

1998-99 BRAKES

Disc - Corvette

DESCRIPTION & OPERATION

Brake system is pedal-actuated dual hydraulic system with a master cylinder, proportioning valve and brake fluid level switch, vacuum brake booster, dual piston front calipers, and single piston rear calipers. Hydraulic brakeline routing is split front and rear for safety reasons. A mechanically actuated parking brake applies rear disc brake independent of hydraulic brake system.

Master cylinder has dual pressure chambers with a primary piston to supply hydraulic pressure to front brakes and a secondary piston to pressurize rear brakes. There is one outlet for both front brakes and one outlet for both rear brakes. Pressure outlets are routed through proportioning valve.

Proportioning valve limits amount of pressure applied to rear brakes to allow most pressure to be applied to front brakes. Hydraulic pressure will be transferred to front brakes if a pressure loss occurs in rear brakes and vice-versa.

Disc brakes are continually self-adjusting. Caliper piston seals are designed to retract pistons enough to allow brake pad to lightly brush rotor. Sliding caliper design compensates for pad wear.

A RED BRAKE warning light is located in instrument cluster. The RED BRAKE warning light will come on if parking brake is not fully released, or if there is a system pressure failure. If brake fluid level in master cylinder reservoir is low, the AMBER ABS Lamp will come on. A bulb check is provided when ignition switch is in START position. Warning light should go off when ignition switch returns to RUN position.

Vacuum booster system is a dual diaphragm unit. In normal released position, there is engine vacuum on both sides of diaphragms. When brakes are applied, atmospheric pressure is admitted to back side of diaphragms providing power assist. When brakes are released, atmospheric pressure is shut off and engine vacuum is applied to back of diaphragms through a vacuum check valve.

BLEEDING BRAKE SYSTEM

CAUTION: Because of brake fluid expansion due to heat absorbed from brakes and engine, DO NOT overfill master cylinder reservoir. DO NOT reuse brake fluid. Use only new, clean DOT 3 brake fluid. Use GM P/N 12377967 Delco Supreme II Brake Fluid or equivalent. DO NOT use DOT 5 silicone brake fluid. Check brake fluid level frequently during bleeding procedure. DO NOT allow brake fluid to contact skin or painted surfaces.

MANUAL BLEEDING

NOTE: Ensure master cylinder reservoir is at least half full during entire bleeding procedure.

1. If entire brake system needs to be bled, start at step 2 . If only brakelines and calipers need to be bled, proceed to step 5 . Fill master cylinder reservoir to proper level. Leave reservoir cap off during bleeding procedure.
2. If master cylinder is suspected to have air in it or is a replacement part, disconnect forward brakeline at master cylinder. Allow brake fluid to fill master cylinder bore until it flows from forward port of master cylinder. Install and tighten forward brakeline at master cylinder.
3. Slowly depress brake pedal one time and hold down. Loosen forward brakeline at master cylinder to purge air from master cylinder. Tighten forward brakeline. Slowly release brake pedal.
4. Wait 15 seconds and repeat steps 2 and 3 until no air exists in master cylinder. Tighten master cylinder brakeline to 13 ft. lbs. (16 N.m). Repeat steps2 - 4 for rear port on master cylinder.
5. To bleed brakelines and calipers, raise and support vehicle. Install clear vinyl bleeder hose onto first bleeder valve to be serviced. See **BRAKE CALIPER BLEEDING SEQUENCE** table. Attach one end of clear tube over bleeder valve and submerge other end in container partially filled with clean brake fluid.
6. Slowly depress brake pedal one time and hold. Open bleeder valve to purge air from caliper. Close bleeder valve and slowly release brake pedal. Wait 15 seconds and repeat this procedure until all air is removed from brake system. It may be necessary to perform this procedure 10 or more times to remove all air. Tighten bleeder valve to 106 INCH lbs. (12 N.m). Rapid pumping of brake pedal pushes master cylinder secondary piston down in bore, making bleeding difficult.
7. Repeat this procedure for other brake calipers as necessary. Ensure master cylinder reservoir is full when finished. Install reservoir cap. Ensure there is no sponginess in brake pedal and that BRAKE warning light is off. If not okay, repeat entire bleeding procedure. If desired pedal travel and feel still cannot be obtained, perform auto bleed procedure. See appropriate ANTI-LOCK article.

