever. Pull out the cotter pins from both ends of the link lever shaft.
4. Remove the link lever brackets bolts and the parking brake plunger bracket bolts, then withdraw the parking brake plunger together with the parking brake link lever.
5. Remove the cotter pin on the parking brake link lever located in the engine compartment, and remove the inter-mediate lever pull rod towards the interior.
6. Disconnect the parking brake cable from the parking brake link lever, and also loosen the lock nut at the end of the cable.
7. Loosen and remove the link lever shaft, and remove the parking brake link lever.
8. Raise the rear end of the vehicle, and support with stands.
9. Remove the transmission under cover, and disconnect the rear propeller shaft from the parking brake drum. Drain the transmission gear lubricant from the transfer case.
10. Pull the cotter pin out of the transfer output shaft, and remove the drum retaining nut. Remove the parking brake drum.
11. Remove the backing plate retaining bolts, and withdraw the backing plate assembly.
12. Turn and remove the brake shoe

hold-down springs, and also remove the hold-down spring pins.

13. Unhook the three tension springs from the brake shoes, and also unhook the parking brake cable from the parking brake shoe lever. Next, remove the brake shoes together with the brake shoe lever and the brake shoe lever strut from the backing plate.

14. Remove the brake shoe adjuster.

Inspection

Wash the disassembled parts except the brake shoes in cleaning solvent.

1. Inspect the brake lining to drum contact condition.

If the inspection indicates poor contact or scores, recondition the linings.

Replace the lining if the thickness is less than 1.5 mm (0.06").

Replace the brake lining if necessary in the same manner as the service brake on page 7-14.

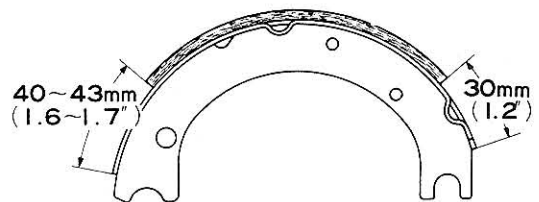


Fig.7-26 Brake Shoe & G2477 Lining

2. Check the drum inner surface for wear, scores or roughness. If necessary, dress or replace the drum.
3. Check the tension springs for damage or weakness.

4. Inspect the backing plate for distortion.
Check the plate contacting surface with the shoes for any nicks or burrs.
 5. Check the pins and pin holes of the linkages for excessive wear.
 6. Check the parking brake cable for smooth movement.
2. Lightly coat with grease onto the contact and sliding portions.
 3. Tighten the brake drum retaining nuts to 14 ~ 17 m-kg (101 ~ 123 ft-lb) torque.
 4. Refill the gear lubricant into the transfer case up-to the filler hole.
Grade: SAE 90
Capacity: 1.7 liters
(1.8 US qts.,
1.5 Imp qts)

Assembly & Installation

Follow the disassembly and removal procedures in the reverse order.

1. Retard the brake shoe adjuster fully when installing the drum.
5. Adjust the parking brake by referring to Parking Brake Adjustment on page 7-6.

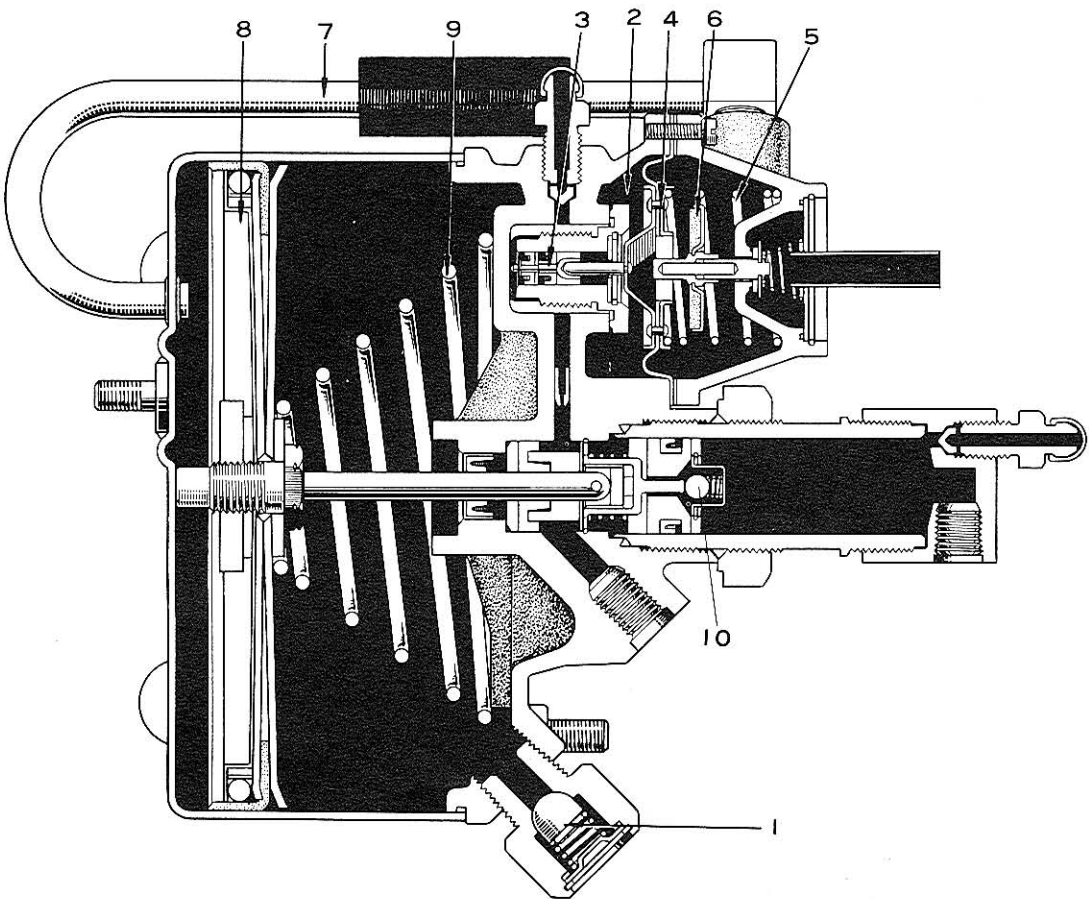
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BRAKE BOOSTER (OLD)

Description

The brake booster is installed as optional equipment, and is mounted on the left front fender apron in the engine compartment.

The booster is a combined hydraulic and vacuum power braking system which utilizes the vacuum created in the engine intake manifold as an operating force. It is a self-contained unit placed between the regular master cylinder and the main line connected to the wheel cylinders.

Operation

1. Check valve
2. Vacuum chamber
3. Relay valve piston
4. Diaphragm
5. Diaphragm spring

6. Poppet valve
7. Connecting pipe
8. Booster piston
9. Booster piston return spring
10. Check ball

Fig.7-27 Brake Booster Cross Section View

Y7028

The brake booster consists of three operating units built into the assembly; a booster cylinder, vacuum control valve and a hydraulic cylinder. A check valve is located in the booster end plate for maintaining maximum vacuum in the system.

When the engine is operating, the vacuum from the intake manifold is transmitted through the vacuum hose to the check valve (1), and from the check valve to the vacuum chamber (2) through the forward end of the power cylinder. At this time, the diaphragm (4) and the relay valve piston are held in the off position by the diaphragm spring (5), and the poppet valve (6) is in open position. This allows the vacuum to be impressed on the rear end of the booster piston (8) through the connecting pipe (7). With the vacuum impressed on each side of the booster piston (8), the pressure on each side is equalized, and the piston is suspended in vacuum.

The booster piston return spring (9) holds the booster piston in the brake released position.

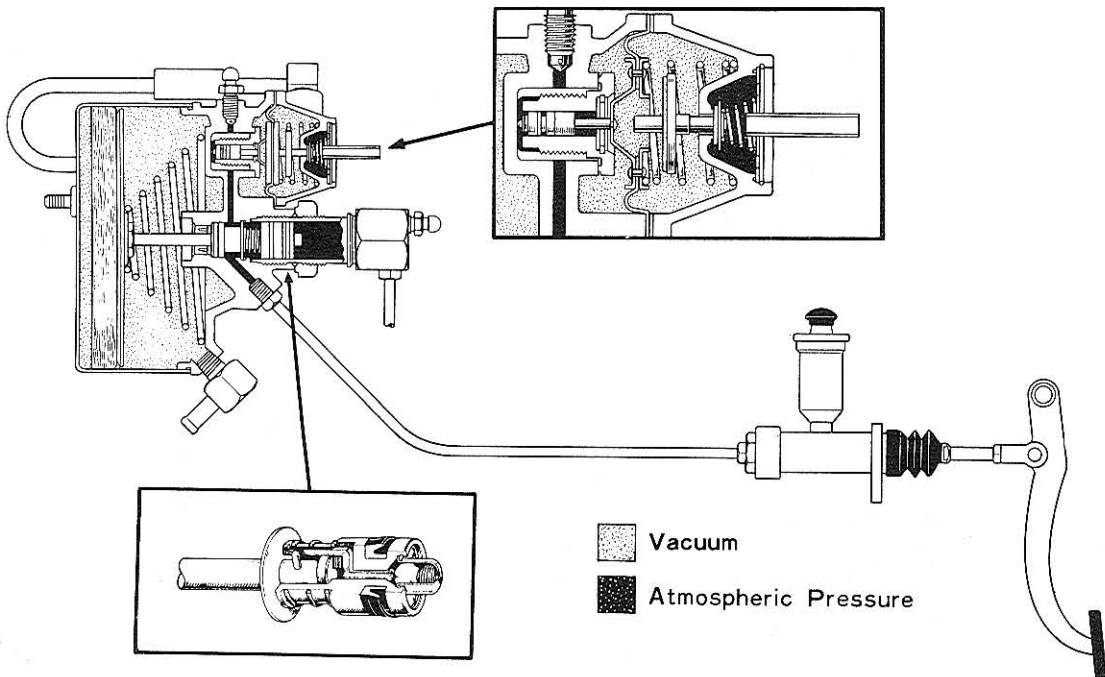


Fig.7-28 Booster in Holding Position

Y7029

When the brake pedal is depressed, the hydraulic pressure is built up within the system. The initial pressure that is transmitted to the check ball (10) in the hydraulic piston, which unseats the check ball and permits the pressure onto the wheel cylinders where braking application begins.

