

BRAKES**GROUP
2**

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**PART
2-1****GENERAL BRAKE SERVICE**

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1 DIAGNOSIS AND TESTING**PRELIMINARY TESTING**

1. Check the fluid level in the master cylinder, and add SAE 70R3-Wagner 21B(301) brake fluid if required.

2. Push the brake pedal down as far as it will go while the engine is running or vacuum is in the system and the car is standing still. If the pedal travels more than halfway between the released position and the floor, check the brake adjustment and the automatic adjusters.

To check rear brake adjuster operation, check the shoes and the adjuster components for binding or improper installation and follow the procedure described under "Brake Shoe Adjustments" in Part 2-2, Section 2.

Make several reverse brake stops to ensure uniform adjustment at the rear wheels.

On front disc brakes, the automatic adjustment is a permanent built-in feature.

3. With the transmission in neutral, stop the engine and apply the

parking brake. Depress the service brake pedal several times to exhaust all vacuum in the system. Then, depress the pedal and hold it in the 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. Follow the procedures in the "Booster Diagnosis Guide."

4. With the engine shut off, exhaust all vacuum in the system. Depress the brake pedal and hold it in the applied position. If the pedal gradually falls away under this pressure, the hydraulic system is leaking. Check all tubing, hoses, calipers, wheel cylinders, and connections for leaks.

If the brake pedal movement feels spongy, bleed the hydraulic system to remove air from the lines and cylinder. See "Hydraulic System Bleeding," Section 2. Also, check for leaks or insufficient fluid.

5. Should one of the brakes be

locked and the car must be moved, open the bleeder screw long enough to let out a few drops of brake fluid. **This bleeding operation will release the brakes, but it will not correct the cause of the trouble.**

ROAD TEST

The car should be road tested only if the brakes will safely stop the car. Apply the brakes at a speed of 25-30 mph to check for the existence of the trouble symptoms listed in Table 1, with the exception of brake chatter and those symptoms resolved in the preliminary tests. For each of the symptoms encountered, check and eliminate the causes which are also listed in Table 1. To check for brake chatter or surge, apply the brakes lightly at approximately 50 mph. Chatter or surge will apply almost entirely to rear brakes only.

For booster removal and installation procedures, refer to Part 2-2, Section 3. For disassembly and assembly procedures, refer to Part 2-2, Section 4. For cleaning and inspection refer to Part 2-1, Section 3.

TABLE 1—Front (Disc) Brake Trouble Symptoms and Possible Causes

| POSSIBLE CAUSES OF TROUBLE | TROUBLE SYMPTOMS | | | | | | | | | |
|--|------------------------|--|------------------------|------|-------|--------|---|----------------------|-----------------------------------|---|
| | Excessive Pedal Travel | Brake Roughness or Chatter (Pedal Pumping) | Excessive Pedal Effort | Pull | Groan | Rattle | Brakes Heat Up During Driving and Fail to Release | Leaky Wheel Cylinder | Grabbing or Uneven Braking Action | No Braking Effect When Pedal is Depressed |
| Shoe and Lining Knock-back after Violent Cornering or Rough Road Travel | X | | | | | | | | | |
| Piston and Shoe and Lining Assembly not Properly Seated or Positioned | X | | | | | | | | | X |
| Air Leak or Insufficient Fluid in System or Caliper | X | | | | | | | | | X |
| Loose Wheel Bearing Adjustment | X | | | | | | | | | |
| Damaged or Worn Caliper Piston Seal | X | | | | | | | X | | X |
| Improper Booster Push Rod Adjustment | X | | | | | | | | | |
| Excessive Lateral Run-Out of Rotor | | X | | | | | | | | |
| Rotor Excessively out of Parallel | | X | | | | | | | | |
| Frozen or Seized Pistons | | | X | X | | | X | | X | |
| Brake Fluid, Oil or Grease on Linings | | | X | X | | | | | X | |
| Shoe and Lining Worn Below Specifications | | | X | | | | | | | |
| Proportioning Valve Malfunction | | | X | | | | | | X | |
| Booster Inoperative | | | X | | | | | | | |
| Caliper Out of Alignment with Rotor | | | | X | | | | | X | |
| Loose Caliper Attachment | | | | X | | | | | X | |
| Need to Slightly Increase or Decrease Pedal Effort | | | | | X | | | | | |
| Excessive Clearance Between Shoe and Caliper or Between Shoe and Splash Shield | | | | | | X | | | | |
| Shoe Hold Down Clips Missing or Improperly Positioned | | | | | | X | | | | |
| Operator Riding Brake Pedal | | | | | | | X | | | |
| Scores in the Cylinder Bore | | | | | | | | X | | |
| Corrosion Build-Up in the Cylinder Bore or on the Piston Surface | | | | | | | | X | | |
| Bleeder Screw Still Open | | | | | | | | | | X |
| Caliper Out of Parallel with Rotor | | | | X | | | | | | |

TABLE 2—Rear (Drum) Brake and General System Trouble Symptoms and Possible Causes

| POSSIBLE CAUSES OF TROUBLE | TROUBLE SYMPTOMS | | | | | | | | | | | | |
|--|------------------|-----------------|------------|--------------|-----------------------|-----------------|----------------|------------------------|-------------------------------|---------------|--------------------------|--------------------------|---------------------|
| | One Brake Drags | All Brakes Drag | Hard Pedal | Spongy Pedal | Car Pulls to One Side | One Wheel Locks | Brakes Chatter | Excessive Pedal Travel | Pedal Gradually Goes to Floor | Brakes Uneven | Shoe Click After Release | Noisy or Grabbing Brakes | Brakes Do Not Apply |
| Mechanical Resistance at Pedal or Shoes | | X | X | | | | | | | | | | |
| Brake Line Restricted | X | X | X | | X | | | | | | | | |
| Leaks or Insufficient Fluid | | | | X | | | | X | X | | | | X |
| Improper Tire Pressure | | | | | X | | | | | X | | | |
| Distorted or Improperly Adjusted Brake Shoe | X | X | X | | X | X | | X | | | | X | |
| Faulty Retracting Spring | X | | | | X | | | | | | | | |
| Drum Out of Round | X | | | | X | | X | | | | | | |
| Lining Glazed or Worn | | | X | | X | X | X | X | | | | X | X |
| Oil or Grease on Lining | | | | | X | X | X | | | X | | X | X |
| Loose Carrier Plate | X | | | | | X | X | | | | | | |
| Loose Lining | | | | | | | X | | | | | | |
| Scored Drum | | | | | | | | | | X | | X | |
| Dirt on Drum-Lining Surface | | | | | | | | | | | | X | |
| Faulty Brake Cylinder | X | | | | X | X | | | | | | X | |
| Dirty Brake Fluid | X | X | | | | | | | | X | | | X |
| Faulty Master Cylinder | | X | | | | | | X | X | | | | X |
| Air in Hydraulic System | X | | | X | | | | X | | | | | X |
| Self Adjusters Not Operating | | | | | X | | | X | | | | | |
| Insufficient Shoe-to-Carrier Plate Lubrication | X | | | | | | | | | | X | X | |
| Tire Tread Worn | | | | | | X | | | | | | | |
| Poor Lining to Drum Contact | | | | | | | X | | | | | | |
| Loose Front Suspension | | | | | | | X | | | | | | |
| "Threads" Left by Drum Turning Tool Pulls Shoes Sideways | | | | | | | | | | | X | | |
| Cracked Drum | | | | | | | | X | | | | | |

BOOSTER DIAGNOSIS GUIDE

| | | |
|---|---|---|
| <p>BOOSTER INOPERATIVE— HARD PEDAL</p> | <p>If the preliminary tests show that the booster is inoperative or if a hard pedal condition still exists after eliminating the causes of "Excessive Pedal Effort" or "Hard Pedal" listed in Tables 1 and 2 the trouble may be caused by vacuum leakage. Disconnect the vacuum line at the booster, remove the vacuum manifold and check valve assembly, and look for a sticking or faulty check valve. Check all vacuum connections for leakage or obstruction. Check all hoses for a leaking or collapsed condition. Re-</p> | <p>pair or replace parts as necessary. If the foregoing procedure does not eliminate the trouble, remove the booster from the car. Separate the front shell from the rear shell, and check the valve and rod assembly reaction disc, diaphragm plates and diaphragm assemblies for damage that would cause leaks. When assembling, be sure that the diaphragm assemblies are properly positioned. Improper location could cause leakage between the vacuum and atmospheric sides of the diaphragms.</p> |
| <p>BRAKES DRAG OR GRAB</p> | <p>If the brakes still drag or grab after eliminating the causes listed in Tables 1 and 2, the condition is probably caused by a sticking valve</p> | <p>plunger assembly. Remove and disassemble the booster. Clean, inspect, and replace parts as necessary.</p> |
| <p>SELF APPLICATION OF BRAKES WHEN ENGINE STARTS</p> | <p>Remove and disassemble the booster. Check for a leak in the rear shell. Check the diaphragms for being out of locating radii in the housing. Check for a sticking or un-</p> | <p>seated valve poppet. Clean, inspect and replace parts as necessary. Be sure that the diaphragms are properly located when assembling.</p> |

2 COMMON ADJUSTMENTS AND REPAIRS

PARKING BRAKE LINKAGE ADJUSTMENT

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

1. Fully release the parking brake pedal by pushing down the manual release lever.
2. Raise the car.
3. Adjust the equalizer lever against the cable spring on the pedal cable to the dimension shown in Fig. 1.
4. Loosen the adjusting nut on the equalizer rod, and then turn the lock nut in front of the equalizer several turns forward.
5. Depress the parking brake pedal $1\frac{3}{4}$ inches from its normal released position.
6. While turning the rear wheels in a rearward direction, turn the adjusting nut against the equalizer until a moderate drag is felt (Fig. 1).
7. When the cables are properly adjusted, tighten the locknut against the equalizer.

8. Release the parking brake, and check to make sure that the brake shoes return to the fully released position.

9. Depress the parking brake pedal two inches. Under normal conditions, this will satisfactorily hold the car.

10. Release the parking brake again, and then depress the pedal $\frac{1}{2}$ inch. The brakes should not drag with the pedal depressed $\frac{1}{2}$ inch.

If the rear brakes do not fully release, check the cables for kinks or binds. Free the cables as required.

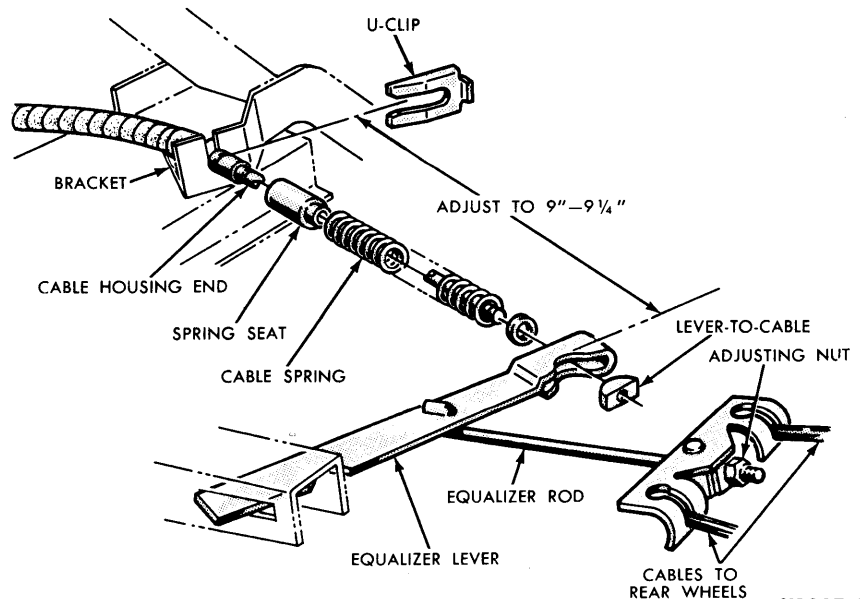


FIG. 1—Parking Brake Adjustments

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MASTER CYLINDER PUSH ROD ADJUSTMENT

The push rod is designed with a self-locking adjustment screw to provide the correct relationship between the booster piston and the master cylinder piston. 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 push rod assembly remains in the original unit.** However, when a new push rod is used or the push rod assembly is transferred to another unit, the distance from the end of the adjustment screw to the mounting surface of the booster body should be rechecked either with a micrometer depth gauge to a dimension of 0.990-0.995 inch, or with a height gauge as shown in Fig. 2. The details for making a height gauge are given in Fig. 3.

To adjust the push rod, hold the serrated end of the rod with cross-milled pliers and turn the adjustment screw in to shorten, or out to lengthen.

After assembly of the master cylinder to the power section, the piston cup in the hydraulic cylinder should just clear the compensating port hole when the unit is in the fully released position. This can be checked by placing a few drops of brake fluid over the compensating port and applying light air pressure to the output port of the master cylinder. If air bubbles appear, the port is open. If the primary piston cup overlaps the compensating port, there will be no flow of air through the compensating port. If this condition exists, the adjustment screw should be turned into the push rod a slight amount or until the compensating port is open.

HYDRAULIC SYSTEM BLEEDING

When any part of the hydraulic system has been disconnected for repair or replacement, air may get into the lines and cause spongy pedal action. Bleed the hydraulic system after it has been properly connected

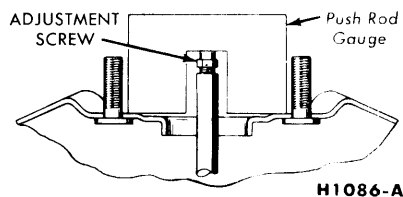


FIG. 2—Push Rod Adjustment

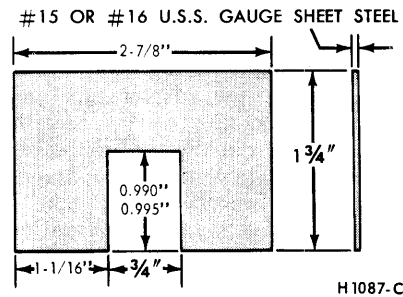


FIG. 3—Push Rod Gauge Dimensions

to be sure that all air is expelled from the brake cylinders, disc brake calipers, and lines.

The hydraulic system can be bled manually or with pressure bleeding equipment.

With disc brakes, more pumping of the pedal is required and more frequent checking of the master cylinder may be necessary while bleeding.

Remove the front wheel and tire assemblies in order to gain access to the bleeder fittings on the disc brake calipers.

MANUAL BLEEDING

Bleed the longest lines first. Keep the master cylinder reservoir filled with new SAE 70R3-Wagner 21B (301) brake fluid during the bleeding operation.

Never use brake fluid which has been drained from the hydraulic system.

1. Position a bent $\frac{3}{8}$ -inch box wrench on the bleeder fitting on the right rear brake wheel cylinder (Fig. 4). Attach a rubber drain tube to the bleeder fitting. **The end of the tube should fit snugly around the bleeder fitting.**

2. 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.

3. Push the brake pedal down slowly thru its full travel. Close the bleeder fitting, then return the pedal to the fully-released position. Repeat this operation until air bubbles cease to appear at the submerged end of the tube.

4. When the fluid is completely free of air bubbles, close the bleeder fitting and remove the drain tube.

5. Repeat this procedure on the brake cylinders or disc calipers at each wheel in order: left rear, right front, and left front. Refill the

master cylinder reservoir after each brake cylinder is bled and when the bleeding operation is completed. The fluid level should be within $\frac{3}{8}$ inch of the top of the reservoir. The diaphragm-type gasket should be properly positioned in the reservoir cap before the cap is installed.

6. Be sure that the front brake pistons are returned to their normal positions and that the shoe and lining assemblies are properly seated.

7. Before driving the car, check the operation of the brakes and be sure that a firm pedal is obtained.

PRESSURE BLEEDING

Bleed the longest lines first. **Never use brake fluid which has been drained from the hydraulic system.**

The bleeder tank should contain enough new heavy-duty brake fluid to complete the bleeding operation, and it should be charged with 10-30 pounds of air pressure.

