

SHOP TIPS

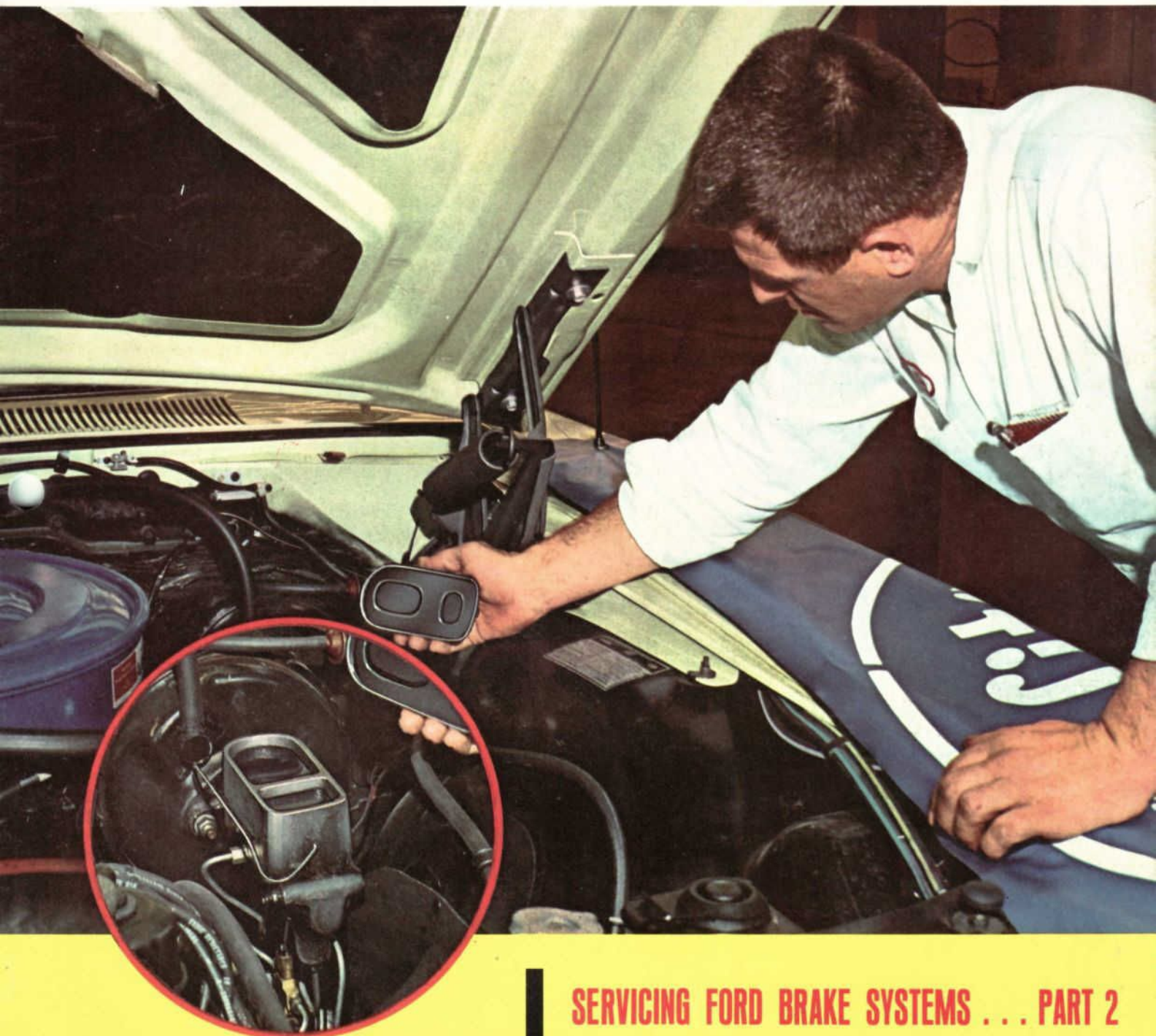
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SERVICING FORD BRAKE SYSTEMS . . . PART 2

- Bleeding Hydraulic System
- Master Cylinder & Power Booster Service
- Parking Brake Adjustment
- **PLUS . . . CORTINA BRAKE SERVICE TIPS**

SERVICING FORD



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January's Shop Tips featured "Servicing Ford Brake Systems . . . Part 1." It covered the operation of drum and disc brakes, plus the most frequent maintenance required; servicing drums, shoes and linings, wheel cylinders, and disc brake lining pads and rotors. This month, Part 2 covers tests, bleeding, master cylinder, and power booster service on domestic-built cars, and brake service tips for the English-built Cortina.

HYDRAULIC SYSTEM

MASTER CYLINDER—Single Chamber

A single chamber master cylinder supplies hydraulic pressure to *both* front and rear wheels in 1966 and prior model Ford-built vehicles. It normally doesn't require service (except to check fluid level), unless internal parts (Fig.1) do not deliver sufficient hydraulic pressure to the wheel cylinders. If necessary to overhaul, service the master cylinder as follows.

CORRECTION—"Servicing Ford Brake Systems, Part 1" January 1969 Shop Tips, stated on page 15 that a release rod on the bottom of the metering valve must be "pulled" and held open at least $\frac{1}{16}$ " during bleeding operations. This is the correct procedure for 1969 and late 1968 model Lincoln Continentals. However, it does not apply to early 1968 and prior model Lincoln Continentals, or ALL trucks with disc brakes.

For these models, instead of "pulling" the release rod, it must be **PUSHED INWARD** and held during bleeding.

Be sure and file this and future bulletins for ready reference. If you have any suggestions for additional information that you would like to see included in this publication, please write to: Autolite-Ford Parts Division of Ford Motor Company, Merchandising Services Dept., P.O. Box 3000, Livonia, Michigan 48151.

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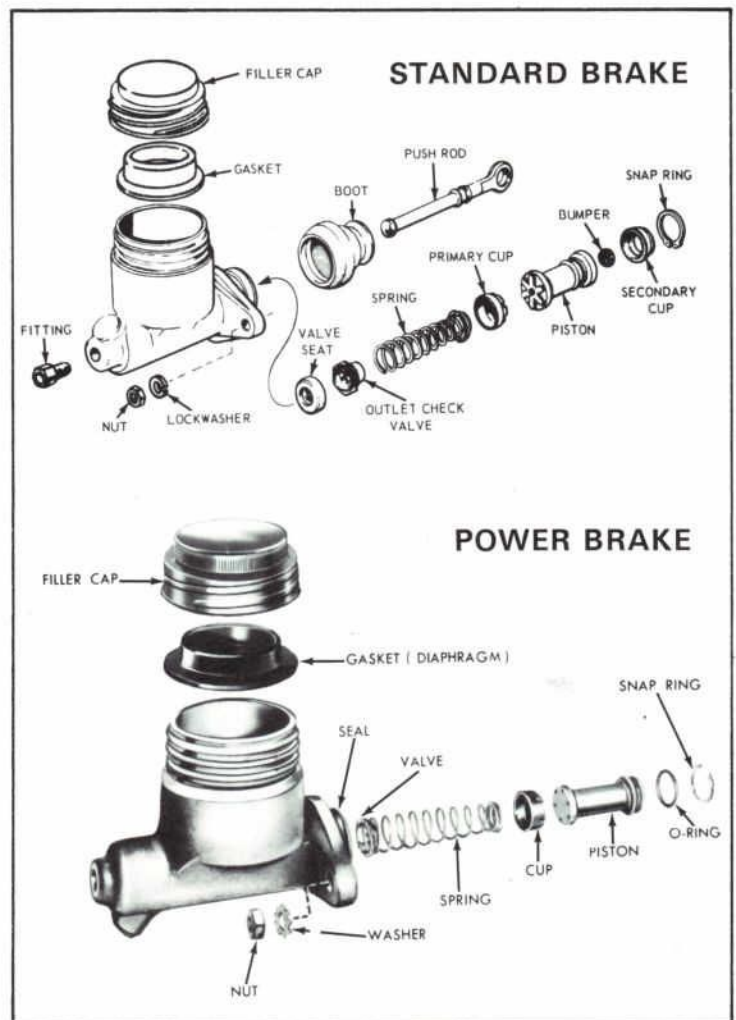


Figure 1—Typical Master Cylinder

BRAKE SYSTEMS . . . PART 2

SERVICE

Disassembly

Disconnect brake lines and remove master cylinder from dash panel. Clean outside of cylinder, then remove filler cap and diaphragm. Pour out any brake fluid that may remain in the cylinder or reservoir. Remove the snap ring from the bore at the rear of the cylinder.

From standard brake master cylinders, remove piston assembly, cup, spring, check valve, and valve seat from cylinder bore. From power brake master cylinders, remove piston assembly, cup, and the spring and check valve assembly from cylinder bore. Remove the O-ring from the piston (Fig. 1).

Cleaning, Inspection and Repair

Clean all parts in denatured alcohol. Inspect for wear or damage, and replace as required. When installing a master cylinder repair kit, use ALL parts supplied!

Check ports and vents in master cylinder to make sure all are open and free of foreign matter. Check condition of the diaphragm type gasket. A leaf type valve rivets to the front end of the piston in standard brake master cylinders. If this valve is loose or has moved so the piston ports are open, replace the piston.

When inspecting power brake master cylinders, check to see that the ports in piston are open and free of foreign material.

Inspect cylinder walls for scores or rust, and recondition if necessary. Hone cylinder walls no more than necessary (0.003-inch maximum). Oversize pistons and cups are not available for excessively honed cylinders. Remove any burrs or loose metal that may have resulted from the honing, and clean the cylinder with denatured alcohol.

