

SECTION 4B

MASTER CYLINDER

TABLE OF CONTENTS

Specifications	4B-1	Proportioning Valves	4B-8
Fastener Tightening Specifications	4B-1	Unit Repair	4B-11
Diagnosis	4B-1	Master Cylinder Overhaul	4B-11
Checking Brake Proportioning Valve	4B-1	General Description and System	
Maintenance and Repair	4B-3	Operation	4B-14
On-Vehicle Service	4B-3	Master Cylinder	4B-14
Master Cylinder Assembly	4B-3	Proportioning Valves	4B-14
Brake Fluid Reservoir	4B-5	Fluid Level Sensor	4B-14

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	N•m	Lb•Ft	Lb•In
Master Cylinder Attaching Nuts	13	-	115
Master Cylinder Brake Lines	16	12	-
Proportioning Valve Brake Lines	10	-	89
Proportioning Valve Nut	10	-	89

DIAGNOSIS

CHECKING BRAKE PROPORTIONING VALVE

Use two brake pressure gauges to check the brake proportioning valves that are attached to the master cylinder on non ABS braking systems. These valves limit the outlet pressure to the rear brakes after a predetermined master cylinder pressure has been reached.

When checking the brake proportioning valves, be sure that the hydraulic line pressure is measured simultaneously and diagonally on the front and the rear axles. To measure the pressure, use the following steps:

1. Remove the bleeder valve and install a pressure gauge to one of the rear brake cylinders.
2. Install another bleeder valve and install another pressure gauge to the diagonally opposite front brake.
3. Build pressure by pressing firmly on the brake pedal several times. The pressure indicated on the gauge is not regulated and represents the actual brake system hydraulic pressure.
4. Build pressure until the test values in the following proportioning valve test chart are achieved.

4B - 2 MASTER CYLINDER

Model	Reference Number for Gradient and Switching Pressure on the Valve Housing	Input Pressure Read on the Manometer at the Front Axle in kPa (psi)	Output Pressure Read on the Manometer at the Rear Axle in kPa (psi)
All	40 bar/0.25	500 (73)	500 (73)
		4 500 (653)	3 450 ± 200 (500 ± 29)
		10 000 (1,450)	5 100 ± 300 (740 ± 44)

Important: If the pressure exceeds 10 000 kPa (1,450 psi), the pressure reading on the rear gauge will not be accurate.

5. Remove the gauges from the tested brake circuit and repeat the test on the remaining circuit.

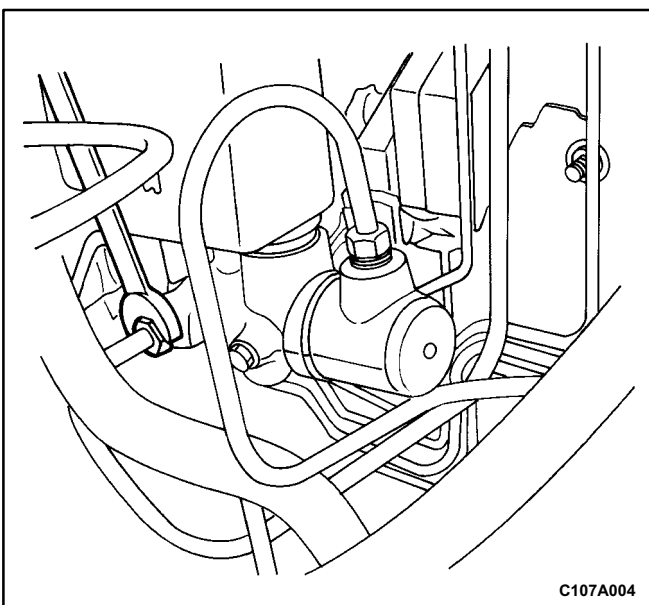
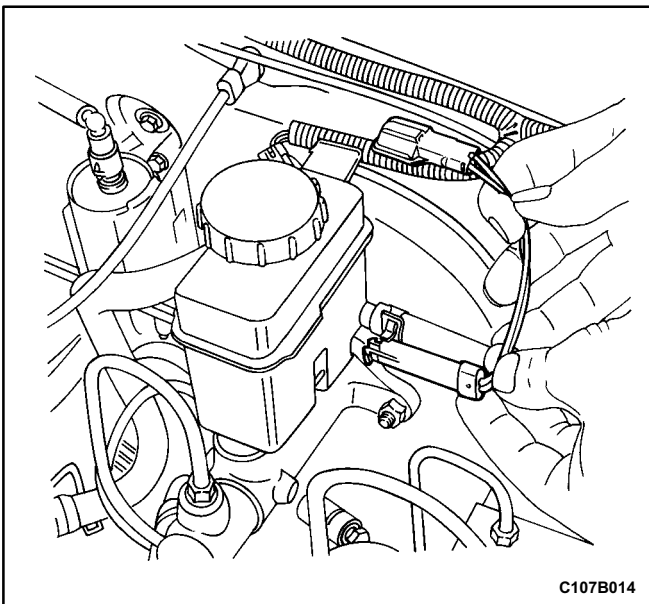
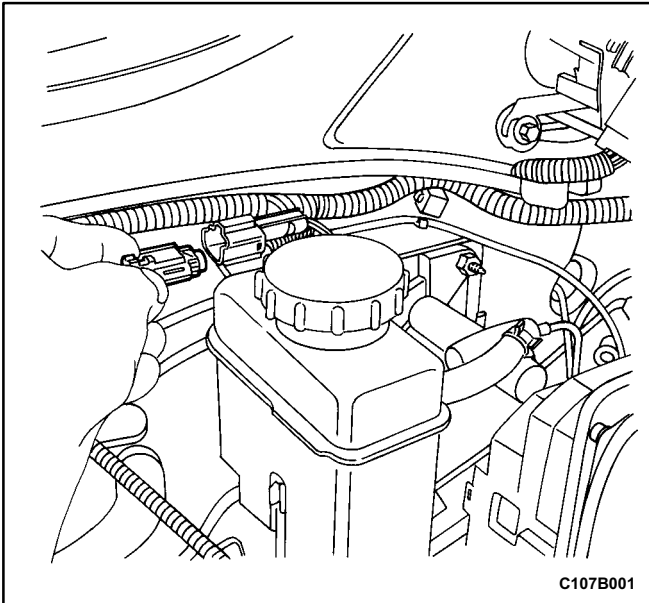
MAINTENANCE AND REPAIR