1. Clean all dirt from the master cylinder reservoir cap.

2. Remove the master cylinder reservoir cap, install an adapter cap to the reservoir, and attach the bleeder tank hose to the fitting on the adapter cap.

An adapter cap can be fabricated by cutting a hole in the center of a reservoir cap and soldering a fitting at the hole. The adapter cap must be securely seated and completely sealed on the master cylinder or leakage will occur.

3. Position a $\frac{3}{8}$ -inch box wrench on the bleeder fitting on the right rear brake wheel cylinder (Fig. 4). Attach a rubber drain tube to the bleeder fitting. **The end of the tube should fit snugly around the bleeder fitting.**

4. Open the valve on the bleeder tank to admit pressurized brake fluid to the master cylinder reservoir.

5. Submerge the free end of the tube in a container partially filled with clean brake fluid, and loosen the bleeder fitting.

6. When air bubbles cease to appear in the fluid at the submerged

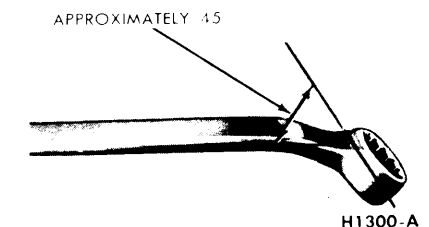


FIG. 4—Brake Bleeder Wrench

end of the drain tube, close the bleeder fitting and remove the tube.

7. Repeat this procedure on the brake cylinder or disc caliper at each wheel in order: left rear, right front, and left front. Refill the master cylinder reservoir after each brake cylinder is bled.

8. When the bleeding operation is

completed, close the bleeder tank valve and remove the tank hose from the adapter fitting.

9. Remove the adapter cap, refill the master cylinder reservoir to within $\frac{3}{8}$ inch from the top of the reservoir. Be sure that the diaphragm-type gasket is properly positioned in the reservoir cap, and then install the

cap.

10. Be sure that the front brake pistons are returned to their normal positions and that the shoe and lining assemblies are properly seated.

11. Before driving the car, check the operation of the brakes and be sure that a firm pedal is obtained.

3 CLEANING AND INSPECTION

FRONT BRAKES

1. Remove the wheel and tire assembly, caliper splash shield, and the shoe and lining assemblies as outlined in Part 2-2, Section 2.

2. Make three thickness measurements with a micrometer across the middle section of the shoe and lining. Take one reading at each side and one in the center. If the assembly has worn to a thickness of 0.195 inch (shoe and lining together) or 0.030 inch (lining material only) at any one of the three measuring locations, replace all (4) shoe and lining assemblies on both front wheels.

3. With the shoe and lining assemblies installed, insert a feeler gauge between the lining and rotor. If the clearance is not within 0.002-0.010 inch, check for shoe and lining assemblies not being properly seated on the caliper bridges, for a piston pushed back in the cylinder bore, for a seized piston, or for malfunction of a piston seal.

Ordinarily, the clearance should be 0.002-0.010 inch. However, if the vehicle was stopped by a brake application just prior to checking the clearance, the brakes may drag slightly.

4. To check rotor runout, first eliminate the wheel bearing end play by tightening the adjusting nut. After tightening the nut check to see that the rotor can still be rotated.

5. Clamp a dial indicator to the caliper housing so that the stylus contacts the rotor at a point approximately 1 inch from the outer edge. Rotate the rotor and take an indicator reading. If the reading exceeds 0.002 inch total indicator runout, replace the rotor. **Do not attempt to refinish a rotor that indicates runout in excess of specification.**

When the runout check is finished be sure to adjust the bearings as outlined in Group 3, in order to prevent bearing failure.

6. Check the rotor for scoring. Minor scores can be removed with a fine emery cloth. If the rotor is excessively scored replace it.

7. Visually check the caliper. If it is cracked or if excess leakage is evident, it should be replaced. Slight leakage or seized pistons indicate removal and disassembly.

8. If upon disassembly the caliper is found to be distorted or damaged, or if the cylinder bores are scored or excessively worn, replace the assembly.

The two halves of the caliper assembly should never be separated. Damage or failure of one requires replacement of both as a unit.

REAR BRAKES

1. Remove the wheel from the drum, and remove the drum as outlined in Part 2-2, Section 2. Wash all the parts except the brake shoes in a cleaning fluid and dry with compressed air.

2. Brush all dust from the carrier plate and interior of the brake drum.

3. Inspect the brake shoes for excessive lining wear or shoe damage. If the lining is worn to within $\frac{1}{32}$ inch of the rivet heads or if the shoes are damaged, they must be replaced. Replace any lining that has been oil saturated. Replace the lining in axle sets. Prior to replacement of the lining, the drum diameter should be checked to determine if oversize linings must be installed.

4. Check the condition of the brake shoes, retracting springs, and drum for signs of overheating. If the

shoes have a slight blue coloring, or if the springs show a change in free length, indicating overheating, replacement of the retracting and hold down springs is necessary. **Overheated springs lose their pull and could cause the new lining to wear prematurely if they are not replaced.**

5. If the car has 30,000 or more miles of operation on the brake linings, or signs of overheating are present when relining brakes, the wheel cylinders should be disassembled and inspected for wear and dirt in the cylinder. The cylinder cups and other parts contained in the overhaul kit should be replaced, thus avoiding future problems.

6. Inspect all other brake parts and replace any that are worn or damaged.

7. Inspect the brake drums and, if necessary, refinish. Refer to Part 2-2, Section 4 for refinishing.

BOOSTER UNIT

Clean all metal parts in a suitable solvent. After the metal parts have been thoroughly cleaned, those parts which came in contact with brake fluid should be re-washed in alcohol. Wash all plastic parts and the rubber center plate seal in alcohol. Blow out dirt and cleaning solvent from all recesses and internal passages. When overhauling the booster, use all parts furnished in the repair kit. **Discard all old rubber parts except the center plate seal which is not replaceable.**

Inspect all parts and replace those parts that are damaged, worn or chipped. If the hydraulic cylinder bore is scored, rusted, pitted or etched, replace it. If the center plate or seal is defective or damaged, replace the plate and seal assembly.

PART 2-2 BRAKE SYSTEM

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1 DESCRIPTION AND OPERATION

The 1965 Thunderbird brake system employs disc brakes on the front wheels and single anchor, internal expanding and self-adjusting brake assemblies on the rear wheels. The system is powered by a vacuum booster as standard equipment.

The master cylinder converts physical force from the brake pedal and booster into hydraulic pressure against the pistons in the calipers (front wheels) or in the wheel cylinders (rear wheels). The pistons in turn convert hydraulic pressure back into physical force at the discs and brake shoes.

DISC BRAKE ASSEMBLIES — FRONT WHEELS

RELATION AND FUNCTION OF COMPONENT PARTS

The disc brake is a fixed caliper, opposed piston, non-energized, ventilated disc type, actuated by a hydraulic system (Fig.1). There is no lateral movement of either the disc (rotor) or the caliper. The caliper assembly consists of two caliper housings bolted together with each half containing two cylinder bores of 1 $\frac{1}{16}$ " diameter. Each cylinder bore

contains a piston with an attached molded rubber dust boot to seal the cylinder bore from contamination (Fig. 2). Square-section rubber piston seals are positioned in grooves in the cylinder bores.

The piston seals perform three important tasks:

1. They provide hydraulic sealing between the cylinders and pistons.
2. They return the pistons to released position, when hydraulic pressure is released.
3. They maintain the shoes in correct adjustment at all times (comparable to the automatic adjusters in drum-type brakes).

The cylinders are connected hydraulically by means of internal passages in the caliper housings and an external transfer tube between the two halves of the caliper assembly. One bleeder screw and fluid inlet fitting is provided on each caliper assembly.

The shoe and lining assemblies are located in between parallel machined abutments within the caliper, and are supported radially by tabs on the outer ends of the shoe assemblies (Fig. 25). The shoes slide axially

in the caliper abutments by means of the tabs which ride on machined ledges (bridges) when hydraulic pressure is applied to the piston (Fig. 11). A shoe and lining assembly consists of friction material bonded to a metal plate called the shoe. It is replaced as a unit. Brake torque is absorbed by the mating of the shoe end against the caliper abutments (Fig. 25). A splash shield is attached to the top of the caliper to retain the shoe and lining assemblies and reduce contamination. The caliper assembly is mounted on the front wheel spindle to the rear of the wheel vertical centerline.

The cast iron disc is of the ventilated rotor type incorporating forty fins and is staked to, and rotates with, the wheel hub. The outside diameter of the rotor is 11.87 inches and the inside diameter is 7.875 inches. This type of design increases cooling area and permits circulation of air through the rotor resulting in more rapid cooling of the brake. A splash shield bolted to the spindle is used primarily to prevent road contaminants from contacting the in-board rotor and lining surfaces (Fig. 12). The wheel provides protection for the outboard surface of the rotor.

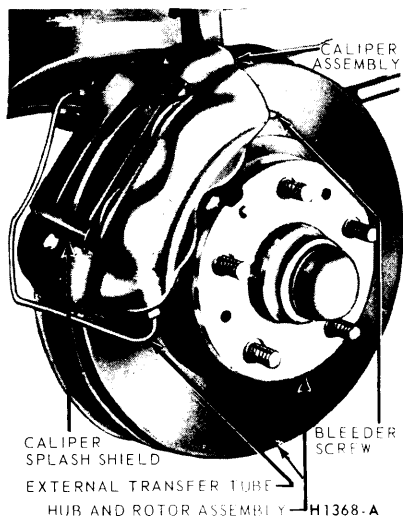


FIG. 1—Disc Brake Assembly

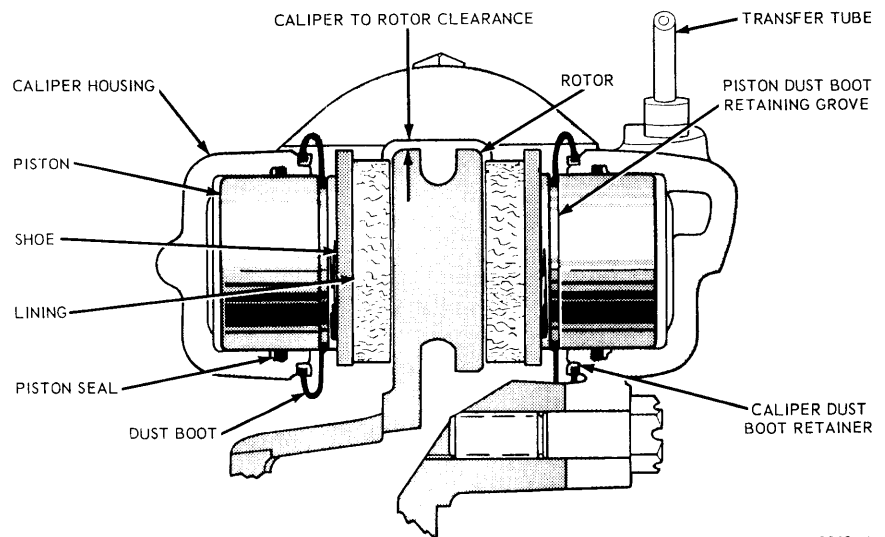


FIG. 2—Caliper Assembly—Sectional View

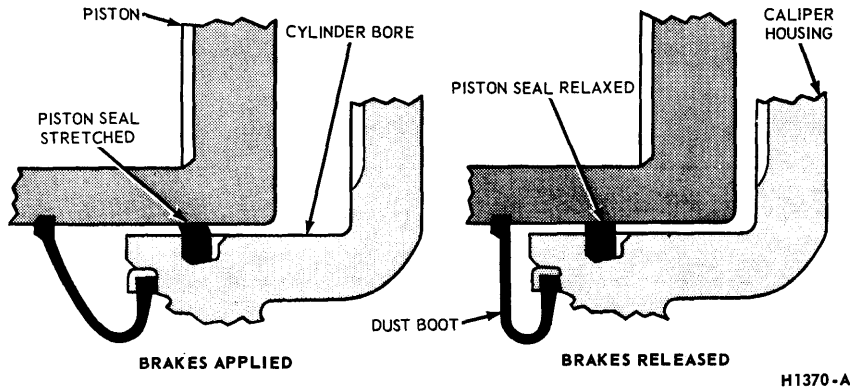


FIG. 3—Function of Piston Seal

OPERATION

As the brake pedal is depressed, hydraulic pressure from the master cylinder forces the pistons out of the caliper bores against their respective shoe and lining assemblies. The force of the pistons against the shoes moves the linings against both sides of the revolving rotor to effect braking action.

During brake application, the rubber seal in each piston stretches as the piston moves against the shoe (Fig. 3). When the hydraulic pressure against the piston is released, the seal relaxes or rolls back. This roll-back action pulls the piston away from the shoe approximately 0.005 inch to relieve the force of the lining against the rotor and, thereby, provide the required running clearance. Also, inherent rotor runout contributes to the maintenance of running clearance. Automatic adjustment is achieved by the pistons sliding in the seals outward from the cylinder bores. The piston gradually changes its position relative to the seal as the lining wears and, thus, maintains the correct adjustment location at all times.

When the brakes are in the unapplied position, there is no hydraulic pressure to the calipers because the fluid source at the master cylinder by-passes the residual check valve.

A warning sound feature is incorporated in the design of the brake shoes. Metal tabs on the ends of the shoes create an audible, metallic, scraping noise, when the linings become worn enough to allow the tabs to contact the rotor. This metal-to-metal contact warns the driver that the shoes need replacing and is not detrimental to the function of the disc brake.

A proportioning valve located between the master cylinder and the rear brake wheel cylinder provides balanced braking action between the front and the rear brakes under a wide range of braking conditions (Fig. 20). By regulating the hydraulic pressure applied to the rear wheel cylinders, the valve limits rear braking action when high pressures are

required at the front brakes. In this manner, premature rear wheel skid is prevented. The proportioning valve is serviced as an assembly and is never adjusted or overhauled.

SELF-ADJUSTING BRAKE ASSEMBLIES—REAR WHEELS

The self-adjusting brake mechanism consists of a cable, cable guide, adjusting lever, adjusting screw assembly, and adjuster spring (Fig. 4). The cable is hooked over the anchor pin at the top and is connected to the lever at the bottom. The cable is connected to the secondary brake shoe by means of the cable guide. The adjuster spring is hooked to the primary brake shoe and to the lever. The automatic adjuster operates only when the brakes are applied while the car is moving rearward and only when the secondary shoe is free to move toward the drum beyond a predetermined point.

