

BRAKES

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GENERAL DESCRIPTION

The braking system consists of hydraulically operated service brakes and a hand lever which applies the brake shoes on the rear wheels independently through a mechanical linkage.

The hydraulic brake system consists of a fluid supply reservoir, a master cylinder in which the hydraulic pressure is originated, four wheel cylinders, where hydraulic pressure is directed to apply the brake shoes to the drums, the tubing and flexible hoses which connect the master cylinder to the wheel cylinders.

A remote filler tube, connected by a pipe to the master cylinder, is mounted on the left side of the cowl to facilitate the addition of fluid to the system.

The master cylinder is mounted on a bracket attached to the frame just ahead of the brake pedal. The function of this unit is to maintain a constant volume of fluid in the brake system at all times, regardless of expansion or contraction due to temperature changes, and to transfer mechanical pressure at the brake pedal to hydraulic pressure on the wheel cylinders.

When the brake pedal is depressed, the master cylinder piston cup closes the by-pass port and builds up pressure in the brake lines and wheel

cylinders. When the pedal is released, however, the return of the piston and primary cup in the master cylinder is much faster than the return of fluid from the wheel cylinders to the master cylinder. Consequently, a momentary vacuum is created behind the piston and fluid is drawn from the reservoir into the cylinder barrel during this period through the drilled holes in the piston and past the lip of the primary cup. When the retracting springs fully release the brake shoes, the excess fluid returning to the master cylinder passes through the by-pass port into the reservoir. A check valve at the front end of the master cylinder traps approximately 9 pounds of fluid pressure in the lines to the wheel cylinders.

Wheel cylinders are of the double piston type and are mounted on the brake backing plate just below the anchor pin. Pressure of the fluid in the wheel cylinder, when the brake pedal is depressed, causes the pistons to move outward and force the brake shoes into contact with the drums.

The front wheel brake cylinders have a larger diameter than those on the rear to maintain a higher braking ratio at the front wheels. This is required so that the front wheels will stop turning at the same time as the rear on emergency stops. Rubber cups, in the master and wheel cylinders,

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prevent the loss of fluid and, consequently, loss of braking pressure.

The brake fluid is forced from the master cylinder to a distributor type fitting mounted on the left frame side bar. From this distributor, three lines carry the fluid to the two front wheel cylinders and to the "T" fitting on the rear axle housing where it is directed to the two rear wheel cylinders. Brake lines are routed along the outside of the left frame side bar, away from the left exhaust system, to prevent overheating of the fluid and resultant loss of brake pedal.

The hand brake control assembly is mounted on the lower flange of the instrument panel at the left of the steering column. It is connected by a steel cable to a relay lever mounted on the frame side bar just in front of the left front body mounting bracket. This lever is connected by a second steel cable, to a lever on the frame X-member which operates the equalizer. A cable runs through the equalizer to each rear brake, where it actuates the brake shoes. The handle of the brake control is pulled straight out to apply the brakes, and turned counter-clockwise to release the brakes. An indicator light on the instrument panel cluster warns the driver when the hand brake is on while the ignition switch is "ON".

The brake stop light switch is operated mechanically by the brake pedal lever arm at its location beneath the toe board. When the brake pedal is depressed, the switch arm, under spring pressure, follows the brake lever downward until the switch is "On". When the brakes are released, the switch arm is returned to its normal "Off" position.

Rivited - on, brake shoe linings of high fade resistant quality are used on all 1954 series cars. The primary linings are grooved at the center to permit dissipation of heat from the surface of the brake drum, resulting in better brake performance and longer lining life.

The brake backing plate flange extends into a groove, formed in the edge of the brake drum, to form an effective trap against water splash, road dirt, or other foreign material.

A vacuum operated Power Brake booster assembly is available as an accessory on all 1954 Cadillac cars. This unit, which is connected in the fluid pressure line between the master cylinder and the brake line distributor fitting on the frame side bar, reduces the amount of foot pedal pressure required to stop the car by utilizing manifold vacuum and atmospheric pressure. The brake pedal height

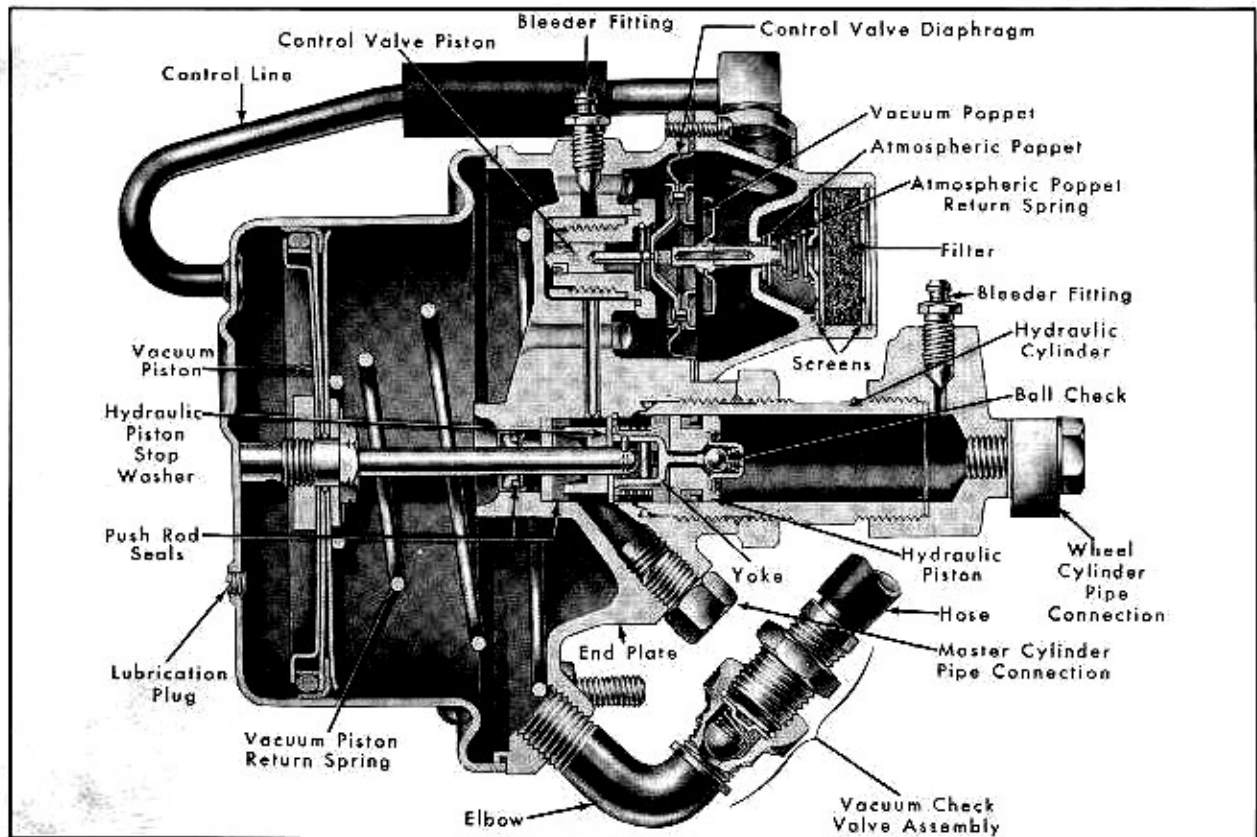


Fig. 9-1 Power Brake Cut-Away View

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on cars equipped with the Factory installed Power Brake, is $7/8$ " lower than that on cars without this accessory.

The Power Brake, Fig. 9-1, consists of three basic units, designed to function as a single assembly and controlled by hydraulic pressure developed in the master cylinder. These three units are:

1. A vacuum power cylinder which contains a piston and a push rod which connects the vacuum piston to the hydraulic piston in the hydraulic cylinder.

2. A hydraulic cylinder which contains a piston with a check valve.

3. A hydraulically actuated vacuum control valve which regulates the degree of brake application or release. This control valve consists of a hydraulically actuated piston, a diaphragm, and an atmospheric and vacuum poppet,

Manifold vacuum is directed to the power brake cylinder through a hose attached to the front of the intake manifold. A check valve in the line between the intake manifold and the power brake serves a dual function:

1. It prevents damage to the power brake in the event of an engine backfire.

2. It traps vacuum in the unit at the highest manifold depression under operating conditions (usually 15 to 22 inches). This trapped vacuum is sufficient to make at least one brake stop with power assist even when manifold vacuum is very low or non-existent.

