

# SECTION B

## 43-44000 DISC BRAKES (DELCO MORaine)

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## DIVISION I SPECIFICATIONS AND ADJUSTMENTS

### 50-6 DISC BRAKE SPECIFICATIONS

#### a. Tightening Specifications

Use a reliable torque wrench to tighten the parts listed, to insure proper tightness without straining or distorting parts. These specifications are for clean and lightly lubricated threads only, dry or dirty threads produce increased friction which prevents accurate measurement of tightness.

Part	Location	Thread Size	Torque
Bolt	Splash Shield and Mounting Bracket to Knuckle (Upper) . . . . .	5/8-18	125 lb. ft.
Bolt & Nut	Splash Shield and Mounting Bracket to Knuckle (Lower) . . . . .	1/2-20	85 lb. ft.
Bolt	Caliper to Mounting Bracket . . . . .	7/16-14	75 lb. ft.
Bolt	Caliper Assembly . . . . .	9/16-18	130 lb. ft.
Screw	Caliper Bleeder . . . . .	Special	65 lb. in.

#### b. General Specifications

Disc Brake Type . . . . .	Fixed Caliper - Disc
Location . . . . .	Front Wheels Only
Disc Type . . . . .	Ventilated - Cast Iron
Disc Diameter . . . . .	11"
Disc Runout (Maximum) . . . . .	.004" Total
Disc Surface Finish . . . . .	30-50 Micro-Inch
Disc Thickness, New . . . . .	.995" - 1.005"
Disc Thickness, Minimum . . . . .	.965"
Disc Parallelism (Thickness Variation) . . . . .	.0005"
Brake Shoe and Lining Type . . . . .	Integrally Molded
Brake Shoe and Lining Thickness (New) . . . . .	.495" - .505"
Brake Shoe and Lining Length . . . . .	5.950"
Brake Shoe and Lining Minimum Thickness Before Replacement . . . . .	.138"

## DIVISION II

### DESCRIPTION AND OPERATION

#### 50-7 DESCRIPTION OF DISC BRAKES

The Delco Moraine Disc Brake consists of a fixed caliper, rotating disc, splash shield and mounting bracket. The caliper assembly contains four pistons and two shoe and lining assemblies with the lining integrally molded to the steel shoes. A seal and dust boot are installed on each piston, with a piston spring in the caliper cylinder bore beneath each piston. A retaining pin extends through each caliper half and both shoes to hold the shoes and linings in

position in the caliper. Machined surfaces within the caliper prevent the shoe and lining assembly from rotating with the brake disc when pressure is applied.

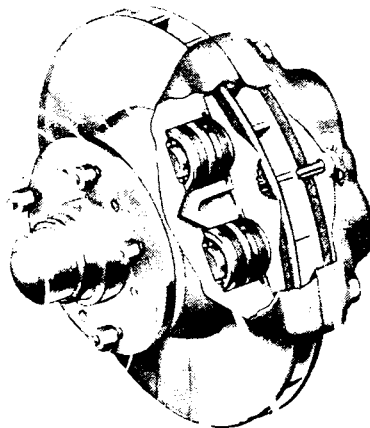
The disc, which has a series of air vent louvers to provide cooling, is mounted on the front wheel hub. The caliper straddles the disc and mounts on a mounting bracket attached to the steering knuckle with two bolts.

A dual master cylinder and power brake assembly is standard on Buicks equipped with disc brakes. The hydraulic lines from the master cylinder are connected to a brake warning light switch. This switch provides a warning to the driver if one part of the hydraulic system fails (pressure to front

and rear wheels is not equal). Since residual hydraulic pressure is not required at the calipers, a residual pressure check valve is used only in the hydraulic line to the rear wheels. A metering valve, in the hydraulic line to the front wheels, prevents front brake application until about 75-100 psi have built up in the hydraulic system so that the linings in the rear drum brakes contact the drums at the same time the linings in the front disc brakes apply braking pressure to the discs.