BRAKE CALIPER BLEEDING SEQUENCE

Application	Sequence
Corvette	RR, LR, RF, LF

PRESSURE BLEEDING

NOTE: **Ensure master cylinder reservoir is at least half full during entire bleeding procedure.**

1. Fill master cylinder reservoir to proper level. Install pressure bleeder Adapter (J-35589) onto reservoir. Pressurize bleeder to 20-25 psi (1.4-1.8 kg/cm²). Connect bleeder hose to adapter.
2. Raise and support vehicle. Install clear vinyl bleeder hose onto first bleeder valve to be serviced. See **BRAKE CALIPER BLEEDING SEQUENCE** table. Attach one end of clear tube over bleeder valve and submerge other end in container partially filled with clean brake fluid.
3. Open bleeder valve at least 3/4 turn. Allow fluid to flow until no air is present. Stroke brake pedal while pressure bleeding. Tighten bleeder valve to 106 INCH lbs. (12 N.m). Repeat this procedure for other brake calipers as necessary. Ensure master cylinder reservoir is full when finished. Install reservoir cap.
4. Ensure there is no sponginess in brake pedal and that BRAKE warning light is off. If not okay, repeat entire bleeding procedure. If desired pedal travel and feel still cannot be obtained, perform auto bleed

procedure. See appropriate ANTI-LOCK article.

ADJUSTMENTS

BRAKE PEDAL HEIGHT & FREE PLAY

Brake pedal height and free play is not adjustable. See **BRAKE PEDAL TRAVEL** .

BRAKE PEDAL TRAVEL

NOTE: **Brake pedal travel is not adjustable. Most low brake pedal problems are caused by air in hydraulic system. Bleed hydraulic system and recheck brake pedal travel. See BLEEDING BRAKE SYSTEM . Other less frequent causes of excessive pedal travel are incorrect power booster push rod length, worn linings, or a leak in hydraulic system. Use the following procedure to determine if brake pedal travel is as specified.**

1. With engine off, pump brake pedal until all vacuum reserve is exhausted from power brake booster. A definite change in pedal feel should occur. Install Brake Pedal Effort Gauge (J-28662) onto brake pedal. Hook end of tape measure over top of brake pedal. Measure and record distance to rim of steering wheel.
2. Apply 70 lbs. (31.5 kg) of force to brake pedal. Measure and record distance to rim of steering wheel again. Difference between measured values is brake pedal travel. If brake pedal travel exceeds 2.76" (70 mm), repair brake system.

PARKING BRAKE

Preliminary Information

1. Parking brake system has a parking brake handle mounted on right side of driveline tunnel, a nylon coated cable system and mechanical actuators on each rear rotor. When parking brake is applied, a lever mechanically forces brake shoe tightly against drum on inside of rear rotor.
2. Parking brake adjustment is automatic. Cycling parking brake lever 2 or 3 times will properly adjust parking brake after disabling it for service. Parking brake cable automatic adjuster must be disabled before servicing parking brake handle or cables. After servicing, ensure automatic adjuster is enabled.

Disabling Automatic Adjuster

Raise and support vehicle. Remove rear wheels. Disconnect parking brake cable from apply lever. Carefully peel carpet away from parking brake lever. With assistance of another technician, pull disconnected parking brake cable downward until fully extended, and install a zip tie or cotter pin through lined up holes in parking brake lever. See **Fig. 1** . DO NOT overextend parking brake cable.

Enabling Automatic Adjuster

Connect parking brake cable to apply lever. Remove zip tie or cotter pin from parking brake lever. Reposition carpet into position. Install rear wheels. Lower vehicle. Apply and release parking brake 3 times to auto adjust.