At the same time, the pressure is also conducted through the passage to the rear end of the relay valve piston (3). As soon as the hydraulic pressure builds up high enough to move the relay valve piston against the pressure of the diaphragm spring, the movement of the valve piston seats the vacuum poppet valve at the center of the diaphragm.

Further movement of the diaphragm unseats the atmospheric poppet valve, allow-

ing air to pass around the atmospheric poppet valve through the connecting pipe (7) and into the booster cylinder to the rear side of the booster piston. The force of air on the rear side of the booster piston, working with the vacuum on the front side of the booster piston, drives the hydraulic piston forward. Then the check ball (10) in the hydraulic piston is closed by the check ball spring and the pressure in the hydraulic line prevents the return of the brake fluid to the master cylinder during the brake application, and forces the brake fluid through the lines to the wheel cylinders for additional braking pressure.

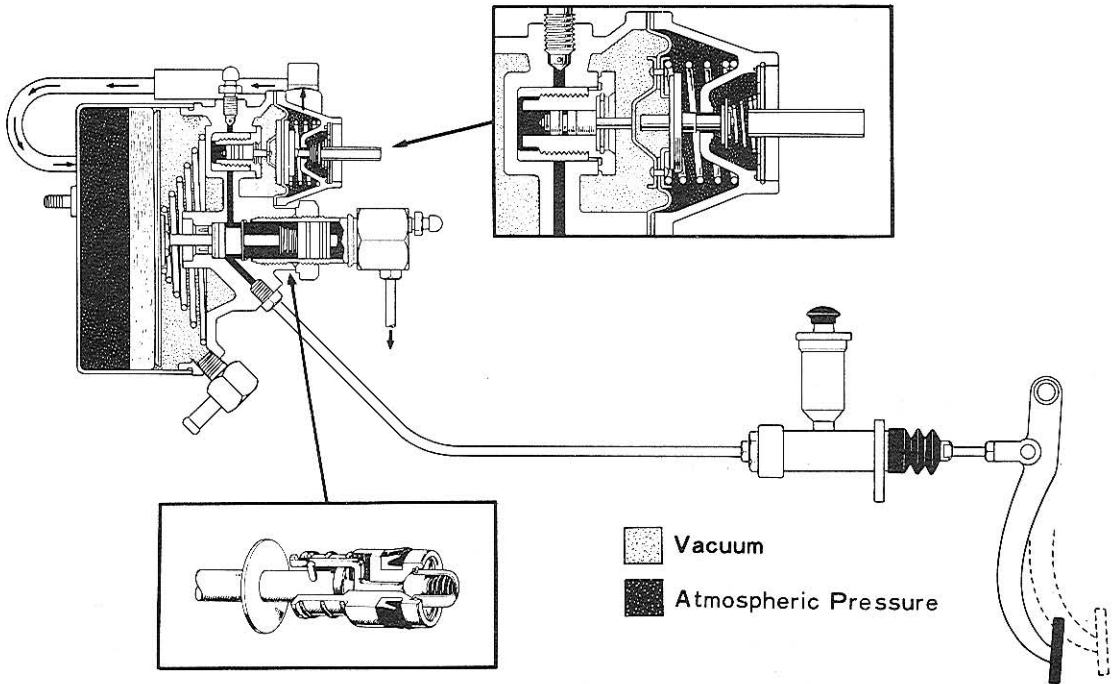


Fig.7-29 Booster in Applied Position

Y7030

When the brake pedal is released, as the hydraulic pressure in the master cylinder and the applied pressure on the relay valve piston decrease, the diaphragm spring moves the diaphragm and the relay valve piston rearward, permitting the spring pressure to seat the atmospheric poppet valve, and unsets the vacuum poppet valve from the diaphragm.

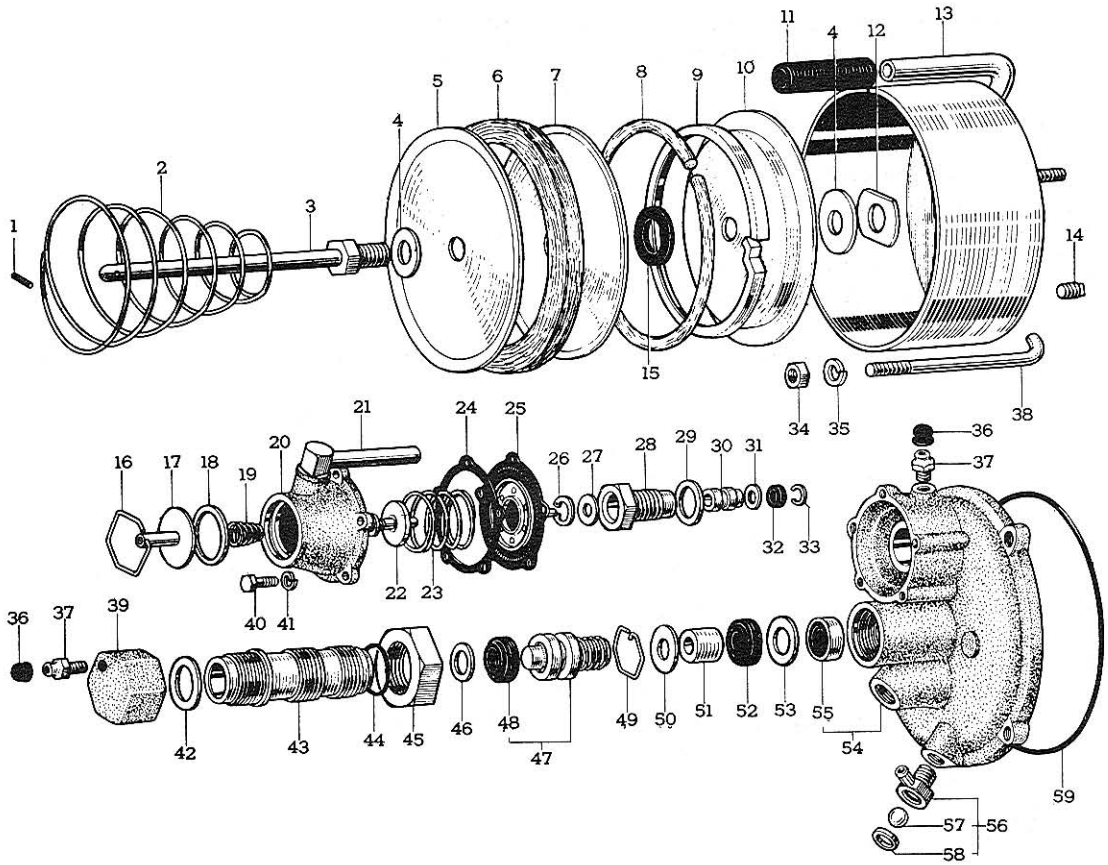
As the vacuum poppet valve opens, the vacuum from the engine intake manifold which draws the air from the rear of the booster cylinder through the diaphragm into the front of the booster cylinder, allowing the booster piston return spring to return the booster piston and the hydraulic piston to their released position. As the hydraulic piston returns, the check ball opens, permitting the brake fluid to flow through the hydraulic piston, allowing it to return to its fully released position.

Trouble Shooting

When the brake booster is not operating properly, check the system for vacuum leaks before proceeding with the trouble shooting operations.

<u>Symptoms & Probable Causes</u>	<u>Remedies</u>
1. Booster inoperative or hard pedal	
a. Leaking vacuum hose	Replace or tighten hose connection
b. Booster check valve faulty or in frozen condition	Replace check valve
c. Dirt on check valve seat	Clean or replace check valve
d. Poppet valve seat leaking	Replace poppet valve
e. Diaphragm damaged	Replace diaphragm
	When a ruptured diaphragm is found, check for gasoline odor on the diaphragm.
	Gasoline can get on it if the check valve is defective.
f. Leaking vacuum chamber	Check for loose valve body securing screws or defective gasket.
g. Relay valve piston sticking	Clean or replace piston and/or valve fitting
h. Hydraulic piston sticking	Clean or replace piston and/or slave cylinder tube
i. Booster piston gasket defective	Replace gasket
2. Lose of brake fluid from brake booster	
a. Defective booster push rod seal	Replace seal
b. Defective relay valve piston cup	Replace cup
c. Loose booster valve fitting, booster slave cylinder tube, hydraulic cylinder plug or slave cylinder lock nut. Damaged respective gaskets or seals	Tighten or replace gaskets or seals
3. Brake pedal kicks back when applied	
a. Defective hydraulic piston cup	Replace cup
b. Improperly seated check ball in the hydraulic piston	Replace hydraulic piston assembly
4. Brake drag or won't release	
a. Sticky relay valve piston	Clean or replace piston or valve fitting
b. Booster piston inoperative	Check piston gasket for proper lubrication
	Fill brake booster oil
5. Brakes applies when engine starts	
a. Sticky or unseated poppet valve	Clean or replace valve
b. Broken poppet valve spring	Replace spring
c. Sticky relay valve piston	Clean or replace piston or valve fitting

