

SECTION : 4B

MASTER CYLINDER

CAUTION : *Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.*

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SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	N•m	Lb-Ft	Lb-In
Brake Lines	16	12	–
Master Cylinder Attaching Nuts	18	13	–
Proportioning Valves	22	16	–

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. (On ABS braking systems, the hydraulic modulator/ motor pack assembly controls the hydraulic pressure to both the rear wheel cylinders or rear calipers, and the front calipers.)

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.

Engine	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 Front Axle in kPa (psi)
2.0L	0.3/40	500 (73)	500 (73)
	5 500 (798)	4 450 ± 200 (645 ± 29)	
	10 000 (1,450)	5 800 ± 300 (841 ± 44)	

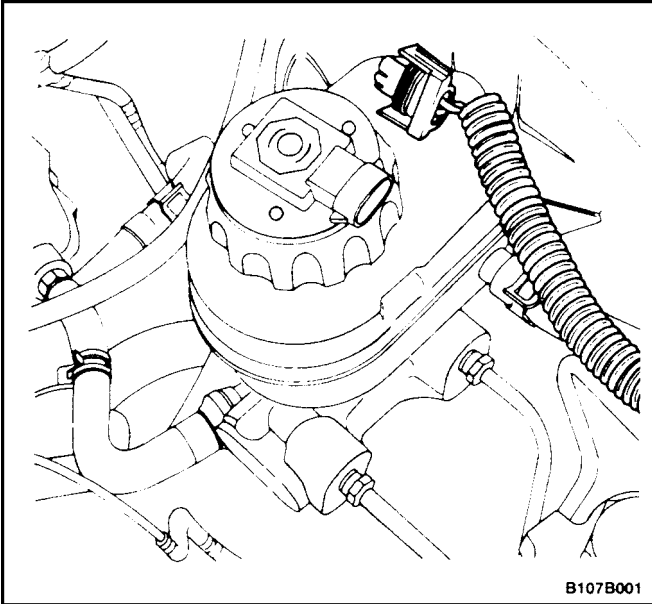
4B – 2 MASTER CYLINDER

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

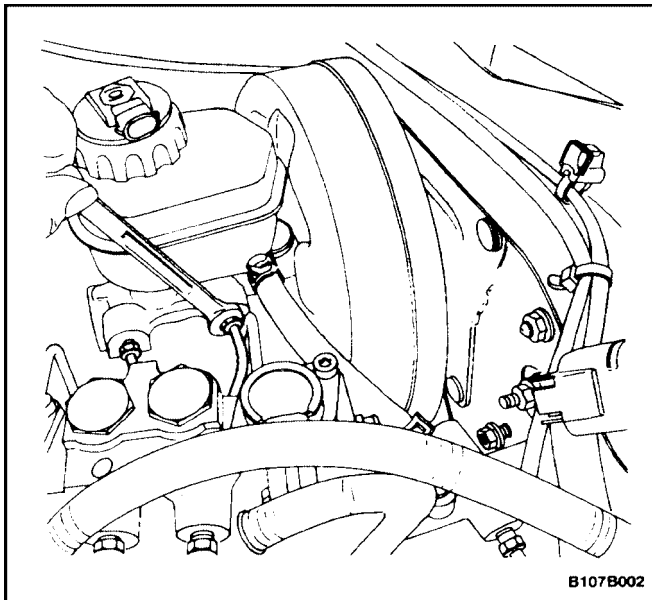
5. Remove the gauges from the tested brake circuit and repeat the test on the remaining circuit.

