

# SECTION C

## FOUR PISTON DISC BRAKES

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## DIVISION I SPECIFICATIONS AND ADJUSTMENTS

### 50-25 FOUR PISTON DISC BRAKE SPECIFICATIONS

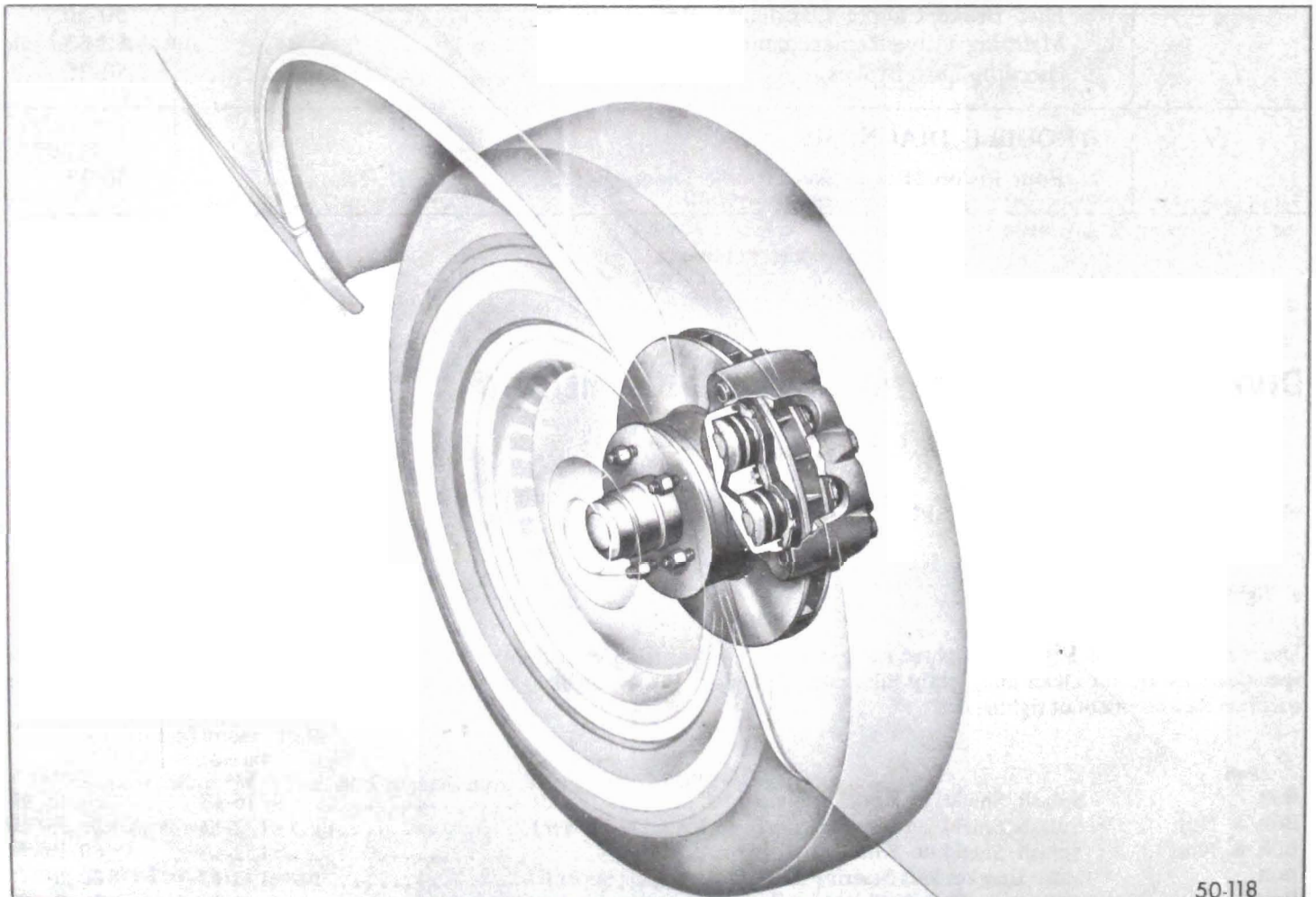
#### a. Tightening Specifications

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 to Knuckle (upper) . . . . .	9/16-18	150 lb. ft.
Bolt & Nut	Splash Shield and Steering Arm to Knuckle (lower) . . . . .	1/2-13	80 lb. ft.
Bolt & Nut	Splash Shield to Knuckle (lower) . . . . .	1/2-13	80 lb. ft.
Bolt	Hose Bracket and Steering Arm to Knuckle (upper) . . . . .	1/2-13	120 lb. ft.
Bolt	Caliper to Splash Shield . . . . .	1/2-20	90 lb. ft.
Bolt	Caliper Assembly . . . . .	9/16-12	125 lb. ft.
Screw	Caliper Bleeder . . . . .	Special	65 lb. in.