Removal & Disassembly



- | | |
|----------------------------------|----------------------------------|
| 1. Booster push rod pin | 31. Retainer washer |
| 2. Booster piston return spring | 32. Piston cup No.1 |
| 3. Booster push rod | 33. Washer |
| 4. Washer | 34. Nut |
| 5. Booster piston front plate | 35. Lock washer |
| 6. Booster piston gasket | 36. Bleeder plug cap |
| 7. Booster piston rear plate | 37. Air bleeder plug |
| 8. Booster gasket wick | 38. Hook bolt |
| 9. Booster piston gasket ring | 39. Hydraulic cylinder plug |
| 10. Booster piston wick retainer | 40. Bolt |
| 11. Vacuum hose | 41. Lock washer |
| 12. Booster nut | 42. Gasket |
| 13. Booster shell | 43. Slave cylinder tube |
| 14. Plug | 44. Slave cylinder seal |
| 15. Booster piston rod seal | 45. Slave cylinder lock nut |
| 16. Snap ring | 46. Booster seal |
| 17. Booster tube & cover | 47. Hydraulic piston assembly |
| 18. Gasket | 48. Hydraulic piston cup No.2 |
| 19. Poppet valve spring | 49. Snap ring |
| 20. Valve body | 50. Piston stop washer |
| 21. Hose elbow | 51. Booster seal retainer |
| 22. Poppet valve | 52. Booster piston cup No.2 |
| 23. Diaphragm spring | 53. Push rod washer |
| 24. Valve body gasket | 54. Booster end plate |
| 25. Diaphragm assembly | 55. Push rod seal |
| 26. Retainer ring | 56. Booster check valve assembly |
| 27. Piston stop washer | 57. Check valve ball |
| 28. Valve fitting | 58. Check valve seal |
| 29. Valve fitting seal | 59. Booster cylinder seal |
| 30. Relay valve piston | |

Fig.7-30 Brake Booster Components

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1. Depress the brake pedal several times to remove all vacuum from the system.
2. Plug the brake master cylinder reservoir inlet.
3. Disconnect the vacuum hose and the two brake tubes from the brake booster.
4. Remove the two bolts retaining the brake booster front bracket onto the brake booster bracket on the front fender apron.
5. Remove the nut at the end of the brake booster shell, then dismount the brake booster assembly with the front bracket.
In removing, do not spill any brake fluid on painted surface.
6. Clamp the hydraulic cylinder plug in a vise, and loosen the slave cylinder tube lock nut. Next, unscrew the slave cylinder tube from the booster end plate.

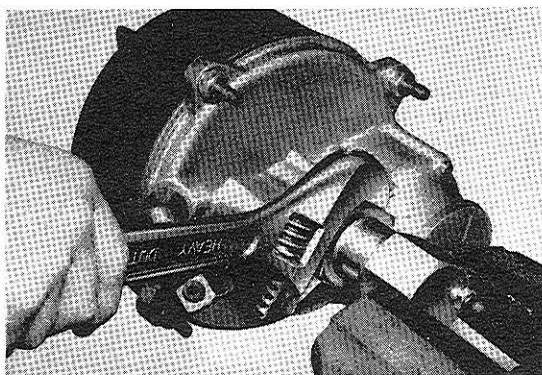


Fig.7-31 Loosening Lock Nut V5 161

7. Scribe mating marks on the booster end plate and the booster shell so that these parts can be assembled in their original position.
8. Remove the nuts on the booster shell end plate hook bolts, and remove the hook bolts. Next, separate the end plate from the booster shell with the booster

piston assembly attached.

9. Remove the five screws securing the valve body onto the end plate then remove the valve body, diaphragm spring, diaphragm and the gasket.

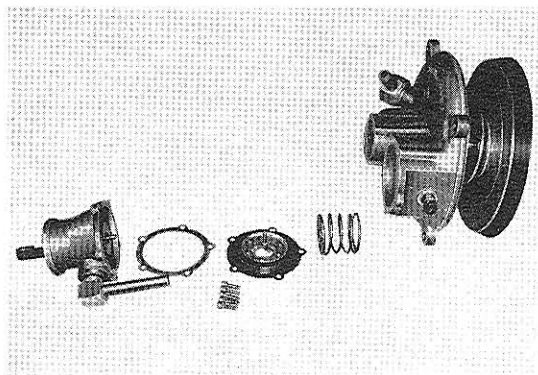


Fig.7-32 Valve Body V5162
Removal

10. By removing the snap ring, remove the booster tube and cover, cover gasket and the poppet valve spring from the valve body.
11. Push down the end plate until the push rod protrudes from the end plate, and then remove the hydraulic piston (1) by removing the push rod pin (2).
Remove the booster piston with the push rod from the end plate.

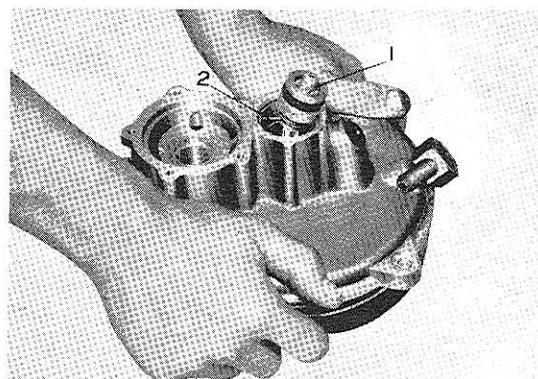


Fig.7-33 Removing Hydraulic Piston V5163

12. Remove the retainer ring (2) and the piston stop washer (3), then pull the relay valve piston (4) out

of the valve fitting (1).

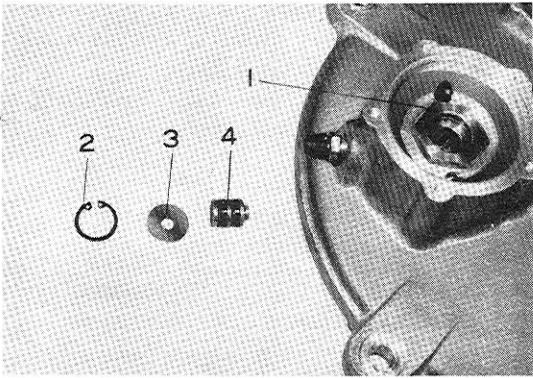


Fig. 7-34 Removing Relay Valve Piston V5164

13. Loosen and remove the valve fitting with a socket wrench.
14. If the booster piston is to be disassembled, clamp the nut on the push rod end in a vise. Loosen and remove the push rod, and disassemble the booster piston.

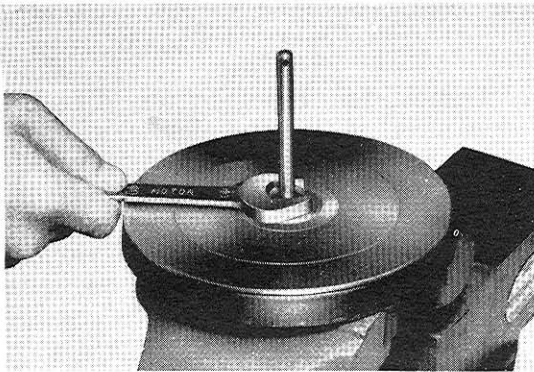


Fig. 7-35 Disassembling Booster Piston V5165

Inspection

Clean all metal parts in cleaning solvent or all hydraulic system parts in brake fluid.

Dry all parts thoroughly, and also dry all passages with compressed air. If necessary, replace the defective parts.

1. Inspect the inner surface of the booster shell for dents and pits or scores.

If the bore is corroded or rusted, polish with fine emery cloth or steel wool.

2. Inspect the booster piston gasket for wear and scores.
3. Inspect the end plate for cracks and deformation, and the push rod seal and piston cup No. 2 for wear or damage. If these require replacement, remove the snap ring, piston stop washer and the seal retainer, and then drive the push rod seal, push rod washer and the piston cup No. 2 out of the end plate. Place the push rod seal, then using a pipe with the outer diameter equal to the seal, press the seal into the end plate. Install the push rod washer, piston cup No. 2, seal retainer, piston stop washer and the snap ring in order.
4. Inspect the hydraulic piston, and the piston cup for wear, scores and other defects, and also inspect the check ball for proper operation.

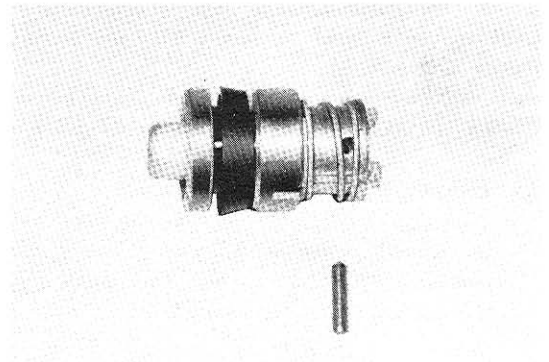


Fig. 7-36 Hydraulic Piston V5166 Inspection

5. Inspect the relay valve piston, piston cup and the valve fitting inner surface for wear, scores and damage. Check the diaphragm for tear and other defects, and also check the poppet valve seat for corrosion.

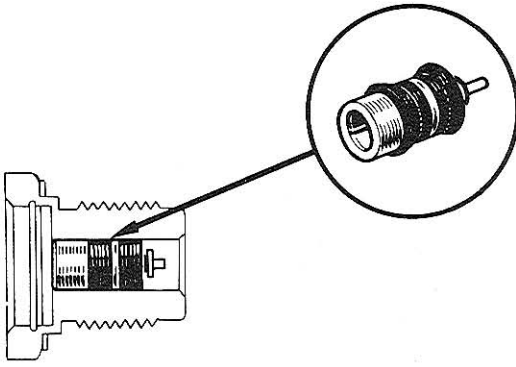


Fig. 7-37 Relay Valve G0414
Piston Inspection

6. Inspect the poppet valve (vacuum and atmospheric valves) for damage.
As the replacement poppet valve Kit is available, and the poppet valve can be removed by using a punch to separate the two valve.
7. Inspect the vacuum check valve for proper operation.