MAINTENANCE AND REPAIR**ON-VEHICLE SERVICE****MASTER CYLINDER ASSEMBLY****Removal Procedure**

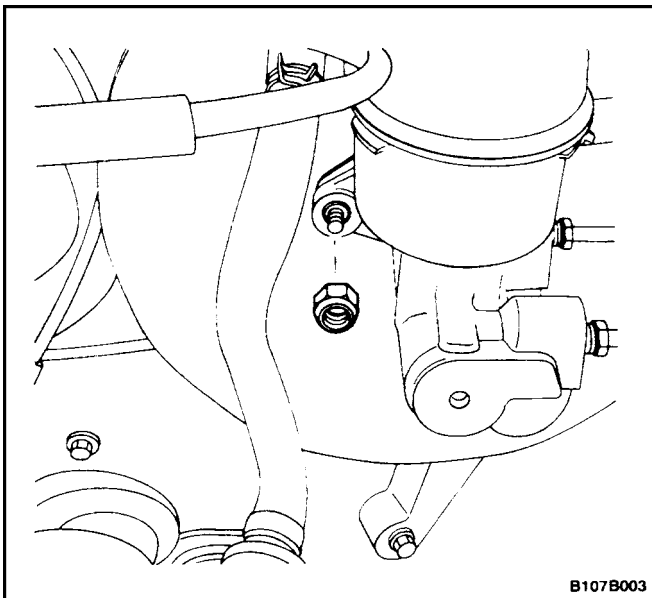
1. Disconnect the electrical connector from the reservoir cap.
2. For vehicles with the ABS braking system, disconnect the brake lines from the master cylinder body.
3. For vehicles with the non-ABS braking system, disconnect the brake lines from the proportioning valves.
4. For vehicles with the manual transaxle, disconnect the clip to the clutch hose connection to the master cylinder and move the clip out of the way.
5. Remove the clutch hose from the master cylinder if equipped.
6. Plug the opening to the brake lines to prevent fluid loss and contamination.
7. Remove the attaching nuts from the power booster.
8. Remove the master cylinder assembly.
9. Drain the brake fluid.



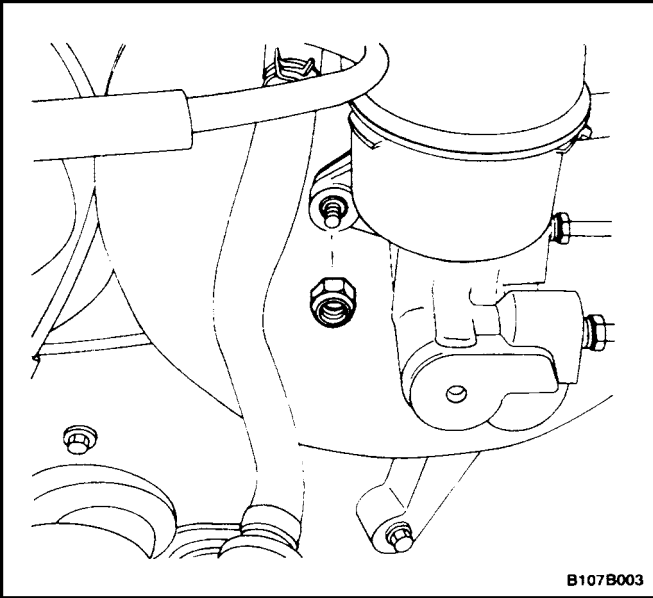
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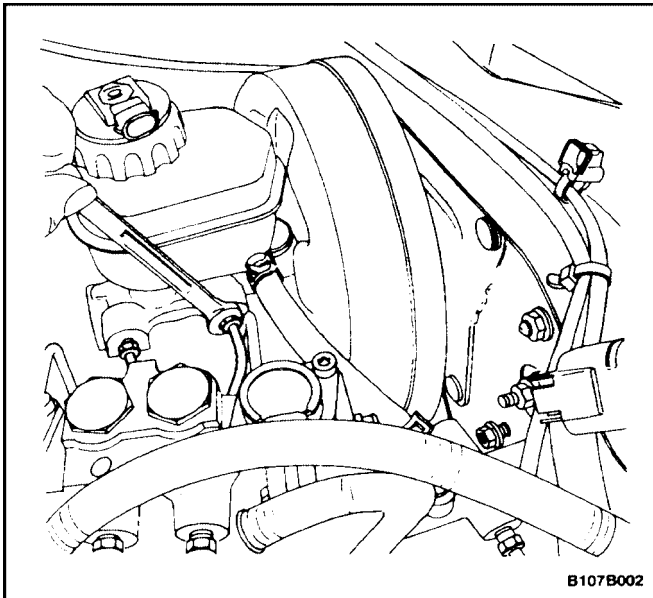


Installation Procedure

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

Tighten

Tighten the master cylinder attaching nuts to 18 N•m (13 lb–ft).