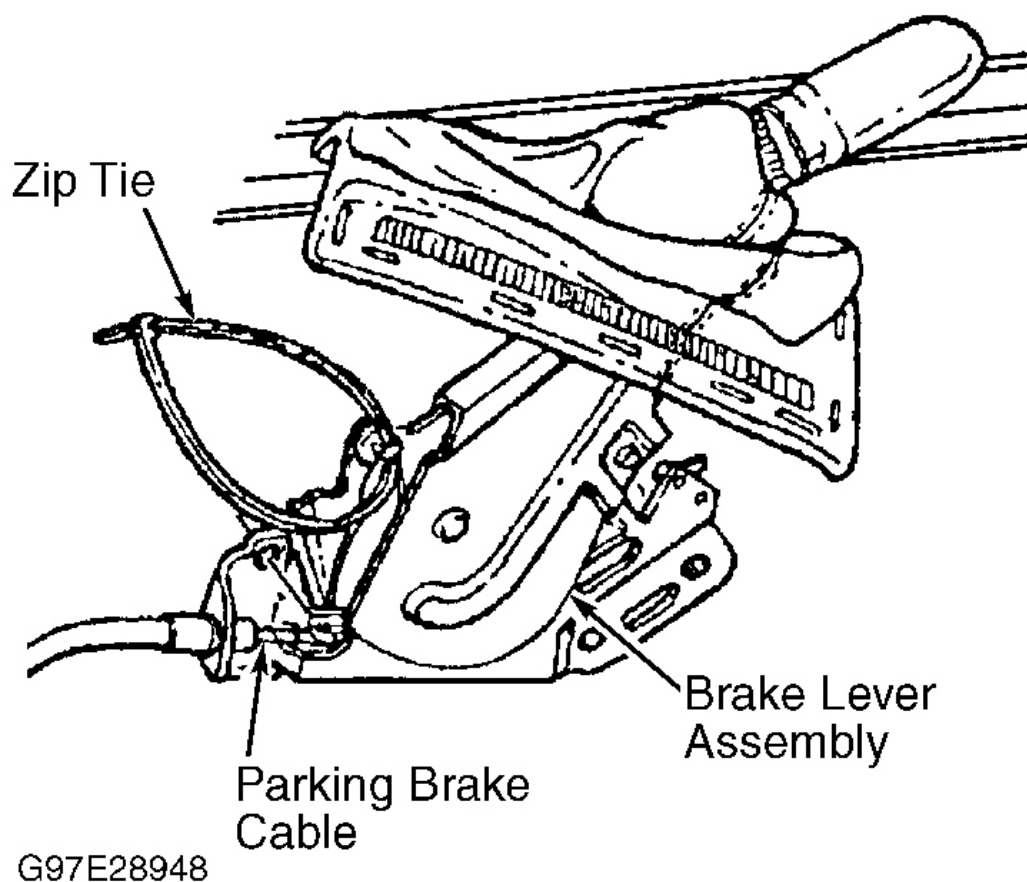


Fig. 1: Disabling & Enabling Parking Brake Cable Automatic Adjuster
Courtesy of GENERAL MOTORS CORP.

NOTE: Adjustments are not normally necessary after replacing parking brake lever or cables. Parking brake is adjusted automatically by applying and releasing parking brake lever 3 times. Never operate parking brake lever while rear brake rotor is removed. If gap between adjuster nut and screw is greater than .25" (5 mm), parking brake shoe assembly must be replaced.

Rear Parking Brake Shoe Adjustment

1. Remove rear brake rotor. See **REAR BRAKE ROTOR** under REMOVAL & INSTALLATION. Adjust parking brake shoe-to-drum clearance to .015" (.38 mm). Center parking brake shoe assembly. Measure brake shoe lining diameter across horizontal centerline. Brake shoe lining diameter should be 7.464-7.472" (189.6-189.8 mm).
2. Temporarily install brake rotor. Tighten lug nuts finger tight. Apply and release parking brake lever 3

times. Rotate brake rotor and check for drag. If drag is present, recheck and adjust parking brake shoe-to-drum clearance. To complete procedure, reverse removal procedure.

BRAKELIGHT/CRUISE CONTROL SWITCH

NOTE: **Stoplight/cruise control switch must be correctly adjusted for ABS/TCS system to operate properly.**

1. Depress brake pedal to applied position. Press stoplight/cruise control switch into retainer until switch body is fully seated. Pull brake pedal fully rearward against pedal stop until clicking noise is no longer heard as switch moves through retainer. DO NOT exceed 50 lbs. (22.5 kg) of pressure, or power brake booster may be damaged.
2. Switch is now adjusted. Ensure brakelights do not stay on with brake pedal released. Switch is correctly installed when no clicking sounds are heard as brake pedal is pulled rearward.

TESTING

BRAKE WARNING INDICATOR INOPERATIVE

See appropriate INSTRUMENT PANELS article in ACCESSORIES & EQUIPMENT.

REMOVAL & INSTALLATION

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See **COMPUTER RELEARN PROCEDURES** article in **GENERAL INFORMATION** before disconnecting battery.