#### 50-8 OPERATION OF DISC BRAKES

Hydraulic pressure builds up in the system when the brake pedal is depressed. When the pressure



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Figure 50-26—Delco Moraine Disc Brake

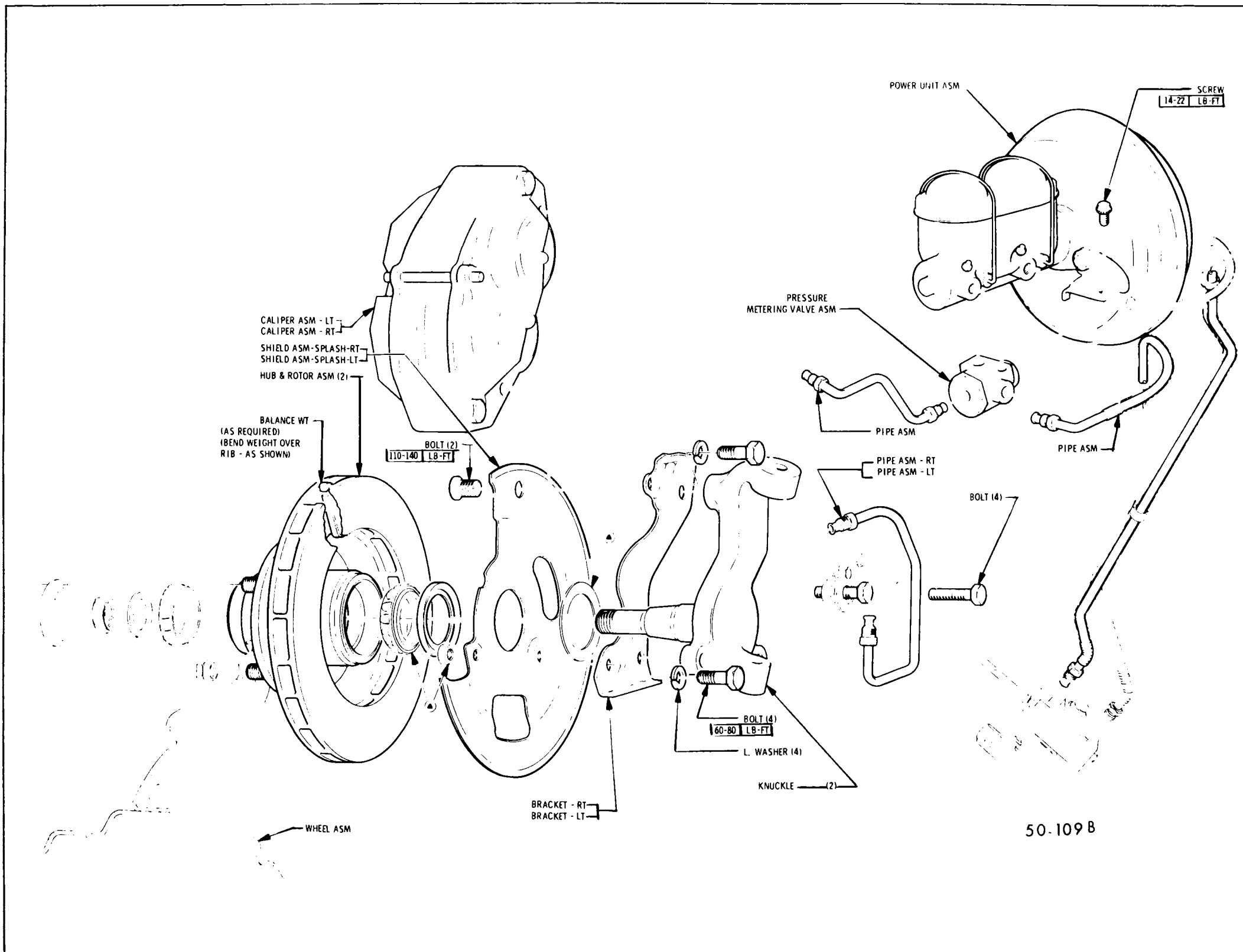


Figure 50-27—Disc Brake System



exceeds 75-100 psi (to overcome the metering valve), pressure is transmitted through the metering valve to the caliper cylinder bores. The pistons move out of the cylinder bores and force the shoe and lining assemblies toward the center of the caliper, clamping the disc between the linings with equal and opposite force. When the brake pedal is released, the hydraulic pressure decreases and the pistons relax. The compressed piston springs in the cylinder bores position the linings lightly against the disc, ready for the next brake application.