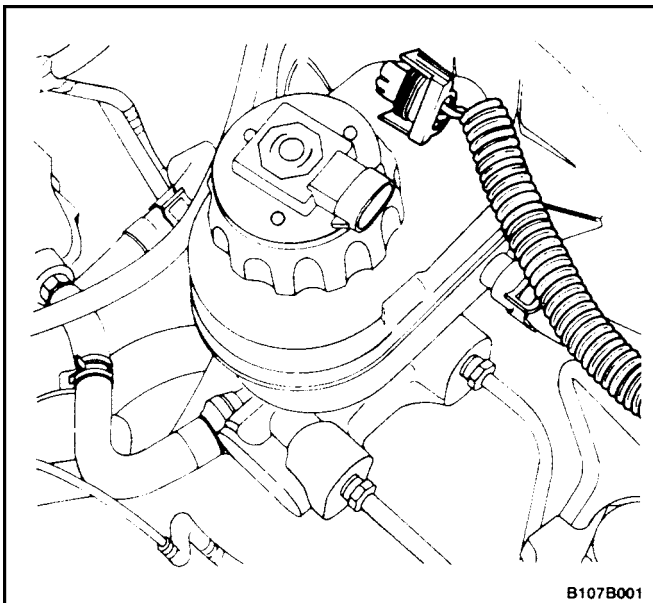


2. For vehicles with the ABS braking system (as shown), connect the brake lines to the cylinder body.
3. For vehicles with the non–ABS braking system, connect the brake lines to the proportioning valves.

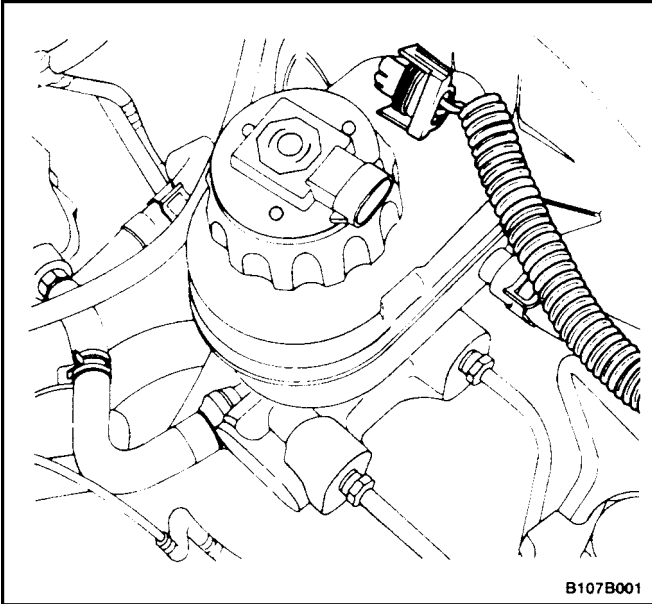
Tighten

Tighten the brake lines to 16 N•m (12 lb–ft).

4. For vehicles with the manual transaxle, connect the clip to the clutch hose connection to the master cylinder reservoir if equipped.



5. Connect the electrical connector on the reservoir cap.
6. Add brake fluid.
7. Check for leaks and recheck the fluid level.
8. Bleed the brake system. Refer to *Section 4A, Hydraulic Brakes*

