

BRAKES

CONTENTS

SECTION 4A	HYDRAULIC BRAKES
SECTION 4B	MASTER CYLINDER
SECTION 4C	POWER BOOSTER
SECTION 4D	FRONT DISC BRAKES
SECTION 4E	REAR DISC BRAKES
SECTION 4F	ANTILOCK BRAKE SYSTEM AND TRACKING CONTROL SYSTEM
SECTION 4G	PARKING BRAKE

SECTION 4A

HYDRAULIC BRAKES

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.

TABLE OF CONTENTS

<p>Specifications 4A-1</p> <p> General Specifications 4A-1</p> <p> Fastener Tightening Specifications 4A-2</p> <p>Schematic and Routing Diagrams 4A-2</p> <p> Brake Lamp Warning Circuit 4A-2</p> <p>Diagnosis 4A-3</p> <p> Brake System Testing 4A-3</p> <p> Brake Hose Inspection 4A-3</p> <p> Brake Lamp Warning Circuit 4A-3</p> <p>Maintenance and Repair 4A-6</p>	<p>On-Vehicle Service 4A-6</p> <p> Manual Bleeding the Brakes 4A-6</p> <p> Brake Hose Rear 4A-9</p> <p> Brake Hose Front 4A-11</p> <p> Stoplamp Switch 4A-13</p> <p> Brake Pedal 4A-14</p> <p>General Description and System</p> <p> Operation 4A-17</p> <p> Warning Lamp Operation 4A-17</p>
---	--

SPECIFICATIONS

GENERAL SPECIFICATIONS

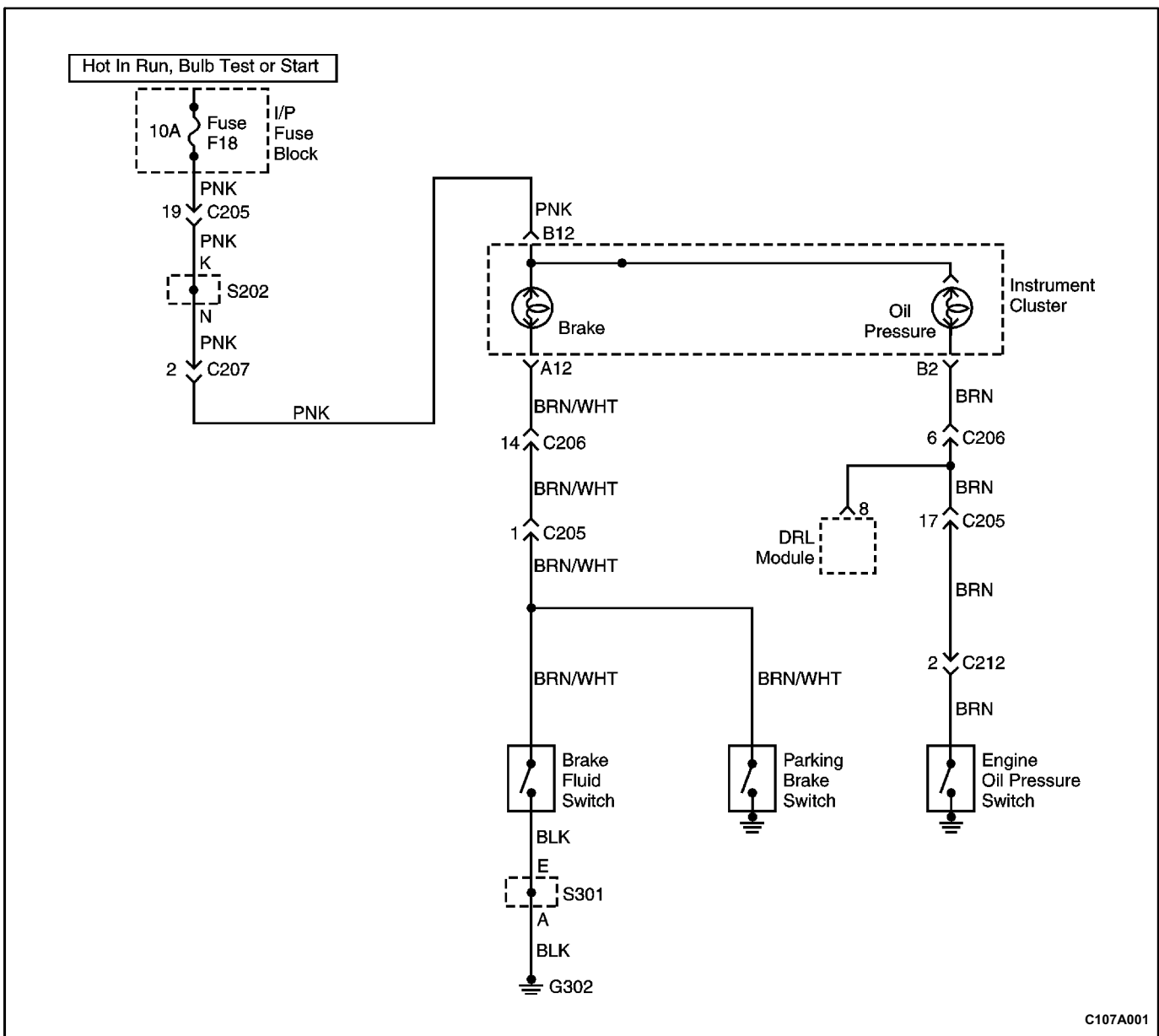
2.0L SOHC/DOHC Engines		
Application	Millimeters	Inches
Front Brake Rotors:		
Discard Thickness	22.00	0.87
Lateral Runout (Installed)	0.10	0.004
Rotor Diameter	256.00	10.08
Rotor Thickness (New)	24.00	0.95
Thickness Tolerance	0.0 / 0.30	0.0 / 0.01
Rear Brake Rotors:		
Discard Thickness	8.0	0.314
Lateral Runout (Installed)	0.100	0.004
Rotor Diameter	258.00	10.16
Rotor Thickness (New)	10.40	0.41
Thickness Tolerance	0.0 / 0.20	0.0 / 0.008
Master Cylinder:		
Bore Diameter (Nominal)	23.81	0.94
Bore Diameter (Maximum)	23.862	0.942
Caliper:		
Minimum Piston Diameter (Front)	57	2.24
Minimum Piston Diameter (Rear)	35	1.38

FASTENER TIGHTENING SPECIFICATIONS

Application	N•m	Lb•Ft	Lb•In
Bleeder Screw	6	-	53
Brake Lines	16	12	-
Brake Pedal to Pedal Bracket Hex Nut	18	13	-
Front Disc Brake Hose to Caliper Bolt	40	30	-
Rear Disc Brake Hose to Caliper Bolt	32	24	-
Trim Panel Screws	3	-	27

SCHEMATIC AND ROUTING DIAGRAMS

BRAKE LAMP WARNING CIRCUIT



DIAGNOSIS

BRAKE SYSTEM TESTING

Brakes should be tested on a dry, clean, reasonably smooth and level roadway. A true test of brake performance cannot be made if the roadway is wet, greasy, or covered with loose dirt which can cause all tires not to grip the road equally. Testing also will be adversely

affected if the roadway is crowned so as to throw the vehicle's weight so roughly that the wheels tend to bounce.

Test the brakes at different vehicle speeds with both light and heavy pedal pressure; however, avoid locking the brakes and sliding the tires. Locked brakes and sliding tires do not indicate brake efficiency since heavily braked but turning wheels will stop the vehicle in less distance than locked brakes. More tire to road friction is present with a heavily braked, turning tire than with a sliding tire.

Because of the high deceleration capability, a firmer pedal may be felt at higher deceleration levels.

There are three major external conditions that affect brake performance:

- Tires having unequal contact and grip of the road will cause unequal braking. Tires must be equally inflated, and the tread pattern of the right and the left tires must be approximately equal.
- Unequal loading of the vehicle can affect the brake performance since the most heavily loaded wheels require more braking power, and thus more braking effort, than the others.
- Misalignment of the wheels, particularly conditions of excessive camber and caster, will cause the brakes to pull to one side.