When the brake pedal is in the released position, the areas on both sides of the vacuum diaphragm

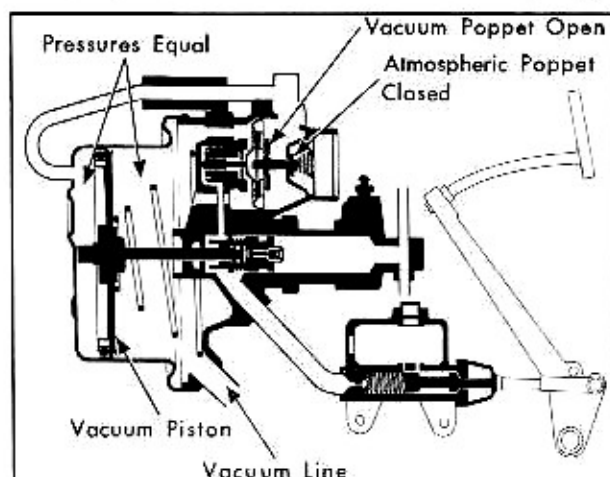


Fig. 9-2 Power Brake Operation - Released Position

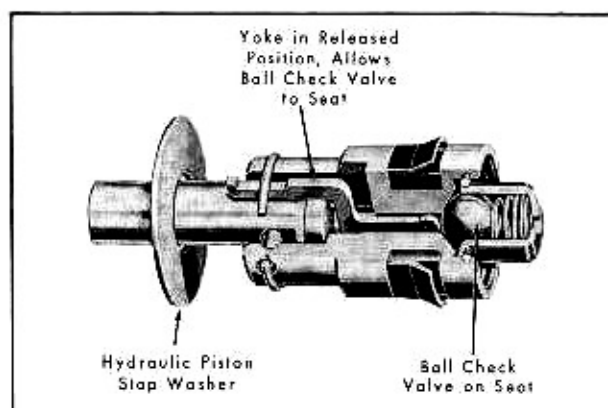


Fig. 9-3 Hydraulic Piston Assembly

and the power piston, Fig. 9-2, are exposed to manifold vacuum.

As the brake pedal is depressed, the hydraulic pressure developed in the master cylinder is transmitted to the power brake hydraulic cylinder and to the hydraulic piston in the vacuum control valve. As the hydraulic piston in the hydraulic cylinder is against the stop washer when the pedal is first depressed, the check ball in the piston is held off of its seat by the hydraulic piston yoke, Fig. 9-3. This allows fluid from the master cylinder to pass through the piston directly to the wheel cylinders. This safety feature permits normal operation of the standard brake system when the engine is not running or in the event that the power system should fail.

Fluid under pressure is also directed to the hydraulic piston in the vacuum control valve. As

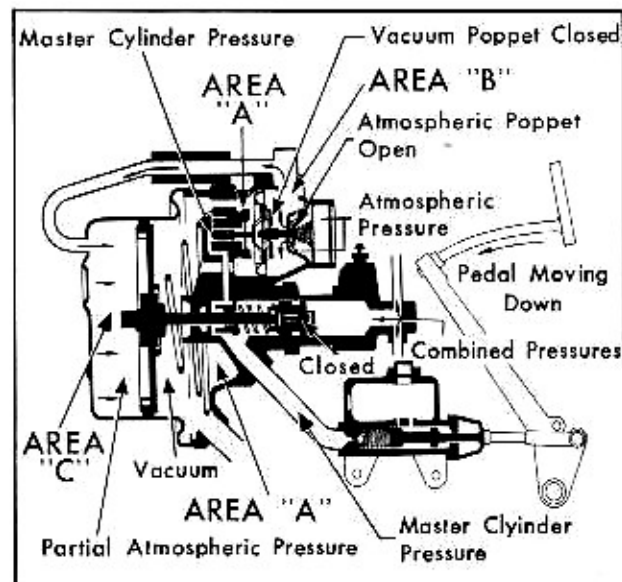


Fig. 9-4 Power Brake Operation - Brakes Applied

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fluid pressure moves this piston, it actuates the vacuum diaphragm control shaft and forces the diaphragm against the vacuum poppet valve, sealing off area "B" from manifold vacuum. Continued movement of the piston (and the diaphragm) forces the atmospheric poppet valve off of its seat and admits air under atmospheric pressure through area "B", to area "C". The pressure differential between areas "C" and "A" forces the vacuum piston and push rod toward the hydraulic cylinder. The push rod, attached to the hydraulic piston, forces the hydraulic piston and yoke away from the stop washer, permitting the check valve to close and trap fluid under pressure ahead of the piston. From this point, the total hydraulic pressure, developed in the hydraulic power cylinder and transmitted to the wheel cylinders, is the sum of the push

rod pressure and the pressure developed in the master cylinder, Fig. 9-4.

The degree of power brake assist is regulated in the vacuum control valve assembly by controlling the pressure differential between area "B" and "D". Here, hydraulic pressure against the piston is opposed by air pressure and spring pressure on the area "B" side of the diaphragm, when the diaphragm is in contact with the vacuum poppet valve. As the pressure in area "B" increases, (while the atmospheric poppet is open) the force against the vacuum valve and the diaphragm also increases, tending to close the atmospheric valve. Therefore, the degree of power assist is proportional to hydraulic pressure on the small hydraulic piston and consequently it is proportional to foot pedal pressure.

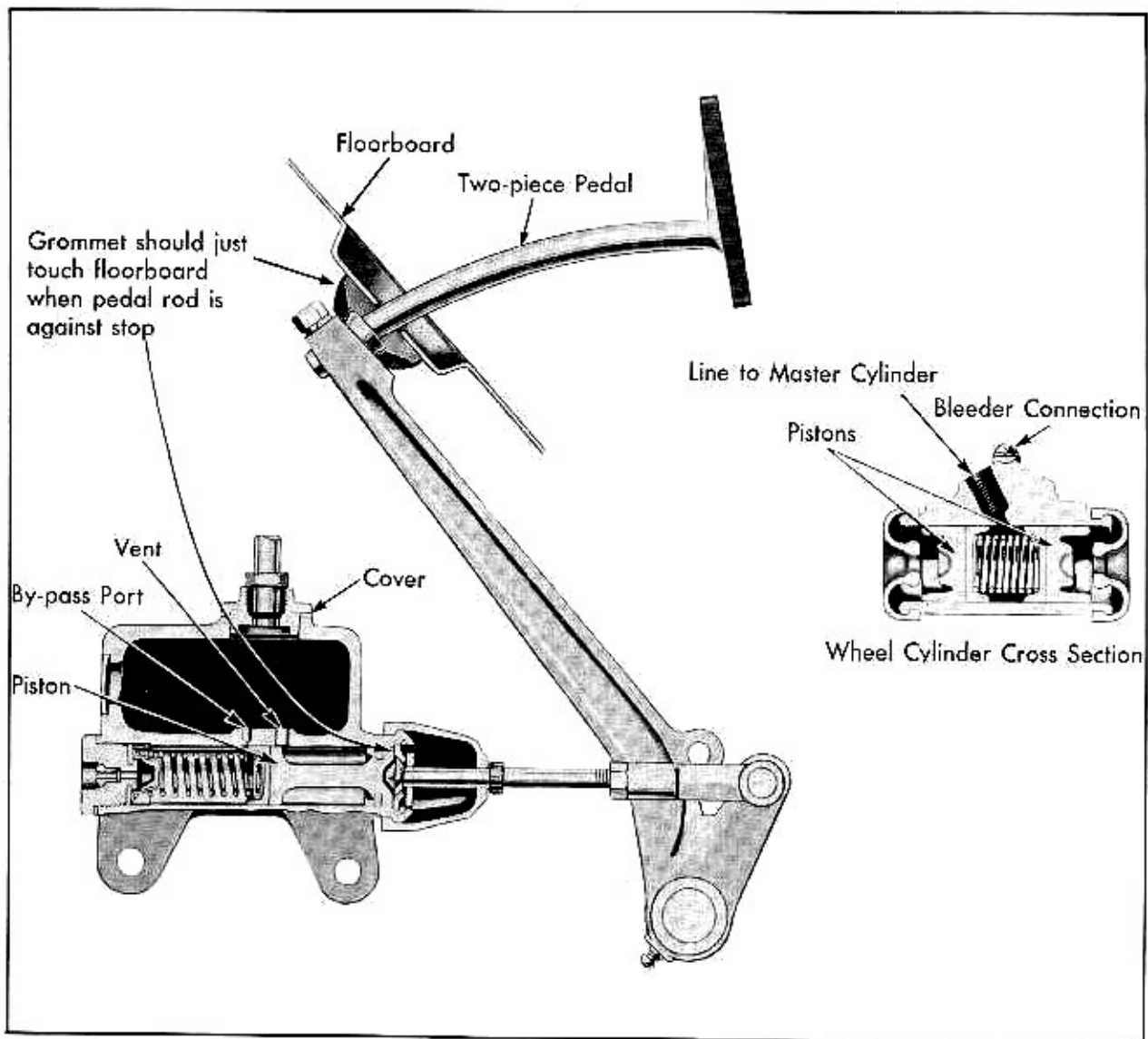


Fig. 9-5 Brake Master Cylinder and Pedal

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SERVICE INFORMATION

(1) Brake Pedal Adjustment

NOTE: This adjustment is important and should be checked whenever a major or minor brake adjustment is performed, to be sure that the master cylinder piston and primary cup are properly positioned when the brakes are released to avoid the possibility of brake drag.

1. Check brake pedal action. Pedal must operate freely without any bind at operating shaft or interference with the floor carpet grommet.
2. If brake pedal returns slowly, check the brake pedal return spring. If it is weak or broken replace spring.
3. Loosen lock nut on link between master cylinder and clevis on brake operating arm. Fig. 9-5.
4. Turn link into clevis until grommet on the pedal shaft clears the underside of the toeboard.
5. Back link out of clevis until grommet just rests against the toeboard.
6. Tighten lock nut on link.

