

**Fig. 114 Shoe-to-anchor spring installation**

➔ **When servicing drum brakes, only disassemble and assemble one side at a time, leaving the remaining side intact for reference.**

4. Remove the front and rear shoe-to-anchor springs.
5. Remove the adjusting wheel spring and the adjuster.
6. Remove the strut and the strut return spring.
7. Remove the shoe hold-down cup, spring and pin.
8. Remove the shoe and lining assembly.
9. Unfasten the clips and the retaining bolts, then remove the parking brake cable(s).

**To install:**

10. Installation is the reverse of the removal procedure.
11. Install the adjuster so the shoe adjusting bolt of the left hand wheel is attached toward the front of

the vehicle and the shoe adjusting bolt of the right hand wheel is toward the rear of the vehicle.

12. The load on the respective shoe-to-anchor springs is different, so the spring in the figure has been painted, as shown in the accompanying figure.

**1997-00 Diamante**

♦ **See Figure 115**

1. Raise and safely support the vehicle securely on jackstands.
2. Remove the caliper assembly.
3. Remove the rear brake rotor.

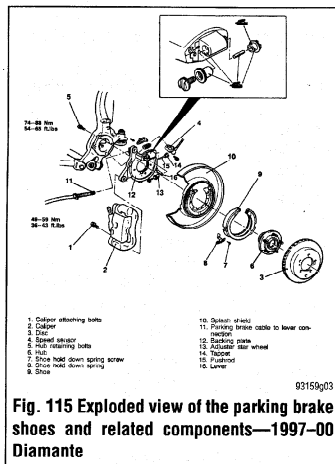
➔ **When servicing drum brakes, only disassemble and assemble one side at a time, leaving the remaining side intact for reference.**

4. Remove the shoe hold-down spring retaining screw.
5. Remove the shoe hold-down spring.
6. Remove the shoe assembly from the backing plate.
7. The installation is the reverse of removal.

**ADJUSTMENT**

1. Remove the floor console, release the lever and back off the cable adjuster locknut at the base of the lever.
2. Raise the vehicle, support safely and remove the wheel.

3. Remove the hole plug in the brake rotor.
4. Remove the brake caliper and hang out of the way with wire. Do not disconnect the fluid line.
5. Use a suitable prybar to pry up on the self-adjuster wheel until the rotor will not turn.
6. Return the adjuster 5 notches in the opposite direction. Make sure the rotor turns freely with a slight drag.
7. Install the caliper and check operation.



**Fig. 115 Exploded view of the parking brake shoes and related components—1997-00 Diamante**

**ANTI-LOCK BRAKE SYSTEM**

**General Information**

The 4-Wheel Anti-lock Brake System (ABS) is an electronically operated, all wheel brake control system. Major components include the vacuum power brake booster, master cylinder, the wheel speed sensors, the Hydraulic Control Unit (HCU), Anti-lock control unit, a relay, and on the AWD Galant, a G sensor.

The system is designed to retard wheel lockup during periods of high wheel slip when braking. Retarding wheel lockup is accomplished by modulating fluid pressure to the wheel brake units. When the control unit detects a variation in voltage across the wheel speed sensors, the ABS is activated. The control unit opens and closes various valves located inside the HCU. These valves, called dump and isolation valves, modulate the hydraulic pressure to the wheels by applying and venting the pressure to the brake fluid circuits.

**PRECAUTIONS**

- Certain components within the Anti-Lock Brake System (ABS) are not intended to be serviced or repaired individually. Only those components with removal and installation procedures should be serviced.
- Do not use rubber hoses or other parts not specifically specified for an ABS system. When using repair kits, replace all parts included in the kit. Partial or incorrect repair may lead to functional problems and require the replacement of components.

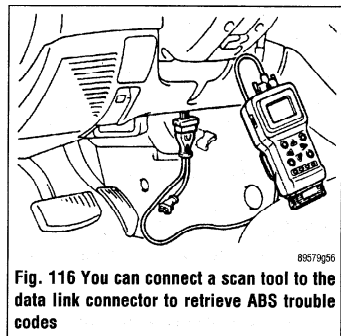
- Lubricate rubber parts with clean, fresh brake fluid to ease assembly. Do not use lubricated shop air to clean parts; damage to rubber components may result.
- Use only specified brake fluid from an unopened container.
- If any hydraulic component or line is removed or replaced, it may be necessary to bleed the entire system.
- A clean repair area is essential. Always clean the reservoir and cap thoroughly before removing the cap. The slightest amount of dirt in the fluid may plug an orifice and impair the system function. Perform repairs after components have been thoroughly cleaned; use only denatured alcohol to clean components. Do not allow ABS components to come into contact with any substance containing mineral oil; this includes used shop rags.
- The Anti-Lock control unit is a microprocessor similar to other computer units in the vehicle. Ensure that the ignition switch is **OFF** before removing or installing controller harnesses. Avoid static electricity discharge at or near the controller.
- If any arc welding is to be done on the vehicle, the control unit should be unplugged before welding operations begin.