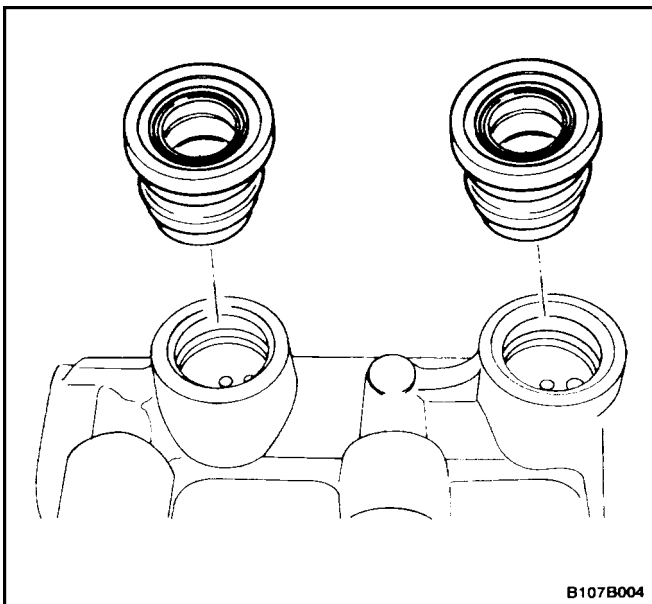
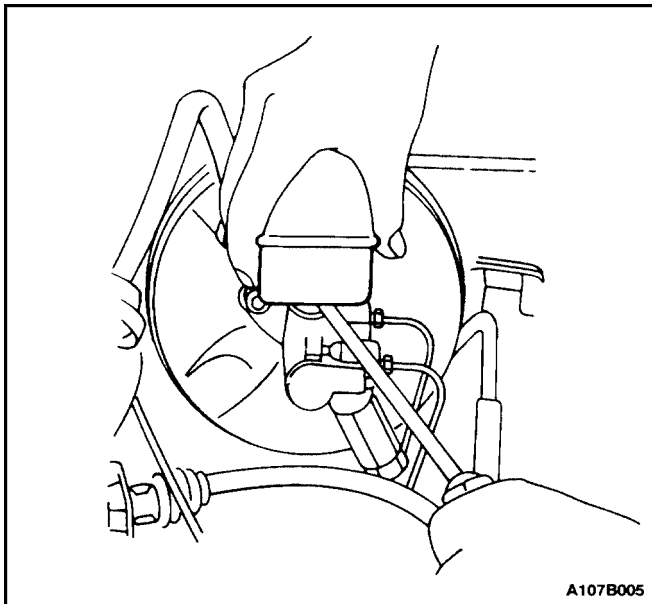


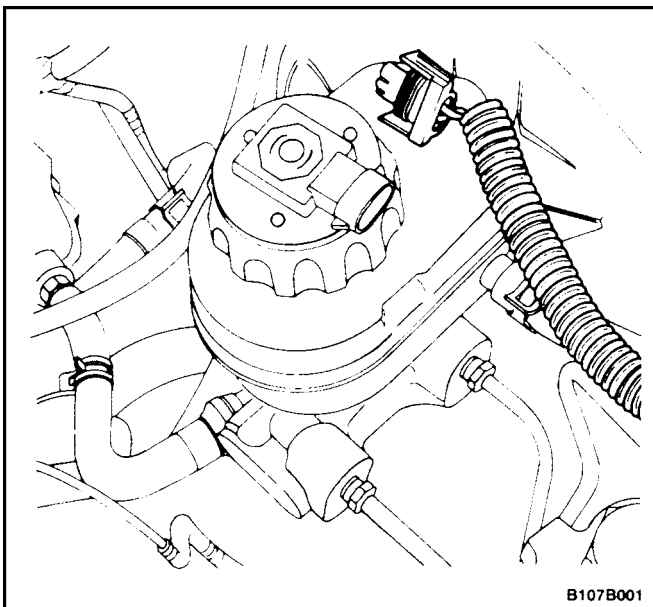
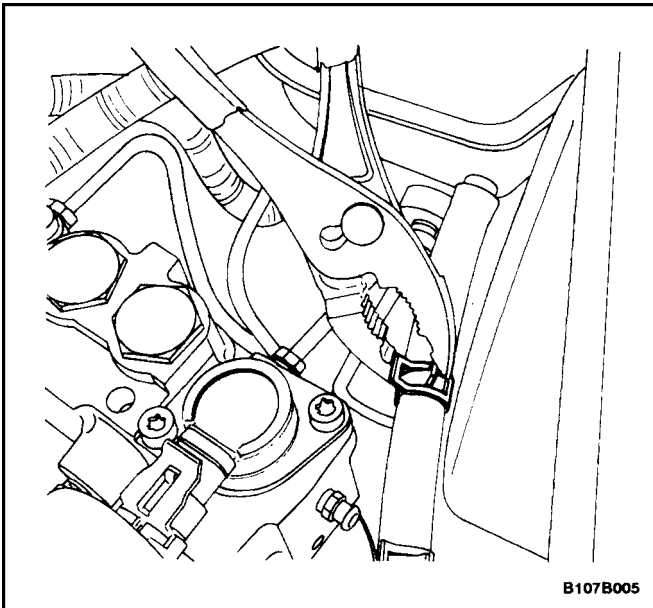
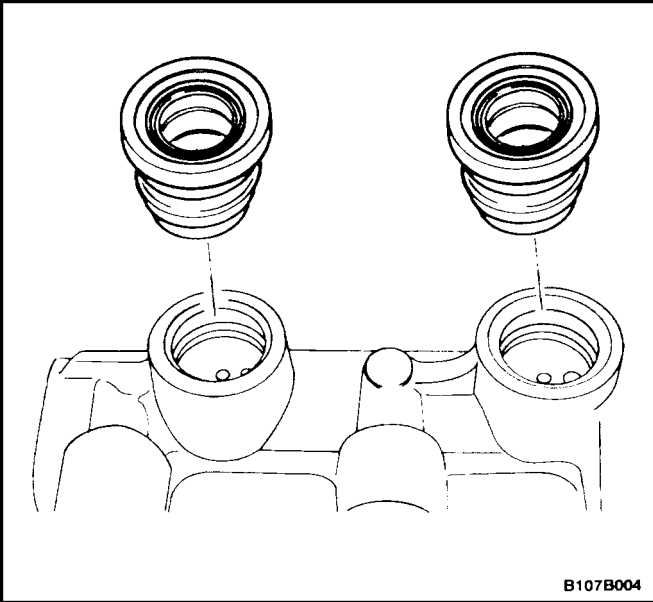
BRAKE FLUID RESERVOIR