(2) Minor Brake Adjustment

1. Jack up car and remove adjusting hole cover from each brake backing plate.
 2. Check front wheel bearing adjustment and correct, if necessary, as outlined in Section 6, Note 3.
- NOTE:** This is very important to assure permanency of lining to drum operating clearance.
3. Check to see that hand brake cables and linkage, including lever on secondary shoes, are free.
 4. Tighten the ratchet adjustment (star wheel), using Adjuster Tool No. J-1603A, until the road wheel cannot be turned by hand.
 5. Back off ratchet 14 notches and install adjusting hole cover.

CAUTION: Any deviation from this adjustment, such as backing off less than 14 notches to obtain a "high" pedal, can cause serious brake troubles.

6. Repeat this operation on all four wheels.
7. Lower car and check for brake pedal free play. Adjust as explained in Note 1.

(3) Major Brake Adjustment

1. Jack up car and remove all four wheels. Remove adjusting hole cover from each brake backing plate.
2. Check fluid level in master cylinder filler tube and add fluid if necessary.
3. Loosen hand brake cable at equalizer, just to the rear of frame cross member.
4. Check to see that hand brake cables and linkage, including levers on secondary shoes, are free.
5. Adjust brake pedal for free action, complete return to stop, and proper free play at toeboard. See Note 1.
6. Remove front and rear drums and clean out all dirt from brake assemblies and drums. Use care to avoid getting dirt into wheel bearings.
7. Inspect drums and recondition or replace as required.
8. Inspect brake lining assemblies for wear, loose rivets, glazing, or imbedded particles. Also check for oil seal or wheel cylinder leakage and correct as necessary.
9. Lubricate brake backing plate at shoe contact areas with "Lubriplate". Also lubricate hand brake lever and cable at backing plate.
10. Install drums and adjust front wheel bearings.
11. Loosen the anchor pin lock nut 1/2 turn, and tap anchor pin up, then all the way down to bottom of its slot with a hammer.
12. Using adjuster Tool No. J-1603-A, turn the star wheel adjuster to expand brake shoes until drum can just be turned in direction of forward rotation with a two foot bar. This is equivalent to a two hand drag with the wheel and tire installed.
13. Using a hammer, tap the brake backing plate adjacent to the anchor pin. This will cause the

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brake shoes to raise the anchor pin into a central position between the ends of the shoes.

14. Check brake drag with the two foot bar, and retighten star wheel adjuster if drag has decreased. Tap backing plate again and recheck drag.

15. Tighten the anchor lock nut to 80 to 120 ft. lbs. torque. The brake drag should increase somewhat when the anchor nut is tightened.

16. Loosen the star wheel 14 notches and insert the .015" feeler gage of Tool, J-1040 in the drum slot with slot at bottom.

17. Rotate drum forward until feeler is wedged between the secondary shoe and the drum. This forces the primary shoe tight against the drum, providing the necessary conditions for measuring secondary shoe clearance.

18. Turn the drum back until the feeler is at the bottom of the secondary lining. Check clearance between secondary shoe and lining. This should be .015". If clearance is not as specified, adjust star wheel to obtain the proper clearance.

19. Check the clearance between upper end of secondary shoe and drum. This should be .010".

20. If upper clearance is greater or less than .010", it will be necessary to loosen anchor pin lock nut, slightly, and tap anchor pin up if clearance

is more than specified, or down if clearance is less than .010". Reset lower clearance with star wheel and recheck upper clearance. The clearance between drum and linings at any point, should not be less than .010".

(4) Hand Brake Adjustment

NOTE: Service brakes should be properly adjusted before adjusting the hand brake.

1. Lubricate complete hand brake linkage and check for free movement of cables in conduit and in equalizer, Fig. 9-6.

2. Check rear relay lever spring and replace if weak or broken.

3. Check for proper tension of intermediate cable which may be determined by measuring the distance between the rear edge of the rear relay lever and the end of the slot in the frame X-member. Fig. 9-7. This distance should be 1/8".

4. If distance is greater or less than the specified, adjust the lock nut on the intermediate cable link to obtain the 1/8" clearance specified.

5. Adjust the equalizer lock nut until the rear brake cables are taut.

6. Using a spring scale, pull hand brake lever until scale shows 50 lbs. pull. Measure the distance the handle has traveled from its released position. This should be 2-1/8" to 2-3/8".

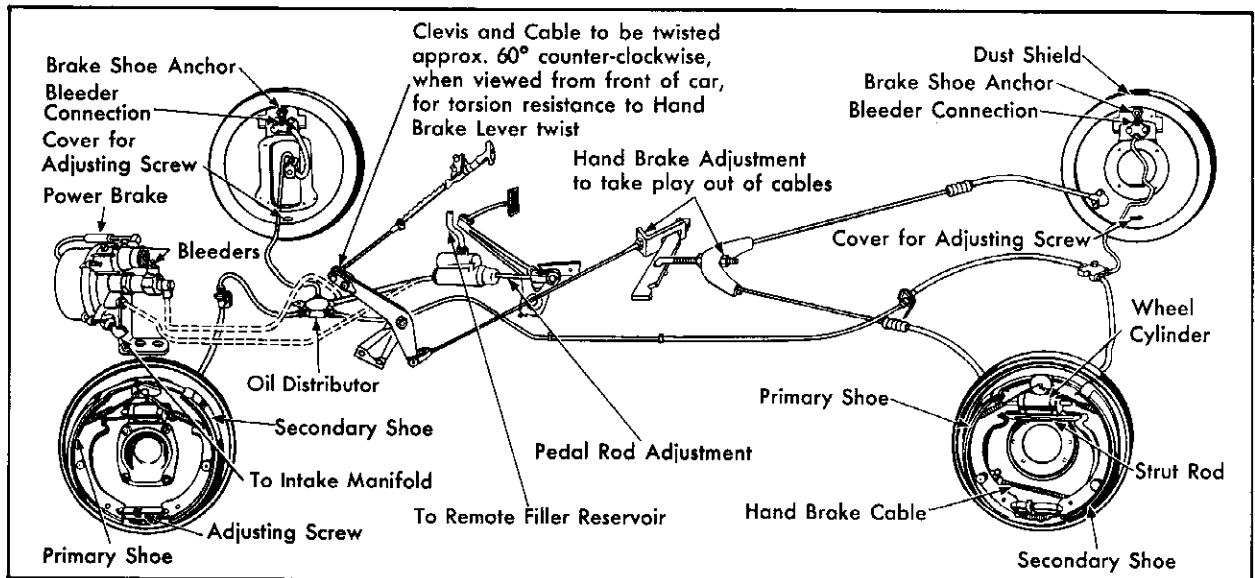


Fig. 9-6 Brake Adjustment References

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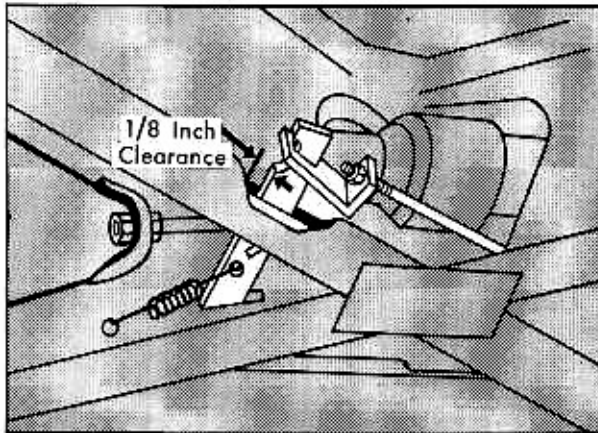


Fig. 9-7 Brake Relay Adjustment

7. Adjust cable tension until above specification is reached. Tighten lock nut.

8. Recheck front cable adjustment as explained in Step 3, above.

(5) Brake Shoe Assemblies

When it is necessary to reline the brakes, it is recommended that the complete brake lining and shoe assemblies be replaced with new assemblies available from the Factory Parts Department. The lining and shoe assemblies are ground to fit a new 12 inch drum perfectly to prevent the possibility of imperfect braking action due to warped or im-

properly assembled shoes. This reduces the time required for the complete relining operation and insures a satisfactory job for the customer. Those service departments that have adequate brake shoe relining equipment can, of course, obtain lining from the Factory Parts Department.

(6) Relineing Brakes

1. Jack up car and dismount all four wheels.
2. Remove wheel hub and brake drum assemblies. (See Section 6, Notes 16 and 26).

CAUTION: Do not depress brake pedal when one or more brake drums are removed.

3. Loosen hand brake cable lock nut at equalizer.
4. Remove brake shoe hold-down cups and springs, Fig. 9-8.
5. Install Wheel Cylinder Clamp, Tool No. KMO-145 to hold wheel cylinder pistons in position.
6. Disconnect brake shoe return springs using Tool No. KMO-526A.