The disc brake, having small friction segments (linings), operates on a small area of the disc surface and a large proportion of the disc is exposed to the atmosphere for heat dissipation. Thus, the disc brake provides consistent performance, even on frequent high speed stops.

Since the brake linings brush lightly against the disc when the brakes are not applied, disc brakes automatically compensate for lining wear; therefore, no adjustment is required. The linings should be inspected periodically, however, to insure they do not wear too thin. The rate and type of wear will vary considerably with driving conditions.

As the linings wear, the pistons move further out of the caliper cylinder bores. The large diameter of the cylinder bores requires a considerable volume of brake fluid and the master cylinder fluid level should be checked frequently.

## DIVISION III

### SERVICE PROCEDURES

#### 51-5 REPLACE DISC BRAKE SHOES

The linings should be inspected whenever the wheels are removed for any reason (tire rotation,

etc.). Shoe and lining should be replaced, if the lining is worn to the bottom of the grooves or to within .020" of the shoe at either end. Shoe and lining sets are listed in the Buick Master Parts Catalog under Group 5.017.

1. Raise car and remove front wheels.
2. Attach a drain hose to caliper bleed screw and submerge other end of hose in a container partially filled with brake fluid. When bottoming pistons, open bleed screw to allow excess fluid to drain. After pistons are bottomed, tighten bleed screw before relieving pressure on shoes and linings.

**NOTE:** This step is necessary when replacing worn disc brake shoes, since insertion of full thickness lining will force the pistons back into caliper, displacing fluid into master cylinder, causing reservoir to overflow. Do not drain reservoir completely as there is the possibility that air could be pumped into the system, if brake pedal is depressed, which would make it mandatory to bleed system.

3. Starting with inboard shoe (shoe closest to car), push shoe back as far away from disc as possible. Do not pry against disc. Using a screwdriver or putty knife between shoe and lining assembly and piston, press pistons to bottom of cylinder bores. Piston springs will not allow pistons to remain completely bottomed.

4. Slip Piston Retainer J-22674 over caliper half, with flat side between piston and back of shoe. (If you have 2 sets of these tools, you can do both shoes at this time.)

5. Remove and discard cotter pin from inboard end of shoe retaining pin and slide out retaining pin.
6. Remove worn shoes and insert new replacements by rotating

either end out of caliper and pulling shoe from caliper. If any difficulty is experienced in removing or installing shoe, rotate shoe in opposite direction. Shoes are to be replaced in axle sets only. Shoes are interchangeable. See Figure 50-28.

**NOTE:** Be sure lining material is next to disc.

7. Reinstall shoe retaining pin through outboard caliper half, outboard shoe, inboard shoe and inboard caliper half. Place a new, 3/32 x 5/8 plated cotter pin through retaining pin and lock. Remove piston retaining clips.

8. Repeat steps 2 through 7 at other front wheel.

9. Install wheels and tighten wheel nuts to 65 lb. ft.

10. Lower hoist or remove jack stands.

11. Check master cylinder fluid level and fill, if necessary. Depress brake pedal several times to seat linings on disc. Recheck master cylinder fluid level and refill, if necessary. If brake pedal feels spongy, bleed brakes. See paragraph 56-4.

**CAUTION:** Do not move car until a firm brake pedal is obtained.

#### 51-6 BRAKE DISC SERVICING

In manufacturing brake disc, tolerances of rubbing surfaces for



Figure 50-28—Installing Brake Shoes





Figure 50-29—Checking Disc Runout

flatness is .002" and for parallelism is .0005", while lateral runout of the faces must not exceed .004" total. See Figure 50-29. Maintenance of these close controls of the shape of the rubbing surfaces is necessary to prevent brake roughness. In addition, surface finish must be non-directional and maintained at 30-50 micro-inch. This control of rubbing surface finish is necessary to avoid pulls and erratic performance and promote long lining life and equal lining wear of both left and right brakes. Light scoring of disc surfaces not exceeding .015" in depth, which may result from normal use, is not detrimental to brake operation.

When total disc thickness is less than .965", disc should be replaced. Disc thickness less than this can permit shoes to come out of contact with shoe abutments and cause malfunction. Because performance is not impaired by surface imperfection not exceeding .015" deep, refinishing of rubbing surface is not necessary.