To check for brake fluid leaks, hold constant foot pressure on the pedal with the engine running at idle and the shift lever in NEUTRAL. If the pedal gradually falls away with the constant pressure, the hydraulic system may be leaking. Perform a visual check to confirm any suspected leaks.

Check the master cylinder fluid level. While a slight drop in the reservoir level results from normal lining wear, an abnormally low level indicates a leak in the system. The hydraulic system may be leaking either internally or externally. Refer to the procedure below to check the master cylinder. The system may appear to pass this test while still having a slight leak. If the fluid level is normal, check the vacuum booster pushrod length. If an incorrect pushrod length is found, adjust or replace the rod.

Check the master cylinder using the following procedure:

- Check for a cracked master cylinder casting or a brake fluid leak around the master cylinder. Leaks are indicated only if there is at least one drop of fluid. A damp condition is not abnormal.

- Check for a binding pedal linkage and for an incorrect pushrod length. If both of these parts are in satisfactory condition, disassemble the master cylinder and check for an elongated or swollen primary cylinder or piston seals. If swollen seals are found, substandard or contaminated brake fluid should be suspected. If contaminated brake fluid is found, all the components should be disassembled and cleaned, and all the rubber components should be replaced. All of the pipes must also be flushed.

Improper brake fluid, or mineral oil or water in the fluid, may cause the brake fluid to boil or cause deterioration of the rubber components. If the primary piston cups in the master cylinder are swollen, then the rubber parts have deteriorated. This deterioration may also be evidenced by swollen wheel cylinder piston seals on the drum brake wheels.

If deterioration of the rubber is evident, disassemble all the hydraulic parts and wash the parts with alcohol. Dry these parts with compressed air before reassembly to keep the alcohol out of the system. Replace all the rubber parts in the system, including the hoses. When working on the brake mechanisms, check for fluid on the linings. If excessive fluid is found, replace the linings.

If the master cylinder piston seals are in satisfactory condition, check for leaks or excessive heat conditions. If these conditions are not found, drain the fluid, flush the master cylinder with brake fluid, refill the master cylinder, and bleed the system. Refer to „Manual Bleeding the Brakes” in this section.

BRAKE HOSE INSPECTION

The hydraulic brake hoses should be inspected at least twice a year. The brake hose assembly should be checked for road hazard damage, cracks, chafing of the outer cover, and for leaks or blisters. Inspect the hoses for proper routing and mounting. A brake hose that rubs on a suspension component will wear and eventually fail. A light and a mirror may be needed for an adequate inspection. If any of the above conditions are observed on the brake hose, adjust or replace the hose as necessary.

BRAKE LAMP WARNING CIRCUIT

Test Description

The number(s) below refer to step(s) on the diagnostic table.

1. The BRAKE warning lamp should only illuminate when either the brake fluid reservoir is low or the parking brake is applied.
5. The brake fluid level switch is a normally open switch. If the BRAKE warning lamp is off after disconnecting the switch, the brake fluid level switch is stuck closed.
7. If the BRAKE warning lamp is still on after disconnecting the parking brake switch, there is a short to ground in the wire to the parking brake switch.
12. If the BRAKE warning lamp does not operate while performing any of the functions, the fault should be in the ignition feed to the circuit.

4A - 4 HYDRAULIC BRAKES

17. This step determines if the problem is in the ignition feed to the circuit or in the instrument cluster.
22. The BRAKE warning lamp should illuminate when jumpering the parking brake connector to ground.

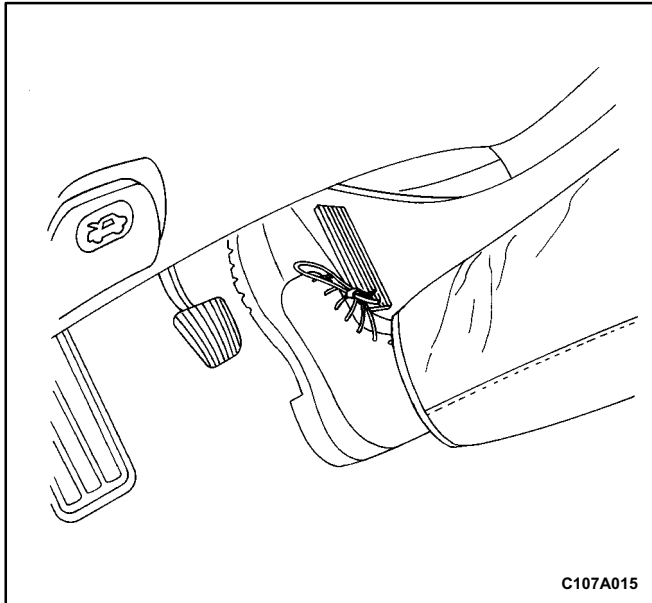
24. If the BRAKE warning lamp is on after jumpering the brake fluid level switch terminals, the switch is faulty.

Brake Lamp Warning Circuit

Step	Action	Value(s)	Yes	No
1	Turn the ignition ON and keep the engine running. Is the BRAKE warning lamp always on?	-	Go to Step 2	Go to Step 11
2	Release the parking brake fully. Is the BRAKE warning lamp off?	-	System OK	Go to Step 3
3	Check the brake fluid level. Is the fluid level OK?	-	Go to Step 5	Go to Step 4
4	1. Fill the brake fluid reservoir with clean DOT 3 / DOT 4 equivalent hydraulic fluid. 2. Replace the cap on the fluid reservoir. Is the BRAKE warning lamp on?	-	Go to Step 5	System OK
5	Disconnect the harness connector from the brake fluid level switch. Is the BRAKE warning lamp on?	-	Go to Step 7	Go to Step 6
6	Replace the brake fluid level switch. Is the repair complete?	-	System OK	-
7	1. Connect the brake fluid level switch. 2. Disconnect the parking brake switch. Is the BRAKE warning lamp on?	-	Go to Step 9	Go to Step 8
8	Replace the parking brake switch. Is the repair complete?	-	System OK	-
9	Check for a short to ground in the wiring between the instrument cluster terminal A12 and the parking brake switch. Is there a short?	-	Go to Step 10	Go to Step 11
10	Repair the wiring as needed. Is the repair complete?	-	System OK	-
11	Check the BRAKE warning lamp after doing each of the following functions: <ul style="list-style-type: none"> ● Apply the parking brake. ● Activate the low level switch. Does the BRAKE warning lamp operate for all of these conditions?	-	System OK	Go to Step 12
12	Check the BRAKE warning lamp after doing each of the following functions: <ul style="list-style-type: none"> ● Apply the parking brake. ● Activate the low level switch. Does the BRAKE warning lamp operate for none of these conditions?	-	Go to Step 13	Go to Step 20
13	1. Turn the ignition off. 2. Inspect the I/P fuse F18. Is the fuse OK?	-	Go to Step 15	Go to Step 14
14	Replace the I/P fuse. Is the repair complete?	-	System OK	-

Brake Lamp Warning Circuit (Cont'd)