Removal Procedure

Important : Remove the reservoir only when replacing a damaged or a leaking reservoir.

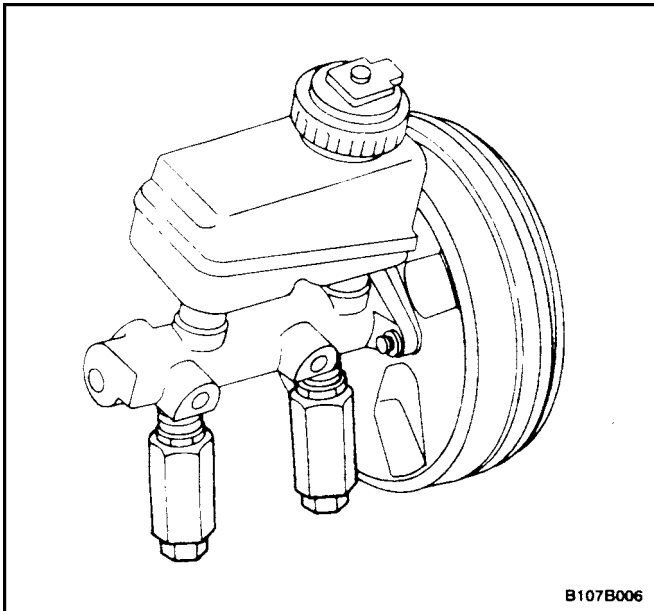
1. Disconnect the electrical connector from the reservoir cap.
2. For vehicles with the manual transaxle, disconnect the clip to the clutch hose connection to the master cylinder, and move the clip out of the way.
3. Remove the clutch hose from the master cylinder.
4. Gently pry upwards with a screwdriver to release the reservoir.
5. Tilt the reservoir and pull it upward in order to remove it.
6. Remove the reservoir seals from the master cylinder body.





Installation Procedure

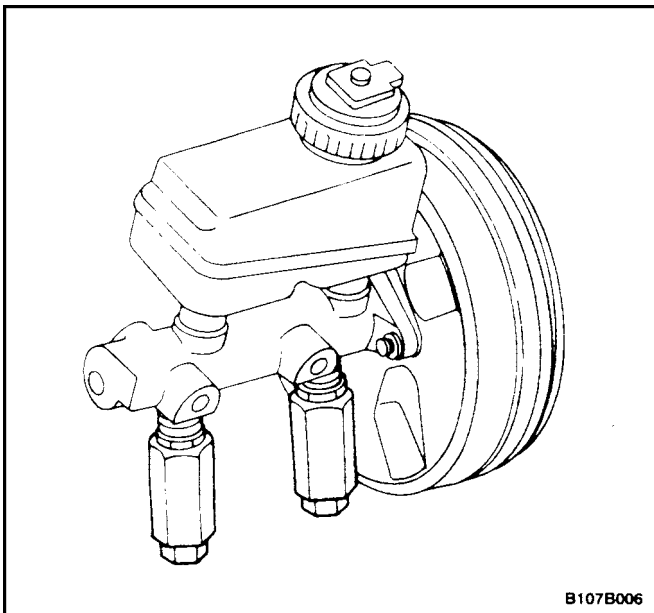
1. Lubricate the new seals with clean brake fluid. Install the seals into the cylinder body.
2. Install the reservoir on the master cylinder body.
3. For vehicles with the manual transaxle, connect the clip to the clutch hose connection to the master cylinder.
4. Add brake fluid.
5. Raise and suitably support the vehicle.
6. Bleed the braking system. Refer to *Section 4A, Hydraulic Brakes* or *Section 4F, Antilock Brake System*.
7. Bleed the clutch master cylinder. Refer to *Section 5C, Clutch*.
8. Lower the vehicle.
9. Connect the reservoir electrical connector.



