

BRAKES

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GENERAL DESCRIPTION (Fig. 5-1)

All Tempest models are equipped with duo-servo self-adjusting hydraulic brakes.

The brake pedal is suspended from a bracket attached to the instrument panel and dash. The pedal pivots in nylon bushings at the pivot shaft.

The brake master cylinder is attached to the engine side of the dash. A push rod connects the brake pedal to the master cylinder.

The brake light switch is mounted on the brake pedal mounting bracket (Fig. 5-1).

DRUMS

More effective brake cooling has been achieved with 9 1/2" brake drums. They are much wider and heavier for increased performance and are coated well into the air stream for excellent heat dissipation.

The front drums are centrifugally cast iron in a corrugated steel shell while the rears are statically cast iron with 40 axle ribs around the outside. Both front and rear drums have cooling flanges that extend beyond the backing plate for improved cooling.

BACKING PLATES

Efficient water sealing has been achieved through the use of special shields welded to the backing plates.

LININGS

Thicker secondary linings have resulted in increased service life. The longer primary linings improve performance and increase the brake effectiveness.

PARKING BRAKES

The parking brake lever (Fig. 5-2) operates the rear brakes through a system of cables. This brake is foot operated and the actuating lever is mounted under the left side of the instrument panel.

OPERATION

BRAKE MECHANISM

The self-adjusting brake mechanism operates only when brakes are applied while car is moving rearward. This action causes the secondary shoe to move a pre-determined distance toward the brake drum providing the brake linings are worn enough to allow this movement.

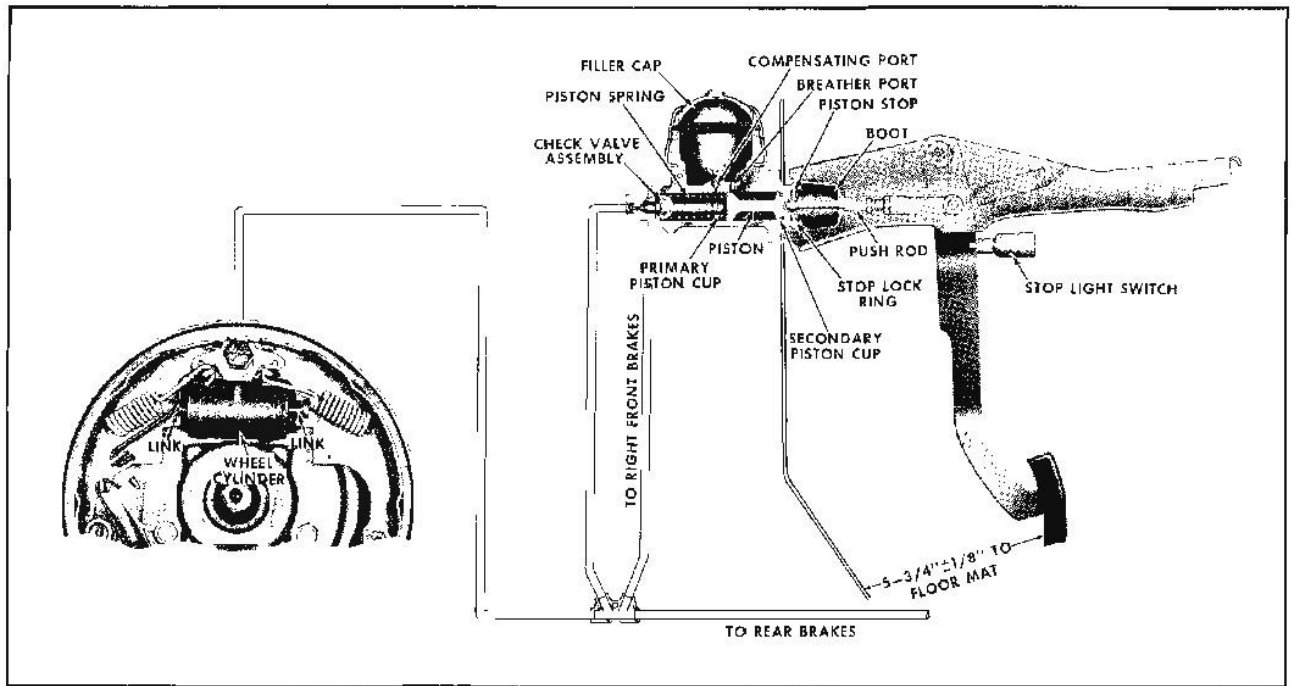


Fig. 5-1 Schematic Diagram of Hydraulic System

As car moves in reverse and brakes are applied, friction develops between the primary (or front) shoe and the drum. This friction forces the primary shoe against the anchor pin. At the same time, hydraulic pressure in the wheel cylinder forces the upper end of the secondary (or rear) shoe away from the anchor pin. As the secondary shoe moves away from the anchor pin, the upper end of the adjuster lever is prevented from moving by the actuating link which is attached to the anchor pin. Since the adjuster lever pivots on the secondary shoe, the above movement forces the lower end of the adjuster lever against the adjusting screw star wheel.

If the brake linings are worn enough to allow the secondary shoe to move a pre-determined distance, the adjuster lever will turn the adjusting screw star wheel one or two teeth, depending on amount of lining wear. If the secondary shoe does not move the pre-determined distance, adjuster lever movement will not be enough to rotate the adjusting screw star wheel.

When brakes are released, the actuating lever return spring will reposition the actuating lever into the adjusting position at the adjusting screw star wheel.

An override feature is incorporated into the self-adjusting brake which in the event the adjusting

screw is "frozen", prevents the self-adjuster from operating.

When the car is moving forward and brakes are applied, the upper end of the secondary shoe is forced against the anchor pin because of the self-energizing action of the brakes, and the self-adjuster does not operate.

HYDRAULIC SYSTEM

Depressing the brake pedal moves the master cylinder push rod and piston, forcing hydraulic fluid out through a check valve (Fig. 5-1). This fluid flows through the hydraulic lines into the wheel cylinders, forcing the wheel cylinder pistons outward from the center of the cylinder and expanding the brake shoes and linings against the brake drums.

When the brake pedal is released quickly, the master cylinder piston returns to the released position faster than fluid returns from the lines. Holes in the piston head allow fluid to pass from the rear to front of the piston head, past the primary cup to fill in this space.

At the same time (when the pedal is released) the brake shoe return springs force the wheel cylinder pistons to return toward the center of the wheel cylinder (released position). Fluid forced out of the

wheel cylinders by this action returns to the master cylinder by overcoming the pressure of the master cylinder piston spring which holds the check valve closed. As this fluid returns, the excess portion will return to the reservoir through the compensating port which must be uncovered when the master cylinder piston is in the released position. The piston spring will close the check valve when the pressure in the lines is reduced to 8-12 pounds per square inch, maintaining a slight pressure in the lines at all times. The purpose of this pressure is to keep wheel cylinder cups from leaking fluid and to reduce the possibility of air entering the system.

PARKING BRAKES

When the parking brake lever is depressed the lever pulls tight the cables connected to the rear brakes.

Each cable attaches to a rear brake actuating lever which pivots at a hole in the secondary shoe web. When the bottom of the lever is moved forward by the brake cable, the top of the lever engages the secondary shoe and forces it against the brake drum. At the same time the actuating lever forces the primary (front) to contact the brake drum by means of a strut between the actuating lever and the primary shoe.

To release the parking brake, pull the release lever handle located just below the lower left side of the instrument panel.