Step	Action	Value(s)	Yes	No
15	Inspect the BRAKE warning lamp bulb. Is the bulb OK?	-	Go to <i>Step 17</i>	Go to <i>Step 16</i>
16	Replace the bulb. Is the repair complete?	-	System OK	-
17	1. Disconnect the instrument cluster connector. 2. Turn the ignition ON. 3. Measure the voltage at the instrument cluster connector terminal B12. Does the voltage measure within the value specified?	11-14 V	Go to <i>Step 18</i>	Go to <i>Step 19</i>
18	1. Turn the ignition off. 2. Repair the open in the instrument cluster. Is the repair complete?	-	System OK	-
19	1. Turn the ignition off. 2. Repair the open in the wiring between the instrument cluster connector terminal B12 and the ignition switch. Is the repair complete?	-	System OK	-
20	Apply the parking brake. Does the BRAKE warning lamp operate with the parking brake applied?	-	Go to <i>Step 21</i>	Go to <i>Step 22</i>
21	Activate the low level switch. Does the BRAKE warning lamp operate with the low level switch activated?	-	System OK	Go to <i>Step 24</i>
22	1. Turn the ignition ON. 2. Disconnect the parking brake switch. 3. Jumper the parking brake switch connector terminal to ground. Is the BRAKE warning lamp on?	-	Go to <i>Step 8</i>	Go to <i>Step 23</i>
23	1. Turn the ignition off. 2. Repair the open in the wire between the instrument cluster connector terminal A12 and the parking brake switch connector terminal. Is the repair complete?	-	System OK	-
24	1. Disconnect the brake fluid level switch. 2. Turn the ignition ON. 3. Jumper the brake fluid level switch connector terminals. Is the BRAKE warning lamp on?	-	Go to <i>Step 6</i>	Go to <i>Step 25</i>
25	1. Turn the ignition off. 2. Connect a test light between the battery positive and the BRN/WHT wire terminal of the brake fluid level switch. Is the test light on?	-	Go to <i>Step 26</i>	Go To <i>Step 27</i>
26	Repair the open in the wiring between ground and the brake fluid level switch. Is the repair complete?	-	System OK	-
27	Repair the open in the wiring between the instrument cluster connector terminal A12 and the brake fluid level switch. Is the repair complete?	-	System OK	-



MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE

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

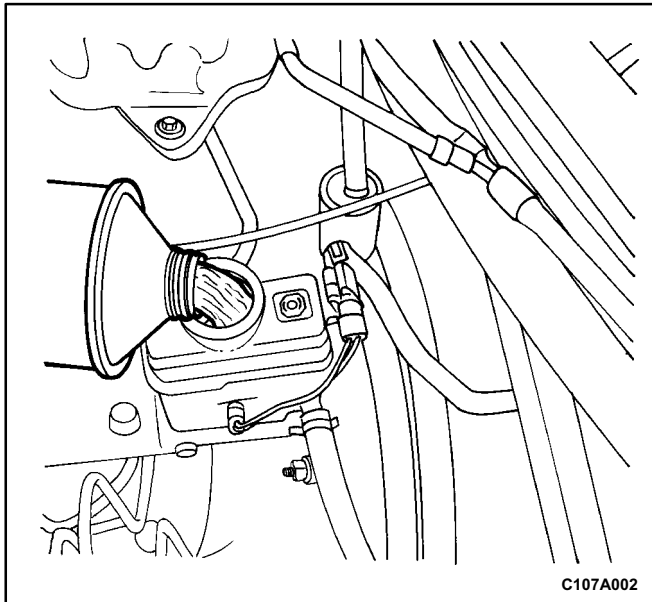
MANUAL BLEEDING THE BRAKES

Important: The bleeding sequence for vehicles equipped with a conventional braking system is as follows: right rear, left front, left rear, and right front. For ABS vehicles, refer to *Section 4F, Antilock Brake System and Traction Control System*.

1. Remove the booster reserve by applying the brakes several times with the engine off until all the reserve is depleted.

Important: If the master cylinder is known or suspected to have air in the bore, then it must be bled before any wheel cylinder or caliper is bled.

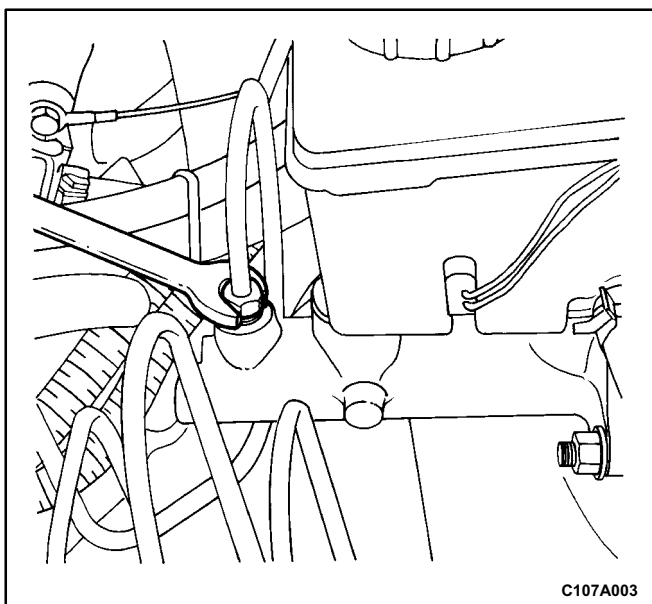
2. Fill the master cylinder reservoir with the brake fluid. Keep the master cylinder at least one half full of the brake fluid during the bleeding operation.

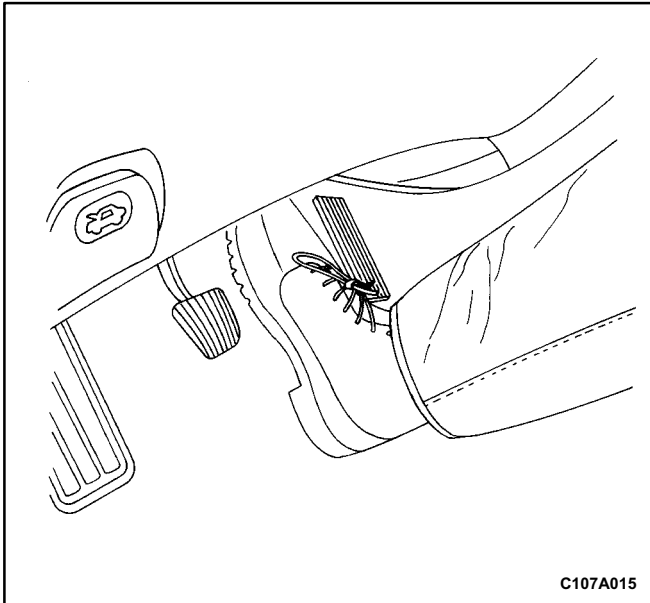


3. Disconnect the brake line at the top of the master cylinder.
4. Allow brake fluid to fill the master cylinder until it begins to flow from the port.
5. Connect the brake line to the master cylinder.