PROPORTIONING VALVE

Removal Procedure

1. Disconnect the brake lines from the proportioning valves.
2. Remove the valves from the master cylinder body.



Installation Procedure

Important : Since these valves are adjusted in pairs to the correct control range, they must be replaced in pairs.

1. Install the proportioning valves to the cylinder body.

Tighten

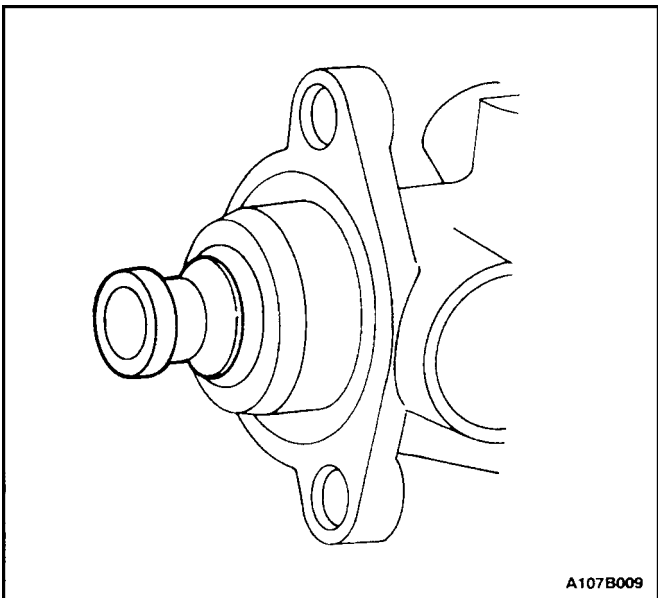
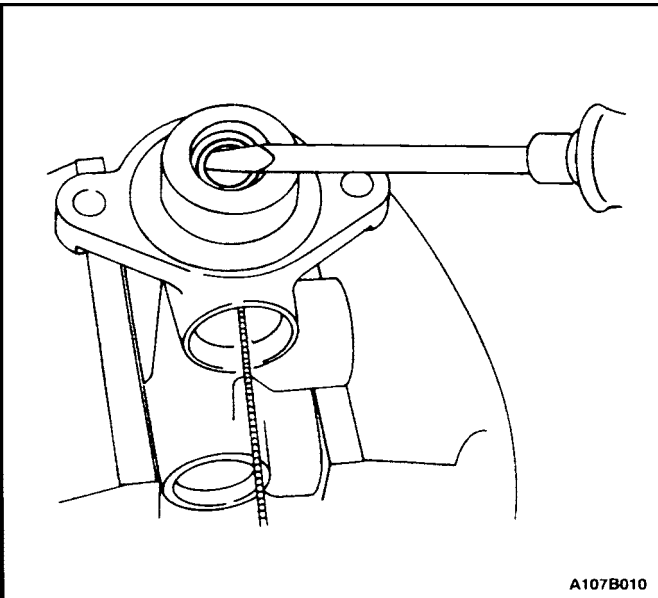
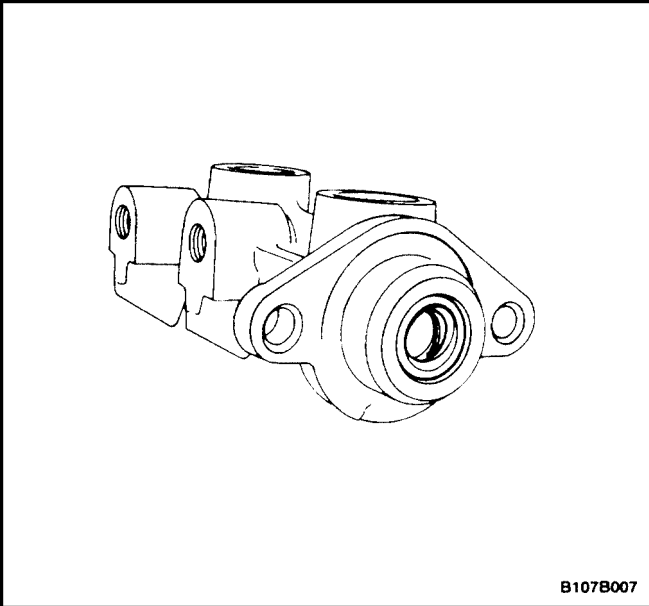
Tighten the proportioning valves to 22 N•m (16 lb–ft).