Assembly

Dip all parts in the specified brake fluid. Install brake line fitting on cylinder and tighten securely. On standard brake master cylinders, install valve seat, check valve, spring, cup, and piston assembly in cylinder bore. On power brake master cylinders, install O-ring on piston, then install spring and check valve assembly, cup, and piston in cylinder bore. Install snap ring in back of the bore.

Installation

With the rubber boot on push rod, guide master cylinder over end of push rod, and position the cylinder on mounting studs against the dash panel. Install lock washers and nuts. Connect brake line to fitting, but leave loose. Fill reservoir with specified fluid. Be sure diaphragm is properly seated in the filler cap. Install and tighten filler cap. Bleed master cylinder to let air escape at brake line fitting. Then, tighten fitting. Again fill reservoir to within $\frac{3}{8}$ -inch of top, install cap and wipe fluid from cylinder. Connect rubber boot to master cylinder and bleed brake system.

MASTER CYLINDER—Dual Chamber

All 1967 and later model Ford-built cars use a dual chamber master cylinder (Fig. 2). The front cylinder furnishes hydraulic pressure to the rear brakes; the rear cylinder pressure to the front brakes. Thus, if a malfunction occurs in either system (sensed by a differential valve that flashes a red light on the instrument panel when the brakes are applied), the other hydraulic system will still provide braking action. The differential valve must be "centralized" any time either system has been bled, because the valve always moves to the low pressure side.

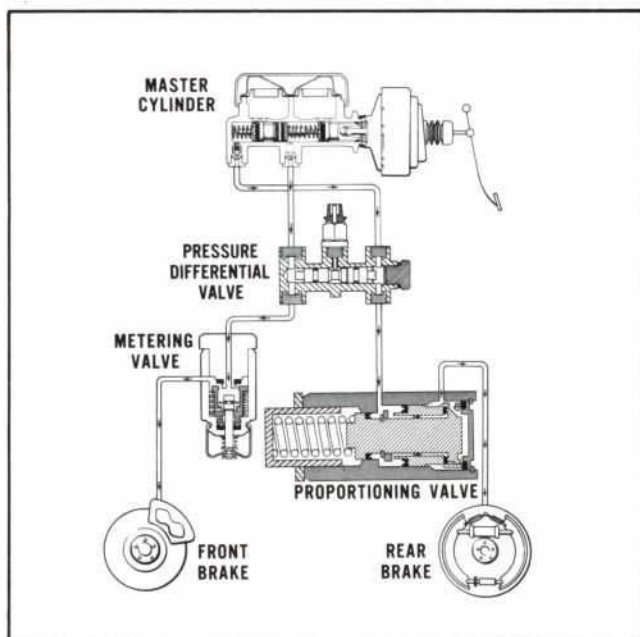


Figure 2—Dual Brake Master Cylinder for Disc Brakes

The proportioning valve shown in Figure 2 is only used on cars with disc brakes. It provides balanced braking action between the front (disc) and rear (drum) brakes. The proportioning valve reduces pressure at the rear brakes, since equivalent amounts of hydraulic pressure would cause more braking by the self-energizing rear drum brakes and the non-energizing front disc brakes. The metering valve in Figure 2 is only used on Lincoln-Continental and F-250 and F-350 truck models with disc brakes. It prevents the front disc brakes from applying until master cylinder pressure reaches about 120 psi. This delay prevents the front disc brakes from performing all the braking action at low speed stops, thereby increasing disc brake lining life.

SERVICE

Disassembly

Remove dual master cylinder from vehicle and clean outside before removing filler cover. Pour out and discard any old brake fluid in the reservoirs. Remove the secondary piston stop bolt from bottom of cylinder (Fig. 3), and the bleed screw if required.

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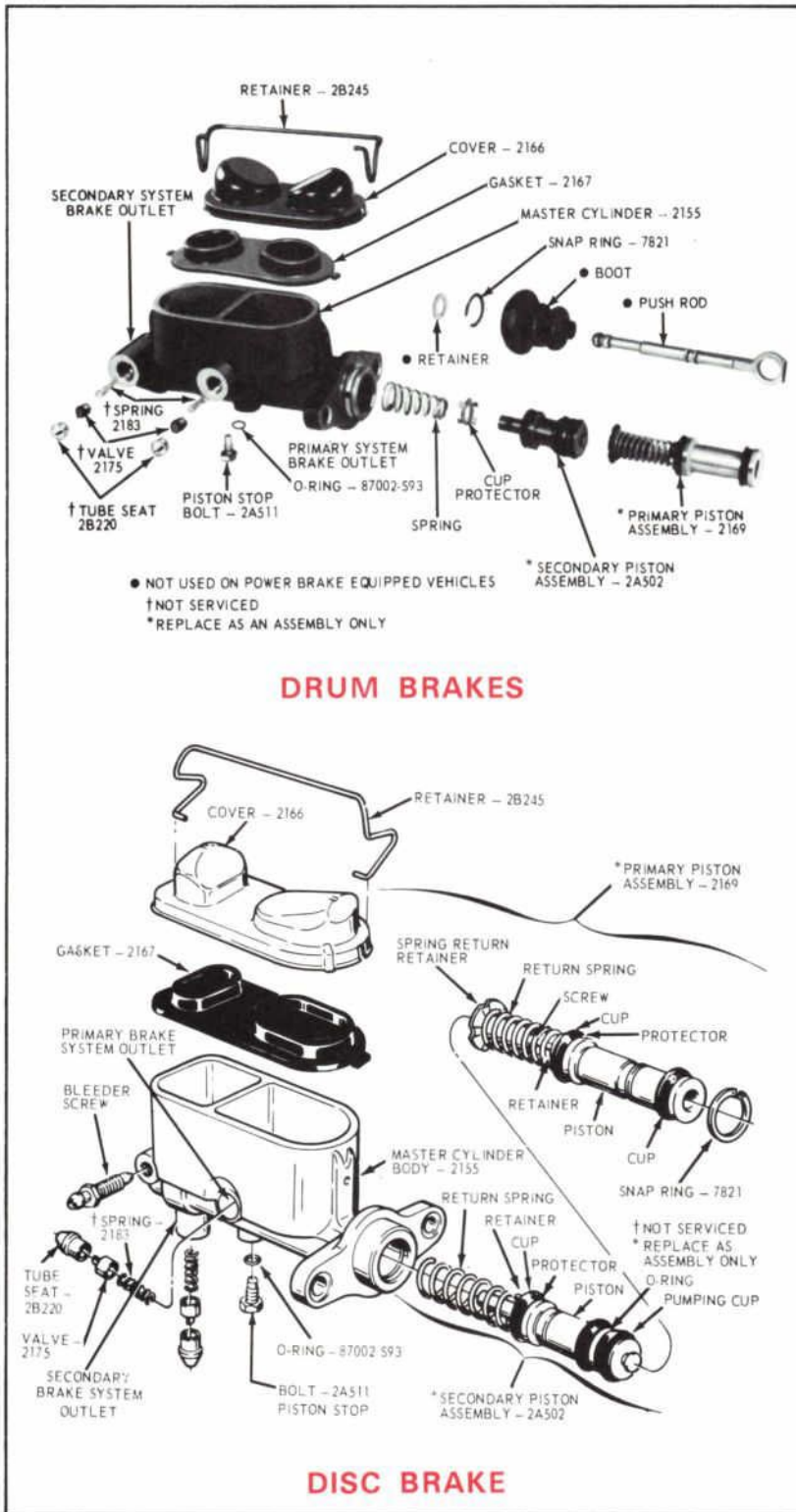


Figure 3—Dual Master Cylinder Disassembled

Depress the primary piston and remove snap ring from retaining groove at the rear of cylinder bore. Remove push rod and primary piston assembly from master cylinder bore. *Do not remove the screw that retains primary return spring retainer, return spring, primary cup and protector on the primary piston. This assembly is factory pre-adjusted and should not be disassembled.*

Remove the secondary piston assembly. *Do not remove outlet tube seats, outlet check valves and outlet check valve springs from the master cylinder.*

Inspection and Repair

Clean all parts in clean isopropyl alcohol. Inspect parts for chipping, excessive wear or damage. *When installing a master cylinder repair kit, use ALL the parts supplied.*

Check all recesses, openings and internal passages to be sure they are open and free of foreign matter. Use an air hose to blow out dirt and cleaning solvent. Place all parts on a clean pan or paper. Inspect master cylinder bore for signs of etching, pitting, scoring or rust. If necessary to hone, do not exceed 0.003-inch.

Assembly

Dip all parts in specified brake fluid. Carefully insert the complete secondary piston and return spring assembly in master cylinder. Install the primary piston and install the snap ring in its groove.

Install push rod, boot and retainer on push rod, if so equipped. Install push rod assembly into primary piston. *Make sure the retainer is properly seated and holding the push rod securely.*

Position the inner end of push rod boot (if so equipped) in master cylinder body retaining groove. Install secondary piston stop bolt and O-ring in bottom of master cylinder.

Install bleed screw (if so equipped). Install diaphragm gasket in filler cover. Position gasket as shown in Figure 3. *Be sure the gasket is securely seated.*

Install master cylinder in vehicle. Fill both reservoirs to within 1/4-inch of top with specified brake fluid. Install cover and bleed both brake systems. Centralize the differential valve.

BRAKE SYSTEMS . . . PART 2

Power Brake Booster System

A self-contained vacuum-hydraulic braking unit (Fig. 4) mounts on the dash panel to assist in brake application. It is a diaphragm type brake booster that utilizes engine manifold vacuum and atmospheric pressure for its power. The only service recommended is adjustment of the push rod. If the booster doesn't function properly, it must be replaced as a complete assembly.