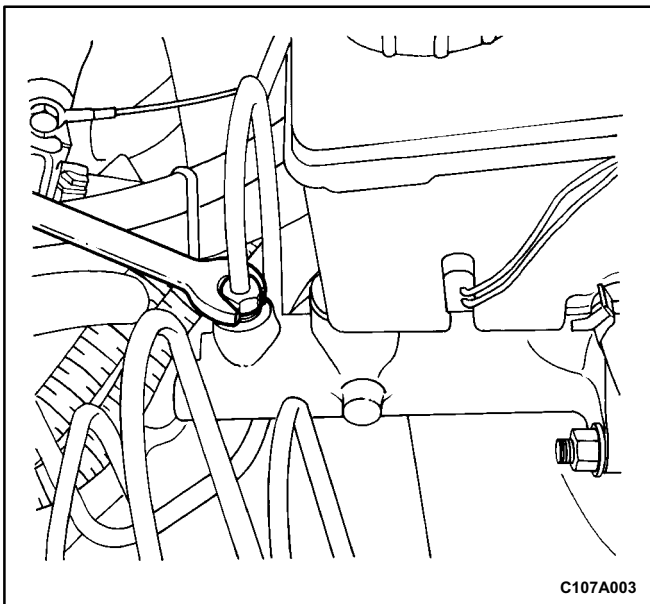
Tighten

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

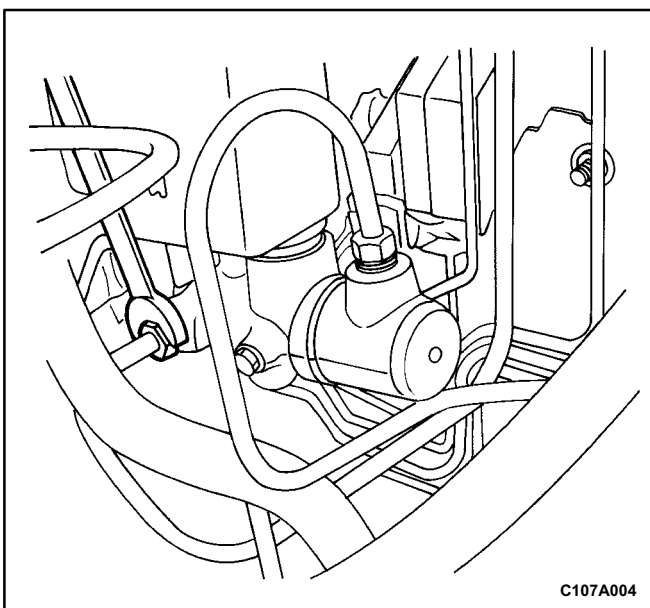




6. Slowly push and hold the brake pedal one time.

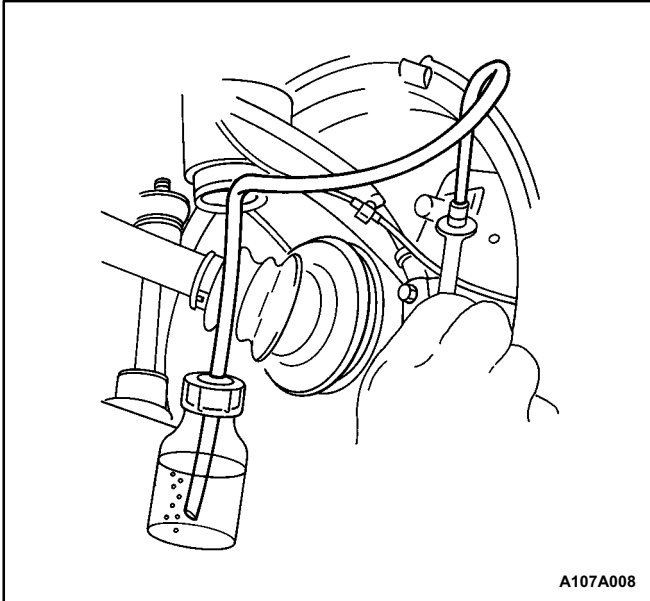


7. Loosen the brake line at the top of the master cylinder to purge the air from the cylinder.
8. Tighten the brake line, as in Step 5, and then release the brake pedal slowly. Wait 15 seconds before proceeding to the next step.
9. Repeat the sequence, including the 15 second wait, until all the air is removed from the master cylinder bore.

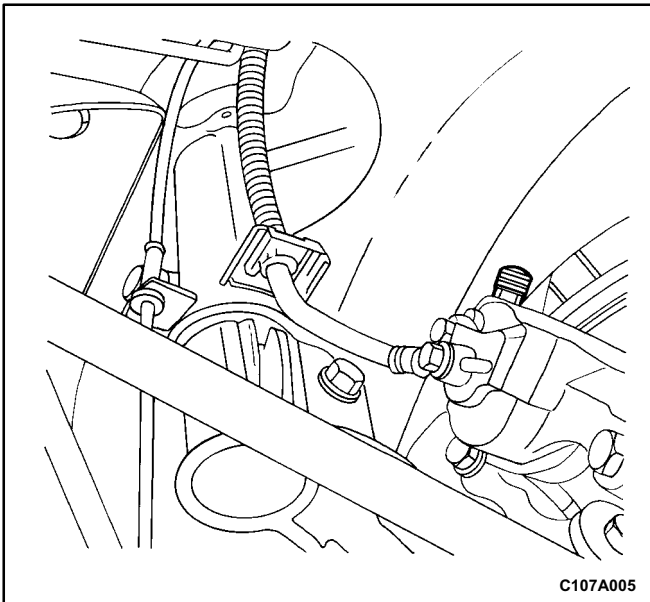


Notice: Care must be taken to prevent the brake fluid from contacting any painted surface to prevent damage to the paint finish.

10. After all the air has been removed at the top connection, bleed the master cylinder at the side connection in the same manner as with the top connection.



11. Attach a transparent tube over the valve. Allow the tube to hang submerged in the brake fluid in a transparent container.



12. Slowly push and hold the brake pedal one time.
13. Remove the bleeder valve cap and loosen the bleeder valve to purge the air from the cylinder.
14. Tighten the rear bleeder screw.

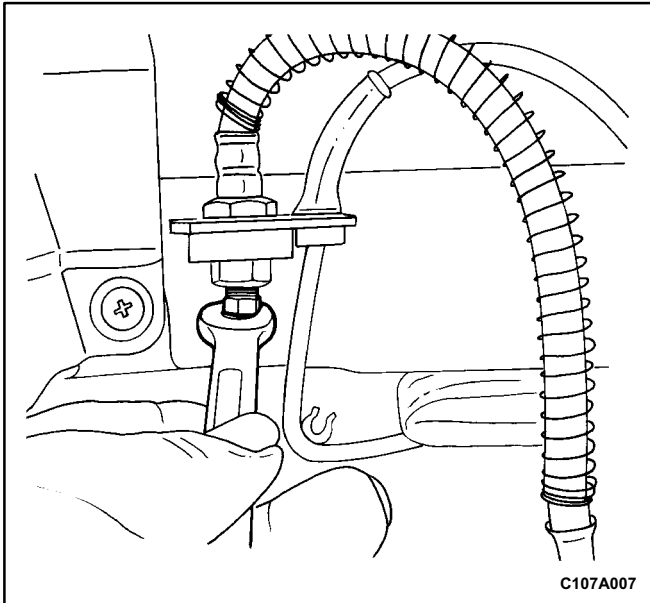
Tighten

Tighten the bleeder screw (front or rear) to 6 N•m (53 lb•in).

15. Slowly release the brake pedal. Wait 15 seconds before proceeding with the next step.

Important: Rapid pumping of the brake pedal pushes the master cylinder secondary piston down the bore in a manner that makes it difficult to bleed the system.

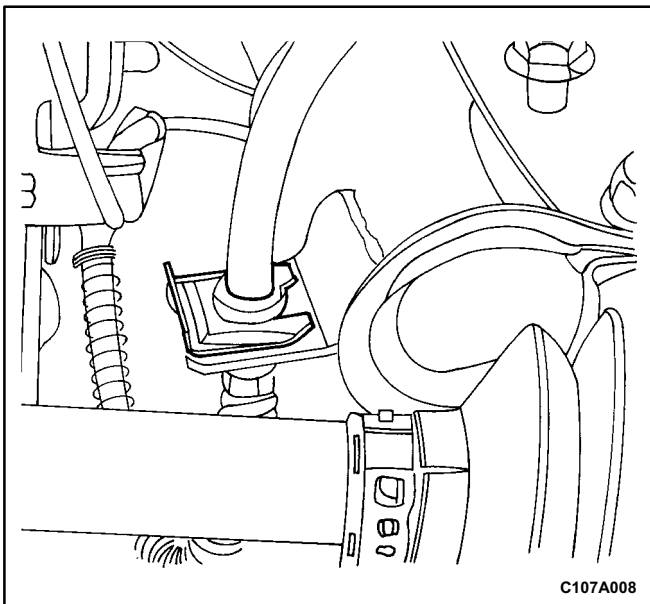
16. Repeat the sequence, including the 15 second wait, until all the air is removed. It may be necessary to repeat the sequence 10 or more times to remove all the air.
17. Locate the front bleeder caps.
18. Bleed the front brake following the appropriate sequence for non ABS systems, beginning with Step 12.
19. Check the brake pedal for sponginess. Repeat the entire bleeding procedure to correct this condition.