7. Disconnect hand brake cables from hand brake operating levers at rear brakes.

8. Remove shoes and star wheel adjuster from brake locking plate.

9. Disengage shoes from star wheel adjuster and connecting spring.

10. If it is necessary to machine brake drums, do not remove more than .060" over original limit of inside diameter.

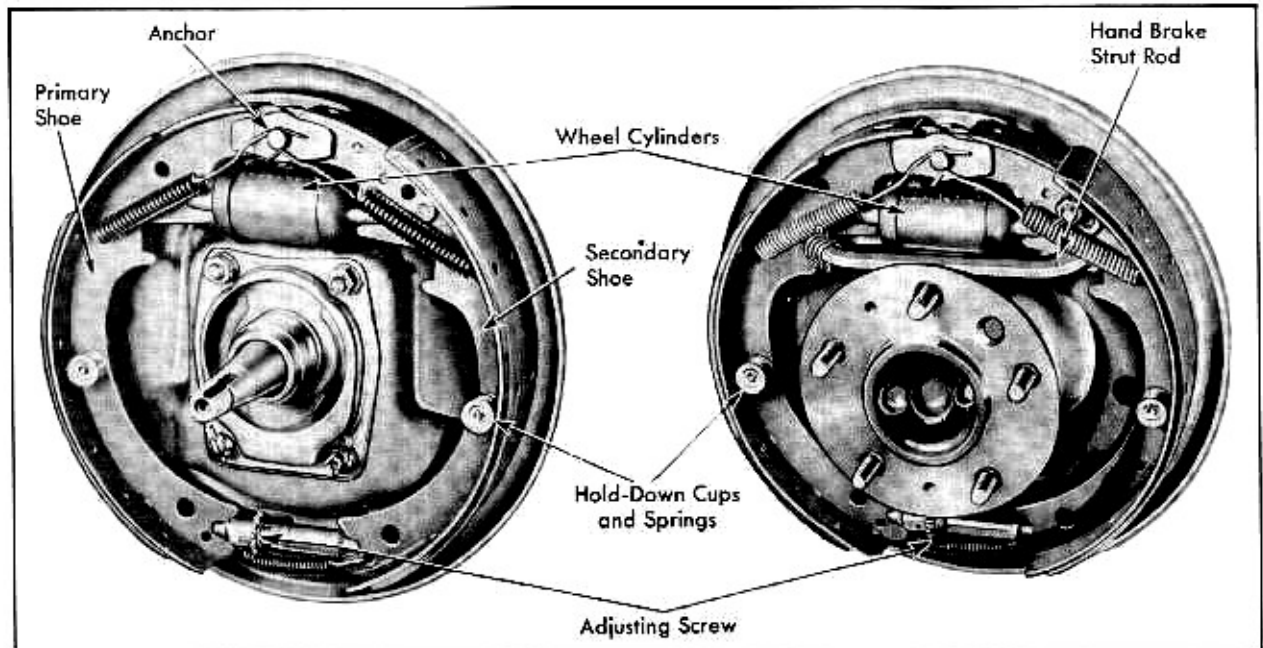


Fig. 9-8 Brake Mechanism at Front and Rear Wheels

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9. Clean the brake dust shields and all brake parts.

10. Tighten bolts that hold backing plates to rear axle housing and front wheel spindles.

11. Lubriplate all points of contact between the brake shoe and other brake parts. Use lubriplate sparingly, especially on brake shoe pads.

12. Hook connecting spring between primary and secondary shoes and install star wheel adjuster between shoes so that star wheel will line up with backing plate slot.

13. Install brake shoe hold-down cups and springs and return springs.

14. Remove wheel Cylinder Clamp, Tool No. KMO-145.

15. Loosen notched adjustment screw ("star wheel") to permit assembly of hubs and drums.

16. Install wheel hub and drum assemblies and road wheels.

17. Adjust front wheel bearings, as explained in Section 6, Note 3.

18. Adjust service brakes as outlined in Note 3.

19. Adjust hand brake as explained in Note 4.

20. Install adjusting hole covers on all four brakes.

(7) Machining Brake Drums

When machining brake drums, they must not be machined more than .060" beyond original limit of inside diameter (12.060" total after machining). When brake drums are too thin, the intense heat that frequently develops under severe driving conditions may cause them to distort or warp excessively. Drum diameter should be measured 1/2" from outer flange. If drum runout exceeds .007" it will be necessary to machine the drum, using suitable equipment for this purpose. Be sure to install drum in the machining equipment correctly and to check runout of lathe spindle to insure accuracy of final machining operation.

Replacement brake drums supplied by the Factory Parts Department are finish machined at the Factory before being shipped. This eliminates the necessity of further finishing before installation. Do not machine drums to roughen the braking surface; use coarse emery cloth for this purpose.

(8) Break-In of New Linings

The useful life of brake linings and drums can be prolonged if care is exercised when "breaking-

in" the brakes on new cars, or when linings are replaced and drums refinished on cars in service.

To break in the linings and drums, it is only necessary to apply the brakes lightly at low speeds a number of times and to use discretion about applying them at full force at high speeds.

(9) Bleeding Brakes

Bleeding the brakes may be made considerably easier through the use of one of the pressure brake bleeder tools now available. This equipment comprises a tank partially filled with Delco Super No. 11 brake fluid and a rubber hose which connects to the master cylinder remote reservoir. Compressed air applied to the tank forces the fluid into the brake system.

To bleed the brakes after the bleeder has been connected to the master cylinder remote reservoir by its long rubber hose, it is only necessary to loosen the bleeder valve on the wheel cylinder to be bled, and direct the fluid into a partially filled bottle of new brake fluid until bubbles cease. On cars equipped with Power Brakes, attach the bleeder drain hose to the bleeder fitting on the end cap of the power cylinder, back off fitting three quarters of a turn and bleed fluid into a partially full bottle of clean brake fluid until bubbles cease. Next, bleed fitting on end plate above vacuum control valve housing then proceed to wheel cylinders.

CAUTION: Do not run engine when bleeding brakes on cars equipped with Power Brakes. Do not allow any brake fluid to come in contact with the fender or body, as it will damage the finish.

The procedure to be used if the pressure bleeder is not available is as follows:

1. Fill master cylinder remote filler reservoir with Delco Super No. 11 Brake Fluid only. Keep reservoir at least partially filled at all times during bleeding operation.

CAUTION: To avoid possible damage to the braking system do not use any other type of brake fluid.

2. Remove screw from end of bleeder valve at wheel cylinder and install a Bleeder Drain Hose, Tool No. J-747, allowing it to hang in a clean container partially filled with new brake fluid.

On cars equipped with Power Brakes, bleed the power cylinder first by attaching bleeder hose to fitting on end cap, back off fitting three quarters of a turn, and depress brake pedal until bubbles cease. Next, bleed upper fitting on end plate above

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vacuum control valve housing and then proceed to bleed wheel cylinders.

3. Unscrew hex head bleeder valve three quarters of a turn.

4. Depress brake pedal slowly by hand. Close bleeder valve, while slowly depressing brake pedal then allow pedal to return to released position. Repeat until no bubbles appear. This provides a pumping action which forces fluid through the tubing and out at wheel cylinder (or power cylinder), carrying with it any air that may be present.

5. Watch flow of fluid from drain hose, keeping end of hose in container below fluid level, and when air bubbles cease to appear, or when flow is uninterrupted, close bleeder valve and install bleeder valve screw.

6. If entire system is to be bled, repeat this operation at each of the four wheels.

7. Replenish fluid in reservoir after each cylinder is bled.

NOTE: The fluid withdrawn in bleeding operation should NOT be used again.

8. Refill reservoir with clean Delco Super No. 11 Brake Fluid only to within 3/4 inch of top.

(10) Removal and Disassembly of Master Cylinder

1. Remove splash shield from flywheel housing.

2. Disconnect brake line at front of master cylinder.

3. Depress brake pedal a few times to force all fluid from master cylinder.

4. Loosen remote filler reservoir pipe fitting in master cylinder cover.

5. Disconnect pedal operating rod at clevis on brake pedal. Disconnecting the rod at this point retains approximate adjustment.

6. Remove two bolts holding master cylinder to frame bracket and lower unit from car.

7. Slip rubber boot away from operating rod end of master cylinder.

8. Remove piston stop plate retaining ring, stop plate, and pedal operating rod.

9. Pull piston and secondary cup from end of cylinder barrel.

10. Lightly tap cylinder on a block of wood to remove return spring, primary cup with retainer, and check valve assembly from cylinder barrel.

11. Remove master cylinder head and valve seat from front end of cylinder.

12. Remove master cylinder cover.

After all parts have been removed from master cylinder, they should be washed in clean alcohol. Special care should be taken to make sure that bypass port in body and bleed holes in piston are clean. Use compressed air to clean holes. Do not run a wire through port, as it may make a burr in the cylinder bore which would score primary cup.

Before washing parts, hands must be clean. Do not wash hands in gasoline or oil before cleaning master cylinder parts. Use soap and water to clean hands. Inspect master cylinder, boot, rubber cups, and check valve. Replace any parts which are scored, swollen, shrunk, or excessively worn.

(11) Assembly and Installation of Master Cylinder

1. Install master cylinder cover.

2. Install master cylinder head and fittings, using a new rubber washer and gasket.

3. Dip check valve assembly in clean brake fluid and install the return spring, and retainer as a unit in the cylinder barrel, with check valve next to cylinder head.