With the car moving rearward and

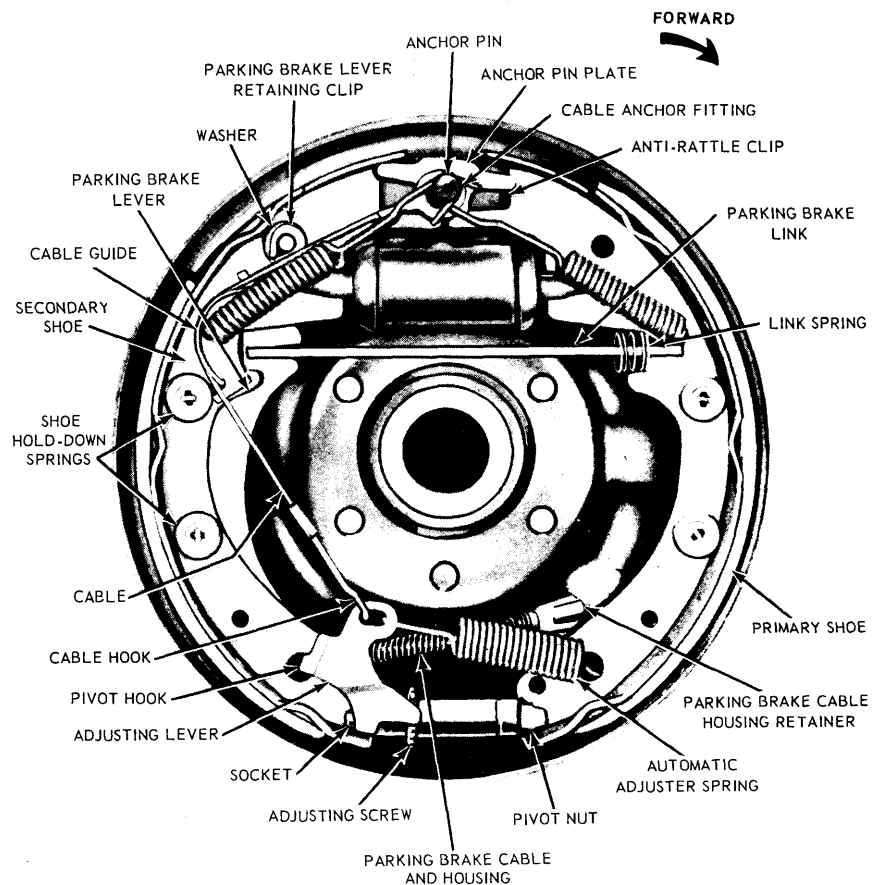


FIG. 4—Thunderbird Self Adjusting Brake Assembly—Rear Wheel

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the brakes applied, the "wrap-around" action of the shoes following the drum forces the upper end of the primary shoe against the anchor pin. The action of the wheel cylinder moves the upper end of the secondary shoe away from the anchor pin. The movement of the secondary shoe causes the cable to pull the adjusting lever upward and against the end of a tooth on the adjusting screw star-wheel. The upward travel of the lever increases as lining wear increases. When the lever can move upward far enough, it passes over the end of the tooth and engages the tooth. When the brakes are released, the adjuster spring pulls the lever downward causing the star-wheel to turn and expand the shoes. The star-wheel is turned one tooth at a time as the linings progressively wear.

With the car moving forward and the brakes applied, the secondary shoe is against the anchor pin and the primary shoe is moved toward the drum. Therefore, the adjuster does not operate.

The conventional parking brake lever, link, and spring are used in the rear brake. The anchor pins are fixed and non-adjustable.

BOOSTER SYSTEM DESCRIPTION

The tandem diaphragm type Master Vac is a self-contained vacuum hydraulic power braking unit. It is of the vacuum suspended type which utilizes engine intake manifold vacuum and atmospheric pressure for its power. It consists of three basic elements combined into a single unit (Fig. 5).

The three basic elements are:

1. A vacuum power chamber which consists of a front and a rear shell, a center plate, a front and a rear diaphragm, a hydraulic push rod and a vacuum diaphragm return spring.

2. A mechanically actuated control valve integral with the vacuum power diaphragms that controls the degree of power brake application or release in accordance with the foot pressure applied to the valve operating rod through the brake pedal linkage. The control valve consists of a single poppet with an atmospheric port and a vacuum port. The vacuum port seat is a part of the valve body attached to the dia-

phragm assembly. The atmospheric port seat is a part of the valve plunger which moves within the valve housing and vacuum power diaphragm assembly.

3. A hydraulic cylinder which contains all of the elements of the conventional brake master cylinder except for the hydraulic push rod which has a self locking adjustment screw at one end with a piston head at the other end.

The vacuum power diaphragms and the components which make up the valve assembly are connected to the brake pedal through the valve operating rod and pedal linkage. The valve operating rod is connected to the valve plunger which moves within the power diaphragm assembly. A valve return spring returns the valve plunger and valve rod to the released position when pressure is released from the brake pedal. The valve poppet is of flexible rubber type and is supported by the valve body. In the released position the poppet return spring holds the poppet against the atmospheric port seat. A special type of seal is used to seal the opening between valve body sleeve and the rear end plate. Vacuum is supplied to the Master Vac through a vacuum check valve located in the front housing. Air for operation is admitted through

a silencer within the valve housing. A rubber valve rod guard keeps dust and dirt from getting into the valve mechanism. A seal located in the front vacuum chamber seals the opening between the vacuum chamber and the hydraulic push rod. The hydraulic push rod forms the link between the vacuum power diaphragms assembly and the hydraulic piston of the hydraulic cylinder. The center plate located between the two diaphragms divides the power unit into four chambers. A long, threaded hub on the front plate attaches to the hub of the rear plate and maintains a set separation between the two vacuum power diaphragms, moving backward and forward through a seal in the stationary center plate.

OPERATION

Released Position. With the engine running and the brakes released, vacuum from the intake manifold is admitted through the vacuum check valve to the front (left) vacuum chamber and to the vacuum chamber to the front (left) of the rear diaphragm (Fig. 6). In the released position (no pressure applied to the brake pedal), the valve operating rod and valve plunger are held to the right in the valve housing by the valve return

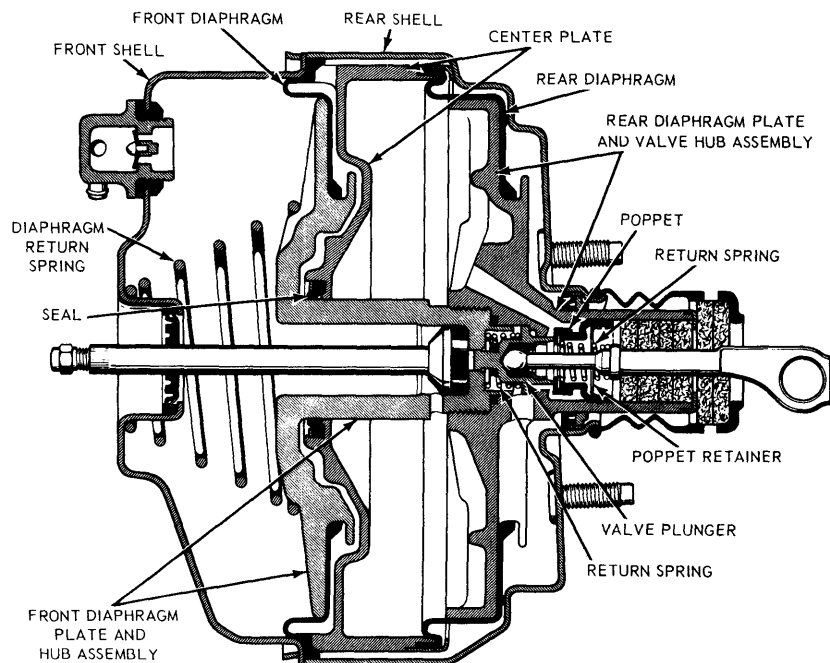


FIG. 5—Booster Unit—Sectional View

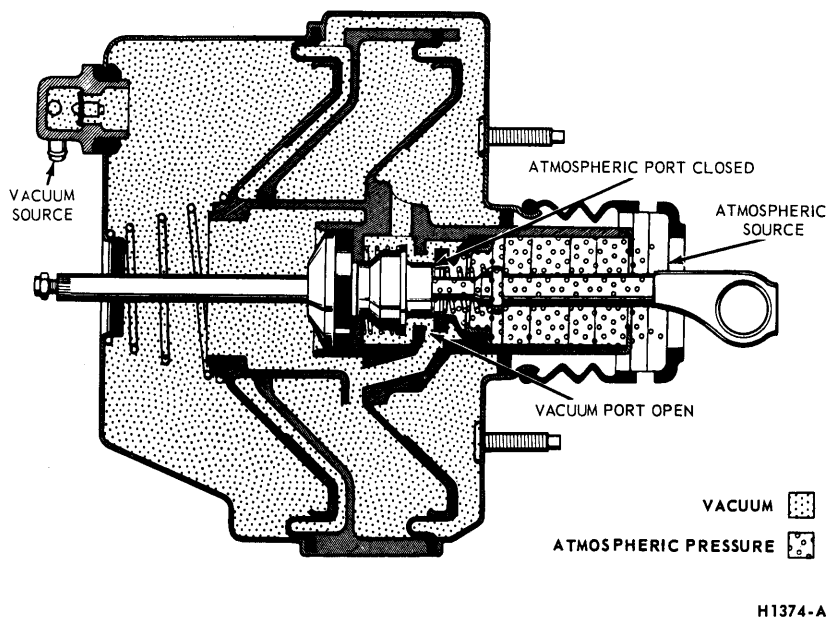


FIG. 6—Booster in Released Position

spring to CLOSE the atmospheric port and OPEN the vacuum port. With the valve in this position, the chambers to the rear of both the front and rear diaphragm are open to vacuum through the portings around the edge of the center plate and through the hub of the valve housing. The vacuum power diaphragms are then balanced or suspended in vacuum, since vacuum is present on both sides of both diaphragms. The vacuum power diaphragm return spring is then free to return the diaphragm assembly with the hydraulic push rod to the fully released position. With the hydraulic push rod in the released position, the hydraulic compensating port in the hydraulic master cylinder is open to permit brake fluid to either return from the brake system to the fluid reservoir or enter the brake system from the fluid reservoir to compensate for expansion of/ or loss of fluid from the brake system.

Applied Position. As the brakes are applied by the driver, the valve operating rod and valve plunger move to the left in the power diaphragms assembly to compress the valve return spring and bring the poppet valve into contact with the vacuum valve seat in the valve housing to "CLOSE" the vacuum port (Fig. 7). Any additional movement of the valve operating rod in the applied direction, moves the valve plunger away from the poppet

valve to "OPEN" the atmospheric port and admit atmosphere through the air filter and passages to the chambers at the right sides of both the front and rear vacuum power diaphragms. With vacuum on the left side of the front and rear diaphragms and atmospheric pressure on the right side of the front and rear diaphragms, a force is developed to move the vacuum power diaphragm assembly, hydraulic push rod and hydraulic piston to the left to close the compensating port

and force hydraulic fluid under pressure through the residual check valve and brake tubes into the brake wheel cylinders. As hydraulic pressure is developed in the hydraulic cylinder, a counter force (to the right) acting through the hydraulic push rod sets up a reaction force against the vacuum power diaphragm and valve plunger through the rubber reaction disc at the end of the hydraulic push rod piston. The rubber disc reacts similar to a column of fluid to distribute the pressure between the vacuum power diaphragm assembly and the valve plunger in proportion to their respective contact areas.

The pressures acting against the valve plunger and valve operating rod tend to move the valve plunger slightly to the right in relation to the diaphragm and valve housing assembly to close off the atmospheric port. Since part of the counter force (to the right) reacts through the valve plunger and valve operating rod against the driver's foot, a "feel" of the braking effort is provided. The amount of reaction transmitted to the valve plunger is designed into the Master Vac to assure maximum power consistent with the assurance that the driver always maintains a "feel" of the amount of brake that is being applied. This reaction force is in direct proportion to the hydraulic pressure developed within the brake systems.

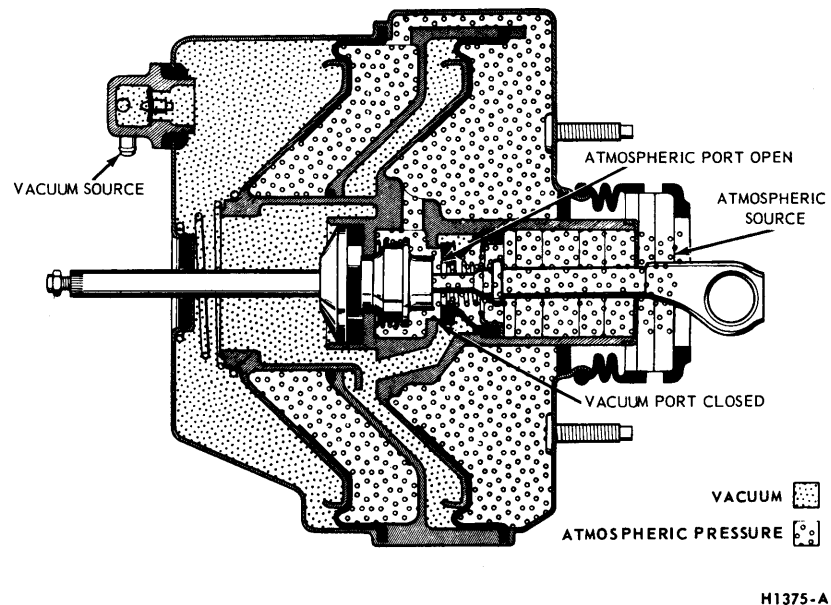
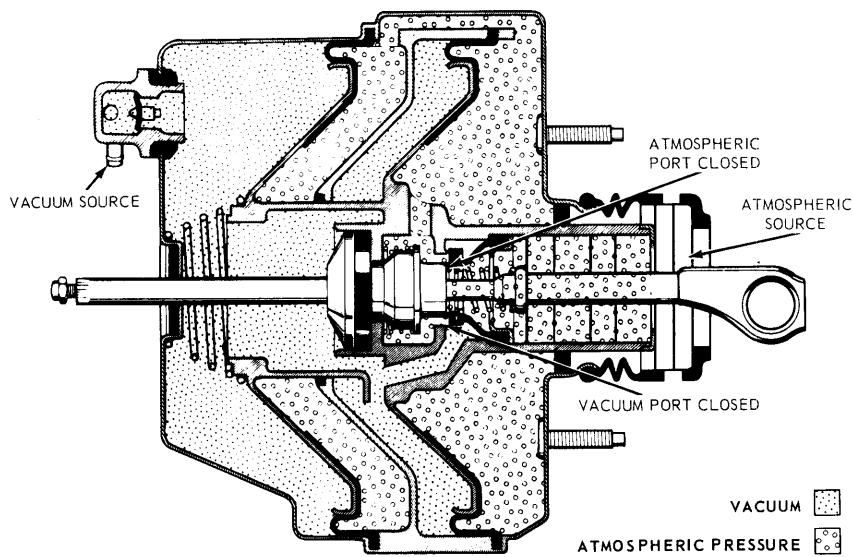


FIG. 7—Booster in Applied Position

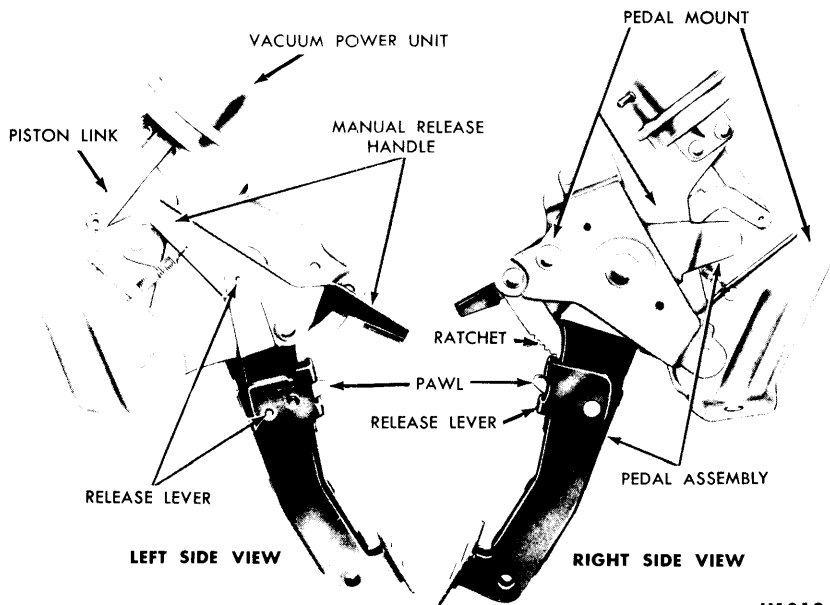


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FIG. 8—Booster in Lap or Holding Position

Lap or Holding Position. During application of the brakes the “reaction” against the valve plunger is working against the driver to close the atmospheric port. With both atmospheric and vacuum ports closed, the Master Vac is said to be in the “lap” or holding position (Fig. 8). When both valves are closed or “lapped off”, any degree of braking application attained will be held until either the atmospheric port is reopened by an increase in pedal pressure to further increase the

brake application or by a decrease in pedal pressure to reopen the vacuum port to decrease the brake application. Whenever the pressure applied to the brake pedal is held constant for a moment, the valve returns to its “lap” or holding position. However, upon reaching the fully applied position, the valve plunger is held away from the valve poppet atmospheric valve seat to admit maximum atmospheric pressure to the chambers to the right of the front and rear diaphragms.