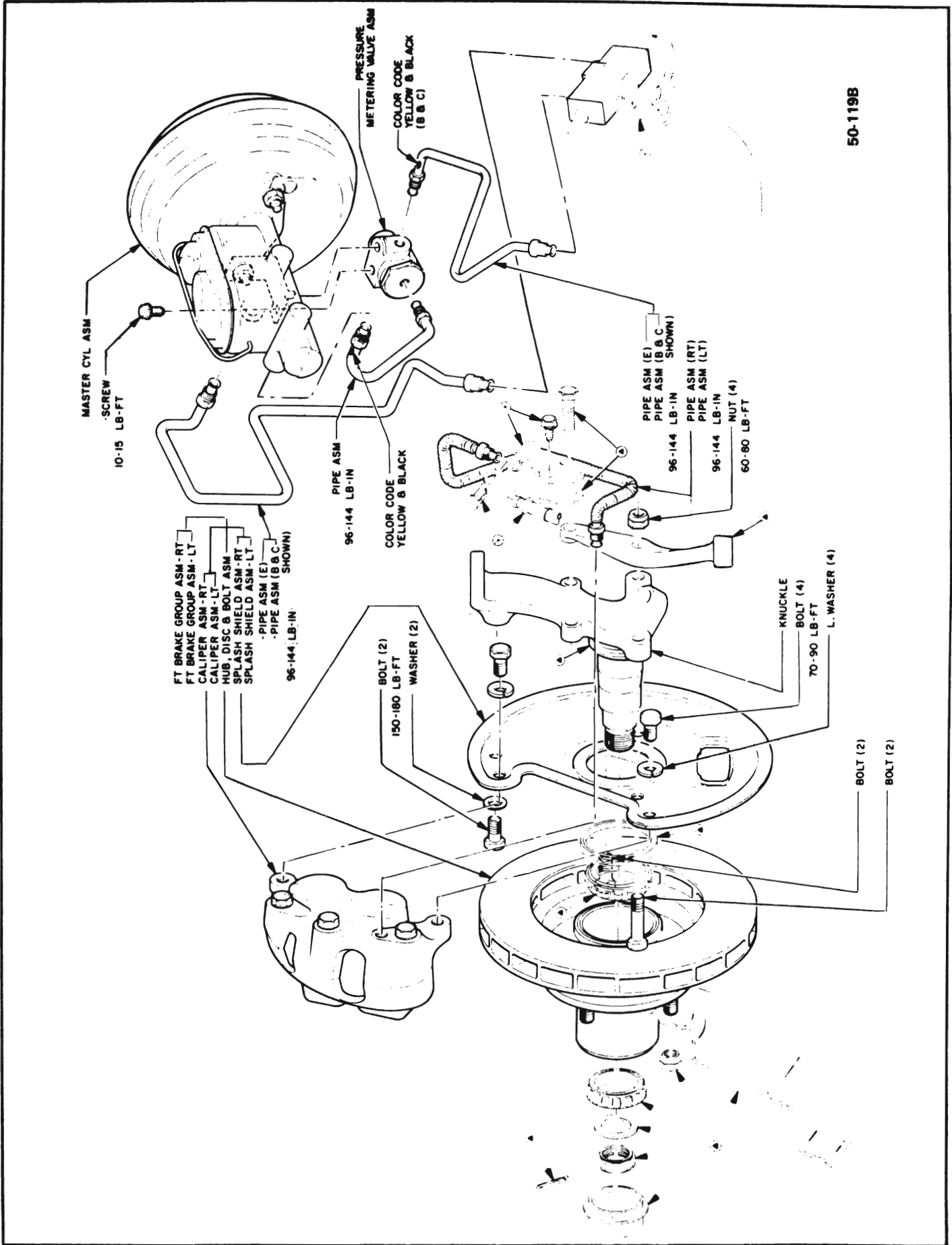
## b. General Specifications

Disc Brake Type	Fixed Caliper — Disc
Location	Front Wheels only
Disc Type	Ventilated — Cast Iron
Disc Diameter	11.920"
Disc Runout (Maximum)	.005" Total
Disc Surface Finish	30-50 Micro-Inch
Disc Thickness, New	.994" — 1.006"
Disc Thickness, Minimum	.965"
Disc Parallelism (Thickness Variation)	.0005"
Brake Shoe and Lining Type	Integrally Molded
Brake Shoe and Lining Thickness (New)	.560" — .580"
Brake Shoe and Lining Length	5.420" — 5.425"
Brake Shoe and Lining Minimum Thickness (before replacement)	.195"



50-118

Figure 50-51--Bendix Disc Brake



50-119B

Figure 50-52 Disc Brake System

## DIVISION II

### DESCRIPTION AND OPERATION

#### 50-26 DESCRIPTION OF DISC BRAKES

The Bendix Disc Brake consists of a fixed caliper, rotating disc and splash shield. 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. Machined surfaces within the caliper hold the shoes and linings in position.

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 splash shield 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.

#### 50-27 OPERATION OF DISC BRAKES

Hydraulic pressure builds up in the system when the brake pedal is

depressed. When the pressure 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