FRONT BRAKE CALIPER

Removal

1. Remove and discard 2/3 of brake fluid from master cylinder reservoir to prevent overflow when servicing. Raise and support vehicle. Mark wheel in relation to hub. Remove wheel. Install and finger-tighten 2 lug nuts with flat side toward rotor to hold rotor when caliper is removed.
2. If not completely removing caliper (such as for overhaul), go to next step. If completely removing caliper, remove bolt securing brake hose to caliper. Disconnect brake hose from caliper. Discard both gaskets. Plug opening in brake hose to prevent fluid loss and contamination.
3. Position "C" clamp with stationary end of clamp on caliper housing and threaded end on outboard pad. Tighten "C" clamp until pistons are pushed into bore far enough to slide caliper off of rotor. Plug hole in caliper where brake hose connects to prevent contamination. Remove "C" clamp.
4. Remove caliper guide pin bolts. Remove brake caliper from rotor and caliper mounting bracket. If brake hose is still connected to caliper, hang caliper by wire so brake hose will not be damaged. Remove pads from caliper (if being replaced).

Installation

1. Install NEW pads (if removed). Install outer pad with insulator installed toward caliper housing. Install inner pad with wear sensor installed near caliper piston. Wear sensor must be in trailing position during forward wheel rotation. Apply thin coat of Silicone Grease (18010909) or equivalent to brake pad, where pad comes in contact with retainers and caliper bracket. Install caliper over rotor into caliper mounting bracket. Install caliper guide pin bolts. Tighten caliper guide pin bolts to specification. See **TORQUE SPECIFICATIONS** table.
2. If brake hose was not disconnected, go to next step. If brake hose was disconnected, using 2 NEW gaskets, connect brake hose to caliper. Tighten fitting bolt to specification. See **TORQUE SPECIFICATIONS** table. Bleed brake hydraulic system. See **BLEEDING BRAKE SYSTEM** .
3. Remove 2 lug nuts securing rotor and carefully align reference marks made in step 1) and install wheel, tighten lug nuts to specification. See **TORQUE SPECIFICATIONS** table. Lower vehicle and ensure master cylinder fluid level is correct. Start engine and apply brakes slowly and firmly several times to seat pads. Recheck master cylinder fluid level and fill as necessary. Road-test vehicle.

FRONT BRAKE PADS

Removal

Remove caliper. See **FRONT BRAKE CALIPER** . Remove pads from caliper using screwdriver to disengage pads. See **Fig. 2** . Remove inner pad.

Installation

1. Clean outside surface of caliper piston boot with denatured alcohol. Slowly compress pistons into bore with a "C" clamp, being careful not to cock pistons to one side or damage piston boots.
2. Install outer pad with insulator installed toward caliper housing. Install inner pad with wear sensor installed near caliper piston. Wear sensor must be in trailing position during forward wheel rotation. Apply a thin layer of Silicone Grease (18010909) or equivalent to brake pad retainers and caliper bracket, where pads come into contact with them. Install caliper over rotor into caliper mounting bracket. Install caliper guide pin bolts. Tighten caliper guide pin bolts to specification. See **TORQUE SPECIFICATIONS** table.
3. Remove 2 lug nuts securing rotor and install wheel using reference marks and tighten lug nuts to specification. See **TORQUE SPECIFICATIONS** table. Lower vehicle and ensure master cylinder fluid level is correct. Start engine and apply brakes slowly and firmly several times to seat pads. Recheck master cylinder fluid level, then road-test vehicle.

FRONT BRAKE ROTOR

Removal & Installation

NOTE: After brake pads have been replaced and/or rotors have been resurfaced, it is recommended new braking surfaces be broken in or burnished. While test driving vehicle, perform 20 stops from 30 MPH using medium to firm pedal pressure. Ensure brakes do not overheat.

Raise and support vehicle. Remove and support caliper. See **FRONT BRAKE CALIPER** . Remove rotor. To install, reverse removal procedure. Rotors may have directional cooling fins, if so ensure rotors are installed on correct side of vehicle, according to left or right designator stamped on rotor casting. Tighten wheel lug nuts to specification.

REAR BRAKE CALIPER

Removal

1. Raise and support vehicle. Mark wheel in relation to hub. Remove wheel. Install and finger-tighten 2 lug nuts with flat side toward rotor to hold rotor when caliper is removed.
2. If not completely removing caliper (such as for overhaul), go to next step. If completely removing caliper, remove bolt securing brake hose to caliper. Disconnect brake hose from caliper. Discard both gaskets. Plug opening in brake hose and caliper to prevent fluid loss and contamination.
3. Remove upper and lower caliper guide pin bolts. Remove caliper from rotor and caliper mounting bracket. Support caliper with wire if not removing. See **Fig. 3** .