**Diagnosis and Testing**

♦ **See Figures 116 thru 123**

The diagnosis of the ABS system is rather complex and requires quite a few special tools including scan

tools, special test harnesses and other special and expensive tools. Alternative methods and common sense can be substituted, however, We at Chilton feel that it is beyond the scope of the average do-it-yourselfer. If you experience the amber ANTI LOCK light on in the instrument cluster of your vehicle, check the fluid level in the master cylinder first. Low fluid level will usually illuminate the red BRAKE lamp in the instrument cluster as well as, but not always, the amber ANTI LOCK lamp in the instrument cluster. The low fluid level could indicate a leak, but sometimes just indicates low, worn brake linings that have caused the caliper pistons and wheel cylinders to extend further, and thus using more fluid to exert force on them. Inspect the brake system for hydraulic fluid leaks and also inspect the brake linings for excessive wear.



**Fig. 116 You can connect a scan tool to the data link connector to retrieve ABS trouble codes**

Diagnostic trouble code No.	Inspection item	Diagnostic content	Detection conditions
11	Right front wheel speed sensor	Open circuit	A, B
12	Left front wheel speed sensor		
13	Right rear wheel speed sensor		
14	Left rear wheel speed sensor		
15	Wheel speed sensor system	Abnormal output signal	B
16	Power supply system	Abnormal battery positive voltage	A, B
21	Right front wheel speed sensor	Excessive gap or short circuit	B
22	Left front wheel speed sensor		
23	Right rear wheel speed sensor		
24	Left rear wheel speed sensor		
38	Stop light switch system	Open circuit or ON malfunction	A, B
41	Right front solenoid valve system	No response to solenoid valve drive signal	A, B
42	Left front solenoid valve system		
43	Rear solenoid valve system		
51	Valve relay system	Valve relay OFF failure	A, B
53	Motor relay or motor system	Motor relay OFF failure and motor drive failure	B
63	ABS-ECU	Malfunction in ABS-ECU (program maze, etc.)	A, B

**Detection conditions**

- A: During system check immediately after starting
- B: When driving

**Fig. 117 ABS diagnostic trouble code list—1992–96 Diamante**

8957954

Diagnostic trouble code no.	Inspection item	Detection conditions
11	Front right wheel speed sensor	Open circuit
12	Front left wheel speed sensor	
13	Rear right wheel speed sensor	
14	Rear left wheel speed sensor	
15	Wheel speed sensor output signal abnormal	A, B
16	Power supply system	A, B, C
21	Front right wheel speed sensor	Short circuit
22	Front left wheel speed sensor	
23	Rear right wheel speed sensor	
24	Rear left wheel speed sensor	
38	Stop light switch system	B, C
41	Front right solenoid valve (inlet)	B, C
42	Front left solenoid valve (inlet)	
43	Rear right solenoid valve (inlet)	
44	Rear left solenoid valve (inlet)	
45	Front right solenoid valve (outlet)	B, C
46	Front left solenoid valve (outlet)	
47	Rear right solenoid valve (outlet)	
48	Rear left solenoid valve (outlet)	
51	Valve relay	A, B, C
53	Motor relay	R
63	ABS-ECU	A, B, C

**Detection conditions**

- A: During system check immediately after starting
- B: While ABS control is not operating while driving
- C: While ABS control is operating

**Fig. 118 ABS diagnostic trouble code list—1997–00 Diamante**

9316504

The ABS control unit performs system tests and self-tests during startup and normal operation. The valves, wheel sensors and fluid level circuits are monitored for proper operation. If a fault is found, the

ABS will be deactivated and the amber ANTI LOCK light will be lit until the ignition is turned OFF. When the light is lit, the Diagnostic Trouble Code (DTC) may be obtained. Under normal operation, the ANTI-

Diagnostic trouble code		Diagnostic trouble code	
No.	Scan tool (DRB-II) display letters	No.	Scan tool (DRB-II) display letters
11	FL SPD SENSOR	41	SOL V FRONT L
12	FR SPD SENSOR	42	SOL V FRONT R
13	RL SPD SENSOR	43	SOL V REAR
14	RFR SPD SENSOR	51	VALVE RLY
15	SENSOR FAULT	52	MOTOR RLY
22	STOP SW	55	ECU

8957953

**Fig. 119 ABS diagnostic trouble code list—1990–93 Galant**

LOCK warning lamp will flash either twice (FWD) or 4 times (AWD) vehicles, in about 1 second with the ignition switch **ON**, then the lamp will turn OFF.