H1312-A

FIG. 9—Parking Brake Control Assembly

With the chambers to the left of the diaphragms open to manifold vacuum, full power application is attained which is referred to as the “run out” point of the power unit. Any increase in hydraulic pressure beyond this point would have to be supplied entirely by physical effort of the driver.

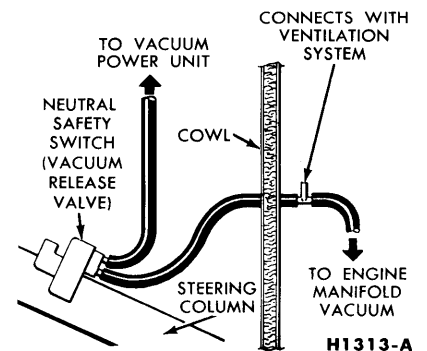
PARKING BRAKES

An independent foot-operated parking brake control (Fig. 9) actuates the rear wheel brake shoes through a cable linkage. The operating cable is routed from the parking brake control assembly to the equalizer lever which is attached to the equalizer assembly. The rear brake cables connect the equalizer assembly to the parking brake lever at each rear secondary shoe (Fig. 1, Part 2-1 and Fig. 22).

When the pedal is depressed the secondary brake shoes are forced against the rear brake drums. The pedal is held in the applied position by the engagement of a spring-loaded pawl with a ratchet in the control assembly.

A vacuum power unit will release the parking brakes automatically when the transmission selector lever is moved into any drive position with the engine running. The brakes will not release automatically, however, when the selector lever is in the neutral or park position with the engine running, or in any position with the engine off.

The parking brake control assembly is mounted to the left cowl side panel (Fig. 22). The pedal assembly pivots on a stationary pedal mount (Fig. 9). A spring-loaded pawl and a release lever are assembled to the pedal. A ratchet is as-



H1313-A

FIG. 10—Connections for Automatic Parking Brake Release

sembled to the stationary mount. The pawl contacts the ratchet at such an angle that it will slide over the ratchet teeth as the pedal is depressed; however, when the applying motion stops and the pedal starts to release, the pawl engages the ratchet and thus locks the brakes in the applied position. Since the release lever pivots against the pawl, a slight movement of the release lever will disengage the pawl from the ratchet allowing the brakes to release. The release lever is actuated by a manual release handle which is

connected to the lever through a slot and rivet pin (Fig. 9).

The vacuum power unit with mounting bracket is riveted to the control assembly. The vacuum actuated piston within the unit is connected by a link to the upper end of the release handle which actuates the release lever to move the pawl out of engagement with the ratchet (Fig. 9). The lower end of the release handle extends out for alternate manual release in the event of vacuum power failure or for optional manual release at any time.

Hoses connect the power unit and the engine manifold to a vacuum release valve in the transmission neutral safety switch (Figs. 9 and 10). Moving the transmission selector lever into any drive position with the engine running will open the release valve to connect engine manifold vacuum to one side of the actuating piston in the power unit. The pressure differential thus created will cause the piston and link to pull the manual release handle which, in turn, actuates the release lever.

2 IN-CAR ADJUSTMENTS AND REPAIRS

After any brake service work, obtain a firm brake pedal before moving the car. Riding the brake pedal (common on left foot applications) should be avoided when driving the car.

FRONT (DISC) BRAKE SHOE AND LINING REPLACEMENT

REMOVAL

1. Remove the wheel and tire assembly from the hub and rotor assembly. **Be careful to avoid damage or interference with the caliper splash shield, bleeder screw fitting or transfer tube.**

2. Remove the two bolts that retain the caliper splash shield, and remove the shield (Fig. 1).

3. To facilitate removal and installation of the shoe and lining assemblies, the pistons must be pushed into their bores. Apply a steady inward pressure against each shoe and lining assembly toward its respective caliper housing on each side of the rotor (Fig. 2). Maintain the pressure for at least a minute. If the pistons will not go in easily, force them in with water pump pliers.

4. Grasp the metal flange on the outer end of the shoe with two pairs of pliers and pull the shoe out of the caliper (Fig. 11).

CLEANING AND INSPECTION

When the shoe and lining assemblies are replaced, remove the dust boots from the pistons. Check the condition of the boots, and inspect each piston surface for damage or corrosion. Thoroughly clean each dust boot and surrounding area before installing.

INSTALLATION

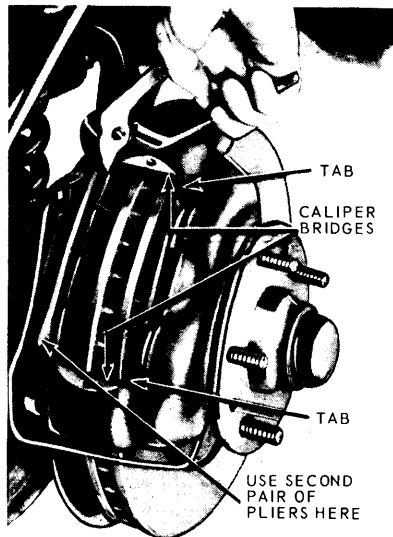
1. Position a new shoe and lining assembly on each side of the rotor so that the lining faces the rotor. Be sure that the tabs on the shoe flanges seat fully against the caliper bridges (Fig. 11).

2. Install the caliper splash shield and secure the shield to the caliper with two retaining bolts (Fig. 1).

3. Pump the brake pedal several times until a firm pedal is obtained and the shoe and lining assemblies are properly seated.

4. Install the wheel and tire assembly on the hub and rotor assembly.

5. Check and refill the master cylinder reservoir with specified brake fluid as required.



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FIG. 11—Removing Disc Brake Shoe and Lining Assembly

6. Road test the car.

It should not be necessary to bleed the system after a shoe and lining replacement.

DISC BRAKE CALIPER ASSEMBLY

REMOVAL

1. Remove the wheel and tire assembly from the hub and rotor assembly. **Be careful to avoid damage or interference with the caliper splash shield, bleeder screw fitting or transfer tube.**

2. Disconnect the front brake flexible hose from the brake tube at the bracket on the frame (Fig. 20).

3. Remove the two bolts that retain the caliper to the spindle.

Take care to avoid loosening the bridge bolts that hold the two halves of the caliper together.

4. Lift the caliper assembly off the rotor.

INSTALLATION

1. Position the caliper assembly on the rotor, and mate the mounting bolt holes in the caliper with those in the spindle. It may be necessary to push the caliper pistons into the cylinder bores to obtain clearance between the shoe and lining assemblies and the rotor. The shoe and lining assemblies should be seated properly on the bridges.

2. Install the caliper to spindle retaining bolts and torque to specification. Note the difference in bolt lengths. Check to insure that the rotor runs squarely and centrally between the two halves of the caliper. There should be approximately 0.090-0.120 inch clearance between the caliper and the rotor outside diameter (Fig. 2).

3. Connect the front wheel brake flexible hose to the brake tube at the bracket on the frame (Fig. 20). The hose should be checked for correct routing.

4. Bleed the brake system as outlined in Section 2-1. Check the master cylinder fluid level, and the specified brake fluid as required.

5. Pump the brake pedal several times to actuate the piston seals and to position the shoe and lining assemblies.

6. Install the wheel and tire assembly.

7. Road test the car.

FRONT WHEEL HUB AND ROTOR ASSEMBLY

REMOVAL

1. Remove the wheel and tire assembly from the hub and rotor assembly (Fig. 12). **Be careful to avoid damage or interference with the caliper splash shield, bleeder screw fitting or transfer tube.**

2. Remove the caliper assembly from the spindle and the rotor. If the caliper does not require servicing, it is not necessary to disconnect the brake hose or remove the caliper from the car. Position the caliper out of the way, and support it with a wire to avoid damaging the caliper or stretching the hose. Insert a clean cardboard spacer between the linings to prevent the pistons from coming out of the cylinder bores while the caliper is removed.

Handle the rotor and caliper assemblies in such a way as to avoid deformation of the rotor and nicking or scratching of the brake linings.

3. Remove the grease cap from the hub. Remove the cotter pin, nut lock, adjusting nut, and flat washer from the spindle. Remove the outer bearing cone and roller assembly.

4. Remove the hub and rotor assembly from the spindle.

INSTALLATION

1. If the rotor is being replaced, remove the protective coating from the new rotor with carburetor degreaser. Pack a new set of bearings with specified grease, and install the inner bearing cone and roller assembly in the inner cup. Pack grease lightly between the lips of a new grease retainer and install the retainer (Fig. 12).

If the original rotor is being installed, make sure that the grease in the hub is clean and adequate, that the inner bearing and grease retainer are lubricated and in good condition, and that the rotor braking surfaces are clean.

2. Install the hub and rotor assembly on the spindle.

3. Lubricate and install the outer wheel bearing, washer and adjusting nut.

4. Adjust the wheel bearings to specification, and then install the nut lock, cotter pin, and grease cap. **The wheel bearing adjustment is**

especially important with disc brakes.

5. Mount the caliper assembly on the spindle and torque the two mounting bolts to specification. If necessary, push the caliper pistons into the cylinder bores to obtain clearance between the shoe and lining assemblies and the rotor. Be sure that the shoe and lining assemblies are seated on the bridges. Check the flexible hose for correct routing.

6. Install the wheel and tire on the hub and rotor assembly.

DISC BRAKE ROTOR SPLASH SHIELD

REMOVAL

1. Remove the caliper and the hub and rotor assembly as outlined under "Removal" in the foregoing procedure.

2. Remove the three bolts that retain the splash shield to the spindle, and remove the shield (Fig. 12).

3. Remove the gasket.

INSTALLATION

1. Install the gasket.

2. If the shield is bent, straighten it out before installation. Position the shield to the spindle, install the retaining bolts, and torque to specification (Fig. 12).

3. Install the hub and rotor assembly and the caliper as outlined under "Installation" in the foregoing procedure.

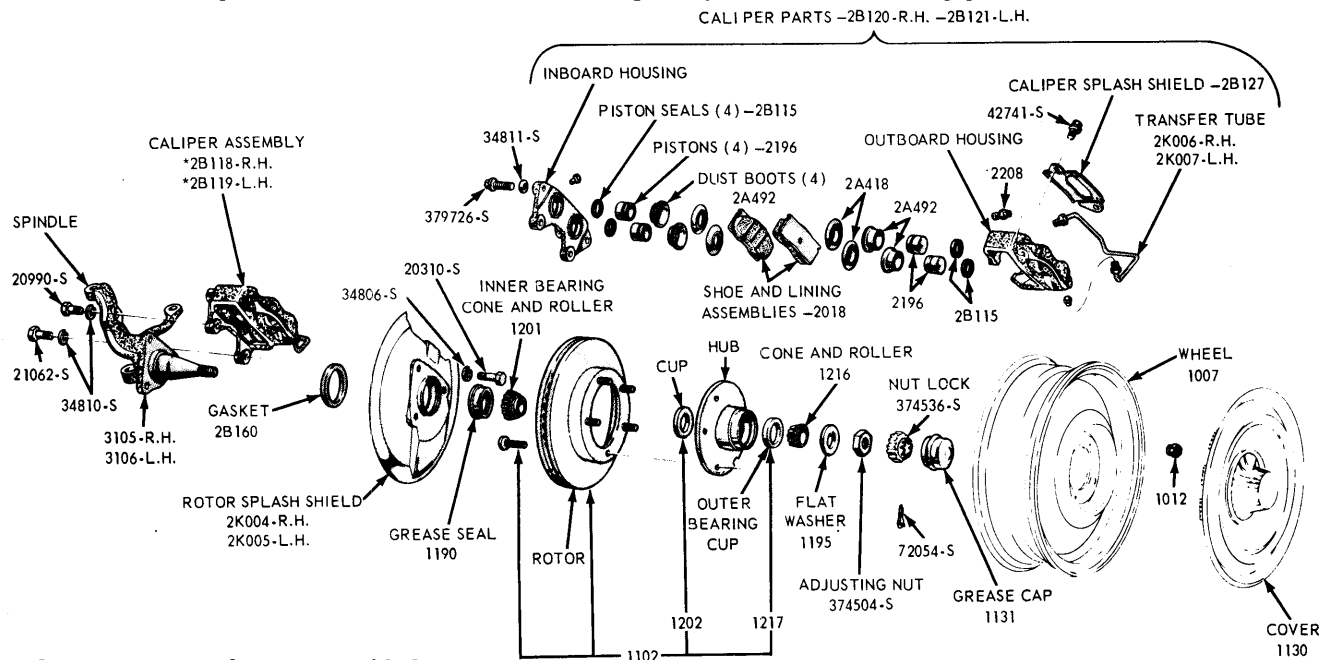


FIG. 12—Disc Brake Disassembled

PROPORTIONING VALVE

REMOVAL

1. Disconnect and remove the master cylinder - to - proportioning valve brake tube (Fig. 20).

2. Disconnect the front - to - rear brake tube from the proportioning valve.

3. Working underneath the left fender, remove the bolt that retains the proportioning valve to the fender apron and remove the valve through the access hole (Fig. 13).

INSTALLATION

1. From underneath the left fender, install the proportioning valve through the access hole in the fender apron. Position the valve to the apron so that the mounting tang extends through the hole in the fender apron as shown in Fig. 13. Install the retaining bolt.

2. Connect the front-to-rear brake tube to the valve (Fig. 20).

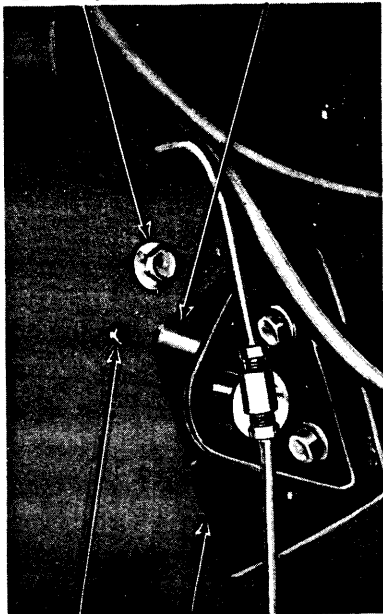
3. Position and connect the master cylinder - to - proportioning valve brake tube.

4. Bleed the brake system.

BRAKE SHOE ADJUSTMENTS — REAR WHEELS

The car should be raised with the wheels off the floor.

RETAINING BOLT PROPORTIONING VALVE



MOUNTING TANG FENDER APRON H1365-A

FIG. 13—Removing or Installing the Proportioning Valve

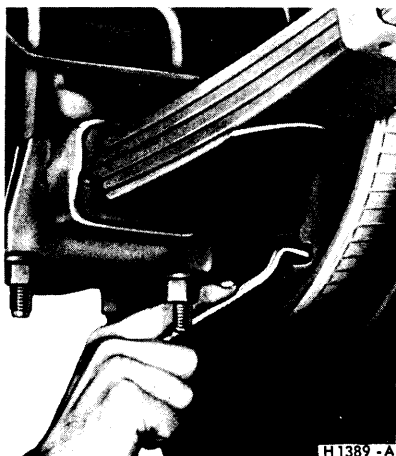


FIG. 14—Expanding Brake Shoes

The rear hydraulic service brakes are self-adjusting and require a manual adjustment only after the brake shoes have been relined, replaced, or when the length of the adjusting screw has been changed while performing some other service operation.

The brake drums should be at normal room temperature when adjusting the brake shoes. If the shoes are adjusted when the drums are hot and expanded, the shoes may drag when the drums are cool and contracted.

1. After the shoes have been installed or the adjusting screw has been turned, install the drum. Be sure that all excess grease, oil, and other foreign material are wiped off the carrier plate and drum.

2. Remove the adjusting hole cover from the carrier plate and, from the carrier plate side, turn the adjusting screw upward to expand the shoes (Fig. 14). Expand the shoes until a drag is felt when the drum is rotated.