Installation

1. Apply a thin layer of Silicone Grease (18010909) or equivalent to caliper bracket and retainers where they will come in to contact with brake pads. Install caliper housing over rotor and into caliper mounting bracket. Install upper and lower caliper guide pin bolts and tighten to specification. See **TORQUE SPECIFICATIONS** table. See **Fig. 3** .
2. If brake hose was not disconnected, go to next step. If brake hose was disconnected, using 2 NEW gaskets, connect brake hose to caliper. Tighten fitting bolt to specification. Bleed brake hydraulic system, and go to next step. See **BLEEDING BRAKE SYSTEM** .
3. Install wheel by carefully aligning reference marks. Tighten wheel lug nuts to specification. Fill brake fluid reservoir. Start engine. Pump brake pedal slowly and firmly to seat pads. Recheck master cylinder fluid level before road testing vehicle.

REAR BRAKE PADS

Removal

1. Remove and discard 2/3 of brake fluid from master cylinder reservoir. Raise and support vehicle. Mark wheel in relation to hub. Remove wheel. Install and finger-tighten 2 lug nuts with flat side toward rotor to hold rotor when caliper is removed. Using a "C" clamp, depress caliper piston into bore to provide clearance between pads and rotor. Ensure one end of "C" clamp is on inlet brake hose bolt and other end is against outer brake pad.
2. Remove caliper guide pin bolts. Using a screwdriver, remove outer and inner pads. See **Fig. 3** . Clean residue from pad guide surfaces on caliper mounting bracket and caliper housing. Apply a thin layer of Silicone Grease (8010909) or equivalent to pad guide surfaces.

Installation

1. Replace guide pins or boots if corroded or damaged. Install outer pad with insulator installed toward

caliper housing. Install inner pad with wear sensor installed near caliper piston. Wear sensor must be in trailing position during forward wheel rotation.

2. Install guide pin bolts and tighten to specification. See **TORQUE SPECIFICATIONS** table. Start engine. Pump brake pedal slowly and firmly to seat pads. Install wheel. Tighten wheel lug nuts to specification. Check brake fluid reservoir level. Road-test vehicle.

REAR BRAKE ROTOR

Removal & Installation

Raise and support vehicle. Mark wheel in relation to hub. Remove wheel. Remove caliper, and wire aside. See **REAR BRAKE CALIPER** . Mark rotor in relation to hub for installation reference. Remove rotor. To install, reverse removal procedure. DO NOT operate parking brake with rotor removed. DO NOT force rotor off. If rotor is difficult to remove, ease rotor off by gently rotating and pulling outward.

MASTER CYLINDER

Removal

Remove brake fluid from master cylinder reservoir. Disconnect electrical connector from brake fluid level switch. Disconnect brakelines from master cylinder. Plug openings. Remove nuts securing master cylinder to power brake booster. Remove master cylinder. See **Fig. 4** .

Installation

Bench bleed master cylinder. To complete installation, reverse removal procedure. Tighten master cylinder nuts and brakeline fittings to specification. See **TORQUE SPECIFICATIONS** table. Bleed brake system. See **BLEEDING BRAKE SYSTEM** .

POWER BRAKE BOOSTER

Removal

NOTE: **Power brake booster can be removed without completely removing master cylinder, but if both components are to be removed, remove master cylinder first.**

1. Disconnect negative battery cable. Remove windshield washer fluid reservoir. Disconnect electrical connector from master cylinder brake fluid level switch. Remove brakelines from master cylinder.
2. Remove nuts securing master cylinder to booster. Remove master cylinder from booster. Remove vacuum check valve from booster. Remove left sound insulator under instrument panel. Remove input push rod retaining clip and pin from brake pedal. Remove booster mounting nuts and washers. Remove booster with seals. Inspect seals and sealing surfaces for damage. Repair or replace as needed.

Installation

Lubricate all friction parts, particularly Input Pushrod (brake pedal pin end) with Delco Brake Lube (GM P/N 12377969 or equivalent). Attach seals to brackets. Install booster. Install booster washers and stud nuts. Tighten nuts to specification. See **TORQUE SPECIFICATIONS** table. Bleed brake system. See **BLEEDING BRAKE SYSTEM** . To complete installation, reverse removal procedure.