#### a. Remove Brake Disc

1. Raise car and remove front wheels.
2. Remove brake hose support to caliper mounting bracket screw. See Figure 50-27.

3. Remove caliper to mounting bracket bolts. Hang caliper from upper suspension.

**NOTE:** Do not place strain on brake hose.

4. Remove spindle nut and disc and hub assembly.

#### b. Install Brake Disc

1. Install new bearings or seal as necessary. See Group 100.
2. Install hub and disc assembly on spindle. Tighten spindle nut to 19 lb. ft. while rotating wheel. Back off nut and re-torque to 11 lb. ft. If a spindle hole lines up with a slot in the nut, back off nut one slot. If neither spindle hole lines up with a slot in the nut, back off nut not more than 1/4 turn to align a slot of the nut with hole in spindle.
3. Install caliper and tighten bolts to 75 lb. ft. Mount tube support bracket and tighten screw to 11 lb. ft.
4. Mount wheel and tighten wheel bolt nuts to 65 lb. ft. Lower hoist or remove jack stands.
5. Depress brake pedal several times to seat linings on disc.

**CAUTION:** Do not move car until a firm brake pedal is obtained.

### 51-7 DISC BRAKE CALIPER OVERHAUL

#### a. Removal and Disassembly of Caliper

1. Disconnect brake line tube nut from inboard caliper side of the calipers. Plug end of tube to prevent entrance of dirt and loss of fluid.
2. Detach caliper assembly from mounting bracket by removing two hex head bolts and take to clean work area. See Figure 50-27.
3. Remove and discard cotter pin from inboard end of shoe retaining pin, slide out retaining pin. If old shoes are to be reused,

they should be marked for proper installation at time of assembly. Clean outside of caliper with Declene or clean denatured alcohol.

4. Separate caliper halves by removing two large hex head bolts. Remove two small "O" rings from cavities around fluid transfer holes in both ends of outboard caliper halves. See Figure 50-30.

5. To free piston boots so pistons may be removed, push piston down into caliper as far as it will go. Insert a screwdriver blade under inner edge of steel ring in boot and using piston as a fulcrum, pry boot from its seat in caliper half. See Figure 50-31.

6. Remove piston assemblies and springs from caliper half. Remove boot and seal from piston.

#### b. Inspection and Cleaning of Caliper

Inspect cylinder bore for scoring or corrosion. It is best to replace a corroded cylinder.

**NOTE:** Staining is not to be confused with corrosion. Corrosion can be identified as pits or excessive roughness.

Polish any discolored or stained area with crocus cloth by rotating the cloth supported by a finger in the bore. Do not slide the cloth in or out of bore under pressure. Do not use any other form of abrasive or abrasive cloth.

Clearance of piston in bore as checked using a feeler gage should be .0045" to .01".

All rubber parts, boots, seals and "O" rings, should be replaced with new parts. All rubber parts are contained in repair kit listed in the Buick Master Parts Catalog under Group 4.667.

Use Declene or denatured alcohol to remove all traces of dirt or grease. Do not use mineral base solvents to clean brake parts.