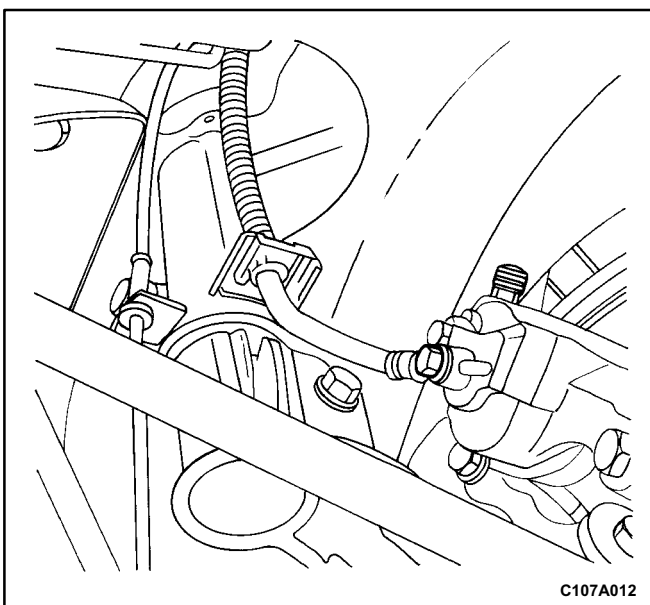
BRAKE HOSE REAR

Removal Procedure

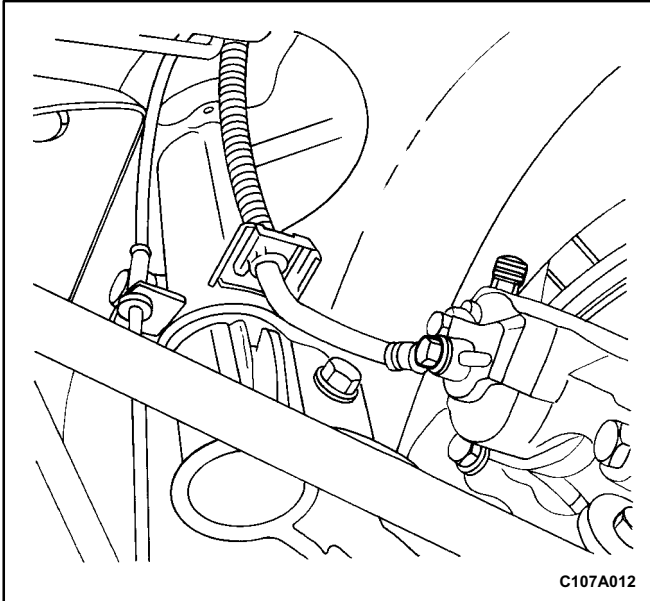
1. Raise and suitably support the vehicle.
2. Disconnect the brake line from the disc brake hose at the wheel housing bracket on each side of the vehicle.
3. Remove the brake hose retainer.



4. Remove the rear disc brake hose retainer and the brake hose from the bracket on the steering knuckle shaft.



5. Remove the rear disc brake hose from the caliper.

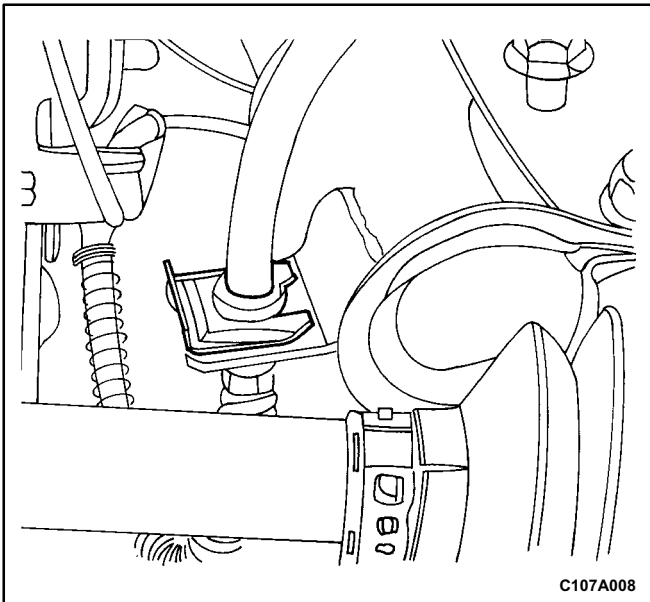


Installation Procedure

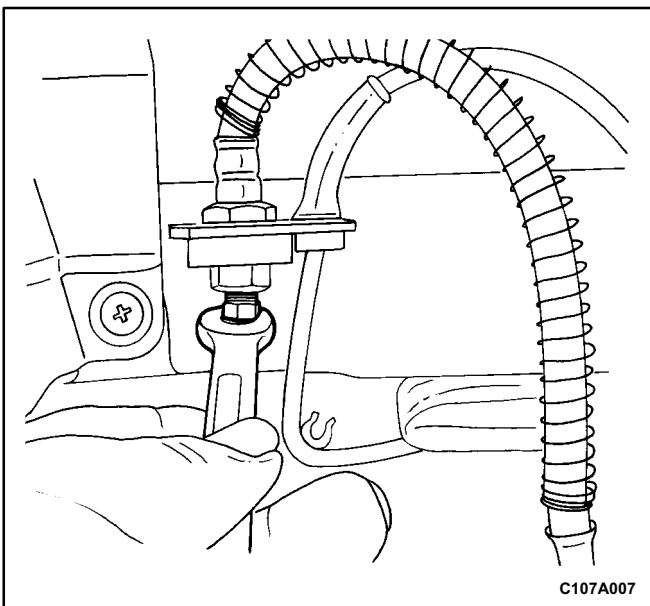
1. Install the rear disc brake hose to the caliper.

Tighten

Tighten the rear disc brake hose to caliper bolt to 32 N•m (24 lb•ft).



2. Install the rear disc brake hose and the retainer on the bracket on the steering knuckle shaft.

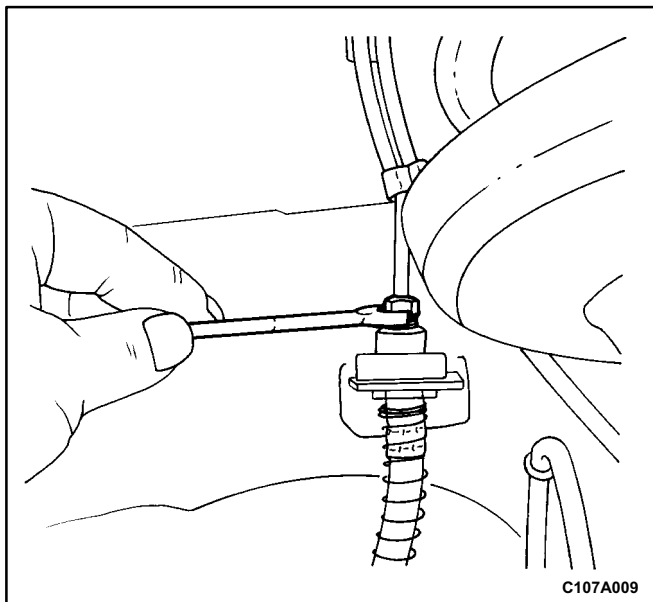


3. Install the rear disc brake line to the brake hose on the wheel housing bracket.

Tighten

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

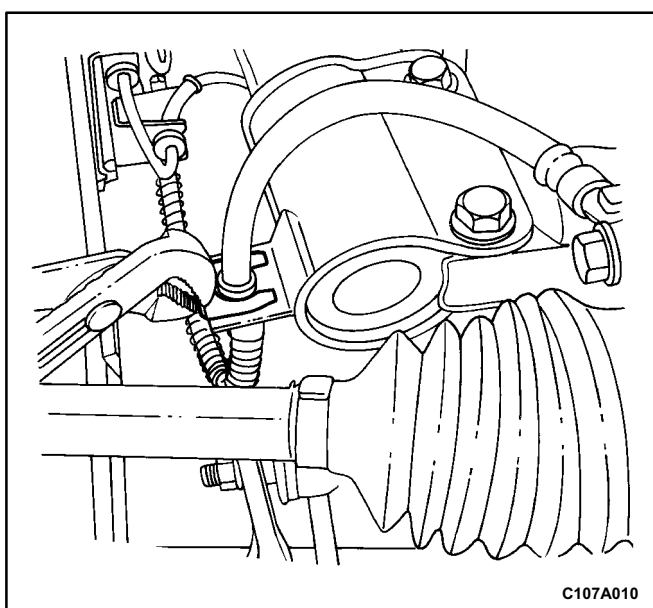
4. Lower the vehicle.
5. Bleed the brake system. Refer to „Manual Bleeding the Brakes” in this section.
6. Check the brake system for leaks.