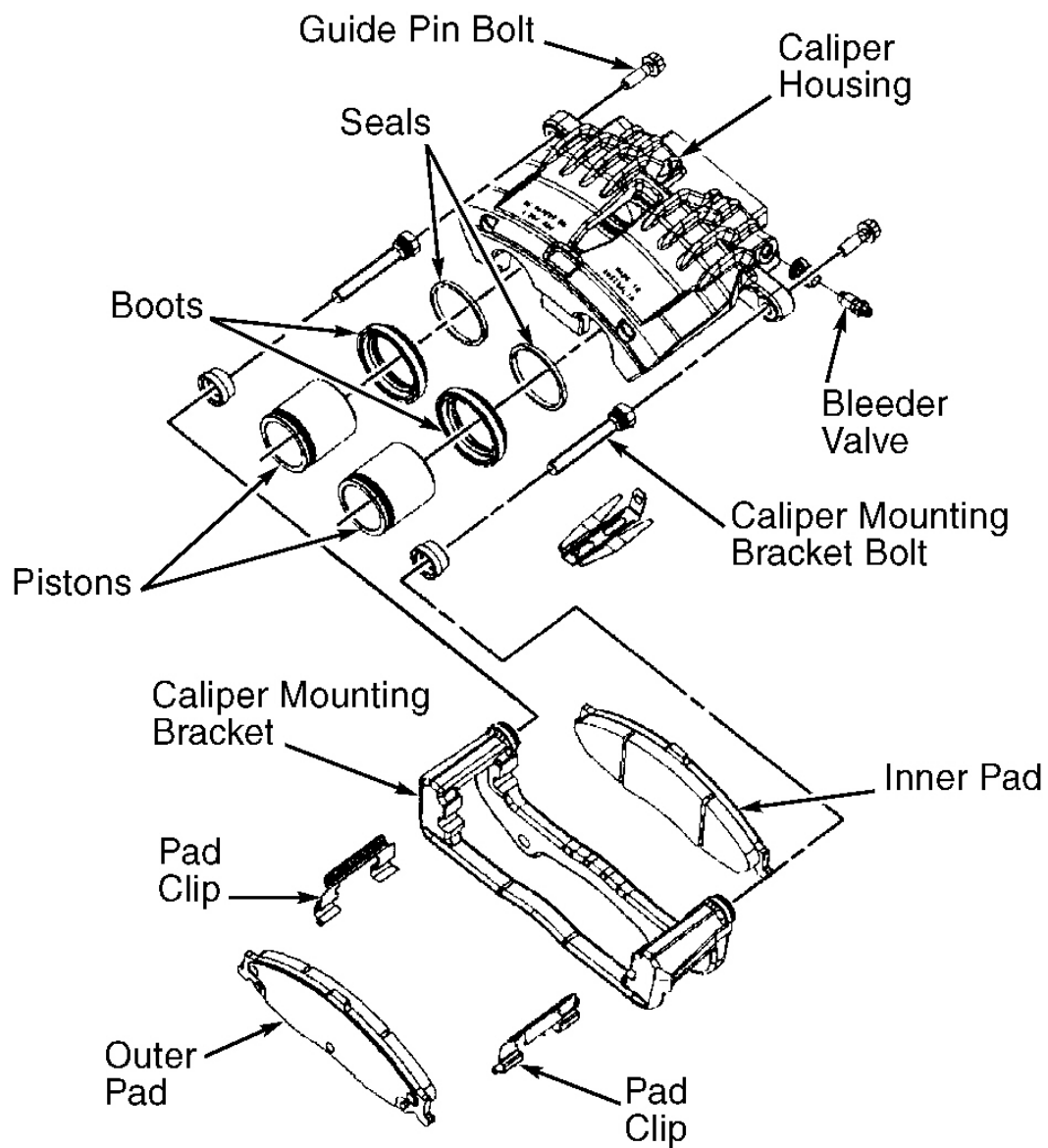
PROPORTIONING VALVE

Removal & Installation

1. Disconnect brakelines from brake proportioning valve. Plug brakelines to prevent contamination. Replace assembly as necessary. Install proportioning valve. Tighten brakeline fittings to specification. See **TORQUE SPECIFICATIONS** table. Bleed brake system. See **BLEEDING BRAKE SYSTEM** . To complete installation, reverse removal procedure.