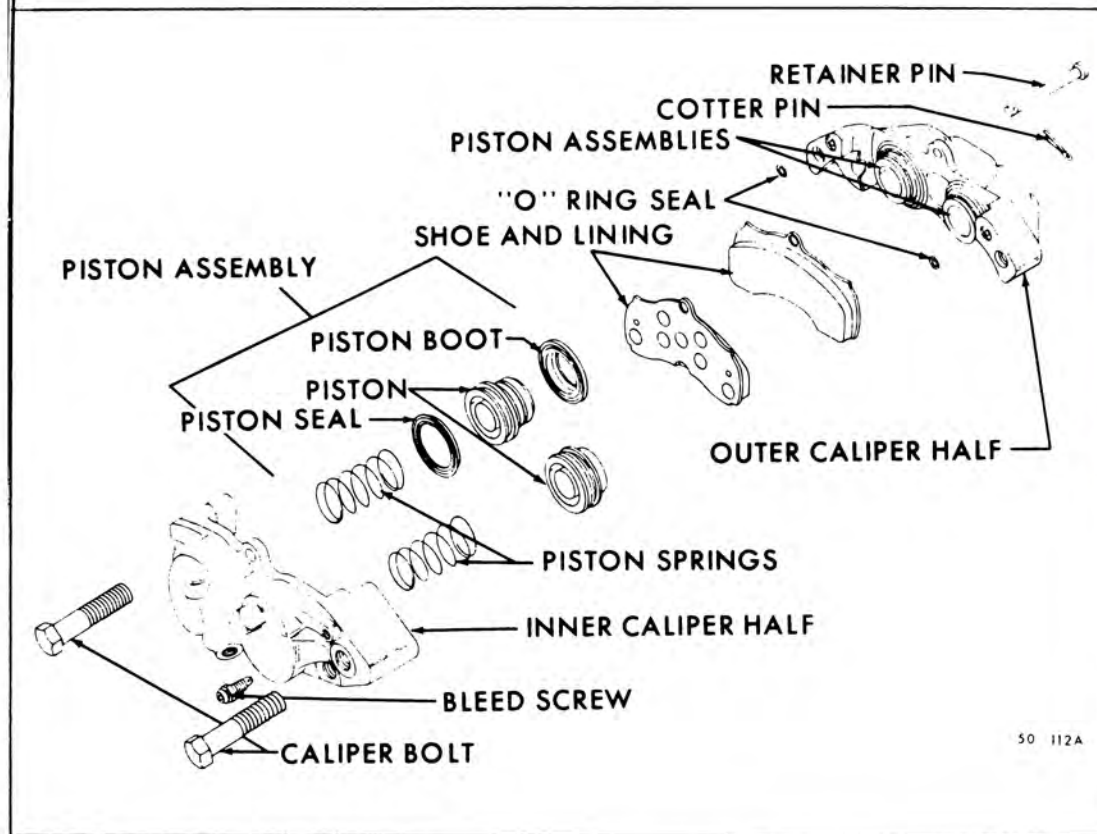


Figure 50-30—Caliper - Exploded View

Using an air hose, blow out all fluid passages in caliper halves, making sure that there is no dirt or foreign material blocking any passage. During reassembly, use care to keep dirt out of caliper assembly.

### c. Assembly and Installation of Caliper

1. Assemble seal in groove in piston which is closest to flat end of piston. The lip on the seal

must face toward large end of piston. Be sure seal lips are in piston groove and do not extend over step in end of groove. See Figure 50-32.

2. Place spring in bottom of piston bore.

3. Lubricate piston seal and cylinder bore with clean brake fluid.

4. Install piston assembly in bore, using Piston Ring Compressor J-22591. See Figure 50-33.



Figure 50-31—Removing Piston Boot

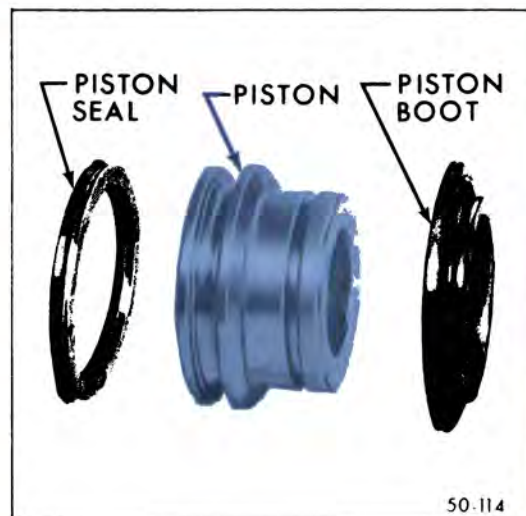


Figure 50-32—Piston - Exploded View



Figure 50-33—Installing Piston Assembly in Bore

5. Depress pistons and check that they slide smoothly into bore until end of piston is flush with end of bore. If not, recheck piston assembly and location of piston spring and seal.

6. Assemble boot in groove of piston closest to concave end of piston. Fold in boot must face toward end of piston with seal on it.