#### 50-28 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 thickness of the shoe and lining (at thinnest point) is .195" or less. Shoes and lining sets are listed in the Buick Master Parts Catalog under Group 5.017.

1. Raise car and remove front wheels.
2. Remove tube support bracket bolt. Do not disconnect hydraulic tube or hose.
3. Remove top (upper) caliper mounting bolt and loosen lower caliper mounting bolt. Rotate upper end of caliper toward rear of car.
4. 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.**

5. Using screwdrivers or putty knives between shoe and lining assemblies and pistons, press pistons to bottom of cylinder bores. Piston springs will not allow pistons to remain completely bottomed. Do not pry against disc.
6. Remove old shoes and linings from caliper. Discard shoes and linings. See Figure 50-53.
7. Check for piston seal leaks (moisture around pistons) and for any rupture of dust boots. Wipe interior of caliper clean with a shop towel. Check dust boots for proper seating in pistons and grooves around caliper cylinder bores. If brake fluid is

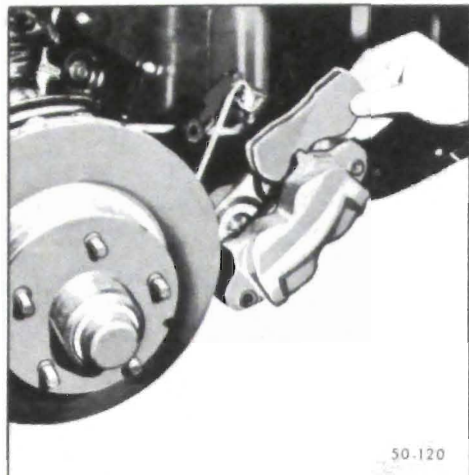


Figure 50-53--Installing Brake Shoes

evident, disassemble caliper and install new seals and boots.

8. Insert new shoe and lining assemblies in caliper, curved edge first, with shoe against open ends of pistons.

9. Spread shoes and linings apart and rotate caliper back to its normal position (caliper straddles disc). Install upper caliper mounting bolt and tighten both mounting bolts to 70 lb. ft.