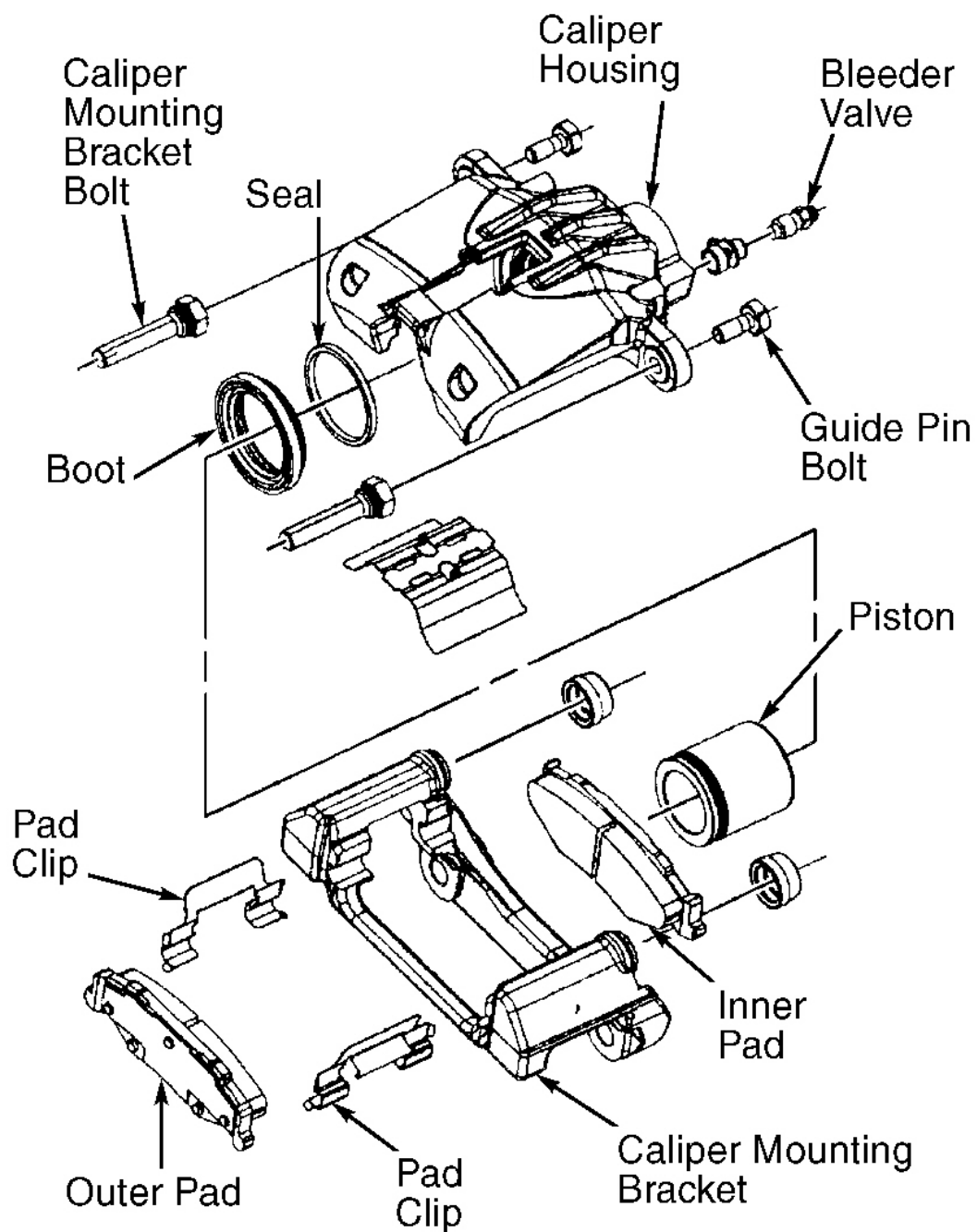
OVERHAUL

NOTE: Use illustrations to aid in overhaul. See **Fig. 2 -Fig. 4** .