Assembly

When overhauling the brake booster, it is recommended that all gaskets, piston cups and seals to be replaced upon assembly. All rubber parts should be dipped in clean brake fluid before assembly.

1. Booster piston assembly.
 - a. Clamp the hexagon nut on the push rod (1) in a vise with the threaded end upward.
 - b. Install the washer (2) onto the push rod, then place the piston front plate (3) onto the push rod with the curved edge to the lower side, then install the piston gasket (5) onto the front plate with the lip upward.
 - c. Place the piston rod seal (4), and place the piston rear plate (6) with the lip towards the piston gasket (5).

d. Install the gasket ring (8) and the gasket wick (7) onto the wick retainer (9), then install the assembled wick retainer. Install the washer (10), and tighten the nut (11) securely.

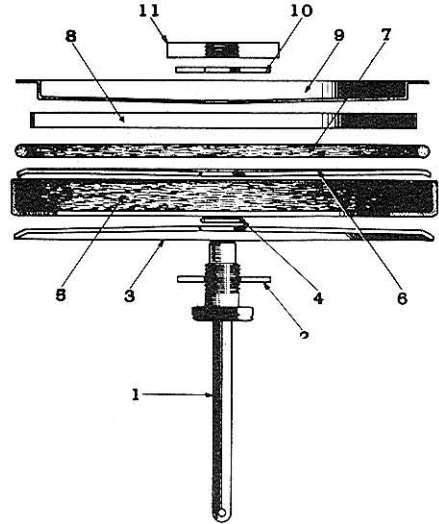


Fig. 7-38 Booster Piston G2479
Assembly

2. Install the valve fitting with the gasket into the end plate, and tighten it to 4 ~ 5 m-kg (29 ~ 36 ft-lb) torque with a socket wrench. Next, install the relay valve piston assembly, piston stop washer and the retaining ring into the valve fitting.
3. Place the piston return spring onto the booster piston front plate with the small end of the spring towards the front plate.
Next, install the booster piston into the end plate until the push rod protrudes from the end plate, and install the hydraulic piston assembly onto the end of the push rod. Compress the spring on the hydraulic piston, and install the push rod pin, and release the spring.
4. Align the mating marks on the booster shell and the end plate, and assemble the booster piston

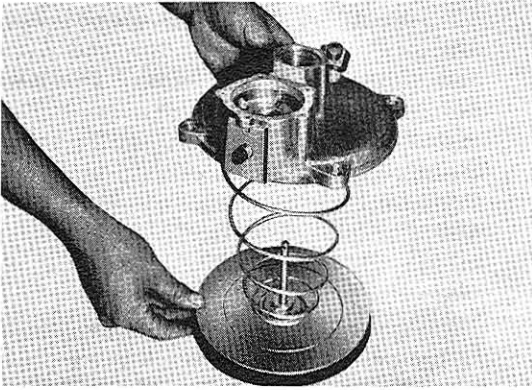


Fig.7-39 Installing Booster V5167
Piston

and the end plate with the booster cylinder seal into the booster shell. Install the hook bolts and tighten the nut evenly.

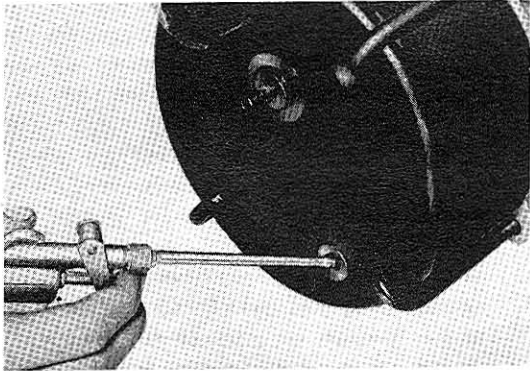


Fig.7-40 Filling Booster V5168
Oil

5. Install the slave cylinder tube and the cylinder plug with the slave cylinder seal over the hydraulic piston into the end plate. When installing the slave cylinder, the bleeder plug on the cylinder plug should be aligned with the bleeder plug on the end plate. Tighten the slave cylinder lock nut securely.
6. Place the diaphragm, diaphragm spring onto the end plate, then, install the valve body with the gasket onto the end plate. Tighten the screws evenly, and at this time, connect the vacuum hose to the elbow on the valve body.

7. Install the poppet valve spring with the small end towards the poppet valve, and cover gasket, booster tube and the cover into the valve body.

Secure the tube and cover by installing the snap ring.

8. Fill the brake booster with 30 cc (0.06 US qt., 0.05 Imp qt) of oil from the oil plug on the end of the booster shell.

Note:

Periodical oil filling should be performed every 30,000 kilometers (19,000 miles) or every once a year.

Installation

Follow the removal procedures in the reverse order.

1. To bleed the entire hydraulic system, the brake booster must be bled at both bleeder plugs before attempting to bleed at the wheel cylinders. To air bleed, refer to Air Bleeding on page 7-6.

Caution:

The bleeding operation must be performed without running the engine, and no vacuum in the power system.

Performance Test

The following method of diagnosing the brake booster trouble may lack in accuracy, but it enables servicemen to roughly understand the condition of the brake booster by inspecting it in the following orders.

1. With the engine stopped, depress the brake pedal in the normal manner, then start the engine with the pedal depressed. If the brake pedal stroke after a period of time, sinks a little, it indicates that the brake booster is in the satisfactory working condition.

2. With the engine running, depress the brake pedal fully.

If the pumping of the brake pedal is noted, it indicates the brake booster defect in the hydraulic lines.

3. With engine at idle speed, disconnect the hose from the booster tube and cover located in the valve body, and bring a piece of string near the inlet of the tube. If the string tends to be drawn into the tube of the valve body, it indicates that there is a leak in the poppet valve.

If the string is rapidly drawn towards the tube only when the brake pedal is depressed, the poppet valve is satisfactory.

4. Diagnosis with the tester.

a. Vacuum leak test when the brake pedal is not depressed.

Remove the oil plug on the rear end of the booster shell, and connect a vacuum gauge at the plug. With the engine idling, adjust the idle speed so that the vacuum gauge reading will be 480 ~ 500 mmHg (18.9 ~ 19.7 inHg).

Now stop the engine, and note the vacuum drop on the gauge, which should not exceed the limit of 25 mmHg (1 inHg) within 15 seconds. If it exceeds this limit, recheck the poppet valve, connection of the vacuum hose and the valve body fitting condition.

- b. Vacuum control valve operation test.

(1) Connect the vacuum gauge to the oil plug hole at the rear end of the booster shell.

Start the engine, and adjust the vacuum gauge reading to about 480 ~ 500 mmHg (18.9 ~ 19.7 inHg) by controlling the engine speed.

Next, depress the brake pedal fully. At this time, the vacuum should be zero at a moment. If it does not, check the poppet valve, diaphragm and the poppet valve spring.

(2) Connect one pressure gauge to the plug on the top of the end plate, and connect the other pressure gauge to the bleeder plug on the hydraulic cylinder plug.

Connect the vacuum gauge to the rear end of the booster shell. Start the engine, and set the vacuum gauge reading at 480 ~ 500 mmHg (18.9 ~ 19.7 inHg).

Both pressure gauges begin to register as the brake pedal is slowly depressed.

But when the poppet valve (atmospheric valve) opens, the pressure gauge on the hydraulic cylinder plug momentary jumps up to indicate higher pressure reading. At this time, check the pressure gauge on the top of the end plate. The pressure should be 5 ~ 7 kg/cm² (71 ~ 99 psi), and this is the control valve piston operating pressure.

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BRAKE BOOSTER(NEW)

Operation

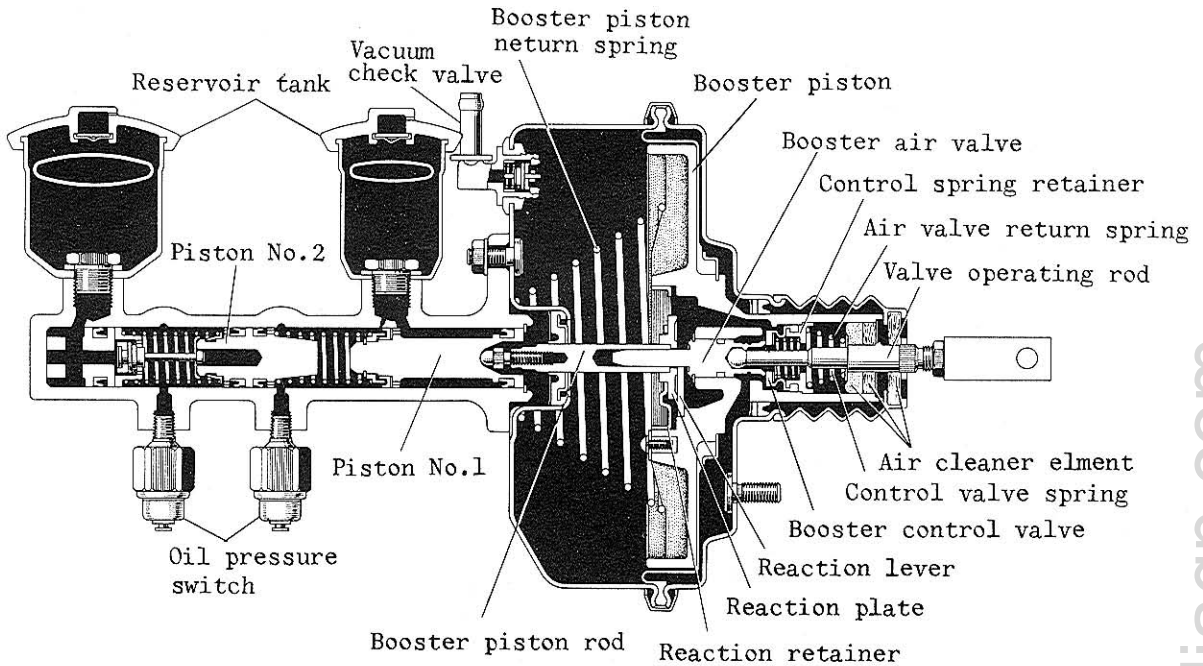


Fig. 7-41 Tandem Master Cylinder & Brake Booster Section View

S0569

1. Non-Operating State

In this case, the operating rod is pulled toward the right by the tension of brake pedal return spring. The air valve, being attached to the operating rod ball end, is pulled to the right together with the rod, shutting off the atmospheric air passing through the air cleaner element. The control valve is also separated from the booster piston valve seat (C), forming continuity between passages A and B. Since this provides continuity between the constant pressure chamber and the variable pressure chamber, there will be no pressure difference in the chambers at both sides of the booster piston, and the piston

will be pushed to the right by the tension of piston return spring.