PERIODIC SERVICE

The brake system should be checked each time the car is lubricated. When the car is raised on a lift or lubrication, brake lines, hoses, and cables should be inspected for signs of chafing, deterioration, or other damage. A careful check for leaks should be made. Repairs as necessary should be performed as outlined in this section.

If the brake pedal travels to within 2" of floor mat when brakes are applied, or if pulls, grabs, or other irregularities are noted, a need for brake service exists. Corrections should be made as outlined in this section.

The parking brake cables must be lubricated early or when brakes are relined.

PEDAL AND STOP LIGHT SWITCH (Fig. 5-1)

Specified pedal height for normal usage (Fig. 5-1) may be changed to accommodate special owner requirements. The pedal may be raised or lowered by moving clevis toward or away from the master cylinder. If pedal is moved it is essential to reset stop light switch. DO NOT lower pedal more than absolutely necessary as insufficient brake pedal travel may result when used at high speed with worn linings.

After changing pedal height or stop light switch, adjust stop light switch, and check pedal for freedom of movement.

CAUTION: If stop light switch or pedal bracket prevents full return of brake pedal and master cylinder push rod, the master cylinder piston may be prevented from returning to its internal stop. This can block off the compensating port which prevents brake shoes from returning fully when the pedal is released (see Fig. 5-1). A further complication which follows a blocked compensating port is lining drag and complete brake burn-up. It is necessary that in the released position the primary cup be entirely clear of the compensating port to provide a safety factor against normal rubber swell in addition to expansion and deflection of body parts and pedal linkage.

PARKING BRAKE—ADJUST

Automatic brake adjusters normally keep the parking brake adjusted correctly. There may be a condition where the parking brake system will require additional adjustment even though the service brakes are perfectly satisfactory.

1. Apply the parking brake slightly and check equalization by turning the rear wheels by hand.
2. If only a slight difference exists, loosen the adjusting screw of the tighter brake.
3. If equalization requires more than a few notches movement, retighten adjusting screw to point for proper adjustment of that brake and equalize rear cable by loosening the cable clamp screws at the equalizer clevis, and pulling downward on the tight side of the cable. It may be necessary to open the clamp with a screwdriver to allow the cable to equalize (Fig. 5-2).

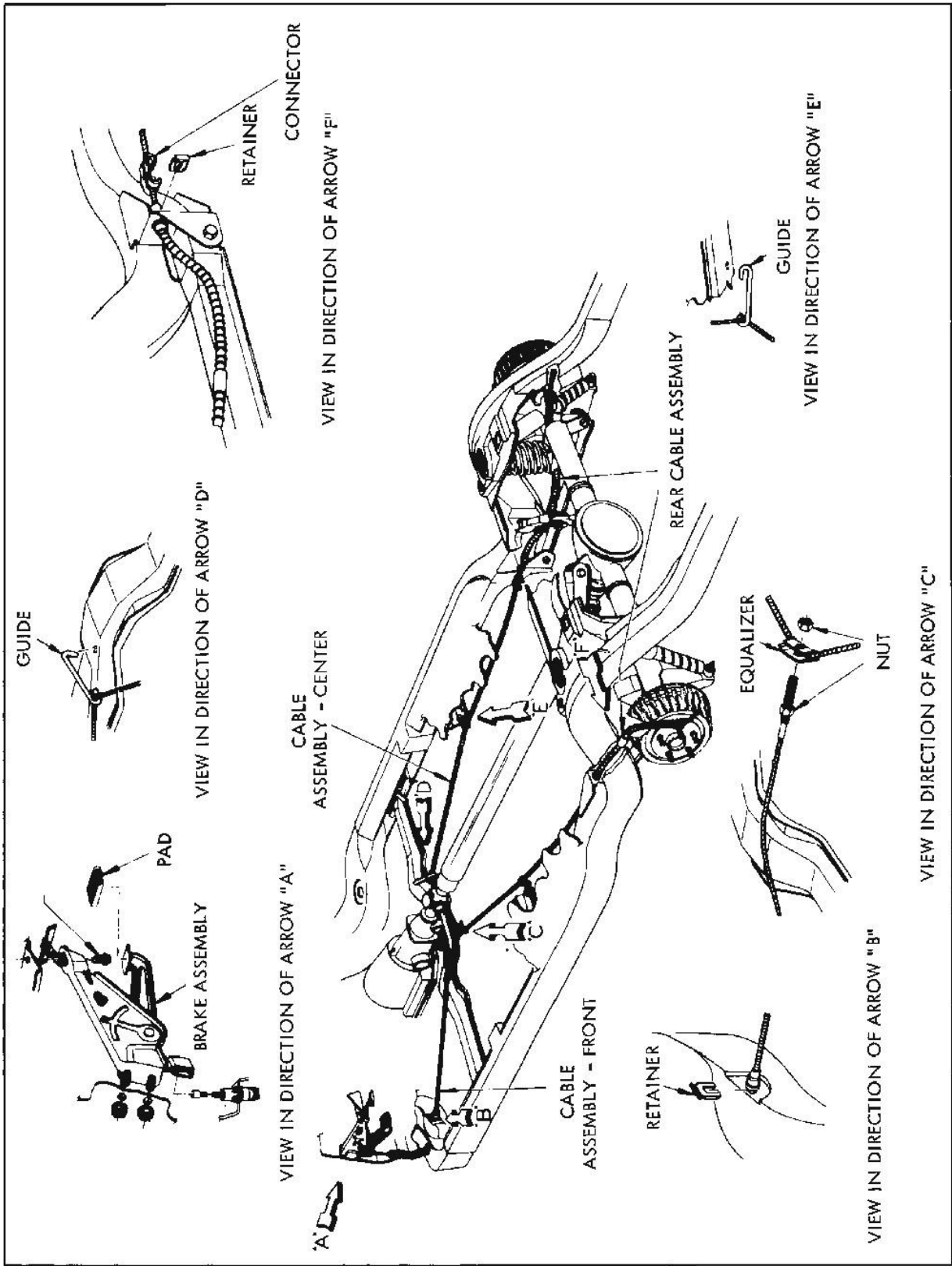


FIG. 5-2 Schematic Diagram of Parking Brake System

4. Tighten the clamp screws on the equalizer while the parking brake lever is still in the applied position. When parking brake lever is released, it should be possible to turn each wheel by hand without feeling drag when rear cable is pulled downward by the other hand, gripping cable midway between conduit and guide on frame.

CAUTION: It is very important that parking brake cables are not adjusted too tightly to cause brake drag. With automatic brake adjusters, a tight cable causes brake drag and also positions the secondary brake shoe, hence the adjuster lever, so that it continues to adjust to compensate for wear caused by the drag. The result is a cycle of wear and adjustment that can wear out linings very rapidly.

5. Close adjustment for tension may be secured by adjusting the clevis at the rear end of the front cable. In adjusting here, be certain to turn clevis on or off cable end and do not twist the cable (Fig. 5-2).

BLEEDING BRAKES

Depressing the pedal with a low fluid level in master cylinder reservoir or disconnecting any part of the hydraulic system permits air to enter the system. Air may also enter the system occasionally when brake shoes are replaced. This air must be removed by bleeding.

Bleeding may either be done by operating the brake pedal using bleeder tube as outlined below, or by using pressure bleeding equipment.