3. Remove the drum. Mark the tooth on the star wheel where the lever contacts the adjusting screw. While holding the adjusting lever out of engagement with the adjusting screw, back off the adjusting screw $\frac{3}{4}$ of a turn with the fingers. If finger movement will not turn the screw, free it up; otherwise, the self-adjusting lever will not turn the screw. Lubricate the screw with a thin uniform coating of high-temperature grease (see Specifications).

Any other adjustment procedure may cause damage to the adjusting screw with consequent self adjuster problems.

4. Apply a small quantity of high-

temperature grease to the points where the shoes contact the carrier plate, being careful not to get the lubricant on the linings. Install the drum. Secure the drum with three Tinnerman nuts.

5. Install the wheel and tire. Tighten the mounting nuts to specification.

6. Install the adjusting hole cover on the brake carrier plate.

7. Check the parking brake cables for proper adjustment. Make sure that the equalizer lever operates freely.

8. After the brake shoes have been properly adjusted, check the operation of the brakes.

REAR BRAKE DRUM

REMOVAL

1. Raise the car until the wheel and tire clear the floor.

2. Remove the hub cap and wheel. Remove the three Tinnerman nuts and remove the brake drum. If the brake drum will not come off easily, insert a narrow screwdriver through the brake adjusting hole in the carrier plate, and disengage the adjusting lever from the adjusting screw. While holding the adjusting lever away from the adjusting screw, back off the adjusting screw with the brake adjusting tool (Fig. 15). **Back off the adjustment only if the drum cannot be removed. Be very careful not to burr, chip, or damage the notches in the adjusting screw; otherwise, the self-adjusting mechanism will not function properly.** If the adjustment was changed, make certain that the adjuster lever is properly seated in the shoe web.

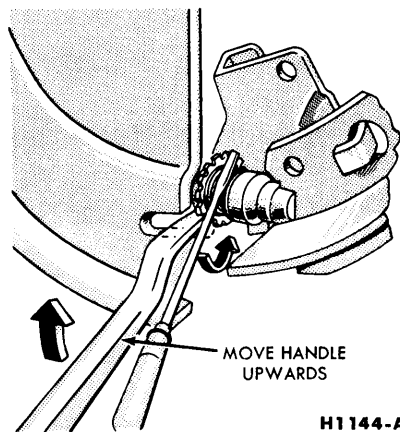


FIG. 15—Backing off Brake Adjustment

INSTALLATION

1. Remove the protective coating from a new drum with carburetor degreaser.

2. Place the drum over the brake assembly and into position. If required, adjust the brakes as outlined under "Brake Shoe Adjustments" in this section. Make sure the adjusting lever is properly seated in the shoe web.

3. Install the three Tinnerman nuts and tighten securely. Install the wheel on the axle shaft flange studs against the drum, and tighten the retaining nuts to specifications. Install the hub cap.

REAR BRAKE SHOE REPLACEMENT

REMOVAL

1. Remove the wheel and the brake drum.

2. Contact the shoes as follows:

a. Disengage the adjusting lever from the adjusting screw by pulling backward on the adjusting lever (Fig. 4).

b. Move the outboard side of the adjusting screw upward and back off the pivot nut as far as it will go.

3. Pull the adjusting lever, cable and automatic adjuster spring down and toward the rear to unhook the pivot hook from the large hole in the secondary shoe web. **Do not attempt to pry the pivot hook out of the hole.**

4. Remove the automatic adjuster spring and adjusting lever (Fig. 4).

5. Remove the primary shoe to anchor spring with the tool shown in Fig. 16. With the same tool, remove the secondary shoe to anchor spring and unhook the cable eye from the anchor pin.

6. Remove the anchor pin plate and the anti-rattle clip.

7. Remove the cable guide from the secondary shoe (Fig. 4).

8. Remove the shoe hold-down springs, shoes, adjusting screw, pivot nut, and socket.

9. Remove the parking brake link and spring. Disconnect the parking brake cable from the parking brake lever.

10. After removing the secondary shoe, disassemble the parking brake lever from the shoe by removing the retaining clip and spring washer (Fig. 4).

INSTALLATION

1. Before installing the brake shoes, back off the parking brake adjustment. Then assemble the parking brake lever to the secondary shoe and secure with the spring washer and retaining clip.

2. Apply a light coating of high-temperature grease at the points where the brake shoes contact the carrier plate.

3. Position the brake shoes on the carrier plate and secure the assembly with the hold-down springs. Install the parking brake link and spring. Connect the parking brake cable to the parking brake lever (Fig. 4).

4. Install the anti-rattle clip and the anchor pin plate on the anchor pin.

5. Place the cable eye over the anchor pin with the crimped side toward the carrier plate.

6. Install the cable guide on the secondary shoe web with the flanged hole properly fitted into the hole in the secondary shoe web. Thread the cable around the cable guide groove (Fig. 4).

It is imperative that the cable be positioned in this groove and not between the guide and the shoe web.

7. Install the secondary shoe to anchor spring (Fig. 17).

8. Install the primary shoe to anchor spring with the tool shown in Fig. 4.

Be certain that the cable eye is not cocked or binding on the anchor pin when installed. All parts should be flat on the anchor pin.

9. Apply high-temperature grease to the threads and the socket end of the adjusting screw. Turn the adjusting screw into the adjusting pivot nut to the limit of the threads and then back off $\frac{1}{2}$ turn.

Interchanging the brake shoe adjusting screw assemblies from one side of the car to the other would cause the brake shoes to retract rather than expand each time the automatic adjusting mechanism operated. To prevent installation on the wrong side of the car, the socket end of the adjusting screw is stamped with an R or L (Fig. 18). The adjusting pivot nuts can be distinguished by the number of grooves machined around the body of the nut. Two grooves indicate a right hand nut; one groove indicates a left hand nut.

10. Place the adjusting socket on the screw and install this assembly between the shoe ends with the adjusting screw toothed wheel nearest the secondary shoe.

11. Hook the cable hook into the hole in the adjusting lever. The adjusting levers are stamped with an R or L to indicate their installation on a right or left hand brake assembly (Fig. 18).

12. Position the hooked end of the adjuster spring completely into the large hole in the primary shoe web. The last coil of the spring should be at the edge of the hole. Connect the loop end of the spring to the adjuster lever hole.

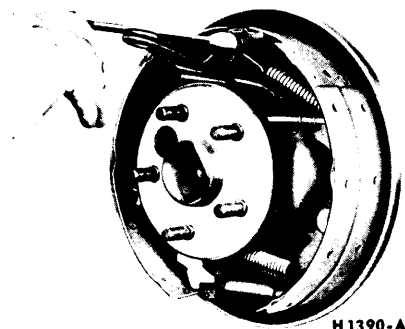


FIG. 16—Retracting Spring Removal

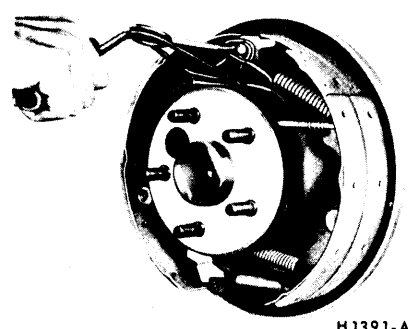


FIG. 17—Retracting Spring Installation

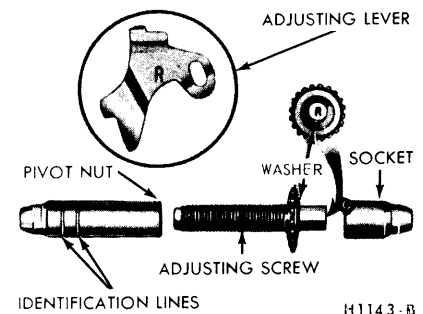


FIG. 18—Adjusting Screw and Lever Identification

13. Pull the adjuster lever, cable and automatic adjuster spring down and toward the rear to engage the pivot hook in the large hole in the secondary shoe web (Fig. 4).

14. After installation, check the action of the adjuster by pulling the section of the cable between the cable guide and the adjusting lever toward the secondary shoe web far enough to lift the lever past a tooth on the adjusting screw wheel. The lever should snap into position behind the next tooth, and release of the cable should cause the adjuster spring to return the lever to its original position. This return action of the lever will turn the adjusting screw one tooth.

If pulling the cable does not produce the action described, or if the lever action is sluggish instead of positive and sharp, check the position of the lever on the adjusting screw toothed wheel. With the brake in a vertical position (anchor at the top), the lever should contact the adjusting wheel $\frac{3}{16}$ inch (plus or minus $\frac{1}{32}$ inch) above the centerline of the screw. If the contact point is below this centerline, the lever will not lock on the teeth in the adjusting screw wheel, and the screw will not be turned as the lever is actuated by the cable.

To determine the cause of this condition:

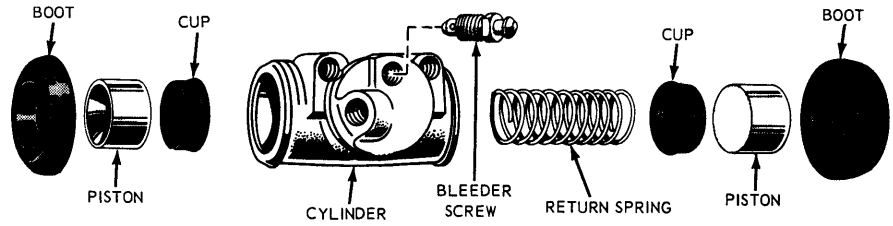
a. Check the cable end fittings. The cable should completely fill or extend slightly beyond the crimped section of the fittings. If it does not meet this specification, possible damage is indicated and the cable assembly should be replaced.

b. Check the cable length. The cable should measure $11\frac{1}{8}$ inches (plus or minus $\frac{1}{64}$ inch) from the end of the cable anchor to the end of the cable hook.

c. Check the cable guide for damage. The cable groove should be parallel to the shoe web, and the body of the guide should lie flat against the web. Replace the guide if it shows damage.

d. Check the pivot hook on the lever. The hook surfaces should be square with the body of the lever for proper pivoting. Replace the lever if the hook shows damage.

e. See that the adjusting screw socket is properly seated in the notch in the shoe web.



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FIG. 19—Rear Brake Wheel Cylinder

REAR WHEEL CYLINDER REPAIR

It is not necessary to remove the brake cylinder from the carrier plate to disassemble, inspect, or hone and overhaul. Removal is necessary only when the cylinder is damaged or scored beyond repair.

DISASSEMBLY

1. Remove the links and the rubber boots from the ends of the brake cylinder. Remove the pistons, cups, and return spring from the cylinder bore (Fig. 19).

2. Remove the bleeder screw from the cylinder.

INSPECTION

1. Wash all parts in clean denatured alcohol. If alcohol is not available, use specified brake fluid. Dry with compressed air.

2. Check all internal parts for excessive wear or damage. **If any of the internal parts require replacing, all should be replaced.**

3. Inspect the cylinder bore for score marks or rust. If either condition is present, the cylinder bore must be honed. **However, the cylinder should not be honed more than 0.003 inch beyond its original diameter.**

4. Check the bleed hole to be sure that it is open.

ASSEMBLY

1. Apply a coating of heavy-duty brake fluid to all internal parts.

2. Thread the bleeder screw into the cylinder and tighten securely.

3. Insert the return spring, cups, and pistons into their respective positions in the cylinder bore (Fig. 19). Place a boot over each end of the cylinder.

REAR WHEEL CYLINDER REPLACEMENT

REMOVAL

1. With the wheel in a raised posi-

tion, remove the wheel and the drum.

2. Remove the brake shoe assemblies, following procedures outlined in this section.

3. Disconnect the brake line from the brake cylinder. **Be sure the engine is stopped and there is no vacuum in the booster system before disconnecting the hydraulic lines.**

Unscrew the tube fitting that connects the tube to the cylinder. **Do not pull the metal tube away from the cylinder. Pulling the tube out of the cylinder connection will bend the metal tube and make installation difficult.** The tube will separate from the cylinder when the cylinder is removed from the carrier plate.

4. Remove the brake cylinder retaining bolts and lock washers and remove the cylinder.

INSTALLATION

Wipe the end(s) of the hydraulic line to remove any foreign matter before making connections.

1. Place the rear wheel cylinder into position. Enter the tubing into the cylinder, and start the tube fitting nut into the threads of the cylinder.

2. Secure the cylinder to the carrier plate by installing the retaining bolts and lock washers.

3. Tighten the tube fitting nut to specification with Milbar tool 1112-144 or its equivalent.

4. Bleed the brake hydraulic system as detailed in Section 2.

REAR BRAKE CARRIER PLATE REPLACEMENT

REMOVAL

1. Remove the wheel and brake drum. Disconnect the brake line from the brake cylinder.

2. Remove the brake shoe and adjuster assemblies and the wheel

cylinder as outlined in this section. On the rear wheel, disconnect the parking brake lever from the cable.

3. Rotate the axle shaft so that the hole in the axle shaft flange line up with the carrier plate retaining nuts and remove the nuts. Pull the axle shaft assembly out of the housing with tool 4235C and a slide hammer (Part 4-2), and then remove the carrier plate.

INSTALLATION

1. Position a new rear carrier plate on the retaining bolts in the axle housing flange. Insert the axle shaft into the housing so that the splines engage the differential side gear with the bearing retainer sliding onto the retaining bolts and against the carrier plate. Install the retaining nuts through the access hole in the axle shaft flange.

2. Install the wheel cylinder and connect the brake line as outlined in this section.

3. Install the brake shoe and ad-

juster assemblies as outlined in this section. Connect the parking brake cable to the lever. Install the brake drum and wheel.

4. Adjust the brake shoes (Section 2), and bleed the brake system as outlined in Part 2-1, Section 2.

HYDRAULIC LINES

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 connector (Fig. 20).

Always bleed the entire system after any hose or line replacement.

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 flared properly to provide good leak-proof connections. Clean the brake tubing by flushing with clean denatured alcohol, before installation.

When connecting a tube to a hose, tube connector, disc caliper, or brake cylinder, tighten the tube fitting nut to the 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 screw the hose assembly into the front disc brake caliper. Place the opposite end of the hose at the bracket on the frame. Install the horseshoe-type retaining

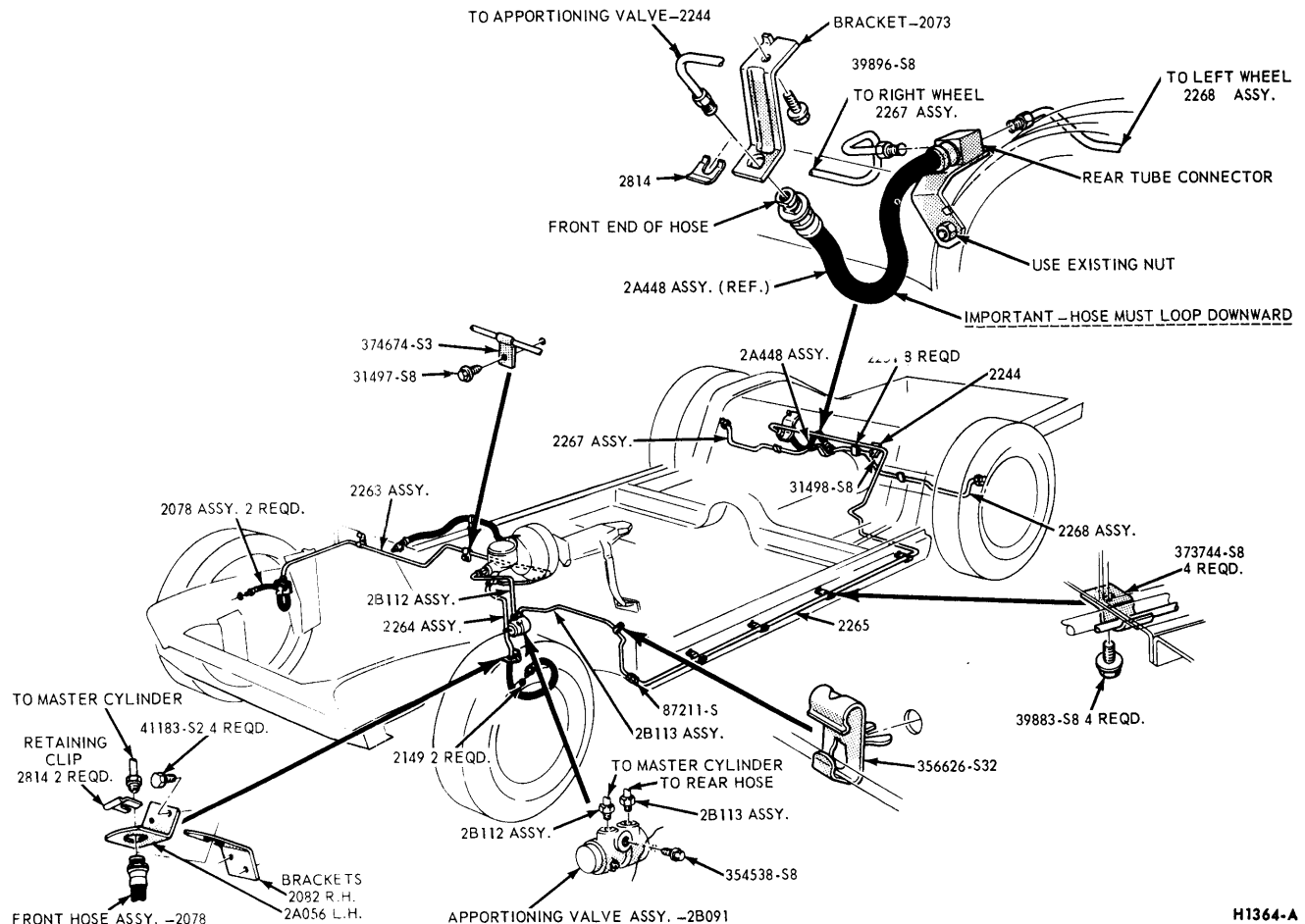


FIG. 20—Service Brake System

H1364-A

clip, and connect the tube to the hose with the tube fitting nut. (Fig. 20).