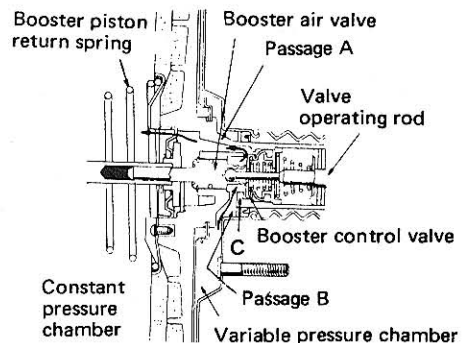


Fig. 7-42 Non-Operating State

S0570

2. Operating State

Stepping down on the brake pedal causes the operating rod to push the air valve. The control valve is also pushed to the left by spring tension, and contacts against the booster piston valve seat (C) to shut off passage A from passage B and closing the continuity between the constant and variable pressure chambers. As the air valve moves further to the left, the air valve separates from the control valve. Since the air will pass through passage B and flow into the variable pressure chamber, a pressure difference will be created with constant pressure chamber and cause the piston to start moving to the left. This force is transmitted to one end of each reaction lever through the fulcrum provided in the piston, while the force subjected on the operating rod is transmitted

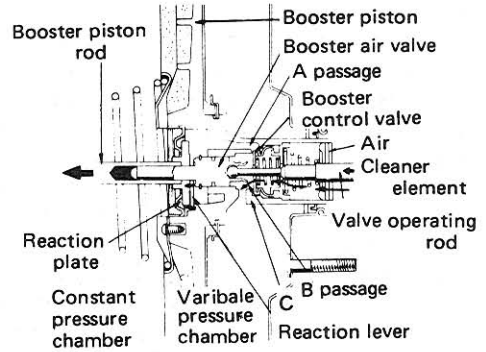


Fig.7-43 Operating State

S0571

to the other end of each reaction lever through the fulcrum provided on the air valve. The sum of the forces acting on the ends of the reaction levers is transmitted to the reaction plate outer circumference, and then from the booster piston rod to the mastery cylinder piston

3. Holding State

If the pressure on the brake pedal is such that the force acting on the air valve from the operating rod and the force acting on the booster piston due to pressure difference are in balance, with reaction plate outer circumference serving as the fulcrum, the control valve will be contacting against the air valve and also the booster piston valve seat (C). This state will be held as long as the pressure on the brake pedal remains unchanged.

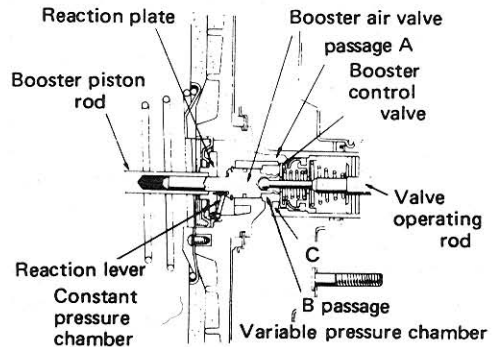


Fig.7-44 Holding State

S0572

4. Released State

When the pedal pressure is increased until the variable pressure chamber is completely under atmospheric pressure, maximum pressure difference will be acting on the booster piston, and the air valve will be fully separated from the control valve. If the pedal pressure is increased further, there will no longer be any more balancing effect on the reaction levers so that only the increased amount of pedal pressure will act on the booster piston rod.

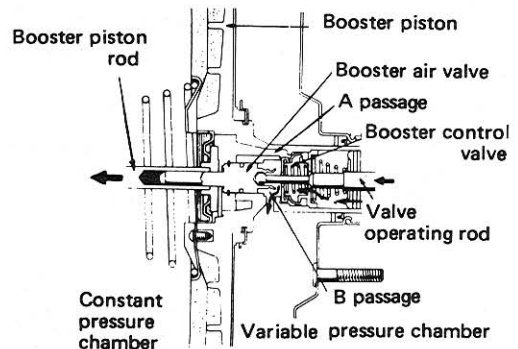


Fig.7-45 Maximum Boosting State

S0573

5. Released State

When the pressure on the brake pedal is released, the reaction lever balance will be destroyed and the air valve will be returned to the right. The air valve will then contact against the control valve and shut off the variable pressure chamber from the atmosphere. As the air valve moves further to the right, the control valve is separated from the booster piston valve seat (C). This creates continuity between the passages A and B so that the variable pressure chamber comes under vacuum until there is no longer any pressure difference with the constant pressure chamber. The piston assembly will then be pushed back by the return spring to the non-operating position.

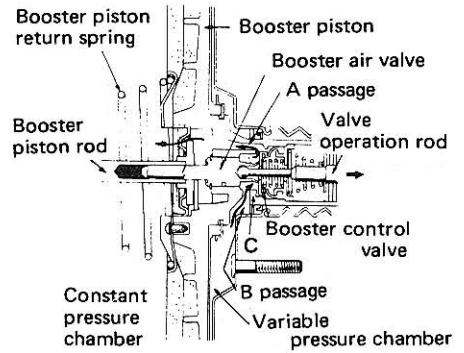


Fig.7-46 Released State S0574

6. Lost Vacuum State

In this case, the constant and variable pressure chambers will both be under atmospheric pressure. Stepping down on the brake pedal will cause the operating rod push the air valve and advance to the left. The reaction levers will push the reaction plate, and the reaction plate will push the booster piston rod, which in turn will push the master cylinder piston.

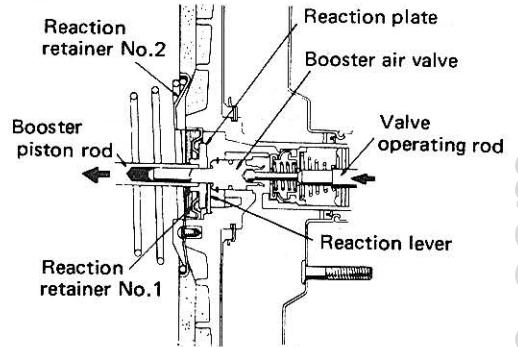


Fig.7-47 Lost Vacuum State S0575

At this time, the reaction plate will push the reaction retainer No.1, and in turn, the retainer No.2 attached to the booster piston, and advance the piston assembly to the left against the tension of return spring.

Although there will be no boosting action supplied in this case, it will still be possible to push the master cylinder piston and develop hydraulic power. Thus the hydraulic brake function will still be retained even if the brake booster should fail to operate due to trouble.

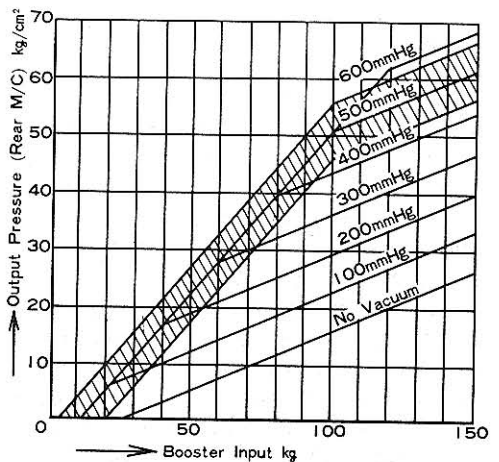


Fig.7-48 Booster Performance Curves G7658

Table 7-1 Brake Booster Specifications

Type	Vacuum servo
Diaphragm effective dia.	191.5 mm (9.05")
Power piston stroke	40 mm (1.57")
Servo ratio	3.37