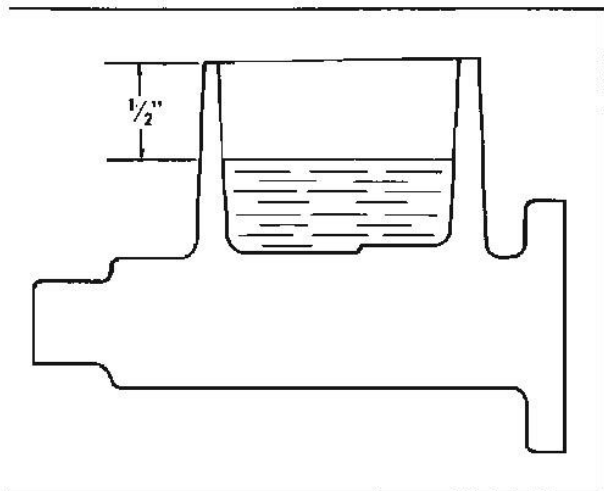


Fig. 5-3 Correct Fluid Level in Master Cylinder

When using pressure bleeding equipment follow instructions of the equipment manufacturer and always use bleeder tube attached to wheel cylinder to prevent brake fluid from running down backing plate.

When bleeding by operating pedal proceed as outlined below:

1. Fill master cylinder reservoir with recommended brake fluid.

CAUTION: Always clean away any dirt from around master cylinder filler cap before removing cap for any reason. Never depress pedal while any brake drum is off unless bleeder valve is open.

Never use an inexpensive or reclaimed brake fluid as this will positively result in brake trouble. Even though reclaimed fluid may look clear, tests have shown such fluid to be corrosive. If there is doubt as to the grade of fluid in the system, flush out system and fill with recommended brake fluid complying with SAE 70R3 specifications.

2. Starting at left front wheel, attach bleeder tube allowing tube to hang submerged in brake fluid in a clean quart jar. Unscrew bleeder valve three quarters of a turn, depress pedal a full stroke and allow it to return slowly making sure end of bleeder tube is under the surface of liquid in container. Continue operating pedal, refilling reservoir after each five strokes (unless an automatic filling device is used), until liquid containing no air bubbles emerges from bleeder tube.

3. Close bleeder valve securely and remove bleeder tube; proceed bleeding one brake at a time as described above, right front, left rear and right rear.

4. When bleeding operation is completed, refill reservoir to within 1/2" of top of master cylinder and then replace filler cap (Fig. 5-3).

MAJOR BRAKE ADJUSTMENT

A manual brake shoe adjustment is required only when new linings are installed or whenever the length of the brake shoe adjusting screw has been changed.

Remove all four wheels then remove brake drums separately being careful to avoid damaging grease seal and blow out dust from all drums and brake assemblies.

INSPECTION

1. Inspect drums for scoring. Road dirt frequently cuts grooves in drums which do not impair operation of brakes unless grooving is extremely severe. When drums are badly scored, inspect lining carefully for imbedded foreign material. Replace or recondition drums only when drums are badly scored.

CAUTION: Removing material from brake drum reduces strength of drum and also the ability of drum to absorb heat, so this operation should not be done unnecessarily.

2. Inspect front wheel bearings and oil seals and replace as necessary.

3. Note whether exterior of wheel cylinder boots is wet with brake fluid. Excessive amounts of fluid at this point indicates leakage past piston cups.

NOTE: A slight amount of fluid is nearly always present and acts as lubricant for the piston.

4. If an excessive amount of fluid is present, overhaul wheel cylinder.

5. Inspect hoses and hydraulic lines for wear or damage and replace as necessary.

6. Check to see that parking brake cables are not too tight as this would cause the rear brakes to drag.

7. Pull all shoe assemblies away from backing plate and apply a small amount of petroleum base

lubricant to pads where brake shoes contact backing plates.

8. Remove adjusting hole covers from backing plates.

9. Reinstall brake drums and wheels.

ADJUSTMENT

1. Using tool J-8915, expand adjusting screw to produce 14-20 lb. drag on outside of tire.

2. Insert a small rod or screwdriver through the adjusting screw slot in the backing plate and hold automatic adjuster lever away from the adjusting screw star wheel (Fig. 5-5 and 5-6).

3. Back off 30 notches.

4. After adjustment, drum rotation should be free from drag.

5. Install adjusting hole covers in backing plates.

6. Road test car to check brake operation.

FLUSHING HYDRAULIC SYSTEM

It may sometimes become necessary to flush out the brake hydraulic system due to the presence of mineral oil, kerosene, gasoline, carbon tetrachloride