Power Brake Functional Test

1. Check hydraulic system for leaks or insufficient fluid.

2. With transmission in neutral, apply parking brake. Depress brake pedal several times to exhaust all vacuum in the system.
3. With engine shut off and all vacuum in system exhausted, depress the pedal and hold it in applied position. Start the engine. If the vacuum system is operating, the pedal will tend to fall away under foot pressure and less pressure will be required to hold the pedal in the applied position. If no action is felt, the vacuum booster system is not functioning.

NOTE: If the brake pedal movement feels spongy, bleed the hydraulic system to remove air.

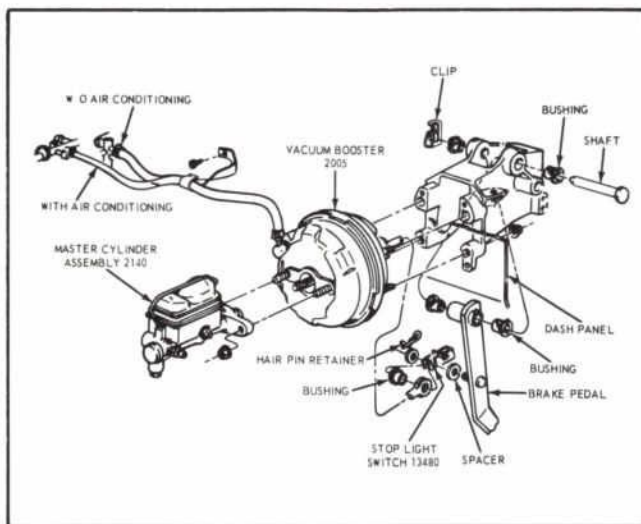


Figure 4—Typical Power Brake Booster Assembly

Power Brake Master Cylinder Push Rod Adjustment

The push rod is provided with an adjustment screw to maintain the correct relationship between the booster control valve plunger and the master cylinder. If the plunger is too long, it prevents the master cylinder piston from completely releasing hydraulic pressure and can cause the brakes to drag. If the plunger is too short, it causes excessive pedal travel and an undesirable clunk in the booster area.

The adjustment screw is set to the correct height at the time of original assembly of the power unit. Under normal service, the adjustment screw does not require any further attention—providing the original push rod assembly remains in the original unit.

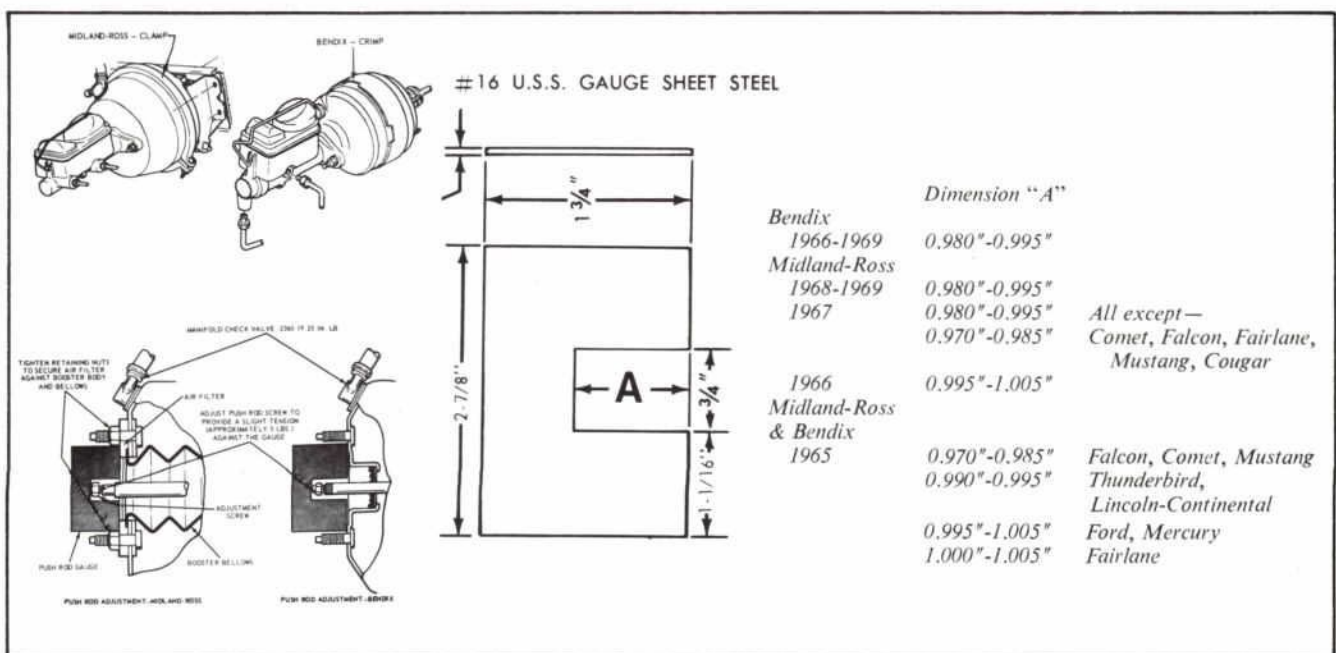


Figure 5—Push Rod Gauge Dimensions

SERVICING FORD



Midland-Ross Boosters

1. Disconnect master cylinder from booster assembly and secure away from booster without disconnecting brake tubes.
2. Reinstall air filter assembly on booster if it was removed with master cylinder.
3. Install and tighten master cylinder retaining nuts to retain air filter assembly securely against booster body and to seal booster bellows against air leaks.
4. Place the gauge against master cylinder mounting surface of air filter assembly (Fig. 5).
5. Adjust the push rod screw to provide a slight tension against inner edge of adjustment gauge slot (approximately 5-pounds of tension is required to assure that the push rod is firmly seated in the booster assembly).
6. Remove retaining nuts from mounting studs and install master cylinder on the booster.

Bendix

1. Disconnect master cylinder from booster and secure away without disconnecting brake tubes.
2. Adjust push rod screw to provide slight tension against inner edge of gauge (approximately 5-pounds).
3. Install master cylinder on brake booster. *Do not set up side forces on push rod as it may break the valve plunger. This is an approximate adjustment only.* To verify proper adjustment, look through the make-up (rear) port of the master cylinder when installing the booster. The master cylinder piston should not move more than 0.015-inch as it contacts the push rod. No movement (exact contact) is ideal.

HYDRAULIC SYSTEM BLEEDING

When any part of the hydraulic system has been disconnected for repair or replacement, air may enter and cause spongy pedal action. After properly connecting the system, bleed to be sure all air is expelled.

Manual Bleeding

NOTE: *The Lincoln-Continental hydraulic brake system is to be bled only with pressure bleeding equipment.*

The primary and secondary (front and rear) hydraulic brake systems are individual systems and are bled separately. Bleed the longest line first on the individual system being serviced. During the complete bleeding operation, **DO NOT** allow the reservoirs to run dry. Keep the master cylinder reservoirs filled with specified fluid. Do not mix low temperature brake fluids with the specified fluid during the bleeding operations. Never re-use brake fluid which has been drained from the hydraulic systems.

1. If the master cylinder is equipped with a bleed screw, loosen the bleed screw. Push the brake pedal down slowly through its full travel. Close the bleeder fitting and return the pedal to the fully released position. Repeat this operation until fluid is free of air bubbles, then tighten the

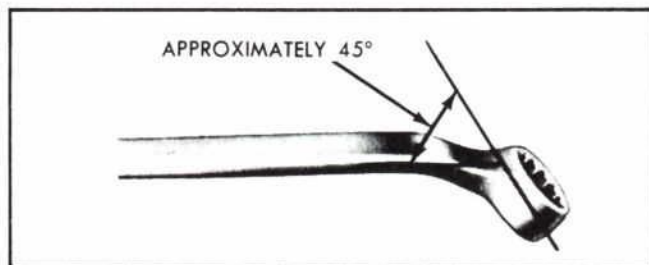


Figure 6—Wrench for Bleeding Brake Hydraulic System

bleeder screw. Do not use the secondary piston stop screw, located on the bottom of the master cylinder to bleed the brake system. Loosening or removing this screw could result in damage to the secondary piston or stop screw.

2. To bleed the secondary (rear) brake system, position a suitable $\frac{3}{8}$ -inch box wrench (Fig. 6) on the bleeder fitting on the brake wheel cylinder. Attach a rubber drain tube to the bleeder fitting. The end of the tube should fit snugly around the bleeder fitting.
3. Submerge the free end of the tube in a container partially filled with clean brake fluid, and loosen the bleeder fitting approximately $\frac{3}{4}$ turn.
4. Push the brake pedal down slowly through its full travel. Close the bleeder fitting, then return the pedal to the full-released position. Repeat this operation until air bubbles cease to appear at the submerged end of the bleeder tube.
5. When the fluid is completely free of air bubbles, close the bleeder fitting and remove the bleeder tube.
6. Repeat this procedure at the brake wheel cylinder on the opposite side.

Refill the master cylinder reservoir after each wheel cylinder is bled and install the master cylinder cover and gasket. Be sure the diaphragm type gasket is properly positioned in the master cylinder cover. When the bleeding operation is completed, the fluid level should be filled to within $\frac{1}{4}$ -inch of the top of the reservoirs.

7. If the primary (front brake) system is to be bled, repeat steps 2 through 6 starting at the right front brake caliper or cylinder and ending at the left front brake caliper or cylinder.
8. On disc brake equipped models be sure that the front brake pistons are returned to their normal positions and that the shoe and lining assemblies are properly seated by depressing the brake pedal several times until normal pedal travel is established.
9. Centralize the pressure differential valve. Refer to the Centralizing the Pressure Differential Valve procedures which follow on page 8.

Pressure Bleeding

The Lincoln Continental hydraulic brake system is to be bled only with pressure bleeding equipment.