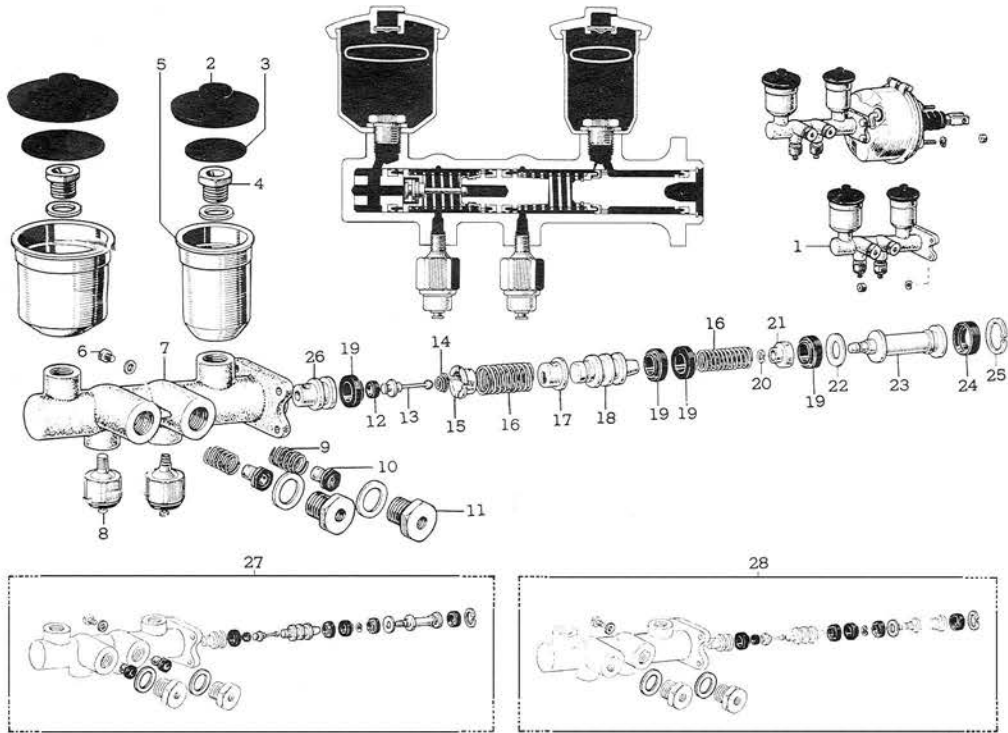
TROUBLE SHOOTING

Brake Booster

Symptoms & Possible Causes	Remedies
No Braking Effect or Pedal is Heavy 1. Loose coupling 2. Vacuum hose clogged, disconnected, or broken 3. Vacuum check valve not functioning properly 4. Seals defective 5. Seals defective 6. Control valve not functioning properly 7. Air valve binding on booster piston rod 8. Air cleaner clogged	Repair Replace Replace Replace Replace Repair or replace Replace
Brakes Drag or Retract Poorly 1. Air valve binding on booster piston rod 2. Booster piston rod out of adjustment 3. Valve operating rod out of adjustment	Replace Adjust Adjust
Braking Effect Insufficient or Slow 1. Vacuum check valve not functioning properly 2. Vacuum hose clogged, disconnected, or broken 3. Valve operating rod out of adjustment	Replace Replace Adjust
Pedal Sticks and Noisy 1. Air valve binding on booster piston rod 2. Valve operating rod out of adjustment 3. Excessive clearance between booster piston rod and master cylinder piston	Replace Adjust Adjust

TANDEM MASTER CYLINDER

Component Parts



1. Cylinder sub-assy., tandem master
2. Cap assembly, reservoir filler
3. Float, master cylinder reservoir
4. Bolt, master cyl. reservoir set
5. Reservoir, master cylinder
6. Bolt
7. Body, tandem master cylinder
8. Switch assy., oil pressure
9. Spring, compression
10. Valve assy., master cyl. outlet check
11. Plug, master cyl. fluid outlet
12. Valve, inlet
13. Rod, inlet valve connecting
14. Spring, conical
15. Case, inlet valve
16. Spring, compression
17. Retainer, piston return spring, No.2
18. Piston, master cylinder, No.2
19. Cup, cylinder
20. Link, shaft snap
21. Retainer, piston return spring
22. Spacer, master cylinder piston cup
23. Piston, master cylinder, No.1
24. Ring, hole snap
25. Boot, master cylinder
26. Seat, inlet valve
27. Kit, master cylinder
28. Kit, master cylinder cup

Fig.7-49 Tandem Master Cylinder Component Parts

S0560

Removal

Note: Do not allow the brake fluid to get on any of the vehicle painted surfaces.

1. Disconnect the brake tubes from the cylinder.

2. Disconnect the oil pressure switch wiring.
3. Remove the master cylinder from the booster unit.

Disassembly**Note:**

Disassemble the master cylinder by holding it in a vise, and taking care not to damage the reservoir installation surface. Do not damage any of the disassembled parts.

1. Remove the master cylinder.
2. Remove the oil pressure switches.
3. Remove the snap ring and take out piston No.1 and spring.
4. Loosen the bolt and take out piston No.2, and inlet valve seat.
5. Remove the outlet plugs, and take out the outlet check valves.
6. Disassemble the piston assembly.
 - (1) Pry up the spring retainer lips, and remove the piston.
 - (2) Remove the connecting rod from the retainer, and remove the inlet valve.
 - (3) Remove the piston cap from the piston.

Inspection

Replace any disassembled part if found defective.

1. Inspect master cylinder bore and piston outside surfaces to see if worn, out of round, or damaged.
2. Inspect cylinder cups, inlet valve, spacer, gaskets, and outlet check valve to see if damaged, deformed, or worn.
3. Inspect reservoir for damage and if deformed at mounting part.

Note: Defects in the above parts are difficult to detect, and since rubber parts tend to deteriorate, it is recommended that these parts be replaced when the master cylind-

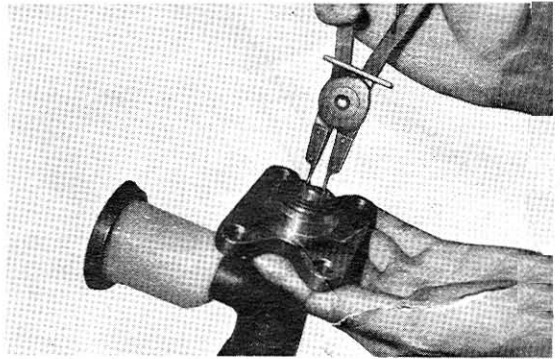


Fig.7-50 Snap Ring Removal

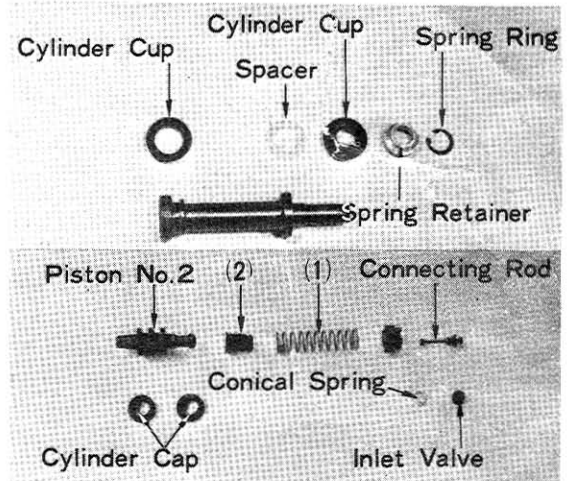


Fig.7-51 Piston Disassembly B6844

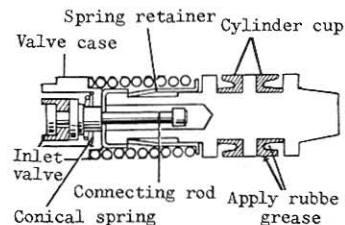


Fig.7-52 Assembling Piston G6973

er is disassembled.

Assembly

Note: Wash all parts to be assembled in clean brake fluid.

1. Assemble the inlet valve seat.

Note: Make sure it is assembled in correct direction.
2. Bend down the spring retainer lips.
3. Bend down the spring retainer lips.

4. Insert the inlet valve seat (1) into the master cylinder.
5. Insert the piston No.2 (2) into the cylinder and install the stop bolt, (3).
Tightening torque 80~120 kg-cm
(69.2~103.9 in-lb)
6. Insert the return spring (4) into the cylinder.
7. Install the piston No.1 assembly (5) into the piston, and install the snap ring (6).
8. Install the spring (7), outlet check valve (8), gasket and union bolt (9).
Tightening torque 1100~1800 kg-cm
(79.5~130.0 ft-lb)
9. Install the oil pressure switches (10).
Tightening torque 300~450 kg-cm
(22~29 ft-lb)
10. Install the master cylinder reservoirs (11).
Tightening torque 200~300 kg-cm
(14~22 ft-lb)