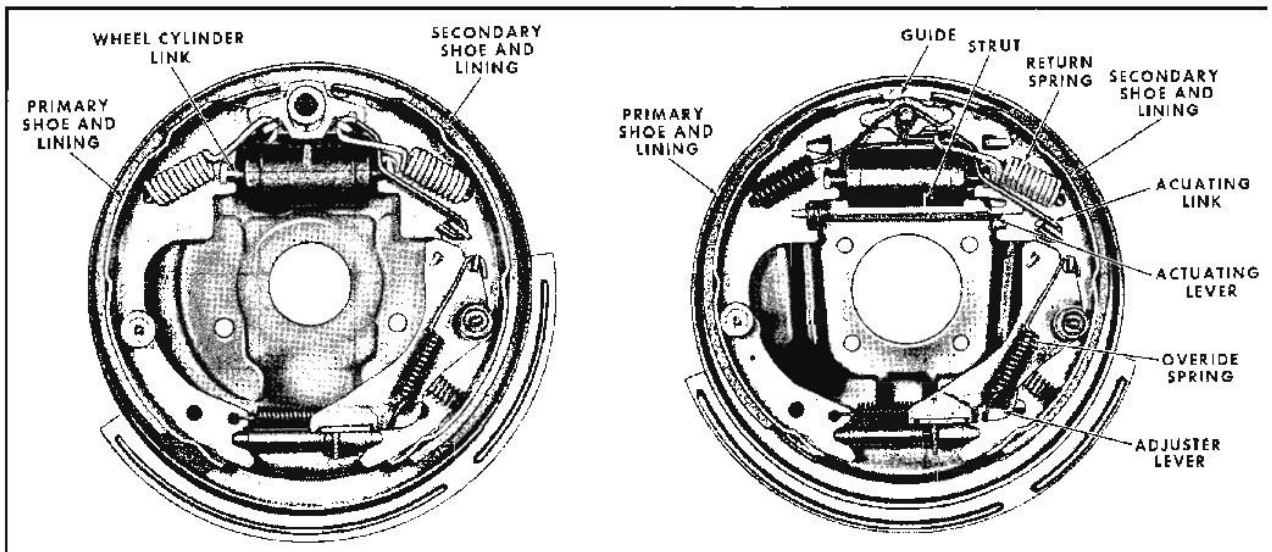


Fig. 5-4 Front and Rear Self-Adjusting Brake Assemblies

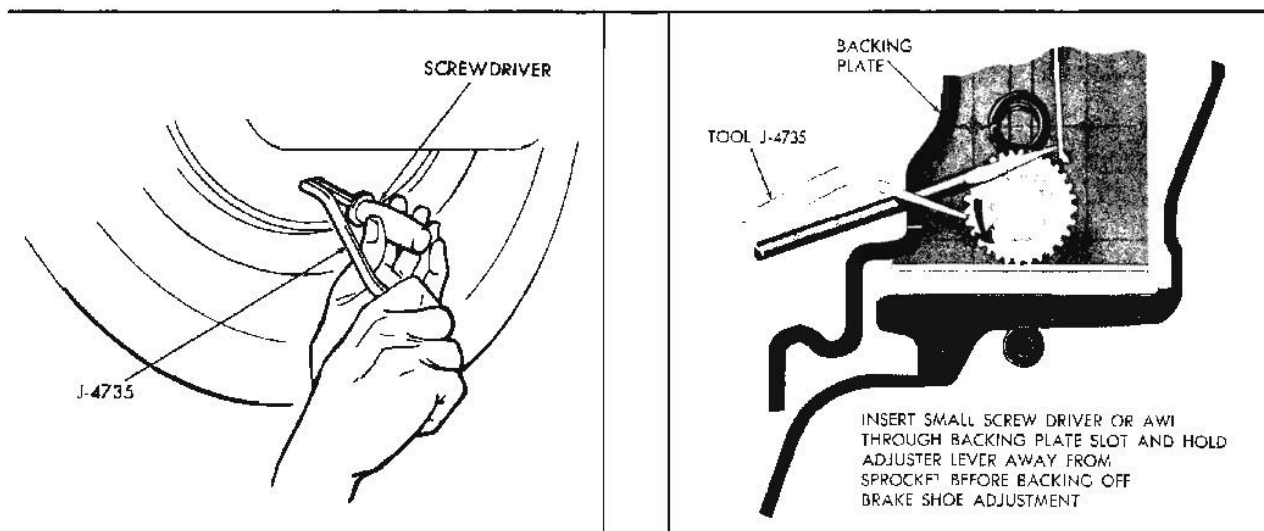


Fig. 5-5 Preparing to Back Off Adjusting Screw

etc., which will cause swelling of rubber piston cups and valves so they become inoperative.

To flush the hydraulic system, proceed as follows:

1. Attach bleeder tube and open bleeder valve at left front wheel.

2. Flush out system thoroughly with clean de-aerated alcohol, pumping the fluid from master cylinder reservoir and out of wheel cylinder bleeder valve.

3. Repeat steps 1 and 2 at remaining wheel cylinders. To ensure thorough flushing approximately 1/2 pint of alcohol should be bled through each wheel cylinder.

4. Replace all rubber parts in master and wheel cylinders. Thoroughly clean cylinders and pistons in alcohol before installing new parts.

5. After installing parts, fill system with recommended brake fluid and follow steps 2 through 4 under "bleeding brakes" to flush system of cleaning solution and to bleed brakes. In doing this, pump brake fluid from wheel cylinder bleeder valves until brake fluid flows from bleeder tube and then, if necessary, continue until no air bubbles emerge from bleeder tube.

PARKING BRAKE—LUBRICATE

1. Thoroughly clean cable, from conduit to cable equalizer.

Fig. 5-6 Backing Off Adjusting Screw

2. Remove retainer at forward end of conduits.
3. Unhook parking brake rear cable at connector.
4. Unhook cable from parking brake lever assembly in drum.
5. Pull the cable forward in the conduit.
6. Clean the cable, examine for broken strands, and apply light grease, chassis lubricant, or equivalent.
7. Inspect cable connections to hand brake actuating lever to be certain cable is seated in lever hook.
8. Secure rear brake cable to lever assembly.
9. Slide brake cable conduit back in position and secure at forward end with retainer.
10. Hook rear cable to connector and adjust as described under PARKING BRAKE—ADJUST.

BRAKES—OVERHAUL (Fig. 5-7)

BRAKE SHOES—REMOVE

1. Raise all four wheels off ground and disconnect parking brake equalizer.
2. Remove front wheels, front hub and drum assemblies, rear wheels and rear drums.

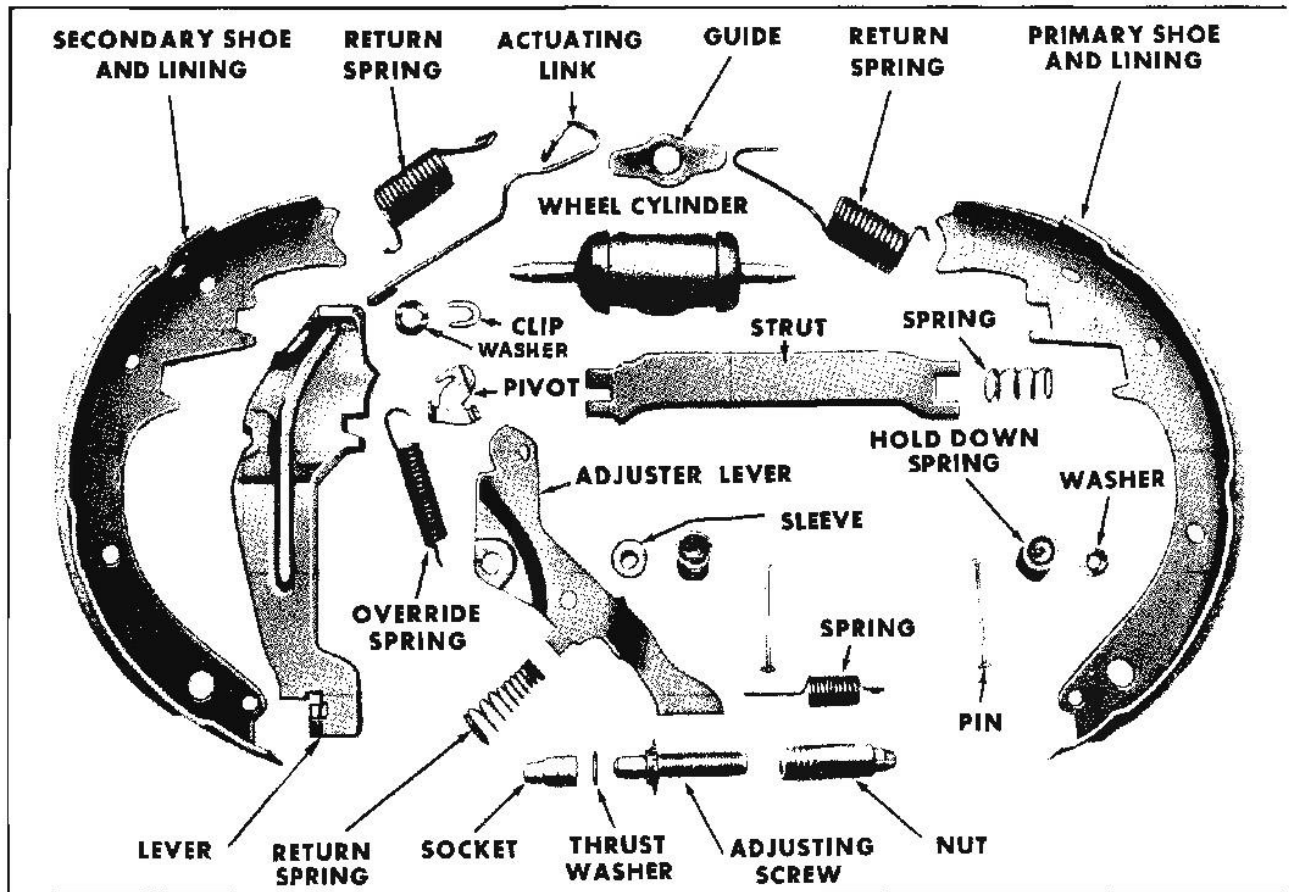


Fig. 5-7 Self-Adjusting Brake Assembly-Exploded View

NOTE: It may be necessary to back off the brake shoe adjustment before the brake drums can be removed. To back off shoe adjustment, rotate adjusting screw upward (Fig. 5-6).

3. Remove the primary and secondary shoe return springs.

4. Remove the actuating lever.

5. On rear brakes, spread shoes slightly and remove the parking brake lever strut and spring, then disconnect the parking brake cable from the operating lever.

6. Remove the brake shoe hold down springs, pins and washers, and the adjuster lever and return spring.

7. Spread shoes to clear wheel cylinder links, then remove the primary and secondary shoes as an assembly.

CAUTION: Extreme care must be taken to prevent oil, grease, or brake fluid from getting on linings. Even oily finger prints on linings may affect the operation of brakes.