2. Connect the brake lines to the valves.

Tighten

Tighten the brake lines to 16 N•m (12 lb–ft).

3. Raise and suitably support the vehicle.
4. Bleed the braking system. Refer to *Section 4A, Hydraulic Brakes* or *Section 4F, Antilock Brake System*.
5. Lower the vehicle.



UNIT REPAIR

MASTER CYLINDER OVERHAUL

Disassembly Procedure

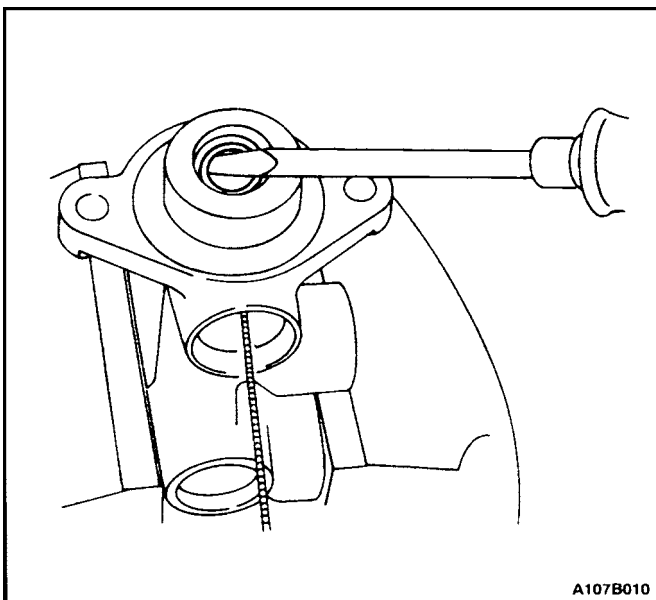
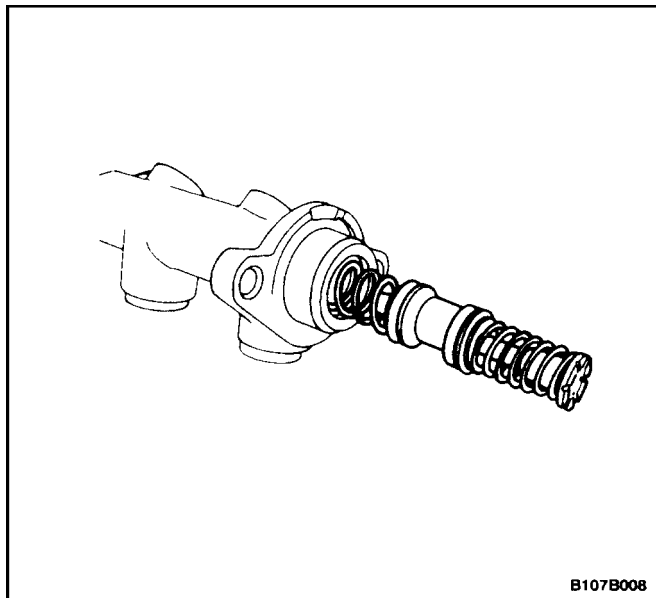
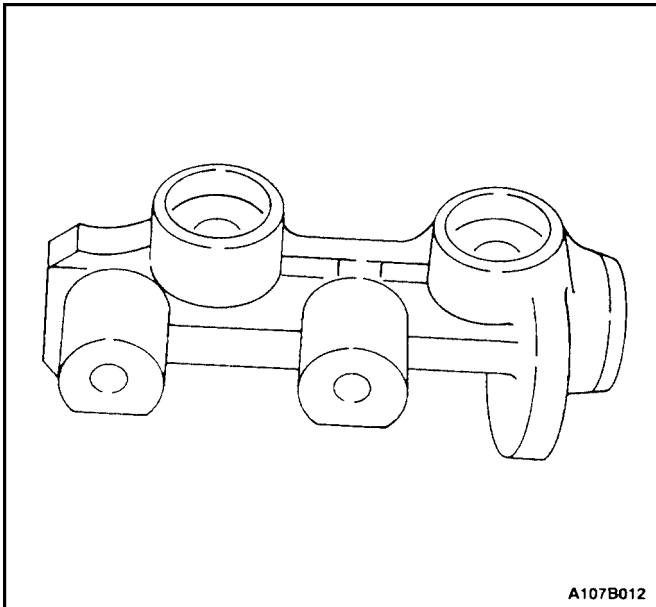
1. Remove the master cylinder. Refer to "Master Cylinder Assembly" in this section.
2. Remove the brake fluid reservoir. Refer to "Brake Fluid Reservoir" in this section.
3. Remove the seal ring from the cylinder bore.