4. Install primary cup in barrel, with cupped end over end of spring.

5. Dip secondary cup in clean brake fluid and assemble on piston.

6. Install piston and secondary cup in barrel, with bleeder holes in piston next to primary cup.

7. Place pedal operating rod against end of piston and install stop plate and retaining ring.

8. Slip boot over end of master cylinder.

9. Position master cylinder in car, with cover below remote reservoir filler pipe, and thread pipe fitting into hole in cover, then install and tighten two cylinder-to-frame bracket bolts. Tighten fitting in cover.

10. Connect pedal operating clevis to pedal and adjust, as explained in Note 1.

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11. Connect brake line to master cylinder.
12. Add fluid and bleed all four brakes, and power cylinder on cars so equipped, as explained in Note 9.
13. Install splash shield on flywheel housing.

(12) Removal and Disassembly of Wheel Cylinder

1. Jack up wheel and remove hub and brake drum assemblies.
2. Disconnect brake line at wheel cylinder. Install a cap on line fitting to prevent dirt from entering brake line.
3. Remove brake shoe retracting springs and hold down springs.
4. Remove two cap screws holding wheel cylinder to backing plate and remove cylinder from car.
5. Remove rubber boot from end of wheel cylinder.
6. Slide piston and rubber cup from end of cylinder.
7. Remove piston return spring.
8. Wash all parts in clean alcohol, after washing hands thoroughly with soap and water.
9. Install a plug in brake line fitting hole to prevent entry of dirt into cylinder.

(13) Assembly and Installation of Wheel Cylinder

1. Install piston return spring in cylinder.
2. Install rubber cup and piston in each end of cylinder. Flat side of each cup goes against flat side of piston. (See Fig. 5).
3. Install rubber boot over each end of cylinder.
4. Position wheel cylinder on brake backing plate, slipping the cylinder-to-shoe connecting links in place at the same time.
5. Install cap screws holding wheel cylinder to backing plate.
6. Install brake shoe hold down springs and retracting springs.
7. Remove plug from brake line fitting hole in

wheel cylinder and cap from line then connect brake line to cylinder.

8. Install wheel hub, brake drum assembly, and wheel.
9. Bleed brake wheel cylinder that was removed, as explained in Note 9.

(14) Removal of Power Brake Assembly

1. Disconnect brake lines at power cylinder end plate.
2. Loosen vacuum line hose clamp at check valve and slide hose off of check valve.
3. Remove three nuts and lockwashers from the cylinder mounting bracket and remove Power Brake assembly from car.

(15) Disassembly of Power Brake Assembly

a. Disassembly of Hydraulic Cylinder Assembly

NOTE: When disassembling Power Brake, use care in handling parts to prevent their coming in contact with mineral oil or greases. Do not handle hydraulic cups and seals with greasy hands.

1. Loosen hydraulic cylinder nut and unscrew hydraulic cylinder assembly from the end plate. Fig. 9-9.
2. Hold the end cap in a vise and remove the hydraulic cylinder from the cap using an open end wrench on the flat part of the cylinder.
3. Remove cylinder to end cap gasket. Remove the bleeder fitting from the end cap.
4. Remove the bolt holding the hydraulic line connection to the end cap. Remove the fitting and two copper gaskets.
5. Scribe a line on the cylinder shell and end plate so that these parts can be reassembled in their original position.
6. Loosen the four hook bolt nuts and remove cylinder shell, sliding the cylinder tube out of the rubber hose.
7. Compress the piston spring by pressing down on the end plate and install the Vacuum Piston Retaining Strap, Tool No. J-5650, under opposite hook

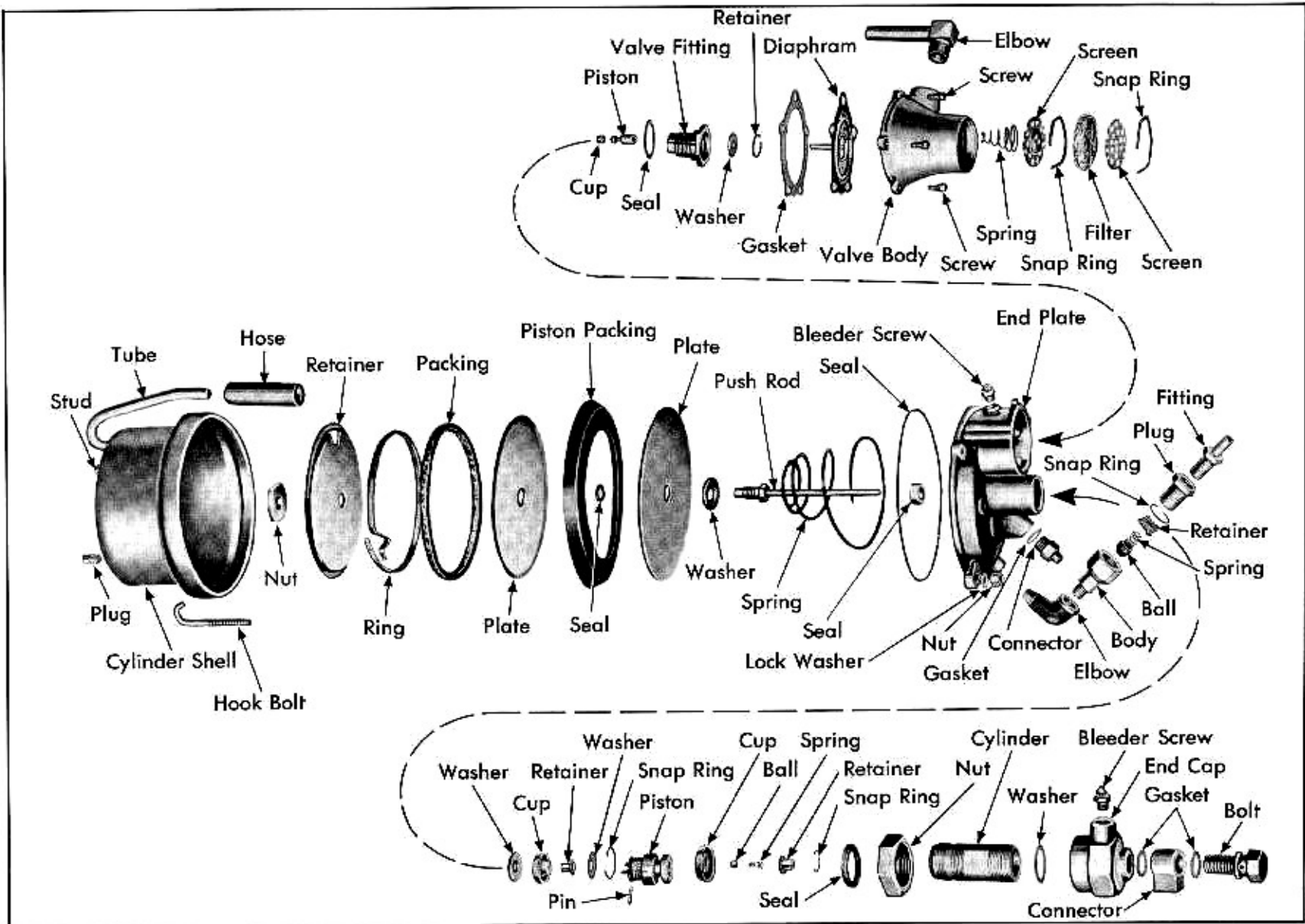


Fig. 9-9 Power Brake - Disassembled

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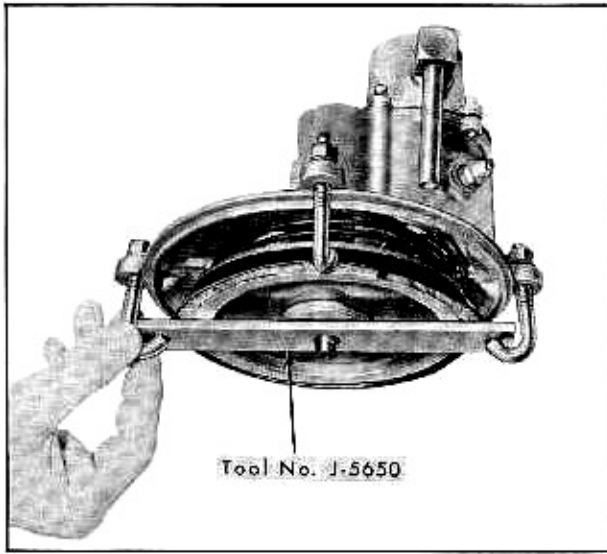


Fig. 9-10 Installing Retaining Strap

bolts as shown in Fig. 9-10.

8. Remove the hydraulic piston assembly from the push rod by holding retaining spring back and removing the small pin, Fig. 9-11.

9. Remove the Retaining Strap, while compressing the return spring, then remove the vacuum piston with push rod and vacuum spring.