A rear brake hose should be installed so that it does not touch the

muffler outlet pipe or shock absorber.

Place a new gasket over the rear hose fitting and screw the hose assembly into the rear brake tube con-

necter. Place the front end of the hose at the bracket on the frame. Install the horseshoe-type retaining clip, and connect the tube to the hose with the tube fitting nut.

3 REMOVAL AND INSTALLATION

MASTER CYLINDER

REMOVAL

1. Disconnect the brake lines from the outlet fittings (Fig. 20).

2. Remove the two nuts and lock washers that secure the master cylinder to the booster unit. Separate the master cylinder from the booster unit and make sure that the master cylinder does not rest on the push rod.

3. Remove and discard the rubber seal from the outer groove at the end of the master cylinder.

4. Remove the push rod from the power unit. **Do not disturb the adjusting screw.**

INSTALLATION

1. Apply a light coating of lubricant COAZ-19584-A to the piston end of the hydraulic push rod and guide the piston end of the push rod into the center bore of the booster piston.

2. Twist the push rod to make certain the end of the piston is bottomed against the reaction disc and there is no air pocket between the end of the push rod and the reaction disc.

3. Before proceeding with the installation, check the distance from the outer end of the push rod to the master cylinder mounting surface at the end of the vacuum cylinder (Part 2-1, Fig. 2). This dimension should be from 0.990 to 0.995 inch measured metal to metal. If the push rod dimension is not correct, see "Master Cylinder Push Rod Adjustment", Part 2-1, Section 2.

4. When the push rod adjustment is correct, install a new rubber seal in the groove at the end of the master cylinder.

5. Position the master cylinder over the push rod onto the two studs that are integral with the booster body.

6. Install the attaching nuts and lock washers and torque the nuts to specifications.

7. Connect the brake lines to the outlet fittings (Fig. 20).

8. Bleed the brake system. Fill the master cylinder to $\frac{3}{8}$ -inch from the top of the filler opening. Be sure that the gasket is properly seated in the filler cap, and install the cap.

BRAKE BOOSTER

REMOVAL

1. Disconnect the vacuum hose from the booster.

2. Remove three bolts and loosen one to allow the brace between the cowl and spring tower to be positioned inboard for obtaining clearance.

3. Remove the retaining nuts and lock washers, and remove the master cylinder from the booster. It is not necessary to disconnect the brake lines.

4. Working inside the car below

the instrument panel, disconnect the booster push rod link from the brake pedal assembly. To do this, proceed as follows:

Disconnect the stop light switch wires at the connector. Remove the hairpin retainer. Slide the stop light switch off from the brake pedal **just far enough for the switch outer hole to clear the pin**, and then lift switch straight **upward** from the pin. Slide the master cylinder push rod and the nylon washer and bushing off from the brake pedal pin (Fig. 21).

5. Remove the four bracket-to-dash panel retaining nuts and washers.

6. Remove the booster and bracket assembly from the dash panel, sliding the push rod link out from the

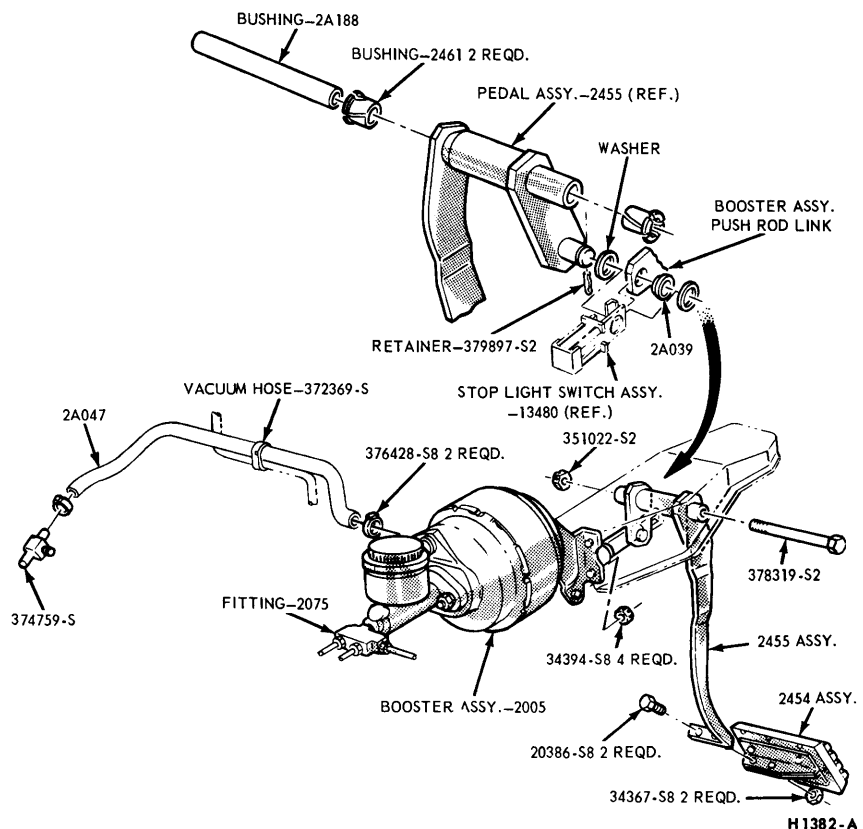


FIG. 21—Brake Booster and Pedal Installation

engine side of the dash panel (Fig. 21).

7. Remove the dust seal from the booster push rod link and position it in the slot in the dash panel for installation.

INSTALLATION

1. Mount the booster and bracket assembly to the dash panel by sliding the bracket mounting studs and the push rod link in through the holes in the dash panel (Fig. 21).

2. Working inside the car below the instrument panel, install the mounting bracket-to-dash panel retaining nuts and washers. Leave the nuts loose until after the pedal assembly has been connected.

3. Working inside the car below the instrument panel, connect the booster push rod link to the brake pedal assembly. To do this, proceed as follows:

Install the inner nylon washer, the master cylinder push rod, and the bushing on the brake pedal pin. Position the switch so that it straddles the push rod with the switch slot on

the pedal pin and the switch outer hole just clearing the pin. Slide the switch completely onto the pin. Install the outer nylon washer as shown in Fig. 21. Secure these parts to the pin with the hairpin retainer. Connect the stop light switch wires to the connector, and install the wires in the retaining clip.

4. Tighten and torque the booster retaining nuts to specification.

5. Position the master cylinder to the booster, install the lock washers and retaining nuts, and torque to specification.

6. Position the cowl to spring tower brace, install the bolts and nuts, and torque to specification.

7. Connect the vacuum hoses to the booster.

BRAKE PEDAL

REMOVAL

1. Loosen the booster mounting nuts.

2. Disconnect the stop light switch wires at the connector.

3. Remove the hairpin retainer.

Slide the stop light switch off from the brake pedal pin **just far enough for the switch outer hole to clear the pin**, and then lift the switch straight **upward** from the pin. Slide the master cylinder push rod and the nylon washers and bushing off from the brake pedal pin (Fig. 21).

4. Remove the pivot bolt and nut that holds the pedal to the pedal support bracket. Remove the brake pedal assembly from the pedal support bracket, and remove the bushings.

INSTALLATION

1. Apply a coating of Lubriplate to the bushings and locate all the bushings in their proper places on the pedal assembly (Fig. 21).

2. Install the brake pedal assembly and bushings to the support bracket, and then install the pivot bolt through the support bracket and brake pedal assembly. Install the pivot bolt nut and torque to specification.

3. Install the inner nylon washer, the master cylinder push rod, and

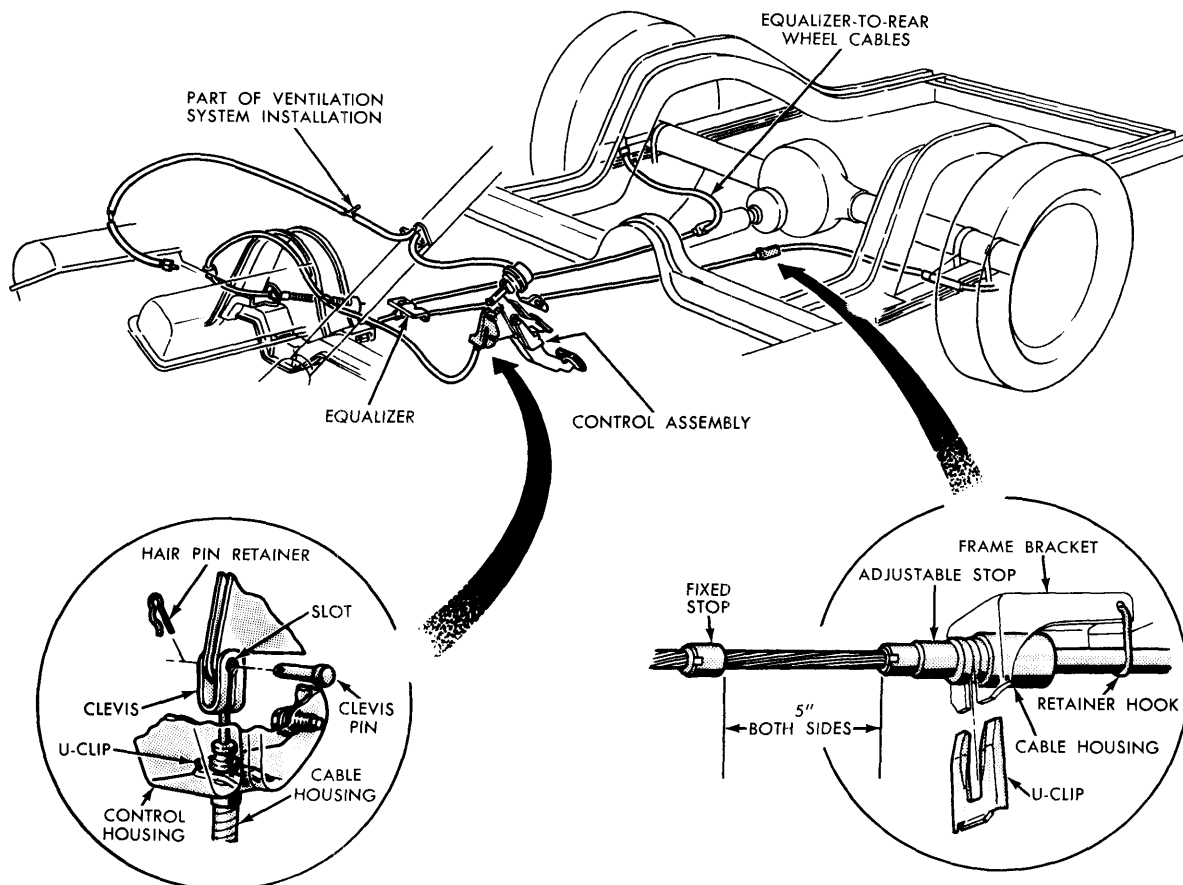


FIG. 22—Parking Brake System

the bushing on the brake pedal pin. Position the switch so that it straddles the push rod with the switch slot on the pedal pin and the switch outer hole just clearing the pin. Slide the switch completely onto the pin, install the outer nylon washer as shown in Fig. 21. Secure these parts to the pin with the hairpin retainer.

4. Connect the stop light switch wires to the connector, and install the wires in the retaining clip.

5. Torque the booster mounting nuts to specification.

PARKING BRAKE CONTROL ASSEMBLY

REMOVAL

1. Raise the car on a hoist and disconnect the pedal cable from the equalizer lever by removing the adjusting nut (Fig. 1, Part 2-1). Remove the U-clip and disengage the cable housing from the bracket.

2. Lower the car. In the passenger compartment, remove the retaining screws and the left kick pad. Remove the four screws that retain the air duct to the inner cowl panel, and then remove the air duct to obtain access to the brake control assembly. Remove the control cable from the air duct.

3. Disconnect the hose from the vacuum power unit.

4. Remove the control assembly-to-mounting bracket bolts.

5. Remove the U-clip that retains the cable housing to the parking brake control housing (Fig. 22).

6. Remove the hairpin retainer and clevis pin from the clevis. Disengage the clevis from the ball end of the cable, then remove the control assembly from the cable and cable housing.

INSTALLATION

1. Position the cable through the hole in the parking brake control housing. Install the clevis on the ball end of the cable and connect the clevis to the actuating arm with the clevis pin (Fig. 22). Secure the clevis pin with the hairpin retainer.

2. Secure the cable housing to the parking brake control housing with the U-clip.

3. Position the parking brake control assembly to the mounting bracket and install the three retaining bolts.

4. Connect the vacuum hose to the vacuum power unit.

5. Position the air duct to the inner cowl panel, and secure with four retaining screws. Connect the air duct control cable to the air duct. Position the left kick pad to the side panel and secure with two retaining screws.

6. Raise the car on a hoist. Engage the cable housing to the frame bracket with a U-clip (Fig. 1, Part 2-1). Install the spring seat, cable spring and washer on the rear end of the cable. Assemble the cable to the equalizer lever and install the half-moon type adjusting nut on the end of the cable.

7. Adjust the parking brake linkage as outlined in Part 2-1, Section 2, and then check the operation of the parking brake.

PARKING BRAKE VACUUM POWER UNIT

REMOVAL

1. Remove the parking brake control assembly from the car as described under "Removal" in the foregoing procedure.

2. Drill out or grind off the two rivets that retain the vacuum power unit to the parking brake control assembly.

3. Drill out or grind off the rivet that connects the vacuum piston link to the release lever, and remove the power unit.

INSTALLATION

1. Position the vacuum power unit on the parking brake control assembly and secure with two round head bolts and nuts.

2. Connect the vacuum piston link to the release lever with a shoulder bolt nut and wave washer. The wave washer is to be positioned on the shoulder bolt between the vacuum piston link and the release lever. The link and release lever must pivot freely.

3. Install the parking brake control assembly in the car as described under "Installation" in the foregoing procedure.

4. Test the lock and automatic release operations of the parking brake control assembly with the engine running in all the transmission selector lever positions. With the engine running, the parking brake should remain engaged in "neutral" or "park" and should release in any drive position.