Figure 50-34—Installing Piston Boot

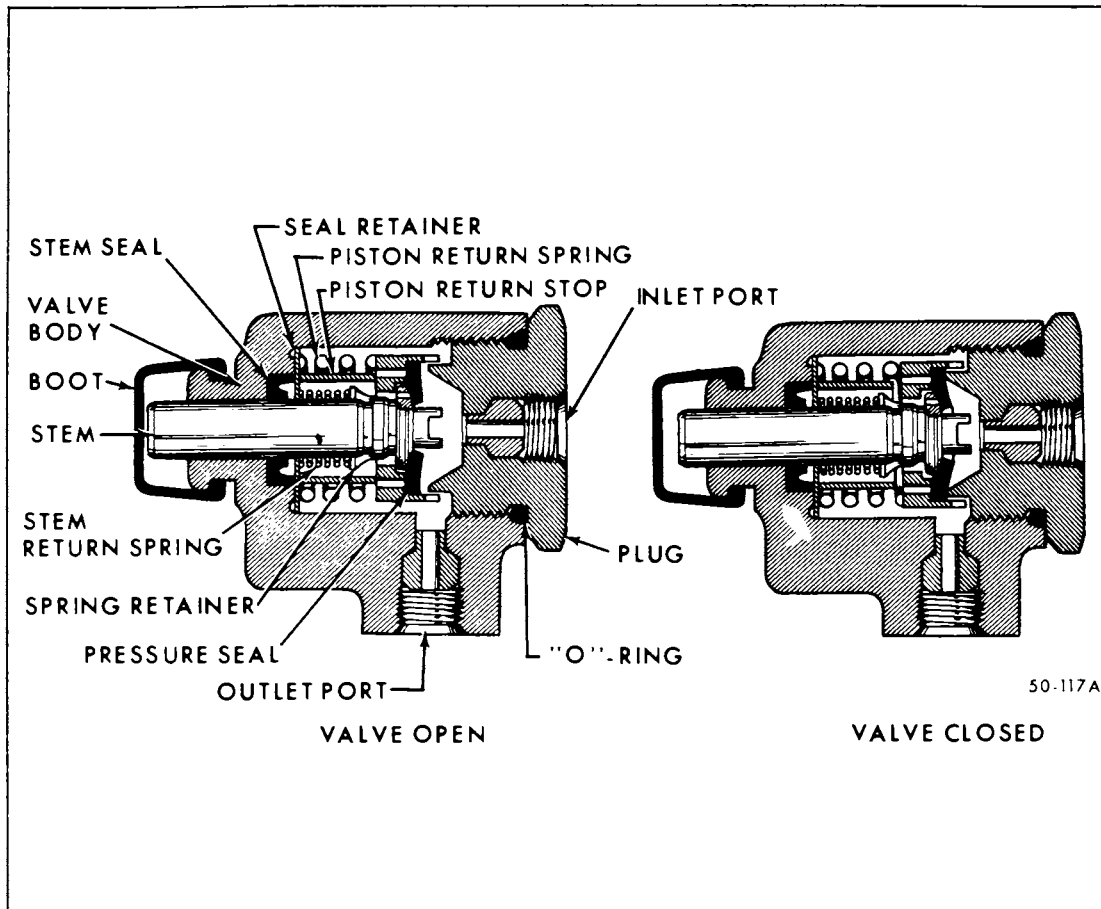


Figure 50-35—Disc Brake Metering Valve

7. Position Boot Installer J-22592 over piston and seat steel boot retaining ring evenly in counter-bore. The boot retaining ring must be flush or below machined face of caliper. Any distortion or uneven seating could allow contaminating and corrosive elements to enter bore. See Figure 50-34.

8. Repeat Steps 1 through 7 for other three pistons.

9. Position "O" rings in small cavities around fluid transfer holes in both ends of outboard caliper halves. Lubricate hex head bolts with Delco Brake Lube

listed in the Buick Master Parts Catalog under Group 4.683, or dip in clean brake fluid. Fit caliper halves together, install bolts and torque to 130 lb. ft.

**NOTE:** It is very important that caliper bolts be lubricated and torqued to values specified. Use a reliable torque wrench.

10. Install shoe assemblies in caliper, push pistons into bore.

11. Position caliper over disc and attach to mounting bracket with two hex head bolts. Torque mounting bolts to 75 lb. ft.

12. Connect brake line tube nut

to caliper and tighten to 100 lb. in.