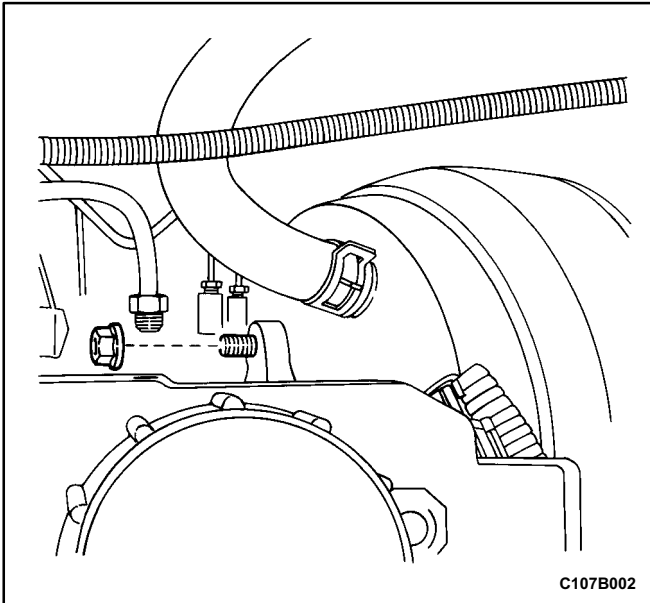
ON-VEHICLE SERVICE

MASTER CYLINDER ASSEMBLY (Left-Hand Drive Shown, Right-Hand Drive Similar)

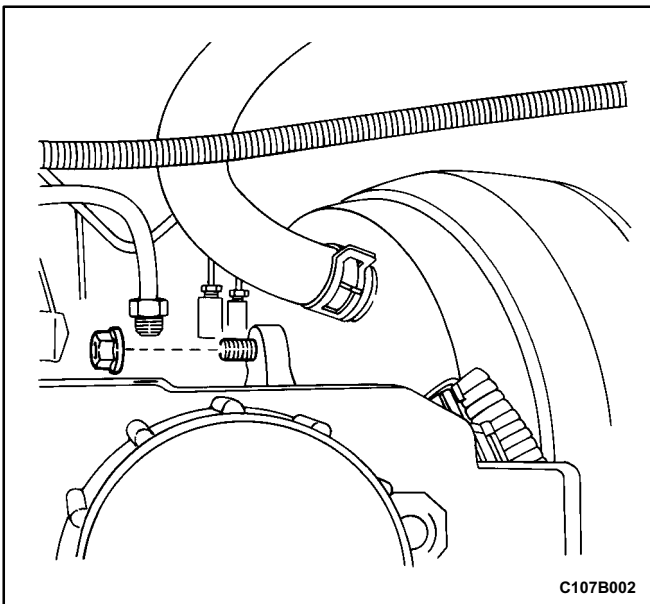
Removal Procedure

1. Remove the harness connector from its receptacle that is mounted to the top of the brake fluid reservoir.
2. Remove the receptacle by sliding it off its reservoir mount.
3. Crimp the plastic tabs of the low brake fluid level switch on the engine side of the brake fluid reservoir.
4. While crimping the plastic tabs, pull the switch out from the other side of the reservoir.
5. Disconnect the brake lines from the master cylinder body.
6. For vehicles with the manual transaxle, disconnect the clip that secures the clutch hose connection to the master cylinder and move the clip out of the way.
7. Remove the clutch hose from the master cylinder.
8. Plug the opening to the brake lines to prevent the loss and the contamination of the fluid.





9. Remove the master cylinder attaching nuts.
10. Remove the master cylinder assembly.
11. Drain the brake fluid.

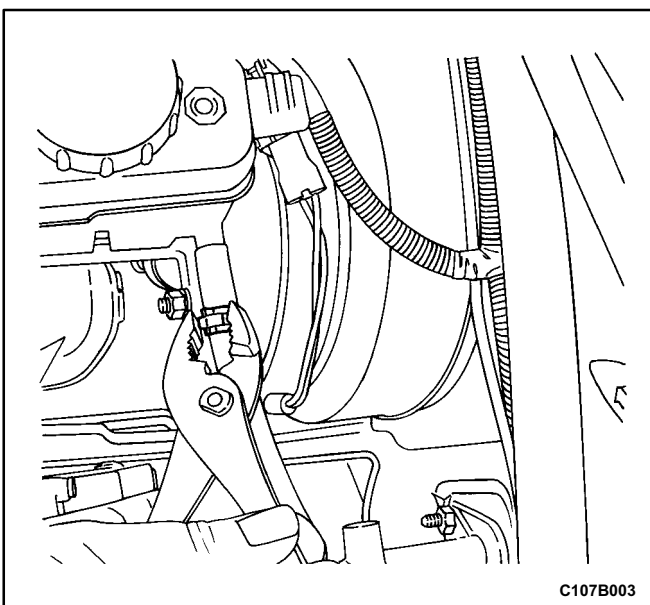


Installation Procedure

1. Install the master cylinder assembly with the new attaching nuts.

Tighten

Tighten the master cylinder attaching nuts to 13 N•m (115 lb•in).

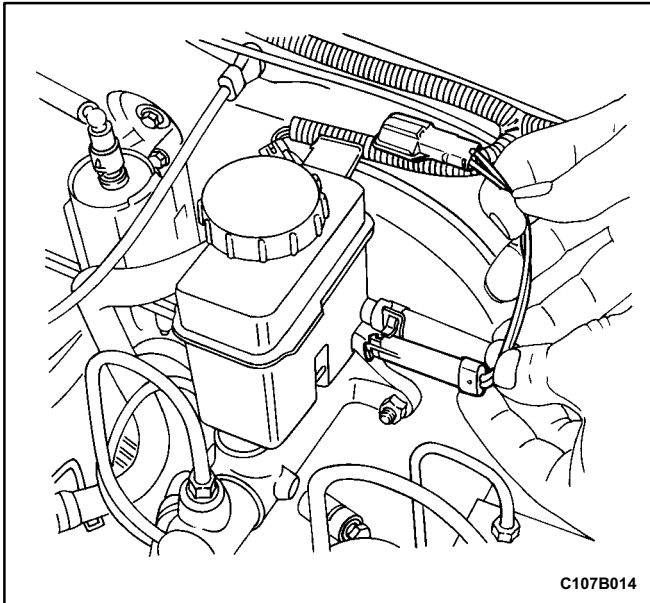


2. Install the brake lines to the master cylinder body.

Tighten

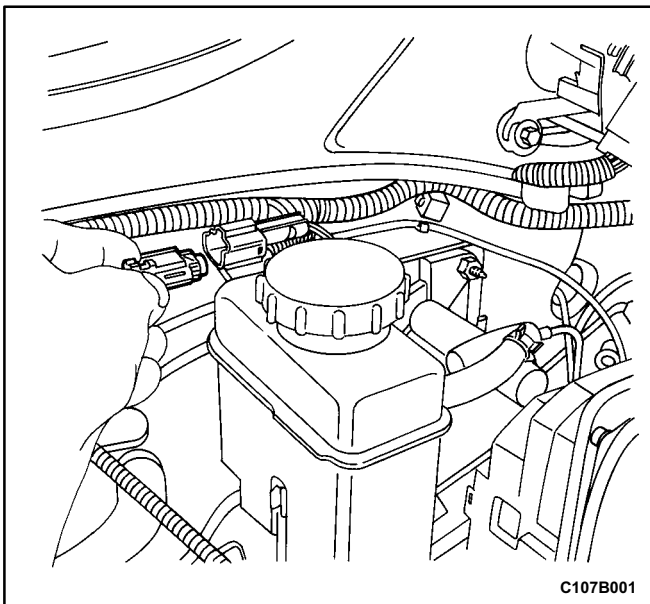
Tighten the master cylinder brake lines to 10 N•m (89 lb•in).