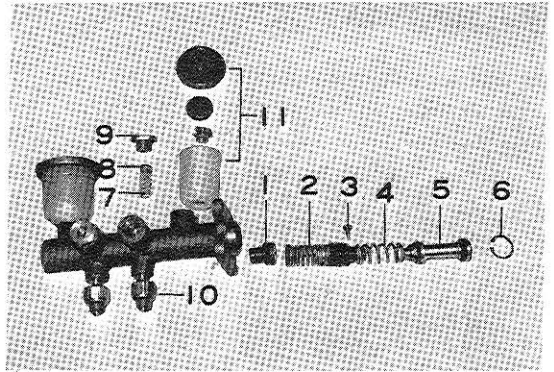


Fig.7-53 Component Parts

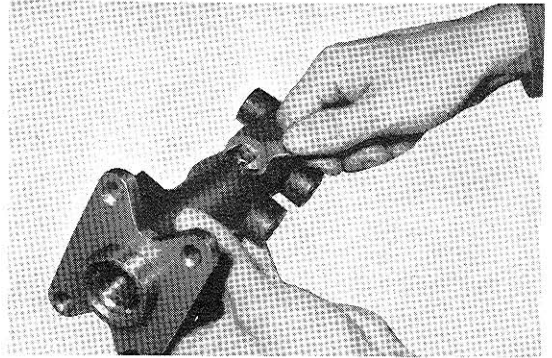


Fig.7-54 Stop Bolt Assembly

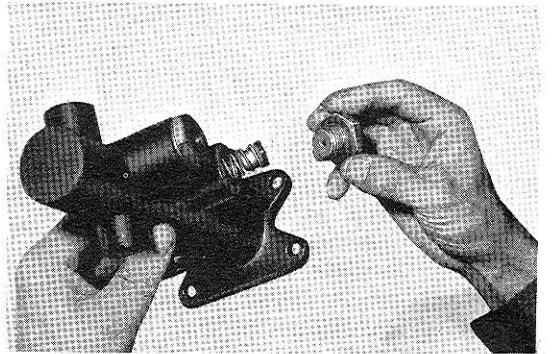


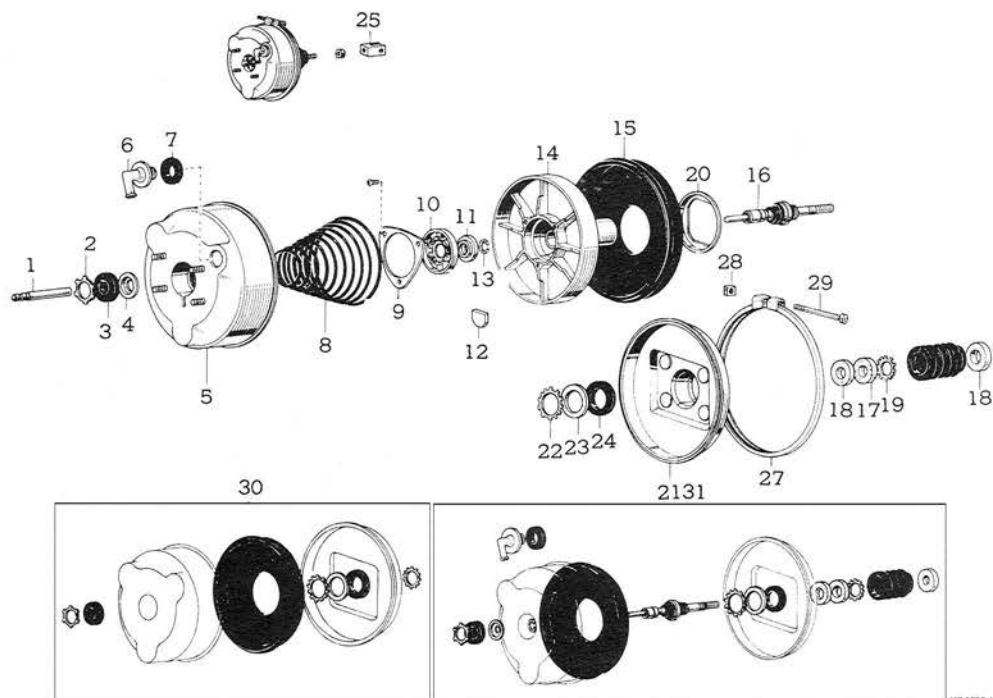
Fig.7-55 Outlet Check Valve Assembly

Installation

1. Adjust the clearance between the booster piston rod and piston. (Refer to P.7-44)
2. Install the master cylinder on the booster unit.
Note: Before tightening the nuts, have the brake tubes screwed a few turns into the master cylinder.
Tightening torque 100~160 kg-cm
(7.2~11.6 ft-lb)
3. Tighten the brake tubes.
4. Connect the oil pressure switch wiring.
5. Adjust pedal height and play, and bleed the system to remove air. (Refer to P.7-5)

BRAKE BOOSTER

Component Parts



- | | |
|----------------------------------|--------------------------------|
| 1. Screw, rod adjust | 17. Separator, air cheaner |
| 2. Ring, circular internal | 18. Element, air cleaner |
| 3. Seal, booster body, No.1 | 19. Ring, circular internal |
| 4. Retainer, booster body seal | 20. Retainer, diaphragm |
| 5. Body, booster, No.1 | 21. Body, booster, No.2 |
| 6. Valve assy., vacuum check | 22. Ring, circular internal |
| 7. Grommet | 23. Bearing, booster piston |
| 8. Spring, booster piston return | 24. Seal, booster body, No.2 |
| 9. Retainer, reaction, No.2 | 25. Clevis |
| 10. Retainer, reaction, No.1 | 26. Boot |
| 11. Plate, reaction | 27. Band, booster |
| 12. Lever, reaction | 28. Nut, screw |
| 13. Ring, snap | 29. Screw, booster body band |
| 14. Piston, booster | 30. Booster kit, brake (Minor) |
| 15. Diaphragm, booster | 31. Booster kit, brake (Major) |
| 16. Valve subassy , booster air | |

Fig.7-56 Brake Booster Component Parts

Removal

1. Disconnect the push rod clevis from the brake pedal.
2. Disconnect the brake tubes, wiring, and vacuum hoses.
3. Remove the booster with the master cylinder attached.
4. Remove the master cylinder from the booster.

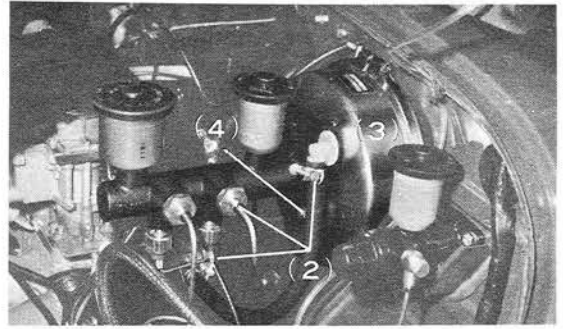


Fig. 7-57 Booster Removal

Disassembly

1. Remove the booster push rod.
2. Using a press, separate the booster No.1 body from the No.2 body.
 - (1) Scribe aligning marks on bodies No.1 and No.2.
 - (2) Remove the band.
3. Remove the boot and booster piston assembly from body No.2.

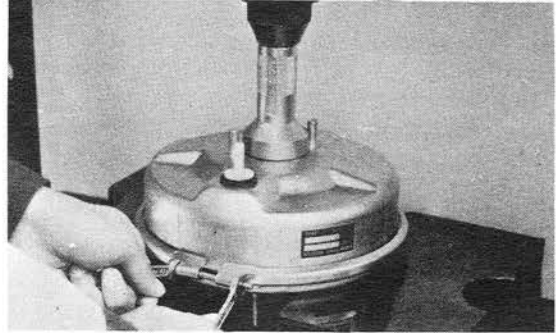


Fig. 7-58 Removing Band

B8545

4. Remove the circular ring from body No.2, and remove the bearing and body seal.

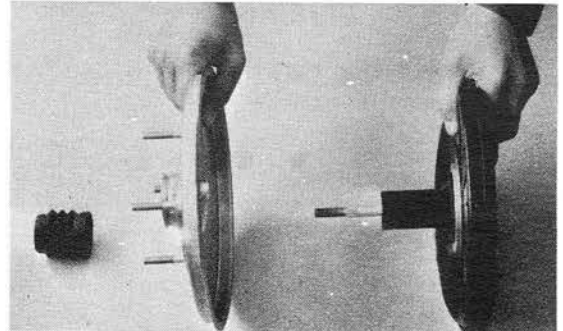


Fig. 7-59 Disassembling Body No. 2

B8546

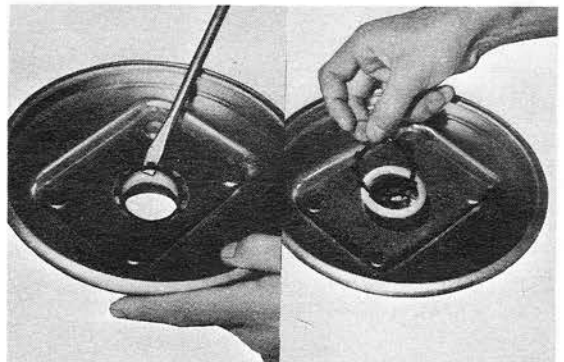


Fig. 7-60 Removing Circular Ring

B8547

5. Remove the circular ring from body No.1, and remove the body seal and seal retainer.

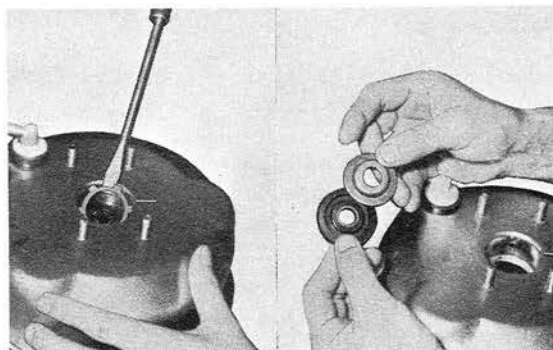


Fig.7-61 Booster Body No.1
Disassembly

6. Disassemble the booster piston.

- (1) Remove the reaction retainer No.2, reaction retainer No.1, reaction palte, and reaction levers.

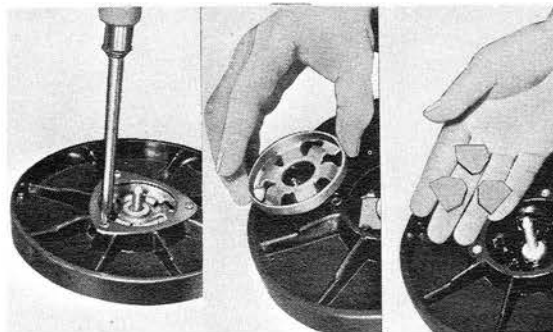


Fig.7-62 Booster Body No.1
Disassembly

B8548

- (2) Remove the snap ring lockeng the booster air valve.

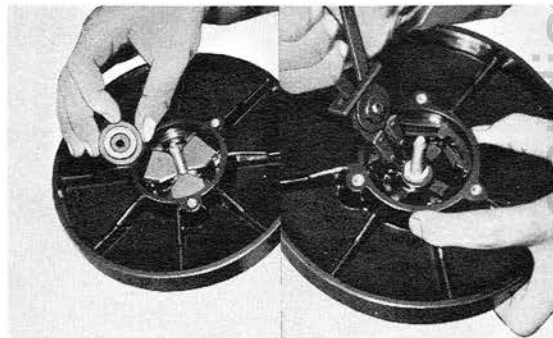


Fig.7-63 Removing Circular
Ring

B8549

- (3) Remove the circular ring, and take out booster air valve, air cleaner element, and separator.