10. Install tube support bracket and tighten bolt to 105 lb. ft.

11. Repeat steps 2 through 11 at other front wheel.

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

13. Lower hoist or remove jack stands.

14. 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 the brakes. See paragraph 50-13.

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

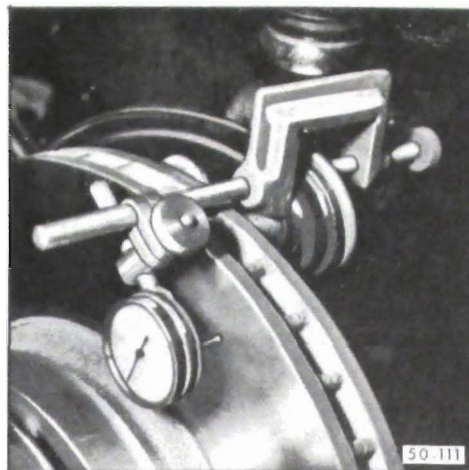


Figure 50-54--Check Disc Runout

### 50-29 BRAKE DISC SERVICING

In manufacturing brake disc, tolerances of rubbing surfaces for flatness is .001" and for parallelism is .0005" while lateral runout of the face must not exceed .005" total. See Figure 50-54. 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.

### 50-30 DISC BRAKE CALIPER OVERHAUL

#### a. Removal and Disassembly of Caliper

1. Raise car and remove wheel.
2. Disconnect hydraulic inlet tube from caliper. Plug end of tube to prevent entrance of dirt and loss of fluid.
3. Remove caliper mounting bolts. Lift caliper from disc and take to clean work area. See Figure 50-52.
4. Remove shoes and linings from caliper, being careful to keep linings clean (free of brake fluid, grease or oil). Mark shoes and linings so they can be reinstalled in their original positions. Open caliper bleed screw and drain fluid from caliper cylinders and internal passages. Clean

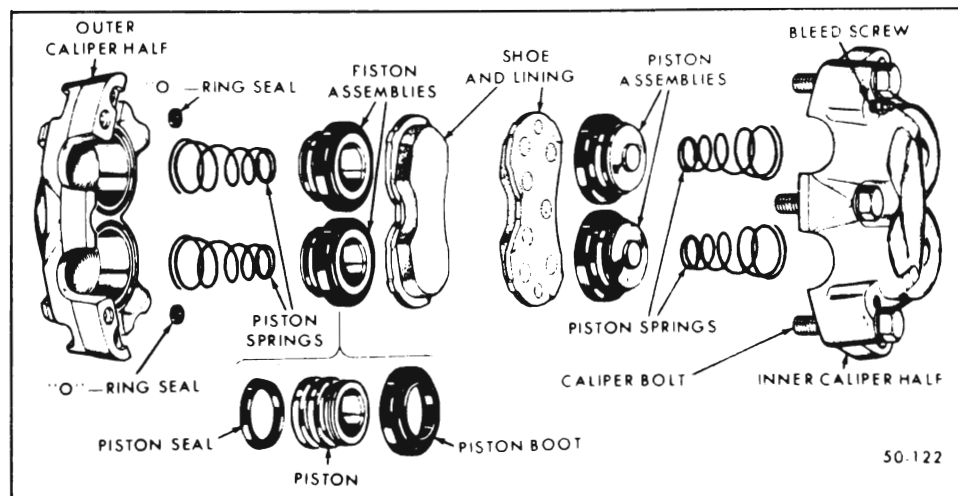


Figure 50-55--Caliper--Exploded View

outside of caliper with Declene or clean denatured alcohol.

5. Clamp outer caliper half (with heads of caliper bolts up) in a vise equipped with a soft-jawed device and remove the three caliper bolts. Lift off inner caliper half. Use a scribe or thin-bladed screwdriver to remove two small "O" ring seals from recesses in mating surface of outer caliper half. See Figure 50-55.

6. Disengage dust boots from grooves in caliper. Remove piston assemblies and springs from caliper half. Remove boot and seal from piston.

**NOTE: Do not scratch or nick pistons or cylinder bores.**

#### b. Inspection and Cleaning of Caliper

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

**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 .006" to .002".

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. 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.