3. For vehicles with the manual transaxle, install the clutch hose connection to the master cylinder with the clip.



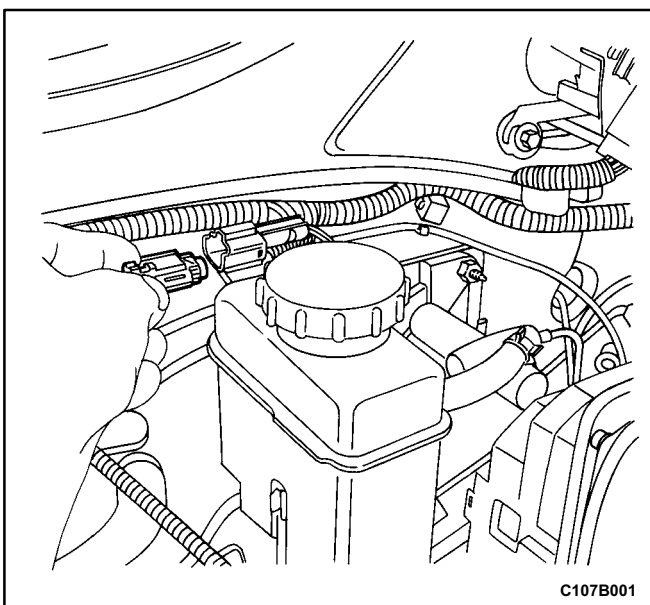
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4. Install the low brake fluid level switch by pushing it into the side of the brake fluid reservoir opposite the engine.



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5. Install the receptacle for the low brake fluid level switch assembly by sliding it into its mount on the top of the brake fluid reservoir.
6. Plug in the harness connector.
7. Add the brake fluid.
8. Check for leaks.
9. Recheck the fluid level.
10. Bleed the brake system. Refer to *Section 4A, Hydraulic Brakes*.



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BRAKE FLUID RESERVOIR

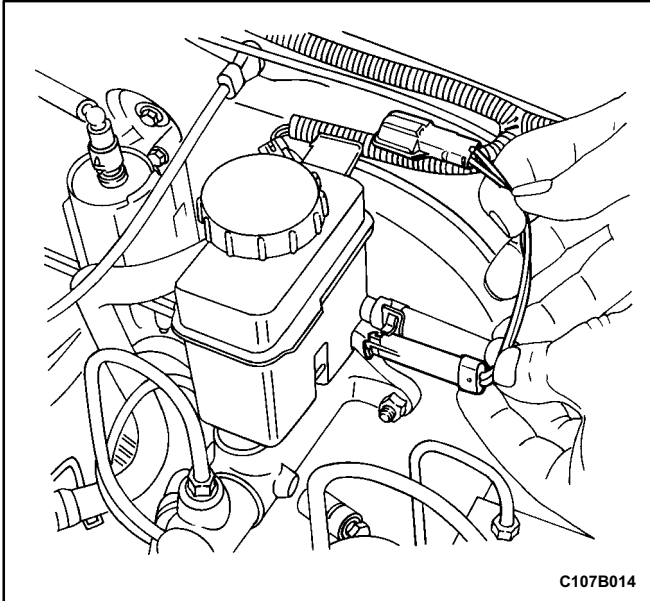
(Left-Hand Drive Shown, Right-Hand Drive Similar)

Removal Procedure

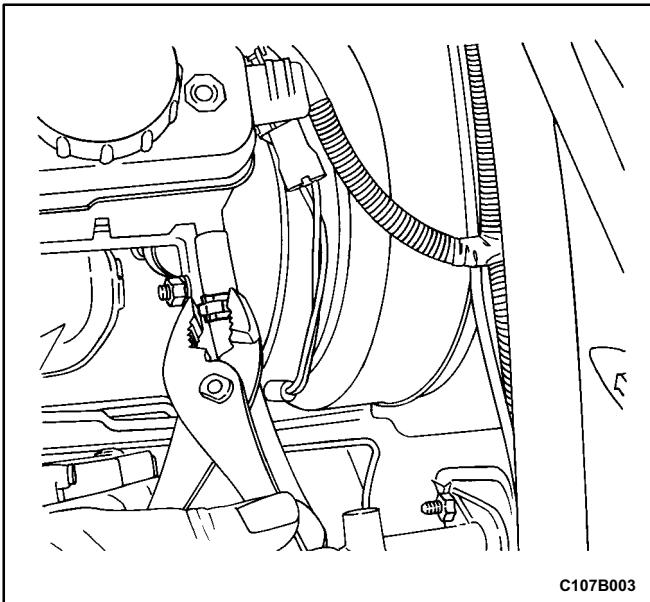
Important: Remove the brake fluid reservoir only when it must be replaced because of damage or leaks.

1. Remove the harness connector from its receptacle that is mounted to the top of the brake fluid reservoir.
2. Remove the receptacle by sliding it off its reservoir mount.

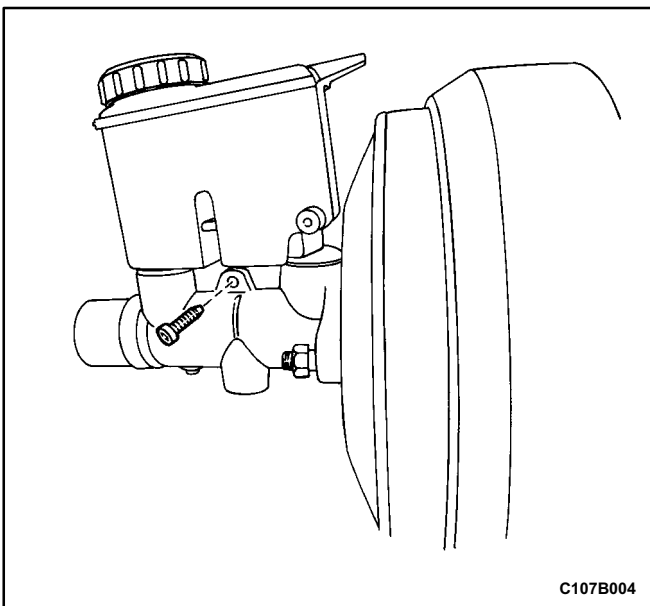
4B - 6 MASTER CYLINDER



3. Crimp the plastic tabs of the low brake fluid level switch on the engine side of the brake fluid reservoir.
4. While crimping the plastic tabs, pull the switch out from the other side of the reservoir.