8. Remove the primary to secondary shoe spring and the adjusting screw.

9. On rear brakes, remove the parking brake lever from the secondary shoe.

BRAKE INSPECTION

1. Inspect linings for wear or cracks. Clean brake shoes, drums and backing plates, removing any foreign particles that may have become imbedded in lining surface. Examine shoes for loose rivets which must be replaced. Install new shoes or reline if linings are badly burned or worn nearly flush with rivets or if linings show evidence of oil, grease or brake fluid on the surface.

CAUTION: In cases of severe brake usage it is possible for shoes to take the shape of worn linings permanently. Before relining a shoe, particularly if it is discolored, check for distortion by laying it against a new shoe. Discard the shoe if its radius has opened up more than the thickness of the rim metal.

2. Inspect drums for scoring. Road dirt frequently cuts grooves in drums which do not impair operation of brakes unless grooving is extremely severe. When drums are badly scored, inspect lining carefully for imbedded foreign material. Replace or recondition drums only when severely scored.

CAUTION: Removing material from brake drum reduces strength of drum and also the ability of drum to absorb heat, so this operation should not be done unnecessarily.

3. Inspect front wheel bearings and oil seals and replace as necessary.

4. Note whether exterior of wheel cylinder boots is wet with brake fluid. Excessive amounts of fluid at this point indicate leakage past piston cups.

NOTE: A slight amount of fluid is nearly always present and acts as lubricant for the piston.

5. If an excessive amount of fluid is present, overhaul wheel cylinder.

6. Clean inner surfaces of brake backing plates and all shoe contacting points.

7. Clean exposed portions of parking brake cables.

8. Disassemble the adjusting screw assembly and inspect as follows:

a. Check thrust washer and mating surfaces for burrs or excessive wear.

b. Inspect teeth on star wheel for wear.

c. Remove all foreign material from adjusting screw and nut. Nut must rotate freely on threads.

9. Check adjuster lever to be certain it is not bent or distorted and that lock is not worn excessively.

10. Check the override pivot for wear or deformed parts.

11. Check brake drum for build-up of rust and dirt at outer circumference. Remove build-up.

12. Inspect hoses and hydraulic lines for wear or damage and replace as necessary.

13. Check to make sure all bolts and nuts securing backing plate to suspension are tightened to 80-110 lb. ft. torque at upper plate to knuckle bolt, 45-65 lb. ft. torque at lower bolt and 30-45 lb. ft. torque on all rear plate to axle flange bolts.

BRAKE SHOES—INSTALL

1. Lubricate the adjusting screw threads, thrust washer mating surfaces, backing plate ledges and all other contacting surfaces with a small amount of brake lubricant or wheel bearing lubricant. Do not lubricate teeth of star wheel of adjusting screw.

2. Pull parking brake rear cable forward and rearward through conduit and examine for broken strands. Lubricate freely with light grease or chassis lubricant and return cable to normal position. Remove any excess lubricant.

3. On rear brake assemblies, install the parking brake lever to the secondary shoe.

4. Assemble the adjusting screw.

5. Attach the primary to secondary shoe spring to the shoes, and install the adjusting screw. The primary to secondary shoe spring must not contact the adjusting screw star wheel.

NOTE: The right front and right rear adjusting screws have left hand threads and can be identified by 4 grooves. All adjusting screws must be installed with the star wheel end of the screw toward the rear of the car.

6. Position shoe assembly on the backing plate. Be sure wheel cylinder links are properly positioned in the shoe notches.

NOTE: When replacing shoes, always be certain to assemble secondary shoes to the rear and primary shoes to the front. Note that linings of primary shoes are lighter in color than secondary linings.

7. On rear brakes, connect parking brake lever to secondary shoe and install strut and spring between lever and primary shoe.

8. Position the upper end of actuating link on the brake shoe guide.

9. Engage the actuating lever with the override pivot then position the adjuster lever and return spring on the secondary shoe. Fasten with hold down spring assembly.

NOTE: The front brake hold down spring retaining pins are identified with the numeral 1 stamped on the outer face. The rear brake retaining pins being identified with the numeral 8 stamped on the outer face.

10. Install the remaining hold down springs.

11. On rear brakes, install the parking brake cable on the parking brake lever.

12. Install the primary and secondary brake shoe return springs.

NOTE: New brake shoe return springs should be installed if old springs have been overheated or strength is doubtful. Overheated springs may be indicated by ends of coils opened up or failure of shoes to return to anchor pin.

13. Sand linings lightly to remove any trace of dirt.

14. When new shoes or linings have been installed, shorten adjusting screw until drum will slide freely over shoes and check to see that adjusting actuator lever can turn adjusting screw star wheel with minimum effort.

15. Install drums, observing instructions for front wheel bearing adjustment.

16. Adjust brake shoes as described in this section under MAJOR BRAKE ADJUSTMENT.

17. If wheel cylinder has been replaced or repaired or hydraulic line has been replaced, bleed brakes as described in this section on BLEEDING BRAKES.

18. Install wheels.

19. Adjust parking brake as outlined under PARKING BRAKE--ADJUST.

20. Check fluid level in master cylinder. Fluid level should be 1/2" below the reservoir opening.

21. Check brake pedal travel to be sure it is within specifications, then road test car for proper operation of the brake system.

CAUTION: New linings must be protected from severe usage for several hundred miles. Stops from high speeds or repeated stops from low speed may permanently injure new linings. This information should be conveyed to owner.

WHEEL CYLINDER—REMOVE AND REPLACE

REMOVE

1. Raise wheels of vehicle and remove wheel then drum.

2. Disconnect hose from wheel cylinder.

3. Remove brake shoes to protect them from dripping fluid.

4. Remove screws and lockwashers which hold cylinder to backing plate and remove wheel cylinder.

DISASSEMBLE (Fig. 5-8)

1. Remove wheel cylinder connecting link.

2. Remove rubber boots.

3. Remove pistons, rubber cups, and spring.

CAUTION: Before cleaning parts, clean hands. Do not wash hands in gasoline or fuel oil before cleaning parts, use soap and water.

4. Wash all parts in clean alcohol and lay on a clean surface (such as a clean piece of paper).

5. Protect parts from dirt until reassembly.

INSPECT

1. Inspect piston rubber cups for softening, distortion, or swelling. This condition indicates oil gasoline, carbon tetrachloride, etc., in hydraulic system which would require flushing of system, and replacing of rubber parts in wheel cylinders as well as in master cylinder.

2. See that rubber cups are flared so they will have tension against the cylinder bore. Loss of flare may be caused by overheating.

3. Examine spring, cylinder bore, and pistons for signs of scoring, rust, pitting or etching. Any of these require replacement of wheel cylinder.

NOTE: A new brake cylinder has a "bearingized" surface. This is accomplished by diamond boring the cylinder then rolling it under heavy pressure to obtain a highly polished hard surface. Honing this surface destroys the "skin" and leaves a softer and rougher surface which will cause more rapid piston wear than the "bearingized" surface. Honing also enlarges the bore and oversize pistons are not available.

ASSEMBLE

1. Apply clean brake fluid to cylinder bore, pistons, and rubber cups before assembly.
2. Place a boot in one end of cylinder.
3. Place a piston in cylinder so that flat side will be toward center of completed assembly.
4. Insert a rubber cup with flat side against piston.
5. Insert spring and expander assembly.
6. Insert a rubber cup with flat side toward opening.
7. Install piston with flat side against cup.
8. Place rubber boot in end of cylinder.