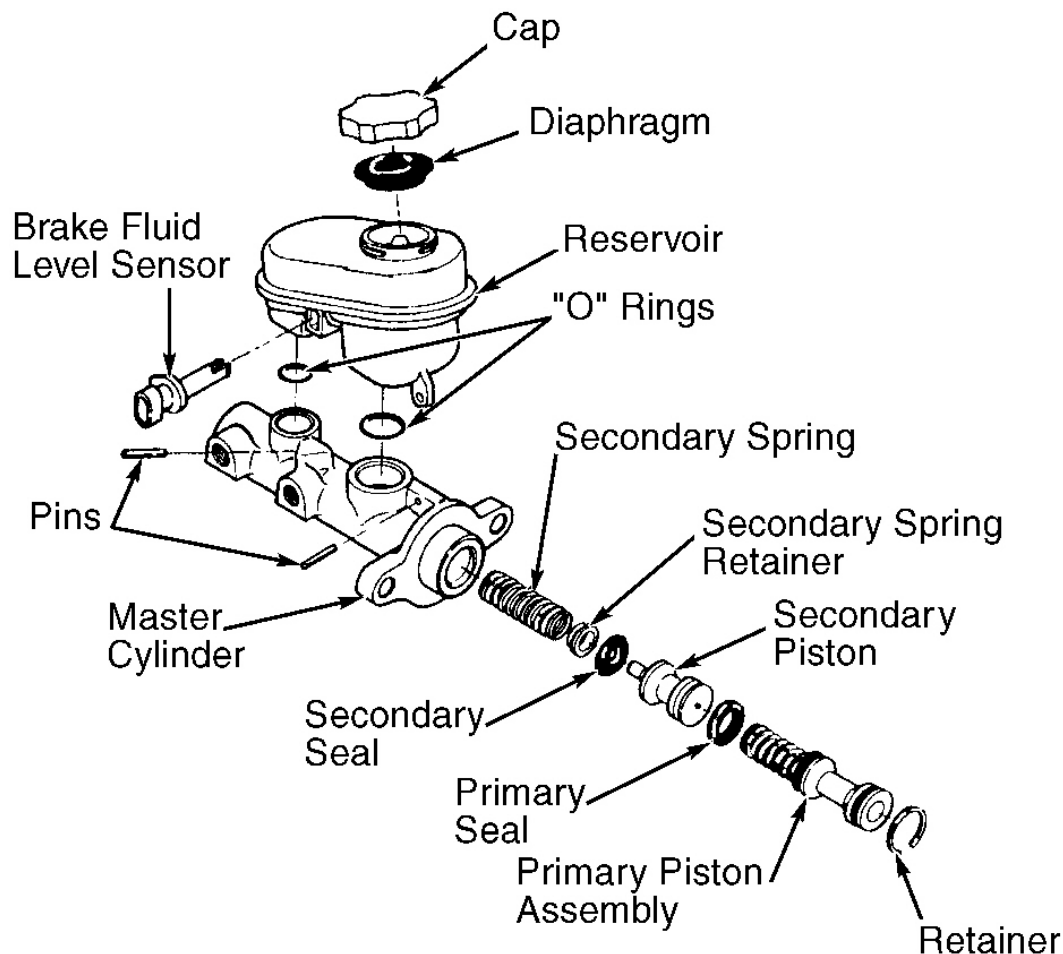
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Fig. 2: Exploded View Of Front Brake Caliper
Courtesy of GENERAL MOTORS CORP.



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Fig. 3: Exploded View Of Rear Brake Caliper
Courtesy of GENERAL MOTORS CORP.



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Fig. 4: Exploded View Of Master Cylinder
 Courtesy of GENERAL MOTORS CORP.

DISC BRAKE SPECIFICATIONS

DISC BRAKE SPECIFICATIONS

Application	In. (mm)
Disc Diameter ⁽¹⁾	
Front	12.80 (325.0)
Rear	12.00 (305.0)
Lateral Runout	.003 (.07)
Parallelism	.0005 (.013)
Minimum Refinish Thickness	

Front	1.205 (30.6)
Rear	.980 (24.9)
Discard Thickness ²	
Front	1.19 (30.3)
Rear	.965 (24.51)
(1) Rotors have directional cooling fins and are not interchangeable from left to right.	

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Brakeline/Brake Hose Fitting	
At Caliper	30 (40)
At Master Cylinder	24 (17)
At Proportioning Valve	18 (13)
Brake Pedal Pivot Nut	29 (21)
Caliper Guide Pin Bolts	23 (31)
Caliper Mounting Bracket Bolts ⁽¹⁾	175 (125)
Master Cylinder-To-Booster Nut	21 (29)
Power Brake Booster-To-Firewall Nut	27 (19)
Wheel Lug Nut	100 (140)
INCH Lbs. (N.m)	
Caliper Bleeder Screw	106 (12)
(1) Clean mounting bracket and knuckle mating surface. Install NEW bolts, supplied with adhesive on threads. Recheck torque immediately. Allow adhesive to cure for 2 hours before moving vehicle.	