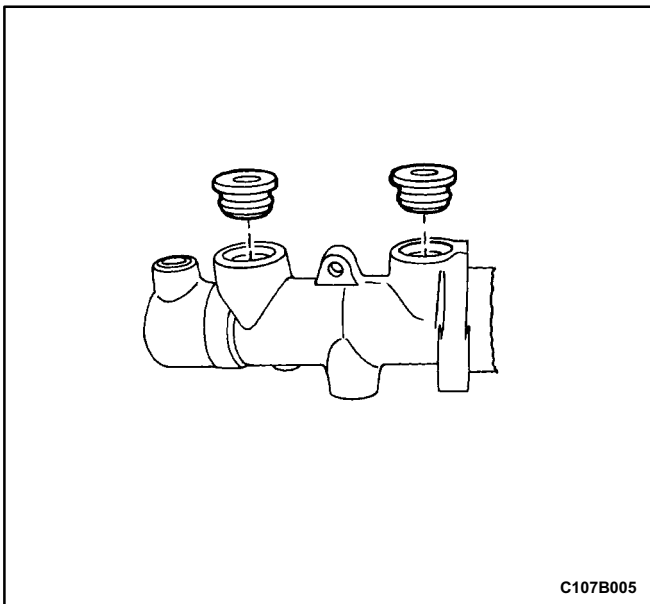
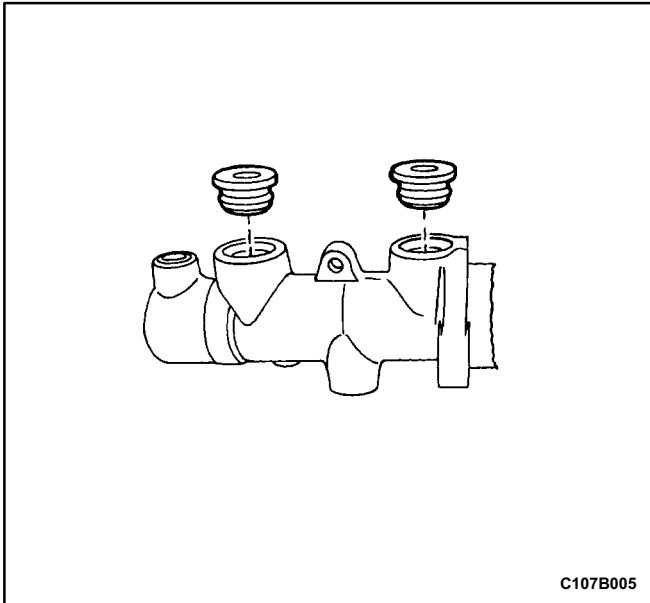


5. For vehicles with the manual transaxle, disconnect the clip that secures the clutch hose connection to the master cylinder and move the clip out of the way.
6. Remove the clutch hose from the master cylinder.



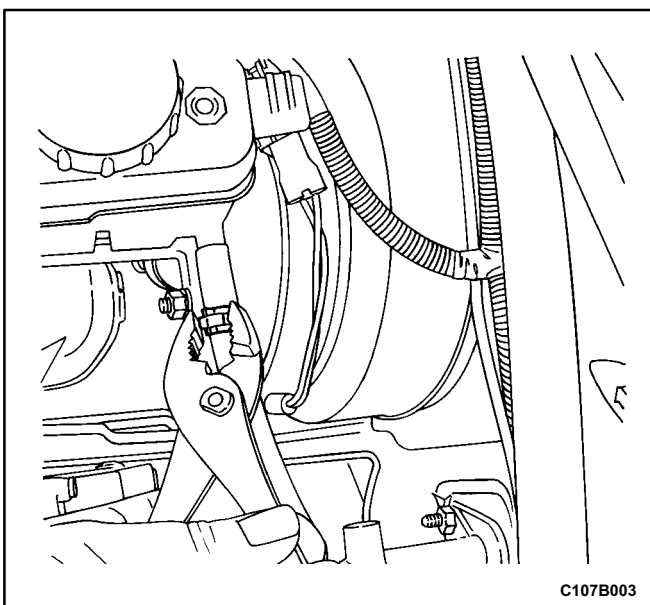
7. Remove the screw that holds the brake fluid reservoir to the master cylinder body.
8. Remove the reservoir from the retaining clamps by gently prying the reservoir upward with a screwdriver.
9. Remove the brake fluid reservoir from the master cylinder body by tilting the reservoir and pulling it upward.