13. Calipers are now ready to be bled with Delco Supreme #11 Brake Fluid or equivalent.

**CAUTION:** Do not move car until a firm brake pedal is obtained.

### 56-3 METERING VALVE REPLACEMENT

The metering valve (Bendix) is not repairable. If a defect is found in the metering valve, the complete valve assembly must be replaced.

1. Disconnect hydraulic lines at metering valve. Plug lines to prevent loss of fluid and entrance of dirt.

2. Remove metering valve.

3. Install metering valve by reversing removal steps.

4. Bleed front brake system. See paragraph 56-4.

**CAUTION:** Do not move car until a firm brake pedal is obtained.

### 56-4 BLEEDING DISC BRAKES

The bleeding operation for disc brakes is the same as for drum brakes. Section A, paragraph 56-2. The only exception is that the metering valve must be held open. This is done by depressing and holding the stem in the end of the valve either by hand or Special Tool J-22793. It is not essential that the boot be removed first. If pressure bleeding equipment is used, pressure must not exceed 30 psi.

**DIVISION IV TROUBLE DIAGNOSIS****59-3 DISC BRAKE TROUBLE DIAGNOSIS**

Since the car is equipped with drum-type rear brakes, also refer to Section A covering drum brakes to diagnose brake problems.

CONDITION	POSSIBLE CAUSE	CORRECTION
<b>EXCESSIVE PEDAL TRAVEL</b> (low pedal)	<ol style="list-style-type: none"> <li>1. Master cylinder fluid level low.</li> <li>2. Poor quality brake fluid (low boiling point) in system.</li> <li>3. Air in hydraulic system.</li> <li>4. Hoses soft and weak (expanding under pressure).</li> <li>5. Disc runout excessive.</li> <li>6. Wheel bearings or steering parts loose or worn (causing shoe and lining knockback).</li> <li>7. Shoe and lining knockback after violent cornering.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill to proper level with approved fluid.</li> <li>2. Drain hydraulic system and fill with approved fluid.</li> <li>3. Bleed hydraulic system and refill with approved fluid.</li> <li>4. Replace defective hoses.</li> <li>5. Check disc for runout and install new disc, if necessary.</li> <li>6. Adjust or replace defective parts.</li> <li>7. Pump pedal to restore normal pedal height.</li> </ol>
<b>SPONGY PEDAL</b> (Springy sensation to pedal upon application)	<ol style="list-style-type: none"> <li>1. Master cylinder fluid level low.</li> <li>2. Poor quality brake fluid (low boiling point) in system.</li> <li>3. Air in hydraulic system.</li> <li>4. Hoses soft or weak (expanding under pressure).</li> <li>5. Caliper seals soft or swollen.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill to proper level with approved fluid.</li> <li>2. Drain hydraulic system and fill with approved fluid.</li> <li>3. Bleed hydraulic system and refill with approved fluids.</li> <li>4. Replace defective hoses.</li> <li>5. Drain hydraulic system, flush system with alcohol and replace all cups and seals in complete brake system.</li> </ol>
<b>HARD PEDAL</b> (Excessive pedal pressure needed to stop vehicle)	<ol style="list-style-type: none"> <li>1. Power brake malfunctioning.</li> <li>2. Linings soiled with brake fluid, oil or grease.</li> <li>3. Lines, hoses or connections dented, kinked, collapsed or clogged.</li> <li>4. Master cylinder cups swollen.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check and repair power unit.</li> <li>2. Replace shoes and linings.</li> <li>3. Repair or replace defective parts.</li> <li>4. Drain hydraulic system, flush system with alcohol and replace all cups and seals in complete brake system.</li> </ol>