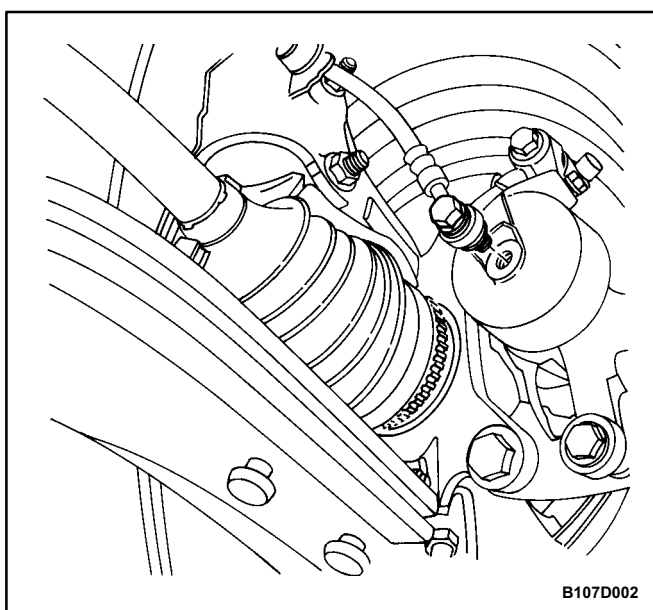
BRAKE HOSE FRONT

Removal Procedure

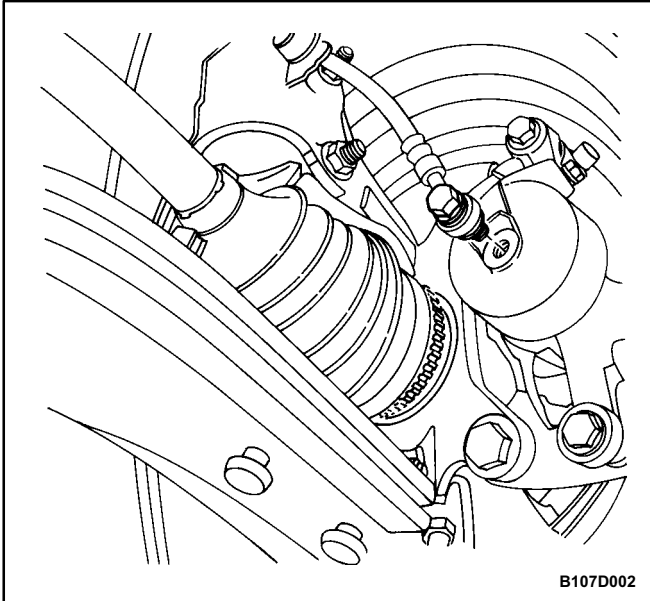
1. Raise and suitably support the vehicle.
2. Disconnect the brake line from the brake hose support bracket on the wheel housing on each side of the vehicle.
3. Remove the retainer.
4. Remove the brake hose from the wheel housing bracket.



5. Remove the retainer and disconnect the brake hose at the steering knuckle shaft bracket.



6. Remove the bolt from the brake caliper.
7. Remove the ring seals and the disc brake hose.

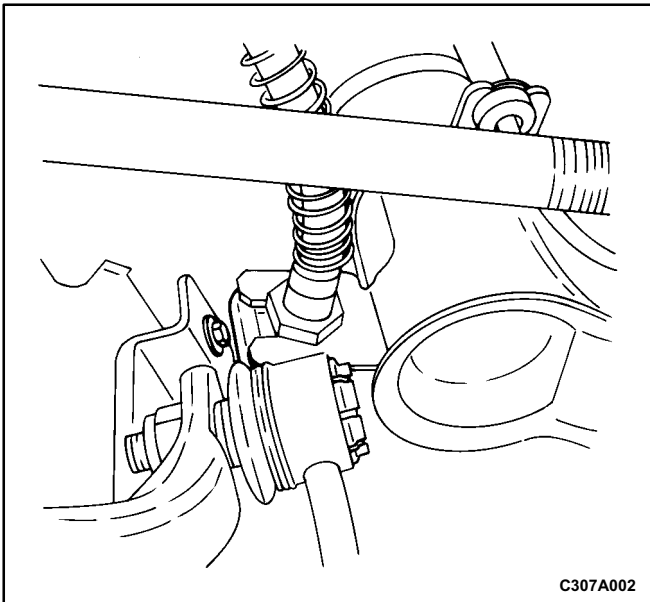


Installation Procedure

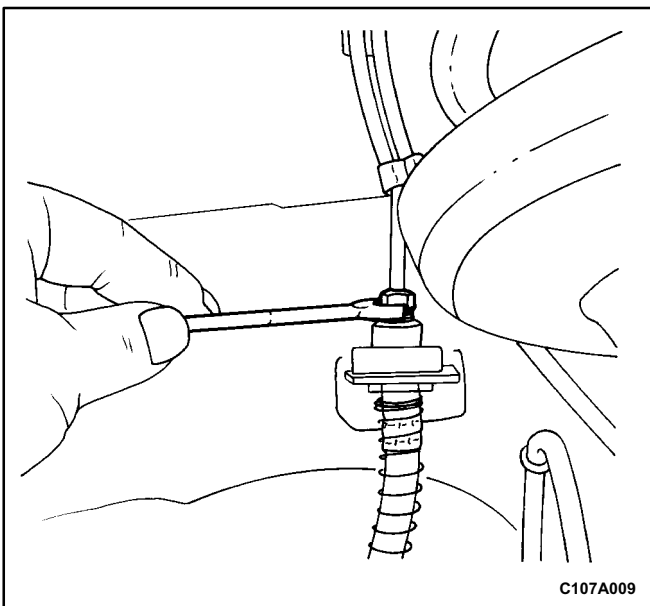
1. Install the new disc brake hose to the caliper with new seal rings and the bolt.

Tighten

Tighten the front disc brake hose to caliper bolt to 40 N•m (30 lb•ft).



2. Connect the brake hose at the steering knuckle shaft bracket and install the retainer.

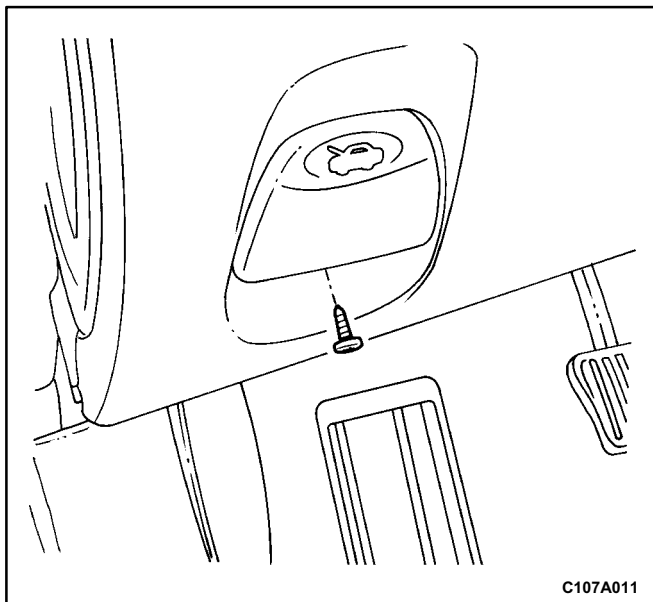


3. Connect the brake line to the brake hose on the wheel housing bracket on each side of the vehicle and install the retainer.