PARKING BRAKE EQUALIZER-TO-CONTROL ASSEMBLY CABLE

REMOVAL

1. Raise the car on a hoist and disconnect the pedal cable from the equalizer lever by removing the adjusting nut (Fig. 1, Part 2-1). Remove the cable washer, spring, and spring seat. Remove the U-clip and disengage the cable housing from the bracket.

2. Lower the car. In the passenger compartment, remove the retaining screws and the left kick pad. Remove the four screws that retain the air duct to the inner cowl panel, and then remove the air duct to obtain access to the brake control assembly. Remove the control cable from the air duct.

3. Disconnect the hose from the vacuum power unit.

4. Remove the control assembly-to-mounting bracket bolts.

5. Remove the U-clip that retains the cable housing to the parking brake control housing (Fig. 22).

6. Remove the hairpin retainer and clevis pin from the clevis. Disengage the clevis from the ball end of the cable. Remove the control assembly from the cable and cable housing.

7. Push the cable and housing down through the hole in the floor pan and remove it from under the car.

INSTALLATION

1. From the underside of the car, guide the upper end of the replacement cable into the hole in the floor pan.

2. From the inside, pull the new cable and housing up through the hole in the floor pan.

3. Position the cable through the hole in the parking brake control housing. Install the clevis on the ball end of the cable and connect the clevis to the actuating arm with the clevis pin (Fig. 22). Secure the clevis pin with the hairpin retainer.

4. Secure the cable housing to the parking brake control housing with the U-clip.

5. Position the parking brake control assembly to the mounting bracket and install the three retaining bolts.

6. Connect the vacuum hose to the vacuum power unit.

7. Position the air duct to the inner cowl panel, and secure with four retaining screws. Connect the air duct control cable to the air

duct. Position the left kick pad to the side panel and secure with two retaining screws.

8. Raise the car on a hoist. Engage the cable housing to the frame bracket with a U-clip (Fig. 1, Part 2-1). Install the spring seat, cable spring and washer on the rear end of the cable. Assemble the cable to the equalizer lever and install the half-moon type adjusting nut on the end of the cable.

9. Adjust the parking brake linkage as outlined in Part 2-1, Section 2, and then check the operation of the parking brake.

PARKING BRAKE EQUALIZER TO REAR WHEEL CABLE

REMOVAL

1. Raise the car and remove the hub cap. Remove the wheel and tire assembly from the drum.

2. Remove the three Tinnerman nuts that retain the brake drum, then remove the drum.

3. Loosen the adjusting nut on the equalizer rod and disengage the ball end of the cable from the equalizer (Fig. 1, Part 2-1).

4. Remove the U-clip that retains the cable housing to the frame bracket. Disengage the housing from the bracket and slip off the retainer hook (Fig. 22).

5. Working on the wheel side of the carrier plate (Fig. 4), compress the prongs on the cable retainer so that they can pass through the hole in the carrier plate. Draw the cable retainer out of the hole.

6. With the spring tension off the parking brake lever, lift the cable out of the slot in the lever and remove through the carrier plate hole.

INSTALLATION

1. Pull enough of the cable through the housing so that the end of the cable may be inserted through the carrier plate access hole from the inner side and engaged with the slot in the parking brake lever.

2. Pulling the excess slack from the cable, insert the cable housing into the carrier plate access hole so that the retainer prongs expand.

3. Thread the front end of the cable through the frame bracket, and engage the cable housing to the bracket. Install the U-clip and retainer hook (Fig. 22).

4. While holding the adjustable cable stop against the cable housing end, pull the cable through the housing until there is a distance of five inches between the two stops as shown in Fig. 22. Crimp the adjustable stop against the cable to hold this dimension.

5. Insert the ball end of the cable into the equalizer and tighten the adjusting nut slightly.

6. Install the rear drum. Tighten the three Tinnerman nuts that retain the drum, and install the wheel and hub cap.

7. Adjust the parking brake linkage as outlined in Part 2-1, Section 2.

4 MAJOR REPAIR OPERATIONS

REAR BRAKE DRUM REFINISHING

Minor scores on a brake drum can be removed with a fine emery cloth. A drum that is excessively scored or shows a total indicator runout or over 0.007 inch should be turned down. Remove only enough stock to eliminate the scores and true up the drum. The refinished diameter must not exceed 0.060 inch oversize (11.150 inches).

If the drum diameter is less than 0.030 inch oversize (11.120 inches) after refinishing, standard lining may be installed. If the drum diameter is 11.120-11.150 inches, oversize linings must be installed.

After a drum is turned down, wipe the refinished surface with a cloth soaked in clean denatured alcohol. If one drum is turned down, the opposite drum on the same axle should also be cut down to the same size.

REAR BRAKE SHOE RELINING

Brake linings that are worn to within $\frac{1}{32}$ inch of the rivet or have been saturated with grease or oil should be replaced. Failure to re-

place worn linings will result in a scored drum. **When it is necessary to replace linings, they must also be replaced on the wheel on the opposite side of the car.**

Inspect brake shoes for distortion, cracks, or looseness. If this condition exists, the shoe should be discarded. **Do not repair a defective brake shoe.**

1. Wash the brake shoes thoroughly in a clean solvent. Remove all burrs or rough spots from the shoes.

2. Check the inside diameter of the brake drum. If the diameter is less than 11.120 inches, standard linings may be installed. If the diameter is 11.120-11.150 inches, oversize lining should be installed.

3. Position the new lining on the shoe. Starting in the center, insert and secure the rivets, working alternately towards each end. Install all parts supplied in the kit. **Ford replacement linings are ground and no further grinding is required.**

4. Check the clearance between the shoe and lining. The lining must seat tightly against the shoe with not more than 0.005 inch clearance between any two rivets.

MASTER CYLINDER

DISASSEMBLY

1. Press in against the piston removing the snap ring retainer, and then remove the piston assembly, cup, spring, residual check valve and seat (Fig. 23).

2. Remove secondary cup from the piston. Remove the cover by re-

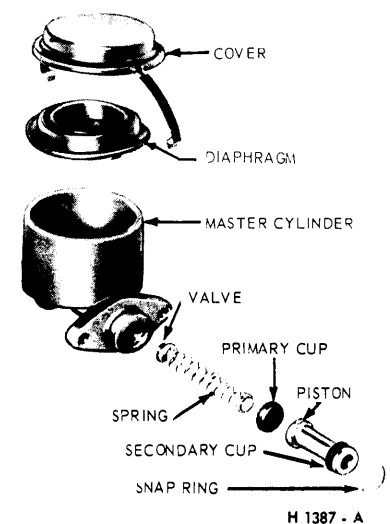


FIG. 23—Master Cylinder—Disassembled

leasing the spring clips on the sides, and remove the hermetic diaphragm.

ASSEMBLY

1. Clamp the master cylinder housing in a vise. Dip the hydraulic cylinder parts in brake fluid and assemble the check valve seal, residual check valve, and piston return spring in the bore of the cylinder in the order shown in Fig. 23.

2. If the secondary piston cup was removed from the piston, dip the cup in brake fluid and assemble the cup in the groove of the piston with the lip of the cup as shown.

3. Place the primary cup on the end of the piston assembly, and guide it into the cylinder bore.

4. Press in against the piston to compress the spring while seating the snap ring in the groove in the cylinder bore.

5. Install a new diaphragm (only if the old one is defective) in the cover, and attach the cover to the cylinder with the spring clips.

DISC BRAKE CALIPER

DISASSEMBLY

Do not remove the bridge bolts that hold the two halves of the caliper together. The two caliper housings are shown separated in Fig. 25 for illustration purposes only.

1. Remove the caliper assembly from the car as outlined in Section 2.
2. Remove the two retaining bolts

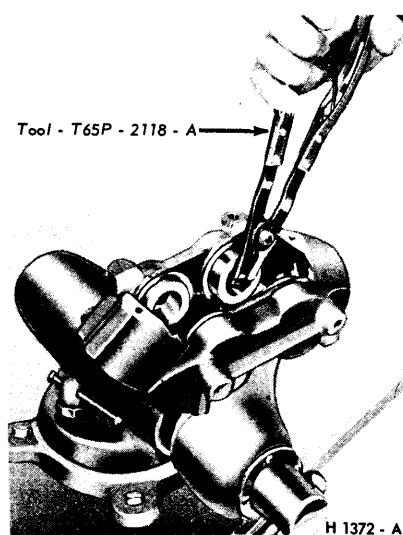


FIG. 24—Removing or Installing Pistons

and the caliper splash shield (Fig. 25).

3. Remove the two shoe and lining assemblies.

4. Remove the flexible brake hose from the caliper.

5. Remove the external transfer tube.

6. Remove the four dust boots from the caliper housings and piston grooves.

7. Clamp the caliper in a vise and secure it by the mounting flanges on the inboard housing (Fig. 24).

8. Remove the four pistons from the cylinder bores with the special tool shown in Fig. 24. To prevent cocking with consequent damage to the piston or bore, rotate the piston with the tool while pulling it outward at the same time. **Be careful to avoid scratching or damaging the outside diameter surface or dust boot retaining groove of the piston. Such damage causes poor sealing.**

If a piston is so completely seized in the cylinder bore that it can not be removed with the special tool, force the cylinder out of the bore by positioning two screwdrivers in the piston dust boot retaining groove and prying outward. To prevent cocking,

tap the end of the piston lightly around the circumference with a hammer, while the prying force is being applied. Be careful to avoid damaging the dust boot retainer in the caliper housing (Fig. 25). If this method of removal is used, the pistons must be replaced.

If the caliper dust boot retainer or retaining groove is damaged or scratched, pry the retainer out of the caliper housing with screwdrivers.

9. Remove the rubber piston seals from the grooves in the cylinder bores by carefully inserting the point of a small knife or other pointed instrument under the seal and raising the seal up far enough to be pulled out with the fingers.

CLEANING AND INSPECTION

Clean all metal parts with alcohol or a suitable solvent (Fig. 25). Use clean, dry, compressed air to clean out and dry the grooves and passage ways. Be sure that the caliper bore and component parts are completely free of any foreign material.

Check the cylinder bores and pistons for damage or excessive wear. Replace the piston if it is pitted, scored, or the chrome plating is

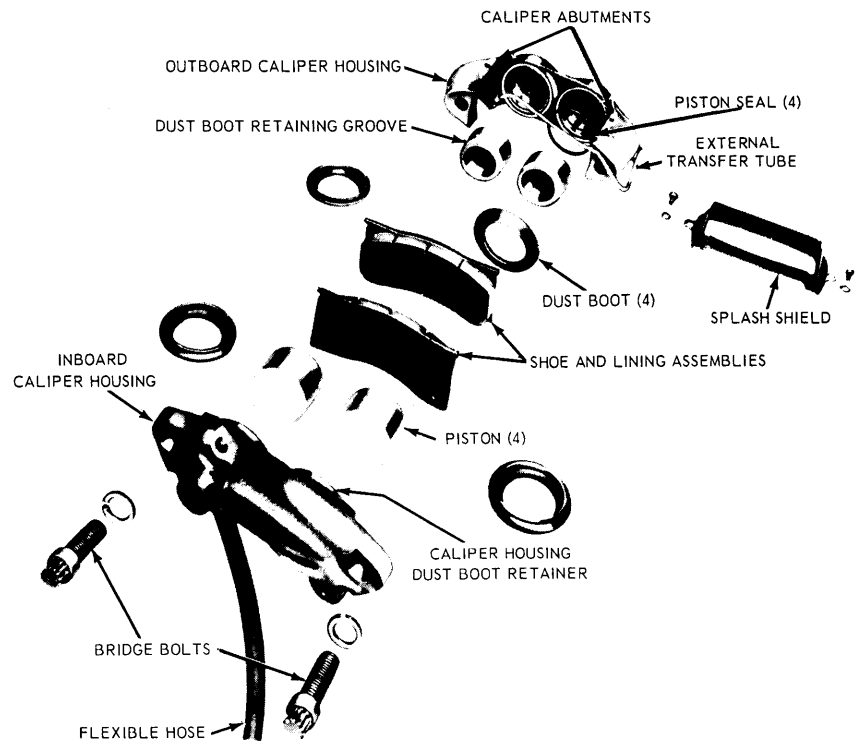


FIG. 25—Caliper Assembly—Exploded View

worn off. Check the caliper dust boot retainer for wear or damage.

ASSEMBLY

1. Clamp the caliper in a vise and secure it by the mounting flange on the inboard housing.

2. If a new caliper dust boot retainer is to be installed, thoroughly clean the contact area on the caliper housing and apply Loctite Sealant, Grade H to the retainer surface that seats in the housing. Install the retainer in the caliper housing.

3. Apply a film of clean brake fluid to new caliper piston seals and install them in the grooves of the cylinder bore. The seal should be positioned at one area in the groove and gently worked around. **Do not use the original seals.**

4. Coat the outside diameter of the pistons with brake fluid and install them in the cylinder bores so that the open end of the piston and the boot retaining groove face out of the bore. To avoid cocking, locate the piston squarely in the bore and apply a slow steady pressure. If a piston will not easily go all the way into the bore, remove it and thoroughly inspect the cylinder bore, the piston seal and the installation of the seal. If the piston still will not go in with bore in good condition and the piston seal properly installed, use the tool shown in Fig. 24. Rotate the piston with the tool while pushing it inward at the same time.

5. Carefully install four new dust boots on the caliper housings and pistons. Be sure that each boot is fully seated in the groove of its respective caliper housing and piston (Fig. 25). **Do not use the original dust boots.**

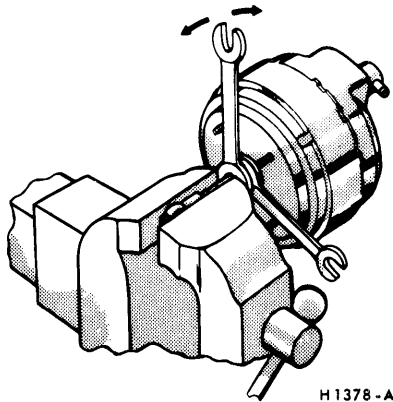


FIG. 26—Removing Valve Rod and Poppet Assembly

6. Install the external transfer tube.
7. Install the flexible brake hose to the caliper.

8. Install the caliper assembly on the spindle, and install the shoe and lining assemblies and the splash shield as outlined in Section 2.

9. Check the caliper for fluid leaks under maximum pedal pressures. **Do not move the car until a firm brake pedal is obtained.**

DISASSEMBLY OF BOOSTER REMOVAL OF EXTERNAL PARTS

1. Make scribe marks across the front and rear shells, the master cylinder flange and the mounting bracket.

2. Remove the master cylinder mounting nuts and lock washers and remove the master cylinder.

3. Remove the retaining nuts and lock washers and the mounting brackets.

4. Apply alcohol to the eye of the valve rod and the small diameter of the dust guard, and then carefully remove the dust guard from the valve rod and the hub of the rear shell (Fig. 28).

5. Remove the hydraulic push rod from the front shell and remove the seal from the push rod.

REMOVAL OF VALVE ROD AND POPPET ASSEMBLY

1. With the valve rod in a vertical position, squirt alcohol down the rod to wet the rubber grommet in the valve plunger and the ball end of the rod.

2. Clamp the valve rod in a vise (Fig. 26), leaving just enough space between the steel retainer on the plastic valve hub and the side of the vise jaw for two medium-sized, open-end wrenches. Use the wrench nearest the vise as a pry to force the valve plunger off the ball end of the valve rod (Fig. 26).

When separating the valve rod from the plunger, hold the power unit to prevent it from falling. When prying with the wrenches be careful not to damage the plastic valve hub.

3. Remove the valve rod from the vise. Pry the retainer off the end of the valve housing being careful not to chip the plastic housing (Fig. 28).

4. Remove the valve return spring, the poppet retainer and the poppet.

DISASSEMBLY OF POWER SECTION

1. Clamp the base of Bendix tool 73800 in a vise and insert the studs of the rear shell in the holes in the base (Fig. 27).