10. Remove the brake fluid reservoir seals from the master cylinder body.

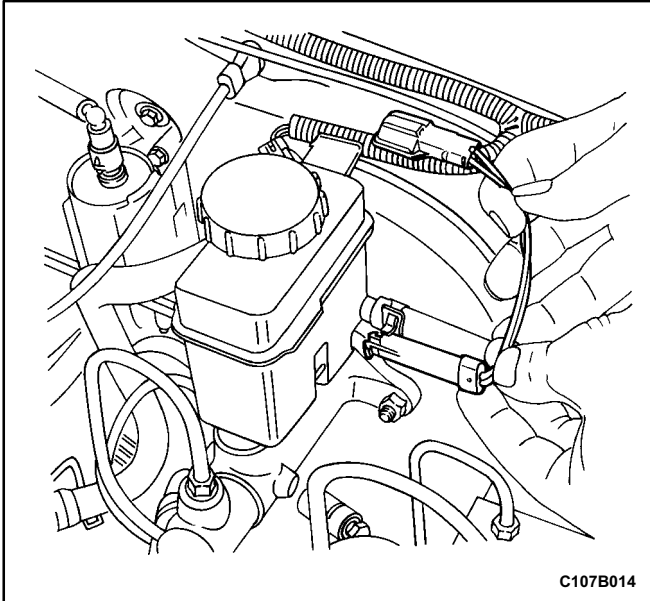


Installation Procedure

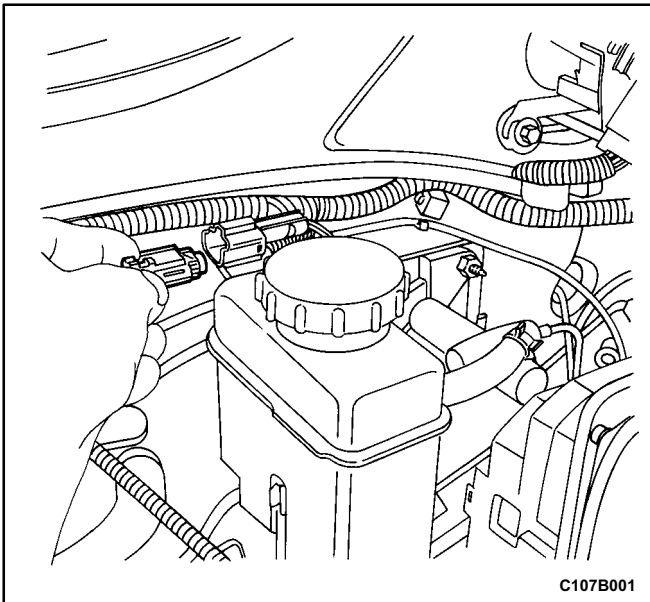
1. Lubricate the new brake fluid reservoir seals with clean brake fluid.
2. Install the brake fluid reservoir seals into the master cylinder body.
3. Install the brake fluid reservoir onto the master cylinder body with the clamps.



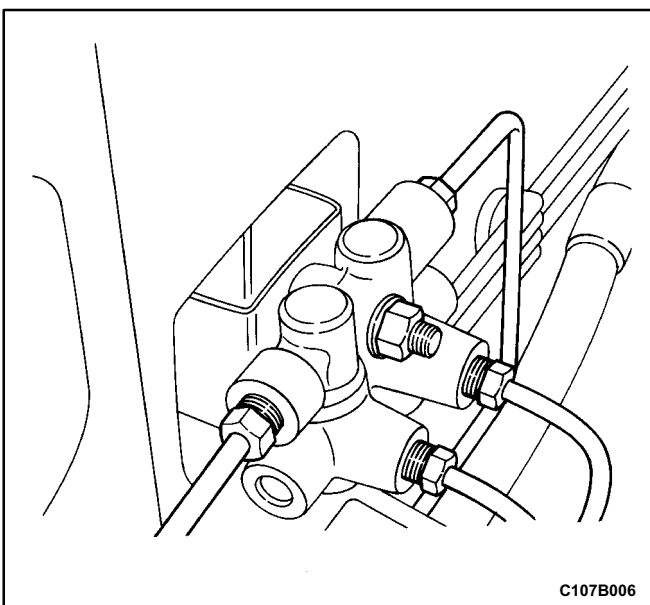
4. For vehicles with the manual transaxle, install the clutch hose connection to the master cylinder with the clip.



5. Add the brake fluid.
6. Raise and suitably support the vehicle.
7. Bleed the braking system. Refer to *Section 4A, Hydraulic Brakes*.
8. Bleed the clutch master cylinder. Refer to *Section 5C, Clutch*.
9. Lower the vehicle.
10. Install the low brake fluid level switch by pushing it into the side of the brake fluid reservoir opposite the engine.



11. Install the receptacle for the low brake fluid level switch assembly by sliding it into its mount on the top of the brake fluid reservoir.
12. Plug in the harness connector.

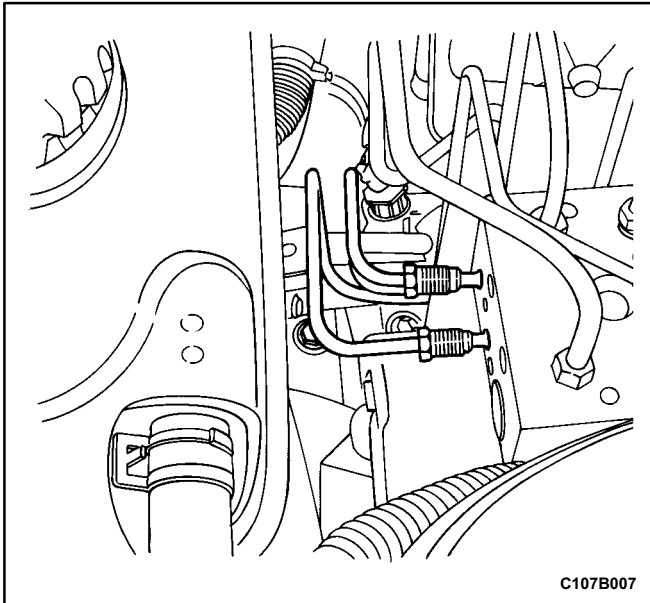


PROPORTIONING VALVES

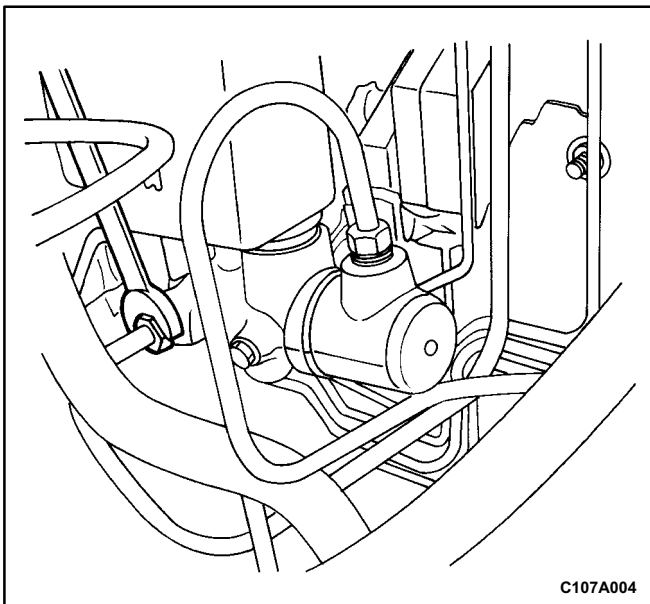
(Left-Hand Drive Shown, Right-Hand Drive Similar)

Removal Procedure

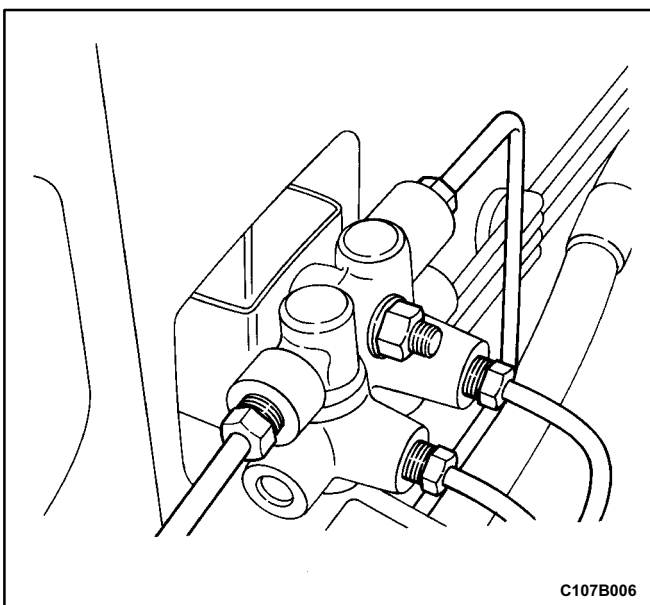
1. Disconnect the brake lines from the proportioning valves. (The ABS proportioning valve is shown.)
2. Remove the nut that secures the proportioning valve to the bulkhead.