REPLACE

1. Install wheel cylinder on backing plate with screws and lockwashers. Tighten to 60-90 pound inches of torque.
2. Replace wheel cylinder connecting links.
3. Install brake shoes.
4. Connect hose or pipe to wheel cylinder (use new gasket with hose).
5. Install brake drums and adjust wheel bearings, if front drum was removed.
6. Bleed all brake lines as described under BLEEDING BRAKES in this section.
7. Adjust and test brakes as previously described in this section.

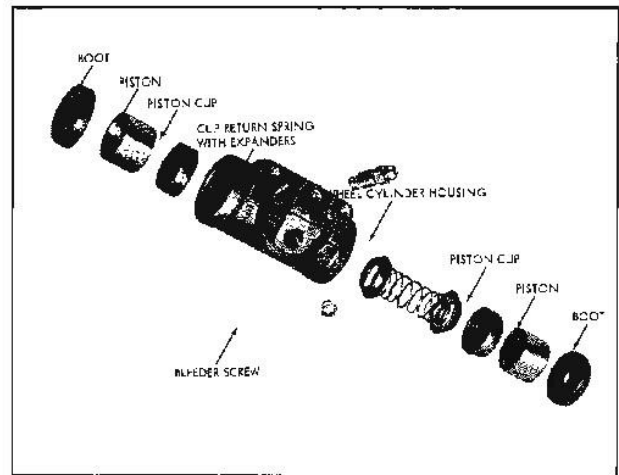


Fig. 5-8 Wheel Cylinder—Exploded View

MASTER CYLINDER—REMOVE AND REPLACE

REMOVE

1. Disconnect brake pedal return spring.
2. Remove retainer and clevis pin from clevis.
3. Remove hydraulic brake line from end of master cylinder. Cover line and plug cylinder to exclude dust, dirt, etc.
4. Remove two nuts and lockwashers, holding master cylinder to dash.
5. Remove master cylinder from automobile.

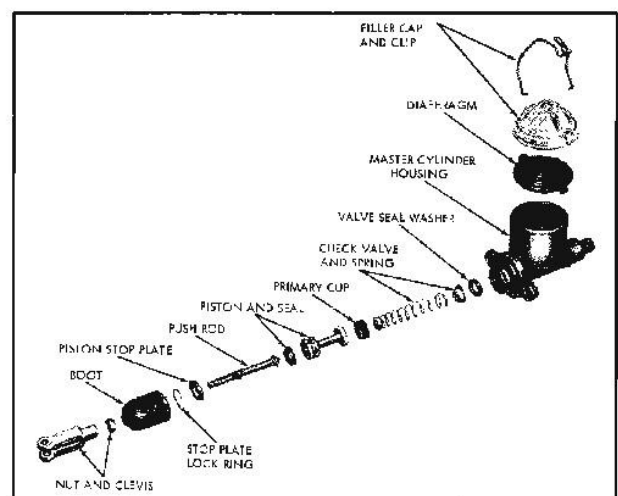


Fig. 5-9 Master Cylinder—Exploded View

DISASSEMBLE (Fig. 5-9)

1. Remove reservoir cover and diaphragm from top of master cylinder and dump fluid.
2. Clamp cylinder in vise.
3. Remove clevis and lock nut from push rod.
4. Remove boot from master cylinder.
5. Carefully remove push rod stop plate lock ring from end of cylinder.

NOTE: Ring is under high tension, use eye protection.

CAUTION: When lock ring is removed piston spring will force piston and stop plate out of cylinder with 10-15 lbs. of force.

6. Remove piston, piston cups, piston spring, and check valve assembly from cylinder.

CAUTION: Before cleaning parts, clean hands. Do not wash hands in gasoline or fuel oil before cleaning parts, use soap and water.

7. Wash all parts in clean alcohol and lay on a clean surface (such as a sheet of clean paper).

8. Protect parts from dirt until reassembly.

INSPECT

1. Inspect piston rubber cups and check valve for softening, distortion or swelling. This indicates oil, gasoline, carbon tetrachloride, etc. in hydraulic system which would require flushing of entire system and replacing of rubber parts in wheel cylinders as well as in master cylinder.

2. Inspect master cylinder bore for signs of scoring, rust, pitting, or etching. Any of these will require replacement of master cylinder. Presence of pitting, rust, or deep etching in master cylinder calls for replacement and careful inspection for similar condition in all wheel cylinders.

CAUTION: A new brake cylinder has a "bearing-ized" surface. This is accomplished by diamond boring the cylinder then rolling it under heavy pressure to obtain a hard surface. Honing this surface destroys the "skin" and leaves a softer and rougher surface which will cause more rapid

piston and cup wear than the "bearingized" surface. Honing also enlarges the bore and oversize pistons are not available.

ASSEMBLE

1. Install washer, check valve and spring in cylinder.

2. Coat primary cup with clean brake fluid and install in cylinder with flat side toward rear; make certain cup seats over end of spring.

3. Coat secondary cup with clean brake fluid and install on piston, with sharp edges of lip pointing toward perforated end of piston.

4. Install secondary cup and piston in cylinder so that flat end of piston is toward front of cylinder.

5. Install push rod and stop plate in cylinder. (A trace of silicone grease on ball end of push rod will help keep it quiet in service.)

6. Install push rod stop plate lock ring in cylinder.

CAUTION: Use eye protection.

NOTE: Inspect piston stop washer in end of master cylinder to see that it is held firmly in place by lock ring bottoming fully in groove seat in master cylinder.

7. Place rubber boot on end of cylinder.

8. Install lock nut and clevis on push rod.

9. Fill reservoir.

10. Install reservoir cover and diaphragm.

REPLACE

1. Install master cylinder on dash and secure with two nuts and lockwashers. Tighten to 15-25 lb. ft torque.

2. Connect master cylinder push rod and clevis to brake pedal with clevis pin and secure with retainer

3. Connect brake pedal return spring.
4. Check and adjust pedal height and stop light switch.
5. Connect hydraulic line to master cylinder.
6. Check level after working pedal several times. Fill master cylinder with recommended fluid to within 1/2" of top of cylinder and replace filler cap (Fig. 5-10).
7. Brake system may be bled as described in this section on BLEEDING BRAKES if necessary.
8. Adjust and test brakes as outlined previously in this section.

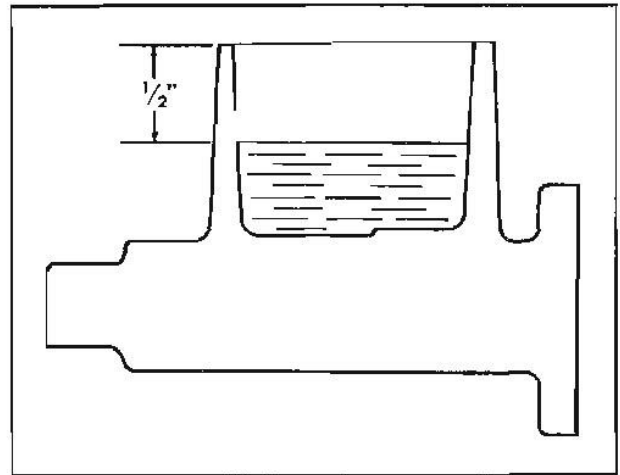


Fig. 5-10 Correct Fluid Level in Master Cylinder

TROUBLE DIAGNOSIS AND TESTING

TESTING FOR LEAK IN HYDRAULIC SYSTEM

NOTE: If there is any evidence of air in system, brakes must be bled before making this test.