Tighten

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

4. Lower the vehicle.
5. Bleed the brake system. Refer to „Manual Bleeding the Brakes” in this section.
6. Check the brake system for leaks.



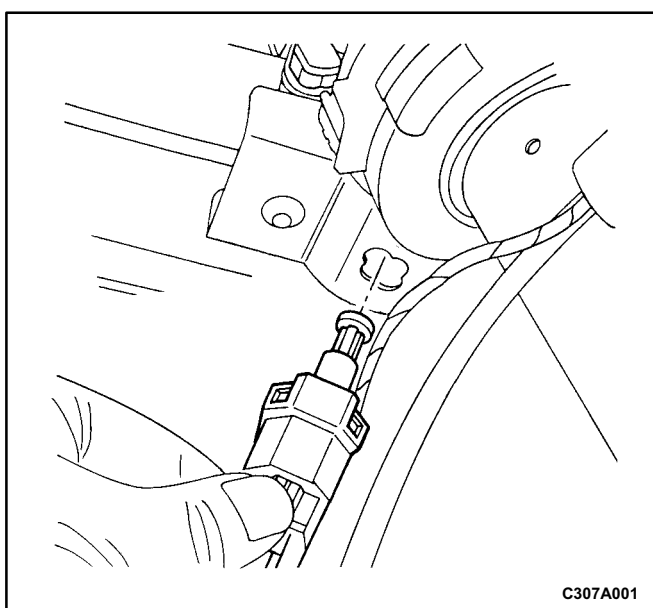
C107A011

STOPLAMP SWITCH

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

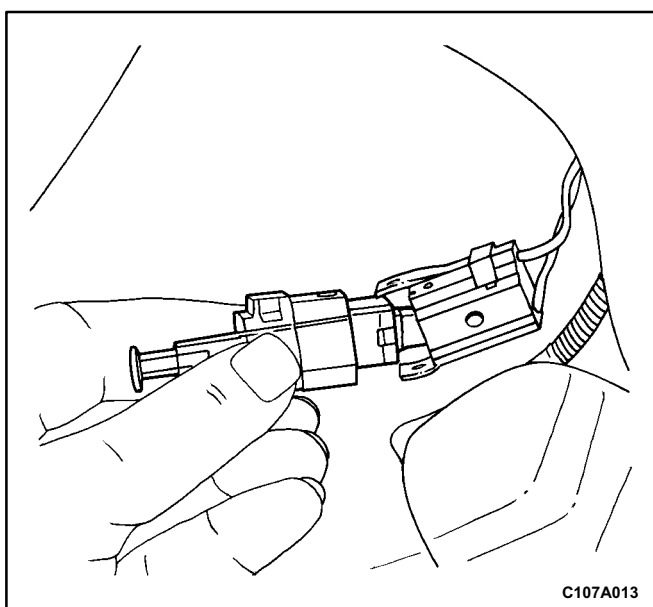
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the trim panel screws.
3. Remove the trim panel.



C307A001

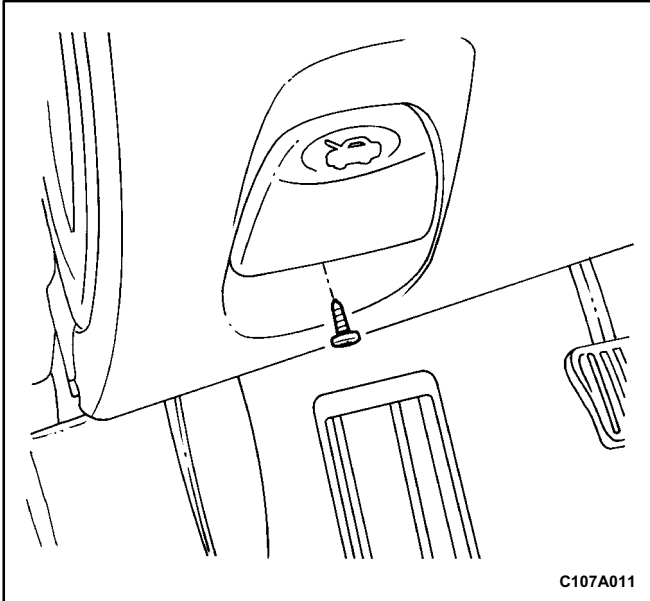
4. Turn the stoplamp switch connector assembly clockwise and remove it from the brake pedal bracket.
5. Separate the stoplamp switch from the connector.



C107A013

Installation Procedure

1. Place the stoplamp switch into the plug connector.
2. Twist the stoplamp switch connector assembly into the brake pedal bracket hole.

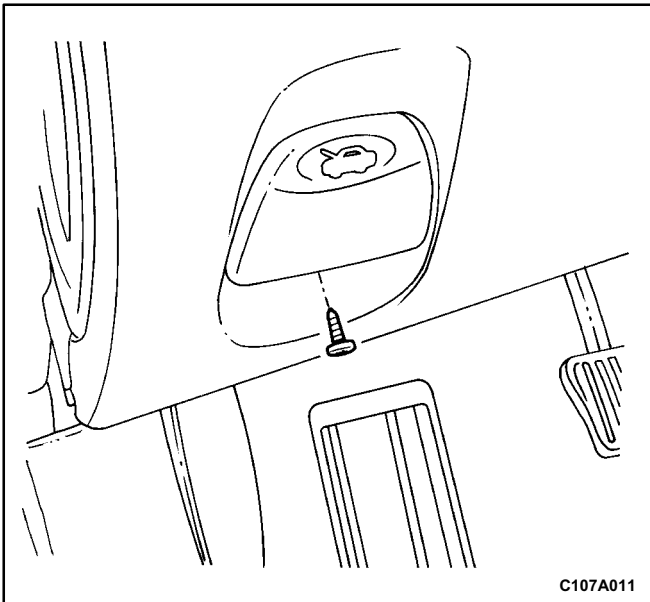


3. Press the brake pedal and pull the switch plunger to its maximum setting to adjust the switch.
4. Release the switch plunger and pull up on the pedal.
5. Install the trim panel with the screws.

Tighten

Tighten the trim panel screws to 3 N•m (27 lb•in).

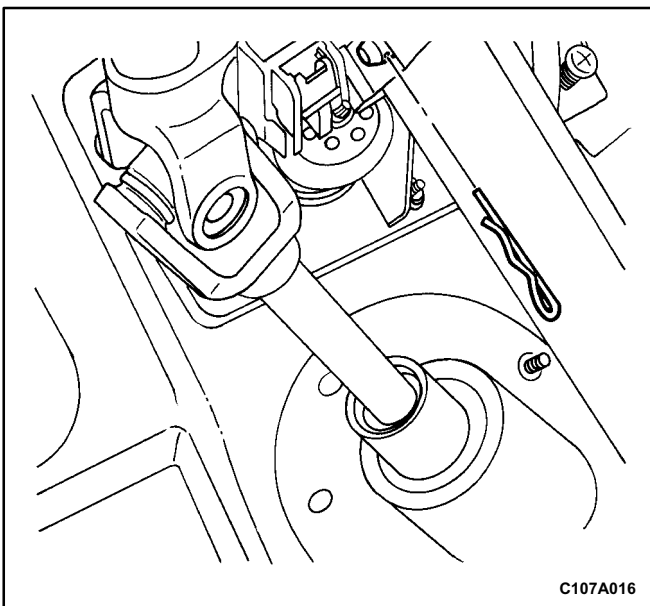
6. Connect the negative battery cable.