The Diagnostic Trouble Codes (DTC) are an alphanumeric code and a scan tool, such as DRB-III, MUT-II or equivalent diagnostic scan tool, is required to retrieve the codes. Refer to the scan tool manufacturer's instructions for operating the tool and retrieving the codes.

The Data Link Connector (DLC) for the ABS is located under the dash on the driver's side. It is the same connector used for the electronic engine control system.

## Hydraulic Control Unit

### REMOVAL AND INSTALLATION

The Hydraulic Control Unit (HCU) is located in the engine compartment. It contains the solenoid valves and the pump/motor assembly which provides pressurized fluid for the anti-lock system when necessary. Hydraulic units are not interchangeable on any vehicles. Neither unit is serviceable; if any fault occurs within the hydraulic unit, the entire unit must be replaced.

#### Diamante

♦ **See Figure 124**

1. Disconnect the negative battery cable.
2. Remove the splash shield from beneath the vehicle.
3. Use a syringe or similar device to remove as much fluid as possible from the reservoir. Some fluid will be spilled from lines during removal of the hydraulic unit; protect adjacent painted surfaces.

### \*\* CAUTION

**Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes and wash your hands thoroughly after handling brake fluid. If you do get brake fluid in your eyes, flush your eyes with clean, running water for 15 minutes. If eye irritation persists, or if you have taken brake fluid internally, IMMEDIATELY seek medical assistance.**

4. Lift the relay box with the harness attached and position it aside.
5. Remove the air intake duct.
6. Disconnect the brake lines from the hydraulic unit. Correct reassembly is critical. Label or identify the lines before removal. Plug each line immediately

Diagnostic trouble code no.	Inspection item	Detection conditions
11	Front right wheel speed sensor	Open circuit
12	Front left wheel speed sensor	
13	Rear right wheel speed sensor	
14	Rear left wheel speed sensor	
16	Power supply system	Short circuit
21	Front right wheel speed sensor	
22	Front left wheel speed sensor	
23	Rear right wheel speed sensor	
24	Rear left wheel speed sensor	Excessive gap
25	Front right wheel speed sensor	
26	Front left wheel speed sensor	
27	Rear right wheel speed sensor	
28	Rear left wheel speed sensor	Pulse processing (wheel speed input corresponding to a vehicle speed of 300 km/h (186 mph) or more)
33	Stop light switch system	
35	Front right wheel speed sensor	
36	Front left wheel speed sensor	
37	Rear right wheel speed sensor	ON impossible
38	Rear left wheel speed sensor	
41	Front right solenoid valve (inside)	
42	Front left solenoid valve (inside)	
43	Rear right solenoid valve (inside)	OFF impossible
44	Rear left solenoid valve (inside)	
45	Front right solenoid valve (outside)	
46	Front left solenoid valve (outside)	
47	Rear right solenoid valve (outside)	ON impossible
48	Rear left solenoid valve (outside)	
51	Valve relay	
52	Valve relay	
53	Motor relay	ON impossible
54	Motor relay	

**Detection conditions**

- A. During system check immediately after starting
- B. While ABS control is not operating while driving
- C. While ABS control is operating

93159j05

Fig. 120 ABS diagnostic trouble code list—1994-98 Galant

DIAGNOSTIC TROUBLE CODE NO.	INSPECTION ITEM	DIAGNOSTIC CONTENT
11	Front right wheel speed sensor	Open circuit or short circuit
12	Front left wheel speed sensor	
13	Rear right wheel speed sensor	
14	Rear left wheel speed sensor	
16	Power supply system	ABS-ECU power supply voltage below or above the standard value. Not displayed if the voltage recovers.
21	Front right wheel speed sensor	
22	Front left wheel speed sensor	Open circuit or short circuit
23	Rear right wheel speed sensor	
24	Rear left wheel speed sensor	
38	Stoplight switch system	
41	Solenoid valve inside hydraulic unit	Open circuit or short circuit
42	ABS-ECU	
51	Hydraulic unit solenoid valve relay open or short circuit	
53	Malfunction of hydraulic unit	
63	ABS-ECU	