3. For ABS equipped vehicles, remove the brake lines from the hydraulic modulator.



4. For non ABS equipped vehicles, remove the brake lines from the master cylinder.
5. Unsnap the brake lines from the brackets along the bulkhead.



Installation Procedure

1. Install the proportioning valve to the bulkhead. (The ABS proportioning valve is shown.)

Tighten

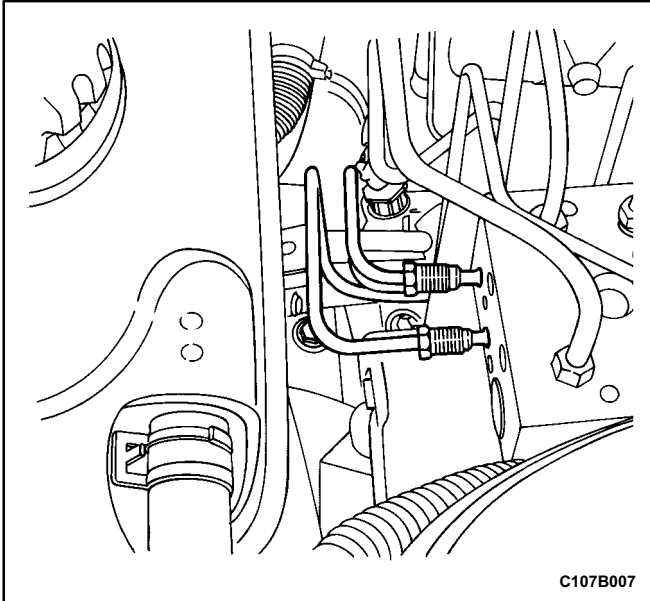
Tighten the proportioning valve nut to 10 N•m (89 lb•in).

2. Connect the brake lines to the proportioning valve.

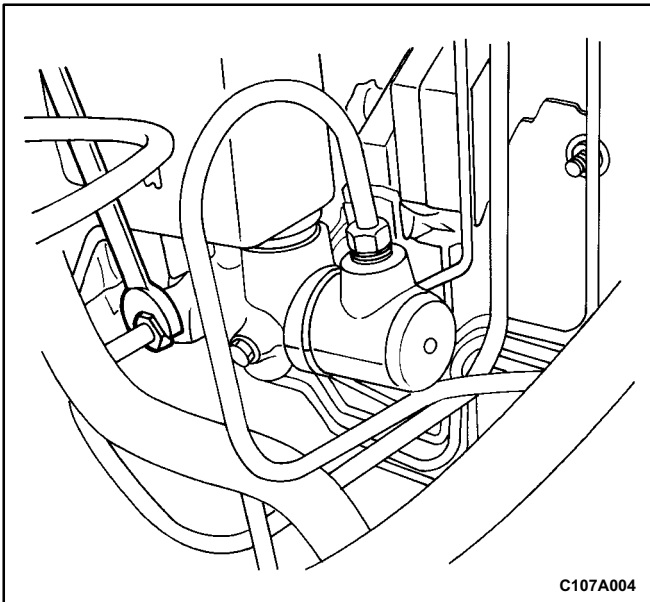
Tighten

Tighten the proportioning valve brake lines to 10 N•m (89 lb•in).

4B - 10 MASTER CYLINDER



3. For ABS equipped vehicles, install the brake lines to the hydraulic modulator.



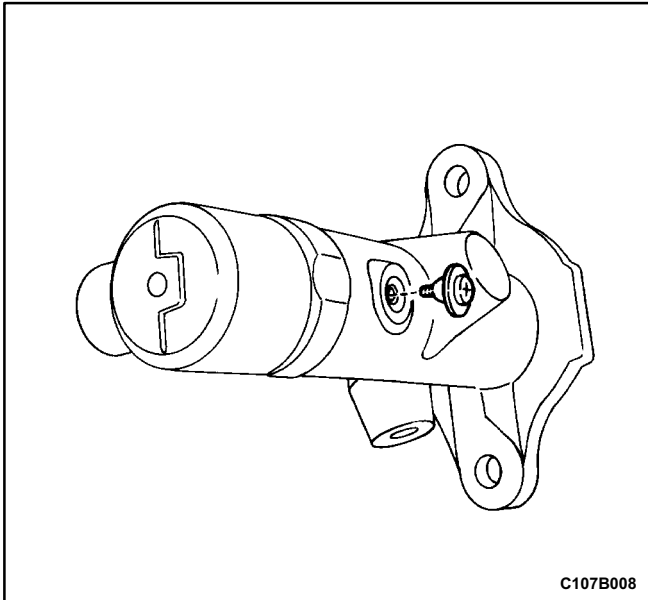
4. For non ABS equipped vehicles, install the brake lines to the master cylinder.
5. Raise and suitably support the vehicle.
6. Bleed the braking system. Refer to *Section 4A, Hydraulic Brakes*.
7. Lower the vehicle.