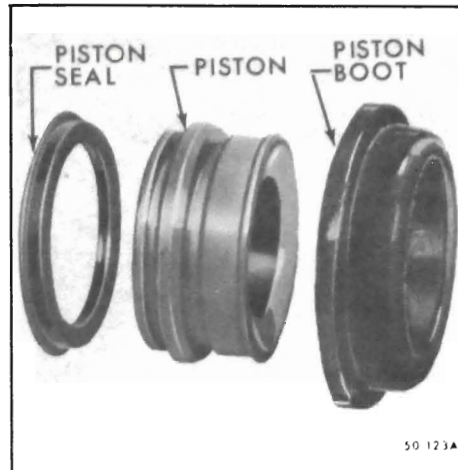


Figure 50-56--Piston - Exploded View

#### c. Assembly and Installation of Caliper

1. Lubricate new piston seals, "O" ring seals and the inner and outer beads of dust boots with clean brake fluid. Install piston seals and boots in piston grooves. Be sure lip of seal is toward closed end of each piston. See Figure 50-56.

2. Insert piston springs in cylinder bores, large coil first.

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

4. Install piston assembly in bore, using Piston Ring Compressor J-22626. Fold dust boot so it will slip through ring compressor. See Figure 50-57.

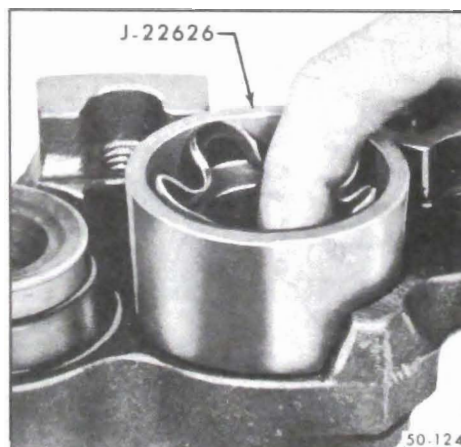


Figure 50-57--Installing Piston Assembly in Bore



Figure 50-58--Installing Piston Boot

5. Position Boot Installer J-22642 over piston and seat boot in groove in caliper using rotating rocking motion. Any distortion or uneven seating could allow contamination and corrosive elements to enter bore. See Figure 50-58.

**NOTE: Be sure outer bead of dust boot is fully seated in groove around caliper cylinder bore. Corrosion may damage cylinder bores beyond repair if dust boots are not fully seated.**

6. Repeat steps 1 through 5 for other three pistons.

7. Position "O" rings in small cavities around fluid transfer holes in both ends of outer caliper half. 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 125 lb. ft.

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

8. Install shoe assemblies in caliper and push pistons into bore.

9. Position caliper over disc and attach to mounting bracket with two

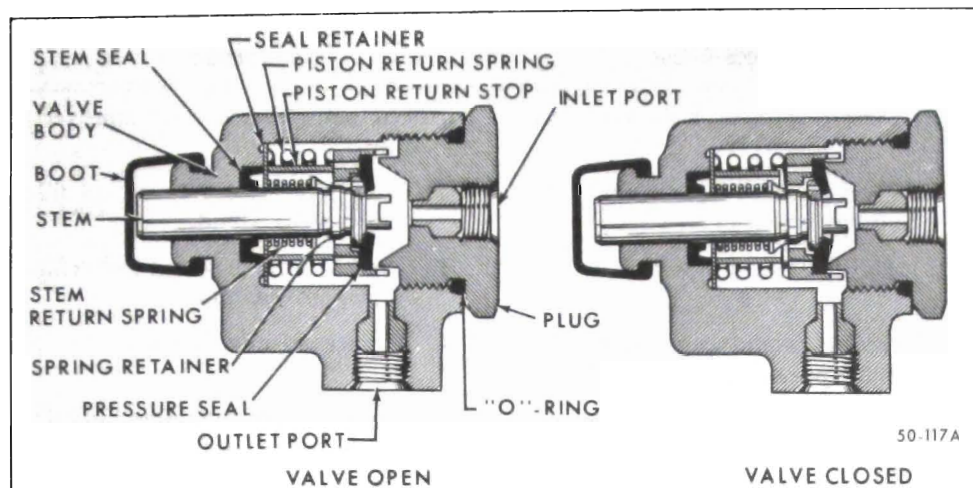


Figure 50-59-- Disc Brake Metering Valve

hex head bolts. Torque mounting bolts to 70 lb. ft.