10. Remove hydraulic piston cup from piston.

11. Remove snap ring, retainer, spring, and ball.

12. Remove the hydraulic cylinder end seal.

13. Remove the retaining ring and the hydraulic cylinder stop washer.

14. Remove the seat retainer. Note that the counter-bored side is next to seal cup.

15. Remove seal and lower stop washer. Note that lip of cup seal is up.

16. Drive push rod leather retainer out with a flat end rod or drift.

b. Disassembly of Vacuum Control Valve Assembly

1. Scribe control valve body and end plate to insure proper location on reassembly.

2. Remove control valve body screws and remove control valve assembly with diaphragm and gasket.

3. Remove diaphragm from control valve body.

4. Remove air intake filter snap ring and screen.

5. Remove filter.

6. Remove lower snap ring and screen with spring.

7. Remove hydraulic control valve fitting from end plate, using a 1-1/8" socket wrench.

8. Push piston out of fitting and remove cup from piston.

9. Remove seal from fitting.

10. Remove retainer ring and stop washer from fitting.

c. Disassembly of Vacuum Piston

1. Remove nut from threaded end of push rod.

2. Remove retainer plate, packing, and expander ring.

3. Remove small diameter piston plate with rubber seal ring.

4. Remove leather packing, larger diameter piston plate, and washer from push rod.

d. Disassembly of Check Valve

1. Remove check valve assembly from pipe elbow in end plate.

2. Remove plug from bushing.

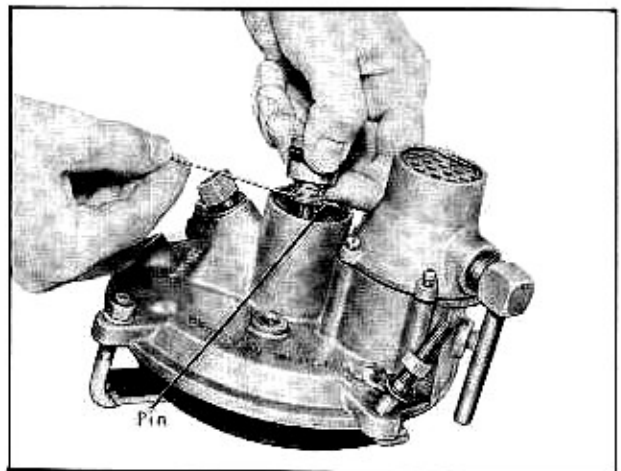


Fig. 9-11 Removing Piston Rod Pin

BRAKES

3. Remove bushing from check valve assembly.
4. Remove snap ring, spring retainer, and spring with check ball.
5. Remove spring from check ball.

(16) Cleaning and Inspection of Power Brake Parts

1. Thoroughly clean all parts to be reused.
2. Keep all hydraulic system parts away from mineral oils or greases.
3. After cleaning, wash hydraulic system parts in clean alcohol before assembly.
4. Do not handle hydraulic system parts with greasy hands.
5. Use new rubber seals and cups when reassembling power brake. Do not attempt to reuse old seals or cups.

(17) Assembly of Power Brake Assembly

a. Assembly of Vacuum Piston

1. Drill a 5/16" hole in a block of wood and place push rod in hole with threaded end up.
2. Install flat washer and larger diameter piston plate (chamfered side of hole up) over threaded end of push rod.
3. Install rubber seal ring over shaft into chamfered hole in piston plate.
4. Install leather packing on piston plate with lip up.
5. Install smaller diameter piston plate over threaded end of push rod, with chamfered side of hole down over rubber sealing ring. Outer diameter of plate will retain leather packing in position.
6. Install cotton wicking in position against inner face of lip of leather packing.
7. Install expander ring inside of cotton wicking, with gripper points up and notch at loop end of expander ring under clip at opposite end of ring.
8. Install retainer plate with cut-out portion over loop of expander ring.
9. Install nut on push rod finger tight, then place hexagonal section of push rod in a vise and tighten

nut securely, using care to be sure that retainer plate does not turn. Stake the nut to the shaft.

b. Assembly of Vacuum Control Valve

1. Install stop washer and retainer ring in hydraulic control valve fitting.
2. Install new rubber cup on valve piston with lip of cup toward small end of piston.
3. Install piston in fitting with hole in end of piston next to stop washer.
4. Install a new rubber seal gasket in groove under head of fitting and install fitting into end plate. Tighten fitting securely.
5. Install gasket on end plate.
6. Install vacuum diaphragm over gasket with shaft in hole in hydraulic valve piston.
7. Position vacuum control valve body over vacuum diaphragm with scribe marks on end plate aligned to body and holes in diaphragm and gasket aligned with screw holes in body.
8. Install and tighten five screws.
9. Install spring in vacuum control valve body with small end over raised area of poppet valve seat.
10. Install screen, with depression in larger end of poppet valve spring, and install snap ring.
11. Install filter, upper screen, and retainer.

c. Assembly of Hydraulic Cylinder

1. Install a new push rod leather seal into end plate with lip of seal toward hydraulic cylinder side of end plate.
2. Place end plate on bench and install stop washer with chamfered side down.
3. Install seal cup with lip up and seal retainer with counterbored side next to cup.
4. Install stop washer next to retainer and install snap ring in groove.
5. Place vacuum piston return spring over push rod with small end of spring next to vacuum piston and carefully guide push rod through seat in end plate.
6. Compress spring and use vacuum piston retaining strap, Tool No. J-5650 to hold end plate and

BRAKES

cylinder together.

7. Install ball, spring, retainer, and snap ring in piston.

8. Dip hydraulic piston cup in Delco No. 11 brake fluid and install in groove with lip of cup toward check valve end of piston.

9. Dip hydraulic piston in Delco No. 11 brake fluid and assemble piston on push rod. Install retaining pin in hole in piston and rod. When pin is in position, retaining spring will hold it in place.

10. Place end cap in a vise and install bleeder screw, end cap gasket, hydraulic line connector with copper gaskets and retaining bolt.

11. Thread hydraulic cylinder tube into end cap with milled flats next to end cap, and securely tighten cylinder.

12. Thread check nut on cylinder to limit of threads.

13. Install hydraulic cylinder end seal against shoulder in end plate.

14. Guide the lip of the piston cup into the cylinder carefully and threaded cylinder into end plate until cylinder bottoms firmly against the end seal. Tighten cylinder until bleed screw on end cap is aligned with bleed screw in end plate and tighten check nut securely.

15. Remove Piston Retaining Strap.

16. Place rubber ring gasket in groove on end plate.

17. Saturate the cotton wicking by dipping vacuum piston in Delco Shock Absorber Fluid, and allow excess oil to drain off. In addition, coat inside of cylinder shell lightly with Delco Shock Absorber Fluid.

18. Insert piston into shell by tipping piston as shown in Fig. 9-12.

19. Align scribe marks on shell and end plate, attach hook bolts, and tighten each bolt evenly until all bolts are uniformly tight.

d. Assembly of Check Valve

1. Install end of spring over check ball.

2. Install spring retainer plate with depression in plate in end of spring and install snap ring.

3. Install plug in check valve body.

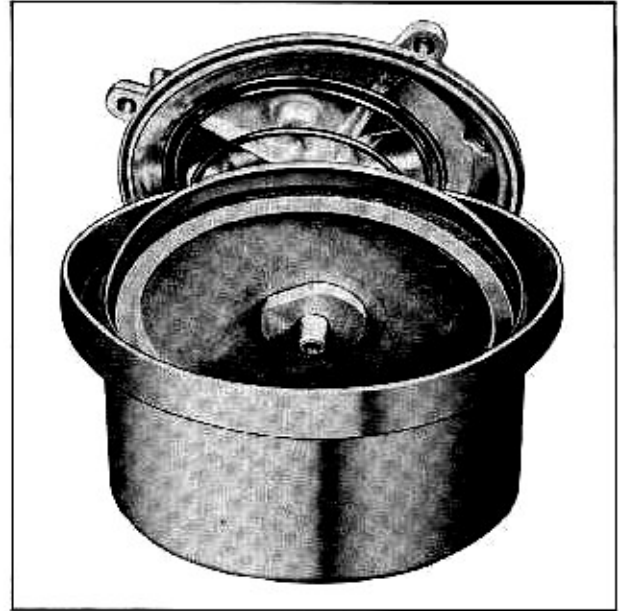


Fig. 9-12 Installing Piston in Cylinder Shell

4. Install fitting in bushing.

5. Install valve assembly in elbow on end plate.

(18) Installation of Power Cylinder Assembly

1. Position Power Brake assembly on mounting bracket and install lockwashers and nuts.

2. Connect vacuum hose to check valve on Power Brake and tighten hose clamp.

3. Connect brake line fittings to end plate.

4. Bleed system as outlined in Note 9.

(19) Tightening Brake Fittings

Whenever brake lines are disassembled for any reason, they should be reassembled with particular care, first, to avoid any foreign matter getting into the system, and, second, to assure leakproof connections.

All of the fittings and connections should be carefully wiped clean before assembly and then tightened thoroughly, to prevent any leakage.

(20) Replacement of Stoplight Switch

a. Removal

1. Fold front carpet back from brake pedal area, to expose stoplight switch mounting screws.

2. Remove mounting screws.

BRAKES

3. Working under the car, disconnect switch wires and remove switch from car.

b. Installation

1. Connect switch wires to switch.
2. Position switch against floor pan, with actuating arm between brake pedal and floor pan.
3. Install screws from top, while switch is being held in position below car.
4. Fold carpet back into position around brake pedal.
5. Check operation of stop lights.