UNIT REPAIR

MASTER CYLINDER OVERHAUL

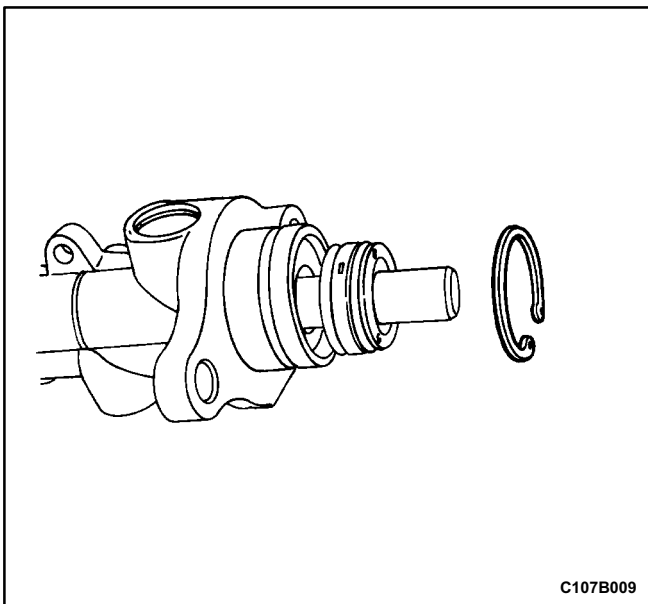
Disassembly Procedure

1. Remove the master cylinder. Refer to „Master Cylinder Assembly” in this section.
2. Remove the brake fluid reservoir. Refer to „Brake Fluid Reservoir” in this section.
3. Remove the retaining screw (if equipped) from the cylinder.

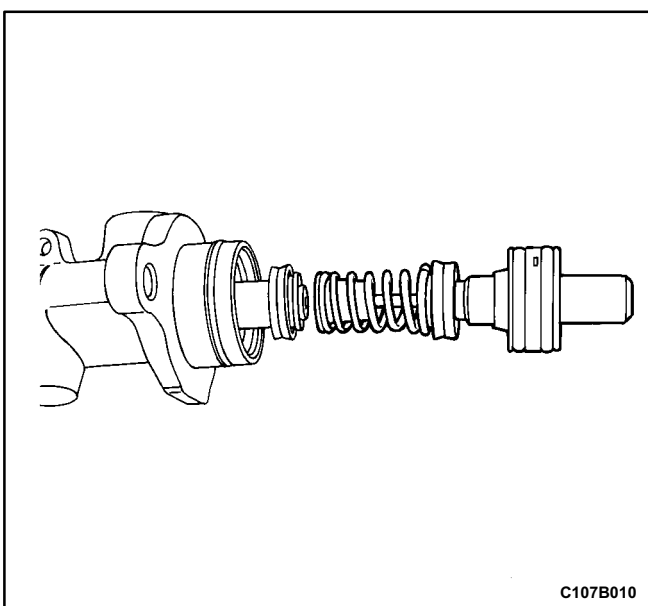


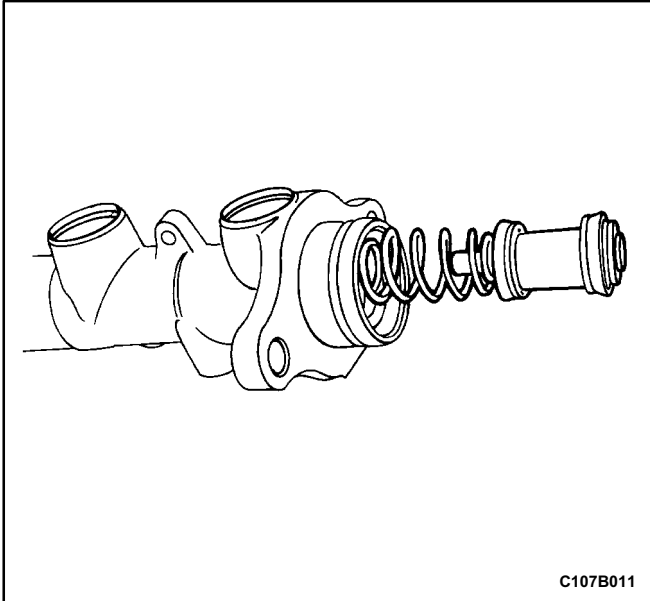
Notice: When removing the retaining ring, avoid damaging the piston or the cylinder wall.

4. Remove and discard the retaining ring from the cylinder body by pressing the hollow shaft and using needle-nosed pliers to grasp and squeeze the retaining ring.



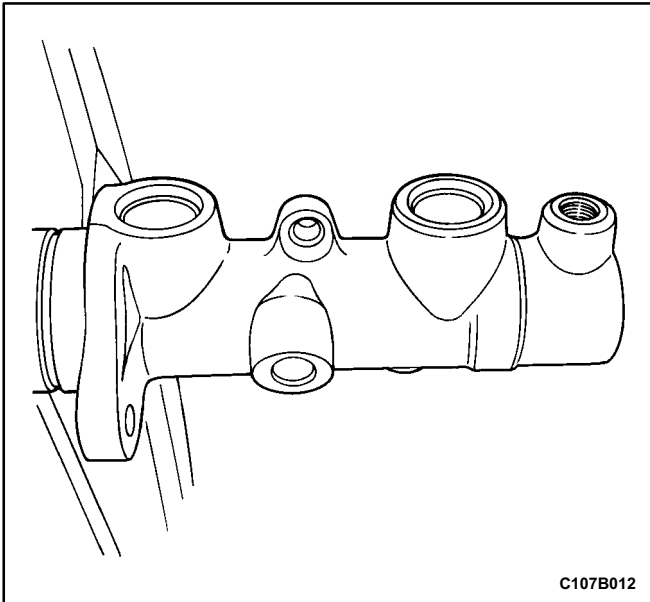
5. Remove the washer and the primary piston assembly.





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6. Carefully remove the secondary piston assembly, including the spring, from the master cylinder bore.



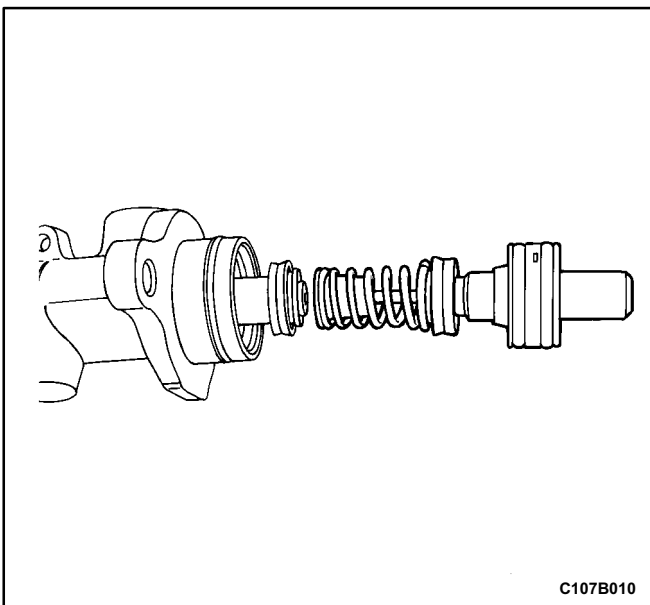
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Assembly Procedure

Notice: Do not use abrasives in the master cylinder bore. Abrasives can damage the bore.