BRAKE SYSTEMS . . . PART 2

Bleed the longest lines first. The bleeder tank should contain enough new brake fluid to complete the bleeding operation. Do not mix low temperature brake fluid with the specified brake fluid during the bleeding operation. Never re-use brake fluid that has been drained from the hydraulic system. The tank should be charged with approximately 10 to 30 pounds of air pressure. Never exceed 50 pounds pressure.

1. Clean all dirt from the master cylinder reservoir cover.
2. Remove the master cylinder reservoir cover and rubber gasket, and fill the master cylinder reservoir with the specified brake fluid. Install the pressure bleeder adapter tool to the master cylinder, and attach the bleeder tank hose to the fitting on the adapter.

Master cylinder pressure bleeder adapter tools can be obtained from the various manufacturers of pressure bleeding equipment. Follow the instructions of the manufacturer when installing the adapter.

3. If the master cylinder is equipped with a bleed screw, loosen the bleed screw and bleed the master cylinder until the fluid is free of air bubbles: then, tighten the bleed screw. Do not use the secondary piston stop screw, located on the bottom of the master cylinder, to bleed the master cylinder.
4. If the rear wheel cylinders (the secondary brake system) are to be bled, position a $\frac{3}{8}$ -inch box wrench (Fig. 6) on the bleeder fitting on the right rear brake wheel cylinder. Attach a bleeder tube to the bleeder fitting. The end of the tube should fit snugly around the bleeder fitting.
5. Open the valve on the bleeder tank to admit pressurized brake fluid to the master cylinder reservoir.
6. Submerge the free end of the tube in a container partially filled with clean brake fluid, and loosen the bleeder fitting.
7. When air bubbles cease to appear in the fluid at the submerged end of the bleeder tube, close the bleeder fitting and remove the tube.
8. Repeat steps 3 through 7 at the left rear wheel cylinder.
9. If the vehicle is equipped with disc brakes, repeat steps 4 through 7, starting at the right front disc caliper and ending at the left front disc caliper.

On the Lincoln Continental models the front wheel and tire assemblies must be removed to gain access to the bleeder fittings on the calipers. Also on Lincoln Continental models the metering valve release rod must be pulled **OUTWARD** and held a minimum of $\frac{1}{16}$ -inch (Fig. 7) while bleeding the primary brake system on 1969 and late 1968 models. The metering valve of early 1968 Lincoln Continentals and all prior models, and 1969 and

prior truck models must be pushed **INWARD** while bleeding the system.

10. If the vehicle contains drum-type front brakes and the primary (front) brake system is to be bled, repeat steps 4 through 7, starting at the right front wheel cylinder ending at the left front wheel cylinder.
11. When the bleeding operation is completed, close the bleeder tank valve and remove the tank hose from the adapter fitting.
12. On disc brake equipment vehicles, be sure that the front brake pistons are returned to their normal positions and that the shoe and lining assemblies are properly seated by depressing the brake pedal several times until normal pedal travel is established.
13. Remove the Pressure Bleeder Adapter Tool. Fill the master cylinder reservoirs to within $\frac{1}{4}$ -inch of the top. Install the master cylinder cover and gasket. Be sure the diaphragm type gasket is properly positioned in the master cylinder cover.
14. Centralize the pressure differential valve as follows.

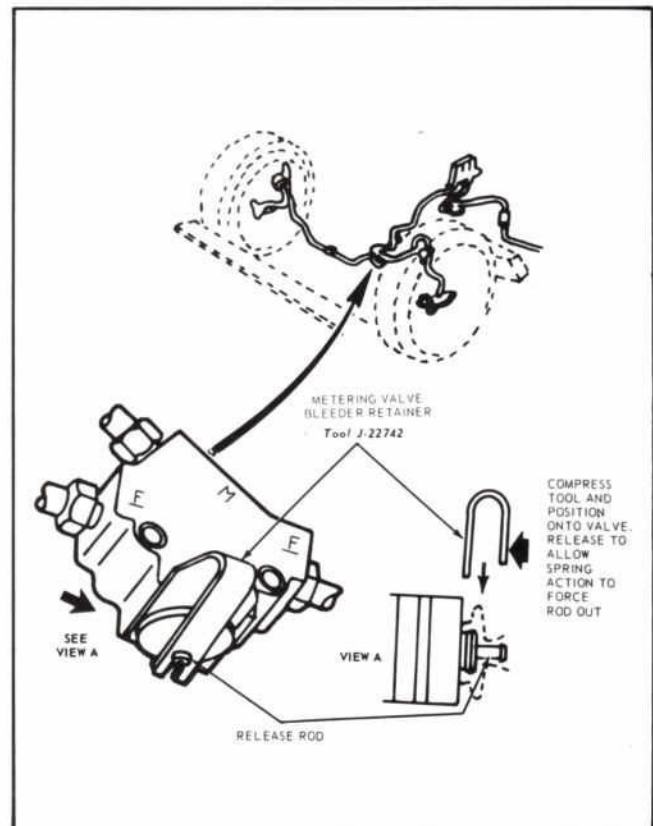


Figure 7—Disc Brake Metering Valve—1969 & late 1968 model Lincoln Continentals

SERVICING FORD



CENTRALIZING THE PRESSURE DIFFERENTIAL VALVE

After dual brake system has been repaired and bled, the warning light on the instrument panel will usually continue to glow because the pressure differential valve is in the off-center position. To centralize the pressure differential valve and turn off the warning light, a pressure differential or unbalance condition must be created in the opposite brake system from the one that was last repaired or bled.

Turn ignition switch to ACC or ON position. Loosen the differential valve assembly brake tube nut at the outlet port on the opposite side of the brake system that was last repaired or bled. Depress brake pedal slowly to build line pressure until the pressure differential valve moves to a centralized position and the brake warning light goes out; then, immediately tighten the outlet port tube nut. Check fluid level in master cylinder reservoirs, and fill to 1/4-inch from the top with specified brake fluid, if necessary. Turn ignition switch OFF. Before driving the vehicle, check operation of brakes and be sure that a firm pedal is obtained.

HYDRAULIC LINE REPAIR

Steel tubing is used throughout the brake system with the exception of the flexible hoses at the front wheels and at the rear axle housing brake tube connection.

Always bleed the applicable primary or secondary brake system hose or line replacement. Centralize the pressure differential valve after bleeding the system.

Brake Tube Replacement

If a section of the brake tubing becomes damaged, the entire section should be replaced with tubing of the same type, size, shape and length. Copper tubing should not be used in a hydraulic system. When bending brake tubing to fit underbody or rear axle contours, be careful not to kink or crack the tube.

All brake tubing should be double flared properly to provide good leak-proof connections. Clean the brake tubing by flushing with clean brake fluid before installation.

When connecting a tube to a hose, tube connector, or brake cylinder, tighten the tube fitting nut to specified torque with Milbar tool 1112-144 or equivalent.

Brake Hose Replacement

A flexible brake hose should be replaced if it shows signs of softening, cracking, or other damage.

When installing a new front brake hose, position the hose to avoid contact with other chassis parts. Place a new copper gasket over the hose fitting and thread the hose assembly into the front wheel cylinder. Engage the opposite end of the hose to the bracket on the frame. Install the horseshoe-type

retaining clip, and connect the tube to the hose with the tube fitting nut. A rear brake hose should be installed so that it does not touch the muffler outlet pipe or shock absorber. Thread the hose into the rear brake tube connector. Engage the front end of the hose to the bracket on the frame. Install the horseshoe-type retaining clip, and connect the tube to the hose with the tube fitting nut.

BRAKE FLUID SPECIFICATIONS

Ford Brake Fluid—Extra Heavy Duty (Part no. C6AZ-19542-A) (Spec. ESA-M6C25-A) or equivalent, is mandatory for all disc brake applications, and recommended for drum brakes. NOTE: All 1968-69 cars are filled with extra heavy duty brake fluid at the factory. Extra heavy duty brake fluid is colored "blue" for identification purposes. Do not mix low boiling point brake fluids with it.

Ford Brake Fluid—Super Heavy Duty (Part no. B7AZ-19542-A) (Spec. SAE J1703), or equivalent, can be used for cars with complete drum brake systems only.

PARKING BRAKE

On most late model cars, foot-operated control actuates the parking brake. Two types of brake pedal controls are used; an automatic (vacuum) release type (Fig. 8) and a manual release type (Fig. 9). The manual type is of conventional