(21) Lubrication of Brake Dust Shields

A popping noise may sometimes occur in the brakes when they are applied in forward speed, after having been applied in reverse. This is generally a result of the edge of the brake shoe hanging slightly on the bosses of the dust shield before centralizing.

In such cases the edges of the shoes should be smoothed up where they contact the bosses and lubricated slightly.

"Lubriplate" is a suitable lubricant for this purpose. Care should be taken in applying lubricant to make sure that none is permitted to get on the brake lining.

This procedure should eliminate objectionable popping. It should be remembered, however, that the centralizing action of the brakes may result in a slight click when the brakes are applied in reverse and should not be construed as cause for repair.

(22) Removal of Hand Brake Handle Assembly

1. Remove bolt holding retaining plates over brake cable pin and brake lever at left side of cowl.
2. Disconnect hand brake cable from lever at left side of cowl by removing bolt holding retaining plates to lever and over pin.
3. Remove two bolts holding hand brake handle assembly to instrument panel.
4. Lower assembly from instrument panel and disconnect wire from hand brake warning light switch.
5. Loosen grommet from cowl panel and remove assembly including grommet from car.

(23) Installation of Hand Brake Handle Assembly

1. Guide cable and pin through opening in cowl panel from inside of car and install grommet on cowl panel.
2. Connect hand brake warning light wire to switch on hand brake assembly.
3. Position hand brake handle below instrument panel and install mounting bolts.
4. Place retainer plates in position on lever, with tangs in holes. Twist pin and cable approximately 60° counterclockwise, as viewed from the front of car, placing pin between retainer plates and into holes in plates. Install bolt through retaining plate and tighten nut.

DIAGNOSIS CHART

Standard Hydraulic Braking System

EFFECT	CAUSE	REMEDY
Brake pedal goes all way down to toeboard.	Normal wear on linings	Adjust brakes.
	No fluid in reservoir.	Add fluid, inspect for leakage, and bleed system.
	Leaks in brake system.	Check entire system for leaks. If no leaks are found at wheels or connections, master cylinder should be removed and bore checked for scratches and scores.

BRAKES

DIAGNOSIS CHART (Cont'd)

Standard Hydraulic Braking System (Cont'd.)

EFFECT	CAUSE	REMEDY
Brake pedal goes all way down to toeboard.	<p data-bbox="505 394 883 476">Air in brake system, which causes a springy, rubbery action of brake pedal.</p> <p data-bbox="505 635 883 697">Rubber cups damaged or shrunk-en by excessive heat.</p> <p data-bbox="505 891 883 972">Rubber cups shrunken or swollen by mineral oil in system, or wrong type of brake fluid.</p>	<p data-bbox="925 394 1303 615">Bleed system. Check for shrunken or swollen rubber cups, and correct cause. If air enters rear wheel cylinders only, advise owner to apply foot brake before pulling on hand brake. Also overhaul master cylinder and replace check valve.</p> <p data-bbox="925 635 1303 768">Replace all affected rubber parts. Inspect shoes and linings, and replace both if damaged by heat. Replace drums that run excessively hot.</p> <p data-bbox="925 788 1303 870">Perform Major brake adjustment, and correct any other cause of overheating.</p> <p data-bbox="925 891 1303 1024">Disassemble all hydraulic parts and wash with alcohol. Dry with compressed air before assembly, to keep alcohol out of system.</p> <p data-bbox="925 1044 1303 1095">Replace all rubber parts in system, including hoses.</p> <p data-bbox="925 1116 1303 1197">Replace brake shoe assemblies or linings if glazed by brake fluid leakage.</p> <p data-bbox="925 1218 1303 1269">Refill and bleed with Delco Super No. 11 Brake Fluid.</p>
No pedal after hard usage.	Excessive heat causes fluid to vaporize.	<p data-bbox="925 1310 1303 1473">Drain fluid, flush system, and refill with Delco Super No. 11 Brake Fluid. Bleed system. Perform Major brake adjustment. Replace linings and shoes if glazed.</p> <p data-bbox="925 1494 1303 1545">Replace drums that run excessively hot.</p> <p data-bbox="925 1565 1303 1596">Replace wheel cylinder cups.</p>
Brakes drag at all wheels.	<p data-bbox="505 1616 883 1667">By-pass port hole in master cylinder blocked.</p> <p data-bbox="505 1749 883 1780">Mineral oil in brake system.</p>	<p data-bbox="925 1616 1303 1729">Adjust brake pedal. If condition not corrected, overhaul master cylinder and check for dirt in by-pass.</p> <p data-bbox="925 1749 1303 1913">Disassemble and clean all brake system parts, as outlined above. Replace all rubber parts, including hoses. Refill and bleed system with Delco Super No. 11 Brake Fluid.</p>

BRAKES

DIAGNOSIS CHART (Cont'd)

Standard Hydraulic Braking System (Cont'd.)

EFFECT	CAUSE	REMEDY
Brake drags on one wheel.	<p>Brake shoes too close to drum</p> <p>Weak or broken shoe return spring.</p> <p>Cylinder cups distorted, or brake hose restricted.</p> <p>Drag or binding in emergency brake cable or linkage.</p> <p>Loose or defective wheel bearings.</p>	<p>Adjust brakes.</p> <p>Replace spring.</p> <p>Replace cylinder cups or hose. Replace all rubber parts and disassemble all parts for cleaning, if improper fluid is suspected. Replace lining if contaminated by fluid leakage.</p> <p>Flush brake system and refill with Delco No. 11 Brake Fluid.</p> <p>Check and correct cable adjustment, and lubriplate lever on secondary shoe.</p> <p>Adjust or replace bearings as necessary.</p>
Car pulls to one side when brakes are applied.	<p>Tires not properly inflated.</p> <p>Loose or defective wheel bearings.</p> <p>Badly misaligned wheels.</p> <p>Steering gear out of adjustment.</p> <p>Backing plate loose on steering knuckle or axle.</p> <p>Anchor adjustment uneven, between left and right sides.</p> <p>Oil or brake fluid on linings.</p> <p>Different makes of lining used, between left and right sides.</p> <p>Scored or out-of-round brake drums.</p>	<p>Inflate tires to correct and uniform pressure.</p> <p>Adjust or replace bearings with new ones as necessary.</p> <p>Correct wheel alignment.</p> <p>Adjust steering gear and linkage. Be certain location and pull through high spot is correct.</p> <p>Tighten backing plate. Readjust anchor and shoes on both sides.</p> <p>Perform Major brake adjustment on both sides of car, or all 4 wheels, as required.</p> <p>Replace brake shoe assemblies or install new linings. Oil soaked linings cannot be cleaned and used again successfully. Also correct condition which caused linings to become soaked.</p> <p>Different makes of lining have different braking efficiency. Replace brake shoes or install new linings, on both sides at once.</p> <p>Machine left and right brake drums, or replace both if more than .030-inches has to be removed.</p>

BRAKES

DIAGNOSIS CHART (Cont'd)

Standard Hydraulic Braking System (Cont'd.)

EFFECT	CAUSE	REMEDY
Car pulls to one side when brakes are applied.	Drums have different friction between left and right sides.	Switch drums left and right. If pulling not corrected, machine both drums, or replace, as required.
Springy pedal action.	<p>Brake shoes improperly adjusted.</p> <p>Air in brake system.</p> <p>New lining improperly fitting brake drums.</p>	<p>Check and correct anchor and shoe adjustment.</p> <p>Brakes must be readjusted with proper clearances at all wheels.</p> <p>Bleed system.</p> <p>Investigate and correct cause of air being drawn into system.</p> <p>Install Cadillac Shoe and Lining Assemblies which are ground to fit. Follow break-in procedure for new linings.</p>
Excessive pedal pressure necessary to stop car.	<p>Brake shoes improperly adjusted.</p> <p>Brake pedal or linkage binds.</p> <p>Lining making only partial contact with drum.</p> <p>Incorrect linings used.</p> <p>Lining glazed.</p>	<p>Check anchor adjustments. Re-adjust brakes with proper clearances at all wheels.</p> <p>Check pedal rod for binding in floorboard grommet. Reposition grommet as required.</p> <p>Lubricate pedal shaft.</p> <p>Check for bind in master cylinder, and overhaul assembly if required.</p> <p>Check anchor and shoe adjustments. If not corrected, replace shoe assemblies and re-adjust.</p> <p>Replace brake shoes or install new linings.</p> <p>Roughen or replace lining. If damaged by heat, replace shoes also, and correct cause of overheating.</p> <p>Reface drums only when scored or overheated.</p> <p>Check and correct brake fluid leakage.</p> <p>Caution owner about breaking in new linings.</p>
Too light pedal pressure (brake action severe).	Brake shoes improperly adjusted.	<p>Check anchor adjustment</p> <p>Brakes must be readjusted with proper clearances at all wheels.</p>

BRAKES

DIAGNOSIS CHART (Cont'd)

Standard Hydraulic Braking System (Cont'd.)