93159j06

Fig. 121 ABS diagnostic trouble code list—1999-00 Galant

Diagnostic trouble code No.	Inspection item	Diagnosis content
11	Front right wheel speed sensor	Open circuit
12	Front left wheel speed sensor	
13	Rear right wheel speed sensor	
14	Rear left wheel speed sensor	
15	Open circuit in sensor	Open circuit in sensor
18	Drop of battery voltage	Drop of ABS operation voltage
21	Front right wheel speed sensor	Short circuit
22	Front left wheel speed sensor	
23	Rear right wheel speed sensor	
24	Rear left wheel speed sensor	
25	Both rear wheel speed sensors	Open circuit in both rear wheel speed sensors, short circuit
31	Rotor of front right wheel speed sensor	Chipped tooth of rotor
32	Rotor of front left wheel speed sensor	Drop of generator output voltage
33	Rotor of rear right wheel speed sensor	
34	Rotor of rear left wheel speed sensor	
35	Generator	
41	Front right solenoid valve	No response to solenoid valve drive signal
42	Front left solenoid valve	
43	Rear right solenoid valve	
44	Rear left solenoid valve	
51	Valve relay 1	Detection impossible in OFF condition
52	Valve relay 2	Detection impossible in ON condition
53	Motor relay, motor 1	ON impossible
54	Motor relay, motor 2	OFF impossible
55	Sticking of motor	Motor operation impossible
62	Malfunction inside hydraulic unit	Hydraulic pressure reduction impossible
63	Malfunction inside ABS-ECU	Irregular program, etc.

93159j07

Fig. 122 ABS diagnostic trouble code list—1993-96 Mirage

Diagnostic trouble code no.	Inspection item	Diagnostic content
11	Front right wheel speed sensor	Open circuit or short circuit
12	Front left wheel speed sensor	
13	Rear right wheel speed sensor	
14	Rear left wheel speed sensor	
15	Wheel speed sensor	Abnormal output signal
16	Power supply system	
21	Front right wheel speed sensor	Open circuit or short circuit
22	Front left wheel speed sensor	
23	Rear right wheel speed sensor	
24	Rear left wheel speed sensor	
33	Stop light switch system	Abnormal output signal
41	Front right solenoid valve (inside)	
42	Front left solenoid valve (inside)	
43	Rear right solenoid valve (inside)	
44	Rear left solenoid valve (inside)	Abnormal output signal
51	Valve relay	
53	Motor relay, motor	
63	ABS-ECU	

93159j08

Fig. 123 ABS diagnostic trouble code list—1997-00 Mirage

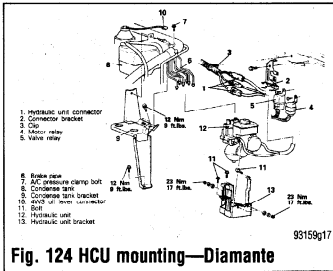


Fig. 124 HCU mounting—Diamante

after removal. It will be necessary to hold the relay box aside to allow wrench access.

7. Detach the wiring harness connections at the hydraulic unit.

8. Disconnect the hydraulic unit ground strap from the chassis.

9. Remove the 3 bolts holding the hydraulic unit bracket. Remove the unit and the bracket.

➔ **The hydraulic unit is heavy; use care when removing it. The unit must remain in the upright position at all times and be protected from impact and shock.**

10. Set the unit upright, supported by blocks on the workbench. The hydraulic unit must not be tilted or turned upside down. No component of the hydraulic unit should be loosened or disassembled.

11. Loosen the nut holding the bracket to the hydraulic unit and remove the bracket.

12. Disconnect the external ground wire from the bracket.

#### To install:

13. Install the bracket if removed.

14. Connect the ground wire to the bracket.

15. Install the hydraulic unit into the vehicle, keeping it upright at all times.

16. Install the retaining nuts and tighten.

17. Connect the hydraulic unit wiring harness.

18. Connect each brake line loosely to the correct port and double check the placement. Tighten each line to 11 ft. lbs. (15 Nm).

19. Fill the reservoir to the MAX line with brake fluid.

20. Bleed the master cylinder, then bleed the brake lines.

21. Secure the relay box in position and install the air duct.

22. Install the splash shield.

#### Galant and Mirage

##### ➔ See Figures 125 and 126

1. Use a syringe or similar device to remove as much fluid as possible from the reservoir. Some fluid will be spilled from lines during removal of the hydraulic unit; protect adjacent painted surfaces.