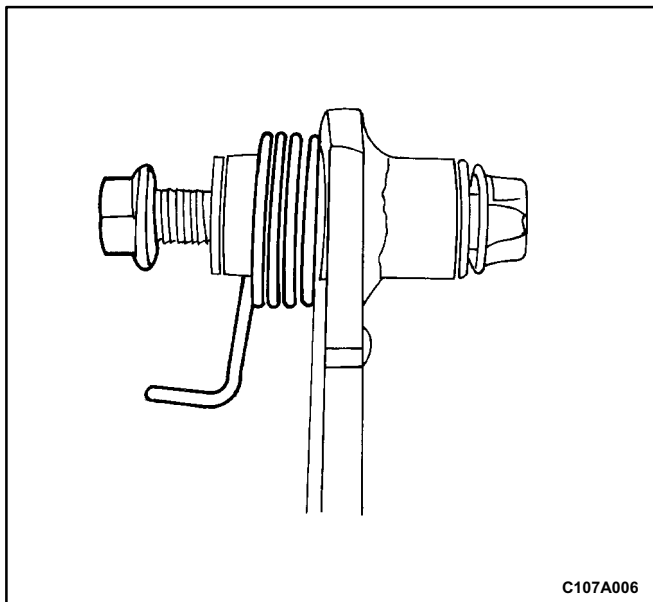
BRAKE PEDAL

Removal Procedure

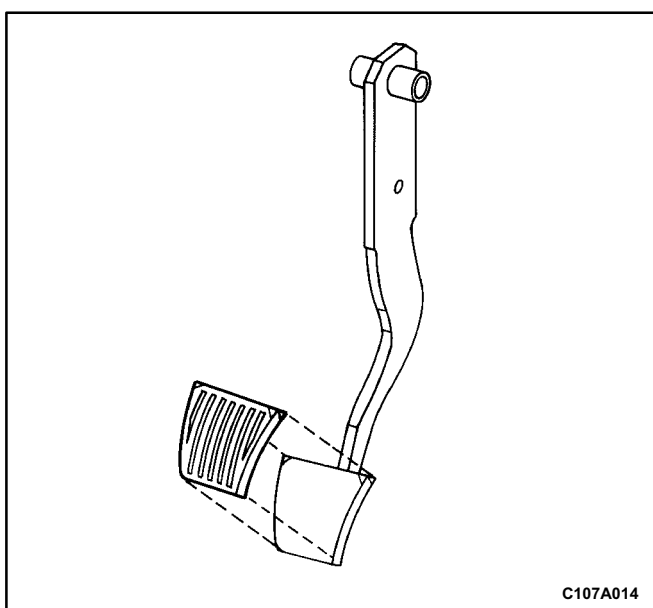
1. Remove the screws holding the trim panel to the instrument panel.
2. Remove the trim panel.



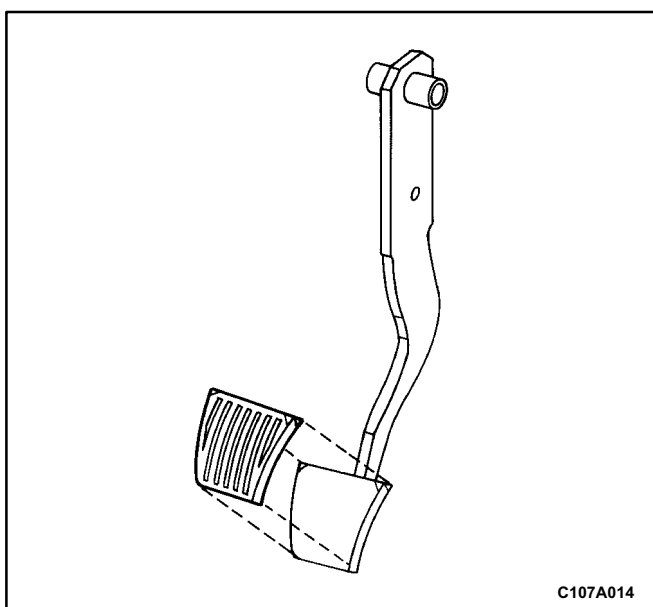
3. Remove the stoplamp switch. Refer to „Stoplamp Switch” in this section.
4. Disconnect the spring retaining clip and the pin from the pushrod clevis.



5. Remove the hex nut and the spring.
6. Remove the brake pedal and the bolt.

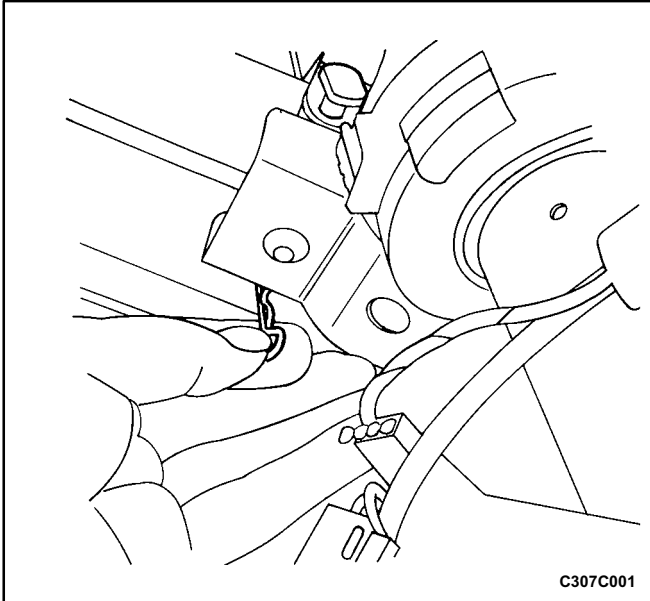


7. Remove the brake pedal cover (manual transaxle pedal shown).



Installation Procedure

1. Install a new pedal cover (manual transaxle pedal shown), if needed.

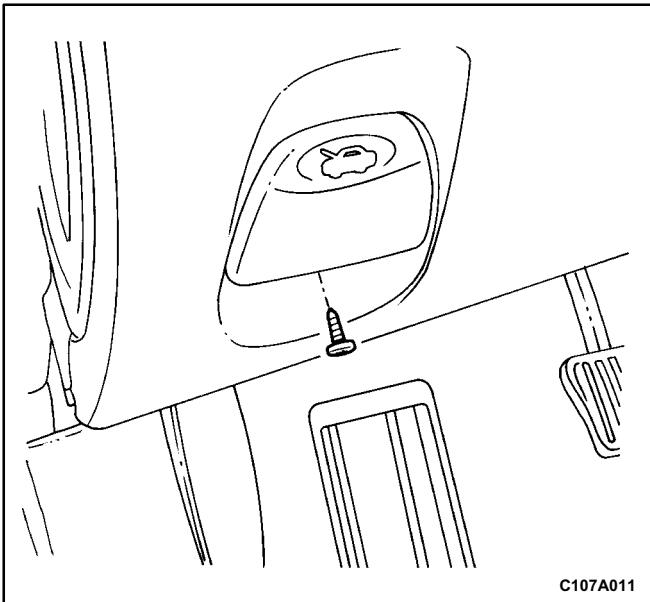


2. Coat the pedal shaft with grease.
3. Position the brake pedal on the pedal to dash panel bracket and the pedal bolt.
4. Place the hex nut and the spring on the pedal bolt.

Tighten

Tighten the brake pedal to pedal bracket hex nut to 18 N•m (13 lb•ft).

5. Install the push rod clevis to the pedal with the pin and the spring retaining clip.



6. Connect the stoplamp switch and connector assembly to the pedal bracket. Refer to „Stoplamp Switch” in this section.
7. Install the trim panel with the screws.

Tighten

Tighten the trim panel screws to 3 N•m (27 lb•in).

GENERAL DESCRIPTION AND SYSTEM OPERATION

WARNING LAMP OPERATION

This brake system uses a BRAKE warning lamp located in the instrument panel cluster. When the ignition switch is in the START position, the BRAKE warning lamp

should illuminate. It should go off when the ignition switch returns to the ON position.

The following conditions will activate the BRAKE warning lamp:

- The lamp should be on whenever the parking brake is applied and the ignition switch is in the ON position.
- A low fluid level in the master cylinder will turn the BRAKE lamp on.