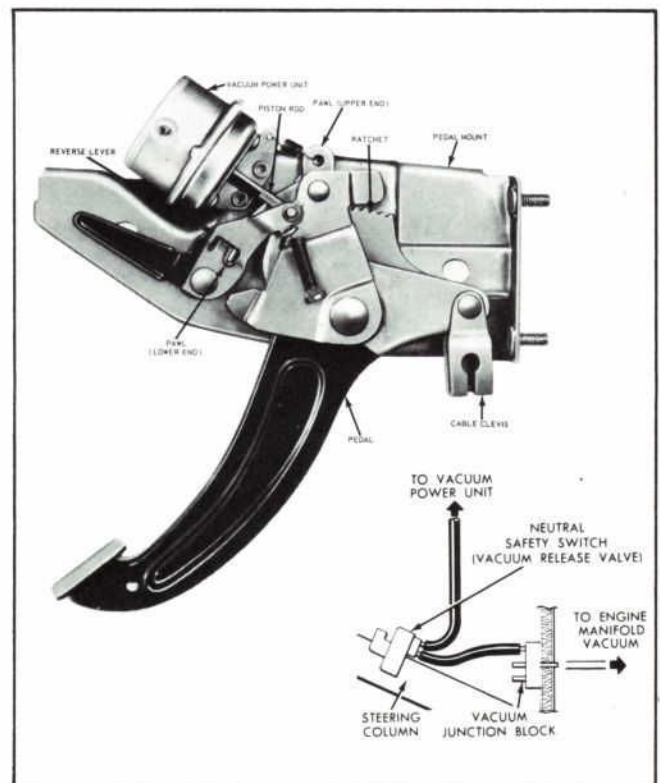


Figure 8—Automatic Release Parking Brake—Typical

BRAKE SYSTEMS . . . PART 2

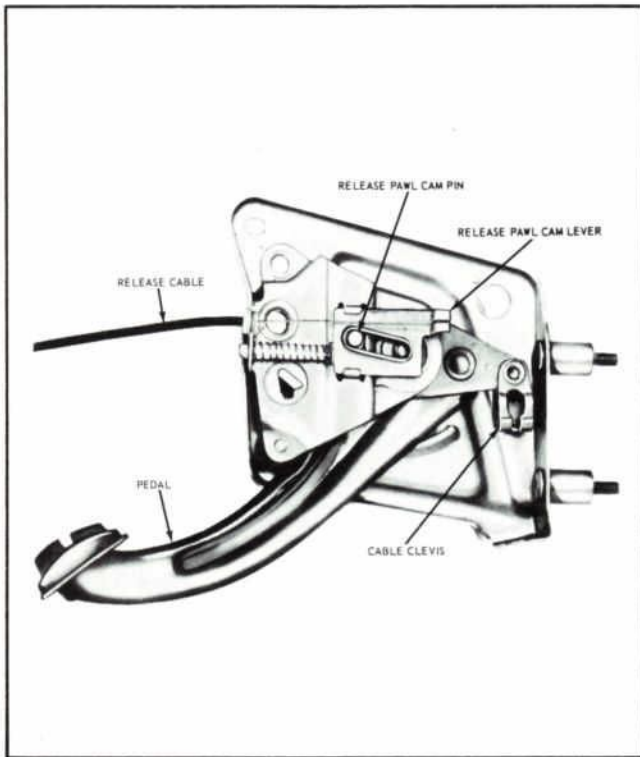


Figure 9—Manual Parking Brake—Typical

design whereby the parking brakes are released by pulling on a release lever. The vacuum type releases the parking brake automatically when the transmission selector lever is moved into any drive position with the engine running. This opens the release valve (Fig. 8) to connect engine manifold vacuum to one side of the actuating piston in the power booster unit. A pressure differential is created that causes the piston and link to pull the release lever.

The brakes will not release, however, when the selector lever is in neutral or park, with the engine running, or in any position with the engine off.

Cars not equipped with a foot-operated parking brake use a hand-operated control. Pulling the handle forces the brake shoes against the drums. Turning the handle disengages a pawl from a ratchet to release the brakes.

PARKING BRAKE ADJUSTMENTS

Exact parking brake adjustment procedures vary from car-to-car and year-to-year. Generally, it involves adjusting a nut at the parking brake equalizer assembly (usually located under the center of the car) so application of the parking brake pedal or handle will hold the rear brake drums.

The following procedure is for 1969 models, but can be used as a guide for past models.

Ford, Mercury, Fairlane, Montego, Falcon, Mustang, and Cougar

Check the parking brake cables when the brakes are fully released and the brake drums cool. If cables are loose, adjust them as follows:

1. Fully release parking brake pedal by pulling release lever.
2. Depress parking brake pedal until it engages first notch of control. On vacuum release brake, the first notch will be about two inches of pedal travel.
3. Raise vehicle. With transmission in neutral, turn the adjusting nut forward against the equalizer (Figs. 10 & 11) until there is 100 ft-lb of breakaway torque. Breakaway torque is the torque required to turn the rear wheels in forward rotation with a torque wrench and a tool such as shown in Figure 12. *The torque measurement must be made relative to the center line of the wheel.*
4. Release parking brake and check to make sure the brake shoes return to the fully released position.
5. Depress parking brake pedal to third notch. Under normal conditions, this will hold vehicle satisfactorily.
6. Release parking brake again, and check as in step 4.
7. If rear brakes do not fully release, check cables for kinks or binds. Free cables as required.
8. Lower vehicle. Remove torque wrench and tool. Install wheel nuts and wheel covers.

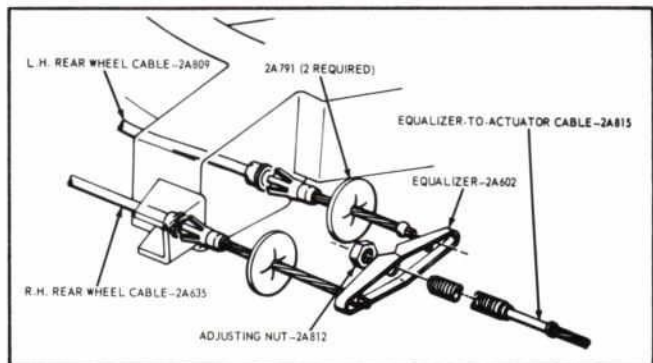


Figure 10—Parking Brake Adjustment—Ford, Mercury, Thunderbird, and Continental Mark III

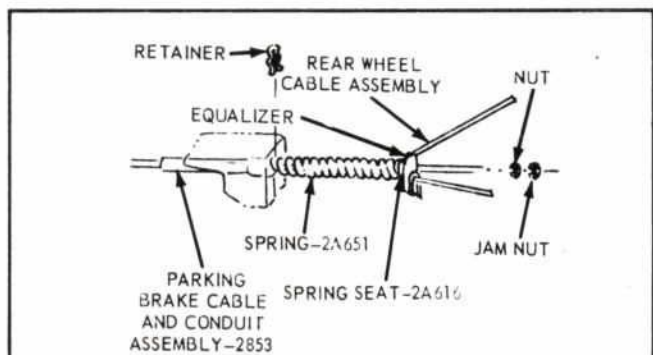


Figure 11—Parking Brake Adjustment—Fairlane, Montego, Falcon, Mustang, and Cougar

SERVICING FORD



Thunderbird, Continental Mark III, and Lincoln Continental

Check the parking brake cables when the brakes are fully released and the brake drums cool. If the cables are loose, adjust them as follows:

1. Fully release parking brake pedal by pushing down the manual release lever.
2. Depress parking brake pedal 1¼-inch from its normal released position.
3. Raise vehicle with transmission in neutral.

4. Loosen the lock nut and turn adjusting nut forward against the equalizer (Figs. 10 & 13) until there is 100 ft-lbs of breakaway torque. Tighten the lock nut.
5. Release parking brake and check to make sure the brake shoes return to the fully released position.
6. Depress parking brake pedal until it is fully engaged.
7. Release parking brake again and check as in step 5.
8. Depress the pedal ½-inch. The brakes should not drag.
9. If rear brakes do not fully release, check the cables for kinks or binds. Free cables as required.
10. Lower vehicle. Remove torque wrench and tool. Install wheel nuts and wheel covers.

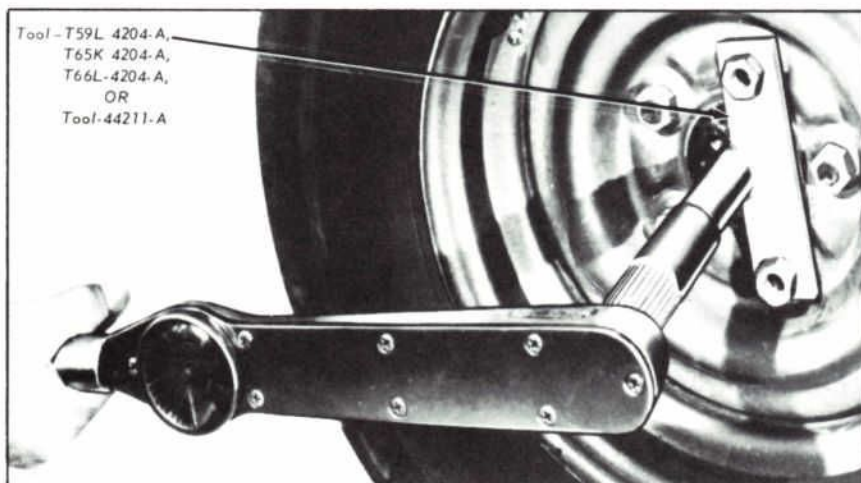


Figure 12—Checking Parking Brake Breakaway Torque

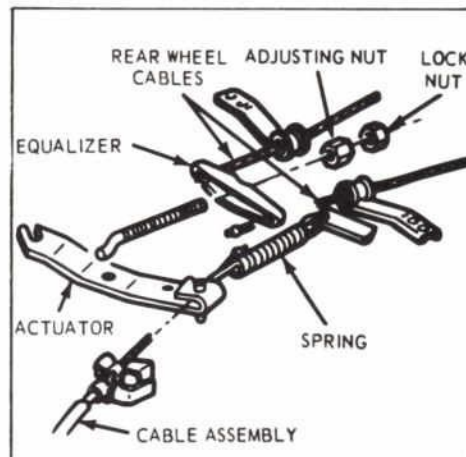


Figure 13—Parking Brake Linkage Adjustment—Lincoln Continental

CORTINA BRAKE SERVICE

The Cortina brake system is similar to that used in other Ford Motor Company vehicles. 1967-68-69 models have "dual" hydraulic lines (Fig. 14) with an instrument panel warning light. Front brakes are "disc" (Fig. 15) with drum-type used on the rear. The disc brakes are the "fixed" caliper type, whereby the complete caliper assembly is bolted to the wheel spindle, as on 1969 Lincoln Continentals. On Cortina GT models the calipers are forward facing, while Deluxe models utilize rearward facing calipers (Fig. 16). The lining pads are also different, as shown in Figure 16, which is important to remember when replacement is necessary.