1. Apply brakes manually, holding as steady a force as possible.
2. If pedal sinks slowly toward floor, a leak is indicated. Check for location of the leak by examining all lines, connections, wheel cylinders and inside of

master cylinder boot. If external leak is not found, remove master cylinder, disassemble and inspect parts. Leak will usually be past primary piston cup due to defective cup or cylinder bore.

NOTE: If leak at wheel cylinder has allowed fluid to reach linings, they must be replaced.

The following is a list of common troubles occurring in the brake system with possible causes and remedies:

PEDAL GOES TO TOE BOARD

CAUSE	REMEDY
Automatic adjusters not working.	Inspect for inoperative condition and correct as necessary.
Normal wear of lining.	Readjust or replace lining.
Low fluid level in master cylinder reservoir.	Low fluid level in reservoir will permit air to be pumped into hydraulic lines. This necessitates refilling reservoir and bleeding lines. Find cause of low fluid and correct.
External leak in hydraulic system, or leak past master cylinder primary piston cup.	Check for leak in system as outlined above.
Air trapped in hydraulic system.	Air trapped in hydraulic system gives pedal a spongy feeling when depressed. Bleed brakes.

ALL BRAKES DRAG AFTER BRAKE ADJUSTMENT IS CHECKED AND FOUND TO BE CORRECT, OR PEDAL BUILDS UP WITH USE

CAUSE	REMEDY
Mineral oil, etc., in system.	The presence in the hydraulic system of any mineral oil, kerosene, gasoline, shock absorber or transmission fluid or carbon tetrachloride will cause swelling of rubber piston cups and valves, so they become inoperative. This is first noticed in the master cylinder. Brakes will not release freely if master cylinder primary piston cup has swollen sufficiently to obstruct the compensating port. Flush system thoroughly with a good grade of clean de-natured alcohol and replace all internal rubber parts in brake system.
Pedal does not return freely or push rod is adjusted too long.	Lubricate pedal linkage and make certain no bind exists. Also, see that pedal return spring has not lost its tension and promptly returns pedal. Check that stop light switch is not defective, incorrectly adjusted or that switch plunger is not binding.
Compensating port of master cylinder closed.	The compensating port in master cylinder must be completely clear when pedal is in released position. <ol style="list-style-type: none"> 1. Check that pedal returns freely. 2. Check that push rod is not adjusted too long. 3. Check that compensating port is not plugged by dirt. To check compensator port, remove master cylinder reservoir cover and watch the fluid in the cylinder as the brake pedal is moved. A "geyser" should be seen as the pedal is first depressed. If no geyser is seen, the compensating port is blocked. 4. Inspect master cylinder piston cup and if found to be swollen or elongated, flush system and replace damaged parts.

ONE WHEEL DRAGS

CAUSE	REMEDY
Improperly adjusted parking brake cables (rear wheels only) or stuck cable.	Adjust parking brake cables and lubricate.
Weak or broken brake shoe return springs.	Replace defective brake shoe springs and lubricate brake shoe pads and shoe contact at anchor pin with grease.

Brake shoe or drum clearance too small.	Readjust brakes to obtain complete freedom from drag.
Loose or incorrect front wheel bearings.	Adjust front wheel bearings or replace as described in section 3.
Wheel cylinder piston cups swollen or distorted or piston stuck.	Replace defective or damaged parts. Look for evidence of dirt in hydraulic system which could cause damage to the cylinders or cups. See first item under ALL BRAKES DRAG . . .
Obstruction in line.	Obstruction in line may be caused by foreign material in line or flattened or kinked tube. If dirt is found in line, remove obstruction and flush hydraulic system with fresh brake fluid. If tube is flattened or kinked, replace damaged parts.
Support assembly shoe pads grooved.	Grind or file pads on backing plate smooth and lubricate.
Incorrect brake shoe radius.	Replace defective brake shoe.

BRAKES DO NOT AUTOMATICALLY ADJUST

CAUSE	REMEDY
Worn, bent or distorted adjuster lever.	Replace adjuster lever.
Improper secondary lining to drum clearance.	Adjust clearance.
Brake linings excessively worn.	Install new linings.

CAR PULLS TO ONE SIDE

CAUSE	REMEDY
Grease or fluid on lining.	Replace with new linings. Linings with even a slight trace of grease or fluid will cause trouble, and can seldom be salvaged by cleaning. Correct cause of grease or fluid reaching linings.
Loose wheel bearings.	Adjust wheel bearings.
Loose backing plate at rear axle or front axle.	Tighten backing plate.
Linings not to specifications, or primary and secondary shoes reversed. New and used linings mixed on one end of car.	Various kinds of linings have different friction effect on the drums and on each other. Each wheel must have similar linings. The primary and secondary linings must not be interchanged. Use only factory specified linings.

Tires not properly inflated or unequal wear of tread.	Inflate tires to specified pressures. Rearrange tires so that a pair with tread surfaces of similar wear will be installed on front wheels.
Linings charred or drums scored.	Sand surfaces of linings and drums. Remove particles of metal that have become embedded in surfaces of linings. See COMPLETE BRAKE RECONDITIONING, regarding road dirt grooving brake drums. Seriously charred linings should be replaced.
Wheel cylinder link off shoe.	Check boot for holes. Check for burrs on wheel cylinder piston.
Water, mud, etc., in brakes.	Remove any foreign material from all brake parts and the inside of drums. Lubricate shoe pads and rear brake cable with grease. Examine support assembly for damage.
Weak chassis springs, loose steering gear, etc.	Replace springs, adjust steering gear, etc.
Incorrect geometry setting of suspension.	Adjust geometry so that car does not have a tendency to "lead" when driven on a level road.

SPONGY PEDAL

CAUSE	REMEDY
Air trapped in hydraulic system.	Remove air by bleeding (if bleeding is not effective check for closed compensating port).
Brake adjustment not correct.	Adjust brakes.
Bent shoes.	Replace.
Compensating port closed.	See ALL BRAKES DRAG.

EXCESSIVE PEDAL PRESSURE REQUIRED TO STOP CAR

CAUSE	REMEDY
Brake adjustment not correct.	Adjust brakes.
Improper lining.	Install factory specified lining.
Grease or fluid soaked linings.	Correct cause and replace linings. See BRAKE CAUTIONS.
Rusted wheel cylinder.	Replace necessary parts.
Wheel cylinder link incorrectly aligned.	Check wheel cylinder piston and boot for damage Install link.

Compensating port not cleared.

Check pedal linkage, stop light switch adjustment, etc. See also "Compensating Port" under "All Brakes Drag . . .".

LIGHT PEDAL PRESSURE—BRAKES TOO SEVERE

CAUSE	REMEDY
Brake adjustment not correct.	Adjust brakes.
Loose support assembly on rear axle or front spindle.	Adjust front wheel bearings and tighten front backing plates. Tighten rear backing plates. Adjust brakes.
Small amount of grease or fluid on linings.	Correct cause and replace linings.
Charred linings or scored drums.	Sand surfaces of linings and drums. Clean loose dust from brakes and drums. In severe cases replace shoes. Caution owner regarding abuse of brakes. Remove all particles of metal that have become embedded in surfaces of linings. Slightly scored drums do not require replacing or turning.
Improper linings.	Install factory specified linings.

BRAKE NOISES

NOISE	CAUSE	REMEDY
*Squeak in brake with car stationary (sometimes mistaken for pedal squeak).	Shoe pads on backing plates dry and rusty.	Pry shoes out with screwdriver—apply grease sparingly to shoe pads with feeler stock.
*Creak when brakes are applied at low car speed.	Anchor pins dry.	Lubricate where shoes bear.
*Snaps in brakes as pedal is applied, car stationary.	Hold down nail heads dry.	Lubricate.
Pedal squeak.	Return spring or stop light switch rubbing pedal.	Lubricate.
Crunch or groan, holding car on hill.	Brake dust and possibly linings which have been overheated.	Sand linings and remove dust from brakes.
High pitch squeak while brakes operate.	A. New linings not yet fully burnished. B. Persistent squeak—no apparent cause.	Let run or sand off high spots of linings. Sand linings for temporary cure of mild cases.