- (4) Using SST(09736-30020),remove the diaphragm by turning it 45°, and remove diaphragm from piston.

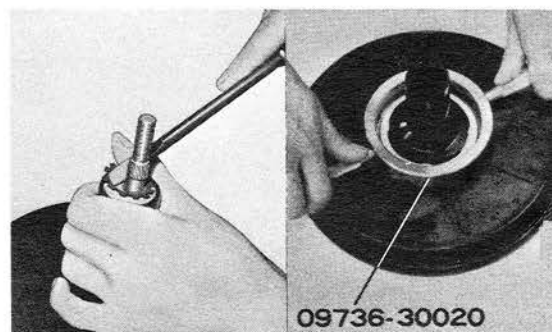


Fig.7-64 Removing Diaphragm

B8550

7. Remove the vacuum check valve from the booster body No.1.

Inspection

Wash all disassembled parts and dry (merely wipe the cups and plastic parts). Inspect the parts on the following points, and repair or replace any found to be defective.

1. Booster piston for damage or crack.
2. Air valve for damage, wear, or corrosion.
3. Reaction levers for wear.

4. Reaction retainer for deformation or crack.
5. Diaphragm for damage.
6. Control valve and spring for damage and weakening.
7. Bearing for wear or damage.
8. Booster push rod for bend or damaged.
9. Body for deformation, crack, or damage.

Assembly

1. Assemble the booster piston.

- (1) Using SST(09736-30020), install the diaphragm on the booster piston.

Note: Coat rubber grease on the contacting surfaces between the diaphragm and booster piston.

- (2) Assemble the air valve.
- (3) Assemble the separator, air cleaner, and circular ring.
- (4) Fit on the reaction levers and place the reaction plate over them.
- (5) Place the reaction retainer No.1, and install the reaction retainer No.2 with screws.

2. Assemble the booster body seal retainer, push it into the body No.1, and install the circular ring.

Notes:

1. Assemble the seal retainer side in the body inner side.
2. Coat rubber grease on the seal outer surface and lip.
3. Assemble the bearing into body No.2.
4. Assemble the booster piston into body No.2.

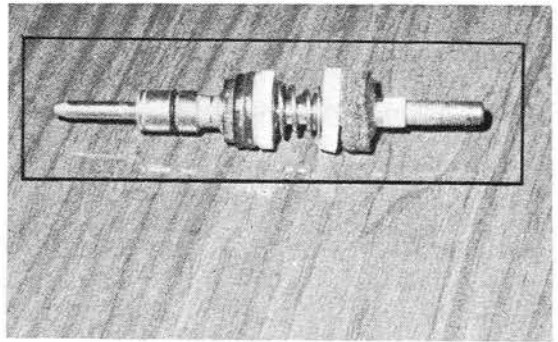


Fig.7-65 Assembling Piston B8551

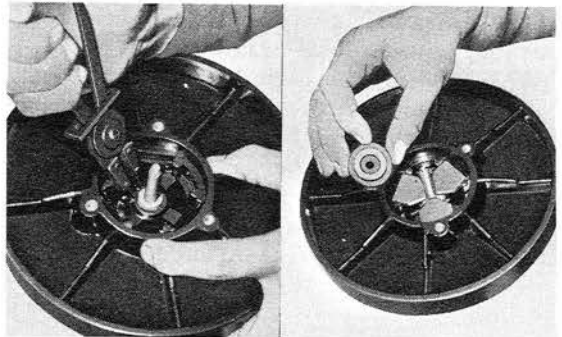


Fig.7-66 Assembling Reaction Lever & Plate B8552

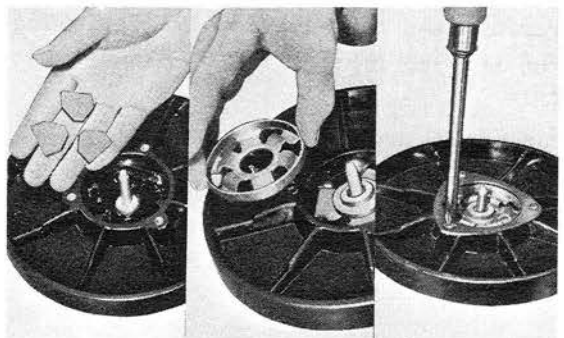


Fig.7-67 Assembling Reaction Retainers B8553

5. Place the piston return spring into body No.2, and using a press, push down body No.1 and install the band. Tightening torque 25~40 kg-cm (21.7~34.6 in-lb)

Note: Align the matching marks of bodies No.1 and No.2.

6. Assemble the booster silencer and install the boot.

7. Install the booster push rod.

Note: Coat rubber grease on the surfaces sliding along the booster push rod.

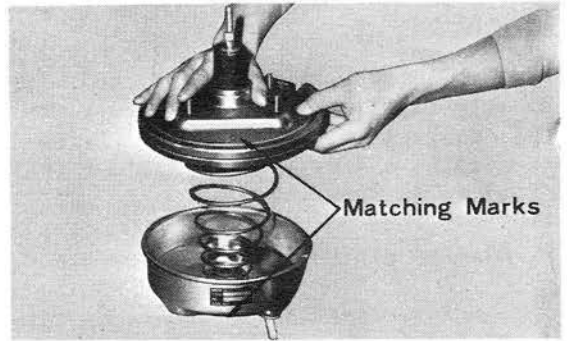


Fig.7-68 Booster Assembly



Fig.6-69 Tightening Brake Band

Adjustment

After assembling the brake booster, measure the master cylinder with SST (09737-22011) as illustrated, and then reverse the gauge. If the reversed gauge and the booster push rod length agree, there will be a clearance of 0.1~0.5 mm (0.004"~0.002") between the push rod and piston.

Piston to push rod clearance
0.1~0.5 mm
(0.004"~0.020")

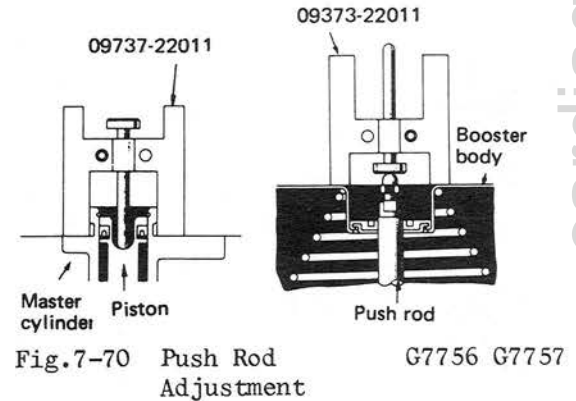


Fig.7-70 Push Rod Adjustment

Notes:

1. Remove air by bleeding.
2. Adjust pedal height and play.

Installation

Perform the installation by following the removal procedures in reverse order.

Booster Performance Check**Test method without using tester**

These methods are not adequate to pinpoint the location of trouble, but the general condition can be determined by performing the check in the following order.

Air tightness check

Start the engine and then stop it after 1-2 minutes. Using pedal pressure for normal braking, step down on the brake pedal several times. If the pedal goes down deep the first time but gradually rises after the second and third time, and condition is good. Therefore, if there is no change in pedal height, the condition is defective.

Note: If defective, make a precision check with tester.

With the engine stopped, step on the brake pedal several times with the same pedal pressure as above. After making sure that there is no change in pedal height, start the engine while keeping the brake pedal depressed. If the pedal goes down slightly, the condition is good, and if there is no change, the condition is defective.

Note: If defective, make a precision check with tester.

Air tightness check under load

Step on the brake pedal while the engine is running, and then stop the engine while still keeping the brake pedal depressed. Hold this state for 30 seconds and if the pedal height does not change, the condition is good. If the pedal rises, the condition is defective.

Note: If defective, make a precision check with tester.

Test methods using tester

As test equipment, have available a foot pressure meter, two compression gauges with brake piping, a vacuum gauge with hoses, and a 3-way connection.

Air tightness check

1. Start the engine and then stop it when the vacuum gauge shows 250mmHg

(9.3"Hg). There should be no loss in vacuum for 15 seconds after stopping the engine.

The same condition should prevail at 500mmHg (19.7"Hg).

2. If defective, the following are the possible causes so that the booster should be disassembled.

- (1) Check valve not functioning properly.
- (2) Leakage in piping.
- (3) Leakage from booster body bolt welded part.
- (4) Air valve not tight.
- (5) Leakage from body seal or bearing.
- (6) Torn diaphragm.

Air tightness test under load

1. Start the engine, step on the brake pedal with 10 kg (22 lb) pedal pressure, and stop the engine when the vacuum gauge shows 250mmHg (1.0"Hg) 15 seconds after the engine is stopped, the condition is satisfactory.
2. If defective, refer to par, 2 above on air tightness check.

Check with booster action

Stop the engine, and when the vacuum gauge indicates zero. If the relationships between fluid pressure and pedal pressure are as prescribed below, the condition is good.

- | | |
|----------|---|
| 5 kg/cm | (71 psi) minimum at 10 kg (22 lb) pedal pressure. |
| 23 kg/cm | (327 psi) minimum at 30kg (66 lb) pedal pressure. |

Check without booster action

Run the engine and have the vacuum gauge indicating 500mmHg (19.7"Hg). If the relationships specified below exist between fluid pressure and pedal pressure, the condition is good.

- | | |
|-------------|---|
| 16~25 kg/cm | (228~356 psi) at 7 kg (15 lb) pedal pressure |
| 36~48 kg/cm | (512~683 psi) at 13 kg (29 lb) pedal pressure |
| 60~70 kg/cm | (853~996 psi) at 20 kg (44 lb) pedal pressure |