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

Important : A welding rod or its equivalent can be used in a compensating port to keep the piston depressed.

4. Remove and discard the retaining ring from the cylinder body (the non-ABS master cylinder body is shown) using a suitable screwdriver.

5. Remove the primary piston (the ABS master cylinder body is shown).
6. Carefully remove the secondary piston assembly, including the springs, from the master cylinder bore.

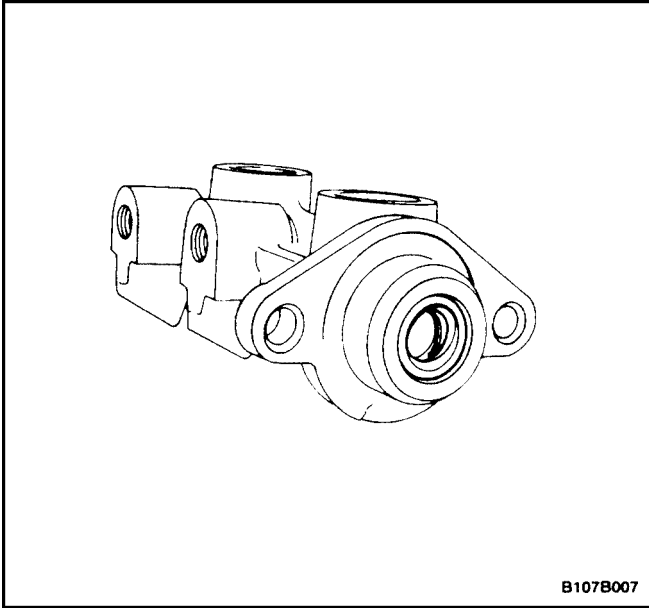


Assembly Procedure

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 parts with denatured alcohol or clean brake fluid. Dry the parts with compressed air. Do not use lubricated shop air on brake parts, as this may damage rubber components.
 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 (the non-ABS master cylinder is shown) with clean brake fluid.
 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.
 6. Press the pistons into the cylinder bore using a wooden or a plastic drift.
- Notice :** When installing the new retaining ring, take care not to damage the cylinder bore.
7. Insert the new retaining ring into the groove in the cylinder bore (the non-ABS cylinder body is shown). Remove the welding rod.
 8. Move the pistons backward and forward after installation to check for free movement.



9. Lubricate the seal ring and insert the seal into the cylinder bore. The open side must face outward until the seal rests on the piston.
10. Install the brake fluid reservoir to 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* or *Section 4F, Antilock Brake System*.
14. Lower the vehicle.

GENERAL DESCRIPTION AND SYSTEM OPERATION

MASTER CYLINDER

The master cylinder is designed for use in a diagonalsplit 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 in the non–antilock braking system. The proportioning valves limit the outlet pressure to the rear brakes after a predetermined master cylinder pressure has been reached.

- Replace all the components included in the repair kits used to service this master cylinder.
- Lubricate rubber parts with clean brake fluid to ease assembly.
- Do not use lubricated shop air on brake parts, as this may damage rubber components.

- 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 VALVE

The proportioning valves limit the outlet pressure to the rear brakes on the non–antilock braking system after a predetermined master cylinder pressure has been reached. This is used when less rear apply force is needed to obtain optimum braking and is usually found on disc/drum brake configurations. On ABS–equipped vehicles, refer to *Section 4F, Antilock Brake System*.

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.