NOISE	CAUSE	REMEDY
	C. Bonded linings.	Install factory specified shoes.
7. Low pitch squeal at end of high rate stop.	A. New linings not fully burnished.	Check adjustment. Sand lining high spots.
	B. Incorrect adjustment.	Adjust.
	C. Bent backing plate (top of shoe webs should be in line with each other looking down on them. Check after pushing shoes toward backing plate at top).	Straighten or replace.
8. Clicks during high rate stops, usually once per wheel revolution in one wheel only.	Threaded drum.	Disappears with usage as drum surface is conditioned by lining wear.
9. Chatter at high speed.	Drum out of round with 2 or more distinct high spots in circumference.	Sometimes corrects with usage. Turn drum.
10. Pedal throb at light applications at low speed.	Drum out of round simply off center.	Turn drum.
11. "Rough feel" during high rate stops from moderate speed.	Tool chatter. Look for faint light and darker stripes running across the braking surface.	Usually corrects with usage.
12. *Click, first application after reversing.	Shoes holding out from anchor pins.	File shoe pads on backing plates; lubricate.
	Incorrect parking brake adjustment.	Check parking brake adjustment.

*Although adjusting brakes temporarily changes these noises, lubrication will remedy.

BRAKE CAUTIONS

1. Do not use a substitute for recommended brake fluid (see below) or reclaimed brake fluid.
2. Do not allow grease, paint, oil or brake fluid to come in contact with brake lining.
3. Do not handle brake shoes or drums with greasy hands.
4. Do not clean rubber parts or inside of cylinders with anything but clean alcohol, or clean brake fluid.
5. Do not use any linings other than those specified by the factory.
6. Do not allow master cylinder reservoir to become less than half full of brake fluid.
7. Under no circumstances should brakes be severely used after new shoes are installed. They should be given moderate use for several hundred miles until linings become well burnished. Repeated severe applications will cause erratic brake action and may permanently injure brake linings. Under no circumstances should severe testing be done that will burn the linings.
8. When linings of one brake require replacement the linings should also be replaced on the other brake at the same end of the car (except on very low mileage new cars on which the brakes have not been abused).

SPECIFICATIONS

NEW DRUMS

Inside diameter—Front and Rear 9-1/2"

Out of Round including taper for full width (max.)

—Front005"

—Rear006"

Indicator reading shall not vary more than .0005" per inch of circumference.

FLUID

Fluid that complies with heavy duty standards of S.A.E. 70R3 Specifications.

LINING

Width—Front 2-1/2"

—Rear 2"

Thickness (Front and Rear)—Primary . . . 0.196"

—Secondary . . . 0.265"

MASTER CYLINDER BORE

. 1"

PEDAL HEIGHT

Underside of Pedal Pad

to Floor Mat 5-3/4" ± 1/8"

WHEEL CYLINDER BORE

—Front 1-1/8"

—Rear 1-5/16"

TORQUE SPECIFICATIONS

	LB. FT.		LB. FT.
Front brake assembly to steering		Brake master cylinder assembly	
knuckle—lower Bolt and Nut	45-65	to dash Nut	15-25
Front brake assembly to steering		Wheel cylinder to backing plate Screw . . .	5-7
knuckle—upper Bolt	80-110	Wheel brake cylinder bleeder Screw	5-10
(Bolt Lubricated)		Parking brake lever assembly to dash Nut .	10-18
Rear brake assembly to axle housing		Parking brake front cable to equalizer Nut .	5-10
Bolt and Nut	30-45		

SPECIAL TOOLS

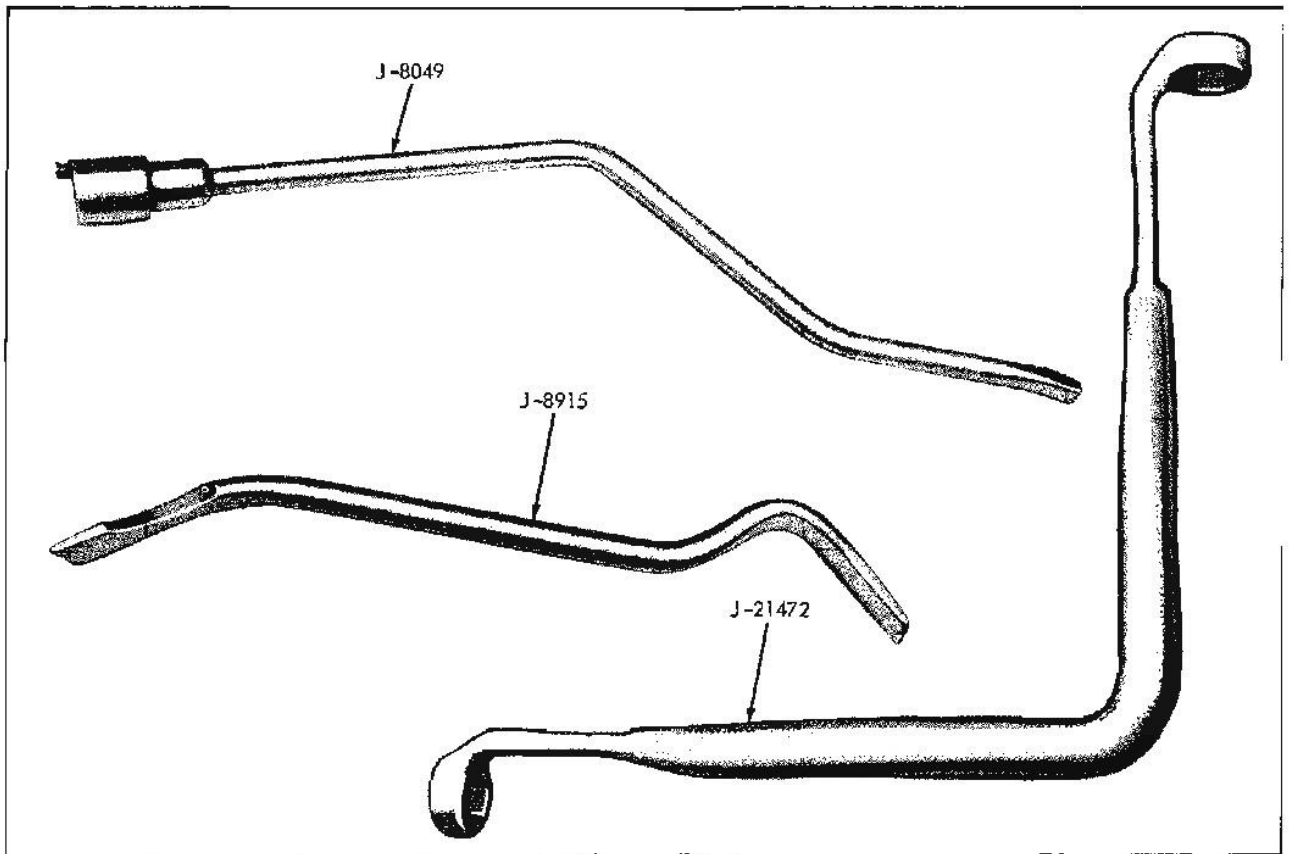


Fig. 5-11 Tempest Brake Tools