10. Connect brake line tube nut to caliper and tighten to 100 lb. in.

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

12. Install wheel and lower car.

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

### 50-31 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. See Figure 50-59.

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 50-13.

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

### 50-32 BLEEDING DISC BRAKES

The bleeding operation for disc brakes is the same as for drum brakes. 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 be kept below 30 psi.

## DIVISION IV

### TROUBLE DIAGNOSIS

#### 50-33 FOUR PISTON 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
<p><b>EXCESSIVE PEDAL TRAVEL</b> (Low pedal).</p>	<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>
<p><b>SPONGY PEDAL</b> (Springy sensation to pedal upon brake application).</p>	<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 fluid.</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>
<p><b>HARD PEDAL</b> (Excessive pedal pressure needed to stop vehicle).</p>	<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> <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>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> <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>

Figure 50-60 - Four Piston Disc Brake Trouble Diagnosis



Condition	Possible Cause	Correction
<p><b>GRABBING OR PULLING.</b> (Severe reaction to pedal pressure and out of line stops.)</p>	<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>
<p><b>FADING PEDAL.</b> (Pedal falling away under steady pressure.)</p>	<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> <li>5. Caliper cylinder seals worn or damaged.</li> <li>6. Caliper cylinder bores corroded, worn or scored.</li> <li>7. Bleed screw open.</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> <li>5. Replace seals.</li> <li>6. Disassemble caliper and remove corrosion or scoring, or replace caliper.</li> <li>7. Close bleed screw and bleed hydraulic system.</li> </ol>

Figure 50-61--Four Piston Disc Brake Trouble Diagnosis

Condition	Possible Cause	Correction
<p>NOISE AND CHATTER. (May be accompanied by brake roughness and pedal pumping.)</p>	<ol style="list-style-type: none"> <li>1. Disc has excessive lateral run-out.</li> <li>2. Disc has excessive thickness variations (out of parallel).</li> <li>3. Shoe and lining knockback after violent cornering.</li> <li>4. Car creeping or moving slowly with brakes applied (may produce groan or crunching noise).</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace disc.</li> <li>2. Replace disc.</li> <li>3. Pump brake pedal.</li> <li>4. Increase or decrease pedal effort slightly.</li> </ol>
<p>DRAGGING BRAKES. (Slow or incomplete release of brakes.)</p>	<ol style="list-style-type: none"> <li>1. Lines, hoses or connections dented, kinked, collapsed or clogged.</li> <li>2. Master cylinder compensating port restricted by swollen primary cup.</li> <li>3. Residual pressure check valve in lines to front wheels.</li> <li>4. Caliper pistons frozen or seized.</li> <li>5. Caliper cylinder seals swollen.</li> <li>6. Caliper cylinder bores corroded or rough.</li> <li>7. Hydraulic push rod on power brake out of adjustment or binding (causing primary cup to restrict master cylinder compensating port).</li> </ol>	<ol style="list-style-type: none"> <li>1. Repair or replace defective parts.</li> <li>2. Drain hydraulic system, flush system with alcohol and replace all cups and seals in complete brake system.</li> <li>3. Check connections at master cylinder and brake warning light switch and install lines correctly.</li> <li>4. Disassemble caliper and free up pistons (replace if necessary).</li> <li>5. Drain hydraulic system, flush system with alcohol and replace all cups and seals in complete brake system.</li> <li>6. Disassemble caliper and remove corrosion or roughness, or replace caliper.</li> <li>7. Adjust or free up and lubricate.</li> </ol>

Figure 50-62--Four Piston Disc Brake Trouble Diagnosis