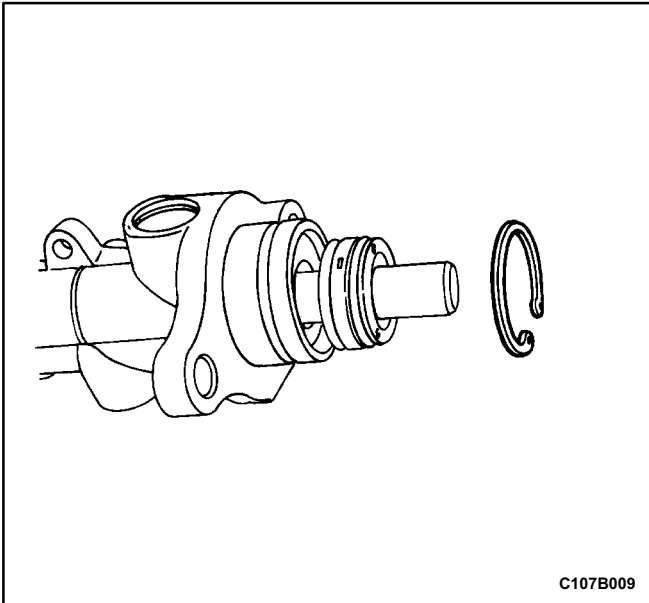
Important: Rubber parts and retaining rings must be discarded and replaced with new parts.

1. Clean all the parts with denatured alcohol or clean brake fluid. Dry the parts with compressed air.
2. Inspect the master cylinder bore for scoring or corrosion. If scoring or corrosion is evident, replace the master cylinder body.
3. Lubricate the master cylinder bore with clean brake fluid. (The non ABS master cylinder is shown.)



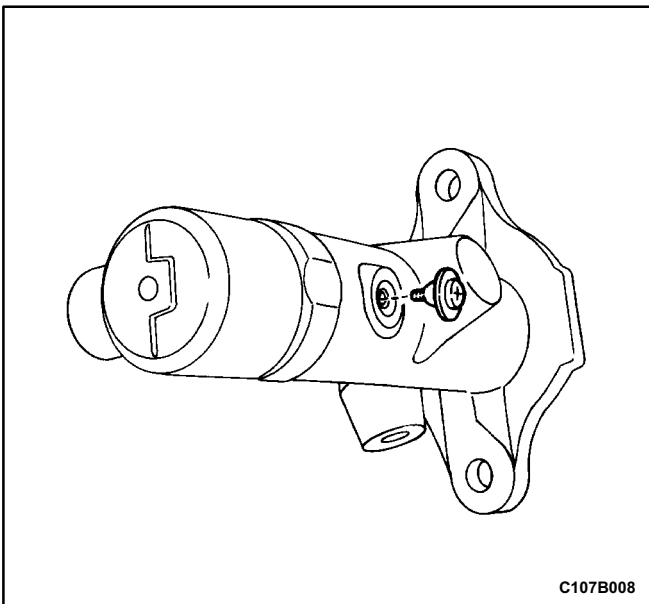
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4. Carefully insert the secondary piston assembly bore until the secondary piston contacts the base of the cylinder body. Use a wood or a plastic drift, if necessary.
5. Insert the primary piston assembly and the washer.

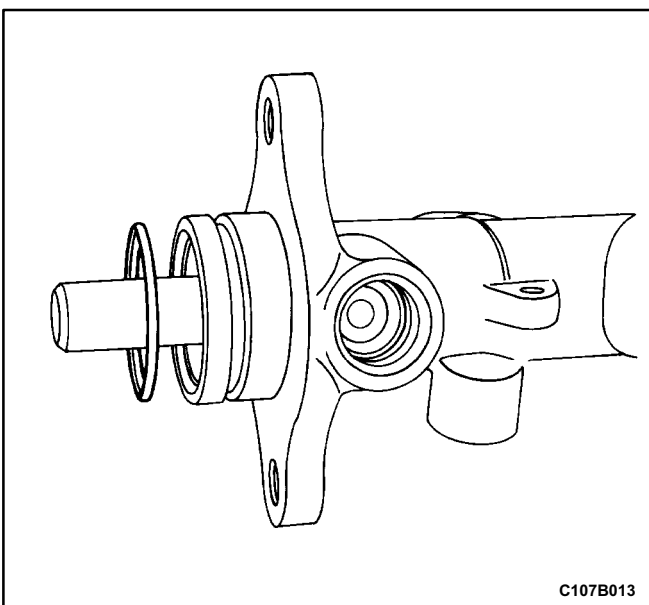


Notice: When installing the washer and the new retaining ring, take care not to damage the cylinder bore.

6. Press the pistons into the cylinder bore using a wooden or a plastic drift.
7. Insert the washer and the new retaining ring into the groove in the cylinder bore.



8. Install the retaining screw (if equipped) in bottom of the master cylinder and tighten it until it bottoms out on the internal piston assembly.



9. Insert a new O-ring over the cylinder body.
10. Install the brake fluid reservoir onto the master cylinder. Refer to „Brake Fluid Reservoir” in this section.
11. Install the master cylinder assembly. Refer to the „Master Cylinder Assembly” in this section.
12. Raise and suitably support the vehicle.
13. Bleed the braking system. Refer to *Section 4A, Hydraulic Brakes*.
14. Lower the vehicle.

GENERAL DESCRIPTION AND SYSTEM OPERATION

MASTER CYLINDER

The master cylinder is designed for use in a diagonally split system. One front and one diagonally opposite rear brake are served by the primary piston. The opposite front and rear brakes are served by the secondary piston. The master cylinder incorporates the functions of the standard dual master cylinder, plus a low fluid level indicator and the proportioning valves. The proportioning valves limit the outlet pressure to the rear brakes after a predetermined master cylinder pressure has been reached.

Notice: Do not use lubricated shop air on the brake parts, as this may damage the rubber components.

Important:

- Replace all the components included in the repair kits used to service this master cylinder.

- Lubricate the rubber parts with clean brake fluid to ease assembly.
- If any hydraulic component is removed or disconnected, it may be necessary to bleed all or part of the brake system.
- The torque values specified are for dry, unlubricated fasteners.
- Perform all service operations on a clean bench, free from all traces of mineral oil.

PROPORTIONING VALVES

The proportioning valves limit the outlet pressure to the rear brakes after a predetermined master cylinder pressure has been reached. This is used when less rear application force is needed to obtain optimum braking.

FLUID LEVEL SENSOR

The master cylinder is equipped with a fluid level sensor. This sensor will activate the BRAKE light if a low fluid level condition is detected. Once the fluid level is corrected, the BRAKE light will go out.