#### ⚠ CAUTION

**Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes and wash your hands thoroughly after handling brake fluid. If you do get brake fluid in your eyes, flush your eyes with clean, running water for 15 minutes. If eye irritation persists,**

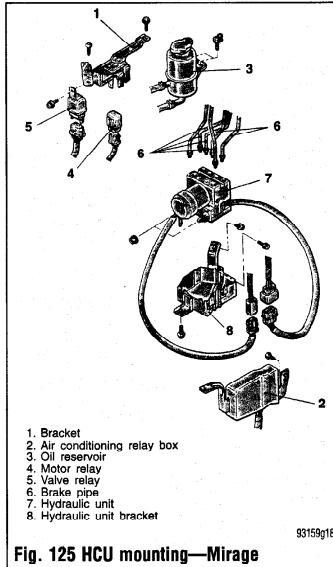


Fig. 125 HCU mounting—Mirage

**or if you have taken brake fluid internally, IMMEDIATELY seek medical assistance.**

2. Remove the splash shield from the left front wheel house or fender area.

3. Remove the coolant reserve tank.

4. Remove the coolant reservoir bracket.

5. Remove the dust shield from below the hydraulic unit.

6. Disconnect the brake hoses and lines from the hydraulic unit. Correct reassembly is critical. Label or identify the lines before removal. Plug each line and each port immediately after removal.

7. Remove the cover from the relay box. Disconnect the electrical harness to the hydraulic unit.

8. Remove the bolts holding the 3 mounting brackets to the vehicle; remove the unit downward and out of the vehicle.

➔ **The hydraulic unit is heavy; use care when removing it. The unit must remain in the upright position at all times and be protected from impact and shock.**

9. Set the unit upright, supported by blocks on the workbench. The hydraulic unit must not be tilted or turned upside down. No component of the hydraulic unit should be loosened or disassembled.

10. The brackets and relays may be removed if desired.

#### To install:

11. Install the brackets and relays if they were removed. Tighten the bracket bolts to 16 ft. lbs. (22 Nm).

12. Install the hydraulic unit into the vehicle, keeping it upright at all times.

13. Install the retaining bolts holding the brackets to the vehicle. Tighten the bolts to 16 ft. lbs. (22 Nm).

14. Connect the hydraulic unit wiring harness.

15. Install the cover on the relay box.

16. Connect each brake line loosely to the correct port and double check the placement. Tighten each line to 10 ft. lbs. (13 Nm).

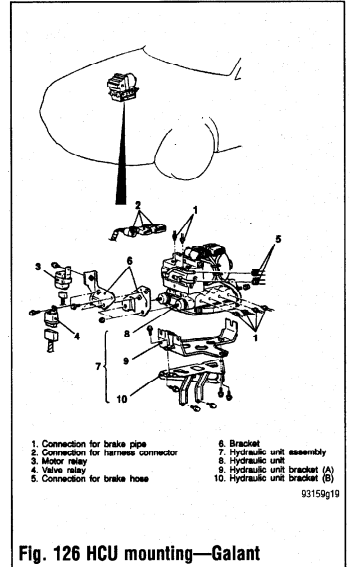


Fig. 126 HCU mounting—Galant

17. Fill the reservoir to the MAX line with brake fluid.

18. Bleed the brake system.

19. Install the dust shield and the coolant reserve tank with its bracket.

20. Install the fender splash shield.

21. Check ABS system function by turning the ignition **ON** and observing the dashboard warning lamp. Test drive the vehicle and confirm system operation.

#### Anti-Lock Control Unit

#### REMOVAL AND INSTALLATION

##### ➔ See Figures 127 and 128

1. Ensure that the ignition switch is OFF throughout the procedure.

2. For Galant and Diamante models, remove the left side luggage compartment trim panel.

3. For Mirage models, remove the floor console assembly.

4. Release the lock on the bottom of the connector. Detach the multi-pin connector from the control unit.

5. Remove the retaining nuts and remove the control unit from its bracket. The bracket may be removed if desired.

#### To install:

6. Place the bracket in position if it was removed. Install the controller and tighten the retaining nuts.

7. Connect the ground wire to the bracket, if removed. Insure a proper, tight connection. The ground must be connected before the multi-pin harness is connected.

8. Attach the multi-pin connector and secure the lock.

9. Install the luggage compartment trim or the floor console.