2. Place the bar wrench and the clamp bar over the studs of the front shell, attach the hook bolts to the base and tighten the center bolt just enough to free the lock at the front shell outer rim.

3. Turn the bar counterclockwise until the lances in the front shell align with the notched sections of the rear shell outer flange. Loosen the center bolt. The shells should begin to separate as the load on the bolts is removed. If the shells do not separate, check the alignment of the lances with the notched sections and tap the front shell with a soft hammer to break the bond between the front shell, the diaphragm and the rear shell.

4. Press down firmly on the front shell while disconnecting the hook bolts so that the diaphragm return spring will not fly out of the assembly.

5. Remove the top clamp bar, the bar wrench, the front shell, and the return spring from the diaphragm and shell assembly.

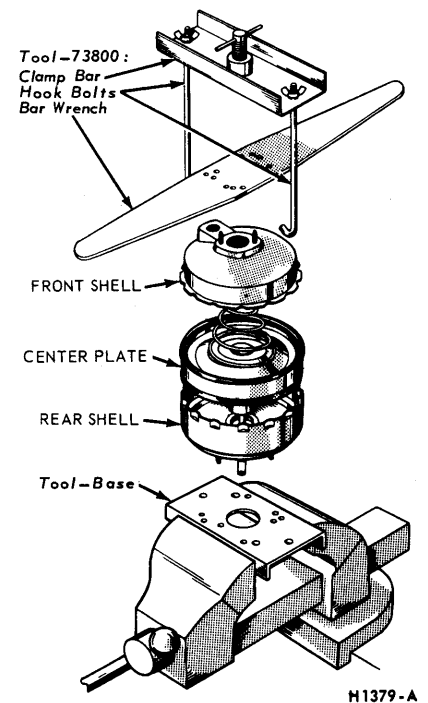


FIG. 27—Disassembly and Assembly of Power Section

6. Lift the diaphragm and plate assembly from the rear shell, and remove the rear shell from the fixture base.

7. Place the rear shell on the bench with the studs up, and drive out the seal with a punch or screw driver. **Do not remove the rear seal unless the seal is defective or a new seal is available.**

DISASSEMBLY OF DIAPHRAGM, PLATES, RETAINER AND PLUNGER

1. Wet the rear diaphragm spring retainer with alcohol and remove, using the fingers only. Remove the rear diaphragm from the rear plate (Fig. 28).

2. Set a piece of $1\frac{1}{16}$ -inch hex bar stock 2 inches long in the bench vise. Set the diaphragm and plate assembly on the hex stock with the hex opening in the front plate seated on the bar. Twist the rear plate counterclockwise, using hand leverage only on the atmospheric pressure channel or outside circumference of the rear plate.

3. After the plates have been loosened, remove the assembly from the vise and complete the disassembly on the bench with the front plate down. Unscrew the rear plate completely and carefully lift it off the front plate hub, grasping the valve plunger and spring with the other hand and removing them from the bore of the front plate hub.

4. Remove the square ring seal from the shoulder of the rear plate. The ring seal may stick to the shoulder of the front plate hub.

5. Using a small rod or screw driver through the center bore of the front plate, push out the reaction disc. Loosen the front diaphragm from the center plate, and slide the center plate carefully off the front plate hub. **Do not damage or remove the seal assembly from the center plate.** Remove the front diaphragm from the front plate.

6. To remove the vacuum check valve from the front shell, work from inside the front shell. Cut off the bead of the rubber grommet. Remove the check valve and grommet. Do not remove the valve unless it is defective.

ASSEMBLY OF BOOSTER

ASSEMBLY OF PLATES, PLUNGER, AND DIAPHRAGMS

1. Place the rear shell on a block

of wood, studs down, and press a new seal, plastic bearing face first, into the recess in the rear shell. Press the top outside flange of the seal approximately $\frac{5}{16}$ inch below the flat shell surface next to the seal (Fig. 28).

2. Install the front diaphragm on the front plate. Apply a light film of Bendix type "O" lubricant to the outside surface of front plate hub. Apply liberally to the seal in the center plate. Carefully guide the center plate and seal assembly, seal side first, onto the front plate hub.

3. Apply Bendix type "O" lubricant lightly to the front and rear bearing surfaces of the valve plunger, being careful not to get any lubricant on the rubber grommet. Assemble the valve plunger return spring on the valve plunger as shown, and set the spring and plunger in the recess of the front plate hub, grommet side up.

4. Place the square ring seal firmly against the shoulder on the outside of the front plate hub.

5. Set the rear plate threaded bore down, over the valve plunger. Using hands only, screw the rear plate to front plate hub. To tighten the plates, place $1\frac{1}{16}$ -inch hex bar stock in the vise, and set the plate assembly, front plate down, on the hex

bar. Hand-torque the plates to 120 to 180 inch pounds. Remove the plate assembly from the vise.

6. Install the rear diaphragm on the rear plate and over the lip of the center plate. Assemble the diaphragm retainer over the rear diaphragm and lip of the center plate. Using the fingers, press the retainer onto center plate until it seats against the shoulder of the center plate.

ASSEMBLY OF DIAPHRAGM AND PLATES IN FRONT AND REAR SHELLS

1. Apply talcum powder to the inside wall of the rear diaphragm shell. Apply Bendix type "O" lubricant liberally to the bearing seal in the rear shell. Apply DC-4 lubricant liberally to scalloped bearing surface of the front shell.

2. Clamp the holding fixture base of Bendix tool 73800 in the vise and insert the studs of the rear shell through the matching holes of the fixture (Fig. 27). When assembling the center plate and diaphragm assembly in the rear shell, the rear diaphragm and center plate lugs must be aligned between the lances on the rear shell. Carefully guide the valve housing sleeve through the bearing seal in the rear shell keeping the center plate and diaphragms in

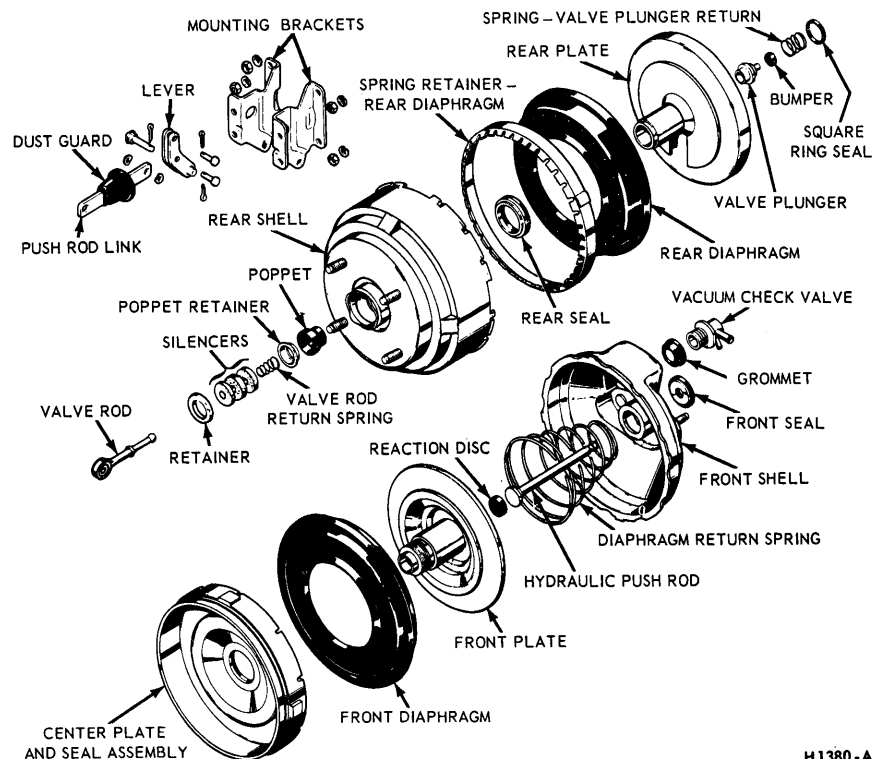


FIG. 28—Booster Disassembled

correct alignment. Work the outer rim of the front diaphragm into the rear shell so that outer rim of the front diaphragm is under each of the retaining lances on the rear shell. Place the large diameter end of the diaphragm return spring over the front plate hub, and position the front shell on the spring so that the scribe marks on the front and rear shells will be aligned when the shells are locked in place.

3. Place the bar wrench over the studs of the front shell, and then attach the clamp bar with the hook bolts. Before tightening the center bolt, make certain that the notched sections on the front shell are aligned with the retaining lances on the rear shell. Guide the rim of the diaphragm into the rear shell. Tighten the center bolt until the rim of the front diaphragm will clear the lock on the front shell. Then twist the front shell clockwise in relation to the rear shell until the stop is contacted.

4. Remove the hold-down plate and bar wrench, and remove the power unit from the holding fixture.

ASSEMBLY OF VACUUM CHECK VALVE, REACTION DISC AND HYDRAULIC PUSH ROD

1. Apply Bendix type "O" lubricant liberally to the entire surface of the reaction disc and to the piston end of the hydraulic push rod (Fig. 28). Place the reaction disc on the piston end of the push rod. Apply Bendix type "O" lubricant sparingly on the rod of the push rod, keeping

lubricant away from the adjusting screw end of the push rod. **Under no condition should the lubricant be allowed to get on the adjustment screw threads.**

2. Insert the push rod with the reaction disc on the piston end into reaction disc hub. Twist the push rod to make certain that the reaction disc is seated in the reaction disc hub and to eliminate air bubbles between the reaction disc and the push rod piston.

3. Assemble the seal, support plate side first, over the adjustment screw end of the push rod. Press the seal into the recess in the front shell until the seal bottoms in the recess.

4. If the vacuum check valve was removed, wet the new grommet in alcohol and press the grommet into the front shell, beveled side first. Make certain that the grommet is seated in the front shell. Wet the shoulder of the check valve in alcohol, and assemble the check valve in the grommet. Press the check valve into the grommet until the entire circumference of the check valve flange bears against the grommet.

INSTALLATION OF VALVE ROD AND POPPET ASSEMBLY

1. Wet the poppet valve in alcohol, and assemble the poppet in the valve housing, small diameter end of poppet first (Fig. 28). Wet the poppet retainer in alcohol and assemble it in the housing with the flange out. Press in against the retainer to make certain that the shoulder on the retainer is positioned inside the poppet.

2. Assemble the retainer, valve silencers, and valve return spring over the ball end of the valve rod as shown.

3. Wet the rubber grommet in the valve plunger and the ball end of the valve rod in alcohol. Guide the spring, and silencers into the valve housing, and assemble the ball end of the valve rod in the valve plunger. Tap the end of the valve rod with a soft hammer to lock the ball end of the rod in the valve plunger.

4. Assemble the retainer on the end of the valve housing, being careful not to chip the plastic housing.

INSTALLATION OF EXTERNAL PARTS

1. Dip the small diameter of the dust guard in alcohol, and assemble the dust guard over the eye of the valve rod (Fig. 28). Do not tear the guard. Press the guard against the valve housing and seat the large end of the guard over the scalloped flange of the rear shell. Before mounting the master cylinder, check the distance from the end of the hydraulic push rod to the hydraulic cylinder mounting face at the front end of the power unit as shown in Figure 2, Part 2-1. If the push rod length is not correct, follow the push rod adjustment procedure outlined in Part 2-1, Section 2. When the push rod length is correct, attach the master cylinder to the power section with lock washers and nuts. Torque the nuts to specification. Attach the mounting bracket to studs on the rear shell with lock washers and nuts and torque to specifications.

PART 2-3 SPECIFICATIONS

DRUM BRAKE DIMENSIONS—IN INCHES

| Drum Inside Diameter | Drum Maximum Boring Limit | Lining Length | | Lining Width | | Wheel Cylinder Bore Diameter | Master Cylinder Bore Diameter |
|----------------------|---------------------------|---------------|-----------|--------------|-----------|------------------------------|-------------------------------|
| | | Primary | Secondary | Primary | Secondary | | |
| 11.090 | 11.150 | 9.39 | 12.21 | 2.50 | 2.50 | 1 $\frac{1}{16}$ | 1 $\frac{1}{16}$ |

BRAKE CHECKS AND ADJUSTMENTS

| Type of Check or Adjustment | Specification |
|-----------------------------|---|
| Brake Shoe Repair | Drum Diameter 11.120-11.150 inch |
| | Brake Lining Required Oversize |
| | Brake Lining Clearance (Midway between Rivets) Maximum 0.008 inch |
| | Lining Wear Limit (From Top of Rivets) Maximum $\frac{1}{32}$ inch |
| Master Cylinder | Hydraulic Master Cylinder Bore, Honed Diameter. Maximum 0.9405 inch |
| Power Unit | Push Rod Adjustment 0.990-0.995 inch |
| Drum Out-of-Round | Refinish if Total Indicator Runout Exceeds 0.007 inch |
| Rotor Runout | Replace if Runout Exceeds 0.002 inch |

TORQUE LIMITS

| Description | Ft Lbs |
|---|---------------|
| Front Brake Hose Bracket to Chassis Bolt | 10-15 |
| Rear Brake Drum to Rear Axle Shaft Flange | Hand Push Fit |
| Rear Wheel to Axle Shaft to Drum | 75-110 |
| Rear Brake Carrier Plate and Bearing Retainer to Axle Housing | 50-70 |
| Master Cylinder to Booster | 12-18 |
| Master Cylinder Tube Fitting | 6-12 |
| Brake Booster to Dash Panel and Pedal Support Bracket | 15-25 |
| Parking Brake Control to Mounting Bracket | 15-19 |

DISC BRAKE SHOE AND LINING DIMENSIONS

| | |
|--|--|
| Lining Material | Bonded Johns Mansville—1398 |
| Lining Size | 5.36" x 1.90" |
| Lining Area | 10.03 Sq. In./segment |
| Shoe and Lining Thickness | 0.600" nominal |
| Lining Thickness | 0.436" nominal |
| Shoe and Lining Maximum Wear Limit | 0.195" |
| Lining Maximum Wear Limit (from surface of shoe) | 0.030" |
| Lining to Rotor Clearance (brakes released) | 0.002-0.010" |
| Proportioning Valve | 450 PSI cut in (43 $\frac{1}{2}$ % reduction in rear line pressure over 450 PSI) |

DISC BRAKE TORQUE SPECIFICATIONS

| | |
|---|--|
| Caliper Assembly to Spindle | 75-100 Ft-Lbs |
| Caliper Bleeder Screw | 10 Ft-Lbs (120 in-lbs)— Maximum—must be leakproof |
| Caliper Splash Shield | 7-9 Ft-Lbs |
| Caliper Bridge Bolts | 65-75 Ft-Lbs |
| Rotor Splash Shield to Spindle | 10-20 Ft-Lbs |
| Brake Tube Fitting Nuts to Proportioning Valve | 70 In-Lbs—Maximum—must be leakproof |
| Hub and Rotor Assembly to Front Wheel Spindle | 17-25 Ft-Lbs—Rotate rotor while torquing* |
| Wheel Assembly to Front Wheel Hub and Rotor Assembly | 75-110 Ft-Lbs |
| *.0005" to .0065" maximum bearing end play with torque specification of 17-25 Ft-Lbs | |

SERVICE TOOLS

| Ford Tool No. | Former No. | Description |
|---------------|--------------------|--|
| — | — | Brake Cylinder Retaining Clamp |
| — | 2018-A | Brake Adjusting Tool |
| — | 2162 | Adapter Cap |
| — | 2035-N 2086-L | Brake Shoe R & R Spring |
| TOOL-33621 | 33621 | Internal Snap Ring Pliers |
| | Milbar 1112-144 | In.-lb. Torque Wrench |
| | Bendix 73800 | Booster Disassembly and Assembly tool |
| TOOL-4235C | 4235C | Axle Shaft Remover |

HYDRAULIC FLUID AND LUBRICANT

| Description | Hydraulic Fluid and Lubricant |
|--------------------------------------|--|
| Brake Shoe Adjusting Screw Lubricant | General Chassis Grease CIAZ-19590-B |
| Brake Fluid | SAE 70R3 Wagner 21B(301) |