EFFECT	CAUSE	REMEDY
Too light pedal pressure (brake action severe).	Backing plate loose on steering knuckle or axle.	Tighten backing plate and re-adjust anchor and shoes.
	Oil or fluid on linings.	Replace brake shoe assemblies or install new linings. Linings cannot be cleared and used again successfully.
	Linings damaged by excessive heat.	Correct condition which caused linings to become soaked. Replace shoes and linings.
	Scored brake drums.	Machine or replace left and right brake drums.
Squeaking on application	Dampening spring missing or insulated from drum.	Install a new spring, or clean drum and spring.
	Improper adjustment.	Adjust anchor and shoes.
	Lining hard or glazed.	Roughen lining or replace.
	Lining making poor contact with drum.	Check anchor and shoe adjustments. Replace shoe assemblies if distorted.
	Brake lining cracked.	Replace lining.
	Rivets loose.	Replace shoes or lining.

DIAGNOSIS CHART

Power Brake

EFFECT	CAUSE	REMEDY
Momentary hissing noise as brakes are applied.	Air passing through filter and atmospheric poppet.	Normal condition. Should be audible only with hood raised.
Hissing noise, engine running, brakes <u>on</u> or <u>off</u> .	External vacuum leak - vacuum side of control diaphragm.	Check and correct leak at control valve body, diaphragm, and gasket to end plate. Check and correct leak between vacuum cylinder and end plate.
Hissing noise, engine running, more pronounced with brakes <u>off</u> .	External vacuum leak - atmospheric side of control diaphragm.	Check and correct leak at atmospheric poppet, external pipe and rubber tubing, and valve body screws.

BRAKES

DIAGNOSIS CHART (Cont'd)

Power Brake (Cont'd.)

EFFECT	CAUSE	REMEDY
Hissing noise, engine running, brakes <u>on</u> only.	Internal vacuum leak - air enters through breather.	Overhaul unit, and check for leak at vacuum poppet, control diaphragm, or vacuum power piston.
Little or no boost from power brake. May be accompanied by hissing noise or loss of brake fluid.	<p>Internal vacuum leak between atmospheric and vacuum side of vacuum power piston.</p> <p>Internal hydraulic leak.</p> <p>External hydraulic leak.</p> <p>Internal friction.</p>	<p>Overhaul unit, and check for leak at vacuum poppet, control diaphragm, or vacuum power piston.</p> <p>Check for low brake fluid level. Overhaul unit, and check for presence of brake fluid in inner side of vacuum cylinder, or inner side of control diaphragm. Check and correct leaks at control valve cup, control valve fitting "O" ring seal, vacuum piston push rod seals, or hydraulic power piston cup or ball-check.</p> <p>Correct leak at point of origin.</p> <p>Check and correct Shock Absorber Fluid level in vacuum cylinder. If necessary, overhaul unit, and check for rusty, dirty, or distorted vacuum cylinder wall, dry or worn vacuum piston leather packing, swollen rubber cups due to heat or wrong brake fluid, worn or damaged rubber cups, or dirt, rust, sludge, or foreign matter in power piston or control valve regions.</p>
Booster loses effectiveness while stopping. Pedal grows harder, or "kicks back".	<p>Internal hydraulic leak.</p> <p>Internal or external vacuum leak.</p>	<p>Overhaul unit, and check for small leaks at control valve, valve fitting, and power piston.</p> <p>Overhaul unit, and check for leak at vacuum poppet, control diaphragm, or vacuum power piston.</p>
Tendency to over-brake, pedal drops under foot. May show up as slow application of Power Brake.	<p>Restriction in atmospheric passage.</p> <p>Sticky control valve.</p>	<p>Clean air filter.</p> <p>Overhaul unit, and check for misalignment of control valve assembly.</p> <p>Check for dirty or sticky vacuum or atmospheric poppet, as well as sticky control valve.</p>

BRAKES

DIAGNOSIS CHART (Cont'd)

Power Brake (Cont'd.)

EFFECT	CAUSE	REMEDY
Tendency to over-brake, pedal drops under foot. May show up as slow application of Power Brake.	Internal hydraulic leak.	Overhaul unit, and check for leak at hydraulic power piston cup or ball check.
	Internal friction.	Check vacuum cylinder lubricant level. Overhaul unit, and check for binding in power piston assembly.
Brakes slow to release, or fail to release completely.	Sluggish control valve action.	Overhaul unit, and check for weak vacuum power piston return spring or atmospheric poppet return spring.
	Internal friction.	Check for dirty or sticky control valve. Check vacuum cylinder lubricant level. Overhaul unit, and check for binding in power piston assembly.
No power assist on first application after engine shut off.	External vacuum leak.	Check and correct leaks at valve body, external pipe, vacuum cylinder, and atmospheric poppet.
	Internal vacuum leak in check valve.	Overhaul or replace check valve assembly.

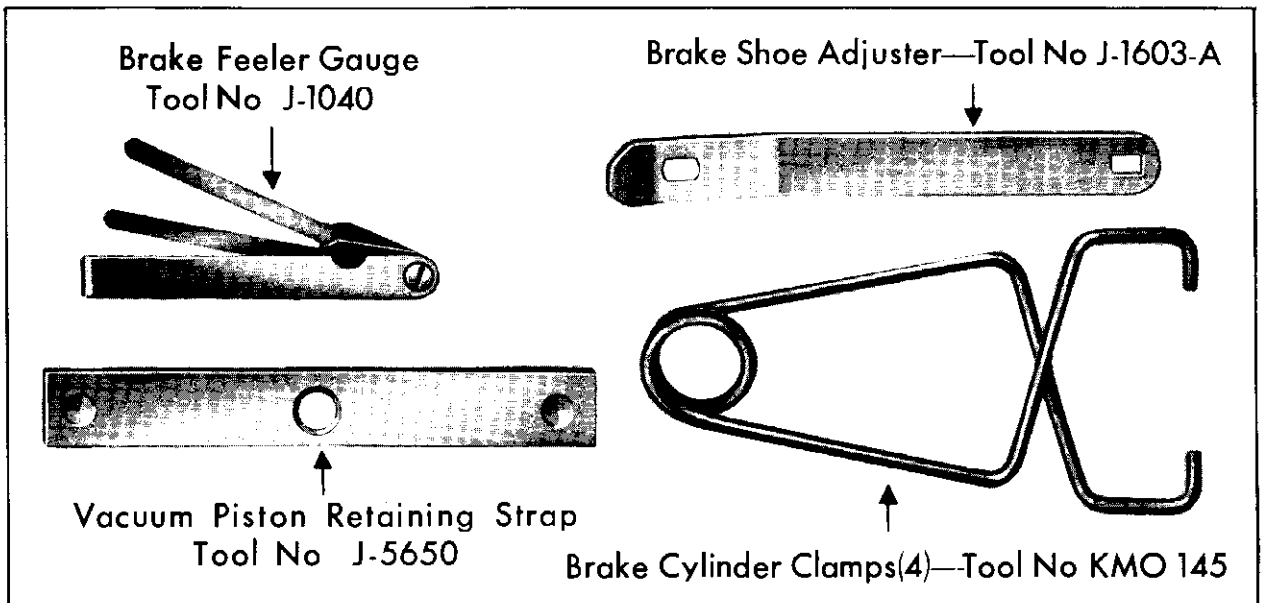


Fig. 9-13 Brake Special Tools

BRAKES

SPECIFICATIONS

Subject and Remarks	54-62, 60S	54-75	54-86
Braking area (Total in Square inches)	220.8	220.8	220.8
Braking ratio -			
Front	55.8%	55.8%	52.8%
Rear	44.2%	44.2%	47.2%
Drums -			
Inside Diameter:			
Front	11.995"-12.005"	11.995"-12.005"	11.995"-12.005"
Rear	11.995"-12.005"	11.995"-12.005"	11.995"-12.005"
Out-of-round inside diam. not over -			
Front007"	.007"	.007"
Rear007"	.006"	.006"
Clearance between lining and drums010"-top .015" bottom	.010" top .015" bottom	.010" top .015" bottom
Remachined diameter not over	12.060"	12.060"	12.060"
Lining - Primary -			
Length, width, thickness:*			
Front	11.45x2-1/2x1/4	11.45x2-1/2x1/4	11.45x2-1/2x1/4
Rear	11.45x2-1/2x1/4	11.45x2-1/2x1/4	11.45x2-1/2x1/4
Lining - Secondary -			
Length, width, thickness:			
Front	12.92x2-1/2x1/4	12.92x2-1/2x1/4	12.92x2-1/2x1/4
Rear	12.92x2-1/2x1/4	12.92x2-1/2x1/4	12.92x2-1/2x1/4
Type	Moulded	Moulded	Moulded
Attached to shoes by	Rivets	Rivets	Rivets
Wheel cylinder bore -			
Front	1-1/8"	1-1/8"	1-1/8"
Rear	1"	1"	1"
* 1/2" wide circumferential groove 1/8" deep full length.			

TORQUE TIGHTNESS

Location	Size	Ft. Lbs. Min.	Ft. Lbs. Max.
Brake fluid line connections	Special	8	9
Hand brake cable clamps (at backing plate)	5/16-24	10	13
Pedal clamp bolt	3/8-16	20	25
Front backing plate to knuckle	7/16-20	60	70
Brake backing plate to axle housing (except 86)	3/8-24	35	40
Brake backing plate to axle housing (54-86 Series)	7/16-20	55	60
Brake anchor pin nuts	Special	80	120