CONDITION	POSSIBLE CAUSE	CORRECTION
HARD PEDAL (Excessive pedal pressured needed to stop vehicle) (Cont'd.)	<ol style="list-style-type: none"> <li>5. Master cylinder bore corroded or rough.</li> <li>6. Caliper pistons frozen or seized.</li> <li>7. Caliper cylinder bores corroded or rough.</li> <li>8. Pedal push rod and linkage binding.</li> </ol>	<ol style="list-style-type: none"> <li>5. Repair or replace master cylinder.</li> <li>6. Disassemble caliper and free up pistons (replace if necessary).</li> <li>7. Disassemble caliper and remove corrosion or roughness, or replace caliper.</li> <li>8. Free up and lubricate.</li> </ol>
GRABBING OR PULLING (severe reaction to pedal pressure and out of line stops)	<ol style="list-style-type: none"> <li>1. Linings soiled with brake fluid, oil or grease.</li> <li>2. Caliper loose.</li> <li>3. Lines, hoses or connections dented, kinked, collapsed or clogged.</li> <li>4. Master cylinder bore corroded or rough.</li> <li>5. Caliper pistons frozen or seized.</li> <li>6. Caliper cylinder seals soft or swollen.</li> <li>7. Caliper cylinder bores corroded or rough.</li> <li>8. Pedal linkage binding (and suddenly releasing).</li> <li>9. Metering valve not functioning properly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace shoes and linings.</li> <li>2. Tighten caliper mounting bolts to specified torque.</li> <li>3. Repair or replace defective parts.</li> <li>4. Repair or replace master cylinder.</li> <li>5. Disassemble caliper and free up pistons (replace if necessary).</li> <li>6. Drain hydraulic system, flush system with alcohol and replace all cups and seals in complete brake system.</li> <li>7. Disassemble caliper and remove corrosion or roughness, or replace caliper.</li> <li>8. Free up and lubricate linkage.</li> <li>9. Replace metering valve.</li> </ol>
FADING PEDAL (Pedal falling away under steady pressure)	<ol style="list-style-type: none"> <li>1. Poor quality brake fluid (low boiling point) in system.</li> <li>2. Hydraulic connections loose; lines or hoses ruptured (causing leakage).</li> <li>3. Master cylinder primary cup worn or damaged.</li> <li>4. Master cylinder bore corroded, worn or scored.</li> </ol>	<ol style="list-style-type: none"> <li>1. Drain hydraulic system and fill with approved fluid.</li> <li>2. Tighten or replace defective parts.</li> <li>3. Repair master cylinder.</li> <li>4. Repair or replace master cylinder.</li> </ol>

CONDITION	POSSIBLE CAUSE	CORRECTION
<p>FADING PEDAL (Pedal falling away under steady pressure) (Cont'd.)</p>	<p>5. Caliper cylinder seals worn or damaged.</p> <p>6. Caliper cylinder bores corroded, worn or scored.</p> <p>7. Bleed screw open.</p>	<p>5. Replace seals.</p> <p>6. Disassemble caliper and remove corrosion or scoring, or replace caliper.</p> <p>7. Close bleed screw and bleed hydraulic system.</p>
<p>NOISE AND CHATTER (May be accompanied by brake roughness and pedal pumping)</p>	<p>1. Disc has excessive lateral runout.</p> <p>2. Disc has excessive thickness variations (out of parallel).</p> <p>3. Shoe and lining knock-back after violent cornering.</p> <p>4. Car creeping or moving slowly with brakes applied (may produce groan or crunching noise).</p>	<p>1. Replace disc.</p> <p>2. Replace disc.</p> <p>3. Pump brake pedal.</p> <p>4. Increase or decrease pedal effort slightly.</p>
<p>DRAGGING BRAKES (Slow or incomplete release of brakes)</p>	<p>1. Lines, hoses or connections dented, kinked, collapsed or clogged.</p> <p>2. Master cylinder compensating port restricted by swollen primary cup.</p> <p>3. Residual pressure check valve in lines to front wheels.</p> <p>4. Caliper pistons frozen or seized.</p> <p>5. Caliper cylinder seals swollen.</p> <p>6. Caliper cylinder bores corroded or rough.</p> <p>7. Hydraulic push rod on power brake out adjustment or binding (causing primary cup to restrict master cylinder compensating port).</p>	<p>1. Repair or replace defective parts.</p> <p>2. Drain hydraulic system, flush system with alcohol and replace all cups and seals in complete brake system.</p> <p>3. Check connections at master cylinder and brake warning light switch and install lines correctly.</p> <p>4. Disassemble caliper and free up pistons (replace if necessary).</p> <p>5. Drain hydraulic system, flush system with alcohol and replace all cups and seals in complete brake system.</p> <p>6. Disassemble caliper and remove corrosion or roughness, or replace caliper.</p> <p>7. Adjust or free up and lubricate.</p>