The conventional rear drum brakes incorporate a self-adjusting mechanism that is activated by a pull handle parking brake. Cortina GT models use 9-inch drums and Cortina Deluxe models use 8-inch drums. Wheel cylinders also may vary in size, which again is important to remember when parts must be replaced.

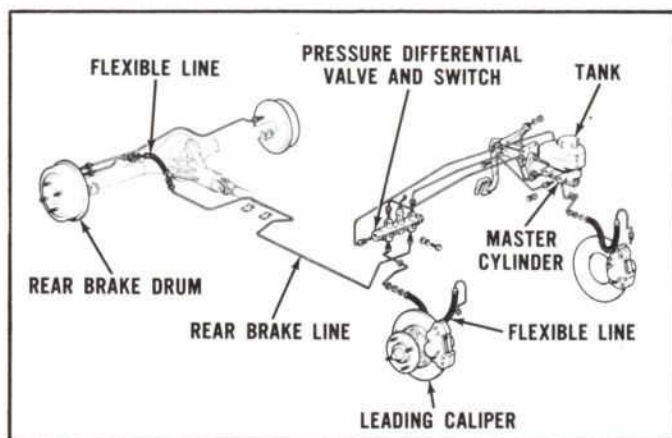


Figure 14—Cortina Dual Hydraulic Brake System

BRAKE SYSTEMS . . . PART 2



Figure 15—Cortina Fixed Caliper Disc Brake

CORTINA FRONT DISC BRAKE SERVICE

Caliper Replacement

Remove hub caps and loosen wheel nuts. Then raise car on hoist and remove wheels. Withdraw retaining clips and pins and remove brake pads. If the caliper is to be overhauled, depress brake pedal to bring pistons into contact with the rotor, which will make it easier to remove the pistons. Remove hydraulic line from the connection at the rear of caliper. Fit a brake line plug to each open end. Bend up the lock tabs and remove the two caliper retaining bolts (Fig. 17). Remove caliper assembly.

When replacing caliper assembly, use a new locking plate. Tighten bolts to 45-50 ft-lbs of torque. Bend up lock tabs.

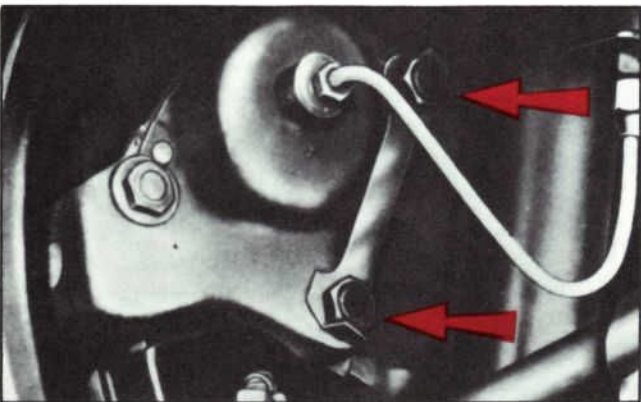


Figure 17—Caliper Lock Plate and Attaching Bolts

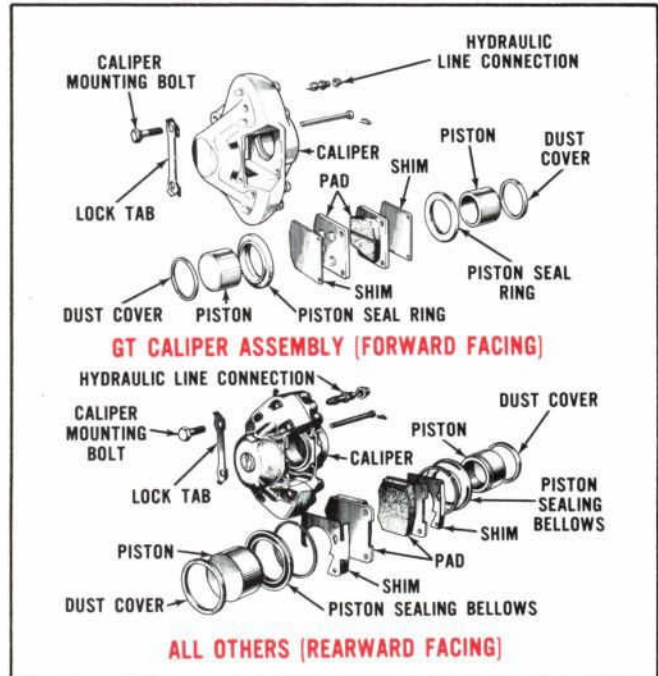


Figure 16—Exploded View—Cortina GT and Deluxe Calipers

Reconnect hydraulic lines. Push pistons sufficiently into their bores to accommodate pads. Install pads and shims. Secure in position with the retaining pins and clips. Replace wheels, lower car, tighten wheel nuts and install hub caps. Bleed brake system.

Caliper Pistons and/or Seals Replacement

NOTE: The two paired caliper halves, which are bolted together, never should be separated under any circumstances.

All Cortina Models Except GT

Remove clip securing dust cover to caliper. Remove cover. Remove piston. Using air or low hydraulic pressure will facilitate piston removal. Remove piston sealing ring from cylinder bore. Repeat these operations for the other cylinder. Wash pistons and cylinder bores with specified brake fluid. Do NOT use a mineral base fluid such as gasoline, kerosene, carbon tetrachloride, etc.

Inspect pistons and bores to be sure they're free from score marks or rust. Damaged pistons should be replaced. Cylinders can be honed to a maximum of 0.003-inch beyond their original diameters. Reassemble with NEW brake cylinder repair kit. Install piston seal in annular groove provided in the cylinder.

Place piston crown first into cylinder, then push piston into the cylinder as far as possible. Fit dust cover over piston and secure to caliper with clip. Repeat these operations for the other cylinder.



GT Models Only

Partially remove piston from one cylinder bore and remove the sealing bellows from its location in the lower part of piston skirt. Using air pressure or low hydraulic pressure will facilitate piston removal. Withdraw the piston. Pull the sealing bellows from its location in the annular ring machined in the cylinder bore. Remove piston sealing ring from cylinder bore. Repeat these operations for the other cylinder. Wash pistons and cylinder bores with specified brake fluid. Do NOT use a mineral base fluid such as gasoline, kerosene, carbon tetrachloride, etc. Inspect pistons and bores to be sure they're free from score marks or rust. Damaged pistons should be replaced. Cylinders can be honed to a maximum of 0.003-inch beyond their original diameters.

Reassemble with NEW brake cylinder repair kit. Install piston seal in annular groove provided in the cylinder. Install rubber bellows in cylinder with the lip that is turned outwards fitting in groove provided in the cylinder. Place piston, crown first, through rubber sealing bellows and into cylinder. Be careful not to damage rubber bellows with the piston. With the piston in cylinder, install the inner edge of the bellows in the annular groove located in piston skirt. Push the piston down in cylinder bore as far as possible. Repeat these operations for the other cylinder.

Disc Brake Pad Replacement

Apply parking brake, raise car and remove front wheels. Pull out retaining clips, withdraw retaining pins and remove brake pads and shims, using if necessary, needle nose pliers. **NOTE:** Prior to installing new pads, check to see they are the correct type, as illustrated in Figure 18. Also be sure the pads and disc are free from grease, oil, or dirt.

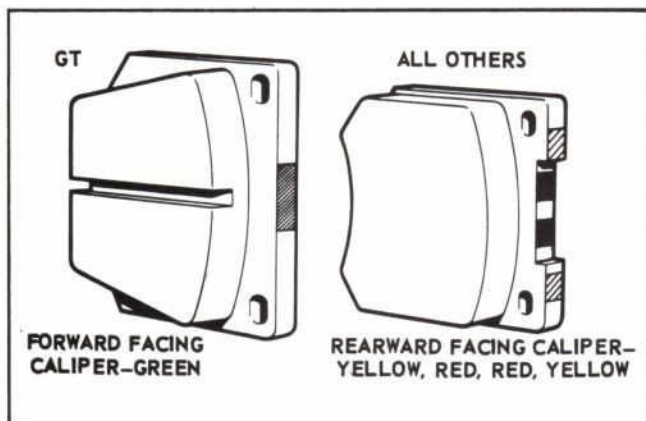


Figure 18—Brake Pad Color Coding

Push pistons into their bores. This may cause fluid to overflow if the master cylinder has recently been topped-off. To avoid this, examine fluid level and, if necessary, remove a quantity of fluid. Install new pads and shims (Fig. 19). Shims for "rearward" facing calipers incorporate an arrow that must point in direction of forward rotation of the wheel. Shims for "forward" facing calipers may be installed either way. Install

retaining pins and secure with retaining pin clips (Fig. 20). Operate the brake pedal several times to bring the pads into correct adjustment. Check to see that the pads are free to move slightly. This indicates the retaining pins are not fouling the pad. Replace wheels and lower car. Tighten wheel nuts and replace hub caps.

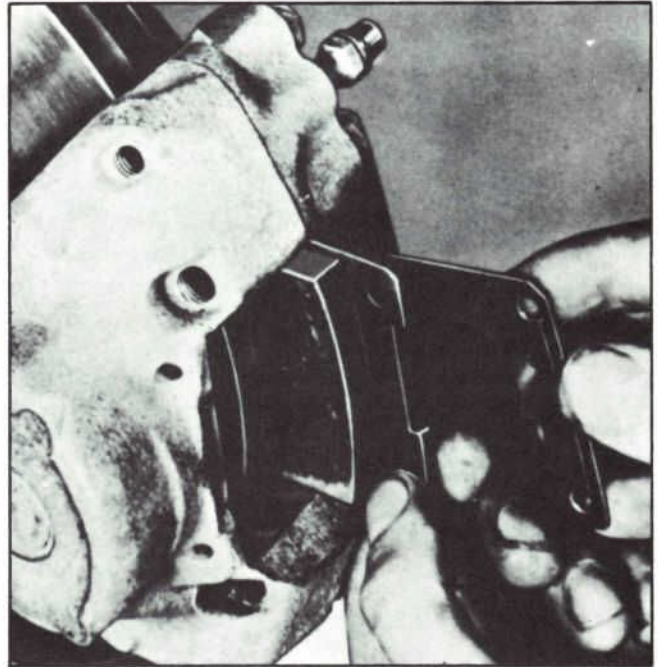


Figure 19—Installing Rearward-Facing Pads and Shims

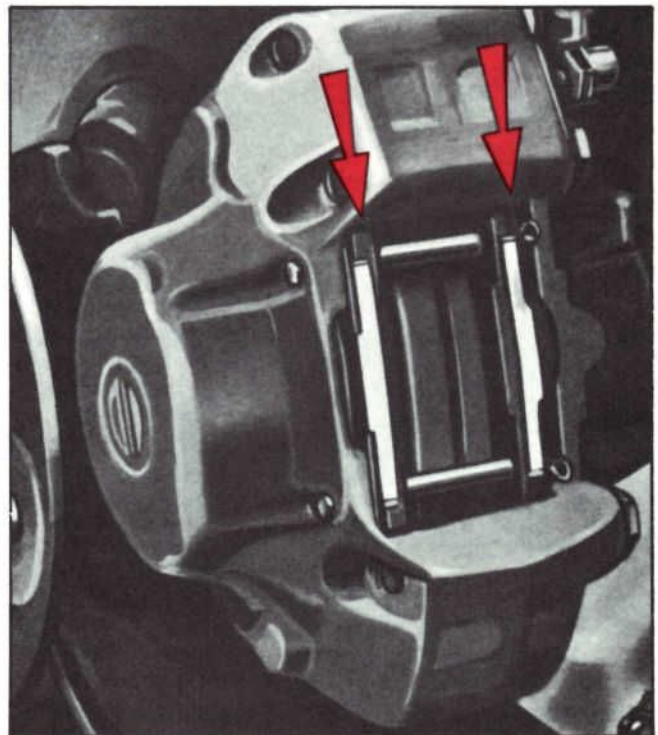


Figure 20—Rearward Facing-Retaining Pins and Clips

BRAKE SYSTEMS . . . PART 2

Rotor Replacement

Damage or excessive run-out of the rotor will necessitate its replacement. The maximum allowable is 0.004-inch total indicator reading. Excessive run-out may be caused by a worn or distorted rotor, dirt between the rotor and hub faces, or mis-alignment of the hub bearing. Whatever the cause, it should be corrected. If the rotor must be replaced, proceed as follows.

Pry dust cap from end of hub. Remove cotter pin and adjusting nut retainer, then unscrew adjusting nut and remove thrust washer and outer bearing cone. Remove hub and rotor assembly from wheel spindle. Remove rotor from hub by bending back bolt lock tabs and unscrewing bolts. Discard lock plates and bolts.

Thoroughly clean mating surfaces of hub and rotor. Align mating marks, place rotor on hub and install two new locking plates and four new bolts. Torque to 30-34 ft-lbs and bend up locking tabs. Install hub and rotor assembly on wheel spindle with outer bearing cone, thrust washer and adjusting nut. Tighten nut to 27 ft-lbs while retaining the rotor to assure proper seating of the bearings. Loosen nut 90° and align nut retainer so that one of the retainer castellations lines up cotter pin hole in spindle. Install cotter pin. Check rotor run-out (relative to axis of spindle) as follows:

- a. Disconnect track rod from the steering arm at its outer end, after removing cotter pin and nut and separating ball joint.
- b. Attach a dial indicator to the steering arm and check run-out. Run-out must not exceed 0.004-inch.
- c. Remove indicator and re-assemble track rod to steering arm. Tighten nut to 18-22 ft-lbs and install new cotter pin.

Tap dust cap into place on end of hub.

CORTINA REAR DRUM BRAKE SERVICE Replace Brake Shoes

Brake shoes should be inspected for wear at 6,000 mile intervals. If the linings are worn to less than 1/32-inch above rivet heads, they should be replaced.

Remove hub cap, loosen wheel nut, and raise vehicle. Check to see that the handbrake is fully released, then remove pan head screw securing the brake drum to the half-shaft and remove drum. Remove shoe hold down springs (Fig. 21) from each shoe by turning the top washer 90°, then pull off washer and spring. Disengage each shoe from its location slot in the fixed pivot and the wheel cylinder and remove shoes. To prevent piston from falling out of wheel cylinder, retain with a rubber band around the cylinder. Remove the retracting springs from the brake shoes. Remove the self-adjusting ratchet wheel assembly from the wheel cylinder and rotate the wheel until it butts against the slotted-head bolt shoulder. This moves brake shoes to the fully off adjustment. If this is not done, difficulty may be encountered when reassembling the brake drum.

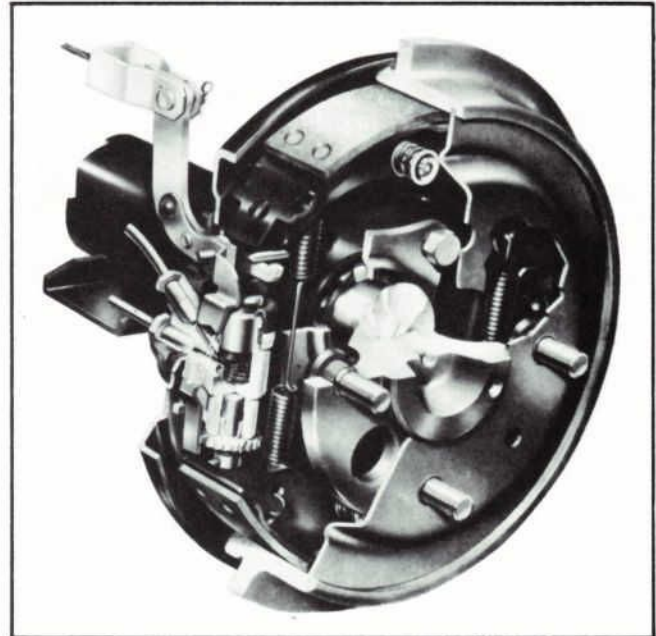


Figure 21—Rear Drum Brake Assembly

When installing new brake shoes, first assemble retracting springs between the two shoes. On 9-inch drums, they must be installed from the drum side of the shoe. On 8-inch drums, install springs on the backing plate side. Apply a light coating of high temperature molybdenum disulfide grease (Ford Part No. CIAZ-19590-B), or equivalent, to the brake shoe pads, brake shoe pivots, ratchet wheel threads of the self-adjusters, and wheel cylinder recess. Fit shoes to backing plate by positioning the rear shoe on the fixed pivot and over the handbrake link.

Secure to backing plate with hold down spindles and retain the spindles with a washer, spring and another washer. Turn the top washer through 90°. Check to see that the shoes are firmly seated and the springs are not binding on backing plate or wheel cylinder. Install brake drum and secure with pan head screw. Install wheel, lower car, tighten wheel nuts and replace the hub cap. Operate handbrake several times to bring brakes into correct adjustment. Check operation of brakes on a road test.

Wheel Cylinder Remove

Disconnect brake fluid pipe (two on right-hand backing plate) and install brake line plugs. Remove spring clip and clevis pin from handbrake link on the inside of the backing plate. Pull the rubber boot on rear of wheel cylinder away from backing plate and remove. Pull off the two "U" shaped retainers securing the cylinder to the backing plate. Remove the wheel cylinder and handbrake link.

Overhaul

Remove boot retainer, pull off boot and withdraw piston, complete with seal from wheel cylinder bore (Fig. 22). Separate seal from piston. Remove the return spring from the



cylinder bore. Remove the ratchet wheel and screw assembly from the other end of the wheel cylinder.

Wash and inspect all parts for wear or damage. Discard unserviceable parts. Secure new overhaul kit. Dip piston and seal in specified brake fluid and re-assemble them. Assemble seal to the piston with flat face of seal adjacent to piston rear shoulder. Install return spring in wheel cylinder bore. Dip piston and seal assembly in specified brake fluid, and insert into cylinder bore seal first. Install rubber boot and retainer over wheel cylinder. Replace self-adjuster ratchet wheel and screw assembly in wheel cylinder recess, after applying high temperature grease to threads. Rotate ratchet wheel until it butts against the shoulder of the slotted-head bolt. This will assure that the brakes are in the fully "off" position.

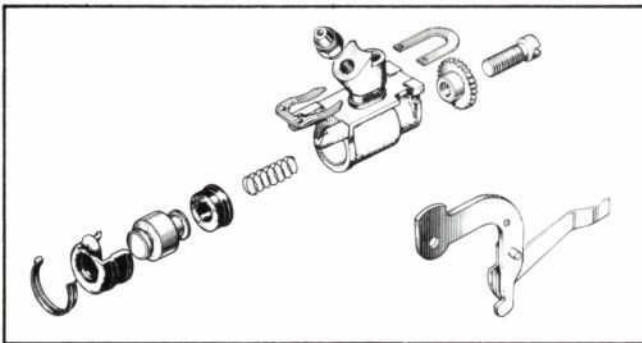


Figure 22—Wheel Cylinder

Replace

Apply high temperature grease in area where wheel cylinder slides. Replace handbrake link and wheel cylinder in backing plate. Be sure the pivot of handbrake link is correctly located in the slot in the wheel cylinder body. Using the "U" shaped flat retainer, attach the wheel cylinder to the backing plate. Note that the spring retainer is attached from the handbrake link end of wheel cylinder and the flat retainer from the other end.

Install rubber boot. Check to see that wheel cylinder can slide in carrier plate. Also be sure the handbrake link operates the self-adjusting mechanism. **NOTE:** *Be sure to use right-hand threaded ratchet on right-hand wheel cylinder and left-hand threaded ratchet on left-hand wheel cylinder. Apply high temperature grease to brake shoe support pads. Reconnect handbrake linkage to handbrake link. Remove brake line plugs and reconnect brake lines. After installing brake shoes, and brake drums, bleed the brake system and road test the car.*

Master Cylinder Overhaul

Remove the master cylinder from the vehicle. Remove rubber boot, circlip and detach push rod. Remove screws retaining reservoir to body. Swing body out of way. Remove circlip end spring from primary recuperating valve (Fig. 23). With Allen wrench, unscrew plug that retains valve and lift out. Plug two outlet ports and block off primary recuperating valve opening. Using an air line, blow air into secondary recuperating valve aperture and expel primary piston and spring, and

secondary piston and recuperating valve assembly. Remove primary piston seal from primary piston. The secondary piston is held in the spring retainer by a tab that engages under a shoulder on front of piston. Carefully lift this tab and remove the piston. Compress the spring and move the retainer to one side to release the end of secondary recuperating valve stem from the retainer. Slide valve spacer and shim off valve stem. Remove rubber valve seal and secondary piston seal.

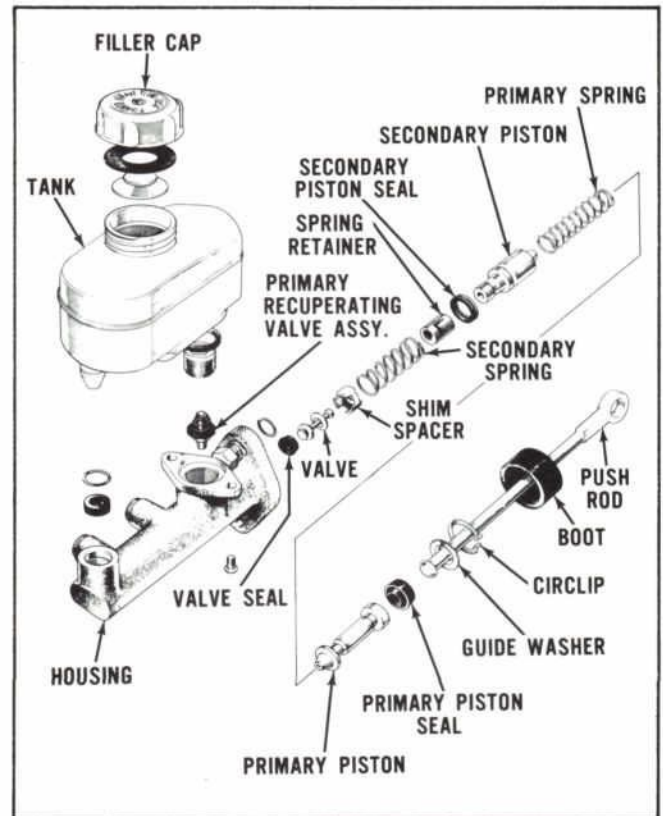


Figure 23—Dual Brake Master Cylinder

Wash all parts in alcohol or specified brake fluid. Do not use mineral base oils (gasoline, kerosene, or carbon tetrachloride). Inspect pistons and cylinder bore for score marks and other damage. Replace unserviceable parts. Install a new seal to the secondary piston. Replace shim washer on valve stem together with the seal spacer so the legs of spacer are towards the valve seal. Be sure that the shim is installed concentrically on the rear shoulder of valve stem so its convex face butts against the shoulder flange. Install return spring over valve stem and insert spring retainer into the end of return spring. Compress spring and the boss on the valve stem in its recess in spring retainer.

Insert end of secondary piston into spring retainer and secure by pressing down the tap so that it is positioned against the shoulder of the piston. Dip secondary piston and recuperating valve assembly in specified brake fluid, and push into cylinder with valve leading. Install a new seal in the primary piston. Install primary piston spring into cylinder. Dip primary piston

BRAKE SYSTEMS . . . PART 2

in specified brake fluid and push into cylinder with the drilled end leading.

Install push rod into the recess in the end of primary piston, press the guide washer into position and secure the complete assembly with the circlip. Check to see that the push rod moves freely. Install the primary recuperating valve into its aperture, moving the push rod as necessary to gain access. Screw retaining plug into position with Allen wrench. Assemble the spring and circlip to the valve plunger. Cycle push rod and be sure the primary recuperating valve "tips" open when the push rod is fully withdrawn, and the valve closes when the push rod is pushed in. Check seals in the recuperating valve entry ports. Install new seals if necessary. Install reservoir and secure with two crosshead screws. Install master cylinder in vehicle. Fill master cylinder with specified brake fluid. Bleed brake system and road test the car.

Bleeding Hydraulic System

Bleeding Cortina brake systems is similar to the procedure used on other cars. The only difference is that the piston in the valve and switch assembly (Fig. 24) must be held in the central position. If this is not done, it is very difficult to get the brake warning light to go out and stay out.

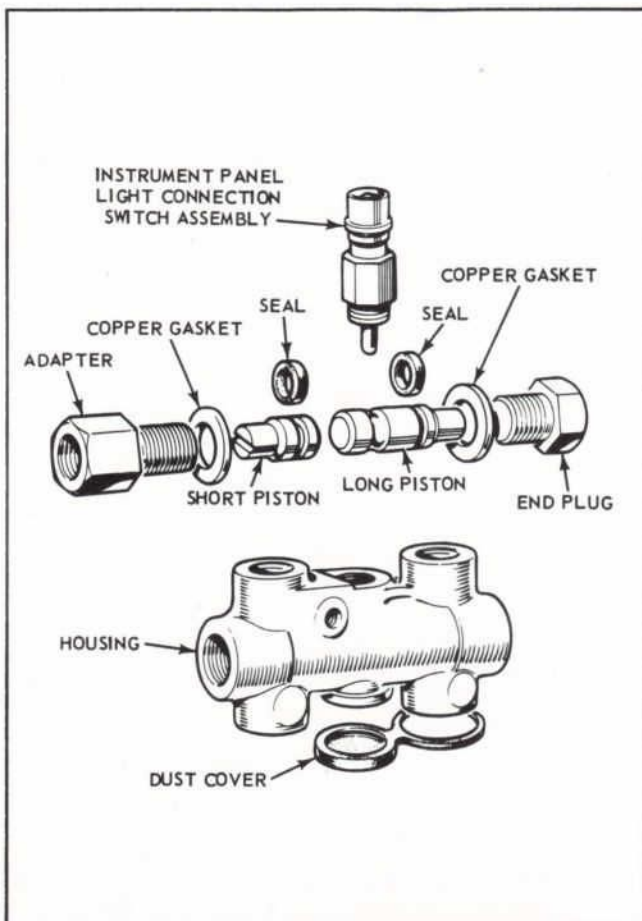


Figure 24—Valve and Switch Assembly

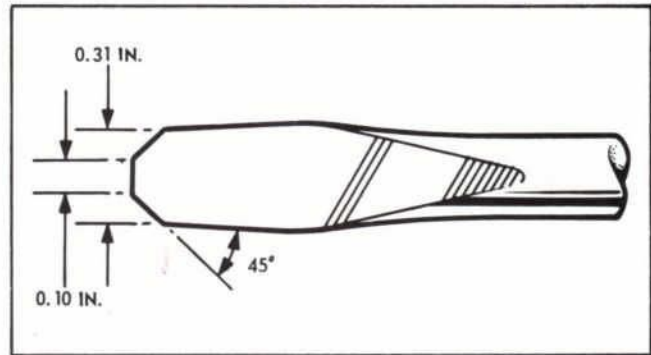


Figure 25—Modified Screwdriver to Centralize Valve

Centralize the piston in the valve and switch assembly, using a screw driver with a blade modified as shown in Figure 25. Insert the tool through the hole in the base of the assembly after removing the rubber dust cover. Remove reservoir cap and fill reservoir with specified brake fluid to assure both halves are filled. Remove rubber dust cap from the right-hand front bleed nipple and fit a bleed tube to it. Place other end of the tube in a glass jar containing a small quantity of specified brake fluid. During bleeding operation, the end of the line must be kept immersed in brake fluid.

Unscrew bleed valve about half-a-turn, depress the brake pedal fully and allow it to return to its "off" or full up position. Brake fluid and/or air should have been pumped into the jar, if not, unscrew bleed valve further. Pause for a moment (about three seconds) to allow full recuperation of the master cylinder. Continue depressing brake pedal, pausing after each return stroke, until the fluid entering the jar is clean and free from air bubbles. Press the pedal down to the floor and hold it there while the bleed valve is tightened. The correct tightening torque is 5-7 ft-lbs. **DO NOT OVER TIGHTEN.** During the bleeding operation, keep the master cylinder filled with the specified brake fluid.

Remove the tube and replace the rubber dust cap. Bleed the left-hand front brake in the same way. Bleed the left-hand rear brake in the same way. Fill master cylinder reservoir and replace the cap after checking that the vent hole is open. Remove the tool from valve and switch assembly and, with the ignition switch on, depress the brake pedal several times. The brake warning light should not light. With the ignition switch still on, operate the test switch on the lower left edge of instrument panel; the warning light should light.

CORTINA

Brake Fluid Specifications

Ford Brake Fluid—Extra Heavy Duty (Part No. C6AZ-19542-A) (Spec. ESA-M6C25-A), or equivalent, is recommended for all Cortina models. This brake fluid is colored "blue" for identification purposes.

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